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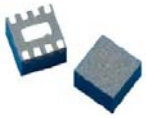
# SGL-0622Z

## 5MHz to 4000MHz LOW NOISE MMIC AMPLIFIER SILICON GERMANIUM



**RFMD Green, RoHS Compliant, Pb-Free**
**Package: QFN, 2x2**

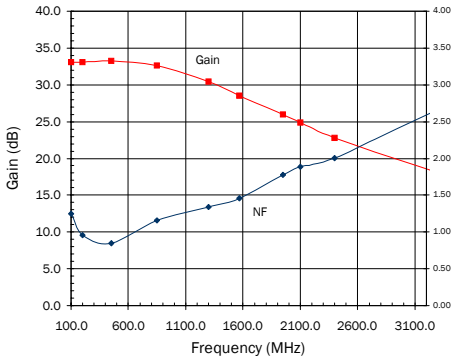
## Product Description

The SGL-0622Z is a low noise, high gain MMIC LNA designed for low power single-supply operation from 2.7V to 3.6V. Its Class-1C ESD protection and high input overdrive capability ensures rugged performance, while its integrated active bias circuit maintains robust stable bias over temperature and process beta variation. The SGL-0622Z is internally matched from 5MHz to 4000 MHz and requires only 4 to 5 external biasing components (DC blocks, bypass caps, inductive choke). The SGL-0622Z is fabricated using highly repeatable Silicon Germanium technology and is housed in a cost-effective RoHS/WEEE compliant QFN 2x2 miniature package.

**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

**Typical Performance**




## Features

- High Gain=28dB at 1575MHz
- Low Noise Figure=1.5dB at 1575MHz
- Low Power Consumption, 10.5mA @ 3.3V
- Battery Operation: 2.7V to 3.6V (Active Biased)
- Fully Integrated Matching
- Class-1C ESD Protection (>1000V HBM)
- High input overdrive capability, +18dBm

## Applications

- High Gain GPS Receivers
- ISM and WiMAX LNAs

| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| Small Signal Gain | 25.0 | 28.0 | 31.0 | dB | 1.575GHz |
| | | 23.0 | | dB | 2.44GHz |
| | 14.5 | 16.5 | 18.5 | dB | 3.50GHz |
| Output Power at 1dB Compression | 3.3 | 5.3 | | dBm | 1.575GHz |
| | | 1.5 | | dBm | 2.44GHz |
| | | -1.4 | | dBm | 3.50GHz |
| Input Third Order Intercept Point | -16.0 | -13.0 | | dBm | 1.575GHz |
| | | -12.0 | | dBm | 2.44GHz |
| | | -8.5 | | dBm | 3.50GHz |
| Input Return Loss | 12.0 | 14.0 | | dB | 1.575GHz |
| | | 12.0 | | dB | 2.44GHz |
| | | 10.0 | | dB | 3.50GHz |
| Output Return Loss | 6.0 | 9.5 | | dB | 1.575GHz |
| | | 14.0 | | dB | 2.44GHz |
| | | 22.0 | | dB | 3.50GHz |
| Noise Figure | | 1.5 | 1.9 | dB | 1.575GHz |
| | | 2.0 | | dB | 2.44GHz |
| | | 2.8 | | dB | 3.50GHz |
| Reverse Isolation | | -28.0 | | dB | 0.05GHz to 4.0GHz |
| Thermal Resistance | | 150 | | °C/W | junction - lead |
| Device Operating Current | 7.5 | 10.5 | 12.5 | mA | |

Test Conditions: $V_{CC}$=3.3V, $I_D$=10.5mA Typ., $IIP_3$ Tone Spacing=1MHz, $P_{OUT}$ per tone=-15dBm, $T_L$=25°C, $Z_S$=$Z_L$=50Ω





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## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Device Current ($I_D$) | 20 | mA |
| Device Voltage ($V_D$) | 4 | V |
| RF Input Power* (See Note) | 18 | dBm |
| Junction Temp ($T_J$) | +150 | °C |
| Operating Temp Range ($T_L$) | -40 to +85 | °C |
| Storage Temp | +150 | °C |
| ESD Rating - Human Body Model (HBM) | Class 1C | |
| Moisture Sensitivity Level | MSL 1 | |

*Note: Load condition1, ZL=50Ω. Load condition2, $Z_L$=10:1 VSWR.

