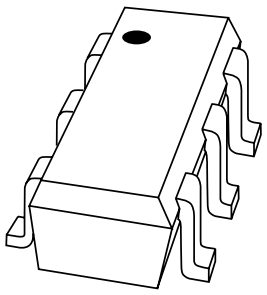
DATA SHEET



BGA2748
MMIC wideband amplifier

Product specification
Supersedes data of 2001 Oct 19

2002 Jul 03

Philips
Semiconductors

PHILIPS

MMIC wideband amplifier BGA2748

FEATURES

- Internally matched
- Wide frequency range
- Optimized for 900 MHz
- Excellent isolation
- Low noise
- Unconditionally stable.

APPLICATIONS

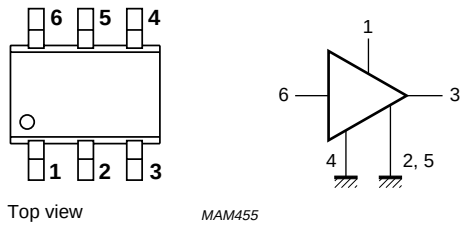
- Cable systems
- LNB IF amplifiers
- General purpose
- ISM.

DESCRIPTION

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

PINNING

PIN	DESCRIPTION
1	V_S
2, 5	GND2
3	RF out
4	GND1
6	RF in



Marking code: G3-.

Fig.1 Simplified outline (SOT363) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_S	DC supply voltage		3	4	V
I_S	DC supply current		5.7	–	mA
$\|s_{21}\|^2$	insertion power gain	f = 1 GHz	21.8	–	dB
NF	noise figure	f = 1 GHz	1.9	–	dB
$P_{L(sat)}$	saturated load power	f = 1 GHz	–2.3	–	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.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_S	DC supply voltage	RF input AC coupled	–	4	V
I_S	supply current		–	15	mA
P_{tot}	total power dissipation	$T_s \leq 80$ °C	–	200	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C
P_D	maximum drive power		–	10	dBm

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to solder point	P_{tot} = 200 mW; $T_s \leq 80$ °C	300	K/W

CHARACTERISTICS

V_S = 3 V; I_S = 5.7 mA; f = 1 GHz; T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_S	supply current		4.5	5.7	8	mA
$\|s_{21}\|^2$	insertion power gain	f = 1 GHz	–	21.8	–	dB
		f = 2 GHz	–	18.5	–	dB
$R_{L\ IN}$	return losses input	f = 1 GHz	–	18	–	dB
		f = 2 GHz	–	14	–	dB
$R_{L\ OUT}$	return losses output	f = 1 GHz	–	7	–	dB
		f = 2 GHz	–	8	–	dB
NF	noise figure	f = 1 GHz	–	1.9	–	dB
		f = 2 GHz	–	2.4	–	dB
BW	bandwidth	at $\|s_{21}\|^2$ –3 dB below flat gain at 1 GHz	–	1.9	–	GHz
$P_{L(sat)}$	saturated load power	f = 1 GHz	–	–2.3	–	dBm
		f = 2 GHz	–	–3.3	–	dBm
$P_{L\ 1\ dB}$	load power	at 1 dB gain compression; f = 1 GHz	–	–9.2	–	dBm
		at 1 dB gain compression; f = 2 GHz	–	–10.9	–	dBm
$IP3_{(in)}$	input intercept point	f = 1 GHz	–	–23.7	–	dBm
		f = 2 GHz	–	–19.9	–	dBm
$IP3_{(out)}$	output intercept point	f = 1 GHz	–	–1.9	–	dBm
		f = 2 GHz	–	–1.4	–	dBm

APPLICATION INFORMATION

Figure 2 shows a typical application circuit for the BGA2748 MMIC. The device is internally matched to 50 Ω, and therefore does not need any external matching. The value of the input and output DC blocking capacitors C2, C3 should be not more than 100 pF for applications above 100 MHz. However, when the device is operated below 100 MHz, the capacitor value should be increased.

The 22 nF supply decoupling capacitor, C1 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.

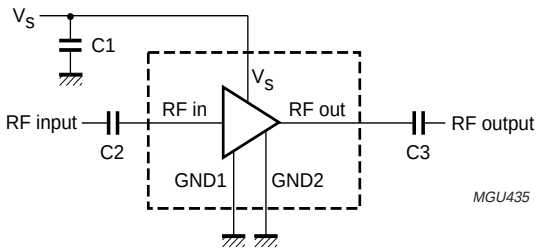


Fig.2 Typical application circuit.

