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# SGL0263Z

## 1400MHz to 2500MHz SILICON GERMANIUM CASCADABLE LOW NOISE AMPLIFIER



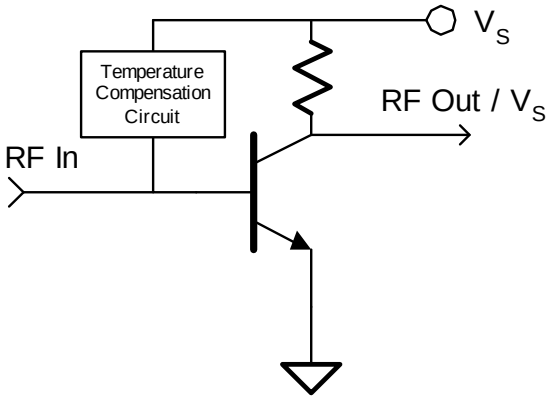
Package: SOT-363

## Product Description

The SGL0263Z is a high performance SiGe HBT MMIC low noise amplifier featuring 1 micron emitters with $F_T$ up to 50GHz. This device has an internal temperature compensation circuit permitting operation directly from supply voltages as low as 2.5V. The SGL0263Z has been characterized at $V_D$=3V for low power and 4V for medium power applications. Only two DC-blocking capacitors, 2 input matching components, a bias resistor, and an optional RF choke are required for operation from 1400MHz to 2500MHz.

**Optimum Technology Matching® Applied**

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☐ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ☑ SiGe HBT
- ☐ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ InP HBT




## Features

- High Input/Output Intercept
- Low Noise Figure: 1.3dB typ. at 1900MHz
- Low Power Consumption
- Single Voltage Supply Operation
- Internal Temperature Compensation

## Applications

- Receivers, GPS, RFID
- Cellular, Fixed Wireless, Land Mobile

| Parameter | Specification ($V_S$=3V) | | | Specification ($V_S$=4V) | | | Unit | Condition |
|---|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | | |
| Small Signal Gain | 12.1 | 13.4 | 14.7 | | 13.8 | | dB | 1900MHz |
| | | 12.5 | | | 12.9 | | dB | 2100MHz |
| | | 10.8 | | | 11.3 | | dB | 2400MHz |
| Output Power at 1dB Compression | 3.5 | 5.5 | | | 11.4 | | dBm | 1900MHz |
| | | 6.8 | | | 12.3 | | dBm | 2100MHz |
| | | 7.9 | | | 12.8 | | dBm | 2400MHz |
| Input Third Order Intercept Point<br>Tone Spacing=1MHz, $P_{OUT}$ per tone=-13dBm | 7.5 | 9.5 | | | 15.1 | | dBm | 1900MHz |
| | | 13.5 | | | 16.8 | | dBm | 2100MHz |
| | | 15.5 | | | 18.4 | | dBm | 2400MHz |
| Noise Figure | | 1.3 | 1.7 | | 1.9 | | dB | 1900MHz, $Z_S$=50Ω |
| | | 1.5 | | | 2.1 | | dB | 2100MHz, $Z_S$=50Ω |
| | | 2.0 | | | 2.8 | | dB | 2400MHz, $Z_S$=50Ω |
| Input Return Loss | 10.0 | 13.3 | | | 21.9 | | dB | 1900MHz |
| Output Return Loss | 10.0 | 12.9 | | | 17.4 | | dB | 1900MHz |
| Reverse Isolation | | 20.7 | | | 21.0 | | dB | 1900MHz |
| Device Current | 9.0 | 12.5 | 15.0 | | 23.0 | | mA | |
| Thermal Resistance (Junction to Lead) | | 255 | | | | | °C/W | |

Test Conditions: 1400MHz to 2500MHz Application Circuit, $T_{LEAD}$=25°C, $Z_0$=$Z_L$=50Ω

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## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Max Device Current ($I_D$) | 45 | mA |
| Max Device Voltage ($V_D$) | 5 | V |
| Max RF Input Power | +10 | dBm |
| Max Junction Temp ($T_J$) | +150 | °C |
| Operating Temp Range ($T_L$) | -40 to +85 | °C |
| Max Storage Temp | +150 | °C |
| ESD | 1A | Class |
| MSL | 1 | |

