

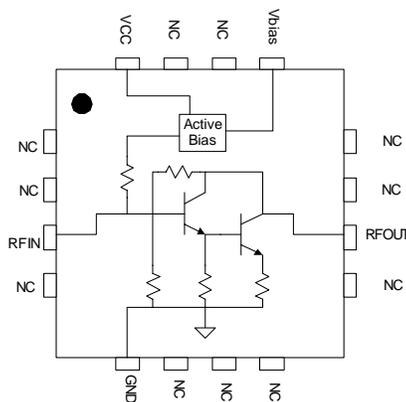
RFMD Green, RoHS Compliant, Pb-Free (Z Part Number)
Package: 3x3 QFN, 16-Pin

Product Description

RFMD's SGB-2433 is a high performance SiGe HBT MMIC amplifier utilizing a Darlington configuration with an active bias network. The active bias network provides stable current over temperature and process Beta variations. Designed to run directly from a 3Vto5V supply the SGB-2433 does not require a drop resistor as compared to typical Darlington amplifiers. This robust amplifier features a Class 1C ESD rating, low thermal resistance, and unconditional stability. The SGB-2433 product is designed for high linearity 3V gain block applications that require small size and minimal external components. It is on chip matched to 50Ω and an external bias inductor choke is required for the application band.

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

- High Reliability SiGe HBT Technology
- Robust Class 1C ESD
- Simple and Small Size
- P_{1dB} = 6.9 dBm at 1950 MHz
- IP₃ = 18.0 dBm at 1950 MHz
- Low Thermal Resistance = 221 C/W

Applications

- 3V Battery Operated Applications
- LO Buffer Amp
- RF Pre-Driver and RF Receive Path

| Parameter | Specification | | | Unit | Condition |
|------------------------------------|---------------|------|------|------|----------------------|
| | Min. | Typ. | Max. | | |
| Small Signal Gain | | 19.1 | | dB | 850 MHz |
| | 15.7 | 17.2 | 18.7 | dB | 1950 MHz |
| | | 16.2 | | dB | 2400 MHz |
| Output Power at 1dB Compression | 5.4 | 6.9 | | dBm | 850 MHz |
| | | 6.2 | | dBm | 1950 MHz |
| | | 6.2 | | dBm | 2400 MHz |
| Output Third Order Intercept Point | | 19.5 | | dB | 850 MHz |
| | 16.0 | 18.0 | | dB | 1950 MHz |
| | | 18.0 | | dB | 2400 MHz |
| Noise Figure | | 3.5 | 4.5 | dB | 1950 MHz |
| Frequency of Operation | DC | | 4000 | MHz | |
| Current, I _C | 21.0 | 25.0 | 29.0 | mA | |
| Input Return Loss | 10.0 | 13.4 | | dB | 1950 MHz |
| Output Return Loss | 10.0 | 13.6 | | dB | 1950 MHz |
| Thermal Resistance | | 221 | | °C/W | junction to backside |

Test Conditions: Z₀ = 50Ω, V_{CC} = 3V, I_C = 25 mA, T = 30°C

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---------------------------------------|--------------|------|
| Current (I_C total) | 60 | mA |
| Max Device Voltage (V_D) | 5 | V |
| Max RF Input Power | 20 | dBm |
| Power Dissipation | 0.2 | W |
| Max Junction Temperature (T_J) | 150 | °C |
| Operating Temperature Range (T_L) | -40 to + 85 | °C |
| Max Storage Temperature | -40 to + 150 | °C |



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.

RoHS status based on EU Directive 2002/95/EC (at time of this document revision).

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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.

