



RF Manual 8th edition

Application and design manual for RF products

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PHILIPS



Henk Roelofs, Vice President & General Manager RF Products

Introduction

Every edition we challenge ourselves to improve our RF manual. This 8th edition is no exception. We have added even more application-based information, more topics and more products. Next to that, the RF manual remains an interactive source and gateway for all information that is available on our RF systems.

We have committed ourselves to inform you about the important developments in your applications twice a year. We will keep maintaining our RF Manual as a dynamic and interactive source of information. Simply 'clicking' on a product type takes you directly to the corresponding product information page on the Philips Semiconductors website. And this also counts for the corresponding application notes.

New applications & design-in tools

To extend our application-driven manual we have added an RF Generic Front-end for ISM applications for e.g. walkie-talkie and remote metering, and a CATV application (CATV Optical Node with Multiple Out-ports). To make it easier to find and get design-in information and materials, you can find tools like s-parameters, spice models and demo boards in our "Design-in tools" chapter.

RF topics

Every edition we go deeper into relevant RF topics. In this edition, we present our BAW offerings and characteristics

in Chapter 5. Chapter 6 informs you about our complete one-stop-shopping portfolio for satellite outdoor units (LNB). Chapter 7, on the CATV C-family, is completely new. We have launched a family of CATV RF modules especially designed for Chinese Hybrid Fiber Coax (HFC) infrastructure, and SARFT compliant. And finally Chapter 8 touches upon our new transimpedance amplifiers, digital fibre optic receiver modules for telecom, data networks and FTTx systems.

Pb-free packaging

Throughout the electronics industry, the desire for Pb-free electronics is a hot topic, and Philips is leading the way to a Pb-free future. The new chapter 9 covers packaging. We are also introducing an innovative leadless ultra-thin plastic package technology for small-signal discrete semiconductors. This reflects the clear trend towards smaller, better RF performing components. An overview of our available packing methods, will help you find the desired package.

RF manual web page

<http://www.philips.semiconductors.com/rfmanual>

RF Products, marketing team

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1. Applications, recommended products and application notes

Philips RF Applications

<http://www.semiconductors.philips.com/products/rf/index.html>

Philips Application notes

http://www.semiconductors.philips.com/products/all_apnotes/

Philips Application notes, MMIC's

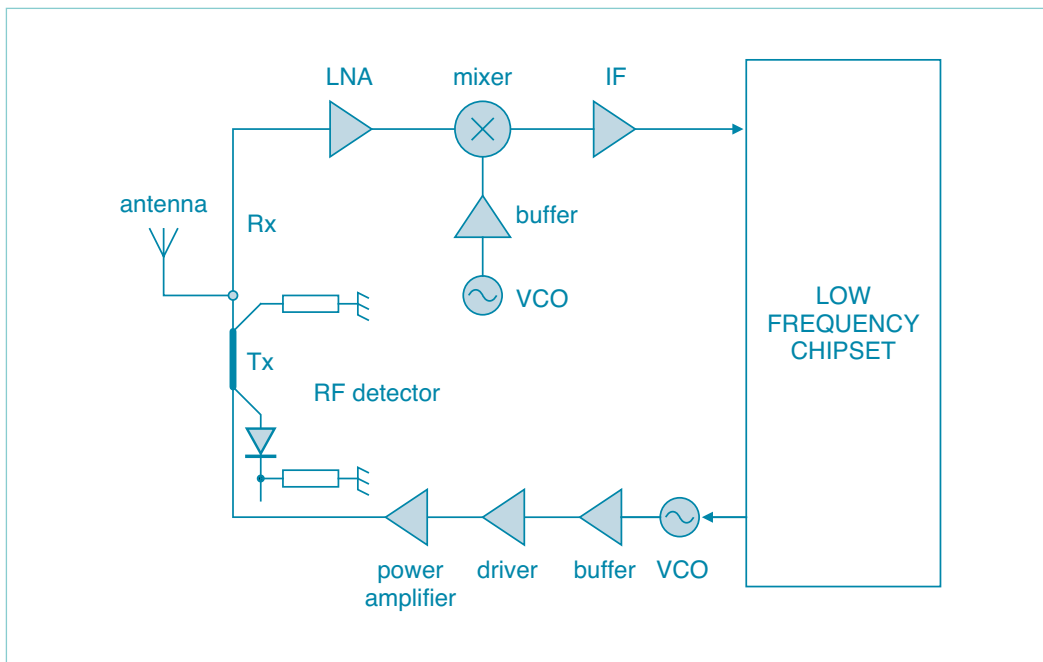
http://www.semiconductors.philips.com/products/discretes/documentation/mmic_amplifiers_mixers/

Philips Application notes, transistors

<http://www.semiconductors.philips.com/products/discretes/documentation/transistors/index.html>

1.1 Low-cost cellular phone front-end for ODM/CEM designs

Application diagram



Recommended products

Function	Product		Package	Type
RF detector	RF schottky diode	Low Cd schottky	SOT323	1PS70SB84
			SOD323	1PS76SB17
			SOD882	1PS10SB82
			SOT666	1PS66SB82

Function	Product		Package	Type
Buffer	RF bipolar transistor	Wideband transistor	SOT343	BFG410W
			SOT343	BFG425W
			SOT343	BFG480W
			SOT23	BFR520T
			SOT416	BFR505T
			SOT323	BF5540

Function	Product		Package	Type
Antenna switch	RF diode	PIN diode	various	BAP50
			various	BAP51
			various	BAP55
			various	BAP63
			various	BAP64
			various	BAP65
			various	BAP1321

Function	Product		Package	Type
VCO	Varicap diodes	VCO varicap diodes	SOD523	
			SOD523	
			SOD523	BB143
			SOD523	BB145
			SOD523	BB145B
			SOD523	BB179

Function	Product		Package	Type
VCxO	Varicap diodes	VCxO varicap diodes	SOD523	BB198
			SOD523	BB199

* = 2 stage variable gain linear amplifier

Function	Product		Package	Type
LNA	MMIC	Low noise wideband amplifier	SOT343R	BGA2001
			SOT343R	BGA2003
			SOT363	BGA2011
			SOT363	BGA2012

Function	Product		Package	Type
Driver	Bipolar transistor	Wideband transistor	SOT343	BFG21W
			SOT343	BFG425W
			SOT343	BFG480W
	MMIC	Amplifier*	SOT363	BGA2031/1
			SOT363	BGA2771
			SOT363	BGA2776

Function	Product		Package	Type
Mixer	RF bipolar transistor	Wideband transistor	SOT343	BFG410W
			SOT343	BFG425W
			SOT343	BFG480W
	MMIC	Linear mixer	SOT363	BGA2022

Function	Product		Package	Type
IF	MMIC	Low noise amplifier	SOT343R	BGA2001
			SOT343R	BGA2003
			SOT363	BGA2771
	RF bipolar transistor	Wideband transistor	SOT363	BGA2776
			SOT363	PRF949
			SOT363	BF517W

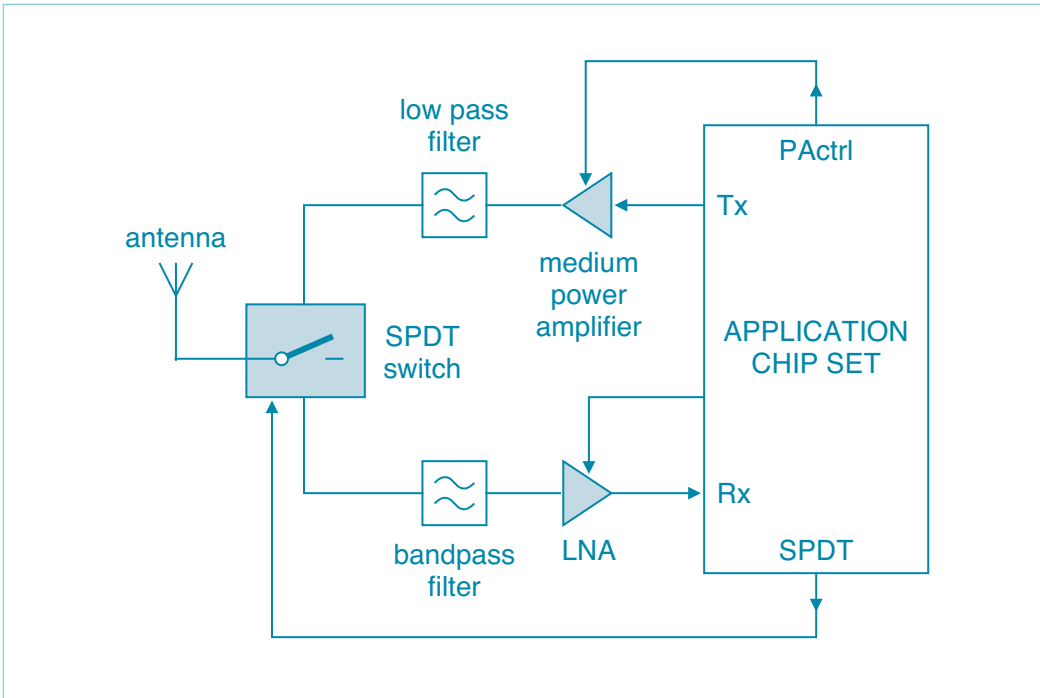
Function	Product		Package	Type
Power amplifier	Bipolar transistor	Wideband transistor	SOT343	BFG21W
			SOT343	BFG480W
			SOT363	BGA2031/1
	MMIC	Amplifier*	SOT363	BGA2771
			SOT363	BGA2776
			SOT363	BGA2776

Recommended application notes

1880MHz PA driver	BFG21W
1880MHz PA driver	BFG480W
2GHz LNA	BFG410W
2GHz LNA	BFG425W
800MHz PA driver	BFG21W
900MHz driver	BFG480W
900MHz LNA	BFG410W
900MHz LNA	BFG480W
CDMA cellular VCO	BFG425W, BFG410W
Demoboard 900MHz LNA	BGA2003
Demoboard for BGA2001	BGA2001
Demoboard for W-CDMA	BGA2003
High IP3 MMIC LNA at 1.8 - 2.4 GHz	BGA2012
High IP3 MMIC LNA at 900MHz	BGA2011
Power amplifier for 1.9GHz DECT and PHS	BFG425W, BFG21W
Rx mixer for 2450MHz	BGA2022
Ultra LNAs for 900&2000MHz with high IP3	BFG410W, BFG425W

1.2 A 2.4 GHz front-end for WLAN, Bluetooth™, DECT, ZigBee™, etc.

Application diagram



Recommended products

Function	Product	Package	Type
SPDT switch	RF diode	PIN diode	SOD523 BAP51-02
			SOD882T BAP51LX
			SOD882T BAP55LX

Function	Product	Package	Type
Medium power amplifier	MMIC	Gen. purpose med. power amplifier	SOT89 BGA6589

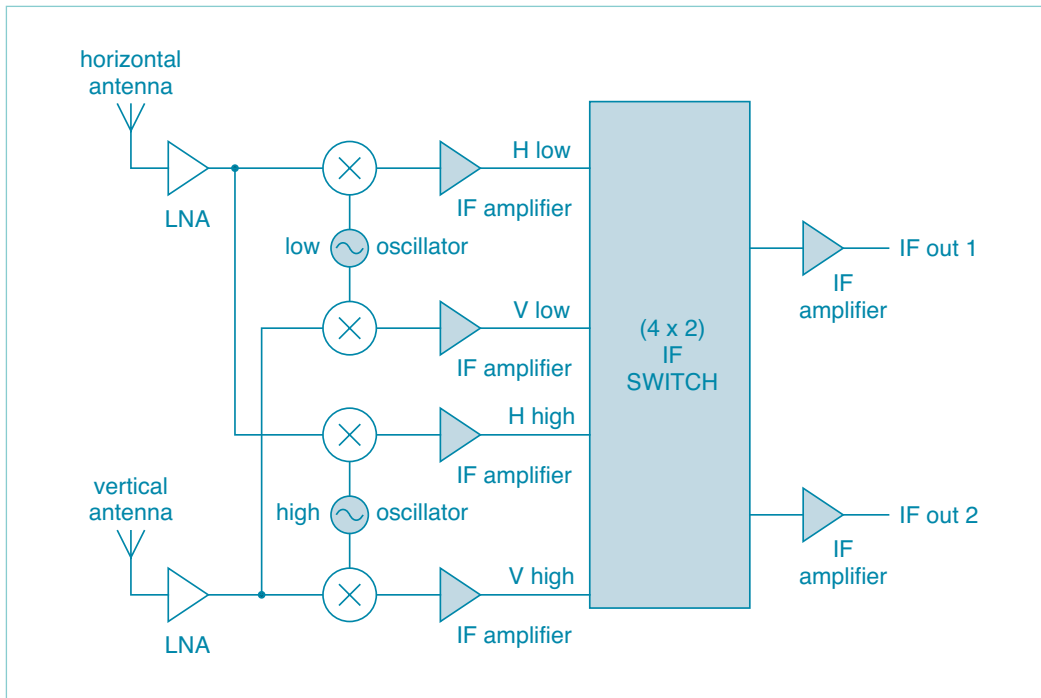
Function	Product	Package	Type
LNA	MMIC	Low noise wideband amplifier	SOT343R BGA2003
			SOT343R BGA2001

Recommended application notes

2.45 Ghz T/R, RF switch	BAP51-02
Low-impedance PIN diode	BAP50-05
Demoboard 900 MHz LNA	BGA2003
Demoboard for 900&1800 MHz	BGA2001
Demoboard for W-CDMA	BGA2003

1.3 Low Noise Block (LNB)

Application diagram



Recommended products

Function	Product	Package	Type	
Oscillator	RF bipolar transistor	Wideband transistor	SOT343	BFG424W
			SOT343F	BFG424F

Function	Product	Package	Type	
IF switch	RF diode	PIN diode	various	BAP64
			various	BAP51
			various	BAP1321
			various	BAP50
			various	BAP63

Function	Product	Package	Type	
1st stage IF amplifier	MMIC	General purpose amplifier	SOT363	BGA2711
			SOT363	BGA2712
			SOT363	BGA2748
			SOT363	BGA2715
			SOT363	BGA2717
			SOT363	BGA2716
	RF bipolar transistor	Wideband transistor	SOT343	BFG424W
			SOT343F	BFG424F

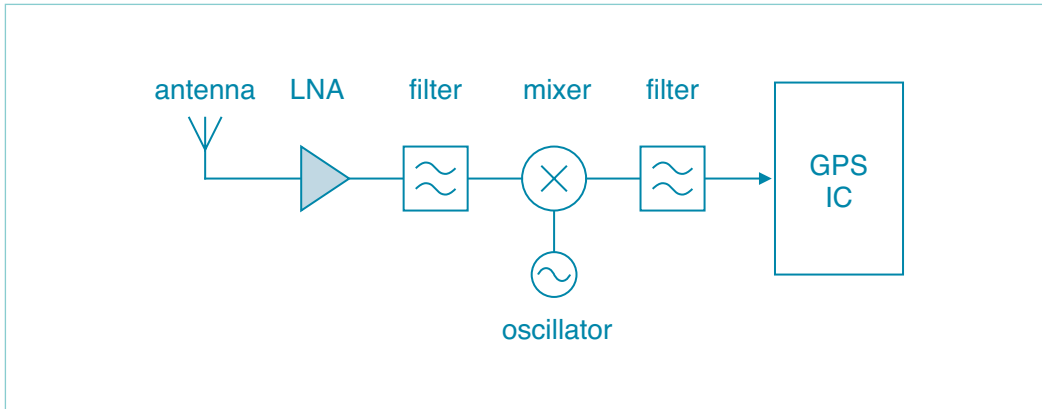
Function	Product	Package	Type	
Output stage IF amplifier	MMIC	General purpose amplifier	SOT363	BGA2709
			SOT363	BGA2776
			SOT363	BGM1014
			SOT363	BGM1012
			SOT363	BGA2716
			SOT363	BGA2716
	RF bipolar transistor	Wideband transistor	SOT343	BFG325

Recommended application notes

2.45 Ghz T/R, RF switch	BAP51-02
Low-impedance PIN diode	BAP50-05

1.4 Global Positioning System (GPS)

Application diagram



Recommended products

Function	Product		Package	Type
LNA	RF bipolar transistor	Wideband transistor	SOT343	BFG425W
			SOT343	BFG410W
	MMIC	Low noise wideband amplifier	SOT343R	BGA2001
			SOT343R	BGA2003
		General purpose wideband amplifier	SOT363	BGM1013
			SOT363	BGM1011
			SOT363	BGA2715
	SOT363	BGA2748		

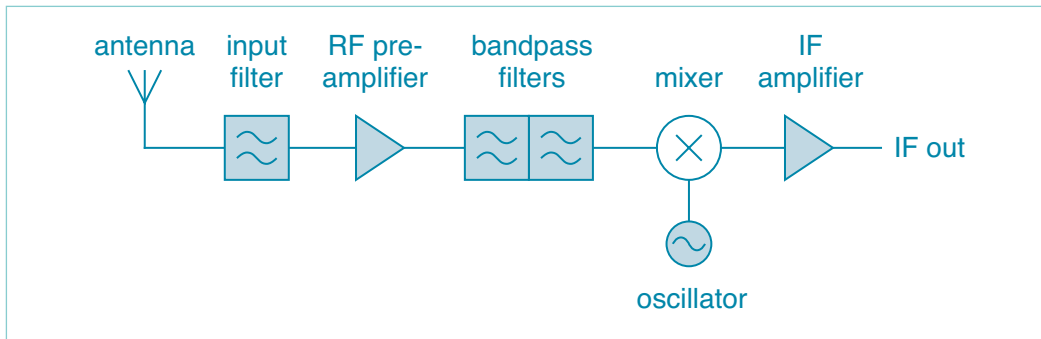
Recommended application notes

Introduction into the GPS front-end*	BGAx, BGMx, BGUx
900 MHz LNA	BFG410W
2 GHz LNA	BFG410W
2 GHz high IP3 LNA	BGA2003

* No web link available, published in Appendix 6th edition, see RF Manual web page.

1.5 TV / VCR / DVD tuning

Application diagram



Recommended products

Function	Product	Package	Type	
Input filter	Varicap diode	VHF low	SOD323	BB152
			SOD523	BB182
		VHF high	SOD323	BB153
			SOD523	BB178
		UHF	SOD523	BB187
			SOD323	BB149A
SOD523	BB179			

Function	Product	Package	Type	
Bandpass filter	Varicap diode	VHF low	SOD323	BB152
			SOD523	BB182
		VHF high	SOD323	BB153
			SOD523	BB178
		UHF	SOD523	BB187
			SOD323	BB149A
SOD523	BB179			

Function	Product	Package	Type	
RF pre-amplifier	MOSFET	5 V	SOT143	BF904
			SOT143	BF909
			SOT143	BF1201
			SOT143	BF1202
			SOT143	BF1105
			SOT143	BF1211
		9 V	SOT143	BF1212
			SOT143	BF1100
		2-in-1.5 V	SOT143	BF1109
			SOT363	BF1102R
			SOT363	BF1203
			SOT363	BF1204
			SOT363	BF1205
			SOT363	BF1206
			SOT363	BF1207
SOT363	BF1208			

Function	Product	Package	Type	
Oscillator	Varicap diode	VHF low	SOD323	BB152
			SOD523	BB182
		VHF high	SOD323	BB153
			SOD523	BB178
		UHF	SOD523	BB187
			SOD323	BB149A
SOD523	BB179			

Function	Product	Package	Type	
IF amplifier	MMIC	Wideband amplifier	SOT363	BGA2717

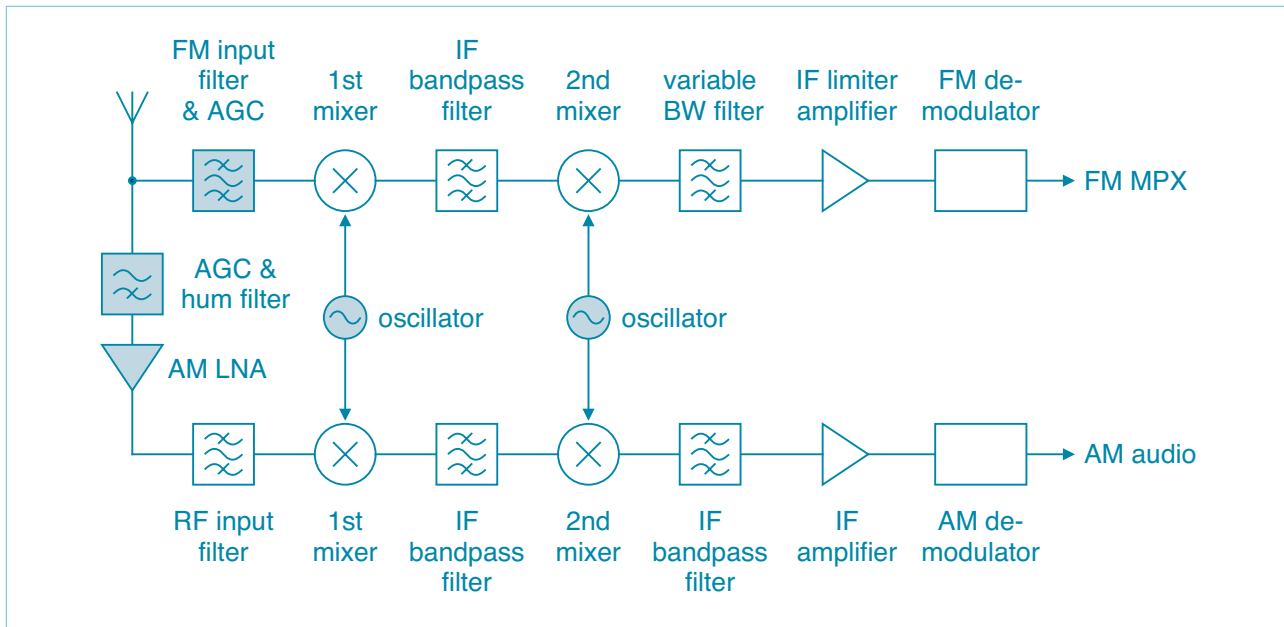
Recommended application notes

Application note for MOSFETs: BF9x, BF110x,	BF9x, BF110x, BF120x
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* No web link available, published in Appendix 3rd edition, see RF Manual web page.

1.6 Car radio receiver (CREST ICs:TEF6860HL,TEF6862HL)

Application diagram



Recommended products

Function	Product	Package	Type
AM LNA	RF transistor	JFET	SOT23 BF862

Function	Product	Package	Type
FM input filter & AGC	RF diode	Varicap diode	SOT23 BB201*
		PIN diode	SOT23 BB207
			SOD523 BAP70-02
			SOD323 BAP70-03

* = OIRT

Note 1:

All these recommended discrete products are applicable for NICEPACS, CCC and DDICE: NICE:TEA6840H,TEA6845H,TEA6846H, NICEPACS:TEA6848H,TEA6849H; CCC:TEF6901H,TEF6903H; DDICE:TEA6721HL.

All these recommended discrete products are applicable excluding AM LNA in: DICE2:TEF6730HWCE ICs:TEF6848H,TEF6849H).

Recommended application notes

Low-voltage FM stereo radio (TEA5767/68)*	BB202
A NICE radio (TEA6848H) - Draft**	JFETS,Varicaps and PIN diodes
Integrated Car Radio CCC (TEF69xxx) - Draft**	JFETS,Varicaps and PIN diodes

* No web link available, published in Appendix 3rd edition, see RF Manual web page.

** No web link available, ask your Philips sales representative.

Function	Product	Package	Type
AGC & hum filter	RF diode	PIN diode	SOT363 BAP70AM

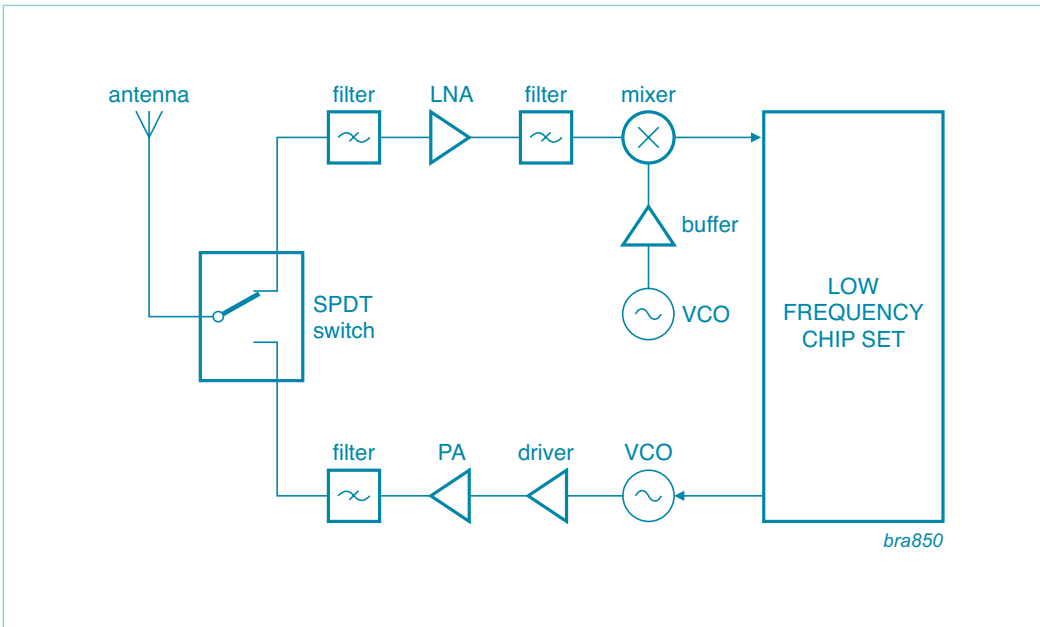
Function	Product	Package	Type
Oscillator	RF diode	Varicap diode	SOD323 BB156
		SOD523 BB208	

Note 2:

Phone and portable radio (IC:TEA5757) use varicap BB200 as FM oscillator. Phone and portable radio (IC:TEA5767/68) use varicap BB202 as FM oscillator.

