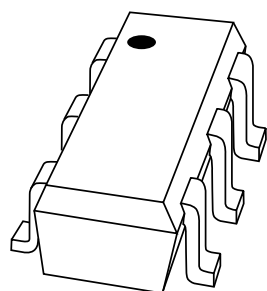


# DATA SHEET



## **BGA2711** MMIC wideband amplifier

Product specification  
Supersedes data of 2001 Apr 04

2001 Oct 19



MMIC wideband amplifier

BGA2711

FEATURES

- Internally matched to 50 Ω
- Very wide frequency range
- Very flat gain
- Unconditionally stable.

APPLICATIONS

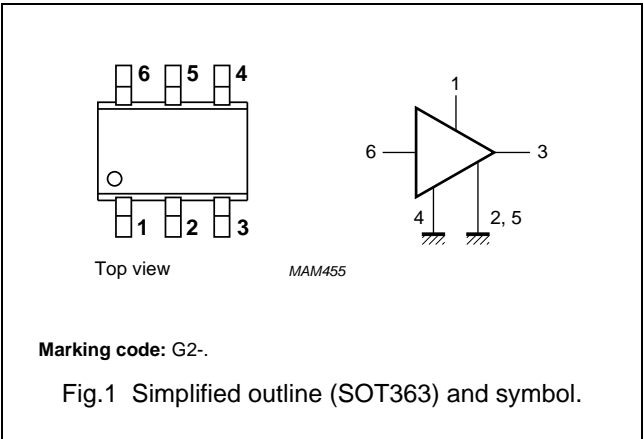
- Cable systems
- LNB IF amplifiers
- General purpose
- ISM.

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		5	6	V
I <sub>S</sub>	DC supply current		12.6	–	mA
s <sub>21</sub>   <sup>2</sup>	insertion power gain	f = 1 GHz	13.1	–	dB
NF	noise figure	f = 1 GHz	4.8	–	dB
P <sub>L(sat)</sub>	saturated load power	f = 1 GHz	2.8	–	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	–	6	V
$I_S$	supply current		–	20	mA
$P_{tot}$	total power dissipation	$T_s \leq 80\text{ }^{\circ}\text{C}$	–	200	mW
$T_{stg}$	storage temperature		–65	+150	$^{\circ}\text{C}$
$T_j$	operating junction temperature		–	150	$^{\circ}\text{C}$
$P_D$	maximum drive power		–	10	dBm

## THERMAL RESISTANCE

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

## CHARACTERISTICS

 $V_S = 5\text{ V}$ ;  $I_S = 12.6\text{ mA}$ ;  $f = 1\text{ GHz}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_S$	supply current		10	12.6	16	mA
$ s_{21} ^2$	insertion power gain	$f = 1\text{ GHz}$	–	13.1	–	dB
		$f = 2\text{ GHz}$	–	13.9	–	dB
$R_{L\ IN}$	return losses input	$f = 1\text{ GHz}$	–	11	–	dB
		$f = 2\text{ GHz}$	–	10	–	dB
$R_{L\ OUT}$	return losses output	$f = 1\text{ GHz}$	–	18	–	dB
		$f = 2\text{ GHz}$	–	13	–	dB
NF	noise figure	$f = 1\text{ GHz}$	–	4.8	–	dB
		$f = 2\text{ GHz}$	–	4.8	–	dB
BW	bandwidth	at $ s_{21} ^2 - 3\text{ dB}$ below flat gain at 1 GHz	–	3.6	–	GHz
$P_{L(sat)}$	saturated load power	$f = 1\text{ GHz}$	–	2.8	–	dBm
		$f = 2\text{ GHz}$	–	0.6	–	dBm
$P_{L\ 1\text{ dB}}$	load power	at 1 dB gain compression; $f = 1\text{ GHz}$	–	–0.7	–	dBm
		at 1 dB gain compression; $f = 2\text{ GHz}$	–	–1.8	–	dBm
$IP3_{(in)}$	input intercept point	$f = 1\text{ GHz}$	–	–4.8	–	dBm
		$f = 2\text{ GHz}$	–	–8.5	–	dBm
$IP3_{(out)}$	output intercept point	$f = 1\text{ GHz}$	–	8.3	–	dBm
		$f = 2\text{ GHz}$	–	5.4	–	dBm

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## APPLICATION INFORMATION

Figure 2 shows a typical application circuit for the BGA2711 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.

