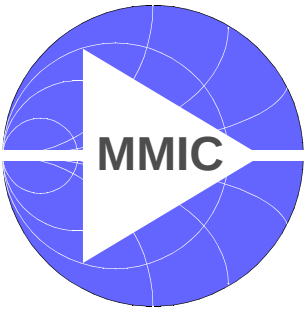
# BGA616

## Silicon Germanium Broadband MMIC Amplifier

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**BGA616**
**Data sheet**
**Revision History: 2003-04-16**

Previous Version: 2002-05-29

| Page | Subjects (major changes since last revision) |
|---|---|
| | Preliminary status removed |
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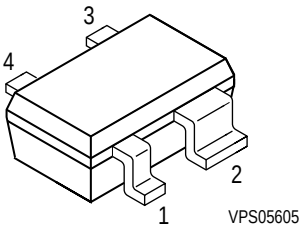
**Silicon Germanium**
**Broadband MMIC Amplifier**

**BGA616**

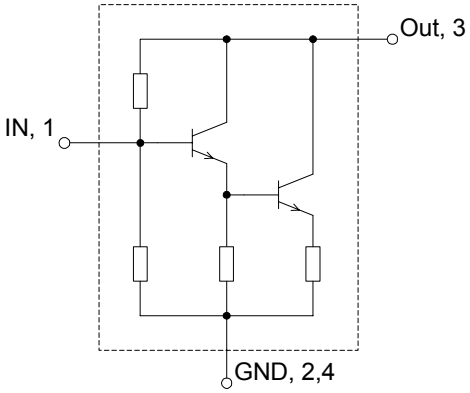
## Features

- Cascadable 50Ω-gain block
- 3 dB-bandwidth: DC to 2.7 GHz with 18.5 dB typical gain at 1.0 GHz
- Compression point $P_{-1dB}$ = 18 dBm at 2.0 GHz
- Noise figure $F_{50\Omega}$ = 2.90 dB at 2.0 GHz
- Absolute stable
- 70 GHz $f_T$ - Silicon Germanium technology




## Applications

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




## Description

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

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

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

| Type | Package | Marking | Chip |
|---|---|---|---|
| BGA616 | SOT343 | BPs | T0566 |

## Maximum Ratings

| Parameter | Symbol | 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 [1] | $P_{In}$ | 10 | dBm |
| Total power dissipation, $T_S$ < 78°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 |
| Thermal resistance: junction-soldering point | $R_{th\ JS}$ | 200 | K/W |

Notes:
All Voltages refer to GND-Node
[1] Valid for $Z_S=Z_L=50\Omega$, $V_{CC}$=6V, $R_{Bias}=33\Omega$
[2] $T_S$ is measured on the ground lead at the soldering point

**Electrical Characteristics** at $T_A$=25°C (measured in test circuit specified in fig. 1)
$V_{CC}$=6V, $R_{Bias}=33\Omega$, Frequency=2GHz, unless otherwise specified

| Parameter | Symbol | min. | typ. | max. | Unit |
|---|---|---|---|---|---|
| Insertion power gain | $\|S_{21}\|^2$ | | | | dB |
| f = 0.1GHz | | - | 19.5 | - | |
| f = 1.0GHz | | - | 18.5 | - | |
| f = 2.0GHz | | - | 17.5 | - | |
| Noise Figure ($Z_S=50\Omega$) | $F_{50\Omega}$ | | | | dB |
| f = 0.1GHz | | - | 2.50 | - | |
| f = 1.0GHz | | - | 2.80 | - | |
| f = 2.0GHz | | - | 2.90 | - | |
| Output Power at 1dB Gain Compression | $P_{-1dB}$ | - | 18 | - | dBm |
| Output Third Order Intercept Point | $OIP_3$ | - | 29 | - | dBm |
| Input Return Loss | $RL_{In}$ | - | 19 | - | dB |
| Output Return Loss | $RL_{Out}$ | - | 25 | - | dB |
| Total Device Current | $I_D$ | - | 60 | - | mA |

