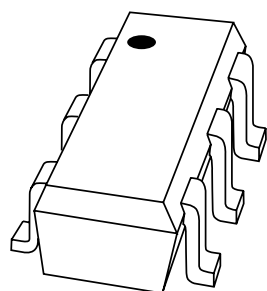


# DATA SHEET



## **BGA2748** MMIC wideband amplifier

Product specification  
Supersedes data of 2002 Jul 03

2010 Sep 13



## MMIC wideband amplifier

BGA2748

## FEATURES

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

## APPLICATIONS

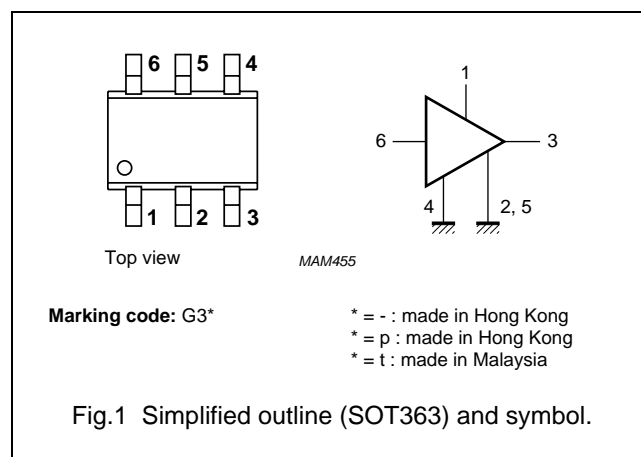
- Cable systems
- LNB IF amplifiers
- General purpose
- ISM.

## DESCRIPTION

Silicon 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



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V <sub>S</sub>	DC supply voltage		3	4	V
I <sub>S</sub>	DC supply current		5.7	—	mA
S <sub>21</sub>   <sup>2</sup>	insertion power gain	f = 1 GHz	21.8	—	dB
NF	noise figure	f = 1 GHz	1.9	—	dB
P <sub>L(sat)</sub>	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.

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

## CHARACTERISTICS

 $V_S = 3\text{ V}$ ;  $I_S = 5.7\text{ mA}$ ;  $f = 1\text{ GHz}$ ;  $T_j = 25\text{ °C}$ ; 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	$f = 1\text{ GHz}$	–	21.8	–	dB
		$f = 2\text{ GHz}$	–	18.5	–	dB
$R_{L\ IN}$	return losses input	$f = 1\text{ GHz}$	–	18	–	dB
		$f = 2\text{ GHz}$	–	14	–	dB
$R_{L\ OUT}$	return losses output	$f = 1\text{ GHz}$	–	7	–	dB
		$f = 2\text{ GHz}$	–	8	–	dB
NF	noise figure	$f = 1\text{ GHz}$	–	1.9	–	dB
		$f = 2\text{ GHz}$	–	2.4	–	dB
BW	bandwidth	at $ s_{21} ^2 - 3\text{ dB}$ below flat gain at 1 GHz	–	1.9	–	GHz
$P_{L(sat)}$	saturated load power	$f = 1\text{ GHz}$	–	–2.3	–	dBm
		$f = 2\text{ GHz}$	–	–3.3	–	dBm
$P_{L\ 1\text{ dB}}$	load power	at 1 dB gain compression; $f = 1\text{ GHz}$	–	–9.2	–	dBm
		at 1 dB gain compression; $f = 2\text{ GHz}$	–	–10.9	–	dBm
IP3(in)	input intercept point	$f = 1\text{ GHz}$	–	–23.7	–	dBm
		$f = 2\text{ GHz}$	–	–19.9	–	dBm
IP3(out)	output intercept point	$f = 1\text{ GHz}$	–	–1.9	–	dBm
		$f = 2\text{ GHz}$	–	–1.4	–	dBm

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## APPLICATION INFORMATION

Figure 2 shows a typical application circuit for the BGA2748 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 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.