1.7 RF generic front-end for ISM band applications, single antenna for e.g. walkie-talkie & remote metering

Application diagram



Recommended products

Function	Product		Package	Type
SPDT Switch	RF diode	Bandswitch diode	SOD523	BA277
			SOD323	BA591
		PIN diode	SOD882T	BAP51LX
			SOD523	BAP1321-02

Function	Product		Package	Type
LNA	RF bipolar transistor	Wideband transistor	SOT23	PBR951
			SOT323	PRF957
			SOT323	PRF947
	MMIC	Low noise wideband ampl.	SOT343R	BGA2001
			SOT343R	BGA2003

Function	Product		Package	Type
Driver	RF bipolar transistor	Wideband transistor	SOT323	PRF957
			SOT23	PBR951
			SOT363	BGA2031/1
	MMIC	Amplifier	SOT363	BGA2031/1
			SOT363	BGA2771
	Gen. purpose wideband ampl.	SOT363	BGA2776	

Function	Product		Package	Type
Mixer	RF bipolar transistor	Wideband transistor	SOT343	BFG410W
			SOT343	BFG425W
			SOT343	BFG480W
	MMIC	Linear mixer	SOT363	BGA2022

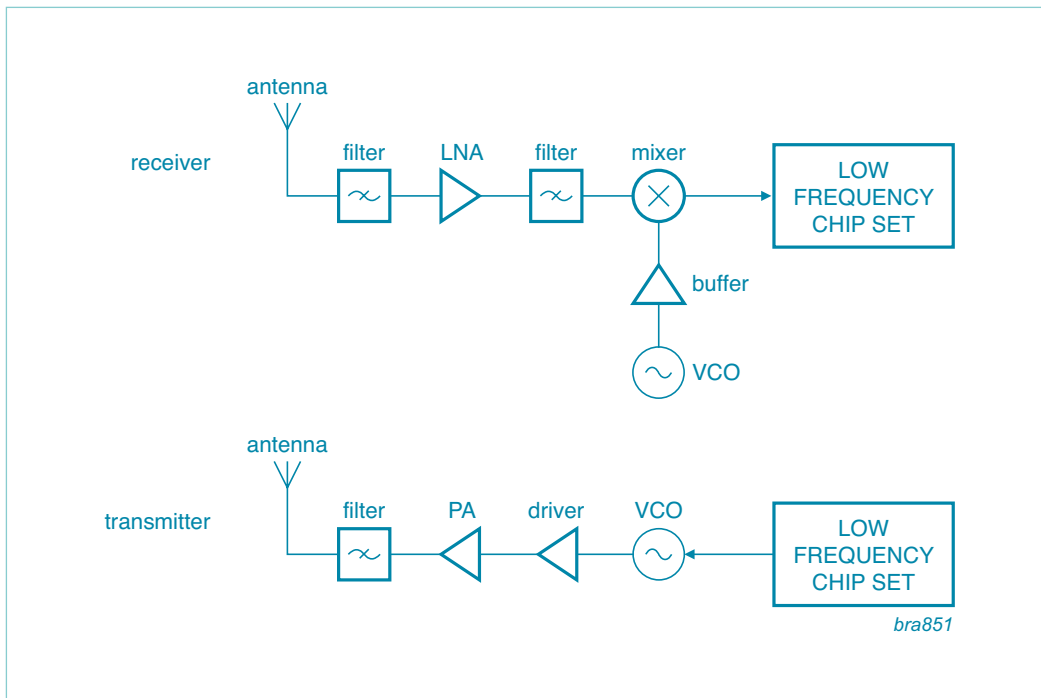
Function	Product		Package	Type
Buffer	RF bipolar transistor	Wideband transistor	SOT23	PBR951
			SOT323	PRF957
			SOT323	PRF947
			SOT416	PRF949

Function	Product		Package	Type
Power amplifier	RF bipolar transistor	Wideband transistor	SOT323	PRF957
			SOT23	PBR951
			SOT363	BGA2031/1
	MMIC	Amplifier	SOT363	BGA2771
			SOT363	BGA2776
	Gen. purpose wideband ampl.	SOT363	BGA2776	

Function	Product		Package	Type
VCO	Varicap diodes	VCO varicap diodes	SOD523	BB198
			SOD323	BB156

1.8 RF generic front-end for ISM band applications, dedicated antenna for reception and transmission for e.g. tire pressure monitoring systems & keyless entry

Application diagram



Recommended products

Function	Product		Package	Type
LNA	RF bipolar transistor	Wideband transistor	SOT23	PBR951
			SOT323	PRF957
			SOT323	PRF947
	MMIC	Low noise wideband ampl.	SOT343R	BGA2001
			SOT343R	BGA2003

Function	Product		Package	Type
Driver	RF bipolar transistor	Wideband transistor	SOT323	PRF957
			SOT23	PBR951
	MMIC	Amplifier	SOT363	BGA2031/1
			SOT363	BGA2771
			SOT363	BGA2776

Function	Product		Package	Type
VCO	Varicap diodes	VCO varicap diodes	SOD323	BB148
			SOD323	BB149A
			SOD523	BB198
			SOD323	BB156

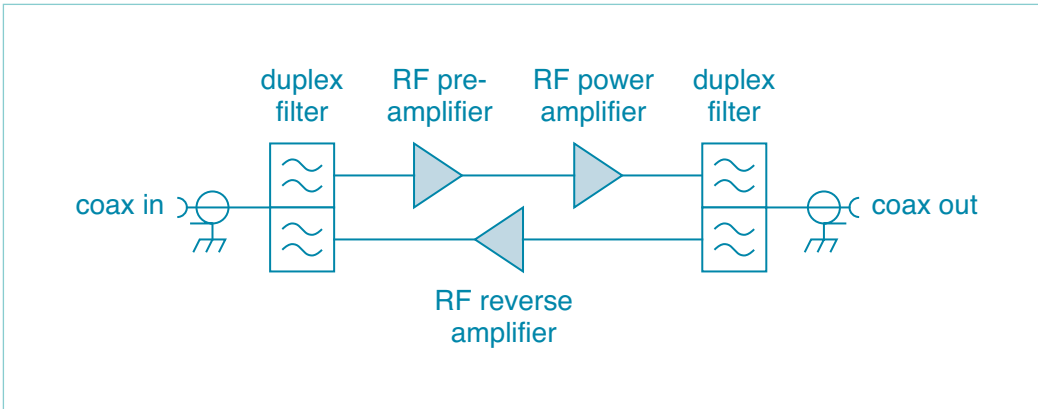
Function	Product		Package	Type
Mixer	RF bipolar transistor	Wideband transistor	SOT343	BFG410W
			SOT343	BFG425W
			SOT343	BFG480W
	MMIC	Linear mixer	SOT363	BGA2022

Function	Product		Package	Type
Buffer	RF bipolar transistor	Wideband transistor	SOT23	PBR951
			SOT323	PRF957
			SOT323	PRF947
			SOT416	PRF949

Function	Product		Package	Type
Power amplifier	RF bipolar transistor	Wideband transistor	SOT323	PRF957
			SOT23	PBR951
	MMIC	Amplifier	SOT363	BGA2031/1
			SOT363	BGA2771
			SOT363	BGA2776

1.9 CATV electrical (line extenders)

Application diagram



Recommended products

Function	Product	Frequency	Gain (dB)	Type
RF pre-amplifier	Push-Pulls	550MHz	33.5 - 35.5	BGY588N
			33.5 - 35.5	BGY588C
			26.2 - 27.8	BGY587B
		600MHz	21 - 22	BGY687
			33.5 - 35.2	BGE788C
			33.5 - 34.5	BGE788
		750MHz	18 - 19	BGY785A
			21 - 22	BGY787
			18 - 19	BGY885A
			21 - 22	BGY887
		870MHz	33.5 - 34.5	BGY888
			25.2 - 25.8	CGY887A
18-19	BGY1085A			

Function	Product	Frequency	Gain (dB)	Type
RF reverse amplifier	Reverse hybrids	5-75 MHz	29.2 - 30.8	BGY68
		5-120 MHz	24.5 - 25.5	BGY66B
		5-200 MHz	23.5 - 24.5	BGY67A

All available in SOT115 package.

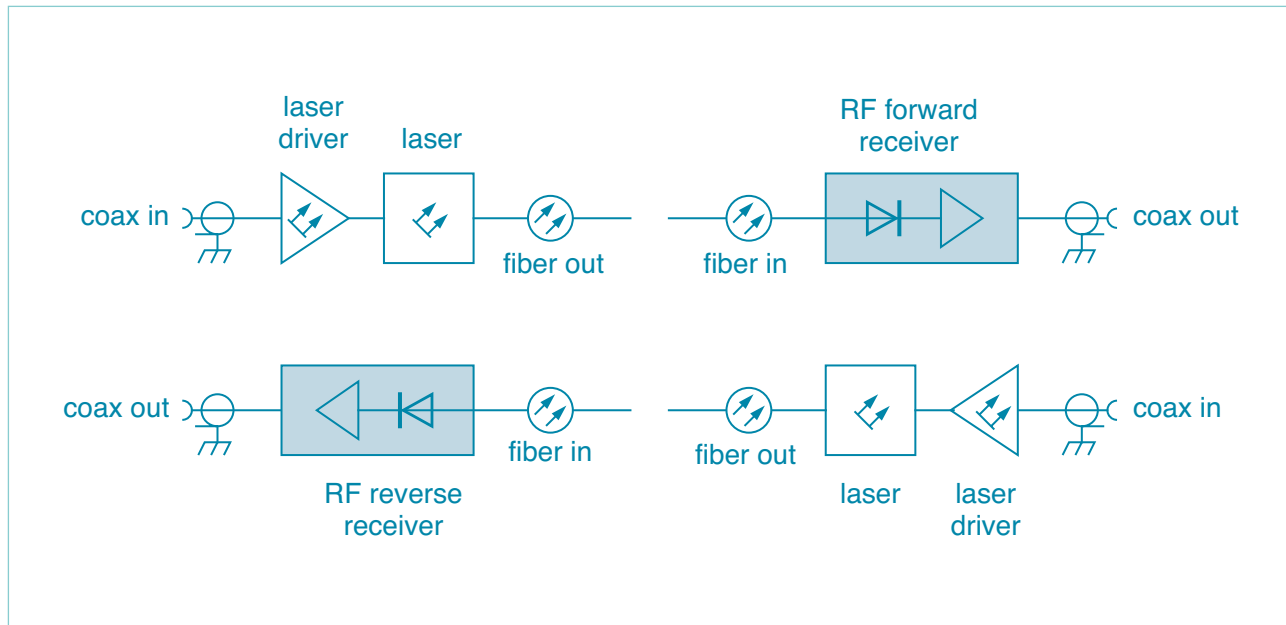
Function	Product	Frequency	Gain (dB)	Type
RF power amplifier	Power doublers	550MHz	18-19	BGD502
			19.5 - 20.5	BGD704
		750MHz	18.2 - 18.8	BGD712
			18.2 - 18.8	BGD712C
			20 - 20.6	BGD714
		870MHz	18 - 19	BGD802
			18.2 - 18.8	BGD812
			19.7 - 20.3	BGD814
			18.2 - 18.8	BGD902
			19.7 - 20.3	BGD904
			21.2 - 21.8	BGD906
			19.75 - 20.25	CGD914
			19.25 - 19.75	CGD923
			20.5 - 23	CGD942C
			23.5 - 25.5	CGD944C
		1000MHz	20.5 - 22.5	CGD1042
			23.5 - 25.5	CGD1044

Recommended application notes

BGS67A high-dynamic-range hybrid ampl. reverse ampl. 2-way CATV systems	BGS67A
A hybrid wideband amplifier module for digital CATV networks with BGD902	BGD902

1.10 CATV optical (optical receiver)

Application diagram



Recommended products

Function	Product	Frequency	Package	Type
RF reverse receiver	Optical reverse receiver	300 MHz	SOT115	BGO387

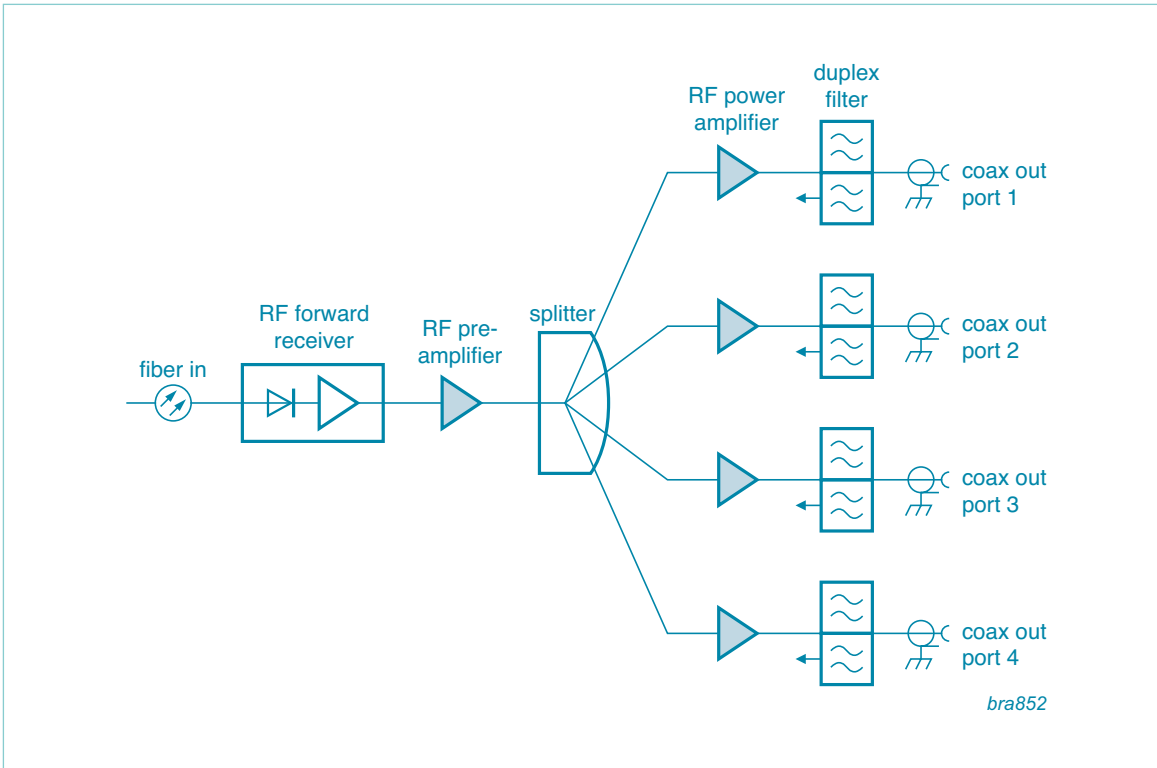
Function	Product	Frequency	Package	Type
RF pre-amplifier	Forward path receiver	750MHz	SOT115	BGO747
		870MHz	SOT115	BGO807
			SOT115	BGO807C
			SOT115	BGO827

Recommended application notes

Using a Philips optical receiver in CATV applications	All optical receivers
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1.11 CATV optical (optical node with multiple out-ports)

Application diagram



Recommended products

Function	Product	Frequency	Package	Type
RF forward receiver	Forward path receiver	870 MHz	SOT115	BGO807C

Function	Product	Frequency	Gain (dB)	Type
RF pre-amplifier	Push-Pulls	870MHz	18-19	BGY885A
			21-22	BGY887
			21.2-21.8	CGY887
	Power doubler	870MHz	18.2-18.8	BGD812

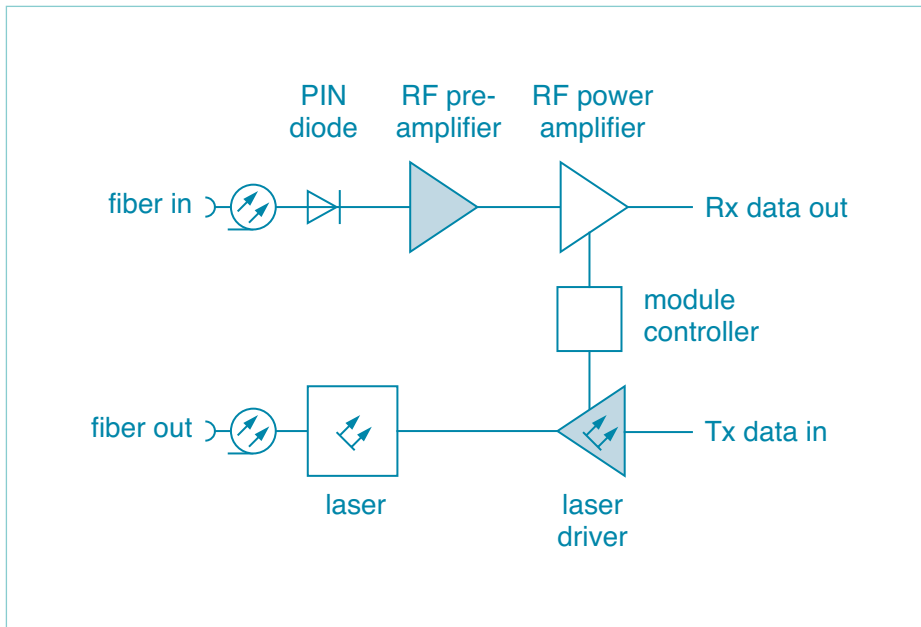
Function	Product	Frequency	Gain (dB)	Type
RF power amplifier	Power doublers	870MHz	20.5-23	CGD942C
			23-25	CGD944C

Recommended application notes

Using a Philips optical receiver in CATV applications	All optical receivers
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1.12 Optical networking (SFF/SFP modules)

Application diagram



Recommended products

Function	Product	Data rate	Package	Type
RF pre-amplifier	Transimpedance amplifier	155	die only	TZA3036
		622	die only	TZA3026
		1200	die only	TZA3046
		2488	die only	TZA3013

Function	Product	Data rate	Package	Type
Laser driver	Laser driver	1250	SOT560-01	TZA3047B
			SOT560-01	TZA3050
		3200	SOT560-01	TZA3010B
			SOT560-01	TZA3011B

Recommended application notes

OM5811 demo boards supporting TZA3010/11/47 laser drivers for 30-3200 Mb/s	TZA3010/11/47
TZA30x6 – Receiver Optical Sub-Assembly*	TZA30x6

* No web link available for this application note.
Please ask your Philips sales representative for assistance.

2. Product portfolio

Philips product selector:

<http://www.semiconductors.philips.com/catalog/219/282/index.html>

Philips RF discretes catalogue:

<http://www.semiconductors.philips.com/catalog/219/282/50805/index.html#50805>

2.1 New products

Type	Application / Description	Product status 1 June 2006	Plan release	Info
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NEW: RF diodes

BB202LX	Varicap for mobile radio in cellulars, MCD in 1006 leadless package	RFS	Released	Chapter 2.2.1 Varicap diodes
BB178LX	Varicap for TV & Satellite in 1006 leadless package	RFS	Released	
BB179BLX	Varicap for TV & Satellite in 1006 leadless package	CQS	Q3 2006	
BB179LX	Varicap for TV & Satellite in 1006 leadless package	RFS	Released	
BB181LX	Varicap for TV & Satellite in 1006 leadless package	CQS	Q3 2006	
BB182LX	Varicap for TV & Satellite in 1006 leadless package	CQS	Q3 2006	
BB184LX	Low voltage varicap for TV & Satellite UHF in 1006 leadless package	CQS	Q3 2006	
BB185LX	Low voltage varicap for TV & Satellite VHF in 1006 leadless package	DEV	Q4 2006	
BB187LX	Varicap for TV & Satellite in 1006 leadless package	CQS	Q3 2006	
BB143LX	Varicap for VCO, VCXO, TCXO in 1006 leadless package	CQS	Q3 2006	
BAP142LX	Cellular phone, Bluetooth, Cordless phone -RF switch & FE module in 1006 leadless	RFS	Released	Chapter 2.2.2 PIN diodes
BAP51LX	Cellular phone, Bluetooth, Cordless phone -RF switch & FE module in 1006 leadless	RFS	Released	
BAP55LX	Cellular phone, Bluetooth, Cordless phone -RF switch & FE module in 1006 leadless	RFS	Released	
BAP70AM	Car Radio AM	RFS	Released	

NEW: RF MOS transistors

BF1206F	Twin MOSFET with two LNAs for TV/VCR/DVD/STB/SAT	RFS	Released	Chapter 2.5.2 MOSFETs
BF1210	Twin MOSFET with two LNAs for TV/VCR/DVD/STB/SAT	DEV	Q4 2006	Not yet in catalog
BF1208D	Twin MOSFET with two LNAs for TV/VCR/DVD/STB/SAT with internal switching	DEV	Q4 2006	Not yet in catalog

NEW: RF IC, Biasing ASIC and pHEMT GaAs transistors

BGA2714	Silicon Gain Block MMIC for Satellite LNB	DEV	Q4 2006	Not yet in catalog
UAF3000	Biasing ASICs for Satellite LNB	CQS	Q3 2006	
CFH703A	Low Noise Amplifier pHEMT transistor for Satellite LNB	DEV	Q4 2006	Chapter 2.5.3 pHEMT GaAs Transistors
CFH705F	Low Noise Amplifier pHEMT transistor for Satellite LNB	DEV	Q4 2006	

NEW: RF modules

OM7650	550 MHz, 34.5 dB gain Push-Pull, SOT115	RFS	Released	Chapter 2.6.2 CATV Push-Pulls
OM7670	750 MHz, 34 dB gain Push-Pull, SOT115	RFS	Released	
BGD712C	750 MHz, 18.5 dB gain Power Doubler, SOT115	RFS	Released	Chapter 2.6.3 CATV Power Doublers
CGD942C	870 MHz, 22 dB gain Power Doubler, GaAs HFET SOT115	RFS	Q2 2006	
CGD944C	870 MHz, 25 dB gain Power Doubler, GaAs HFET SOT115	RFS	Q2 2006	
CGD1042	1 GHz, 22 dB gain Power Doubler, GaAs HFET, SOT115	CQS	Q2 2006	
CGD1044	1 GHz, 25 dB gain Power Doubler, GaAs HFET, SOT115	CQS	Q2 2006	
BGO807C	870 MHz Optical Receiver	RFS	Released	Chapter 2.6.4 CATV Optical Receivers

NEW: Fibre-optic transceiver ICs

TZA3046	Transimpedance Amplifier Datarate 0-1250	RFS	Released	Chapter 2.7.2 Transimpedance amplifiers
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2.2 RF diodes

Philips varicaps:

<http://www.semiconductors.philips.com/varicaps>

Philips RF PIN diodes:

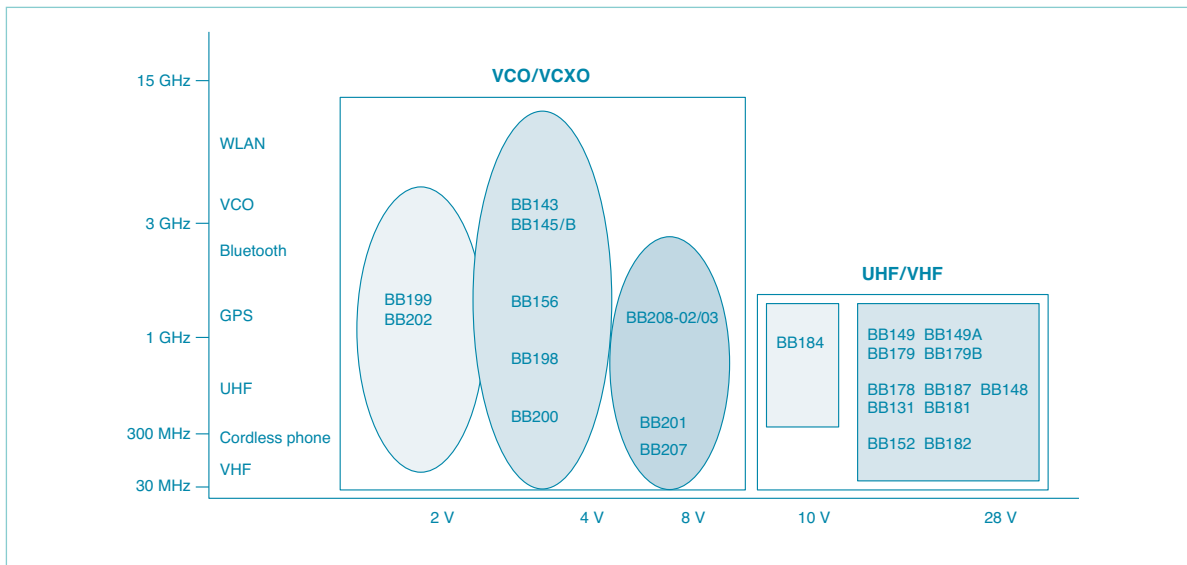
<http://www.semiconductors.philips.com/pindiodes>

Philips RF Schottky diodes:

http://www.semiconductors.philips.com/products/discretes/diodes/low_cd_schottky/index.html

2.2.1 Varicap diodes

Varicap diodes line-up per frequency



VCO varicap diodes

Type	Package	Type of connection	Cd @ Vr (pF)			Cd @ Vr (pF)			TUNING RANGE Cd over voltage range (V)			rs (Ω)
			min	max	(V)	min	max	(V)	ratio (typ.)	V1 to V2	(typ.)	
BB143	SOD523	S	4.75	5.75	1	2.05	2.55	4	2.35	1	4	0.5
BB143LX***	SOD882T	S	5.04	5.56	1	2.05	2.40	4	2.35	1	4	0.5
BB145	SOD523	S	6.4	7.4	1	2.75	3.25	4	2.0 min	1	4	0.6 max
BB145B	SOD523	S	6.4	7.2	1	2.55	2.95	4	2.2 min	1	4	0.6 max
BB202**	SOD523	S	28.2	33.5	0.2	7.2	11.2	2.3	2.5 min	0.2	2.3	0.35
BB202LX	SOD882T	S	28.2	33.5	0.2	7.2	11.2	2.3	2.5 min	0.2	2.3	0.35
BB156	SOD323	S	14.4	17.6	1	4.2	5.4	7.5	3.3	1	7.5	0.4
BB198	SOD523	S	25	28.5	1	4.8	6.8	4	-	-	-	0.8 max
BB199	SOD523	S	36.5	42.5	0.5	11.8	13.8	2	2.8 min	0.5	2	0.25
BB208-02*	SOD523	S	19.9	23.2	1	4.5	5.4	7.5	3.7 – 5.2	1	7.5	0.35
BB208-03*	SOD323	S	19.9	23.2	1	4.5	5.4	7.5	3.7 – 5.2	1	7.5	0.35

■ = New

* = Including special design for FM car radio (CREST-IC:TEF6860).

