# SGC4263Z

## 50MHz to 4000MHz ACTIVE BIAS SILICON GERMANIUM CASCADABLE GAIN BLOCK


**Package: SOT-363**

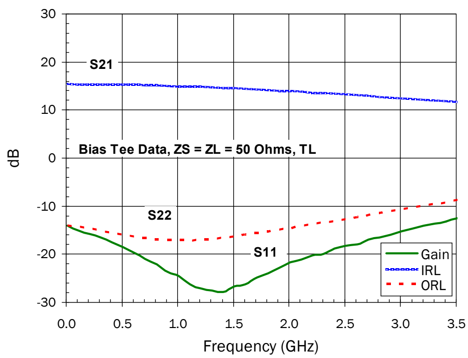
## Product Description

RFMD's SGC4263Z is a high performance SiGe HBT MMIC amplifier utilizing a Darlington configuration with a patented active bias network. The active bias network provides stable current over temperature and process Beta variations. Designed to run directly from a 3V supply, the SGC4263Z does not require a dropping resistor as compared to typical Darlington amplifiers. The SGC4263Z is designed for high linearity 3V gain block applications that require small size and minimal external components. It is internally matched to 50Ω.

**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

**Gain, RL and NF versus Frequency**




## Features

- Single Fixed 3V Supply
- No Dropping Resistor Required
- Patented Self-Bias Circuitry
- $P_{1dB}$=15.1dBm at 1950MHz
- $OIP_3$=30dBm at 1950MHz
- Robust 1000V ESD, Class 1C HBM

## Applications

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

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Small Signal Gain, (G) | | 15.0 | | dB | 500MHz |
| | 13.2 | 14.7 | 16.2 | dB | *850MHz |
| | 12.6 | 14.0 | 15.4 | dB | 1950MHz |
| Output Power at 1dB Compression ($P_{1dB}$) | | 15.2 | | dBm | 500MHz |
| | | 15.1 | | dBm | 850MHz |
| | 13.6 | 15.1 | | dBm | 1950MHz |
| Output Third Order Intercept Point ($OIP_3$) | | 32.0 | | dBm | 500MHz |
| | | 30.5 | | dBm | 850MHz |
| | 27.0 | 30.0 | | dBm | 1950MHz |
| Input Return Loss, (IRL) | 17.0 | 23.5 | | dB | 1950MHz |
| Output Return Loss, (ORL) | 17.0 | 21.0 | | dB | 1950MHz |
| Noise Figure (NF) | | 3.3 | 4.5 | dB | 1930MHz |
| Device Operating Voltage, ($V_D$) | | 3.0 | | V | |
| Device Operating Current, ($I_D$) | 44 | 55 | 64 | mA | |
| Thermal Resistance | | 130 | | °C/W | (Junction - Lead) (Rth, j-l) |

Test Conditions: $V_D$=3V, $I_D$=55mA Typ., $T_L$=25°C, $OIP_3$ Tone Spacing=1MHz. *Bias Tee Data, $Z_S$=$Z_L$=50Ω, $P_{OUT}$ per tone=0dBm, Application Circuit Data Unless Otherwise Noted





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## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Max Device Current ($I_D$) | 110 | mA |
| Max Device Voltage ($V_D$) | 4 | V |
| Max RF Input Power[1] | 12 | dBm |
| Max RF Input Power[2] | 18 | dBm |
| Max Junction Temp ($T_J$) | +150 | °C |
| Operating Temp Range ($T_L$) | -40 to +85 | °C |
| Max Storage Temp | +150 | °C |
| ESD Rating - Human Body Model (HBM) | Class 1C | |
| Moisture Sensitivity Level | MSL 1 | |

Notes
1. Load condition: VSWR ≤ 10:1; $V_{CC}$ ≤ 3.5V
2. Load condition: VSWR ≤ 3:1; $V_{CC}$ ≤ 3.2V

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:
$I_DV_D<(T_J-T_L)/R_{TH}$, j-l and $T_L$=Source Lead Temperature

**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 2011/65/EU (at time of this document revision).



RFMD Green: RoHS compliant per EU Directive 2011/65/EU, 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.