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 and $T_L = T_{LEAD}$

**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 EUDirective2002/95/EC (at time of this document revision).



### Typical RF Performance at Key Operating Frequencies (WIth Application Circuit)

| Parameter | Unit | 100 MHz | 200 MHz | 450 MHz | 850 MHz | 1575 MHz | 1950 MHz | 2440 MHz | 3550 MHz |
|---|---|---|---|---|---|---|---|---|---|
| Small Signal Gain, S21 | dB | 34.6 | 34.9 | 34.4 | 32.8 | 28.5 | 26.1 | 23.0 | 17.0 |
| Input Third Order Intercept Point, IIP3 | dBm | | | | | -13.0 | | -12.0 | -8.5 |
| Output at 1dB Compression, P1dB | dBm | 2.7 | | | | 5.3 | | 1.5 | -1.4 |
| Input Return Loss | dB | 15.1 | 20.0 | 12.6 | 16.0 | 14.3 | 12.8 | 12.0 | 10.0 |
| Output Return Loss | dB | 9.2 | 12.2 | 11.8 | 10.4 | 9.5 | 12.1 | 14.0 | 22.0 |
| Reverse Isolation | dB | 38.8 | 39.8 | 38.7 | 39.9 | 35.6 | 34.8 | 32.0 | 29.0 |
| Noise Figure, NF | dB | 1.25 | 0.96 | 0.84 | 1.16 | 1.50 | 1.78 | 2.01 | 2.81 |

Test Conditions: $V_{CC}$=3.3V $I_D$=10.5mA Typ. $IIP_3$ Tone Spacing=1MHz, $P_{OUT}$ per tone=-15dBm
$T_L$=25°C $Z_S$=$Z_L$=50Ω


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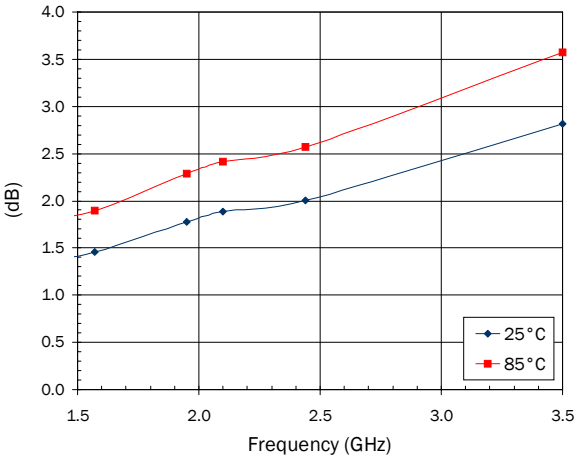
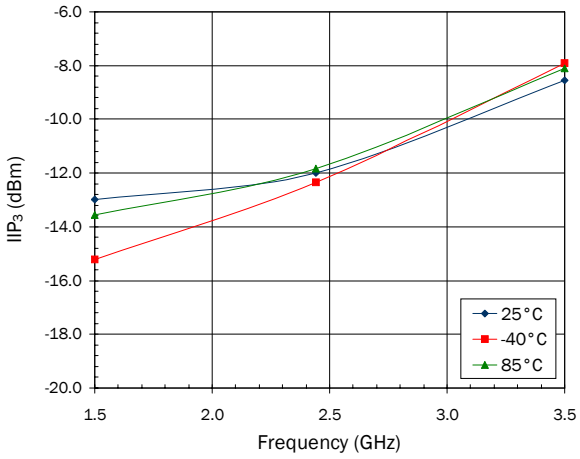
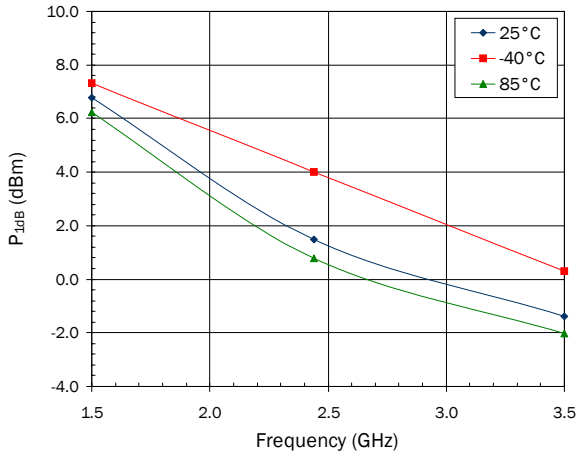
**Noise Figure versus Frequency**




