

# BGA616

Silicon Germanium Broadband MMIC Amplifier

RF & Protection Devices



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**BGA616, Silicon Germanium Broadband MMIC Amplifier****Revision History: 2011-09-02, Rev. 2.1****Previous Version: 2003-04-16**

| Page | Subjects (major changes since last revision)    |
|------|-------------------------------------------------|
| All  | New Chip Version with integrated ESD protection |
| 5    | Electrical Characteristics slightly changed     |
| 7-8  | Figures updated                                 |
| All  | Document layout change                          |
|      |                                                 |
|      |                                                 |
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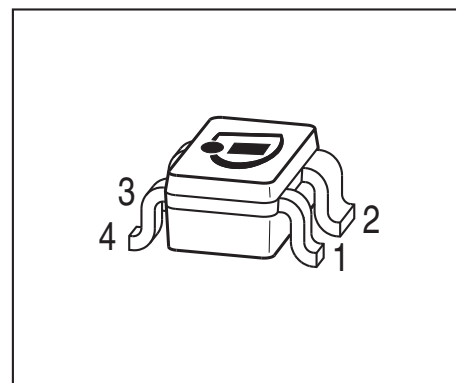
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# 1 Silicon Germanium Broadband MMIC Amplifier

## Feature

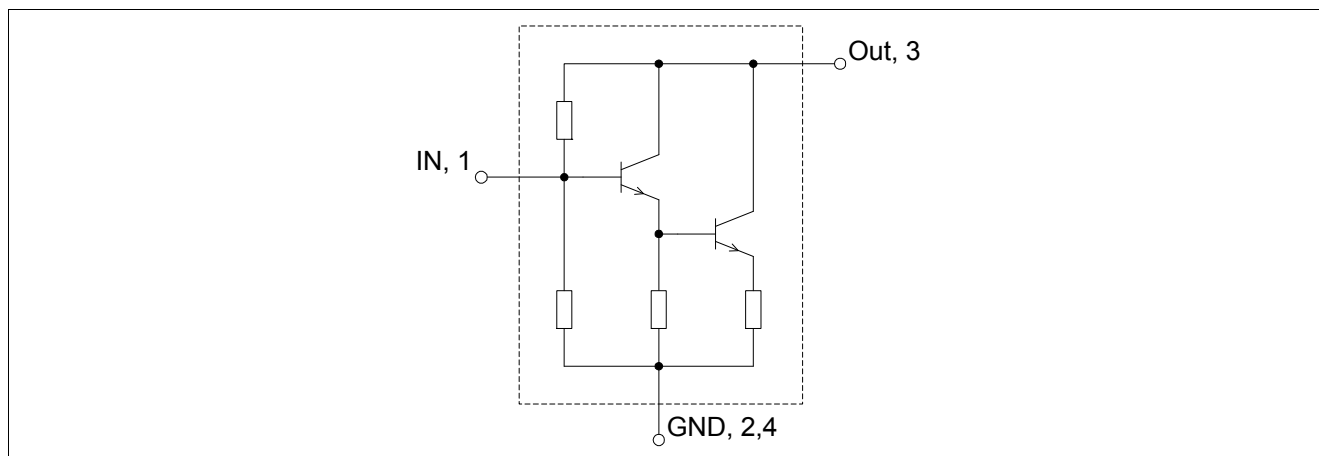
- Cascadable 50  $\Omega$ -gain block
- 3 dB-bandwidth: DC to 2.7 GHz with 19.0 dB typical gain at 1.0 GHz
- Compression point  $P_{-1\text{dB}} = 18$  dBm at 2.0 GHz
- Noise figure  $F_{50\Omega} = 2.60$  dB at 2.0 GHz
- Absolute stable
- 70 GHz  $f_T$  - Silicon Germanium technology
- 1 kV HBM ESD protection (Pin-to-Pin)
- Pb-free (RoHS compliant) package



SOT343

## Applications

- Driver amplifier for GSM/PCS/SCDMA/UMTS
- Broadband amplifier for SAT-TV & LNBs
- Broadband amplifier for CATV


**Figure 1 Pin connection**

## Description

The BGA616 is a broadband matched general purpose MMIC amplifier in a Darlington configuration. It is optimized for a typical supply current of 60 mA.

