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SGA7489Z

DC to 3000MHz SILICON GERMANIUM HBT CASCADABLE GAIN BLOCK

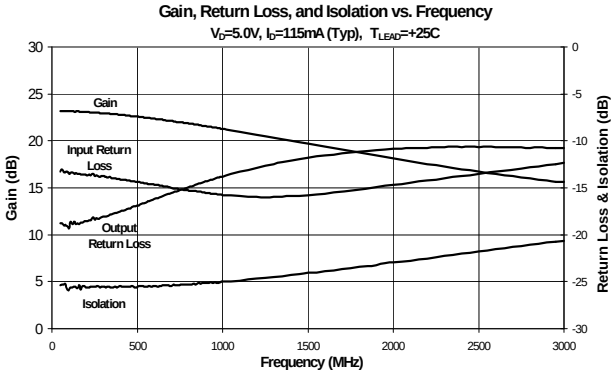
Package: SOT-89

Product Description

The SGA7489Z 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.

Optimum Technology Matching® Applied

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☐ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ✓ SiGe HBT
- ☐ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ InP HBT
- ☐ RF MEMS
- ☐ LDMOS



Features

- DC to 3000MHz Operation
- Very High IF Output IP_3: 39dBm at 100MHz
- High Output IP_3: +35.5dBm typ. at 850MHz
- Low Noise Figure: 3.3dB typ. at 1950MHz

Applications

- Oscillator Amplifiers
- PA for Low/Medium Power Applications
- IF/RF Buffer Amplifier
- Drivers for CATV Amplifiers
- LO Driver Amplifier

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Small Signal Gain	20.0	21.5	23.0	dB	850MHz
	17.0	18.5	20.0	dB	1950MHz
Output Power at 1dB Compression		22.4		dBm	850MHz
	18.5	20.0		dBm	1950MHz
Output Third Intercept Point		39.0		dBm	100MHz
		35.5		dBm	850MHz
	31.0	33.0		dBm	1950MHz
		36.0*		dBm	1950MHz, Using 2GHz App. Ckt.
Bandwidth Determined by Return Loss		3000		MHz	>9dB
Input Return Loss	10.3	15.0		dB	1950MHz
Output Return Loss	9.0	11.0		dB	1950MHz
Noise Figure		3.3	4.3	dB	1950MHz, Z_S=50Ω
Reverse Isolation		23.0		dB	1950MHz
Device Operating Voltage	4.7	5.0	5.3	V	
Device Operating Current	103	115	127	mA	
Thermal Resistance (Junction - Lead)		82		°C/W	

Test Conditions: V_S=8V, I_D=115mA Typ., OIP_3 Tone Spacing=1MHz, P_{OUT} per tone=0dBm, R_{BIAS}=26Ω, T_L=25°C, Z_S=Z_L=50Ω

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Absolute Maximum Ratings

Parameter	Rating	Unit
Max Device Current (I_D)	170	mA
Max Device Voltage (V_D)	7	V
Max RF Input Power, Z_L=50Ω	+16	dBm
Max RF Input Power, Load VSWR=10:1*	+2	dBm
Max Junction Temp (T_J)	+150	°C
Operating Temp Range (T_L)	-40 to +85	°C
Max Storage Temp	+150	°C
Moisture Sensitivity Level	MSL 2	

*Note: Take into account out of band load VSWR presented by devices such as SAW filters to determine maximum RF input power. Reflected harmonic levels in saturation are significant.
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

Caution! ESD sensitive device.

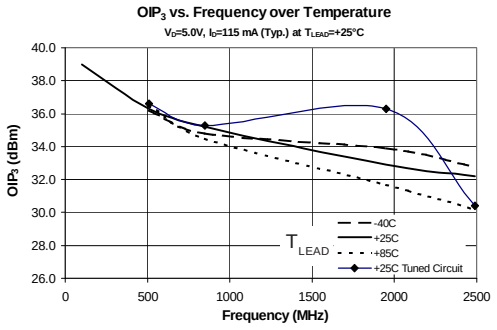
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute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

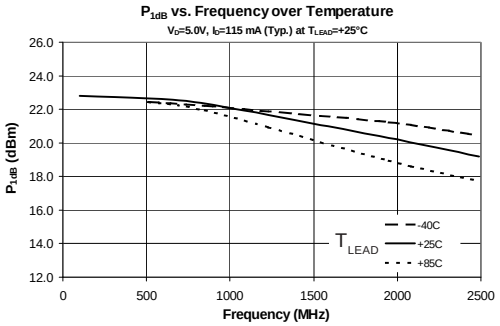
RoHS status based on EUDirective2002/95/EC (at time of this document revision).

