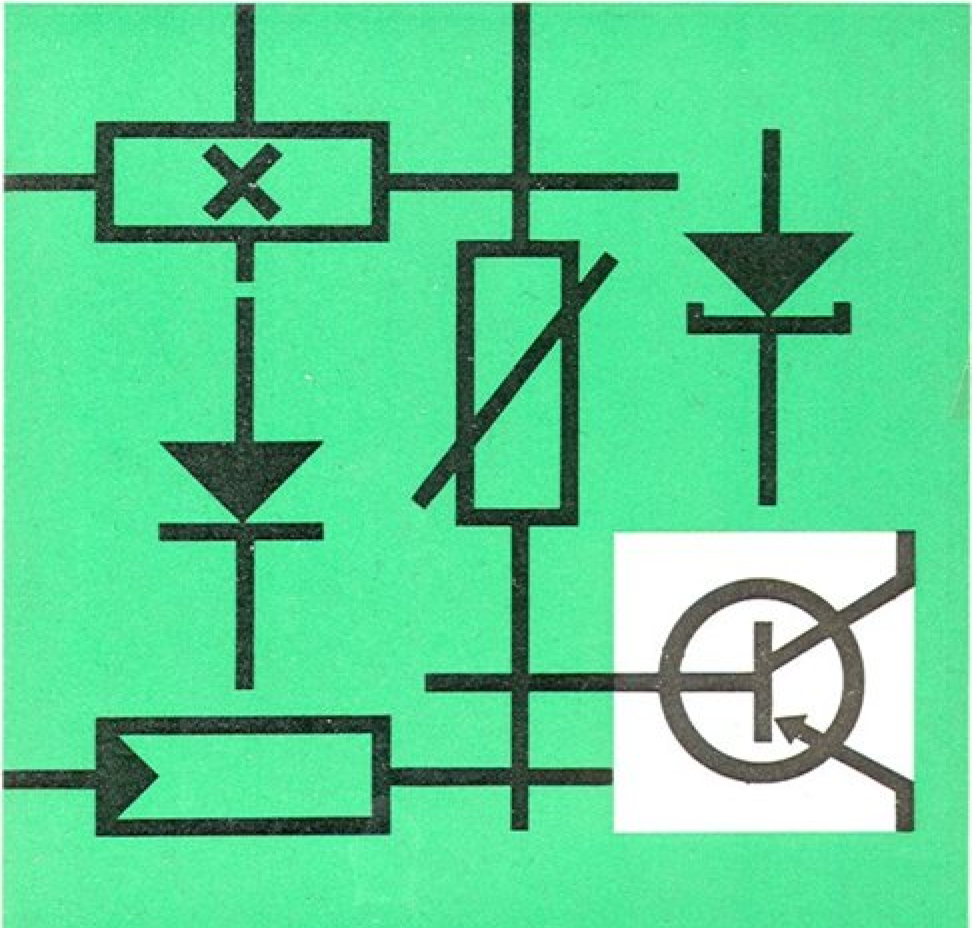
SIEMENS

Semiconductor Manual
Discrete Industrial Types

1974

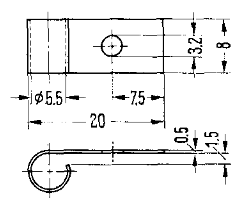


PNP Transistors for AF pre-stages

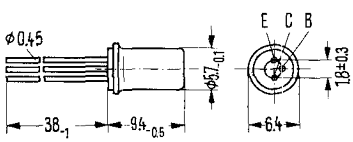
The ACY 23 and ACY 32 are alloyed germanium PNP transistors in the case 1 A 3 DIN 41871 (sim. TO-1). The leads are electrically insulated from the case. The collector terminal is indicated by a red dot on the case rim. The transistors are designed for use in AF prestages.

Type	Order number
ACY 23 V	Q 60103 – Y23 – E
ACY 23 VI	Q 60103 – Y23 – F
ACY 32 V	Q 60103 – Y32 – E
ACY 32 VI	Q 60103 – Y32 – F
Heat sink	Q 62901 – B1

Mounting flange (heat sink)



With careful mounting, thermal resistance between transistor case and heat sink under the fastening screw $R_{th} \leqq 10$ K/W



Weight approx. 1 g Dimensions in mm

Maximum ratings		ACY 23, ACY 32	
Collector-emitter voltage	$-V_{CEO}$	30	V
Collector-emitter voltage ($V_{BE} \geqq 0.2$ V)	$-V_{CEV}$	32	
Collector-base voltage	$-V_{CBO}$	32	V
Emitter-base voltage	$-V_{EBO}$	16	V
Collector current	$-I_C$	200	mA
Base current	$-I_B$	40	mA
Junction temperature	T_j	90	°C
Storage temperature	T_s	−55 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	900	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦300	K/W
Junction to case	$R_{thJcase}$	≦50	K/W

Static characteristics ($T_{amb}=25$ °C)

		ACY 23 ACY 32		
	T_{amb}	25	60	°C
Collector-base cutoff current ($-V_{CBO}=10$ V)	$-I_{CBO}$	3 (<10)	60 (<100)	µA
Collector-base cutoff current ($-V_{CBO}=32$ V)	$-I_{CBO}$	5 (<18)	<150	µA
Collector-emitter cutoff current ($-V_{CEV}=32$ V; $V_{BE} \geqq 0.2$ V)	$-I_{CEV}$	5 (<18*	<50	µA
Emitter-base cutoff current ($-V_{EBO}=16$ V)	$-I_{EBO}$	4 (<18)*	<120	µA

Static characteristics ($T_{amb}=25$ °C) **ACY 23, ACY 32**

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ V
0.5	2	30	67	0.13 (<0.2)
0.5	10	137	73	0.18 (<0.3)
0.5	100	1560	64	0.32 (<0.55)

Collector-emitter saturation voltage ($-I_C=100$ mA; $I_B=5$ mA)	$-V_{CEsat}$	0.11 (<0.18)	V
Collector-emitter saturation voltage ($-I_C=200$ mA on that characteristic that) at constant base current, passes through point $-I_C=220$ mA and $-V_{CE}=0.5$ V)	$-V_{CEsat}$	0.25 (<0.4)	V

Dynamic characteristics($T_{amb}=25$ °C)
The transistors ACY 23 and ACY 32 are classified in groups of dynamic current gain h_{fe}which are indicated by Roman numerals.

Test condition: $-I_C=1$ mA; $-V_{CE}=5$ V; $f=1$ kHz

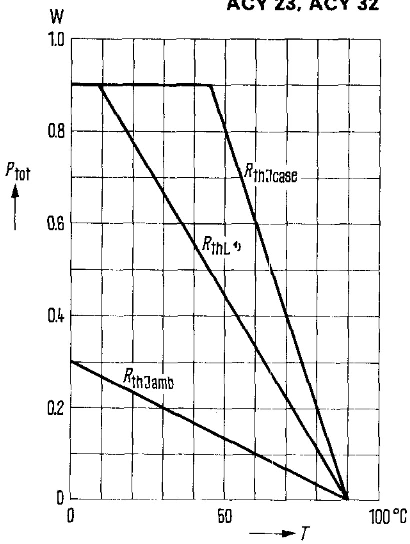
h_{fe} group	V	VI
Current gain h_{fe}	50 to 150	75 to 150*

Dynamic characteristics

($T_{amb}=25$ °C)		ACY 23	ACY 32	
Test condition: $-I_C=1$ mA; $-V_{CE}=5$ V				
Current gain-bandwidth product	f_T	1.5 (>0.5)	1.5 (>0.5)	MHz
Base series resistance	$r_{bb'}$	75 (<200)	75 (<200)	Ω
Collector junction capacitance	$C_{b'c}$	27	27	pf
Noise figure: ($-I_C=0.5$ mA; $-V_{CE}=5$ V; $f=1$ kHz; $\Delta f=200$ Hz; $R_g=500$ Ω)	NF	4 (<10)*	3 (<6)*	db
Test condition:	h_{11e}	3 (1.2 to 5)	3 (1.2 to 5)	kΩ
$-I_C=1$ mA; $-V_{CE}=5$ V;	h_{12e}	7 (<15)	7 (<15)	$\cdot 10^{-4}$
$f=1$ kHz	$h_{fe}=h_{21e}$	100 (50 to 150)	100 (50 to 150)	–
	h_{22e}	40 (>75)	40 (<75)	µmhos

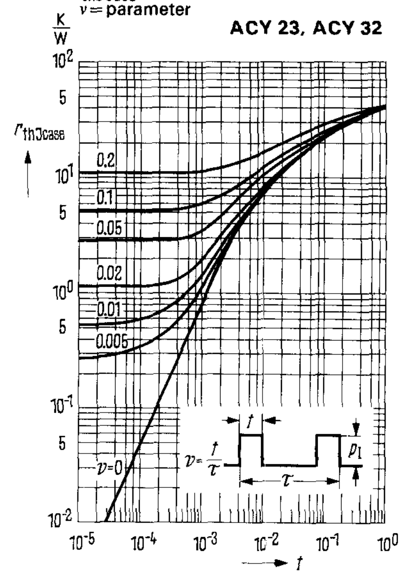
* AQL=0.65%

Maximum power dissipation
$P_{tot} = f(T)$
R_{th} = parameter

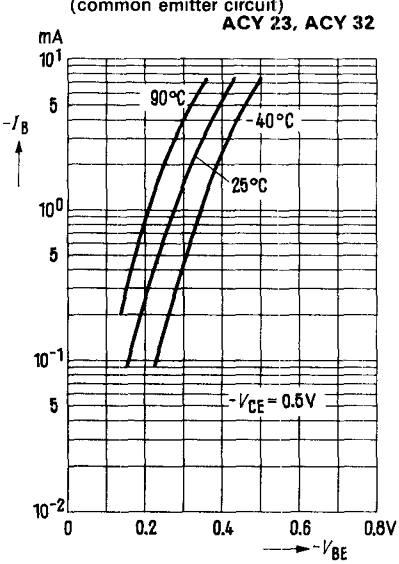


1) heat sink: Aluminium 12.5 cm², 2 mm thick

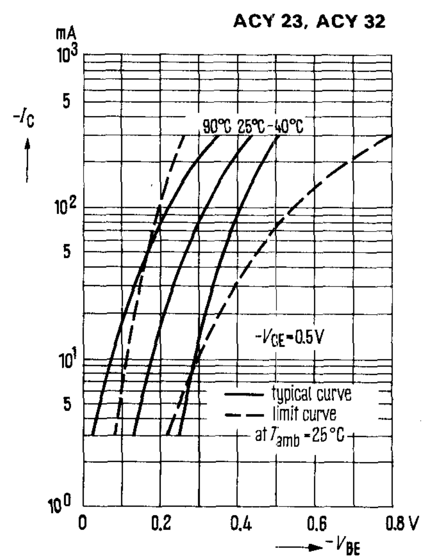
Permissible pulse load
$r_{thJcase} = f(t)$
v = parameter



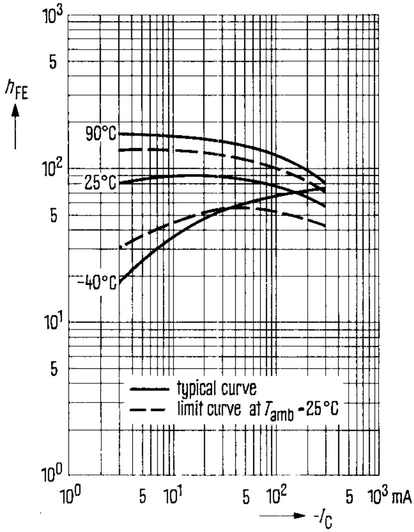
Input characteristics $I_B = f(V_{BE})$
$-V_{BE} = 0.5$ V; T_{amb} = parameter
(common emitter circuit)



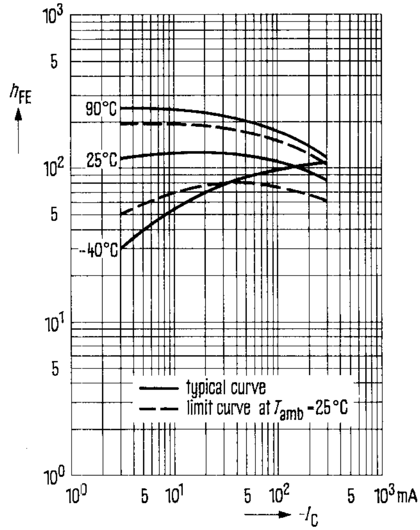
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{amb} = parameter



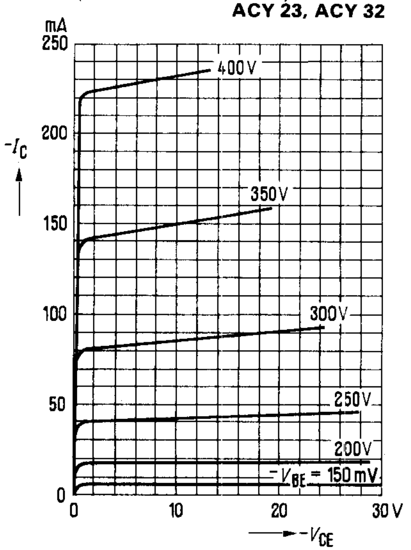
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
(common emitter circuit)
ACY 23 V, ACY 32 V



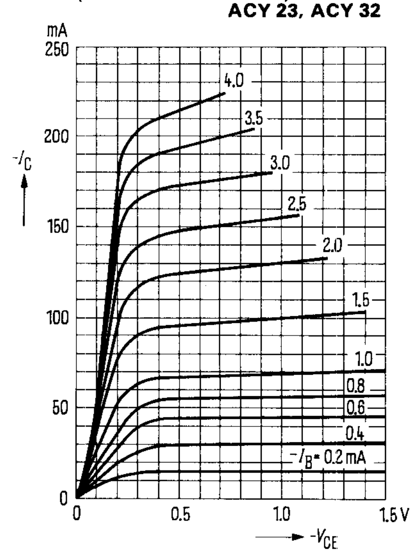
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
(common emitter circuit)
ACY 23 VI, ACY 32 VI



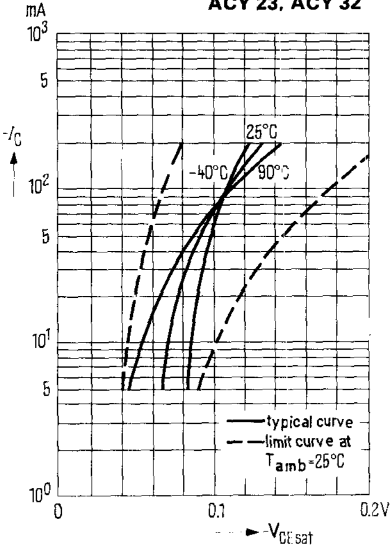
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
ACY 23, ACY 32



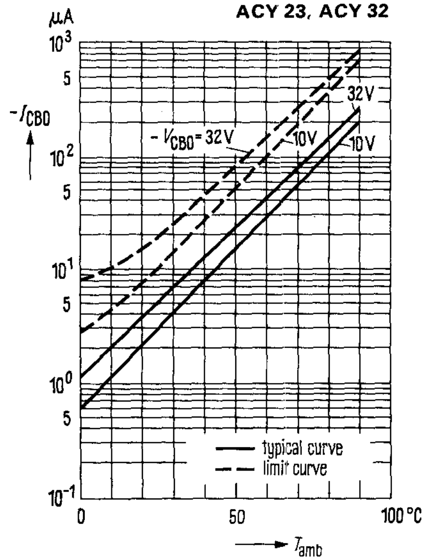
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
ACY 23, ACY 32



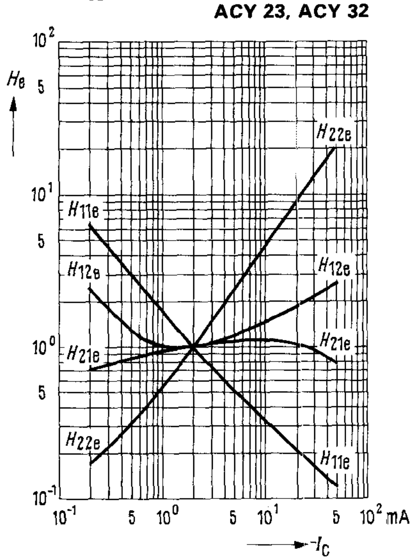
Collector saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter
(common emitter circuit)
ACY 23, ACY 32



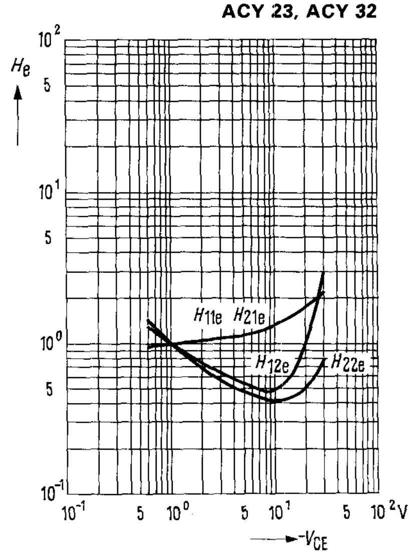
Cutoff current vs. temperature
$I_{CBO} = f(T_{amb})$
$-V_{CBO} = 32$ V; $-V_{CBO} = 10$ V
ACY 23, ACY 32



Small-signal characteristics
$$H_e = \frac{h_e(I_C)}{h_e(I_C = -2\text{ mA})} = f(I_C)$$
$-V_{CE} = 1$ V; $f = 1$ kHz
ACY 23, ACY 32

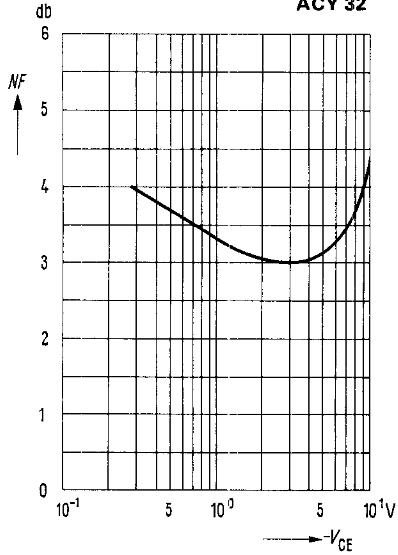


Small-signal characteristics
$$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = -1\text{ V})} = f(V_{CE})$$
$-I_C = 2$ mA; $f = 1$ kHz
ACY 23, ACY 32

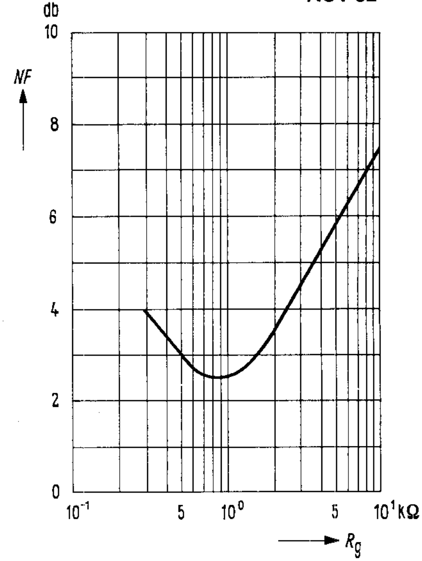


Noise figure $NF = f(V_{CE})$
$R_g = 500\ \Omega$; $f = 1$ kHz
$-I_C = 0.5$ mA

ACY 32

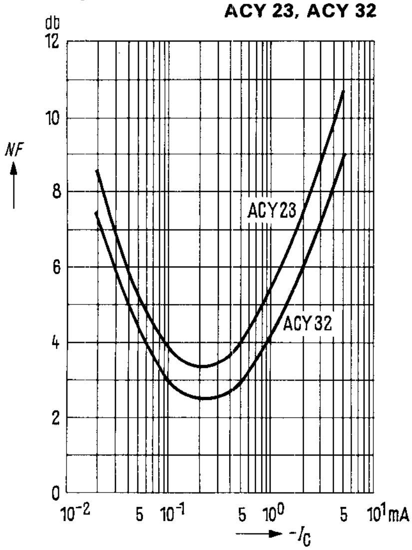


Noise figure as a function of the generator resistance $NF = f(R_g)$
$f = 1$ kHz $-I_C = 0.5$ mA; $-V_{CE} = 5$ V
ACY 32



Noise figure $NF = f(I_C)$
$R_g = 500\ \Omega$; $f = 1$ kHz
$V_{CE} = 5$ V

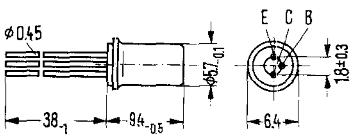
ACY 23, ACY 32



PNP Transistor for AF-driver and power stages

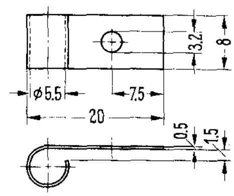
The ACY 33 is a germanium PNP alloyed transistor in a case 1 A 3 DIN 41 871 (similar TO−1). All leads are electrically insulated from the case. The collector terminal is indicated by a red dot on the rim of the case.
For mounting the transistor on a chassis, mounting flange (heat sink) Q 62901 − B1 is available. This part has to be ordered separately.
The ACY 33 is designed for high-quality AF driver and power stages of medium output. For use in push-pull stages, these transistors are available in pairs.

Type	Order number
ACY 33 VI	Q 60103−Y33−F
ACY 33 VII	Q 60103−Y33−G
ACY 33 VIII	Q 60103−Y33−H
ACY 33 paired	Q 60103−Y33−P
Heat sink	Q 60901 − B1



Weight approx. 1 g   Dimensions in mm

Mounting flange (heat sink)



With careful mounting, thermal resistance between transistor case and heat sink under the fastening screw $R_{th} \leqq 10$ K/W

Maximum ratings

		ACY 33	
Collector-emitter voltage	$-V_{CEV}$	32	V
Collector-emitter voltage ($R_{BE} \leqq 500\ \Omega$)	$-V_{CER}$	32	V
Collector-base voltage	$-V_{CBO}$	32	V
Emitter-base voltage	$-V_{EBO}$	10	V
Collector current	$-I_C$	1	A
Base current	$-I_B$	200	mA
Junction temperature	T_j	90	°C
Storage temperature	T_S	−55 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	1.1	W

Thermal resistance

Junction to ambient air	R_{thJamb}	≦300	K/W
Junction to case	$R_{thJcase}$	≦40	K/W

Static characteristics (T_{amb}=25 °C)

The transistors ACY 33 are classified in groups of DC current gain at $-I_C$=300 mA, which are indicated by Roman numerals.
The following values apply at a collector voltage of V_{CB}=0 V

h_{FE} group	VI	VII	VIII	ACY 33
$-I_C$ mA	B I_C/I_B	B I_C/I_B	B I_C/I_B	$-V_{BE}$ V
50	97	167	230	0.22 (<0.3)
300	110 (75 to 150) *	190 (125 to 250) *	260 (175 to 350)	0.32 (<0.45) *
1000	100	173	240	0.43 (<0.70)

		ACY 33	
Collector-emitter saturation voltage ($-I_C$=1 A; I_B=50 mA)	$-V_{CEsat}$	0.16 (0.5) *	V
Collector-emitter saturation voltage ($-I_C$=1 A on that characteristic passing through the point I_C=1.1 A; V_{CE}=1 V constant base current assumed.)	$-V_{CEsat}$	0.35 (<0.6)	V

	T_{amb}	60	25	°C
Collector base cutoff current ($-V_{CBO}$=10 V)	$-I_{CBO}$	–	<10	µA
Collector-emitter cutoff current ($-V_{CEV}$=32 V; $V_{BE}\geqq$1 V)	$-I_{CEV}$	<330	<50 *	µA
Collector-base cutoff current ($-V_{CBO}$=32 V)	$-I_{CBO}$	<330	<50	µA
Emitter-base cutoff current ($-V_{EBO}$=10 V)	$-I_{EBO}$	<280	<50 *	µA

Pairing condition

Relation of the current gains h_{FE1} and h_{FE2} of paired transistors:

Test condition: $-I_C$=50 mA; V_{CB}=0	$\frac{h_{FE1}}{h_{FE2}}$	1.1 (<1.25)	–
Test condition: $-I_C$=300 mA; V_{CB}=0	$\frac{h_{FE1}}{h_{FE2}}$	1.1 (<1.25)	–

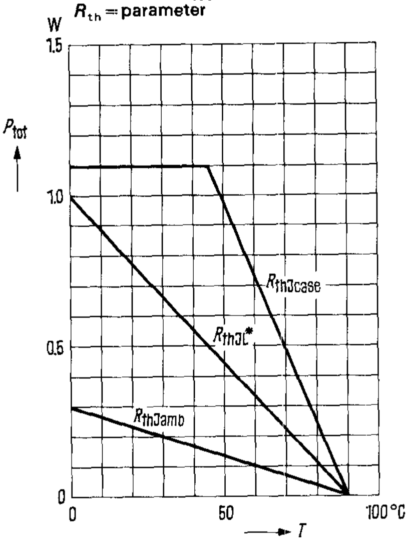
* AQL=0.65%

Dynamic characteristics (T_{amb}=25 °C)		ACY 33	
Test condition: $-I_C$=10 mA; $-V_{CE}$=2 V			
Current gain-bandwidth product	f_T	1.5 (>1)	MHz
Cutoff frequency in common emitter circuit	f_β	15 (>10)	kHz
Test condition: $-I_C$=1 mA; $-V_{CE}$=5 V			
Base series resistance	$r_{bb'}$	25	Ω
Test condition: $-V_{CBO}$=5 V			
Collector-base capacitance	C_{CBO}	100	pf

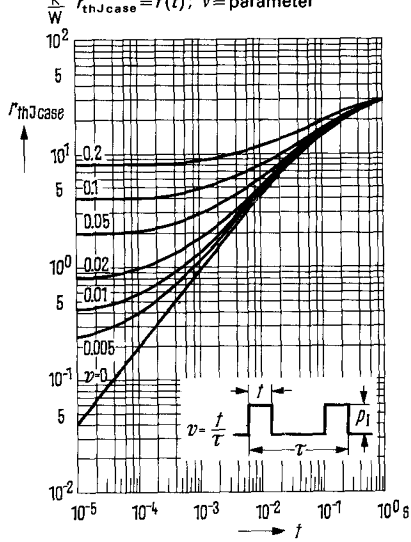
Linearity of the current gain

Test condition: V_{batt}=10 V; R_{CC}=16 Ω			
Quotient resulting from the dynamic operating current gain G_p at $-I_C$=500 mA ($G_{p\,500}$) divided by the maximum operating current gain (G_{pmax})	$\frac{G_{p500}}{G_{pmax}}$	0.6 (>0.5)	–

Maximum permissible power dissipation $P_{tot}=f(T)$
R_{th}=parameter

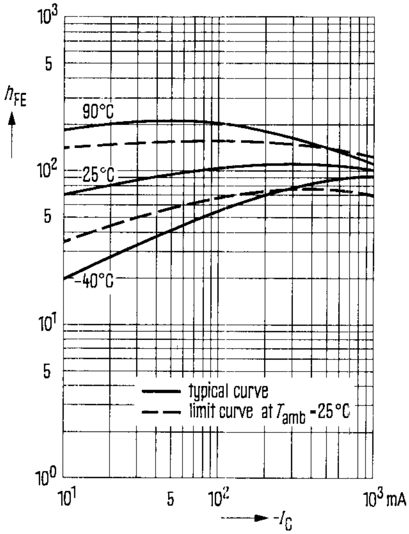


Permissible impulse load
$r_{thJcase}=f(t)$; v=parameter

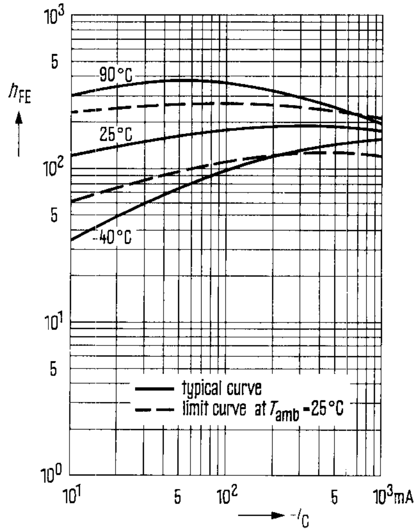


[1]) heat sink aluminium 12.5 cm², 2 mm thick

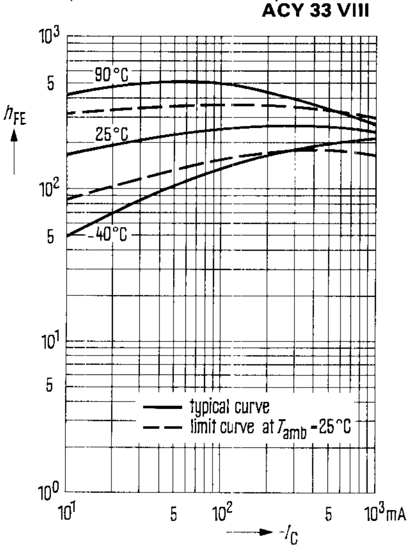
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=25$ °C
(common emitter circuit)
ACY 33 VI



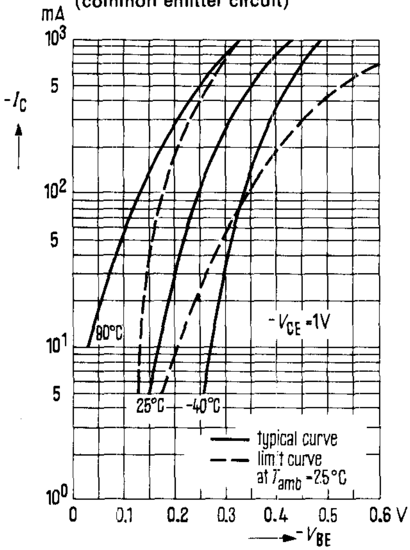
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=25$ °C
(common emitter circuit)
ACY 33 VII



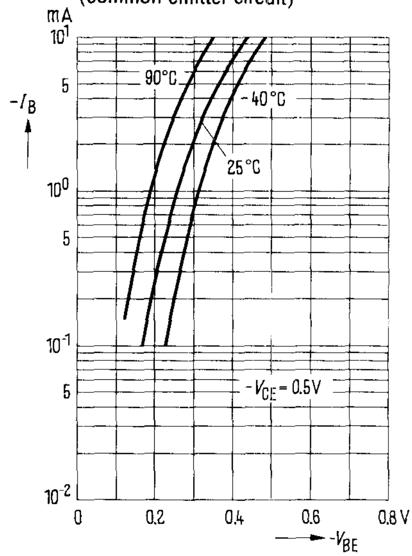
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=25$ °C
(common emitter circuit)
ACY 33 VIII



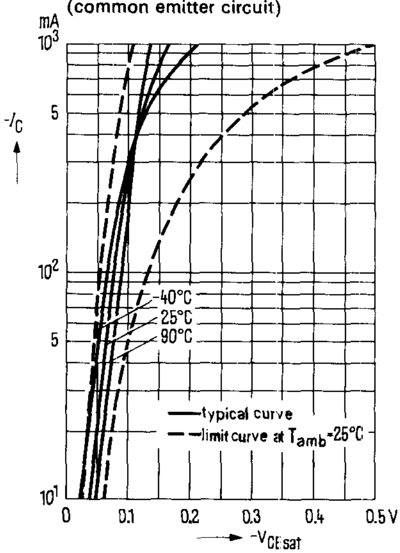
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 1$ V; T_{amb} = parameter
(common emitter circuit)



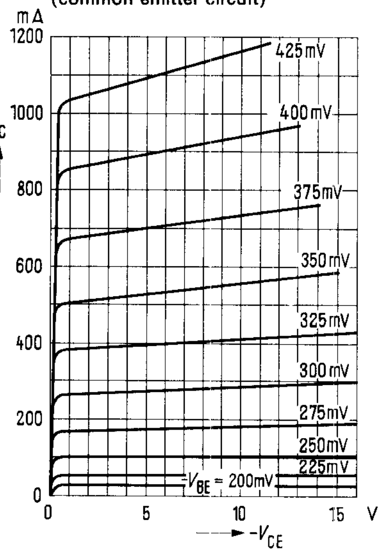
Input characteristics $I_B = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
(common emitter circuit)



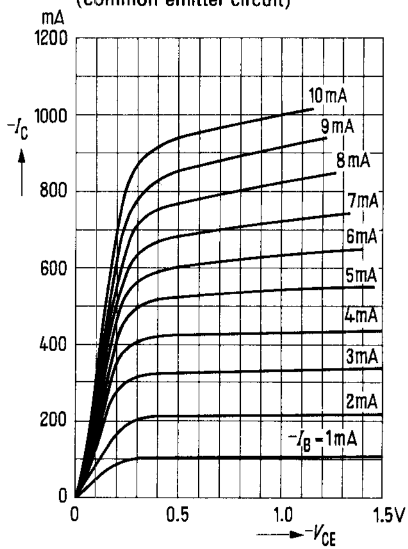
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter
(common emitter circuit)



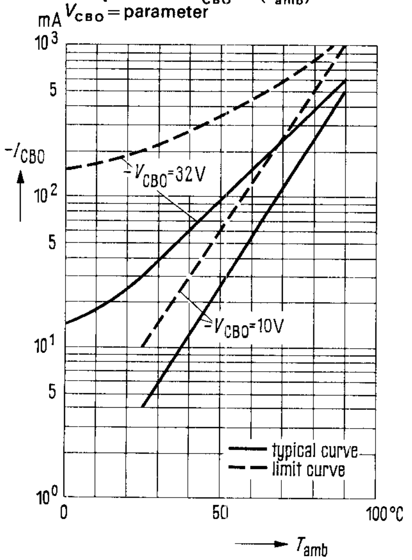
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



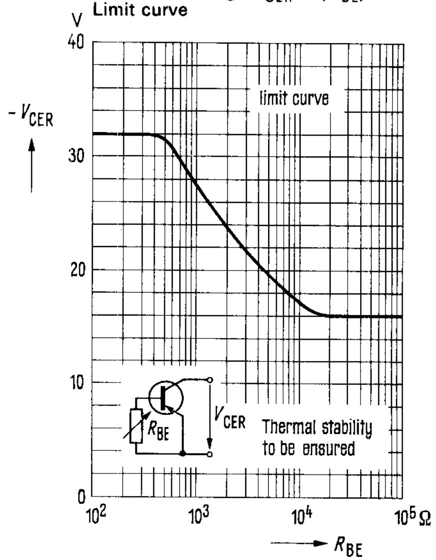
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



Cutoff current as a function of temperature $I_{CBO} = f(T_{amb})$
V_{CBO} = parameter



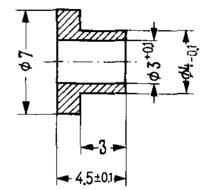
Reverse voltage $V_{CER} = f(R_{BE})$
Limit curve



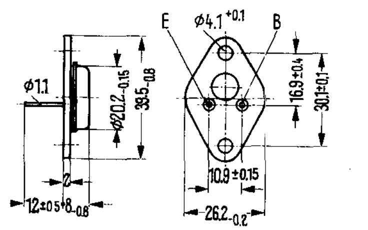
PNP-Transistor for AF-power stages up to 20W

The ADY 27 is a germanium PNP alloyed transistor in a case 3 A 2 DIN 41872 (TO – 3). The collector is electrically connected to the case. For insulated mounting of these transistors on a chassis, the insulating parts Q 62901 – B 11 – A and Q 62901 – B 13 – B are provided. These parts have to be ordered separately.
The ADY 27 is designed for use in high-quality AF power stages having a high output (up to 20 W).
For use in push-pull power stages the transistors ADY 27 are also available in pairs.

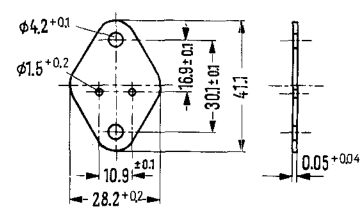
Type	Order number
ADY 27 IV	Q 60104 – Y 27 – D
ADY 27 V	Q 60104 – Y 27 – E
ADY 27 paired	Q 60104 – Y 27 – P
Mica disc	Q 62901 – B 11 – A
Insulating nipple	Q 62901 – B 13 – B



Insulating nipple: scale 2:1



Weight approx. 0.4 g   Dimensions in mm



Mica disc dry: $R_{th} = 1.25$ K/W
greased: $R_{th} = 0.35$ K/W

Maximum ratings

		ADY 27	
Collector-emitter voltage for $I_C = I_{Cmax}$	$-V_{CEO}$	30	V
Collector-emitter voltage ($V_{BE} \geqq 1$ V)	$-V_{CEV}$	32	V
Collector-base voltage	$-V_{CBO}$	32	V
Emitter-base voltage	$-V_{EBO}$	10	V
Collector current	$-I_C$	3.5	A
Base current	$-I_B$	0.6	A
Junction temperature	T_j	100	°C
Storage temperature	T_S	−65 to +90	°C
Total power dissipation ($T_{case} \leqq 45$ °C) ($V_{CE} = 10$ V)	P_{tot}	27.5	W

Thermal resistance

Junction to case	$R_{thJcase}$	$\leqq 2$	K/W

Static characteristics (T_{case} = 25 °C)

The transistors ADY 27 are classified in groups of DC current gain at $-I_C$ = 1 A, which are indicated by Roman numerals. The following values apply at a collector-emitter voltage of $-V_{CE}$ = 1 V and the following collector currents.

h_{FE} groups	IV	V	ADY 27
$-I_C$ A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
0.05	50	82	0.2 (<0.35)
1	45 (30 to 60) *	75 (50 to 100) *	0.46 (<0.7) *
3	38	63	0.75 (<1.1)

Collector-emitter saturation voltage ($-I_C$ = 3 A; I_B = 0.3 A)	$-V_{CEsat}$	0.3 (<0.6) *	V
Collector-emitter saturation voltage (I_C = 3 A on that characteristic passing through the point I_C = 3.3 A; V_{CE} = 1 V; with constant base current)	$-V_{CEsat}$	0.4 (<0.7)	V

	T_{case}	90	25	°C
Collector-emitter cutoff current ($-V_{CEV}$ = 32 V; $V_{BE} \geqq 1$ V)	$-I_{CEV}$	3 (<10)	0.15 (<0.5) *	mA
Emitter-base cutoff current ($-V_{EBO}$ = 10 V)	$-I_{EBO}$	2.5 (<10)	0.07 (<0.4) *	mA
Collector-emitter breakdown voltage ($-I_{CEO}$ = 3 A)	$-V_{(BR)CEO}$	>30	>30	V

Pairing conditions

Test condition: $-I_C$ = 1 A; $-V_{CE}$ = 1 V	$\frac{h_{FE1}}{h_{FE2}}$	≦1.25	–
Test condition: $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	$-V_{BE}$	≦12	mV

Dynamic characteristics (T_{case} = 25 °C)

Current gain-bandwidth product ($-I_C$ = 0.5 A; $-V_{CE}$ = 2 V)	f_T	450	kHz
Cutoff frequency in common emitter circuit ($-I_C$ = 0.5 A; $-V_{CE}$ = 2 V)	f_β	12	kHz

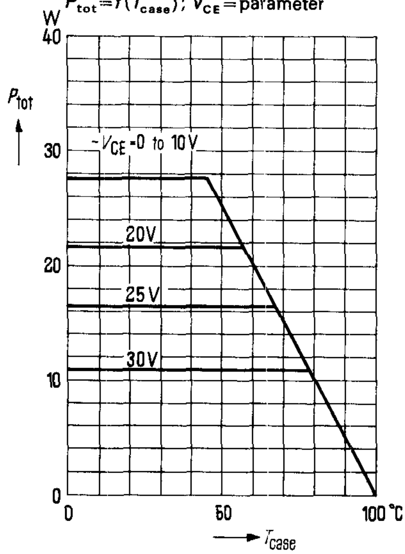
Linearity of forward current transfer ratio

Test condition: V_{batt} = 14 V; R_{CC} = 4 Ω (not short-circuited dynamically)

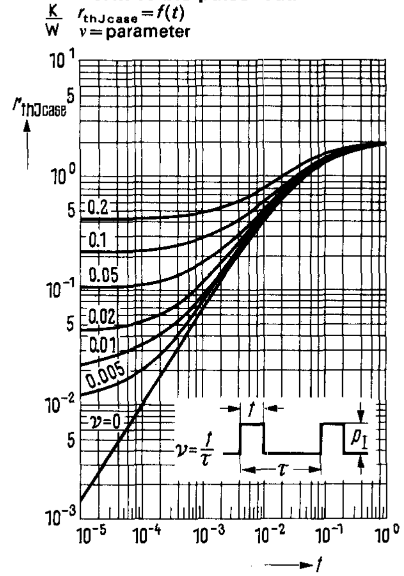
Quotient resulting from the dynamic operating forward current transfer ratio $-I_C$ = 3 A (at G_{p3}) divided by the maximum operating current gain (G_{pmax})	$\frac{G_{p3}}{G_{pmax}}$	0.4 (>0.3)	–

* AQL = 0.65%

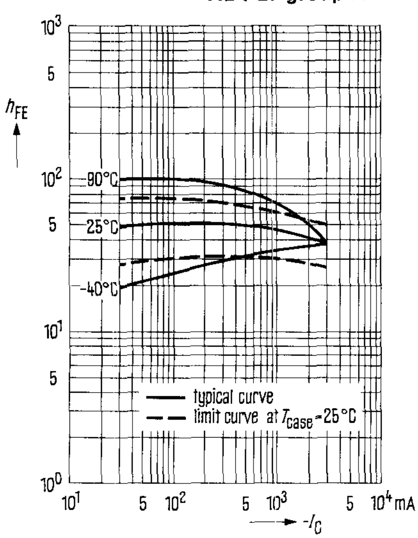
Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter



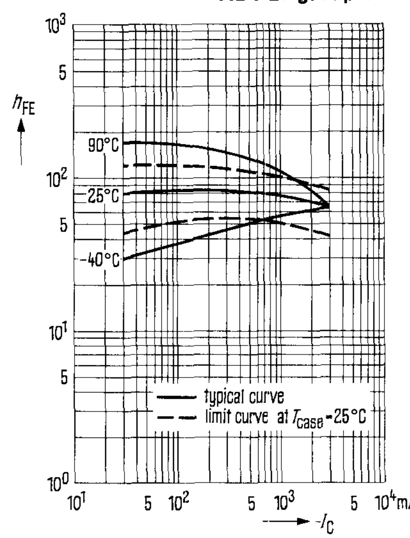
Permissible pulse load
$r_{thJcase} = f(t)$
ν = parameter



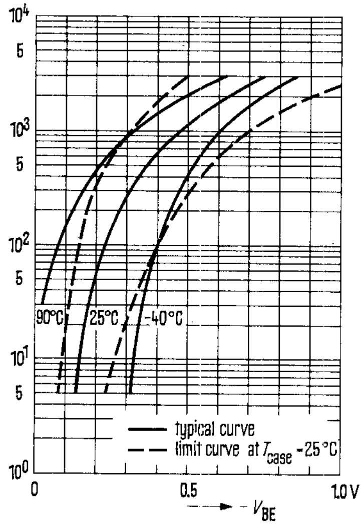
DC forward-current transfer ratio $h_{FE} = f(I_C)$; $-V_{CE} = 1$ V
T_{case} = parameter
(common emitter circuit)
ADY 27 group IV



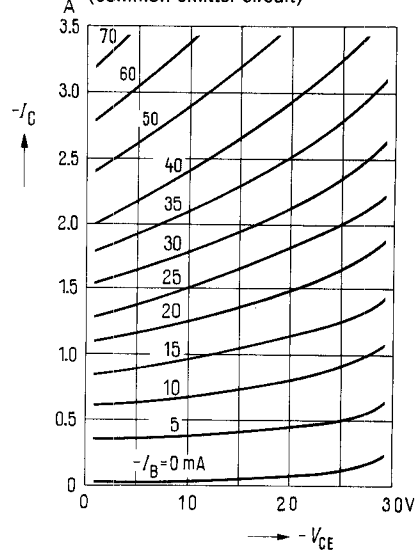
DC forward-current transfer ratio $h_{FE} = f(I_C)$; $-V_{CE} = 1$ V
T_{case} = parameter
(common emitter circuit)
ADY 27 group V



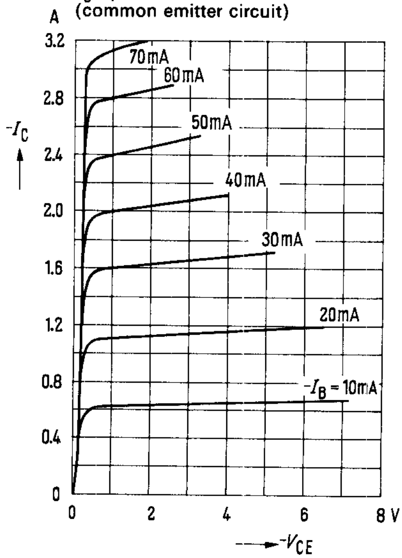
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)



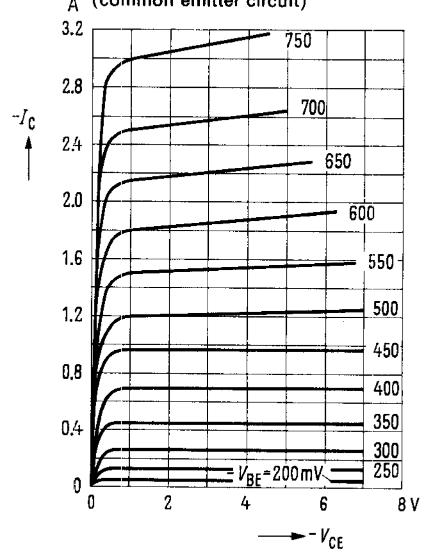
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



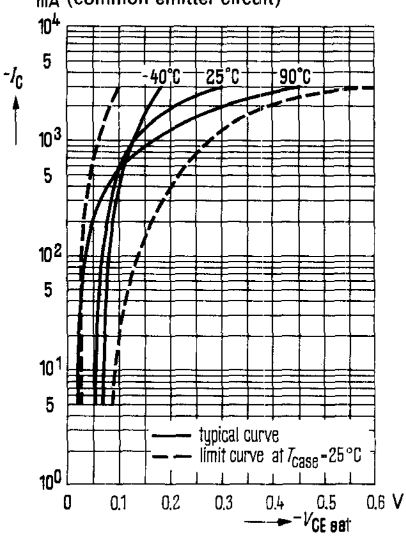
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



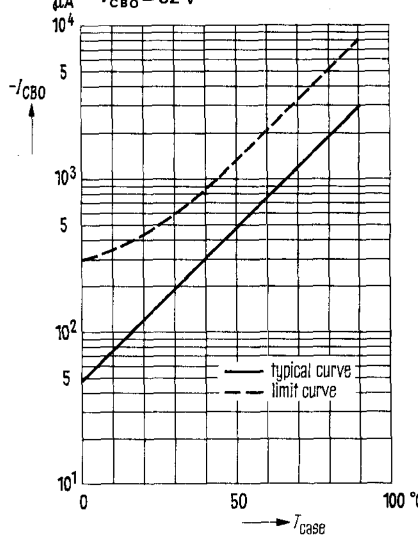
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



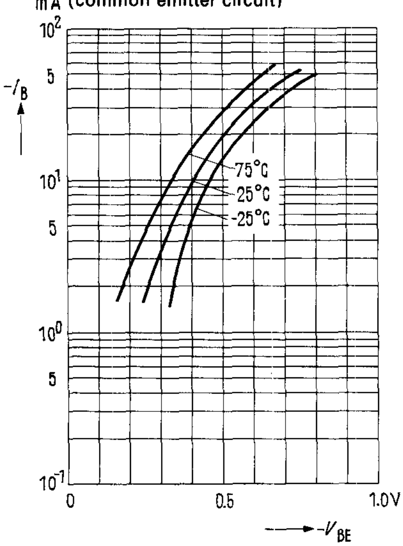
Collector saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 10$
T_{case} = parameter
(common emitter circuit)



Cutoff current $I_{CBO} = f(T_{case})$
$-V_{CBO} = 32$ V



Input characteristics $I_B = f(V_{BE})$
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)

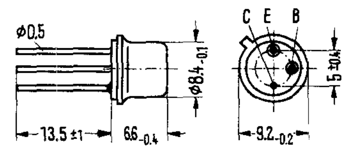


PNP Mesa transistor for RF-application

Not for new development

The AFY 11 is a germanium PNP-RF mesa transistor in a case 5 C 3 DIN 41 873 (TO-39). The collector is electrically connected to the case. AFY 11 is designed for universal RF-applications up to about 300 MHz.

Type	Order number
AFY 11	Q60106–Y11



Weight approx. 1.6 g Dimensions in mm

Maximum ratings		AFY 11	
Collector-emitter voltage	$-V_{CEO}$ [1]	15	V
Collector-base voltage	$-V_{CBO}$	30	V
Emitter-base voltage	$-V_{EBO}$ [2]	1	V
Collector current	$-I_C$	70	mA
Junction temperature	T_j	90	°C
Storage temperature	T_S	−55 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	560	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦250	K/W
Junction to case	$R_{thJcase}$	≦80	K/W

Static characteristics (T_{amb} = 25 °C)			
Collector-base-cutoff current ($-V_{CBO}$ = 15 V)	$-I_{CBO}$	0.8 (<18) *	µA
Collector-base-cutoff current ($-V_{CBO}$ = 15 V; T_{amb} = 60 °C)	$-I_{CBO}$	8 (<80)	µA

[1]) The collector-emitter voltage V_{CEO} does not represent the driving limit for these transistor. It may be exceeded if thermal stability is ensured.
[2]) This value may be exceeded as long as the emitter current does not increase beyond 10 mA.
* AQL = 0.65%.

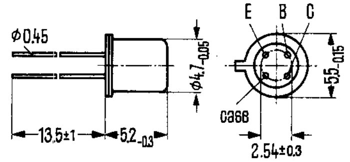
Dynamic characteristics ($T_{amb}=25\ °C$)

		AFY 11	
Test condition: $-I_C=2$ mA; $-V_{CE}=6$ V			
Current gain-bandwidth product	f_T	350 (>150)	MHz
Maximum oscillation frequency	f_{max}	600	MHz
Optimum power gain in common base circuit ($f=100$ MHz)	G_{pbopt}	14 to 18	db
Optimum power gain in common emitter circuit ($f=100$ MHz)	G_{peopt}	17 to 20	db
Noise figure ($f=100$ MHz; $R_g=60\ \Omega$)	NF	4.8	db
Noise figure ($f=200$ MHz; $R_g=60\ \Omega$)	NF	6	db
AC forward current transfer ratio ($f=1$ kHz)	h_{fe}	20 (>10)	–
Feedback time constant ($f=2.5$ MHz)	$r_{bb'} \cdot C_{cb'}$	18 (<40)	ps
Test condition: $-I_C=10$ mA; $-V_{CE}=10$ V			
Current gain-bandwidth product ($f=100$ MHz)	f_T	550 (>200)	MHz
Maximum oscillation frequency	f_{max}	750	MHz
Optimum power gain in common base circuit ($f=100$ MHz)	G_{pbopt}	16 to 20	db
AC forward current transfer ratio ($f=1$ kHz)	h_{fe}	60 (>25)	–
Feedback time constant ($f=2.5$ MHz)	$r_{bb'} \cdot C_{cb'}$	13 (>40)	ps
Collector capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	2.2 (<2.8)	pf

PNP Mesa transistor for RF-application up to 260 MHz

The AFY 12 is a germanium PNP RF mesa transistor for general high-frequency use in a case 18 A 4 DIN 41 876 (TO-72). The terminals are electrically insulated from the case. The AFY 12 is designed for use in pre-stages, mixer stages and oscillator stages up to 260 MHz.

Type	Order number
AFY 12	Q 60106–Y12



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		AFY 12	
Collector-emitter voltage	$-V_{CEO}$	18	V
Collector-base voltage	$-V_{CBO}$	25	V
Emitter-base voltage	$-V_{EBO}$	0.5	V
Collector current	$-I_C$	10	mA
Junction temperature	T_j	90	°C
Storage temperature	T_s	−30 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	112	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦750	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics ($T_{amb}=25$ °C)

For the conditions stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ V
12	1	20 (8.3 to 40)	50 (25 to 120) *	0.325 (0.25 to 0.38)
6	2	29	70	0.34 (0.28 to 0.4)

Collector-base-cutoff current ($-V_{CBO}=12$ V)	$-I_{CBO}$	0.4 (<3)	µA
Collector-base-cutoff current ($-V_{CBO}=25$ V)	$-I_{CBO}$	0.7 (<10) *	µA
Collector-base-cutoff current ($-V_{CBO}=25$ V; $T_{amb}=60$ °C)	$-I_{CBO}$	7 (<70)	µA
Emitter-base-cutoff current ($-V_{EBO}=0.3$ V)	$-I_{EBO}$	<10 *	µA
Collector-emitter breakdown voltage ($-I_{CEO}=500$ µA)	$-V_{(BR)CEO}$	>18	V
Emitter-base breakdown voltage ($-I_{EBO}=100$ µA)	$-V_{(BR)EBO}$	>0.5	V

* AQL=0.65%

Dynamic characteristics (T_{amb} = 25 °C)		AFY 12	
Test condition: $-I_C = 1$ mA; $-V_{CB}$ or $-V_{CE} = 12$ V			
Current gain-bandwidth product ($f = 100$ MHz)	f_T	230	MHz
Oscillation cutoff frequency $\left(f_{max} = \sqrt{\dfrac{f_T}{8 \cdot \pi \cdot r_{bb'} \cdot C_{b'c}}}\right)$	f_{max}	1.35	GHz
AC forward current transfer ratio ($f = 1$ kHz)	h_{fe}	65 (>30)	–
Noise figure ($f = 200$ MHz; $R_g = 60\ \Omega$)	NF	5 (<7)	db
Short circuit reverse capacitance ($f = 450$ kHz)	$-C_{12e}$	0.45	pf
Feedback time constant ($f = 2.5$ MHz)	$r_{bb'} \cdot C_{b'c}$	5	ps
Test condition: $-I_C = 3$ mA; $-V_{CB} = 10$ V; $f = 200$ MHz			
Power gain (measured in circuit stated below)	G_{pb}	17.5 (>16) *	db

Test condition: $-I_C = 1$ mA; $-V_{CB} = 12$ V; $f = 200$ MHz

$g_{11b} = 31$ mmhos	$g_{12b} = 0$ mmhos	$\lvert y_{21b} \rvert = 27$ mmhos	$g_{22} = 0.15$ mmhos
$b_{11b} = -12$ mmhos	$b_{12b} = -0.5$ mmhos	$\varphi_{21b} = 115°$	$b_{22} = 1.9$ mmhos
$C_{11b} = -9.5$ pf	$C_{12b} = -0.4$ pf		$C_{22} = 1.5$ pf

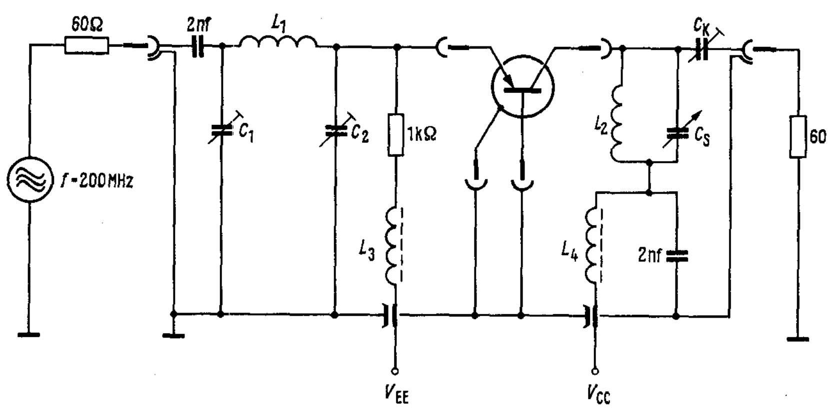
Test condition: $-I_C = 1$ mA; $-V_{CE} = 6$ V; $f = 100$ MHz

$g_{11b} = 36$ mmhos	$g_{12b} = -0.04$ mmhos	$g_{21b} = -27$ mmhos	$g_{22} = 0.09$ mmhos
$b_{11b} = -6$ mmhos	$b_{12b} = -0.48$ mmhos	$b_{21b} = 20$ mmhos	$b_{22} = 1$ mmhos

Test condition: $-I_C = 1$ mA; $-V_{CE} = 12$ V; $f = 35$ MHz

$g_{11e} = 1.5$ mmhos	$g_{12e} = 0$ mmhos	$\lvert y_{21e} \rvert = 36$ mmhos	$g_{22} = 0.01$ mmhos
$b_{11e} = 5$ mmhos	$b_{12e} = -0.12$ mmhos	$\varphi_{21e} = -12°$	$b_{22} = 0.31$ mmhos
$C_{11e} = 23$ pf	$C_{12e} = -0.55$ pf		$C_{22} = 1.4$ pf

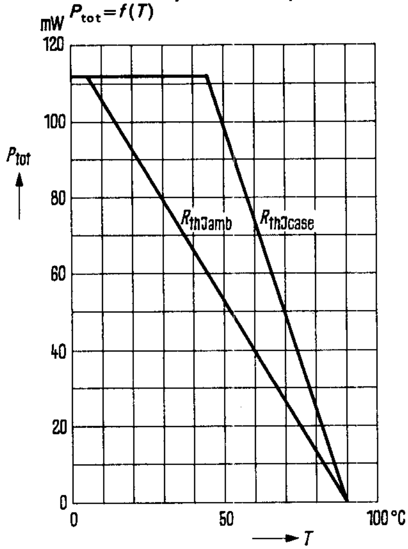
Power gain measuring circuit ($f = 200$ MHz)



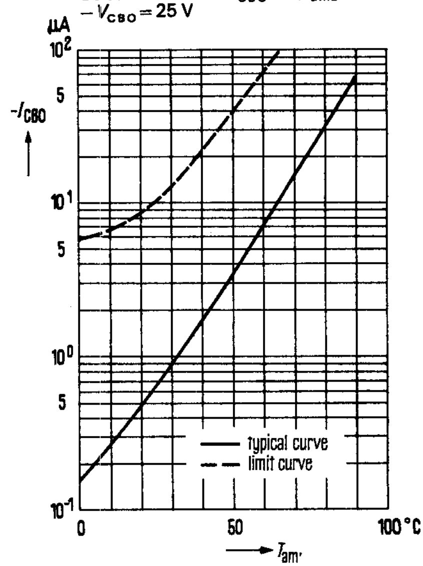
$L_1 = 3$ turns; d = 1 mm; dia = 6.5 mm. $L_2 = 2$ turns; d = 1 mm; dia = 6.5 mm.
$L_3 = L_4 = 20$ turns 0.5 enameled silk-covered copper wire on core B 63310 K 1 A 12.3.
$C_K = 1.5$ to 5 pf so that $R_L = 920\ \Omega$. $C_1 = 6.5$ to 18 pf; $C_2 = 9.5$ to 20 pf. $C_s = 3$ to 10 pf.

* AQL = 0.65%

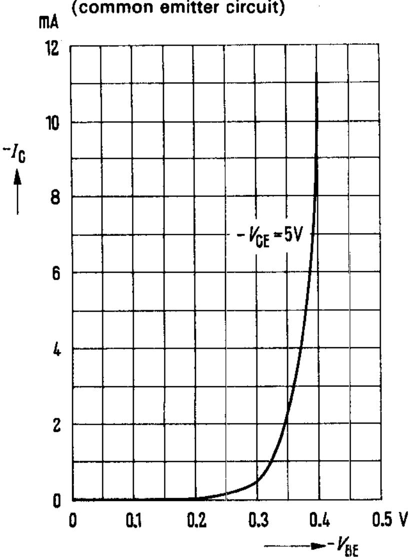
Maximum power dissipation
$P_{tot} = f(T)$



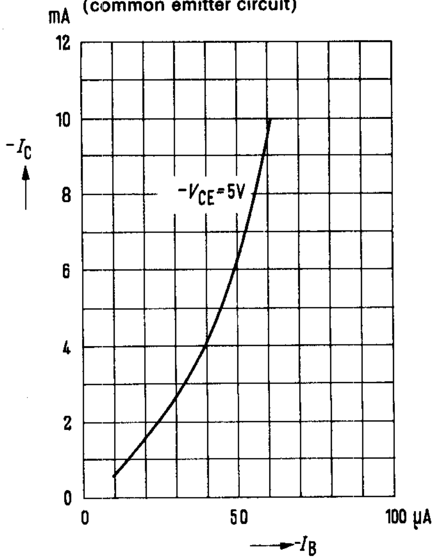
Cutoff current $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 25$ V



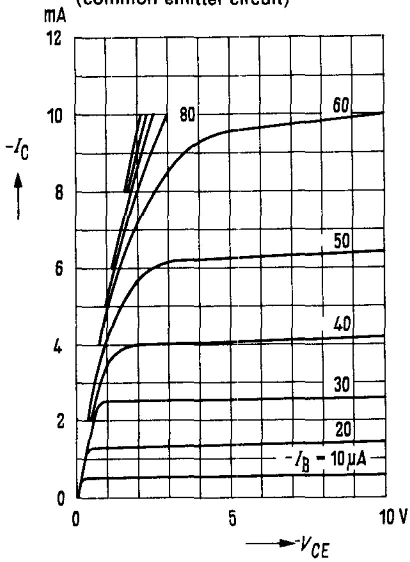
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 5$ V
(common emitter circuit)



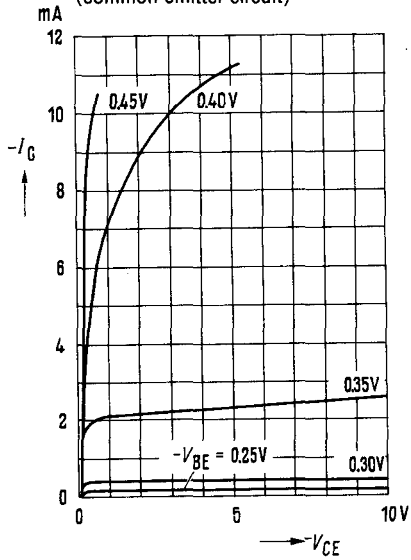
Collector current $I_C = f(I_B)$
$-V_{CE} = 5$ V
(common emitter circuit)



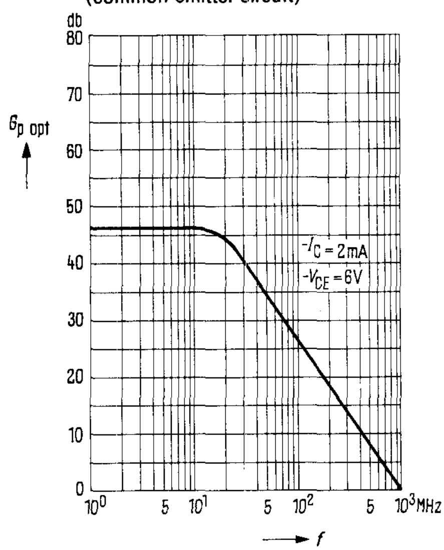
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



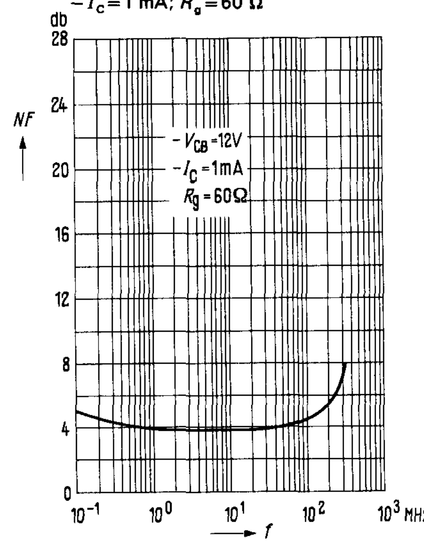
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



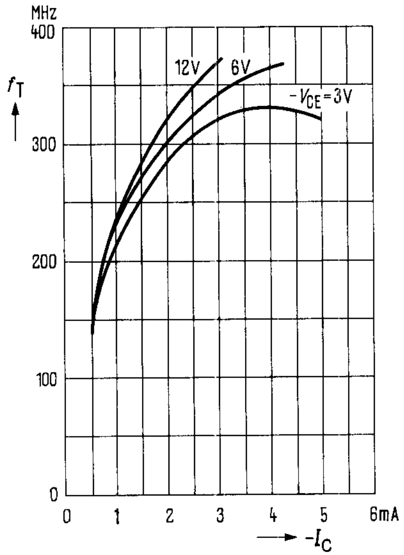
Optimum power gain $G_{p\ opt} = f(f)$
$-I_C = 2$ mA; $-V_{CE} = 6$ V
(common emitter circuit)



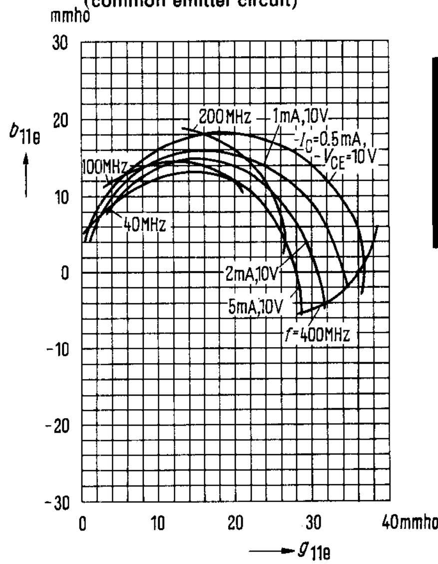
Noise figure $NF = f(f)$
$-V_{CE} = 12$ V (common base circuit)
$-I_C = 1$ mA; $R_g = 60\ \Omega$



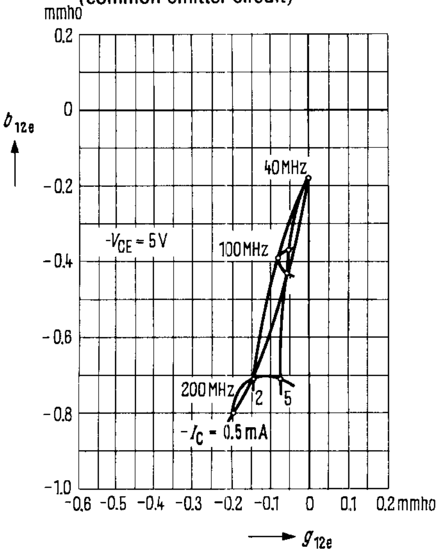
Current gain-bandwidth product
$f_T = f(I_C)$



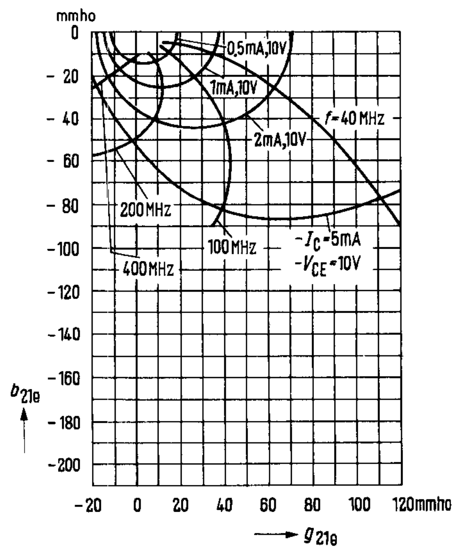
Small-signal short-circuit input admittance y_{11e}
(common emitter circuit)



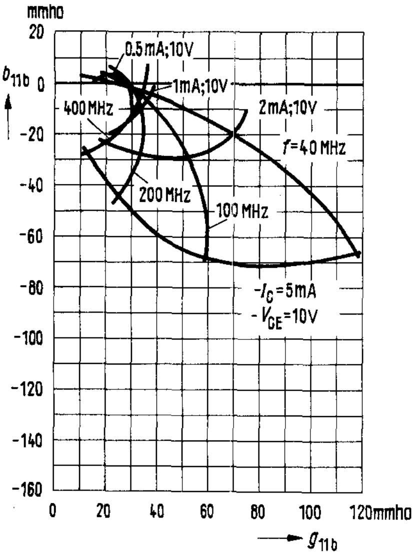
Small-signal short-circuit reverse transfer admittance y_{12e}
(common emitter circuit)



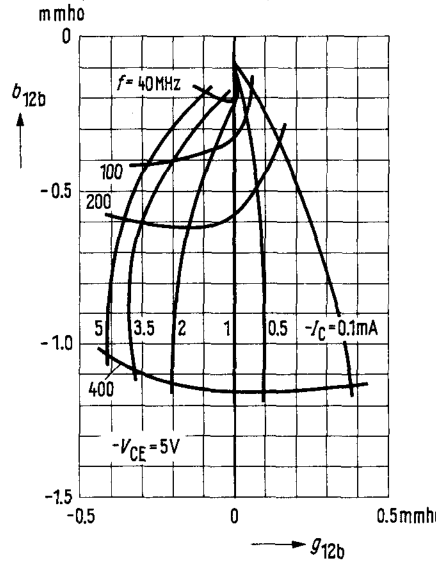
Small-signal short-circuit forward transfer admittance y_{21e}
(common emitter circuit)



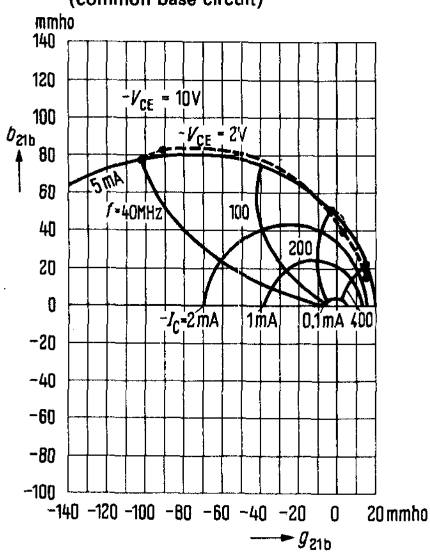
Small-signal short-circuit
input admittance y_{11b}
(common base circuit)



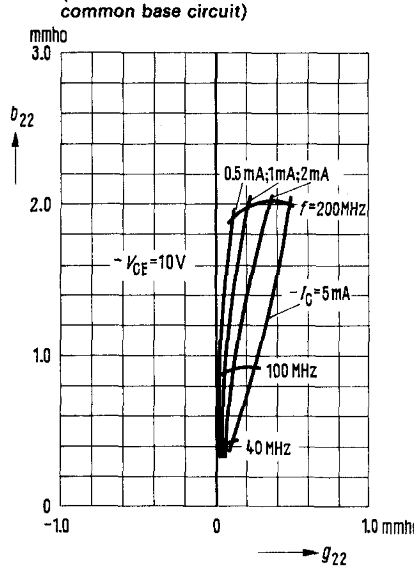
Small-signal short-circuit
reverse transfer admittance y_{12b}
(common base circuit)



Small-signal short-circuit
forward transfer
admittance y_{21b}
(common base circuit)



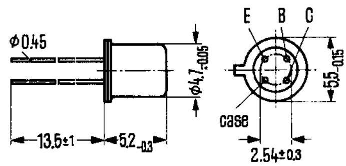
Small-signal short-circuit
output admittance y_{22}
(common emitter and
common base circuit)



PNP Transistor for RF-application up to 900 MHz

The AFY 16 is a germanium PNP RF mesa transistor in a case 18 A 4 DIN 41 876 (TO-72). The terminals are electrically insulated from the case. The AFY 16 is designed for use in pre-stages as well as in mixer and oscillator stages up to 900 MHz.

Type	Order number
AFY 16	Q60106–Y16



Weight approx. 16.5 g   Dimensions in mm

Maximum ratings		AFY 16	
Collector-emitter voltage	$-V_{CEO}$	25	V
Collector-base voltage	$-V_{CBO}$	30	V
Emitter-base voltage	$-V_{EBO}$	0.5	V
Collector current	$-I_C$	10	mA
Emitter current	I_E	11	mA
Base current	$-I_B$	1	mA
Junction temperature	T_j	90	°C
Storage temperature	T_S	−55 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	112	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦750	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics ($T_{amb} = 25$ °C)

For the test conditions stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ mV
12	1.5	25	60 (>10) *	380 (320 to 430)
6	2	31	65	380 (320 to 430)
6	5	56	90	405 (360 to 450)

* AQL = 0.65%

Static characteristics		AFY 16		
	T_{amb}	60	25	°C
Collector-base-cutoff current ($-V_{CBO}=20$ V)	$-I_{CBO}$	6 (<30)	0.4 (<3) *	µA
Emitter-base-cutoff current ($-V_{EBO}=0.5$ V)	$-I_{EBO}$	–	4 (<100) *	µA
Collector-emitter breakdown voltage ($-I_{CEO}=500$ µA)	$-V_{(BR)\,CEO}$	–	>25	V
Collector-base breakdown voltage ($-I_{CBO}=100$ µA)	$-V_{(BR)\,CBO}$		>30	V
Emitter-base breakdown voltage ($-I_{EBO}=100$ µA)	$-V_{(BR)\,EBO}$		>0.5	V

Dynamic characteristics ($T_{amb}=25$ °C)

Test condition: $-I_C=1.5$ mA; $-V_{CE}=12$ V

Current gain-bandwidth product ($f=100$ MHz)	f_T	550	MHz
Feedback time constant ($f=2.5$ MHz)	$r_{bb'} \cdot C_{b'c}$	3	ps
Oscillation cutoff frequency $\left(f_{max}=\sqrt{\frac{f_T}{8 \cdot \pi \cdot r_{bb'} \cdot C_{b'c}}}\right)$	f_{max}	2.7	GHz
Short circuit reverse capacitance ($f=450$ kHz)	$-C_{12e}$	0.25	pf
Power gain common base circuit ($f=800$ MHz)	G_{pb} [1])	11.5 (>10.5) *	db
Power gain in common base circuit ($f=860$ MHz)	G_{pb}	10.3 (>9) *	db
Feedback damping ($f=800$ MHz)	$G_{pb\,inv}$ [1])	23	db
Noise figure ($f=800$ MHz; $R_g=60\,\Omega$)	NF	7 (>8) *	db
Noise figure ($f=860$ MHz; $R_g=60\,\Omega$)	NF	7 (8.6)	db

Test condition: $-I_C=1.5$ mA; $-V_{CE}=12$ V; $f=200$ MHz

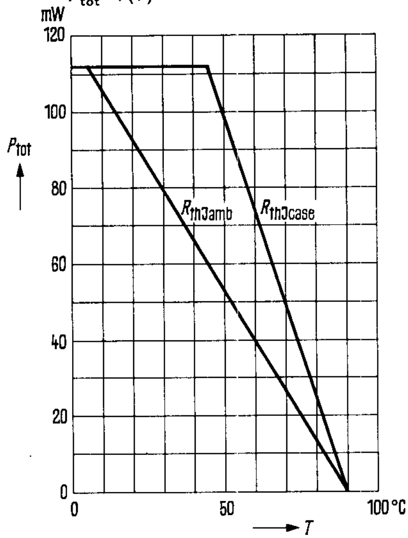
$g_{11b}=28$ mmhos	$g_{12b}=-0.06$ mmhos	$g_{21b}=-22$ mmhos	$g_{22b}=0.09$ mmhos
$b_{11b}=-24$ mmhos	$b_{12b}=-0.16$ mmhos	$b_{21b}=30$ mmhos	$b_{22b}=1.9$ mmhos

Test condition: $-I_C=1.5$ mA; $-V_{CE}=12$ V; $f=800$ MHz

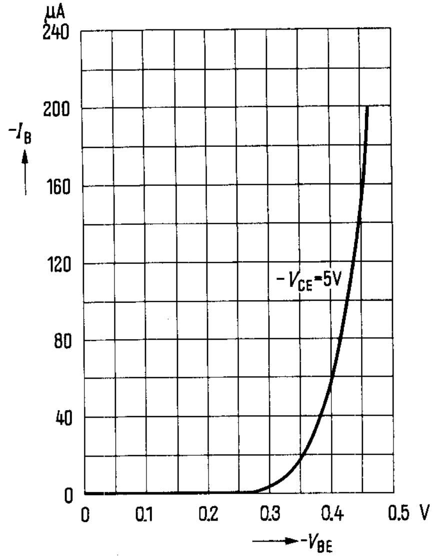
$g_{11b}=-7$ mmhos	$\|y_{12b}\|=0.4$ mmhos	$\|y_{21b}\|=14$ mmhos	$g_{22b}=0.5$ mmhos
$b_{11b}=-11$ mmhos	$\varphi_{12b}=-120°$	$\varphi_{21b}=35°$	$b_{22b}=7.5$ mmhos

[1]) Measured in given circuit
* AQL=0.65%

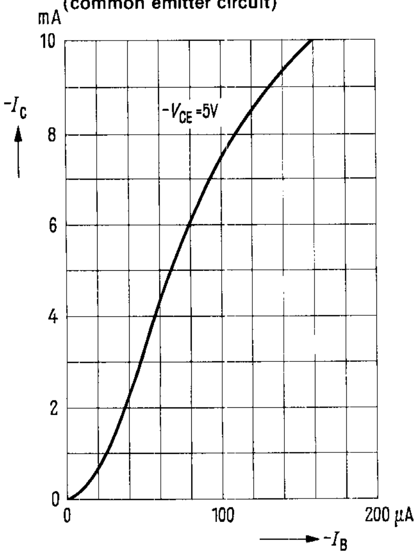
Maximum power dissipation
$P_{tot} = f(T)$



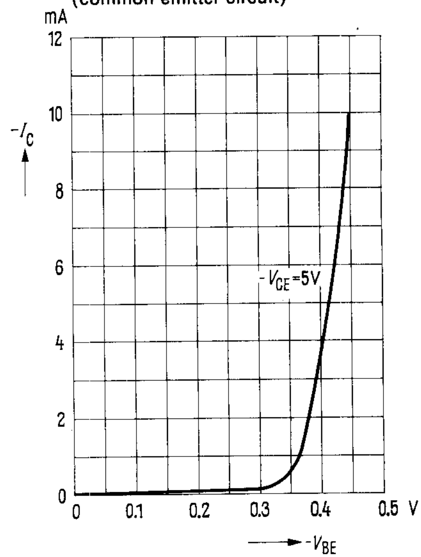
Collector current $I_C = f(V_{BE})$
$V_{CE} = -5$ V
(common emitter circuit)



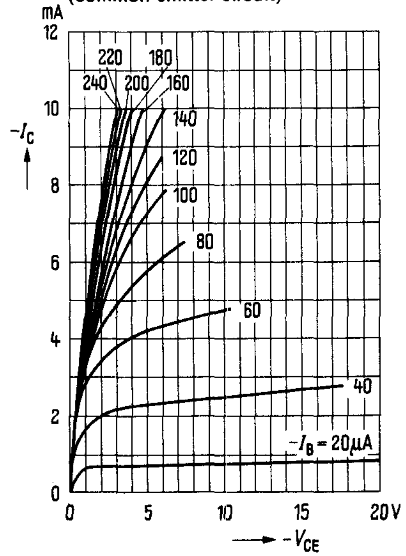
Collector current $I_C = f(I_B)$
$V_{CE} = -5$ V
(common emitter circuit)



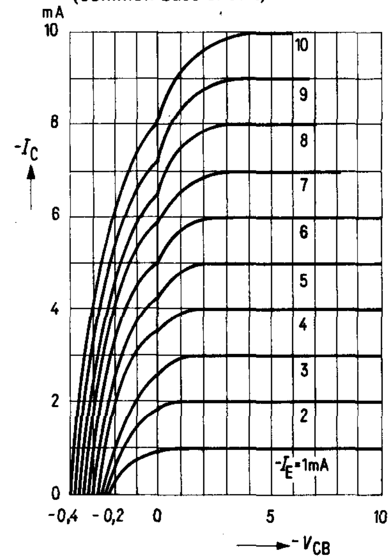
Input characteristic $I_B = f(V_{BE})$
$V_{CE} = -5$ V
(common emitter circuit)



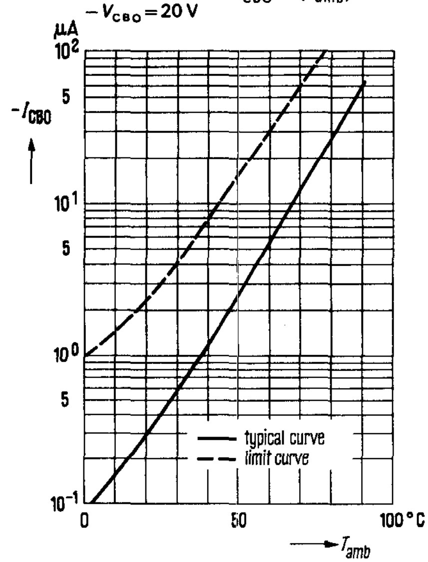
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



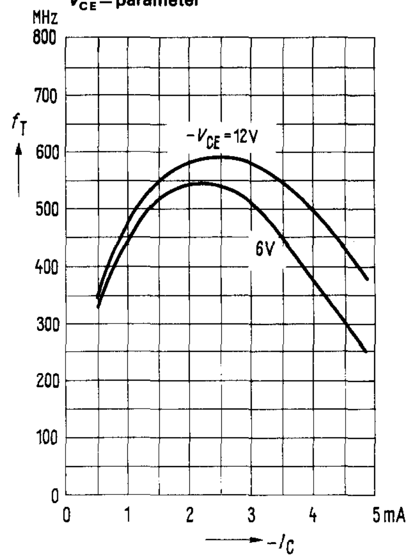
Output characteristics $I_C = f(V_{CE})$
I_E = parameter
(common base circuit)



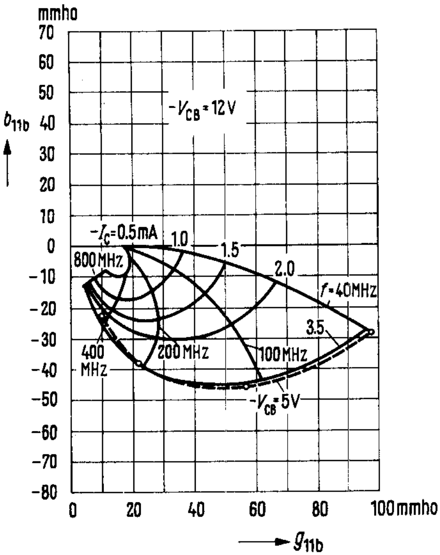
Cutoff current $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 20\,V$



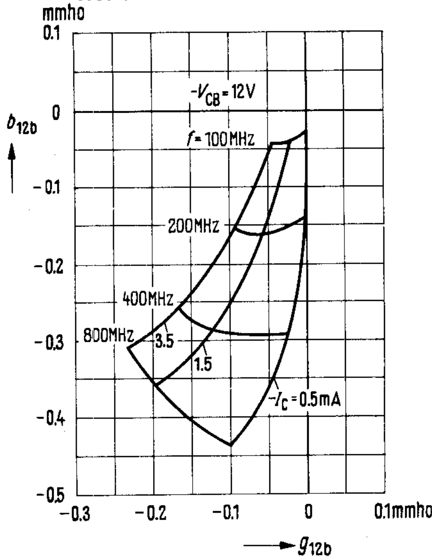
Current gain-bandwidth product $f_T = f(I_C)$
V_{CE} = parameter



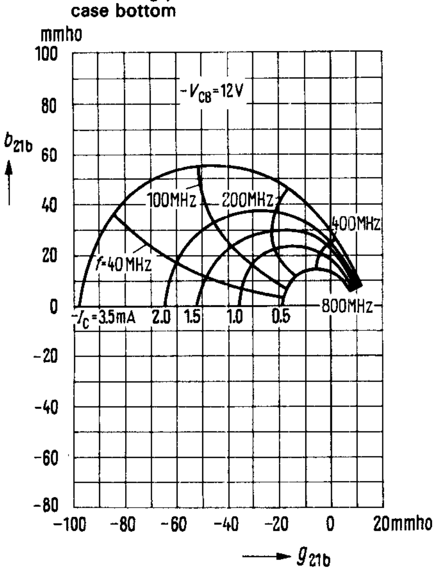
Small-signal short-circuit input admittance y_{11b}
$-V_{CB} = 12$ V (common base circuit)
measuring plane 5 mm under case bottom



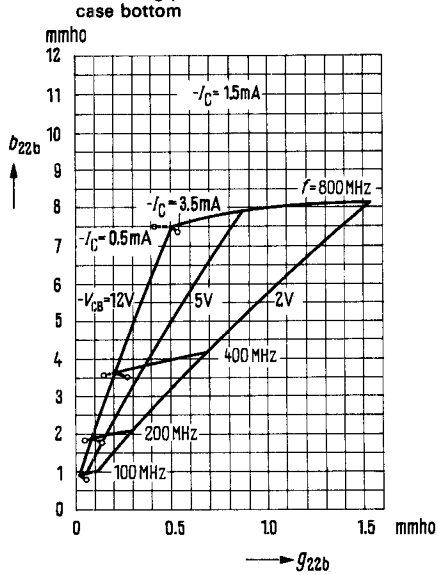
Small-signal short-circuit reverse transfer admittance y_{12b}
$-V_{CB} = 12$ V (common base circuit)
measuring plane 5 mm under case bottom



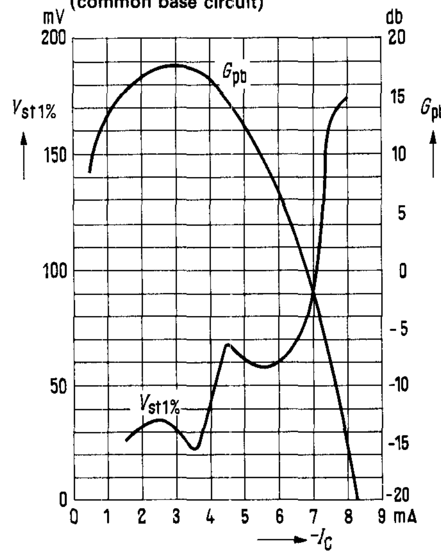
Small-signal short-circuit forward transfer admittance y_{21b}
$-V_{CB} = 12$ V (common base circuit)
measuring plane 5 mm under case bottom



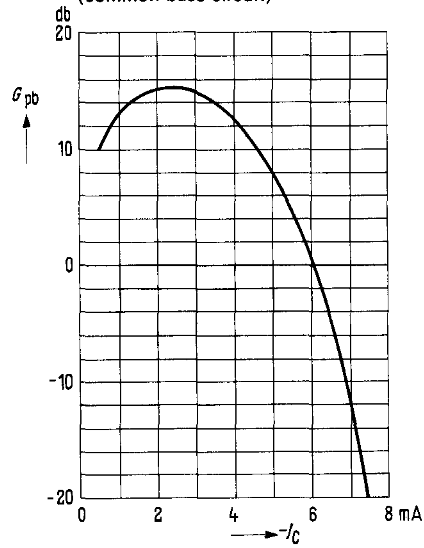
Small-signal short-circuit output admittance y_{22}
$I_C = 1.5$ mA
measuring plane 5 mm under case bottom



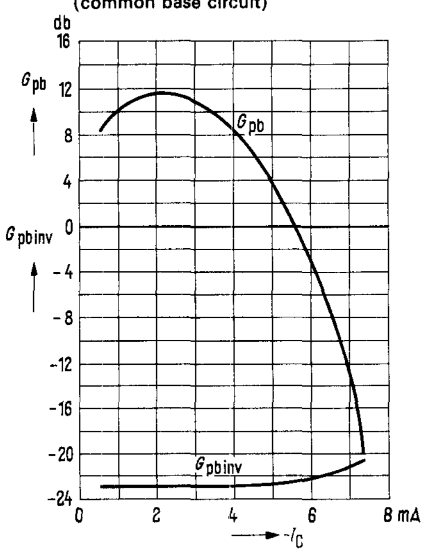
Disturbing voltage[1] V_{st} 1% $= f(I_C)$
Power gain $G_{pb} = f(I_C)$; $f = 200$ MHz
$V_{batt} = 12$ V; $R_L = 0.9$ kΩ; $R_V = 1$ kΩ
(common base circuit)



Power gain $G_{pb} = f(I_C)$;
$f = 500$ MHz
$V_{batt} = 12$ V; $R_V = 1$ kΩ; $R_L = 1.4$ kΩ
(common base circuit)

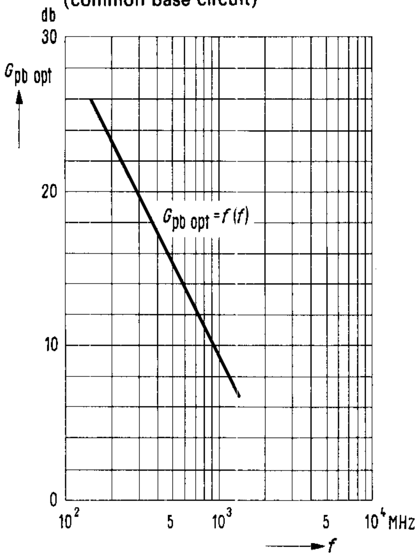


Power gain $G_{pb} = f(I_C)$;
$f = 800$ MHz
$V_{batt} = 12$ V; $R_V = 1$ kΩ; $R_L = 1.4$ kΩ
(common base circuit)

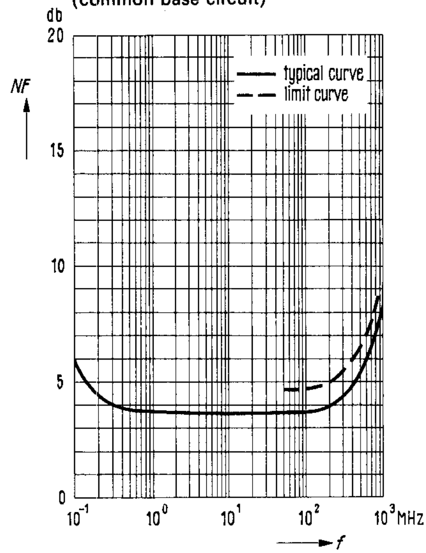


[1]) V_{st} 1% is the r.m.s. value of half the E.M.F. of a 100% sine wave modulated TV-carrier with a generator resistance of 240 Ω which causes 1% amplitude modulation on the signal carrier.

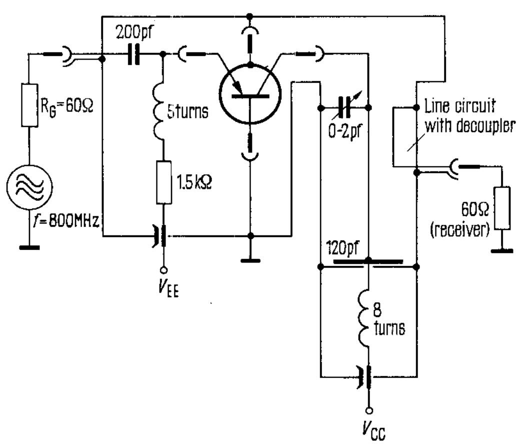
Optimum power gain $G_{pb\ opt} = f(f)$
$-I_C = 1.5$ mA;
$-V_{CE} = 12$ V
(common base circuit)



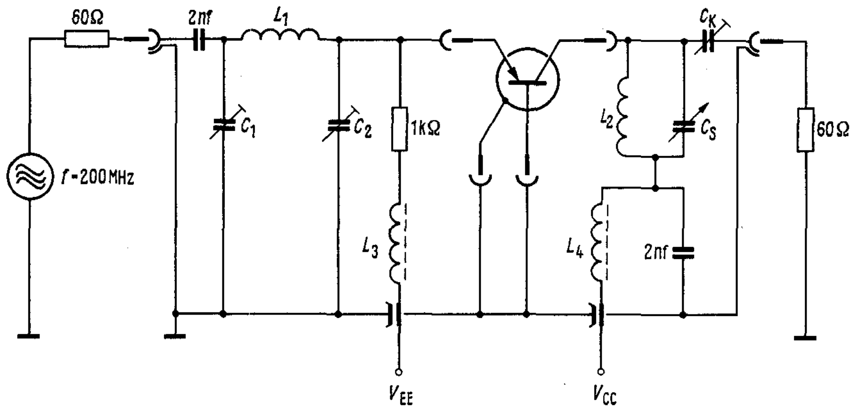
Noise figure $NF = f(f)$
$-V_{CE} = 12$ V; $-I_C = 1.5$ mA;
$R_g = 60\ \Omega$
(common base circuit)



Measuring circuit for power gain and noise figure ($f = 800$ MHz)



Measuring circuit for power gain and noise figure at f=200 MHz[1])

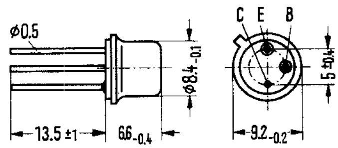


[1]) L_1=3 turns; d=1 mm; dia.=6.5 mm. L_2=2 turns; d=1 mm; dia.=6.5 mm.
L_3=L_4=20 turns 0.5 enameled silk-covered copper wire on core B 63310 K1 A 12.3.
C_K=1.5 tp 5 pf so that R_L=920 Ω. C_1=6.5 to 18 pf. C_2=9.5 to 20 pf. C_f=3 to 10 pf.

PNP Mesa transistor for antenna amplifiers up to 250 MHz

The AFY 18 is a germanium PNP RF epitaxial mesa transistor in a case 5 C 3 DIN 41 873 (TO-39). The collector is electrically connected to the case.
The AFY 18 is designed for antenna amplifiers up to 250 MHz.

Type	Order number
AFY 18 C	Q 60106 – Y 18 – C
AFY 18 D	Q 60106 – Y 18 – D
AFY 18 E	Q 60106 – Y 18 – E



Weight approx. 1.6 g Dimensions in mm

Maximum ratings		AFY 18	
Collector-emitter voltage	$-V_{CEO}$	15	V
Collector-base voltage	$-V_{CBO}$	30	V
Emitter-base voltage	$-V_{EBO}$	0.7	V
Collector current	$-I_C$	100	mA
Junction temperature	T_j	90	°C
Storage temperature	T_S	−55 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	560	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦250	K/W
Junction to case	$R_{thJcase}$	≦80	K/W

Static characteristics ($T_{amb} = 25$ °C)

For the test conditions stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ mA	h_{FE} I_C/I_B	$-V_{BE}$ V
6	2	0.04	50	0.33 (<0.42)
10	10	0.1	100	0.35 (<0.44)
1	100	5	20	0.58 (<0.8)

Collector-base-cutoff current ($-V_{CBO} = 15$ V)	$-I_{CBO}$	0.2 (<10) *	µA
Collector-base breakdown voltage ($-I_{CBO} = 100$ µA)	$-V_{(BR)CBO}$	>30	V
Collector-emitter breakdown voltage ($-I_{CEO} = 10$ mA)	$-V_{(BR)CEO}$	>15	V
Emitter-base breakdown voltage ($-I_{EBO} = 1$ mA)	$-V_{(BR)EBO}$	>0.7	V

* AQL = 65%

Dynamic characteristics (T_{amb}=25 °C)

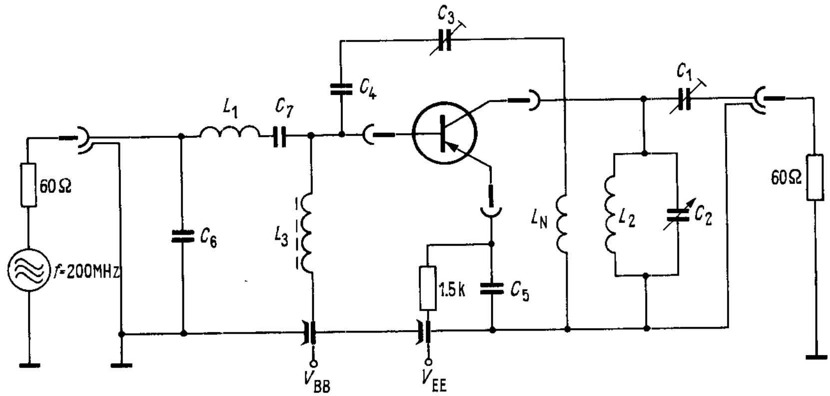
		AFY 18	
Test condition: $-I_C$=10 mA; $-V_{CE}$=10 V			
Current gain-bandwidth product (f=100 MHz)	f_T	600	MHz
Noise figure (f=70 MHz; R_g=60 Ω)	NF	4	db
Test condition: $-I_C$=8 mA; $-V_{CE}$=15 V; f=200 MHz			
Power gain in common emitter circuit	G_{pe} [1])	17 (>14) *	db
Feedback damping	$G_{pe\,inv}$	32 (>30)	db
Test condition: $-I_C$=1 mA; $-V_{CE}$=6 V; f=1 MHz			
Reverse capacitance	$-C_{12e}$	1.05	pf
Test condition: $-V_{CBO}$=10 V; f=1 MHz			
Collector junction capacitance	C_{CBO}	1.8	pf
Test condition: $-I_C$=1 mA; $-V_{CE}$=10 V; f=2.5 MHz			
Feedback time constant	$r_{bb'} \cdot C_{b'c}$	10	ps
Effective output voltage at 60 Ω at a distance of intermodulation of 30 db	$V_{O\,eff}$	600 (>470)	mV

The transistors AFY 18 are classified in groups of dynamic short-circuit current transfer ratio h_{fe}, which are indicated by code letters.
Test condition: $-I_C$=10 mA; $-V_{CE}$=10 V; f=1 kHz

h_{fe} group	C	D	E	AFY 18
h_{fe}	40 to 120	100 to 300	200 to 600 *	

[1]) Measured in opposite circuit
* AQL=0.65%

Circuit for measuring power gain (f=200 MHz)



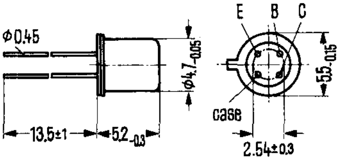
L_1 =2 turns 0.5 CuLS (silk covered, enamelled copper wire), dia=6 mm – no turn spacing.
L_2 =3 turns, d=1 mm, dia=7 mm turn separation 1 mm.
L_N=1 turn 0.5 CuLS.
L_3 =20 turns 0.5 CuLS wound on "Sifferit" core B 63310 M 25 A 12.3.
C_1=2 to 5 pf, set for R_L=900 Ω.
C_2=2 to 4 pf.
C_3=2 to 5 pf neutralized for a transistor short-circuit feedback capacitance of $-C_{12e}$=1.05 pf (I_C=1 mA; V_{CE}=6 V; f=1 MHz).
C_4=1 nf. C_6=10 pf.
C_5=2 nf. C_7=1 nf.

PNP Mesa transistor for antenna amplifiers up to 900 MHz

Not for new development

The AFY 37 is a germanium PNP RF epitaxial mesa transistor in a case 18 A 4 DIN 41876 (TO-72). The terminals are electrically insulated from the case.
The AFY 37 is particularly designed for use in antenna amplifiers up to 900 MHz.

Type	Order number
AFY 37	Q60106–Y37



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		AFY 37	
Collector-emitter voltage	$-V_{CES}$	32	V
Collector-base voltage	$-V_{CBO}$	32	V
Emitter-base voltage	$-V_{EBO}$	0.3	V
Collector current	$-I_C$	20	mA
Junction temperature	T_j	90	°C
Storage temperature	T_s	−30 to +75	°C
Total power dissipation	P_{tot}	112	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦750	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics (T_{amb} = 25 °C)

For the test condition stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ mA	h_{FE} I_C/I_B
12	2	0.05 (<0.2)	40 (>10) *

Collector-base-cutoff current ($-V_{CBO}$ = 20 V)	$-I_{CBO}$	0.4 (<10) *	µA
Collector-emitter breakdown voltage ($-I_{CES}$ = 100 µA)	$-V_{(BR)CES}$	>32	V
Emitter-base breakdown voltage ($-I_{EBO}$ = 100 µA)	$-V_{(BR)EBO}$	>0.3	V

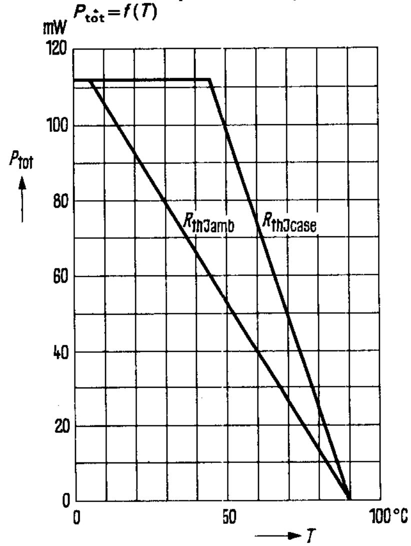
* AQL = 0.65%

Not for new development

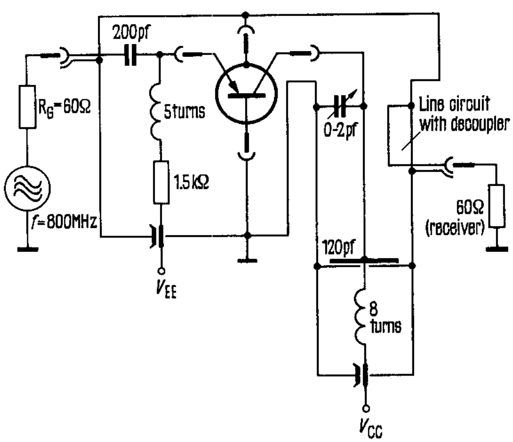
Dynamic characteristics (T_{amb} = 25 °C)

		AFY 37	
Current gain-bandwidth product ($-I_C$ = 1.5 mA; $-V_{CE}$ = 12 V; f = 100 MHz)	f_T	600	MHz
Feedback time constant ($-I_C$ = 1 mA; $-V_{CE}$ = 12 V; f = 2.5 MHz)	$r_{bb'} \cdot C_{b'c}$	3.5	ps
Short circuit reverse capacitance ($-I_C$ = 1 mA; $-V_{CE}$ = 12 V; f = 1 MHz)	$-C_{12e}$	0.27	pf
Power gain in common base circuit[1] ($-I_C$ = 4 mA; $-V_{CB}$ = 16 V; f = 800 MHz; R_g = 60 Ω; R_L = 2 kΩ)	G_{pb}[1]	12 (>10) *	db
Effective output voltage[1] at 60 Ω at a distance of intermodulation of 30 db	V_{Oeff}[1]	350 (>260)	mV
Noise figure ($-I_C$ = 1.5 mA; $-V_{CE}$ = 12 V; f = 800 MHz)	NF[1]	7	db

Maximum power dissipation
$P_{tot} = f(T)$



Measuring circuit for power gain and noise figure at f = 800 MHz



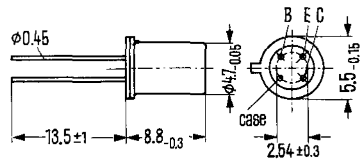
[1]) Measured in circuit shown above
* AQL = 0.65%

PNP Mesa transistor for RF-application up to 500 MHz

Not for new development

The AFY 39 is a germanium PNP RF epitaxial mesa transistor in a case 18 B 4 DIN 41876 (sim. TO−72). The terminals are electrically insulated from the case.
The AFY 18 is designed for use in antenna amplifiers in the VHF range.

Type	Order number
AFY 39	Q60106−Y39



Weight approx. 0.5 g Dimensions in mm

Maximum ratings		AFY 39	
Collector-emitter voltage	$-V_{CES}$	32	V
Collector-base voltage	$-V_{CBO}$	32	V
Emitter-base voltage	$-V_{EBO}$	0.3	V
Collector current	$-I_C$	30	mA
Junction temperature	T_j	90	°C
Storage temperature	T_S	−30 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	225	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦450	K/W
Junction to case	$R_{thJcase}$	≦200	K/W

Static characteristics ($T_{amb}=25$ °C)

For the test condition stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ mV
10	3	35 (<150)	85 (>20) *	360 (280 to 400)

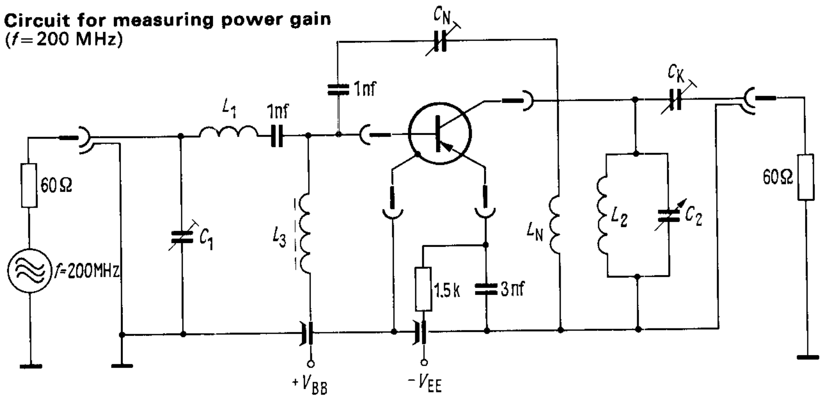
Collector-base-cutoff current ($-V_{CBO}=12$ V)	$-I_{CBO}$	0.4 (<10) *	µA
Collector-base breakdown voltage ($-I_{CBO}=100$ µA)	$-V_{(BR)CBO}$	>32	V
Collector-emitter breakdown voltage ($-I_{CES}=100$ µA)	$-V_{(BR)CES}$	>32	V
Emitter-base breakdown voltage ($I_{EBO}=100$ µA)	$-V_{(BR)EBO}$	>0.3	V

* AQL=0.65%

Not for new development

Dynamic characteristics (T_{amb}=25 °C)		AFY 39	
Current gain-bandwidth product ($-I_C$=8 mA; $-V_{CE}$=6 V)	f_T	500	MHz
Short circuit reverse capacitance ($-I_C$=1 mA; $-V_{CE}$=6 V; f=1 MHz)	$-C_{12e}$	0.75 (0.55 to 0.95)	pf
Power gain in common emitter circuit ($-I_C$=9 mA; $-V_{CE}$=15 V; f=200 MHz)	G_{pe}	17.5 (>16) *	db
Output voltage at 60 Ω with an intermodulation separation of 30 db (f=200 MHz)	$V_{O\,eff}$	0.7 (>0.6)	V

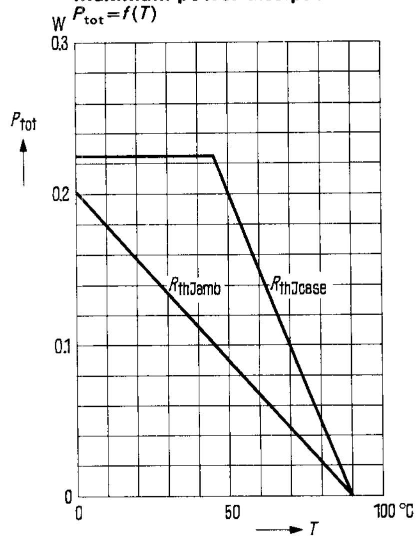
Circuit for measuring power gain
(f=200 MHz)



L_1=2 turns 0.5 CuLS (enameled silk covered copper wire)
dia.=3.5 mm, turn separation 2 mm
L_2 =3 turns d=1 mm; dia.=7 mm
turn separation 2 mm
L_3 =14 turns on core B 63310 U 17 D 13.3
L_N=1 turn 0.5 CuLS
C_K so that R_L=900 Ω

C_1 =3 to 9 pf
C_2=2 to 4 pf
C_N=2 to 5 pf neutralized for a transistor short-circuit reverse capacitance of $-C_{12e}$=0.75 pf ($-I_C$=1 mA; $-V_{CB}$=6 V)

Maximum power dissipation
$P_{tot}=f(T)$

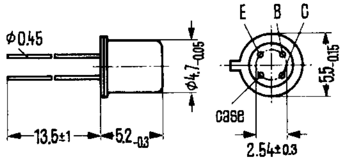


* AQL=0.65%

PNP Mesa transistor for pre-stages, mixer and oscillator stages up to 900 MHz

AFY 42 is a germanium PNP mesa transistor in a case 18 A 4 DIN 41876 (TO–72). The leads are electrically insulated from the case. It is particularly suitable for use in pre-stages as well as in mixer and oscillator stages at frequencies up to 900 MHz.

Type	Order number
AFY 42	Q60106–Y42



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		AFY 42	
Collector-base voltage	$-V_{CBO}$	30	V
Collector-emitter voltage	$-V_{CEO}$	25	V
Emitter-base voltage	$-V_{EBO}$	0.3	V
Collector current	$-I_C$	10	mA
Emitter current	I_E	11	mA
Base current	$-I_B$	1	mA
Junction temperature	T_j	90	°C
Storage temperature	T_s	−30 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	112	mW

Thermal resistance

Junction to ambient air	R_{thJamb}	≦750	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics ($T_{amb} = 25$ °C)

For the given test condition, the following data apply

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ mV
10	2	40	50 (>10)	370
5	5	120	42	400

Collector-emitter cutoff current ($-V_{CES} = 20$ V)	$-I_{CES}$	0.5 (<3)	µA
Collector-base cutoff current ($-V_{CBO} = 20$ V; $T_{amb} = 60$ °C)	$-I_{CBO}$	6 (<30)	µA
Collector-emitter breakdown voltage ($-I_{CEO} = 500$ µA)	$-V_{(BR)CEO}$	>25	V
Collector-base breakdown voltage ($-I_{CBO} = 100$ µA)	$-V_{(BR)CBO}$	>30	V
Emitter-base breakdown voltage ($-I_{EBO} = 100$ µA)	$-V_{(BR)EBO}$	>0.3	V

Dynamic characteristics ($T_{amb}=25\ °C$)		AFY 42	
Current gain-bandwidth product ($-I_C=2$ mA; $-V_{CE}=10$ V; $f=100$ MHz)	f_T	700	MHz
Short circuit reverse capacitance ($-I_C=2$ mA; $-V_{CE}=10$ V)	$-C_{12e}$	0.23	pf
Test condition: $-I_C=2$ mA; $-V_{CE}=10$ V			
Common-base circuit power gain			
($f=800$ MHz $R_L=500\ \Omega$)	G_{pb}	12 (>10)	db
($f=800$ MHz $R_L=2\ k\Omega$)	G_{pb}	14.5 (>13)	db
($f=900$ MHz $R_L=500\ \Omega$)	G_{pb}	11	db
($f=900$ MHz $R_L=2\ k\Omega$)	G_{pb}	13	db
Noise figure ($f=800$ MHz $R_g=60\ \Omega$)	NF	5 (<6)	db
Noise figure ($f=900$ MHz $R_g=60\ \Omega$)	NF	6 (<7)	db

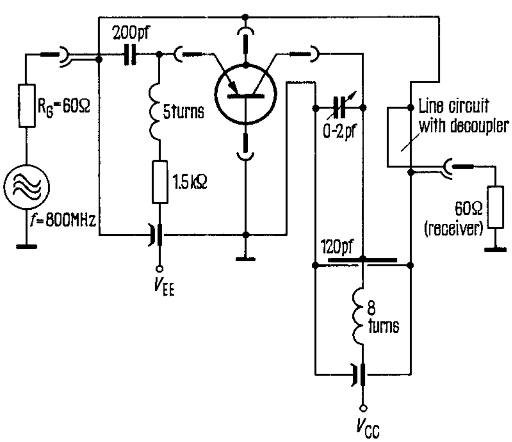
Test condition: $-I_C=2$ mA; $-V_{CE}=10$ V; f=200 MHz (measuring plane 5 mm below case bottom)

$g_{11b}=45$ mmhos $\quad y_{21b}=52$ mmhos $\quad y_{12b}=0.09$ mmhos $\quad g_{22b}=0.05$ mmhos
$b_{11b}=-29$ mmhos $\quad \varphi_{21b}=135°$ $\quad \varphi_{12b}=-90°$ $\quad b_{22b}=1.6$ mmhos

Test condition: $-I_C=2$ mA; $-V_{CB}=10$ V; $f=800$ MHz (measuring plane 5 mm below case bottom)

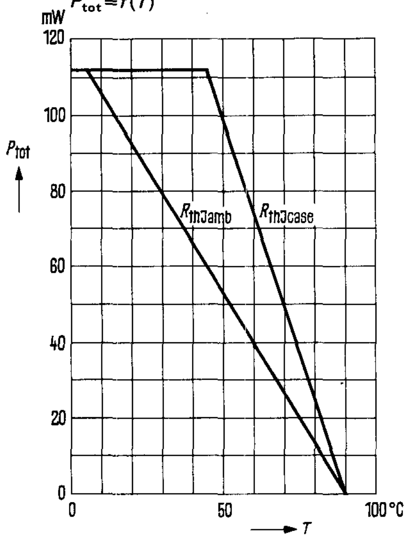
$g_{11b}=2$ mmhos $\quad y_{21b}=20$ mmhos $\quad y_{12b}=-0.38$ mmhos $\quad g_{22b}=0.5$ mmhos
$b_{11b}=-17.5$ mmhos $\quad \varphi_{21b}=37°$ $\quad \varphi_{12b}=-100°$ $\quad b_{22b}=6.3$ mmhos

Circuit for measuring power gain and noise figure at $f=800$ MHz

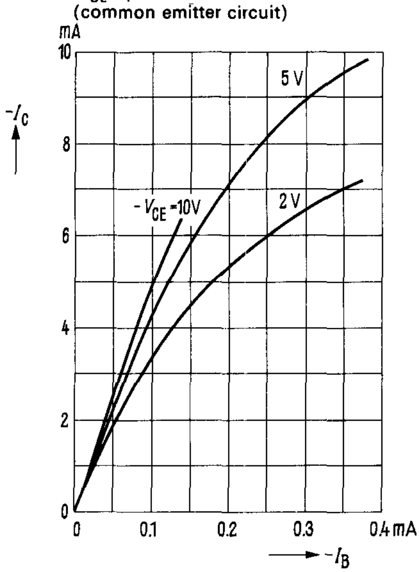


$R_L=2\ k\Omega$

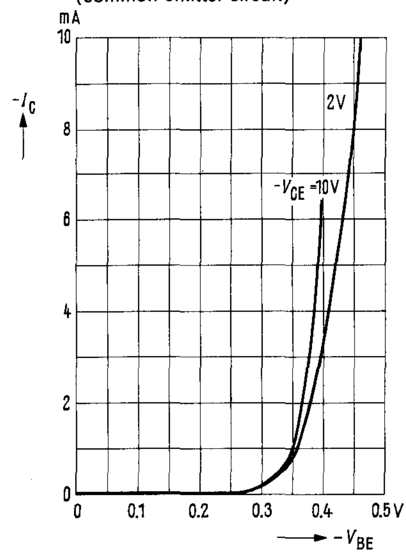
Maximum power dissipation
$P_{tot} = f(T)$



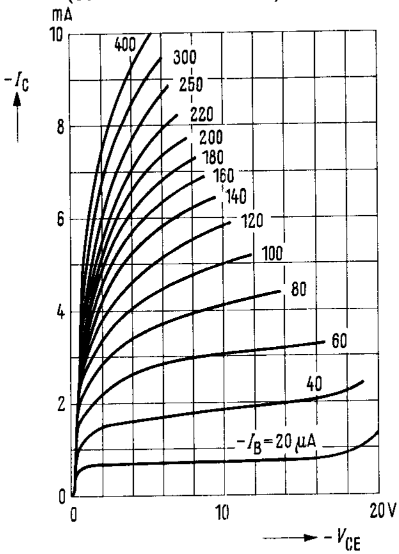
Collector current $I_C = f(I_B)$;
V_{CE} = parameter
(common emitter circuit)



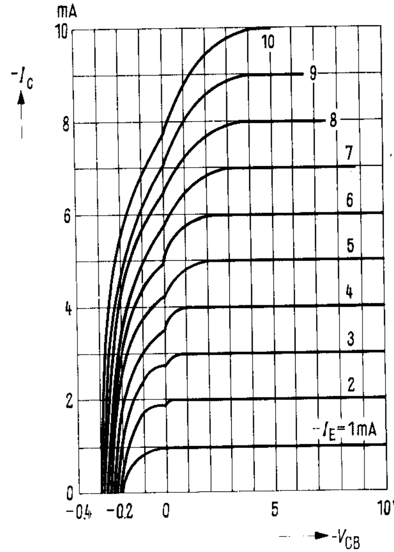
Collector current $I_C = f(V_{BE})$;
V_{CE} = parameter
(common emitter circuit)



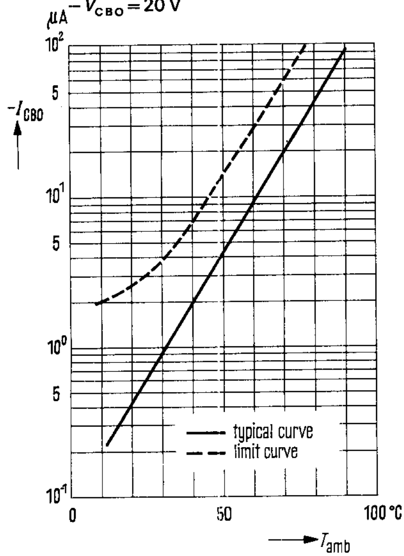
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



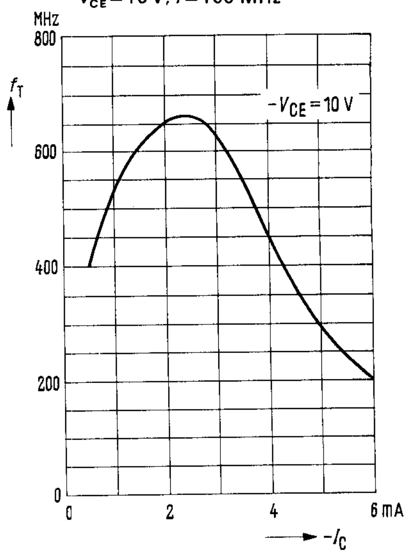
Output characteristics $I_C = f(V_{CB})$
I_E = parameter
(common base circuit)



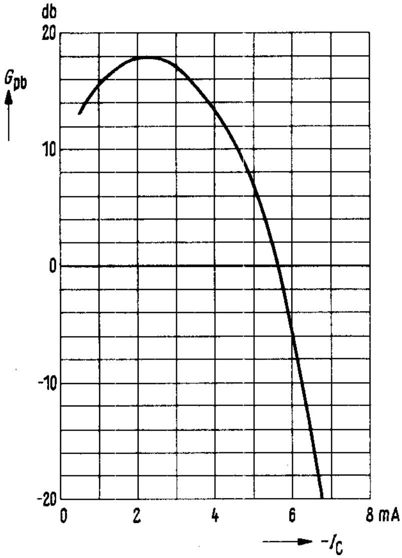
Cutoff current $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 20\ V$



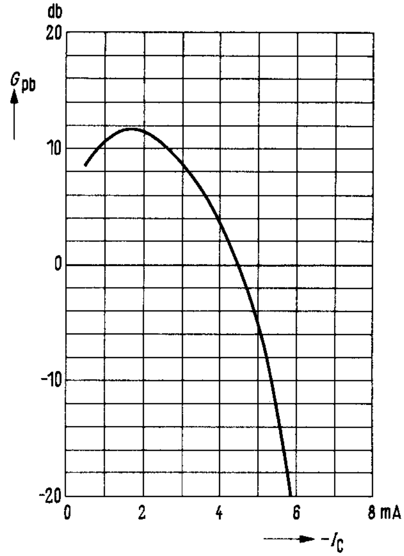
Current gain-bandwidth product $f_T = f(I_C)$
$-V_{CE} = 10\ V$; $f = 100\ MHz$



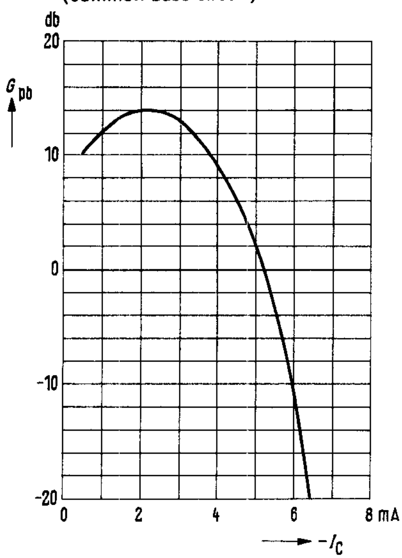
Power gain $G_{pb} = f(I_C)$
$f = 500$ MHz; $V_{batt} = 10$ V; $R_v = 1$ kΩ
$R_L = 2$ kΩ
(common base circuit)



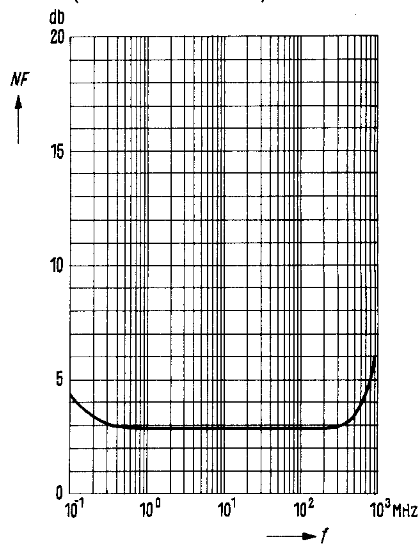
Power gain $G_{pb} = f(I_C)$
$f = 800$ MHz; $V_{batt} = 10$ V; $R_v = 1$ kΩ
$R_L = 500$ Ω
(common base circuit)



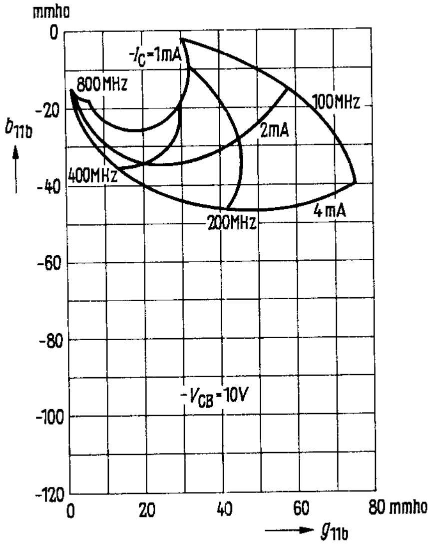
Power gain $G_{pb} = f(I_C)$
$f = 800$ MHz; $V_{batt} = 10$ V; $R_v = 1$ kΩ
$R_L = 2$ kΩ
(common base circuit)



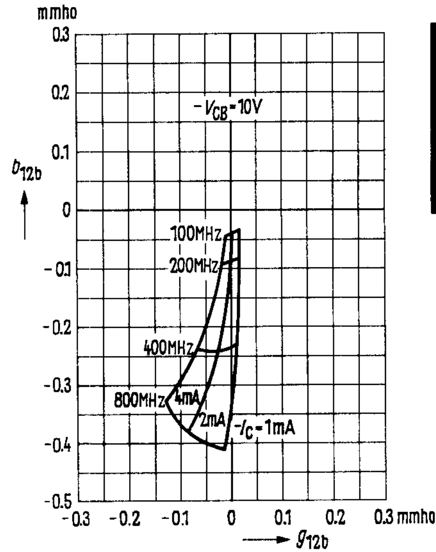
Noise figure $NF = f(f)$
$-V_{CB} = 10$ V; $-I_C = 2$ mA
$R_g = 60$ Ω
(common base circuit)



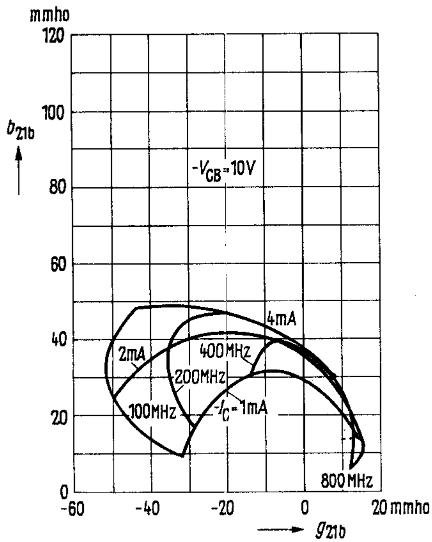
Input admittance y_{11b}
$-V_{CB} = 10$ V (common base circuit)
Measuring plane 5 mm below
case bottom



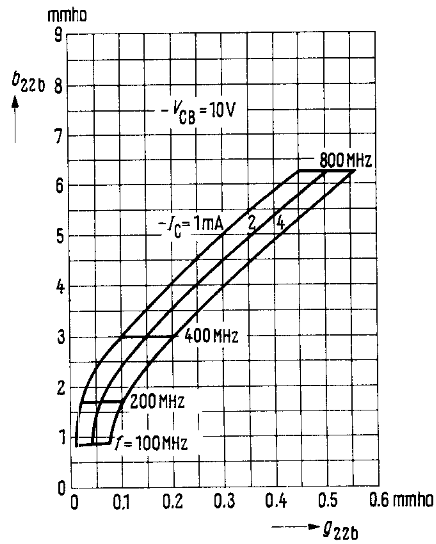
Reverse transconductance y_{12b}
$-V_{CB} = 10$ V (common base circuit)
Measuring plane 5 mm below
case bottom



Forward transconductance y_{21b}
$-V_{CB} = 10$ V (common base circuit)
Measuring plane 5 mm below
case bottom



Output admittance y_{22b}
$-V_{CB} = 10$ V (common base circuit)
Measuring plane 5 mm below
case bottom

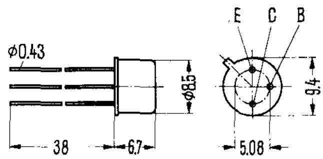


PNP-Transistors for switching applications

Not for new development

ASY 26 and ASY 27 are PNP-germanium-transistors in a case 5 A 3 DIN 41873 (TO−5). The base terminal is electrically connected to the case. The transistors ASY 26 and ASY 27 are designed for medium-speed switching applications.

Type	Order number
ASY 26	Q60118−Y26
ASY 27	Q60118−Y27



Weight approx. 1.4 g Dimensions in mm

Maximum ratings		ASY 26	ASY 27	
Collector-emitter voltage	$-V_{CEO}$	15	15	V
Collector-emitter voltage	$-V_{CEV}$	25	20	V
Collector-base voltage	$-V_{CBO}$	30	25	V
Emitter-base voltage	$-V_{EBO}$	20	20	V
Collector current	$-I_C$	300	300	mA
Junction temperature	T_j	85	85	°C
Storage temperature	T_S	−65 to +100	−65 to +100	°C
Total power dissipation ($T_{amb} \leqq 25$ °C)	P_{tot}	150	150	mW
Thermal resistance				
Junction to ambient air	R_{thJamb}	≦400	≦400	K/W
Junction to case	$R_{thJcase}$	≦200	≦200	K/W

Static characteristics (T_{amb} = 25 °C) **ASY 26**

For the conditions stated below, the following data apply:

$-I_C$ mA	$-V_{CB}$ V	$-I_B$ mA	h_{FE} I_C/I_B	V ($-V_{BE}$) $-V_{BEsat}$	$-V_{CEsat}$ V
10	–	0.4	25	0.2 to 0.37	–
10	0	<0.325	>30*	–	–
10	–	0.33	30	–	<0.2
20	0	0.25 to 0.66	30 to 80	–	–
50	–	2.4	31	<0.55	–
50	–	2	25	–	<0.25
100	0	<4.75	>21*	(<0.65)	–
200	0	<13.3	>15	–	–
300	0	–	–	(<1.5)	–

* AQL=0.65%

Not for new development

Static characteristics (T_{amb}=25 °C) **ASY 27**

For the conditions stated below, the following data apply:

$-I_{CB}$ mA	$-V_{CB}$ V	$-I_B$ mA	h_{FE} I_C/I_B	$-V_{BEsat}$ ($-V_{BE}$) V	$-V_{CEsat}$ V
10	–	0.25	40	0.15 to 0.32	–
10	0	<0.195	>52 *	–	–
10	–	0.2	50	–	>0.2
20	0	0.133 to 0.4	50 to 150	–	–
50	–	1.55	32	<0.45	–
50	–	1.25	40	–	<0.25
100	0	<3.25	>30 *	(<0.55)	–
200	0	<10	>20	–	–
300	0	–	–	(<1.4)	–

Static characteristics (T_{amb}=25 °C)		**ASY 26**	**ASY 27**	
Collector-emitter-cutoff current ($-V_{CEV}$=25 V; V_{BE}=0.2 V; T_{amb}=60 °C)	$-I_{CEV}$	≦35	–	µA
Collector-emitter cutoff current ($-V_{CEV}$=20 V; V_{BE}=0.2 V; T_{amb}=60 °C)	$-I_{CEV}$	–	≦35	µA
Collector-base cutoff current ($-V_{CBO}$=5 V)	$-I_{CBO}$	≦3 *	≦3 *	µA
Emitter-base cutoff current ($-V_{EBO}$=5 V)	$-I_{EBO}$	≦3 *	≦3 *	µA
Collector-emitter breakdown voltage ($-I_{CEO}$=5 mA)	$-V_{(BR)CEO}$	≧15	≧15	V
Emitter-base breakdown voltage ($-I_{EBO}$=100 µA; T_{amb}=60 °C)	$-V_{(BR)EBO}$	≧20 *	–	V
Emitter-base breakdown voltage ($-I_{EBO}$=40 µA; T_{amb}=60 °C)	$-V_{(BR)EBO}$	–	≧20 *	V
Emitter-base open circuit DC voltage ($-V_{CEV}$=25 V; T_{amb}=60 °C)	$-V_{EBfl}$	≦0.2	–	V
Junction punch-through voltage	$-V_{pt}$	≧25 *	–	V
Emitter-base open circuit DC voltage ($-V_{CEV}$=20 V; T_{amb}=60 °C)	$-V_{EBfl}$	–	≦0.2	V
Junction punch-through voltage	$-V_{pt}$	–	≧20 *	V
Base current ($-V_{CE}$=20 V; V_{BE}=5 V; T_{amb}=60 °C)	I_B	≦35 *	≦35 *	µA
Collector-base current ratio 0.1 µs after switching (ΔI_C=50 mA; $-V_{CE}$≦0.3 V) measured in the saturation range	h_{FE}	15 (>10)	15 (>10)	–

* AQL=0.65%

Not for new development

Dynamic characteristics (T_{amb} = 25 °C)		ASY 26	ASY 27	
Current gain-bandwidth product ($-I_C$ = 3 mA; $-V_{CE}$ = 5 V)	f_T	8 (≧4)	14 (≧6)	MHz
Collector-junction capacitance ($-V_{CBO}$ = 5 V)	C_{CBO}	11 (≦16)	11 (≦16)	pf
Emitter diffusion capacitance ($-V_{EBO}$ = 5 V)	C_{EBO}	7 (≦13)	7 (≦13)	pf
Turn-on time constant of the output current with current control ($-V_{CE}$ = 0.75 V; $-i_{CM}$ = 50 mA)	τ	≦2.2	≦2.2	µs
Turn-on time constant of the output current with voltage control ($-V_{CE}$ = 0.75 V; $-i_{CM}$ = 1 mA)	τ	≦0.2	≦0.2	µs
Storage time constant (I_C = 0; $-I_B$ = 1 mA)	τ_S	≦1.25	≦1.25	µs

Switching times **ASY 26**

measured in the circuits shown

Delay time t_d ≦ 0.090 µs
Rise time t_r ≦ 0.49 µs

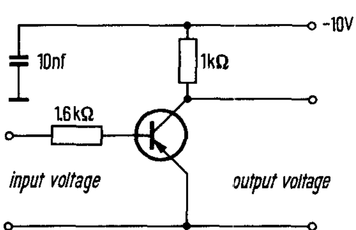
Storage time t_s ≦ 1.35 µs[1])
Fall time t_f ≦ 0.73 µs[2])

Switching times **ASY 27**

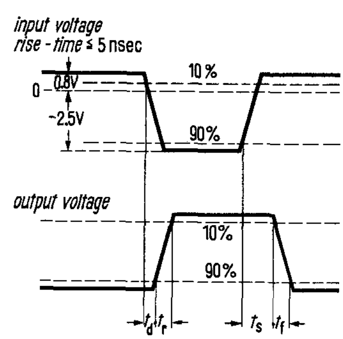
measured in the circuit shown

Delay time t_d ≦ 0.075 µs
Rise time t_r ≦ 0.35 µs

Storage time t_s ≦ 1.55 µs[1])
Fall time t_f ≦ 0.62 µs[2])



output voltage measured with oscillograph (C_I ≤ 8pf, R_I ≥ 10 MΩ)



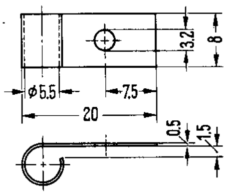
[1]) Rises linearly to 1.5 times the indicated value with T_{amb} increasing to 60 °C
[2]) Rises linearly to 1.25 times the indicated value with T_{amb} increasing to 60 °C

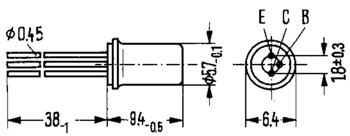
PNP-Transistors for switching applications

ASY 48 and ASY 70 are alloyed PNP-germanium transistors in a case 1 A 3 DIN 41 871 (sim. TO-1). The leads are electrically insulated from the case. The collector terminal is indicated by a red dot on the rim of the case. These transistors are particularly designed for use in switching applications.

Type	Order number
ASY 48 IV	Q60118–Y48–D
ASY 48 V	Q60118–Y48–E
ASY 48 VI	Q60118–Y48–F
ASY 70 IV	Q60118–Y70–D
ASY 70 V	Q60118–Y70–E
ASY 70 VI	Q60118–Y70–F
Heat sink	Q62901–B1

Heat sink





Weight approx. 1 g Dimensions in mm

With careful mounting the thermal resistance between transistor case and heat sink underneath the fastening screw will be: $R_{th} \leqq 10$ K/W

Maximum ratings		ASY 48	ASY 70	
Collector-emitter voltage	$-V_{CEO}$	45	30	V
Collector-emitter voltage ($V_{BE} \geqq 0.2$ V)	$-V_{CEV}$	64	32	V
Collector-base voltage	$-V_{CBO}$	64	32	V
Emitter-base voltage	$-V_{EBO}$	16	16	V
Collector current	$-I_C$	300	300	mA
Base current	$-I_B$	60	60	mA
Junction temperature	T_j	90	90	°C
Storage temperature	T_S	–55 to +75		°C
Total power dissipitation ($T_{case} = 45$ °C)	P_{tot}	900	900	mW
Thermal resistance				
Junction to air	R_{thJamb}	≦300	≦300	K/W
Junction to case	$R_{thJcase}$	≦50	≦50	K/W

Static characteristics (T_{amb} = 25 °C)

		ASY 48		
	T_{amb}	25	60	°C
Collector-base cutoff current ($-V_{CBO}$ = 10 V)	$-I_{CBO}$	<10	<150	µA
Collector-base cutoff current ($-V_{CBO}$ = 64 V)	$-I_{CBO}$	6 (<18) *	<150	µA
Collector-emitter cutoff current ($-V_{CEV}$ = 64 V; $V_{BE} \geqq 0.2$ V)	$-I_{CEV}$	6 (<18)	<150	µA
Emitter-base cutoff current ($-V_{EBO}$ = 16 V)	$-I_{EBO}$	4 (<18) *	<120	µA

		ASY 70		
	T_{amb}	25	60	°C
Collector-base cutoff current ($-V_{CBO}$ = 10 V)	$-I_{CBO}$	3 (<10)	–	µA
Collector-base cutoff current ($-V_{CBO}$ = 32 V)	$-I_{CBO}$	5 (<18) *	<150	µA
Collector-emitter cutoff current ($-V_{CEV}$ = 32 V; $V_{BE} \geqq 0.2$ V)	$-I_{CEV}$	5 (<18)	<150	µA
Emitter-base cutoff current ($-V_{EBO}$ = 16 V)	$-I_{EBO}$	4 (<18) *	<120	µA
Emitter-base cutoff current ($-V_{EBO}$ = 5 V)	$-I_{EBO}$	3 *	–	µA

Static characteristics (T_{amb} = 25 °C) **ASY 48, ASY 70**

The transistors are classified in groups of static forward current transfer ratio h_{FE} at $-I_C$ = 100 mA, which are indicated by Roman numerals.

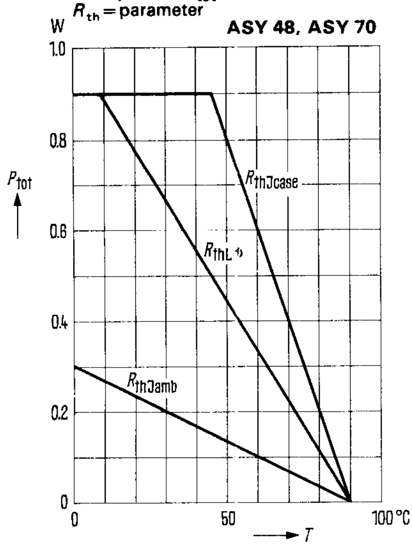
h_{FE} group		IV	V	VI	ASY 48, ASY 70
$-I_C$ mA	$-V_{CE}$ V	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
2	0.5	47	79	114	0.13 (<0.20)
100	0.5	45 (30 to 60) *	75 (50 to 100) *	110 (75 to 150) *	0.32 (<0.55) *
300	0.5	35	58	86	0.44 (<0.80)

Collector-emitter saturation voltage ($-I_C$ = 300 mA; I_B = 15 mA)	$-V_{CEsat}$	0.15 (<0.25) *	V
Collector-emitter saturation voltage ($-I_C$ = 300 mA on that characteristic that, with constant base current, passes through point I_C = 330 mA; V_{CE} = 0.5 V)	$-V_{CEsat}$	0.28 (<0.45) *	V

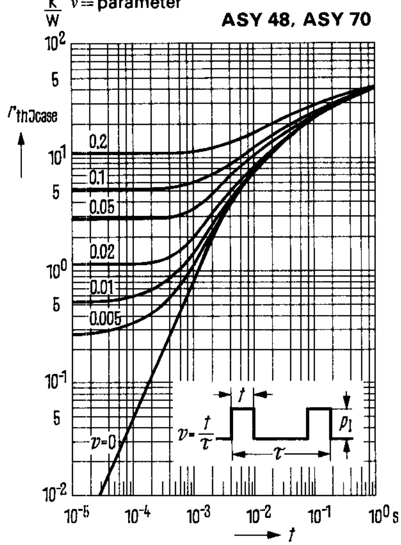
* AQL = 0.65%

Dynamic characteristics (T_{amb} = 25 °C)		ASY 48	ASY 70	
Test condition:				
$-I_C$ = 5 mA; $-V_{CE}$ = 5 V				
Current gain-bandwidth product	f_T	1.2	1.5	MHz
Base series resistance	$r_{bb'}$	75 (<200)	75 (<200)	Ω
Test condition: $-V_{CBO}$ = 5 V				
Collector-base capacitance	C_{CBO}	25 (<40)	25 (<40)	pf
Switching times				
Current control				
Test condition: $-I_C$ = 100 mA	t_{on}	3.5 (<10)	3.5 (<10)	µs
$ü$ = 1.5 to 3; a = 1 to 2;	t_s	1.1 (<3)	1.1 (<3)	µs
$-V_{CC}$ = 10 V	t_f	2.1 (<7)	2.1 (<7)	µs
Voltage control				
Test condition: $-I_C$ = 100 mA	t_{on}	0.25 (<1)	0.15 (<1)	µs
$-V_{BBE1}$ = 4 V; V_{BBE2} = 1 V	t_s	1.3 (<2.5)	1.3 (<2.5)	µs
= 100	t_f	0.5 (<1.5)	0.5 (<1.5)	µs

Permissible total power dissipation $P_{tot} = f(T)$
R_{th} = parameter

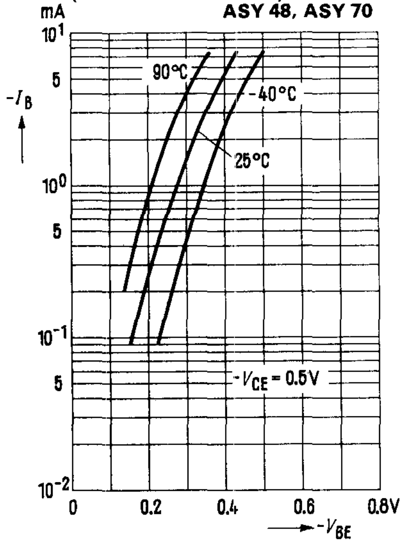


Permissible pulse load
$r_{thJcase} = f(t)$;
v = parameter

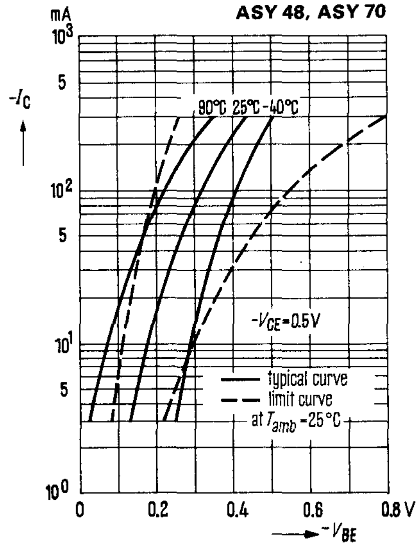


* Heat sink: aluminium 12.5 cm², 2 mm thick

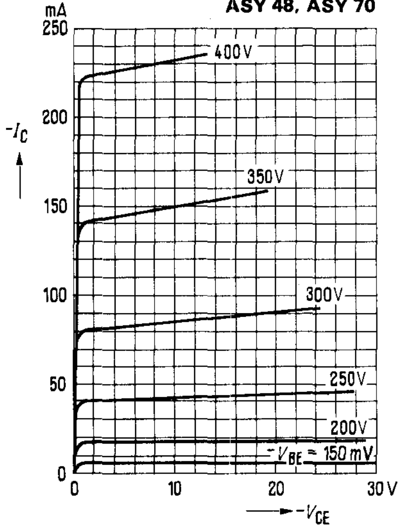
Input characteristics $I_B = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
(common emitter circuit)
ASY 48, ASY 70



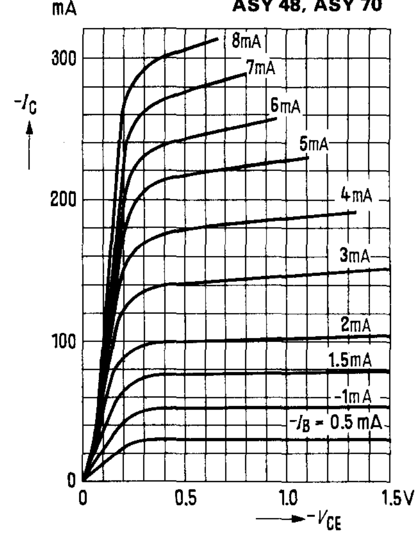
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
ASY 48, ASY 70



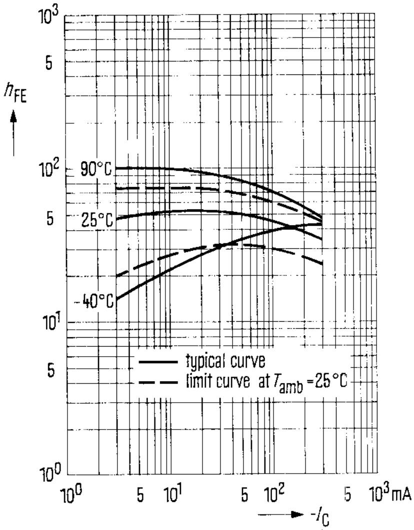
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
ASY 48, ASY 70



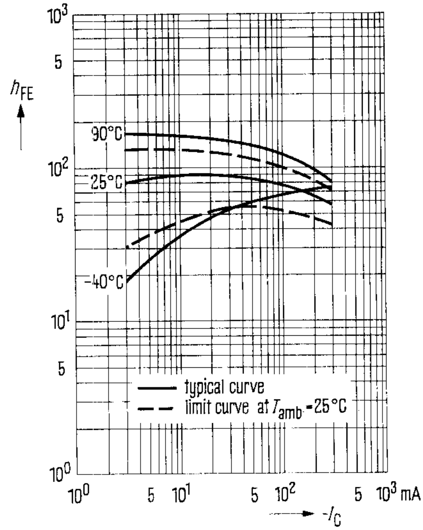
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
ASY 48, ASY 70



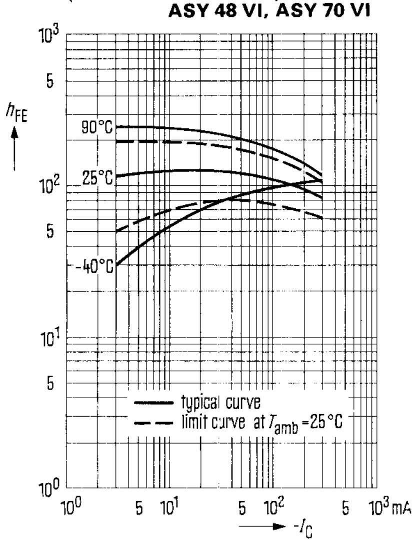
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=0.5$ V; T_{amb} = parameter
(common emitter circuit)
ASY 48 IV, ASY 70 IV



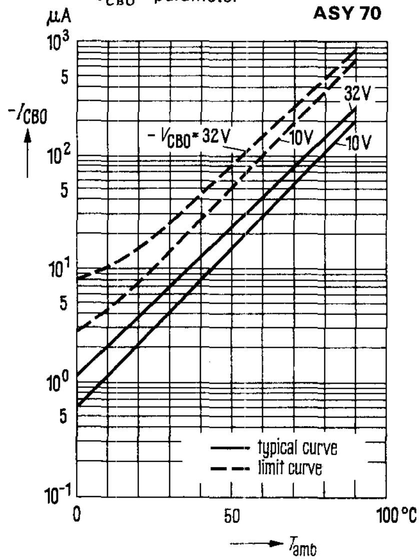
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=0.5$ V; T_{amb} = parameter
(common emitter circuit)
ASY 48 V, ASY 70 V



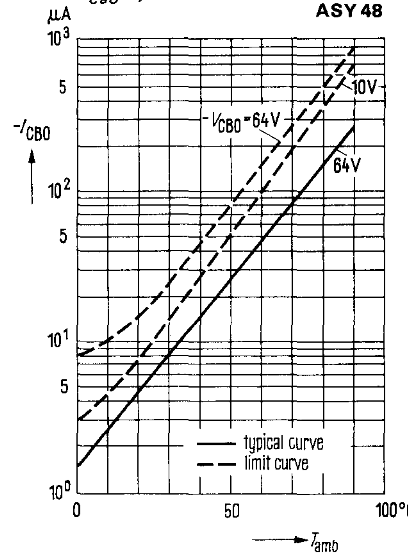
DC forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=0.5$ V; T_{amb} = parameter
(common emitter circuit)
ASY 48 VI, ASY 70 VI



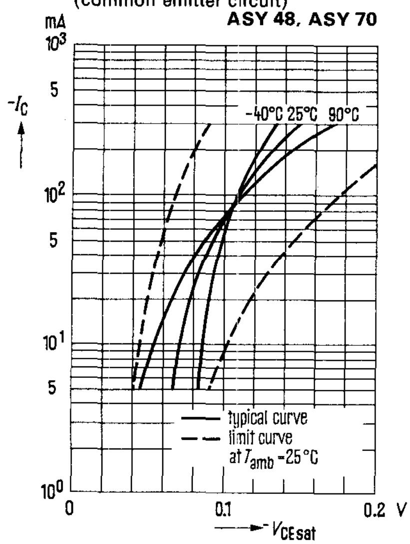
Cutoff current vs. temperature
$I_{CBO} = f(T_{amb})$
$-V_{CBO}$ = parameter
ASY 70



Cutoff current vs. temperature
$I_{CBO} = f(T_{amb})$
V_{CBO} = parameter
ASY 48



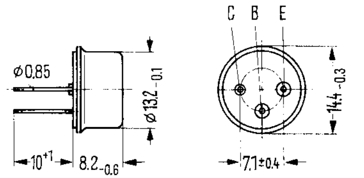
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter
(common emitter circuit)
ASY 48, ASY 70



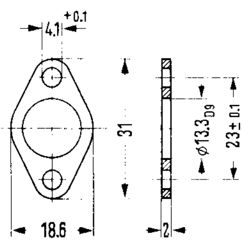
PNP-Transistor for switching applications up to 8 A

The AUY 18 is a germanium PNP alloyed transistor in a case 8 A 3 DIN 41878 (TO−8)
The collector is electrically connected to the case.
For insulated mounting of these transistors on a chassis, mounting parts or insulating parts Q 62901−B 13−B, Q 62901−B 17−A and Q 62901−B 17−B are provided. These parts have to be ordered separately.
The AUY 18 is particularly designed for use as a switch at high voltages.

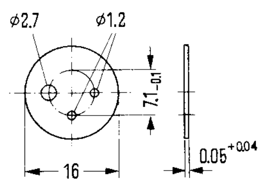
Type	Order number
AUY 18 IV	Q 60120−Y18−D
AUY 18 V	Q 60120−Y18−E
Tensioning plate	Q 62901−B 17−B
Mica disc	Q 62901−B 17−A
Insulating nipple	Q 62901−B 13−B



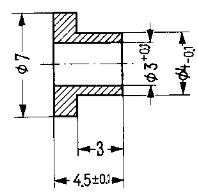
Weight approx. 4.8 g Dimensions in mm



Tensioning plate



Mica disc



Insulating nipple scale: 2:1

Maximum ratings		AUY 18	
Collector-emitter voltage ($-I_C = 2$ A)	$-V_{CEO}$	45	V
Collector-emitter voltage ($-I_C = I_{Cmax}$)	$-V_{CEO}$	35	V
Collector-emitter voltage ($V_{BE} \geqq 1$ V)	$-V_{CEV}$	64	V
Collector-base voltage	$-V_{CBO}$	64	V
Emitter-base voltage	$-V_{EBO}$	20	V
Collector current	$-I_C$	8	A
Base current	$-I_B$	1.5	A
Junction temperature	T_j	100	°C
Storage temperature	T_S	−55 to +90	°C
Total power dissipation ($T_{case} \leqq 45$ °C; $V_{CE} = 10$ V)	P_{tot}	11	W

Thermal resistance			
Junction to case	R_{thJase}	$\leqq 5$	K/W

Static characteristics (T_{amb} = 25 °C)

The transistors AUY 18 are classified in groups of static forward current transfer ratio h_{FE} at $-I_C$ = 5 A. which are indicated by Roman numerals. The following values apply at a collector-emitter voltage of $-V_{CE}$ = 0.5 V.

h_{FE} group	IV	V	AUY 18
$-I_C$ A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
0.5	75	125	0.3
5	45 (30 to 60) *	75 (50 to 100) *	0.55 (<0.95) *
8	36	55	0.65 (<1.1) *

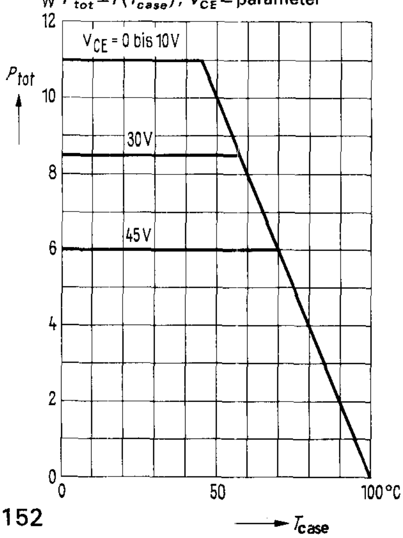
Collector-emitter saturation voltage ($-I_C$=8 A; I_B=0.8 A)	$-V_{CE\,sat}$		0.19 (<0.35) *	V
	T_{case}	90	25	°C
Collector-emitter cutoff current ($-V_{CEV}$=64 V; $V_{BE}\geqq$1 V)	$-I_{CEV}$	3 (<10)	0.15 (<1) *	mA
Emitter-base cutoff current ($-V_{EBO}$=20 V)	$-I_{EBO}$	3 (<10)	0.07 (<1) *	mA
Collector-emitter breakdown voltage ($-I_{CEO}$=2 A)	$-V_{(BR)\,CEO}$	>45	>45	V
($-I_{CEO}$=8 A)	$-V_{(BR)\,CEO}$	>35	>35	V

Dynamic characteristics (T_{amb} = 25 °C)

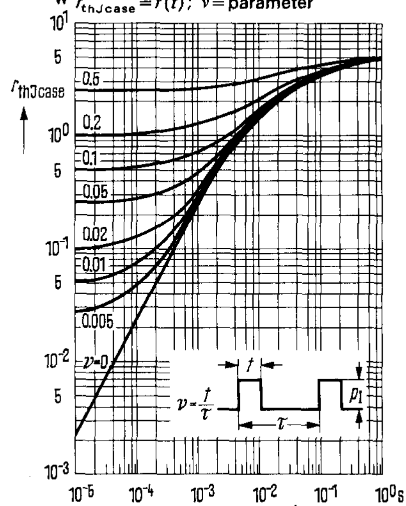
Test condition: $-I_C$=0.5 A; $-V_{CE}$=6 V			
Current gain-bandwidth product ($-I_C$=0.5 A; $-V_{CE}$=6 V)	f_T	300	kHz
Cutoff frequency in common emitter circuit	f_β	8	kHz

* AQL=0.65%

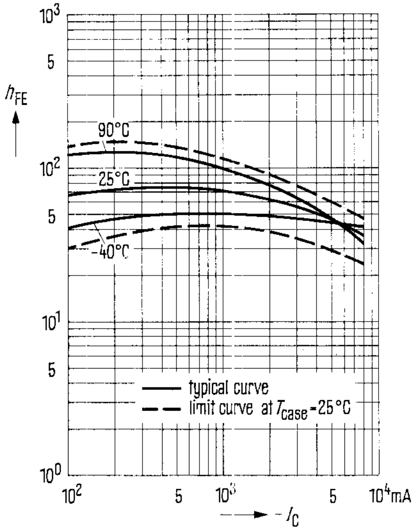
Total power dissipation
$P_{tot}=f(T_{case})$; V_{CE}=parameter



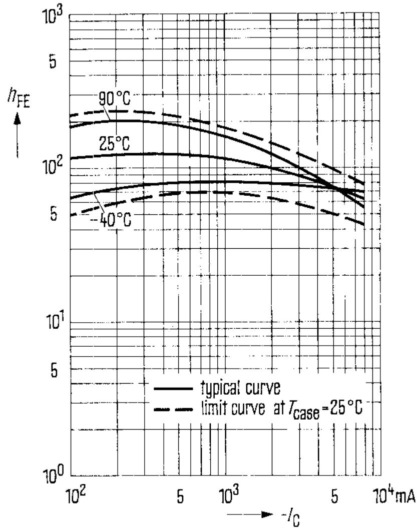
Permissible pulse load
$r_{thJcase}=f(t)$; v=parameter



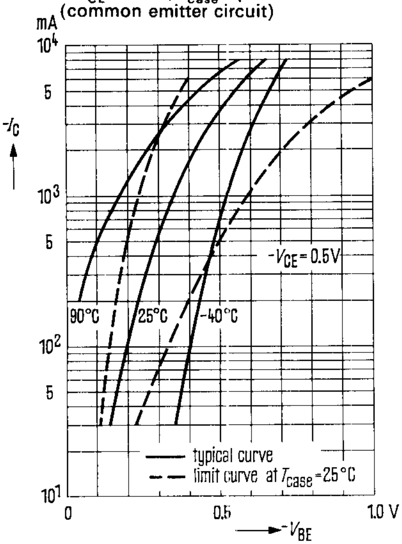
Forward current transfer ratio
$h_{FE}=f(I_C)$
$-V_{CE}=0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 18 h_{FE} group IV



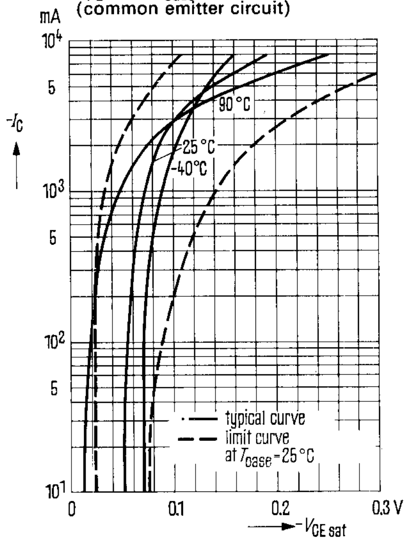
Forward current transfer ratio
$h_{FE}=f(I_C)$
$-V_{CE}=0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 18 h_{FE} group V



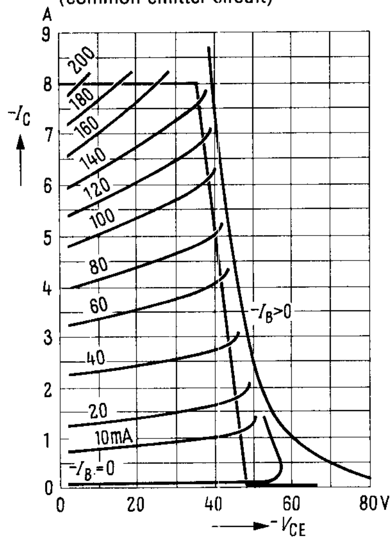
Collector current $I_C=f(V_{BE})$
$-V_{CE}=0.5$ V; T_{case} = parameter
(common emitter circuit)



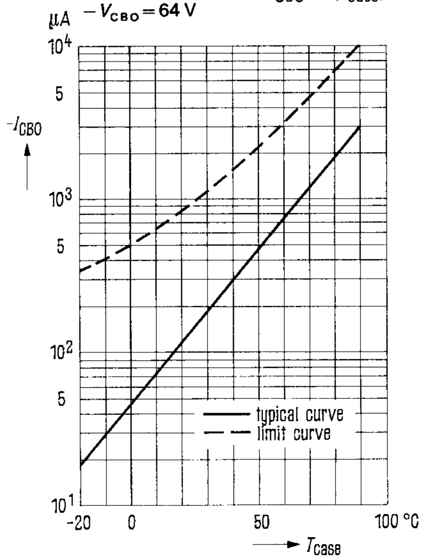
Saturation voltage $V_{CEsat}=f(I_C)$
$h_{FE}=10$; T_{case} = parameter
(common emitter circuit)



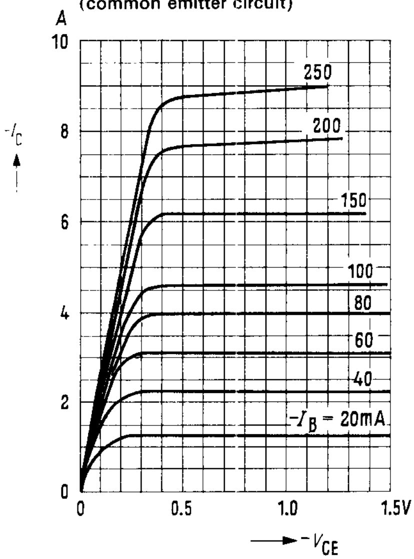
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



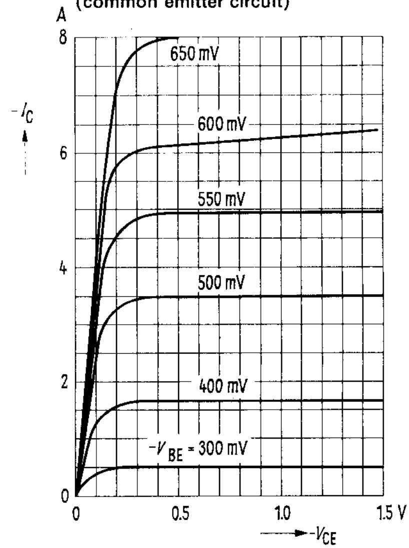
Temperature dependence of the cutoff current $I_{CBO} = f(T_{case})$
$-V_{CBO} = 64$ V



Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



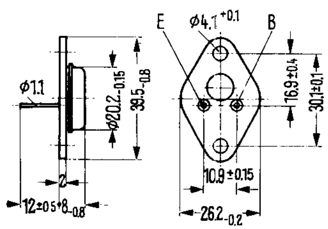
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



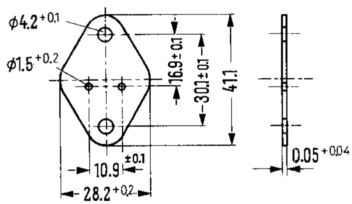
PNP-Transistors for switching applications up to 3 A

AUY 19, AUY 20 and AUY 34 are alloyed PNP germanium transistors in a case 3 A 2 DIN 41 872 (TO-3). The collectors are electrically connected to the case. For insulated mounting of these transistors on a chassis, insulating parts Q 62901 – B 11 – A and Q 62901 – B 13 – B are available, to be ordered separately. The transistors are especially designed for AF switching applications.

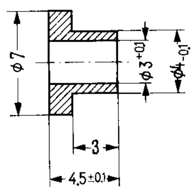
Type	Order number	Type	Order number
AUY 19 III	Q 60120 – Y 19 – C	AUY 34 II	Q 60120 – Y 34 – B
AUY 19 IV	Q 60120 – Y 19 – D	AUY 34 III	Q 60120 – Y 34 – C
AUY 19 V	Q 60120 – Y 19 – E	AUY 34 IV	Q 60120 – Y 34 – D
AUY 20 III	Q 60120 – Y 20 – C	Insulating nipple	Q 62901 – B 13 – B
AUY 20 IV	Q 60120 – Y 20 – D	Mica disc	Q 62901 – B 11 – A
AUY 20 V	Q 60120 – Y 20 – E		



Weight approx. 16.5 g Dimensions in mm



Mica disc
dry: $R_{th} = 1.25$ K/W
greased: $R_{th} = 0.35$ K/W



Insulating nipple
scale 2:1

Maximum ratings		AUY 19	AUY 20	AUY 34	
Collector-emitter voltage ($-I_C = I_{C\,max}$)	$-V_{CEO}$	45	60	80	V
Collector-emitter voltage ($V_{BE} \geqq 1$ V)	$-V_{CEV}$	64	80	100	V
Collector-base voltage	$-V_{CBO}$	64	80	100	V
Emitter-base voltage	$-V_{EBO}$	20	20	20	V
Collector current	$-I_C$	3	3	3	A
Base current	$-I_B$	0.5	0.5	0.5	A
Junction temperature	T_j	90	90	90	°C
Storage temperature	T_s	–55 to +90	–55 to +90	–55 to +90	°C
Total power dissipation ($T_{case} \geqq 45$ °C; $V_{CE} = 10$ V)	P_{tot}	30	30	30	W
Thermal resistance					
Junction to case	$R_{thJcase}$	$\leqq 1.5$	$\leqq 1.5$	$\leqq 1.5$	K/W

Dynamic characteristics ($T_{case}=25$ °C)
Operating point ($-I_C=0.5$ A; $-V_{CE}=2$ V)

		AUY 19, AUY 20, AUY 34	
Cutoff frequency in common emitter circuit	f_β	10	kHz
Current gain-bandwidth product	f_T	350	kHz
Collector-base capacitance ($-V_{CBO}=6$ V)	C_{CBO}	200	pf
Emitter-base capacitance ($-V_{EBO}=6$ V)	C_{EBO}	90	pf

Switching times

At an overdriving factor of $\ddot{u}=1.5$ to 3 and a	t_{on}	10 (<20)	µs
"turn off" base current of $I_{B2}=15$ mA	t_s	8 (<15)	µs
($-I_C=1$ A) the following switching times apply:	t_f	14 (<30)	µs

Static characteristics ($T_{case}=25$ °C)

	T_{case}	90	25	°C
Collector-emitter cutoff current ($-V_{CEV}=64$ V; $V_{BE}\geqq 1$ V) **(AUY 19)**	$-I_{CEV}$	5 (<10)	0.15 (<0.5)*	mA
Collector-emitter cutoff current ($-V_{CEV}=80$ V; $V_{BE}\geqq 1$ V) **(AUY 20)**	$-I_{CEV}$	5 (<10)	0.15 (<0.5)*	mA
Collector-emitter cutoff current ($-V_{CEV}=100$ V; $V_{BE}\geqq 1$ V) **(AUY 34)**	$-I_{CEV}$	5 (<10)	0.15 (<0.5)*	mA
Emitter-base cutoff current ($-V_{EBO}=20$ V)	$-I_{EBO}$	4.5 (<10)	0.07 (<0.4)*	mA
Collector-emitter breakdown voltage ($-I_C=3$ A) **AUY 19**	$-V_{(BR)CEO}$	>45	>45	V
AUY 20	$-V_{(BR)CEO}$	>60	>60	V
AUY 34	$-V_{(BR)CEO}$	>80	>80	V

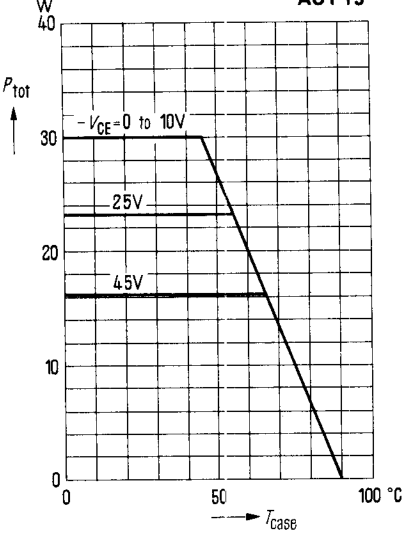
The transistors **AUY 19/34** are classified in groups according to their static forward current transfer ratio h_{FE} at $-I_C=1$ A, which are indicated by Roman numerals. The following values apply at a collector-emitter voltage of $-V_{CE}=1$ V and the following collector currents.

h_{FE} group	II	III	IV	V	
Type	— AUY 34	AUY 19/20 AUY 34	AUY 19/20 AUY 34	AUY 19/20 —	AUY 19 AUY 20 AUY 34
$-I_C$ A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
0.05	30	49	74	124	0.2 (<0.32)
1	19 (12.5 to 25)*	30 (20 to 40)*	45 (30 to 60)*	75 (50 to 100)*	0.6 (<0.8)*
3	10	17	25	42	1.0 (<1.5)

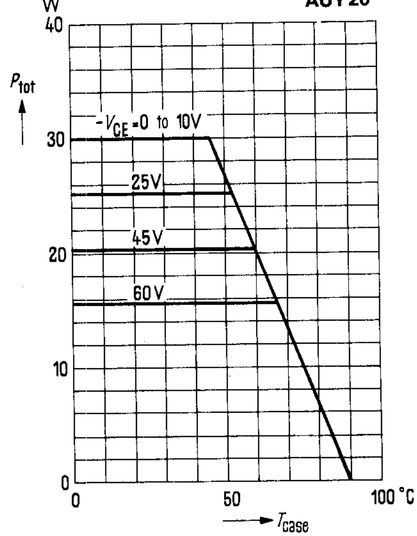
Collector-emitter saturation voltage ($-I_C=3$ A; $I_B=0.3$ A)	$-V_{CEsat}$	0.5 (<1.0)*	V

* AQL=0.65%

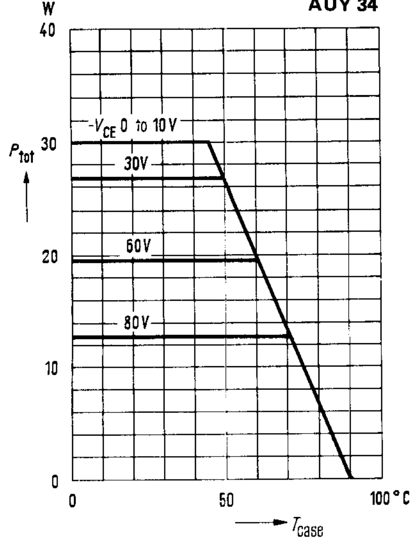
Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter
AUY 19



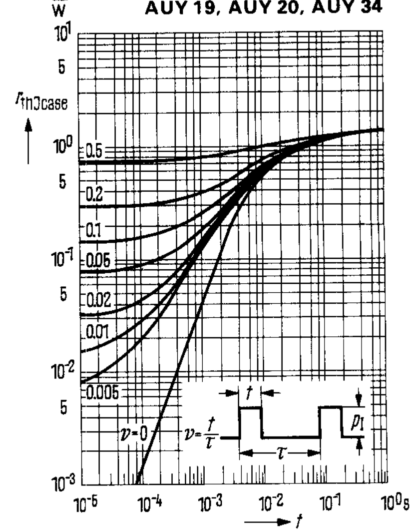
Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter
AUY 20



Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter
AUY 34

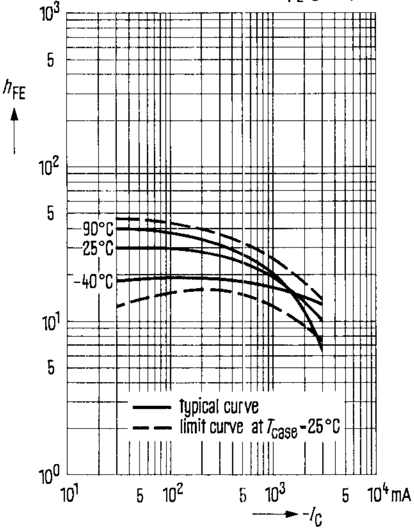


Permissible pulse load
$\frac{K}{W}$ $r_{thJcase} = f(t)$; v = parameter
AUY 19, AUY 20, AUY 34

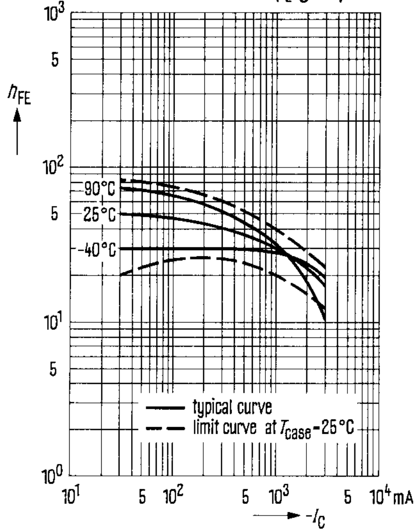


DC forward current transfer ratio $h_{FE} = f(I_C)$;
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)

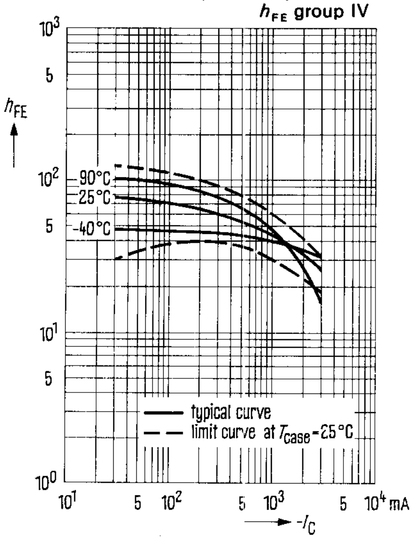
AUY 34 h_{FE} group II



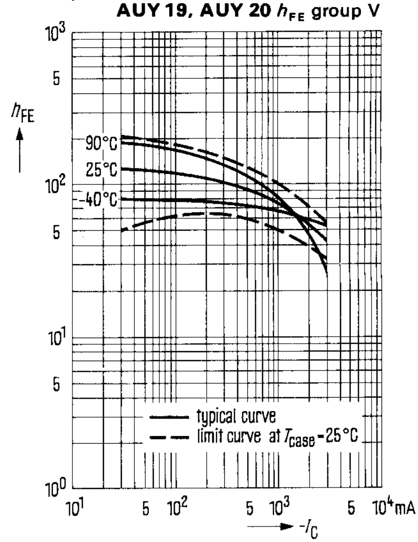
DC forward current transfer ratio $h_{FE} = f(I_C)$;
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)
AUY 19, AUY 20, AUY 34
h_{FE} group III



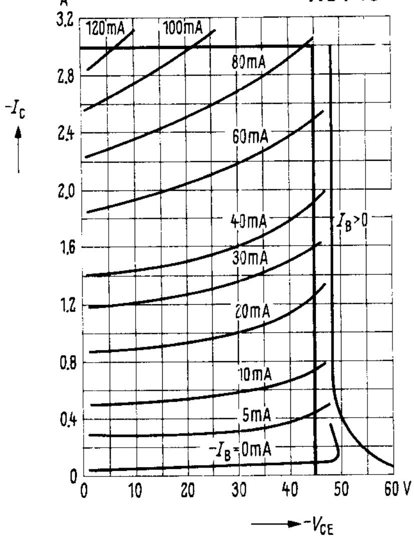
DC forward current transfer ratio $h_{FE} = f(I_C)$;
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)
AUY 19, AUY 20, AUY 34
h_{FE} group IV



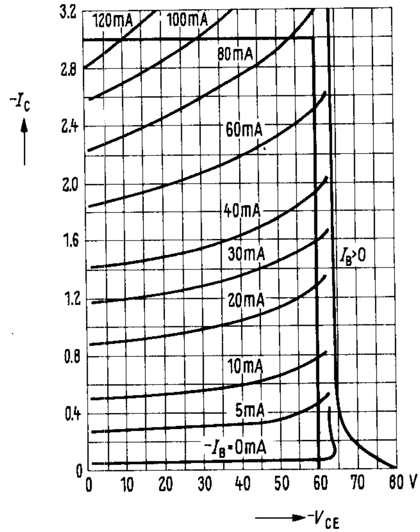
DC forward current transfer ratio $h_{FE} = f(I_C)$;
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)
AUY 19, AUY 20 h_{FE} group V



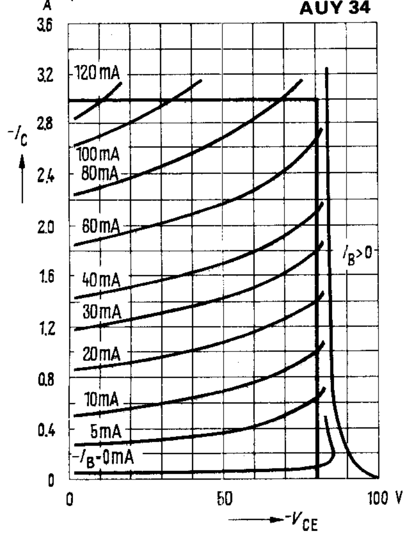
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 19



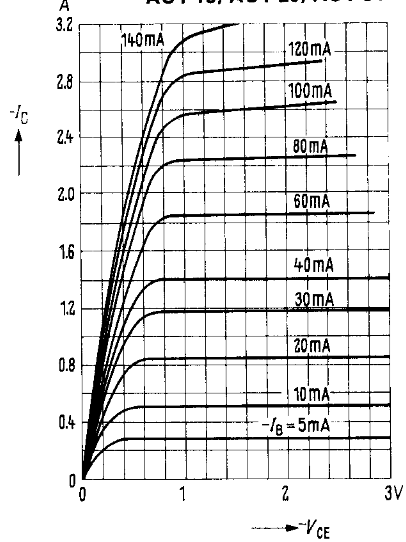
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 20



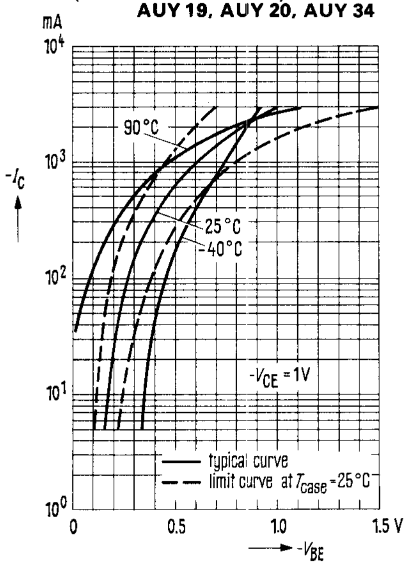
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 34



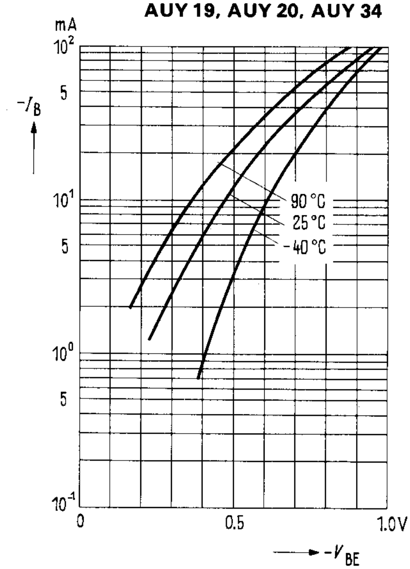
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 19, AUY 20, AUY 34



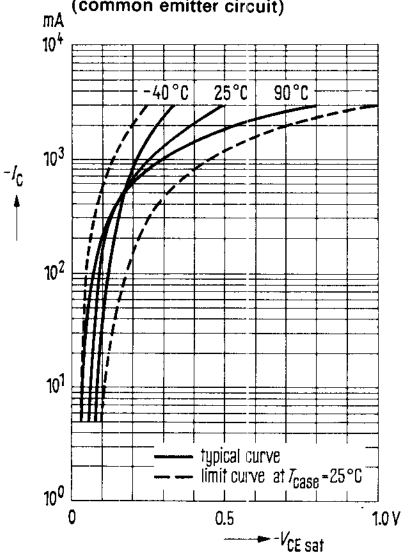
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 1$ V; T_{case} = parameter
(common emitter circuit)
AUY 19, AUY 20, AUY 34



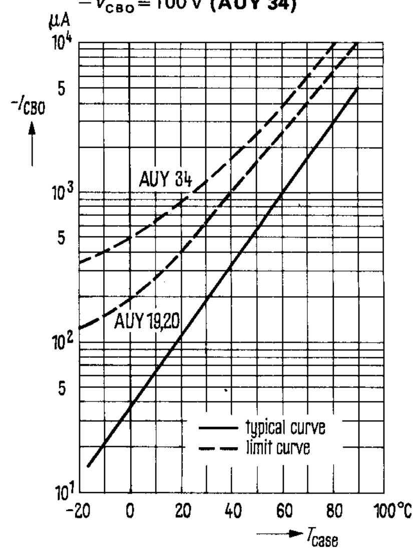
Input characteristics $I_B = f(V_{BE})$
T_{case} = parameter
AUY 19, AUY 20, AUY 34



Saturation voltage $V_{CEsat} = f(I_C)$
T_{case} = parameter
(common emitter circuit)



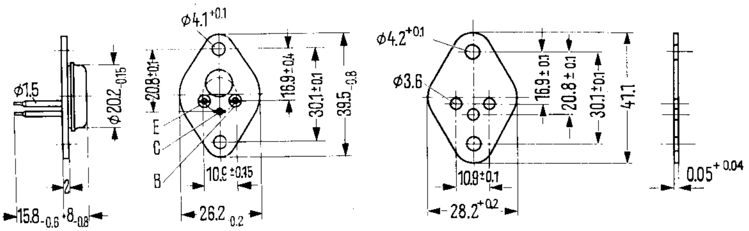
Cutoff current $I_{CBO} = f(T_{case})$
$-V_{CBO} = 64$ V **(AUY 19, AUY 20)**
$-V_{CBO} = 100$ V **(AUY 34)**



PNP-Transistors for high-power switching applications

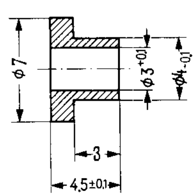
AUY 21, AUY 22 and AUY 29 are alloyed PNP germanium transistors in a case 3 C 3 DIN 41 872 (sim. TO-41). The collectors are electrically connected to the case. For insulated mounting of these transistors on a chassis, insulating parts Q 62901 – B 13 – A and Q 62901 – B 13 – B are available, to be ordered separately. The transistors are especially designed for high-power switching applications.

