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SBA5089Z

DC to 5GHz, CASCADABLE InGaP/GaAs HBT MMIC AMPLIFIER

Package: SOT-89

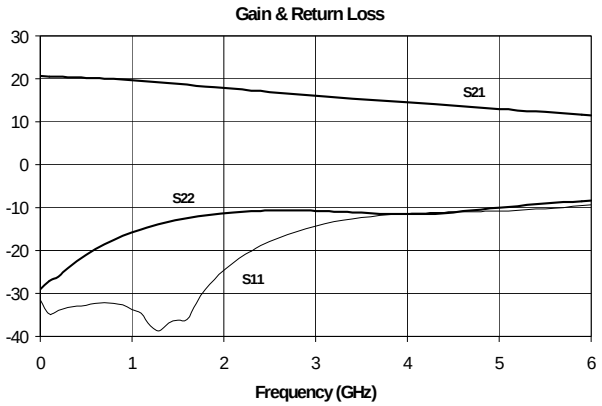
RoHS

Product Description

RFMD's SBA5089Z is a high performance InGaP/GaAs Heterojunction Bipolar Transistor MMIC Amplifier. A Darlington configuration designed with InGaP process technology provides broadband performance up to 5GHz with 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 a single positive supply voltage, 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

- IP3=34.0dBm at 1950MHz
- P_{OUT}=13.0dBm at -45dBc ACP IS-95 1950MHz
- Robust 1000V ESD, Class 1C
- Operates From Single Supply
- Patented Thermal Design

Applications

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

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Small Signal Gain	18.5	20.0	21.5	dB	850MHz
	16.5	18.0	19.5	dB	1950MHz
Output Power at 1dB Compression		19.7		dBm	850MHz
	18.0	19.5		dBm	1950MHz
Output Third Order Intercept Point		36.0		dBm	850MHz
	32.0	34.0		dBm	1950MHz
Output Power		13.0		dBm	1950MHz, -45dBc ACP IS-95 9 Forward Channels
Bandwidth		4400		MHz	Return Loss >10dB
Input Return Loss	14.0	20.0		dB	1950MHz
Output Return Loss	9.0	11.0		dB	1950MHz
Noise Figure		4.5	5.5	dB	1950MHz
Device Operating Voltage	4.7	4.9	5.3	V	
Device Operating Current	72	80	88	mA	
Thermal Resistance (junction to lead)		70		°C/W	

Test Conditions: V_S=8V, I_D=80mA Typ., OIP_3 Tone Spacing=1MHz, P_{OUT} per tone=0dBm, R_{BIAS}=39Ω, T_L=25°C, Z_S=Z_L=50Ω

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Absolute Maximum Ratings

Parameter	Rating	Unit
Device Current (I_D)	130	mA
Device Voltage (V_D)	6	V
RF Input Power	+17	dBm
Junction Temp (T_J)	+150	°C
Operating Temp Range (T_L)	-40 to +85	°C
Storage Temp	+150	°C
Operating Dissipated Power	0.65	W
Moisture Sensitivity Level	MSL 2	

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 and $T_L = T_{LEAD}$

Caution! ESD sensitive device.

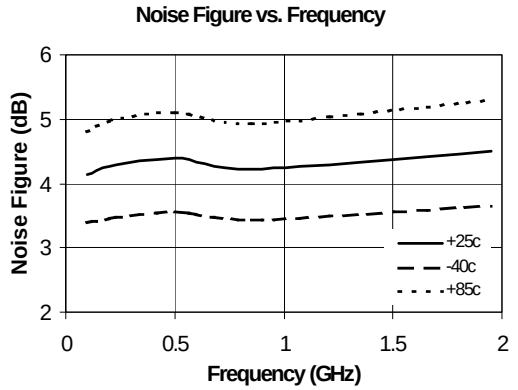
Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute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

