



RFMD Green, RoHS Compliant, Pb-Free (Z Part Number)  
Package: SOT-86

### Product Description

The SGA-3586 is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration featuring one-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 two DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation.

### Features

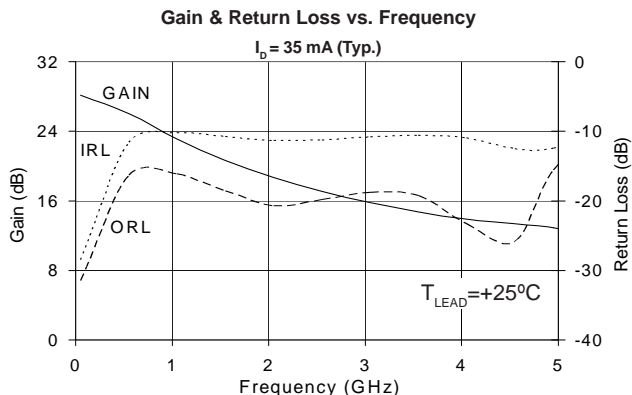
- High Gain: 25dB at 850MHz
- Cascadable 50Ω Gain Block
- High Output IP<sub>3</sub>: 25dBm typ. at 1950MHz
- Low Noise Figure: 2.5dB typ. at 1950MHz
- Low Current Draw: 35mA typ.
- Single Voltage Supply Operation

### Applications

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

#### 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



| Parameter                            | Specification |      |      | Unit | Condition |
|--------------------------------------|---------------|------|------|------|-----------|
|                                      | Min.          | Typ. | Max. |      |           |
| Small Signal Gain                    | 22.5          | 25.0 | 27.5 | dB   | 850MHz    |
|                                      | 18.0          | 20.0 | 22.0 | dB   | 1950MHz   |
|                                      |               | 18.5 |      | dB   | 2400MHz   |
| Output Power at 1dB Compression      |               | 13.0 |      | dBm  | 850MHz    |
|                                      | 11.0          | 12.5 |      | dBm  | 1950MHz   |
| Output Third Intercept Point         |               | 24.5 |      | dBm  | 850MHz    |
|                                      | 23.0          | 25.0 |      | dBm  | 1950MHz   |
| Bandwidth Determined by Return Loss  |               | 5000 |      | MHz  | >10dB     |
| Input Return Loss                    | 9.5           | 11.0 |      | dB   | 1950MHz   |
| Output Return Loss                   | 14.0          | 20.0 |      | dB   | 1950MHz   |
| Noise Figure                         |               | 2.5  | 3.5  | dB   | 1950MHz   |
| Device Operating Voltage             | 3.0           | 3.25 | 3.5  | V    |           |
| Device Operating Current             | 31            | 35   | 39   | mA   |           |
| Thermal Resistance (Junction - Lead) |               | 97   |      | °C/W |           |

Test Conditions:  $I_D = 35\text{mA Typ.}$ ,  $T_{LEAD} = 25^\circ\text{C}$ ,  $Z_S = Z_L = 50\Omega$ ,  $P_{OUT}$  per tone =  $-5\text{dBm}$ ,  $OIP_3$  Tone Spacing =  $1\text{MHz}$

## Absolute Maximum Ratings

| Parameter                      | Rating     | Unit |
|--------------------------------|------------|------|
| Max Device Current ( $I_D$ )   | 70         | mA   |
| Max Device Voltage ( $V_D$ )   | 6          | V    |
| Max RF Input Power             | +18        | dBm  |
| Max Junction Temp ( $T_J$ )    | +150       | °C   |
| Operating Temp Range ( $T_L$ ) | -40 to +85 | °C   |
| Max Storage Temp               | +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.