Type	Order number	Type	Order number
AUY 21 II	Q 60120 – Y 21 – B	AUY 29 III	Q 60120 – Y 29 – C
AUY 21 III	Q 60120 – Y 21 – C	AUY 29 IV	Q 60120 – Y 29 – D
AUY 21 IV	Q 60120 – Y 21 – D	AUY 29 V	Q 60120 – Y 29 – E
AUY 22 II	Q 60120 – Y 22 – B	AUY 29 paired	Q 60120 – Y 29 – P
AUY 22 III	Q 60120 – Y 22 – C	Mica disc	Q 62901 – B 13 – A
AUY 22 IV	Q 60120 – Y 22 – D	Insulating nipple	Q 62901 – B 13 – B



Weight approx. 17 g Dimensions in mm

Mica disc dry: $R_{th} = 1.25$ K/W
greased: $R_{th} = 0.35$ K/W



Insulating nipple
scale 2:1

Maximum ratings		AUY 21	AUY 22	AUY 29	
Collector-emitter voltage ($-I_C = 2$ A)	$-V_{CEO}$	45	60	32	V
Collector-emitter voltage ($-I_C = 10$ A)	$-V_{CEO}$	32	45	20	V
Collector-emitter voltage ($V_{BE} \geqq 1$ V)	$-V_{CEV}$	65	80	50	V
Collector-base voltage	$-V_{CBO}$	65	80	50	V
Emitter-base voltage	$-V_{EBO}$	20	20	10	V
Collector current	$-I_C$	10	8	15	A
Base current	$-I_B$	2	1.5	2	A
Junction temperature	T_j	100	100	100	°C
Storage temperature	T_s	– 55 to + 90	– 55 to + 90	– 55 to + 90	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	36 [1]	36 [2]	36 [3]	W
Thermal resistance					
Junction to case	$R_{thJcase}$	$\leqq 1.5$	$\leqq 1.5$	$\leqq 1.5$	K/W

[1] $V_{CE} = 15$ V; [2] $V_{CE} = 20$ V; [3] $V_{CE} = 10$ V

Static characteristics (T_{case} = 25 °C)

The transistors are classified in groups according to their static forward current transfer ratio h_{FE} at $-I_C$ = 5 A, which are indicated by Roman numerals. The following values apply at a collector-emitter voltage of $-V_{CE}$ = 0.5 V.

h_{FE} group	II	III	IV	V	
Type	AUY 21/22 –	AUY 21/22 AUY 29	AUY 21/22 AUY 29	– AUY 29	AUY 21 AUY 22 AUY 29
$-I_C$ A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
0.5	32	50	75	125	0.3 (<0.5)
5	19 (12.5 to 25)*	30 (20 to 40)*	45 (30 to 60)*	75 (50 to 100)*	0.55 (<0.95)*
8	15	25	36	60	0.65 (<1.1)*

		AUY 21	AUY 22	AUY 29	
Collector-emitter saturation voltage ($-I_C$=10 A; I_B=1 A)	$-V_{CE\,sat}$	0.22 (<0.4) *	–	–	V
Collector-emitter saturation voltage (I_C=10 A on that constant I_B characteristic passing through the point $-I_C$=11 A and V_{CE}=0.5 V)	$-V_{CE\,sat}$	0.27 (<0.5) *	–	–	V
Collector-emitter saturation voltage ($-I_C$=8 A; I_B=0.8 A)	$-V_{CE\,sat}$	–	0.18 (<0.35) *	–	V
Collector-emitter saturation voltage (I_C=8 A on that constant I_B characteristic passing through the point $-I_C$=8.8 A; V_{CE}=0.5 V)	$-V_{CE\,sat}$	–	0.25 (<0.5) *	–	V
Collector-emitter saturation voltage ($-I_C$=15 A; I_B=1.5 A)	$-V_{CE\,sat}$	–	–	0.3 (< 0.5) *	V
Collector-emitter saturation voltage (I_C=15 A on that constant I_B characteristic passing through the point $-I_C$=16.5 A; V_{CE}=0.5 V)	$-V_{CE\,sat}$	–	–	0.35 (<0.5) *	V

* AQL=0.65%

Static characteristics

		AUY 21		
	T_{case}	90	25	°C
Collector-emitter cutoff current ($-V_{CEV}=65$ V; $V_{BE} \geqq 1$ V)	$-I_{CEV}$	3 (<10)	<1 *	mA
Emitter-base-cutoff current ($-V_{EBO}=20$ V)	$-I_{EBO}$	3 (<10)	<1 *	mA
Collector-emitter breakdown voltage ($-I_{CEO}=2$ A)	$-V_{(BR)\,CEO}$	> 45	>45	V
Collector-emitter breakdown voltage ($-I_{CEO}=10$ A)	$-V_{(BR)\,CEO}$	> 32	>32	V

		AUY 22		
Collector-emitter cutoff current ($-V_{CEV}=80$ V; $V_{BE} \geqq 1$ V)	$-I_{CEV}$	3 (<10)	<1 *	mA
Emitter-base-cutoff current ($-V_{EBO}=20$ V)	$-I_{EBO}$	3 (<10)	<1 *	mA
Collector-emitter breakdown voltage ($-I_{CEO}=2$ A)	$-V_{(BR)\,CEO}$	> 60	>60	V
Collector-emitter breakdown voltage ($-I_{CEO}=8$ A)	$-V_{(BR)\,CEO}$	> 45	>45	V

		AUY 29		
Collector-emitter cutoff current ($-V_{CEV}=50$ V; $V_{BE} \geqq 1$ V)	$-I_{CEV}$	3 (<10)	<1 *	mA
Emitter-base-cutoff current ($-V_{EBO}=10$ V)	$-I_{EBO}$	3 (<10)	<1 *	mA
Collector-emitter breakdown voltage ($-I_{CEO}=2$ A)	$-V_{(BR)\,CEO}$	> 32	>32	V
Collector-emitter breakdown voltage ($-I_{CEO}=15$ A)	$-V_{(BR)\,CEO}$	> 20	>20	V

Dynamic characteristics ($T_{case}=25$ °C)
Test condition: $-I_C=0.5$ A; $-V_{CE}=6$ V

		AUY 21 AUY 22 AUY 29	
Cutoff frequency in common emitter circuit	f_β	8	kHz
Current gain-bandwidth product	f_T	300	kHz

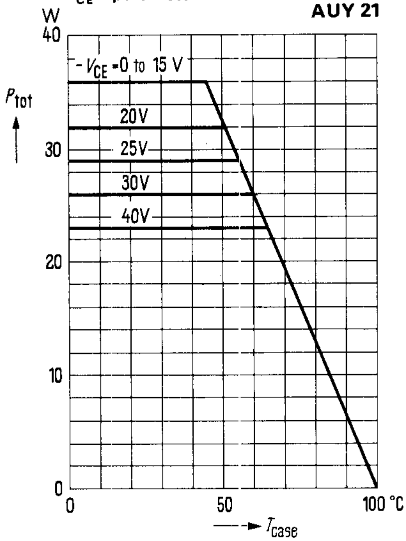
Switching times

At an overdriving factor of $\ddot{u}=1.5$ to 3 and	t_{on}	12 (<25)	µs
a "turn off" base current of $I_{B2}=100$ mA	t_s	8 (<15)	µs
($-I_C=5$ A) the following switching times apply:	t_f	10 (<25)	µs

* AQL=0.65%

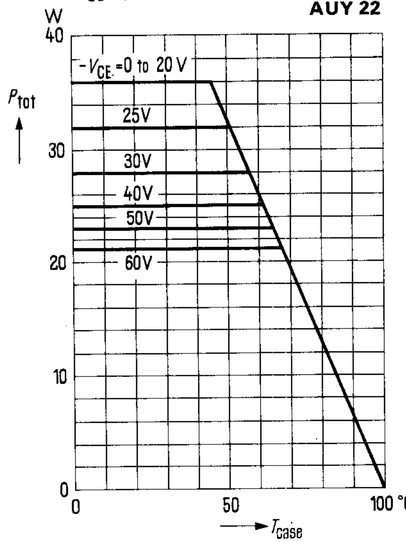
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

AUY 21



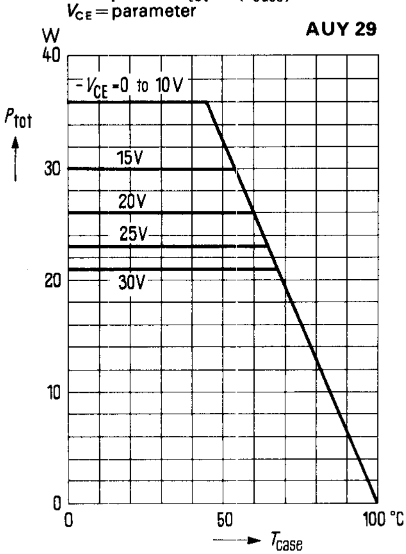
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

AUY 22



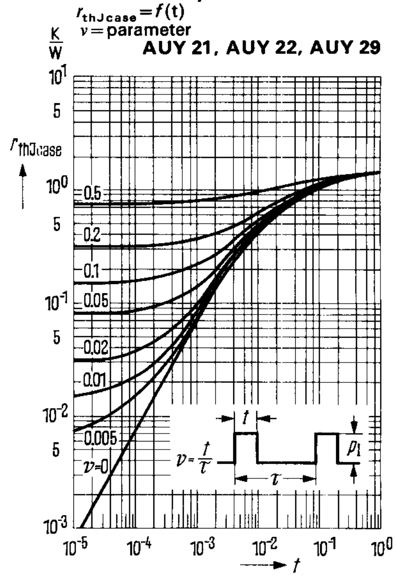
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

AUY 29

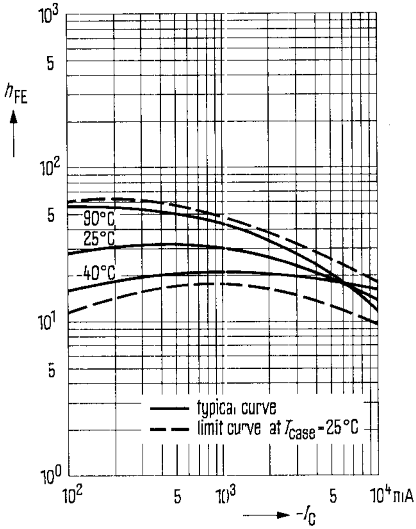


Permissible pulse load
$r_{thJcase} = f(t)$
v = parameter

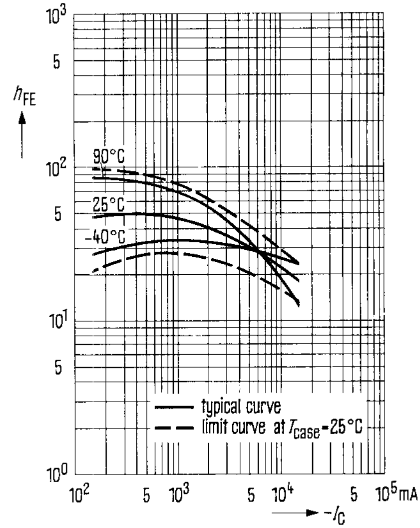
AUY 21, AUY 22, AUY 29



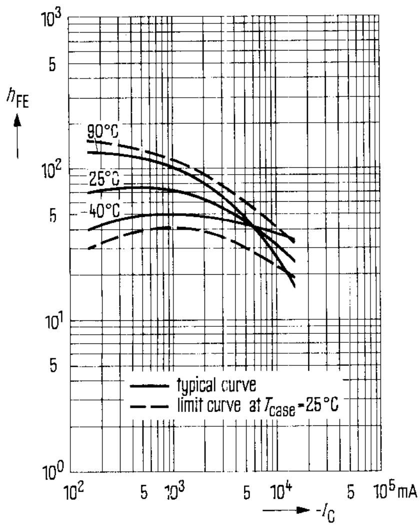
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 21, AUY 22 h_{FE} group II



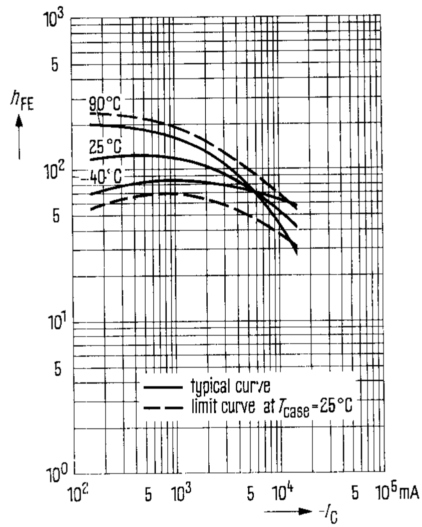
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 21, AUY 22, AUY 29
h_{FE} group III



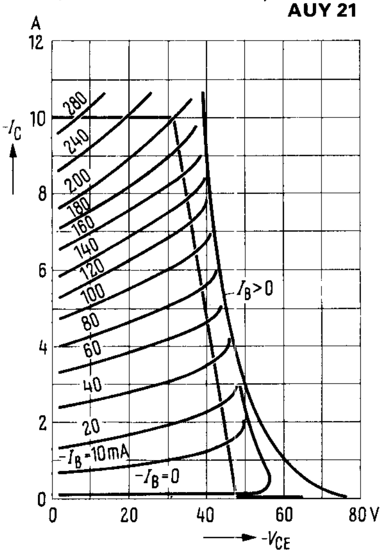
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 21, AUY 22, AUY 29
h_{FE} group IV



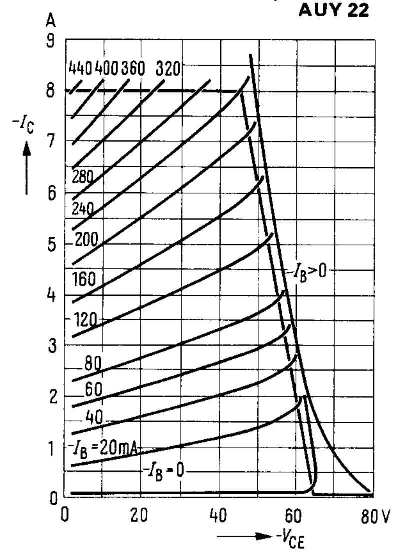
DC forward current transfer ratio $h_{FE} = f(I_C)$
$-V_{CE} = 0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 29 h_{FE} group V



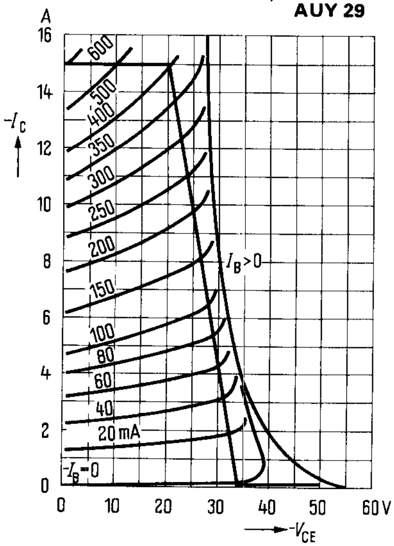
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 21



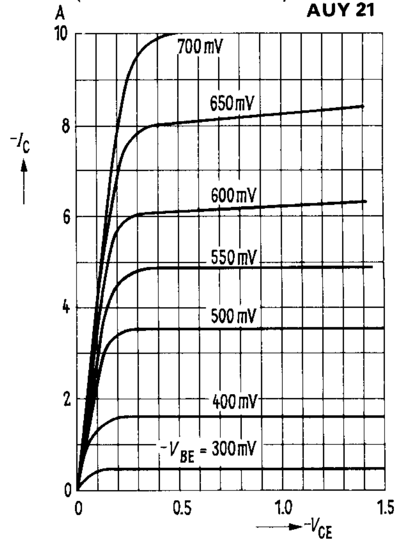
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 22



Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
AUY 29

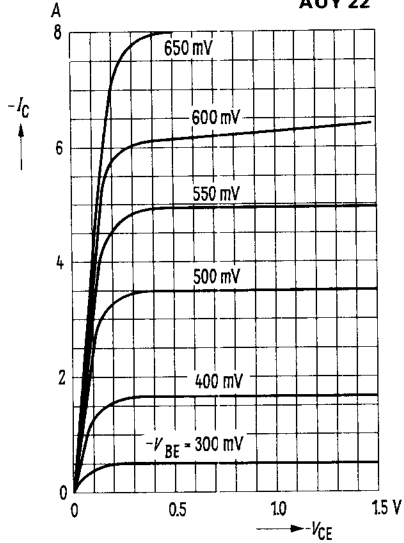


Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
AUY 21



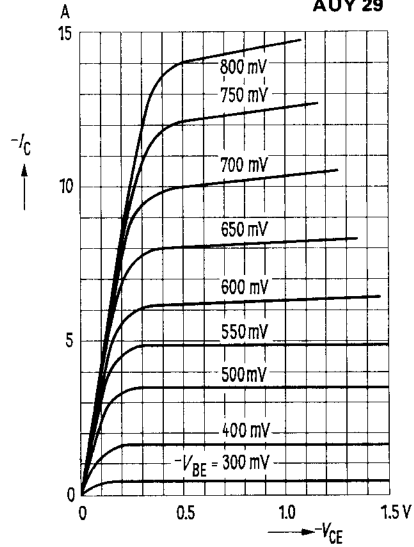
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)

AUY 22



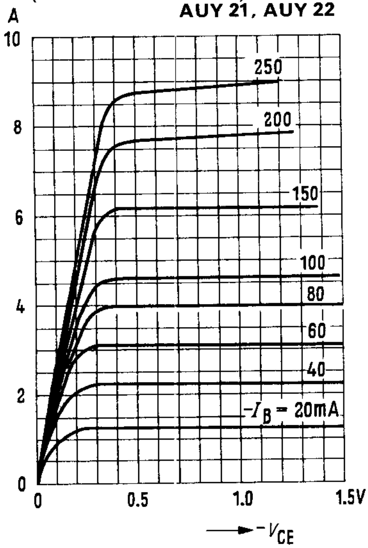
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)

AUY 29



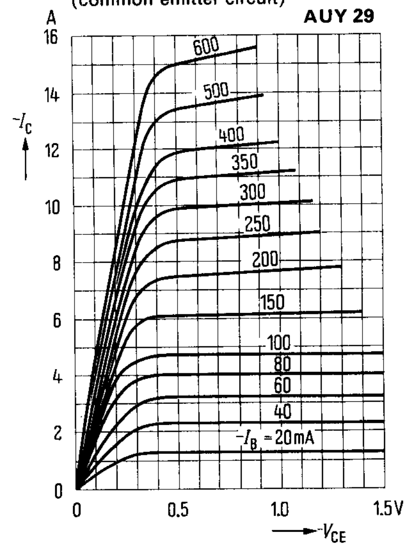
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)

AUY 21, AUY 22

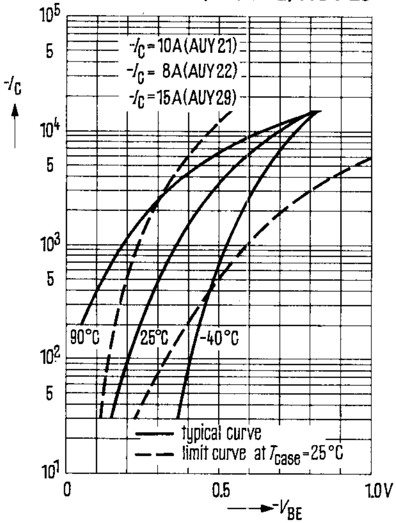


Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)

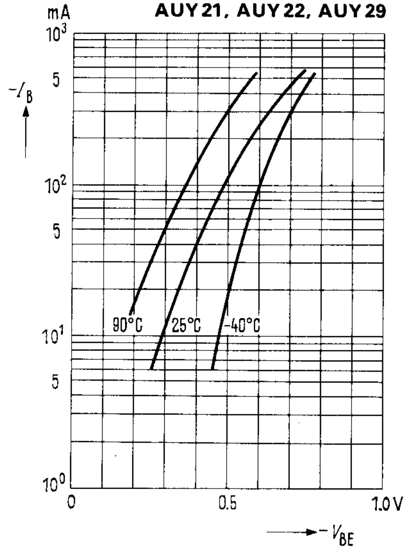
AUY 29



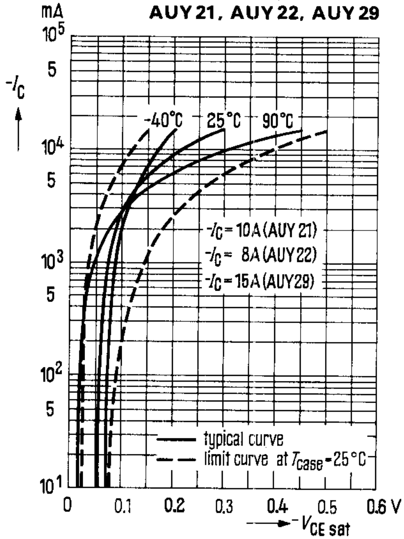
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{case} = parameter
(common emitter circuit)
AUY 21, AUY 22, AUY 29



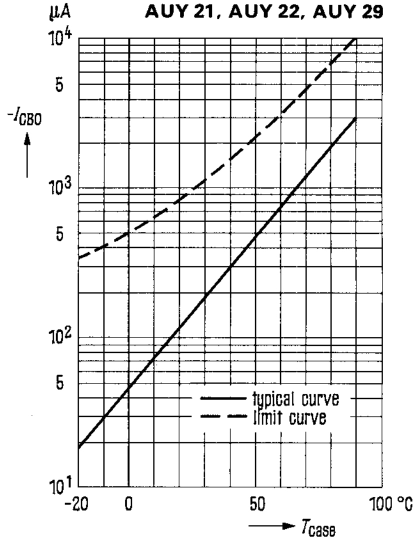
Input characteristics $I_B = f(V_{BE})$;
T_{case} = parameter; $V_{CE} = 0.5$ V
AUY 21, AUY 22, AUY 29



Collector saturation voltage
$V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter
(common emitter circuit)
AUY 21, AUY 22, AUY 29



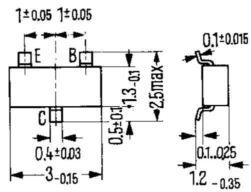
Collector-base cutoff current $I_{CBO} = f(T_{case})$
AUY 21, AUY 22, AUY 29



NPN Transistors for AF prestages and switching applications

BCW 60 and BCX 70 are epitaxial NPN silicon planar transistors in a plastic case 23 A 3 DIN 41869 (SOT-23) for AF prestages and switching applications. They are particularly designed for use in thick and thin film circuits. Both types BCW 60 and BCX 70 are marked by the letter "A" while the following letter (A, B, C or D for BCW 60 and G, H, J or K for BCX 70) refers to the respective static forward current transfer ratio of the transistor. Their complementary transistors are BCW 61 and BCX 71.

Type	Code	Order number
BCW 60	AA	Q 62702–C 331
BCW 60	AB	Q 62702–C 332
BCW 60	AC	Q 62702–C 333
BCW 60	AD	Q 62702–C 334
BCX 70	AG	Q 62702–C 423
BCX 70	AH	Q 62702–C 424
BCX 70	AJ	Q 62702–C 425
BCX 70	AK	Q 62702–C 426



Weight approx. 0.02 g   Dimensions in mm

Maximum ratings

		BCW 60	BCX 70	
Collector-emitter voltage	V_{CES}	32	45	V
Collector-emitter voltage	V_{CEO}	32	45	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	200	200	mA
Base current	I_B	50	50	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_S	–55 to +125		°C
Total power dissipation (T_{amb} = 45 °C) on glass substrate (7 × 7 × 1 mm)	P_{tot}	150 ¹)	150 ¹)	mW
Thermal resistance				
Glass substrate (7 × 7 × 1 mm)	R_{thJamb}	≦0.7	≦0.7	K/mW
Ceramic (30 × 12 × 1 mm)	R_{thJamb}	≦0.45	≦0.45	K/mW
Glass fiber (30 × 12 × 1.5 mm)	R_{thJamb}	≦0.45	≦0.45	K/mW

¹) The permissible total power dissipation is given by the thermal resistance incorporated in each case, according to $P_{perm} = \frac{T_{jmax} - T_{amb}}{R_{thJamb}}$

Static characteristics (T_{amb} = 25 °C)
The transistors BCW 60 and BCX 70 are classified in groups of static forward current transfer ratio h_{FE} and identified by letters:

h_{FE} group						
for **BCW 60**		A	B	C	D	**BCW 60**
for **BCX 70**		G	H	J	K	**BCX 70**
V_{CE} V	I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
5	0.01	78	145 (>20)	220 (>40)	300 (>100)	0.52
5	2	170 (120 to 220)*	250 (180 to 310)*	350 (250 to 460)*	500 (380 to 630)*	0.65 (0.55 to 0.75)*
1	50	>50	>70	>90	>100	0.78

Saturation voltages	V_{CEsat} (V)	V_{BEsat} (V)
I_C = 10 mA; I_B = 0.25 mA	0.12 (0.05 to 0.35)	0.7 (0.6 to 0.85)
I_C = 50 mA; I_B = 1.25 mA	0.2 (0.1 to 0.55)	0.83 (0.7 to 1.85)

		BCW 60	BCX 70	
Collector-emitter cutoff current				
(V_{CES} = 32 V)	I_{CES}	<20	–	nA*
(V_{CES} = 45 V)	I_{CES}	–	<20	nA*
Collector-emitter cutoff current				
(V_{CES} = 32 V; T_{amb} = 150 °C)	I_{CES}	<20	–	µA
(V_{CES} = 45 V; T_{amb} = 150 °C)	I_{CES}	–	<20	µA
Emitter-base cutoff current (V_{EBO} = 4 V)	I_{EBO}	<20	<20	nA*
Collector-emitter breakdown voltage (I_{CEO} = 2 mA)	$V_{(BR)CEO}$	>32	>45	V*
Emitter-base breakdown voltage (I_{EBO} = 1 µA)	$V_{(BR)EBO}$	>5	>5	V*

* AQL = 0.65%

Dynamic characteristics (T_{amb} = 25 °C)

		BCW 60	BCX 70	
Current gain-bandwidth product (I_C = 10 mA; V_{CE} = 5 V; f = 100 MHz)	f_T	250 (>125)		MHz
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	< 4.5	< 4.5	pf
Emitter-base capacitance (V_{EBO} = 0.5 V; f = 1 MHz)	C_{EBO}	8	8	pf
Noise figure (I_C = 0.2 mA; V_{CE} = 5 V; R_g = 2 kΩ; f = 1 kHz; Δf = 200 Hz)	NF	2 (<)	2 (< 6)	db

Four-terminal network data: (I_C = 2 mA; V_{CE} = 5 V; f = 1 kHz)

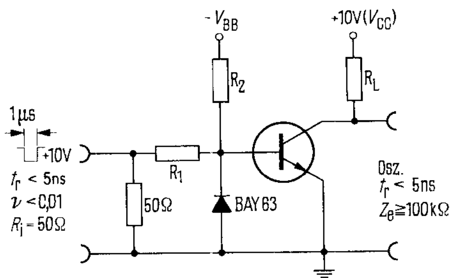
h_{FE} group	A; G	B; H	C; J	D; K	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5 (4.5 to 12)	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200 (125 to 250)	260 (175 to 350)	330 (250 to 500)	520 (350 to 700)	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	5 (<100)	µmhos

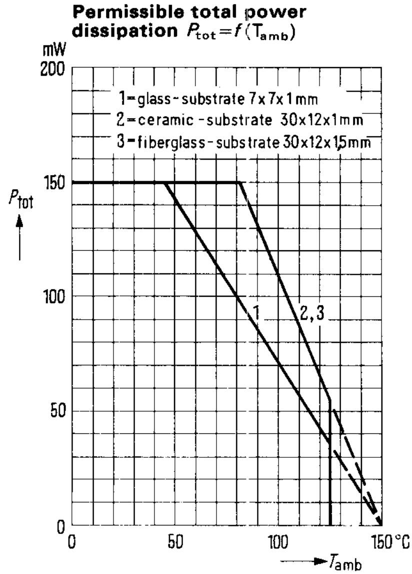
Switching times:

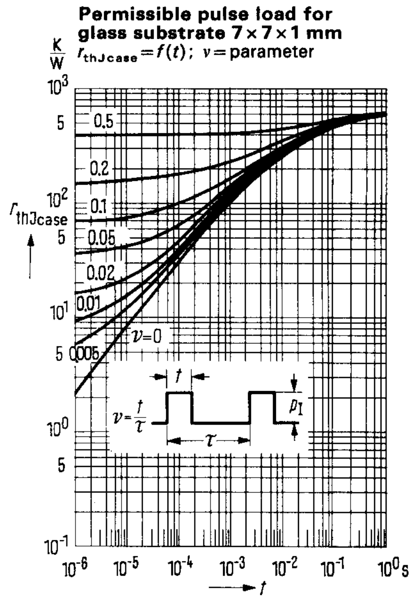
Test condition:
$I_C : I_{B1} : -I_{B2} \approx 10:1:1$ mA; R_1 = 5 kΩ; R_2 = 5 kΩ; $-V_{BB}$ = 3.6 V; R_L = 990 Ω

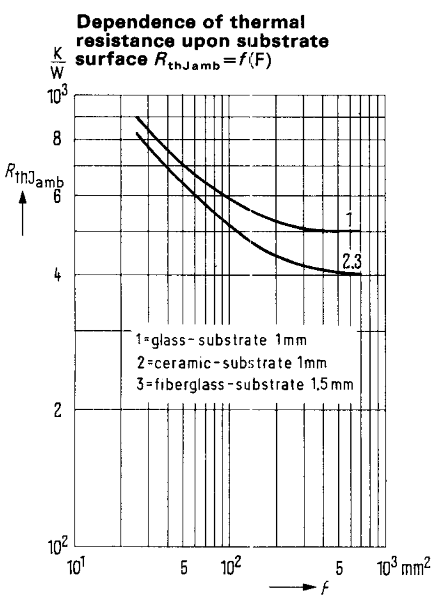
t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

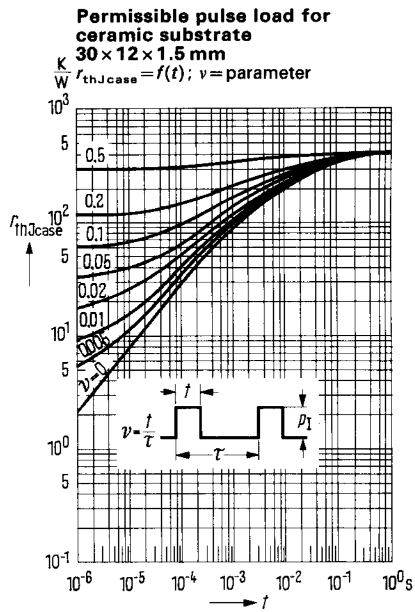
Measuring circuit for switching times



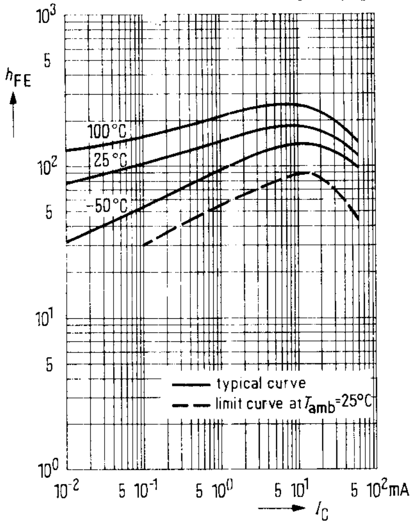

Permissible total power dissipation $P_{tot} = f(T_{amb})$
mW
200
150
100
50
0
P_{tot}
1=glass-substrate 7x7x1mm
2=ceramic-substrate 30x12x1mm
3=fiberglass-substrate 30x12x1,5mm
1
2,3
0
50
100
150°C
T_{amb}


Permissible pulse load for glass substrate 7×7×1 mm
$r_{thJcase} = f(t)$; v = parameter
K/W
10^3
10^2
10^1
10^0
10^{-1}
$r_{thJcase}$
0.5
0.2
0.1
0.05
0.02
0.01
0.005
v=0
$v = \frac{t}{\tau}$
p_I
10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^0 s
t

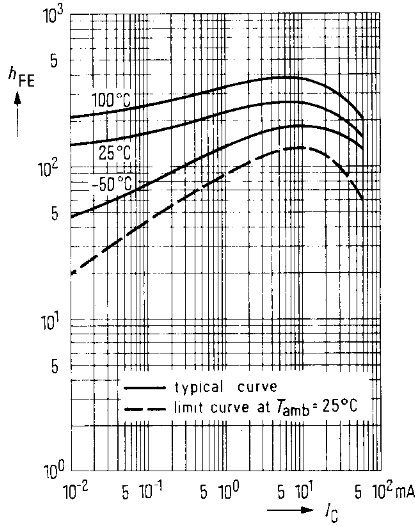

Dependence of thermal resistance upon substrate surface $R_{thJamb} = f(F)$
K/W
10^3
8
6
4
2
10^2
R_{thJamb}
1
2,3
1=glass-substrate 1mm
2=ceramic-substrate 1mm
3=fiberglass-substrate 1,5mm
10^1 5 10^2 5 10^3 mm²
F


Permissible pulse load for ceramic substrate 30×12×1.5 mm
$r_{thJcase} = f(t)$; v = parameter
K/W
10^3
10^2
10^1
10^0
10^{-1}
$r_{thJcase}$
0.5
0.2
0.1
0.05
0.02
0.01
0.005
v=0
$v = \frac{t}{\tau}$
p_I
10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^0 s
t

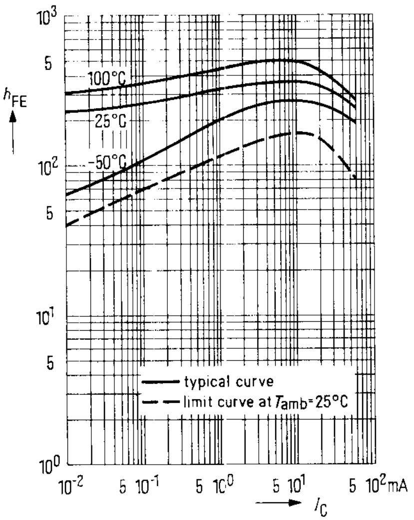
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb}=parameter
BCW 60 A
BCX 70 G



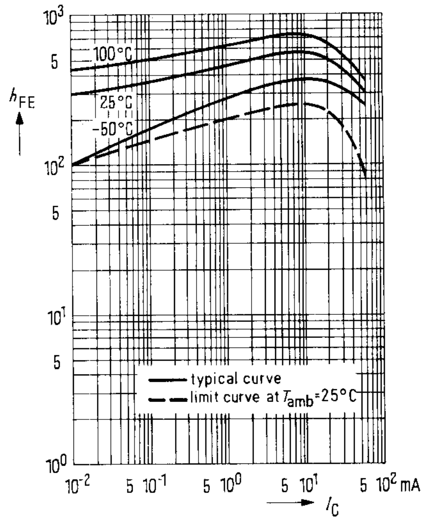
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb}=parameter
BCW 60 B
BCX 70 H



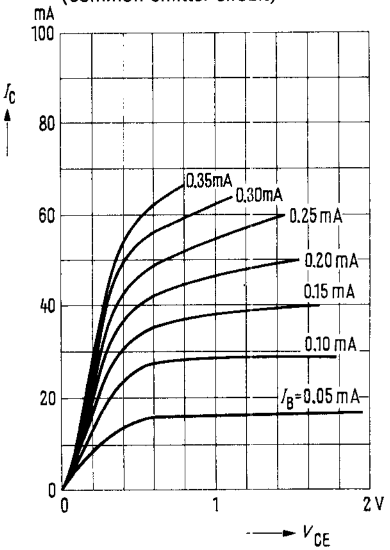
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb}=parameter
BCW 60 C
BCX 70 J



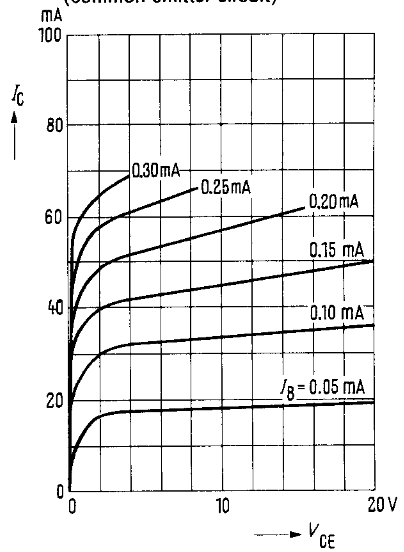
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb}=parameter
BCW 60 D
BCX 70 K



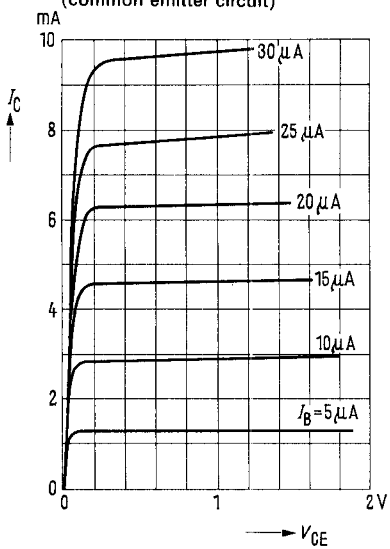
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



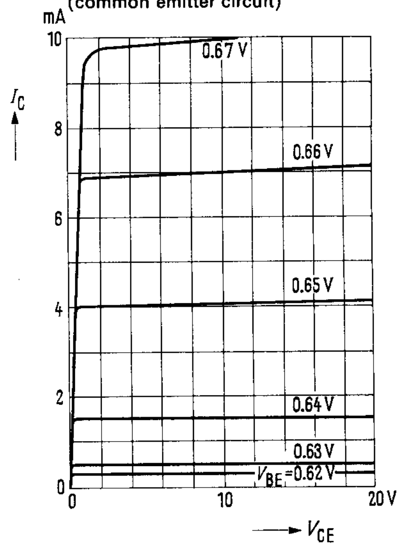
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



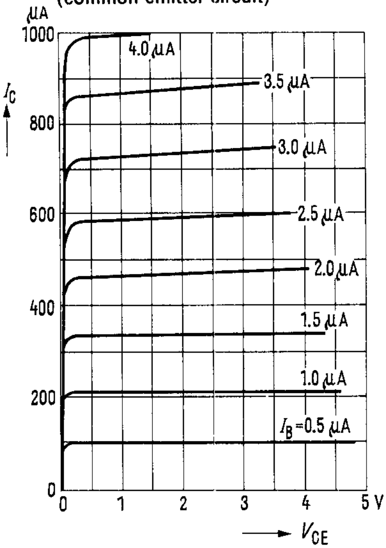
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



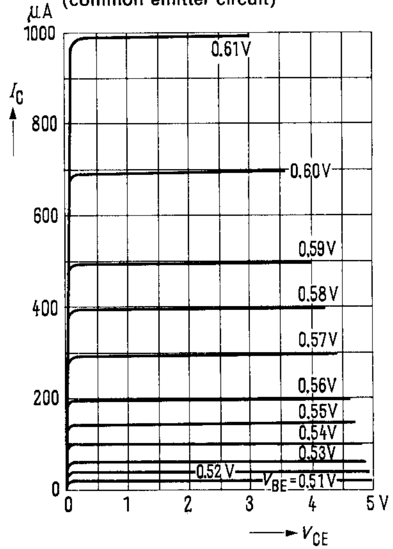
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter
(common emitter circuit)



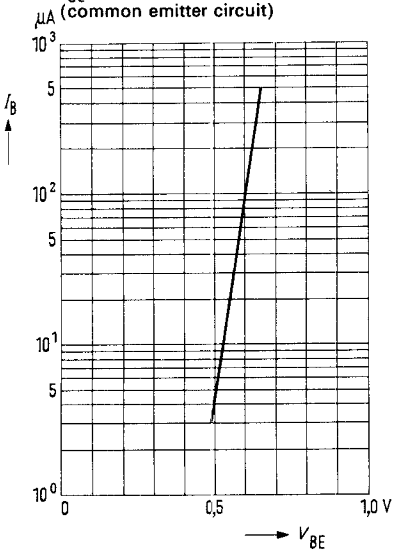
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



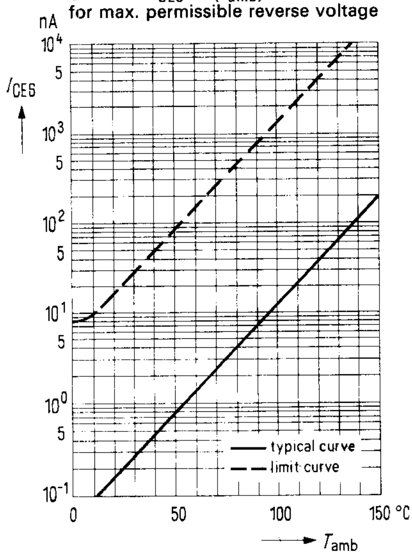
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



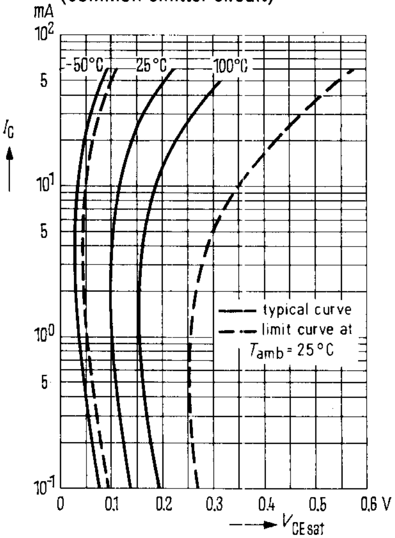
Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V
(common emitter circuit)



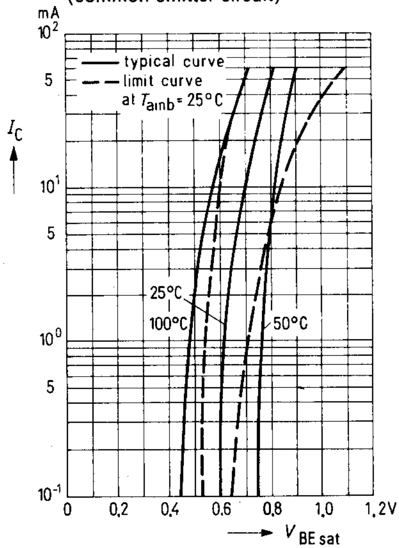
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
for max. permissible reverse voltage



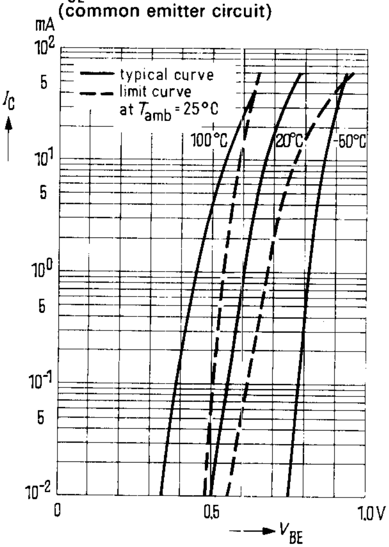
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
(common emitter circuit)



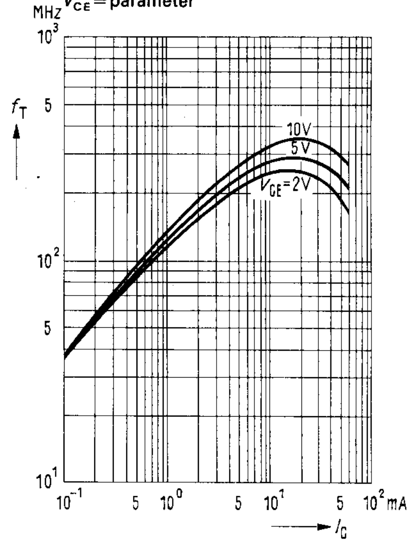
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
(common emitter circuit)



Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V
(common emitter circuit)

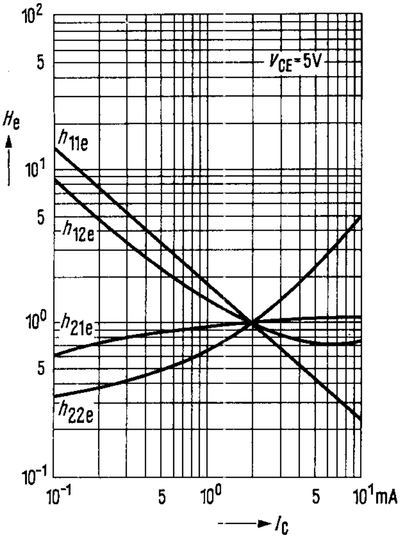


Current gain-bandwidth product $f_T = f(I_C)$
V_{CE} = parameter



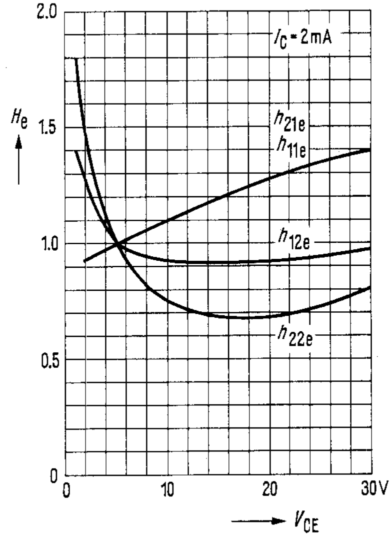
h-parameter vs. collector current

$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\text{ mA})} = f(I_C)$

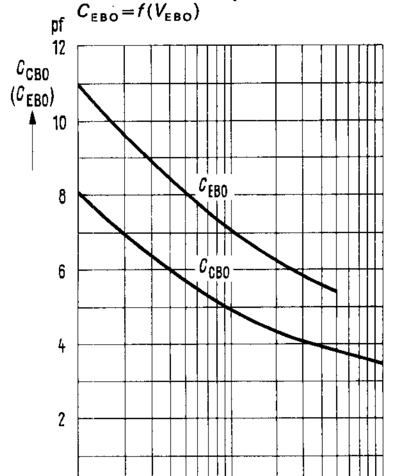


h-parameter vs. collector-emitter voltage

$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\text{ V})} = f(V_{CE})$



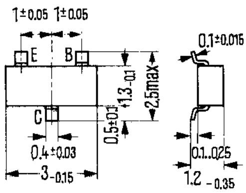
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$



PNP Transistors for AF prestages and switching applications

BCW 61 and BCX 71 are epitaxial PNP silicon planar transistors in a plastic case 23 A 3 DIN 41869 (SOT-23) for AF prestages and switching applications. They are particularly designed for use in thick and thin film circuits. Both types BCW 61 and BCX 71 are identified by the letter "B" while the following letter (A, B, C or D for BCW 61 and G, H, J or K for BCX 71) refers to the respective static forward current transfer ratio of the transistors. Their complementary transistors are BCW 60 and BCX 70.

Type	Code	Order number
BCW 61	BA	Q62702-C335
BCW 61	BB	Q62702-C336
BCW 61	BC	Q62702-C337
BCW 61	BD	Q62702-C338
BCX 71	BG	Q62702-C427
BCX 71	BH	Q62702-C428
BCX 71	BJ	Q62702-C429
BCX 71	BK	Q62702-C430



Weight approx. 0.02 g Dimensions in mm

Maximum ratings		BCW 61	BCX 71	
Collector-emitter voltage	$-V_{CES}$	32	45	V
Collector-emitter voltage	$-V_{CEO}$	32	45	V
Emitter-base voltage	$-V_{EBO}$	5	5	V
Collector current	$-I_C$	200	200	mA
Base current	$-I_B$	50	50	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +125		°C
Total power dissipation (T_{amb} = 45 °C) on glass substrate (7 × 7 × 1 mm)	P_{tot}	150[1])	150[1])	mW
Thermal resistance				
Glass substrate (7 × 7 × 1 mm)	R_{th}	≦700	≦700	K/W
Ceramic (30 × 12 × 1 mm)	R_{th}	≦450	≦450	K/W
Glass fiber (30 × 12 × 1.5 mm)	R_{th}	≦450	≦450	K/W

[1]) The permissible total power dissipation is given by the thermal resistance incorporated in each case, according to $P_{perm} = \frac{T_{jmax} - T_{amb}}{R_{thJamb}}$

Static characteristics ($T_{amb}=25$ °C)
The transistors are classified in groups of static forward current transfer ratio and identified by letters.

h_{FE} group for BCW 61		A	B	C	D	BCW 61
for BCX 71		G	H	J	K	BCX 71
$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
5	0.01	140	200 (>30)	270 (>40)	340 (>100)	0.55
5	2	170 (120 to 220)*	250 (140 to 310)*	350 (250 to 460)*	500 (380 to 630)*	0.65 (0.6 to 0.75)*
1	50	>60	>80	>100	>100	0.72

Saturation voltages	$-V_{CEsat}$ (V)	$-V_{BEsat}$ (V)
$-I_C=10$ mA; $-I_B=0.25$ mA	0.12 (0.06 to 0.25)	0.7 (0.6 to 0.85)
$-I_C=50$ mA; $-I_B=1.25$ mA	0.25 (0.12 to 0.55)	0.8 (0.68 to 1.05)

		BCW 61	BCX 71	
Collector-emitter cutoff current				
($-V_{CES}=32$ V)	$-I_{CES}$	< 20	–	nA*
($-V_{CES}=45$ V)	$-I_{CES}$	–	<20	nA*
Collector-emitter cutoff current				
($-V_{CES}=32$ V; $T_{amb}=150$ °C)	$-I_{CES}$	<20	–	µA
($-V_{CES}=45$ V; $T_{amb}=150$ °C)	$-I_{CES}$	–	<20	µA
Emitter-base cutoff current ($-V_{EBO}=4$ V)	$-I_{EBO}$	<20	<20	nA*
Collector-emitter breakdown voltage ($-I_{CEO}=2$ mA)	$-V_{(BR)CEO}$	>32	>45	V*
Emitter-base breakdown voltage ($-I_{EBO}=1$ µA)	$-V_{(BR)EBO}$	>5	>5	V*

* AQL=0.65%

Dynamic characteristics (T_{amb} = 25 °C)

		BCW 61	BCX 71	
Current gain-bandwidth product (I_C = 10 mA; $-V_{CE}$ = 5 V; f = 100 MHz)	f_T	180	180	MHz
Collector-base capacitance ($-V_{CBO}$ = 10 V; f = 1 MHz)	C_{CBO}	<6	<6	pf
Emitter-base capacitance ($-V_{EBO}$ = 0.5 V; f = 1 MHz)	C_{EBO}	11	11	pf
Noise figure ($-I_C$ = 0.2 mA; $-V_{CE}$ = 5 V; R_g = 2 kΩ f = 1 kHz; Δf = 200 Hz)	NF	2 (<6)	2 (<6)	db

Four-terminal network data: (I_C = 2 mA; V_{CE} = 5 V; f = 1 kHz)

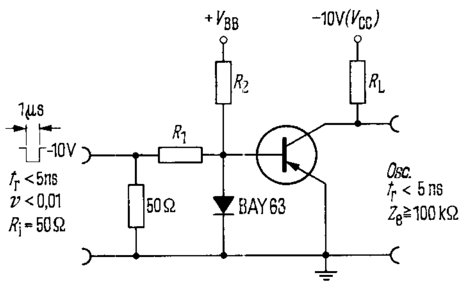
h_{FE} Group	A; G	B; H	C; J	D; K	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5 (4.5 to 12)	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200 (125 to 250)	260 (175 to 350)	330 (250 to 500)	520 (350 to 700	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	μmhos

Switching times:

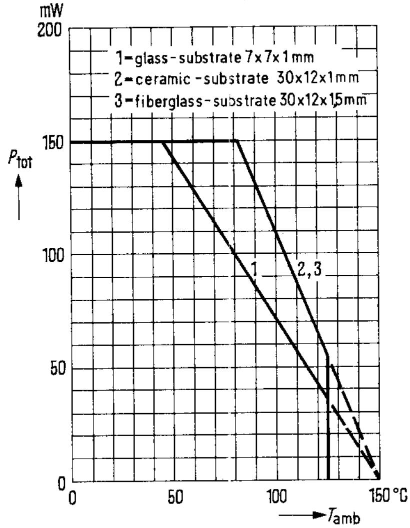
Test condition:
$-I_C$: $-I_{B1}$: $+I_{B2}$ ≈ 10:1:1 mA; R_1 = 5 kΩ; R_2 = 5 kΩ; V_{BB} = 3.6 V; R_L = 990 Ω

t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

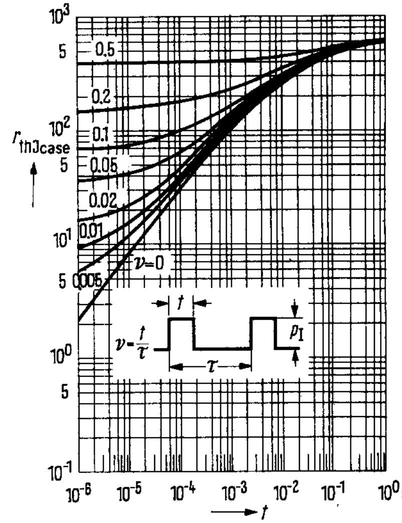
Measuring circuit for switching times



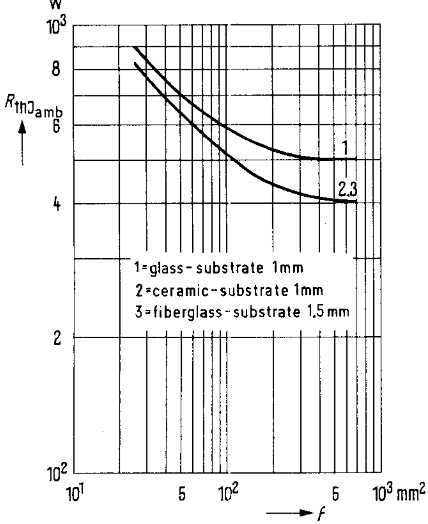
Permissible total power dissipation $P_{tot} = f(T_{amb})$



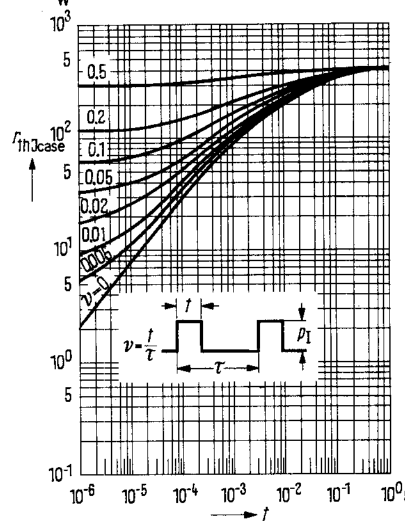
Permissible pulse load for glass substrate 7 × 7 × 1 mm
$\frac{K}{W}$ $r_{thJcase} = f(t)$; v = parameter



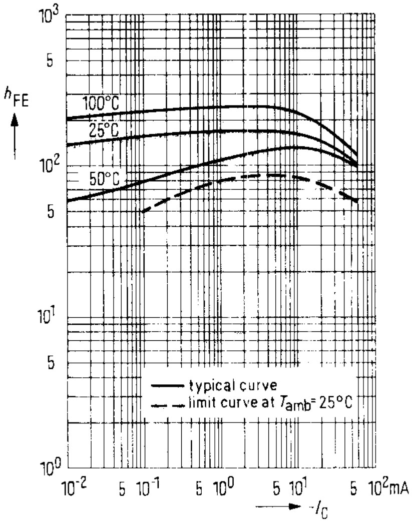
Dependence of thermal resistance on substrate surface $R_{thJamb} = f(F)$
$\frac{K}{W}$



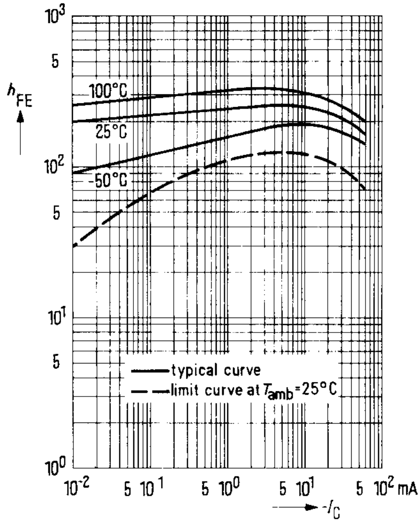
Permissible pulse load for ceramic substrate 30 × 12 × 1.5 mm $R_{thJcase} = f(t)$
$\frac{K}{W}$ v = parameter



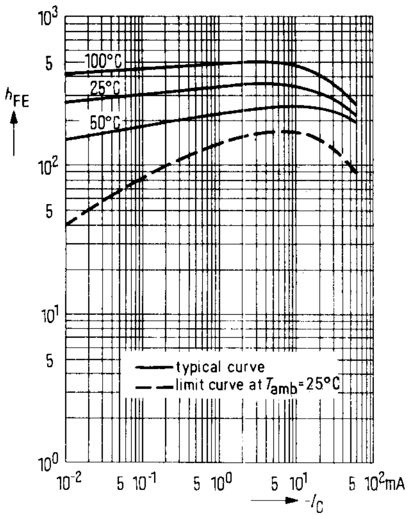
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
BCW 61 A
BCX 71 G



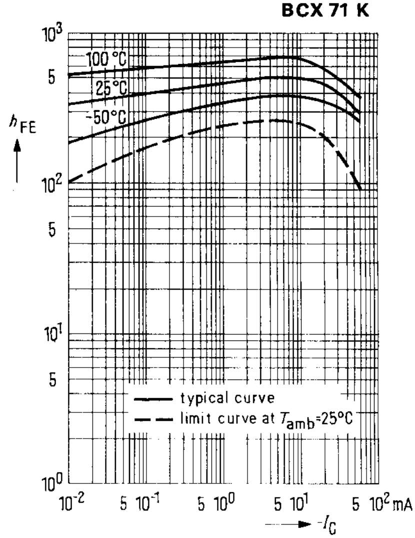
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
BCW 61 B
BCX 71 H



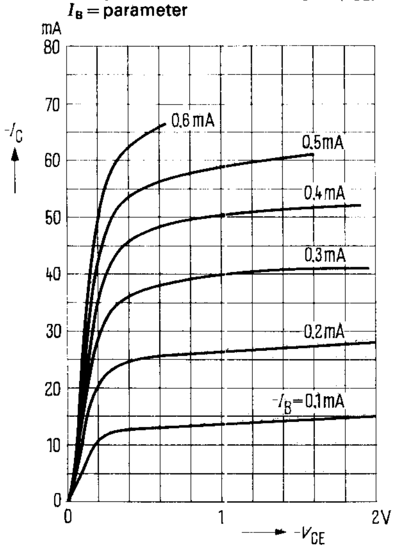
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
BCW 61 C
BCX 71 J



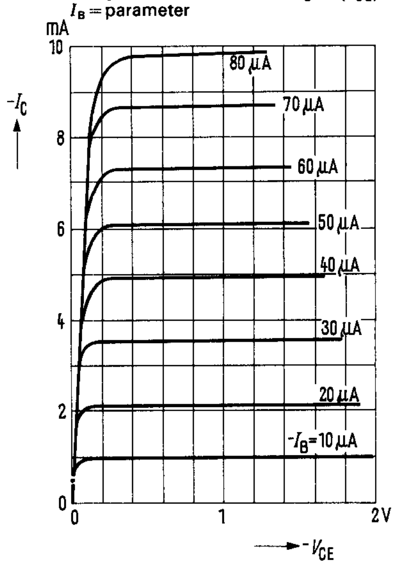
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
BCW 61 D
BCX 71 K



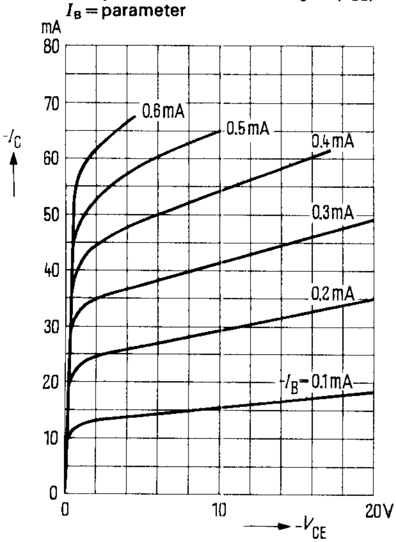
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



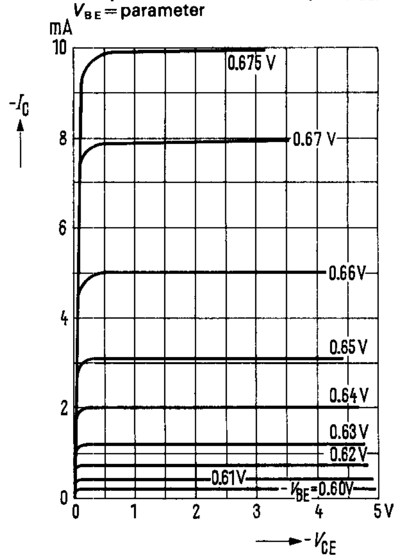
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



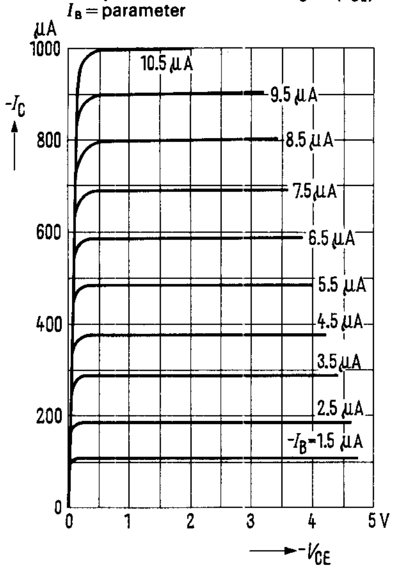
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



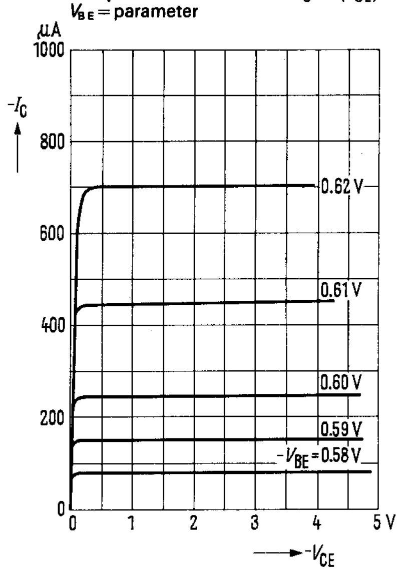
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



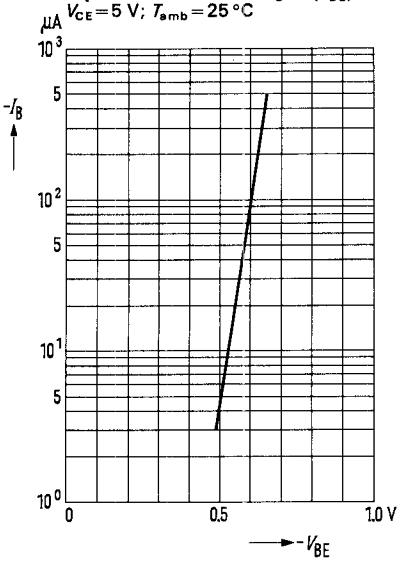
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



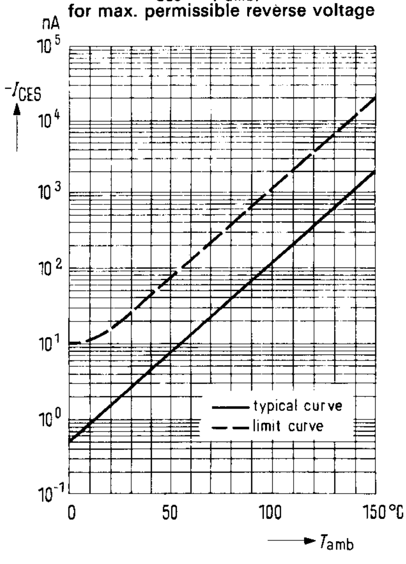
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



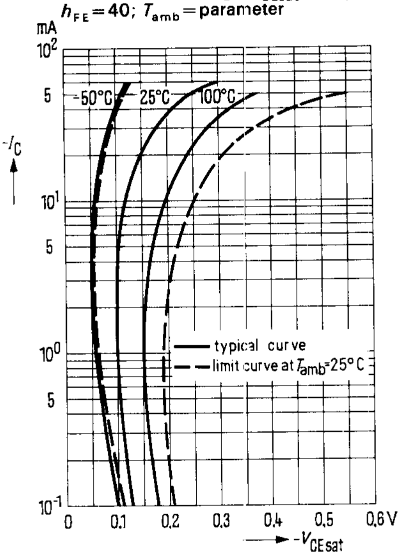
Input characteristic $I_C = f(V_{BE})$
V_{CE} = 5 V; T_{amb} = 25 °C



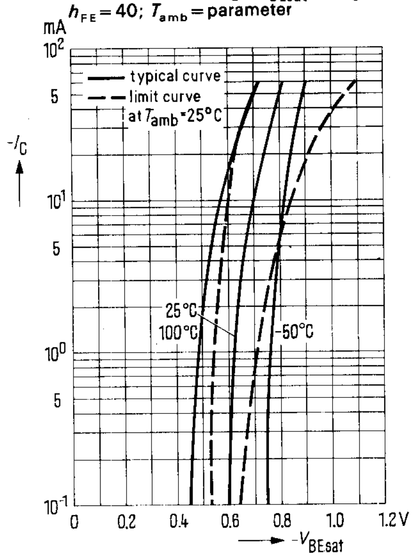
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
for max. permissible reverse voltage



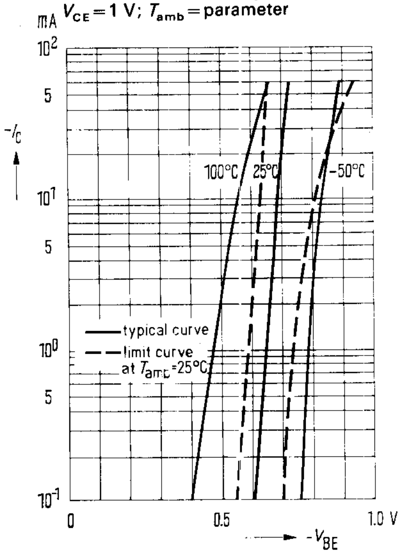
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter



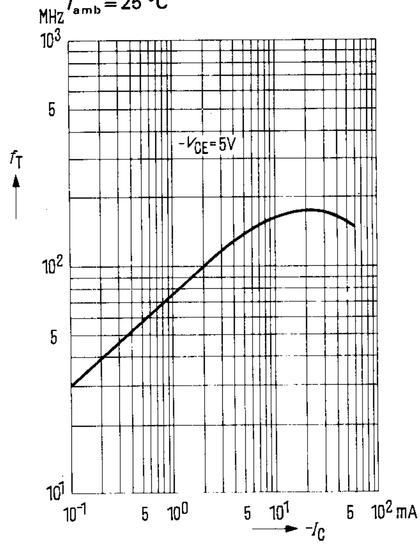
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter



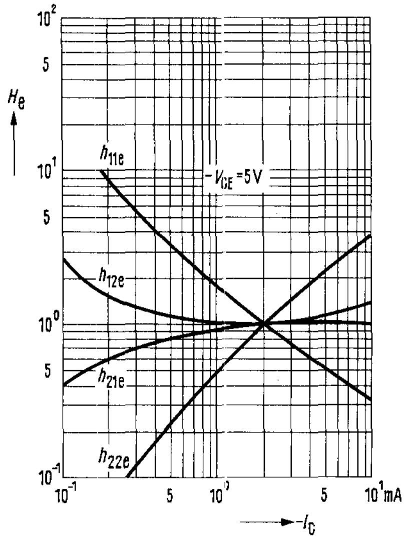
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V; T_{amb} = parameter



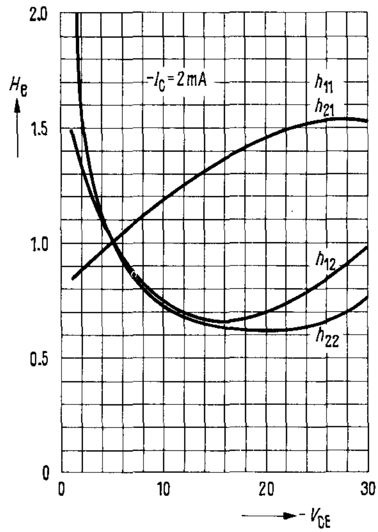
Current gain-bandwidth product $f_T = f(I_C)$
$T_{amb} = 25$ °C



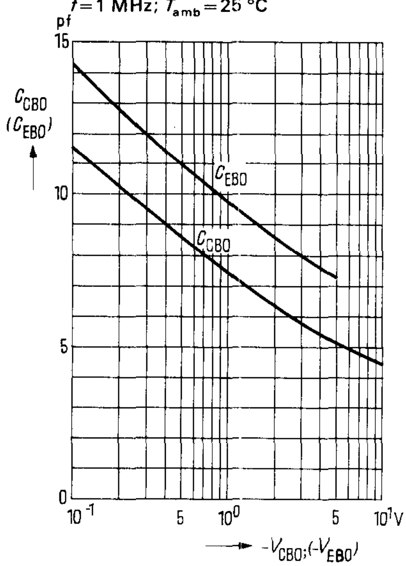
h-parameter vs. collector current
$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\text{ mA})} = f(I_C)$



h-parameter vs. collector-emitter voltage
$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\text{ V})} = f(V_{CE})$



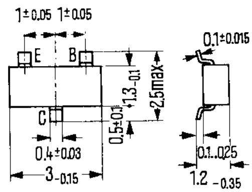
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
$f = 1$ MHz; $T_{amb} = 25$ °C



NPN Transistors for AF driver stages and switching applications

BCW 65 and BCW 66 are epitaxial NPN silicon planar transistors in a plastic package 23 A 3 DIN 41 869 (SOT-23) for use in driver stages and switching as well as universal applications. They are particularly suitable for thick and thin film circuits. Both types BCW 65 and BCW 66 are identified by the letter "E" and the following letter (A, B, C for BCW 65 and F, G, H for BCW 66) refers to the respective static forward current transfer ratio of the transistor. Their complementary transistors are BCW 67 and BCW 68.

Type	Code	Order number
BCW 65	EA	Q62702–C457
BCW 65	EB	Q62702–C458
BCW 65	EC	Q62702–C459
BCW 66	EF	Q62702–C460
BCW 66	EG	Q62702–C461
BCW 66	EH	Q62702–C462



Weight approx. 0.02 g
Dimensions in mm

Maximum ratings		BCW 65	BCW 66	
Collector-emitter voltage	V_{CES}	60	75	V
Collector-emitter voltage	V_{CEO}	32	45	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	800	800	mA
Maximum collector current 10 ms	I_{CM}	1	1	A
Base current	I_B	100	100	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +150	−55 to +150	°C
Total power dissipation (T_{amb}=25 °C) on glass-fiber substrate (30×12×1.5 mm) or ceramic substrate (30×12×1 mm)	P_{tot}	350[1])	350[1])	mW
Thermal resistance				
Ceramic substrate (30×12×1 mm)	R_{thJamb}	≦358	≦358	K/W
Glass fiber substrate (30×12×1.5 mm)	R_{thJamb}	≦358	≦358	K/W

[1]) The permissible total power dissipation is given by the respective thermal resistance conditioned by mounting, in accordance with $P_{perm} \frac{T_{jmax} - T_{amb}}{R_{thJamb}}$

Static characteristics (T_{amb} = 25 °C)
The transistors BCW 65 and BCW 66 are classified in groups of static forward current transfer ratio h_{FE} and identified by letters.

h_{FE}-Group				
for BCW 65		A	B	C
for BCW 66		F	G	H
V_{CE} V	I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B
15	0.1	> 35	> 50	> 80
1	10	< 75	110	< 180
1	100	> 160 (100 to 250)*	250 (160 to 400)*	350 (250 to 630)*
2	500	> 35	> 60	> 100

Saturation voltages	V_{CEsat} (V)	V_{BEsat} (V)
I_C = 100 mA; I_B = 10 mA	< 0.3	–
I_C = 500 mA; I_B = 50 mA	< 0.7	< 2

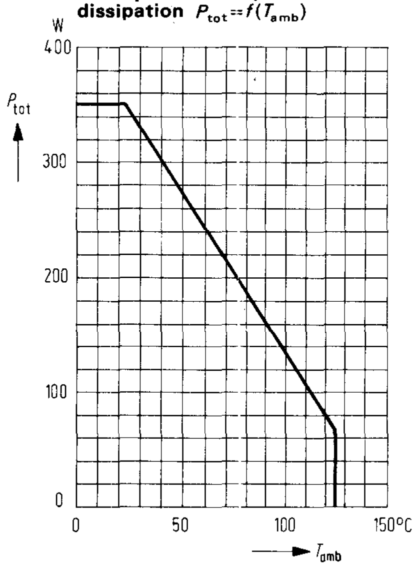
		BCW 65	BCW 66	
Collector-emitter cutoff current (V_{CES} = 32 V)	I_{CES}	< 20	–	nA*
(V_{CES} = 45 V)	I_{CES}	–	< 20	nA*
Collector-emitter cutoff current (V_{CES} = 32 V; T_{amb} = 150 °C)	I_{CES}	< 20	–	µA
(V_{CES} = 45 V; T_{amb} = 150 °C)	I_{CES}	–	< 20	µA
Emitter-base cutoff current (V_{EBO} = 4 V)	I_{EBO}	< 20	< 20	nA*
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	> 32	> 45	V*
Collector-emitter breakdown voltage (I_C = 10 µA)	$V_{(BR)CES}$	> 60	> 75	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	> 5	> 5	V*

Dynamic characteristics ($T_{amb}=25\ °C$)		**BCW 65**	**BCW 66**	
Current-gain bandwidth product ($I_C=20$ mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	>100	>100	MHz
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	8 (<12)	8 (<12)	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	<80	<80	pf
Noise figure ($I_C=0.2$ mA; $V_{CE}=5$ V; $R_g=1\ k\Omega$; $f=1$ kHz	NF	2 (<10)	2 (<10)	db

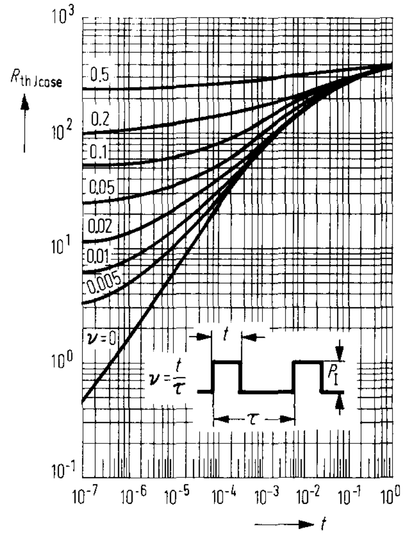
Switching times:

($I_C=150$ mA; $I_{B1}=-I_{B2}=15$ mA; $R_L=150\ \Omega$)	t_{on}	<100	<100	ns
	t_{off}	<400	<400	ns

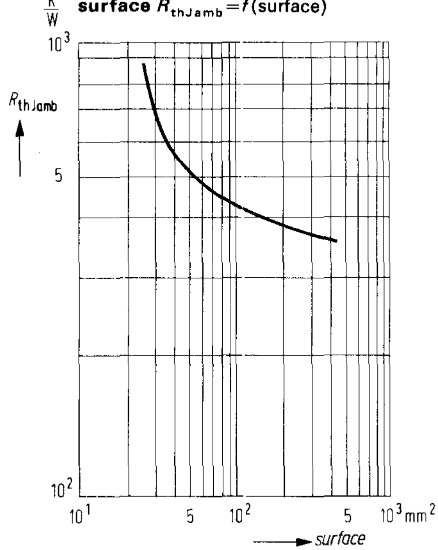
Total permissible power dissipation $P_{tot} = f(T_{amb})$



Permissible pulse load
$r_{thJcase} = f(t)$; ν = parameter
for glass-fiber substrate
30 × 12 × 1.5 mm + ceramic
substrate 30 × 12 × 1 mm

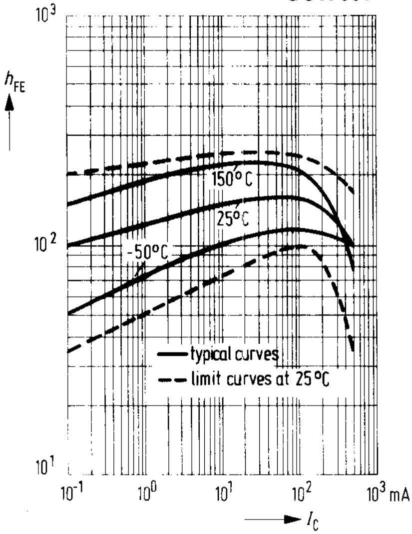


Dependence of thermal resistance upon substrate surface $R_{thJamb} = f$(surface)



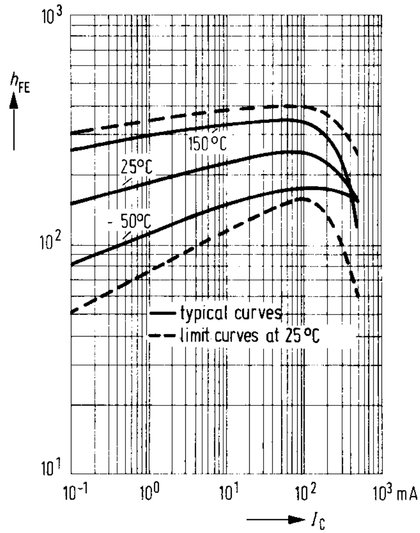
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V;
T_{amb} = parameter

BCW 65 A
BCW 66 F



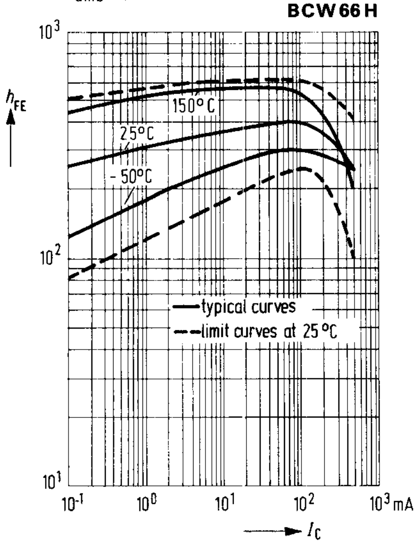
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V;
T_{amb} = parameter

BCW 65 B
BCW 66 G

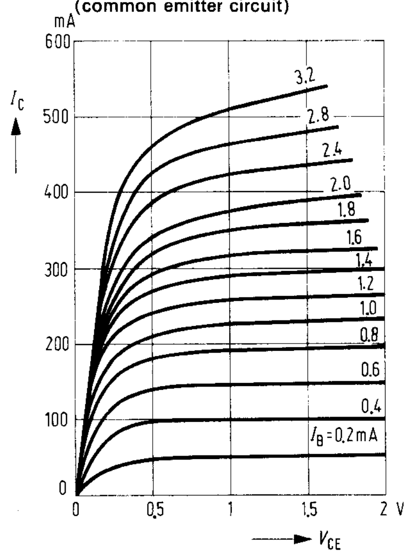


Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V;
T_{amb} = parameter

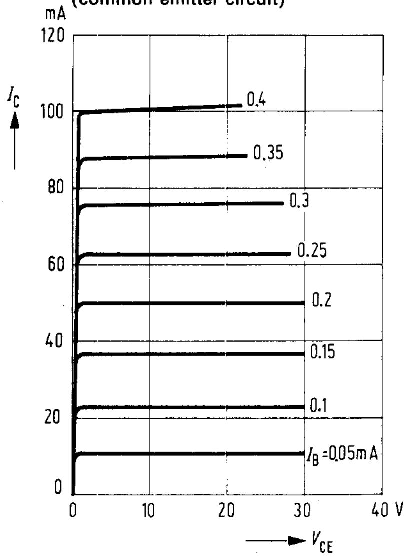
BCW 65 C
BCW 66 H



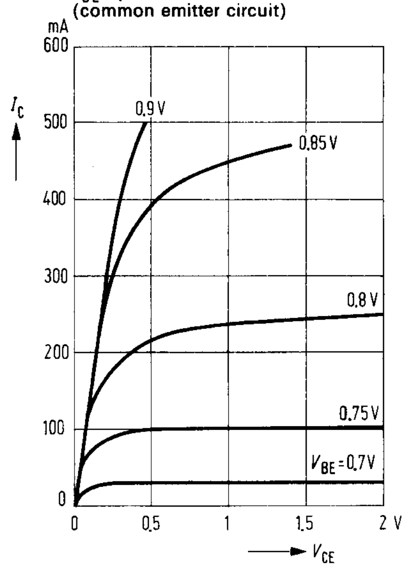
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



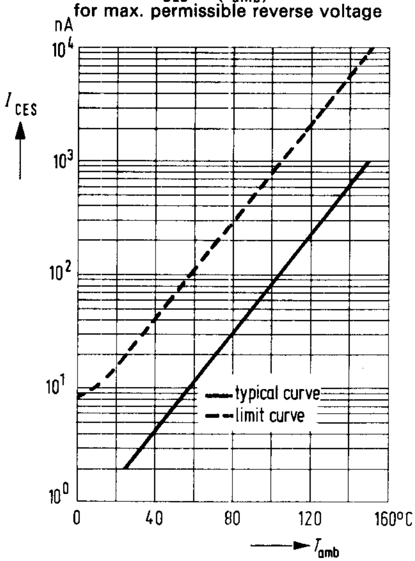
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



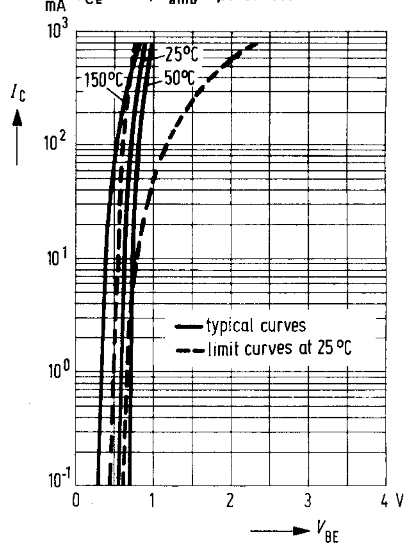
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



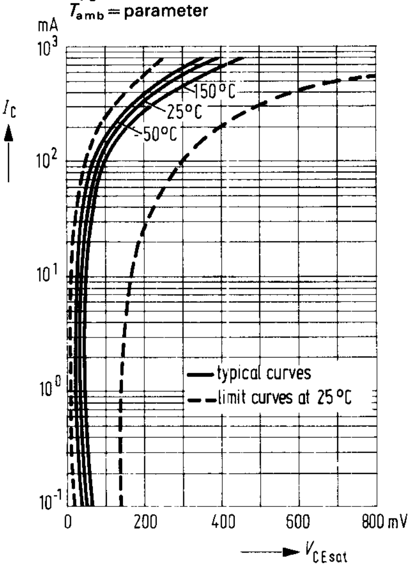
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
for max. permissible reverse voltage



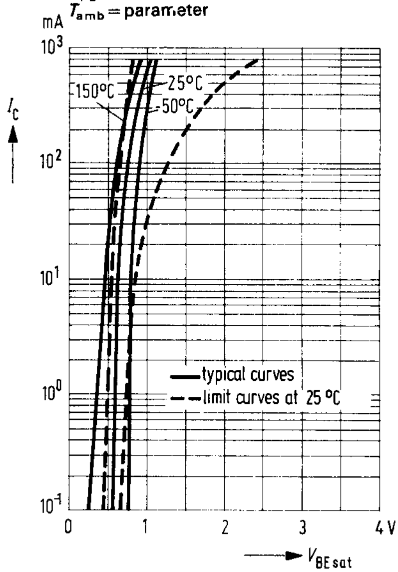
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; T_{amb} = parameter



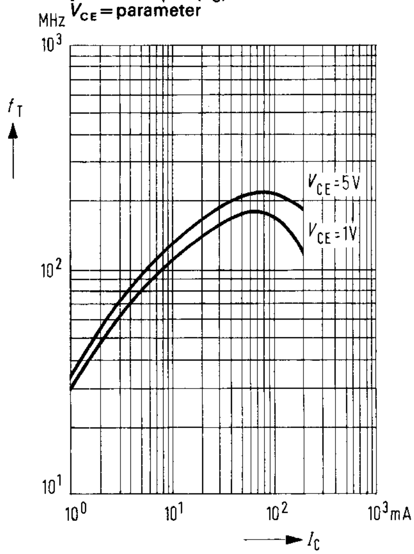
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$;
T_{amb} = parameter



Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$;
T_{amb} = parameter



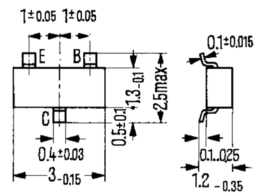
Current gain-bandwidth product $f_T = f(I_C)$
V_{CE} = parameter



PNP Transistors for AF driver stages and switching applications

BCW 67 and BCW 68 are epitaxial PNP silicon planar transistors in a plastic package 23 A 3 DIN 41869 (SOT-23) for AF driver stages and switching as well as universal applications. They are particularly suitable for thick and thin film circuits. Both types BCW 67 and BCW 68 are identified by the letter "D" and the following letter (A, B, C for BCW 67 and F, G, H for BCW 68) refers to the respective static forward current transfer ratio of the transistor. Their complementary transistors are BCW 65 and BCW 66.

Type	Code	Order number
BCW 67	DA	Q62702–C463
BCW 67	DB	Q62702–C464
BCW 67	DC	Q62702–C465
BCW 68	DF	Q62702–C466
BCW 68	DG	Q62702–C467
BCW 68	DH	Q62702–C468



Weight approx. 0.02 g
Dimensions in mm

Maximum ratings		BCW 67	BCW 68	
Collector-emitter voltage	$-V_{CES}$	45	60	V
Collector-emitter voltage	$-V_{CEO}$	32	45	V
Emitter-base voltage	$-V_{EBO}$	5	5	V
Collector current	$-I_C$	800	800	mA
Maximum collector current	$-I_{CM}$	1	1	A
Base current	$-I_B$	100	100	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	–55 to +150	–55 to +150	°C
Total power dissipation (T_{amb} = 25 °C) on glass-fiber substrate (30 × 12 × 1.5 mm) or ceramic substrate (30 × 12 × 1 mm)	P_{tot}	350 [1])	350 [1])	mW

Thermal resistance

Ceramic substrate (30 × 12 × 1 mm)	R_{thJamb}	≦358	≦358	K/W
Glass-fiber substrate (30 × 12 × 1.5 mm)	R_{thJamb}	≦358	≦358	K/W

[1]) The permissible total power dissipation is given by the respective thermal resistance conditioned by mounting, in accordance with $P_{perm} \frac{T_{jmax} - T_{amb}}{R_{thJamb}}$

Static characteristics ($T_{amb}=25\ °C$)

The transistors BCW 67 and BCW 68 are classified in groups of static forward current transfer ratio and identified by letters.

h_{FE} Group for BCW 67		A	B	C
for BCW 68		F	G	H
$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B
1	10	>75	>120	>180
1	100	170 (100 to 250)	250 (160 to 400)	350 (250 to 630)
2	500	>35	>60	>100

Saturation voltages

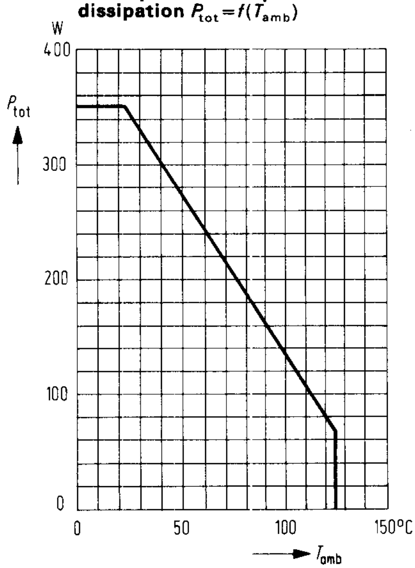
	$-V_{CEsat}$ (V)	$-V_{BEsat}$ (V)
$-I_C=100$ mA; $-I_B=60$ mA	<0.3	–
$-I_C=500$ mA; $-I_B=50$ mA	0.7	<2

		BCW 67	BCW 68	
Collector-emitter cutoff current ($-V_{CES}=32$ V)	$-I_{CES}$	<20	–	nA*
Collector-emitter cutoff current ($-V_{CES}=45$ V)	$-I_{CES}$	–	<20	nA*
Collector-emitter cutoff current ($-V_{CES}=32$ V; $T_{amb}=150\ °C$)	$-I_{CES}$	< 10	–	µA
($-V_{CES}=45$ V; $T_{amb}=150\ °C$)	$-I_{CES}$	–	< 10	µA
Emitter-base cutoff current ($-V_{EBO}=4$ V)	$-I_{EBO}$	<20	<20	nA*
Collector-emitter breakdown voltage ($-I_{CEO}=10$ mA)	$-V_{(BR)CEO}$	>32	>45	V*
Emitter-base breakdown voltage ($-I_{EBO}=10$ µA)	$-V_{(BR)EBO}$	>5	>5	V*

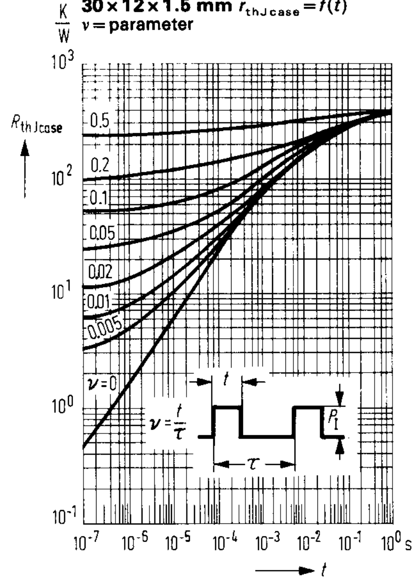
Dynamic characteristics ($T_{amb}=25\ °C$)

Current-gain bandwidth product ($-I_C=20$ mA; $-V_{CE}=10$ V; $f=100$ MHz)	f_T	>100	>100	MHz
Collector-base capacitance ($-V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	12 (<18)	12 (<18)	pf
Emitter-base capacitance ($-V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	<80	<80	pf
Noise figure ($-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=1$ kΩ; $f=1$ kHz; $\Delta f=200$ Hz)	NF	2 (<10)	2 (<10)	db
Switching times ($-I_C=150$ mA; $I_{B1}=-I_{B2}=15$ mA; $R_L=150\ \Omega$)	t_{on}	<100	<100	ns
	t_{off}	<400	<400	ns

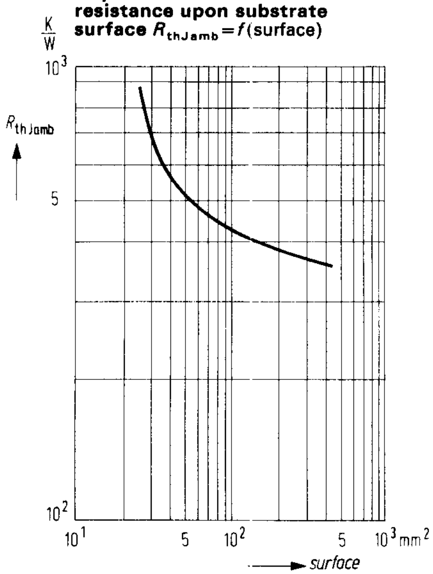
Total permissible power dissipation $P_{tot} = f(T_{amb})$



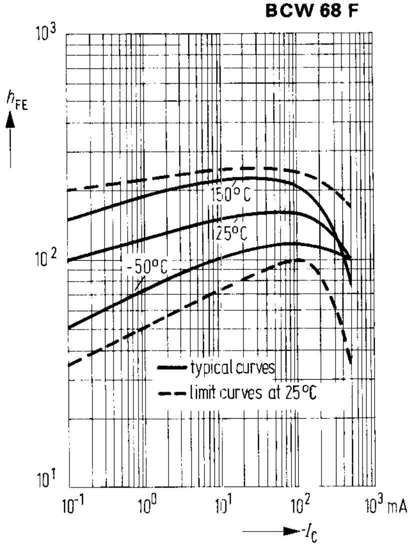
Permissible pulse load for glass-fiber substrate 30 × 12 × 1.5 mm $r_{thJcase} = f(t)$
$\frac{K}{W}$ ν = parameter



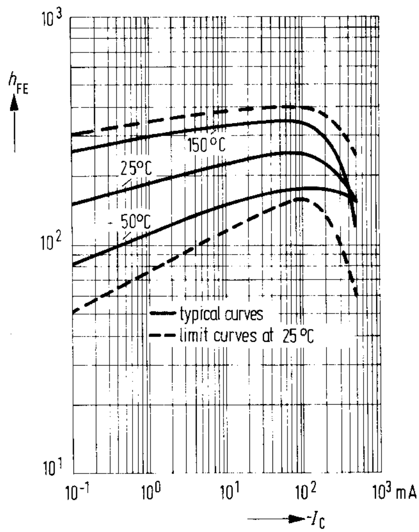
Dependence of thermal resistance upon substrate surface $R_{thJamb} = f$(surface)



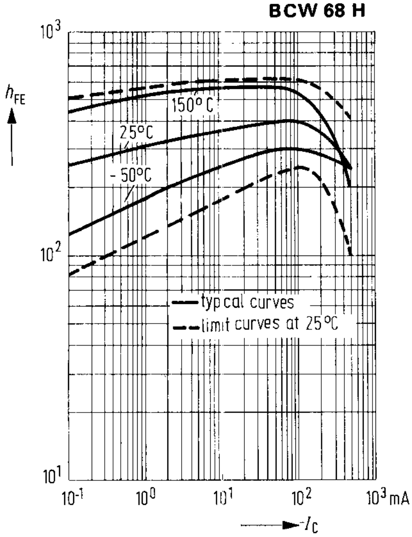
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCW 67 A
BCW 68 F



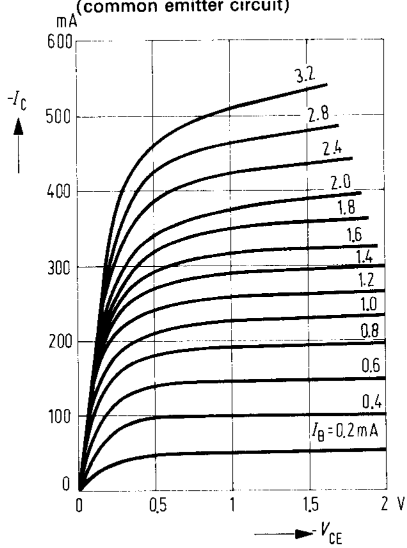
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCW 67 B
BCW 68 G



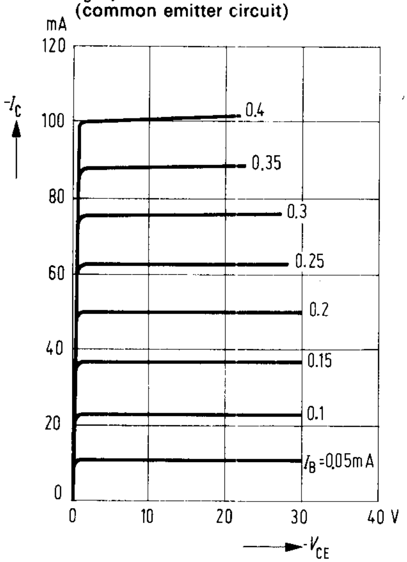
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCW 67 C
BCW 68 H



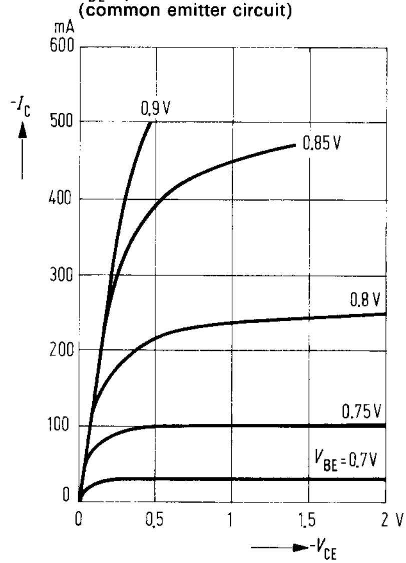
Output characteristics
$I_C=f(V_{CE})$; I_B = parameter
(common emitter circuit)



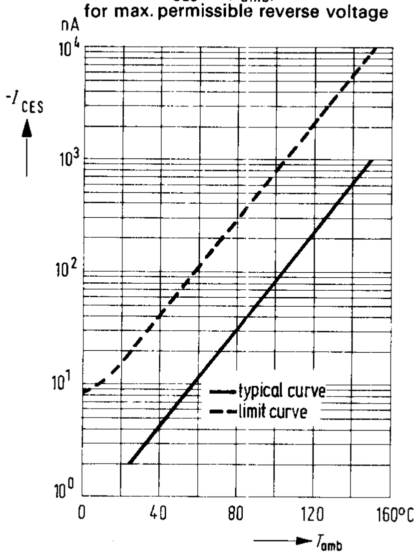
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



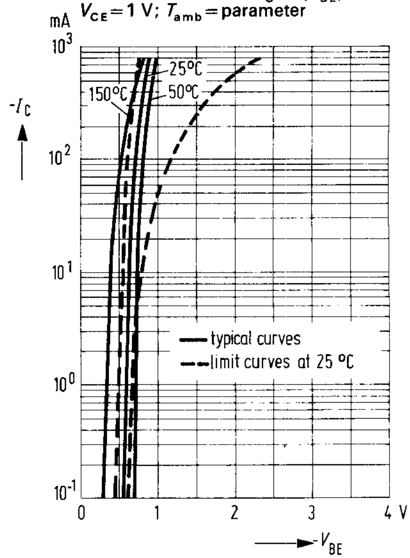
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



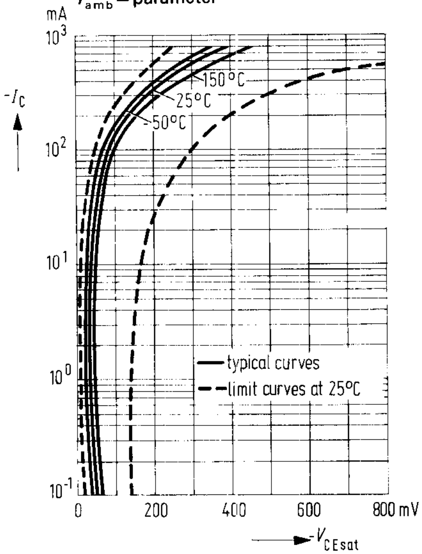
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
for max. permissible reverse voltage



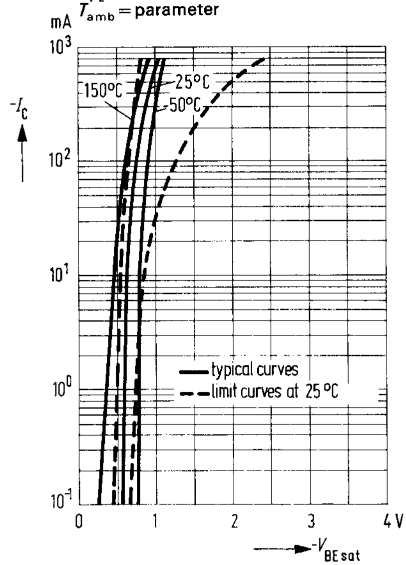
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; T_{amb} = parameter



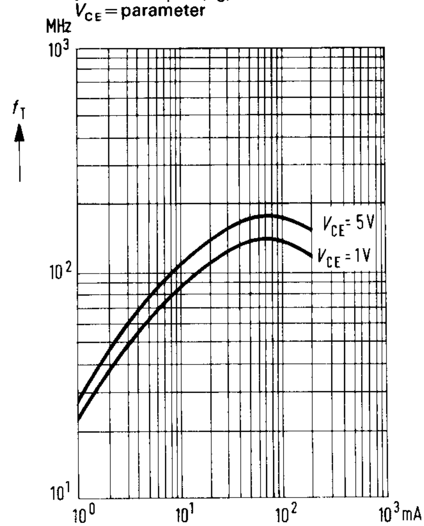
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$
T_{amb} = parameter



Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$
T_{amb} = parameter



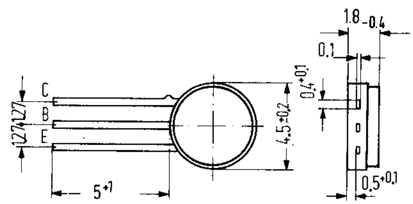
Current gain-bandwidth product $f_T = f(I_C)$
V_{CE} = parameter



NPN Silicon planar AF transistor

The epitaxial silicon planar AF transistor in its hermetically sealed glass/ceramic flat package is especially suited for use in military and space applications. The advantage of this particular package lies in its high packing density.

Type	Order number
BCW 87	Q 62702–C 369



Weight approx. 0.07 g Dimensions in mm

Maximum ratings		BCW 87	
Collector-emitter voltage	V_{CEO}	45	V
Collector-base voltage	V_{CBO}	45	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	100	mA
Base current	I_B	20	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +150	°C
Total power dissipation ($T_{amb} \leqq +25°C$; soldering clearance 3 mm)	P_{tot}	225	mW
Soldering temperature (for < 3 s; clearance from case > 0.8 mm)	T_L	240	°C
Thermal resistance			
Junction to air	R_{thJamb}	≦775	K/W

Static characteristics ($T_{amb}=25$ °C)		**BCW87**	
Collector-emitter breakdown voltage ($I_C=2$ mA)	$V_{(BR)CEO}$	>45	V
Collector-base breakdown voltage ($I_C=10$ µA)	$V_{(BR)CBO}$	>45	V
Emitter-base breakdown voltage ($I_E=1$ µA)	$V_{(BR)EBO}$	>7	V
Static forward current transfer ratio ($I_C=10$ µA; $V_{CE}=5$ V)	h_{FE}	>20	–
($I_C=2$ mA; $V_{CE}=5$ V)	h_{FE}	180 to 630	–
($I_C=10$ mA; $V_{CE}=1$ V)	h_{FE}	120 to 1000	–
($I_C=100$ mA; $V_{CE}=1$ V)	h_{FE}	>45	–
Collector-emitter saturation voltage ($I_C=10$ mA; $I_B=0.25$ mA)	V_{CEsat}	<0.35	V
($I_C=60$ mA; $I_B=3$ mA)	V_{CEsat}	<0.8	V
Base-emitter saturation voltage ($I_C=100$ mA; $I_B=2.5$ mA)	V_{BEsat}	<1.2	V
Collector-base cutoff current ($V_{CB}=45$ V)	I_{CBO}	<20	nA

Dynamic characteristics ($T_{amb}=25$ °C)

Current-gain bandwidth product ($I_C=10$ mA; $V_{CE}=5$ V; $f=100$ MHz)	f_T	>125	MHz
Noise figure ($I_C=0.2$ mA; $V_{CE}=5$ V; $R_g=2$ kΩ; $f=1$ kHz)	NF	2 (<6)	db
Collector-base capacitance ($V_{CB}=10$ V)	C_{CBO}	<6	pf
Emitter-base capacitance ($V_{EB}=0.5$ V)	C_{EBO}	<15	pf

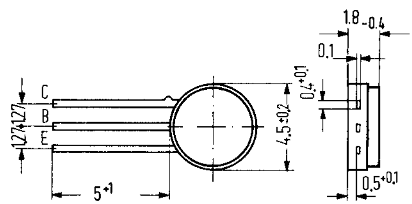
Four-terminal network data:

($I_C=2$ mA; $V_{CE}=5$ V; $f=1$ kHz)	h_{11e}	4.5 (2,5 to 12)	kΩ
	h_{12e}	2	10^{-4}
	h_{21e}	175 to 700	–
	h_{22e}	30 (<100)	µmhos

PNP Silicon planar AF transistor

The epitaxial silicon planar AF transistor in its hermetically sealed glass/ceramic flat package is especially suited for use in military and space applications. The advantage of this particular package lies in its high packing density.

Type	Order number
BCW 88	Q 62702 – C 370



Weight approx. 0.07 g   Dimensions in mm

Maximum ratings		BCW 88	
Collector-emitter voltage	$-V_{CEO}$	45	V
Collector-base voltage	$-V_{CBO}$	45	V
Emitter-base voltage	$-V_{EBO}$	5	V
Collector current	$-I_C$	100	mA
Base current	I_B	20	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +150	°C
Total power dissipation ($T_{amb} \leqq +25$ °C; soldering clearance 3 mm)	P_{tot}	225	mW
Soldering temperature (for <3 s, clearance from case >0.8 mm)	T_L	240	°C

Thermal resistance

Junction to air (soldering clearance 3 mm)	R_{thJamb}	$\leqq$775	K/W

Static characteristics ($T_{amb}=25$ °C)		BCW 88	
Collector-emitter breakdown voltage ($I_C=2$ mA)	$-V_{(BR)CEO}$	>45	V
Collector-base breakdown voltage ($-I_C=10$ μA)	$-V_{(BR)CBO}$	>45	V
Emitter-base breakdown voltage ($-I_E=1$ μA)	$-V_{(BR)EBO}$	>5	V
Static forward current transfer ratio ($-I_C=10$ μA; $-V_{CE}=5$ V)	h_{FE}	>20	–
($-I_C=2$ mA; $-V_{CE}=5$ V)	h_{FE}	180 to 630	–
($-I_C=10$ mA; $-V_{CE}=1$ V)	h_{FE}	120 to 1000	–
($-I_C=100$ mA; $-V_{CE}=1$ V)	h_{FE}	>45	–
Collector-emitter saturation voltage ($-I_C=10$ mA; $-I_B=0.25$ mA)	$-V_{CEsat}$	<0.35	V
($-I_C=100$ mA; $-I_B=2.5$ mA)	$-V_{CEsat}$	<0.8	V
Base-emitter saturation voltage ($-I_C=100$ mA; $-I_B=2.5$ mA)	$-V_{BEsat}$	<1.2	V
Collector-base cutoff current ($-V_{CB}=35$ V)	$-I_{CBO}$	<20	nA

Dynamic characteristics ($T_{amb}=25$ °C)

Current-gain bandwidth product ($-I_C=10$ mA; $-V_{CE}=5$ V; $f=100$ MHz)	f_T	>180	MHz
Noise figure ($-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=2$ kΩ; $f=1$ kHz)	NF	2 (<6)	db
Collector-base capacitance ($-V_{CB}=10$ V)	C_{CBO}	<7	pf
Emitter-base capacitance ($-V_{EB}=0.5$ V)	C_{EBO}	<15	pf

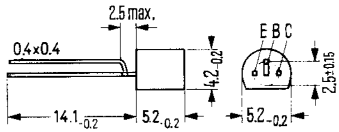
Four-terminal network data:

($-I_C=2$ mA; $-V_{CE}=5$ V; $f=1$ kHz)	h_{11e}	4.5 (2.5 to 12)	kΩ
	h_{12e}	2	10^{-4}
	h_{21e}	175 to 700	–
	h_{22e}	30 (<100)	μmhos

NPN Transistors for AF, pre- and driver stages as well as switching applications

BCX 58 and BCX 59 are epitaxial NPN silicon planar transistors in a plastic package (strip-line design) 10 A 3 DIN 41868 (sim. SOT-30). The transistors are designed for use in AF, pre- and driver stages, as complementary transistors to BCX 78 and BCX 79, as well as for switching applications.

Type	Order number
BCX 58 VII	Q 62702-C 618
BCX 58 VIII	Q 62702-C 619
BCX 58 IX	Q 62702-C 620
BCX 58 X	Q 62702-C 621
BCX 59 VII	Q 62702-C 622
BCX 59 VIII	Q 62702-C 623
BCX 59 IX	Q 62702-C 624
BCX 59 X	Q 62702-C 625



Mounting note: For wafer mounting the leads require a hole of 0.6 mm ∅

Weight approx. 0.25 g
Dimensions in mm

Maximum ratings

		BCX 58	BCX 59	
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-emitter voltage	V_{CES}	32	45	V
Emitter-base voltage	V_{EBO}	7	7	V
Collector current	I_C	100	100	mA
Maximum collector current	I_{CM}	200	200	mA
Base current	I_B	50	50	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_S	−55 to +150		°C
Total power dissipation (T_{amb} < 25 °C)	P_{tot}	450	450	mW

Thermal resistance

Junction to air	R_{thJamb}	< 280	< 280	K/W

Static characteristics (T_{amb} = 25 °C)
BCX 58 and BCX 59 are classified in groups of static forward current transfer ratio h_{FE} and identified by Roman numerals. Under the conditions stated below, the following data apply:

Type		BCX 58, BCX 59				BCX 58 BCX 59
h_{FE} group		VII	VIII	IX	X	
V_{CE} (V)	I_C (mA)	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} (V)
5	0.01	78	145 (>20)	220 (>40)	300 (>100)	0.5
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.62 (0.55 to 0.7)
1	10	190 (>80)	260 (120 to 400)	380 (160 to 630)	550 (240 to 1000)	0.7
1	100	>40	>45	>60	>60	0.83

	BCX 58, BCX 59	
Saturation voltages	V_{CEsat} (V)	V_{BEsat} (V)
I_C=100 mA; I_B=2.5 mA	<0.5	<1

		BCX 58	BCX 59	
Collector-emitter cutoff current				
(V_{CE}=32 V)	I_{CES}	0.2 (<10)	–	nA
(V_{CE}=32 V; T_{amb}=125 °C)	I_{CES}	0.05 (<2.5)	–	µA
(V_{CE}=32 V; T_{amb}=100 °C; V_{BE}=0.2 V)	I_{CEX}	<20	–	µA
Collector-emitter cutoff current				
(V_{CE}=45 V)	I_{CES}	–	0.2 (<10)	nA
(V_{CE}=45 V; T_{amb}=125 °C)	I_{CES}	–	0.05 (<2.5)	µA
(V_{CE}=45 V; T_{amb}=100 °C; V_{BE}=0.2 V)	I_{CEX}	–	<20	µA
Emitter-base cutoff current (V_{EBO}=5 V)	I_{EBO}	<20	<20	nA
Collector-emitter breakdown voltage (I_C=10 mA)	$V_{(BR)CEO}$	>32	>45	V
Emitter-base breakdown voltage (I_{EBO}=1 µA)	$V_{(BR)EBO}$	>7	>7	V

Dynamic characteristics ($T_{amb}=25\,°C$)		**BCX 58**	**BCX 59**	
Current gain-bandwidth product ($I_C=10$ mA; $V_{CE}=5$ V; $f=100$ MHz)	f_T	250 (>125)	250 (>125)	MHz
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	<4.5	<4.5	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	<15	<15	pf
Noise figure ($I_C=0.2$ mA; $V_{CE}=5$ V; $R_g=2\,k\Omega$; $f=1$ kHz)	NF	2 (<6)	2 (<6)	db

Four-terminal network characteristics
($I_C=2$ mA; $V_{CE}=5$ V; $f=1$ kHz)

h_{FE} group	**VII**	**VIII**	**IX**	**X**	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5 (4.5 to 12)	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200 (125 to 250)	260 (175 to 350)	330 (250 to 500)	520 (350 to 700)	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	µmhos

Switching times:

Test condition:
$I_C:I_{B1}:-I_{B2}\approx 10:1:1$ mA; $R_1=5\,k\Omega$; $R_2=5\,k\Omega$; $V_{BB}=3.6$ V; $R_L=999\,\Omega$

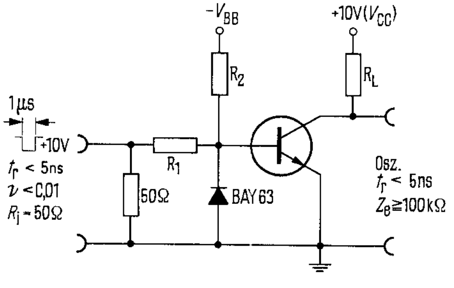
t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

Switching times:

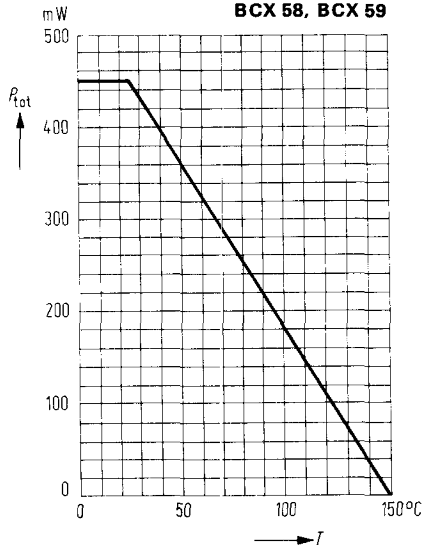
Test condition:
$I_C:I_{B1}:-I_{B2}\approx 100:10:10$ mA; $R_1=500\,\Omega$; $R_2=700\,\Omega$; $V_{BB}=5$ V; $R_L=98\,\Omega$

t_d	5	ns	t_s	250	ns
t_r	50	ns	t_f	200	ns
t_{on}	55 (<150)	ns	t_{off}	450 (<800)	ns

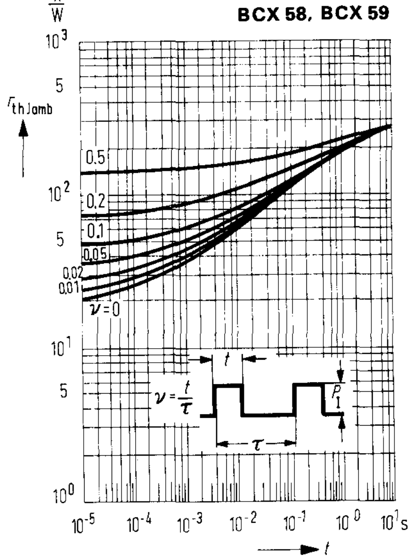
Measuring circuit for switching times:



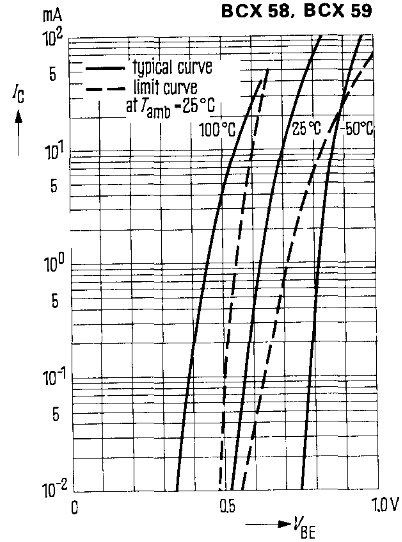
Total permissible power dissipation $P_{tot} = f(T)$



Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter

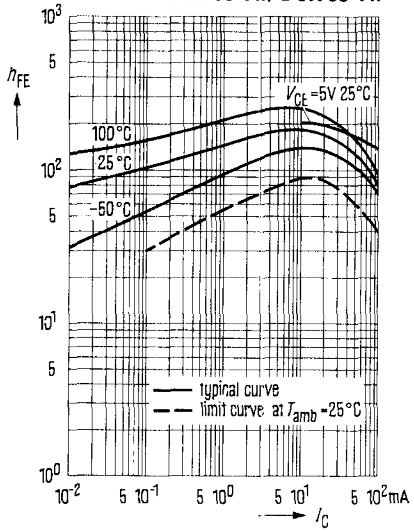


Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; (common emitter circuit)



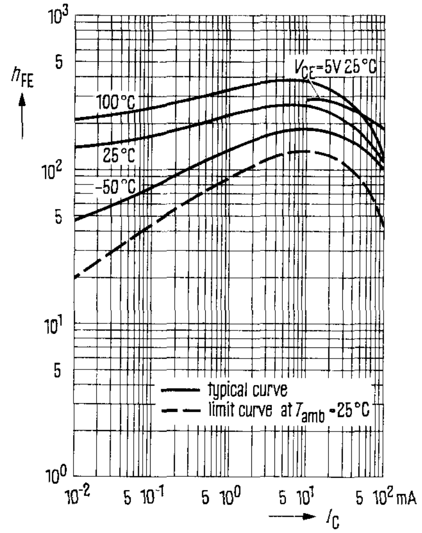
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
(common emitter circuit)

BCX 58 VII, BCX 59 VII



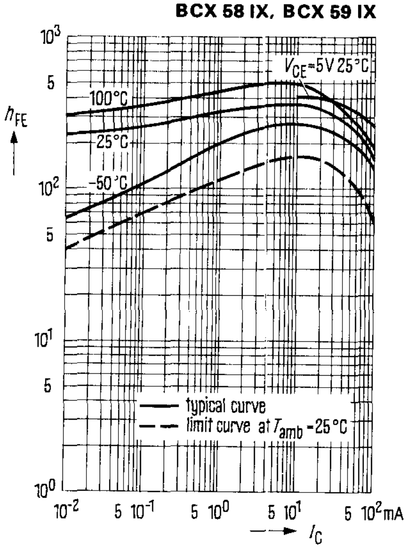
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
(common emitter circuit)

BCX 58 VIII, BCX 59 VIII



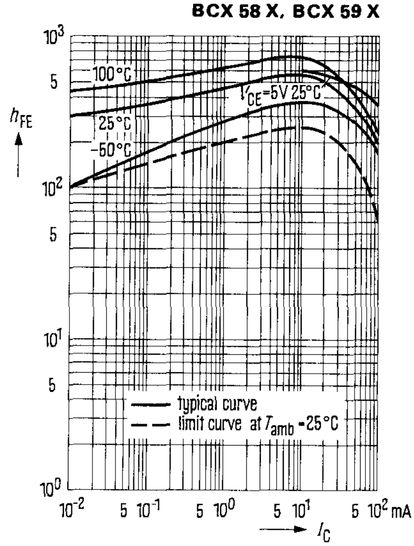
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
(common emitter circuit)

BCX 58 IX, BCX 59 IX

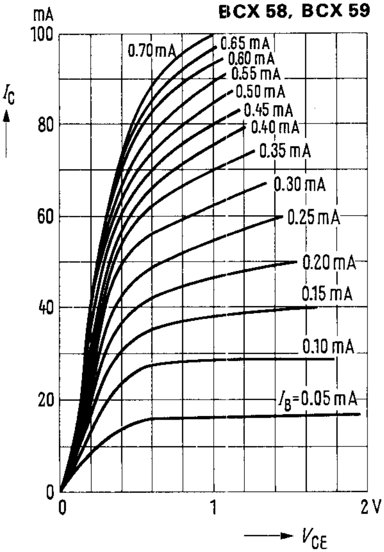


Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1$ V; T_{amb} = parameter
(common emitter circuit)

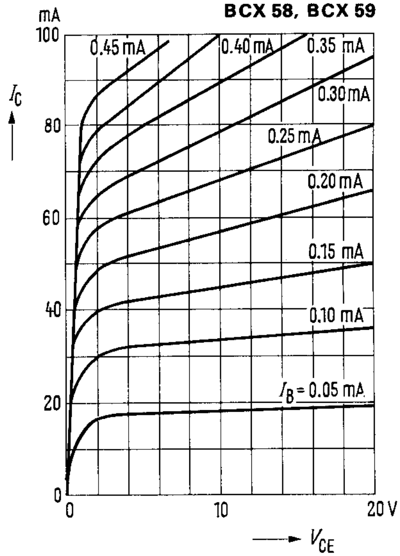
BCX 58 X, BCX 59 X



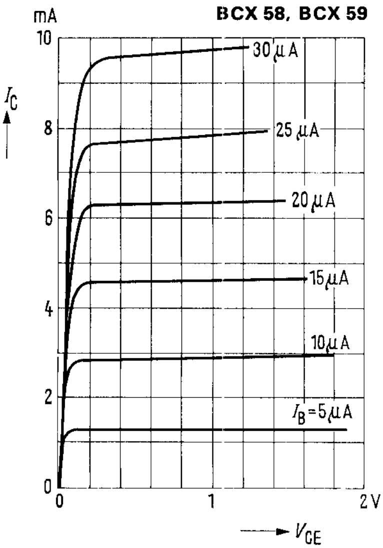
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



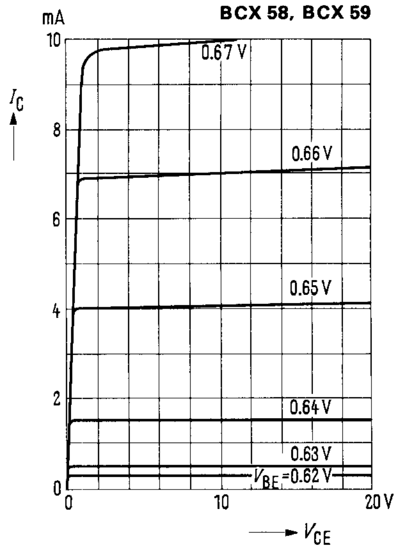
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



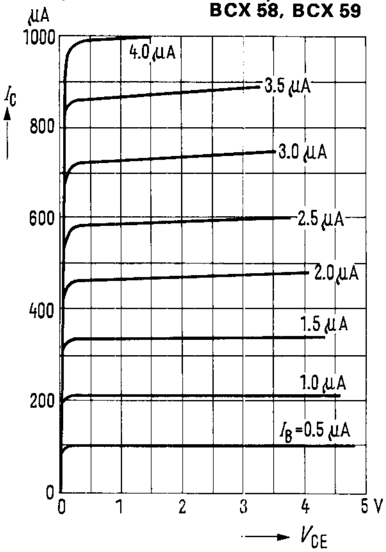
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)



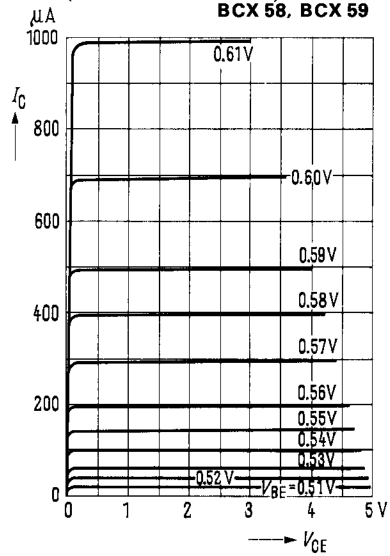
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter
(common emitter circuit)



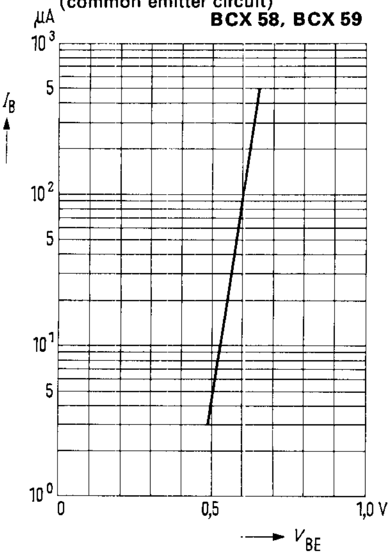
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)
BCX 58, BCX 59



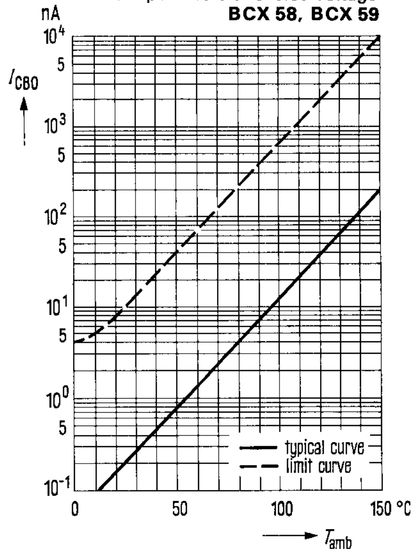
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter
(common emitter circuit)
BCX 58, BCX 59



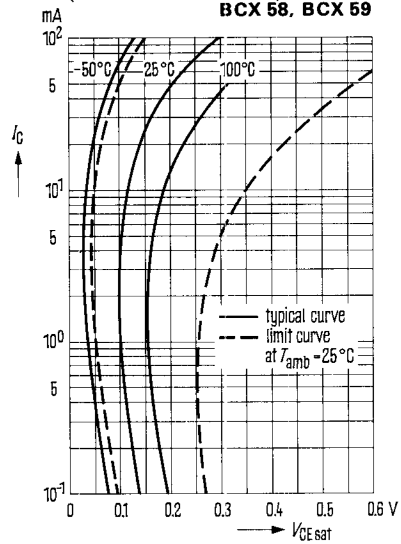
Input characteristic
$I_B = f(V_{BE})$; V_{CE} = 5 V
(common emitter circuit)
BCX 58, BCX 59



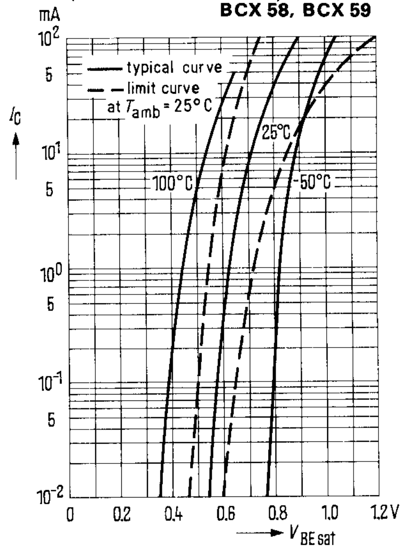
Collector-base cutoff current
$I_{CBO} = f(T_{amb})$
for max. permissible reverse voltage
BCX 58, BCX 59



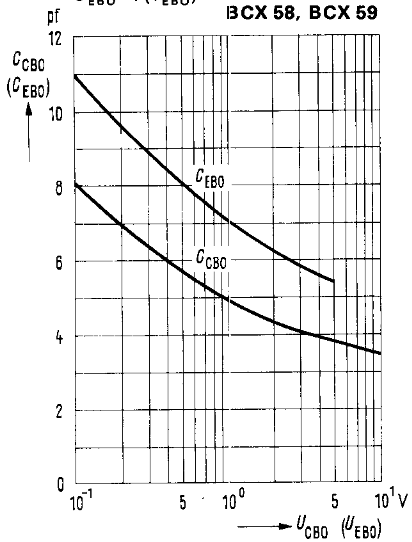
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
(common emitter circuit)
BCX 58, BCX 59



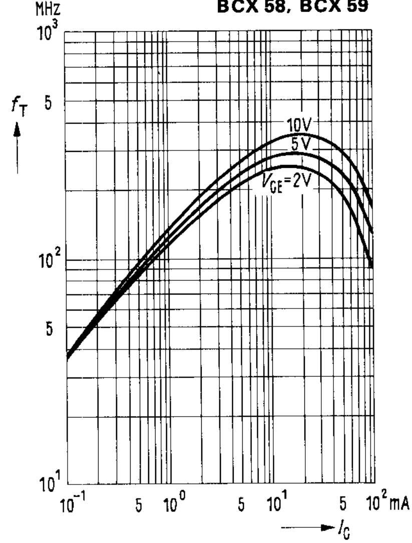
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
(common emitter circuit)
BCX 58, BCX 59



Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
BCX 58, BCX 59



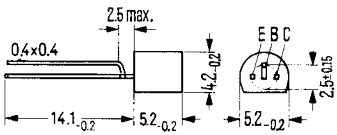
Current gain-bandwidth product $f_T = f(I_C)$;
V_{CE} = parameter
BCX 58, BCX 59



NPN Transistors for AF driver and output stages as well as switching applications

BCX 73 and BCX 74 are epitaxial NPN silicon planar transistors in a plastic package (strip-line design) 10 A 3 DIN 41 868 (SOT-30). The transistors are designed for use in AF driver and output stages, as complementary transistors to BCX 75 and BCX 76, as well as for switching applications.

Type	Order number
BCX 73-16	Q 62702-C 634-S 1
BCX 73-25	Q 62702-C 634-S 2
BCX 73-40	Q 62702-C 634-S 3
BCX 74-16	Q 62702-C 635-S 1
BCX 74-25	Q 62702-C 635-S 2
BCX 74-40	Q 62702-C 635-S 3



Mounting note: For wafer mounting the leads require a hole of 0.6 mm ∅

Weight approx. 0.25 g
Dimensions in mm

Maximum ratings		BCX 73	BCX 74	
Collector-emitter voltage	V_{CEO}	32	45	V
Collector-emitter voltage	V_{CES}	60	75	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	800	800	mA
Maximum collector current	I_{CM}	1000	1000	mA
Base current	I_B	100	100	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_S	−55 to +150		°C
Total power dissipation (T_{amb} > 25 °C)	P_{tot}	625	625	mW
Thermal resistance				
Junction to air	R_{thJamb}	200	200	K/W
Junction to case	$R_{thJcase}$	90	90	K/W
Static characteristics (T_{amb} = 25 °C)				
Collector-emitter cutoff current				
(V_{CE} = 32 V)	I_{CES}	<20	–	nA
(V_{CE} = 32 V; T_{amb} = 125 °C)	I_{CES}	<2	–	µA
Collector-emitter cutoff current				
(V_{CE} = 45 V)	I_{CES}	–	<20	nA
(V_{CE} = 45 V; T_{amb} = 125 °C)	I_{CES}	–	<2	µA
Emitter-base cutoff current				
(V_{EBO} = 4 V)	I_{EBO}	<20	<20	nA

		BCX 73	BCX 74	
Collector-emitter breakdown voltage (I_C=10 µA)	$V_{(BR)CES}$	>60	>75	V
Collector-emitter breakdown voltage (I_C=10 mA)	$V_{(BR)CEO}$	>32	>45	V
Emitter-base breakdown voltage (I_{EBO}=10 µA)	$V_{(BR)EBO}$	>5	>5	V

At the collector currents stated below, the following data apply:

V_{CE} V	I_C mA	h_{FE} I_C/I_B	V_{CEsat} V	V_{BEsat} V	V_{BE} V
10	0.1	>35			
1	1	>50			
1	10	>75			
1	100	100 to 630 [1]	<0.25 [2]		
2	500	>35	<0.6 [3]	<1.5 [3]	<1.4

Dynamic characteristics (T_{amb}=25 °C)

		BCX 73	BCX 74	
Current gain-bandwidth product (I_C=20 mA; V_{CE}=10 V; f=100 MHz)	f_T	>100	>100	MHz
Collector-base capacitance (V_{CBO}=10 V)	C_{CBO}	8 (<12)	8 (<12)	pf
Emitter-base capacitance (V_{EBO}=0.5 V)	C_{EBO}	<80	<80	pf
Noise figure (I_C=0.2 mA; V_{CE}=5 V; R_g=1 kΩ; f=1 kHz)	NF	2 (<10)	2 (<10)	db
Switching times				
($-I_C$=150 mA; R_L=150 Ω; $I_B \approx -I_{B2}$=15 mA)	t_{on}	<100	<100	ns
	t_{off}	<400	<400	ns

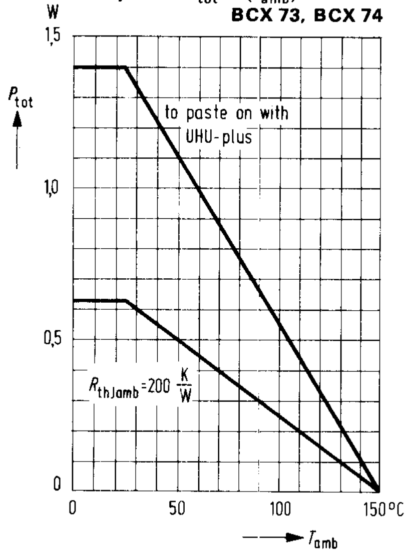
[1]) Subdivided into the groups 16 (h_{FE}=100 to 250)
25 (h_{FE}=160 to 400)
40 (h_{FE}=250 to 630)

[2]) I_B=10 mA

[3]) I_B=50 mA

Total permissible power dissipation $P_{tot} = f(T_{amb})$

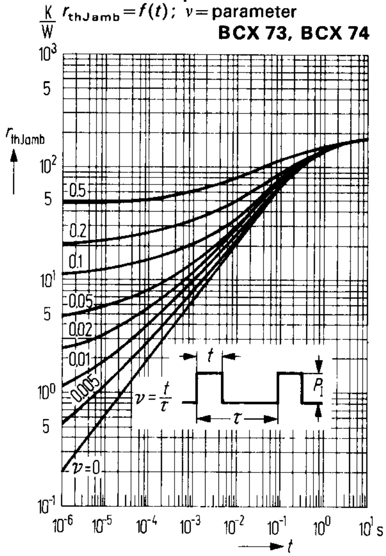
BCX 73, BCX 74



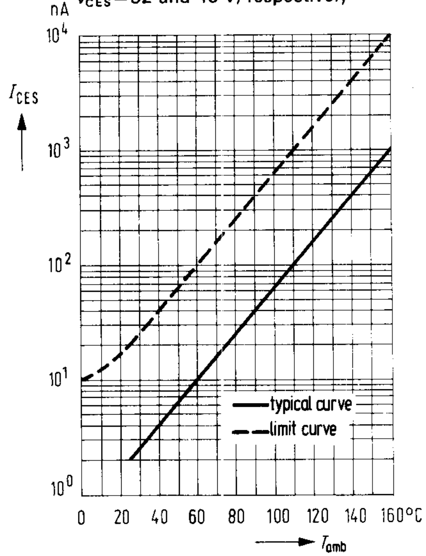
Permissible pulse load

$r_{thJamb} = f(t)$; ν = parameter

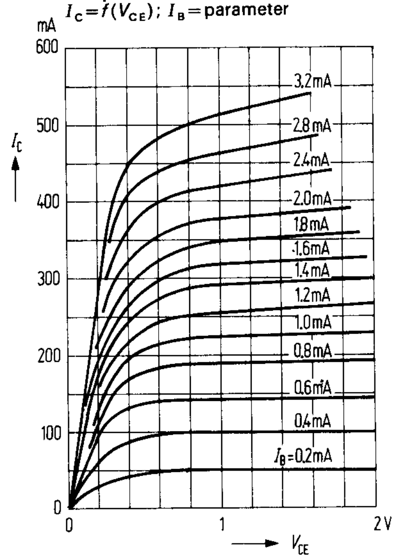
BCX 73, BCX 74



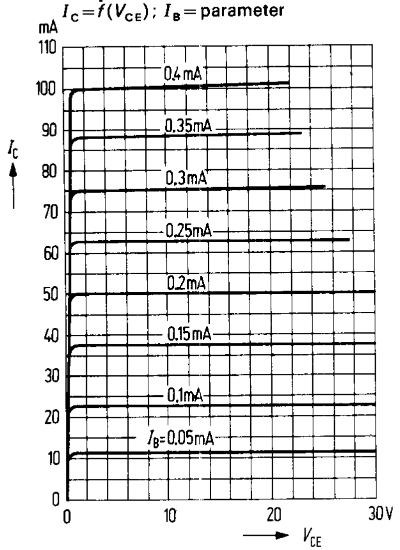
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
$V_{CES} = 32$ and 45 V, respectively



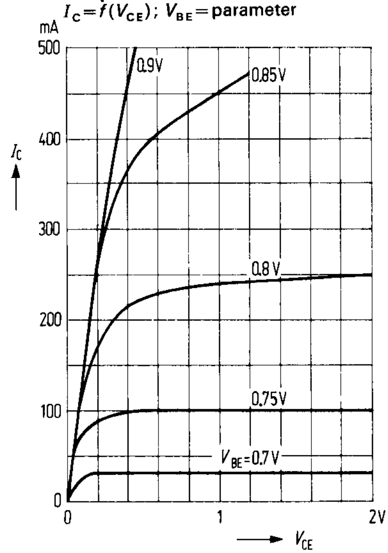
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter



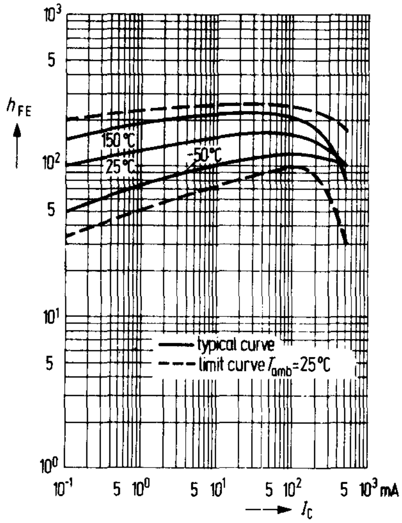
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter



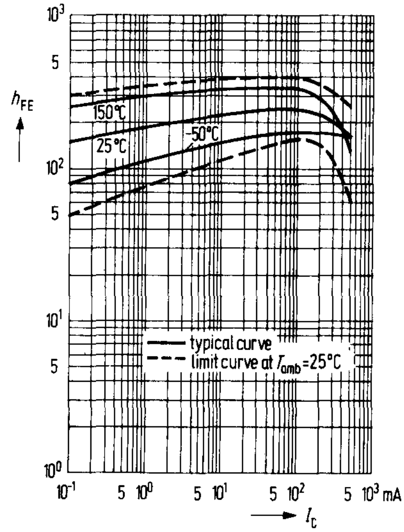
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter



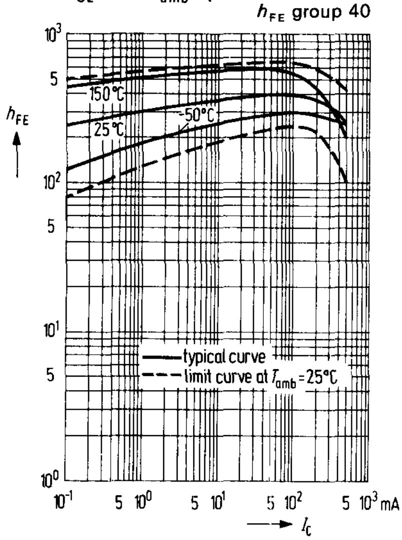
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group 16



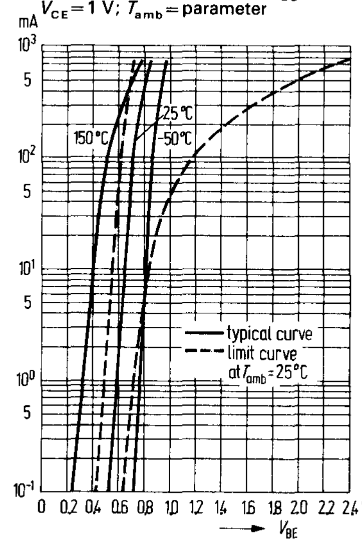
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group 25



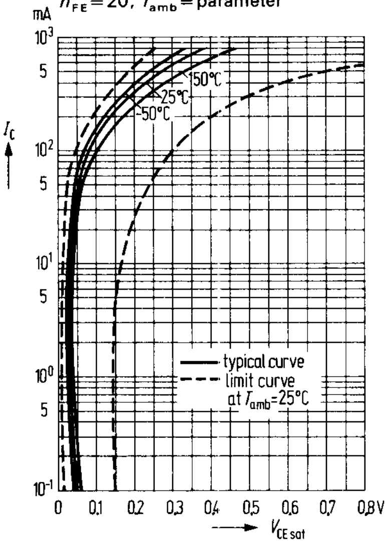
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group 40



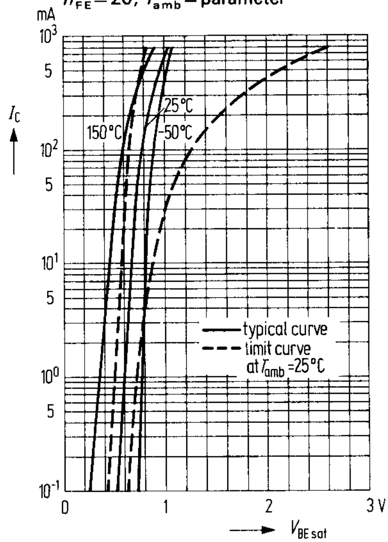
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V; T_{amb} = parameter



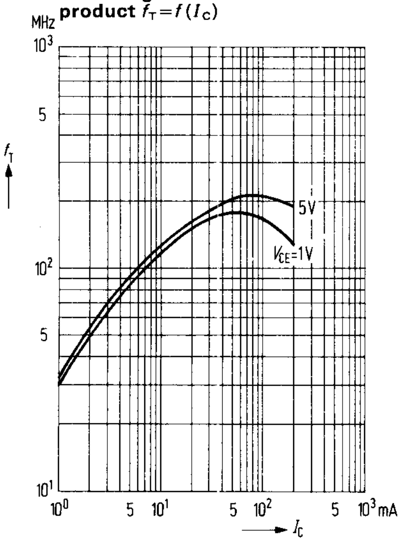
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter



Base-emitter saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter



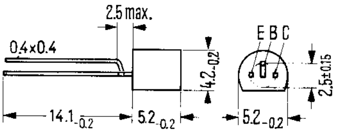
Current gain-bandwidth product $f_T = f(I_C)$



PNP Transistors for AF pre-stages, driver stages and switching applications

BCX 75 and BCX 76 are epitaxial PNP silicon planar transistors in a package 10 A 3 DIN 41868 (sim. SOT-30). The transistors are suitable for use in AF pre- and driver stages as well as for switching applications.

Type	Order number
BCX 75-16	Q 62702-C 636-S 1
BCX 75-25	Q 62702-C 636-S 2
BCX 75-40	Q 62702-C 636-S 3
BCX 76-16	Q 62702-C 637-S 1
BCX 76-25	Q 62702-C 637-S 2
BCX 76-40	Q 62702-C 637-S 3



Mounting note: For wafer mounting the leads require a hole of 0.6 mm ∅

Weight approx. 0.25 g
Dimensions in mm

Maximum ratings		BCX 75	BCX 76	
Collector-emitter voltage	$-V_{CEO}$	32	45	V
Collector-emitter voltage	$-V_{CES}$	60	75	V
Emitter-base voltage	$-V_{EBO}$	5	5	V
Collector current	$-I_C$	800	800	mA
Maximum collector current	$-I_{CM}$	1000	1000	mA
Base current	$-I_B$	100	100	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +150		°C
Total power dissipation (T_{amb} > 25 °C)	P_{tot}	625	625	mW
Thermal resistance				
Junction to air	R_{thJamb}	≧200	≧200	K/W
Junction to case	$R_{thJcase}$	≧90	≧90	K/W

Static characteristics (T_{amb} = 25 °C)				
Collector-emitter cutoff current				
($-V_{CE}$ = 32 V)	$-I_{CES}$	< 20	–	nA
($-V_{CE}$ = 32 V; T_{amb} = 125 °C)	$-I_{CES}$	< 2	–	µA
Collector-emitter cutoff current				
($-V_{CE}$ = 45 V)	$-I_{CES}$	–	< 20	nA
($-V_{CE}$ = 45 V; T_{amb} = 125 °C)	$-I_{CES}$	–	< 2	µA
Emitter-base cutoff current				
($-V_{EBO}$ = 4 V)	$-I_{EBO}$	< 20	< 20	nA

		BCX 75	BCX 76	
Collector-emitter breakdown voltage ($-I_C=10\ \mu A$)	$-V_{(BR)CES}$	>60	>75	V
Collector-emitter breakdown voltage ($-I_C=10$ mA)	$-V_{(BR)CEO}$	>32	>45	V
Emitter-base breakdown voltage ($-I_{EBO}=10\ \mu A$)	$-V_{(BR)EBO}$	>5	>5	V

At the collector current stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	$-V_{CEsat}$ V	$-V_{BEsat}$ V	$-V_{BE}$ V
10	0.1	>35			
1	1	>50			
1	10	>75			
1	100	100 to 630[1])	<0.25[2])		
2	500	>35	<0.6[3])	<1.5[3])	<1.4

Dynamic characteristics ($T_{amb}=25$ °C)

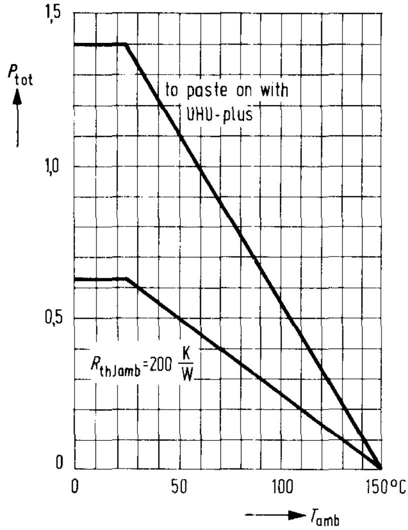
Current-gain bandwidth product ($-I_C=20$ mA; $-V_{CE}=10$ V; $f=100$ MHz)	f_T	>100	>100	MHz
Noise figure ($-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=1$ kΩ; $f=1$ kHz)	NF	2 (<10)	2 (<10)	db
Collector-base capacitance ($V_{CBO}=10$ V)	C_{CBO}	12 (<18)	12 (<18)	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V)	C_{EBO}	<80	< 80	pf
Switching times: ($I_C=150$ mA; $R_L=150\ \Omega$; $I_{B1}\approx -I_{B2}=15$ mA)	t_{on}	<100	<100	ns
	t_{off}	<400	<400	ns

[1]) Subdivided into the groups 16 ($h_{FE}=100$ to 250)
25 ($h_{FE}=160$ to 400)
40 ($h_{FE}=250$ to 630)

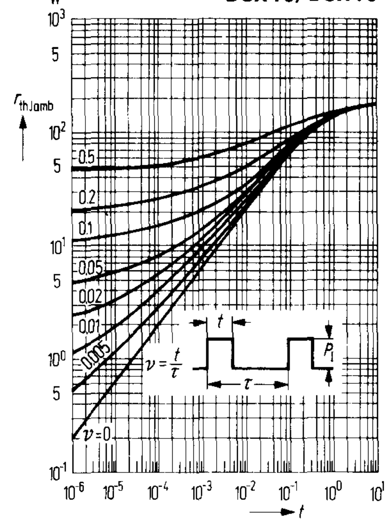
[2]) $I_B=10$ mA

[3]) $I_B=50$ mA

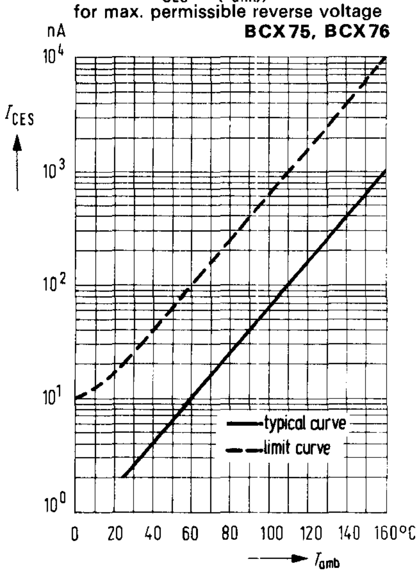
Total permissible power dissipation $P_{tot} = f(T_{amb})$
BCX 75, BCX 76



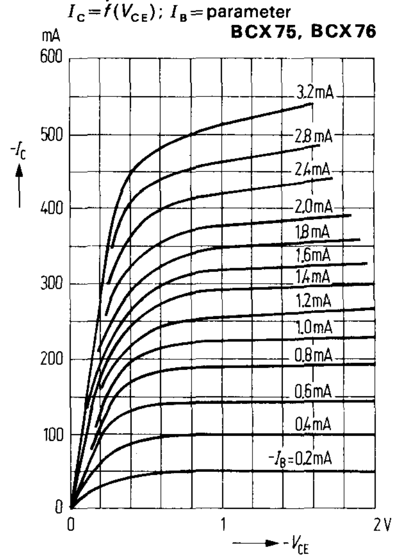
Permissible pulse load
$r_{thJamb} = f(t)$; v = parameter
BCX 75, BCX 76



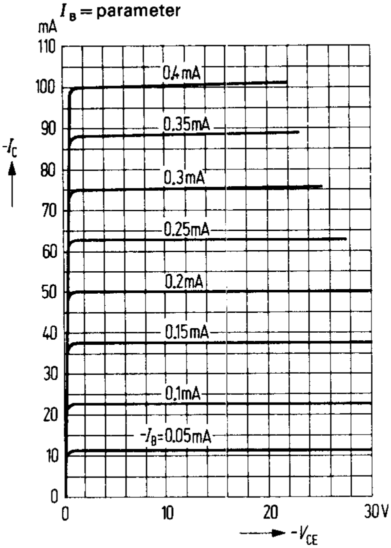
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
for max. permissible reverse voltage
BCX75, BCX76



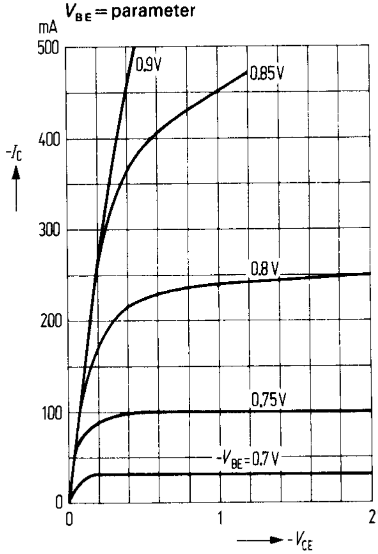
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
BCX75, BCX76



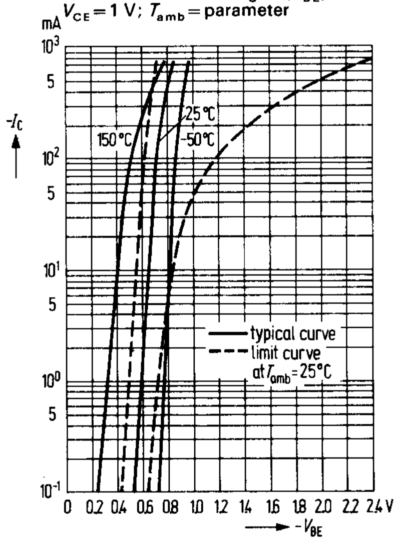
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



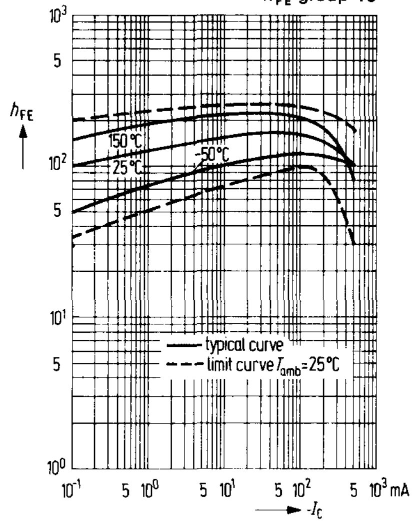
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



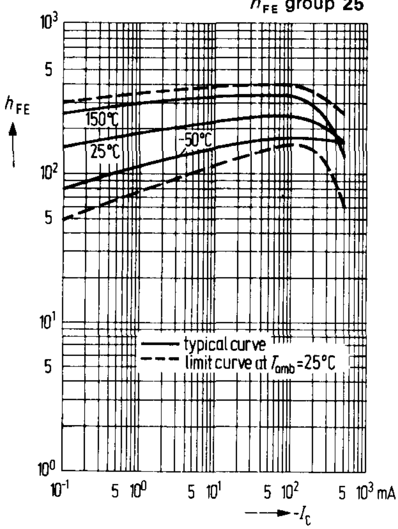
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; T_{amb} = parameter



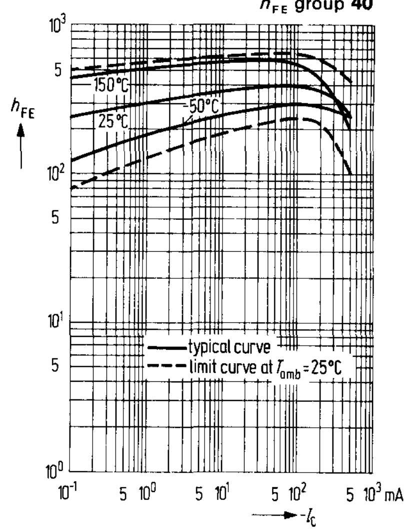
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group **16**



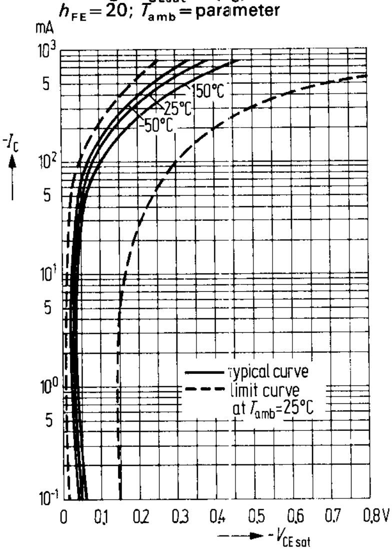
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group **25**



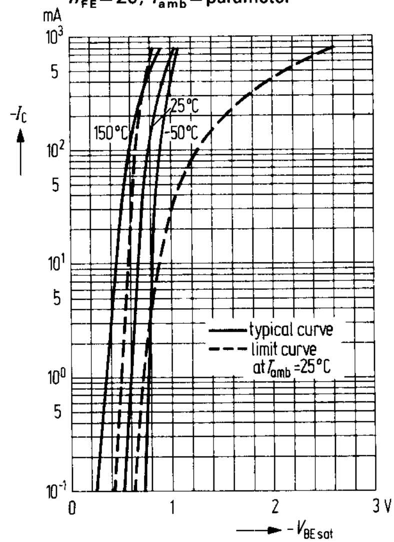
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
h_{FE} group **40**



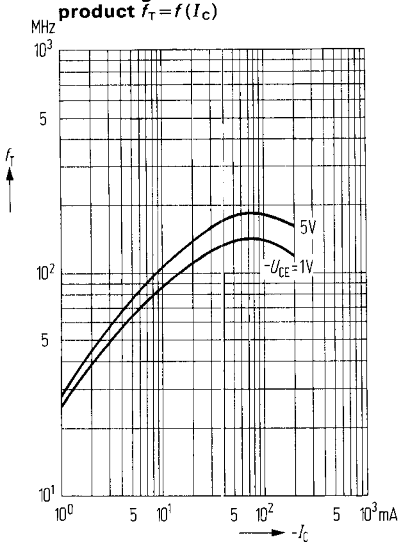
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter



Base-emitter saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 20$; T_{amb} = parameter



Current gain-bandwidth product $f_T = f(I_C)$

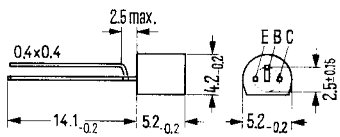


PNP Transistors for AF pre- and driver stages as well as switching applications

Preliminary data

BCX 78 and BCX 79 are epitaxial PNP silicon planar transistors in a plastic package (strip-line design) 10 A 3 DIN 41868 (sim. SOT-30). The transistors are suitable for use in AF pre- and driver stages, as complementary transistors to BCX 58 and BCX 59, as well as for switching applications.

Type	Order number
BCX 78 VII	Q62702-C626
BCX 78 VIII	Q62702-C627
BCX 78 IX	Q62702-C628
BCX 78 X	Q62702-C629
BCX 79 VII	Q62702-C630
BCX 79 VIII	Q62702-C631
BCX 79 IX	Q62702-C632
BCX 79 X	Q62702-C633



Mounting note: For wafer mounting the leads require a hole of 0.6 mm ∅

Weight approx. 0.25 g
Dimensions in mm

Maximum ratings		**BCX 78**	**BCX 79**	
Collector-emitter voltage	$-V_{CEO}$	32	45	V
Collector-emitter voltage	$-V_{CES}$	32	45	V
Emitter-base voltage	$-V_{EBO}$	5	5	V
Collector current	$-I_C$	100	100	mA
Maximum collector current	$-I_{CM}$	200	200	mA
Base current	$-I_B$	50	50	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +150		°C
Total power dissipation (T_{amb} < 25 °C)	P_{tot}	450	450	mW
Thermal resistance				
Junction to air	R_{thJamb}	< 280	< 280	K/W

Static characteristics (T_{amb} = 25 °C)

BCX 78 and BCX 79 are classified in groups of static forward current transfer ratio and identified by Roman numerals.

Type		BCX 78, BCX 79				BCX 78 BCX 79
h_{FE}-Group		VII	VIII	IX	X	
$-V_{CE}$ (V)	$-I_C$ (mA)	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ (V)
5	0.01	140	200 (>30)	270 (>40)	340 (>100)	0.55
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.65 (0.60 to 0.70)
1	10	180 (>80)	260 (120 to 400)	360 (160 to 630)	500 (240 to 1000)	0.68
1	100	>40	>45	>60	>60	0.76 (<0.9)

Saturation voltages	$-V_{CEsat}$ (V)	$-V_{BEsat}$ (V)
($-I_C$=100 mA; $-I_B$=2.5 mA)	<0.6	<1

		BCX 78	BCX 79	
Collector-emitter cutoff current				
($-V_{CE}$=32 V)	$-I_{CES}$	0.2 (<10)	–	nA
($-V_{CE}$=32 V; T_{amb}=125 °C)	$-I_{CES}$	0.05 (<2.5)	–	µA
($-V_{CE}$=32 V; T_{amb}=100 °C; V_{BE}=0.2 V)	$-I_{CEX}$	<20	–	µA
Collector-emitter cutoff current				
($-V_{CE}$=45 V)	$-I_{CES}$	–	0.2 (<10)	nA
($-V_{CE}$=45 V; T_{amb}=125 °C)	$-I_{CES}$	–	0.05 (<2.5)	µA
($-V_{CE}$=45 V; T_{amb}=100 °C; V_{BE}=0.2 V)	$-I_{CEX}$	–	<20	µA
Emitter-base cutoff current ($-V_{EBO}$=4 V)	$-I_{EBO}$	<20	<20	nA
Collector-emitter breakdown voltage (I_C=10 mA)	$-V_{(BR)CEO}$	>32	>45	V
Emitter-base breakdown voltage ($-I_{EBO}$=1 µA)	$-V_{(BR)EBO}$	>5	>5	V

Dynamic characteristics ($T_{amb}=25\ °C$)

		BCX 78	BCX 79	
Current-gain bandwidth product ($-I_C=10$ mA; $-V_{CE}=5$ V; $f=100$ MHz)	f_T	200	200	MHz
Collector-base capacitance ($-V_{CBO}=10$ V; f=1 MHz)	C_{CBO}	<4.5	<4.5	pf
Emitter-base capacitance ($-V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	<15	<15	pf
Noise figure ($-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=2\ k\Omega$; $f=1$ kHz)	NF	2 (<6)	2 (<6)	db

Four-terminal network characteristics
($-I_C=2$ mA; $-V_{CE}=5$ V; $f=1$ kHz)

h_{FE} Group	VII	VIII	IX	X	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200 (125 to 250)	260 (175 to 350)	330 (250 to 500)	520 (350 to 700)	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	µmhos

Switching times

Test condition:

$-I_C$: I_{B1}: $-I_{B2}\approx 10:1:1$ mA; $R_1=5\ k\Omega$; $R_2=5\ k\Omega$; $V_{BB}=3.6$ V : $R_L=999\ \Omega$

t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

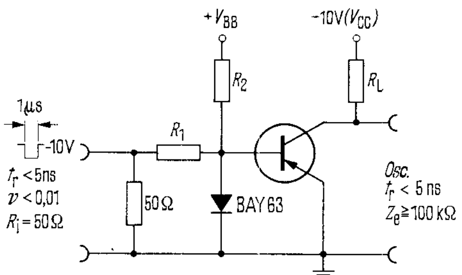
Switching times:

Test condition:

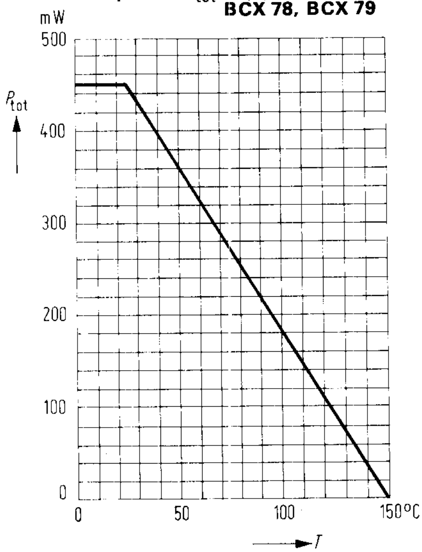
$-I_C$: I_{B1}: $-I_{B2}\approx 100:10:10$ mA; $R_1=500\ \Omega$; $R_2=700\ \Omega$; $V_{BB}=5$ V; $R_L=98\ \Omega$

t_d	5	ns	t_s	250	ns
t_r	50	ns	t_f	200	ns
t_{on}	55 (<150)	ns	t_{off}	450 (<800)	ns

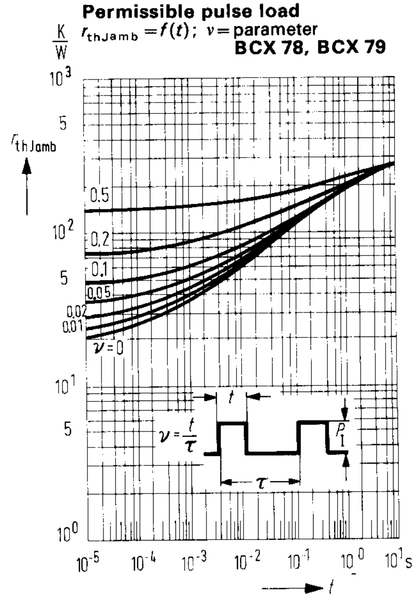
Measuring circuit for switching times:



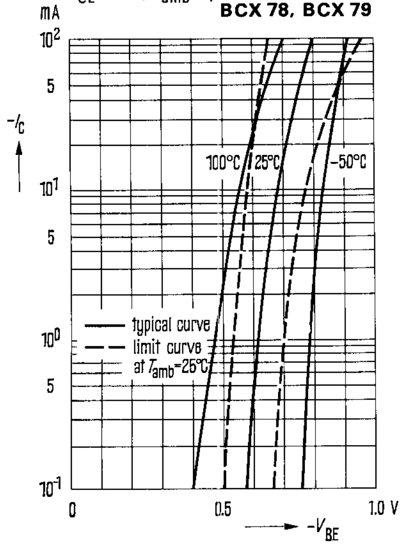
Total permissible power dissipation $P_{tot} = f(T)$
BCX 78, BCX 79



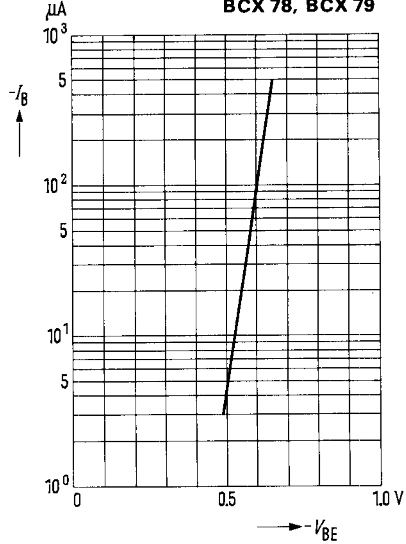
Permissible pulse load
$r_{thJamb} = f(t)$; ν = parameter
BCX 78, BCX 79



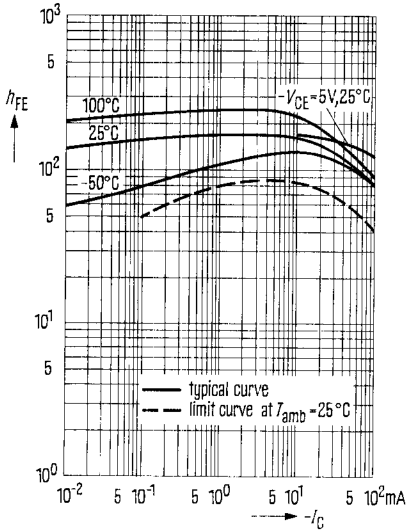
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V; T_{amb} = parameter
BCX 78, BCX 79



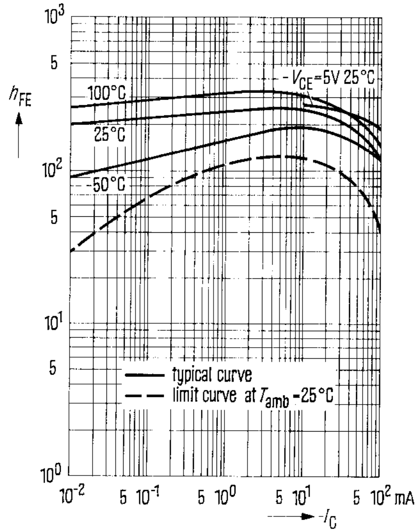
Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V; T_{amb} = 25 °C
BCX 78, BCX 79



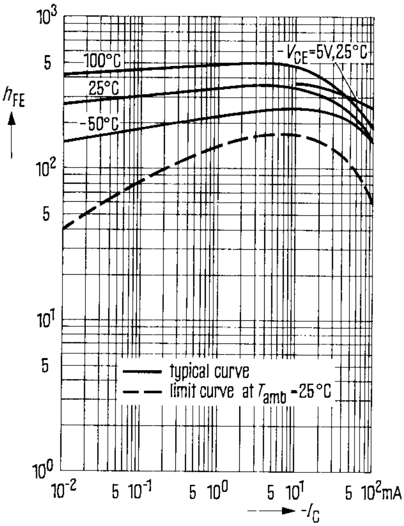
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
BCX 78 VII, BCX 79 VII



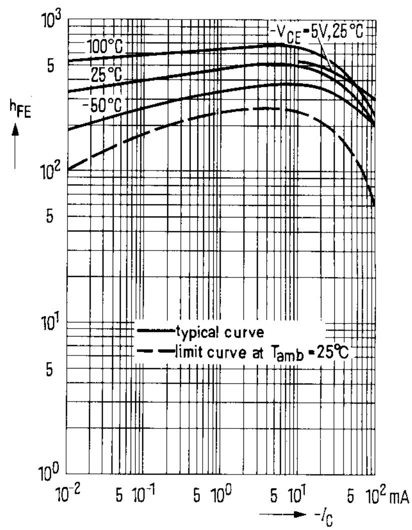
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
BCX 78 VIII, BCX 79 VIII



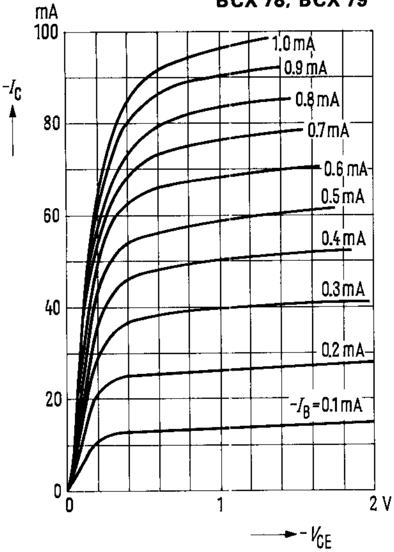
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
BCX 78 IX, BCX 79 IX



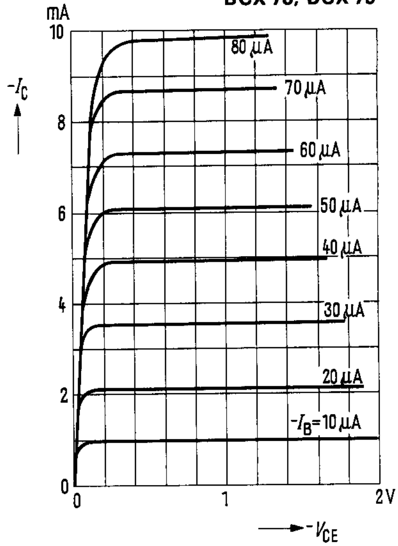
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
BCX 78 X, BCX 79 X



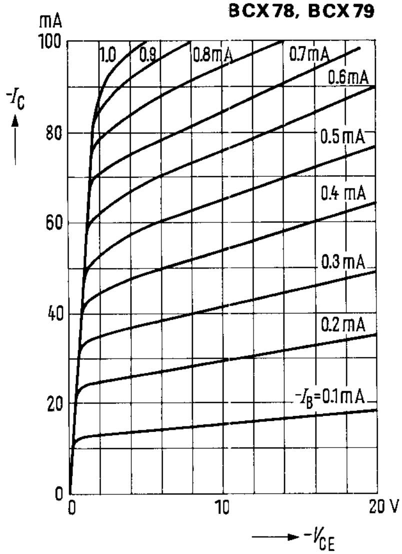
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
BCX 78, BCX 79



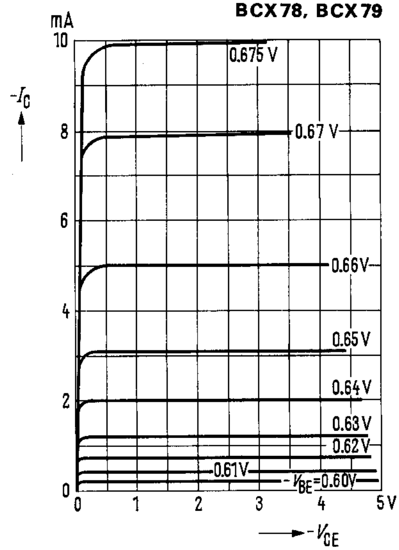
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
BCX 78, BCX 79



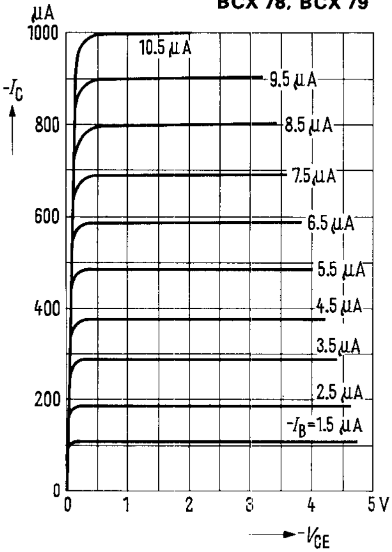
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BCX 78, BCX 79



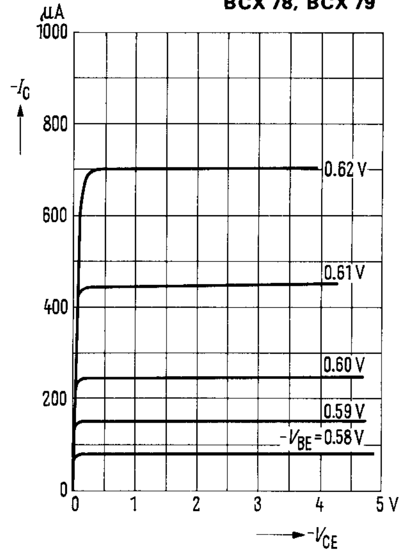
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
BCX 78, BCX 79



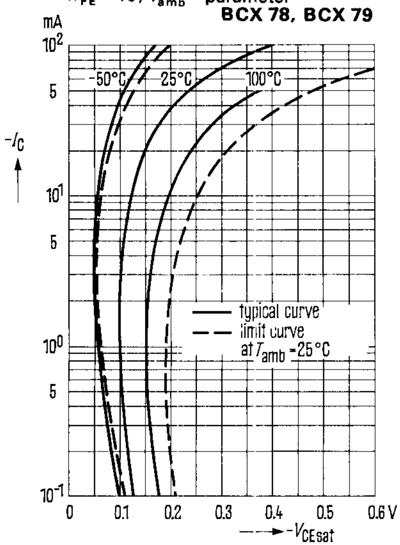
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
BCX 78, BCX 79



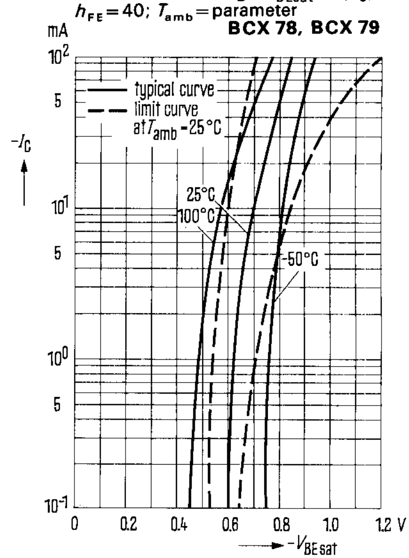
Output characteristics
$I_C = f(V_{CE})$; V_{BE} = parameter
BCX 78, BCX 79



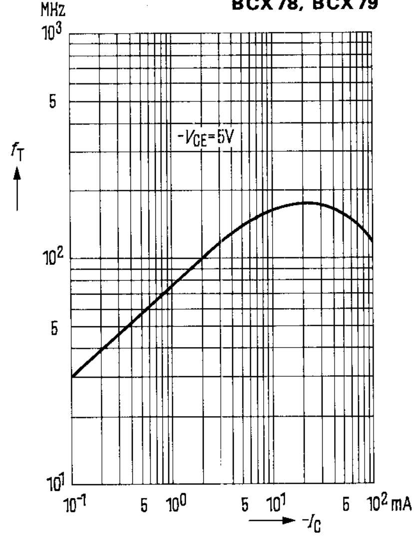
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
BCX 78, BCX 79



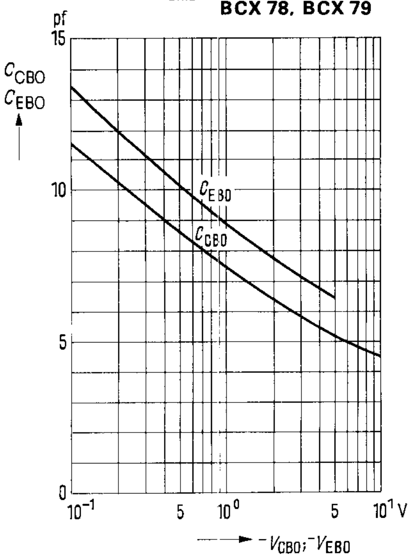
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
BCX 78, BCX 79



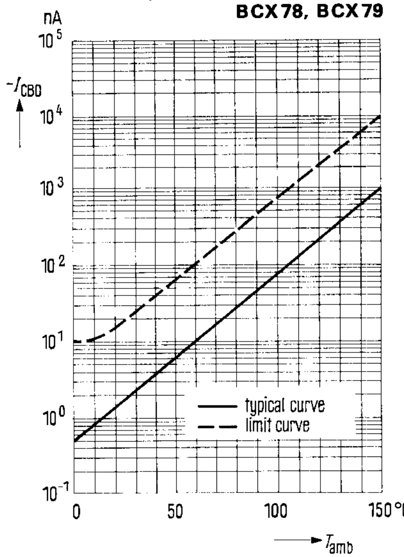
Current gain-bandwidth product $f_T = f(I_C)$
BCX 78, BCX 79



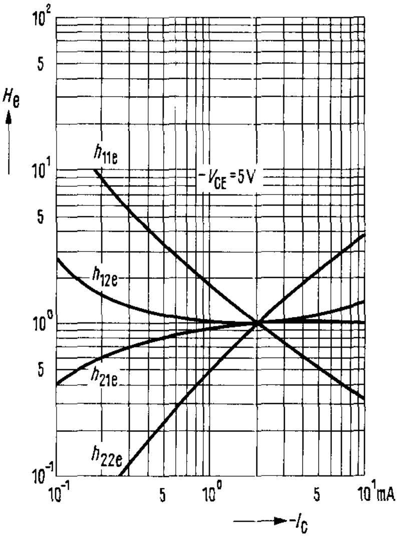
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
f = 1 MHz; T_{amb} = 25 °C
BCX 78, BCX 79



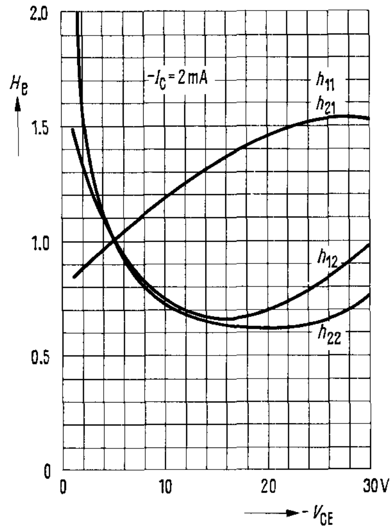
Collector-base cutoff current
$I_{CBO} = f(T_{amb})$
for max. permissible reverse voltage
BCX 78, BCX 79



h-parameter vs. collector current
$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\text{ mA})} = f(I_C)$
BCX 78, BCX 79



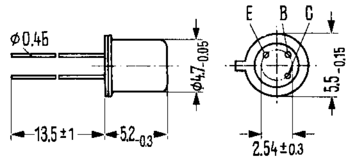
h-parameter vs. collector-emitter voltage
$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\text{ V})} = f(V_{CE})$
BCX 78, BCX 79



NPN Transistors for AF prestages, driver stages and switching applications

BCY 58, BCY 59 and BCY 65 E are silicon planar NPN epitaxial transistors in a case 18 A 3 DIN 41876 (TO-18). The collector is electrically connected to the case. The transistors are particularly suited to AF prestages driver stages and switching applications.

