

BGU7041

1 GHz wideband low-noise amplifier

Rev. 2 — 13 September 2011

Product data sheet

1. Product profile

1.1 General description

The BGU7041 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 10 dB
- Flat gain between 40 MHz and 1 GHz
- Noise figure of 3.8 dB
- High linearity with an $IP3_O$ of 29 dBm
- 75 Ω 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

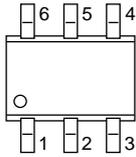
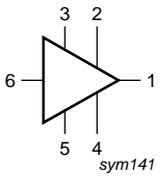
$T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values at $V_{CC} = 3.3\text{ V}$; $Z_S = Z_L = 75\text{ }\Omega$; $R_{bias} = 7.5\text{ }\Omega$; $40\text{ MHz} \leq f_1 \leq 1000\text{ MHz}$.

| 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 | | - | 38 | - | mA |
| T_{amb} | ambient temperature | | -10 | - | +70 | $^{\circ}\text{C}$ |
| NF | noise figure | | - | 3.8 | - | dB |
| $P_{L(1dB)}$ | output power at 1 dB gain compression | 1 GHz | - | 12 | - | 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 | |
| BGU7041 | - | plastic surface-mounted package; 6 leads | SOT363 |

4. Marking

Table 4. Marking

| Type number | Marking code | Description |
|-------------|--------------|--|
| BGU7041 | *VA | * = p : made in Hong Kong * = W : made in China * = 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} ≤ 100 °C | [1] | 250 | mW |
| P _i | input power | single tone | - | 10 | dBm |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| T _j | junction temperature | | - | 150 | °C |
| T _{amb} | ambient temperature | | -10 | +70 | °C |
| V _{ESD} | electrostatic discharge voltage | Human Body Model (HBM); according to JEDEC standard 22-A114E | 2 | - | kV |
| | | Charged Device Model (CDM); according to JEDEC standard 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 °C; typical values at V_{CC} = 3.3 V; Z_S = Z_L = 75 Ω; R_{bias} = 7.5 Ω; 40 MHz ≤ f₁ ≤ 1000 MHz.

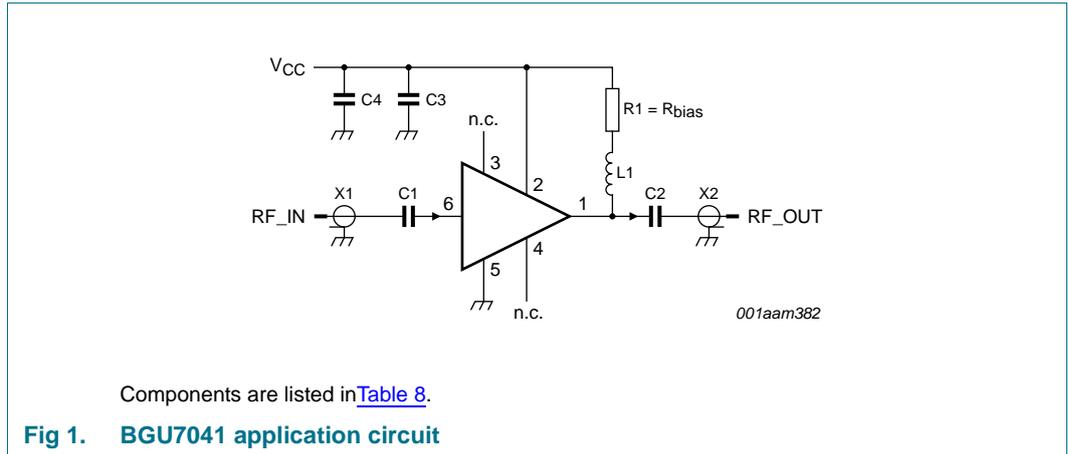
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|---------------------|-----|-----|-----|------|
| V _{CC} | supply voltage | RF input AC coupled | 3.1 | 3.3 | 3.5 | V |
| I _{CC(tot)} | total supply current | | - | 38 | - | 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 | | - | 3.8 | - | dB |
| RL _{in} | input return loss | | - | 21 | - | dB |
| RL _{out} | output return loss | | - | 12 | - | dB |
| P _{L(1dB)} | output power at 1 dB gain compression | 1 GHz | - | 12 | - | dBm |
| IP3 _O | output third-order intercept point | | [1] | 29 | - | dBm |

