



# Philips RF Manual

product & design manual for  
RF small signal discretes

4<sup>th</sup> edition  
March 2004

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*Product Line RF Consumer Products / Business Development:  
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### **APPENDIX (in separate appendix-file, see last page 35)**

Appendix A:	2.4GHz Generic Front-End reference design
Appendix B:	RF Application-basics
Appendix C:	RF Design-basics

### **Application notes:**

Appendix D:	Application of RF Switch BF1107/8 Mosfet
Appendix E:	BGA2715-17 gen. purpose wideband ampl., 50 Ohm Gain Blocks
Appendix F:	BGA6x89 gen. purpose medium power ampl., 50 Ohm Gain Blocks



## 1 What's New

### New

- **Products recently granted RFS (release for supply)** chapter 1.1
- **Philips offering bare dies** chapter 4.7
- **The new SOT88x package platform** chapter 6
  
- New application notes:**
- **BGA2715-17 general purpose wideband amplifiers** appendix E
- **BGA6x89 general purpose medium power amplifiers** appendix F

### Updates

- Application diagrams & reference designs**
  - improved tuning, LNB and 2.4 GHz reference design. chapter 2
- Application notes list**
  - added new application notes. chapter 3
- Product portfolio**
  - added new products and deleted obsolete products . chapter 4
- X-references**
  - added new x-references and improved lay-out. chapter 5
- Promotion materials**
  - added new materials and visuals of demoboards. chapter 7
- 2.4GHz generic front-end reference design**
  - content extensions and improvement. appendix A
- RF application-basics**
  - content improvement. appendix B
- RF design-basics**
  - content improvement. appendix C



## 1.1 New products

**RFS = release for supply**

Products in yellow block recently granted RFS. Products in white block will be granted RFS soon.

### **New Pin diodes**

Product Type	Application/description	RFS	More info:
<b>BAP51L</b>	Cellular phone, BlueTooth, Cordless phone -RF switch & FE module	Q3 2003	Chapter 4.1
<b>BAP142L</b>		Q1 2004	
<b>BAP51-06W</b>	General purpose, LNB switching	Q3 2003	
<b>BAP70-05</b>	Set Top Box, Cable TV, Car radio FM, Car antenna amplifier		
<b>BAP70-04W</b>			
<b>BAP55L</b>	Cellular phone, BlueTooth, Cordless phone -RF switch	Q2 2004	
<b>BAP69L</b>	& FE module		

### **New MMIC's**

Product Type	Application/description	RFS	More info:
<b>BGA2715</b>	General purpose wideband 50 Ohm Gain Blocks for LNB IF, Cable systems, Satellite distribution amplifiers, metering systems .	Q1 2004	Chapter 4.2
<b>BGA2716</b>			
<b>BGA2717</b>			
<b>BGM1013</b>			

### **New Wideband transistors**

Product Type	Application/description	RFS	More info:
<b>BFG310(W)/XR</b>	4.5 generation of wideband transistors for LNB Oscillator, LNBIF, Cordless, Automotive TPMS, GPS	Q1 2004	Chapter 4.3
<b>BFG325(W)/XR</b>			
<b>BFG425F</b>	5 <sup>th</sup> gen. wideband transistor for LNB Oscillator,	Q3 2004	

### **New Varicap diodes (varactors)**

Product Type	Application/description	RFS	More info:
<b>BB207</b>	Double diode varicap FM car radio (TEF6860).	Q4 2003	Chapter 4.4
<b>BB208-02</b>	Low voltage varicap diodes for VCO's, incl. special design for FM car radio (CREST-IC, TEF6860).		
<b>BB208-03</b>			
<b>BB184</b>	Low voltage (10V) UHF varicap for portable TV.	Q1 2004	
<b>BB199</b>	Varicap for VCO, VCXO, TCXO.		
<b>BB202L</b>	Varicap for mobile radio in e.g. mobile phones, MCD	Q2 2004	

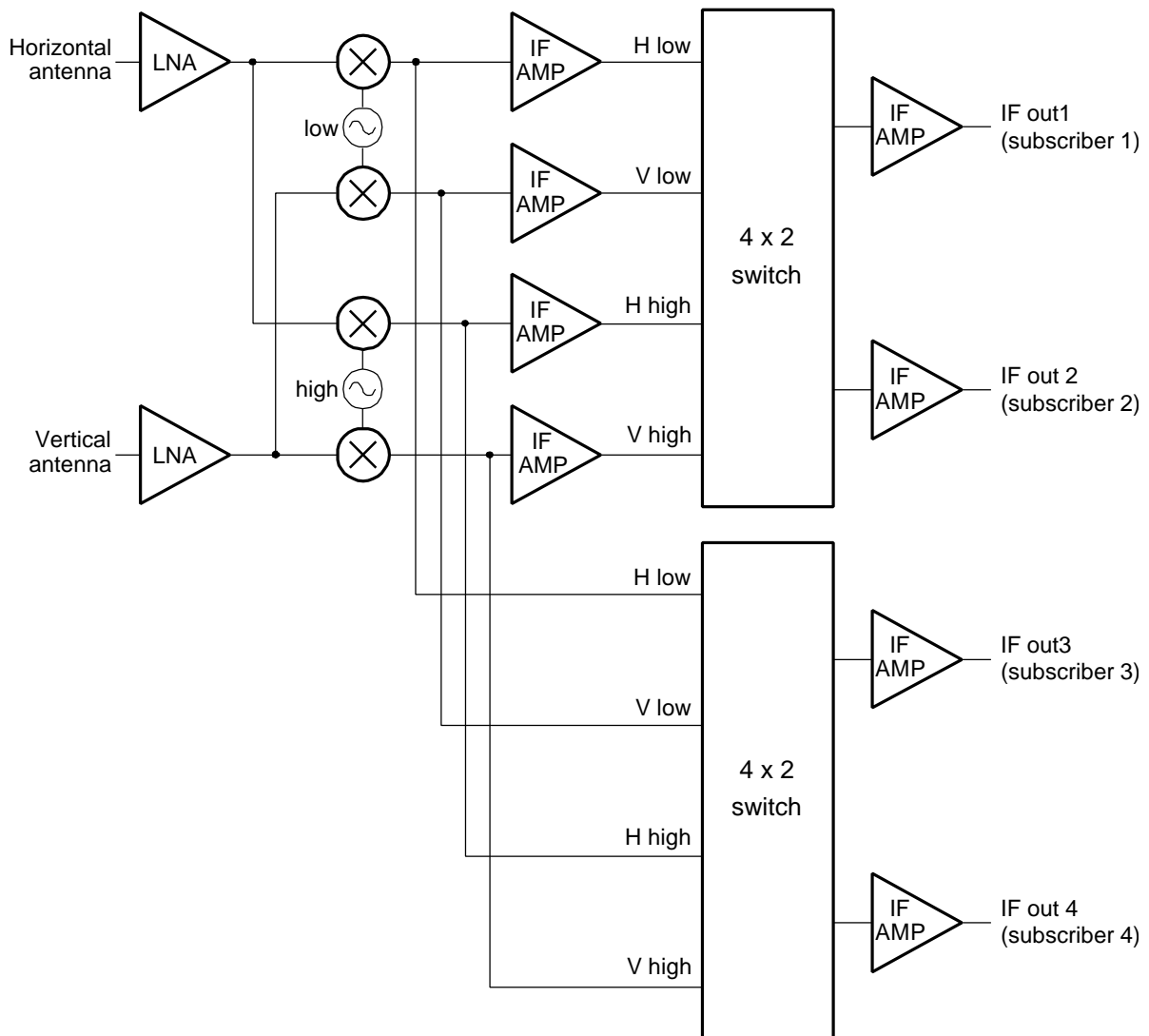
### **New Field Effect transistors**

Product Type	Application/description	RFS	More info:
<b>PMBFJ620</b>	2 in 1 Junction FET for car antenna amplifying.	Q4 2003	Chapter 4.6
<b>BF1205C</b>	Twin VHF Mosfet with improved cross modulation.	Q1 2004	
<b>BF1206</b>	VHF Mosfet improved on noise/gain for TV/VCR/SAT.	Q3 2003	
<b>BF1211(R)(WR)</b>	Improved dual gate Mosfets for TV/VCR/SAT with significant lower noise in the amplifier.		
<b>BF1212(R)(WR)</b>			



## 2 Application Diagrams & Reference Designs

LNB generic diagram



RF Amplifier  
GaAs HEMTs

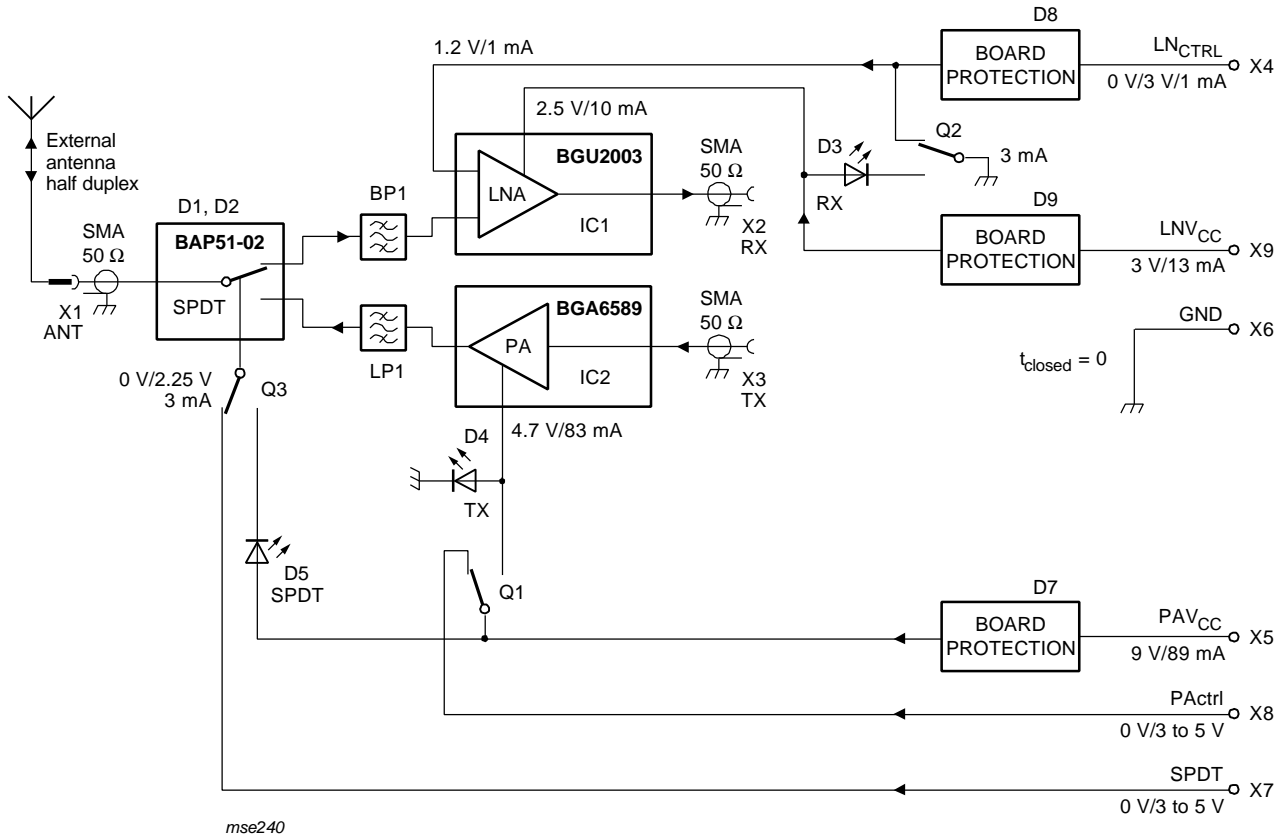
Oscillator and Mixer  
BJTs and/or FETs  
BFG425, BFU5x0

GaAs 4 x 2  
Switch matrix

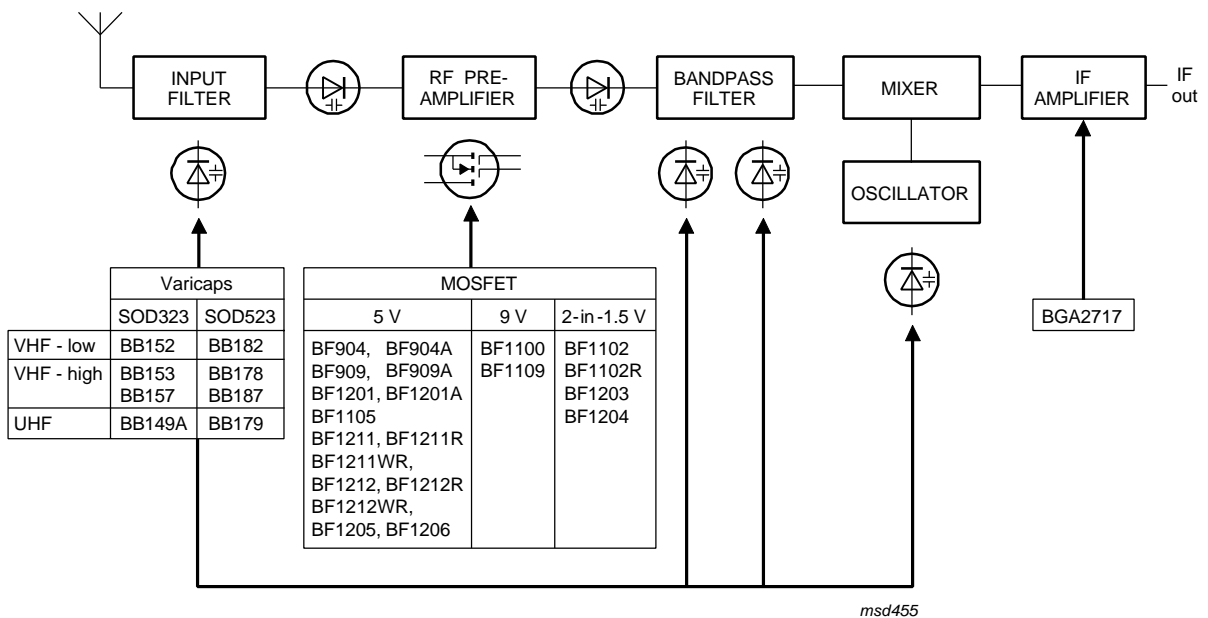
Gain Block  
BGA2709  
BGA2776  
BGM1011