Type	Order number
BCY 58 VII	Q 60203-Y 58-G
BCY 58 VIII	Q 60203-Y 58-H
BCY 58 IX	Q 60203-Y 58-J
BCY 58 X	Q 60203-Y 58-K
BCY 59 VII	Q 60203-Y 59-G
BCY 59 VIII	Q 60203-Y 59-H
BCY 59 IX	Q 60203-Y 59-J
BCY 59 X	Q 60203-Y 59-K
BCY 65 E VII	Q 60203-Y 65-E 7
BCY 65 E VIII	Q 60203-Y 65-E 8
BCY 65 E IX	Q 60203-Y 65-E 9



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		**BCY 58**	**BCY 59**	**BCY 65 E**	
Collector-emitter voltage	V_{CES}	32	45	60	V
Collector-emitter voltage	V_{CEO}	32	45	60	V
Emitter-base voltage	V_{EBO}	7	7	7	V
Collector current	I_C	200	200	100	mA
Base current	I_B	50	50	50	mA
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	1	1	1	W
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦450	≦450	≦450	K/W
Junction to case	$R_{thJcase}$	≦150	≦150	≦150	K/W

Static characteristics ($T_{amb}=25$ °C)

The transistors are classified in groups according to their static forward current transfer ratio h_{FE} and are indicated by Roman numerals.

Static characteristics ($T_{amb} = 25$ °C)

Type		**BCY 65 E**	**BCY 65 E**	**BCY 65 E**	–	**BCY 59**
		BCY 58/59	**BCY 58/59**	**BCY 58/59**	**BCY 58/59**	**BCY 65 E**
h_{FE} group		**VII**	**VIII**	**IX**	**X**	**BCY 58**
V_{CE} V	I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
5	0.01	78	145 (<20)	220 (>40)	300 (>100)	0.5
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.62 (0.55 to 0.7)*
1	10	190 (>80)	260 (120 to 400)	380 (160 to 630)	550 (240 to 1000)	0.7
1	50[1]	>40	>45	>60	–	0.76
1	100[2]	>40	>45	>60	>60	0.76

Saturation voltages:	V_{CEsat}	V_{BEsat}	
($I_C = 10$ mA; $I_B = 0.25$ mA)	0.12 (0.05 to 0.35)	0.7 (0.6 to 0.85)	V
($I_C = 100$ mA; $I_B = 2.5$ mA)[2]	0.3 (0.15 to 0.7)	0.9 (0.75 to 1.2)	V
($I_C = 50$ mA; $I_B = 1.25$ mA)[1]	0.1 (>0.7)	0.9 (>1.2)	V

		BCY 58	**BCY 59**	**BCY 65 E**	
Collector-emitter cutoff current ($V_{CES} = 32$ V)	I_{CES}	0.2 (<10)	–	–	nA*
($V_{CES} = 45$ V)	I_{CES}	–	0.2 (<10)	–	nA*
($V_{CES} = 60$ V)	I_{CES}	–	–	0.2 (<10)	nA*
Collector-emitter cutoff current ($V_{CES} = 32$ V; $T_{amb} = 150$ °C)	I_{CES}	0.2 (<10)	–	–	µA
($V_{CES} = 45$ V; $T_{amb} = 150$ °C)	I_{CES}	–	0.2 (<10)	–	µA
($V_{CES} = 60$ V; $T_{amb} = 150$ °C)	I_{CES}	–	–	0.2 (<10)	µA
Collector-emitter cutoff current ($V_{CE} = 32$ V; $V_{BE} = 0.2$ V; $T_{amb} = 100$ °C)	I_{CEX}	<20	–	–	µA
($V_{CE} = 45$ V; $V_{BE} = 0.2$ V; $T_{amb} = 100$ °C)	I_{CEX}	–	<20	–	µA
($V_{CE} = 60$ V; $V_{BE} = 0.2$ V; $T_{amb} = 100$ °C)	I_{CEX}	–	–	<20	µA
Emitter-base cutoff current ($V_{EBO} = 5$ V)	I_{EBO}	<10	<10	<10	nA*
Collector-emitter breakdown voltage ($I_{CEO} = 2$ mA)	$V_{(BR)CEO}$	>32	>45	>60	V*
Emitter-base breakdown voltage ($I_{EBO} = 1$ µA)	$V_{(BR)EBO}$	>7	>7	>7	V*

[1] only applies to BCY 65 E
[2] only applies to BCY 58, BCY 59
* AQL = 0.65%

Dynamic characteristics ($T_{amb}=25\ °C$)

		BCY 58	BCY 59	BCY 65 E	
Current gain-bandwidth product ($I_C=10$ mA; $V_{CE}=5$ V; $f=100$ MHz)	f_T	250 (>125)	250 (>125)	250 (>125)	MHz
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	3.5 (<6)	3.5 (<6)	3.5 (<6)	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	8 (<15)	8 (<15)	8 (<15)	pf
Noise figure ($I_C=0.2$ mA; $V_{CE}=5$ V; $R_g=2$ kΩ; $f=1$ kHz; $\Delta f=200$ Hz)	NF	2 (<6)	2 (<6)	2 (<6)	db

Four-terminal characteristics ($I_C=2$ mA; $V_{CE}=5$ V; $f=1$ kHz)

h_{FE}-group	VII	VIII	IX	X	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5 (4.5 to 12)	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200 (125 to 250)	260 (175 to 350)	330 (250 to 500)	520 (350 to 700)	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	µmhos

Switching times:

Operating point: **BCY 58; BCY 59; BCY 65 E**

$I_C : I_{B1} : -I_{B2} \approx 10:1:1$ mA; $R_1=5$ kΩ; $R_2=5$ kΩ; $V_{BB}=3.6$ V; $R_L=990$ Ω

t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

Operating point: **BCY 58; BCY 59**

$I_C : I_{B1} : -I_{B2} \approx 100:10:10$ mA; $R_1=500$ Ω; $R_2=700$ Ω; $V_{BB}=5$ V; $R_L=98$ Ω

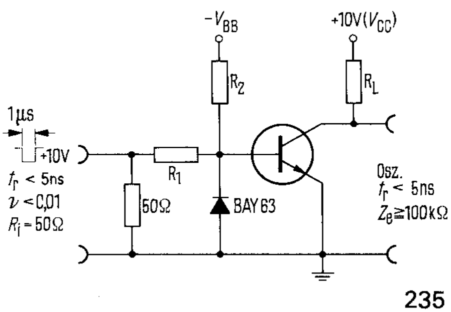
t_d	5	ns	t_s	250	ns
t_r	50	ns	t_f	200	ns
t_{on}	55 (<150)	ns	t_{off}	450 (<800)	ns

Operating point: **BCY 65 E**

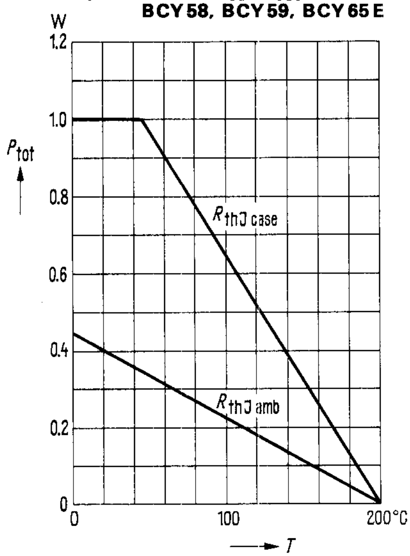
$I_C : I_{B1} : -I_{B2} \approx 50:5:5$ mA; $R_1=1$ kΩ; $R_2=1.3$ kΩ; $V_{BB}=4.7$ V; $R_L=195$ kΩ

t_d	15	ns	t_s	300	ns
t_r	50	ns	t_f	150	ns
t_{on}	65 (<150)	ns	t_{off}	450 (<800)	ns

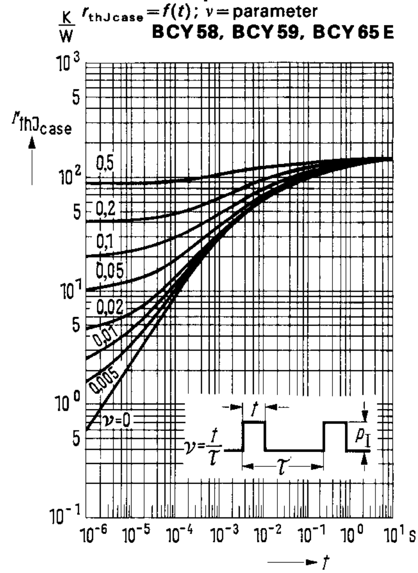
Measuring circuit for switching times



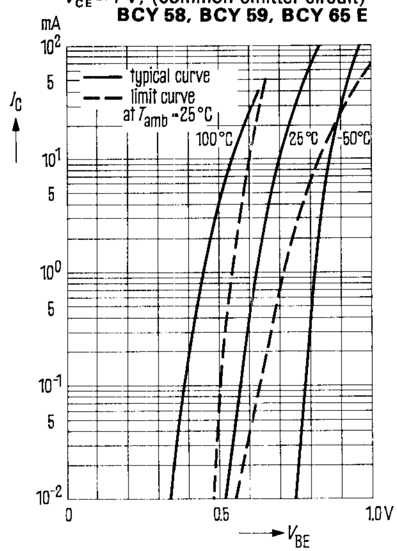
Total permissible power dissipation $P_{tot} = f(T)$
R_{th} = parameter; $V_{CE} \leq V_{CEO}$
BCY 58, BCY 59, BCY 65 E



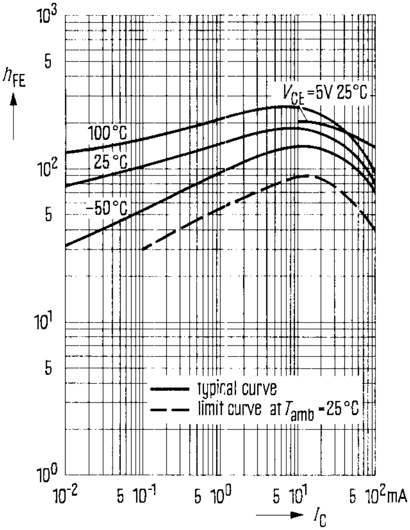
Permissible pulse load
$r_{thJcase} = f(t)$; ν = parameter
BCY 58, BCY 59, BCY 65 E



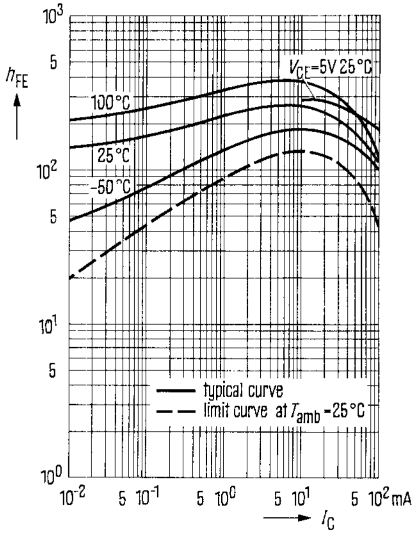
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V; (common emitter circuit)
BCY 58, BCY 59, BCY 65 E



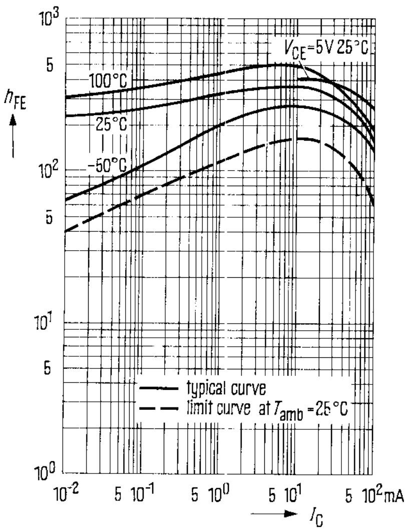
Static forward current transfer ratio $h_{FE} = f(I_C)$; T_{amb} = parameter
$V_{CE} = 1$ V (common emitter circuit)
BCY 58 VII, BCY 59 VII, BCY 65 E VII



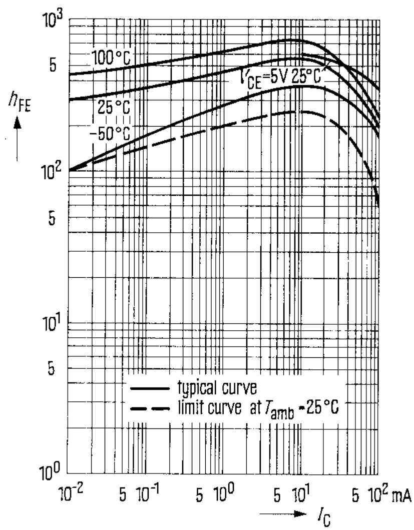
Static forward current transfer ratio $h_{FE} = f(I_C)$; T_{amb} = parameter
$V_{CE} = 1$ V (common emitter circuit)
BCY 58 VIII, BCY 59 VIII, BCY 65 E VIII



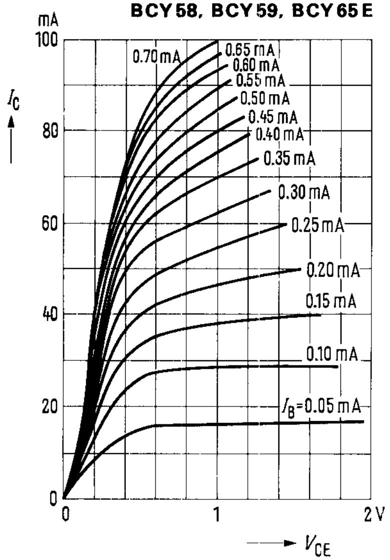
Static forward current transfer ratio $h_{FE} = f(I_C)$; T_{amb} = parameter
$V_{CE} = 1$ V (common emitter circuit)
BCY 58 IX, BCY 59 IX, BCY 65 E IX



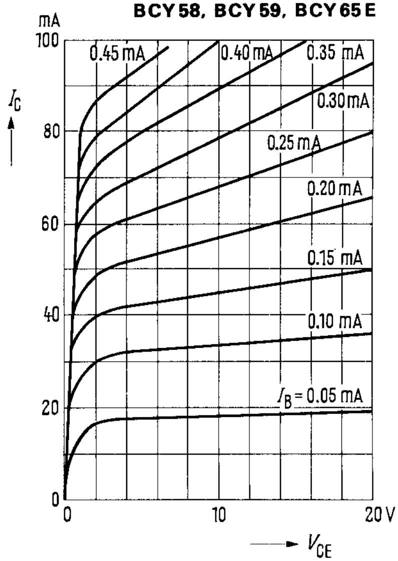
Static forward current transfer ratio $h_{FE} = f(I_C)$; T_{amb} = parameter
$V_{CE} = 1$ V (common emitter circuit)
BCY 58 X, BCY 59 X



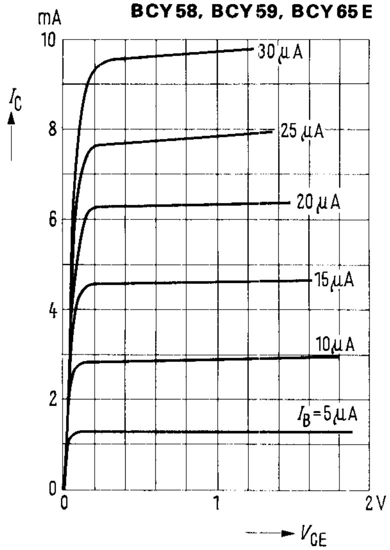
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



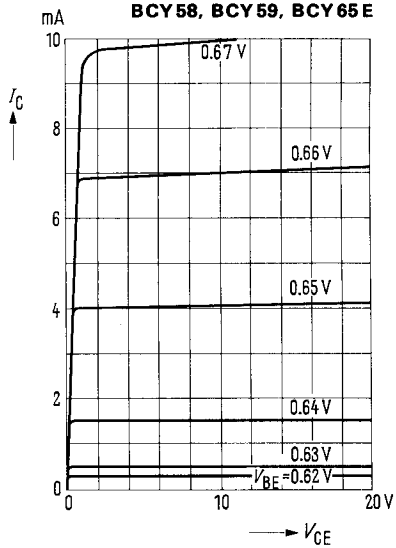
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



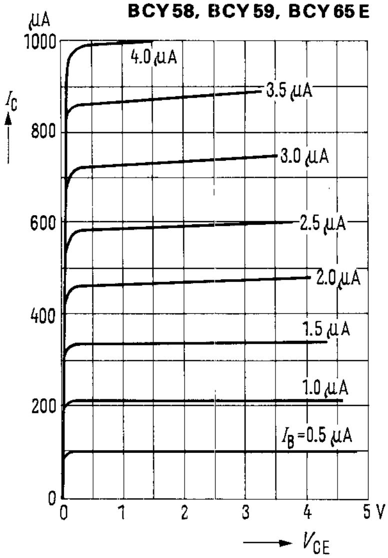
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



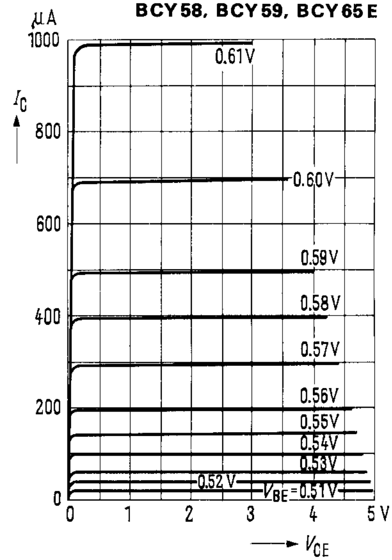
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



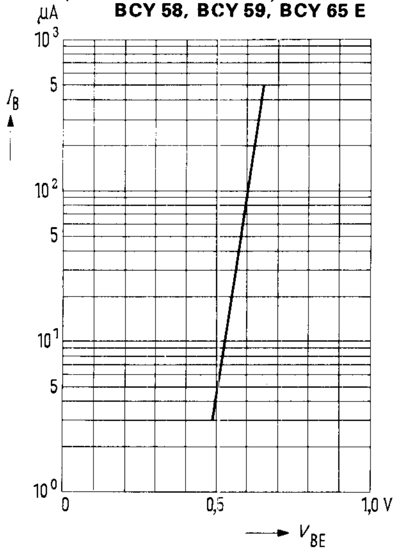
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



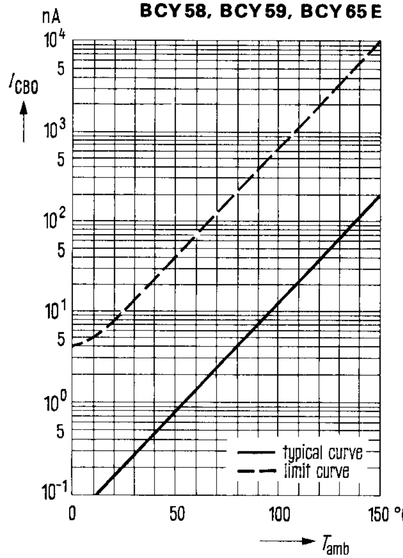
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



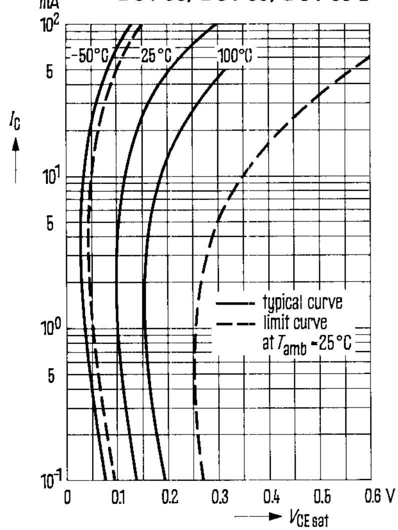
Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



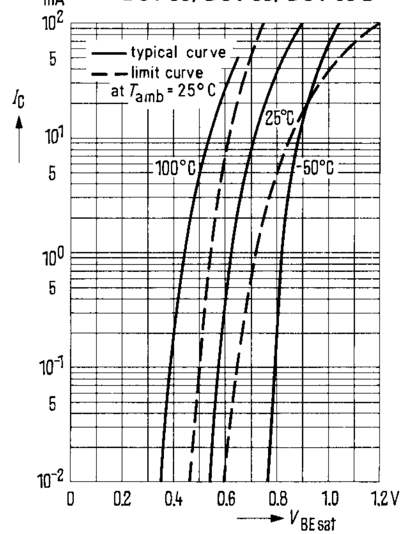
Collector-base cutoff current
$I_{CBO} = f(T_{amb})$
for max. permissible reverse voltage
BCY 58, BCY 59, BCY 65 E



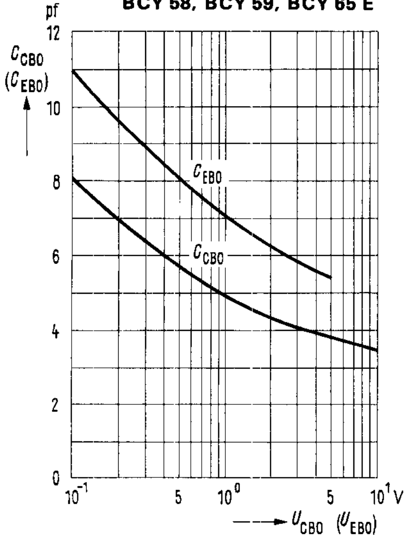
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; $T_{amb} =$ parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



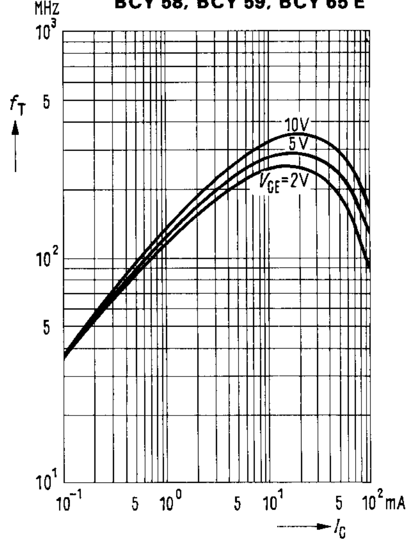
Base-emitter saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 40$; $T_{amb} =$ parameter
(common emitter circuit)
BCY 58, BCY 59, BCY 65 E



Collector-base capacitance $C_{CBO} = f(V_{CBO})$
Emitter-base capacitance $C_{EBO} = f(V_{EBO})$
BCY 58, BCY 59, BCY 65 E



Current gain-bandwidth product $f_T = f(I_C)$
$V_{CE} =$ parameter
BCY 58, BCY 59, BCY 65 E

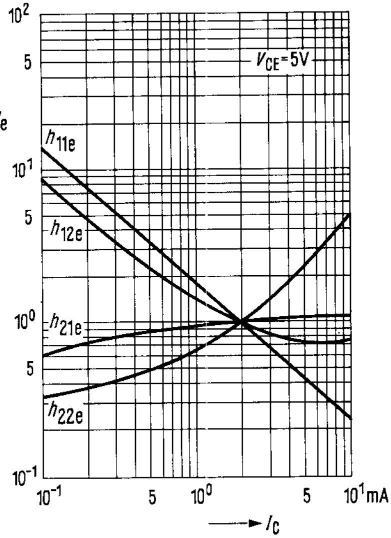


h-parameter versus collector current

$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\ mA)} = f(I_C)$;

$V_{CE} = 5\ V$

BCY 58, BCY 59, BCY 65 E

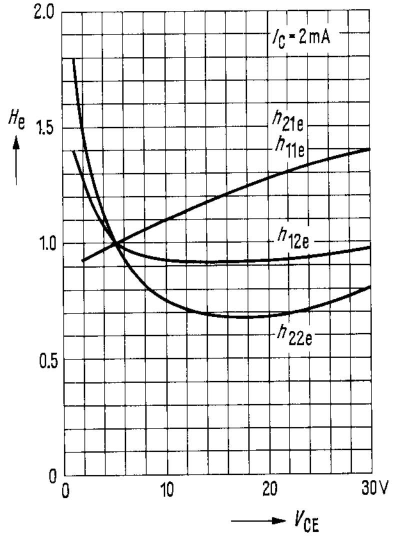


h-parameter versus collector-emitter voltage

$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\ V)} = f(V_{CE})$;

$I_C = 2\ mA$

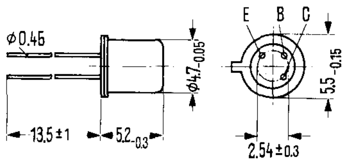
BCY 58, BCY 59, BCY 65 E



NPN Transistor for low-noise AF pre-stages

BCY 66 is an epitaxial NPN silicon planar transistor in a case 18 A 3 DIN 41876 (TO-18). The collector is electrically connected to the case.
The transistor has been designed for especially low-noise AF pre-stages.

Type	Order number
BCY 66	Q60203-Y66



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		**BCY 66**	
Collector-emitter voltage	V_{CES}	45	V
Collector-emitter voltage	V_{CEO}	45	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	50	mA
Base current	I_B	5	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation (T_{case}=45 °C)	P_{tot}	1	W

Thermal resistance

Junction to ambient air	R_{thJamb}	≦450	K/W
Junction to case	$R_{thJcase}$	≦150	K/W

Static characteristics (T_{amb}=25 °C)

V_{CE} V	I_C mA	h_{FE} I_C/I_B	V_{BE} V
5	0.01	>40	0.5
5	2	350 (180 to 630)	0.62 (0.55 to 0.7)*
1	10	120 to 1000[1])	0.7

Collector-emitter saturation voltage (I_C=10 mA; I_B=0.25 mA)	V_{CEsat}	0.12 (0.05 to 0.35)	V
Base-emitter saturation voltage (I_C=10 mA; I_B=0.25 mA)	V_{BEsat}	0.7 (0.6 to 0.85)	V

[1]) The upper limit applies to at least 90% of all transistors
* AQL=0.65%

Static characteristics ($T_{amb} = 25\ °C$)

		BCY 66	
Collector-emitter cutoff current ($V_{CES} = 45\ V$)	I_{CES}	0.2 (<10)	nA
Collector-emitter cutoff current ($V_{CES} = 45\ V$; $T_{amb} = 150\ °C$)	I_{CES}	0.2 (<10)	µA
Emitter-base cutoff current ($V_{EBO} = 5\ V$)	I_{EBO}	<10*	nA
Collector-emitter breakdown voltage ($I_{CEO} = 2\ mA$)	$V_{(BR)CEO}$	>45*	V
Emitter-base breakdown voltage ($I_{EBO} = 1\ \mu A$)	$V_{(BR)EBO}$	>7*	V

Dynamic characteristics ($T_{amb} = 25\ °C$)

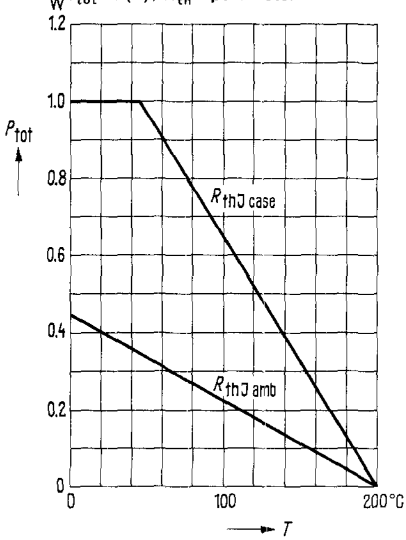
Current gain-bandwidth product ($I_C = 10\ mA$; $V_{CE} = 5\ V$; $f = 100\ MHz$)	f_T	250 (>125)	MHz
Collector-base capacitance ($V_{CBO} = 10\ V$; $f = 1\ MHz$)	C_{CBO}	3.5 (<6)	pf
Emitter-base capacitance ($V_{EBO} = 0.5\ V$; $f = 1\ MHz$)	C_{EBO}	8 (<15)	pf
Noise figure ($I_C = 0.2\ mA$; $V_{CE} = 5\ V$; $R_g = 2\ k\Omega$; $f = 1\ kHz$; $\Delta f = 200\ Hz$)	NF	1.2 (<2)	db
$I_C = 20\ \mu A$; $V_{CE} = 5\ V$; $f = 100\ Hz$; $R_g = 10\ k\Omega$	NF	<4	db
$I_C = 20\ \mu A$; $V_{CE} = 5\ V$; $f = 1\ kHz$; $R_g = 10\ k\Omega$	NF	<2	db
$I_C = 20\ \mu A$; $V_{CE} = 5\ V$; $f = 10\ kHz$; $R_g = 10\ k\Omega$	NF	<2	db
$I_C = 200\ \mu A$; $V_{CE} = 5\ V$; $\Delta f = 15.7\ kHz$; $R_g = 2\ k\Omega$	NF	<3	db

Four-terminal characteristics ($I_C = 2\ mA$; $V_{CE} = 5\ V$; $f = 1\ kHz$)

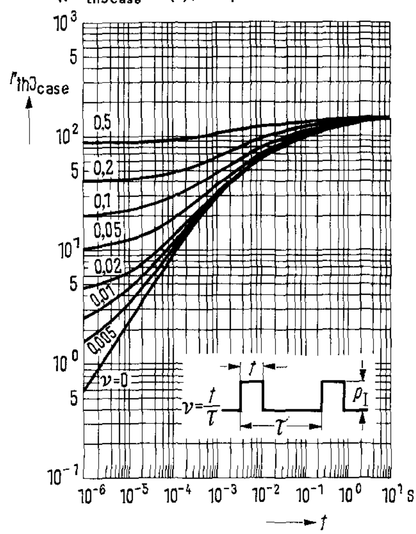
h_{11e}	4.5 (2.5 to 12)	kΩ
h_{12e}	2	10^{-4}
h_{21e}	330 (175 to 700)	–
h_{22e}	30 (<100)	µmhos

* AQL = 0.65%

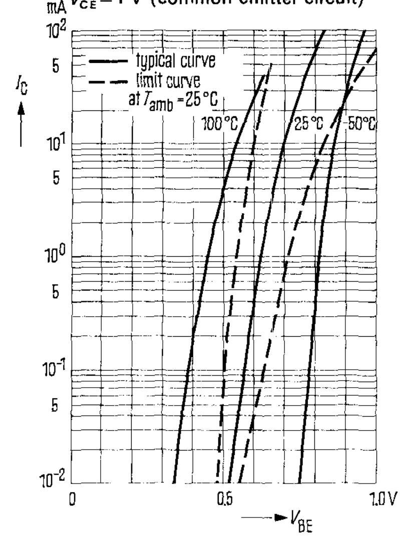
Total power dissipation
$P_{tot} = f(T)$; R_{th} = parameter



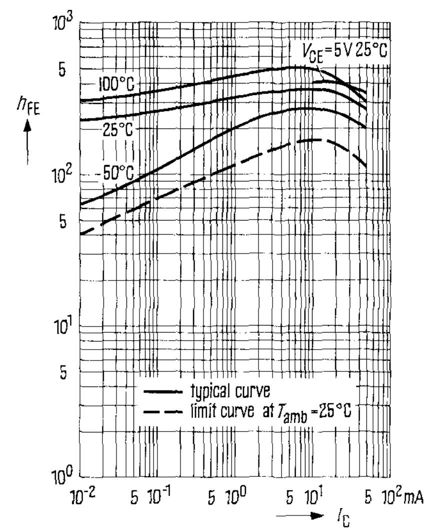
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



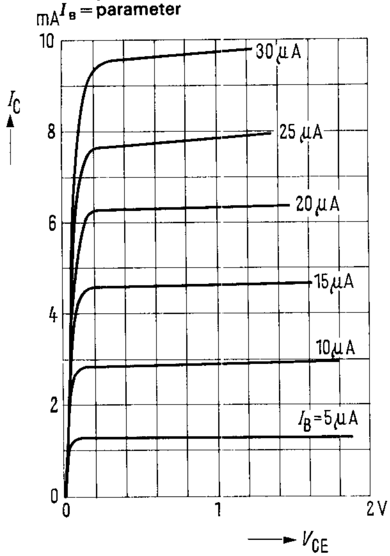
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V (common emitter circuit)



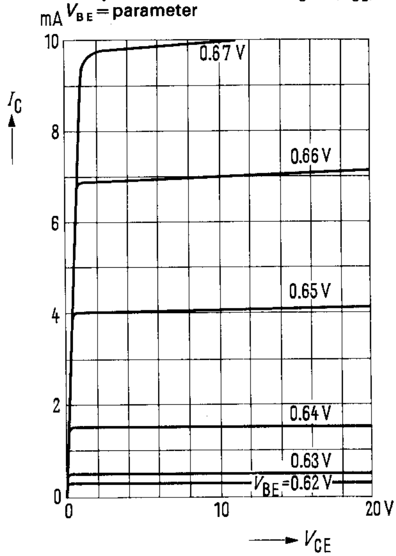
Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{amb} = parameter; $V_{CE} = 1$ V



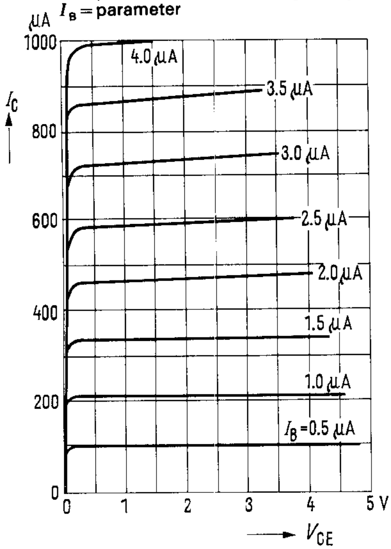
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



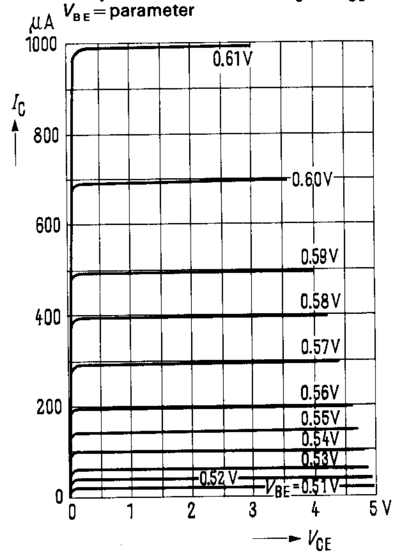
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



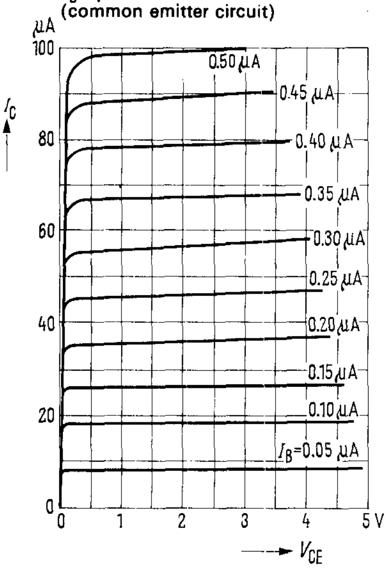
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



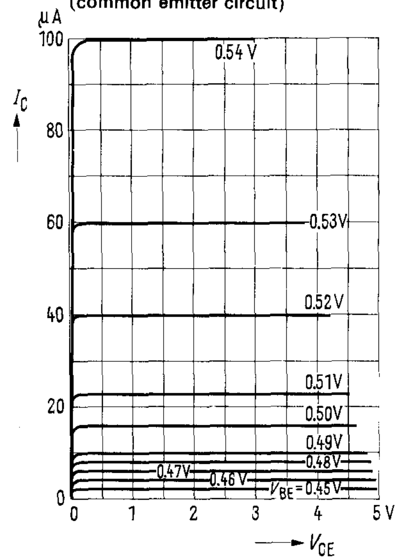
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



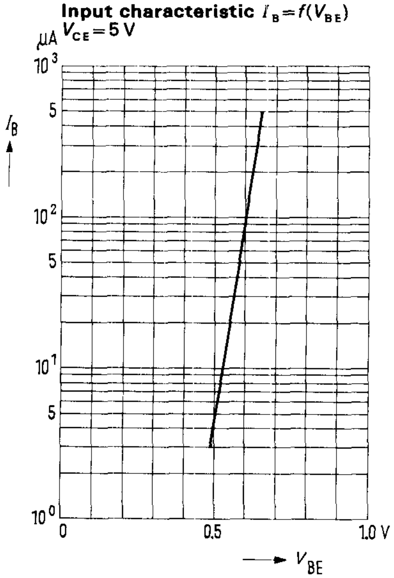
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



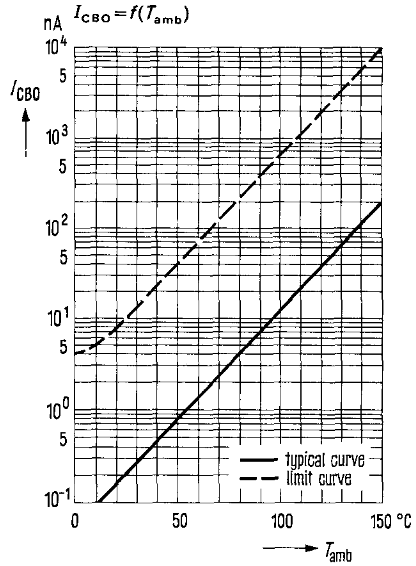
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



Input characteristic $I_B = f(V_{BE})$
V_{CE} = 5 V

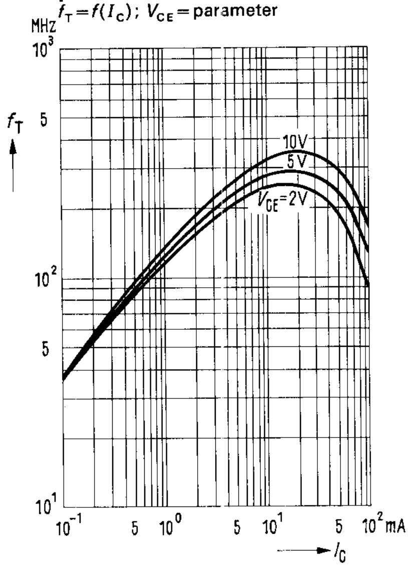


Collector-base cutoff current
$I_{CBO} = f(T_{amb})$



Current gain-bandwidth product

$f_T = f(I_C)$; V_{CE} = parameter

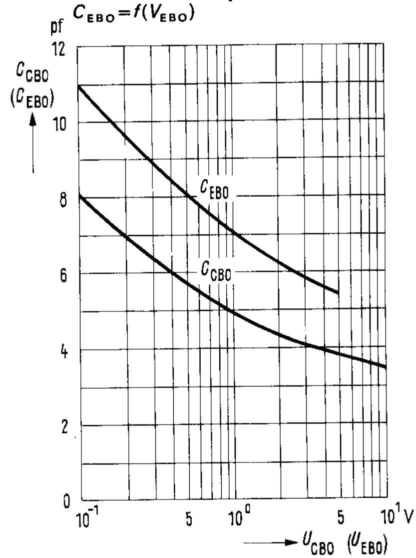


Collector-base capacitance

$C_{CBO} = f(V_{CBO})$

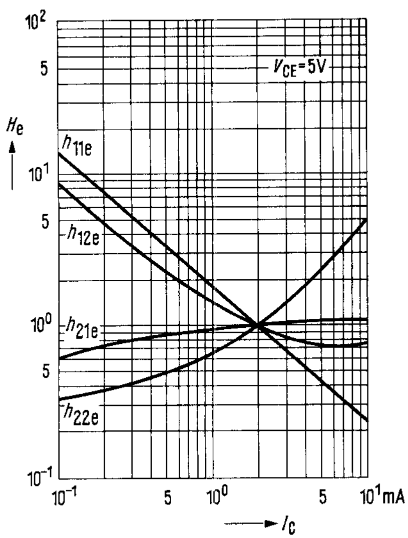
Emitter-base capacitance

$C_{EBO} = f(V_{EBO})$



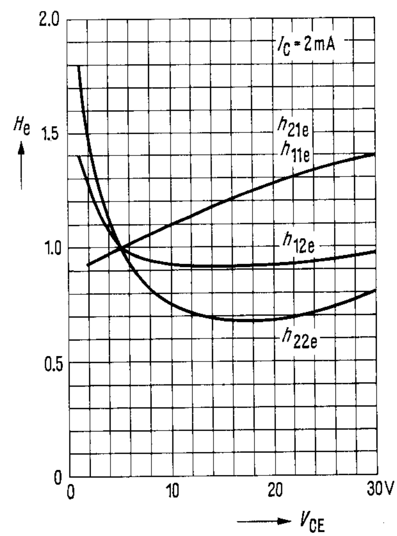
h-parameter versus collector current

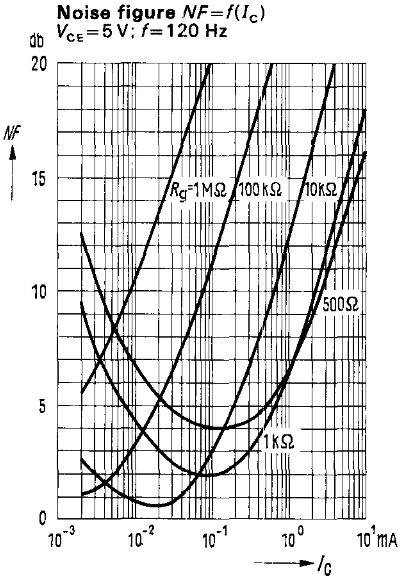
$$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\,\text{mA})} = f(I_C)$$

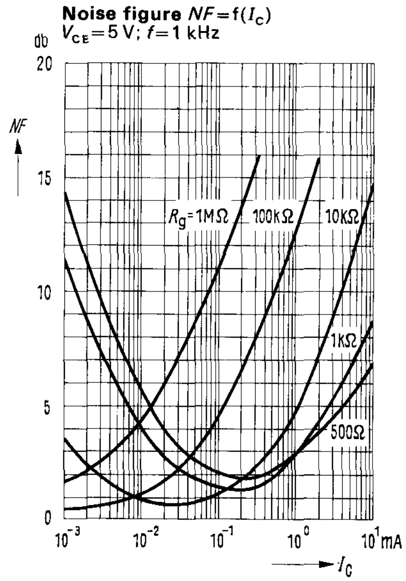


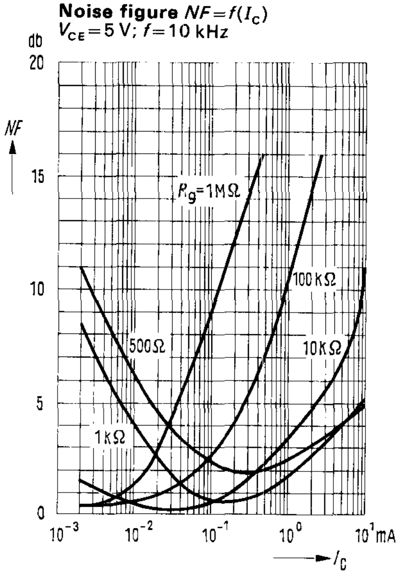
h-parameter versus collector-emitter voltage

$$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\,\text{V})} = f(V_{CE})$$

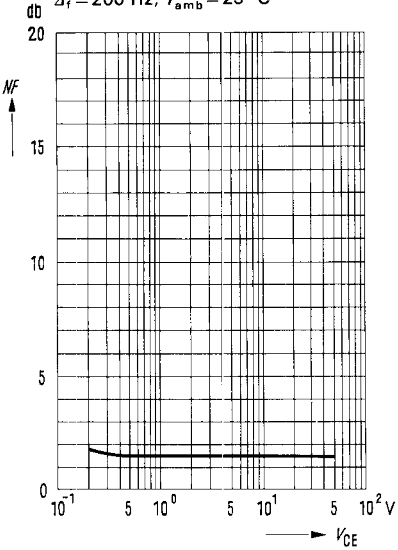



Noise figure $NF=f(I_C)$
$V_{CE}=5$ V; $f=120$ Hz
db
NF
R_g=1MΩ
100kΩ
10kΩ
500Ω
1kΩ
mA
I_C

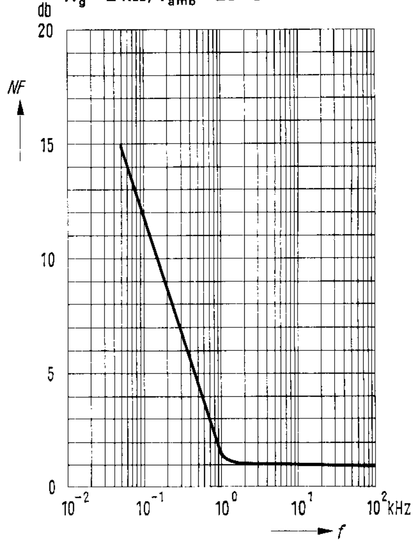

Noise figure $NF=f(I_C)$
$V_{CE}=5$ V; $f=1$ kHz
db
NF
R_g=1MΩ
100kΩ
10kΩ
1kΩ
500Ω
mA
I_C


Noise figure $NF=f(I_C)$
$V_{CE}=5$ V; $f=10$ kHz
db
NF
R_g=1MΩ
100kΩ
500Ω
10kΩ
1kΩ
mA
I_C

Noise figure $NF = f(V_{CE})$
$I_C = 0.2$ mA; $R_g = 2$ kΩ; $f = 1$ kHz
$\Delta_f = 200$ Hz; $T_{amb} = 25$ °C



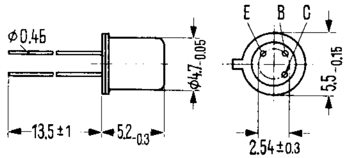
Noise figure $NF = f(f)$
$V_{CE} = 5$ V; $I_C = 0.2$ mA
$R_g = 2$ kΩ; $T_{amb} = 25$ °C



PNP Transistor for low-noise AF pre-stages

BCY 67 is an epitaxial PNP silicon planar transistor in a case 18 A 3 DIN 41876 (TO-18). The collector is electrically connected to the case.
The transistor has been designed for especially low-noise pre-stages as well as in complementary stages to BCY 66.

Type	Order number
BCY 67	Q62702-C254



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		**BCY 67**	
Collector-emitter voltage	$-V_{CES}$	45	V
Collector-emitter voltage	$-V_{CEO}$	45	V
Emitter-base voltage	$-V_{EBO}$	5	V
Collector current	$-I_C$	50	mA
Base current	$-I_B$	5	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{case}=45$ °C; $V_{CE}=20$ V)	P_{tot}	1	W
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦450	K/W
Junction to case	$R_{thJcase}$	≦150	K/W

Static characteristics ($T_{amb}=25$ °C)

$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	$-V_{BE}$ V
5	0.01	>40	0.5
5	2	350 (180 to 630)	0.62 (0.55 to 0.7)
1	10	120 to 1000[1])	0.7

Collector-emitter saturation voltage ($I_C=10$ mA; $I_B=0.25$ mA)	$-V_{CEsat}$	0.12 (0.06 to 0.25)	V
Base-emitter saturation voltage ($I_C=10$ mA; $I_B=0.25$ mA)	$-V_{BEsat}$	0.7 (0.6 to 0.85)	V

[1]) The upper limit applies to at least 90% of all transistors

Static characteristics ($T_{amb}=25$ °C)		**BCY 67**	
Collector-emitter-cutoff current ($V_{CES}=35$ V)	$-I_{CES}$	2 (<20)*	nA
Collector-emitter-cutoff current ($V_{CES}=35$ V; $T_{amb}=150$ °C)	$-I_{CES}$	<10	μA
Emitter-base cutoff current ($V_{EBO}=4$ V)	$-I_{EBO}$	<20	nA
Collector-emitter breakdown voltage ($-I_{CEO}=2$ mA)	$-V_{(BR)CEO}$	>45*	V
Collector-emitter breakdown voltage ($-I_{CES}=10$ μA)	$-V_{(BR)CES}$	>45	V
Emitter-base breakdown voltage ($I_{EBO}=1$ μA)	$-V_{(BR)EBO}$	>5*	V

Dynamic characteristics ($T_{amb}=25$ °C)

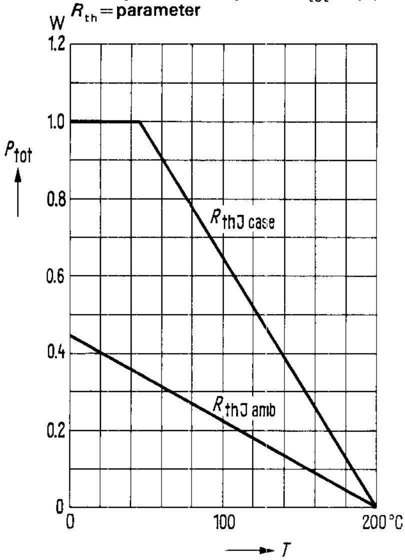
Current gain-bandwidth product ($I_C=10$ mA; $V_{CE}=5$ V)	f_T	180	MHz
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	4.5 (<7)	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V)	C_{EBO}	11 (<15)	pf
Noise figure $-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=2$ kΩ; $f=1$ kHz; $\Delta f=200$ Hz	NF	1.2 (2)	db
$-I_C=$ 20 μA; $-V_{CE}=5$ V; $R_g=10$ kΩ; $f=100$ Hz	NF	<4	db
$-I_C=$ 20 μA; $-V_{CE}=5$ V; $R_g=10$ kΩ; $f=1$ kHz	NF	<2	db
$-I_C=$ 20 μA; $-V_{CE}=5$ V; $R_g=10$ kΩ; $f=10$ kHz	NF	<2	db
$-I_C=200$ μA; $-V_{CE}=5$ V; $R_g=2$ kΩ; $\Delta f=15.7$ kHz	NF	<3	db

Four-terminal characteristics ($-I_C=2$ mA; $-V_{CE}=5$ V; $f=1$ kHz)

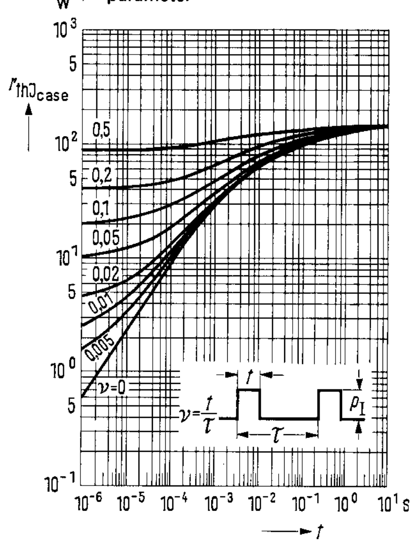
h_{11e}	4.5 (2.5 to 12)	kΩ
h_{12e}	2	10^{-4}
h_{21e}	330 (175 to 700)	–
h_{22e}	30 (<100)	μmhos

* AQL=0.65%

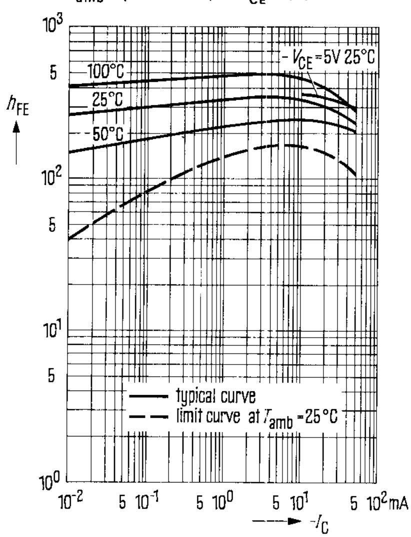
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter



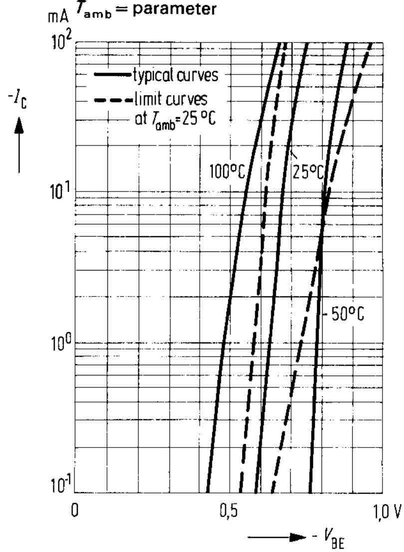
Permissible pulse load
$r_{thJcase} = f(t)$
ν = parameter



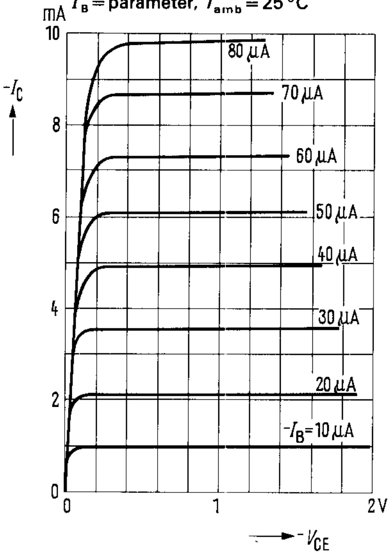
Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{amb} = parameter; $-V_{CE} = 1$ V



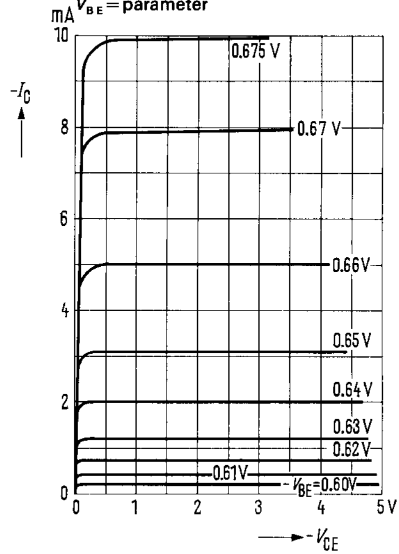
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 1$ V
T_{amb} = parameter



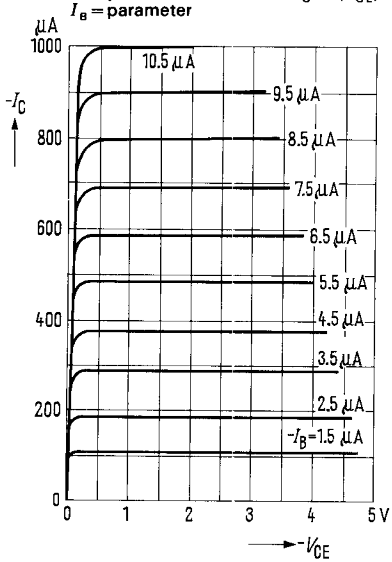
Output characteristics $I_C = f(V_{CE})$
I_B = parameter, T_{amb} = 25 °C



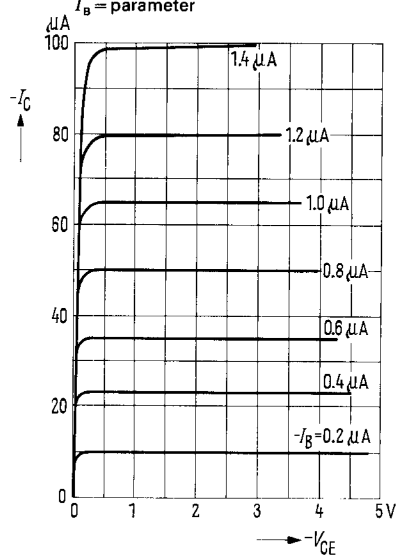
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



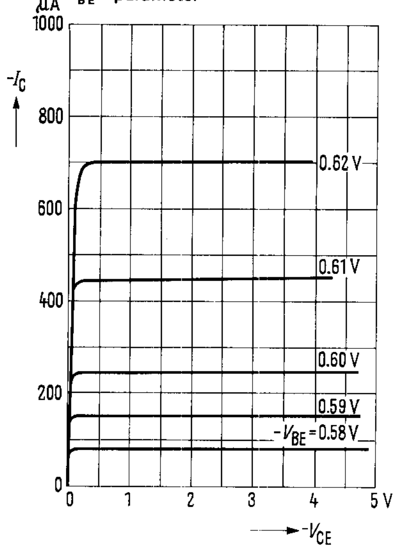
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



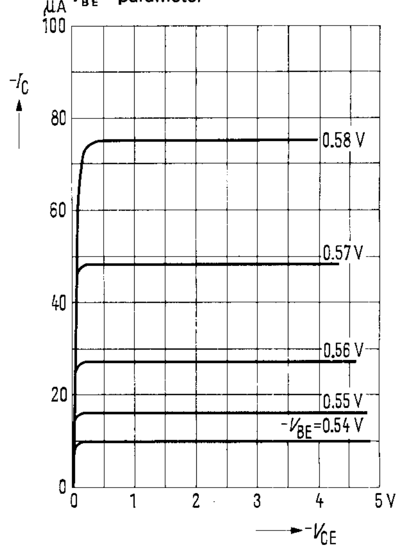
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



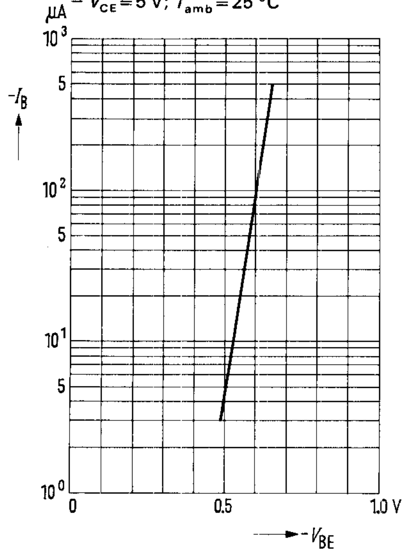
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



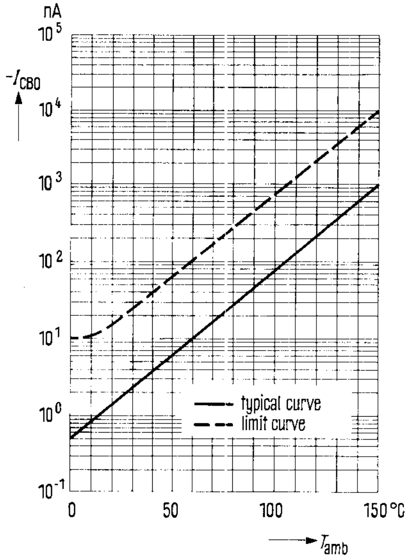
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



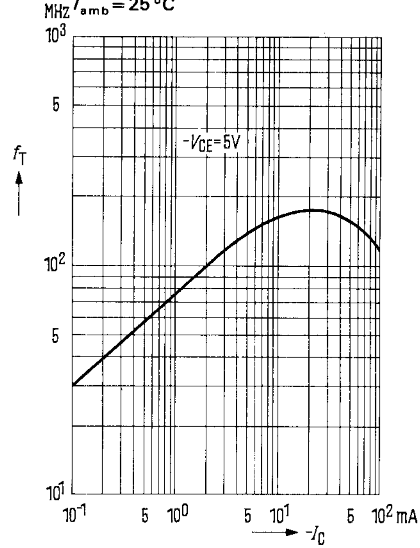
Input characteristics $I_B = f(V_{BE})$
$-V_{CE} = 5$ V; $T_{amb} = 25$ °C



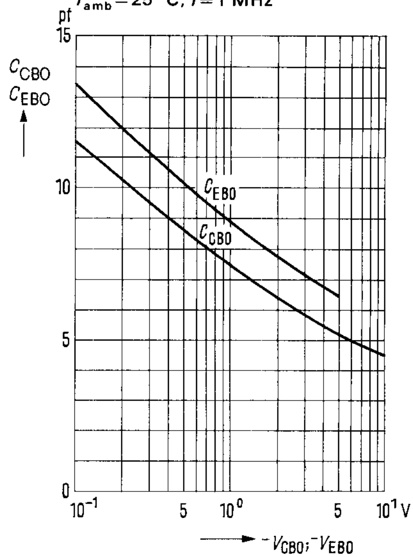
Collector-base cutoff current versus temperature $I_{CBO} = f(T_{amb})$



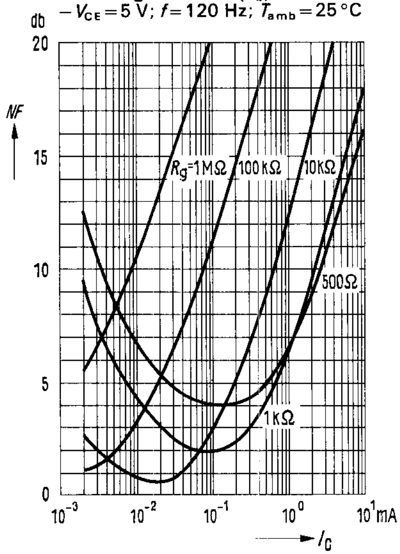
Current gain-bandwith product $f_T = f(I_C)$
$T_{amb} = 25$ °C



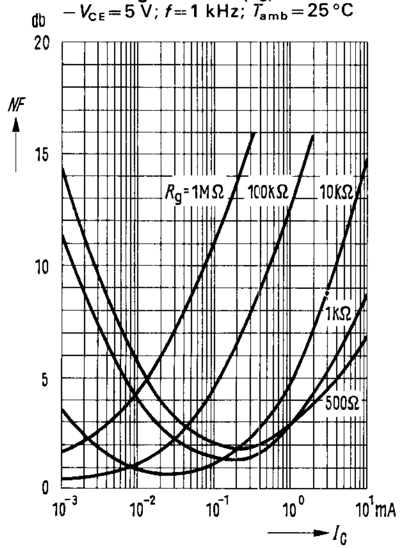
Collector-base-capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base-capacitance
$C_{EBO} = f(V_{EBO})$
$T_{amb} = 25$ °C; $f = 1$ MHz



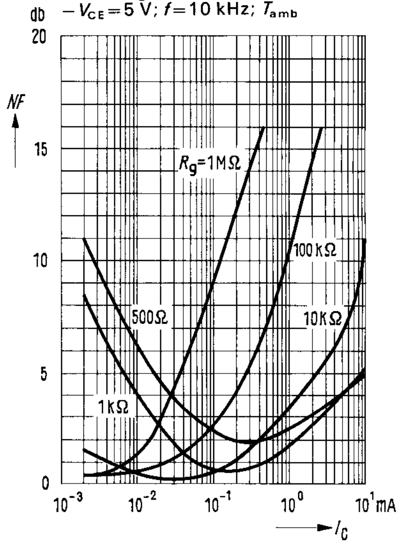
Noise figure $NF = f(I_C)$
$-V_{CE} = 5$ V; $f = 120$ Hz; $T_{amb} = 25$ °C



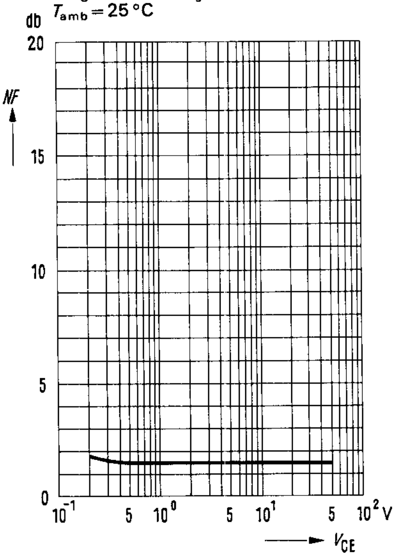
Noise figure $NF = f(I_C)$
$-V_{CE} = 5$ V; $f = 1$ kHz; $T_{amb} = 25$ °C



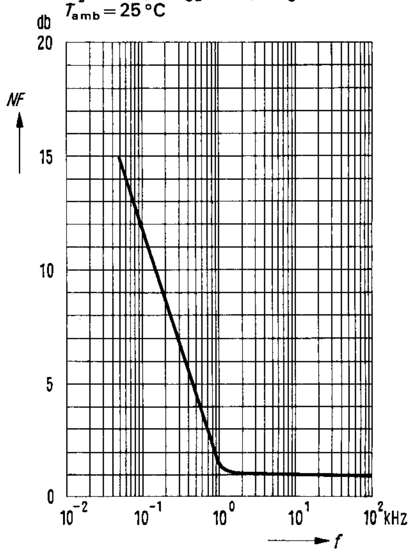
Noise figure $NF = f(I_C)$
$-V_{CE} = 5$ V; $f = 10$ kHz; T_{amb}



Noise figure $NF = f(V_{CE})$
$-I_C = 0.2$ mA; $R_g = 2$ kΩ; $f = 1$ kHz
$T_{amb} = 25$ °C

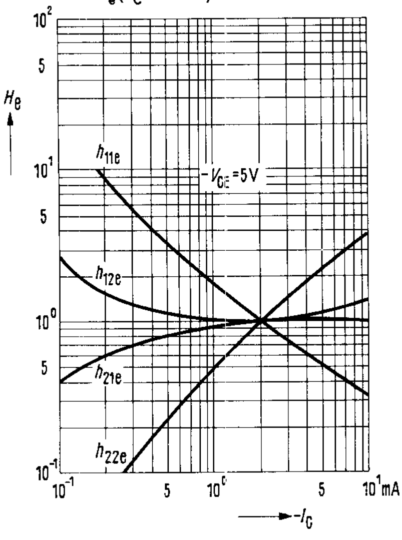


Noise figure $NF = f(f)$
$R_g = 2$ kΩ; $-V_{CE} = 5$ V; $-I_C = 0.2$ mA
$T_{amb} = 25$ °C



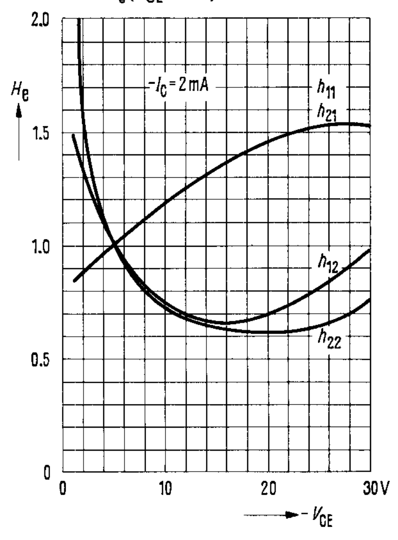
***h*-parameter versus collector current**

$$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\,\text{mA})} = f(I_C)$$



***h*-parameter versus collector-emitter-voltage**

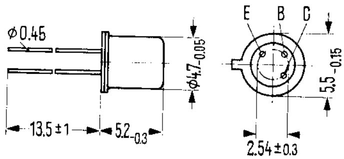
$$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\,\text{V})} = f(V_{CE})$$



PNP Transistors for low-noise AF pre- and driver stages

BCY 77, BCY 78 and BCY 79 are epitaxial PNP silicon planar transistors in a case 18 A 3 DIN 41876 (TO-18). The collector is electrically connected to the case. The transistors are of particular use in low-noise AF pre- and driver stages as well as in complementary stages with BCY 58; BCY 59; BCY 65 E.

Type	Order number
BCY 77 VII	Q62702-C327-V1
BCY 77 VIII	Q62702-C327-V2
BCY 77 IX	Q62702-C327-V3
BCY 78 VII	Q60203-Y78-G
BCY 78 VIII	Q60203-Y78-H
BCY 78 IX	Q60203-Y78-J
BCY 78 X	Q60203-Y78-K
BCY 79 VII	Q60203-Y79-G
BCY 79 VIII	Q60203-Y79-H
BCY 79 IX	Q60203-Y79-J



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		BCY 77	BCY 78	BCY 79	
Collector-emitter voltage	$-V_{CES}$	60	32	45	V
Collector-emitter voltage	$-V_{CEO}$	60	32	45	V
Emitter-base voltage	$-V_{EBO}$	5	5	5	V
Collector current	$-I_C$	100	200	200	mA
Base current	$-I_B$	50	20	20	mA
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation (T_{case}=45 °C)	P_{tot}	1	1	1	W

Thermal resistance					
Junction to ambient air	R_{thJamb}	≦450	≦450	≦450	K/W
Junction to case	$R_{thJcase}$	≦150	≦150	≦150	K/W

Static characteristics (T_{amb}=25 °C)

BCY 77, BCY 78 and BCY 79 are classified in groups of static forward current transfer ratio h_{FE} and identified by Roman numerals

Type		BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	— BCY 78 —	BCY 77 BCY 78 BCY 79
h_{FE} group		VII	VIII	IX	X	
$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
5	0.01	140	200 (>30)	270 (>40)	340 (>100)	0.55
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.65 (0.6 to 0.75)*
1	10	180 (>80)	260 (120 to 400)	360 (160 to 630)	500 (240 to 1000)	0.68
1[1]	100	>40	>45	>60	>60	0.75
1[2]	50	>40	>45	>60	>60	0.72

Saturation voltages

	$-V_{CEsat}$	$-V_{BEsat}$	
($-I_C$= 10 mA; $-I_B$=0.25 mA)	0.12 (0.06 to 0.25)	0.7 (0.6 to 0.85)	V
($-I_C$=100 mA; $-I_B$=2.5 mA)[1]	0.4 (0.2 to 0.8)	0.85 (0.7 to 1.2)	V
($-I_C$= 50 mA; $-I_B$=1.25 mA)[2]	0.4 (0.2 to 0.8)	0.85 (0.7 to 1.2)	V

[1]) applies only to BCY 78, BCY 79
[2]) applies only to BCY 77
* AQL=0.65%

Static characteristics (T_{amb} = 25 °C)		BCY 77	BCY 78	BCY 79	
Collector-emitter cutoff current ($-V_{CES}$ = 50 V)	$-I_{CES}$	2 (<20)	–	–	nA*
Collector-emitter cutoff current ($-V_{CES}$ = 25 V)	$-I_{CES}$	–	2 (<20)	–	nA*
Collector-emitter cutoff current ($-V_{CES}$ = 35 V)	$-I_{CES}$	–	–	2 (<20)	nA*
Collector-emitter cutoff current ($-V_{CES}$ = 60 V)	$-I_{CES}$	<100	–	–	nA*
Collector-emitter cutoff current ($-V_{CES}$ = 32 V)	$-I_{CES}$	–	<100	–	nA
Collector-emitter cutoff current ($-V_{CES}$ = 45 V)	$-I_{CES}$	–	–	<100	nA
Collector-emitter cutoff current ($-V_{CES}$ = 60 V; T_{amb} = 150 °C)	$-I_{CES}$	<10	–	–	µA
Collector-emitter cutoff current ($-V_{CES}$ = 25 V; T_{amb} = 150 °C)	$-I_{CES}$	–	<10	–	µA
Collector-emitter cutoff current ($-V_{CES}$ = 35 V; T_{amb} = 150 °C)	$-I_{CES}$	–	–	<10	µA
Collector-emitter cutoff current ($-V_{CE}$ = 60 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	<20	–	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 32 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	<20	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 45 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	–	<20	µA
Emitter-base cutoff current ($-V_{EBO}$ = 4 V)	$-I_{EBO}$	<20	<20	<20	nA*
Emitter-base breakdown voltage ($-I_{EBO}$ = 1 µA)	$-V_{(BR)EBO}$	>5	>5	>5	V*
Collector-emitter breakdown voltage (I_{CEO} = 2 mA)	$-V_{(BR)CEO}$	>60	>32	>45	V*
Collector-emitter breakdown voltage ($-I_{CES}$ = 10 µA)	$-V_{(BR)CES}$	>60	>32	>45	V

The "I_{CEX}" data is valid for emitter-base diodes which are not entirely reversed. V_{BE} = 0.2 V is applied to the base in forward direction, however, does not suffice to control a silicon transistor (e.g. when the transistor base is driven by the collector of a preceding transistor in such a way that it is reversed, lies between base and emitter but the saturation voltage of the transistor driven earlier is still applied.)

* AQL = 0.65%

Dynamic characteristics ($T_{amb}=25\,°C$)		BCY 77 BCY 78 BCY 79	
Current gain-bandwidth product ($-I_C=10$ mA; $-V_{CE}=5$ V; $f=100$ MHz)	f_T	180	MHz
Collector-base capacitance ($-V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	4.5 (<7)	pf
Emitter-base capacitance ($-V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	11 (<15)	pf
Noise figure ($-I_C=0.2$ mA; $-V_{CE}=5$ V; $R_g=2\,k\Omega$; $f=1$ kHz; $\Delta f=200$ Hz)	NF	2 (<6)	db

Four-terminal characteristics ($-I_C=2$ mA; $-V_{CE}=5$ V; $f=1$ kHz)

Type	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	– BCY 78 –	
h_{FE} group	VII	VIII	IX	X	
h_{11e}	2.7 (1.6–4.5)	3.6 (2.5–6)	4.5 (3.2–8.5)	7.5	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200	260	330	520	–
	(125 to 250)	(175 to 350)	(250 to 500)	(350 to 700)	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	µmhos

Switching times:

BCY 77, BCY 78, BCY 79 Operating point:
I_C: I_{B1}: $I_{B2}\approx 10{:}1{:}1$ mA; $R_1=5\,k\Omega$; $R_2=5\,k\Omega$; $V_{BB}=3.6$ V; $R_L=990\,\Omega$

t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

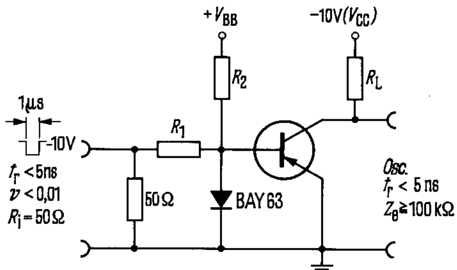
BCY 78, BCY 79 Operating point:
I_C: I_{B1}: $I_{B2}\approx 100{:}10{:}10$ mA; $R_1=500\,\Omega$; $R_2=700\,\Omega$; $V_{BB}=5$ V; $R_L=98\,\Omega$

t_d	5	ns	t_s	250	ns
t_r	50	ns	t_f	200	ns
t_{on}	55 (<150)	ns	t_{off}	450 (<800)	ns

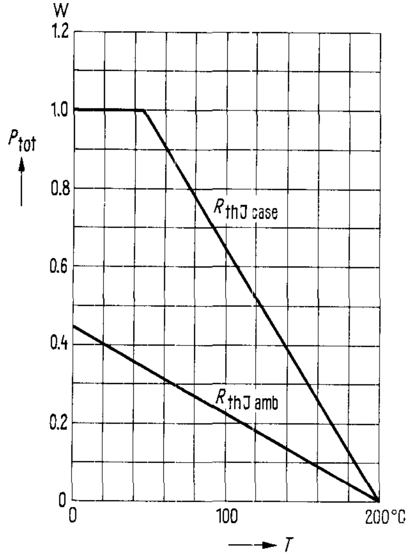
BCY 77 Operating point:
I_C: I_{B1}: $I_{B2}\approx 50{:}5{:}5$ mA; $R_1=1\,k\Omega$; $R_2=1.3\,k\Omega$; $V_{BB}=4.7$ V; $R_L=195\,\Omega$

t_d	15	ns	t_s	300	ns
t_r	50	ns	t_f	150	ns
t_{on}	65 (<150)	ns	t_{off}	450 (<800)	ns

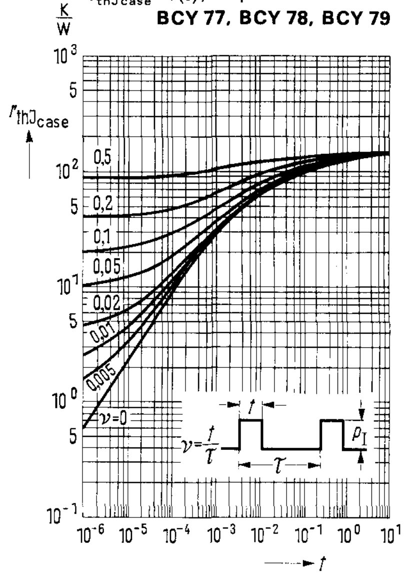
Circuit for measuring switching times



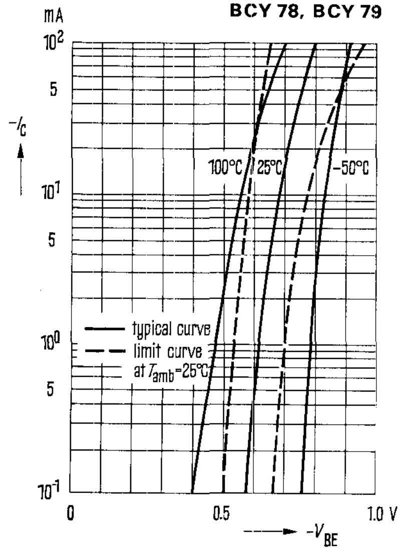
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter; $V_{CE} \leqq V_{CEO}$
BCY 77, BCY 78, BCY 79



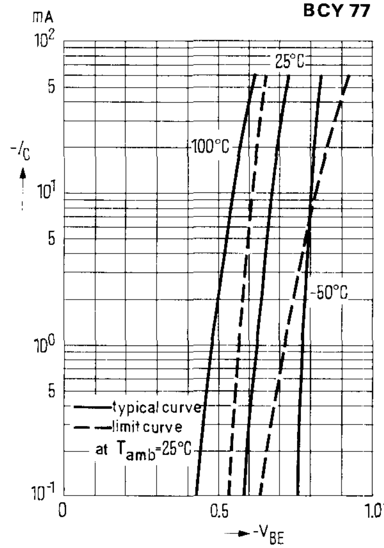
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BCY 77, BCY 78, BCY 79



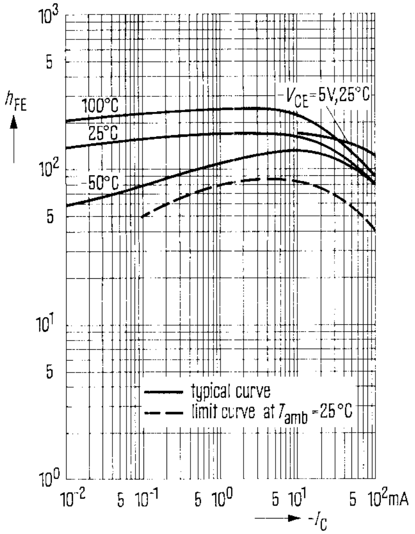
Collector current $I_C = f(V_{BE})$
$(-V_{CE} = 1\ V)$; T_{amb} = parameter
BCY 78, BCY 79



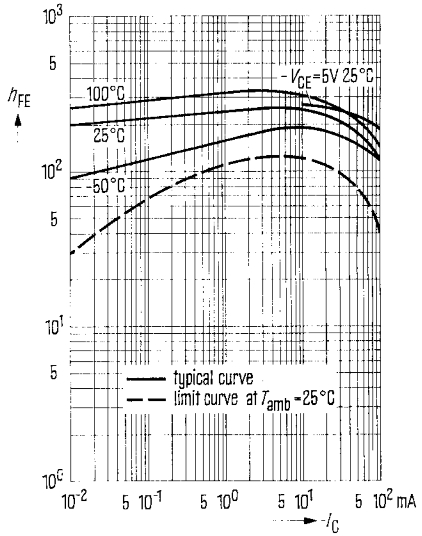
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 1\ V$ (common emitter circuit)
T_{amb} = parameter
BCY 77



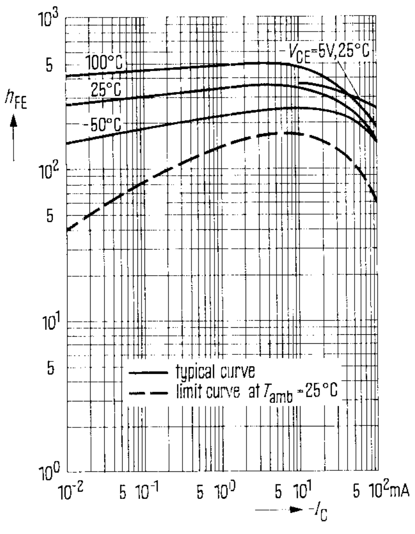
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCY 78 VII, BCY 79 VII



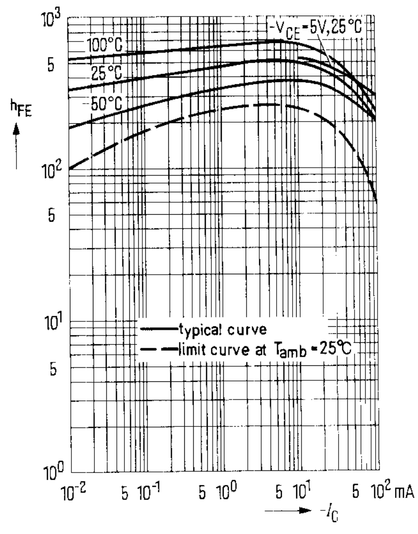
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCY 78 VIII, BCY 79 VIII



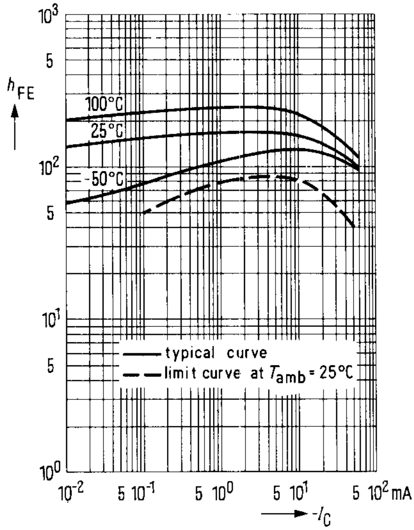
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCY 78 IX, BCY 79 IX



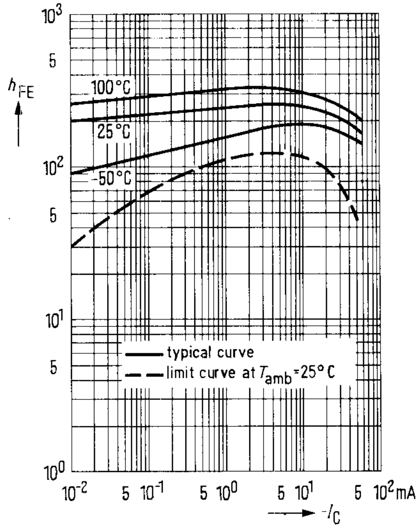
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; T_{amb} = parameter
BCY 78 X



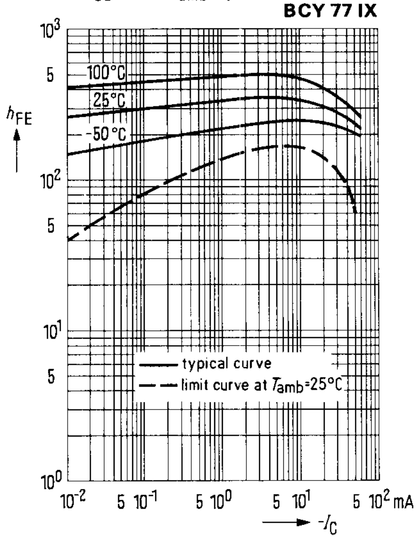
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=$ parameter
BCY 77 VII



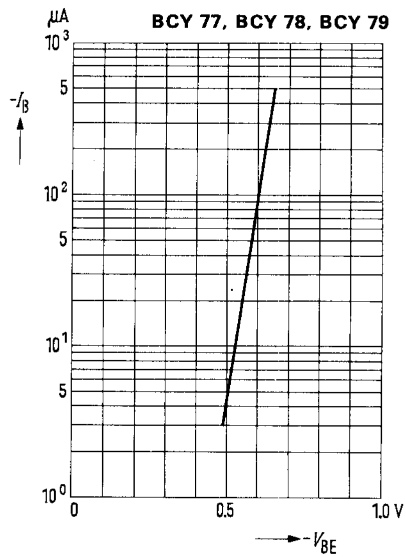
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=$ parameter
BCY 77 VIII



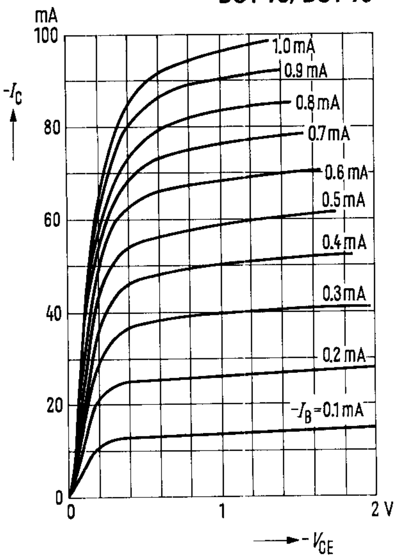
Static forward current transfer ratio $h_{FE}=f(I_C)$
$-V_{CE}=1$ V; $T_{amb}=$ parameter
BCY 77 IX



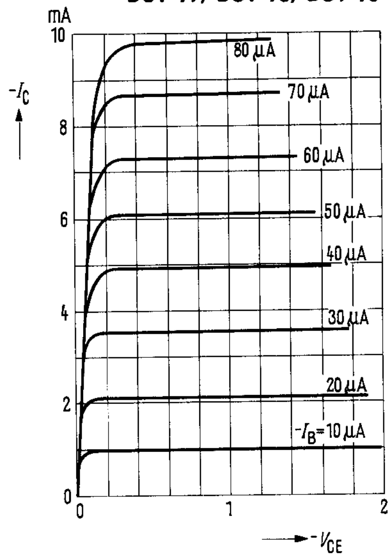
Input characteristic $I_C=f(V_{BE})$
$-V_{CE}=5$ V; $T_{amb}=25$ °C
BCY 77, BCY 78, BCY 79



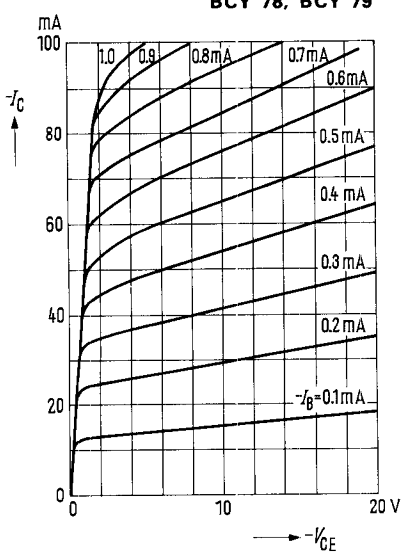
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BCY 78, BCY 79



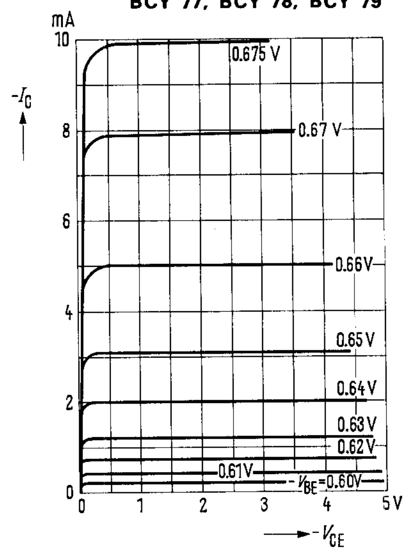
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BCY 77, BCY 78, BCY 79



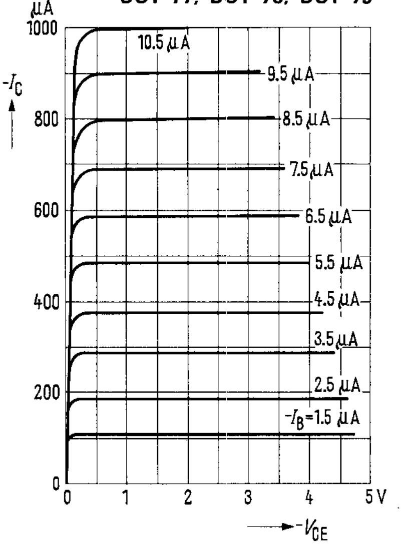
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BCY 78, BCY 79



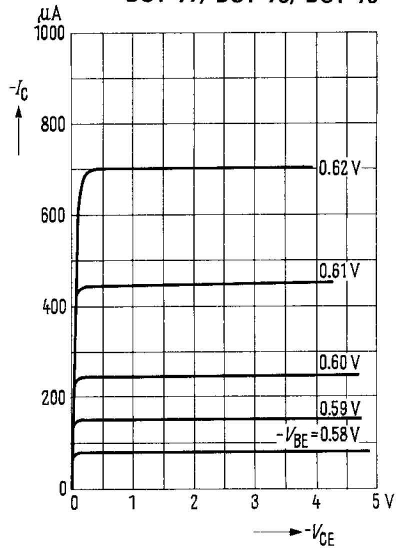
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
BCY 77, BCY 78, BCY 79



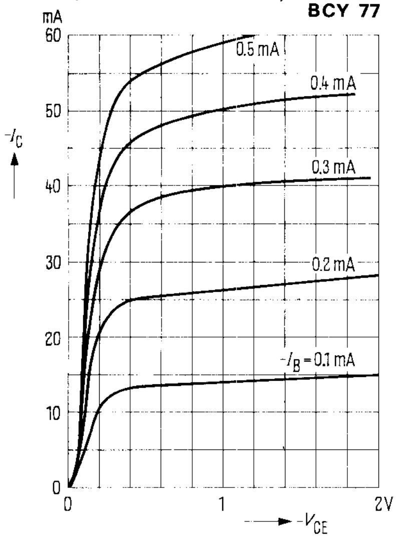
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BCY 77, BCY 78, BCY 79



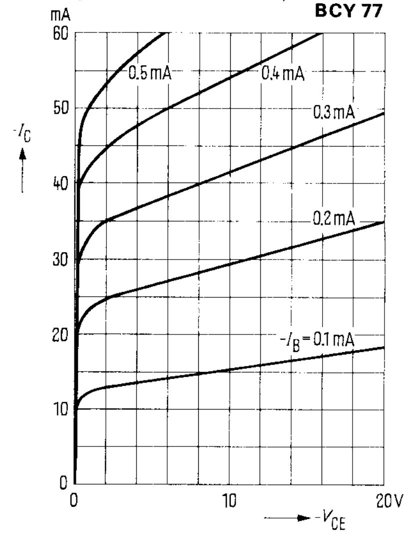
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
BCY 77, BCY 78, BCY 79



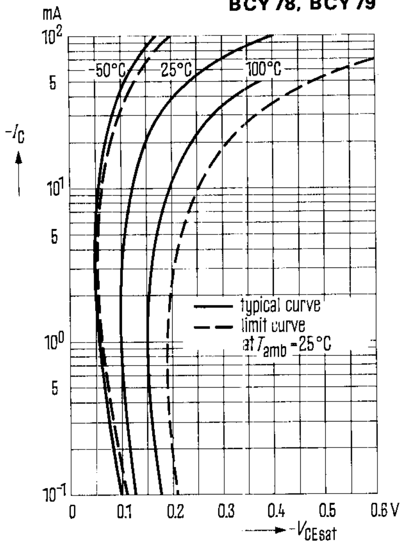
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 77



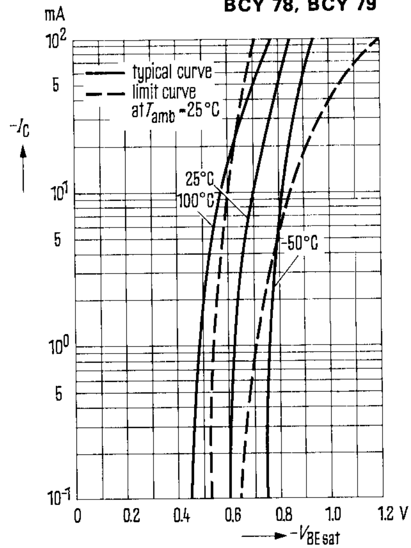
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BCY 77



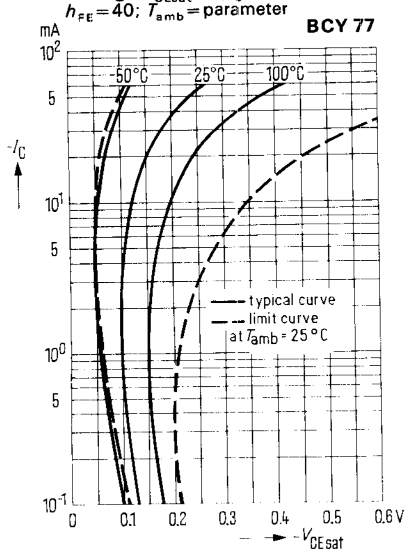
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$, T_{amb} = parameter
BCY 78, BCY 79



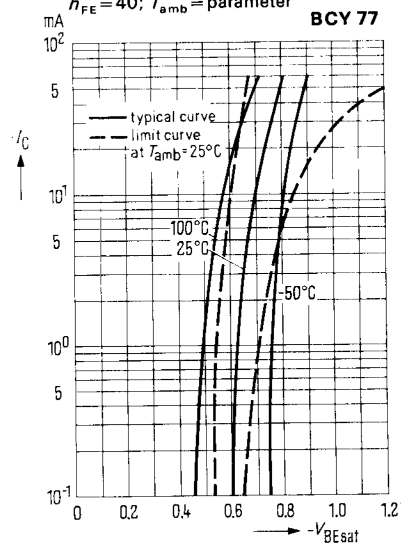
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
BCY 78, BCY 79



Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
BCY 77

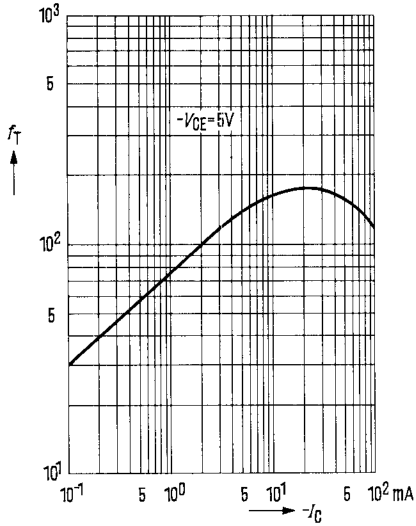


Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 40$; T_{amb} = parameter
BCY 77



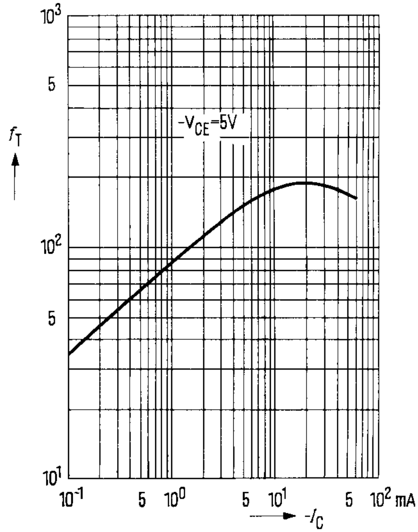
Current gain bandwidth product $f_T = f(I_C)$
$-V_{CE} = 5\ \text{V}\ (T_{amb} = 25\ °\text{C})$

BCY 78, BCY 79



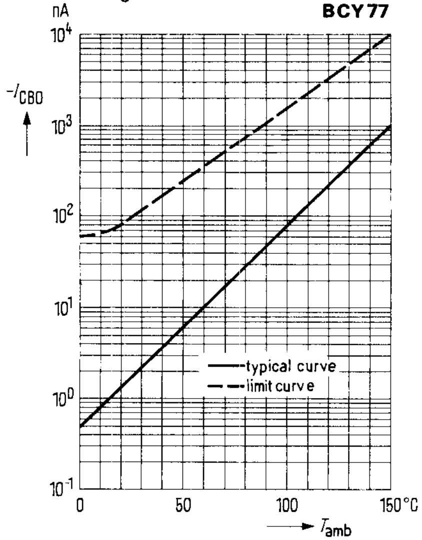
Current gain-bandwidth product $f_T = f(I_C)$
$-V_{CE} = 5\ \text{V};\ T_{amb} = \text{parameter}$

BCY 77



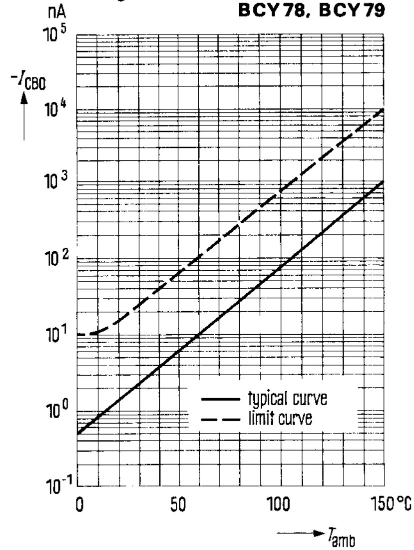
Collector-base cutoff current versus temperature $I_{CBO} = f(T_{amb})$ **for maximum permissible reverse voltages**

BCY 77



Collector-base cutoff current versus temperature $I_{CBO} = f(T_{amb})$ **for maximum permissible reverse voltages**

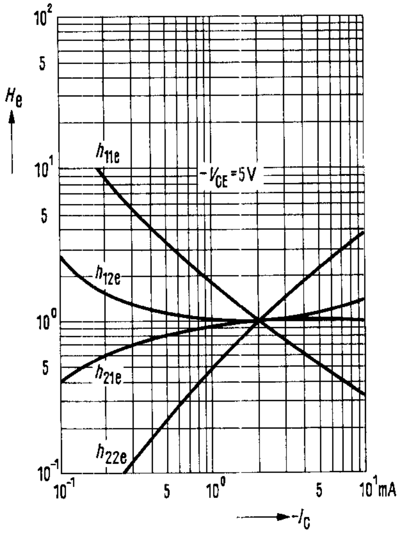
BCY 78, BCY 79



h-parameter versus collector current

$$H_e = \frac{h_e(I_C)}{h_e(I_C = 2\ \text{mA})} = f(I_C)$$

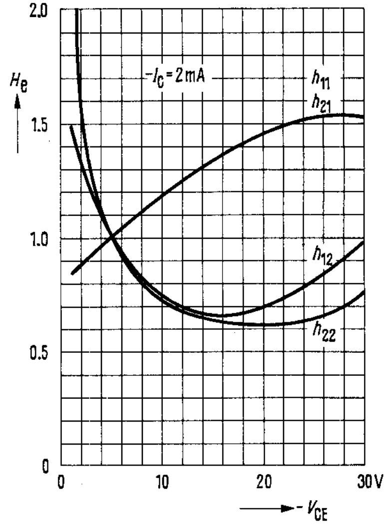
BCY 77, BCY 78, BCY 79



h-parameter versus collector-emitter voltage

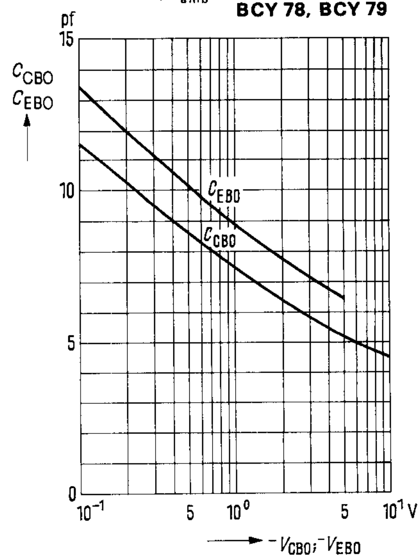
$$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = 5\ \text{V})} = f(V_{CE})$$

BCY 77, BCY 78, BCY 79



Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
$f = 1$ MHz; $T_{amb} = 25$ °C

BCY 78, BCY 79

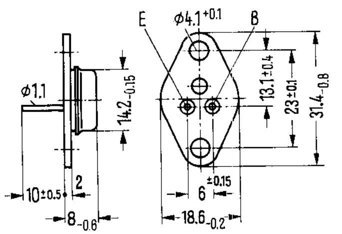


NPN Silicon power transistor for high-quality AF output stages and switching applications

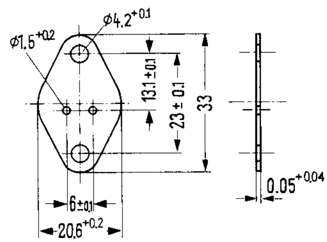
BDX 25 is an epitaxial NPN silicon planar power transistor in the case 9 A 2 DIN 41875 (SOT-9). The collector is electrically connected to the case. For insulated mounting of the transistor on a chassis 1 mica disc and 2 insulating nipples are provided for, to be ordered separately. The transistor is particularly designed for use in high-quality AF output stages and for switching applications.

Type	Order number
BDX 25-4	Q62702-D145-V4
BDX 25-6	Q62702-D145-V6
BDX 25-10	Q62702-D145-V10

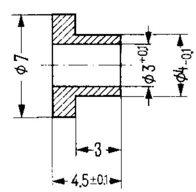
Type	Order number
Mica disc	Q62901-B16-A
Insulating nipple (Siprelit)	Q62901-B50



Weight approx. 8.3 g
Dimensions in mm



Mica disc
greased: $R_{th} = 1$ K/W
dry: $R_{th} = 2.5$ K/W



Insulating
nipple: scale 2:1

Maximum ratings		BDX 25	
Collector-emitter voltage	V_{CEO}	125	V
Collector-base voltage	V_{CBO}	130	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	5	A
Maximum collector current[1]	I_{CM}	10	A
Emitter current	I_E	6	A
Maximum emitter current[1]	I_{EM}	10	A
Base current	I_B	2	A
Maximum base current[1]	I_{BM}	3	A
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{case} = 45$ °C; $V_{CE} < 13$ V)	P_{tot}	34	W
Thermal resistance			
Junction to case	$R_{thJcase}$	≦4.6	K/W
Junction to air	R_{thJamb}	≦85	K/W

[1]) $v \geqq 10$ tp; tp$\leqq 10$ ms

Static characteristics (T_{case} = 25 °C)

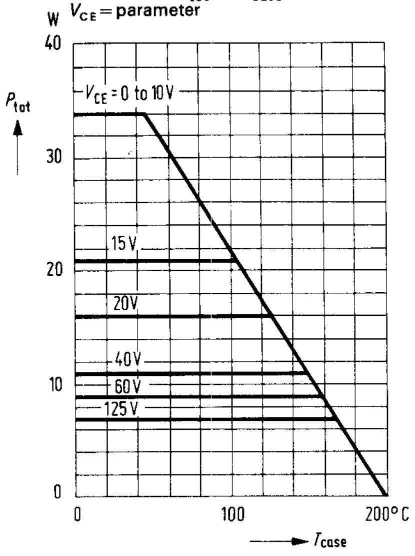
BDX 25 is classified in groups of static forward current transfer ratio h_{FE} at I_C = 1 A and V_{CE} = 1 V and identified by figures of the DIN-R-5 series. For the test conditions stated below, the following data apply:

Type		**BDX 25**			**BDX 25**
h_{FE}-Group		**4**	**6**	**10**	
V_{CE} (V)	I_C (A)	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} (V)
1	0.01	–	>30	–	
1	0.1	–	>15	–	
1	1	40 (25 to 60)	63 (40 to 100)	100 (63 to 160)	<1.2
2	3	–	>20	–	
2	5	–	>10	–	<1.8

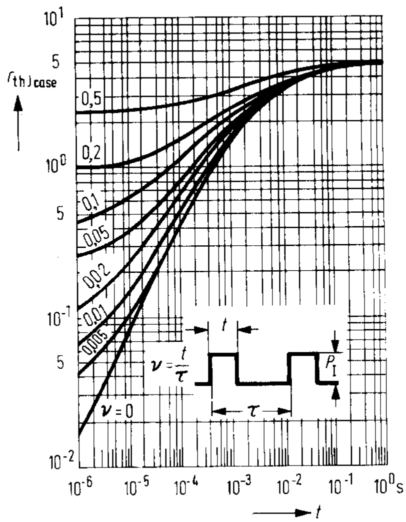
		BDX 25	
Collector-emitter saturation voltage (I_C = 1 A; I_B = 0.1 A)	V_{CEsat}	<0.5	V
(I_C = 3 A; I_B = 0.3 A)	V_{CEsat}	<1	V
Collector-emitter cutoff current (V_{CE} = V_{CEmax})	I_{CES}	<1	µA
Collector-emitter cutoff current (T_{amb} = 150 °C)	I_{CES}	<150	µA
Collector-emitter cutoff current (T_{amb} = 100 °C)	I_{CES}	<300	µA
Emitter-base cutoff current	I_{EBO}	<1	µA
Collector-emitter breakdown voltage (I_C = 50 mA)	$V_{(BR)CEO}$	>125	V
Collector-base breakdown voltage (I_C = 100 µA)	$V_{(BR)CBO}$	>130	V
Emitter-base breakdown voltage (I_E = 10 µA)	$V_{(BR)EBO}$	>5	V

		BDX 25	
Dynamic characteristics ($T_{case}=25\,°C$)			
Current-gain bandwidth product ($I_C=200$ mA; $V_{CE}=10$ V; $f=20$ MHz)	f_T	30	MHz
Open-circuit collector-base capacitance ($V_{CB}=10$ V; $I_E=0$, $f=1$ MHz	C_{CBO}	70	pf
Switching times:			
$I_C=2$ A; $I_{B1}\approx I_{B2}\approx 200$ mA	t_{on}	<0.5	µs
	t_{off}	<2	µs
	t_s	<1	µs
$I_C=1$ A; $I_{B1}\approx I_{B2}\approx 50$ mA	t_{on}	<0.3	µs
	t_{off}	<1.5	µs

Total permissible power dissipation $P_{tot}=f(T_{case})$
V_{CE} = parameter



Permissible pulse load
$r_{thJcase}=f(t)$; v = parameter

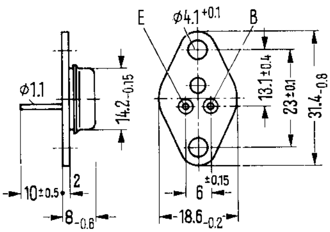


PNP Silicon power transistors for AF output stages and switching applications

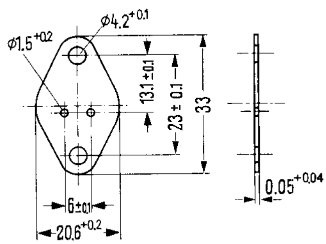
BDX 27, BDX 28, BDX 29 and BDX 30 are epitaxial PNP silicon power transistors in a case 9 A 2 DIN 41875 (SOT-9). The collector is electrically connected to the case. The transistors are particularly suited for use in high-quality AF output stages and for switching applications.

Type	Order number
BDX 27-6	Q62702-D162-V6
BDX 27-10	Q62702-D162-V10
BDX 27-16	Q62702-D162-V16
BDX 28-6	Q62702-D159-V6
BDX 28-10	Q62702-D159-V10
BDX 28-16	Q62702-D159-V16

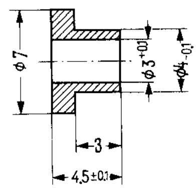
Type	Order number
BDX 29-6	Q62702-D160-V6
BDX 29-10	Q62702-D160-V10
BDX 30-6	Q62702-D163-V6
BDX 30-10	Q62702-D163-V10
Mica disc	Q62901-B16-A
Insulating nipple (Siprelit)	Q62901-B50



Weight approx. 8.3 mm
Dimensions in mm



Mica disc dry: $R_{th} = 2.5$ K/W
grased: $R_{th} = 1$ K/W



Insulating nipple: scale 2:1

Maximum ratings		BDX 27	BDX 28	BDX 29	BDX 30	
Collector-emitter reverse voltage	$-V_{CEO}$	40	60	80	125	V
Collector-emitter reverse voltage	$-V_{CES}$	40	60	80	125	V
Collector-base reverse voltage	$-V_{CBO}$	40	60	80	125	V
Emitter-base reverse voltage	$-V_{EBO}$	5	5	5	5	V
Collector-current	$-I_C$	5	5	5	5	A
Maximum collector current ($t<1$ ms)	$-I_{CM}$	7	7	7	7	A
Emitter current	I_E	6	6	6	6	A
Base current	$-I_B$	1	1	1	1	A
Junction temperature	T_j	200	200	200	200	°C
Storage temperature	T_S	−65 to +200		−65 to +200		°C
Total power dissipation ($T_{case}<45$°C)	P_{tot}	34	34	34	34	W

Maximum ratings		BDX 27	BDX 28	BDX 29	BDX 30	
Thermal resistance						
Junction to air	R_{thJamb}	≦85	≦85	≦85	≦85	K/W
Junction to case	$R_{thJcase}$	≦4.6	≦4.6	≦4.6	≦4.6	K/W

Static characteristics (T_{case}=25 °C)

		BDX 27	BDX 28	BDX 29	BDX 30	
Collector-emitter breakdown voltage (I_C = −50 mA)	$-V_{(BR)CEO}$	>40	>60	>80	>125	V
Collector-emitter breakdown voltage (I_c = −0.1 mA)	$-V_{(BR)CES}$	>40	>60	>80	>125	V
Emitter-base breakdown voltage (I_E = −10 μA)	$-V_{(BR)EBO}$	>5	>5	>5	>5	V
Collector-base cutoff current						
($-V_{CE}$=40 V)	$-I_{CBO}$	>1	–	–	–	μA
($-V_{CE}$=40 V; T_{case}=150 °C)	$-I_{CBO}$	<100	–	–	–	μA
($-V_{CE}$=60 V)	$-I_{CBO}$	–	<1	–	–	μA
($-V_{CE}$=60 V; T_{case}=150 °C)	$-I_{CBO}$	–	<100	–	–	μA
($-V_{CE}$=80 V)	$-I_{CBO}$	–	–	<1	–	μA
($-V_{CE}$=80 V; T_{case}=150 °C)	$-I_{CBO}$	–	–	<100	–	μA
($-V_{CE}$=100 V)	$-I_{CBO}$	–	–	–	<1	μA
($-V_{CE}$=100 V; T_{case}=150 °C)	$-I_{CBO}$	–	–	–	<100	μA
Collector-emitter cutoff current						
($-V_{CE}$=40 V; $-V_{BE}$=0.2 V; T_{case}=100 °C)	$-I_{CEX}$	<300	–	–	–	μA
($-V_{CE}$=60 V; $-V_{BE}$=0.2 V; T_{case}=100 °C)	$-I_{CEX}$	–	<300	–	–	μA
($-V_{CE}$=80 V; $-V_{BE}$=0.2 V; T_{case}=100 °C)	$-I_{CEX}$	–	–	<300	–	μA
($-V_{CE}$=100 V; $-V_{BE}$=0.2 V; T_{case}=100 °C)	$-I_{CEX}$	–	–	–	<300	μA

Static characteristics		BDX 27	BDX 28	BDX 29	BDX 30	
Emitter-base cutoff current ($-V_{EB}=4$ V)	$-I_{EBO}$	<1	<1	<1	<1	μA
Static forward current transfer ratio						
($-I_C=10$ mA; $-V_{CE}=1$ V)	h_{FE}	>30		>30		–
($-I_C=1$ A; $-V_{CE}=1$ V)	h_{FE}	40 to 250		40 to 160		–
($-I_C=3$ A; $-V_{CE}=2$ V)	h_{FE}	>20		>20		–
($-I_C=5$ A; $-V_{CE}=2$ V)	h_{FE}	>10		>10		–
Base-emitter forward voltage						
($-I_C=1$ A; $-V_{CE}=1$ V)	$-V_{BE}$	<1.1		<1.1		V
($-I_C=5$ A; $-V_{CE}=2$ V)	$-V_{BE}$	<1.7		<1.7		V
Collector-emitter saturation voltage						
($-I_C=1$ A; $-I_B=0.1$ A)	$-V_{CESat}$	<0.5		<0.5		V
($-I_C=3$ A; $-I_B=0.3$ A)	$-V_{CESat}$	<1.0		<1.0		V

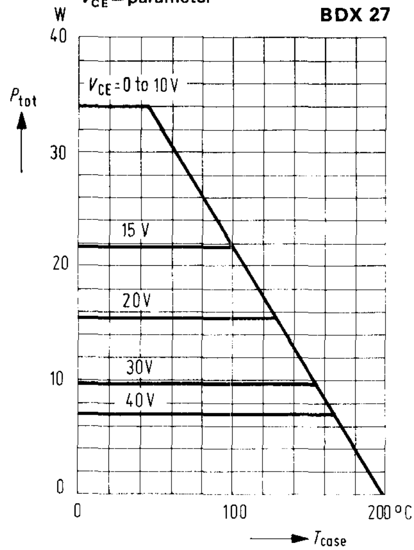
The transistors are classified in groups of static forward current transfer ratio h_{FE} and identified by figures of the DIN-R-5 series.

Type		BDX 27 BDX 28 BDX 29 BDX 30	BDX 27 BDX 28 BDX 29 BDX 30	BDX 27 BDX 28 – –
Group		**6**	**10**	**16**
I_C mA	$-V_{CE}$ V	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B
10	1	70 (>30)	115 (>55)	180 (>80)
1000	1	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)
3000	2	32 (>20)	55 (>30)	85 (>50)

Dynamic characteristics ($T_{amb}=25$ °C)		BDX 27	BDX 28	BDX 29	BDX 30	
Current-gain bandwidth product ($-I_C=200$ mA; $-V_{CE}=10$ V; $f=20$ MHz)	f_T	50	50	50	50	MHz
Open-circuit output capacitance ($-V_{CB}=10$ V)	C_{ob}	130	130	100	100	pf
Switching times:						
Test condition: ($-I_C=2$ A; $-I_{B1}\approx I_{B2}=200$ mA)	t_{on}	<0.5	<0.5	<0.5	<0.5	μs
($-I_C=2$ A; $-I_{B1}\approx I_{B2}=200$ mA)	t_{off}	<2	<2	<2	<2	μs

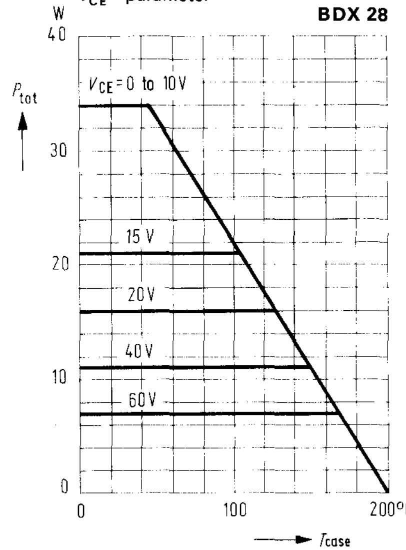
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

BDX 27



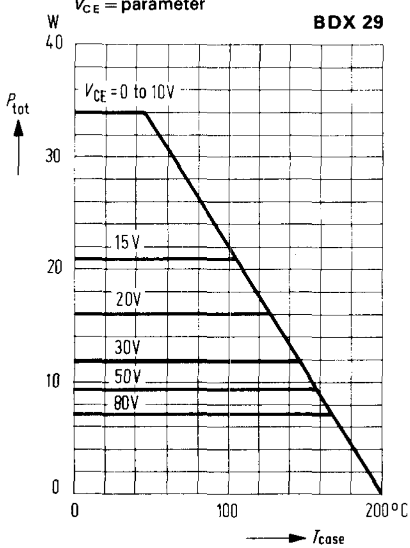
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

BDX 28



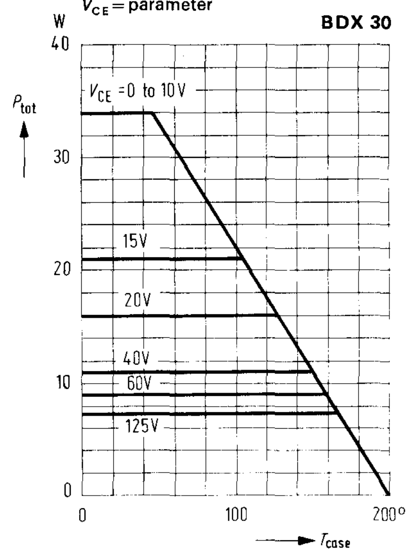
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

BDX 29



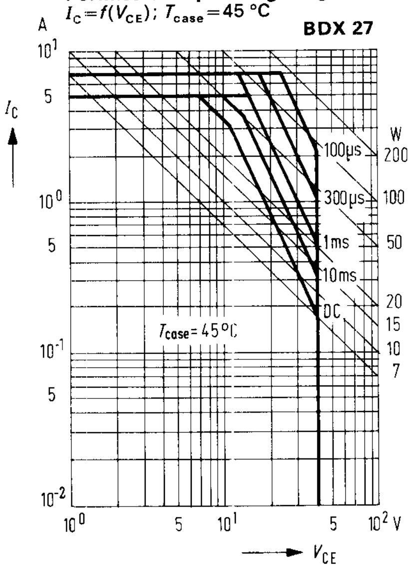
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter

BDX 30



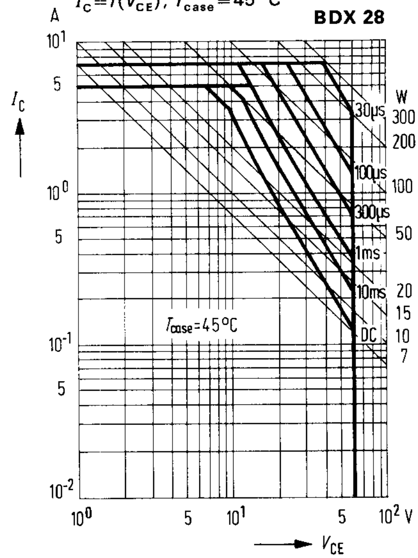
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 45\ °C$

BDX 27



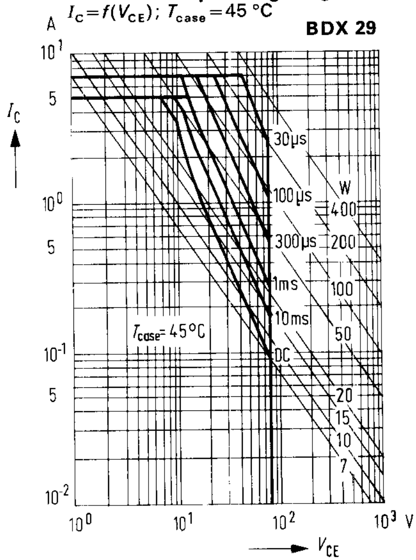
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 45\ °C$

BDX 28



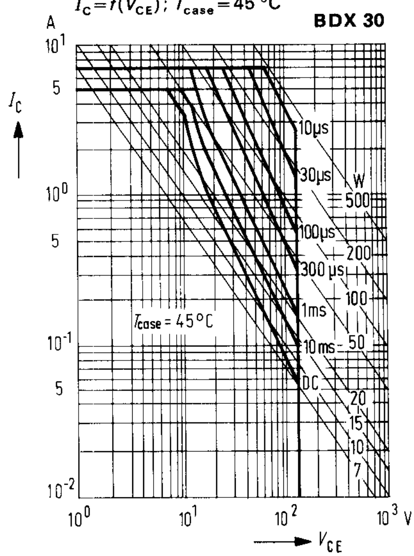
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 45\ °C$

BDX 29

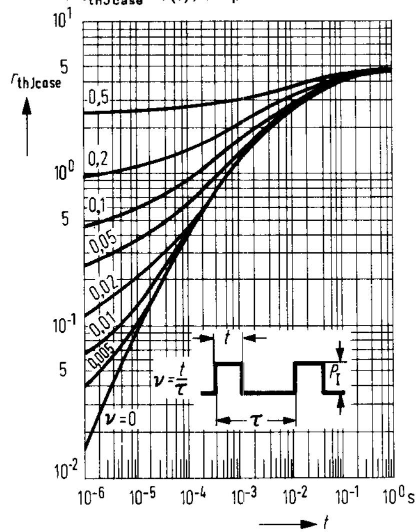


Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 45\ °C$

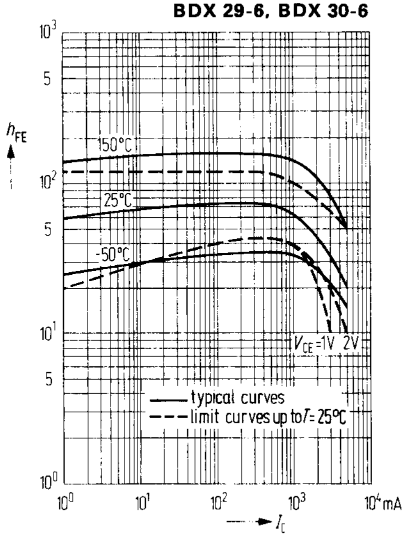
BDX 30



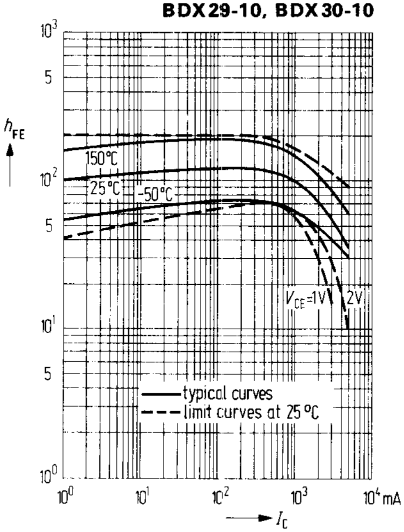
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



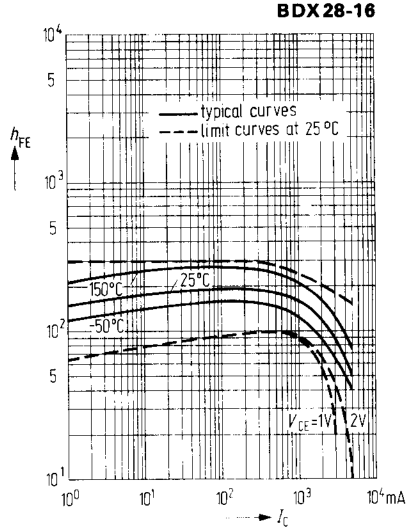
Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{case} = parameter
BDX 27-6, BDX 28-6
BDX 29-6, BDX 30-6



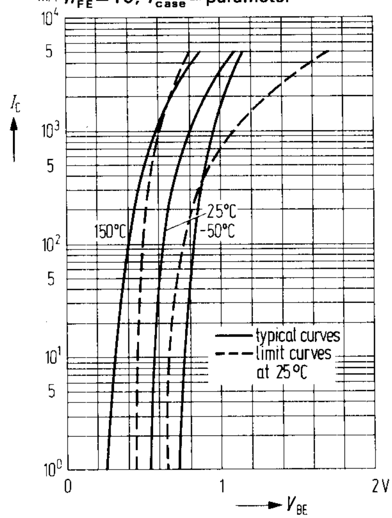
Static forward current tranfer ratio $h_{FE} = f(I_C)$
T_{case} = parameter
BDX27-10, BDX28-10
BDX29-10, BDX30-10



Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{case} = parameter
BDX27-16
BDX28-16



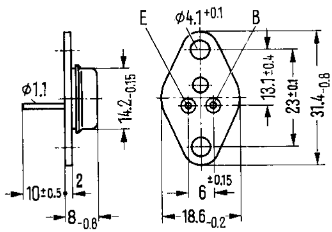
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter



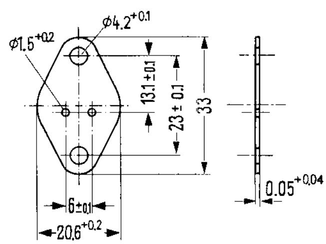
NPN Transistors for AF output stages and switching applications

BDY 12 and BDY 13 are epitaxial NPN silicon planar power transistors in a case 9 A 2 DIN 41875 (SOT-9). The collector is electrically connected to the case.
In order that the transistors may be mounted insulated from the chassis, 1 mica disc and 2 insulating nipples (Teflon) ea. are available, to be ordered separately. The transistors are especially suitable for use in high-quality AF power stages and as switches.

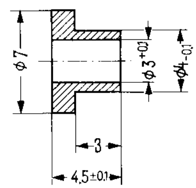
Type	Order number	Type	Order number
BDY 12-6	Q 60204-Y 12-B	BDY 13-10	Q 60204-Y 13-C
BDY 12-10	Q 60204-Y 12-C	BDY 13-16	Q 60204-Y 13-D
BDY 12-16	Q 60204-Y 12-D	Mica disc	Q 62901-B 16-A
BCY 13-6	Q 60204-Y 13-B	Insulating nipple	Q 62901-B 13-C



Weight approx. 8.3 g Dimensions in mm



Mica disc dry: $R_{th} = 2.5$ K/W
greased: $R_{th} = 1$ K/W



Insulating nipple
scale 2:1

Maximum ratings		BDY 12	BDY 13	
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-emitter voltage	V_{CES}	60	80	V
Emitter-base voltage	V_{EBO}	5	5	V
Base current	I_B	300	300	mA
Collector current	I_C	3	3	A
Junction temperature	T_j	175	175	°C
Storage temperature	T_s	−65 to +175	−65 to +175	°C
Total power dissipation ($T_{case} = 45$ °C; $V_{CE} < 13$ V)	P_{tot}	26	26	W

Thermal resistance

Junction to case	$R_{thJcase}$	≦5	≦5	K/W

Static characteristics (T_{case} = 25 °C)

The transistors BDY 12 and BDY 13 are classified in groups of static forward current transfer ratio at I_C = 1 A and V_{CE} = 1 V and indicated by figures of the DIN-R-5 standard series. For the conditions stated below, the following data apply:

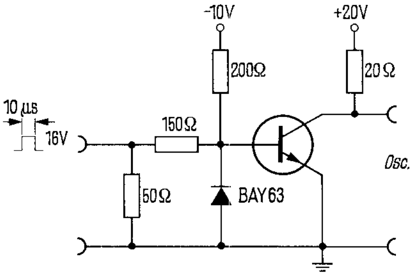
Type		BDY 12, BDY 13			BDY 12 BDY 13
h_{FE} group		6	10	16	
V_{CE} V	I_C A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
1	0.1	70 (>30)	110	180	0.78 (<0.85)
1	1	63 (40 to 100)*	100 (63 to 160)*	160 (100 to 250)*	0.85 (<1.2)*
5	2	40 (>25)	70	120	0.95 (<1.3)

Static characteristics (T_{case} = 25 °C)		BDY 12	BDY 13	
Collector-emitter saturation voltage (I_C = 2 A; I_B = 0.2 A)	V_{CEsat}	0.4 (<8)*	0.4 (<0.8)*	V
Base-emitter saturation voltage (I_C = 2 A; I_B = 0.2 A)	V_{BEsat}	1.0 (<1.3)	1.0 (<1.3)	V
Collector-emitter cutoff current (V_{CES} = 40 V)	I_{CES}	10 (<100)	–	nA
Collector-emitter cutoff current (V_{CES} = 40 V; T_{case} = 150 °C)	I_{CES}	10 (<100)	–	µA
Collector-emitter cutoff current (V_{CES} = 60 V)	I_{CES}	–	10 (<100)*	nA
Collector-emitter cutoff current (V_{CES} = 60 V; T_{case} = 150 °C)	I_{CES}	–	10 (<100)	µA
Collector-emitter breakdown voltage (I_{CE} = 100 mA) (Impulse width 200 µs; keying ratio 1%)	$V_{(BR)CEO}$	>40	>60	V
Collector-base breakdown voltage (I_{CB} = 100 µA)	$V_{(BR)CBO}$	>60	>80	V
Emitter-base breakdown voltage (I_{EB} = 10 µA)	$V_{(BR)EBO}$	>5	>5	V

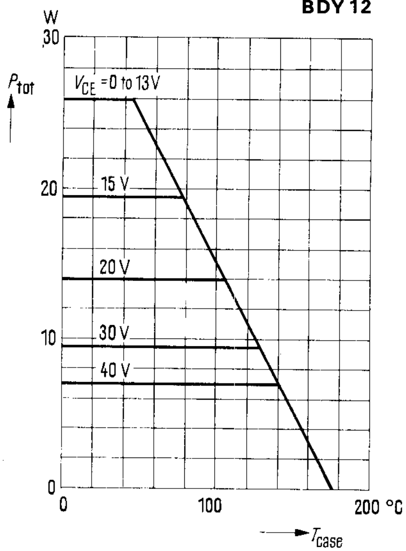
* AQL = 0.65%

Dynamic characteristics (T_{case} = 25 °C)		**BDY 12**	**BDY 13**	
Current gain-bandwidth product (I_C = 200 mA; V_{CE} = 10 V)	f_T	70 (>30)	70 (>30)	MHz
Collector-base capacitance (V_{CB} = 10 V)	C_{CBO}	35 (<70)	35 (<70)	pf
Switching times: ($I_C \approx 1$ A; $I_{B1} \approx I_{B2} \approx 50$ mA)	t_{on}	<0.3	<0.3	µs
	t_{off}	<1.5	<1.5	µs

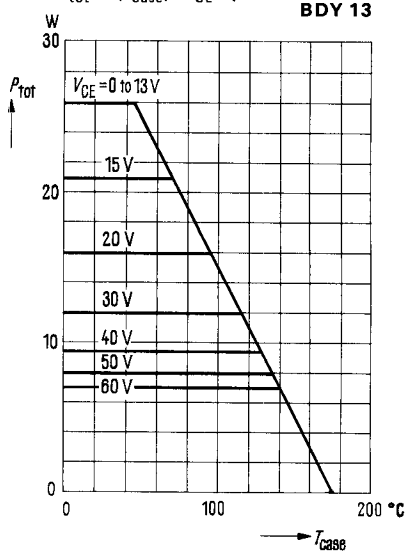
Circuit for measuring switching times



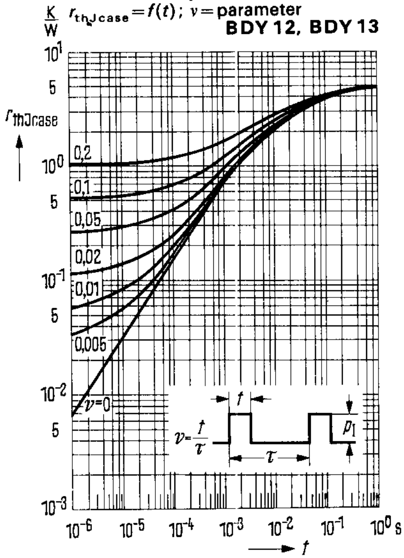
Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter
BDY 12



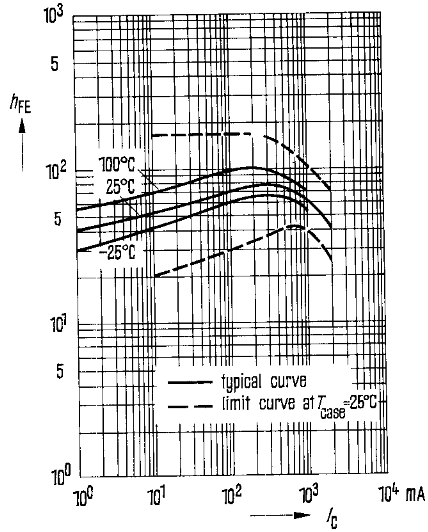
Maximum power dissipation
$P_{tot} = f(T_{case})$; V_{CE} = parameter
BDY 13



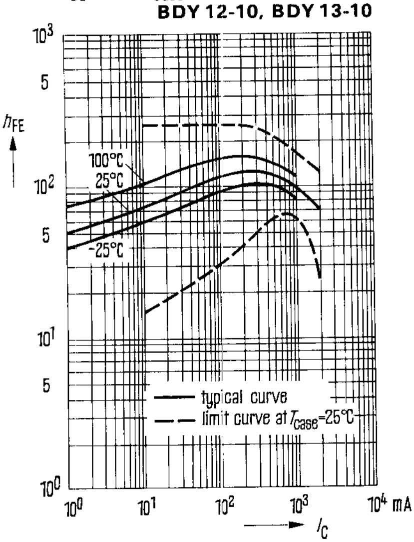
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BDY 12, BDY 13



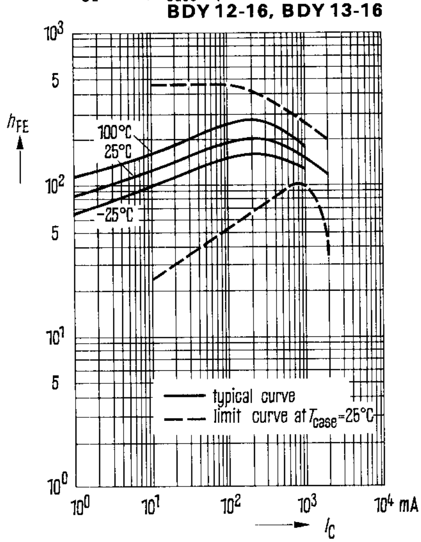
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{case} = parameter
BDY12-6, BDY13-6



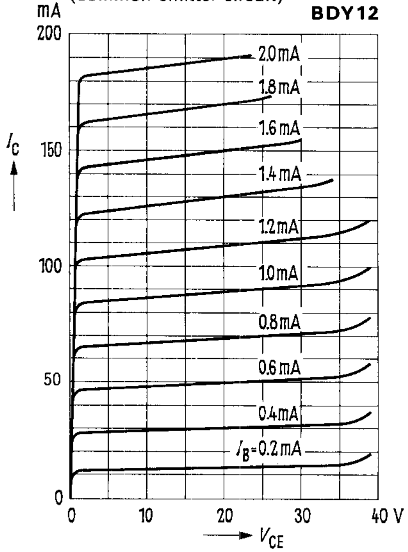
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{case} = parameter
BDY 12-10, BDY 13-10



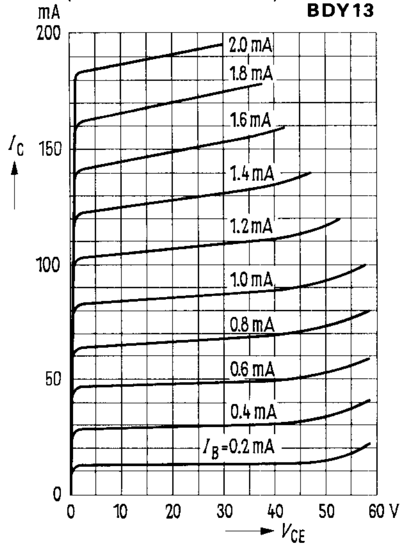
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{case} = parameter
BDY 12-16, BDY 13-16



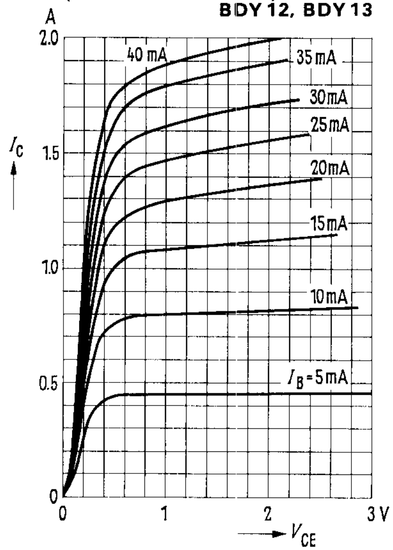
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BDY12



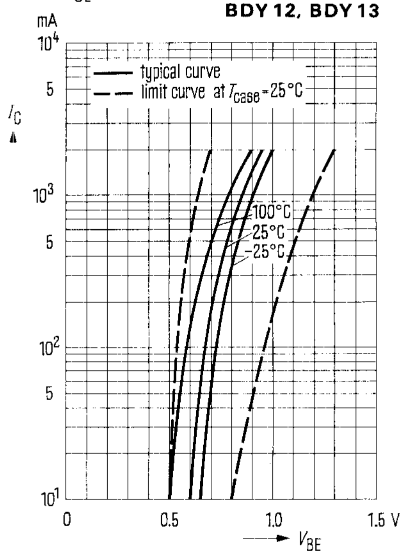
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BDY13



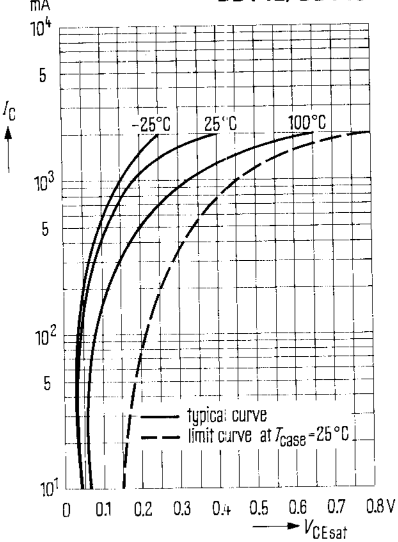
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BDY 12, BDY 13



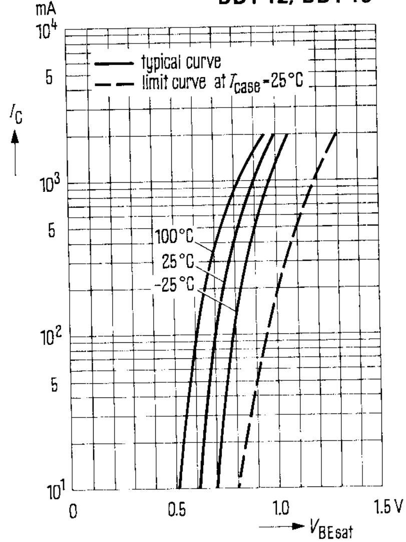
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V
BDY 12, BDY 13



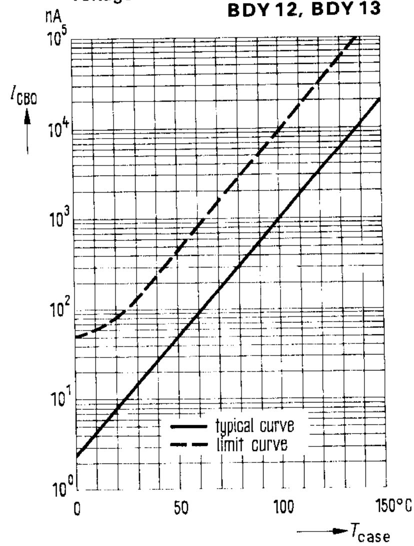
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter
(common emitter circuit)
BDY12, BDY13



Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter
(common-emitter circuit)
BDY 12, BDY 13



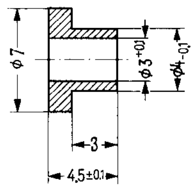
Collector-base cutoff current
$I_{CBO} = f(T_{case})$
for max. permissible breakdown voltage
BDY 12, BDY 13



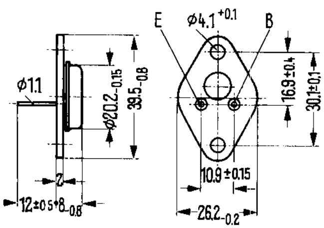
NPN Transistor for high-power AF output stages

The BDY 39 is a single diffused NPN silicon transistor in a case 3 A 2 DIN 41872 (sim. TO-3). The collector is electrically connected to the case. The transistor is especially designed for use in high-power AF output stages and in stabilized power supplies. Upon request, the transistors are also available in pairs. For insulated mounting of the transistor, 1 mica disc and 2 insulating nipples (Siprelit) are provided for, which are to be ordered separately.

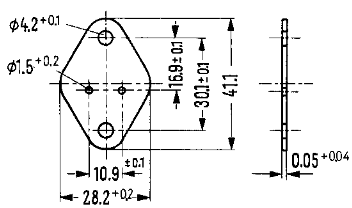
Type	Order number
BDY 39-4	Q 62702-D98-V1
BDY 39-6	Q 62602-D98-V2
BDY 39 paired	Q 62702-D98
Mica disc	Q 62901-B11-A
Insulating nipple (Siprelit)	Q 62901-B50



Insulating nipple
(Siprelit f. temperatures up to 200 °C)



Weight approx. 16.5 g
Dimensions in mm



Mica disc dry: R_{th} = 1.25 K/W
greased: R_{th} = 0.35 K/W

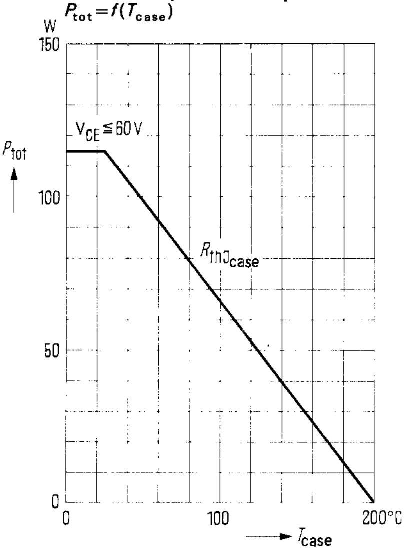
Maximum ratings		**BDY 39**	
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage ($V_{BE} = -1.5$ V; $I_C = 10$ mA)	V_{CEV}	100	V
Collector-emitter voltage ($R_{BE} = 100\ \Omega$; $I_C = 200$ mA)	V_{CER}	70	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	15	A
Maximum collector current ($t \leqq 10$ ms)	I_{CM}	22.5	A
Base current	I_B	7	A
Emitter current	I_E	20	A
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{case} = 25$ °C)	P_{tot}	115	W
Thermal resistance			
Junction to case	$R_{thJcase}$	<1.5	K/W

Static characteristics (T_{case} = 25 °C)		BDY 39	
Collector-emitter cutoff current (V_{CE} = 30 V)	I_{CEO}	< 0.7	mA
Collector-emitter cutoff current (V_{CES} = 100 V)	I_{CES}	< 1	mA
Collector-emitter cutoff current (V_{CEV} = 100 V; V_{BE} = −1.5 V)	I_{CEV}	< 1	mA
Collector-emitter cutoff current (V_{CEV} = 60 V; V_{BE} = −1.5 V; T_{case} = 150 °C)	I_{CEV}	< 5	mA
Collector-emitter cutoff current (V_{CE} = 100 V; V_{BE} = −1.5 V; T_{case} = 150 °C)	I_{CEV}	< 30	mA
Emitter-base cutoff current (V_{EBO} = 7 V)	I_{EBO}	< 1	mA
Collector-emitter breakdown voltage (I_C = 200 mA)	$V_{(BR)CEO}$	> 60	V
Base-emitter voltage (I_C = 4 A; V_{CE} = 4 V)	V_{BE}	< 1.1	V
Collector-emitter breakdown voltage (I_C = 200 mA; R_{BE} = 100 Ω)	$V_{(BR)CER}$	> 70	V
Collector-emitter breakdown voltage (I_C = 100 mA; V_{BE} = −1.5 V)	$V_{(BR)CEV}$	> 100	V
Collector-emitter saturation voltage (I_C = 4 A; I_B = 0.4 A)	V_{CEsat}	< 0.7	V
Static forward current transfer ratio (I_C = 4 A; V_{CE} = 4 V)[1])	h_{FE}	25 to 100	–
Pairing condition: (I_C = 500 mA; V_{CE} = 4 V)	h_{FE1}/h_{FE2}	≦ 1.41	–

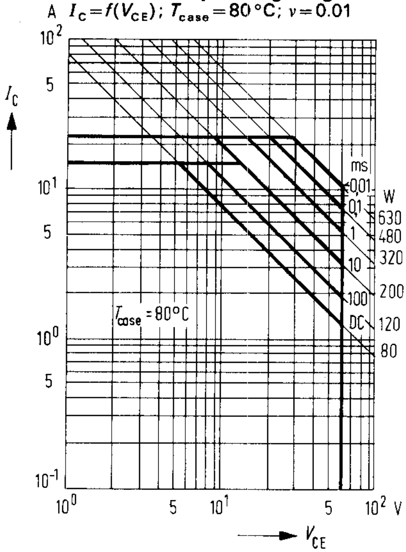
Dynamic characteristics (T_{case} = 25 °C)			
Current gain-bandwidth product (I_C = 300 mA; V_{CE} = 2 V)	f_T	1.1 (> 0.8)	MHz
Cutoff frequency (I_C = 1 A; V_{CE} = 4 V)	f_s	20	kHz
Forward current transfer ratio (I_C = 1 A; V_{CE} = 4 V; f = 1 kHz)	h_{fe}	> 15	–

[1]) Available in h_{FE}-groups 4 = 25 to 63
and 6 = 40 to 100

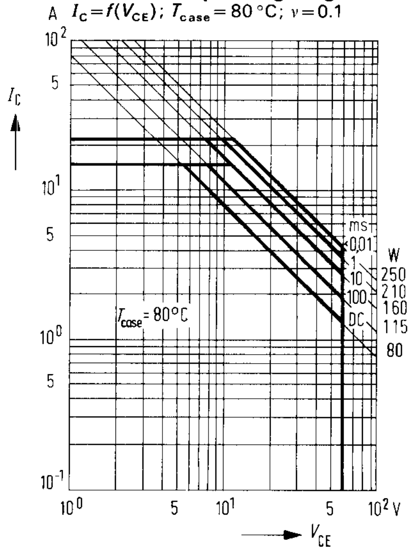
Maximum power dissipation
$P_{tot} = f(T_{case})$



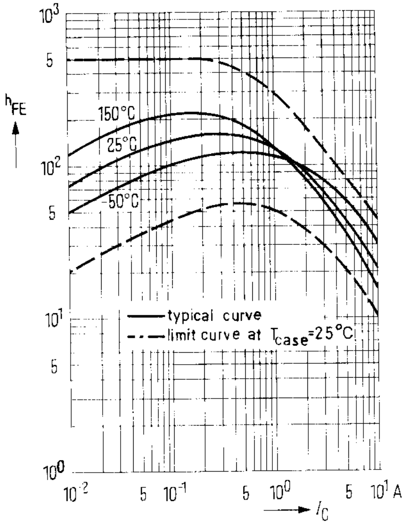
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80$ °C; $v = 0.01$



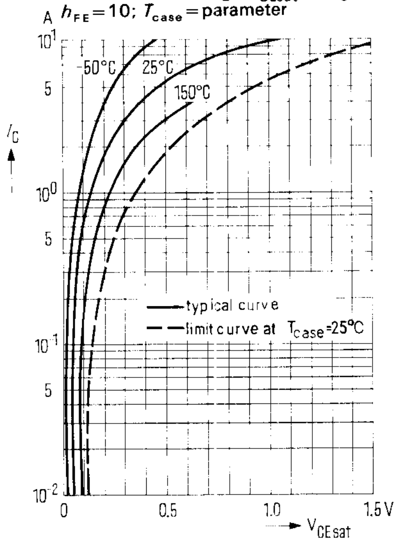
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80$ °C; $v = 0.1$



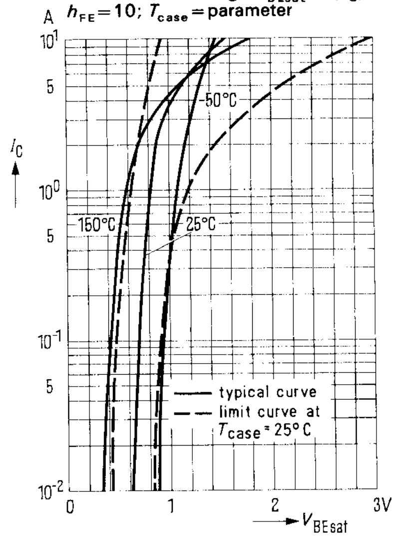
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 4\ V$



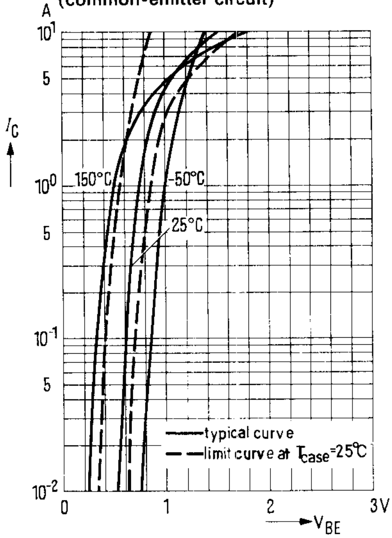
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter



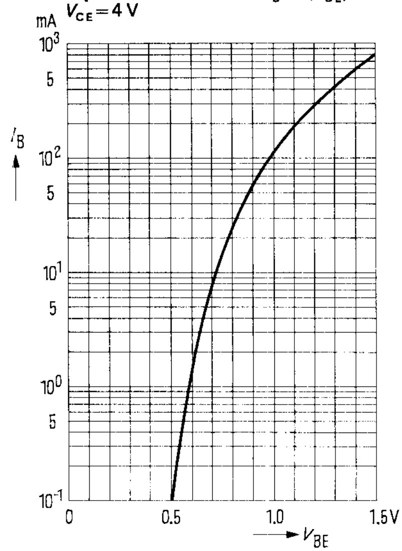
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter



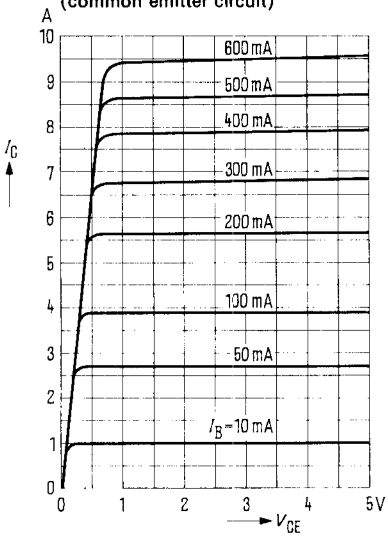
Collector current $I_C = f(V_{BE})$
$V_{CE} = 4$ V; T_{case} = parameter
(common-emitter circuit)



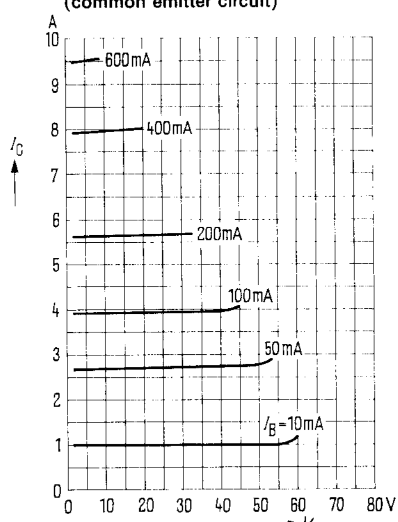
Input characteristic $I_B = f(V_{BE})$
$V_{CE} = 4$ V



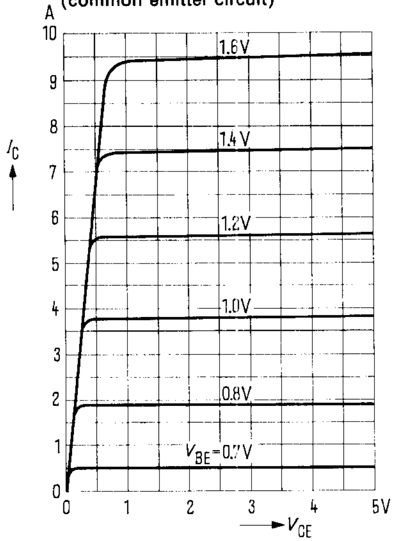
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



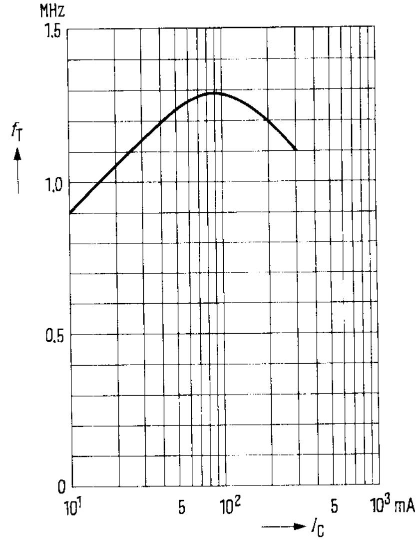
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



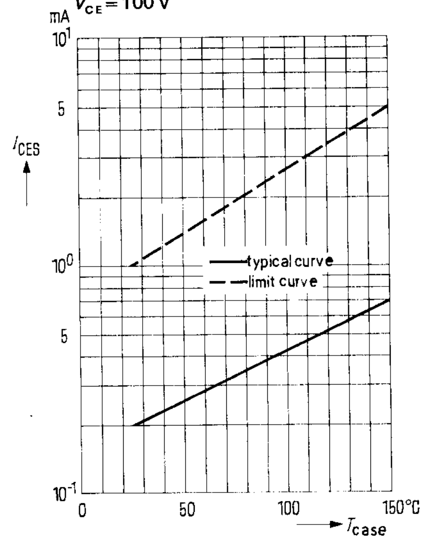
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



Current gain-bandwidth product $f_T = f(I_C)$
$V_{CE} = 4\text{ V}$



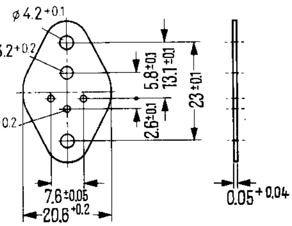
Collector-emitter cutoff current $I_{CES} = f(T_{case})$
$V_{CE} = 100\text{ V}$



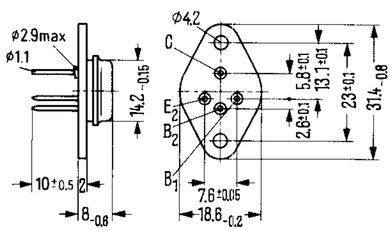
NPN Darlington stages for AF and switching applications

BDY 87, BDY 88, and BDY 89 are high-powered and highly amplifying NPN output stages for AF and switching applications. They consist of two single-diffused NPN transistor systems each in compound connection in a case 9 A 4 DIN 41875 (SOT-9) with 4 terminals. The collector terminal is electrically connected to the case.

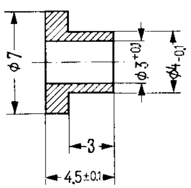
Type	Order number
BDY 87	Q 62702-D 131
BDY 88	Q 62702-D 130
BDY 89	Q 62702-D 129
Insulating nipple	Q 62901-B 50
Mica disc	Q 62901-B 40



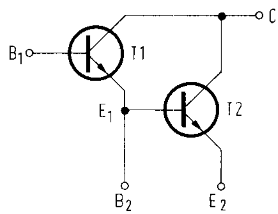
Mica disc for mounting on 3 mm heat sink



Weight approx. 9 g Dimensions in mm



Insulating nippel f. temperatures up to 200 °C scale 2:1



Circuit diagram

Maximum ratings		BDY 87	BDY 88	BDY 89	
Collector-base voltage	V_{CB1}	20	40	60	V
	V_{CB2}	20	40	60	V
Collector-emitter voltage[1]	$V_{CE(RX)}$	20	40	60	V
Collector-emitter voltage	V_{CE_2O}	20	40	60	V
Emitter-base voltage	$V_{E_1B_1O}$	7	7	7	V
	$V_{E_2B_2O}$	7	7	7	V
Collector current	I_C	8	8	8	A
Base-current	I_{B_1}	0.5	0.5	0.5	A
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation (T_{case} = 45 °C)	P_{tot}	35	35	35	W
Thermal resistance					
Junction to case	$R_{thJcase}$	4.4	4.4	4.4	K/W

[1]) $R_{B_2E_2} \leqq 150\ \Omega$; $V_{B_1E_2} < 0.4$ V

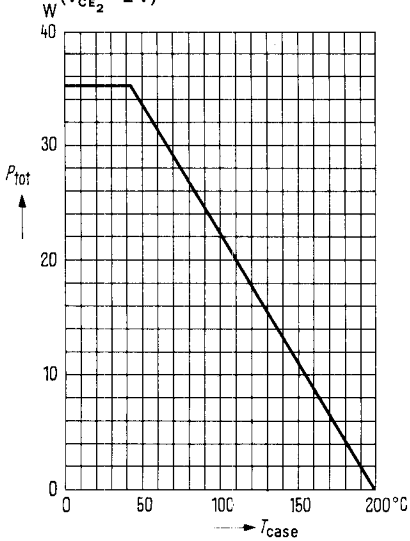
Static characteristics (T_{case} = 25 °C)		BDY 87	BDY 88	BDY 89	
Collector-base cutoff current					
(V_{CB_1} = 20 V)	I_{CB_1O}	<0.5			mA
(V_{CB_1} = 40 V)	I_{CB_1O}		<0.5		mA
(V_{CB_1} = 60 V)	I_{CB_1O}			<0.5 V	mA
Collector-emitter cutoff current (V_{CE} = 20 V; $V_{B_1E_2}$ < +0.4 V; $R_{B_2E_2}$ = 150 Ω; T_{case} = 150 °C)	$I_{CE(RX)}$	<50			mA[1])
(V_{CE} = 40 V;	$I_{CE(RX)}$		<50		mA[1])
(V_{CE} = 60 V;	$I_{CE(RX)}$			<50	mA[1])
Collector-emitter breakdown voltage (I_C = 200 mA)	$V_{(BR)CE_2O}$	>20	>40	>60	V[2])
Emitter-base breakdown voltage (I_{B_1} = I_{B_2} = 2 mA)	$V_{(BR)E_1B_1O} = V_{(BR)E_2B_2O}$	>7	>7	>7	V
Collector-emitter saturation voltage (I_C = 4 A; I_{B_1} = 10 mA)	$V_{CE_2(sat)}$	<1.8	<1.8	<1.8	V
Base-emitter saturation voltage (I_C = 4 V; I_{B_1} = 10 mA)	$V_{B_1E_2(sat)}$	<2.5	<2.5	<2.5	V
Static forward current transfer ratio (B_2 open)					
(I_C = 0.5 A; V_{CE} = 2 V)	h_{FE}	>2000	>2000	>2000	–
(I_C = 4 A; V_{CE} = 2 V)	h_{FE}	2500 (>500)	2500 (>1000)	2500 (>500)	–
(I_C = 8 A; V_{CE} = 4 V)	h_{FE}	>200	>300	>200	–
Emitter-base voltage (I_C = 4 A; V_{CE} = 2 V)	$V_{B_1E_2}$	<2.3	<2.3	<2.3	V

Dynamic characteristics (T_{case} = 25 °C)

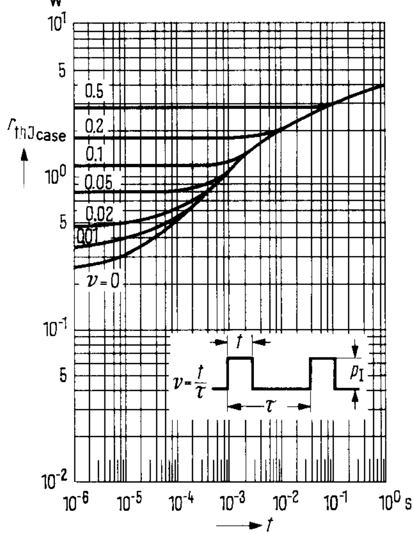
Forward current transfer ratio at I_C = 0.3 A; V_{CE} = 2 V; f = 1 MHz	h_{fe}	1.5	1.5	1.5	–

[1]) $I_{CE(RX)}$: Collector-emitter cutoff current with open emitter diode and resistance $R_{B_2E_2}$ between base B_2 and emitter E_2
[2]) Pulse length = 200 µs; duty cycle: 1%

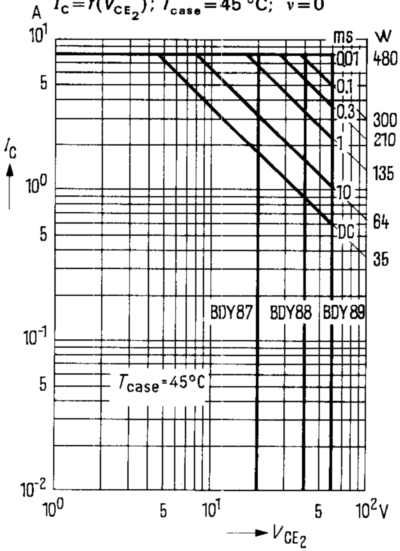
Maximum power dissipation
$P_{tot} = f(T_{case})$
($V_{CE_2} = 2$ V)



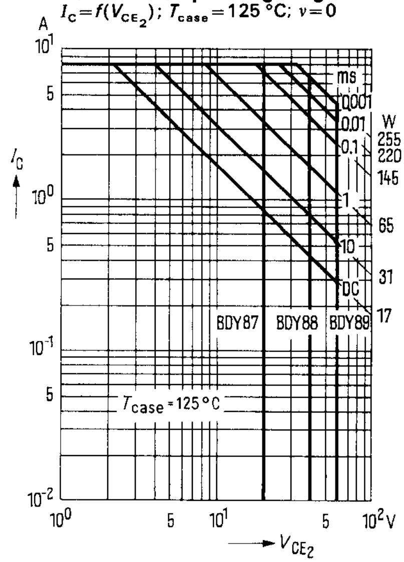
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



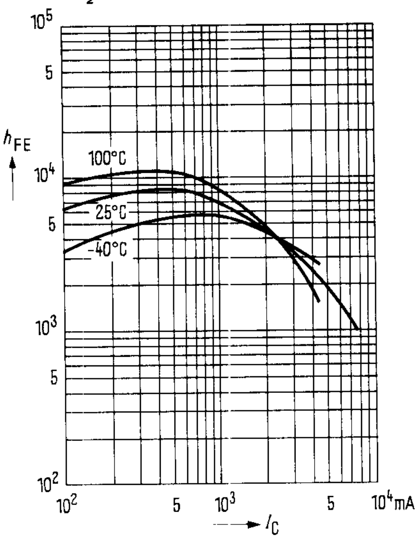
Permissible operating range
$I_C = f(V_{CE_2})$; $T_{case} = 45$ °C; $v = 0$



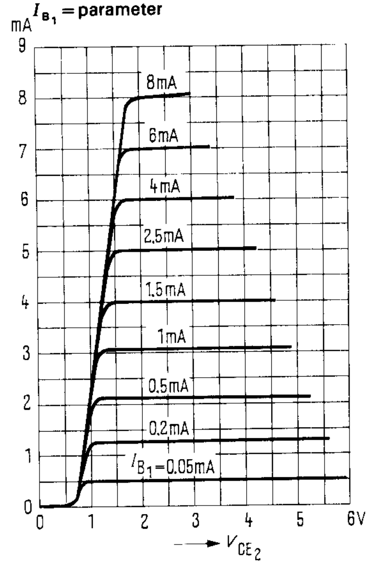
Permissible operating range
$I_C = f(V_{CE_2})$; $T_{case} = 125$ °C; $v = 0$



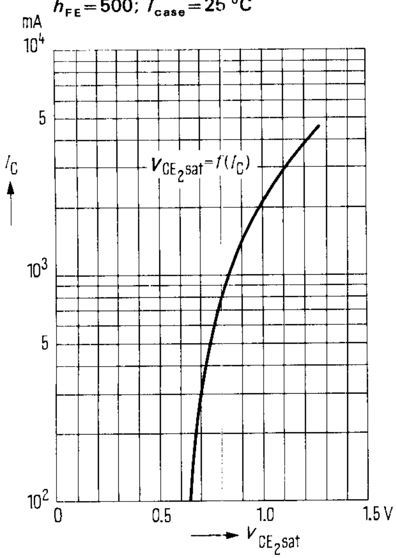
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE_2}=2$ V; T_{case}=parameter



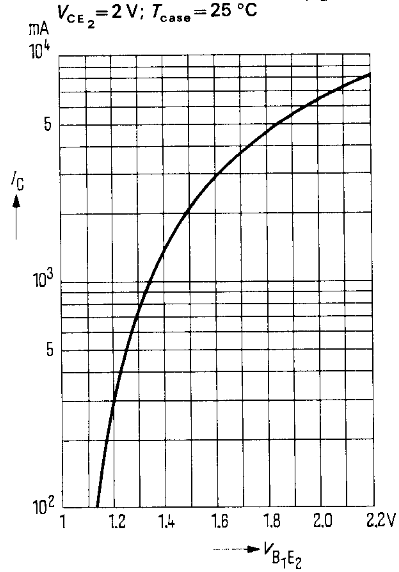
Output characteristics $I_C=f(V_{CE_2})$
I_{B_1}=parameter



Saturation voltage $V_{CE_2sat}=f(I_C)$
$h_{FE}=500$; $T_{case}=25$ °C



Collector current $I_C=f(V_{B_1E_2})$
$V_{CE_2}=2$ V; $T_{case}=25$ °C

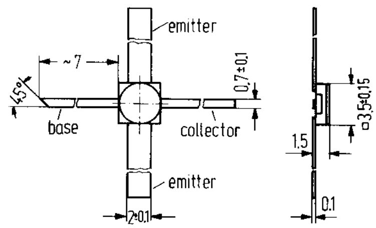


NPN Silicon planar microwave transistor

BFR14A is an expitaxial NPN silicon planar microwave transistor. Due to its low noise figure high amplification and low distortion it is particularly suitable for use in low-noise pre-stages, broad-band, IF and radar amplifiers up to 5 GHz as well as for low-output oscillator circuits.

The strip-line ceramic package is particularly adapted for use in thin and thick film technology and permits use in space engineering. The emitter terminal is connected to the case.