** = Including special design for mobile phone tuner ICs.

*** = Not yet released, samples available.

Type of connection:

S: Single

CC: Common Cathode

Radio varicap diodes: FM radio tuning

Type	Package	Type of connection	Cd @ Vr (pF)			Cd @ Vr (pF)			TUNING RANGE Cd over voltage range (V)			rs (Ω) (typ.)
			min	max	(V)	min	max	(V)	ratio (typ.)	V1 to V2	(typ.)	
BB804	SOT23	CC	42	46.5	2	26 typ.		8	1.65	2	8	0.2
BB200	SOT23	CC	65.8	74.2	1	12	14.8	4.5	5	1	5	0.43
BB201	SOT23	CC	89	102	1	25.5	29.7	7.5	3.1	1	7.5	0.25
BB202**	SOD523	S	28.2	33.5	0.2	7.2	11.2	2.3	2.5	0.2	2.3	0.35
BB202LX	SOD882T	S	28.2	33.5	0.2	7.2	11.2	2.3	2.5	0.2	2.3	0.35
BB156	SOD323	S	14.4	17.6	1	4.2	5.4	7.5	2.7	1	7.5	0.4
BB207*	SOT23	CC	76	86	1	25.5	29.7	7.5	2.6	1	7.5	0.2

■ = New

* = Including special design for FM car radio (CREST-IC:TEF6860).

** = Including special design for mobile phone tuner ICs.

Type of connection:

S: Single

CC: Common Cathode

TV & satellite varicap diodes - UHF tuning

Type	Package	Type of connection	Cd @ Vr (pF)			TUNING RANGE Cd over voltage range (V)			rs (Ω) (typ.)	MATCHED SETS %	TYPICAL APPLICATIONS			
			min	max	(V)	ratio (typ.)	V1 to V2	TV			VCO	SAT.	STB	

Matched

BB149	SOD323	S	1.90	2.25	28	9.0	1	28	0.75	1.0 +	X	-	-	X
BB149A	SOD323	S	1.951	2.225	28	9.0	1	28	0.75	2.0 +	X	-	-	X
BB179	SOD523	S	1.951	2.225	28	9.0	1	28	0.75	2.0 +	X	X	-	X
BB179LX	SOD882T	S	1.951	2.225	28	9.0	1	28	0.65 typ.	2.0 +	X	X	-	X
BB179B	SOD523	S	1.90	2.25	28	9.0	1	28	0.75	2.0 +	X	-	-	X
BB179BLX***	SOD882T	S	1.90	2.25	28	9.0	1	28	0.65 typ.	2.0 +	X	-	-	X
BB184	SOD523	S	1.87	2.13	10	7	1	10	0.65 typ.	2.0 +	X	X	-	-
BB184LX***	SOD882T	S	1.87	2.13	10	7	1	10	0.65 typ.	2.0	X	X	-	-

Unmatched

BB135	SOD323	S	1.70	2.10	28	9.9 - 12	0.5	28	0.75	-	X	X	-	-
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■ = New

*** = Not yet released, samples available.

Type of connection:

S: Single

CC: Common Cathode

TV & satellite varicap diodes - VHF tuning

Type	Package	Type of connection	Cd @ Vr (pF)			TUNING RANGE Cd over voltage range (V)			rs (Ω) (typ.)	MATCHED SETS %	TYPICAL APPLICATIONS			
			min	max	(V)	ratio (typ.)	V1 to V2	TV			VCO	SAT.	STB	

Matched

BB148	SOD323	S	2.4	2.75	28	15	1	28	0.9	1.0 +	X	-	-	X
BB152	SOD323	S	2.48	2.89	28	22	1	28	1.2	2.0 +	X	-	-	X
BB153	SOD323	S	2.36	2.75	28	15	1	28	0.8	2.0 +	X	-	-	X
BB178	SOD523	S	2.36	2.75	28	15	1	28	0.8	2.0 +	X	-	-	X
BB178LX	SOD882T	S	2.361	2.754	28	15	1	28	0.7 typ.	2.0 +	X	-	-	X
BB182	SOD523	S	2.48	2.89	28	22	1	28	1.2	2.0 +	X	-	-	X
BB182LX***	SOD882T	S	2.48	2.89	28	22	1	28	1.0 typ.	2.0 +	X	-	-	X
BB187	SOD523	S	2.57	2.92	25	11 min.	2	25	0.75	2.0 +	X	-	-	X
BB187LX***	SOD882T	S	2.57	2.92	25	11 min	2	25	0.75 typ.	2.0 +	X	-	-	X

Unmatched

BB131	SOD323	S	0.7	1.055	28	14	0.5	28	3	-	X	-	X	X
BB181	SOD523	S	0.7	1.055	28	14	0.5	28	3	-	X	-	X	X
BB181LX***	SOD882T	S	0.7	1.055	28	14	0.5	28	2.0 typ.	-	X	-	X	X
BBY40	SOT23		4.3	6.00	25	5.5	3	25	0.7	-	X	-	-	X

■ = New

*** = Not yet released, samples available.

Type of connection:

S: Single

CC: Common Cathode

2.2.2 PIN diodes

PIN diodes

Type	Package	Conf	Limits		RD (Ω) typ @			Cd (pF) type @		
			Vr(V)	If(mA)	0.5mA	1 mA	10 mA	0V	1V	20V
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
BAP51LX	SOD882T	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
BAP51-04W	SOT323	SS	50	50	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	2	0.4	0.3	0.2 @ 5V
BAP55LX	SOD882T	S	50	100	3.4	2.3	1	0.27	0.23	0.18 @ 5V
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	CA	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
BAP70AM	SOT363	SS	50	100	77	40	5.4	0.57	0.4	0.2
BAP70-02	SOD523	S	50	100	77	40	5.4	0.57	0.4	0.2
BAP70-03	SOD323	S	50	100	77	40	5.4	0.57	0.4	0.2
BAP70-04W	SOT323	SS	50	100	77	40	5.4	0.57	0.4	0.2
BAP70-05	SOT23	CC	50	100	77	40	5.4	0.57	0.4	0.2
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
BAP142LX	SOT882T	S	50	100	3.3	2.4	1	0.26	0.23	0.15

- = New
- S = Single
- SS = Series
- CC = Common Cathode
- CA = Common Anode

2.2.3 Band-switch diodes

Type	Package	MAXIMUM RATINGS		CHARACTERISTICS ; maximals					
		VR(V)	IF(mA)	Rd @ IF and f			Cd @ VR and f		
				-	(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

2.2.4 Schottky diodes

Features

- (Very) low diode capacitance
- (Very) low forward voltage
- Single and triple-isolated diode
- (Ultra / very) small package

Applications

- Digital applications:
 - ultra high-speed switching
 - clamping circuits
- RF applications:
 - diode ring mixer
 - RF detector
 - RF voltage doubler

Low-capacitance Schottky diodes

Type	Package	VR max. (V)	IF max. (mA)	VF max. (mV)	CD max. (pF)
BAT17	SOT23	4	30	450 @ IF = 1 mA	1 @ VR = 0V
PMBD353	SOT23	4	30	450 @ IF = 1 mA	1 @ VR = 0V
PMBD354	SOT23	4	30	450 @ IF = 1 mA	1 @ VR = 0V
1PS76SB17	SOD323	4	30	450 @ IF = 1 mA	1 @ VR = 0V
1PS66SB17	SOT666	4	30	450 @ IF = 1 mA	1 @ VR = 0V
1PS79SB17	SOD523	4	30	450 @ IF = 1 mA	1 @ VR = 0V
1PS66SB63	SOT666	5	20	250 @ IF = 1 mA	0.5 @ VR = 0V
1PS79SB63	SOD523	5	20	250 @ IF = 1 mA	0.5 @ VR = 0V
1PS10SB63	SOD882	5	20	250 @ IF = 1 mA	0.5 @ VR = 0V
1PS88SB82	SOT363	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS70SB82	SOT323	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS70SB84	SOT323	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS70SB85	SOT323	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS70SB86	SOT323	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS66SB82	SOT666	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS10SB82	SOD882	15	30	340 @ IF = 1 mA	1 @ VR = 0V
1PS76SB62	SOD323	40	20	800 @ IF = 2 mA	0.6 @ VR = 0V
1PS66SB62	SOT666	40	20	800 @ IF = 2 mA	0.6 @ VR = 0V
1PS79SB62	SOD523	40	20	800 @ IF = 2 mA	0.6 @ VR = 0V
1PS10SB62	SOD882	40	20	800 @ IF = 2 mA	0.6 @ VR = 0V

2.3 RF Bipolar transistors

2.3.1 Wideband transistors

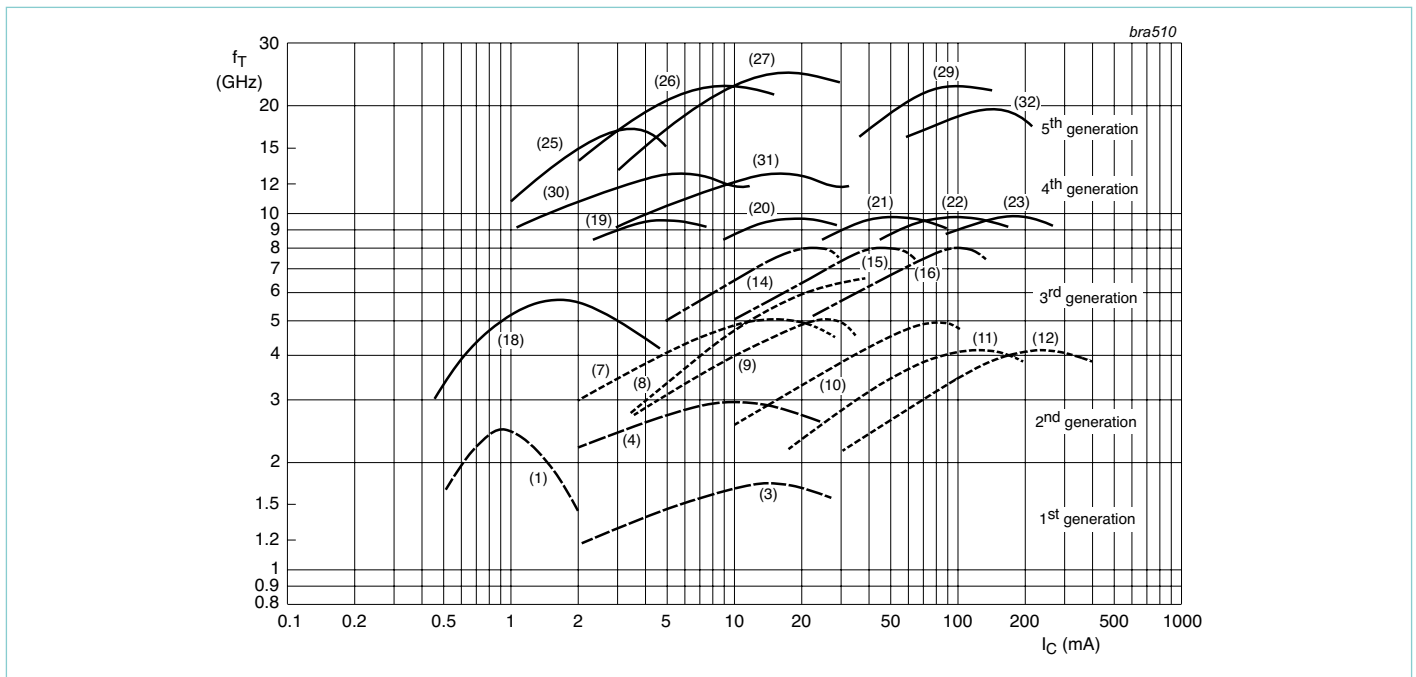
RF wideband transistors:

<http://www.semiconductors.philips.com/rftransistors>

Wideband transistors

The f_T - I_C curve represents Transition Frequency (f_T) characteristics as a function of collector current (I_C) for the six generations of RF wideband transistors. A group of transistors having the same collector current (I_C) & similar transition frequencies (f_T) represents a curve. The curve number matches products in the table, detailing their RF characteristics.

Wideband transistors line-up per frequency



Wideband transistors (RF small signal)

Type	Curve	Package	f_T	V_{ce0}	I_C	P_{tot}	Polarity	Gum	F	@	Gum	F	@	V_o	PI	ITO	@ I_C & V_{ce}	
			(GHz)	(V)	(mA)	(mW)		(dB)	(dB)	(MHz)	(dB)	(dB)	(MHz)	(mV)	(dBm)	(dBm)	(mA)	(V)
BFG10(X)	23	SOT143	-	8	250	250	NPN	-	-	-	7	-	1900	-	-	-	-	-
BFG10W/X	23	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	-	-	-	-	-	-	-	-
BFS17	3	SOT23	1	15	25	300	NPN	-	4.5	500	-	-	-	-	-	-	-	-
BFS17W	3	SOT323	1.6	15	50	300	NPN	-	4.5	500	-	-	-	-	-	-	-	-
BFT25	1	SOT23	2.3	5	6.5	30	NPN	18	3.8	500	12	-	800	-	-	-	-	-
BFS17A	4	SOT23	2.8	15	25	300	NPN	13.5	2.5	800	-	-	-	150	-	-	14	10
BFG35	11	SOT223	4	18	150	1000	NPN	15	-	500	11	-	800	750	-	-	100	10
BFQ18A	11	SOT894	18	150	1000	NPN	-	-	-	-	-	-	-	-	-	-	-	-

■ = New

Wideband transistors (RF small signal)

Type	Curve	Package	F_T	V_{ce0}	I_c	P_{tot}	Polarity	G_{um}	F	$@$	G_{um}	F	$@$	V_o	PI	ITO	$@ I_c \& V_{ce}$	
			(GHz)	(V)	(mA)	(mW)		(dB)	(dB)	(MHz)	(dB)	(dB)	(MHz)	(mV)	(dBm)	(dBm)	(mA)	(V)
BFG25A/X	18	SOT143	5	5	6.5	32	NPN	18	1.8	1000	-	-	-	-	-	-	-	-
BFG25AW/X	18	SOT343	5	5	6.5	500	NPN	16	2	1000	8	-	2000	-	-	-	-	-
BFG31	10	SOT223	5	15	100	1000	PNP	16	-	500	12	-	800	550	-	-	70	10
BFG590(/X)	22	SOT143	5	15	200	400	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFG92A(/X)	7	SOT143	5	15	25	400	NPN	16	2	1000	11	3	2000	-	-	-	-	-
BFQ149	10	SOT89	5	15	100	1000	PNP	12	3.75	500	-	-	-	-	-	-	-	-
BFR106	10	SOT23	5	15	100	500	NPN	11.5	3.5	800	-	-	-	350	-	-	50	9
BFR92A	7	SOT23	5	15	25	300	NPN	14	2.1	1000	8	3	2000	150	-	-	14	10
BFR92AW	7	SOT323	5	15	25	300	NPN	14	2	1000	-	3	2000	-	-	-	-	-
BFR93AW	8	SOT323	5	12	35	300	NPN	13	1.5	1000	8	2.1	2000	-	-	-	-	-
BFS25A	18	SOT323	5	5	6.5	32	NPN	13	1.8	1000	-	-	-	-	-	-	-	-
BFT25A	18	SOT23	5	5	6.5	32	NPN	15	1.8	1000	-	-	-	-	-	-	-	-
BFT92	7	SOT23	5	15	25	300	PNP	18	2.5	500	-	-	-	150	-	-	14	10
BFT92W	7	SOT323	5	15	35	300	PNP	17	2.5	500	11	3	1000	-	-	-	-	-
BFT93	9	SOT23	5	12	35	300	PNP	16.5	2.4	500	-	-	-	300	-	-	30	5
BFT93W	9	SOT323	5	12	50	300	PNP	15.5	2.4	500	10	3	1000	-	-	-	-	-
BFG97	10	SOT223	5.5	15	100	1000	NPN	16	-	500	12	-	800	700	-	-	70	10
BFQ19	10	SOT89	5.5	15	100	1000	NPN	11.5	3.3	500	7.5	-	800	-	-	-	-	-
BFG93A(/X)	8	SOT143	6	12	35	300	NPN	16	1.7	1000	10	2.3	2000	-	-	-	-	-
BFG94	8	SOT223	6	12	60	700	NPN	-	2.7	500	13.5	3	1000	500	21.5	34	45	10
BFR93A(R)	8	SOT23	6	12	35	300	NPN	13	1.9	1000	-	3	2000	425	-	-	30	8
BFG135	16	SOT223	7	15	150	1000	NPN	16	-	500	12	-	800	850	-	-	100	10
BFG591	22	SOT223	7	15	200	2000	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFQ591	22	SOT89	7	15	200	2000	NPN	13	-	900	7.5	-	2000	-	-	-	-	-
BFG198	15	SOT223	8	10	100	1000	NPN	18	-	500	15	-	800	700	-	-	70	8
BFG67(/X)	14	SOT143	8	10	50	380	NPN	17	1.7	1000	10	2.5	2000	-	-	-	-	-
BFQ67	14	SOT23	8	10	50	300	NPN	14	1.7	1000	8	2.7	2000	-	-	-	-	-
BFQ67W	14	SOT323	8	10	50	300	NPN	13	2	1000	8	2.7	2000	-	-	-	-	-
PBR941	20	SOT23	8	10	50	360	NPN	15	1.4	1000	9.5	2	2000	-	-	-	-	-
PBR951	21	SOT23	8	10	100	365	NPN	14	1.3	1000	8	2	2000	-	-	-	-	-
PRF947	20	SOT323	8.5	10	50	250	NPN	16	1.5	1000	10	2.1	2000	-	-	-	-	-
PRF957	21	SOT323	8.5	10	100	270	NPN	15	1.3	1000	9.2	1.8	2000	-	-	-	-	-
BFG505(/X)	19	SOT143	9	15	18	150	NPN	20	1.6	900	13	1.9	2000	-	4	10	5	6
BFG520(/X)	20	SOT143	9	15	70	300	NPN	19	1.6	900	13	1.9	2000	275	17	26	20	6
BFG520W(/X)	20	SOT343	9	15	70	500	NPN	17	1.6	900	11	1.85	2000	275	17	26	20	6
BFG540(/X)	21	SOT143	9	15	120	500	NPN	18	1.9	900	11	2.1	2000	500	21	34	40	8
BFG540W(/X)	21	SOT343	9	15	120	500	NPN	16	1.9	900	10	2.1	2000	500	21	34	40	8
BFG541	21	SOT223	9	15	120	650	NPN	15	1.9	900	9	2.1	2000	500	21	34	40	8
BFM505	19	SOT363	9	8	18	500	NPN	17	1.4	900	10	1.9	2000	-	-	-	-	-
BFM520	20	SOT363	9	8	70	1000	NPN	15	1.7	900	9	1.9	2000	-	-	-	-	-
BFQ540	21	SOT89	9	12	120	1200	NPN	-	1.9	900	-	-	-	500	-	-	40	8
BFR505	19	SOT23	9	15	18	150	NPN	17	1.6	900	10	1.9	2000	-	4	10	5	6
BFR505T	19	SOT416	9	-	18	150	NPN	17	1.2	900	-	-	-	-	-	-	-	-
BFR520	20	SOT23	9	15	70	300	NPN	15	1.6	900	9	1.9	2000	-	17	26	20	6
BFR520T	20	SOT416	9	-	70	150	NPN	15	1.6	900	9	1.9	2000	-	17	26	-	-
BFR540	21	SOT23	9	15	120	500	NPN	14	1.9	900	7	2.1	2000	550	21	34	40	8
BFS505	19	SOT323	9	15	18	150	NPN	17	1.6	900	10	1.9	2000	-	4	10	5	6
BFS520	20	SOT323	9	15	70	300	NPN	15	1.6	900	9	1.9	2000	-	17	26	20	6
BFS540	21	SOT323	9	15	120	500	NPN	14	1.9	900	8	2.1	2000	-	21	34	40	8
PRF949	20	SOT416	9	10	50	150	NPN	16	1.5	1000	-	-	-	-	-	-	-	-
BFG310W/XR	30	SOT343XR	14	6	10	60	NPN	18	1.1	1000	-	-	-	-	1.8	8	5	3
BFG310/XR	30	SOT143XR	14	6	10	60	NPN	18	1.1	1000	-	-	-	-	1.8	8	5	3
BFG325W/XR	31	SOT343XR	14	6	35	210	NPN	18	1.1	3000	-	-	-	-	8.7	19	15	3
BFG325/XR	31	SOT143XR	14	6	35	210	NPN	18	1.1	3000	-	-	-	-	8.7	19	15	3
BFG403W	25	SOT343	17	4.5	3.6	16	NPN	-	1	900	-	1.6	2000	-	5	6	1	1
BFG21W	32	SOT343	18	4.5	500	600	NPN	-	-	-	10	-	1900	-	-	-	-	-
BFG480W	29	SOT343	21	4.5	250	360	NPN	-	1.2	900	-	1.8	2000	-	-	28	80	2
BFG410W	26	SOT343	22	4.5	12	54	NPN	-	0.9	900	-	1.2	2000	-	5	15	10	2
BFG424F	27	SOT343F	25	4.5	30	135	NPN	-	0.8	900	-	1.2	2000	-	12	22	25	2
BFG424W	27	SOT343	25	4.5	30	135	NPN	-	0.8	900	-	1.2	2000	-	12	22	25	2
BFG425W	27	SOT343	25	4.5	30	135	NPN	-	0.8	900	-	1.2	2000	-	12	22	25	2

■ = New

2.4 RF ICs

2.4.1 MMICs

Philips RF MMICs:

<http://www.semiconductors.philips.com/mmics>

General-purpose wideband amplifiers (50 Ohm gain blocks)

Type	Package	@		Fu ⁽¹⁾	@ 1GHz					Gain ⁽³⁾ (dB) @				Limits		
		Vs (V)	Is (mA)	@-3dB (GHz)	NF (dB)	Psat (dBm)	Gain ⁽³⁾ (dB)	P1dB (dBm)	OIP3 (dBm)	100 MHz	2.2 GHz	2.6 GHz	3.0 GHz	Vs (V)	Is (mA)	Ptot (mW)
BGA2711	SOT363	5	12.6	3.6 ⁽²⁾	4.8	2.8	13.1	-0.7	8.3	13.0	14.1	13.8	12.7	6	20	200
BGA2748	SOT363	3	5.7	1.9	1.9 ⁽²⁾	-2.3	21.8	-9.2	-1.9	14.8	17.6	15.0	11.9	4	15	200
BGA2771	SOT363	3	33.3	2.4	4.5	13.2 ⁽²⁾	21.4	12.1	21.9	20.3	20.4	17.9	15.5	4	50	200
BGA2776	SOT363	5	24.4	2.8	4.9	10.5	23.2 ⁽²⁾	7.2	18.6	22.4	23.2	21.8	19.3	6	34	200
BGA2709	SOT363	5	23.5	3.6	4.0	12.5	22.7	8.3	22	22.2	23.0	22.1	21.1	6	35	200
BGA2712	SOT363	5	12.3	3.2	3.9	4.8	21.3	0.2	11	20.8	21.9	21.2	19.3	6	25	200
BGM1011	SOT363	5	25.5	-	4.7	13.8	30 ⁽²⁾	12.2	23	25.0	37.0	32.0	28.0	6	35	200
BGM1012	SOT363	3	14.6 ⁽²⁾	3.6	4.8	9.7	20.1	5.6	18	19.5	20.4	19.9	18.7	4	50	200
BGM1013	SOT363	5	27.5	2.1	4.6	14.0	35.5 ⁽²⁾	12.0	22.7	35.2	31.8	29.7	26.1	6	35	200
BGM1014	SOT363	5	21.0 ⁽²⁾	2.5	4.2	12.9	32.3	11.2	20.5	30.0	34.1	30.5	26.4	6	30	200
BGA2715	SOT363	5	4.3 ⁽²⁾	3.3	2.6	-4.0	21.7	-8.0	2.3	13.3	23.3	22.1	20.1	6	8	200
BGA2716	SOT363	5	15.9 ⁽²⁾	3.2	5.3	11.6	22.9	8.9	22.2	22.1	22.8	22.1	20.8	6	25	200
BGA2717	SOT363	5	8.0	3.2	2.3 ⁽²⁾	1.4	23.9	-2.6	10.0	18.6	25.1	24.0	22.1	6	15	200