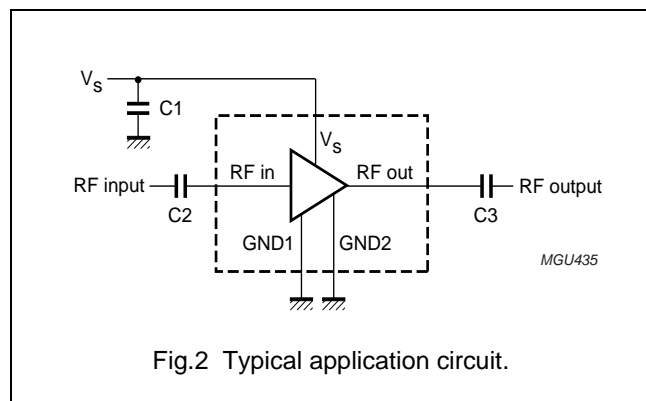


Fig.2 Typical application circuit.

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.

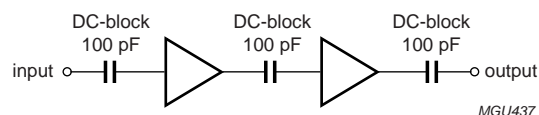


Fig.3 Easy cascading application circuit.

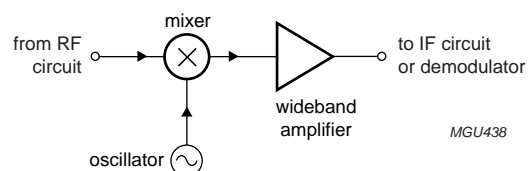


Fig.4 Application as IF amplifier.

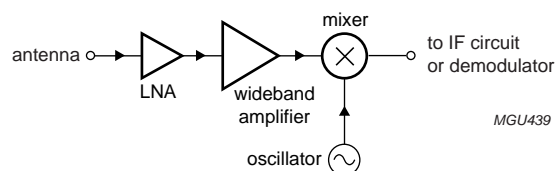


Fig.5 Application as RF amplifier.

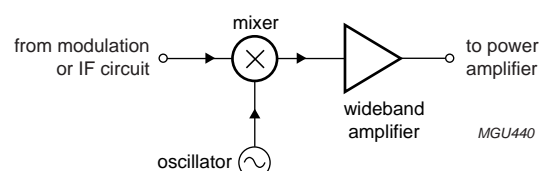
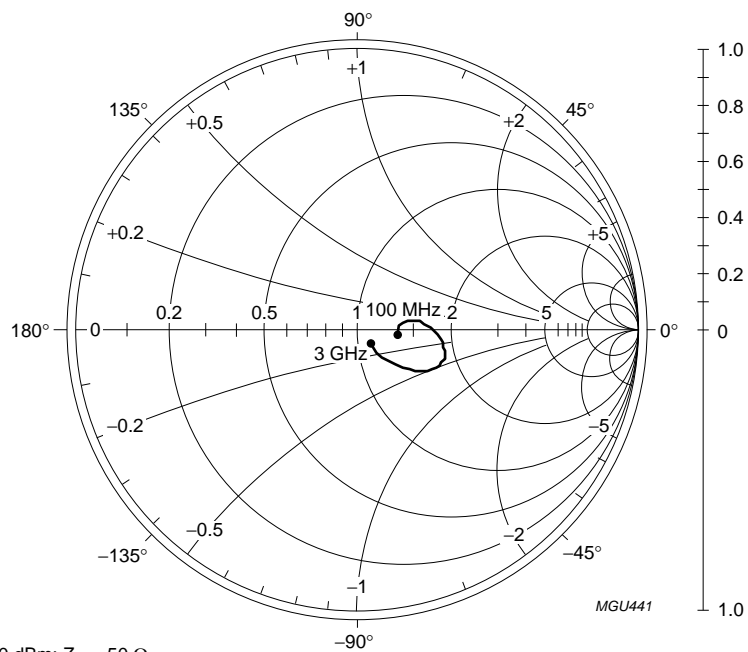
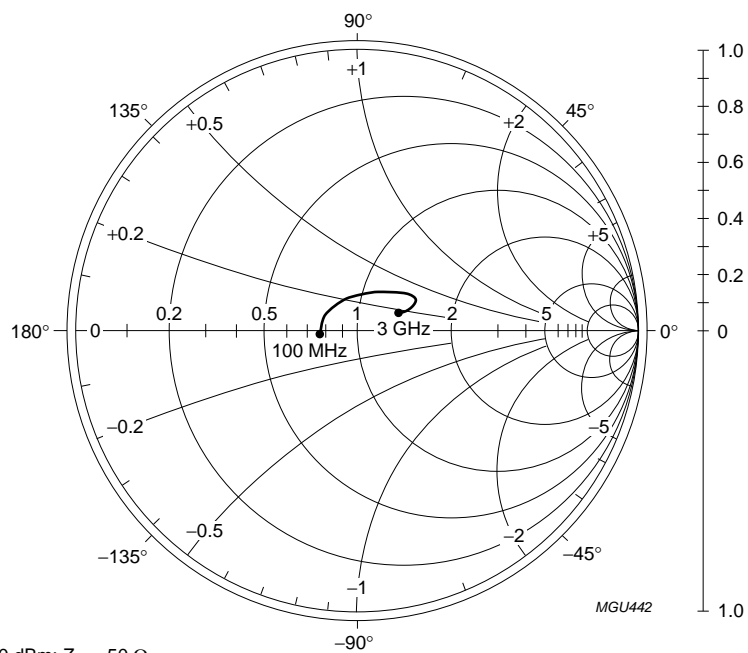