Type	Order number
BFR14A	Q62702-F416



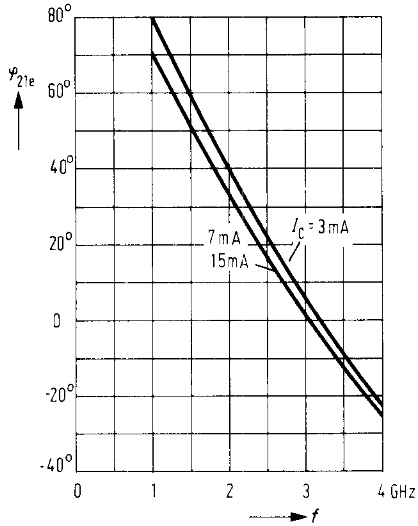
Weight approx. 0.3 g Dimensions in mm

Maximum ratings		**BFR14A**	
Collector-emitter voltage	V_{CEO}	12	V
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage ($R_{BE}=50\ \Omega$)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	30	mA
Base current	I_B	4	mA
Max. junction temperature	T_j	175	°C
Storage temperature	T_S	−65 to +175	°C
Total power dissipation ($T_{amb} \leqq 25$ °C)	P_{tot}	250	mW
Thermal resistance			
Junction to ambient air when mounted on Al_2O_3 ceramics 16 × 25 × 0.6 mm or glass-fiber reinforced Teflon 40 × 25 × 1.5 mm	R_{thJamb}	≦250	K/W

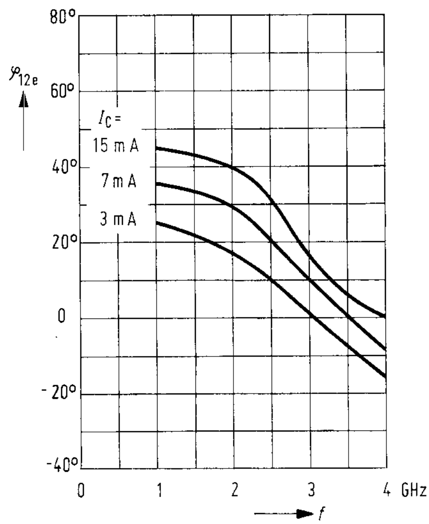
		BFR 14 A	
Static characteristics ($T_{amb}=25\ °C$)			
Collector-emitter breakdown voltage ($I_{CEO}=500\ \mu A$)	$V_{(BR)CEO}$	≧12	V
Collector-emitter breakdown voltage ($I_{CER}=10$ mA; $R_{BE}=50\ \Omega$)	$V_{(BR)CER}$	≧20	V
Emitter-base breakdown voltage ($I_{EBO}=100\ \mu A$)	$V_{(BR)EBO}$	≧3.5	V
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	<50	nA
($V_{CBO}=10$ V; $T=150$ °C)	I_{CBO}	<50	µA
Collector-emitter cutoff current ($V_{CEO}=20$ V; $V_{BE}=0$)	I_{CES}	<100	µA
Static forward current transfer ratio ($I_C=5$ mA; $V_{CE}=6$ V)	h_{FE}	≧30	–
Dynamic characteristics ($T_{amb}=25\ °C$)			
Short-circuit forward current transfer ratio ($I_C=5$ mA; $V_{CE}=6$ V; $f=1$ kHz)	h_{21e}	75 (≧40)	–
($I_C=20$ mA; $V_{CE}=5$ V; $f=1$ kHz)	h_{21e}	75 (≧40)	–
Current-gain bandwidth product ($I_C=20$ mA; $V_{CE}=10$ V; $f=2$ GHz)	f_T	5	GHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=6$ V; $f=1$ MHz)	$-C_{12e}$	0.45 (≦0.65)	pf
Noise figure ($I_C=2$ mA; $V_{CE}=6$ V; $f=200$ MHz; $R_g=100\ \Omega$)	NF	2	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=2$ GHz; $Z_g=Z_{gopt}$)	NF	3.8 (≦5)	db
Matched power gain ($I_C=15$ mA; $V_{CE}=10$ V; $f=2$ GHz)	$G_{pe\ opt}$	12 (≦10)	db

Scatter parameters for frequencies ranging from 1 to 4 GHz

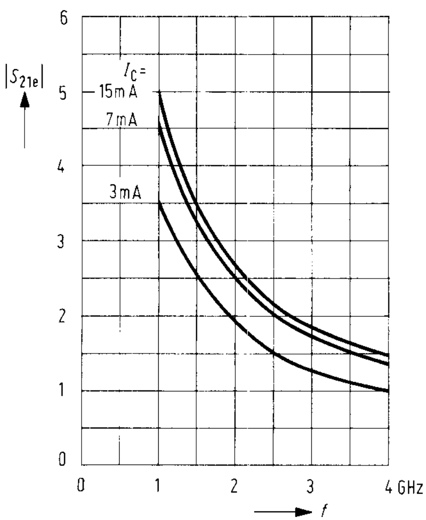
Phase of forward-transfer coefficient $s_{21e}=f(f)$
$Z_o=50\ \Omega$; $V_{CE}=10\ V$



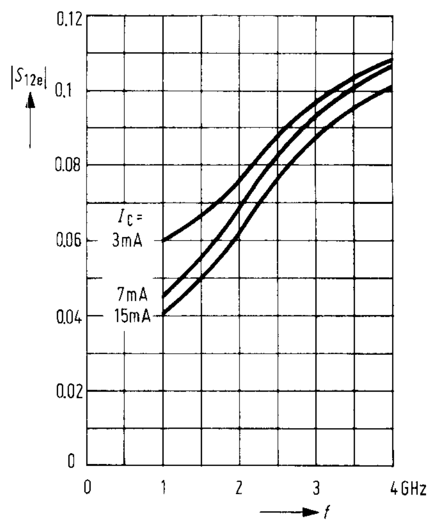
Phase of reverse-transfer coefficient $s_{12e}=f(f)$
$Z_o=50\ \Omega$; $V_{CE}=10\ V$



Amount of the forward-transfer coefficient $s_{21e}=f(f)$
$Z_o=50\ \Omega$; $V_{CE}=10\ V$

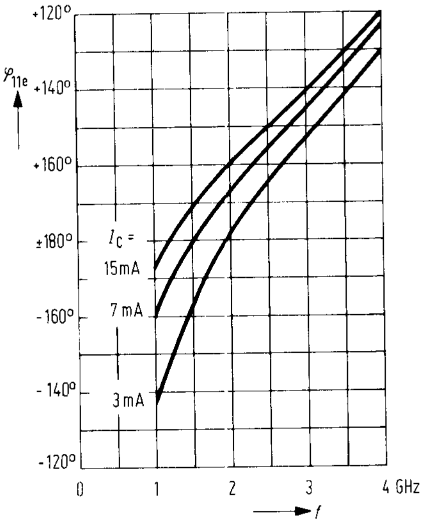


Amount of the reverse-transfer coefficient $s_{12e}=f(f)$
$Z_o=50\ \Omega$; $V_{CE}=10\ V$

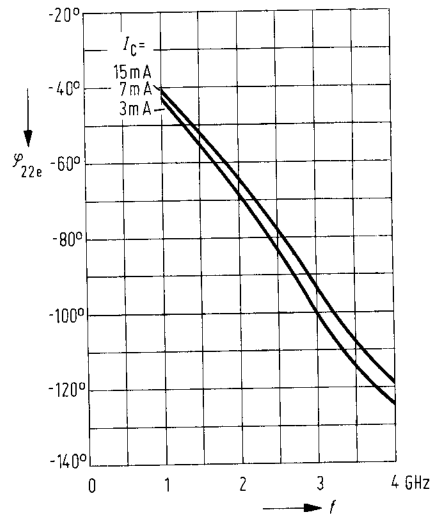


Scatter parameters for frequencies ranging from 1 to 4 GHz

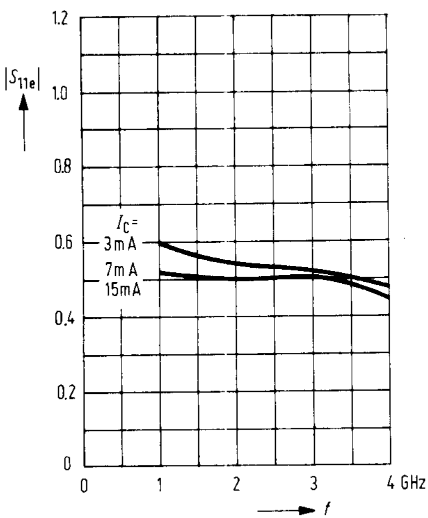
Phase of the input reflection coefficient $s_{11e} = f(f)$
$Z_o = 50\ \Omega$; $V_{CE} = 10\ V$



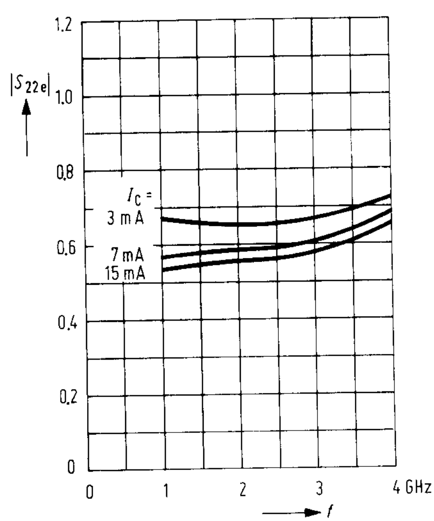
Phase of the output reflection coefficient $s_{22e} = f(f)$
$Z_o = 50\ \Omega$; $V_{CE} = 10\ V$



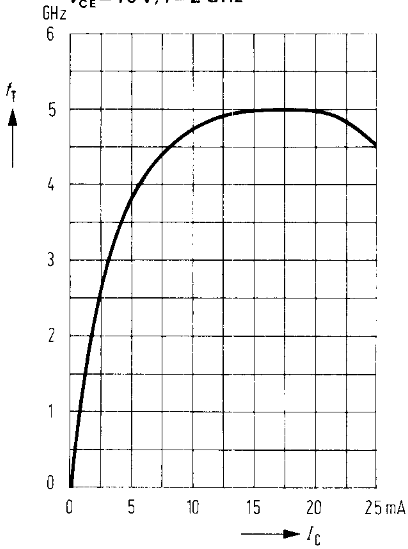
Amount of the input reflection coefficient $s_{11e} = f(f)$
$Z_o = 50\ \Omega$; $V_{CE} = 10\ V$



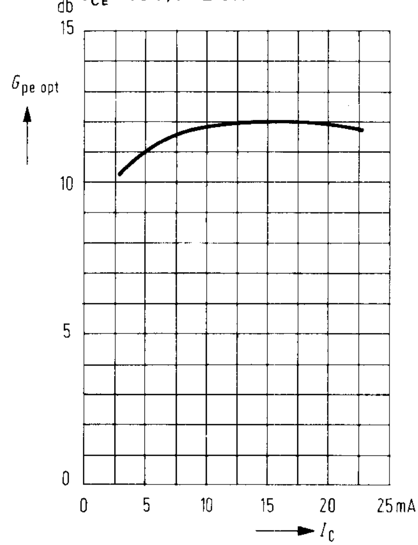
Amount of the output reflection coefficient $s_{22e} = f(f)$
$Z_o = 50\ \Omega$; $V_{CE} = 10\ V$



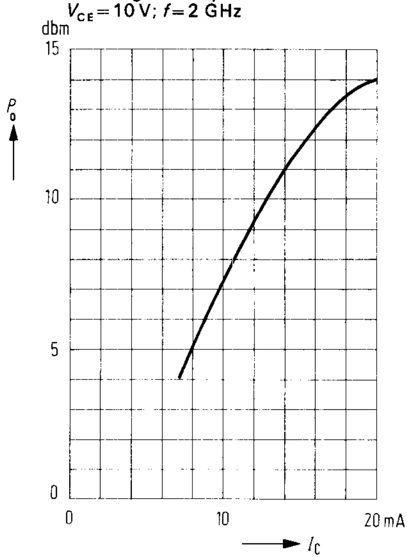
Current-gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 10\,V$; $f = 2\,GHz$



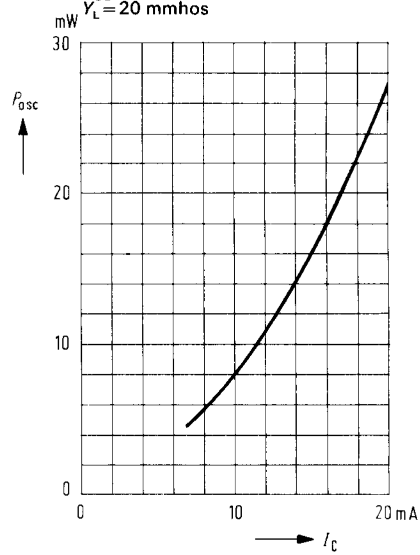
Maximum power gain
$G_{pe\,opt} = f(I_C)$
$V_{CE} = 10\,V$; $f = 2\,GHz$



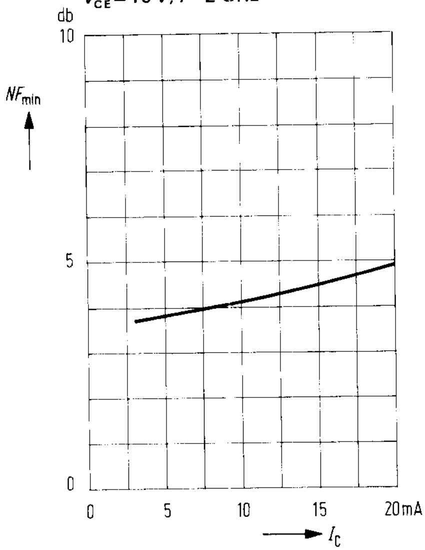
Output power $P_o = f(I_C)$
at 1 db gain compression
$V_{CE} = 10\,V$; $f = 2\,GHz$



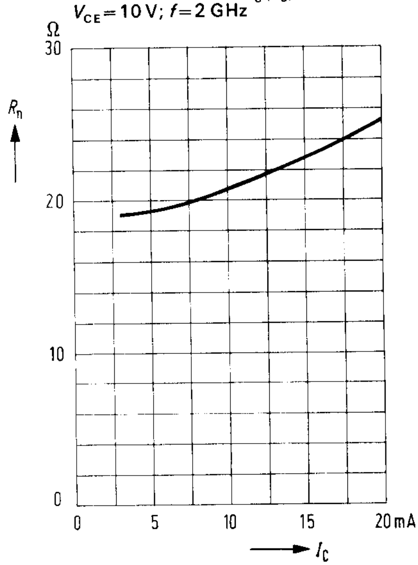
Oscillator output power
$P_{osc} = f(I_C)$
$V_{CE} = 10\,V$; $f = 4\,GHz$;
$Y_L = 20$ mmhos



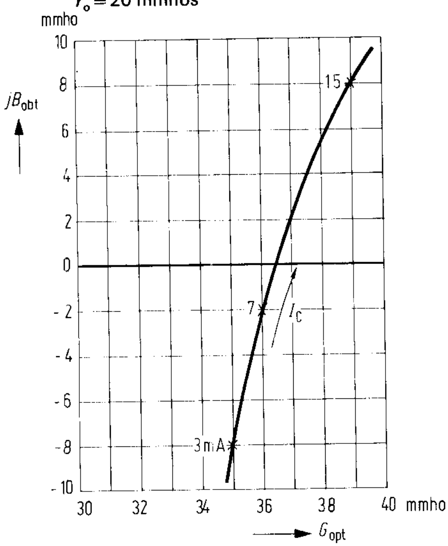
Minimum noise figure
$NF_{min} = f(I_C)$ at $Y_s = Y_{opt}$
$V_{CE} = 10$ V; $f = 2$ GHz



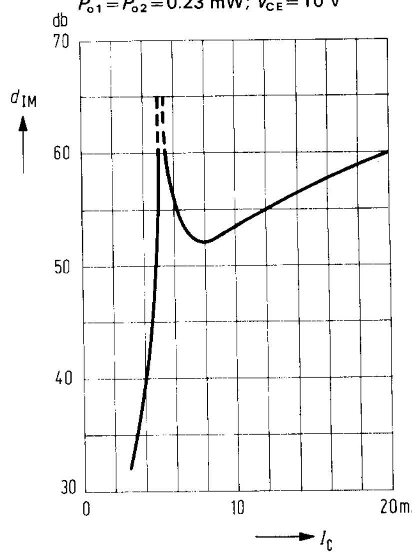
Equivalent noise resistance
$R_n = f(I_C)$
$NF = NF_{min} + R_n \cdot \frac{|Y_s - Y_{opt}|^2}{R_e(Y_s)}$
$V_{CE} = 10$ V; $f = 2$ GHz



Optimum generator admitance
$Y_{opt} = f(I_C)$ for $NF = NF_{min}$
$Y_{opt} = G_{opt} + jB_{opt}$
$V_{CE} = 10$ V; $f = 2$ GHz;
$Y_o = 20$ mmhos



Intermodulation product distance $d_{IM} = f(I_C)$
$f_1 = 2$ GHz; $f_2 = 2.003$ GHz
$Y_s = Y_L = 20$ mmhos;
$P_{o1} = P_{o2} = 0.23$ mW; $V_{CE} = 10$ V

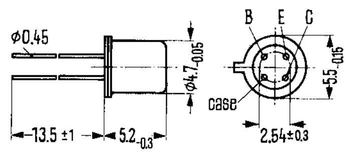


NPN Transistor for low-noise broadband and antenna amplifiers

BFR 15 is an epitaxial NPN silicon planar RF transistor in the case 18A4 DIN 41876 (TO-72) for universal application up into the GHz range, e. g. for low-noise broadband and antenna amplifiers.

The terminals E, B and C are insulated from the case.

Type	Order number
BFR 15	Q62702-F322



Weight approx. 0.4g Dimensions in mm

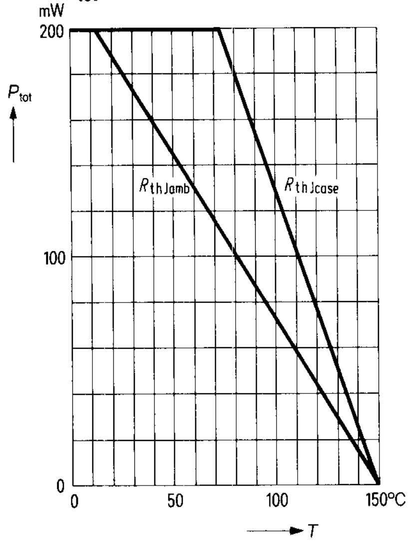
Maximum ratings		BFR 15	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage ($R_{BE} \leqq 50\ \Omega$)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	30	mA
Base current	I_B	4	mA
Junction temperature	T_j	150	°C
Storage temperature	T_s	−65 to +150	°C
Total power dissipation ($T_{case} \leqq 70$ °C)	P_{tot}	200	mW
Thermal resistance			
Junction to air	R_{thJamb}	≦700	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics ($T_{amb}=25$ °C)		BFR 15	
Collector-emitter breakdown voltage ($I_{CEO}=500$ µA)	$V_{(BR)CEO}$	>12	V
Collector-emitter breakdown voltage ($I_{CER}=10$ mA; $R_{BE}=50$ Ω)	$V_{(BR)CER}$	>20	V
Emitter-base breakdown voltage ($I_{EBO}=100$ µA)	$V_{(BR)EBO}$	>3.5	V
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	<50	nA
Static forward current transfer ratio ($I_C=5$ to 20 mA; $V_{CE}=6$ V)	h_{FE}	$\leqq 25$	–
Dynamic characteristics ($T_{amb}=25$ °C)			
Short-circuit forward current transfer ratio ($I_C=5$ mA; $V_{CE}=6$ V; $f=1$ kHz)	h_{21e}	70	–
Current-gain bandwidth product ($I_C=10$ mA; $V_{CE}=6$ V; $f=500$ MHz)	f_T	3.3	GHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=6$ V; $f=1$ MHz)	$-C_{12e}$	0.42	pf
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	$\leqq 1.1$	pf
Noise figure			
($I_C=2$ mA; $V_{CE}=6$ V; $f=1$ MHz; $R_g=100$ Ω)	NF	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=200$ MHz; $R_g=100$ Ω)	NF	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω)	NF	3	db
Power gain ($I_C=10$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω; $Z_L=Z_{Lopt}$)	G_{pe}	11.5	db

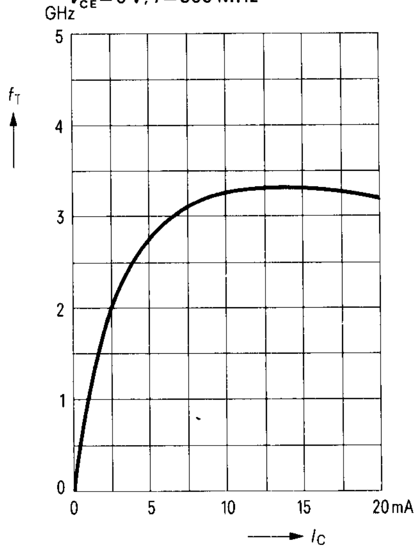
S-parameters at $V_{CE}=6$ V; $I_C=15$ mA; $Z_0=50$ Ω

$f=200$ MHz		$f=800$ MHz	
$S_{11e}=0.28$;	$\varphi_{11e}=-58°$	$S_{11e}=0.04$;	$\varphi_{11e}=-168°$
$S_{22e}=0.72$;	$\varphi_{22e}=-19°$	$S_{22e}=0.58$;	$\varphi_{22e}=-40°$
$S_{12e}=0.028$;	$\varphi_{12e}=+75°$	$S_{12e}=0.085$;	$\varphi_{12e}=+55°$
$S_{21e}=11.8$;	$\varphi_{21e}=+114°$	$S_{21e}=3.3$;	$\varphi_{21e}=+61°$

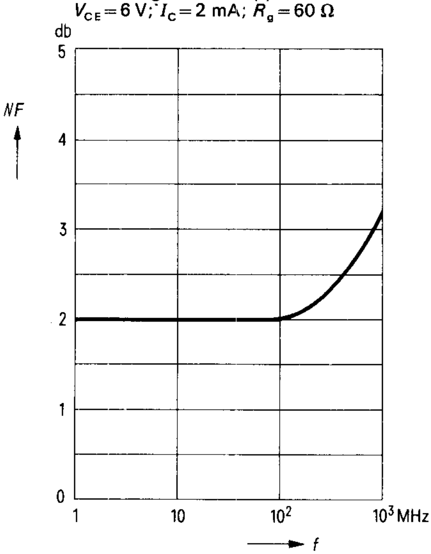
Total permissible power dissipation
$P_{tot} = f(T)$



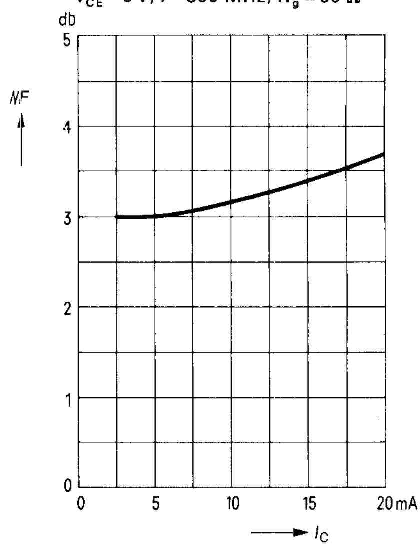
Current-gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 6$ V; $f = 500$ MHz



Noise figure $NF = f(f)$
$V_{CE} = 6$ V; $I_C = 2$ mA; $R_g = 60\ \Omega$



Noise figure $NF = f(I_C)$
$V_{CE} = 6$ V; $f = 800$ MHz; $R_g = 60\ \Omega$

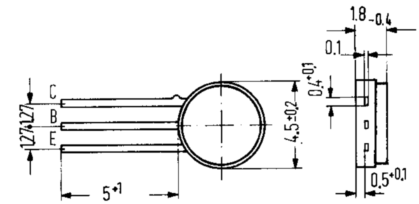


NPN Silicon planar RF transistor

Preliminary data

The epitaxial silicon planar RF transistor in its hermetically sealed glass/ceramic flat package is particularly designed for use in military and space applications. The advantage of this special package lies in its high packing density.

Type	Order number
BFR 28	Q62702-F310



Weight approx. 0.07 g Dimensions in mm

Maximum ratings		BFR 28	
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	30	V
Emitter-base voltage	V_{EBO}	3	V
Collector current	I_C	50	mA
Base current	I_B	5	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +150	°C
Total power dissipation ($T_{amb} \leqq 45$ °C; soldering clearance 3 mm)	P_{tot}	200	mW
Soldering temperature (for <3 s, clearance from case >0.8 mm)	T_L	240	°C
Thermal resistance			
Junction to air (soldering clearance 3 mm)	R_{thJamb}	≦775	K/W

Static characteristics (T_{amb}=25 °C)

		BFR 28	
Collector-emitter breakdown voltage (I_C=10 mA)	$V_{(BR)CEO}$	>20	V
Collector-base breakdown voltage (I_C=10 µA)	$V_{(BR)CBO}$	>30	V
Emitter-base breakdown voltage (I_E=10 µA)	$V_{(BR)EBO}$	>3	V
Collector-base cutoff current (V_{CB}=20 V)	I_{CBO}	≦20	nA
Static forward current transfer ratio (I_C=10 mA; V_{CE}=10 V)	h_{FE}	95	–

Dynamic characteristics (T_{amb}=25 °C)

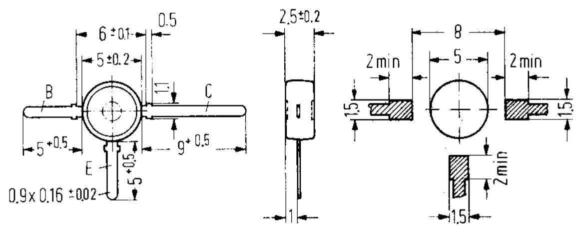
Short-circuit forward current transfer ratio	h_{21e}	>30	–
Current-gain bandwidth product (I_C=2 mA; V_{CE}=5 V; f=100 MHz)	f_T	>400	MHz
(I_C=10 mA; V_{CE}=10 V; f=100 MHz)	f_T	1000	MHz
Noise figure (I_C=2 mA; V_{CE}=10 V; R_g=60 Ω; f=200 MHz)	NF	3<4.5	db
Short-circuit feedback capacitance (I_C=1 mA; V_{CE}=10 V; f=1 MHz)	$-C_{12e}$	<0.95	pf

NPN Transistor for low-noise RF amplifier applications

Preliminary data

BFR 34 and BFR 34 A are epitaxial NPN silicon planar UHF transistors in a plastic case 50 B 3, DIN 41867 (sim. to TO-50) for use in RF amplifiers up into the GHz range, e.g. low-noise pre-stages, broadband antenna amplifiers and oscillators.

Type	Order number
BFR 34	Q 62702-F 346
BFR 34 A	Q 62702-F 346-S 1



Weight approx. 0.25 g   Dimensions in mm

Maximum ratings

		BFR 34 BFR 34 A	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage (R_{BE} = 50 Ω)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	30	mA
Base current	I_B	4	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−55 to +125	°C
Total power dissipation[1] (T_{amb} = 25 °C)	P_{tot}	200	mW
Thermal resistance			
Junction to air	R_{thJamb}	≦650	K/W
Junction to air[1]	R_{thJamb}	≦500	K/W

[1]) When mounted on epoxy glass 40 × 25 × 1.5 mm

Static characteristics ($T_{amb}=25$ °C)

		BFR 34 A	BFR 34	
Collector-emitter breakdown voltage ($I_{CEO}=500$ μA)	$V_{(BR)CEO}$	>12	>12	V
Collector-emitter breakdown voltage ($I_{CER}=10$ mA; $R_{BE}=50$ Ω)	$V_{(BR)CER}$	>20	>20	V
Emitter-base breakdown voltage ($I_{EBO}=100$ μA)	$V_{(BR)EBO}$	>3.5	>3.5	V
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	<50	<50	nA
DC forward current transfer ratio ($I_C=5$ to 25 mA; $V_{CE}=6$ V)	h_{FE}	≧25	≧25	–

Dynamic characteristics ($T_{amb}=25$ °C)

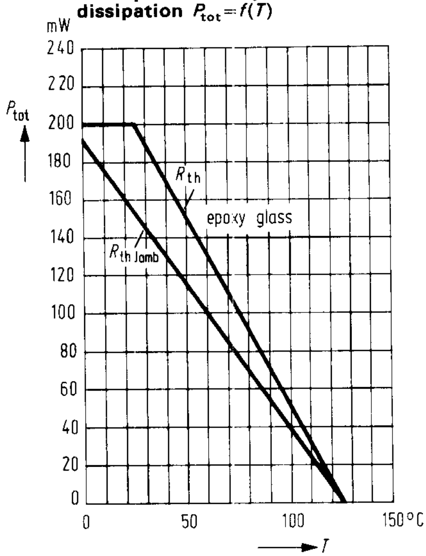
		BFR 34 A	BFR 34	
Short-circuit forward current transfer ratio ($F_C=5$ mA; $V_{CE}=6$ V; $f=1$ kHz)	h_{21e}	70	70	–
Current-gain bandwidth product ($I_C=20$ mA; $V_{CE}=10$ V; $f=500$ MHz)	f_T	4.5	–	GHz
($I_C=10$ mA; $V_{CE}=6$ V; $f=500$ MHz)	f_T	–	3.3	GHz
($I_C=20$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	–	3.0	GHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=6$ V; $f=1$ MHz)	$-C_{12e}$	0.38	0.38	pf
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	0.75	0.75	pf
Noise figure ($I_C=2$ mA; $V_{CE}=6$ V; $f=1$ MHz; $R_g=100$ Ω)	NF	–	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=200$ MHz; $R_g=100$ Ω)	NF	2	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω)	NF	2.5	3	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=2$ GHz; $Z_g=Z_{gopt}$)	NF	4	5.5	db
Power gain ($I_C=15$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω; $Z_L=Z_{Lopt}$)	G_{pe}	13	–	db

BFR 34 A:

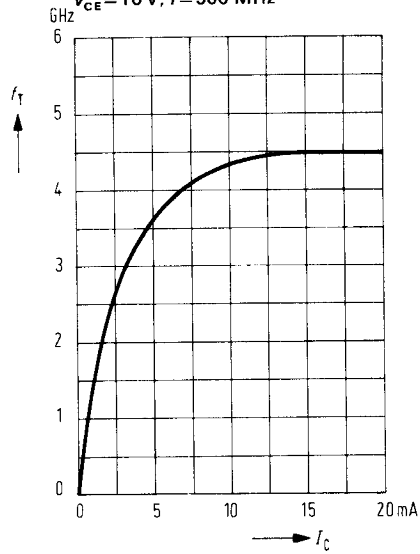
S-parameters at $V_{CE}=6$ V; $I_C=15$ mA; $Z_0=50$ Ω

$f=200$ MHz		$f=800$ MHz	
$S_{11e}=0.33$;	$\varphi_{11e}=-90°$	$S_{11e}=0.2$;	$\varphi_{11e}=-175°$
$S_{22e}=0.68$;	$\varphi_{22e}=-20°$	$S_{22e}=0.5$;	$\varphi_{22e}=-20°$
$S_{12e}=0.028$;	$\varphi_{12e}=+70°$	$S_{12e}=0.07$;	$\varphi_{12e}=+75°$
$S_{21e}=15.5$;	$\varphi_{21e}=+120°$	$S_{21e}=4.3$;	$\varphi_{21e}=+80°$

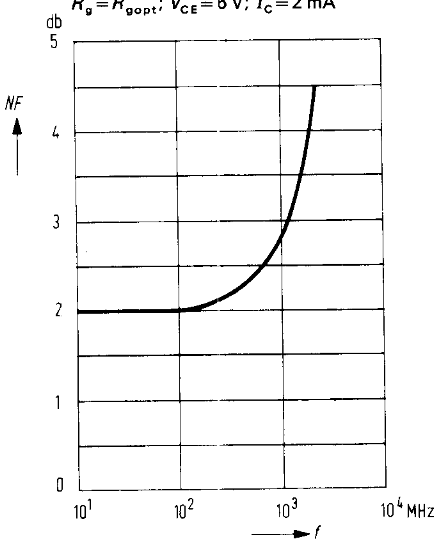
Total permissible power dissipation $P_{tot} = f(T)$



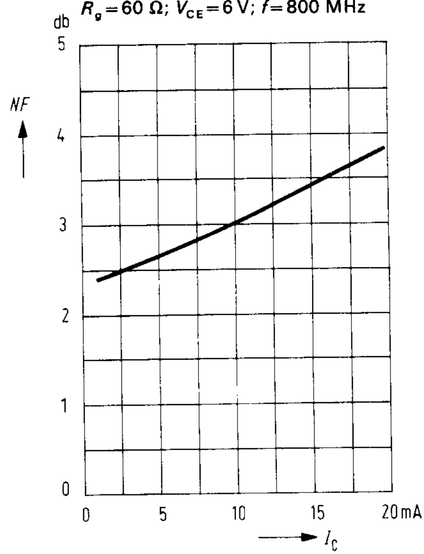
Current-gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 10$ V; $f = 500$ MHz



Noise figure $NF = f(f)$
$R_g = R_{gopt}$; $V_{CE} = 6$ V; $I_C = 2$ mA



Noise figure $NF = f(I_C)$
$R_g = 60\ \Omega$; $V_{CE} = 6$ V; $f = 800$ MHz

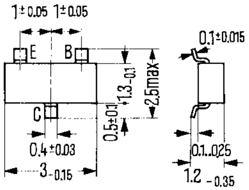


NPN Transistor for low-noise RF amplifiers and high-speed switching applications

Preliminary data

BFR 35 and BFR 35 A are epitaxial NPN silicon planar UHF transistors in a plastic case 23 A 3 DIN 41869 (SOT-23) for use in film circuits up into the GHz range, e.g. for broadband amplifiers and ultra-high-speed unsaturated logical circuits.

Type	Code	Order number
BFR 35	GA	Q62702-F347
BFR 35 A	GB	Q62702-F347-S1



Weight approx. 0.02 g   Dimensions in mm

Maximum ratings

		BFR 35 BFR 35 A	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage ($R_{BE} \leqq 50\ \Omega$)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector-current	I_C	30	mA
Base current	I_B	4	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−55 to +125	°C
Total power dissipation[1]) (T_{amb} = 25 °C)	P_{tot}	200	mW

Thermal resistance

Junction to air when mounted on:			
1. Glass substrate 7 × 7 × 1 mm	R_{th}	≦800	K/W
[1]) 2. Ceramic substrate 30 × 12 × 1 mm	R_{th}	≦500	K/W
[1]) 3. Epoxy glass substrate 30 × 12 × 1.5 mm	R_{th}	≦500	K/W

Static characteristics ($T_{amb}=25$ °C)		BFR 35 A	BFR 35	
Collector-emitter breakdown voltage ($I_{CEO}=500$ µA)	$V_{(BR)CEO}$	>12	>12	V
Collector-emitter breakdown voltage ($I_{CER}=10$ mA; $R_{BE}=50\ \Omega$)	$V_{(BR)CER}$	>20	>20	V
Emitter-base breakdown voltage ($I_{EBO}=100$ µA	$V_{(BR)EBO}$	>3.5	>3.5	V
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	>50	<50	nA
DC forward current transfer ratio ($I_C=5$ to 20 mA; $V_{CE}=6$ V)	h_{FE}	≧25	≧25	–

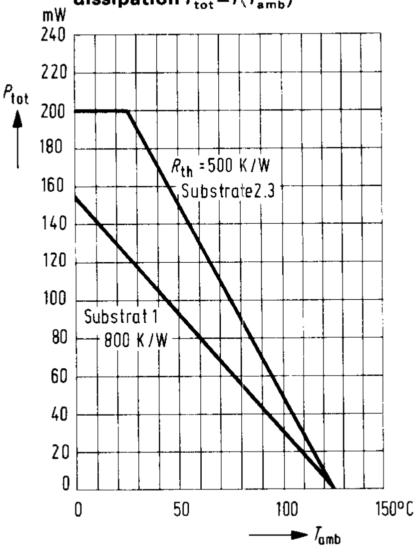
Dynamic characteristics ($T_{amb}=25$ °C)				
Short-circuit forward current transfer ratio ($I_C=5$ mA; $V_{CE}=6$ V; $f=1$ kHz)	h_{21e}	70	70	–
Current-gain bandwidth product ($I_C=20$ mA; $V_{CE}=10$ V; $f=500$ MHz)	f_T	4.2	–	GHz
($I_C=10$ mA; $V_{CE}=6$ V; $f=500$ MHz)	f_T	–	3.3	GHz
($I_C=20$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	–	3	GHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=6$ V; $f=1$ MHz)	$-C_{12e}$	0.38	0.38	pf
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	0.7	0.7	pf
Noise figure				
($I_C=2$ mA; $V_{CE}=6$ V; $f=1$ MHz; $R_g=100\ \Omega$)	NF	–	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=200$ MHz; $R_g=100\ \Omega$)	NF	2	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60\ \Omega$)	NF	2.5	3	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=2$ GHz; $R_g=R_{gopt}$)	NF	4	5.5	db
Power gain				
($I_C=15$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60\ \Omega$; $Z_L=Z_{Lopt}$)	G_{pe}	13	–	db

BFR 35 A:

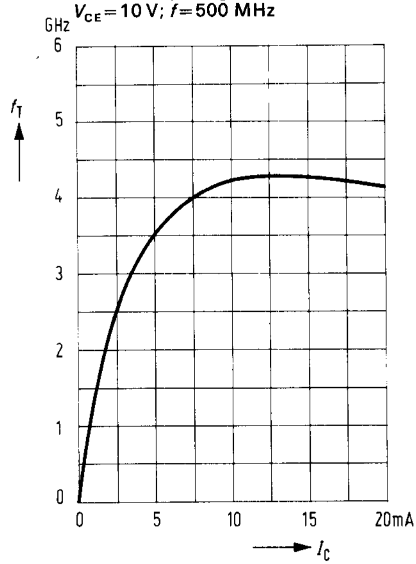
S-parameters at $V_{CE}=6$ V: $I_C=15$ mA; $Z_0=50\ \Omega$

$f=200$ MHz	$f=800$ MHz
$S_{11e}=0.33$; $\varphi_{11e}=-90°$	$S_{11e}=0.2$; $\varphi_{11e}=-175°$
$S_{22e}=0.68$; $\varphi_{22e}=-20°$	$S_{22e}=0.5$; $\varphi_{22e}=-20°$
$S_{12e}=0.028$; $\varphi_{12e}=+70°$	$S_{12e}=0.07$; $\varphi_{12e}=+75°$
$S_{21e}=15.5$; $\varphi_{21e}=+120°$	$S_{21e}=4.3$; $\varphi_{21e}=+80°$

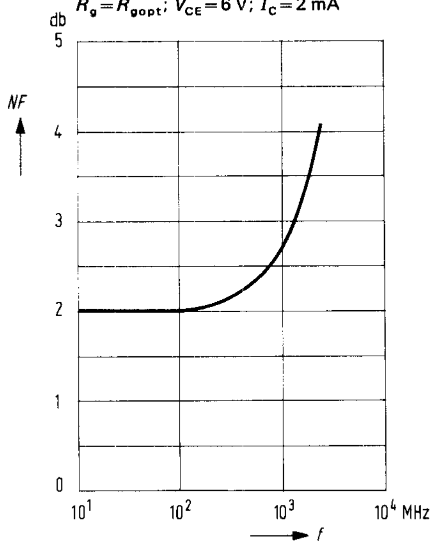
Total permissible power dissipation $P_{tot} = f(T_{amb})$



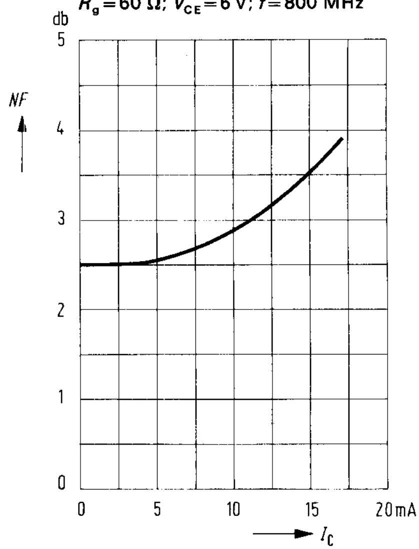
Current-gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 10$ V; $f = 500$ MHz



Noise figure $NF = f(f)$
$R_g = R_{gopt}$; $V_{CE} = 6$ V; $I_C = 2$ mA



Noise figure $NF = f(I_C)$
$R_g = 60\ \Omega$; $V_{CE} = 6$ V; $f = 800$ MHz

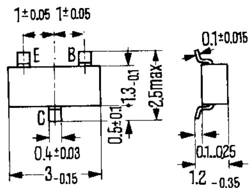


NPN Silicon planar RF transistor

BFS 17 is an epitaxial NPN silicon planar RF transistor in a plastic package 23 A 3 DIN 41869 (SOT-23), for use in film circuits up into the GHz range.

The transistor marked: MA

Type	Code	Order number
BFS 17	MA	Q62702-F337



Weight approx. 0.02 g   Dimensions in mm

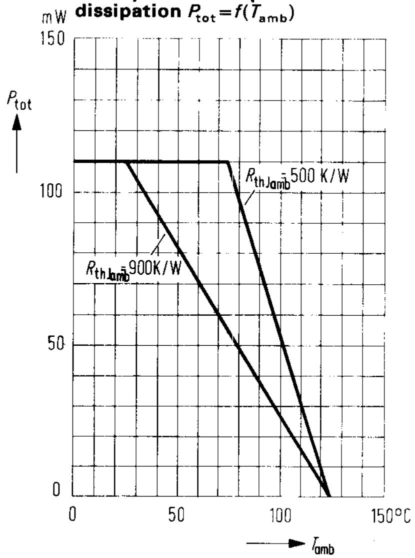
Maximum ratings		BFS 17	
Collector-emitter voltage	V_{CEO}	15	V
Collector-base voltage	V_{CBO}	25	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	25	mA
Maximum collector current	I_{CM}	50	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−65 to +125	°C
Total power dissipation ($T_{amb} \leqq 25$ °C)	P_{tot}	110	mW
Thermal resistance			
Junction to air, mounted on			
5 × 5 × 1 mm glass substrate	R_{thJamb}	<900	K/W
24 × 12 × 1.5 mm glass-fiber substrate	R_{thJamb}	<500	K/W

Static characteristics ($T_{amb}=25$ °C)			
Collector-base cutoff current			
($V_{CBO}=10$ V)	I_{CBO}	<50	nA
($V_{CBO}=10$ V; $T_j=100$ °C)	I_{CBO}	<10	µA
Collector-emitter breakdown voltage ($I_{CEO}=10$ mA)	$V_{(BR)CEO}$	>15	V
Forward current transfer ratio			
($I_C=2$ mA; $V_{CE}=1$ V)	h_{FE}	20 to 150	–
($I_C=25$ mA; $V_{CE}=1$ V)	h_{FE}	≧20	–

Dynamic characteristics (T_{amb} = 25 °C)

		BFS 17	
Current-gain bandwidth product (I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz)	f_T	1	GHz
(I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz)	f_T	1.3	GHz
Feedback capacitance (I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz)	$-C_{12e}$	0.65	pf
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	$\leqq$1.5	pf
Noise figure (I_C = 2 mA; V_{CE} = 5 V; R_g = 50 Ω; f = 500 MHz)	NF	4.5	db

Total permissible power dissipation $P_{tot} = f(T_{amb})$

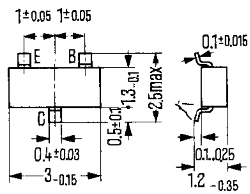


NPN Silicon planar RF transistor

BFS 20 is an epitaxial NPN silicon planar RF transistor in a plastic package 23 A 3 DIN 41869 (SOT-23), designed for use in film circuits.

The transistor is marked: NA

Type	Code	Order number
BFS 20	NA	Q62702-F350



Weight approx. 0.02 g
Dimensions in mm

Maximum ratings		BFS 20	
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	30	V
Emitter-base voltage	V_{EBO}	4	V
Collector current	I_C	25	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−65 to +125	°C
Total power dissipation[1])	P_{tot}	110[1])	mW
Thermal resistance			
Junction to air, mounted on			
5 × 5 × 1 mm glass substrate	R_{thJamb}	$\leqq$900	K/W
24 × 12 × 1.5 mm glass-fiber substr.	R_{thJamb}	$\leqq$500	K/W

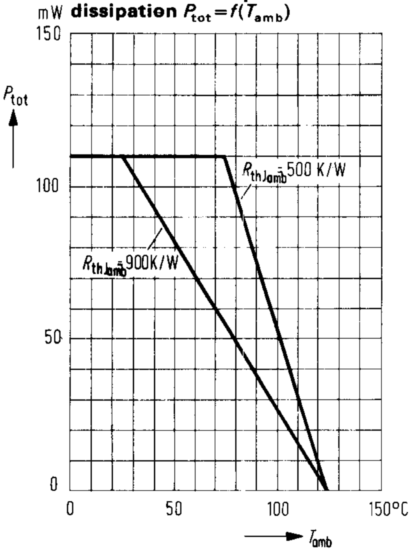
[1]) The permissible total power dissipation is given by the respective thermal resistance conditioned by mounting, in accordance with

$$P_{perm} = \frac{T_{j\,max} - T_{amb}}{R_{thJamb}}.$$

Static characteristics ($T_{amb}=25$ °C)		**BFS 20**	
Collector-emitter breakdown voltage ($I_{CEO}=2$ mA)	$V_{(BR)CEO}$	≧20	V
Collector-base cutoff current ($V_{CBO}=20$ V)	I_{CBO}	<100	nA
($V_{CBO}=20$ V; $T_j=100$ °C)	I_{CBO}	<10	µA
Base-emitter voltage ($V_{CE}=10$ V; $I_C=7$ mA)	V_{BE}	740 (≦900)	mV
Forward current transfer ratio ($V_{CE}=10$ V; $I_C=7$ mA)	h_{FE}	85 (≧40)	–

Dynamic characteristics ($T_{amb}=25$ °C)			
Current-gain bandwidth product ($V_{CE}=10$ V; $I_C=5$ mA; $f=100$ MHz)	f_T	450 (≧275)	MHz
Feedback capacitance ($V_{CE}=10$ V; $I_C=1$ mA; $f=1$ MHz)	$-C_{12e}$	0.35	pf
Collector-base capacitance ($V_{CB}=10$ V; $f=1$ MHz)	C_{CBO}	0.8	pf

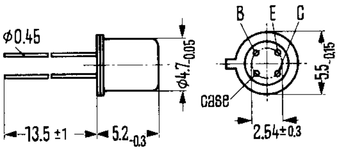
Permissible total power dissipation $P_{tot}=f(T_{amb})$



NPN Transistor for RF applications up to the GHz range

BFS 55 is a NPN silicon RF transistor in a case 18 A 4 DIN 41876 (TO-72). The terminals are electrically insulated from the case. The transistor is especially designed for use in RF applications up into the GHz range, e.g., antenna amplifiers and radar IF amplifiers and satellite engineering.

Type	Order number
BFS 55	Q62702-F272



Weight approx. 0.3 g   Dimensions in mm

Maximum ratings		**BFS 55**	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	50	mA
Base current	I_B	10	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation (T_{amb}=45 °C)	P_{tot}	325	mW
Thermal resistance			
Junction to air	R_{thJamb}	≦700	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

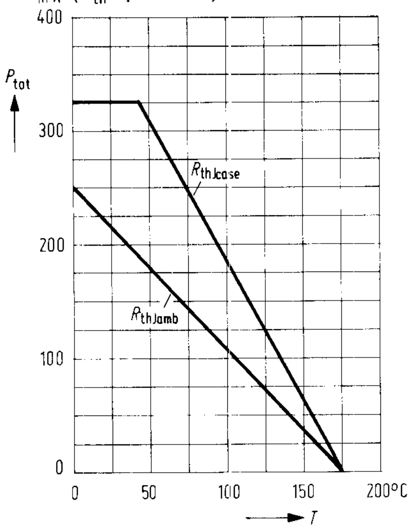
Static characteristics (T_{amb}=25 °C)		BFS 55	
Collector-emitter breakdown voltage (I_C=0.5 mA; I_B=0)	$V_{(BR)CEO}$	>12	V
Collector-emitter breakdown voltage (I_C=10 mA; R_{BE}=50 Ω)	$V_{(BR)CER}$	>20	V
Emitter-base breakdown voltage (I_E=0.1 mA; I_C=0)	$V_{(BR)EBO}$	>3.5	V
Collector-base cutoff current (V_C=10 V; I_E=0)	I_{CBO}	<50	nA
Forward current transfer ratio (I_C=25 mA; V_{CE}=8 V)	h_{FE}	>30	–
(I_C=50 mA; V_{CE}=5 V)	h_{FE}	>30	–

Dynamic characteristics (T_{amb}=25 °C)			
Small-signal short-circuit forward current transfer ratio (I_C=25 mA; V_{CE}=8 V; f=1 kHz)	h_{fe}	70	–
Current-gain bandwidth product (f=500 MHz; I_C=25 mA; V_{CE}=8 V)	f_T	3.3	GHz
Feedback capacitance (f=1 MHz; I_C=1 mA; V_{CE}=8 V)	$-C_{12e}$	0.65	pf
Output capacitance (f=1 MHz; V_{CBO}=8 V)	C_{CBO}	0.85	pf
Noise figure (I_C=25 mA; V_{CE}=8 V; f=800 MHz; R_g=60 Ω)	NF	5	db
Power gain (I_C=25 mA; V_{CE}=8 V; f=800 MHz; R_g=R_L=50 Ω)	G_{pe}	10	db
Output voltage (I_C=25 mA; V_{CE}=8 V; f=800 MHz; R_g=R_L=50 Ω; d_{IM}=60 db; f_1=798 MHz; f_2=802 MHz)	V_O	200	mV

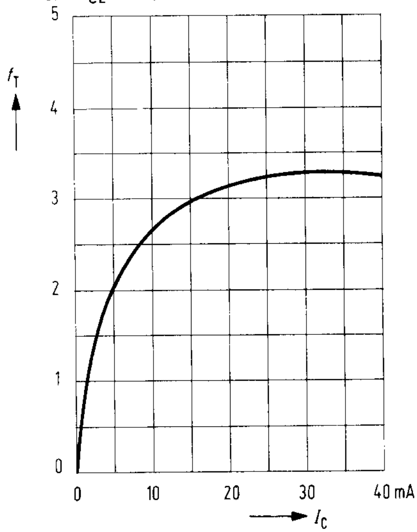
S-parameters at V_{CE}=8 V; I_C=25 mA; Z_O=50 Ω

f=200 MHz	f=800 MHz
S_{11e}= 0.2; φ_{11e}=+ 76°	S_{11e}=0.05; φ_{11e}=+170°
S_{22e}= 0.55; φ_{22e}=– 26°	S_{22e}=0.44; φ_{22e}=– 48°
S_{12e}= 0.04; φ_{12e}=+ 70°	S_{12e}=0.12; φ_{12e}=+ 52°
S_{21e}=11.5; φ_{21e}=+100°	S_{21e}=2.9; φ_{21e}=+ 60°

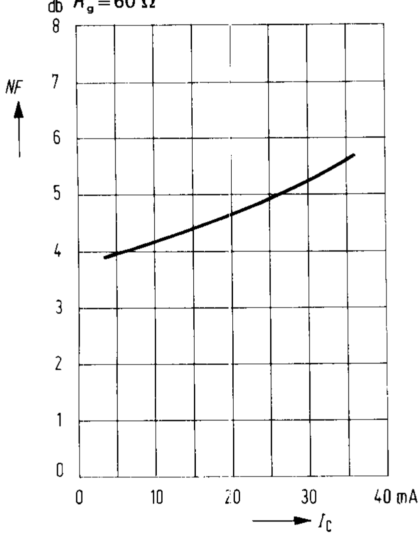
Total permissible power dissipation $P_{tot} = f(T)$
(R_{th} = parameter)



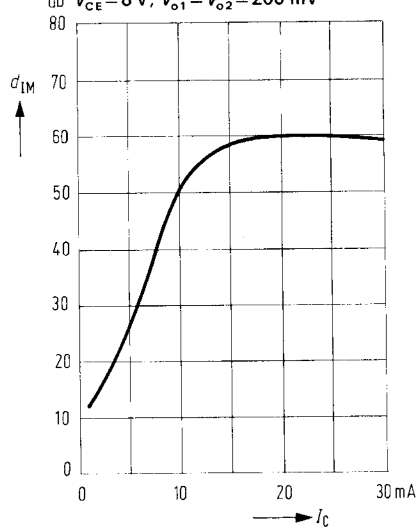
Current gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 8$ V; $f = 500$ MHz



Noise figure $NF = f(I_C)$
$V_{CE} = 8$ V; $f = 800$ MHz
$R_g = 60\ \Omega$



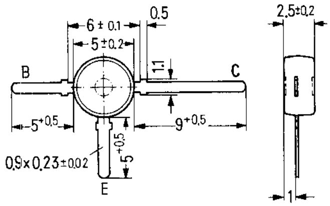
Intermodulation product distance $d_{IM} = f(I_C)$
$f_1 = 798$ MHz; $f_2 = 802$ MHz
$R_g = R_L = 50\ \Omega$
$V_{CE} = 8$ V; $V_{o1} = V_{o2} = 200$ mV



NPN Silicon planar RF transistor

BFT 12 is an epitaxial NPN silicon planar RF transistor in a plastic package 50 B 3 DIN 41867 (sim. TO-50) for universal application in amplifiers up into the GHz range, e.g. for broadband antenna amplifiers with a high output power and linearity and for oscillators.

Type	Order number
BFT 12	Q62702-F390



Weight approx. 0.25 g Dimensions in mm

Maximum ratings		BFT 12	
Collector-base voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	150	mA
Maximum collector current (f > 1 MHz)	I_{CM}	300	mA
Base current	I_B	50	mA
Junction temperature	T_j	150	°C
Storage temperature	T_s	−55 to +150	°C
Total power dissipation	P_{tot}	0.7	W

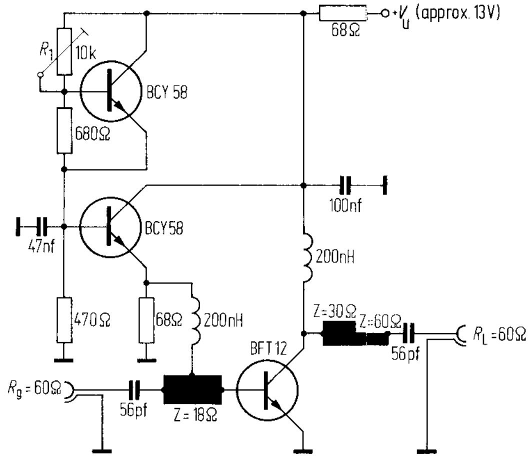
Thermal resistance			
Junction to air	R_{thJamb}	≦250	K/W
Junction to case	$R_{thJcase}$	≦90	K/W
when mounted on wafer	$R_{thJwafer}$	≦120	K/W

		BFT 12	
Static characteristics (T_{amb}=25 °C)			
Collector-base breakdown voltage (I_{CBO}=100 µA)	$V_{(BR)CBO}$	>25	V
Forward current transfer ratio (I_C=50 mA; V_{CE}=5 V)	h_{FE}	≧25	–
Dynamic characteristics (T_{amb}=25 °C)			
Current-gain bandwidth product (I_C=80 mA; V_{CE}=5 V; f=200 MHz)	f_T	2	GHz
Feedback capacitance (I_C=5 mA; V_{CE}=10 V; f=1 MHz)	$-C_{12e}$	2.4	pf
Open-circuit output capacitance (V_{CBO}=10 V; f=1 MHz)	C_{CBO}	3	pf
Power gain (I_C=40 mA; V_{CE}=7.5 V; f=800 MHz)	G_p	7.5	db
(I_C=80 mA; V_{CE}=7.5 V; f=800 MHz)	G_p	8	db
Noise figure (R_g=60 Ω; I_C=40 mA; V_{CE}=7.5 V; f=800 MHz)	NF	6.5	db
Output voltage (I_C=80 mA; V_{CE}=7.5 V; f=800 MHz; d_{IM}=60 db;) simulated SSB test method	V_o	700	mV

S-parameters at V_{CE}=7.5 V; I_C=70 mA; Z_o=50 Ω

f=200 MHz	f=800 MHz
S_{11e}=0.67; φ_{11e}=+177°	S_{11e}=0.66; φ_{11e}=+153°
S_{22e}=0.15; φ_{22e}=− 95°	S_{22e}=0.2; φ_{22e}=−116°
S_{12e}=0.04; φ_{12e}=+ 73°	S_{12e}=0.14; φ_{12e}=+ 68°
S_{21e}=6.4; φ_{21e}=+ 83°	S_{21e}=1.6; φ_{21e}=+ 44°

Circuit diagram: Broadband RF amplifier



Mounted on a double-backed chip
(Dimensioned drawing and suggested arrangement available upon request).

Test condition (set with R_1):
$I_C = 80$ mA; $V_{CE} = 7.5$ V

At $f = 800$ MHz and an intermodulation product distance of $d_{IM} = 60$ db[1]), the following values are obtained:

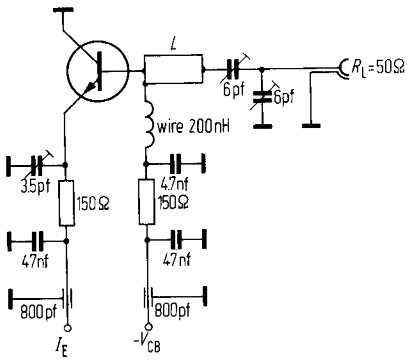
Output voltage $V_o = 700$ mV
Power gain $G_p = 8$ db
(cf. curve $G_p = f(f)$)

[1]) Simulated SSB test method; $f_1 = 800$ MHz; $f_2 = 804$ MHz.

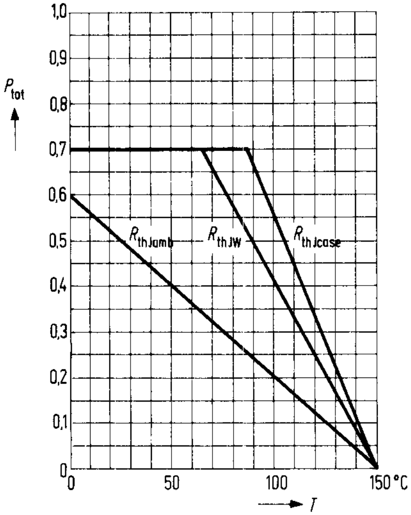
Oscillator diagram

$f = 1$ GHz, $L = 15$ mm strip-line

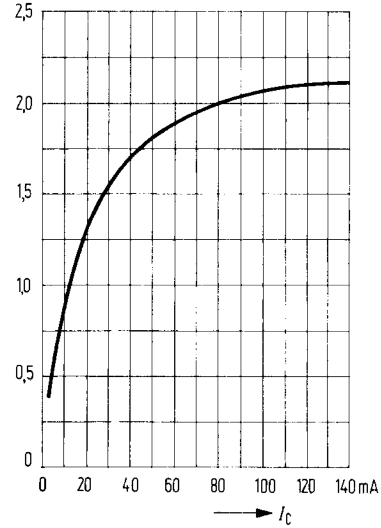
$Z_o = 50\ \Omega$



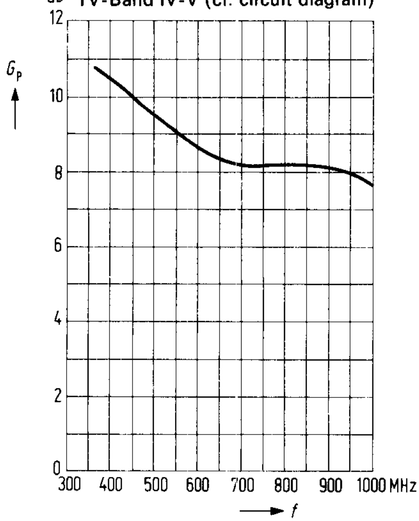
Total permissible power dissipation $P_{tot} = f(T)$
W (R_{th} = parameter)



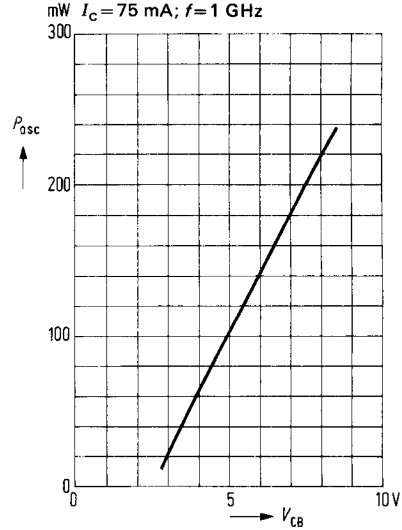
Current-gain bandwidth product $f_T = f(I_C)$
GHz V_{CE} = 5 V; f = 100 MHz



Power gain $G_p = f(f)$
I_C = 80 mA; V_{CE} = 7.5 V
db TV-Band IV-V (cf. circuit diagram)



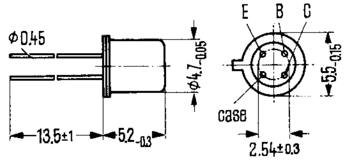
Oscillator output power $P_{osc} = f(V_{CB})$
mW I_C = 75 mA; f = 1 GHz



NPN Silicon planar RF transistor

BFW 16 A is an epitaxial NPN silicon planar RF transistor in a case 5 C 3 DIN 41873 (TO-39). The collector is electrically connected to the case. This transistor is designed for universal application up into the GHz range, e.g. for driver and output stages of channel and band antenna amplifiers up to band V, as well as for vertical amplifier output stages in broadband oscillographs.

Type	Order number
BFW 16 A	Q62702-F319



Weight approx. 1.6 g
Dimensions in mm

Maximum ratings		BFW 16 A	
Collector-base voltage	V_{CBO}	40	V
Collector-emitter voltage ($R_{BE} \leqq 50\ \Omega$)	V_{CER}	40	V
Collector-emitter voltage	V_{CEO}	25	V
Emitter-base voltage	V_{EBO}	2	V
Collector current	I_C	150	mA
Maximum collector current ($f \geqq 1$ MHz)	I_{CM}	300	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation	P_{tot}	1.5	W
Thermal resistance			
Junction to air	R_{thJamb}	$\leqq$250	K/W
Junction to case	$R_{thJcase}$	$\leqq$50	K/W

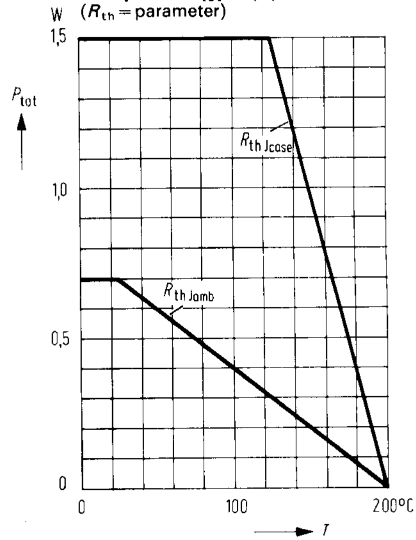
Static characteristics ($T_{amb}=25$ °C)

		BFW 16 A	
Collector-base cutoff current ($V_{CBO}=20$ V; $T_{amb}=150$ °C)	I_{CBO}	≦20	µA
Collector-emitter saturation voltage ($I_C=100$ mA)	V_{CEsat}[1])	≦0.75	V
Forward current transfer ratio ($I_C=$ 50 mA; $V_{CE}=5$ V)	h_{FE}	≧25	–
($I_C=150$ mA; $V_{CE}=5$ V)	h_{FE}	≧25	–

Dynamic characteristics ($T_{amb}=25$ °C)

Current-gain bandwidth product ($I_C=150$ mA; $V_{CE}=15$ V; $f=200$ MHz)	f_T	1.2	GHz
Feedback capacitance ($I_C=10$ mA; $V_{CE}=15$ V; $f=1$ MHz)	$-C_{12e}$	1.7	pf
Collector-base capacitance ($V_{CBO}=15$ V; $f=1$ MHz)	C_{CBO}	≦4	pf
Power gain ($I_C=70$ mA; $V_{CE}=18$ V; $f=200$ MHz)	G_p	16	db
($I_C=70$ mA; $V_{CE}=18$ V; $f=800$ MHz)	G_p	6.5	db
Noise figure ($I_C=30$ mA; $V_{CE}=15$ V; $f=200$ MHz; $R_g=75$ Ω)	NF	≦6	db

Total permissible power dissipation $P_{tot}=f(T)$
(R_{th} = parameter)

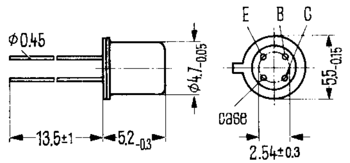


[1]) For that characteristic passing at constant I_B through the point $I_C=110$ mA; $V_{CE}=1$V.

NPN Silicon planar RF transistor

BFW 30 is an epitaxial NPN silicon planar RF transistor in a case 18 A 4 DIN 41876 (TO-72), designed for universal application up into the GHz range, e.g. for vertical amplifiers in broadband oscillographs and for broadband antenna amplifiers. Terminals E, B, C are insulated from the case.

Type	Order number
BFW 30	Q62702-F320



Weight approx. 0.4 g Dimensions in mm

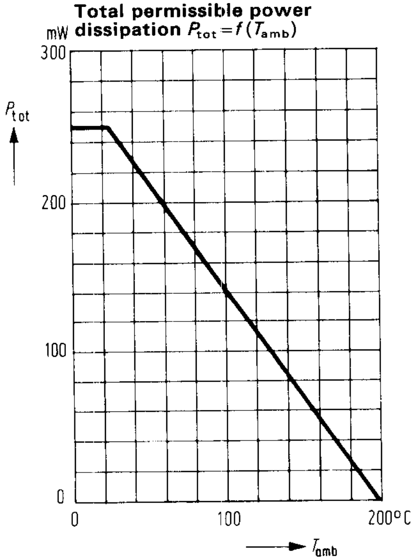
Maximum ratings		BFW 30	
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	50	mA
Maximum collector current ($f \geqq 1$ MHz)	I_{CM}	100	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{amb} \leqq 25$ °C)	P_{tot}	250	mW
Thermal resistance			
Junction to air	R_{thJamb}	≦700	K/W
Junction to case	$R_{thJcase}$	≦500	K/W

Static characteristics (T_{amb}=25 °C)		BFW 30	
Collector-base cutoff current (V_{CBO}=10 V)	I_{CBO}	≦50	nA
Forward current transfer ratio (I_C=25 mA; V_{CE}=5 V)	h_{FE}	≧25	–
(I_C=50 mA; V_{CE}=5 V)	h_{FE}	≧25	–

Dynamic characteristics (T_{amb}=25 °C)

Current-gain bandwidth product (I_C=50 mA; V_{CE}=5 V; f=500 MHz)	f_T	1.6	GHz
Feedback capacitance (I_C=2 mA; V_{CE}=5 V; f=1 MHz)	$-C_{12e}$	0.8	pf
Collector-base capacitance (V_{CBO}=5 V; f=1 MHz)	C_{CBO}	≦1.5	pf
Power gain (I_C=30 mA; V_{CE}=5 V; f=200 MHz)	G_{pe}	21 (≧19)	db
(I_C=30 mA; V_{CE}=5 V; f=800 MHz)	G_{pe}	7.5	db
Noise figure (I_C=2 mA; V_{CE}=5 V; f=500 MHz; R_g=50 Ω)	NF	≦5	db

Total permissible power dissipation $P_{tot}=f(T_{amb})$

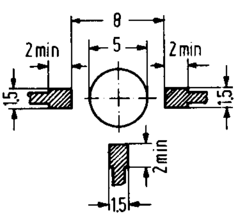


NPN Silicon planar RF transistor

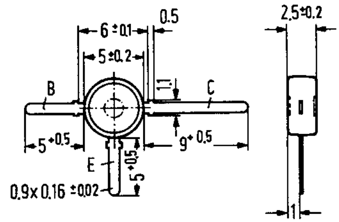
BFW 92 is an epitaxial NPN silicon planar RF transistor in a plastic package 50 B 3 DIN 41867 for use as RF amplifiers up into the GHz range, e.g. for broadband antenna amplifiers.

Type	Order number
BFW 92	Q62702-F321

Hole and terminals of chip



Material: Epoxy glass
40 mm × 25 mm × 1 mm



Weight approx. 0.25 g Dimension in mm

Maximum ratings		BFW 92	
Collector-base voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	25	mA
Maximum collector current (f > 1 MHz)	I_{CM}	50	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−40 to + 125	°C
Total power dissipation	P_{tot}	130	mW
Thermal resistance			
Junction to ambient air (when mounted on wafer)	R_{thJamb}	400	K/W

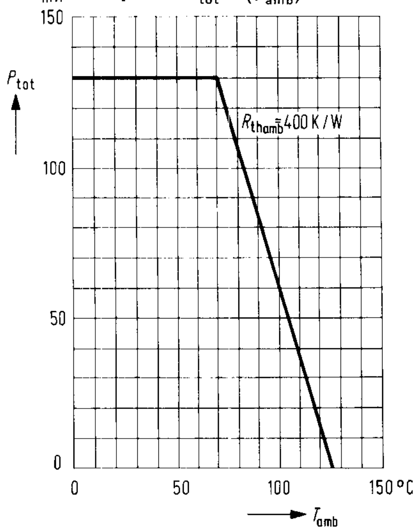
Static characteristics ($T_{amb}=25$ °C)

		BFW 92	
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	≦50	nA
Collector-emitter saturation voltage ($I_C=20$ mA)	V_{CEsat}[1])	≦0.75	V
Forward current transfer ratio ($I_C=2$ mA; $V_{CE}=1$ V)	h_{FE}	20 to 150	–
($I_C=25$ mA; $V_{CE}=1$ V)	h_{FE}	≧20	–

Dynamic characteristics ($T_{amb}=25$ °C)

Current-gain bandwidth product ($I_C=25$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	1.6	GHz
Feedback capacitance ($I_C=2$ mA; $V_{CE}=5$ V; $f=1$ MHz)	$-C_{12e}$	0.6	pf
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	0.7	pf
Power gain ($I_C=10$ mA; $V_{CE}=10$ V; $f=200$ MHz)	G_p	23	db
($I_C=10$ mA; $V_{CE}=10$ V; $f=800$ MHz)	G_p	11	db
Noise figure ($I_C=2$ mA; $V_{CE}=5$ V; $f=500$ MHz; $R_g=50$ Ω)	NF	4	db

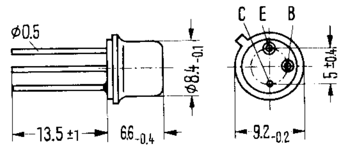
Total permissible power dissipation $P_{tot}=f(T_{amb})$



[1]) For that characteristic passing at constant I_B through the point $I_C=22$ mA; $V_{CE}=1$ V.

NPN Transistor for VHF output stages in antenna amplifiers

BFX 55 is an epitaxial NPN silicon planar transistor in a case 5 C 3 DIN 41873 (TO-39). The collector has been electrically connected to the case. The transistor is especially suitable for use in the VHF output stages of channel- and wideband antenna amplifiers.

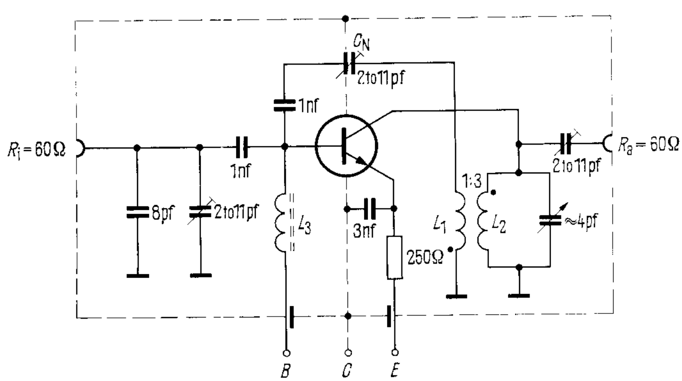


Weight approx. 1.5 g Dimensions in mm

Type	Order number
BFX 55	Q 60206-X 55

Maximum ratings		BFX 55	
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	400	mA
Base current	I_B	100	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation (T_{case} = 45 °C)	P_{tot}	2.2	W
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦220	K/W
Junction to case	$R_{thJcase}$	≦60	K/W

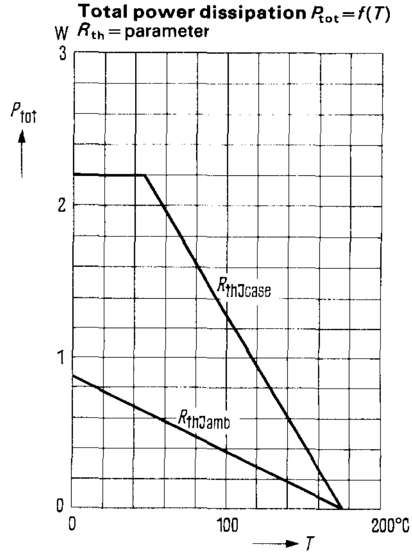
Circuit for measuring power gain
f = 200 MHz (Transistor cooled by mounted radiator of R_{th} = 30 K/W)



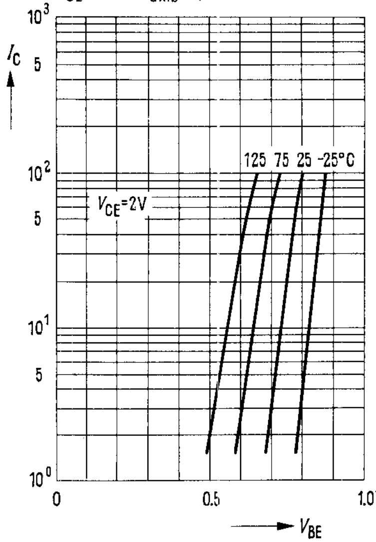
L_1 1 turn 0.5 CuLS (enameled, silk insulated copper wire)
L_2 3 turns 6.5 ∅, spacing 1.5 mm, 1 ∅ silvered Cu
L_3 20 turns 0.5 CuLS on Siferrit core B 63310-A 3004-X 025 transformed load resistance R_L = 450 Ω

		BFX 55	
Static characteristics ($T_{amb}=25$ °C)			
Collector-base cutoff current ($V_{CBO}=40$ V)	I_{CBO}	≦50	nA
Collector-base breakdown voltage ($I_{CBS}=100$ µA)	$V_{(BR)CBS}$	>60	V
Forward current transfer ratio ($I_C=50$ mA; $V_{CE}=5$ V)	h_{FE}	30 to 160	–
Dynamic characteristics ($T_{amb}=25$ °C)			
Current-gain bandwidth product ($I_C=50$ mA; $V_{CE}=15$ V)	f_T	>500	MHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=10$ V; $f=1$ MHz)	$-C_{12e}$	2.5 (<3.5)	pf
Power gain in common emitter circuit ($f=200$ MHz; $R_L=450$ Ω; see circuit) ($I_C=40$ mA; $V_{CB}=25$ V)	G_{pe}	16	db
Output voltage on 60 Ω ($I_C=40$ mA; $V_{CB}=25$ V; adjacent channel interference separation=30 db)	V_{Aeff}	2.4	V

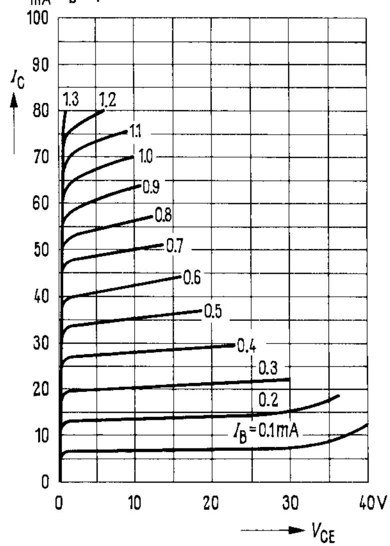
Total power dissipation $P_{tot}=f(T)$



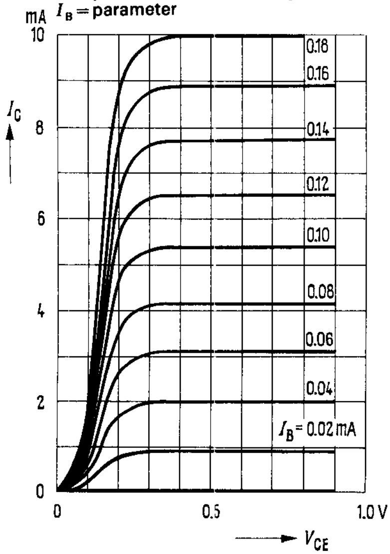
Collector current $I_C = f(V_{BE})$
$V_{CE} = 2$ V; T_{amb} = parameter



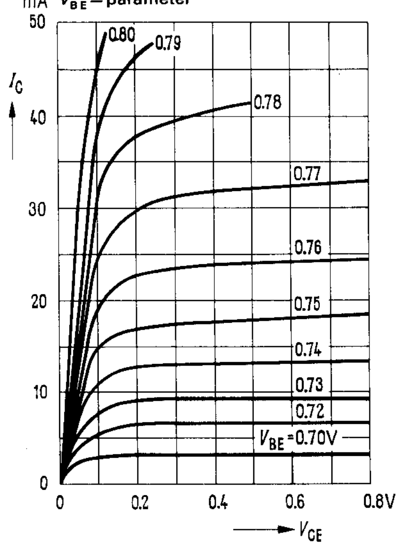
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



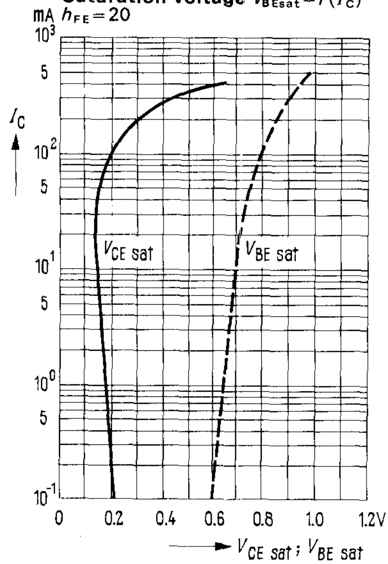
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



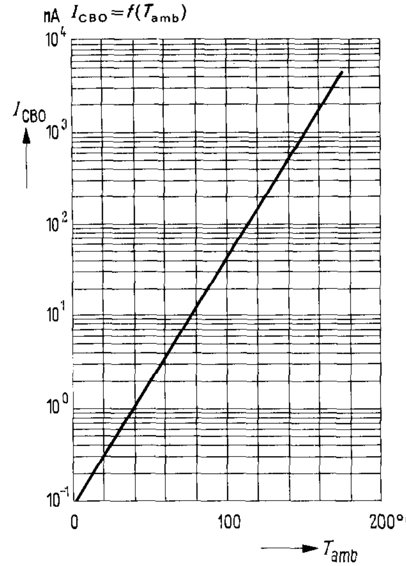
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter



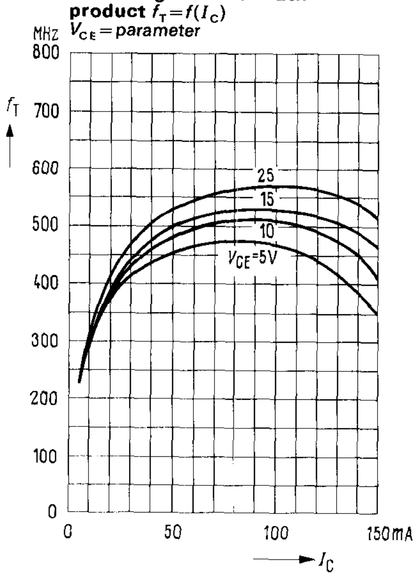
Saturation voltage $V_{CEsat} = f(I_C)$
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 20$



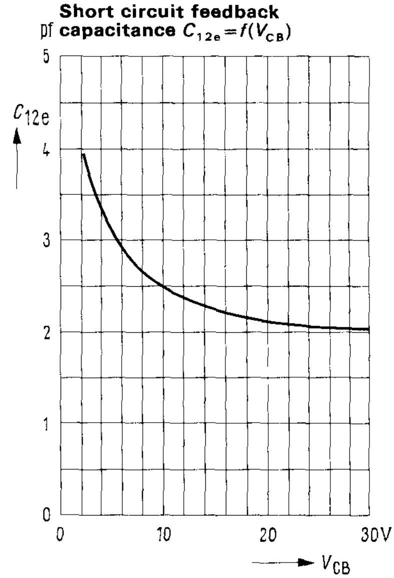
Collector-base cutoff current
$I_{CBO} = f(T_{amb})$



Current-gain bandwidth product $f_T = f(I_C)$
V_{CE} = parameter



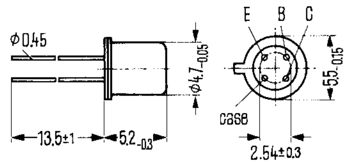
Short circuit feedback capacitance $C_{12e} = f(V_{CB})$



NPN Transistor for low-power driver and output stages in antenna amplifiers

BFX 59 is an epitaxial NPN silicon planar RF transistor in a case 18 A 4 DIN 41876 (TO-72). The leads are electrically insulated from the case. BFX 59 is suitable for use in low-power amplifier, driver and power stages at frequencies up to the UHF range.

Type	Order number
BFX 59	Q60206-X59

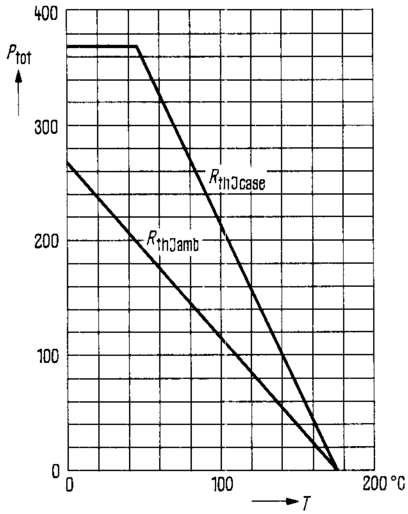


Weight approx. 0.4 g Dimensions in mm

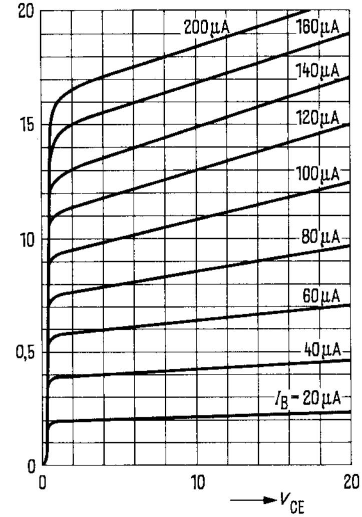
Maximum ratings		BFX 59	
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	30	V
Emitter-base voltage	V_{EBO}	3	V
Collector current	I_C	100	mA
Base current	I_B	30	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	370	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦650	K/W
Junction to case	$R_{thJcase}$	≦350	K/W

		BFX 59	
Static characteristics ($T_{amb}=25$ °C)			
Collector-base cutoff current ($V_{CBO}=20$ V)	I_{CBO}	0.3 ($\leqq$10)	nA
Collector-emitter breakdown voltage ($I_{CEO}=10$ mA)	$V_{(BR)CEO}$	>20	V
Emitter-base-breakdown voltage ($I_{EBO}=10$ µA)	$V_{(BR)EBO}$	>3	V
Dynamic characteristics ($T_{amb}=25$ °C)			
Short circuit forward current transfer ratio ($I_C=10$ mA; $V_{CE}=10$ V; $f=1$ kHz)	h_{21e}	30 to 200	–
Current gain-bandwidth product ($I_C=8$ mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	900 (>600)	MHz
($I_C=20$ mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	1000 (>700)	MHz
Short circuit feedback capacitance ($I_C=1$ mA; $V_{CB}=10$ V; $f=1$ MHz)	$-C_{12e}$	0.4 to 0.6	pf
Feedback time constant ($I_C=10$ mA; $V_{CB}=10$ V; $f=30$ MHz)	$r_{bb'} \cdot C_{b'c}$	4	ps
Noise figure ($I_C=3$ mA; $V_{CE}=10$ V; $f=200$ MHz; $R_g=60$ Ω)	NF	3.4 (<4.5)	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=300$ kHz; $R_g=300$ Ω)	NF	2.6	db

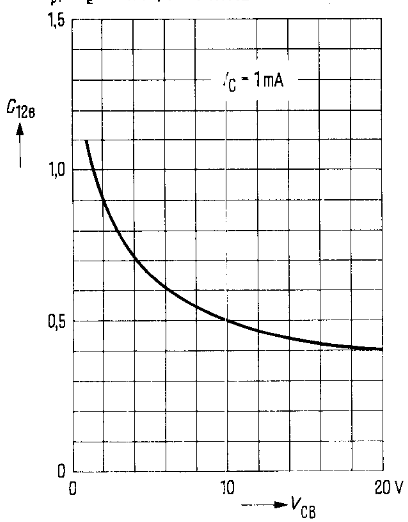
Total power dissipation
$P_{tot} = f(T)$; R_{th} = parameter



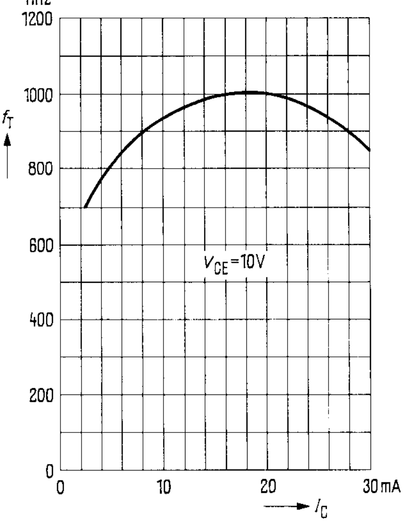
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



Short-circuit feadback capacitance $C_{12e} = f(V_{CB})$
I_E = 1 mA; f = 1 MHz



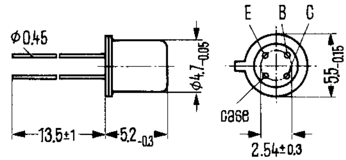
Current gain bandwidth product $f_T = f(I_C)$
f = 100 MHz



NPN Transistor for driver and output stages in antenna amplifiers

BFX 59 F is an epitaxial NPN silicon planar RF transistor in a case 18 A 4 DIN 41 876 (TO-72). The leads are electrically insulated from the case. BFX 59 F is suitable for use in low-power driver and output stages up to the UHF range, especially at a higher collector current.

Type	Order number
BFX 59 F	Q 60206-X 59-S 5



Weight approx. 0.4 g   Dimensions in mm

Maximum ratings		BFX 59 F	
Collector-emitter voltage	V_{CEO}	20	V
Collector-base voltage	V_{CBO}	30	V
Emitter-base voltage	V_{EBO}	3	V
Collector-current	I_C	100	mA
Base current	I_B	30	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation (T_{case} = 45 °C)	P_{tot}	370	mW

Thermal resistance

Junction to ambient air	R_{thJamb}	≦650	K/W
Junction to case	$R_{thJcase}$	≦350	K/W

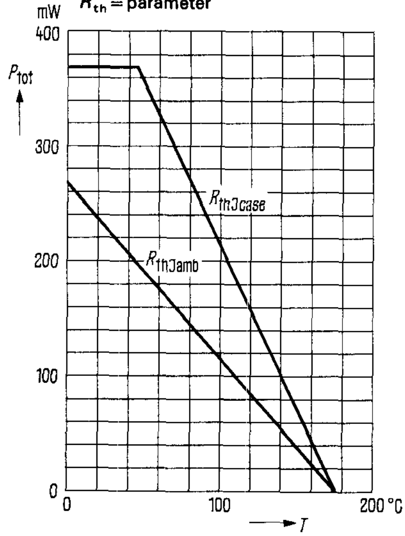
Static characteristics ($T_{amb}=25$ °C)

		BFX 59 F	
Collector-base cutoff current ($V_{CBO}=20$ V)	I_{CBO}	0.3 (≦10)	nA
Collector-emitter breakdown voltage ($I_{CEO}=10$ mA)	$V_{(BR)CEO}$	>20	V
Emitter-base breakdown voltage ($I_{EBO}=10$ μA)	$V_{(BR)EBO}$	>3	V

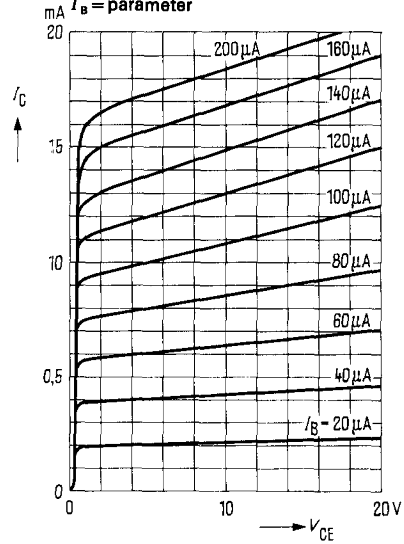
Dynamic characteristics ($T_{amb}=25$ °C)

Short-circuit forward current transfer ratio ($I_C=10$ mA; $V_{CE}=10$ V; $f=1$ kHz)	h_{21e}	30 to 200	–
Current-gain bandwidth product ($I_C=$ 8 mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	900 (>600)	MHz
($I_C=20$ mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	1050 (>700)	MHz
($I_C=35$ mA; $V_{CE}=10$ V; $f=100$ MHz)	f_T	1000 (>700)	MHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CB}=10$ V; $f=1$ MHz)	$-C_{12e}$	0.6 to 0.9	pf
Feedback time constant ($I_C=10$ mA; $V_{CB}=10$ V; $f=30$ MHz)	$r_{bb'} \cdot C_{b'c}$	4	ps
Noise figure ($I_C=3$ mA; $V_{CE}=10$ V; $f=200$ MHz; $R_g=60\ \Omega$)	NF	3.4 (<4.5)	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=300$ kHz; $R_g=300\ \Omega$)	NF	2.6	db

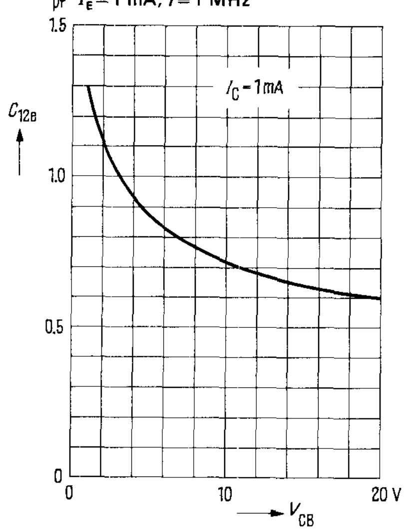
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter



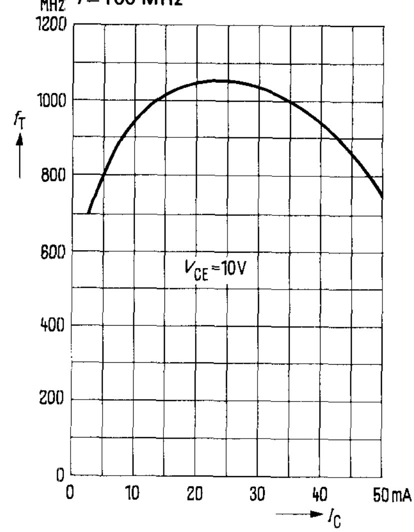
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



Short-circuit feedback capacitance $C_{12e} = f(V_{CB})$
$I_E = 1$ mA; $f = 1$ MHz



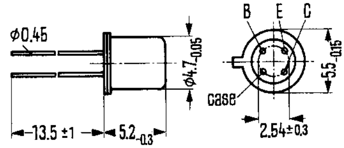
Current-gain bandwidth product $f_T = f(I_C)$
$f = 100$ MHz



NPN Transistor for RF amplifier stages

BFX 60 is an epitaxial NPN silicon planar RF transistor in a case 18 A 4 DIN 41876 (TO-72), with different lead arrangement however. The leads are electrically insulated from the case. The transistor is particularly suitable for common-emitter RF amplifier stages.

Type	Order number
BFX 60	Q60206-X60



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		BFX 60	
Collector-base voltage	V_{CBO}	40	V
Collector-emitter voltage	V_{CEO}	25	V
Emitter-base voltage	V_{EBO}	4	V
Collector current	I_C	25	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation (T_{case}=25 °C)	P_{tot}	370	mW

Thermal resistance

Junction to ambient air	R_{thJamb}	≦650	K/W
Junction to case	$R_{thJcase}$	≦350	K/W

Static characteristics (T_{amb}=25 °C)

Forward current transfer ratio (I_C=7 mA; V_{CE}=10 V)	h_{FE}	100>50	–
Base-emitter voltage (I_C=7 mA; V_{CE}=10 V)	V_{BE}	0.74<0.9	V
Base current (V_{CB}=2 V; $-I_E$=20 mA)	I_B	<1.3	mA
Collector-base cutoff current (V_{CBS}=40 V)	I_{CBS}	<100	nA
Collector-emitter breakdown voltage (I_{CEO}=2 mA)	$V_{(BR)CEO}$	>25	V
Emitter-base breakdown voltage (I_{EBO}=1 µA)	$V_{(BR)EBO}$	>4	V

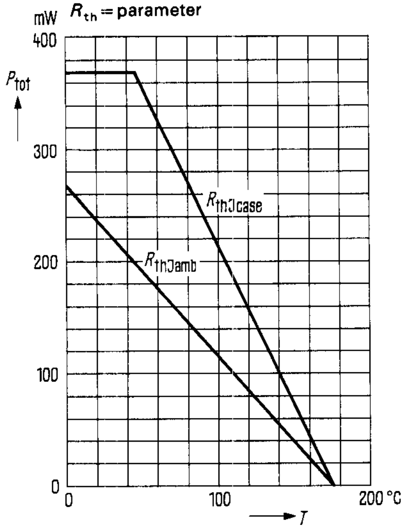
Dynamic characteristics ($T_{amb} = 25$ °C)

		BFX 60	
Current-gain bandwidth product ($V_{CE} = 10$ V; $I_C = 5$ mA; $f = 100$ MHz)	f_T	550 (>400)	MHz
Feedback capacitance ($V_{CE} = 10$ V; $I_C = 1$ mA; $f = 1$ MHz)	$-C_{12e}$	0.23 (<0.3)	pf
Noise figure ($I_C = 2$ mA; $V_{CE} = 10$ V; $f = 200$ MHz; $R_g = 60\ \Omega$)	NF	5	db

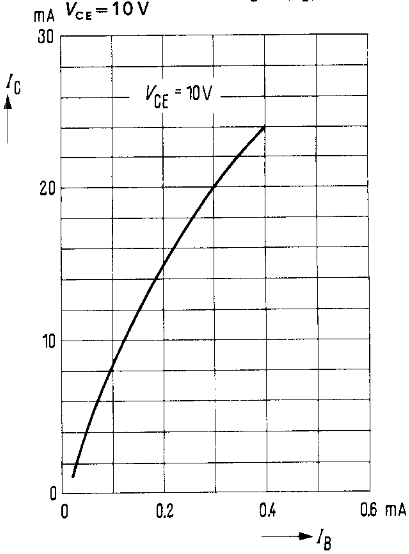
Forward transconductance y_{21e}

at:	$I_C = 2$ mA; $V_{CE} = 10$ V	$I_C = 7$ mA; $V_{CE} = 10$ V
$f = 35$ MHz	$y_{21e} = 67$ mmhos; $\varphi_{21e} = -10°$	$y_{21e} = 140$ mmhos; $\varphi_{21e} = -30°$
$f = 100$ MHz	$y_{21e} = 63$ mmhos; $\varphi_{21e} = -37°$	$y_{21e} = 110$ mmhos; $\varphi_{21e} = -60°$
$f = 200$ MHz	$y_{21e} = 60$ mmhos; $\varphi_{21e} = -60°$	$y_{21e} = 80$ mmhos; $\varphi_{21e} = -90°$

Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter

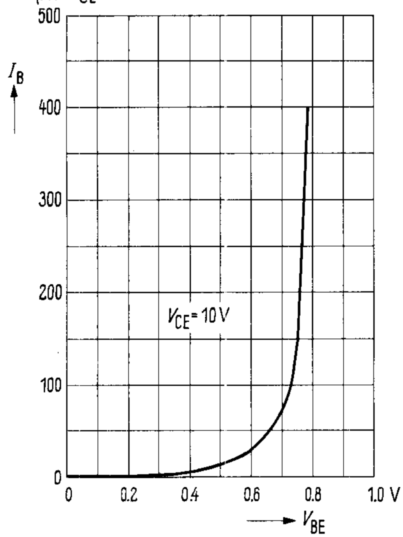


Collector current $I_C = f(I_B)$
$V_{CE} = 10$ V

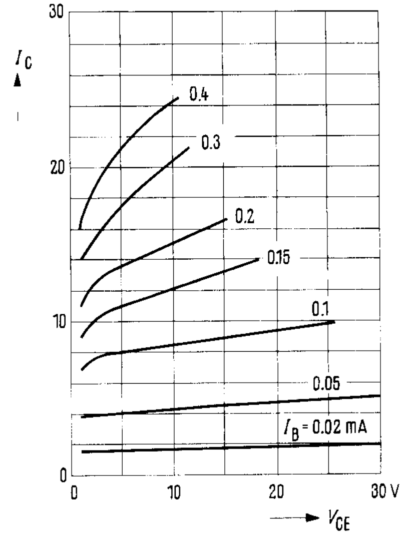


Input characteristic $I_B = f(V_{BE})$

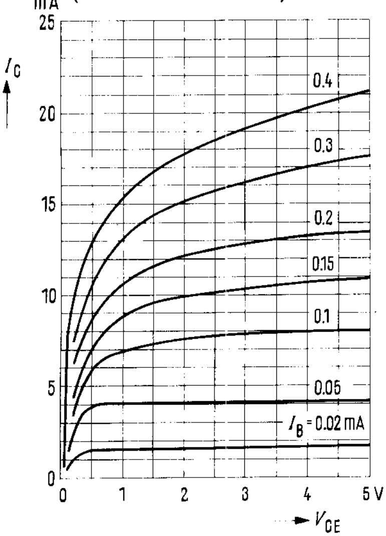
$V_{CE} = 10$ V



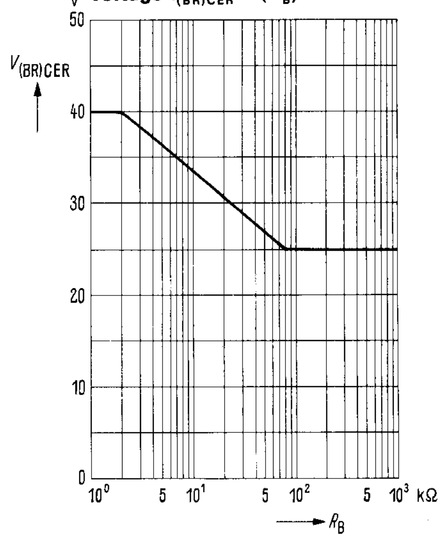
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



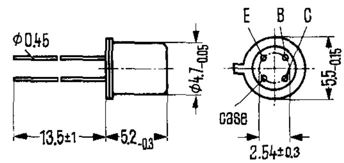
Collector-emitter breakdown voltage $V_{(BR)CER} = f(R_B)$



NPN Transistor for amplifier and oscillator stages up to 1 GHz

BFX 62 is an NPN silicon planar transistor in a case 18A4 DIN 41876 (TO-72). The leads are insulated from the case. The transistor is particularly suitable for amplifier and oscillator stages at frequencies up to 1 GHz.

Type	Order number
BFX 62	Q60206-X62



Weight approx. 0.4 g Dimensions in mm

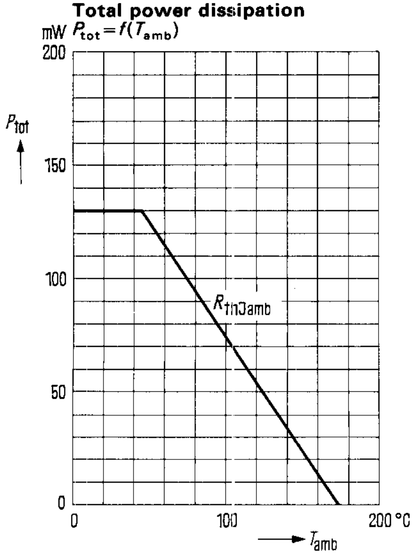
Maximum ratings		BFX 62	
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CEO}	20	V
Emitter-base voltage	V_{EBO}	4	V
Collector current	I_C	12	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−65 to +175	°C
Total power dissipation ($T_{amb} \leqq 45$ °C)	P_{tot}	130	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	1000	K/W

Static characteristics ($T_{amb} = 25$ °C)

Forward current transfer ratio ($I_C = 2$ mA; $V_{CE} = 10$ V)	h_{FE}	40 (>20)	–
Collector-emitter cutoff current ($V_{CEV} = 30$ V; $V_{BE} = 1$ V)	I_{CEV}	<10	µA
Collector-base cutoff current ($V_{CBO} = 20$ V)	I_{CBO}	0.5<50	nA
Emitter-base-cutoff current ($V_{EBO} = 4$ V)	I_{EBO}	<10	µA

Dynamic characteristics ($T_{amb}=25$ °C)		**BFX 62**	
Current gain-bandwidth product ($I_C=2$ mA; $V_{CE}=10$ V)	f_T	675	MHz
Feedback capacitance ($I_C=1$ mA; $V_{CE}=10$ V)	$-C_{12e}$	0.28 < (0.35)	pf
Feedback time constant ($I_C=3$ mA; $V_{CE}=12$ V; $f=30$ MHz)	$r_{bb'} \cdot C_{b'c}$	2.5	ps
Power gain ($I_C=2$ mA; $V_{CE}=10$ V; $f=800$ MHz; $R_g=60\ \Omega$; $R_L=2\ k\Omega$)	G_{pb}	12.5 (> 9)	db
Noise figure			
($I_C=2$ mA; $V_{CE}=10$ V; $f=100$ kHz; $R_g=300\ \Omega$)	NF	4	db
($I_C=2$ mA; $V_{CE}=10$ V; $f=100$ MHz; $R_g=60\ \Omega$)	NF	3 (< 4.5)	db
($I_C=2$ mA; $V_{CE}=10$ V; $f=800$ MHz; $R_g=60\ \Omega$)	NF	5 (< 6.5)	db

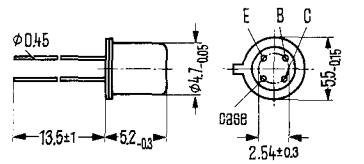
Total power dissipation
$P_{tot}=f(T_{amb})$



NPN Transistor for antenna amplifiers

BFX 89 is an epitaxial NPN silicon RF transistor in a case 18A4 DIN 41876 (TO-72). The leads are electrically insulated from the case. This transistor is suitable for general applications and, for instance, for use in antenna and RF amplifiers up into the GHz range.

Type	Order number
BFX 89	Q62702-F296



Weight approx. 0.4 g Dimensions in mm

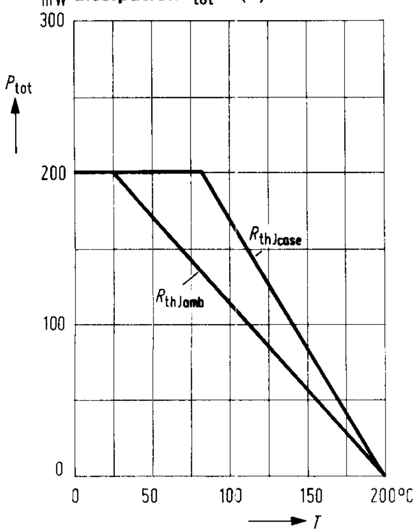
Maximum ratings		**BFX 89**	
Collector-base voltage	V_{CBO}	30	V
Collector-emitter voltage ($R_{BE} \leqq 50\ \Omega$)	V_{CER}	30	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	25	mA
Maximum collector current ($t < 1\ \mu s$)	I_{CM}	50	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{amb} = 60$ °C)	P_{tot}	200	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦700	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

Static characteristics (=25 °C)			
Collector-base cutoff current ($V_{CBO} = 15$ V)	I_{CBO}	≦10	nA
Collector-emitter saturation voltage ($I_C = 20$ mA)	V_{CEsat}	≦0.75	V
Static forward current transfer ratio ($I_C = 2$ mA; $V_{CE} = 1$ V)	h_{FE}	20 to 150	–
($I_C = 25$ mA; $V_{CE} = 1$ V)	h_{FE}	20 to 125	–

Dynamic characteristics (T_{amb}=25 °C)

		BFX 89	
Current-gain bandwidth product			
(I_C= 2 mA; V_{CE}=5 V; f=500 MHz)	f_T	1	GHz
(I_C=25 mA; V_{CE}=5 V; f=500 MHz)	f_T	1.3	GHz
Feedback capacitance			
(I_C=2 mA; V_{CE}=5 V; f=1 MHz)	$-C_{12e}$	0.6	pf
Collector-base capacitance			
(V_{CB}=10 V; I_E=0; f=1 MHz	C_{CBO}	≦1.7	pf
Noise figure (I_C=2 mA; V_{CE}=5 V)			
(f=200 MHz; R_g=100 Ω)	NF	3 (≦4)	db
(f=500 MHz; R_g= 60 Ω)	NF	≦6.5	db
(f=800 MHz; R_g= 60 Ω)	NF	7	db

Total permissible power dissipation $P_{tot}=f(T)$



BFY 33, BFY 34 (2N 1613); BFY 46 (2N 1711)

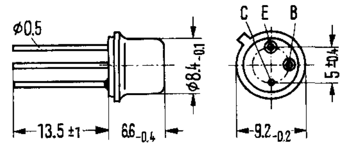
NPN-Transistors for universal RF application

Not for new development

BFY 33, BFY 34 and BFY 46 are double-diffused planar NPN silicon RF-transistors in a case 5 C 3 DIN 41873 (TO-39). The collector is electrically connected to the case. The transistors are for universal application.

BFY 34 corresponds to type 2 N 1613;
BFY 46 corresponds to type 2 N 1711.

Type	Order number
BFY 33	Q 60206-Y 33
BFY 34	Q 60206-Y 34
BFY 46	Q 60206-Y 46



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		BFY 33	BFY 34	BFY 46	
Collector-emitter voltage (I_{CEO} = 30 mA)	V_{CEO}	24	30	30	V
Collector-emitter voltage (R_{BE} < 10 Ω)	V_{CER}	30	50	50	V
Collector-base voltage	V_{CBO}	50	75	75	V
Emitter-base voltage	V_{EBO}	7	7	7	V
Collector current	I_C	500	500	500	mA
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_S	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	2.6	2.6	2.6	W
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦220	≦220	≦220	K/W
Junction to case	$R_{thJcase}$	≦60	≦60	≦60	K/W

Not for new development

Static characteristics ($T_{amb}=25$ °C) BFY 33

At a collector voltage of $V_{CE}=10$ V and the collector currents stated below, the following data apply:

I_C mA	I_B mA	h_{FE} I_C/I_B	V_{BEsat} [3] V	V_{CEsat} [3] V
10 [1]	<0.29	>35*	–	–
150 [1]	<3.75	>40*	–	–
150	15	10	0.95 (<1.3)	0.6 (<1.5)*
500 [1]	<25	>20*	–	–

Collector-base cutoff current ($V_{CBO}=40$ V)	I_{CBO}	0.8 (<20)*	nA
Collector-emitter breakdown voltage ($I_{CER}=100$ mA; $R_{BE}\leqq 10\ \Omega$)	$V_{(BR)CER}$	>30	V
Collector-base breakdown voltage ($I_{CBO}=100\ \mu$A)	$V_{(BR)CBO}$	>50	V
Emitter-base breakdown voltage ($I_{EBO}=100\ \mu$A)	$V_{(BR)EBO}$	>7*	V

Static characteristics ($T_{amb}=25$ °C) BFY 34

For a collector voltage $V_{CE}=10$ V and the listed collector currents I_C:

I_C mA	I_B mA	h_{FE} I_C/I_B	V_{BEsat} [3] V	V_{CEsat} [3] V
0.01	$<0.656\cdot 10^{-3}$	35	–	–
0.1	$2\ (<5)\cdot 10^{-3}$	50 (>20)	–	–
10 [1]	0.29 (<0.5) [2]	35 (>20)	–	–
10 [1]	0.125 (<0.29)	80 (>35)	–	–
150 [1]	1.25 to 3.75	40 to 120*	–	–
150	15	10	0.95 (<1.3)	0.6 (<1.5)*
500 [1]	9.1 (<25)	55 (>20)*	–	–

	T_{amb}	150	25	°C
Collector-base cutoff current ($V_{CBO}=60$ V)	I_{CBO}	–	0.3 (<10)*	nA
Collector-base cutoff current ($V_{CBO}=60$ V)	I_{CBO}	–0.4 (<10)	–	µA
Emitter-base cutoff current ($V_{EBO}=5$ V)	I_{EBO}	–	0.05 (<10)*	nA

[1] Measured with impulses: impulse length 200 µs; duty cycle <0.01
[2] For $T_{amb}=-55$ °C
[3] The transistor has been overdriven to such an extent that the DC current gain has fallen to a value $h_{FE}=10$
* AQL=0.65%

Not for new development

Static characteristics (T_{amb} = 25 °C) **BFY 34**

Collector-emitter breakdown voltage (I_{CEO} = 30 mA)	$V_{(BR)CEO}$	> 30	V
Collector-emitter breakdown voltage (I_{CER} = 100 mA; $R_{BE} \leqq 10\ \Omega$)	$V_{(BR)CER}$	> 50	V
Collector-base breakdown voltage (I_{CBO} = 100 µA)	$V_{(BR)CBO}$	> 75	V
Emitter-base breakdown voltage (I_{EBO} = 100 µA)	$V_{(BR)EBO}$	> 7	V

Static characteristics (T_{amb} = 25 °C) **BFY 46**

For a collector voltage of V_{CE} = 10 V and the listed collector currents I_C:

I_C mA	I_B mA	h_{FE} I_C/I_B	V_{BEsat} ³) V	V_{CEsat} ³) V
0.01	0.167 (< 0.5) · 10^{-3}	60 (> 20)	–	–
0.1	1.25 (< 2.9) · 10^{-3}	80 (> 35)	–	–
10¹)	0.154 (< 2.9)²)	65 (> 35)	–	–
10¹)	0.077 (< 0.134)	130 (> 75)	–	–
150¹)	0.5 to 1.5	100 to 300*	–	–
150	15	10	0.95 (< 1.3)	0.5 (< 1.5)*
500¹)	6.67 (< 12.5)	75 (> 40)*	–	–

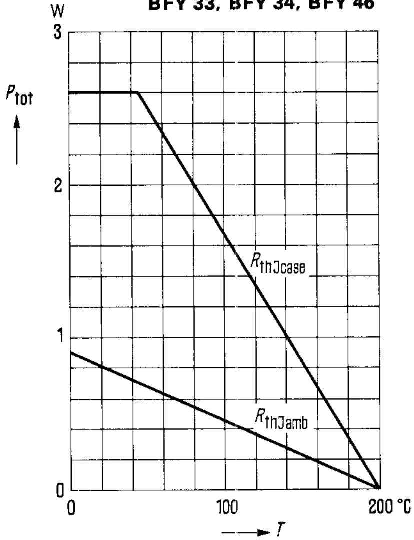
	T_{amb}	150	25	°C
Collector-base cutoff current (V_{CBO} = 60 V)	I_{CBO}	–	0.3 (< 10)*	nA
Collector-base cutoff current (V_{CBO} = 60 V)	I_{CBO}	0.4 (< 10)	–	µA
Emitter-base cutoff current (V_{EBO} = 5 V)	I_{EBO}	–	0.05 (< 5)*	nA

Collector-emitter breakdown voltage (I_{CEO} = 30 mA)	$V_{(BR)CEO}$	> 30	V
(I_{CER} = 100 mA [Impulse]; $R_{BE} \leqq 10\ \Omega$)	$V_{(BR)CER}$	> 50	V
Collector-base breakdown voltage (I_{CBO} = 100 µA)	$V_{(BR)CBO}$	> 75	V
Emitter-base breakdown voltage (I_{EBO} = 100 µA)	$V_{(BR)EBO}$	> 7	V

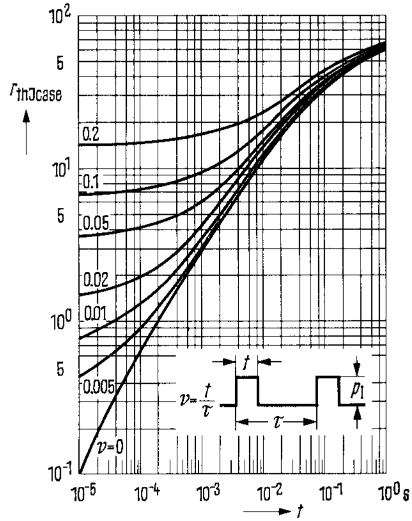
¹) Measured with impulses: impulse length 200 µs; duty cycle < 0.01
²) For T_{amb} = −55 °C
³) The transistor has been overdriven to such an extent that the DC current gain has fallen to a value h_{FE} = 10
* AQL = 0.65%

Not for new development

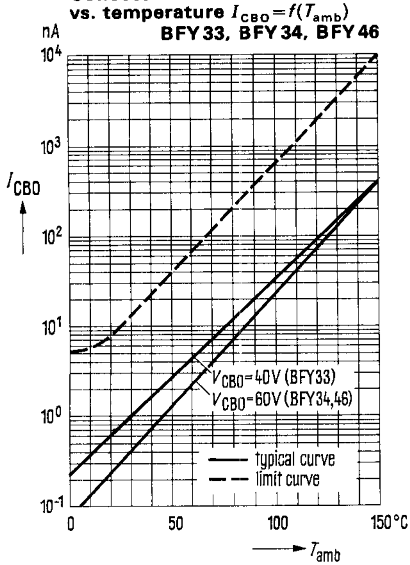
Total power dissipation
$P_{tot} = f(T)$; R_{th} = parameter
BFY 33, BFY 34, BFY 46



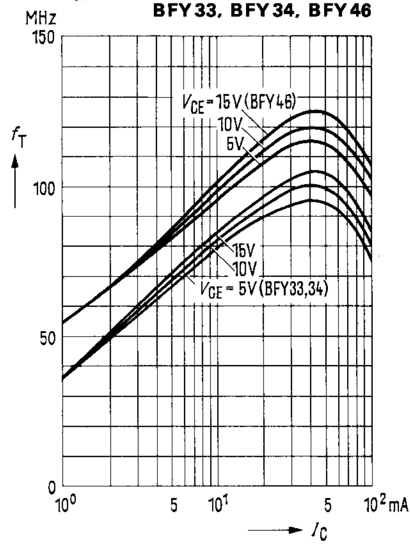
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BFY 33, BFY 34, BFY 46



Collector-base cutoff current vs. temperature $I_{CBO} = f(T_{amb})$
BFY 33, BFY 34, BFY 46



Current-gain bandwidth product $f_T = f(I_C)$
V_{CE} = parameter
BFY 33, BFY 34, BFY 46

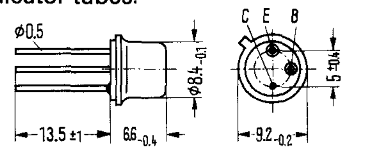


NPN Transistor for lower-power switching applications

Not for new development

The BFY 45 is a silicon double-diffused NPN planar transistor in a case 5C3 DIN 41873 (TO-39). The collector is electrically connected to the case.
The BFY 45 is designed for low power, high voltage switching applications, e.g. for the control of Nixie and similar glow-discharge indicator tubes.

Type	Order number
BFY 45	Q60206-Y45



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		BFY 45	
Collector-emitter voltage	V_{CEO}	90	V
Collector-emitter voltage	V_{CES}	140	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	30	mA
Emitter current	$-I_E$	35	mA
Base current	I_B	5	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−55 to +200	°C
Total power dissipation (T_{amb}=25 °C)	P_{tot}	2.5	W
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦250	K/W
Junction to case	$R_{thJcase}$	≦70	K/W

Static characteristics (T_{amb}=25 °C)

For the text condition stated below, the following data apply:

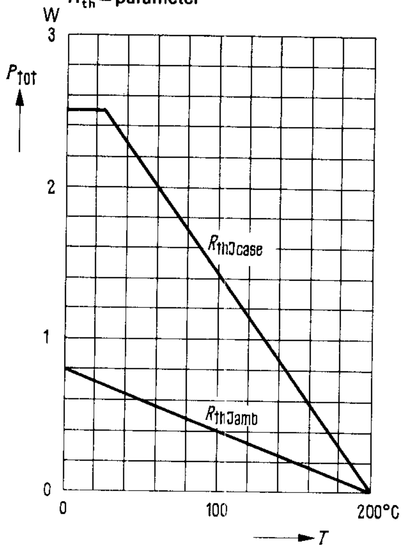
I_C mA	V_{CE} V	I_B µA	h_{FE} I_C/I_B	V_{BE} V
10	10	167 (<250)	60 (>40)*	0.7
10	1	<1000	>10	0.75
0.1	1	<6.7	>15	0.58

Collector-emitter cutoff current (V_{CES}=140 V)	I_{CES}	<100*	nA
Collector-emitter breakdown voltage (I_{CEO}=3 mA)	$V_{(BR)CEO}$	>90	V
Emitter-base breakdown voltage (I_{EBO}=10 µA)	$V_{(BR)EBO}$	>5*	V
Dynamic characteristics (T_{amb}=25 °C)			
Current gain-bandwidth product (I_C=10 mA; V_{CE}=10 V; f=100 MHz)	f_T	130	MHz
Collector base capacitance (V_{CBO}=10 V)	C_{CBO}	2.8 (<3.5)	pf

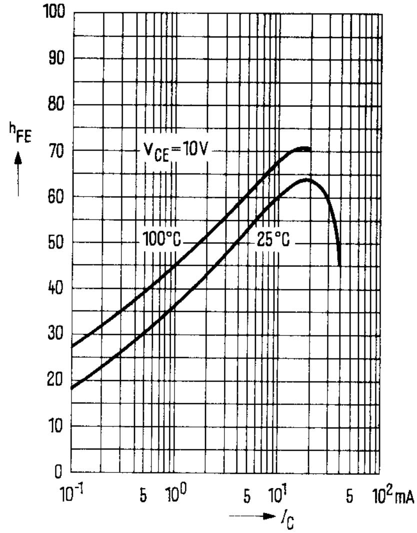
* AQL=0.65%

Not for new development

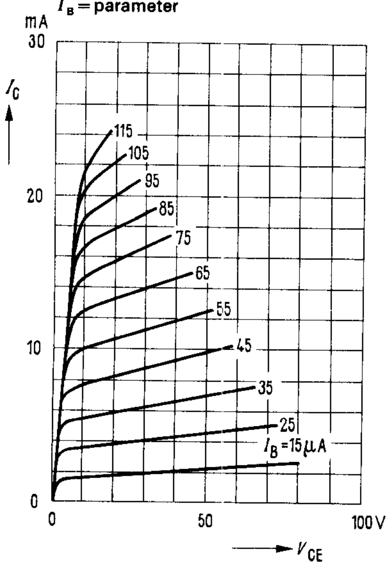
Total power dissipation $P_{tot}=f(T)$
R_{th} = parameter



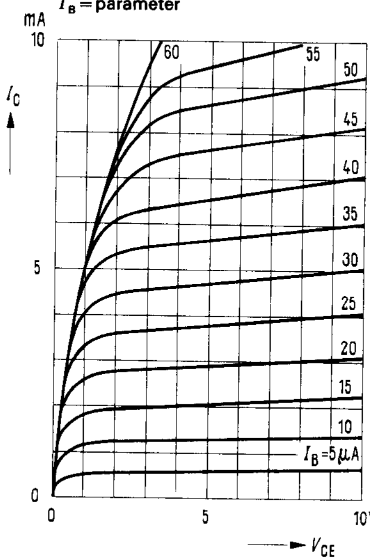
DC forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=10$ V; T_{amb} = parameter



Output characteristics $I_C=f(V_{CE})$
I_B = parameter

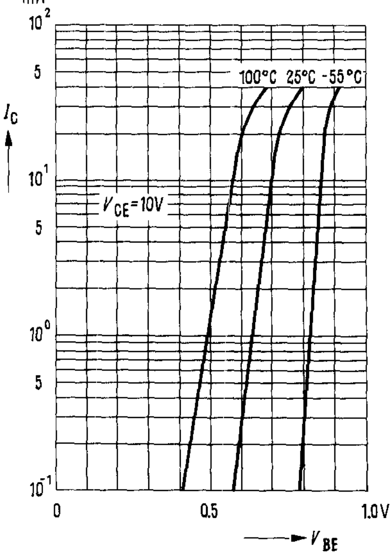


Output characteristics $I_C=f(V_{CE})$
I_B = parameter

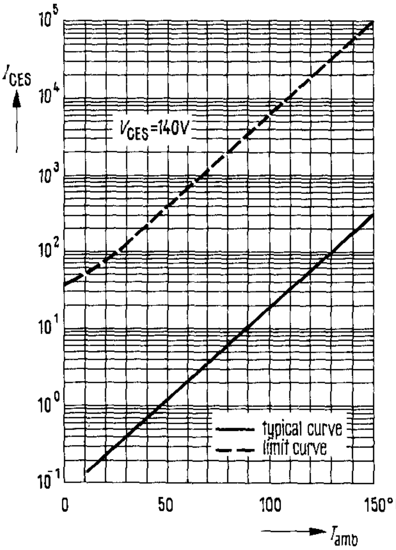


Not for new development

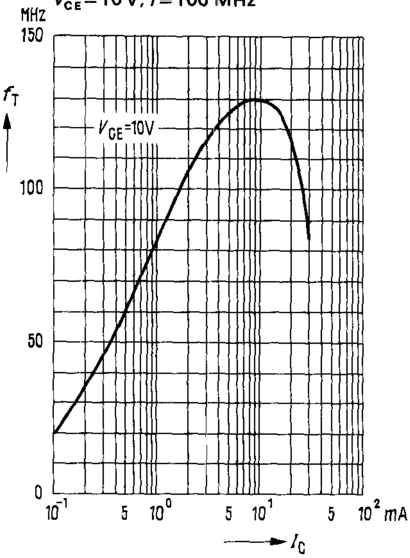
Collector current $I_C = f(V_{BE})$
$V_{CE} = 10$ V; T_{amb} = parameter



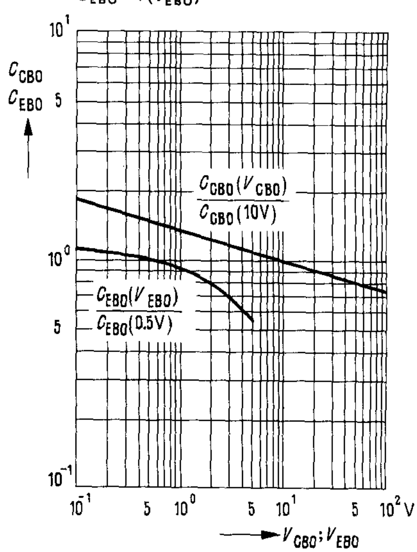
Collector-emitter cutoff current $I_{CES} = f(T_{amb})$
$V_{CES} = 140$ V



Current gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 10$ V; $f = 100$ MHz



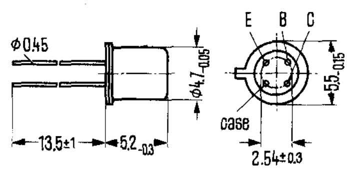
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$



NPN Transistor for antenna amplifiers

BFY 90 is an epitaxial NPN silicon planar RF transistor in a case 18A4 DIN 41876 (TO-72). The leads are electrically insulated from the case. This transistor is suitable for general application up into the GHz range, e.g. in antenna and RF amplifiers.

Type	Order number
BFY 90	Q62702-F297



Weight approx. 0.4 g   Dimensions in mm

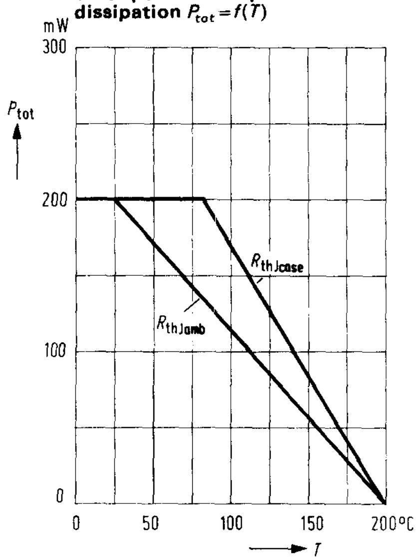
Maximum ratings		BFY 90	
Collector-base voltage voltage	V_{CBO}	30	V
Collector-emitter voltage	V_{CER}	30	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	25	mA
Maximum collector current ($t<1$ µs)	I_{CM}	50	mA
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{amb} \leqq 60$ °C)	P_{tot}	200	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦700	K/W
Junction to case	$R_{thJcase}$	≦400	K/W
Static characteristics ($T_{amb}=25$ °C)			
Collector-base cutoff current ($V_{CBO}=15$ V; $I_E=0$)	I_{CBO}	≦10	nA
Forward current transfer ratio ($I_C=2$ mA; $V_{CE}=1$ V)	h_{FE}	25 to 150	–
($I_C=25$ mA; $V_{CE}=1$ V)	h_{FE}	20 to 125	–
Collector-emitter saturation voltage[1] ($I_C=20$ mA)	V_{CEsat}	≦0.75	V

[1]) Applicable to that characteristic going through point $I_C=22$ mA, $V_{CE}=1$ V at constant I_B

Dynamic characteristics ($T_{amb}=25$ °C)

		BFY 90	
Current-gain bandwidth product			
($I_C=2$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	$\leqq 1.1$	GHz
($I_C=25$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	$\leqq 1.4$	GHz
Feedback capacitance			
($I_C=2$ mA; $V_{CE}=5$ V; $f=1$ MHz)	$-C_{12e}$	0.6 ($\leqq 0.8$)	pf
Collector-base capacitance			
($V_{CB}=10$ V; $I_E=0$; $f=1$ MHz)	C_{CBO}	$\leqq 1.5$	pf
Noise figure			
($I_C=2$ mA; $V_{CE}=5$ V)			
($f=100$ kHz; $R_g=R_{gopt}$)	NF	$\leqq 4$	db
($f=200$ MHz; $R_g=R_{gopt}$)	NF	2.5 ($\leqq 3.5$)	db
($f=500$ MHz; $R_g=50\ \Omega$)	NF	$\leqq 5$	db
($f=800$ MHz; $R_g=50\ \Omega$)	NF	5.5 ($\leqq 6.5$)	db
Attainable power gain			
($I_C=14$ mA; $V_{CE}=10$ V; $f=200$ MHz)	G_{popt}	22	db

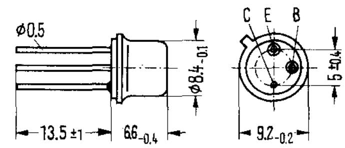
Total permissible power dissipation $P_{tot}=f(T)$



PNP-Transistors for switching applications

BSV 15, BSV 16 and BSV 17 are silicon planar PNP epitaxial transistors in a case 5 C 3 DIN 41873 (TO-39). The collector is electrically connected to the cases. The transistors are particularly suited to AF amplifiers and for AF switching applications.

Type	Order number
BSV 15-6	Q 62702-S 207
BSV 15-10	Q 62702-S 208
BSV 15-16	Q 62702-S 209
BSV 16-6	Q 62702-S 210
BSV 16-10	Q 62702-S 211
BSV 16-16	Q 62702-S 212
BSV 17-6	Q 62702-S 213
BSV 17-10	Q 62702-S 214



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		BSV 15	BSV 16	BSV 17	
Collector-emitter voltage	$-V_{CEO}$	40	60	80	V
Collector-emitter voltage	$-V_{CES}$	40	60	90	V
Emitter-base voltage	$-V_{EBO}$	5	5	5	V
Collector current	$-I_C$	1	1	1	A
Base current	$-I_B$	0.2	0.2	0.2	A
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	5	5	5	W
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦200	≦200	≦200	K/W
Junction to case	$R_{thJcase}$	≦35	≦35	≦35	K/W

Static characteristics (T_{amb} = 25 °C)

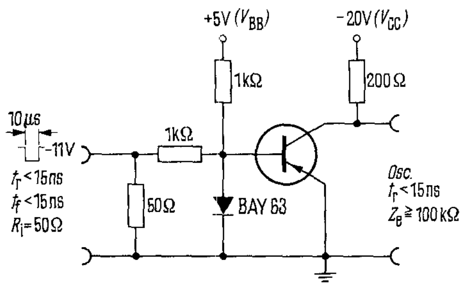
The transistors BSV 15, BSV 16 and BSV 17 are classified in groups of DC current gain at I_C = 100 mA, V_{CE} = 1 V which are indicated by figures of the DIN-R 5 series. For the conditions stated below, the following data apply:

Type	BSV 15 BSV 16 BSV 17	BSV 15 BSV 16 BSV 17	BSV 15 BSV 16	BSV 15 BSV 16 BSV 17
h_{FE} group	6	10	16	
I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
0.1	44 (>15)	75 (>20)	120 (>30)	–
100	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)	<1
500	40 (>20)	55 (>25)	85 (>35)	0.85 (0.7 to 1.4)

Static characteristics (T_{amb} = 25 °C)		BSV 15	BSV 16	BSV 17	
Collector-emitter saturation voltage ($-I_C$ = 500 mA; I_B = 25 mA)	$-V_{CEsat}$	0.25 to 1	0.25 to 1	0.25 to 1	V
Collector-emitter cutoff current ($-V_{CE}$ = 40 V)	$-I_{CES}$	<100	–	–	nA
Collector-emitter cutoff current ($-V_{CE}$ = 40 V; T_{amb} = 150 °C)	$-I_{CES}$	<50	–	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 60 V)	$-I_{CES}$	–	<100	–	nA
Collector-emitter cutoff current ($-V_{CE}$ = 60 V; T_{amb} = 150 °C)	$-I_{CES}$	–	<50	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 80 V)	$-I_{CES}$	–	–	<100	nA
Collector-emitter cutoff current ($-V_{CE}$ = 80 V; T_{amb} = 150 °C)	$-I_{CES}$	–	–	<50	µA
Emitter-base cutoff current ($-V_{EB}$ = 4 V)	$-I_{EBO}$	<50	<50	<50	nA
Collector-emitter cutoff current ($-V_{CE}$ = 40 V; $-V_{BE}$ = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	<50	–	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 60 V; $-V_{BE}$ = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	<50	–	µA
Collector-emitter cutoff current ($-V_{CE}$ = 80 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	–	<50	µA
Collector-emitter reverse voltage ($-I_{CE}$ = 50 mA; Imp. = 200 µsec. 1%)	$-V_{CEO}$	>40	>60	>80	V
Collector-emitter voltage ($-I_{CE}$ = 10 µA)	$-V_{CES}$	>40	>60	>90	V
Emitter-base reverse voltage ($-I_{EB}$ = 10 µA)	$-V_{EBO}$	>5	>5	>5	V

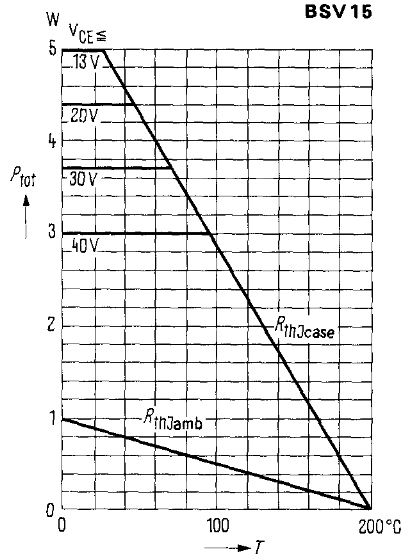
Dynamic characteristics (T_{amb} = 25 °C)		**BSV 15** **BSV 16**	**BSV 17**	
Current-gain bandwidth product (I_C = 50 mA; V_{CE} = 10 V, 20 MHz)	f_T	> 50	> 50	MHz
Collector-base capacitance (V_{CBO} = 10 V; I_E = 0; f = 1 MHz)	C_{CBO}	20 (< 30)	15 (< 25)	pf
Emitter-base capacitance (V_{EBO} = 0.5 V; I_C = 0; f = 1 MHz)	C_{EBO}	180	180	pf
Dynamic short circuit forward current transfer ratio (I_C = 1 mA; V_{CE} = 5 V; f = 1 kHz)	h_{fe}	> 20	> 20	–
Switching times:				
Switch-on time (I_C = 100 mA; $I_{B1} \approx -I_{B2} \approx 5$ mA)	t_{on}	< 500	< 500	ns
Storage time (I_C = 100 mA; $I_{B1} \approx -I_{B2} \approx 5$ mA)	t_s	< 500	< 500	ns
Fall time (I_C = 100 mA; $I_{B1} \approx -I_{B2} \approx 5$ mA)	t_f	< 150	< 150	ns

Circuit for measuring switching times
Test circuit for $I_C = 100$ mA



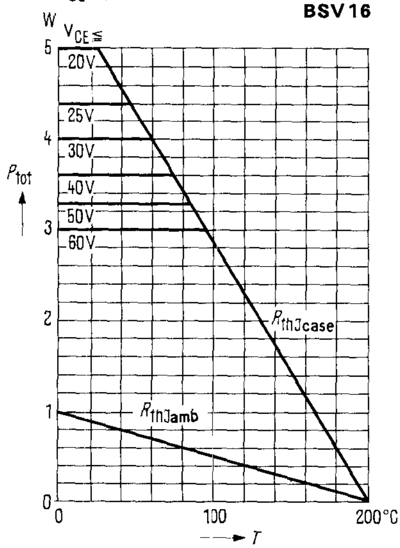
Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

BSV 15



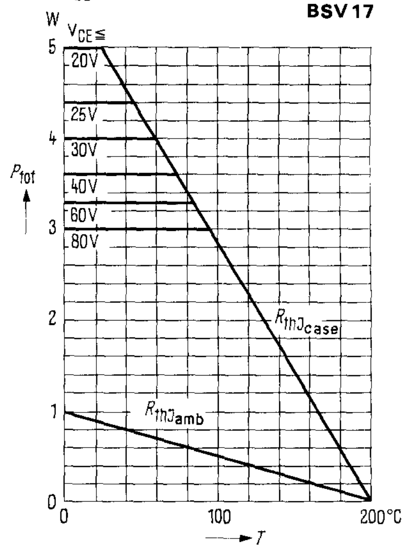
Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

BSV 16

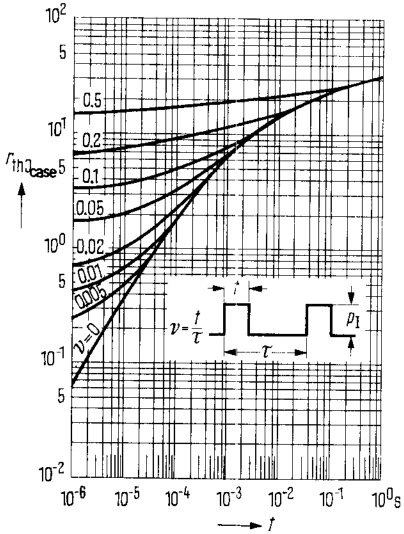


Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

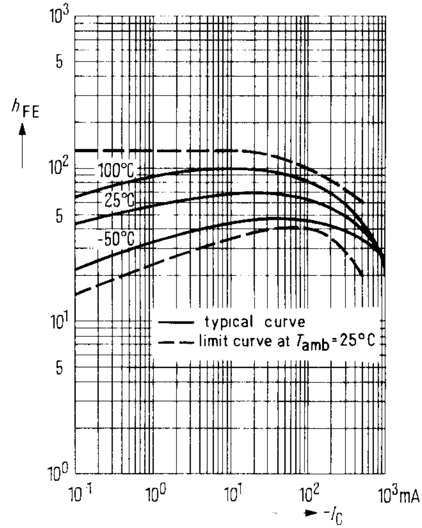
BSV 17



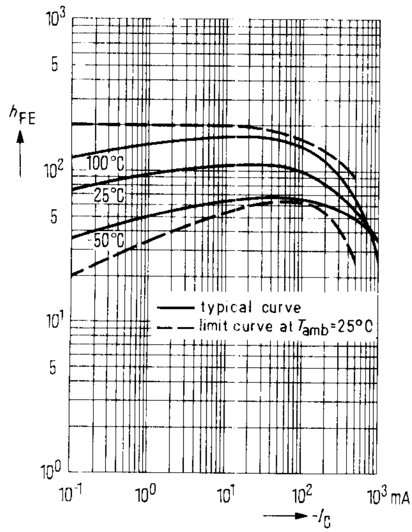
Permissible pulse load
$r_{thJcase} = f(t)$
ν = parameter
BSV 15, BSV 16, BSV 17



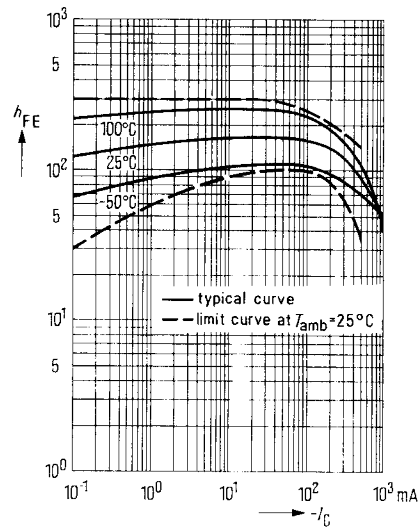
Static forward current transfer ratio $h_{FE} = f(I_C)$
V_{CE} = 1 V; T_{amb} = parameter
BSV 15-6, BSV 16-6, BSV 17-6



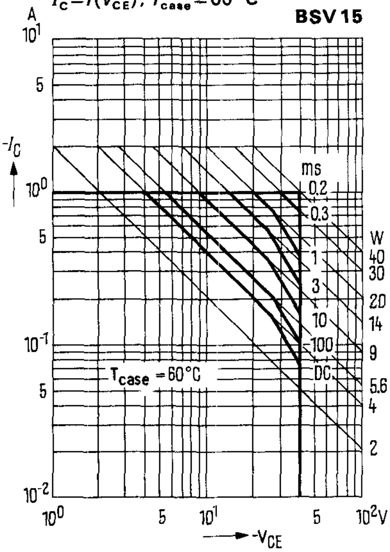
Static forward current transfer ratio $h_{FE} = f(I_C)$
V_{CE} = 1 V; T_{amb} = parameter
BSV 15-10, BSV 16-10, BSV 17-10



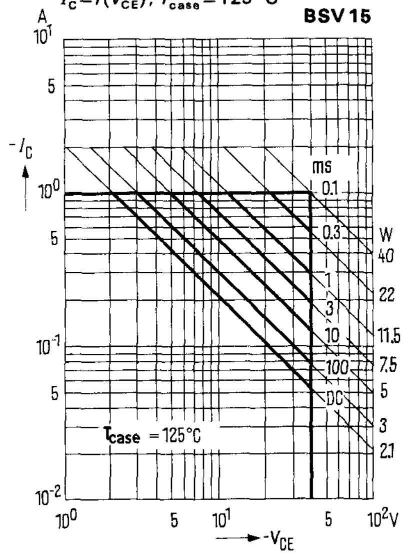
Static forward current transfer ratio $h_{FE} = f(I_C)$
V_{CE} = 1 V; T_{amb} = parameter
BSV 15-16, BSV 16-16



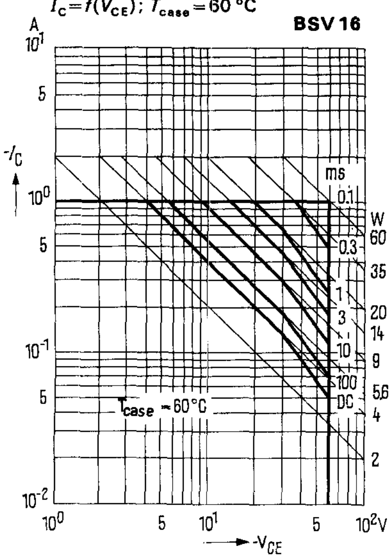
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 60$ °C



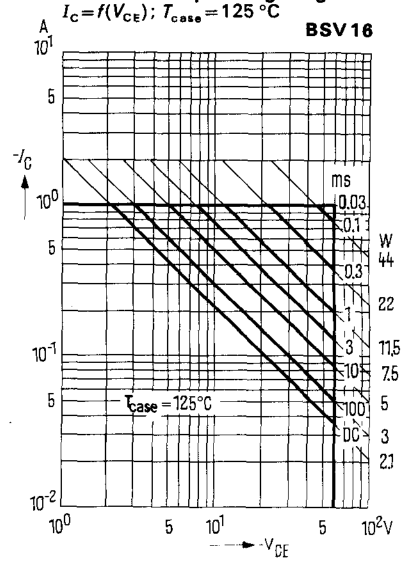
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 125$ °C



Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 60$ °C

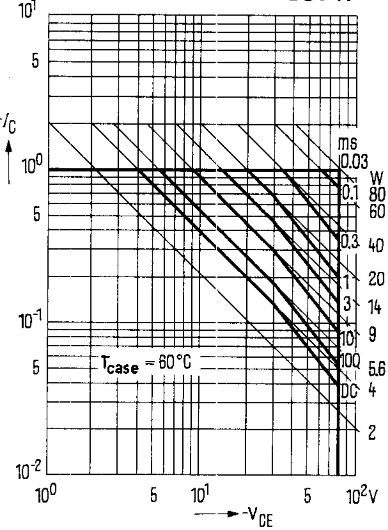


Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 125$ °C

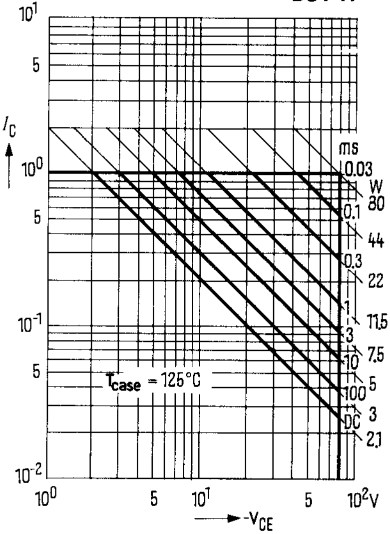


The permissible operating ranges apply to single pulses ($v = 0$). For pulse sequences the power dissipation has to be reduced in accordance with the diagram "permissible pulse load".

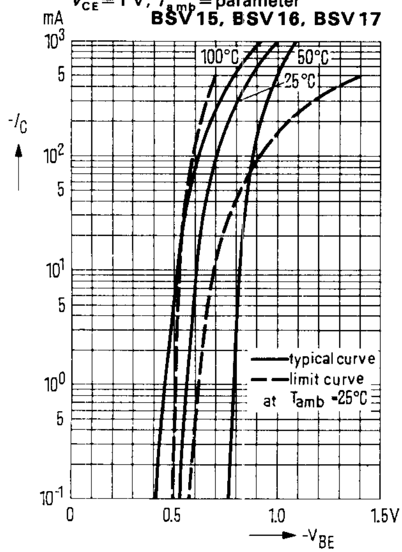
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 60$ °C
BSV 17



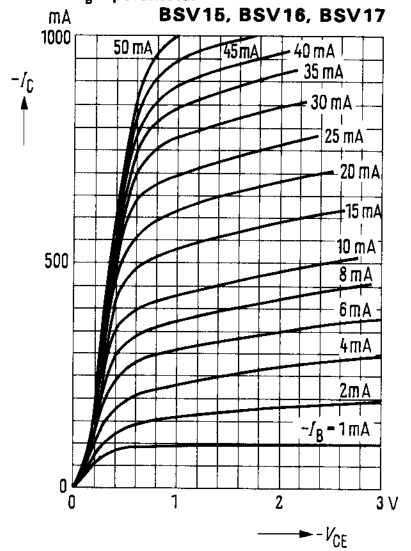
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 125$ °C
BSV 17



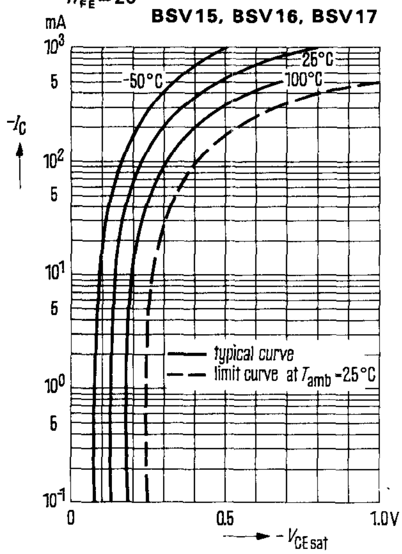
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V; T_{amb} = parameter
BSV 15, BSV 16, BSV 17



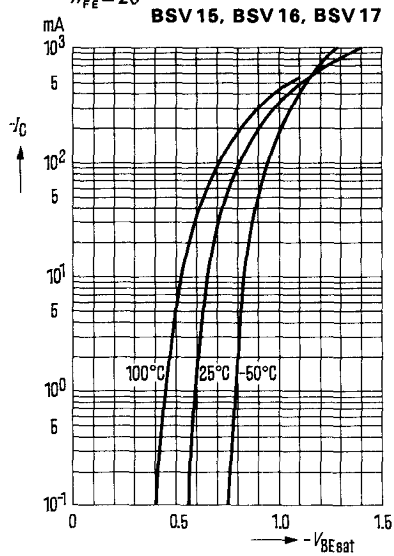
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BSV 15, BSV 16, BSV 17



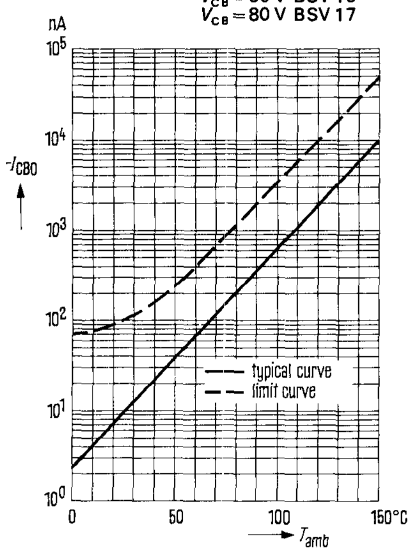
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
T_{amb} = parameter
$h_{FE} = 20$



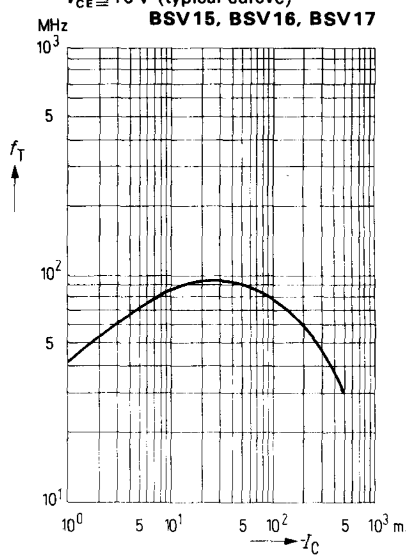
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; T_{amb} = parameter
$h_{FE} = 20$



Cutoff current vs. temperature
$I_{CBO} = f(T_{amb})$; $V_{CB} = 40$ V BSV 15
$V_{CB} = 60$ V BSV 16
$V_{CB} = 80$ V BSV 17



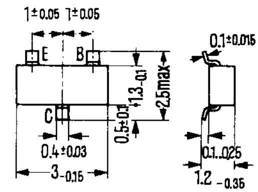
Current gain bandwidth product $f_T = f(I_C)$
$V_{CE} \leq 10$ V (typical cureve)



NPN Transistor for switching applications

BSV 65 is an epitaxial NPN silicon planar switching transistor in a case 23 A 3 DIN 41689 (SOT-23) for thick and thin film circuits. It is particularly suitable for logical applications in microelectronics and hybrid IC's.
The type BSV 65 is identified by the letter "F", while the following letters "A" and "B" refer to the static forward current transfer ratio group.

Type	Code	Order number
BSV 65 FA	FA	Q62702-S347
BSV 65 FB	FB	Q62702-S348



Weight approx. 0.02 g
Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)		**BSV 65**	
Collector-emitter voltage	V_{CEO}	15	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	150	mA
Base current	I_B	30	mA
Junction temperature	T_j	150	°C
Storage temperature	T_s	−55 to +125	°C
Total power dissipation (T_{amb} = 45 °C) on glass substrate (7 × 7 × 1 mm)	P_{tot}	150[1])	mW
Thermal resistance on:			
Glass substrate (7 × 7 × 1 mm)	R_{thJamb}	≦700	K/W
Ceramic substrate (30 × 12 × 1 mm)	R_{thJamb}	≦450	K/W
Glass-fiber substr. (30 × 12 × 1.5)	R_{thJamb}	≦450	K/W

[1]) The permissible total power dissipation is determined by the respective thermal resistance depending on mounting, in accordance with $P_{perm} = \frac{T_{jmax} - T_{amb}}{R_{thJamb}}$

Static characteristics (T_{amb} = 25 °C)		BSV 65	
Forward current transfer ratio			
(V_{CE} = 0.35 V; I_C = 10 mA) (FA)	h_{FE}	40 to 300	–
(FB)	h_{FE}	75 to 300	–
Collector-emitter saturation voltage (I_C = 10 mA; I_B = 1 mA)	V_{CEsat}	< 0.3	V
Base-emitter-saturation voltage (I_C = 10 mA; I_B = 1 mA)	V_{BEsat}	< 0.9	V
Collector-base cutoff current			
(V_{CBO} = 15 V)	I_{CBO}	< 500	nA
(V_{CBO} = 15 V; T_{amb} = 125 °C)	I_{CBO}	< 30	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	> 15	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	> 20	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	> 5	V

Dynamic characteristics (T_{amb} = 25 °C)			
Current-gain bandwidth product (V_{CE} = 10 V; I_C = 10 mA; f = 100 MHz)	f_T	> 280	MHz
Collector-base capacitance (V_{CBO} = 5 V)	C_{CBO}	< 5	pf
Switching times (I_C = 10 mA; I_{B1} = 3 mA;	t_{on}	< 20	ns
$-I_{B2}$ = 1.5 mA; R_L = 270 Ω)	t_{off}	< 40	ns
Storage time (I_C = I_{B1} = I_{B2} = 10 mA; R_{CL} = 1 kΩ)	t_s	< 20	ns

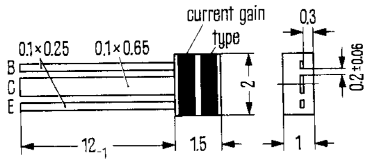
NPN-Transistor for switching applications

Not for new development

The BSW 13 is an epitaxial NPN silicon planar transistor in miniature design and in a plastic case (U-32). It is suitable for use in compact logical applications, especially for thick and thin film circuits. (The type is marked by a brown and the current gain by a white or red stripe on the case).

Mounting instructions: For mounting, the leads may be shortened to a minimum of 2.5 mm. With this lead length, the maximum soldering temperature permissible is T_{Lmax} 240 °C with a maximum soldering time of t_{Lmax} 2 s. Used in potted building blocks, the transistors may be expected to have a minimum thermal resistance of R_{thJamb}=450 K/W. In this case, a soldering length of L=5 mm is recommended.

Type	Code	Order number
BSW 13	red-brown	Q 62702-S 119-X 2
BSW 3	white-brown	Q 62702-S 119-X 1



Weight approx. 0.02 g Dimensions in mm

Maximum ratings (T_{amb}=25 °C)		BSW 13	
Collector-emitter voltage	V_{CEO}	15	V
Collector-base voltage	V_{CBO}	20	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	50	mA
Junction temperature	T_j	+125	°C
Storage temperature	T_s	−55 to +125	°C
Total power dissipation (tape length=2.5 mm)	P_{tot}	160	mW

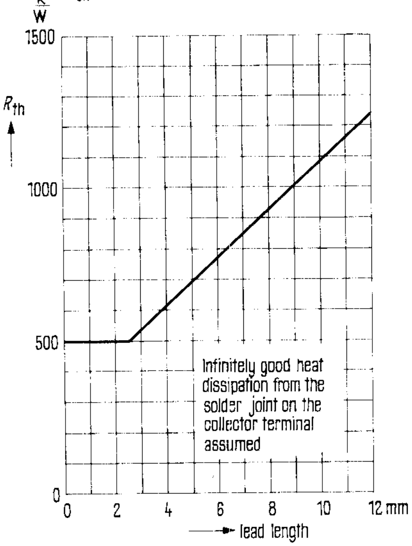
Thermal resistance (see diagram)

Junction to ambient air			
tape length l=2.5 mm	R_{thJamb}	<500	K/W
tape length l=12 mm	R_{thJamb}	<1200	K/W

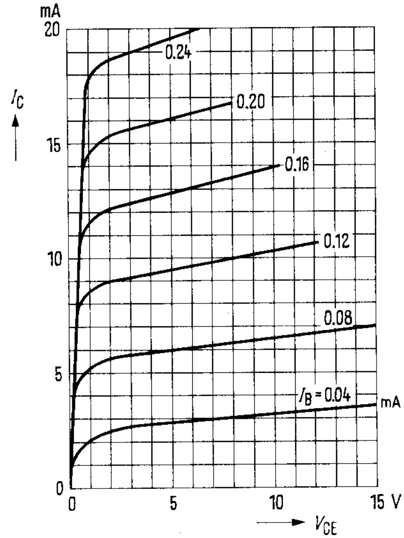
		BSW 13	
Static characteristics ($T_{amb}=25$ °C)			
($V_{CE}=0.35$ V; $I_C=10$ mA) red-brown	h_{FE}	40 to 300	–
white-brown	h_{FE}	75 to 300	–
Collector-emitter cutoff voltage ($I_C=10$ mA; $I_B=1$ mA)	V_{CEsat}	<0.3	V
Base-emitter cutoff voltage ($I_C=10$ mA; $I_B=1$ mA)	V_{BEsat}	<0.9	V
Collector-base cutoff current ($V_{CBO}=15$ V)	I_{CBO}	<500	nA
($V_{CBO}=15$ V; $T_{amb}=125$ °C)	I_{CBO}	<30	μA
Collector-emitter breakdown voltage ($I_{CEO}=10$ mA)	$V_{(BR)CEO}$	>15	V
Collector-base breakdown voltage ($I_{CBO}=1$ μA)	$V_{(BR)CBO}$	>20	V
Emitter-base breakdown voltage ($I_{EBO}=10$ μA)	$V_{(BR)EBO}$	>5	V
Dynamic characteristics ($T_{amb}=25$ °C)			
Current gain-bandwidth product ($V_{CE}=10$ V; $I_C=10$ mA; $f=100$ MHz)	f_T	>280	MHz
Collector-base capacitance ($V_{CBO}=5$ V)	C_{CBO}	<5	pf
Switching times ($I_C=10$ mA; $I_{B1}=3$ mA;	t_{on}	<20	ns
$-I_{B2}=1.5$ mA; $R_L=270\ \Omega$)	t_{off}	<40	ns
Storage time ($I_C=I_{B1}=I_{B2}=10$ mA; $R_{CC}=1\ k\Omega$)	t_s	<20	ns

Not for new development

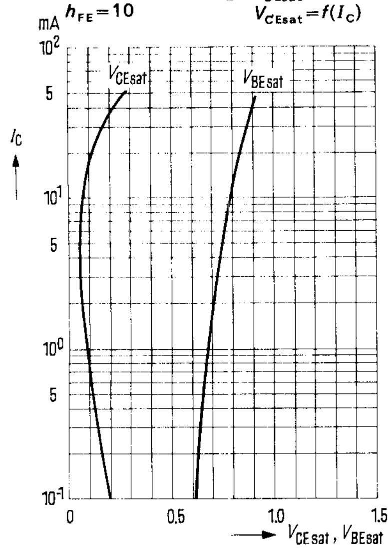
Thermal resistance
$R_{th} = f$(lead length "L")



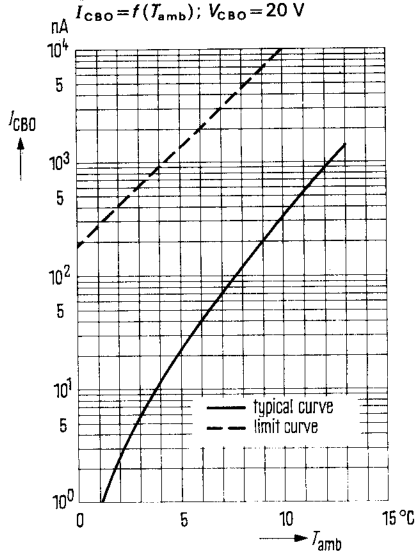
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$ $V_{CEsat} = f(I_C)$



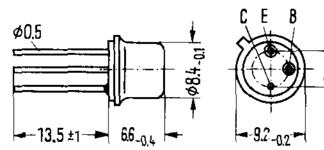
Collector-base cutoff current
$I_{CBO} = f(T_{amb})$; $V_{CBO} = 20$ V



NPN Transistor for AF amplifier and switching applications

BSX 45, BSX 46, and BSX 47 are epitaxial NPN silicon planar transistors in a case 5 C 3 DIN 41873 (TO-39). Their collectors are electrically connected to their cases. The transistors are particularly suitable for AF amplifiers and AF switching applications up to 1 A.

Type	Order number
BSX 45-6	Q60218-X45-V6
BSX 45-10	Q60218-X45-V10
BSX 45-16	Q60218-X45-V16
BSX 46-6	Q60218-X46-V6
BSX 46-10	Q60218-X46-V10
BSX 46-16	Q60218-X46-V16
BSX 47-6	Q60218-X47-V6
BSX 47-10	Q60218-X47-V10



Weight approx. 1.5 g   Dimensions in mm

Maximum ratings		BSX 45	BSX 46	BSX 47	
Collector-emitter voltage	V_{CEO}	40	60	80	V
Collector-emitter voltage	V_{CES}	80	100	120	V
Emitter-base voltage	V_{EBO}	7	7	7	V
Collector current	I_C	1	1	1	A
Base current	I_B	0.2	0.2	0.2	A
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	5	5	5	W
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦200	≦200	≦200	K/W
Junction to case	$R_{thJcase}$	≦35	≦35	≦35	K/W

Static characteristics ($T_{amb} = 25$ °C)

The transistors BSX 45, BSX 46, and BSX 47 are classified in groups of static forward current transfer ratio h_{FE} and identified by figures of the DIN-R 5 series.

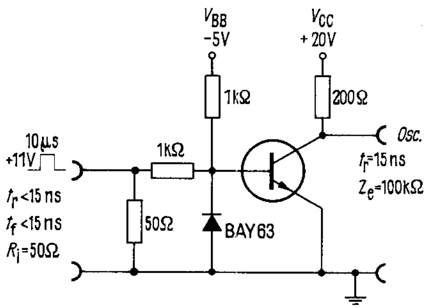
Type	**BSX 45 BSX 46 BSX 47**	**BSX 45 BSX 46 BSX 47**	**BSX 45 BSX 46 –**	**BSX 45 BSX 46 BSX 47**
h_{FE}-Gruppe	**6**	**10**	**16**	
I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
0.1	28 (>10)	40 (>15)	90 (>25)	–
100	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)	<1
500	25 (>15)	40 (>25)	60 (>35)	0.75 to 1.5
1000	15	20	30	1.3 (<2)

Static characteristics ($T_{amb}=25$ °C)		BSX 45	BSX 46	BSX 47	
Collector-emitter saturation voltage ($I_C=1$ A; $h_{FE}=10$)	V_{CEsat}	0.7 (<1)	0.7 (<1)	–	V
Collector-emitter saturation voltage ($I_C=0.5$ A; $h_{FE}=20$)	V_{CEsat}	–	–	0.5 (<0.9)	V
Collector-emitter cutoff current ($V_{CES}=60$ V)	I_{CES}	1 (<30)	1 (<30)	–	nA
Collector-emitter cutoff current ($V_{CES}=60$ V; $T_{amb}=150$ °C)	I_{CES}	1 (<10)	1 (<10)	–	µA
Collector-emitter cutoff current ($V_{CES}=80$ V)	I_{CES}	–	–	<30	nA
Collector-emitter cutoff current ($V_{CES}=80$ V; $T_{amb}=150$ °C)	I_{CES}	–	–	<10	µA
Collector-emitter cutoff current ($V_{CE}=60$ V; $V_{BE}=0.2$ V; $T_{amb}=100$ °C)	I_{CEX}	<50	<50	–	µA
Collector-emitter cutoff current ($V_{CE}=80$ V; $V_{BE}=0.2$ V; $T_{amb}=100$ °C)	I_{CEX}	–	–	<50	µA
Emitter-base cutoff current ($V_{EBO}=5$ V)	I_{EBO}	<10	<10	<10	nA
Collector-emitter breakdown voltage ($I_{CE}=50$ mA; pulse length = 200 µs; duty cycle 1%)	$V_{(BR)CEO}$	>40	>60	>80	V
Collector-emitter breakdown voltage ($I_{CES}=100$ µA)	$V_{(BR)CES}$	>80	>100	>120	V
Emitter-base breakdown voltage ($I_{EBO}=100$ µA)	$V_{(BR)EBO}$	>7	>7	>7	V

Dynamic characteristics

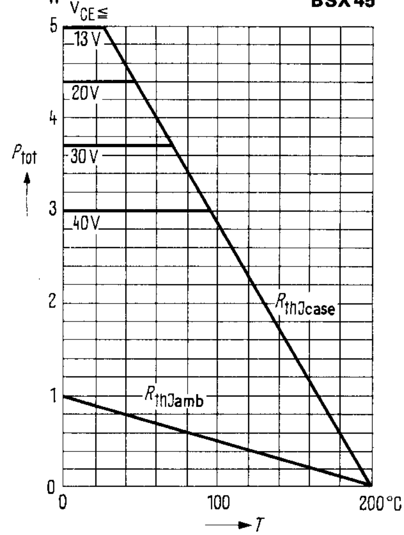
Current-gain bandwidth product ($I_C=50$ mA; $V_{CE}=10$ V; $f=20$ MHz)	f_T	>50	>50	>50	MHz
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	<25	<20	<15	pf
Emitter-base capacitance ($V_{EBO}=0.5$ V; $f=1$ MHz)	C_{EBO}	<80	<80	<80	pf
Noise figure ($I_C=100$ µA; $V_{CE}=10$ V; $f=1$ kHz; $\Delta f=200$ Hz; $R_g=1$ kΩ)	NF	3.5	3.5	3.5	db
Switching times: $I_C=100$ mA; $I_{B_1}\approx -I_{B_2}\approx 5$ mA	t_{on}	<200	<200	<200	ns
	t_{off}	<850	<850	<850	ns

Circuit for measuring switching times



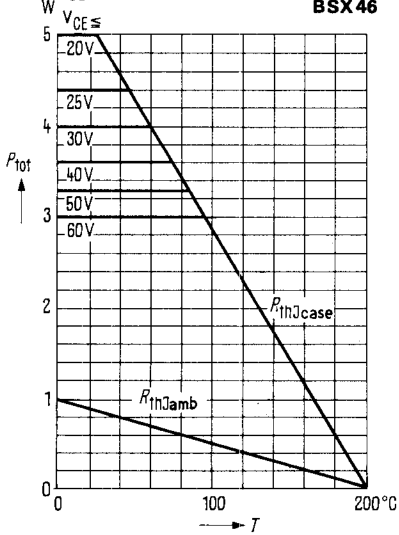
Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

BSX 45



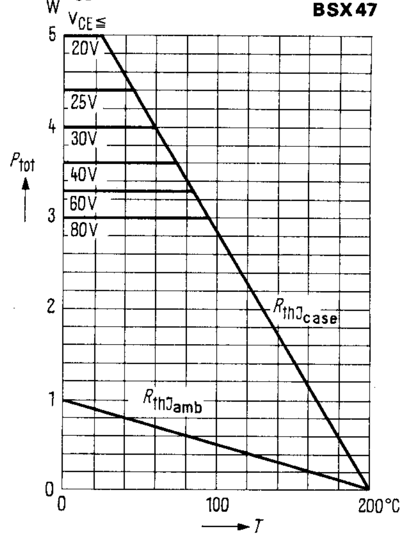
Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

BSX 46

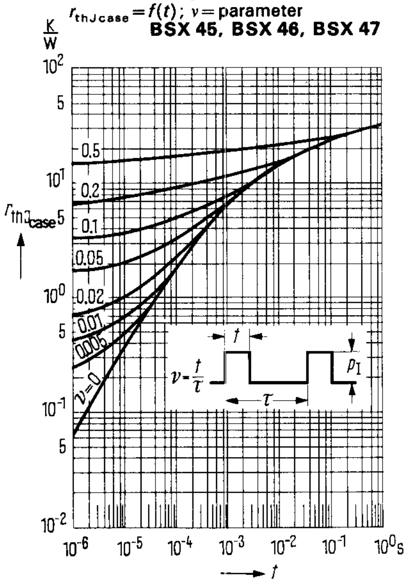


Total power dissipation $P_{tot} = f(T)$
V_{CE} = parameter

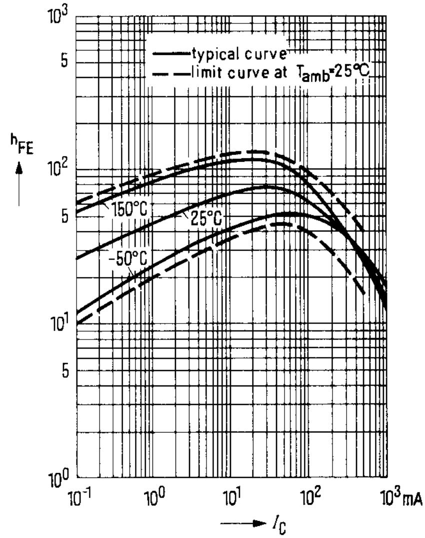
BSX 47



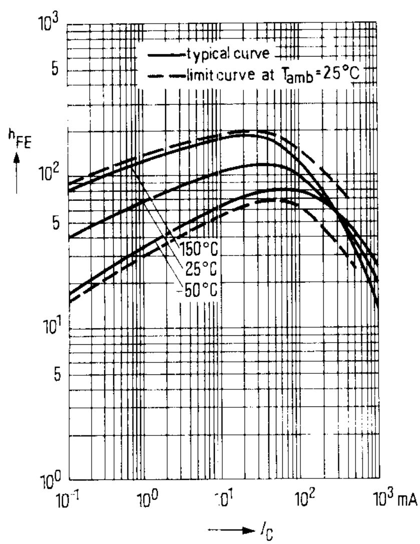
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BSX 45, BSX 46, BSX 47



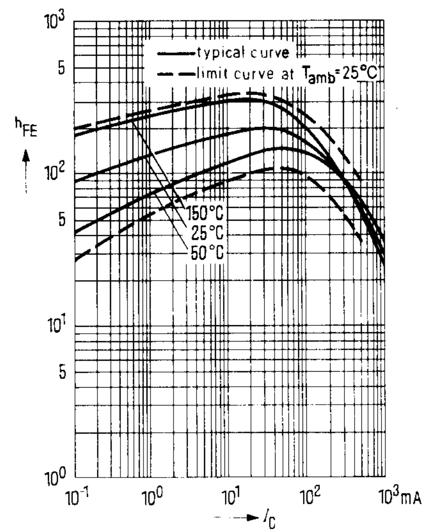
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX45-6, BSX46-6, BSX47-6



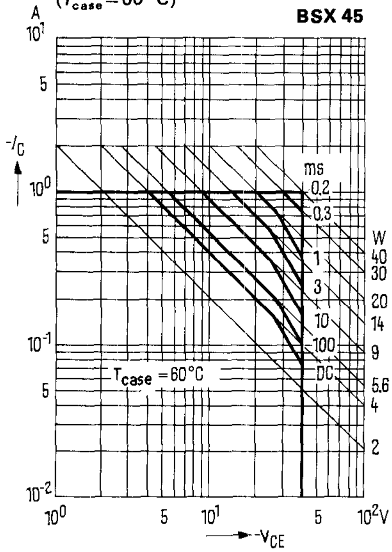
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX45-10, BSX46-10, BSX47-10



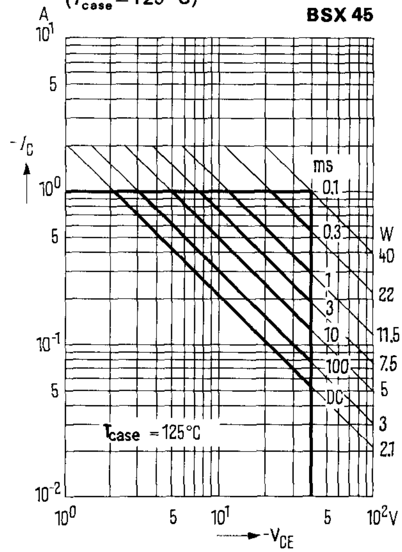
Static forward current transfer ratio $h_{FE} = f(I_C)$
$V_{CE} = 1$ V
BSX45-16, BSX46-16



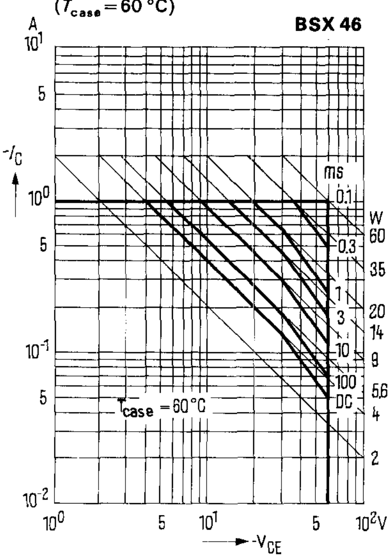
Permissible operating range
$I_C = f(V_{CE})$
($T_{case} = 60$ °C)
BSX 45



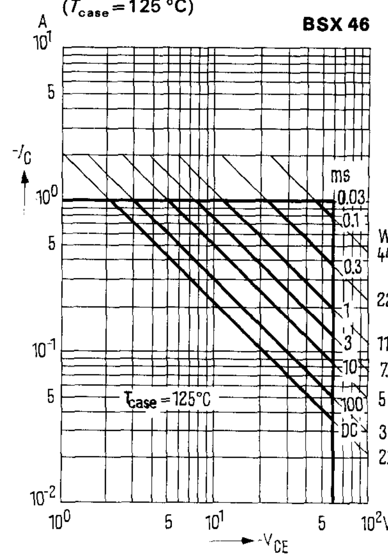
Permissible operating range
$I_C = f(V_{CE})$
($T_{case} = 125$ °C)
BSX 45



Permissible operating range
$I_C = f(V_{CE})$
($T_{case} = 60$ °C)
BSX 46

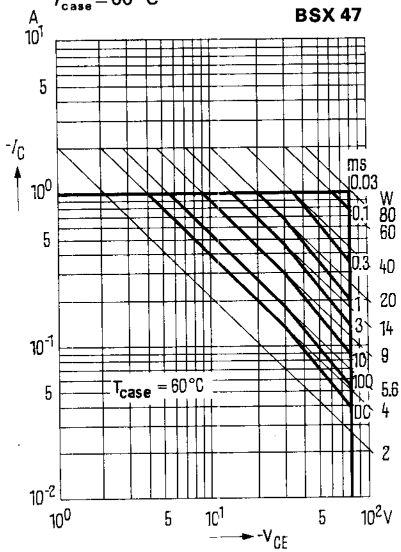


Permissible operating range
$I_C = f(V_{CE})$
($T_{case} = 125$ °C)
BSX 46

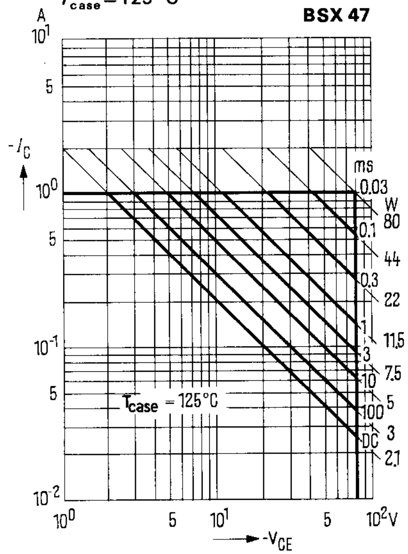


The permissible operating ranges apply to single pulses ($v = 0$). For pulse sequences, the power dissipation has to be reduced in accordance with the diagram "permissible pulse load".