Notes: ⁽¹⁾ Upper -3 dB point, to gain at 1 GHz. ⁽²⁾ Optimized parameter ⁽³⁾ Gain = |S₂₁|²

2-stage variable-gain linear amplifier

Type	Package	@		Frequency Range	@ 900MHz				@1900 MHz				Limits		
		Vs (V)	Is (mA)		Gain ⁽¹⁾ (dBm)	DG ⁽²⁾ (dB)	P1dB (dBm)	ACPR (dBc)	Gain ⁽¹⁾ (dBm)	DG ⁽²⁾ (dB)	P1dB (dBm)	ACPR (dBc)	Vs (V)	Is (mA)	Ptot (mW)
BGA2031/1	SOT363	3	51	800-2500	24	62	11	49	23	56	13	49	3.3	77	200

Notes: ⁽¹⁾ Gain = GP, power gain. ⁽²⁾ DG = Gain control range

Wideband linear mixer

Type	Package	@		RF Input Frequency Range	IF Output Frequency Range	@ 880MHz			@1900 MHz			Limits		
		Vs (V)	Is (mA)			NF (dB)	Gain ⁽¹⁾ (dB)	OIP3 (dBm)	NF (dB)	Gain ⁽¹⁾ (dB)	OIP3 (dBm)	Vs (V)	Is (mA)	Ptot (mW)
BGA2022	SOT363	3	6	800-2500	50-500	9	5	4	9	6	10	4	10	40

Notes: ⁽¹⁾ Gain = GP, power gain. ⁽²⁾ DG = Gain control range

Low-noise wideband amplifiers

Type	Package	@		@ 900MHz			@1800 MHz			Gain ⁽³⁾ (dB) @				Limits		
		Vs (V)	Is (mA)	NF (dB)	Gain (dB)	IIP3 (dBm)	NF (dB)	Gain (dB)	IIP3 (dBm)	100 MHz	1 GHz	2.6 GHz	3.0 GHz	Vs (V)	Is (mA)	Ptot (mW)
BGA2001	SOT343R	2.5	4	1.3	22 ⁽¹⁾	-7.4	1.3	19.5 ⁽¹⁾	-4.5	20	17.1	11.6	10.7	4.5	30	135
BGA2003	SOT343R	2.5	10 ⁽²⁾	1.8	24 ⁽¹⁾	-6.5	1.8	16 ⁽¹⁾	-4.8	26	18.6	11.1	10.1	4.5	30	135
BGA2011	SOT363	3	15	1.5	19 ⁽³⁾	10	-	-	-	24	14.8	8	6.5	4.5	30	135
BGA2012	SOT363	3	7	-	-	-	1.7	16 ⁽³⁾	10	22	18.2	11.6	10.5	4.5	15	70

Notes: ⁽¹⁾ MSG ⁽²⁾ Adjustable bias ⁽³⁾ |S₂₁|²

General-purpose, med. power ampl. (50 ohm gain blocks)

Type	Package	@		@ 900MHz				@1800 MHz				Gain ⁽²⁾	Limits		
		Vs ⁽¹⁾ (V)	Is (mA)	NF (dB)	Gain ⁽²⁾ (dB)	OIP3 (dBm)	P1dB (dBm)	NF (dB)	Gain ⁽²⁾ (dB)	OIP3 (dBm)	P1dB (dBm)	2.5 MHz	Vs ⁽¹⁾ (V)	Is (mA)	Ptot (mW)
BGA6289	SOT89	4.1	84	3.5	15	31	17	3.7	13	28	15	12	6	120	480
BGA6489	SOT89	5.1	78	3.1	20	33	20	3.3	16	30	17	15	6	120	480
BGA6589	SOT89	4.8	81	3.0	22	33	21	3.3	17	32	20	15	6	120	480

Notes: ⁽¹⁾ Device voltage without bias resistor. ⁽²⁾ Gain = |S₂₁|²

2.5 RF MOS transistors

2.5.1 JFETs

Philips RF FETs:

<http://www.semiconductors.philips.com/fets>

N-channel junction field-effect transistors for switching

Type	Package	V _{DS} (V)	I _G (mA)	CHARACTERISTICS										
				I _{DSS} (mA)		V _{(p)GS} (V)		R _{DS(on)} (Ω)	C _{rs} (pF)		t _{on} (ns)		t _{off} (ns)	
				min	max	min	max	max	min	max	typ	max	typ	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 N-channel junction field-effect transistors

Type	Package	V _{DS} (V)	I _G (mA)	CHARACTERISTICS										
				I _{DSS} (mA)		V _{(p)GS} (V)		R _{DS(on)} (Ω)	C _{rs} (pF)		t _{on} (ns)		t _{off} (ns)	
				min	max	min	max	max	min	max	typ	max	typ	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	-

N-channel junction field-effect transistors for switching

Type	Package	V _{DS}	I _G	CHARACTERISTICS							
				I _{DSS}		V _{GS(off)}		Y _{fs}		C _{rs}	
				(V)	(mA)	(mA)	(V)	(mS)	(pF)	(pF)	
max	max	min	max	min	max	min	max	min	max		

DC, LF and HF amplifiers

BF245A	SOT54	30	10	2	6.5	<8		3	6.5	Typ.=1.1	-
BF245B	SOT54	30	10	6	15	<8		3	6.5	Typ.=1.1	-
BF245C	SOT54	30	10	12	25	<8		3	6.5	Typ.=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	-	0.8	-
BF556C	SOT23	30	10	11	18	0.5	7.5	4.5	-	0.8	-

Pre-amplifiers for AM tuners in car radios

BF861A	SOT23	25	10	2	6.5	0.2	1.0	12	20	2.1	2.7
BF861B	SOT23	25	10	6	15	0.5	1.5	16	25	2.1	2.7
BF861C	SOT23	25	10	12	25	0.8	2	20	30	2.1	2.7
BF862	SOT23	20	10	10	25	0.3	2	35		typ=1.9	-

RF stages FM portables, car radios, main radios & mixer stages

BF510 ¹⁾	SOT23	20	10	0.7	3	typ. 0.8		2.5	0.4	0.5
BF511 ¹⁾	SOT23	20	10	2.5	7	typ. 1.5		4	0.4	0.5
BF512 ¹⁾	SOT23	20	10	6	12	typ. 2.2		6	0.4	0.5
BF513 ¹⁾	SOT23	20	10	10	18	typ. 3		7	0.4	0.5

Low-level general purpose amplifiers

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	-

General-purpose amplifiers

BFT46	SOT23	25	5	0.2	1.5	<1.2		>1	1.5	-
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AM input stages UHF/VHF amplifiers

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

¹⁾ Asymmetrical

2.5.2 MOSFETs

N-channel, single MOSFETs for switching

Type	Package	V _{DS} (V) max	CHARACTERISTICS														MODE
			I _D (mA) max	I _{DSS} (nA)		V _{(p)GS} (V)		R _{DS(on)} (Ω) max	C _{rs} (pF)		t _{on} (ns)		t _{off} (ns)		S _{21(on)} ₂ (dB) max	S _{21(off)} ₂ (dB) min	
				min	max	min	max		min	max	typ	max	typ	max			
BSS83	SOT143	10	50	-	-	0.1 ²⁾	2 ¹⁾	45	typ.0.6	-	1	-	5	-	-	enh.	

Silicon RF Switches

BF1107	SOT23	3	10	-	100 ³⁾	-	7 ⁴⁾	20	-	-	-	-	-	-	2.5	30	depl.
BF1108 ⁵⁾	SOT143B	3	10	-	100 ³⁾	-	7 ⁴⁾	20	-	-	-	-	-	-	3	30	depl.
BF1108R ⁵⁾	SOT143R	3	10	-	100 ³⁾	-	7 ⁴⁾	20	-	-	-	-	-	-	3	30	depl.

N-channel, dual-gate MOSFETs

Type	Package	V _{DS} (V) max	I _D (mA) max	CHARACTERISTICS											
				I _{DSX} (mA)		V _{(th)GS} (V)		Y _{fs} (mS)		C _{is} (pF) typ	C _{os} (pF) typ	F @ 800 MHz (dB) typ	VHF	UHF	
				min	max	min	max	min	max	typ	typ	typ			

With external bias

BF908	SOT143	12	40	3	27	-	-2	36	50	3.1	1.7	1.5	X	X
BF908R	SOT143R	12	40	3	27	-	-2	36	50	3.1	1.7	1.5	X	X
BF908WVR	SOT343R	12	40	3	27	-	-2	36	50	3.1	1.7	1.5	X	X
BF991	SOT143	20	20	4	25	-	-2.5	10	-	2.1	1.1	1	X	-
BF992	SOT143	20	40	-	-	-	-1.3	20	-	4	2	1.2 ⁷⁾	X	-
BF994S	SOT143	20	30	4	20	-	-2.5	15	-	2.5	1	1 ⁷⁾	X	-
BF996S	SOT143	20	30	4	20	-	-2.5	15	-	2.3	0.8	1.8	-	X
BF998	SOT143	12	30	2	18	-	-2.0	21	-	2.1	1.05	1	X	X
BF998R	SOT143R	12	30	2	18	-	-2.0	21	-	2.1	1.05	1	X	X
BF998WVR	SOT343R	12	30	2	18	-	-2.5	22	-	2.1	1.05	1	X	X

Fully internal bias

BF1105	SOT143	7	30	8	16	0.3	1.2 ⁶⁾	25	-	2.2 ⁹⁾	1.2 ⁸⁾	1.7	X	X
BF1105R	SOT143R	7	30	8	16	0.3	1.2 ⁶⁾	25	-	2.2 ⁹⁾	1.2 ⁸⁾	1.7	X	X
BF1105WVR	SOT343R	7	30	8	16	0.3	1.2 ⁶⁾	25	-	2.2 ⁹⁾	1.2 ⁸⁾	1.7	X	X
BF1109	SOT143	11	30	8	16	0.3	1.2 ⁶⁾	24	-	2.2 ⁹⁾	1.3 ⁸⁾	1.5	X	X
BF1109R	SOT143R	11	30	8	16	0.3	1.2 ⁶⁾	24	-	2.2 ⁹⁾	1.3 ⁸⁾	1.5	X	X
BF1109WVR	SOT343R	11	30	8	16	0.3	1.2 ⁶⁾	24	-	2.2 ⁹⁾	1.3 ⁸⁾	1.5	X	X

Partly internal bias

BF904(A)	SOT143	7	30	8	13	0.3	1 ⁶⁾	22	30	2.2	1.3	2	X	X
BF904(A)R	SOT143R	7	30	8	13	0.3	1 ⁶⁾	22	30	2.2	1.3	2	X	X
BF904(A)WVR	SOT343R	7	30	8	13	0.3	1 ⁶⁾	22	30	2.2	1.3	2	X	X
BF909(A)	SOT143	7	40	12	20	0.3	1 ⁶⁾	36	50	3.6	2.3	2	X	X
BF909(A)R	SOT143R	7	40	12	20	0.3	1 ⁶⁾	36	50	3.6	2.3	2	X	X
BF909(A)WVR	SOT343R	7	40	12	20	0.3	1 ⁶⁾	36	50	3.6	2.3	2	X	X

¹⁾ Asymmetrical

²⁾ V_{GS(th)}

³⁾ I_D

⁴⁾ V_{SG}

⁵⁾ Depletion FET plus diode in one package

⁶⁾ V_{GS(th)}

⁷⁾ @ 200 MHz

⁸⁾ C_{OSS}

⁹⁾ C_{rg}

¹⁰⁾ Two equal dual gate MOSFETs in one package

¹¹⁾ Two low noise gain amplifiers in one package

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

¹³⁾ Internal switching function

¹⁴⁾ Transistor A: partly internal bias, transistor B: fully internal bias

N-channel, dual-gate MOSFETs

Type	Package	V _{DS} (V)	I _D (mA)	CHARACTERISTICS										VHF	UHF
				I _{DSX} (mA)		V _{(th)gs} (V)		Y _{fs} (mS)		C _{is} (pF)	C _{os} (pF)	F @ 800 MHz (dB)			
				min	max	min	max	min	max	typ	typ	typ			
Partly internal bias															
BF1100	SOT143	14	30	8	13	0.3	1.2 ⁶⁾	24	33	2.2	1.4	2	X	X	
BF1100R	SOT143R	14	30	8	13	0.3	1.2 ⁶⁾	24	33	2.2	1.4	2	X	X	
BF1100WR	SOT343R	14	30	8	13	0.3	1.2 ⁶⁾	24	33	2.2	1.4	2	X	X	
BF1101	SOT143	7	30	8	16	0.3	1 ⁶⁾	25	-	2.2	1.2 ⁸⁾	1.7	X	X	
BF1101R	SOT143R	7	30	8	16	0.3	1 ⁶⁾	25	-	2.2	1.2 ⁸⁾	1.7	X	X	
BF1101WR	SOT343R	7	30	8	16	0.3	1 ⁶⁾	25	-	2.2	1.2 ⁸⁾	1.7	X	X	
BF1102(R) ¹⁰⁾	SOT363	7	40	12	20	0.3	1.2 ⁶⁾	36	-	2.8 ⁹⁾	1.6 ⁸⁾	2	X	X	
BF1201	SOT143	10	30 ¹⁾	11	19	0.3	1.2 ⁶⁾	23	35	2.6	0.9	1.9	X	X	
BF1201R	SOT143R	10	30 ¹⁾	11	19	0.3	1.2 ⁶⁾	23	35	2.6	0.9	1.9	X	X	
BF1201WR	SOT343R	10	30 ¹⁾	11	19	0.3	1.2 ⁶⁾	23	35	2.6	0.9	1.9	X	X	
BF1202	SOT143	10	30	8	16	0.3	1.2 ⁶⁾	25	40	1.7	0.85	1.1	X	X	
BF1202R	SOT143R	10	30	8	16	0.3	1.2 ⁶⁾	25	40	1.7	0.85	1.1	X	X	
BF1202WR	SOT343R	10	30	8	16	0.3	1.2 ⁶⁾	25	40	1.7	0.85	1.1	X	X	
BF1203 ¹¹⁾	SOT363	10	30	11	19	0.3	1.2 ⁶⁾	23	35	2.6	0.9	1.9	X	-	
		10	30	8	16	0.3	1.2	25	40	1.7	0.85	1.1	-	X	
BF1204 ¹⁰⁾	SOT363	10	30	8	16	0.3	1.2 ⁶⁾	25	40	1.7	0.85	1.1	X	X	
BF1205C ¹¹⁾ 12)13)	SOT363	6	30	14	24	0.3	1	26	41	2.2	0.9	1.4	X	-	
		6	30	9	17	0.3	1	28	43	2	0.85	1.4	-	X	
BF1205 ¹¹⁾ 12)13)	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 ¹¹⁾	SOT363	6	30	14	23	0.3	1.0	33	48	2.4	1.1	1.6	X	-	
		6	30	9	17	0.3	1.0	29	44	1.7	0.85	1.4	-	X	
BF1206F ¹⁾	SOT666	6	30	3	6.5	0.3	1.0	17	32	2.4	1.1	1.1	X	-	
		6	30	3	6.5	0.3	1.0	17	32	1.7	0.85	1.0	-	X	
BF1207 ¹¹⁾ 13)14)	SOT363	6	30	13	23	0.3	1.0	25	40	2.2	0.9	1.4	X	-	
		6	30	9	19	0.3	1.0	26	41	1.8	0.8	1.4	-	X	
BF1208 ¹¹⁾ 12)13)	SOT666	6	30	14	24	0.3	1	26	41	2.2	0.9	1.4	X	-	
		6	30	9	17	0.3	1	28	43	2	0.85	1.4	-	X	
BF1211	SOT143	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.3	X	-	
BF1211R	SOT143R	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.3	X	-	
BF1211WR	SOT343	6	30	11	19	0.3	1.0	25	40	2.1	0.9	1.3	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	

■ = New

2) V_{GS(th)}

3) I_D

4) V_{SG}

5) Depletion FET plus diode in one package

7) @200 MHz

8) C_{OSS}

9) C_g

10) Two equal dual gate MOSFETs in one package

11) Two low noise gain amplifiers in one package

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

13) Internal switching function

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

2.5.3 pHEMT GaAs Transistors

Type	@		@ 12GHz		Limits		
	V _{ds} (V)	I _d	NF (dB)	Gain* (dB)	V _{ds} (V)	I _d (mA)	
CFH705F	2	10	0.55	11.5	4	70	2nd stage LNAs, also for mixer
CFH703A	2	10	0.35	13.5	4	70	1st stage LNAs

2.6 RF Modules

CATV types for Chinese (C-types) and Indian market (OM-types)

New in our CATV Hybrid portfolio are two families of products. The C types are specially designed for the Chinese market, fitting two major governmental projects. And the OM types, also called the INDI types, are designed for low end CATV infrastructure networks deployed in India. Both families will be extended in the following months to cover most of those two specific market segments.

C types (China)

- CATV push pulls, chapter 2.6.2 :
BGY588C and BGE788C
- CATV power doubler, chapter 2.6.3 :
BGD712C
- CATV optical receiver, chapter 2.6.4 :
BGO807C

OM types (India)

- CATV push pulls, chapter 2.6.2 :
OM7650 and OM7670

2.6.1 CATV Reverse Hybrids

Frequency range	Type number	Gain (dB)	Slope (dB)	FL	S11/ S22	CTB	XMOD	CSO	@ Ch	@ Vo (dBmV)	F @ fmax	Itot (mA)
5 -65 MHz	BGS67A	25 - 26	-0.1 - 0.6	± 0.2	20/20	-64	-54	-	4	50	3.5	85
5 -75 MHz	BGY68	29.2 - 30.8	-0.2 - 0.5	± 0.2	20/20	-68	-60	-	4	50	3.5	135
5 -120 MHz	BGY66B	24.5 - 25.5	-0.2 - 0.5	± 0.2	20/20	-66	-54	-	14	48	5	135
	BGY67	21.5 - 22.5	-0.2 - 0.5	± 0.2	20/20	-67	-60	-	22	50	5.5	230
5 -200 MHz	BGY67A	23.5 - 24.5	-0.2 - 0.5	± 0.2	20/20	-67	-59	-	22	50	5.5	230
	BGR269	34.5 - 35.5	0 - 0.6	± 0.4	20/20	-57	-50	-70	28	50	5.2	160

2.6.2 CATV Push-Pulls

Frequency range	Type number	Gain (dB)	Slope (dB)	FL	S11/ S22	CTB	XMOD	CSO	@ Ch	@ Vo (dBmV)	F @ fmax	Itot (mA)
40 - 550 MHz	OM7650	33.2 - 35.5	0.2 - 2	-	10/10	-45	-	-57	77	44	8	340
	BGY588C	33.2 - 35.5	0.2 - 1.7	± 0.5	16/16	-57	-	-62	77	44	8	345
	BGY585A	17.7 - 18.7	0.5 - 2	± 0.2	20/20	-59	-62	-59	77	44	8	240
	BGY587	21.5 - 22.5	0.2 - 1.5	± 0.2	20/20	-57	-58	-54	77	44	7	240
	BGY587B	26.2 - 27.8	0.5 - 2.5	± 0.4	20/20	-57	-60	-57	77	44	6.5	340
	BGY588N	33.5 - 35.5	0.5 - 1.5	± 0.4	20/20	-57	-59	-62	77	44	6	340
40 - 600 MHz	BGY685A	17.7 - 18.7	0.5 - 2.2	± 0.2	20/20	-55	-60	-56	85	44	8.5	240
	BGY687	21 - 22	0.8 - 2.2	± 0.2	20/20	-54	-54	-52	85	44	6.5	240
40 - 750 MHz	OM7670	33.2 - 35.2	1/4	-	10/8	-43	-	-54	110	44	8	340
	BGY785A	18 - 19	0 - 2	± 0.3	20/20	-53	-56	-53	110	44	7	240
	BGE788C	33.2 - 35.2	0.3 - 2.3	± 0.6	16/16	-49	-	-52	110	44	8	325
	BGY787	21 - 22	0 - 1.5	± 0.5	20/20	-53	-52	-53	110	44	6.5	240
	BGE787B	28.5 - 29.5	0.2 - 2.2	± 0.5	20/20	-50	-54	-56	110	44	7	320
	BGE788	33.5 - 34.5	0.5 - 2.5	± 0.5	20/20	-49	-51	-52	110	44	7	320
40 - 870 MHz	BGY883	14.5 - 15.5	0 - 2	± 0.3	20/20	-61	-61	-61	49	44	8.5	235
	BGE885	16.5 - 17.5	0.2 - 1.2	± 0.5	14/14	-	-	-	129	59	8	240
	BGX885N	16.5 - 17.5	0.2 - 1.4	± 0.3	20/20	-	-	-	129	59	8	240
	BGY885A	18 - 19	0 - 2	± 0.3	20/20	-61	-61	-61	49	44	8	240
	BGY885B	19.5 - 20.5	0 - 2	± 0.3	20/20	-60	-60	-60	49	44	7.5	235
	BGY887	21 - 22	0.2 - 2	± 0.3	20/20	-55	-61	-57	129	40	6.5	235
	CGY887	21.2 - 21.8	0.6 - 1.4	± 0.5	20/21	-59	-56	-57	132	40	5.5	240
	CGY887A	25.2 - 25.8	0.5 - 1.4	± 0.5	20/21	-62	-56	-59	129	40	5	240
	CGY887B	27.2 - 27.8	0.5 - 1.5	± 0.5	24/23	-57.5	-51	-58	132	44	5	310
	BGY887B	28.5 - 29.5	0.5 - 2.5	± 0.5	20/20	-60	-60	-60	49	44	6.5	340
BGY888	33.5 - 34.5	0.5 - 2.5	± 0.5	20/20	-60	-59	-55	49	44	7	340	
40 -1000 MHz	BGY1085A	18 - 19	0 - 2	± 0.3	20/20	-53	-54	-56	150	44	7.5	240

■ = New

2.6.3 CATV power doublers

Frequency range	Type number	Gain (dB)	Slope (dB)	FL	S11/ S22	CTB	XMOD	CSO	@ Ch	@ Vo (dBmV)	F @ fmax	Itot (mA)
40 - 550 MHz	BGD502	18 - 19	0.2 - 2.2	± 0.3	20/20	-65	-68	-62	77	44	8	435
40 - 750 MHz	BGD702	18 - 19	0.2 - 2	± 0.5	20/20	-58	-62	-58	110	44	8.5	435
	BGD702N	18 - 19	0.2 - 2	± 0.25	20/20	-58	-62	-58	110	44	8.5	435
	BGD712	18.2 - 18.8	0.5 - 1.5	± 0.35	23/23	-62	-63	-63	112	44	7	410
	BGD712C	18.2 - 18.8	0.5 - 1.5	± 0.4	17/17	-62	-	-63	112	44	7	410
	BGD704	19.5 - 20.5	0 - 2	± 0.5	20/20	-57	-61	-56	110	44	8.5	435
	BGD714	20 - 20.6	0.5 - 1.5	± 0.35	23/23	-61	-62	-62	112	44	7	410
40 - 870 MHz	BGD885	16.5 - 17.5	0.2 - 1.6	± 0.5	20/20	-	-	-	129	59	8	450
	BGD802	18 - 19	0.2 - 2	± 0.5	20/20	-54	-59	-56	129	44	9	410
	BGD812	18.2 - 18.8	0.4 - 1.4	± 0.5	23/23	-58	-62	-60	132	44	7.5	410
	BGD902	18.2 - 18.8	0.4 - 1.4	± 0.3	21/25	-58	-62	-58	129	44	8	435
	BGD902L	18 - 19	0.4 - 1.4	± 0.3	21/21	-56	-60	-59	129	44	7.5	380
	CGD923	19.25 - 19.75	0 - 1	± 0.6	20/20	-56	-57	-54	132	48	5.5	475
	BGD804	19.5 - 20.5	0.2 - 2	± 0.5	20/20	-53	-61	-54	129	44	7.5	410
	BGD814	19.7 - 20.3	0.4 - 1.4	± 0.5	22/25	-57.5	-62	-59	132	44	7.5	410
	BGD904	19.7 - 20.3	0.4 - 1.4	± 0.3	21/25	-57.5	-61	-58	129	44	7.5	435
	BGD904L	19.7 - 20.3	0.4 - 1.4	± 0.3	21/25	-55	-59	-59	129	44	7.5	380
	CGD914	19.75 - 20.25	0.2 - 1.5	± 0.45	20/21	-59.5	-64	-50	132	44	4	375
	BGD816L	21.2 - 21.8	0.5 - 1.5	± 0.5	22/25	-55	-58	-56	129	44	7.5	375
BGD906	21.2 - 21.8	0.5 - 1.5	± 0.35	22/22	-57	-60	-54	129	44	7.5	435	
40 - 870 MHz	CGD944C	23 - 25	0 - 1	± 0.5	18/18	-66	-58	-68	98	48	7	450
	CGD942C	20.5 - 23	0 - 1	± 0.5	18/18	-66	-58	-68	98	48	7	450
40 - 1000 MHz	CGD1042	20.5 - 23	0 - 1	± 0.3	20/23	-74	-64	-69	79	58.1	4.6	485
	CGD1044	23.5 - 25.5	0 - 1	± 0.3	20/23	-74	-64	-69	79	58.1	4.6	485

■ = New

2.6.4 CATV optical receivers

Frequency range	Type number	Rmin (V/W)	Slope (dB)	FL	S22 (dB)	d3	d2	@fm (MHz)	@Pi (mW)	F @ fmax	Conn.	Itot (mA)
Optical Reverse Receiver												
5 - 300	BGO387	800	0 - 2	± 0.3	16	-80	-70	54.25	1	7.5		190
Forward Path Receiver												
40 - 750	BGO747	800	0 - 2	1	11	-75	-63	746.5	1	7		205
	BGO747/FC0	750	0 - 2	1	11	-75	-63	746.5	1	7	FC	205
40 - 870	BGO807	800	0 - 2	1	11	-71	-55	854.5	1	8.5		205
	BGO807C	800	0 - 2	1	11	-71	-54	854.4	1	8.5		205
	BGO807/FC0	750	0 - 2	1	11	-71	-55	854.5	1	8.5	FC	205
	BGO807/SC0	750	0 - 2	1	11	-71	-55	854.5	1	8.5	SC	205
	BGO827	800	0 - 2	1	11	-73	-57	854.5	1	9		205
	BGO827/FC0	750	0 - 2	1	11	-73	-57	854.5	1	8.5	FC	205
	BGO827/SC0	750	0 - 2	1	11	-73	-57	854.5	1	8.5	SC	205
	BGO847	800	0 - 2	1	11	-73	-63	854.5	1	8		205

■ = New

* NOTES: This table is for reference only.
For full data please refer to the latest datasheet.
For availability please check the Philips Sales office.

