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# SGA-2386(Z)

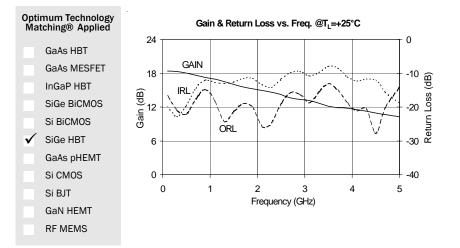
DC to 5000 MHz, CASCADABLE SiGe HBT MMIC AMPLIFIER



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

### **Product Description**

The SGA-2386 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: 15.3 dB at 1950MHz
- Cascadable 50Ω
- Operates from Single Supply
- Low Thermal Resistance Package

### **Applications**

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

Parameter	Specification			Unit	Condition	
Farameter	Min.	Тур.	Max.	Unit	Condition	
Small Signal Gain	15.5	17.2	18.9	dB	850MHz	
		15.3		dB	1950MHz	
		14.5		dB	2400MHz	
Output Power at 1dB Compression		8.5		dBm	850MHz	
		7.5		dBm	1950MHz	
Output Third Intercept Point		20.5		dBm	850MHz	
		19.5		dBm	1950MHz	
Bandwidth Determined by Return Loss (>10dB)		2800		MHz	>10dB	
Input Return Loss		11.5		dB	1950MHz	
Output Return Loss		20.2		dB	1950MHz	
Noise Figure		3.2		dB	1950MHz	
Device Operating Voltage	2.4	2.7	3.0	V		
Device Operating Current	17	20	23	mA		
Thermal Resistance (Junction - Lead)		97		°C/W		

 $\label{eq:conditions: V_S=5V, I_D=20mA Typ., OIP_3 Tone Spacing=1MHz, P_{OUT} per tone=-5 dBm, R_{BIAS}=120\Omega, T_L=25\,^{\circ}\text{C}, Z_S=Z_L=50\Omega$ 

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#### **Absolute Maximum Ratings**

Parameter	Rating	Unit
Max Device Current (I <sub>D</sub> )	40	mA
Max Device Voltage (V <sub>D</sub> )	5	V
Max RF Input Power	+18	dBm
Max Junction Temp (T <sub>J</sub> )	+150	°C
Operating Temp Range (T <sub>L</sub> )	-40 to +85	°C
Max Storage Temp	+150	°C

Operation of this device beyond any one of these limits may cause permanent dam-age. 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



Caution! ESD sensitive device.

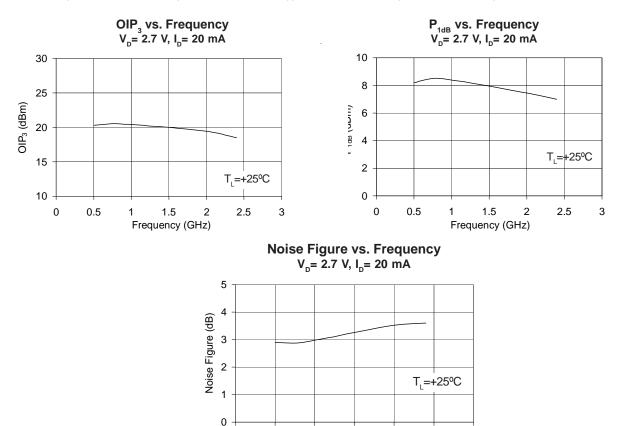
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical perfor-mance or functional operation of the device under Absolute Maximum Rating condi-tions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

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Parameter	Unit	100 MHz	500 MHz	850 MHz	1950MHz	2400 MHz
Small Signal Gain	dB	18.4	18.0	17.2	15.3	14.5
Output Third Order Intercept Point	dBm		20.3	20.5	19.5	18.5
Output Power at 1dB Compression	dBm		8.2	8.8	8.0	7.6
Input Return Loss	dB	20.0	19.6	12.0	11.5	13.7
Output Return Loss	dB	16.8	22.1	14.8	20.2	25.2
Reverse Isolation	dB	21.1	21.1	21.4	21.7	21.3
Noise Figure	dB		2.9	2.9	3.5	3.6

Test Conditions:  $V_S = 5V$ ,  $I_D = 20$  mA Typ., OIP<sub>3</sub> Tone Spacing = 1 MHz,  $P_{OUT}$  per tone = -5 dBm,  $R_{BIAS} = 120\Omega$ ,  $T_L = 25$  °C,  $Z_S = Z_L = 50\Omega$ 



