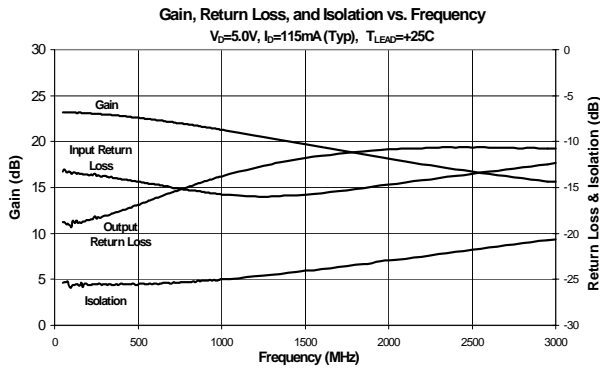




Product Description

The SGA-7489 is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration featuring 1 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 2 DC-blocking capacitors, a bias resistor and an optional RF choke are required for operation.

The matte tin finish on Sirenza's lead-free package utilizes a post annealing process to mitigate tin whisker formation and is RoHS compliant per EU Directive 2002/95. This package is also manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.



| Symbol | Parameter | Freq. (MHz) | Min. | Typ. | Max. | Units |
|--------------|---|------------------------------|--------------|--------------------------------|--------------|-------|
| P_{1dB} | Output Power at 1dB Compression | 850 1950 | 18.5 | 22.4 20.0 | | dBm |
| OIP_3 | Output Third Order Intercept Point * Using 2 GHz App.Ckt. (see page 5) | 100 850 1950 1950 * | 31.0 | 39.0 35.5 33.0 36.0 * | | dBm |
| S_{21} | Small Signal Gain | 850 1950 | 20.0 17.0 | 21.5 18.5 | 23.0 20.0 | dB |
| Bandwidth | Determined by Return Loss (>9dB) | | | 3000 | | MHz |
| IRL | Input Return Loss | 1950 | 10.3 | 15.0 | | dB |
| ORL | Output Return Loss | 1950 | 9.0 | 11.0 | | dB |
| S_{12} | Reverse Isolation | 1950 | | 23.0 | | dB |
| NF | Noise Figure, $Z_s = 50$ Ohms | 1950 | | 3.3 | 4.3 | dB |
| V_D | Device Operating Voltage | | 4.7 | 5.0 | 5.3 | V |
| I_D | Device Operating Current | | 103 | 115 | 127 | mA |
| $R_{TH} j-l$ | Thermal Resistance (junction - lead) | | | 82 | | ° C/W |

Test Conditions:

$V_s = 8 V$ $I_D = 115 mA$ Typ.
 Bias Resistance = 26 Ohms

OIP_3 Tone Spacing = 1 MHz, P_{out} per tone = 0 dBm
 $T_j = 25^\circ C$ $Z_o = Z_i = 50$ Ohms

NOTE: The recommended operating current in the preliminary datasheet was 130mA. Supplemental measurements have since shown that an operating current of 115mA results in optimal RF performance over temperature. Continued operation at 130mA is reliable, however, the recommended operating current has been changed to 115mA.

SGA-7489

SGA-7489Z RoHS Compliant & Green Package

DC-3000 MHz Silicon Germanium HBT Cascadeable Gain Block



Product Features

- Now available in Lead Free, RoHS Compliant, & Green Packaging
- DC-3000 MHz Operation
- Very High IF Output IP3: 39dBm at 100MHz
- High Output IP3: +35.5 dBm typ. at 850 MHz
- Low Noise Figure: 3.3 dB typ. at 1950 MHz