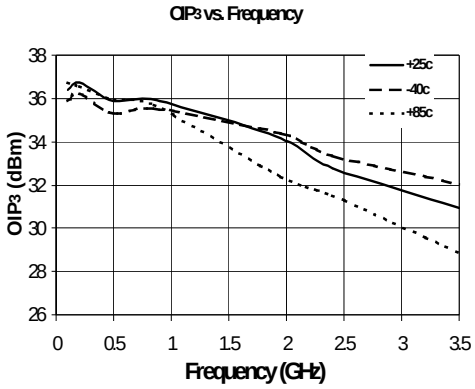
RoHS status based on EUDirective2002/95/EC (at time of this document revision).

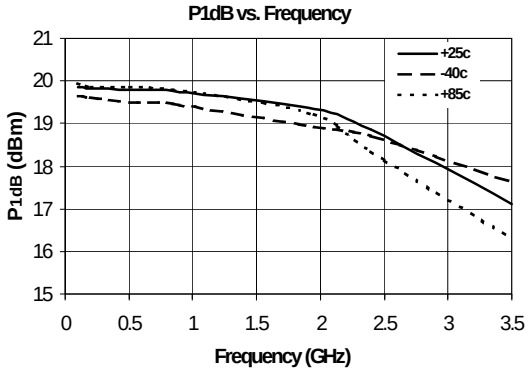
Typical Performance at Key Operating Frequencies

Parameter	Unit	100MHz	500MHz	850MHz	1950MHz	2400MHz	3500MHz
Small Signal Gain	dB	20.5	20.2	19.9	18.0	17.1	15.3
Output Third Order Intercept Point	dBm	36.3	35.8	36.0	34.0	32.7	30.9
Output Power at 1dB Compression	dBm	19.8	19.8	19.7	19.5	18.8	17.1
Input Return Loss	dB	29	27	25	20	17	11.8
Output Return Loss	dB	27	21	17	11	11	11
Reverse Isolation	dB	22	22	23	23	23	23
Noise Figure	dB	4.1	4.3	4.2	4.5	-	-

Test Conditions: $V_S = 8V$, $I_D = 80mA$ Typ., OIP_3 Tone Spacing = 1MHz, P_{OUT} per tone = 0dBm, $R_{BIAS} = 39\Omega$, $T_L = 25°C$, $Z_S = Z_L = 50\Omega$







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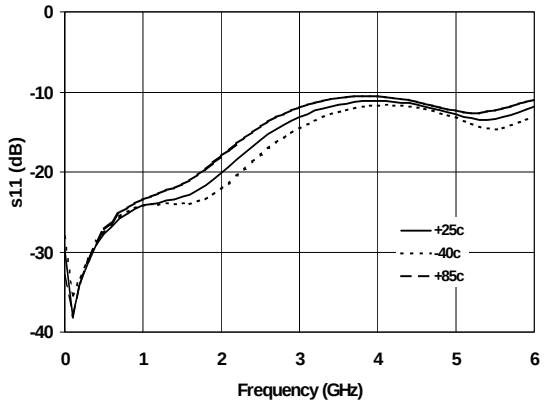
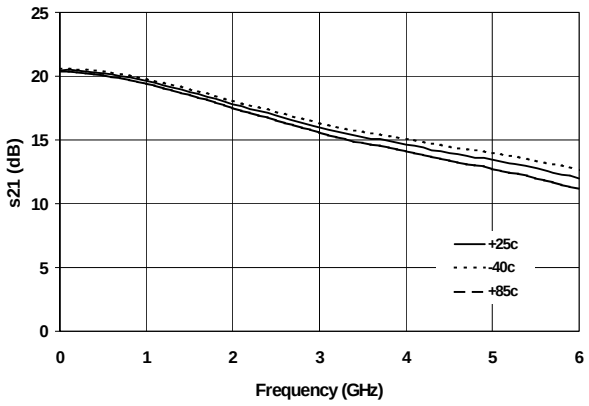
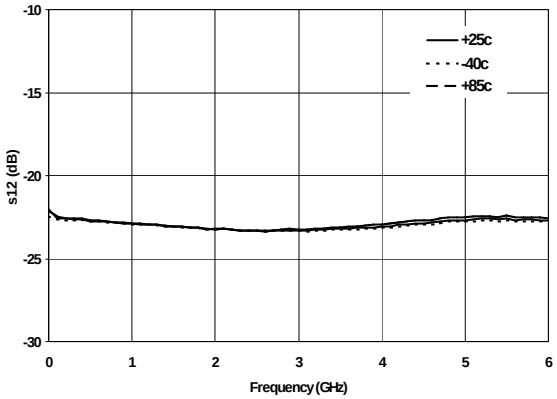
|S11| vs. Frequency



