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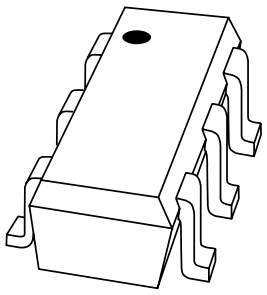

BGA2771
MMIC wideband amplifier

Preliminary specification

2001 Mar 30

Philips
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MMIC wideband amplifier BGA2771

FEATURES

- Internally matched
- Wide frequency range
- Unconditionally stable.

APPLICATIONS

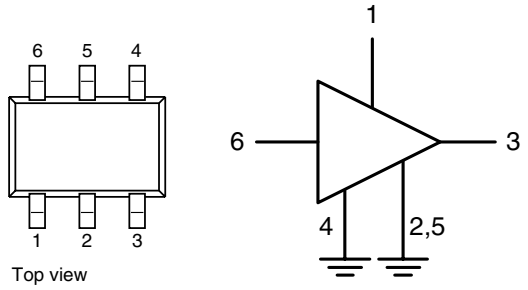
- Cable systems
- LNB IF amplifiers
- General purpose
- ISM.

DESCRIPTION

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

PINNING

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



Marking code: G4-

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		33.3	–	mA
$\|S_{21}\|^2$	insertion power gain	f = 1 GHz	21	–	dB
NF	noise figure	f = 1 GHz	4.4	–	dB
$P_{L\ sat}$	saturated load power		12	–	dBm

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_S	DC supply voltage	RF input AC coupled	–	4	V
I_S	supply current		–	50	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		–	0	dBm

THERMAL RESISTANCE

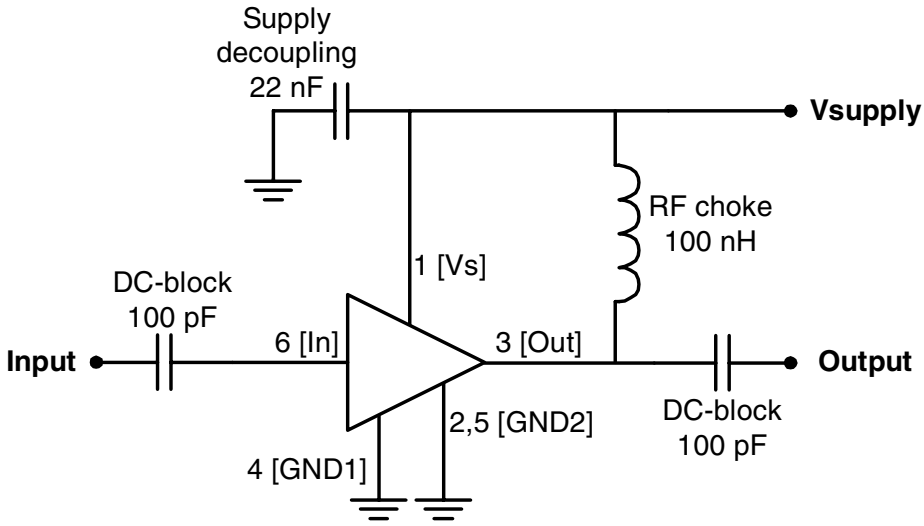
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to solder point	P_{tot} = 200 mW; $T_s \leq 80$ °C	300	K/W

CHARACTERISTICS

V_S = 3 V; I_S = 33.3 mA; f = 1 GHz; T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_S	supply current		29	33.3	45	mA
$\lvert S_{21}\rvert^2$	insertion power gain		–	21	–	dB
$R_{L\ IN}$	return losses input		13	–	–	dB
$R_{L\ OUT}$	return losses output		10	–	–	dB
NF	noise figure		–	4.4	–	dB
f_u	upper frequency limit	at $\lvert s_{21}\rvert^2$ –3 dB below flat gain at 1 GHz	–	2.4	–	GHz
$P_{L\ sat}$	saturated load power		–	12	–	dBm
$P_{L\ 1\ dB}$	load power	at 1 dB gain compression	–	11	–	dBm
$IP3_{(in)}$	input intercept point		–	1	–	dBm
$IP3_{(out)}$	output intercept point		–	22	–	dBm

APPLICATION INFORMATION



The MMIC is internally matched for 50 Ω and therefore it does not need any external matching.

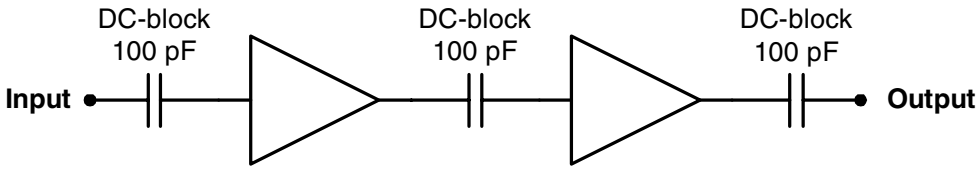
The input and output DC-block capacitors are to be 100 pF or less for operation above 100 MHz.
For operation below 100 MHz, their value should be increased.