Figure 3 shows two cascaded MMICs. This configuration doubles overall gain while preserving broadband characteristics. Supply decoupling and grounding conditions for each MMIC are the same as those for the circuit of Fig.2.

The excellent wideband characteristics of the MMIC make it and ideal building block in IF amplifier applications such as LBNs (see Fig.4).

As a buffer amplifier between an LNA and a mixer in a receiver circuit, the MMIC offers an easy matching, low noise solution (see Fig.5).

In Fig.6 the MMIC is used as a driver to the power amplifier in part of a transmitter circuit. Good linear performance and matched input and output offer quick design solutions in such applications.

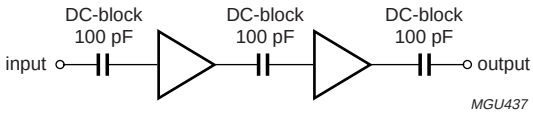


Fig.3 Easy cascading application circuit.

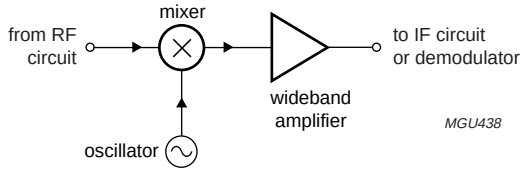


Fig.4 Application as IF amplifier.

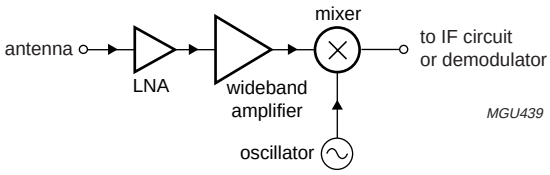


Fig.5 Application as RF amplifier.

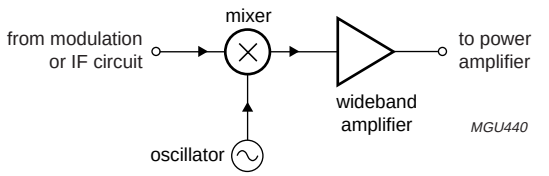
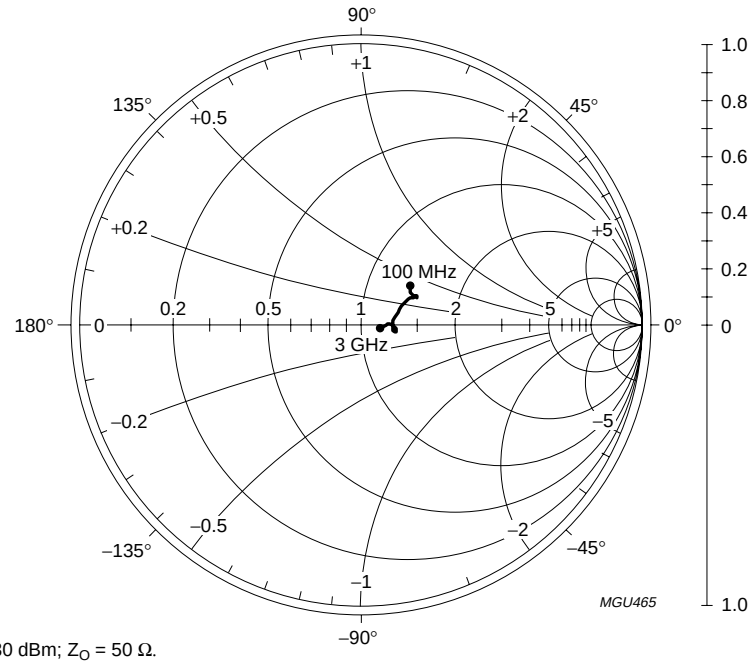
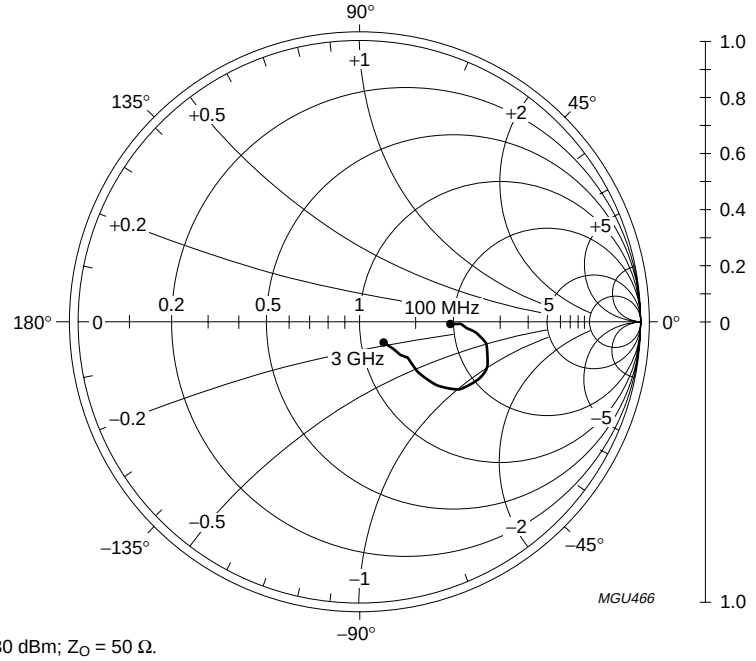