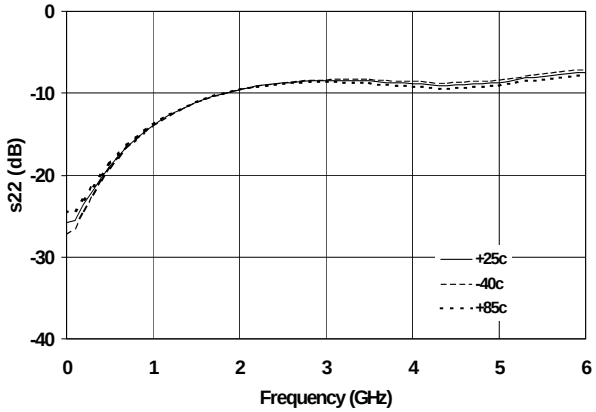
|S21| vs. Frequency



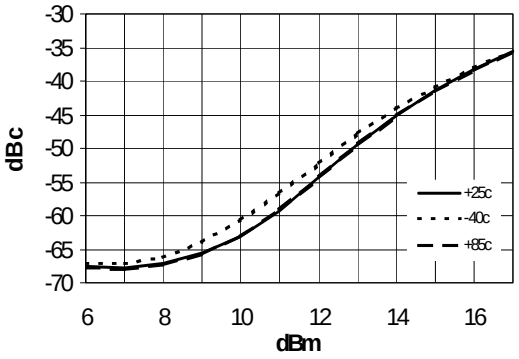
|S12| vs. Frequency



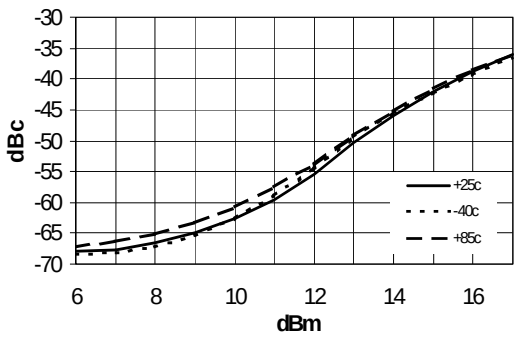
|S22| vs. Frequency



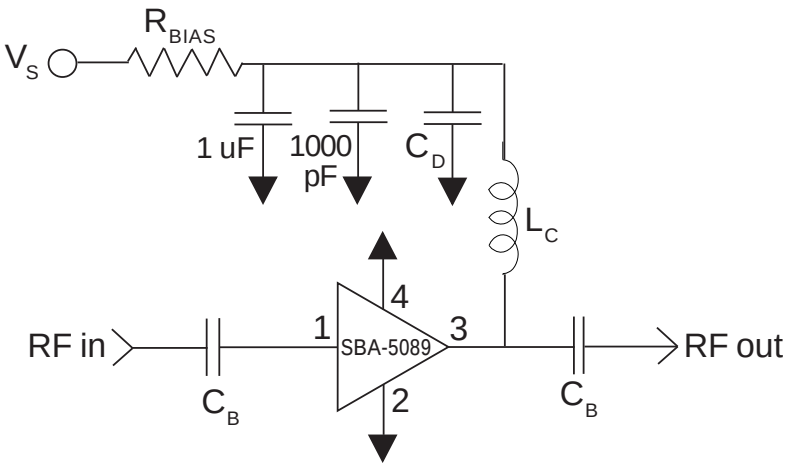
IS-95 @ 850MHz
Adj. Channel Pwr. vs. Channel output Pwr.