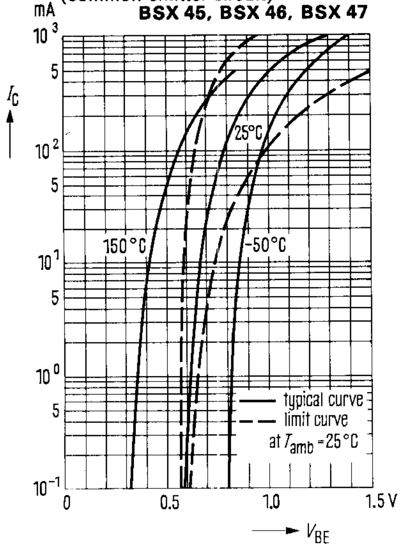
Permissible operating range
$I_C = f(V_{CE})$
$T_{case} = 60\ °C$



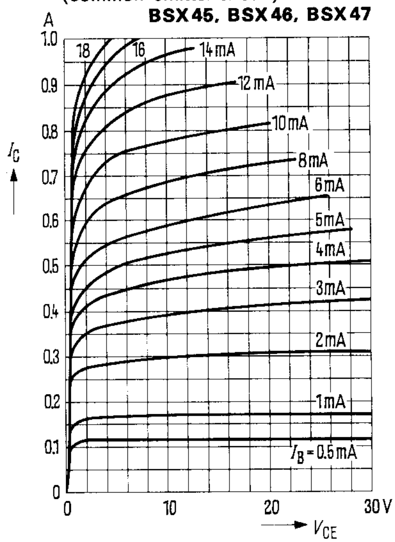
Permissible operating range
$I_C = f(V_{CE})$
$T_{case} = 125\ °C$



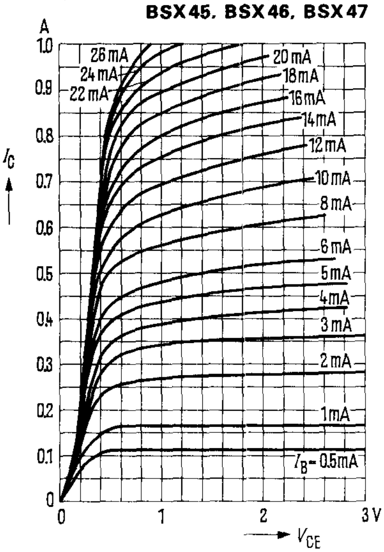
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1\ V$; T_{amb} = parameter
(common emitter circuit)



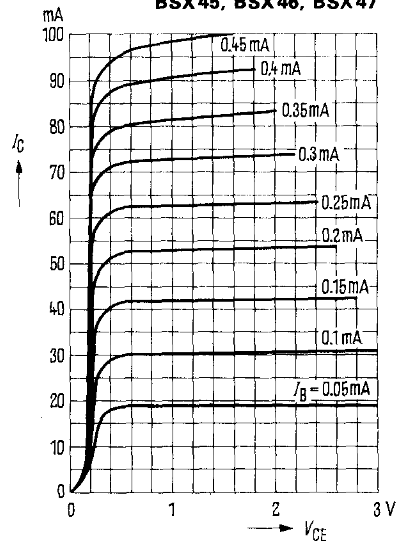
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common-emitter circuit)



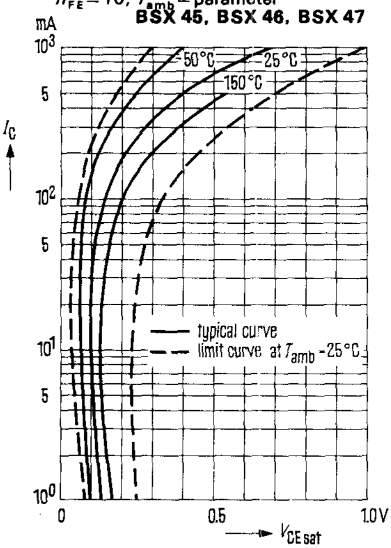
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSX 45, BSX 46, BSX 47



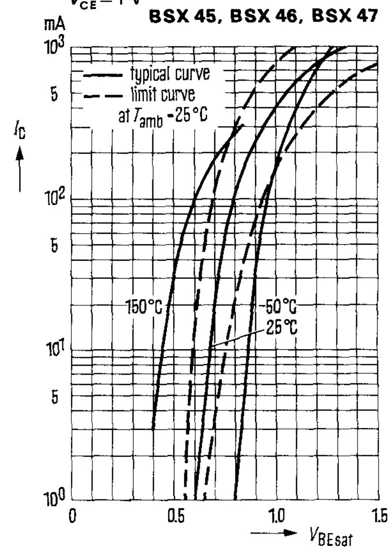
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
BSX 45, BSX 46, BSX 47



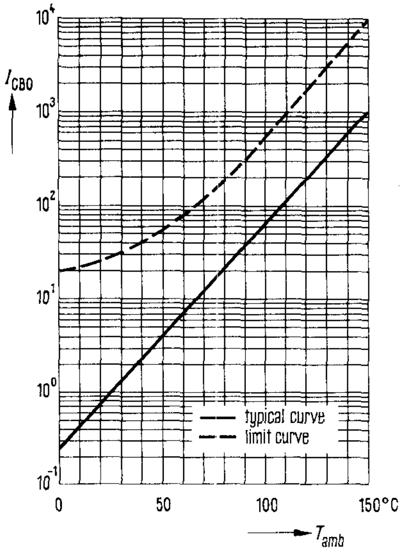
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
BSX 45, BSX 46, BSX 47



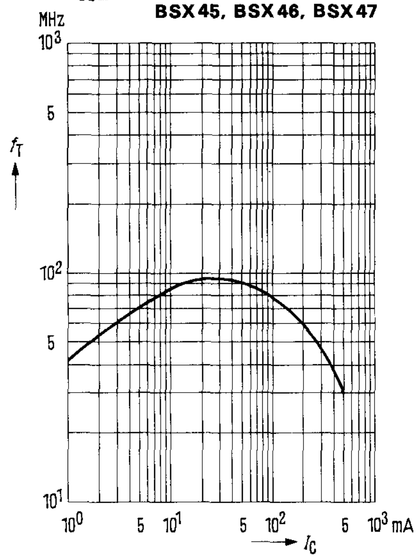
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
$V_{CE} = 1$ V
BSX 45, BSX 46, BSX 47



Cutoff current $I_{CBO} = f(T_{amb})$
$V_{CB} = 60\,V$ BSX 45, BSX 46,
$V_{CB} = 80\,V$ BSX 47



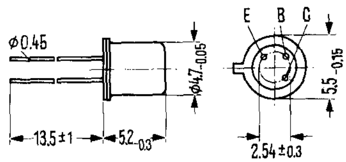
Current gain bandwidth product $f_T = f(I_C)$
$V_{CE} \leqq 10\,V$
BSX 45, BSX 46, BSX 47



NPN Transistors for switching applications

Transistors BSX 48 and BSX 49 are double diffused epitaxial silicon planar transistors in a case 18 A 3 DIN 41 876 (TO-18). The collector is electrically connected to the case. The transistors are for use as high-speed switches, and are particularly suitable for driving magnetic cores. BSX 48 is electrically similar to type BSY 58, BSX 49 to type BSY 34. Data on the switching characteristics of BSX 48 and BSX 49 may be taken from the curves of the corresponding types BSY 34 and BSY 58

Type	Order number
BSX 48	Q60218-X48
BSX 49	Q60218-X49



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		**BSX 48**	**BSX 49**	
Collector-emitter voltage	V_{CEO}	25	40	V
Collector-emitter voltage	V_{CES}	50	60	V
Collector-base voltage	V_{CBO}	50	60	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	600	600	mA
Base current	I_B	200	200	mA
Junction temperature	T_j	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	1	1	W
Thermal resistance				
Junction to ambient air	R_{thJamb}	≦500	≦500	K/W
Junction to case	$R_{thJcase}$	≦150	≦150	K/W

Static characteristics (T_{amb}=25 °C)

At a collector emitter-voltage of V_{CE}=1 V and the following collector currents; the following values apply:

	BSX 48			**BSX 49**		
I_C mA	$h_{FE}=I_C/I_B$	V_{BEsat} V¹)	V_{CEsat} V¹)	$h_{FE}=I_C/I_B$	V_{BEsat} V¹)	V_{CEsat} V¹)
1	23	0.62	–	23	0.62	–
10	37	0.70	–	37	0.70	–
100	42 (>17)*	0.85	0.17	42 (>25)*	0.85	0.17
500	25	1.2 (<1.5)*	0.6 (<1.5)*	25 (>10)	1.2 (<1.5)*	0.6 (<1.0)*

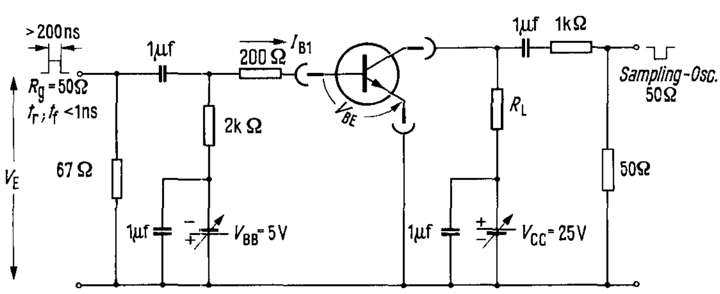
¹) The transistor is overdriven to such an extent that the static forward current transfer ratio has fallen to a value h_{FE}=10

* AQL=0.65%

Static characteristics ($T_{amb}=25\ °C$)		BSX 48	BSX 49	
Collector-base cutoff current ($V_{CBO}=50\ V$)	I_{CBO}	<120*	<70*	nA
Collector-emitter breakdown voltage ($I_{CEO}=10\ mA$)	$V_{(BR)CEO}$	>25	>40	V
Collector-base breakdown voltage ($I_{CBE}=100\ \mu A$)	$V_{(BR)CBO}$	>50	>60	V
Emitter-base breakdown voltage ($I_{EBO}=100\ \mu A$)	$V_{(BR)EBO}$	>5	>5	V

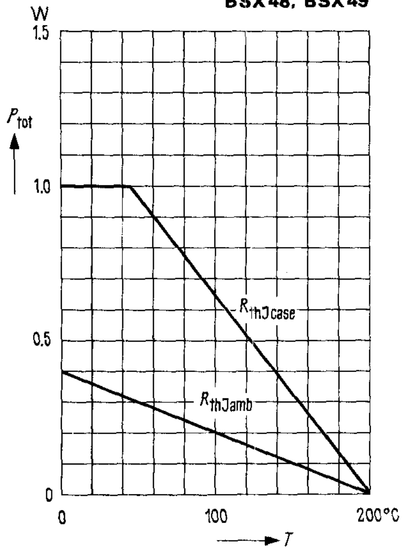
Dynamic characteristics ($T_{amb}=25\ °C$)				
Current gain-bandwidth product ($I_C=30\ mA$; $V_{CE}=10\ V$; $f=100\ MHz$)	f_T	400 (>250)	400 (>250)	MHz
Collector-base capacitance ($V_{CBO}=10\ V$)	C_{CBO}	4.5 (<6)	4.5 (<6)	pf
Emitter-base capacitance ($V_{EBO}=1\ V$)	C_{EBO}	22	22	pf
Switching times				
Operating point: $I_C=150\ mA$; $I_{B1}=15\ mA$; $-I_{B2}=15\ mA$; $R_L=150\ \Omega$	t_{on}	35	30	ns
	t_{off}	60	50	ns
Operating point: $I_C=500\ mA$; $I_{B1}=50\ A$; $-I_{B2}=25\ mA$; $V_E=15\ V$; $R_L=80\ \Omega$ for **BSX 49** ($V_{CC}=40\ V$) $R_L=50\ \Omega$ for **BSX 48** ($V_{CC}=25\ V$)	t_{on}	35 (<65)	30 (<50)	ns
	t_{off}	65 (<110)	65 (<95)	ns

Circuit for measuring switching times

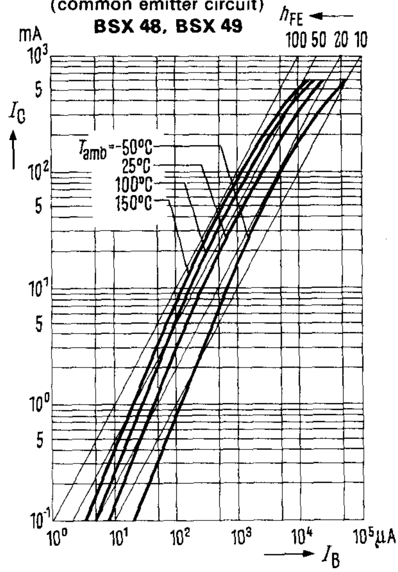


* AQL=0.65%

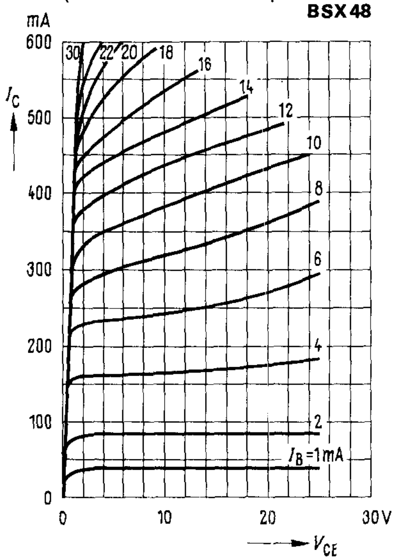
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter
BSX 48, BSX 49



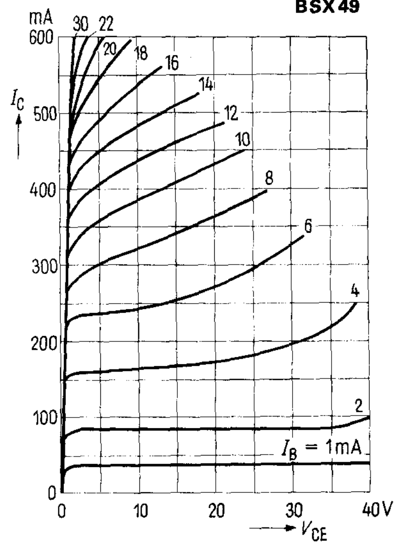
Collector current $I_C = f(I_B)$
$V_{CE} = 1$ V
(common emitter circuit)
BSX 48, BSX 49



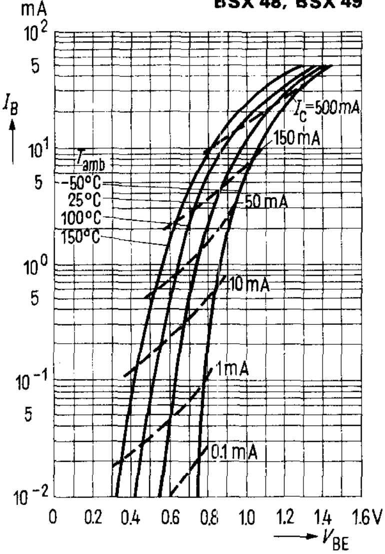
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSX 48



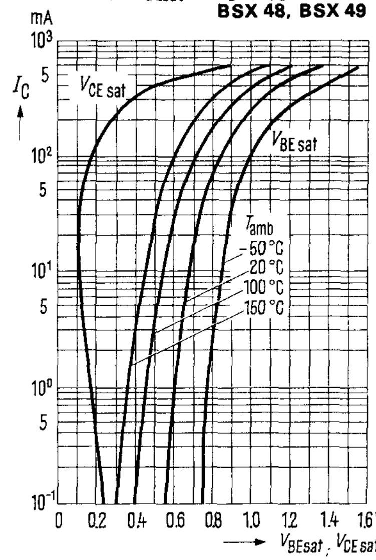
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSX 49



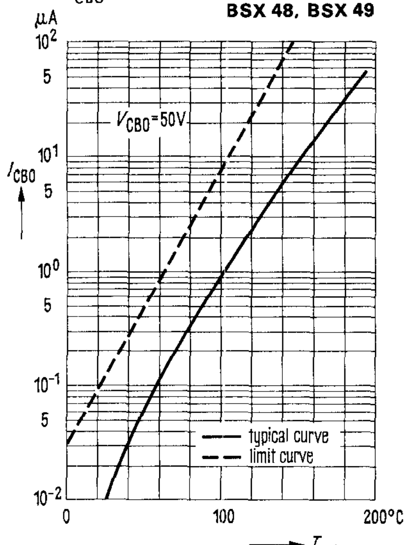
Input characteristics $I_B = f(V_{BE})$
$V_{CE} = 1$ V (common emitter circuit)
BSX 48, BSX 49



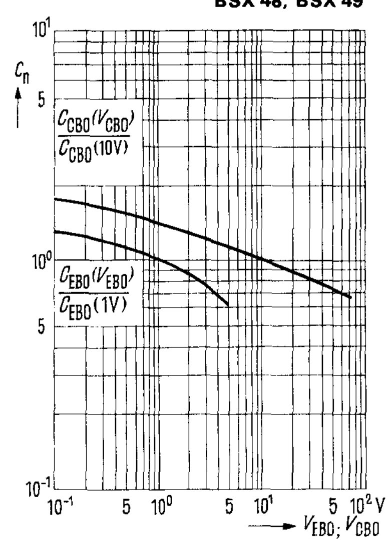
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$; $h_{FE} = 10$
Base-emitter saturation voltage $V_{BEsat} = f(I_C)$; $h_{FE} = 10$
BSX 48, BSX 49



Collector cutoff current
$I_{CBO} = f(T_{amb})$
$V_{CBO} = 50$ V
BSX 48, BSX 49



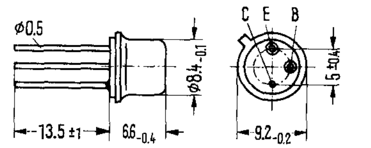
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
BSX 48, BSX 49



NPN transistors for AF output stages and switching applications

BSX 62 and BSX 63 are epitaxial silicon NPN planar transistors in a case 5 C 3 DIN 41873 (TO-39). The collector is electrically connected to the case. The transistors are particularly suitable for AF output stages and as a medium-power switch.

Type	Order number
BSX 62-6	Q60218-X62-B
BSX 62-10	Q60218-X62-C
BSX 62-16	Q60218-X62-D
BSX 63-6	Q60218-X63-B
BSX 63-10	Q60218-X63-C



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		BSX 62	BSX 63	
Collector-emitter voltage	V_{CEO}	40	60	V
Collector-emitter voltage	V_{CES}	60	80	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	3	3	A
Base current	I_B	500	500	mA
Junction temperature	T_j	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	5	5	W
Thermal resistance				
Junction to case	$R_{thJcase}$	≦35	≦35	K/W
Junction to ambient air	R_{thJamb}	≦200	≦200	K/W

Static characteristics ($T_{case} = 25$ °C)

Transistors BSX 62 and BSX 63 are grouped according to their static forward current transfer ratio h_{FE} at $I_C = 1$ mA and $V_{CE} = 1$ V. The different groups are designated by figures of the DIN-R 5 series.

Type		BSX 62 BSX 63	BSX 62 BSX 63	BSX 62 –	BSX 62, BSX 63		
h_{FE} group		6	10	16			
V_{CE} V	I_C A	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V	V_{CEsat} [1] V	V_{BEsat} [1] V
1	0.1	70 (>30)	110	180	0.72 (<1)	–	–
1	1	63 (40 to 100)*	100 (63 to 160)*	160 (100 to 250)*	0.9 (<1.2)	–	–
5	2	40 (>25)	70	120	1.0 (<1.3)	–	–
	2	–	–	–	–	0.4 (<0.8)	1.0 (<1.3)
	1	–	–	–	–	0.2 (<0.7)	0.9 (<1.2)

[1] The transistor is overdriven to such an extent that the DC current gain h_{FE} has fallen to a value $h_{FE} = 10$

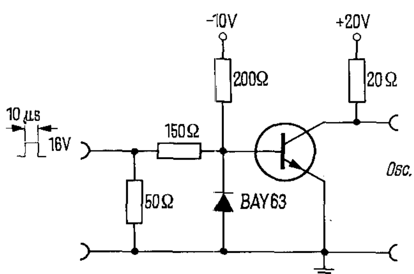
* AQL = 0.65%

		BSX 62	BSX 63	
Collector-emitter cutoff current (V_{CES}=40 V; T_{case}=25 °C)	I_{CES}	10 (<100)*	–	nA
Collector-emitter cutoff current (V_{CES}=60 V; T_{case}=25 °C)	I_{CES}	–	10 (<100)*	nA
Collector-emitter cutoff current (V_{CES}=40 V; T_{case}=150 °C)	I_{CES}	10 (<100)	–	µA
Collector-emitter cutoff current (V_{CES}=60 V; T_{case}=150 °C)	I_{CES}	–	10 (<100)	µA
Collector-emitter breakdown voltage (I_{CE}=100 mA; impulse width 200 µs; keying ratio 1%)	$V_{(BR)CEO}$	>40	>60	V
Emitter-base breakdown voltage (I_{EB}=10 µA)	$V_{(BR)EBO}$	>5	>5	V
Collector-base breakdown voltage (I_{CB}=100 µA)	$V_{(BR)CBO}$	>60	>80	V

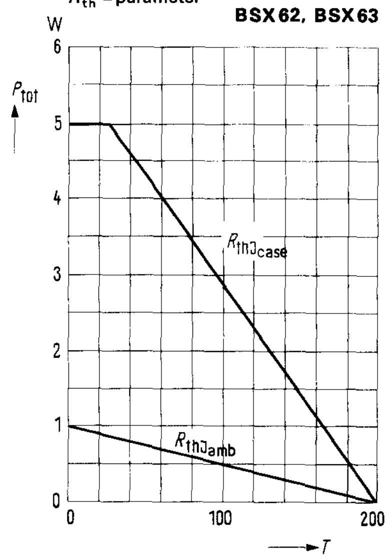
Dynamic characteristics (T_{case}=25 °C)

Current gain bandwidth product (I_C=200 mA; V_{CE}=10 V)	f_T	70 (>30)	70 (>30)	MHz
Collector-base capacitance (V_{CB}=10 V)	C_{CBO}	35 (<70)	35 (<70)	pf
Switching times (I_C≈1 A; I_{B1}≈$-I_{B2}$≈50 mA)	t_{on}	<0.3	<0.3	µs
	t_{off}	<1.5	<1.5	µs

Circuit for measuring switching times

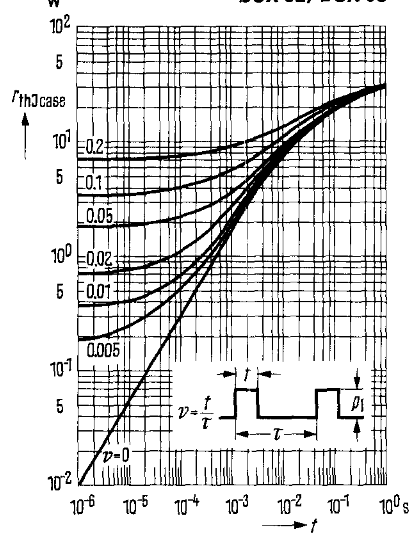


Total power dissipation $P_{tot}=f(T)$
R_{th}=parameter
BSX 62, BSX 63

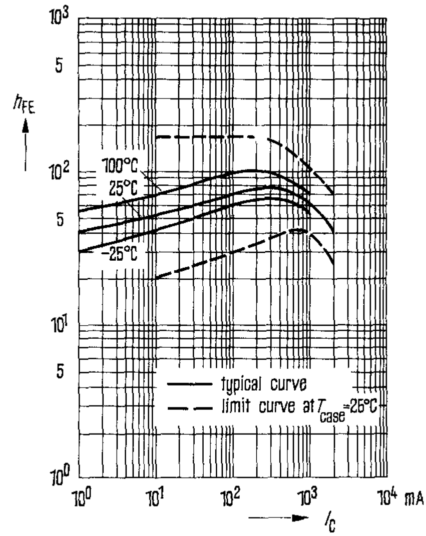


* AQL=0.65%

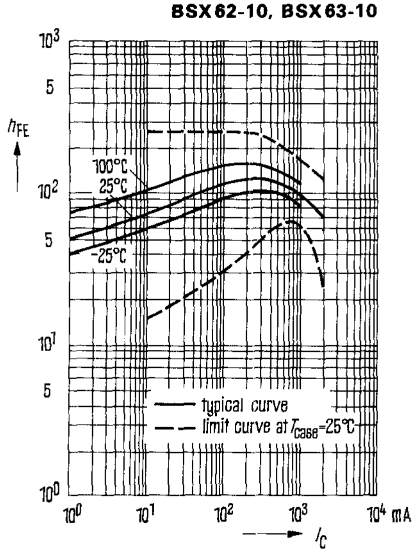
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BSX 62, BSX 63



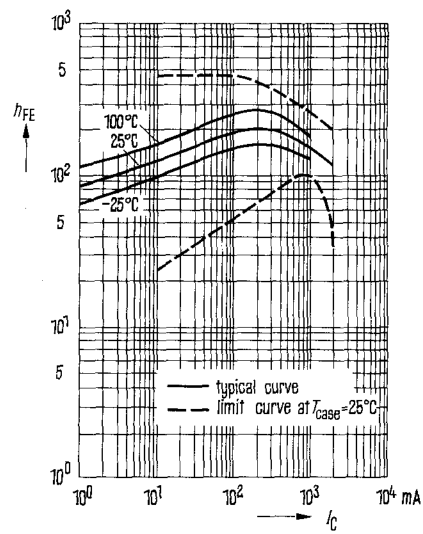
Static forward current transfer ratio $h_{FE} = f(I_C)$; V_{CE} = 1 V
T_{amb} = parameter
(common emitter circuit)
BSX 62-6, BSX 63-6



Static forward current transfer ratio $h_{FE} = f(I_C)$; V_{CE} = 1 V
T_{amb} = parameter
(common emitter circuit)
BSX 62-10, BSX 63-10

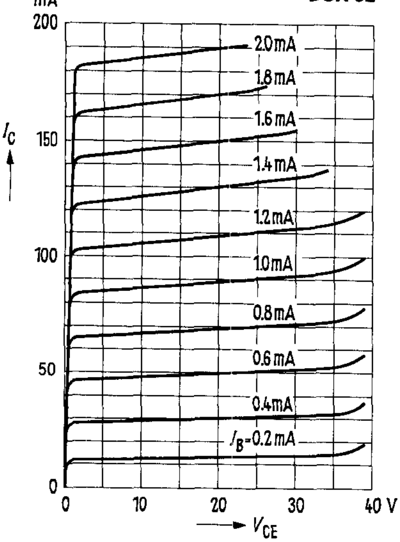


Static forward current transfer ratio $h_{FE} = f(I_C)$; V_{CE} = 1 V
T_{amb} = parameter
(common emitter circuit)
BSX 62-16



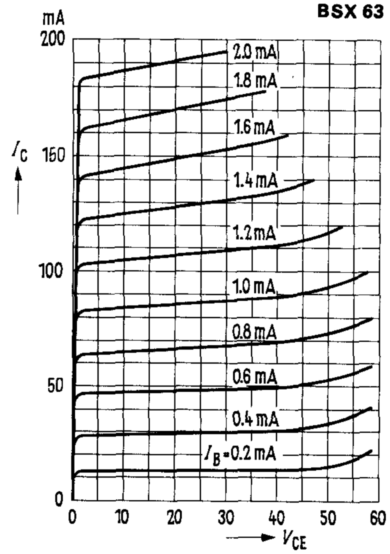
Output characteristics
$I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)

BSX 62



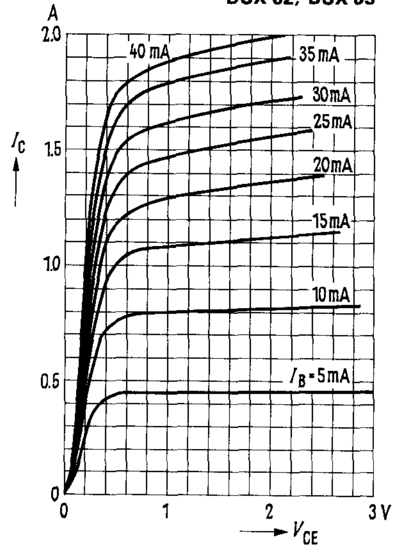
Output characteristics
$I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)

BSX 63

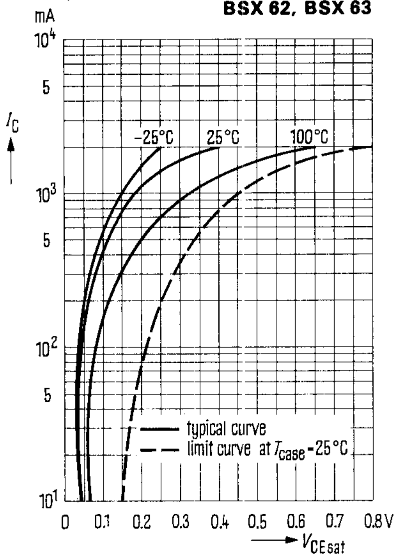


Output characteristics
$I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)

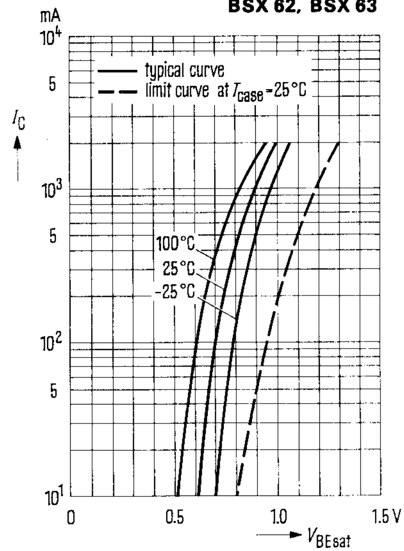
BSX 62, BSX 63



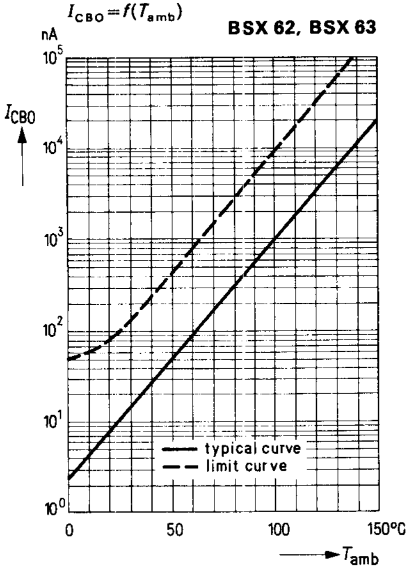
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
(common emitter circuit)
BSX 62, BSX 63



Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
(common emitter circuit)
BSX 62, BSX 63



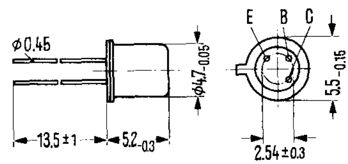
Collector cutoff current
$I_{CBO} = f(T_{amb})$
BSX 62, BSX 63



NPN RF Transistors for switching applications

BSY 17, BSY 18, BSY 62 and BSY 63 are double-diffused epitaxial NPN silicon planar RF transistors in a case 18A3 DIN 41876 (TO-18). Their collectors are electrically connected to their cases. Transistor BSY 17 corresponds to type 2N743, BSY 18 to 2N744, BSY 62 group A to type 2N706A and BSY 63 to type 2N708. The transistors are especially suitable for high-speed logic gate applications.

Type	Order number
BSY17	Q60218-Y17
BSY18	Q60218-Y18
BSY62A	Q60218-Y62-A
BSY62B	Q60218-Y62-B
BSY63	Q60218-Y63



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		BSY 18 BSY 17	BSY 62	BSY 63	
Collector-emitter voltage	V_{CEO}	12	15	15	V
Collector-base voltage	V_{CBO}	20	25	40	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C	200	200	200	mA
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	−65 to +200	°C
Total power dissipation (T_{case} = 45 °C)	P_{tot}	1	1	1	W
Thermal resistance					
Junction to ambient air	R_{thJamb}	≦500	≦500	≦500	K/W
Junction to case	$R_{thJcase}$	≦150	≦150	≦150	K/W

Static characteristics		BSY 17		
	T_{amb}	170	25	°C
Collector-base cutoff current (V_{CBO} = 20 V)	I_{CBO}	<100	<1*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>12	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>20	V

* AQL = 0.65%

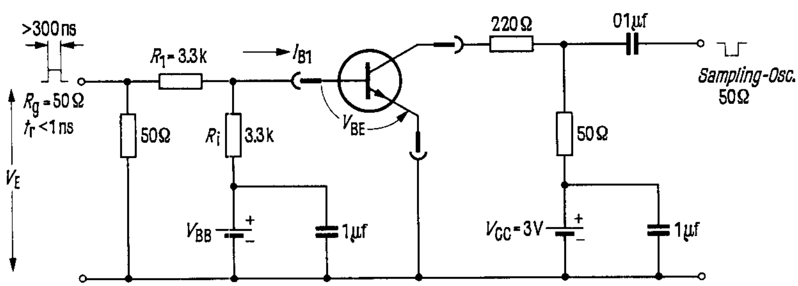
Static characteristics

		BSY 18		
	T_{amb}	170	25	°C
Collector-base cutoff current (V_{CBO} = 20 V)	I_{CBO}	<100	<1*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>12	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V

		BSY 62		
	T_{amb}	150	25	°C
Collector-base cutoff current (V_{CBO} = 15 V)	I_{CBO}	<30	<0.5*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>15	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>25	V

		BSY 63		
	T_{amb}	150	25	°C
Collector-base cutoff current (V_{CBO} = 20 V)	I_{CBO}	<15	0.003 (<0.025)*	µA
Collector-emitter cutoff current (V_{CE} = 20 V; V_{BE} = 0.25 V; T_{amb} = 125 °C)	I_{CEV}	<10	–	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>15	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>40	V

Circuit for measuring on and off-switching times (t_{on}; t_{off}), keying ratio <2%



Static characteristics (T_{amb}=25 °C)

BSY 17

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B	V_{BEsat} [1]) V	V_{CEsat} [1]) V
0.25	<0.1	1	>10*	0.65	–
0.35	0.167 to 0.5	10	20 to 60*	0.7 (<0.85)	<0.28*
1.0	<10	100	>10*	<1.5	–

BSY 18

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B	V_{BEsat} [1]) V	V_{CEsat} [1]) V
0.25	<0.05	1	>20*	0.65	–
0.35	0.083 to 0.25	10	40 to 120*	0.7 (<0.85)	<0.28*
1.0	<5.0	100	>20*	<1.5	–

BSY 62 The transistors are grouped according to the static forward current transfer ratio and identified by the code letters "A" or "B".

h_{FE} Group	V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B
A	1	0.17 to 0.5	10	20 to 60*
B	1	0.033 to 0.33	10	30 to 300*

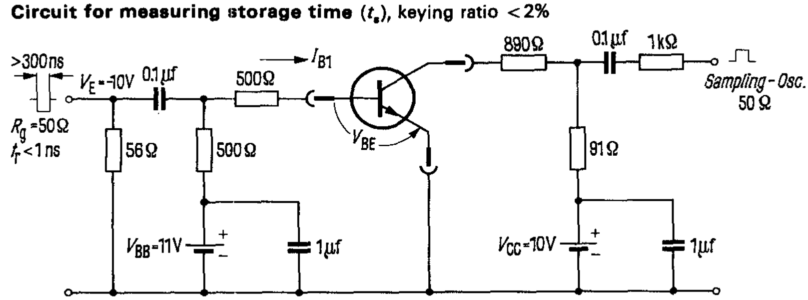
Saturation voltage (I_C=10 mA; I_B=10 mA) V_{BEsat}[1]) = <0.9 V
V_{CEsat}[1]) = <0.6 V

BSY 63

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B
1	<0.033	0.5	>15*
1	0.083 to 0.33	10	30 to 120*

Saturation voltage (I_C=10 mA; I_B=10 mA) V_{BEsat}[1]) = 0.72 (<0.8) V
V_{CEsat}[1]) = <0.4* V

Circuit for measuring storage time (t_s), keying ratio <2%

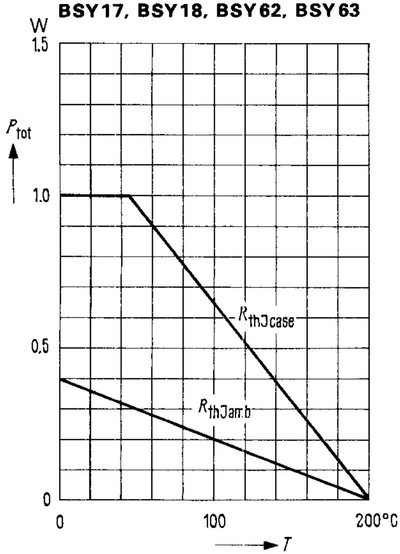


[1]) The transistor has been overdriven to such an extent that the DC forward current transfer ratio has decreased to a value h_{FE}=10.
* AQL=0.65%.

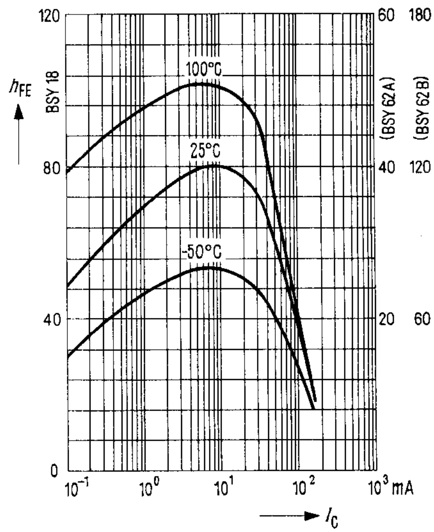
Dynamic characteristics (T_{amb}=25 °C)

		BSY 17	BSY 18	BSY 62	BSY 63	
Current-gain bandwidth product (I_C=10 mA; V_{CE}=10 V; f=100 MHz)	f_T	>280	>280	>280	>300	MHz
Collector-base capacitance (V_{CBO}=5 V)	C_{CBO}	2.7 (<5)	2.7 (<5)	2.7 (<5)	2.7 (<6)	pf
Switching times:						
Test condition I_C=10 mA; I_{B1}=3 mA;	t_{on}	<16	<16	<40	<40	ns
$-I_{B2}$=1.5 mA; R_L=270 Ω	t_{off}	<24	<24	<75	<75	ns
Test condition I_C=100 mA; I_{B1}=40 mA;	t_{on}	7	7	–	–	ns
$-I_{B2}$=20 mA; R_L=50 Ω	t_{off}	25	25	–	–	ns
$I_C=I_{B1}=-I_{B2}$=10 mA; R_L=1 kΩ	t_s	<14	<18	<25	<25	ns

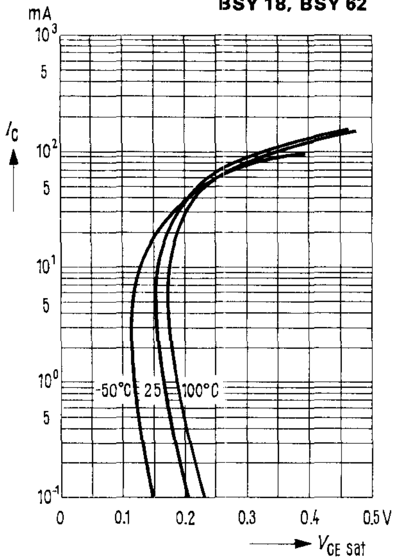
Total power dissipation $P_{tot}=f(T)$
R_{th}=parameter
BSY 17, BSY 18, BSY 62, BSY 63



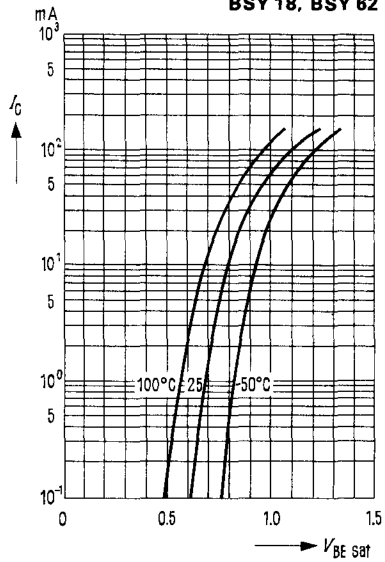
Static forward current transfer ratio $h_{FE}=f(I_C)$; V_{CE}=1 V;
T_{amb}=parameter (common emitter circuit)
BSY 18, BSY 62 A, BSY 62 B



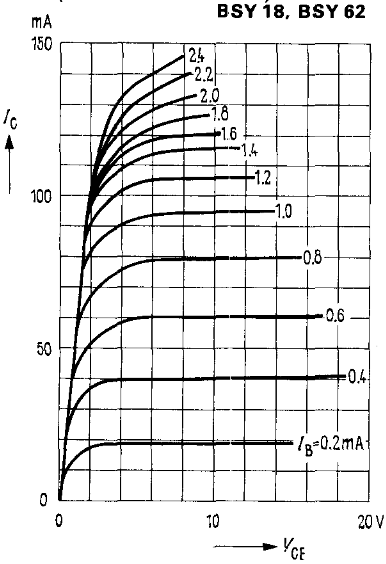
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$; $h_{FE} = 10$
T_{amb} = parameter
BSY 18, BSY 62



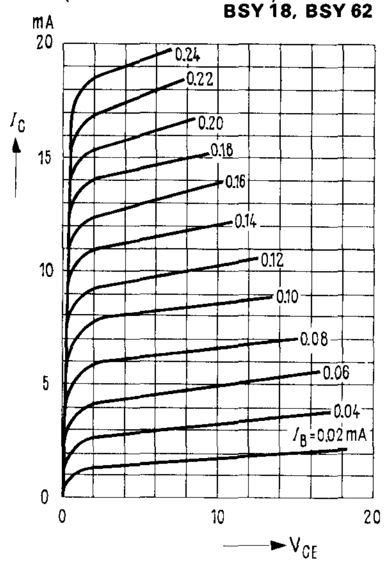
Base-emitter saturation voltage $V_{BEsat} = f(I_C)$; $h_{FE} = 10$
T_{amb} = parameter
BSY 18, BSY 62



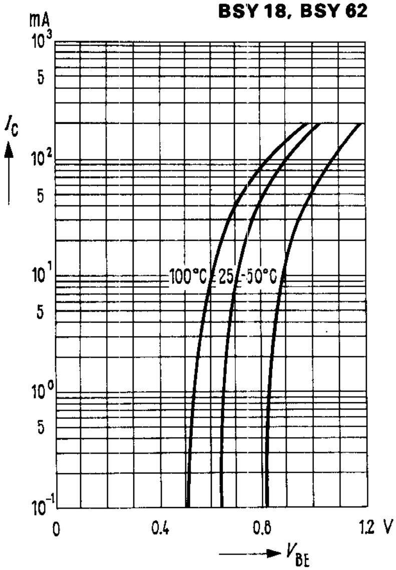
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSY 18, BSY 62



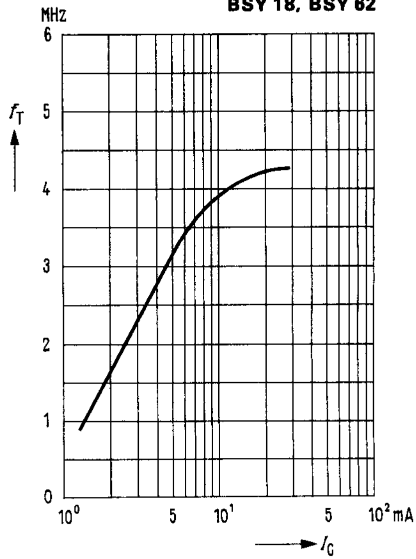
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSY 18, BSY 62



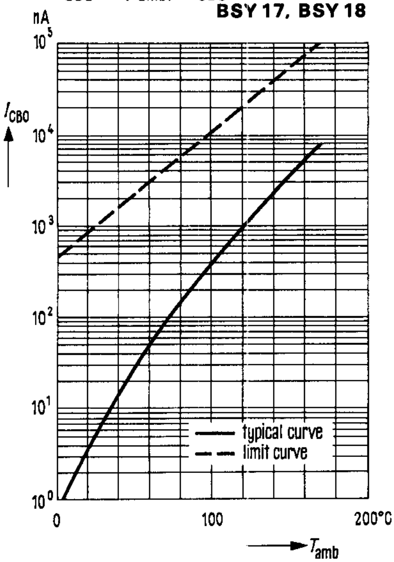
Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V (common emitter circuit)
BSY 18, BSY 62



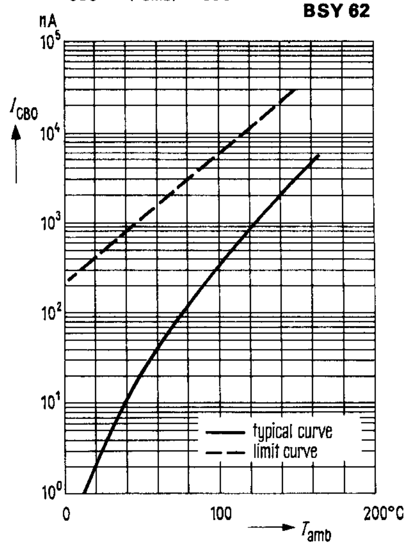
Current-gain bandwidth product $f_T = f(I_C)$ $V_{CE} = 10$ V; $T_{amb} = 25$ °C; $f = 100$ MHz
BSY 18, BSY 62



Collector-base cutoff current
$I_{CBO} = f(T_{amb})$; $V_{CBO} = 20$ V
BSY 17, BSY 18

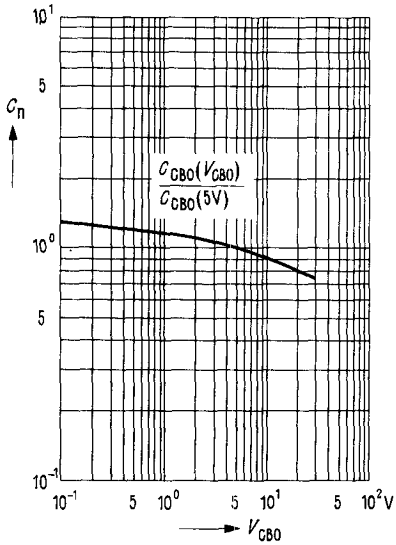


Collector-base cutoff current
$I_{CBO} = f(T_{amb})$; $V_{CBO} = 15$ V
BSY 62



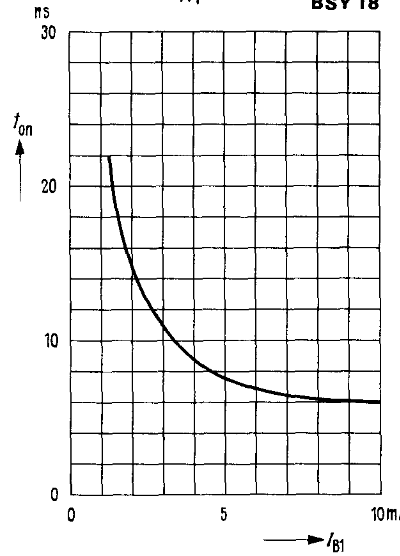
Collector-base capacitance
$C_n = f(V_{CBO})$

BSY 18, BSY 62



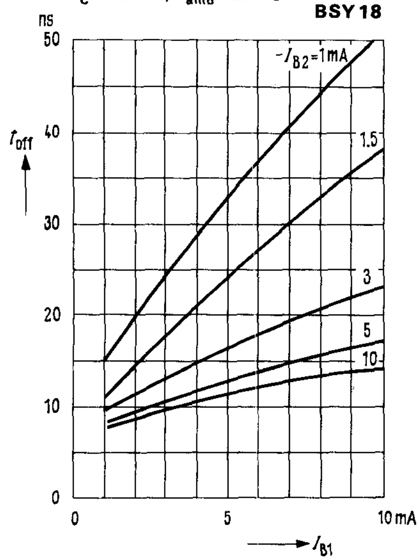
Switch-on time $t_{on} = f(I_{B1})$
$I_C = 10$ mA; $T_{amb} = 25$ °C
$V_{BB} = -3$ V; $\frac{R_2}{R_1} = 1$

BSY 18



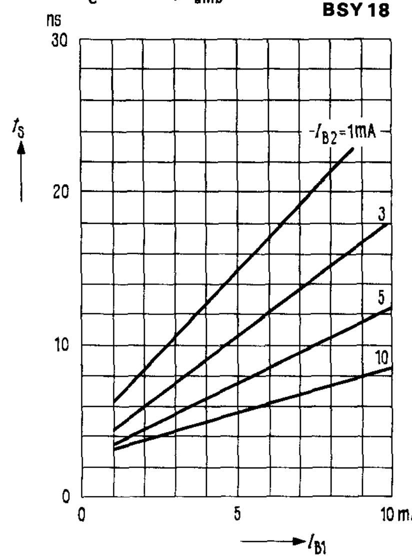
Switch-off time $t_{off} = f(I_{B1})$
$-I_{B2}$ = parameter
$I_C = 10$ mA; $T_{amb} = 25$ °C

BSY 18



Storage time $t_s = f(I_{B1})$
$-I_{B2}$ = parameter
$I_C = 10$ mA; $T_{amb} = 25$ °C

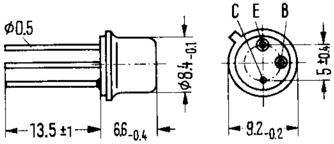
BSY 18



NPN RF Transistors for switching applications

Transistors BSY 34 and BSY 58 are double diffused epitaxial NPN silicon planar transistors in a case 5 C 3 DIN 41873 (TO-39). The collector is electrically connected to the case.
The transistors are for use as high-speed switches and are particularly for driving magnetic cores.

Type	Order number
BSY 34	Q60218-Y34
BSY 58	Q60218-Y58



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		BSY 34	BSY 58	
Collector-emitter voltage	V_{CEO}	40	25	V
Collector-emitter voltage	V_{CES}	60	50	V
Collector-base voltage	V_{CBO}	60	50	V
Emitter-base voltage	V_{EBO}	5	5	V
Collector current	I_C	600	600	mA
Base current	I_B	200	200	mA
Junction temperature	T_j	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	°C
Total power dissipation (T_{case}=45 °C)	P_{tot}	2.6	2.6	W
Thermal resistance				
Junction to ambient air	R_{thJamb}	≦220	≦220	K/W
Junction to case	$R_{thJcase}$	≦60	≦60	K/W

Static characteristics (T_{amb}=25 °C; V_{CE}=1 V)

	BSY 34			BSY 58		
I_C mA	h_{FE} I_C/I_B	V_{BEsat} 1) V	V_{CEsat} 1) V	h_{FE} I_C/I_B	V_{BEsat} 1) V	V_{CEsat} 1) V
1	23	0.62	–	23	0.62	–
10	37	0.7	–	37	0.7	–
100	42 (>25)*	0.85	0.17	42 (>17)*	0.85	0.17
500	25 (>10)	1.2 (<1.5)*	0.6 (<1)*	25	1.2 (<1.5)*	0.6 (<1.5)*

1) The transistor is overdriven to such an extent that the static current gain h_{FE} has decreased to a value of 10
* AQL=0.65%

Static characteristics

		BSY 34		BSY 58	
	T_{amb}	150	25	25	°C
Collector cutoff current (V_{CBO}=50 V)	I_{CBO}	$<7 \cdot 10^4$	<70*	<120*	nA
Collector-emitter breakdown voltage (I_{CEO}=10 mA)	$V_{(BR)CEO}$		>40	>25	V
Collector-emitter breakdown voltage (I_{CES}=10 μA)	$V_{(BR)CES}$		>60	>50	V
Collector-base breakdown voltage (I_{CBO}=100 μA)	$V_{(BR)CBO}$		>60	>50	V
Emitter-base breakdown voltage (I_{EBO}=100 μA)	$V_{(BR)EBO}$		>5	>5	V

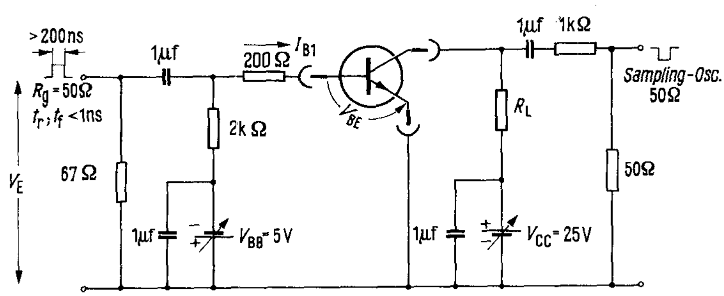
Dynamic characteristics (T_{amb}=25 °C)

		BSY 34	BSY 58	
Current gain-bandwidth product (I_C=30 mA; V_{CE}=10 V; f=100 MHz)	f_T	400 (>250)	400 (>250)	MHz
Collector-base capacitance (V_{CBO}=10 V)	C_{CBO}	4.5 (<6)	4.5 (<6)	pf
Emitter-base capacitance (V_{EBO}=1 V)	C_{EBO}	22	22	pf

Switching times

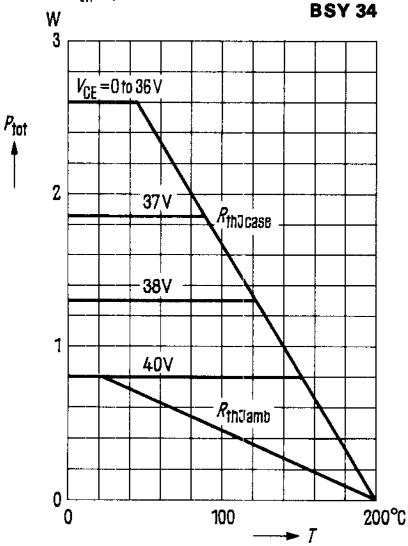
		BSY 34	BSY 58	
Test condition: I_C=150 mA; I_{B1}=15 mA;	t_{on}	30	35	ns
$-I_{B2}$=15 mA; R_L=150 Ω	t_{off}	50	60	ns
Test condition: I_C=500 mA; I_{B1}=50 mA; $-I_{B2}$=25 mA; V_E=15 V				
R_L=80 Ω for **BSY 34** (V_{CC}=40 V)	t_{on}	30 (< 50)	35 (<65)	ns
R_L=50 Ω for **BSY 58** (V_{CC}=25 V)	t_{off}	65 (< 95)	65 (<110)	ns

Switching time measuring circuit

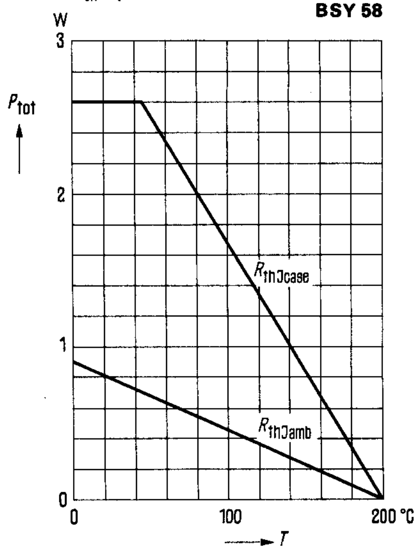


* AQL=0.65%

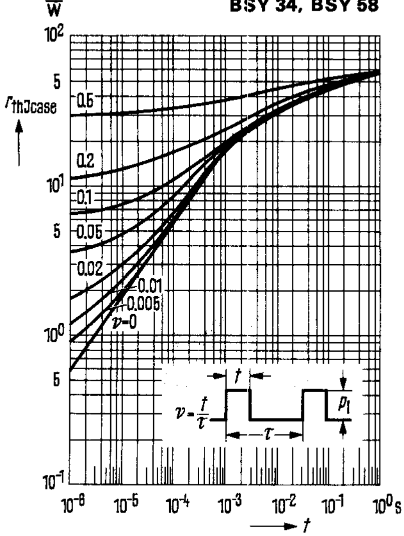
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter
BSY 34



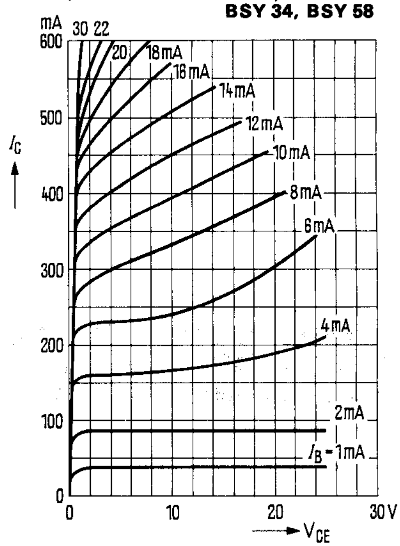
Total power dissipation $P_{tot} = f(T)$
R_{th} = parameter
BSY 58



Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter
BSY 34, BSY 58



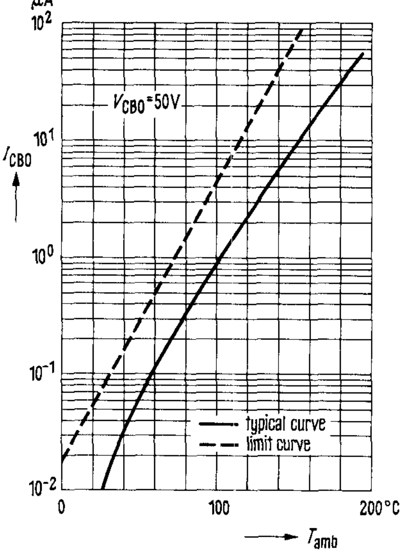
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)
BSY 34, BSY 58



Collector-base cutoff current

$I_{CBO} = f(T_{amb})$; $V_{CBO} = 60$ V

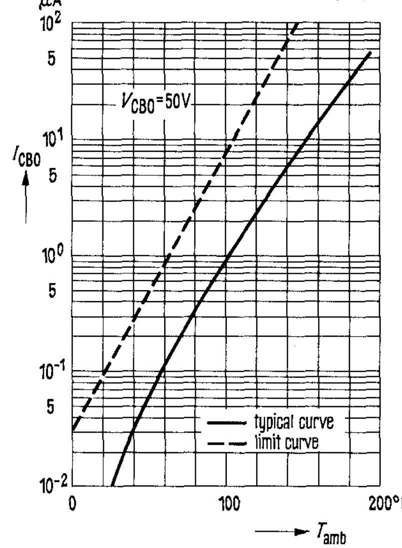
BSY 34



Collector-base cutoff current

$I_{CBO} = f(T_{amb})$; $V_{CBO} = 50$ V

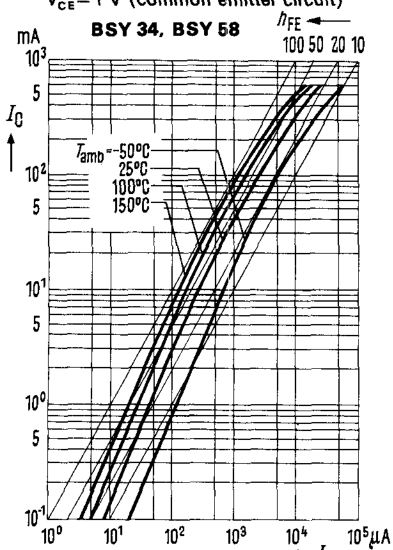
BSY 58



Collector current $I_C = f(I_B)$

$V_{CE} = 1$ V (common emitter circuit)

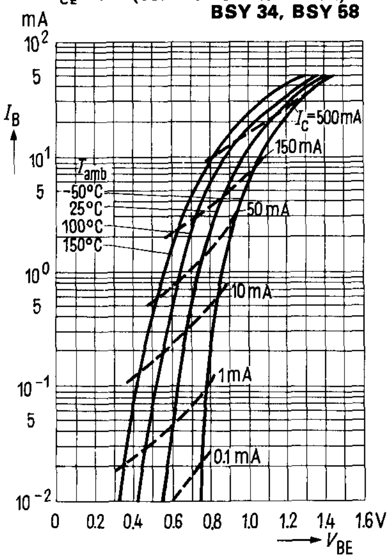
BSY 34, BSY 58



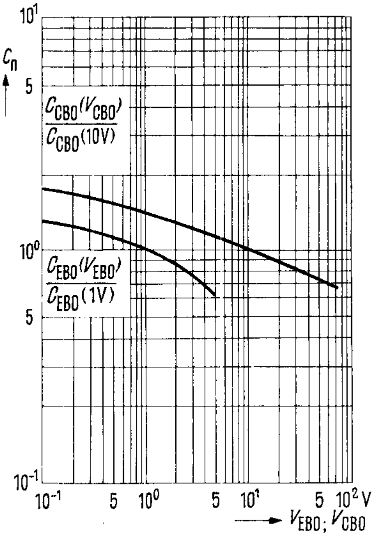
Input characteristics $I_B = f(V_{BE})$

$V_{CE} = 1$ V (common emitter circuit)

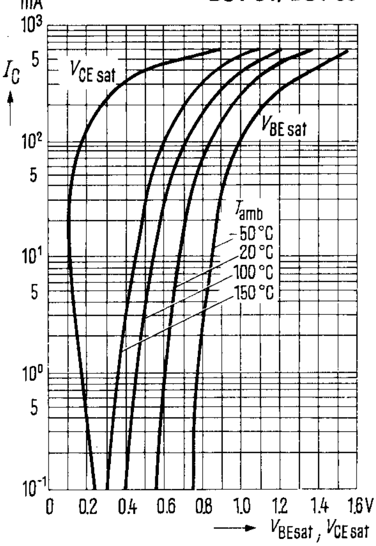
BSY 34, BSY 58



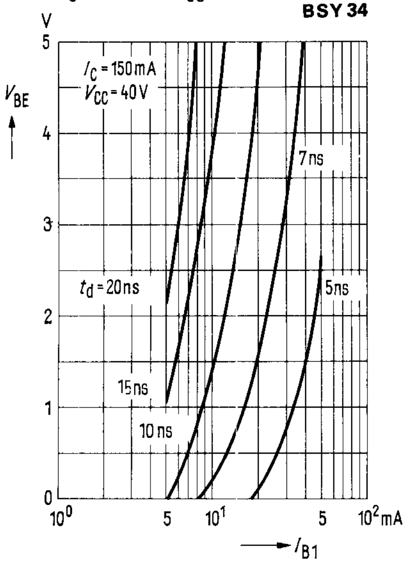
Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$
BSY 34, BSY 58



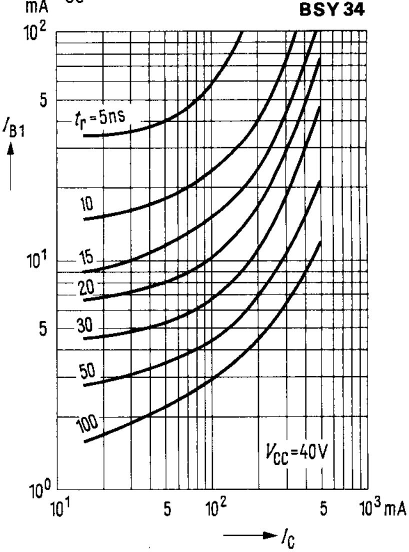
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{amb} = parameter
BSY 34, BSY 58



Delay time t_d
$I_C = 150$ mA; $V_{CC} = 40$ V
BSY 34

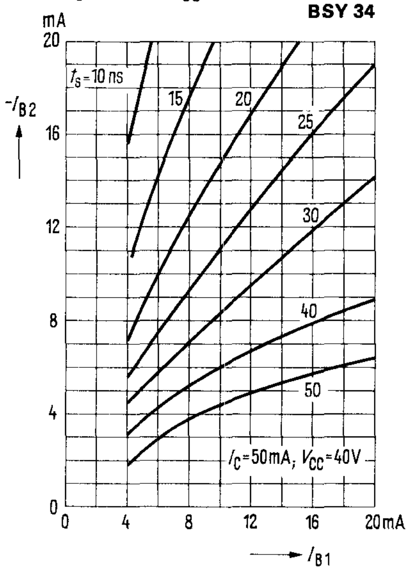


Rise time t_r
$V_{CC} = 40$ V
BSY 34



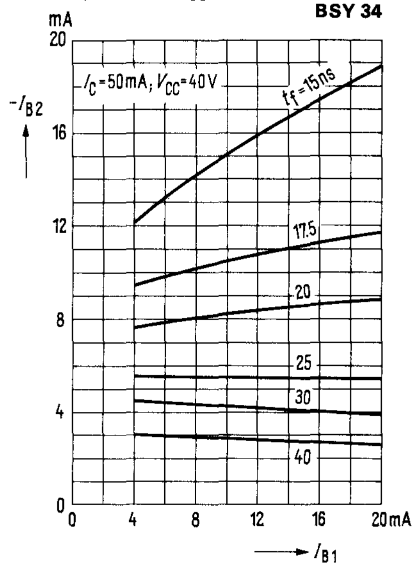
Storage time t_s
$I_C = 50$ mA; $V_{CC} = 40$ V

BSY 34



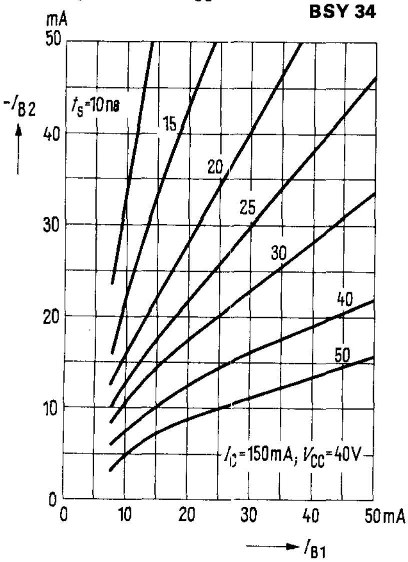
Fall time t_f
$I_C = 50$ mA; $V_{CC} = 40$ V

BSY 34



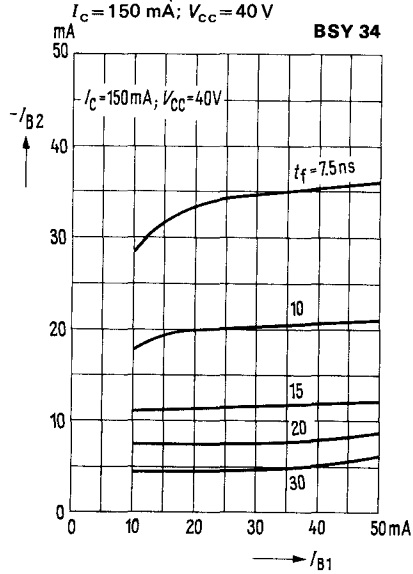
Storage time t_s
$I_C = 150$ mA; $V_{CC} = 40$ V

BSY 34



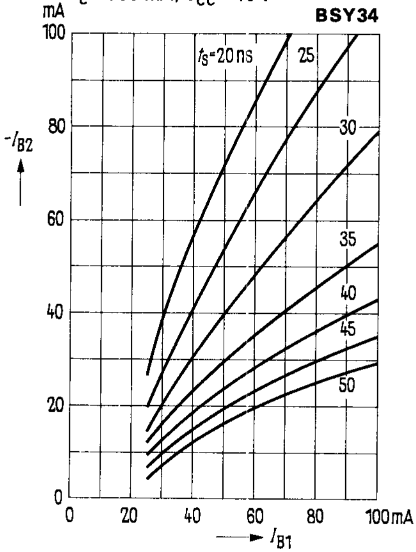
Fall time t_f
$I_C = 150$ mA; $V_{CC} = 40$ V

BSY 34



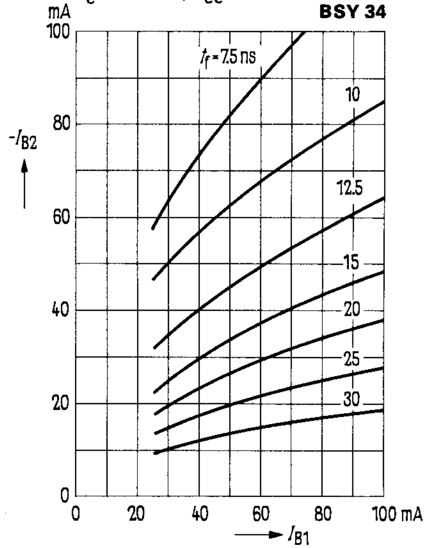
Storage time t_s
$I_C = 500$ mA; $V_{CC} = 40$ V

BSY34



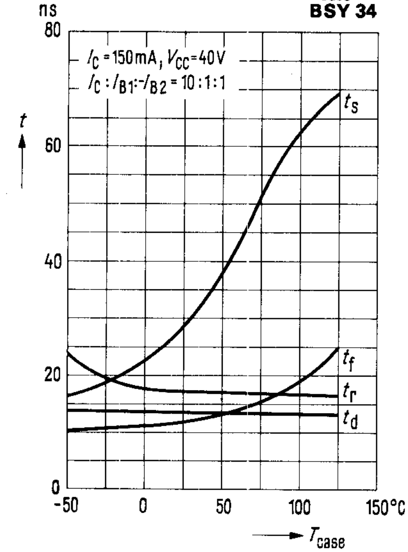
Fall time t_f
$I_C = 500$ mA; $V_{CC} = 40$ V

BSY 34



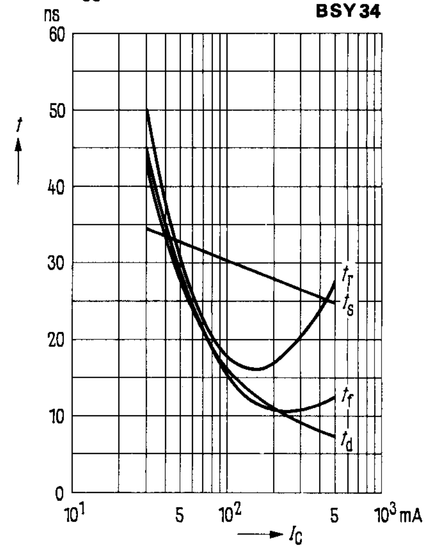
Switching times as a function of case temperature $t = f(T_{case})$

BSY 34



Switching times $t = f(I_C)$
$V_{CC} = 40$ V

BSY 34

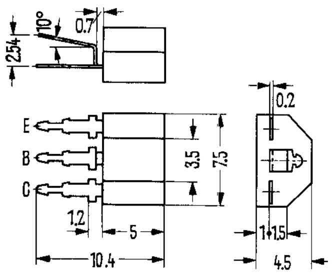


PNP Transistor for switching applications

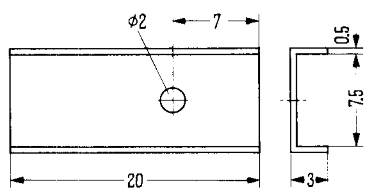
Not for new development

The transistor BSY 59 is an epitaxial silicon planar PNP transistor in a plastic case 11 A 3 DIN 41869 (SOT-25). The transistor is especially designed for use as switch of medium speed as well as for universal application.

Type	Order number
BSY 59	Q62702-S157



Weight approx. 0.33 g Dimensions in mm



Heat sink (Cu) for gluing on transistor (suggestion)

Maximum ratings		BSY 59	
Collector-emitter voltage	$-V_{CES}$	30	V
Collector-emitter voltage	$-V_{CEO}$	30	V
Emitter-base voltage	$-V_{EBO}$	5	V
Collector current	$-I_C$	800	mA
Base current	$-I_B$	100	mA
Junction temperature	T_j	150	°C
Storage temperature	T_S	−55 to +150	°C
Total power dissipation ($T_{amb} \leqq 25$ °C)	P_{tot}	280	mW
Total power dissipation ($T_{case} \leqq 45$ °C) [1]	P_{tot}	480	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	<450	K/W
Junction to case[1]	$R_{thJcase}$	<220	K/W

[1]) Transistor glued onto heat sink

Not for new development

Static characteristics (T_{amb}=25 °C)

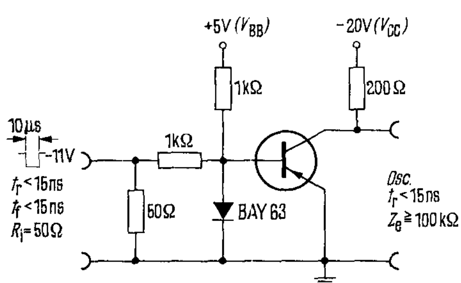
V_{CE} V	$-I_C$ mA	h_{FE} I_C/I_B	$-V_{BE}$ V
0.7	100	160 (63 to 400)	<1
0.7	500	20 (>10)	–

Saturation voltage ($-I_C$=500 mA; I_B=50 mA)	V_{CEsat}	<0.7	V
Collector-emitter cutoff current ($-V_{CE}$=25 V)	$-I_{CES}$	2 (<100)	nA
Collector-emitter cutoff current ($-V_{CE}$=25 V; T_{amb}=125 °C)	$-I_{CES}$	<10	µA
Emitter-base breakdown voltage ($-I_{EB}$=10 µA)	$-V_{(BR)EBO}$	>5	V
Collector-emitter breakdown voltage ($-I_{CE}$=10 mA)	$-V_{(BR)CEO}$	>30	V
($-I_{CE}$=10 µA)	$-V_{(BR)CES}$	>30	V

Dynamic characteristics(T_{amb}=25 °C)

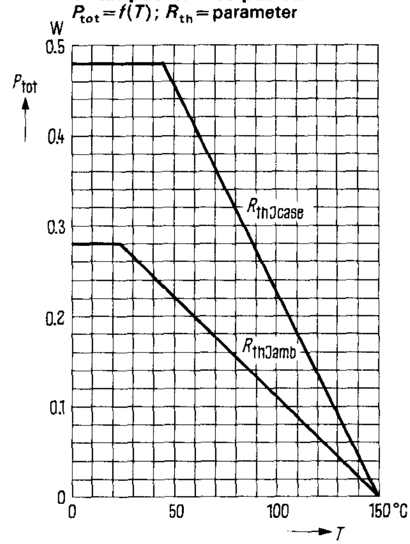
Current gain-bandwidth product ($-I_C$=10 mA; $-V_{CE}$=5 V; f=50 MHz)	f_T	100	MHz
Collector-base capacitance ($-V_{CB}$=10 V; f=1 MHz)	C_{CBO}	12	pf
Switching times (I_C=100 mA; I_{B1}≈I_{B2}≈5 mA)	t_{on}	<500	ns
	t_{off}	<850	ns

Circuit for measuring switching times



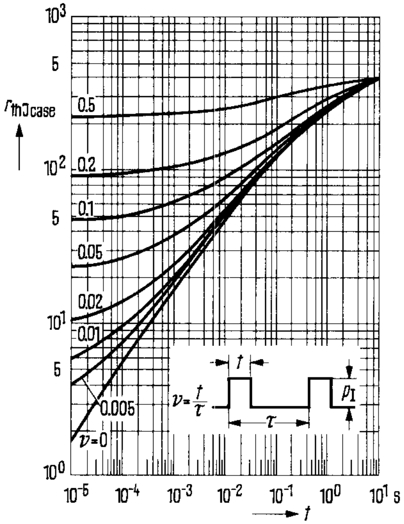
Teat circuit for I_C=100 mA

Total power dissipation
$P_{tot}=f(T)$; R_{th}=parameter

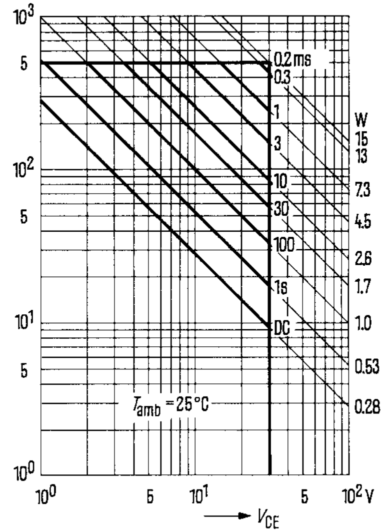


Not for new development

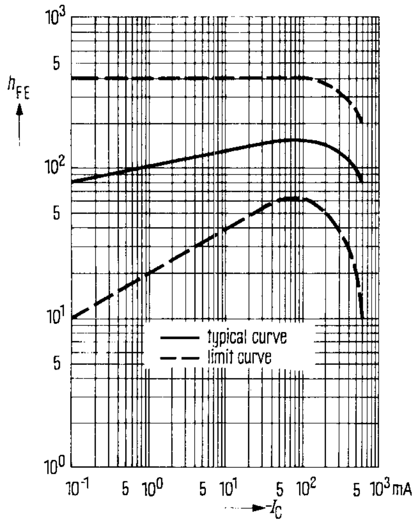
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



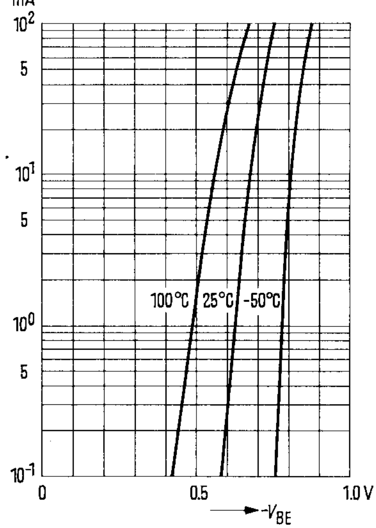
Permissible operating range
$I_C = f(V_{CE})$



Static forward current transfer ratio $h_{FE} = f(I_C)$
V_{CE} = 1 V; T_{amb} = 25 °C

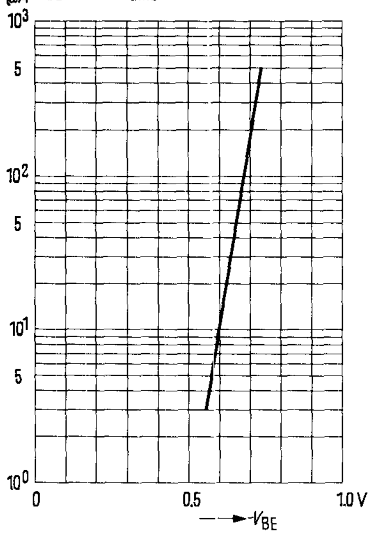


Collector current $I_C = f(V_{BE})$
V_{CE} = 5 V; T_{amb} = parameter

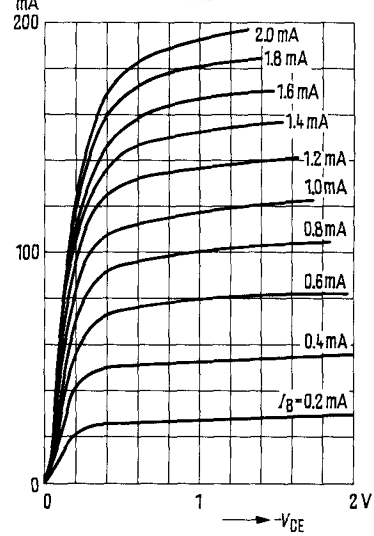


Not for new development

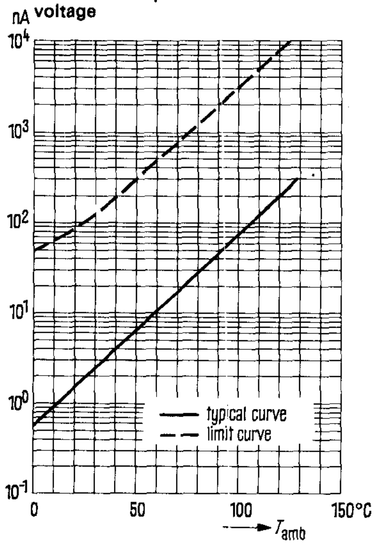
Input characteristic $I_B = f(V_{BE})$
$V_{CE} = 5\ V$; $T_{amb} = 25\ °C$



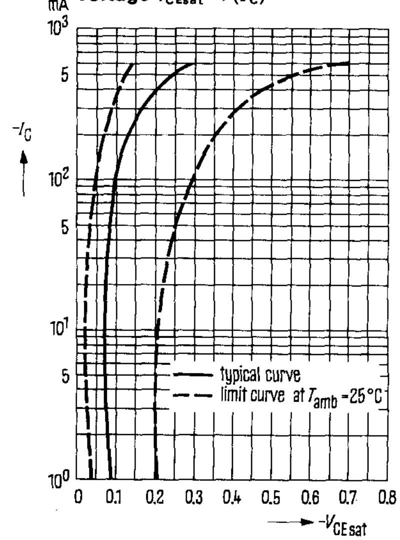
Output characteristics $I_C = f(V_{CE})$
I_B = parameter; $T_{amb} = 25\ °C$



Collector-base cutoff current
$I_{CBO} = f(T_{amb})$
for maximum permissible reverse voltage



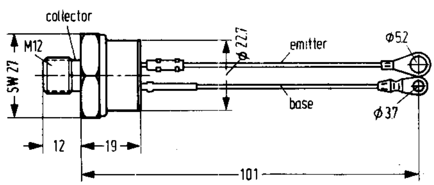
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$



NPN Power transistors for switching applications

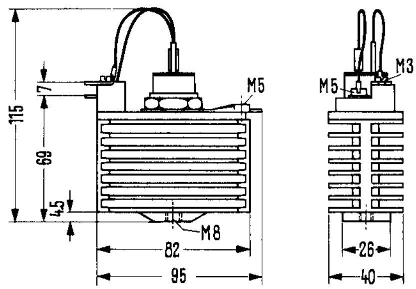
BUY 26, BUY 27 and BUY 28 are alloyed NPN silicon transistors in a metal case. The collector is electrically connected to the case. The insulation clearances correspond to the insulation group C of the German VDE Standard 0110. The transistors are particularly suitable for switching applications at high voltages and currents.

Type	Order number
BUY 26	C 66060-A 2399-A 1
BUY 27	C 66060-A 2399-A 2
BUY 28	C 66060-A 2399-A 3
Heat sink	(Cooling block)
FK 04	C 66055-A 6103-B 3
HK 04	C 66055-A 6104-B 2



Weight approx. 50 g   Dimensions in mm

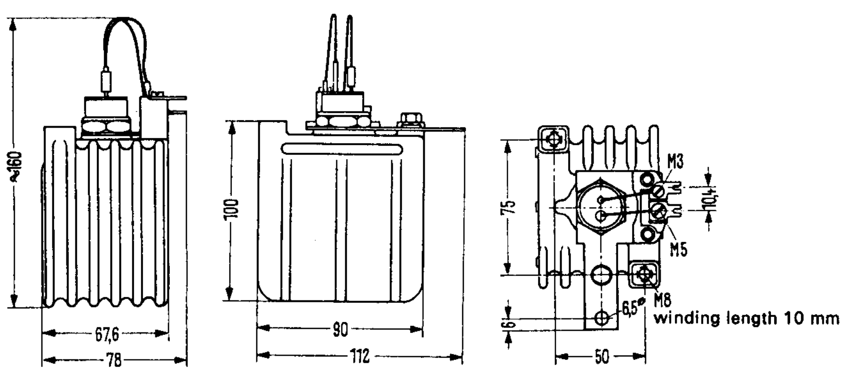
Heat sink FK 04
Thermal resistance at P_{tot} = 25 W (self-cooled)



Weight approx. 260 g   Dimensions in mm

Heat sink HK 04
Thermal resistance at P_{tot} = 60 W (self-cooled) R_{thHS} 1.1 K/W

at forced ventilation with 15 l/s R_{thHS} 0.4 K/W



Weight approx. 700 g   Dimensions in mm

Maximum ratings		BUY 26	BUY 27	BUY 28	
Collector-emitter voltage ($R_{BE} \leqq 100\,\Omega$)	V_{CER}	200	360	420	V
Collector-emitter voltage	V_{CES}	200	360	420	V
Collector-emitter voltage	V_{CEO}	150	250	300	V
Collector-base voltage	V_{CBO}	200	360	420	V
Emitter-base voltage	V_{EBO}	15	25	25	V
Collector current	I_C	10	10	10	A
Base current	I_B	5	5	5	A
Emitter current	I_E	15	15	15	A
Junction temperature	T_j	100	100	100	°C
Storage temperature	T_s		−40 to +100		°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	100	100	100	W
Thermal resistance					
Junction to case	$R_{thJcase}$	≦0.6	≦0.6	≦0.6	K/W

Static characteristics ($T_{amb}=25$ °C)

At a collector-emitter voltage of $V_{CE}=3$ V and the following collector currents, the following values apply:

I_C A	I_B mA	h_{FE} I_C/I_B	V_{BE} V
0.5	21	24	0.6
2	120 (<155)	17 (>13)	0.7
10	1800 (<2000)	5.5 (>5)	1.15 (<1.5)

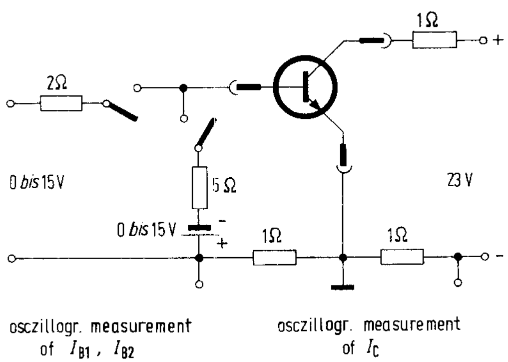
Collector-emitter saturation voltage
($V_{CE}=3$ V; $I_C=8$ A) $V_{CEsat}=0.4$ (<0.75 V)

The transistor is overdriven to such an extent that the static forward current transfer ratio has dropped to $h_{FE}=3$.

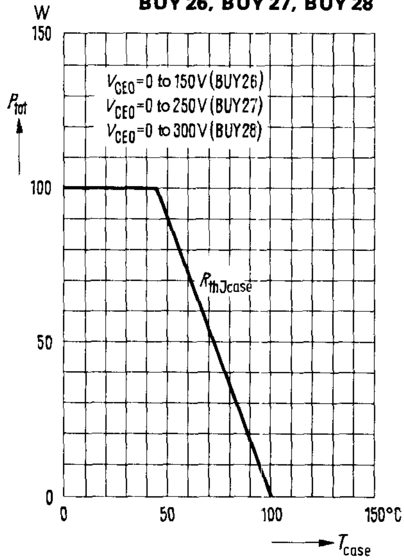
		BUY 26	BUY 27	BUY 28	
Collector-emitter cutoff current (at $R_{BE}=100\,\Omega$)					
($V_{CER}=200$ V; $T_j=25$ °C)	I_{CER}	<15	–	–	mA
($V_{CER}=360$ V; $T_j=25$ °C)	I_{CER}	–	<15	–	mA
($V_{CER}=420$ V; $T_j=25$ °C)	I_{CER}	–	–	<15	mA
($V_{CER}=200$ V; $T_j=100$ °C)	I_{CER}	<20	–	–	mA
($V_{CER}=360$ V; $T_j=100$ °C)	I_{CER}	–	<20	–	mA
($V_{CER}=420$ V; $T_j=100$ °C)	I_{CER}	–	–	<20	mA
($V_{CER}=110$ V; $T_j=100$ °C)	I_{CER}	<2	–	–	mA
($V_{CER}=200$ V; $T_j=100$ °C)	I_{CER}	–	<2	–	mA
($V_{CER}=250$ V; $T_j=100$ °C)	I_{CER}	–	–	<2	mA
Emitter-base cutoff current ($V_{EBO}=20$ V; $T_j=100$ °C)	I_{EBO}	<15	<15	<15	mA

Dynamic characteristics (T_{amb} = 25 °C)		BUY 26	BUY 27	BUY 28	
Current-gain bandwidth product (I_C = 10 A; V_{CE} = 3 V)	f_T	10	10	10	kHz
Switching times:					
Test condition:					
(I_C = 10 A; I_{B1} = 2 A; $-I_{B2}$ = 0; V_{CE} = 3 V)	t_r	20	20	20	µs
	t_s	3	3	3	µs
	t_f	60	60	60	µs
Test condition:					
(I_C = 10 A; I_{B1} = $-I_{B2}$ = 2 A; V_{CE} = 3 V)	t_r	20	20	20	µs
	t_s	3	3	3	µs
	t_f	30	30	30	µs

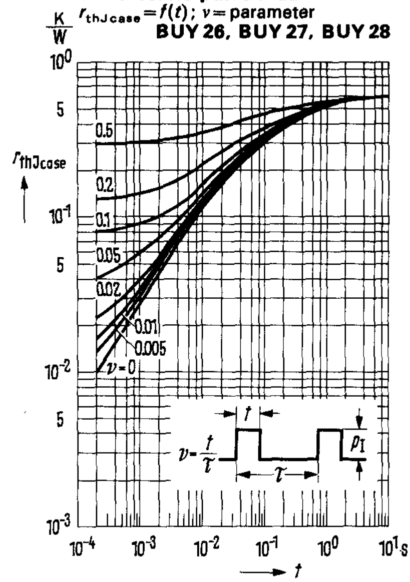
Measuring circuit for switching times



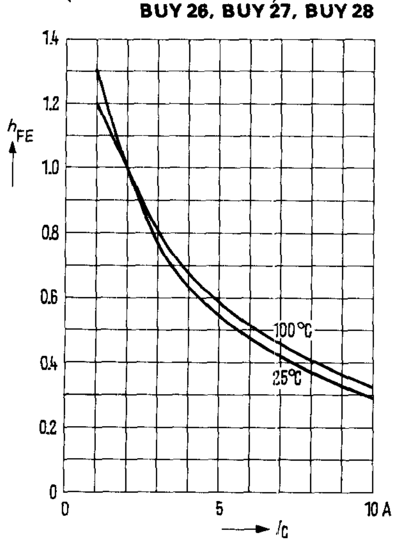
Total permissible power dissipation $P_{tot} = f(T_{case})$
BUY 26, BUY 27, BUY 28



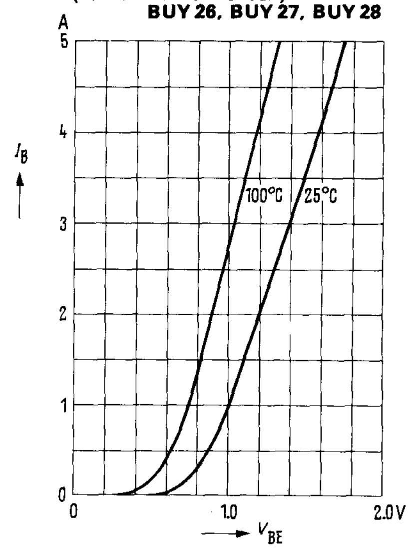
Permissible pulse load $r_{thJcase} = f(t)$; v = parameter
BUY 26, BUY 27, BUY 28



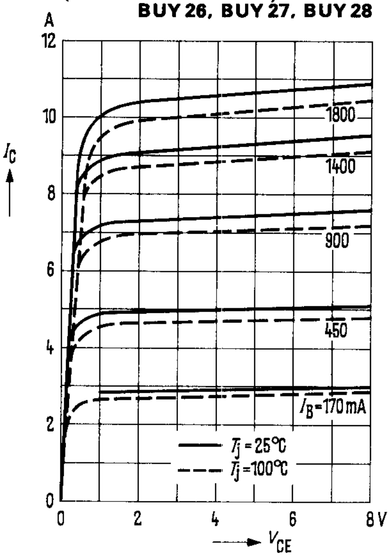
Static forward current transfer ratio $h_{FE} = f(I_C)$; $V_{CE} = 3$ V
T_{case} = parameter
(common emitter circuit)
BUY 26, BUY 27, BUY 28



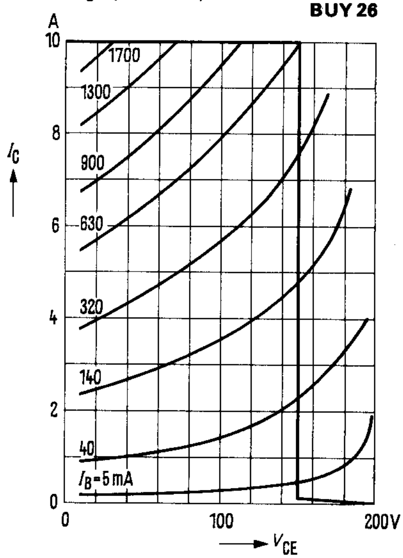
Input characteristics $I_B = f(V_{BE})$
$V_{CE} = 3$ V; T_{case} = parameter
(common emitter circuit)
BUY 26, BUY 27, BUY 28



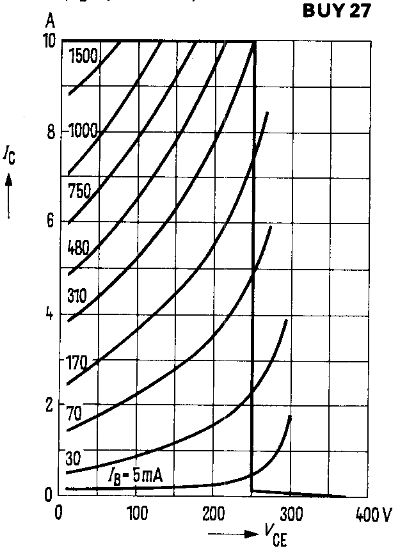
Output characteristics $I_C = f(V_{CE})$; I_B = parameter
(common emitter circuit)
BUY 26, BUY 27, BUY 28



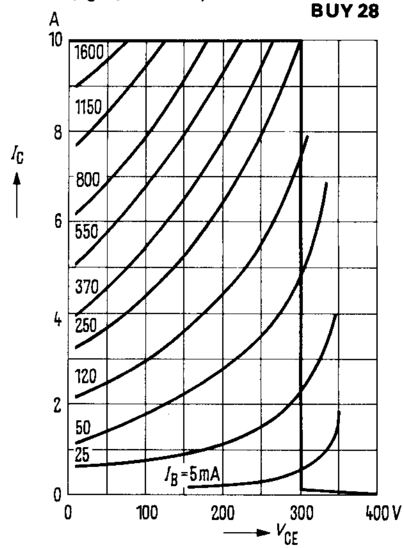
Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(I_B = parameter)
BUY 26



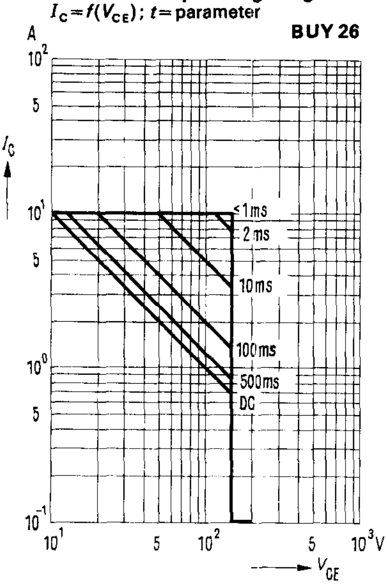
Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(I_B = parameter)
BUY 27



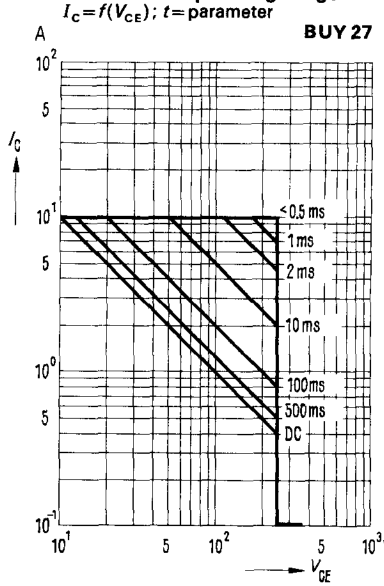
Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(I_O = parameter)
BUY 28



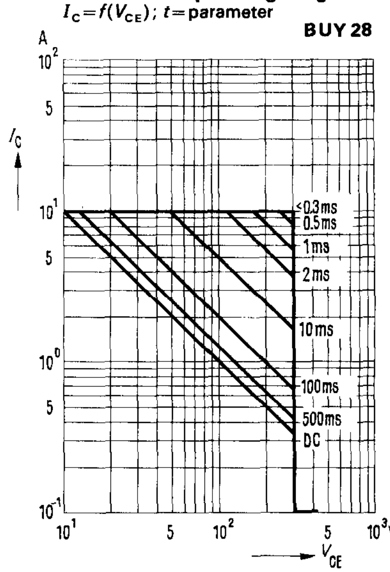
Permissible operating range
$I_C = f(V_{CE})$; t = parameter



Permissible operating range
$I_C = f(V_{CE})$; t = parameter



Permissible operating range
$I_C = f(V_{CE})$; t = parameter

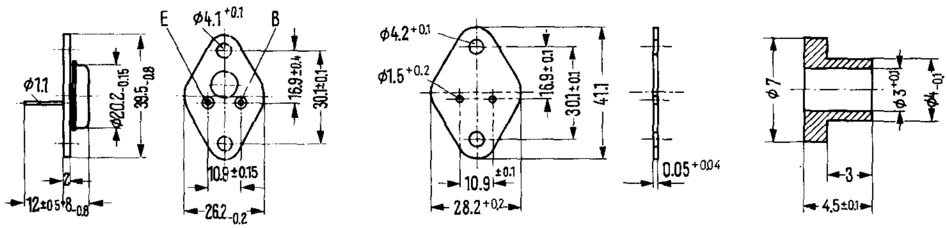


NPN Silicon power transistor

Preliminary data

BUY 35 is a single-diffused NPN silicon power transistor in a case 3 A 2 DIN 41872 (TO-3). The transistor is particularly suitable for use as switch at higher voltages.

Type	Order number
BUY 35	Q 62702-U 112
Mica disc	Q 62901-B 11-A
Insulating nipple (Siprelit)	Q 62901-B 50

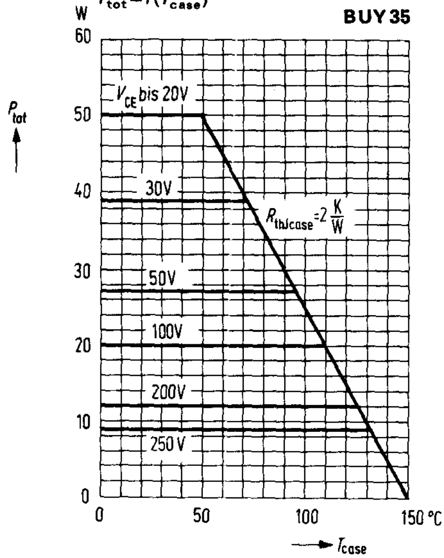


Weight approx. 16.5 g   Dimensions in mm   Mica disc   Insulating nipple scale 2:1

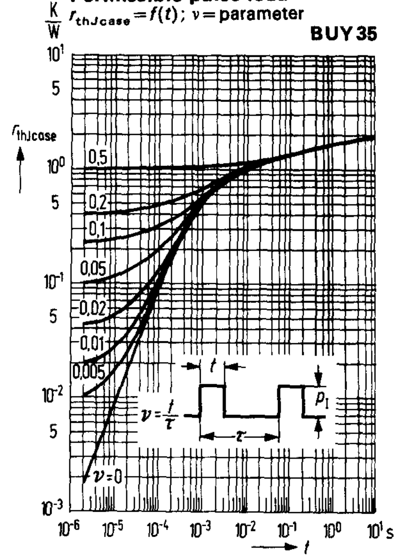
Maximum ratings		**BUY 35**	
Collector-emitter voltage	V_{CEO}	250	V
Collector-emitter voltage	V_{CES}	350	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	6	A
Maximum collector current	I_{CM}	8	A
Base current	I_B	3	A
Junction temperature	T_j	150	°C
Storage temperature	T_s	−55 to +150	°C
Total power dissipation ($T_{case} \leqq 50$ °C; $V_{CE} \leqq 20$ V)	P_{tot}	50	W
Thermal resistance			
Junction to case	$R_{thJcase}$	$\leqq 2$	K/W

		BUY 35	
Static characteristics (T_{case} = 25 °C)			
Forward current transfer ratio (I_C = 3 A; V_{CE} = 5 V)	h_{FE}	< 5	–
Collector-emitter breakdown voltage (I_C = 100 mA; t = 200 µs)	$V_{(BR)CEO}$	> 250	V
Collector-emitter breakdown voltage (I_C = 1 mA; V_{BE} = −3.5 V)	$V_{(BR)CEV}$	> 350	V
Collector-emitter saturation voltage (I_C = 3 A; I_B = 1 A)	V_{CEsat}	< 1.5	V
Base-emitter saturation voltage (I_C = 3 A; I_B = 1 A)	V_{BEsat}	< 2	V
Collector-emitter cutoff current (V_{CE} = 350 V; T_{case} = 150 °C)	I_{CES}	< 15	mA
Emitter-base cutoff current (V_{EBO} = 6 V)	I_{EBO}	< 1	mA
Dynamic characteristics (T_{case} = 25 °C)			
Current-gain bandwidth product (I_C = 200 mA; V_{CE} = 10 V)	f_T	20	MHz
Switching times: Fall time (I_C = 3 A; I_{B1} = $-I_{B2}$ = 1 A)	t_f	1	µs

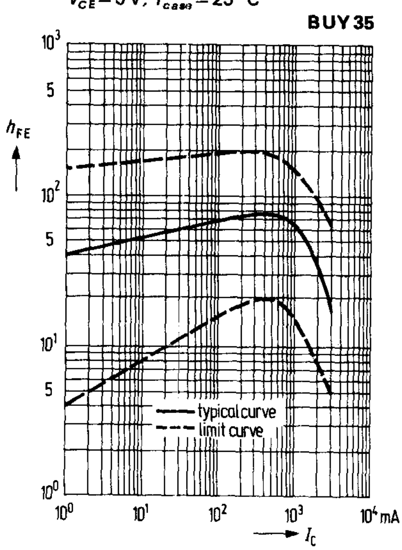
Total power dissipation
$P_{tot} = f(T_{case})$



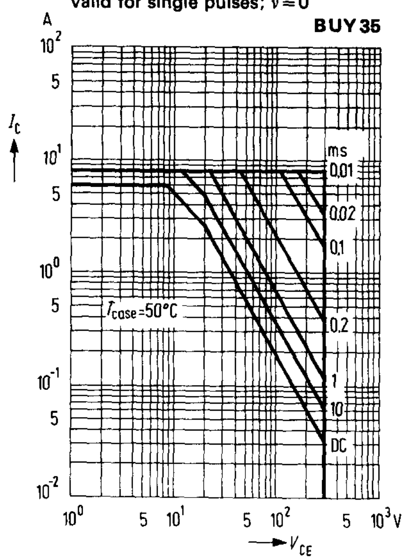
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



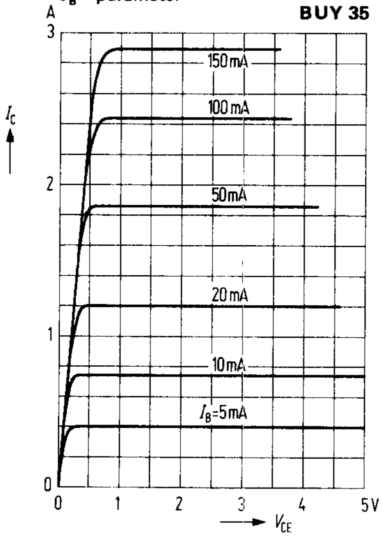
Static forward current transfer ratio $h_{FE} = f(I_C)$;
$V_{CE} = 5$ V; $T_{case} = 25$ °C



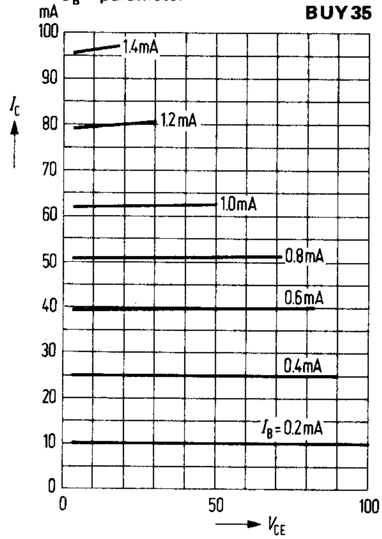
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 50$ °C
valid for single pulses; $v = 0$



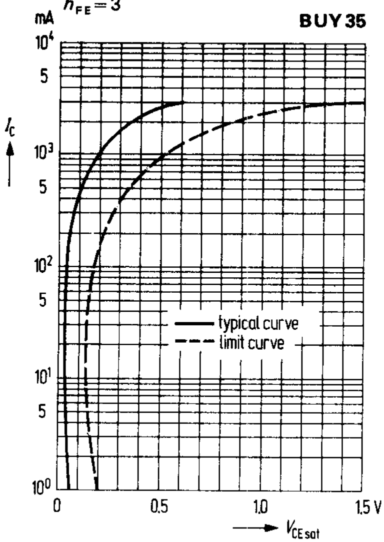
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



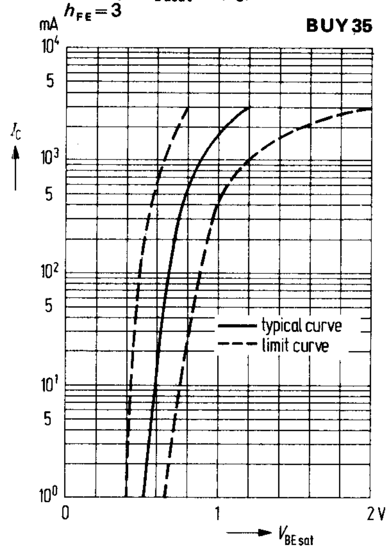
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



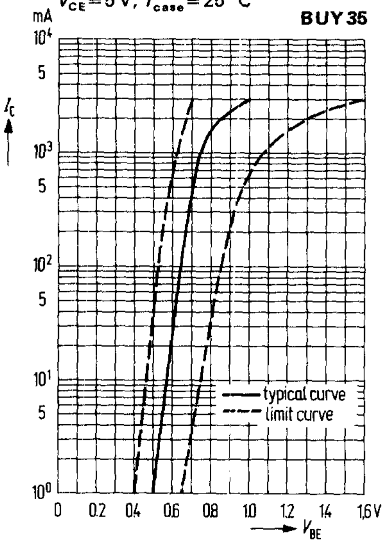
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 3$



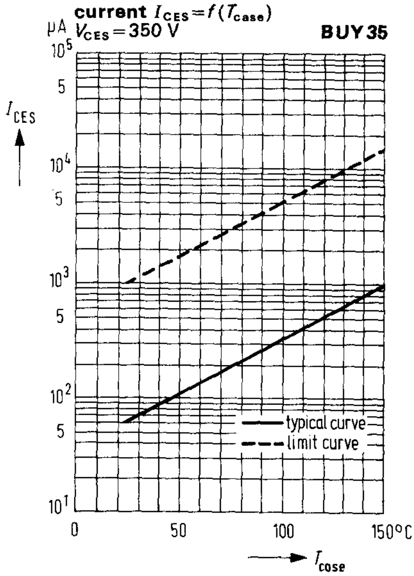
Base-emitter saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 3$



Collector current $I_C = f(V_{BE})$
$V_{CE} = 5$ V; $T_{case} = 25$ °C
BUY 35



Collector-emitter cutoff current $I_{CES} = f(T_{case})$
$V_{CES} = 350$ V
BUY 35

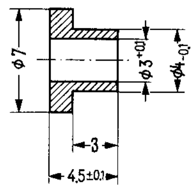


NPN Transistors for AF amplifiers and switching applications

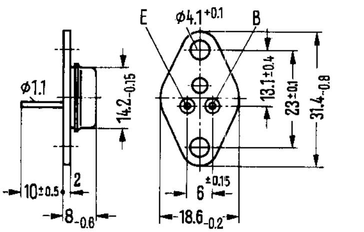
Not for new development

BUY 43 and BUY 46 are single-diffused NPN silicon transistors in a case 9 A 2 DIN 41875 (SOT-9). The collector is electrically connected to the case. BUY 43 and BUY 46 are particularly designed for use in AF amplifiers and switching applications up to 4 A.

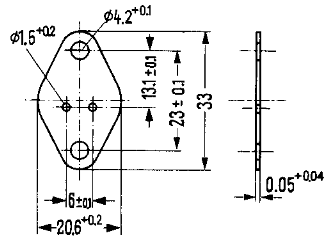
Type	Order number
BUY 43-6	Q 62702-U 80-V 2
BUY 43-10	Q 62702-U 80-V 3
BUY 43-16	Q 62702-U 80-V 4
BUY 46-4	Q 62702-U 82-V 4
BUY 46-6	Q 62702-U 82-V 2
Mica disc	Q 62901-B 16-A
Insulating nipple (Siprelit)	Q 62901-B 50



Insulating nipple (Teflon) for temperatures up to 200 °C



Weight approx. 8.3 g Dimensions in mm



Mica disc dry: $R_{th} = 2.5$ K/W
greased: $R_{th} = 1$ K/W

Maximum ratings		BUY 43	BUY 46	
Collector-emitter voltage	V_{CEO}	40	55	V
Collector-emitter voltage	V_{CES}	50	–	V
Collector-emitter voltage ($V_{BE} = -1.5$ V)	V_{CEV}	–	90	V
Emitter-base voltage	V_{EBO}	7	7	V
Collector current	I_C	4	4	A
Base current	I_B	2	2	A
Junction temperature	T_j	200	200	°C
Storage temperature	T_s	–65 to +200	–65 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C; $V_{CE} \leqq 40$ V)	P_{tot}	31	–	W
($T_{case} \leqq 45$ °C; $V_{CE} \leqq 55$ V)	P_{tot}	–	31	W
Thermal resistance				
Junction to case	$R_{thJcase}$	≦5	≦5	K/W

Not for new development

Static characteristics (T_{amb} = 25 °C)

Type		— BUY 46	BUY 43 BUY 46	BUY 43 —	BUY 43	BUY 43 BUY 46
h_{FE} Group		**4**	**6**	**10**	**16**	
V_{CE} V	I_C mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
1.5	500	40 (25 to 63)	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)	<1.5

Static characteristics (T_{amb} = 25 °C)

		BUY 43	BUY 46	
Collector-emitter breakdown voltage (I_{CEO} = 200 mA)	$V_{(BR)CEO}$	>40	>55	V
Emitter-base breakdown voltage (I_{EBO} = 1 mA)	$V_{(BR)EBO}$	>7	>7	V
Collector-emitter cutoff current (V_{CES} = 50 V; T_{amb} = 25 °C)	I_{CES}	<1	–	mA
(V_{CES} = 50 V; T_{amb} = 150 °C)	I_{CES}	<10	–	mA
(V_{CEV} = 90 V; V_{BE} = −1.5 V)	I_{CEV}	–	<1	mA
(V_{CEV} = 50 V; V_{BE} = −1.5 V; T_{amb} = 150 °C)	I_{CEV}	–	<6	mA
Collector-emitter saturation voltage (I_C = 2 A; I_B = 0.2 A)	V_{CEsat}	<1.1	–	V
(I_C = 500 mA; I_B = 50 mA)	V_{CEsat}	–	<1	V

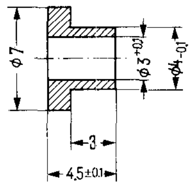
Dynamic characteristics (T_{amb} = 25 °C)

Current gain-bandwidth product (I_C = 500 mA; V_{CE} = 2 V)	f_T	1	0.8	MHz

NPN Triple-diffused silicon power transistors

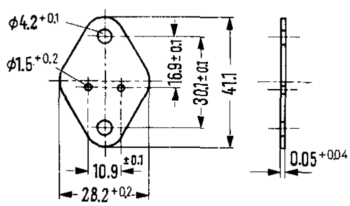
BUY 55, BUY 56 and BUY 72 are triple-diffused NPN silicon power transistors in the case 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistors are designed for general switching applications at higher outputs.

Typer	Order number
BUY 55	Q 62702-U 107
BUY 56	Q 62702-U 108
BUY 72	Q 62702-U 123
Mica disc	Q 62901-B 11-A
Insulating nipple (Siprelit)	Q 62901-B 50

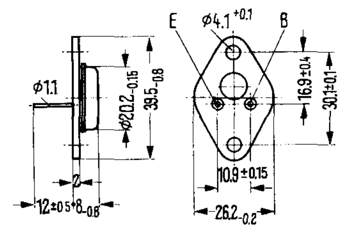


Insulating nipple (for temperatures up to 200 °C)

Special features:
High reverse voltages
High switching currents
High safety against thermal breakdown
Good switching properties



Mica disc: dry: =1.25 K/W
greased: =0.35 K/W



Weight approx. 16.5 g
Dimensions in mm

Maximum ratings		BUY 55	BUY 56	BUY 72	
Collector-emitter reverse voltage	V_{CEO}	125	160	200	V
Collector-emitter reverse voltage	V_{CES}	150	250	280	V
Collector-base reverse voltage	V_{CBO}	150	250	280	V
Base-emitter voltage	V_{EBO}	6	6	6	V
Collector current	I_C	10	10	10	A
Maximum collector current ($t_p < 1$ ms)	I_{CM}	15	15	15	A
Maximum emitter current ($t_p < 1$ ms)	I_{EM}	15	15	15	A
Base current	I_B	2	2	2	A
Maximum base current ($t_p < 10$ ms)	I_{BM}	3	3	3	A
Junction temperature	T_j	175	175	175	°C
Storage temperature	T_S		−65 to +175		°C
Total power dissipation ($V_{CE} \leqq 18$ V; $T_{case} \leqq 75$ °C)	P_{tot}	60	60	60	W

Thermal resistance

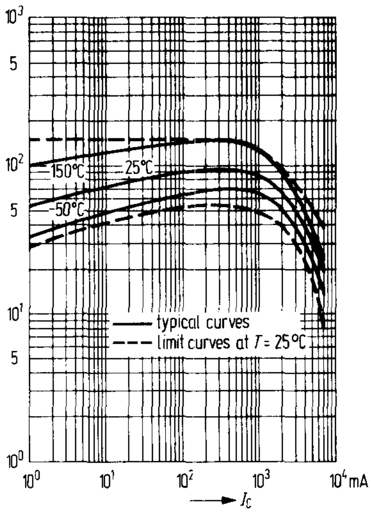
Junction to case	$R_{thJcase}$	$\leqq$1.66	$\leqq$1.66	$\leqq$1.66	K/W

Static characteristics (T_{case} = 25 °C)		BUY 55	BUY 56	BUY 72	
Collector-emitter breakdown					
voltage (I_C = 20 mA)	$V_{(BR)CEO}$	>125	>160	>200	V
(I_C = 1 mA)	$V_{(BR)CES}$	>150	>250	>280	V
Collector-base breakdown voltage					
(I_C = 1 mA)	$V_{(BR)CBO}$	>150	>250	>280	V
Emitter-base breakdown voltage					
(I_E = 1 mA)	$V_{(BR)EBO}$	>6	>6	>6	V
Collector-base cutoff current					
(V_{CB} = 150 V)	I_{CBO}	<1	–	–	mA
(V_{CB} = 150 V; T_{case} = 150 °C)	I_{CBO}	<10	–	–	mA
(V_{CB} = 250 V)	I_{CBO}	–	<1	–	mA
(V_{CB} = 250 V; T_{case} = 150 °C)	I_{CBO}	–	<10	–	mA
(V_{CB} = 280 V)	I_{CBO}	–	–	<1	mA
(V_{CB} = 280 V; T_{case} = 150 °C)	I_{CBO}	–	–	<10	mA
Collector-emitter cutoff current					
(V_{CE} = 150 V)	I_{CES}	<1 –	–	–	mA
(V_{CE} = 150 V; T_{case} = 150 °C)	I_{CES}	<10	–	–	mA
(V_{CE} = 250 V)	I_{CES}	–	<1	–	mA
(V_{CE} = 250 V; T_{case} = 150 °C)	I_{CES}	–	<10	–	mA
(V_{CE} = 280 V)	I_{CES}	–	–	<1	mA
(V_{CE} = 280 V; T_{case} = 150 °C)	I_{CES}	–	–	<10	mA
Emitter-base cutoff current					
(V_{EB} = 6 V)	I_{EBO}	<1	<1	<1	mA
Forward current transfer ratio					
(I_C = 2 A; V_{CE} = 1.5 V)	h_{FE}		25 to 160		–
(I_C = 7 A; V_{CE} = 1.5 V)	h_{FE}	>8	>8	>8	–
Base-emitter forward voltage					
(I_C = 7 A; V_{CE} = 1.5 V)	V_{BE}	<1.5	<1.5	<1.6	V
Collector-emitter saturation voltage					
(I_C = 7 A; I_B = 0.875 A)	V_{CEsat}	<1.5	<1.5	<1.5	V

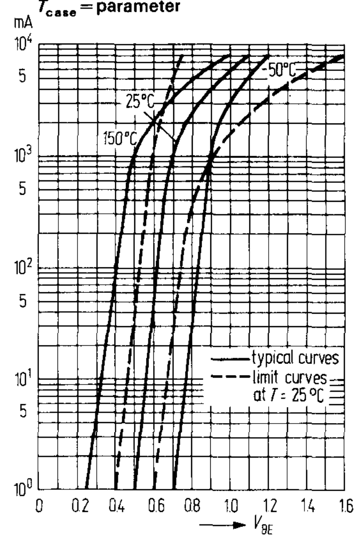
Dynamic characteristics (T_{case} = 25 °C)

		BUY 55	BUY 56	BUY 72	
Current-gain bandwidth product (I_C=0.2 A; V_{CE}=10 V; f=5 MHz)	f_T	20 (>10)	20 (>10)	20 (>10)	MHz
Open-circuit output capacitance (V_{CB}=10 V; f=1 MHz)	C_{ob}	<200	<200	<200	pf
Switching times (I_C=6 A; $I_{B_1} \approx I_{B_2} \approx 1$ A)	t_{on}	<2	<2	<2	µs
	t_{off}	<2	<2	<2	µs
	t_s	1.2	1.2	1.2	µs

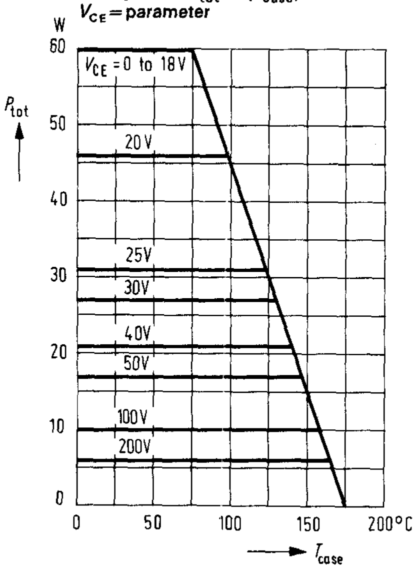
Static forward current transfer ratio $h_{FE}=f(I_C)$
V_{CE}=1.5 V; T_{case}=parameter



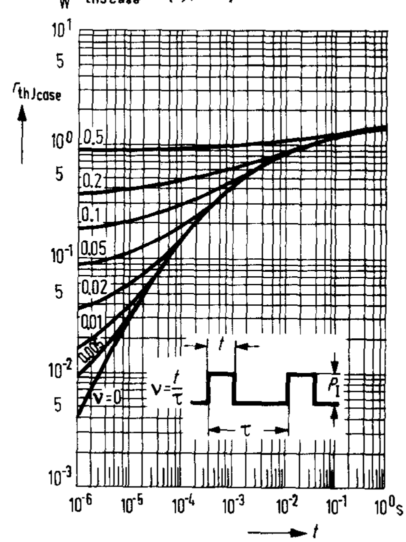
Collector current $I_C=f(V_{BE})$
V_{CE}=1.5 V
T_{case}=parameter



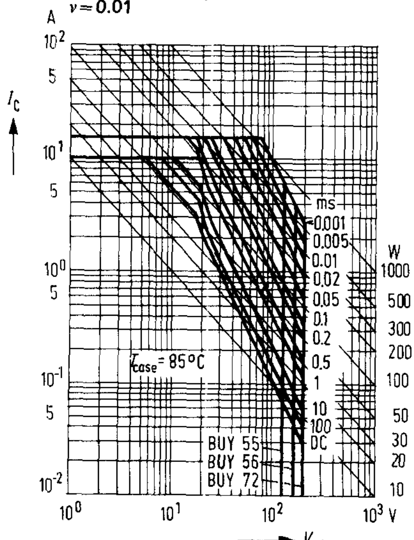
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter



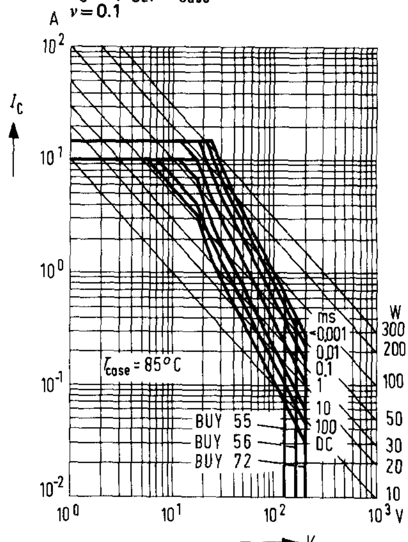
Permissible pulse load
$\frac{K}{W}$ $r_{thJcase} = f(t)$; ν = parameter



Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 85$ °C
$\nu = 0.01$



Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 85$ °C
$\nu = 0.1$



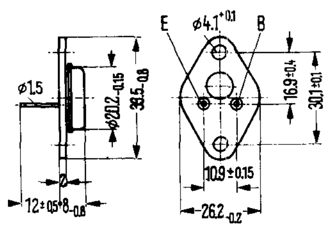
NPN Triple-diffused silicon power transistors

Preliminary data

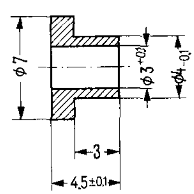
BUY 57, BUY 58 and BUY 73 are triple-diffused NPN silicon power transistors in a case sim. to 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistors are particularly suitable for use as power switches for high voltages and currents e.g. in power supplies, ignitions of cars and horizontal deflection output stages.

Type	Order number
BUY 57	Q 62702-U 109
BUY 58	Q 62702-U 110
BUY 73	Q 62702-U 124
Mica disc	Q 62901-B 48
Insulating nipple (Siprelit)	Q 62901-B 50

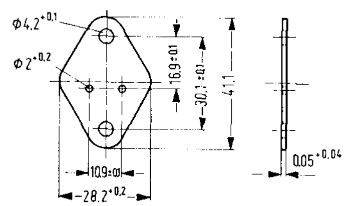
Special features:
High reverse voltages
High currents
High safety against second breakdown
Short switching times



Weight approx. 16.5 g
Dimensions in mm



Insulating nipple (Siprelit) for temp. up to 200 °C



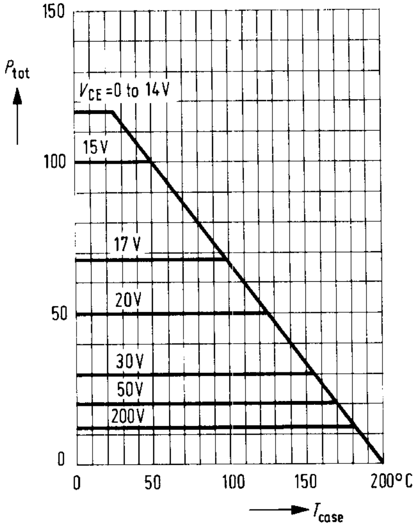
Mica disc:
dry: R_{th} = 1.25 K/W
greased: R_{th} = 0.35 K/W

Maximum ratings		BUY 57	BUY 58	BUY 73	
Collector-emitter reverse voltage	V_{CEO}	125	160	200	V
Collector-emitter reverse voltage	V_{CES}	150	250	280	V
Collector-base reverse voltage	V_{CBO}	150	250	280	V
Base-emitter voltage	V_{EBO}	6	6	6	V
Collector current	I_C	15	15	15	A
Maximum collector current (t_p < 10 ms)	I_{CM}	25	25	25	A
Base current	I_B	5	5	5	A
Maximum base current (t_p < 10 ms)	I_{BM}	10	10	10	A
Junction temperature	T_j	200	200	200	°C
Storage temperature	T_s		−65 to +175		°C
Total power dissipation ($T_{case} \leqq 25$ °C; $V_{CE} \leqq 14$ V)	P_{tot}	117	117	117	W
Thermal resistance					
Junction to case	$R_{thJcase}$	< 1.5	< 1.5	< 1.5	K/W

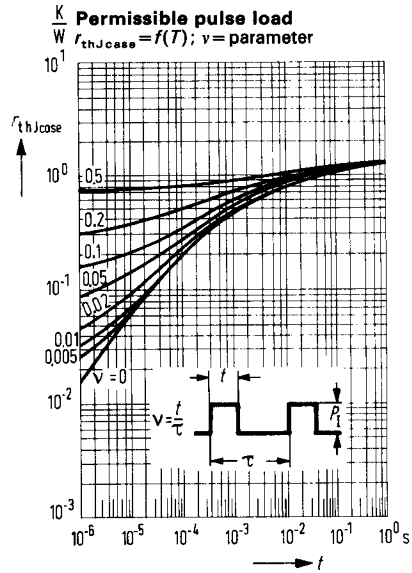
Static characteristics (T_{amb} = 25 °C)		BUY 57	BUY 58	BUY 73	
Collector-emitter breakdown voltage					
(I_C = 50 mA)	$V_{(BR)CEO}$	>125	>160	>200	V
(I_C = 1 mA)	$V_{(BR)CES}$	>150	>250	>280	V
Collector-base breakdown voltage (I_C = 1 mA)	$V_{(BR)CBO}$	>150	>250	>280	V
Emitter-base breakdown voltage (I_E = 1 mA)	$V_{(BR)EBO}$	6	6	6	V
Collector-base cutoff current					
(V_{CB} = 130 V)	I_{CBO}	<1	–	–	mA
(V_{CB} = 200 V)	I_{CBO}	–	<1	–	mA
(V_{CB} = 230 V)	I_{CBO}	–	–	<1	mA
Collector-emitter cutoff current					
(V_{CE} = 130 V; T_{case} = 150 °C)	I_{CES}	<15	–	–	mA
(V_{CE} = 200 V; T_{case} = 150 °C)	I_{CES}	–	<15	–	mA
(V_{CE} = 230 V; T_{case} = 150 °C)	I_{CES}	–	–	<15	mA
Emitter-base cutoff current (V_{EB} = 6 V)	I_{EBO}	<1	<1	<1	mA
Base-emitter forward voltage					
(I_C = 10 A; V_{CE} = 1.5 V)	V_{BE}	<1.5	<1.5	<1.5	V
(I_C = 12 A; V_{CE} = 1.5 V)	V_{BE}	<1.7	<1.7	<1.7	V
(I_C = 1 A; V_{CE} = 1.5 V)	V_{BE}	<1.0	<1.0	<1.0	V
Collector-emitter saturation voltage (I_C = 10 A; I_B = 1.25 A)	V_{CEsat}	<1.3	<1.3	<1.4	V
Base-emitter saturation voltage (I_C = 10 A; I_B = 1.25 A)	V_{BEsat}	<1.5	<1.5	<1.5	V
Forward current transfer ratio					
(I_C = 1 A; V_{CE} = 1.5 V)	h_{FE}	>20	>20	>20	–
(I_C = 10 A; V_{CE} = 1.5 V)	h_{FE}	>12	>12	>10	–
(I_C = 12 A; V_{CE} = 1.5 V)	h_{FE}	>10	>10	>8	–

Dynamic characteristics (T_{amb} = 25 °C)		BUY 57	BUY 58	BUY 73	
Current-gain bandwidth product (I_C = 1 A; V_{CE} = 10 V; f = 10 MHz)	f_T	20	20	20	MHz
Open-circuit output capacitance (V_{CB} = 10 V)	C_{ob}	330 (<400)	330 (<400)	300 (<400)	pf
Switching times:					
Switch-on time (I_C = 10 A; $I_{B1} \approx I_{B2}$ = 1.25 A)	t_{on}	<1.0	<1.0	<1.0	µs
Switch-off time (I_C = 10 A; $I_{B1} \approx I_{B2}$ = 1.25 A)	t_{off}	<1.6	<1.6	<1.7	µs
Storage time (I_C = 10 A; $I_{B1} \approx I_{B2}$ = 1.25 A)	t_s	<1.0	1.0	<1.0	µs

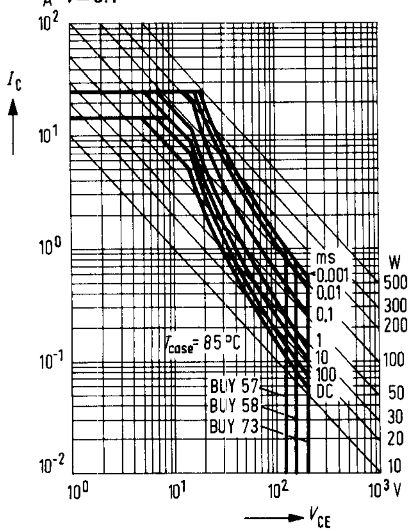
Total permissible power dissipation $P_{tot} = f(T_{case})$



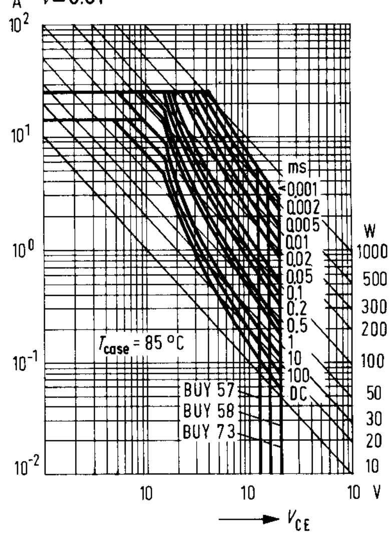
Permissible pulse load
$r_{thJcase} = f(T)$; ν = parameter



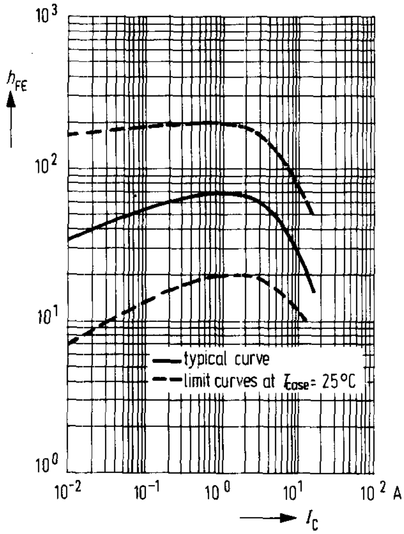
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 85$ °C
$\nu = 0.1$



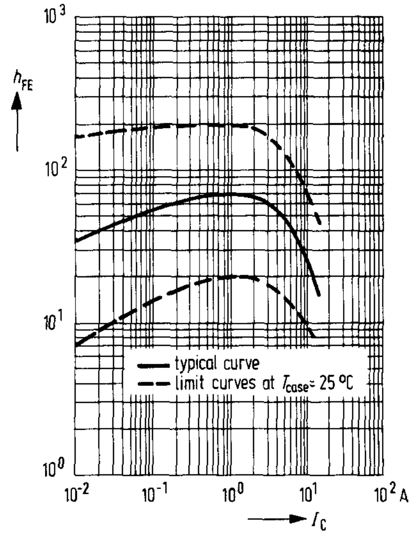
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 85$ °C
$\nu = 0.01$



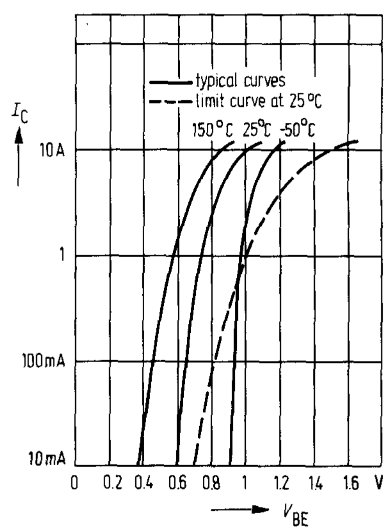
Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{case} = parameter
BUY 57, BUY 58



Static forward current transfer ratio $h_{FE} = f(I_C)$
T_{case} = parameter
BUY 73



Collector current $I_C = f(V_{BE})$
T_{case} = parameter
BUY 57, BUY 58

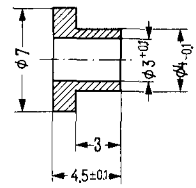


NPN Silicon power transistors for switching applications

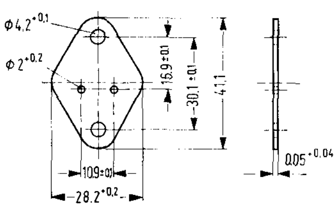
Preliminary data

BUY 74, BUY 75 and BUY 76 are triple-diffused NPN silicon power transistors in a case sim. to 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistors are particularly designed for use as high-speed power switches at high voltages.

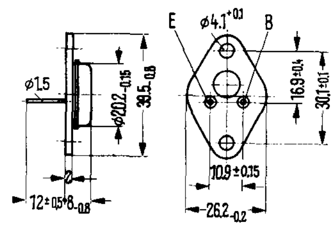
Type	Order number
BUY 74	Q 62702-U 146
BUY 75	Q 62702-U 147
BUY 76	Q 62702-U 148
Mica disc	Q 62901-B 48
Insulating nipple (Siprelit)	Q 62901-B 50



Insulating nipple
(for temperatures up to 200 °C)



Mica disc



Weight approx. 17 g   Dimensions in mm

Maximum ratings		BUY 74	BUY 75	BUY 76	
Collector-emitter voltage	V_{CEO}	250	300	350	V
Collector-emitter voltage	V_{CES}	400	600	750	V
Collector-base voltage	V_{CBO}	400	600	750	V
Base-emitter voltage	V_{EBO}	7	7	7	V
Collector current	I_C	12	12	12	A
Maximum collector current (t< 10 ms)	I_{CM}	17	17	17	A
Emitter current	I_E	17	17	17	A
Maximum emitter current (t< 10 ms)	I_{EM}	20	20	20	A
Base current	I_B	5	5	5	A
Maximum base current (t< 10 ms)	I_{BM}	7	7	7	A
Storage temperature	T_S		−65 to +175		°C
Junction temperature	T_j	175	175	175	°C
Total power dissipation ($T_{case} \leq 25$ °C; $V_{CE} \leq 25$ V)	P_{tot}	120	120	120	W
Thermal resistance Junction to case	$R_{thJcase}$	<1.25	<1.25	<1.25	K/W

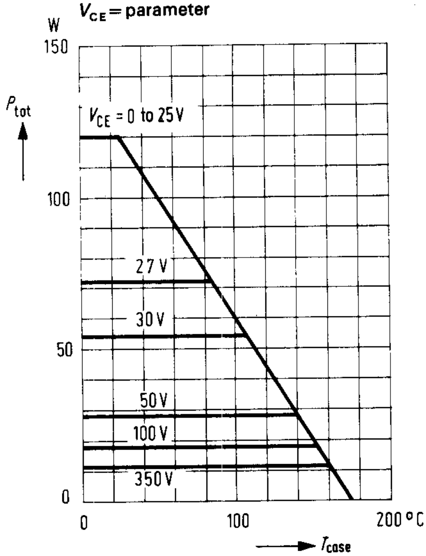
Static characteristics (T_{case} = 25 °C)

		BUY 74	BUY 75	BUY 76	
Collector-emitter breakdown voltage (I_C = 0.2 A)	$V_{(BR)CEO}$	> 250	> 300	> 350	V
Collector-emitter breakdown voltage (I_C = 2 mA)	$V_{(BR)CES}$	> 400	> 600	> 750	V
Collector-base breakdown voltage (I_C = 2 mA)	$V_{(BR)CBO}$	> 400	> 600	> 750	V
Emitter-base breakdown voltage (I_E = 2 mA)	$V_{(BR)EBO}$	> 7	> 7	> 7	V
Collector-emitter cutoff current ($V_{CE} = V_{CEmax}$ V)	I_{CES}	< 1	< 1	< 1	mA
($V_{CE} = V_{CEmax}$ V; T_{case} = 150 °C)	I_{CES}	< 15	< 15	< 15	mA
Emitter-base cutoff current (V_{EBO} = 6 V)	I_{EBO}	< 1	< 1	< 1	mA
Forward current transfer ratio (I_C = 5 A; V_{CE} = 1.5 V)	h_{FE}	> 10	> 10	> 8	–
Base-emitter voltage (I_C = 5 A; V_{CE} = 1.5 V)	V_{BE}	< 1.5	< 1.5	< 1.5	V
Collector-emitter saturation voltage (I_C = 7 A; I_B = 1.4 A)	V_{CEsat}	< 1.4	1.4	< 1.5	V

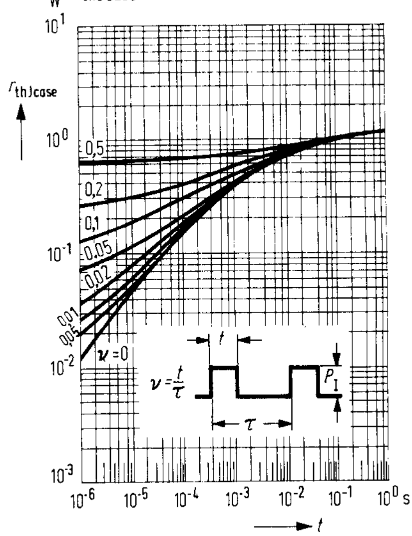
Dynamic characteristics (T_{case} = 25 °C)

Current-gain bandwidth product (I_C = 0.5 A; V_{CE} = 10 V; f = 10 MHz)	f_T	15	15	15	MHz
Fall time (I_C = 8 A; $I_{B1} \approx I_{B2}$ = 2 A)	t_f	< 1	< 1	< 1	µs

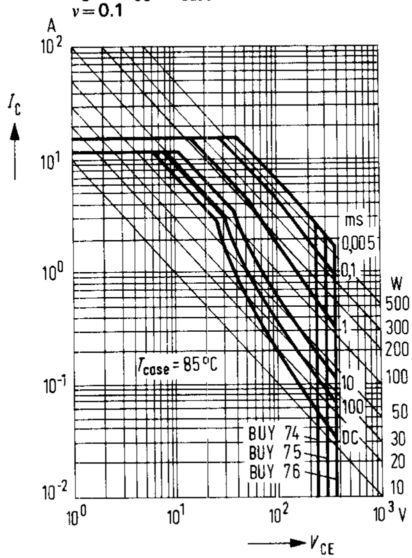
Total permissible power dissipation $P_{tot} = f(T_{case})$
V_{CE} = parameter



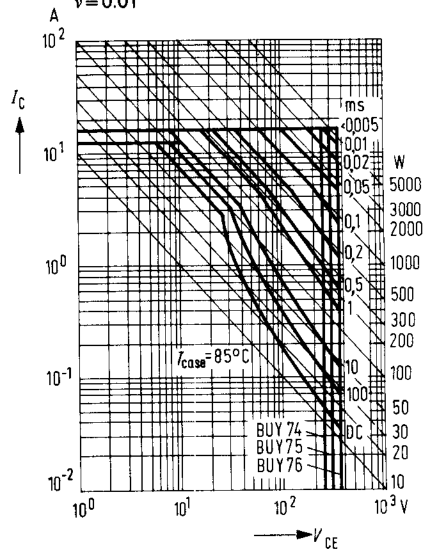
Permissible pulse load
$r_{thJcase} = f(t)$; ν = parameter



Permissible operating range
$I_C = f(V_{CE})$; T_{case} = 85 °C;
ν = 0.1



Permissible operating range
$I_C = f(V_{CE})$; T_{case} = 85 °C;
ν = 0.01

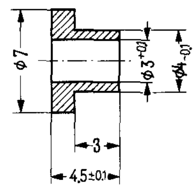


NPN Silicon power transistors

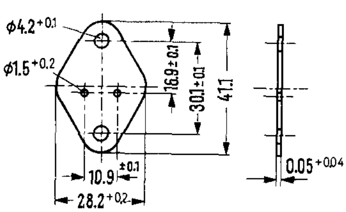
Preliminary data

BUY 77, BUY 78 and BUY 79 are triple-diffused NPN silicon power transistors in a case 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistors are particularly designed for use as high-speed power switches at high voltages.

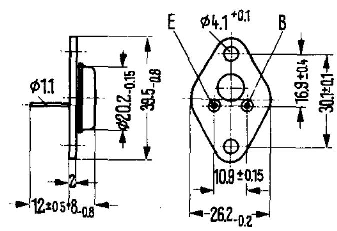
Type	Order number
BUY 77	Q 62702-U 151
BUY 78	Q 62702-U 152
BUY 79	Q 62702-U 153
Mica disc	Q 62901-B 11-A
Insulating nipple (Siprelit)	Q 62901-B 50



Scale 2:1
Insulating nipple for temp. up to 200 °C



Mica disc Dimensions in mm



Weight approx. 16.5 g Dimensions in mm

Maximum ratings		BUY 77	BUY 78	BUY 79	
Collector-emitter voltage	V_{CEO}	250	300	350	V
Collector-emitter voltage	V_{CES}	400	600	750	V
Collector-base voltage	V_{CBO}	400	600	750	V
Base-emitter voltage	V_{EBO}	7	7	7	V
Collector current	I_C	8	8	8	A
Maximum collector current ($t<1$ ms)	I_{CM}	10	10	10	A
Emitter current	I_E	10	10	10	A
Maximum emitter current ($t<1$ ms)	I_{EM}	12	12	12	A
Storage temperature	T_s		−65 to +175		°C
Junction temperature	T_j	175	175	175	°C
Total power dissipation ($T_{case} \leqq 75$ °C; $V_{CE} \leqq 18$ V)	P_{tot}	60	60	60	W
Thermal resistance					
Junction to case	$R_{thJcase}$	<1.66	<1.66	<1.66	K/W

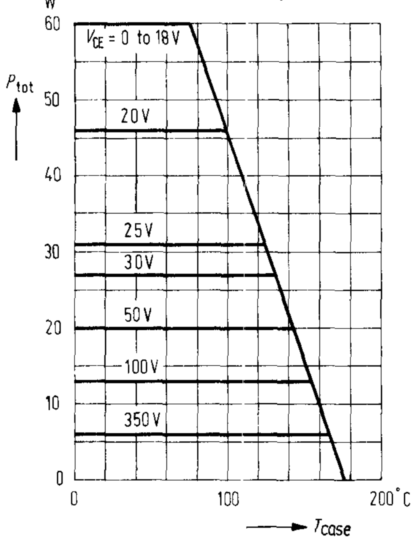
Static characteristics (T_{case}=25 °C)

		BUY 77	BUY 78	BUY 79	
Collector-emitter breakdown voltage (I_C=0.1 A)	$V_{(BR)CEO}$	>250	>300	>350	V
Collector-emitter breakdown voltage (I_C=1 mA)	$V_{(BR)CES}$	>400	>600	>750	V
Collector-base breakdown voltage (I_C=1 mA; V_{BE}=−3.5 V)	$V_{(BR)CEV}$	>400	>600	>750	V
Emitter-base breakdown voltage (I_E=1 mA)	$V_{(BR)EBO}$	>7	>7	>7	V
Collector-emitter cutoff current ($V_{CB}=V_{CBmax}$ V)	I_{CBO}	<1	<1	<1	mA
($V_{CE}=V_{CEmax}$ V; T_j=150 °C)	I_{CES}	<15	<15	<15	mA
Forward current transfer ratio (I_C=5 A; V_{CE}=1.5 V)	h_{FE}	>5	>5	>4	–
Collector-emitter saturation voltage (I_C=5 A; I_B=1.25 A)	V_{CEsat}	<1.4	<1.4	<1.5	V
Base-emitter saturation voltage (I_C=5 A; I_B=1.25 A)	V_{BEsat}	<1.7	<1.7	<1.7	V

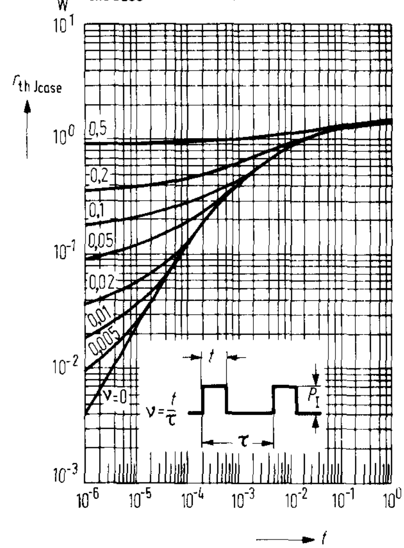
Dynamic characteristics (T_{case}=25 °C)

Current-gain bandwidth product (I_C=0.5 A; V_{CE}=10 V; f=10 MHz)	f_T	15	15	15	MHz
Fall time (I_C=3 A; $I_{B1}\approx I_{B2}$=0.6 A)	t_f	<1	<1	<1	µs

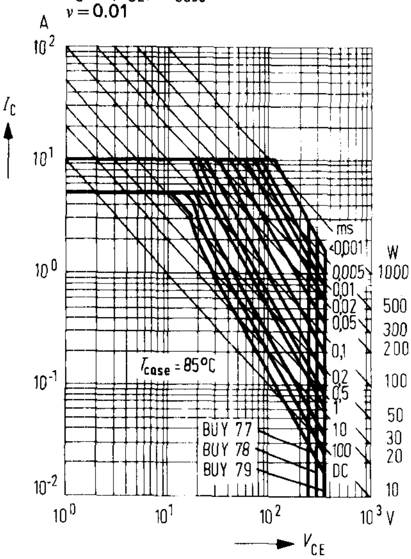
Total permissible power dissipation $P_{tot} = f(T_{case})$



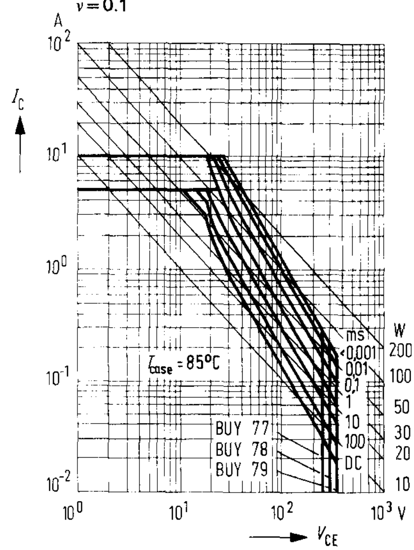
Permissible pulse load
$r_{thJcase} = f(t)$; v = parameter



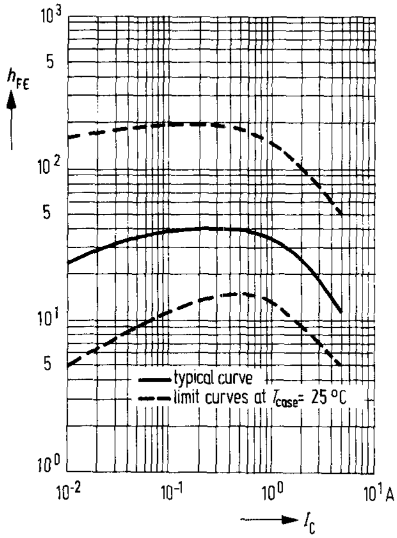
Permissible operating range
$I_C = f(V_{CE})$; T_{case} = 85 °C;
v = 0.01



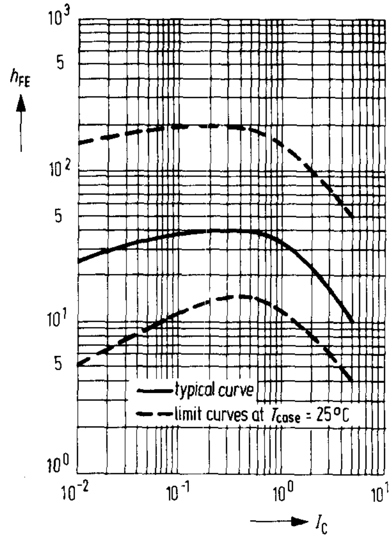
Permissible operating range
$I_C = f(V_{CE})$; T_{case} = 85 °C
v = 0.1



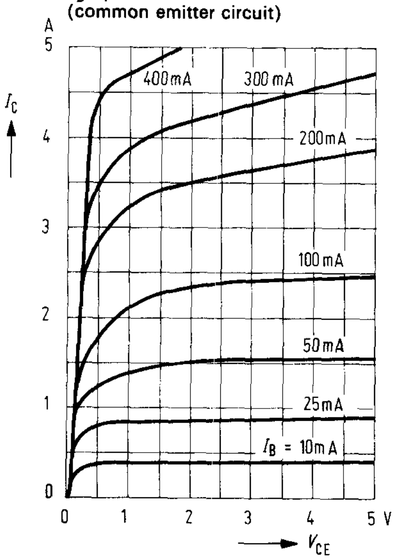
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1.5$ V
(common emitter circuit)
BUY 77, BUY 78



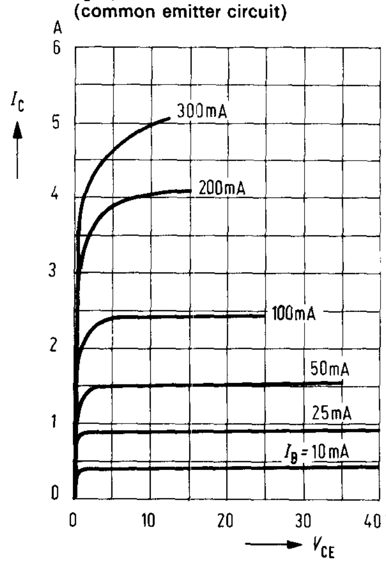
Static forward current transfer ratio $h_{FE}=f(I_C)$
$V_{CE}=1.5$ V
(common emitter circuit)
BUY 79



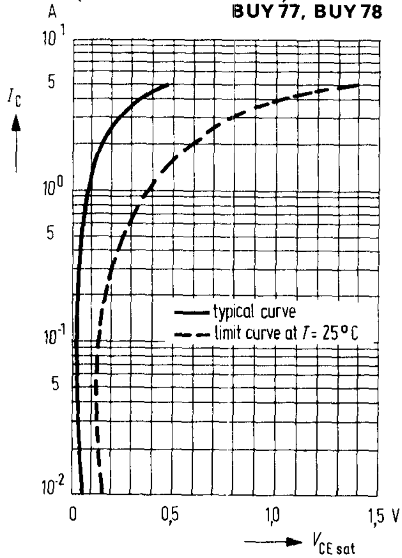
Output characteristics $I_C=f(V_{CE})$
I_B = parameter
(common emitter circuit)



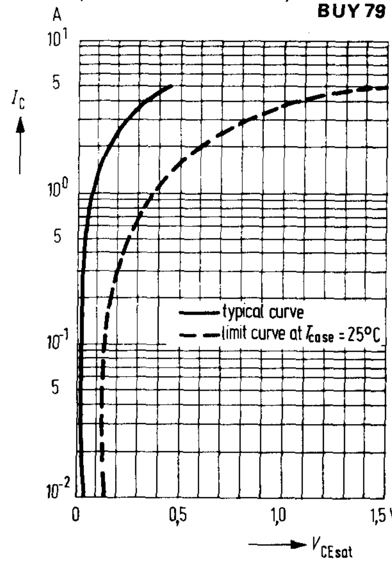
Output characteristics $I_C=f(V_{CE})$
I_B = parameter
(common emitter circuit)



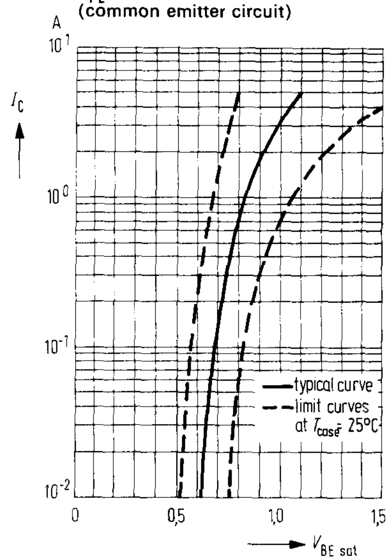
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 4$
(common emitter circuit)
BUY 77, BUY 78



Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 4$
(common emitter circuit)
BUY 79



Base-emitter saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 4$
(common emitter circuit)

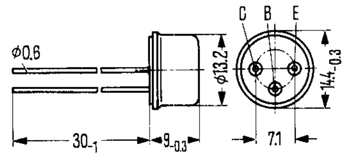


PNP Transistors for AF output stages and switching applications

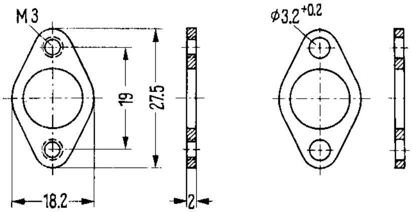
Not for new development

TF 78/30 and TF 78/60 are alloyed PNP germanium transistors in cases 8 A 3 DIN 41878 (sim. TO-8). The terminals are electrically insulated from the case.
For mounting the transistors on a chassis, mounting parts Q 62901-B 2-A and Q 62901-B 2-B are available, to be ordered separately.
TF 78/30 and TF 78/60 are designed for AF power stages and for switching applications; for use in push-pull power stages, the transistors TF 78/30 are also available in pairs.

Type	Order number
TF 78/30 II	Q 62606-X 3078-X 2
TF 78/30 III	Q 62606-X 3078-X 3
TF 78/30 IV	Q 62606-X 3078-X 4
TF 78/30 V	Q 62606-X 3078-X 5
TF 78/30 paired	Q 62606-P 3078
TF 78/60 II	Q 62606-X 6078-X 2
TF 78/60 III	Q 62606-X 6078-X 3
TF 78/60 IV	Q 62606-X 6078-X 4
TF 78/60 V	Q 62606-X 6078-X 5
Tensioning plate	Q 62901-B 2-A
washer	Q 62901-B 2-B



Weight approx. 5.5 g Dimensions in mm



Part A: Tensioning plate Part B: Washer

Maximum ratings		TF 78/30	TF 78/60	
Collector-emitter voltage	$-V_{CEO}$	24	45	V
Collector-emitter voltage ($V_{BE} \geqq 0.25$ V)	$-V_{CEV}$	32	64	V
Collector-base voltage	$-V_{CBO}$	32	64	V
Emitter-base voltage	$-V_{EBO}$	10	16	V
Collector current	$-I_C$	600	600	mA
Base current	$-I_B$	100	100	mA
Junction temperature	T_j	90	90	°C
Storage temperature	T_s	−30 to +75	−30 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	3	3	W
Thermal restance				
Junction to ambient air	R_{thJamb}	$\leqq 120$	$\leqq 120$	K/W
Junction to case	$R_{thJcase}$	$\leqq 15$	$\leqq 15$	K/W

Not for new development

Static characteristics ($T_{case}=25$ °C)

The transistors TF 78/30 and TF 78/60 are classified in groups of static forward current transfer ratio h_{FE} at $-I_C=50$ mA, which are indicated by Roman numerals. The following values apply at a collector voltage of $-V_{CE}=0.7$ V and the following collector currents.

II		III	IV	V	h_{FE} group
$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	V_{BE} V
50	38 (30 to 45)*	56 (45 to 67)*	83 (67 to 100)*	125 (100 to 150)*	0.27 (<0.45)
200	35	52	77	116	0.41 (<0.65)
500	25	37	55	83	0.54 (<1.0)

Collector saturation voltage for the characteristics which pass the operating points stated below:

		TF 78/30, TF 78/60	
$-V_{CE}=0.7$ V; $-I_C=50$ mA	$-V_{CEsat}$	0.19 (<0.3)	V
$-V_{CE}=0.7$ V; $-I_C=200$ mA	$-V_{CEsat}$	0.21 (<0.4)	V
$-V_{CE}=0.7$ V; $-I_C=500$ mA	$-V_{CEsat}$	0.26 (<0.5)	V

Cutoff currents

Collector-emitter cutoff current ($-V_{CEV}$[1])	$-I_{CEV}$	10 (<30)*	µA
Collector-base cutoff current ($-V_{CBO}$[1])	$-I_{CBO}$	10 (<30)	µA
Collector-emitter cutoff current ($-V_{CEO}=5$ V)	$-I_{CEO}$	200	µA
Emitter-base cutoff current ($-V_{EBO}$[1])	$-I_{EBO}$	8 (<30)*	µA

Dynamic characteristics ($T_{case}=25$ °C)

Test conditions: $-I_C=5$ mA; $-V_{CE}=5$ V

Cutoff frequency in common emitter circuit	f_α	12	kHz
Cutoff frequency in common base circuit	f_β	700	kHz
Base series resistance	$r_{bb'}$	50	Ω
Collector junction capacitance	$C_{b'c}$	70	pf

Four-terminal characteristics
Test condition: $-I_C=5$ mA; $-V_{CE}=5$ V; $f=1$ kHz

h_{11e}	350	Ω
h_{12e}	6	$\cdot 10^4$
h_{21e}	45	–
h_{22e}	100	µmhos
y_{21e}	127	mmhos

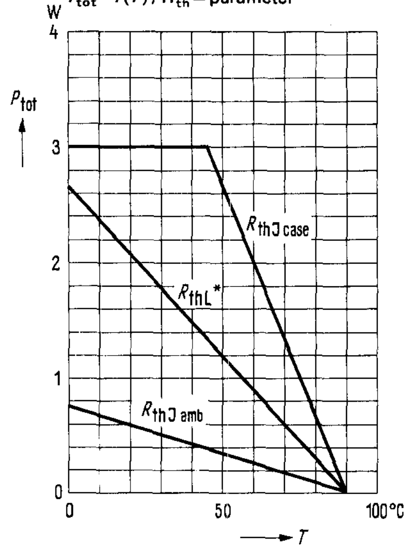
Switching times

At an overdriving factor of $\ddot{u}=1.5$ to 3 and a "turn-off" base current of $I_{B2}=3.3$ mA ($-I_C=200$ mA) the following switching times apply:

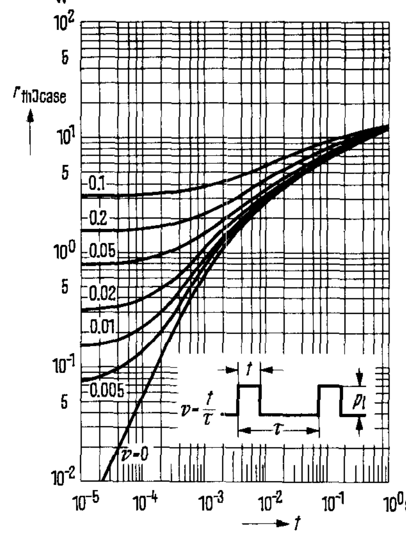
t_{on}	6 (<12)	µs
t_s	4 (<10)	µs
t_f	18 (<36)	µs

[1]) See maximum ratings
* AQL=0.65%

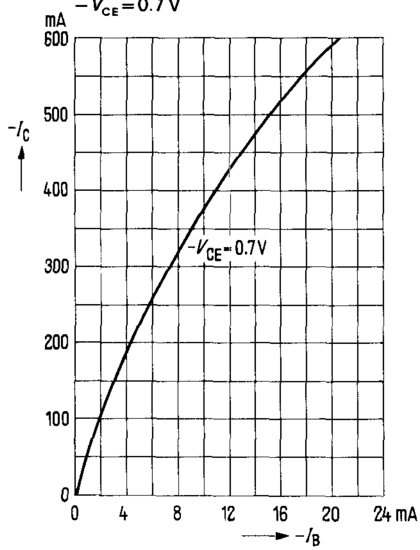
Total power dissipation
$P_{tot}=f(T)$; $R_{th}=$ parameter



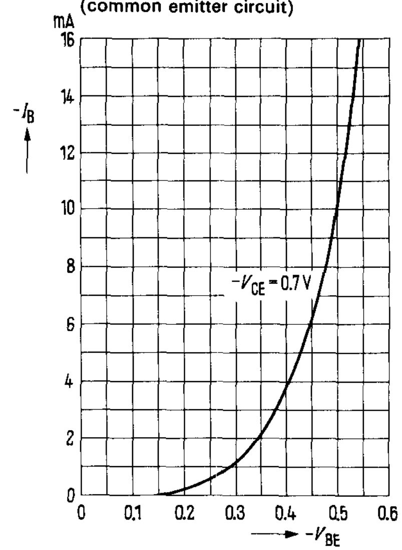
Permissible pulse load
$\frac{K}{W}$ $r_{thJcase}=f(t)$; $v=$ parameter



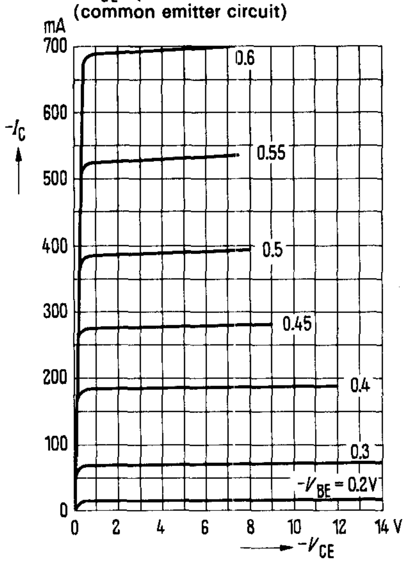
Collector current $I_C=f(I_B)$
$-V_{CE}=0.7$ V



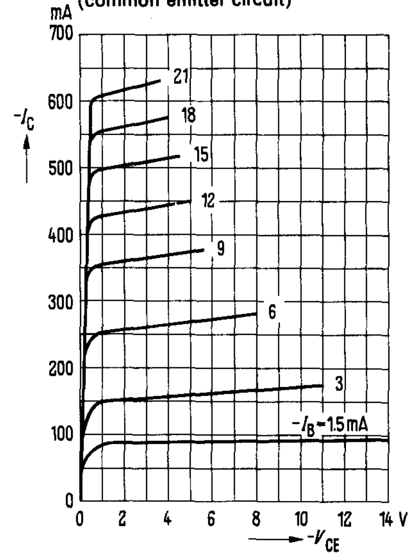
Input characteristic $I_B=f(V_{BE})$
$-V_{CE}=0.7$ V
(common emitter circuit)



Output characteristics $I_C = f(V_{CE})$
$-V_{BE}$ = parameter
(common emitter circuit)

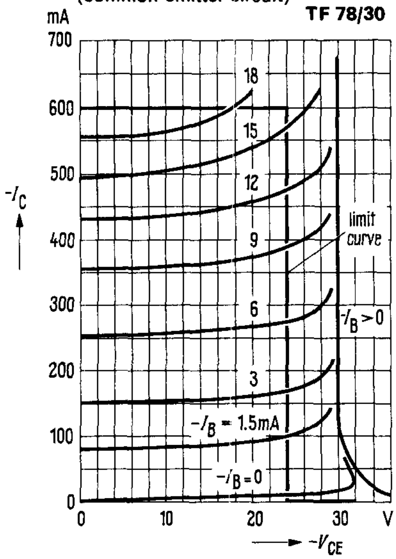


Output characteristics $I_C = f(V_{CE})$
$-I_B$ = parameter
(common emitter circuit)



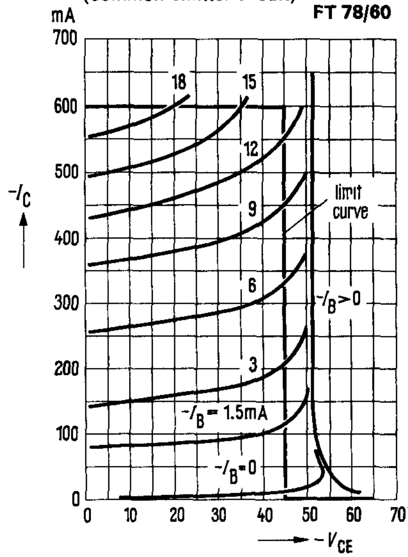
Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(common emitter circuit)

TF 78/30



Output characteristics and limit curve for switching operation $I_C = f(V_{CE})$
(common emitter circuit)

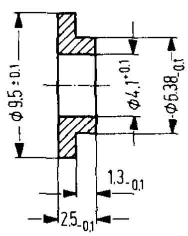
FT 78/60



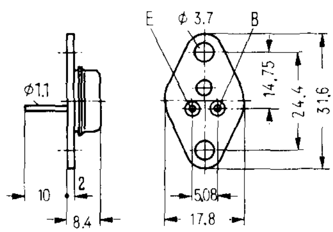
NPN Power transistor for AF amplifier and switching applications

2 N 3054 is a *single-diffused* NPN *silicon transistor* in a TO-66 case. The collector is electrically connected to the case. The transistor 2 N 3054 is particularly suitable for switching applications up to 4 A and as AF amplifier.

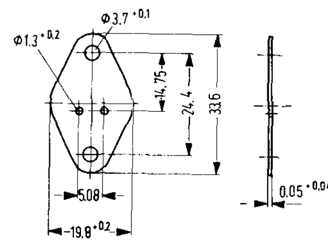
Type	Order number
2 N 3054	Q 62702-U 116
Mica disc	Q 62901-B 11-A
Insulating nipple	Q 62901-B 11-B



Insulating nipple



Weight approx. 8 g



Mica disc

Maximum ratings		2 N 3054	
Collector-base voltage	V_{CBO}	90	V
Collector-emitter voltage	V_{CEO}	55	V
Collector-emitter voltage (R_{BE}<100 Ω)	V_{CER}	60	V
Collector-emitter voltage (V_{BE}= −1.5 V)	V_{CEV}	90	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	4	A
Base current	I_B	2	A
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation (T_{case}≦25 °C)	P_{tot}	25	W
Thermal resistance			
Junction to case	$R_{thJcase}$	≦7	K/W

Static characteristics ($T_{amb}=25$ °C)

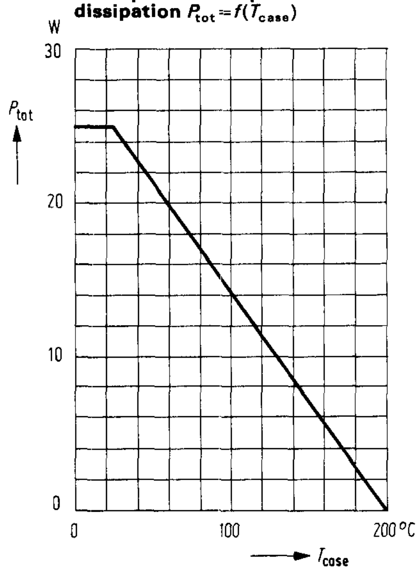
		2 N 3054	
Collector-emitter breakdown voltage			
($I_{CEO}=100$ mA)	$V_{(BR)CEO}$	>55	V *
($I_{CER}=100$ mA; $R_{BE}<100\ \Omega$)	$V_{(BR)CER}$	>60	V
Collector-emitter cutoff current ($V_{CEO}=30$ V)	I_{CEO}	<0.5	mA*
($V_{CEX}=90$ V; $V_{BE}=1.5$ V)	I_{CEX}	<1	mA*
($V_{CEX}=90$ V; $V_{BE}=1.5$ V; $T_{amb}=150$ °C)	I_{CEX}	<6	mA
Emitter-base cutoff current ($V_{EBO}=7$ V)	I_{EBO}	<1	mA*
Collector-emitter saturation voltage			
($I_C=500$ mA; $I_B=50$ mA)	V_{CEsat}	<1	V *
($I_C=3$ A; $I_B=1$ A)	V_{CEsat}	<6	V
Base-emitter voltage ($I_C=500$ mA; $V_{CE}=4$ V)	V_{BE}	<1.7	V *
Static forward current transfer ratio			
($I_C=500$ mA; $V_{CE}=4$ V)	h_{FE}	25 to 100	–*
($I_C=3$ A; $V_{CE}=4$ V)	h_{FE}	>5	–

Dynamic characteristics ($T_{amb}=25$ °C)

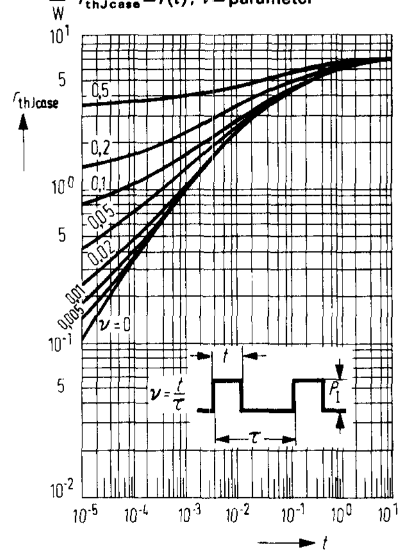
Current-gain transfer ratio ($I_C=200$ mA)	f_T	>800	kHz
Cutoff frequency in common emitter circuit ($I_C=0.1$ A; $V_{CE}=4$ V)	f_β	>30	kHz
Dynamic forward current transfer ratio ($I_C=0.1$ A; $V_{CE}=4$ V; $f=1$ kHz)	h_{fe}	>25	–

* AQL=0.65%

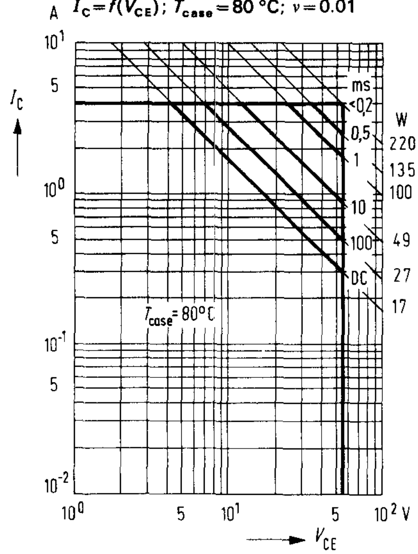
Total permissible power dissipation $P_{tot} = f(T_{case})$



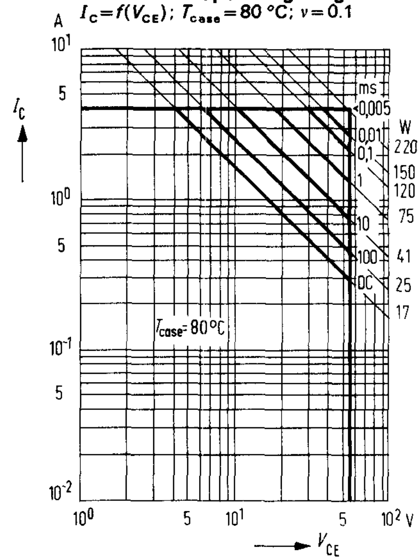
Permissible pulse load
$r_{thJcase} = f(t)$; ν = parameter



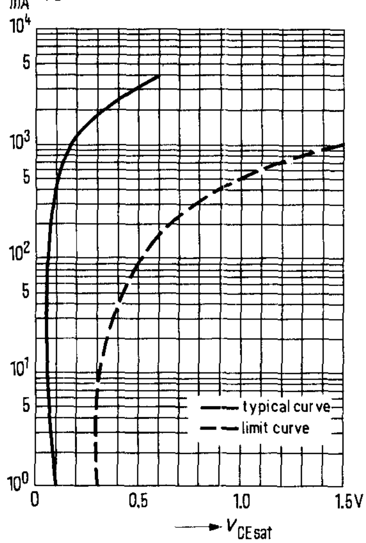
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $\nu = 0.01$



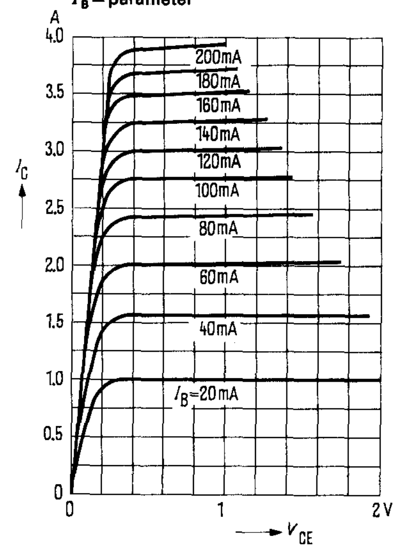
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $\nu = 0.1$



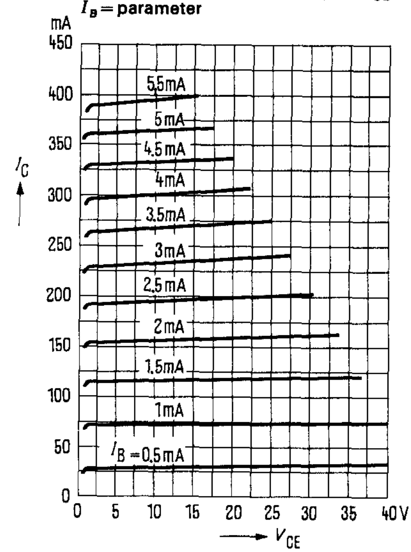
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$



Output characteristics $I_C = f(V_{CE})$
I_B = parameter



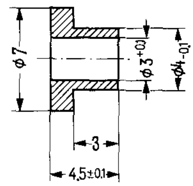
Output characteristics $I_C = f(V_{CE})$
I_B = parameter



NPN Transistor for high-power AF output stages

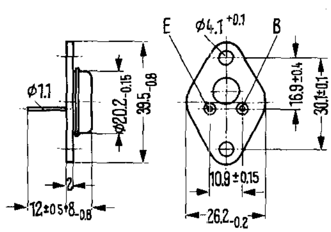
2 N 3055 is a single-diffused NPN silicon transistor in a case 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistor is particularly designed for use in high-power AF output stages and in stabilized power supplies. Upon request, these transistors are also available in pairs. For insulated mounting of the transistor on a chassis, 1 mica disc and 2 insulating nipples (Siprelit) are provided for, to be ordered separately.