1

1.5

Frequency (GHz)

2

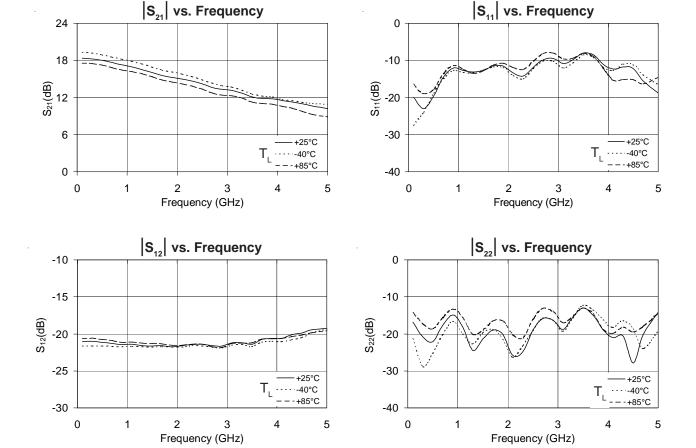
2.5

3

0

0.5

# Typical RF Performance Over Temperature (Bias: $V_D = 2.7 V$ , $I_D = 20 mA (Typ.)$ )



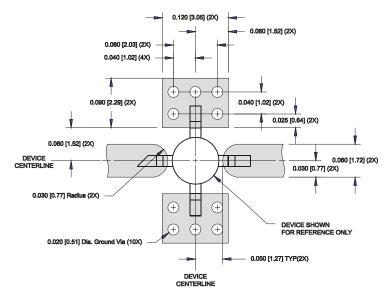


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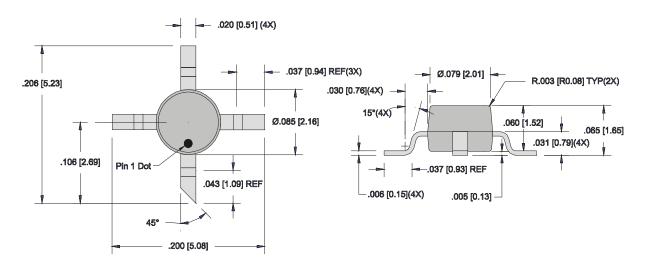
Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.
3	RF OUT/BIAS	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper oper- ation.

## **Suggested Pad Layout**



### **Package Drawing**

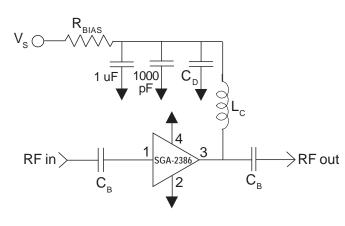
Dimensions in inches (millimeters) Refer to drawing posted at www.rfmd.com for tolerances.







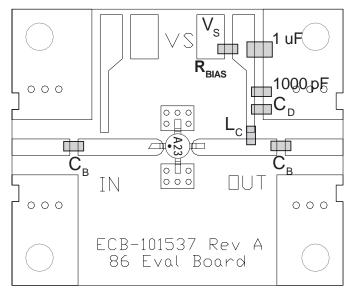
### **Application Schematic**



Reference	Frequency (Mhz)					
Designator	500	850	1950	2400	3500	
C <sub>B</sub>	220 pF	100 pF	68 pF	56 pF	39 pF	
C <sub>D</sub>	100 pF	68 pF	22 pF	22 pF	15 pF	
L <sub>c</sub>	68 nH	33 nH	22 nH	18 nH	15 nH	

Recommended Bias Resistor Values for $I_{D}$ =20mA $R_{BIAS}$ =( $V_{S}$ - $V_{D}$ ) / $I_{D}$					
Supply Voltage(V <sub>S</sub> )	5 V	6 V	8 V	10 V	
R <sub>BIAS</sub> 120 Ω 160 Ω 270Ω 360 Ω					
Note: R <sub>BIAS</sub> provides DC bias stability over temperature.					

### **Evaluation Board Layout**



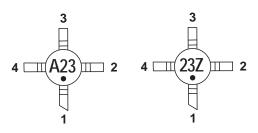
#### **Mounting Instructions**

- 1. Use a large ground pad area under device pins 2 and 4 with many plated through-holes as shown.
- 3. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.





## **Part Identification**



# **Ordering Information**

Part Number	Reel Size	Devices/Reel
SGA-2386	13"	3000
SGA-2386Z	13"	3000