Preliminary

SGA-0363

SGA-0363Z

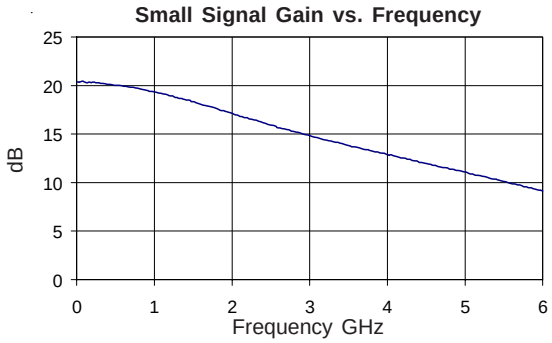
RoHS Compliant & Green Package

DC-5000 MHz, Silicon Germanium Cascadeable Gain Block

Product Description

The SGA-0363 is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration featuring 1 micron emitters provides high F_T and excellent thermal perfomance. 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.



Product Features

- **Now available in Lead Free, RoHS Compliant, & Green Packaging**
- **DC-5000 MHz Operation**
- **Single Voltage Supply**
- **Low Current Draw: 11mA at 2.5V typ.**
- **High Output Intercept: 14 dBm typ. at 1950MHz**

Applications

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

Symbol	Parameter	Frequency	Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	850 MHz 1950 MHz 2400 MHz	dBm dBm dBm		2.3 2.3 1.6	
IP_3	Third Order Intercept Point	850 MHz 1950 MHz 2400 MHz	dBm dBm dBm		14.2 14.0 13.1	
S_{21}	Small Signal Gain	850 MHz 1950 MHz 2400 MHz	dB dB dB		19.6 17.2 16.2	
BW_{3dB}	3dB Bandwidth		MHz		5000	
$VSWR_{IN}$	Input VSWR	DC - 4500MHz	-		1.8:1	
$VSWR_{OUT}$	Output VSWR	DC - 4500MHz	-		1.7:1	
S_{12}	Reverse Isolation	850 MHz 1950 MHz 2400 MHz	dB dB dB		24.0 22.8 22.1	
NF	Noise Figure	1950 MHz	dB		3.0	
V_D	Device Operating Voltage		V		2.5	
I_D	Device Operating Current		mA	9	11	13
R_{TH}, j-l	Thermal Resistance (junction - lead)		ºC/W		255	

Test Conditions: V_S = 5 V, R_{BIAS} = 220 Ohms, I_D = 11 mA Typ., T_L = 25ºC, OIP_3 Tone Spacing = 1 MHz, Pout per tone = -12 dBm, $Z_S = Z_L$ = 50 Ohms

Key parameters, at typical operating frequencies:

Parameter	Typical 25ºC	Unit	Test Condition (I_D = 11mA, unless otherwise noted)
100 MHz			
Gain	20.4	dB	
Output IP3	14.8	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	3.2	dBm	
Input Return Loss	9.3	dB	
Reverse Isolation	23.9	dB	
Noise Figure	2.9	dB	Z_s = 50 Ohms
500 MHz			
Gain	20.0	dB	
Output IP3	14.5	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	2.9	dBm	
Input Return Loss	9.4	dB	
Reverse Isolation	23.9	dB	
Noise Figure	2.8	dB	Z_s = 50 Ohms
850 MHz			
Gain	19.6	dB	
Output IP3	14.2	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	2.3	dBm	
Input Return Loss	9.4	dB	
Reverse Isolation	24.0	dB	
Noise Figure	3.0	dB	Z_s = 50 Ohms
1950 MHz			
Gain	17.2	dB	
Output IP3	14.0	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	2.3	dBm	
Input Return Loss	10.4	dB	
Reverse Isolation	22.8	dB	
Noise Figure	3.0	dB	Z_s = 50 Ohms
2400 MHz			
Gain	16.2	dB	
Output IP3	13.1	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	1.6	dBm	
Input Return Loss	10.8	dB	
Reverse Isolation	22.1	dB	
3500 MHz			
Gain	13.8	dB	
Output IP3	11.5	dBm	Tone spacing = 1 MHz, Pout per tone = -12dBm
Output P1dB	0.8	dBm	
Input Return Loss	11.3	dB	
Reverse Isolation	20.1	dB	

