## DISCRETE SEMICONDUCTORS



Preliminary specification

2002 Jan 14



### **BGM1011**

### **FEATURES**

- Internally matched to 50  $\Omega$
- Very high gain (up to 37 dB at 2 Ghz)
- · Sloped gain curve for optimal performance with output into lossy cable
- 14 dBm saturated output power at 1 GHz
- High linearity (23 dBm IP3(out) at 1 GHz)
- · 40 dB isolation

### **APPLICATIONS**

- LNB IF amplifiers
- · Cable systems
- · General purpose.

### DESCRIPTION

Silicon Monolithic Microwave Integrated Circuit (MMIC) wideband amplifier with internal matching circuit in a 6-pin SOT363 SMD plastic package.

### PINNING

PIN	DESCRIPTION
1	V <sub>S</sub>
2, 5	GND2
3	RF out
4	GND1
6	RF in





Marking code: C1-.

Fig.1 Simplified outline (SOT363) and symbol.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V <sub>S</sub>	DC supply voltage		5	6	V
I <sub>S</sub>	DC supply current		25.5	-	mA
s <sub>21</sub>   <sup>2</sup>	insertion power gain	f = 1 GHz	30	-	dB
NF	noise figure	f = 1 GHz	4.7	-	dB
P <sub>L(sat)</sub>	saturated load power	f = 1 GHz	13.8	_	dBm

#### LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>S</sub>	DC supply voltage	RF input AC coupled	-	6	V
I <sub>S</sub>	supply current		_	35	mA
P <sub>tot</sub>	total power dissipation	$T_s \le 90 \ ^{\circ}C$	-	200	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C
Tj	operating junction temperature		_	150	°C
P <sub>D</sub>	maximum drive power		_	0	dBm

#### CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

### BGM1011

### THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to solder point	$P_{tot}$ = 200 mW; $T_s \le$ 90 °C	300	K/W

### CHARACTERISTICS

 $V_S$  = 5 V;  $I_S$  = 25.5 mA;  $T_j$  = 25  $^\circ C$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I <sub>S</sub>	supply current		20	25.5	32	mA
s <sub>21</sub>   <sup>2</sup>	insertion power gain	f = 100 MHz	_	25	-	dB
		f = 1 GHz	_	30	-	dB
		f = 1.8 GHz	-	35	-	dB
		f = 2.2 GHz	_	37	-	dB
		f = 2.6 GHz	-	32	-	dB
		f = 3 GHz	_	28	-	dB
R <sub>L IN</sub>	return losses input	f = 1 GHz	-	11	-	dB
		f = 2.2 GHz	-	8	-	dB
R <sub>L OUT</sub>	return losses output	f = 1 GHz	_	18	-	dB
		f = 2.2 GHz	-	12	-	dB
NF	noise figure	f = 1 GHz	_	4.7	-	dB
		f = 2.2 GHz	_	4.6	-	dB
BW	bandwidth	at  s <sub>21</sub>   <sup>2</sup> –3 dB below flat gain at 1 GHz	_	2.9	-	GHz
К	stability factor	f = 1 GHz	_	1.8	-	-
		f = 2.2 GHz	_	0.9	-	_
P <sub>L(sat)</sub>	saturated load power	f = 1 GHz	_	13.8	-	dBm
		f = 2.2 GHz	-	10.8	-	dBm
P <sub>L 1 dB</sub>	load power	at 1 dB gain compression; f = 1 GHz	_	12.2	-	dBm
		at 1 dB gain compression; f = 2.2 GHz	_	7.7	-	dBm
IP3 <sub>(in)</sub>	input intercept point	f = 1 GHz	_	-7	-	dBm
		f = 2.2 GHz	-	-20	-	dBm
IP3 <sub>(out)</sub>	output intercept point	f = 1 GHz	-	23	-	dBm
		f = 2.2 GHz	_	16	_	dBm

**BGM1011** 

#### **APPLICATION INFORMATION**

Figure 2 shows a typical application circuit for the BGM1011 MMIC. The device is internally matched to 50  $\Omega$ , and therefore does not need any external matching. The value of the input and output DC blocking capacitors C1, C2 should be not more than 100 pF for applications above 100 MHz. Their values can be used to fine tune the input and output impedance. However, when the device is operated below 100 MHz, the capacitor value should be increased.

The nominal value of the RF choke, L1 is 100 nH. At frequencies below 100 MHz this value should be increased to 200 nH. At frequencies between 1 and 3 GHz a much lower value must be used (e.g. 18 nH) to improve return losses. For optimal results, a good quality chip inductor such as the TDK MLG 1608 (0603), or a wire-wound SMD type should be chosen.

Capacitor, C4 and resistor, R1 are added for optimal supply decoupling.