### 2.4 GHz Front-end reference design



### TV/VCR/DVD Tuning Application Diagram





### 3 Application notes (Interactive)

**Online application notes** on Philips Semiconductors website:  
[http://www.semiconductors.philips.com/products/all\\_appnotes.html](http://www.semiconductors.philips.com/products/all_appnotes.html)

Please contact your Philips representatives for off-line application notes

Product Family	Application Note Title	Relevant Types
MMICs	Demoboard for 900&1800MHz <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/9001800MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/9001800MHZ.pdf</a>	BGA2001
	Demoboard for BGA2001 <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/9001800MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/9001800MHZ.pdf</a>	BGA2001
	Demoboard 900MHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/LNA900MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/LNA900MHZ.pdf</a>	BGA2003
	Demoboard for W-CDMA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/WBCDMA.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/WBCDMA.pdf</a>	BGA2003
	2GHz high IP3 LNA	BGA2003
	High IP3 MMIC LNA at 900MHz <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2011_LNA_950MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2011_LNA_950MHZ.pdf</a>	BGA2011
	High IP3 MMIC LNA at 1.8 - 2.4 GHz <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2012_LNA_18_24GHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2012_LNA_18_24GHZ.pdf</a>	BGA2012
	Rx mixer for 1800MHz	BGA2022
	Rx mixer for 2450MHz <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2022_MIXER.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BGA2022_MIXER.pdf</a>	BGA2022
	High-linearity wideband driver mobile communication	BGA2031
	CDMA PCS demoboard	BGA2030
	WDMA appl. For the BGA6589 wideband amplifier	BGA6589
	Wideband transistors	1880MHz PA driver <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG21W_1880DRV.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG21W_1880DRV.pdf</a>
800MHz PA driver <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG21W_800DRV2.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG21W_800DRV2.pdf</a>		BFG21W
900MHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/LNA9M403.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/LNA9M403.pdf</a>		BFG403W
2GHz buffer amplifier <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG410W_BUF2_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG410W_BUF2_1.pdf</a>		BFG410W
900MHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/B770LNA9M410.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/B770LNA9M410.pdf</a>		BFG410W
2GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/RD7B0789.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/RD7B0789.pdf</a>		BFG410W
Ultra LNA's for 900&2000MHz with high IP3 <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/KV96157A.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/KV96157A.pdf</a>		BFG410W, BFG425W
1.5GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/IU5GHZLN.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/IU5GHZLN.pdf</a>		BFG425W
2GHz driver-amplifier		BFG425W
900MHz driver-amplifier with enable-switch <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHAP2.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHAP2.pdf</a>		BFG425W





Product Family	Application Note Title	Relevant Types
Wideband transistors	900MHz driver amplifier <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHZDR.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHZDR.pdf</a>	BFG425W
	1.9GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG425W_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG425W_1.pdf</a>	BFG425W
	Improved IP3 behavior of the 900MHz LNA	BFG425W
	2GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/B773LNA2G425.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/B773LNA2G425.pdf</a>	BFG425W
	Power amplifier for 1.9GHz DECT and PHS <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/DECT.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/DECT.pdf</a>	BFG425W, BFG21W
	2.4GHz power amplifier <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG425W_21W_2400M_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG425W_21W_2400M_1.pdf</a>	BFG425W, BFG21W
	CDMA cellular VCO <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/VCOB827.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/VCOB827.pdf</a>	BFG425W, BFG410W, BB142
	900MHz LNA	BFG480W
	2.45GHz power amplifier <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2450M_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2450M_1.pdf</a>	BFG480W
	2.4GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2400M_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2400M_1.pdf</a>	BFG480W
	2GHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2G_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_2G_1.pdf</a>	BFG480W
	900MHz LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_900M_1.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AI_BFG480W_900M_1.pdf</a>	BFG480W
	1880MHz PA driver <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG480W_1880DRV.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG480W_1880DRV.pdf</a>	BFG480W
	900MHz driver <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG480W_900MDRV.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/BFG480W_900MDRV.pdf</a>	BFG480W
	Low noise, low current preamplifier for 1.9GHz at 3V <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/IP9GHZLC.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/IP9GHZLC.pdf</a>	BFG505
	1890MHz power own converter with 11MHz IF <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/1890MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/1890MHZ.pdf</a>	BFG505/X
	Low noise 900MHz preamplifier at 3V <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHZ.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/900MHZ.pdf</a>	BFG520, BFR505, BFR520
	Power amplifier for 1.9GHz at 3V <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/IP9GHZ3.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/IP9GHZ3.pdf</a>	BFG540/X, BFG10/X, BFG11/X
	400MHz :LNA <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/400MHZUL.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/400MHZUL.pdf</a>	BFG540W/X
	Varicaps	Low voltage FM stereo radio with TEA5767/68
FETs	Application for RF switch BF1107	BF1107
	Application note for MOSFET	BF9..., BF110..., BF120..
	Application for RF switch BF1108	BF1108
Pin diodes	2.45 GHz T/R, RF switch for e.g. Bluetooth application <a href="http://www.philips.semiconductors.com/acrobat/applicationnotes/AN10173-01.pdf">http://www.philips.semiconductors.com/acrobat/applicationnotes/AN10173-01.pdf</a>	BAP51-02
	Low impedance Pin diode <a href="http://www.semiconductors.philips.com/acrobat/applicationnotes/AN10174-01.pdf">http://www.semiconductors.philips.com/acrobat/applicationnotes/AN10174-01.pdf</a>	BAP50-05
	1.8GHz transmit-receive Pin diode switch	BAP51-03



## 4.1 Product portfolio: Pin diodes

**New products in blue block**

### Pin diodes

Type	Package	Conf	Limits		RD ( $\Omega$ ) typ @			Cd (pF) type @		
			Vr(V)	If(mA)	0.5mA	1 mA	10 mA	0V	1V	20V
BAP142L	SOD882	S	60	60	5.5	3.6	1.5	0.40	0.30	0.2 @ 5V
BAP50-02	SOD523	S	50	50	25	14	3	0.4	0.3	0.22 @ 5V
BAP50-03	SOD323	S	50	50	25	14	3	0.4	0.3	0.2 @ 5V
BAP50-04	SOT23	SS	50	50	25	14	3	0.45	0.35	0.3 @ 5V
BAP50-04W	SOT323	SS	50	50	25	14	3	0.45	0.35	0.3 @ 5V
BAP50-05	SOT23	CC	50	50	25	14	3	0.45	0.35	0.3 @ 5V
BAP50-05W	SOT323	CC	50	50	25	14	3	0.45	0.35	0.3 @ 5V
BAP51L	SOD882	S	60	60	5.5	3.6	1.5	0.4	0.3	0.2 @ 5V
BAP51-02	SOD523	S	60	60	5.5	3.6	1.5	0.4	0.3	0.2 @ 5V
BAP51-03	SOD323	S	60	60	5.5	3.6	1.5	0.4	0.3	0.2 @ 5V
BAP51-05W	SOT323	CC	60	60	5.5	3.6	1.5	0.4	0.3	0.2 @ 5V
BAP51-06W	SOT323	CA	50	50	5.5	3.6	15	0.4	0.3	0.2 @ 5V
BAP63L	SOD882	S	50	100	2.5	1.95	1.17	0.36	0.32	0.25
BAP63-02	SOD523	S	50	100	2.5	1.95	1.17	0.36	0.32	0.25
BAP63-03	SOD323	S	50	100	2.5	1.95	1.17	0.4	0.35	0.27
BAP63-05W	SOT323	CC	50	100	2.5	1.95	1.17	0.4	0.35	0.3
BAP64-02	SOD523	S	200	175	20	10	2	0.52	0.37	0.23
BAP64-03	SOD323	S	200	175	20	10	2	0.52	0.37	0.23
BAP64-04	SOT23	SS	200	175	20	10	2	0.52	0.37	0.23
BAP64-04W	SOT323	SS	200	100	20	10	2	0.52	0.37	0.23
BAP64-05	SOT23	CC	200	175	20	10	2	0.52	0.37	0.23
BAP64-05W	SOT323	CC	200	100	20	10	2	0.52	0.37	0.23
BAP64-06	SOT23	CA	200	175	20	10	2	0.52	0.37	0.23
BAP64-06W	SOT323	S	100	100	20	10	2	0.52	0.37	0.23
BAP65-02	SOD523	S	30	100		1	0.56	0.65	0.6	0.375
BAP65-03	SOD323	S	30	100		1	0.56	0.65	0.6	0.375
BAP65-05	SOT23	CC	30	100		1	0.56	0.65	0.6	0.375
BAP65-05W	SOT323	CC	30	100		1	0.56	0.65	0.6	0.375
BAP70-02	SOD523	S	70	100	70	27	4.5	0.29	0.2	0.125
BAP70-03	SOD323	S	70	100	70	27	4.5	0.29	0.2	0.125
BAP70-04W	SOD324	S	70	100	70	27	4.5	0.29	0.2	0.125
BAP70-05	SOD325	S	70	100	70	27	4.5	0.29	0.2	0.125
BAP1321L	SOD882	S	60	100	3.4	2.4	1.2	0.4	0.35	0.25
BAP1321-02	SOD523	S	60	100	3.4	2.4	1.2	0.4	0.35	0.25
BAP1321-03	SOD323	S	60	100	3.4	2.4	1.2	0.4	0.35	0.25
BAP1321-04	SOT23	SS	60	100	3.4	2.4	1.2	0.4	0.35	0.25



## 4.2 Product portfolio: MMIC's

### New products in blue block

General Purpose Wideband Amplifiers, 50 Ohm Gain Blocks	Type	Package	Limits			$f_u^1$ @-3dB (GHz)	@ 1GHz					Gain <sup>3</sup> (dB) @				@	
			Vs (V)	Is (mA)	Ptot (mW)		NF (dB)	Psat (dBm)	Gain <sup>3</sup> (dB)	P <sub>1</sub> dB (dBm)	OIP <sub>3</sub> (dBm)	100 MHz	2.2 GHz	2.6 GHz	3.0 GHz	Vs (V)	Is (mA)
BGA2711	SOT363	6	20	200	3.6 <sup>2)</sup>	4.7	2	12.9	-2	10	13	14.1	13.8	12.8	5	12	
BGA2748	SOT363	4	15	200	1.9	1.8 <sup>2)</sup>	-4	21.3	-10	-2	14.8	17.6	14.2	11.3	3	5.7	
BGA2771	SOT363	4	50	200	2.4	4.4	12 <sup>2)</sup>	21	11	22	20.3	20.4	17.5	15.2	3	33	
BGA2776	SOT363	6	34	200	2.8	4.7	8	22.8 <sup>2)</sup>	5.5	17	22.2	23.2	20.8	18.7	5	23.8	
BGA2709	SOT363	6	35	200	2.8	4	12.4	22.7	8.3	24	22.6	22.7	22.0	21.1	5	23.5	
BGA2712	SOT363	6	25	200	2.8	3.9	4.8	21.3	0	12	20.9	21.9	20.8	18.6	5	12.5	
BGM1011	SOT363	6	35	200	-	4.7	13.8	30	12.2	23	25.0	37.0	32.0	28.0	5	25.5	
BGM1012	SOT363	4	50	200	3.6	4.8	9.7	20.1	6	18	19.5	20.4	19.9	18.7	3	14.6	
BGM1013	SOT363	6	35	200	2.1	4	15	35	12	24	34.4	31.0	28.2	25.3	5	27.5	
BGA2715	SOT363	6	8	200	3.0	2.6	-5	22	-9	14	14.0	22.0	21	19	5	4.3 <sup>2)</sup>	
BGA2716	SOT363	6	25	200	3.6	4.9	11	24	7	24	24.0	24.0	24	23	5	15.9 <sup>2)</sup>	
BGA2717	SOT363	6	15	200	3.0	2.1	1	23	-3	20	20.0	23.0	23	20	5	8.0	

Notes: 1. Upper -3 db point, to gain at 1 ghz. 2. Optimized parameter. 3. Gain =  $|S_{21}|^2$

2 Stage Variable Gain Linear Amplifier	Type	Package	Limits			Frequency Range (MHz)	@ 900MHz				@ 1900 MHz				@	
			Vs (V)	Is (mA)	Ptot (mW)		Gain <sup>1</sup> (dB)	DG <sup>2</sup> (dB)	P1dB (dBm)	ACPR (dBc)	Gain <sup>1</sup> (dB)	DG <sup>2</sup> (dB)	P1dB (dBm)	ACPR (dBc)	Vs (V)	Is (mA)
BGA2031/1	SOT363	3.3	50	200	800-2500	24	62	11	49	23	56	13	49	3	51	

Notes: 1. Gain = G<sub>p</sub>, power gain. 2. DG = Gain control range

Wideband Linear Mixer	Type	Package	Limits			RF Input Freq. Range (MHz)	IF Output Freq. Range (MHz)	@ 880MHz			@ 2450 MHz			@	
			Vs (V)	Is (mA)	Ptot (mW)			NF (dB)	Gain <sup>1</sup> (dB)	OIP3 (dBm)	NF (dB)	Gain <sup>1</sup> (dB)	OIP3 (dBm)	Vs (V)	Is (mA)
BGA2022	SOT363	4	20	40	800-2500	50-500	9	5	4	9	6	10	3	51	

Notes: 1. Gain = G<sub>c</sub>, Conversion gain

Low Noise Wideband Amplifiers	Type	Package	Limits			@ 900MHz			@ 1800 MHz			Gain <sup>3</sup> (db) @				@	
			Vs (V)	Is (mA)	Ptot (mW)	NF (dB)	Gain (dB)	IIP <sub>3</sub> (dBm)	NF (dB)	Gain (dB)	IIP <sub>3</sub> (dBm)	100 MHz	1 GHz	2.6 GHz	3.0 GHz	Vs (V)	Is (mA)
BGA2001	SOT343R	4.5	30	135	1.3	22 <sup>1)</sup>	-7.4	1.3	19.5 <sup>1)</sup>	-4.5	20	17.1	11.6	10.7	2.5	4	
BGA2003	SOT343R	4.5	30	135	1.8	24 <sup>1)</sup>	-6.5	1.8	16 <sup>1)</sup>	-4.8	26	18.6	11.1	10.1	2.5	10 <sup>2)</sup>	
BGA2004 <sup>4)</sup>	SOT363	3.3	15	50				1.4	18	-5					2.7	6	
BGA2011	SOT363	4.5	30	135	1.5	19 <sup>3)</sup>	10	-	-	-	24	14.8	8	6.5	3	15	
BGA2012	SOT363	4.5	15	70	-	-	-	1.7	16 <sup>3)</sup>	10	22	18.2	11.6	10.5	3	7	
BGU2003	SOT343R	4.5	30	135	1	23	-6	1.1	18	-5	25	19	12.3	11.6	2.5	10 <sup>2)</sup>	

