TUNGSRAM

ELECTRON TUBES AND SEMI-CONDUCTORS

1979

RADIO & TV RECEIVING TUBES

OSCILLOSCOPE & MONITOR TUBES

TRANSMITTING TUBES, RECTIFIERS & MICROWAVE TUBES

SEMICONDUCTORS

TUNGSRAM

RADIO & TV RECEIVING TUBES

1979

RECEIVING TUBES

CONSUMER TYPES
INDUSTRIAL TYPES

VOLTAGE REGULATORS

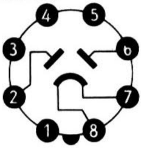
TYPE ASSORTMENT

SYMBOLS

C_{ag1}	capacitance, anode to grid
C_{boost}	capacitance of booster diode
C_{filt}	maximum capacitance of smoothing filter
C_i	input capacitance, i.e. capacitance between grid No. 1 and all other electrodes except anode
C_o	output capacitance, i.e. capacitance between anode and all other electrodes except grid No. 1
d	direct-heated cathode
i	indirect-heated cathode
I_a	anode current; at voltage regulators: arc current
I_{as}	peak anode current
I_f	heater current
$I_{g2...4}$	direct current to grids No. 2...4
I_k	cathode current
I_l	current to fluorescent screen
max	maximum value
min	minimum value
N_a	anode dissipation
$N_{g2...4}$	dissipation of grids No. 2...4
N_o	output power ($k < 10\%$)
r_i	internal resistance
R_a	external resistance in an anode lead
R_d	protecting resistance of rectifier tube
R_{eq}	equivalent noise resistance
R_{fk}	external resistance between cathode and heater
$R_{g1...4}$	external resistor in the circuit of grid No. 1...4
R_k	cathode resistance
s	peak value
S	mutual conductance
S_c	conversion conductance
T_b	bulb temperature
U_a	anode voltage
U_{a0}	cold-cathode anode voltage, the DC-voltage allowed between anode and cathode of the unheated tube and/or the tube operation under anode current cutoff condition ($I_a = 0$ mA)
U_{arc}	arc voltage
$\triangle U_{arc}$	arc voltage difference in the control range
U_b	supply voltage
U_f	heater voltage
U_{fk}	maximum voltage between cathode and heater if cathode is negative
U_{-fk}	maximum voltage between cathode and heater if cathode is positive
$U_{g2...4}$	D.C. voltage between grids No. 2...4 and cathode
U_{ign}	ignition voltage
U_l	voltage on fluorescent screen
U_{tr}	transformer voltage (secondary)
μ	amplification factor
μ_{g2g1}	amplification factor of grid No. 2 with respect to grid No. 1

The base connections given in the catalogue are represented in bottom-view.
It is not permitted to connect anything to the pin even if it is free according to the drawing because an inner connection may be on the free pin.

AZ 41
Outline: 8



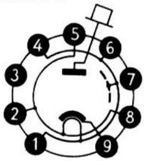
U_f = 4 V
I_f = 1.1 A

FULL-WAVE RECTIFIER

Typical Operation

U_{tr}	=	2 × 300	2 × 400	2 × 500 V_{eff}
I_a	=	70	65	60 mA
C_{filt}	=	50	50	50 μF
$R_{d\,min}$	=	2 × 100	2 × 150	2 × 200 Ω

DY 86
Outline: 15



U_f = 1.4 V
I_f = 0.55 A

HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

Maximum Ratings

$-U_{as}$[1] = 22 kV
I_a = 0.8 mA
I_{as} = 40 mA
C_{filt} = 2 nF

Typical Operation

U_a = 18 kV
I_a = 0.15 mA

Capacitance
C_o = 1.8 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 μs

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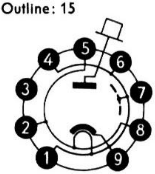
DY 87

HIGH VOLTAGE RECTIFIER for TV receivers

Electrical data identical with DY 86.

The envelope is coated with a water repellent layer to preclude flash-overs even at high ambient humidity.

DY 802
Outline: 15



U_f = 1.4 V
I_f = 0.6 A

HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

Maximum Ratings

$-U_{as}$[1] = 25 kV
I_a[2] = 0.5 mA
I_{as} = 50 mA
C_{filt} = 3 nF

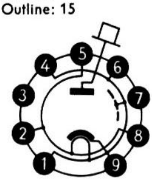
Typical Operation

U_a = 20 kV
I_a = 200 μA

Capacitance
C_o = 1 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 μs
[2] in circuits with constant load; during short periods as in operation of TV circuits I_a = max. 0.8 mA

DY 806
Outline: 15



U_f = 1.4 V
I_f = 0.55 A

HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

Maximum Ratings

$-U_{as}$[1] = 22 kV
I_a = 0.8 mA
I_{as} = 40 mA
C_{filt} = 2 nF

Typical Operation

U_a = 18 kV
I_a = 0.15 mA

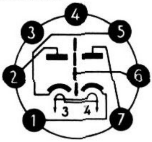
Capacitance
C_o = 1.8 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 μs

DY 807

HIGH VOLTAGE RECTIFIER for TV receivers
Electrical data identical with DY 806.
The envelope is coated with a water-repellent layer to preclude flash-overs even at high humidity.

EAA 91
Outline: 2



U_f = 6.3 V
I_f = 300 mA
U_{fks} = 150 V
U_{fks}[1] = 330 V

TWIN DIODE for AM, FM demodulators and ratio detectors

Maximum Ratings per Section

$-U_{as}$ = 420 V
I_a = 9 mA
I_{as} = 54 mA
R_{fk} = 20 kΩ

Typical Operation per Section

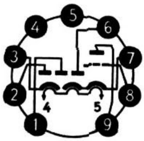
U_{tr} = 150 V_{eff}
I_a = 9 mA

Capacitance

C_o = 3.2 pF

[1] DC component max. 200 V

EABC 80
Outline: 12



U_f = 6.3 V
I_f = 480 mA
U_{fk} = 150 V

TRIPLE DIODE-TRIODE intended for AM and FM signal detection and AF amplifiers

Maximum Ratings

Triode

U_a = 300 V
N_a = 1 W
I_k = 5 mA
R_g = 3 MΩ
R_g[1] = 22 MΩ
R_{fk} = 20 kΩ

Diodes

$-U_{dIs}$ = 350 V
$-U_{dIIs}$ = 350 V
$-U_{dIIIs}$ = 350 V
I_{dIs} = 6 mA
I_{dIIs} = 75 mA
I_{dIIIs} = 75 mA
I_{dI} = 1 mA
I_{dII} = 10 mA
I_{dIII} = 10 mA

Typical Operation

Triode

U_a = 200 V
$-U_g$ = 2.3 V
I_a = 1 mA
S = 1.4 mA/V
r_i = 50 kΩ
μ = 70

Diodes

I_{dI} = 2 mA
U_{dI} = 10 V
I_{dII} = 25 mA
U_{dII} = 5 V
I_{dIII} = 25 mA
U_{dIII} = 5 V

Capacitances of Triode

C_i = 1.9 pF
C_o = 1.4 pF
C_{ag} = 2 pF

[1] grid current bias

EAF 42
Outline: 5

U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

DIODE-PENTODE for RF, IF or AF amplifiers

Maximum Ratings

Pentode

U_{a0} = 550 V
N_a = 2 W
N_{g2} = 0.3 W
U_{g2} = 550 V
I_k = 10 mA
R_{g1} = 3 MΩ
R_{g3} = 3 MΩ

Diode

$-U_{as}$ = 350 V
I_{as} = 5 mA
I_a = 0.8 mA

Typical Operation

Pentode in RF or IF amplifiers

U_a = 250 V
I_a = 5 mA
U_{g3} = 0 V
U_{g2} = 85 V
I_{g2} = 1.5 mA
R_{g2} = 110 kΩ
$-U_{g1}$ = 2 V
R_k = 0.31 kΩ
S = 2 mA/V
r_i = 1.4 MΩ
μ_{g2g1} = 16

Capacitances

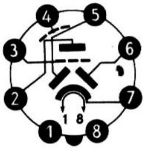
Pentode

C_i = 4 pF
C_o = 6.5 pF
C_{ag} = 2 mpF

Diode

C_o = 3.8 pF

EBC 41
Outline: 5



U_f = 6.3 V
I_f = 230 mA
U_{fk} = 100 V

TWIN DIODE-TRIODE FOR AF amplifiers

Maximum Ratings

Triode

U_{a0} = 550 V
N_a = 0.5 W
I_k = 5 mA
R_g = 3 MΩ

Diodes

$-U_{as}$ = 350 V
I_{as} = 5 mA
I_a = 0.8 mA

Typical Operation

Triode

U_a = 250 V
$-U_g$ = 3 V
I_a = 1 mA
S = 1.2 mA/V
μ = 70
r_i = 58 kΩ

Capacitances

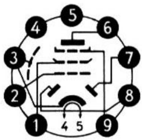
Triode

C_i = 2.7 pF
C_o = 1.7 pF
C_{ag1} = 1.5 pF

Diode

C_{d1} = 0.8 pF
C_{d2} = 0.7 pF

EBF 80
Outline: 12



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

TWIN DIODE-PENTODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers

Maximum Ratings

Pentode

U_{a0} = 550 V
N_a = 1.5 W
N_{g2} = 0.3 W
U_{g2} = 300 V
I_k = 10 mA
R_{g1}[1] = 3 MΩ

Diodes

$-U_{as}$ = 350 V
I_{as} = 5 mA
I_a = 0.8 mA

Typical Operation

Pentode

U_a = 250 V
I_a = 5 mA
U_{g2} = 85 V
I_{g2} = 1.75 mA
R_{g2} = 95 kΩ
$-U_{g1}$ = 2 V
R_k = 300 Ω
S = 2.2 mA/V
r_i = 1.4 MΩ
μ_{g2g1} = 18

Capacitances

Pentode

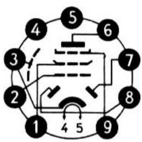
C_i = 4.2 pF
C_o = 4.9 pF
C_{ag1} = 4 mpF

Diode

C_o = 2.2 pF

[1] automatic bias

EBF 89
Outline: 12



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

TWIN DIODE-PENTODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers

Maximum Ratings

Pentode

U_{a0} = 550 V
N_a = 2.25 W
U_{g2} = 300 V
N_{g2} = 0.45 V
I_k = 16.5 mA
R_{g1} = 3 MΩ

Diodes

$-U_{as}$ = 200 V
I_{as} = 5 mA
I_a = 0.8 mA

Typical Operation

Pentode

U_a = 250 V
I_a = 9 mA
U_{g3} = 0 V
U_{g2} = 100 V
I_{g2} = 2.7 mA
$-U_{g1}$ = 2 V
S = 3.8 mA/V
r_i = 1 MΩ
μ_{g2g1} = 20

Capacitances

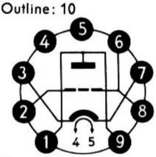
Pentode

C_i = 5 pF
C_o = 5.2 pF
C_{ag1} = 3.5 mpF

Diodes

C_o = 2.5 pF

EC 86
Outline: 10



U_f = 6.3 V
I_f = 175 mA
U_{fk} = 50 V
U_{-fk} = 100 V

TRIODE for use as UHF amplifier and self-oscillating mixer for bands IV and V

Maximum Ratings

U_{a0} = 550 V
U_a = 220 V
N_a = 2.2 W
I_k = 20 mA
$-U_g$ = 50 V
R_g = 1 MΩ

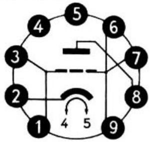
Typical Operations

U_a = 175 V
I_a = 12 mA
$-U_g$ = 1.5 V
S = 14 mA/V
μ = 68
R_{eq} = 230 Ω

Capacitances

C_i = 3.6 pF
C_o = 2.3 pF
C_{ag} = 2.2 pF

EC 88
Outline: 10

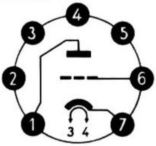


TRIODE for use as UHF amplifier for bands IV and V

Maximum Ratings	Typical Operations	Capacitance
U_{a0} = 550 V	U_a = 160 V	C_{ag} = 1.7 pF
U_a = 175 V	I_a = 12.5 mA	
N_a = 2 W	$-U_g$ = 1.3 V	
I_k = 13 mA	S = 13.5 mA/V	
$-U_g$ = 50 V	μ = 65	
R_g = 1 MΩ	R_{eq} = 240 Ω	
	R_k = 100 Ω	

U_f = 6.3 V
I_f = 165 mA
U_{fk} = 100 V

EC 92
Outline: 3

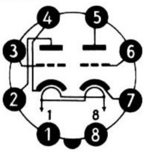


TRIODE for use as oscillator, mixer or amplifier in FM and TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 550 V	U_a = 250 V	C_i = 2.8 pF
U_a = 300 V	I_a = 10 mA	C_o = 0.55 pF
N_a = 2.5 W	$-U_g$ = 2 V	C_{ag} = 1.8 pF
I_k = 15 mA	S = 5.5 mA/V	
$-U_g$ = 50 V	r_i = 11 kΩ	
R_g = 1 MΩ	μ = 60	

U_f = 6.3 V
I_f = 150 mA
U_{fk} = 100 V

ECC 40
Outline: 7

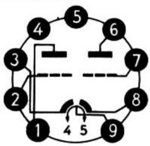


TWIN TRIODE for use as AF amplifier, phase inverter or output tube

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a = 250 V	C_i = 2.8 pF
U_a = 300 V	I_a = 6 mA	C_o = 1.1 pF
N_a = 1.5 W	$-U_g$ = 5.6 V	C_{ag} = 2.7 pF
N_g = 0.1 W	S = 2.9 mA/V	
R_g = 1 MΩ	μ = 32	
I_k = 10 mA	r_i = 11 kΩ	

U_f = 6.3 V
I_f = 600 mA
U_{fk} = 90 V

ECC 81
Outline: 10

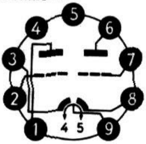


TWIN TRIODE for use as oscillator, mixer or amplifier in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a = 250 V	C_i = 2.5 pF
U_a = 300 V	I_a = 10 mA	C_o = 0.4 pF
N_a = 2.5 W	$-U_g$ = 2 V	C_{ag} = 1.7 pF
I_k = 15 mA	S = 5.5 mA/V	
$-U_g$ = 50 V	r_i = 11 kΩ	
R_g = 1 MΩ	μ = 60	

U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 90 V

ECC 82
Outline: 10



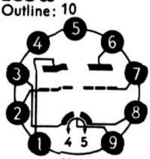
U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 180 V

TWIN TRIODE for use as AF amplifier

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a ≈ 250 V	C_i = 1.8 pF
U_a = 300 V	I_a ≈ 10.5 mA	C_{oI} = 0.5 pF
N_a = 2.75 W	$-U_g$ ≈ 8.5 V	C_{oII} = 0.37 pF
I_k = 20 mA	S ≈ 2.2 mA/V	C_{ag} = 1.6 pF
$-U_g$ = 100 V	r_i ≈ 7.7 kΩ	
R_g[1] = 1 MΩ	μ ≈ 17	

[1] automatic bias

ECC 83
Outline: 10

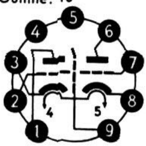


U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 180 V

TWIN TRIODE for use as AF amplifier

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a ≈ 250 V	C_i = 1.7 pF
U_a = 300 V	I_a ≈ 1.2 mA	C_{oI} = 0.46 pF
N_a = 1 W	$-U_g$ ≈ 2 V	C_{oII} = 0.34 pF
I_k = 8 mA	S ≈ 1.6 mA/V	C_{ag} = 1.7 pF
$-U_g$ = 50 V	r_i ≈ 62.5 kΩ	
R_g = 2 MΩ	μ ≈ 100	

ECC 85
Outline: 10

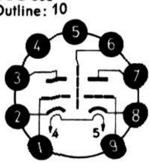


U_f = 6.3 V
I_f = 435 mA
U_{fk} = 90 V

TWIN TRIODE for use as RF amplifier and self-oscillating mixer

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a ≈ 250 V	C_i = 3 pF
U_a = 300 V	I_a ≈ 10 mA	C_o = 1.2 pF
N_a = 2.5 W	$-U_g$ ≈ 2.2 V	C_{ag} = 1.5 pF
I_k = 15 mA	S = 6 mA/V	
$-U_g$ = 100 V	r_i = 9.4 kΩ	
R_g = 1 MΩ	μ = 57	

ECC 808
Outline: 10



U_f = 6.3 V
I_f = 340 mA
U_{fk} = 100 V
U_{fk} = 100 V

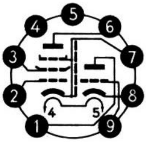
TWIN TRIODE for use as low noise, low hum pre-amplifier

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a ≈ 300 V	U_a ≈ 250 V	C_i = 2.2 pF
N_a ≈ 0.5 W	I_a ≈ 1.2 mA	C_o = 1.5 pF
I_k ≈ 4 mA	$-U_g$ ≈ 1.9 V	C_{ag} = 1.5 pF
R_g[1] ≈ 1 MΩ	S = 1.6 mA/V	
R_g[2] ≈ 22 MΩ	μ = 100	

[1] fixed grid bias
[2] grid current bias

ECF 80
Outline: 10

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers



U_f = 6.3 V
I_f = 430 mA
U_{kf} = 100 V
U_{-fk} = 100 V

Maximum Ratings

Triode

U_a = 250 V
N_a = 1.5 W
I_k = 14 mA
R_g = 0.5 MΩ

Pentode

U_a = 250 V
U_{g2} = 175 V
N_a = 1.7 W
N_{g2} = 0.75 W
I_k = 14 mA
R_{g1} = 1 MΩ

Typical Operation

Triode

U_a = 100 V
I_a = 14 mA
$-U_g$ = 2 V
S = 5 mA/V
μ = 20

Pentode

U_a = 170 V
U_{g2} = 170 V
$-U_{g1}$ = 2 V
I_a = 10 mA
I_{g2} = 2.8 mA
S = 6.2 mA/V
μ_{g2g1} = 47
r_i = 0.4 MΩ

Capacitances

Triode

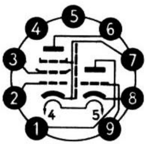
C_i = 2.5 pF
C_o = 1.8 pF
C_{ag} = 1.5 pF

Pentode

C_i = 5.2 pF
C_o = 3.4 pF
C_{ag1} < 25 mpF

ECF 82
Outline: 10

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers



U_f = 6.3 V
I_f = 430 mA
U_{fk} = 90 V

Maximum Ratings

Triode

U_a = 300 V
N_a = 1.5 W
I_k = 20 mA
R_g = 1 MΩ

Pentode

U_a = 300 V
U_{g2} = 300 V
N_a = 2 W
N_{g2} = 0.5 W
I_k = 20 mA
R_{g1} = 1 MΩ

Typical Operation

Triode

U_a = 150 V
I_a = 11 mA
$-U_g$ = 2 V
S = 5.8 mA/V
μ = 35

Pentode

U_a = 170 V
I_a = 10 mA
U_{g2} = 110 V
I_{g2} = 3.3 mA
S = 5.5 mA/V
r_i = 400 kΩ
μ_{g2g1} = 32

Capacitances

Triode

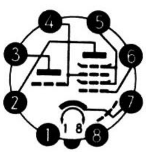
C_i = 2.5 pF
C_o = 0.4 pF
C_{ag} = 1.8 mpF

Pentode

C_i = 5.2 pF
C_o = 2.6 pF
C_{ag1} < 15 mpF

ECH 42
Outline: 5

TRIODE-HEXODE for use as frequency changer and phase inverter



U_f = 6.3 V
I_f = 230 mA
U_{fk} = 100 V

Maximum Ratings

Triode

U_a = 175 V
N_a = 0.8 W
I_k = 6 mA
R_g = 3 MΩ

Hexode

U_a = 300 V
N_a = 1.5 W
I_k = 10 mA
U_{g2+4} = 125 V
N_{g2+4} = 0.3 W
R_{g1} = 3 MΩ
R_{g3} = 3 MΩ

Typical Operation

Triode

U_a = 100 V
U_g = 0 V
I_a = 10 mA
S = 2.8 mA/V
μ = 22

Hexode as frequency changer

U_a = 250 V
$-U_{g1}$ = 2 V
U_{g2+4} = 85 V
I_a = 3 mA
I_{g2+4} = 3 mA
S_c = 750 μA/V
R_i = 1 MΩ
$R_1 = R_2$ = 2 kΩ
R_k = 180 Ω

Capacitances

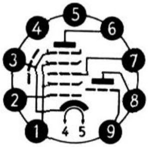
Triode

C_i = 5.5 pF
C_o = 2.3 pF
C_{ag} = 1.2 pF

Hexode

C_i = 4.1 pF
C_o = 9.2 pF
C_{ag1} < 0.1 pF

ECH 81
Outline: 12



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-HEPTODE; heptode section for use as mixer, RF or IF amplifier, triode section for use as oscillator in AM or FM receivers

Maximum Ratings

Triode

U_a	=	250 V
N_a	=	0.8 W
I_k	=	6.5 mA
R_g	=	3 MΩ

Heptode

U_a	=	300 V
N_a	=	2 W
U_{g2+4}	=	125 V
N_{g2+4}	=	0.8 W
I_k	=	18 mA
R_{g1}	=	3 MΩ
R_{g3}[1]	=	3 MΩ

[1] in case No. 3 is directly connected to grid triode

Typical Operation

Triode

U_a	=	100 V
U_g	=	0 V
I_a	=	13.5 mA
S	=	3.7 mA/V
μ	=	22

Heptode

U_a	=	160 V
U_{g3}	=	0 V
U_{g2+4}	=	100 V
I_{g1}	=	0.5 μA
$-U_{g1}$	=	0.5 V
I_a	=	11 mA
I_{g2+4}	=	7 mA
S	=	4.5 mA/V
μ_{g2g1}	=	25

Capacitances

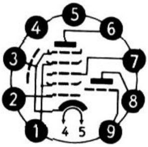
Triode

C_i	=	3.3 pF
C_o	=	2.7 pF
C_{ag}	=	1 pF

Heptode

C_i	=	4.8 pF
C_o	=	7.9 pF
C_{ag1}	<	8 mpF

ECH 83
Outline: 12



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-HEPTODE for use as mixer in car radio sets and as synchronizing separator in TV receivers

Maximum Ratings

Triode

U_a	=	250 V
N_a	=	0.8 W
I_k	=	6.5 mA
R_g[1]	=	3 MΩ

Heptode

U_a	=	50 V
U_{g2+4}	=	50 V
I_k	=	5 mA
R_{g1}[1]	=	3 MΩ
R_{g3}	=	50 kΩ

[1] grid current bias

Typical Operation

Triode

U_a	=	6.3 V
I_a	=	0.3 mA
S	=	0.8 mA/V
μ	=	14.6
R_g[1]	=	47 kΩ

Heptode as mixer[2]

U_a	=	6.3 V
U_{g2+4}	=	6.3 V
I_a	=	50 μA
I_{g2+4}	=	80 μA
S_c	=	80 μA/V
r_i	=	1.3 MΩ

U_{osc}	=	1.1 V_{eff}
R_{g1}[1]	=	1 MΩ
R_{g3}	=	47 kΩ
I_{g3}	=	7 μA

Capacitances

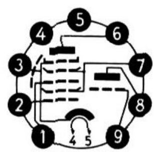
Triode

C_i	=	3.3 pF
C_o	=	2.7 pF
C_{ag}	<	1 pF

Heptode

C_i	=	4.8 pF
C_o	=	7.9 pF
C_{ag1}	=	12 mpF

ECH 84
Outline: 12



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-HEPTODE for use as pulse separator, noise inverter and synchronizing amplifier

Maximum Ratings

Triode

U_a	=	250 V
N_a	=	1.3 W
$-U_{gs}$	=	200 V
I_k	=	10 mA
R_g	=	3 MΩ

Heptode

U_a	=	250 V
N_a	=	1.7 W
U_{g2+4}	=	250 V
N_{g2+4}	=	0.8 W
I_k	=	12.5 mA
$-U_{g1s}$	=	150 V
R_{g1}	=	3 MΩ
$-U_{g3s}$	=	150 V
R_{g3}	=	3 MΩ

Typical Operation

Triode

U_a	=	50 V
U_g	=	0 V
I_a	=	3 mA
S	=	3.7 mA/V
μ	=	50

Heptode

U_a	=	135 V
U_{g3}	=	0 V
U_{g2+4}	=	14 V
I_a	=	1.7 mA
I_{g2+4}	=	0.9 mA
S	=	2.2 mA/V

Capacitances

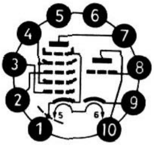
Triode

C_i	=	3 pF
C_{ag}	=	1.1 pF

Heptode

C_{ag1}	<	9 mpF

ECH 200
Outline: 10



U_f = 6.3 V
I_f = 435 mA
U_{fk} = 100 V

TRIODE-HEPTODE; triode section for use as pulse amplifier and heptode section for use as noisegated synchronizing separator

Maximum Ratings

Triode

U_a = 250 V
N_a = 1.5 W
I_k = 20 mA
R_g = 3 MΩ
$-U_{gs}$ = 200 V

Heptode

U_a = 100 V
U_{g2+4} = 50 V
N_a = 0.5 W
N_{g2+4} = 0.5 W
I_k = 8 mA
R_{g1} = 3 MΩ
R_{g3}[1] = 3 MΩ
$-U_{g1s}$ = 100 V
$-U_{g3s}$ = 150 V

[1] automatic bias

Typical Operation

Triode

U_a = 100 V
I_a = 9 mA
$-U_g$ = 1 V
S = 8.8 mA/V
μ = 50

Heptode

U_a = 14 V
U_{g2+4} = 14 V
U_{g3} = 0 V
U_{g1} = 1.5 V
I_{g2+4} = 1.3 mA

Capacitances

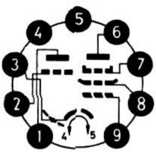
Triode

C_i = 3.3 pF
C_o = 1.7 pF
C_{ag} = 1.8 pF

Heptode

C_i = 4.4 pF
C_o = 5.4 pF
C_{ag1} < 100 mpF

ECL 80
Outline: 12



U_f = 6.3 V
I_f = 0.3 A
U_{fk} = 150 V

TRIODE-OUTPUT PENTODE: triode for use as AF preamplifier and oscillator; pentode for use as synchronizing pulse separator, frame output tube and AF power amplifier

Maximum Ratings

Triode

U_a = 200 V
N_a = 1 W
I_k = 8 mA
R_g = 1 MΩ

Pentode

U_a = 400 V
N_a = 3.5 W
N_{g2} = 1.2 W
I_k = 25 mA
R_{g1} = 1 MΩ

Typical Operation

Triode

U_a = 100 V
U_g = 0 V
I_a = 8 mA
S = 1.9 mA/V
μ = 20

Pentode as AF power amplifier, class A

U_a = 170 V
I_a = 15 mA
U_{g3} = 0 V
U_{g2} = 170 V
$-U_{g1}$ = 6.7 V
I_{g2} = 2.8 mA
S = 3.2 mA/V
μ_{g2g1} = 14

Capacitances

Triode

C_i = 2.1 pF
C_o = 0.8 pF
C_{ag} = 0.9 pF

Pentode

C_i = 4.3 pF
C_o = 4.8 pF
C_{ag1} = 2 pF

ECL 82
Outline: 13

U_f = 6.3 V
I_f = 780 mA
U_{fk} = 150 V

TRIODE-OUTPUT PENTODE: triode for use as frame oscillator and AF amplifier, pentode for use as frame output tube and AF power amplifier

Maximum Ratings

Triode

U_a = 300 V
N_a = 1 W
I_k = 15 mA
R_g[1] = 3 MΩ

Pentode

U_a = 300 V
N_a = 5 W
U_{g2} = 300 V
N_{g2} = 2 W
I_k = 50 mA
R_{g1}[1] = 2 MΩ

[1] automatic bias

Typical Operation

Triode

U_a = 100 V
U_g = 0 V
I_a = 3.5 mA
S = 2.2 mA/V
μ = 70

Pentode

U_a = 170 V
U_{g2} = 170 V
$-U_{g1}$ = 11.5 V
I_a = 41 mA
I_{g2} = 9 mA
S = 7.5 mA/V
r_i = 16 kΩ
μ_{g2g1} = 9.5

Capacitances

Triode

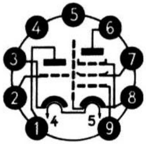
C_i = 3 pF
C_o = 4.3 pF
C_{ag} = 4.4 pF

Pentode

C_i = 9.3 pF
C_o = 8 pF
C_{ag1} < 0.3 pF

ECL 85

Outline: 13



U_f = 6.3 V
I_f = 860 mA
U_{fk} = 100 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as frame oscillator or pulse amplifier, pentode for use as frame output tube

Maximum Ratings

Triode

U_a = 300 V
N_a = 0.5 W
I_k = 15 mA
R_g[1] = 3.3 MΩ

Pentode

U_a = 300 V
U_{g2} = 250 V
N_a = 7 W
N_{g2} = 1.5 W
I_k = 75 mA
R_{g1}[1] = 2.2 MΩ

[1] automatic bias

Typical Operation

Triode

U_a = 100 V
I_a = 10 mA
U_g = 0 V
S = 7 mA/V
μ = 63
r_i = 9 kΩ

Pentode

U_a = 50 V
U_{g2} = 170 V
$-U_{g1}$ = 1 V
I_{as} = 200 mA
I_{g2s} = 35 mA

Capacitances

Pentode

C_{ag1} = 0.6 pF

ECL 86

Outline: 13

U_f = 6.3 V
I_f = 700 mA
U_{fk} = 100 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as AF amplifier, pentode for use as AF amplifier

Maximum Ratings

Triode

U_a = 300 V
N_a = 0.5 W
I_k = 4 mA
R_g = 1 MΩ

Pentode

U_a = 300 V
U_{g2} = 300 V
N_a = 9 W
N_{g2} = 1.8 W
I_k = 55 mA
R_{g1} = 0.5 MΩ

Typical Operation

Triode

U_a = 250 V
$-U_g$ = 1.9 V
I_a = 1.2 mA
S = 1.6 mA/V
μ = 100

Pentode

U_a = 250 V
U_{g2} = 250 V
$-U_{g1}$ = 7 V
I_a = 36 mA
I_{g2} = 6 mA
S = 10 mA/V
μ_{g2g1} = 21
r_i = 48 kΩ

Capacitances

Triode

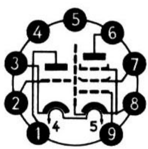
C_i = 2.3 pF
C_o = 2.3 pF
C_{ag1} = 1.4 pF

Pentode

C_i = 10 pF
C_{ag1} = 0.4 pF

ECL 805

Outline: 13



U_f = 6.3 V
I_f = 860 mA
U_{fk} = 200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as oscillator or preamplifier, pentode for use as power stage for vertical deflection

Maximum Ratings

Triode

U_a = 300 V
N_a = 0.5 W
I_k = 15 mA
R_g = 1 MΩ

Pentode

U_a = 300 V
N_a = 8 W
U_{g2} = 250 V
N_{g2} = 1.5 W
I_k = 75 mA
R_{g1} = 1 MΩ

Typical Operation

Triode

U_a = 100 V
$-U_g$ = 0.85 V
I_a = 5 mA
S = 5.5 mA/V
μ = 60

Pentode

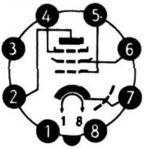
U_a = 65 V
U_{g2} = 210 V
$-U_{g1}$ = 1 V
I_{as} = 285 mA
I_{g2s} = 45 mA

Capacitances

Pentode

C_{ag1} < 1 pF

EF 40
Outline: 5



U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

PENTODE for use as AF amplifier

Maximum Ratings	Typical Operation	Capacitance
U_a = 300 V	U_a = 250 V	C_i = 4.5 pF
N_a = 1 W	U_{g3} = 0 V	C_o = 5.2 pF
U_{g2} = 200 V	U_{g2} = 140 V	C_{ag1} < 40 mpF
N_{g2} = 0.2 W	$-U_{g1}$ = 2 V	
I_k = 6 mA	I_a = 3 mA	
R_{g1} = 3 MΩ	I_{g2} = 0.55 mA	
	S = 1.85 mA/V	
	r_i = 2.5 MΩ	
	μ_{g2g1} = 38	

EF 41
Outline: 5

U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

PENTODE with variable transconductance for use as RF and F amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 5 pF
N_a = 2 W	I_a = 6 mA	C_o = 5.7 pF
U_{g2}[1] = 300 V	I_{g2} = 1.7 mA	C_{ag1} < 3 mpF
N_{g2} = 0.3 W	S = 2.2 mA/V	
I_k = 10 mA	r_i = 1.1 MΩ	
R_{g1} = 3 MΩ	μ_{g2g1} = 18	
R_{g2} = 90 kΩ		
R_k = 325 Ω		

[1] in case I_a < 3 mA

EF 42
Outline: 5

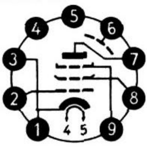
U_f = 6.3 V
I_f = 330 mA
U_{fk} = 50 V

PENTODE for use as wide-band amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 9 pF
N_a = 3.5 W	U_{g1} = 2 V	C_o = 4.3 pF
U_{g2} = 300 V	U_{g3} = 0 V	C_{ag1} < 6 mpF
N_{g2} = 0.7 W	U_{g2} = 250 V	
I_k = 25 mA	I_a = 10 mA	
R_{g1}[1] = 1 MΩ	I_{g2} = 2.4 mA	
	S = 9 mA/V	
	r_i = 0.5 MΩ	
	μ_{g2g1} = 83	

[1] automatic bias

EF 80
Outline: 12

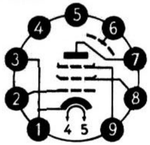


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE for use as RF, IF and video amplifying tubes or as mixing tube in TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 7.5 pF
N_a = 2.5 W	U_{g3} = 0 V	C_o = 3.3 pF
U_{g2} = 300 V	U_{g2} = 250 V	C_{ag1} < 7 mpF
N_{g2} = 0.7 W	$-U_{g1}$ = 3.5 V	
I_k = 15 mA	I_a = 10 mA	
R_{g1} = 1 MΩ	I_{g2} = 2.8 mA	
	S = 6.8 mA/V	
	r_i = 0.65 MΩ	
	μ_{g2g1} = 50	

EF 85
Outline: 12

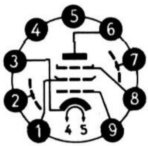


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE with variable transconductance for use as RF or IF amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 250 V	C_i = 7.2 pF
N_a = 2.5 W	U_{g3} = 0 V	C_o = 3.2 pF
U_{g2} = 250 V	$-U_{g1}$ = 2 V	C_{ag1} < 7 mpF
N_{g2} = 0.65 W	U_{g2} = 100 V	
R_{g1} = 3 MΩ	I_a = 10 mA	
I_k = 15 mA	I_{g2} = 2.5 mA	
	R_{g2} = 60 kΩ	
	S = 6 mA/V	
	r_i = 0.6 MΩ	
	μ_{g2g1} = 26	

EF 86
Outline: 10

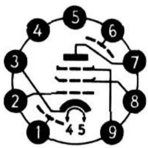


U_f = 6.3 V
I_f = 200 mA
U_{fk} = 150 V

PENTODE for use as AF amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 4 pF
N_a = 1 W	U_{g3} = 0 V	C_o = 5.5 pF
U_{g2} = 200 V	U_{g2} = 140 V	C_{ag1} < 50 mpF
N_{g2} = 0.2 W	$-U_{g1}$ = 2.2 V	
R_{g1} = 3 MΩ	I_a = 3 mA	
I_k = 6 mA	I_{g2} = 0.6 mA	
	S = 2.2 mA/V	
	μ_{g2g1} = 38	
	r_i = 2.5 MΩ	

EF 89
Outline: 11

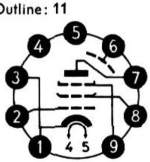


U_f = 6.3 V
I_f = 200 mA
U_{fk} = 100 V

PENTODE with variable transconductances for use as RF or IF amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 5.5 pF
N_a = 2.25 W	U_{g2} = 85 V	C_o = 5.1 pF
U_{g2} = 300 V	U_{g3} = 0 V	C_{ag1} < 2.5 mpF
N_{g2} = 0.45 W	I_a = 9 mA	
I_k = 16.5 mA	$-U_{g1}$ = 1.2 V	
	I_{g2} = 3.2 mA	
	S = 4 mA/V	
	r_i = 0.75 MΩ	
	μ_{g2g1} = 21	

EF 183
Outline: 11

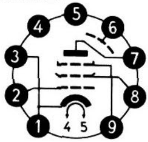


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE with variable transconductance for use as IF amplifier in TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 200 V	C_i = 9.5 pF
N_a = 2.5 W	U_{g3} = 0 V	C_o = 3 pF
U_{g2} = 250 V	U_{g2} = 90 V	C_{ag1} < 5 mpF
$-U_{g1}$ = 50 V	$-U_{g1}$ = 2 V	
N_{g2} = 0.65 W	I_a = 12 mA	
I_k = 20 mA	I_{g2} = 4.5 mA	
	S = 12.5 mA/V	
	r_i = 500 kΩ	

EF 184
Outline: 11

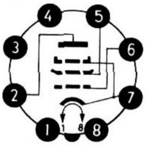


$U_f = 6.3$ V
$I_f = 300$ mA
$U_{fk} = 150$ V

PENTODE for use as IF amplifier in TV receivers

Maximum Ratings	Typical Operation	Capacitances
$U_a = 250$ V	$U_a = 200$ V	$C_i = 10$ pF
$N_a = 2.5$ W	$U_{g3} = 0$ V	$C_o = 3$ pF
$U_{g2} = 250$ V	$U_{g2} = 200$ V	$C_{ag1} < 5.5$ mpF
$-U_{g1s} = 50$ V	$-U_{g1} = 2.5$ V	
$N_{g2} = 0.9$ W	$I_a = 10$ mA	
$I_k = 25$ mA	$I_{g2} = 4.1$ mA	
	$S = 15$ mA	
	$r_i = 380$ kΩ	
	$R_{g2} = 7.5$ kΩ	

EL 41
Outline: 8

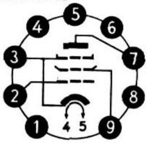


$U_f = 6.3$ V
$I_f = 710$ mA
$U_{fk} = 50$ V

PENTODE for use as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
$U_a = 300$ V	$U_a = 250$ V	$C_i = 10$ pF
$U_{g2} = 300$ V	$U_{g2} = 250$ V	$C_o = 7.8$ pF
$N_a = 9$ W	$-U_{g1} = 7$ V	$C_{ag1} < 1$ pF
$N_{g2} = 1.4$ W	$I_a = 36$ mA	
$I_k = 55$ mA	$I_{g2} = 5.2$ mA	
$R_{g1} = 1$ MΩ	$S = 10$ mA/V	
	$\mu_{g2g1} = 22$	
	$r_i = 40$ kΩ	
	$N_o = 3.9$ W	

EL 84
Outline: 13



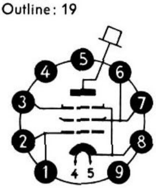
$U_f = 6.3$ V
$I_f = 760$ mA
$U_{fk} = 100$ V

PENTODE for use as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
$U_a = 300$ V	$U_a = 250$ V	$C_i = 11$ pF
$N_a = 12$ W	$U_{g2} = 250$ V	$C_o = 6$ pF
$U_{g2} = 300$ V	$-U_{g1} = 7.3$ V	$C_{ag1} < 500$ mpF
$N_{g2} = 2$ W	$I_a = 48$ mA	
$-U_{g1} = 100$ V	$I_g = 5.5$ mA	
$I_k = 65$ mA	$N_o = 6$ W	
R_{g1}[1] $= 1$ MΩ	$S = 11.3$ mA/V	
	$\mu_{g2g1} = 19$	
	$r_i = 38$ kΩ	

[1] automatic bias

EL 504
Outline: 19



$U_f = 6.3$ V
$I_f = 1380$ mA
$U_{fk} = 220$ V

PENTODE for use as line output tube in TV receivers

Maximum Ratings	Typical Operation[1]	Capacitance
$U_a = 250$ V	$U_a = 50$ V	$C_{ag1} = 1.75$ pF
U_{as}[2] $= 7$ kV	$U_{g2} = 200$ V	
$U_{g2} = 250$ V	$-U_{g1} = 10$ V	
$I_k = 250$ mA	$I_{as} = 420$ mA	
R_{g1}[3] $= 0.5$ MΩ	$I_{g2s} = 37$ mA	
	$N_a = 16$ W	
	$N_{g2} = 4$ W	

[1] measured under pulse conditions
[2] Max. pulse duration is 22% of a cycle and max. 18 μs
[3] should not exceed 2.2 MΩ for line output application

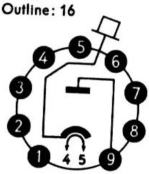
EY 86
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 86.

EY 87
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 87.

EY 88
Outline: 16



$U_f = 6.3$ V
$I_f = 1550$ mA

BOOSTER DIODE for use as line time-base circuits of transformerless TV receivers

Maximum Ratings

U_a = 250 V
N_a = 5 W
I_a = 220 mA
I_{as} = 550 mA
$U_{as}{}^2$ = 6000 V
$U_{fks}{}^1$ = 6600 V

Capacitance
$C_o = 8.9$ pF

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] cathode positive with respect to anode

EY 500A
$U_f = 6.3$ V
$I_f = 2.1$ A

BOOSTER DIODE for line time-base circuits of colour TV receivers
Further data identical with PY 500 A.

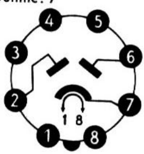
EY 806
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 806.

EY 807
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 807.

EZ 40
Outline: 7



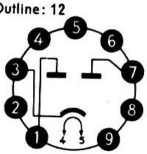
$U_f = 6.3$ V
$I_f = 600$ mA
$U_{fk} = 300$ V

FULL-WAVE RECTIFIER

Typical Operation

U_{tr} =	2 × 250	2 × 275	2 × 300	2 × 350 V_{eff}
I_a =	90	90	90	90 mA
C_{filt} =	50	50	50	50 μF
R_d =	2 × 125	2 × 175	2 × 215	2 × 300 Ω

EZ 80
Outline: 12



$U_f = 6.3$ V
$I_f = 600$ mA
$U_{fk} = 300$ V

FULL-WAVE RECTIFIER

Typical Operation

U_{tr} =	2 × 250	2 × 275	2 × 300	2 × 350 V_{eff}
I_a =	90	90	90	90 mA
C_{filt} =	50	50	50	50 μF
R_d =	2 × 125	2 × 175	2 × 215	2 × 300 Ω

PABC 80
U_f = 9.5 V
I_f = 300 mA
U_{fk} = 150 V

AF TRIODE WITH 3 DIODES for FM and AM signal detections and AF signal amplifications

Further data identical with EABC 80.

PC 86
U_f = 3.8 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE for use as UHF amplifier and selfoscillating mixer for bands IV and V

Further data identical with EC 86.

PC 88
U_f = 4 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE for use as UHF amplifier for bands IV and V

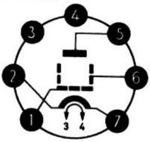
Further data identical with EC 88.

PC 92
U_f = 3.1 V
I_f = 300 mA
U_{fk} = 250 V

TRIODE for use as RF amplifier, selfoscillating mixer and video amplifying tube of TV receivers

Further data identical with EC 92.

PC 900
Outline: 1

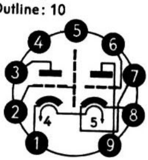


U_f = 3.9 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE for use as RF amplifier of TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_{ao} = 550 V	U_a = 135 V	C_i = 4.5 pF
U_a = 200 V	U_s = 0 V	C_o = 3 pF
N_a = 2.2 W	I_a = 11.5 mA	C_{ag} = 0.35 pF
I_k = 20 mA	$-U_g$ = 1 V	
$-U_g$ = 50 V	S = 14.5 mA/V	
R_g = 1 MΩ	μ = 76	

PCC 84
Outline: 10

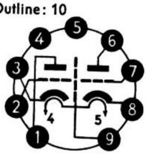


U_f = 7.2 V
I_f = 300 mA
U_{fk} = 90 V

TWIN TRIODE for use in cascode pre-stages in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 180 V	U_a = 90 V	C_i = 2.3 pF
N_a = 2 W	$-U_g$ = 1.5 V	C_o = 0.45 pF
I_k = 22 mA	I_a = 12 mA	C_{ag1} = 1150 mpF
$-U_g$ = 50 V	S = 6 mA/V	
	μ = 24	

PCC 88
Outline: 10

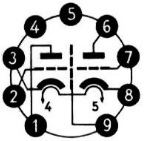


U_f = 7 V
I_f = 300 mA
U_{fk} = 80 V

TWIN-TRIODE for use as cascode amplifier in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 130 V	U_a = 90 V	C_i = 3.3 pF
N_a = 1.8 W	$-U_g$ = 1.3 V	C_o = 1.8 pF
I_k = 25 mA	I_a = 15 mA	C_{ag1} = 1.4 pF
$-U_g$ = 50 V	S = 12.5 mA/V	
R_g = 1 MΩ	μ = 33	

PCC 189
Outline: 10



U_f = 7.2 V
I_f = 300 mA
U_{fk} = 80 V

TWIN-TRIODE with variable transconductance for use as VHF cascode amplifier in TV receivers

Maximum Ratings per Section

U_a = 130 V
N_a = 1.8 W
$-U_g$ = 50 V
R_g[1] = 1 MΩ
I_k = 22 mA

Typical Operation per Section

U_a = 90 V
$-U_g$ = 1.4 V
I_a = 15 mA
S = 12.5 mA/V
r_i = 2.5 kΩ

Capacitances

C_i = 3.5 pF
C_i = 1.7 pF
C_{ag1} = 1.9 pF

[1] for unit a—g—k; for unit a'—g'—k': R_g = 0.5 MΩ

PCF 80
U_f = 9 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers

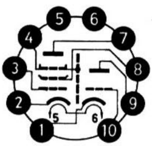
Further data identical with ECF 80.

PCF 82
U_f = 9 V
I_f = 300 mA
U_{fk} = 90 V

TRIODE-PENTODE with separate cathodes for use as mixer in TV receivers

Further data identical with ECF 82.

PCF 200
Outline: 10



U_f = 8 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-PENTODE for use in TV receivers, triode section as limiter, noise detector, AGC amplifier, synchronizing separator and pulse amplifier; pentode section as sound IF amplifier and video IF amplifier

Maximum Ratings
Pentode

U_a = 250 V
N_a = 2.1 W
I_k = 20 mA
U_{g2} = 250 V
N_{g2} = 0.75 W
R_{g1} = 1 MΩ
U_{fk} = 150 V

Triode

U_a = 250 V
N_a = 1.5 W
I_k = 18 mA
R_g = 1 MΩ
U_{fk} = 150 V
U_{-fk} = 200 V

Typical Operation
Pentode

U_a = 160 V
U_{g3} = 0 V
U_{g2} = 135 V
$-U_{g1}$ = 1.7 V
I_a = 13 mA
I_{g2} = 5.3 mA
S = 14 mA/V
μ_{g2g1} = 53

Triode

U_a = 170 V
$-U_g$ = 1 V
I_a = 8.5 mA
S = 5.2 mA
μ = 57

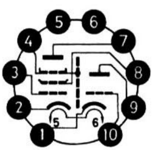
Capacitances
Triode

C_i = 2.1 pF
C_o = 2.9 pF
C_{ag} = 2.2 pF

Pentode

C_i = 6 pF
C_o = 3.3 pF
C_{ag1} = 5.6 mpF

PCF 201
Outline: 10



U_f = 8 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-PENTODE for use in TV receivers; triode section as line blocking oscillator, part of multivibrator, synchronizing separator, pulse amplifier of AGC delay diode; pentode section with remote cut-off as video IF amplifier

Maximum Ratings
Pentode

U_a = 250 V
N_a = 2.1 W
U_{g2} = 250 V
N_{g2} = 0.7 W
R_{g1} = 1 MΩ
I_k = 20 mA

Triode

U_a = 250 V
N_a = 1.5 W
R_g = 1 MΩ
I_k = 18 mA

Typical Operation
Pentode

U_a = 160 V
U_{g3} = 0 V
U_{g2} = 110 V
$-U_{g1}$ = 1.4 V
I_a = 13 mA
I_{g2} = 5.3 mA
S = 12.6 mA/V
μ_{g2g1} = 45

Triode

U_a = 100 V
$-U_g$ = 2 V
I_a = 14 mA
S = 4.8 mA/V
μ = 17.5

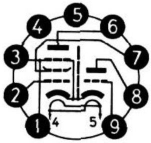
Capacitance
Triode

C_i = 2.1 pF
C_o = 3 pF
C_{ag} = 2 pF

Pentode

C_i = 6 pF
C_o = 3.3 pF
C_{ag1} = 5.6 mpF

PCF 801
Outline: 9



U_f = 8.5 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE; high transconductance triode section as oscillator, pentode section for use as frequency changer in VHF TV tuners

Maximum Ratings

Pentode

U_a = 250 V
N_a = 2 W
U_{g2} = 250 V
$-U_{g1}$ = 50 V
R_{g1} = 1 MΩ
I_k = 18 mA

Triode

U_a = 125 V
N_a = 1.5 W
$-U_g$ = 50 V
R_g = 0.5 MΩ
I_k = 20 mA

Typical Operation

Pentode

U_a = 170 V
U_{g2} = 120 V
$-U_{g1}$ = 1.4 V
I_a = 10 mA
I_{g2} = 3 mA
S = 11 mA/V
r_i = 350 kΩ
μ_{g2g1} = 55

Triode

U_a = 100 V
$-U_g$ = 3 V
I_a = 15 mA
S = 9 mA/V
μ = 20

Capacitances

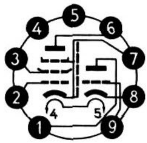
Triode

C_i = 3.3 pF
C_o = 1.7 pF
C_{ag} = 1.8 pF

Pentode

C_i = 6.2 pF
C_o = 3.5 pF
C_{ag1} = 9 mpF

PCF 802
Outline: 9



U_f = 9 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE; triode section for use as reactance tube, pentode section for use as sine wave oscillator or pulse shaper in TV receivers

Maximum Ratings

Pentode

U_a = 250 V
N_a = 1.2 W
U_{g2} = 250 V
N_{g2} = 0.8 W
R_{g1} = 0.56 MΩ
I_k = 15 mA

Triode

U_a = 250 V
N_a = 1.4 W
R_g = 3 MΩ
I_k = 10 mA

Typical Operation

Pentode

U_a = 100 V
U_{g2} = 100 V
$-U_{g1}$ = 1 V
I_a = 6 mA
I_{g2} = 1.7 mA
S = 5.5 mA/V
r_i = 400 kΩ
μ_{g2g1} = 47

Triode

U_a = 200 V
$-U_g$ = 2 V
I_a = 3.5 mA
S = 3.5 mA/V
r_i = 20 kΩ
μ = 70

Capacitances

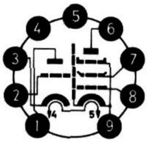
Triode

C_i = 2.4 pF
C_{ag} = 1.5 pF

Pentode

C_i = 5.4 pF
C_{ag1} = 60 mpF

PCF 812
Outline: 9



U_f = 10.4 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-OUTPUT TETRODE for use as synchronizing separator and oscillator of vertical deflection

Maximum Ratings

Tetrode

U_a = 250 V
N_a = 3 W
U_{g2} = 250 V
N_{g2} = 1 W

Triode

U_a = 250 V
N_a = 2 W

Typical Operation

Tetrode

U_a = 170 V
U_{g2} = 170 V
$-U_{g1}$ = 2 V
I_a = 10 mA
I_{g2} = 2.5 mA
S = 8 mA/V
μ_{g1g2} = 44

Triode

U_a = 200 V
$-U_g$ = 7.7 V
I_a = 10 mA
S = 3.4 mA/V
μ = 18

Capacitances

Triode

C_i = 2.5 pF
C_o = 1.8 pF
C_{ag} = 1.5 pF

Tetrode

C_i = 5.2 pF
C_o = 3.4 pF
C_{ag1} < 25 mpF

PCH 200
$U_f = 9.2$ V
$I_f = 300$ mA
$U_{fk} = 100$ V

TRIODE-HEPTODE; triode section for use as pulse amplifier and heptode section for use as noisegated synchronizing separator

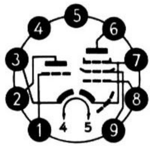
Further data identical with ECH 200.

PCL 82
$U_f = 16$ V
$I_f = 300$ mA
$U_{fk} = 200$ V

TRIODE-OUTPUT PENTODE; triode section for use as frame oscillator and AF amplifier, pentode section for use as frame output tube and AF amplifier

Further data identical with ECL 82.

PCL 84
Outline: 12



$U_f = 15$ V
$I_f = 300$ mA
$U_{fk} = 150$ V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use in circuits for gated AGC, synchronizing separation, synchronizing amplification and noise suppression, pentode section for use as video output tube.

