



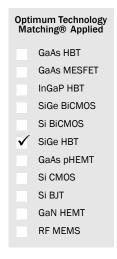
DC to 5000 MHz, CASCADABLE SiGe HBT MMIC AMPLIFIER

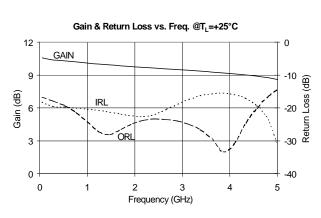
Package: SOT-363



Product Description

The SGA2163Z 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

- Broadband Operation: DC to 5000 MHz
- 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	9.5	10.5	11.5	dB	850MHz	
		9.8		dB	1950MHz	
		9.6		dB	2400 MHz	
Output Power at 1dB Compression		7.1		dBm	850MHz	
		6.2		dBm	1950MHz	
Output Third Intercept Point		21.0		dBm	850MHz	
		18.0		dBm	1950MHz	
Bandwidth Determined by Return Loss		5000		MHz	>10dB	
Input Return Loss		22.5		dB	1950MHz	
Output Return Loss		24.8		dB	1950MHz	
Noise Figure		4.4		dB	1950MHz	
Device Operating Voltage	1.9	2.2	2.5	V		
Device Operating Current	17	20	23	mA		
Thermal Resistance		255		°C/W	junction - lead	

Test Conditions: $V_S = 5V$, $I_D = 20$ mA Typ., OIP_3 Tone Spacing = 1MHz, P_{OLIT} per tone = -10 dBm, $R_{BIAS} = 140\Omega$, $T_L = 25$ °C, $Z_S = Z_L = 50\Omega$



Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Current (I _D)	40	mA
Max Device Voltage (V _D)	4	V
Max RF Input Power	+18	dBm
Max Junction Temperature (T _J)	+150	°C
Operating Temperature Range (T _L)	-40 to +85	°C
Max Storage Temperature	+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: $I_DV_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) / \, R_{TH}, \, j - I_D < (T_J - T_L) /$



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.

The information in this publication is believed to be accurate and reliable. However, no responsibility is assumed by RF Micro Devices, Inc. ("RFMD") for its use, nor for any infringement of patents, or other rights of third parties, resulting from its use. No license is granted by implication or otherwise under any patent or patent rights of RFMD. RFMD reserves the right to change component circuitry, recommended application circuitry and specifications at any time without prior notice.



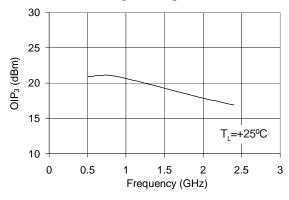
RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Typical Performance at Key Operating Frequencies

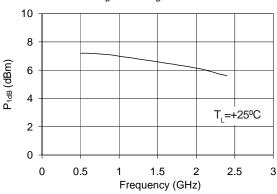
Parameter	Unit	100 MHz	500 MHz	850MHz	1950MHz	2400 MHz	3500 MHz
Small Signal Gain	dB	10.7	10.6	10.5	9.8	9.6	9.3
Output Third Order Intercept Point	dBm		20.9	21.0	18.0	16.9	
Output Power at 1dB Compression	dBm		7.2	7.1	6.2	5.6	
Input Return Loss	dB	18.7	19.8	20.3	22.5	22.1	16.0
Output Return Loss	dB	17.2	19.1	22.3	24.8	23.4	27.6
Reverse Isolation	dB	15.6	15.4	15.5	16.1	16.4	16.9
Noise Figure	dB		4.2	4.1	4.4	4.8	

 $\textbf{Test Conditions: V}_S = \textbf{5V}, \textbf{I}_D = \textbf{20mA Typ., OIP}_3 \textbf{ Tone Spacing} = \textbf{1MHz}, \textbf{P}_{OUT} \textbf{ per tone} = -\textbf{10dBm}, \textbf{R}_{BIAS} = \textbf{140}\Omega, \textbf{T}_L = \textbf{25}^{\circ}\textbf{C}, \textbf{Z}_S = \textbf{Z}_L = \textbf{50}\Omega$

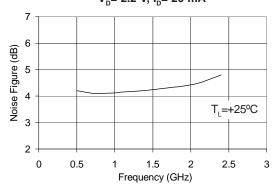
OIP₃ vs. Frequency V_D= 2.2 V, I_D= 20 mA