[1] The fundamental frequency (f₁) is 1000 MHz. The intermodulation product (IM3) is 2 × f₂ - f₁, where f₂ = f₁ ± 1 MHz. Input power P_i = -10 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

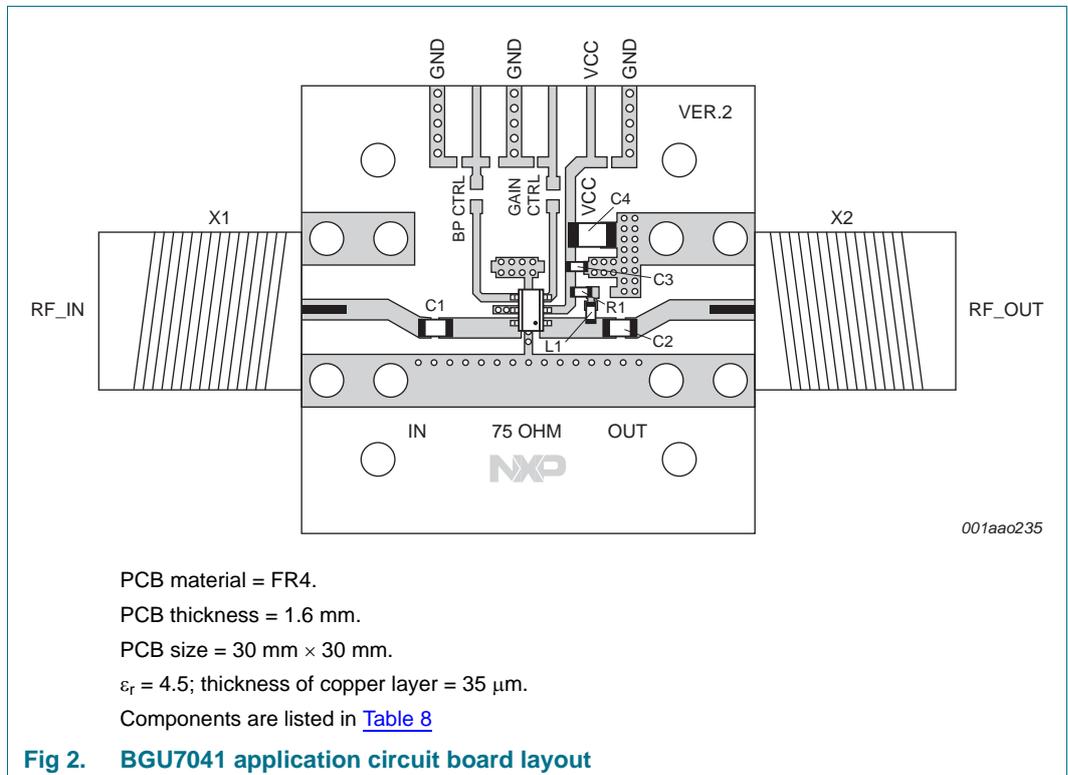


Table 8. List of componentsSee [Figure 1](#) and [Figure 2](#)

| Component | Description | Value | Remarks | Function |
|-----------|-------------------|----------------|--|--------------|
| C1, C2 | capacitor | 10 nF | | DC blocking |
| C3 | capacitor | 10 nF | | decoupling |
| C4 | capacitor | 10 μ F | | decoupling |
| L1 | chip ferrite bead | 1.5 k Ω | [1] Murata BLM18HE152SN1DF | RF choke |
| R1 | resistor | 7.5 Ω | [1] R _{bias} | bias setting |
| X1, X2 | connector | 75 Ω | 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