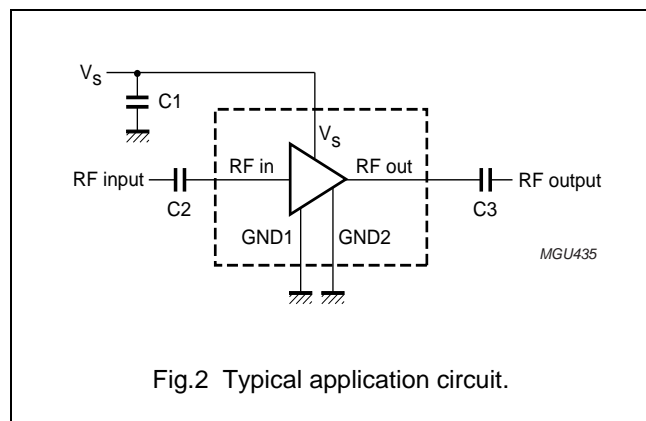


Fig.2 Typical application circuit.

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 an 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.

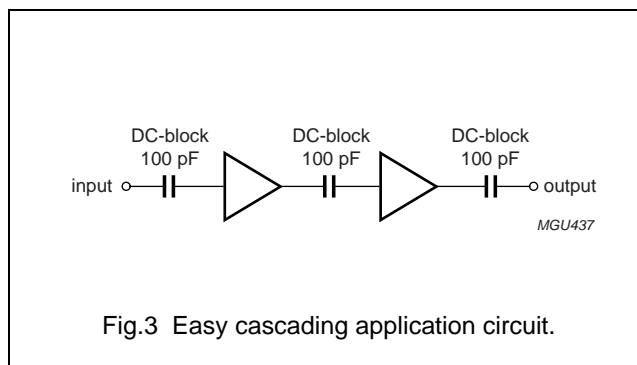


Fig.3 Easy cascading application circuit.

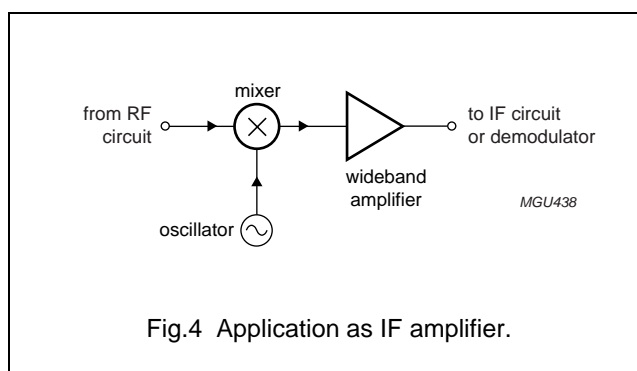


Fig.4 Application as IF amplifier.

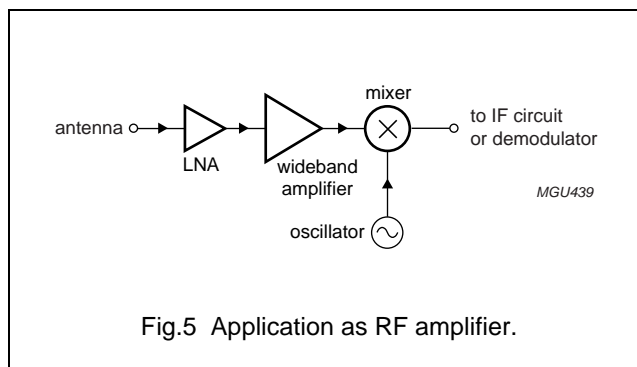


Fig.5 Application as RF amplifier.