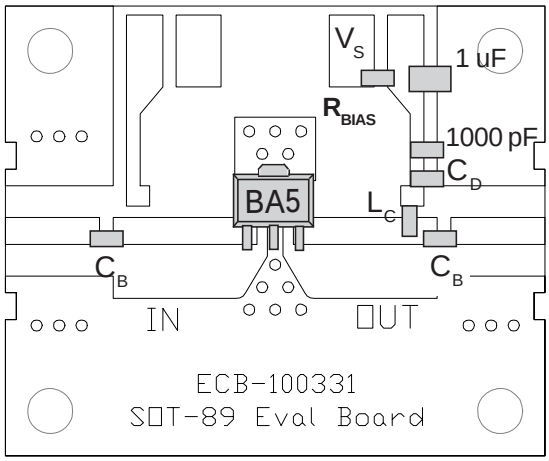
IS-95 @ 1950MHz
Adj. Channel Pwr. vs. Channel Output Power



Basic Application Circuit



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 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 31mil thick FR-4 board with 1 ounce copper on both sides.

Application Circuit Element Values

Reference Designator	500MHz	850MHz	1950MHz	2400MHz	3500MHz
C_B	220pF	100pF	68pF	56pF	39pF
C_D	100pF	68pF	22pF	22pF	15pF
L_C	68nH	33nH	22nH	18nH	15nH

Recommended Bias Resistor Values for I_D=80mA, $R_{BIAS}=(V_S-V_D)/I_D$

Supply Voltage (V_S)	7.5V	8V	10V	12V
R_{BIAS}	33Ω	39Ω	68Ω	91Ω

Note: R_{BIAS} provides DC bias stability over temperature.

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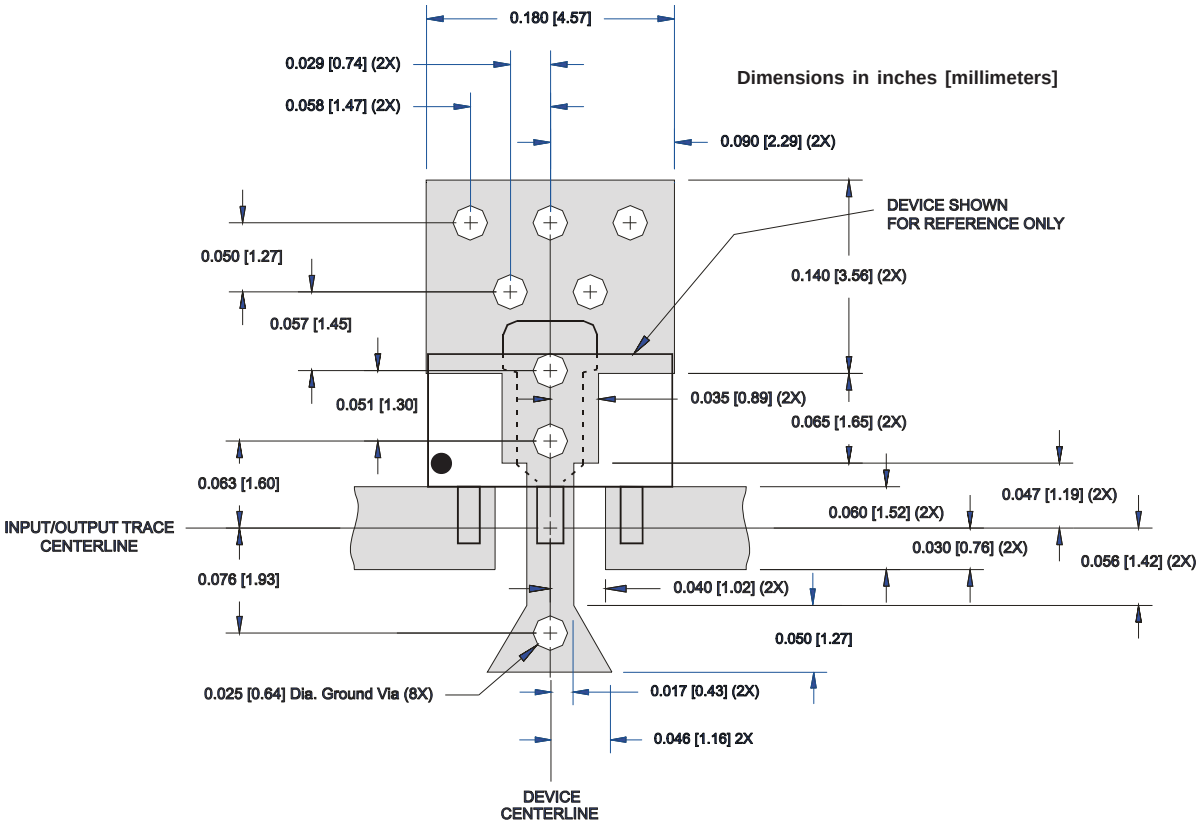
Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC-blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.
3	RF OUT/BIAS	RF output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