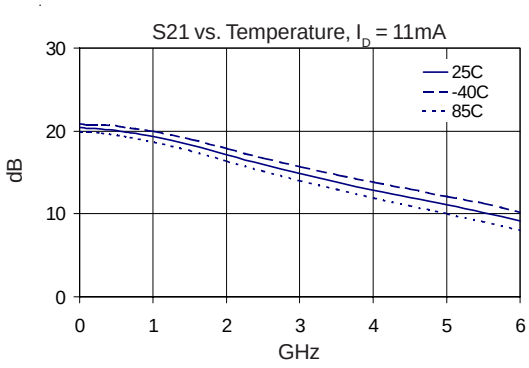
Absolute Maximum Ratings

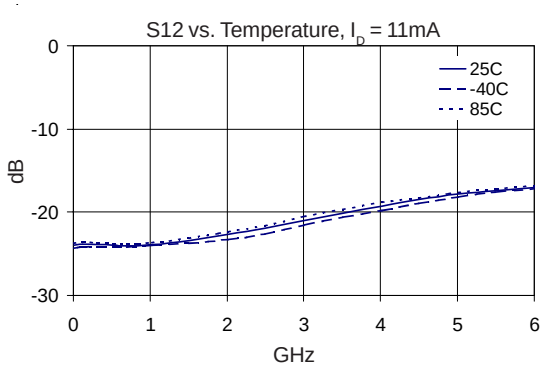
Parameter	Absolute Limit
Max. Device Current (I_D)	22 mA
Max. Device Voltage (V_D)	6 V
Max. RF Input Power	-5 dBm
Max. Junction Temp. (T_J)	+150°C
Operating Temp. Range (T_L)	-40°C to +85°C
Max. Storage Temp.	+150°C

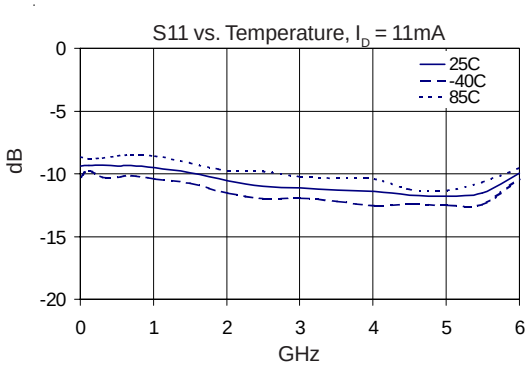
Operation of this device beyond any one of these limits may cause permanent damage. For reliable continous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

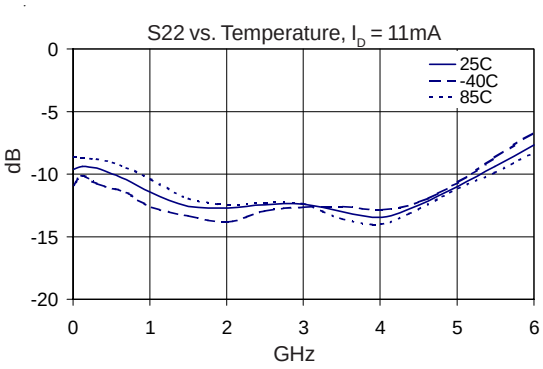
Bias conditions should also satisfy the following expression:

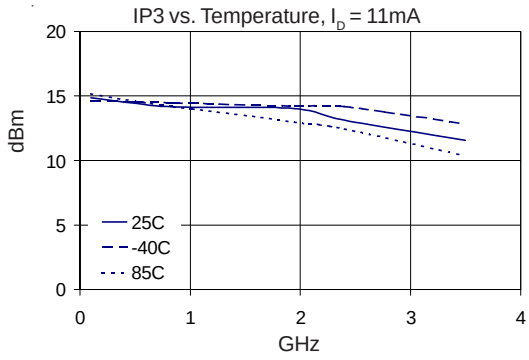
$$I_D V_D < (T_J - T_L) / R_{TH,\ j\text{-}l}$$