Notes : 1. MSG 2. Adjustable bias 3.  $|S_{21}|^2$  4. Switched LNA with internal match for 1.8 GHz. Objective Data

General Purpose Med.Power Ampl., 50 ohm gain blocks	Type	Package	Limits			@ 900MHz				@ 1800 MHz				Gain <sup>3</sup> 2.5 GHz	$f_u^1$ @-3dB (MHz)	@	
			Vs (V)	Is (mA)	Ptot (mW)	NF (dB)	Gain <sup>3</sup> (dB)	OIP <sub>3</sub> (dBm)	P <sub>1</sub> dB (dBm)	NF (dB)	Gain <sup>3</sup> (dB)	NF (dB)	P <sub>1</sub> dB (dBm)			Vs (V)	Is (mA)
														Gain <sup>3</sup>	NF		
BGA6289	SOT89	6	120	480	3.8	15	31	17	4.1	13	4.1	15	12	4000	3.8	83	
BGA6489	SOT89	6	120	480	3.1	20	33	20	3.3	16	3.3	17	15	4000	5.1	83	
BGA6589	SOT89	6	120	480	3	22	33	21	3.3	17	3.3	20	15	4000	4.8	83	

Notes:1 Determined by return Loss(>10dB) 3. Gain =  $|S_{21}|^2$



## 4.3 Product portfolio: Wideband transistors

### Wideband transistors (RF small signal)

Type	Package	Ft	Vceo	Ic	Ptot	Polarity	Gum (dB)	F (dB)	@ (MHz)	Gum (dB)	F (dB)	@ (MHz)	Vo 1) (mV)	PI (dBm)	ITO (dBm)	@ Ic & (mA)	Vce (V)
		(GHz)	(V)	(mA)	(mW)												
		Typical	Maximum values														
BFG10(X)	SOT143	-	8	250	250	NPN	-	-	-	7	-	1900	-	-	-	-	-
BFG10W/X	SOT343	-	10	250	400	NPN	-	-	-	7	-	1900	-	-	-	-	-
BLT80	SOT223	-	10	250	2000	NPN	>6	-	900	-	-	-	-	-	-	-	-
BLT81	SOT223	-	9.5	500	2000	NPN	>6.5	-	900	-	-	-	-	-	-	-	-
BLT50	SOT223	-	10	500	2000	NPN	>7	-	900	-	-	-	-	-	-	-	-
BLT70	SOT223	-	8	250	2100	NPN	>6	-	900	-	-	-	-	-	-	-	-
PMBHT10	SOT23	0.65	25	40	400	NPN	-	-	-	-	-	-	-	-	-	-	-
BFS17	SOT23	1	15	25	300	NPN	-	4.5	500	-	-	-	-	-	-	-	-
BFS17W	SOT323	1.6	15	50	300	NPN	-	4.5	500	-	-	-	-	-	-	-	-
BFT25	SOT23	2.3	5	6.5	30	NPN	18	3.8	500	12	-	800	-	-	-	-	-
BFS17A	SOT23	2.8	15	25	300	NPN	13.5	2.5	800	-	-	-	150	-	-	14	10
BFR94A	SOT122	3.5	25	150	3500	NPN	-	8	200	-	5	500	-	-	-	-	-
BFG35	SOT223	4	18	150	1000	NPN	15	-	500	11	-	800	750	-	-	100	10
BFQ18	SOT89	4	18	150	1000	NPN	-	-	-	-	-	-	-	-	-	-	-
BFQ34/01	SOT122	4	18	150	2700	NPN	16.3	8	500	-	-	-	1200	26	45	120	15
BFQ68	SOT122	4	18	300	4500	NPN	13	-	800	-	-	1600	1600	28	47	240	15
BFG25A/X	SOT143	5	5	6.5	32	NPN	18	1.8	1000	-	-	-	-	-	-	-	-
BFG25W(/X)	SOT343	5	5	6.5	500	NPN	16	2	1000	8	-	2000	-	-	-	-	-
BFG31	SOT223	5	15	100	1000	PNP	16	-	500	12	-	800	550	-	-	70	10
BFG590(/X)	SOT143	5	15	200	400	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFG590W/X	SOT343	5	15	200	500	NPN	13	-	900	7.5	-	2000	-	21	-	80	5
BFG92A(/X)	SOT143	5	15	25	400	NPN	16	2	1000	11	3	2000	-	-	-	-	-
BFQ149	SOT89	5	15	100	1000	PNP	12	3.75	500	-	-	-	-	-	-	-	-
BFR106	SOT23	5	15	100	500	NPN	11.5	3.5	800	-	-	-	350	-	-	50	9
BFR92A	SOT23	5	15	25	300	NPN	14	2.1	1000	8	3	2000	150	-	-	14	10
BFR92AW	SOT323	5	15	25	300	NPN	14	2	1000	-	3	2000	-	-	-	-	-
BFR93AW	SOT323	5	12	35	300	NPN	13	1.5	1000	8	2.1	2000	-	-	-	-	-
BFS25A	SOT323	5	5	6.5	32	NPN	13	1.8	1000	-	-	-	-	-	-	-	-
BFT25A	SOT23	5	5	6.5	32	NPN	15	1.8	1000	-	-	-	-	-	-	-	-
BFT92	SOT23	5	15	25	300	PNP	18	2.5	500	-	-	-	150	-	-	14	10
BFT92W	SOT323	5	15	35	300	PNP	17	2.5	500	11	3	1000	-	-	-	-	-
BFT93	SOT23	5	12	35	300	PNP	16.5	2.4	500	-	-	-	300	-	-	30	5
BFT93W	SOT323	5	12	50	300	PNP	15.5	2.4	500	10	3	1000	-	-	-	-	-
BFG97	SOT223	5.5	15	100	1000	NPN	16	-	500	12	-	800	700	-	-	70	10
BFQ19	SOT89	5.5	15	100	1000	NPN	11.5	3.3	500	7.5	-	800	-	-	-	-	-
BFG93A(/X)	SOT143	6	12	35	300	NPN	16	1.7	1000	10	2.3	2000	-	-	-	-	-
BFG94	SOT223	6	12	60	700	NPN	-	2.7	500	13.5	3	1000	500	21.5	34	45	10
BFQ270	SOT172	6	19	500	10000	NPN	16	-	500	-	-	-	1600	-	-	240	18
BFR93A	SOT23	6	12	35	300	NPN	13	1.9	1000	-	3	2000	425	-	-	30	8
BFQ135	SOT172	6.5	19	150	2700	NPN	17	-	500	13.5	-	800	1200	-	-	120	18



## 4.3 Product portfolio: Wideband transistors

New products in blue block

### Wideband transistors (RF small signal)

Type	Package	Ft	Vceo	Ic	Ptot	Polarity	Gum	F	@	Gum	F	@	Vo 1)	PI	ITO	@ Ic &	Vce
		(GHz)	(V)	(mA)	(mW)												
		Typical	Maximum values														
BFG135	SOT223	7	15	150	1000	NPN	16	-	500	12	-	800	850	-	-	100	10
BFG591	SOT223	7	15	200	2000	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFQ591	SOT89	7	15	200	2000	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFQ621	SOT172	7	16	150	800	NPN	18.5	-	500	-	-	-	1200	-	-	120	18
BFG198	SOT223	8	10	100	1000	NPN	18	-	500	15	-	800	700	-	-	70	8
BFG67(/X)	SOT143	8	10	50	380	NPN	17	1.7	1000	10	2.5	2000	-	-	-	-	-
BFQ67	SOT23	8	10	50	300	NPN	14	1.7	1000	8	2.7	2000	-	-	-	-	-
BFQ67W	SOT323	8	10	50	300	NPN	13	2	1000	8	2.7	2000	-	-	-	-	-
PBR941	SOT23	8	10	50	360	NPN	15	1.4	1000	9.5	2	2000	-	-	-	-	-
PBR951	SOT23	8	10	100	365	NPN	14	1.3	1000	8	2	2000	-	-	-	-	-
PRF947	SOT323	8.5	10	50	250	NPN	16	1.5	1000	10	2.1	2000	-	-	-	-	-
PRF957	SOT323	8.5	10	100	270	NPN	15	1.3	1000	9.2	1.8	2000	-	-	-	-	-
BFG505(/X)	SOT143	9	15	18	150	NPN	20	1.6	900	13	1.9	2000	-	4	10	5	6
BFG520(/X)	SOT143	9	15	70	300	NPN	19	1.6	900	13	1.9	2000	275	17	26	20	6
BFG520W(/X)	SOT343	9	15	70	500	NPN	17	1.6	900	11	1.85	2000	275	17	26	20	6
BFG540(/X)	SOT143	9	15	120	500	NPN	18	1.9	900	11	2.1	2000	500	21	34	40	8
BFG540W(/X)	SOT343	9	15	120	500	NPN	16	1.9	900	10	2.1	2000	500	21	34	40	8
BFG541	SOT223	9	15	120	650	NPN	15	1.9	900	9	2.1	2000	500	21	34	40	8
BFM505	SOT363	9	8	18	500	NPN	17	1.4	900	10	1.9	2000	-	-	-	-	-
BFM520	SOT363	9	8	70	1000	NPN	15	1.7	900	9	1.9	2000	-	-	-	-	-
BFQ540	SOT89	9	12	120	1200	NPN	-	1.9	900	-	-	-	500	-	-	40	8
BFR505	SOT23	9	15	18	150	NPN	17	1.6	900	10	1.9	2000	-	4	10	5	6
BFR505T	SOT416	9	-	18	150	NPN	17	1.2	900	-	-	-	-	-	-	-	-
BFR520	SOT23	9	15	70	300	NPN	15	1.6	900	9	1.9	2000	-	17	26	20	6
BFR520T	SOT416	9	-	70	150	NPN	15	1.6	900	9	1.9	2000	-	17	26	-	-
BFR540	SOT23	9	15	120	500	NPN	14	1.9	900	7	2.1	2000	550	21	34	40	8
BFS505	SOT323	9	15	18	150	NPN	17	1.6	900	10	1.9	2000	-	4	10	5	6
BFS520	SOT323	9	15	70	300	NPN	15	1.6	900	9	1.9	2000	-	17	26	20	6
BFS540	SOT323	9	15	120	500	NPN	14	1.9	900	8	2.1	2000	-	21	34	40	8
PRF949	SOT416	9	10	50	150	NPN	16	1.5	1000	-	-	-	-	-	-	-	-
BFG310W/XR	SOT343X	14	6	10	60	NPN	18	1.1	1000	-	-	-	-	1.8	8	5	3
BFG310/XR	SOT143X	14	6	10	60	NPN	18	1.1	1000	-	-	-	-	1.8	8	5	3
BFG325W/XR	SOT343X	14	6	35	210	NPN	18	1.1	3000	-	-	-	-	8.7	19	15	3
BFG325/XR	SOT143X	14	6	35	210	NPN	18	1.1	3000	-	-	-	-	8.7	19	15	3
BFG403W	SOT343	17	4.5	3.6	16	NPN	-	1	900	-	1.6	2000	-	5	6	1	1
BFG21W	SOT343	18	4.5	200	600	NPN	-	-	-	10	-	1900	-	-	-	-	-
BFG480W	SOT343	21	4.5	250	360	NPN	-	1.2	900	-	1.8	2000	-	-	28	80	2
BFG410W	SOT343	22	4.5	12	54	NPN	-	0.9	900	-	1.2	2000	-	5	15	10	2
BFG425W	SOT343	25	4.5	30	135	NPN	-	0.8	900	-	1.2	2000	-	12	22	25	2
BFU510	SOT343	45	2.5	15	38	NPN	-	0.6	900	20	0.9	2000	-	-	-	-	-
BFU540	SOT343	45	2.5	50	125	NPN	-	0.6	900	20	0.9	2000	-	-	-	-	-



## 4.4 Product portfolio: Varicap diodes

New products in blue block

### TV & Satellite Varicap Diodes - UHF tuning

Type	Package	Cd @ Vr (pF)			TUNING RANGE			rs (Ω)	MATCHED SETS	TYPICAL APPLICATIONS			
					Cd over voltage range (V)					max	%	TV	VCO
		min	max	(V)	ratio	V1 to V2							
<b>Matched</b>													
BB134	SOD323	1.70	2.10	28	10.0	0.5	28	0.75	0.5	X		X	X
BB146	SOD323	1.70	2.10	28	23.0	0.5	28	1.40	1.6	X			X
BB149	SOD323	1.90	2.25	28	9.0	1	28	0.75	1.0	X			X
BB149A	SOD323	1.95	2.22	28	9.7	1	28	0.75	2.0	X			X
BB149A/TM	SOD323	1.95	2.22	28	9.7	1	28	0.75	2.0	X			X
BB179	SOD523	1.95	2.22	28	9.7	1	28	0.75	2.0	X	X		X
BB179B	SOD523	1.90	2.25	28	9.2	1	28	0.75	2.0	X			X
BB184	SOD523	1.87	2.13	10	6	1	10	0.65 typ.	2	X	X		
<b>Unmatched</b>													
BB135	SOD323	1.70	2.10	28	10.0	0.5	28	0.75		X	X		
BB159	SOD323	1.90	2.25	28	9.0	1	28	0.75		X			
BBY31	SOT23	1.60	2.00	28	8.3	1	28	1.20	-	X			X
BBY39													
BBY62	SOT143												