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-l

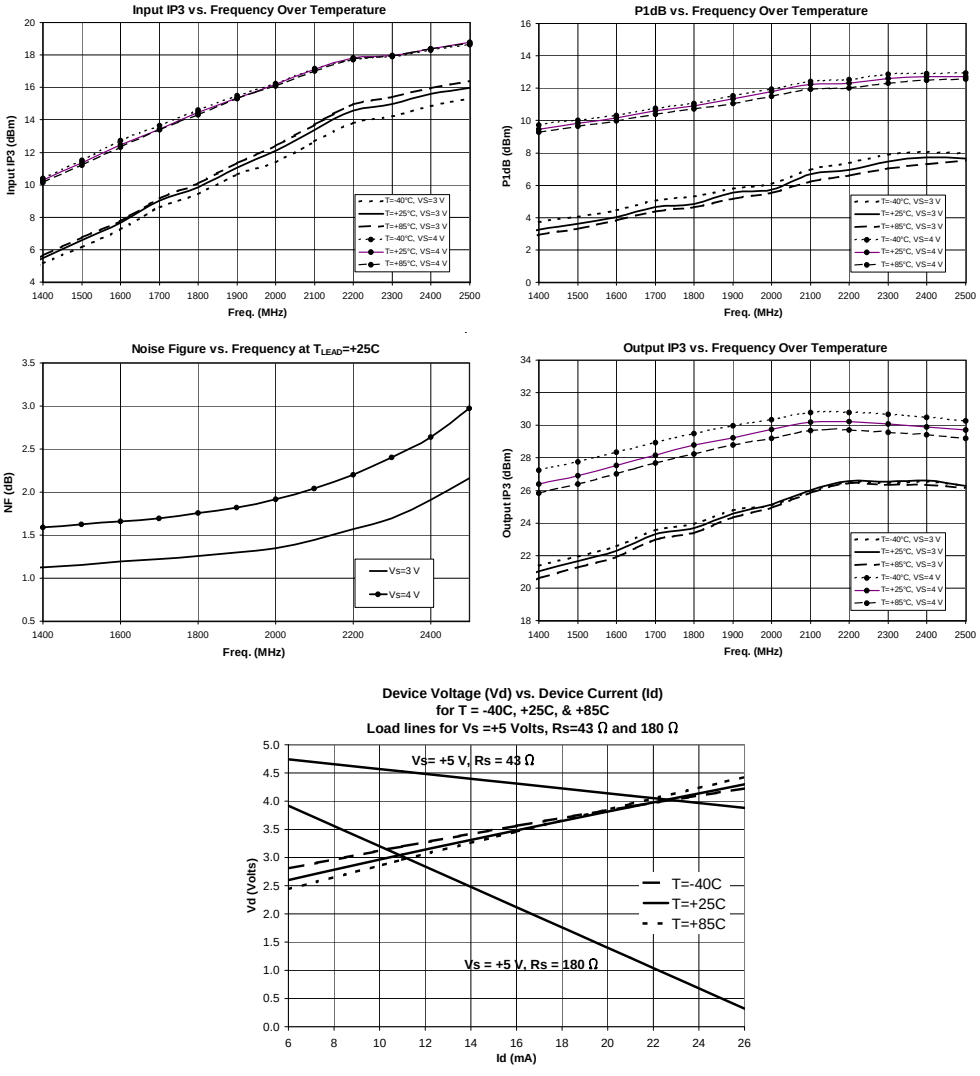
**Caution!** ESD sensitive device.

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, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

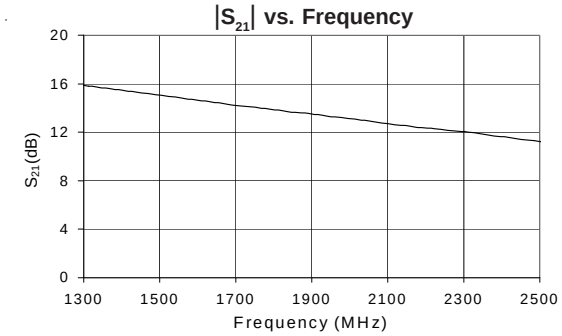
### Typical RF Performance Over Lead Temperature at 3 V and 4 V -- 1400-2500 MHz Evaluation Board