Maximum Ratings

Triode
$U_a = 250$ V
$N_a = 1$ W
$I_k = 12$ mA
$R_g = 1$ MΩ

Pentode
$U_a = 250$ V
$U_{g2} = 250$ V
$N_a = 4$ W
$N_{g2} = 1.7$ W
$I_k = 40$ mA
$R_{g1} = 1$ MΩ

Typical Operation

Triode
$U_a = 200$ V
$-U_g = 1.7$ V
$I_a = 3$ mA
$S = 4$ mA/V
$\mu = 65$

Pentode
$U_a = 170$ V
$U_{g2} = 170$ V
$-U_{g1} = 2.1$ V
$I_a = 18$ mA
$I_{g2} = 3$ mA

$S = 11$ mA/V
$\mu_{g2g1} = 36$
$r_i = 100$ kΩ

Capacitances

Triode
$C_i = 4$ pF
$C_o = 2.5$ pF
$C_{ag} = 2.7$ pF

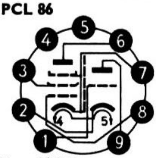
Pentode
$C_i = 9$ pF
$C_o = 4.5$ pF
$C_{ag1} < 100$ mpF

PCL 85
$U_f = 18$ V
$I_f = 300$ mA
$U_{fk} = 200$ V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as frame oscillator or pulse amplifier, pentode section for use as frame output tube

Further data identical with ECL 85.

PCL 86

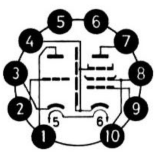


$U_f = 14.5$ V
$I_f = 300$ mA
$U_{fk} = 100$ V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as AF amplifier, pentode section for use as AF amplifier

Further data identical with ECL 86.

PCL 200
Outline: 13



$U_f = 15.5$ V
$I_f = 300$ mA
$U_{fk} = 200$ V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use in circuits for gated AGC, pentode section for use in video output stage

Maximum Ratings

Triode
$U_a = 250$ V
$N_a = 1.7$ W
$I_k = 15$ mA
$R_g = 0.5$ MΩ

Pentode
$U_a = 250$ V
$N_a = 6$ W
$U_{g2} = 250$ V
$N_{g2} = 2.5$ W
$I_k = 85$ mA
$R_{g1} = 0.5$ MΩ

Typical Operation

Pentode
$U_a = 150$ V
$U_{g2} = 220$ V
$-U_{g1} = 2.1$ V
$I_a = 40$ mA
$I_{g2} = 8$ mA
$S = 28$ mA/V
$r_i = 22$ kΩ

Triode
$U_a = 200$ V
$-U_g = 1.5$ V
$I_a = 8.5$ mA

$S = 5.2$ mA/V
$\mu = 55$

Capacitances

Triode
$C_i = 3$ pF
$C_o = 4.4$ pF
$C_{ag} = 2.5$ pF

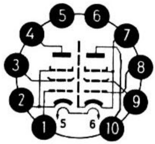
Pentode
$C_i = 14.5$ pF
$C_o = 6$ pF
$C_{ag1} = 70$ mpF

PCL 805
U_f = 18 V
I_f = 300 mA
U_{fk} = 200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as oscillator and pre-amplifier, pentode section for use as power stage for vertical deflection

Further data identical with ECL 805.

PFL 200
Outline: 13

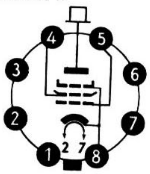


U_f = 17 V
I_f = 300 mA
U_{fk} = 200 V

DOUBLE PENTODE for use as video output tube, synchronizing separator, AGC amplifier or IF sound amplifier

Maximum Ratings	Typical Operation	Capacitances
L section	L section	L section
U_a = 250 V	U_a = 170 V	C_i = 13 pF
N_a = 5.1 W	U_{g2} = 170 V	C_o = 7 pF
U_{g2} = 250 V	$-U_{g1}$ = 2.7 V	C_{ag1} = 100 mpF
N_{g2} = 2.5 W	I_a = 30 mA	F section
R_{g1} = 1 MΩ	I_{g2} = 7 mA	C_i = 10 pF
I_k = 60 mA	S = 22 mA/V	C_o = 10.5 pF
F section	r_i = 33 kΩ	C_{ag1} = 140 mpF
U_a = 250 V	μ_{g2g1} = 38	
N_a = 1.5 W	F section	
U_{g2} = 250 V	U_a = 150 V	
N_{g2} = 0.5 W	U_{g2} = 150 V	
R_{g1} = 1 MΩ	$-U_{g1}$ = 2.1 V	
I_k = 15 mA	I_a = 10 mA	
	I_{g2} = 3 mA	
	S = 8.5 mA/V	
	r_i = 150 kΩ	
	μ_{g2g1} = 38	

PL 36
Outline: 17



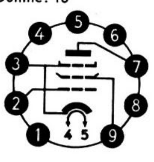
U_f = 25 V
I_f = 300 mA
U_{fk} = 250 V

PENTODE for use as line output tube in TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 100 V	C_i = 17.5 pF
U_{as}[1] = 7 kV	U_{g2} = 100 V	C_o = 8 pF
U_{g2} = 250 V	$-U_{g1}$ = 8.2 V	C_{ag1} = 1.15 pF
I_k = 200 mA	I_a = 100 mA	
R_{g1} = 0.5 MΩ	I_{g2} = 7 mA	
N_a = 12 W	S = 14 mA/V	
N_{g2}[2] = 4 W	μ_{g2g1} = 5.6	
	r_i = 5 kΩ	

[1] max. pulse duration is 22% of a cycle, max. 18 μs
[2] if N_a = 8 W, N_{g2} = max. 5 W

PL 82
Outline: 13



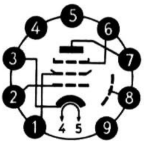
U_f = 16.5 V
I_f = 300 mA
U_{fk} = 200 V

PENTODE for use as frame output tube in TV receivers and as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 170 V	C_i = 11 pF
U_{g2} = 250 V	U_{g2} = 170 V	C_o = 5.9 pF
N_a = 9 W	$-U_{g1}$ = 10.4 V	C_{ag1} = 1 pF
N_{g2} = 2.5 W	I_a = 53 mA	
I_k = 75 mA	I_{g2} = 10 mA	
R_{g1} = 0.4 MΩ	S = 10.2 mA/V	
	r_i = 20 kΩ	
	μ_{g2g1} = 10	

PL 83

Outline: 13



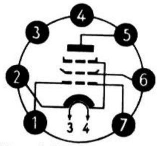
U_f = 15 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE for use as video output tube

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 170 V	C_i = 10.8 pF
U_{g2} = 250 V	U_{g3} = 0 V	C_o = 6.6 pF
N_a = 9 W	U_{g2} = 170 V	C_{ag1} < 100 mpF
N_{g2} = 2 W	$-U_{g1}$ = 2.3 V	
I_k = 70 mA	I_a = 36 mA	
R_{g1} = 0.5 MΩ	I_{g2} = 5 mA	
	S = 10.5 mA/V	
	μ_{g2g1} = 24	
	r_i = 0.1 MΩ	

PL 95

Outline: 4



U_f = 4.5 V
I_f = 300 mA
U_{fk} = 100 V

PENTODE for use as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 550 V	U_a = 250 V	C_i = 5.3 pF
U_a = 300 V	U_{g2} = 250 V	C_o = 3.5 pF
U_{g2} = 300 V	$-U_{g1}$ = 9 V	C_{ag1} < 400 mpF
N_a = 6 W	I_a = 24 mA	
N_{g2} = 1.25 W	I_{g2} = 4.5 mA	
I_k = 35 mA	S = 5 mA/V	
R_{g1} = 2 MΩ	μ_{g2g1} = 17	
	R_i = 80 kΩ	

PL 500

BEAM PENTODE for use as line output tube in TV receivers

All data are identical with PL 504.

PL 504

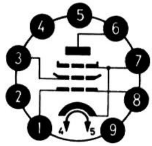
U_f = 27 V
I_f = 300 mA
U_{fk} = 220 V

BEAM PENTODE for use as line output tube in TV receivers

Further data identical with EL 504.

PL 508

Outline: 18



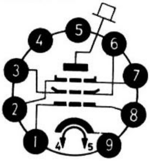
U_f = 17 V
I_f = 300 mA
U_{fk} = 220 V

PENTODE for use as frame output amplifier in colour TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_a = 400 V	U_a = 190 V	C = 18 pF
U_{as}[1] = 2.5 kV	U_{g2} = 190 V	C_o = 10 pF
U_{g2} = 275 V	$-U_{g1}$ = 17 V	C_{ag1} = 1.4 pF
N_a = 12 W	I_a = 60 mA	
N_{g2} = 3 W	I_{g2} = 4.5 mA	
I_k = 100 mA	S = 9 mA/V	
R_{g1} = 1 MΩ	μ_{g2g1} = 8	

[1] max. pulse duration is 5% of a cycle and max. 1 ms

PL 509
Outline: 22



U_f = 40 V
I_f = 300 mA
U_{fk} = 250 V

PENTODE for colour TV line deflection circuits

Maximum Ratings

U_{a0}	= 700 V
U_{as}[1]	= 7000 V
U_{g3}	= 50 V
U_{g2}	= 275 V
N_a	= 30 W
N_{g2}	= 7 W
I_k	= 500 mA
I_{ks}	= 1.2 A
R_{g1}	= 0.5 MΩ

Typical Operation[2]

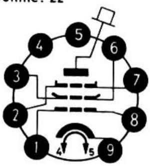
U_a	=160	50 V
U_{g3}	= 0	0 V
U_{g2}	=160	175 V
U_{g1}	= 0	10 V
I_a	= 1.4	0.8 A
I_{g2}	= 45	70 mA

Capacitances

C_{ag1} = 2.5 pF

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] measured under pulse conditions

PL 519
Outline: 22



U_f = 40 V
I_f = 300 mA
U_{fk} = 250 V

PENTODE for colour TV line deflection circuits

Maximum Ratings

U_{a0}	= 700 V
U_{as}[1]	= 7000 V
U_{g3}	= 50 V
U_{g2}	= 275 V
N_{g2}	= 7 W
N_a	= 35 W
I_k	= 500 mA
I_{ks}	= 1.4 A
R_{g1}	= 0.5 Ω

Typical Operation[2]

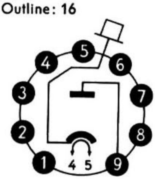
U_a	=160	50 V
U_{g3}	= 0	0 V
U_{g2}	=160	175 V
U_{g1}	= 0	10 V
I_a	= 1.4	0.8 A
I_{g2}	= 45	70 mA

Capacitance

C_{ag1} = 2.5 pF

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] measured under pulse conditions

PY 81
Outline: 16



U_f = 17 V
I_f = 300 mA
U_{fks}[1] = 5 kV

BOOSTER DIODE for use in line time-base circuits of transformerless TV receivers

Maximum Ratings

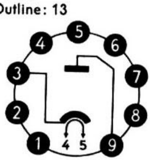
U_b	= 250 V
N_a	= 3.5 W
I_a	= 150 mA
I_{as}	= 450 mA
U_{as}[1,2]	= 5 kV
R_s	= 80 Ω

Capacitance

C_o = 6.4 pF

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] cathode positive with respect to anode

PY 82
Outline: 13



U_f = 19 V
I_f = 300 mA
U_{fk} = 550 V

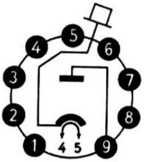
HALF-WAVE RECTIFIER

Typical Operation

U_{tr}	=250	220	127 V_{eff}
U_o	=195	195	127 V
I_o	=180	180	180 mA
R_t	=125	65	0 Ω
C_{filt}	= 60	60	60 μF

PY 83
Outline: 14

BOOSTER DIODE for TV receivers



Maximum Ratings		Capacitance
$-U_{as}$[1,2]	= 5 kV	C_o=9.2 pF
I_a	=175 mA	
I_{as}	=500 mA	
N_a	= 3.5 W	

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] cathode positive with respect to anode

U_f = 20 V
I_f =300 mA
U_{fks}[1] = 5 kV

PY 88
U_f = 30 V
I_f =300 mA
U_{fks}[1] = 6.6 kV

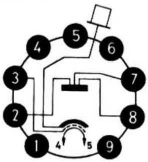
BOOSTER DIODE for use as line time-base circuits of transformerless TV receivers

Further data identical with EY 88.

[1] max. pulse duration is 22% of a cycle and max. 18 μs

PY 500 A
Outline: 20

BOOSTER DIODE for time-base circuits of colour TV receivers



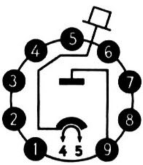
Maximum Ratings		Capacitance
N_a	= 11 W	C_o=13.5 pF
I_a	=440 mA	
I_{as}	= 1 A	
U_{as}[1,2]	= 5.6 kV	

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] cathode positive with respect to anode

U_f = 42 V
I_f =300 mA
U_{fks}[1] = 6.3 kV

PY 801
Outline: 14

BOOSTER DIODE for TV receivers



Maximum Ratings		Capacitance
$-U_{as}$[1,2]	=5.25 kV	C_o=6.4 pF
I_a	=1.50 mA	
I_{as}	= 500 mA	
N_a	= 3.5 W	

[1] max. pulse duration is 22% of a cycle and max. 18 μs
[2] cathode positive with respect to anode

U_f = 19 V
I_f = 300 mA
U_{fks}[1]=5.75 kV

UAF 42
U_f =12.6 V
I_f = 100 mA
U_{fk}= 150 V

DIODE-PENTODE for use as RF, IF or AF amplifier

Further data identical with EAF 42.

UBC 41
U_f = 14 V
I_f = 100 mA
U_{fk} = 100 V

TWIN DIODE WITH TRIODE for AF amplifiers

Further data identical with EBC 41.

UBF 80
U_f = 17 V
I_f = 100 mA
U_{fk} = 100 V

TWIN DIODE AND TRIODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers

Further data identical with EBF 80.

UCH 42
U_f = 14 V
I_f = 100 mA
U_{fk} = 150 V

TRIODE-HEXODE for use as frequency changer and phase inverter

Further data identical with ECH 42.

UCH 81
U_f = 19 V
I_f = 100 mA
U_{fk} = 100 V

TRIODE-HEPTODE; heptode section for use as mixer, RF or IF amplifier, triode section for use as oscillator in AM or FM receivers.

Further data identical with ECH 81.

UF 41
U_f = 12.6 V
I_f = 100 mA
U_{fk} = 150 V

PENTODE for use as RF or IF amplifier

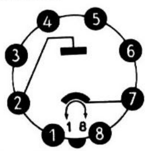
Further data identical with EF 41.

UL 41
U_f = 45 V
I_f = 100 mA
U_{fk} = 150 V

PENTODE for use as AF power amplifier

Further data identical with EL 41.

UY 41
Outline: 6



U_f = 31 V
I_f = 100 mA
U_{fk} = 300 V

HALF-WAVE RECTIFIER

Typical Operation

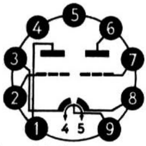
U_a = 220 V_{eff}
I_a = 80 mA
R_d > 160 Ω
C_{filt} = 50 μF

UY 82
U_f = 55 V
I_f = 100 mA
U_{fk} = 550 V

HALF-WAVE RECTIFIER

Further data identical with PY 82.

E80CC
Outline: 13

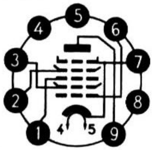


U_f = 6.3 V
I_f = 600 mA
or
U_f = 12.6 V
I_f = 300 mA
U_{fk} = 120 V

TWIN TRIODE with separate cathodes, for use in professional and commercial equipments

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 600 V	U_a = 250 V	C_i = 2.4 pF
U_a = 300 V	I_a = 6 mA	C_o = 0.45 pF
N_a = 2 W	S = 5.5 mA/V	C_{ag} = 3.1 pF
I_k = 12 mA	μ = 30	
$-U_g$ = 200 V		
R_g = 1 MΩ		

E81H
Outline: 12

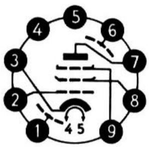


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 120 V

HEPTODE with two linear control grids

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 500 V	U_a = 150 V	C_i = 5.3 pF
U_a = 250 V	U_{g2} = 75 V	C_o = 6.7 pF
U_{g20} = 500 V	U_{g4} = 75 V	C_{ag1} < 0.1 pF
U_{g2} = 125 V	U_{g1} = 0 V	
U_{g40} = 500 V	I_a = 7 mA	
U_{g4} = 250 V	I_{g2} = 6.6 mA	
N_a = 1.2 W		
N_{g2} = 0.8 W		
N_{g4} = 0.4 W		
I_k = 20 mA		

E81L
Outline: 12

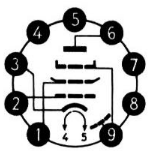


U_f = 6.3 V
I_f = 375 mA
U_{fk} = 120 V

OUTPUT PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitance
U_{a0} = 550 V	U_a = 210 V	C_{ag1} < 0.02 pF
U_a = 210 V	U_{g3} = 0 V	
N_a = 4.5 W	U_{g2} = 210 V	
U_{g2} = 210 V	I_a = 20 mA	
N_{g2} = 1.2 W	I_{g2} = 5.3 mA	
I_k = 30 mA	S = 11 mA/V	
	r_i = 0.4 MΩ	

E83F
Outline: 12

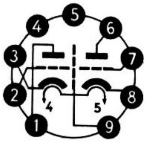


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

WIDE-BAND PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitance
U_{a0} = 550 V	U_a = 210 V	C_{ag1} < 15 mpF
U_a = 210 V	U_{g3} = 0 V	
N_a = 2.1 W	U_{g2} = 120 V	
U_{g2} = 210 V	I_a = 10 mA	
N_{g2} = 350 mW	I_{g2} = 2.1 mA	
I_k = 16 mA	S = 9 mA/V	
	r_i = 0.5 MΩ	

E88CC
Outline: 10

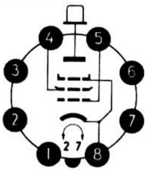


TWIN TRIODE for use in cascode circuits, HF or IF amplifiers, mixer or phase inverter stages, multivibrators and in cathode followers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a = 100 V	C_i = 3 pF
U_a = 220 V	I_a = 15 mA	C_o = 0.8 pF
N_a = 1.5 W	S = 12.5 mA/V	C_{ag} = 1.4 pF
$-U_g$ = 200 V	μ = 33	
I_k = 20 mA	R_{eq} = 300 Ω	

U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

E130L
Outline: 23

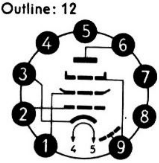


OUTPUT PENTODE for use as wide band amplifier, cathode follower, series regulator tube for stabilised d.c. supply

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 2000 V	U_a = 250 V	C_i = 35 pF
U_a = 900 V	U_{g2} = 150 V	C_o = 17 pF
N_a = 27.5 W	$-U_{g1}$ = 15.5 V	C_{ag1} = 2 pF
U_{g20} = 550 V	I_a = 100 mA	
U_{g2} = 250 V	S = 27.5 mA/V	
N_{g2} = 5 W	μ_{g2g1} = 6.5	
I_k = 300 mA	r_i = 10 kΩ	

U_f = 6.3 V
I_f = 1.7 A
U_{fk} = 100 V

18042
Outline: 12

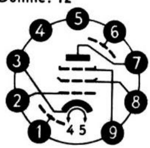


WIDE-BAND PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 550 V	U_a = 210 V	C_i = 8.0 pF
U_a = 210 V	U_{g3} = 0 V	C_o = 3.5 pF
N_a = 2.1 W	U_{g2} = 120 V	C_{ag1} < 150 mpF
U_{g20} = 550 V	I_a = 10 mA	
U = 210 V	S = 9 mA/V	
N_{g2} = 0.35 W	r_i = 0.5 MΩ	
I_k = 16 mA	μ_{g2g1} = 34	

U_f = 18 V
I_f = 100 mA
U_{fk} = 100 V

18046
Outline: 12



OUTPUT PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 550 V	U_a = 210 V	C_i = 11.5 pF
U_a = 210 V	U_{g3} = 0 V	C_o = 6.5 pF
N_a = 4.5 W	U_{g2} = 210 V	C_{ag1} = 20 mpF
U_{g20} = 550 V	I_a = 20 mA	
U_{g2} = 210 V	I_{g2} = 5.3 mA	
N_{g2} = 1.2 W	S = 11 mA/V	
I_k = 30 mA	μ_{g2g1} = 36	

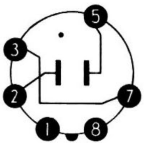
U_f = 20 V
I_f = 135 mA
U_{fk} = 120 V

VOLTAGE REGULATORS

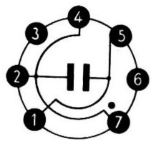
Type	Anode voltage drop			DC anode current			Typical Operation					Outline
	$U_{arc\,min}$ V	U_{arc} V	$U_{arc\,max}$ V	$I_{a\,min}$ mA	I_a mA	$I_{a\,max}$ mA	$U_{ign\,max}$ V	$\Delta U_{arc\,max}$ V	r_i Ω	I_{as} mA	T_b °C	
OA 3	68	75	85	5	20	40	105	6.5	100	100[1]	—55 . . . +90	21
OC 3	103	108	116	5	20	40	135	4.5	100	100[1]	—55 . . . +90	21
OD 3	142	153	165	5	20	40	185	5.5	100	100[1]	—55 . . . +90	21
85A2T/OG 3	83	85	87	1	5.5	10	125	4	250		—55 . . . +90	3
108C1/OB 2	106	108	111	5	17.5	30	138	3.5	100	75[2]	—55 . . . +90	4
150C2/OA 2	144	150	164	5	17.5	30	190	4.5	100	75[2]	—55 . . . +90	4

[1] Averaged over a starting period not exceeding 10 s. This starting period must be followed by a steady-state operating condition of at least 20 minutes, otherwise tube performance will be impaired

[2] duration not to exceed 10 s; such short overloads may be repeated only once or twice in 8 hours

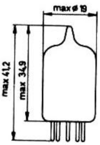


OA 3
OC 3
OD 3



85 A2T/OG 3
108 C1/OB 2
150 C2/OA 2

OUTLINES



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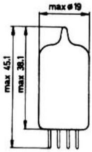

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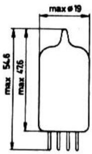

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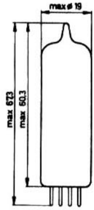

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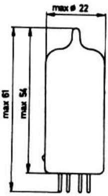

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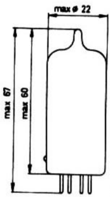

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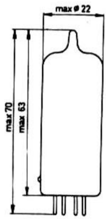

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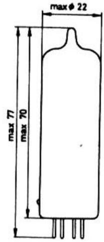

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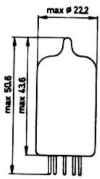

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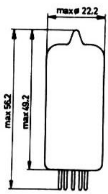

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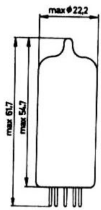

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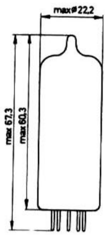

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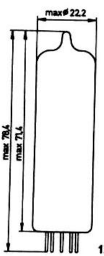

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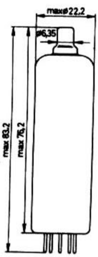

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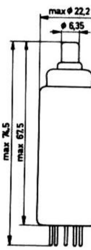

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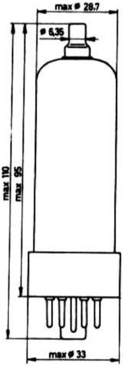

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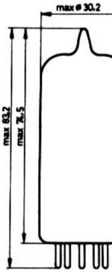

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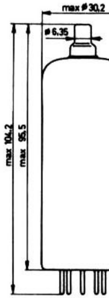

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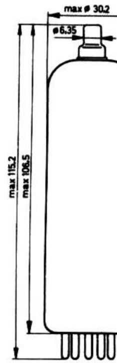

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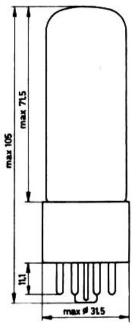

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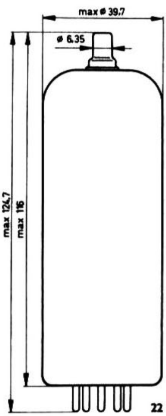

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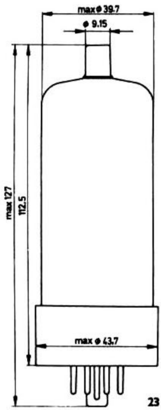

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INTERCHANGEABILITY LIST

In the following list the TUNGSRAM equivalents to other makes are indicated. Type designations without brackets are direct equivalents, while those in brackets are near equivalents only.

Type	TUNGSRAM Type	Type	TUNGSRAM Type	Type	TUNGSRAM Type
AA 61	ECC 40	N 154	PL 82	6AK8	EABC 80
B 152	ECC 81	N 308	(PL 36)	6AL3	EY 88
B 309	ECC 81	N 329	PL 82	6AN7	(ECH 81)
B 319	(PCC 84)	N 369	PCL 82	6AQ8	ECC 85
B 329	ECC 82	N 709	EL 84	6BH5	(EF 89)
B 339	ECC 83	OA 2	150C2	6BK8	(EF 86)
B 719	ECC 85	OA 3	VR 75	6BM8	ECL 82
BF 61	EL 41	OB 2	108C1	6BQ5	EL 84
CV 283	EAA 91	OC 3	VR 105	6BT4	EZ 40
CV 455	ECC 81	OD 3	VR 150	6BW7	(EF 80)
CV 491	ECC 82	OG 3	85A2T	6BX6	EF 80
CV 492	ECC 83	R 19	(DY 86)	6BY7	EF 85
CV 1375	EF 85	U 26	EY 86	6C10	ECH 42
CV 1376	EF 80	U 49	EY 86	6C12	ECH 81
CV 1535	EZ 80	U 119	UY 85	6CA4	EZ 81
CV 1977	UL 41	U 142	UY 41	6CJ5	EF 41
CV 2128	ECH 81	U 150	EZ 40	6CK5	EL 41
CV 2901	EF 86	U 153	PY 81	6CM4	EC 86
CV 2966	EY 86	U 154	PY 82	6CT7	EAF 42
CV 2975	EL 84	U 192	PY 82	6CU7	ECH 42
CV 3882	EBC 41	U 319	(PY 82)	6CV7	EBC 41
CV 3883	EAF 42	U 381	UY 85	6DA6	EF 89
CV 3884	ECC 40	U 404	(UY 41)	6DC8	EBF 89
CV 3885	EF 40	UCH 171	(UCH 81)	6DL4	EC 88
CV 3887	EF 42	V 41	AZ 41	6DS8	ECH 83
CV 3888	ECH 42	V 61	EZ 40	6DT8	(ECC 85)
CV 3889	EL 41	W 142	UF 41	6EC7	(EF 89)
CV 3891	EZ 40	W 719	EF 85	6EH7	EF 183
CV 3892	AZ 41	W 729	(EF 85)	6EJ7	EF 184
CV 5072	EZ 81	WD 142	UAF 42	6EL7	EF 80
CV 5156	EF 89	WD 150	EAF 42	6F18	(EF 89)
CV 5192	PCC 84	WD 709	EBF 80	6F19	EF 85
D 2M9	EAA 91	X 119	UCH 81	6F20	(EF 85)
D 121	(UAF 42)	X 142	UCH 42	6F23	(EF 80)
D 152	EAA 91	X 143	ECH 21	6F24	(EF 184)
DH 150	EBC 41	X 150	ECH 42	6F25	(EF 183)
DH 718	EBC 41	X 719	ECH 81	6F29	EF 183
DH 719	EABC 80	Z 150	EF 42	6F30	EF 184
E 2163	ECC 82	Z 152	EF 80	6F40	EF 86
E 2164	ECC 83	Z 329	(EF 80)	6FD12	EBF 89
E 2175	ECC 81	Z 719	EF 80	6FG6	EM 84
E 2385	(EY 86)	Z 729	EF 86	6GB5A	EL 504
EBF 171	(EBF 80)	ZD 152	EBF 80	6GK6	(EL 84)
EBF 175	(EBF 89)	1BG2	DY 51	6GW8	ECL 86
ECH 113	ECH 42	1BQ2	DY 802	6KX8	ECC 808
ECH 171	(ECH 81)	1H2	DY 86	6JX8	ECH 84
EF 174	(EF 80)	1S2	DY 86	6L12	ECC 85
EF 175	(EF 85)	1S2A	DY 87	6L13	ECC 88
EF 804	(EF 86)	1X2A	(DY 86)	6LD3	EBC 41
EL 171	(EL 84)	1X2B	(DY 86)	6LD12	EABC 80
LN 152	ECL 80	4CM4	PC 86	6M5	(EL 84)
LN 309	(PCL 82)	4DL4	PC 88	6N8	EBF 80
LN 329	(PCL 82)	4HA5	PC 900	6N8K	(EBF 89)
LZ 319	(PCF 80)	6AB4	EC 92	6P15	EL 84
LZ 329	(PCF 80)	6AB8	ECL 80	6PD12	EBF 89
N 142	UL 41	6AD8	(EBF 89)	6S2	EY 86
N 150	EL 41	6AJ8	ECH 81	6S2A	EY 87

Type	TUNGSRAM Type
6S8	EY 86
6T8	(EABC 80)
6V4	EZ 80
7AN7	PCC 84
7DE7	(EF 80)
7DJ8	PCC 88
7ES8	PCC 189
7FC7	(PCC 189)
8D8	(EF 86)
8GJ7	PCF 801
8U9	PCF 201
9A8	PCF 80
9AK8	PABC 80
9D7	(EF 85)
9JW8	PCF 802
9U8	PCF 82
9V9	PCH 200
10C14	UCH 81
12AC5	UF 41
12AT7	ECC 81
12AU7	ECC 82
12AX7	ECC 83
12S7	UAF 42
14GW8	PCL 86

Type	TUNGSRAM Type
14K7	UCH 42
14Y7	(UCH 81)
15DQ8	PCL 84
16A5	PL 82
16A8	PCL 82
16Y9	PFL 200
17C8	UBF 80
17KW6	PL 508
17V9	PFL 200
17Z3	PY 81
17Z3A	PY 83
18GV8	PCL 85
19AJ8	UCH 81
19D8	UCH 81
19SU	PY 82
19Y3	PY 82
25E5	PL 36
28GB5	PL 500
	PL 504
30AE3	PY 88
30C1	PCF 80
30F5	(EF 80)
30F27	(EF 184)
30L1	PCC 84

Type	TUNGSRAM Type
30P4	(PL 36)
30P16	PL 82
30PL1	(PCL 82)
30PL13	(PCL 82)
31A3	UY 41
38A3	UY 85
40KG6	PL 509
45A5	UL 41
62DDT	EBC 41
62TH	ECH 42
64SPT	EF 80
66KU	EZ 40
67PT	EL 41
121VP	UF 41
141TH	UCH 42
163Pen	PL 82
311SU	UY 41
451PT	UL 41
3885	EF 40
3887	EF 42
5879	(EF 86)
6267	EF 86
7025	(ECC 83)

TUNGSRAM

OSCILLOSCOPE & MONITOR TUBES

1979

SINGLE & DOUBLE TRACE OSCILLOSCOPE TUBES

MONITOR TUBES

SYMBOLS AND DESIGNATION OF ELECTRODES AND ELECTRODE CONNECTIONS

A	side connection according to JEDEC J1-22
$a_1 \ldots a_4$	anodes 1...4
b	metal rimband
B	side connection according to JEDEC J1-21
D_1 and D_2	horizontal deflection plates
D_3 and D_4	vertical deflection plates
d_{12}	horizontal deflection factor
d_{34}	vertical deflection factor
f	heater
$g_1 \ldots g_4$	grids 1...4
I_f	heater current
i. c.	internal connection; base connection should not be used as tie point for components
k	cathode
m	external conductive coating
t_h	heating time
U_a	anode voltage
$U_{a1} \ldots U_{a4}$	voltage of anodes 1...4
U_f	heater voltage
$U_{g1} \ldots U_{g4}$	DC voltage between grids 1...4 and cathode
$-U_{g1\ cut\ off}$	negative grid bias for the visual extinction of the undeflected focused spot (at oscilloscope tubes) and of the raster (at monitor tubes)
U_k	voltage between grid 1 and cathode at cathode control

All voltages refer to cathode unless otherwise stated.

In double trace oscilloscope tubes with equal systems the equivalent electrodes are distinguished by subscripts a and b.

symbol		old	new
first letter	before the group of numbers	D: electrostatic deflection and focus	D: single trace oscilloscope tube M: monitor tube K: under development
second letter		B, F, G, H, L, N, P or W: cf. screen designation system	—
third letter		M: multiple trace tube	—
number preceding hyphen		screen diameter or screen diagonal in cm	
number following hyphen		serial number indicating a particular design or development	
final letters		F: flat faceplate	BE, GH, GJ, GL, GM, GR, LF, LD or W: cf. screen designation system

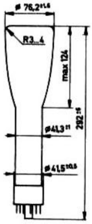
For eliminating the parallax the oscilloscope and monitor tubes can be provided with internal graticules. These tubes are available on special order. The type designation of tubes with not illuminable graticules must be completed with /01, /03, /05, etc., while those with illuminable graticules with /02, /04, /06 etc., and those with illuminable graticules and with fittings for illumination with /02S, /04S, /06S, etc.
The dimensions of internal graticules designated /01 and /02 vary with the useful screen dimensions. For 7 cm screen diameter the internal graticule spacing is 5 mm and for screen diameters greater than 7 cm the internal graticule spacing is 10 mm. Internal graticules with /03 and above are produced with designs as requested by the customer.

SCREEN DESIGNATION SYSTEM

Code			Screen colour		Persistence
new	old	EIA	fluorescence	phosphorescence	
BE	B	P11	blue	blue	medium short (10 μs...1 ms)
GH	H	P31	green	green	medium short (10 μs...1 ms)
GJ	G	P1	yellowish green	yellowish green	medium (1 ms...100 ms)
GL	N	P2	yellowish green	yellowish green	medium short (10 μs...1 ms)
GM	P	P7	bluish white	yellowish green	long (100 ms...1 s)
GR	—	P39	yellowish green	yellowish green	long (100 ms...1 s)
LD	L	P33	orange	orange	very long (over 1 s)
LF	F	P19	orange	orange	very long (over 1 s)
W	W	P4	white	white	medium (1 ms...100 ms)

LD-, LF-, P19- and P31-screen:
for special purposes screen materials are available whose fluorescence (initial luminance) as well as they phosphorescence (persistence) is orange coloured. The persistence of these screen materials is even longer than the persistence of the GM screen. Moreover, having one screen layer these screens have a higher definition than the GM screen with two layers. However, due to its higher susceptibility to poisoning these screens will only be used if the envisaged application does not allow the use of the GM screen. The danger of poisoning may be reduced on operation with the highest possible acceleration voltage. Consequently only such tubes are provided with these screens whose overall acceleration voltage is in excess of 10 kV, e.g. picture tubes for long afterglow as well as tubes for special applications. The long persistence of these screens may be utilised best at only low excitation (low beam current) and weak ambient light. Displays are therefore operated in darkened rooms.
With the rise of the anode voltage the screen P22R/P31 changes its colour steadily from red to yellowish green.
Persistence is defined as the period of time during which brightness diminishes to 1/10 of its initial value.

with flat faceplate, for medium operating voltages



Application

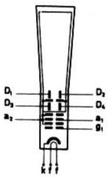
in small size portable oscilloscopes for medical and industrial purposes

Screen Types

DB 7-113 F
DG 7-113 F
DN 7-113 F
DP 7-113 F

System Structure

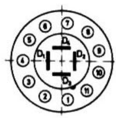
Arrangement of Electrodes:



Base Connections

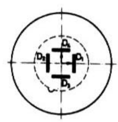
(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — D_3
6 — D_4
7 — a_2
8 — D_2
9 — D_1
10 — i. c.
11 — f



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Medium-Shell Magnal, 11-pin, JETEC No. B11-66

Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Typical Operation

U_{a2} = 2 kV
U_{a1} = 320...600 V
$-U_{g1\ cut\ off}$ = 45...90 V
d_{12} = 39.4...53.5 V/cm
d_{34} = 30...41 V/cm

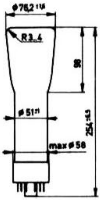
Maximum Ratings

U_{a2} = 2.5 kV
U_{a1} = 1 kV

Accessories

Socket: VST 5
Metallic Shield: ART 1

with flat faceplate, for medium operating voltages



Application

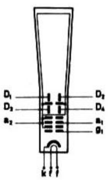
in small size portable oscilloscopes for medical and industrial purposes

Screen Types

DB 7-115 F
DG 7-115 F
DN 7-115 F

System Structure

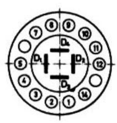
Arrangement of Electrodes:



Base Connections

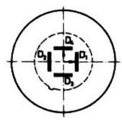
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Typical Operation

U_{a2}	=	2 kV
U_{a1}	=	320...720 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	75 V/cm
d_{34}	=	59 V/cm

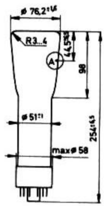
Maximum Ratings

U_{a2} = 2.2 kV
U_{a1} = 1.1 kV

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 6

with flat faceplate, post-deflection accelerator, for medium operating voltages



Application

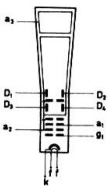
In small size portable oscilloscopes for medical and industrial purposes, most suitable for small oscillosynchroscopes

Screen Types

DB 7-116 F
DG 7-116 F
DN 7-116 F
DP 7-116 F

System Structure

Arrangement of Electrodes:



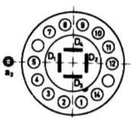
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

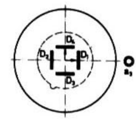
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

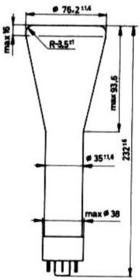
U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 1 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	400...690 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	67...91 V/cm
d_{34}	=	49...67 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 5
Final Accelerator Contact Connector: VST 2



with flat faceplate, for low and medium operating voltages

Application

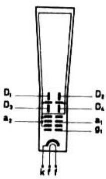
in small size portable oscilloscopes for medical and industrial purposes

Screen Types

DG 7-119/3RP1A
DH 7-119/3RP31A

System Structure

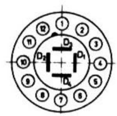
Arrangement of Electrodes:



Base Connections

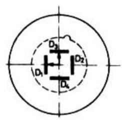
(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — i. c.
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.
12 — f



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Small-Shell Duodecal, 12-pin, JETEC No. B12-43

Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Typical Operation

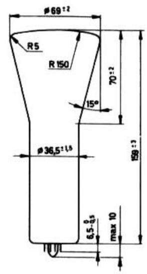
U_{a2}	=	1 kV
U_{a1}	=	165...310 V
$-U_{g1\,cut\,off}$	=	max. 67,5 V
d_{12}	=	28,5...39 V/cm
d_{34}	=	20,5...27,5 V/cm

Maximum Ratings

U_{a2} = 2.5 kV
U_{a1} = 1 kV

Accessories

Socket: VST 10
Metallic Shield: ART-K601



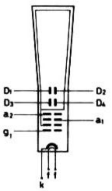
for asymmetrical operation with short overall length, for low operating voltages

Application

low anode voltage indicator tube for asymmetrical horizontal deflection

System Structure

Arrangement of Electrodes:



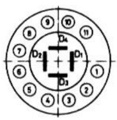
Deflection Method: electrostatic, D_{12} asymmetrical (D_2 must be connected to a_2), D_{34} symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.

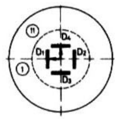


Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 63 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

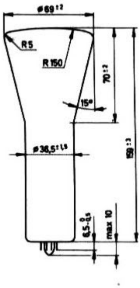
U_{a2} = 1 kV
U_{a1} = 0.4 kV

Accessories

Socket: VST 8
Metallic Shield: ART-K411

Typical Operation

U_{a2}	=	0.8 kV
U_{a1}	=	0...180 V
$-U_{g1\ cut\ off}$	=	80...160 V
d_{12}	=	36...44 V/cm
d_{34}	=	24...30 V/cm



for symmetrical operation with short overall length, for low operating voltages

Application

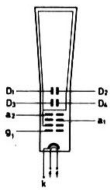
low anode voltage indicator tube

Screen Types

DG 7-124
DN 7-124

System Structure

Arrangement of Electrodes:



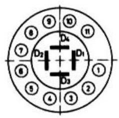
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.

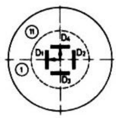


Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 63 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

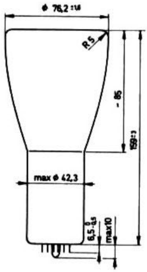
U_{a2} = 1 kV
U_{a1} = 0.4 kV

Accessories

Socket: VST 8
Metallic Shield: ART-K411

Typical Operation

U_{a2}	=	0.8 kV
U_{a1}	=	0...180 V
$-U_{g1\,cut\,off}$	=	80...160 V
d_{12}	=	36...44 V/cm
d_{34}	=	24...30 V/cm



with cathode of low heating power, flat face-plate and short overall length, for low operating voltages.

Application

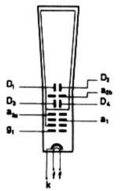
in small size portable transistorized oscilloscopes and other equipments of low operating voltage

Screen Types

DG 7-125
DP 7-125

System Structure

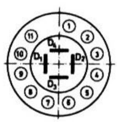
Arrangement of Electrodes:



Base Connections

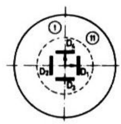
(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_2
7 — D_1
8 — a_{2a}
9 — D_3
10 — D_4
11 — a_{2b}



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Minimum Useful Screen Diameter 65 mm

Heating

U_f = 6.3 V
I_f = 95 mA

Typical Operation

U_{a2a}	= 0.8 kV
U_{a1}	=0...180 V
$-U_{g1\,cut\,off}$	=30...60 V
d_{12}	=36...44 V/cm
d_{34}	=24...30 V/cm

Maximum Ratings

U_{a2a} =1.6 kV
U_{a1} =0.4 kV

Accessories

Socket: VST8
Metallic Shield: ART-K591A

with spiral post-deflection accelerator, for medium operating voltages

Application

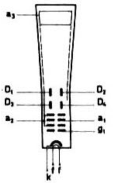
in small oscilloscopes of high brightness and other equipments; with W-screen as monitor tube in small size display devices

Screen Types

DB 7-126
DG 7-126
DN 7-126
DP 7-126
DW 7-126

System Structure

Arrangement of Electrodes:



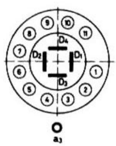
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.
A — a_3

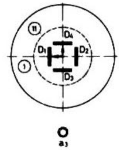


Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

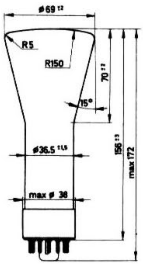
U_{a3} = 4 kV
U_{a2} = 1 kV
U_{a1} = 0.4 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	1 kV
U_{a1}	=	0...250 V
$-U_{g1\ cut\ off}$	=	80...180 V
d_{12}	=	55...62.5 V/cm
d_{34}	=	37.5...46 V/cm

Accessories

Socket: VST 8
Metallic Shield: ART-K501A
Final Accelerator Contact Connector: VST 2



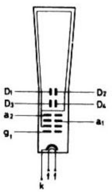
for asymmetrical operation with low operating voltages

Application

low anode voltage indicator tube for asymmetrical horizontal deflection

System Structure

Arrangement of Electrodes:



Deflection Method: electrostatic, D_{12} asymmetrical (D_1 must be connected to a_2), D_{34} symmetrical

Focusing Method: electrostatic

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a2} = 0.8 kV
U_{a1} = 0.2 kV

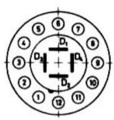
Accessories

Socket: VST 10
Metallic Shield: ART-K461A

Base Connections

(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — i. c.
6 — D_3
7 — D_4
8 — a_2
9 — D_1
10 — D_2
11 — i. c.
12 — f



Base

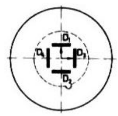
Small-Shell Duodecal, 12-pin, JETEC No. B12-43

Typical Operation

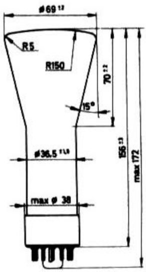
U_{a2}	=	0.5 kV
U_{a1}	=	0...120 V
$-U_{g1\ cut\ off}$	=	50...100 V
d_{12}	=	33.3...41.5 V/cm
d_{34}	=	18.8...23.2 V/cm

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 63 mm



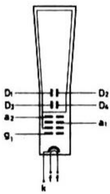
for symmetrical operation with low operating voltages

Application

low anode voltage indicator tube

System Structure

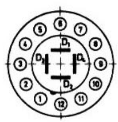
Arrangement of Electrodes:



Base Connections

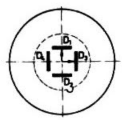
(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — i. c.
6 — D_3
7 — D_4
8 — a_2
9 — D_1
10 — D_2
11 — i. c.
12 — f



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Small-Shell Duodecal, 12-pin, JETEC No. B12-43

Minimum Useful Screen Diameter 63 mm

Heating

$U_f = 6.3$ V
$I_f = 300$ mA

Typical Operation

U_{a2}	=	0.5 kV
U_{a1}	=	0...120 V
$-U_{g1\ cut\ off}$	=	50...100 V
d_{12}	=	33.3...41.5 V/cm
d_{34}	=	18.8...23.2 V/cm

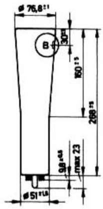
Maximum Ratings

$U_{a2} = 0.8$ kV
$U_{a1} = 0.2$ kV

Accessories

Socket: VST 10
Metallic Shield: ART-K461A

of high deflection sensitivity, with flat faceplate and spiral post-deflection accelerator, for medium operating voltages



Application

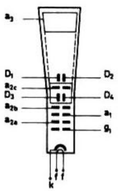
In small size transistorized broad-band oscilloscopes

Screen Types

DB 7-178
DH 7-178
DN 7-178
DP 7-178

System Structure

Arrangement of Electrodes:



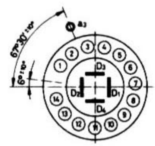
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
B — a_3

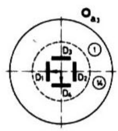


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection at $U_{a3}/U_{a2b} = 4$

in direction D_{12}: 60 mm
in direction D_{34}: 45 mm

Heating

$U_f = 6.3$ V
$I_f = 300$ mA

Maximum Ratings

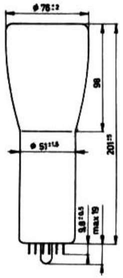
$U_{a3} =$ 5 kV
$U_{a2a} =$ 1.6 kV
$U_{a1} =$ 1 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2a}	=	1 kV
U_{a1}	=	35...165 V
$-U_{g1\ cut\ off}$	=	30...60 V
d_{12}	=	31...40 V/cm
d_{34}	=	10.5...13.7 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART 4
Final Accelerator Contact Connector: VST-K005



with flat faceplate and short overall length, for low operating voltages. Tentative data

Application

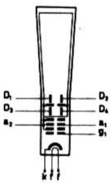
In small size portable transistorized oscilloscopes, industrial and medical instruments

Screen Types

D 7-190 GH/T
D 7-190 GL/T
D 7-190 GM/T

System Structure

Arrangement of Electrodes:



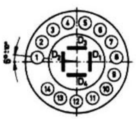
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

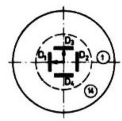
(bottom view)

1 — f
2 — i. c.
3 — g_1
4 — D_2
5 — i. c.
6 — D_1
7 — k
8 — a_1
9 — a_2
10 — D_3
11 — i. c.
12 — D_4
13 — i. c.
14 — f



Deflection

(viewed from screen end)



Base

special, 14-pin

Minimum Useful Deflection

in direction D_{12}: 60 mm
in direction D_{34}: 50 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a2a} = 2.2 kV
U_{a1} = 2.2 kV

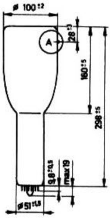
Accessories

Socket: VST 7
Metallic Shield: ART-K651

Typical Operation

U_{a2}	=	1000 ± 25 V
U_{a1}	=	100...180 V
$-U_{g1\ cut\ off}$	=	max. 35 V
d_{12}	=	29 (max. 31) V/cm
d_{34}	=	11.5 (max. 12.5) V/cm

of high deflection sensitivity, with flat faceplate and spiral post-deflection accelerator, for medium operating voltages



Application

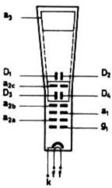
in medium size universal oscilloscopes

Screen Types

D 10-12 BE
D 10-12 GH
D 10-12 GL
D 10-12 GM

System Structure

Arrangement of Electrodes:



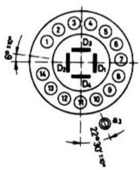
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

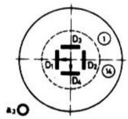
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Base

special, 14-pin

Minimum Useful Deflection

in direction D_{12}: 85 mm
in direction D_{34}: 60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

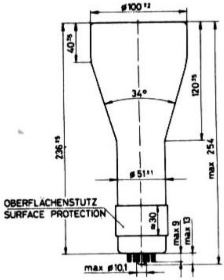
U_{a3} = 5 kV
U_{a2a} = 2.2 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3} = 4 kV
U_{a2a} = 1 kV
U_{a1} = 50...200 V
$-U_{g1\ cut\ off}$ = 25...67 V
d_{12} = 24...31 V/cm
d_{34} = 8.6...11 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K451
Final Accelerator Contact Connector: VST 2



with flat faceplate and short overall length, for low operating voltages. Tentative data

Application

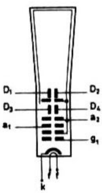
In medium size low frequency oscilloscopes

Screen Types

D 10-260 GH
D 10-260 GJ
D 10-260 GL
D 10-260 GM

System Structure

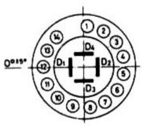
Arrangement of Electrodes:



Base Connections

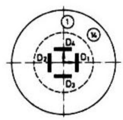
(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — i.c.
7 — D_2
8 — D_1
9 — i.c.
10 — a_2
11 — D_3
12 — i.c.
13 — D_4
14 — i.c.