P_{1dB} vs. Frequency $V_D = 2.2 \text{ V}, I_D = 20 \text{ mA}$

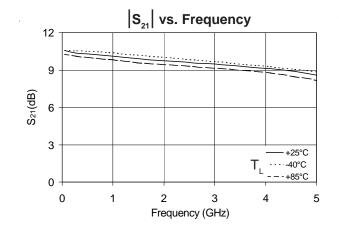


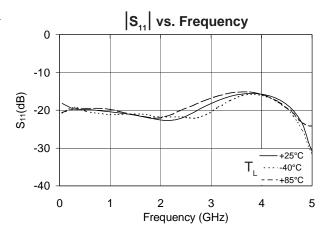
Noise Figure vs. Frequency $V_D = 2.2 \text{ V}, I_D = 20 \text{ mA}$

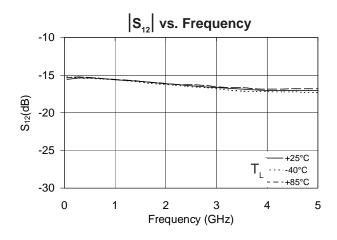


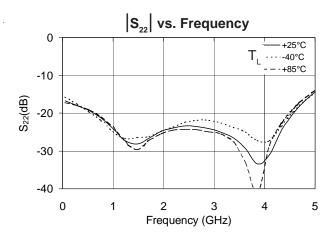


Typical RF Performance Over Temperature (Bias: V_D=2.2V, I_D=20 mA (Typ.))





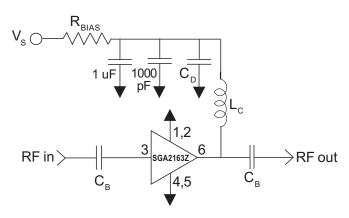


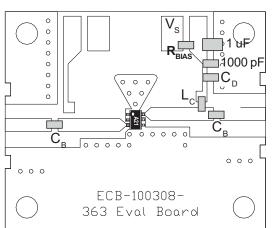


Pin	Function	Description
3	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
1, 2,	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.
4, 5		oie.
6	RF OUT/BIAS	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.



Basic Application Circuit





Application Circuit Element Values

Reference		Fre	equency (N	Mhz)	
Designator	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 =20mA R_{BIAS} =(V_S - V_D) / I_D				
Supply Voltage(V _S)	5 V	6 V	8 V	10 V
R_{BIAS}				
Note: R _{BIAS} provides DC bias stability over temperature.				

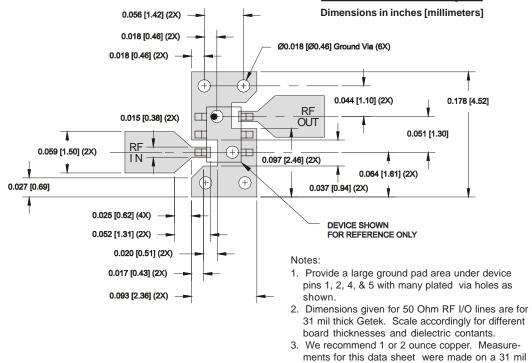
Mounting Instructions

- Use a large ground pad area near device pins 1, 2,
 4, and 5 with many plated through-holes as shown.
- 2. 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.

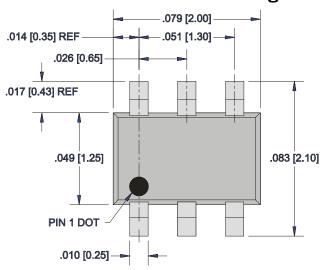


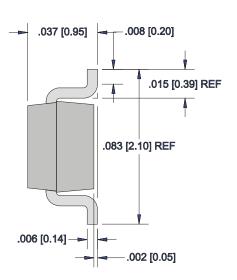
SOT-363 PCB Pad Layout

SOT-363 PCB Pad Layout



Package Dimensions

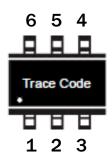




thick Getek with 1 ounce copper on both sides.



Package Drawing.



Ordering Information

Ordering Code	Description
SGA2163Z	7" Reel with 3000 pieces
SGA2163ZSQ	Sample bag with 25 pieces
SGA2163ZSR	7" Reel with 100 pieces
SGA2163ZPCK1	850MHz, 5V Operation PCBA with 5-piece sample bag