Fig.6 Application as driver amplifier.

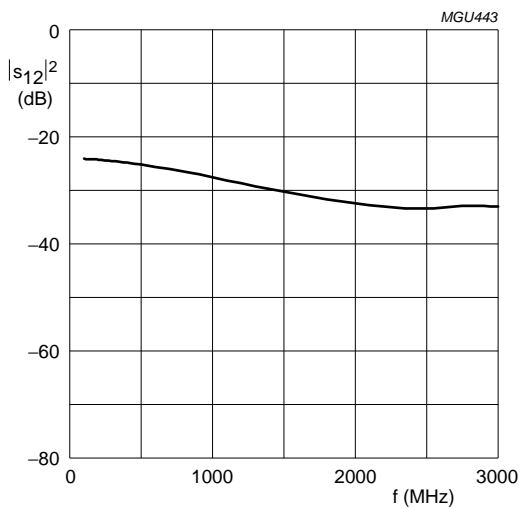
## MMIC wideband amplifier

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

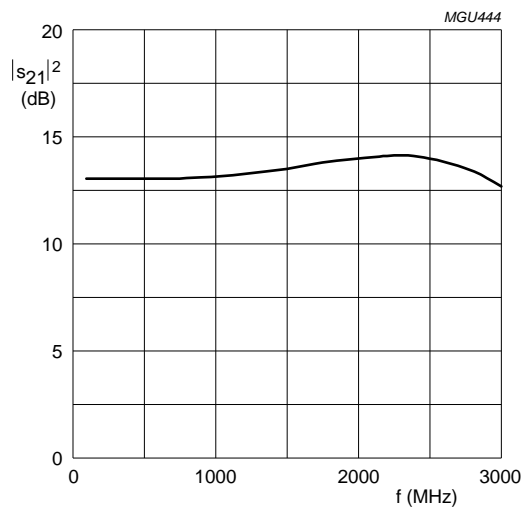
MMIC wideband amplifier

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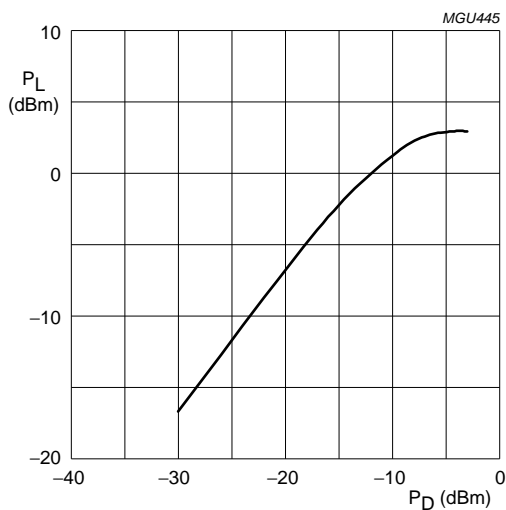
$I_S = 12.6 \text{ mA}$ ;  $V_S = 5 \text{ V}$ ;  $P_D = -30 \text{ dBm}$ ;  $Z_O = 50 \Omega$ .

