

# BGU7031

## 1 GHz wideband low-noise amplifier

Rev. 2 — 7 September 2010

Product data sheet

## 1. Product profile

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### 1.1 General description

The BGU7031 MMIC is a wideband amplifier with internal biasing. It is designed specifically for high linearity, low-noise applications over a frequency range of 40 MHz to 1 GHz. It is especially suited to Set-Top Box applications.

The LNA is housed in a 6-pin SOT363 plastic SMD package.

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features and benefits

- Internally biased
- Flat gain between 40 MHz and 1 GHz
- Noise figure of 4.5 dB
- High linearity with an  $IP3_O$  of 29 dBm
- 75  $\Omega$  input and output impedance
- ESD protection > 2 kV Human Body Model (HBM) on all pins

### 1.3 Applications

- Terrestrial and cable Set-Top Boxes (STB)
- Silicon and “Can” tuners
- Personal and Digital Video Recorders (PVR and DVR)
- Home networking and in-house signal distribution



### 1.4 Quick reference data

**Table 1. Quick reference data**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; typical values at  $V_{CC} = 5\text{ V}$ ;  $Z_S = Z_L = 75\text{ }\Omega$ ;  $R_{bias} = 43\text{ }\Omega$ ;  $40\text{ MHz} \leq f_1 \leq 1000\text{ MHz}$ .

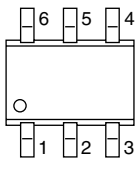
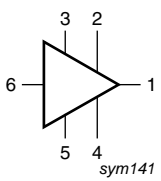
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	4.75	5.0	5.25	V
$I_{CC(tot)}$	total supply current		[1]	-	43	mA
$T_{amb}$	ambient temperature		-10	+25	+70	$^{\circ}\text{C}$
NF	noise figure		-	4.5	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	1 GHz	-	13	-	dBm
IP3O	output third-order intercept point		[2]	-	29	dBm

[1]  $I_{CC(tot)}$  is configurable with external resistor.

[2] The fundamental frequency ( $f_1$ ) lies between 40 MHz and 1000 MHz. The intermodulation product (IM3) is  $2 \times f_2 - f_1$ , where  $f_2 = f_1 \pm 1\text{ MHz}$ . Input power  $P_i = -10\text{ dBm}$ .

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	RF_OUT		
2	$V_{CC}$		
3	n.c.		
4	n.c.		
5	GND		
6	RF_IN		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BGU7031	-	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
BGU7031	SC%

Note: % character indicates the location of production.

## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	-0.6	5.25	V
$I_{CC(tot)}$	total supply current	configurable with external resistor	-	60	mA
$P_{tot}$	total power dissipation	$T_{sp} \leq 100\text{ }^{\circ}\text{C}$	[1]	250	mW
$P_i$	input power	single tone	-	10	dBm
$T_{stg}$	storage temperature		-65	+150	$^{\circ}\text{C}$
$T_j$	junction temperature		-	150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature		-10	+70	$^{\circ}\text{C}$
$V_{ESD}$	electrostatic discharge voltage	Human Body Model (HBM); according to JEDEC standard 22-A114E	2	-	kV

[1]  $T_{sp}$  is the temperature at the solder point of the ground lead.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		240	K/W

## 7. Characteristics

**Table 7. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; typical values at  $V_{CC} = 5\text{ V}$ ;  $Z_S = Z_L = 75\text{ }\Omega$ ;  $R_{bias} = 43\text{ }\Omega$ ;  $40\text{ MHz} \leq f_1 \leq 1000\text{ MHz}$ .

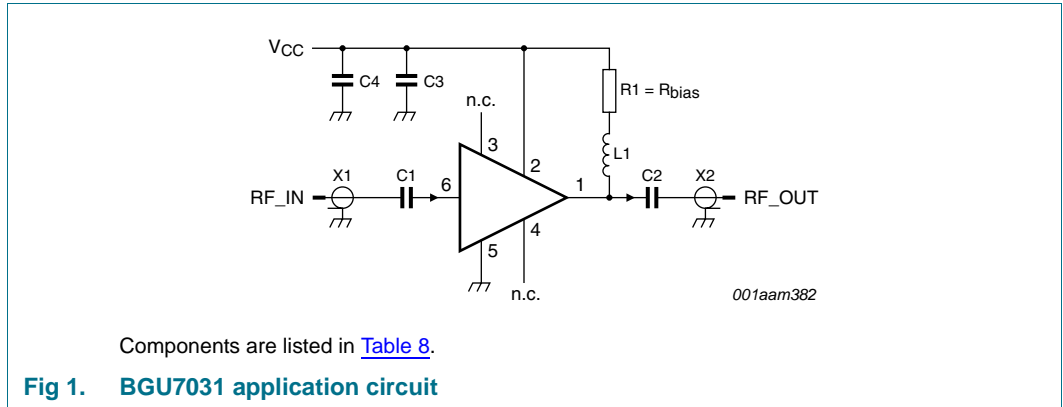
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	RF input AC coupled	4.75	5.0	5.25	V
$I_{CC(tot)}$	total supply current		-	43	-	mA
$ S_{21} ^2$	insertion power gain		-	10	-	dB
$SL_{sl}$	slope straight line		-	-1	-	dB
FL	flatness of frequency response		-	-0.2	-	dB
NF	noise figure		-	4.5	-	dB
$RL_{in}$	input return loss		-	18	-	dB
$RL_{out}$	output return loss		-	12	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	1 GHz	-	14	-	dBm
IP3 <sub>O</sub>	output third-order intercept point		[1]	29	-	dBm