Applications

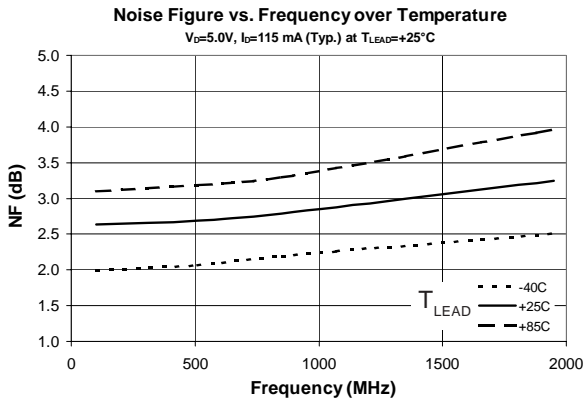
- Oscillator Amplifiers
- PA for Low / Medium Power Applications
- IF/ RF Buffer Amplifier
- Drivers for CATV Amplifiers
- LO Driver Amplifier

Typical RF Performance at Key Operating Frequencies

| Symbol | Parameter | Unit | Frequency (MHz) | | | | |
|------------------|------------------------------------|------|-----------------|------|------|--------|------|
| | | | 100 | 500 | 850 | 1950 | 2400 |
| G | Small Signal Gain | dB | 23.0 | 22.5 | 21.5 | 18.5 | 17.0 |
| OIP ₃ | Output Third Order Intercept Point | dBm | 39.0 | 36.5 | 35.5 | 33.0 * | 32.2 |
| P _{1dB} | Output Power at 1dB Compression | dBm | 22.8 | 22.6 | 22.4 | 20.0 | 19.0 |
| IRL | Input Return Loss | dB | 13.5 | 14.5 | 15.5 | 15.0 | 13.5 |
| ORL | Output Return Loss | dB | 19.5 | 17.0 | 14.5 | 11.0 | 10.5 |
| S ₁₂ | Reverse Isolation | dB | 26.0 | 25.5 | 25.0 | 23.0 | 22.0 |
| NF | Noise Figure | dB | 2.7 | 2.7 | 2.8 | 3.3 | |

Test Conditions: V_S = 8 V I_D = 115 mA Typ. OIP₃ Tone Spacing = 1 MHz, P_{out} per tone = 0 dBm
Bias Resistance = 26 Ohms T_L = 25°C Z_S = Z_L = 50 Ohms

* NOTE: An OIP3 of +36dBm at 1950 MHz is achieved using the tuned circuit shown on page 5.



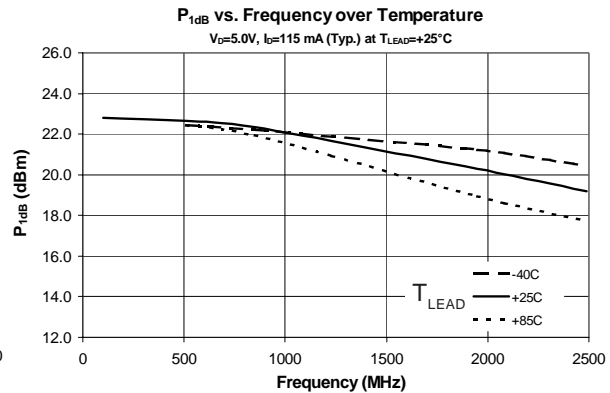
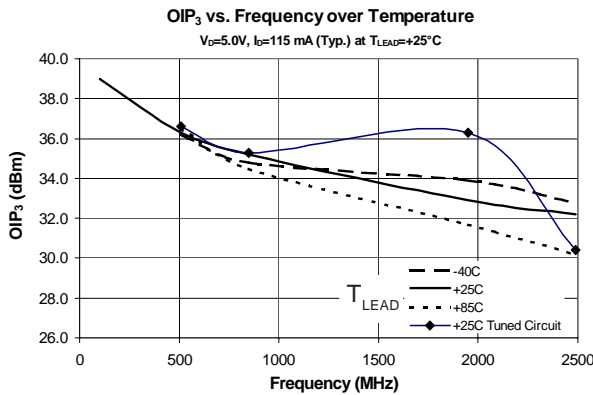
Absolute Maximum Ratings

| Parameter | Absolute Limit |
|--|----------------|
| Max. Device Current (I _D) | 170 mA |
| Max. Device Voltage (V _D) | 7 V |
| Max. RF Input Power : Z _L = 50 Ohms | +16 dBm |
| Max. RF Input Power : Load VSWR=10:1* | +2 dBm |
| Max. Junction Temp. (T _J) | +150°C |
| Operating Temp. Range (T _O) | -40°C to +85°C |
| Max. Storage Temp. | +150°C |