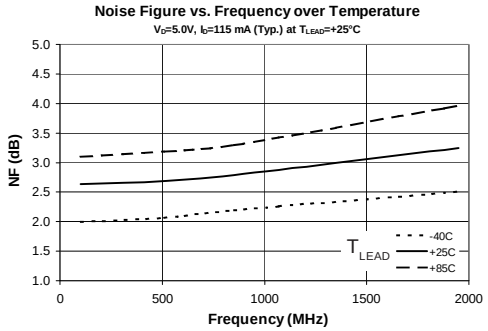
Typical Performance at Key Operating Frequencies

Parameter	Unit	100 MHz	500 MHz	850 MHz	1950 MHz	2400 MHz
Small Signal Gain	dB	23.0	22.5	21.5	18.5	17.0
Output Third Order Intercept Point	dBm	39.0	36.5	35.5	33.0*	32.2
Output Power at 1dB Compression	dBm	22.8	22.6	22.4	20.0	19.0
Input Return Loss	dB	13.5	14.5	15.5	15.0	13.5
Output Return Loss	dB	19.5	17.0	14.5	11.0	10.5
Reverse Isolation	dB	26.0	25.5	25.0	23.0	22.0
Noise figure	dB	2.7	2.7	2.8	3.3	

Test Conditions: V_S=8V, ID=115mA Typ., OIP_3 Tone Spacing=1MHz, P_{OUT} per tone=0dBm, Bias Resistance=26Ω, T_L=25°C, Z_S=Z_L=50Ω
*Note: An OIP_3 of +36dBm at 1950MHz is achieved using the tuned circuit







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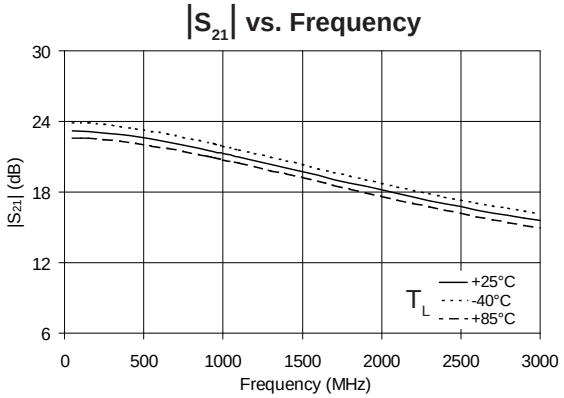
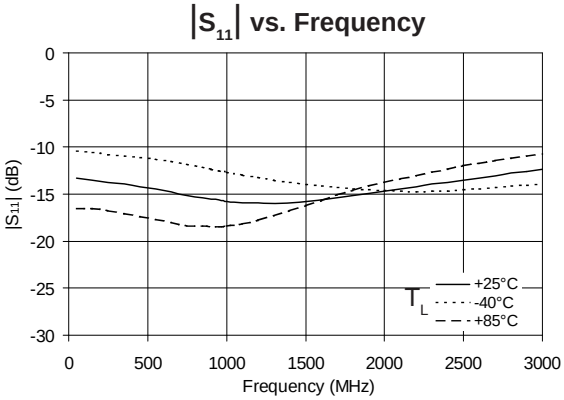
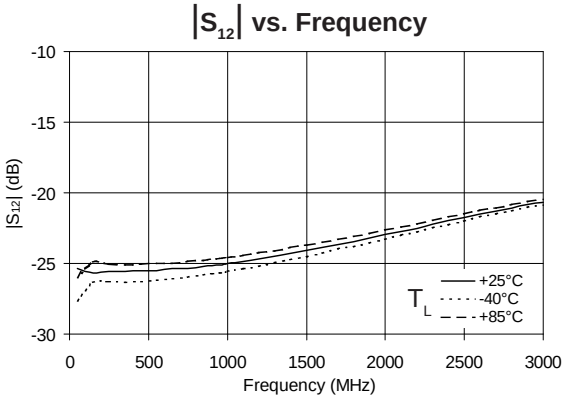
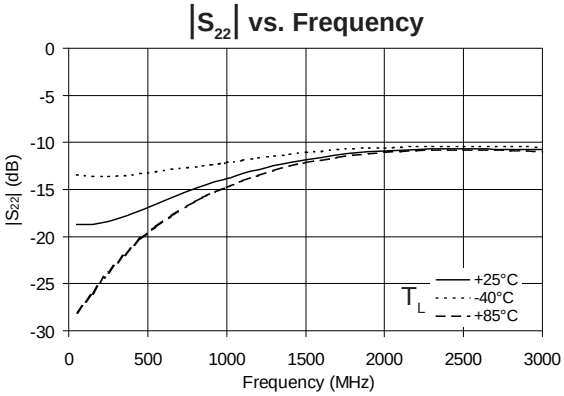
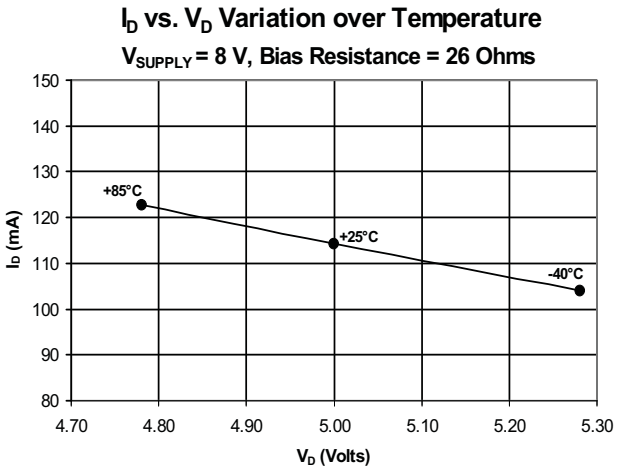
Typical RF Performance Over Temperature (Bias: V_S= 8.0 V, Bias Resistance=26 Ohms, I_D= 115 mA)

