



DC to 4500 MHz, CASCADABLE SiGe HBT MMIC AMPLIFIER

Package: SOT-86

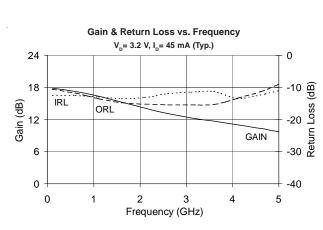




Product Description

The SGA4386Z 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: 14.6dB 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. Typ.		Max.	UIIIL	Condition	
Small Signal Gain	15.0	17.0	18.5	dB	850MHz	
		14.6		dB	1950MHz	
		13.7		dB	2400MHz	
Output Power at 1dB Compression		15.3		dBm	850MHz	
		13.0		dBm	1950MHz	
Output Third Intercept Point		28.9		dBm	850MHz	
		26.9		dBm	1950MHz	
Bandwidth Determined by Return Loss (>9dB)		4500		MHz	>9dB	
Input Return Loss		13.2		dB	1950MHz	
Output Return Loss		15.2		dB	1950MHz	
Noise Figure		3.1		dB	1950MHz	
Device Operating Voltage	2.9	3.2	3.5	V		
Device Operating Current	41	45	49	mA		
Thermal Resistance (Junction - Lead)		97		°C/W		

Test Conditions: $V_S = 8V$, $I_D = 45$ mA Typ., OIP₃ Tone Spacing = 1MHz, P_{OUT} per tone = -5 dBm, $R_{BIAS} = 110 \Omega$, $T_L = 25$ °C, $Z_S = Z_L = 50 \Omega$



Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Current (I _D)	90	mA
Max Device Voltage (V _D)	5	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

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:

 $I_DV_D < (T_J - T_L) / R_{TH}, j - I$



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.

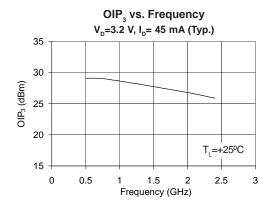
RoHS status based on EU Directive 2002/95/EC (at time of this document revision).

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Typical Performance at Key Operating Frequencies

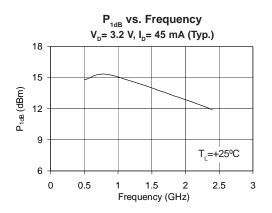
Parameter	Unit	100	500	850	1950	2400	3500
		MHz	MHz	MHz	MHz	MHz	MHz
Small Signal Gain	dB	17.9	17.4	17.0	14.6	13.7	11.8
Output Third Order Intercept Point	dBm		29.1	28.9	26.9	25.9	
Output Power at 1dB Compression	dBm		14.8	15.3	13.0	11.9	
Input Return Loss	dB	12.5	12.5	12.8	13.2	12.4	10.9
Output Return Loss	dB	10.6	11.4	12.9	15.2	15.2	15.0
Reverse Isolation	dB	21.3	21.5	21.6	20.8	19.9	17.3
Noise Figure	dB		2.8	2.9	3.1	3.4	

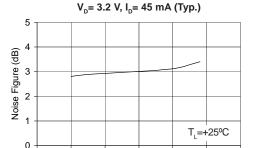
Test Conditions: $V_S = 8V$, $I_D = 45 \text{ mA}$ Typ., OIP_3 Tone Spacing = 1MHz, P_{OUT} per tone = -5dBm, $R_{BIAS} = 110 \Omega$, $T_L = 25 \,^{\circ}\text{C}$, $Z_S = Z_L = 50 \Omega$



0

0.5





Noise Figure vs. Frequency

1.5

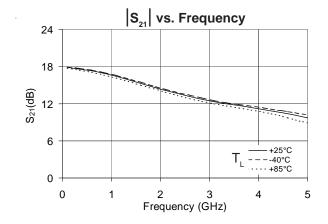
Frequency (GHz)