Fig.6 Application as driver amplifier.



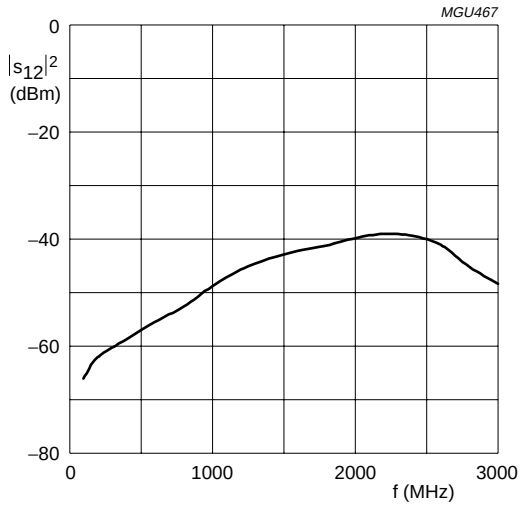
I_S = 5.66 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω.

Fig.7 Input reflection coefficient (s_{11}); typical values.



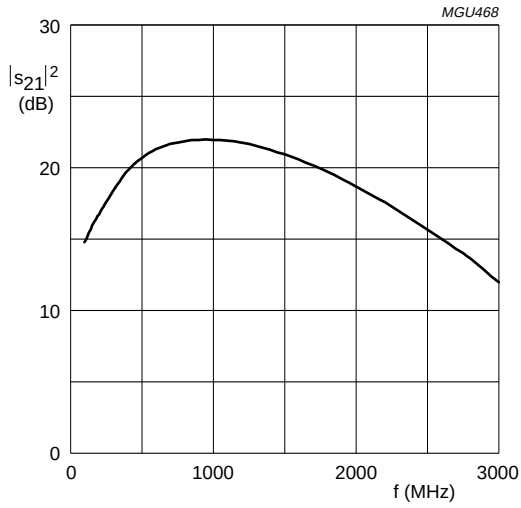
I_S = 5.66 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω.

Fig.8 Output reflection coefficient (s_{22}); typical values.



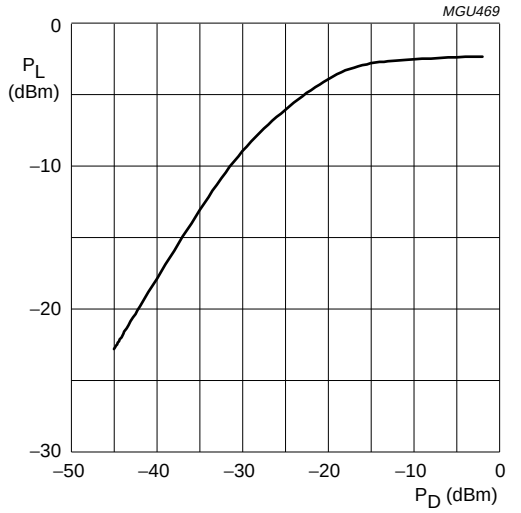
I_S = 5.66 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω.