**$IIP_3$ versus Frequency**

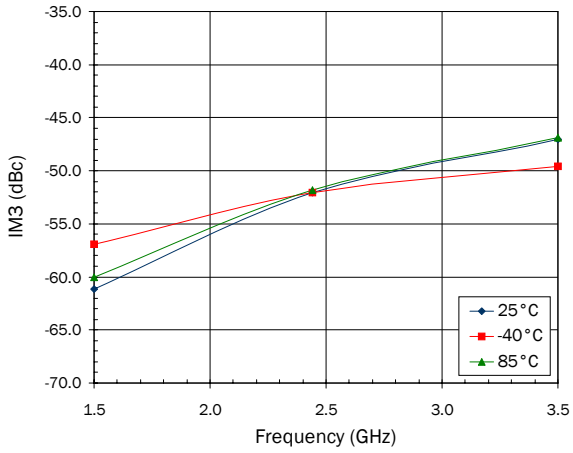



**$P_{1dB}$ versus Frequency**

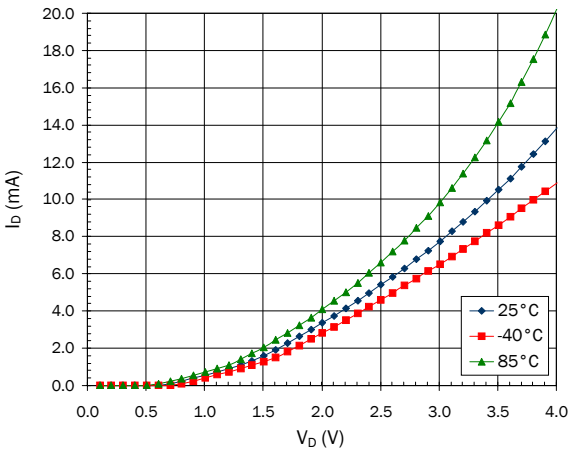


## Application Circuit Data, $V_{CC}$= 3.3V, $I_D$= 9mA

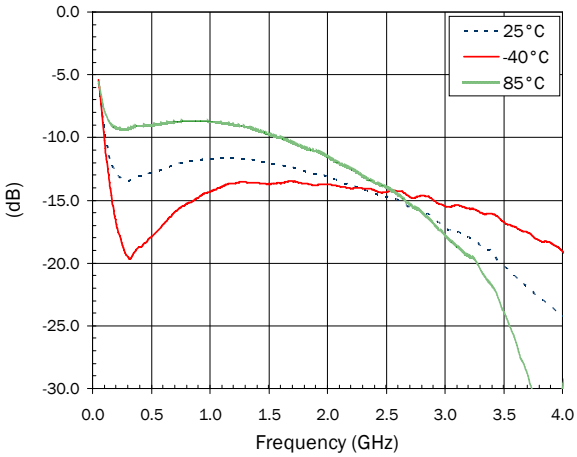
IM3 versus Frequency



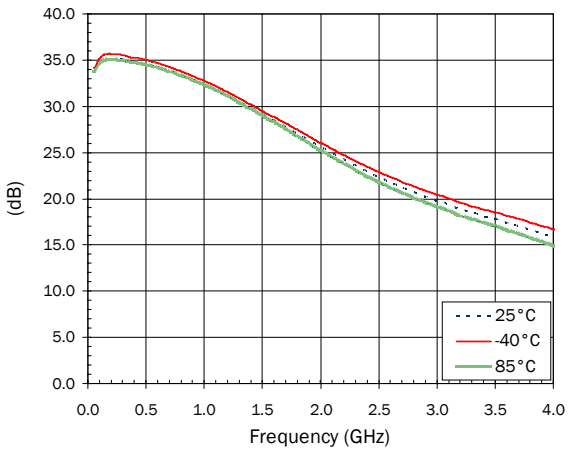

DCIV over Temperature



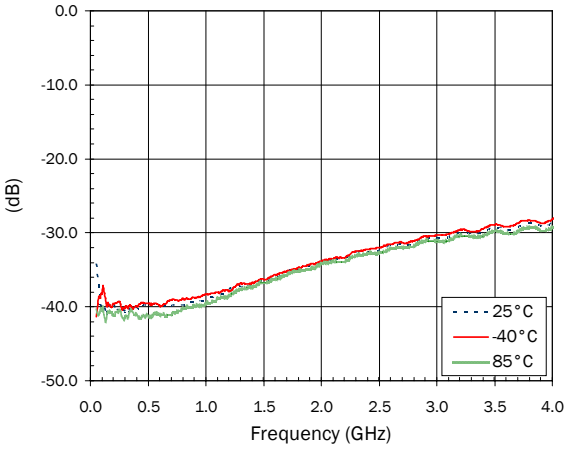

S22 versus Frequency



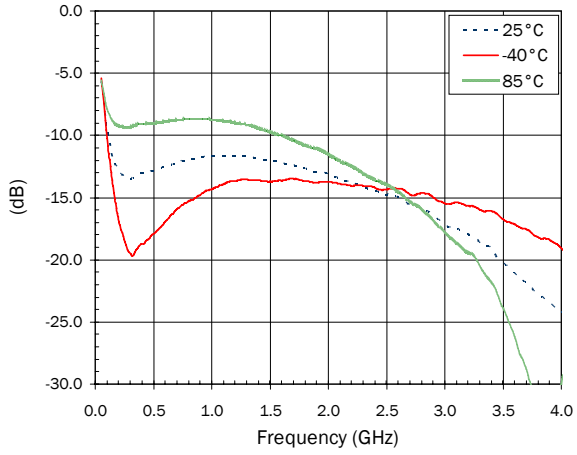

S21 versus Frequency




S12 versus Frequency




S22 versus Frequency



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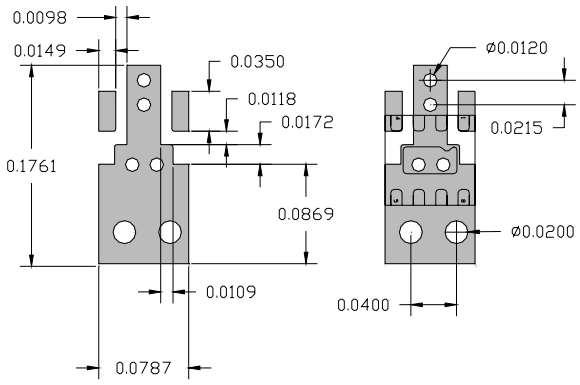
| Pin | Function | Description |
|---|---|---|
| 1 | RF OUT/VD | RF output and bias pin. Bias should be supplied to this pin through an external RF choke. (See application circuit) |