### TV & Satellite Varicap diodes - VHF tuning

Type	Package	Cd @ Vr (pF)			TUNING RANGE			rs (Ω)	MATCHED SETS	TYPICAL APPLICATIONS			
					Cd over voltage range (V)					max	%	TV	VCO
		min	max	(V)	ratio	V1 to V2							
<b>Matched</b>													
BB132	SOD323	2.3	2.75	28	26	0.5	28	2	1	X			X
BB133	SOD323	2.2	2.75	28	16	0.5	28	0.9	0.7	X			X
BB147	SOD323	2.4	2.80	28	40	0.5	28	2.8	2	X			X
BB148	SOD323	2.4	2.75	28	15	1	28	0.9	1	X			X
BB152	SOD323	2.48	2.89	28	>20.6	1	28	1.2	2	X			X
BB153	SOD323	2.36	2.75	28	>13.5	1	28	0.8	2	X			X
BB157	SOD323	2.57	2.92	25	11	2	25	0.75	2	X			X
BB157/TM	SOD323	2.57	2.92	25	11	2	25	0.75	2	X			X
BB164	SOD323	2.9	3.40	28	>19.5	1	28	1.4	2	X			X
BB178	SOD523	2.36	2.75	28	>13.5	1	28	0.8	2	X			X
BB182	SOD523	2.48	2.89	28	>20.6	1	28	1.2	2	X			X
BB187	SOD523	2.57	2.92	25	11	2	25	0.75	2	X			X
<b>Unmatched</b>													
BB131	SOD323	0.7	1.055	28	14	0.5	28	3				X	
BB158	SOD323	2.4	2.75	28	15	1	28	0.9		X		X	
BB181	SOD523	0.7	1.055	28	14	0.5	28	3				X	
BBY40	SOT23	4.3	6.00	25	5.5	3	25	0.7	-	X			X



## 4.4 Product portfolio: Varicap diodes

**New products in blue block**

### VCO Varicap diodes

Type	Package	Cd @ Vr (pF)			Cd @ Vr (pF)			TUNING RANGE			rs (Ω)
		min	max	(V)	min	max	(V)	Cd over voltage range (V)			
								ratio	V1 to V2	typ.	
BB140L	SOD882	2.48	2.69	1	1.27	1.38	3	1.88 - 2.04	1	3	1.2
BB141	SOD523	3.9	4.5	1	2.22	2.55	4	1.76	1	4	0.4
BB142	SOD523	4	4.9	1	1.85	2.35	4	2.2	1	4	0.5
BB143	SOD523	4.75	5.75	1	2.05	2.55	4	2.35	1	4	0.5
BB145	SOD523	6.4	7.4	1	2.75	3.25	4	2	1	4	0.6
BB145B	SOD523	6.4	7.4	1	2.55	2.95	4	2.2	1	4	0.6
BB145C	SOD523	6.4	7.2	1	2.55	2.85	4	2.39 - 2.53	1	4	
BB202	SOD523	28.2	33.5	0.2	7.2	11.2	2.3	2.5	0.2	2.3	0.35
BB151	SOD323	15.4	17	1	9 typ.		4	1.8	1	4	0.4
BB156	SOD323	14.4	17.6	1	7.6	9.6	4	1.86	1	4	0.4
BB199	SOD523	36.5	42.5	0.5	11.8	13.8	2	-	-	-	-
BB208-02*	SOD523	19.9	23.2	1	4.5	5.4	7.5	4.3	1	7.5	0.35
BB208-03*	SOD323	19.9	23.2	1	4.5	5.4	7.5	4.3	1	7.5	0.35

ad\* = including special design for FM car radio (CREST-IC: TEF6860)

### Radio Varicap diodes FM radio tuning

Type	Package	Cd @ Vr (pF)			Cd @ Vr (pF)			TUNING RANGE			rs (Ω)
		min	max	(V)	min	max	(V)	Cd over voltage range (V)			
								ratio (min)	V1 to V2	typ.	
BB804	SOT23	42	46.5	2	26 typ.		8	1.75	2	8	0.2
BB200	SOT23	65.8	74.2	1	12	14.8	4.5	5	1	4.5	0.43
BB201	SOT23	89	102	1	25.5	29.7	7.5	3.1	1	7.5	0.3
BB202	SOD523	28.2	33.5	0.2	7.2	11.2	2.3	2.5	0.2	2.3	0.35
BB156	SOD323	14.4	17.6	1	7.6	9.6	4	3.3	1	7.5	0.4
BB207	SOT23	76	86	1	25.5	29.7	7.5	2.6	1	7.5	0.2



## 4.5 Product portfolio: Fet's

### N-channel Junction Field-effect transistors for switching

Type	Package	V <sub>DS</sub> (V)	I <sub>G</sub> (mA)	CHARACTERISTICS										
				I <sub>DSS</sub> (mA)		V <sub>(p)GS</sub> (V)		R <sub>DS(on)</sub> ( $\Omega$ )	C <sub>rs</sub> (pF)		t <sub>on</sub> (ns)		t <sub>off</sub> (ns)	
				min	max	min	max	max	min	max	typ	max	typ	max
				max	max									
BSR56	SOT23	40	50	50	-	4	10	25	-	5	-	-	-	25
BSR57	SOT23	40	50	20	100	2	6	40	-	5	-	-	-	50
BSR58	SOT23	40	50	8	80	0.8	4	60	-	5	-	-	-	100
PMBFJ108	SOT23	25	50	80	-	3	10	8	-	15	4	-	6	-
PMBFJ109	SOT23	25	50	40	-	2	6	12	-	15	4	-	6	-
PMBFJ110	SOT23	25	50	10	-	0.5	4	18	-	15	4	-	6	-
PMBFJ111	SOT23	40	50	20	-	3	10	30	-	typ.3	13	-	35	-
PMBFJ112	SOT23	40	50	5	-	1	5	50	-	typ.3	13	-	35	-
PMBFJ113	SOT23	40	50	2	-	0.5	3	100	-	typ.3	13	-	35	-
J108	SOT54	25	50	80	-	3	10	8	-	15	4	-	6	-
J109	SOT54	25	50	40	-	2	6	12	-	15	4	-	6	-
J110	SOT54	25	50	10	-	0.5	4	18	-	15	4	-	6	-
J111	SOT54	40	50	20	-	3	10	30	-	typ.3	13	-	35	-
J112	SOT54	40	50	5	-	1	5	50	-	typ.3	13	-	35	-
J113	SOT54	40	50	2	-	0.5	3	100	-	typ.3	13	-	35	-
PMBF4391	SOT23	40	50	50	150	4	10	30	-	3.5	-	15	-	20
PMBF4392	SOT23	40	50	25	75	2	5	60	-	3.5	-	15	-	35
PMBF4393	SOT23	40	50	5	30	0.5	3	100	-	3.5	-	15	-	50

### P-channel Junction Field-effect transistors for switching

Type	Package	V <sub>DS</sub> (V)	I <sub>G</sub> (mA)	CHARACTERISTICS										
				I <sub>DSS</sub> (mA)		V <sub>(p)GS</sub> (V)		R <sub>DS(on)</sub> ( $\Omega$ )	C <sub>rs</sub> (pF)		t <sub>on</sub> (ns)		t <sub>off</sub> (ns)	
				min	max	min	max	max	min	max	typ	max	typ	max
				max	max									
PMBFJ174	SOT23	30	50	20	135	5	10	85	typ.4	7	-	15	-	
PMBFJ175	SOT23	30	50	7	70	3	6	125	typ.4	15	-	30	-	
PMBFJ176	SOT23	30	50	2	35	1	4	250	typ.4	35	-	35	-	
PMBFJ177	SOT23	30	50	1.5	20	0.8	2.25	300	typ.4	45	-	45	-	
J174	SOT54	30	50	20	135	5	10	85	typ.4	7	-	15	-	
J175	SOT54	30	50	7	70	3	6	125	typ.4	15	-	30	-	
J176	SOT54	30	50	2	35	1	4	250	typ.4	35	-	35	-	
J177	SOT54	30	50	1.5	20	0.8	2.25	300	typ.4	45	-	45	-	





## 4.5 Product portfolio: Fet's

New products in blue block

### N-channel Junction Field-effect transistors

Type	Package	CHARACTERISTICS									
		V <sub>DS</sub> (V)	I <sub>G</sub> (Ma)	I <sub>DSS</sub> (mA)		V <sub>(p)GS</sub> (V)		Y <sub>fs</sub>   (mS)		C <sub>rs</sub> (pF)	
				min	max	min	max	min	max	min	max
<b>DC, LF and HF amplifiers</b>											
BF245A	SOT54	30	10	2	6.5	<8		3	6.5	1.1	-
BF245B	SOT54	30	10	6	15	<8		3	6.5	1.1	-
BF245C	SOT54	30	10	12	25	<8		3	6.5	1.1	-
BF545A	SOT23	30	10	2	6.5	0.4	7.5	3	6.5	0.8	-
BF545B	SOT23	30	10	6	15	0.4	7.5	3	6.5	0.8	-
BF545C	SOT23	30	10	12	25	0.4	7.5	3	6.5	0.8	-
BF556A	SOT23	30	10	3	7	0.5	7.5	4.5	0.8	-	-
BF556B	SOT23	30	10	6	13	0.5	7.5	4.5	0.9	-	-
BF556C	SOT23	30	10	11	18	0.5	7.5	4.5	0.8	-	-
<b>Preamplifiers for AM tuners in car radios</b>											
BF861A	SOT23	25	10	2	6.5	0.2	1.0	12	2.1	2.7	-
BF861B	SOT23	25	10	6	15	0.5	1.5	16	2.1	2.7	-
BF861C	SOT23	25	10	12	25	0.8	2	20	2.1	2.7	-
BF862	SOT23	20	10	13	25	<20		35	2.5	-	-
<b>RF stages FM portables, car radios, main radios &amp; mixer stages</b>											
BF510 <sup>1)</sup>	SOT23	20	10	0.7	3	typ. 0.8		2.5	0.4	0.5	-
BF511 <sup>1)</sup>	SOT23	20	10	2.5	7	typ. 1.5		4	0.4	0.5	-
BF512 <sup>1)</sup>	SOT23	20	10	6	12	typ. 2.2		6	0.4	0.5	-
BF513 <sup>1)</sup>	SOT23	20	10	10	18	typ. 3		7	0.4	0.5	-
<b>Low level general purpose amplifiers</b>											
BFR30	SOT23	25	5	4	10	<5		1	4	1.5	-
BFR31	SOT23	25	5	1	5	<2.5		1.5	4.5	1.5	-
<b>General purpose amplifiers</b>											
BFT46	SOT23	25	5	0.2	1.5	<1.2		>1	1.5	-	-
<b>AM input stages UHF/VHF amplifiers</b>											
PMBFJ308	SOT23	25	50	12	60	1	6.5	>10	1.3	2.5	-
PMBFJ309	SOT23	25	50	12	30	1	4	>10	1.3	2.5	-
PMBFJ310	SOT23	25	50	24	60	2	6.5	>10	1.3	2.5	-
PMBFJ620	SOT363	25	50	24	60	2	6.5	10	1.3	2.5	-

### N-channel, single MOS-FETS for switching

Type	Package	V <sub>DS</sub> (V)	I <sub>D</sub> (mA)	CHARACTERISTICS													
				I <sub>DSS</sub> (mA)		V <sub>(p)GS</sub> (V)		R <sub>DS(on)</sub> ( $\Omega$ )	C <sub>rs</sub> (pF)	t <sub>on</sub> (ns)	t <sub>off</sub> (ns)	S <sub>21(on)</sub>   <sup>2</sup> (dB)	S <sub>21(off)</sub>   <sup>2</sup> (dB)	MODE			
				min	max	min	max	max	min	max	typ	max	typ		max		
BSD22	SOT143	20	50	-	-	-	2	30	typ.0.6	-	1	-	5	-	-	depl.	
BSS83	SOT143	10	50	-	-	0.1 <sup>2)</sup>	2 <sup>1)</sup>	45	typ.0.6	-	1	-	5	-	-	enh.	
<b>Silicon RF Switches</b>																	
BF1107	SOT23	3	10	-	100 <sup>3)</sup>	-	7 <sup>4)</sup>	20	-	-	-	-	-	-	2.5	30	depl.
BF1108 <sup>5)</sup>	SOT143B	3	10	-	100 <sup>3)</sup>	-	7 <sup>4)</sup>	20	-	-	-	-	-	-	3	30	depl.



## 4.5 Product portfolio: Fet's

### N-channel, Dual Gate MOS-FETS

Type	Package	V <sub>DS</sub>	CHARACTERISTICS											VHF	UHF
			I <sub>D</sub>	I <sub>DSS</sub>		V <sub>(p)GS</sub>		Y <sub>fs</sub>		C <sub>is</sub>	C <sub>os</sub>	F @ 800 MHz			
				(mA)		(V)		(mS)		(pF)	(pF)	(dB)			
				(V)	(mA)	min	max	min	max	min	max	typ.	typ.		
<b>With external bias</b>															
BF901	SOT143	12	30	2	18	-	0.7 <sup>6)</sup>	25	-	2.35	1.4	1.7	X	X	
BF901R	SOT143R	12	30	2	18	-	0.7 <sup>6)</sup>	25	-	2.35	1.4	1.7	X	X	
BF908	SOT143	12	40	3	27	-	2	36	-	3.1	1.7	1.5	X	X	
BF908R	SOT143R	12	40	3	27	-	2	36	-	3.1	1.7	1.5	X	X	
BF908WR	SOT343R	12	40	3	27	-	2	36	-	3.1	1.7	1.5	X	X	
BF991	SOT143	20	20	4	25	-	2.5	10	-	2.1	1.1	0.7 <sup>7)</sup>	X		
BF992	SOT143	20	40	-	-	-	1.3	20	-	4	2	1.2 <sup>7)</sup>	X		
BF994S	SOT143	20	30	4	20	-	2.5	15	-	2.5	1	1 <sup>7)</sup>	X		
BF996S	SOT143	20	30	4	20	-	2.5	15	-	2.3	0.8	1.8		X	
BF998	SOT143	12	30	2	18	-	2.5	21	-	2.1	1.05	1	X	X	
BF998R	SOT143R	12	30	2	18	-	2.5	21	-	2.1	1.05	1	X	X	
BF998WR	SOT343R	12	30	2	18	-	2.5	22	-	2.1	1.05	1	X	X	
<b>Fully internal bias</b>															
BF1105	SOT143	7	30	8	16	-	-	25	-	2.2 <sup>9)</sup>	1.2 <sup>8)</sup>	1.7	X	X	
BF1105R	SOT143R	7	30	8	16	-	-	25	-	2.2 <sup>9)</sup>	1.2 <sup>8)</sup>	1.7	X	X	
BF1105WR	SOT343R	7	30	8	16	-	-	25	-	2.2 <sup>9)</sup>	1.2 <sup>8)</sup>	1.7	X	X	
BF1109	SOT143	11	30	8	16	-	1.2 <sup>6)</sup>	24	-	2.2 <sup>9)</sup>	1.3 <sup>8)</sup>	1.5	X	X	
BF1109R	SOT143R	11	30	8	16	-	1.2 <sup>6)</sup>	24	-	2.2 <sup>9)</sup>	1.3 <sup>8)</sup>	1.5	X	X	
BF1109WR	SOT343R	11	30	8	16	-	1.2 <sup>6)</sup>	24	-	2.2 <sup>9)</sup>	1.3 <sup>8)</sup>	1.5	X	X	
<b>Partly internal bias</b>															
BF904(A)	SOT143	7	30	8	13	-	1 <sup>6)</sup>	22	-	2.2	1.3	2	X	X	
BF904(A)R	SOT143R	7	30	8	13	-	1 <sup>6)</sup>	22	-	2.2	1.3	2	X	X	
BF904(A)WR	SOT343R	7	30	8	13	-	1 <sup>6)</sup>	22	-	2.2	1.3	2	X	X	
BF909(A)	SOT143	7	40	12	20	-	1 <sup>6)</sup>	36	-	3.6	2.3	2	X	X	
BF909(A)R	SOT143R	7	40	12	20	-	1 <sup>6)</sup>	36	-	3.6	2.3	2	X	X	
BF909(A)WR	SOT343R	7	40	12	20	-	1 <sup>6)</sup>	36	-	3.6	2.3	2	X	X	