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

special, 14-pin

Minimum Useful Deflection

In direction D_{12}: 80 mm
In direction D_{34}: 60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

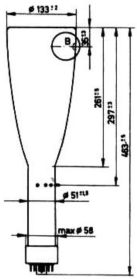
U_{a_2} = 2.5 kV

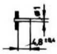
Typical Operation

U_{a2} = 1500 ± 30 V
U_{a1} = 150 . . . 270 V
$-U_{g1\ cut\ off}$ = 19 . . . 50 V
d_{12} = 28 . . . 32.5 V/cm
d_{34} = 12.6 . . . 14.5 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K661





of high deflection sensitivity, with metal-backed flat faceplate, spiral post-deflection accelerator and small capacitance deflection plates with side contacts, for high operating voltages. With internal graticules: Type D 13-21 ../01

Application

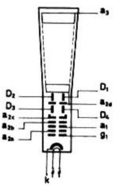
in broad-band oscilloscopes of high cut-off frequency

Screen Types

D 13-21 BE
D 13-21 GH
D 13-21 GL

System Structure

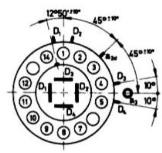
Arrangement of Electrodes:



Base Connections

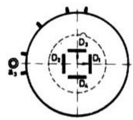
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — i. c.
8 — a_{2a}
9 — a_{2b}
10 — i. c.
11 — a_{2c}
12 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection at $U_{a3}/U_{a2b} = 6$

in direction D_{12}: 100 mm
in direction D_{34}: 40 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

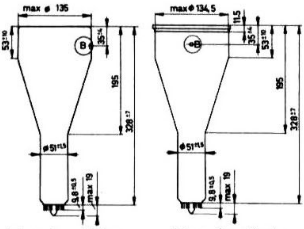
U_{a3} = 12 kV
U_{a2a} = 2.1 kV
U_{a1} = 1.5 kV

Typical Operation

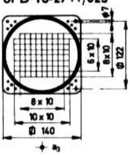
U_{a3}	=	10 kV
U_{a2a}	=	1.67 kV
U_{a1}	=	200...500 V
$-U_{g1\ cut\ off}$	=	50...80 V
d_{12}	=	27...33.5 V/cm
d_{34}	=	5.7...7.2 V/cm

Accessories

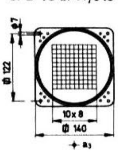
Socket: VST 4 or VST 6
Metallic Shield: ART-K002 for type D 13-21 .., ART-K003 for type D 13-21 ../01
Final Accelerator Contact Connector: VST-K005
Side Contacts: VST 9 (5 pcs.)
Mandrel for twist coil: VST-K003 for type with internal graticules



Internal graticules of D 13-27 . ./02S



Internal graticules of D 13-27 . ./04S



of high deflection sensitivity, with flat faceplate, spiral post-deflection accelerator and beam blanking, for medium operating voltages. With not illuminable graticules: D 13-27 . ./01, D 13-27 . ./03; with illuminable graticules with illumination equipment: D 13-27 . ./02S, D 13-27 . ./04S

Application

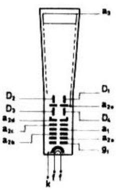
in universal oscilloscopes and medical instruments

Screen Types

D 13-27 BE
D 13-27 GH
D 13-27 GL
D 13-27 GM

System Structure

Arrangement of Electrodes:

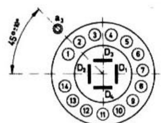


Deflection Method: electrostatic, symmetrical
Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2c}
9 — D_1
10 — D_2
11 — a_{2b}
12 — a_{2a}
13 — a_{2d}
14 — f
B — a_3

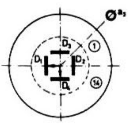


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 100 mm
in direction D_{34}: 80 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

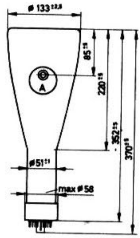
U_{a3} = 5 kV
U_{a2a} = 1.7 kV
U_{a1} = 1.2 kV

Typical Operation

U_{a3}	=	3 kV
U_{a2a}	=	1.5 kV
U_{a1}	=	200..380 V
$-U_{g1\ cut\ off}$	=	38...135 V
d_{12}	=	21...27 V/cm
d_{34}	=	9.8...12.2 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K521A for type D 13-27 . ., ART-K522A for types with internal graticules
Final Accelerator Contact Connector: VST-K005
Mandrel for twist coil: VST-K003 for types with internal graticules



with flat faceplate and post-deflection accelerator, for medium operating voltages

Application

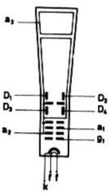
in low-frequency oscilloscopes and industrial instruments

Screen Types

DB 13-114
DG 13-114
DN 13-114
DP 13-114

System Structure

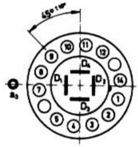
Arrangement of Electrodes:



Base Connections

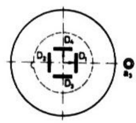
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_1
11 — D_2
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection

in direction D_{12}: 102 mm
in direction D_{34}: 102 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

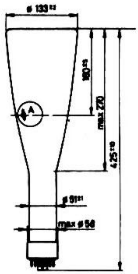
U_{a3} = 6 kV
U_{a2} = 3 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 360...620 V
$-U_{g1\ cut\ off}$ = 48...82 V
d_{12} = 30...37 V/cm
d_{34} = 24...30 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 7
Final Accelerator Contact Connector: VST 2



with post-deflection accelerator, for medium operating voltages

Application

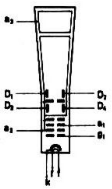
for displaying high speed non-recurring phenomena, e.g. for surge voltage tests

Screen Types

DB 13-116 F
DG 13-116 F
DN 13-116 F
DP 13-116 F

System Structure

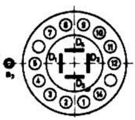
Arrangement of Electrodes:



Base Connections

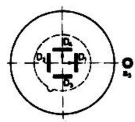
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

U_{a3} = 4.4 kV
U_{a2} = 2.2 kV
U_{a1} = 1 kV

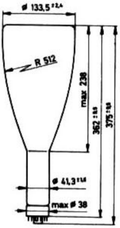
Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	370...690 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	30.5...42 V/cm
d_{34}	=	26...35.5 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 3Z
Final Accelerator Contact Connector: VST 2

with flat faceplate, for medium operating voltages



Application

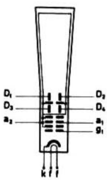
In service oscilloscopes and for display purposes

Screen Types

DB 13-132 F
DG 13-132 F
DN 13-132 F
DP 13-132 F

System Structure

Arrangement of Electrodes:



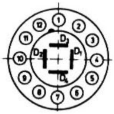
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — i. c.
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.
12 — f

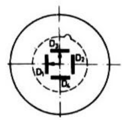


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-43

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

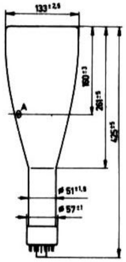
U_{a2} = 2.75 kV
U_{a1} = 1.1 kV

Typical Operation

U_{a2}	= 2 kV
U_{a1}	= 340...640 V
$-U_{g1\,cut\,off}$	= 30...90 V
d_{12}	= 22...30.5 V/cm
d_{34}	= 18...24.5 V/cm

Accessories

Metallic Shield: ART-K471



of high deflection sensitivity, with flat faceplate and post-deflection accelerator, for medium operating voltages

Application

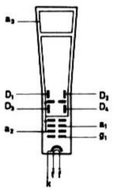
in oscilloscopes for observing high speed non-recurring phenomena

Screen Types

DB 13-134
DG 13-134
DN 13-134
DP 13-134

System Structure

Arrangement of Electrodes:



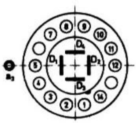
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3

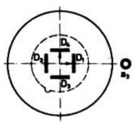


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 102 mm
in direction D_{34}: 102 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

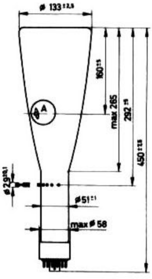
U_{a3} = 6 kV
U_{a2} = 2.6 kV
U_{a1} = 1 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	400...700 V
$-U_{g1\ cut\ off}$	=	45...75 V
d_{12}	=	21...26 V/cm
d_{34}	=	16...20 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-3Z
Final Accelerator Contact Connector: VST 2



of high deflection sensitivity, with flat faceplate, post-deflection accelerator and small capacitance deflection plates with side contacts, for medium operating voltages

Application

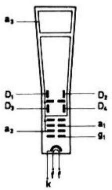
in broad-band oscilloscopes

Screen Types

DB 13-154
DG 13-154
DN 13-154
DP 13-154

System Structure

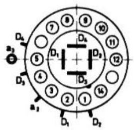
Arrangement of Electrodes:



Base Connections

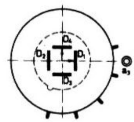
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — i. c.
8 — i. c.
9 — i. c.
10 — i. c.
11 — i. c.
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 8 kV
U_{a2} = 4 kV
U_{a1} = 2 kV

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 3
Final Accelerator Contact Connector: VST 2
Side Contacts: VST 1 (5 pcs.)

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Typical Operation

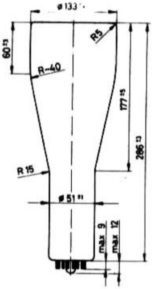
U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 360...700 V
$-U_{g1\ cut\ off}$ = 30...90 V

without post-deflection accelerator
d_{12} = 17...23 V/cm
d_{34} = 7...14 V/cm

with post-deflection accelerator
d_{12} = 24...28.5 V/cm
d_{34} = 10...16 V/cm

Minimum Useful Deflection

in direction D_{12}: 105 mm
in direction D_{34}: 65 mm



of high deflection sensitivity, with flat faceplate, and low operating voltages

Application

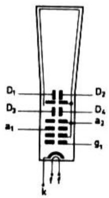
in service oscilloscopes and for industrial instruments

Screen Types

D 13-620 GH
D 13-620 GM
D 13-620 P7
D 13-620 P31

System Structure

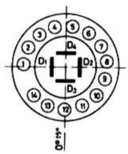
Arrangement of Electrodes:



Base Connections

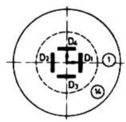
(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — i.c.
7 — D_2
8 — D_1
9 — i.c.
10 — a_2
11 — D_3
12 — i.c.
13 — D_4
14 — i.c.



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection

in direction D_{12}: 100 mm
in direction D_{34}: 80 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Typical Operation

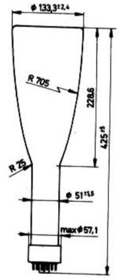
U_{a2}	=	2000 V
U_{a1}	=	220...370 V
$-U_{g1\ cut\ off}$	=	25...65 V
d_{12}	=	25...31 V/cm
d_{34}	=	13.5...15.5 V/cm

Maximum Ratings

U_{a2} = 2 kV

Accessories

Socket: VST 7
Metallic Shield: ART-K 762



of high deflection sensitivity with flat face-plate, 5 AQP..A/T of close tolerance, for medium operating voltages

Application

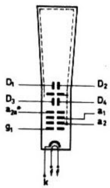
in service oscilloscopes and for medical purposes

Screen Types

5 AQP 1/T	5 AQP 1A/T	5 AQP 1AC/T	5 AQP 1C/T
5 AQP 2/T	5 AQP 2A/T	5 AQP 2AC/T	5 AQP 2C/T
5 AQP 7/T	5 AQP 7A/T	5 AQP 7AC/T	5 AQP 7C/T
5 AQP 11/T	5 AQP 11A/T	5 AQP 11AC/T	5 AQP 11C/T
5 AQP 31/T	5 AQP 31A/T	5 AQP 31AC/T	5 AQP 31C/T

System Structure

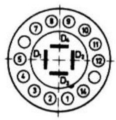
Arrangement of Electrodes:



Base Connections

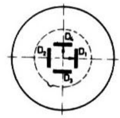
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.*
14 — f



Deflection

(viewed from screen end)



* At types 5AQP..C/T and 5AQP..AC/T: 12 — a_{2a}

Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection

in direction D_{12}: 102 mm
in direction D_{34}: 102 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

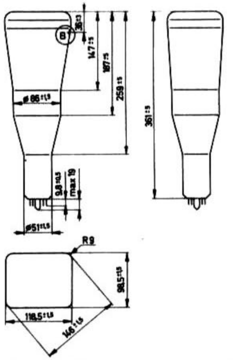
U_{a2} = 4400 V
U_{a1} = 1650 V

Typical Operation

U_{a2} = 2.5 kV
U_{a1} = 0...300 V
$-U_{g1\ cut\ off}$ = 34...56 V
d_{12} = 16...20 V/cm
d_{34} = 12.5...15 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-K008



of high deflection sensitivity, with rectangular flat faceplate, spiral post-deflection accelerator and ray extinction, for medium operating voltages. Data of K 2011 .. are tentative.

Application

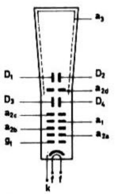
in service oscilloscopes of medium bandwidth and other equipments

Screen Types

D 14-180 GH/T	K 2011 GH
D 14-180 GM/T	K 2011 GM

System Structure

Arrangement of Electrodes:



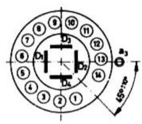
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2d}
6 — D_4
7 — D_3
8 — a_{2a}
9 — D_1
10 — D_2
11 — a_{2b}
12 — a_{2c}
13 — i. c.
14 — f
B — a_3

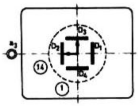


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 100 mm
in direction D_{34}: 80 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

D 14-180../T

U_{a3} = 7 kV
U_{a2a} = 1.75 kV
U_{a1} = 1 kV

K 2011..

U_{a3} = 4 kV
U_{a2a} = 1.75 kV
U_{a1} = 1 kV

Typical Operation

D 14-180../T

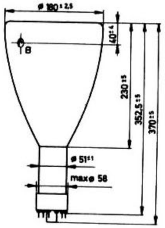
U_{a3} = 6 kV
U_{a2a} = 1.5 kV
U_{a1} = 260...600 V
$-U_{g1\,cut\,off}$ = 50...95 V
d_{12} = 21.2...25.5 V/cm
d_{34} = 10...13.1 V/cm

K 2011..

U_{a3} = 3 kV
U_{a2a} = 1.5 kV
U_{a1} = 260...600 V
$-U_{g1\,cut\,off}$ = 50...95 V
d_{12} = 15.6...18.5 V/cm
d_{34} = 8.5...11.5 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K611Z
Final Accelerator Contact Connector: VST-K005
Mandrel for twist coil: VST-K006



with flat faceplate and spiral post-deflection accelerator, for medium operating voltages. With not illuminable graticules: D. 18-114/01, with illuminable graticules: D. 18-114/02.

Application

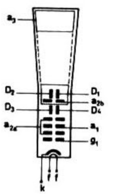
in large screen oscilloscopes

Screen Types

DB 18-114
DG 18-114
DH 18-114
DN 18-114
DP 18-114

System Structure

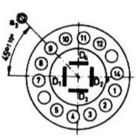
Arrangement of Electrodes:



Base Connections

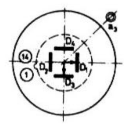
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_{2a}
10 — D_2
11 — D_1
12 — a_{2b}
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection

in direction D_{12}: 150 mm
in direction D_{34}: 150 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

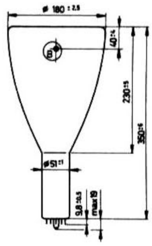
U_{a3} = 6 kV
U_{a2a} = 3 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2a}	=	2 kV
U_{a1}	=	200...600 V
$-U_{g1\ cut\ off}$	=	45...95 V
d_{12}	=	31.5...37.5 V/cm
d_{34}	=	26.5...31.5 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-K541Z for Type D. 18-114, ART-K543 for Type D. 18-114/01, ART-K543Z for Type D. 18-114/02
Final Accelerator Contact Connector: VST-K005



with flat faceplate and spiral post-deflection accelerator, for medium operating voltages. With not illuminable graticules: D. 18-116/01, with illuminable graticules: D. 18-116/02.

Application

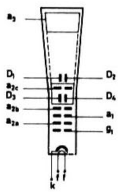
in large screen oscilloscopes

Screen Types

DB 18-116
DG 18-116
DH 18-116
DN 18-116
DP 18-116

System Structure

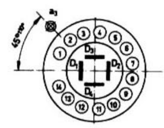
Arrangement of Electrodes:



Base Connections

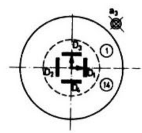
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

special, 14-pin

Minimum Useful Deflection at $U_{a3}/U_{a2b}=2$

in direction D_{12}: 150 mm
in direction D_{34}: 150 mm

Heating

$U_f = 6.3$ V
$I_f = 300$ mA

Maximum Ratings

$U_{a3} = 6$ kV
$U_{a2} = 3$ kV
$U_{a1} = 1.5$ kV

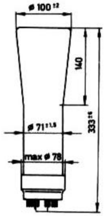
Typical Operation

U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 200...600 V
$-U_{g1\ cut\ off}$ = 45...95 V
d_{12} = 31.5...37.5 V/cm
d_{34} = 26.5...31.5 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K541 for Type D. 18-116, ART-K542 for Type D. 18-116/01, ART-K542Z for Type D. 18-116/02
Final Accelerator Contact Connector: VST-K005

with flat faceplate, for medium operating voltages



Application

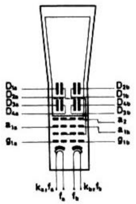
in small size double trace oscilloscopes for industrial and medical purposes

Screen Types

DBM 10-111
DGM 10-111
DNM 10-111

System Structure

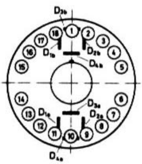
Arrangement of Electrodes:



Base Connections

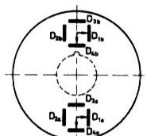
(bottom view)

1 — a_2
2 — D_{1b}
3 — D_{2b}
4 — D_{4b}
5 — D_{3b}
6 — D_{4a}
7 — D_{3a}
8 — D_{2a}
9 — D_{1a}
10 — i. c.
11 — a_{1a}
12 — f_a, k_a
13 — g_{1a}
14 — f_a
15 — f_b, k_b
16 — g_{1b}
17 — f_b
18 — a_{1b}



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 18-pin

Minimum Useful Screen Diameter 80 mm

Heating

U_f = 6.3 V
I_f = 2 × 300 mA

Maximum Ratings

(each system)

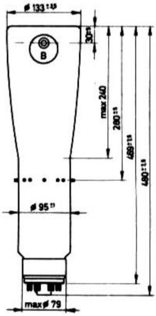
U_{a2} = 2.5 kV
U_{a1} = 1.1 kV

Typical Operation (each system)

U_{a2}	=	2 kV
U_{a1}	=	340...640 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	41 V/cm
d_{34}	=	40 V/cm

Accessories

Socket: VST 3
Metallic Shield: ART-K004



of high deflection sensitivity, with flat faceplate, spiral post-deflection accelerator and small capacitance deflection plates with side contacts, for medium operating voltages

Application

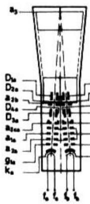
in broad-band oscilloscopes for observing very high speed non-recurring phenomena

Screen Types

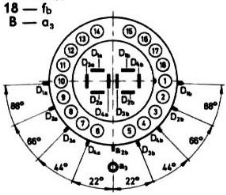
DBM 13-136
DGM 13-136
DNM 13-136
DPM 13-136

System Structure and Base Connections (bottom view)

Arrangement of Electrodes:

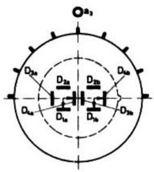


1 — k_b
2 — f_b
3 — i. c.
4 — a_{2a}
5 — i. c.
6 — a_{1a}
7 — g_{1a}
8 — i. c.
9 — f_a
10 — k_a
11 — f_a
12 — i. c.
13 — a_{1ca}
14 — a_{2cb}
15 — a_{1b}
16 — g_{1b}
17 — i. c.
18 — f_b
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 18-pin

Minimum Useful Deflection at U_{a3}=4 kV and U_{a2}=2 kV

in direction D_{12}: 110 mm
in direction D_{34}: 70 mm

Heating

U_f = 6.3 V
I_f = 2 × 300 mA

Maximum Ratings

(each system)

U_{a3} = 8 kV
U_{a2} = 4 kV
U_{a1} = 2 kV

Typical Operation (each system)

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	360...700 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	24...28.5 V/cm
d_{34}	=	10...16 V/cm

Accessories

Socket: VST 3
Metallic Shield: ART 9
Final Accelerator Contact Connector: VST-K005
Side Contacts: VST 9 (9 pcs.)

with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power and metal-backed flat faceplate, no ion-trap (with internal graticules if required)

Application

with W-screen: in monitor-television sets and video telephones; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

K 2001 GH
K 2001 GL
K 2001 GM
K 2001 GR
K 2001 W

Minimum Useful Display Area: 130 mm × 150 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 11 V
I_f = 68 mA

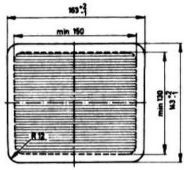
Maximum Ratings

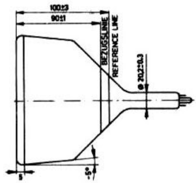
U_a = 15 kV
U_{g2} = 450 V
U_{g4} = 450 V

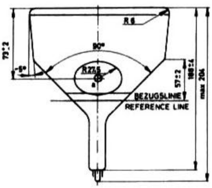
Typical Operation

at cathode control

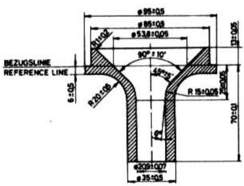
U_a = 14 kV
U_{g2} = 200...350 V
U_{g4} = 0...400 V
$U_{k\ cut\ off}$ = 30...70 V
Resolution = min 625 Lines

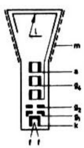






Reference Gauge





1 — g_1
2 — k
3 — f
4 — f
5 — i.c.
6 — g_2
7 — g_4

with electrostatic focusing, 55° magnetic deflection, small neck diameter, low filament input power, metal-backed faceplate, no ion-trap (with internal graticules if required). Tentative data.

Application

with W-screen: in monitor-television sets and as camera-monitor tube; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 12-100 GH
M 12-100 GL
M 12-100 GM
M 12-100 GR
M 12-100 W

Minimum Useful Display Area: 70 mm × 90 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 55°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-30

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K008

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

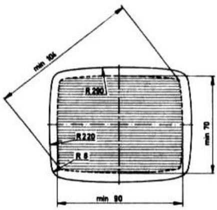
U_a = 10 kV
U_{g2} = 450 V
U_{g4} = 1.1 kV

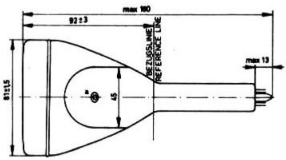
Typical Operation

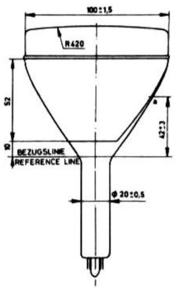
at grid control

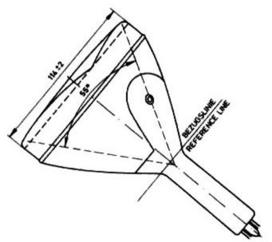
U_a	=	8 kV
U_{g2}	=	300 V
U_{g4}	=	—50...300 V
$-U_{g1\ cut\ off}$	=	25...50 V

Resolution = min 625 Lines

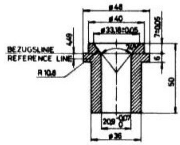


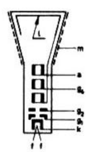




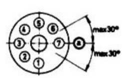


Reference Gauge





1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4



with electrostatic focusing, 75° magnetic deflection, small neck diameter, low filament input power and metal-backed flat faceplate, no ion-trap (with internal graticules if required), Types M 17-111 ../T and M 17-111 ../TK with holding frame

Application

with W-screen: in monitor-television sets and as camera-monitor-tubes; with GH-, GL-, GM-, GR- or P22R/P31-screen: in industrial display units

Screen Types

M 17-11 GH	M 17-111 GH/T	M 17-111 GH/TK
M 17-11 GL	M 17-111 GL/T	M 17-111 GL/TK
M 17-11 GM	M 17-111 GM/T	M 17-111 GM/TK
M 17-11 GR	M 17-111 GR/T	M 17-111 GR/TK
M 17-11 P22R/P31	M 17-111 P22R/P31/T	M 17-111 P22R/P31/TK
M 17-11 W	M 17-111 W/T	M 17-111 W/TK

Minimum Useful Display Area: 95 mm × 125 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 75°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 14 kV
U_{g2} = 350 V
U_{g4} = 500 V

Typical Operation

at grid control

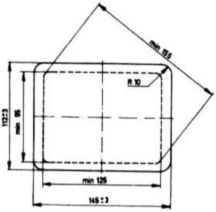
U_a = 13 kV
U_{g2} = 350 V
U_{g4} = 50...400 V
$-U_{g1\ cut\ off}$ = 46....91 V
Resolution = min 625 Lines

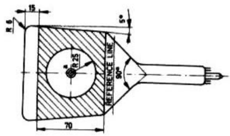
at cathode control

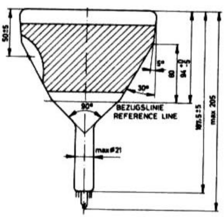
U_a = 13 kV
U_{g2} = 200...350 V
U_{g4} = 50...400 V
U_k = approx. 47 V

The three with the naked eye distinguishable shades on the P 22R/P31-screen are:

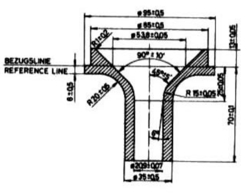
U_a = 5... 6 kV: red
U_a = 9.5...11 kV: yellow
U_a = 13...14 kV: yellowish green

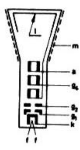






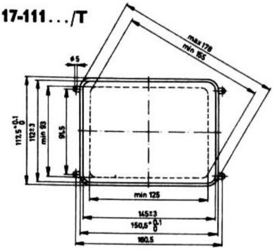
Reference Gauge

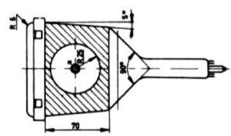


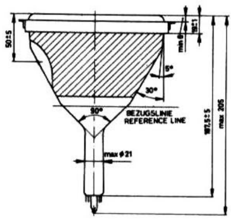


1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4

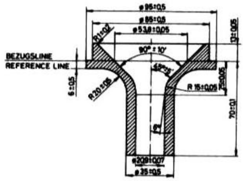
M 17-111.../T



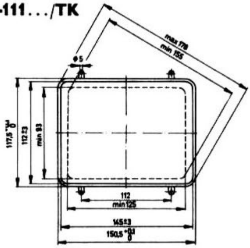


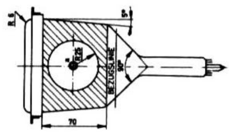


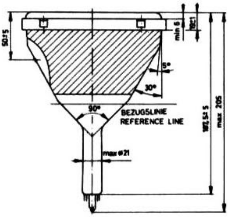
Reference Gauge



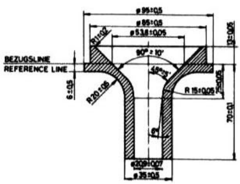
M 17-111.../TK







Reference Gauge



with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power, metal-backed grey glass faceplate and rimband-reinforced envelope with integral mounting leaks[1], suitable for push-through technique (with internal graticules if required). Tentative data.

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display devices

Screen Types

M 23-100 GH
M 23-100 GL
M 23-100 GM
M 23-100 GR
M 23-100 W

Minimum Useful Display Area: 140 mm × 183 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 12 kV
U_{g2} = 125 V
U_{g4} = 1.1 kV

Typical Operation

at grid control
U_a = 9 kV
U_{g2} = 100 V
U_{g4} = —50...300 V
$-U_{g1\,cut\,off}$ = 32...50 V
Resolution = min 625 Lines

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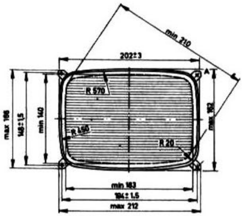
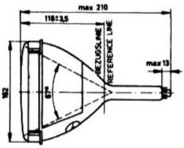
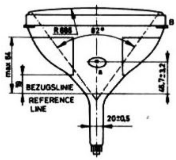
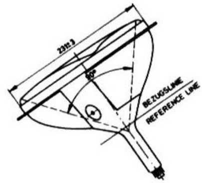
[1] The tube can be applied without safety plate and fixed at the metal rimband.

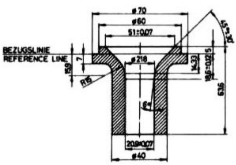




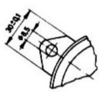


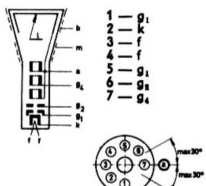


Reference Gauge

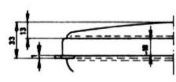


Detail A





Detail B



with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power and metal-backed grey glass faceplate, no ion-trap, for use without safety plate, suitable for push-through technique (with internal graticules if required)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM-, GR- or P22R/P31-screen: in industrial display units

Screen Types

M 28-12 GH
M 28-12 GL
M 28-12 GM
M 28-12 GR
M 28-12 P22R/P31
M 28-12 W

Minimum Useful Display Area: 171 mm × 228 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 14 kV
U_{g2} = 350 V
U_{g4} = 500 V

Typical Operation

at grid control

U_a = 13 kV
U_{g2} = 350 V
U_{g4} = 50...400 V
$-U_{g1\,cut\,off}$ = 46... 91 V

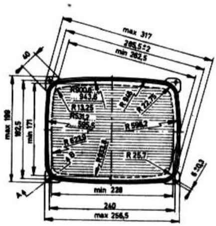
Resolution = min 900 Lines

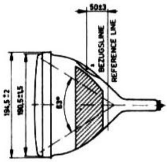
at cathode control

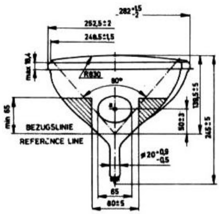
U_a = 13 kV
U_{g2} = 200...350 V
U_{g4} = 50...400 V
U_k = approx. 47 V

The three with the naked eye distinguishable shades on the P22R/P31-screen are:

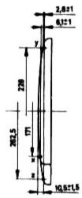
U_a = 5... 6 kV: red
U_a = 9.5...11 kV: yellow
U_a = 13...14 kV: yellowish green



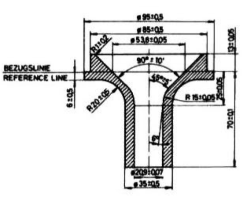




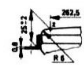
Spherical
Faceplate

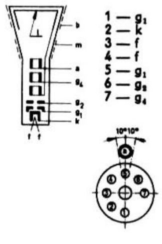


Reference Gauge



Section A-B





with electrostatic focusing, 110° magnetic deflection, metal-backed grey glass faceplate and rimband-reinforced envelope with integral mounting leaks[1], suitable for push-through technique (with internal graticules if required). Tentative data.

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 31-120 GH
M 31-120 GL
M 31-120 GM
M 31-120 GR
M 31-120 W

Minimum Useful Display Area: 195 mm × 257 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 12 kV
U_{g2} = 350 V
U_{g4} = 500 V

Typical Operation

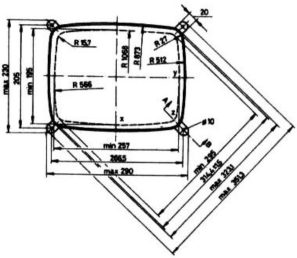
at grid control

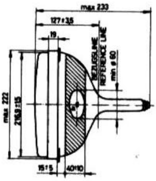
U_a = 11 kV
U_{g2} = 250 V
U_{g4} = 0...350 V
$-U_{g1\,cut\,off}$ = 35...69 V
Resolution = min 625 lines

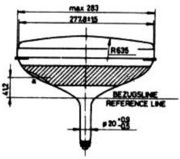
at cathode control

U_a = 11 kV
U_{g2} = 250 V
U_{g4} = 0...350 V
U_k = 32...58 V

[1] The tube can be applied without safety plate and fixed at the metal rimband.

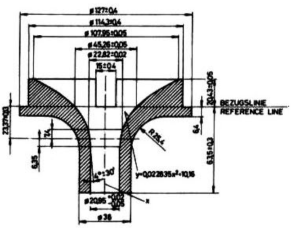




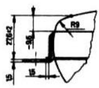


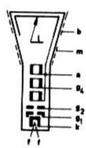
Spherical Faceplate

Reference Gauge

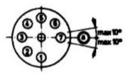


Section A-B





1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4



with electrostatic focusing, 90° magnetic deflection, metal-backed grey glass faceplate and rimband-reinforced envelope.

Application

with W-screen: in monitor-television sets; with GH-screen: in industrial display units

Screen Types

M 31-131 GH/T
M 31-131 W/T

Minimum Useful Display Area: 195 mm × 257 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K010
Final Accelerator Contact Connector: VST-K005

Heating

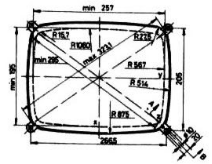
U_f = 6.3 V
I_f = 300 mA

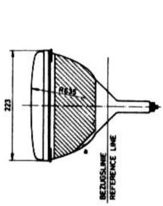
Maximum Ratings

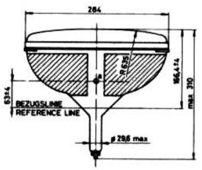
U_a = 18 kV
U_{g2} = 800 V
U_{g4} = 1 kV

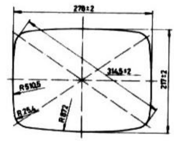
Typical Operation

U_a = 16 kV
U_{g2} = 600 V
U_{g4} = 0...400 V
$-U_{g1\ cut\ off}$ = 60...130 V
Resolution = min 900 Lines

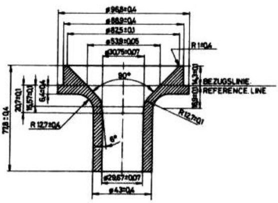




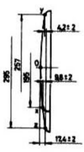




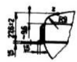
Reference Gauge

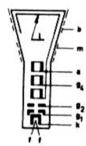


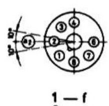
Spherical Faceplate



Section A-B







1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_1
7 — k
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate (with internal graticules if required)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 38-120 GH
M 38-120 GL
M 38-120 GM
M 38-120 GR
M 38-120 W

Minimum Useful Display Area: 226 mm × 291 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K005

Heating

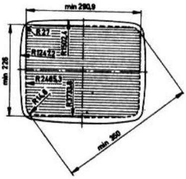
U_f = 6.3 V
I_f = 300 mA

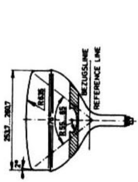
Maximum Ratings

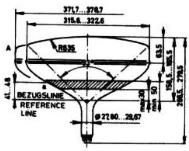
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

Typical Operation

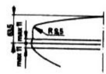
U_a = 16 kV
U_{g2} = 400 V
U_{g4} = 0...400 V
$-U_{g1\,cut\,off}$ = 40...85 V
Resolution = min 625 lines



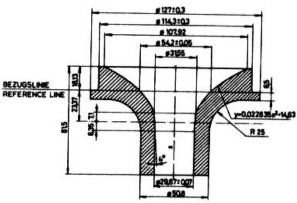


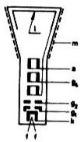


Detail A



Reference Gauge





1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_1
7 — k
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate and rimband-reinforced envelope with integral mounting leaks[1], suitable for push-through technique (with internal graticules if required)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 38-121 GH/T
M 38-121 GL/T
M 38-121 GM/T
M 38-121 GR/T
M 38-121 W/T

Minimum Useful Display Area: 226 mm × 290 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K010
Final Accelerator Contact Connector: VST-K005

Heating

U_f = 6.3 V
I_f = 300 mA

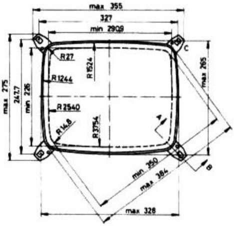
Maximum Ratings

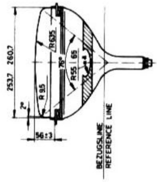
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

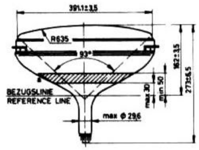
Typical Operation

U_a	= 16 kV
U_{g2}	= 400 V
U_{g4}	= 0...400 V
$-U_{g1\ cut\ off}$	= 40...85 V
Resolution	= min 625 Lines

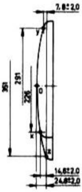
[1] The tube can be applied without safety plate and fixed at the metal rimband.



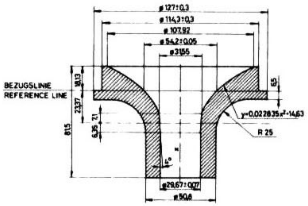




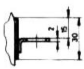
Spherical Faceplate



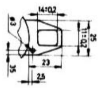
Reference Gauge

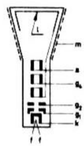


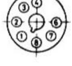
Section A-B



Detail C







1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_1
7 — k
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate, for use without safety plate (with internal graticules if required)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 47-26 GH
M 47-26 GL
M 47-26 GM
M 47-26 GR
M 47-26 W

Minimum Useful Display Area: 305 mm × 384 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...6.5 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity contact: JEDEC No. J1-21

Accessories

Socket: VST-K010
Final Accelerator Contact Connector: VST-K005

Heating

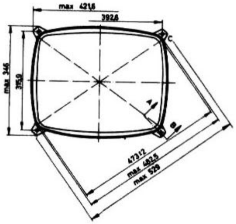
U_f = 6.3 V
I_f = 300 mA

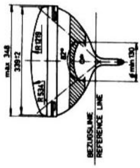
Maximum Ratings

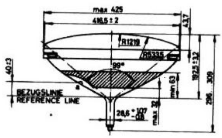
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

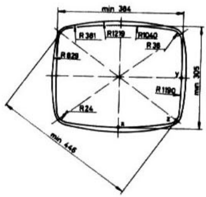
Typical Operation

U_a = 18 kV
U_{g2} = 500 V
U_{g4} = 0...400 V
$-U_{g1\ cut\ off}$ = 50...93 V
Resolution = min 625 Lines

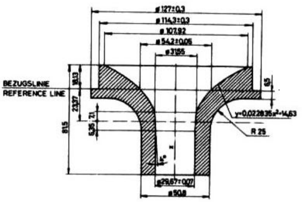




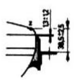




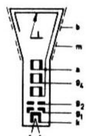
Reference Gauge

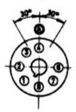


Section A-B

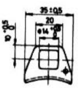


Spherical Faceplate





Detail C



1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_1
7 — k
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate, no ion-trap, for use without safety plate (with internal graticules if required)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 59-23 GH
M 59-23 GL
M 59-23 GM
M 59-23 GR
M 59-23 W

Minimum Useful Display Area: 385 mm × 489 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity Contact: JEDEC No. J1-21

Accessories

Socket: VST-K010
Final Accelerator Contact Connector: VST-K005

Heating

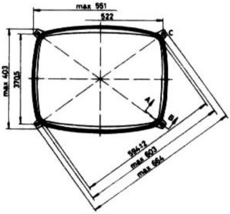
U_f = 6.3 V
I_f = 300 mA

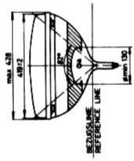
Maximum Ratings

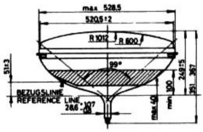
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

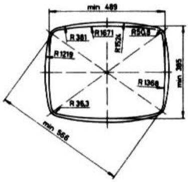
Typical Operation

U_a = 18 kV
U_{g2} = 500 V
U_{g4} = 0...400 V
$-U_{g1\ cut\ off}$ = 50...93 V
Resolution = min 625 Lines

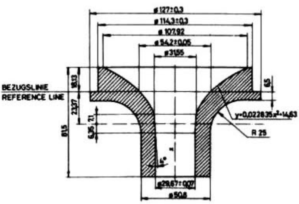




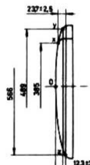




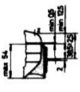
Reference Gauge

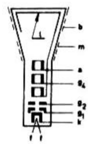


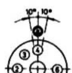
Spherical Faceplate



Section A-B

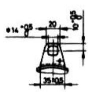






1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_1
7 — k
8 — f

Detail C



with electrostatic focusing, 70° magnetic deflection, small neck diameter, low filament input power and metal-backed faceplate, no ion-trap (with internal graticules if requested).

Application

with B4- and W-screen: in monitor-television sets and as camera-monitor-tubes; with B2-, B7-, B31-, B39-, GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

140 MB2/T (equal to GL)
140 MB4/T (equal to W)
140 MB7/T (equal to GM)
140 MB31/T (equal to GH)
140 MB39/T (equal to GR)

Minimum Useful Display Area: 85 mm × 110 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 70°
Focusing Method: electrostatic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-21

Accessories

Socket: VST-K011
Final Accelerator Contact Connector: VST-K008

Heating

U_f = 11 V
I_f = 68 mA

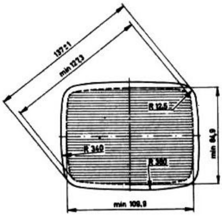
Typical Operation

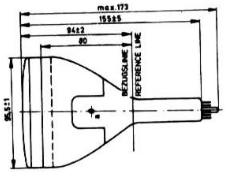
at grid control

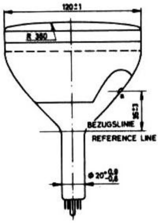
U_a = 8 kV (140 MB./T)
U_a = 5 kV (140 MB./TK)
U_{g2} = 300 V
U_{g4} = 0...300 V
$-U_{g1\ cut\ off}$ = 15...40 V
Resolution = min 625 Lines

Maximum Ratings

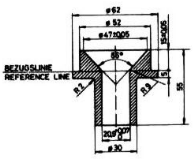
U_a = 10 kV
$U_{a\ min}$ = 7 kV (140 MB./T)
$U_{a\ min}$ = 4 kV (140 MB./TK)
U_{g2} = 450 V
U_{g4} = 1.1 kV

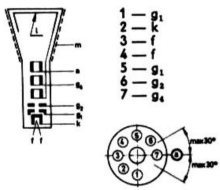






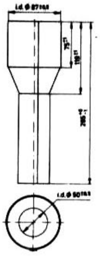
Reference Gauge



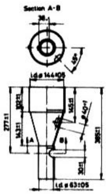


1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4

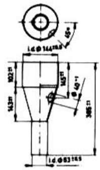
METALLIC SHIELDS



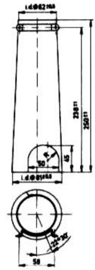
ART-1



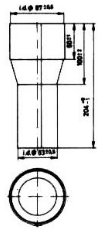
ART-3



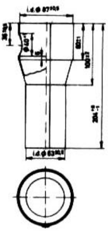
ART-3Z



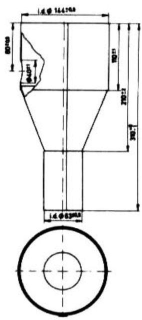
ART-4



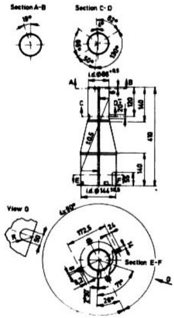
ART-5



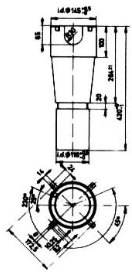
ART-6



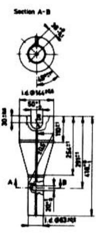
ART-7



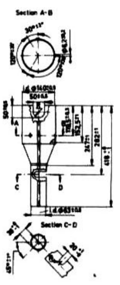
ART-8



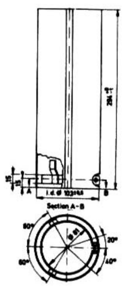
ART-9



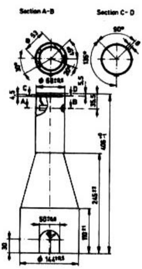
ART-K002



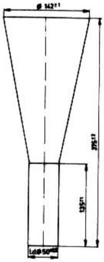
ART-K003



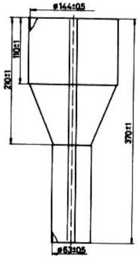
ART-K004



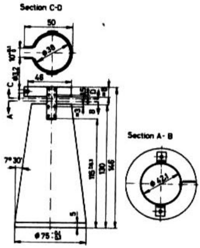
ART-K005



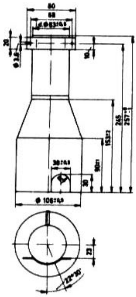
ART-K006



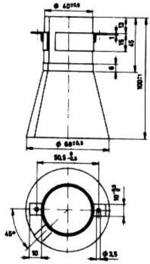
ART-K008



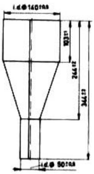
ART-K411



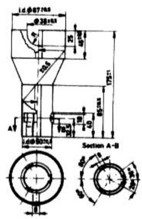
ART-K451



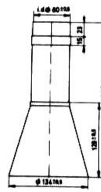
ART-K461A



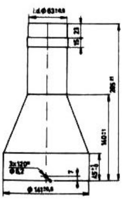
ART-K471



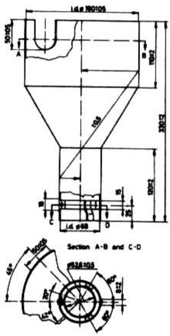
ART-K501A



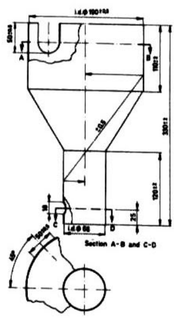
ART-K521A



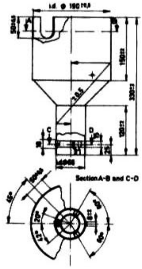
ART-K522A



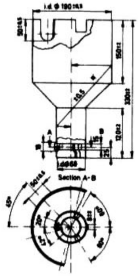
ART-K541



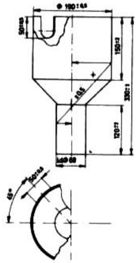
ART-K541Z



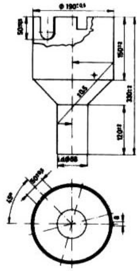
ART-K542



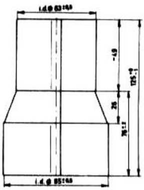
ART-K542Z



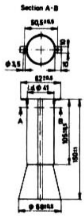
ART-K543



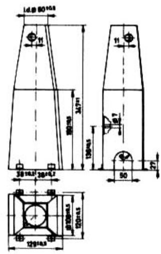
ART-K543Z



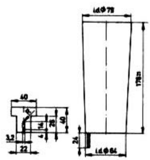
ART-K591A



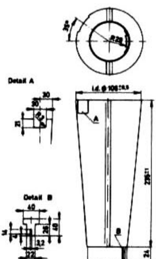
ART-K601



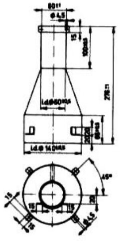
ART-K611Z



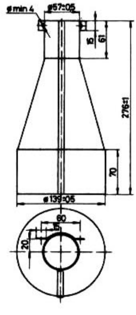
ART-K651



ART-K661

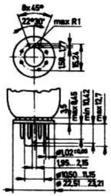


ART-K671

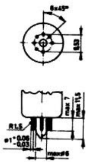


ART-K762

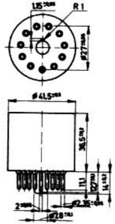
BASES



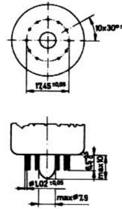
Small-Button Neoeightar,
7-pin
JEDEC No. B7-208
B8H



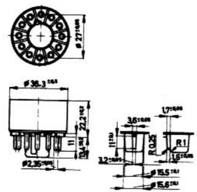
Miniature, 7-pin, with exhaust connection
JEDEC No. E7-91
B7G/D



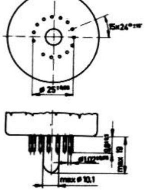
Medium-Shell Magnal,
11-pin
JETEC No. B11-66



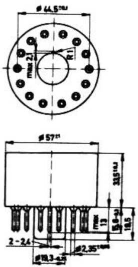
Small-Button Unidecar,
11-pin
JETEC No. E11-22



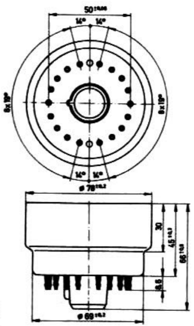
Small-Shell Duodecal, 12-pin
JETEC No. B12-43
10-pin (without pins 5 and 11):
JETEC No. B10-75



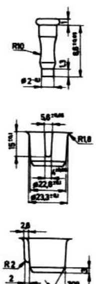
14-pin Special Base



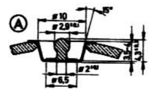
Medium-Shell Diheptal
14-pin: JETEC No. B14-38
12-pin (without pins 6 and 13): JETEC No. B12-37



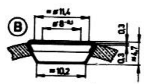
18-pin Special Base



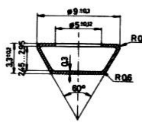
CAVITY CONTACTS



Cavity Cap
JEDEC No. J1-22
CT8



Recessed Small Ball Cap
JEDEC No. J1-21
CT7



Cavity Cap
JEDEC No. J1-30

INTERCHANGEABILITY LIST

The oscilloscope and monitor tubes in this interchangeability list are not identical, but owing to their similarity they are interchangeable in almost every circuit.

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
B7S4	DH 7-178	D 18-141 GH[2]	DH 18-116	DP 7-14[3]	DP 7-116 F
B7S4N	DN 7-178	D 18-141 GJ[2]	DG 18-116	DP 7-78	DP 7-178
B10S21[1]	DGM 10-111	D 18-141 GH[2]	DP 18-116	DP 13-2	DP 13-116
B10S21B[1]	DBM 10-111	DB 7-14[3]	DB 7-116 F	DP 13-14	DP 13-114
B10S21N[1]	DNM 10-111	DB 7-78	DB 7-178	DP 13-32	DP 13-132
B13S5[1]	DG 13-154	DB 13-2	DB 13-116	DP 13-34	DP 13-134
B13S5B[1]	DB 13-154	DB 13-14	DB 13-114	DP 13-54	DP 13-154
B13S5DN[1]	DP 13-154	DB 13-32	DB 13-132	DP 18-14[2]	DP 18-114
B13S5N[1]	DN 13-154	DB 13-34	DB 13-134	M 17-11 LF	M 17-11 LF
B13S6[1]	DG 13-114	DB 13-54	DB 13-154	M 17-18 W	M 17-11 W
B13S6DN[1]	DP 13-114	DB 13-58[2]	D 13-21 BE	M 28-10 GL[2]	M 28-12 GL
B13S6N[1]	DN 13-114	DB 13-78[2]	D 13-21 BE	M 28-12 GL[2]	M 28-12 GL
B13S7[2]	D 13-21 GH	DB 13-79	D 13-21 BE	M 28-10 GM	M 28-12 GM
B13S7N[2]	D 13-21 GL	DG 7-14[3]	DG 7-116 F	M 28-12 GM[2]	M 28-12 GM
B13S7DN[2]	D 13-21 GM	DG 7-31	DG 7-131	M 47-12 GM	M 47-26 GM
B13S25[1]	DGM 13-116	DG 7-32	DG 7-132	M 47-12 LF	M 47-26 LF
B13S52	DG 13-154	DG 13-2	DG 13-116	M 47-25..[1]	M 47-26..
B13S52DN	DP 13-153	DG 13-14	DG 13-114	M 59-25..[1]	M 59-23..
B13S52N	DN 13-154	DG 13-32	DG 13-132	M 59-33 GM	M 59-23 GM
D 7-190 GH	D 7-190 GH/T	DG 13-34	DG 13-134	M 59-33 GR	M 59-23 GR
D 10-12 BE	D 10-12 BE	DG 13-54	DG 13-154	M 59-33 LF	M 59-23 LF
D 10-12 GH	D 10-12 GH	DG 13-58[2]	D 13-21 GH	T 54P2[2]	D 13-21 GL
D 10-12 GL	D 10-12 GL	DG 18-14 A[2]	DG 18-114	T 54P11[2]	D 13-21 BE
D 10-12 GM	D 10-12 GM	DG 18-14[2]	DH 18-114	T 54P31[2]	D 13-21 GH
D 10-160 GH	D 10-160 GH/T	DH 7-78	DH 7-178	T 543P2	D 13-21 GL
D 13-21 BE	D 13-21 BE	DH 13-78[2]	D 13-21 GH	T 543P11	D 13-21 BE
D 13-21 BG	D 13-21 BE	DH 13-79	D 13-21 GH	T 543P31	D 13-21 GH
D 13-21 GH	D 13-21 GH	DN 7-14[3]	DN 7-116 F	3AMP1A	DG 7-132
D 13-21 GL	D 13-21 GL	DN 7-78	DN 7-178	3BKP2	DN 7-178
D 13-21 GM	D 13-21 GM	DN 13-2	DN 13-116	3BKP7	DP 7-178
D 13-21 GP	D 13-21 GL	DN 13-14	DN 13-114	3BKP11	DB 7-178
D 13-27 GH	D 13-27 GH	DN 13-32	DN 13-132	3BKP31	DH 7-178
D 14-180 GH[4]	D 14-180 GH/T	DN 13-34	DN 13-134	3JP1-F	DG 7-116 F
D 18-140 GH[2]	DH 18-114	DN 13-58[2]	D 13-21 GL	3JP2-F	DN 7-116 F
D 18-140 GJ[2]	DG 18-114	DN 13-78[2]	D 13-21 GL	3JP7-F	DP 7-116 F
D 18-140 GH[2]	DP 18-114	DN 13-79	D 13-21 GL	3JP11-F	DB 7-116 F

[1], [2], [3] and [4]
see next page

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
3KP1-F	DG 7-113 F	5AQP2	5AQP2/T	5ELP31	D 13-21 GH
3KP2-F	DN 7-113 F	5AQP2A	5AQP2A/T	5UP1-F	DG 13-132 F
3KP11-F	DB 7-113 F	5AQP7	5AQP7/T	5UP2-F	DN 13-132 F
3RP1A	DG 7-119	5AQP7A	5AQP7A/T	5UP7-F	DP 13-132 F
3RP31A	DH 7-119	5AQP31	5AQP31/T	5UP11-F	DB 13-132 F
5ADP1	DG 13-134	5AQP31A	5AQP31A/T	5YP1	DG 13-154
5ADP1A	DG 13-134	5BPH2[3]	D 13-21 GL	5YP2	DN 13-154
5ADP2	DN 13-134	5BPH11[3]	D 13-21 BE	5YP7	DP 13-154
5ADP2A	DN 13-134	5BPH31[3]	D 13-21 GH	5YP11	DB 13-154
5ADP7	DP 13-134	5CP1-A	DG 13-116 F	13L036V	DP 13-116 F
5ADP7A	DP 13-134	5CP2-A	DN 13-116 F	13L037A	DB 13-116 F
5ADP11	DB 13-134	5CP7-A	DP 13-116 F	13L037I	DG 13-116 F
5ADP11A	DB 13-134	5DQP2	D 13-21 GL	31B82	D 13-21 GH
5ADP31	DH 13-134	5DQP31	D 13-21 GH	140 MB.	140 MB./T
5AQP1	5AQP1/T	5ELP2	D 13-21 GL		
5AQP1A	5AQP1A/T	5ELP11	D 13-21 BE		

[1] type with similar data
[2] type with identical data
[3] also for asymmetrical deflection
[4] different base

COMPARISON CHART OF OSCILLOSCOPE TUBES

Designation System

Line 1: Type number(s) (e.g. DG 7-131, DG 7-132)

Line 2: Screen form (e.g. KS), accelerator (e.g.: o), max. overall length in mm (e.g.: 172)

Line 3: max. horizontal (e.g. 41.6) and vertical (e.g. 23.2) deflection factors in V/cm

Code for Screen Forms

K — round tube
R — rectangular tube
S — spherical faceplate
P — flat faceplate

Code for Accelerators

o — monoaccelerator
n — with post-deflection accelerator
s — spiral post-deflection accelerator
m — mesh post-deflection accelerator

U_s (kV)	Minimal useful screen diameter and diagonal respectively (cm)			
	7	10	13	18
Bandwidth: f < 10 MHz				
0.5	DG 7-131, DG 7-132 KS o 172 41.5 23.2			
0.8	DG 7-123, DG 7-124 KS o 172 44 30			
0.8	D. 7-125, K 2007.. KP o 172 44 30			
1	D. 7-119 KP o 238 39 27.5			
1	D 7-190../T KP o 225 31 12.5			
1.5		D 10-260../T KP o 260 31.5 13.2		
2	D. 7-113 F KP o 298 53.5 41	D.M 10-111 KP o 339 41 40	D. 13-132 F KP o 384.5 30.5 24.5	
2	D. 7-115 F KP o 260.5 75 59			
2.5			5AQP../T KP o 430 20 15	

U_a (kV)	Minimal useful screen diameter and diagonal respectively (cm)			
	7	10	13	18
4	D. 7-116 F KP n 260.5 91 67		D. 13-114 KP n 375 37 30	D. 18-114 KP s 375 37.5 31.5
4			D. 13-116 F KS n 431 42 35.5	D. 18-116 KP s 375 37.5 31.5
Bandwidth: f = 10...25 MHz				
2			D 13-620.. KP o 298 31 15.5	
3			D 13-27.. KP s 350 27 12.2	
3			K 2011.. RP s 380 18.5 11.5	
4	D. 7-126 KP s 200 62.5 46	D 10-12.. KP s 320 31 11	D. 13-134 KP n 430 26 20	
4	D. 7-178 KP s 296 40 13.7		D.M 13-136 KP s 487.5 28.5 16	
4			D. 13-154 KP n 457.5 28.5 16	
6			D 14-180../T RP s 386 25.5...13.1	
Bandwidth: f = 25...100 MHz				
10			D 13-21.. KP s 468 33.5 7.2	