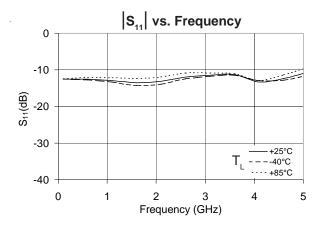
2.5

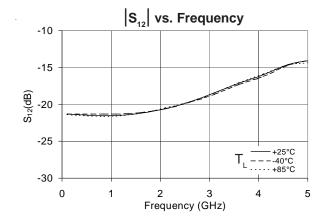
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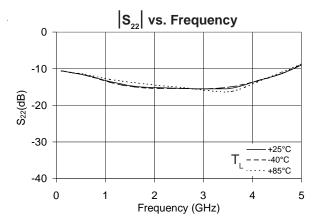


Typical RF Performance Over Temperature (Bias: $V_D = 3.2 \text{ V}, \ I_D = 45 \text{ mA (Typ.)}$)





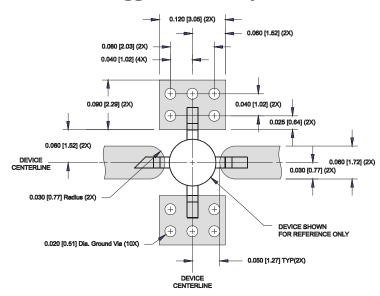






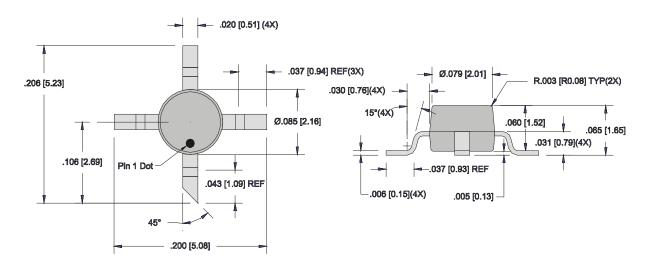
Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC-blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. For optimum RF performance, use via holes as close to ground leads as possible to reduce lead inductance.
3	RF OUT/BIAS	RF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

Suggested Pad Layout



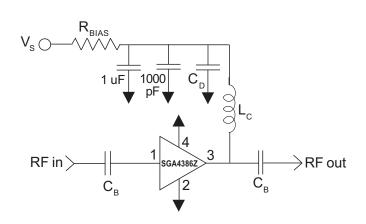
Package Drawing

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





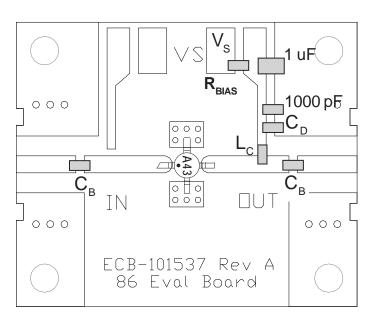
Application Schematic



Po	ference	Frequency (Mhz)						
-	signator	500	850	1950	2400	3500		
	C _B	220 pF	100 pF	68 pF	56 pF	39 pF		
	C _D	100 pF	68 pF	22 pF	22 pF	15 pF		
	L _c	68 nH	33 nH	22 nH	18 nH	15 nH		

Recommended Bias Resistor Values for $I_D=45$ mA $R_{BIAS}=(V_S-V_D)/I_D$				
Supply Voltage(V _s)	6 V	8 V	10 V	12 V
R _{BIAS}	62Ω	110Ω	150Ω	200Ω
Note: R _{BIAS} provides DC bias stability over temperature.				

Evaluation Board Layout

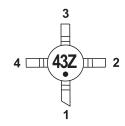


Mounting Instructions

- 1. Use a large ground pad area under device pins 2 and 4 with many plated through-holes as shown.
- 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

Ordering Code	Description
SGA4386Z	13" Reel with 3000 pieces
SGA4386ZSQ	Sample bag with 25 pieces
SGA4386ZSR	7" Reel with 100 pieces
SGA4386ZPCK1	850MHz, 8V Operation PCBA with 5-piece sample bag