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



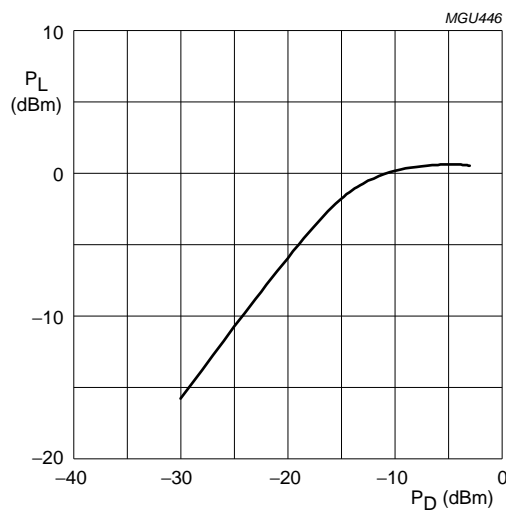
$I_S = 12.6 \text{ mA}$ ;  $V_S = 5 \text{ V}$ ;  $P_D = -30 \text{ dBm}$ ;  $Z_O = 50 \Omega$ .

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



$V_S = 5 \text{ V}$ ;  $f = 1 \text{ GHz}$ ;  $Z_O = 50 \Omega$ .

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

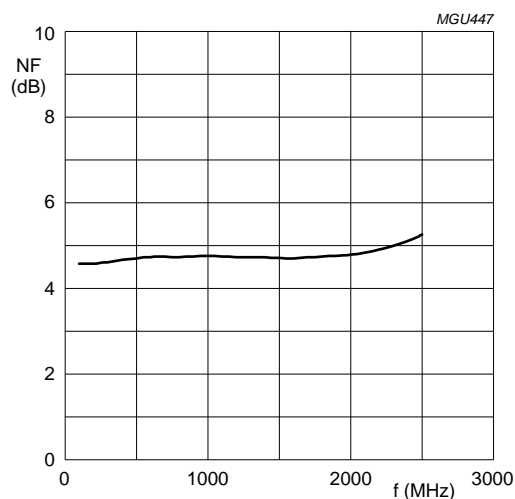


$V_S = 5 \text{ V}$ ;  $f = 2 \text{ GHz}$ ;  $Z_O = 50 \Omega$ .

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

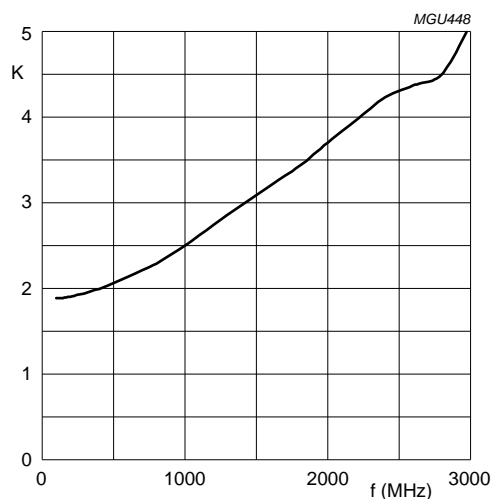
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$I_S = 12.6 \text{ mA}$ ;  $V_S = 5 \text{ V}$ ;  $Z_O = 50 \Omega$ .

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



$I_S = 12.6 \text{ mA}$ ;  $V_S = 5 \text{ V}$ ;  $Z_O = 50 \Omega$ .

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

Scattering parameters:  $I_S = 12.6 \text{ mA}$ ;  $P_D = -30 \text{ dBm}$ ;  $Z_O = 50 \Omega$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

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	0.14563	-3.502	4.4867	-1.843	0.06220	-2.939	0.13029	-174.50
200	0.15253	5.557	4.4944	-6.788	0.06117	-8.095	0.12640	169.58
400	0.18735	10.06	4.4841	-15.22	0.05751	-16.61	0.11957	148.02
600	0.22695	8.206	4.4862	-22.94	0.05240	-22.85	0.11288	126.58
800	0.26122	2.635	4.4985	-30.57	0.04744	-27.72	0.11286	104.24
1000	0.28776	-2.465	4.5390	-38.34	0.04187	-31.17	0.12236	82.570
1200	0.30888	-8.179	4.6052	-46.14	0.03666	-32.98	0.14066	65.815
1400	0.32055	-13.16	4.6862	-54.45	0.03251	-33.25	0.16341	53.911
1600	0.32492	-17.85	4.7929	-63.29	0.02903	-32.38	0.18689	45.122
1800	0.31849	-22.43	4.9219	-72.67	0.02624	-29.24	0.20662	38.894
2000	0.30085	-26.75	4.9973	-83.08	0.02395	-26.62	0.22092	33.706
2200	0.27106	-31.57	5.0755	-93.96	0.02228	-22.20	0.22754	29.699
2400	0.23157	-35.78	5.0668	-106.1	0.02134	-17.95	0.22679	26.622
2600	0.18594	-40.38	4.9143	-118.1	0.02176	-13.86	0.21806	23.868
2800	0.13159	-44.34	4.6797	-129.6	0.02276	-12.70	0.19660	22.060
3000	0.07266	-41.76	4.3139	-140.5	0.02241	-17.06	0.16355	22.273