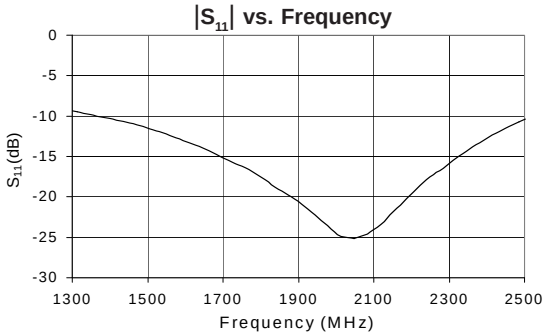


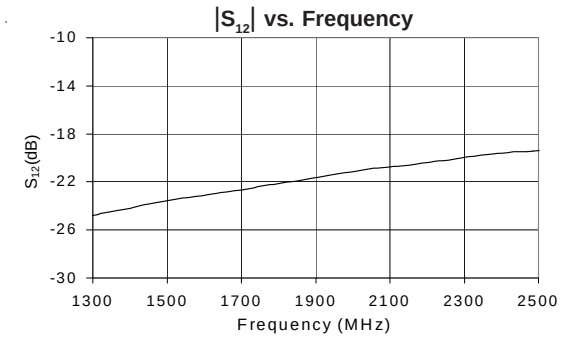


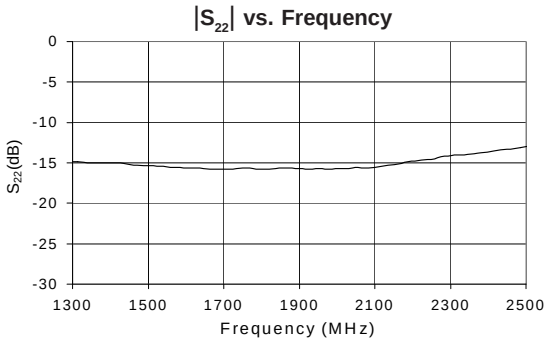

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## Typical RF Performance at $V_S$ = 3 V -- 1400-2500 MHz Evaluation Board -- $T_{LEAD}$=+25°C