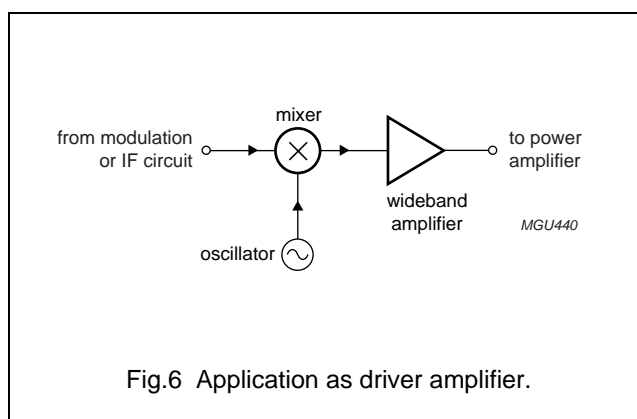
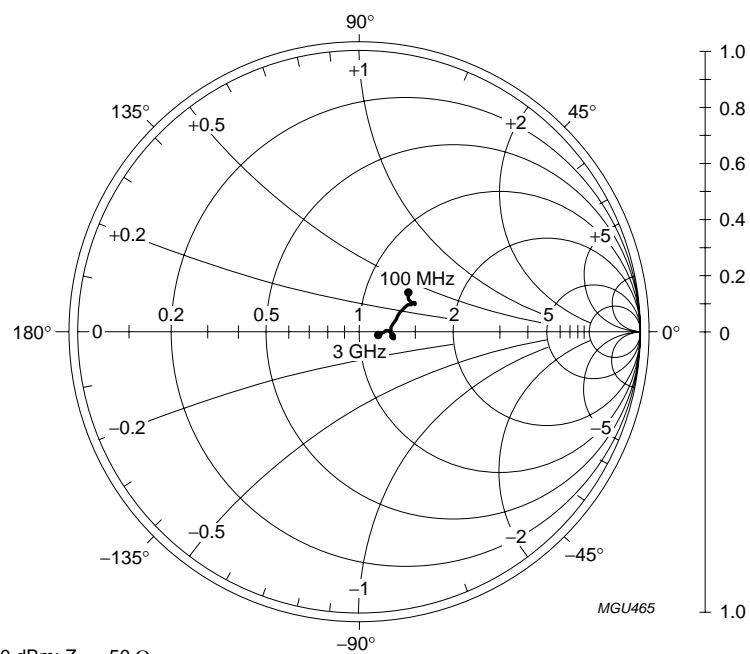
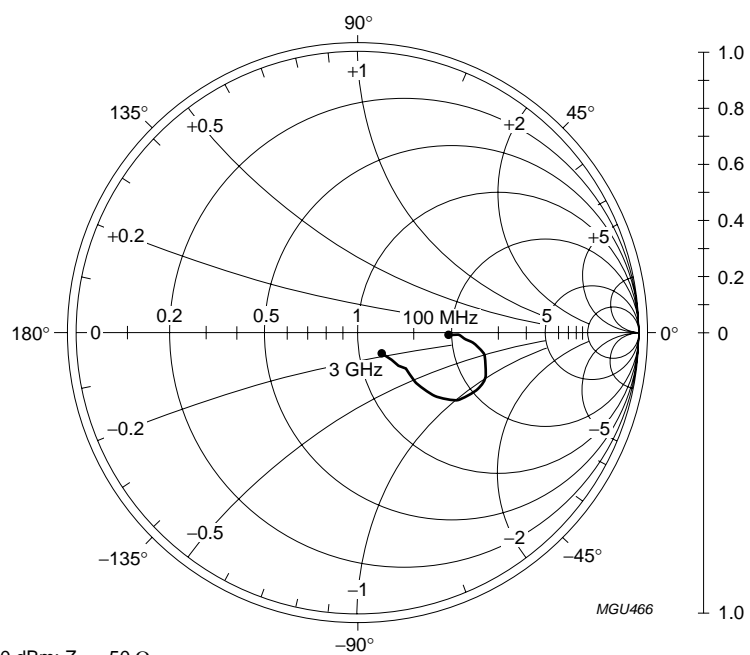


Fig.6 Application as driver amplifier.

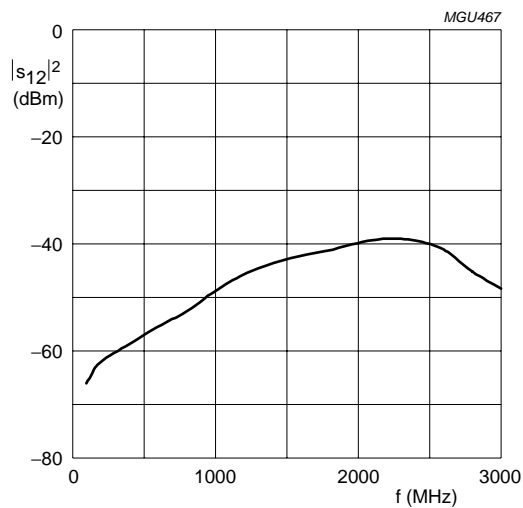
## MMIC wideband amplifier

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Fig.7 Input reflection coefficient ( $s_{11}$ ); typical values.Fig.8 Output reflection coefficient ( $s_{22}$ ); typical values.