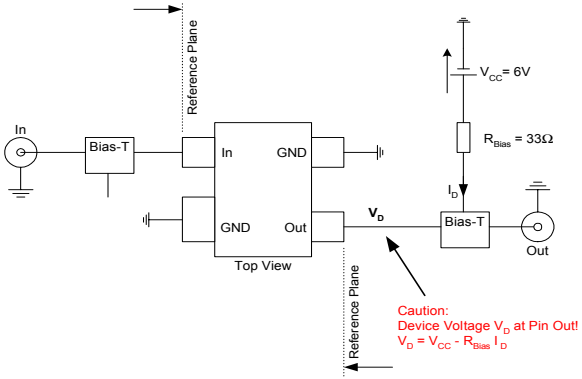
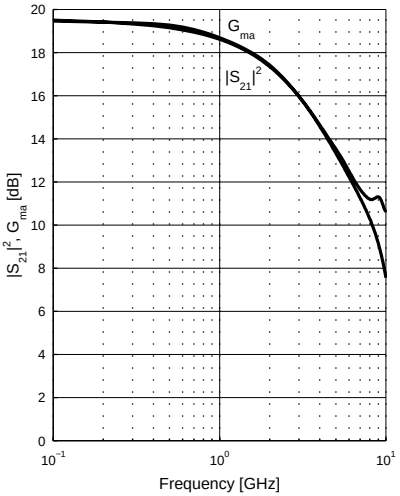



Fig.1: Test Circuit for Electrical Characteristics and S-Parameters

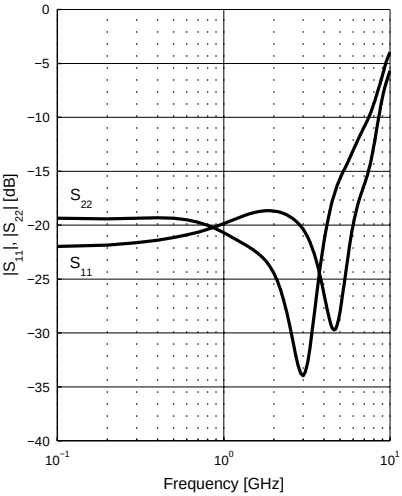
**S-Parameter** $V_{CC}$=6V, $R_{Bias}$=33Ω (see Electrical Characteristics for conditions)

| Frequency [GHz] | S11 Mag | S11 Ang | S21 Mag | S21 Ang | S12 Mag | S12 Ang | S22 Mag | S22 Ang |
|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.0788 | 36.2 | 9.3218 | 177.9 | 0.0758 | -0.1 | 0.1072 | 1.0 |
| 0.2 | 0.0822 | 10.5 | 9.3036 | 173.8 | 0.0756 | 1.0 | 0.1071 | -1.2 |
| 0.4 | 0.0824 | 15.1 | 9.1939 | 166.6 | 0.0749 | 2.5 | 0.1082 | -3.8 |
| 0.6 | 0.0888 | 17.9 | 9.0876 | 160.2 | 0.0748 | 4.4 | 0.1052 | -7.0 |
| 0.8 | 0.0981 | 15.7 | 8.8024 | 153.5 | 0.0752 | 6.1 | 0.0999 | -10.4 |
| 1.0 | 0.1033 | 20.0 | 8.5448 | 147.6 | 0.0762 | 8.0 | 0.0937 | -14.0 |
| 1.2 | 0.1103 | 22.4 | 8.3023 | 141.8 | 0.0772 | 9.3 | 0.0860 | -16.7 |
| 1.4 | 0.1134 | 20.4 | 8.0733 | 135.4 | 0.0782 | 10.6 | 0.0800 | -20.7 |
| 1.6 | 0.1159 | 18.6 | 7.8136 | 130.5 | 0.0801 | 12.2 | 0.0735 | -24.8 |
| 1.8 | 0.1113 | 13.6 | 7.5448 | 125.1 | 0.0820 | 13.1 | 0.0666 | -29.8 |
| 2.0 | 0.1201 | 15.4 | 7.3943 | 120.1 | 0.0831 | 14.5 | 0.0578 | -35.8 |
| 3.0 | 0.0875 | 7.4 | 6.2842 | 97.2 | 0.0969 | 18.2 | 0.0165 | -116.2 |
| 4.0 | 0.0512 | 20.9 | 5.3567 | 77.5 | 0.1136 | 18.3 | 0.0831 | 164.4 |
| 5.0 | 0.0422 | 107.8 | 4.6655 | 59.3 | 0.1333 | 15.8 | 0.1644 | 147.1 |
| 6.0 | 0.0960 | 137.4 | 4.1016 | 41.5 | 0.1538 | 10.6 | 0.2237 | 129.0 |
| 7.0 | 0.1586 | 122.7 | 3.6045 | 26.0 | 0.1734 | 4.8 | 0.2858 | 116.3 |
| 8.0 | 0.2356 | 113.5 | 3.2953 | 9.3 | 0.1950 | -3.0 | 0.3679 | 108.2 |