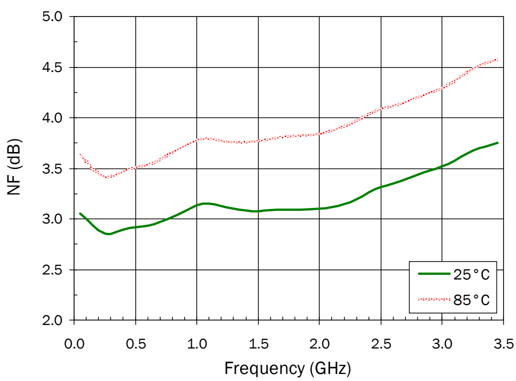
## Typical RF Performance with Application Circuit at Key Operating Frequencies (App Circuit Data Unless Noted Otherwise)

| Parameter | Unit | *100 MHz | 500 MHz | 850 MHz | 1950 MHz | 2500 MHz | *3500 MHz |
|---|---|---|---|---|---|---|---|
| Small Signal Gain (G) | dB | 15.4 | 15.0 | 14.7 | 14.0 | 13.1 | 11.6 |
| Output Third Order Intercept Point ($OIP_3$) | dBm | 33.0 | 32.0 | 30.5 | 30.0 | 29.5 | 27.0 |
| Output Power at 1dB Compression ($P_{1dB}$) | dBm | 15.4 | 15.2 | 15.1 | 15.1 | 15.3 | 14.3 |
| Input Return Loss (IRL) | dB | 14.5 | 16.0 | 21.5 | 23.5 | 16.0 | 13.0 |
| Output Return Loss (ORL) | dB | 13.5 | 13.5 | 17.0 | 21.0 | 20.5 | 9.0 |
| Reverse Isolation ($S_{12}$) | dB | 18.5 | 19.0 | 19.5 | 19.5 | 19.5 | 18.5 |
| Noise Figure (NF) | dB | 2.8 | 3.2 | 3.1 | 3.3 | 3.5 | 3.8 |

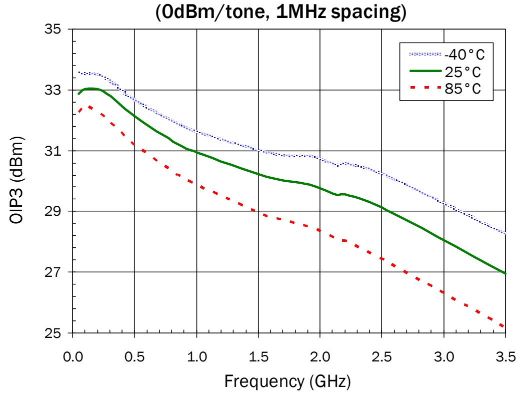
Test Conditions: $V_D$=3V, $I_D$=55mA Typ. $OIP_3$ Tone Spacing=1MHz, $P_{OUT}$ per tone=0dBm, $T_L$=25°C, $Z_S$=$Z_L$=50Ω, *Bias Tee Data