Description

Frequency range: minimum and maximum frequency in MHz at which data are characterized @Ch/@Vo. The number of channels and the output voltage at which CTB, XM, CSO and d2 are characterized @fm. Measurement frequency is F. Noise Figure is in dB or Noise in pA/Sqrt(Hz). FL is Flatness Rmin is Minimum responsivity of optical receivers.

2.7 Fiber-optic transceiver ICs

2.7.1 Laser drivers

Part number	Data-rate	Package type	Bare die	I _{mod} /I _{Bias}	Dual loop	Input	V _{cc}	Power dissipation
		Mb/s		[mA]				mW
TZA3047A	30-1250	SOT560-1	X	100-100	X	CML/PECL	3.3	420
TZA3047B	30-1250	SOT560-1	X	100-100	X	CML/PECL	3.3 ¹⁾	420
TZA3050	30-1250	SOT560-1	X	100-100	-	CML/PECL	3.3 ¹⁾	420
TZA3010B	30-3200	SOT560-1	-	60-100	-	CML/PECL	3.3 ¹⁾	420
TZA3011A	30-3200	SOT560-1	X	100-100	X	CML/PECL	3.3	420
TZA3011B	30-3200	SOT560-1	X	100-100	X	CML/PECL	3.3 ¹⁾	420

2.7.2 Transimpedance amplifiers

Part number	Data-rate	Package type	Bare die	In	E _q Sens	RSSI	Output	V _{cc}	Power dissipation
		Mb/s		[nA]	[dBm]				mW
TZA3036	0-155	die only	X	10	-40	Yes	50 Ohm	3.3	50
TZA3026	0-622	die only	X	67	-32	Yes	50 Ohm	3.3	60
TZA3046	0-1250	die only	X	130	-29	Yes	50 Ohm	3.3	70
TZA3013	0-2488	die only	X	450	-24	-	50 Ohm	3.3	86

■ = New

*) NOTES: All figures given are typical at 25 deg C

Power dissipation is given for V_{cc} = 3.3 V

E_q sensitivity conditions: Calculated from noise figure using a lowpass bandwidth filter at 0.7x bit rate and a source with an extinction ratio of 10% and a photodiode responsivity of 0.9A/W.

3.3¹⁾ means that the output stage is capable of driving 5 V laser applications.

3. Design-in tools

This chapter will make it easier to find and get hold of design-in information and materials, with web links or references to the Philips representative / authorized distributor.

3.1 S-Parameters

S-Parameters help you to simulate the behaviour of our devices to your specific adjustments for e.g. voltage, current.

3.1.1 Wideband transistors & MMICs

First, click on the type number, which takes you directly to the corresponding product information page on the Philips Semiconductors internet.

Second, scroll down on this product information page to find the S-Parameters.

Wideband			MMICs
BFG135	BFG94	BFS17A	BGA2001
BFG198	BFG97	BFS17W	BGA2003
BFG21W	BFM505	BFS25A	BGA2711
BFG31	BFM520	BFS505	BGA2748
BFG35	BFQ149	BFS520	BGA2771
BFG403W	BFQ18A	BFS540	BGA2776
BFG410W	BFQ19	BFT25	BGA2709
BFG425W	BFQ67	BFT25A	BGA2712
BFG480W	BFQ67W	BFT92	BGM1011
BFG505	BFR106	BFT92W	BGM1012
BFG520	BFR505	BFT93	BGM1013
BFG520W	BFR520	BFT93W	BGM1014
BFG540	BFR540	PBR941	BGA2715
BFG540W	BFR92A	PBR951	BGA2716
BFG541	BFR92AW	PRF947	BGA2717
BFG590	BFR93A	PRF957	BGA2011
BFG591	BFR93AW		BGA2012
BFG93A	BFS17		

Or click on the web link(s) below, which takes you to a list of wideband transistors, MMICs, varicap diodes and FET transistors with available S-Parameters on the Philips Semiconductors internet.

<http://www.semiconductors.philips.com/models/spicespar/wideband.html>
<http://www.semiconductors.philips.com/models/spicespar/mmics.html>

3.2 Spice models

Spice models help you to create the optimal performance and to understand which external components have a certain influence on that performance.

3.2.1 Wideband transistors

First, click on the type number which takes you directly to the corresponding product information page on the Philips Semiconductors internet.

Second, scroll down on this product information page to find the Spice models.

BFG10	BFG505/X	BFG93A	BFS17
BFG10/X	BFG505W/X	BFG94	BFS17A
BFG10W/X	BFG520	BFG97	BFS17W
BFG135	BFG520/X	BFG97	BFS25A
BFG198	BFG520/XR	BFM505	BFS505
BFG21W	BFG520W	BFM520	BFS520
BFG25A/X	BFG520W/X	BFQ149	BFS540
BFG25AW/X	BFG540	BFQ18A	BFT25A
BFG31	BFG540/X	BFQ19	BFT92
BFG310/XR	BFG540/XR	BFQ67	BFT92W
BFG310W/XR	BFG540W	BFQ67W	BFT93
BFG325/XR	BFG540W/X	BFR106	BFT93W
BFG325W/XR	BFG540W/XR	BFR505	PBR941
BFG35	BFG541	BFR520	PBR951
BFG403W	BFG590	BFR540	PRF947
BFG410W	BFG590/X	BFR92A	PRF949
BFG425W	BFG591	BFR92AW	PRF957
BFG480W	BFG67/X	BFR93A	
BFG505	BFG92A/X	BFR93AW	

Or click on the web link below, which takes you to a list of wideband transistors with available Spice models on the Philips Semiconductors internet.

<http://www.semiconductors.philips.com/models/spicespar/wideband.html>

3.2.2 Field effect transistors

First, click on the type number which takes you directly to the corresponding product information page on the Philips Semiconductors internet.

Second, scroll down on this product information page to find the Spice models.

BF245A	BF904	BFR31	J177
BF245B	BF904R	BFT46	PMBF4391
BF245C	BF904WR	BSR56	PMBF4392
BF510	BF908	BSR57	PMBF4393
BF511	BF908R	BSR58	PMBFJ108
BF512	BF908WR	BSS83	PMBFJ109
BF513	BF909	J108	PMBFJ110
BF545A	BF909R	J109	PMBFJ111
BF545B	BF909WR	J110	PMBFJ112
BF545C	BF992	J111	PMBFJ113
BF556A	BF994S	J112	PMBFJ174
BF556B	BF998	J113	PMBFJ175
BF861A	BF998R	J174	PMBFJ176
BF861B	BF998WR	J175	PMBFJ177
BF861C	BFR30	J176	

Or click on the web link below, which takes you to a list of field effect transistors with available Spice models on the Philips Semiconductors internet.

<http://www.semiconductors.philips.com/models/spicespar/fet.html>

3.2.3 Varicap diodes

First, click on the type number, which takes you directly to the corresponding product information page on the Philips Semiconductors internet.

Second, scroll down on this product information page to find the Spice models.

BB143	BB149A	BB200	BB208-02
BB145	BB156	BB201	BB804
BB145B	BB179	BB202	
BB149	BB179B	BB207	

Or click on the web link below, which takes you to a list of varicap diodes with available Spice models on the Philips Semiconductors internet.

<http://www.semiconductors.philips.com/models/spicespar/varicap.html>

3.3 Application notes

<http://www.semiconductors.philips.com/products/discretes/documentation/index.html> For the application notes we refer you to chapter 1 of this manual. For each application, we have given the recommended application notes which are available on the internet (with interactive link) or via your local Philips representative or authorized distributor (look at the last chapter: Web Links and Contacts).

3.4 Demo boards

3.4.1 MMIC demo boards

MMIC demo boards are available (although limited) via your local Philips representative or authorized distributor (look at the last chapter: Web Links and Contacts).

BGA2001	BGA2748	BGA2012	BGM1011
BGA2022	BGA6289	BGA2715	BGM1012
BGA2011	BGA2003	BGA2776	BGM1013
BGA2031	BGA2711	BGA6589	BGM1014
BGA2709	BGA2771	BGA2712	
BGA2716	BGA6489		

Or click on the web link below, which takes you to a list of wideband transistors with available Spice models on the Philips Semiconductors internet.

<http://www.semiconductors.philips.com/models/spicespar/wideband.html>

3.4.2 Transimpedance amplifier demo boards

Transimpedance amplifier demo boards are available (although limited) via your local Philips representative or authorized distributor (see last chapter: Web Links and Contacts).

TZA3026
TZA3036
TZA3046

3.5 Samples of products in development

For development samples, please ask your local Philips representative or authorized distributor (see last chapter: Web Links and Contacts) to order the latest versions at the RF development team.

3.6 Samples of released products

For all released products, samples are available in the sample warehouse. Your local Philips representative (see last chapter: Web Links and Contacts), can order these samples to a certain maximum quantity at the online sample store for you.

3.7 Datasheets

For all released products, datasheets are available on the Philips Semiconductors internet. Simply 'clicking' on a product type (in this manual chapter 1 or 2) takes you to the corresponding product information page on the Philips Semiconductors website.

3.8 Design-in support

If you need special design-in support from our design-in engineers, please ask your local Philips representative or authorized distributor (see last chapter: Web Links and Contacts), to pass on your request to the RF development team.

4. Cross-references & Replacements

Philips cross-references:

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

Philips end-of-life:

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

4.1 Cross-references: Manufacturer types versus Philips types

In alphabetical order of manufacturer type

Abbreviations:

BS diode	Band Switch Diode
CATV PD	CATV Power Doubler
CATV PPA	CATV Push Pull Amplifier
CATV PPA/HG	CATV Push Pull Amplifier High Gain
CATV RA	CATV Reverse Amplifier
FET	Field Effect Transistor
IS	Industry Standard
MMIC	Monolithic Microwave Integrated Circuit
Varicap	Varicap Diode
WB trs 1-4	Wideband Transistor 1-4 generation
WB trs 5-7	Wideband Transistor 5-7 generation

Manufacturer type	Manufacturer	Philips type	Product family
1SS314	Toshiba	BA591	BS diode
1SS356	Rohm	BA591	BS diode
1SS381	Toshiba	BA277	BS diode
1SS390	Rohm	BA891	BS diode
1SV172	Toshiba	BAP50-04	PIN diode
1SV214	Toshiba	BB149	Varicap
1SV214	Toshiba	BB149A	Varicap
1SV215	Toshiba	BB153	Varicap
1SV228	Toshiba	BB201	Varicap
1SV231	Toshiba	BB152	Varicap
1SV232	Toshiba	BB148	Varicap
1SV233	Sanyo	BAP70-03	PIN diode
1SV234	Sanyo	BAP64-04	PIN diode
1SV239	Toshiba	BB145B	Varicap
1SV241	Sanyo	BAP64-02	PIN diode
1SV246	Sanyo	BAP64-04W	PIN diode
1SV247	Sanyo	BAP70-02	PIN diode
1SV248	Sanyo	BAP50-02	PIN diode
1SV249	Sanyo	BAP50-04W	PIN diode
1SV250	Sanyo	BAP50-03	PIN diode
1SV251	Sanyo	BAP50-04	PIN diode
1SV252	Toshiba	BAP50-04W	PIN diode
1SV254	Toshiba	BB179	Varicap
1SV263	Sanyo	BAP50-02	PIN diode
1SV264	Sanyo	BAP50-04W	PIN diode
1SV266	Sanyo	BAP50-03	PIN diode
1SV267	Sanyo	BAP50-04	PIN diode
1SV269	Toshiba	BB148	Varicap
1SV270	Toshiba	BB156	Varicap
1SV271	Toshiba	BAP50-03	PIN diode

Manufacturer type	Manufacturer	Philips type	Product family
1SV278	Toshiba	BB179	Varicap
1SV279	Toshiba	BB179	Varicap
1SV280	Toshiba	BB145	Varicap
1SV282	Toshiba	BB178	Varicap
1SV282	Toshiba	BB178	Varicap
1SV282	Toshiba	BB187	Varicap
1SV283	Toshiba	BB187	Varicap
1SV283	Toshiba	BB178	Varicap
1SV283	Toshiba	BB178	Varicap
1SV283	Toshiba	BB187	Varicap
1SV284	Toshiba	BB156	Varicap
1SV288	Toshiba	BB152	Varicap
1SV290	Toshiba	BB182	Varicap
1SV294	Sanyo	BAP70-03	PIN diode
1SV305	Toshiba	BB202	Varicap
1SV307	Toshiba	BAP51-03	PIN diode
1SV308	Toshiba	BAP51-02	PIN diode
1SV314	Toshiba	BB143	Varicap
1SV329	Toshiba	BB143	Varicap
1T362	Sony	BB149	Varicap
1T362 A	Sony	BB149A	Varicap
1T363 A	Sony	BB153	Varicap
1T368 A	Sony	BB148	Varicap
1T369	Sony	BB152	Varicap
1T379	Sony	BB131	Varicap
1T397	Sony	BB152	Varicap
1T399	Sony	BB148	Varicap
1T402	Sony	BB179B	Varicap
1T402	Sony	BB179B	Varicap
1T403	Sony	BB178	Varicap

Manufacturer type	Manufacturer	Philips type	Product family
1T403	Sony	BB178	Varicap
1T404A	Sony	BB187	Varicap
1T405 A	Sony	BB187	Varicap
1T406	Sony	BB182	Varicap
1T408	Sony	BB187	Varicap
2N3330	IS	J176	FET
2N3331	IS	J176	FET
2N4220	IS	BF245A	FET
2N4856	IS	BSR56	FET
2N4857	IS	BSR57	FET
2N4858	IS	BSR58	FET
2N5114	IS	J174	FET
2N5115	IS	J175	FET
2N5116	IS	J175	FET
2N5432	IS	J108	FET
2N5433	IS	J108	FET
2N5434	IS	J109	FET
2N5457	IS	BF245A	FET
2N5458	IS	BF245A	FET
2N5459	IS	BF245B	FET
2N5653	IS	J112	FET
2N5654	IS	J111	FET
2SC4094	NEC	BFG520/XR	WB trs 1-4
2SC4095	NEC	BFG520/XR	WB trs 1-4
2SC4182	NEC	BFS17W	WB trs 1-4
2SC4184	NEC	BFS17W	WB trs 1-4
2SC4185	NEC	BFS17W	WB trs 1-4
2SC4186	NEC	BFR92AW	WB trs 1-4
2SC4226	NEC	PRF957	WB trs 1-4
2SC4227	NEC	BFQ67W	WB trs 1-4
2SC4228	NEC	BFS505	WB trs 1-4
2SC4247	Toshiba	BFR92AW	WB trs 1-4
2SC4248	Toshiba	BFR92AW	WB trs 1-4
2SC4315	Toshiba	BFG520/XR	WB trs 1-4
2SC4320	Toshiba	BFG520/XR	WB trs 1-4
2SC4321	Toshiba	BFQ67W	WB trs 1-4
2SC4325	Toshiba	BFS505	WB trs 1-4
2SC4394	Toshiba	PRF957	WB trs 1-4
2SC4536	NEC	BFQ19	WB trs 1-4
2SC4537	Renesas	BFR93AW	WB trs 1-4
2SC4592	Renesas	BFG520/XR	WB trs 1-4
2SC4593	Renesas	BFS520	WB trs 1-4
2SC4703	NEC	BFQ19	WB trs 1-4
2SC4784	Renesas	BFS505	WB trs 1-4
2SC4807	Renesas	BFQ18A	WB trs 1-4
2SC4842	Toshiba	BFG540W/XR	WB trs 1-4
2SC4899	Renesas	BFS505	WB trs 1-4
2SC4900	Renesas	BFG520/XR	WB trs 1-4
2SC4901	Renesas	BFS520	WB trs 1-4
2SC4988	Renesas	BFQ540	WB trs 1-4
2SC5011	NEC	BFG540W/XR	WB trs 1-4
2SC5012	NEC	BFG540W/XR	WB trs 1-4
2SC5065	Toshiba	PRF957	WB trs 1-4
2SC5085	Toshiba	PRF957	WB trs 1-4
2SC5087	Toshiba	BFG520/XR	WB trs 1-4
2SC5088	Toshiba	BFG540W/XR	WB trs 1-4
2SC5090	Toshiba	BFS520	WB trs 1-4
2SC5092	Toshiba	BFG520/XR	WB trs 1-4
2SC5095	Toshiba	BFS505	WB trs 1-4
2SC5107	Toshiba	BFS505	WB trs 1-4
2SC5463	Toshiba	BFQ67W	WB trs 1-4
2SC5593	Renesas	BFG410W	WB trs 5-7
2SC5594	Renesas	BFG425W	WB trs 5-7
2SC5623	Renesas	BFG410W	WB trs 5-7
2SC5624	Renesas	BFG425W	WB trs 5-7
2SC5631	Renesas	BFQ540	WB trs 1-4
2SJ105GR	IS	J177	FET
2SK163-K	Renesas	J113	FET
2SK163-L	Renesas	J113	FET
2SK163-M	Renesas	J113	FET
2SK163-N	Renesas	J113	FET
2SK210BL	Renesas	PMBFJ309	FET
2SK370BL	Renesas	J109	FET
2SK370GR	Renesas	J109	FET

Manufacturer type	Manufacturer	Philips type	Product family
2SK370V	Renesas	J109	FET
2SK381	Renesas	J113	FET
2SK43	Renesas	J113	FET
2SK435	Renesas	J113	FET
2SK508	Renesas	PMBFJ308	FET
3SK290	Renesas	BF998WR	FET
BA592	Infineon	BA591	BS diode
BA592	Infineon	BA591	BS diode
BA595	Infineon	BAP70-03	PIN diode
BA597	Infineon	BAP70-03	PIN diode
BA885	Infineon	BAP70-03	PIN diode
BA892	Infineon	BA891	BS diode
BA892	Infineon	BA891	BS diode
BA895	Infineon	BAP70-02	PIN diode
BAR14-1	Infineon	BAP70-03	PIN diode
BAR15-1	Infineon	BAP70-03	PIN diode
BAR16-1	Infineon	BAP70-03	PIN diode
BAR17	Infineon	BAP50-03	PIN diode
BAR60	Infineon	BAP50-03	PIN diode
BAR61	Infineon	BAP50-03	PIN diode
BAR63	Infineon	BAP63-03	PIN diode
BAR63-02L	Infineon	BAP63-02	PIN diode
BAR63-02V	Infineon	BAP63-02	PIN diode
BAR63-02W	Infineon	BAP63-02	PIN diode
BAR63-03W	Infineon	BAP63-03	PIN diode
BAR63-05	Infineon	BAP63-05W	PIN diode
BAR63-05W	Infineon	BAP63-05W	PIN diode
BAR64-02V	Infineon	BAP64-02	PIN diode
BAR64-02W	Infineon	BAP64-02	PIN diode
BAR64-03W	Infineon	BAP64-03	PIN diode
BAR64-04	Infineon	BAP64-04	PIN diode
BAR64-04W	Infineon	BAP64-04W	PIN diode
BAR64-05	Infineon	BAP64-05	PIN diode
BAR64-05W	Infineon	BAP64-05W	PIN diode
BAR64-06	Infineon	BAP64-06	PIN diode
BAR64-06W	Infineon	BAP64-06W	PIN diode
BAR65-02V	Infineon	BAP65-02	PIN diode
BAR65-02W	Infineon	BAP65-02	PIN diode
BAR65-03W	Infineon	BAP65-03	PIN diode
BAR66	Infineon	BAP1321-04	PIN diode
BAR67-02W	Infineon	BAP1321-02	PIN diode
BAR67-03W	Infineon	BAP1321-03	PIN diode
BB304C	Renesas	BF1201WR	FET
BB304M	Renesas	BF1201R	FET
BB305C	Renesas	BF1201WR	FET
BB305M	Renesas	BF1201R	FET
BB403M	Renesas	BF909R	FET
BB501C	Renesas	BF1202WR	FET
BB501M	Renesas	BF1202R	FET
BB502C	Renesas	BF1202WR	FET
BB502M	Renesas	BF1202R	FET
BB503C	Renesas	BF1202WR	FET
BB503M	Renesas	BF1202R	FET
BB535	Infineon	BB149	Varicap
BB545	Infineon	BB149A	Varicap
BB555	Infineon	BB179B	Varicap
BB555	Infineon	BB179B	Varicap
BB565	Infineon	BB179	Varicap
BB601M	Renesas	BF1202	FET
BB639	Infineon	BB148	Varicap
BB639	Infineon	BB153	Varicap
BB640	Infineon	BB152	Varicap
BB641	Infineon	BB152	Varicap
BB659	Infineon	BB178	Varicap
BB659	Infineon	BB178	Varicap
BB664	Infineon	BB187	Varicap
BB664	Infineon	BB178	Varicap
BB664	Infineon	BB178	Varicap
BB669	Infineon	BB152	Varicap
BB814	Infineon	BB201	Varicap
BB831	Infineon	BB131	Varicap
BB833	Infineon	BB131	Varicap
BB835	Infineon	BB131	Varicap
BBY53	Infineon	BB143	Varicap

Manufacturer type	Manufacturer	Philips type	Product family
BBY53-03VW	Infineon	BB143	Varicap
BBY58-02V	Infineon	BB202	Varicap
BBY65	Infineon	BB202	Varicap
BBY66-05	Infineon	BB200	Varicap
BF1005S	Infineon	BF1105	FET
BF1009S	Infineon	BF1109	FET
BF1009SW	Infineon	BF1109WR	FET
BF2030	Infineon	BF1101	FET
BF2030R	Infineon	BF1101R	FET
BF2030W	Infineon	BF1101WR	FET
BF244A	IS	BF245A	FET
BF244B	IS	BF245B	FET
BF244C	IS	BF245C	FET
BF247A	IS	J108	FET
BF247B	IS	J108	FET
BF247C	IS	J108	FET
BF256A	IS	BF245A	FET
BF256B	IS	BF245B	FET
BF256C	IS	BF245C	FET
BF770A	Infineon	BFR93A	WB trs 1-4
BF771	Infineon	PBR951	WB trs 1-4
BF771W	Infineon	BFS540	WB trs 1-4
BF772	Infineon	BFG540	WB trs 1-4
BF775	Infineon	BFR92A	WB trs 1-4
BF775A	Infineon	BFR92A	WB trs 1-4
BF775W	Infineon	BFR92AW	WB trs 1-4
BF851A	IS	BF861A	FET
BF851B	IS	BF861B	FET
BF851C	IS	BF861C	FET
BF994S	Vishay	BF994S	FET
BF996S	Vishay	BF996S	FET
BF998	Vishay	BF998	FET
BF998	Infineon	BF998	FET
BF998R	Vishay	BF998R	FET
BF998RV	Vishay	BF998WR	FET
BF998W	Infineon	BF998WR	FET
BFG135A	Infineon	BFG135	WB trs 1-4
BFG193	Infineon	BFG198	WB trs 1-4
BFG194	Infineon	BFG31	WB trs 1-4
BFG196	Infineon	BFG541	WB trs 1-4
BFG195	Infineon	BFG97	WB trs 1-4
BFG235	Infineon	BFG135	WB trs 1-4
BFP180	Infineon	BFG505/X	WB trs 1-4
BFP181	Infineon	BFG67/X	WB trs 1-4
BFP182	Infineon	BFG67/X	WB trs 1-4
BFP183	Infineon	BFG520/X	WB trs 1-4
BFP183R	Infineon	BFG520/XR	WB trs 1-4
BFP193	Infineon	BFG540/X	WB trs 1-4
BFP193V	Infineon	BFG540W/XR	WB trs 1-4
BFP196W	Infineon	BFG540W/XR	WB trs 1-4
BFP280	Infineon	BFG505/X	WB trs 1-4
BFP405	Infineon	BFG410W	WB trs 5-7
BFP420	Infineon	BFG425W	WB trs 5-7
BFP450	Infineon	BFG480W	WB trs 5-7
BFP81	Infineon	BFG92A/X	WB trs 1-4
BFP93A	Infineon	BFG93A/X	WB trs 1-4
BFQ193	Infineon	BFQ540	WB trs 1-4
BFQ19S	Infineon	BFQ19	WB trs 1-4
BFR106	Infineon	BFR106	WB trs 1-4
BFR180	Infineon	BFR505	WB trs 1-4
BFR180W	Infineon	BFS505	WB trs 1-4
BFR181	Infineon	BFR520	WB trs 1-4
BFR181W	Infineon	BFS520	WB trs 1-4
BFR182	Infineon	PBR941	WB trs 1-4
BFR182W	Infineon	PRF947	WB trs 1-4
BFR183	Infineon	PBR951	WB trs 1-4
BFR183W	Infineon	PRF957	WB trs 1-4
BFR193	Infineon	PBR951	WB trs 1-4
BFR193W	Infineon	PRF957	WB trs 1-4
BFR35AP	Infineon	BFR92A	WB trs 1-4
BFR92AL	Motorola	BFR92A	WB trs 1-4
BFR92P	Infineon	BFR92A	WB trs 1-4
BFR92W	Infineon	BFR92AW	WB trs 1-4
BFR93A	Infineon	BFR93A	WB trs 1-4