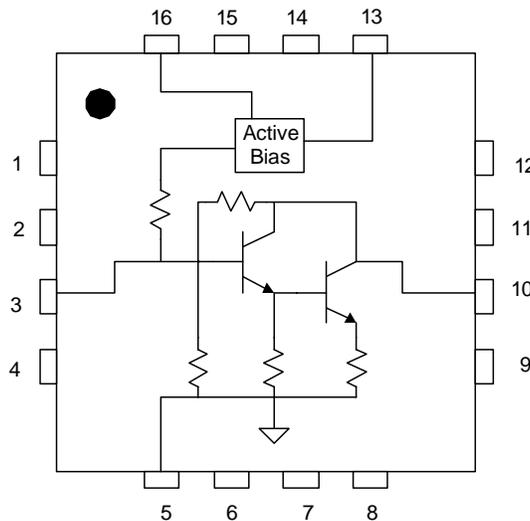
Bias Conditions should also satisfy the following expression:

$$I_D V_D < (T_J - T_L) / R_{TH, J-I}$$

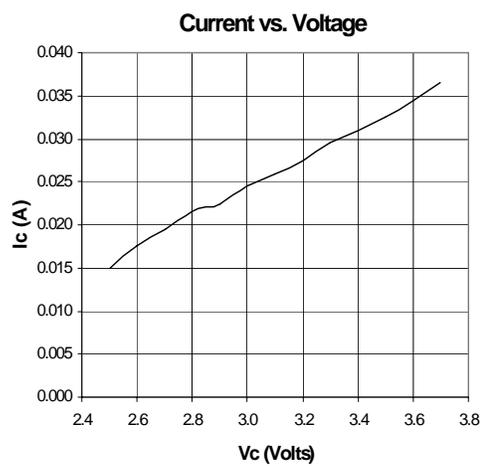
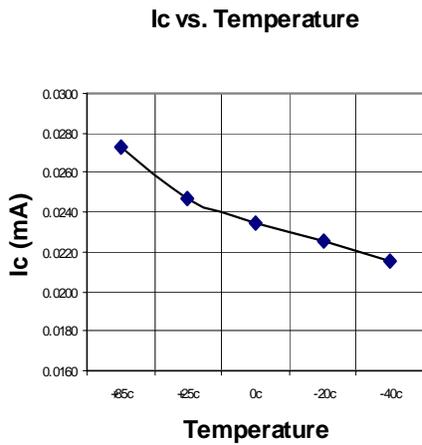
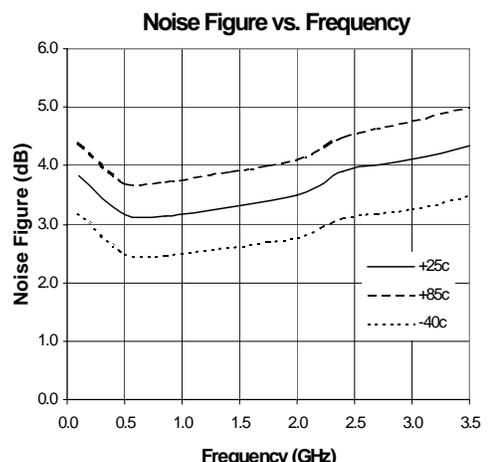
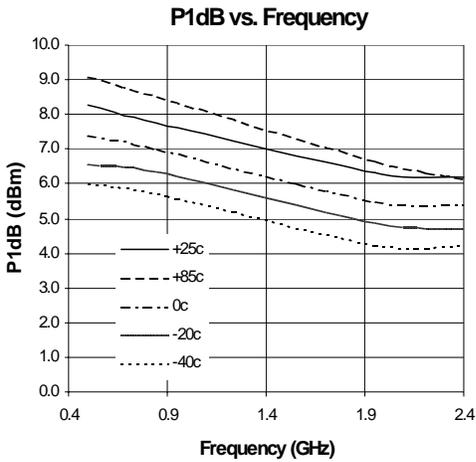
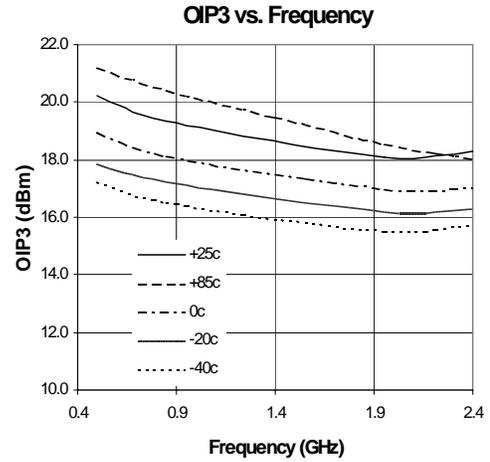
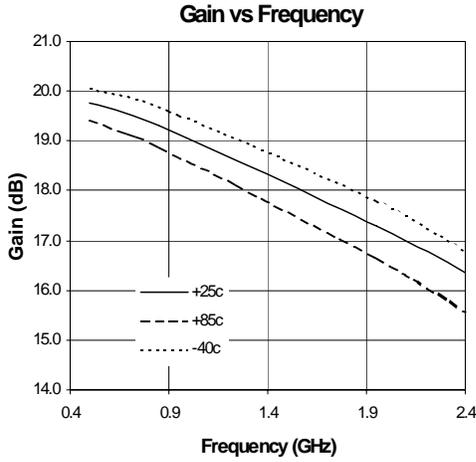
Detailed Performance Table: $V_{CC}=3V$, $I_C=25mA$, $T=25^\circ C$, $Z=50\Omega$