## Typical Performance with Bias Tee, $V_D$=3V, $I_D$=55mA

**Noise Figure versus Frequency**

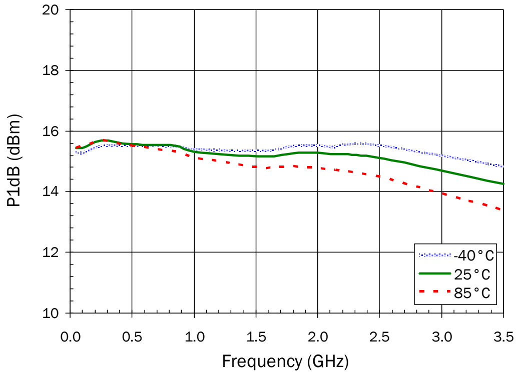



**OIP3 versus Frequency (0dBm/tone, 1MHz spacing)**

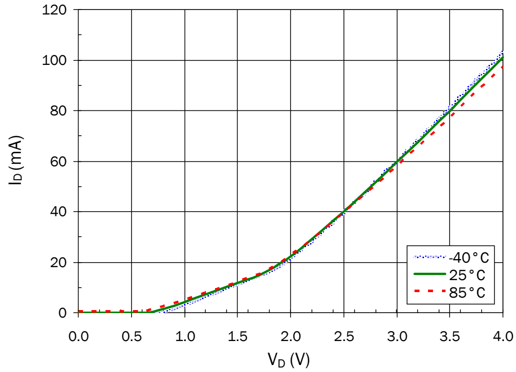


## Typical Performance with Bias Tee, $V_D = 3V$, $I_D = 55mA$

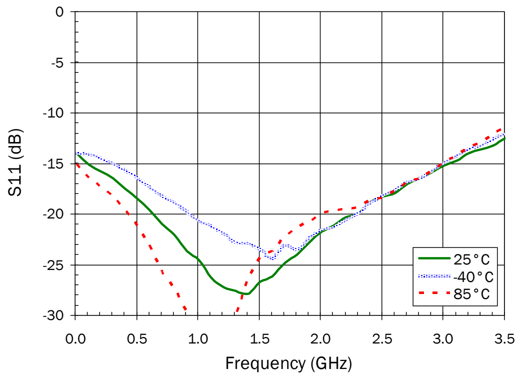
### P1dB versus Frequency



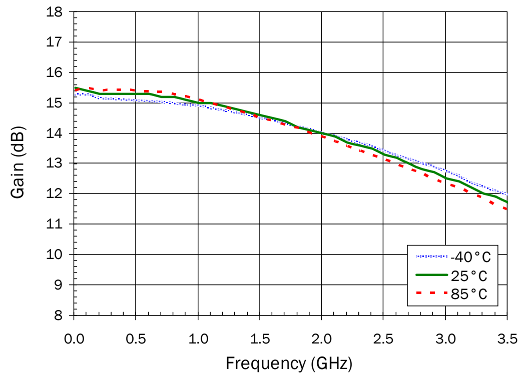

### DCIV



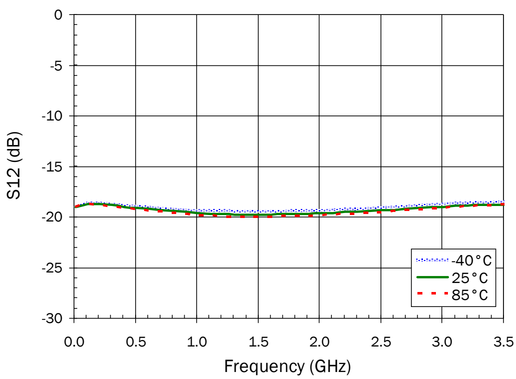