Manufacturer type	Manufacturer	Philips type	Product family
BFR93AL	Motorola	BFR93A	WB trs 1-4
BFR93AW	Infineon	BFR93AW	WB trs 1-4
BFS17L	Motorola	BFS17	WB trs 1-4
BFS17P	Infineon	BFS17A	WB trs 1-4
BFS17W	Infineon	BFS17W	WB trs 1-4
BFS481	Infineon	BFM505	WB trs 1-4
BFS483	Infineon	BFM520	WB trs 1-4
BFT92	Infineon	BFT92	WB trs 1-4
BFT93	Infineon	BFT93	WB trs 1-4
BIC701C	Renesas	BF1105WR	FET
BIC701M	Renesas	BF1105R	FET
BIC702C	Renesas	BF1105WR	FET
BIC702M	Renesas	BF1105R	FET
BIC801M	Renesas	BF1105	FET
BSR111	IS	PMBFJ111	FET
BSR112	IS	PMBFJ112	FET
BSR113	IS	PMBFJ113	FET
BSR174	IS	PMBFJ174	FET
BSR175	IS	PMBFJ175	FET
BSR176	IS	PMBFJ176	FET
BSR177	IS	PMBFJ177	FET
CA2830	IS	BGR269	CATV RA
CA901	IS	BGX885N	CATV PPA
CA901A	IS	BGX885N	CATV PPA
CA922	IS	BGD885	CATV PD
CA922A	IS	BGD885	CATV PD
CMY91	Infineon	BGA2022	MMIC
D5540185	IS	BGD502	CATV PD
D7540185	IS	BGD702	CATV PD
D7540200	IS	BGD704	CATV PD
D8640185	IS	BGD802	CATV PD
D8640250GT	IS	CGD914	CATV PD
D8640250GTH	IS	CGD923	CATV PD
D8740180GT	IS	CGD923	CATV PD
D8740200GT	IS	CGD923	CATV PD
FSD273TA	Skyworks	BB148	Varicap
FSD273TA	Skyworks	BB178	Varicap
FSD273TA	Skyworks	BB178	Varicap
HBFP0405	Agilent	BFG410W	WB trs 5-7
HBFP0420	Agilent	BFG425W	WB trs 5-7
HBFP0450	Agilent	BFG480W	WB trs 5-7
HSC277	Renesas	BA277	BS diode
HSMP3800	Agilent	BAP70-03	PIN diode
HSMP3802	Agilent	BAP50-04	PIN diode
HSMP3804	Agilent	BAP50-05	PIN diode
HSMP3810	Agilent	BAP50-03	PIN diode
HSMP3814	Agilent	BAP50-05	PIN diode
HSMP381B	Agilent	BAP50-03	PIN diode
HSMP381C	Agilent	BAP50-05	PIN diode
HSMP381F	Agilent	BAP64-05W	PIN diode
HSMP3820	Agilent	BAP1321-03	PIN diode
HSMP3822	Agilent	BAP1321-04	PIN diode
HSMP3830	Agilent	BAP64-03	PIN diode
HSMP3832	Agilent	BAP64-04	PIN diode
HSMP3833	Agilent	BAP64-06	PIN diode
HSMP3834	Agilent	BAP64-05	PIN diode
HSMP3860	Agilent	BAP50-03	PIN diode
HSMP3862	Agilent	BAP50-04	PIN diode
HSMP3864	Agilent	BAP50-05	PIN diode
HSMP386B	Agilent	BAP50-02	PIN diode
HSMP386E	Agilent	BAP50-04W	PIN diode
HSMP386L	Agilent	BAP50-05W	PIN diode
HSMP3880	Agilent	BAP51-03	PIN diode
HSMP3890	Agilent	BAP51-03	PIN diode
HSMP3892	Agilent	BAP64-04	PIN diode
HSMP3894	Agilent	BAP64-05	PIN diode
HSMP3895	Agilent	BAP51-02	PIN diode
HSMP389B	Agilent	BAP51-02	PIN diode
HSMP389C	Agilent	BAP64-04	PIN diode
HSMP389F	Agilent	BAP51-05W	PIN diode
HVB14S	Renesas	BAP50-04W	PIN diode
HVC131	Renesas	BAP65-02	PIN diode
HVC132	Renesas	BAP51-02	PIN diode
HVC200A	Renesas	BB178	Varicap

Manufacturer type	Manufacturer	Philips type	Product family
HVC200A	Renesas	BB178	Varicap
HVC200A	Renesas	BB187	Varicap
HVC202A	Renesas	BB179	Varicap
HVC202B	Renesas	BB179B	Varicap
HVC202B	Renesas	BB179B	Varicap
HVC300A	Renesas	BB182	Varicap
HVC300A	Renesas	BB182	Varicap
HVC300B	Renesas	BB182	Varicap
HVC306A	Renesas	BB187	Varicap
HVC306B	Renesas	BB187	Varicap
HVC355	Renesas	BB145	Varicap
HVC355B	Renesas	BB145B	Varicap
HVC359	Renesas	BB202	Varicap
HVC363A	Renesas	BB178	Varicap
HVC363A	Renesas	BB178	Varicap
HVC369B	Renesas	BB143	Varicap
HVC376B	Renesas	BB198	Varicap
HVC376B	Renesas	BB202	Varicap
HVD132	Renesas	BAP51-02	PIN diode
HVU131	Renesas	BAP65-03	PIN diode
HVU132	Renesas	BAP51-03	PIN diode
HVU202(A)	Renesas	BB149	Varicap
HVU202(A)	Renesas	BB149A	Varicap
HVU300A	Renesas	BB152	Varicap
HVU307	Renesas	BB148	Varicap
HVU315	Renesas	BB148	Varicap
HVU316	Renesas	BB131	Varicap
HVU363A	Renesas	BB148	Varicap
HVU363A	Renesas	BB153	Varicap
HVU363B	Renesas	BB148	Varicap
INA-51063	Agilent	BGA2001	MMIC
J270	IS	J177	FET
J308	IS	J108	FET
J309	IS	J109	FET
J310	IS	J110	FET
JDP2S01E	Toshiba	BAP65-02	PIN diode
JDP2S01U	Toshiba	BAP65-03	PIN diode
JDP2S02T	Toshiba	BAP63-02	PIN diode
JDP2S04E	Toshiba	BAP50-02	PIN diode
KV1470	Toko	BB200	Varicap
KV1835E	Toko	BB199	Varicap
MA2S077	IS	BA277	BS diode
MA2S357	Matsushita	BB187	Varicap
MA2S357	Matsushita	BB178	Varicap
MA2S357	Matsushita	BB178	Varicap
MA2S372	Matsushita	BB179	Varicap
MA2S374	Matsushita	BB182	Varicap
MA2SV01	Renesas	BB202	Varicap
MA357	Matsushita	BB153	Varicap
MA366	Matsushita	BB148	Varicap
MA368	Matsushita	BB131	Varicap
MA372	Matsushita	BB149	Varicap
MA372	Matsushita	BB149A	Varicap
MA4CP101A	Matsushita	BAP65-03	PIN diode
MA4P274-1141	Matsushita	BAP51-03	PIN diode
MA4P275-1141	Matsushita	BAP65-03	PIN diode
MA4P275CK-287	Matsushita	BAP65-05	PIN diode
MA4P277-1141	Matsushita	BAP70-03	PIN diode
MA4P278-287	Matsushita	BAP70-03	PIN diode
MA4P789-1141	Matsushita	BAP1321-03	PIN diode
MA4P789ST-287	Matsushita	BAP1321-04	PIN diode
MC7712	IS	BGY785A	CATV PPA
MC7716	IS	BGY787	CATV PPA
MC7722	IS	BGY785A	CATV PPA
MC7726	IS	BGY787	CATV PPA
MC7833	IS	CGY887A	CATV PPA/HG
MC7852	IS	BGY885A	CATV PPA
MC7856	IS	CGY887	CATV PPA
MC7862	IS	CGD923	CATV PD
MC7866	IS	BGD816L	CATV PD
MHW11224	Motorola/Freescale	BGY67	CATV RA
MHW1244	Motorola/Freescale	BGY67A	CATV RA
MHW1303LA	Motorola/Freescale	BGR269	CATV RA
MHW1304LA	Motorola/Freescale	BGY68	CATV RA

Manufacturer type	Manufacturer	Philips type	Product family
MHW5182A	Motorola/Freescale	BGY585A	CATV PPA
MHW5185B	Motorola/Freescale	BGD502	CATV PD
MHW5222A	Motorola/Freescale	BGY587	CATV PPA
MHW5272A	Motorola/Freescale	BGY587B	CATV PPA/HG
MHW5342A	Motorola/Freescale	BGY588N	CATV PPA/HG
MHW5342T	Motorola/Freescale	BGY588N	CATV PPA/HG
MHW6182	Motorola/Freescale	BGY585A	CATV PPA
MHW6182-6	Motorola/Freescale	BGY685A	CATV PPA
MHW6182T	Motorola/Freescale	BGY585A	CATV PPA
MHW6185B	Motorola/Freescale	BGD502	CATV PD
MHW6185T	Motorola/Freescale	BGD502	CATV PD
MHW6205	Motorola/Freescale	BGD704	CATV PD
MHW6222	Motorola/Freescale	BGY587	CATV PPA
MHW6222B	Motorola/Freescale	BGY687	CATV PPA
MHW6222T	Motorola/Freescale	BGY587	CATV PPA
MHW6272	Motorola/Freescale	BGY587B	CATV PPA/HG
MHW6272T	Motorola/Freescale	BGY587B	CATV PPA/HG
MHW6342	Motorola/Freescale	BGY588N	CATV PPA/HG
MHW6342T	Motorola/Freescale	BGY588N	CATV PPA/HG
MHW7182B	Motorola/Freescale	BGY785A	CATV PPA
MHW7185C	Motorola/Freescale	BGD712	CATV PD
MHW7205C	Motorola/Freescale	BGD714	CATV PD
MHW7222	Motorola/Freescale	BGY787	CATV PPA
MHW7222A	Motorola/Freescale	BGY787	CATV PPA
MHW7222B	Motorola/Freescale	BGY787	CATV PPA
MHW7222B	Motorola/Freescale	BGY787	CATV PPA
MHW7292	Motorola/Freescale	BGE787B	CATV PPA/HG
MHW7292A	Motorola/Freescale	BGE787B	CATV PPA/HG
MHW7342	Motorola/Freescale	BGE788	CATV PPA/HG
MHW8142	Motorola/Freescale	BGY883	CATV PPA
MHW8182B	Motorola/Freescale	BGY885A	CATV PPA
MHW8185	Motorola/Freescale	BGD902	CATV PD
MHW8185L	Motorola/Freescale	BGD902L	CATV PD
MHW8202B	Motorola/Freescale	BGY885B	CATV PPA
MHW8205	Motorola/Freescale	BGD904	CATV PD
MHW8205L	Motorola/Freescale	BGD904L	CATV PD
MHW8272A	Motorola/Freescale	CGY887B	CATV PPA/HG
MHW8292	Motorola/Freescale	BGY887B	CATV PPA/HG
MHW9182B	Motorola/Freescale	BGY1085A	CATV PPA
MHW9187	Motorola/Freescale	CGD923	CATV PD
MHW9188	Motorola/Freescale	CGD923	CATV PD
MHWJ5272A	Motorola/Freescale	BGY587B	CATV PPA/HG
MHWJ7185A	Motorola/Freescale	BGD712	CATV PD
MHWJ7205A	Motorola/Freescale	BGD714	CATV PD
MHWJ7292	Motorola/Freescale	BGE787B	CATV PPA/HG
MHWJ9182	Motorola/Freescale	BGY1085A	CATV PPA
MMBF4391	Motorola	PMBF4391	FET
MMBF4392	Motorola	PMBF4392	FET
MMBF4393	Motorola	PMBF4393	FET
MMBF4860	Motorola	PMBFJ112	FET
MMBF5484	Motorola	BFR31	FET
MMBFJ113	Motorola	PMBFJ113	FET
MMBFJ174	Motorola	PMBFJ174	FET
MMBFJ175	Motorola	PMBFJ175	FET
MMBFJ176	Motorola	PMBFJ176	FET
MMBFJ177	Motorola	PMBFJ177	FET
MMBFJ308	Motorola	PMBFJ308	FET
MMBFJ309	Motorola	PMBFJ309	FET
MMBFJ310	Motorola	PMBFJ310	FET
MMBFU310	Motorola	PMBFJ310	FET
MMBR5031L	Motorola	BFS17	WB trs 1-4
MMBR5179L	Motorola	BFS17A	WB trs 1-4
MMBR571L	Motorola	PBR951	WB trs 1-4
MMBR901L	Motorola	BFR92A	WB trs 1-4
MMBR911L	Motorola	BFR93A	WB trs 1-4
MMBR920L	Motorola	BFR93A	WB trs 1-4
MMBR931L	Motorola	BFT25A	WB trs 1-4
MMBR941BL	Motorola	PBR941	WB trs 1-4
MMBR941L	Motorola	PBR941	WB trs 1-4
MMBR951AL	Motorola	PBR951	WB trs 1-4
MMBR951L	Motorola	PBR951	WB trs 1-4
MMBV105GLT1	ON Semicond.	BB156	Varicap
MMBV109LT1	ON Semicond.	BB148	Varicap
MPF102	IS	BF245A	FET

Manufacturer type	Manufacturer	Philips type	Product family
MPPF970	IS	J174	FET
MPPF971	IS	J176	FET
MRF577	Motorola	PRF957	WB trs 1-4
MRF5811L	Motorola	BFG93A/X	WB trs 1-4
MRF917	Motorola	BFG67W	WB trs 1-4
MRF927	Motorola	BFS25A	WB trs 1-4
MRF9411L	Motorola	BFG520/X	WB trs 1-4
MRF947	Motorola	BFS520	WB trs 1-4
MRF947A	Motorola	PRF947	WB trs 1-4
MRF9511L	Motorola	BFG540/X	WB trs 1-4
MRF957	Motorola	PRF957	WB trs 1-4
MT4S34U	Toshiba	BFG410W	WB trs 5-7
PRF947B	Motorola	PRF947	WB trs 1-4
PZPJ108	IS	J108	FET
PZPJ109	IS	J109	FET
PZPJ110	IS	J110	FET
R0605250L	IS	BGY66B	CATV RA
R0605300L	IS	BGY68	CATV RA
R0605300L	IS	BGY68	CATV RA
R2005240	IS	BGY67A	CATV RA
R2005240	IS	BGY67A	CATV RA
R2005350L	IS	BGR269	CATV RA
RN142G	Rohm	BAP1321-03	PIN diode
RN142S	Rohm	BAP1321-02	PIN diode
RN731V	Rohm	BAP50-03	PIN diode
RN739D	Rohm	BAP50-04	PIN diode
RN739F	Rohm	BAP50-04W	PIN diode
S505T	Vishay	BF1101	FET
S505TR	Vishay	BF1101R	FET
S505TRW	Vishay	BF1101WR	FET
S5540220	IS	BGY587	CATV PPA
S595T	Vishay	BF1105	FET
S595TR	Vishay	BF1105R	FET
S595TRW	Vishay	BF1105WR	FET
S7540185	IS	BGY785A	CATV PPA
S7540215	IS	BGY787	CATV PPA
S8740190	IS	BGD812	CATV PD
S8740220	IS	BGD814	CATV PD
S8740230	IS	BGD816L	CATV PD
S949T	Vishay	BF1109	FET
S949TR	Vishay	BF1109R	FET
S949TRW	Vishay	BF1109WR	FET
S974T	Vishay	BF1109	FET
S974TR	Vishay	BF1109R	FET
S974TRW	Vishay	BF1109WR	FET
SMP1302-004	Skyworks	BAP50-05	PIN diode
SMP1302-005	Skyworks	BAP50-04	PIN diode
SMP1302-011	Skyworks	BAP50-03	PIN diode
SMP1302-074	Skyworks	BAP50-05W	PIN diode
SMP1302-075	Skyworks	BAP50-04W	PIN diode
SMP1302-079	Skyworks	BAP50-02	PIN diode
SMP1304-001	Skyworks	BAP70-03	PIN diode
SMP1304-011	Skyworks	BAP70-03	PIN diode
SMP1307-001	Skyworks	BAP70-03	PIN diode
SMP1307-011	Skyworks	BAP70-03	PIN diode
SMP1320-004	Skyworks	BAP65-05	PIN diode
SMP1320-011	Skyworks	BAP65-03	PIN diode
SMP1320-074	Skyworks	BAP65-05W	PIN diode
SMP1321-001	Skyworks	BAP1321-03	PIN diode
SMP1321-005	Skyworks	BAP1321-04	PIN diode
SMP1321-011	Skyworks	BAP1321-03	PIN diode

Manufacturer type	Manufacturer	Philips type	Product family
SMP1321-075	Skyworks	BAP1321-04	PIN diode
SMP1321-079	Skyworks	BAP1321-02	PIN diode
SMP1322-004	Skyworks	BAP65-05	PIN diode
SMP1322-011	Skyworks	BAP65-03	PIN diode
SMP1322-074	Skyworks	BAP65-05W	PIN diode
SMP1322-079	Skyworks	BAP65-02	PIN diode
SMP1340-011	Skyworks	BAP63-03	PIN diode
SMP1340-079	Skyworks	BAP63-02	PIN diode
SMP1352-011	Skyworks	BAP64-03	PIN diode
SMP1352-079	Skyworks	BAP64-02	PIN diode
SMV1235-004	Skyworks	BB181	Varicap
SMV1236-004	Skyworks	BB156	Varicap
SMV1263-079	Skyworks	BB143	Varicap
SST111	IS	PMBFJ111	FET
SST112	IS	PMBFJ112	FET
SST113	IS	PMBFJ113	FET
SST174	IS	PMBFJ174	FET
SST175	IS	PMBFJ175	FET
SST176	IS	PMBFJ176	FET
SST177	IS	PMBFJ177	FET
SST201	IS	BFT46	FET
SST202	IS	BFR31	FET
SST203	IS	BFR30	FET
SST308	IS	PMBFJ308	FET
SST309	IS	PMBFJ309	FET
SST310	IS	PMBFJ310	FET
SST4391	IS	PMBF4391	FET
SST4392	IS	PMBF4392	FET
SST4393	IS	PMBF4393	FET
SST4856	IS	BSR56	FET
SST4857	IS	BSR57	FET
SST4859	IS	BSR56	FET
SST4860	IS	BSR57	FET
SST4861	IS	BSR58	FET
SVC201SPA	Sanyo	BB187	Varicap
TMPF4091	IS	PMBF4391	FET
TMPF4092	IS	PMBF4392	FET
TMPF4093	IS	PMBF4393	FET
TMPF4391	IS	PMBF4391	FET
TMPF4392	IS	PMBF4392	FET
TMPF4393	IS	PMBF4393	FET
TMPFB246A	IS	BSR56	FET
TMPFB246B	IS	BSR57	FET
TMPFB246C	IS	BSR58	FET
TMPFJ111	IS	PMBFJ111	FET
TMPFJ112	IS	PMBFJ112	FET
TMPFJ113	IS	PMBFJ113	FET
TMPFJ174	IS	PMBFJ174	FET
TMPFJ175	IS	PMBFJ175	FET
TMPFJ176	IS	PMBFJ176	FET
TMPFJ177	IS	PMBFJ177	FET
TSDF54040	Vishay	BF1102	FET
uPC2709	NEC	BGA2709	MMIC
uPC2711	NEC	BGA2711	MMIC
uPC2712	NEC	BGA2712	MMIC
uPC2745	NEC	BGA2001	MMIC
uPC2746	NEC	BGA2001	MMIC
uPC2748	NEC	BGA2748	MMIC
uPC2771	NEC	BGA2771	MMIC
uPC8112	NEC	BGA2022	MMIC

4.2 Cross-references: Philips discontinued types versus Philips replacement types

In alphabetical order of manufacturer type

Abbreviations:

BS diode	Band Switch Diode
CATV	Community Antenna Television System
FET	Field Effect Transistor
Varicap	Varicap Diode
WB trs	Wideband Transistor
OM	Optical Module

Philips discontinued type	Product family	Philips replacement type
BA277-01	BS diode	BA277
BAP142L	PIN diode	BAP142LX
BAP51-01	PIN diode	BAP51LX
BAP51L	PIN diode	BAP51LX
BAP55L	PIN diode	BAP55LX
BB145B-01	Varicap	BB145B
BB151	varicap	BB135
BB157	varicap	BB187
BB178L	Varicap	BB178LX
BB179BL	Varicap	BB179BLX
BB179L	Varicap	BB179LX
BB181L	Varicap	BB181LX
BB182B	Varicap	BB182
BB182B	Varicap	BB182
BB182L	Varicap	BB182LX
BB187L	Varicap	BB187LX
BB190	Varicap	BB149
BB202L	Varicap	BB202LX
BBY42	Varicap	BBY40
BF1203	FET	BF1203
BF689K	WB trs	BF517
BF763	WB trs	BF517
BF851A	FET	BF861A
BF851A	FET	BF861A
BF851B	FET	BF851B
BF851B	FET	BF851B
BF851C	FET	BF861C
BF851C	FET	BF861C
BF992/01	FET	BF992
BFC505	WB trs	BFM505
BFC520	WB trs	BFM520
BFET505	WB trs	BFM505
BFET520	WB trs	BFM520
BFG17A	WB trs	BF517A
BFG197	WB trs	BFG198
BFG197/X	WB trs	BFG198
BFG25AW/XR	WB trs	BFG25AW/X
BFG410W/CA	WB trs	BFG410W
BFG425W/CA	WB trs	BGF425W
BFG425W/CA	WB trs	BGF425W
BFG505/XR	WB trs	BFG505/X
BFG505W/XR	WB trs	BFG505W/X
BFG520W/XR	WB trs	BFG520W/X
BFG590/XR	WB trs	BFG590/X
BFG590W	WB trs	BFG590W/X
BFG590W/XR	WB trs	BFG590W/X
BFG67/XR	WB trs	BFG67
BFG92A	WB trs	BFG92A/X
BFG92A/XR	WB trs	BFG92A/X
BFG93A/XR	WB trs	BFG93A/X
BFQ34/01	WB trs	BFG35
BFR92	WB trs	BFR92A
BFR92AR	WB trs	BFR92A
BFR92AT	WB trs	BFR92AW
BFR93	WB trs	BFR92A
BFR93AT	WB trs	BFR93AW