The BGA616 is based on Infineon Technologies' B7HF Silicon Germanium technology.

| Type   | Package | Marking |
|--------|---------|---------|
| BGA616 | SOT343  | BPs     |

**Note:** **ESD:** Electrostatic discharge sensitive device, observe handling precaution

## Maximum Ratings

**Table 1** Maximum ratings

| Parameter                                          | Symbol    | Limit Value | Unit |
|----------------------------------------------------|-----------|-------------|------|
| Device voltage                                     | $V_D$     | 4.5         | V    |
| Device current                                     | $I_D$     | 80          | mA   |
| Current into pin In                                | $I_{in}$  | 0.7         | mA   |
| Input power <sup>1)</sup>                          | $P_{in}$  | 10          | dBm  |
| Total power dissipation, $T_S < 78\text{ °C}^{2)}$ | $P_{tot}$ | 360         | mW   |
| Junction temperature                               | $T_J$     | 150         | °C   |
| Ambient temperature range                          | $T_A$     | -65... 150  | °C   |
| Storage temperature range                          | $T_{STG}$ | -65... 150  | °C   |
| ESD capability all pins (HBM: JESD22-A114)         | $V_{ESD}$ | 1000        | V    |

1) Valid for  $Z_S = Z_L = 50\ \Omega$ ,  $V_{CC} = 6\text{ V}$ ,  $R_{Bias} = 33\ \Omega$

2)  $T_S$  is measured on the ground lead at the soldering point

Note: All Voltages refer to GND-Node

## Thermal resistance

**Table 2** Thermal resistance

| Parameter                                | Symbol     | Value | Unit |
|------------------------------------------|------------|-------|------|
| Junction - soldering point <sup>1)</sup> | $R_{thJS}$ | 200   | K/W  |

1) For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

## 2 Electrical Characteristics

Electrical characteristics at  $T_A = 25\text{ °C}$  (measured in test circuit specified in [Figure 2](#))

$V_{CC} = 6\text{ V}$ ,  $R_{Bias} = 33\ \Omega$ , Frequency = 2 GHz, unless otherwise specified

**Table 3** Electrical Characteristics

| Parameter                             | Symbol         | Values |      |      | Unit | Note / Test Condition |
|---------------------------------------|----------------|--------|------|------|------|-----------------------|
|                                       |                | Min.   | Typ. | Max. |      |                       |
| Insertion power gain                  | $ S_{21} ^2$   |        | 20.0 |      | dB   | $f = 0.1\text{ GHz}$  |
|                                       |                |        | 19.0 |      | dB   | $f = 1\text{ GHz}$    |
|                                       |                |        | 18.0 |      | dB   | $f = 2\text{ GHz}$    |
| Noise figure ( $Z_S = 50\ \Omega$ )   | $F_{50\Omega}$ |        | 2.2  |      | dB   | $f = 0.1\text{ GHz}$  |
|                                       |                |        | 2.5  |      | dB   | $f = 1\text{ GHz}$    |
|                                       |                |        | 2.6  |      | dB   | $f = 2\text{ GHz}$    |
| Output power at 1 dB gain compression | $P_{-1dB}$     |        | 18   |      | dBm  |                       |
| Output third order intercept point    | $OIP_3$        |        | 29   |      | dBm  |                       |
| Input return loss                     | $RL_{in}$      |        | 15   |      | dB   |                       |
| Output return loss                    | $RL_{out}$     |        | 15   |      | dB   |                       |
| Total device current                  | $I_D$          |        | 60   |      | mA   |                       |