COMPARISON CHART OF MONITOR TUBES

Designation System
Line 1: Type number(s) (e.g.: M 12-100..)
Line 2: Useful screen sizes in mm × mm (e.g.: 70 × 90), max. overall length in mm (e.g.: 180), nominal neck sizes in mm (e.g.: 20)
Line 3: Resolution in lines (e.g.: 625), $-U_{g1\ cut\ off}$ in V (e.g.: 25...50)

U_a (kV)	Deflection angle			
	55°	70°...75°	90°	110°
4		140 MB./TK, 85 × 110, 173, 20 625, 15...40		
8	M 12-100.. 70 × 90, 180, 20 625, 25...50	140 MB./T, 85 × 110, 173, 20 625, 15...40		
9			M 23-100.. 140 × 183, 210, 20 625, 32...50	
11				M 31-120.. 195 × 257, 233, 20 625, 35...69
13		M 17-11.., M 17-111../T, M 17-111../TK 95 × 125, 205, 20 625, 46...91	M 28-12.. 171 × 228, 250, 20 850, 46...91	
14			K 2001.. 130 × 150, 204, 20 625, 30...70	
16			M 31-131../T 195 × 257, 900, 60...130	M 38-120.. 226 × 291, 280, 29 625, 40...85
18				M 38-121../T 226 × 290, 280, 29 625, 40...85
18				M 47-26.. 305 × 348, 309, 29 625, 50...93
18				M 59-23.. 385 × 489, 368, 29 625, 50...93

TUNGSRAM

TRANSMITTING TUBES, RECTIFIERS & MICROWAVE TUBES

1979

TRANSMITTING TUBES

TRIODES
TETRODES
PENTODES

RECTIFIERS

HIGH VOLTAGE RECTIFIERS
THYRATRONS
SENDITRONS

MICROWAVE TUBES

REFLEX KLYSTRONS
TRAVELLING WAVE TUBES

SYMBOLS AND ABBREVIATIONS

a	anode
c	collector
f	heater
f	frequency
Δf	frequency range
f_m	centre of heater
F	noise figure
g or g_1	grid No. 1
g_2	grid No. 2
g_3	grid No. 3
G_N	power amplification factor
I_a	anode current
I_{as}	peak anode current
I_c	collector current
I_e	emission current
I_f	heater current
I_g or I_{g1}	grid No. 1 current
I_{g2}	grid No. 2 current
I_h	helix current
I_k	cathode current
I_{Res}	resonator current
h	helix
i.c.	internal connection
k	cathode
N_a	anode dissipation
N_i	input power
N_o	output power
$N_{o\,sat}$	saturated output power
Refl	reflector
Res	resonator
s	internal shield
S	mutual conductance
S_m	reflector modulation sensitivity
U_a	anode voltage
$-U_{as}$	peak inverse anode voltage
U_c	collector voltage
U_f	heater voltage
$-U_g$ or U_{g1}	grid No. 1 voltage
U_{g2}	grid No. 2 voltage
U_h	helix voltage
U_{Res}	resonator voltage
W	Wehnelt cylinder
μ	amplification factor
μ_{g2g1}	grid No. 2 amplification factor
⇨ (open arrow)	air cooling
➡ (solid arrow)	water cooling

Cathode

do	directly-heated oxide-coated
id	indirectly-heated dispenser type
io	indirectly-heated oxide-coated
pt	directly-heated pure tungsten
tt	directly-heated thoriated tungsten

Construction

mco	metal-ceramic construction, outer cavity
mgo	metal-glass construction, outer cavity
mmi	all-metal construction, mechanically-tuned integral cavity

Cooling

f	forced-air
n	natural
v	vapour
w	water

Filling

Hg	mercury
Xe	xenon

Magnet

p	permanent
pp	periodical permanent
s	solenoid

Operation

af/B-2	class B, af power amplifier stage, two tubes in push-pull
rf/C/o	class C oscillator for industrial and medical applications, unfiltered d.c. anode voltage from a three-phase rectifier
rf/C/tg	class C, telegraphy, rf power amplifier
rf/C/tph	class C, telephony, anode-modulated power amplifier
tv/B	class B, television service, negative modulation, positive synchronization
tv/PT	TV picture transmitter
tv/T	TV translator

TRANSMITTING TRIODES

TYPE	OUTLINE	COOLING	CATHODE	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION							
				U_f	I_f	S	μ	I_c	f	U_a	N_a	operation	f	U_a	$-U_g$	I_a	I_g	N_i	N_o
				V	A	mA/V		A	MHz	kV	kW (W)		MHz	kV	V	A	mA	W	kW (W)
OQQ 55/1500	1	n	tt	7.5	3	2.2	20	0.75	60	1.5	(55)	af/B-2 rf/C/tg	— 15	1.5 1.5	65 140	220 135	16 18	2.6 5.5	(220) (150)
OQQ 151/3000	2	n	tt	10.5	4	3	18	1.3	60	2.5	(150)	af/B-2 rf/C/tg	— 30	2.5 2.5	112 170	270 220	17.4 25	3 8	(430) (400)
OQQ 501/3000	3	n	pt	23	16	4	36	1.8	60	3	(500)	af/B-2 rf/C/tg	— 20	3 3	60 150	900 500	120 100	40 50	2 1
OT 100	4	n	tt	10	3.25	5	20	1.2	100	1.5	(75)	af/B-2 rf/C/tg	— 40	1.5 1.5	88 165	280 160	16 15	2.8 4	(286) (180)
OT 400	5	n	tt	10	10	10	35	3.5	75	3	(300)	af/B-2 rf/C/tg	— 30	3 3	70 200	744 415	110 55	20 20	(1650) 1
3S012T	6	n	tt	10	4.5	4.5	33	1.2	50	2.25	(125)	af/B-2 rf/C/tg	— 30	2 2	50 160	420 250	64 40	10 12	(590) (375)
3S013T-1[1]	7	n	tt	5	6.5	4.7	25	1.2	200	2.5	(135)	af/B-2 rf/C/tg	— 100	2.5 2.5	100 240	312 220	54 50	12 20	(520) (430)
3S035T-1	8	n	tt	5	15	9	30	2.4	150	4	(350)	af/B-2 rf/C/tg	— 100	4 4	130 290	660 340	170 75	40 30	(1960) (1050)
3L030K	15	f	tt	3.4	19	10	32	3	900	2.5	0.3	rf/C/tph rf/C/tg	175 175	2 2.5	200 200	0.335 0.260	120 100	30 25	0.505 0.475
3L050K	16	f	tt	3.4	19	14	70	3	625	2.5	0.5	rf/C/tg	400	2.5	70	0.380	160	70	0.670
3L1T	17	f	tt	5	50	13	25	7	200	4	2	af/B-2 rf/C/tph rf/C/tg	— 100 100	4 3 4	130 300 300	1.4 0.5 0.6	350 140 150	96 70 70	4 1.2 1.9
3L2T 3V2T	18 19	f w	tt	12.6	29	12	30	10	220	6	3	af/B-2 rf/C/tph rf/C/tg	— 30 30	4.7 4.7 6	200 400 550	2.8 0.96 1.25	280 280 290	195 170 1225	8.8 3.7 7
3L3T 3V3T	20 21	f w	tt	5.5	120	25	8	20	—	4	5	af/B-2	—	4	665	7.2	1000	1190	20
3L4Z[1] 3L4Z-1[1]	22 23	f f	pt	2×22 22	2×38 76	7	22	8	30	12	4	af/B-2 rf/C/tph rf/C/tg	— 5 5	10 10 12	400 800 700	2.4 1 1.21	120 440 280	80 530 300	16 7.7 10.5

[1] Not for new developments

3L5T 3V5T	24 25	f w	tt	12.6	28	10	22	11	50	9	5	af/B-2 rf/C/tph rf/C/tg	— 30 30	9 6.5 8	410 1040 1360	3.34 1.23 1.74	468 240 330	374 356 646	20 6 10.4
3G6T-1 3L6T-1 3V6T-1	26 27 28	v f w	tt	5	140	25	40	20	100	10	10 8 10	af/B-2 rf/C/tph rf/C/tg	— 30 30	10 8 10	250 382 467	6 2.25 2.8	600 320 400	680 232 320	32 13 20
3V6T-U[1]	29	w	tt	5	67	16	15	8	155	7	6	—	—	—	—	—	—	—	—
3G10T-2 3V10T-2	30 31	v w	tt	10	125	55	6	50	—	4	10	af/B-2	—	4	600	15	1400	1050	40
3L10T-U1 3V10T-U1[2] 3V10T-U2[2]	32 33 34	f w w	tt	10	75	62	62	30	220	4	10	tv/B	220	4	70	4.8	1100	1300	12
3G12T 3V12T	35 36	v w	tt	8.5	110	30	50	28	30	14	12	af/B-2 rf/C/tph rf/C/tg	— 30 30	14 12 14	280 810 1060	6.4 2.7 4.3	1500 470 1120	810 520 1660	65 24 48
3L20T 3V20T	37 38	f w	tt	14.5	47	12	30	22	30	12	20	af/B-2 rf/C/tph rf/C/tg	— 15 15	12 12 12	400 1550 1900	6 4.46 3.3	800 310 526	830 677 1530	48 20 30
3V20T-1	38	w	tt	10	140	23	40	45	30	12	20	af/B-2 rf/C/tph rf/C/tg	— 15 15	12 12 12	300 1200 1450	10 3.6 6.7	2000 800 1450	1530 1370 3160	80 32.4 60
3L20Z-21[2] 3V20Z-21[2]	37 39	f w	pt	21	64	5	12	7.5	5	17.5	20	af/B-2 rf/C/tph rf/C/tg	— 5 5	15 12 17.5	1250 3000 4150	4.8 1 1.6	400 130 200	620 500 1000	48 9 21
3L20Z-31[2] 3V20Z-31[2]	37 39	f w	pt	22.5	71	10	23	12	22	17.5	20	af/B-2 rf/C/tph rf/C/tg	— 5 5	17.5 14 17.5	700 2120 2400	6 1.72 2	560 240 240	1600 675 740	70 18 26.75
3L25T-1 3V25T-1	40 41	f w	tt	10	320	50 56	40 42	80	30	15	25 50	af/B-2 rf/C/tph rf/C/tg	— 30 15	12 12 15	260 820 1250	10.3 6 6.67	850 1000 1000	360 1200 1680	72.5 55 75
3V30T[1]	42	w	tt	10.5	195	27	4.2	80	—	6	30	—	—	—	—	—	—	—	—
3V50Z-1	43	w	pt	20	400	8	55	50	5	18	50	rf/C/o	5	18	1430	8	360	730	108
3V80Z-1[2]	44	w	pt	26.5	248	20	36	45	22	17.5	80	af/B-2 rf/C/tph rf/C/tg	— 2 2	14 12 17.5	150 600 600	13 5 9.6	1000 500 500	2000 500 950	100 40 100
3G125T	45	v	tt	2×9.6	2×290	85	34	175	27	14	125	rf/C/tg	27	14	765	17.5	3100	4000	200
3V705Z 3V705Z-1	46 47	w	pt	2×22 22	2×38 76	7	22	8	30	12	7.5	af/B-2 rf/C/tph rf/C/tg	— 20 5	10 8 12	385 700 700	3.6 1 1.7	260 350 350	180 500 385	24 6.2 15

[1] tentative data
[2] Not for new developments

TRANSMITTING TETRODES AND PENTODES

TYPE	OUTLINE	COOLING	CATHODE	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION									
				U_f	I_f	S	μ_{g2g1}	I_e	f	U_a	N_a	operation	f	U_a	U_{g2}	$-U_{g1}$	I_a	I_{g2}	I_{g1}	N_i	N_o
				V	A	mA/V		A	MHz	kV	kW (W)		MHz	kV	kV	V	A	mA	mA	W	kW(W)
4S016T-1[2]	7	n	tt	5	6.5	4	5.5	1.2	200	3	(160)	af/B-2 rf/C/tg	— 60	3 3	350 350	55 145	330 185	46 28	11 10	1.2 1	(715) (423)
4S040T-1	8	n	tt	5	15	4.5	5	2.4	120	4	(400)	af/B-2 rf/C/tg	— 50	4 4	400 400	70 165	560 325	76 58	12 12	1.2 3	(1600) 1
44S004[2]	9	n	io	6.3 12.6	1.8 0.9	4.5	8	—	250	0.75	(2 × 20)	af/B-2 rf/C/tg	— 250	0.6 0.75	250 250	25 80	200 160	26 17	5.2 3	0.2 3	(86) (85)
4G3T-U1 4L3T-U1 4V3T-U1 4V3T-U2[2]	48 49 50 51	v f w w	tt	5	64	22	5.2	10	230	4	4	tv/B	230	4	0.6	115	1.5	40	60	550	5.5
4L10K[1]	52	f	tt	7.5	75	—	4.5	—	110	7.5	10	af/B-2 rf/C/tg	— 30	7.5 7.5	1.5 0.5	340 350	6.66 2.8	250 500	0 250	0 150	31.9 16
4G10T 4L10T 4V10T 4G11T	53 54 55 56	v f w v	tt	8.5	110	20	10	28	30	10	8 10 10 12	af/B-2 rf/C/tph rf/C/tg	— 30 30	10 8 10	1.5 1.5 1.5	150 400 400	2.2 1.2 1.2	1000 500 500	200 100 100	40 50 50	13.2 6.5 8.2
4L11K[1]	57	f	tt	10	86	67	8.4	35	250	5	12	tv/PT tv/T	220 220	4 3.6	0.8 0.85	95 70	3.7 2.25	110 —	60 0	560 0	6.6 2.2
OS 51	10	n	io	12.6	1.35	6	6.7	—	60	1	(45)	af/B-2 rf/C/tg	— 60	1 1	250 250	34 120	268 177	56 28	1.6 5	0.60 0.65	(194) (132)
OS 70/1750	11	n	tt	10	3.25	2.7	6.2	1.2	75	1.25	(70)	af/B-2 rf/C/tg	— 30	1.7 1.25	750 400	120 95	248 160	43 35	0 12	0 2.1	(300) (150)
OS 125/2000	12	n	tt	10	5	4.5	10.5	1.5	60	2	(125)	rf/C/tg	30	2	500	90	160	45	12	2	(210)
5S045T 5S045T-1	13 14	n	tt	12	8.5	5.5	3.5	3.5	60	3	(450)	rf/C/tg	10	3	500	300	465	200	20	9	(950)

[1] tentative data [2] Not for new developments

RECTIFIERS, THYRATRONS AND SENDITRON

TYPE	OUTLINE	FILLING	CATHODE	HEATING		MAXIMUM RATINGS		
				U_f	I_f	$-U_{as}$	I_a	I_{as}
				V	A	kV	A	A
4Q025 4Q025-1 4Q025-2 4Q025-3	58 59 60 61	Hg	do	2.5	4.8	10	0.25	1
4X025	62	Xe	do	2.5	5	10	0.25	1
5Q105	63	Hg	do	5	7	13	1.5	6
9Q205	64	Hg	do	5	12	21	2.5	10
RG 250/3000 RG 250/3000-1	65 66	Hg	do	2.5	4.8	10	0.25	1
RG 1000/3000 RG 1000/3000-1 RG 1000/3000-2	67 68 69	Hg	do	5	6.5	10	1.25	5
4QR8	70	Hg	do	2.5	22	14	6	24
8QR45	71	Hg	io	5	40	20	45	200
12QR205	72	Hg	do	5	14	27	2.5	10
15QR40[1] 15QR40-1[1] 15QR40-2	73 74 75	Hg Hg Hg	do do do	5	15	15	12.5	40
GRG 200/3000 GRG 250/3000	76 76	Hg Hg	do do	2.5	4.8	7.5	0.25	1
600QS4	77	Hg	—	—	—	1.2	3	50
600XR8	70	Xe	do	2.5	22	1.2	8	25

[1] Not for new developments

REFLEX KLYSTRONS

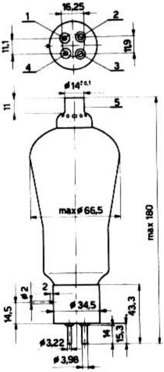
TYPE	OUTLINE	COOLING	CONSTRUCTION	CATHODE	HEATING		TYPICAL CHARACTERISTICS				
					U_f	I_f	Δf	U_{Res}	I_{Res}	S_m	N_o
					V	A	GHz	V	mA	MHz/V	mW
MR 01/40 MR 01/60 MR 01/61 MR 01/81	78	n	mgo	io	6.3	0.64	3.30...4.90 4.90...7.05 5.60...6.60 7.80...8.50	1000	20	0.3	80
MR 02 MR 02/M	79	n	mmi	id	6.3	0.92	3.37...3.55 3.4±0.005	450	40	0.5 2	250 50
MR 03	79	n	mmi	id	6.3	0.92	3.63...3.92	450	40	0.5...2	250
MR 06	80	n	mgo	io	6.3	0.7	1...4	250	28.5	0.4	100
MR 53	81	n	mco	io	6.3	0.6	6.8...7.5	350	40	1	80

TRAVELLING WAVE TUBES

TYPE	OUTLINE	COOLING	MAGNET	CATHODE	HEATING		TYPICAL CHARACTERISTICS								
					U_f	I_f	Δf	U_h	U_c	I_h	I_k	G_N	N_o	$N_{o\,sat}$	F
					V	A	GHz	kV	kV	mA	mA	dB	W	W	dB
MH 03	82	f	p	io	6.3	1.2	3.4...3.9	1.5...2.1	1.1...1.5	2	65	33	5	10	—
MH 10[1]	83	n	pp	io	6.3	0.4	5.6...6.2	2.6...2.9	1.6	2.2	43	34	10	18	30
MH 11[2]	86	n	pp	io	6.3	0.4	3.4...4.2	2.15...2.65	1.75	2	60	37	16	25	27
MH 12[3]	89	n	pp	io	6.3	0.4	5.6...6.5	2.6...2.9	1.75	2	43	34	10	18	30
MH 41	88	n	s	io	2.5	0.7	2.6...3.2	0.325...0.375	0.45	0.004	0.5	20	—	0.002	7
MH 43	85	n	s	io	2.7	0.7	0.75...0.95	0.18...0.24	0.375	0.005	0.23	20	—	0.0018	7

[1] for this type magnetic mount MF 10 (outline drawing No. 84) is available
[2] for this type magnetic mount MF 11 (outline drawing No. 87) is available
[3] for this type magnetic mount MF 12 (outline drawing No. 90) is available

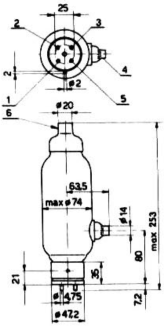
OUTLINES



1

OQQ 55/1500

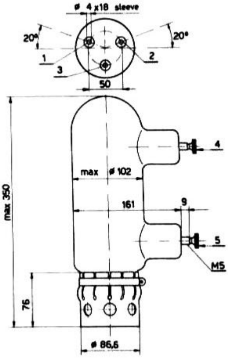
1 — g
2 — f
3 — f
4 — i.c.
5 — a



2

OQQ 151/3000

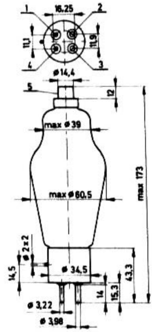
1 — i.c.
2 — f
3 — i.c.
4 — g
5 — f
6 — a



3

OQQ 501/3000

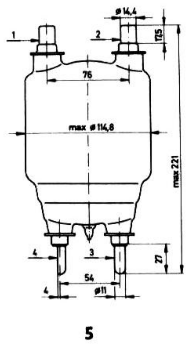
1 — f
2 — f
3 — f_m
4 — a
5 — g



4

OT 100

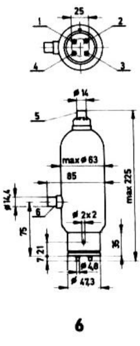
1 — g
2 — f
3 — f
4 — i.c.
5 — a



5

OT 400

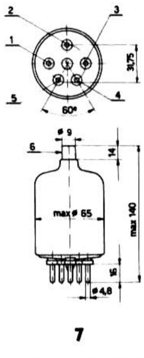
1 — a
2 — g
3 — f
4 — f



6

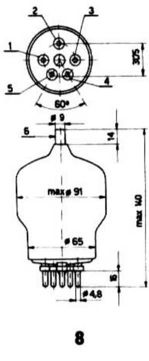
3S012T

1 — f
2 — i.c.
3 — f
4 — i.c.
5 — a
6 — g



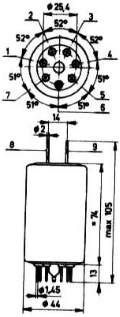
7

3S013T-1	**4S016T-1**
1 — g	1 — g_2
2 — g	2 — g_1
3 — g	3 — g_2
4 — f	4 — f
5 — f	5 — f
6 — a	6 — a



8

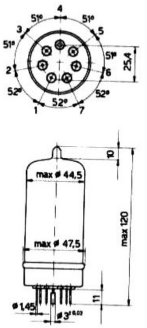
3S035T-1	**4S040T-1**
1 — g	1 — g_2
2 — g	2 — g_1
3 — g	3 — g_2
4 — f	4 — f
5 — f	5 — f
6 — a	6 — a



9

44S004

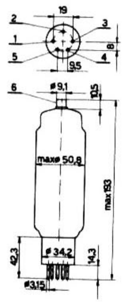
1 — g_1
2 — f
3 — f
4 — g_1
5 — g_2
6 — k
7 — f_m
8 — a
9 — a



10

OS 51

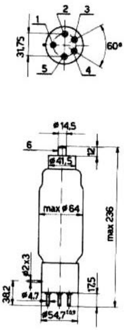
1 — f
2 — g_1
3 — g_2
4 — a
5 — k
6 — g_3
7 — f



11

OS 70/1750

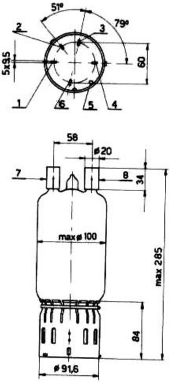
1 — g_2
2 — g_1
3 — g_3
4 — f
5 — f
6 — a



12

OS 125/2000

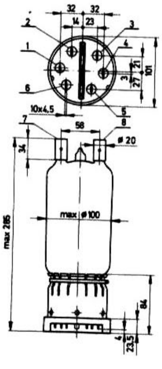
1 — g_1
2 — g_3
3 — f
4 — f
5 — g_2
6 — a



13

5S045T

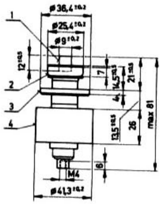
1 — g_1
2 — g_3
3 — f
4 — g_2
5 — f_m
6 — f
7 — a
8 — g_2



14

5S045T-1

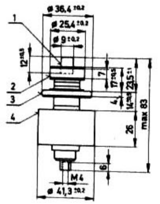
1 — f
2 — g_1
3 — g_3
4 — f_m
5 — g_3
6 — f
7 — a
8 — g_3



15

3L030K

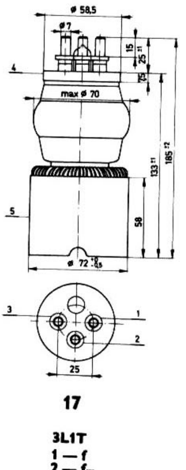
1 — f
2 — f
3 — g
4 — a



16

3L050K

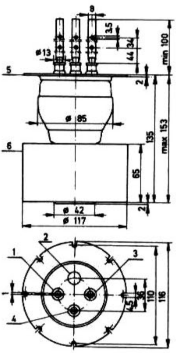
1 — f
2 — f
3 — g
4 — a



17

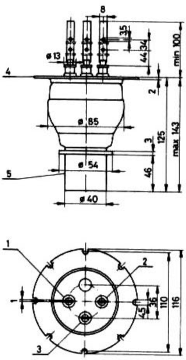
3L1T

1 — f
2 — f_m
3 — f
4 — g
5 — a



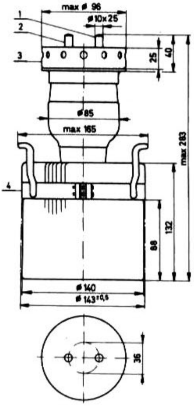
18

3L2T
1 — f
3 — f
4 — f_m
5 — g
6 — a



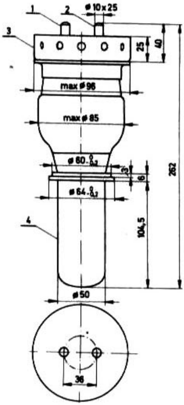
19

3V2T
1 — f
2 — f
3 — f_m
4 — g
5 — a



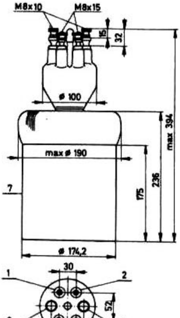
20

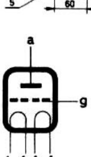
3L3T
1 — f 3 — g
2 — f 4 — a



21

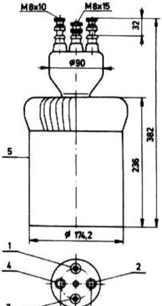
3V3T
1 — f 3 — g
2 — f 4 — a





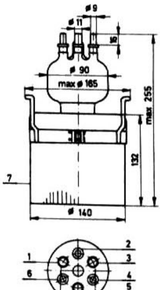
22

3L4Z
1 — f_1
2 — f_2
3 — g
4 — f_2
5 — f_1
6 — g
7 — a



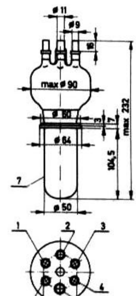
23

3L4Z-1
1 — f
2 — g
3 — f
4 — g
5 — a



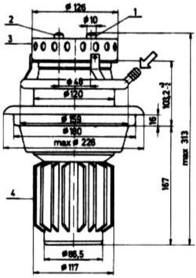
24

3L5T
1 — f
2 — g
3 — f
4 — g
5 — f_m
6 — g
7 — a



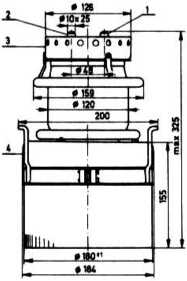
25

3V5T
1 — f
2 — g
3 — f
4 — g
5 — f_m
6 — g
7 — a



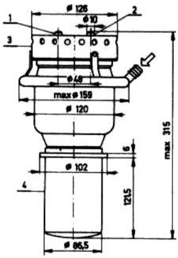
26

3G6T-1
1 — f
2 — f
3 — g
4 — a



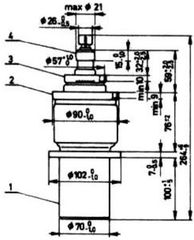
27

3L6T-1
1 — f
2 — f
3 — g
4 — a



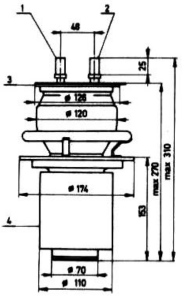
28

3V6T-1
1 — f
2 — f
3 — g
4 — a



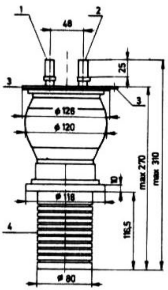
29

3V6T-U
1 — a
2 — g
3 — f
4 — f



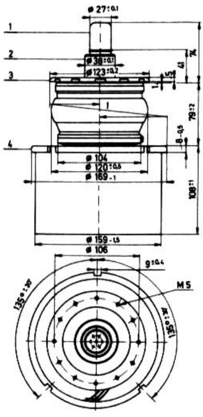
30

3G10T-2
1 — f
2 — f
3 — g
4 — a



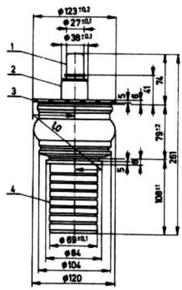
31

3V10T-2
1 — f
2 — f
3 — g
4 — a



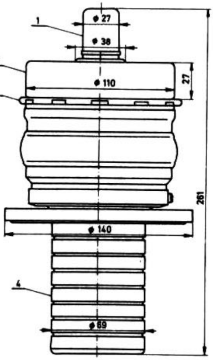
32

3L10T-U1
1 — f
2 — f
3 — g
4 — a



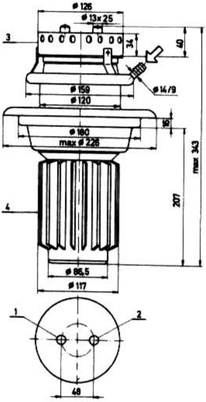
33

3V10T-U1
1 — f
2 — f
3 — g
4 — a



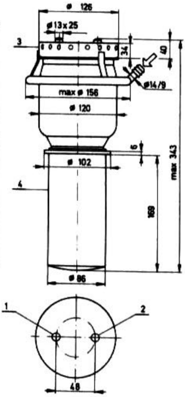
34

3V10T-U2
1 — f
2 — f
3 — g
4 — a



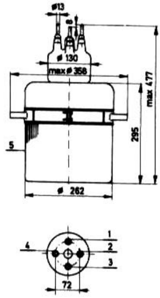
35

3G12T
1 — f
2 — f
3 — g
4 — a



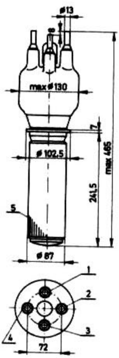
36

3V12T
1 — f
2 — f
3 — g
4 — a



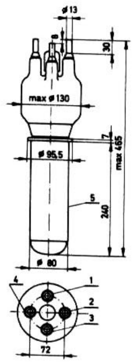
37

3L20T, 3L20Z-21, 3L20Z-31
1 — g
2 — f
3 — g
4 — f
5 — a



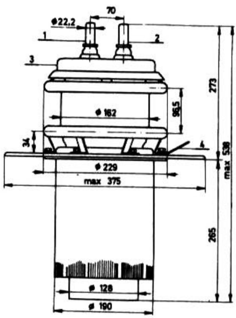
38

3V20T, 3V20T-1
1 — g
2 — f
3 — g
4 — f
5 — a



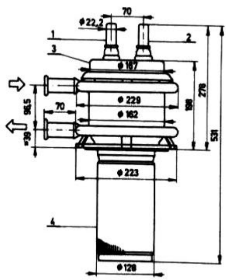
39

3V20Z-21, 3V20Z-31
1 — g
2 — f
3 — g
4 — f
5 — a



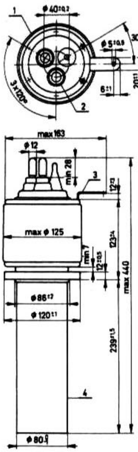
40

3L25T-1
1 — f
2 — f
3 — g
4 — a



41

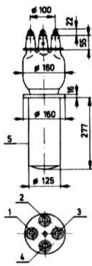
3V25T-1
1 — f
2 — f
3 — g
4 — a



42

3V30T

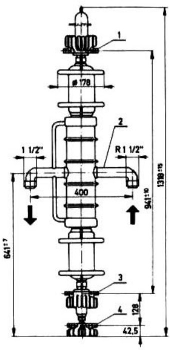
1 — f
2 — f
3 — g
4 — a



43

3V50Z-1

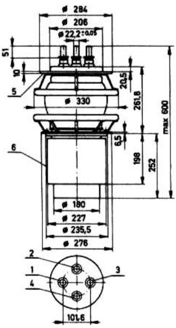
1 — f
2 — g
3 — f
4 — g
5 — a

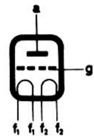


44

3V80Z-1

1 — g
2 — a
3 — f
4 — f

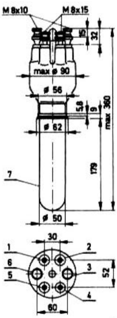


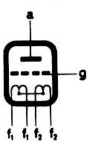


45

3G125T

1 — f_1
2 — f_2
3 — f_1
4 — f_2
5 — g
6 — a

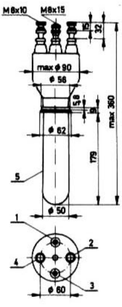




46

3V705Z

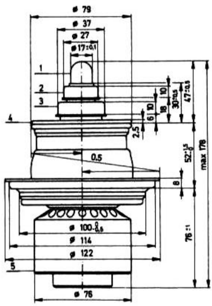
1 — f_1
2 — f_2
3 — g
4 — f_2
5 — f_1
6 — g
7 — a



47

3V705Z-1

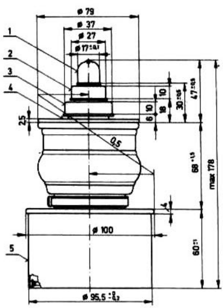
1 — f
2 — g
3 — f
4 — g
5 — a



48

4G3T-U1

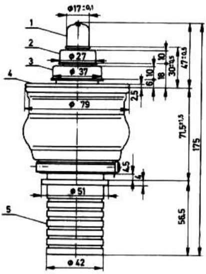
1 — f
2 — f
3 — g_1
4 — g_2
5 — a



49

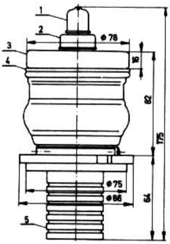
4L3T-U1

1 — f
2 — f
3 — g_1
4 — g_2
5 — a



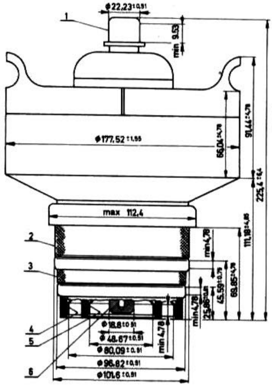
50

4V3T-U1
1 — f
2 — f
3 — g_1
4 — g_2
5 — a



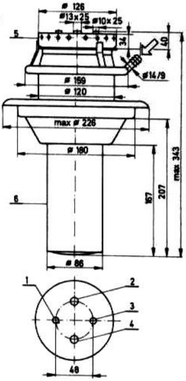
51

4V3T-U2
1 — f
2 — f
3 — g_1
4 — g_2
5 — a



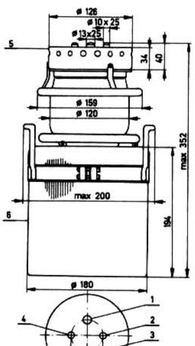
52

4L10K
1 — a
2 — g_2
3 — g_1
4 — f
5 — f
6 — i.c.



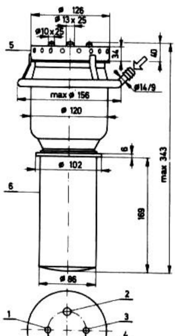
53

4G10T
1 — g_1
2 — f
3 — g_1
4 — f
5 — g_2
6 — a



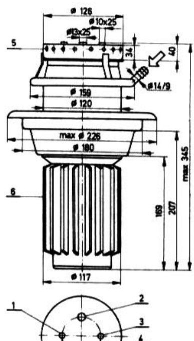
54

4L10T
1 — f
2 — g_1
3 — f
4 — g_1
5 — g_2
6 — a



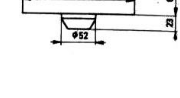
55

4V10T
1 — g_1
2 — f
3 — g_1
4 — f
5 — g_2
6 — a



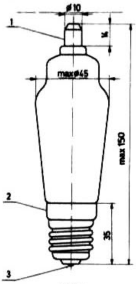
56

4G11T
1 — g_1
2 — f
3 — g_1
4 — f
5 — g_2
6 — a



57

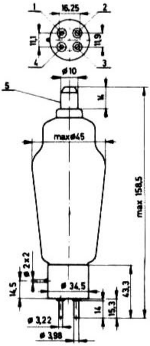
4L11K
1 — f
2 — f
3 — g_1
4 — g_2
5 — a



E27

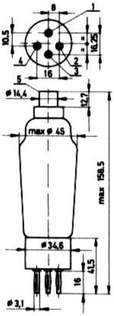
58

4Q025
1 — a
2 — f
3 — f



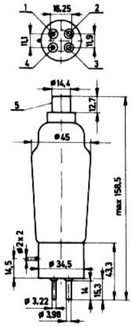
59

4Q025-1
1 — i.c.
2 — f
3 — f
4 — i.c.
5 — a



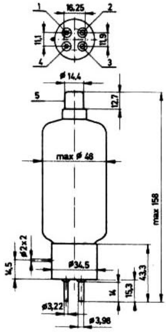
60

4Q025-2
1 — i.c.
2 — f
3 — i.c.
4 — f
5 — a



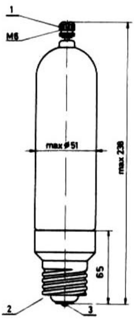
61

4Q025-3
1 — i.c.
2 — f
3 — f
4 — i.c.
5 — a



62

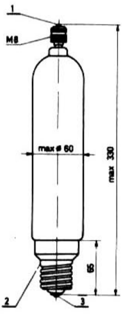
4X025
1 — i.c.
2 — f
3 — f
4 — i.c.
5 — a



E40

63

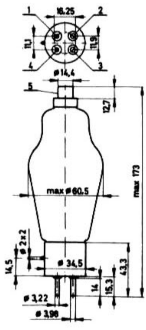
5Q105
1 — a
2 — f
3 — f



E40

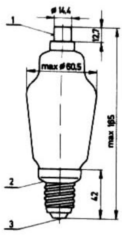
64

9Q205
1 — a
2 — f
3 — f



65

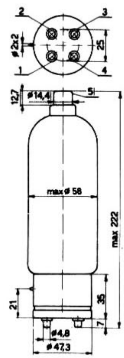
RG 250/3000
1 — i.c.
2 — f
3 — f
4 — i.c.
5 — a



E27

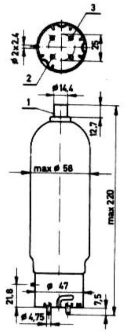
66

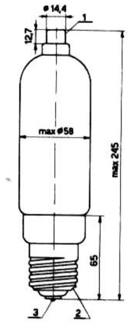
RG 250/3000-1
1 — a
2 — f
3 — f



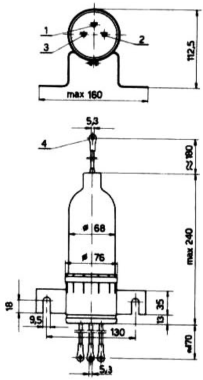
67

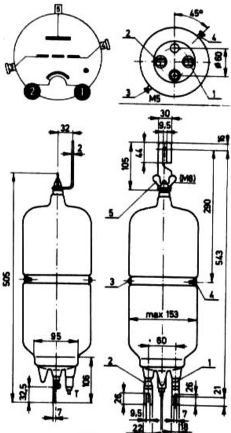
RG 1000/3000
1 — i.c.
2 — f
3 — i.c.
4 — f
5 — a





E40





68

RG 1000/3000-1

1 — a
2 — f
3 — f

69

RG 1000/3000-2

1 — a
2 — f
3 — f

70

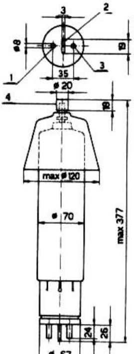
4QR8, 600XR8

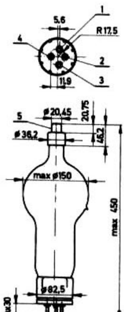
1 — g
2 — f
3 — f
4 — a

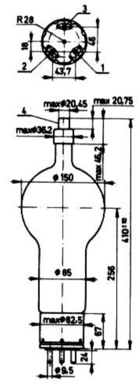
71

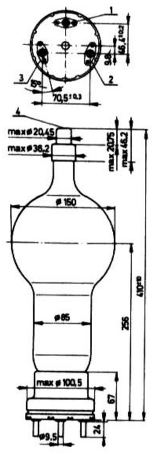
8QR45

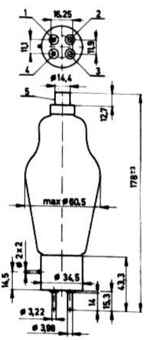
1 — f
2 — f, k
3 — g
4 — g
5 — a











72

12QR205

1 — f
2 — g
3 — f
4 — a

73

15QR40

1 — f
2 — k
3 — f, k
4 — g
5 — a

74

15QR40-1

1 — f
2 — f, k
3 — g
4 — a

75

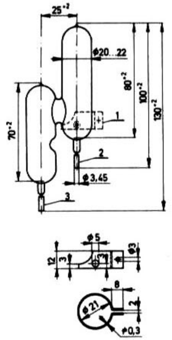
15QR40-2

1 — g
2 — f
3 — f, k
4 — a

76

GRG 200/3000, GRG 250/3000

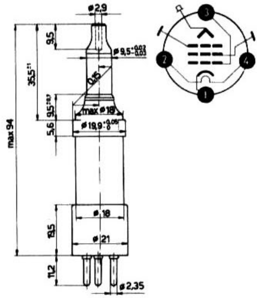
1 — g
2 — f
3 — f
4 — i.c.
5 — a



77

600QS4

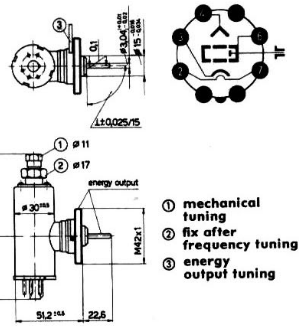
1 — g
2 — k
3 — a



78

MR 01/40, MR 01/60, MR 01/61, MR 01/81

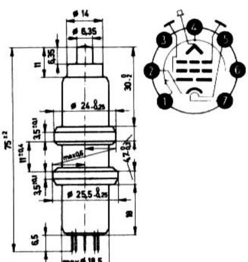
1 — k
2 — f
3 — g
4 — f
cap — Refl
disc output — Res



79

MR 02, MR 02/M, MR 03

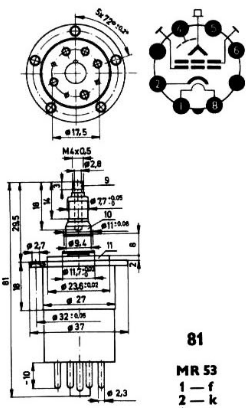
2 — f
3 — k
4 — Refl
6 — Res
7 — f



80

MR 06

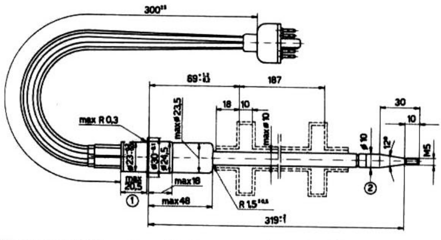
1 — W
2 — k
3 — i.c.
4 — W
5 — f
6 — W
7 — f
cap — Refl
disc output — Res



81

MR 53

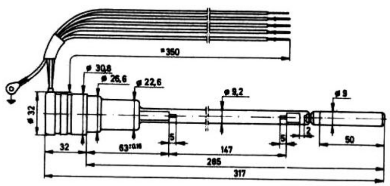
1 — f
2 — k
4 — s
6 — i.c.
8 — f
9 — Refl
10 — Res
11 — Res

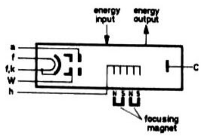


The tube must be aligned in the magnetic system ① and ②.

82

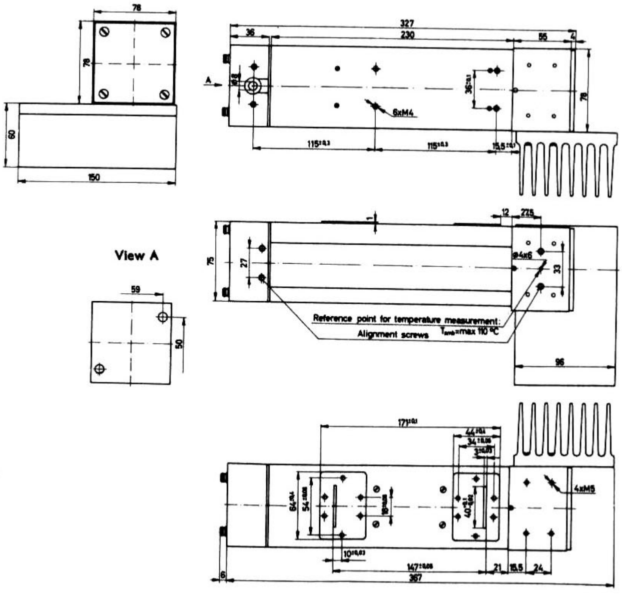
MH 03
1 — f
3 — h
5 — a
7 — W
8 — f, k
connecting screw — c





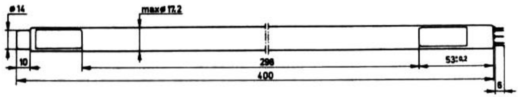
83

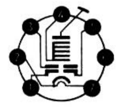
MH 10
red — f, k
yellow — f
blue — a
black — h
cap (green)[1] — c
[1] mounted in magnetic mount



84

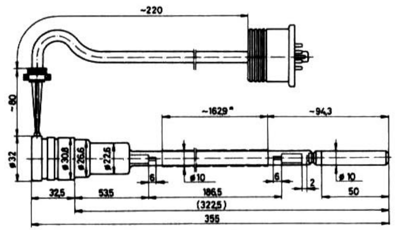
MF 10



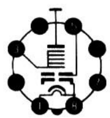


85

MH 43
1 — W
2 — f, k
3 — a
4 — h
5 — W
6 — i.c.
7 — f
cap — c

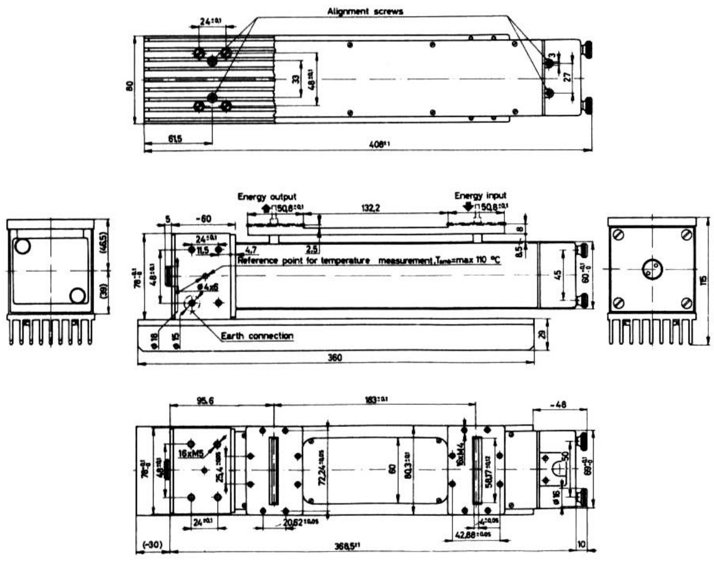


* Varnish-protected aquadag coating



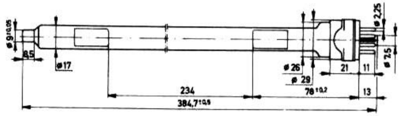
86

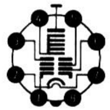
MH 11
1 — f
3 — h
5 — a
7 — i.c.
8 — f, k, W
cap — c



87

MF 11

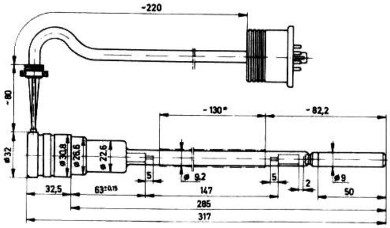




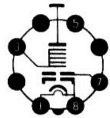
88

MH 41

1 — W
2 — f, k
3 — a_3
4 — h
5 — a_2
6 — a_1
7 — f
8 — i.c.
cap — c



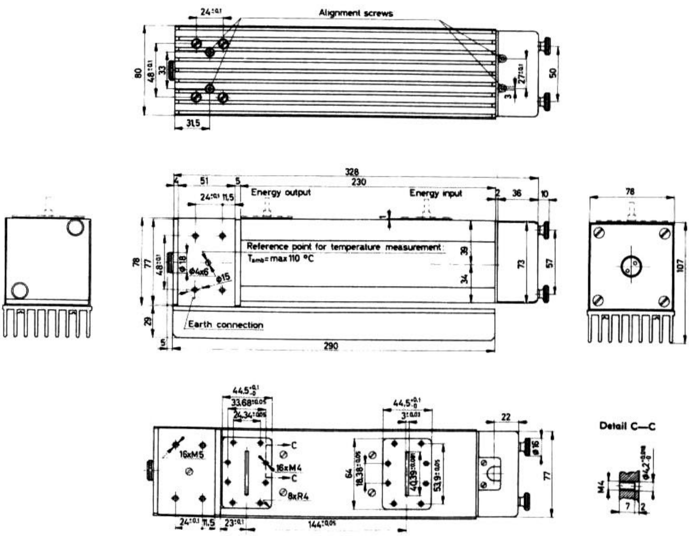
* Varnish-protected aquadag coating



89

MH 12

1 — f
3 — h
5 — a
7 — i.c.
8 — f, k, W
cap — c



90

MF 12

REPLACEMENT GUIDE

Owing to the similarity of their data the transmitting tubes, rectifiers and microwave tubes of the replacement guide are interchangeable in almost every case.
The following list includes the TUNGSRAM equivalents to other makes.