PCB Pad Layout



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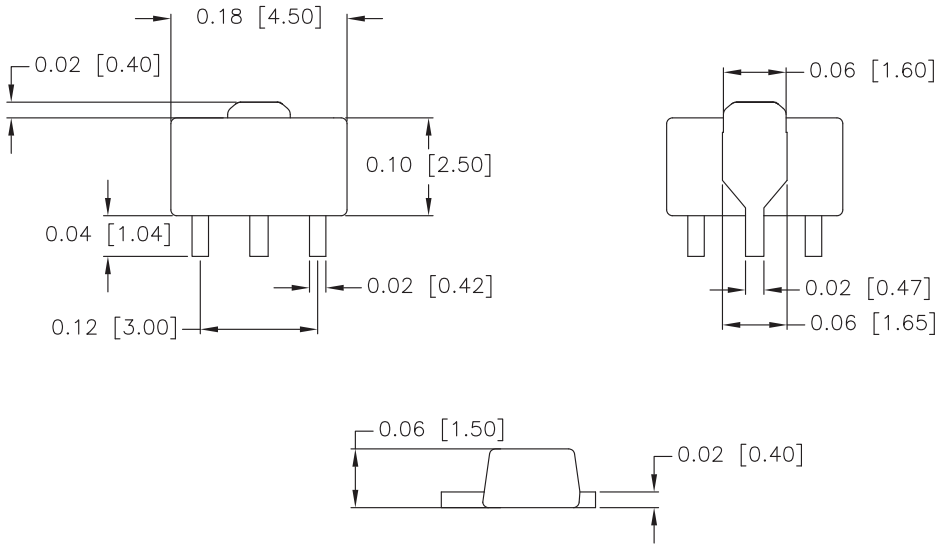
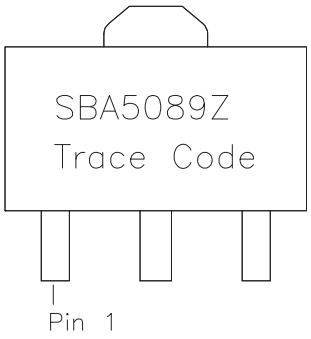
Package Drawing

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



Part Identification



Ordering Information

Part Number	Reel Size	Devices/Reel
SBA-5089	7”	1000
SBA-5089Z	7”	1000

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