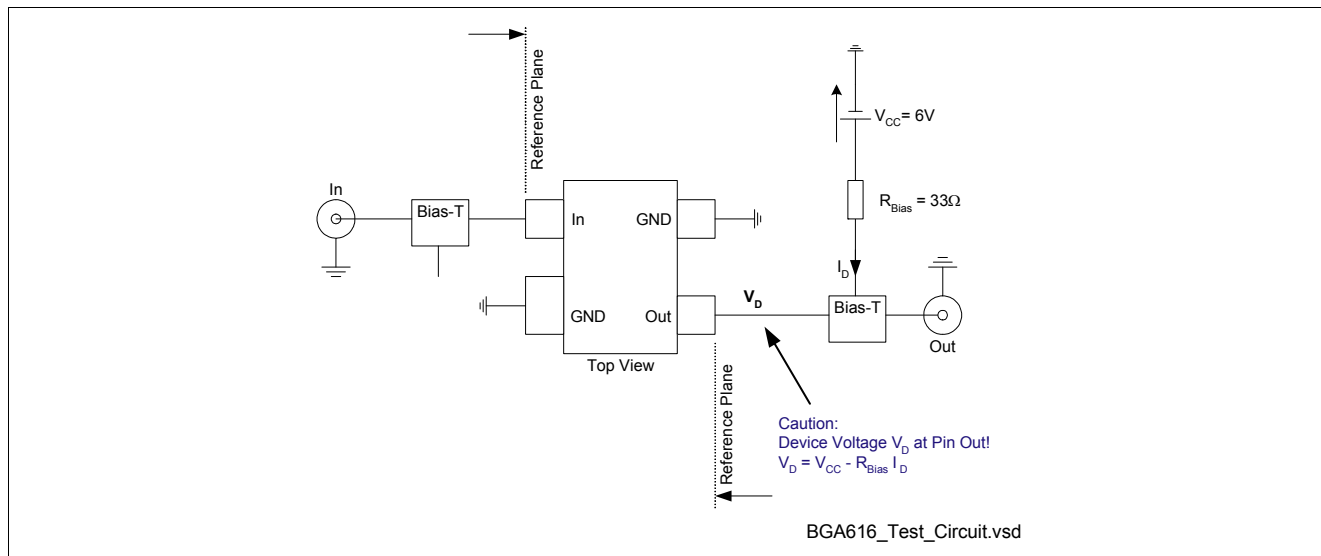
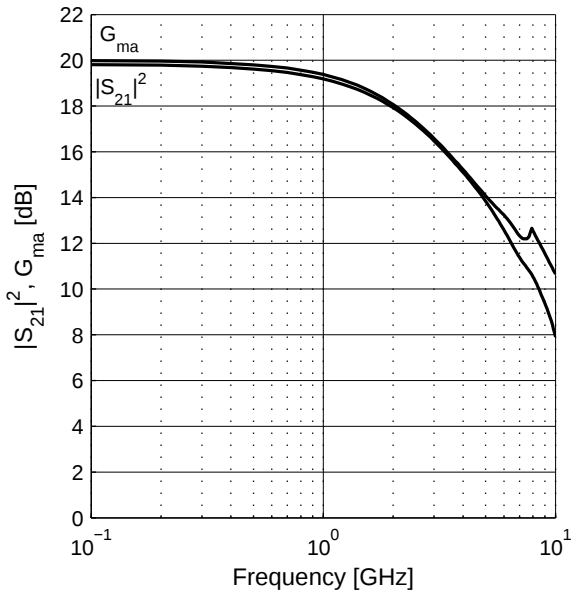


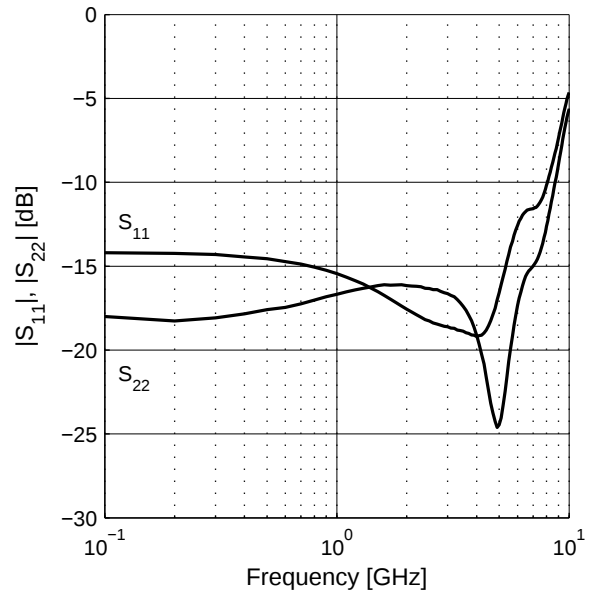
Figure 2 Test Circuit for Electrical Characteristics and S-Parameter

### 3 Measured Parameters

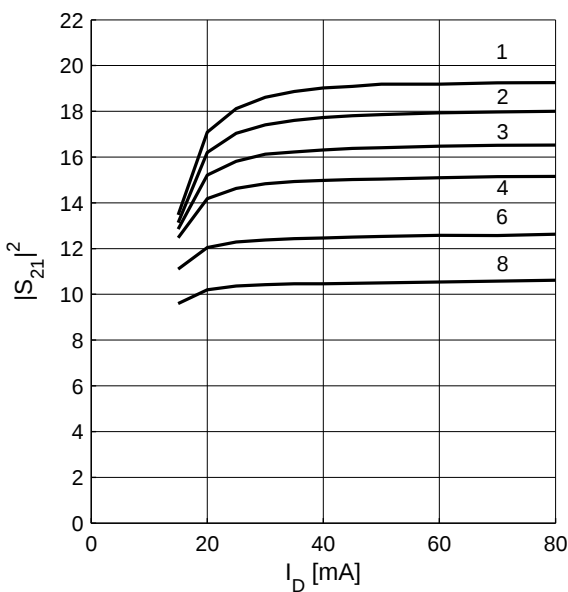
**Power Gain**  $|S_{21}|^2$ ,  $G_{ma} = f(f)$   
 $V_{CC} = 6V$ ,  $R_{Bias} = 33\Omega$ ,  $I_C = 60mA$