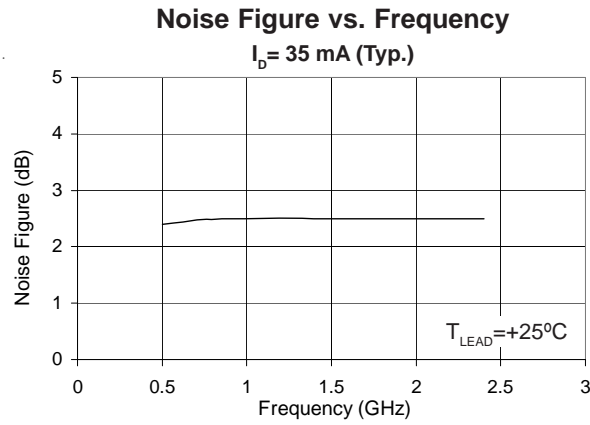
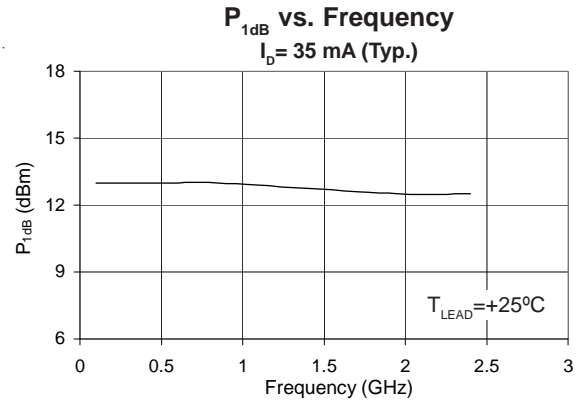
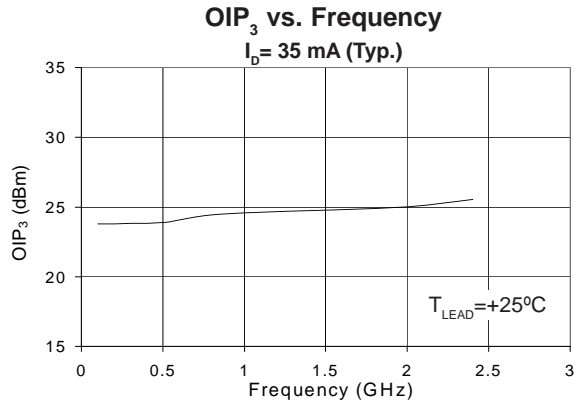
Bias Conditions should also satisfy the following expression:

$$I_D V_D < (T_J - T_L) / R_{TH, j-l}$$

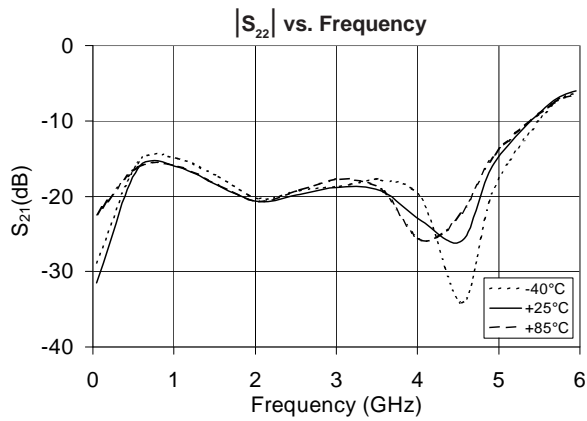
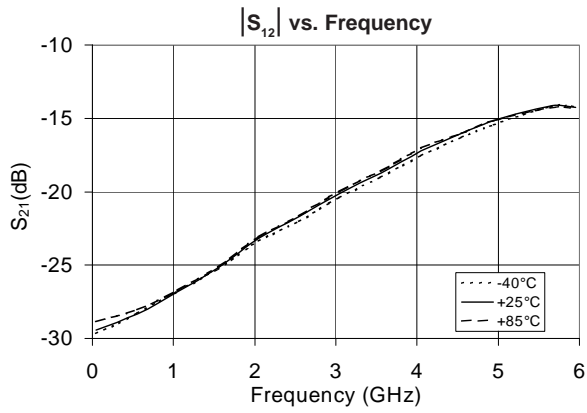
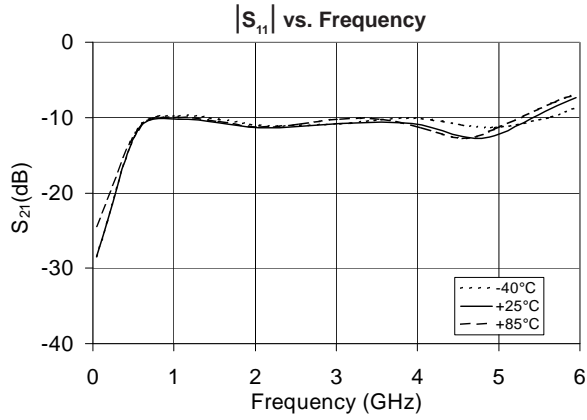
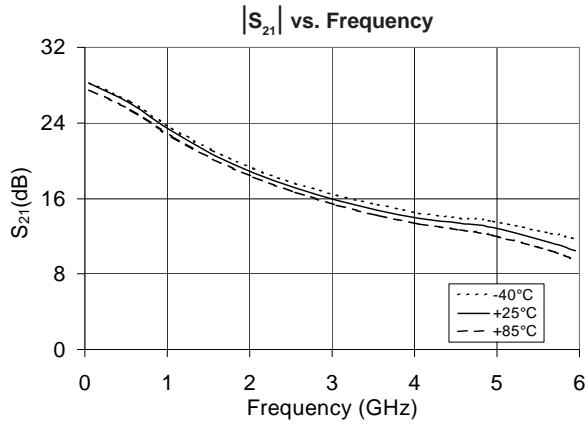
## Typical Performance at Key Operating Frequencies

| Parameter                          | Unit | 100 MHz | 500 MHz | 850 MHz | 1950 MHz | 2400 MHz | 3500 MHz |
|------------------------------------|------|---------|---------|---------|----------|----------|----------|
| Small Signal Gain                  | dB   | 28.2    | 27.1    | 25.0    | 19.7     | 18.3     | 14.8     |
| Output Third Order Intercept Point | dBm  | 23.8    | 23.9    | 24.5    | 25.0     | 25.5     |          |
| Output Power at 1dB Compression    | dBm  | 13.0    | 13.0    | 13.0    | 12.5     | 12.5     |          |
| Input Return Loss                  | dB   | 28.4    | 12.8    | 10.7    | 10.5     | 11.1     | 10.6     |
| Output Return Loss                 | dB   | 31.5    | 17.1    | 15.9    | 20.5     | 20.3     | 18.9     |
| Reverse Isolation                  | dB   | 29.4    | 29.0    | 28.1    | 24.1     | 22.4     | 19.2     |
| Noise Figure                       | dB   |         | 2.4     | 2.5     | 2.5      | 2.5      |          |

Test Conditions:  $I_D = 35$  mA Typ., OIP<sub>3</sub> Tone Spacing = 1 MHz, P<sub>OUT</sub> per tone = -5 dBm, R<sub>BIAS</sub> = 100 Ω, T<sub>L</sub> = 25 °C, Z<sub>S</sub> = Z<sub>L</sub> = 50 Ω