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
AX-6768	15QR40	DQ 2	4Q025-1	QB 3.5/750	4S040T-1
AX-9900	3S013T-1	DQ 2a	4Q025	QQE 06/40	44S004
AX-9901	3S035T-1	DQ 4a	5Q105	QQV 06/40	44S004
AX-9909	OS 51	DQ 61	9Q205	QY 3-125	4S016T-1
AX4-125A	4S016T-1	DX 2	4X025	QY 4-250	4S040T-1
AX4-250	4S040T-1	G 7.5/6.0 ds	4Q025-2	RD 200B	OQQ 151/3000
B143	OT 400	G 10/1 d	4Q025-3	RD 3005	3S035T-1
B1135	3S035T-1	G 10/1 dV	4X025	RE 125A	4S016T-1
BT 69	15QR40	G 10/4 d	RG 1000/3000-1	RE 400P	4S040T-1
BY 1144	3G125T	G 20/5 d	9Q205-1	REE 30B	44S004
C144	44S004	GL 5830	15QR40	RK 5721	MR 01/40
C178A	44S004	Gle 13000/1.5/6	5Q105		MR 01/60
C200	OQQ 151/3000	Gle 20000/2.5/10	9Q205-1		MR 01/61
C1108	4S016T-1	GM-1A	3V30T		MR 01/81
C1112	4S040T-1	GRI-0.25/1.5	4Q025-1	RK 6390	MR 01/61
CV2116	MR 06	GU 59A	3V6T-U		MR 01/81
CV2797	44S004	GU 80	5S045T-1	RL 65A	OS 70/1750
CV6184	4L10K	HF 201	OQQ 151/3000	RS 329G	OQQ 501/3000
D177	OS 70/1750	ML 5894	44S004	RS 384	5S045T-1
DCG 4/1000 ED	4Q025	P 120-1	OS 70/1750	RS 614	3S013T-1
DCG 4/1000 G	4Q025-1	PB 1/150	OS 70/1750	RS 685	4S016T-1
DCG 5/5000 EG	5Q105	PB 3/800	5S045T	RS 686	4S040T-1
DCG 5/5000 GB	RG 1000/3000	PC 2/500	OS 125/2000	RS 1002	3S013T-1
DCG 7/100	15QR40	PE 1/100	OS 51	RS 1006B	3S013T-1
DCG 9/20	9Q205	PY 3-450	5S045T	RS 1007	4S016T-1
DCG 12/30	12QR205	Q 160-1	4S016T-1	RS 1009	44S004
DCX 4/1000	4X025	Q 400-1	4S040T-1	RS 1011L	3L10T-U1
		QB 3/300	4S016T-1	RS 1011W	3V10T-U2

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
RS 1012L	4L3T-U1	TQ 61	12QR205	828	OS 70/1750
RS 1012V	4G3T-U1	TQ 71	15QR40	833-A	OT 400
RS 1026	3S035T-1	TQ 91	8QR45	834-BV11	OQQ 55/1500
RS 2022CL	4L11K	TR 12/15	15QR40	866	RG 250/3000
RSQ 15/40 i	15QR40	TX 2/6	600XR8		RG 250/3000-1
S 15/5 d	12QR205	TY 1-50	OQQ 55/1500		4Q025
S 15/40 i	15QR40	TY 2-125	3S013T-1	866A	4Q025-1
SRL 351	3L1T	TY 3-250	3S035T-1	872	5Q105
SRL 353	3L6T-1	TY 4-350	OT 400	872A	RG 1000/3000-1
SRS 301	OQQ 501/3000	UA 3A	9Q205	4030C	3V80Z-1
SRS 360	3S035T-1	VRV 352	3G10T-2	4079A	15QR40-1
SRS 361	3S013T-1	VRW 352	3V10T-2	4079GA	15QR40-2
SRS 455	4S016T-1	XG 15-10	15QR40	4080A	15QR40-2
SRS 456	4S040T-1	YL 1181	4L3T-U1	4080GA	15QR40-2
SRS 502	5S045T-1	YL 1182	4G3T-U1	5557	GRG 250/3000
SRS 4451	44S004	2B94	44S004	5721	MR 01/40
SRW 353	3V6T-1	3 B/504A	OQQ 55/1500		MR 01/60
Ste 2000/6/80	600XR8	3 C/150A	OQQ 151/3000		MR 01/61
Ste 2500/05/2	GRG 250/3000	3I 200A	3L20Z-21		MR 01/81
Ste 15000/15/45	15QR40	3I 221E	3L20Z-31	5762-7C24	3L2T
T 50-2	OT 100	3Q 200A	3V20Z-21	5866	3S013T-1
T 100-1	OQQ 151/3000	3Q 221E	3V20Z-31	5867	3S035T-1
T 130-1	3S013T-1	3T 50	OQQ 55/1500	5870	12QR205
T 150-1	3S012T	3T 200A	OQQ 151/3000	5894	44S004
T 300-1	OT 400	4CX10,000 D	4L10K	6083	OS 51
T 329T	OQQ 501/3000	5 B/700A	OS 70/1750	6155-4D21	4S016T-1
T 350-1	3S035T-1	5T 125	OS 125/2000	6156-5D22	4S040T-1
TAL 12/10	3L4Z	8F11R	4L10K	8005	OT 100
TAW 12/10	3V705Z	8Q5	15QR40-1	8171	4L10K
TB 1/60A	OQQ 55/1500	8Q15	15QR40-2		
TB 2.5/300	3S013T-1	8QR5	15QR40-1		
TB 3/750	3S035T-1	8QR15	15QR40-2		
TBL 2/300	3L030K	55B/400A	44S004		
TBL 2/500	3L050K	803	OS 125/2000		
TG 2	GRG 250/3000	810	3S012T		

TYPE ASSORTMENT

TUNGSRAM

SEMI-
CONDUCTORS

1979

DISCRETE SEMICONDUCTORS

DIODES
RECTIFIERS
THYRISTORS
TRANSISTORS

INTEGRATED CIRCUITS

DIGITAL ICs
BIPOLAR MEMORIES
LINEAR ICs

EXPLANATION OF SYMBOLS

A	anode
B	base
C	collector
C	capacitance
C_D	diode capacitance
C_{12e}	feedback capacitance
E	emitter
E	exposition
f	frequency
f_T	gain-bandwidth product
F	noise figure
G_p	power gain
GND	ground
h_{21e}	small-signal forward current transfer ratio
h_{21E}	D. C. forward current transfer ratio
I_C	collector current
I_F	forward current
I_{FAV}	average forward current
I_{FM}	peak forward current
I_{FRM}	repetitive peak forward current
I_{FSM}	non-repetitive peak forward current
I_{GT}	trigger current
I_H	holding current
I_O	rectified current
I_p	photo current
I_R	reverse current
I_{Rp}	dark current
I_{TAV}	average on-state current at thyristors
I_{TRM}	repetitive peak forward current at thyristors
I_{TSM}	non-repetitive on-state peak current at thyristors
I_Z	Z-current
I_1	recommended operating current
K	cathode
N	npn-type transistor
NC	no internal connection
P	pnp-type transistor
P_{tot}	total power dissipation
r_F	differential forward resistance
r_S	series loss resistance
r_{Zj}	differential inner resistance at Z-diodes
R	resistance
R_L	load resistance
R_S	series resistance
R_{thja}	thermal resistance junction to ambient
R_{thjc}	thermal resistance junction to case
S	photo sensitivity
t_{on}	turn-on time
t_{off}	turn-off time
t_q	turn-off time at thyristors
t_r	rise time of photo current
t_{rr}	reverse recovery time
T_{amb}	ambient temperature
T_{case}	case temperature
T_j	junction temperature
T_L	lead temperature
U_{CBO}	collector-base voltage (with emitter open-circuited)
U_{CC}	supply voltage
U_{CE}	collector-emitter voltage
U_{CEO}	collector-emitter voltage (with base open-circuited)
U_{CES}	collector-emitter voltage (emitter and base short-circuited)
U_{CEsat}	collector-emitter saturation voltage
U_D	off-state voltage at thyristors
U_{DRM}	repetitive peak off-state voltage at thyristors
U_{EBO}	emitter-base voltage (with collector open-circuited)
U_F	forward voltage
U_{GT}	trigger voltage
U_I	input voltage
U_O	output voltage
U_R	reverse voltage
U_{RM}	reverse peak voltage
U_{RRM}	repetitive reverse peak voltage
U_{RSM}	non-repetitive reverse peak voltage
U_{RWM}	crest working reverse voltage
U_Z	Z-voltage
U_{12}	stabilized voltage at integrated voltage stabilizers
α_{UZ}	temperature coefficient of Z-voltage
ΔG_p	control range of power gain

SUMMARY OF TRANSISTORS, DIODES, RECTIFIERS AND THYRISTORS

Consumer Types

Industrial Types

DIODES

GERMANIUM DIODES

Point-contact diodes

type	outline	MAXIMUM RATINGS (T_{amb} = 25 °C) U_R V	U_{RM} V	I_F mA	I_{FM} mA	TYPICAL CHARACTERISTICS (T_j = 25 °C) U_F V	at I_F mA	I_R µA	at U_R V	notes
AA 112[1]	1	15	20	30	45	0.95 < 1.5	10	12 < 40	10	for use in low-resistance demodulator circuits
AA 113[1]	1	60	65	25	50	1.1 < 1.6	10	180 < 500	60	for use in high-resistance demodulator circuits
AA 116[1] (OA 90)	1	20	30	30[4]	45	1 < 1.5	10	20 < 140	10	for use in low-resistance demodulator circuits
AA 117 (OA 91)	1	90	115	50[4]	150	1.2 < 1.85	10	80 < 280	100	for general purposes
AA 118[1] (OA 95)	1	90	115	50[4]	150	1.05 < 1.55	10	75 < 250	100	for use in phase-discriminator circuits
AA 119[1]	1	30	45	35[4]	100	1.5 < 2.2	10	90 < 350	45	for use in high-resistance rectifier circuits
AA 132	1	100	110	50[4]	150	1.35 < 1.8	10	38 < 120	60	for general purposes
AA 137	1	30	40	20	25	0.9 < 1.5	10	13 < 50	10	for use in AGC circuits
AAZ 10[2]	1	25	30	30	30	0.95 < 1.5	10	13 < 40	10	for use in switchin circuits
OA 1154Q[3]	1	50	55	30	75	1.2 < 1.6	10	30 < 100	40	for use in ring-modulator circuits
OA 1161[3]	1	130	140	20	75	1.4 < 2.3	10	55 < 200	100	for general purposes

Gold-bonded diodes

AA 135	1	20	30	150	500	< 0.75	100	< 30	20	for general purposes
AA 136	1	50	60	150	500	< 0.85	100	< 30	50	for general purposes
AA 139	1	20	20	200	400	< 0.5	10	< 100	20	for use in switching circuits
OA 1180[3]	1	20	30	150	400	< 0.75	100	< 20	10	for use in switching circuits
OA 1182[3]	1	80	100	150	500	< 0.85	100	< 20	60	for use in switching circuits
OA 1182D[3]	1	50	60	150	500	< 0.85	100	< 30	50	for use in switching circuits

[1] *Also available in matched pairs.*
[2] *Also available in matched quads type 4-AAZ 10 for use in ring modulator circuits.*
[3] *Not recommended for new designs.*
[4] *I_{FAV} at U_R = 0 V.*

SILICON EXPITAXIAL PLANAR SWITCHING DIODES

type	outline	MAXIMUM RATINGS					TYPICAL CHARACTERISTICS (T_j = 25 °C)									notes
		P_{tot}[2] mW	U_R V	U_{RM} V	I_F mA	I_{FM} mA	U_F max. V	at I_F mA	I_R max. nA	at U_R V	C_D pF	at U_R V	t_{rr} ns	at I_F mA	and I_R mA	
BA 243	2		20		100		1	100	100	15	≤2	15				bandswitching diode for use in v.h.f.-band, r_F = max. 1 Ω
BA 244	2		20		100		1	100	100	15	≤2	15				bandswitching diode for use in i.h.f.-band, r_F = max. 0.5 Ω
BAY 41	2	250	40	40	225	600	1	200	50	20	≤5	0	≤15	200	200	for use in switching circuits
BAY 42	2	250	60	60	225	600	1	200	50	30	≤5	0	≤15	200	200	
BAY 43	2	250	80	80	225	600	1	200	50	40	≤5	0	≤15	200	200	
BAY 93	2	500	20	25	115	225	1	10	100	10	≤5	0	≤15	10	10	
1N 4148 (1N 914)	2	500	75	100	200	450	1	10	5000	75	≤4	0	≤4[1]	10		for use in fast switching (logic) circuits
1N 4149 (1N 916)	2	500	75	100	200	450	1	10	5000	75	≤2	0	≤4[1]	10		
1N 4151 (BAY 95)	2	500	50	75	200	450	1	50	50	50	≤2	0	≤4	10	10	
1N 4154 (BAY 94)	2	500	25	35	200	450	1	30	100	25	≤4	0	≤4	10	10	
1N 4446 (1N 914A)	2	500	75	100	200	450	1	20	5000	75	≤4	0	≤4[1]	10		
1N 4447 (1N 916A)	2	500	75	100	200	450	1	20	5000	75	≤2	0	≤4[1]	10		
1N 4448 (1N 914B)	2	500	75	100	200	450	1	100	5000	75	≤4	0	≤4[1]	10		
1N 4449 (1N 916B)	2	500	75	100	200	450	1	30	5000	75	≤2	0	≤4[1]	10		
N 125	2	300	50		150		1	100	100	35	≤2	0				

[1] *U_R = 6 V, R_L = 100 Ω.*
[2] *Valid provided that connection leads are kept at $T_L \leq 25\,°C$ at a distance of 4 mm from the case.*

LOW-VOLTAGE Z-DIODES

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_{amb} = 25 °C)					
		P_{tot} (T_{amb} = 25 °C) mW	I_{FRM} max. mA	R_{thja} °C/mW	T_j max. °C	U_F V	F max. Ω	α_{UZ} mV/°C	at I_F mA	I_R max. µA	at U_R V
ZF 0,7	4	400	250	0.35	150	0.65 … 0.75	10	—1.7	5	1	2.5
ZF 1,4	4	400	130	0.35	150	1.30 … 1.50	20	—3.4	5	1	5
ZF 1,5	2	400	130	0.35	150	1.39 … 1.61	25	—3.4	5	1	5
ZF 2,1	4	400	80	0.35	150	1.90 … 2.30	30	—5.1	5	1	5

SILICON PLANAR Z-DIODES

The stabilized voltages of types ZG correspond to the international series E12 with a tolerance of ± 10%.

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_{amb} = 25 °C)						
		P_{tot}[1] mW	I_Z (T_{amb} = 45 °C) max. mA	R_{thja} °C/mW	T_j max. °C	U_Z V	r_{Zj} max. Ω	α_{UZ} mV/°C	at I_Z mA	U_R I_R = 1 µA min. V	U_F max. V	at I_F A
ZG 2,7	2	400	92	0.35	150	2.4 … 3.1	100	—1.8	5		1	0.1
ZG 3,3	2	400	73	0.35	150	2.9 … 3.7	100	—2.2	5		1	0.1
ZG 3,9	2	400	63	0.35	150	3.5 … 4.3	100	—2.0	5		1	0.1
ZG 4,7	2	400	53	0.35	150	4.1 … 5.2	90	—1.4	5		1	0.1
ZG 5,6	2	400	46	0.35	150	5.0 … 6.3	75	0.2	5	1	1	0.1
ZG 6,8	2	400	40	0.35	150	6.1 … 7.5	15	2.8	5	2	1	0.1
ZG 8,2	2	400	32	0.35	150	7.3 … 9.2	10	4.5	5	3.5	1	0.1
ZG 10	2	400	26	0.35	150	8.8 … 11	15	7.0	5	5	1	0.1
ZG 12	2	400	21	0.35	150	10.7 … 13.4	30	9.0	5	7	1	0.1
ZG 15	2	400	18	0.35	150	13.0 … 16.5	55	13.0	5	10	1	0.1
ZG 18	2	400	14.5	0.35	150	16.0 … 20.0	80	16.5	5	10	1	0.1
ZG 22	2	400	12	0.35	150	19.6 … 24.4	100	20.5	5	12	1	0.1
ZG 27	2	400	9	0.35	150	24.1 … 30.0	120	24.5	5	14	1	0.1
ZG 33	2	400	7.3	0.35	150	29.6 … 36.3	120	24.5	5	17	1	0.1

[1] *Valid provided that connection leads are kept at T_{amb} = 25 °C at a distance of 4 mm from the case.*

SILICON PLANAR Z-DIODES

The stabilized voltages of types ZF correspond to the international series E24 with a tolerance of ±5%.

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_{amb} = 25°C)						
		P_{tot}[1] mW	I_Z (T_{amb} = 45°C) max. mA	R_{thja} °C/mW	T_j max. °C	U_Z V	r_{Zj} max. Ω	α_{UZ} mV/°C	at I_Z mA	U_R I_R = 1 µA min. V	U_F max. V	at I_F A
ZF 2,7	2	400	99	0.35	150	2.5 ... 2.9	85	—1.8	5		1	0.1
ZF 3	2	400	86	0.35	150	2.8 ... 3.2	90	—2.0	5		1	0.1
ZF 3,3	2	400	77	0.35	150	3.1 ... 3.5	90	—2.1	5		1	0.1
ZF 3,6	2	400	71	0.35	150	3.4 ... 3.8	95	—2.2	5		1	0.1
ZF 3,9	2	400	65	0.35	150	3.7 ... 4.1	90	—2.0	5		1	0.1
ZF 4,3	2	400	58	0.35	150	4.0 ... 4.6	90	—1.8	5		1	0.1
ZF 4,7	2	400	55	0.35	150	4.4 ... 5.0	85	—1.2	5		1	0.1
ZF 5,1	2	400	52	0.35	150	4.8 ... 5.4	70	—0.8	5		1	0.1
ZF 5,6	2	400	49	0.35	150	5.3 ... 6.0	65	0.2	5	1	1	0.1
ZF 6,2	2	400	45	0.35	150	5.8 ... 6.6	25	1.4	5	1	1	0.1
ZF 6,8	2	400	41	0.35	150	6.4 ... 7.2	15	2.8	5	2	1	0.1
ZF 7,5	2	400	37	0.35	150	7.1 ... 7.9	10	3.7	5	2.0	1	0.1
ZF 8,2	2	400	33	0.35	150	7.7 ... 8.7	12	4.6	5	3.5	1	0.1
ZF 9,1	2	400	30	0.35	150	8.5 ... 9.6	15	5.8	5	3.5	1	0.1
ZF 10	2	400	28	0.35	150	9.4 ... 10.6	20	7.0	5	5	1	0.1
ZF 11	2	400	25	0.35	150	10.4 ... 11.6	25	8.1	5	5	1	0.1
ZF 12	2	400	22.5	0.35	150	11.4 ... 12.7	30	9.0	5	7	1	0.1
ZF 13	2	400	20.5	0.35	150	12.5 ... 14.0	40	10.8	5	7	1	0.1
ZF 15	2	400	19	0.35	150	13.8 ... 15.5	55	13.0	5	10	1	0.1
ZF 16	2	400	17	0.35	150	15.3 ... 17.0	60	14.5	5	10	1	0.1
ZF 18	2	400	15	0.35	150	16.8 ... 19.0	80	16.5	5	10	1	0.1
ZF 20	2	400	14	0.35	150	18.8 ... 21.0	80	18.0	5	10	1	0.1
ZF 22	2	400	12.5	0.35	150	20.8 ... 23.0	90	20.5	5	12	1	0.1
ZF 24	2	400	11	0.35	150	22.8 ... 25.6	100	22.0	5	12	1	0.1
ZF 27	2	400	10	0.35	150	25.4 ... 28.6	120	22.0	5	14	1	0.1
ZF 30	2	400	9	0.35	150	28.4 ... 31.6	120	24.5	5	14	1	0.1
ZF 33	2	400	8	0.35	150	31.3 ... 34.5	120	24.5	5	17	1	0.1

[1] *Valid provided that connection leads are kept at T_{amb} = 25°C at a distance of 4 mm from the case.*

SILICON PLANAR Z-DIODES

The stabilized voltages of types ZPD correspond to the international series E24 with a tolerance of ± 5%

type	outline	MAXIMUM RATINGS[1]			TYPICAL CHARACTERISTICS (T_{amb} = 25 °C)					
		P_{tot}[3,4] mW	I_Z[2] mA	I_Z[3] mA	U_Z at I_Z = 5 mA V	r_{zj} at I_Z = 5 mA Ω	r_{zj} at I_Z = 1 mA Ω	α_{UZ} at I_Z = 5 mA 10^{-4}/°C	U_F at I_F = 100 mA V	U_R at I_R = 0.1 μA V
ZPD 2,7	2	430	160	135	2.5 ... 2.9	75 (<83)	<500	−9 ... −4	<1	
ZPD 3	2	430	140	117	2.8 ... 3.2	80 (<90)	<500	−9 ... −3	<1	
ZPD 3,3	2	430	130	109	3.1 ... 3.5	80 (<90)	<500	−8 ... −3	<1	
ZPD 3,6	2	430	120	101	3.4 ... 3.8	80 (<90)	<500	−8 ... −3	<1	
ZPD 3,9	2	430	110	92	3.7 ... 4.1	80 (<90)	<500	−7 ... −3	<1	
ZPD 4,3	2	430	100	85	4.0 ... 4.6	80 (<90)	<500	−6 ... −1	<1	
ZPD 4,7	2	430	90	76	4.4 ... 5.0	70 (<78)	<500	−5 ... +2	<1	
ZPD 5,1	2	430	80	67	4.8 ... 5.4	30 (<60)	<480	−3 ... +4	<1	> 0.8
ZPD 5,6	2	430	70	59	5.2 ... 6.0	10 (<40)	<400	−2 ... +6	<1	> 1
ZPD 6,2	2	430	64	54	5.8 ... 6.6	4.8 (<10)	<200	−1 ... +7	<1	> 2
ZPD 6,8	2	430	58	49	6.4 ... 7.2	4.5 (< 8)	<150	+2 ... +7	<1	> 3
ZPD 7,5	2	430	53	44	7.0 ... 7.9	4 (< 7)	< 50	+3 ... +7	<1	> 5
ZPD 8,2	2	430	47	40	7.7 ... 8.7	4.5 (< 7)	< 50	+4 ... +7	<1	> 6
ZPD 9,1	2	430	43	36	8.5 ... 9.6	4.8 (<10)	< 50	+5 ... +8	<1	> 7
ZPD 10	2	430	40	33	9.4 ... 10.6	5.2 (<15)	< 70	+5 ... +8	<1	> 7.5
ZPD 11	2	430	36	30	10.4 ... 11.6	6 (<20)	< 70	+5 ... +9	<1	> 8.5
ZPD 12	2	430	32	28	11.4 ... 12.7	7 (<20)	< 90	+6 ... +9	<1	> 9
ZPD 13	2	430	29	25	12.4 ... 14.1	9 (<25)	<110	+7 ... +9	<1	>10
ZPD 15	2	430	27	23	13.8 ... 15.6	11 (<30)	<110	+7 ... +9	<1	>11
ZPD 16	2	430	24	20	15.3 ... 17.1	13 (<40)	<170	+8 ... +9.5	<1	>12
ZPD 18	2	430	21	18	16.8 ... 19.1	18 (<50)	<170	+8 ... +9.5	<1	>14
ZPD 20	2	430	20	17	18.8 ... 21.2	20 (<50)	<220	+8 ... +10	<1	>15
ZPD 22	2	430	18	16	20.8 ... 23.3	25 (<55)	<220	+8 ... +10	<1	>17
ZPD 24	2	430	16	13	22.8 ... 25.6	28 (<80)	<220	+8 ... +10	<1	>18
ZPD 27	2	430	14	12	25.1 ... 28.9	30 (<80)	<250	+8 ... +10	<1	>20
ZPD 30	2	430	13	10	28.0 ... 32.0	35 (<80)	<250	+8 ... +10	<1	>22.5
ZPD 33	2	430	12	9	31.0 ... 35.0	40 (<80)	<250	+8 ... +10	<1	>25

[1] *Valid provided that connection leads are kept at the specified ambient temperature at a distance of 8 mm from the case.*
[2] *T_{amb} = 25 °C.*
[3] *T_{amb} = 45 °C.*
[4] *P_{tot} = 500 mW at T_L <25 °C.*

SILICON MEDIUM POWER Z-DIODES

The stabilized voltages of types ZY correspond to the international series E24 with a tolerance of ± 5 %.

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_{amb} = 25 °C)						
		P_{tot}[1] W	I_Z (T_{amb} = 45 °C) max. mA	R_{thja}[1] °C/W	T_j max. °C	U_Z V	r_{Zj} max. Ω f = 1 kHz	α_{UZ} mV/°C	at I_Z mA	U_R I_R = 1 µA min. V	U_F max. V	at I_F A
ZY 7,5	5	1.32	120	95	150	7.0 ... 7.9	2	3.5	100	2	1	0.5
ZY 8,2	5	1.32	110	95	150	7.7 ... 8.7	2	4.5	100	3.5	1	0.5
ZY 9,1	5	1.32	100	95	150	8.5 ... 9.6	4	5.5	50	3.5	1	0.5
ZY 10	5	1.32	90	95	150	9.4 ... 10.6	4	6.6	50	5	1	0.5
ZY 11	5	1.32	82	95	150	10.4 ... 11.6	7	7.3	50	5	1	0.5
ZY 12	5	1.32	75	95	150	11.4 ... 12.7	7	8.2	50	7	1	0.5
ZY 13	5	1.32	67	95	150	12.4 ... 14.1	10	9.2	50	7	1	0.5
ZY 15	5	1.32	60	95	150	13.8 ... 15.8	10	10.5	50	10	1	0.5
ZY 16	5	1.32	56	95	150	15.3 ... 17.1	15	12	25	10	1	0.5
ZY 18	5	1.32	53	95	150	16.8 ... 19.1	15	13.2	25	10	1	0.5
ZY 20	5	1.32	48	95	150	18.8 ... 21.2	15	14.0	25	10	1	0.5
ZY 22	5	1.32	44	95	150	20.8 ... 23.3	15	15	25	12	1	0.5
ZY 24	5	1.32	40	95	150	22.8 ... 25.6	15	17	25	12	1	0.5
ZY 27	5	1.32	35	95	150	25.1 ... 28.9	15	19	25	14	1	0.5
ZY 30	5	1.32	31	95	150	28.0 ... 32.0	15	24	25	14	1	0.5
ZY 33	5	1.32	28	95	150	31.0 ... 35	15	28	25	17	1	0.5

[1] *Valid provided that connection leads are kept at T_{amb} = 25 °C at a distance of 10 mm from the case.*

RECTIFIERS AND THYRISTORS

SILICON RECTIFIERS

type	outline	MAXIMUM RATINGS						TYPICAL CHARACTERISTICS (T_j = 25 °C)			notes
		U_{RRM} V	U_{RSM} V	I_{FAV} A	I_{FRM} A	I_{FSM} A	T_j °C	U_F max. V at	I_F A	I_R max. at U_{RRM} μA	
BA 157	5	400		0.4	2	15	150	1.3	1	5	t_{rr} = 0,3 μs
BA 158	5	600		0.4	2	15	150	1.3	1	5	I_F = I_R = 10 mA
BA 159	5	1000		0.4	2	15	150	1.3	1	5	at I_R = 1 mA
BY 127	5	1250		1	10	40	150	1.5	5	10	
BY 133	5	1300	1600	1	10	50	150	1.3	2	5	
BY 134	5	600	800	1	10	50	150	1.3	2	5	
BY 135	5	150	200	1	10	50	150	1.3	2	5	
BY 238	6	1200	1500	0.8	8	60	150	1	0.5	10[2]	
BYX 42/100T	7	100	120	10[1]	40[1]	80[1]	155	1.1	10	60	
BYX 42/200T	7	200	240	10[1]	40[1]	80[1]	155	1.1	10	60	
BYX 42/300T	7	300	360	10[1]	40[1]	80[1]	155	1.1	10	60	
BYX 42/400T	7	400	480	10[1]	40[1]	80[1]	155	1.1	10	60	

[1] *Applied in half-wave rectifier circuits in case R_{thja} = 30 °C/W is not exceeded. Applied up to T_{amb} 85 °C in case the rectifier is mounted on 2 mm Al. heatsink of 12.5 × 12.5 cm^2.*
[2] *At U_R = 900 V.*

type	outline	MAXIMUM RATINGS						TYPICAL CHARACTERISTICS (T_j = 25 °C)			
		U_{RRM} V	U_{RSM} V	I_{FAV} ($T_{amb} \leq 75$ °C) A	I_{FRM} A	I_{FSM} A	T_j °C	U_F max. V at	I_F A	I_R max. μA at	U_R V
1N 4001	5	100	100	1	10	50	175	1.3	2	5	100
1N 4002	5	200	200	1	10	50	175	1.3	2	5	200
1N 4003	5	400	400	1	10	50	175	1.3	2	5	400
1N 4004	5	600	600	1	10	50	175	1.3	2	5	600
1N 4005	5	800	800	1	10	50	175	1.3	2	5	800
1N 4006	5	1000	1000	1	10	50	175	1.3	2	5	1000
1N 4007	5	1300	1300	1	10	50	175	1.3	2	5	1300

SILICON THYRISTORS

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_j = 25 °C)					
		U_{DRM} V	U_{RRM} V	I_{TAV} A	I_{TSM} (I_{TRM}) A	I_H max. mA	t_q µs	I_{GT} max. mA	at U_D V	U_{GT} max. V	at U_D V
ST 103/1	8	100	100	3[2]	(15)	20	40<100	20	6	3	6
ST 103/2	8	200	200	3[2]	(15)	20	40<100	20	6	3	6
ST 103/3	8	300	300	3[2]	(15)	20	40<100	20	6	3	6
ST 103/4	8	400	400	3[2]	(15)	20	40<100	20	6	3	6
ST 103/5	8	500	500	3[2]	(15)	20	40<100	20	6	3	6
ST 103/6	8	600	600	3[2]	(15)	20	40<100	20	6	3	6
ST 108/1	9	100	100	6[3]	(50)	80	60	100	12	3	12
ST 108/2	9	200	200	6[3]	(50)	80	60	100	12	3	12
ST 108/3	9	300	300	6[3]	(50)	80	60	100	12	3	12
ST 108/4	9	400	400	6[3]	(50)	80	60	100	12	3	12
ST 108/5	9	500	500	6[3]	(50)	80	60	100	12	3	12
ST 108/6	9	600	600	6[3]	(50)	80	60	100	12	3	12
T0,8N/ 50T	10	50	50	1[1]	15	17	40	10	10	3	10
T0,8N/100T	10	100	100	1[1]	15	17	40	10	10	3	10
T0,8N/200T	10	200	200	1[1]	15	17	40	10	10	3	10
T0,8N/300T	10	300	300	1[1]	15	17	40	10	10	3	10
T0,8N/400T	10	400	400	1[1]	15	17	40	10	10	3	10
T3N/ 50T	11	50	50	3[1]		20	40	15	10	3	10
T3N/100T	11	100	100	3[1]		20	40	15	10	3	10
T3N/200T	11	200	200	3[1]		20	40	15	10	3	10
T3N/300T	11	300	300	3[1]		20	40	15	10	3	10
T3N/400T	11	400	400	3[1]		20	40	15	10	3	10
T15N/ 50T	12	50	50	15[1]	120	50		40	10	3	10
T15N/100T	12	100	100	15[1]	120	50		40	10	3	10
T15N/200T	12	200	200	15[1]	120	50		40	10	3	10
T15N/300T	12	300	300	15[1]	120	50		40	10	3	10
T15N/400T	12	400	400	15[1]	120	50		40	10	3	10

[1] T_{case} = *max 60 °C.*
[2] T_{case} = *max 75 °C.*
[3] T_{case} = *max 80 °C.*

TRANSISTORS

GERMANIUM LOW- AND MEDIUM-POWER ALLOY TRANSISTORS

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} mW	R_{thjc} (R_{thja}) °C/mW	f_T MHZ	h_{21E}	bei I_C mA	U_{CEsat} max. V	bei I_C A	
AC 125	P	13	32	12	10	0.2	90	163[3]	(0.4)	1.7	75 ... 175	50			F = 4 (max. 10) dB
AC 126	P	13	32	12	10	0.2	90	163[3]	(0.4)	2.3	125 ... 350	50			
AC 125(z)[1]	P	13	32	12	12	0.25	75	125[3]	(0.4)	1.5	50 ... 250	50			F = 4 (max. 10) dB
AC 125F(z)[1]	P	13	32	12	12	0.25	75	125[3]	(0.4)	1.5	50 ... 250	50			F = 3 (max. 5) dB
AC 125K(z)[1]	P	13	40	12	12	0.25	75	125[3]	(0.4)	1.5	50 ... 250	50	0.25	0.1	t_{on} = 0,6 µs, t_{off} = µs
AC 125U(z)[1]	P	13	60	12	12	0.25	75	125[3]	(0.4)	1.5	50 ... 250	50	0.25	0.1	
AC 128[2]	P	14	32	16	10	1	90	1000[4]	0.05	1.5	50 ... 250	300	0.6	1	complementary pair
AC 176	N	14	32	18	10	1	90	1000[4]	0.05	3	50 ... 250	300	0.6	1	
AC 128K[2]	P	16	32	16	10	1	90	1000[4]	0.055	1.5	50 ... 250	300	0.6	1	complementary pair
AC 176K	N	16	32	18	10	1	90	1000[4]	0.055	3	50 ... 250	300	0.6	1	
AC 128(z)[1]	P	14	32	16	10	1	75	1000[4]	0.05	1.5	50 ... 250	300	0.6	1	
AC 187	N	14	25	15	10	1	90	1000[4]	0.05	3	100 ... 500	300	0.6	1	complementary pair
AC 188	P	14	25	15	10	1	90	1000[4]	0.05	1.5	100 ... 500	300	0.6	1	
AC 187K	N	16	25	15	10	1	90	1000[4]	0.055	3	100 ... 500	300	0.6	1	complementary pair
AC 188K	P	16	25	15	10	1	90	1000[4]	0.055	1.5	100 ... 500	300	0.6	1	

[1] *Also available in groups* h_{21E}.
[2] *Also available in matched pairs.*
[3] T_{amb} = 25 °C.
[4] T_{case} = 60 °C.

AC 125U(z)

V	VI
50 ... 100	75 ... 150

AC 125(z), AC 125F(z), AC 125K(z), AC 128(z)

V	VI	VII
50 ... 100	75 ... 150	125 ... 250

GERMANIUM ALLOY POWER TRANSISTORS

type	structure	outline	MAXIMUM RATINGS U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot}[3] W	R_{thjc} °C/W	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	h_{21E}	at I_C A	U_{CEsat} max. V	at I_C A	notes
ASZ 15[1]	P	18	100	60	40	8	90	26	2	0.2	15 ... 30	6	0.4	10	t_{on} = max. 27 μs, t_{off} = max. 30 μs, at I_C = 1 A
ASZ 16[1]	P	18	60	32	20	8	90	26	2	0.25	35 ... 80	6	0.4	10	
ASZ 17[1]	P	18	60	32	20	8	90	26	2	0.22	20 ... 45	6	0.4	10	
ASZ 18[1]	P	18	100	32	40	8	90	26	2	0.22	20 ... 65	6	0.4	10	
ASZ 1015[1]	P	18	80	60	40	6	90	22.5	2	0.2	15 ... 30	6	1	6	
ASZ 1016[1]	P	18	60	32	20	6	90	22.5	2	0.25	35 ... 80	6	1	6	
ASZ 1017[1]	P	18	60	32	20	6	90	22.5	2	0.22	20 ... 45	6	1	6	
ASZ 1018[1]	P	18	80	32	40	6	90	22.5	2	0.22	20 ... 65	6	1	6	
OC 26[1, 2]	P	18	40	20	10	3.5	90	22.5	2	0.16	20 ... 55	1	0.8	3	

[1] *Also available in matched pairs.*
[2] *Not recommended for new designs.*
[3] T_{case} *25 °C.*

GERMANIUM MESA TRANSISTORS

type	structure	outline	MAXIMUM RATINGS U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[1] mW	R_{thja} °C/mW	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	G_p dB typ.	G_p dB min.	and F dB typ.	F dB max.	at f MHz	notes
AF 106	P	15	25	18	0.3	10	90	60	0.75	220	17.5	14	5.5	7.5	200	for use in v.h.f.-band to 260 MHz
AF 139	P	15	20	15	0.3	10	90	60	0.75	550	11	9	7	8.2	800	for use in u.h.f.-band to 860 MHz
AF 200[2]	P	17	25		0.3	10	90	145	0.45		29				35	ΔGp = 60 dB at f = 35 MHz for use in i.f. amplifier stages of tv-receivers
AF 201[2]	P	17	25		0.3	10	90	145	0.45		30	28			35	for use in i.f. amplifier stages of tv-receivers

[1] T_{amb} = *25 °C.*
[2] *Not recommended for new designs.*

GERMANIUM MESA TRANSISTORS

type	structure	outline	MAXIMUM RATINGS U_{CES} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[1] mW	R_{thja} °C/mW	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	G_p dB typ.	G_p dB min.	and F dB typ.	F dB max.	at f MHz	notes
AF 239	P	15	20	15	0.3	10	90	60	0.75	700	14.5	11.5	5	6	800	for use in u.h.f. preamplifier stages to 900 MHz
AF 239S	P	15	20	15	0.3	10	90	60	0.75	780	15	12.5		5	800	for use in diode tuners to 900 MHz
AF 279	P	26	20	15	0.3	10	90	60	0.6	780	16			5	800	for use in u.h.f.-band to 900 MHz
AF 279S	P	26	20	15	0.3	10	90	60	0.6	820	20			4.5	800	for use in diode tuners to 900 MHz
AF 280	P	26	20	15	0.3	10	90	60	0.6	550	14		7		800	for use in u.h.f.-band to 900 MHz
AF 379	P	26		13	0.3	20	90	100	0.45	1250	18		5		800	u.h.f./v.h.f. high current input and mixer stages

[1] T_{amb} = 45 °C

SILICON MEDIUM-POWER EPITAXIAL PLANAR TRANSISTORS FOR USE IN AMPLIFIERS AND SWITCHING CIRCUITS

type	structure	outline	MAXIMUM RATINGS U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[1] mW	R_{thjc} (R_{thja}) °C/mW	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	h_{21E}	at I_C mA	U_{CEsat} max. V	at I_C mA
BFY 33	N	20	50	24	7	500	200	2.6	0.06	100	>40	150	1.5	150
BFY 34 2N 1613	N	20	75	30	7	500	200	2.6	0.06	100	40 … 120	150	1.5	150
BFY 46 2N 1711	N	20	75	30	7	500	200	2.6	0.06	120	100 … 300	150	1.5	150
BSX 32	N	22	65	40	6	1000	200	0.8[2]	(0.21)	300	60 … 150	100	0.85	1000
KFY 16	P	20	75	45	5	600	200	2.6	0.06	90	85 (>40)	150	1	150

[1] T_{case} = 25 °C.
[2] T_{amb} = 25 °C.

SILICON LOW-POWER EPITAXIAL PLANAR TRANSISTORS FOR USE IN AMPLIFIERS AND SWITCHING CIRCUITS

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[1] mW	R_{thjc} (R_{thja}) °C/mW	f_T MHz	h_{21E}	at I_C mA	U_{CEsat} max. V	at I_C mA	
BF 173	N	15	40	25	4	25	175	260	(0.65)	550	>38	7			G_{pb} = 26 dB at 36.4 MHz
BF 198	N	24	40	30	4	25	150	300	(0.35)	400	30 ... 80	4			
BF 199	N	24	40	25	4	25	150	300	(0.35)	550	>40	7			
BF 200	N	15	30	20	3	20	175	150	(1)	380	15	3			
BF 224	N	24	45	30	4	50	150	250	(0.34)	450	>30	7			C_{12e} = 0.3 pF
BF 225	N	24	50	40	4	50	150	250	(0.4)	700	75 (>30)	4			C_{12e} = 0.28 pF
BF 240	N	24	40	40	4	25	150	300	(0.42)	430	67 ... 220	1			
BF 241	N	24	40	40	4	25	150	300	(0.42)	400	36 ... 125	1			
BF 257	N	22	160	160	5	100	175	750	0.03	90	>25	30	1	30	
BF 258	N	22	250	250	5	100	175	750	0.03	90	>25	30	1	30	
BF 259	N	22	300	300	5	100	175	750	0.03	90	>25	30	1	30	

[1] T_{amb} = 25 °C.

SILICON UHF EPITAXIAL PLANAR TRANSISTORS

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHRACTERISTICS (T_j = 25 °C)						notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[1] mW	R_{thja} °C/mW	f_T MHz	G_p dB typ.	G_p dB min.	and F dB typ.	F dB max.	at f MHz	
BF 479	P	26	30	25	3	50	150	160	0.6	1800	15	12.5	4.5	6.0	800	
BF 506	P	19	40	35	4	30	150	300	0.35	500	15	17	3.0	4.0	200	
BF 509	P	19	40	35	4	30	150	300	0.35	750	15	17	2.6		200	
BF 679	P	26	40	35	3	30	150	160	0.6	880	10.5	12	3.5	5.0	800	
BF 679S	P	26	40	35	3	30	150	160	0.6	1100	11	13	3.5	4.2	800	
BF 680	P	26	40	35	3	30	150	160	0.6	750	10	12	4.8	6.0	800	

[1] T_{amb} = 25 °C

SILICON LOW-POWER EPITAXIAL PLANAR TRANSISTORS FOR GENERAL PURPOSES

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} (U_{CES}) V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot} mW	R_{thjc} (R_{thja}) °C/mW	f_T MHz	h_{21E}	at I_C mA	U_{CEsat} max. V	at I_C mA	
BC 107	N	21	(50)	45	6	100	175	300[1]	(0.5)	250	120 ... 460	2	0.2	10	F = 2 (max. 10) dB
BC 108	N	21	(30)	20	5	100	175	300[1]	(0.5)	250	120 ... 800	2	0.2	10	F = 2 (max. 10) dB
BC 109	N	21	(30)	20	5	50	175	300[1]	(0.5)	300	180 ... 800	2	0.2	10	F = max. 4 dB
BC 177	P	21	(50)	45	5	100	175	300[1]	(0.5)	130	120 ... 460	2	0.2	10	F = max. 10 dB
BC 178	P	21	(30)	25	5	100	175	300[1]	(0.5)	130	120 ... 800	2	0.2	10	F = max. 10 dB
BC 179	P	21	(25)	20	5	50	175	300[1]	(0.5)	130	180 ... 800	2	0.2	10	F = max. 4 dB
BC 182	N	19	60	50	6	200	150	300[1]	(0.42)	>150	120 ... 460	2	0.25	10	F = 2 (max. 10) dB
BC 183	N	19	45	30	6	200	150	300[1]	(0.42)	>150	120 ... 800	2	0.25	10	F = 2 (max. 10) dB
BC 184	N	19	45	30	6	200	150	300[1]	(0.42)	>150	180 ... 800	2	0.25	10	F = max. 4 dB
BC 212	P	19	60	50	5	200	150	300[1]	(0.42)	>200	120 ... 460	2	0.25	10	F = 2.5 (max. 10) dB
BC 213	P	19	45	30	5	200	150	300[1]	(0.42)	>200	120 ... 800	2	0.25	10	F = 2.5 (max. 10) dB
BC 214	P	19	45	30	5	200	150	300[1]	(0.42)	>200	180 ... 800	2	0.25	10	F = max. 4 dB
BC 237	N	19	(50)	45	6	100	150	300[1]	(0.42)	250	120 ... 460	2	0.2	10	F = 2 (max. 10) dB
BC 238	N	19	(30)	20	5	100	150	300[1]	(0.42)	250	120 ... 800	2	0.2	10	F = 2 (max. 10) dB
BC 239	N	19	(30)	20	5	50	150	300[1]	(0.42)	300	180 ... 800	2	0.2	10	F = max. 4 dB
BC 250	P	19	20	20	5	100	150	300[2]	(0.42)	180	80 ... 600	2	0.4	30	
BC 307	P	19	(50)	45	5	100	150	300[1]	(0.42)	200	120 ... 460	2	0.2	10	F = max. 10 dB
BC 308	P	19	(30)	25	5	100	150	300[1]	(0.42)	200	120 ... 800	2	0.2	10	F = max. 10 dB
BC 309	P	19	(25)	20	5	50	150	300[1]	(0.42)	200	180 ... 800	2	0.2	10	F = max. 4 dB
BC 327	P	23	(50)	45	5	800	150	500[1]	0.17	100	100 ... 630	100	0.7	500	
BC 328	P	23	(30)	25	5	800	150	500[1]	0.17	100	100 ... 630	100	0.7	500	
BC 337	N	23	(50)	45	5	800	150	500[1]	0.17	100	100 ... 630	100	0.7	500	
BC 338	N	23	(30)	25	5	800	150	500[1]	0.17	100	100 ... 630	100	0.7	500	
BC 413	N	19	45	30	5	100	150	300[1]	(0.42)	250	180 ... 800	2	0.25	10	F = max. 2.5 dB
BC 414	N	19	50	45	5	100	150	300[1]	(0.42)	250	180 ... 460	2	0.25	10	F = max. 2.5 dB

1 T_{amb} = 25 °C.

2 *Valid provided that connection leads are kept at T_{amb} = 25 °C at a distance of 2 mm from the case.*

SILICON LOW-POWER EPITAXIAL PLANAR TRANSISTORS FOR GENERAL PURPOSES

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} (U_{CES}) V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot} W	R_{thjc} (R_{thja}) °C/mW	f_T MHz	h_{21E} bei	I_C mA	U_{CEsat} max. V	bei I_C A	
BC 415	P	19	45	35	5	100	150	0.3[1]	(0.42)	200	180 ... 800	2	0.25	10	F = max. 2 dB
BC 416	P	19	50	45	5	100	150	0.3[1]	(0.42)	200	180 ... 460	2	0.25	10	F = max. 2 dB
BC 546	N	19	80	65	6	100	150	0.5[1]	(0.25)	300	70 ... 450	2	0.25	10	F = max. 10 dB
BC 547	N	19	50	45	6	100	150	0.5[1]	(0.25)	300	70 ... 450	2	0.25	10	F = max. 10 dB
BC 548	N	19	30	30	5	100	150	0.5[1]	(0.25)	300	70 ... 800	2	0.25	10	F = max. 10 dB
BC 549	N	19	30	30	5	100	150	0.5[1]	(0.25)	250	200 ... 800	2	0.25	10	F = max. 4 dB
BC 550	N	19	50	45	5	100	150	0.5[1]	(0.25)	250	200 ... 800	2	0.25	10	F = max. 3 dB
BC 556	P	19	80	65	5	100	150	0.5[1]	(0.25)	150	70 ... 450	2	0.3	10	F = 2 (max. 10) dB
BC 557	P	19	50	45	5	100	150	0.5[1]	(0.25)	150	70 ... 450	2	0.3	10	F = 2 (max. 10) dB
BC 558	P	19	30	30	5	100	150	0.5[1]	(0.25)	150	70 ... 800	2	0.3	10	F = 2 (max. 10) dB
BC 559	P	19	30	30	5	100	150	0.5[1]	(0.25)	150	110 ... 800	2	0.3	10	F = max. 4 dB
BC 560	P	19	50	45	5	100	150	0.5[1]	(0.25)	150	110 ... 800	2	0.3	10	F = max. 2 dB
BC 635	N	25	45	45	5	1000	150	1[1]	(0.156)	50	40 ... 236	150	0.5	500	also available in matched pairs: BC 635/BC 636 BC 637/BC 638 BC 639/BC 640
BC 636	P	25	45	45	5	1000	150	1[1]	(0.156)	50	40 ... 236	150	0.5	500	
BC 637	N	25	60	60	5	1000	150	1[1]	(0.156)	50	40 ... 150	150	0.5	500	
BC 638	P	25	60	60	5	1000	150	1[1]	(0.156)	50	40 ... 150	150	0.5	500	
BC 639	N	25	80	80	5	1000	150	1[1]	(0.156)	50	40 ... 150	150	0.5	500	
BC 640	P	25	80	80	5	1000	150	1[1]	(0.156)	50	40 ... 150	150	0.5	500	
BCY 58	N	21	(32)	32	7	200	200	1[2]	0.15	250	120 ... 630	2	0.35	10	t_{on} = 85 ns, t_{off} = 480 ns at I_C = 10 mA
BCY 59	N	21	(45)	45	7	200	200	1[2]	0.15	250	120 ... 630	2	0.35	10	
BCY 78	P	21	(32)	32	5	200	200	1[2]	0.15	180	120 ... 630	2	0.25	10	
BCY 79	P	21	(45)	45	5	200	200	1[2]	0.15	180	120 ... 460	2	0.25	10	

[1] T_{amb} = 25 °C.
[2] T_{case} = 25 °C.

The types indicated on the previous page are also available in groups according to their D. C. forward current transfer ratio h_{21E}, in compliance with the tables below.
Measured at operating point $U_{CE} = 5V$, $I_C = 2$ mA

Character of group h_{21E}:	A	B	C
h_{21E}	120 ... 220	180 ... 460 (80 ... 250)	380 ... 800 (180 ... 600)
npn-types	BC 107, BC 182, BC 237 BC 108, BC 183, BC 238	BC 107, BC 182, BC 237, BC 413 BC 108, BC 183, BC 238, BC 414 BC 109, BC 184, BC 239	BC 108, BC 183, BC 238, BC 413 BC 109, BC 184, BC 239
npn-types	BC 177, BC 212, BC 307 BC 178, BC 213, BC 308	BC 177, BC 212, BC 307, BC 415 BC 178, BC 213, BC 308, BC 416 BC 179, BC 214, BC 309, (BC 250)	BC 178, BC 213, BC 308, BC 415 BC 179, BC 214, BC 309, (BC 250)
h_{21E}	110 ... 220	200 ... 450	420 ... 800
npn-types	—	BC 549, BC 550	BC 549, BC 550
npn-types	BC 559, BC 560	BC 559, BC 560	BC 559, BC 560

Character of group h_{21E}:	VII	VIII	IX	X
h_{21E}	120 ... 220	180 ... 310	250 ... 460	380 ... 630
npn-types	BCY 58, BCY 59	BCY 58, BCY 59	BCY 58, BCY 59	BCY 58, BCY 59
Typ pnp	BCY 78, BCY 79	BCY 78, BCY 79	BCY 78, BCY 79	BCY 78

Character of group h_{21E}:	VI	A	B	C
h_{21E}	70 ... 130	110 ... 220	200 ... 450	420 ... 800
npn-types	BC 546, BC 547, BC 548	BC 546, BC 547, BC 548	BC 546, BC 547, BC 548	BC 548
pnp-types	BC 556, BC 557, BC 548	BC 556, BC 557, BC 558	BC 556, BC 557, BC 558	BC 558

Measured at operating point $U_{CE} = 2V$, $I_C = 150$ mA

Character of group h_{21E}:	6	10	16
h_{21E}	40 ... 95	67 ... 150	106 ... 236
Typ npn	BC 635, BC 637, BC 639	BC 635, BC 637, BC 639	BC 635
pnp-types	BC 636, BC 638, BC 640	BC 636, BC 638, BC 640	BC 636

SILICON MEDIUM-POWER TRANSISTORS FOR USE IN AMPLIFIERS

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} W	R_{thjc} °C/W	f_T MHz	h_{21E} at	I_C A	U_{CEsat} max. V	at I_C A	
BC 300	N	22	120	80	7	0.5	175	6[1]	25	120	Gr. 4: 40... 80	0.15	0.5	0.15	also available in matched pairs: BC 301/BC 303 BC 302/BC 304
BC 301	N	22	90	60	7	0.5	175	6[1]	25	120	Gr. 4: 40... 80	0.15	0.5	0.15	
BC 302	N	22	60	45	7	0.5	175	6[1]	25	120	Gr. 5: 70...140	0.15	0.5	0.15	
BC 303	P	22	85	60	7	0.5	175	6[1]	25	75	Gr. 6: 120...240	0.15	0.65	0.15	
BC 304	P	22	60	45	7	0.5	175	6[1]	25	75		0.15	0.65	0.15	
BC 211	N	22	80	40	5	1	175	4.25[1]	35	> 50	Gr. 6: 40...100	0.15	1	1	also available in matched pairs: BC 211/BC 313 BC 211A/BC 313 A
BC 211A	N	22	100	60	5	1	175	4.25[1]	35	> 50	Gr. 10: 63...160	0.15	1	1	
BC 313	P	22	60	40	5	1	175	4.25[1]	35	> 50	Gr. 16: 100...250	0.15	1	1	
BC 313A	P	22	80	60	5	1	175	4.25[1]	35	> 50		0.15	1	1	
BD 135	N	27	45	45	5	1	150	8[2]	10	> 50	40...250	0.15	0.5	0.5	also available in matched pairs: BD 135/BD 136 BD 137/BD 138 BD 139/BD 140
BD 137	N	27	60	60	5	1	150	8[2]	10	> 50	40...160	0.15	0.5	0.5	
BD 139	N	27	80	80	5	1	150	8[2]	10	> 50	40...160	0.15	0.5	0.5	
BD 136	P	27	45	45	5	1	150	8[2]	10	> 50	40...250	0.15	0.5	0.5	
BD 138	P	27	60	60	5	1	150	8[2]	10	> 50	40...160	0.15	0.5	0.5	
BD 140	P	27	80	80	5	1	150	8[2]	10	> 50	40...160	0.15	0.5	0.5	
BD 165	N	27	45	45	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	also available in matched pairs: BD 165/BD 166 BD 167/BD 168 BD 169/BD 170
BD 166	P	27	45	45	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	
BD 167	N	27	60	60	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	
BD 168	P	27	60	60	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	
BD 169	N	27	80	80	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	
BD 170	P	27	80	80	5	1.5	150	20[1]	6.25	> 3	>40	0.15	0.5	0.5	
BD 233	N	27	45	45	5	2	150	25[1]	5	> 3	>25	1	0.6	1	also available in matched pairs: BD 233/BD 234 BD 235/BD 236 BD 237/BD 238
BD 235	N	27	60	60	5	2	150	25[1]	5	> 3	>25	1	0.6	1	
BD 237	N	27	80	80	5	2	150	25[1]	5	> 3	>25	1	0.6	1	
BD 234	P	27	45	45	5	2	150	25[1]	5	> 3	>25	1	0.6	1	
BD 236	P	27	60	60	5	2	150	25[1]	5	> 3	>25	1	0.6	1	
BD 238	P	27	80	80	5	2	150	25[1]	5	> 3	>25	1	0.6	1	

[1] T_{case} = *25 °C.*
[2] T_{case} = *70 °C.*

SILICON EPITAXIAL PLANAR TRANSISTORS FOR USE IN AMPLIFIERS AND SWITCHING CIRCUITS

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} W	R_{thjc} (R_{thja}) °C/W	f_T MHz	h_{21E}	at I_C mA	U_{CEsat} max. V	at I_C mA	
2N 2218	N	22	60	30	5	0.8	175	3[1]	50	>250	40 ... 120	150	0.4	150	2N 2218A, 2N 2219A,
2N 2218A	N	22	75	40	6	0.8	175	3[1]	50	>250	40 ... 120	150	0.3	150	2N 2221A, 2N 2222A:
2N 2219	N	22	60	30	5	0.8	175	3[1]	50	>250	100 ... 300	150	0.4	150	$t_{on} \leq$ 35 ns,
2N 2219A	N	22	75	40	6	0.8	175	3[1]	50	>300	100 ... 300	150	0.3	150	$t_{off} \leq$ 285 ns
2N 2221	N	21	60	30	5	0.8	175	1.8[1]	83	>250	40 ... 120	150	0.4	150	at I_C = 150 mA
2N 2221A	N	21	75	40	6	0.8	175	1.8[1]	83	>250	40 ... 120	150	0.3	150	
2N 2222	N	21	60	30	5	0.8	175	1.8[1]	83	>250	100 ... 300	150	0.4	150	
2N 2222A	N	21	75	40	6	0.8	175	1.8[1]	83	>300	100 ... 300	150	0.3	150	
2N 2368 (BSX 19)	N	21	40	15	4.5	0.2	200	0.36[2]	(480)	400	20 ... 60	10	0.25	10	$t_{on} \leq$ 12 ns, $t_{off} \leq$ 15 ns at I_C = 10 mA
2N 2369 (BSX 20)	N	21	40	15	4.5	0.2	200	0.36[2]	(480)	600	40 ... 120	10	0.25	10	$t_{on} \leq$ 12 ns, $t_{off} \leq$ 18 ns
2N 2369A	N	21	40	15	4.5	0.2	200	0.36[2]	(480)	500	40 ... 120	10	0.2	10	at I_C = 10 mA
2N 2894	P	21	12	12	4	0.2	200	0.36[2]	(480)	>400	40 ... 150	30	0.5	100	$t_{on} \leq$ 60 ns, $t_{off} \leq$ 90 ns at I_C = 30 mA
2N 2904	P	22	60	40	5	0.6	200	3[1]	58	>200	40 ... 120	150	0.4	150	
2N 2904A	P	22	60	60	5	0.6	200	3[1]	58	>200	40 ... 120	150	0.4	150	
2N 2905	P	22	60	40	5	0.6	200	3[1]	58	>200	100 ... 300	150	0.4	150	
2N 2905A	P	22	60	60	5	0.6	200	3[1]	58	>200	100 ... 300	150	0.4	150	$t_{on} \leq$ 45 ns,
2N 2906	P	21	60	40	5	0.6	200	1.8[1]	97	>200	40 ... 120	150	0.4	150	$t_{off} \leq$ 100 ns
2N 2906A	P	21	60	60	5	0.6	200	1.8[1]	97	>200	40 ... 120	150	0.4	150	at I_C = 150 mA
2N 2907	P	21	60	40	5	0.6	200	1.8[1]	97	>200	100 ... 300	150	0.4	150	
2N 2907A	P	21	60	60	5	0.6	200	1.8[1]	97	>200	100 ... 300	150	0.4	150	
PN 2218/PN 2221	N	19	60	30	5	0.8	150	0.625[2]	125	>250	40 ... 120	150	0.4	150	PN 2218A, PN 2219A,
PN 2218A/PN 2221A	N	19	75	40	6	0.8	150	0.625[2]	125	>250	40 ... 120	150	0.3	150	PN 2221A, PN 2222A:
PN 2219/PN 2222	N	19	60	30	5	0.8	150	0.625[2]	125	>250	100 ... 300	150	0.4	150	$t_{on} \leq$ 35 ns,
PN 2219A/PN 2222A	N	19	75	40	6	0.8	150	0.625[2]	125	>300	100 ... 300	150	0.3	150	$t_{off} \leq$ 285 ns at I_C = 150 mA
PN 2904/PN 2906	P	19	60	40	5	0.6	150	0.625[2]	125	>200	40 ... 120	150	0.4	150	$t_{on} \leq$ 45 ns,
PN 2904A/PN 2906A	P	19	60	60	5	0.6	150	0.625[2]	125	>200	40 ... 120	150	0.4	150	$t_{off} \leq$ 100 ns
PN 2905/PN 2907	P	19	60	40	5	0.6	150	0.625[2]	125	>200	100 ... 300	150	0.4	150	at I_C = 150 mA
PN 2905A/PN 2907A	P	19	60	60	5	0.6	150	0.625[2]	125	>200	100 ... 300	150	0.4	150	
PN 2369	N	19	40	15	4.5	0.2	150	0.625[2]	125	600	40 ... 120	10	0.25	10	$t_{on} \leq$ 12 ns, $t_{off} \leq$ 18 ns
2N 5769	N	19	40	15	4.5	0.2	150	0.625[2]	125	600	40 ... 120	10	0.2	10	at I_C = 10 mA

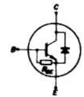
[1] T_{case} = 25 °C.
[2] T_{amb} = 70 °C.