For the RF choke optimal results are obtained with a good quality chip inductor like TDK MLG1608 (0603) or a wirewound SMD. For operation below 100 MHz, the value should be increased to 220 μH. For operation above 1 GHz, a smaller value (e.g. 10 nH) improves the return loss.

The RF choke and supply decoupling capacitor should be placed as close as possible to the MMIC.

Separate paths have to be used for the ground plane of the GND1 and GND2 pins and the paths should be as short as possible.
When using vias, use multiple vias per pin in order to limit ground path induction.

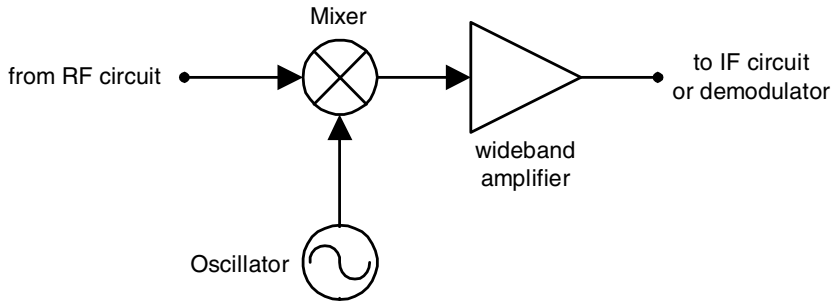
Fig.2 Typical application circuit



Cascading two MMICs doubles the gain, preserving the good broadband characteristics.
Supply decoupling and grounding for each MMIC should be performed as for the typical application.

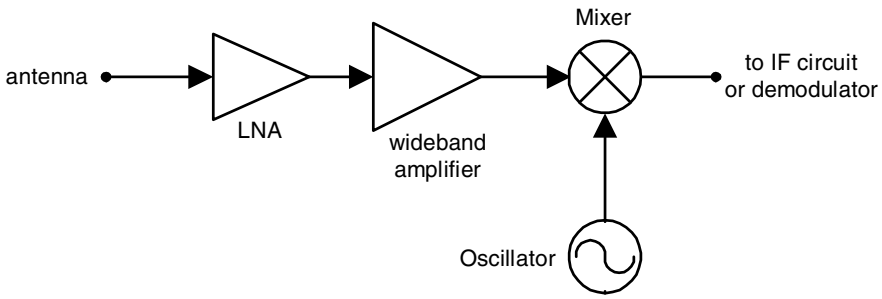
Fig.3 Easy cascading application circuit

Application examples



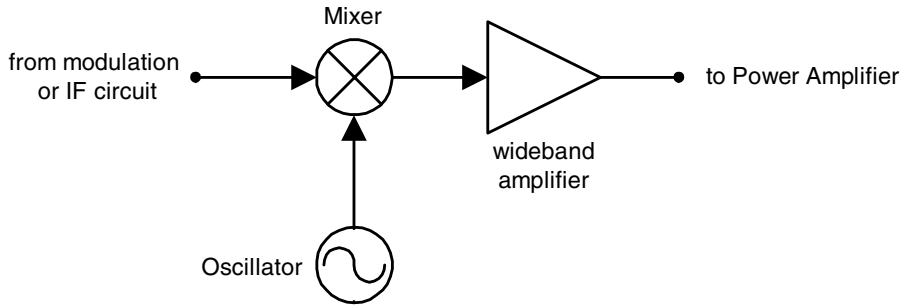
The MMIC is very suitable as IF amplifier in e.g. LNB's.
The excellent wideband characteristics make it an easy building block.

Fig.4 Application as IF amplifier



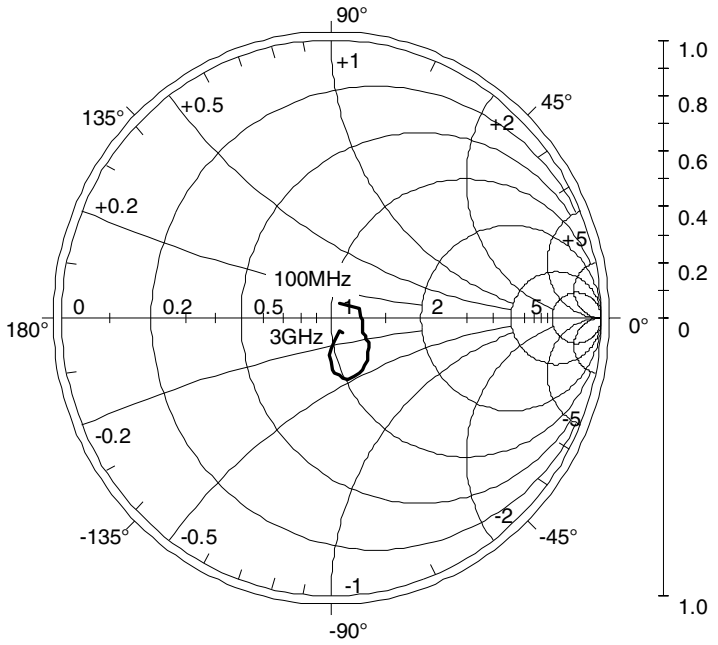
As second amplifier after an LNA, the MMIC offers an easy matching, low noise solution