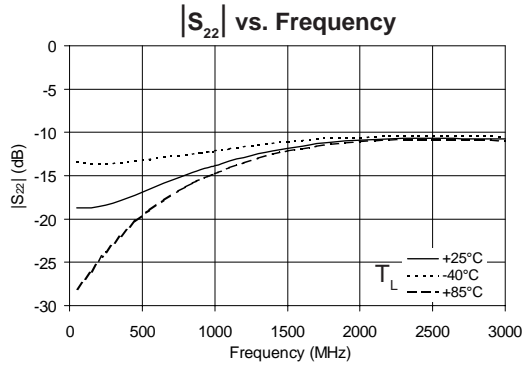
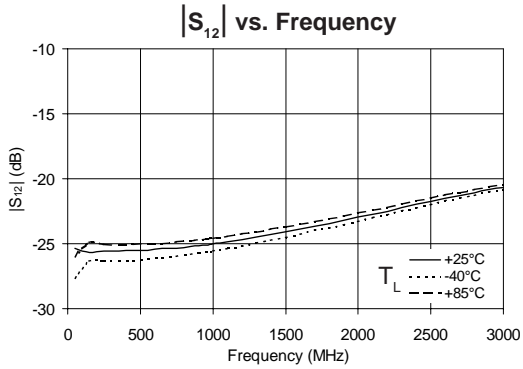
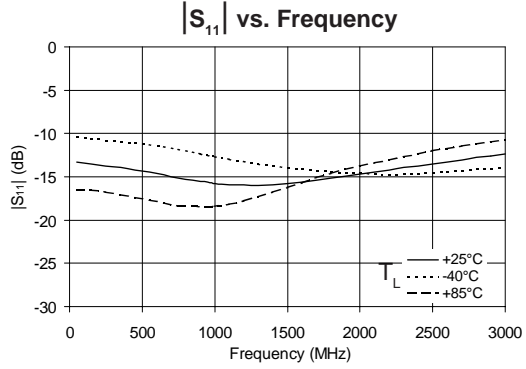
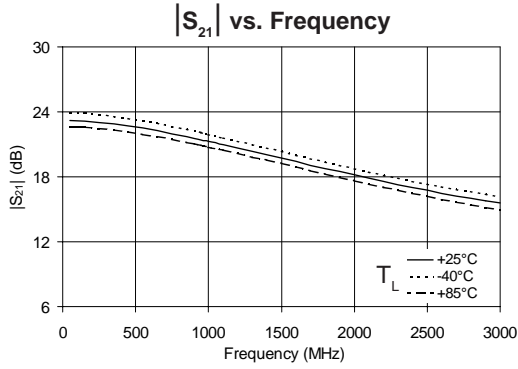
Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage must not exceed 5.3V and the device current must not exceed 143mA.

Bias Conditions should also satisfy the following expression:
 $I_D V_D < (T_J - T_O) / R_{TH} \text{ J-I}$

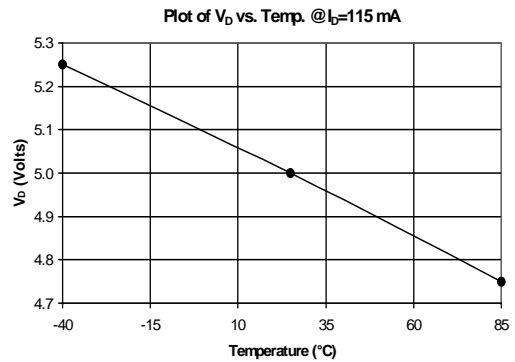
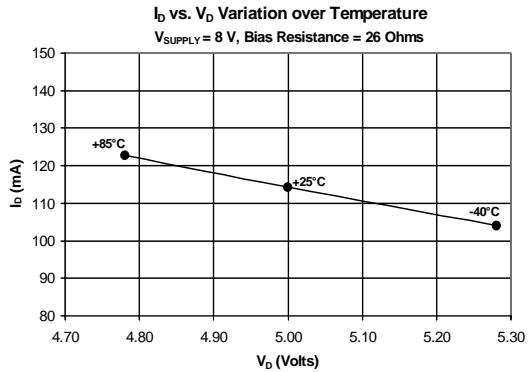
*Note: Take into account out of band load VSWR presented by devices such as SAW filters to determine maximum RF input power. Reflected harmonic levels in saturation are significant.