**Matching**  $|S_{11}|$ ,  $|S_{22}| = f(f)$   
 $V_{CC} = 6V$ ,  $R_{Bias} = 33\Omega$ ,  $I_C = 60mA$

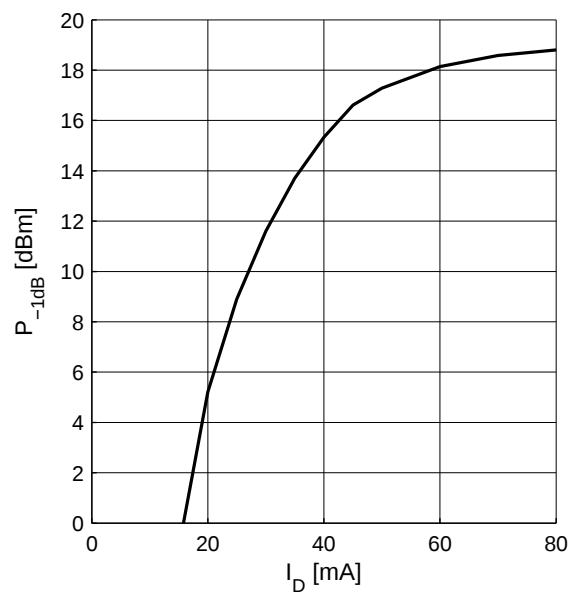


**Power Gain**  $|S_{21}| = f(I_D)$   
 $f = \text{parameter in GHz}$



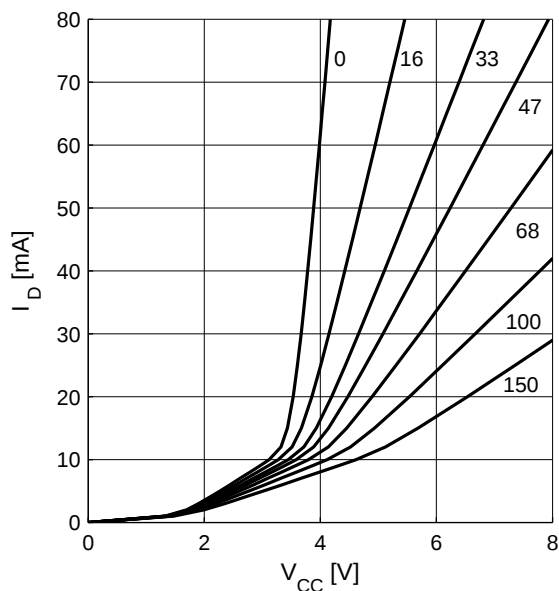
**Output Compression Point**

$P_{-1dB} = f(I_D)$ ,  $f = 2GHz$



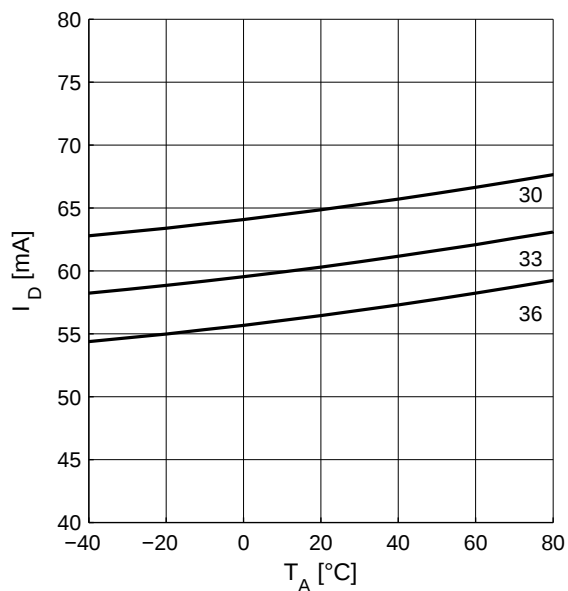
**Device Current  $I_D = f(V_{CC})$**

$R_{Bias}$  = parameter in  $\Omega$