1) Asymmetrical

2) V<sub>GS(th)</sub>

3) I<sub>b</sub>

4) V<sub>SG</sub>

5) Depletion FET plus diode in one package

6) V<sub>GS(th)</sub>

7) @ 200 mHz

8) C<sub>oss</sub>

9) C<sub>ig</sub>

10) Two equal dual gate MOS-FETs in one package

11) Two low noise gain amplifiers in one package

12) Transistor A: fully internal bias, transistor B: partly internal bias



## 4.5 Product portfolio: Fet's

New products in blue block

### N-channel, Dual Gate MOS-FETS

Type	Package	V <sub>DS</sub>	CHARACTERISTICS											
			I <sub>D</sub>	I <sub>DSS</sub>		V <sub>(p)GS</sub>		Y <sub>fs</sub>		C <sub>is</sub>	C <sub>os</sub>	F @ 800 MHz	VHF	UHF
				(mA)		(V)		(mS)		(pF)	(pF)	(dB)		
				(V)	(mA)	min	max	min	max	min	max	typ.		
<b>Partly internal bias</b>														
BF1100	SOT143	14	30	8	13	-	1 <sup>6)</sup>	24	-	2.2	1.4	2	X	X
BF1100R	SOT143R	14	30	8	13	-	1 <sup>6)</sup>	24	-	2.2	1.4	2	X	X
BF1100WR	SOT343R	14	30	8	13	-	1 <sup>6)</sup>	24	-	2.2	1.4	2	X	X
BF1101	SOT143	7	30	8	16	-	1 <sup>6)</sup>	25	-	2.2	1.2 <sup>8)</sup>	1.7	X	X
BF1101R	SOT143R	7	30	8	16	-	1 <sup>6)</sup>	25	-	2.2	1.2 <sup>8)</sup>	1.7	X	X
BF1101WR	SOT343R	7	30	8	16	-	1 <sup>6)</sup>	25	-	2.2	1.2 <sup>8)</sup>	1.7	X	X
BF1102(R)	SOT363	7	40	12	20	-	1.2 <sup>6)</sup>	36	-	2.8 <sup>9)</sup>	1.6 <sup>8)</sup>	2	Note 10	
BF1201	SOT143	10	301	11	19	-	1.2 <sup>6)</sup>	23	-	2.6	0.9	1.9	X	X
BF1201R	SOT143R	10	301	11	19	-	1.2 <sup>6)</sup>	23	-	2.6	0.9	1.9	X	X
BF1201WR	SOT343R	10	301	11	19	-	1.2 <sup>6)</sup>	23	-	2.6	0.9	1.9	X	X
BF1202	SOT143	10	30	8	16	-	1.2 <sup>6)</sup>	25	-	1.7	0.85	1	X	X
BF1202R	SOT143R	10	30	8	16	-	1.2 <sup>6)</sup>	25	-	1.7	0.85	1	X	X
BF1202WR	SOT343R	10	30	8	16	-	1.2 <sup>6)</sup>	25	-	1.7	0.85	1	X	X
BF1203 <sup>11)</sup>	SOT363	10	30	11	19	-	1.2 <sup>6)</sup>	23	-	2.6	0.9	1.8	X	X
BF1204 <sup>11)</sup>	SOT363	10	30	8	16	-	1.2 <sup>6)</sup>	25	-	1.7	0.85	1	X	X
BF1205C <sup>11) 12)</sup>	SOT363	6	30	14	24	0.3	1	26	41	2.2	0.75	1.4	X	
		6	30	9	17	0.3	1	28	43	2	0.85	1.4		X
BF1205 <sup>11) 12)</sup>	SOT363	10	30	8	16	0.3	1.0	26	40	1.8	0.75	1.2	X	-
		7	30	8	16	0.3	1.0	26	40	2.0	0.85	1.4	-	X
BF1206 <sup>11)</sup>	SOT363	6	30	14	23	0.3	1.0	33	45	2.6	1.1	1.6	X	-
		6	30	9	17	0.3	1.0	29	41	1.9	0.85	1.4	-	X
BF1211	SOT143	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.4	X	-
BF1211R	SOT143R	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.4	X	-
BF1211WR	SOT343	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.4	X	-
BF1212	SOT143	6	30	8	16	0.3	1.0	28	43	1.7	0.9	1.1	-	X
BF1212R	SOT143R	6	30	8	16	0.3	1.0	28	43	1.7	0.9	1.1	-	X
BF1212WR	SOT343	6	30	8	16	0.3	1.0	28	43	1.7	0.9	1.1	-	X

1) Asymmetrical

2) V<sub>GS(th)</sub>

3) I<sub>D</sub>

4) V<sub>SG</sub>

5) Depletion FET plus diode in one package

6) V<sub>GS(th)</sub>

7) @ 200 mHz

8) C<sub>oss</sub>

9) C<sub>ig</sub>

10) Two equal dual gate MOS-FETs in one package

11) Two low noise gain amplifiers in one package

12) Transistor A: fully internal bias, transistor B: partly internal bias



## 4.6 Product portfolio: Bandswitch diodes

### Band Switch diodes

Type	Package	MAXIMUM RATINGS		CHARACTERISTICS ; maximals					
		VR (V)	IF (mA)	Rd @ IF and f			Cd @ VR and f		
				O	(mA)	(MHz)	(pF)	(V)	(MHz)
BA277	SOD523	35	100	0.7	2	100	1.2	6	1
BA278	SOD523	35	100	0.7	2	100	1.2	6	1
BA891	SOD523	35	100	0.7	3	100	0.9	3	1
BA591	SOD323	35	100	0.7	3	100	0.9	3	1
BA792	SOD110	35	100	0.7	3	200	1.1	3	1 to 100
BAT18	SOT23	35	100	0.7	5	200	1.0	20	1



## 4.7 Bare dies

Philips Semiconductor’s RF modules line of business has recently entered into agreement with Mintech Semiconductors (Die Technology sister company) of UK for sales & value added services of RF small signal bare dies. Philips & Mintech will leverage this to meet the growing demand of usage in applications requiring the benefits of using bare dies.

### The benefits of using bare die

Designers these days face the challenge of determining how to incorporate more functions into reduced spaces in a timely & cost-effective manner. For many small form factor products silicon packaging has become a major size limiting element of their design layout. The conversion from standard packaging to unpackaged die provides the system designer opportunities for efficient usage of space. At the same time the implementation of dies offers improved performance.

Primary value propositions of naked- over packaged die are lower parasitics and real estate reduction.

- **Electrical performance:** The lower inductance & capacitance of bare die is vital in RF applications. Signal propagation & ground distributions are also improved.
- **Size:** Usage of bare dies provide designers with opportunities to incorporate expanding functions into reduced spaces.

### Bare die product portfolio:

Contact us for our portfolio of products which are obtainable as bare dies.

Services	Philips	Die Technology
Testing		✓
Visual inspection		✓
Initial quality		✓
Sawing		✓
Packing dies		✓
Handling & care		✓
Pre-testing	✓	
Marking	✓	
Wafer supply	✓	
Final shipment	✓	✓

For more information, please contact : [sales@ditech.co.uk](mailto:sales@ditech.co.uk) or [sales@mintech.co.uk](mailto:sales@mintech.co.uk)

For contacts in your respective regions please look at the following websites:

<http://www.mintech.co.uk> <http://www.ditech.co.uk/> <http://www.ditech.co.uk/chinese.htm>



## 5 X-references

### Alphabetical order on manufacturer type

Manufacturer

Manufacturer Type

closest Philips Type

‡ = Exact drop in, ▲ Different package

Toshiba	1SS314	BA591 ‡
Rohm	1SS356	BA591 ‡
Toshiba	1SS381	BA277 ‡
Rohm	1SS390	BA891 ‡
Toshiba	1SV172	BAP50-04 ‡
Toshiba	1SV214	BB149
Toshiba	1SV214	BB149A
Toshiba	1SV215	BB153
Toshiba	1SV217	BB133
Toshiba	1SV228	BB201 ‡
Toshiba	1SV229	BB190
Toshiba	1SV231	BB132 ‡
Toshiba	1SV231	BB152
Toshiba	1SV232	BB148
Sanyo	1SV233	BAP70-03 ▲
Sanyo	1SV234	BAP64-04
Toshiba	1SV239	BB145B
Sanyo	1SV241	BAP64-02 ▲
Toshiba	1SV242	BB164
Sanyo	1SV246	BAP64-04W
Sanyo	1SV247	BAP70-02 ▲
Sanyo	1SV248	BAP50-02 ▲
Sanyo	1SV249	BAP50-04W
Sanyo	1SV250	BAP50-03 ▲
Sanyo	1SV251	BAP50-04
Toshiba	1SV252	BAP50-04W ‡
Toshiba	1SV254	BB179
Toshiba	1SV262	BB133
Sanyo	1SV263	BAP50-02 ▲
Sanyo	1SV264	BAP50-04W ‡
Sanyo	1SV266	BAP50-03 ▲
Sanyo	1SV267	BAP50-04 ‡
Toshiba	1SV269	BB148
Toshiba	1SV270	BB156
Toshiba	1SV271	BAP50-03 ‡
Toshiba	1SV276	BB151
Toshiba	1SV277	BB142
Toshiba	1SV278	BB179

Toshiba	1SV279	BB190
Toshiba	1SV280	BB145
Toshiba	1SV281	BB151
Toshiba	1SV282	BB178
Toshiba	1SV282	BB187
Toshiba	1SV283	BB178
Toshiba	1SV283	BB187
Toshiba	1SV283	BB187 ‡
Toshiba	1SV284	BB156
Toshiba	1SV285	BB142 ‡
Toshiba	1SV288	BB152
Toshiba	1SV290	BB182
Toshiba	1SV290	BB182 B
Toshiba	1SV293	BB151
Toshiba	1SV293	BB190 ‡
Sanyo	1SV294	BAP70-03 ▲
Toshiba	1SV305	BB202
Toshiba	1SV307	BAP51-03 ‡
Toshiba	1SV308	BAP51-02 ‡
Toshiba	1SV314	BB143
Toshiba	1SV329	BB143
Sony	1T362	BB149
Sony	1T362 A	BB149A ‡
Sony	1T363 A	BB153 ‡
Sony	1T368	BB133
Sony	1T368 A	BB148
Sony	1T369	BB132
Sony	1T369	BB152 ‡
Sony	1T369	BB164
Sony	1T379	BB131
Sony	1T397	BB152
Sony	1T399	BB148
Sony	1T402	BB179 B ‡
Sony	1T403	BB178 ‡
Sony	1T404A	BB187 ‡
Sony	1T405 A	BB187
Sony	1T406	BB182 ‡
Sony	1T407	BB182B



Sony	1T408	BB187 I
Indust. standard	2N3330	J176
Indust. standard	2N3331	J176
Indust. standard	2N4091	PN4391
Indust. standard	2N4092	PN4392
Indust. standard	2N4093	PN4393
Indust. standard	2N4220	BF245A
Indust. standard	2N4391	PN4391
Indust. standard	2N4392	PN4392
Indust. standard	2N4393	PN4393
Indust. standard	2N4416	PMBF4416
Indust. standard	2N4856	BSR56
Indust. standard	2N4857	BSR57
Indust. standard	2N4858	BSR58
Indust. standard	2N5114	J174
Indust. standard	2N5115	J175
Indust. standard	2N5116	J175
Indust. standard	2N5432	J108
Indust. standard	2N5433	J108
Indust. standard	2N5434	J109
Indust. standard	2N5457	BF245A
Indust. standard	2N5458	BF245A
Indust. standard	2N5459	BF245B
Indust. standard	2N5484	PMBF5484
Indust. standard	2N5485	PMBF5485
Indust. standard	2N5486	PMBF5486
Indust. standard	2N5638	PN4391
Indust. standard	2N5639	PN4392
Indust. standard	2N5640	PN4393
Indust. standard	2N5653	J112
Indust. standard	2N5654	J111
NEC	2SC4092	BFG67/XR
NEC	2SC4093	BFG67/XR
NEC	2SC4094	BFG520/XR
NEC	2SC4095	BFG520/XR
NEC	2SC4182	BFS17W
NEC	2SC4184	BFS17W
NEC	2SC4185	BFS17W
NEC	2SC4186	BFR92AW
NEC	2SC4226	PRF957
NEC	2SC4227	BFQ67W
NEC	2SC4228	BFS505
Toshiba	2SC4247	BFR92AW
Toshiba	2SC4248	BFR92AW
Toshiba	2SC4315	BFG520/XR
Toshiba	2SC4320	BFG520/XR
Toshiba	2SC4321	BFQ67W
Toshiba	2SC4325	BFS505
Toshiba	2SC4394	PRF957