| Parameter | Unit | 100 MHz | 500 MHz | 850 MHz | 1950 MHz | 2400 MHz | 3500 MHz |
|---|------|---------|---------|---------|----------|----------|----------|
| Small Signal Gain (G) | dB | 19.7 | 19.5 | 19.1 | 17.2 | 16.2 | 14.0 |
| Output 3rd Order Intercept Point (OIP_3) | dBm | | 20.0 | 19.5 | 18.0 | 18.0 | |
| Output Power at 1dB Compression (P_{1dB}) | dBm | | 8.3 | 7.7 | 6.9 | 6.2 | |
| Input Return Loss (IRL) | dB | 25.0 | 19.9 | 17.1 | 13.4 | 12.7 | 10.5 |
| Output Return Loss (ORL) | dB | 20.5 | 18.9 | 17.1 | 13.6 | 13.1 | 13.0 |
| Reverse Isolation (S_{12}) | dB | 22.4 | 22.6 | 22.9 | 23.7 | 23.9 | 24.5 |
| Noise Figure (NF) | dB | 3.8 | 3.2 | 3.2 | 3.5 | 3.9 | 4.3 |

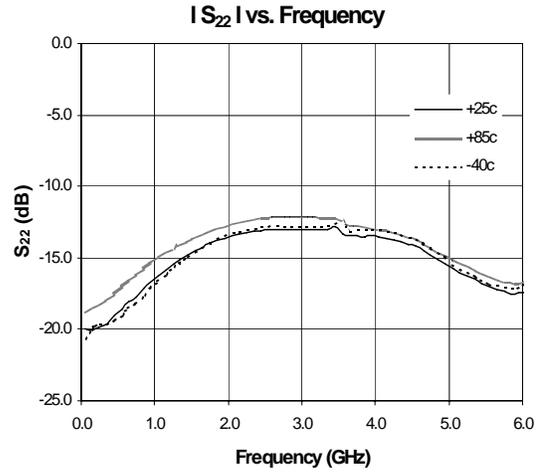
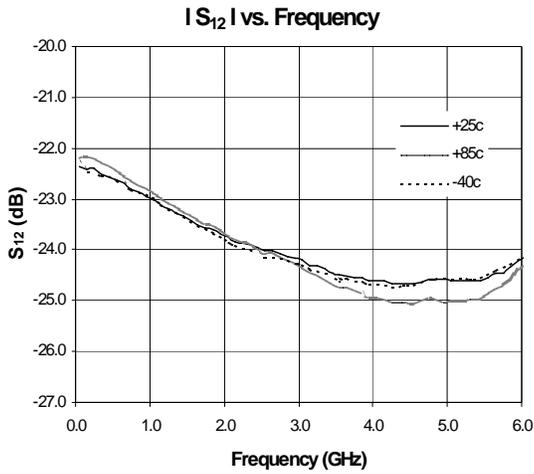
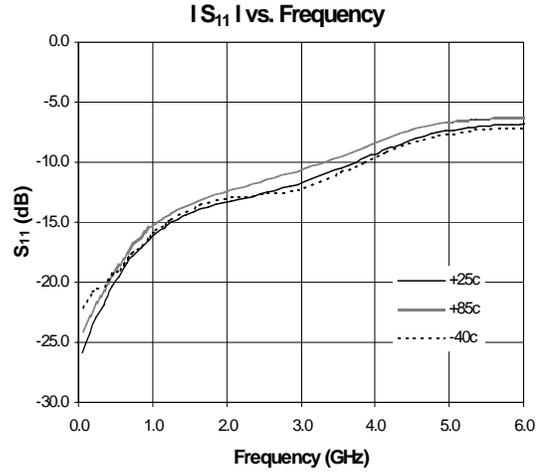
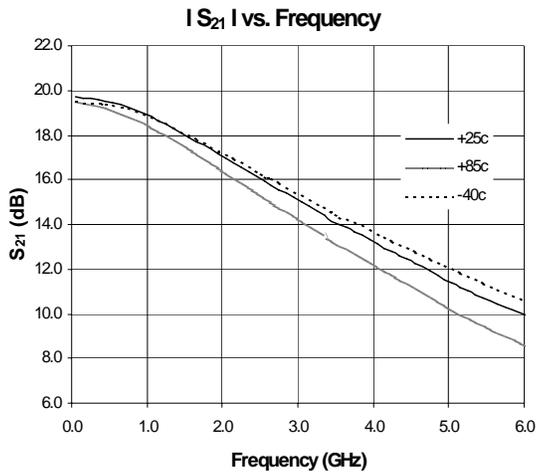
Simplified Device Schematic



Evaluation Board Data ($V_{CC}=V_{BIAS}=3.0V$, $I_C=25mA$) Bias Tee substituted for DC feed inductor (L1)

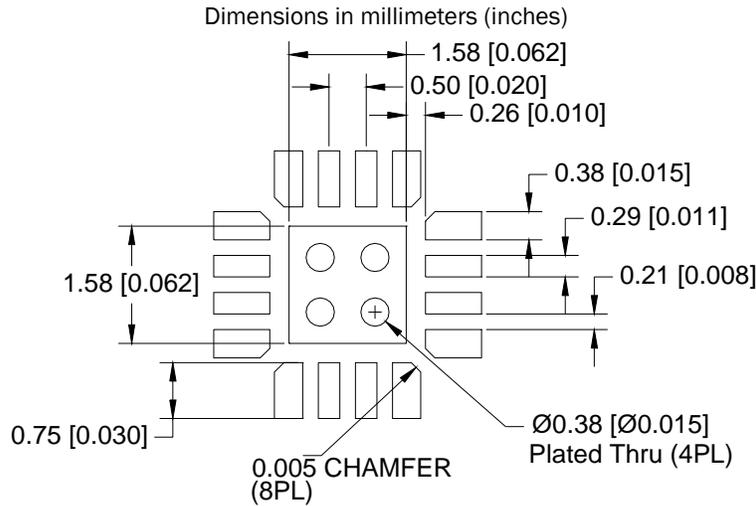


Evaluation Board Data ($V_{CC}=V_{BIAS}=3.0V$, $I_C=25mA$) Bias Tee substituted for DC feed inductor (L1) cont.