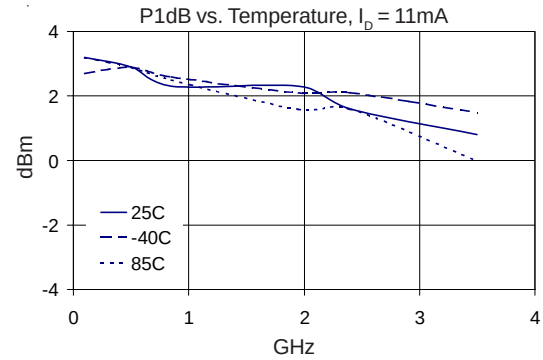

S21 vs. Temperature, I_D = 11mA
dB
GHz
25C
-40C
85C


S12 vs. Temperature, I_D = 11mA
dB
GHz
25C
-40C
85C

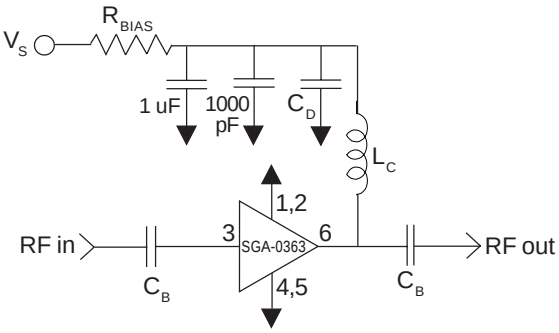

S11 vs. Temperature, I_D = 11mA
dB
GHz
25C
-40C
85C

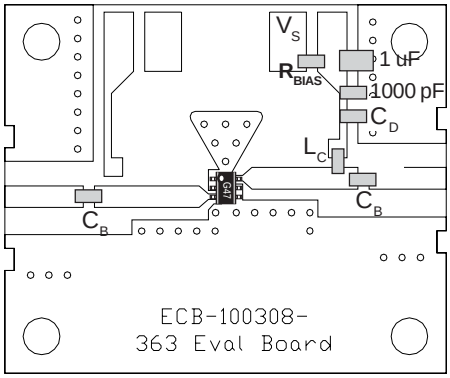

S22 vs. Temperature, I_D = 11mA
dB
GHz
25C
-40C
85C


IP3 vs. Temperature, I_D = 11mA
dBm
GHz
25C
-40C
85C

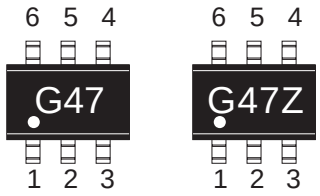

P1dB vs. Temperature, I_D = 11mA
dBm
GHz
25C
-40C
85C

Basic Application Circuit





Part Identification Marking



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

Application Circuit Element Values

Reference Designator	Frequency (Mhz)				
	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=11mA R_{BIAS}=(V_S-V_D) / I_D				
Supply Voltage(V_S)	5 V	7.5 V	9 V	12 V
R_{BIAS}	220 Ω	470 Ω	620 Ω	910 Ω
Note: R_{BIAS} provides DC bias stability over temperature.				

Mounting Instructions

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

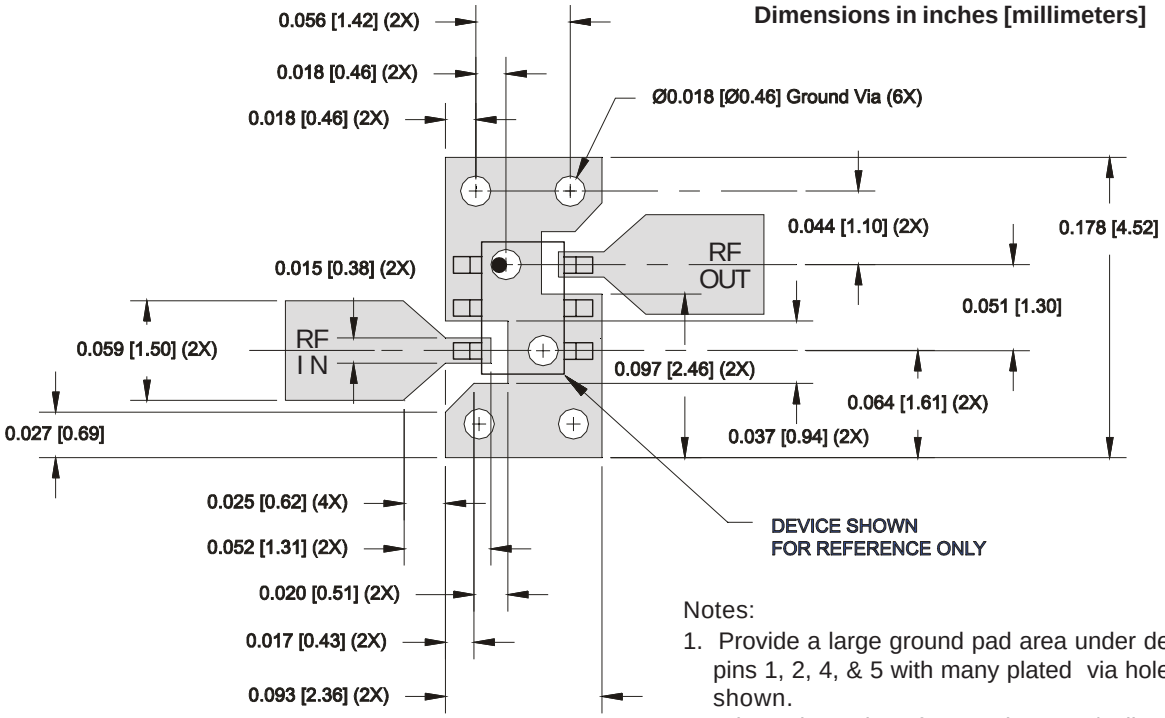
2. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.

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, 4, 5	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.
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.

Part Number	Reel Size	Devices/Reel
SGA-0363	**7"**	**3000**
SGA-0363Z	**7"**	**3000**

SOT-363 PCB Pad Layout

Dimensions in inches [millimeters]



Notes:

1. Provide a large ground pad area under device pins 1, 2, 4, & 5 with many plated via holes as shown.
2. Dimensions given for 50 Ohm RF I/O lines are for 31 mil thick Getek. Scale accordingly for different board thicknesses and dielectric contants.
3. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick Getek with 1 ounce copper on both sides.

SOT-363 Nominal Package Dimensions

Dimensions in inches [millimeters]

A link to the SOT-363 package outline drawing with full dimensions and tolerances may be found on the product web page at www.sirenza.com.