Hitachi	2SC4463	BF547W
NEC	2SC4536	BFQ19
Hitachi	2SC4537	BFR93AW
Hitachi	2SC4592	BFG520/XR
Hitachi	2SC4593	BFS520
NEC	2SC4703	BFQ19
Hitachi	2SC4784	BFS505
Hitachi	2SC4807	BFQ18A
Toshiba	2SC4842	BFG540W/XR
Hitachi	2SC4899	BFS505
Hitachi	2SC4900	BFG520/XR
Hitachi	2SC4901	BFS520
Hitachi	2SC4988	BFQ540
NEC	2SC5011	BFG540W/XR
NEC	2SC5012	BFG540W/XR
Toshiba	2SC5065	PRF957
Toshiba	2SC5085	PRF957
Toshiba	2SC5087	BFG520/XR
Toshiba	2SC5088	BFG540W/XR
Toshiba	2SC5090	BFS520
Toshiba	2SC5092	BFG520/XR
Toshiba	2SC5095	BFS505
Toshiba	2SC5107	BFS505
Toshiba	2SC5463	BFQ67W
Hitachi	2SC5593	BFG410W
Hitachi	2SC5594	BFG425W
Hitachi	2SC5623	BFG410W
Hitachi	2SC5624	BFG425W
Hitachi	2SC5631	BFQ540
Indust. standard	2SJ105GR	J177
Hitachi	2SK108	PN4392
Hitachi	2SK147BL	PN4393
Hitachi	2SK162-K	PN4393
Hitachi	2SK162-L	PN4393
Hitachi	2SK162-M	PN4393
Hitachi	2SK162-N	PN4393
Hitachi	2SK163-K	J113
Hitachi	2SK163-L	J113
Hitachi	2SK163-M	J113
Hitachi	2SK163-N	J113
Hitachi	2SK170BL	PN4393
Hitachi	2SK170GR	PN4393
Hitachi	2SK170V	PN4393
Hitachi	2SK170Y	PN4393
Hitachi	2SK197D	PMBF4416
Hitachi	2SK197E	PMBF4416
Hitachi	2SK2090	PMBF4416
Hitachi	2SK209BL	PMBF4416
Hitachi	2SK209GR	PMBF4416



Hitachi	2SK209Y	PMBF4416
Hitachi	2SK210BL	PMBFJ309
Hitachi	2SK210GR	PMBF4416
Hitachi	2SK2110	PMBF4416
Hitachi	2SK211GR	PMBF4416
Hitachi	2SK211Y	PMBF4416
Hitachi	2SK212	PN4393
Hitachi	2SK217D	PMBF4416
Hitachi	2SK217E	PMBF4416
Hitachi	2SK223	PN4393
Hitachi	2SK242E	PMBF4416
Hitachi	2SK242F	PMBF4416
Hitachi	2SK370BL	J109
Hitachi	2SK370GR	J109
Hitachi	2SK370V	J109
Hitachi	2SK381	J113
Hitachi	2SK425	PMBF4416
Hitachi	2SK426	PMBF4416
Hitachi	2SK43	J113
Hitachi	2SK435	J113
Hitachi	2SK508	PMBFJ308
Hitachi	3SK290	BF998WR
Hitachi	3SK322	BF990A
Indust. standard	40894	BFR30
Indust. standard	40895	BFR30
Indust. standard	40896	BFR30
Indust. standard	40897	BFR30
Infineon	BA592	BA591
Infineon	BA592	BA591 †
Infineon	BA595	BAP70-03 †
Infineon	BA597	BAP70-03
Infineon	BA885	BAP70-03 ▲
Infineon	BA892	BA891
Infineon	BA892	BA891 †
Infineon	BA895	BAP70-02 †
Infineon	BAR14-1	2xBAP70-03 ▲
Infineon	BAR15-1	2xBAP70-03 ▲
Infineon	BAR16-1	2xBAP70-03 ▲
Infineon	BAR17	BAP50-03 ▲
Infineon	BAR60	3xBAP50-03 ▲
Infineon	BAR61	3xBAP50-03 ▲
Infineon	BAR63	BAP63-03 ▲
Infineon	BAR63-02L	BAP63-02 ▲
Infineon	BAR63-02V	BAP63-02
Infineon	BAR63-02W	BAP63-02 ▲
Infineon	BAR63-03W	BAP63-03
Infineon	BAR63-05	BAP63-05W ▲
Infineon	BAR63-05W	BAP63-05W
Infineon	BAR64-02V	BAP64-02 †

Infineon	BAR64-02W	BAP64-02 † s
Infineon	BAR64-03W	BAP64-03 †
Infineon	BAR64-04	BAP64-04 †
Infineon	BAR64-04W	BAP64-04W †
Infineon	BAR64-05	BAP64-05 †
Infineon	BAR64-05W	BAP64-05W †
Infineon	BAR64-06	BAP64-06 †
Infineon	BAR64-06W	BAP64-06W †
Infineon	BAR65-02V	BAP65-02 †
Infineon	BAR65-02W	BAP65-02 †
Infineon	BAR65-03W	BAP65-03 †
Infineon	BAR66	BAP1321-04 †
Infineon	BAR67-02L	BAP1321-01
Infineon	BAR67-02W	BAP1321-02 †
Infineon	BAR67-03W	BAP1321-03 †
Infineon	BAT18	BAT18 †
Hitachi	BB304C	BF1201WR
Hitachi	BB304M	BF1201R
Hitachi	BB305C	BF1201WR
Hitachi	BB305M	BF1201R
Hitachi	BB403M	BF909R
Hitachi	BB501C	BF1202WR
Hitachi	BB501M	BF1202R
Hitachi	BB502C	BF1202WR
Hitachi	BB502M	BF1202R
Hitachi	BB503C	BF1202WR
Hitachi	BB503M	BF1202R
Infineon	BB535	BB134
Infineon	BB535	BB149 †
Infineon	BB545	BB149A †
Infineon	BB555	BB179B
Infineon	BB565	BB179
Hitachi	BB601M	BF1202
Infineon	BB639	BB133
Infineon	BB639	BB148 †
Infineon	BB639	BB153
Infineon	BB640	BB132
Infineon	BB640	BB152
Infineon	BB640	BB164
Infineon	BB641	BB132
Infineon	BB641	BB152
Infineon	BB641	BB164
Infineon	BB659	BB155 ▲
Infineon	BB659	BB178
Infineon	BB664	BB178
Infineon	BB664	BB187 †
Infineon	BB669	BB152
Infineon	BB814	BB201
Infineon	BB831	BB131





Infineon	<i>BB833</i>	<a href="#">BB131</a>
Infineon	<i>BB835</i>	<a href="#">BB131</a>
Infineon	<i>BBY51</i>	<a href="#">BB141</a>
Infineon	<i>BBY51-03W</i>	<a href="#">BB142</a>
Infineon	<i>BBY53</i>	<a href="#">BB143</a>
Infineon	<i>BBY53-03W</i>	<a href="#">BB143</a>
Infineon	<i>BBY55-03W</i>	<a href="#">BB190</a>
Infineon	<i>BBY58-02V</i>	<a href="#">BB202</a>
Infineon	<i>BBY66-05</i>	<a href="#">BB200</a>
Infineon	<i>BF1005S</i>	<a href="#">BF1105</a>
Infineon	<i>BF1009S</i>	<a href="#">BF1109</a>
Infineon	<i>BF1009SW</i>	<a href="#">BF1109WR</a>
Infineon	<i>BF2030</i>	<a href="#">BF1101</a>
Infineon	<i>BF2030R</i>	<a href="#">BF1101R</a>
Infineon	<i>BF2030W</i>	<a href="#">BF1101WR</a>
Infineon	<i>BF2040</i>	<a href="#">BF909(A)</a>
Infineon	<i>BF2040W</i>	<a href="#">BF909(A)WR</a>
Indust. standard	<i>BF244A</i>	<a href="#">BF245A</a>
Indust. standard	<i>BF244B</i>	<a href="#">BF245B</a>
Indust. standard	<i>BF244C</i>	<a href="#">BF245C</a>
Indust. standard	<i>BF247A</i>	<a href="#">J108</a>
Indust. standard	<i>BF247B</i>	<a href="#">J108</a>
Indust. standard	<i>BF247C</i>	<a href="#">J108</a>
Indust. standard	<i>BF256A</i>	<a href="#">BF245A</a>
Indust. standard	<i>BF256B</i>	<a href="#">BF245B</a>
Indust. standard	<i>BF256C</i>	<a href="#">BF245C</a>
Infineon	<i>BF770A</i>	<a href="#">BFR93A</a>
Infineon	<i>BF771</i>	<a href="#">PBR951</a>
Infineon	<i>BF771W</i>	<a href="#">BFS540</a>
Infineon	<i>BF772</i>	<a href="#">BFG540</a>
Infineon	<i>BF775</i>	<a href="#">BFR92A</a>
Infineon	<i>BF775A</i>	<a href="#">BFR92A</a>
Infineon	<i>BF775W</i>	<a href="#">BFR92AW</a>
Infineon	<i>BF799</i>	<a href="#">BF747</a>
Infineon	<i>BF799</i>	<a href="#">BF747</a>
Infineon	<i>BF799W</i>	<a href="#">BF547W</a>
Indust. standard	<i>BF851A</i>	<a href="#">BF861A</a>
Indust. standard	<i>BF851B</i>	<a href="#">BF861B</a>
Indust. standard	<i>BF851C</i>	<a href="#">BF861C</a>
Vishay	<i>BF994S</i>	<a href="#">BF994S</a>
Vishay	<i>BF996S</i>	<a href="#">BF996S</a>
Infineon	<i>BF998</i>	<a href="#">BF998</a>
Vishay	<i>BF998</i>	<a href="#">BF998</a>
Vishay	<i>BF998R</i>	<a href="#">BF998R</a>
Vishay	<i>BF998RW</i>	<a href="#">BF998WR</a>
Infineon	<i>BF998W</i>	<a href="#">BF998WR</a>
Infineon	<i>BFG135A</i>	<a href="#">BFG135</a>
Infineon	<i>BFG193</i>	<a href="#">BFG198</a>
Infineon	<i>BFG194</i>	<a href="#">BFG31</a>

Infineon	<i>BFG196</i>	<a href="#">BFG541</a>
Infineon	<i>BFG19S</i>	<a href="#">BFG97</a>
Infineon	<i>BFG235</i>	<a href="#">BFG135</a>
Infineon	<i>BFP180</i>	<a href="#">BFG505/X</a>
Infineon	<i>BFP181</i>	<a href="#">BFG67/X</a>
Infineon	<i>BFP182</i>	<a href="#">BFG67/X</a>
Infineon	<i>BFP182R</i>	<a href="#">BFG67/XR</a>
Infineon	<i>BFP183</i>	<a href="#">BFG520/X</a>
Infineon	<i>BFP183R</i>	<a href="#">BFG520/XR</a>
Infineon	<i>BFP193</i>	<a href="#">BFG540/X</a>
Infineon	<i>BFP193W</i>	<a href="#">BFG540W/XR</a>
Infineon	<i>BFP196W</i>	<a href="#">BFG540W/XR</a>
Infineon	<i>BFP280</i>	<a href="#">BFG505/X</a>
Infineon	<i>BFP405</i>	<a href="#">BFG410W</a>
Infineon	<i>BFP420</i>	<a href="#">BFG425W</a>
Infineon	<i>BFP450</i>	<a href="#">BFG480W</a>
Infineon	<i>BFP520</i>	<a href="#">BFU510</a>
Infineon	<i>BFP540</i>	<a href="#">BFU540</a>
Infineon	<i>BFP81</i>	<a href="#">BFG92A/X</a>
Infineon	<i>BFP93A</i>	<a href="#">BFG93A/X</a>
Infineon	<i>BFQ193</i>	<a href="#">BFQ540</a>
Infineon	<i>BFQ19S</i>	<a href="#">BFQ19</a>
Infineon	<i>BFR106</i>	<a href="#">BFR106</a>
Infineon	<i>BFR180</i>	<a href="#">BFR505</a>
Infineon	<i>BFR180W</i>	<a href="#">BFS505</a>
Infineon	<i>BFR181</i>	<a href="#">BFR520</a>
Infineon	<i>BFR181W</i>	<a href="#">BFS520</a>
Infineon	<i>BFR182</i>	<a href="#">PBR941</a>
Infineon	<i>BFR182W</i>	<a href="#">PRF947</a>
Infineon	<i>BFR183</i>	<a href="#">PBR951</a>
Infineon	<i>BFR183W</i>	<a href="#">PRF957</a>
Infineon	<i>BFR193</i>	<a href="#">PBR951</a>
Infineon	<i>BFR193W</i>	<a href="#">PRF957</a>
Infineon	<i>BFR35AP</i>	<a href="#">BFR92A</a>
Motorola	<i>BFR92AL</i>	<a href="#">BFR92A</a>
Infineon	<i>BFR92P</i>	<a href="#">BFR92A</a>
Infineon	<i>BFR92W</i>	<a href="#">BFR92AW</a>
Infineon	<i>BFR93A</i>	<a href="#">BFR93A</a>
Motorola	<i>BFR93AL</i>	<a href="#">BFR93A</a>
Infineon	<i>BFR93AW</i>	<a href="#">BFR93AW</a>
Motorola	<i>BFS17L</i>	<a href="#">BFS17</a>
Motorola	<i>BFS17L</i>	<a href="#">BFS17</a>
Infineon	<i>BFS17P</i>	<a href="#">BFS17A</a>
Infineon	<i>BFS17W</i>	<a href="#">BFS17W</a>
Infineon	<i>BFS481</i>	<a href="#">BFM505</a>
Infineon	<i>BFS483</i>	<a href="#">BFM520</a>
Infineon	<i>BFT92</i>	<a href="#">BFT92</a>
Infineon	<i>BFT93</i>	<a href="#">BFT93</a>
Infineon	<i>BGB540</i>	<a href="#">BGU2003</a>