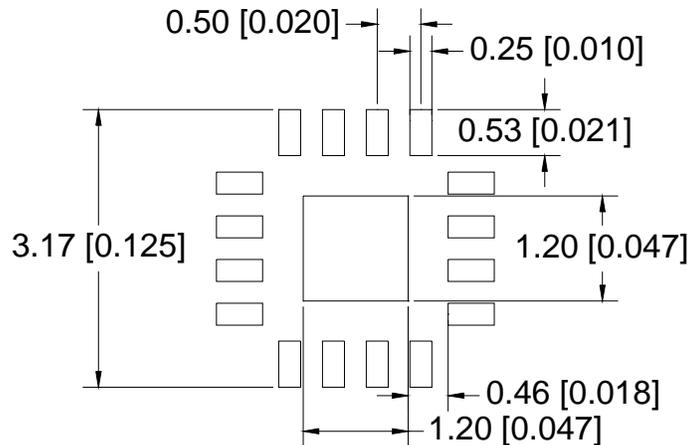


| Pin | Function | Description |
|--|----------|---|
| 1, 2, 4, 6, 7, 8, 11, 12, 14 | NC | These are no connect pins. Leave them unconnected on the PC board. |
| 3 | RF IN | RF input pin. A DC voltage should not be connected externally to this pin |
| 5 | GND | An extra ground pin that is connected to the backside exposed paddle. Connection is optional. |
| 10 | RF OUT | RF Output pin. Bias is applied to the Darlington stage thru this pin. |
| 13 | VBIAS | This pin sources the current from the active bias circuit. Connect to pin 10 thru an inductor choke. |
| 16 | VCC | This is Vcc for the active bias circuit. |
| Back-side | GND | The backside exposed paddle is the main electrical GND and requires multiple vias in the PC board to GND. It is also the main thermal path. |

Recommended Land Pattern



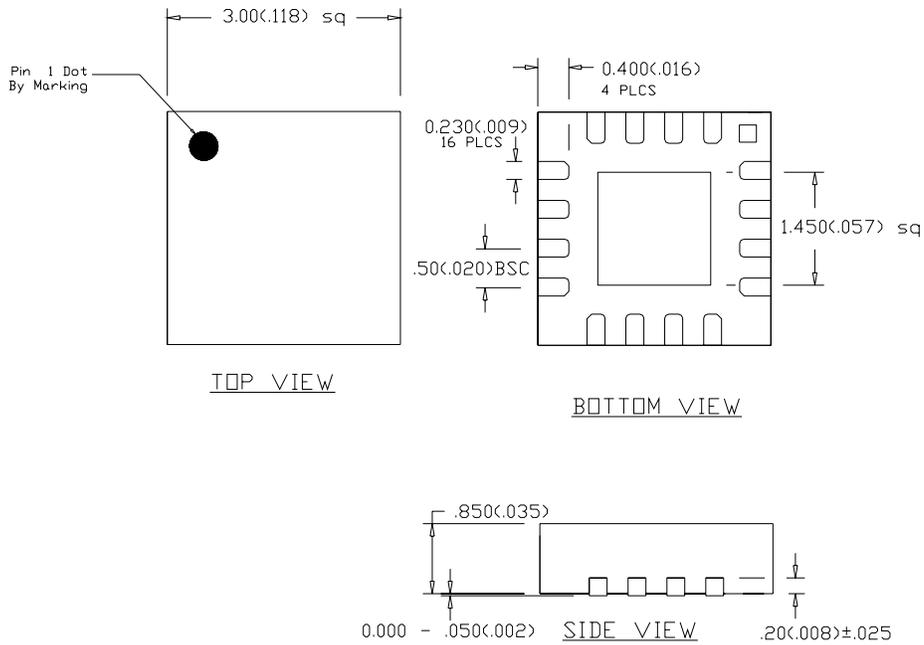
Recommended PCB Soldermask for Land Pattern