### S11 versus Frequency



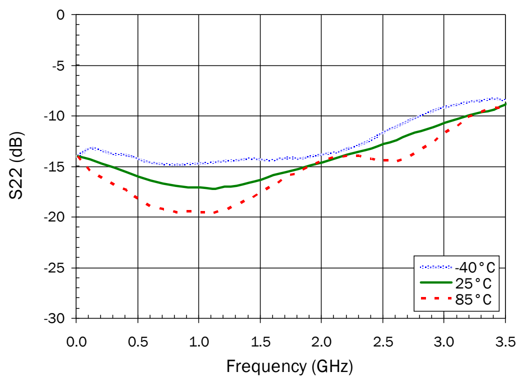

### S21 versus Frequency



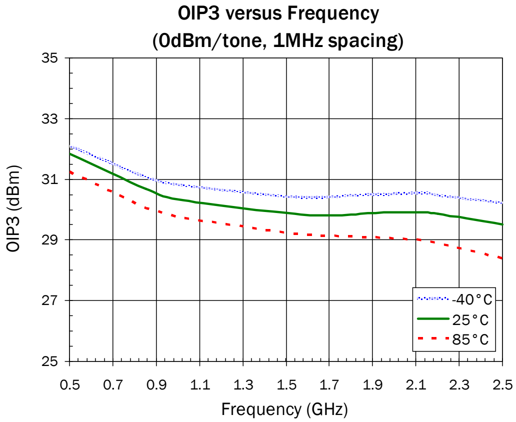

### S12 versus Frequency

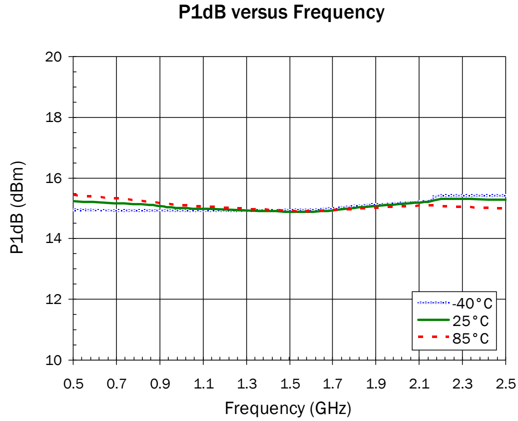


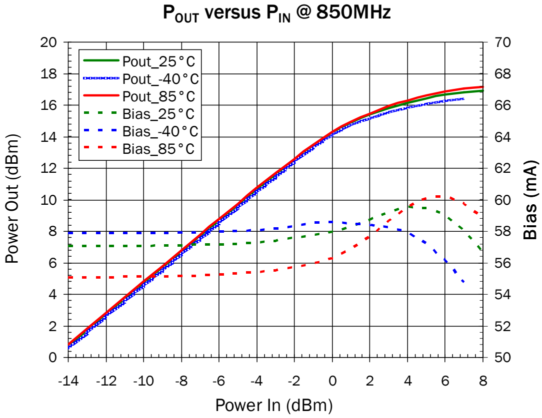

### S22 versus Frequency

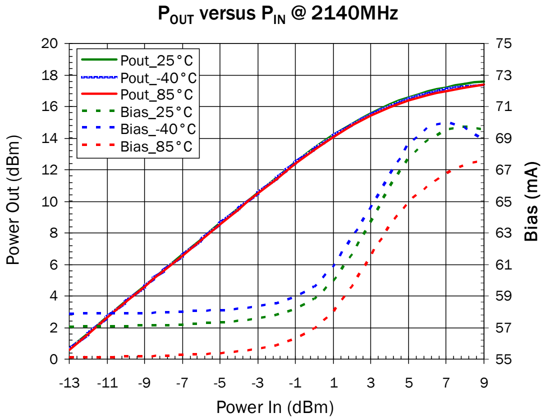


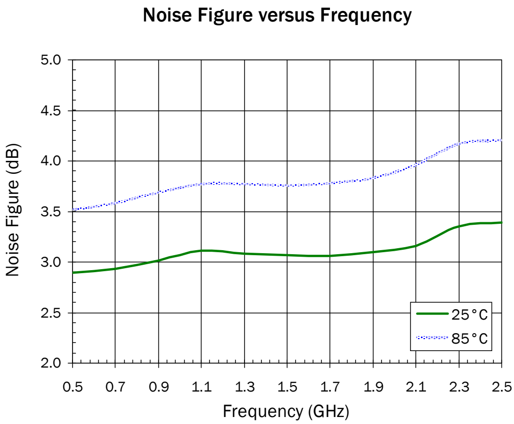
## Typical Performance with Application Circuit, $V_D$=3V, $I_D$=55mA