Hitachi	<i>BIC701C</i>	<a href="#">BF1105WR</a>
Hitachi	<i>BIC701M</i>	<a href="#">BF1105R</a>
Hitachi	<i>BIC702C</i>	<a href="#">BF1105WR</a>
Hitachi	<i>BIC702M</i>	<a href="#">BF1105R</a>
Hitachi	<i>BIC801M</i>	<a href="#">BF1105</a>
Indust. standard	<i>BSR111</i>	<a href="#">PMBFJ111</a>
Indust. standard	<i>BSR112</i>	<a href="#">PMBFJ112</a>
Indust. standard	<i>BSR113</i>	<a href="#">PMBFJ113</a>
Indust. standard	<i>BSR174</i>	<a href="#">PMBFJ174</a>
Indust. standard	<i>BSR175</i>	<a href="#">PMBFJ175</a>
Indust. standard	<i>BSR176</i>	<a href="#">PMBFJ176</a>
Indust. standard	<i>BSR177</i>	<a href="#">PMBFJ177</a>
Infineon	<i>CMY91</i>	<a href="#">BGA2022</a>
Agilent	<i>HBFP0405</i>	<a href="#">BFG410W</a>
Agilent	<i>HBFP0420</i>	<a href="#">BFG425W</a>
Agilent	<i>HBFP0450</i>	<a href="#">BFG480W</a>
Hitachi	<i>HSC277</i>	<a href="#">BA277</a> †
Agilent	<i>HSMP3800</i>	<a href="#">BAP70-03</a> ▲
Agilent	<i>HSMP3802</i>	<a href="#">BAP50-04</a>
Agilent	<i>HSMP3804</i>	<a href="#">BAP50-05</a>
Agilent	<i>HSMP3810</i>	<a href="#">BAP50-03</a> ▲
Agilent	<i>HSMP3814</i>	<a href="#">BAP50-05</a>
Agilent	<i>HSMP381B</i>	<a href="#">BAP50-03</a> ▲
Agilent	<i>HSMP381C</i>	<a href="#">BAP50-05</a> ▲
Agilent	<i>HSMP381F</i>	<a href="#">BAP64-05W</a>
Agilent	<i>HSMP3820</i>	<a href="#">BAP1321-03</a> ▲
Agilent	<i>HSMP3822</i>	<a href="#">BAP1321-04</a> †
Agilent	<i>HSMP3830</i>	<a href="#">BAP64-03</a> ▲
Agilent	<i>HSMP3832</i>	<a href="#">BAP64-04</a> †
Agilent	<i>HSMP3833</i>	<a href="#">BAP64-06</a> †
Agilent	<i>HSMP3834</i>	<a href="#">BAP64-05</a> †
Agilent	<i>HSMP3860</i>	<a href="#">BAP50-03</a> ▲
Agilent	<i>HSMP3862</i>	<a href="#">BAP50-04</a> †
Agilent	<i>HSMP3864</i>	<a href="#">BAP50-05</a> †
Agilent	<i>HSMP386B</i>	<a href="#">BAP50-02</a> ▲
Agilent	<i>HSMP386E</i>	<a href="#">BAP50-04W</a> †
Agilent	<i>HSMP386L</i>	<a href="#">BAP50-05W</a> †
Agilent	<i>HSMP3880</i>	<a href="#">BAP51-03</a> ▲
Agilent	<i>HSMP3890</i>	<a href="#">BAP51-03</a> ▲
Agilent	<i>HSMP3892</i>	<a href="#">BAP64-04</a>
Agilent	<i>HSMP3894</i>	<a href="#">BAP64-05</a>
Agilent	<i>HSMP3895</i>	<a href="#">2xBAP51-02</a> ▲
Agilent	<i>HSMP389B</i>	<a href="#">BAP51-02</a> ▲
Agilent	<i>HSMP389C</i>	<a href="#">BAP64-04</a> ▲
Agilent	<i>HSMP389F</i>	<a href="#">BAP51-05W</a> †
Hitachi	<i>HSU277</i>	<a href="#">BA951</a>
Hitachi	<i>HVB14S</i>	<a href="#">BAP50-04W</a> †
Hitachi	<i>HVC131</i>	<a href="#">BAP65-02</a> †
Hitachi	<i>HVC132</i>	<a href="#">BAP51-02</a> †

Hitachi	<i>HVC200A</i>	<a href="#">BB178</a>
Hitachi	<i>HVC200A</i>	<a href="#">BB187</a>
Hitachi	<i>HVC202A</i>	<a href="#">BB179</a> †
Hitachi	<i>HVC202B</i>	<a href="#">BB179B</a>
Hitachi	<i>HVC300A</i>	<a href="#">BB182</a> †
Hitachi	<i>HVC300A</i>	<a href="#">BB182</a>
Hitachi	<i>HVC300B</i>	<a href="#">BB182</a> †
Hitachi	<i>HVC300B</i>	<a href="#">BB182B</a>
Hitachi	<i>HVC306A</i>	<a href="#">BB187</a> †
Hitachi	<i>HVC306B</i>	<a href="#">BB187</a>
Hitachi	<i>HVC355</i>	<a href="#">BB145</a> †
Hitachi	<i>HVC355B</i>	<a href="#">BB145B</a> †
Hitachi	<i>HVC359</i>	<a href="#">BB202</a> †
Hitachi	<i>HVC363A</i>	<a href="#">BB178</a> †
Hitachi	<i>HVC369B</i>	<a href="#">BB143</a>
Hitachi	<i>HVC372B</i>	<a href="#">BB151</a>
Hitachi	<i>HVD131</i>	<a href="#">BAP65-01</a> †
Hitachi	<i>HVD132</i>	<a href="#">BAP51-02</a>
Hitachi	<i>HVD139</i>	<a href="#">BAP63-01</a>
Hitachi	<i>HVD142</i>	<a href="#">BAP63-01</a>
Hitachi	<i>HVU131</i>	<a href="#">BAP65-03</a> †
Hitachi	<i>HVU132</i>	<a href="#">BAP51-03</a> †
Hitachi	<i>HVU200A</i>	<a href="#">BB133</a>
Hitachi	<i>HVU202(A)</i>	<a href="#">BB149</a>
Hitachi	<i>HVU202(A)</i>	<a href="#">BB149A</a>
Hitachi	<i>HVU202A</i>	<a href="#">BB134</a>
Hitachi	<i>HVU300A</i>	<a href="#">BB132</a>
Hitachi	<i>HVU300A</i>	<a href="#">BB152</a> †
Hitachi	<i>HVU300A</i>	<a href="#">BB164</a>
Hitachi	<i>HVU306A</i>	<a href="#">BB133</a>
Hitachi	<i>HVU307</i>	<a href="#">BB148</a>
Hitachi	<i>HVU315</i>	<a href="#">BB148</a> †
Hitachi	<i>HVU316</i>	<a href="#">BB131</a>
Hitachi	<i>HVU356</i>	<a href="#">BB155</a>
Hitachi	<i>HVU357</i>	<a href="#">BB190</a>
Hitachi	<i>HVU363A</i>	<a href="#">BB133</a>
Hitachi	<i>HVU363A</i>	<a href="#">BB148</a> †
Hitachi	<i>HVU363A</i>	<a href="#">BB153</a> †
Hitachi	<i>HVU363B</i>	<a href="#">BB148</a> †
Agilent	<i>INA-51063</i>	<a href="#">BGA2001</a>
Indust. standard	<i>J201</i>	<a href="#">BF410A</a>
Indust. standard	<i>J202</i>	<a href="#">BF410B</a>
Indust. standard	<i>J203</i>	<a href="#">BF410C</a>
Indust. standard	<i>J204</i>	<a href="#">BF410D</a>
Indust. standard	<i>J270</i>	<a href="#">J177</a>
Indust. standard	<i>J308</i>	<a href="#">J108</a>
Indust. standard	<i>J309</i>	<a href="#">J109</a>
Indust. standard	<i>J310</i>	<a href="#">J110</a>
Toshiba	<i>JDP2S01E</i>	<a href="#">BAP65-02</a> †



Toshiba	JDP2S01U	BAP65-03
Toshiba	JDP2S02S	BAP63-01
Toshiba	JDP2S02T	BAP63-02
Toshiba	JDP2S04E	BAP50-02
Toko	KV1470	BB200
Matsushita	MA27V07	BB140-01
Indust. standard	MA2S077	BA277
Matsushita	MA2S357	BB178
Matsushita	MA2S357	BB187
Matsushita	MA2S372	BB179
Matsushita	MA2S374	BB182
Matsushita	MA357	BB153
Matsushita	MA366	BB133
Matsushita	MA366	BB148
Matsushita	MA368	BB131
Matsushita	MA372	BB149
Matsushita	MA372	BB149A
Matsushita	MA374	BB164
Matsushita	MA377	BB141
Matsushita	MA4CP101A	BAP65-03
Matsushita	MA4P274-1141	BAP51-03
Matsushita	MA4P275-1141	BAP65-03
Matsushita	MA4P275CK-287	BAP65-05
Matsushita	MA4P277-1141	BAP70-03
Matsushita	MA4P278-287	BAP70-03
Matsushita	MA4P789-1141	BAP1321-03
Matsushita	MA4P789ST-287	BAP1321-04
Motorola	MMBF4391	PMBF4391
Motorola	MMBF4392	PMBF4392
Motorola	MMBF4393	PMBF4393
Motorola	MMBF4416	PMBF4416
Motorola	MMBF4860	PMBFJ112
Motorola	MMBF5484	BFR31
Motorola	MMBFJ113	PMBFJ113
Motorola	MMBFJ174	PMBFJ174
Motorola	MMBFJ175	PMBFJ175
Motorola	MMBFJ176	PMBFJ176
Motorola	MMBFJ177	PMBFJ177
Motorola	MMBFJ308	PMBFJ308
Motorola	MMBFJ309	PMBFJ309
Motorola	MMBFJ310	PMBFJ310
Motorola	MMBFU310	PMBFJ310
Motorola	MMBR5031L	BFS17
Motorola	MMBR5179L	BFS17A
Motorola	MMBR571L	PBR951
Motorola	MMBR901L	BFR92A
Motorola	MMBR911L	BFR93A
Motorola	MMBR920L	BFR93A
Motorola	MMBR931L	BFT25A

Motorola	MMBR941BL	PBR941
Motorola	MMBR941L	PBR941
Motorola	MMBR951AL	PBR951
Motorola	MMBR951L	PBR951
ON Semicond.	MMBV105GLT1	BB151
ON Semicond.	MMBV105GLT1	BB156
ON Semicond.	MMBV109LT1	BB148
Indust. standard	MPF102	BF245A
Indust. standard	MPF4391	PN4391
Indust. standard	MPF4392	PN4392
Indust. standard	MPF4393	PN4393
Indust. standard	MPF4416	PN4416
Indust. standard	MPF970	J174
Indust. standard	MPF971	J176
Motorola	MRF577	PRF957
Motorola	MRF5811L	BFG93A/X
Motorola	MRF917	BFQ67W
Motorola	MRF927	BFS25A
Motorola	MRF9411L	BFG520/X
Motorola	MRF947	BFS520
Motorola	MRF947A	PRF947
Motorola	MRF9511L	BFG540/X
Motorola	MRF957	PRF957
Toshiba	MT4S34U	BFG410W
Motorola	PRF947B	PRF947
Indust. standard	PZFJ108	J108
Indust. standard	PZFJ109	J109
Indust. standard	PZFJ110	J110
Rohm	RN142G	BAP1321-03
Rohm	RN142S	BAP1321-02
Rohm	RN731V	BAP50-03
Rohm	RN739D	BAP50-04
Rohm	RN739F	BAP50-04W
Vishay	S503T	BF909(A)
Vishay	S503TR	BF909(A)R
Vishay	S503TRW	BF909(A)WR
Vishay	S504T	BF904(A)
Vishay	S504TR	BF904(A)R
Vishay	S504TRW	BF904(A)WR
Vishay	S505T	BF1101
Vishay	S505TR	BF1101R
Vishay	S505TRW	BF1101WR
Vishay	S595T	BF1105
Vishay	S595TR	BF1105R
Vishay	S595TRW	BF1105WR
Vishay	S949T	BF1109
Vishay	S949TR	BF1109R
Vishay	S949TRW	BF1109WR
Vishay	S974T	BF1109



Vishay	S974TR	BF1109R
Vishay	S974TRW	BF1109WR
Alpha/Skyworks	SMP1302-004	BAP50-05 †
Alpha/Skyworks	SMP1302-005	BAP50-04 †
Alpha/Skyworks	SMP1302-011	BAP50-03 †
Alpha/Skyworks	SMP1302-074	BAP50-05W †
Alpha/Skyworks	SMP1302-075	BAP50-04W †
Alpha/Skyworks	SMP1302-079	BAP50-02 †
Alpha/Skyworks	SMP1304-001	BAP70-03
Alpha/Skyworks	SMP1304-011	BAP70-03
Alpha/Skyworks	SMP1307-001	BAP70-03
Alpha/Skyworks	SMP1307-011	BAP70-03
Alpha/Skyworks	SMP1320-004	BAP65-05
Alpha/Skyworks	SMP1320-011	BAP65-03
Alpha/Skyworks	SMP1320-074	BAP65-05W
Alpha/Skyworks	SMP1321-001	BAP1321-03
Alpha/Skyworks	SMP1321-005	BAP1321-04 †
Alpha/Skyworks	SMP1321-011	BAP1321-03 †
Alpha/Skyworks	SMP1321-075	BAP1321-04
Alpha/Skyworks	SMP1321-079	BAP1321-02 †
Alpha/Skyworks	SMP1322-004	BAP65-05 †
Alpha/Skyworks	SMP1322-011	BAP65-03 †
Alpha/Skyworks	SMP1322-074	BAP65-05W †
Alpha/Skyworks	SMP1322-079	BAP65-02 †
Alpha/Skyworks	SMP1340-011	BAP63-03
Alpha/Skyworks	SMP1340-079	BAP63-02
Alpha/Skyworks	SMP1352-011	BAP64-03 †
Alpha/Skyworks	SMP1352-079	BAP64-02 †
Alpha/Skyworks	SMV1236-011	BB151
Alpha/Skyworks	SMV1263-079	BB143
Indust. standard	SST111	PMBFJ111
Indust. standard	SST112	PMBFJ112
Indust. standard	SST113	PMBFJ113
Indust. standard	SST174	PMBFJ174
Indust. standard	SST175	PMBFJ175
Indust. standard	SST176	PMBFJ176
Indust. standard	SST177	PMBFJ177
Indust. standard	SST201	BFT46
Indust. standard	SST202	BFR31

Indust. standard	SST203	BFR30
Indust. standard	SST308	PMBFJ308
Indust. standard	SST309	PMBFJ309
Indust. standard	SST310	PMBFJ310
Indust. standard	SST4391	PMBF4391
Indust. standard	SST4392	PMBF4392
Indust. standard	SST4393	PMBF4393
Indust. standard	SST4416	PMBF4416
Indust. standard	SST4856	BSR56
Indust. standard	SST4857	BSR57
Indust. standard	SST4859	BSR56
Indust. standard	SST4860	BSR57
Indust. standard	SST4861	BSR58
Hitachi	TBB1004	BF1203
Indust. standard	TMPF4091	PMBF4391
Indust. standard	TMPF4092	PMBF4392
Indust. standard	TMPF4093	PMBF4393
Indust. standard	TMPF4391	PMBF4391
Indust. standard	TMPF4392	PMBF4392
Indust. standard	TMPF4393	PMBF4393
Indust. standard	TMPFB246A	BSR56
Indust. standard	TMPFB246B	BSR57
Indust. standard	TMPFB246C	BSR58
Indust. standard	TMPFJ111	PMBFJ111
Indust. standard	TMPFJ112	PMBFJ112
Indust. standard	TMPFJ113	PMBFJ113
Indust. standard	TMPFJ174	PMBFJ174
Indust. standard	TMPFJ175	PMBFJ175
Indust. standard	TMPFJ176	PMBFJ176
Indust. standard	TMPFJ177	PMBFJ177
Vishay	TSDF54040	BF1102
NEC	uPC2709	BGA2709
NEC	uPC2711	BGA2711
NEC	uPC2712	BGA2712
NEC	uPC2745	BGA2001
NEC	uPC2746	BGA2001
NEC	uPC2748	BGA2748
NEC	uPC2771	BGA2771
NEC	uPC8112	BGA2022

Online X-reference tool:

<http://www.semiconductors.philips.com/products/xref/>

## 6 Packaging

### SOT88x package platform

Maximum functionality, minimum space

Philips' continues to address the trend for smaller, more energy-efficient solutions with the launch of its SOT88x package platform. A milestone in package miniaturisation, the ultra-small SOT88x brings unique space saving and power dissipation capabilities to a wide range of our small-signal, RF and power discretes.