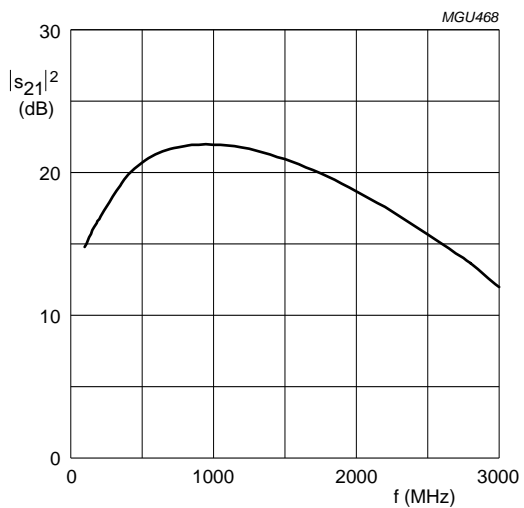
MMIC wideband amplifier

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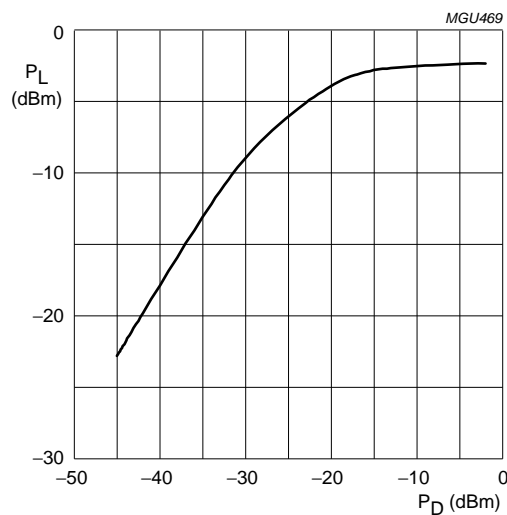
$I_S = 5.66$  mA;  $V_S = 3$  V;  $P_D = -30$  dBm;  $Z_O = 50$   $\Omega$ .

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



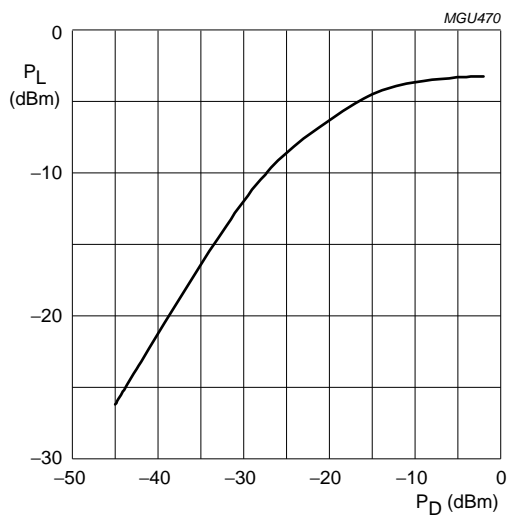
$I_S = 5.66$  mA;  $V_S = 3$  V;  $P_D = -30$  dBm;  $Z_O = 50$   $\Omega$ .

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



$V_S = 3$  V;  $f = 1$  GHz;  $Z_O = 50$   $\Omega$ .

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

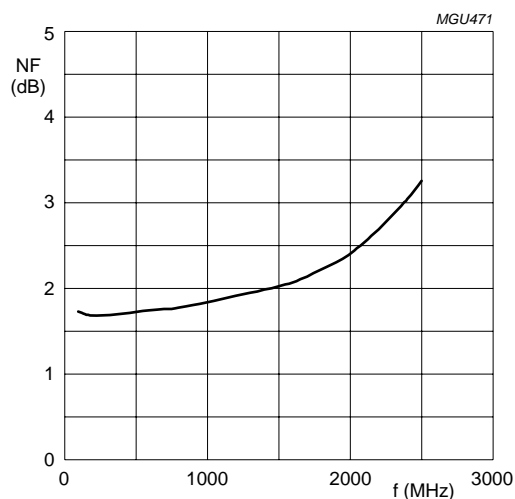


$V_S = 3$  V;  $f = 2$  GHz;  $Z_O = 50$   $\Omega$ .