Type	Order number
2 N 3055	Q62702-U58
2 N 3055 paired	Q62702-U58-P
Mica disc	Q62901-B11-A
Insulating nipple (Siprelit)	Q62901-B50

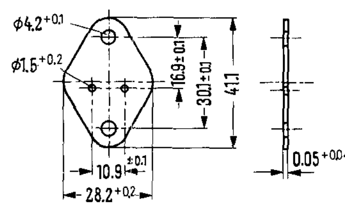


Scale 2:1

Insulating nipple (Siprelit for temp. up to 200 °C)



Weight approx. 16.5 g Dimensions in mm



Mica disc:
dry: =1.25 K/W
greased: =0.35 K/W

Maximum ratings		2 N 3055	
Collector-base voltage	V_{CBO}	100	V
Collector-emitter voltage ($V_{BE}=-1.5$ V; $I_C=10$ mA)	V_{CEV}	100	V
Collector-emitter voltage ($R_{BE}=100\ \Omega$; $I_C=200$ mA)	V_{CER}	70	V
Collector-emitter voltage	V_{CEO}	60	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	15	A
Maximum collector current ($t \leqq 10$ ms)	I_{CM}	22.5	A
Base current	I_B	7	A
Emitter current	I_E	20	A
Junction temperature	T_j	200	°C
Storage temperature	T_s	–65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	117	W

Thermal resistance

Junction to case	$R_{thJcase}$	$\leqq 1.5$	K/W

Static characteristics (T_{case}=25 °C)

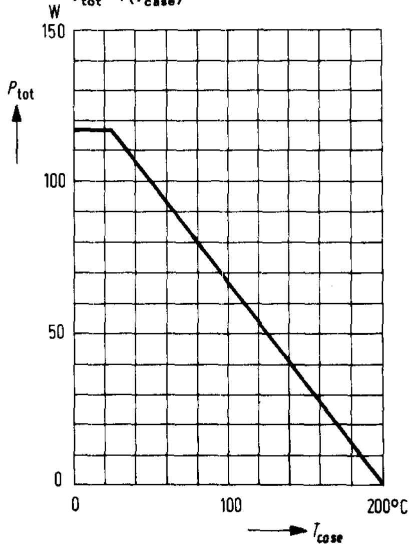
		2N 3055	
Collector-emitter cutoff current (V_{CE}=30 V)	I_{CEO}	<0.7	mA*
Collector-emitter cutoff current (V_{CES}=100 V)	I_{CES}	<5	mA*
Collector-emitter cutoff current (V_{CEV}=100 V; V_{BE}=−1.5 V)	I_{CEV}	<5	mA*
Collector-emitter cutoff current (V_{CEV}=100 V; V_{BE}=−1.5 V; T_{case}=150 °C)	I_{CEV}	<30	mA
Emitter-base cutoff current (V_{EBO}=7 V)	I_{EBO}	<5	mA*
Collector-emitter breakdown voltage (I_C=200 mA)	$V_{(BR)CEO}$	>60	V*
Collector-emitter breakdown voltage (I_C=100 mA; V_{BE}=−1.5 V)	$V_{(BR)CEV}$	>90	V
Collector-emitter breakdown voltage (I_C=200 mA; R_{BE}=100 Ω)	$V_{(BR)CER}$	>70	V
Base-emitter voltage (I_C=4 A; V_{CE}=4 V)	V_{BE}	<1.8	V*
Collector-emitter saturation voltage (I_C=4 A; I_B=0.4 A)	V_{CEsat}	<1.1	V*
Static forward current transfer ratio (I_C=4 A; V_{CE}=4 V)	h_{FE}	20 to 70	–*
Static forward current transfer ratio (I_C=10 A; V_{CE}=4 V)	h_{FE}	>5	–
Pairing conditions: (I_C=500 mA; V_{CE}=4 V)	h_{FE1}/h_{FE2}	1.41	–

Dynamic characteristics (T_{case}=25 °C)

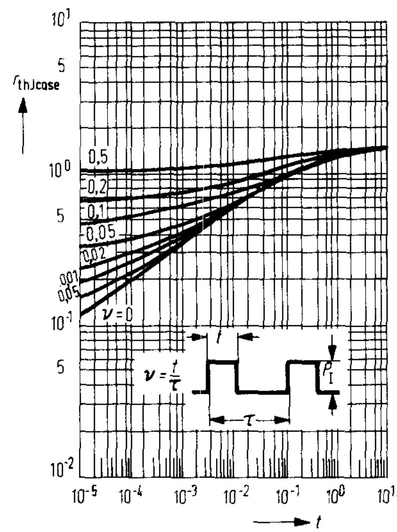
Current-gain bandwidth product (I_C=300 mA; V_{CE}=2 V)	f_T	>0.8	MHz
Short-circuit forward current transfer ratio (I_C=1 A; V_{CE}=4 V)	h_{21e}	15 to 120	–

* AQL=0.65%

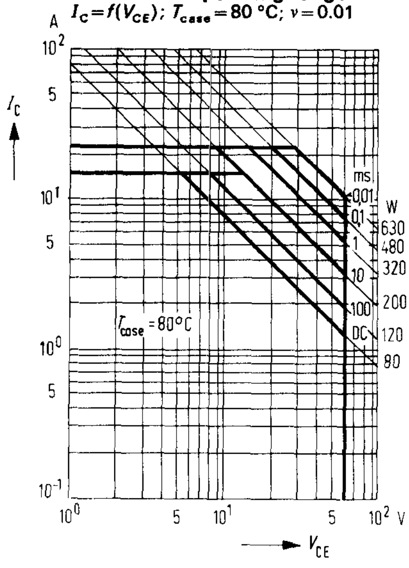
Total power dissipation
$P_{tot} = f(T_{case})$



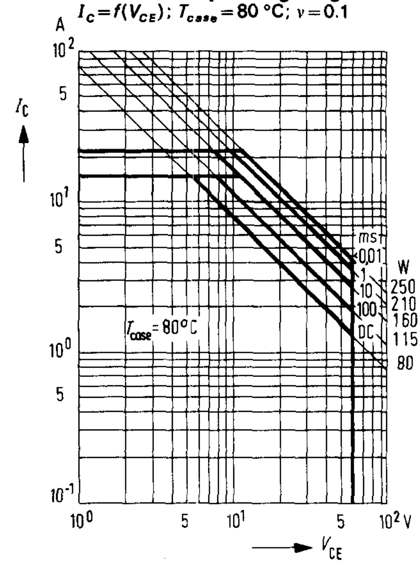
Permissible pulse load
$r_{thJcase} = f(t)$



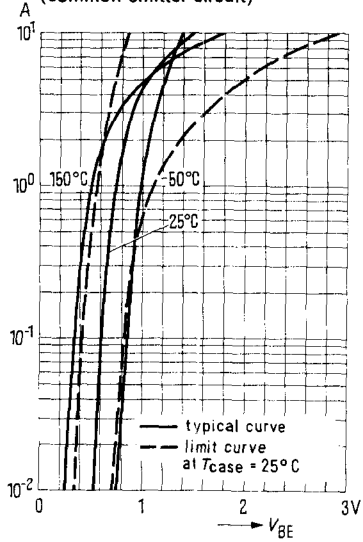
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $\nu = 0.01$



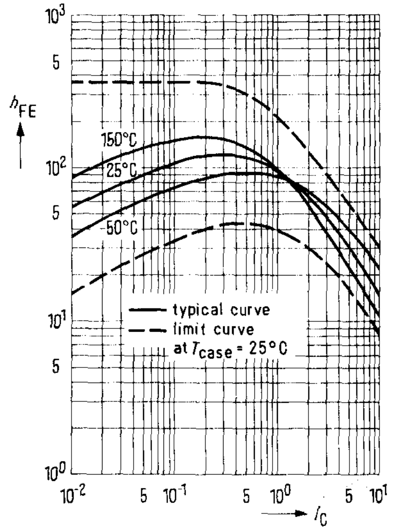
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $\nu = 0.1$



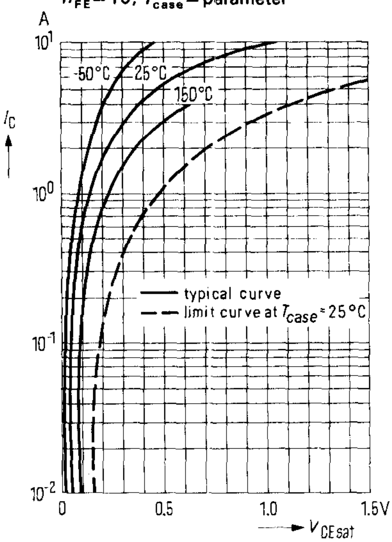
Collector current $I_C = f(V_{BE})$
$V_{CE} = 4$ V; T_{case} = parameter
(common emitter circuit)



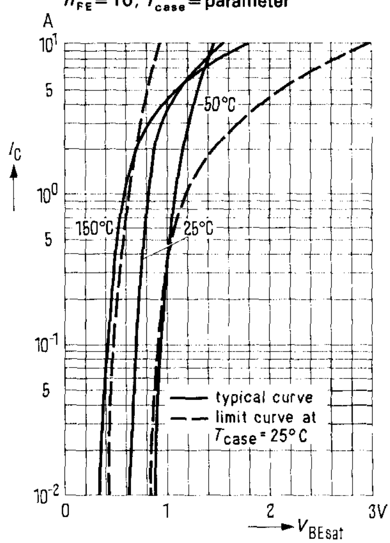
Static forward transfer ratio
$h_{FE} = f(I_C)$
$V_{CE} = 4$ V; T_{case} = parameter



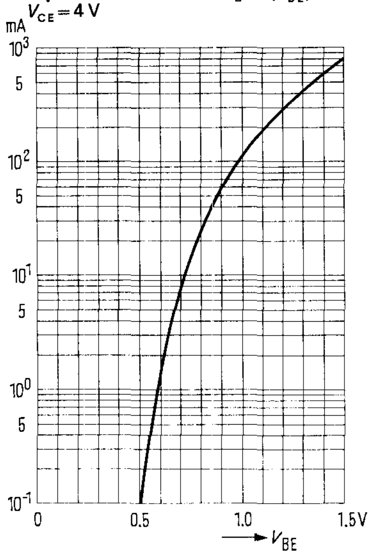
Saturation voltage $V_{CEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter



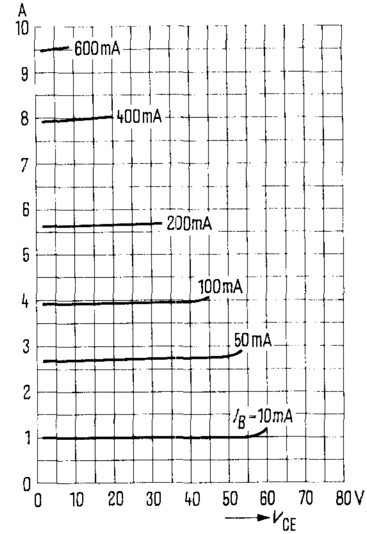
Saturation voltage $V_{BEsat} = f(I_C)$
$h_{FE} = 10$; T_{case} = parameter



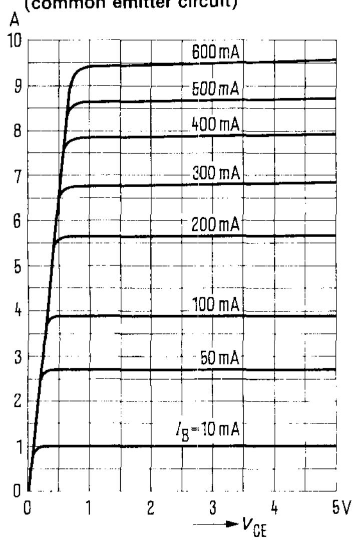
Input characteristic $I_B = f(V_{BE})$
$V_{CE} = 4$ V



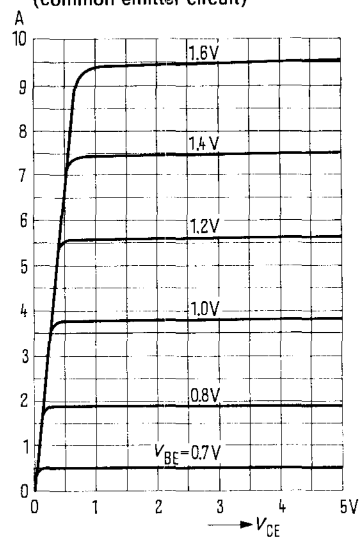
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



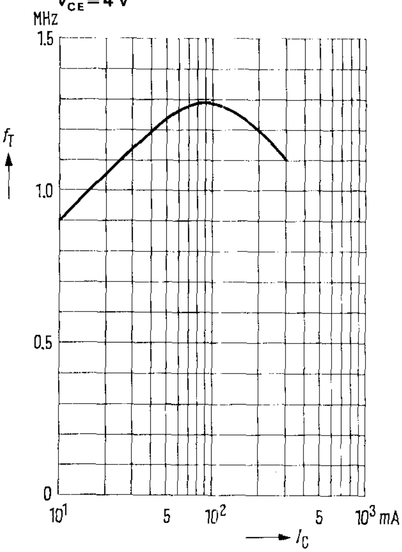
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



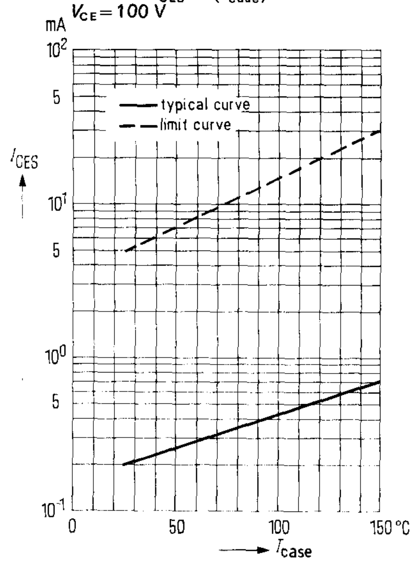
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



Current-gain bandwidth product $f_T = f(I_C)$
$V_{CE} = 4$ V



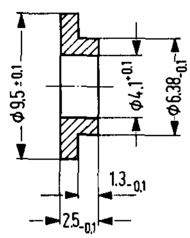
Collector-emitter cutoff current $I_{CES} = f(T_{case})$
$V_{CE} = 100$ V



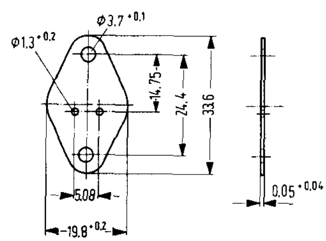
NPN Power transistor for AF amplifiers and switching applications

2N3441 is a single-diffused NPN silicon transistor in a TO-66 case. The collector is electrically connected to the case. The transistor 2N3441 is particularly suitable for use as a high-quality switch of medium output at high voltages.

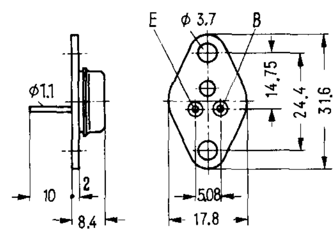
Type	Order number
2N3441	Q62702-D34
Mica disc	Q62902-B11-A
Insulating nipple	Q62902-B11-B



Insulating nipple



Mica disc



Weight approx. 8 g

Maximum ratings

		2N3441	
Collector-base voltage	V_{CBO}	160	V
Collector-emitter voltage	V_{CEO}	140	V
Collector-emitter voltage (R_{BE} < 100 Ω)	V_{CER}	150	V
Collector-emitter voltage ($V_{BE} = -1.5$ V)	V_{CEV}	160	V
Emitter-base voltage	V_{EBO}	7	V
Collector current	I_C	3	A
Maximum collector current	I_{CM}	4	A
Base current	I_B	2	A
Junction temperature	T_j	200	°C
Storage temperature	T_s	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	25	W

Thermal resistance

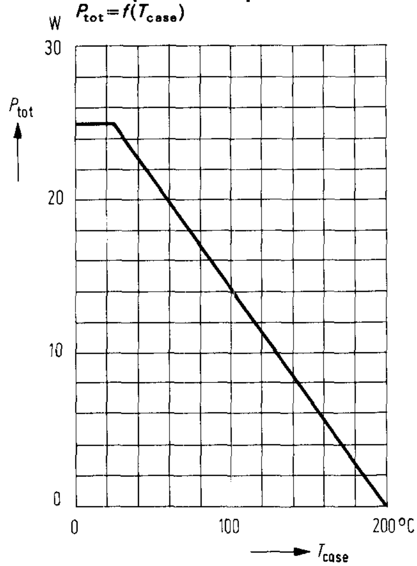
Junction to case	$R_{thJcase}$	≦7	K/W

Static characteristics ($T_{amb}=25$ °C)		2 N 3441	
Collector-emitter breakdown voltage			
($I_{CEO}=0.1$ A)	$V_{(BR)CEO}$	>140	V*
($I_{CER}=0.1$ A; $R_{BE}<100\ \Omega$)	$V_{(BR)CER}$	>150	V
($I_{CEV}=0.1$ A; $-V_{BE}=1.5$ V)	$V_{(BR)CEV}$	>160	V
Collector-emitter cutoff current ($V_{CEO}=140$ V)	I_{CEO}	<100	mA
($V_{CEV}=140$ V; $-V_{BE}=1.5$ V)	I_{CEV}	<1	mA
($V_{CEV}=140$ V; $-V_{BE}=1.5$ V; $T_{amb}=150$ °C)	I_{CEV}	<5	mA
Emitter-base cutoff current ($V_{EBO}=7$ V)	I_{EBO}	<1	mA
Collector-emitter saturation voltage			
($I_C=500$ mA; $I_B=50$ mA)	V_{CEsat}	<1	V*
($I_C=2.7$ A; $I_B=0.9$ A)	V_{CEsat}	<6	V
Base-emitter voltage ($I_C=500$ mA; $V_{CE}=4$ V)	V_{BE}	<1.7	V*
($I_C=2.7$ A; $V_{CE}=4$ V)	V_{BE}	<6	V
Static forward current transfer ratio			
($I_C=500$ mA; $V_{CE}=4$ V)	h_{FE}	25 to 100	–*
($I_C=2.7$ A; $V_{CE}=4$ V)	h_{FE}	>5	–

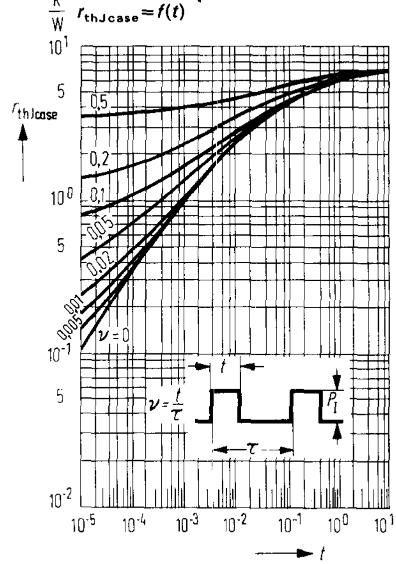
Dynamic characteristics ($T_{amb}=25$ °C)			
Current-gain bandwidth product			
($I_C=200$ mA; $V_{CE}=4$ V)	f_T	>800	kHz
Dynamic forward current transfer ratio			
($I_C=0.5$ A; $V_{CE}=4$ V; $f=1$ kHz)	h_{fe}	15 to 75	–
($I_C=0.5$ A; $V_{CE}=4$ V; $f=0.4$ MHz)	h_{fe}	>5	–

* AQL=0.65%

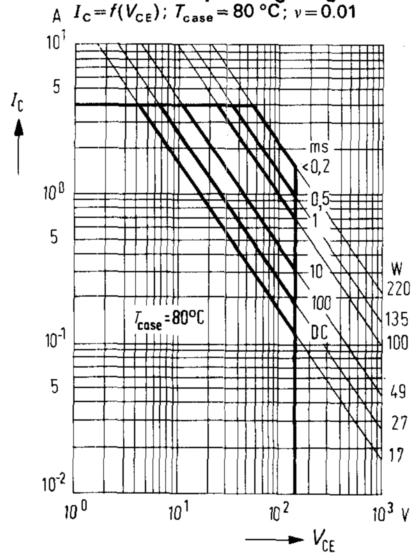
Total power dissipation
$P_{tot} = f(T_{case})$



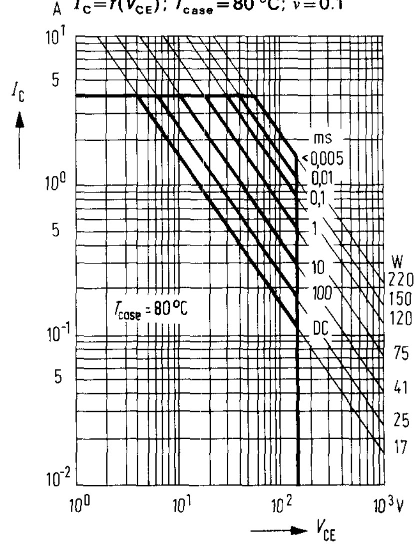
Permissible pulse load
$r_{thJcase} = f(t)$



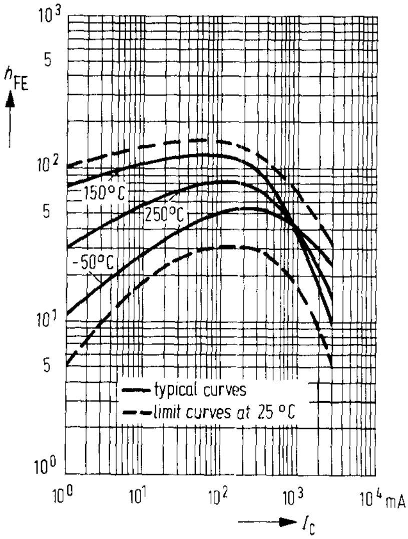
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80$ °C; $\nu = 0.01$



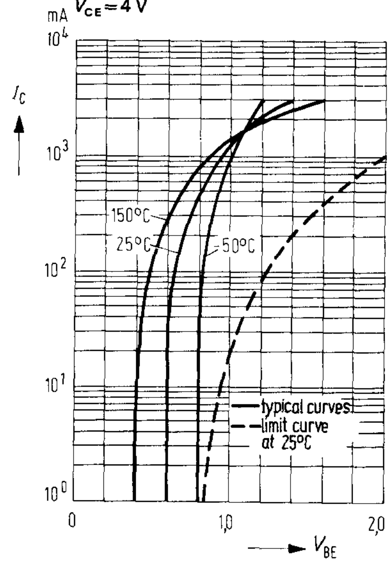
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80$ °C; $\nu = 0.1$



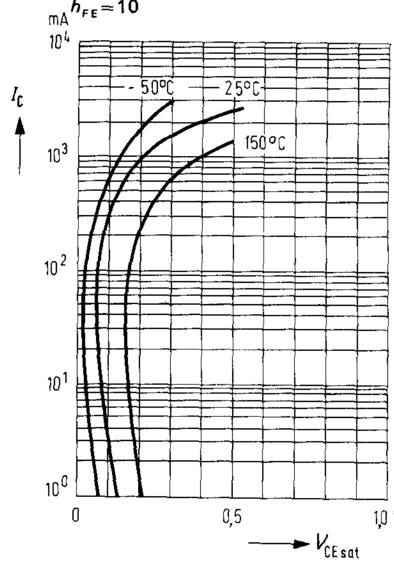
Static forward current transfer ratio $h_{FE}=f(I_C)$



Collector current $I_C=f(V_{BE})$
$V_{CE}=4$ V



Collector-emitter saturation voltage $V_{CEsat}=f(I_C)$
$h_{FE}=10$

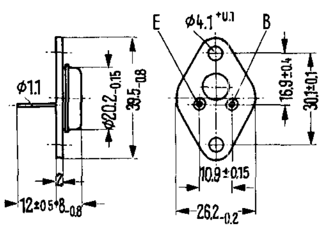


NPN Power transistors

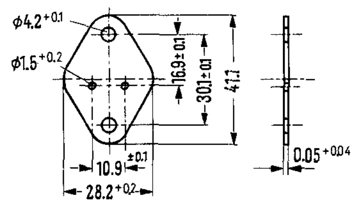
2 N 3442 and 2 N 4347 are single-diffused NPN silicon transistors in a case 3 A 2 DIN 41872 (TO-3). The collector is electrically connected to the case. The transistors are particularly designed for use at high operating voltages in AF output stages, as power switches and in control engineering. For insulated mounting of these transistors on a chassis, 1 mica disc and 2 insulating nipples (Siprelit) each are provided for, to be ordered separately.

Type	Order number
2N3442	Q62702-U59-F100
2N4347	Q62702-U38-F100

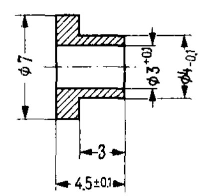
Type	Order number
Mica disc	Q62901-B11-A
Insulating nipple (Siprelit)	Q62901-B 50



Weight approx. 16.5 g



Mica disc



Insulating nipple: scale 2:1

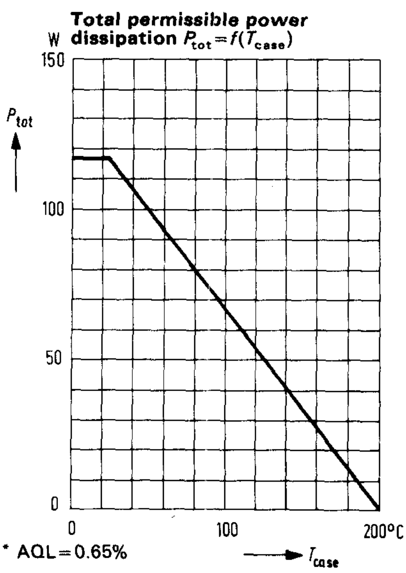
Maximum ratings

		2N4347	2N3442	
Collector-base voltage	V_{CBO}	140	160	V
Collector-emitter voltage ($V_{BE} = -1.5$ V)	V_{CEV}	140	160	V
Collector-emitter voltage	V_{CEO}	120	140	V
Emitter-base voltage	V_{EBO}	7	7	V
Collector current	I_C	10	10	A
Maximum collector current	I_{CM}	15	15	A
Base current	I_B	7	7	A
Junction temperature	T_j	200	200	°C
Storage temperature	T_s	−65 to +200	−65 to +200	°C
Total power dissipation ($T_{case} \leqq 25$ °C)	P_{tot}	117	117	W
Thermal resistance				
Junction to case	$R_{thJcase}$	≦1.5	≦1.5	K/W

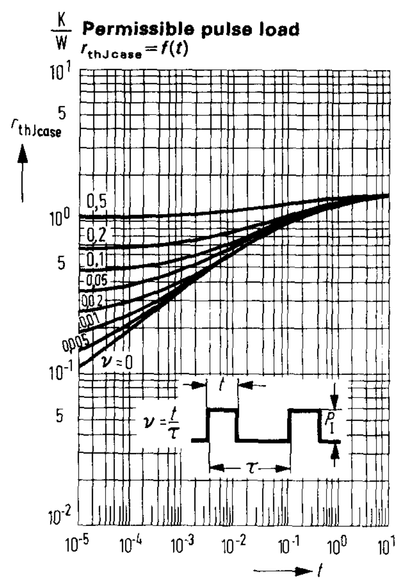
Static characteristics (T_{amb} = 25 °C)		2 N 4347	2 N 3442	
Collector-base cutoff current (V_{CEO} = 140 V)	I_{CBO}	–	<1	mA*
Collector-emitter cutoff current (V_{CEV} = 120 V; $-V_{BE}$ = 1.5 V)	I_{CEV}	<2	–	mA*
Collector-emitter cutoff current (V_{CEV} = 140 V; $-V_{BE}$ = 1.5 V)	I_{CEV}	–	<1	mA*
Collector-emitter cutoff current (V_{CEV} = 120 V; $-V_{BE}$ = 1.5 V; T_{case} = 150 °C)	I_{CEV}	<10	–	mA
Collector-emitter cutoff current (V_{CE} = 140 V; $-V_{BE}$ = 1.5 V; T_{case} = 150 °C)	I_{CEV}	–	<10	mA
Emitter-base cutoff current (V_{EBO} = 7 V)	I_{EBO}	<5	<5	mA*
Collector-emitter breakdown voltage (I_C = 200 mA)	$V_{(BR)CEO}$	>120	>140	V*
Collector-emitter breakdown voltage (I_C = 100 mA; $-V_{BE}$ = 1.5 V)	$V_{(BR)CEV}$	>140	>160	V
Base-emitter voltage (I_C = 3 A; V_{CE} = 4 V)	V_{BE}	<1.7	<1.7	V*
Collector-emitter saturation voltage (I_C = 3 A; I_B = 0.3 A)	V_{CEsat}	<1	<1	V
Static forward current transfer ratio (I_C = 3 A; V_{CE} = 4 V)	h_{FE}	20 to 70*	20 to 70*	–

Dynamic characteristics (T_{case} = 25°)

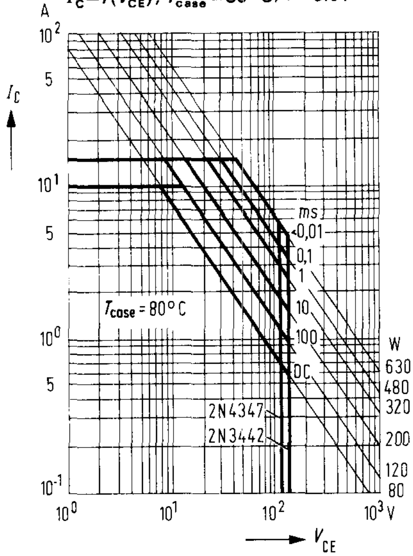
Current-gain bandwidth product (I_C = 300 mA; V_{CE} = 2 V)	f_t	>0.8	>0.8	MHz
Short-circuit forward current transfer ratio (I_C = 2 A; V_{CE} = 4 V)	h_{21e}	>12	>12	–



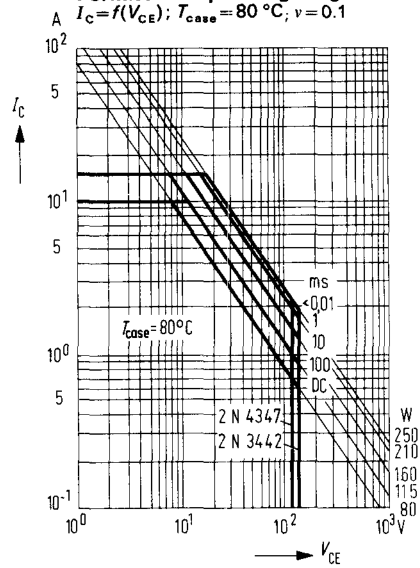
* AQL = 0.65%



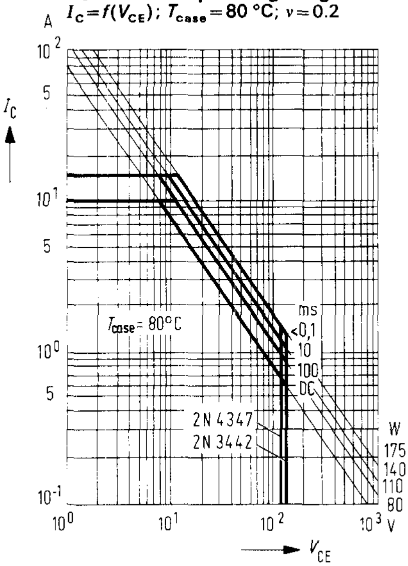
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $v = 0.01$



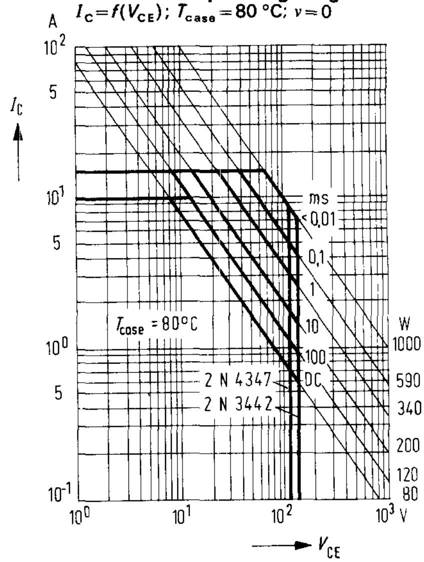
Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $v = 0.1$



Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $v = 0.2$

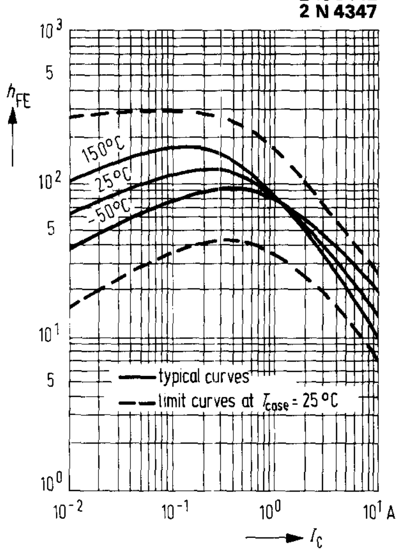


Permissible operating range
$I_C = f(V_{CE})$; $T_{case} = 80\ °C$; $v = 0$



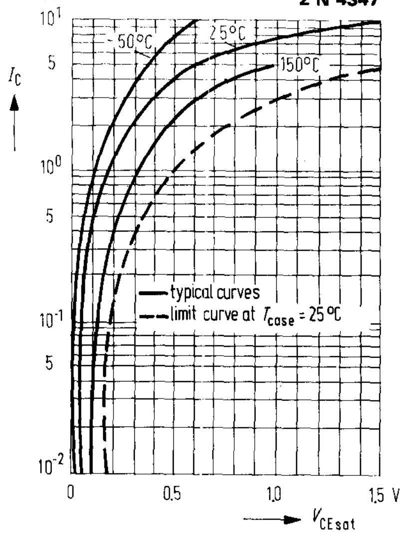
Static forward current transfer ratio $h_{FE} = f(I_C)$

2 N 3442
2 N 4347



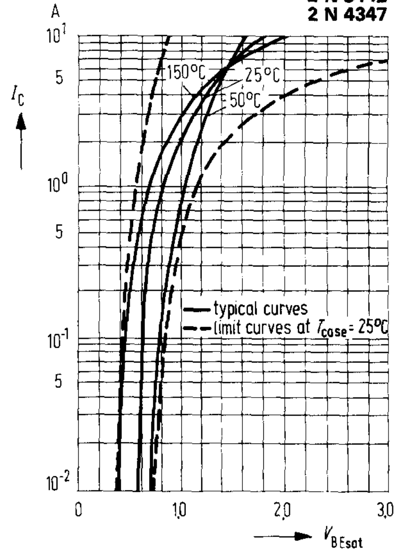
Collector-emitter saturation voltage $V_{CEsat} = f(I_C)$

2 N 3442
2 N 4347



Base-emitter saturation voltage $V_{BEsat} = f(I_C)$

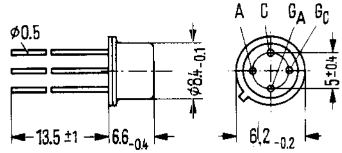
2 N 3442
2 N 4347



PNPN-Thyristor

The BRY 20 is an extinguishable silicon PNPN planar thyristor-tetrode in a case 5 C 4 DIN 41873 (TO-12). The anode gate (G_A) is electrically connected to the case. The BRY 20 is particularly suitable for use as a medium fast switch.

Type	Order number
BRY 20	Q60217-Y20



Weight approx. 1 g Dimensions in mm

Maximum ratings		BRY 20	
Anode gate reverse voltage	V_{GAR}	40	V
Negative reverse voltage	$-V_R$	40	V
Negative control voltage	V_{GKR}	5	V
Peak current (see diagram)	I_{FSM}	5	A
Continuous forward current	I_F	500	mA
Gate to cathode control current	I_{GK}	100	mA
Anode gate control current	I_{GA}	300	mA
Junction temperature	T_j	−55 to +125	°C
Storage temperature	T_S	−55 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	1.3	W

Thermal resistance

Junction to ambient air	R_{thJamb}	≦220	K/W
Junction to case	$R_{thJcase}$	≦60	K/W

Static characteristics (T_{amb} = 25 °C)

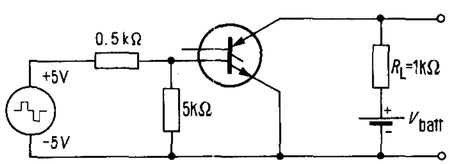
Off-state current			
(V_D = 40 V; R_{GKK} = 5 kΩ; I_{GA} = 0)	I_D	3 < 200	nA
(V_D = 30 V; R_{GKK} = 5 kΩ; I_{GA} = 0)	I_D	2 < 100	nA
Reverse current			
(V_R = 40 V; R_{GK} = 5 kΩ; I_{GA} = 0)	I_R	< 200	nA
(V_R = 40 V; R_{GK} = 5 kΩ; T_{amb} = 125 °C)	I_R	< 25	µA
Cathode-gate reverse current (V_{GK} = 5 V; I_{AK} = 0)	$-I_{GKR}$	< 10	µA
Anode-gate reverse voltage (V_{GA} = 40 V)	I_{GAR}	< 200	nA
Forward voltage (I_F = 100 mA; R_{GK} = 5 kΩ; I_{GA} = 0)	V_F	< 1.3	V
Breakover voltage (−55 to +125 V) R_{GK} = 5 kΩ; I_{GA} = 0	V_{BO}	> 40	V
Holding current (R_{GK} = 5 kΩ)	I_H	2 (0.3 to 6.5)	mA[1])

[1]) Narrower tolerance available on request

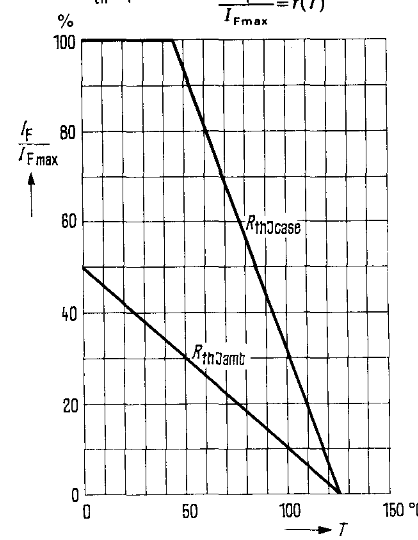
Static characteristics: Test condition:		BRY 20	
at $V_{batt}=15$ V; $R_L=1$ kΩ; $I_{GA}=0$			
Gate trigger current	I_{GKT}	50<100	µA
Turn-off current	I_{GKQ}	2.5<5	mA
Gate trigger voltage	V_{GKT}	0.4 to 0.8	V
at $V_{Batt}=15$ V; $R_L=500$ Ω; $I_{GA}=0$			
Gate trigger current	I_{GKT}	50<100	µA
Turn-off current	I_{GKQ}	10<15	mA
at $V_{Batt}=15$ V; $R_L=0.5$ kΩ; $R_{GK}=5$ kΩ			
Anode gate trigger current	I_{GAT}	<3	mA
Anode gate trigger voltage	V_{GAT}	0.4 to 0.8	V

Dynamic characteristics: Test condition:			
at $V_{batt}=15$ V; $R_L=1$ kΩ; $R_{GK}=5$ kΩ			
$I_{GKT}=I_{GKQ}=5$ mA			
Trigger time	t_{gt}	100 (<300)	ns
Switch-off time	t_{gq}	(<5)	µs
Junction capacitance ($V_{AK}=20$ V)	C_{AK}	3.5	pf
Recovery time ($V_{AA}=15$ V; $R_L=1$ kΩ; $R_{AK}=5$ kΩ)	t_q	7	µs
Critical voltage-time ratio ($V_{AA}=40$ V; $R_{GK}=100$ kΩ) [1]	$\left(\frac{dV_D}{dt}\right)_{crit}$	>5	V/µs

Circuit for measuring switching times

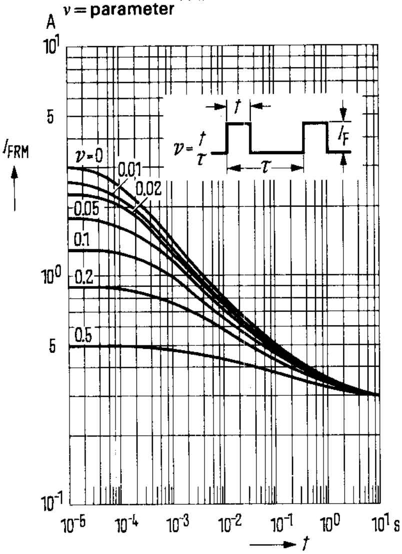


Max. permissible anode current
R_{th} = parameter $\frac{I_F}{I_{Fmax}}=f(T)$

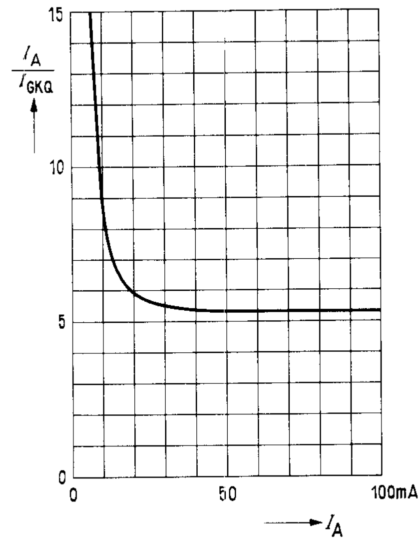


[1]) If the anode gate is connected to the anode supply voltage via a 200 kΩ resistor, the rate of increase of the forward voltage can tend to infinity

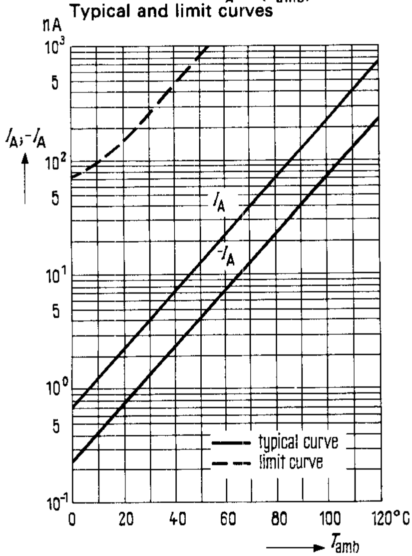
Permissible anode current as a function of pulse width and duty cycle $I_{FRM}=f(t)$;
v = parameter



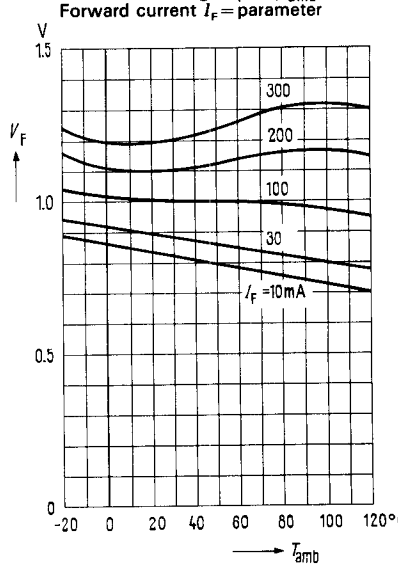
Switching ratio $I_A/I_{GKQ}=f(I_A)$



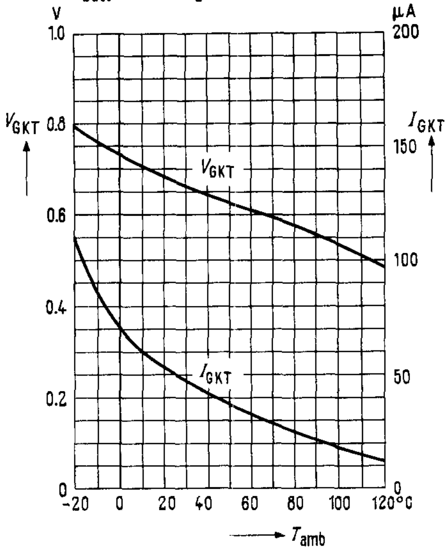
Anode current $I_A=f(T_{amb})$
Typical and limit curves



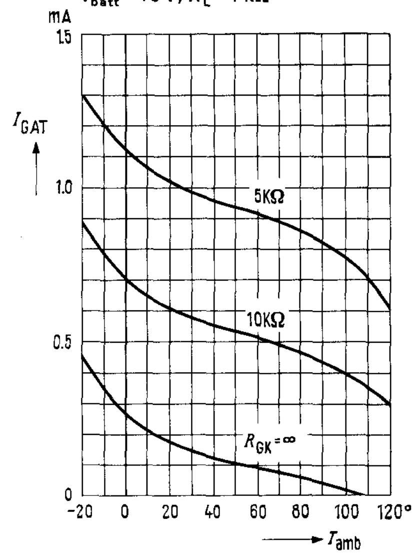
Forward voltage $V_F=f(T_{amb})$
Forward current I_F = parameter



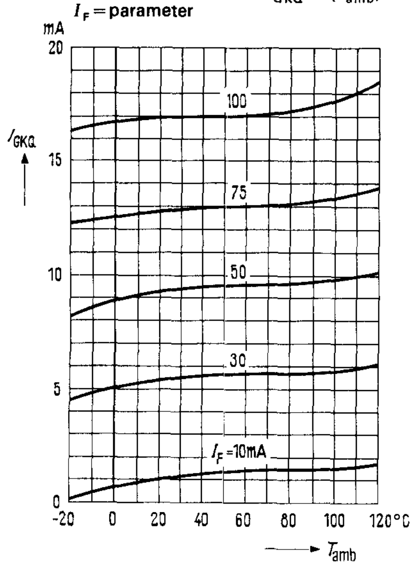
Trigger current $I_{GKT} = f(T_{amb})$
Trigger voltage $V_{GKT} = f(T_{amb})$
$V_{batt} = 15$ V; $R_L = 1$ kΩ



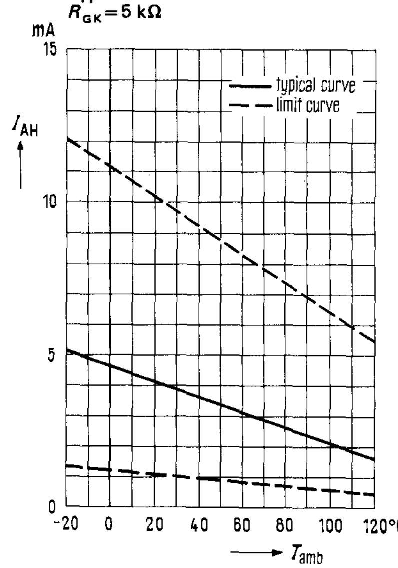
Anode control current
$I_{GAT} = f(T_{amb})$
R_{GK} = parameter
$V_{batt} = 15$ V; $R_L = 1$ kΩ



Switch-off current $I_{GKQ} = f(T_{amb})$
I_F = parameter



Holding current $I_{AH} = f(T_{amb})$
Typical and limit curves;
$R_{GK} = 5$ kΩ

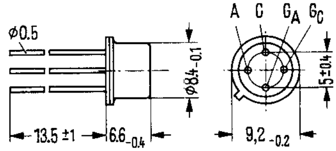


PNPN-Thyristor

Preliminary data

BRY 21 is an extinguishable PNPN silicon planar thyristor tetrode in a case 5 C 4 DIN 41873 (TO-12). The anode gate (G_A) is electrically connected to the case. The thyristor tetrode BRY 21 is particularly designed for use as a switch of medium speed.

Type	Order number
BRY 21	Q 62702-R 81



Weight approx. 1 g Dimensions in mm

Maximum ratings

		BRY 21	
Anode gate reverse voltage	V_{GAR}	80	V
Negative reverse voltage	$-V_R$	80	V
Negative control voltage	V_{GKR}	5	V
Forward current[1]	I_F	500	mA
Maximum forward current	I_{FSM}	5	mA
Gate to cathode control current	I_{GC}	100	mA
Anode gate control current	I_{CA}	300	mA
Junction temperature	T_j	−55 to +125	°C
Storage temperature	T_S	−55 to +200	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	1.3	W

Thermal resistance

Junction to case	$R_{thJcase}$	≦60	K/W
Junction to ambient air	R_{thJamb}	≦220	K/W

Static characteristics

Breakover voltage (R_{GK}=5 kΩ; $T_{amb} \leqq 125$ °C)	V_{BO}	80	V
Off-state current (V_D=80 V; R_{GK}=5 kΩ; T_{amb}= 25 °C)	I_D	<200	nA
(V_D=80 V; R_{GK}=5 kΩ; T_{amb}=125 °C)	I_D	<25	µA
Negative reverse current (V_R=80 V; R_{GK}=5 kΩ; T_{amb}= 25 °C)	I_R	<200	nA
(V_R=80 V; R_{GK}=5 kΩ; T_{amb}=125 °C)	I_R	<25	µA
Cathode gate reverse current (V_{GKR}=5 V; T_{amb}=25 °C)	$-I_{GKR}$	<10	µA
Anode gate reverse current (V_{GAR}=80 V; T_{amb}=25 °C)	I_{GAR}	<200	nA

[1]) *di*/*dt* is unlimited

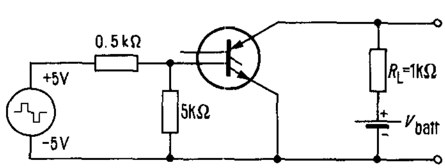
Static characteristics

		BRY 21	
Forward voltage (I_F=100 mA; R_{GK}=5 kΩ; T_{amb}=25 °C)	V_F	<1.3	V
(I_F=300 mA; R_{GK}=5 kΩ; T_{amb}=25 °C)	V_F	<1.7	V
Holding current (R_{GK}=5 kΩ; T_{amb}=25 °C)	I_H	2 (0.3 to 6.5)	mA
Cathode gate trigger current (V_{AA}=15 V; R_L=1 kΩ; t_{IGKT}>50 µs; T_{amb}=25 °C)	I_{GKT}	50<100	µA
Turn-off current (V_{AA}=15 V; R_L=500 Ω; t_{JGKQ}>50 µs; T_{amb}=25 °C)	I_{GKQ}	10<15	mA
Gate trigger voltage (V_{AA}=15 V; R_L=1 kΩ; T_{amb}=25 °C)	V_{GKT}	0.4 to 0.8	V
Anode gate trigger current (V_{AA}=15 V; R_L=1 kΩ; T_{amb}=25 °C)	I_{GAT}	<3	mA
Anode gate trigger voltage (V_{AA}=15 V; R_L=1 kΩ; T_{amb}=25 °C; R_{GK}=5 kΩ)	V_{GAT}	0.4 to +0.8	V

Dynamic characteristics (T_{amb}=25 °C)

Anode cathode capacitance (V_C=20 V; f=1 MHz)	C_{AK}	3.5	pf
Switching times			
Trigger time (V_G=±5 V; V_{AA}=15 V)	t_{gt}	0.1 (<0.3)	µs
Switch-off time (R_{GK}=5 kΩ; R_G=500 Ω)	t_{gq}	<5	µs
Recovery time (V_{AA}=15 V; R_L=1 kΩ; R_{GK}=5 kΩ)	t_q	7	µs
Critical voltage-time ratio (V_{AA}=80 V; R_{GK}=100 kΩ)	$\left(\frac{dV_D}{dt}\right)_{crit}$	>5	V/µs

Measuring circuit for switching times

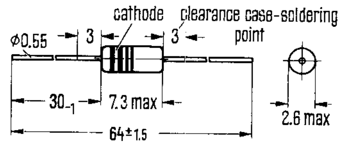


[1]) If the anode gate is connected to the anode supply voltage via a 220 kΩ resistor the permissible voltage increase of the anode is unlimited

Germanium RF point-contact diode

In addition to a high forward transconductance, the germanium diode AAY 27 displays small switching times and a good detector voltage efficiency at high frequencies. Therefore it is qualified for general purposes in RF as well as switching applications. The diode is housed in a glass-case 51 A 2 DIN 41880 (Do-7), has no lacquer coat and is identified by colour rings. Starting at the cathode end, the colour code runs as follows: brown, gray, red, violet.

Type	Order number
AAY 27	Q60101-Y27



Weight approx. 0.3 g Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)

		AAY 27	
Reverse voltage	V_R	25	V
Maximum reverse voltage	V_{RM}	25	V
Forward current	I_F [1]	75	mA
Maximum current	i_{FM}	190	mA
Junction temperature	T_j	90	°C
Ambient temperature	T_{amb}	−55 to +90	°C
Thermal resistance (L = 5 mm)	R_{thJamb}	≦400	K/W

Static characteristics

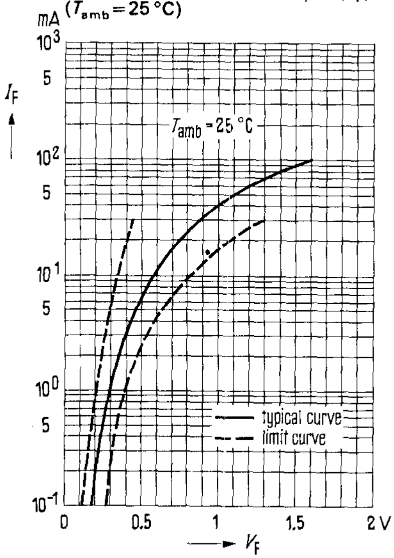
at an ambient temperature of	T_{amb}	25	60	°C
Forward voltage (I_F = 0.1 mA)	V_F	0.18 (≦0.25)	–	V*
Forward voltage (I_F = 1 mA)	V_F	0.29 (≦0.39)	–	V*
Forward voltage (I_F = 10 mA)	V_F	0.58 (≦0.83)	–	V*
Forward voltage (I_F = 30 mA)	V_F	0.87 (≦1.3)	–	V*
Reverse current (V_R = 1.5 V)	I_R	1.5 (≦6)	8 (≦25)	µA
Reverse current (V_R = 10 V)	I_R	6 (≦30)	10 (≦60)	µA*
Reverse current (V_R = 20 V)	I_R	20 (≦95)	40 (≦250)	µA

Dynamic characteristics (T_{amb} = 25 °C)

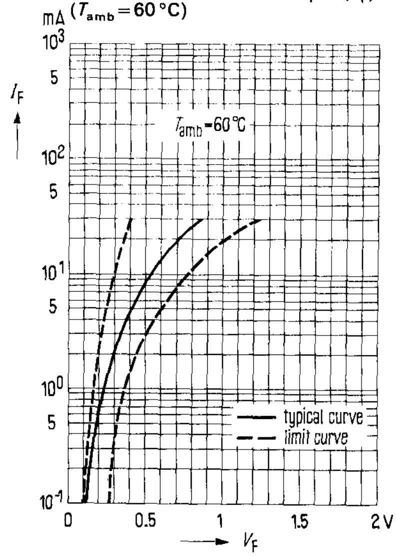
Diode capacitance (V_R = 1 V; f = 1 MHz)	C_D	0.5 (<0.9)	pf
Detector voltage efficiency at			
f = 100 MHz; V_{eff} = 1 V; R_L = 5 kΩ; C_L = 20 pf	η_V	56	%
f = 50 MHz; V_{eff} = 1 V; R_L = 2 kΩ; C_L = 5 nf	η_V	58 (≦45)	%
f = 30 MHz; V_{eff} = 3 V; R_L = 4 kΩ; C_L = 10 pf	η_V	63	%
Loss resistance at			
f = 30 MHz; V_{eff} = 3 V; R_L = 4 kΩ; C_L = 10 pf	R_d	2.8	kΩ
Reverse recovery time until 10% of I_R is reached when switching from I_F = 20 mA to I_R = 20 mA	t_{rr}	15	ns
Charge storage (I_F = 10 mA)	Q_D	150	p Coulomb

[1] t_{av} ≦ 50 ms (see diagram)
* AQL = 0.65%

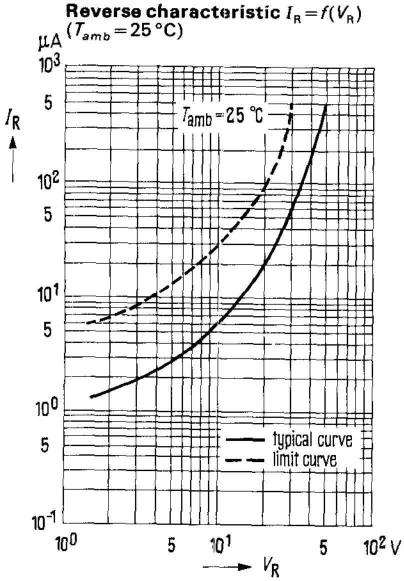
Forward characteristic $I_F = f(V_F)$
($T_{amb} = 25\,°C$)



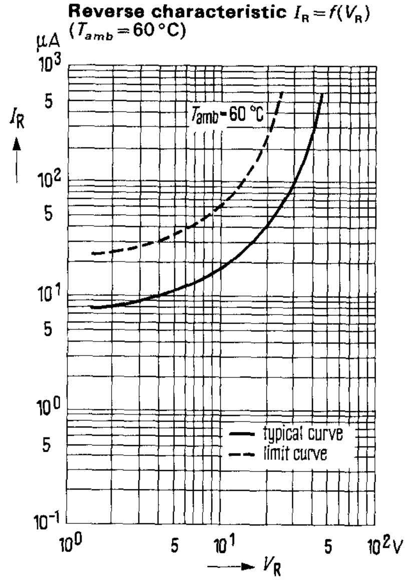
Forward characteristic $I_F = f(V_F)$
($T_{amb} = 60\,°C$)



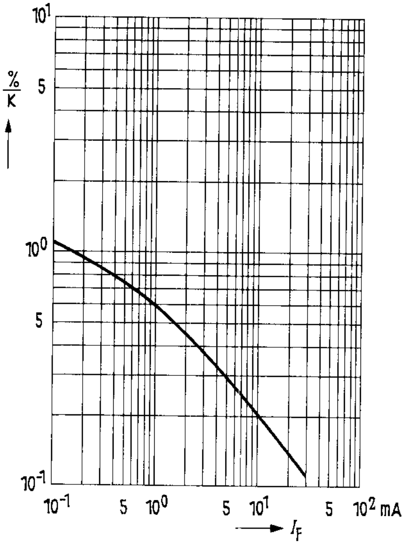
Reverse characteristic $I_R = f(V_R)$
($T_{amb} = 25\,°C$)



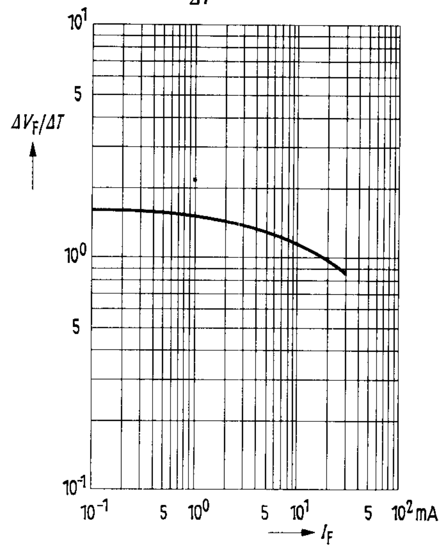
Reverse characteristic $I_R = f(V_R)$
($T_{amb} = 60\,°C$)



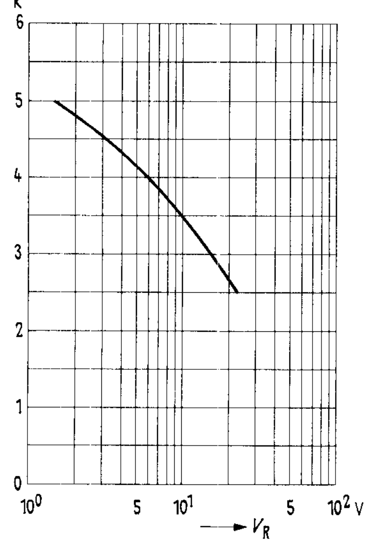
Forward voltage temperature coefficient as a function of forward current



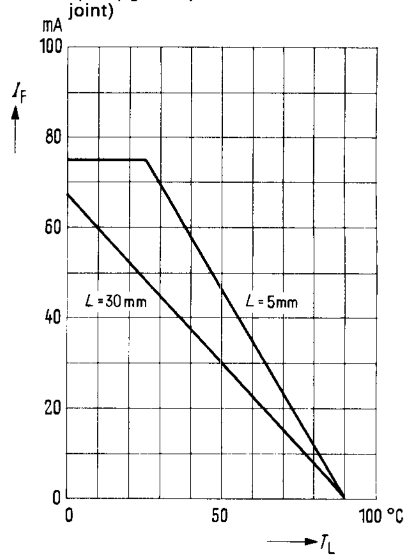
Rate of change of forward voltage with temperature as a function of the forward current $\frac{\Delta V_F}{\Delta T} = f(I_F)$



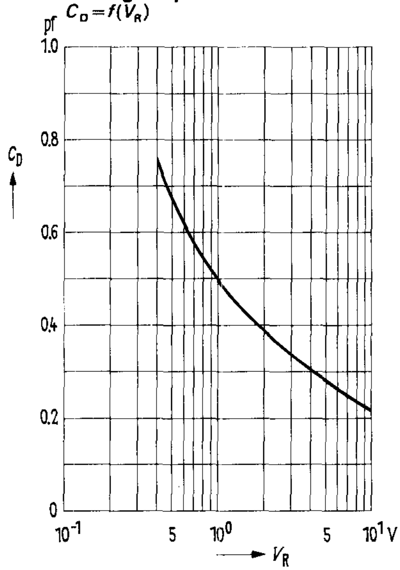
Reverse current temperature coefficient as a function of the reverse voltage



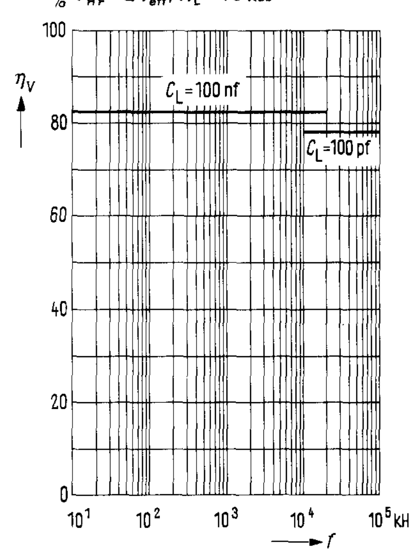
Forward current $I_F = f(T_L)$
$I_F = f(T_L$ = temperature at soldered joint)



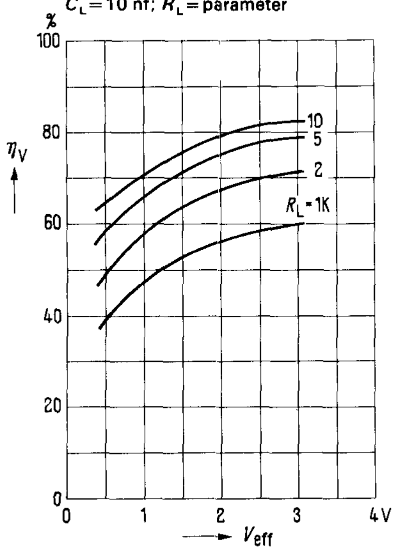
Average capacitance variation
$C_D = f(V_R)$



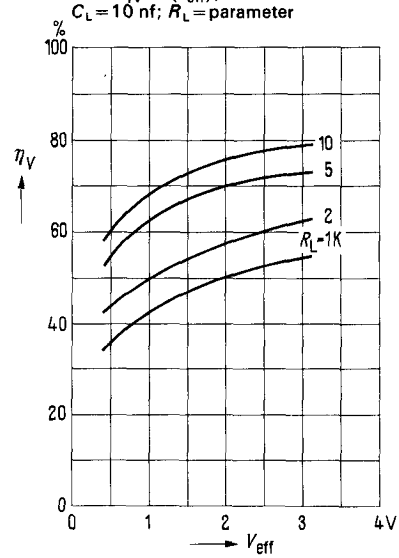
Reverse-to-forward voltage ratio $\eta_V = f(f)$
% $V_{HF} = 2\ V_{eff}$; $R_L = 10\ k\Omega$



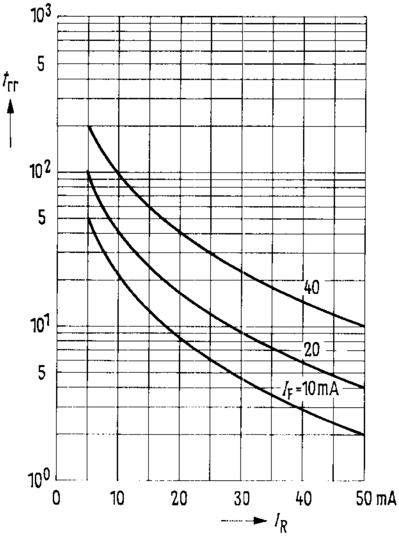
Reverse-to-forward voltage ratio $\eta_V = f(V_{eff})$; $f = 30$ MHz;
$C_L = 10$ nf; R_L = parameter



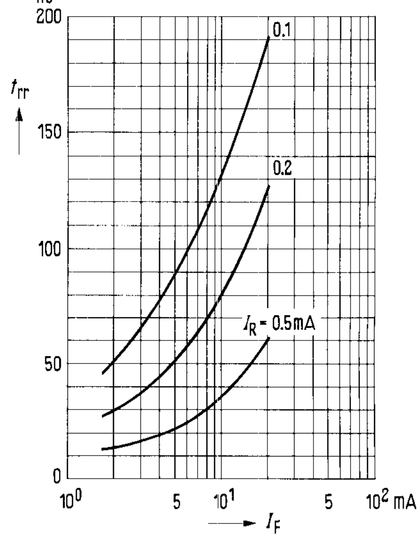
Reverse-to-forward voltage ratio $\eta_V = f(V_{eff})$; $f = 100$ MHz
$C_L = 10$ nf; R_L = parameter



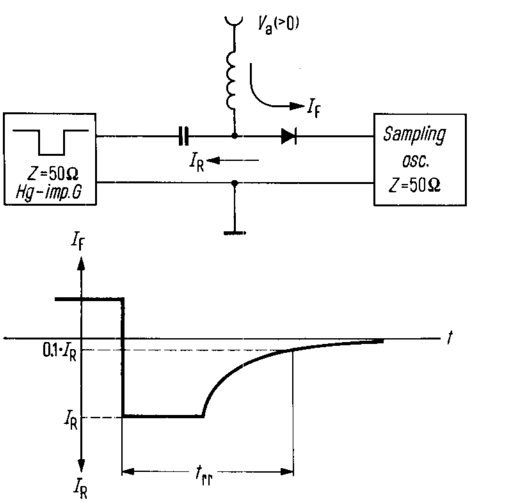
Reverse recovery time $t_{rr} = f(I_R)$
(see measuring circuit)



Reverse recovery time $t_{rr} = f(I_F)$
I_R = parameter for impressed currents



Circuit for measuring average reverse recovery time

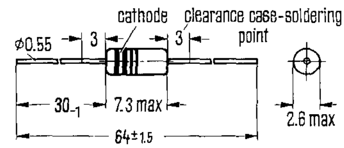


The recovery time is the time taken to attain a diode reverse resistance >20 kΩ measured from the time of application of the reverse current

High-voltage germanium point-contact diode

The high-voltage germanium diode AAY 28 in the glass case 51 A 2 DIN 41880 (DO-7) for universal application has no lacquer coat and is marked by coulor rings. Starting at the cathode end, the colour code runs as follows: brown/gray/red/gray.

Type	Order number
AAY 28	Q 60101-Y 28



Weight approx. 0.3 g Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)

		AAY 28	
Reverse voltage	V_R	100	V
Maximum reverse voltage	V_{RM}	100	V
Forward current	I_F	50	mA
Junction temperature	T_j	90	°C
Ambient temperature	T_{amb}	−55 to +90	°C
Thermal resistance (L = 5 mm)	R_{thJamb}	≦400	K/W

Static characteristics

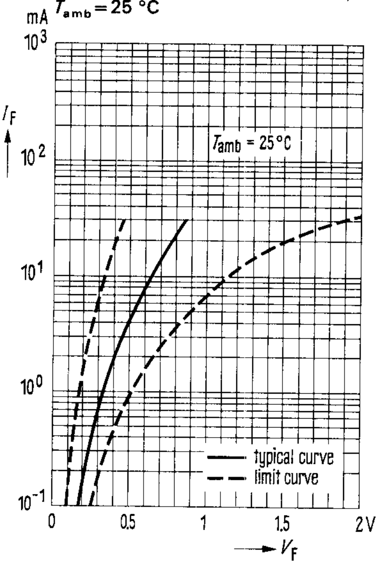
for an ambient temperature of	T_{amb}	25	60	°C
Forward voltage (I_F = 0.1 mA)	V_F	0.18 (≦0.25)	–	V*
Forward voltage (I_F = 10 mA)	V_F	0.65 (≦1.15)	–	V*
Forward voltage (I_F = 30 mA)	V_F	0.85 (≦1.9)	–	V*
Reverse current (V_R = 1.5 V)	I_R	1.0 (≦4.5)*	12 (≦26)	µA
Reverse current (V_R = 10 V)	I_R	3.0 (≦7)	17 (≦40)	µA*
Reverse current (V_R = 100 V)	I_R	100 (≦250)*	200 (≦430)	µA

Dynamic characteristics (T_{amb} = 25 °C)

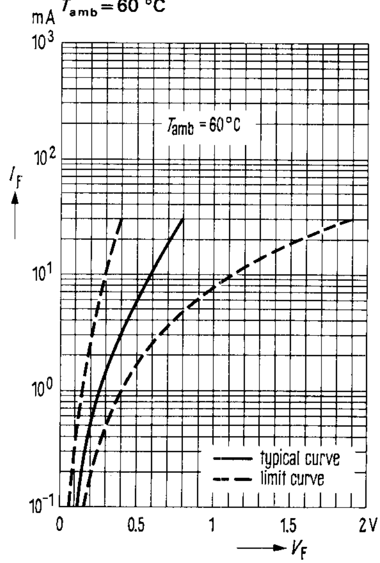
Diode capacitance (V_R = 1 V; f = 1 MHz)	C_D	0.2	pf
Switching time when switching from I_F = 5 mA to I_R = 0.5 mA	t_{rr}	100	ns
Voltage rectifying efficiency (f = 10 MHz; V_{eff} = 2 V; R_L = 10 kΩ; C_L = 300 pf)	η_V	65 (>55)	%

* AQL = 0.65%

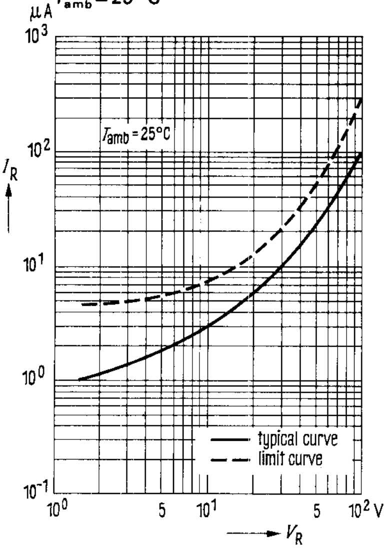
Forward characteristic $I_F = f(V_F)$
$T_{amb} = 25\ °C$



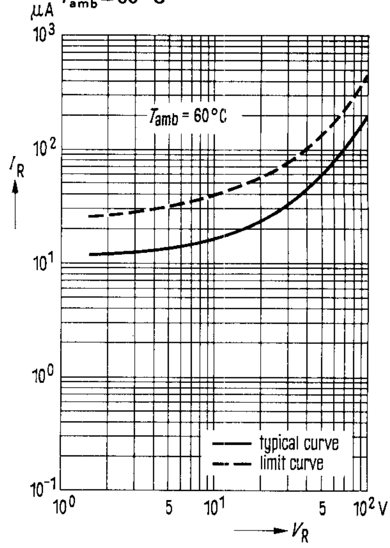
Forward characteristic $I_F = f(V_F)$
$T_{amb} = 60\ °C$



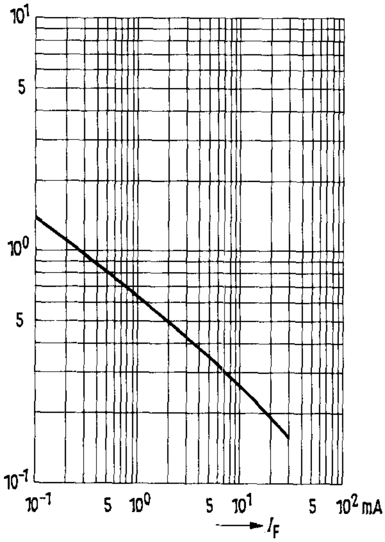
Reverse characteristic $I_R = f(V_R)$
$T_{amb} = 25\ °C$



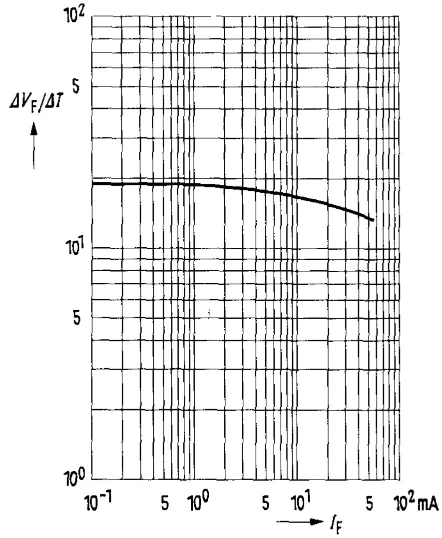
Reverse characteristic $I_R = f(V_R)$
$T_{amb} = 60\ °C$



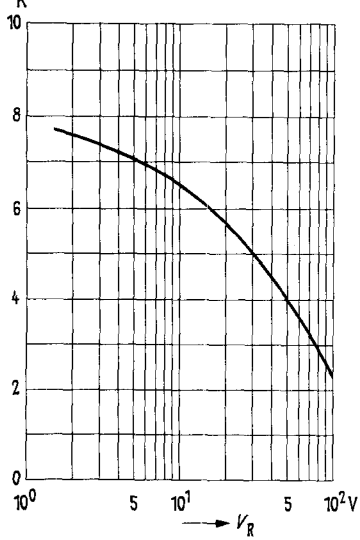
Temperature coefficient of the forward voltage as a function of the forward current
$\frac{\%}{K}$ (T_{amb} = 25 °C to 60 °C)



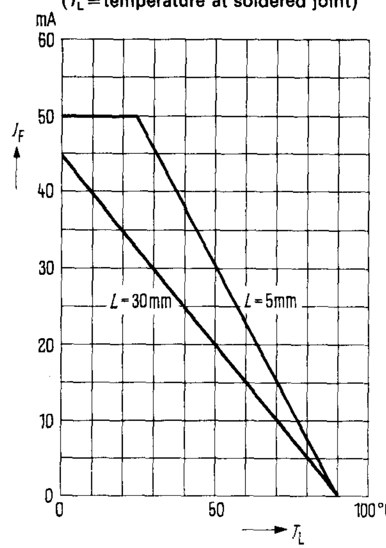
Change of forward voltage per degree of temperature change as a function of the forward current $\frac{\Delta V_F}{\Delta T} = f(I_F)$
$\frac{mV}{K}$ (T_{amb} = 25 °C to 60 °C)



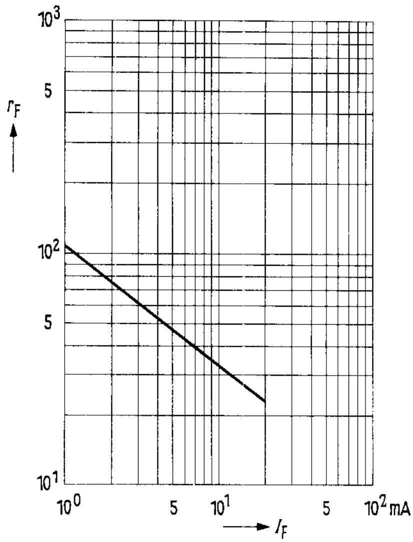
Temperature coefficient of the reverse current as a function of the reverse voltage
$\frac{\%}{K}$



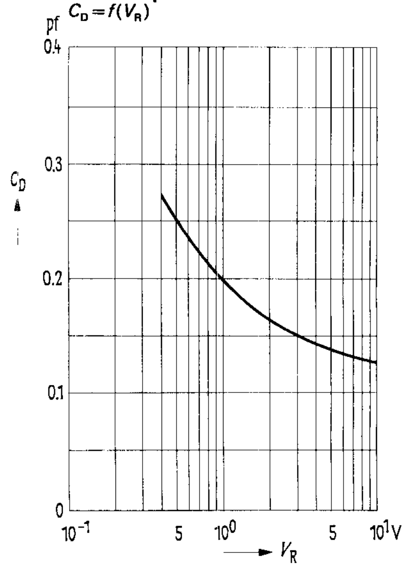
Forward current $I_F = f(T_L)$
(T_L = temperature at soldered joint)



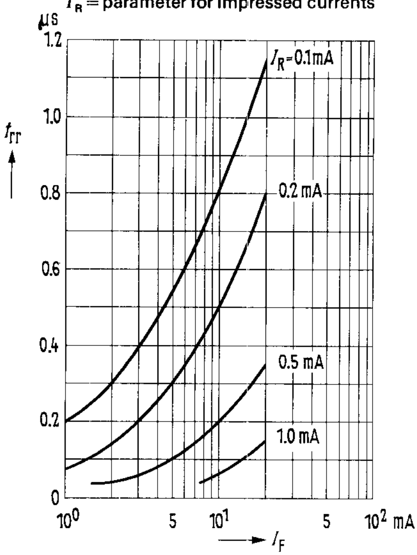
Dynamic forward resistance as a function of the forward current $r_F = f(I_F)$



Mean capacitance curve $C_D = f(V_R)$



Switching time diagram $t_{rr} = f(I_F)$
I_R = parameter for impressed currents



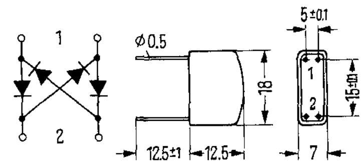
The reverse recovery time t_{rr} is the time taken for the diode to attain a reverse resistance >20 kΩ, measured from the time of application of the reverse current

Germanium ring modulator diode quartet

Not for new development

Diode quartet AAY 43 is suitable for use as a modulator or demodulator in carrier frequency and single-side-band systems. The quartet consists of four single diodes (Type AAY 27) cast into a plastic housing. The following data apply to the individual diodes.

Type	Order number
AAY 43	Q 60101-Y 43



Weight approx. 5 g   Dimensions in mm

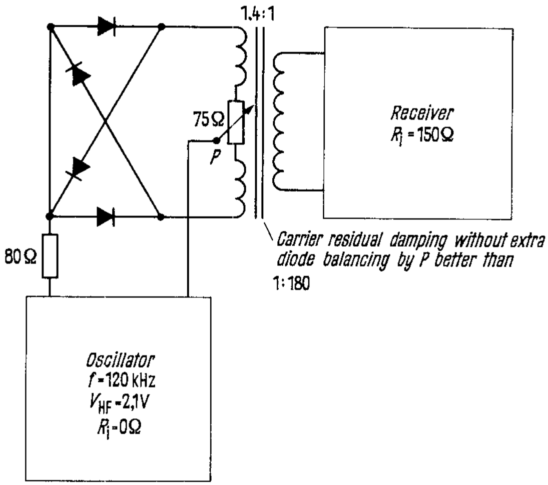
Maximum ratings (T_{amb} = 25 °C)		AAY 43	
Reverse voltage	V_R	25	V
Maximum reverse voltage	V_{RM}	25	V
Forward current	I_F	75	mA
Maximum current	i_{FM}	190	mA

Static characteristics

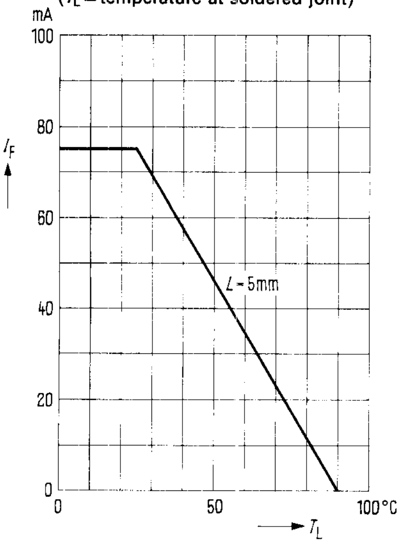
for an ambient temperature:	T_{amb}	25	60	°C
Forward voltage (I_F = 0.1 mA)	V_F	0.18 (≦0.25)	–	V
Forward voltage (I_F = 1 mA)	V_F	0.29 (≦0.39)	–	V
Forward voltage (I_F = 10 mA)	V_F	0.58 (≦0.83)	–	V
Forward voltage (I_F = 30 mA)	V_F	0.87 (≦1.3)	–	V
Reverse current (V_R = 1.5 V)	I_R	1.5 (≦6)	8 (≦25)	µA
Reverse current (V_R = 10 V)	I_R	6 (≦30)	18 (≦60)	µA
Reverse current (V_R = 20 V)	I_R	20 (≦95)	40 (≦250)	µA

Dynamic characteristics (T_{amb} = 25 °C)			
Diode capacitance (V_R = 1 V; f = 1 MHz)	C_D	0.2	pf
Reverse recovery time, switching from I_F = 5 mA to I_R = 0.5 mA	t_{rr}	100	ns

Circuit measuring diode quartet AAY 43



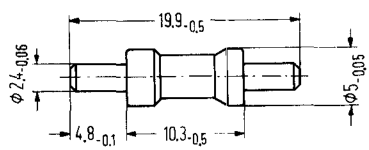
Forward current $I_F = f(T_L)$
(T_L = temperature at soldered joint)



Germanium point-contact diodes

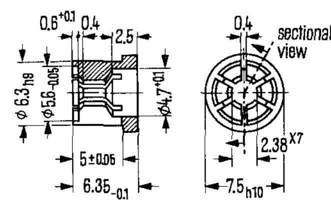
Germanium point-contact diodes GD 731, GD 732 and GD 733 are special-quality diodes with a high rectifying efficiency into the UHF region. These types are suitable for high resistance quality rectifying circuits, and are noted for their small spread in the quadratic region of the characteristic as well as the very small frequency dependence of their rectifying efficiency. With matching adapter (Q62901-B6) these diodes may be inserted into a cartridge fitting (type DIN 41861). The type number and diode symbol are stamped on the case. (Replacement for the former AAY 53, AAY 54, AAY 55.)

Type	Order number
GD 731	Q62601-X731
GD 732	Q62601-X732
GD 733	Q62601-X733
Adapter	Q62901-B6



Weight approx. 1 g   Dimensions in mm

Adapter   Scale 2:1



Weight approx. 1 g

Maximum ratings		GD 731	GD 732	GD 733	
Reverse voltage	V_R	36	36	40	V
Maximum reverse voltage	V_{RM}	40	40	45	V
Maximum current	i_{FS}	50	50	50	mA
Junction temperature	T_j	60	60	60	°C
Ambient temperature	T_{amb}	−20 to +60	−20 to +60	−20 to +60	°C
Storage temperature	T_S	−40 to +60	−40 to +60	−40 to +60	°C
Thermal resistance	R_{thJamb}	≦400	≦400	≦400	K/W

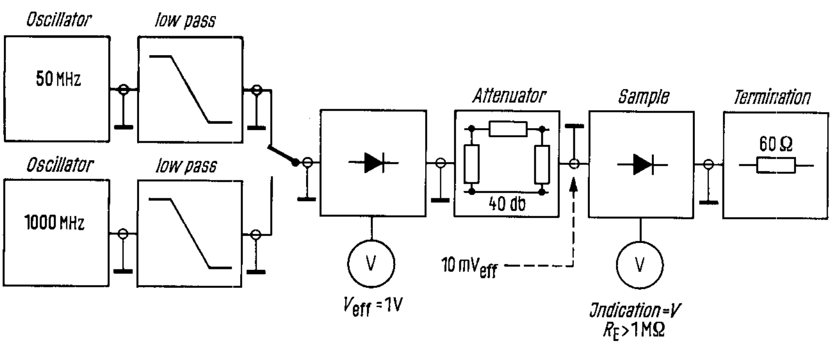
Static characteristics (T_{amb} = 25 °C)					
Forward voltage (I_F = 2 mA)	V_F	<1	<1	<1[1])	V
Reverse current (V_R = 40 V)	I_R	<300	<300	50 (<100)	µA
Reverse current (V_R = 10 V)	I_R	–	–	3 (<5)	µA

[1]) I_F = 5 mA

Dynamic characteristics (T_{amb} = 25 °C)		**GD 731**	**GD 732**	**GD 733**	
Diode capacitance (V_R = 0 V; f = 1 MHz)	C_D	1.5	1.5	1.5	pf
Series inductance	L_S	10	10	10	nH
Voltage rectifying efficiency (V_{eff} = 10 mV; f = 50 MHz; R_L = 10 MΩ)	η	10 (9 to 13)	10 (9 to 13)	> 60[1]	%
Fall in voltage rectifying efficiency from 50 MHz to 1 GHz (V_{eff} = 10 mV; R_L = 1 MΩ)	$\frac{\Delta\eta}{\eta}$	< 30	–	< 10[2]	%

Dynamic characteristics are measured in the peak value rectifying circuit below.

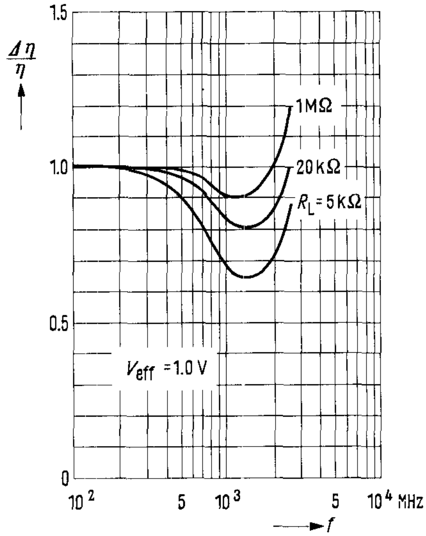
Block diagram: for GD 731, GD 732, GD 733



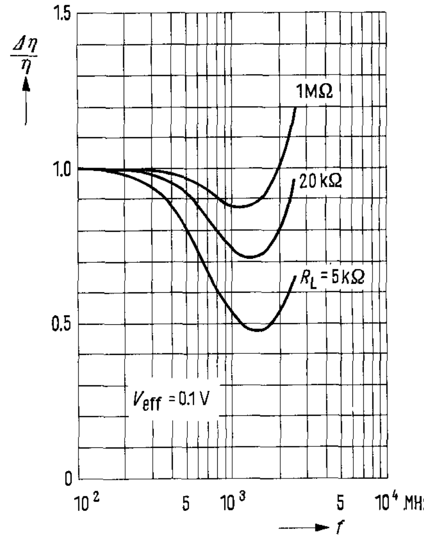
[1]) (V_{eff} = 2 V; f = 100 MHz; R_L = 5 kΩ; C_L = 20 pf)
[2]) Between 1 MHz and 400 MHz (V_{eff} = 1 V; R_L = 100 kΩ; C_L = 5 nf)

Voltage rectifying efficiency as a function of frequency $\frac{\Delta\eta}{\eta} = f(f)$ for input voltages

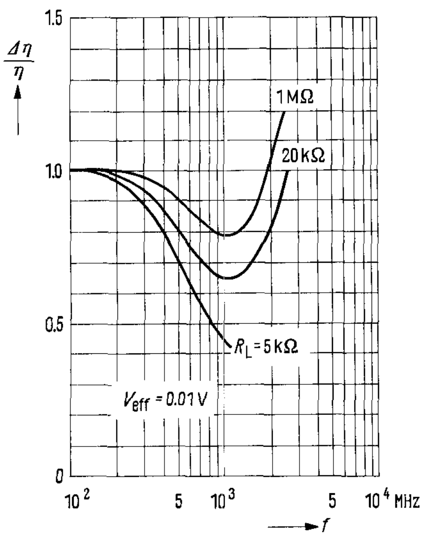
R_L = parameter
V_{eff} = 1 V



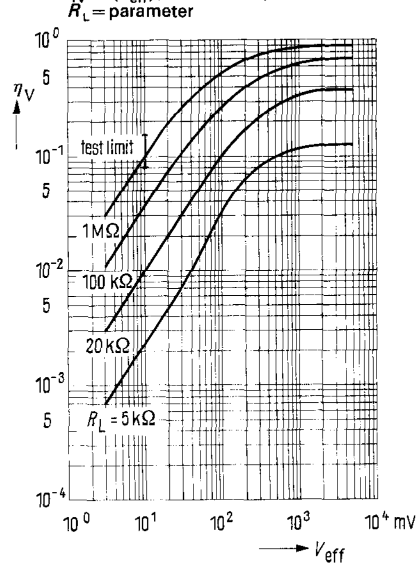
R_L = parameter
V_{eff} = 0.1 V



R_L = parameter
V_{eff} = 0.01 V



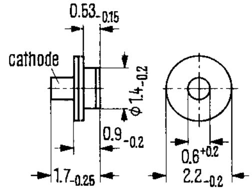
Voltage rectifying efficiency
$\eta_V = f(V_{eff})$; f = 50 MHz;
R_L = parameter



P-Germanium tunnel diodes

Tunnel diodes AEY 30 are specially designed for use as micro-wave amplifiers. Built into coaxial ceramic microwave cases the diodes are sorted according to capacitance and identified by the letters A, B, C or D. Each diode is supplied in a single package. Type designation and code letters are stamped into the package.

Type	Order number
AEY 30 A	Q62701-E12
AEY 30 B	Q62701-E13
AEY 30 C	Q62701-E14
AEY 30 D	Q62701-E21



Weight approx. 0.006 g
Dimensions in mm

Maximum ratings		AEY 30 A, AEY 30 B AEY 30 C, AEY 30 D	
Maximum current (T_{case} = 80 °C)	$I_{FM} = I_{RM}$	10	mA
Storage temperature	T_S	−55 to +100	°C
Thermal resistance	$R_{thJcase}$	≦1000	K/W

Characteristics (T_{amb} = 25 °C)			
Peak voltage	V_p	75	mV
Valley voltage	V_V	350	mV
Maximum current	I_p	1.6 (1.4 to 1.8)	mA
Peak-valley current ratio	I_p/I_V	9>6	–
Series resistance[1])	R_S	5.5<8	Ω
Series inductance	L_S	0.2	nH
Case capacitance	C_{case}	0.4	pf

Characteristics (T_{amb} = 25 °C)

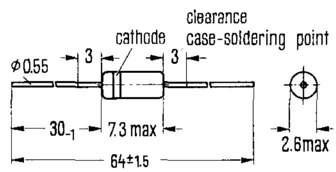
Type	Diode Capacitance ($V_F = V_V$) C_D (pf)	Negative Resistance $R_N - R_S$ [2]) (Ω)
AEY 30 A	0.6 to 0.9	60 to 110
AEY 30 B	0.9 to 1.2	50 to 100
AEY 30 C	1.2 to 1.5	40 to 90
AEY 30 D	1.5 to 1.8	40 to 90

[1]) $R_S = \Delta V_R / \Delta I_R$; I_{R1} = 80 mA; I_{R2} = 40 mA; t = 0.2 µs; f = 200 Hz
[2]) At point of inflection of $I_F - V_F$ characteristic; $R_n \geq 0$

P-Germanium tunnel diodes

Tunnel diodes of the series TU 205, TU 210 and TU 220 are particularly designed for use as ultra-high-speed switches. Built into unvarnished glass cases 51 A 2 DIN 41880 (DO-7) the diodes are available in 2 groups of maximum current tolerance (±5% and ±10%). The type designation code states the data on maximum current I_P and tolerance of the maximum current (e.g. TU 220/10: $I_P = 2 \pm 0.2$ mA).

Type	Order number
TU 205/5	Q 62701-E 20
TU 205/10	Q 62701-E 22
TU 210/5	Q 62701-E 16
TU 210/10	Q 62701-E 23
TU 220/5	Q 62701-E 24
TU 220/10	Q 62701-E 25



Weight approx. 0.3 g Dimensions in mm

Maximum ratings		TU 205 TU 210 TU 220	
Maximum current	$I_{FM} = I_{RM}$	$5 \times I_P$	mA
Storage temperature	T_S	−55 to +100	°C

Characteristics ($T_{amb} = 25$ °C)

Valley voltage	V_V	350	mV
Voltage at projected peak	V_{PP}	540	mV
Peak-valley current ratio	I_P/I_V	>6	–
Case inductance	L_S	6	nH
Switching time product	$R_N \cdot C_D$	<1	ns

Characteristics ($T_{amb} = 25$ °C)

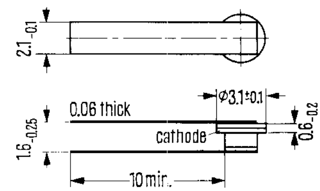
Type	Peak current I_P (mA)	Peak voltage V_P (mV)	Diode capacitance[1]) C_D (pf)	Series resistance R_S (Ω)
TU 205/5	5 (4.75 to 5.25)	80	7 (4 to 10)	2<3
TU 205/10	5 (4.5 to 5.5)	80	7 (4 to 10)	2<3
TU 210/5	10 (9.5 to 10.5)	90	10 (6 to 13)	1.5<2.5
TU 210/10	10 (9 to 11)	90	10 (6 to 13)	1.5<2.5
TU 220/5	20 (19 to 21)	110	20 (10 to 30)	1<2.5
TU 220/10	20 (18 to 22)	110	20 (10 to 30)	1<2.5

[1]) $V_F = V_V$
[2]) $R_S = \Delta V_R / \Delta I_R$; $I_{R1} = 220$ mA; $I_{R2} = 300$ mA; $t = 0.2$ µs; $f = 200$ Hz
[3]) Other tolerance ranges upon request

P-Germanium tunnel diodes

Tunnel diodes of the series 301, 302, 305 and 310 are specially suitable for switching and triggering applications. They are built into coaxial ceramic microwave cases with band leads.

Type	Order number
TU 301	Q62701-E26
TU 302	Q62701-E27
TU 305/5	Q62701-E28
TU 305/10	Q62701-E29
TU 310/5	Q62701-E30
TU 310/10	Q62701-E31
TU 320/5	Q62701-E32
TU 320/10	Q62701-E33



Weight approx. 1 g Dimensions in mm

Maximum ratings		**TU 301, TU 305 TU 310, TU 320**	
Maximum current ($T_{case} \leqq 80$ °C)	$I_{FM} = I_{RM}$	$5 \times I_p$	mA
Storage temperature	T_S	−55 to +100	°C

Characteristics ($T_{amb} = 25$ °C)			
Valley voltage	V_v	350	mV
Voltage at projected peak	V_{pp}	540	mV
Peak-valley current ratio	I_p/I_v	> 6 (10)	–
Case capacitance	C_{case}	0.35	pf
Series inductance	L_S	min. 0.4	nW
Switching time product	$R_N \times C_D$	< 1	ns

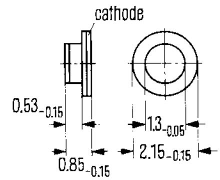
Type	Peak current I_p (mA)	Peak voltage V_p (mV)	Negative resist-ance R_N (Ω)	Diode capac-itance[1] C_D (pf)	Series resistance[2] R_S (Ω)
TU 301	0.9 to 1.1	65	120	1.5<3	4<6
TU 302	1.8 to 2.2	70	60	3<5	3<5
TU 305/5	4.75 to 5.25	80	30	5<8	2<3
TU 305/10	4.5 to 5.5	80	30	5<8	2<3
TU 310/5	9.5 to 10.5	90	15	10<15	1.5<2.5
TU 310/10	9 to 11	90	15	10<15	1.5<2.5
TU 320/5	19 to 21	110	10	15<20	1.5<2.5
TU 320/10	18 to 22	110	10	15<20	1.5<2.5

[1]) $V_F = V_V$;
[2]) $R_S = \Delta V_R / \Delta I_R$; $I_{R1} = 220$ mA; $I_{R2} = 300$ mA; $t = 0.2$ µs; $f = 200$ Hz

P-Germanium tunnel diodes

Tunnel diodes of the series 410 are particularly designed for use as high-speed switching diodes for counting and triggering applications up into the GHz range. Built into coaxial ceramic microwave cases these diodes are available in 2 groups of maximum current tolerance (±5% and ±10%). The type designation code contains the data on maximum current and tolerance of the maximum current (e.g. TU 410/5: $I_1 = 10 \pm 0.5$ mA).

Type	Order number
TU 410/5	Q 62701-E 34
TU 410/10	Q 62701-E 35



Weight approx. 0.006 g

Dimensions in mm

Maximum ratings		TU 410	
Maximum current ($T_{case} \leqq 80$ °C)	$I_{FM} = I_{RM}$	25	mA
Storage temperature	T_S	−55 to +100	°C

Characteristics ($T_{case} = 25$ °C)			
Valley voltage	V_v	350	mV
Peak-valley current ratio	I_p / I_v	9 (>6)	–
Case capacitance	C_{case}	0.4	pf
Series inductance	L_S	0.2	nH
Negative resistance[2]	$R_N - R_S$	15	Ω

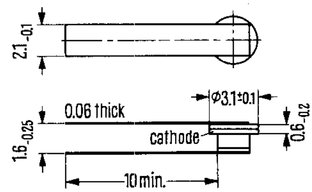
Type	Peak current I_p (mA)	Peak voltage V_p (mV)	Diode capacitance ($V_F = V_v$) C_D (pf)	Series resistance[1] R_S (Ω)
TU 410/5	10 (9.5 to 10.5)	100	3<5	3<5
TU 410/10	10 (9 to 11)	100	3<5	3<5

[1] $R_S = \Delta V_R / \Delta I_R$; $I_{R1} = 220$ mA; $I_{R2} = 300$ mA; $t = 0.2$ µs; $f = 200$ Hz
[2] At point of inflection of the $I_F = V_F$ characteristic; $R_N \geqq 0$

Germanium backward diode

TU 300 is a germanium backward diode with good RF characteristics and a particularly steep forward characteristic. TU 300 is used as rectifier, detector or mixer. (TU 300 was designed to replace TU 1 B).

Type	Order number
TU 300	Q 62701-E 36



Weight approx. 1 g Dimensions in mm

Maximum ratings		TU 300	
Maximum reverse voltage	V_{RM}	approx. 0.5	V
Peak current	I_{RM}	1	mA
Peak current	I_{FM}	5	mA
Storage temperature	T_S	−55 to +100	°C

Characteristics (T_{amb} = 25 °C)

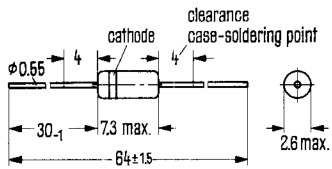
Reverse voltage (I_R = 300 µA)	V_R	420 to 520	mV
Forward voltage (I_F = 3 mA)	V_F	80 to 120	mV
Total capacitance (C_{case} + C_j)	C_D	0.8 (<1.5)	pf
Case capacitance	C_{case}	0.35	pf
Maximum current	I_p	<300	µA

1 N 3604

Silicon planar diode

The silicon planar diode 1 N 3604 in the glass package 51 A 2 DIN 41880 (DO-7) is designed for use as high-speed switching diode as well as for general switching applications. The planar technique results in short reverse recovery time, small capacitance and low scatter of data and, in addition, increased reliability. The cathode is marked by a colour ring.

Type	**Order number**
1 N 3604	Q 62702-A 104-F 100



Weight approx. 0.2 g   Dimensions in mm

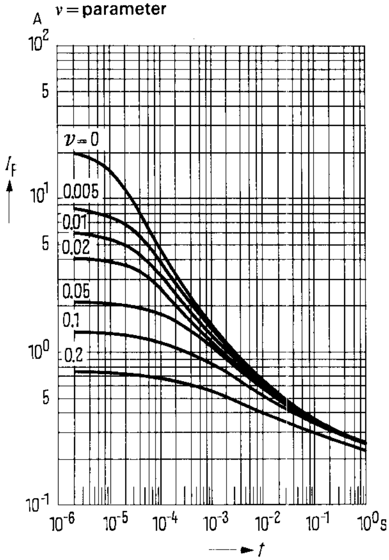
Maximum ratings (T_{amb} = 25 °C)		**1 N 3604**	
Reverse voltage	V_R	50	V
Rectified current (t_{av} < 10 ms)	I_O	115	mA
Forward current	I_F	200	mA
Maximum forward current	i_{FM}	300	mA
Surge current (t < 1 μs)	i_{FS}	2	A
Junction temperature	T_j	200	°C
Ambient temperature	T_{amb}	−65 to +200	°C
Total power dissipation (T_{amb} = 25 °C)	P_{tot}	250	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦ 700	K/W
Static characteristics (T_{amb} = 25 °C)			
Forward voltage (I_F = 100 mA)	V_F	≦ 1 *	V
Reverse current (V_R = 50 V)	I_R	≦ 0.1 *	μA
Reverse current (V_R = 50 V; T_{amb} = 150 °C)	I_R	≦ 100	μA

* AQL = 0.65%

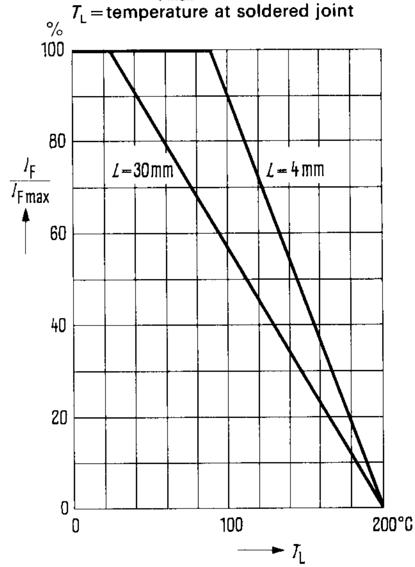
Dynamic characteristics (T_{amb} = 25 °C)

		1 N 3604	
Capacitance (V_R = 0 V)	C_o	≦2	pf
Reverse recovery time ($I_F = I_R$ = 10 mA; recovery to 1 mA)	t_{rr}	≦4	ns
Reverse recovery time (I_F = 10 mA; V_R = 6 V; R_L = 100 Ω)	t_{rr}	≦2	ns

Permissible pulse load $I_F = f(t)$
v = parameter



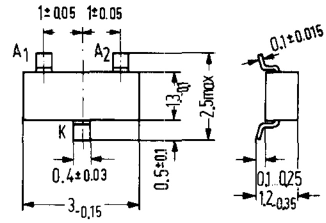
Max. permissible forward current $\frac{I_F}{I_{Fmax}} = f(T_L)$
T_L = temperature at soldered joint



Silicon planar twin-diode

The silicon planar twin-diode BAV 74 in the minature plastic case 23 A 3 DIN 41869 (SOT-23) is suitable for use as high-speed switching diode in film circuits. The diode is coded JA. The stated data apply for any diode system, unless otherwise specified.

Type	Code	Order number
BAV 74	JA	Q 62702-A 498



Weight approx. 0.02 g Dimensions in mm

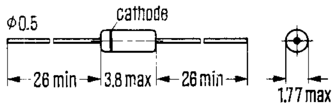
Maximum ratings (T_{amb} = 25 °C)		**BAV 74**	
Reverse voltage	V_R	50	V
Rectified current (t_{av} < 10 ms)	I_O [1]	100	mA
Forward current	I_F [1]	150	mA
Maximum forward current (t < 15 ms)	i_{FM} [1]	200	mA
Surge current (t < 1 µs)	i_{FS}	1	A
Junction temperature	T_j	150	°C
Ambient temperature	T_{amb}	−55 to +125	°C
Total power dissipation	P_{tot} [2]	150	mW
Thermal resistance when mounted on			
Glass substrate (7 × 7 × 1 mm)	R_{thJamb} [2]	≦700	K/W
Ceramic substrate (30 × 12 × 1 mm)	R_{thJamb} [2]	≦450	K/W
Glass-fiber substr. (30 × 12 × 1.5 mm)	R_{thJamb} [2]	≦450	K/W
Static characteristics (T_{amb} = 25 °C)			
Forward voltage (I_F = 100 mA)	V_F	≦1	V
Reverse current (V_R = 50 V)	I_R	≦0.1	µA
Reverse current (V_R = 50 V; T_{amb} = 125 °C)	I_R	≦100	µA
Breakdown voltage (I_R = 5 µA)	V_{BR}	≧51	V
Dynamic characteristics (T_{amb} = 25 °C)			
Capacitance (V_R = 0 V)	C_O	≦2	pf
Reverse recovery time (I_F = I_R = 10 mA; recovery to 1 mA)	t_{rr}	≦4	ns
Reverse recovery time (I_F = 10 mA; V_R = 6 V; R_L = 100 Ω)	t_{rr}	≦2	ns

[1]) Sum of both diode currents
[2]) P_{tot} is the total power dissipation of the component resulting in the junction temperature T_j. R_{th} applies independent of the distribution of the electrical load over the two diode systems.

Silicon planar logical diode

BAW 75 is a silicon planar diode in "double heat sink" technique in a case 56 A 2 DIN 41 883 (DO-35). The cathode is marked by a green colour ring. BAW 75 is particularly suitable for use as high-speed switch in computers as well as for general switching applications. Its low capacitance and limited spread in electrical data offer a high degree of reliability. BAW 75 is the follower type to BAY 60 and is similar to the diode 1 N 4154.

Type	Order number
BAW 75	Q62702-A396



Weight approx. 0.18 g Dimensions in mm

Type BAW 75 may be marked either by clear coding or by colour rings (red, blue, violet, green)

Maximum ratings (T_{amb} = 25 °C)

		BAW 75	
Reverse voltage	V_R	35	V
Rectified current (t_{av} < 50 ms)	I_O	150	mA
Forward current	I_F	300	mA
Maximum forward current	i_{FM}	500	mA
Impulse current (t < 1 µs)	i_{FS}	2	A
Junction temperature	T_j	200	°C
Ambient temperature	T_{amb}	−65 to +200	°C
Total power dissipation (T_{amb} = 25 °C)	P_{tot}	500	mW

Static characteristics (T_{amb} = 25 °C)

Forward voltage (I_F = 30 mA)	V_F	≦1.0*	V
Reverse current (V_R = 35 V)	I_R	≦5	µA
Reverse current (V_R = 25 V)	I_R	≦0.1*	µA
Reverse current (V_R = 25 V; T_{amb} = 150 °C)	I_R	≦100	µA

Dynamic characteristics (T_{amb} = 25 °C)

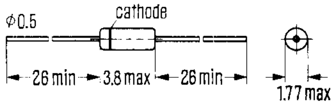
Capacitance (V_R = 0 V)	C_O	≦4	pf
Reverse recovery time (I_F = I_R = 10 mA; recovery to 1 mA)	t_{rr}	≦4	ns
Reverse recovery time (I_F = 10 mA; V_R = 6 V; R_L = 100 Ω)	t_{rr}	≦2	ns

* AQL = 0.65%

Silicon planar logical diode

BAW 76 is a silicon planar diode in "double heat sink" technique in a case 56 A 2 DIN 41883 (DO-35). The cathode is marked by a blue colour ring. BAW 76 is particularly suitable for use as high-speed switch in computers as well as for general switching applications. Its low capacitance and limited spread in electrical data offer a high degree of reliability. BAW 76 is the follower type to BAY 63 and is similar to the diode 1 N 4151.

Type	Order number
BAW 76	Q62702-A397



Weight approx. 0.18 g Dimensions in mm

Type BAW 76 may be marked either by clear coding or by colour rings (red, blue, violet, blue)

Maximum ratings (T_{amb} = 25 °C)		**BAW 76**	
Reverse voltage	V_R	75	V
Rectified current (t_{av} < 50 ms)	I_O	150	mA
Forward current	I_F	300	mA
Maximum current	i_{FM}	500	mA
Surge current (t < 1 µs)	i_{FS}	2	A
Junction temperature	T_j	200	°C
Ambient temperature	T_{amb}	−65 to +200	°C
Total power dissipation (T_{amb} = 25 °C)	P_{tot}	500	mW

Static characteristics (T_{amb} = 25 °C)			
Forward voltage (I_F = 100 mA)	V_F	≦1.0*	V
Reverse current (V_R = 75 V)	I_R	≦5	µA
Reverse current (V_R = 50 V)	I_R	≦0.1*	µA
Reverse current (V_R = 50 V; T_{amb} = 150 °C)	I_R	≦100	µA

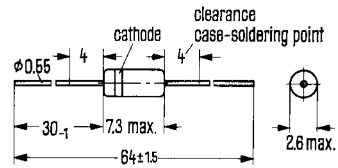
Dynamic characteristics (T_{amb} = 25 °C)			
Capacitance (V_R = 0 V)	C_O	≦2	pf
Reverse recovery time (I_F = I_R = 10 mA; recovery to 1 mA)	t_{rr}	≦4	ns
Reverse recovery time (I_F = 10 mA; V_R = 6 V; R_L = 100 Ω)	t_{rr}	≦2	ns

* AQL = 0.65%

Silicon planar switching diodes

Silicon planar diodes BAY 41, BAY 42 and BAY 43 are suitable for high-speed, medium-current switching applications. They are supplied in glass-cases 51 A 2 DIN 41880 (DO-7). The cathode is identified by a colour ring.

Type	Order number
BAY 41	Q 60201-Y 41
BAY 42	Q 60201-Y 42
BAY 43	Q 60201-Y 43



Weight approx. 0.2 g   Dimensions in mm

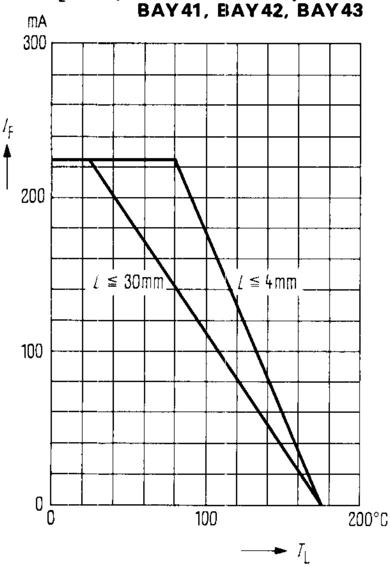
Maximum ratings (T_{amb} = 25 °C)		BAY 41	BAY 42	BAY 43	
Reverse voltage	V_R	40	60	80	V
Maximum reverse voltage	v_{RM}	40	60	80	V
Forward current	I_F		225		mA
Maximum forward current	i_{FM}		600		mA
Maximum forward current (T_{amb} = 60 °C)	i_{FM}		300		mA
Surge current	i_{FS}		1000		mA
Surge current (T_{amb} = 60 C)	i_{FS}		500		mA
Junction temperature	T_j		175		°C
Ambient temperature	T_{amb}		−65 to +175		°C
Power dissipation (T_{amb} = 25 °C; L = 30 mm)	P_{tot}		250		mW
Thermal resistance (L = 4 mm) ²)	R_{thJamb}		<380		K/W

Static characteristics (T_{amb} = 25 °C)			
Forward voltage (I_F = 200 mA)	V_F	0.93 (<1)*	V
Forward voltage (I_F = 200 mA; T_{amb} = 100 °C	V_F	0.85	V
Reverse current at $V_R/2$	I_R	<50	nA
Reverse current at V_R	I_R	0.1 (<5)	µA
Reverse current at V_R (T_{amb} = 100 °C)	I_R	6 (<30)	µA

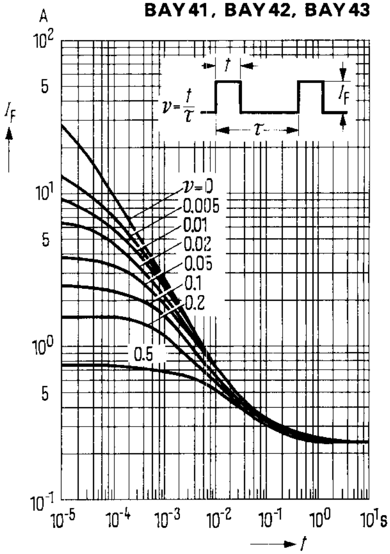
Dynamic characteristics			
Capacitance (V_R = 0 V)	C_0	3 (<5)	pf
Reverse recovery time ¹)	t_{rr}	10 (<15)	ns

¹) Measured by switching from I_F = 200 mA to I_R = 200 mA until recovery to 10% of I_R is attained
²) Clearance case soldering point 4 mm
* AQL = 0.65%

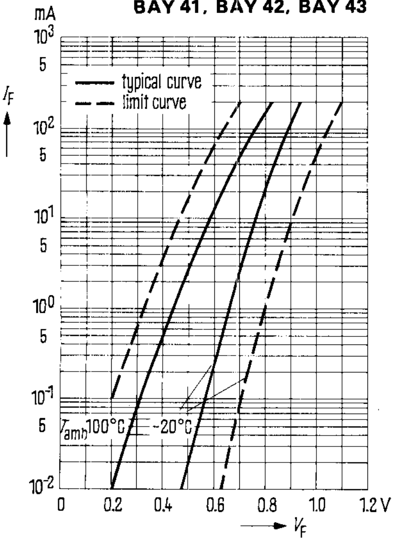
Maximum permissible forward current $I_F = f(T_L)$
L = clearance case-soldered joint
T_L = temperature at soldered joint
BAY 41, BAY 42, BAY 43



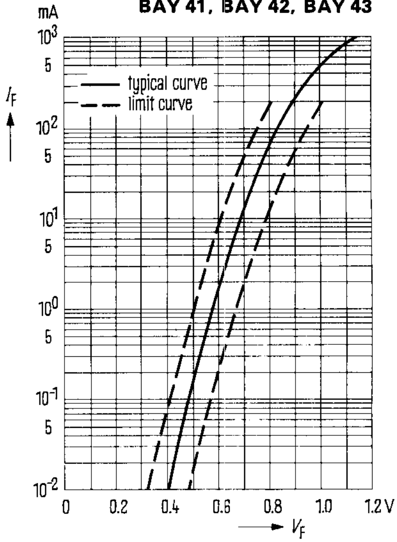
Permissible pulse load $I_F = f(t)$
v = parameter; $T_{amb} = 25$ °C
BAY 41, BAY 42, BAY 43



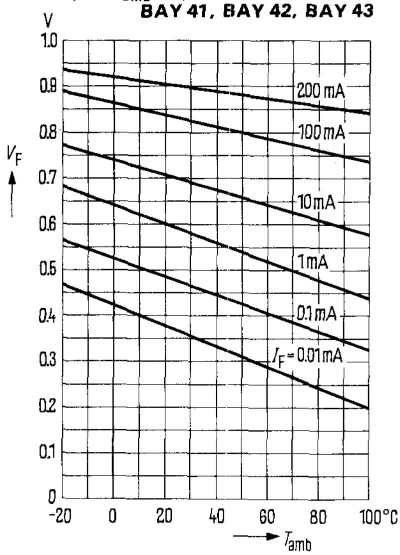
Forward characteristics
$I_F = f(V_F)$; T_{amb} = parameter
BAY 41, BAY 42, BAY 43



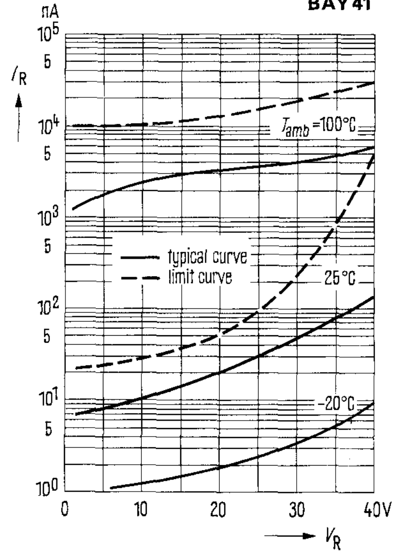
Forward characteristics
$I_F = f(V_F)$; $T_{amb} = 25$ °C
BAY 41, BAY 42, BAY 43



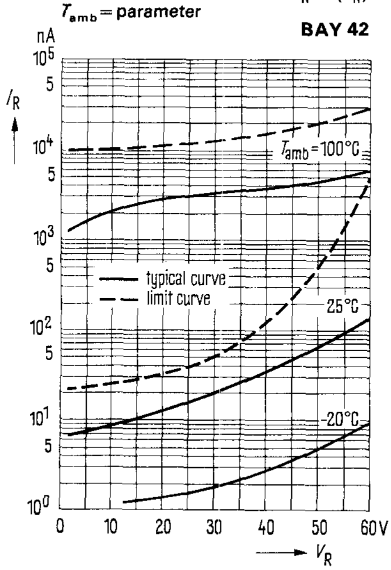
Forward characteristics
$V_F = f(T_{amb})$; I_F = parameter
BAY 41, BAY 42, BAY 43



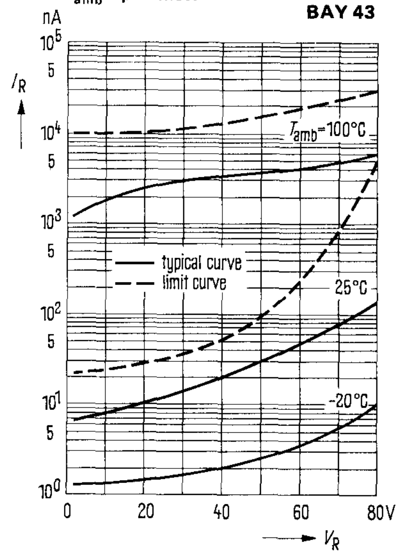
Reverse characteristics $I_R = f(V_R)$
T_{amb} = parameter
BAY 41



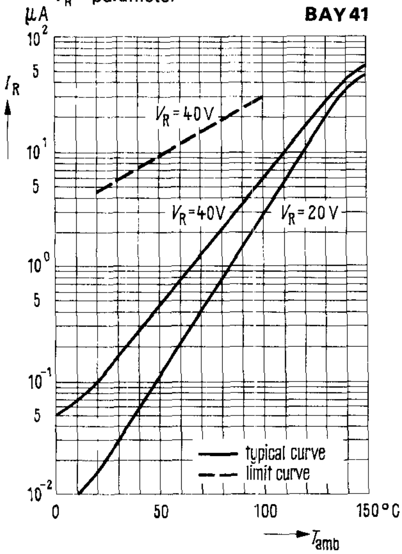
Reverse characteristics $I_R = f(V_R)$
T_{amb} = parameter
BAY 42



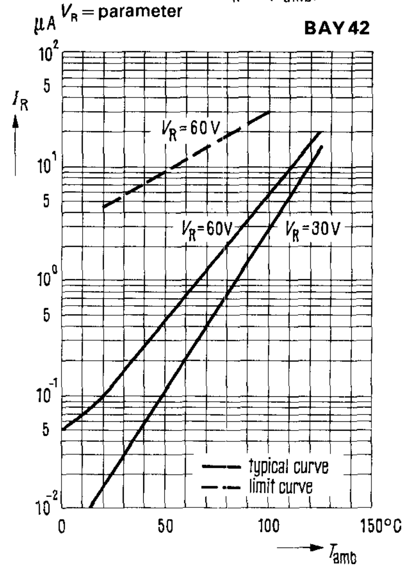
Reverse characteristics $I_R = f(V_R)$
T_{amb} = parameter
BAY 43



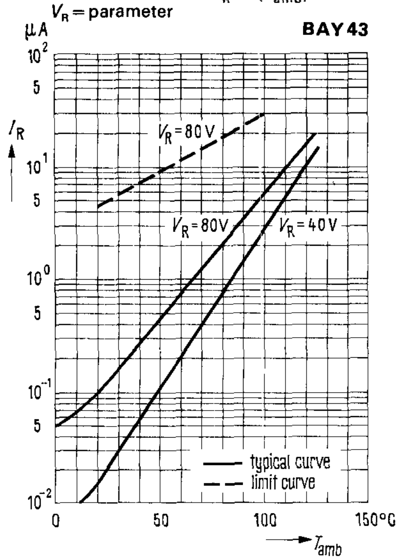
Reverse current $I_R = f(T_{amb})$
V_R = parameter



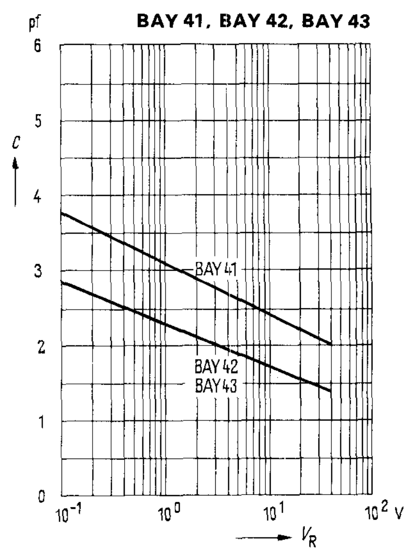
Reverse current $I_R = f(T_{amb})$
V_R = parameter



Reverse current $I_R = f(T_{amb})$
V_R = parameter



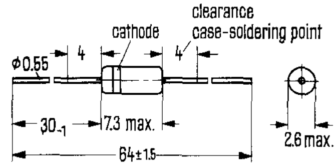
Junction capacitance $C = f(V_R)$



General-purpose silicon diodes

Silicon diodes BAY 44, BAY 45 and BAY 46 are suitable for universal application in equipment with high operating temperatures and where space is at a premium. They are provided with a glass-case 51 A 2 DIN 41880 (DO-7). The cathode end is marked by a colour ring.

Type	Order number
BAY 44	Q 60201-Y 44
BAY 45	Q 60201-Y 45
BAY 46	Q 60201-Y 45



Weight approx. 0.2 g   Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)		BAY 44	BAY 45	BAY 46	
Reverse voltage	V_R	50	150	300	V
Maximum reverse voltage	V_{RM}	50	150	300	V
Forward current (L = 4 mm; see diagram)	I_F		250		mA
Maximum forward current (t = 10 µs see diagram)	i_{FM}		30		A
Junction temperature	T_j		150		°C
Ambient temperature	T_{amb}		−55 to +125		°C
Total power dissipation (T_{amb} = 25 °C; L = 4 mm)	P_{tot}		250		mW
Thermal resistance (L = 4 mm)[2]	R_{thJamb}		<380		K/W

Static characteristics

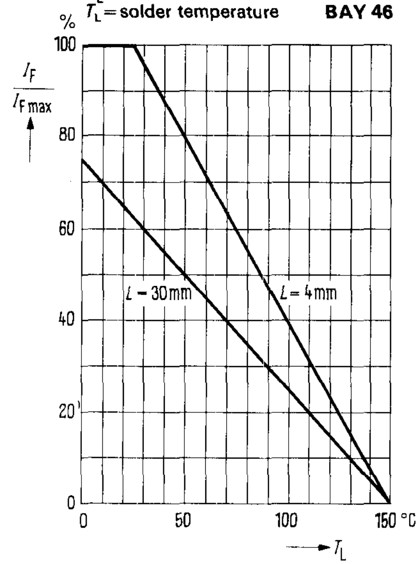
Forward voltage (I_F = 100 mA; T_{amb} = 25 °C)	V_F	0.97 (<1.1)*	V
Forward voltage (I_F = 100 mA; T_{amb} = 100 °C)	V_F	0.9	V
Reverse current ($V_R = V_{RM}$; T_{amb} = 25 °C)	I_R	0.02 (<0.2)*	µA
Reverse current ($V_R = V_{RM}$; T_{amb} = 100 °C)	I_R	0.4 (<10)	µA

Dynamic characteristics

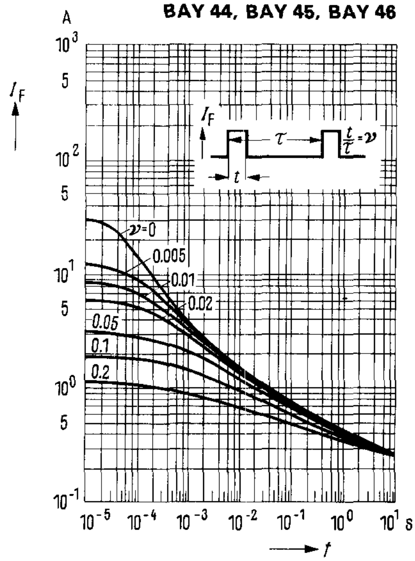
Capacitance (V_R = 0 V; f = 1 MHz)	C_0	7	pf
Capacitance (V_R = 5 V; f = 1 MHz)	C_s	2.5	pf
Reverse recovery time when switching from I_F = 5 mA to I_R = 2 mA[1])	t_{rr}	4.5	µs
Detector voltage efficiency (V_{eff} = 5 V; f = 1 MHz; R_L = 10 kΩ; C_L = 10 nf)	η_v	65	%

[1]) Measured with Tektronix type S plug-in unit   * AQL = 0.65%
[2]) These value apply to a case-soldering point clearance of 4 mm

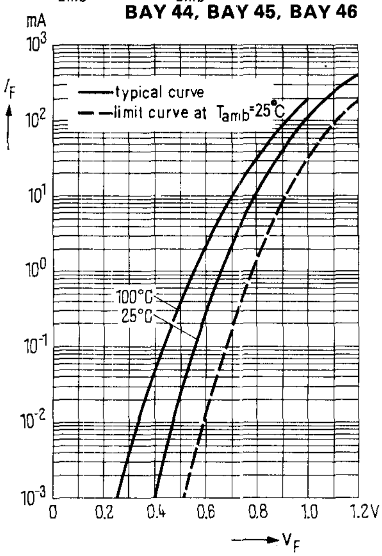
Max. permissible forward current
$I_F/I_{F\,max} = f(T_L)$ **BAY 44**
L_L = distance case to solder: **BAY 45**
T_L = solder temperature **BAY 46**



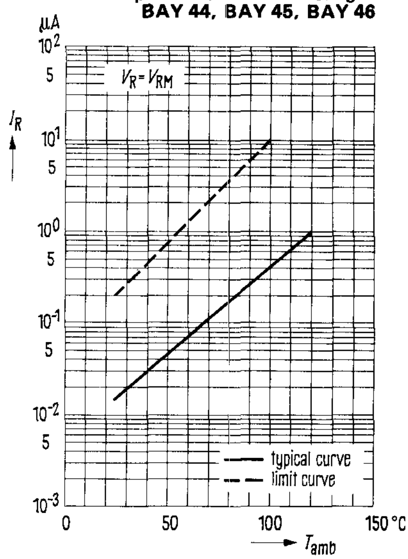
Permissible pulse load $I_F = f(t)$
ν = parameter; T_{amb} = 25 °C
BAY 44, BAY 45, BAY 46



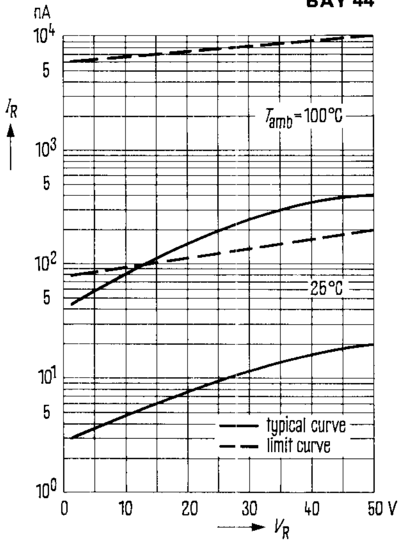
Forward characteristic $I_F = f(V_F)$
T_{amb} = 25 °C; T_{amb} = 100 °C
BAY 44, BAY 45, BAY 46



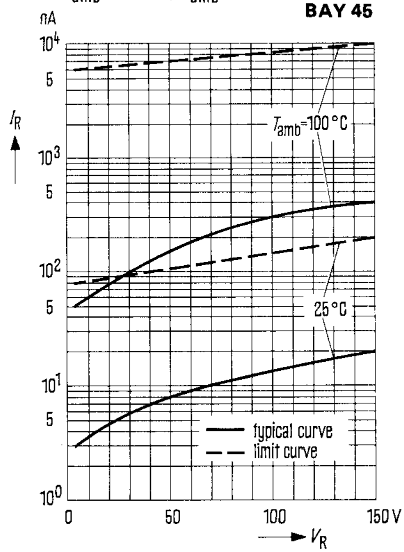
Reverse current $I_R = f(T_{amb})$
at max. permissible reverse voltage
BAY 44, BAY 45, BAY 46



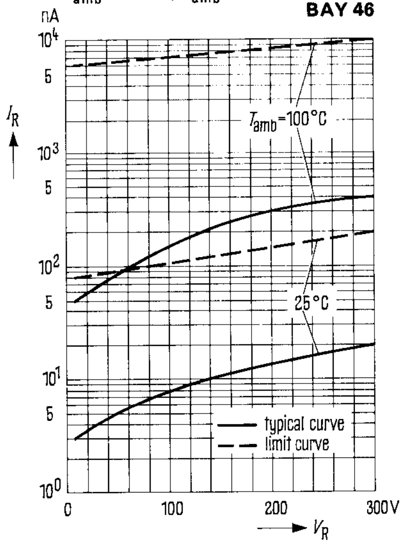
Reverse characteristics $I_R = f(V_R)$
$T_{amb} = 25\ °C$; $T_{amb} = 100\ °C$
BAY 44



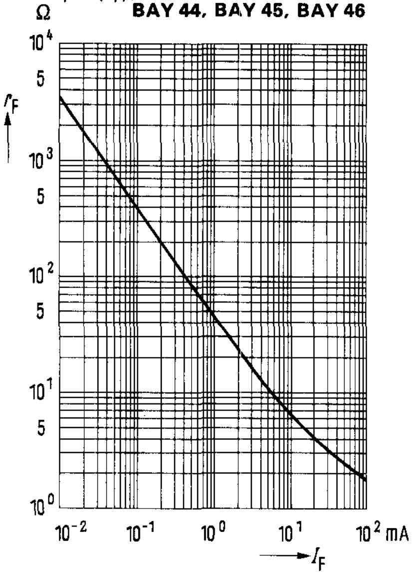
Reverse characteristics $I_R = f(V_R)$
$T_{amb} = 25\ °C$; $T_{amb} = 100\ °C$
BAY 45



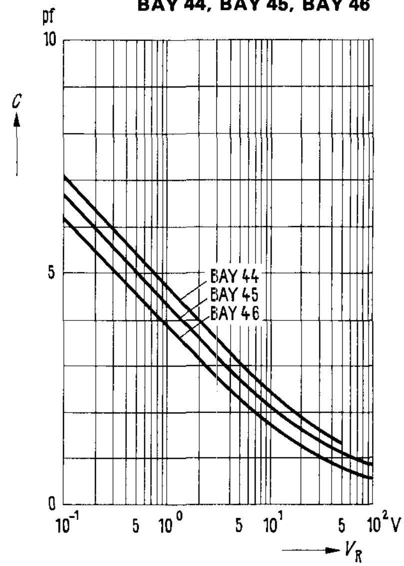
Reverse characteristics $I_R = f(V_R)$
$T_{amb} = 25\ °C$; $T_{amb} = 100\ °C$
BAY 46



Dynamic forward resistance
$r_F = f(I_F)$; at $f = 1$ MHz
BAY 44, BAY 45, BAY 46



Junction capacitance as a function of reverse voltage
$C = f(V_R)$
BAY 44, BAY 45, BAY 46

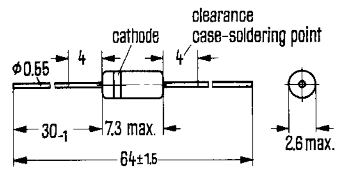


Silicon planar logic diodes

Not for new development

Silicon planar diodes BAY 60 and BAY 63 are designed for use as high-speed switches in computers, as well as for general switching applications. Small reverse recovery times, low capacitance and limited spread in the characteristics, coupled with improved reliability are achieved through use of planar techniques. The diodes are housed in a glass-case 51 A 2 DIN 41880 (DO-7) with axial leads; the cathode side is marked with a white colour ring.

Type	Order number
BAY 60	Q 60201-Y 60
BAY 63	Q 60201-Y 63



Weight approx. 0.2 g   Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)		BAY 60[1]	BAY 63[2]	
Reverse voltage	V_R	25	50	V
Rectified current (t_{av} < 10 ms)	I_O	75	115	mA
Forward current	I_F	115	200	mA
Maximum forward current	i_{FM}	225	300	mA
Surge current (t < 1 µs)	i_{FS}	20	20	A
Junction temperature	T_j	200	200	°C
Ambient temperature	T_{amb}	−65 to +200	−65 to +200	°C
Total power dissipation (T_{amb} = 25 °C)	P_{tot}	250	250	mW
Thermal resistance	R_{thJamb}	≦700	≦700	K/W

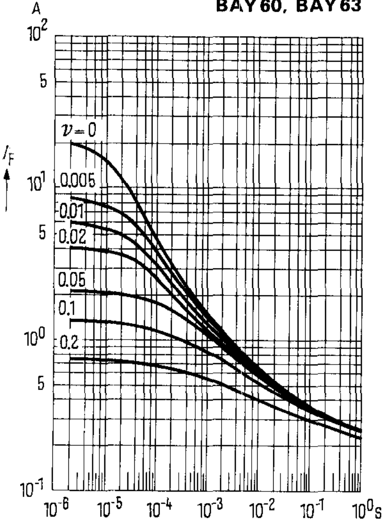
[1]) Replacement for BAY 60 = BAW 75
[2]) Replacement for BAY 63 = BAW 76

Not for new development

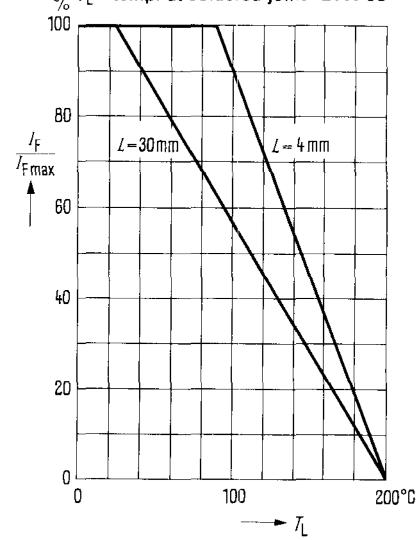
Static characteristics (T_{amb} = 25 °C)		BAY 60	BAY 63	
Breakdown voltage (I_R = 5 µA)	V_R	≧35	–	V
Forward voltage (I_F = 30 mA)	V_F	≦1.0*	–	V
Reverse current (V_R = 25 V)	I_R	≦0.1*	–	µA
Reverse current (V_R = 25 V; T_{amb} = 150 °C)	I_R	≦100	–	µA
Forward voltage (I_F = 100 mA)	V_F	–	≦1*	V
Reverse current (V_R = 50 V)	I_R	–	≦0.1*	µA
Reverse current (V_R = 50 V; T_{amb} = 150 °C)	I_R	–	≦100	µA

Dynamic characteristics (T_{amb} = 25 °C)				
Capacitance (V_R = 0 V)	C_0	≦4	≦2	pf
Reverse recovery time ($I_F = I_R$ = 10 mA; recovery to 1 mA)	t_{rr}	≦4	≦4	ns
Reverse recovery time (I_F = 10 mA; V_R = 6 V; R_L = 100 Ω)	t_{rr}	≦2	≦2	ns

Permissible pulse load $I_F = f(t)$
v = parameter
BAY 60, BAY 63



Max. permissible forward current $\frac{I_F}{I_{Fmax}} = f(T)$
T_L = temp. at soldered joint
BAY 60
BAY 63

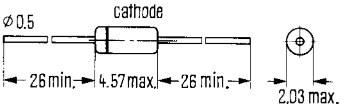


* AQL = 0.65%

Silicon switching diode

BAY 61 is a silicon diode in a glass case 56A2 DIN 41883 (DO-35). It is particularly suitable for use as switching diode, having a short reverse recovery time and low capacitance. The diode is similar to type 1N4148 and identified by colour rings (blue, brown), the cathode end being blue.

Type	Order number
BAY 61	Q62702-A389



Weight approx. 0.18 g   Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)		BAY 61	
Reverse voltage	V_R	75	V
Rectified current	I_O	75	mA
Rectified current (at T_{amb} = 150 °C)	I_O	20	mA
Forward current	I_F	200	mA
Surge current (t < 1 s)	i_{FS}	500	mA
Junction temperature	T_j	200	°C
Ambient temperature	T_{amb}	−65 to +200	°C
Total power dissipation	P_{tot}	400	mW

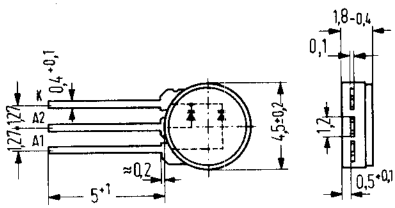
Static characteristics (T_{amb} = 25 °C)			
Breakdown voltage (I_R = 100 µA)	$V_{(BR)}$	≧100	V
Forward voltage (I_F = 10 mA)	V_F	≦1	V
Reverse current (V_R = 20 V)	I_R	≦25	nA
Reverse current (V_R = 75 V)	I_R	≦5	µA
Reverse current (V_R = 20 V; T_{amb} = 150 °C)	I_R	≦50	µA

Dynamic characteristics (T_{amb} = 25 °C)			
Capacitance (V_R = 0 V)	C_O	≦4	pf
Reverse recovery time (I_F = 10 mA; V_F = 6 V; recovery to 1 mA)	t_{rr}	≦4	ns
Reverse recovery time (I_F = I_R = 10 mA; recovery to 1 mA)	t_{rr}	≦8	ns

Twin capacitance diode

The planar silicon twin capacitance diode BBY 29 with its common cathode in a hermetically sealed glass/ceramic flat package is particularly suitable for military and space applications. The advantage of this package lies in its high packing density.

Type	Order number
BBY 29	Q 62702-B 42



Weight approx. 0.3 g   Dimensions in mm

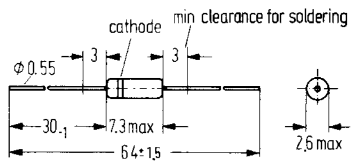
Maximum ratings		BBY 29	
Reverse voltage	V_R	30	V
Forward current ($T_{amb} \leqq 60$ °C)	I_F	50	mA
Operating temperature	T_{amb}	−55 to +125	°C
Storage temperature	T_S	−65 to +150	°C
Soldering temperature (for $t \leqq 3$ s, clearance from case >0.8 mm)	T_L	240	°C

Characteristics (T_{amb} = 25 °C)			
Breakdown voltage (I_R = 10 µA)	$V_{(BR)}$	>32	V
Reverse current (V_R = 30 V)	I_R	<50	nA
Capacitance (V_R = 3 V; f = 1 MHz)	C_D	38 to 40	pf
Capacitance ratio	C_{D3v}/C_{D30v}	2.4 to 2.75	–
Quality level (C_D = 38 pf; f = 50 MHz)	Q	>120	–
Temperature coefficient (V_R = 3 V)	TK_C	0.03	%/K

Silicon planar capacitance diode

BBY 30 is a capacitance diode in a case 51 A2 DIN 41880 (DO-7) for commercial applications.

Type	Order number
BBY 30	Q62702-B44



Weight approx. 0.2 g Dimensions in mm

Maximum ratings		BBY 30	
Reverse voltage	V_R	30	V
Forward current ($T_{amb} \leqq 60\,°C$)	I_F	100	mA
Operating temperature	T_{amb}	−55 to +125	°C
Storage temperature	T_S	−55 to +125	°C
Soldering temperature (for $t \leqq 5$ s, clearance from case > 3.0 mm)	T_L	240	°C

Characteristics ($T_{amb} = 25\,°C$)			
Breakdown voltage ($I_R = 10\,\mu A$)	$V_{(BR)}$	>32	V
Reverse current ($V_R = 30$ V)	I_R	<50	nA
Capacitance			
($V_R = 3$ V; $f = 1$ MHz)	C_D	29 to 31	pf
($V_R = 30$ V; $f = 1$ MHz)	C_D	11	pf
Capacitance ratio	C_{D3V}/C_{D30V}	2.5 to 2.8	–
Quality factor ($C_D = 30$ pf; $f = 50$ MHz)	Q	>200	–
Series resistance ($C_D = 30$ pf; $f = 100$ MHz)	r_S	<0.5	Ω
Temperature coefficient	TK_C	0.03	%/K

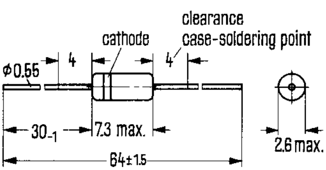
Silicon planar Z-Diode

BZX 55 is a silicon planar Z-diode in a glass-case 51 A2 DIN 41880 (DO-7), for stabilizing and limiting voltages as well as for generating reference voltages at low power requirements. The planar technique ensures a very low reverse current level, low noise and an excellent time stability of the electrical values.

The cathode side of BZX 55 is identified by a colour ring. When used as "Z"-diode the cathode is to have positive voltage. The planar Z-diodes will be supplied in the 5% tolerance-series (C) and 10% tolerance-series (D). Narrower tolerances available upon request.

Type	Order number
BZX 55 C0V8	Q62702-Z569
BZX 55 C5V6	Q62702-Z570
BZX 55 C6V2	Q62702-Z571
BZX 55 C6V8	Q62702-Z572
BZX 55 C7V5	Q62702-Z573
BZX 55 C8V2	Q62702-Z574
BZX 55 C9V1	Q62702-Z575
BZX 55 C10	Q62702-Z682
BZX 55 C11	Q62702-Z683
BZX 55 C12	Q62702-Z684
BZX 55 C13	Q62702-Z835
BZX 55 C15	Q62702-Z686
BZX 55 C16	Q62702-Z840
BZX 55 C18	Q62702-Z688
BZX 55 C20	Q62702-Z689
BZX 55 C22	Q62702-Z690
BZX 55 C24	Q62702-Z841
BZX 55 C27	Q62702-Z847
BZX 55 C30	Q62702-Z848
BZX 55 C33	Q62702-Z849
BZX 55 C36	Q62702-Z850

Type	Order number
BZX 55 D5V6	Q62702-Z576
BZX 55 D6V8	Q62702-Z577
BZX 55 D8V2	Q62702-Z578
BZX 55 D10	Q62702-Z579
BZX 55 D12	Q62702-Z692
BZX 55 D15	Q62702-Z693
BZX 55 D18	Q62702-Z694
BZX 55 D22	Q62702-Z695
BZX 55 D27	Q62702-Z851
BZX 55 D33	Q62702-Z852



Weight approx. 0.2 g Dimensions in mm

Maximum ratings		BZX 55	
Forward current ($t_{av} \leqq 50$ msec)	I_F	200	mA
Perm. peak Z current see diagram	I_{ZN}	$f(V_Z/t)$	A
"Z" current	I_Z	P_{tot}/V	mA
Junction temperature	T_j	175	°C
Ambient temperature	T_{amb}	−65 to +150	°C
Total power dissipation ($T_L = 50$ °C) [1]	P_{tot}	400	mW
Thermal resistance			
Junction and static ambient air	R_{thJamb}	<500	K/W
Thermal resistance			
Junction and wire, 4 mm from case	R_{thJL}	<310	K/W

Characteristics ($T_{amb} = 25$ °C)

Forward voltage ($I_F = 100$ mA)	V_F	0.9 (<1.1)	V*

*) AQL=0.65% [1]) T_L = temperature at soldering point 4 mm away from case

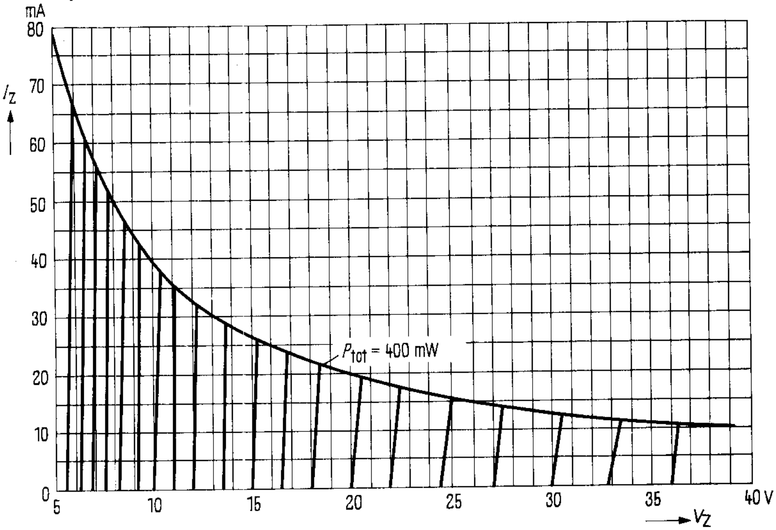
Inventory of Types

Type	Nominal voltage	$I_Z = 5$ mA		$I_Z = 1$ mA	I_R at			I_Z 4)	$I_{Z max}$ 4)
BZX 55	(V)	V_Z-range (V) 1) *)	r_Z dyn (Ω) 2) *)	r_Z dyn 2) Ω	$T_{amb} = 25$ °C (nA)	$T_{amb} = 150$ °C (µA)	V_R (V)	($T_L = 50$ °C) (mA)	$T_L = 100$ °C) 3) (mA)
C0V8	0.78	0.73 to 0.83	<8	–	–	–	–	–	–
C5V6	5.6	5.2 to 6.0	<40	<450	2<100	0.1<2	2	60	36
C6V2	6.2	5.8 to 6.6	<10	<200	2<100	0.1<2	2	55	33
C6V8	6.8	6.4 to 7.2	<8	<150	2<100	0.1<2	3	48	29
C7V5	7.5	7.0 to 7.9	<7	<50	2<100	0.1<2	5	44	27.5
C8V2	8.2	7.7 to 8.7	<7	<50	2<100	0.1<2	6	39	23.5
C9V1	9.1	8.5 to 9.6	<10	<50	2<100	0.1<2	7	36	22
C10	10	9.4 to 10.6	<15	<70	2<100	0.1<2	7.5	33	20
C11	11	10.4 to 11.6	<20	<70	2<100	0.1<2	8.5	30	18
C12	12	11.4 to 12.7	<20	<90	2<100	0.1<2	9.0	27	16
C13	13	12.4 to 14.1	<26	<110	2<100	0.1<2	10	24	14.4
C15	15	13.8 to 15.6	<30	<110	2<100	0.1<2	11	22.5	13.5
C16	16	15.3 to 17.1	<40	<170	2<100	0.1<2	12	20	12
C18	18	16.8 to 19.1	<55	<170	2<100	0.1<2	14	18.5	11
C20	20	18.8 to 21.2	<55	<220	2<100	0.1<2	15	17	10
C22	22	20.8 to 23.3	<55	<220	2<100	0.1<2	17	15.5	9.3
C24	24	22.8 to 25.6	<80	<220	2<100	0.1<2	18	14	8.4
C27	27	25.1 to 28.9	<80	<220	2<100	0.1<2	20	12.5	7.5
C30	30	28.0 to 32.0	<80	<220	2<100	0.1<2	22	11	6.6
C33	33	31.0 to 35.0	<80	<220	2<100	0.1<2	24	10	6.0
C36	36	34.0 to 38.0	<80	<220	2<100	0.1<2	27	9.5	5.7
D5V6	5.6	5.0 to 6.3	<60	<600	2<100	0.1<2	1	53	35.5
D6V8	6.8	6.0 to 7.5	<15	<200	2<100	0.1<2	2	47	28
D8V2	8.2	7.3 to 9.2	<10	<50	2<100	0.1<2	6	38	23
D10	10	8.8 to 11.0	<15	<70	2<100	0.1<2	7	31	18.5
D12	12	10.7 to 13.4	<30	<90	2<100	0.1<2	8.5	25	15
D15	15	13.0 to 16.5	<55	<170	2<100	0.1<2	11	23	14
D18	18	16.0 to 20.0	<55	<220	2<100	0.1<2	13	18	10.8
D22	22	19.6 to 24.4	<55	<220	2<100	0.1<2	16	15	9
D27	27	24.1 to 30.0	<80	<220	2<100	0.1<2	20	12	7.2
D33	33	29.6 to 36.5	<80	<220	2<100	0.1<2	24	9.5	5.7

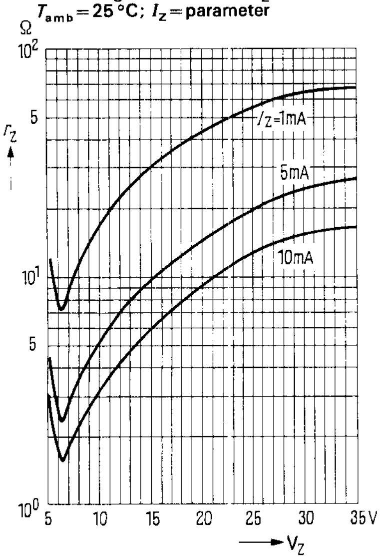
The BZX 55 C0V8 is a diode with very small tolerances to be used in forward direction. The cathode is marked by a colour ring and has to be connected with the minus pole of the voltage supply

1) Measured with current pulses < 100 msec
2) Measured with $I_{eff} = 0.1 \times I_Z$; $f = 1$ kHz
3) T_L = Soldering temperature 4 mm away from case
4) These values apply when the leads are maintained at 50 °C or 100 °C 4 mm away from the case. They may be exceeded when the dissipation is $\leq P_{perm}$ (see diagram)
* AQL = 0.65%

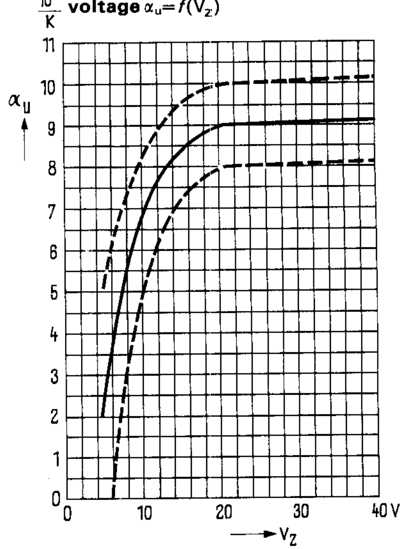
Dynamic characteristics within the Z range $V_Z = f(I_Z)$; ($T_{amb} = 25\ °C$)



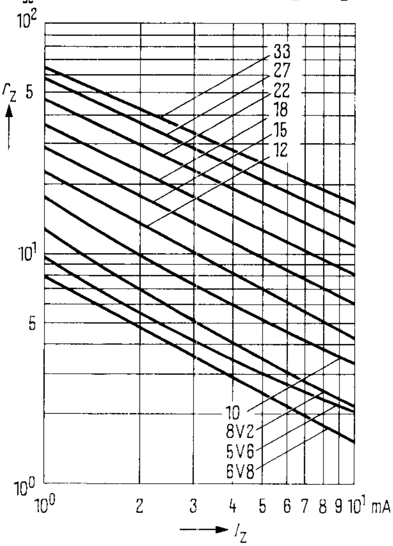
Dynamic Z resistance $r_Z = f(V_Z)$;
measuring current = $0.1 \times I_Z$;
$T_{amb} = 25\ °C$; I_Z = parameter



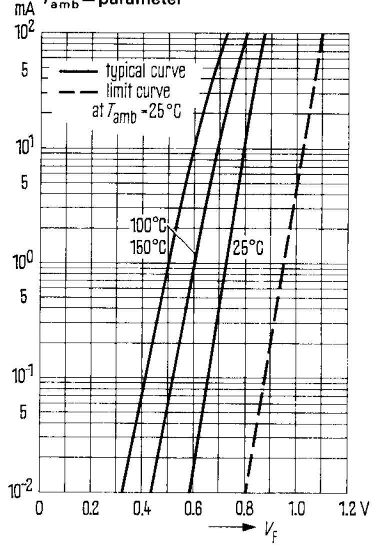
Temperature coefficient of Z voltage $\alpha_u = f(V_Z)$



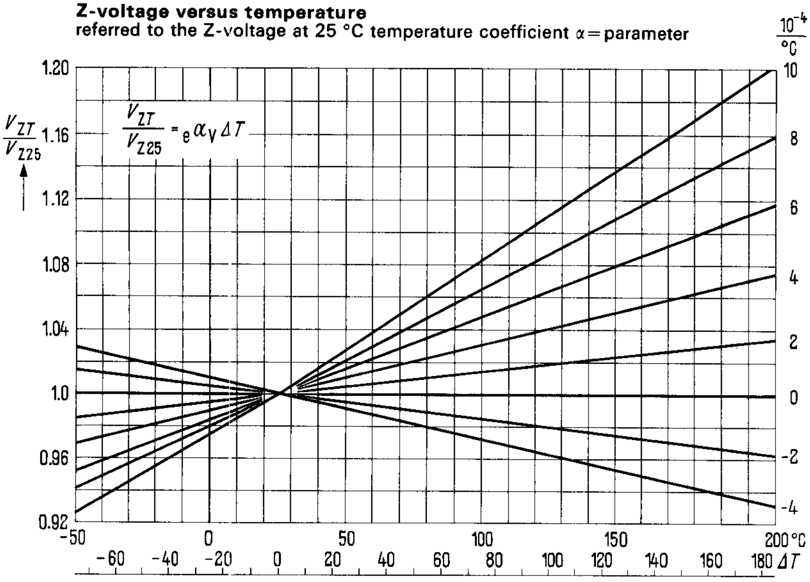
Typical dyn. Z-resistance $r_Z = f(I_Z)$



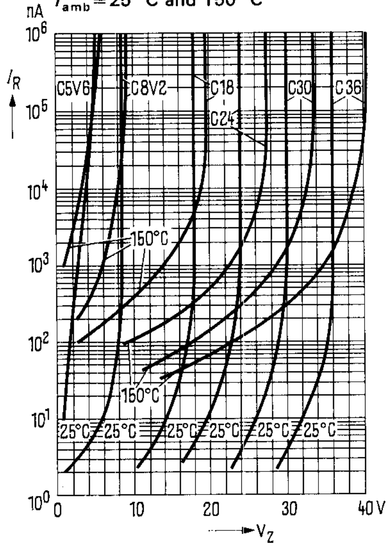
Forward characteristics $I_F = f(V_F)$
T_{amb} = parameter



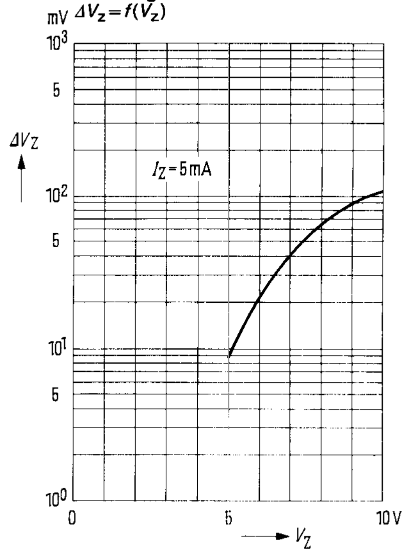
Z-voltage versus temperature
referred to the Z-voltage at 25 °C temperature coefficient α = parameter



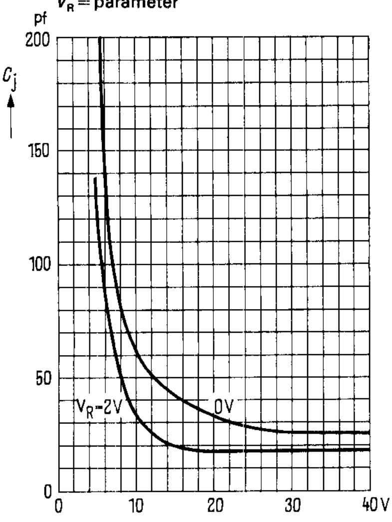
Reverse characteristics $I_R = f(V_Z)$
$T_{amb} = 25$ °C and 150 °C



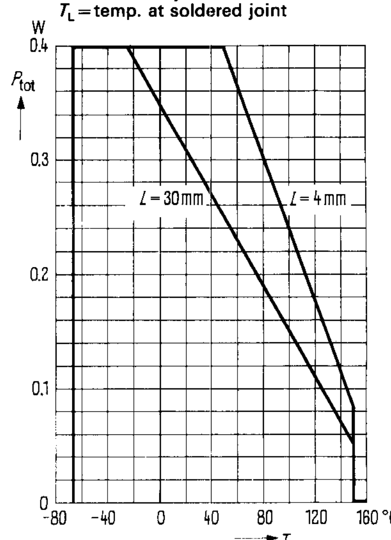
Alteration of the Z-voltage from the switching moment to the reaching of the thermal balance $\Delta V_Z = f(V_Z)$



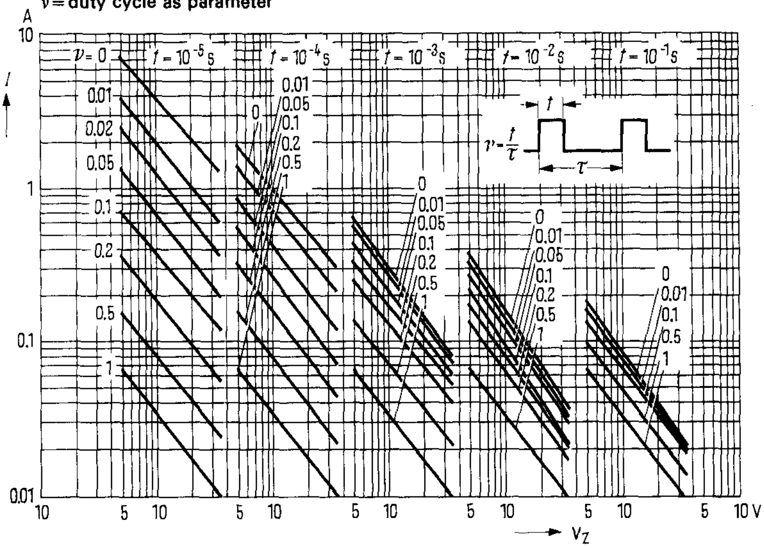
Junction capacitance $C_j = f(V_Z)$
V_R = parameter



Maximum permissible power dissipation $P_{tot} = f(T_L)$;
L = clearance joint-case;
T_L = temp. at soldered joint



Permissible maximum Z current for turn-on period 10^{-5}, 10^{-4}, 10^{-3}, 10^{-2}, 10^{-1} S as a function of Z voltage $I = f(V_Z)$
ν = duty cycle as parameter



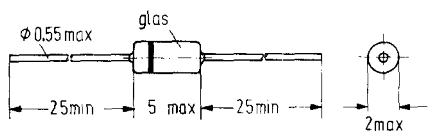
These characteristics apply when the leads are maintained at 50 °C 4 mm away from the case. At higher temperatures linear interpolation should be applied between 50 °C and 150 °C.

Silicon Z diode for 500 mW

BZX 83 is an epitaxial silicon planar Z diode in a glass case 56 A 2 DIN 41883 (DO-35). It is used for the stabilization and limitation of voltages as well as for the generation of reference voltages at low power requirements.

Modern technology ensures a particularly sharp break-off of the reverse characteristic, low noise and an excellent time stability of the electrical data. The cathode end is marked by a colour ring.

Type	Order number
BZX 83 C0V8	Q62702-Z1352
BZX 83 C2V4	Q62702-Z1353
BZX 83 C2V7	Q62702-Z1063
BZX 83 C3V0	Q62702-Z1064
BZX 83 C3V3	Q62702-Z1065
BZX 83 C3V6	Q62702-Z1066
BZX 83 C3V9	Q62702-Z1067
BZX 83 C4V3	Q62702-Z1068
BZX 83 C4V7	Q62702-Z1069
BZX 83 C5V1	Q62702-Z1070
BZX 83 C5V6	Q62702-Z1071
BZX 83 C6V2	Q62702-Z1072
BZX 83 C6V8	Q62702-Z1073
BZX 83 C7V5	Q62702-Z1074
BZX 83 C8V2	Q62702-Z1075
BZX 83 C9V1	Q62702-Z1076
BZX 83 C10	Q62702-Z1077
BZX 83 C11	Q62702-Z1078
BZX 83 C12	Q62702-Z1079
BZX 83 C13	Q62702-Z1080
BZX 83 C15	Q62702-Z1081
BZX 83 C16	Q62702-Z1082
BZX 83 C18	Q62702-Z1083
BZX 83 C20	Q62702-Z1084
BZX 83 C22	Q62702-Z1085
BZX 83 C24	Q62702-Z1086
BZX 83 C27	Q62702-Z1087
BZX 83 C30	Q62702-Z1088
BZX 83 C33	Q62702-Z1089



Weight approx. 0.5 g   Dimensions in mm

Maximum ratings at $T_{amb} = 25\,°C$		**BZX 83**	
Storage temperature	T_S	−55 to +175	°C
Junction temperature	T_j	max. 175	°C
Maximum power dissipation at $T_{amb} = 25\,°C$	P_{tot}	500	mW
Thermal resistance			
Junction to air	R_{thJamb}	$\leqq 300$	K/W

The leads are maintained at 25 °C 4 mm away from the case.

Inventory of types

values apply to $T_{amb} = 25\,°C$

Type	Nominal voltage	Breakdown voltage range	Dyn. resistance		Reverse current	
		$I_Z = 5$ mA	$I_Z = 5$ mA	$I_Z = 1$ mA		at
	V_Z (V) *)	V_Z (V)	r_Z (Ω)	r_Z (Ω)	I_R (μA)	V_R (V)
BZX 83 C0V8	0.78	0.73 to 0.83	<10	–	–	–
BZX 83 C2V4	2.4	2.28 to 2.56	<90	<600	<120	1
BZX 83 C2V7	2.7	2.5 to 2.9	<90	<600	<200	1
BZX 83 C3V0	3	2.8 to 3.2	<90	<600	<60	1
BZX 83 C3V3	3.3	3.1 to 3.5	<90	<600	<30	1
BZX 83 C3V6	3.6	3.4 to 3.8	<90	<600	<20	1
BZX 83 C3V9	3.9	3.7 to 4.1	<90	<600	<10	1
BZX 83 C4V3	4.3	4.0 to 4.6	<85	<600	<5	1
BZX 83 C4V7	4.7	4.4 to 5.0	<80	<600	<2	1
BZX 83 C5V1	5.1	4.8 to 5.4	<60	<550	<1	1
BZX 83 C5V6	5.6	5.2 to 6.0	<40	<450	<1	1
BZX 83 C6V2	6.2	5.8 to 6.6	<10	<200	<1	2
BZX 83 C6V8	6.8	6.4 to 7.2	<8	<150	<1	3
BZX 83 C7V5	7.5	7.0 to 7.9	<7	<50	<1	3.5
BZX 83 C8V2	8.2	7.7 to 8.7	<7	<50	<1	4
BZX 83 C9V1	9.1	8.5 to 9.6	<10	<50	<1	5
BZX 83 C10	10	9.4 to 10.6	<15	<70	<1	6
BZX 83 C11	11	10.4 to 11.6	<20	<70	<1	7
BZX 83 C12	12	11.4 to 12.7	<20	<90	<1	8
BZX 83 C13	13	12.4 to 14.1	<25	<110	<1	9
BZX 83 C15	15	13.8 to 15.6	<30	<110	<1	11
BZX 83 C16	16	15.3 to 17.1	<40	<170	<1	11
BZX 83 C18	18	16.8 to 19.1	<55	<170	<1	12
BZX 83 C20	20	18.8 to 21.2	<55	<220	<1	14
BZX 83 C22	22	20.8 to 23.3	<50	<220	<1	15
BZX 83 C24	24	22.8 to 25.6	<80	<220	<1	16
BZX 83 C27	27	25.1 to 28.9	<80	<250	<1	18
BZX 83 C30	30	28 to 32	<90	<250	<1	20
BZX 83 C33	33	31 to 35	<90	<250	<1	22

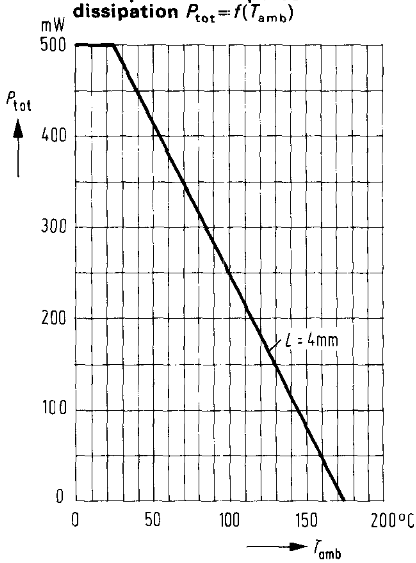
*) Measured by impulses: $t_p < 100$ ms

Inventory of types

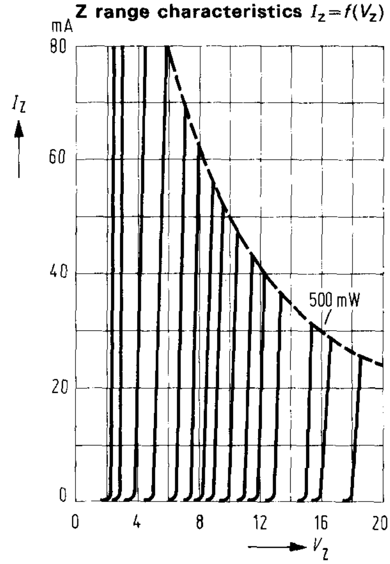
values apply to $T_{amb} = 25\,°C$; $L = 4$ mm

Type	Z current $T_{amb} = 50\,°C$ I_{Zmax} (mA)	TC of V_Z at I_Z TC (10^{-4}/K)	Forward voltage at $I_F = 50$ mA V_F (V)
BZX 83 C0V8	–	–	–
BZX 83 C2V4	<155	−8	<1
BZX 83 C2V7	<135	−7	<1
BZX 83 C3V0	<125	−7	<1
BZX 83 C3V3	<115	−6	<1
BZX 83 C3V6	<106	−7	<1
BZX 83 C3V9	<95	−5.5	<1
BZX 83 C4V3	<85	−4.5	<1
BZX 83 C4V7	<80	1.5	<1
BZX 83 C5V1	<74	2	<1
BZX 83 C5V6	<66	3	<1
BZX 83 C6V2	<60	4	<1
BZX 83 C6V8	<55	4.5	<1
BZX 83 C7V5	<50	5	<1
BZX 83 C8V2	<46	5.5	<1
BZX 83 C9V1	<41	6	<1
BZX 83 C10	<37	6.5	<1
BZX 83 C11	<34	7	<1
BZX 83 C12	<31	7	<1
BZX 83 C13	<28	7.5	<1
BZX 83 C15	<25	7.5	<1
BZX 83 C16	<23	8	<1
BZX 83 C18	<21	8	<1
BZX 83 C20	<18	8	<1
BZX 83 C22	<17	8.5	<1
BZX 83 C24	<15	8.5	<1
BZX 83 C27	<14	8.5	<1
BZX 83 C30	<12	8.5	<1
BZX 83 C33	<11	8.5	<1

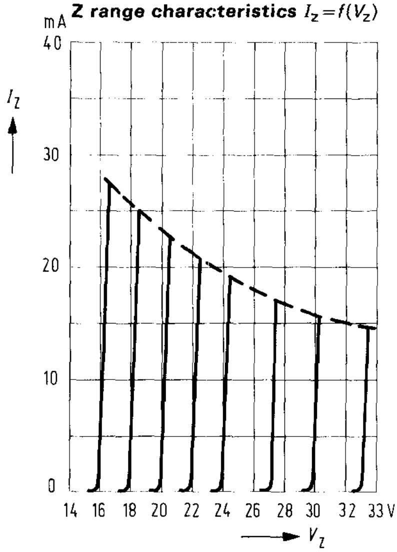
Total permissible power dissipation $P_{tot} = f(T_{amb})$



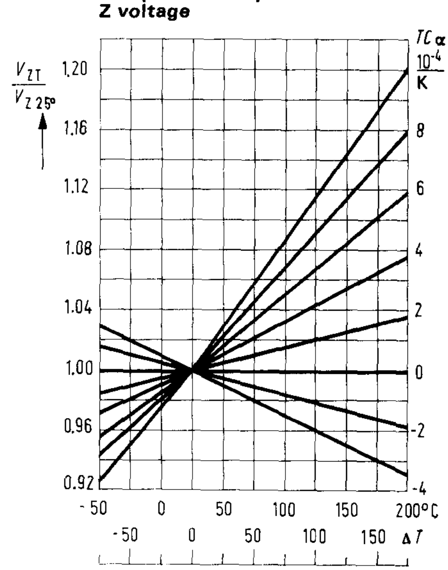
Z range characteristics $I_Z = f(V_Z)$



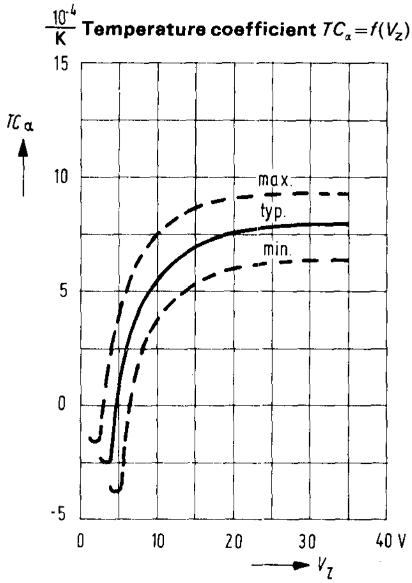
Z range characteristics $I_Z = f(V_Z)$



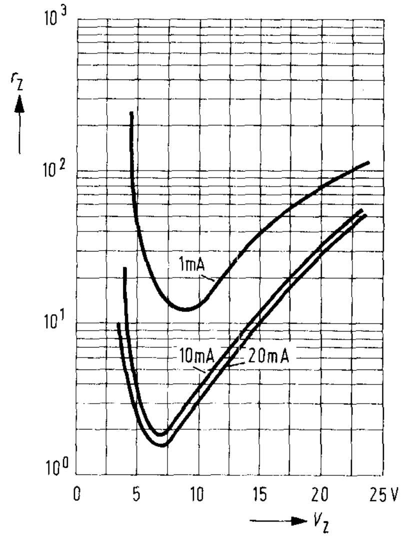
Temperature dependence of Z voltage



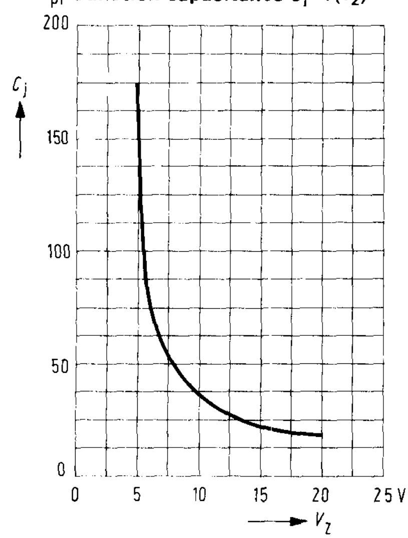
Temperature coefficient $TC_\alpha = f(V_Z)$



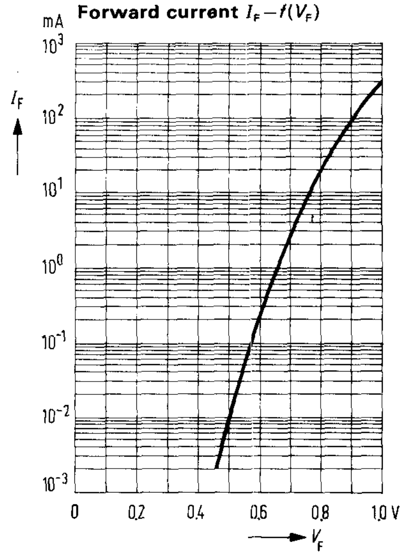
Dynamic resistance $r_Z = f(V_Z)$



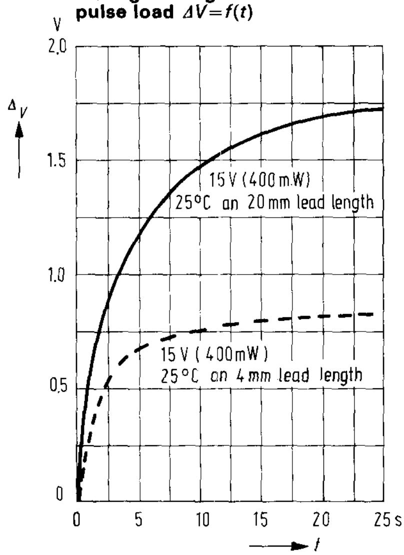
Junction capacitance $C_j = f(V_Z)$



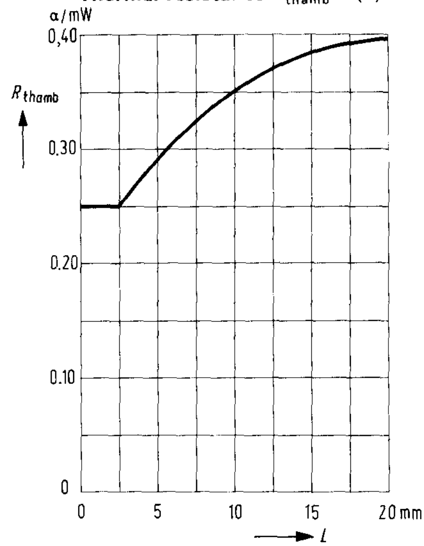
Forward current $I_F - f(V_F)$



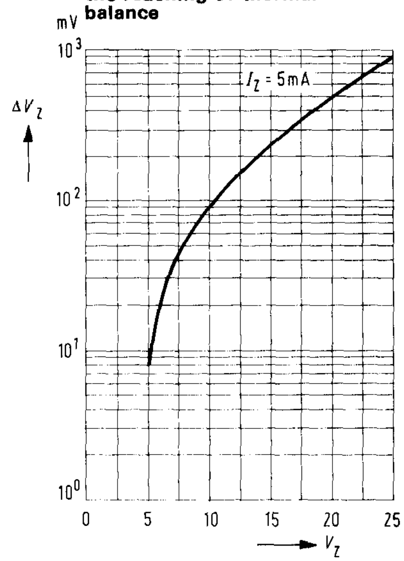
Voltage change in case of pulse load $\Delta V = f(t)$



Thermal resistance $R_{thamb} = f(L)$



Alteration of the Z voltage from the switching moment to the reaching of thermal balance



Silicon Z diode for 500 mW

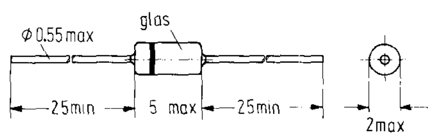
BZX 97 is an epitaxial silicon planar Z diode in a glass case 56 A 2 DIN 41883 (DO-35). It is used for the stabilization and limitation of voltages as well as for the generation of reference voltages at low power requirements.

Modern technology ensures a particularly sharp break-off of the reverse characteristic, low noise and an excellent time stability of electrical data. The cathode end is marked by a colour ring.

These diodes are particularly designed for professional applications.