**SOT88x compared to SOT23**

#### Key features

- Dimensions: 1.0 x 0.6 x 0.5 mm
- Footprint only 14% of SOT23 or SOT346 (SC-59)
- Power dissipation up to 250 mW
- SOT883 compatible with JEITA standard SC-101
- Lead-free, 'green' plastic

#### Key benefits

- Reduces board space requirements
- Power dissipation comparable to SOT23 or SOT346 (SC-59)
- Very efficient packing: up to 10000 products on standard 180 mm reel
- leading to lower inventory and assembly costs
- Environmentally friendly

#### Key applications

- Cordless and mobile phones
- Digital cameras and camcorders
- PDAs and notebook PCs
- Optical disc drives
- DC/DC converters



Cost-effective and flexible, Philips' new SOT88x surface mount, ultrasmall plastic package platform delivers compact devices with excellent power dissipation. Its unique benefits are utilized by a wide variety of our discrete semiconductors to form a comprehensive portfolio covering small-signal, RF and power product ranges. Ideal for any market, SOT88x devices are excellent solutions where power dissipation and limited space are critical design factors; helping designers maximize functionality while minimizing space, particularly in hand-held, portable and battery-operated applications.

SOT88x packages are built in a Quad Flat Non-leaded technology (QFN), a well-known and proven technology for ICs. In terms of power dissipation, the leadless layout means they offer efficiency comparable to SOT23. The SOT88x platform is also environmentally friendly, with pure tin plating, green plastic and the highly efficient packing method – already standard for passive components – meeting all environmental protection targets.

Initially released in two and three solder pad options (SOD882 and SOT883 / SC-101 respectively), the SOT88x platform is based on a leadframe encapsulated by a plastic body compatible with existing pick and-place equipment and soldering methods. This superior, cost effective design gives Philips the opportunity to introduce sophisticated, multi-pin devices incorporating four, six or even more solder pads.

All SOD882 and SOT883 products are available in papertape and 180 mm standard reels exclusively. Very thin papertape (h = 0.6 mm) combined with a 2 mm product pitch enables Philips to offer 10000 devices on a single 180 mm standard reel, minimizing pick-and-place handling effort, reducing warehouse space and creating less waste material.



### **SOT88x – using the benefits of paper tape**

For leadless devices as small as the SOT88x, paper tape offers a much higher level of security against non-tilting or non-movement than a blister tape, due to the tape cavity's rectangular shape – a facility that cannot be achieved with a blister tape of the same dimension. Together with the 2 mm carrier tape pitch and up to 10000 devices per reel, paper



tape offers a state-of-the-art packing method with a superb device per reel ratio – better than with any small-signal packages – which is also environmentally friendly.

The large number of devices per reel minimizes storage space and reduces waste, while optimizing the changeover times at pick-and-place machines. We make exclusive use of a ‘flamed-off’ quality tape. This ensures no loose paper particles from the cavity stamping process of the carrier tape contaminate your working environment – any particles are burned off before the tape is delivered into production at Philips.

Surface resistivity of paper tape varies with the relative humidity of the working environment (following an inverse relationship). By enclosing the carrier tape with top and bottom anti-static tape layers, there is no risk to the enclosed devices from possible ESD failures resulting from humidity variations. ESD safety has been checked with very sensitive devices at extremely low relative humidities (16 %) and the requirements were fulfilled.

**Pick-and-place: machines and processes**

In general, every pick-and-place machine capable of handling ‘0402’ (based on Inch scaling) or ‘1005’ (based on metric scaling) devices has been proven to handle the SOD882 and SOT883 packages. Passive components with similar package dimensions have been an absolute world-standard for a long time in virtually all applications.

**RF discretes portfolio in SOD882**

VCO / VCXO Varicap diodes

Type	CD @ VR (pF)			CD @ VR (pF)			TUNING RANGE CD over voltage range (V)			rs (ohm) typ.
	min	max	(V)	min	Max	(V)	ratio	V1 to V2		
BB145BL	6.4	7.4	1	2.55	2.95	4	>2.2	1	4	0.6
BB140L	2.77 typ.	-	1	1.29 typ.	-	3	2.14	1	3	1.1
BB141L	3.9	4.5	1	2.22	2.55	4	1.76	1	4	0.4
BB142L	4	4.9	1	1.85	2.35	4	2.2	1	4	0.5
BB143L	4.75	5.75	1	2.05	2.55	4	2.35	1	4	0.5
BB145L	6.4	7.4	1	2.75	3.25	4	2	1	4	0.6
BB145CL	6.4	7.2	1	2.55	2.85	4	2.39 - 2.53	1	4	0.6
BB202L	28.2	33.5	0.2	7.2	11.2	2.3	2.5	0.2	2.3	0.35
BB151L	15.4	17	1	9 typ.	-	4	1.8	1	4	0.4
BB156L	14.4	17.6	1	7.6	9.6	4	1.86	1	4	0.4
BB190L	18	20	1	10.1	11.6	4	1.55	1	4	0.26
BB155L	45.2	49.8	0.34	24.55	26.70	2.82	-	-	-	0.35

Band switch diodes

Type	MAX. RATINGS		CHARACTERISTICS ; maximals					
	VR (V)	IF (mA)	RD @ IF and f			CD @ VR and f		
			ohm	(mA)	(MHz)	(pF)	(V)	(MHz)
BA277L	35	100	0.7	2	100	1.2	6	1

PIN diodes

Type	Conf	Limits		RD (ohm) typ @			CD (pF) type @		
		VR(V)	IF(mA)	0.5 mA	1 mA	10 mA	0 V	1 V	20 V
BAP51L	S	60	60	5.5	3.6	1.5	0.4	0.3	0.2 @ 5V
BAP1321L	S	60	100	3.4	2.4	1.2	0.4	0.35	0.25



## 7 Promotion Material

For samples or promotion materials below, please contact your Philips Account Manager or contact person in your region, see contacts & references.

Ad \* = contact Regional Sales Office

Focus	Description	Deliverable	12NC
RF General	Philips RF Manual 4th edition, product & design manual for RF small signal discretes, 4th edition and Appendix, February 2004	Manual Manual Appendix	4322 252 06387 4322 252 06388
RF General	Philips RF Manual 3rd edition, product & design manual for RF small signal discretes, 3rd edition and Appendix, July 2003	Manual Manual Appendix	4322 252 06384 4322 252 06385
RF General	PeRFectly tuned in to your ideas	Brochure	9397 750 07019
RF General	Standard Products Selection Guide 2002	Guide	9397 750 09014
RF General	The peRFect connection	Brochure	9397 750 07928
RF General	Philips Semiconductors comprehensive product portfolio	CDRom	9397 750 07536
RF General	Double polysilicon	Fact sheet	9397 750 04787
Packaging	Discrete Packages 2000	Brochure	9397 750 05988
Packaging	Discrete Semiconductor Packages	Databook SC18	9397 750 05011
Tuning	RF Tuning Sample Kit (English version)	Sample kit	9397 750 10168
Tuning	RF Tuning Sample Kit (Chinese version)	Sample kit	9397 750 10606
Tuning	Small-signal Field-effect Transistors and Diodes	Databook SC07	9397 750 06017
Pin diodes	Pin diodes designed for RF applications up to 3GHz	Leaflet	9397 750 08008
Pin diodes	Pin diodes	Replacement card	9397 750 08573
Pin diodes	Pin diodes	Sample kit *	9397 750 07299
MMIC's	Optimized MMICs Gain Blocks	Leaflet	9397 750 07976
MMIC's	RF MMIC Sample Kit (ready end of Q1 2004)	Sample kit *	9397 750 10168
MMIC's	RF Wideband Transistors and MMICs	Databook SC14	9397 750 06311
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2709	Demoboard	Contact RSO
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2711	Demoboard	Contact RSO
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2712	Demoboard	Contact RSO
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2748	Demoboard	Contact RSO
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2771	Demoboard	Contact RSO
Wideband amplifiers	50 ohm gain block for IF, buffer and driver amplifier: BGA2776	Demoboard	Contact RSO
Wideband transistors	Wideband transistors	Linecard	9397 750 08634
Wideband transistors	RF Wideband Transistors and MMICs	Databook SC14	9397 750 06311
Wideband transistors	Wideband transistors	Sample kit *	9397 750 08553





Sample kits:



**RF MMIC Sample Kit:**

This new RF MMIC Sample Kit will be ready at the end of the first quarter 2004.

Shortest possible design time, minimized PCB area, excellent and reliable performance are some of the delights that might ease your tight design criteria. It is all possible when choosing from Philips' range of RF MMIC's.

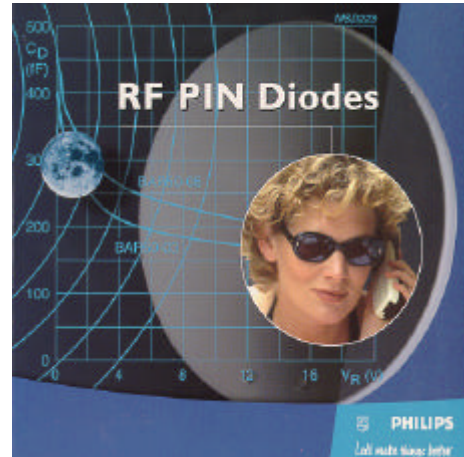
[9397 750 12477](tel:939775012477) ([9397 750 12809 Chinese version](tel:939775012809))



**RF Tuning Sample Kit:**

The selection of this RF Tuning sample kit gives you an impression of our tuning competence. The 32 products have been carefully selected from more than 150 products. This RF Tuning sample kit also shows you our packaging competence for RF Small Signal products, including leadless MCD (SOD882).

[9397 750 10168](tel:939775010168) ([9397 750 10606 Chinese version](tel:939775010606))



**RF PIN Diodes Sample Kit:**

This sample kit contains a selection of our RF PIN diodes, and a CD ROM with data sheets, application notes, and S-parameters. These PIN diodes have been developed to provide RF switching and attenuator functions in RF circuit applications. The types include duals and singles in SOT23, SOT323, SOD323 and SOD523, and can be used to replace most competitors' PIN diodes.

[9397 750 07299](tel:939775007299)



**RF Wideband Transistors Sample Kit:**

This sample kit contains 5 each of 24 different types of RF Wideband transistors, which have been carefully selected from more than 100 different types for performance, size and cost, and for the widest range of application requirements. Use the Selection Guide on the back to choose your type.

[9397 750 08553](tel:939775008553)



## 8 Contacts & References

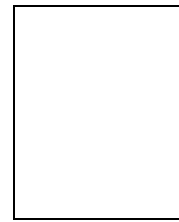
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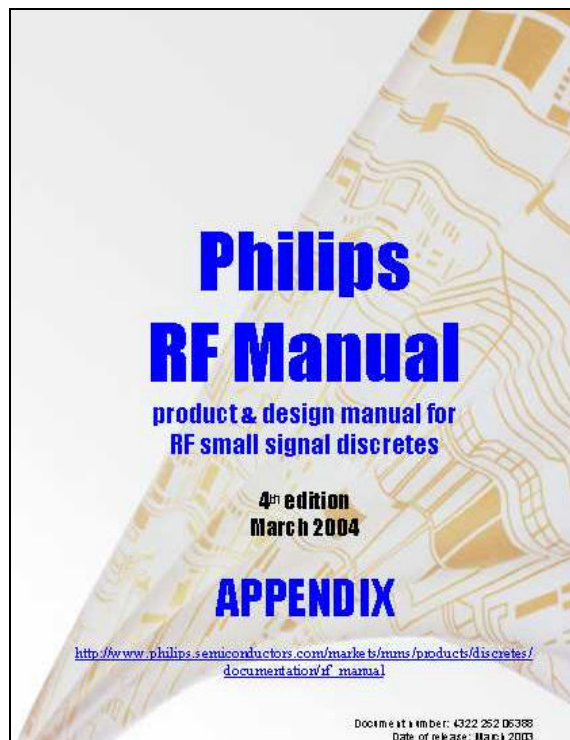
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## APPENDIX

*In separate appendix-file !*



## Content:

### **APPENDIX (in separate appendix-file):**

- Appendix A: 2.4GHz Generic Front-End reference design
- Appendix B: RF Application-basics
- Appendix C: RF Design-basics

#### Application notes:

- Appendix D: Application of RF Switch BF1107/8 Mosfet
- Appendix E: BGA2715-17 general purpose wideband amplifier,50 Ohm Gain Blocks
- Appendix F: BGA6x89 general purpose medium power amplifier,50 Ohm Gain Blocks

- download appendix from internet:

[http://www.philips.semiconductors.com/markets/mms/products/discretes/documentation/rf\\_manual](http://www.philips.semiconductors.com/markets/mms/products/discretes/documentation/rf_manual)