



Package: SOT-363

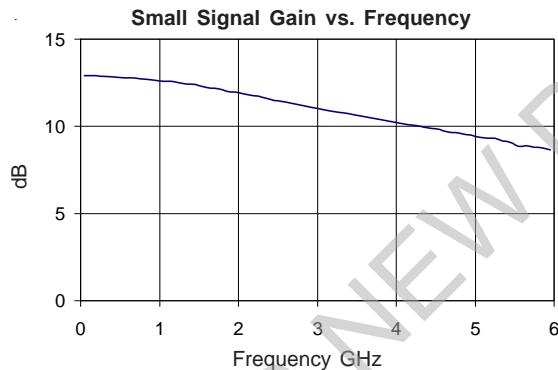


Product Description

The SGA0163Z is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration featuring one-micron emitters provides high F_T and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Only two DC-blocking capacitors, a bias resistor and an optional RF choke are required for operation.

Optimum Technology Matching® Applied

- GaAs HBT
- GaAs MESFET
- InGaP HBT
- SiGe BiCMOS
- Si BiCMOS
- SiGe HBT
- GaAs pHEMT
- Si CMOS
- Si BJT
- GaN HEMT
- RF MEMS



Features

- DC to 4500 MHz Operation
- Single Voltage Supply
- Low Current Draw: 8mA at 2.1V typ.
- High Output Intercept: 10dBm Typ. at 1900 MHz

Applications

- PA Driver Amplifier
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite

| Parameter | Specification | | | Unit | Condition |
|---------------------------------|---------------|-------|------|------|-----------------|
| | Min. | Typ. | Max. | | |
| Output Power at 1dB Compression | | -1.8 | | dBm | 850MHz |
| | | -1.8 | | dBm | 1950MHz |
| | | -2.4 | | dBm | 2400MHz |
| Third Order Intercept Point | | 9.4 | | dBm | 850MHz |
| | | 9.8 | | dBm | 1950MHz |
| | | 9.2 | | dBm | 2400MHz |
| Small Signal Gain | | 12.7 | | dB | 850MHz |
| | | 12.0 | | dB | 1950MHz |
| | | 11.6 | | dB | 2400MHz |
| 3dB Bandwidth | | 4500 | | MHz | |
| Input VSWR | | 1.6:1 | | | DC to 4500MHz |
| Output VSWR | | 1.3:1 | | | DC to 4500MHz |
| Reverse Isolation | | 17.6 | | dB | 850MHz |
| | | 18.1 | | dB | 1950MHz |
| | | 18.3 | | dB | 2400MHz |
| Noise Figure ^[1] | | 4.6 | | dB | 1950MHz |
| Device Operating Voltage | | 2.1 | | V | |
| Device Operating Current | 6 | 8 | 10 | mA | |
| Thermal Resistance | | 255 | | °C/W | junction - lead |

Test Conditions: $V_S = 5V$, $I_D = 8mA$ Typ., $T_L = 25^\circ C$. OIP3 Tone Spacing = 1 MHz, P_{OUT} per tone = -17 dBm, $R_{BIAS} = 360\Omega$, $Z_S = Z_L = 50\Omega$

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|--------------------------------|------------|------|
| Device Current (I_D) | 16 | mA |
| Device Voltage (V_D) | 6 | V |
| RF Input Power | -4 | dBm |
| Junction Temp (T_J) | +150 | °C |
| Operating Temp Range (T_L) | -40 to +85 | °C |
| Storage Temp | +150 | °C |

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias Conditions should also satisfy the following expression:

$$I_D V_D < (T_J - T_L) / R_{TH} \cdot j_l$$

**Caution!** ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

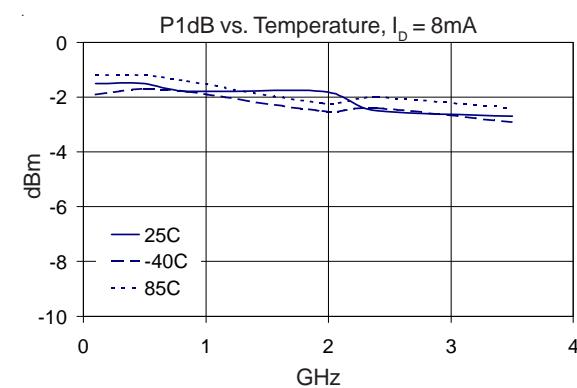
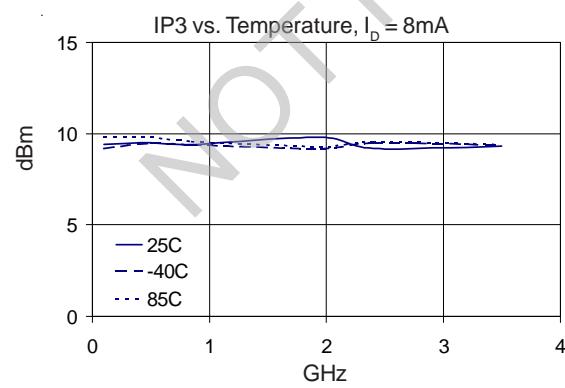
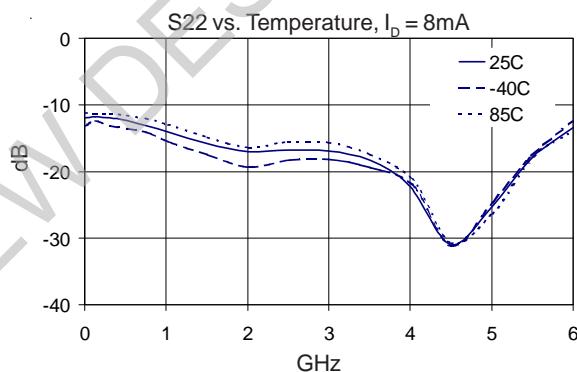
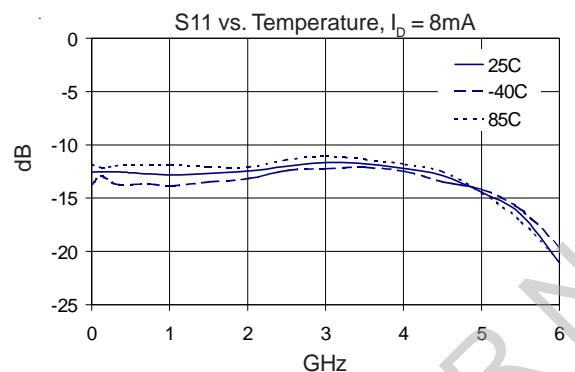
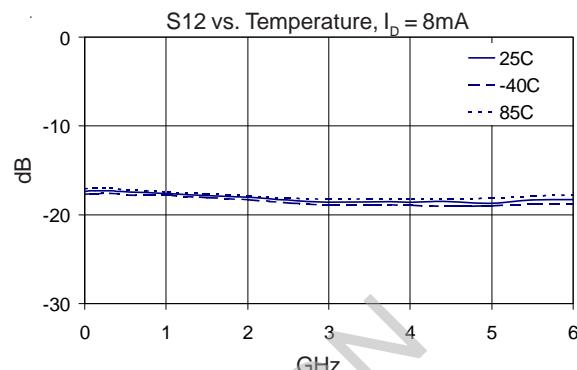
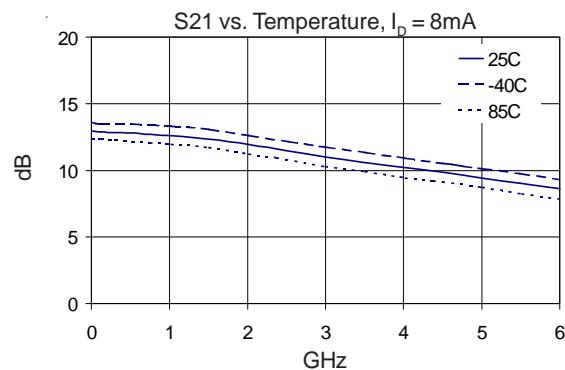
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RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

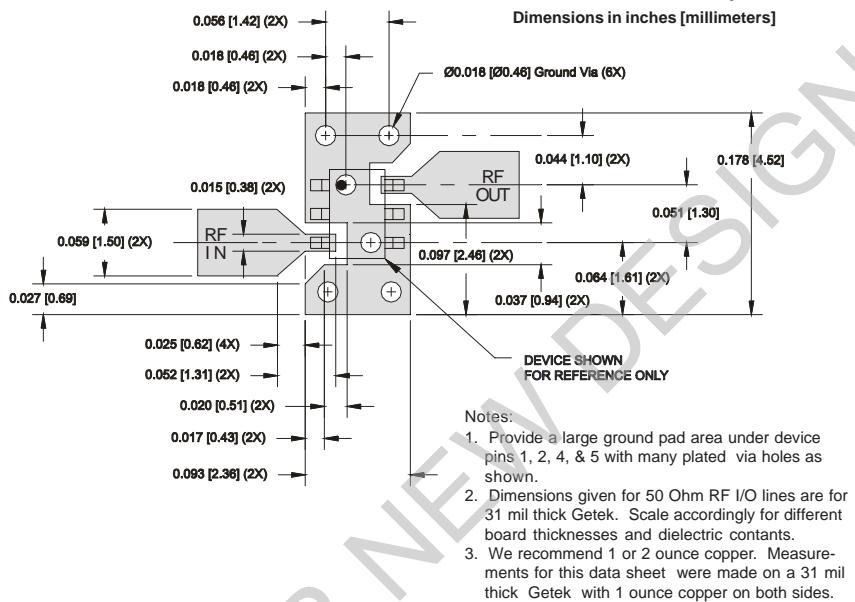
| Parameter | Specification | | | Unit | Condition |
|-------------------------|---------------|------|------|------|---|
| | Min. | Typ. | Max. | | |
| Gain | 12.9 | | | dB | 100MHz |
| | 12.8 | | | dB | 500MHz |
| | 12.7 | | | dB | 850MHz |
| | 12.0 | | | dB | 1950MHz |
| | 11.6 | | | dB | 2400MHz |
| | 10.6 | | | dB | 3500MHz |
| Output IP ₃ | 9.4 | | | dBm | 100MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| | 9.5 | | | dBm | 500MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| | 9.4 | | | dBm | 850MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| | 9.8 | | | dBm | 1950MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| | 9.2 | | | dBm | 2400MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| | 9.3 | | | dBm | 3500MHz, Tone spacing=1MHz, P _{OUT} per tone = -17 dBm |
| Output P _{1dB} | -1.5 | | | dBm | 100MHz |
| | -1.5 | | | dBm | 500MHz |
| | -1.8 | | | dBm | 850MHz |
| | -1.8 | | | dBm | 1950MHz |
| | -2.5 | | | dBm | 2400MHz |
| | -2.7 | | | dBm | 3500MHz |
| Input Return Loss | 12.5 | | | dB | 100MHz |
| | 12.7 | | | dB | 500MHz |
| | 12.8 | | | dB | 850MHz |
| | 12.4 | | | dB | 1950MHz |
| | 12.1 | | | dB | 2400MHz |
| | 11.8 | | | dB | 3500MHz |
| Reverse Isolation | 17.3 | | | dB | 100MHz |
| | 17.4 | | | dB | 500MHz |
| | 17.6 | | | dB | 850MHz |
| | 18.1 | | | dB | 1950MHz |
| | 18.3 | | | dB | 2400MHz |
| | 18.5 | | | dB | 3500MHz |
| Noise Figure | 4.6 | | | dB | 100MHz, Z _S =50Ω |
| | 4.6 | | | dB | 500MHz, Z _S =50Ω |
| | 4.7 | | | dB | 850MHz, Z _S =50Ω |
| | 4.6 | | | dB | 1950MHz, Z _S =50Ω |

Test Conditions: $I_D = 8\text{mA}$, unless otherwise noted



| Pin | Function | Description |
|---------------|-------------|---|
| 3 | RF IN | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |
| 1, 2, 4, 5 | GND | Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible. |
| 6 | RF OUT/BIAS | RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation. |