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

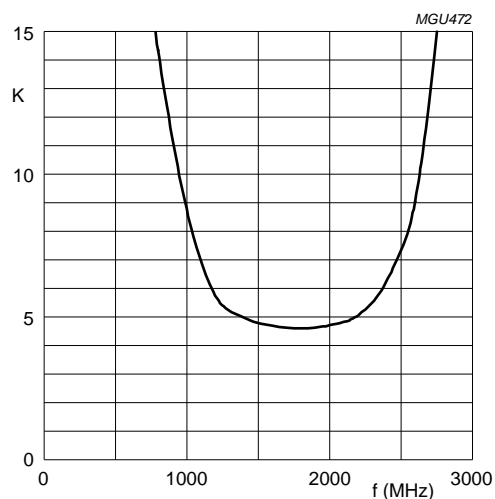
## MMIC wideband amplifier

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$I_S = 5.66 \text{ mA}$ ;  $V_S = 3 \text{ V}$ ;  $Z_O = 50 \Omega$ .

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



$I_S = 5.66 \text{ mA}$ ;  $V_S = 3 \text{ V}$ ;  $Z_O = 50 \Omega$ .

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

**Table 1** Scattering parameters:  $I_S = 5.66 \text{ mA}$ ;  $V_S = 3 \text{ V}$ ;  $P_D = -30 \text{ dBm}$ ;  $Z_O = 50 \Omega$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	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

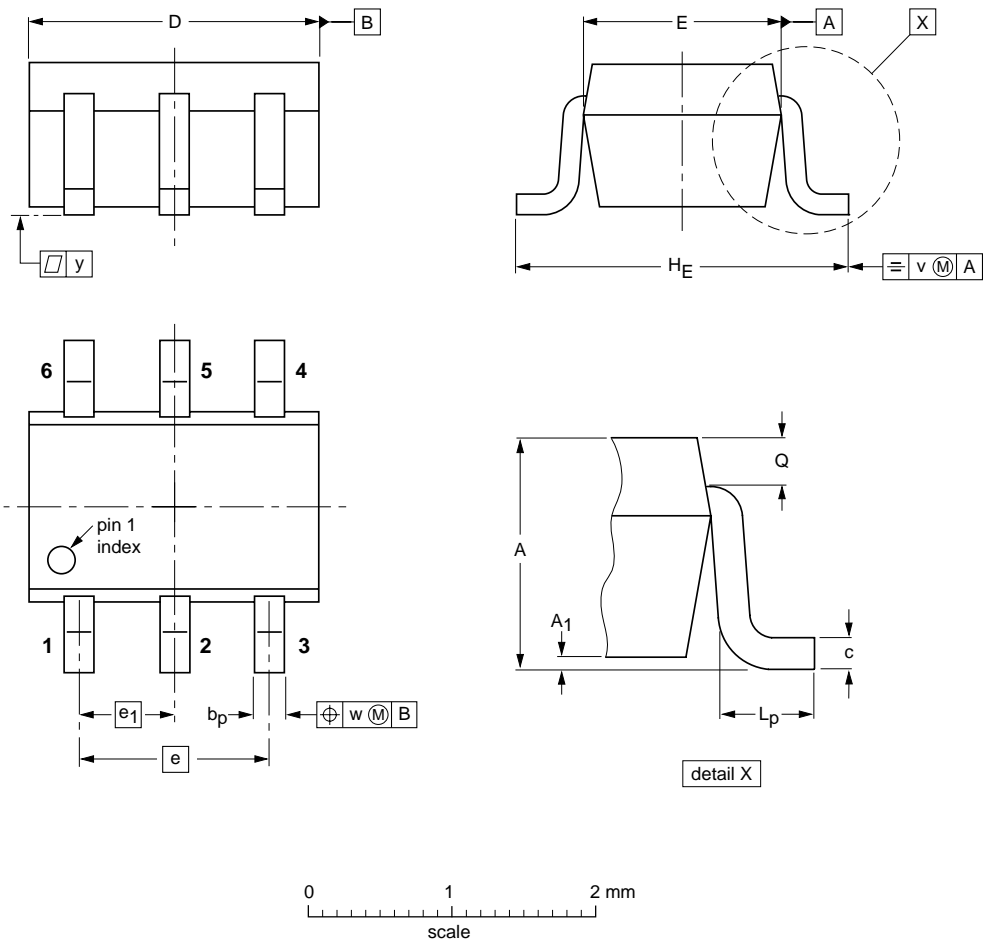
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PACKAGE OUTLINE

Plastic surface-mounted package; 6 leads

SOT363



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	bp	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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	JEITA			
SOT363			SC-88			04-11-08 06-03-16



## MMIC wideband amplifier

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## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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## **Contact information**

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