Fig.5 Application as RF amplifier



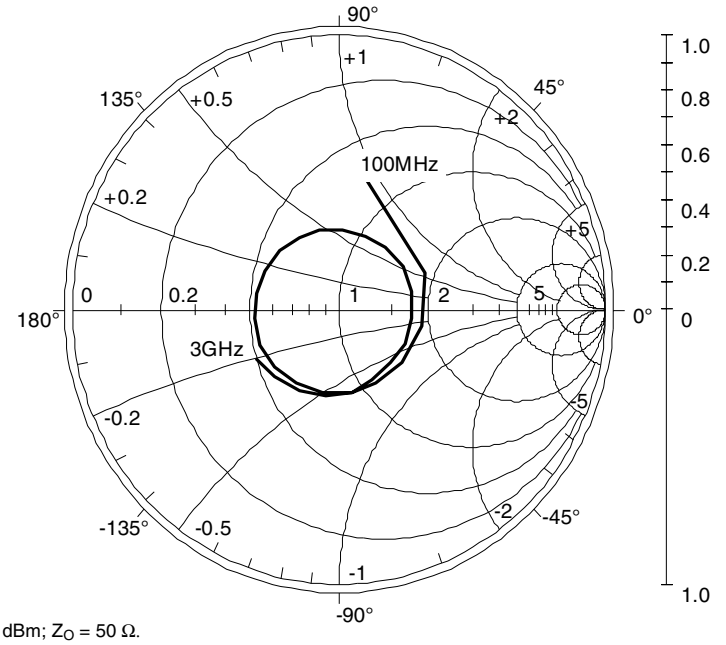
As driver amplifier in the TX path, the good linear performance and matched in- and output offer quick design

Fig.6 Application as driver amplifier



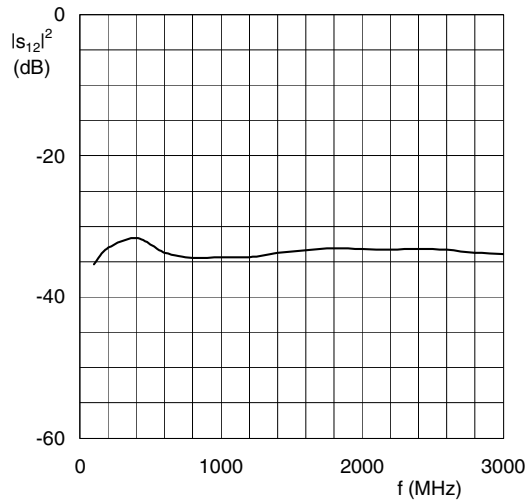
I_S = 33 mA; V_S = 3 V; P_D = −30 dBm; Z_O = 50 Ω.

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



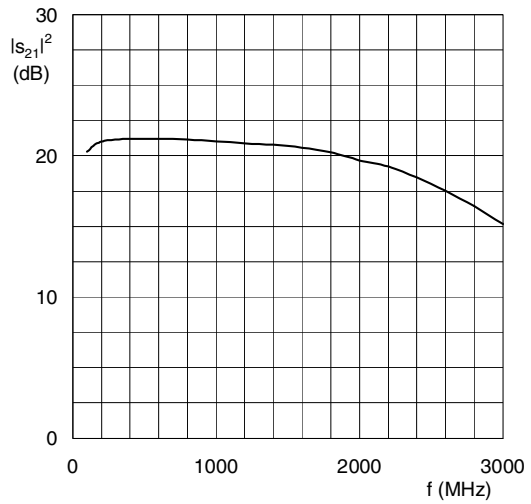
I_S = 33 mA; V_S = 3 V; P_D = −30 dBm; Z_O = 50 Ω.

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



I_S = 33 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 = 33 mA; V_S = 3 V; P_D = –30 dBm; Z_O = 50 Ω.