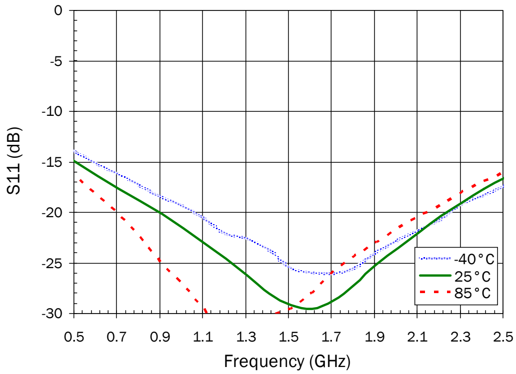



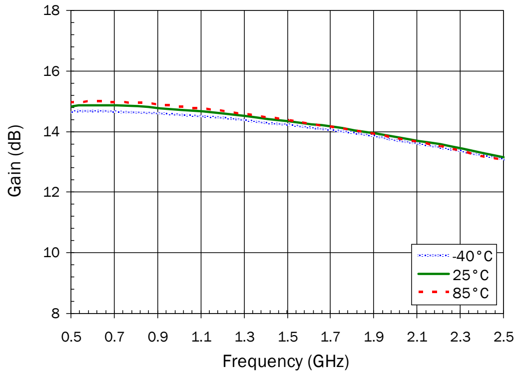



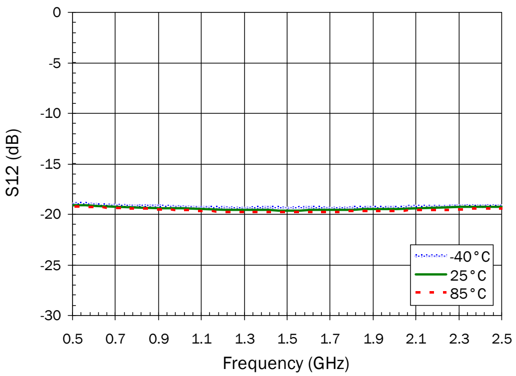
S11 versus Frequency



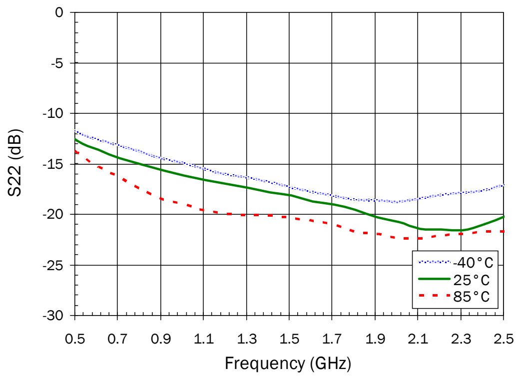

S21 versus Frequency




S12 versus Frequency

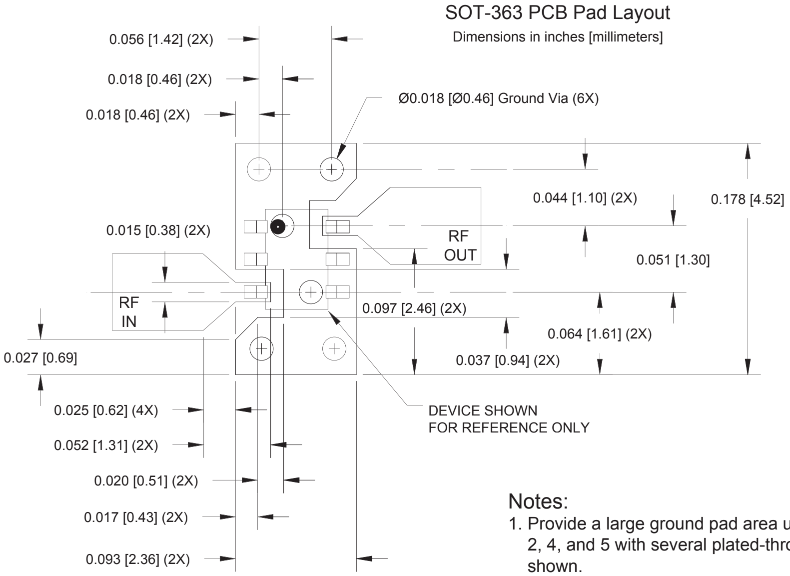



S22 versus Frequency



| 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 as close to the device ground leads as possible to reduce ground inductance and achieve optimum RF performance. |
| 6 | RF OUT/ DC BIAS | RF output and bias pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |

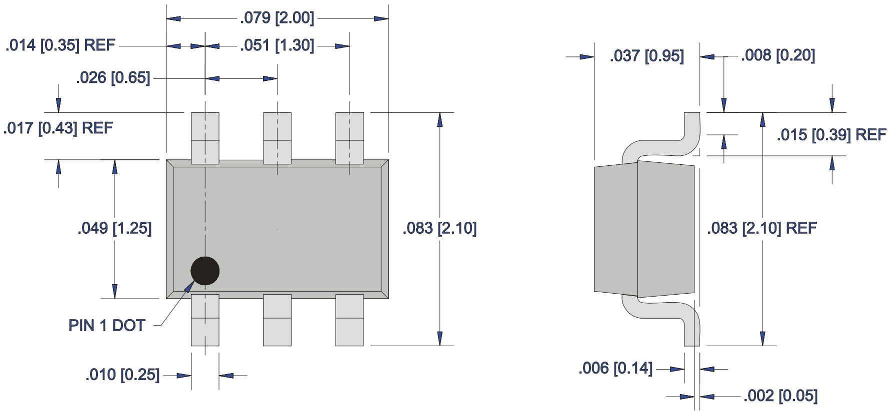
## SOT-363 PCB Pad Layout



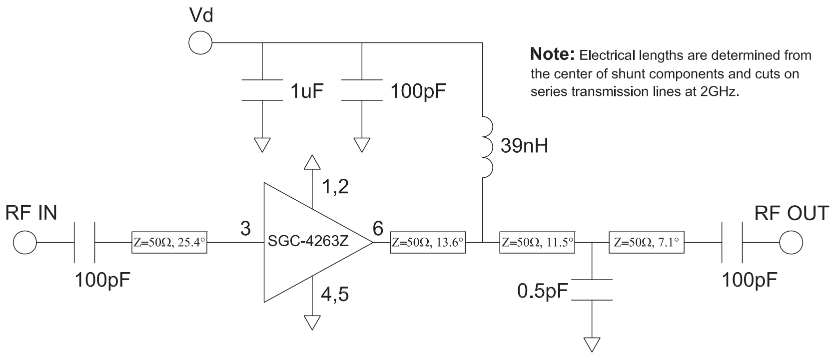

Notes:
1. Provide a large ground pad area under device pins 1, 2, 4, and 5 with several plated-through holes placed as shown.
2. 1/2 ounce finished copper thickness is recommended.
3. RF I/O lines are 50Ω

## Package Drawing

Dimensions in inches (millimeters)
Refer to drawing posted at www.rfmd.com for tolerances.




## Application Schematic




**Note:** Electrical lengths are determined from the center of shunt components and cuts on series transmission lines at 2GHz.



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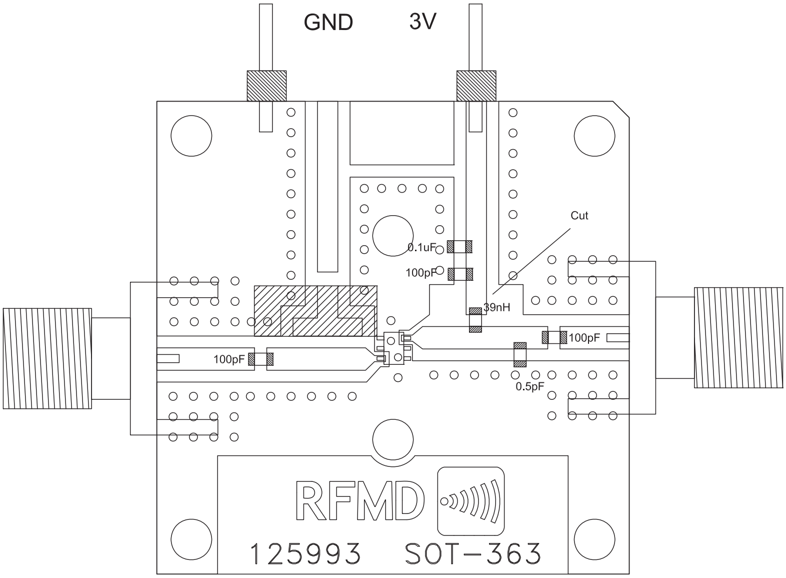
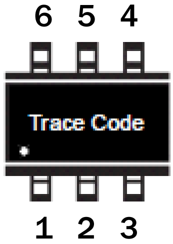
## Evaluation Board Layout




PCB Assy. 800 to 2200 MHz

## Part Identification Marking




## Ordering Information

| Ordering Code | Description |
|---|---|
| SGC4263Z | 7” Reel with 3000 pieces |
| SGC4263ZSQ | Sample bag with 25 pieces |
| SGC4263ZSR | 7” Reel with 100 pieces |
| SGC4263ZPCK | 800 MHz to 2200 MHz PCBA with 5-piece sample bag |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