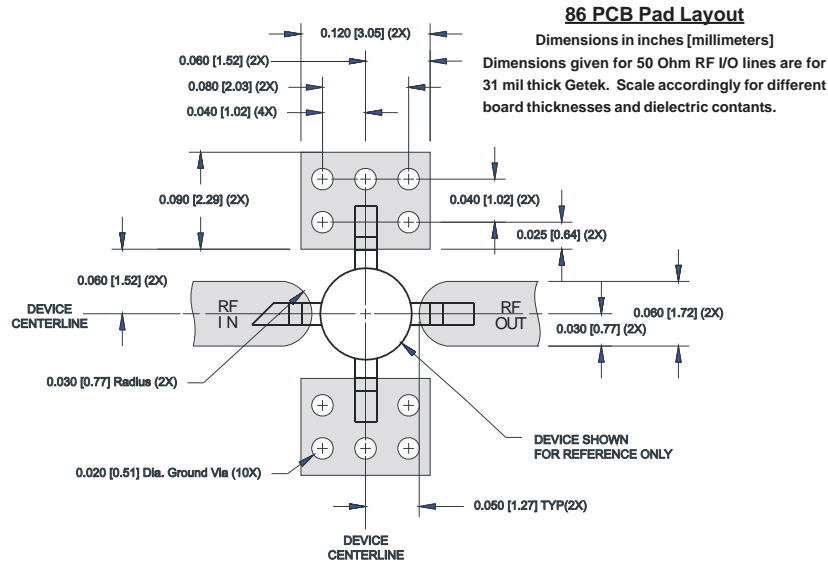


Typical RF Performance Over Lead Temperature -- Bias:  $I_D = 35$  mA (Typ.) at  $T_{LEAD} = +25^\circ\text{C}$



| 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. |

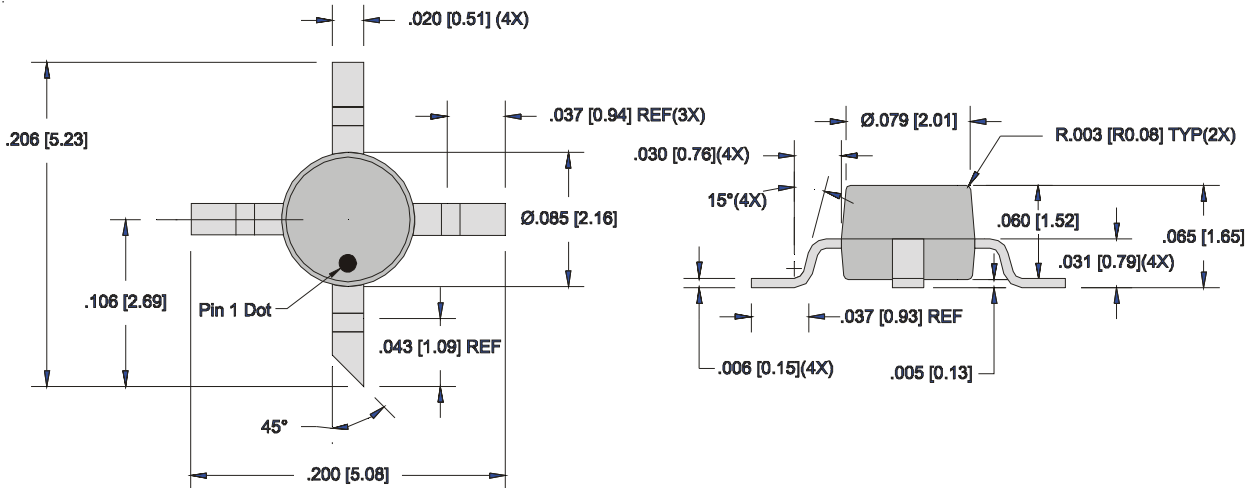
### Suggested Pad Layout



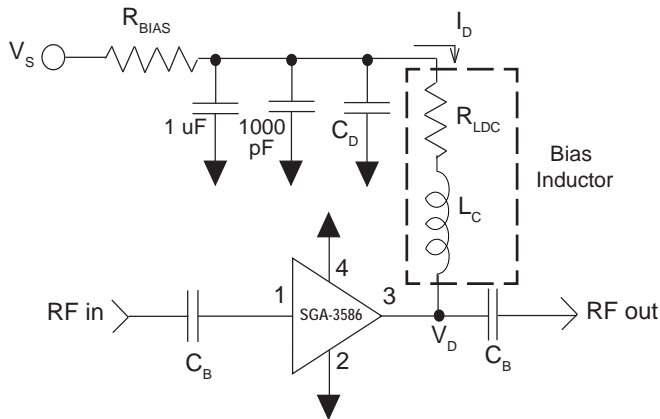
### Package Drawing

Dimensions in inches (millimeters)

Refer to drawing posted at [www.rfmd.com](http://www.rfmd.com) for tolerances.