SILICON HIGH-POWER TRANSISTORS FOR USE IN AMPLIFIERS

type	structure	outline	MAXIMUM RATINGS U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} W	R_{thjc} °C/W	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	h_{21E}	at I_C A	U_{CEsat} max. V	at I_C A	notes
BDX 18	P	18	100	60	7	15	200	117[1]	1.5	>4	20 ... 70	4	1.1	4	also available in matched pairs
BDX 18N	P	18	70	60	7	15	200	117[1]	1.5	>4	20 ... 70	4	1.1	4	
BDY 73	N	18	100	60	7	15	200	117[1]	1.5	>0.8	50 ... 150	4	1.1	4	also available in matched pairs
BUY 12	N	18	210	80	5	10	150	70[3]	1.5	26	>10	8	1.7	8	
BUY 12T	N	18	200	80	6	10	155	50[2]	1.5	12	>10	8	1.7	8	
2N 3055	N	18	100	60	7	15	200	117[1]	1.5	0.8	20 ... 70	4	1.1	4	also available in matched pairs
2N 3442	N	18	160	140	7	10	200	117[1]	1.5	>0.8	20 ... 70	3	1	3	

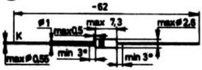
[1] T_{case} = 25 °C. [2] T_{case} = 70 °C. [3] T_{case} = 35 °C.

SILICON HIGH-VOLTAGE POWER TRANSISTORS FOR USE IN SWITCHING CIRCUITS

type	structure	outline	MAXIMUM RATINGS U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} W	R_{thjc} °C/W	TYPICAL CHARACTERISTICS (T_j = 25 °C) f_T MHz	h_{21E}	at I_C mA	U_{CEsat} max. V	at I_C mA	notes
BU 104	N	18	150	10	7	200	85	2	10	10 ... 50	5	2.5	7	BU 104D, BU 109D 
BU 104D	N	18	150	7	7	200	85	2	10	< 7	7	2.5	7	
BU 109	N	18	120	10	10	200	85	2	10	<20	7	2	7	
BU 109D	N	18	120	10	10	200	85	2	10	< 7	7	2	7	
BU 126	N	18	300	6	3	125	30	2.5	21	15 ... 60	1	0.5...5	4	
BU 126A	N	18	250	6	3	125	30	2.5	21	15 ... 60	1	0.5...5	4	
BU 326	N	18	375	10	6	150	60	1.67	6	15	2.5	3	4	
BU 326A	N	18	400	10	6	115	60	1.67	6	15	2.5	3	4	
BU 204	N	18	600	5	2.5	115	10	2.5	7.5	< 2	2	5	2	
BU 205	N	18	700	5	2.5	115	10	2.5	7.5	< 2	2	5	2	
BU 207	N	18	600	5	5	115	12.5	1.6	7	< 2.25	4.5	5	4.5	
BU 208	N	18	700	5	5	115	12.5	1.6	7	< 2.25	4.5	5	4.5	
BU 209	N	18	800	5	4	115	12.5	1.6	7	< 2.25	3	5	3	

OUTLINES OF TRANSISTORS, DIODES AND RECTIFIERS

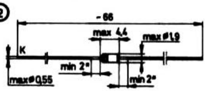
①



* *Not to be soldered.*

DO-7

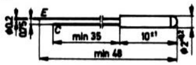
②



* *Not to be soldered.*

DO-35

③



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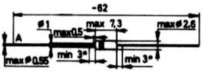
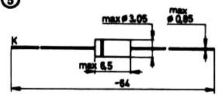


* *Not to be soldered.*

DO-7

⑤



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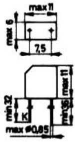

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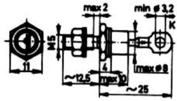

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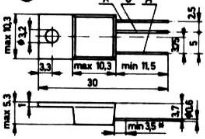

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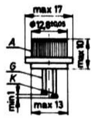

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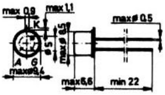
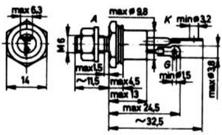


similar to TO-39

⑪



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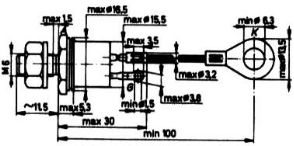

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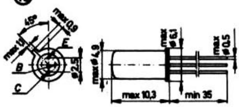
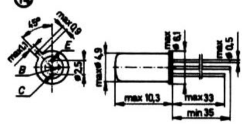


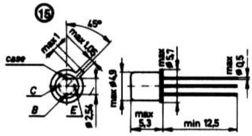
TO-1

⑭



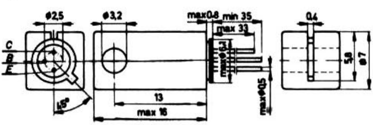
TO-1

⑮



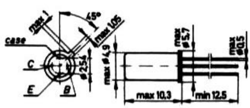
TO-72

⑯



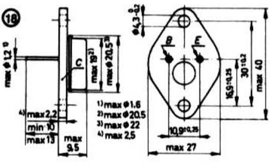
TO-1 + heat conducting block

⑰



TO-72

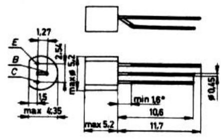
(18)



1) 2) 3) 4):
BUY 12, BUY 12T
2) 3):
BDX 18
BDX 18N
BDY 73
2N 3055
2N 3442
BU-Transistors

TO-3

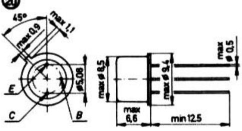
(19)



* Not to be soldered.

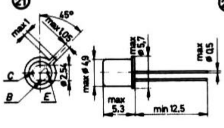
TO-92Z

(20)



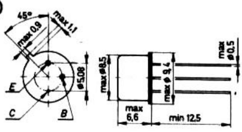
TO-5

(21)



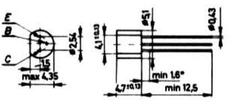
TO-18

(22)



TO-39

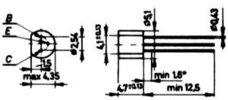
(23)



* Not to be soldered.

TO-92

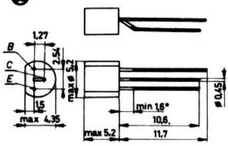
(24)



* Not to be soldered.

TO-92

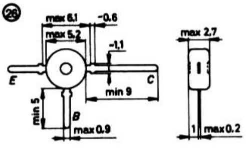
(25)



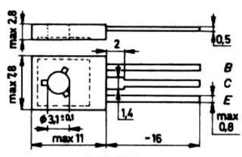
* Not to be soldered.

TO-927

(26)

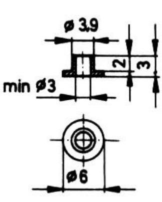


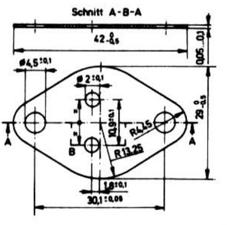
(27)

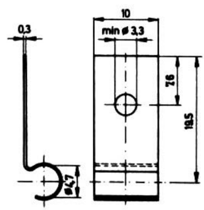


SOT-32

ACCESSOIRES







VA-M168/B
insulating bush for TO-3

CL-M024/C
insulating washer for TO-3

HL-M613/A
heat sink for TO-1

TTL DIGITAL INTEGRATED CIRCUITS

SSI AND MSI TTL INTEGRATED CIRCUITS

The standard TTL devices are medium speed, small and medium scale integrated circuits useful for a wide variety of digital system applications. The standard TTL features good noise immunity, high fan-out, and good drive capability. These products are available in plastic DIP packages.

Operating temperatures T_{amb} = 0...70 °C
Supply voltage U_{CC} = 5 V ± 5%

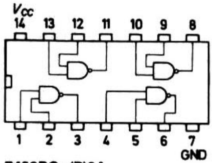
Type	Function
7400PC	Quad 2-Input NAND-Gate, standard output
7401PC	Quad 2-Input NAND-Gate, with open-collector output (5.5 V)
7402PC	Quad 2-Input NOR-Gate, standard output
7403PC	Quad 2-Input NAND-Gate, with open-collector output (5.5 V)
7404PC	Hex Inverter, standard output
7405PC	Hex Inverter, with open-collector output (5.5 V)
7406PC	Hex Inverter/Buffer/Driver with open-collector output (30 V)
7407PC	Hex Buffer/Driver with open-collector output (30 V)
7408PC	Quad 2-Input AND-Gate, push-pull output
7409PC	Quad 2-Input AND-Gate, with open-collector output (5.5 V)
7410PC	Triple 3-Input NAND-Gate, standard output
7411PC	Triple 3-Input AND-Gate, standard output
7412PC	Triple 3-Input NAND-Gate, with open-collector output (5.5 V)
7413PC	Dual 4-Input Schmitt-triggered NAND-Gate, standard output
7414PC	Hex Schmitt-Trigger Inverter
7416PC	Hex Inverter/Driver with open-collector output (15 V)
7417PC	Hex Buffer/Driver with open-collector output (15 V)
7420PC	Dual 4-Input NAND-Gate, standard output
7421PC	Dual 4-Input AND-Gate, standard output
7423PC	Dual 4-Input NOR-Gate with strobe and expander input
7425PC	Dual 4-Input NOR-Gate with strobe input, standard output
7426PC	Quad 2-Input Interface NAND-Gate, with open-collector output (15 V)
7427PC	Triple 3-Input NOR-Gate, standard output
7430PC	Single 8-Input NAND-Gate, standard output
7432PC	Qaud 2-Input OR-Gate, push-pull output
7437PC	Quad 2-Input NAND-Buffer Gate, push-pull output
7438PC	Quad 2-Input NAND-Buffer Gate, with open-collector output (5.5 V)
7439PC	Quad 2-Input NAND-Buffer Gate, with open-collector output
7440PC	Dual 4-Input NAND-Buffer Gate
7441PC	BCD-to-Decimal Decoder, with transistor output stages for driving numerical indicator tubes
7442PC	BCD-to-Decimal Decoder, standard output
7443PC	Excess 3-to-Decimal Decoder, standard output
7444PC	Excess 3 Gray-to-Decimal Decoder, standard output
7445PC	BCD-to-Decimal Decoder/Driver with open-collector output (30 V, 80 mA)

Type	Function
7446PC	BCD-to-Seven Segment Decoder/Driver with open-collector output (30 V, 40 mA)
7447PC	BCD-to-Segment Decoder/Driver with open-collector output (15 V, 40 mA)
7448PC	BCD-to-Seven Segment Decoder/Driver
7449PC	BCD-to-Seven Segment Decoder, with open-collector-output
7450PC	Dual 2-Wide, 2-Input AND-OR-INVERT-Gate, standard output (expandable by 7460PC)
7451PC	Dual 2-Wide, 2-Input AND-OR-INVERT-Gate, standard output
7453PC	4-Wide, 2-Input AND-OR-INVERT-Gate, standard output (expandable by 7460PC)
7454PC	4-Wide, 2-Input AND-OR-INVERT-Gate, standard output
7460PC	Dual 4-Input Expander
7470PC	DC-Clocked J-K Flip-Flop, one $\overline{J}$-input, one $\overline{K}$-input, two J-inputs, two K-inputs, standard output
7472PC	J-K Master-Slave Flip-Flop with three J-inputs, and three K-inputs, standard outputs
7473PC	Dual J-K Master-Slave Flip-Flop, with separate Clears and Clocks standard outputs
7474PC	Dual D-Flip-Flop, standard outputs
7475PC	Quad D-Flip-Flop, standard outputs
7476PC	Dual J-K Master-Slave Flip-Flop, with separate Clears and Clocks standard outputs
7477PC	4-Bit bistable Latch
7480PC	1-Bit Full Adder, standard outputs
7482PC	2-Bit Full Adder, standard outputs
7483PC	4-Bit Full Adder with carry
7485PC	4-Bit Magnitude Comparator
7486PC	Quad 2-Input Exclusive OR-Gate, standard outputs
7490PC	Decade Counter, standard outputs
7491PC	8-Bit Shift Register, data serial-in and serial-out, standard outputs
7492PC	Divide by 12 Counter (divide by two and divide by six), standard outputs
7493PC	4-Bit Binary Counter, standard outputs
7494PC	4-Bit Shift Register, data serial-in or parallel-in and serial-out
7495PC	4-Bit Shift Register, data-in and data-out serial or parallel, standard outputs
7496PC	5-Bit Shift Register, data-in and data-out serial or parallel
7497PC	Synchronous Programmable 6-Bit Binary Counter
74104PC	J-K Master-Slave Flip-Flop, three J-inputs, three K-inputs, one JK-input, push-pull outputs
74105PC	J-K Master-Slave Flip-Flop, two J-inputs, two K-inputs, one $\overline{J}$-input and one $\overline{K}$-input, one JK-input, push-pull outputs
74107PC	Dual J-K Master-Slave Flip-Flops with separate Clears and Clocks
74109PC	Dual J-K Positive-Edge-Triggered Flip-Flop with Present and Clears Flip-Flop, standard outputs
74116PC	Dual 4-Bit Latches with Clear
74121PC	Monostable Multivibrator, standard outputs
74122PC	Monostable Multivibrator, retriggerable, push-pull outputs

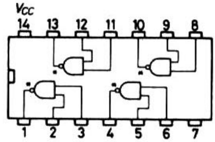
Type	Function
74123PC	Dual Monostable Multivibrator, retriggerable, push-pull outputs
74125PC	Quad 3-State-Buffer (active low enable gate)
74126PC	Quad 3-State-Buffer (active high enable gate)
74132PC	Quad 2-Input POSITIVE-NAND Schmitt Triggers
74141PC	BCD-to-Decimal Decoder with transistor-output stages for driving numerical indicator tubes
74145PC	BCD-to-Decimal Decoder/Driver with open-collector output (15 V, 80 mA)
74148PC	8-Input Priority Encoder
74150PC	16-Bit Dataselector/Multiplexer, push-pull outputs
74151PC	8-Bit-Dataselector/Multiplexer, standard outputs
74152PC	8-Bit Dataselector/Multiplexer, push-pull outputs
74153PC	Dual 4-Bit Dataselector/Multiplexer, standard output
74154PC	4-Line-to-16-Line Decoder/Demultiplexer
74155PC	Dual 2-Line-to-4-Line-Decoder/Demultiplexer, standard output
74156PC	Dual 2-Line-to-4-Line-Decoder/Demultiplexer, with open-collector output (5,5 V, 16 mA)
74157PC	Quad 2-Bit-Dataselector/Multiplexer, push-pull output
74160PC	Synchronous Decade Counter with direct Clear, push-pull outputs
74161PC	Synchronous 4-Bit Binary Counter with direct Clear, push-pull outputs
74162PC	Synchronous Decade Counter with synchronous Clear, push-pull outputs
74163PC	Synchronous 4-Bit Binary Counter with synchronous clear, push-pull outputs
74164PC	Synchronous 8-Bit Shift Register with direct clear, data serial-in and parallel-out, push-pull outputs
74165PC	Synchronous 8-Bit Shift Register, data parallel-in and serial-out, push-pull outputs
74166PC	Synchronous 8-Bit Shift Register, data parallel-in and serial-out
74167PC	Synchronous Programmable Decade Counter
74170PC	16-Bit Register File, organized as 4 words of 4 bits each
74174PC	Hex D-Flip-Flop with Clear
74175PC	Quad D-Flip-Flop with Clear
74176PC	Asynchronous Decade Counter
74177PC	Asynchronous Binary Counter
74178PC	4-Bit Shift Right Register, data parallel-in and parallel out
74179PC	4-Bit Shift Right Register with Clear, data parallel-in and parallel-out
74180PC	8-Bit Odd/Even Parity Generator/Checker
74181PC	4-Bit Arithmetic Logic Unit with External Carry Lookahead
74182PC	Carry Lookahead Generator for 74181PC
74190PC	Synchronous Decade Up/Down Counter, push-pull outputs
74191PC	Synchronous Binary Up/Down Counter, push-pull outputs
74192PC	Synchronous Decade Up/Down Counter, standard outputs
74193PC	Synchronous 4-Bit Binary Up/Down Counter, standard outputs
74194PC	4-Bit Shift Register for both shifting directions, data-in serial or parallel data-out parallel, push-pull outputs
74195PC	4-Bit Shift Right Register, data serial-in or parallel-in and parallel-out, push-pull output

Type	Function
74196PC	Asynchronous 4-Bit Decade Counter with direct Clear
74197PC	Asynchronous 4-Bit Binary Counter with direct Clear
74198PC	8-Bit Shift Register for both shifting directions, data-in parallel, data-out parallel
74199PC	8-Bit Shift Register, data-in parallel, data-out parallel
74248PC	BCD-to-Seven Segment Decoder for driving a display
74259PC	8-Bit Addressable Latch
74279PC	4-Bit $\overline{S}$-$\overline{R}$-Latch
74283PC	4-Bit Full Adder with Carry
74290PC	Asynchronous Decade Counter
74293PC	Asynchronous 4-Bit Binary Counter
74298PC	Quad 2-Input Multiplexers with Storage

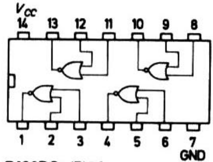
CONNECTION DIAGRAMS-PACKAGE OUTLINE CODES



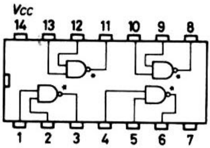
7400PC; (P)9A



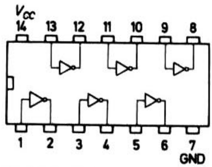
7401PC; (P)9A



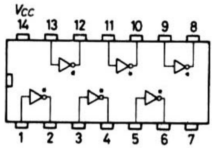
7402PC; (P)9A



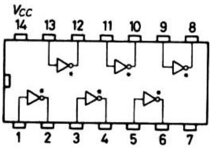
7403PC; (P)9A



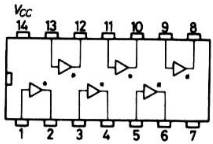
7404PC; (P)9A



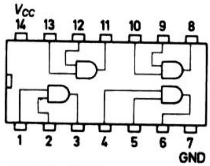
7405PC; (P)9A



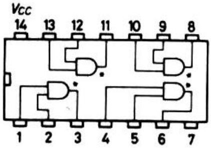
7406PC, 7416PC; (P)9A



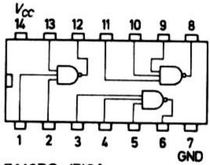
7407PC, 7417PC; (P)9A



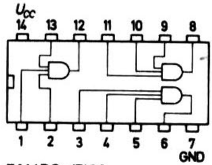
7408PC; (P)9A



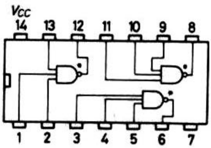
7409PC; (P)9A



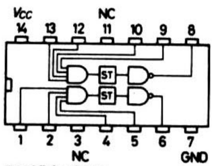
7410PC; (P)9A



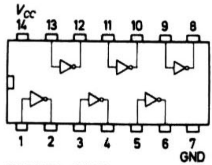
7411PC; (P)9A



7412PC; (P)9A



7413PC; (P)9A



7414PC; (P)9A

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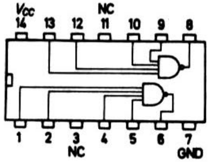
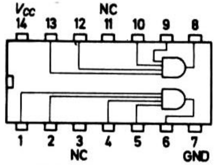
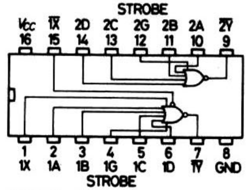


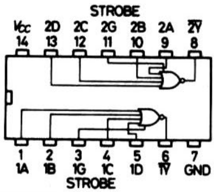
7420PC; (P)9A



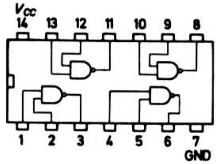
7421PC; (P)9A



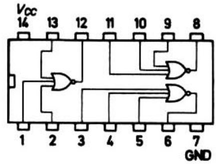
7423PC; (P)9B



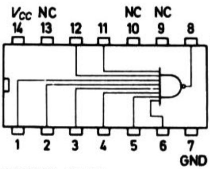
7425PC; (P)9A



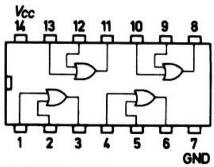
7426PC; (P)9A



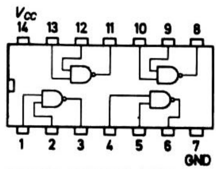
7427PC; (P)9A



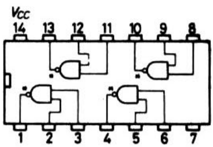
7430PC; (P)9A



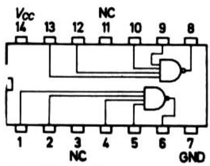
7432PC; (P)9A



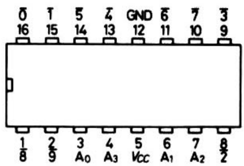
7437PC, 7438PC; (P)9A



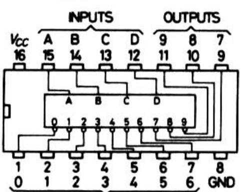
7439PC; (P)9A



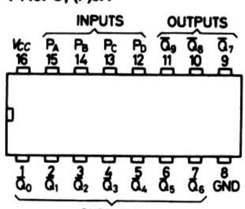
7440PC; (P)9A



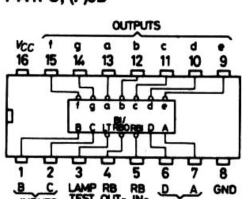
7441PC; (P)9B



7442PC, 7443PC, 7444PC; (P)9B



7445PC, 74145PC; (P)9B



7446PC, 7447PC; (P)9B

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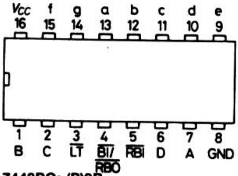
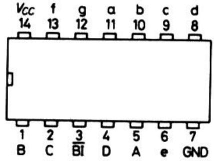


7448PC; (P)9B



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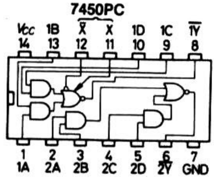

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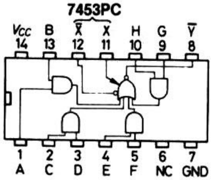
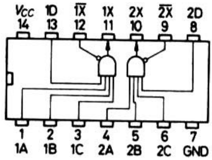
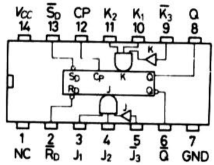


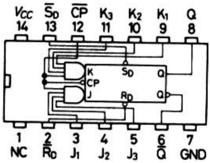
7453PC, 7454PC; (P)9A



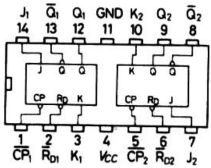
7460PC; (P)9A



7470PC; (P)9A



7472PC; (P)9A



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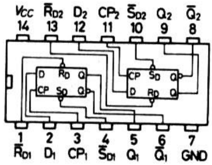

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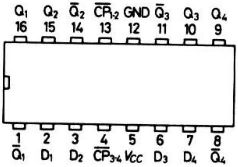

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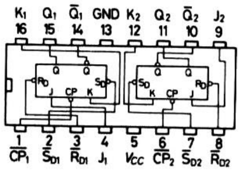

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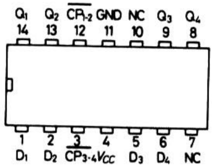

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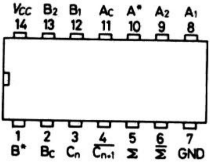

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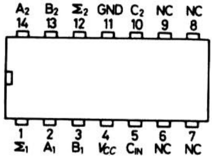

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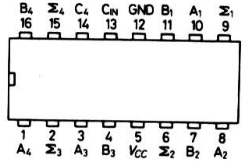

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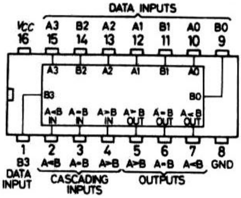

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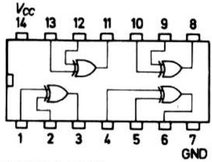

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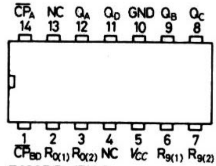
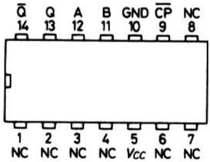


7490PC; (P)9A



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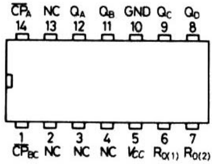

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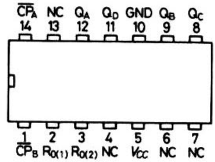

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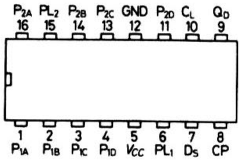

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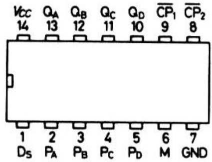

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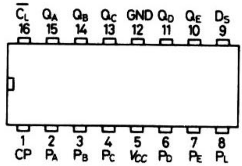

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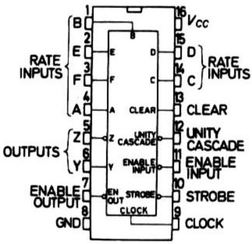

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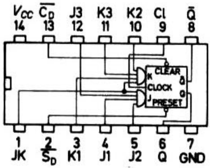

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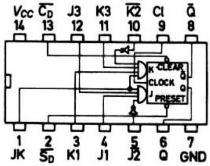

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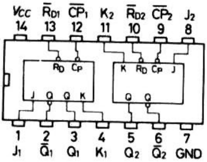

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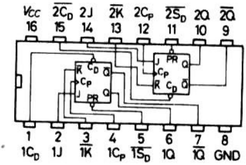

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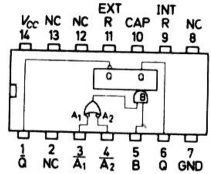
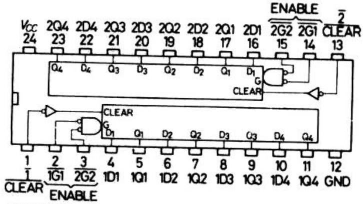
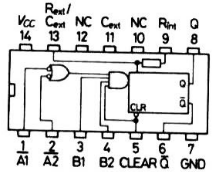


74121PC; (P)9A



74116PC; 9N



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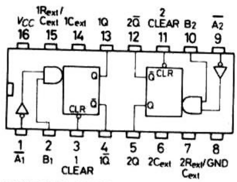

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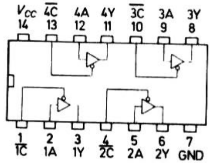

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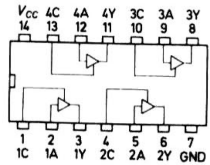

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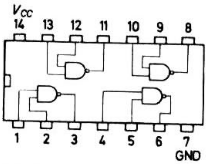

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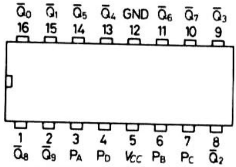

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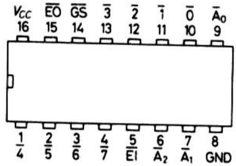

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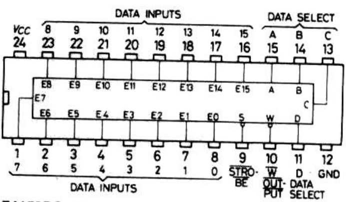

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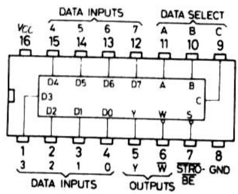

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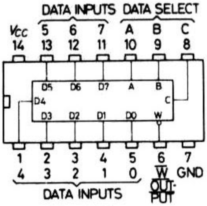

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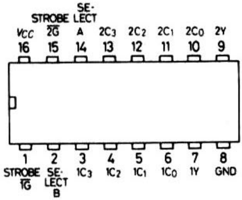

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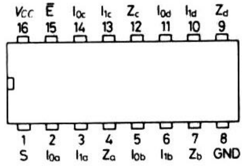

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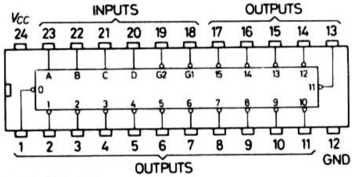
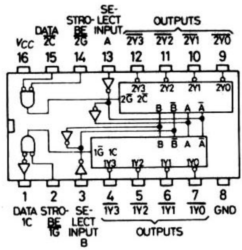
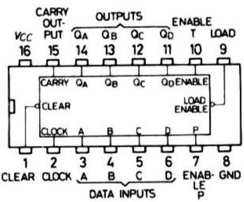


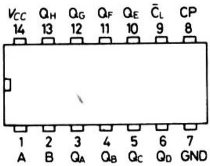
74154PC; 9N



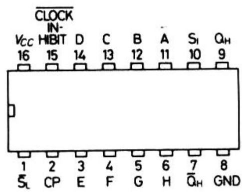
74155PC, 74156PC; (P)9B



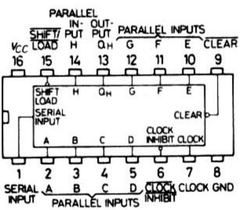
74160PC, 74161PC, 74162PC, 74163PC; (P)9B



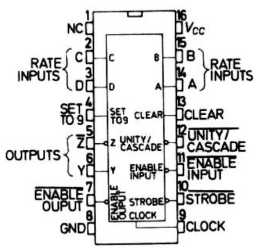
74164PC; (P)9A



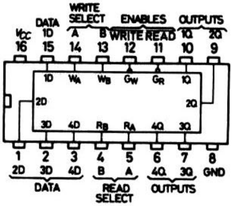
74165PC; (P)9B



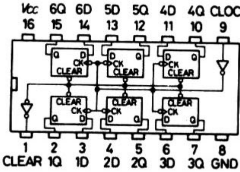
74166PC; (P)9B



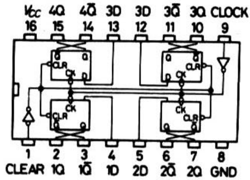
74167PC; (P)9B



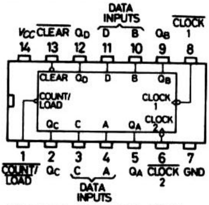
74170PC; (P)9B



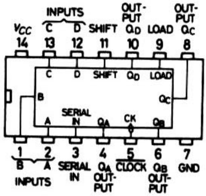
74174PC; (P)9B



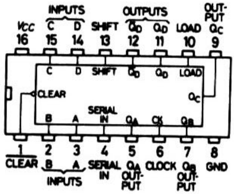
74175PC; (P)9B



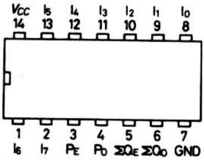
74176PC, 74177PC; (P)9A



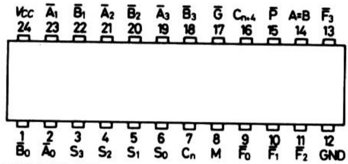
74178PC; (P)9A



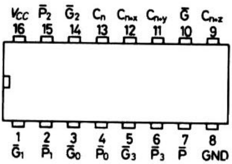
74179PC; (P)9B



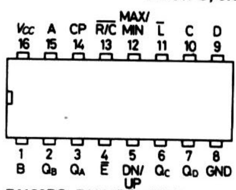
74180PC; (P)9A



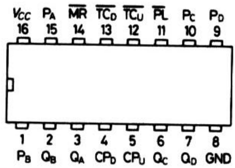
74181PC; 9N



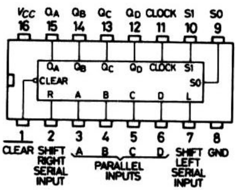
74182PC; (P)9B



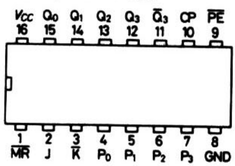
74190PC, 74191PC; (P)9B



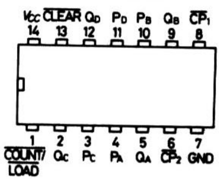
74192PC, 74193PC; (P)9B



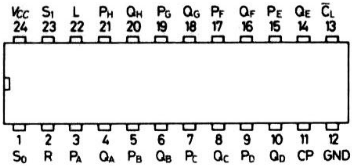
74194PC; (P)9B



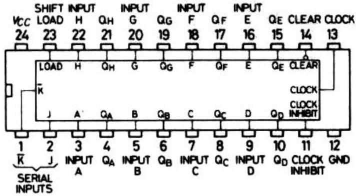
74195PC; (P)9B



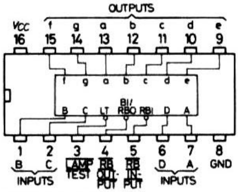
74196PC, 74197PC; (P)9A



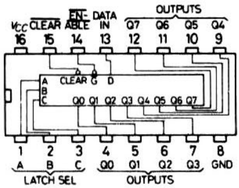
74198PC; 9N



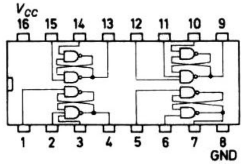
74199PC; 9N



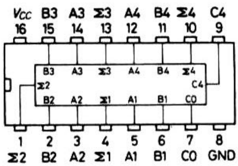
74248PC; (P)9B



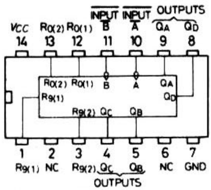
74259PC; (P)9B



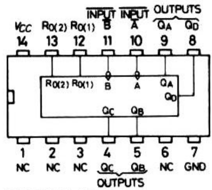
74279PC; (P)9B



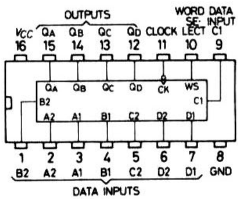
74283PC; (P)9B



74290PC; (P)9A



74293PC; (P)9A

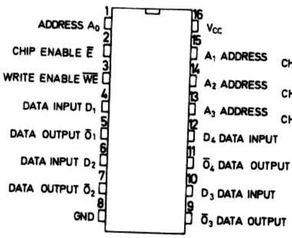


74298PC; (P)9B

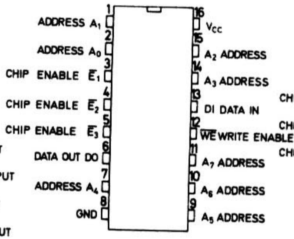
BIPOLAR MEMORIES

Type	Class	Function
TM 101	RAM	16 × 4-Bit, Open Collector Outputs
TM 106	RAM	256 × 1-Bit, 3-State Outputs
TM 107	RAM	256 × 1-Bit, Open Collector Outputs
TM 188PC	PROM	32 × 8-Bit, Schottky, Open Collector Outputs
TM 601	PROM	256 × 4-Bit, Schottky, Open Collector Outputs
TM 621	PROM	256 × 4-Bit, Schottky, 3-State Outputs
TM 622	PROM	512 × 4-Bit, Schottky, 3-State Outputs
TM 624	PROM	512 × 8-Bit, Schottky, 3-State Outputs

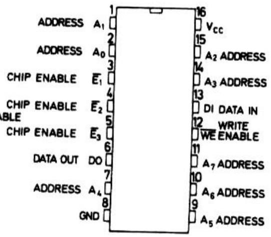
CONNECTION DIAGRAMS — PACKAGE OUTLINE CODES



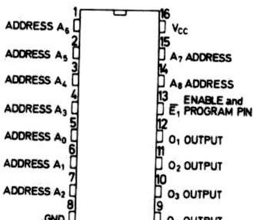
TM 101; (P)9B



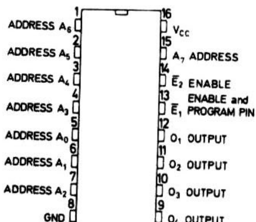
TM 106; (P)9B
TM 107; (P)9B



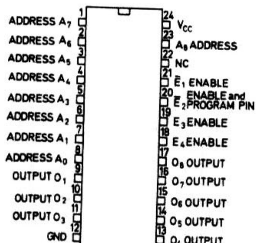
TM 188PC; (P)9B



TM 601, TM 621; (P)9B



TM 622; (P)9B



TM 624;9N

INTERFACE CIRCUITS

Some functional categories of interface circuits are:

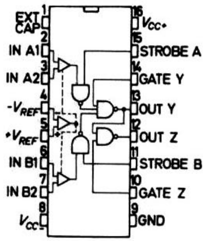
Data Transmission
Memory Driving and Sensing
General Purpose Driving
Level Translation

Design consideration was given to specific requirements in each of these categories, that is why the interface line consists of drivers and receivers varying in configuration, function and complexity.

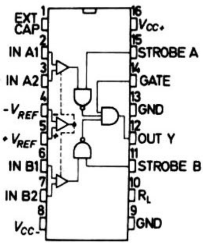
Type	Function
7520PC	Dual-Channel Sense Amplifier with complementary outputs
7521PC	Dual-Channel Sense Amplifier with complementary outputs
7522PC	Dual-Channel Sense Amplifier with open-collector outputs and possbility of the wired-AND-configuration
7523PC	Dual-Channel Sense Amplifier with open-collector outputs and possibility of the wired-AND-configuration
7524PC	Dual-Channel Sense Amplifier with separate outputs
7525PC	Dual-Channel Sense Amplifier with separate outputs
7528PC	Dual-Channel Sense Amplifier with amplifier test points and separate outputs
7529PC	Dual-Channel Sense Amplifier with amplifier test points and separate outputs
7534PC	Dual-Channel Sense Amplifier with open-collector outputs
7535PC	Dual-Channel Sense Amplifier with open-collector outputs
75107PC	Dual Line Receivers with TTL-compatible active pull-up outputs
75108PC	Dual Line Receivers with open-collector outputs and possibility of the wired-AND-configuration
75109PC	Dual Line Driver (6 mA Current Switch)
75110PC	Dual Line Driver (12 mA Current Switch)
75121PC	Dual Line Driver with emitter-follower outputs
75122PC	Triple Line Receiver with TTL-compatible active pull-up outputs
75123PC	Dual Line Driver with emitter-follower outputs
75124PC	Triple Line Receiver with TTL-compatible active pull-up outputs
75150PC	Dual Line Driver with inverting outputs
75154PC	Quad Line Receiver with TTL-compatible active pull-up outputs
75207PC	Dual-Channel Sense Amplifier for MOS-Memories with TTL-compatible active pull-up outputs
75208PC	Dual-Channel Sense Amplifier for MOS-Memories with open-collector outputs and possibility of the wired-AND-configuration
75234PC	Dual-Channel Sense Amplifier with internal decoupling capacitor and inverted separate outputs
75235PC	Dual-Channel Sense Amplifier with internal decoupling capacitor and inverted separate outputs
75325PC	Memory Driver for use with magnetic memories, it contains two 600 miliampere source-switch pairs and two 600 miliampere sink-switch pairs

Type	Function
75450APC	Dual Peripheral Driver (two TTL AND-Gates and two uncommitted transistors)
75460PC	Dual High Voltage High Current Peripheral Driver
75491PC and 75492PC	The 75491PC and 75492PC are designed to be used together with MOS integrated circuits and with common-cathode VLED's in serially adressed multidigit displays. The 75491PC is a Quad Segment Driver with 50 mA source or sink capability, the 75492PC is a Hex Digit Driver with 250 mA sink capability

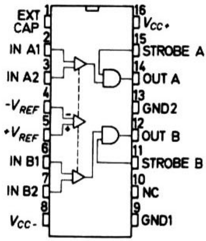
CONNECTION DIAGRAMS — PACKAGE OUTLINE CODES



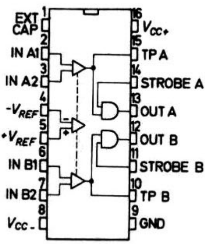
7520PC,
7521PC; (P)9B



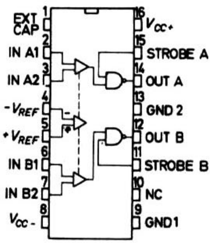
7522PC,
7523PC; (P)9B



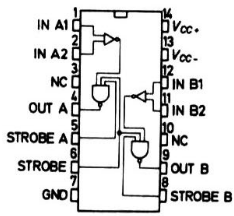
7524PC,
7525PC; (P)9B



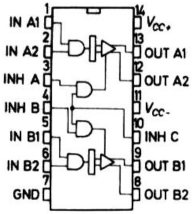
7528PC,
7529PC; (P)9B



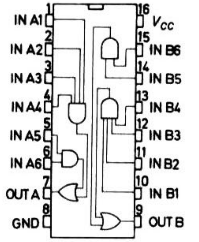
7534PC,
7535PC; (P)9B



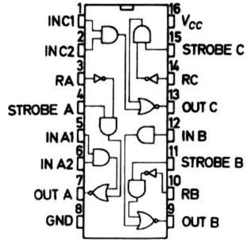
75107APC, 75107BPC,
75108APC, 75108BPC; (P)9A



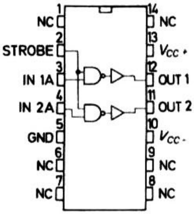
75109PC,
75110PC; (P)9A



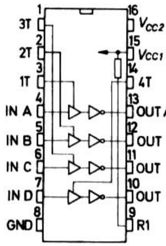
75121PC,
75123PC; (P)9B



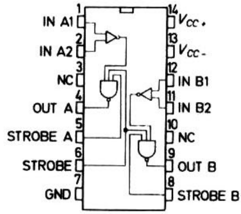
75122PC,
75124PC; (P)9B



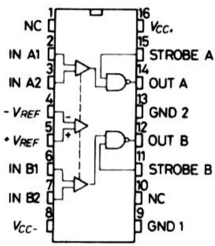
75150PC; (P)9A



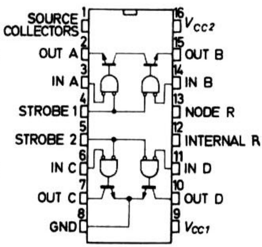
75154PC; (P)9B



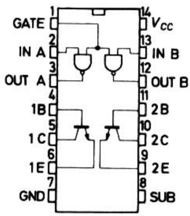
75207PC,
75208PC; (P)9A



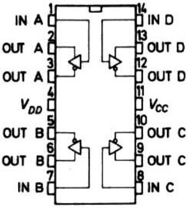
75234PC,
75235PC; (P)9B



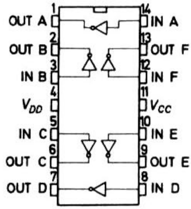
75325PC; (P)9B



75450PC,
75460PC; (P)9A



75491PC; (P)9A



75492PC; (P)9A

LINEAR INTEGRATED CIRCUITS

OPERATIONAL AMPLIFIERS

type	function	supply voltage min. (V)	supply voltage max. (V)	input offset voltage (mV)	input offset volt drift (µV/°C)	common mode range (V)	input offset current (nA)
µA 702PC	Wideband DC amplifier	+ 6 — 3	+ 14 — 7	<5	<20	— 4 + 0.5	<2000
µA 709PC	High-performance operational amplifier	± 9	± 18	<7.5	<20	± 8	< 500
µA 715PC	High-speed operational amplifier	± 6	± 18	<7.5	< 6	± 10	< 250
µA 739PC	Dual low-noise audio preamplifier/operational amplifier	± 4	± 18	<6		± 10	<1000
µA 741PC	Frequency-compensated operational amplifier	± 5	± 18	<6		± 12	< 200
µA 747PC	Dual frequency-compensated operational amplifier	± 5	± 22	<6		± 12	< 200
µA 748PC	High-perfomance operational amplifier	± 5	± 22	<6		± 12	< 200
µA 749PC	Dual audio operational amplifier/ audio preamplifier	± 4	± 18	< 6		± 15	< 750
µA 777PC	Precision operational amplifier	± 5	± 22	< 5		± 12	< 20

COMPARATORS

type	function	supply voltage (V)	input offset voltage (mV)	input offset volt drift (mV/°C)	input offset current (μA)	input voltage range (V)	output voltage (V)	
							min.	max.
μA 710PC	High-speed differential comparator	+ 12, −6	5.0	5.0	< 7.5	± 5	−0.5	+ 3.2
μA 711PC	Dual comparator	+ 12, −6	5.0	5.0	<25	± 5	−0.5	+ 4.5
μA 760PC	High-speed differential comparator	± 4.5... ... ± 6.5	6.0	3.0	< 7.5	± 4	−3	+ 3

VOLTAGE REGULATOR

μA 723PC

- Positive or negative supply operation
- Series, shunt, switching or floating operation
- 0.1% line and load regulation
- Output voltage adjustable from 2 V to 37 V
- Output current: 150 mA

Operating Temperature Range	0°C to + 70 °C
Input Voltage Range	9.5. . .40 V
Ripple Rejection	74 dB
Output Noise Voltage	20 μV_{eff}
Long Term Stability:	0.1%/1000 hrs.

CONSUMER CIRCUITS

μA 720PC AM radio system

The μA 720PC contains two amplifiers, a mixer-oscillator, an AGC detector and a voltage regulator. It is intended for superheterodyne AM receiver applications.

μA 721PC AM/FM IF subsystem

The μA 721PC is a complete AM/FM IF subsystem. It provides AM conversion, AM RF and IF amplification with a wide range of AGC capability; FM IF amplification and the FM detection. The device is extremely versatile; it can be used in many applications including hi-fi radios, table radios, portable radios and car radios.

μA 733PC differential video amplifier

The μA 733PC is a two-stage differential input, differential output video amplifier. Internal series shunt feedback is used to obtain wide bandwidth, low phase distortion, and excellent gain stability. Emitter follower outputs enable the device to drive capacitive loads and all stages are current-source biased to obtain high-power supply and common mode rejection ratios. It offers fixed gains of 10, 100 or 400 without external components, and adjustable gains from 10 to 400 by the use of a single external resistor.

μA 758PC phase locked loop FM stereo multiplex decoder

The μA 758PC decodes an FM stereo multiplex signal into right and left audio channels while inherently suppressing SCA information when it is contained in the composite input signal. Internal functions include automatic mono-stereo mode switching and drive for an external lamp to indicate stereo mode operation.

μA 796PC double-balanced modulator-demodulator

The μA 796PC is a monolithic double-balanced modulator/demodulator. This circuit produces an output voltage which is the product of an input voltage (signal) and a switching function (carrier). Communications applications include modulation and demodulation of AM, SSB, DSB, FSK, FM and phase encoded signals.

μA 3065PC (CA 3065PC) TV sound system

The μA 3065PC contains a multi-stage limiting IF amplifier, dc gain control, FM detector and an audio driver. Excellent sensitivity, high AM rejection and an internally regulated supply, coupled with low external component requirements make the circuit ideally suited for TV sound channels.

μA 3089PC (CA 3089PC) FM-IF limiter,detector,audio preamplifier

The μA 3089PC is a multifunction FM IF detector subsystem. It contains a three-stage FM-IF amplifier, a detector and an audio buffer amplifier. Auxiliary functions of the device include AGC and AFC for the tuner, a muting circuit and a tuning meter circuit.

SAS 6600, SAS 6700 sensitive switching-amplifier for touch-keys

The SAS 6600 and SAS 6700 are especially well suited for an application in radio and TV-sets, as well as in elevators, to perform touch-controlled switching functions.

TAA 550 voltage stabilizer

The TAA 550 circuit is an integrated voltage stabilizer with low temperature coefficient and low differential input resistance. It is primarily intended to provide a supply voltage which is independent of variations in mains supply or temperature, for variable capacitance diodes in radio and television tuners or can be used as a reference element for general purposes.

The TAA 550 is supplied in 3 groups of stabilized voltage:
TAA 550A (for U_{12} range 30...32 V)
TAA 550B (for U_{12} range 32...34 V)
TAA 550C (for U_{12} range 34...36 V)

TAA 691 wideband amplifier, FM detector, audio preamplifier/driver

The TAA 691 contains a multistage wideband IF amplifier/limiter section, an FM-detector stage, a Zener-diode-regulated power supply section and an audio-amplifier section specifically designed to drive directly any type of valve or transistor output stage.

TBA 120AS, TBA 120S, TBA 120U FM-IF-amplifier and demodulator

The TBA 120s are symmetrical 8-stage amplifier with symmetrical coincidence-demodulator for the amplification, limiting and demodulation of frequency-modulated signals, espacially suited for the sound IF-portion in TV-sets and as FM-IF amplifier in radio sets.

TBA 520 PAL TV chroma demodulator

The TBA 520 is a synchronous demodulator for colour video output stages. It is designed for use in colour television receivers, operating on the PAL system. This circuit consists of two synchronous demodulators, a decoding matrix and a PAL switch with internal multivibrator.

TBA 530 RGB matrix preamplifier

The TBA 530 is designed for colour TV receivers incorporating a matrix preamplifier for RGB cathode or grid drive of the picture tube without clamping circuits.

TBA 540 reference combination

The TBA 540 is a reference oscillator circuit for PAL colour television receivers.

TBA 560C luminance and chrominance control combination

The TBA 560C consists of a luminance and a chroma ampilifier. The luminance amplifier input is matched to the delay line. DC contrast, brightness, black level clamping, blanking, and beam current limiting functions are provided by the luminance amplifier portion of the circuit. The chroma amplifier performs functions such as gain controlled amplification, chroma gain control tracked with contrast control, separate saturation control, PAL delay line driver, burst gating and colour killer.

TBA 800, TBA 800A audio power amplifier

The TBA 800 is a monolithic audio power amplifier. The external cooling tabs enable 2.5 W output power to be achieved without external heat sink and 5 W output power using a small area of the pc board coopper as a heat sink.
It is ideally as an audio amplifier in solid state television receivers and other class B audio amplifier applications over a wide range of supply voltage (5—30 V).

TBA 810AS, TBA 810S, TBA 810DS, TBA 810DAS 7 W audio power amplifiers

The TBA 810 offers high output current capability (up to 2.5 A), high efficiency (75% at 6 W output) and very low harmonic and crossover distortion.

TBA 820 audio power amplifier

The TBA 820 is an integrated monolithic audio amplifier in a 14-lead quad in-line plastic package.
It is intended for use as low frequency class B amplifier with wide range of supply voltage: 3 to 16 V.
Main features are: minimum working voltage of 3 V, low quiescent current, low number of external components, good ripple rejection, no cross-over distortion.

TBA 920, TBA 920S television horizontal oscillator

The TBA 920 accepts the composite video signal, separate synchronous pulses (with the added safeguard of noise gating) and provide a synchronous output for the vertical integrator. Also incorporated is the horizontal oscillator along with two phase comparators, one to compare flyback pulses to the oscillator and the other for synchronous phase comparison.

TBA 950, TBA 950:1, TBA 950:2 regulated impulse-generator for transistor-line output stage

Monolithic integrated circuit for pulse separation and line synchronization in TV receivers with transistor line output stage. It comprises the sync separator with noise suppression, the frame pulse integrator, the phase comparator, a switching stage for automatic changeover of noise immunity, the line oscillator with frequency range limiter, a phase control circuit and the output stage. It delivers prepared frame sync pulses for triggering the frame oscillator. The phase comparator may be switched for video recording operation. Due to the large scale of integration few external components are needed.

TBA 970 television video amplifier

The TBA 970 includes a video preamplifier, a d. c. contrast control utilizing a linear potentiometer which can be ganged to the chroma gain control, beam current limiting via contrast. Beam current limiting could be obtained with either positive or negative control voltage. Black level control is achieved by a clamped feedback circuit combined with the brightness control. Emitter follower output can be used to directly drive the video output stage.

TBA 990 PAL TV chroma demodulator

The TBA 990 is a colour demodulator circuit for colour television receivers incorporating two active synchronous demodulators for the R-Y and B-Y chrominance signals, a matrix (producing the G-Y colour difference signal), a PAL phase switch and a flip-flop. It is suitable for DC coupled drive to the picture tube.

TDA 440 television video amplifier

The TDA 440 is a Monolithic Integrated Circuit for Video IF amplifiers for colour and monochrome television receivers.

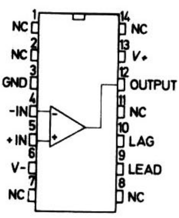
TDA 1170 television video amplifier

The TDA 1170 is a monolithic integrated circuit designed primarily for use in vertical deflection stages of black and white TV receivers with large or small screen and of industrial TV monitors.
The device is supplied in 12-pin plastic power package with the heat sink fins bent for easy insertation into the printed circuit board.

