

# BGU7044

## 1 GHz wideband low-noise amplifier

Rev. 1 — 2 January 2012

Product data sheet

## 1. Product profile

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### 1.1 General description

The BGU7044 MMIC is a 3.3 V 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 for Set-Top Box applications.

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

### 1.2 Features and benefits

- Voltage supply of 3.3 V
- Internally biased
- Gain of 14 dB
- Flat gain between 40 MHz and 1 GHz
- Noise figure of 2.8 dB
- High linearity with an  $IP3_O$  of 29 dBm
- 75  $\Omega$  input and output impedance
- ESD protection > 2 kV Human Body Model (HBM) and > 1.5 kV Charged Device Model (CDM) on all pins

### 1.3 Applications

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



### 1.4 Quick reference data

**Table 1. Quick reference data**

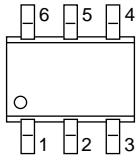
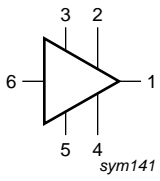
$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; typical values at  $V_{CC} = 3.3\text{ V}$ ;  $Z_S = Z_L = 75\text{ }\Omega$ ;  $R_{bias} = 18\text{ }\Omega$ ;  $40\text{ MHz} \leq f_1 \leq 1000\text{ MHz}$ .

| Symbol        | Parameter                             | Conditions          | Min | Typ | Max | Unit               |
|---------------|---------------------------------------|---------------------|-----|-----|-----|--------------------|
| $V_{CC}$      | supply voltage                        | RF input AC coupled | 3.1 | 3.3 | 3.5 | V                  |
| $I_{CC(tot)}$ | total supply current                  |                     | 30  | 34  | 38  | mA                 |
| $T_{amb}$     | ambient temperature                   |                     | -40 | -   | +85 | $^{\circ}\text{C}$ |
| NF            | noise figure                          |                     | -   | 2.8 | -   | dB                 |
| $P_{L(1dB)}$  | output power at 1 dB gain compression | 1 GHz               | -   | 13  | -   | dBm                |
| IP3O          | output third-order intercept point    |                     | [1] | -   | 29  | dBm                |

[1] The fundamental frequency ( $f_1$ ) is 1000 MHz. The intermodulation product (IM3) is  $2 \times f_2 - f_1$ , where  $f_2 = f_1 \pm 1\text{ MHz}$ . Input power  $P_1 = -10\text{ dBm}$ .

## 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                              |         |
| BGU7044     | -       | plastic surface-mounted package; 6 leads | SOT363  |

## 4. Marking

**Table 4. Marking**

| Type number | Marking code | Description  |
|-------------|--------------|--|
| BGU7044     | LJ*          | * = p : made in Hong Kong<br>* = W : made in China<br>* = t : made in Malaysia |

## 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 | 3.5  | V    |
| $I_{CC(tot)}$ | total supply current            | configurable with external resistor                                    | -    | 60   | mA   |
| $P_{tot}$     | total power dissipation         | $T_{sp} \leq 100\text{ °C}$  | [1]  | 250  | mW   |
| $P_i$         | input power                     | single tone  | -    | 20   | dBm  |
| $T_{stg}$     | storage temperature             |  | -65  | +150 | °C   |
| $T_j$         | junction temperature            |  | -    | 150  | °C   |
| $T_{amb}$     | ambient temperature             |  | -40  | +85  | °C   |
| $V_{ESD}$     | electrostatic discharge voltage | Human Body Model (HBM);<br>according to JEDEC standard<br>22-A114E     | 2    | -    | kV   |
|               |                                 | Charged Device Model (CDM);<br>according to JEDEC standard<br>22-C101B | 1.5  | -    | 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**

$T_{amb} = 25\text{ °C}$ ; typical values at  $V_{CC} = 3.3\text{ V}$ ;  $Z_S = Z_L = 75\ \Omega$ ;  $R_{bias} = 18\ \Omega$ ;  $40\text{ MHz} \leq f_1 \leq 1000\text{ MHz}$ .