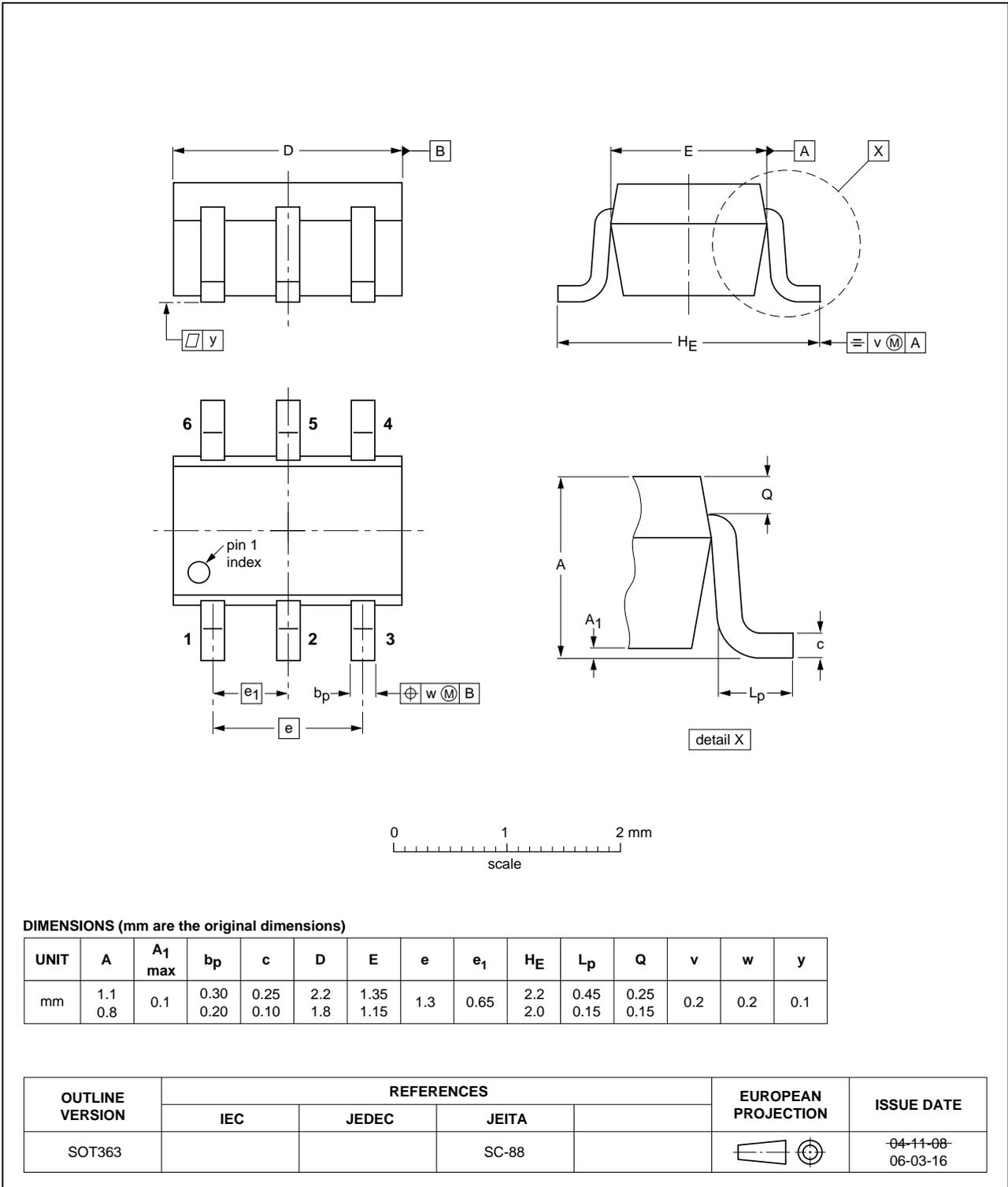


Fig 3. Package outline SOT363

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 |
|----------------|--|--------------------|---------------|-------------|
| BGU7041 v.2 | 20110913 | Product data sheet | | BGU7041 v.1 |
| Modifications: | <ul style="list-style-type: none">Noise figure value updated | | | |
| BGU7041 v.1 | 20110629 | Product data sheet | - | - |

12. Legal information

12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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. |

[1] Please consult the most recently issued document before initiating or completing a design.

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

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