Philips discontinued type	Product family	Philips replacement type
BFR93R	WB trs	BFR93A
BFU510	WB trs	CFH705W
BFU540	WB trs	CFH705W
BGA2031	WB trs	BGA2031/1
BGD102/02	CATV	BGD502
BGD102/04	CATV	BGD502
BGD104	CATV	BGD704
BGD104/04	CATV	BGD704
BGD502/01	CATV	BGD502
BGD502/01	CATV	BGD502
BGD502/01	CATV	BGD502
BGD502/01	CATV	BGD502
BGD502/01	CATV	BGD502
BGD502/03	CATV	BGD502
BGD502/03	CATV	BGD502
BGD502/05	CATV	BGD502
BGD502/07	CATV	BGD502
BGD502/6M	CATV	BGD702
BGD502/C7	CATV	BGD502
BGD502/R	CATV	BGD502
BGD504	CATV	BGD704
BGD504/01	CATV	BGD704
BGD504/02	CATV	BGD704
BGD504/09	CATV	BGD704
BGD602	CATV	BGD702
BGD602/02	CATV	BGD702
BGD602/07	CATV	BGD702
BGD602/09	CATV	BGD702
BGD602/14	CATV	BGD702
BGD602D	CATV	BGD712
BGD702D	CATV	BGD712
BGD702D/08	CATV	BGD712
BGD704/01	CATV	BGD704
BGD704/07S	CATV	BGD704
BGD704/S9	CATV	BGD704
BGD704N	CATV	BGD714
BGD802/09	CATV	BGD802
BGD802N	CATV	BGD812
BGD802N	CATV	BGD812
BGD802N/07	CATV	BGD812
BGD802N/07	CATV	BGD812
BGD804N	CATV	BGD814
BGD804N	CATV	BGD814
BGD804N/02	CATV	BGD814
BGD804N/02	CATV	BGD814
BGD902/07	CATV	BGD902
BGD904/02	CATV	BGD904
BGD904/07	CATV	BGD904
BGD906/02	CATV	BGD906
BGE67BO	CATV	BGO387
BGE67BO	CATV	BGO387
BGE847BO	CATV	BGO827
BGE847BO	CATV	BGO827
BGE847BO	CATV	BGO827
BGE847BO/FC	CATV	BGO827/FC0
BGE847BO/FC0	CATV	BGO827/FC0
BGE847BO/FC0	CATV	BGO827/FC0

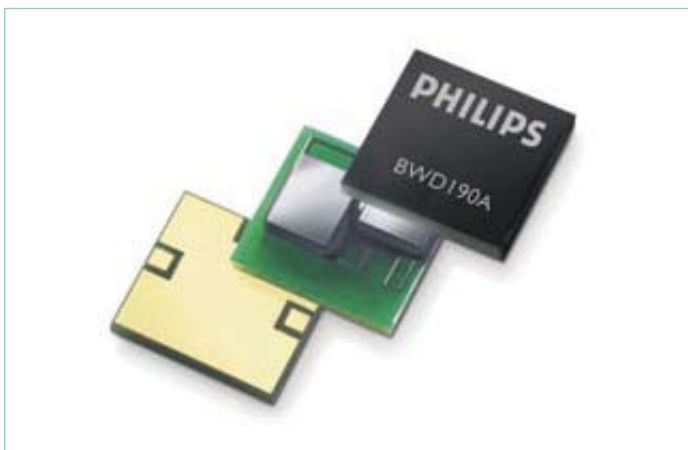
Philips discontinued type	Product family	Philips replacement type
BGE847BO/FC1	CATV	BGO827/FC0
BGE847BO/SC	CATV	BGO827/SC0
BGE847BO/SC0	CATV	BGO827/SC0
BGE847BO/SC0	CATV	BGO827/SC0
BGE887BO	CATV	BGO827
BGE887BO/FC	CATV	BGO827/FC0
BGE887BO/FC1	CATV	BGO827/FC0
BGE887BO/SC	CATV	BGO827/SC0
BGO747/SC0	CATV	BGO747
BGO847/01	CATV	BGO847
BGO847/01	CATV	BGO847
BGO847/FC0	CATV	BGO827/FC0
BGO847/FC0	CATV	BGO827/FC0
BGO847/FC01	CATV	BGO827/FC0
BGO847/FC01	CATV	BGO827/FC0
BGO847/SC0	CATV	BGO827/SC0
BGQ34/01	WB	BFG35
BGU2003	WB trs	BGA2003
BGX885/02	CATV	BGX885N
BGY1085A/07	CATV	BGY1085A
BGY584A	CATV	BGY585A
BGY585A/01	CATV	BGY585A
BGY586	CATV	BGY587
BGY586/05	CATV	BGY587
BGY587/01	CATV	BGY587
BGY587/01	CATV	BGY587
BGY587/02	CATV	BGY587
BGY587/02	CATV	BGY587
BGY587/02	CATV	BGY587
BGY587/07	CATV	BGY587
BGY587/09	CATV	BGY587
BGY587B/01	CATV	BGY587B
BGY587B/02	CATV	BGY587B
BGY587B/09	CATV	BGY587B
BGY588	CATV	BGY588N
BGY588/04	CATV	BGY588N
BGY66B/04	CATV	BGY66B
BGY67/04	CATV	BGY67
BGY67/09	CATV	BGY67
BGY67/14	CATV	BGY67
BGY67/19	CATV	BGY67
BGY67A/04	CATV	BGY67A
BGY67A/14	CATV	BGY67A
BGY67BO	CATV	BGO387
BGY68/01	CATV	BGY68
BGY685A/07	CATV	BGY685A
BGY685AD	CATV	BGY785A
BGY685AD	CATV	BGY785A
BGY685AL	CATV	BGY785A
BGY687/07	CATV	BGY687
BGY687/14	CATV	BGY687
BGY687B	CATV	BGE787B
BGY687B/02	CATV	BGE787B
BGY785A/07	CATV	BGY785A
BGY785A/09	CATV	BGY785A
BGY785AD	CATV	BGY785A
BGY785AD/06	CATV	BGY785A
BGY785AD/8M	CATV	BGY885A

Philips discontinued type	Product family	Philips replacement type
BGY785AD/8M	CATV	BGY885A
BGY787/02	CATV	BGY787
BGY787/07	CATV	BGY787
BGY787/09	CATV	BGY787
BGY847BO	CATV	BGO827
BGY847BO/SC	CATV	BGO827/SC0
BGY84A	CATV	BGY585A
BGY84A/04	CATV	BGY585A
BGY84A/05	CATV	BGY585A
BGY85	CATV	BGY585A
BGY85A	CATV	BGY585A
BGY85A/04	CATV	BGY585A
BGY85A/05	CATV	BGY585A
BGY85H/01	CATV	BGY585A
BGY86	CATV	BGY587
BGY86/05	CATV	BGY587
BGY87	CATV	BGY587
BGY87/J1	CATV	BGY587
BGY87B	CATV	BGY587B
BGY88	CATV	BGY588N
BGY88/04	CATV	BGY588N
BGY88/04	CATV	BGY588N
BGY88/07	CATV	BGY588N
BGY887/02	CATV	BGY887
BGY887BO	CATV	BGO827
BGY887BO/FC	CATV	BGO827/FC0
BGY887BO/FC1	CATV	BGO827/FC0
BGY887BO/SC	CATV	BGO827/SC0
ON4520/09	CATV	BGY687
ON4520/2	CATV	BGY687
ON4594/M5	CATV	BGY585A
ON4749	CATV	BGY588N
ON4749	CATV	BGY588N
ON4831-2	CATV	BGY885A
ON4869	CATV	BGY587
ON4876	CATV	BGY1085A
ON4890	CATV	BGD712
ON4890	CATV	BGD712
ON4990	CATV	BGD885
OQ2545	OM	TZA3011
OQ2545B	OM	TZA3011
PMBT3640/AT	WB trs	BFS17
PN4392	FET	PMBF4392
PN4393	FET	PMBF4393
SA5223	OM	TZA3036
TZA3001	OM	TZA3047
TZA3001	OM	TZA3047
TZA3023	OM	TZA3026
TZA3031	OM	TZA3047
TZA3031	OM	TZA3047
TZA3033	OM	TZA3036
TZA3041	OM	TZA3047
TZA3042B	OM	TZA3047
TZA3043	OM	TZA3046
TZA3043B	OM	TZA3046
XSA5223	OM	TZA3036
XSA5223	OM	TZA3036

5. High performance miniature BAW filters and duplexers

Bulk Acoustic Wave (BAW) filters and duplexers for Front-End Modules and Cellular Phones

Bulk Acoustic Wave filters provide high performance, ultra small size solutions for next generation integrated cellular phones. Together with Philips' patented Chip Scale Package this allows for seamless integration of BAW filters into RF front-end modules.



The Philips series of high-performance Bulk Acoustic Wave (BAW) filters and duplexers is optimized for (W-)CDMA/GSM cellular phones. Available in Philips-patented Wafer Level Chip Scale Packaging (WL-CSP), they provide superior performance in an ultra-small size.

Compared to Surface Acoustic Wave (SAW) filters, BAW typically offers superior power handling, enhanced ESD robustness, smaller size, reduced in-band insertion loss and increased steepness of the filter skirts in lower and upper transition bands. BAW filters also offer less center frequency drift versus temperature change and are more suitable for applications at frequencies ranging from 1 to 20 GHz.

High-performance BAW filters & Duplexers

Designed for easy integration into front-end modules, they deliver low insertion loss and high selectivity. Philips BAW filters and duplexers support receive (Rx) and transmit (Tx) applications in (W-)CDMA and other wireless applications higher than 1.5 GHz :

Features

- High performance BAW filters and duplexers
 - Low insertion loss
 - High stopband rejections/isolations
 - Low temperature drift
 - Superior power handling
 - Enhanced ESD robustness
- Ultra-small, Philips-patented Chip Scale Package
 - Ultra-small footprint (as small as 1.5mm²)
 - Very low profile (height < 450 μ m after solder reflow)
- Flip Chip assembly

- US PCS (1900 MHz)
 - BWT190(A) high-rejection Tx interstage filter
 - BWD190(A) duplexer
- UMTS (2100MHz)
 - BWD210(A) BAW duplexer
- Bluetooth/WLAN antenna filter (2400 MHz)
 - BWR240(A) antenna filter

Customer benefits

- Optimized for:
 - 1900 MHz US PCS (W-)CDMA
 - UMTS
 - Satellite radio, Bluetooth
- Easy package-less chip scale integration into RF front-end module
- Integrated balun option via Philips passive integration process technology
- Reduced PCB implementation size
- Ideal for high frequency applications
- Superior performance in very small size

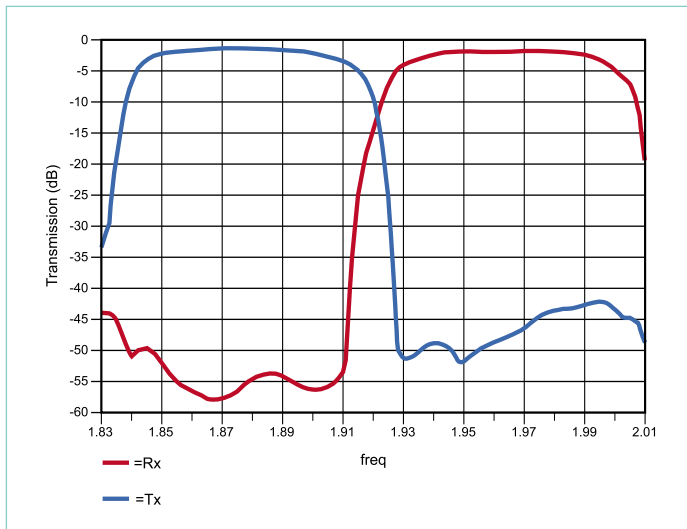
Philips Semiconductors BAW devices

Type	Description	Freq. (MHz)	Size chip scale (mm ²)	Molded
BWT190(A)	PCSTx interstage filter	1900	1.7 × 1.0	2.0 × 1.6
BWD190(A)	PCS duplexer	1900	Tx: 1.5 × 1.5 Rx: 1.8 × 1.5	3.8 × 3.8
BWD210(A)	UMTS duplexer	2100	Tx: 1.5 × 1.5 Rx: 1.8 × 1.5	3.8 × 3.8
BWR240(A)	Bluetooth/WLAN filter	2400	1.5 × 1.0	n.a.

Electrical characteristics of the BWD190A, T_j = 25°C, Z₀ = 50Ω

Parameter	Band	Frequency (MHz)	Min (dB)	Max (dB)
Insertion Loss	Tx	1850 – 1910	-	3.5
	Rx	1930 – 1990	-	3.8
Ripple	Tx		-	2
Rejection			-	-
Tx to Antenna	Rx		41	-
Rx to Antenna	Tx		50	-
Return Loss	Tx		12	-
	Rx		12	-
	Antenna		12	-
Isolation (Tx – Rx)	Tx		53	-
	Rx		45	-

Passband characteristics of duplexer BWD190A



6. Satellite outdoor unit (LNB)

One-stop shop for low-noise block downconverter designs

Helping simplify your supply chain, Philips Semiconductors meets all your hardware needs for low-noise block down converter (LNB) designs. Our high-quality components are finely tuned to work together seamlessly for the best performance. In addition, a wide choice of types ensures maximum design freedom.



The low-noise block down converter (LNB) or outdoor unit (ODU) plays a vital role in delivering satellite TV signals to consumers. Philips offers a complete range of components required to design high-performance LNB systems. Our portfolio covers everything from gallium-arsenide (GaAs) pHEMTs for the low-noise amplifier (LNA) stages to silicon monolithic microwave ICs (MMICs) for the output IF amplifiers – and everything in between. All fully optimized to work together to deliver the best performance.

All our LNB components are supplied in easy-to-use industry-standard packages, making system assembly simpler. And full design support is available to help cut time-to-market even further. Our one-stop shop range greatly simplifies your supply chain, and gives you the reassurance of reliable high-volume supply.

Key benefits

- Complete one-stop shop for LNB designs, ensuring simple & convenient supply chain
- Full system and application support available
- Reliable, high-volume supply
- Easy-to-use, industry-standard packages

Featured products

- CFH70x GaAs pHEMT LNAs
- BFG424F bipolar wideband transistor oscillator
- BGA27xx & BGM101x MMIC IF amplifiers

CFH70x GaAs LNAs (in development)

The CFH70x pHEMT family is fabricated using GaAs process technology to deliver extremely low noise and very high gain. It is supplied in the easy-to-use SOT343FP plastic 4-pin SMD package. CFH70x pHEMTs are ideal solutions for the mixer and both LNA stages in satellite LNB downconverters.

Key features

- Low noise
- High gain
- Compact flat-lead SOT343FP package simplifies assembly

Product overview

Type	@		@ 12GHz		Limits		
	V _{ds} (V)	I _d	NF (dB)	Gain* (dB)	V _{ds} (V)	I _d (mA)	
CFH705F	2	10	0.55	11.5	4	70	2nd stage LNAs, also for mixer
CFH703A	2	10	0.35	13.5	4	70	1st stage LNAs

Notes: * Ga = associated gain

BFG424F bipolar oscillator

The BFG424F is an NPN double polysilicon wideband transistor with a buried layer for low-voltage applications. Housed in an easy-to-use SOT343F package, it features very high gain, stable phase noise & low feedback capacitance.

Key features

- Stable phase noise over temperature performance
Compact flat-lead SOT343F package simplifies assembly
- Free oscillations at all LO frequencies

Product overview

BFG424F															
V _{CBO} (V)	V _{CEO} (V)	I _C (mA)	P _{tot} (mW)	h _{FE} (dB)	C _{re} (fF)	f _T (GHz)	G _{max} (dB)	Noise (dB)	Phase noise @ 13.85GHz (dBc)			Phase noise @ 14.35GHz (dBc)			
										25°C	35°C	65°C	25°C	35°C	65°C
10	4.5	30	135	120	95	25	20	1.2		-94.68			-95.68		

BGA27xx and BGM101x silicon MMIC IF amplifiers

MMICs integrate several components onto a single chip to reduce component count and simplify design. They deliver high gain and low noise, and automatically compensate for temperature and process variations. Our BGA27xx and BGM101x families include a range of innovative products such as low-current and low-voltage options. They are supplied in the compact, SOT363 package for easy system integration.

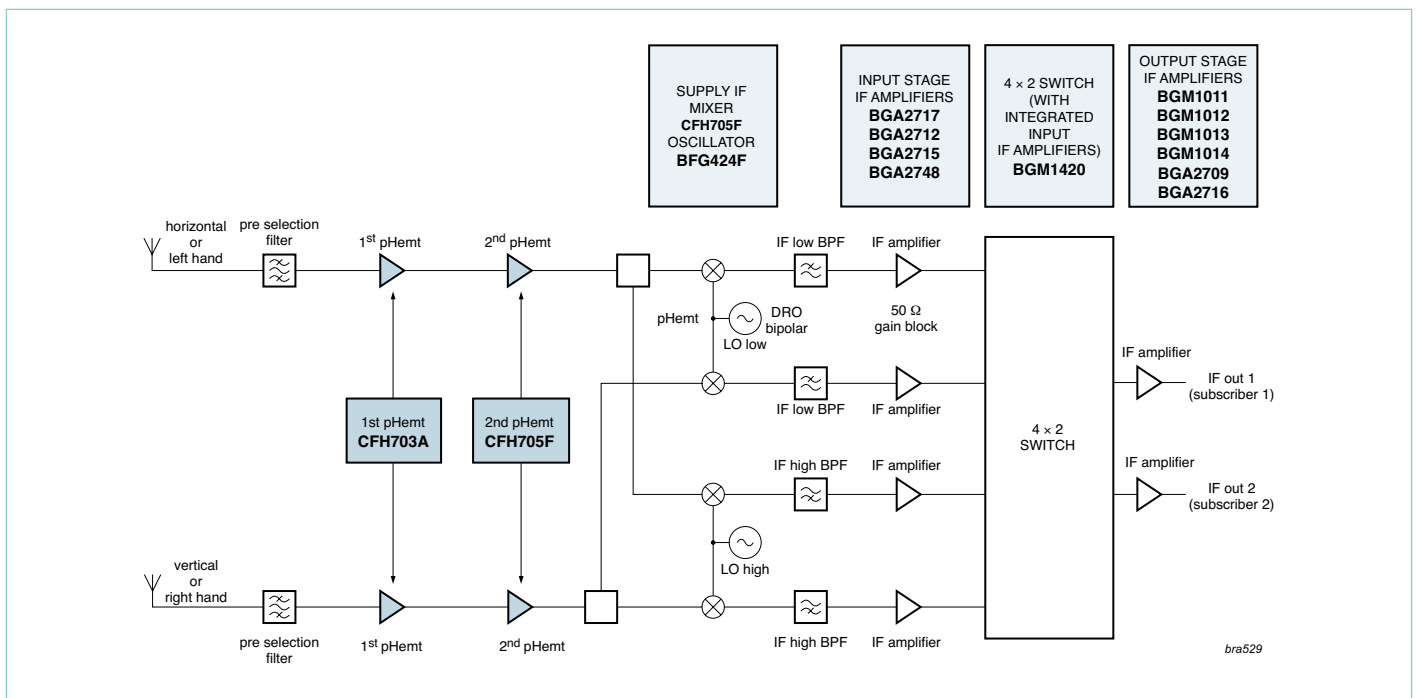
Features

- Wide range of options for maximum design flexibility
- Variety of gain slopes (including flat gain over frequency), low voltage (3V) & low current (4mA) option.

Product overview

BGA27xx & BGM10xx IF amplifiers in SOT363 6 pin SMD package														
Type	@ fu		@1GHz						Gain(dB) @				Limits	
	Vs (V)	Is (mA)	@-dB (mA)	NF (dB)	Psat (dbm)	Gain (dB)	P1dB (dbm)	OIP3 (dbm)	100 MHz	2.2 Hz	2.6 Hz	3.0 GHz	Vs (V)	Is (mA)
BGA2709	5	23.5	3.6	4.0	12.5	22.7	8.3	22	22.2	23	22.1	21.1	6	35
BGA2712	5	12.3	3.2	3.9	4.8	21.3	0.2	11	20.8	21.9	21.2	19.3	6	25
BGA2715	5	4.3	3.3	2.6	-4	21.7	-8	2.3	13.3	23.3	22.1	20.1	6	8
BGA2716	5	15.9	3.2	5.3	11.6	22.9	8.9	22.2	22.1	22.8	22.1	20.8	6	30
BGM1013	5	27.5	2.1	4.6	14	35.5	13	22.7	35.2	31.8	29.7	26.1	6	35
BGM1011	5	25.5	2.9	4.7	13.8	30	12.2	23	25	37	32	28	6	35
BGM1012	3	14.6	3.6	4.8	9.7	20.1	5.6	18	19.5	20.4	19.9	18.7	4	30
BGM1014	5	21	2.5	4.2	12.9	32.3	12.2	20.5	30	34.1	30.5	26.4	6	30

BGA2715 / BGA 2716: Low current types BGM1013 / BGM1011 / BGM1012 / BGM1014: Optimized & high slope types



LNB complete solution block diagram

7. Philips CATV C-family for the Chinese SARFT standard

Connecting people, protecting your network

Specially designed for the Chinese Hybrid Fiber Coax (HFC) infrastructure, Philips CATV C-family offers you a total solution for cable TV networks. It is both flexible enough for connecting rural communities as part of China's 'Connecting every village' program and powerful enough for upgrading major cities from analog to high-end digital services. All C-type devices are compliant with the Chinese State Administration for Radio, Film and Television (SARFT) standard, and cover most HFC applications in the 550 - 860 MHz range.



Products

- BGY588C and BGE788C push-pull amplifiers
- BGD712C, CGD944C and CGD942C power doublers
- BGO807C optical receiver

Benefits

- Compliant with Chinese SARFT HFC networks standard
- Transparent cap allows confirmation of product authenticity
- Rugged construction

Features

- Excellent linearity, stability and reliability
- High power gain
- Extremely low noise
- Silicon Nitride passivity
- GaAs HFET dies for high end devices

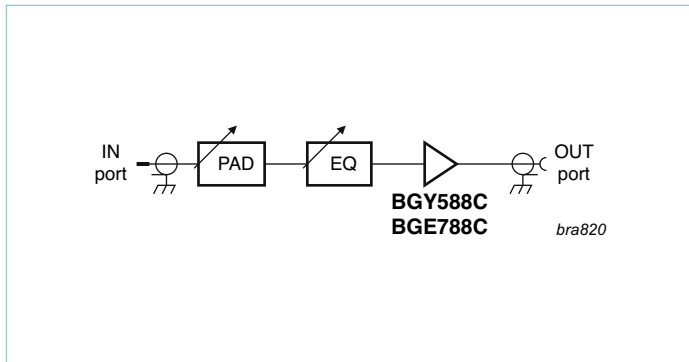
Further extending our high quality CATV portfolio, this new family lets you address an even wider range of HFC applications. Dedicated solutions for the implementation of CATV systems in China, our C-type devices deliver the performance you need for modern TV infrastructures.

The BGY588C, BGE788C and BGD712C devices cover the frequency range from 550 MHz to 750 MHz. Extending the C-family portfolio into the high-end segment, the CGD944C, CGD942C and BGO807C operate between 40 MHz and 870 MHz and have been specifically tested under Chinese raster conditions. Manufactured using our GaAs HFET die process, the CGD942C and CGD944C are high-gain, high-performance 870 MHz power doublers. They are capable of satisfying the demanding requirements of top-end applications including high-power optical nodes.

All CATV C-type devices feature a see-through cap that makes it easy to distinguish them from counterfeit products.

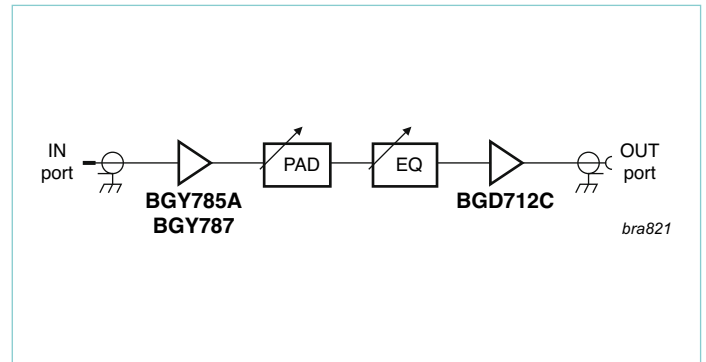
BGY588C and BGE788C

The last stage of an HFC network structure is always a terminating amplifier or as it is closest to the subscribers the 'user amplifier'. Each terminating amplifier requires a single module, with the BGY588C ideal for 550 MHz systems and the BGE788C for 750 MHz. These modules will often be found in Chinese 'Connecting to Every Village' projects.



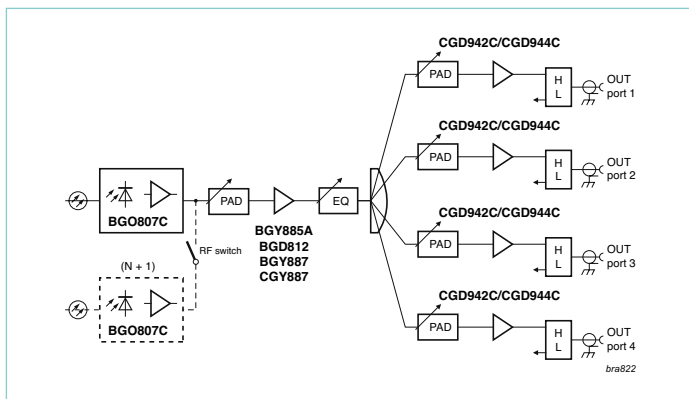
BGD712C

The BGD712C is a 750 MHz, 18 dB power doubler module. It has been designed for 750 MHz optical nodes including optical receivers and distribution amplifiers. It can also be used in line extender amplifiers together with a 750 MHz push-pull module, such as BGY785A or BGY787. As such it can be used widely in Chinese 'Connecting to Every Village' projects.