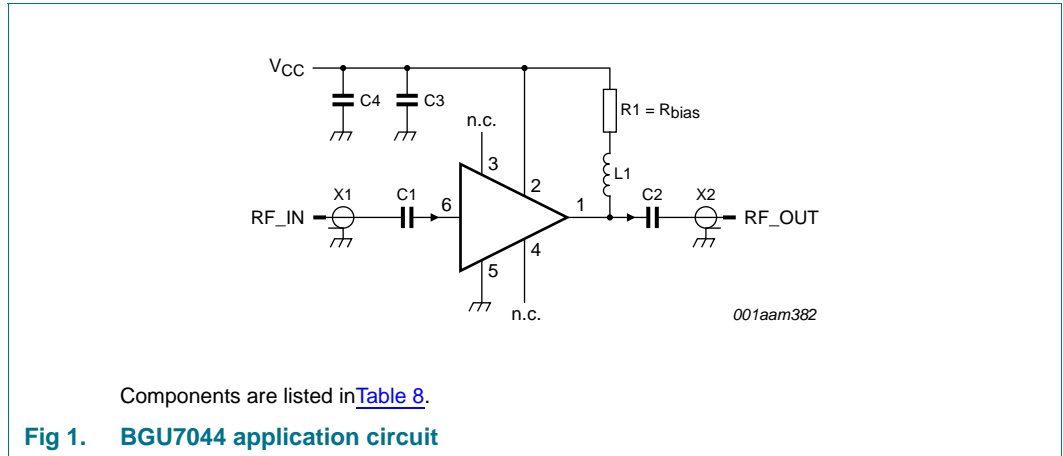
| Symbol        | Parameter                             | Conditions          | Min | Typ | Max | Unit |
|---------------|---------------------------------------|---------------------|-----|-----|-----|------|
| $V_{CC}$      | supply voltage                        | RF input AC coupled | 3.1 | 3.3 | 3.5 | V    |
| $I_{CC(tot)}$ | total supply current                  |                     | 30  | 34  | 38  | mA   |
| $ S_{21} ^2$  | insertion power gain                  |                     | -   | 14  | -   | dB   |
| $SL_{sl}$     | slope straight line                   |                     | -   | -1  | -   | dB   |
| FL            | flatness of frequency response        |                     | -   | 0.2 | -   | dB   |
| NF            | noise figure                          |                     | -   | 2.8 | -   | dB   |
| $RL_{in}$     | input return loss                     |                     | -   | 20  | -   | dB   |
| $RL_{out}$    | output return loss                    |                     | -   | 12  | -   | dB   |
| $P_{L(1dB)}$  | output power at 1 dB gain compression | 1 GHz               | -   | 13  | -   | dBm  |
| $IP3_O$       | output third-order intercept point    |                     | [1] | 29  | -   | dBm  |

[1] The fundamental frequency ( $f_1$ ) is 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

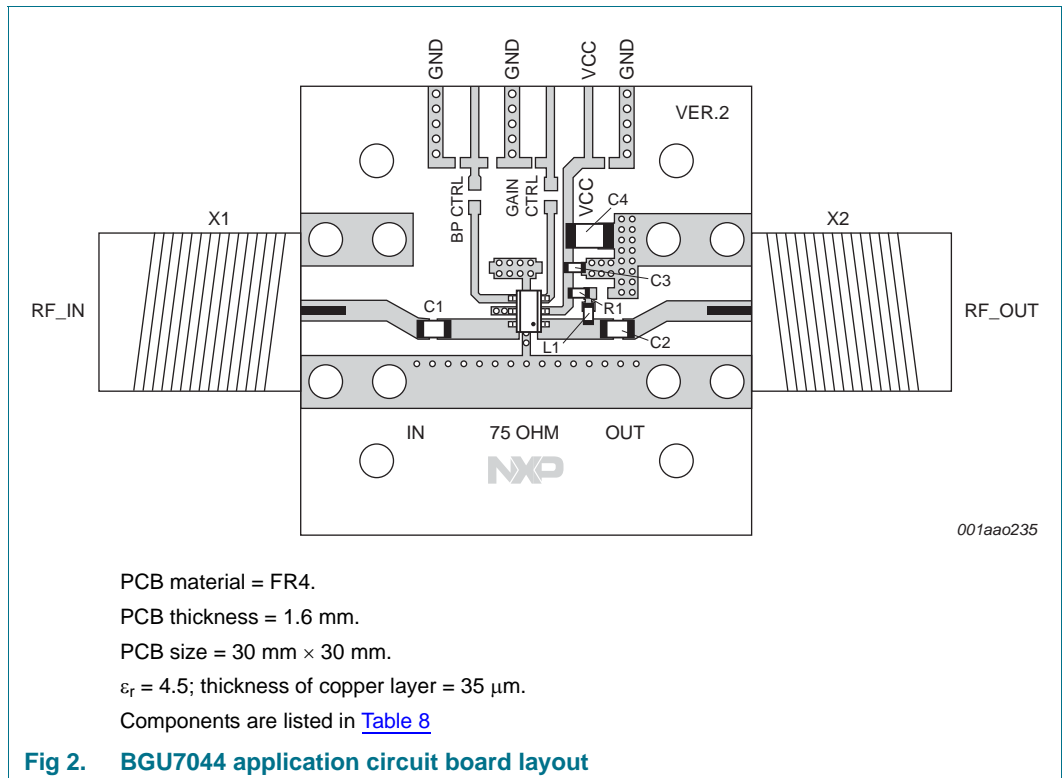
Other applications are possible. Please contact your local sales representative for more information. Application notes are available on the NXP website.