Fig.9 Isolation ($|s_{12}|^2$) as a function of frequency; typical values.



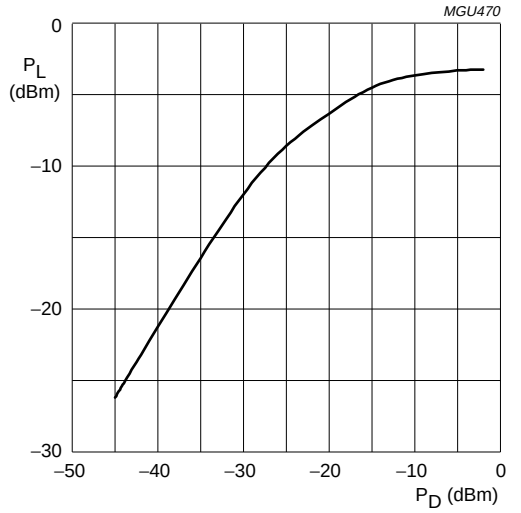
I_S = 5.66 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω.

Fig.10 Insertion gain ($|s_{21}|^2$) as a function of frequency; typical values.



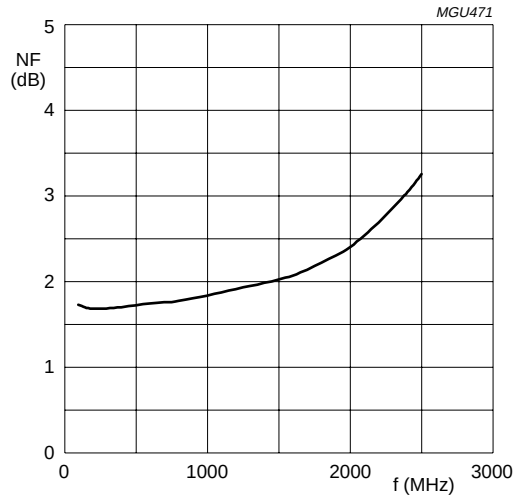
V_S = 3 V; f = 1 GHz; Z_O = 50 Ω.

Fig.11 Load power as a function of drive power at 1 GHz; typical values.



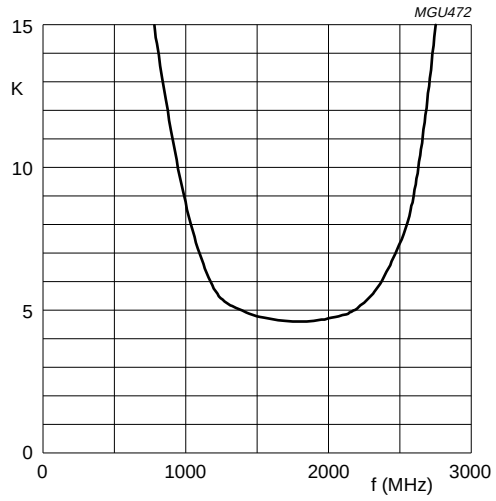
V_S = 3 V; f = 2 GHz; Z_O = 50 Ω.

Fig.12 Load power as a function of drive power at 2 GHz; typical values.



I_S = 5.66 mA; V_S = 3 V; Z_O = 50 Ω.

Fig.13 Noise figure as a function of frequency; typical values.



I_S = 5.66 mA; V_S = 3 V; Z_O = 50 Ω.