Both the RF choke, L1 and the 22 nF supply decoupling capacitor, C3 should be located as closely as possible to the MMIC.

Separate paths must be used for the ground planes of the ground pins GND1, GND2, and these paths must be as short as possible. When using vias, use multiple vias per pin in order to limit ground path inductance.



#### List of components used for the typical application; an amplifier for LNB IF output.

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS.	
C1, C2	multilayer ceramic chip capacitor	100 pF	0603	
C3	multilayer ceramic chip capacitor	22 nF	0603	
C4	multilayer ceramic chip capacitor	5.6 pF	0603	
R1	SMD resistor	10 Ω	0603	
L1	SMD inductor	10 to 200 nH	0603	











f (MHz)MAGNITUDE (ratio)ANGLE (ratio)MAGNITUDE (ratio)MAGLUTUDE (ratio)MAGLUTUDE (ratio)MAGLUTUDE (ratio)MAGLUTUDE (ratio)MAGLUTUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGLI (ratio)MAGLE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGNITUDE (ratio)MAGLI (ratio) <th></th> <th>S11</th> <th></th> <th>S21</th> <th></th> <th>S12</th> <th></th> <th>S22</th> <th></th> <th>2</th>		S11		S21		S12		S22		2
0.36264 $13.342$ $17.83811$ $24.366$ $0.01974$ $16.631$ $0.32582$ $75.129$ $75.129$ $0.36374$ $0.954$ $18.52172$ $12.011$ $0.017226$ $3.391$ $0.22343$ $80.749$ $80.749$ $0.36404$ $-11.09$ $20.26048$ $4.008$ $0.014492$ $-9.722$ $0.13121$ $63.715$ $63.715$ $0.35160$ $-19.36$ $4.77$ $-1.373$ $0.011953$ $-9.388$ $0.10301$ $30.828$ $80.749$ $0.35160$ $-19.36$ $7.408$ $0.010391$ $-5.844$ $0.10619$ $1.087$ $8.749$ $0.32818$ $-26.32$ $13.8$ $-7.408$ $0.010391$ $-5.844$ $0.10619$ $1.087$ $0.227290$ $-23.66$ $29.73953$ $-14.9$ $0.009534$ $0.916619$ $1.087$ $0.22790$ $-23.66$ $29.73953$ $-14.9$ $0.007313$ $23.979$ $0.10565$ $-25.66$ $0.25490$ $-31.1$ $35.11364$ $-24.67$ $0.008254$ $9.695$ $0.13665$ $-25.66$ $0.255490$ $-24.67$ $0.008254$ $9.0955$ $0.13665$ $-25.66$ $-24.67$ $0.255490$ $-4.547$ $50.8261$ $-52.69$ $0.007313$ $23.979$ $0.15766$ $-44.12$ $0.255490$ $-4.547$ $50.8261$ $-52.69$ $0.007684$ $33.26$ $0.13665$ $-44.12$ $0.20591$ $-4.547$ $50.8261$ $-7.313$ $0.007684$ $33.26$ $0.16642$ $-44.12$ $0.239031$ $16.643$ $60.12684$ $-$	f (MHz)	MAGNITUDE (ratio)	ANGLE(d eg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	FACTOR
0.36374 0.954 18.52172 12.011 0.017526 3.391 0.22343 80.749   0.36404 -11.09 20.26048 4.008 0.014492 -9.722 0.13121 63.715   0.35160 -19.36 4.7 -1.373 0.011953 -9.388 0.10301 30.828   0.35160 -19.36 4.7 -1.373 0.011953 -9.388 0.10301 30.828   0.35160 -19.36 7.408 0.010391 -5.884 0.10371 30.828   0.023291 -29.66 29.73953 -14.9 0.009534 9.695 0.15766 -15.72   0.25490 -31.1 35.11364 -24.67 0.008544 9.695 0.15665 -25.66   0.25491 -24.6 0.007813 23.979 0.15786 -33.18   0.20591 -24.6 0.007814 33.26 0.15665 -25.66 -44.12   0.18024 45.61 0.008713 23.979 0.15786 -44.12 -65.13   0.	100	0.36264	13.342	17.83811	24.366	0.01974	16.631	0.32582	75.129	1.2