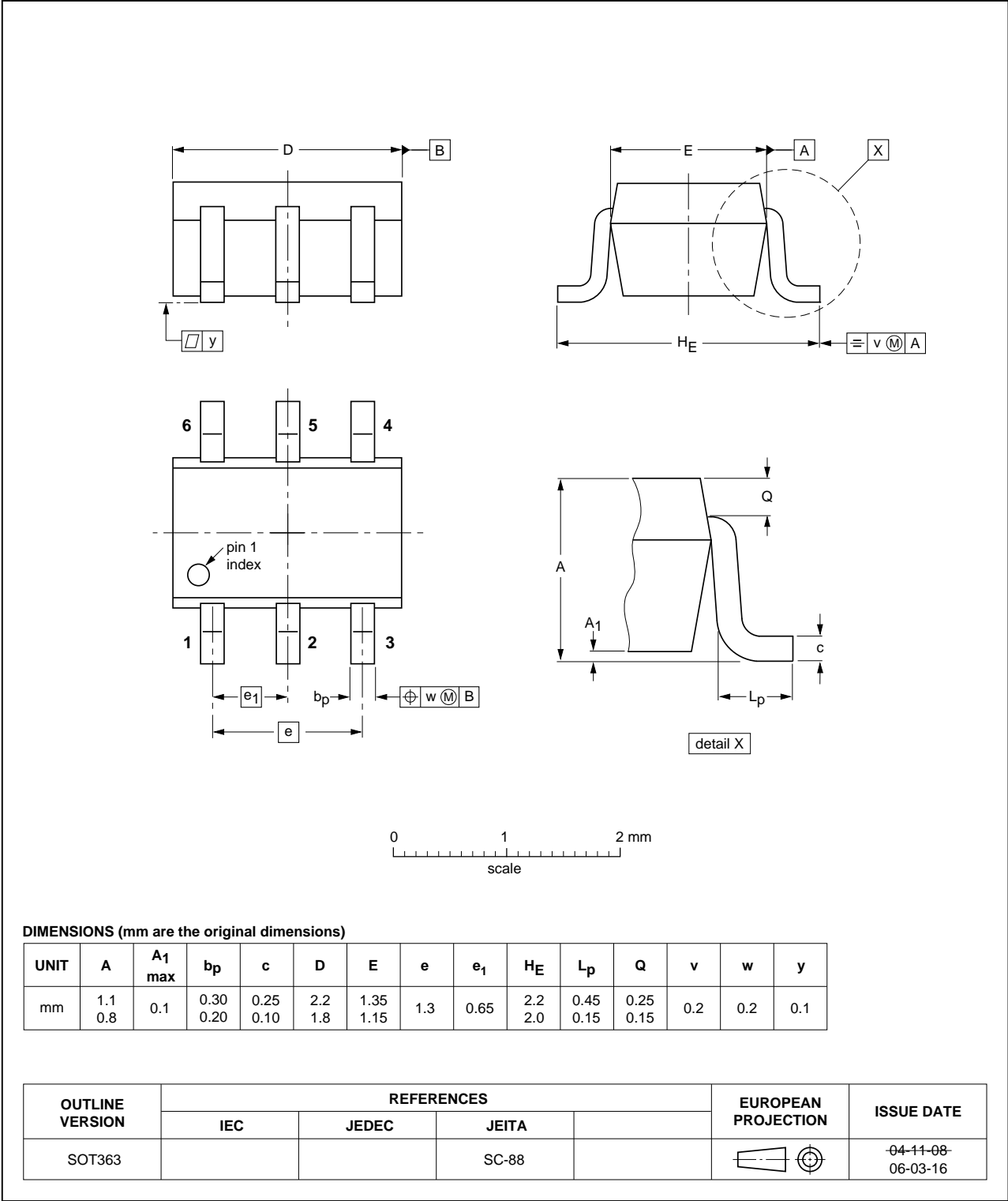
MMIC wideband amplifier

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PACKAGE OUTLINE

Plastic surface-mounted package; 6 leads

SOT363



## 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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Printed in The Netherlands

R77/02/pp11

Date of release: 2001 Oct 19