[1] The fundamental frequency ( $f_1$ ) lies between 40 MHz and 1000 MHz. The intermodulation product (IM3) is  $2 \times f_2 - f_1$ , where  $f_2 = f_1 \pm 1\text{ MHz}$ . Input power  $P_i = -10\text{ dBm}$ .

## 8. Application information

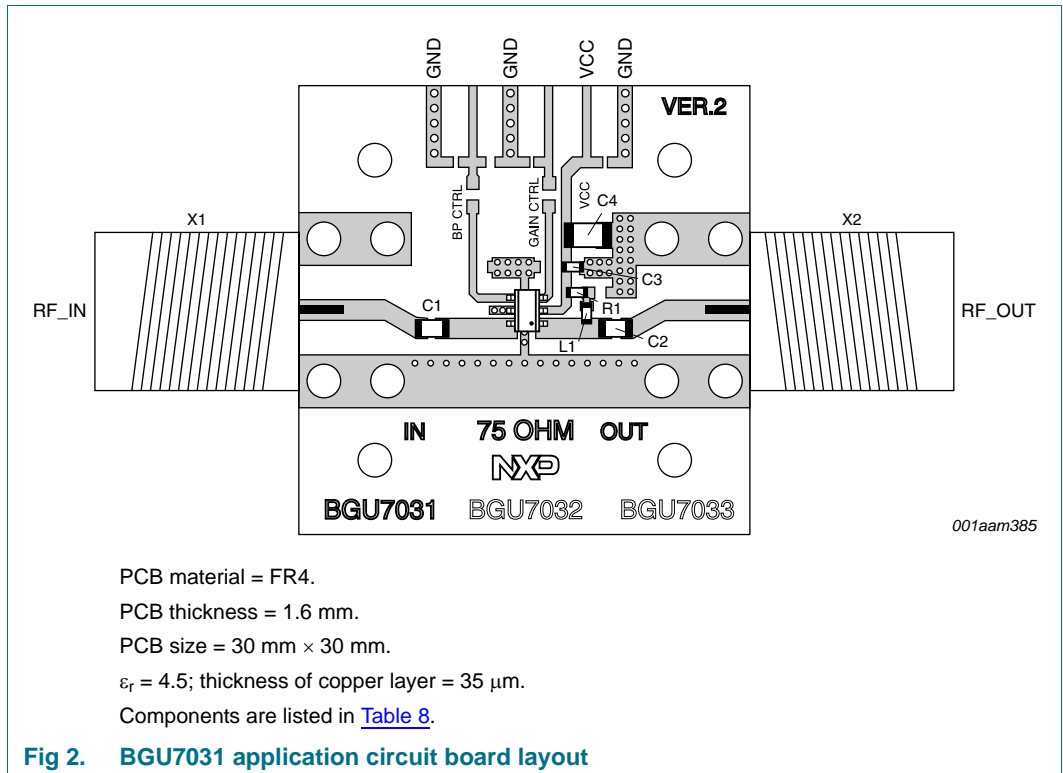
Other applications are possible. Please contact your local sales representative for more information. Application notes are available on the NXP website.

### 8.1 Application circuit



All control and supply lines must be decoupled properly. The decoupling capacitors must be placed as close to the device as possible.

### 8.2 Application circuit board layout



**Table 8. List of components**See [Figure 1](#) and [Figure 2](#).

Component	Description	Value	Remarks	Function
C1, C2	capacitor	10 nF		DC blocking
C3	capacitor	10 nF		decoupling
C4	capacitor	10 $\mu$ F		decoupling
L1	chip ferrite bead	1.5 k $\Omega$	[1] Murata BLM18HE152SN1DF	RF choke
R1	resistor	43 $\Omega$	[1] R <sub>bias</sub>	bias setting
X1, X2	connector	75 $\Omega$	F-connector, edge mount PCB reflow type, Bomar 861V509ERG	input/output

[1] L1 and R1 must have a power rating of 0.1 W or higher.