0.36404 $-11.09$ $20.26048$ $4.008$ $0.014492$ $-9.722$ $0.13121$ $63.715$ $63.715$ $0.035160$ $-19.36$ $4.7$ $-1.373$ $0.011953$ $-9.388$ $0.10301$ $30.828$ $30.828$ $0.032818$ $-26.32$ $13.8$ $-7.408$ $0.010391$ $-5.884$ $0.10619$ $1.087$ $30.828$ $0.029729$ $-29.66$ $29.73953$ $-14.9$ $0.009534$ $-6.816$ $0.12032$ $-15.72$ $-15.72$ $0.25490$ $-21.1$ $35.11364$ $-24.67$ $0.008534$ $9.695$ $0.15786$ $-15.72$ $-15.72$ $0.25910$ $-24.6$ $42.13907$ $-36.83$ $0.007313$ $23.979$ $0.15786$ $-33.18$ $-15.72$ $0.20591$ $-24.6$ $42.13907$ $-36.83$ $0.0077313$ $23.979$ $0.15786$ $-33.18$ $-15.72$ $0.20591$ $-24.6$ $42.13907$ $-36.83$ $0.0077313$ $23.979$ $0.15786$ $-33.18$ $-15.72$ $0.18024$ $-44.57$ $50.8261$ $-52.69$ $0.007684$ $33.26$ $0.18642$ $-44.12$ $0.201021$ $16.78$ $60.12684$ $-73.19$ $0.007713$ $23.979$ $0.15786$ $-44.12$ $0.22913$ $16.789$ $60.12684$ $-73.19$ $0.007713$ $24.501$ $0.21778$ $-65.13$ $0.23031$ $16.649$ $67.08784$ $-190.2$ $67.08784$ $-190.2$ $-160.2$ $-100.2$ $0.23933$ $16.649$ $67.08784$ $-160.2$ $0.013803$ $62.91$	200	0.36374	0.954	18.52172	12.011	0.017526	3.391	0.22343	80.749	1.4
0.35160 -19.36 4.7 -1.373 0.011953 -9.388 0.10301 30.828 3   0.02818 -26.32 13.8 -7.408 0.010391 -5.884 0.10619 1.087 1   0.028729 -29.66 29.73953 -14.9 0.009534 -0.816 0.12032 -15.72 1   0.029729 -29.66 29.73953 -14.9 0.009534 -0.816 0.15065 -25.66 15.72   0.025490 -31.1 35.11364 -24.67 0.008254 9.695 0.13665 -15.72 15.72   0.025310 -24.6 42.13907 -36.83 0.007313 23.979 0.15665 -33.18   0.018024 -4.15 0.008254 9.695 0.13665 -44.12 1   0.023153 16.758 60.12684 -73.19 0.01761 44.601 0.21778 -65.13 1   0.033031 16.643 67.0657 -101.2 0.013121 42.512 0.24156 -100.6 1	400	0.36404	-11.09	20.26048	4.008	0.014492	-9.722	0.13121	63.715	1.6
0.32818 -26:32 13.8 -7.408 0.010391 -5.884 0.10619 1.087 1   0 029729 -29:66 29.73953 -14.9 0.009534 0.1816 0.12032 -15.72 15.72   0 025490 -31.1 35.11364 -24.67 0.008534 9.695 0.13665 -25.66 -33.78 15.778 -44.12 15   0 020591 -24.6 42.13907 -36.83 0.007313 23.979 0.15665 -25.66 -33.18 -44.12 16 10 10 10 10 10 10 10 11 10 11 10 11 10 11 10 11 10 10 10 10 10 10 10 10 10 10 11 10	600	0.35160	-19.36	4.7	-1.373	0.011953	-9.388	0.10301	30.828	1.7
0.29729 -29.66 29.73953 -14.9 0.009534 -0.816 0.12032 -15.72 1   0.25490 -31.1 35.11364 -24.67 0.008254 9.695 0.13665 -25.66    0.20591 -24.6 42.13907 -36.83 0.007313 23.379 0.15786 -33.18    0.20591 -24.6 42.13907 -56.83 0.007313 23.379 0.15786 -33.18    0.18024 -45.57 50.8261 -52.69 0.007684 33.26 0.15642 -44.12    0.23153 16.758 60.12684 -73.19 0.007713 44.601 0.21778 -65.13    0.232933 16.758 67.06676 -100.2 0.01019 42.512 0.24156 -100.6    0.33031 4.0661 -8.496 67.08784 -131.3 0.013121 46.727 0.28137 173.89   0.34466 -8.496 56.50333 -160.5 0.013121 46.727	800	0.32818	-26.32	13.8	-7.408	0.010391	-5.884	0.10619	1.087	1.8
0.25490 -31.1 35.11364 -24.67 0.008254 9.695 0.13665 -25.66 -33.18   0.20591 -24.6 42.13907 -36.83 0.007313 23.979 0.15786 -33.18   0.20591 -24.6 42.13907 -36.83 0.007313 23.979 0.15786 -33.18   0.20591 -44.57 50.8261 -52.69 0.007684 33.26 0.18642 -44.12    0.018024 16.758 60.12684 -73.19 0.008713 44.601 0.21778 -65.13    0.023933 16.643 67.0676 -100.2 0.01019 42.512 0.24166 -100.6   0.339031 4.096 67.08784 -131.3 0.011761 49.659 0.26347 -146.8   0.34466 -8.496 56.50393 -160.5 0.013121 46.727 0.28137 173.89   0.025915 -10.05 41.2726 0.13803 52.913 0.33170 151.71   0.21573 16.4.33	1000	0.29729	-29.66	29.73953	-14.9	0.009534	-0.816	0.12032	-15.72	1.7