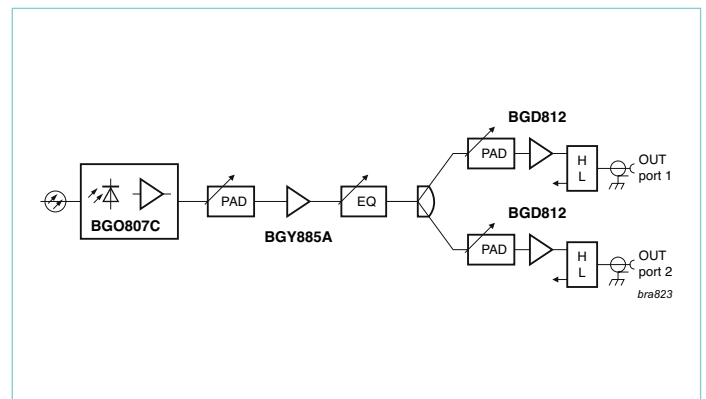
CGD944C and CGD942C

As full GaAs Power doublers modules, the CGD942C and CGD944C offer lower current and better CTB and CSO than other modules. Designed for high-end HFC devices such as optical nodes with multiple out-ports, the high output competency of these modules enables each port to directly cover at least 125 subscribers. In some big cities, these two devices will be widely used in updating HFC networks to 860 MHz.



BGO807C

An integrated optical receiver module, the BGO807C provides high output levels and includes an integrated temperature compensated circuit. A single BGO807C is required for each optical node, so it will be widely used in 'Connecting to Every Village' projects as well as digital upgrades to HFC networks in the large cities. This wide and flexible application range relies on the high performance / price ratio of the BGO807C.



C-family application information

Philips C-family by application						
Application	BGY588C	BGE788C	BGD712C	BGO807C	CGD944C	CGD942C
Optical node			•	•	•	•
Optical receiver			•	•	•	•
Distribution amplifier			•	•	•	
Line extender amplifier			•	•	•	
Terminating amplifier	•	•				

Push-pull amplifiers

Parameters	BGY588C		BGE788C	
	min	max	min	max
Power gain (dB)	33.5	33.7	33.2	33.5
Slope cable equivalent (dB)	0.2	1.7	0.3	2.3
Composite triple beat (dB)		-57		-49
Composite 2 nd order distortion (dB)		-62		-52
Noise (@ f_{max}) (dB)		8		8
Total current consumption (mA)	305	345	285	325
Frequency range (MHz)	40 to 550		40 to 750	

Power doublers

Parameters	BGD712C		CGD944C		CGD942C	
	min	max	min	max	min	max
Power gain (dB)	18.2	18.8	23	25	20.5	23
Slope cable equivalent (dB)	0.5	1.5	0	1	0	1
Composite triple beat (dB)	-	-62	-	-66	-	-66
Composite 2 nd order distortion (dB)	-	-63	-	-68	-	-68
Noise (@ f_{max}) (dB)	-	7	-	7	-	7
Total current consumption (mA)	380	410	-	450	-	450
Frequency range (MHz)	40 to 750		40 to 870		40 to 870	

Optical receiver

Parameters	BGO807C	
	min	max
Responsivity (R_{min})	800	
Slope cable equivalent (dB)	0	2
Composite triple beat (dB)	-	-71
Composite 2 nd order distortion (dB)	-	-54
Noise (@ f_{max}) (dB)	-	8.5
Connector	- / SCO / FCO	
Total current consumption (mA)	175	205
Frequency range (MHz)	40 to 870	

8. TZA30x6 transimpedance amplifiers

TIAs for TO-can based ROSA applications up to 1250 Mbps

Designed for STM1/OC3, STM4/OC12, and FC/GE applications, these high-quality transimpedance preamplifiers have automatic gain control and provide low noise, a wide dynamic range, and low power dissipation.



The TZA30x6 family of transimpedance preamplifiers (TIAs) brings high receiver sensitivity, wide dynamic range, and low power dissipation to receiver optical sub assembly (ROSA) applications that operate at up to 1250 Mbps. Each member of the family is optimized for a particular bit rate and transmission system.

Product no.	Bit rate	Transmission system
TZA3036	155 Mbps	STM1/OC3
TZA3026	622 Mbps	STM4/OC12
TZA3046	1250 Mbps	FC/GE

The absence of offset control loops lets these devices operate from DC upwards and protects the output waveform from consecutive identical digits (CIDs).

Key features

- High receiver sensitivity, low equivalent input noise
- Exceptionally wide bandwidths
- On-chip AGC with options for external control
- Input overload up to 1.5 mA pp
- Differential outputs
- Bias voltage for PIN diode
- Single 3.3-V supply voltage (range: 2.9 to 3.6 V)

Customer benefits

- Current output of average photo current for RSSI monitoring (SFF8472-compliant)
- Easy layout bonding -Identical ports available on both sides of die -RF polarity selection

Applications

- Digital fiber optic receiver modules (SFF/SFP transceivers)
 - Telecommunications transmission systems
 - High-speed data networks
 - FTTx systems

High receiver sensitivity

By minimizing noise, TZA30x6 devices deliver exceptionally high receiver sensitivity. Typical noise levels, calculated with a lowpass bandwidth filter at a 0.7x bit rate and a source with an extinction ratio of 10% and a photodiode responsivity of 0.9A/W, are -40 (TZA3036), -32 (TZA3026), and -29 (TZA3046).

Wide dynamic range

To prevent excessive distortion at the output stage, each TZA30x6 device has an integrated automatic gain control (AGC) loop that reduces the preamplifier's feedback resistance. The AGC loop can be controlled externally and includes a hold capacitor, reducing external chip-count.

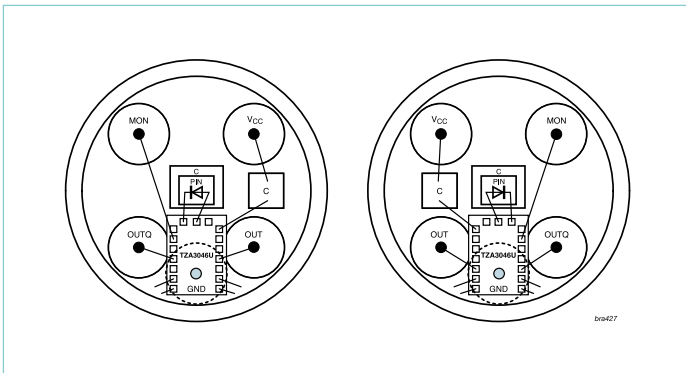
TO-can assemblies

Small size, identical ports on both sides, and RF polarity selection make TZA30x6 devices easy to use with cost-effective TO-can assemblies. Short bonding wires to ground improve overall performance.

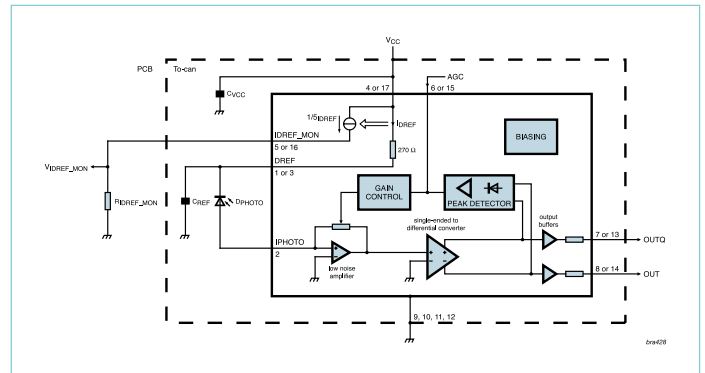
TZA30x6 transimpedance preamplifiers

Product	Application	Bit rate	Sensitivity	In	Overload	Gain	Flow	Fhigh
		(Mbps)	(S) ¹	(nARMS)	(mApp)	(kOhmdiff)	(Hz)	(-3dB)
TZA3036	STM1/OC3	155	-40	10	1.5	69.0	DC	160 MHz
TZA3026	STM4/OC12	622	-32	67	1.5	14.0	DC	650 MHz
TZA3046	FC/GE	1250	-29	130	1.5	9.0	DC	1050 MHz

¹ Calculated from noise figure using a lowpass bandwidth filter at 0.7x bit rate and a source with an extinction ratio of 10% and a photodiode responsivity of 0.9A/W.



Possible TZA30x6 application highlighting flexible pad layout



TZA30x6 application diagram

9. Packing and packaging information

9.1 Leading the way to Pb-free packaging

Throughout the electronics industry, the desire for Pb-free electronics is a hot topic. Customers and manufacturers alike are keen to ensure that new regulations in Europe, the US and Far East are complied with, and sooner rather than later.

The electronics industry is now focused on Pb-free assembly processes and the issues concerning the higher temperatures needed for both reflow and wave Pb-free soldering. By investing heavily in our own research organization, we have developed cost-effective Pb-free manufacturing processes that guarantee the reliability of our components.

More information about this topic:

http://www.semiconductors.philips.com/green_roadmap/

This simple guide offers you answers to some of the most common questions about Philips' lead-free solutions.

What is the difference between RoHS and Pb-free symbol

For Philips Semiconductors all Pb-free products are RoHS compliant. There are also a few types which will have the RoHS indicator but not Pb-free symbol. These are exempt products which may not be completely Pb-free but are RoHS compliant.

Q. Why lead-free?

Environmental improvement (reduction or elimination of the potential hazardous effects from lead poisoning). Philips promotes lead-free manufacturing, which is mandated by legislation and supported by strong market demand.

Q. What is the definition of Pb-free?

Content less than 1000 ppm Pb by weight (E3).


Q. What is the definition of 'Green / RoHS'?

Product complies to RoHS (Restriction of use of Hazardous Substances) legislation.

Q. What is the meaning of "Pb-free terminals"?

Products contain lead inside, however the terminals/leads are Pb-free. Products comply to RoHS because they are on the RoHS exemption list.

Q. How can you see whether a product or package is Pb-free?

The status can be found on the product information page on the internet. Pb-free products are marked with . Detailed conversion status per package can be found in our online product matrix.


Q. Do Philips products contain lead today?

Although numerous Philips products have been lead-free for many years, we are now ensuring all our products are converted to lead-free materials. Of course most packages still contain traces of lead: small amounts well below legislative requirements. Conventional Sn/Pb soldering contributes significantly to overall lead content of electronic equipment, together with any lead present in the components themselves.

Q. How do I get lead-free samples?

For most products, samples can be ordered via your normal sales contact. For small-signal discretes, please order through the sample-store adding the comment 'Only lead-free' to your order.

Q. How are Philips Semiconductors' lead-free packages identified?

A Pb-free logo will be added to the label (see example below). Where there is no room for this a self-adhesive sticker, shown below, is attached to both reel and SPQ. 

9.2 Ultra thin leadless package platform



Philips ultra-thin leadless package (UTLP) platform for faster time-to-market, smaller form factor.

Key features

- Low height (0.4 mm)
- Small footprint
- Very flexible platform
- High silicon-to-footprint ratio
- Increased performance
- Footprint compatible with JETA standard SC-101
- Very efficient packing (15k/7" reel)
- RoHS-compliant, green plastic.

Key benefits

- Improved electrical, thermal and moisture resistance
- Reduced noise
- Easier board assembly
- More functionality in a smaller space
- Excellent RF performance.

The Philips ultra-thin leadless package (UTLP) platform uses a patent-pending etch process that produces a high silicon-to-footprint ratio, increasing overall performance with the same footprint and a profile as low as 0.4 mm. The process also improves the package's electrical, thermal, and moisture resistance.

The very small footprint makes it ideally suited to space-constrained portable applications like mobile communications, PDAs, and handhelds. The package has no leads, so it delivers very low parasitics and hence provides better RF performance than leaded and QFN packages. This expands its design-in range to include high-frequency applications operating at up to 24 GHz.

The patent-pending etch process puts more functionality in a smaller space. The result is a package that increases design flexibility, reduces time-to-market, and even improves performance in a broad range of mobile applications.

Ordering information

Type number	Description	Package
BAP51LX	Silicon PIN diode	SOD882T
BB202LX	Low-voltage variable FM capacitance diode	SOD882T
BB178LX	VHF-high variable capacitance diode	SOD882T
BB179LX	UHF variable capacitance diode	SOD882T
BB182LX	VHF-low variable capacitance diode	SOD882T
BAP55LX	Silicon PIN diode	SOD882T
BAP142LX	Silicon PIN diode	SOD882T

The patent-pending etch process produces a lead frame that delivers relative freedom between the bottom and top layouts. This creates a high degree of flexibility for assembly formats, supporting techniques like multiple die, multiple leads with isolated die pads, re-routing, and even fine-pitch flip-chip, which can enhance RF performance even further.

The package also makes board assembly easier. The footprint is compatible with JETA standard SC-101 and the package itself can be packed very efficiently, with as many as 15k units on a 7-inch reel. To lessen its impact on the environment, the package uses RoHS-compliant green plastic. Internal structure of UTLP package

9.3 Packing quantities per package with relevant ordering code

Package	Packing quantity	Product 12NC ending	Packing method
SOD110	3,000	115	8 mm tape and reel
	11,000	132	8 mm tape and reel
SOD323/SC-76	3,000	115	8 mm tape and reel
	10,000	135	8 mm tape and reel
SOD523/SC-79	3,000	115	8 mm tape and reel
	10,000	135	8 mm tape and reel
	8,000	315	2 mm pitch tape and reel
	24,000	335	2 mm pitch tape and reel
SOD882T	15,000	315	8 mm tape and reel
SOT23	3,000	215	8 mm tape and reel
	10,000	235	8 mm tape and reel
SOT54	5,000	112	bulk, delta pinning
	5,000	412	bulk, straight leads
	10,000	116	tape and reel, wide pitch
	10,000	126	tape ammpack, wide pitch
SOT89/SC-62	1,000	115	12 mm tape and reel
	4,000	135	12 mm tape and reel
SOT115	100	112	4 tray/box
SOT143(N/R)	3,000	215	8 mm tape and reel
	10,000	235	8 mm tape and reel
SOT223/SC-73	1,000	115	12 mm tape and reel
	4,000	135	12 mm tape and reel
SOT323/SC-70	3,000	115	8 mm tape and reel
	10,000	135	8 mm tape and reel
SOT343(N/R)	3,000	115	8 mm tape and reel
	10,000	135	8 mm tape and reel
SOT363/SC-88	3,000	115	8 mm tape and reel
	10,000	135	8 mm tape and reel
SOT416/SC-75	3,000	115	8 mm tape and reel
SOT560	490	551	Tray
	2,450	557	Multiple trays
SOT567	200	112	4tray/box
	500	118	32 mm tape and reel
SOT638	90	551	Tray
	450	557	Multiple trays
SOT666	4,000	115	8 mm tape and reel
SOT724	2,500	118	16 mm tape and reel
SOT921	3,000	115	8 mm tape and reel

9.4 Marking codes list

Marking code	Type	Package
1	BA277	SOD523
2	BB182	SOD523
7	BA891	SOD523
8	BB178	SOD523
9	BB179	SOD523
%13	BB207	SOT23
%3A	BGA6289	SOT89
%4A	BGA6489	SOT89
%5A	BGA6589	SOT89
%6G	PMBF4393	SOT23
%6J	PMBF4391	SOT23
%6K	PMBF4392	SOT23
%6S	PMBF176	SOT23
%6W	PMBF175	SOT23
%6X	PMBF174	SOT23
%6Y	PMBF177	SOT23
%AB	BF1210	SOT363
10%	BAT18	SOT23
16%	BB804	SOT23
1B%	BGA2717	SOT363
1C%	BAP50-05	SOT23
1N%	BAP70-04W	SOT323
1W-	BAP51-05W	SOT323
20%	BF545A	SOT23
21%	BF545B	SOT23
22%	BF545C	SOT23
24%	BF556A	SOT23
25%	BF556B	SOT23
26%	BF556C	SOT23
28%	BF861A	SOT23
29%	BF861B	SOT23
2A%	BF862	SOT23
2L	BF1208	SOT666
2N	BF1206F	SOT666
2R	BF1207F	SOT666
30%	BF861C	SOT23
31%	BFR505	SOT23
32%	BFR520	SOT23
33%	BFR540	SOT23
34%	BFT25A	SOT23
38%	PMBF108	SOT23
39%	PMBF109	SOT23
40%	PMBF110	SOT23
41%	PMBF111	SOT23
42%	PMBF112	SOT23
47%	PMBF113	SOT23
48%	PMBF308	SOT23
49%	PMBF309	SOT23
4K%	BAP64-04	SOT23
4L%	BAP50-04	SOT23
4W%	BAP64-04W	SOT323
50%	PMBF310	SOT23
5K%	BAP64-05	SOT23
5W%	BAP64-05W	SOT323
6F%	BAP1321-04	SOT23
6K%	BAP64-06	SOT23
6W%	BAP50-04W	SOT323
7K%	BAP65-05	SOT23
8K%	BAP70-05	SOT23
A1	BA591	SOD323
A1	BB208-02	SOD523
A1	BGA2001	SOT343
A2	BAT18	SOT23
A2	BB184	SOD523
A2	BB208-03	SOD323
A2%	BGA2022	SOT363
A3	BAP64-03	SOD323
A3	BB198	SOD523
A3	BGA2003	SOT343
A3%	BGA2031/1	SOT363

Marking code	Type	Package
A5	BAP51-03	SOD323
A5%	BGA2011	SOT363
A6%	BGA2012	SOT363
A7%	BFG310W/XR	SOT343
A8	BAP50-03	SOD323
A8%	BFG325W/XR	SOT343
A8%	PMBF620	SOT363
A9	BAP70-03	SOD323
A9%	CFH705W	SOT343
B3%	CFH705F	SOT343
B4%	CFH703A	SOT343
B6%	BGA2715	SOT363
B7%	BGA2716	SOT363
BC%	BFQ591	SOT89
BFG135	BFG135	SOT223
BFG198	BFG198	SOT223
BFG31	BFG31	SOT223
BFG35	BFG35	SOT223
BFG541	BFG541	SOT223
BFG591	BFG591	SOT223
BFG94	BFG94	SOT223
BFG97	BFG97	SOT223
BLT50	BLT50	SOT223
BLT70	BLT70	SOT223
BLT80	BLT80	SOT223
BLT81	BLT81	SOT223
C1%	BGM1011	SOT363
C2%	BGM1012	SOT363
C4%	BGM1013	SOT363
C5%	BGM1014	SOT363
D2	BAP63-03	SOD323
D3	BAP65-03	SOD323
E1%	BFS17	SOT23
E1%	BFS17/FD	SOT23
E1%	BFS17W	SOT323
E2%	BFS17A	SOT23
E2%	BGA2712	SOT363
E3%	BGA2709	SOT363
FB	BFQ19	SOT89
FF	BFQ18A	SOT89
FG	BFQ149	SOT89
G2	BA278	SOD523
G2%	BGA2711	SOT363
G3%	BGA2748	SOT363
G4%	BGA2771	SOT363
G5%	BGA2776	SOT363
K1	BAP51-02	SOD523
K2	BAP51-05W	SOD523
K3	BB145C	SOD523
K4	BAP50-02	SOD523
K5	BAP63-02	SOD523
K6	BAP65-02	SOD523
K7	BAP1321-02	SOD523
K8	BAP70-02	SOD523
K9	BB199	SOD523
L	BB143	SOD523
L1	BB202LX	SOD882T
L2	BAP51LX	SOD882T
L2	BB202	SOD523
L2%	BF1203	SOT363
L3	BB178LX	SOD882T
L3%	BF1204	SOT363
L4	BB179LX	SOD882T
L4%	BF1205	SOT363
L5	BB179BLX	SOD882T
L6	BB181LX	SOD882T
L6%	BF1206	SOT363
L7	BB182LX	SOD882T
L8	BA792	SOD110
L8	BB187LX	SOD882T

Marking code	Type	Package
L9%	BF1208	SOT363
LA	BF1201WR	SOT343
LA%	BF1201	SOT143
LB%	BF1201R	SOT143
LD%	BF1202	SOT143
LE	BF1202WR	SOT343
LE%	BF1202R	SOT143
LF%	BF1211	SOT143
LG%	BF1212	SOT143
LH%	BF1211R	SOT143
LK%	BF1212R	SOT143
M08	PMBF308	SOT23
M09	PMBF309	SOT23
M1%	BFR30	SOT23
M10	PMBF310	SOT23
M2%	BF1207	SOT363
M2%	BFR31	SOT23
M26	BF908	SOT143
M27	BF908R	SOT143
M28	BF909	SOT143
M29	BF909R	SOT143
M3%	BFT46	SOT23
M33	BF861A	SOT23
M33	BF909A	SOT143
M34	BF861B	SOT23
M34	BF909AR	SOT143
M35	BF861C	SOT23
M41	BF904A	SOT143
M42	BF904AR	SOT143
M6%	BF1205C	SOT363
M65	BF545A	SOT23
M66	BF545B	SOT23
M67	BF545C	SOT23
M74	BSS83	SOT143
M84	BF556A	SOT23
M85	BF556B	SOT23
M86	BF556C	SOT23
M91	BF991	SOT143
M92	BF992	SOT143
MB	BF998WR	SOT343
MC	BF904WR	SOT343
MD	BF908WR	SOT343
ME	BF909WR	SOT343
MF	BF1100WR	SOT343
MG	BF909AWR	SOT343
MG%	BF994S	SOT143
MH	BF904AWR	SOT343
MH-%	BF996S	SOT143
MK	BF1211WR	SOT343
ML	BF1212WR	SOT343
MO%	BF998	SOT143
MO%	BF998R	SOT143
MO4	BF904	SOT143
MO6	BF904R	SOT143
N	BB181	SOD523
N0	BFR505T	SOT416
N0%	BFM505	SOT363
N0%	BF5505	SOT323
N1	BFG505W/X	SOT343
N2	BFR520T	SOT416
N2%	BFM520	SOT363
N2%	BF5520	SOT323
N28	BFR520	SOT23
N29	BFR540	SOT23
N3	BFG520W	SOT343
N30	BFR505	SOT23
N33	BFG505	SOT143
N36	BFG520	SOT143
N37	BFG540	SOT143
N38	BFG590	SOT143

Marking code	Type	Package
N39	BFG505/X	SOT143
N4	BFG520W/X	SOT343
N4	BFQ540	SOT89
N4%	BFS540	SOT323
N42	BFG520/X	SOT143
N43	BFG540/X	SOT143
N44	BFG590/X	SOT143
N48	BFG520/XR	SOT143
N49	BFG540/XR	SOT143
N6%	BFS25A	SOT323
N7	BFG540W/X	SOT343
N71	BFG10/X	SOT143
N8	BFG540W/XR	SOT343
N9	BFG540W	SOT343
N9%	BAP70AM	SOT363
NA	BF1105WR	SOT343
NA%	BF1105R	SOT143
NB	BF1109WR	SOT343
NB%	BF1109R	SOT143
NC	BF1101WR	SOT343
NC%	BF1101R	SOT143
ND	BFG424W	SOT343
ND%	BF1101	SOT143
NE	BFG424F	SOT343
NE%	BF1105	SOT143
NF%	BF1109	SOT143
NG%	BF1108	SOT143
NH%	BF1108R	SOT143
P08	PMBF108	SOT23
P09	PMBF109	SOT23
P1	BB131	SOD323
P1	BFG21W	SOT343

Marking code	Type	Package
P10	PMBF110	SOT23
P11	PMBF111	SOT23
P12	PMBF112	SOT23
P13	PMBF113	SOT23
P2%	BFR92A	SOT23
P2%	BFR92AW	SOT323
P3	BFG403W	SOT343
P4	BFG410W	SOT343
P5	BB135	SOD323
P5	BFG425W	SOT343
P6	BFG480W	SOT343
P7	BB147	SOD323
P8	BB148	SOD323
P9	BB149	SOD323
PA	BB151	SOD323
PB	BB152	SOD323
PC	BB153	SOD323
PE	BB155	SOD323
PF	BB156	SOD323
PL	BB149A	SOD323
R2%	BFR93A	SOT23
R2%	BFR93AW	SOT323
R5	BFR93AR	SOT23
R7%	BFR106	SOT23
R8%	BFG93A	SOT143
S	BAP64-02	SOD523
S1%	BFG310/XR	SOT143
S2%	BBY40	SOT23
S2%	BFG325/XR	SOT143
S3%	BF1107	SOT23
S4%	BBY62	SOT143
S6%	BF510	SOT23

Marking code	Type	Package
S7%	BF511	SOT23
S8%	BF512	SOT23
S9%	BF513	SOT23
SB%	BB200	SOT23
SC%	BB201	SOT23
SF5	BB804	SOT23
T5	BFG10W/X	SOT343
U	BB145	SOD523
V1	BFG25AW/X	SOT343
V1%	BFT25	SOT23
V10	BFT25A	SOT23
V11	BFG25A/X	SOT143
V12	BFG67/X	SOT143
V14	BFG92A/X	SOT143
V15	BFG93A/X	SOT143
V2%	BFQ67	SOT23
V2%	BFQ67W	SOT323
V3%	BFG67	SOT143
V4%	BAP64-06W	SOT323
V6%	BAP65-05W	SOT323
V8	BAP1321-03	SOD323
W1	BF1102	SOT363
W1%	BFT92	SOT23
W1%	BFT92W	SOT323
W2%	BF1102R	SOT363
W4%	BAP50-05W	SOT323
W6%	BAP51-04W	SOT323
W7%	BAP51-06W	SOT323
W9%	BAP63-05W	SOT323
X	BB187	SOD523
X1%	BFT93	SOT23
X1%	BFT93W	SOT323

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How to contact your authorized distributor or local Philips representative

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http://www.semiconductors.philips.com/products/all_appnotes/

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