## Application Schematic



| Application Circuit Element Values |                 |        |        |       |       |       |
|------------------------------------|-----------------|--------|--------|-------|-------|-------|
| Reference Designator               | Frequency (Mhz) |        |        |       |       |       |
|                                    | 100             | 500    | 850    | 1950  | 2400  | 3500  |
| C <sub>B</sub>                     | 1000 pF         | 220 pF | 100 pF | 68 pF | 56 pF | 39 pF |
| C <sub>D</sub>                     | 100 pF          | 100 pF | 68 pF  | 22 pF | 22 pF | 15 pF |
| L <sub>C</sub>                     | 470 nH          | 68 nH  | 33 nH  | 22 nH | 18 nH | 15 nH |

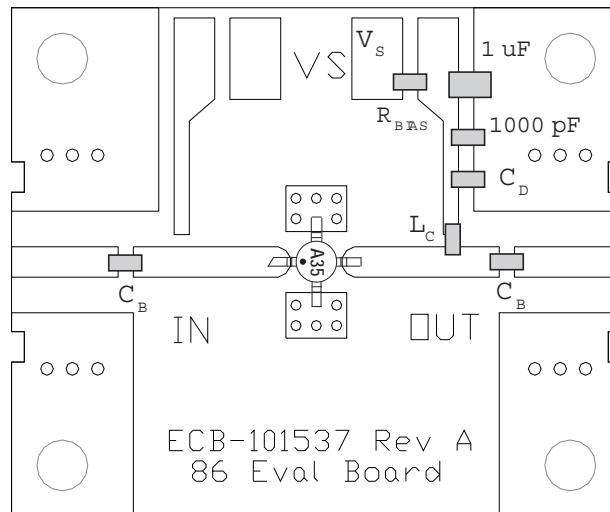
| Recommended Bias Resistance for I <sub>D</sub> = 35 mA |     |    |    |     |     |     |     |
|--|-----|----|----|-----|-----|-----|-----|
| Supply Voltage (V <sub>S</sub> ) (Volts)               | < 5 | 5  | 6  | 7   | 8   | 9   | 10  |
| Bias Resistance* (Ohms)                                | N/R | 50 | 79 | 107 | 136 | 164 | 193 |

\* Bias Resistance =  $R_{BIAS} + R_{LDC} = (V_S - V_D) / I_D$

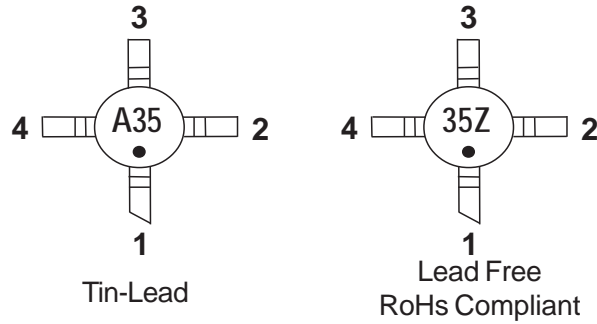
Select R<sub>BIAS</sub> so that R<sub>BIAS</sub> + R<sub>LDC</sub> ~ the recommended bias resistance. Use 1% or 5% tolerance resistors or parallel combinations to attain the recommended bias resistance +/- 3%. R<sub>BIAS</sub> provides current stability over temperature.

\* N/R=Not Recommended. Contact Sirenza technical support for guidance when available supply voltage is less than 5 Volts.

## Evaluation Board Layout



**Part Identification**



**Ordering Information**

| Part Number | Package / Lead Composition | Reel Size | Devices / Reel |
|-------------|----------------------------|-----------|----------------|
| SGA-3586    | Tin-Lead                   | 13"       | 3000           |
| SGA-3586Z   | Lead Free, RoHs Compliant  | 13"       | 3000           |

# SGA-3586(Z)