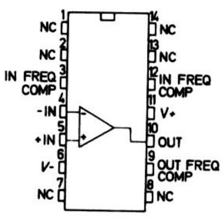
TDA 1190 complete TV sound channel

The TDA 1190 performs all the functions needed for the TV sound channel: IF limiter-amplifier, active low-pass filter, FM detector, DC volume control, AF preamplifier, AF output stage.

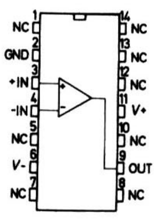
CONNECTION DIAGRAMS — PACKAGE OUTLINE CODES



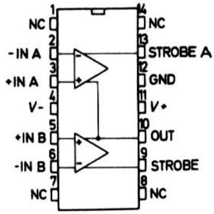
μA 702PC; (P)9A



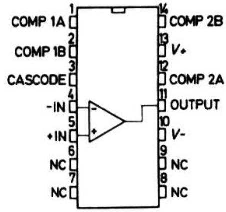
μA 709PC; (P)9A



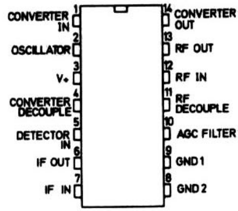
μA 710PC; (P)9A



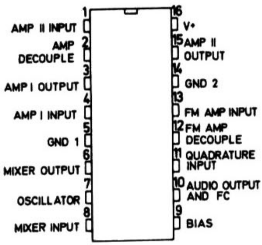
μA 711PC; (P)9A



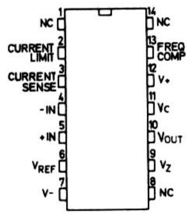
μA 715PC; (P)9A



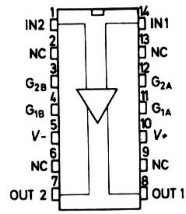
μA 720PC; (P)9A



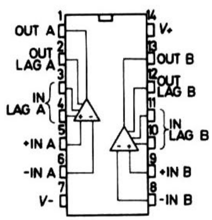
μA 721PC; (P)9B



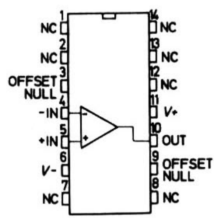
μA 723PC; (P)9A



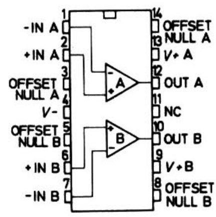
μA 733PC; (P)9A



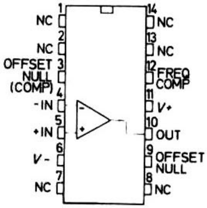
μA 739PC,
μA 749; (P)9A



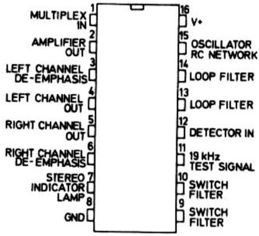
μA 741PC; (P)9A



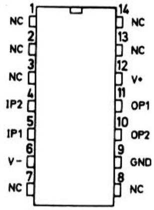
μA 747PC; (P)9A



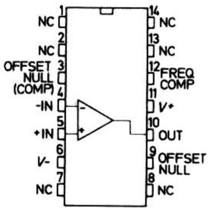
μA 748PC; (P)9A



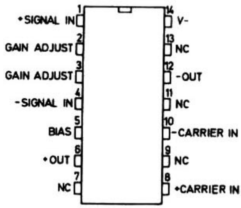
μA 758PC; (P)9B



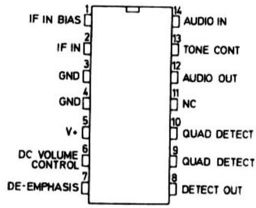
μA 760PC; (P)9A



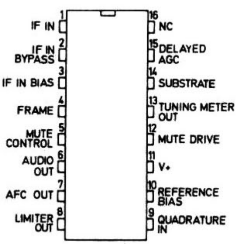
μA 777PC; (P)9A



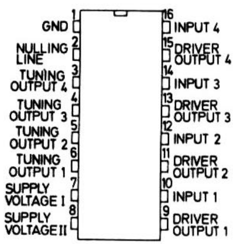
μA 796PC; (P)9A



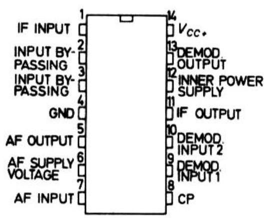
μA 3065PC
(CA 3065PC); (P)9A



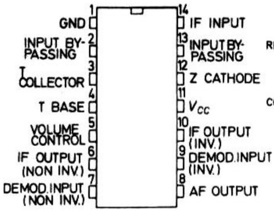
μA 3089PC
(CA 3089PC); (P)9B



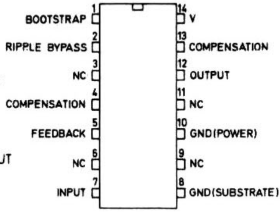
SAS 6600, SAS 6700; (P)9B-E



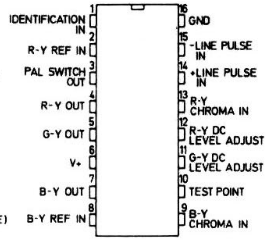
TAA 691; (P)9A-Q



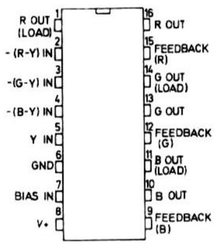
TBA 120AS; 9A-Q
TBA 120S; 9A-E



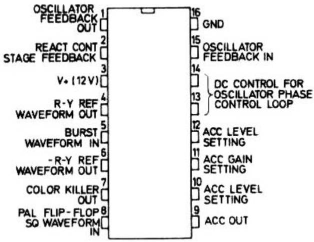
TBA 120U; 9A-Q



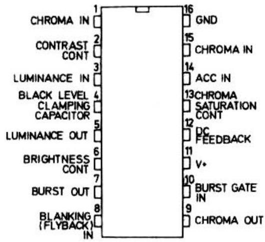
TBA 520; (P)9B-E



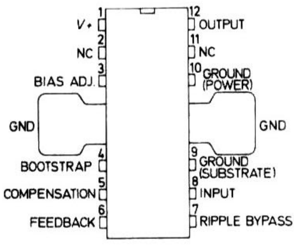
TBA 530; (P)9B-E



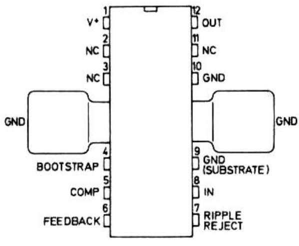
TBA 540; (P)9B-E



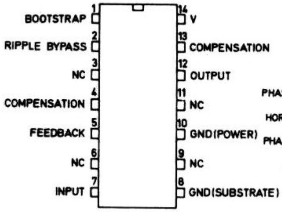
TBA 560C; (P)9B-E



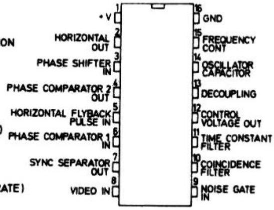
TBA 800; (P3)9W
TBA 800A; (P4)9W



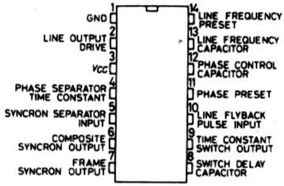
TBA 810S; (P3)9W
TBA 810AS; (P4)9W
TBA 810DS; (P3)9W
TBA 810DAS; (P4)9W



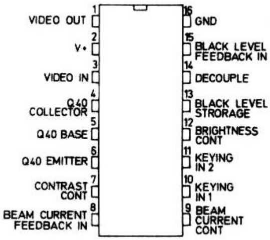
TBA 820; 9A-Q



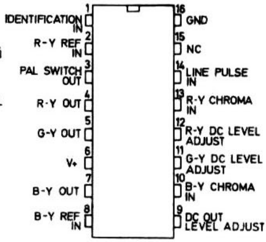
TBA 920, TBA 920S; (P)9B-E



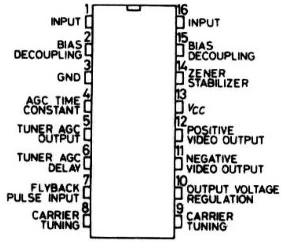
TBA 950; (P)9A



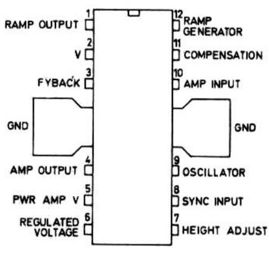
TBA 970; (P)9B-E



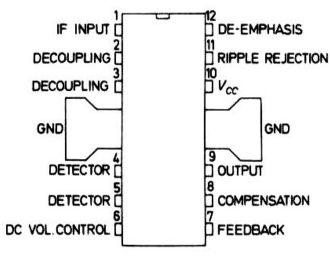
TBA 990; (P)9B-E



TDA 440; (P)9B-E

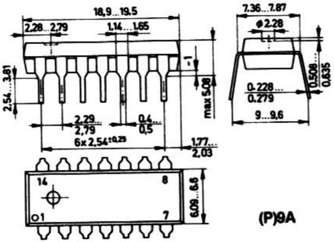


TDA 1170; (P3)9W

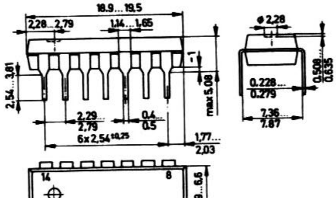


TDA 1190; (P3)9W

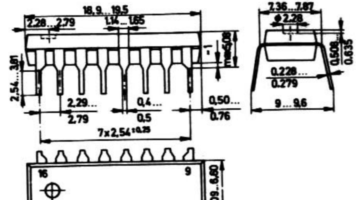
PACKAGE OUTLINES OF INTEGRATED CIRCUITS



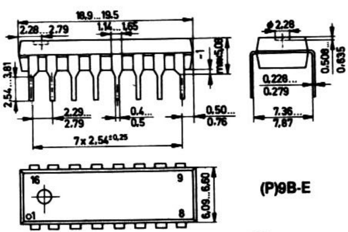
(P)9A



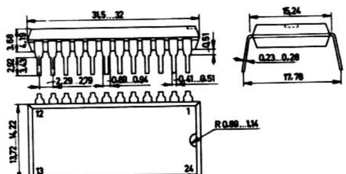
(P)9A-E



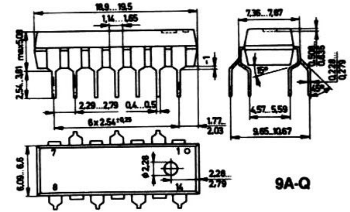
(P)9B



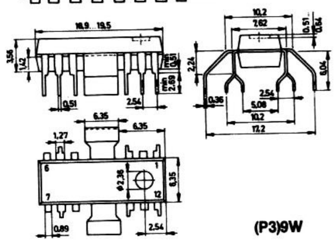
(P)9B-E



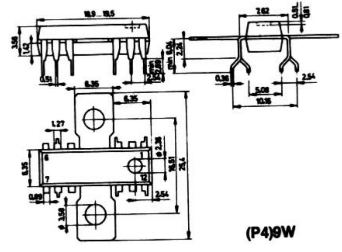
9N



9A-Q



(P3)9W



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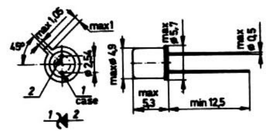

TO-18

INTERCHANGEABILITY GUIDE

The following list includes the TUNGSRAM equivalents to other makes. The comparisons are made on the basis of their typical applications. Minor differences may occur in the characteristics or constructions of the types compared. In such cases it is always necessary to examine the conditions of application in accordance with the detailed catalogue data.

Diodes, Z-diodes, rectifiers and thyristors

TYPE	TUNGSRAM-TYPE
AA 111	AA 119
AA 114	AA 116
AA 121	AA 116
AA 123	AA 119
AA 130	AA 116
AA 131	AA 119
AA 133	AA 132
AA 134	AA 113
AA 138	AA 116
AA 140	AA 119
AA 142	AA 119
AA 143	AA 116
AA 144	AA 118
AAY 11	AA 118
AAY 12	OA 1182
AAY 14	OA 1182
AAY 21	AA 116
AAY 22	AA 116
AAY 27	AAZ 10
AAY 28	AA 118
AAY 30	AA 118
AAY 43	4-AAZ 10
BA 128	BAY 43
BA 133F	1N 4007
BA 136	BA 243
BA 152	BA 243
BA 174	1N 4154
BA 174	(BAY 94)
BA 175	1N 4151
BA 175	(BAY 95)
BA 177	BA 243
BA 178	BA 243
BA 182	BA 243
BA 184	1N 4004
BA 185	1N 4005
BA 186	1N 4005
BA 187	BAY 42
BA 200	BAY 94
BA 201	BAY 95
BA 202	BAY 95
BA 204	BAY 42
BA 213	BAY 95
BA 214	BAY 95
BA 220	BAY 94
BA 221	BAY 94
BA 222	BAY 95
BA 282	BA 243
BA 283	BA 244
BA 316	BAY 94
BA 317	BAY 94
BA 318	BAY 95
BAV 10	BAY 95
BAV 12	BAY 43
BAV 13	BAY 42
BAV 17	BAY 94
BAV 18	BAY 95
BAV 24	BAY 42
BAV 54-30	BAY 94
BAV 54-70	BAY 95

TYPE	TUNGSRAM-TYPE
BAW 10	BAY 42
BAW 33	BAY 43
BAW 54	BAY 42
BAW 55	BAY 43
BAW 59	BAY 41
BAW 62	BAY 95
BAW 75	BAY 94
BAW 76	BAY 95
BAX 13	BAY 95
BAX 14	BAY 41
BAX 20	BAY 93
BAX 21	BAY 42
BAX 22	BAY 41
BAX 78	BAY 42
BAX 79	BAY 43
BAX 80	BAY 95
BAY 31	BAY 93
BAY 38	BAY 95
BAY 52	BAY 94
BAY 60	BAY 94
BAY 63	BAY 95
BAY 67	BAY 41
BAY 68	BAY 95
BAY 69	BAY 95
BAY 71	BAY 95
BAY 74	BAY 42
BAY 77	BAY 41
BAY 89	1N 4005
BAY 90	1N 4006
BAY 97	BAY 94
BAY 99	BAY 41
BStB 0106	T0,8N/100T
BStB 0113	T0,8N/200T
BStB 0126	T0,8N/440T
BStB 0206	T3N/100T
BStB 0213	T0,8N/200T
BStB 0226	T3N/440T
BStC 0313	T15N/200T
BStC 0326	T15N/400T
BStD 0313	T15N/200T
BStD 0326	T15N/400T
BTY 79/100R	T15N/100T
BTY 79/200R	T15N/200T
BTY 79/400R	T15N/400T
BTY 87/100R	T15N/100T
BTY 87/200R	T15N/200T
BTY 87/400R	T15N/400T
BY 100	BY 133
BY 101	BY 134
BY 102	BY 135
BY 103	BY 133
BY 105	BY 133
BY 112	BY 135
BY 113	BY 133
BY 114	BY 135
BY 116	BY 133
BY 126	BY 135
BY 138	BY 133
BY 152	BY 133

TYPE	TUNGSRAM-TYPE
BY 156	1N 4006
BY 157	1N 4006
BY 158	1N 4004
BY 177	BY 133
BY 178	BY 133
BY 188	1N 4004
BY 242	BY 133
BY 250	BY 133
BYX 36/150	BY 134
BYX 36/300	BY 134
BYX 36/600	BY 134
BYX 38/300	BYX 42/300T
BYX 48/300	BYX 42/300T
BYY 31	1N 4002
BYY 32	1N 4003
BYY 33	1N 4004
BYY 34	1N 4005
BYY 35	1N 4006
BYY 36	1N 4007
BYY 37	BY 133
BZX 10...BZX 27	ZPD 6,2...ZPD 33
BZX 58/C6V8... ...BZX 60/C33	ZPD 6,8... ...ZPD 33
BZX 69/C7V5... ...BZX 69/C12	ZPD 7,5... ...ZPD 12
BZX 71/C5V1... ...BZX 71/C24	ZPD 5,1... ...ZPD 24
BZX 74/C5V6... ...BZX 74/C12	ZPD 5,6... ...ZPD 12
BZX 79/C4V7... ...BZX 79/C33	ZPD 4,7... ...ZPD 33
BZX 83/C2V7... ...BZX 83/C33	ZF 2,7... ...ZF 33
BZX 96/C2V7... ...BZX 96/C33	ZPD 2,7... ...ZPD 33
BZX 97/C2V7... ...BZX 97/C33	ZPD 2,7... ...ZPD 33
BZY 17/C5V6... ...BZY 17/C33	ZF 5,6... ...ZF 33
BZY 56...BZY 69	ZPD 4,7...ZPD 12
BZY 83/C4V7... ...BZY 83/C22	ZF 4,7... ...ZF 22
BZY 85/C2V7... ...BZY 85/C33	ZF 2,7... ...ZF 33
BZY 85/D4V7... ...BZY 85/D22	ZF 4,7... ...ZF 22
BZY 88/C3V3... ...BZY 88/C30	ZPD 3,3... ...ZPD 30
BZY 94/C10... ...BZY 94/C33	ZPD 10... ...ZPD 33
EM 401	1N 4002
EM 402	1N 4003
EM 404	1N 4004
EM 406	1N 4005
EM 408	1N 4006
EM 410	1N 4007
ESM 100	1N 4002
ESN 100	BY 135

TYPE	TUNGSRAM-TYPE
FS 19	OA 1180
FS 36	AAZ 10
IS 1941	BY 135
N 20	1N 4148
OA 70	AA 116
OA 71	AA 113
OA 72	AA 118
OA 73	AA 116
OA 79	AA 119
OA 81	AA 117
OA 85	AA 118
OA 86	AA 117
OA 150	AA 117
OA 154	AAZ 10
OA 154Q	4-AAZ 10
OA 160	AA 116
OA 161	AA 118
OA 172	AA 119
OA 180	OA 1180
OA 182	OA 1182
OA 182B	QA 1182D
OAZ 200…OAZ 213	ZF 4,7…ZF 12
OAZ 240…OAZ 273	ZF 4,7…ZF 12
OY 1011	BY 134
OY 1021	BY 133
SFD 43	BAY 94
SFD 83	BAY 94
SFD 104	AA 116
SFD 105	AAZ 10
SFD 106	AA 119
SFD 107	AA 116
SFD 108	AA 118
SFD 108A	AA 118
SFD 110	AA 119
SFD 111	2-AA 116
SFD 112	AA 119
SFD 115	4-AAZ 10
SFD 121	AAZ 10
SFD 122	AAZ 10
SFD 180	BAY 94
SFD 183	BAY 95
SFD 185	BAY 42
SFR 105	BYX 42/200T
SFR 164	BY 133
SSiB 0110	BY 134
SSiB 0120	BY 134
SSiB 0140	BY 133
SSiB 0610	BY 134
SSiB 0620	BY 134
SSiB 0640	BY 133
SSiC 1320	BYX 42/300T
TIC 60	T0,8N/50T
TIC 61	T0,8N/50T
TIC 62	T0,8N/100T
TIC 63	T0,8N/200T
TIC 64	T0,8N/200T
TIC 106A	T3N/100T
TIC 106B	T3N/200T
TIC 106C	T3N/300T
TIC 106D	T3N/400T
TIC 106F	T3N/50T
TIC 106Y	T3N/50T
TIC 126A	T15N/100T
TIC 126B	T15N/200T
TIC 126C	T15N/300T
TIC 126D	T15N/400T
TIC 126F	T15N/50T
T0,8N 0,6A00	T0,8N/50T
T0,8N 1A00	T0,8N/100T

TYPE	TUNGSRAM-TYPE
T0,8N 2A00	T0,8N/200T
T0,8N 3A00	T0,8N/300T
T0,8N 4A00	T0,8N/400T
T0,8N 100	T0,8N/100T
T0,8N 200	T0,8N/200T
T0,8N 300	T0,8N/300T
T0,8N 400	T0,8N/400T
T3N 0,6000	T3N/50T
T3N 1000	T3N/100T
T3N 2000	T3N/200T
T3N 3000	T3N/300T
T3N 4000	T3N/400T
T3N 100	T3N/100T
T3N 200	T3N/200T
T3N 300	T3N/300T
T3N 400	T3N/400T
1N 34A	AA 118
1N 36	AA 119
1N 38	AA 118
1N 40	AA 116
1N 43	AA 113
1N 44	AA 117
1N 45	AA 117
1N 46	AA 113
1N 48	AA 117
1N 49	AA 118
1N 50	AA 118
1N 51	AA 113
1N 52	AA 118
1N 54	AA 118
1N 57	AA 118
1N 58	AA 118
1N 60	AA 119
1N 63	AA 118
1N 64	AA 119
1N 65	AA 117
1N 66	AA 113
1N 67	AA 117
1N 68	AA 118
1N 69	AA 117
1N 70	AA 117
1N 75	AA 118
1N 81	AA 113
1N 84	AAZ 10
1N 86	AA 117
1N 87	AAZ 10
1N 88	AA 118
1N 89	AA 117
1N 90	AA 113
1N 96	AA 113
1N 97	AA 118
1N 98	AA 118
1N 99	AA 118
1N 100	AA 118
1N 103	AAZ 10
1N 104	AAZ 10
1N 111	AA 117
1N 112	AA 118
1N 113	AA 117
1N 114	AA 117
1N 115	AA 117
1N 116	AA 118
1N 126	AA 113
1N 128	AA 113
1N 133	AA 116
1N 135	AA 118
1N 142	AA 118
1N 194	BAY 42
1N 195	BAY 42
1N 196	BAY 42
1N 198	AA 118
1N 251	BAY 41
1N 252	BAY 41
1N 265	AA 117

TYPE	TUNGSRAM-TYPE
1N 266	AA 118
1N 267	AA 119
1N 268	AA 119
1N 294	AA 118
1N 295	AA 113
1N 297	AA 117
1N 304	AA 113
1N 367	AA 116
1N 429	ZF 6,2
1N 430	ZF 8,2
1N 440B	BY 135
1N 441B	BY 134
1N 442B	BY 134
1N 443B	BY 134
1N 444B	BY 133
1N 445B	BY 133
1N 456	BAY 41
1N 457	BAY 43
1N 476	AA 117
1N 477	AA 117
1N 478	AA 118
1N 479	AA 117
1N 482	BAY 42
1N 483	BAY 43
1N 530	1N 4002
1N 531	1N 4003
1N 532	1N 4004
1N 533	1N 4004
1N 534	1N 4005
1N 535	1N 4005
1N 536	1N 4001
1N 537	1N 4002
1N 538	1N 4003
1N 539	1N 4004
1N 540	1N 4004
1N 541	AA 116
1N 542	AA 116
1N 547	1N 4005
1N 548	1N 4007
1N 550	1N 4002
1N 551	1N 4003
1N 552	1N 4004
1N 553	1N 4004
1N 554	1N 4005
1N 555	1N 4005
1N 560	1N 4006
1N 561	1N 4007
1N 562	1N 4006
1N 563	1N 4007
1N 596	1N 4005
1N 597	1N 4006
1N 598	1N 4007
1N 599	1N 4001
1N 600	1N 4002
1N 601	1N 4003
1N 603	1N 4004
1N 604	1N 4004
1N 605	1N 4005
1N 606	1N 4005
1N 607	1N 4001
1N 608	1N 4002
1N 609	1N 4003
1N 610	1N 4003
1N 611	1N 4004
1N 612	1N 4004
1N 613	1N 4005
1N 614	1N 4005
1N 616	AA 116
1N 617	AA 117
1N 618	AA 118
1N 619	BAY 41
1N 625	BAY 41
1N 626	BAY 42
1N 645A	1N 4004
1N 647	1N 4004
1N 648	1N 4005

TYPE	TUNGSRAM-TYPE
1N 649	1N 4005
1N 659	BAY 42
1N 662	BAY 43
1N 663	BAY 43
1N 681	1N 4004
1N 682	1N 4004
1N 683	1N 4004
1N 684	1N 4004
1N 685	1N 4005
1N 686	1N 4005
1N 687	1N 4005
1N 689	1N 4005
1N 702…1N 726	ZPD 2,7…ZPD 33
1N 746…1N 759	ZPD 3,3…ZPD 12
1N 805	AA 113
1N 812	BAY 41
1N 819	BAY 43
1N 840	BAY 41
1N 914	1N 4148
1N 914A	1N 4446
1N 914B	1N 4448
1N 916	1N 4149
1N 916A	1N 4447
1N 916B	1N 4449
1N 957…1N 973	ZF 6,8…ZF 33
1N 1100	BY 135
1N 1101	BY 134
1N 1102	BY 134
1N 1103	BY 134
1N 1104	BY 133
1N 1105	BY 133
1N 1487	1N 4002
1N 1488	1N 4003
1N 1489	1N 4004
1N 1490	1N 4004
1N 1492	1N 4005
1N 1581	BYX 42/100T
1N 1582	BYX 42/100T
1N 1583	BYX 42/200T
1N 1584	BYX 42/300T
1N 1585	BYX 42/400T
1N 1692	BY 135
1N 1693	BY 134
1N 1694	BY 134
1N 1695	BY 134
1N 1696	BY 133
1N 1697	BY 133
1N 1927…1N 1938	ZF 3,9…ZF 33
1N 2069	1N 4003
1N 2070A	1N 4004
1N 2071	1N 4005
1N 3017B… …1N 3032B	ZY 7,5… …ZY 33
1N 3600	BAY 42
1N 3604	BAY 95
1N 3605	BAY 94
1N 3606	BAY 95
1N 3786B… …1N 3801B	ZY 7,5… …ZY 33
1N 4099…1N 4521	ZPD 6,8…ZPD 33
1N 4159…1N 4174B	ZY 7,5…ZY 33
1N 4364	1N 4002
1N 4365	1N 4003
1N 4366	1N 4004
1N 4367	1N 4004
1N 4368	1N 4005
1N 4369	1N 4005
1N 4737…1N 4752A	ZY 7,5…ZY 33
1N 5223…1N 5257	ZF 2,7…ZF 33
1S 10-400	BYX 42/400T
1S 32	AA 117
1S 33	AA 117
1S 34	AA 118
1S 34A	AA 117
1S 38A	AA 118

TYPE	TUNGSRAM-TYPE
1S 73	OA 1180
1S 82	OA 1180
1S 83	OA 1180
1S 100	BY 135
1S 101	BY 134
1S 103	BY 134
1S 105	BY 133
1S 107	BY 134
1S 111	1N 4004
1S 112	1N 4004
1S 113	1N 4004
1S 115	1N 4005
1S 117	1N 4006
1S 120	BAY 42
1S 130	BAY 42
1S 134…1S 143	ZF 4,7…ZF 16
1S 1515	1N 4151 (BAY 95)
1S 1516	1N 4151 (BAY 95)
1S 1553	BAY 43
1S 1554	BAY 42
1S 1555	BAY 41
1S 1652	BYX 43/200T
1S 1653	BYX 42/300T
1S 1942	BY 134
1S 1943	BY 134
1S 1944	BY 133
1S 2030…1S 2330	ZF 3…ZF 33
1S 2074(H)	BAY 42
1S 7030A… …1S 7160A	ZPD 3… …ZPD 16
2N 1595	T0,8N/50T
2N 1596	T0,8N/100T
2N 1597	T0,8N/200T
2N 1598	T0,8N/300T
2N 1599	T0,8N/400T
2N 5060	T0,8N/50T
2N 5061	T0,8N/50T
2N 5062	T0,8N/100T
2N 5063	T0,8N/200T
2N 5064	T0,8N/200T
12GC 11	BYX 42/400T
15P1	OA 1182
19P1	OA 1180
62R2	BYX 42/200T
62R2	BYX 42/400T

Types not included in the existing delivery programme or not recommended for new designs

TYPE	TUNGSRAM-TYPE
AY 101T	BY 135
AY 102T	BY 135
AY 103T	BY 134
AY 104T	BY 134
AY 105T	BY 134
AY 106T	BY 134
AY 107T	BY 134
BAY 44	1N 4148
BAY 45	1N 4002
BAY 46	1N 4003
BTX 30-100	T0,8N/100T
BTX 30-200	T0,8N/200T

TYPE	TUNGSRAM-TYPE
BTX 30-300	T0,8N/300T
BTX 30-400	T0,8N/400T
GEN 51	BYX 42/100T
GEN 52	BYX 42/100T
GEN 53	BYX 42/100T
GEN 54	BYX 42/200T
GEN 55	BYX 42/200T
OA 1150	AA 117
OA 1154	AAZ 10
OA 1154Q	4-AAZ 10
OA 1160	AA 116
OA 1161	AA 118
OA 1172	AA 119
OA 1180	AA 135
OA 1182D	AA 136
SIEK 1F	1N 4001
SIEK 2F	1N 4002
SIEK 3F	1N 4003
SIEK 4F	1N 4004
SIEK 5F	1N 4005
SIEK 6F	1N 4006
SIEK 7F	1N 4007
ZPY 7,5…33	ZY 7,5…ZY 33

Transistors

TYPE	TUNGSRAM-TYPE
AC 105	AC 128
AC 106	AC 128
AC 107	AC 125F(z)
AC 108	AC 125
AC 109	AC 125
AC 110	AC 125
AC 116	AC 128K
AC 117	AC 128K
AC 120	AC 125
AC 121	AC 125
AC 122	AC 125
AC 122/30	AC 125(z)
AC 123	AC 128K
AC 124	AC 128K
AC 127	AC 176
AC 129	AC 125
AC 130	AC 128
AC 131	AC 128
AC 132	AC 125
AC 134	AC 126
AC 135	AC 125
AC 136	AC 128
AC 137	AC 126
AC 138	AC 128
AC 139	AC 128
AC 141	AC 176
AC 141B	AC 176
AC 141K	AC 176K
AC 142	AC 128
AC 142K	AC 128K
AC 150	AC 125
AC 150	AC 126
AC 151	AC 125
AC 151r	AC 125F(z)
AC 152	AC 125
AC 153	AC 128
AC 153K	AC 128K
AC 160	AC 125F(z)
AC 161	AC 125F(z)
AC 162	AC 125
AC 163	AC 126
AC 170	AC 125
AC 171	AC 126
AC 172	AC 176
AC 173	AC 125

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
AC 174	AC 128	AF 178	AF 106	BC 116	BC 301
AC 175	AC 176K	AF 179	AF 106	BC 118	BC 237A
AC 175	AC 187K	AF 181	AF 200	BC 119	BC 301
AC 178	AC 128K	AF 182	AF 201	BC 120	BC 301
AC 179	AC 187K	AF 185	AF 106	BC 125	BC 301
AC 180	AC 128	AF 186	AF 139	BC 126	BC 304
AC 180K	AC 128K	AF 194	AF 200	BC 129	BC 237
AC 180L	AC 128K	AF 251	AF 239	BC 130	BC 238
AC 181	AC 176	AF 252	AF 239S	BC 131	BC 239
AC 181K	AC 176K	AF 253	AF 139	BC 132	BC 237A
AC 181L	AC 176K	AF 256	AF 106	BC 134	BC 237B
AC 182	AC 125	AF 257	AF 106	BC 135	BC 237A
AC 183	AC 176	AF 264	AF 106	BC 136	BC 301
AC 184	AC 125			BC 137	BC 302
AC 185	AC 176	AFY 12	AF 106	BC 138	BC 301
AC 186	AC 176	AFY 13	AF 106	BC 139	BC 304
AC 186	AC 187			BC 140	BC 301
AC 191	AC 125	AFZ 12	AF 106	BC 141	BC 300
AC 191	AC 126			BC 142	BC 300
AC 192	AC 125	ASY 12	AC 128(z)	BC 143	BC 304
AC 193	AC 128	ASY 13	AC 125U(z)	BC 144	BC 301
AC 194	AC 176	ASY 14	AC 125U(z)	BC 150	BC 238B
		ASY 23	AC 125U(z)	BC 151	BC 237
ACY 16	AC 128(z)	ASY 24	AC 125U(z)	BC 152	BC 237B
ACY 17	AC 125U(z)	ASY 26	BCY 78	BC 153	BC 308
ACY 18	AC 125U(z)	ASY 27	BCY 78	BC 154	BC 309
ACY 19	AC 125U(z)	ASY 28	AC 176	BC 157	BC 307
ACY 20	AC 125(z)	ASY 29	AC 176	BC 158	BC 308
ACY 21	AC 125(z)	ASY 30	AC 125U(z)	BC 159	BC 309
ACY 22	AC 125(z)	ASY 31	BCY 78	BC 160	BC 304
ACY 23	AC 125(z)	ASY 32	BCY 78	BC 161	BC 303
ACY 24	AC 125U(z)	ASY 48	AC 125U(z)	BC 167	BC 237
ACY 27	AC 125U(z)	ASY 50	AC 125K(z)	BC 168	BC 238
ACY 28	AC 125U(z)	ASY 53	AC 176	BC 169	BC 239
ACY 29	AC 125U(z)	ASY 54	AC 125F(z)	BC 170	BC 238
ACY 30	AC 125U(z)	ASY 55	AC 125F(z)	BC 171	BC 237
ACY 31	AC 125U(z)	ASY 61	AC 176	BC 172	BC 238
ACY 32	AC 125F(z)	ASY 62	AC 176	BC 173	BC 239
ACY 33	AC 128(z)	ASY 63	AC 125(z)	BC 174	BC 239
ACY 34	AC 125(z)	ASY 70	AC 125K(z)	BC 175	BC 239
ACY 35	AC 125(z)	ASY 72	AC 176	BC 180	BC 237
ACY 36	AC 125(z)	ASY 73	AC 176	BC 181	BC 307A
ACY 40	AC 125(z)	ASY 74	AC 176	BC 185	BC 301
ACY 41	AC 125(z)	ASY 75	AC 176	BC 186	BC 307A
ACY 44	AC 125U(z)	ASY 76	AC 125K(z)	BC 187	BC 308B
		ASY 77	AC 125U(z)	BC 190	BC 239
ACZ 10	AC 125U(z)	ASY 80	AC 125K(z)	BC 192	BC 328
		ASY 81	AC 125U(z)	BC 196	BC 308
AD 105	ASZ 1015	ASY 90	AC 125K(z)	BC 197	BC 237
AD 130	ASZ 1017	ASY 91	AC 125(z)	BC 198	BC 238
AD 131	ASZ 1016			BC 199	BC 239
AD 132	ASZ 1015	ASZ 10	AC 125U(z)	BC 204	BC 307
AD 138	ASZ 16	ASZ 11	AC 125(z)	BC 205	BC 308
AD 138/50	ASZ 15	ASZ 12	AC 125(z)	BC 206	BC 309
AD 142	ASZ 1018			BC 207	BC 237
AD 143	ASZ 16	AUY 10	ASZ 1015	BC 208	BC 238
AD 145	ASZ 16	AUY 18	ASZ 16	BC 209	BC 239
AD 149	ASZ 1017	AUY 19	ASZ 16	BC 210	BC 337
AD 150	ASZ 1017	AUY 20	ASZ 18	BC 215	BC 327
AD 153	ASZ 1017	AUY 21	ASZ 16	BC 216	BC 328
AD 163	ASZ 15	AUY 21A	ASZ 17	BC 218	BC 237A
AD 166	ASZ 1018	AUY 22	ASZ 15	BC 219	BC 301
AD 167	ASZ 16	AUY 22A	ASZ 15	BC 220	BC 237A
AD 262	ASZ 1017	AUY 28	ASZ 15	BC 221	BC 327
AD 263	ASZ 1017	AUY 30	ASZ 15	BC 222	BC 337
		AUY 31	ASZ 16	BC 223	BC 337
ADY 22	ASZ 16	AUY 32	ASZ 15	BC 224	BC 307A
ADY 23	ASZ 1018	AUY 33	ASZ 16	BC 225	BC 309
ADY 24	ASZ 1018	AUY 34	ASZ 15	BC 226	BC 301
ADY 25	ASZ 18	AUY 35	ASZ 16	BC 230	BC 239
ADY 27	ASZ 17	AUY 36	ASZ 16	BC 231	BC 327
ADY 28	ASZ 15	AUY 37	ASZ 18	BC 232	BC 337
				BC 234	BC 237A
AF 102	AF 106	BC 113	BC 237B	BC 235	BC 237B
AF 106A	AF 106	BC 114	BC 413C	BC 251	BC 307
AF 121	AF 200	BC 115	BC 237A	BC 252	BC 308

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
BC 253	BC 309	BC 363	BD 138	BCW 13	BC 327
BC 254	BC 556	BC 364	BD 140	BCW 14	BC 337
BC 255	BC 337	BC 365	BD 135	BCW 15	BC 327
BC 256	BC 556	BC 366	BD 137	BCW 16	BC 337
BC 257	BC 557	BC 367	BD 139	BCW 17	BC 327
BC 258	BC 558	BC 370	BC 328	BCW 20	BC 337
BC 259	BC 559	BC 371	BC 301	BCW 21	BC 327
BC 260	BC 178	BC 377	BC 337	BCW 22	BC 337
BC 261	BC 177	BC 378	BC 338	BCW 23	BC 327
BC 262	BC 178	BC 381	BC 328	BCW 24	BC 414B
BC 263	BC 179	BC 382	BC 414	BCW 34	2N 2222A
BC 266	BC 556	BC 383	BC 413	BCW 35	2N 2907A
BC 267	BC 337	BC 384	BC 413	BCW 36	2N 2222A
BC 268	BC 338	BC 385	BC 237	BCW 37	2N 2907A
BC 269	BC 338	BC 386	BC 238	BCW 44	BC 300
BC 270	BC 338	BC 387	BC 301	BCW 45	BC 304
BC 271	BC 338	BC 388	BC 304	BCW 46	BC 546
BC 272	BC 337	BC 389	BC 107B	BCW 47	BC 237
BC 274	BC 307	BC 390	BC 108B	BCW 48	BC 238
BC 275	BC 308	BC 391	BC 108C	BCW 49	BC 239
BC 276	BC 309	BC 395	BC 300	BCW 51	BC 182B
BC 277	BC 237	BC 396	BC 303	BCW 52	BC 212B
BC 278	BC 238	BC 406	BC 309B	BCW 56	BC 556
BC 279	BC 239	BC 407	BC 237	BCW 57	BC 307
BC 280	BC 414B	BC 408	BC 238	BCW 58	BC 308
BC 281	BC 309	BC 409	BC 239	BCW 59	BC 309
BC 284	BC 237	BC 410	BC 238C	BCW 62	BC 307
BC 286	BC 300	BC 411	BC 300	BCW 63	BC 307
BC 287	BC 304	BC 417	BC 307	BCW 64	BC 309
BC 289	BC 237	BC 418	BC 308	BCW 82	BC 237
BC 290	BD 414	BC 419	BC 309	BCW 83	BC 237
BC 291	BC 307A	BC 424	BC 300	BCW 84	BC 239
BC 292	BC 309	BC 425	BC 301	BCW 90	BC 337
BC 294	BC 304	BC 426	BC 303	BCW 90A	2N 2221
BC 295	BC 237A	BC 427	BC 304	BCW 90B	2N 2222
BC 297	BC 327	BC 437	BC 237	BCW 91A	2N 2221A
BC 298	BC 328	BC 438	BC 238	BCW 91B	2N 2222A
BC 310	BC 300	BC 439	BC 239	BCW 92	BC 327
BC 311	BC 303	BC 440	BC 301	BCW 92A	2N 2906
BC 315	BC 560	BC 441	BC 300	BCW 92B	2N 2907A
BC 317	BC 337	BC 460	BC 304	BCW 93A	2N 2906A
BC 318	BC 237	BC 461	BC 303	BCW 93B	2N 2907A
BC 319	BC 239	BC 467	BC 237	BCW 94	BC 337
BC 320	BC 327	BC 468	BC 238	BCW 96	BC 327
BC 321	BC 327	BC 477	BC 556		
BC 322	BC 327	BC 469	BC 239	BCX 10	BC 304
BC 324	BC 300	BC 478	BCY 79	BCX 58	BCY 58
BC 325	BC 309	BC 479	BC 309	BCX 59	BCY 59
BC 326	BC 309B	BC 479	BC 416	BCX 73	PN 2218-21
BC 329	BC 414	BC 507	BC 182	BCX 74	PN 2218A-21A
BC 330	BC 414	BC 508	BC 182	BCX 78	BCY 78
BC 331	BC 237	BC 509	BC 414	BCX 79	BCY 79
BC 332	BC 238	BC 510	BC 413		
BC 333	BC 549	BC 512	BC 307	BCY 10	2N 2906
BC 334	BC 559A	BC 513	BC 308	BCY 11	2N 2906
BC 335	BC 549	BC 514	BC 309	BCY 12	2N 2906
BC 336	BC 559A	BC 520	BC 337	BCY 17	BC 307A
BC 340	BC 301	BC 521	BC 337	BCY 18	BC 307A
BC 341	BC 300	BC 522	BC 338	BCY 19	BC 212A
BC 342	BC 300	BC 523	BC 414B	BCY 20	BC 212A
BC 343	BC 304	BC 526	BC 327	BCY 21	BC 212A
BC 344	BC 300	BC 527	BC 304	BCY 22	BC 212A
BC 345	BC 303	BC 528	BC 303	BCY 23	BC 308A
BC 347	BC 547	BC 537	BC 301	BCY 24	BC 308A
BC 348	BC 547	BC 538	BC 300	BCY 25	BC 308A
BC 349	BC 548	BC 582	BC 237	BCY 27	BC 307A
BC 350	BC 557	BC 583	BC 238	BCY 28	BC 308A
BC 351	BC 558	BC 584	BC 239	BCY 29	BC 212A
BC 352	BC 558	BC 727	BC 327	BCY 30	BC 212A
BC 354	BC 548	BC 728	BC 328	BCY 31	BC 212A
BC 355	BC 558	BC 737	BC 337	BCY 32	BC 212A
BC 357	BC 558	BC 738	BC 338	BCY 33	BC 213A
BC 358	BC 238B			BCY 34	BC 308A
BC 360	BC 304	BCW 10	BC 338	BCY 42	BC 107A
BC 361	BC 303	BCW 11	BC 338	BCY 43	BC 107A
BC 362	BD 136	BCW 12	BC 337	BCY 49	BC 308A
				BCY 50	BC 238A

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
BCY 51	BC 238A	BF 118	BF 258	BF 456	BF 257
BCY 56	BC 414B	BF 119	BF 257	BF 457	BF 257
BCY 57	BC 413C	BF 120	BF 258	BF 458	BF 258
BCY 66	BCY 59	BF 121	BF 198	BF 459	BF 259
BCY 69	BC 238C	BF 123	BF 199	BF 475	BF 257
BCY 70	BC 177	BF 125	BF 199	BF 478	BF 258
BCY 71	BC 309	BF 127	BF 198	BF 497	BF 199
BCY 72	BCY 78	BF 136	BF 198	BF 523	BF 225
BCY 90	BC 307A	BF 137	BF 257	BF 596	BF 198
BCY 91	BC 307A	BF 138	BF 198	BF 597	BF 199
BCY 92	BC 307A	BF 157	BF 257	BF 694	BF 199
BCY 98	BC 307A	BF 158	BF 199	BF 979	BF 479
		BF 159	BF 199	BF 967	BF 679
BCZ 10	BC 308A	BF 162	BF 240	BF 967	BF 680
BCZ 11	BC 308A	BF 163	BF 240		
BCZ 13	BC 308A	BF 164	BF 240	BFJ 45	BC 302
BCZ 14	BC 308A	BF 167	BF 198	BFJ 46	BC 302
		BF 168	BF 199	BFJ 47	BC 300
BD 130	2N 3055	BF 169	BC 237B	BFJ 48	BC 300
BD 141	2N 3442	BF 179	BF 259	BFJ 49	BC 300
BD 142	2N 3055	BF 186	BF 198	BFJ 50	BC 300
BD 173	BD 235	BF 196	BF 225	BFJ 57	BF 257
BD 175	BD 233	BF 197	BF 199	BFJ 70	BF 199
BD 176	BD 234	BF 207	BF 198	BFJ 72	BCY 59
BD 177	BD 235	BF 208	BF 199	BFJ 73	BCY 59
BD 178	BD 236	BF 223	BF 224	BFJ 74	BC 182A
BD 179	BD 237	BF 227	BF 199	BFJ 75	BC 182A
BD 180	BD 238	BF 231	BF 199	BFJ 92	BCY 59
BD 181	2N 3055	BF 232	BF 199	BFJ 93	BCY 59
BD 182	2N 3055	BF 237	BF 199	BFJ 98	BF 257
BD 183	2N 3442	BF 238	BF 199		
BD 184	2N 3442	BF 242	BCY 59	BFR 16	BC 414B
BD 191	2N 3055	BF 251	BF 225	BFR 17	BC 414C
BD 192	2N 3055	BF 260	BF 199	BFR 18	2N 2221
BD 193	2N 3442	BF 261	BF 199	BFR 19	2N 2218
BD 375	BD 233	BF 267	BF 198	BFR 20	2N 2219
BD 376	BD 234	BF 270	BF 225	BFR 21	2N 2218A
BD 377	BD 235	BF 271	BF 199	BFR 22	2N 2218A
BD 378	BD 236	BF 273	BF 241	BFR 23	BC 303
BD 379	BD 237	BF 274	BF 240	BFR 24	BC 304
BD 380	BD 238	BF 287	BF 241	BFR 25	BF 257
		BF 288	BF 240	BFR 27	BF 257
BDX 10	2N 3055	BF 290	BF 198	BFR 57	BF 257
BDX 11	2N 3442	BF 291	BC 237A	BFR 58	BF 258
BDX 13	2N 3055	BF 292	BF 258	BFR 59	BF 259
BDX 22	2N 3442	BF 293	BC 237A	BFR 60	BC 303
BDX 23	BUY 12T	BF 294	BF 257	BFR 61	BC 304
BDX 40	2N 3055	BF 297	BF 257	BFR 67	BC 237
BDX 50	2N 3442	BF 298	BF 258	BFR 68	BC 238
BDX 60	2N 3055	BF 299	BF 259	BFR 69	BC 307
BDX 61	2N 3055	BF 302	BF 199	BFR 70	BC 308
		BF 303	BF 199	BFR 71	BC 237
BDY 10	2N 3055	BF 304	BF 199	BFR 72	BC 237
BDY 11	2N 3055	BF 305	BF 258	BFR 73	BC 307
BDY 17	2N 3055	BF 306	BF 199	BFR 74	BC 307
BDY 18	BUY 12T	BF 308	BF 199	BFR 77	BC 300
BDY 19	BUY 12T	BF 309	BF 199	BFR 78	BC 300
BDY 20	2N 3055	BF 311	BF 199	BFR 86	BF 257
BDY 25	2N 3442	BF 329	BF 198	BFR 87	BF 257
BDY 38	2N 3055	BF 330	BF 199	BFR 88	BF 258
BDY 39	2N 3055	BF 334	BF 199	BFR 89	BF 259
BDY 53	BUY 12T	BF 335	BF 198		
BDY 54	BUY 12	BF 336	BF 258	BFS 11	BF 198
BDY 55	BUY 12T	BF 337	BF 258	BFS 12	BC 304
BDY 56	BUY 12T	BF 338	BF 259	BFS 62	BF 199
BDY 57	BUY 12T	BF 366	BF 198	BFS 89	BF 259
BDY 58	BUY 12T	BF 367	BF 198	BFS 92	BC 303
BDY 72	2N 3442	BF 371	BF 199	BFS 93	BC 303
BDY 74	2N 3442	BF 387	BF 257	BFS 94	BC 303
BDY 76	2N 3055	BF 388	BF 258	BFS 99	BF 257
BDY 79	2N 3442	BF 389	BF 259		
BDY 90	BUY 12T	BF 411	BF 257	BFT 39	BC 300
BDY 91	BUY 12T	BF 412	BF 257	BFT 40	BC 301
BDY 92	BUY 12T	BF 413	BF 258	BFT 41	BC 301
		BF 454	BF 240	BFT 47	BF 257
BF 111	BF 258	BF 455	BF 241	BFT 48	BF 258

TYPE	TUNGSRAM-TYPE
BFT 49	BF 259
BFT 60	BC 303
BFT 61	BC 304
BFT 79	BC 303
BFT 80	BC 303
BFT 81	BC 304
BFV 68	BC 414B
BFW 20	BC 309B
BFW 20	BC 416B
BFW 22	BC 309C
BFW 22	BC 416C
BFW 23	BC 309C
BFW 23	BC 416C
BFW 24	BC 301
BFW 25	BC 302
BFW 26	BC 302
BFW 29	2N 2219A
BFW 31	2N 2907
BFW 32	2N 2222
BFW 33	BC 300
BFW 34	BC 302
BFW 35	BC 302
BFW 36	BF 258
BFW 37	BF 257
BFW 38	BF 258
BFW 45	BF 257
BFW 63	BF 198
BFW 64	BF 198
BFW 66	2N 2219A
BFW 67	BF 259
BFW 68	2N 2222A
BFW 70	BF 199
BFX 12	BCY 78
BFX 13	BCY 78
BFX 18	BF 198
BFX 19	BF 198
BFX 21	BF 198
BFX 29	2N 2905A
BFX 30	2N 2905A
BFX 31	BF 198
BFX 32	BF 198
BFX 33	2N 2218
BFX 35	BCY 79
BFX 39	BC 304
BFX 40	BC 303
BFX 41	BC 303
BFX 43	2N 2369
BFX 44	2N 2368
BFX 45	BC 238B
BFX 50	2N 2222A
BFX 51	2N 2221A
BFX 52	2N 2222A
BFX 60	BF 199
BFX 61	BC 300
BFX 68	2N 1711
BFX 69	2N 1613
BFX 74	2N 2904
BFX 74A	2N 2904A
BFX 77	BF 198
BFX 84	BC 301
BFX 85	BC 301
BFX 86	BC 302
BFX 87	2N 2904A
BFX 88	2N 2904
BFX 92	BC 414B
BFX 93	BC 414B
BFX 94	2N 2221
BFX 95	2N 2222
BFX 96	2N 2218
BFX 97	2N 2219
BFX 98	BF 257
BFY 10	BC 237A

TYPE	TUNGSRAM-TYPE
BFY 11	BC 237A
BFY 12	BC 302
BFY 13	BC 301
BFY 14	BC 300
BFY 17	BCY 59
BFY 18	BCY 59
BFY 19	BCY 58
BFY 28	BC 182A
BFY 31	BC 302
BFY 37	BC 238A
BFY 39	BC 107
BFY 40	BC 302
BFY 41	BC 300
BFY 43	BF 257
BFY 45	BF 257
BFY 50	BC 302
BFY 51	BC 302
BFY 52	BC 302
BFY 53	BC 302
BFY 55	BC 302
BFY 56	BC 302
BFY 57	BF 257
BFY 65	BF 257
BFY 67	BC 302
BFY 68	BC 302
BFY 72	2N 2218A
BFY 74	BC 182A
BFY 75	BC 182B
BFY 76	BC 414B
BFY 77	BC 414B
BFY 80	BF 257
BFY 88	BF 199
BSS 11	2N 2369A
BSS 23A	2N 2221A
BSS 30	BC 301
BSS 31	BC 301
BSS 32	BC 300
BSS 33	BF 258
BSS 34	BF 257
BSS 35	BF 257
BSS 38	BF 257
BSS 40	2N 2221A
BSS 41	2N 2221
BSS 68	BF 257
BSV 16	BC 304
BSV 17	BC 303
BSV 28	BF 257
BSV 29	BF 257
BSV 42	BC 303
BSV 43	BC 304
BSV 44	BC 304
BSV 51	BF 257
BSV 83	BC 303
BSV 86	2N 2222A
BSV 87	2N 2221A
BSV 88	2N 2221
BSV 89	2N 2368
BSV 90	2N 2369
BSV 91	2N 2369A
BSV 96	2N 2907A
BSV 97	2N 2906A
BSV 98	2N 2906
BSW 10	BC 301
BSW 19	BCY 78
BSW 20	BCY 78
BSW 21	BC 308A
BSW 22	BC 308B
BSW 23	2N 2904
BSW 24	2N 2906
BSW 25	2N 2894A
BSW 26	2N 2221A
BSW 32	BF 257
BSW 33	BC 237A

TYPE	TUNGSRAM-TYPE
BSW 34	BC 237A
BSW 39	BC 300
BSW 40	BC 303
BSW 41	2N 2221
BSW 42	BC 237A
BSW 43	BC 237B
BSW 44	BC 307A
BSW 45	BC 307B
BSW 51	2N 2218
BSW 52	2N 2219
BSW 53	2N 2218A
BSW 54	2N 2219A
BSW 58	2N 2368
BSW 59	2N 2369
BSW 61	2N 2221
BSW 62	2N 2222
BSW 63	2N 2221A
BSW 64	2N 2222A
BSW 69	BF 257
BSW 70	BF 257
BSW 72	2N 2906
BSW 73	2N 2907
BSW 74	2N 2906
BSW 75	2N 2907
BSW 82	2N 2221
BSW 83	2N 2222
BSW 84	2N 2221
BSW 85	2N 2222
BSW 88	BC 237
BSW 89	BC 237
BSW 92	BC 238A
BSX 20	2N 6769
BSX 21	BF 257
BSX 24	BC 237A
BSX 26	2N 2221A
BSX 27	2N 2368
BSX 28	2N 2369
BSX 29	2N 2894
BSX 32	2N 2218
BSX 33	2N 2221A
BSX 35	2N 2894A
BSX 36	2N 2906
BSX 38	BCY 59
BSX 39	2N 2369
BSX 40	2N 2904
BSX 41	2N 2905
BSX 42	2N 2221A
BSX 45	BC 302
BSX 46	BC 301
BSX 47	BC 300
BSX 51	BCY 58
BSX 52	BCY 59
BSX 53	BCY 58
BSX 54	BCY 59
BSX 66	BCY 58
BSX 67	BCY 58
BSX 68	BC 238A
BSX 69	BC 238A
BSX 70	2N 2221A
BSX 71	2N 2222A
BSX 72	2N 2219
BSX 76	BCY 58
BSX 77	BCY 59
BSX 78	BCY 59
BSX 79	BCY 59
BSX 88	2N 2369
BSX 90	2N 2368
BSX 92	2N 2368
BSX 93	2N 2369
BSX 97	2N 2218
BSY 10	2N 2218
BSY 11	BCY 59
BSY 17	2N 2368
BSY 18	2N 2369