| 2 | GND | Connect to ground per application circuit drawing. |
| 3, 5, 6, 7, 8 | N/A | Not Used |
| 4 | RF IN | RF input pin. This pin requires the use of an external DC blocking capacitor as shown in the application schematics. |
| EPAD | GND | Exposed area on the bottom side of the package needs to be soldered to the ground plane of the board for thermal and RF performance. Vias should be located under the EPAD as shown in the recommended land pattern. |

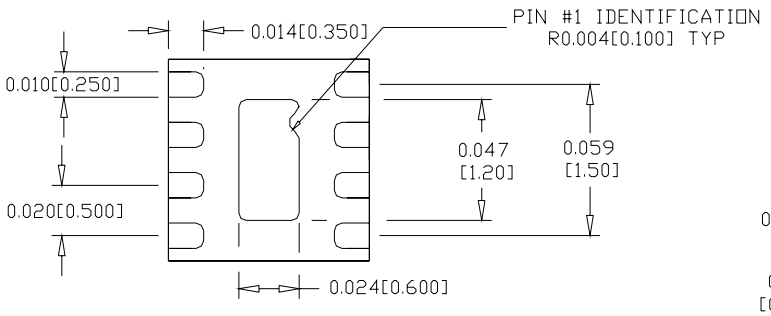
## Suggested Pad Layout

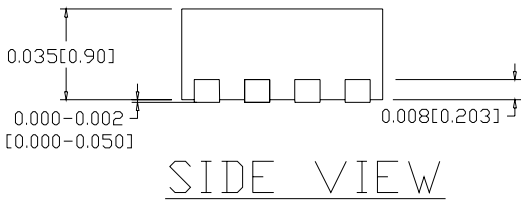



## Nominal Package Dimensions

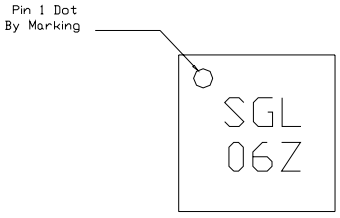
Dimensions in inches (millimeters)
Refer to drawing posted at www.rfmd.com for tolerances.