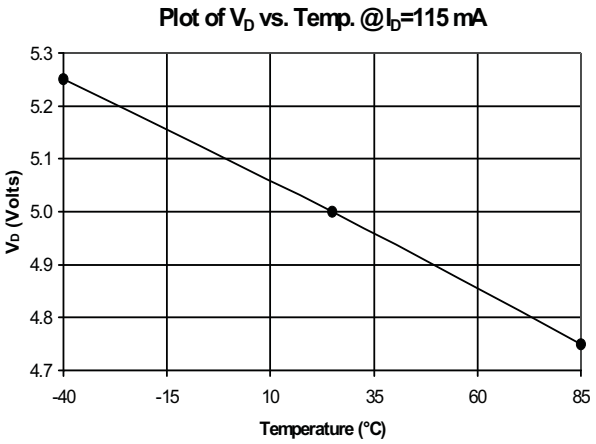






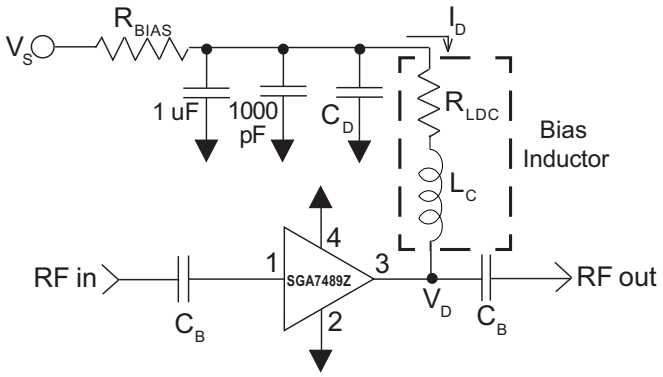






Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.
3	RF OUT/BIAS	RF output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

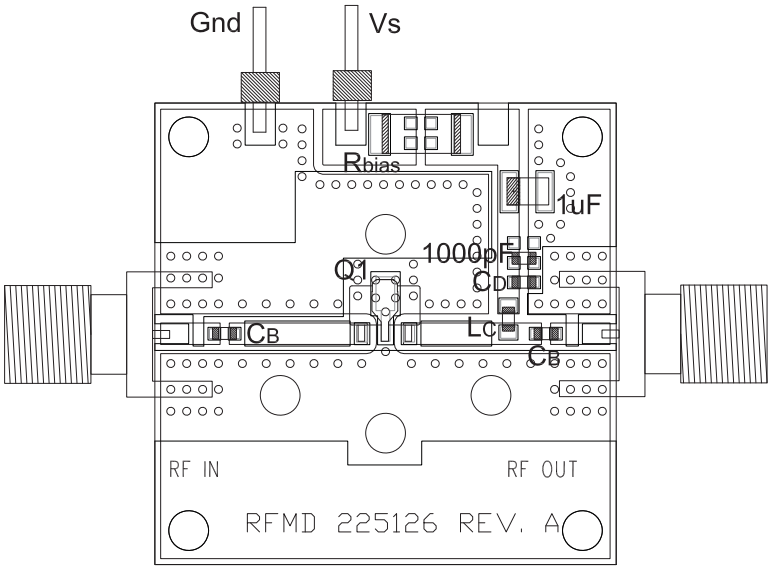
Application Schematic



Reference Designator	Frequency (Mhz)				
	100	500	850	1950	2400
C_B	1000 pF	220 pF	100 pF	68 pF	56 pF
C_D	100 pF	100 pF	68 pF	22 pF	22 pF
L_C	470 nH	68 nH	33 nH	22 nH	18 nH

Required Bias Resistance for I_D=115mA Bias Resistance = R_{BIAS}+ R_{LDC} = (V_S-V_D) / I_D				
Supply Voltage(V_S)	7 V	8 V	9 V	12 V
Bias Resistance	17 Ω	26 Ω	35 Ω	61 Ω
Bias resistor improves current stability over temperature.				