Type	Order number
BZX 97 C0V8	Q 62702-Z1385
BZX 97 C2V4	Q 62702-Z1273
BZX 97 C2V7	Q 62702-Z1221
BZX 97 C3V0	Q 62702-Z1222
BZX 97 C3V3	Q 62702-Z1223
BZX 97 C3V6	Q 62702-Z1224
BZX 97 C3V9	Q 62702-Z1225
BZX 97 C4V3	Q 62702-Z1226
BZX 97 C4V7	Q 62702-Z1227
BZX 97 C5V1	Q 62702-Z1228
BZX 97 C5V6	Q 62702-Z1229
BZX 97 C6V2	Q 62702-Z1230
BZX 97 C6V8	Q 62702-Z1231
BZX 97 C7V5	Q 62702-Z1232

Type	Order number
BZX 97 C8V2	Q 62702-Z1233
BZX 97 C9V1	Q 62702-Z1234
BZX 97 C10	Q 62702-Z1235
BZX 97 C11	Q 62702-Z1236
BZX 97 C12	Q 62702-Z1237
BZX 97 C13	Q 62702-Z1238
BZX 97 C15	Q 62702-Z1239
BZX 97 C16	Q 62702-Z1240
BZX 97 C18	Q 62702-Z1241
BZX 97 C20	Q 62702-Z1242
BZX 97 C22	Q 62702-Z1243
BZX 97 C24	Q 62702-Z1244
BZX 97 C27	Q 62702-Z1245
BZX 97 C30	Q 62702-Z1246
BZX 97 C33	Q 62702-Z1247



Weight approx. 0.5 g   Dimensions in mm

Maximum ratings at $T_{amb} = 25\,°C$		BZX 97	
Storage temperature	T_S	−65 to +175	°C
Junction temperature	T_j	−65 to +175	°C
Maximum power dissipation	P_{tot} [1])	500	mW
Thermal resistance			
Junction to air	R_{thJamb} [1])	≦300	K/W

[1]) The leads are maintained at 25 °C 4 mm away from the case

Inventory of types

at $T_{amb} = 25\,°C$

Type	Nominal voltage	Breakdown voltage range	Dyn. resistance $f = 1000$ Hz		Reverse current	
		$I_Z = 5$ mA	$I_Z = 5$ mA	$I_Z = 1$ mA		
	V_Z (V)[1]	V_Z (V)	r_Z (Ω)	r_Z (Ω)	I_R (nA)	V_R (V)
BZX 97 C0V8	0.78	0.73 to 0.83	<8	–	–	–
BZX 97 C2V4	2.4	2.28 to 2.56	<85	<600	<10000	1
BZX 97 C2V7	2.7	2.5 to 2.9	<85	<600	<10000	1
BZX 97 C3V0	3.0	2.8 to 3.2	<85	<600	<4000	1
BZX 97 C3V3	3.3	3.1 to 3.5	<85	<600	<2000	1
BZX 97 C3V6	3.6	3.4 to 3.8	<85	<600	<2000	1
BZX 97 C3V9	3.9	3.7 to 4.1	<85	<600	<2000	1
BZX 97 C4V3	4.3	4.0 to 4.6	<75	<600	<1000	1
BZX 97 C4V7	4.7	4.4 to 5.0	<60	<600	100<500	1
BZX 97 C5V1	5.1	4.8 to 5.4	<35	<550	10<100	1
BZX 97 C5V6	5.6	5.2 to 6.0	<25	<450	10<100	1
BZX 97 C6V2	6.2	5.8 to 6.6	<10	<200	10<100	2
BZX 97 C6V8	6.8	6.4 to 7.2	<8	<150	10<100	3
BZX 97 C7V5	7.5	7.0 to 7.9	<7	<50	10<100	5
BZX 97 C8V2	8.2	7.7 to 8.7	<7	<50	10<100	6
BZX 97 C9V1	9.1	8.5 to 9.6	<10	<50	10<100	7
BZX 97 C10	10	9.4 to 10.6	<15	<70	10<100	7.5
BZX 97 C11	11	10.4 to 11.6	<20	<70	10<100	8.5
BZX 97 C12	12	11.4 to 12.7	<20	<90	10<100	9
BZX 97 C13	13	12.4 to 14.1	<26	<110	10<100	10
BZX 97 C15	15	13.8 to 15.6	<30	<110	10<100	11
BZX 97 C16	16	15.3 to 17.1	<40	<170	10<100	12
BZX 97 C18	18	16.8 to 19.1	<50	<170	10<100	14
BZX 97 C20	20	18.8 to 21.2	<55	<220	10<100	15
BZX 97 C22	22	20.8 to 23.3	<55	<220	10<100	17
BZX 97 C24	24	22.8 to 25.6	<80	<220	10<100	18
BZX 97 C27	27	25.1 to 28.9	<80	<220	10<100	20
BZX 97 C30	30	28 to 32	<80	<220	10<100	22
BZX 97 C33	33	31 to 35	<80	<220	10<100	24

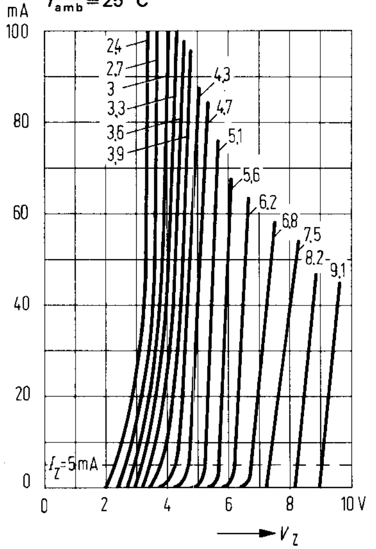
[1]) Measured by impulses: $t_p \leqq 100$ ms

Inventory of types

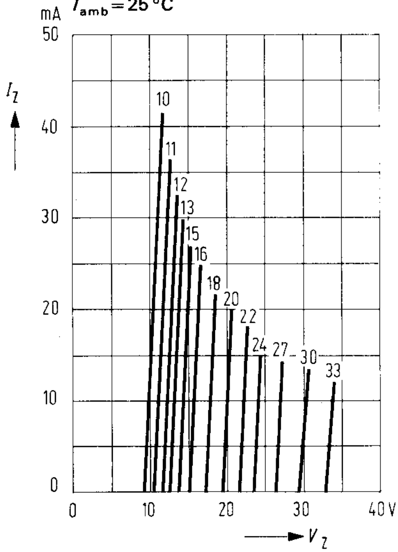
at $T_{amb} = 25\,°C$; $L = 4$ mm

Type	Z current $T_{amb} = 50\,°C$ I_{Zmax} (mA)	TC of V_Z TC ($10^{-4}/°C$) min.	max.	Forward voltage at $I_F = 100$ mA V_F (V)	Reverse current at $T_{amb} = 150\,°C$ I_R (μA)	V_R (V)
BZX 97 C0V8	–	−8	−6	–	–	–
BZX 97 C2V4	<155	−8	−6	<1.0	−100	1
BZX 97 C2V7	<135	−8	−6	<1.0	<50	1
BZX 97 C3V0	<125	−8	−6	<1.0	<40	1
BZX 97 C3V3	<115	−8	−5	<1.0	<40	1
BZX 97 C3V6	<105	−8	−4	<1.0	<40	1
BZX 97 C3V9	<95	−7	−3	<1.0	<40	1
BZX 97 C4V3	<90	−4	−1	<1.0	<20	1
BZX 97 C4V7	<85	−3	+1	<1.0	<10	1
BZX 97 C5V1	<80	−2	+5	<1.0	<2	1
BZX 97 C5V6	<70	−1	+6	<1.0	<2	1
BZX 97 C6V2	<64	±0	+7	<1.0	<2	2
BZX 97 C6V8	<58	+1	+8	<1.0	<2	3
BZX 97 C7V5	<53	+1	+9	<1.0	<2	5
BZX 97 C8V2	<47	+1	+9	<1.0	<2	6
BZX 97 C9V1	<43	+2	+10	<1.0	<2	7
BZX 97 C10	<40	+3	+11	<1.0	<2	7.5
BZX 97 C11	<36	+3	+11	<1.0	<2	8.5
BZX 97 C12	<32	+3	+11	<1.0	<2	9
BZX 97 C13	<29	+3	+11	<1.0	<2	10
BZX 97 C15	<27	+3	+11	<1.0	<2	11
BZX 97 C16	<24	+3	+11	<1.0	<2	12
BZX 97 C18	<21	+3	+11	<1.0	<2	14
BZX 97 C20	<20	+3	+11	<1.0	<2	15
BZX 97 C22	<18	+3	+11	<1.0	<2	17
BZX 97 C24	<16	+3	+12	<1.0	<2	18
BZX 97 C27	<14	+4	+12	<1.0	<2	20
BZX 97 C30	<13	+4	+12	<1.0	<2	22
BZX 97 C33	<12	+4	+12	<1.0	<2	24

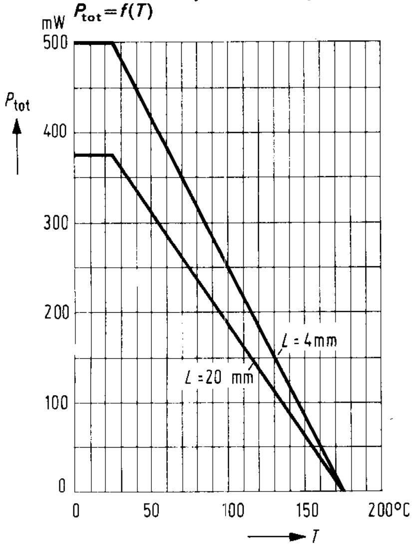
Characteristics within the Z-range $I_Z = f(V_Z)$
$T_{amb} = 25\ °C$



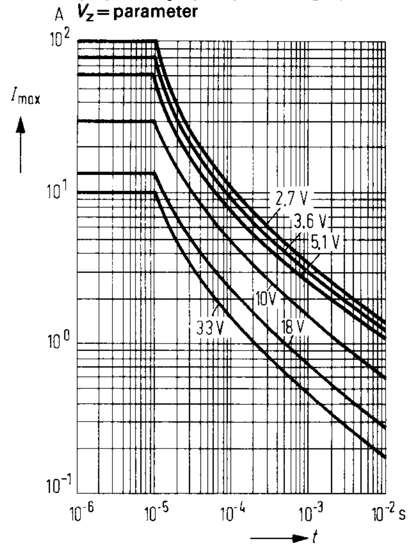
Characteristics within the Z-range $I_Z = f(V_Z)$
$T_{amb} = 25\ °C$

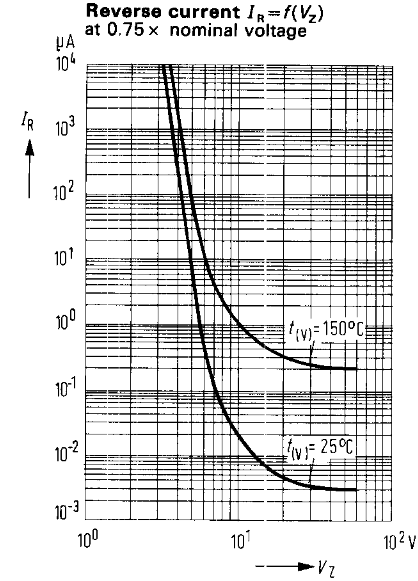


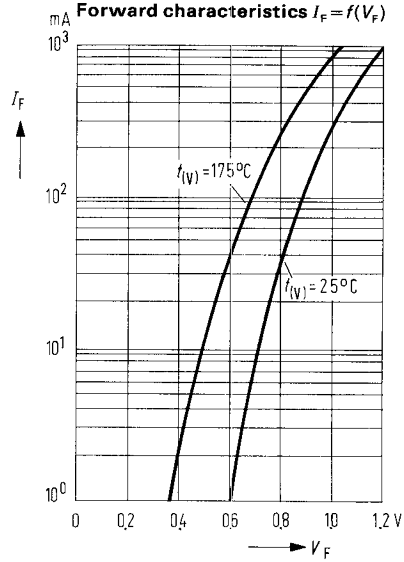
Permissible power dissipation
$P_{tot} = f(T)$

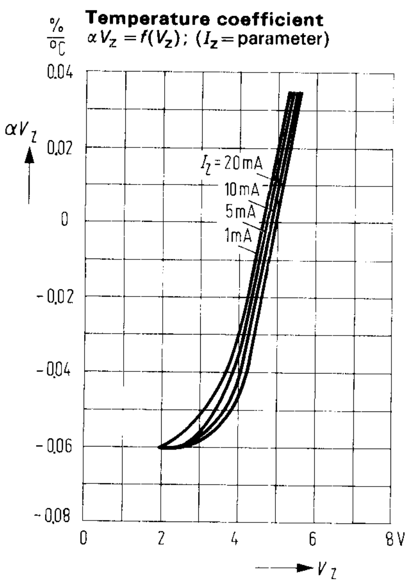


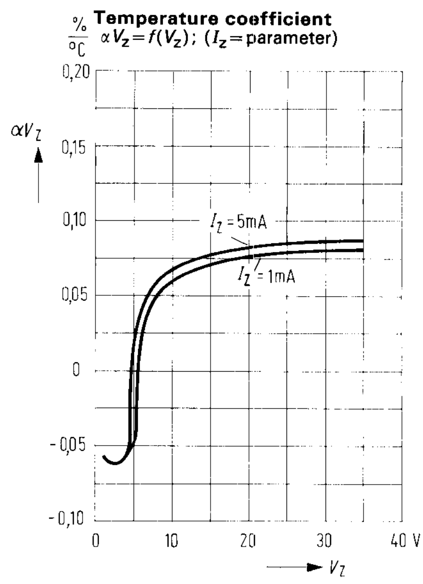
Permissible pulse load $I_{max} = f(t)$
(depending upon pulse length)
V_Z = parameter



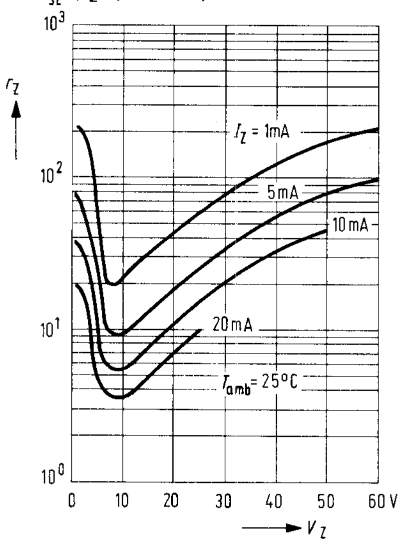

Reverse current $I_R = f(V_Z)$
at 0.75 × nominal voltage
µA
I_R
10^4
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
$t_{(V)}$ = 150°C
$t_{(V)}$ = 25°C
10^0
10^1
10^2 V
V_Z


Forward characteristics $I_F = f(V_F)$
mA
I_F
10^3
10^2
10^1
10^0
$t_{(V)}$ = 175°C
$t_{(V)}$ = 25°C
0
0.2
0.4
0.6
0.8
1.0
1.2 V
V_F

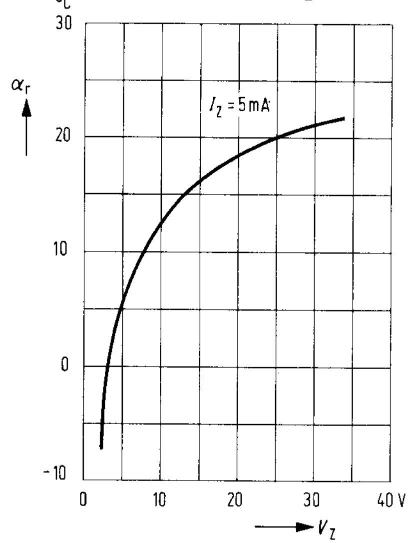

Temperature coefficient
$\alpha V_Z = f(V_Z)$; (I_Z = parameter)
%/°C
αV_Z
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
I_Z = 20 mA
10 mA
5 mA
1 mA
0
2
4
6
8 V
V_Z


Temperature coefficient
$\alpha V_Z = f(V_Z)$; (I_Z = parameter)
%/°C
αV_Z
0,20
0,15
0,10
0,05
0
-0,05
-0,10
I_Z = 5 mA
I_Z = 1 mA
0
10
20
30
40 V
V_Z

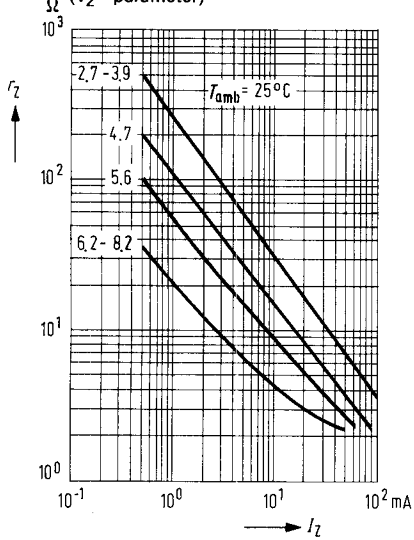
Dynamic Z-resistance $r_Z = f(V_Z)$
(I_Z = parameter)



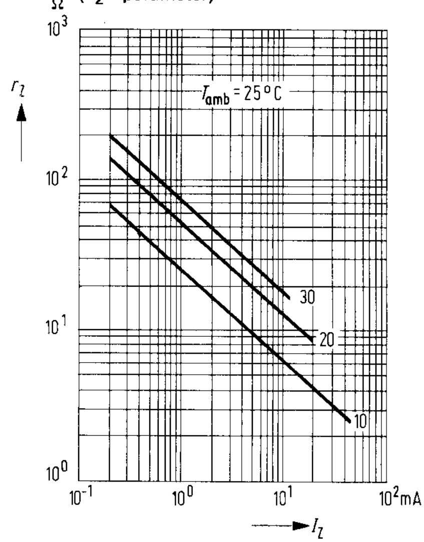
Temperature coefficient of Z-resistance $\alpha_r = f(V_Z)$



Mean dyn. Z-resistance $r_Z = f(I_Z)$
(V_Z = parameter)



Mean dyn. Z-resistance $r_Z = f(I_Z)$
(V_Z = parameter)



Silicon Z-diodes

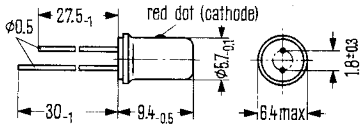
Silicon Z-diodes type BZY 83 and BZY 85 are available with 5% tolerance (C) and 10% tolerance (D). BZY 83 is provided with a metal case 1 A2 DIN 41871 and may be operated in free air as well as mounted on a chassis with a cooling fin (heat sink). BZY 85 is provided with a glass case 51 A2 DIN 41880 (DO-7). They are suitable for stabilizing and limiting voltages as well as for generating reference voltages at low power requirements. The cathode lead is marked by a red dot (BZY 83) or a colour ring (BZY 85).

Type	Order number
BZY 83/C4V7	Q60225-Y83-J1
BZY 83/C5V1	Q60225-Y83-J2
BZY 83/C5V6	Q60225-Y93-J3
BZY 83/C6V2	Q60225-Y83-J4
BZY 83/C6V8	Q60225-Y83-J5
BZY 83/C7V5	Q60225-Y83-J6
BZY 83/C8V2	Q60225-Y83-J7
BZY 83/C9V1	Q60225-Y83-J8
BZY 83/C10	Q60225-Y83-J9
BZY 83/C11	Q60225-Y83-J10
BZY 83/C12	Q60225-Y83-J11
BZY 83/C13	Q60225-Y83-J20
BZY 83/C15	Q60225-Y83-J13
BZY 83/C16	Q60225-Y83-J21
BZY 83/C18	Q60225-Y83-J15
BZY 83/C20	Q60225-Y83-J16
BZY 83/C22	Q60225-Y83-J17
BZY 83/C24	Q60225-Y83-J22
BZY 83/D1	Q60225-Y83-K1
BZY 83/D4V7	Q60225-Y83-K2
BZY 83/D5V6	Q60225-Y83-K3
BZY 83/D6V8	Q60225-Y83-K4
BZY 83/D8V2	Q60225-Y83-K5
BZY 83/D10	Q60225-Y83-K6
BZY 83/D12	Q60225-Y83-K7
BZY 83/D15	Q60225-Y83-K8
BZY 83/D18	Q60225-Y83-K9
BZY 83/D22	Q60225-Y83-K10
Heat sink	Q62901-B1

Type	Order number
■ BZY 85/C4V7	Q60225-Y85-J47
■ BZY 85/C5V1	Q60225-Y85-J51
■ BZY 85/C5V6	Q60225-Y85-J56
■ BZY 85/C6V2	Q60225-Y85-J62
■ BZY 85/C6V8	Q60225-Y85-J68
■ BZY 85/C7V5	Q60225-Y85-J75
■ BZY 85/C8V2	Q60225-Y85-J82
■ BZY 85/C9V1	Q60225-Y85-J91
■ BZY 85/C10	Q60225-Y85-J100
■ BZY 85/C11	Q60225-Y85-J110
■ BZY 85/C12	Q60225-Y85-J120
■ BZY 85/C13	Q60225-Y85-J936
■ BZY 85/C15	Q60225-Y85-J150
■ BZY 85/C16	Q60225-Y85-J937
■ BZY 85/C18	Q60225-Y85-J180
■ BZY 85/C20	Q60225-Y85-J200
■ BZY 85/C22	Q60225-Y85-J220
■ BZY 85/C24	Q60225-Y85-J938
■ BZY 85/D1	Q60225-Y85-K10
■ BZY 85/D4V7	Q60225-Y85-K47
■ BZY 85/D5V6	Q60225-Y85-K56
■ BZY 85/D6V8	Q60225-Y85-K68
■ BZY 85/D8V2	Q60225-Y85-K82
■ BZY 85/D10	Q60225-Y85-K100
■ BZY 85/D12	Q60225-Y85-K120
■ BZY 85/D15	Q60225-Y85-K150
■ BZY 85/D18	Q60225-Y85-K180
■ BZY 85/D22	Q60225-Y85-K220

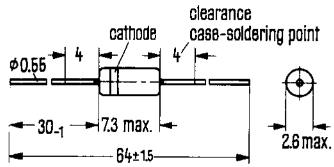
■ Not for new development

BZY 83

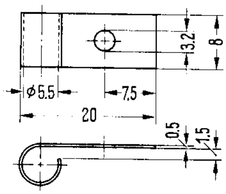


Weight approx. 1 g Dimensions in mm

BZY 85



Weight approx. 0.2 g Dimensions in mm



heat sink

Maximum ratings		**BZY 83**	**BZY 85**	
Forward current	I_F	200	200	mA
Maximum current	i_{FM}	300	300	mA
Junction temperature	T_j	150	150	°C
Ambient temperature	T_{amb}	−55 to +125	−55 to +150	°C
Total power dissipation (T_{amb}=45 °C)	P_{tot}	300[1])	–	mW
Total power dissipation (T_{amb}=25 °C)	P_{tot}	250	400[2])	mW
Thermal resistance				
between junction and static ambient air	R_{thJamb}	<500	<310[2])	K/W
between junction and case	$R_{thJcase}$	<250	–	K/W
When mounted on a chassis of sheet aluminium 12 cm² in area with cooling fin (heat sink)	R_{thL}	<350	–	K/W

Static characteristic (T_{amb}=25 °C)

Forward voltage (I_F=100 mA)	V_F	0.8 (<1.0)*	0.9 (<1.0)*	V

Current and voltage data see following table

[1]) When mounted on a chassis of sheet aluminium 12 cm² in area with cooling fin (heat sink) R_{thL}=350 K/W
[2]) clearance case soldering point 4 mm (T_{case}=max. 25 °C)
* AQL=0.65%

Delivery program BZY 83

Type	Nominal voltage (V)	$I_{ztest} = 5$ mA V_Z-range *) (V)	r_{zdyn} *) (Ω)	r_{Zstat} (Ω)	I_R *) at $V_R = 1$ V (nA)	V_R *) at $I_R = 1$ µA (V)	I_{Zmax} [1]) $T_{amb} = 45$ °C (mA)
BZY 83/C4V7	4.7	4.4 to 5.0	66<90	66	<500	>1	52
BZY 83/C5V1	5.1	4.8 to 5.4	48<75	48	<500	>1	48
BZY 83/C5V6	5.6	5.2 to 6.0	20<60	20	<500	>1	43.5
BZY 83/C6V2	6.2	5.8 to 6.6	8<40	11	<500	>1	39.5
BZY 83/C6V8	6.8	6.4 to 7.2	3.5<8	9	<100	>1.5	36
BZY 83/C7V5	7.5	7.0 to 7.9	3.5<6	10	<100	>1.5	33
BZY 83/C8V2	8.2	7.7 to 8.7	4<7	14	<100	>3	30
BZY 83/C9V1	9.1	8.5 to 9.6	5.5<10	18	<100	>3	27
BZY 83/C10	10	9.4 to 10.6	7<15	24	<100	>4.5	24.5
BZY 83/C11	11	10.4 to 11.6	9.5<20	31	<100	>4.5	22
BZY 83/C12	12	11.4 to 12.7	12<30	39	<100	>6.5	20.2
BZY 83/C13	13	12.4 to 14.1	17<30	54	<100	>6.5	18.4
BZY 83/C15	15	13.8 to 15.6	24<55	70	<100	>9.5	16.8
BZY 83/C16	16	15.3 to 17.1	34<75	92	<100	>9.5	15.3
BZY 83/C18	18	16.8 to 19.1	47<110	120	<100	>9.5	13.6
BZY 83/C20	20	18.8 to 21.2	70<150	160	<100	>9.5	12.3
BZY 83/C22	22	20.8 to 23.3	95<170	205	<100	>11.5	11.3
BZY 83/C24	24	22.8 to 25.6	120<200	250	<100	>11.5	10.2
BZY 83/D1 [2])	0.7	0.62 to 0.78	8	–	–	>1	200
BZY 83/D4V7	4.7	4.1 to 5.2	66<90	66	<500	>1	49
BZY 83/D5V6	5.6	5.0 to 6.3	20<75	20	<500	>1	41
BZY 83/D6V8	6.8	6.0 to 7.5	3.5<15	9	<100	>1.5	35
BZY 83/D8V2	8.2	7.3 to 9.2	4<10	14	<100	>3	28.2
BZY 83/D10	10	8.8 to 11.0	7<15	24	<100	>4.5	23.5
BZY 83/D12	12	10.7 to 13.4	12<30	39	<100	>6.5	19
BZY 83/D15	15	13 to 16.5	24<55	70	<100	>9.5	15.6
BZY 83/D18	18	16 to 20	47<100	120	<100	>9.5	13
BZY 83/D22	22	19.6 to 24.4	95<200	205	<100	–	10.6

[1]) When mounted on a chassis of sheet aluminium 12 cm² in area with cooling fin (heat sink)
[2]) The BZY 83 D1 is a diode with very small tolerances to be used in forward direction. The cathode is marked by a red dot and has to be connected with the minus pole of the voltage supply
* AQL = 0.65%

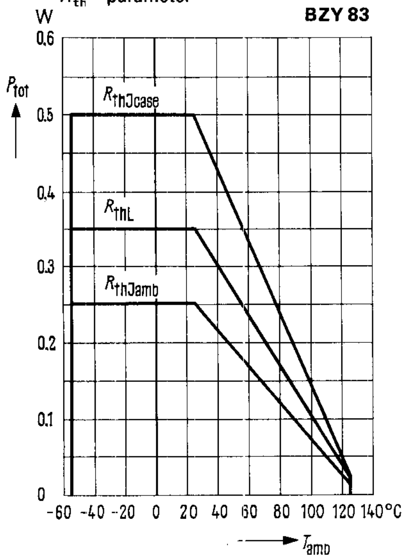
Delivery program BZY 85

Not for new development

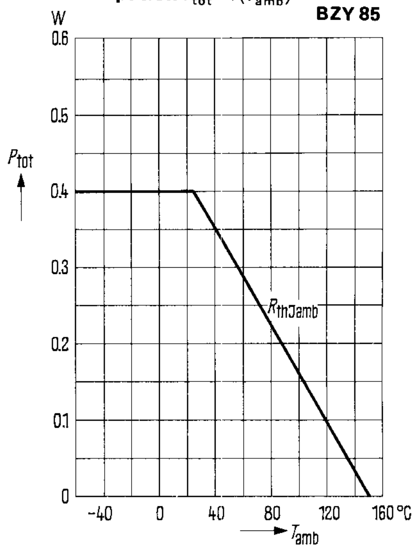
Type	Nominal voltage (V)	I_{ztest} = 5 mA V_Z-range *) (V)	r_{zdyn} *) (Ω)	r_{Zstat} (Ω)	I_R *) at V_R = 1 P (nA)	V_R *) at I_R = 1 µA (V)	I_{Zmax} [1]) T_L [2]) = 45 °C (mA)
BZY 85/C4V7	4.7	4.4 to 5.0	70	70	<500	>1	55
BZY 85/C5V1	5.1	4.8 to 5.4	60	64	<500	>1	52
BZY 85/C5V6	5.6	5.2 to 6.0	40	47	<500	>1	49
BZY 85/C6V2	6.2	5.8 to 6.6	10	23	<100	>1	45
BZY 85/C6V8	6.8	6.4 to 7.2	8	24	<100	>1.5	41
BZY 85/C7V5	7.5	7.0 to 7.9	7	29	<100	>1.5	37
BZY 85/C8V2	8.2	7.7 to 8.7	7	36	<100	>3	33
BZY 85/C9V1	9.1	8.5 to 9.6	10	47	<100	>3	30
BZY 85/C10	10	9.4 to 10.6	15	60	<100	>4.5	28
BZY 85/C11	11	10.4 to 11.6	20	74	<100	>4.5	25
BZY 85/C12	12	11.4 to 12.7	20	91	<100	>6.5	22.5
BZY 85/C13	13	12.4 to 14.1	26	108	<100	>6.5	20.5
BZY 85/C15	15	13.8 to 15.6	30	138	<100	>9.5	19
BZY 85/C16	16	15.3 to 17.1	40	177	<100	>9.5	17
BZY 85/C18	18	16.8 to 19.1	55	226	<100	>9.5	15
BZY 85/C20	20	18.8 to 21.2	55	275	<100	>9.5	14
BZY 85/C22	22	20.8 to 23.3	55	319	<100	>11.5	12.5
BZY 85/C24	24	22.8 to 25.6	80	408	<100	>11.5	11
BZY 85/D1 [3])	0.7	0.62 to 0.78	8	7.6	–	>1	200
BZY 85/D4V7	4.7	4.1 to 5.2	85	95	1000	>1	55
BZY 85/D5V6	5.6	5.0 to 6.3	75	85	<500	>1	49
BZY 85/D6V8	6.8	6.0 to 7.5	15	33	<100	>1.5	45
BZY 85/D8V2	8.2	7.3 to 9.2	10	43	<100	>3	41
BZY 85/D10	10	8.8 to 11.0	15	65	<100	>4.5	28
BZY 85/D12	12	10.7 to 13.4	30	110	<100	>6.5	22.5
BZY 85/D15	15	13 to 16.5	55	185	<100	>9.5	19
BZY 85/D18	18	16 to 20	55	255	<100	>9.5	15
BZY 85/D22	22	19.6 to 24.4	55	355	<100	>9.5	12.5

[1]) Clearance case soldering point 4 mm (T_{case} = max. 45 °C)
[2]) T_L = temperature at soldered joint 4 mm away from case
[3]) The BZY 85/D1 is a diode with very small tolerances to be used in forward direction. The anode is marked by a colour ring
* AQL = 0.65%

Total permissible power dissipation $P_{tot} = f(T_{amb})$
R_{th} = parameter

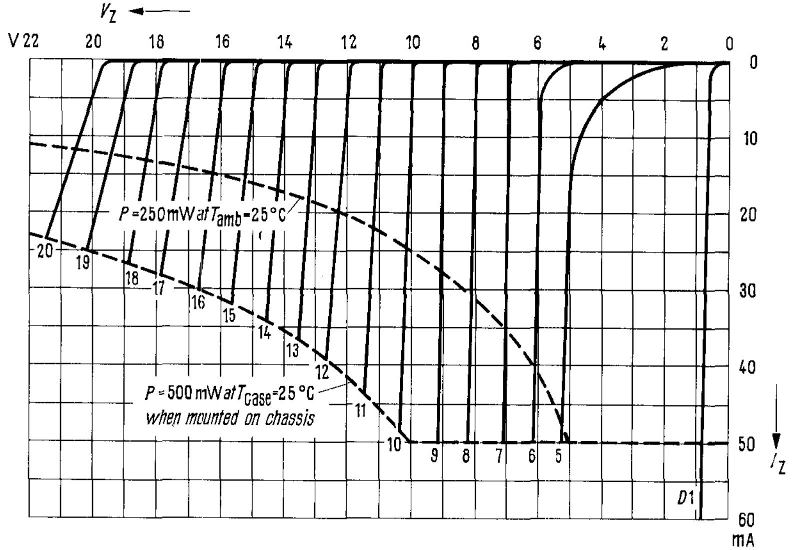


Total permissible power dissipation $P_{tot} = f(T_{amb})$



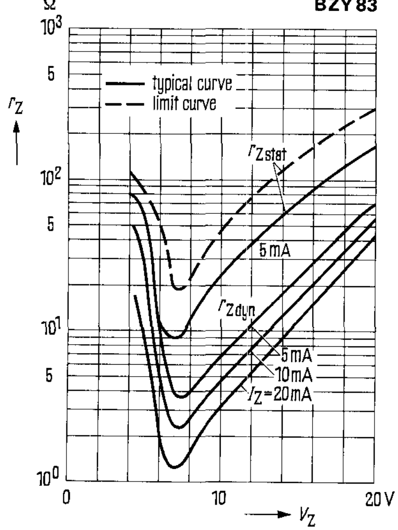
Characteristics within the Z-range (mean values) $V_Z = f(I_Z)$; ($T_{amb} = 25$ °C)

BZY 83



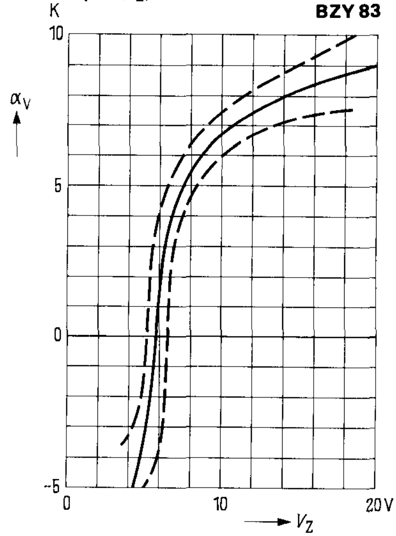
Static and dynamic Z-resistance $r_Z = f(V_Z)$
$T_{amb} = 25$ °C; measured at $f = 50$ Hz
measuring current $0.1 \cdot I_Z$

BZY 83

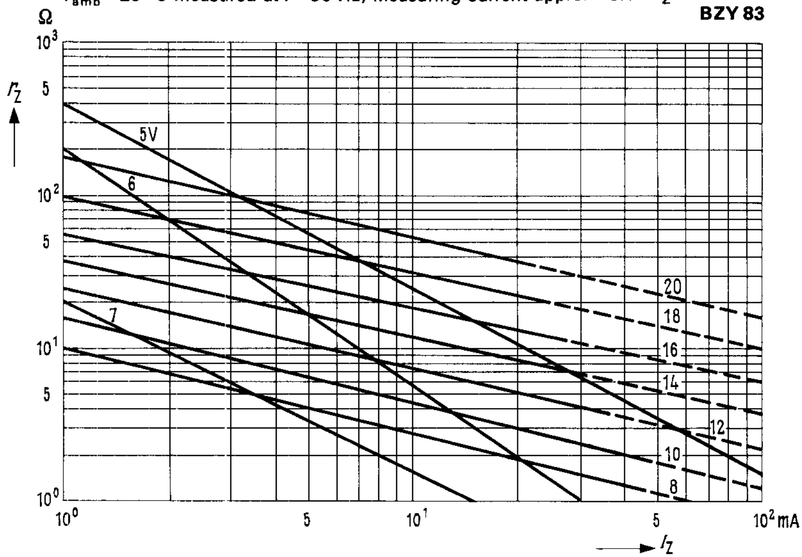


Relative temperature coefficient of the Z-voltage $\alpha_V = f(V_Z)$

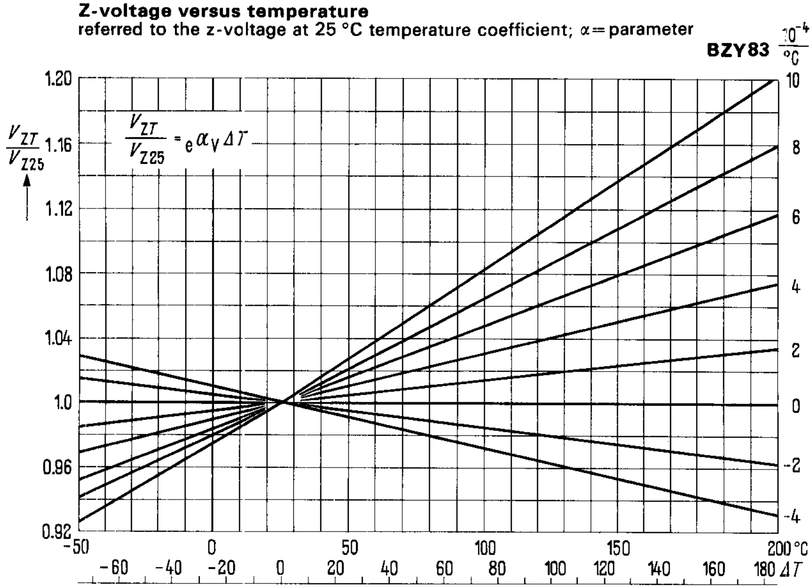
BZY 83



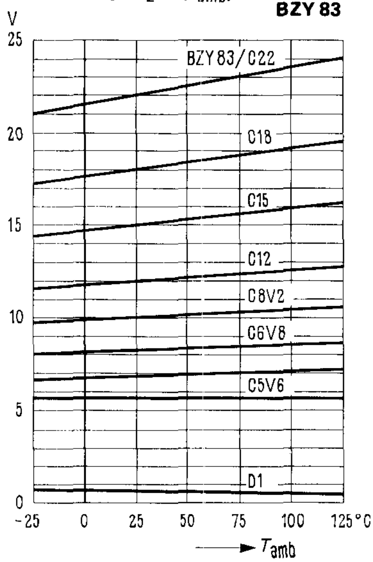
Typical Z-resistance $r_Z = f(I_Z)$ V_Z = parameter
T_{amb} = 25 °C measured at f = 50 Hz; measuring current approx. 0.1 × I_Z



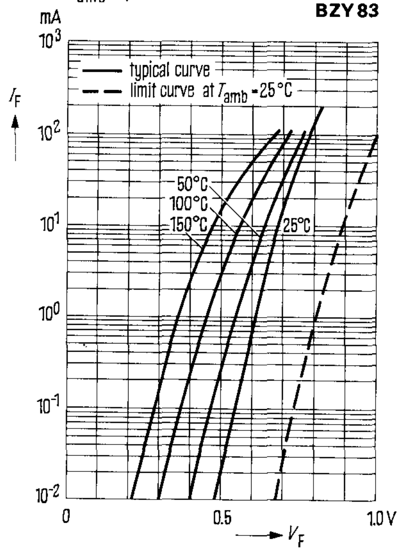
Z-voltage versus temperature
referred to the z-voltage at 25 °C temperature coefficient; α = parameter



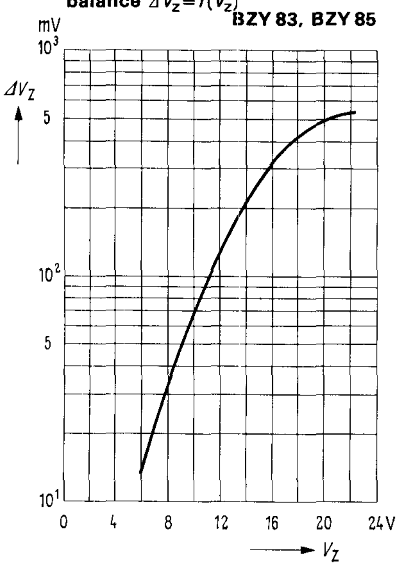
Z-Voltage $V_Z = f(T_{amb})$
BZY 83



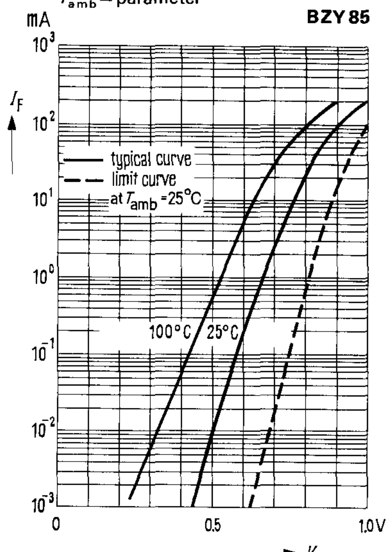
Forward characteristics $I_F = f(V_F)$
T_{amb} = parameter
BZY 83



Alteration of the Z-voltage from the switching moment to the reaching of the thermal balance $\Delta V_Z = f(V_Z)$
BZY 83, BZY 85



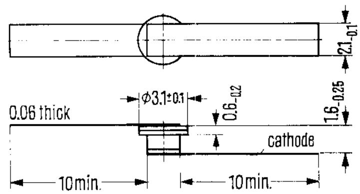
Forward characteristics $I_F = f(V_F)$
T_{amb} = parameter
BZY 85



Depletion-layer varactors

BBY 24 through BBY 27 are epitaxial silicon mesa depletion-layer varactors and are particularly designed for use in modulation and tuning applications in the GHz range. The varactors are housed in a microwave case with a gold-plated Ni lead strip on both ends.

Type	Order number
BBY 24	Q 62702-B 20
BBY 25	Q 62702-B 21
BBY 26	Q 62702-B 22
BBY 27	Q 62702-B 23



Weight approx. 1 g

Maximum ratings (T_{amb} = 25 °C)		**BBY 24, BBY 25 BBY 26, BBY 27**	
Reverse voltage	V_R	120	V
Forward current	I_F	200	mA
Junction temperature	T_j	150	°C
Storage temperature	T_S	−55 to +150	°C
Thermal resistance between junction and case	$R_{thJcase}$	≦70	K/W

Static characteristics

Reverse current (V_R = 100 V; T_{amb} = 25 °C	I_R	<10	nA
Reverse current (V_R = 100 V; T_{amb} = 60 °C)	I_R	<100	nA
Forward voltage (I_F = 200 mA; T_{amb} = 25 °C)	V_F	<1	V

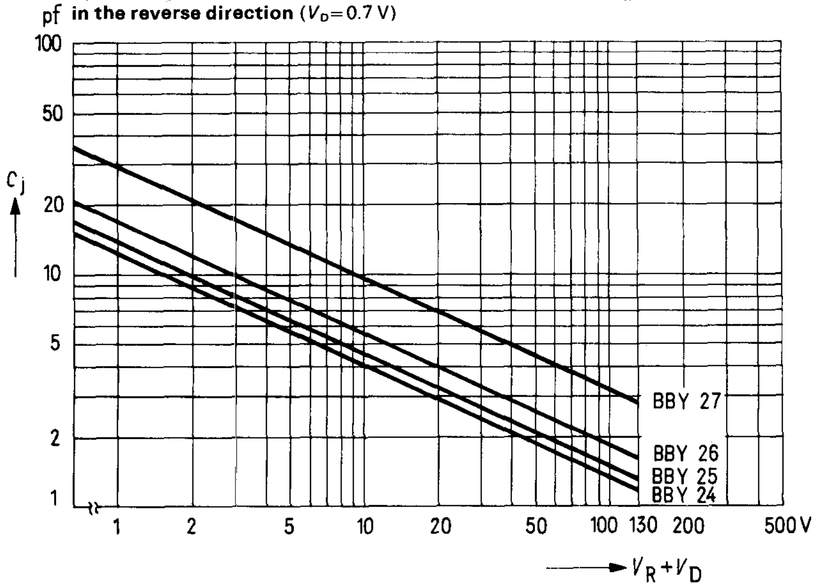
Dynamic characteristics (T_{amb} = 25 °C)

		BBY 24	BBY 25	BBY 26	BBY 27	
Diode capacitance (V_R = 0 V; f = 1 MHz)	C_D	14 (12 to 16)	18 (16 to 20)	22 (20 to 24)	38 (36 to 40)	pf pf
Capacitance ratio (V_R = 0 to 120 V; f = 1 MHz)	$\frac{C_{D0}}{C_{D120}}$	>8.5	>9.0	>9.5	>10.0	–

		BBY 24, BBY 25 BBY 26, BBY 27	
Case capacitance	C_{case}	0.35	pf
Case series inductance	L_S	0.4	nH
Voltage dependence of junction capacitance (V_R = 0 to 120 V)	n[1])	2 to 2.15	–
Quality (V_R = 4 V; f = 50 MHz)	Q	>200	–
Series resistance (V_R = 100 V; f = 2.4 GHz)	R_S	<0.9	Ω

[1]) $\frac{G(V_{R1})}{G(V_{R2})} = \left(\frac{V_{R2}+V_D}{V_{R1}+V_D}\right)^{\frac{1}{n}}$; $V_D \approx 0.7$ V

Typical capacitance characteristics as a function of bias $V_R + V_D$ in the reverse direction (V_D = 0.7 V)

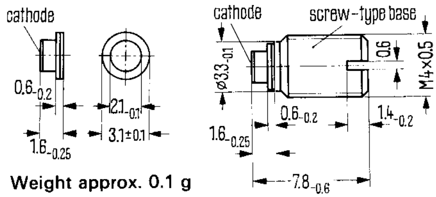


Charge storage varactors for frequency multiplication

Epitaxial silicon mesa diodes in a ceramic microwave case.

	Type	Order number
▼	BXY 10 A	Q 60223-Y 10-A
▼	BXY 10 B	Q 60223-Y 10-B
▼	BXY 11 F	Q 60223-Y 11-F
	BXY 13 A	Q 62702-X 86
	BXY 13 B	Q 60223-Y 13-B
	BXY 14 F	Q 60223-Y 14-F

BXY 10, BXY 11 **BXY 13, BXY 14**



Weight approx. 0.1 g
Dimensions in mm

Weight approx. 0.5 g

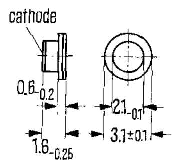
		BXY 10 A BXY 13 A	BXY 10 B BXY 13 B	BXY 11 F BXY 14 F	
Frequency range		1 to 15	1 to 15	0.05 to 5	GHz
RF-Input power	P_e	to 0.5	to 1	to 4	W
Junction temperature	T_j	+150	+150	+150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	−55 to +175	°C
Thermal resistance Junction to case	$R_{thJcase}$	≦90	≦70	≦60	K/W
Diode capacitance $V_R=0$ V; $f=1$ MHz	C_D	0.5 to 1.5	0.9 to 1.8	9 to 18	pf
Breakdown voltage $I_R=10$ µA	V_R	(35 to 45)	(33 to 47)	(60 to 90)	V
Reverse current $V_R=30$ V	I_R	≦5	≦5	≦5	nA
Forward voltage $I_F=100$ mA	V_F	≦1.2	≦1.1	≦1	V
Series resistance $V_R=20$ V; $f=2.4$ GHz	R_s	≦0.8	≦0.6	≦0.5	Ω
Storage time ($I_F=$ 200 mA; $I_R=200$ mA) fall to 80% of I_R	t_s	8	10	75	ns
Fall time ($I_F=200$ mA; $I_R=200$ mA) fall from 80% to 20% of I_R	t_f	1	0.8	6	ns
Case capacitance (without grub screw)	C_{case}	0.35	0.35	0.35	pf
Case series inductance (without grub screw)	L_S	0.4	0.4	0.4	nH
Applications: conversion loss, e.g. tripling	K	7.0	4.5	2.0	db
from		6.5	2.5	0.2	GHz
to		13	7.5	0.6	GHz
RF-Input power	P_E	0.02	0.3	3.0	W

Charge storage varactors for frequency multiplication

Epitaxial silicon mesa diodes in a ceramic microwave case

Type	Order number
BXY10C	Q60223-Y10-C
BXY10D	Q60223-Y10-D
BXY11E	Q60223-Y11-E
BXY13C	Q60223-13-CY
BXY13D	Q60223-Y13-D
BXY14E	Q60223-Y14-E

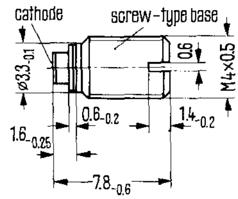
BXY10, BXY11



Weight approx. 0.1 g

Dimensions in mm

BXY13, BXY14



Weight approx. 0.5 g

		BXY10C BXY13C	BXY10D BXY13D	BXY11E BXY14E	
Frequency range		1 to 10	1 to 10	0.3 to 3	GHz
RF-Input power	P_e	to 1.5	to 2.5	to 3	W
Junction temperature	T_j	+150	+150	+150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	−55 to +175	°C
Thermal resistance Junction to case	$R_{thJcase}$	≦70	≦70	≦70	K/W
Diode capacitance $V_R = 0$ V; $f = 1$ MHz	C_D	2.5 (1.5 to 3.5)	4.5 (3 to 6)	7 (5 to 10)	pf
Breakdown voltage $I_R = 10$ µA	V_R	(34 to 50)	(50 to 70)	(50 to 70)	V
Reverse current $V_R = 30$ V	I_R	≦5	≦5	≦5	nA
Forward voltage $I_F = 100$ mA	V_F	≦1.1	≦1	≦1	V
Series resistance $V_R = 20$ V; $f = 2.4$ GHz	R_s	≦0.6	≦0.6	≦0.5	Ω
Storage time ($I_F =$ 200 mA; $I_R = 200$ mA) fall to 80% of I_R	t_s	15	25	40	ns
Fall time ($I_F = 200$ mA; $I_R = 200$ mA) fall from 80% to 20% of I_R	t_f	0.8	0.8	1.5	ns
Case capacitance (without grub screw)	C_{case}	0.35	0.35	0.35	pf
Case series inductance (without grub screw)	L_S	0.4	0.4	0.4	nH
Applications: conversion loss, e.g. tripling	K	3.5	4.0	2.5	db
from		2	2	0.7	GHz
to		6	6	2.1	GHz
RF-Input power	P_E	0.5	1	1.5	W

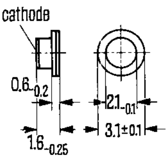
Charge storage varactors for frequency multiplication

Epitaxial silicon mesa diodes in ceramic microwave cases.

Type	Order number
BXY 11 GA	Q60223-Y11-G

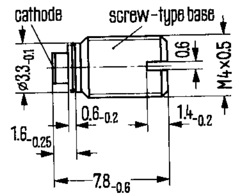
Type	Order number
BXY 14 GA	Q62702-X48

BXY 11 GA



Weight approx. 0.1 g Dimensions in mm

BXY 14 GA



Weight approx. 0.5 g

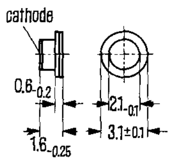
		BXY 11 GA BXY 14 GA	
Frequency range		0.05 to 2	GHz
RF input power	P_e	to 4	W
Junction temperature	T_j	+150	°C
Storage temperature	T_s	−55 to +175	°C
Thermal resistance			
Junction to case	$R_{thJcase}$	≦60	K/W
Diode capacitance $V_R=0$; $f=1$ MHz	C_D	20 (15 to 25)	pf
Breakdown voltage $I_R=10\ \mu A$	V_R	60 to 90	V
Reverse current $V_R=30$ V	I_R	≦5	nA
Forward voltage $I_F=100$ mA	V_F	≦1	V
Series resistance $V_R=20$ V; $f=2.4$ GHz	R_S	≦0.5	Ω
Storage time ($I_F=100$ mA; $I_R=200$ mA) fall to 80% of I_R	t_s	75	ns
Fall time ($I_F=100$ mA; $I_R=200$ mA) fall from 80% to 20% of I_R	t_f	6	ns
Case capacitance (without grub screw)	C_{case}	0.35	pf
Case series inductance (without grub screw)	L_S	0.4	nH
Applications: conversion loss	K	2	db
e.g. tripling			
from		0.2	GHz
to		0.6	GHz
RF input power	P_e	3	W

Charge storage varactors for frequency multiplication

Glass-passivated silicon mesa twin-diodes.

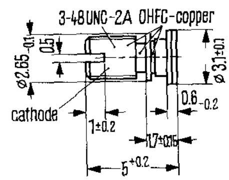
Type	Order number
BXY 15 CA-1	Q 62702-X 72
BXY 15 CA-2	Q 62702-X 73

BXY 15 CA 2



Weight approx. 0.1 g

BXY 15 CA 1



Weight approx 0.15 g

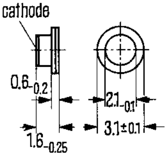
		BXY 15 CA-1 BXY 15 CA-2	
Frequency range		2 to 15	GHz
RF input power	P_e	2.5	W
Junction temperature	T_j	150	°C
Storage temperature	T_s	−55 to +175	°C
Thermal resistance			
Junction to case	$R_{thJcase}$	≦25	K/W
Diode capacitance $V_R=0$ V; $f=1$ MHz	C_D	1.5 to 2.5	pf
Breakdown voltage $I_R=10$ µA	V_R	40 to 50	V
Reverse current $V_R=30$ V	I_R	≦3	nA
Forward voltage $I_F=100$ mA	V_F	≦1	V
Series resistance $V_R=20$ V; $f=2.4$ GHz	R_S	≦0.6	Ω
Storage time ($I_F=100$ mA; $I_R=200$ mA) fall to 80% of I_R	t_s	12	ns
Fall time ($I_F=100$ mA; $I_R=200$ mA) fall from 80% to 20% of I_R	t_f	0.5	ns
Case capacitance (without grub screw)	C_{case}	0.35	pf
Case series inductance (without grub screw)	L_S	0.4	nH
Applications: conversion loss	K	4	db
e.g. doubling			
from		6.5	GHz
to		13	GHz
RF input power	P_e	2	W

BXY 15 DC-1, BXY 15 DC-2, BXY 17 CA-1, BXY 17 CA-2

Charge storage varactors for frequency multiplication

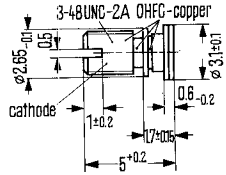
Type	Order number
BXY 15 DC-1	Q 62702-X 89
BXY 15 DC-2	Q 62702-X 90
BXY 17 CA-1	Q 62702-X 94
BXY 17 CA-2	Q 62702-X 95

BXY 15 DC-2
BXY 17 CA-2



Weight approx. 0.1 g
Dimensions in mm

BXY 15 DC-1
BXY 17 CA-1

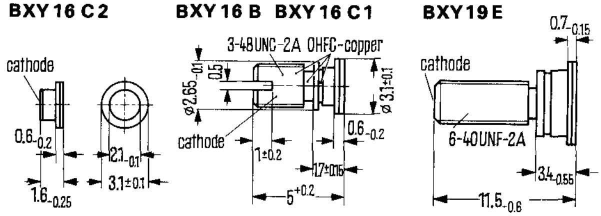


Weight approx. 0.15 g

		BXY 15 DC-1 BXY 15 DC-2	BXY 17 CA-1 BXY 17 CA-2	
Frequency range		1 to 10	1 to 10	GHz
RF input power	P_e	5	4	W
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	°C
Thermal resistance				
Junction to case	$R_{thJcase}$	≦20	≦20	K/W
Diode capacitance ($V_R = 0$ V; $f = 1$ MHz)	C_D	3 to 6	1.5 to 2.5	pf
Breakdown voltage ($I_R = 10$ µA)	V_R	50 to 70	55 to 70	V
Reverse current ($V_R = 30$ V)	I_R	≦3	≦3	nA
Forward voltage ($I_F = 100$ mA)	V_F	≦1	≦1	V
Series resistance ($V_R = 20$ V; $f = 2.4$ GHz)	R_S	≦0.5	≦0.5	Ω
Storage time ($I_F = 100$ mA; $I_R = 200$ mA) fall to 80% of I_R	t_s	30	20	ns
Fall time ($I_F = 100$ mA; $I_R = 200$ mA) fall from 80% to 20% of I_R	t_f	0.5	0.5	ns
Case capacitance (without grub screw)	C_{case}	0.35	0.35	pf
Case series inductance (without grub screw)	L_S	0.4	0.4	nH
Applications: conversion loss,	K	5	4.5	db
e.g. tripling				
from		2.1	2.5	GHz
to		6.3	7.5	GHz
RF input power	P_e	5	3.5	W

Charge storage varactors for frequency multiplication

Type	Order number
BXY 16 B	Q 60223-Y16-V1
BXY 16 C1	Q 60223-Y16-C1
BXY 16 C2	Q 60223-Y16-C2
BXY 19 E	Q 60223-Y19-E



Dimensions in mm Weight approx. 0.1 g Weight approx. 0.15 g Weight approx. 0.9 g

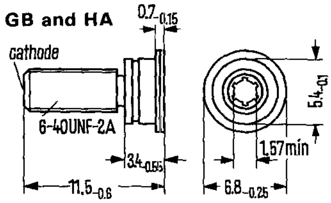
		BXY16B	BXY16C1 BXY16C2	BXY19E	
Frequency range		2 to 13	1 to 10	0.1 to 3	GHz
RF input power	P_e	to 1.5	to 4	to 8	W
Junction temperature	T_j	+150	+150	+150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	−55 to +175	°C
Thermal resistance					
Junction to case	$R_{thJcase}$	≦30	≦25	≦15	K/W
Diode capacitance (V_R=0 V; f=1 MHz)	C_D	≦1.5	2.5 (1.5 to 3.5)	8 (5 to 10)	pf
Breakdown voltage (I_R=10 μA)	V_R	40 to 50	(52 to 70)	(85 to 105)	V
Reverse current (V_R=30 V)	I_R	≦5	≦5	≦5	nA
Forward voltage (I_F=100 mA)	V_F	≦1.1	≦1.1	≦1.0	V
Series resistance (V_R=20 V; f=2.4 GHz)	R_S	≦0.6	≦0.6	≦0.5	Ω
Storage time (I_F= 100 mA; I_R=200 mA) fall to 80% of I_R	t_s	12	20	80	ns
Fall time (I_F= 100 mA; I_R=200 mA) fall from 80% to 20% of I_R	t_f	0.5	0.8	2	ns
Case capacitance (without grub screw)	C_{case}	0.35	0.35	1.0	pf
Case series inductance (without grub screw)	L_S	0.4	0.4	0.6	nN
Applications: conversion loss,	K	4.0	4.0	3.0	db
e.g. tripling or doubling from		6	2.5	0.8	GHz
to		12	7.5	2.4	GHz
RF input power	P_e	1	5 [1])	8	W

[1]) At series circuit of BXY 16 C-1 and BXY 16 C-2

Charge storage varactors for frequency multiplication

Type	Order number
BXY19F	Q60223-Y19-F
BXY19FB	Q62702-X53
BXY19GB	Q60223-Y19-G2
BXY19HA	Q62702-X50

BXY19F, FB, GB and HA



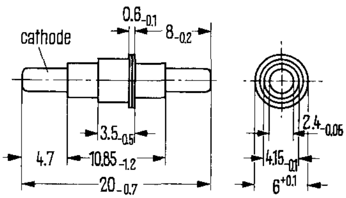
Dimensions in mm
Weight approx. 0.9 g

		BXY 19 F	BXY 19 FB	BXY 19 GB	BXY 19 HA	
Frequency range		0.1 to 3	0.1 to 3	0.1 to 2.4	0.1 to 2.0	GHz
Input power	P_e	to 15	to 15	to 20	to 30	W
Junction temperature	T_j	+150	+150	+150	+150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	−55 to +175	−55 to +175	°C
Thermal resistance Junction to case	$R_{thJcase}$	≦12	≦12	≦10	≦10	K/W
Diode capacitance (V_R=0 V; f=1 MHz)	C_D	9 to 18	12 to 18	20 to 30	30 to 40	pf
Breakdown voltage (I_R=10 µA)	V_R	85 to 105	85 to 105	95 to 115	115 to 135	V
Reverse current (V_R=30 V)	I_R	≦5	≦5	≦5	≦5	nA
Forward voltage (I_F=100 mA)	V_F	≦1.0	≦1.0	≦1.0	≦1.0	V
Series resistance (V_R=20 V; f=2.4 GHz)	R_S	≦0.5	≦0.5	≦0.5	≦0.5	Ω
Storage time (I_F= 100 mA; I_R=200 mA) fall to 80% of I_R	t_s	90	90	150	180	ns
Fatt time (I_F= 100 mA; I_R= 200 mA) fall from 80% to 20% of I_R	t_f	2	2	4	5	ns
Case capacitance (without grub screw)	C_{case}	1.0	1.0	1.0	1.0	pf
Case series inductance (without grub screw)	L_S	0.6	0.6	0.6	0.6	nH
Applications: conversion loss,	K	3.5	3.0	1.5	1.5	db
e.g. tripling or doubling from to RF input power	 P_e	 0.8 2.4 10	 0.8 2.4 10	 0.4 0.8 15	 0.2 0.4 20	 GHz GHz W

Depletion-layer varactors

BXY 21 CA is an epitaxial silicon mesa diode in a ceramic case. It is suitable for use as frequency converter and mixer in the GHz range.

Type	Order number
BXY 21 CA	Q62702-X54



Weight approx. 1.4 g   Dimensions in mm

Maximum ratings ($T_{amb}=25\,°C$)		BXY 21 CA	
Reverse voltage	V_R	20	V
Junction temperature	T_j	150	°C
Storage temperature	T_S	−55 to +150	°C
Power dissipation	P_{tot}	1.2	W
Thermal resistance			
Junction to case	$R_{thJcase}$	≦70	K/W

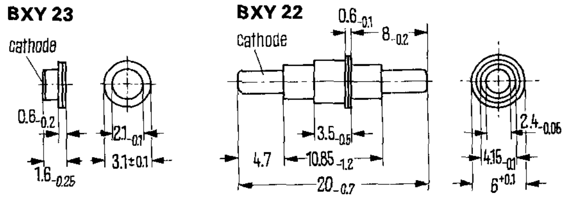
Static characteristics ($T_{amb}=25\,°C$)			
Forward voltage ($I_F=100$ mA)	V_F	≦1.1	V
Reverse current ($V_R=15$V)	I_R	≦5	nA
Breakdown voltage ($I_R=10\,\mu$A)	V_{BR}	30 (>20)	V

Dynamic characteristics ($T_{amb}=25\,°C$)			
Diode capacitance ($V_R=0$ V; $f=1$ MHz)	C_D	2 (1.5 to 2.5)	pf
Case capacitance	C_{case}	0.85	pf
Series inductance	L_S	2	nH
Series resistance ($V_R=20$ V; $f=2.4$ GHz)	R_S	0.5 (<0.8)	Ω

Depletion-layer varactor

Are capacitance diodes for tuning, switching and modulator applications up into the GHz range.

Type	Order number
BXY 22 G	Q 60223-Y 22-G
BXY 22 H	Q 60223-Y 22-H
BXY 22 J	Q 60223-Y 22-J
BXY 23	Q 60223-Y 23



Weight approx. 0.1 g   Weight approx. 1.4 g
Dimensions in mm

Maximum ratings (T_{amb} = 25 °C)		**BXY 22 G BXY 22 H BXY 22 J**	**BXY 23**	
Reverse voltage	V_R	30	30	V
Forward current	I_F	200	200	mA
Junction temperature	T_j	150	150	°C
Storage temperature	T_s	−55 to +175	−55 to +175	°C
Power dissipation	P_{tot}	1.2	1.2	W
Thermal resistance between junction and case	$R_{thJcase}$	≦70	≦70	K/W
between junction and static ambient air	R_{thJamb}	≦150	≦150	K/W
Static characteristics				
Reverse current (V_R = 30 V; T_{amb} = 25 °C)	I_R	≦10	≦10	nA
Reverse current (V_R = 30 V; T_{amb} = 60 °C)	I_R	≦100	≦100	nA
Forward voltage (I_F = 200 mA; T_{amb} = 25 °C)	V_F	≦1	≦1	V
Dynamic characteristics (T_{amb} = 25 °C)				
Case capacitance	C_{case}	0.85	0.35	pf
Case series inductance	L_S	2	0.4	nH
Temperature dependence of the diode (V_R = 3 V)	TK_{CD}	$4 \cdot 10^{-4}$	$4 \cdot 10^{-4}$	1/°C
Capacitance ratio (V_R = 3 to 25 V; f = 1 MHz)	$\frac{C_{D3}}{C_{D25}}$	2 to 2.5	2 to 2.5	–
Voltage dependence of the junction capacitance (V_R = 3 to 25 V)	n [1]	2 to 2.3	2 to 2.3	–
Series resistance (V_R = 3 V; f = 2.4 GHz)	R_S	<1.5	0.9	Ω

		BXY 22 G	**BXY 22 H**	**BXY 22 J**	**BXY 23**	
Diode capacitance (V_R = 15 V; f = 1 MHz)	C_D [2]	10 (8.8 to 11.2)	12 (10.8 to 13.2)	14.5 (13 to 16)	–	pf
(V_R = 3 V; f = 1 MHz)	C_D [2]	–	–	–	12 (10.7 to 13.3)	pf

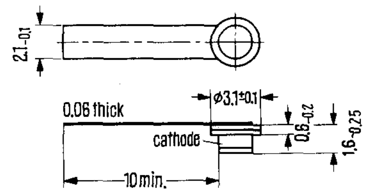
[1] $\frac{C_j(V_{R1})}{C_j(V_{R2})} = \left(\frac{V_{R2}+V_D}{V_{R1}+V_D}\right)^{\frac{1}{n}}$; $V_D \approx 0.7$ V

[2] $C_D = C_j + C_{case}$

Depletion-layer varactor

BXY 24 EA 3 is an epitaxial silicon mesa diode in a ceramic case. It is particularly suitable for use in the GHz range, e.g. as mixer, frequency converter and modulator.

Type	Order number
BXY 24 EA 3	Q 62702-X76-E3



Weight approx. 1 g   Dimensions in mm

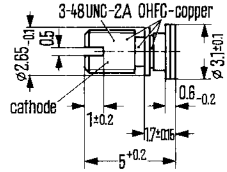
		BXY 24 EA 3	
Maximum ratings (T_{amb} = 25 °C)			
Reverse voltage	V_R	60	V
Forward current	I_F	200	mA
Junction temperature	T_j	175	°C
Storage temperature	T_s	−55 to +175	°C
Power dissipation	P_{tot}	2	W
Thermal resistance			
Junction to case	$R_{thJcase}$	≦35	K/W
Static characteristics (T_{amb} = 25 °C)			
Forward voltage (I_F = 100 mA)	V_F	≦1.0	V
Reverse current (V_R = 30 V)	I_R	≦10	nA
(V_R = 30 V; T_{amb} = 60 °C)	I_R	100	nA
Breakdown voltage (I_R = 10 µA)	V_{BR}	>60	V
Dynamic characteristics (T_{amb} = 25 °C)			
Diode capacitance (V_R = 0; f = 1 MHz)	C_D	6 (5 to 8)	pf
Case capacitance	C_{case}	0.35	pf
Series inductance	L_S	0.4	nH
Series resistance (V_R = 20 V; f = 2.4 GHz)	R_S	<0.8	Ω

IMPATT-diodes for C and X band

Avalanche transit time (ATT) diodes BGY 12 A, -12 B, -13 A, -13 B, -14 A and 14 B are silicon epitaxial mesa devices with multilayer glass passivation. IMPATT-diodes are suitable for generating and amplifying microwave power directly from the DC supply. They can be used in power oscillators, microwave amplifiers and receiver oscillators operating in the GHz range. When mounting the diodes, good heat conduction through the threaded stud to the heat sink is important.

	Type	Order number
▼	BGY 12 A	Q 62702-G 1
▼	BGY 12 B	Q 62702-G 2
▼	BGY 13 A	Q 62702-G 3
▼	BGY 13 B	Q 62702-G 4
▼	BGY 14 A	Q 62702-G 5
▼	BGY 14 B	Q 62702-G 6

Weight approx. 0.15 g
Dimensions in mm



Type		BGY 12A	BGY 12B	BGY 13A	BGY 13B	BGY 14A[1]	BGY 14B[1]	
Maximum ratings ($T_{amb}=25\,°C$)								
Junction temperature	T_j	250	250	250	250	250	250	°C
Power dissipation	P_{tot}	3	3	3	3	10	13	W
Thermal resistance Junction to case[2]	$R_{thJcase}$	≦70	≦60	≦80	≦70	≦20	≦15	K/W
Dynamic characteristics ($T_{amb}=25\,°C$)								
DC-datas	V_R min	120	120	85	85	120	120	V
	max	160	160	105	105	160	160	V
	I_R min	15	15	30	30	60	680	mA
	max	25	25	40	40	80	100	mA
CW-output power	P_{out}	>50	>100	>25	>75	>500	>750	mW
Frequency range[3]		4–6	4–6	8–10	8–10	5–7	5–7	GHz
Efficiency		2	4	2	2.5	5	6	%
Diode capacitance at V_R ($f=1$ MHz)	$C_D(V_R)$	0.5	0.5	0.6	0.6	0.2	0.2	pf
Series resistance at V_R ($f=2.4$ GHz)	$r_s(V_R)$	1	1	0.5	0.5	1	1	Ω
Case capacitance (without threaded stud)	C_{case}	0.35	0.35	0.35	0.35	0.35	0.35	pf
Case series inductance (without threaded stud)	L_S	0.4	0.4	0.4	0.4	0.4	0.4	nH

▼ new Type

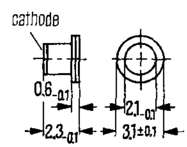
[1]) Upside down diodes for maximum heat dissipation
[2]) R_{th} measured according to Haitzetal
[3]) IMPATT diodes for other frequencies on request

PIN-diodes

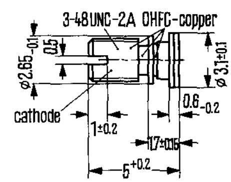
PIN-diodes BXY 42, BXY 43 and BXY 44 are glass passivated silicon mesa diodes with a high resistivity storage zone. As their design resembles that of the charge storage varactor, they have the same high reliability.
When the PIN diode is driven in the forward direction, strong modulation of the high resistivity storage zone conductivity occurs, which reduces the diode series resistance from about 100 Ω (at $I_F = 10\ \mu A$) to values less than 1 Ω (at 100 mA). Here the diode functions as a variable high frequency resistance. When driven in the reverse direction, the series resistance falls until the depletion region extends over the complete I zone, then remains constant. The PIN diode is suitable as a switching diode, variable high frequency resistance and as a phase shifter in the GHz range.
Types BXY 42 and BXY 43 with a low breakdown voltage are especially suitable for fast switching operations (around 10 ns) at low power, whereas type BXY 44 can be used at high power for switching times around 100 ns.

	Type	Order number
▼	BXY 42	Q 62702-X 81
▼	BXY 43	Q 62702-X 82
▼	BXY 44	Q 62702-X 83

BXY 42
BXY 43



BXY 44



Weight approx. 0.1 g Dimensions in mm Weight approx. 0.15 g

Maximum ratings ($T_{amb} = 25\ °C$)		BXY 42	BXY 43	BXY 44	
Junction temperature	T_j	150	150	150	°C
Storage temperature	T_S	−55 to +175	−55 to +175	−55 to +175	°C
Thermal resistance Junction to case	$R_{thJcase}$	<70	<70	<25	K/W
Power dissipation	P_{tot}	1.0	1.0	5	W

Static characteristics

Breakdown voltage ($I_R = 10\ \mu A$)	V_{BR}	>150	>150	>350	V
Forward voltage ($I_F = 100$ mA)	V_F	1.1	1.1	1.0	V

▼ New Type

PIN-diodes

Dynamic characteristics		BXY 42	BXY 43	BXY 44	
Diode capacitance (V_R = 50 V; f = 1 MHz)	C_D	<0.3	<0.45	<1.3	pf
Series resistance (V_R = 50 V; f = 2.4 GHz)	r_s	<1.0	<1.0	–	Ω
(I_F = 100 mA; f = 2.4 GHz)	r_s	–	–	<1.0	Ω
Storage time (I_F = 10 mA, I_R = 6 mA) recovery to 10% of I_R	t_S	>0.2	>0.25	>2.0	µs
Case capacitance	C_{case}	0.18	0.18	0.35	pf
Case series inductance	L_S	0.45	0.45	0.40	nH

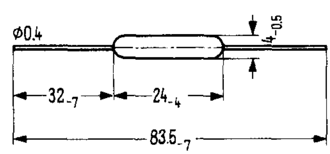
Negative temperature coefficient thermistor, starting-type

The thermistors A 34 are suitable for obtaining a defined current rise with time, particularly for delaying relays.

The type A 34-2/30 is available in two models according to the tolerance of the delay τ_M [2]).

Special production and aging processes ensure high reliability. The type designation code is stamped onto the glass-case.

Type	Order number
A 34-2/30 a	Q 63034-A1-J
A 34-2/30 b	Q 63034-A1-M
A 34-4/20	Q 63034-A2
A 34-5/15	Q 63034-A3
A 34-6/40	Q 63034-A4
A 34-7/10	Q 63034-A5
A 34-10/25	Q 63034-A6
A 34-14/30	Q 63034-A7
A 34-25/18	Q 63034-A8



Weight approx. 0.6 g Dimensions in mm

Maximum ratings		A 34 -2/30	A 34 -4/20	A 34 -5/15	A 34 -6/40	
Maximum continuous power	P_{tot}	60	80	75	240	mW
Maximum momentary power[1])	P_i	600	600	600	1200	mW
Maximum current momentary[1])	I_i	60	30	25	60	mA
Minimum permissible hot-state resistance	R_W	40	150	300	120	Ω
Storage temperature	T_s	−55 to +125				°C

Maximum ratings		A 34 -7/10	A 34 -10/25	A 34 -14/30	A 34 -25/18	
Maximum continuous power	P_{tot}	70	250	420	450	mW
Maximum momentary power[1])	P_i	600	1200	2000	2000	mW
Maximum current momentary[1])	I_i	20	40	60	25	mA
Minimum permissible hot-state resistance	R_W	500	350	350	1000	Ω
Storage temperature	T_s	−55 to +125				°C

[1]) Only as long as the thermistor resistance exceeds R_{min}
[2]) A 34-2/30 a with a τ_M tolerance from −40 to +20%, and
A 34-2/30 b with a τ_M tolerance from −20 to +40%

Characteristics (T_{amb} = 20 °C)		A 34 -2/30	A 34 -4/20	A 34 -5/15	A 34 -6/40	
Nominal voltage	V_N	2	4	5	6	V
Nominal current	I_N	30	20	15	40	mA
Voltage maximum	V_1	4	8	13	9	V
Cold-state resistance	R_{20}	5	15	40	6	kΩ
Tolerance of cold-state resistance	R_{20}-Tol.	±30	±30	±30	±20	%
Nominal value of delay [1]	τ_M	0.7	0.7	0.6	7	s
Tolerance of delay		[2]	±30	±30	±25	%
Operating voltage τ_M	V_B	12	24	36	24	V
Dropping resistance for τ_M	R_V	0.2	0.6	1.2	0.4	kΩ
Switching current	I_S	30	20	15	30	mA
B-value [2]	B	3440	3440	3450	2920	JK/J
Thermal conduction constant	$G_{th\,amb}$	0.4	0.4	0.4	1.5	mW/K
Thermal cooling time constant	τ_{th}	1.2	1.2	1.2	7	s
Thermal capacity	C_{th}	0.5	0.5	0.5	10	mWs/K

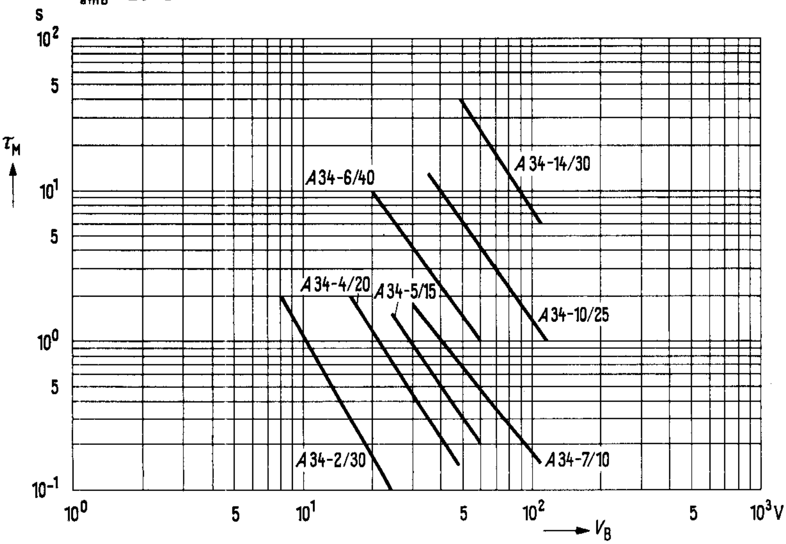
Characteristics (T_{amb} = 20 °C)		A 34 -7/10	A 34 -10/25	A 34 -14/30	A 34 -25/18	
Nominal voltage	V_N	7	10	14	25	V
Nominal current	I_N	10	25	30	18	mA
Voltage maximum	V_1	18	21	28	60	V
Cold-state resistance	R_{20}	100	40	40	200	kΩ
Tolerance of cold-state resistance	R_{20}-Tol.	±30	±20	±20	±20	%
Nominal value of delay [1]	τ_M	0.5	3.5	24	5	s
Tolerance of delay		±30	±25	±25	±25	%
Operating voltage for τ_M	V_B	60	60	60	220	V
Dropping resistance for τ_M	R_V	3	1.5	1.5	10	kΩ
Switching current	I_S	10	20	20	11	mA
B-value [2]	B	3950	3440	3440	3900	JK/J
Thermal conduction constant	G_{thJamb}	0.4	1.2	2.3	2.5	mW/K
Thermal cooling time constant	τ_{th}	1.2	6	14	12	s
Thermal capacity	C_{th}	0.5	7	32	30	mWs/K

[1]) The thermistor is connected in series with the dropping resistor R_V to voltage V_B. After the period τ_M the current has reached the value I_S through the heating of the thermistor
[2]) Determined by measuring at 20 °C and 100 °C

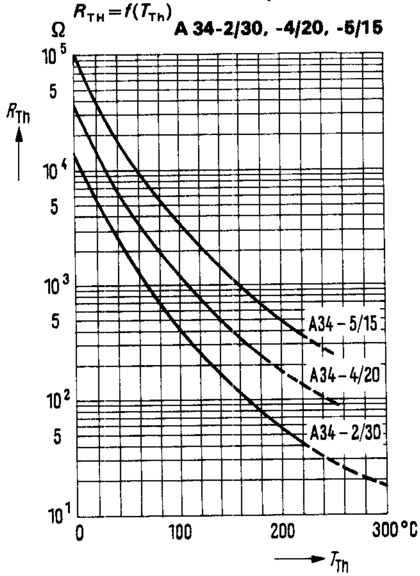
Standard Values of Delays at Different Operating Voltages ($T_{amb} = 20\,°C$)

	Type	8 V	12 V	16 V	24 V	36 V	48 V	60 V	110 V	220 V
A 34	2/30	2	0.7	0.4	0.1	–	–	–	–	–
A 34	4/20	–	–	1.7	0.7	0.2	0.1	–	–	–
A 34	5/15	–	–	–	1.5	0.6	0.3	0.2	–	–
A 34	6/40	–	–	17	7	2.5	1.5	–	–	–
A 34	7/10	–	–	–	–	2	0.8	0.5	–	–
A 34	10/25	–	–	–	–	10	6	3.5	1	–
A 34	14/30	–	–	–	–	–	40	24	6	(1)
A 34	25/18	–	–	–	–	–	–	–	20	5

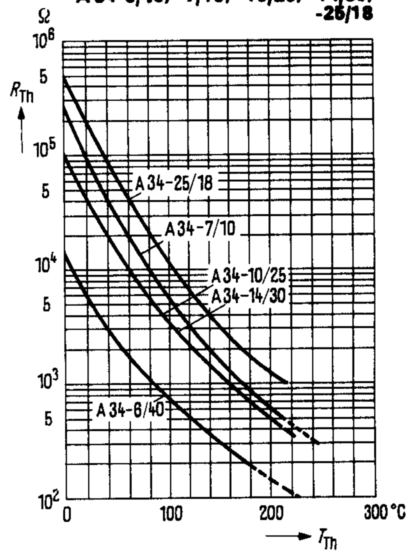
Standard Values of the Delay τ_M as a Function of the Operating Voltage V_B for thermistor type series A 34
$T_{amb} = 20\,°C$



Thermistor resistance as a function of the temperature
$R_{TH} = f(T_{Th})$
A 34-2/30, -4/20, -5/15

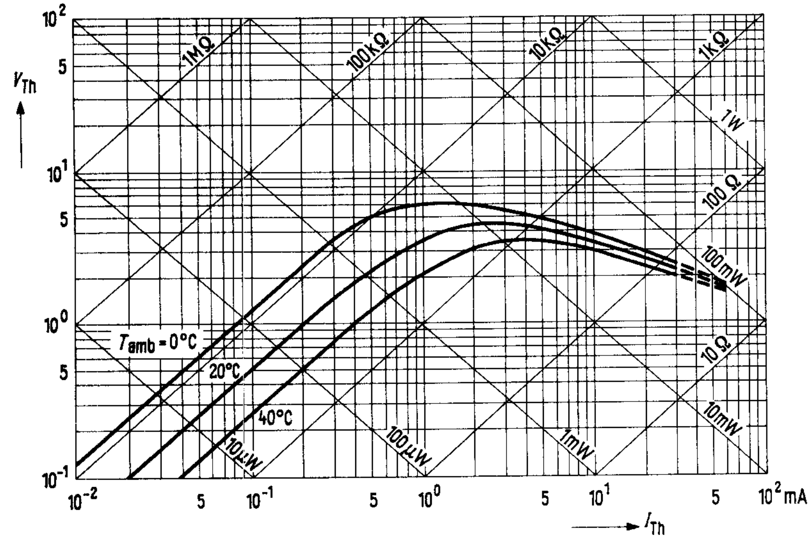


Thermistor resistance as a function of the temperature
$R_{Th} = f(T_{Th})$
A 34-6/40, -7/10, -10/25, -14/30, -25/18



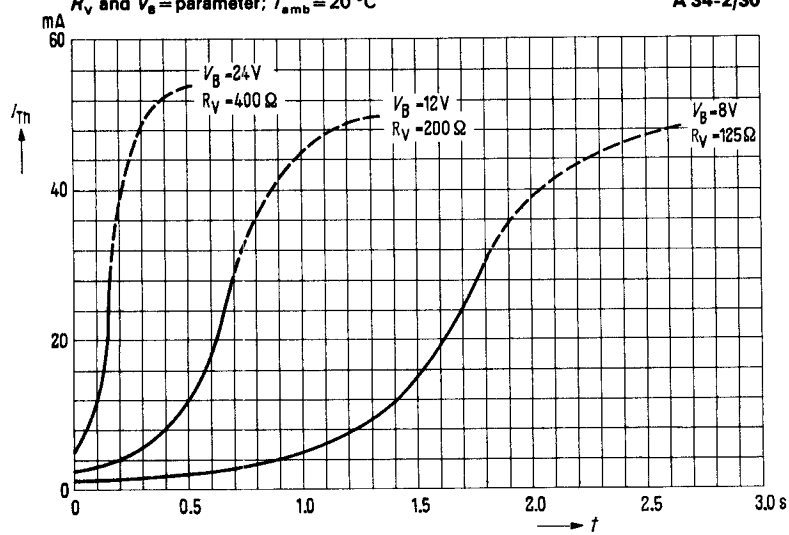
Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

A 34-2/30

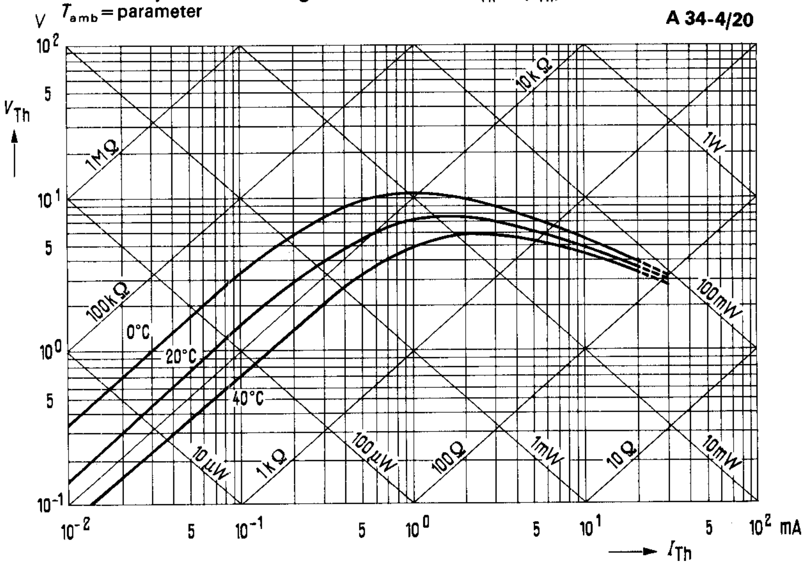


Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C

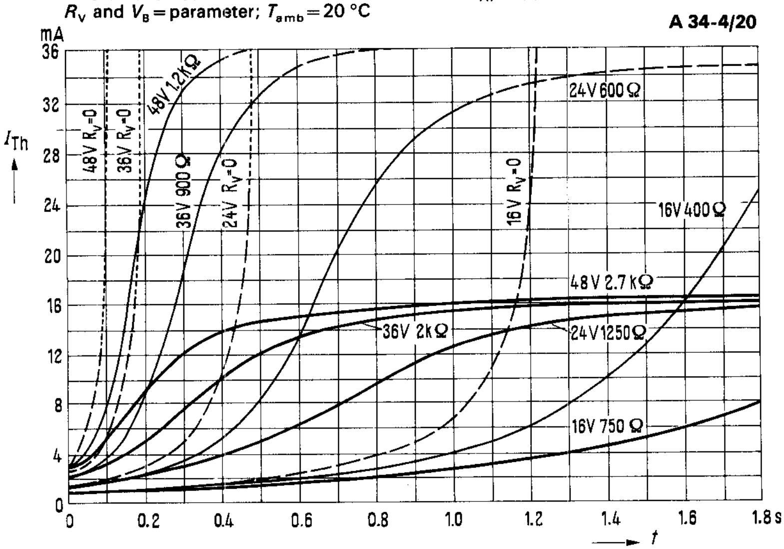
A 34-2/30



Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

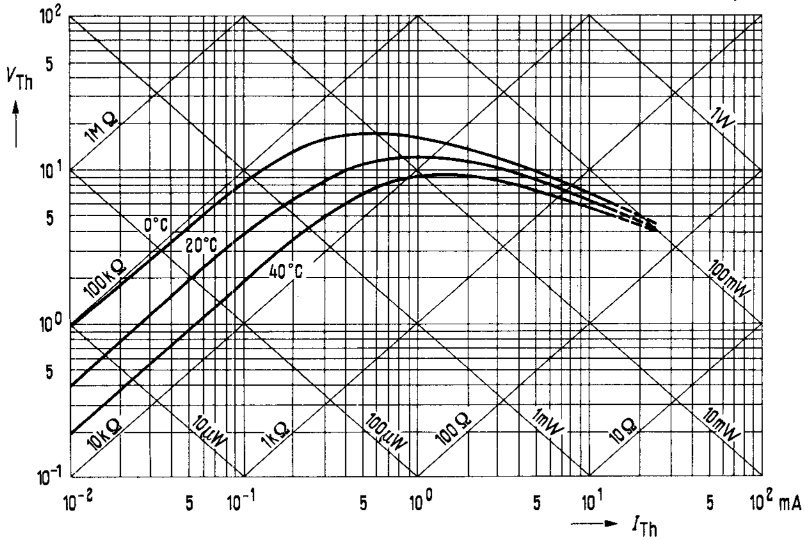


Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C



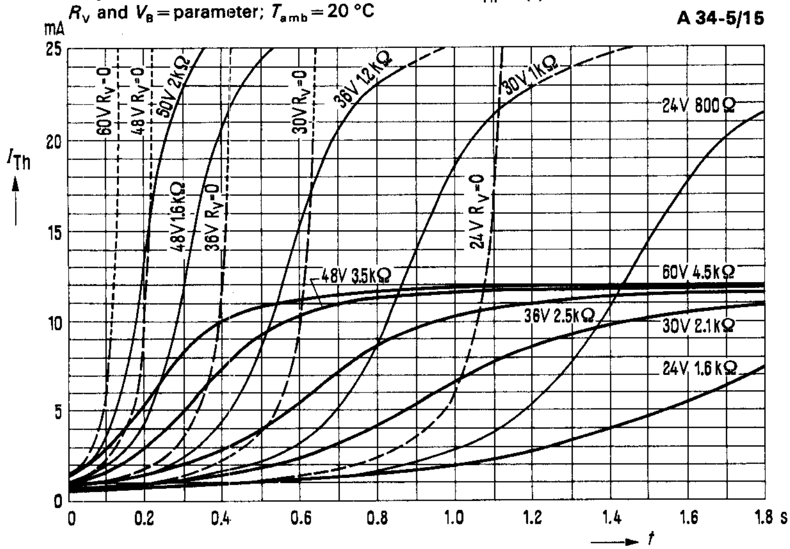
Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

A 34-5/15

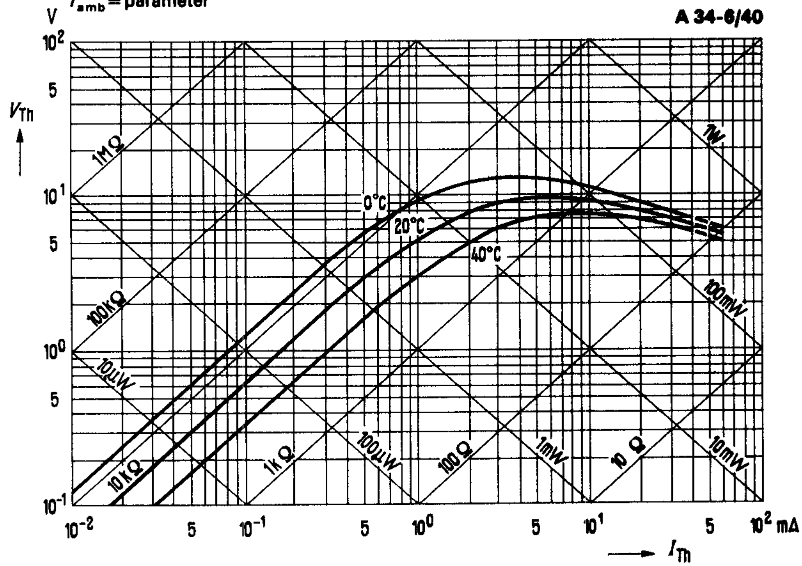


Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C

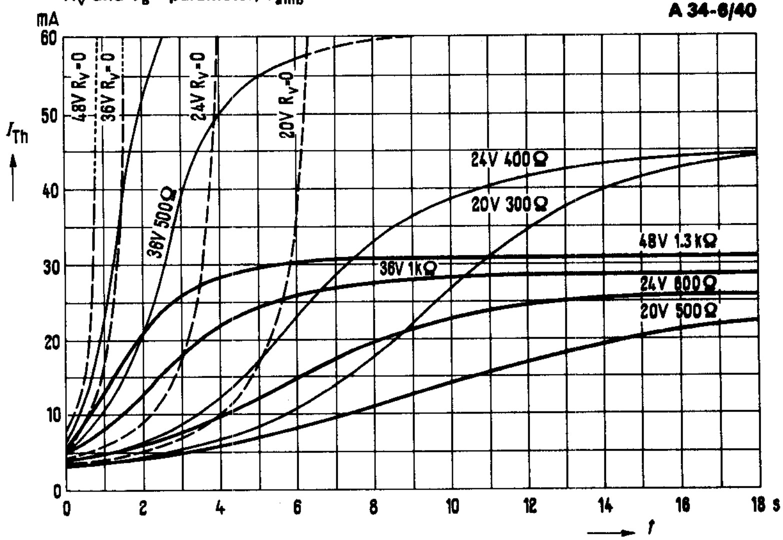
A 34-5/15



Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

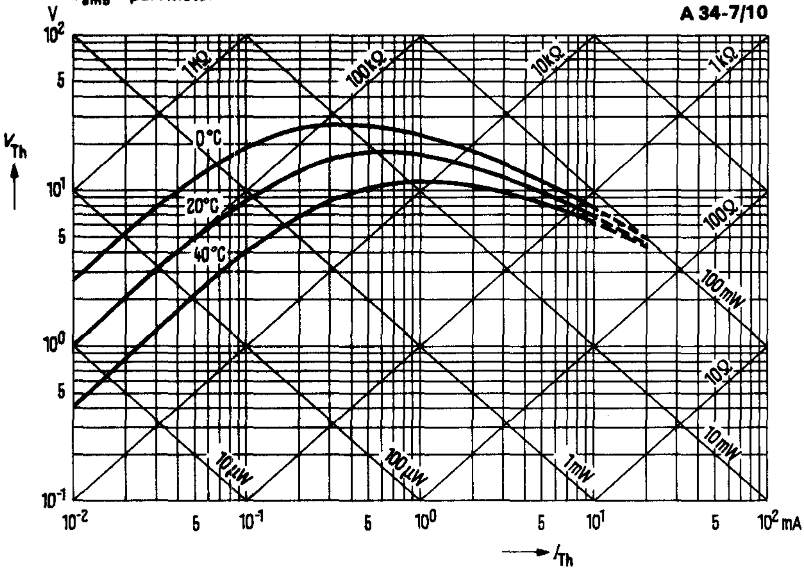


Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C



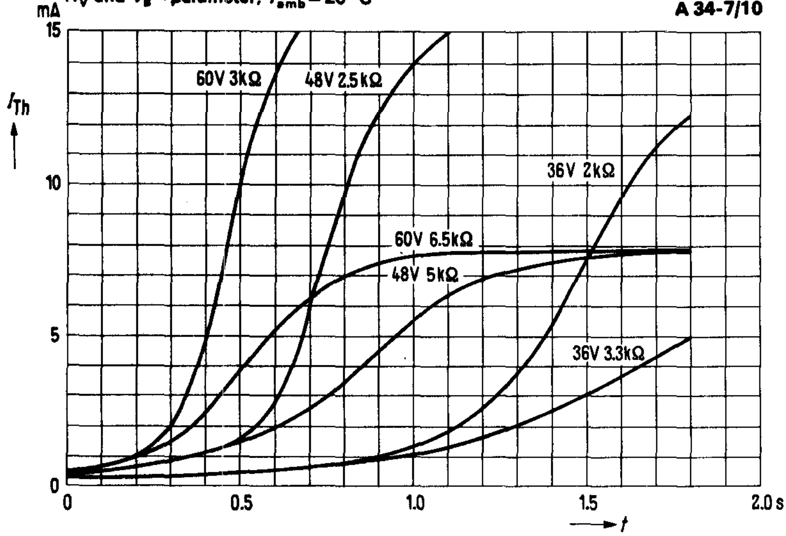
Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

A 34-7/10



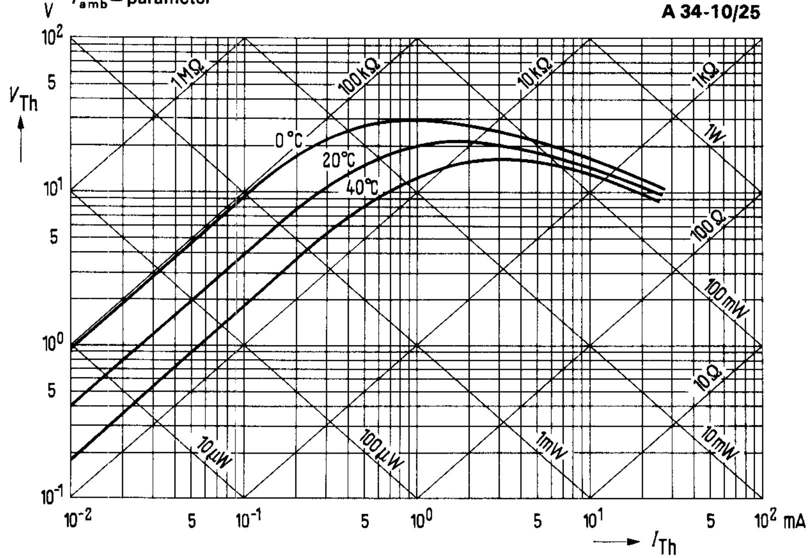
Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_s = parameter; T_{amb} = 20 °C

A 34-7/10



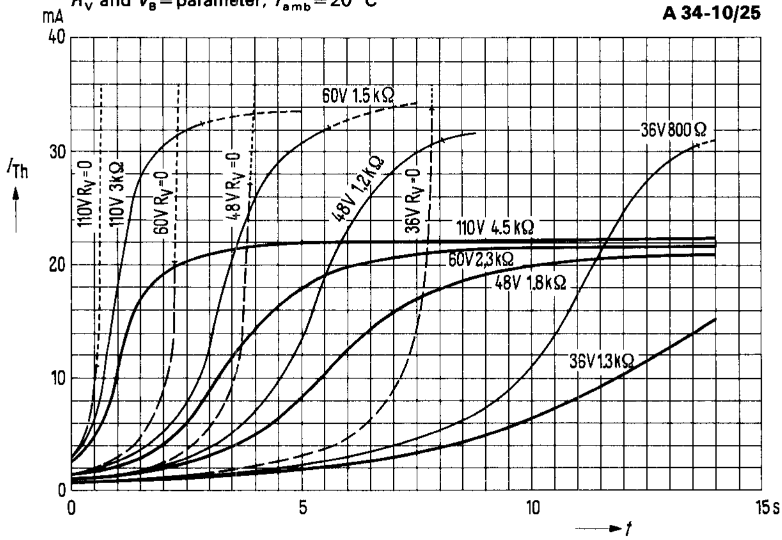
Stationary current-voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter

A 34-10/25

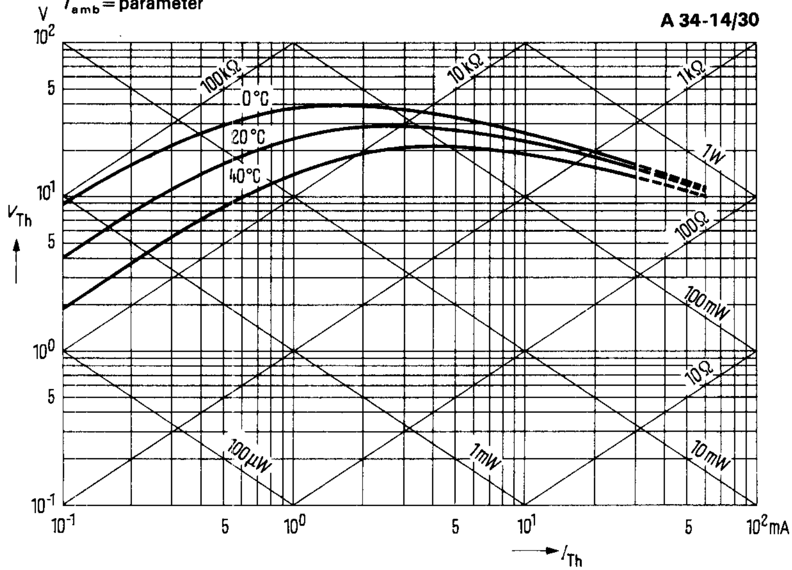


Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C

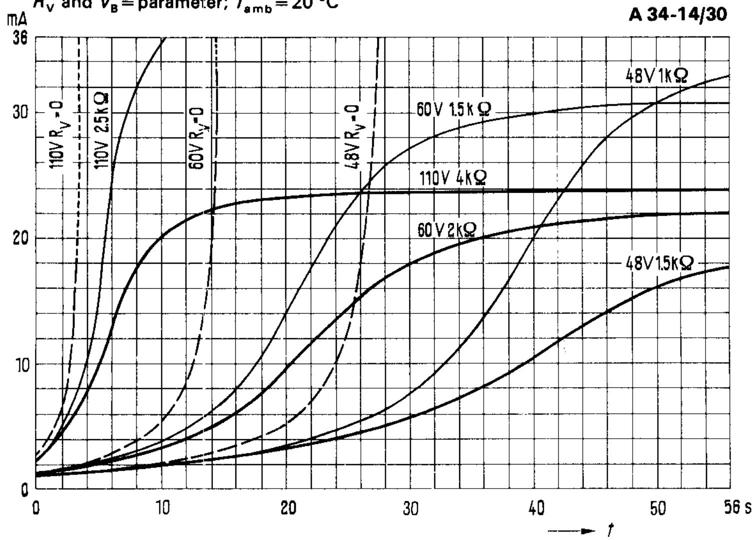
A 34-10/25



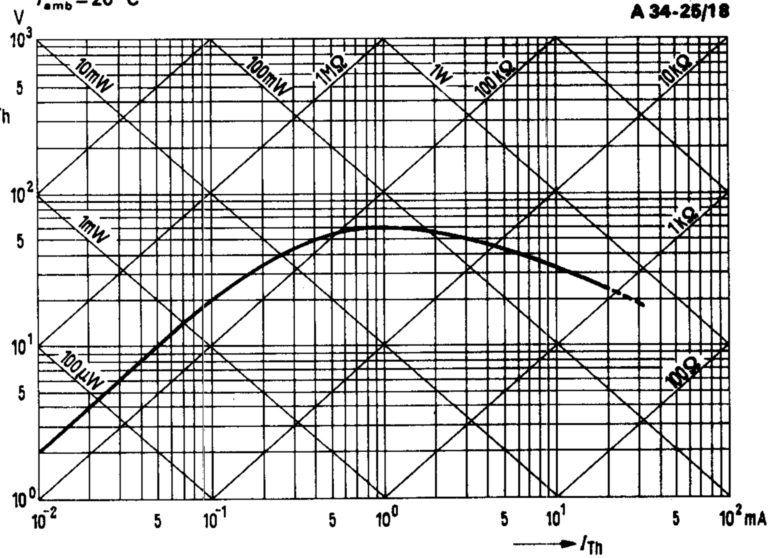
Stationary current voltage characteristic $V_{Th} = f(I_{Th})$
T_{amb} = parameter



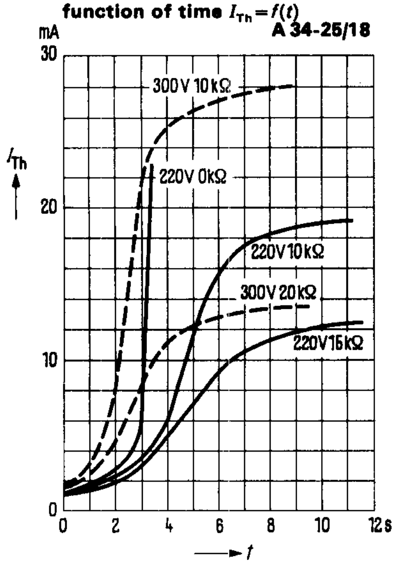
Thermistor current as a function of time $I_{Th} = f(t)$,
R_V and V_B = parameter; T_{amb} = 20 °C



Stationary current voltage characteristic V_{Th}
$T_{amb} = 20\ °C$



Thermistor current as a function of time $I_{Th} = f(t)$

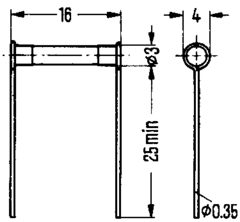


Negative temperature coefficient thermistor, starting-type

Not for new development

Thermistors A 37-9/85 and A 37-22/38 are suitable for universal starting applications, such as the suppression of current pulses at switching transients and the design of delay circuits.

Type	Order number
A 37-9/85	Q 63037-A 3
A 37-22/38	Q 63037-A 4



Weight approx. 0.5 g Dimensions in mm

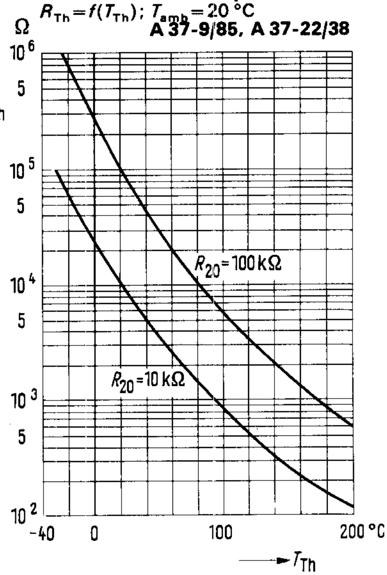
Maximum ratings		A 37-9/85	A 37-22/38	
Maximum current, momentary [1]	i_{Thm}	150	60	mA
Peak load [1]	P_i	1.5	1.5	W
Hot resistance, continuous	R_W	120	600	Ω
Maximum operating temperature	T	200	200	°C

Characteristics (T_{amb} = 20 °C)				
Nominal voltage	V_N	8	22	V
Nominal current	I_N	85	38	mA
Nominal power dissipation	P_{tot}	765	840	mW
Voltage maximum	V_1	20	58	V
Cold-state resistance	R_{20}	10	100	kΩ
Tolerance of the cold-state resistance	R_{20}-Tol.	±20	±20	%
Cold-state resistance (T_{Th} = 25 °C)	R_{25}	8.2	79	kΩ
Hot-state resistance	R_W	120	600	Ω
B-value [2]	B	3440	3950	JK/J
Tolerance of B-value	B-Tol.	±5	±5	%
Temperature coefficient	TC	−4.0	−4.0	%/°C
Temperature of thermistor at R_W	T_W	+200	+200	°C
Thermal conduction constant	$G_{th\,amb}$	4	4	mW/K
Thermal cooling time constant	τ_{th}	60	60	s
Thermal capacity	C_{th}	240	240	mWs/K

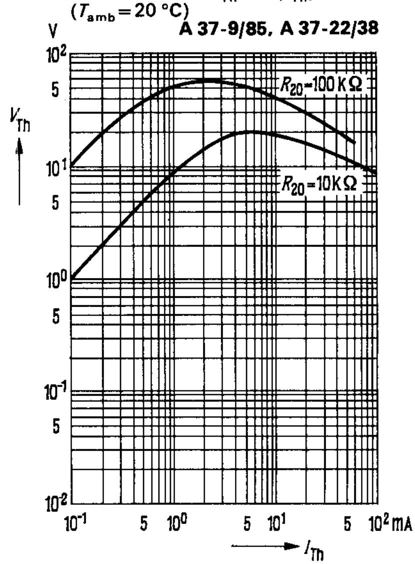
[1]) Only as long as the thermistor resistance exceeds the maximum rating of R_{min}
[2]) Determined by measuring at 20 °C and 100 °C

Not for new development

Thermistor resistance as a function of the temperature
$R_{Th} = f(T_{Th})$; $T_{amb} = 20\ °C$
A 37-9/85, A 37-22/38



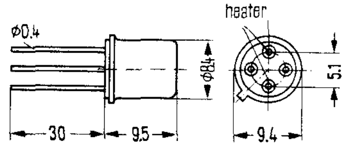
Stationary current voltage characteristic $V_{Th} = f(I_{Th})$;
($T_{amb} = 20\ °C$)
A 37-9/85, A 37-22/38



Negative temperature coefficient thermistor, heater-type

Heater-type thermistors F 74-35/15x and F 74-51/25x lend themselves to the solution of regulation problems in electronic equipment, and are suitable for use in place of mechanical regulation devices. Both the thermistor and the heater terminals are insulated from the case. The type designation code is stamped on the case.

Type	Order number
F 74-35/15x	Q63074-F2
F 74-51/25x	Q63074-F1



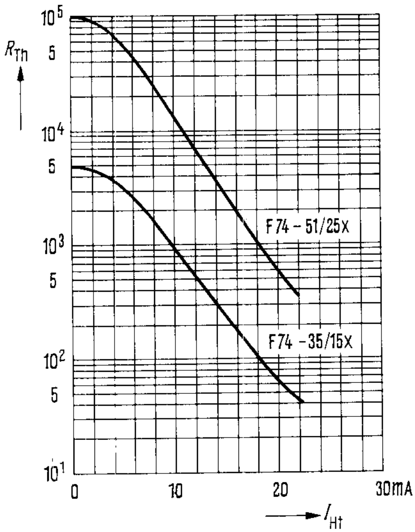
Weight approx. 3 g Dimensions in mm

Maximum ratings		F 74-35/15 x	F 74-51/25 x	
Minimum permissible hot-state resistance	R_W	40	350	Ω
Potential difference between thermistor and heater	$V_{Th\text{-}Ht}$	≦42	≦42	V
Storage temperature	T_s	–55 to +125		°C

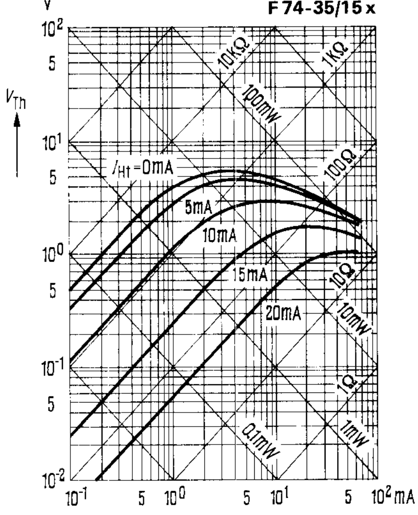
Characteristics (T_{amb} = 20 °C)				
Cold-state resistance (I_{Ht} = 0)	R_{20}	5	100	kΩ
Tolerance of cold-state resistance	R_{20}-Tol.	±20	±20	%
Cold-state resistance (I_{Ht} = 0; T_{Th} = 25 °C)	R_{25}	4.1	80	kΩ
Hot-state resistance (I_{Ht} approx. 22 mA < 25 mA)	R_W	50	500	Ω
Thermal conduction constant of the heater	$G_{th\,amb}$	0.8	0.8	mW/K
B-value[1])	B	3440	3950	JK/J
Tolerance of B-value	B-Tol.	±5	±5	%
Resistance of the heater helix	R_{Ht}	400	400	Ω
Tolerance of resistance of the heater helix	R_{Ht}-Tol.	±10	±10	%
Insulation resistance	R_{is}	$>10^8$	$>10^8$	Ω
Thermal cooling time constant	τ_{th}	15	15	s

[1]) Evaluated from measurements at 20 °C and 100 °C

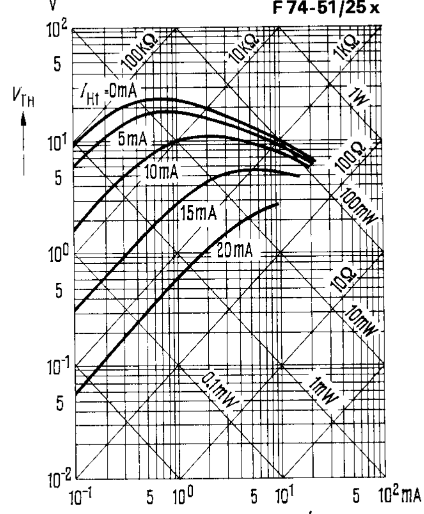
Regulation characteristic $R_{Th}=f(I_{Ht})$
Power dissipation in the thermistor
$\leqq 100\ \mu W$ mean values; $T_{amb}=20\ °C$
F 74-35/15 x, F 74-51/25 x



Stationary current voltage characteristics $V_{Th}=f(I_{Th})$;
I_{Ht}=parameter; ($T_{amb}=20\ °C$)
F 74-35/15 x



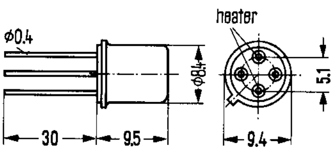
Stationary current voltage characteristics $V_{Th}=f(I_{Th})$;
I_{Ht}=parameter; $T_{amb}=20\ °C$
F 74-51/25 x



Negative temperature coefficient thermistor, heater-type

Heater-type thermistors type F 75-34/14, -41/21, -46/23 and -54/32 lend themselves to the solution of regulation problems in electronic equipment and are also suitable for level control and for use in place of mechanical regulating devices. The thermistor and heater terminals are arranged in diagonal pairs. The thermistor and heater terminals are insulated from the case. The type designation code is stamped on the case.

Type	Order number
F 75-34/14 u	Q 63075-F 9
F 75-41/21 u	Q 63075-F 2
F 75-46/23 u	Q 63075-F 4
F 75-54/32 u	Q 63075-F 6
F 75-34/14 x	Q 63075-F 1
F 75-41/21 x	Q 63075-F 3
F 75-46/23 x	Q 63075-F 5
F 75-54/32 x	Q 63075-F 7
F 75-54/32 s	Q 63075-F 8



Weight approx. 3 g   Dimensions in mm

Delivery program

Type	R_{Ht} (Ω)	Tol. of R_{Ht} (%)
F 75-34/14 u, F 75-41/21 u	100	±10
F 75-34/14 x, F 75-41/21 x	400	±10
F 75-46/23 u, F 75-54/32 u	100	±10
F 75-46/23 x, F 75-54/32 x	400	±10
F 75-54/32 s	100	±10

Maximum ratings		F 75 -34/14	F 75 -41/21	F 75 -46/23	F 75 -54/32	
Minimum permissible hot-state resistance	R_{min}	35	≧80	≧250	≧1500	Ω
Potential difference between thermistor and heater	$V_{Th\text{-}Ht}$	≦42	≦42	≦42	≦42	V
Storage temperature	T_s		−55 to +125			°C

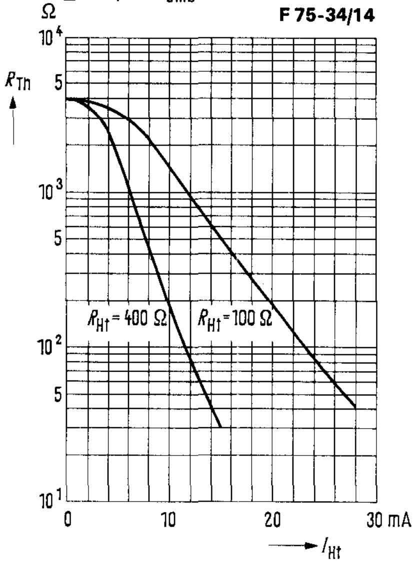
Characteristics (T_{amb}=20 °C)

Cold-state resistance (I_{Ht}=0)	R_{20}	4	10	60	400	kΩ
Tolerance of cold-state resistance	R_{20}-Tol	±20	±20	±20	±20 [3]	%
Cold-state resistance (I_{Ht}=0; T_{Th}=25 °C)	R_{20}	3.3	8.2	48	310	kΩ
Hot-state resistance (I_{Ht} approx. 28<32 mA)	R_w	40	100	300	2000	Ω
Thermal conduction constant of the heater	$G_{th\,amb}$	450	400	400	400	µW/K
B-value [2]	B	3440	3440	3950	4300	JK/J
Tolerance of B-value	B-Tol.	±5	±5	±5	±5	%
Resistance of the heater helix [1] index "u"	R_{Ht}	100	100	100	100	Ω
Insulation resistance between heater and thermistor	R_{is}	$>10^8$	$>10^8$	$>10^8$	$>10^8$	Ω
Thermal cooling time constant	τ_{th}	3	3	3	3	s
Capacitance between heater and thermistor	$C_{Th\text{-}Ht}$	approx.2	–	–	–	pf
Parallel capacitance with thermistor at R_{20}	C_P		approx. 1			pf
Series inductance with thermistor at R_{Th}=35 Ω	L_S		approx. 20			nH
Inductance of heater 100 Ω	L_{Ht}		approx. 200			nH

[1] These thermistors are available with 400 Ω heaters (index "x" on request. The heater current required for obtaining the hot-state resistance R_w is in this case reduced to I_{Ht}≦16 mA
[2] Determined by measuring at 20 °C and 100 °C
[3] F 75-54/32 s: Tolerance of R_{20}±30%

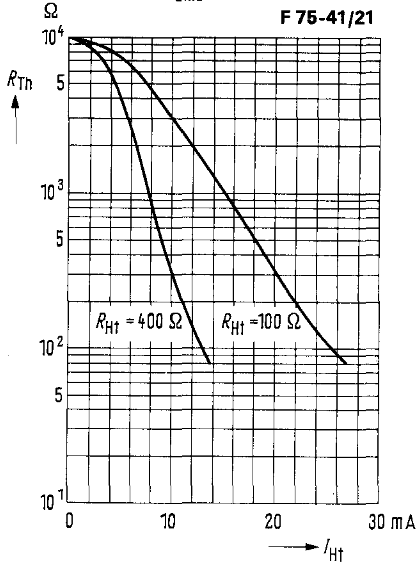
Regulation characteristic $R_{Th} = f(I_{Ht})$
Power dissipation in the thermistor
$\leqq 100\,\mu W$; $T_{amb} = 20\,°C$

F 75-34/14



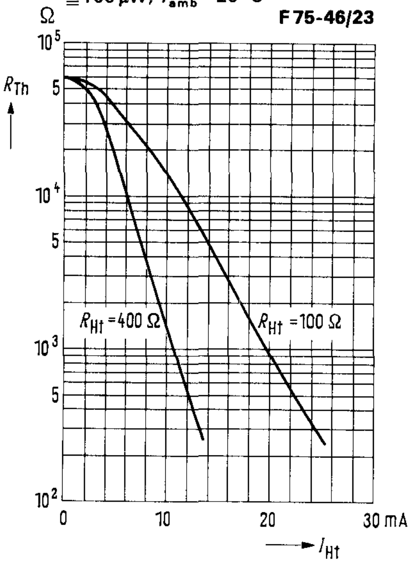
Regulation characteristic $R_{Th} = f(I_{Ht})$
Power dissipation in the thermistor
$\leqq 100\,\mu W$; $T_{amb} = 20\,°C$

F 75-41/21



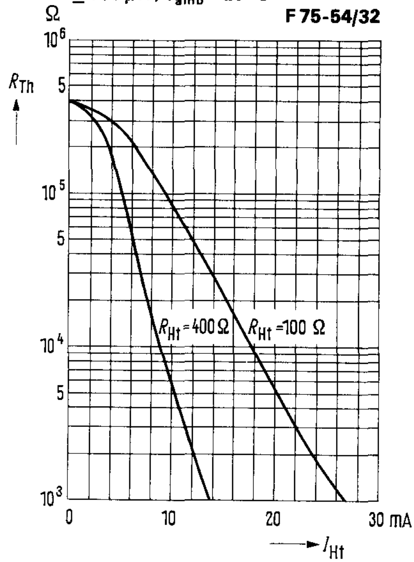
Regulation characteristic $R_{Th} = f(I_{Ht})$
Power dissipation in the thermistor
$\leqq 100\,\mu W$; $T_{amb} = 20\,°C$

F 75-46/23



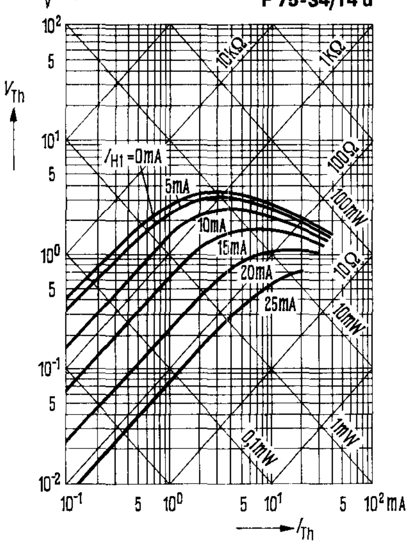
Regulation characteristic $R_{Th} = f(I_{Ht})$
Power dissipation in the thermistor
$\leqq 100\,\mu W$; $T_{amb} = 20\,°C$

F 75-54/32



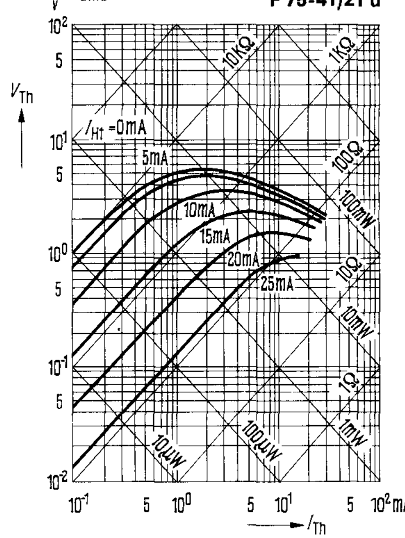
Stationary current voltage characteristic $V_{Th}=f(I_{Th})$; for different heater currents $T_{amb}=20\,°C$

F 75-34/14 u



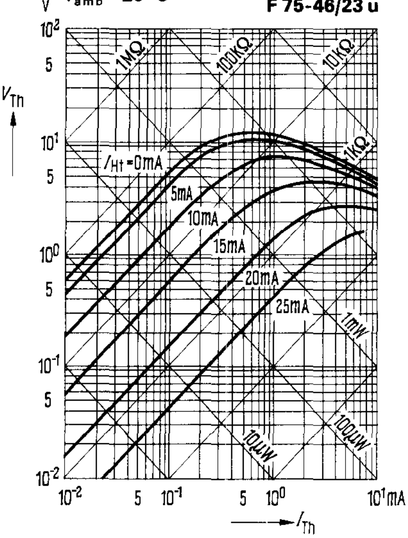
Stationary current voltage characteristic $V_{Th}=f(I_{Th})$; for different heater currents $T_{amb}=20\,°C$

F 75-41/21 u



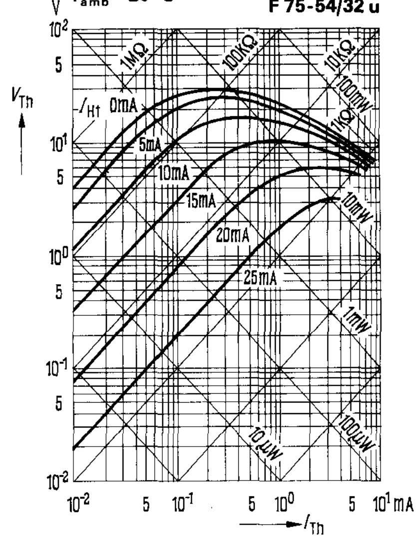
Stationary current voltage characteristic $V_{Th}=f(I_{Th})$; for different heater currents $T_{amb}=20\,°C$

F 75-46/23 u



Stationary current voltage characteristic $V_{Th}=f(I_{Th})$; for different heater currents $T_{amb}=20\,°C$

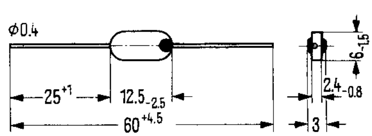
F 75-54/32 u



Negative temperature coefficient thermistor compensation and measuring type

Thermistor K 11 lends itself to the solution of compensation and measuring problems at low loads. It is available with 14 different resistance values. Special production and aging processes ensure high reliability. The surface is coated with blue enamel. The type is identified by its characteristic oval shape. The resistance value R_{20} and the value of the temperature coefficient are stamped on the thermistor. A colour dot indicates closer tolerance ranges of the resistance value, e.g. $R_{20} \pm 10\%$ = silver; $R_{20} \pm 5\%$ = gold.

Type	Order number	Type	Order number
K 11/5%/50 Ω	Q 63011-K 500-J	K 11/10%/10 K	Q 63011-K 103-K
K 11/5%/100 Ω	Q 63011-K 101-J	K 11/10%/20 K	Q 63011-K 203-K
K 11/5%/200 Ω	Q 63011-K 201-J	K 11/10%/50 K	Q 63011-K 503-K
K 11/5%/500 Ω	Q 63011-K 501-J	K 11/10%/100 K	Q 63011-K 104-K
K 11/5%/1 K	Q 63011-K 102-J 1	K 11/10%/500 K	Q 63011-K 504-K
K 11/5%/2 K	Q 63011-K 202-J	K 11/20%/10 Ω	Q 63011-K 100-M
K 11/5%/5 K	Q 63011-K 502-J	K 11/20%/20 Ω	Q 63011-K 200-M
K 11/5%/10 K	Q 63011-K 103-J	K 11/20%/50 Ω	Q 63011-K 500-M
K 11/5%/20 K	Q 63011-K 203-J	K 11/20%/100 Ω	Q 63011-K 101-M
K 11/5%/50 K	Q 63011-K 503-J	K 11/20%/200 Ω	Q 63011-K 201-M
K 11/5%/100 K	Q 53011-K 104-J	K 11/20%/500 Ω	Q 63011-K 501-M
K 11/10%/20 Ω	Q 63011-K 200-K	K 11/20%/1 K	Q 63011-K 102-M 1
K 11/10%/50 Ω	Q 63011-K 500-K	K 11/20%/2 K	Q 63011-K 202-M
K 11/10%/100 Ω	Q 63011-K 101-K	K 11/20%/5 K	Q 63011-K 502-M
K 11/10%/200 Ω	Q 63011-K 201-K	K 11/20%/10 K	Q 63011-K 103-M
K 11/10%/500 Ω	Q 63011-K 501-K	K 11/20%/20 K	Q 63011-K 203-M
K 11/10%/1 K	Q 63011-K 102-K 1	K 11/20%/50 K	Q 63011-K 503-M
K 11/10%/2 K	Q 63011-K 202-K	K 11/20%/100 K	Q 63011-K 104-M
K 11/10%/5 K	Q 63011-K 502-K	K 11/20%/500 K	Q 63011-K 504-M



Weight approx. 0.5 g   Dimensions in mm

Maximum ratings		K 11	
Maximum continuous operating temperature	T	+120	°C
Maximum continuous load (T_{amb} = 20 °C)	P_{tot}	100	mW

Characteristics (T_{amb} = 20 °C)

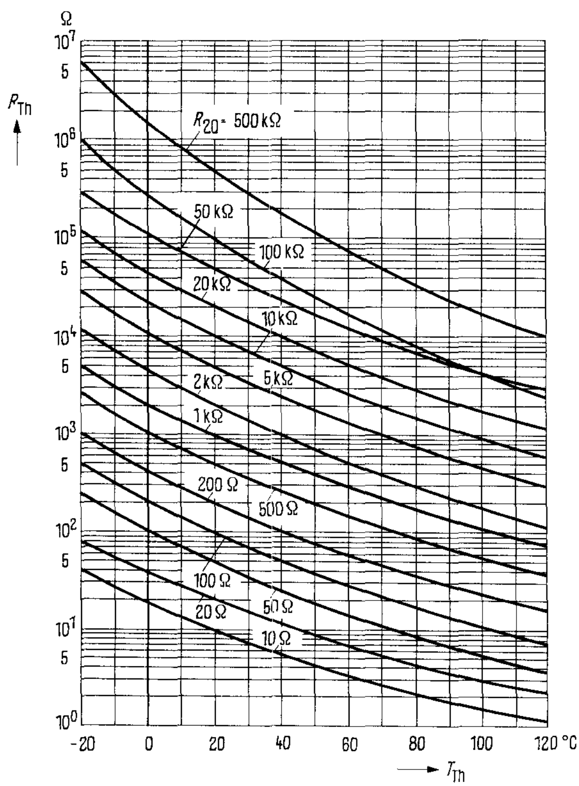
Thermal conduction constant	$G_{th\,amb}$	8	mW/K
Thermal cooling time constant	τ_{th}	30	s
Tolerance of B-value	B-Tol.	±5	%

Delivery program

Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient at 20 °C, as well as tolerances of R_{20}.

	K11														
R_{20}	10	20	50	100	200	500	1 k	2 k	5 k	10 k	20 k	50 k	100 k	500 k	Ω
R_{25}	8.6	17	42	84	170	420	830	1.7 k	4.2 k	8.3 k	16.6 k	41 k	78 k	390 k	Ω
B [1])	2580	2580	3000	3000	3000	3000	3240	3240	3250	3250	3250	3250	4250	4550	JK/J
TC	3.0	3.0	3.5	3.5	3.5	3.5	3.8	3.8	3.8	3.8	3.8	3.8	5.0	5.3	%/K
±20% (b)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
±10% (c)		*	*	*	*	*	*	*	*	*	*	*	*	*	
±5% (d)			*	*	*	*	*	*	*	*	*	*	*		

Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table



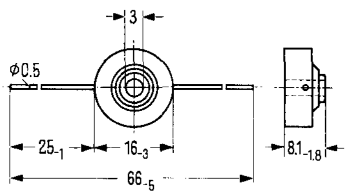
[1]) Determined by measuring at 20 °C and 100 °C

Negative temperature coefficient thermistor, compensation and measuring type

Not for new development

Thermistor K 13 lends itself to the solution of temperature measuring, control, and compensation problems at higher loads. Special production and aging processes ensure high reliability. The metal case, which is electrically insulated from the thermistor, provides for good thermal contact with the chassis. The type is identified by its shape. The resistance value R_{20} and the value of the temperature coefficient are stamped on the thermistor. The maximum permissible torque to be applied when screwing the thermistor to the chassis is 4 cm · N [3]).

Type	Order number
K 13/10%/50 Ω	Q63013-K500-K
K 13/10%/200 Ω	Q63013-K201-K
K 13/10%/2 K	Q63013-K202-K
K 13/10%/50 K	Q63013-K503-K



Weight approx. 5 g   Dimensions in mm

Maximum ratings

		K 13	
Maximum continuous operating temperature	T	+120	°C
Maximum continuous load (T_{amb} = 20 °C)	P_{tot} [1])	600	mW
Voltage between thermistor and chassis	V	≤42	V

Characteristics (T_{amb} = 20 °C)

Thermal conductivity [1])	$G_{th\,case}$	60	mW/K
Thermal cooling time constant [1])	$\tau_{th\,case}$	approx. 50	s
Tolerance of cold-state resistance R_{20}	R_{20}-Tol.	±10	%
Tolerance of B-value	B-Tol.	±5	%

Delivery program

Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient TC at 20 °C.

	K 13				
R_{20}	50	200	2 k	50 k	Ω
R_{25}	42	160	1.6 k	39 k	Ω
B [2])	3000	3530	3950	4600	JK/J
TC	3.5	4.1	4.6	5.4	%/K

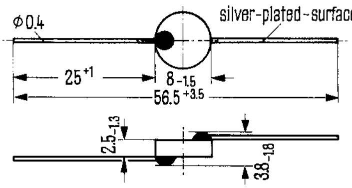
Types with different electrical values and tolerances available on request from special production runs.

[1]) When mounted on a chassis
[2]) Determined by measuring at 20 °C and 100 °C
[3]) N = Newton (1 kp = 9.806 N)

Negative temperature coefficient thermistor, compensation-type

Thermistor K 15 is suitable for solving compensation problems at low loads. It is supplied without an enamel coat. The type is identified by its shape. The resistance value R_{20} is stamped on the thermistor.

Type	Order number
K 15/20%/4 Ω	Q63015-K40-M
K 15/20%/50 Ω	Q63015-K500-M
K 15/20%/150 Ω	Q63015-K151-M
K 15/20%/500 Ω	Q63015-K501-M
K 15/20%/2 K	Q63015-K202-M
K 15/20%/5 K	Q63015-K53-M



Weight approx. 0.5 g   Dimensions in mm

Maximum ratings

		K 15	
Maximum continuous operating temperature	T	+150	°C
Maximum continuous load (T_{amb}=20 °C)	P_{tot}	1000	mW

Characteristics (T_{amb}=20 °C)

Thermal conduction constant	$G_{th\,amb}$	8	mW/K
Thermal cooling time constant	τ_{th}	30	s
Tolerance of B-value	B-Tol.	±5	%
Tolerance of cold-state resistance	R_{20}-Tol.	±20	%

Delivery program

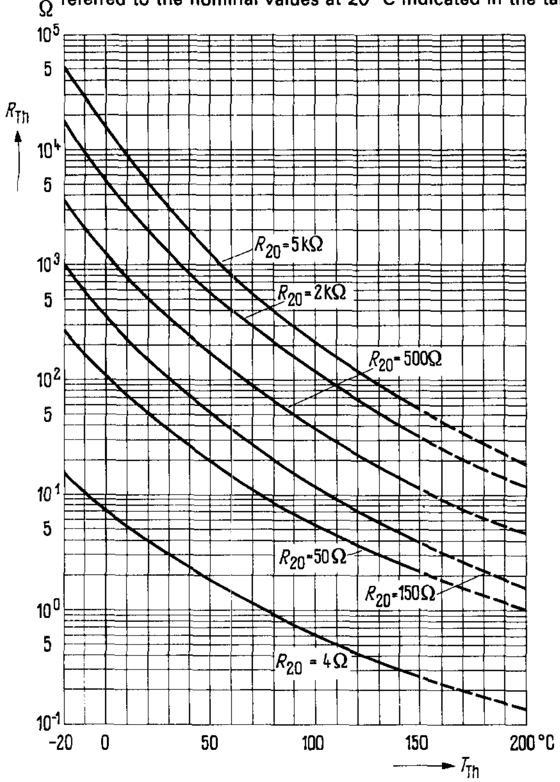
Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient TC at 20 °C.

	K 15						
R_{20}	4	50	150	500	2 k	5 k	Ω
R_{25}	3.5	42	120	410	1.6 k	3.9 k	Ω
B[1])	2580	3000	3530	3610	3950	4250	JK/J
TC	3.0	3.5	4.1	4.2	4.6	5.0	%/K

Types with different electrical values and tolerances available on request from special production runs.

[1]) Determined by measuring at 20 °C and 100 °C

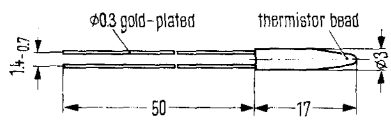
Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table



Negative temperature coefficient thermistor, measuring-type

Thermistors K 17 are temperature probes and are suitable for the solution of measuring and control problems. The thermistor bead sealed into a glass-case displays low thermal inertia. The leads are gold-plated. Special production and aging processes ensure high reliability. The type designation code and the resistance value R_{20} are stamped on the case. Thermistors K 17/4 kΩ, K 17/10 kΩ and K 17/100 kΩ can be supplied as pairs, if desired.

Type	Order number
K 17/10%/2.5 K	Q63017-K252-K
K 17/10%/4 K	Q63017-K402-K
K 17/10%/4 K-P1	Q63017-K402-K1
K 17/10%/4 K-P2	Q63017-K402-K2
K 17/10%/10 K	Q63017-K103-K
K 17/10%/10 K-P1	Q63017-K103-K1
K 17/10%/10 K-P2	Q63017-K103-K2
K 17/10%/100 K-P1	Q63017-K104-K1
K 17/10%/100 K-P2	Q63017-K104-K2
K 17/10%/100 K	Q63017-K104-K
K 17/20%/2.5 K	Q63017-K252-M
K 17/20%/4 K	Q63017-K402-M
K 17/20%/4 K-P1	Q63017-K402-M1
K 17/20%/4 K-P2	Q63017-K402-M2
K 17/20%/10 K	Q63017-K103-M
K 17/20%/10 K-P1	Q63017-K103-M1
K 17/20%/10 K-P2	Q63017-K103-M2
K 17/20%/100 K	Q63017-K104-M
K 17/20%/100 K-P1	Q63017-K104-M1
K 17/20%/100 K-P2	Q63017-K104-M2



Weight approx. 0.25 g   Dimensions in mm

Maximum ratings		K 17	
Maximum continuous operating temperature	T	+250	°C
Maximum continuous load (T_{amb} = 20 °C)	P_{tot}	160	mW

Characteristics (T_{amb} = 20 °C)			
Thermal conductivity	$G_{th\,amb}$	0.8	mW/K
Thermal cooling time constant	τ_{th}	3	s
Tolerance of cold-state resistance²)	R_{20}-Tol.	±20 (b)	%
		±10 (c)	%
Tolerance of B-value	B-Tol.	±5	%

Delivery program

Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient TC at 20 °C.

	K 17				
R_{20}	2.5 k	4 k	10 k	100 k	Ω
R_{25}	2 k	3.3 k	8.2 k	80 k	Ω
B¹)	3420	3420	3420	3950	JK/J
TC	4.0	4.0	4.0	4.6	%/K

Types with different electrical values and tolerances of R_{20} on request.

¹) Determined by measuring at 20 °C and 100 °C
²) Thermistors labelled with "b" = ±20%, "c" = ±10% and "h" = ±30%

Pairing conditions for type K 17 – Pairs:

Pairing 1

$\frac{\Delta R}{R_M} \leqq \pm 2.5\%$; $\frac{\Delta B}{B_M} \leqq \pm 2\%$

Designation for ordering:
K 17/20%/4k-P1,
Q63017-K402-M1

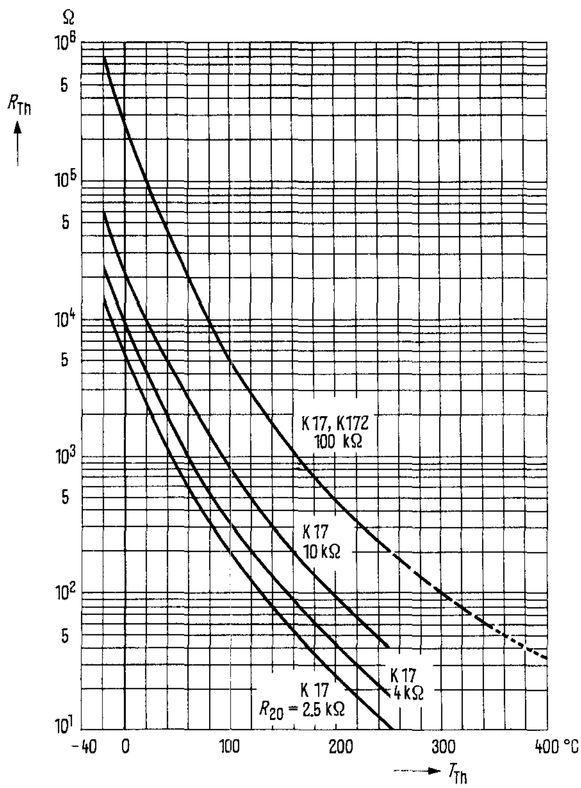
Pairing 2

$\frac{\Delta R}{R_M} \leqq \pm 1.5\%$; $\frac{\Delta B}{B_M} \leqq \pm 1\%$

Designation for ordering:
K 17/20%/4k-P2,
Q63017-K402-M2

R_M = Average cold resistance value
B_M = Average B-value
ΔR = R_{20}-difference of the pair
ΔB = B-value difference of the pair

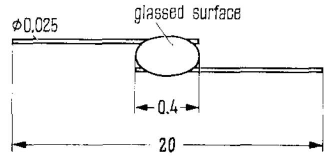
Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table



Negative temperature coefficient thermistor, measuring type

Thermistor K 19 is a thermistor bead of small dimensions with a very small time constant. It is designed for mounting in holders adapted to the application involved, and used for temperature measurements, especially where rapid changes in temperature occur, and for measuring heat radiation, vacua, and the rate of flow of gases. Thermistor K 19 is available in pairs on request.

Type	Order number
K 19/20%/12 K	Q 63019-K 123-M
K 19/20%/12 K-P 1	Q 63019-K 123-M 1
K 19/20%/12 K-P 2	Q 63019-K 123-M 2
K 19/10%/12 K	Q 63019-J 123-K



Weight approx. 0.3 g Dimensions in mm

		K 19	
Maximum ratings			
Maximum continuous operating temperature	T	+200	°C
Maximum continuous load (T_{amb} = 20 °C)	P_{tot}	25	mW
Characteristics (T_{amb} = 20 °C)			
Cold-state resistance	R_{20}	12	kΩ
Tolerance of cold-state resistance	R_{20}-Tol.	±20; ±10	%
Cold-state resistance (T_{amb} = 25 °C)	R_{25}	10	kΩ
Thermal conduction constant [1]	$G_{th\,amb}$	140	μW/K
B-value [2]	B	3440	JK/J
Tolerance of B-value	B-Tol.	±5	%
Temperature coefficient	TC	−4.0	%/K
Thermal cooling time constant [1]	τ_{th}	approx. 0.4	s

Other characteristics on request.

Pairing conditions for type K 19 – Pairs

Pairing 1

$$\frac{\Delta R}{R_M} \leqq \pm 2.5\%; \quad \frac{\Delta B}{B_M} \leqq \pm 2\%$$

Designation for ordering:
K 19/20%/12 K-P 1
Q 63019-K 123-M 1

Pairing 2

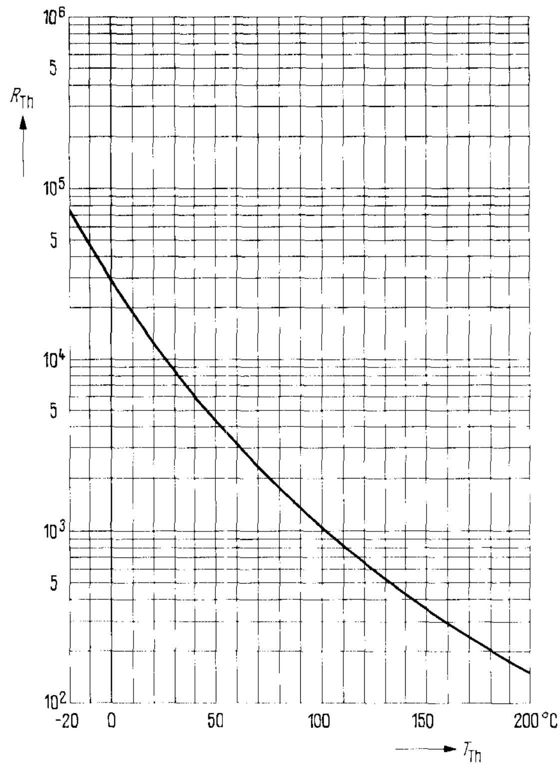
$$\frac{\Delta R}{R_M} \leqq \pm 1.5\%; \quad \frac{\Delta B}{B_M} \leqq \pm 1\%$$

Designation for ordering:
K 19/20%/12 K-P 2
Q 63019-K 123-M 2

R_M = Mean cold resistance of the two thermistors
B_M = Mean B-value of the two thermistors
$\Delta R = R_{20}$ difference between the two thermistors
$\Delta B = B$-value difference between the two thermistors

[1]) In static air
[2]) Evaluated from measurements at 20 °C and 100 °C

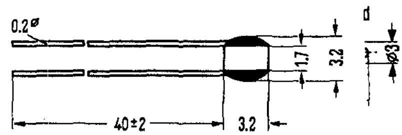
Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$



Negative temperature coefficient thermistor, compensation and measuring type

Thermistor K 22 lends itself to the solution of compensation and measuring problems, particularly as a probe in automatic protection devices for copper coils. The type is identified by its shape. The cold-state resistance values are indicated by a colour dot.

Type	Order number
K 22/20%/1 K	Q 63022-K 102-M
K 22/20%/10 K	Q 63022-K 103-M
K 22/20%/40 K	Q 63022-K 403-M
K 22/20%/250 K	Q 63022-K 254-M



Weight approx. 0.1 g Dimensions in mm

Maximum ratings		K 22	
Maximum continuous operating temperature	T	+200	°C
Maximum electrical load (T_{amb} = 20 °C)	P_{tot}	150	mW

Characteristics (T_{amb} = 20 °C)			
Thermal conduction constant	$G_{th\,amb}$	1	mW/K
Thermal cooling time constant	τ_{th}	30	s
Tolerance of B-value	B-Tol.	±7	%
Tolerance of cold-state resistance	R_{20}-Tol.	±20	%

Delivery program

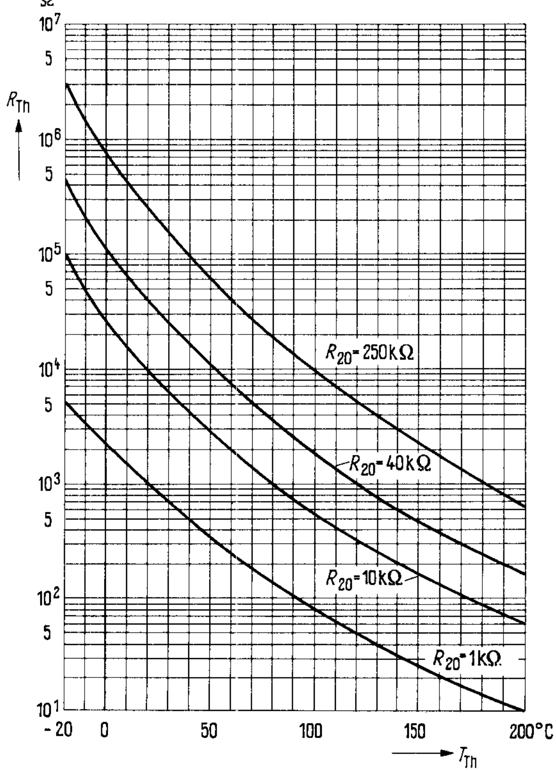
Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient TC at 20 °C, as well a colour coding scheme.

	K 22				
R_{20}	1 k	10 k	40 k	250 k	Ω
R_{25}	820	8 k	31 k	195 k	Ω
B[1])	3530	3950	4300	4560	JK/J
TC	4.1	4.6	5.0	5.3	%/K
Colour code	orange	brown	yellow	none	–

K 22 without wire on request (K 220).
Other resistance values on request.

[1]) Determined by measuring at 20 °C and 100 °C

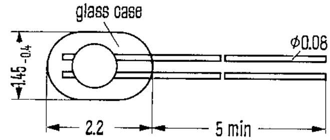
Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table



Measuring thermistors

Thermistors K 29 and K 292 consist of glass coated thermistor beads. Their small dimensions allow measurement in small spaces. The thermistors are suitable for temperature measurement and control, as well as radiation and flow measurement. They are delivered in pairs, if requested.

Type	Order number
K 29/10/12 K	Q 63029-K 123-K
K 29/10%/12 K-P 1	Q 63029-K 123-K 1
K 29/10%/12 K-P 2	Q 63029-K 123-K 2
K 29/20%/12 K	Q 63029-K 123-M
K 29/20%/12 K-P 1	Q 63029-K 123-M 1
K 29/20%/12 K-P 2	Q 63029-K 123-M 2
K 292/20%/100 K	Q 63029-K 2104-M
K 292/20%/100 K-P 1	Q 63029-K 2104-M 1
K 292/20%/100 K-P 2	Q 63029-K 2104-M 2



Weight approx 6 mg Dimensions in mm

Maximum ratings		K 29	K 292	
Maximum operating temperature	T	+250	+350	°C
Maximum continuous load (T_{amb} = 20 °C)	P_{tot}	80	120	mW
Characteristics (T_{amb} = 20 °C)				
Cold-state resistance	R_{20}	12	100	kΩ
Tolerance of cold-state resistance	R_{20}-Tol.	±20	±20	%
		±10	–	%
Cold-state resistance (T_{amb} = 25 °C)	R_{25}	10	80	kΩ
B-value [1]	B	3430	3950	JK/J
Tolerance of the B-value	B-Tol.	±5	±5	%
Temperature coefficient	TC	−4	−4.6	%/K
Thermal conduction constant in static air	G_{thamb}	0.4	0.4	mW/K
Thermal cooling time constant	τ_{th}	appr. 5	appr. 5	s

Other characteristics on request.

Pairing conditions for K – Thermistor – Pairs:

Pairing 1

$\frac{\Delta R}{R_M} \leqq \pm 2.5\%;\quad \frac{\Delta B}{B_M} \leqq \pm 2\%$

Ordering code: K 29/20%/12 K-P 1
Q 63029-K 123-M 1

Pairing 2

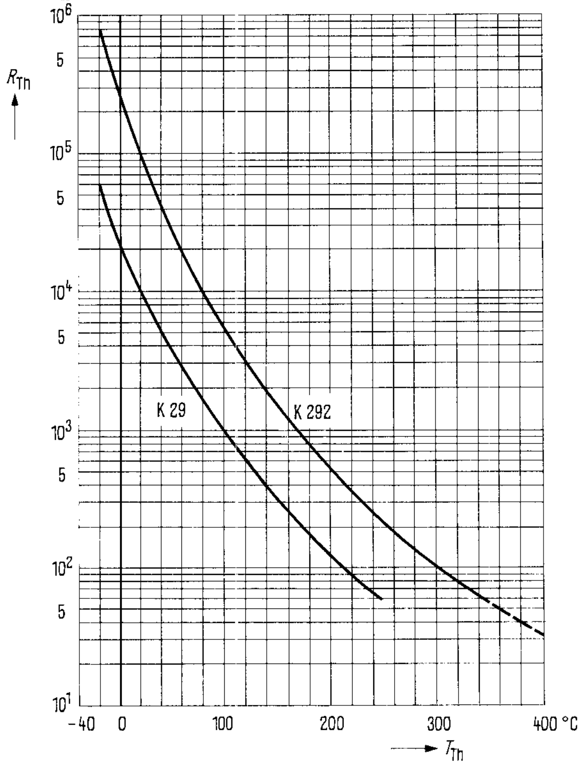
$\frac{\Delta R}{R_M} \leqq \pm 1.5\%;\quad \frac{\Delta B}{B_M} \leqq \pm 1\%$

Ordering code: K 29/20%/12 K-P 2
Q 63029-K 123-M 2

R_M = Mean value of the cold-state resistances of both types
B_M = Mean value of the B-values of both types
$\Delta R = R_{20}$ difference between the two thermistors
ΔB = Difference between the B-values of the two thermistors

[1]) Determined by measuring at 20 °C and 100 °C

Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$

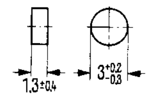


K 220 S 1/2.5 kΩ

Measuring thermistor

The thermistor K 220 S 1/2.5 kΩ is suitable for the solution of measuring problems at low electrical loads. The faces of the thermistor disc are lapped in a plane parallel way in order to ensure good thermal contact when mounting the disc in a probe case. The magnitude of the thermal conduction constant G_{th} and the thermal cooling time constant τ_{th} depend on the respective mounting conditions.

Type	Order number
K 220 S 1/2.5 kΩ	Q63022-K302-S1



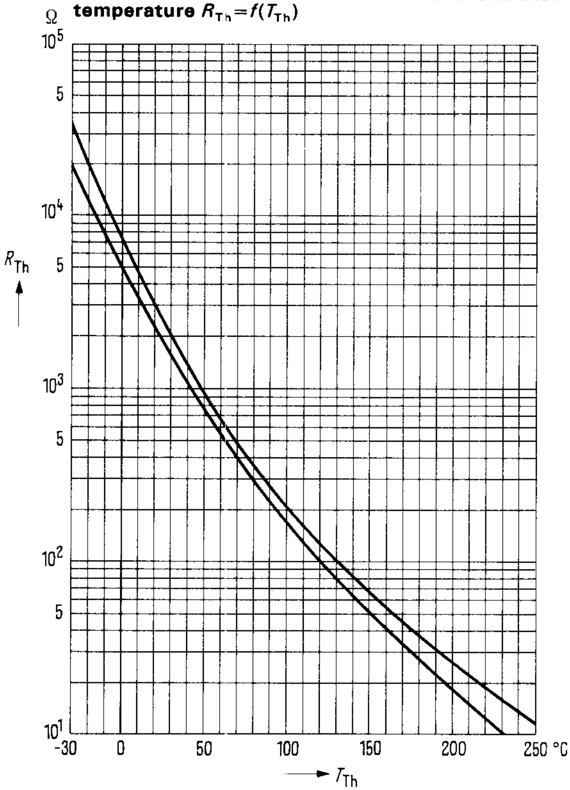
Weight approx. 0.1 g Dimensions in mm

Maximum ratings		K 220 S 1/2.5 kΩ	
Maximum operating temperature	T	250	°C
Minimum permissible hot-state resistance	R_{min}	appr. 10	Ω
Storage temperature	T_s	−55 to +250	°C

Characteristics			
Cold-state resistance	R_{20}	2.5	k
Tolerance of the cold-state resistance	R_{20}-Tol.	±10	%
Cold-state resistance	R_{130}	90	%
Tolerance of the cold-state resistance	R_{130}-Tol.	±10	%
B-value[1])	B	3530	JK/J
Thermal capacity	C_{th}	appr. 30	mWs/K

[1]) Determined by measuring at 20 °C and 100 °C

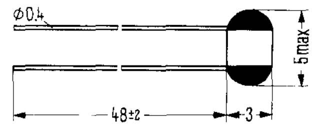
Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$



Measuring and compensation thermistor

Type K 222 S 1/2.5 kΩ is suitable for the solution of measuring and compensation problems at low electrical load. It is supplied unvarnished.

Type	Order number
K 222 S 1/2.5 kΩ	Q63022-K2-S1



Weight approx. 0.2 g Dimensions in mm

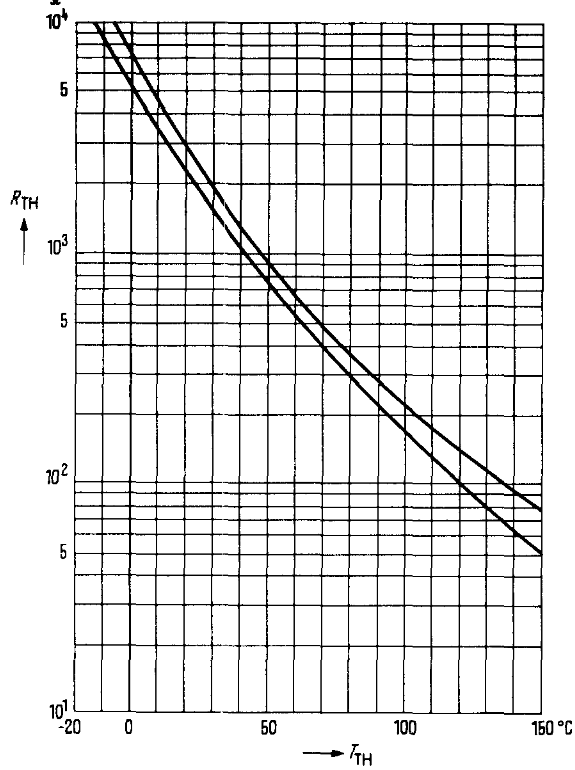
Maximum ratings		K 222 S 1/2.5 kΩ	
Maximum operating temperature	T	150	°C
Maximum power dissipation	P_{tot}	160	mW

Characteristics

Cold-state resistance	R_{20}	2.5	kΩ
Tolerance of the cold-state resistance	R_{20}-Tol.	±10	%
Cold-state resistance	R_{25}	2.1	kΩ
Cold-state resistance	R_{80}	325	Ω
Tolerance of the cold-state resistance	R_{80}-Tol.	±10	%
Thermal conduction constant	G_{thamb}	2	mW/K
B-value [1])	B	3530	JK/J
Thermal cooling time constant	τ_{th}	20	s

[1]) In static air
[2]) Determined by measuring at 20 °C and 100 °C

Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$



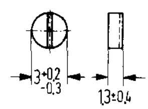
Measuring and compensation thermistors

Preliminary data

Type K 228 is particularly suitable for thick and thin film circuits due to its special shape. It consists of an unwired 3 mm tablet which is slotted on one side so that there are two contact surfaces in the form of a half-circle.

The thermistor may be soldered on by wetting the contact surfaces with flux, placing the thermistor on the conductor paths and heating the entire substrate.

Type	Order number
K 228 4.7 kΩ	Q 63022-K 8004-N 40
K 228 25 kΩ	Q 63022-K 8025-N 40
K 228 35 kΩ	Q 63022-K 8035-N 40
K 228 100 kΩ	Q 63022-K 8100-N 40



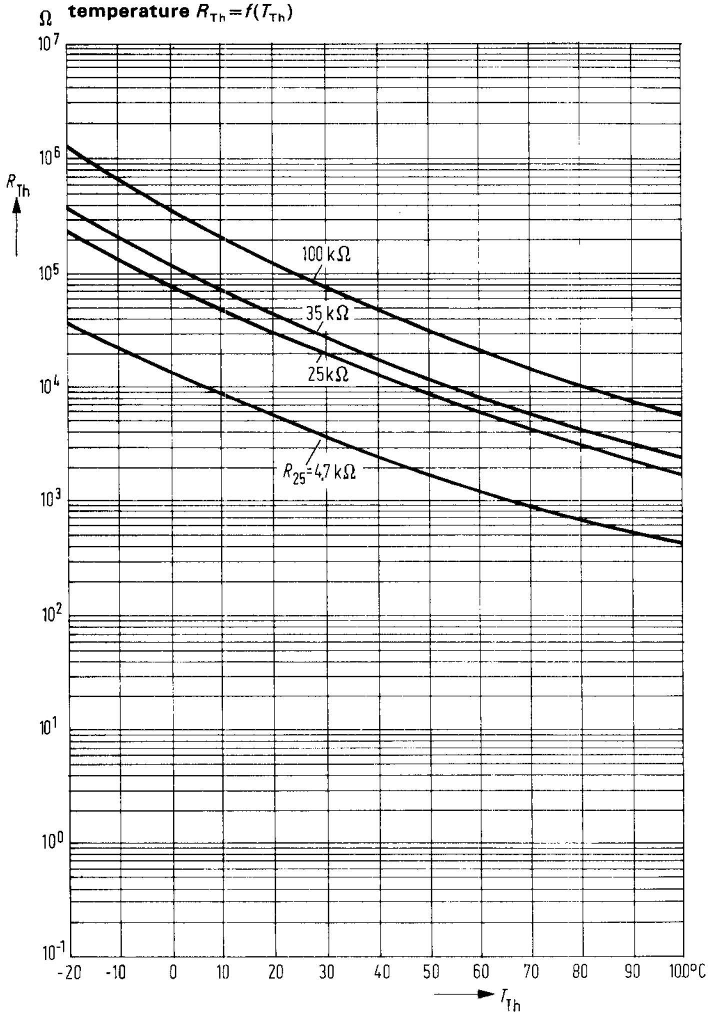
Weight approx. 0.15 g Dimensions in mm

Maximum ratings		K 228	
Maximum operating temperature	T_{max}	+100	°C
Storage temperature	T_S	−55 to +150	°C
Maximum soldering temperature	T_L	+250	°C
Maximum soldering time	t	25	s
Maximum power dissipation (T_{amb} = 25 °C)	P_{tot}	approx. 100	mW

Characteristics						
Cold-state resistance	R_{25}	4.7	25	35	100	kΩ
Tolerance of the cold-state resistance	R_{25}-Tol.	±25	±25	±25	±25	%
B-value	B	3560	3950	4100	4300	K
Tolerance of the B-value	B-Tol.	±5	±5	±5	±5	%

The magnitude of the thermal conduction constant G_{th} and the thermal cooling time constant τ_{th} depend on the respective mounting conditions.

Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$



Thermistor thermostat

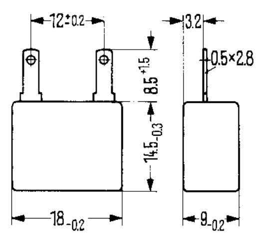
K 243 is designed for monitoring and controlling the temperature of deep freezers or cold-storage plants. It consists of a thermistor tablet built into a plastic case.

The thermistor has two 2.8 × 0.5 flat prongs, suitable for use with AMP-Faston type plugs.

In order to obtain a high mesuring accuracy at the operating temperature, the nominal resistance of the K 243/9.4 kΩ is measured with a tolerance of ±3.5% at −15 °C to −30 °C (cf. table).

The type designation code is stamped on the case.

Type	Order number
K 243/9.4 KΩ	Q63024-K3942



Weight approx. 4.5 g Dimensions in mm

Maximum ratings		K 243/9.4 kΩ	
Maximum continuous load	P_{tot} [1])	300	mW
(T_{amb} = 20 °C)	P_{tot} [2])	150	mW
Maximum operating temperature	T	100	°C
Storage temperature	T_S	−55 to +100	°C
Characteristics			
Nominal resistance (T_{Th} = −30 °C)	R_{-30}	9.4	kΩ
Tolerance of nominal resistance	R_{-30}-Tol.	3.5	%
from −15 °C to −30 °C	R_{Th}-Tol.	±3.5	%
Thermal conduction constant [1])	$G_{th\,case}$	≥ 20	mW/K
Thermal cooling time constant [1])	$\tau_{th\,case}$	approx. 45	s
Thermal conduction constant [2])	$G_{th\,amb}$	approx. 12	mW/K
Thermal cooling time constant [2])	$\tau_{th\,amb}$	approx. 180	s

[1]) When mounted on metal plates with good thermal conduction
[2]) In static air

Thermistor resistance as a function of the thermistor temperature $R_{Th}=f(T_{Th})$

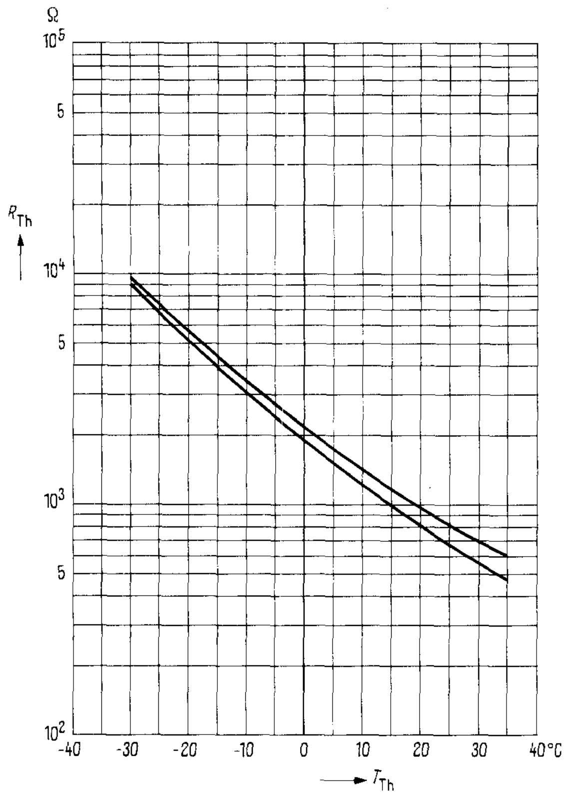


Table of resistance temperature

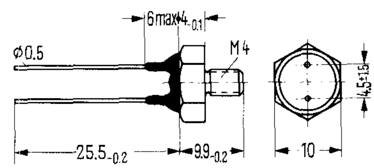
Resistance value kΩ ± 3.5%	Temperature °C
4.26	−15
4.48	−16
4.71	−17
4.96	−18
5.22	−19
5.49	−20
5.79	−21
6.10	−22
6.43	−23
6.78	−24
7.15	−25
7.55	−26
7.97	−27
8.42	−28
8.89	−29
9.40	−30

Negative temperature coefficient thermistor, compensation and measuring type

Thermistor K 252 us suitable for temperature compensation at higher loads, and for use as a measuring probe in temperature control circuits, particularly in heating systems. Being electrically insulated from the thermistor, the metal case ensures good thermal conduction to the mounting plane.

The type is identified by its shape. The nominal resistance and the tolerance of R_{20} ($\pm$10%="c"; $\pm$20%="b") is stamped on the case.

Type	Order number
K 252/10%/500 Ω	Q 63025-K 2501-K
K 252/10%/1 K	Q 63025-K 2013-K
K 252/10%/6 K	Q 63025-K 2063-K
K 252/10%/40 K	Q 63025-K 2044-K
K 252/20%/500 Ω	Q 63025-K 2501-M
K 252/20%/1 K	Q 63025-K 2102-M
K 252/20%/6 K	Q 63025-K 2063-M
K 252/20%/40 K	Q 63025-K 2044-M



Weight approx. 1.5 g Dimensions in mm

Maximum ratings		K 252	
Maximum continuous operating temperature	T	+120	°C
Maximum continuous load (T_{amb}=20 °C)	P_{tot} [1]	400	mW

Characteristics

Thermal conduction constant [1]	$G_{th\,case}$	>30	mW/K
Thermal cooling time constant [1]	τ_{th}	approx. 20	s
Tolerance of B-value	B-Tol.	$\pm$5	%

Delivery program

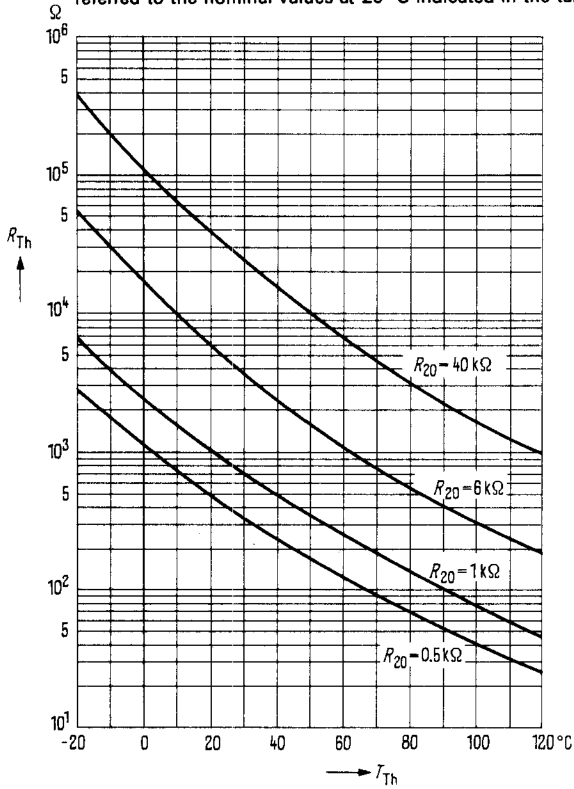
Nominal values of cold-state resistance R_{20}, R_{25}, B-value and (negative) temperature coefficient TC at 20 °C, as well as tolerances of R_{20}.

	K 252				
R_{20}	500	1 k	6 k	40 k	Ω
R_{25}	410	820	4.8 k	31 k	Ω
B [2]	3400	3530	3950	4250	JK/J
TC	4.0	4.1	4.6	5.0	%/K
$\pm$10% "c"	*	*	*	*	
$\pm$20% "b"	*	*	*	*	

Types with different electrical values and tolerances of R_{20} on request.

[1] When mounted on metal plates with good thermal conduction
[2] Evaluated from measurements at 20 °C and 100 °C

Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table

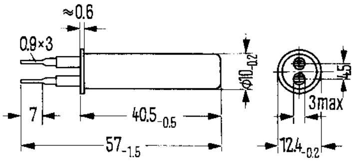


Measuring thermistor

K 274 is designed for monitoring and controlling the temperature of liquids, especially of lye in washing machines. It consists of a thermistor tablet mounted into a probe case with mounting flange. The probe carries two 2.8 × 0.8 mm flat prongs for connection to AMP-Faston sockets.

To ensure a high temperature accuracy the nominal resistance is measured at 60 °C and divided into 10 tolerance groups. The tolerance groups are identified by coloured dots between the AMP prongs.

Type	Order number
K 274	Q 63027-K 125-M



Weight approx. 10 g Dimensions in mm

Maximum ratings		**K 274**	
Maximum operating temperature	T	100	°C
Maximum operating voltage (Th-case)	$V_{Th\text{-}case}$	250	V_{eff}
Maximum continuous load (T_{amb} = 20 °C in liquids)	P_{tot}	500	mW
Test voltage (Th-case)	V_{is}	2500	V_{eff}
Test time	t	1	s

Characteristics

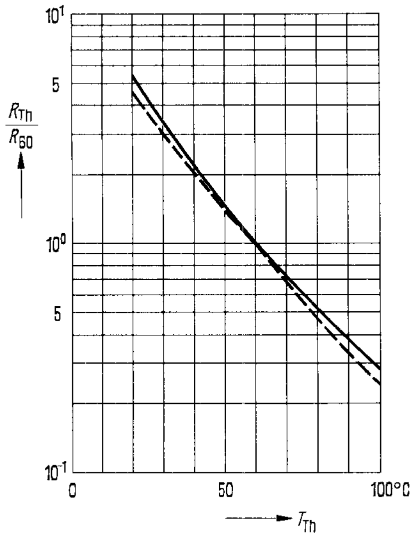
B-value[1])	B	3930	JK/J
Tolerance of the B-value	B-Tol.	±3	%
Thermal conduction constant	G_{thFL}	approx. 50	mW/K
Nominal resistance (T_{Th} = 60 °C)	R_{60}	1.25	kΩ

Tolerance group of R_{60}.

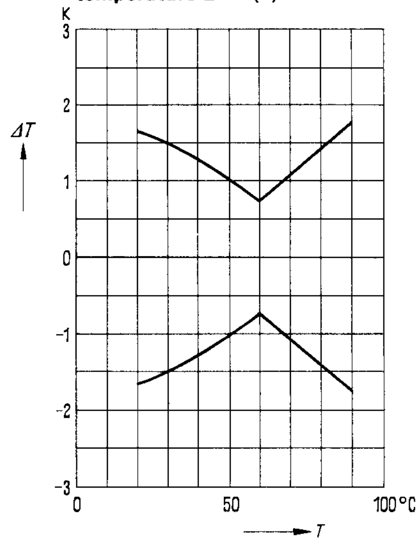
group	tolerance	colour code
1	−20.5 to −15.5%	brown
2	−16.5 to −11.5%	red
3	−12.5 to − 7.5%	orange
4	− 8.5 to − 3.5%	yellow
5	− 4.5 to + 0.5%	green
6	− 0.5 to + 4.5%	blue
7	+ 3.5 to + 8.5%	violet
8	+ 7.5 to +12.5%	grey
9	+11.5 to +16.5%	white
10	+15.5 to +20.5%	black

[1]) Evaluated from measurements at 20 °C and 100 °C

Standardized thermistor resistance as a function of the thermistor temperature
$R_{Th}/R_{60} = f(T_{Th})$



Attainable temperature accuracy as a function of temperature $\Delta T = f(T)$



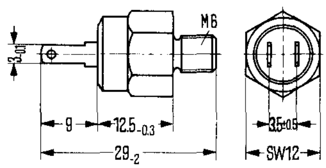
The $R = f(T)$ characteristics and tolerance ranges are obtained if the lower R_{60} limit values of the individual tolerance groups are multiplied by the R_{Th}/R_{60} values of the broken curve, while the upper R_{60} limit values are multiplied by the R_{Th}/R_{60} values of the continuous curve

Thermistor thermostat

K 283 is designed for monitoring and controlling the temperature of machine parts or pipe lines (for instance in heating systems). Being electrically insulated from the thermistor, the copper case ensures good thermal conduction to metal.

The probe has two flat prongs, suitable for use with the AMP Faston socket. In soldering operations on the prongs, the data stated below must be observed.

Type	Order number
K 283/20%/1.25 k	Q63028-K1252-M



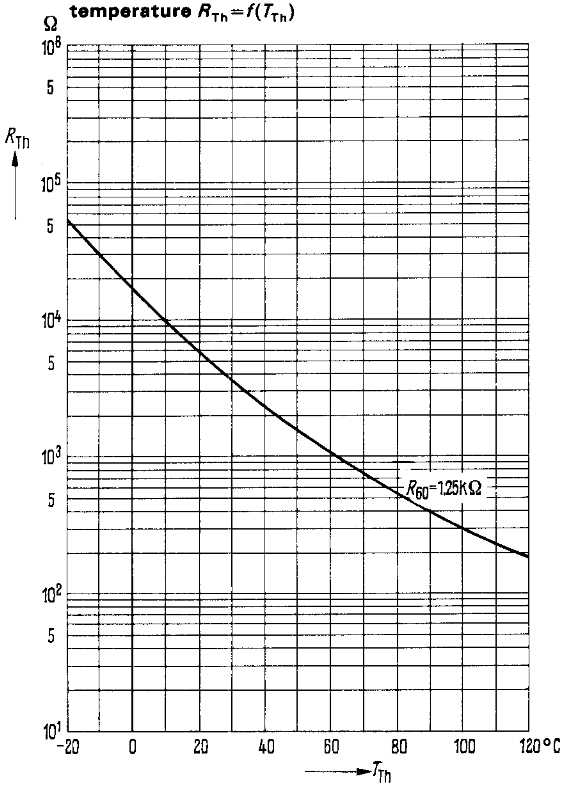
Weight approx. 10 g   Dimensions in mm

Maximum ratings		K 283	
Maximum operating temperature	T	130	°C
Test voltage (Th-case)	V	250	V
Insulating resistance	R_{is}	$>10^8$	Ω
Maximum permissible torque	$M_{d\,max}$	$\leqq 200$	cm N [3])
Maximum soldering temperature on flat prongs at a soldering time of 5 s.	$T_{L\,max}$	250	°C
Maximum continuous load ($T_{amb}=20\,°C$)	P_{tot} [2])	600	mW

Characteristics			
Nominal resistance ($T_{Th}=60\,°C$)	R_{60}	1.25	kΩ
Tolerance nominal resistance	R_{60}-Tol.	±20	%
B-value [1])	B	3950	JK/J
Tolerance of the B-value	B-Tol.	±5	%
Thermal conduction constant [2])	$G_{th\,case}$	$\geqq 40$	mW/K
Thermal cooling time constant [2])	$\tau_{th\,case}$	approx. 4	s

[1]) Evaluated from measurements at 20 °C and 100 °C
[2]) When mounted on metal plates with good thermal conduction
[3]) N = Newton (1 kp = 9.806 N)

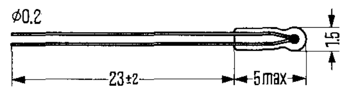
Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$



Measuring thermistor

The thermistor M 81 consists of glass coated semiconductor beads. Its small dimensions allow measurement in small spaces. The thermistor is suitable for temperature measurement and control, as well as radiation and flow measurement.

Type	Order number
M 81/10%/10 K	Q 63081-M 103-K
M 81/20%/10 K	Q 63081-M 103-M



Weight approx. 40 mg Dimensions in mm

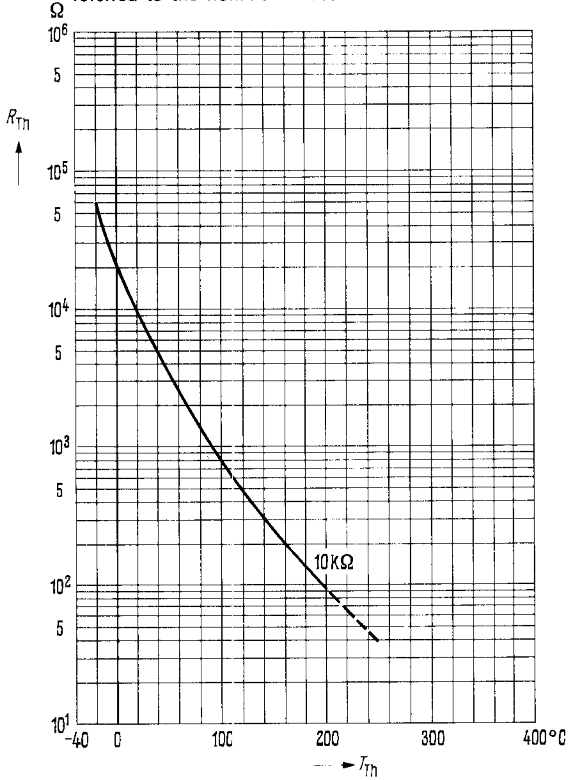
Maximum ratings		M 81	
Maximum operating temperature	T_{max}	+200	°C
Maximum continuous load	P_{tot}	120	mW
Storage temperature	T_s	−40 to +200	°C

Characteristics			
Cold-state resistance	R_{20}	10	kΩ
Cold-state resistance (T_{amb} = 25 °C)	R_{25}	approx. 8	kΩ
Tolerance of cold-resistance	R_{20}-Tol.	±20 (±10)	%
B-value[1])	B	3430	JK/J
Tolerance of the B-value	B-Tol.	±5	%
Thermal conduction constant in static air	$G_{th\,amb}$	0.7	mW/K
Thermal cooling time constant	τ_{th}	5	s

Types with different electrical values and tolerances on request.

[1]) Evaluated from measurements at 20 °C and 100 °C

Thermistor resistance as a function of the thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal values at 20 °C indicated in the table

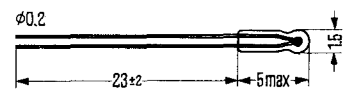


NTC thermistor, measuring-type

Preliminary data

Thermistor M 812 consists of a glass-coated thermistor bead. Its small dimensions allow measurements in small spaces. M 812 is suitable for temperature measurement and control and for radiation and flow measurements.