### 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          | 18 $\Omega$    | [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

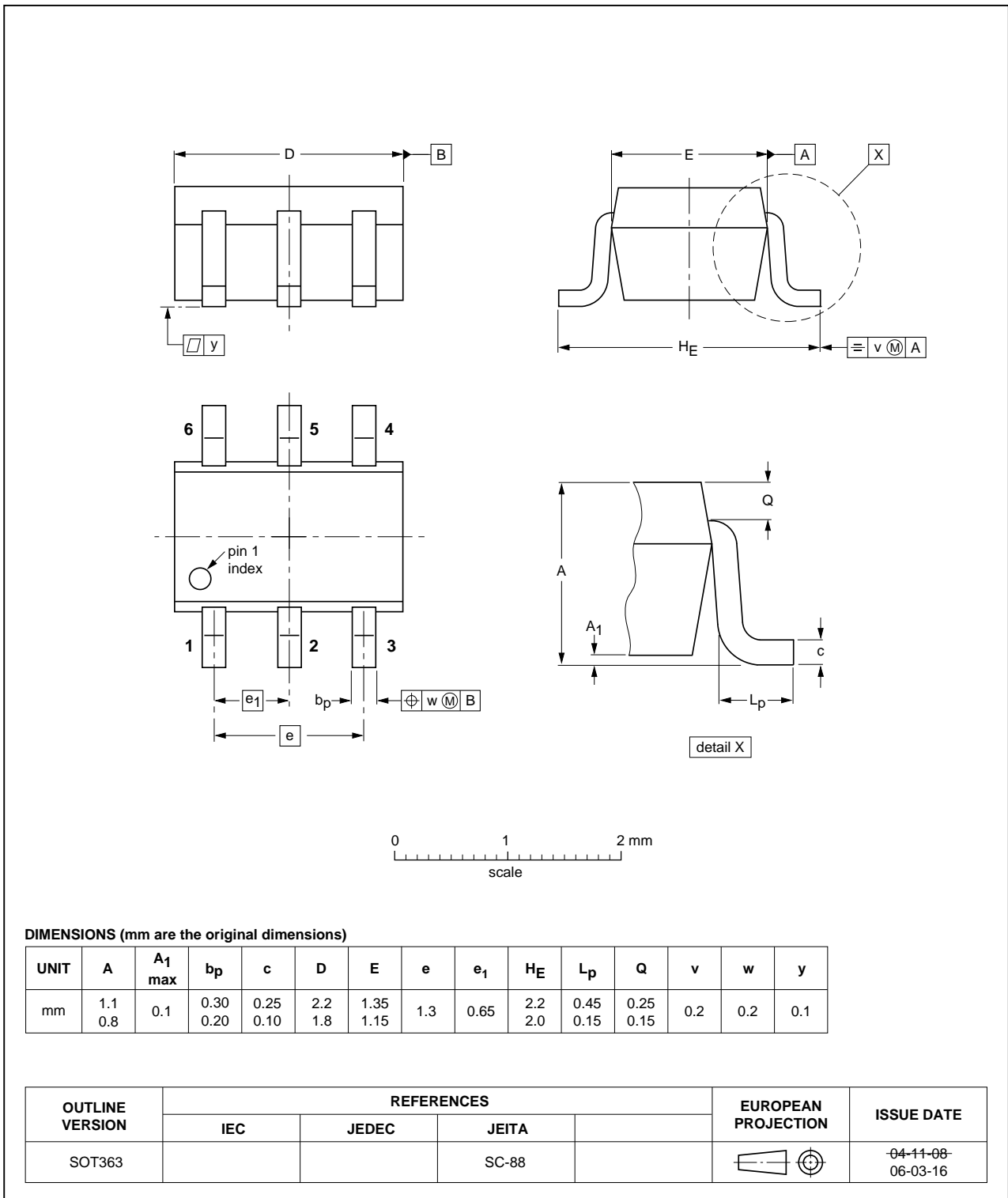


Fig 3. Package outline SOT363

## 10. Abbreviations

Table 9. Abbreviations

| Acronym | Description                             |
|---------|---|
| AC      | Alternating Current                     |
| DC      | Direct Current                          |
| ESD     | ElectroStatic Discharge                 |
| 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 |
|-------------|--------------|--------------------|---------------|------------|
| BGU7044 v.1 | 20120102     | Product data sheet | -             | -          |

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### 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. |
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| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

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