9. Package outline

Plastic surface-mounted package; 6 leads

SOT363

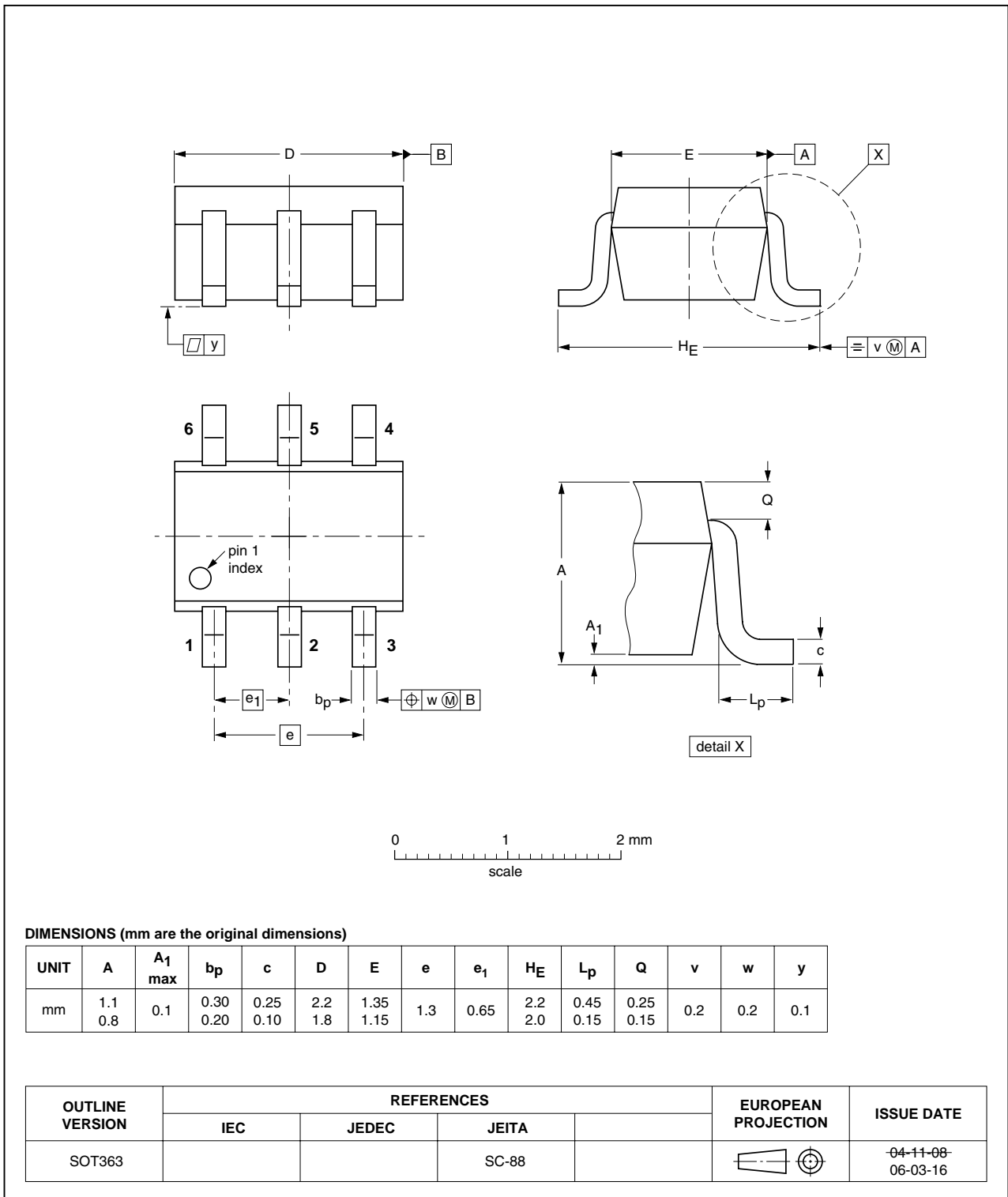


Fig 3. Package outline SOT363

## 10. Abbreviations

Table 9. Abbreviations

Acronym	Description
AC	Alternating Current
DC	Direct Current
LNA	Low-Noise Amplifier
MMIC	Monolithic Microwave Integrated Circuit
PCB	Printed-Circuit Board
RF	Radio Frequency
SMD	Surface-Mounted Device

## 11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGU7031 v.2	20100907	Product data sheet	-	BGU7031 v.1
Modifications:		<ul style="list-style-type: none"><li>The status of this data sheet has been changed to Product data sheet.</li><li><a href="#">Table 5 on page 3</a>: The minimum value for <math>V_{CC}</math> has been added.</li></ul>		
BGU7031 v.1	20100812	Preliminary data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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[2] The term 'short data sheet' is explained in section "Definitions".

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