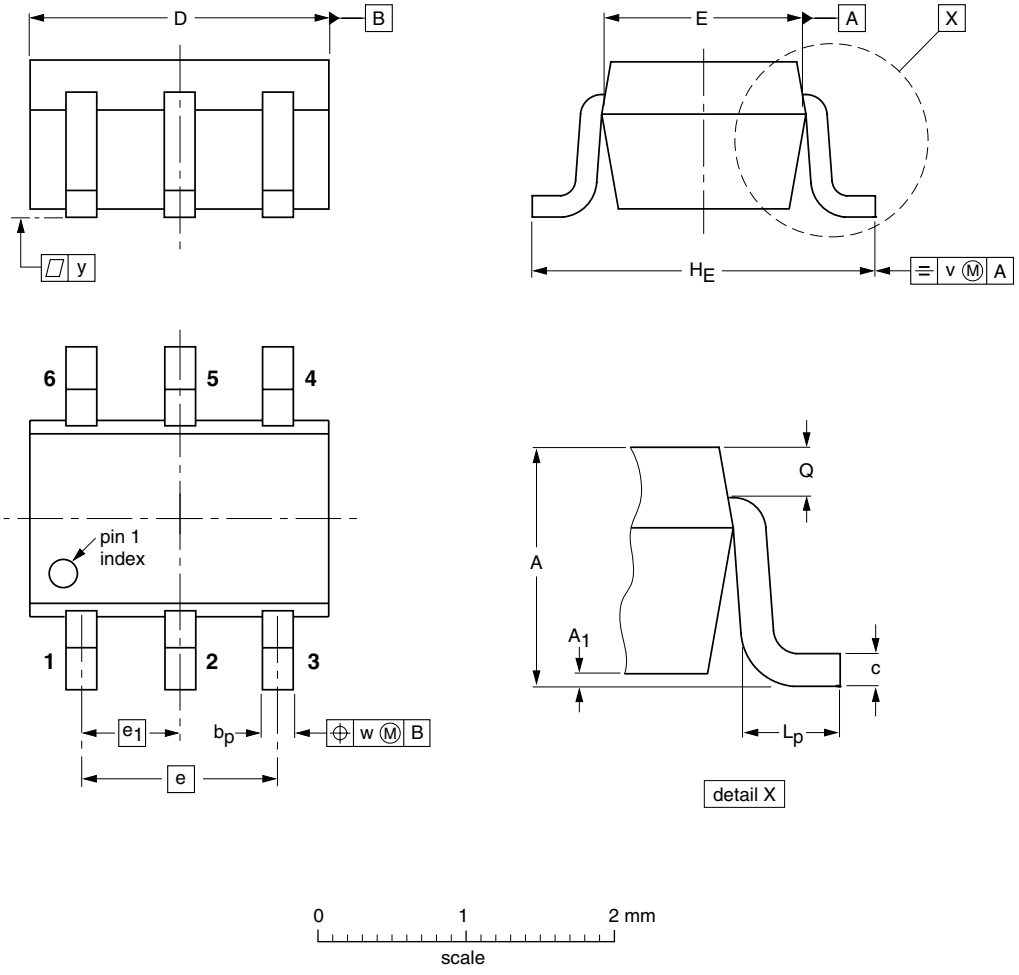
Fig.10 Insertion gain ($|s_{21}|^2$) as a function of frequency; typical values.

Scattering parameters: I_S = 33 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	0.057	61.299	10.355	16.087	0.0170	–74.818	0.478	76.916
200	0.106	17.478	11.232	–9.462	0.0227	8.389	0.349	23.045
400	0.115	–2.063	11.483	–42.370	0.0260	–23.825	0.304	–38.581
600	0.119	–15.293	11.500	–68.524	0.0196	–45.126	0.307	–80.857
800	0.129	–25.188	11.432	–95.433	0.0189	–47.969	0.310	–120.73
1000	0.150	–29.599	11.278	–121.66	0.0190	–55.476	0.320	–156.63
1200	0.173	–37.334	11.084	–147.90	0.0191	–69.573	0.316	168.76
1400	0.191	–44.490	10.949	–174.35	0.0232	–81.354	0.311	136.29
1600	0.207	–53.292	10.697	160.93	0.0214	–90.700	0.299	104.75
1800	0.224	–61.963	10.295	133.53	0.0221	–102.17	0.281	70.043
2000	0.230	–74.683	9.643	107.03	0.0218	–115.46	0.286	33.354
2200	0.208	–81.585	9.163	79.555	0.0206	–121.52	0.276	–6.455
2400	0.187	–88.228	8.379	52.153	0.0219	–138.58	0.274	–45.045
2600	0.131	–93.129	7.508	27.701	0.0220	–157.48	0.302	–80.059
2800	0.084	–79.612	6.625	3.225	0.0206	–165.22	0.333	–116.82
3000	0.064	–52.015	5.731	–20.112	0.0201	–175.69	0.357	–150.14

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

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