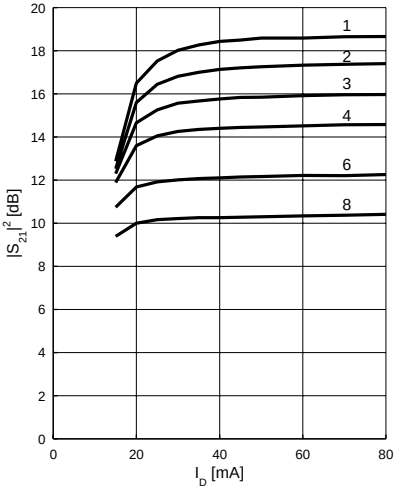
**Power Gain** $|S_{21}|^2$, $G_{ma}$ = f(f)
$V_{CC}$ = 6V, $R_{Bias}$ = 33Ω, $I_C$ = 60mA



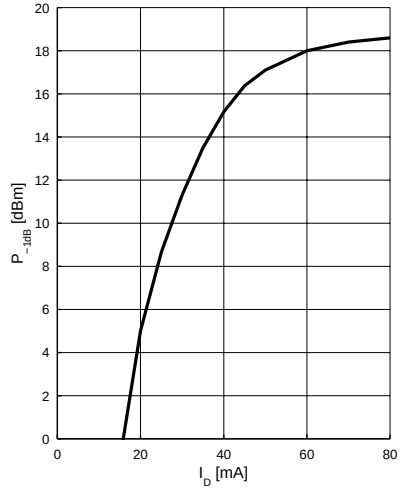

**Matching** $|S_{11}|$, $|S_{22}|$ = f(f)
$V_{CC}$ = 6V, $R_{Bias}$ = 33Ω, $I_C$ = 60mA



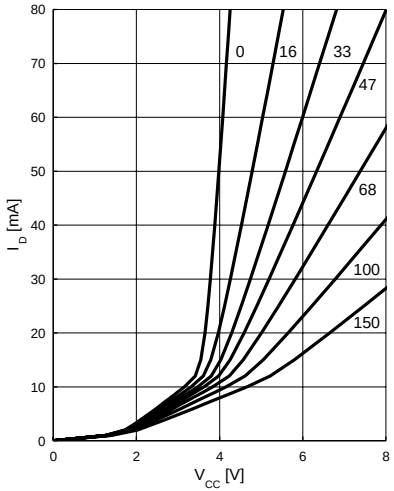

**Power Gain** $|S_{21}|$ = f($I_D$)
f = parameter in GHz



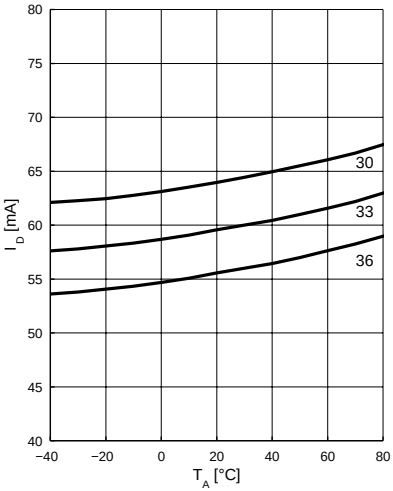

**Output Compression Point**
$P_{-1dB}$ = f($I_D$), f = 2GHz



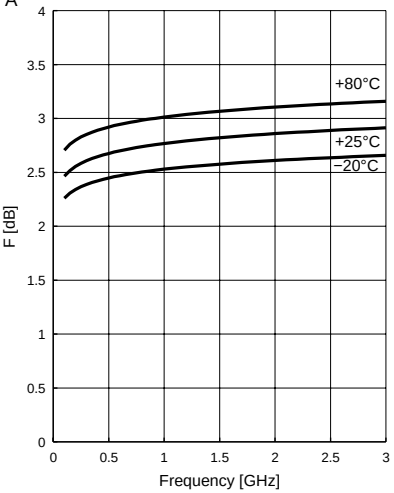
**Device Current** $I_D = f(V_{CC})$
$R_{Bias}$ = parameter in Ω




**Device Current** $I_D = f(T_A)$
$V_{CC}$ = 6V, $R_{Bias}$ = parameter in Ω




**Noise figure** F = f(f)
$V_{CC}$ = 6V, $R_{Bias}$ = 33Ω, $Z_S$ = 50Ω
$T_A$ = parameter in °C




**Package Outline**