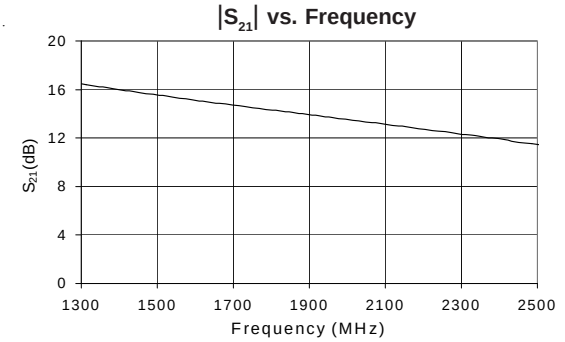


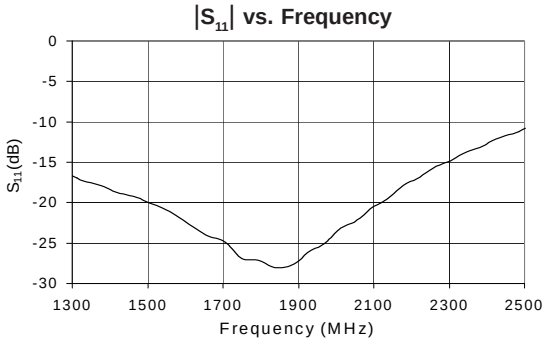



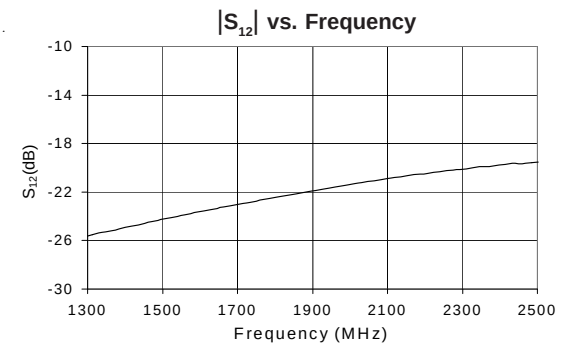



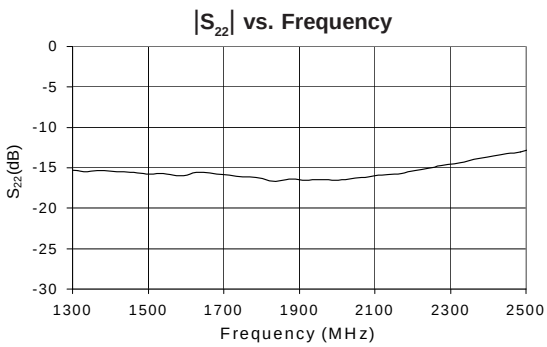




## Typical RF Performance at $V_S$ = 4 V -- 1400-2500 MHz Evaluation Board -- $T_{LEAD}$=+25°C



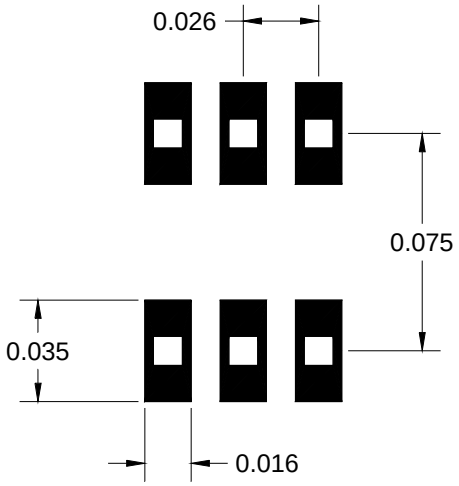



| Pin | Function | Description |
|---|---|---|
| 1 | N/C | No electrical connection. Provide an isolated (ungrounded) solder pad for mounting integrity. |
| 3 | RF IN | RF input pin. This pin requires the use of an external DC-blocking capacitor chosen for the frequency of operation. |
| 4 | DC BIAS | Voltage supply connection. Bypass with suitable capacitors. |
| 2, 5 | GND | Connection to ground. Provide via holes as close to ground leads as possible to reduce ground inductance and achieve optimum RF performance. |
| 6 | RF OUT/BIAS | RF output and voltage supply. DC voltage is present on this pin, therefore a DC-blocking capacitor is necessary for proper operation. |

## Suggested Pad Layout

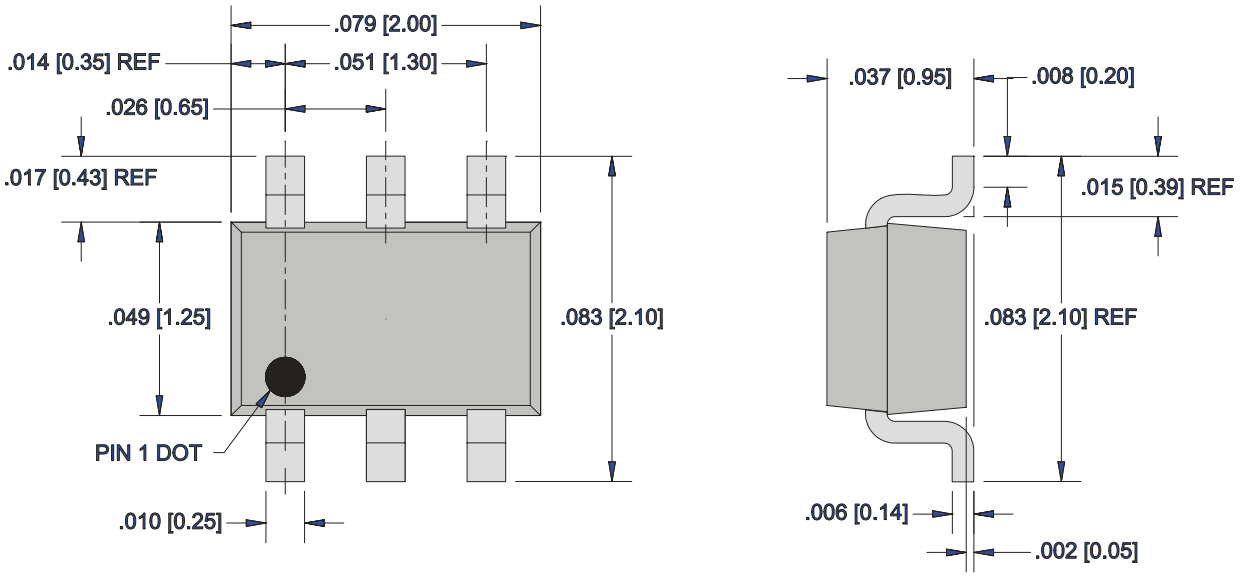



Notes:

1. Provide a ground pad area under device pins 2 & 5 with plated via holes to the PCB ground plane.
2. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick Getek with 1 ounce copper on both sides.