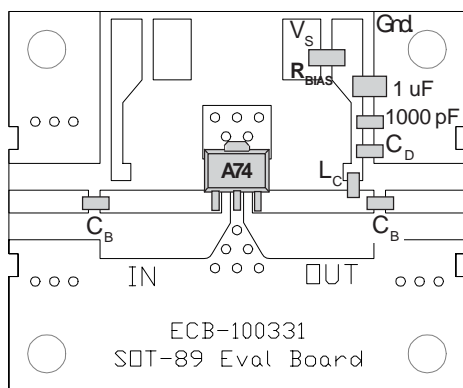
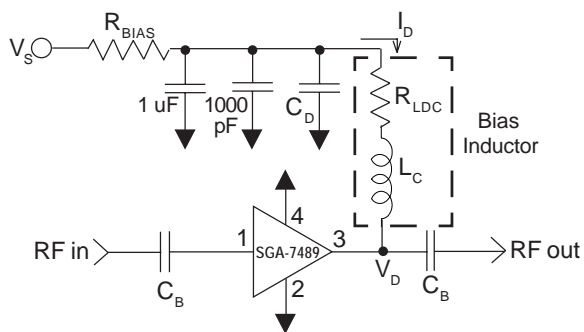
Typical RF Performance Over Temperature (Bias: $V_s = 8.0$ V, Bias Resistance=26 Ohms, $I_b = 115$ mA)



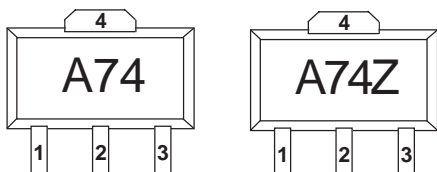
NOTE: Full S-parameter data available at www.sirenza.com



Basic Application Circuit



Part Identification Marking



Caution: ESD sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.

See Application Note AN-075
for Package Outline Drawing

Application Circuit Element Values

| Reference Designator | Frequency (Mhz) | | | | |
|----------------------|-----------------|--------|--------|-------|-------|
| | 100 | 500 | 850 | 1950 | 2400 |
| C _B | 1000 pF | 220 pF | 100 pF | 68 pF | 56 pF |
| C _D | 100 pF | 100 pF | 68 pF | 22 pF | 22 pF |
| L _C | 470 nH | 68 nH | 33 nH | 22 nH | 18 nH |

| Required Bias Resistance for I _D =115mA | | | | |
|---|------|------|------|------|
| Bias Resistance = R _{BIAS} + R _{LDC} = (V _S -V _D) / I _D | | | | |
| Supply Voltage(V _S) | 7 V | 8 V | 9 V | 12 V |
| Bias Resistance | 17 Ω | 26 Ω | 35 Ω | 61 Ω |

Bias resistor improves current stability over temperature.

Mounting Instructions

1. Solder the copper pad on the backside of the device package to the ground plane.
2. Use a large ground pad area with many plated through-holes as shown.
3. We recommend 1 or 2 ounce copper. Measurement for this data sheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.

| Pin # | Function | Description |
|-------|-------------|---|
| 1 | RF IN | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |
| 2, 4 | GND | Connection to ground. For optimum RF performance, use via holes as close to ground leads as possible to reduce lead inductance. |
| 3 | 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. |

Part Number Ordering Information

| Part Number | Reel Size | Devices/Reel |
|------------------|------------|--------------|
| SGA-7489 | 13" | 3000 |
| SGA-7489Z | 13" | 3000 |