Type	Order number
M 812/10%/100 kΩ	Q63081-M2104-K
M 812/20%/100 kΩ	Q63081-M2104-M



Weight approx. 40 mg Dimensions in mm

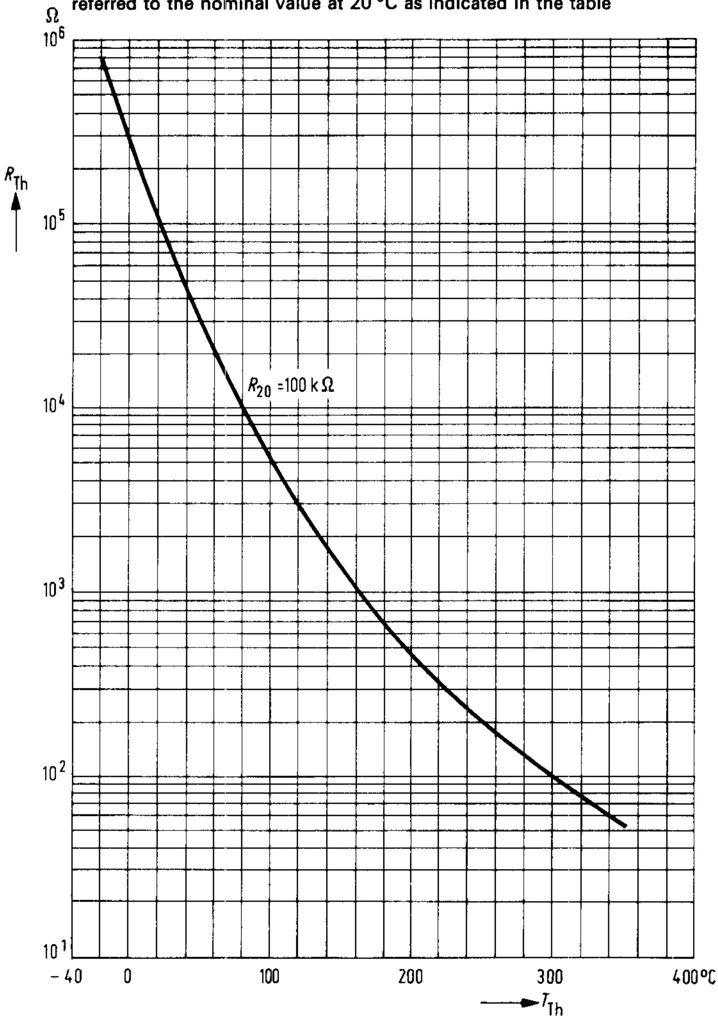
Maximum ratings		K 812	
Maximum operating temperature	T_{max}	+350	°C
Maximum electrical load	P_{tot}	120	mW
Storage temperature	T_s	–40 to +350	°C

Characteristics

Cold-state resistance	R_{20}	100	kΩ
Cold-state resistance (T_{amb} = 25 °C)	R_{25}	approx. 80	kΩ
Tolerance of the cold-state resistance	R_{20}-Tol.	±20 (±10)	%
B-value [1])	B	3950	JK/J
Tolerance of the *B*-value	B-Tol.	±5	%
Thermal conduction constant in static air	$G_{th\,amb}$	0.7	mW/K
Thermal cooling time constant	τ_{th}	5	s

[1]) Determined by measuring at 20 °C and 100 °C

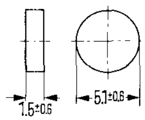
Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$
referred to the nominal value at 20 °C as indicated in the table



NTC thermistor, measuring type

Thermistor M 820 S 1/80 Ω is suitable for the solution of measuring problems at low electrical loads. The faces of the thermistor disc are lapped in a plane parallel way in order to ensure a good thermal contact in a probe case when mounting the disc. The magnitude of the thermal conduction constant G_{th} and the thermal cooling time constant τ_{th} depend on the respective mounting conditions.

Type	Order number
M 820 S 1/80 Ω	Q 63082-M 800-S 1



Weight approx. 0.2 g   Dimensions in mm

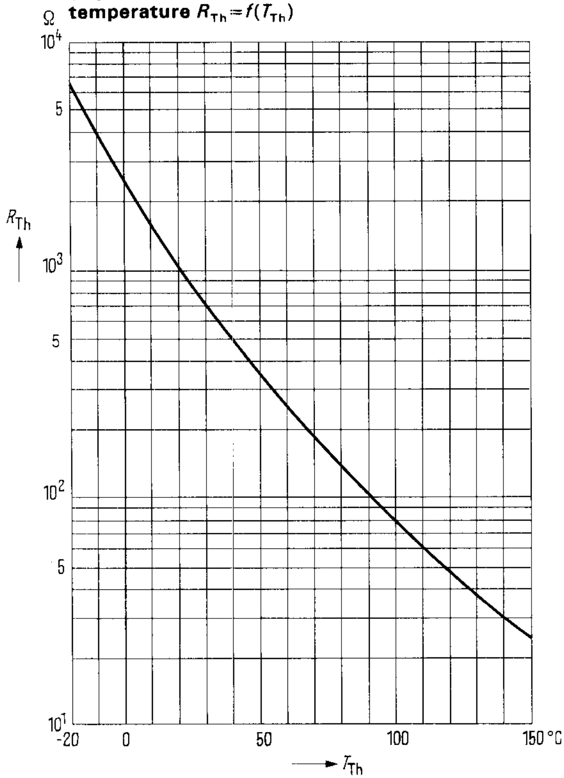
Maximum ratings		M 820 S1/80 Ω	
Maximum operating temperature	T	150	°C
Minimum permissible hot-state resistance	R_{min}	20	Ω
Storage temperature	T_s	−55 to +150	°C

Characteristics

Cold-state resistance	R_{25}	880	Ω
Tolerance of the cold-state resistance	R_{25}-Tol.	±10	%
Cold-state resistance	R_{100}	80	Ω
Tolerance of the cold-state resistance	R_{100}-Tol.	±5	%
Cold-state resistance	R_{120}	49	Ω
Tolerance of the cold-state resistance	R_{120}-Tol.	±6	%
B-value [1]	B	3530	JK/J
Thermal capacity	C_{th}	approx. 60	mWs/K

[1]) Determined by measuring at 20 °C and 100 °C

Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$

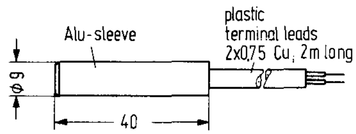


NTC Thermistor, measuring type

The thermistor thermostats M 831 and M 832 are designed for temperature measurements of air and liquids. They consist of a thermistor tablet provided with a 2 m long connecting cable and cast into an aluminium case of 0.5 mm wall thickness.

M 831 is provided with a PVC cable and M 832 with a silicon cable

Type	Order number
M 831 S 1/2 kΩ	Q 63083-M 1002-S 14
M 831 S 1/9.4 kΩ	Q 63083-M 1009-S 144
M 831 c/1 kΩ	Q 63083-M 1001-K 40
M 831 c/1.5 kΩ	Q 63083-M 1001-K 45
M 831 c/6.8 kΩ	Q 63083-M 1006-K 48
M 831 c/10 kΩ	Q 63083-M 1010-K 40
M 832 S 1/1.8 kΩ	Q 63083-M 2001-K 148
M 832 S 1/9.5 kΩ	Q 63083-M 2009-S 145
M 832 c/22 kΩ	Q 63083-M 2022-K 40



Weight approx. 120 g   Dimensions in mm

Maximum ratings		M 831	M 832	
Maximum operating temperature	T	+85	+160	°C
Storage temperature	T_S	−55 to +85	−55 to +160	°C
Test voltage (thermistor to case)	V_{isol}	2500	2500	V_{eff}
Test time	t	1	1	s
Maximum electrical load (T_{amb} = 25 °C in air)	P_{tot}	1000	1000	mW

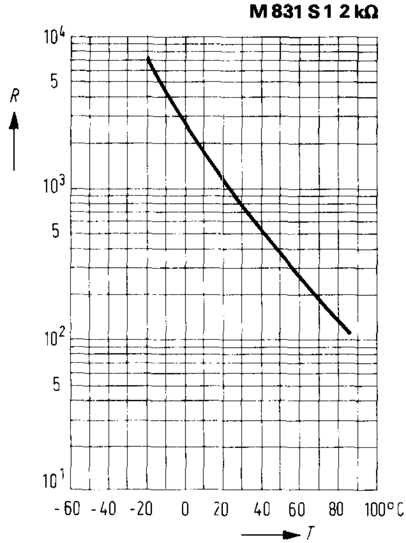
Characteristics				
B-tolerance	B-Tol.	±5	±5	%
Thermal conduction constant	$G_{th\,amb}$	11	11	mW/K
Thermal conduction constant	$G_{th\,case}$	20	20	mW/K
Thermal cooling time constant	$\tau_{th\,amb}$	500	500	s
Thermal cooling time constant	$\tau_{th\,case}$	22	22	s

Delivery program

	M 831/S1[1])	M 831/S1	M 831 c[2])				M 832/S1		M 832 c[2])	
R_{+5}	2 kΩ	–	–	–	–	–	–	–	–	Ω
R_{+5}-Tol.	±3.5	–	–	–	–	–	–	–	–	%
R_{-30}	–	9.4 K	–	–	–	–	–	–	–	Ω
R_{-30}-Tol.	–	±10	–	–	–	–	–	–	–	%
R_{25}	–	–	1 K	1.5 K	6.8 K	10 K	–	–	22 K	Ω
R_{25}-Tol.	–	–	±10	±10	±10	±10	–	–	±10	%
R_{100}	–	–	–	–	–	–	1.8 K	9.5 K	–	Ω
R_{100}-Tol.	–	–	–	–	–	–	±10	±10	–	%
B-Value	3530	3560	3560	3850	4050	4050	4300	4560	4200	K
T_{max}	85	85	85	85	85	85	160	160	125	°C

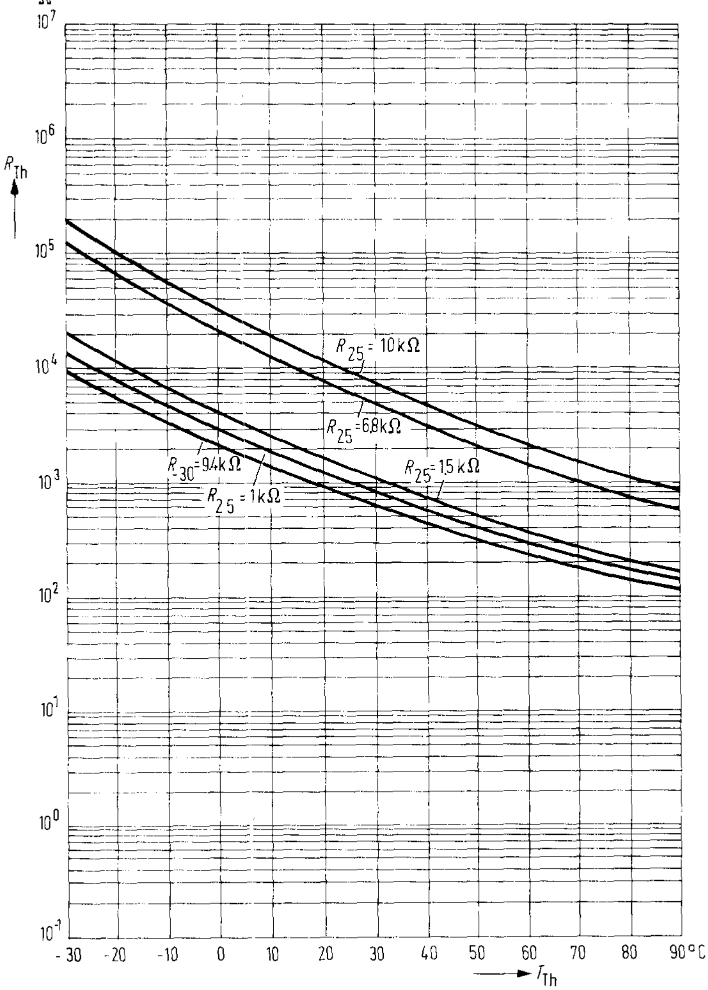
Thermistor resistance as a function of thermistor temperature $R_{Th}=f(T_{Th})$

M 831 S1 2 kΩ

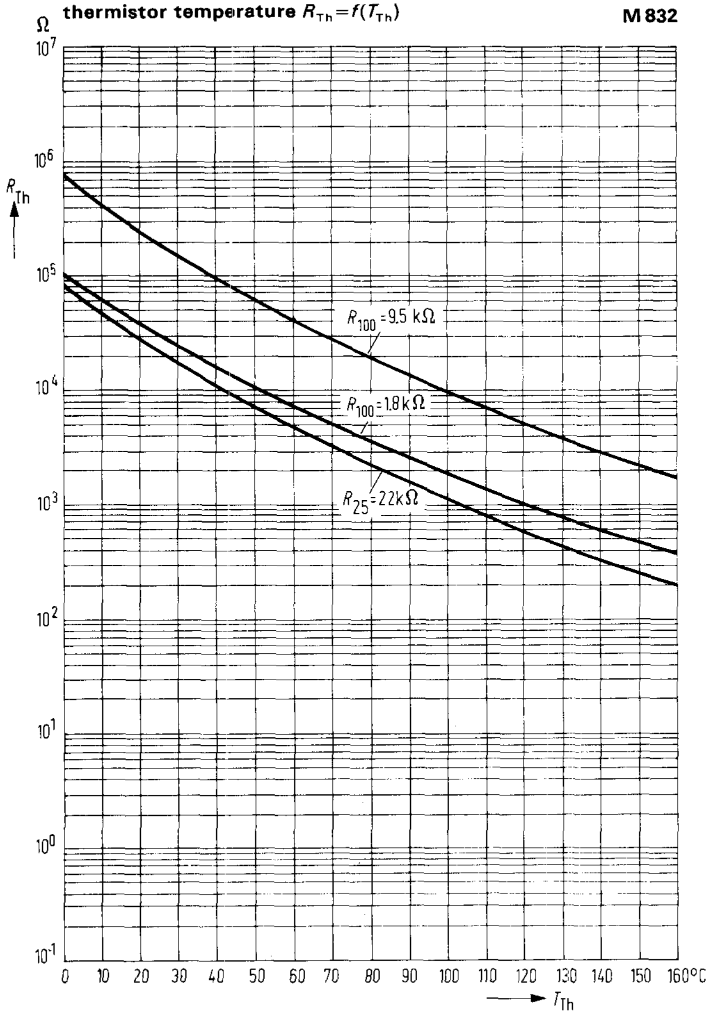


[1]) This type is provided with a connecting cable of 500 mm length
[2]) Index "c" refers to a ±10% tolerance of the resistance value (e.g. R_{25})

Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$ M 831



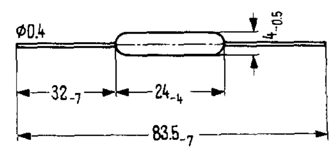
Thermistor resistance as a function of thermistor temperature $R_{Th} = f(T_{Th})$ **M 832**



Negative temperature coefficient thermistor, automatic control type

Automatic control thermistors R 51-4/1/20 and R 51-8/0.5/10 are used for stabilizing small voltages in the RF range as well as for amplitude stabilization of amplifiers. Special production and aging processes ensure high reliability. The type designation code is stamped on the glass-case.

Type	Order number
R 51-4/1/20 b	Q63051-R5
R 51-4/1/20 c	Q63051-R6
R 51-4/1/20 d	Q63051-R7
R 51-8/0.5/10 b	Q63051-R1
R 51-8/0.5/10 c	Q63051-R2
R 51-8/0.5/10 d	Q63051-R3



Weight approx. 0.6 g   Dimensions in mm

Maximum ratings		R 51-4/1/20	R 51-8/0.5/10	
Maximum continuous operating current	I_N	20	10	mA
Maximum continuous load	P_{tot}	40	40	mW
Momentary load, but only as long as $I \leqq 20$ mA and $R \geqq 90\ \Omega$	P_I	≦200	≦200[3]	mW
Series resistor for obtaining a horizontal current-voltage characteristic	R	appr. 110	appr. 500	Ω
Minimum permissible hot-state resistance	R_{Wmin}	90	350	Ω

Characteristics (T_{amb} = 20 °C)				
Voltage maximum	V_1	4	8	V
Current at voltage maximum	I_1	1	0.5	mA
Nominal current	I_N	20	10	mA
Cold-state resistance	R_{20}	10	40	kΩ
Cold-state resistance (T_{amb} = 25 °C)	R_{25}	8.25	33	kΩ
Hot-state resistance	R_W	90	360	Ω
B-value[1]	B	3350	3350	JK/J
Temperature coefficient	TC	−3.9	−3.9	%/°C
Thermal conduction constant	$G_{th\,amb}$	0.2	0.2	mW/K
Thermal cooling time constant	τ_{th}	0.6	0.6	s
Parallel capacitance	C_p	appr. 1.5	appr. 1.5	pf
Distortion factor at 30 Hz[2]	k	8	8	‰
Distortion factor at 3 KHz	k	1	1	‰

[1]) Determined by measuring at 20 °C and 100 °C
[2]) The relatively high value of the distortion factor at a frequency of 30 Hz is due to the small thermal inertia of the thermistor bead
[3]) $I \leqq 10$ mA and $R \geqq 360\ \Omega$

Delivery program R 51-4/1/20

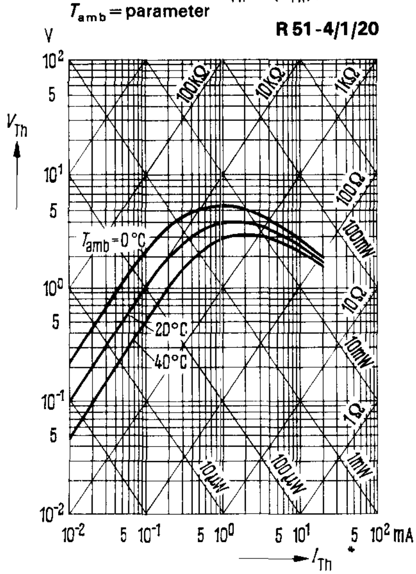
Tolerance of the thermistor as supplied[1])	Cold-state resistance[2]) at $I \leqq 50\ \mu A$	Voltage V[2]) at 1.5 mA	V[2]) at 5 mA	V[2]) at 20 mA
b = ±20%	6 to 13 kΩ	3.2 to 4.8 V	2.8 to 3.60 V	1.60 to 2.10 V
c = ±10%	7.5 to 11.5 kΩ	3.6 to 4.4 V	2.9 to 3.45 V	1.70 to 2.00 V
d = ±5%	8 to 11 kΩ	3.8 to 4.2 V	3.0 to 3.35 V	1.75 to 1.95 V

Delivery program R 51-8/0.5/10

Tolerance of the thermistor as supplied[3])	Cold-state resistance[2]) at $I \leqq 25\ \mu A$	Voltage V[2]) at 0.6 mA	V[2]) at 4 mA	V[2]) at 10 mA
b = ±20%	25 to 50 kΩ	6.4 to 9.6 V	4.6 to 6.1 V	3.15 to 4.15 V
c = ±10%	28 to 47 kΩ	7.2 to 8.8 V	4.9 to 5.8 V	3.35 to 3.95 V
d = ±5%	32 to 44 kΩ	7.6 to 8.4 V	5.1 to 5.6 V	3.45 to 3.85 V

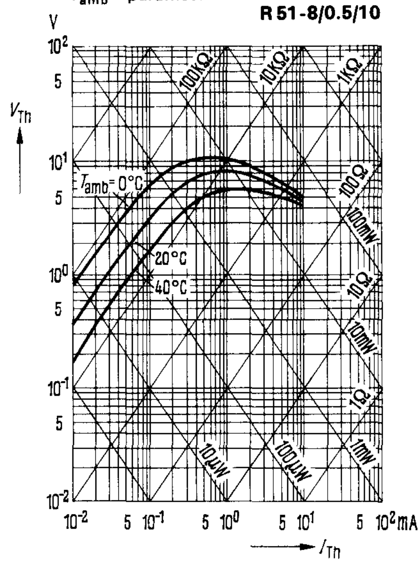
Stationary current-voltage characteristics $V_{Th} = f(I_{Th})$; T_{amb} = parameter

R 51-4/1/20



Stationary current-voltage characteristics $V_{Th} = f(I_{Th})$; T_{amb} = parameter

R 51-8/0.5/10



[1]) The tolerance data are referred to the regulated voltage at 1.5 mA, but not to the cold-state resistance
[2]) At T_{amb} = 20 °C
[3]) The tolerance data are referred to the regulated voltage at 0.6 mA, but not to the cold-state resistance

Insertion probe EA 218, Field probe FA 22e

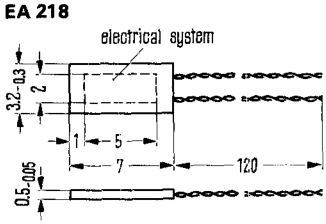
EA 218 and FA 22e are Hall generators suitable for measuring AC and DC fields (semiconductor material InAs).

EA 218 Hall voltage leads: red/yellow, control current leads: green/violet (In mounting the top face (seat of electrode) must be insulated)

FA 22 e Hall voltage leads: blue tubing, control current leads: red tubing Wire length: 120 mm; tubing length: 100 mm. (The first 10 mm of the system may be subjected neither to a bending nor a compressive stress.)

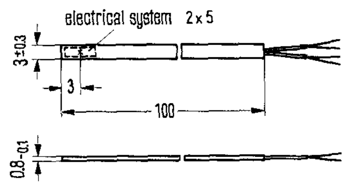
Type	Order number
EA 218	Q64001-E218
FA 22e	Q64001-F22E

EA 218



Weight approx. 0.3 g Dimensions in mm

FA 22e



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		EA 218	FA 22e	
Maximum permissible control current in static air	i_{1M}	150	200	mA
Thermal resistance between semiconductor layer and outer surface of jacket (both sides)	R_{th}	app. 50	app. 50	K/W
Storage temperature	T_s	−50 to +100		°C
Working temperature	T	−20 to +90		°C

Characteristics ($T_{amb} = 25\ °C$)		EA 218	FA 22e	
Rated value of control current for operation in air	I_{1n}	100	150	mA
Open-circuit Hall voltage at I_{1n}; $B = 1$ Tesla [2]	V_{20}	$\geqq 85$	$\geqq 120$	mV
Load resistance for optimum linearity (0–1 Tesla) [2]	R_{LL}	5 to 20 [1]	app. 8	Ω
Linearization error for termination into R_{LL} (referred to 1 Tesla) [2]	F_{LL}	< 1	< 1	%
Open-circuit sensitivity (referred to 1 Tesla) [2]	K_{BO}	$\geqq 0.85$	$\geqq 0.8$	V/AT
Mean sensitivity for termination into R_{LL} (in % of K_{BO} referred to 1 T)	K_{BL}	app. 70	app. 65	% of K_{BO}
Control-side internal resistance at $B = 0$ (including lead resistance)	R_{10}	app. 3	app. 2	Ω
Hall-side internal resistance of $B = 0$ (including lead resistance)	R_{20}	app. 1.5	app. 1.5	Ω
Resistive zero component	R_0	< 0.005	< 0.002	V/A
Inductive zero component	A_2	< 0.05	< 0.05	cm^2
Mean temperature coefficient of V_{20} between -20 and $+90\ °C$	β	app. -0.1	app. -0.1	%/K
Mean temperature coefficient of R_{10} and R_{20} between -20 and $+90\ °C$	α	app. 0.2	app. 0.2	%/K

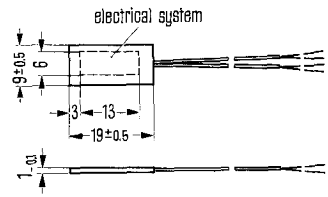
[1]) The exact value of resistance is written on the package
[2]) 1 $T = 1$ Tesla $= 10^4$ Gauss

Field probe FA 24

The field probe FA 24 is suitable for measuring AC and DC fields (semiconductor material InAs).

FA 24 Hall voltage leads: blue tubing; control current leads: red tubing
Wire length: 120 mm; tubing length: 100 mm.

Type	Order number
FA 24	Q64001-F24



Weight approx. 0.7 g Dimensions in mm

Maximum ratings		**FA 24**	
Max. permissible control current in static air	i_{1M}	500	mA
Thermal resistance between semiconductor layer and outer surface of jacket (both sides)	R_{th}	12	K/W
Storage temperature	T_S	−50 to +100	°C
Working temperature	T	−20 to +90	°C

Characteristics (T_{amb} = 25 °C)			
Rated value of control current for operation in air	I_{1n}	400	mA
Open-circuit Hall voltage at I_{1n}; B = 1 Tesla = 1 T	V_{20}	≧300	mV
Load resistance for optimum linearity (0 to 1 T)	R_{LL}	approx. 7	Ω
Linearization error for termination into R_{LL} (referred to 1 T)	F_{LL}	<1	%
Open-circuit sensitivity (referred to 1 T)	K_{BO}	0.75	V/AT
Mean sensitivity for termination into R_{LL} (in % of K_{BO} referred to 1 T)	K_{BL}	approx. 75	%
Control-side internal resistance at $B = 0$ (including lead resistance)	R_{10}	approx. 1.4	Ω
Hall-side internal resistance at $B = 0$ (including lead resistance)	R_{20}	approx. 1.1	Ω
Resistive zero component	R_0	$<2.5 \cdot 10^{-3}$	V/A
Inductive zero component	A_2	>0.05	cm^2
Mean temperature coefficient of V_{20} between −20 and +90 °C	β	approx. −0.07	%/K
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	approx. 0.2	%/K

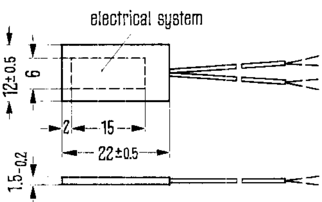
Field probes

FC 32, FC 33, and FC 34 are designed for high-precision measurements of magnetic fields. Temperature coefficients β are minimized (semiconductor material InAsP).

Type	Order number
FC 32	Q 64003-F 32
FC 33	Q 64003-F 33
FC 34	Q 64003-F 34

Hall voltage leads: blue tubing;
control current leads: red tubing;
wire length: 120 mm;
tubing length: 100 mm.

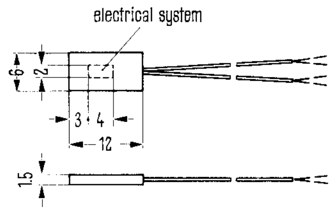
FC 34



Weight approx. 1.3 g

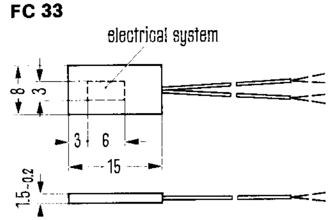
Thickness of the probe all types 1.5−0.2 mm
Dimensions in mm

FC 32



Weight approx. 0.4 g

FC 33



Weight approx. 0.5 g

Maximum ratings			**FC 32**	**FC 33**	**FC 34**	
Maximum permissible control current in static air	$i_{1\,M}$		125	125	250	mA
Thermal resistance between semi-conductor layer and outer surface of jacket (both sides)	R_{th}	approx.	60	40	20	K/W
Storage temperature	T_S			−50 to +100		°C
Working temperature	T			−20 to +65		°C

Characteristics (T_{amb} = 25 °C)		**FC 32**	**FC 33**	**FC 34**	
Rated value of control current for operation in air	I_{1n}	100	100	200	mA
Open-circuit Hall voltage (at I_{1n}; B = 1 T) [1]	V_{20n}	≧130	≧145	≧290	mV
Load resistance for optimum linearity (0 to 1 T)	R_{LL}	app. 13	app. 1.5	app. 25	Ω
Linearization error for termination into R_{LL} (referred to 1 T)	F_{LL}	<0.2	<0.2	<0.2	%
Open-circuit sensitivity (referred to 1 T)	K_{BO}	≧1.30	≧1.45	≧1.45	V/AT
Mean sensitivity for termination into R_{LL} (in % of K_{BO} referred to 1 T)	K_{BL}	app. 70	app. 75	app. 85	%
Control-side internal resistance at B = 0 (including lead resistance)	R_{10}	app. 6.5	app. 5	app. 5	Ω
Hall-side internal resistance at B = 0 (including lead resistance)	R_{20}	app. 2.4	app. 3	app. 3	Ω
Resistive zero component	R_0	$<1.5 \cdot 10^{-3}$	$<1.0 \cdot 10^{-3}$	$<1.0 \cdot 10^{-3}$	V/A
Inductive zero component	A_2	<0.05	<0.05	<0.05	cm^2
Mean temperature coefficient of V_{20} between −20 and +65 °C	β	app. −0.06	app. −0.04	app. −0.04	%/K
Mean temperature coefficient of R_{10} and R_{20} between −20 and +65 °C	α	app. 0.2	app. 0.2	app. 0.2	%/K

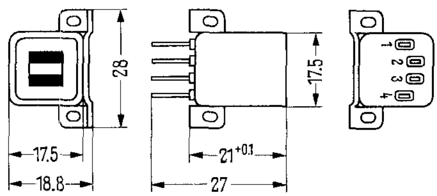
[1]) 1 T = 1 Tesla = 10^4 Gauss

Contactless signal generator

KSM 2 is a ferrite Hall generator of type RHY 15, however in a mumetal case, screened against neighbouring magnet fields.

Leads: Control current 1.2, Hall voltage 3.4

Type	Order number
KSM 2	Q64018-M2



Weight app. 21 g Dimensions in mm

Maximum ratings		KSM 2	
Maximum permissible control current	I_{1M}	75	mA
Storage temperature	T_s	−50 to +100	°C
Working temperature	T	−20 to +90	°C

Characteristics (T_{amb} = 25 °C)			
Nominal control current	I_{1n}	50	mA
Hall voltage rise when moving magnet over the generator 1 × 1 < 1 mm; a = 0.5 mm; magnet 4.5 ∅ × 10 mm; face flux 15×10^{-7} Wb			
Slope $\frac{dV_{20}}{dx}$ 1 × 1 < 1 mm		> 200	mV/mm
Remanence Hall voltage after activation by the magnet	V_{20Rem}	< 5	mV
Control-side internal resistance (B = 0)	R_{10}	approx. 30	Ω
Hall-side internal resistance (B = 0)	R_{20}	approx. 30	Ω
Zero voltage at I_{1n} (generator demagnetized)	V_{2RO}	< 10	mV
Zero point stability		approx. 200	μV/°C
Temperature coefficient of V_{20} between 0 °C and 50 °C	β	approx. −2	%/K
Temperature coefficient of R_{10} and R_{20} between 0 °C and 50 °C	α	approx. −2	%/K
Insulation resistance between case and semiconductor layer up to 400 V	R_{is}	> 1	MΩ

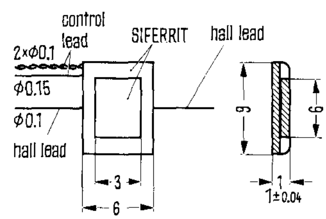
Hall multiplier probe

Not for new development

The probe MB 23 has a small effective air gap and is thus suitable for insertion in flux-sensitive multipliers and for measuring small, bundled magnetic fields. The control leads have been so attached that errors caused by their field are as small as possible. By adjusting the current distribution in the twisted control current leads, the residual Hall voltage may be balanced. This distribution may be changed by shortening one of the twisted leads. A 10 mm change in the length of one lead results in an ohmic zero component shift of about $0.6 \cdot 10^{-3}$ V/A (semiconductor material InAs).

Wire length of leads: 60 mm (copper wire)

Type	Order number
MB 23	Q 64002-M 23



Weight approx. 0.3 g Dimensions in mm

Maximum ratings

		MB 23	
Thermal resistance between semiconductor layer and outer surface of jacket (both sides)	R_{th}	approx. 20	K/W
Storage temperature	T_s	−50 to +100	°C
Working temperature	T	−20 to +90	°C

Characteristics (T_{amb} = 25 °C)
(assuming embodiment[1]) in mumetal core EI 38)

Maximum field excitation	$I_F \cdot n$	20	AW
Rated value of control current	I_{1n}	800	mA
Control-side internal resistance including lead ($B = 0$)	R_{10}	approx. 1.0	Ω
Hall-side internal resistance including lead ($B = 0$)	R_{20}	approx. 1.0	Ω
Open-circuit Hall voltage with rated values	V_{20n}	≧80	mV
Resistive termination for linear matching	R_{LL}	approx. 20	Ω
Multiplication error for termination into R_{LL}	F_{LL}	< ±1.5	%
Mean temperature coefficient of V_{20} between −20 and +90 °C	β	approx. −0.1	%/K
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	approx. 0.2	%/K
Resistive zero component	R_0	$<10^{-3}$	V/A
Inductive zero component can be reduced to any value by appropriate arrangement of Hall leads			

[1]) Attention must be paid to potential freedom between semiconductor system (control and Hall leads) and magnetic core as insulation resistance of approx. 5 kΩ non-loadable

Hall multipliers

Hall multipliers MB 26/El 38 and RMY 10 are suitable for "electrical multiplication" applications, i.e. power measurements, torque determinations and direct harmonic analysis of alternating magnetic fields (semiconductor material InAs).

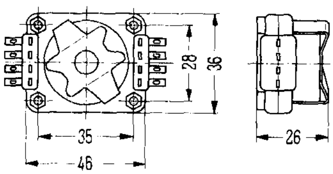
In mounting potential freedom between Hall generators (control and Hall voltage leads) and core must be ensured as the insulation resistance of ferrite is only 5 kΩ and may not be loaded.

Type	Order number
MB 26/EL 38	Q64002-M26-S1
RMY 10	Q61712-Y10

Maximum ratings ($T_{amb}=25\,°C$)		**MB 26/EL 38**	**RMY 10**	
Maximum permissible control current	I_{1M}	500	600	mA
Characteristics ($T_{amb}=25\,°C$)				
Rated value of field excitation	$I_F \cdot n$	70	70	AW
Field-side input power at rated values	P_e	app. 200	app. 200	mW
Rated value of control current	I_{1n}	400	500	mA
Control-side internal resistance ($B=0$)	R_{10}	app. 2	app. 2	Ω
Hall-side internal resistance ($B=0$)	R_{20}	app. 2	app. 1.8	Ω
Open-circuit Hall voltage at rated values	V_{20n}	$\geqq 160$	$\geqq 200$	mV
Resistive termination for linear matching	R_{LL}	app. 12	app. 25	Ω
Multiplication error for termination into R_{LL} (incl. hysteretic share)	F_{LL}	0.3	1	%
Resistive zero component	R_0	$\leqq 10^{-3}$	$\leqq 10^{-3}$	V/A
Inductive zero component	A_2	<0.05	<0.05	cm^2
Remanence residual Hall voltage after an field excitation =70 AW and at I_{1n}	V_{Rem}	app. 0.8	app. 1.5	mV
Mean temperature coefficient of V_{20} between 0° and 100 °C	β	app. −0.1	app. −0.1	%/K
Mean temperature coefficient of R_{10} and R_{20} between 0° and 100 °C	α	app. 0.2	app. 0.2	%/K
Magnetically effective air gap	δ	0.3	0.3	mm
Height of winding	h_w	4	4.5	mm
Width of winding	b_w	15	11	mm
Inductance of magnetic coil referred to square of turns (A_L)	L/n^2	app. $0.9 \cdot 10^{-6}$	app. $0.5 \cdot 10^{-6}$	H/n^2
Control terminals		1.2	1.2	
Hall voltage terminals		3.4	3.4	
Field winding I terminals		5.6	5.7	
Field winding II terminals		7.8	6.8	

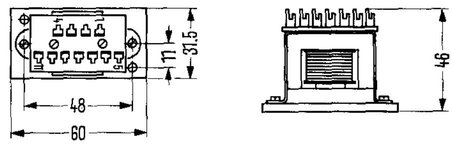
Hall multipliers

RMY 10 Hall multiplier in cup-core design
Material: siferrite N 28



Weight approx. 75 g (without winding)   Dimensions in mm

MB 26 built into an EL 38/ mumetal core
External dimensions: approx. 38 × 30 × 24 mm



Weight-approx. 170 g (without winding)

Winding data using enamelled copper wire (CuL wire) – guiding values

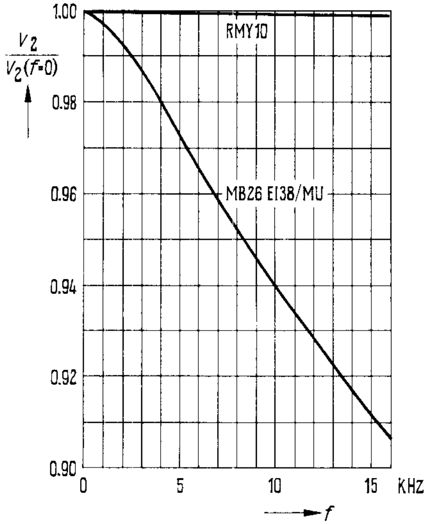
Diameter of wire	Fully wound without inter-layer insulation		
(mm)	Number of turns n	EI 38 Ω	RMY 10 Ω
0.05	12000	7800	6200
0.06	7800	3500	2800
0.07	6500	2050	1650
0.08	5300	1350	1080
0.09	4300	1100	880
0.10	3400	570	450
0.11	2800	380	300
0.12	2400	280	220
0.13	2100	220	175
0.14	1850	175	140
0.15	1650	135	108
0.16	1450	100	80
0.17	1350	80	64
0.18	1180	65	52
0.19	1080	54	43
0.20	1000	42	34
0.22	850	30	24
0.23	780	25	20
0.24	720	21	16.5
0.25	660	18	14.3
0.26	610	15.5	12.5

Diameter of wire	Fully wound without inter-layer insulation		
(mm)	Number of turns n	EI 38 Ω	RMY 10 Ω
0.27	570	13.5	10.8
0.28	540	12.0	9.5
0.30	490	9.5	7.5
0.32	420	6.5	5.2
0.34	375	5.2	4.1
0.36	330	4.3	3.5
0.38	305	3.5	2.8
0.40	275	2.9	2.3
0.45	210	1.9	1.5
0.50	170	1.2	0.96
0.55	140	0.75	0.60
0.60	115	0.56	0.45
0.65	100	0.4	0.32
0.70	85	0.29	0.23
0.75	75	0.24	0.19
0.80	65	0.2	0.16
0.85	56	0.15	0.12
0.90	50	0.11	0.09
1.1	35	0.052	0.044
1.2	24	0.035	0.03
1.4	14	0.018	0.015
>1.4	–	[1]	[2]

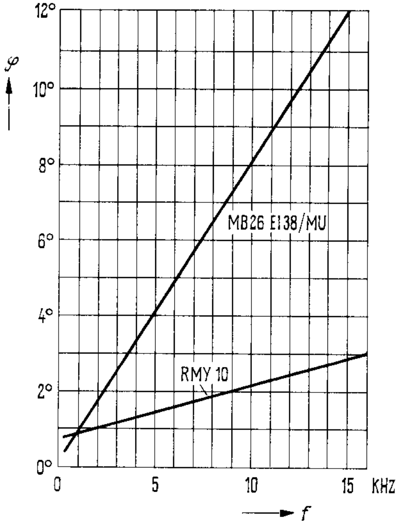
The inductance of the field winding: $L_s = A_L \cdot n^2$.
A_L – value see characteristics.

[1] Terminals of >1.4 mm ∅ freely protruding
[2] Wire diameter of >1.4 mm impossible

Typical frequency vs. Hall voltage characteristic



Phase shift between field current and Hall voltage (inductive zero component compensated) in degree φ



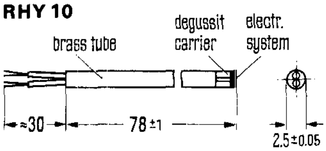
Axial field probes

RHY 10 and RHY 11 are Hall generators for measuring axial magnetic fields in smaller and larger (respectively) diameter bores (semiconductor material InAs).

Hall voltage leads: blue tubing; control current leads: red tubing.

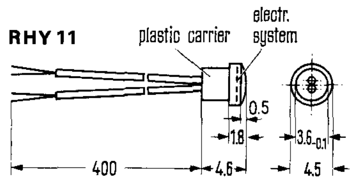
Type	Order number
RHY 10	Q61708-Y10
RHY 11	Q61708-Y11

RHY 10



Weight approx. 1.3 g Dimensions in mm

RHY 11



Weight approx. 0.6 g Dimensions in mm

Maximum ratings		RHY 10	RHY 11	
Maximum permissible control current in static air	I_{1M}	150	200	mA
Storage temperature	T_S	−50 to +100		°C
Working temperature	T	−20 to +90		°C

Characteristics (T_{amb} = 25 °C)

		RHY 10	RHY 11	
Rated value of control current for operation in air	I_{1n}	100	150	mA
Open-circuit Hall voltage (at I_{1n}; B=1 T)[1]	V_{20}	≧70	≧105	mV
Load resistance for optimum linearity (0 to 1 T)[1]	R_{LL}	app. 10	app. 20	Ω
Linearization error for termination into R_{LL} (referred to 1 T)[1]	F_{LL}	<1	<1	%
Open-circuit sensitivity (referred to 1 T)[1]	K_{BO}	≧0.7	≧0.7	V/AT
(referred to 0.01 T)	K_{BO}	≧0.5	≧0.5	V/AT
Mean sensitivity for termination into R_{LL} (in % of K_{BO} referred to 1 T)[1]	K_{BL}	app. 80	app. 90	%
Control-side internal resistance at B=0 (including lead resistance)	R_{10}	app. 2	app. 3	Ω
Hall-side internal resistance at B=0 (including lead resistance)	R_{20}	app. 1.6	app. 2.6	Ω
Resistive zero component	R_0	$<2.5\cdot10^{-3}$	$<2\cdot10^{-3}$	V/A
Inductive zero component	A_2	<0.05	<0.05	cm^2
Mean temperature coefficient of V_{20} between −20 and +90 °C	β	app. −0.1	app. −0.1	%/K
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	app. +0.2	app. +0.2	%/K

[1]) 1 T = 1 Tesla = 10^4 Gauss

Ferrite-Hall-Effect Devices

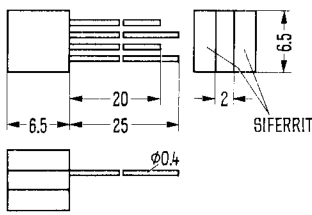
RHY 15 is a ferrite Hall effect device which in connection with permanent magnets is suitable as a contactless signal emission device and as a control and programming device for motion processes. Signal shape and range see the following figs. 1 – 6 (semiconductor material: indium antimonide InSb).

RHY 15 R is a ferrite Hall effect device sim. to RHY 15 with remanent properties that enable to retain the last information in the case of mains failure, thus being able e.g. to actuate a low gear for machine tools (semiconductor material InSb).

RHY 20 is a ferrite Hall effect device similar to RHY 15 with a ferrite head reflector and a gap width of 0.2 mm to read magnetograms with wavelengths of >1 mm (semiconductor material InSb).

Type	Order number
RHY 15	Q61708-Y15
RHY 15 R	Q61708-Y15-R
RHY 20	Q61708-Y20

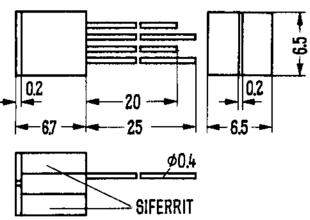
RHY 15; RHY 15 R



Weight approx. 2 g

Dimensions in mm

RHY 20



Weight approx. 2 g

Fixtures for these probes: see page 694

Control leads: long;

Hallleads: short

Construction magnetically symmetrical.

Maximum ratings		**RHY 15**	**RHY 15 R**	**RHY 20**	
Maximum permissible control current	I_{1M}	60	60	60	mA
Storage temperature	T_S	–50 to +100			°C
Working temperature	T	–20 to +65			°C

Characteristics (T_{amb} = 25 °C)

		RHY 15	RHY 15 R	RHY 20	
Rated value of control current	I_{1n}	50	50	50	mA
Open circuit Hall voltage for a probe flux of 2×10^{-7} Wb and I_{1n}	V_{20n}	≧120	≧120	≧120	mV
Hall remanence voltage after a probe flux of 2×10^{-7} Wb and I_{1n}	V_{20Rem}	<5	>40	<5	mV
Control-side internal resistance (B = 0)	R_{10}	app. 30	app. 30	app. 30	Ω
Hall-side internal resistance (B = 0)	R_{20}	app. 30	app. 30	app. 30	Ω
Ohmic zero voltage for I_{1n} (Hall effect device de-magnetized)	V_{2RO}	<10	<10	<10	mV
Temperature coefficient of V_{20} between 0 and 50 °C	β	app.–1.5	app.–1.5	app.–1.5	%/K
Temperature coefficient of R_{10} and R_{20} between 0 and 50 °C	α	app. –2	app. –2	app. –2	%/K
Insulation resistance between semiconductor system and ferrite parts	R_{is}	>5	>5	>5	kΩ

Hall voltage V_2 as a function of the travel across different magnetic systems (for RHY 15 or KSM 2)

Fig. 1: Hall generator RHY 15 is moved along the x-axis across a single magnet at a distance *D*. Signal level: $a_1 \geqq p_1 \cdot q$ (p_1 and q see table or figures 5 a, 5 b, resp.)

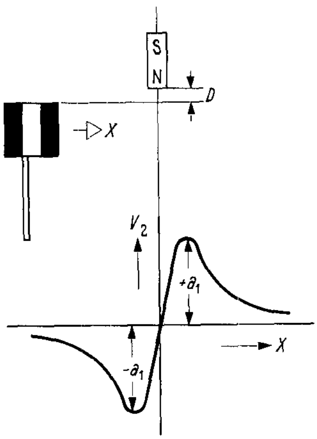


Fig. 2: Hall generator RHY 15 is moved along the x-axis across two parallel magnets of opposite polarity at a distance *D*

Signal level: $b_2 \approx \frac{a_2}{2}$; a_2 see fig. 6

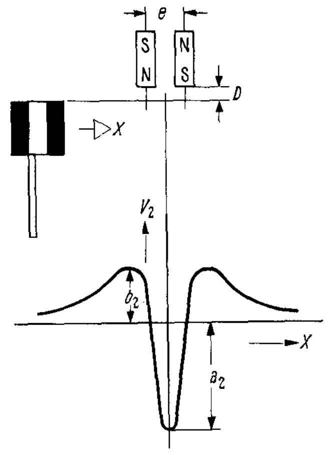


Fig. 3: Hall generator RHY 15 is moved along the x-axis across a series of magnets of varying polarity at a distance *D*. Signal level: $a \geqq p_3 \cdot q$ (p_3 and q see figures 5 a, 5 b, resp.)

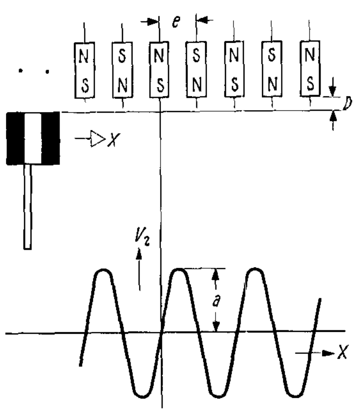
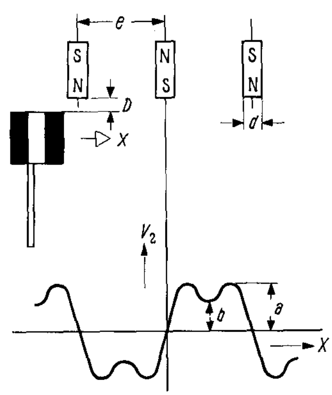


Fig. 4: same as figure 3, however, the spacing of the magnets is increased $e > 6 + d$ (mm). (p_3, p_4 and q see figures 5 a, 5 b, resp.)
Signal level: $a \geqq p_3 \cdot q$
$b \geqq p_4 \cdot q$



Signal level for various magnet sizes

Fig. 5 a: factor *p* as a function of the spacing *B* for various magnet sizes

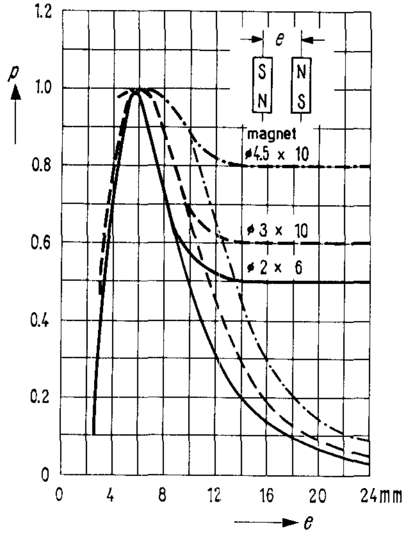


Table ad Fig. 5 a

Magnet dimensions Ø × length in mm	2 × 6	3 × 10	4.5 × 10
Face flux in Weber	5 to 10^{-7}	15 to 10^{-7}	25 to 10^{-7}
P_1	0.5	0.6	0.8
P_3	———	- - - -	—·—
P_4	———	- - - -	—·—

Fig. 5 b: Hall voltage level for type RHY 15 ($i_1 = 50$ mA) $T_{amb} = 25$ °C) as a function of the distance *D* for various magnet sizes

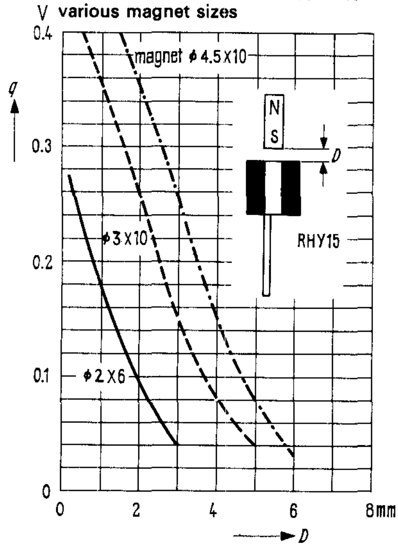
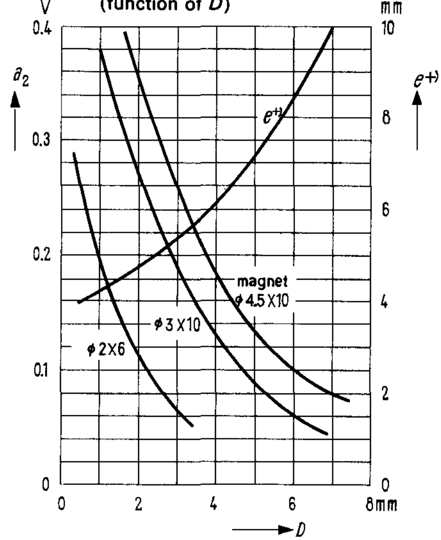


Fig. 6: Signal level a_2 for type RHY 15
D = distance magnet-hall generator
e = magnet spacing
e^* = optimal magnet spacing (function of *D*)

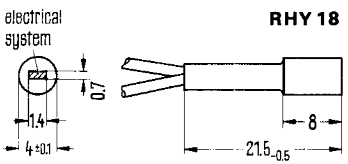


Low-temperature Hall probes

RHY 17 and RHY 18 are Hall generators for measuring magnetic fields down to −269 °C. The flat and cylindrical (respectively) forms are suitable for universal and axial measurements (respectively). They find application in cryology, i.e. superconductivity measurements (semiconductor material InAs – vapour-deposited layer).

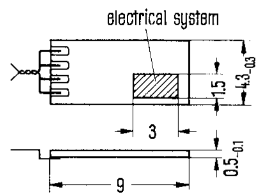
Hall leads: red wires; Control leads: green wires.

Type	Order number
RHY 17	Q61708-Y17
RHY 18	Q61708-Y18



Weight approx. 1.5 g Dimensions in mm

RHY 17

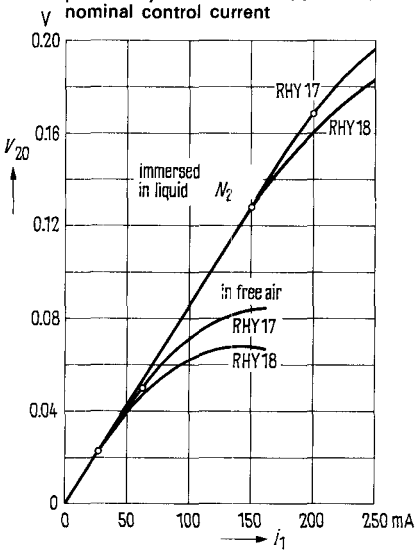


Weight approx. 0.4 g Dimensions in mm

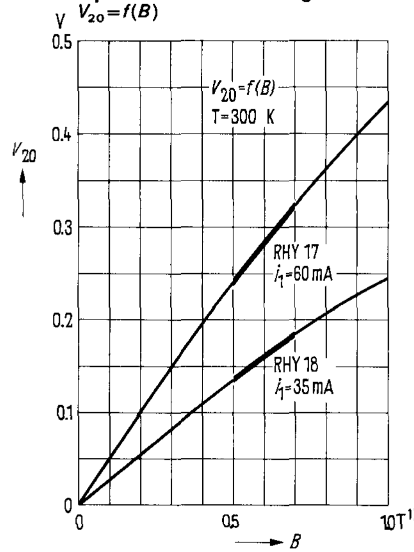
Maximum ratings		**RHY 17**	**RHY 18**	
Maximum permissible control current (when operated in air)	I_{1M}	110	70	mA
Storage temperature	T_S	−269 to +100		°C
Working temperature	T	−269 to +80		°C
Characteristics (T_{amb} = 25 °C)				
Rated value[1]) of control current in air[2])	I_{1n}	60	35	mA
Open-circuit Hall voltage for I_{1n} and B = 1 T[3])	V_{20n}	≧300	≧150	mV
Open-circuit sensitivity referred to B = 0.5 T	K_{BO}	≧6.0	≧6.0	V/AT
Mean control-side internal resistance (B = 0)	R_{10}	app. 30	app. 30	Ω
Mean Hall-side internal resistance (B = 0)	R_{20}	app. 30	app. 30	Ω
Ohmic zero voltage for I_{1n} and B = 0	V_{2RO}	≦2	≦2	mV
Mean temperature coefficient of V_{20} between −269 and +100 °C	β	app. −0.1	app. −0.1	%/K
Mean temperature coefficient of R_{10} between −269 and +100 °C	α	app. +0.1	app. +0.1	%/K

[1]) Rated value meaning the upper limit of the driving range under normal operating conditions
[2]) Control current may be increased by a factor of 3 – 4 when operating the probe in liquid gases i. e. He, N_2, O_2.
[3]) 1 T = 1 Tesla = 10^4 Gauss

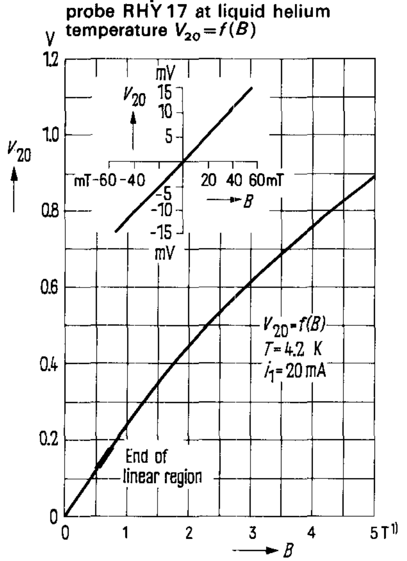
Open circuit Hall voltage
$V_{20}=f(i_1)$
The lightly bent curve shows that the probe may be loaded far above the nominal control current



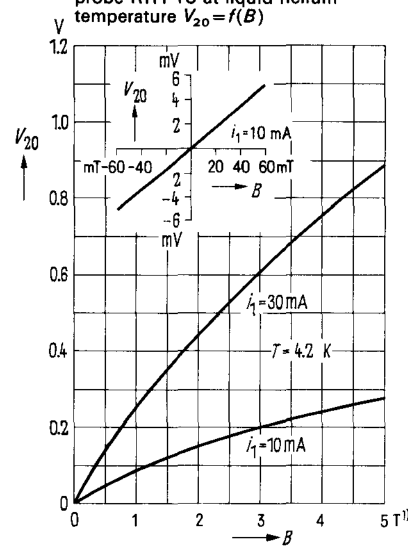
Open circuit Hall voltage
$V_{20}=f(B)$



Characteristic of low-temperature Hall probe RHY 17 at liquid helium temperature $V_{20}=f(B)$



Characteristic of low-temperature Hall probe RHY 18 at liquid helium temperature $V_{20}=f(B)$



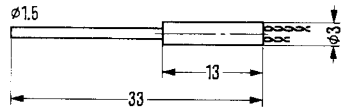
[1]) 1 Tesla = 10^4 Gauss

Axial field probe

RHY 18 S 1 is a Hall effect device designed for use in magnetic field measurements in particularly small holes at low temperatures (−269 °C).

Hall voltage lead: blue tubing; wire length: 20 mm.
Control current lead: red tubing; wire length: 25 mm.

	Type	Order number
▼	RHY 18 S 1	Q71708-Y18-S2



Weight approx. 1.2 g   Dimensions in mm

Maximum ratings		RHY18S1	
Maximum permissible control current in static air	I_{1M}	25	mA
Storage temperature	T_s	−269 to +50	°C
Working temperature	T	−269 to +50	°C

Characteristics (T_{amb} = 25 °C)			
Rated value[1]) of control current operated in air[2])	I_{1n}	10	mA
Open-circuit Hall voltage (at I_{1n} and B = 1 Tesla)	V_{20}	25	mV
Open-circuit sensitivity at I_{1n} referred to B = 0.5 T	K_{BO}	≧3	V/AT
Control-side internal resistence at B = 0	R_{10}	approx. 40	Ω
Hall-side internal resistance at B = 0	R_{20}	approx. 40	Ω
Ohmic zero voltage at I_{1n}	V_{2RO}	≦10	mV
Mean temperature coefficient of V_{20} between −196 and +50 °C	β	approx. −0.1	%/K
Mean temperature coefficient of R_{10} between −196 and +50 °C	α	approx. 0.1	%/K

[1]) The rated value refers to the upper limit of the driving range under normal operating conditions
[2]) The control current may be increased by a factor of 2 when operating the probes in liquid gases (He, N_2, O_2)
▼ New type

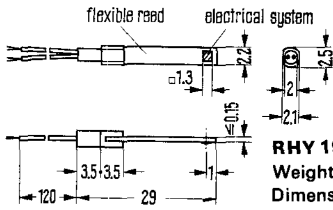
Hall probes for small air gaps

Hall-effect device RHY 19 and SBV 525 are designed for magnetic field measurements in extremely narrow air gaps (semiconductor material InAs).

Hall voltage leads: blue tubing; control current leads: red tubing.
RHY 19 Wire length: 150 mm; tubing length: 120 mm.
SBV 525 Wire length: 130 mm; tubing length: 100 mm.
Electrical system and wires insulated varnish.

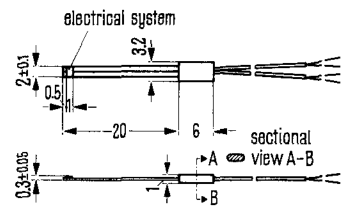
Type	Order number
RHY 19	Q61708-Y19

Type	Order number
SBV 525	Q64099-V525



RHY 19
Weight approx. 0.3 g
Dimensions in mm

SBV 525
Weight approx. 0.2 g
Dimensions in mm



		RHY 19	SBV 525	
Maximum ratings				
Maximum permissible control current in static air	I_{1M}	125	125	mA
Storage temperature	T_S	−50 to +100		°C
Working temperature	T	−20 to +90		°C
Characteristics (T_{amb} = 25 °C)				
Rated value of control current for operation in air	I_{1n}	80	100	mA
Open-circuit Hall voltage (at I_{1n}; B = 1 T)	V_{20n}	≧120	≧97	mV
Load resistance for optimum linearity (0 to 1 Tesla)	R_{LL}	≧100	3 to 20[1])	Ω
Linearization error for termination into R_{LL} (referred to 1 Tesla)	F_{LL}	<0.5	<1	%
Open-circuit sensitivity (referred to 1 Tesla)	K_{BO}	≧1.5	≧0.97	V/AT
Mean sensitivity for termination into R_{LL} (in % of K_{BO} referred to 1 Tesla)	K_{BL}	app. 90	app. 70	%
Control-side internal resistance at $B=0$ (including lead resistance)	R_{10}	app. 3.5	app. 2.2	Ω
Hall-side internal resistance at $B=0$ (including lead resistance)	R_{20}	app. 3.5	app. 1.8	Ω
Resistive zero component	R_0	$<3\cdot10^{-3}$	$<2.5\cdot10^{-3}$	V/A
Inductive zero component	A_2	<0.05	<0.05	cm²
Mean temperature coefficient V_{20} between −20 and +90 °C	β	app. −0.1	app. −0.1	%/K
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	app. 0.2	app. 0.2	%/K

[1]) The exact resistance value is shown on the package

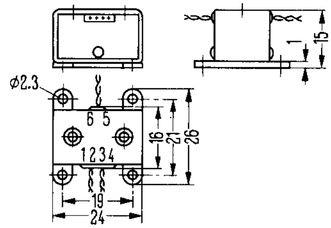
Microvolt modulator

Not for new development

For modulating small DC currents and voltages in the input stage of highly sensitive DC amplifiers (semiconductor material InSb).

Input leads 1 and 2; output leads 3 and 4.
Field coil leads 5 and 6

Type	Order number
RMY 11	Q61712-Y11



Weight approx. 21 g   Dimensions in mm

Maximum ratings		RMY 11	
Maximum input voltage	V_{1M}	1.5	V
Maximum value of field current (f=1 kHz)	I_{3M}	50	mA
Storage temperature	T_S	−50 to +100	°C
Operating temperature	T	−20 to +65	°C

Characteristics (T_{amb}=25 °C)			
Rated value of field current (frequency f=1 kHz)	I_{3n}	35	mA
Resistance of field coil	R_3	3	Ω
Inductance of field coil	L_3	$0.5 \cdot 10^{-3}$	H
Input resistance (control resistance)	R_{10}	approx. 60	Ω
Output resistance (Hall resistance)	R_{20}	approx. 30	Ω
Voltage reduction at I_{3n}	$n = v_2/V_1$	approx. 1 : 6	–
Transfer resistance	v_{20}/i	approx. 10	Ω
Inductive interference voltage (f=1 kHz) in input circuit at I_n	v	$< \pm 5$	µV
Inductive interference voltage (f=1 kHz) in output circuit at I_n	v	$< \pm 1$	µV
Resistive zero component	R_0	<5	V/A

The Hall generator lies in an alternating field excited by a field current at the modulation frequency. The DC quantity to be modulated is placed on the control leads. The Hall voltage appearing on the Hall leads is then proportional to the DC quantity at the input. The mumetal case acts as a screen against interference fields.

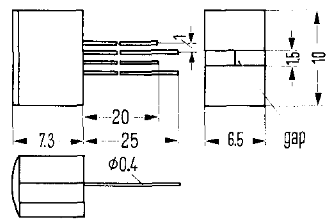
Hall read-head

Not for new development

SBV 536 is a Hall read-head for longitudinally magnetized magnetic tapes (semiconductor material InSb).

Hall voltage terminals: short;
Control current terminals: long.

Type	Order number
SBV 536	Q 64099-V 536



Weight approx. 2 g   Dimensions in mm

Maximum ratings		**SBV 536**	
Maximum permissible control current	I_{1M}	60	mA
Characteristics (T_{amb} = 25 °C)			
Rated value of control current	I_{1n}	50	mA
Open-circuit Hall voltage for I_{1n} and scanning of a recording (1 kHz, track width 1.5 mm, tape speed 15 inch/s) with a tape flux of $5 \cdot 10^{-10}$ Wb	V_{20}	≧300	µV
Control-side internal resistance	R_{10}	approx. 30	Ω
Hall-side internal resistance	R_{20}	approx. 30	Ω
Ohmic zero voltage at I_{1n}	V_{2RO}	≦10	mV
Temperature coefficient of V_{20}	β	approx. −1.5	%/°C
Direction of magnetization	–	longitudinal	–
Track width	s	1.5	mm
Effective gap width	δ	≦15	µm
Soft-iron pole pieces insulation resistance between semiconductor system and ferrite parts	R_{is}	>5	kΩ

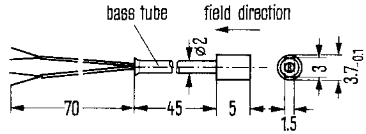
SBV 552

Axial field probe

The Hall-effect device SBV 552 is suitable for measuring axial fields in bore holes (semiconductor material InAs).

Hall-voltage leads: blue tubing; control current leads: red tubing; electrical system: dotted rectangle.

Type	Order number
SBV 552	Q64099-V552



Weight approx. 1.3 g   Dimensions in mm

Maximum ratings		**SBV 552**	
Maximum permissible control current in static air	I_{1M}	150	mA
Storage temperature	T_S	−50 to +100	°C
Working temperature	T	−20 to +90	°C

Characteristics (T_{amb} = 25 °C)

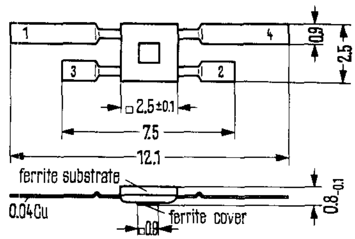
Rated value of control current for operation in air	I_{1n}	100	mA
Open-circuit Hall voltage (at I_{1n}, $B = 1$ Tesla)	V_{20}	≧50	mV
Open-circuit sensitivity (at $B = 0.01$ T)	K_{BO}	≧0.4	V/AT
Open-circuit sensitivity (at $B = 1$ T)	K_{BO}	≧0.5	V/AT
Control-side internal resistance at $B = 0$ (including lead resistance)	R_{10}	approx. 1.5	Ω
Hall-side internal resistance at $B = 0$ (including lead resistance)	R_{20}	approx. 1.1	Ω
Resistive zero component	R_0	$< 10^{-3}$	V/A
Inductive zero component	A_2	<0.05	cm^2
Mean temperature coefficient of V_{20} between −20 and +90 °C	β	approx. −0.08	%/°C
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	approx. 0.2	%/°C
Load resistance for optimum linearity (0 to 1 T)	R_{LL}	approx. 4	Ω
Linearization error for termination into R_{LL} (referred to 1 Tesla)	F_{LL}	<1.5	%

Ferrite Hall signal probe

The Hall generator SBV 566 is especially suitable as contactless signal emission device as well as position indicator of magnets. At constant control current, the Hall voltage is proportional to the flux through the ferrite cover up to $2 \cdot 10^{-7}$ Wb (corresponds to a induction of 0.25 Tesla).

The temperature dependence can be compensated by connecting a resistor of 0.5 R_{10} parallel to the control current path of the Hall generator and by supplying this arrangement with a current being three times the nominal control current.

Type	Order number
SBV 566	Q64099-V566



Weight approx. 0.2 g Dimensions in mm

Hall voltage leads: 3.4 (or 1.2).
Control current leads: 1.2 (or 3.4).

Maximum ratings

		SBV 566	
Maximum permissible control current in static air	I_{1M}	75	mA
Thermal resistance between semiconductor layer and bed	R_{th}	approx. 250	K/W
Storage temperature	T_s	−50 to +100	°C
Working temperature	T	−20 to +65	°C

Characteristics (T_{amb} = 25 °C)

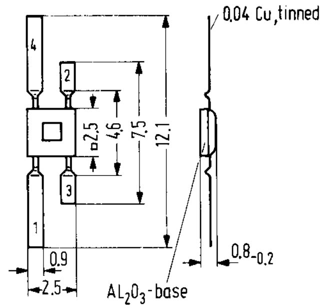
Rated value of control current for operation in air	I_{1n}	35	mA
Open-circuit Hall voltage at I_{1n} and a probe flux of $2 \cdot 10^{-7}$ Wb	V_{20}	≧400	mV
Control-side internal resistance (B = 0)	R_{10}	approx. 30	Ω
Hall-side internal resistance (B = 0)	R_{20}	approx. 30	Ω
Resistive zero component	R_0	≦1.0	V/A
Hall remanence voltage at I_{1n} after a probe flux of $2 \cdot 10^{-7}$ Wb	V_{20Rem}	approx. 1.5 of V_{20}	%
Mean temperature coefficient of V_{20} between 0 and 50 °C	β	approx. −1.5	%/°C
Mean temperature coefficient of R_{10} and R_{20} between 0 and 50 °C	α	approx. −2	%/°C
Insulation resistance between semiconductor system and ferrite parts	R_{is}	>1	kΩ

Hall signal probe

The signal probe SBV 570 serves for contactless signal emission or position indication of magnets. Its design and dimensions are similar to those of SBV 566, however, it does not have a ferromagnetic cover and has no ferromagnetic substrate; i.e. there are no attractive forces between Hall generator and magnet (semiconductor material InSb).

The temperature dependence may be compensated by connecting a resistor of 0.5 R_{10} in parallel with the control current path of the Hall generator and by supplying this arrangement with a current being three times the nominal control current.

	Type	Order number
▼	SBV 570	Q64099-V570



Dimensions in mm

Control current leads: 1.2 (or 3.4).
Hall voltage leads: 3.4 (or 1.2).

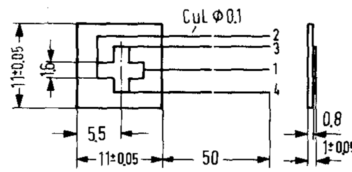
Maximum ratings		**SBV 570**	
Maximum permissible control current in static air	I_{1M}	50	mA
Thermal resistance between semiconductor layer and bed	R_{th}	approx. 200	K/W
Storage temperature	T_s	−50 to +100	°C
Operating temperature	T	−20 to +65	°C
Characteristics ($T_{amb}=25$ °C)			
Rated value of control current	I_{1n}	25	mA
Open-circuit Hall voltage (at I_{1n} and $B=0.2$ Tesla)	V_{20}	≧250	mV
Control-side internal resistance	R_{10}	approx. 25	Ω
Hall-side internal resistance	R_{20}	approx. 25	Ω
Resistive zero component at I_{1n}	V_{2RO}	≦25	mV
Temperature coefficient of V_{20} between 0 and 50 °C	β	approx. −1.5	%/°C
Temperature coefficient of R_{10} and R_{20} between 0 and 50 °C	α	approx. −2	%/°C

▼ New type

Hall field probe

The field probe SBV 579 is only suited to measure DC magnetic fields. The Hall chip of cross-shaped design ensures a particularly small linearization error (semiconductor material InAs). The electrical system is protected by a coat of varnish.

Type	Order number
▼ SBV 579	Q64099-V579



Control current leads: 1.2
Hall voltage leads: 3.4
Wire length: 50 mm

Maximum ratings

		SBV 579	
Maximum permissible control current in static air	I_{1M}	200	mA
Thermal resistance between semiconductor layer and bed	R_{th}	approx. 15	K/W
Storage temperature	T_S	−50 to +100	°C
Operating temperature	T	−20 to +80	°C

Characteristics (T_{amb}=25 °C)

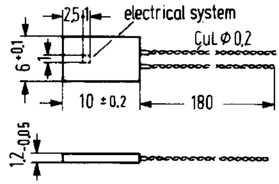
Rated value of control current (free in air)	I_{1n}	100	mA
Open-circuit Hall voltage (at I_{1n} and B=1 Tesla)	V_{20}	≧110	mV
Control-side internal resistance	R_{10}	approx. 1.8	Ω
Hall-side internal resistance	R_{20}	approx. 1.8	Ω
Resistive termination for linear matching (for field range 0 to 1 T)	R_{LL}	approx. 250	Ω
Linearization error when terminating into R_{LL} (referred to 1 T)	F_{LL}	<0.5	%
Open-circuit sensitivity (referred to 1 T)	K_{B0}	>1.1	V/AT
Resistive zero component	R_0	$<10^{-3}$	V/A
Mean temperature coefficient of V_{20} between 0 and 100 °C	β	approx. 0.05	%/°C
Mean temperature coefficient of R_{10} and R_{20} between 0 and 100 °C	α	approx. 0.2	%/°C

▼ New type

Hall field probe

The field probe SBV 595 with an epitaxial semiconductor layer of GaAs is particularly suitable for precision measurements of magnetic fields. The cross-shaped Hall chip ensures a particularly small linearization error.

Type	Order number
▼ SBV 595	Q 64099-V 595



Weight approx. 3.3 g

Control current leads: green/violet
Hall voltage leads: red/yellow
Wire length: 180 mm

Maximum ratings		**SBV 595**	
Maximum permissible control current in static air	$I_{1\,max}$	50	mA
Thermal resistance between semiconductor layer and bed	R_{th}	approx. 15	K/W
Operating temperature	T	−50 to +150	°C
Storage temperature	T_s	−60 to +160	°C
Characteristics (T_{amb} = 25 °C)			
Rated value of control current (free in air)	I_{1n}	10	mA
Open-circuit Hall voltage (at I_{1n} and B = 1 Tesla)	V_{20}	≧300	mV
Control-side internal resistance	R_{10}	approx. 200	Ω
Hall-side internal resistance	R_{20}	approx. 200	Ω
Linearization error in open circuit (field range 0 to 1 Tesla)	F_{LL}	<0.2	%
Open-circuit sensitivity	K_{BO}	≦30	V/AT
Resistive zero component	R_0	$\leqq 5 \cdot 10^{-3}$	V/A
Mean temperature coefficient of V_{20} between 0 and 100 °C	β	approx. −0.025	%/°C
Mean temperature coefficient of R_{10} and R_{20} between 0 and 100 °C	α	approx. 0.3	%/°C

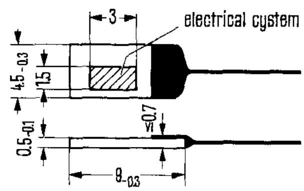
▼ New type

Hall signal probe with vapour-deposited layer

SV 110 is a high sensitivity, high internal resistance Hall device for application in control and regulating circuits (semiconductor material InSb – vapour-deposited layer).

Terminals: Hall voltage red; control current green; wire length 100 mm.

Type	Order number
SV 110/II	Q64021-S110-S2
SV 110/III	Q64021-S110-S3



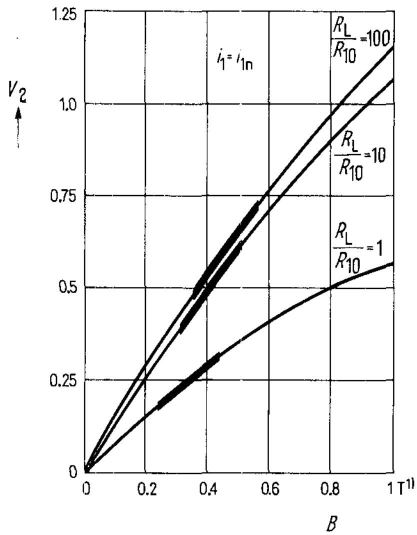
Weight approx. 0.1 g   Dimensions in mm

Maximum ratings		SV 110/II	SV 110/III	
Maximum permissible control current for operation in air	I_{1M}	30	50	mA
Operating temperature	T	−70 to +80	−70 to +80	°C

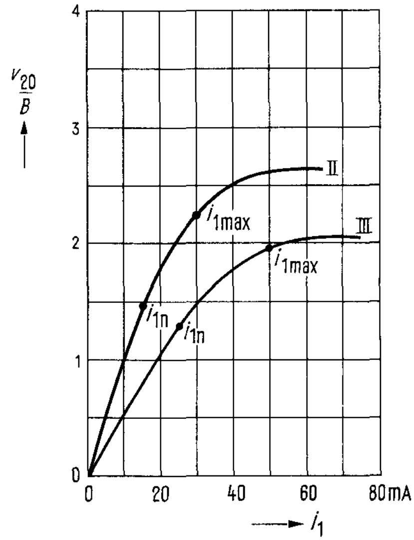
Characteristics (T_{amb} = 25 °C)

		SV 110/II	SV 110/III	
Rated value of control current for operation in air	I_{1n}	15	25	mA
Open-circuit Hall voltage (at B = 1 Tesla and I_{1n})	V_{20}	$\geqq 1.0$	$\geqq 0.8$	V
Open-circuit sensitivity referred to B = 0.5 Tesla	K_{BO}	approx. 100	approx. 50	V/AT
Control-side internal resistance at B = 0	R_{10}	approx. 500	approx. 200	Ω
Hall-side internal resistance at B = 0	R_{20}	$\leqq R_{10}$	$\leqq R_{10}$	Ω
Ohmic zero voltage at I_{1n}	V_{2RO}	$\leqq 10$	$\leqq 10$	mV
Inductive zero component	A_2	$\leqq 0.2$	$\leqq 0.2$	cm^2
Mean temperature coefficient of V_{20} between 0 and 50 °C	β	approx. −1.0	approx. −1.0	%/°C
Temperature coefficient of R_{10} between 0 and 50 °C	α	approx. −1.5	approx. −1.5	%/°C

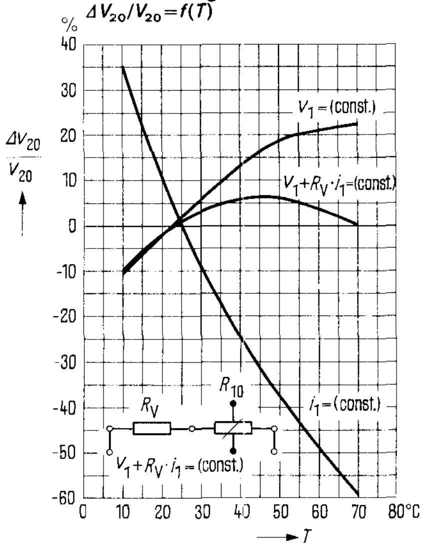
Hall voltage $V_2 = f(B)$;
R_L/R_{10} = parameter
Darkened region: end of linear portion



$\frac{V}{T}$[1] **Sensitivity curves $V_{20}/B = f(i_1)$**



Temperature dependence of Hall voltage
$\Delta V_{20}/V_{20} = f(T)$



The optimum series resistance R_V may be calculated from the individual data according to:

$$R_V = \frac{R_{10}(\alpha - \beta)}{\beta}$$

[1]) 1 Tesla = 10^4 Gauss

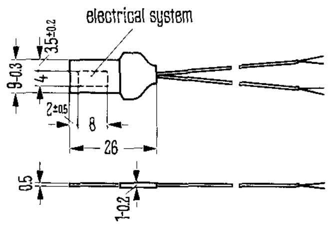
Hall signal probe with vapour-deposited layer

Not for new development

SV 130 is a high sensitivity, high internal resistance Hall device, particularly for control and regulating applications (semiconductor material InSb – vapour-deposited layer).

Hall voltage leads: blue tubing; control current leads: red tubing; wire length: 110 mm; tubing length: 100 mm.

Type	Order number
SV 130/I	Q64021-S130-S1
SV 130/II	Q64021-S130-S2
SV 130/III	Q64021-S130-S3



Weight approx. 0.5 g Dimensions in mm

Maximum ratings		SV 130/I	SV 130/II	SV 130/III	
Maximum permissible control current	I_{1M}	70	100	160	mA
Operating temperature	T	–40 to +80	–40 to +80	–40 to +80	°C

Characteristics (T_{amb} = 25 °C)

		SV 130/I	SV 130/II	SV 130/III	
Rated value of control current for operation in air	I_{1n}	35	50	80	mA
Open-circuit Hall voltage (at B = 1 Tesla and I_{1n})	V_{20}	$\geqq$1.7	$\geqq$1.3	$\geqq$1	V
Open-circuit sensitivity referred to B = 0.5 Tesla	K_{B0}	approx. 100	approx. 50	approx. 2.5	V/AT
Control-side internal resistance at B = 0	R_{10}	approx. 200	approx. 120	approx. 60	Ω
Hall-side internal resistance at B = 0	R_{20}	$\leqq R_{10}$	$\leqq R_{10}$	$\leqq R_{10}$	Ω
Ohmic zero voltage at I_{1n}	V_{2R0}	$\leqq$10	$\leqq$10	$\leqq$10	mV
Inductive zero component	A_2	$\leqq$1	$\leqq$1	$\leqq$1	cm²
Mean temperature coefficient of V_{20} between –20 and +80 °C	β	approx. –1.0	approx. –1.0	approx. –1.0	%/°C
Temperature coefficient of R_{10} between –20 and +80 °C	α	approx. –1.5	approx. –1.5	approx. –1.5	%/°C

Hall signal probe with vapour-deposited layer

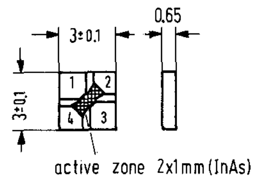
SV 200 is a Hall device of medium sensitivity with a relatively small temperature coefficient.

Within the linear region it may be used as a multiplier. It is also suitable for control and regulating circuits. Its essential advantage lies in the three types of design available (semiconductor material InAs – vapour-deposited layer).

A. **Hall chip** (contactable by thermocompression)

	Type	Order number
▼	SV 200/I	Q 64021-S 200-S 11
▼	SV 200/II	Q 64021-S 200-S 21
▼	SV 200/III	Q 64021-S 200-S 31

Hall voltage: contacts 1.3
Control current: contacts 2.4

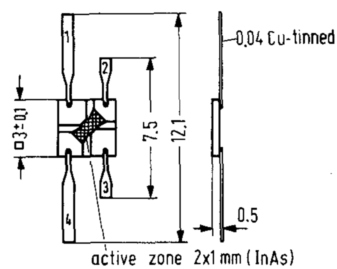


Dimensions in mm Weight approx. 0.01 g

B. **With soldering lugs**

	Type	Order number
▼	SV 200/I	Q 64021-S 200-S 12
▼	SV 200/II	Q 64021-S 200-S 22
▼	SV 200/III	Q 64021-S 200-S 32

Hall voltage: lug 1.3
Control current: lug 2.4

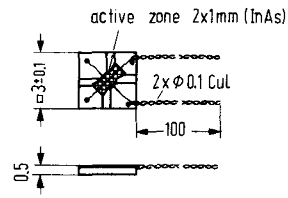


Dimensions in mm Weight approx. 0.2 g

C. **With leads**

	Type	Order number
▼	SV 200/I	Q 64021-S 200-S 13
▼	SV 200/II	Q 64021-S 200-S 23
▼	SV 200/III	Q 64021-S 200-S 33

Wires: varnished Cu wire 0.1 ∅
100 mm long
Hall voltage: red/yellow
Control current: green/blue



Dimensions in mm Weight approx. 0.02 g

▼ New type

Maximum ratings		**SV 200/I**	**SV 200/II**	**SV 200/III**	
Maximum permissible control current for operation in air	I_{1M}	80	60	40	mA
Operating temperature	T		−55 to +100		°C

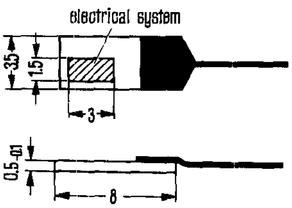
Characteristics					
Rated value of control current for operation in air	I_{1n}	40	30	20	mA
Open-circuit Hall voltage (at I_{1n} and $B=1$ Tesla)	V_{20}	≧100	≧150	≧200	mV
Open-circuit sensitivity referred to $B=0.5$ Tesla	K_{BO}	≧3.0	≧6.0	≧10	V/AT
Control-side internal resistance at $B=0$	R_{10}	appr. 20	appr. 35	appr. 60	Ω
Hall-side internal resistance at $B=0$	R_{20}	$\leqq R_{10} \cdot 2$	$\leqq R_{10} \cdot 2$	$\leqq R_{10} \cdot 2$	Ω
Ohmic zero voltage at I_{1n}	V_{2RO}	≦3.5	≦5	≦6	mV
Mean temperature coefficient of V_{20} between 0 and 100 °C	β	−0.1	−0.1	−0.1	%/°C
Mean temperature coefficient of R_{10} between 0 and 100 °C	α	0.1	0.1	0.1	%/°C
Temperature effect of zero voltage between 0 and 100 °C		10	10	10	µV/°C
Inductive zero component (for design type C)	A_2	≦0.05	≦0.05	≦0.05	cm²

Hall signal probes with vapour-deposited layer

SV 210, SV 230 S are medium sensitivity Hall devices with a relatively small temperature coefficient. Within the linear region they may be used as multipliers, outside in control and regulating circuits (semiconductor material InAs – vapour-deposited layer).

Type	Order number
SV 210	Q 64021-S 210
SV 230 S	Q 64021-S 230 S

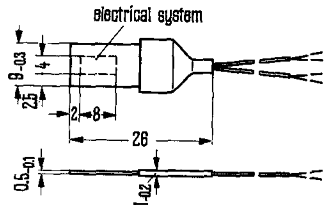
SV 210



Weight approx. 0.1 g Dimensions in mm

Hall voltage leads: red wire
Control current leads: green wire
Wire length: 100 mm

SV 230 S



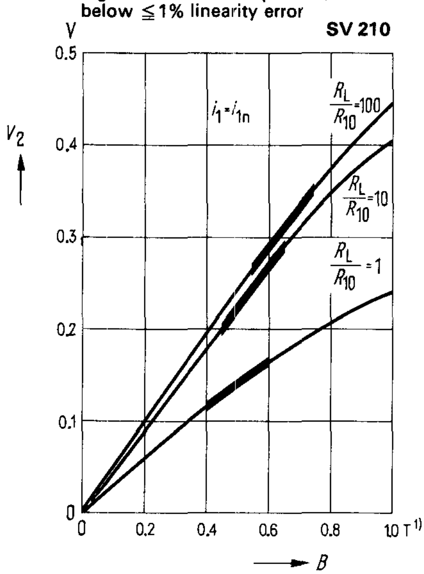
Weight approx. 1 g Dimensions in mm

Hall voltage leads: blue tubing
Control current leads: red tubing
Wire length: 110 mm
Tubing length: 100 mm

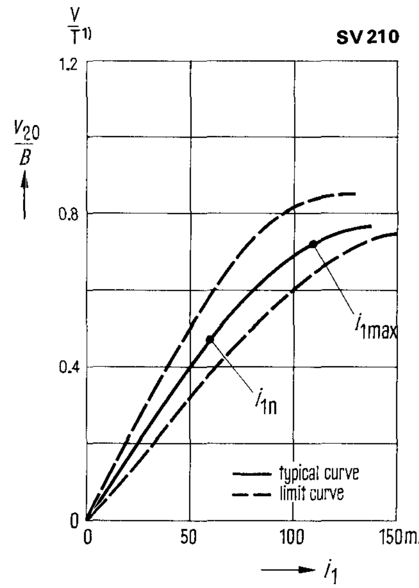
Maximum ratings		**SV 210**	**SV 230 S**	
Maximum permissible control current for operation in air	I_{1M}	110	200	mA
Operating temperature	T	–70 to +100	–40 to +100	°C
Characteristics (T_{amb} = 25 °C)				
Rated value of control current for operation in air[1])	I_{1n}	60	100	mA
Open-circuit Hall voltage at B = 1 Tesla and I_{1n}	V_{20}	≧300	≧650	mV
Open-circuit sensitivity referred to B = 0.5 Tesla	K_{B0}	≧6	≧6.5	V/AT
Control-side internal resistance at B = 0	R_{10}	approx. 30	approx. 30	Ω
Hall-side internal resistance at B = 0	R_{20}	≦R_{10}	≦R_{10}	Ω
Ohmic zero voltage at I_{1n}	V_{2R0}	≦2	≦10	mV
Inductive zero component	A_2	≦0.17	≦1.2	cm²
Mean temperature coefficient of V_{20} between 0 and 100 °C	β	approx. –0.1	≦0.1	%/°C
Mean temperature coefficient of R_{10} between 0 and 100 °C	α	approx. 0.1	<0.1	%/°C

[1]) The rated control current as well as the maximum permissible control current may be increased by a factor of 2–3 in case of operation with both-sided cooling (e.g. pole shoe)

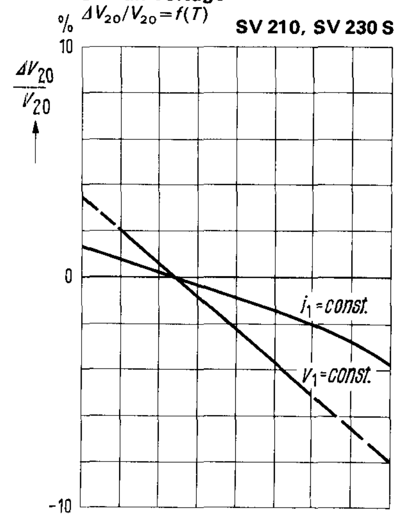
Linearity $V_2 = f(B)$;
R_L/R_{10} = parameter Darkened region: end of linear portion; below ≦1% linearity error



Sensitivity $V_{20}/B = f(i_1)$
Spread

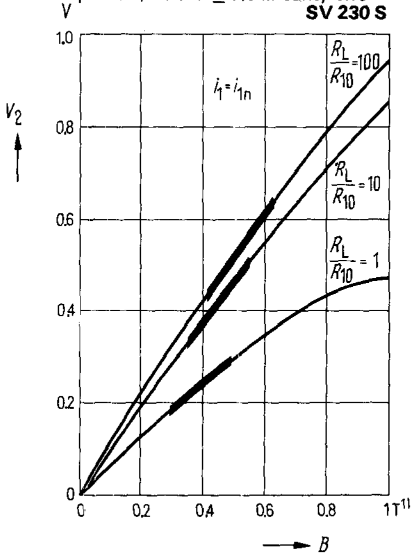


Temperature dependence of Hall voltage
$\Delta V_{20}/V_{20} = f(T)$

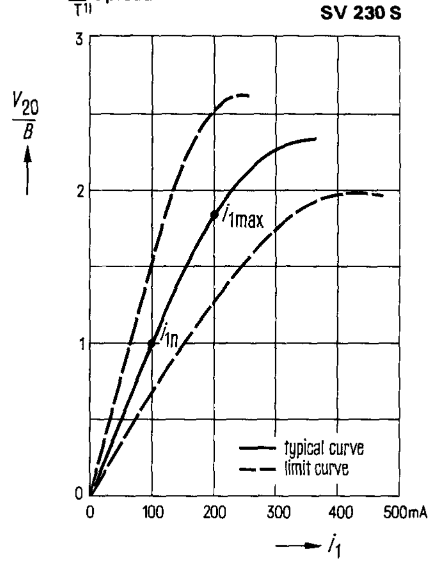


[1]) 1 T = 1 Tesla = 10^4 Gauss

Linearity $V_2 = f(B)$;
R_L/R_{10} = parameter
Darkened region: end of linear portion; below ≦ 1% linearity error



Sensitivity $V_{20}/B = f(i_1)$
Spread



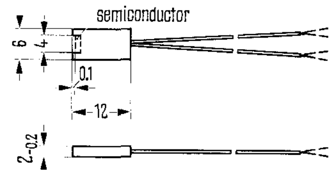
[1] 1 T = 1 Tesla = 10^4 Gauss

Tangential probe

TC 21 is a Hall effect device for measuring the tangential field intensity of magnetic materials (semiconductor material InAs).

Hall voltage leads: blue tubing; wire length: 120 mm.
Control current leads: red tubing; tubing length: 100 mm.

Type	Order number
TC 21	Q 64003-T 21



Weight approx. 0.6 g Dimensions in mm

Maximum ratings		TC 21	
Maximum permissible control current in static air	I_{1M}	200	mA
Thermal resistance between semiconductor layer and outer surface of jacket (both sides)	R_{th}	approx. 35	K/W
Storage temperature	T_s	−50 to +100	°C
Operating temperature	T	−20 to +90	°C

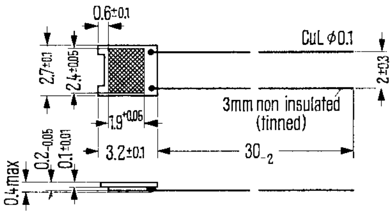
Characteristics (T_{amb} = 25 °C)

Rated value of control current for operation in air	I_{1n}	150	mA
Open-circuit Hall voltage (at I_{1n}; B = 1 Tesla)	V_{20n}	≧90	mV
Resistive termination for linear matching for the field range 0 to 1 Tesla	R_{LL}	approx. 6	Ω
Linearization error when terminating into R_{LL} (referred to 1 T)	F_{LL}	<1.5	%
Open-circuit sensitivity referred to 1 Tesla	K_{BO}	≧0.6	V/AT
Mean sensitivity when terminating into R_{LL} (in % of K_{BO} referred to 1 T)	K_{BL}	approx. 65	%
Control-side internal resistance at B = 0 (including 0.45 Ω lead resistance)	R_{10}	approx. 1.2	Ω
Hall-side internal resistance at B = 0 (including 0.65 Ω lead resistance)	R_{20}	approx. 1.2	Ω
Ohmic zero component	R_0	$<2 \times 10^{-3}$	V/A
Inductive zero component	A_2	<0.08	cm^2
Mean temperature coefficient of V_{20} between −20 and +90 °C	β	approx. −0.1	%/°C
Mean temperature coefficient of R_{10} and R_{20} between −20 and +90 °C	α	approx. 0.2	%/°C
Effective surface of el. system		3 × 1.5	mm^2

Magneto resistor

FP 17 D 500 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 500 Ω. The "D" material produces the largest resistance change R_B/R_0 in the magnetic field. The temperature coefficient TC, however, is very high. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 17 D 500 E	Q 65017-D 500-E



Weight approx. 0.02 g
Dimensions in mm

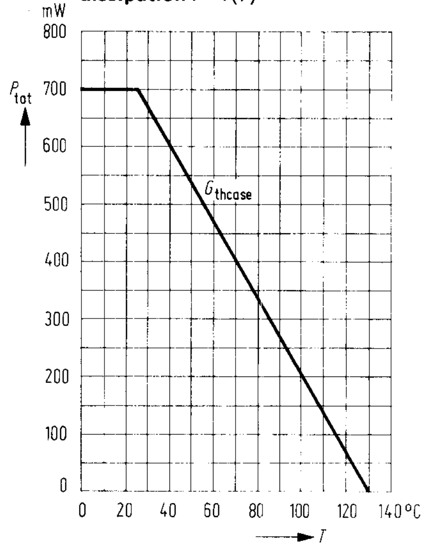
Maximum ratings		FP 17 D 500 E	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	700	mW
Insulating voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	15	mW/K
free in air	$G_{th\,amb}$	1.5	mW/K

Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	500	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	3 (>2.8)	–
$B = \pm 1$ T	R_B/R_0	15 (>12)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−1.8	%/°C
$B = \pm 0.3$ T	TC_{25}	−2.7	%/°C
$B = \pm 1$ T[1]	TC_{25}	−2.9	%/°C

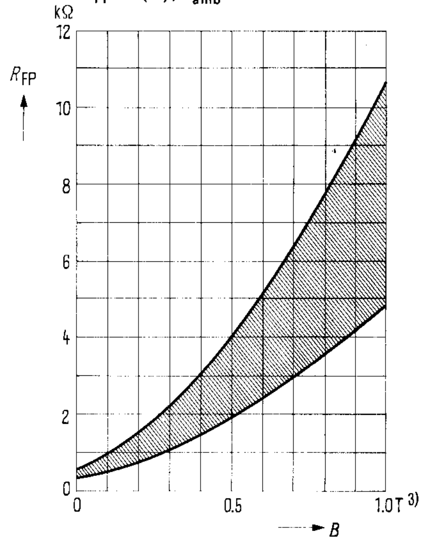
[1]) 1 T = 1 Tesla = 10^4 Gauss

FP 17 D 500 E

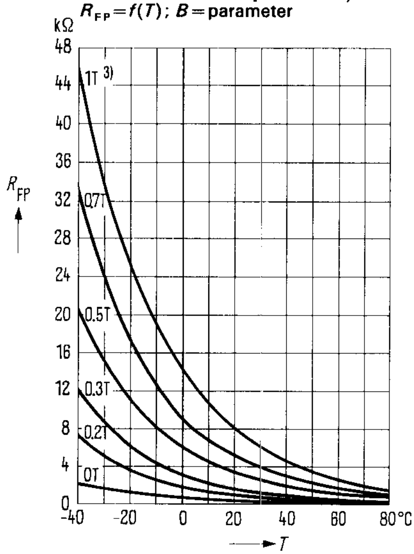
Total permissible power dissipation $P = f(T)$



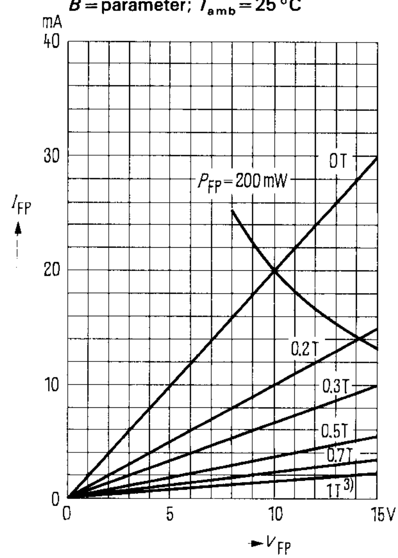
Spread of resistance of magneto resistor[1] at various magnetic flux values B; $R_{FP} = f(B)$; $T_{amb} = 25\ °C$



Magneto resistor resistance as a function of temperature[2] $R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density B = parameter; $T_{amb} = 25\ °C$

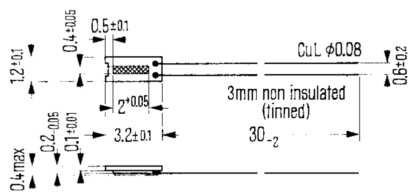


[1]) incl. a spread of ±20% of basic resistance R_0
[2]) for mean values of *MR* resistance R_{FP}
[3]) 1 T = 1 Tesla = 10^4 Gauss

Magneto resistor

FP 30 D 50 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 50 Ω. The "D" material produces the largest resistance variation R_B/R_0 in the magnetic field. The temperature coefficient *TC*, however, is very high. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 30 D 50 E	Q 65030-D 50-E



Weight approx. 0.017 g
Dimensions in mm

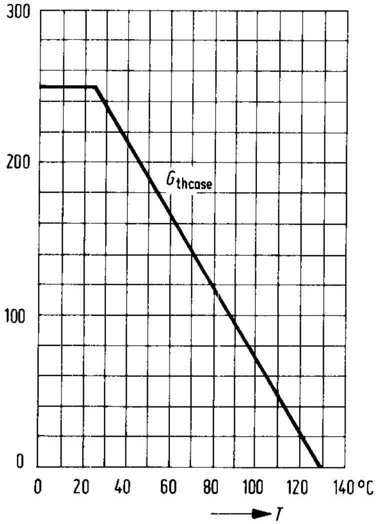
Maximum ratings		FP 30 D 50 E	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	250	mW
Insulating voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	5	mW/K
free in air	$G_{th\,amb}$	0.5	mW/K

Characteristics (T_{amb} = 25 °C)

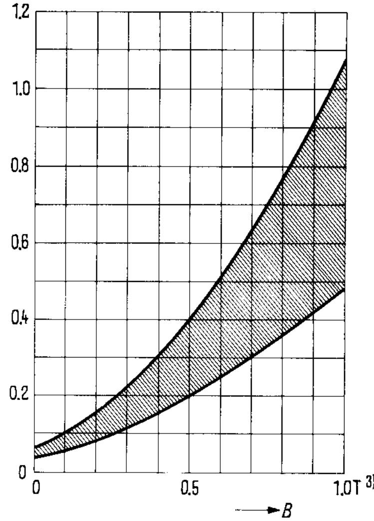
Basic resistance	R_0	50	Ω
Tolerance of the basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T=Tesla)	R_B/R_0	3 (>2.8)	–
$B = \pm 1$ T[1])	R_B/R_0	15 (>12)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−1.8	%/°C
$B = \pm 0.3$ T	TC_{25}	−2.7	%/°C
$B = \pm 1$ T[1])	TC_{25}	−2.9	%/°C

[1]) 1 *T* = 1 Tesla = 10^4 Gauss

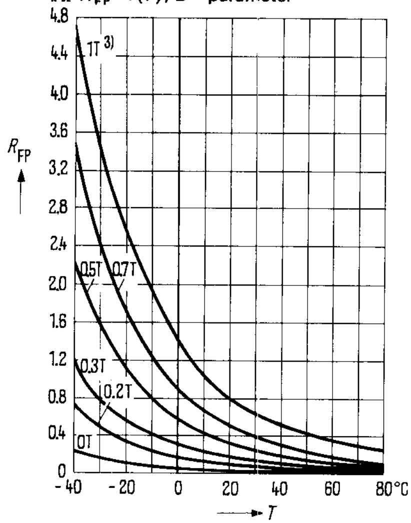
Total permissible power dissipation $P_{tot} = f(T)$



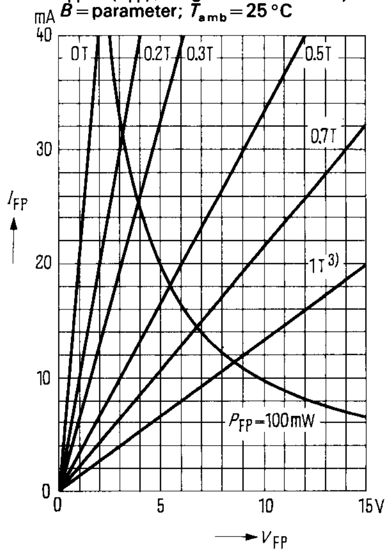
Spread of resistance of magneto resistor[1] at various magnetic flux values B;
$R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density B = parameter; $T_{amb} = 25\,°C$

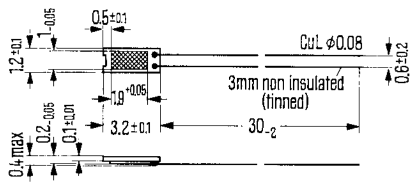


[1]) incl. the spread of ±20% of basic resistance R_0
[2]) for mean values of MR resistance R_{FP}
[3]) 1 T = 1 Tesla = 10^4 Gauss

Magneto resistor

FP 30 D 250 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 250 Ω. The "D" material produces the largest resistance variation R_B/R_0 in the magnetic field. The temperature coefficient *TC*, however, is very high. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 30 D 250 E	Q65030-D250-E

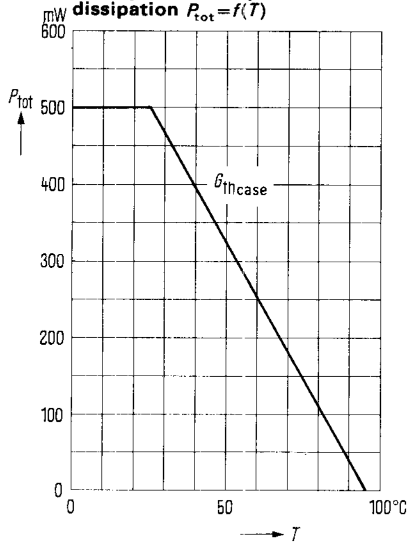


Weight approx. 0.017 g Dimensions in mm

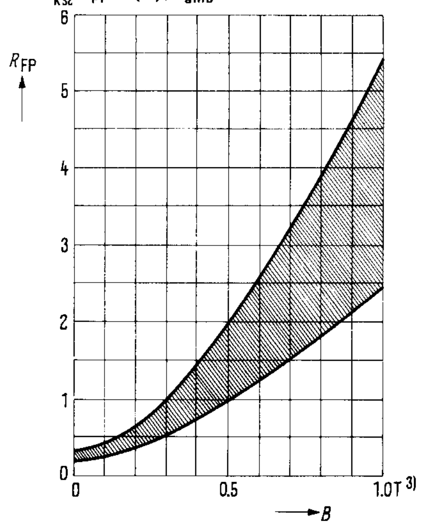
Maximum ratings		**FP 30 D 250 E**	
Maximum operating temperature	T_{max}	95	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	500	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	95	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	10	mW/K
free in air	$G_{th\,amb}$	1	mW/K
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	250	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	3 (>2.8)	–
$B = \pm 1$ T[1])	R_B/R_0	15 (>12)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−1.8	%/°C
$B = \pm 0.3$ T	TC_{25}	−2.7	%/°C
$B = \pm 1$ T[1])	TC_{25}	−2.9	%/°C

[1]) 1 *T* = 1 Tesla = 10^4 Gauss

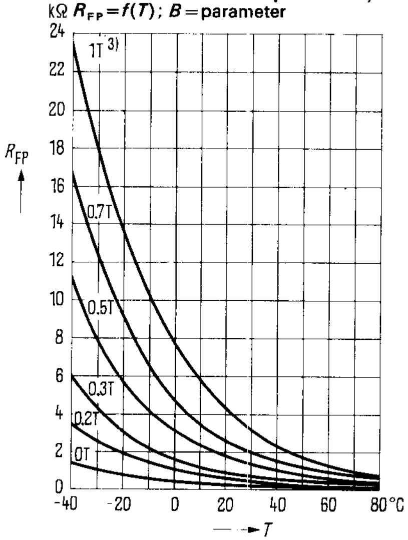
Total permissible power dissipation $P_{tot} = f(T)$



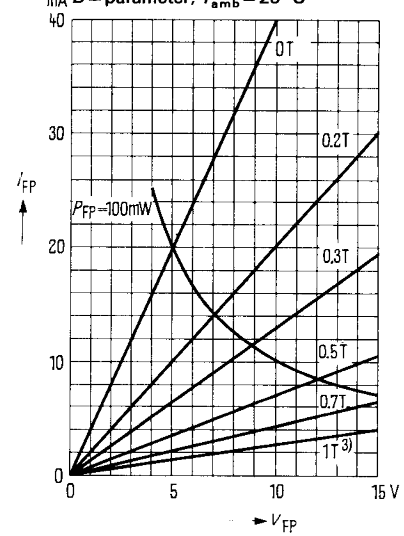
Spread of resistance of magneto resistor[1])
at various magnetic flux values B
$R_{FP} = f(B)$; $T_{amb} = 25$ °C



Magneto resistor resistance as a function of temperature[2])
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density
B = parameter; $T_{amb} = 25$ °C

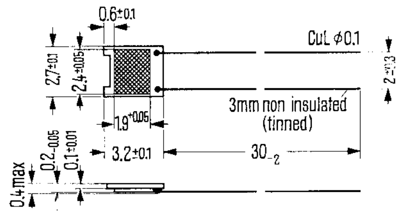


[1]) incl. the spread of ±20% of basic resistance R_o
[2]) for mean values of MR resistance R_{FP}
[3]) 1 T = 1 Tesla = 10^4 Gauss

Magneto resistor

FP 17 L 200 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 200 Ω. The "L" material has a smaller temperature coefficient *TC* and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 17 L 200 E	Q 65017-L 200-E



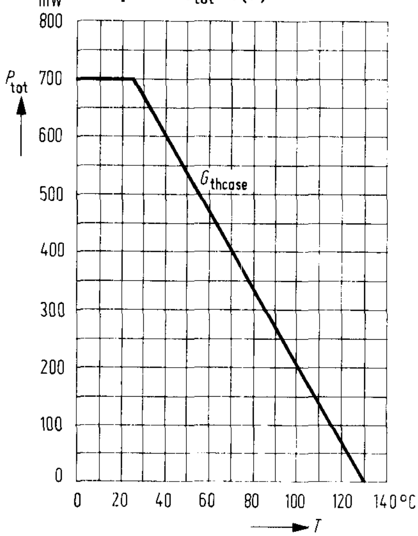
Weight approx. 0.02 g   Dimensions in mm

Maximum ratings		FP 17 L 200 E	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	700	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	15	mW/K
free in air	$G_{th\,amb}$	1.5	mW/K

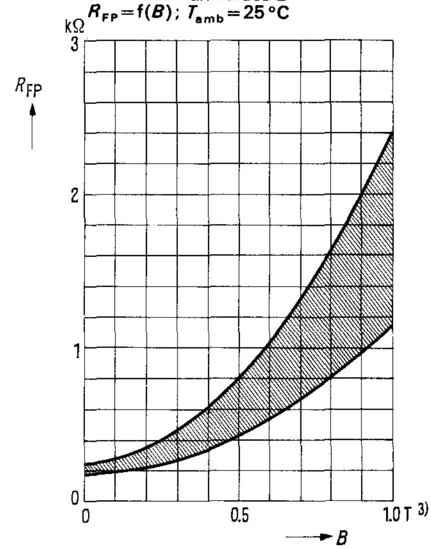
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	200	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1])	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.38	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.54	%/°C

[1]) 1 *T* = 1 Tesla = 10^4 Gauss

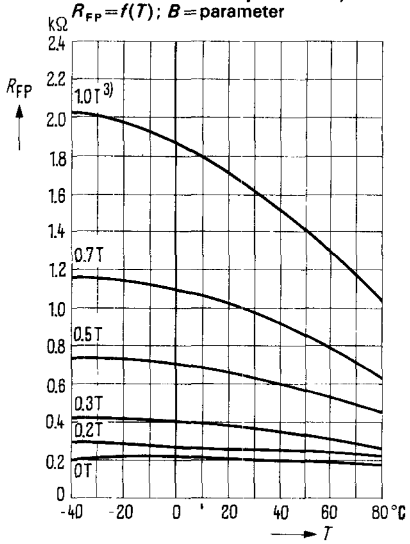
Total permissible power dissipation $P_{tot} = f(T)$



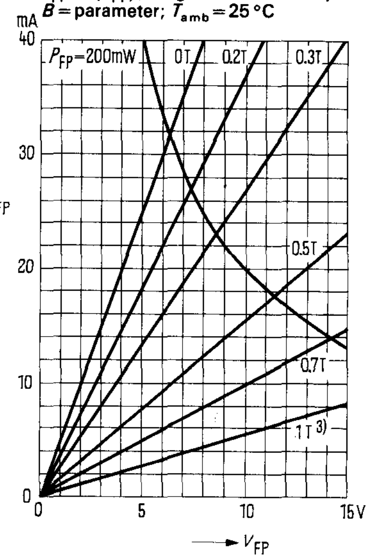
Spread of resistance of magneto resistor[1]
at various flux values B
$R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density
B = parameter; $T_{amb} = 25\,°C$

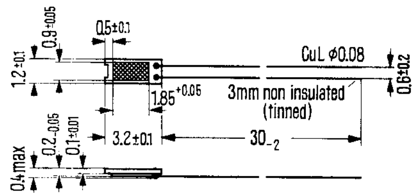


[1] incl. the spread of ±20% of basic resistance R_0
[2] for mean values of MR resistance R_{FP}
[3] 1 T = 1 Tesla = 10^4 Gauss

Magneto resistor

FP30L50E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 50 Ω. The "L" material has a smaller temperature coefficient TC and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on an iron substrate.

Type	**Order number**
FP 30 L 50 E	Q65030-L50-E



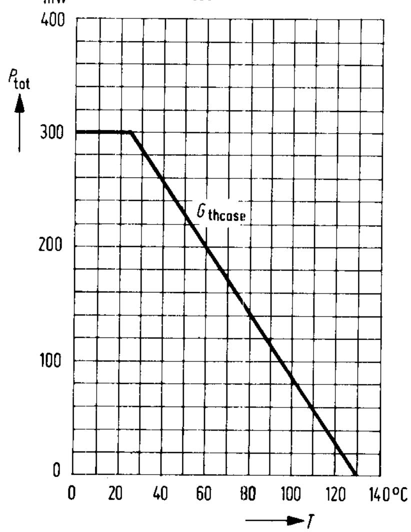
Weight approx. 0.017 g Dimensions in mm

Maximum ratings		**FP30L50E**	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	300	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	6	mW/K
free in air	$G_{th\,amb}$	0.6	mW/K

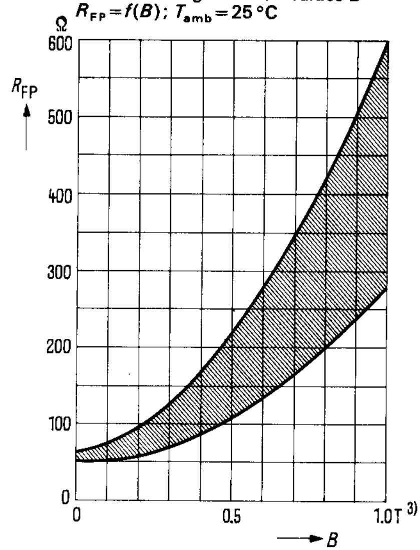
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	50	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1])	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.38	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.54	%/°C

[1]) 1 T = 1 Tesla = 10^4 Gauss

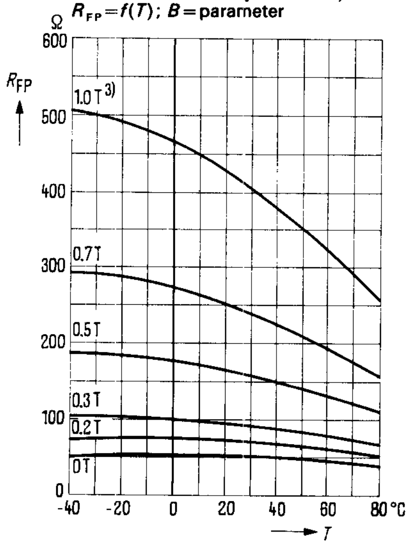
Total permissible power dissipation $P_{tot} = f(T)$



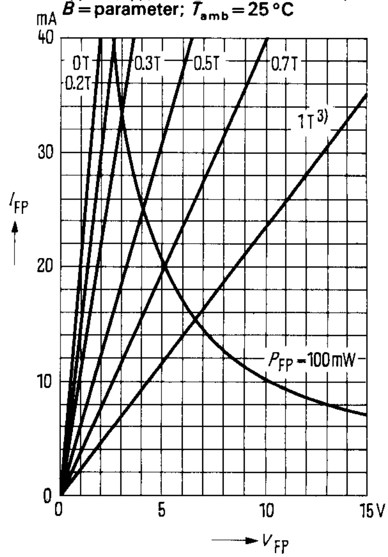
Spread of resistance of magneto resistor[1]
at various magnetic flux values B
$R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density
B = parameter; $T_{amb} = 25\,°C$

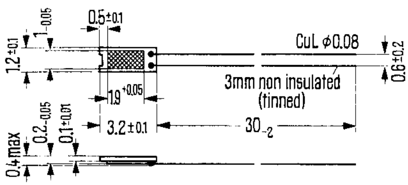


[1]) incl. the spread of $\pm 20\%$ of basic resistance R_o
[2]) for mean values of MR resistance R_{FP}
[3]) $1\,T = 1$ Tesla $= 10^4$ Gauss

Magneto resistor

FP30L100E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 100 Ω. The "L" material has a smaller temperature coefficient TC and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 30 L 100 E	Q65030-L100-E



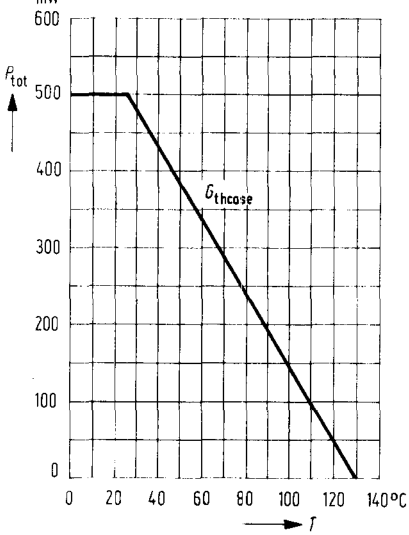
Weight approx. 0.017 g   Dimensions in mm

Maximum ratings		**FP30L100E**	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	500	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	10	mW/K
free in air	$G_{th\,amb}$	1	mW/K

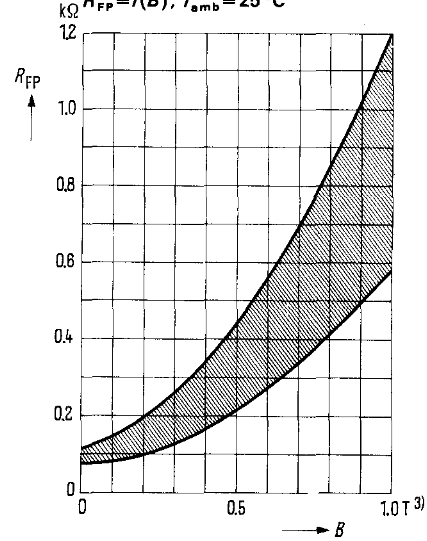
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	100	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1])	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.38	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.54	%/°C

[1]) 1 T = 1 Tesla = 10^4 Gauss

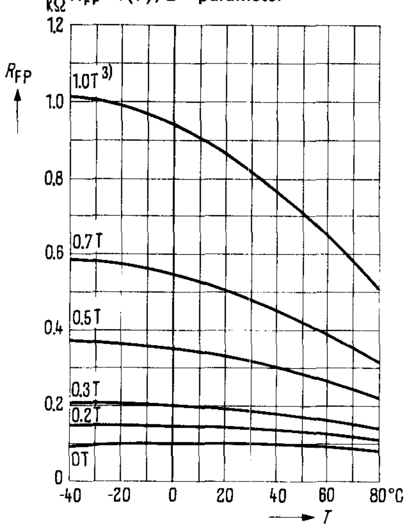
Total permissible power dissipation $P_{tot} = f(T)$



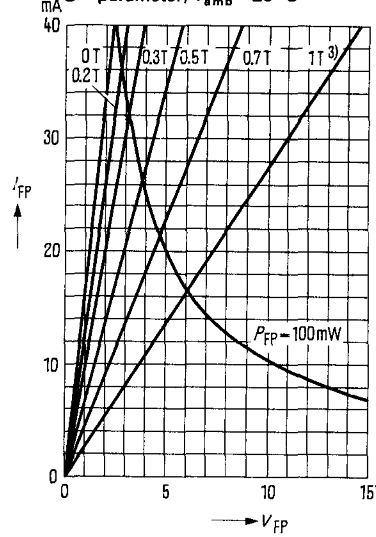
Spread of resistance of magneto resistor[1]
at various magnetic flux values B
$R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density
B = parameter; $T_{amb} = 25\,°C$



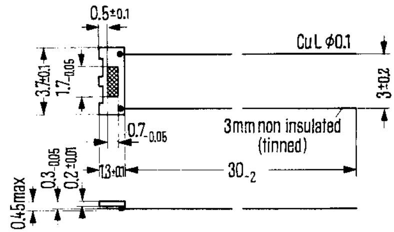
[1] incl. the ±20% spread of basic resistance R_0
[2] for mean values of MR resistance R_{FP}
[3] 1 T = 1 Tesla = 10^4 Gauss

Magneto resistor

Not for new development

FP 38 L 40 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 40 Ω. The "L" material has a smaller temperature coefficient TC and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 38 L 40 E	Q65038-L40-E



Weight approx. 0.017 g   Dimensions in mm

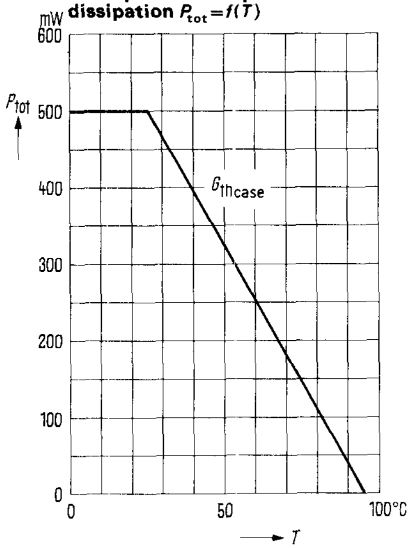
Maximum ratings		FP 38 L 40 F	
Maximum operating temperature	T_{max}	95	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	500	MW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	95	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	10	mW/K
free in air	$G_{th\,amb}$	1	mW/K

Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	40	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T=Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1])	B_B/R_0	8.6 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.38	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.54	%/°C

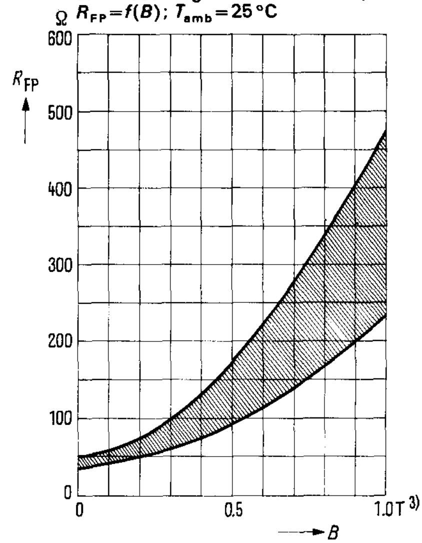
[1]) 1 T = 1 Tesla = 10^4 Gauss

Not for new development

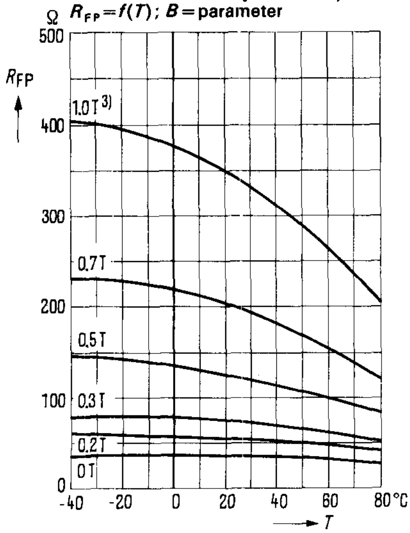
Total permissible power dissipation $P_{tot} = f(T)$



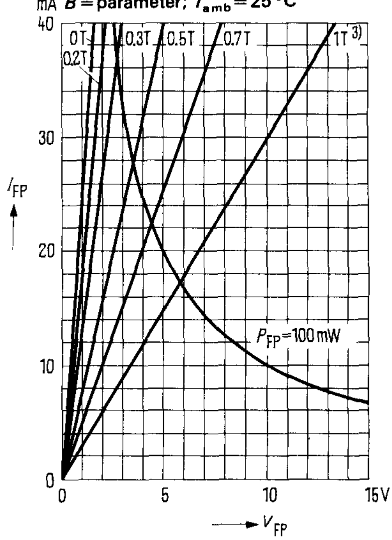
Spread of resistance of magneto resistor[1]
at various magnetic flux values B, $R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density B = parameter; $T_{amb} = 25\,°C$

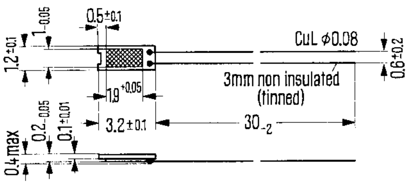


[1] Incl. the ±20% spread of basic resistance R_0
[2] For mean values of MR resistance R_{FP}
[3] $1\,T = 1$ Tesla $= 10^4$ Gauss

Magneto resistor

FP 30 N 60 E is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 60 Ω. In case of "N" material the temperature coefficient *TC* and the relative resistance variation R_B/R_0 in the magnetic field are smaller than with "D" and "L" materials. The magneto resistor is mounted on an iron substrate.

Type	Order number
FP 30 N 60 E	Q 65030-N 60-E



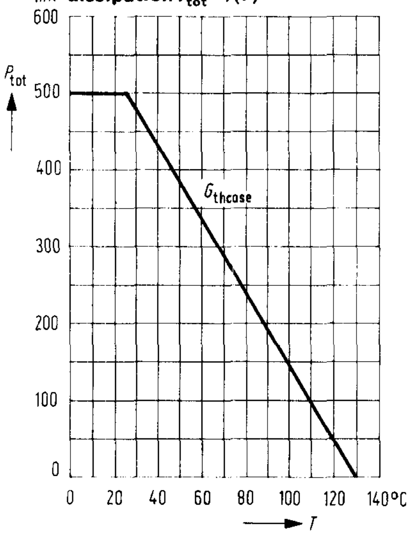
Weight approx. 0.017 g   Dimensions in mm

Maximum ratings		FP 30 N 60 F	
Maximum operating temperature	T_{max}	130	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	500	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	150	°C
Thermal conduction constant:			
on side glued to metal surface	$G_{th\,case}$	10	mW/K
free in air	$G_{th\,amb}$	1	mW/K

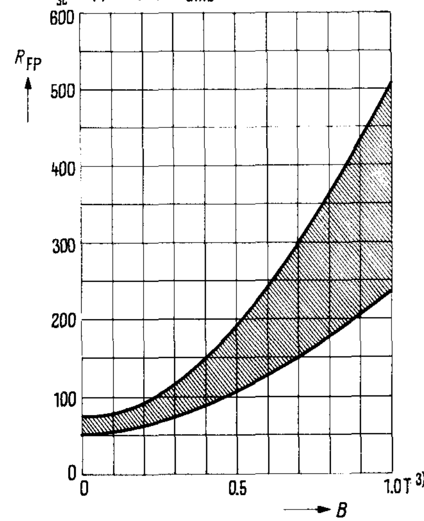
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	60	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T=Tesla)	R_B/R_0	1.6 (>1.4)	–
$B = \pm 1$ T[1])	R_B/R_0	6 (>5)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	+0.02	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.13	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.25	%/°C

[1]) 1 *T* = 1 Tesla = 10^4 Gauss

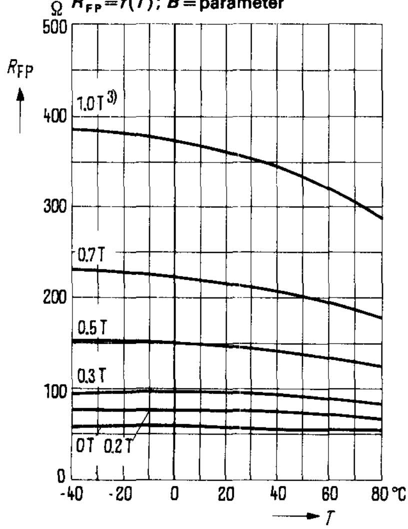
Total permissible power dissipation $P_{tot} = f(T)$



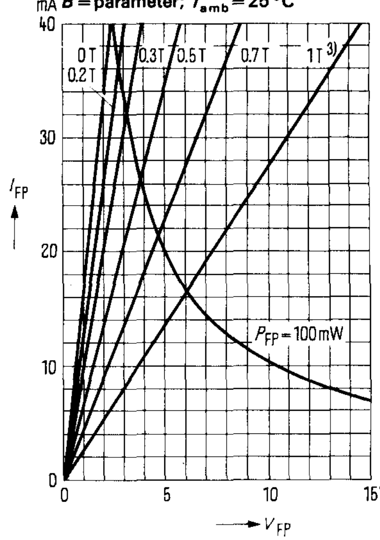
Spread of resistance of magneto resistor[1]
at various magnetic flux values *B*, $R_{FP} = f(B)$; $T_{amb} = 25\ °C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; *B* = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density *B* = parameter; $T_{amb} = 25\ °C$

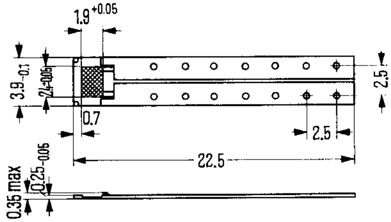


[1] Incl. the ±20% spread of basic resistance R_0
[2] For mean values of MR resistance R_{FP}
[3] $1\ T = 1$ Tesla $= 10^4$ Gauss

Magneto resistor

FP17L200J is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 200 Ω. The "L" material has a smaller temperature coefficient *TC* and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on a non-magnetic substrate. It is particularly suitable for free suspension in an air gap.

Type	Order number
FP 17 L 200 J	Q65017-L200-J



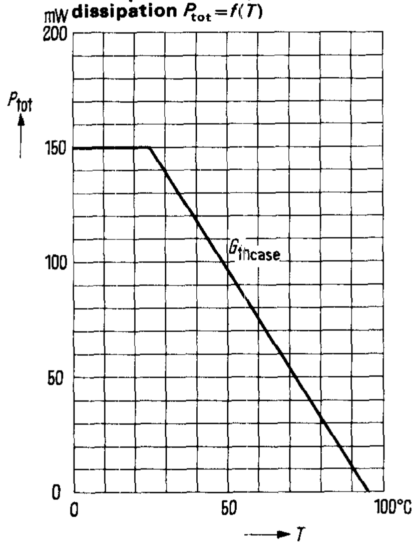
Weight approx. 0.03 g Dimensions in mm

Maximum ratings		**FP17L200J**	
Maximum operating temperature	T_{max}	95	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	150	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	95	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	4.5	mW/K
free in air	$G_{th\,amb}$	1.5	mW/K

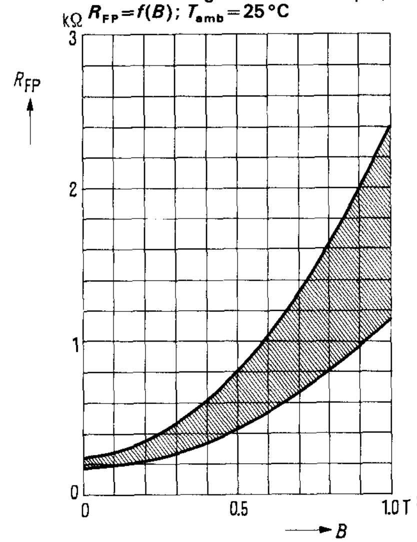
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	200	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T=Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1])	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	−0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	−0.38	%/°C
$B = \pm 1$ T[1])	TC_{25}	−0.54	%/°C

[1]) 1 *T* = 1 Tesla = 10^4 Gauss

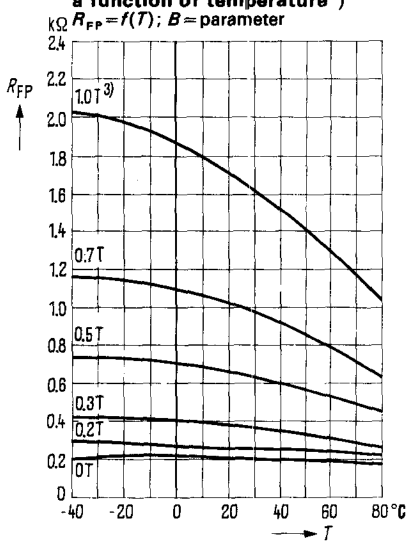
Total permissible power dissipation $P_{tot} = f(T)$



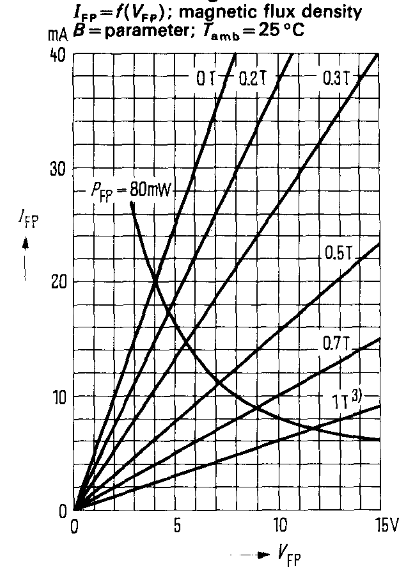
Spread of resistance of magneto resistor[1]
at various magnetic flux density B, $R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2]
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density B = parameter; $T_{amb} = 25\,°C$

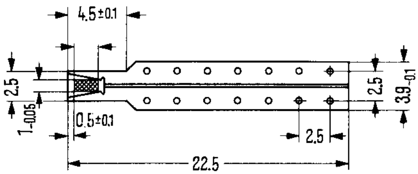


[1] Incl. the ±20% spread of basic resistance R_0
[2] For mean values of MR resistance R_{FP}
[3] $1\,T = 1$ Tesla $= 10^4$ Gauss

Magneto resistor

FP 30 L 100 J is a magneto resistor made of indium antimonide – nickel antimonide with a basic resistance R_0 of 100 Ω. The "L" material has a smaller temperature coefficient TC and a lower relative resistance variation R_B/R_0 in the magnetic field than the "D" material. The magneto resistor is mounted on non-magnetic substrate. It is particularly suitable for free suspension in an air gap.

Type	Order number
FP 30 L 100 J	Q 65030-L 100-J



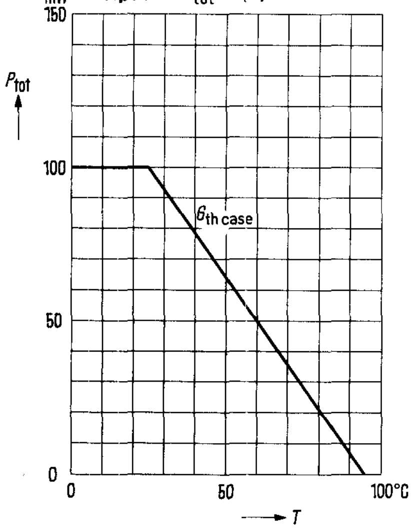
Weight approx. 0.025 g Dimensions in mm

Maximum ratings		FP 30 L 100 J	
Maximum operating temperature	T_{max}	95	°C
Maximum electrical load (T_{case} = 25 °C)	P_{tot}	100	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	95	°C
Thermal conduction constant:			
one side glued to metal surface	$G_{th\,case}$	3	mW/K
free in air	$G_{th\,amb}$	1	mW/K

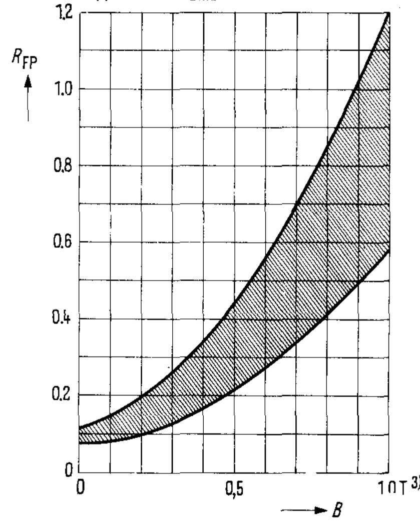
Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_0	100	Ω
Tolerance of basic resistance	R_0-Tol.	±20	%
Relative resistance variation:			
$B = \pm 0.3$ T (T = Tesla)	R_B/R_0	1.85 (>1.7)	–
$B = \pm 1$ T[1]	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
$B = 0$ T	TC_{25}	–0.16	%/°C
$B = \pm 0.3$ T	TC_{25}	–0.38	%/°C
$B = \pm 1$ T[1]	TC_{25}	–0.54	%/°C

[1]) 1 T = 1 Tesla = 10^4 Gauss

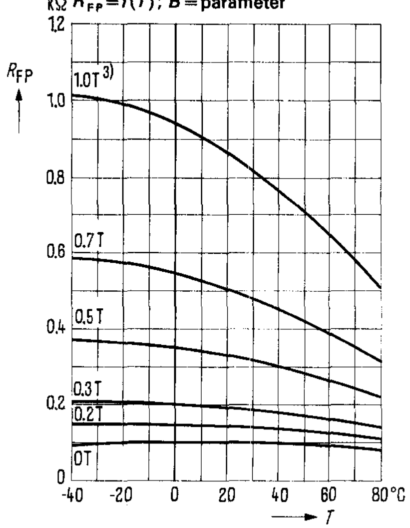
Total permissible power dissipation $P_{tot} = f(T)$



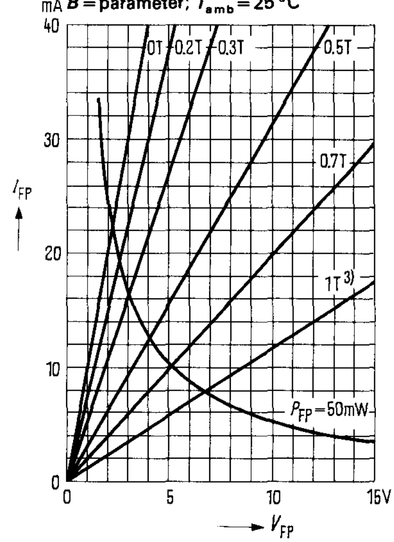
Spread of resistance of magneto resistor[1])
at various magnetic flux density B; $R_{FP} = f(B)$; $T_{amb} = 25\,°C$



Magneto resistor resistance as a function of temperature[2])
$R_{FP} = f(T)$; B = parameter



Current-voltage characteristics
$I_{FP} = f(V_{FP})$; magnetic flux density B = parameter; $T_{amb} = 25\,°C$



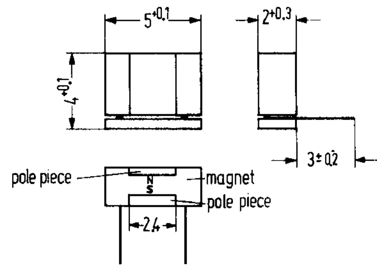
[1]) Incl. the ±20% spread of basic resistance R_0
[2]) For mean values of MR resistance R_{FP}
[3]) $1\,T = 1$ Tesla $= 10^4$ Gauss

Magnetically biassed magneto resistor

The magnetically biassed magneto resistor FP 100 L 100 has a InSb/NiSb system with a basic resistance R_0 of approximately 115 Ω (±20%). The MR resistance is raised in the linear range of the characteristic by a magnetic bias of about 0.6 T. R_{V0} runs to about 450 Ω (±30%). The pole pieces of the magnetic circuit consist of Permenorm 5000 H 2. Strontium ferrite DS 2 is used as a permanent magnet.

FP 100 L 100 is suitable for measuring the direction of a magnetic field. The component has small dimensions (5 × 2 × 4 mm) and a low temperature coefficient *TC* (approx. 0.7%/°C).

Type	Order number
FP 100 L 100	Q65100-L100-V



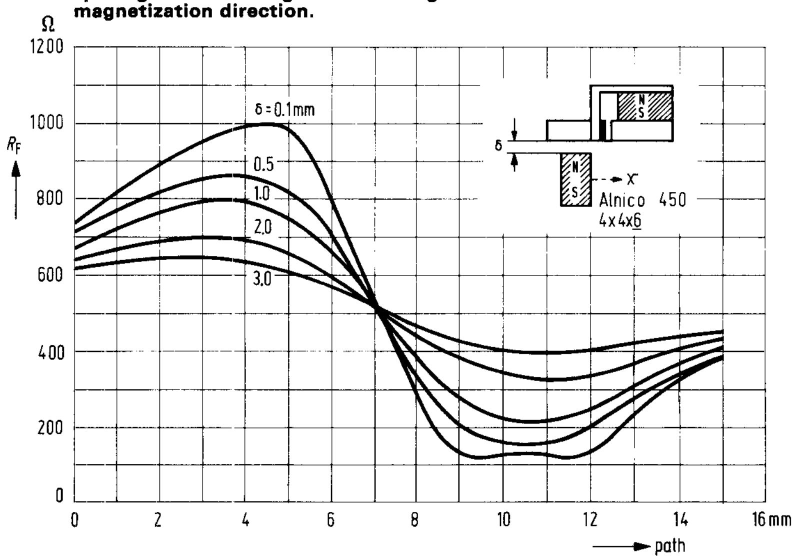
Weight approx. 0.25 g Dimensions in mm

Maximum ratings		FP 100 L 100	
Operating temperature	T	130	°C
Electrical load (T_{case} = 25 °C)	P_{tot}	500	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	−40 to +150	°C
Thermal conduction constant (glued on metal plane on one side with pole piece)	$G_{th\,case}$	10	mW/K
Thermal conduction constant (free in air)	$G_{th\,amb}$	1	mW/K

Magnetically biassed magneto resistor

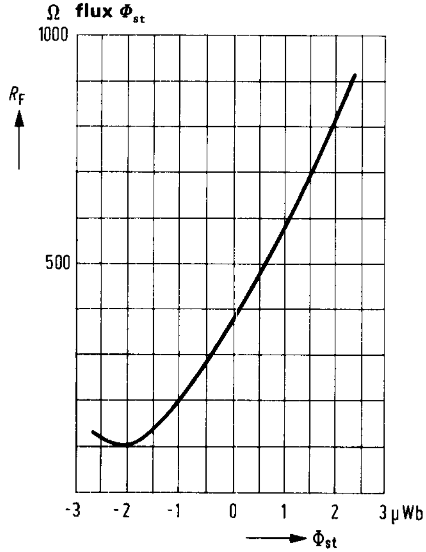
Characteristics ($T_{amb} = 25\ °C$)		FP 100 L 100	
Basic resistance without bias ($B = 0$)	R_0	115	Ω
Tolerance of R_0	R_0-Tol.	±20	%
Resistance with bias ($B = \pm 0.6$ T) [1]	R_{V0}	450	
Tolerance of R_{V0}	R_{V0}-Tol.	±30	%
Resistance ratio	R_{V0}/R_0	>3	–
Flux sensitivity ($S_\Phi = \Delta R / \Delta \Phi_{st}$) [2]	S_Φ	200	Ω/μWb
Field sensitivity ($S_B = \Delta R / \Delta B_{st}$) [3]	S_B	2	/mT
Temperature coefficient of R_{V0}, S_Φ, S_B	TC	−0.7	%/°C

R_F as a function of the permanent magnet path for various spacings. Control magnet and H magnet have the same magnetization direction.

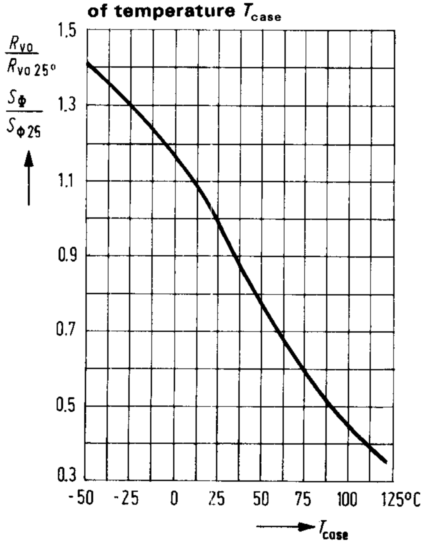


[1] 1 T = 1 Tesla = 10^4 Gauss = 10 kG
[2] S_Φ is the relation of the resistance variation to the change of the externally fed control current.
[3] S_B is the relation of the resistance variation to the change of the externally applied magnetic induction.

Magneto resistor resistance R_F as a function of the control flux Φ_{st}

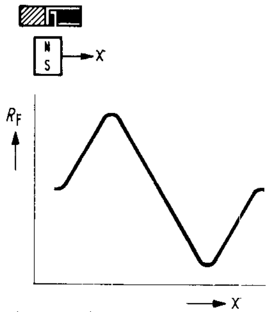


Relative magneto resistor resistance $\frac{R_{VO}}{R_{VO25}}$ as a function of temperature T_{case}

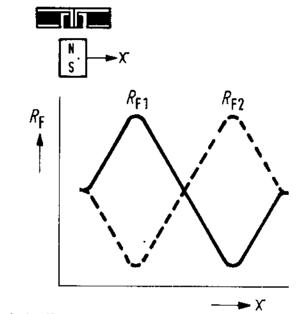


Magnetically biassed magneto resistor

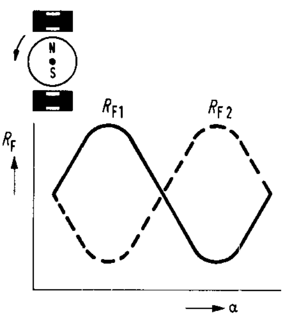
Examples of application for FP 100 L 100



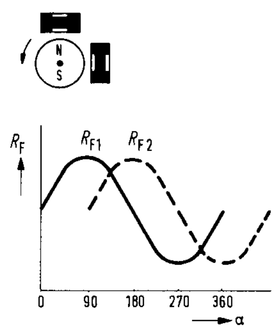
pulse generator



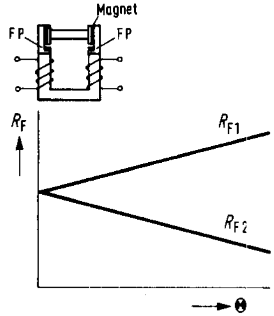
inductive displacement pick-up,
limit switch, pressure gauge



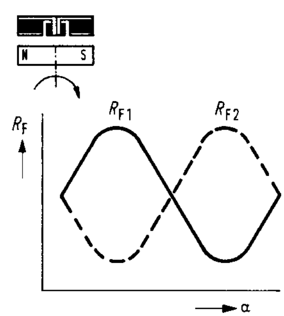
potentiometer



collector-less motor,
rotary-displacement sensor



electr. potentiometer, potential divider



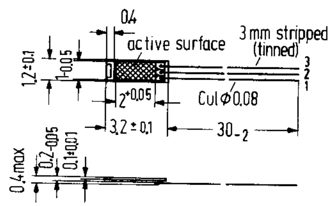
potentiometer

Center-tap magneto resistors

The center-tap magneto resistors FP 110 D 155 and FP 110 L 60 are magnetically controllable resistors made of InSb/NiSb and having an intrinsic resistance R_0 of $2 \times 155\,\Omega$ and $2 \times 60\,\Omega$, respectively. They are mounted on an insulated iron substrate. In the magnetic field, the "D" material has a larger relative resistance change R_B/R_0 than the "L" material, but also a higher temperature coefficient TC.

The center-tap magneto resistor is particularly suitable for the detection of small displacements and for the construction of a potentiometer circuit permitting also good temperature compensation.

Type	Order number
FP 110 D 155	Q65110-D155-D
FP 110 L 60	Q65110-L60-D



Weight approx. 0.02 g Dimensions in mm

		FP110D155	FP110L60	
Maximum ratings				
Operating temperature	T	130	130	°C
Electrical load ($T_{case} = 25\,°C$)	P_{tot}	500	500	mW
Insulation voltage between system and substrate	V_I	100	100	V
Storage temperature	T_S	−40 to +150		°C
Thermal conduction constant: (one side glued to metal plane)	G_{thcase}	10	10	mW/K
Thermal conduction constant (free in air)	G_{thamb}	1	1	mW/K
Characteristics ($T_{amb} = 25\,°C$)				
Basic resistance ($B = 0$)	R_{13}	310	120	Ω
Tolerance of R_0	R_0-Tol.	±20	±20	%
Centre symmetry [1]	M	2 (<5)	2 (<5)	%
Relative resistance change: ($B = \pm 0.3$ T) [2]	R_B/R_0	3 (>2.8)	1.85 (>1.7)	–
($B = \pm 1$ T)	R_B/R_0	15 (>12)	8.5 (>7)	–
Temperature coefficient: ($B = 0$ T)	TC	−1.8	−0.16	%/°C
($B = 0.3$ T)	TC	−2.7	−0.38	%/°C
($B = 1$ T)	TC	−2.9	−0.54	%/°C

[1] $M = \frac{R_1 - R_2}{R_1} \times 100$; for $R_1 > R_2$

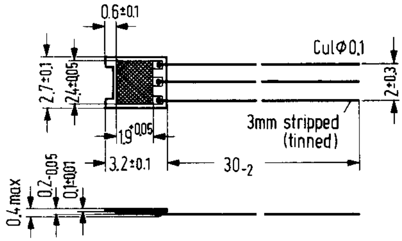
[2] 1 T (Tesla) = 10^4 Gauss = 10 kG (kilo-Gauss)

Center-tap magneto resistor

The center-tap magneto resistor FP 111 L 100 is a magnetically controllable resistor made of InSb/NiSb and having a basic resistance R_0 of 2 × 100 Ω. It is mounted on an insulated iron substrate. The "L" material is characterized by a large resistance change R_B/R_0 in the magnetic field and by a low temperature coefficient *TC*.

The component is particularly suitable for the detection of small displacements and for the construction of a potentiometer circuit permitting also good temperature compensation.

Type	Order number
FP 111 L 100	Q65111-L100-D



Weight approx. 0.02 g   Dimensions in mm

Maximum ratings		FP 111 L 100	
Operating temperature	T	130	°C
Electrical load (T_{case} = 25 °C)	P_{tot}	700	mW
Insulation voltage between system and substrate	V_I	100	V
Storage temperature	T_S	−40 to +150	°C
Thermal conduction constant (one side glued to metal plane)	$G_{th\,case}$	15	mW/K
Thermal conduction constant (free in air)	$G_{th\,amb}$	1.5	mW/K

Characteristics (T_{amb} = 25 °C)			
Basic resistance	R_{13}	200	Ω
Tolerance of R_0	R_0-Tol.	±20	%
Centre symmetry [1]	M	2 (<5)	%
Relative resistance variation:			
(B = ±0.3 T) [2]	R_B/R_0	1.85 (>1.7)	–
(B = ±1 T)	R_B/R_0	8.5 (>7)	–
Temperature coefficient:			
B = 0 T	TC	−0.16	%/°C
B = 0.3 T	TC	−0.38	%/°C
B = 1 T	TC	−0.54	%/°C

[1] $M = \frac{R_1 - R_2}{R_1} \times 100$; for $R_1 > R_2$

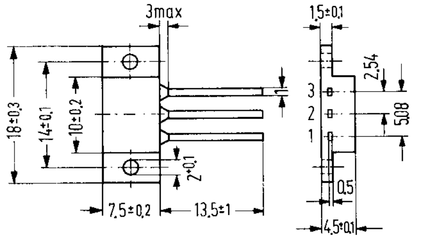
[2] 1 T = 1 (Tesla) = 10^4 Gauss = 10 kG (kilo-Gauss)

Magneto resistor differential sensor

The magneto resistor differential sensor FP 200 L 100 is composed of two magnetically biassed magneto resistors made of "L" material and having a basic resistance —without bias—of approximately 125 Ω each. Both are wired as potential dividers and incorporated and potted in an aluminium case to protect them against mechanical stress.

The magneto resistor differential sensor FP 200 L 100 may be used as a zero switch. Within the linear range, it then shows a voltage variation of about 1.3 V/mm. Moreover, this magnetically controllable sensor may be applied as a direction dependent, contactless switch, for the measurement of angles, and a analog converter of small displacements into electrical signals.

Type	Order number
FP 200 L 100	Q 65200-L100-W



Dimensions in mm   Weight approx. 1.5 g

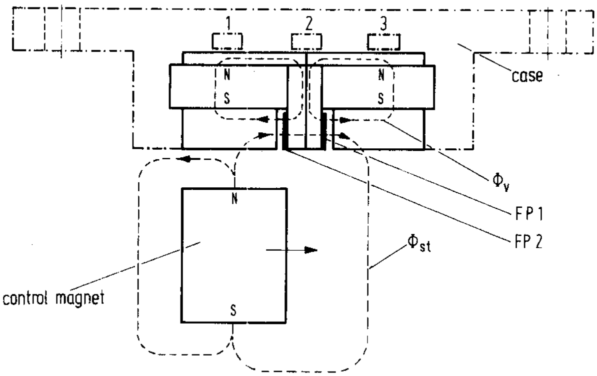
Maximum ratings ($T_{case} = 25\,°C$)		FP 200 L100	
Operating voltage	V_{1-3}	10	V
Insulation voltage between system and case	V_I	100	V
Electrical load of the individual system (R_{1-2} and R_{2-3}, resp.)	P_{tot}	400	mW
Total system (R_{1-3})	P_{tot}	600	mW
Operating temperature	T	−40 to +125	°C
Storage temperature	T_S	−40 to +130	°C
Thermal conduction constant (system to air)	G_{thamb}	≧10	mW/K

Characteristics ($T_{amb} = 25\,°C$)			
Total resistance (air gap $\delta = \infty$)	R_{1-3}	1000	Ω
Tolerance of R_{1-3}	R_{1-3}-Tol.	+400, −300	Ω
Open-circuit output voltage ¹) (face flux ~2 µWB; $\delta = 0.5$ mm; $V_B = 8$ V)	V_{opp}	4 (>3.5)	V
Cut-off frequency of V_{opp} ¹)	f_g	>7	kHz
Centre symmetry $M = \frac{R_1 - R_2}{R_1} \times 100\%$ for $R_1 > R_2$	M	<10	%

¹) In accordance with measuring arrangement shown above.

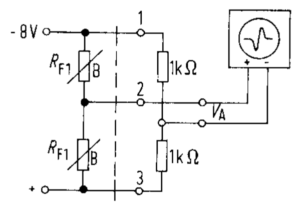
Magneto resistor differential sensor

This sensor system is controlled by means of a permanent magnet. With the arrangement shown in the following drawing the magnetic flux ϕ_{st} of the control magnet will increase the flux ϕ_V of the right-hand magneto resistor produced by the magnetic bias (terminals 2–3) and weaken that of the left-hand magneto resistor (terminals 1–2). The resistance value of MR 1 thus rises while that of MR 2 decreases. Moving the control magnet to the right will reverse the operation.

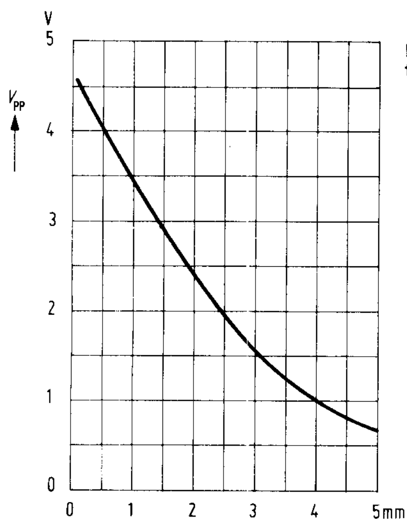


Control of the sensor by means of a bar magnet.

Circuit diagram:

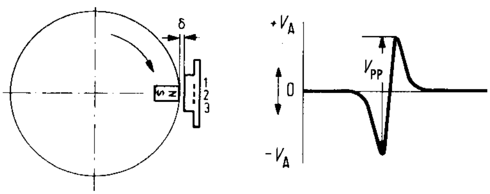


To measure the output signal, the two magnetically biassed magneto resistors of the sensor are supplemented by two additional resistors to form a bridge.
The curve shows the peak value of the output signal as a function of the air gap width δ. These values were determined with a control magnet Alnico 450 (dimensions 4 × 4 × 6 mm; face flux ~2 µWb) at a supply voltage of 8 V and an ambient temperature T_{amb} = 25 °C. The measuring arrangement and the shape of the output voltage to be expected is schematically shown below.



Peak value of the bridge voltage V_{pp} as a function of the air gap width δ; $V_{pp} = f(\delta)$

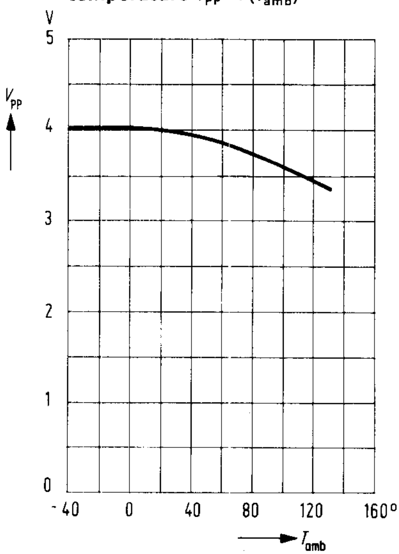
Measuring arrangement and schematic shape of the bridge voltage V_{App}



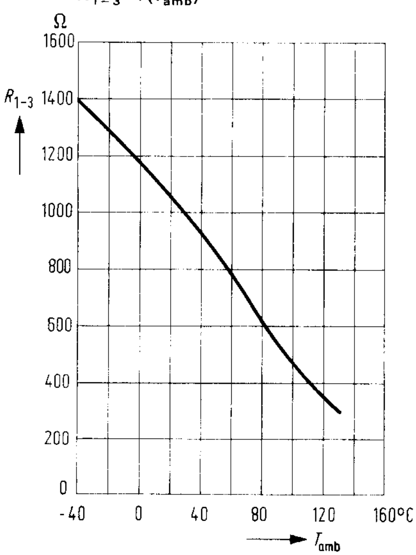
By wiring the two magneto resistors as potential dividers a low temperature dependence of the signal voltage V_{PP} is ensured. The curve shown in the following graph was determined with a control magnet Alnico 450 at an air gap δ of 0.5 mm and a constant supply voltage of 8 V.

When the magneto resistor differential sensor is operated at higher temperatures attention has to be paid to the fact that, at a constant supply voltage, the maximum permissible power dissipation for each magneto resistor system is not exceeded. The graph below shows the total resistance R_{1-3} of the sensor as a function of the temperature.

Output voltage V_{PP} as a function of ambient temperature $V_{PP}=f(T_{amb})$



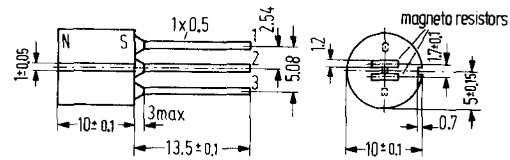
Total resistance R_{1-3} as a function of temperature $R_{1-3}=f(T_{amb})$



Magneto resistor differential sensor

The **FP 210 D 250** consists of 2 magneto resistors made of "D" material, which possess a basic resistance of approximately 250 Ω each without any magnetic bias. Both are mounted on a joint permanent magnet and connected in series so that the resistance of the total system increases to 1 kΩ with a tolerance of ±300 Ω in consequence of the magnetic bias. The sensor system is incorporated and potted in an aluminium package in order to protect it against mechanical stress.

Type	Order number
FP 210 D 250	Q 65210-D 250-W



Weight approx. 2.4 g Dimensions in mm

Maximum ratings		**FP 210 D 250**	
Operating temperature	T	80	°C
Operating voltage (T_{case} = 25 °C)[1]	V_{1-3}	10	V
Electrical load (T_{case} = 25 °C) of the individual resistor (R_{1-2} and R_{2-3}, resp.)	P_{tot}	250	mW
Insulation voltage between system and case	V_I	100	V
Storage temperature	T_S	−40 to +100	°C
Thermal conduction constant	$G_{th\,amb}$	>5	mW/K

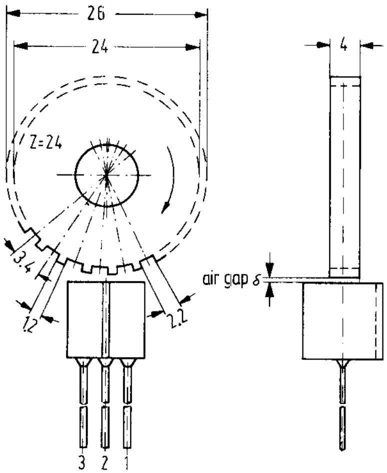
Characteristics (T_{amb} = 25 °C)

Total resistance of sensor (air gap $\delta = \infty$)	R_{1-3}	1000	Ω
Tolerance of R_{1-3}	R_{1-3}-Tol.	±300	Ω
Total resistance[1] (air gap δ = 0.1 mm)	R_{1-3}	approx. 2000	Ω
Output voltage (R_a = 1 MΩ; V_{1-3} = 6 V; δ = 0.1 mm)	V_{opp}	2 (>1.5)	V
Centre symmetry (air gap $\delta = \infty$) $M = \frac{R_1 - R_2}{R_1} \times 100\%$ for $R_1 > R_2$	M	<10	%
Cutoff frequency	f_g	20	kHz

A resistance change of the magneto resistors is brought about by bringing a soft-magnetic material close to this sensor system. The potentiometer circuit of the MR's will then produce a corresponding increase of the desired signal while the temperature is largely compensated at the some time.

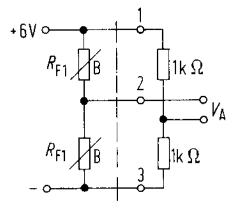
* Measuring arrangement cf. Fig. 2. (The total resistance, however, depends on the tooth shape)

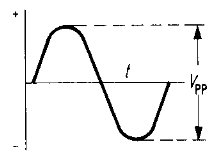
This sensor system is particularly suitable for digital speed measurements where a gear wheel consisting of a soft-magnetic material and being affixed to the shaft to be controlled is being sensed by means of the FP 210 D 250. The tooth pitch should correspond to double the center distance of the magneto resistors (cf. drawing).



For output voltage measurements the magneto resistors are supplemented by 2 additional resistors to form a bridge. The signal voltage may be covered as bridge voltage V_0.

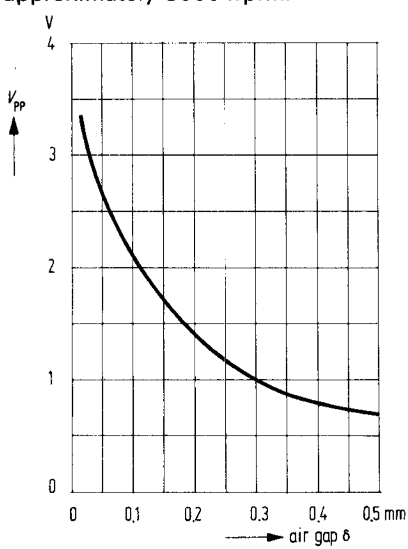
Circuit diagram:

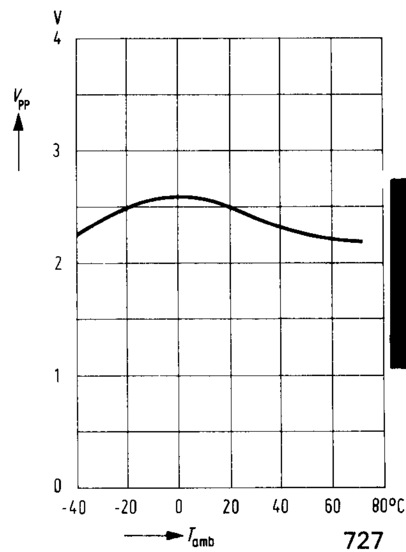




The graph below shows the peak value of the output signal V_{PP} as a function of the air gap width δ. The measurements were carried out with a gear of 24 teeth at a speed of approximately 3000 r.p.m. and at a temperature of $T_{amb} = 25\,°C$.

The following graph shows the variation of the output signal V_{PP} when the sensor is tested at various temperatures. The speed of the 24-teeth gear amounts to approximately 3000 r.p.m.

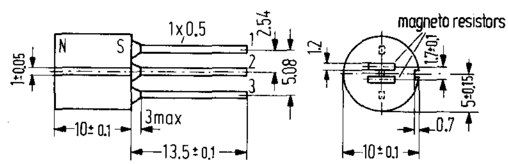




Magneto resistor differential sensor

The FP 210 L 100 consists of 2 magneto resistors made of "L" material, which possess a basic resistance of approximately 100 Ω each, without any magnetic bias. Both are mounted on a common permanent magnet and connected in series so that the resistance of the total system increases to 300 Ω with a tolerance of ±80 Ω in consequence of the magnetic bias. The sensor system is incorporated and potted in an aluminium package to protect it against mechanical stress.

Type	Order number
FP 210 L 100	Q65210-L100-W



Weight approx. 2.4 g   Dimensions in mm

Maximum ratings		FP 210 L 100	
Operating temperature	T	80	°C
Operating voltage (T_{case} = 25 °C)	V_{1-3}	10	V
Electrical load (T_{case} = 25 °C) of the individual resistor (R_{1-2} and R_{2-3}, resp.)	P_{tot}	250	mW
Insulation voltage between system and case	V_I	100	V
Storage temperature	T	−40 to +100	°C
Thermal conduction constant	$G_{th\,amb}$	>5	mW/K

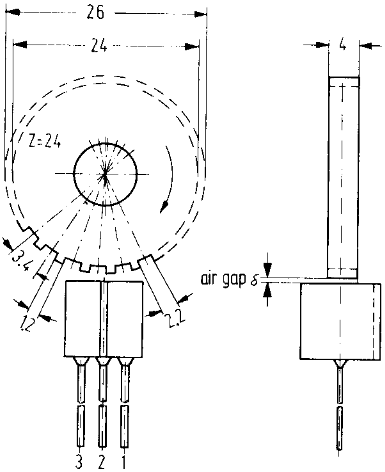
Characteristics (T_{amb} = 25 °C)

Total resistance of sensor (air gap $\delta = \infty$)	R_{1-3}	300	Ω
Tolerance of R_{1-3}	R_{1-3}-Tol.	±80	Ω
Total resistance[1] (air gap δ = 0.1 mm)	R_{1-2}	approx. 550	Ω
Output voltage[1] (R_a = 1 MΩ; V_{1-3} = 6 V; δ = 0.1 mm)	V_{pp}	2 (>1.5)	V
Center symmetry (air gap $\delta = \infty$) $M = \frac{R_1 - R_2}{R_1} \times 100\%$ for $R_1 > R_2$	M	<10	%
Cutoff frequency	f_g	20	kHz

A resistance variation of the magneto resistors is achieved by bringing a soft-magnetic material close to the sensor system. The potentiometer circuit will then produce a corresponding increase of the desired signal while the temperature is largely compensated at the same time.

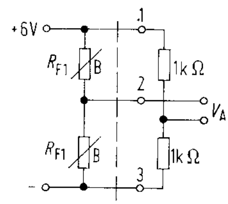
• Measuring diagram see Fig. 2. (The total resistance, however, depends on the tooth shape)

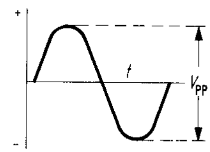
This sensor system is particularly suitable for digital speed measurements where a gear wheel consisting of a soft-magnetic material and being affixed to the shaft to be controlled is being sensed by means of the FP 210 L 100. The tooth pitch should correspond to double the center distance of the magneto resistors (cf. drawing).



For output voltage measurements the magneto resistors are supplemented by 2 additional resistors to form a bridge. The signal voltage may be covered as bridge voltage V_0.

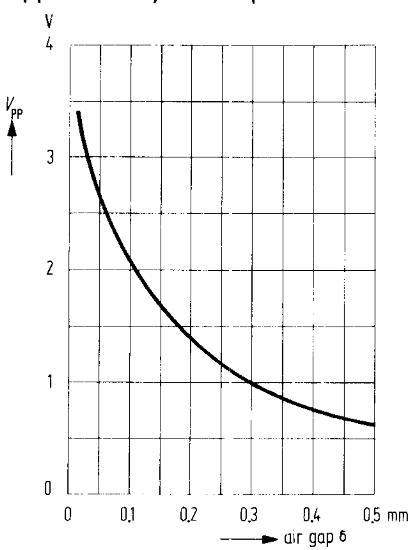
Circuit diagram:

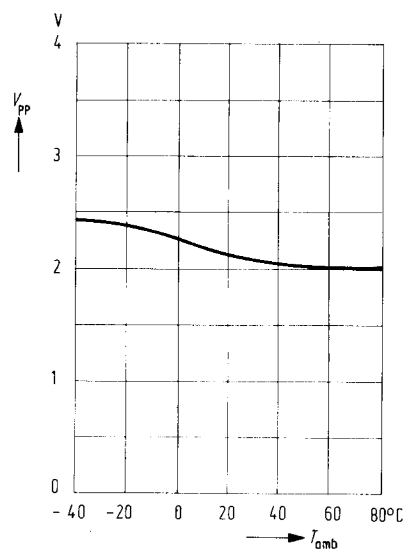




The curve on the left shows the peak value of the output signal V_{PP} as a function of the air gap width δ. The measurements were carried out with a 24-tooth gear at a speed of approximately 3000 r.p.m. and at a temperature of T_{amb} = 25 °C.

The curve on the right shows the variation of the output signal V_{PP} when the sensor is tested at various temperatures. The speed of the 24-teeth gear amounts to approximately 3000 r.p.m.





9.1. Transistors

Type (P = PNP) (N = NPN)		Collector base reverse voltage V_{CBO}; V (V_{CES}); V	Collector current I_C mA (I_{CM}); mA	Current gain-bandwidth product f_T; MHz	Thermal resistance R_{thJamb}; K/W ($R_{thJcase}$); K/K	Case (Pl) = plastic
AF 200 U	P	−25	−10	220	≦750 (400)	TO-72
AF 201 U	P	−25	−10	220	≦750 (400)	TO-72
AF 202	P	−25	−30	210	≦450 (200)	sim. TO-72
AF 202 S	P	−32	−30	210	≦450 (200)	sim. TO-72
AF 239	P	(−20)	−10	700	≦750 (400)	TO-72
AF 239 S	P	(−20)	−10	780	≦750 (400)	TO-72
AF 240	P	(−20)	−10	500	≦750 (400)	TO-72
AF 279	P	(−20)	−10	780	≦600	sim. TO-50 (Pl)
AF 280	P	(−20)	−10	550	≦600	sim. TO-50 (Pl)
AF 306	P	−25	−15	280	≦500	sim. SOT-30
AF 379	P	−20[1]	−20	1250	(≦450)	sim. TO-50
BC 107	N	(50)	(200)	250	≦500 (200)	TO-18
BC 108	N	(30)	(200)	250	≦500 (200)	TO-18
BC 109	N	(30)	50	300	≦500 (200)	TO-18
BC 110	N	80	50	100	≦500 (200)	TO-18
BC 121	N	5	75	250	≦1000	U 32 (Pl)
BC 122	N	30	75	250	≦1000	U 32 (Pl)
BC 123	N	45	75	250	≦1000	U 32 (Pl)
BC 140	N	80	1000	50	≦200 (35)	TO-39
BC 141	N	100	1000	50	≦200 (35)	TO-39
BC 147	N	(50)	(200)	250	≦420	SOT-25 (Pl)
BC 148	N	(30)	(200)	250	≦420	SOT-25 (Pl)
BC 149	N	(30)	50	300	≦420	SOT-25 (Pl)
BC 157	P	(−50)	(−200)	130	≦420	SOT-25 (Pl)
BC 158	P	(−30)	(−200)	130	≦420	SOT-25 (Pl)
BC 159	P	(−25)	−50	130	≦420	SOT-25 (Pl)
BC 160	P	−40	−1000	>50	≦200 (35)	TO-39
BC 161	P	−60	−1000	>50	≦200 (35)	TO-39
BC 167	N	(50)	(200)	250	≦420	TO-92 (Pl)
BC 168	N	(30)	(200)	250	≦420	TO-92 (Pl)

[1]) V_{CER} (R_{BE} ≦ 500 Ω)

9.1. Transistors

Type (P = PNP) (N = NPN)		Collector base reverse voltage V_{CBO}; V (V_{CES}); V	Collector current I_C; A	Current gain-bandwidth product f_T; MHz	Thermal resistance R_{thJamb}; K/W ($R_{thJcase}$); K/W	Case (Pl) = plastic
BD 136	P	−45	−1.5	50	≦100	SOT-32 (Pl)
BD 137	N	60	1.5	50	≦100	SOT-32 (Pl)
BD 138	P	−60	−1.5	50	≦100	SOT-32 (Pl)
BD 139	N	80	1.5	>50	≦100	SOT-32 (Pl)
BD 140	P	−80	−1.5	>50	≦100	SOT-32 (Pl)
BD 233	N	45	2	>3	(≦5)	SOT-32 (Pl)
BD 234	P	−45	−2	>3	(≦5)	SOT-32 (Pl)
BD 235	N	60	2	>3	(≦5)	SOT-32 (Pl)
BD 236	P	−60	−2	>3	(≦5)	SOT-32 (Pl)
BD 237	N	100	2	>3	(≦5)	SOT-32 (Pl)
BD 238	P	−100	−2	>3	(≦5)	SOT-32 (Pl)
BD 433	N	22	4	>3	<100	SOT-32 (Pl)
BD 434	P	−22	−4	>3	<100	SOT-32 (Pl)
BD 435	N	32	4	>3	<100	SOT-32 (Pl)
BD 436	P	−32	−4	>3	<100	SOT-32 (Pl)
BD 437	N	45	4	>3	<100	SOT-32 (Pl)
BD 438	P	−45	−4	>3	<100	SOT-32 (Pl)
BD 439	N	60	4	>3	<100	SOT-32 (Pl)
BD 440	P	−60	−4	>3	<100	SOT-32 (Pl)
BD 441	N	80	4	>3	<100	SOT-32 (Pl)
BD 442	P	−80	−4	>3	<100	SOT-32 (Pl)
BD 533	N	45	4	>3	<80	TOP-66
BD 534	P	−45	−4	>3	<80	TOP-66
BD 535	N	60	4	>3	<80	TOP-66
BD 536	P	−60	−4	>3	<80	TOP-66
BD 537	N	80	4	>3	<80	TOP-66
BD 538	P	−80	−4	>3	<80	TOP-66
BD 675	N	45	4	>1	<100	SOT-32 (Pl)
BD 676	P	−45	−4	>1	<100	SOT-32 (Pl)
BD 677	N	60	4	>1	<100	SOT-32 (Pl)
BD 678	P	−60	−4	>1	<100	SOT-32 (Pl)
BD 679	N	80	4	>1	<100	SOT-32 (Pl)
BD 680	P	−80	−4	>1	<100	SOT-32 (Pl)

9.2. Germanium-diodes

Type	Application	Reverse voltage V_R (V)	Forward voltage V_F at $I_F = 10$ mA (V)	Reverse current I_R at $V_R = 10$ V (μA)
AA 113 [1]	HF-diode	60	1.1 (<1.6)	12
AA 116 [1]	HF-diode	20	<1.0	20
AA 117	General purpose diode	90	<1.2	4
AA 118 [1]	General purpose diode	90	<1.05	2.5
AA 119 [1]	RF-diode	30	<1.5	4.5

9.3. Silicon diodes (metal case)

Type	Application	Reverse voltage V_R (V)	Forward voltage V_F at $I_F = 100$ mA (V)	Reverse current I_R at V_R (μA)
BA 103	Rectifier	6	≦1.0	≦1
BA 104	Rectifier for high temp.	100	≦1.1	≦1
BA 105	Rectifier for high temp.	300	≦1.1	≦1
BA 108	Rectifier for high temp.	50	≦1.1	≦1

[1] Available in matched pairs [2] V_{CBS}

9.8. Silicon switching diode

Type	Application	Reverse voltage V_R (V)	Max. permissible forward current I_F (mA)	Reverse current I_R (nA)
BA 182	VHF-switching diode	35	100	<100

9.9. Optoelectronic Semiconductor devices (photo voltaic cells, photo diodes, photo transistors, photo resistors, LED's, optoelectronic coupler)

(photo voltaic cells, photo diodes, photo transistors, photo resistors, LED's.

For more complete data please write for special data book "Optoelectronic Semiconductor Manual" to our agent representing you, or Semiconductor device at Siemens AG, 8000 Munich 80, Balenstrasse 73

9.10. NTC-thermistors

Type	Application	Cold-state resistance		B-value	Temperature coefficient	Thermal conduction constant	Thermal cooling time constant
		R_{20} (kΩ)	R_{25} (kΩ)	B[2] (K)	TC (%/°C)	G_{thJamb} (mW/K)	τ_{th} (s)
K 25	Temperature compensation, measurement and control	0.010 to 6	0.0085 to 4.8	2580 to 3950	−3.0 to −4.6	30[1]	20[1]
K 26	Temperature compensation	6 to 16	5 to 13	3250 to 3530	3.8 to 4.1	4	20
K 35	Temperature compensation	0.04	approx. 0.033	2800	3.2	20[1]	–
K 154	Temperature compensation	0.004 to 60	0.0035 to 45	2580 to 4600	−3.0 to −5.4	8	30
K 164	Temperature compensation	–	0.0068 to 100	2580 to 4600	–	7.5	15

[1]) When mounted on a chassis plate with good thermal conduction
[2]) Evaluated from measurements at 20 °C and 100 °C