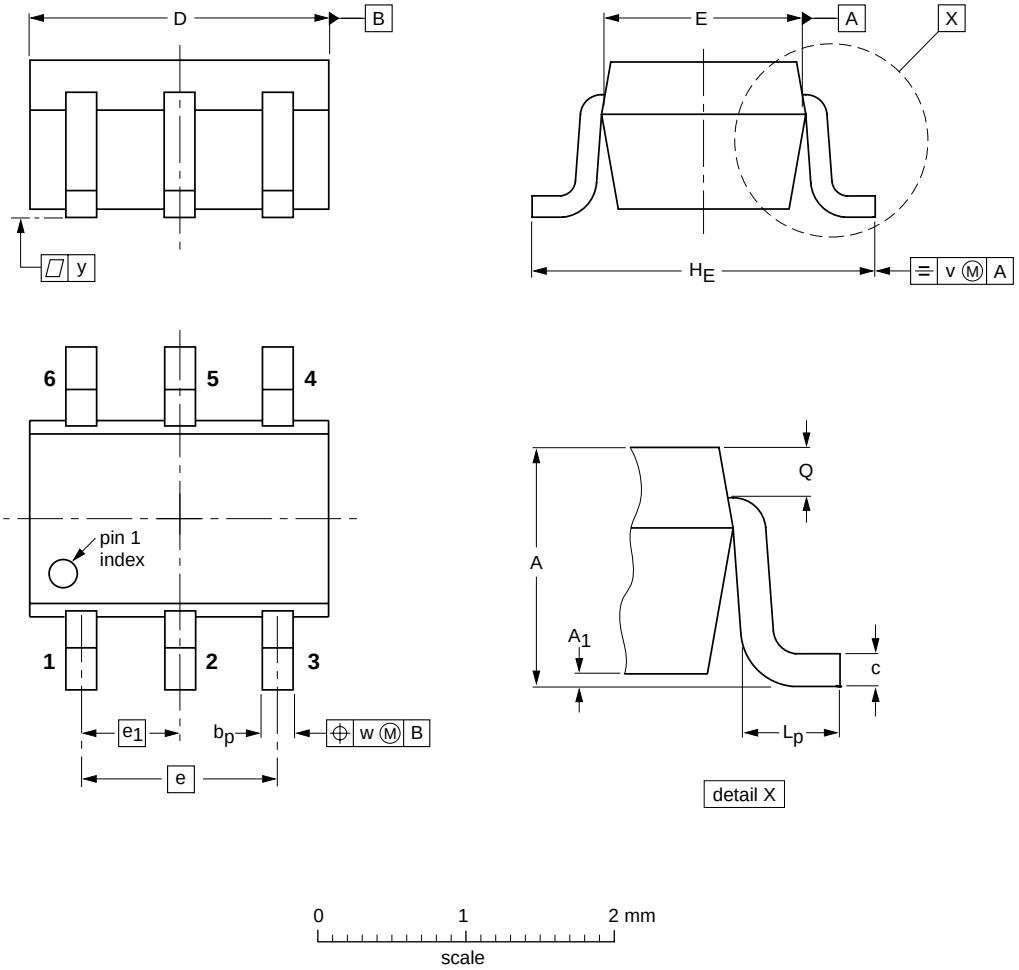
Fig.14 Stability factor as a function of frequency; typical values.

Table 1 Scattering parameters: I_S = 5.66 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω; T_{amb} = 25 °C

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
100	0.08233	–6.058	5.4700	14.75	0.00049	–92.64	0.32715	–3.589
200	0.08934	1.505	6.8702	17.10	0.00078	–91.63	0.32763	–2.304
400	0.10677	1.621	9.7365	5.277	0.00164	–108.6	0.33688	–1.542
600	0.12257	–2.565	11.586	–12.73	0.00168	–119.4	0.36332	–1.800
800	0.12902	–8.769	12.372	–31.11	0.00233	–113.0	0.39884	–3.931
1000	0.12635	–11.24	12.519	–48.70	0.00363	–129.6	0.44177	–8.067
1200	0.11634	–9.574	12.232	–65.32	0.00551	–140.5	0.47449	–14.54
1400	0.11643	1.8040	11.550	–81.52	0.00659	–151.4	0.48300	–21.47
1600	0.12552	14.913	10.664	–96.69	0.00779	–163.4	0.46932	–28.10
1800	0.15177	23.659	9.6775	–111.1	0.00871	–176.5	0.43106	–34.03
2000	0.18258	27.689	8.5565	–124.5	0.01025	172.8	0.37882	–38.74
2200	0.20634	29.316	7.5480	–136.9	0.01124	160.7	0.31996	–41.11
2400	0.22422	28.365	6.5362	–148.4	0.01078	146.8	0.26441	–40.43
2600	0.22777	26.661	5.6120	–158.5	0.00884	131.1	0.22542	–37.88
2800	0.21931	28.691	4.8007	–167.7	0.00548	123.8	0.18502	–38.37
3000	0.22247	37.201	3.9567	–175.6	0.00384	160.7	0.12693	–37.56

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads **SOT363**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT363			SC-88			97-02-28

DATA SHEET STATUS

DATA SHEET STATUS[1]	PRODUCT STATUS[2]	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.
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