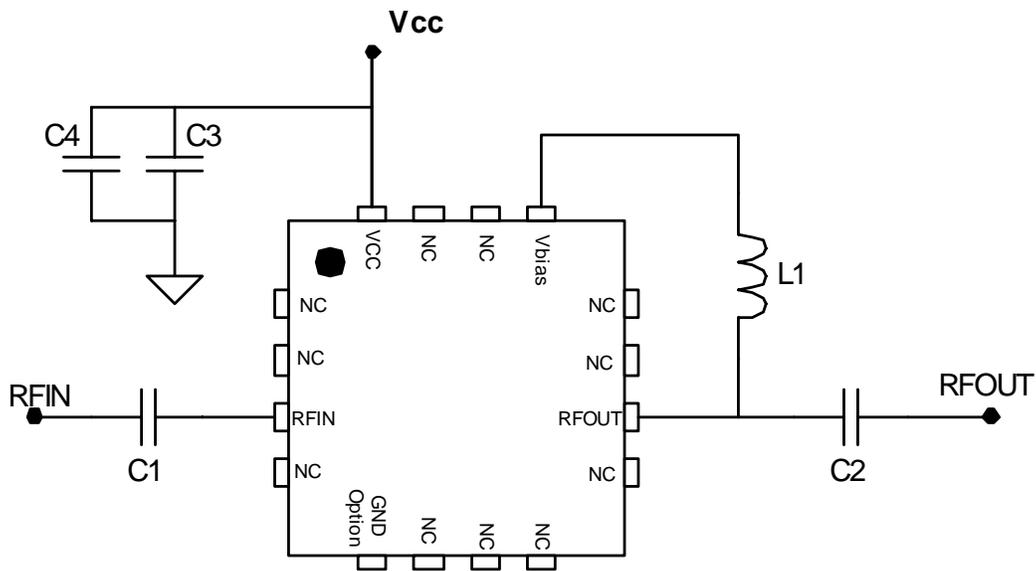
Package Drawing

Dimensions in millimeters (inches)

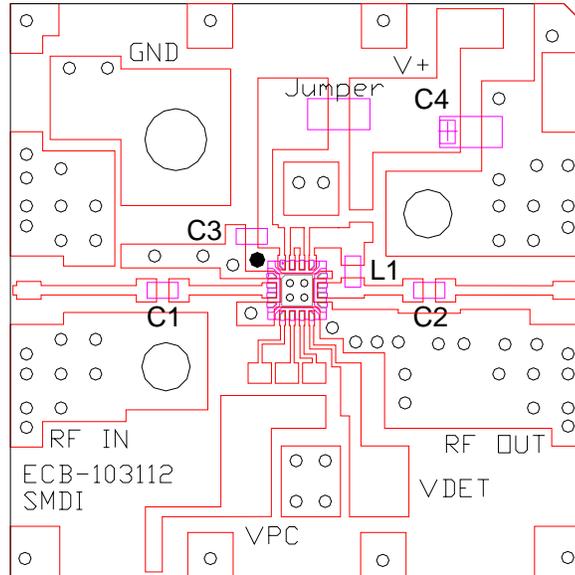
Refer to drawing posted at www.rfmd.com for tolerances.



Typical Evaluation Board Schematic for 3.0V



Evaluation Board Layout and Bill of Materials



Board material GETEK, 31mil thick, Dk=4.2, 1oz copper.

Component Values By Band

| Designator | 500MHz | 850MHz | 1950MHz | 2400MHz |
|------------|--------|--------|---------|---------|
| C3 | 1000pF | 1000pF | 1000pF | 1000pF |
| C4* | 1uF | 1uF | 1uF | 1uF |
| C1, C2 | 220pF | 68pF | 43pF | 22pF |
| L1 | 68nH | 33nH | 22nH | 18nH |

*C4 is optional depending on application and filtering. Not required for SGB device operation.

Note: The amplifier can be run from a 5V supply by simply inserting a 82Ω resistor in series with V_{CC}.

Part Identification

The part will be symbolized with an "SGB2433" for Sn/Pb plating or "SGB24Z" for RoHS green compliant product. Marking designator will be on the top surface of the package.

Ordering Information

| Part Number | Reel Size | Devices/Reel |
|-------------|-----------|--------------|
| SGB-2433 | 13" | 3000 |
| SGB-2433Z | 13" | 3000 |