Evaluation Board Layout



Mounting Instructions:

1. Solder the copper pad on the backside of the device package to the ground plane.

2. Use a large ground pad area with many plated through-holes as shown.

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

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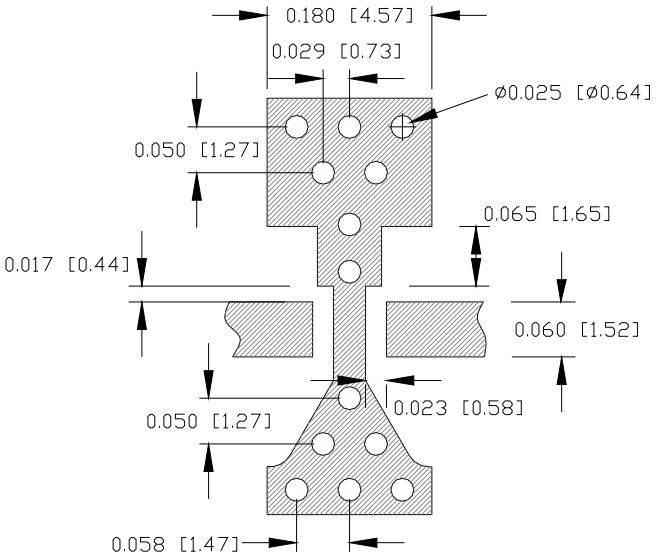
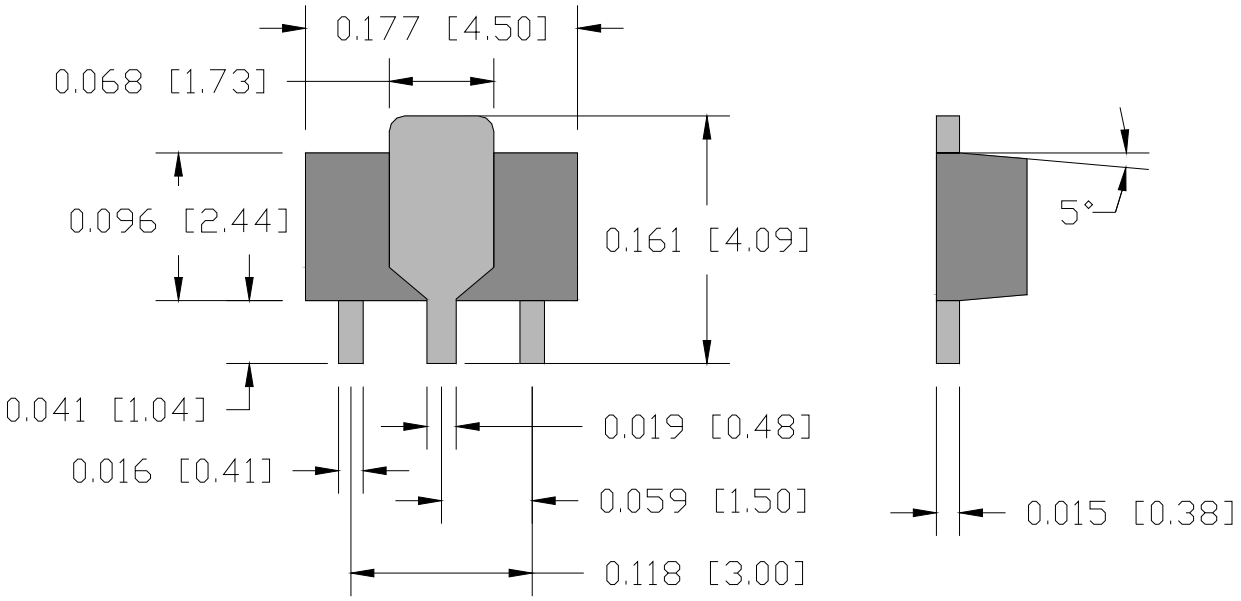
Suggested Pad Layout

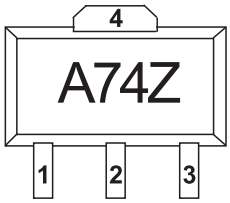


Package Drawing

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



Part Identification



Alternate marking is SGA7489Z on line 1 with Trace Code on line 2.

Ordering Information

Ordering Code	Description
SGA7489Z	13” Reel with 3000 pieces
SGA7489ZSQ	Sample bag with 25 pieces
SGA7489ZSR	7” Reel with 100 pieces
SGA7489ZPCK1	850MHz, 8V Operation PCBA with 5-piece sample bag

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