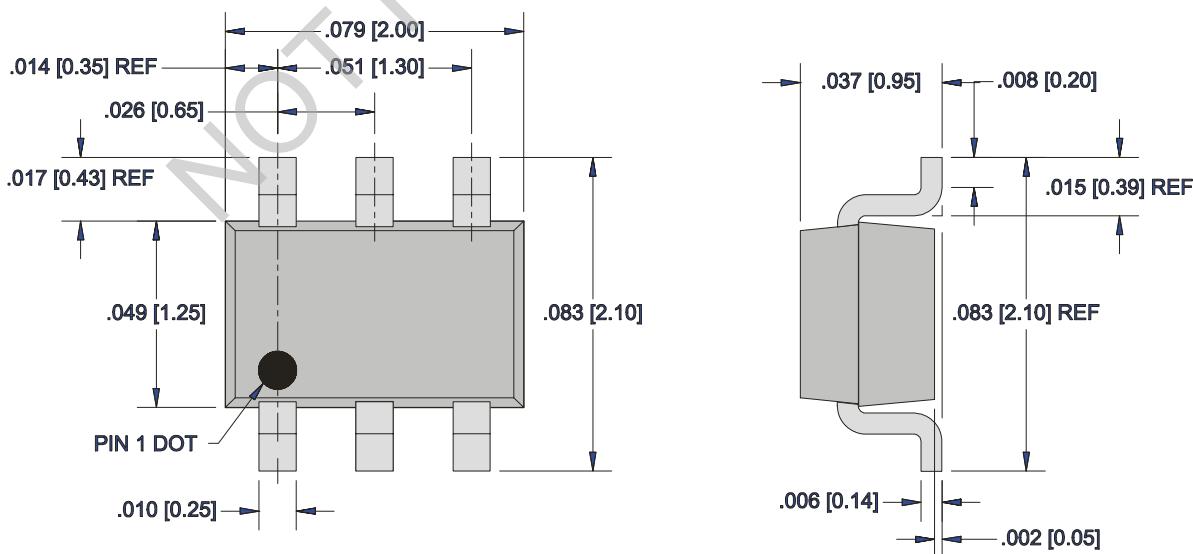
Suggested Pad Layout



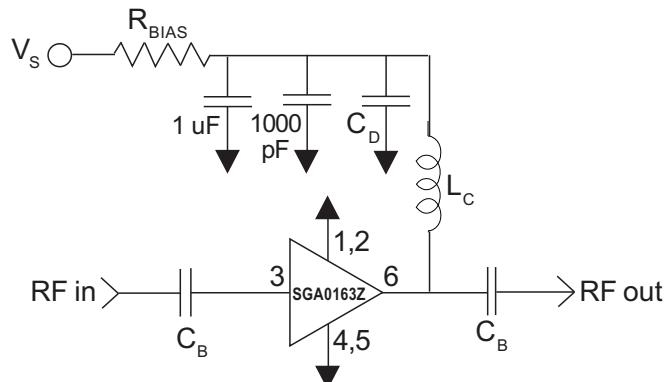
Package Drawing

Dimensions in inches (millimeters)

Refer to drawing posted at www.rfmd.com for tolerances.



Application Schematic



| Reference Designator | Frequency (Mhz) | | | | |
|----------------------|-----------------|--------|-------|-------|-------|
| | 500 | 850 | 1950 | 2400 | 3500 |
| C _B | 220 pF | 100 pF | 68 pF | 56 pF | 39 pF |
| C _D | 100 pF | 68 pF | 22 pF | 22 pF | 15 pF |
| L _C | 68 nH | 33 nH | 22 nH | 18 nH | 15 nH |

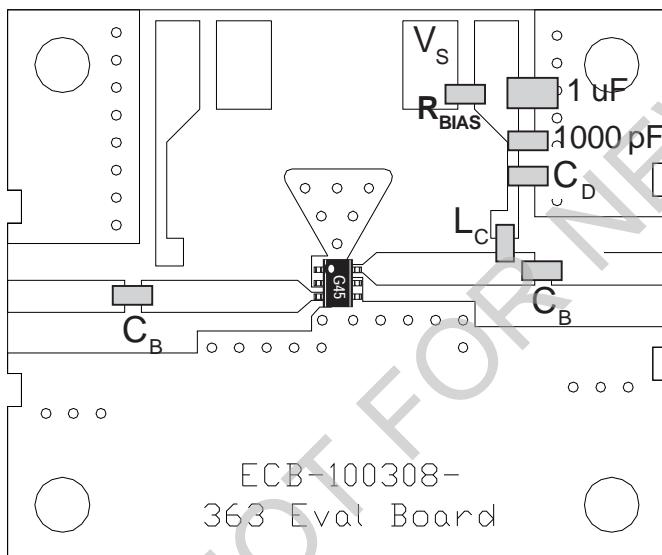
Recommended Bias Resistor Values for I_D=8mA

$$R_{BIAS} = (V_s - V_D) / I_D$$

| Supply Voltage(V _s) | 5 V | 7.5 V | 9 V | 12 V |
|---------------------------------|-------|-------|-------|--------|
| R _{BIAS} | 360 Ω | 680 Ω | 820 Ω | 1.2K Ω |

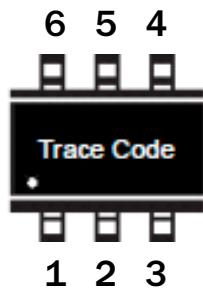
Note: R_{BIAS} provides DC bias stability over temperature.

Evaluation Board Layout



Mounting Instructions

1. Use a large ground pad area near device pins 1, 2, 4, and 5 with many plated through-holes as shown.
2. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.

Part Identification Marking**Ordering Information**

| Ordering Code | Description |
|---------------|---------------------------|
| SGA0163Z | 7" Reel with 3000 pieces |
| SGA0163ZSQ | Sample bag with 25 pieces |
| SGA0163ZSR | 7" Reel with 100 pieces |
| SGA0163Z-EVB1 | 850MHz, 5V Operation PCBA |

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