0.20591-24.642.13907-36.830.00731323.9790.15786-33.18-33.180.18024-4.54750.8261-52.690.00768433.260.18642-44.12-44.120.2315316.75860.12684-73.190.00871344.6010.21778-65.13-65.130.2303116.64367.0676-100.20.01001942.5120.24156-100.6-100.60.3208316.64367.08784-131.30.01176149.6590.26347-146.8-146.80.34466-8.49656.50393-160.50.01312146.7270.28137173.89-146.80.25915-10.0541.27266178.270.01380352.9130.30823151.71-146.80.21573-13.0131.24721164.330.01380352.9130.38233151.71-146.80.22915-10.0541.27266178.270.01380352.9130.38233151.710.22915-10.0541.27266178.270.01394650.4990.38137153.690.22915-10.0541.27266178.270.01394650.4990.31700136.520.22915-10.0523.98115154.160.01454855.480.31700136.520.2297012.69823.98115154.160.01454855.480.37422130.13	1200	0.25490	-31.1	35.11364	-24.67	0.008254	9.695	0.13665	-25.66	1.7
0.18024 -4.547 50.8261 -52.69 0.007684 33.26 0.18642 -44.12   0.23153 16.758 60.12684 -73.19 0.008713 44.601 0.21778 -65.13   0.23153 16.758 60.12684 -73.19 0.010019 42.512 0.21778 -65.13   0.032083 16.643 67.6076 -100.2 0.011761 49.659 0.24156 -100.6   0.39031 4.096 67.08784 -131.3 0.011761 49.659 0.26347 -146.8   0.34466 -8.496 56.50393 -160.5 0.01321 46.727 0.28137 173.89   0.25915 -10.05 41.27266 178.27 0.013803 52.913 0.30823 151.71   0.25515 -10.05 31.24721 164.33 0.013946 50.499 0.33170 136.52   0.21573 -13.01 31.24721 164.33 0.013946 50.499 0.3170 136.52   0.20270 12.698 23.98115	1400	0.20591	-24.6	42.13907	-36.83	0.007313	23.979	0.15786	-33.18	1.6
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0.39031 4.096 67.08784 -131.3 0.011761 49.659 0.26347 -146.8   0.34466 -8.496 56.50393 -160.5 0.013121 46.727 0.28137 173.89   0.25915 -10.05 41.27266 178.27 0.013803 52.913 0.30823 151.71   0.25915 -10.05 31.24721 164.33 0.013946 50.499 0.30823 151.71   0.21573 -1.301 31.24721 164.33 0.013946 50.499 0.33170 136.52   0.20270 12.698 23.98115 154.16 0.014548 55.48 0.37422 130.13	2000	0.32983	16.643	67.60676	-100.2	0.010019	42.512	0.24156	-100.6	0.9
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0.25915 -10.05 41.27266 178.27 0.013803 52.913 0.30823 151.71 1   0.21573 -1.301 31.24721 164.33 0.013946 50.499 0.33170 136.52 1   0.20270 12.698 23.98115 154.16 0.014548 55.48 0.37422 130.13 1	2400	0.34466	-8.496	56.50393	-160.5	0.013121	46.727	0.28137	173.89	6.0
0.21573 -1.301 31.24721 164.33 0.013946 50.499 0.33170 136.52 1   0.20270 12.698 23.98115 154.16 0.014548 55.48 0.37422 130.13 1	2600	0.25915	-10.05	41.27266	178.27	0.013803	52.913	0.30823	151.71	1.0
0.20270 12.698 23.98115 154.16 0.014548 55.48 0.37422 130.13	2800	0.21573	-1.301	31.24721	164.33	0.013946	50.499	0.33170	136.52	1.2
	3000	0.20270	12.698	23.98115	154.16	0.014548	55.48	0.37422	130.13	1.3



2002 Jan 14

# MMIC wideband amplifier

BGM1011

## MMIC wideband amplifier

### PACKAGE OUTLINE

### Plastic surface mounted package; 6 leads



# SOT363

BGM1011

#### DATA SHEET STATUS

DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

#### Notes

- 1. Please consult the most recently issued data sheet before initiating or completing a design.
- 2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

#### DEFINITIONS

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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