## Package Drawing

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

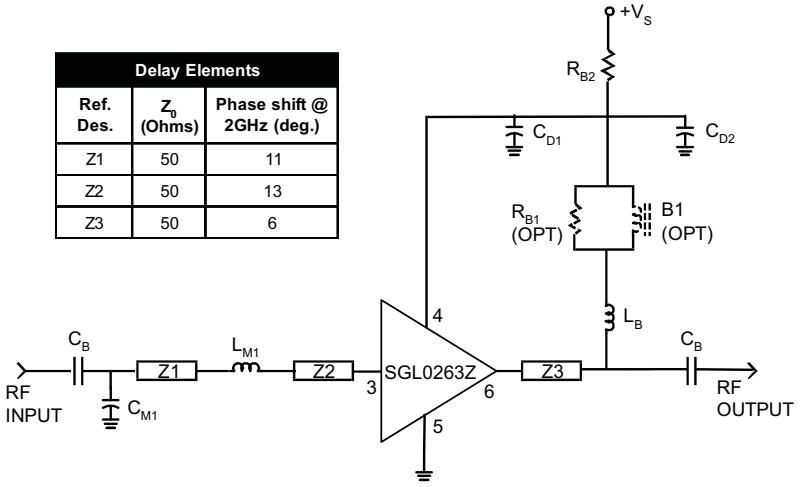




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## 1400MHz to 2500MHz Application Circuit

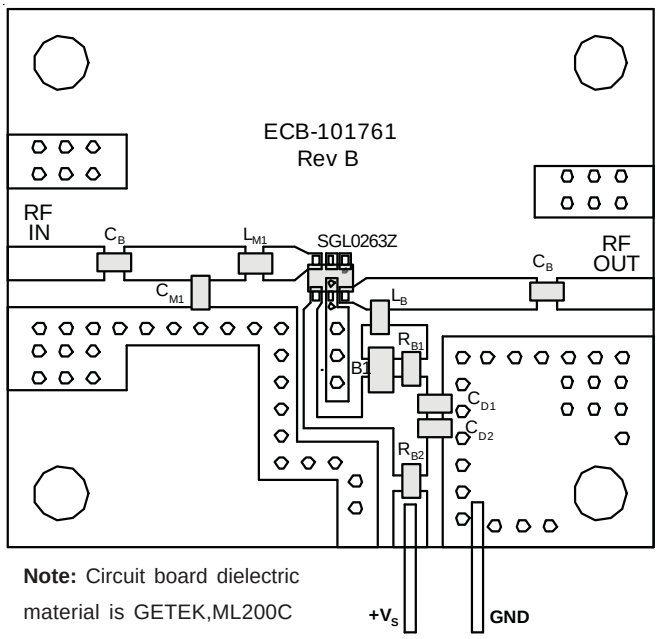
| Delay Elements | | |
|---|---|---|
| Ref. Des. | $Z_0$ (Ohms) | Phase shift @ 2GHz (deg.) |
| Z1 | 50 | 11 |
| Z2 | 50 | 13 |
| Z3 | 50 | 6 |




| Application Circuit Element Values | | |
|---|---|---|
| Reference Designator | Value | Manufacturer & Part No. |
| $L_B$ | 27 nH | TOKO LL1608-FS27NJ |
| $L_{M1}$ | 1.2 nH | TOKO LL1608-FS1R2NJ |
| B1 [1] | 1500 Ohms @100 MHz | FAIR-RITE 2508051527y0 Ferrite Bead |
| $C_B$, $C_{D1}$ | 0.1 uF | SAMSUNG CL10B103KBNC |
| $C_{D2}$ | 22 pF | ROHM MCH185AA220DJK |
| $C_{M1}$ | 1.0 pF | ROHM MCH185A1R0CK |
| $R_{B1}$ [1] | 47 Ohms | PHILLIPS 9C06031A47R0 JL HFT |
| $R_{B2}$ [2] | 0 Ohms | PHILLIPS 9C06031A0R00 JL HFT |

Notes:
1. B1 and $R_{B1}$ provide improved K-factor but are optional.
2. $R_{B2}$ may be introduced as a voltage dropping resistor for use with supply voltages greater than the desired device bias voltage.

## Evaluation Board Layout

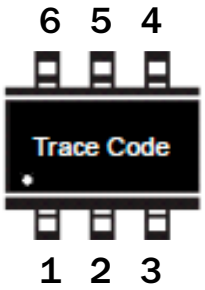



**Note:** Circuit board dielectric material is GETEK,ML200C



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## Alternate Marking with Trace Code Only




## Ordering Information

| Part Number | Description |
|---|---|
| SGL0263Z | 7" Reel with 3000 pieces |
| SGL0263ZSQ | Sample Bag with 25 pieces |
| SGL0263ZSR | 7" Reel with 100 pieces |
| SGL0263ZPCK1 | 1400MHz to 2500MHz PCBA with 5-piece Sample Bag |


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