**Device Current  $I_D = f(T_A)$**

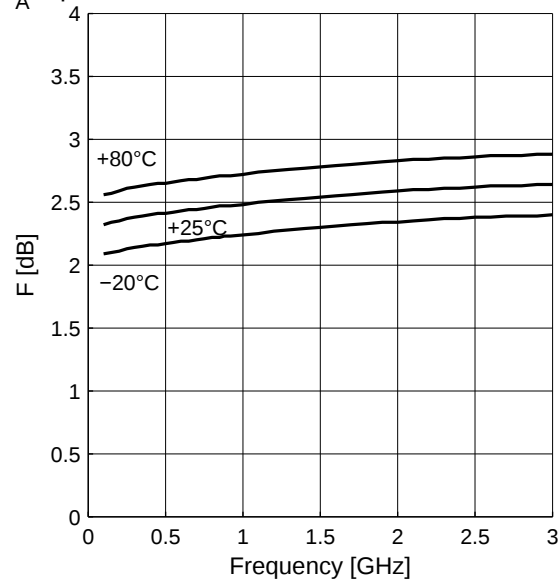
$V_{CC} = 6V$ ,  $R_{Bias}$  = parameter in  $\Omega$



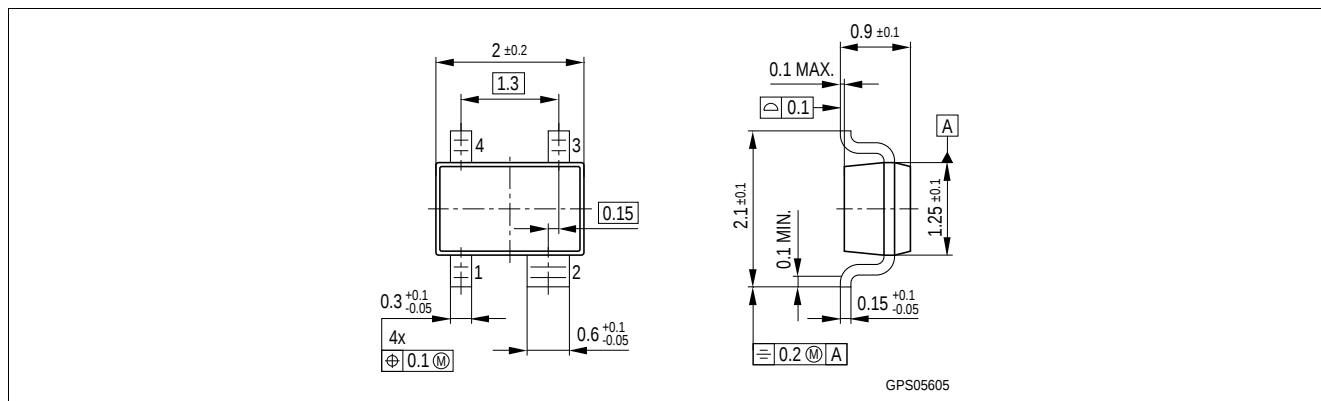
**Noise figure  $F = f(f)$**

$V_{CC} = 6V$ ,  $R_{Bias} = 33\Omega$ ,  $Z_S = 50\Omega$

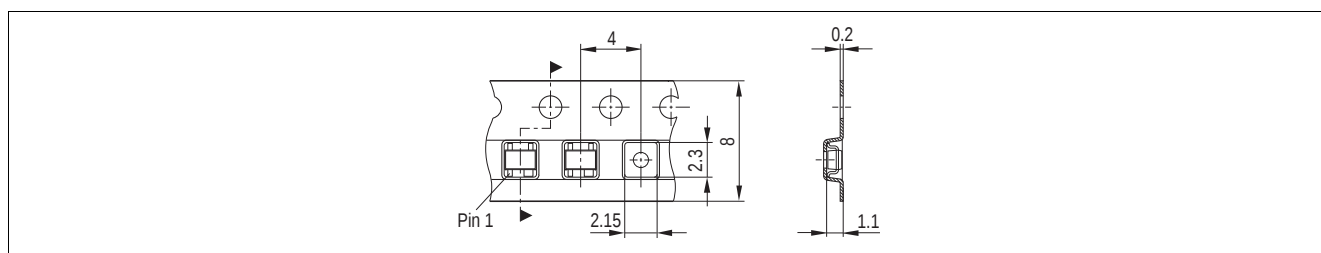
$T_A$  = parameter in  $^{\circ}C$



## 4 Package Information



**Figure 3 Package Outline SOT343**



**Figure 4 Tape for SOT343**