Package Type:
2 x 2 QFN

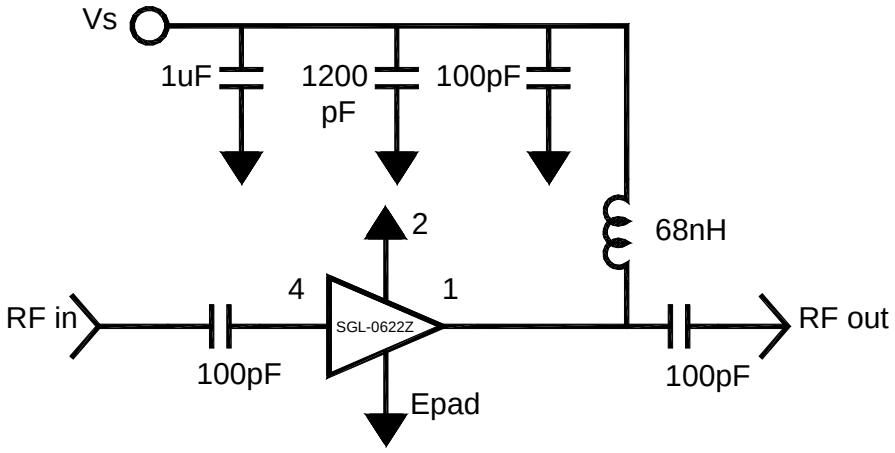


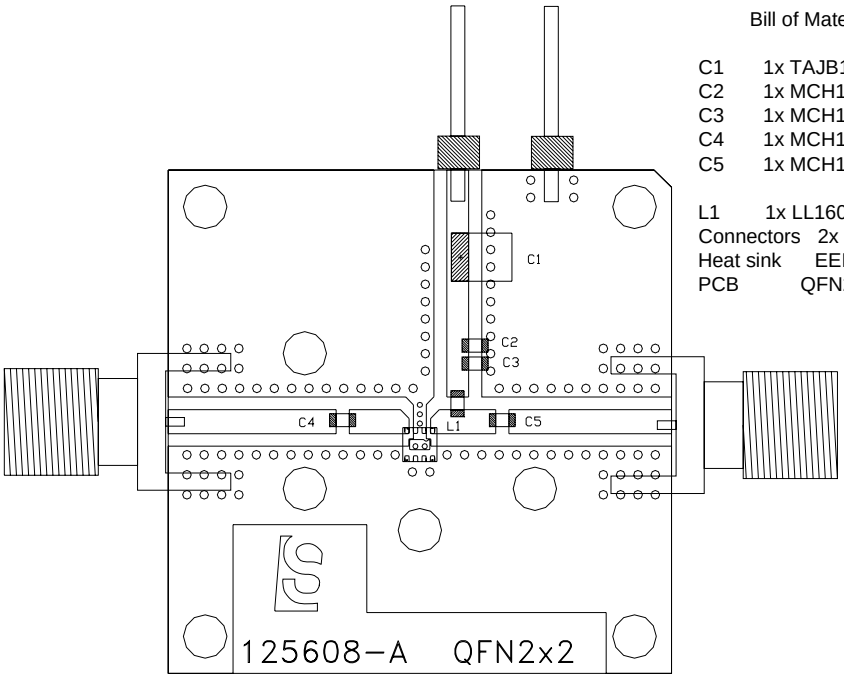

## Part Identification



## Application Schematic




## Evaluation Board Layout and Bill of Materials




Bill of Materials

| | |
|---|---|
| C1 | 1x TAJB105KLRH Rohm 1.0uF |
| C2 | 1x MCH185C122KK Rohm 1200pF |
| C3 | 1x MCH185A101JK Rohm 100pF |
| C4 | 1x MCH185A101JK Rohm 100pF |
| C5 | 1x MCH185A101JK Rohm 100pF |
| L1 | 1x LL1608-FS56NJ Toko 68nH |
| Connectors | 2x PSF-S01-1mm GigaLane Co. |
| Heat sink | EEF-102059 |
| PCB | QFN2x2 |

## Ordering Information

| Part Number | Description | Reel Size | Devices/Reel |
|---|---|---|---|
| SGL-0622Z | Lead Free, RoHS Compliant | 7" | 3000 |
| SGL-0622Z-EVB1 | 100-3500MHz | N/A | N/A |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