TYPE	TUNGSRAM-TYPE
BSY 19	2N 2369
BSY 21	2N 2369
BSY 29	2N 2369
BSY 38	2N 2368
BSY 40	2N 2894
BSY 41	2N 2894
BSY 44	BC 302
BSY 45	BC 300
BSY 46	BC 301
BSY 51	BC 302
BSY 52	2N 1711
BSY 53	2N 1613
BSY 54	2N 1711
BSY 55	BC 300
BSY 56	BC 300
BSY 58	2N 2218
BSY 62B	2N 2369
BSY 63	2N 5769
BSY 68	BF 257
BSY 72	BC 239B
BSY 73	BC 238A
BSY 74	BC 238A
BSY 75	BC 237A
BSY 76	BC 237A
BSY 78	2N 2222
BSY 79	BF 257
BSY 80	BC 238C
BSY 81	BC 302
BSY 82	BC 302
BSY 83	BC 302
BSY 84	BC 302
BSY 85	BC 300
BSY 86	BC 300
BSY 87	BC 301
BSY 88	BC 301
BSY 89	BC 238B
BSY 93	2N 2222
BSY 95	2N 2369
BU 118	BU 406D
BU 118	BU 407D
BU 127	BUY 12
BUX 10	BUY 12
BUX 39	BUY 12T
BUY 57	BUY 12T
BUY 58	BUY 12
OC 16	ASZ 1017
OC 22	ASZ 1017
OC 23	ASZ 1017
OC 24	ASZ 1017
OC 27	ASZ 1017
OC 28	ASZ 1015
OC 29	ASZ 1016
OC 35	ASZ 1017
OC 36	ASZ 1018
OC 41	AC 125
OC 42	AC 125
OC 43	AC 125
OC 46	AC 176
OC 47	AC 176
OC 70	AC 125
OC 71	AC 125
OC 72	AC 125
OC 74	AC 128
OC 75	AC 125
OC 76	AC 125K(z)
OC 77	AC 125U(z)
OC 79	AC 128
OC 83	AC 128
OC 84	AC 128
OC 200	BC 178
OC 201	BC 178
OC 202	BC 178

TYPE	TUNGSRAM-TYPE
OC 204	BCY 79
OC 206	BCY 79
OC 207	BCY 79
OC 303	AC 125
OC 304	AC 125
OC 305	AC 126
OC 306	AC 125F(z)
OC 307	AC 125K(z)
OC 308	AC 125K(z)
OC 309	AC 125U(z)
OC 469	BCY 78
OC 470	BCY 78
OC 602	AC 125
OC 603	AC 125
OC 604	AC 125
SFT 223	AC 125(z)
SFT 228	BCY 78
SFT 229	BCY 78
SFT 243	AC 125U(z)
SFT 253	AC 128(z)
SFT 288	BCY 78
SFT 321	AC 125
SFT 322	AC 125
SFT 323	AC 125
SFT 335	AC 125
SFT 351	AC 125
SFT 352	AC 125
SFT 353	AC 126
TI 3021	ASZ 15
TI 3027	ASZ 1016
TI 3028	ASZ 1015
TI 3031	ASZ 15
TIP 516	BUY 12T
TIP 516	BUY 12
TIP 3055	2N 3055
TIS 37	BC 308
TIS 38	BC 308
TIS 47	2N 5769
TIS 48	2N 5769
TIS 49	2N 5769
TIS 51	2N 5769
2N 160	2N 2218
2N 161	2N 2218
2N 162	2N 2221
2N 163	2N 2221
2N 257	ASZ 1016
2N 257	ASZ 1017
2N 268	ASZ 1015
2N 279	AC 125
2N 280	AC 125
2N 281	AC 125
2N 282	AC 125
2N 283	AC 125
2N 284	AC 125U(z)
2N 332	2N 2221
2N 333	2N 2221
2N 334	2N 2221
2N 354	2N 2906
2N 355	2N 2906
2N 404	BCY 78
2N 470	2N 2221
2N 471	BC 107
2N 472	2N 2221
2N 473	BC 109
2N 474	2N 2221
2N 475	2N 2221
2N 476	2N 2221
2N 477	2N 2221
2N 478	2N 2221
2N 479	2N 2221
2N 480	2N 2221

TYPE	TUNGSRAM-TYPE
2N 497	BC 301
2N 524	AC 128
2N 525	AC 128
2N 526	AC 128
2N 527	AC 128
2N 541	2N 2221
2N 542	2N 2221
2N 543	2N 2221
2N 552	2N 2218
2N 591	AC 128
2N 619	2N 2221A
2N 620	2N 2221
2N 621	2N 2221
2N 656	BC 301
2N 696	2N 1613
2N 697	BC 302
2N 698	BC 300
2N 699	BC 300
2N 702	BCY 58
2N 703	BCY 58
2N 706	2N 2368
2N 708	2N 2368
2N 715	2N 2221
2N 716	2N 2221
2N 717	BCY 58
2N 718	BCY 58
2N 721	BCY 78
2N 722	BCY 78
2N 726	BC 177A
2N 727	BC 177A
2N 730	2N 2218
2N 731	2N 2221
2N 734	BC 301
2N 735	BC 301
2N 736	BC 301
2N 738	BC 300
2N 739	BC 300
2N 740	BC 300
2N 743	2N 2368
2N 744A	2N 2369A
2N 745	2N 2221
2N 746	2N 2221
2N 747	2N 2221
2N 748	2N 2221
2N 749	2N 2221
2N 751	2N 2221
2N 752	2N 2221A
2N 753	2N 2369A
2N 756	BCY 59
2N 757	BCY 59
2N 758	BCY 59
2N 761	BC 107A
2N 762	BC 107A
2N 780	BCY 59
2N 839	BCY 59
2N 840	BCY 59
2N 841	BCY 59
2N 842	BCY 59
2N 843	BCY 59
2N 847	2N 2369A
2N 849	2N 2368
2N 850	2N 2369A
2N 851	2N 2368
2N 852	2N 2369A
2N 858	2N 2906
2N 859	2N 2906
2N 860	2N 2906
2N 861	2N 2906
2N 862	2N 2906
2N 863	2N 2906
2N 864	2N 2906
2N 865	2N 2906
2N 866	2N 2906
2N 867	2N 2906
2N 869	BCY 78
2N 869A	BCY 78

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
2N 870	BC 301	2N 1371	AC 125K(z)	2N 2309	2N 2218
2N 871	BC 301	2N 1372	AC 125K(z)	2N 2314	2N 2221A
2N 902	2N 2221	2N 1373	AC 125(z)	2N 2315	2N 2221A
2N 903	2N 2221	2N 1374	AC 125K(z)	2N 2317	2N 1613
2N 904	2N 2221	2N 1375	AC 125(z)	2N 2350	2N 2222A
2N 905	2N 2221	2N 1376	AC 125K(z)	2N 2351	2N 2221A
2N 906	2N 2221	2N 1377	AC 125(z)	2N 2352	2N 2221A
2N 907	2N 2221	2N 1386	2N 2219	2N 2353	2N 2221
2N 908	2N 2221	2N 1387	2N 2219	2N 2380	2N 2218A
2N 909	2N 2222	2N 1388	2N 2219	2N 2389	2N 1613
2N 910	BC 301	2N 1389	2N 2219	2N 2390	2N 1711
2N 911	BC 301	2N 1390	2N 2219	2N 2393	2N 2904
2N 912	BC 301	2N 1409	BC 302	2N 2394	2N 2904
2N 914A	2N 2369A	2N 1410	BC 302	2N 2395	2N 2218
2N 915	2N 2221A	2N 1420	2N 2219	2N 2396	2N 2218
2N 923	2N 2906	2N 1439	2N 2906A	2N 2397	2N 2369A
2N 924	2N 2906	2N 1440	2N 2906A	2N 2411	BC 178A
2N 925	2N 2906	2N 1441	2N 2906	2N 2412	BC 178A
2N 926	2N 2906	2N 1442	2N 2906	2N 2413	2N 2221
2N 927	2N 2906	2N 1443	2N 2906	2N 2415	AF 239S
2N 928	2N 2906	2N 1469	2N 2906	2N 2416	AF 239S
2N 929	BC 414B	2N 1474	2N 2906A	2N 2431	AC 128
2N 930	BC 414B	2N 1475	2N 2906A	2N 2432	BCY 58
2N 935	2N 2906	2N 1491	2N 2222	2N 2432A	BCY 59
2N 936	2N 2906	2N 1492	2N 2222	2N 2433	2N 1613
2N 937	2N 2906	2N 1505	2N 2218A	2N 2434	2N 1711
2N 938	2N 2906	2N 1506	2N 2218	2N 2478	2N 2218A
2N 939	2N 2906	2N 1507	2N 2219	2N 2479	2N 2218A
2N 940	2N 2906	2N 1514	BC 301	2N 2483	BC 414B
2N 941	2N 2906	2N 1515	BC 301	2N 2484	BC 414B
2N 942	2N 2906	2N 1528	2N 2218	2N 2494	AF 106
2N 943	2N 2906	2N 1704	2N 2218	2N 2495	AF 106
2N 944	2N 2906	2N 1764	2N 2369A	2N 2538	2N 2219
2N 945	2N 2906	2N 1889	BC 301	2N 2539	2N 2222
2N 946	2N 2906	2N 1890	BC 301	2N 2540	2N 2222
2N 956	BC 302	2N 1893	BC 300	2N 2570	BCY 58
2N 958	2N 2369A	2N 1924	AC 125U(z)	2N 2586	BC 414B
2N 959	2N 2369A	2N 1925	AC 125U(z)	2N 2595	2N 2906A
2N 978	2N 2906	2N 1926	AC 125U(z)	2N 2596	2N 2906A
2N 988	2N 2221	2N 1944	2N 2219	2N 2597	2N 2906A
2N 989	2N 2221	2N 1945	2N 2219	2N 2601	2N 2906A
2N 995	BC 178A	2N 1946	2N 2219A	2N 2602	2N 2906A
2N 996	BC 178A	2N 1953	2N 2218	2N 2603	2N 2906A
2N 1051	2N 2218	2N 1972	2N 2219	2N 2604	BC 309
2N 1074	2N 2218	2N 1973	BC 301	2N 2605	BC 309
2N 1075	2N 2218	2N 1974	BC 301	2N 2618	2N 2218
2N 1076	2N 2218	2N 1975	BC 301	2N 2692	BCY 59
2N 1077	2N 2218	2N 1983	2N 2219	2N 2693	BCY 59
2N 1081	2N 2221	2N 1984	2N 2218	2N 2694	BCY 59
2N 1082	2N 2221	2N 1985	2N 2218	2N 2695	2N 2906
2N 1116	BC 301	2N 1986	2N 2218	2N 2696	2N 2906
2N 1131	BC 304	2N 1987	2N 2218	2N 2697	2N 2906
2N 1132A	2N 2904	2N 1988	2N 2218A	2N 2706	AC 125
2N 1135	2N 2369A	2N 1989	2N 2218A	2N 2711	BC 238
2N 1199	2N 2368	2N 1990	BC 301	2N 2712	BC 238
2N 1228	2N 2904	2N 1991	2N 2904	2N 2713	BC 238
2N 1229	2N 2904	2N 1992	2N 2221	2N 2714	BC 238
2N 1230	2N 2904	2N 2049	2N 2219A	2N 2715	BC 238
2N 1231	2N 2904	2N 2102	BC 300	2N 2716	BC 238
2N 1232	2N 2904A	2N 2192	2N 2219A	2N 2787	2N 2218A
2N 1233	2N 2904A	2N 2193	2N 2218A	2N 2788	2N 2218A
2N 1267	2N 2369A	2N 2194	2N 2218A	2N 2789	2N 2219A
2N 1268	2N 2369A	2N 2195	2N 2218	2N 2790	2N 2221A
2N 1269	2N 2369A	2N 2205	2N 2368	2N 2791	2N 2221A
2N 1270	2N 2369A	2N 2206	2N 2369A	2N 2792	2N 2222A
2N 1271	2N 2369A	2N 2214	2N 2368	2N 2800	2N 2904A
2N 1272	2N 2369A	2N 2217	2N 2218	2N 2801	2N 2905A
2N 1273	AC 125(z)	2N 2236	2N 2218	2N 2831	2N 2221
2N 1274	AC 125(z)	2N 2237	2N 2218	2N 2837	2N 2906A
2N 1335	2N 2218A	2N 2240	2N 2218	2N 2838	2N 2907A
2N 1336	2N 2218A	2N 2241	2N 2219	2N 2863	2N 2218
2N 1337	2N 2218A	2N 2243	BC 300	2N 2864	2N 2218
2N 1338	2N 2218A	2N 2270	BC 301	2N 2886	2N 2218A
2N 1339	BC 300	2N 2272	2N 2222	2N 2909	2N 2221A
2N 1340	BC 300	2N 2297	BC 302	2N 2921	BC 237A
2N 1341	BC 300	2N 2303	2N 2905	2N 2922	BC 237A

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
2N 2923	BC 237A	2N 3504	2N 2907	2N 4250	BC 416C
2N 2924	BC 237B	2N 3505	2N 2907A	2N 4256	BC 237B
2N 2925	BC 237B	2N 3508	2N 2369A	2N 4286	BCY 58
2N 2926	BC 237A	2N 3509	2N 2369A	2N 4289	BCY 79
2N 2927	2N 2904	2N 3565	BC 413B	2N 4314	BC 303
2N 2938	2N 2369A	2N 3566	BC 237B	2N 4354	BC 304
2N 2944	BCY 78	2N 3605	2N 5769	2N 4355	BC 304
2N 2945	BCY 78	2N 3606	2N 5769	2N 4356	BC 303
2N 2946	BCY 79	2N 3607	2N 5769	2N 4384	BC 337
2N 2960	2N 2219	2N 3642	2N 2218A	2N 4386	BC 337
2N 2961	2N 2219	2N 3662	BF 198	2N 4402	BC 307A
2N 3011	2N 2369	2N 3663	BF 198	2N 4403	BC 307A
2N 3012	2N 2894	2N 3665	BC 300	2N 4404	BC 303
2N 3015	2N 2218	2N 3666	BC 300	2N 4405	BC 303
2N 3019	BC 300	2N 3671	2N 2905A	2N 4424	BCY 59
2N 3020	BC 300	2N 3672	BCY 79	2N 4449	2N 2369A
2N 3036	BC 300	2N 3673	2N 2907A	2N 4450	2N 2222
2N 3053	BC 302	2N 3691	BC 237A	2N 4451	2N 2894
2N 3056	BC 301	2N 3692	BC 237A	2N 4452	2N 2907
2N 3057	BC 301	2N 3702	BC 308	2N 4873	2N 2369A
2N 3074	AF 106	2N 3703	BC 307	2N 4890	2N 2904
2N 3075	AF 200	2N 3704	BC 237	2N 4951	2N 2221
2N 3107	BC 301	2N 3704	BC 237	2N 4952	2N 2221
2N 3108	BC 301	2N 3706	BC 238	2N 4953	2N 2222
2N 3109	BC 302	2N 3707	BC 237A	2N 4954	2N 2222
2N 3110	BC 302	2N 3708	BC 237A	2N 4960	BC 301
2N 3115	2N 2221	2N 3709	BC 237A	2N 4961	BC 300
2N 3116	2N 2222	2N 3710	BC 237A	2N 5086	BC 307A
2N 3117	BC 414C	2N 3711	BC 237B	2N 5087	BC 307B
2N 3118	2N 2219	2N 3712	BF 257	2N 5088	BC 237B
2N 3120	2N 2904	2N 3713	2N 3055	2N 5089	BC 239
2N 3121	2N 2906	2N 3715	2N 3055	2N 5106	2N 2219
2N 3122	2N 2219	2N 3721	BC 238B	2N 5107	2N 2222
2N 3123	2N 2219	2N 3742	BF 259	2N 5131	BC 413B
2N 3133	2N 2904	2N 3771	BUY 12T	2N 5132	BC 413B
2N 3135	2N 2906	2N 3772	BUY 12T	2N 5133	BC 413C
2N 3136	2N 2907	2N 3773	BUY 12	2N 5137	BC 338
2N 3232	2N 3055	2N 3830	2N 2218A	2N 5138	BC 413C
2N 3235	2N 3055	2N 3831	2N 2218A	2N 5139	BC 308A
2N 3241	2N 2222	2N 3855	BC 238A	2N 5172	BC 237A
2N 3242	2N 2222	2N 3856	BC 238B	2N 5186	2N 2368
2N 3248	2N 2905	2N 3903	BC 237A	2N 5187	2N 2369
2N 3250	BCY 79	2N 3904	BC 237A	2N 5209	BC 414B
2N 3251	BCY 79	2N 3905	BC 307A	2N 5210	BC 414C
2N 3326	2N 2218A	2N 3906	BC 307B	2N 5219	BC 238B
2N 3390	BC 238C	2N 3945	2N 2218A	2N 5220	BC 338
2N 3391	BC 238B	2N 3964	BC 177B	2N 5221	BC 328
2N 3392	BC 238B	2N 3981	2N 2218	2N 5223	BC 239B
2N 3393	BC 237A	2N 3982	2N 2218	2N 5225	BC 338
2N 3394	BC 238A	2N 4030	BC 304	2N 5226	BC 338
2N 3395	BC 238B	2N 4031	BC 303	2N 5354	BC 327
2N 3396	BC 238B	2N 4032	BC 304	2N 5355	BC 327
2N 3397	BC 238B	2N 4033	BC 303	2N 5356	BC 327
2N 3398	BC 238B	2N 4034	BCY 79	2N 5367	BCY 79
2N 3399	AF 139	2N 4035	BCY 79	2N 5447	BC 307A
2N 3402	BC 338-16	2N 4036	BC 303	2N 5448	BC 307A
2N 3403	BC 338-25	2N 4037	BC 304	2N 5449	BC 337
2N 3404	BC 337-16	2N 4046	2N 2218	2N 5450	BC 337
2N 3405	BC 337-25	2N 4058	BC 307A	2N 5451	BC 337
2N 3414	BCY 58	2N 4059	BC 307A	2N 5539	BC 178A
2N 3415	BCY 58	2N 4060	BC 307A	2N 5763	2N 2907A
2N 3416	BCY 59	2N 4061	BC 307A	2N 5810	BC 337
2N 3417	BCY 59	2N 4062	BC 307B	2N 5811	BC 327
2N 3445	BUY 12T	2N 4121	BC 416A	2N 5812	BC 337
2N 3446	BUY 12T	2N 4122	BC 416B	2N 5813	BC 327
2N 3447	BUY 12T	2N 4125	BC 415B	2N 5814	BC 337
2N 3448	BUY 12T	2N 4126	BC 415B	2N 5815	BC 327
2N 3464	2N 2219A	2N 4235	BC 304	2N 5816	BC 337
2N 3485	2N 2906	2N 4236	BC 303	2N 5817	BC 327
2N 3486	2N 2907	2N 4237	BC 302	2N 5818	BC 337
2N 3498	BF 257	2N 4238	BC 301	2N 5819	BC 327
2N 3499	BF 257	2N 4239	BC 300	2N 5824	BC 237A
2N 3500	BF 257	2N 4248	BC 309C	2N 5825	BC 237A
2N 3501	BF 257	2N 4248	BC 416C	2N 5826	BC 237B
2N 3502	2N 2905	2N 4249	BC 309B	2N 5827	BC 237B
2N 3503	2N 2905A	2N 4250	BC 309C	2N 5828	BC 237B

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
2N 5855	BC 304	2SA 628	BC 308A	2SC 17	BC 107A
2N 5856	BC 301	2SA 629	BC 308B	2SC 18	BC 107A
2N 5857	BC 303			2SC 46	BC 301
2N 5858	BC 300	2SB 25(g)	ASZ 16	2SC 47	BC 302
2N 5865	BC 303	2SB 26	ASZ 1017	2SC 48	BC 300
2N 5961	BC 414C	2SB 40(g)	AC 125K(z)	2SC 49	BC 300
2N 5962	BC 414C	2SB 44	AC 126	2SC 69	BC 300
2N 5963	BC 413C	2SB 44(g)	AC 125(z)	2SC 70	BF 258
2N 6076	BC 307B	2SB 47(g)	AC 125F(z)	2SC 74	BC 108A
2N 6253	2N 3055	2SB 54	AC 125	2SC 103	BC 107A
2N 6257	2N 3055	2SB 54	AC 126	2SC 104	BC 107A
2N 6262	2N 3442	2SB 54(g)	AC 125(z)	2SC 105	BC 109B
2N 6354	2N 3442	2SB 55(g)	AC 125U(z)	2SC 117	BC 301
		2SB 56	AC 125	2SC 118	BC 301
2SA 50(g)	AC 125(z)	2SB 66(H)	AC 125(z)	2SC 119	BC 301
2SA 95(g)	2N 2894	2SB 67(H)	AC 125U(z)	2SC 149	BC 300
2SA 126	AC 125	2SB 67A(H)	AC 125U(z)	2SC 154C	BF 259
2SA 238	AF 139	2SB 73(H)	AC 125F(z)	2SC 281	BC 108A
2SA 239	AF 106	2SB 75	AC 125	2SC 283	BC 107
2SA 240	AF 106	2SB 75(H)	AC 125(z)	2SC 303	BC 302
2SA 242	AF 106	2SB 75A(H)	AC 125K(z)	2SC 304	BC 302
2SA 243	AF 106	2SB 77	AC 125	2SC 305	BC 300
2SA 244	AF 139	2SB 77	AC 126	2SC 306	BC 302
2SA 245	AF 139	2SB 77A	AC 126	2SC 307	BC 302
2SA 246	AF 106	2SB 77(H)	AC 125(z)	2SC 308	BC 301
2SA 247	AF 106	2SB 77A(H)	AC 125K(z)	2SC 309	BC 300
2SA 288	AF 139	2SB 89(H)	AC 125(z)	2SC 350	BC 107B
2SA 289	AF 139	2SB 91(g)	AC 125(z)	2SC 352	BC 107A
2SA 290	AF 139	2SB 122	ASZ 1015	2SC 360	BC 108A
2SA 292	AF 106	2SB 122	ASZ 1018	2SC 361	BC 237A
2SA 293	AF 106	2SB 122(g)	ASZ 18	2SC 362	BC 237B
2SA 294	AF 106	2SB 123	ASZ 1016	2SC 363	BC 237B
2SA 372	AF 200	2SB 123	ASZ 1017	2SC 368	BC 238B
2SA 372	AF 201	2SB 149	ASZ 1016	2SC 369	BC 239C
2SA 482	BC 304	2SB 149	ASZ 1017	2SC 370	BC 237A
2SA 485	BC 303	2SB 156A	AC 125	2SC 371	BC 237A
2SA 486	BC 304	2SB 189	AC 128	2SC 372	BC 237
2SA 493	BC 309	2SB 189(g)	AC 128(z)	2SC 373	BC 237B
2SA 493	BC 416	2SB 200	AC 128	2SC 374	BC 237B
2SA 494	BC 308	2SB 200(g)	AC 128(z)	2SC 377	BF 198
2SA 494	BC 415	2SB 201	AC 128	2SC 378	BF 198
2SA 495	BC 307	2SB 201(g)	AC 128(z)	2SC 379	BC 237A
2SA 497	BC 303	2SB 257	AC 125	2SC 380	BF 198
2SA 498	BC 304	2SB 337	ASZ 1016	2SC 381	BF 198
2SA 499	BC 177	2SB 338(H)	ASZ 16	2SC 382	BF 198
2SA 500	BC 178	2SB 338(H)	ASZ 17	2SC 388	BF 199
2SA 501	BC 177A	2SB 339(H)	ASZ 16	2SC 389	BF 199
2SA 503	BC 304	2SB 339(H)	ASZ 17	2SC 394	BF 198
2SA 506	AF 106	2SB 340(H)	ASZ 15	2SC 395A	2N 2369
2SA 507	AF 106	2SB 340(H)	ASZ 18	2SC 400	BC 107
2SA 508	AF 106	2SB 341(H)	ASZ 15	2SC 403	BC 237A
2SA 511	BC 303	2SB 341(H)	ASZ 18	2SC 458	BC 107
2SA 512	BC 303	2SB 364	AC 126	2SC 458LG	BC 109
2SA 513	BC 304	2SB 367	AD 162	2SC 464	BF 199
2SA 522	BC 178A	2SB 368	AD 162	2SC 479(H)	2N 2218
2SA 525	AF 106	2SB 370	AC 125	2SC 482	BFY 33
2SA 530	BC 177A	2SB 370A	AC 125	2SC 485	BC 300
2SA 532	BC 177A	2SB 415	AC 128	2SC 486	BC 301
2SA 537	BC 304	2SB 415(g)	AC 128(z)	2SC 497	BC 300
2SA 539	BC 307A	2SB 424	ASZ 1015	2SC 498	BC 301
2SA 544	BC 177A	2SB 424	ASZ 1018	2SC 501	2N 2218
2SA 545	BC 307A	2SB 425	ASZ 1016	2SC 503	BC 301
2SA 546	BC 303	2SB 425	ASZ 1017	2SC 504	BC 302
2SA 549	BC 178A	2SB 426	ASZ 1016	2SC 511	BC 300
2SA 550	BC 178B	2SB 426	ASZ 1017	2SC 512	BFY 46
2SA 552	BC 177A	2SB 439	AC 125	2SC 512	2N 1711
2SA 561	BC 307	2SB 439	AC 126	2SC 513	BC 302
2SA 564	BC 308B	2SB 459	AC 125	2SC 528	BC 238A
2SA 567	BC 178B	2SB 460	AC 125	2SC 529	BC 237A
2SA 571	BC 304	2SB 461	AC 128	2SC 530	BC 237
2SA 578	BC 177B	2SB 471	ASZ 1016	2SC 531	BC 237A
2SA 579	BC 177B	2SB 471	ASZ 1017	2SC 532	BC 237A
2SA 606	BC 303	2SB 472	ASZ 1015	2SC 533	BC 237A
2SA 708	BC 303	2SB 496	AC 125	2SC 548(H)	BCY 78
2SA 617	BC 177A			2SC 548(H)	BCY 79
2SA 618	BC 177A	2SC 16	BC 107A	2SC 560	BC 301

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
2SC 590	BC 300	2SD 96	AC 176	AD 150	ASZ 1017
2SC 649	BC 108	2SD 151	2N 3055	AD 1202	ASZ 1017
2SC 650	BC 109	2SD 163	2N 3055	AD 1203	ASZ 1017
2SC 682	BF 198	2SD 164	2N 3055		
2SC 689(H)	2N 2369	2SD 165	2N 3442	AF 109R	AF 139
2SC 696	BC 301	2SD 170	AC 176		
2SC 708A(H)	BFY 34	2SD 170A	AC 176	AFY 12	AF 106
2SC 708A(H)	2N 1613	2SD 180	2N 3055		
2SC 732	BC 413B	2SD 217	2N 3442	BC 147	BC 237
2SC 733	BC 237	2SD 341H	2N 3055	BC 148	BC 238
2SC 734	BC 237			BC 149	BC 239
2SC 784	BF 198				
2SC 785	BF 198			BF 167	BF 198
2SC 786	BF 198			BF 173	BF 199
2SC 816	BC 302			BF 179A	BF 257
2SC 826	BC 301			BF 179B	BF 258
2SC 827	BC 301			BF 179C	BF 259
2SC 907A(H)	BCY 59				
2SC 941	BC 413	Types not included in the existing delivery programme or not recommended for new designs		OC 26	ASZ 1017
2SC 979	BCY 59			OC 1016	ASZ 1017
2SC 980	BC 237			OC 44K(z)	BCY 78
2SC 984	BC 337			OC 1044	BC 178
2SC 1008	BC 301			OC 1045	BC 178
2SC 1079	2N 3442			OC 1070	AC 125
2SC 1204	BF 240	AC 107	AC 125F(z)	OC 1071	AC 125
2SC 1205	BF 241	AC 125F	AC 125F(z)	OC 1072	AC 125
2SC 1303	BC 302	AC 127	AC 176	OC 1074	AC 128
		AC 132	AC 125	OC 1075	AC 125
2SD 73	2N 3055			OC 1076	AC 125K(z)
2SD 74	2N 3442	AD 136	ASZ 16	OC 1077	AC 125U(z)
2SD 77	AC 176	AD 149	ASZ 1017	OC 1079	AC 128

Integrated Circuits

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
TTL digital integrated circuits		DM 7454N	7454PC	DM 74164N	74164PC
		DM 7460N	7460PC	DM 74165N	74165PC
		DM 7470N	7470PC	DM 74166N	74166PC
		DM 7472N	7472PC	DM 74174N	74174PC
DM 7401N	7401PC	DM 7473N	7473PC	DM 74175N	74175PC
DM 7402N	7402PC	DM 7474N	7474PC	DM 74176N	74176PC
DM 7403N	7403PC	DM 7475N	7475PC	DM 74177N	74177PC
DM 7404N	7404PC	DM 7476N	7476PC	DM 74180N	74180PC
DM 7405N	7405PC	DM 7485N	7485PC	DM 74181N	74181PC
DM 7406N	7406PC	DM 7486N	7486PC	DM 74182N	74182PC
DM 7407N	7407PC	DM 8300N	74195PC	DM 74190N	74190PC
DM 7408N	7408PC	DM 8560N	74192PC	DM 74191N	74191PC
DM 7409N	7409PC	DM 8563N	74193PC	DM 74192N	74192PC
DM 7410N	7410PC	DM 8570N	74164PC	DM 74193N	74193PC
DM 7411N	7411PC	DM 8590N	74165PC	DM 74195N	74195PC
DM 7413N	7413PC	DM 8601N	74122PC	DM 74196N	74196PC
DM 7414N	7414PC	DM 74107N	74107PC	DM 74197N	74197PC
DM 7416N	7416PC	DM 74121N	74121PC	DM 74198N	74198PC
DM 7417N	7417PC	DM 74123N	74123PC	DM 74199N	74199PC
DM 7420N	7420PC	DM 74125N	74125PC		
DM 7423N	7423PC	DM 74126N	74126PC	FJH 101	7430PC
DM 7425N	7425PC	DM 74132N	74132PC	FJH 111	7420PC
DM 7426N	7426PC	DM 74141N	74141PC	FJH 121	7410PC
DM 7427N	7427PC	DM 74145N	74145PC	FJH 131	7400PC
DM 7430N	7430PC	DM 74150N	74150PC	FJH 141	7440PC
DM 7432N	7432PC	DM 74153N	74153PC	FJH 151	7450PC
DM 7437N	7437PC	DM 74154N	74154PC	FJH 161	7451PC
DM 7438N	7438PC	DM 74155N	74155PC	FJH 171	7453PC
DM 7440N	7440PC	DM 74156N	74156PC	FJH 181	7454PC
DM 7442N	7442PC	DM 74157N	74157PC	FJH 191	7480PC
DM 7445N	7445PC	DM 74160N	74160PC	FJH 201	7482PC
DM 7450N	7450PC	DM 74161N	74161PC	FJH 221	7402PC
DM 7451N	7451PC	DM 74162N	74162PC	FJH 231	7401PC
DM 7453N	7453PC	DM 74163N	74163PC	FJH 241	7404PC

TYPE	TUNGSRAM-TYPE
FJH 251	7405PC
FJH 261	7442PC
FJH 271	7486PC
FJH 281	74180PC
FJH 291	7403PC
FJH 301	7426PC
FJH 321	7416PC
FJH 341	74154PC
FJH 421	7408PC
FJJ 101	7470PC
FJJ 111	7472PC
FJJ 121	7473PC
FJJ 131	7474PC
FJJ 181	7475PC
FJJ 191	7476PC
FJJ 231	7495PC
FJJ 241	7496PC
FJJ 251	7492PC
FJJ 261	74107PC
FJK 101	74121PC
FJL 131	7413PC
FJY 101	7460PC
FLH 101	7400PC
FLH 111	7410PC
FLH 121	7420PC
FLH 131	7430PC
FLH 141	7440PC
FLH 151	7450PC
FLH 161	7451PC
FLH 171	7453PC
FLH 181	7454PC
FLH 191	7402PC
FLH 201	7401PC
FLH 211	7404PC
FLH 221	7480PC
FLH 231	7482PC
FLH 271	7405PC
FLH 291	7403PC
FLH 291U	7426PC
FLH 341	7486PC
FLH 351	7413PC
FLH 381	7408PC
FLH 491	7409PC
FLH 401	74181PC
FLH 411	74182PC
FLH 421	74180PC
FLH 431	7485PC
FLH 481	7406PC
FLH 481T	7416PC
FLH 491	7407PC
FLH 491T	7417PC
FLH 501	7412PC
FLH 511	7423PC
FLH 521	7425PC
FLH 531	7437PC
FLH 541	7438PC
FLH 551	7448PC
FLH 601	74132PC
FLH 621	7427PC
FLH 631	7432PC
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FLJ 121	7473PC
FLJ 131	7476PC
FLJ 141	7474PC
FLJ 151	7475PC
FLJ 161	7490PC
FLJ 181	7493PC
FLJ 201	74190PC
FLJ 211	74191PC

TYPE	TUNGSRAM-TYPE
FLJ 231	7494PC
FLJ 241	74192PC
FLJ 251	74193PC
FLJ 261	7496PC
FLJ 271	74107PC
FLJ 281	74104PC
FLJ 291	74105PC
FLJ 311	74198PC
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FLJ 331	7497PC
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FLJ 401	74160PC
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FLJ 441	74164PC
FLJ 451	74165PC
FLJ 461	74166PC
FLJ 471	74167PC
FLJ 531	74174PC
FLJ 541	74175PC
FLJ 551	74194PC
FLJ 561	74195PC
FLK 101	74121PC
FLK 111	74122PC
FLK 121	74123PC
FLL 101	74141PC
FLL 111	7445PC
FLL 111T	74145PC
FLJ 121	7446PC
FLJ 121T	7447PC
FLQ 131	74170PC
FLY 101	7460PC
FLY 111	74150PC
FLY 131	74153PC
FLY 141	74154PC
FLY 151	74155PC
FLY 161	74156PC
FLY 171	74157PC
MC 3021P	7486PC
MC 7400P	7400PC
MC 7401P	7401PC
MC 7402P	7402PC
MC 7403P	7403PC
MC 7404P	7404PC
MC 7405P	7405PC
MC 7406P	7406PC
MC 7407P	7407PC
MC 7408P	7408PC
MC 7409P	7409PC
MC 7410P	7410PC
MC 7416P	7416PC
MC 7417P	7417PC
MC 7420P	7420PC
MC 7426P	7426PC
MC 7430P	7430PC
MC 7437P	7437PC
MC 7438P	7438PC
MC 7440P	7440PC
MC 7441P	7441PC
MC 7445P	7445PC
MC 7446P	7446PC
MC 7447P	7447PC
MC 7448P	7448PC
MC 7450P	7450PC
MC 7451P	7451PC
MC 7453P	7453PC
MC 7454P	7454PC
MC 7460P	7460PC
MC 7470P	7470PC

TYPE	TUNGSRAM-TYPE
MC 7472P	7472PC
MC 7473P	7473PC
MC 7475P	7475PC
MC 7476P	7476PC
MC 7480P	7480PC
MC 7486P	7486PC
MC 7493P	7493PC
MC 8300P	74195PC
MC 8601P	74122PC
MC 17482P	7482PC
MC 74107P	74107PC
MC 74121P	74121PC
MC 74123P	74123PC
MC 74145P	74145PC
MC 74150P	74150PC
MC 74153P	74153PC
MC 74155P	74155PC
MC 74156P	74156PC
MC 74157P	74157PC
MC 74180P	74180PC
MC 74181P	74181PC
MC 74182P	74182PC
MC 74192P	74192PC
MC 74193P	74193PC
MIC 7400	7400PC
MIC 7401	7401PC
MIC 7402	7402PC
MIC 7403	7403PC
MIC 7404	7404PC
MIC 7405	7405PC
MIC 7406	7406PC
MIC 7407	7407PC
MIC 7408	7408PC
MIC 7409	7409PC
MIC 7410	7410PC
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MIC 7417	7417PC
MIC 7420	7420PC
MIC 7421	7421PC
MIC 7425	7425PC
MIC 7426	7426PC
MIC 7430	7430PC
MIC 7432	7432PC
MIC 7437	7437PC
MIC 7438	7438PC
MIC 7440	7440PC
MIC 7445	7445PC
MIC 7446	7446PC
MIC 7447	7447PC
MIC 7448	7448PC
MIC 7450	7450PC
MIC 7451	7451PC
MIC 7453	7453PC
MIC 7454	7454PC
MIC 7460	7460PC
MIC 7470	7470PC
MIC 7472	7472PC
MIC 7473	7473PC
MIC 7474	7474PC
MIC 7475	7475PC
MIC 7476	7476PC
MIC 7480	7480PC
MIC 7482	7482PC
MIC 7486	7486PC
MIC 7494	7494PC
MIC 7495	7495PC
MIC 7496	7496PC
MIC 74104	74104PC
MIC 74105	74105PC
MIC 74107	74107PC
MIC 74109	74109PC
MIC 74121	74121PC

TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE	TYPE	TUNGSRAM-TYPE
MIC 74122	74122PC	N 74109	74109PC	SFC 4122E	74122PC
MIC 74123	74123PC	N 74116	74116PC	SFC 4123E	74123PC
MIC 74141	74141PC	N 74121	74121PC	SFC 4141E	74141PC
MIC 74145	74145PC	N 74122	74122PC	SFC 4154E	74154PC
MIC 74150	74150PC	N 74123	74123PC	SFC 4155E	74155PC
MIC 74153	74153PC	N 74125	74125PC	SFC 4156E	74156PC
MIC 74154	74154PC	N 74126	74126PC	SFC 4180E	74180PC
MIC 74155	74155PC	N 74132	74132PC	SFC 4181E	74181PC
MIC 74156	74156PC	N 74145	74145PC	SFC 4182E	74182PC
MIC 74157	74157PC	N 74148	74148PC	SFC 4192E	74192PC
MIC 74160	74160PC	N 74150	74150PC	SFC 4193E	74193PC
MIC 74161	74161PC	N 74153	74153PC		
MIC 74162	74162PC	N 74154	74154PC	SN 7400N	7400PC
MIC 74163	74163PC	N 74155	74155PC	SN 7401N	7401PC
MIC 74164	74164PC	N 74156	74156PC	SN 7402N	7402PC
MIC 74165	74165PC	N 74157	74157PC	SN 7403N	7403PC
MIC 74180	74180PC	N 74160	74160PC	SN 7404N	7404PC
MIC 74190	74190PC	N 74161	74161PC	SN 7405N	7405PC
MIC 74191	74191PC	N 74162	74162PC	SN 7406N	7406PC
MIC 74192	74192PC	N 74163	74163PC	SN 7407N	7407PC
MIC 74193	74193PC	N 74164	74164PC	SN 7408N	7408PC
MIC 74194	74194PC	N 74165	74165PC	SN 7409N	7409PC
MIC 74195	74195PC	N 74166	74166PC	SN 7410N	7410PC
		N 74170	74170PC	SN 7411N	7411PC
N 7400	7400PC	N 74174	74174PC	SN 7412N	7412PC
N 7401	7401PC	N 74175	74175PC	SN 7413N	7413PC
N 7402	7402PC	N 74176	74176PC	SN 7414N	7414PC
N 7403	7403PC	N 74177	74177PC	SN 7416N	7416PC
N 7404	7404PC	N 74178	74178PC	SN 7417N	7417PC
N 7405	7405PC	N 74179	74179PC	SN 7420N	7420PC
N 7406	7406PC	N 74180	74180PC	SN 7421N	7421PC
N 7407	7407PC	N 74181	74181PC	SN 7423N	7423PC
N 7408	7408PC	N 74182	74182PC	SN 7425N	7425PC
N 7409	7409PC	N 74190	74190PC	SN 7426N	7426PC
N 7410	7410PC	N 74191	74191PC	SN 7427N	7427PC
N 7411	7411PC	N 74192	74192PC	SN 7430N	7430PC
N 7412	7412PC	N 74193	74193PC	SN 7432N	7432PC
N 7413	7413PC	N 74194	74194PC	SN 7437N	7437PC
N 7414	7414PC	N 74195	74195PC	SN 7438N	7438PC
N 7416	7416PC	N 74196	74196PC	SN 7440N	7440PC
N 7417	7417PC	N 74197	74197PC	SN 7445N	7445PC
N 7420	7420PC	N 74198	74198PC	SN 7446N	7446PC
N 7421	7421PC	N 74199	74199PC	SN 7448N	7448PC
N 7425	7425PC	N 74279	74279PC	SN 7449N	7449PC
N 7426	7426PC	N 74283	74283PC	SN 7450N	7450PC
N 7427	7427PC	N 74298	74298PC	SN 7451N	7451PC
N 7430	7430PC			SN 7453N	7453PC
N 7432	7432PC	SFC 400E	7400PC	SN 7454N	7454PC
N 7437	7437PC	SFC 401E	7401PC	SN 7460N	7460PC
N 7438	7438PC	SFC 402E	7402PC	SN 7470N	7470PC
N 7440	7440PC	SFC 403E	7403PC	SN 7472N	7472PC
N 7442	7442PC	SFC 408E	7408PC	SN 7473N	7473PC
N 7443	7443PC	SFC 409E	7409PC	SN 7474N	7474PC
N 7444	7444PC	SFC 410E	7410PC	SN 7475N	7475PC
N 7445	7445PC	SFC 420E	7420PC	SN 7476N	7476PC
N 7448	7448PC	SFC 426E	7426PC	SN 7480N	7480PC
N 7450	7450PC	SFC 430E	7430PC	SN 7482N	7482PC
N 7451	7451PC	SFC 437E	7437PC	SN 7483N	7483PC
N 7453	7453PC	SFC 438E	7438PC	SN 7485N	7485PC
N 7454	7454PC	SFC 440E	7440PC	SN 7486N	7486PC
N 7460	7460PC	SFC 442E	7442PC	SN 7490N	7490PC
N 7470	7470PC	SFC 450E	7450PC	SN 7491N	7491PC
N 7472	7472PC	SFC 451E	7451PC	SN 7493N	7493PC
N 7473	7473PC	SFC 453E	7453PC	SN 7494N	7494PC
N 7474	7474PC	SFC 454E	7454PC	SN 7496N	7496PC
N 7475	7475PC	SFC 460E	7460PC	SN 7497N	7497PC
N 7476	7476PC	SFC 472E	7472PC	SN 74104N	74104PC
N 7480	7480PC	SFC 473E	7473PC	SN 74105N	74105PC
N 7483	7483PC	SFC 474E	7474PC	SN 74107N	74107PC
N 7485	7485PC	SFC 475E	7475PC	SN 74109N	74109PC
N 7486	7486PC	SFC 476E	7476PC	SN 74116N	74116PC
N 7491	7491PC	SFC 485E	7485PC	SN 74121N	74121PC
N 7494	7494PC	SFC 486E	7486PC	SN 74122N	74122PC
N 7495	7495PC	SFC 492E	7492PC	SN 74123N	74123PC
N 7496	7496PC	SFC 4107E	74107PC	SN 74125N	74125PC
N 74107	74107PC	SFC 4121E	74121PC	SN 74126N	74126PC

TYPE	TUNGSRAM-TYPE
SN 74132N	74132PC
SN 74141N	74141PC
SN 74145N	74145PC
SN 74148N	74148PC
SN 74150N	74150PC
SN 74151N	74151PC
SN 74153N	74153PC
SN 74154N	74154PC
SN 74155N	74155PC
SN 74156N	74156PC
SN 74157N	74157PC
SN 74160N	74160PC
SN 74161N	74161PC
SN 74162N	74162PC
SN 74163N	74163PC
SN 74164N	74164PC
SN 74165N	74165PC
SN 74166N	74166PC
SN 74167N	74167PC
SN 74170N	74170PC
SN 74174N	74174PC
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SN 74181N	74181PC
SN 74182N	74182PC
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SN 74191N	74191PC
SN 74192N	74192PC
SN 74193N	74193PC
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SN 74196N	74196PC
SN 74197N	74197PC
SN 74198N	74198PC
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SN 74259N	74259PC
SN 74279N	74279PC
SN 74283N	74283PC
SN 74290N	74290PC
SN 74293N	74293PC
SN 74298N	74298PC
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T 7405	7405PC
T 7406	7406PC
T 7407	7407PC
T 7408	7408PC
T 7409	7409PC
T 7410	7410PC
T 7416	7416PC
T 7417	7417PC
T 7420	7420PC
T 7426	7426PC
T 7430	7430PC
T 7440	7440PC
T 7442	7442PC
T 7443	7443PC
T 7444	7444PC
T 7450	7450PC
T 7451	7451PC
T 7453	7453PC
T 7454	7454PC
T 7460	7460PC
T 7472	7472PC
T 7473	7473PC
T 7474	7474PC
T 7475	7475PC

TYPE	TUNGSRAM-TYPE
T 7476	7476PC
T 7486	7486PC
T 7492	7492PC
T 74107	74107PC
T 74121	74121PC
T 74122	74122PC
T 74123	74123PC
T 74157	74157PC
T 74180	74180PC
T 74192	74192PC
T 74193	74193PC
TD 3400	7400PC
TD 3401	7401PC
TD 3402	7402PC
TD 3403	7403PC
TD 3404	7404PC
TD 3405	7405PC
TD 3406	7406PC
TD 3407	7407PC
TD 3408	7408PC
TD 3409	7409PC
TD 3410	7410PC
TD 3416	7416PC
TD 3417	7417PC
TD 3420	7420PC
TD 3421	7421PC
TD 3426	7426PC
TD 3430	7430PC
TD 3437	7437PC
TD 3438	7438PC
TD 3440	7440PC
TD 3450	7450PC
TD 3451	7451PC
TD 3460	7460PC
TD 3472	7472PC
TD 3473	7473PC
TD 3474	7474PC
TD 3475	7475PC
TD 3476	7476PC
TD 3480	7480PC
TD 3486	7486PC
TD 3490	7490PC
TD 3491	7491PC
TD 3492	7492PC
TD 3493	7493PC
TD 34107	74107PC
TD 34121	74121PC
TD 34192	74192PC
TD 34193	74193PC
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TL 7407N	7407PC
TL 7408N	7408PC
TL 7409N	7409PC
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TL 7413N	7413PC
TL 7414N	7414PC
TL 7416N	7416PC
TL 7417N	7417PC
TL 7420N	7420PC
TL 7423N	7423PC
TL 7425N	7425PC
TL 7426N	7426PC
TL 7427N	7427PC
TL 7430N	7430PC
TL 7432N	7432PC
TL 7437N	7437PC
TL 7438N	7438PC

TYPE	TUNGSRAM-TYPE
TL 7440N	7440PC
TL 7442N	7442PC
TL 7443N	7443PC
TL 7444N	7444PC
TL 7445N	7445PC
TL 7446N	7446PC
TL 7447N	7447PC
TL 7448N	7448PC
TL 7450N	7450PC
TL 7451N	7451PC
TL 7453N	7453PC
TL 7454N	7454PC
TL 7460N	7460PC
TL 7470N	7470PC
TL 7472N	7472PC
TL 7473N	7473PC
TL 7474N	7474PC
TL 7475N	7475PC
TL 7476N	7476PC
TL 7480N	7480PC
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TL 74105N	74105PC
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TL 74116N	74116PC
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TL 74125N	74125PC
TL 74126N	74126PC
TL 74132N	74132PC
TL 74141N	74141PC
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TL 74165N	74165PC
TL 74166N	74166PC
TL 74167N	74167PC
TL 74170M	74170PC
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TL 74192N	74192PC
TL 74193N	74193PC
TL 74194N	74194PC
TL 74195N	74195PC
TL 74196N	74196PC
TL 74197N	74197PC
TL 74198N	74198PC
TL 74199N	74199PC
TL 74279N	74279PC

TYPE	TUNGSRAM-TYPE
TL 74283N	74283PC
TL 74298N	74298PC
Interface circuits	
LM 7520N	7520PC
LM 7521N	7521PC
LM 7522N	7522PC
LM 7523N	7523PC
LM 7524N	7524PC
LM 7525N	7525PC
LM 7528N	7528PC
LM 7529N	7529PC
LM 7534N	7534PC
LM 7535N	7535PC
LM 75107AN	75107APC
LM 75108AN	75108APC
LM 75109N	75109PC
LM 75110N	75110PC
LM 75150N	75150PC
LM 75154N	75154PC
LM 75207N	75207PC
LM 75208N	75208PC
LM 75234N	75234PC
LM 75235N	75235PC
LM 75325N	75325PC
LM 75450N	75450APC
LM 75460N	75460PC
MC 8T 13P	75121PC
MC 8T 14P	75122PC
MC 8T 23P	75123PC
MC 8T 24P	75124PC
MC 7520P	7520PC
MC 7521P	7521PC
MC 7522P	7522PC
MC 7523P	7523PC
MC 7524P	7524PC
MC 7525P	7525PC
MC 7528P	7528PC
MC 7529P	7529PC
MC 7534P	7534PC
MC 7535P	7535PC
MC 75107P	75107APC
MC 75108P	75108APC
MC 75109P	75109PC
MC 75110P	75110PC
MC 75450P	75450APC
MC 75491P	75491PC
MC 75492P	75492PC
N 7520B	7520PC
N 7521B	7521PC
N 7522B	7522PC
N 7523B	7523PC
N 7524B	7524PC
N 7525B	7525PC
SFC 5107AE	75107APC
SFC 5108AE	75108APC
SFC 5109E	75109PC
SFC 5110E	75110PC
SFC 5325E	75325PC
SFC 5450AE	75450APC
SN 7520N	7520PC
SN 7521N	7521PC
SN 7522N	7522PC
SN 7523N	7523PC

TYPE	TUNGSRAM-TYPE
SN 7524N	7524PC
SN 7525N	7525PC
SN 7528N	7528PC
SN 7529N	7529PC
SN 7534N	7534PC
SN 7535N	7535PC
SN 75107AN	75107APC
SN 75108AN	75108APC
SN 75109N	75109PC
SN 75110N	75110PC
SN 75121N	75121PC
SN 75122N	75122PC
SN 75123N	75123PC
SN 75124N	75124PC
SN 75150N	75150PC
SN 75207N	75207PC
SN 75208N	75208PC
SN 75234N	75234PC
SN 75235N	75235PC
SN 75325N	75325PC
SN 75450AN	75450APC
SN 75460N	75460PC
SN 75491N	75491PC
SN 75492N	75492PC
T 75107A	75107APC
T 75108A	75108APC
T 75109	75109PC
T 75110	75110PC
75S107A	75107APC
75S108A	75108APC
Operational amplifiers, voltage comparators, voltage regulators	
L 123B1	μA723PC
L 141	μA741PC
LM 709	μA709PC
LM 710	μA710PC
LM 711	μA711PC
LM 723	μA723PC
LM 741	μA741PC
LM 747	μA747PC
LM 748	μA748PC
MC 1709CP	μA709PC
MC 1710CP	μA710PC
MC 1711CP	μA711PC
MC 1712C	μA712PC
MC 1723CP	μA723PC
MC 1741CP1	μA741PC
MC 1747CP	μA747PC
MC 1748CP	μA748PC
N 723CA	μA723PC
N 747CA	μA747PC
N 5101A	μA748PC
N 5709A	μA709PC
N 5710A	μA710PC
N 5711A	μA711PC
N 5741A	μA741PC

TYPE	TUNGSRAM-TYPE
N 5748A	μA748PC
SFC 2709EC	μA709PC
SFC 2710EC	μA710PC
SFC 2711EC	μA711PC
SFC 2741EC	μA741PC
SN 72702N	μA702PC
SN 72709N	μA709PC
SN 72710N	μA710PC
SN 72711N	μA711PC
SN 72723N	μA723PC
SN 72741N	μA741PC
SN 72747N	μA747PC
SN 72748N	μA748PC
SN 76131N	μA739PC
SN 76149N	μA749PC
TA 7502	μA709PC
TA 7504	μA741PC
TA 75747	μA747PC
TBA 221	μA741PC
TDBO 723A	μA723PC
TL 1709C	μA709PC
TL 1723C	μA723PC
TL 1741C	μA741PC
ICs for entertainment	
LM 733	μA733PC
LM 1596	μA796PC
LM 1800	μA758PC
LM 1820	μA720PC
LM 3065	μA3065PC
LM 3089	μA3089PC
MC 1358P	μA3065PC
MC 1389P	μA3089PC
MC 1733CP	μA733PC
N 5065A	μA3065PC
N 5733	μA733PC
NE 546A	μA720PC
SAS 660S	SAS 6600
SAS 670S	SAS 6700
SN 72733N	μA733PC
SN 76116N	μA758PC
SN 76635N	μA720PC
SN 76665N	μA3065PC
SN 76689N	μA3089PC
TA 7171	SAS 6600
TA 7172	SAS 6700
TA 7176	μA3065PC
TAA 940	TAA 550
TBA 271	TAA 550
ZTK 33	TAA 550

The purpose of this list is to facilitate the selection of the most convenient types used in different fields of application.

In the interest of easier survey we indicate only the essential data.

For more information on technical data and/or terms of delivery apply to: