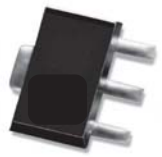
Preliminary

SBB-5089
SBB-5089Z

RoHS Compliant & Green Package

0.05-6 GHz, Cascadable Active Bias InGaP/GaAs HBT MMIC Amplifier

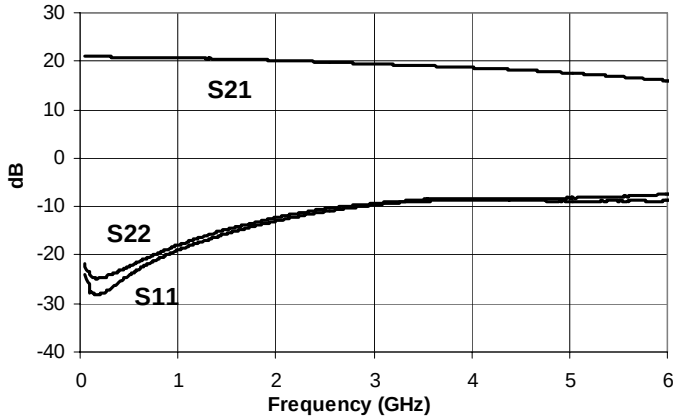


Product Description

Sirenza Microdevices' SBB-5089 is a high performance InGaP HBT MMIC amplifier utilizing a Darlington configuration with an active bias network. The active bias network provides stable current over temperature and process Beta variations. Designed to run directly from a 5V supply, the SBB-5089 does not require a dropping resistor as compared to typical Darlington amplifiers. The SBB-5089 product is designed for high linearity 5V gain block applications that require small size and minimal external components. It is internally matched to 50 ohms.

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.

Gain & Return Loss vs. Frequency (w/ BiasTees)



Product Features

- **Available in Lead free, RoHS compliant, & Green packaging**
- **Wideband Flat Gain to 4GHz: +/-1.1dB**
- **P1dB = 20.4 dBm @ 1950MHz**
- **Single Fixed 5V Supply**
- **Robust 1000V ESD, Class 1C**
- **Patented Thermal Design & Patent Pending Bias Circuit**
- **Low Thermal Resistance**
- **MSL 1 moisture rating**

Applications

- **PA Driver Amplifier**
- **Cellular, PCS, GSM, UMTS**
- **Wideband Intrumentation**
- **Wireless Data, Satellite Terminals**

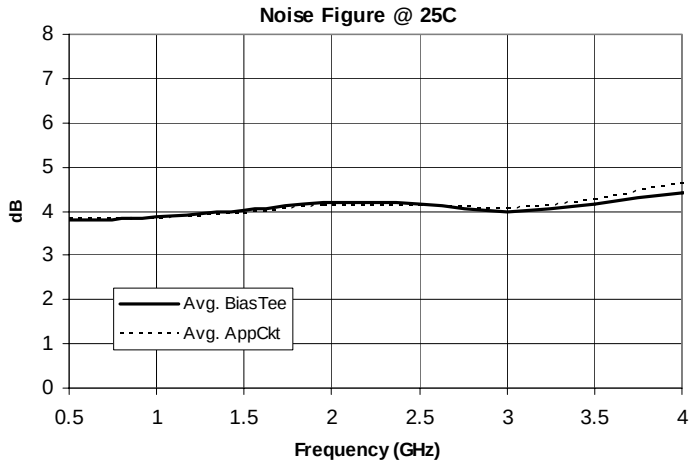
Symbol	Parameters	Units	Frequency	Min.	Typ.	Max.
S_{21}	Small Signal Gain	dB	850 MHz 1950 MHz 6000 MHz	18.7	20.7 20.2 16	21.7
P_{1dB}	Output Power at 1 dB Compression	dBm	850 MHz 1950 MHz	18.9	20.5 20.4	
IP_3	Third Order Intercept Point	dBm	850 MHz 1950 MHz	32.8	38.6 34.8	
Bandwidth	S_{11}, S_{22}: Minimum 10dB Return Loss (typ.)	MHz			3000	
S_{11}	Input Return Loss	dB	1950 MHz		12.8	
S_{22}	Output Return Loss	dB	1950 MHz		12.3	
S_{12}	Reverse Isolation	dB	1950 MHz		23.3	
NF	Noise Figure	dB	1950 MHz		4.2	5.2
V_D	Device Operating Voltage	V			5	5.25
I_D	Device Operating Current	mA		72	80	88
R_{TH}, j-l	Thermal Resistance (junction - lead)	°C/W			97	

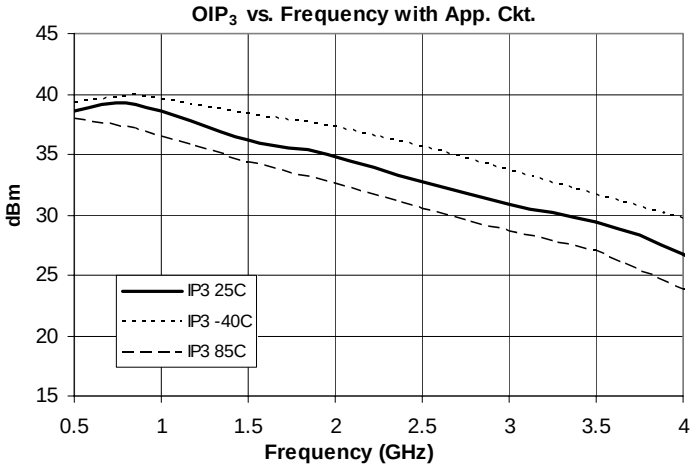
Test Conditions: V_D = 5V, I_D = 80mA Typ., OIP_3 Tone Spacing = 1MHz, Pout per tone = 0 dBm
T_L = 25°C, $Z_S = Z_L$ = 50 Ohms, Tested with Bias Tees

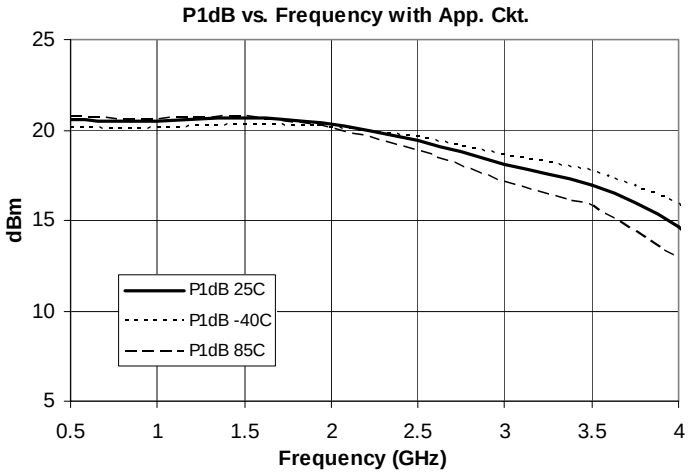
Typical RF Performance at Key Operating Frequencies (With .5-3.5 GHz Application Circuit)

Symbol	Parameter	Unit	Frequency (MHz) 500	850	1950	2500	3500	4000
S_{21}	Small Signal Gain	dB	20.8	20.8	20.1	19.8	18.7	17.8
OIP_3	Output Third Order Intercept Point	dBm	38.6	39.2	34.9	32.8	29.4	26.8
P_{1dB}	Output Power at 1dB Compression	dBm	20.5	20.4	20.4	19.4	16.9	14.7
S_{11}	Input Return Loss	dB	27.2	22.7	14.6	12.9	10.6	11.6
S_{22}	Output Return Loss	dB	31.8	21.5	13.5	12.0	13.5	27.5
S_{12}	Reverse Isolation	dB	22.7	22.8	23.4	23.7	24.7	25.7
NF	Noise Figure	dB	3.8	3.8	4.1	4.1	4.3	4.6

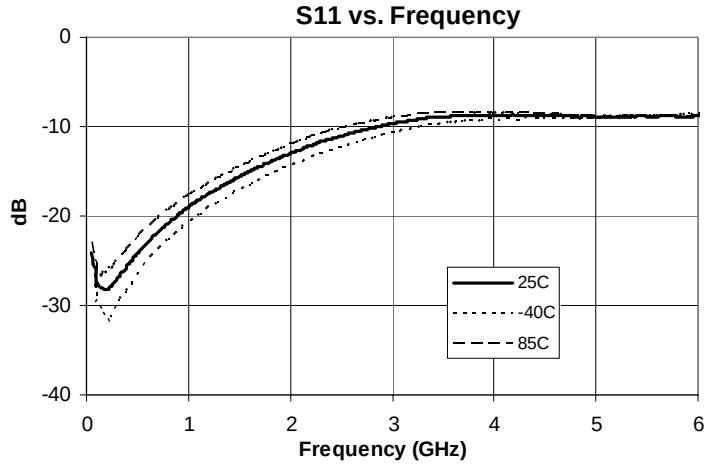
Test Conditions: VCC = 5V I_D = 80mA Typ. OIP_3 Tone Spacing = 1MHz, Pout per tone = 0 dBm
T_L = 25°C $Z_S = Z_L$ = 50 Ohms

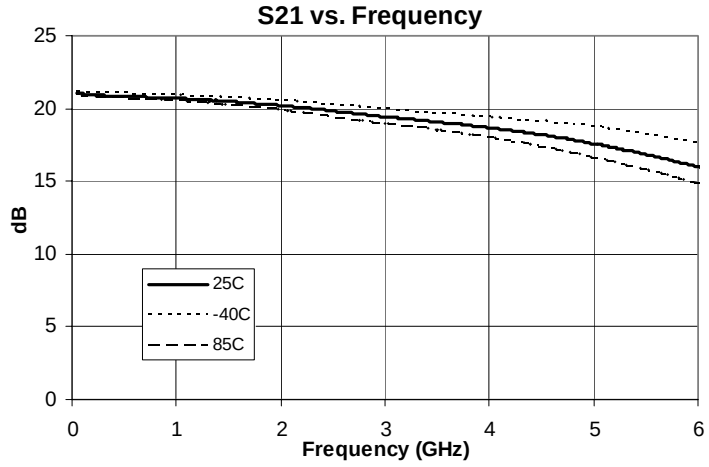


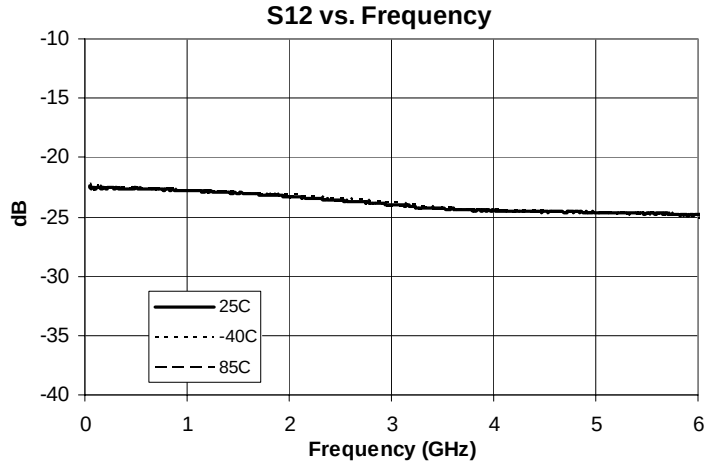


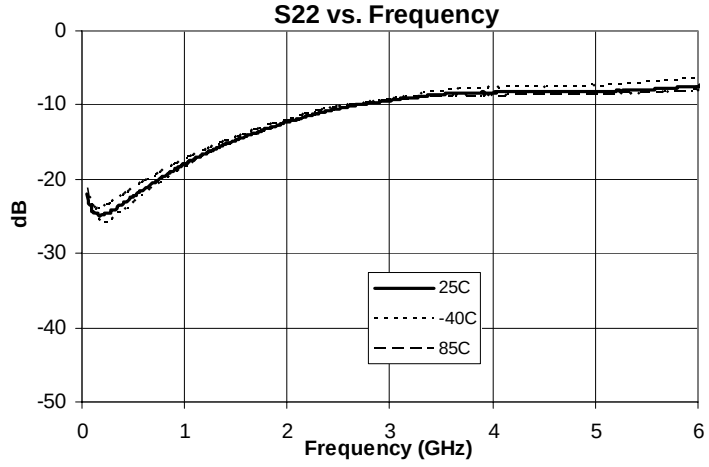


S-Parameters taken with Bias Tees over Temperature

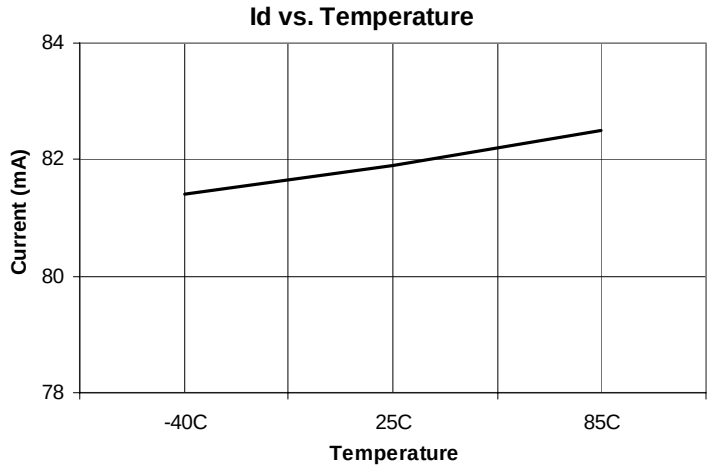


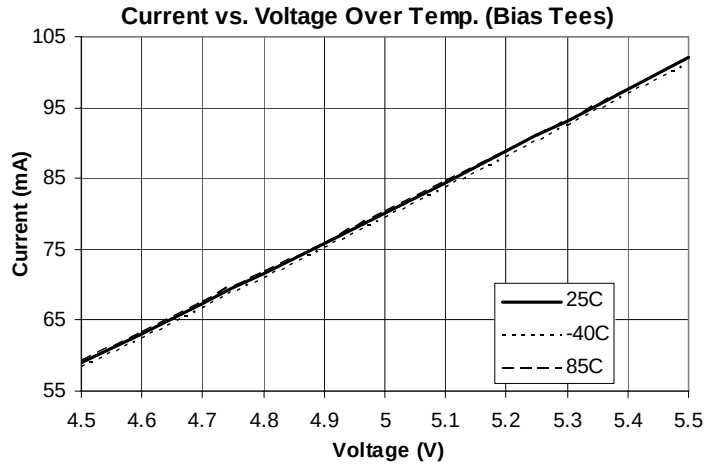




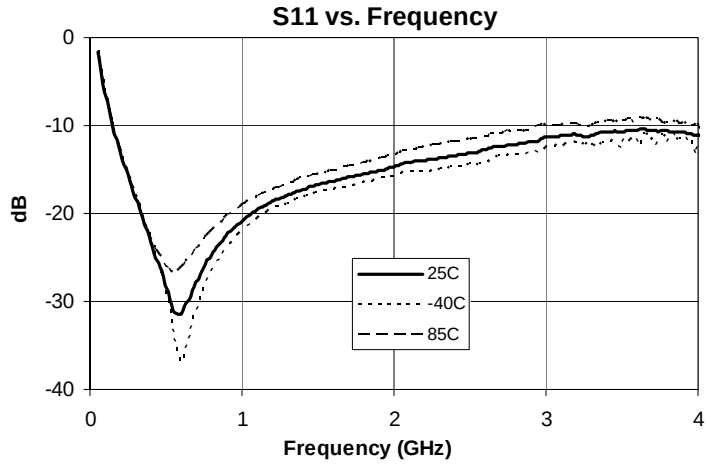


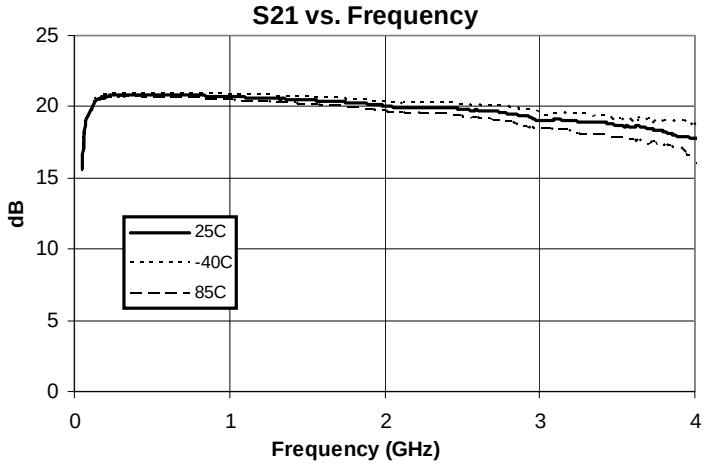
Device Current over Temperature (w/Bias Tees)

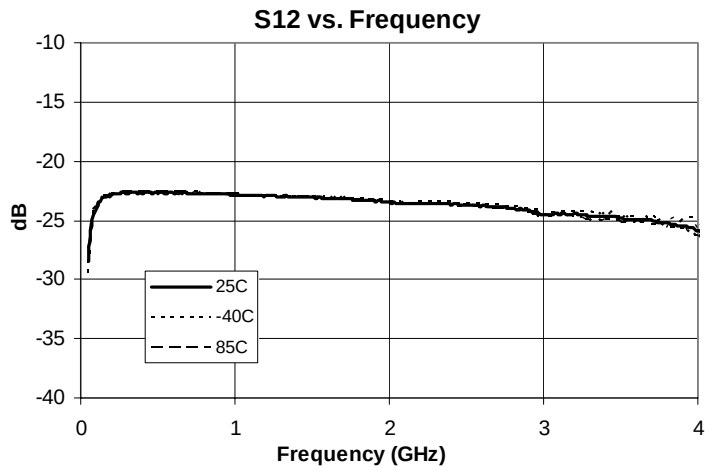


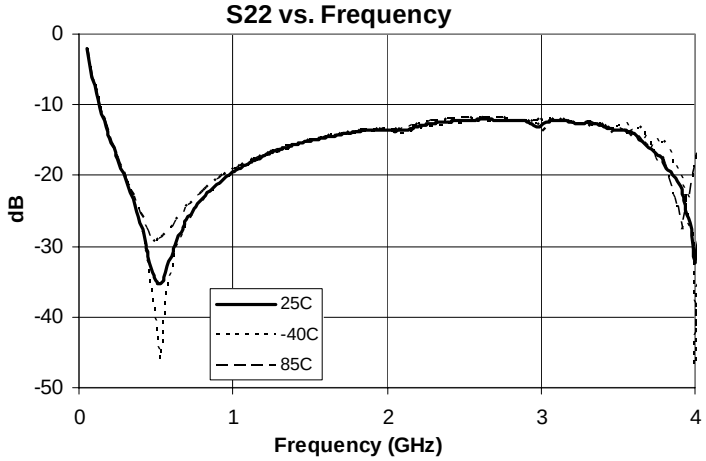


0.5 to 3.5GHz Application Circuit S-Parameters over Temperature

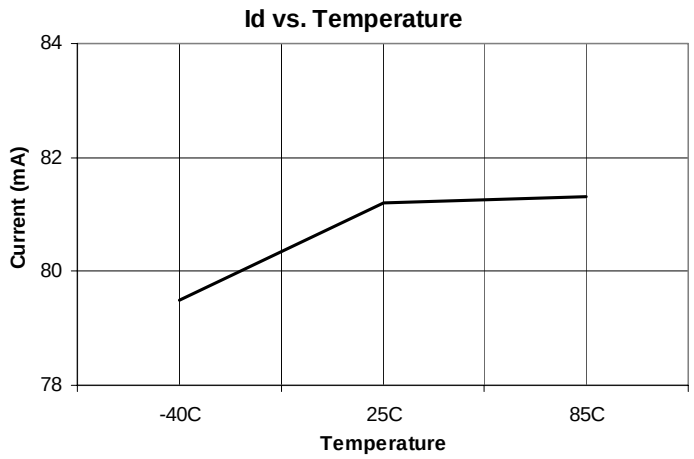


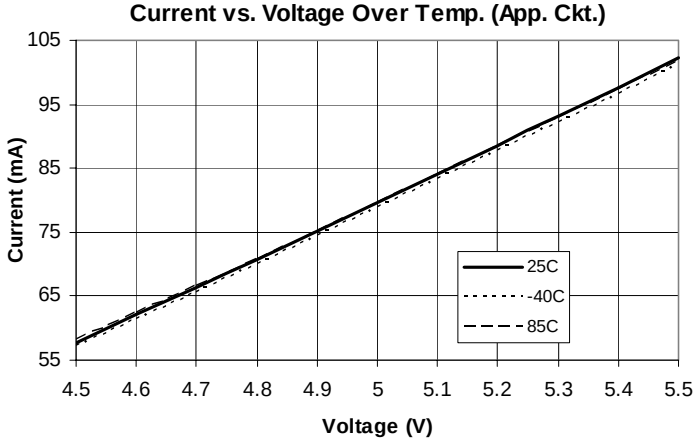




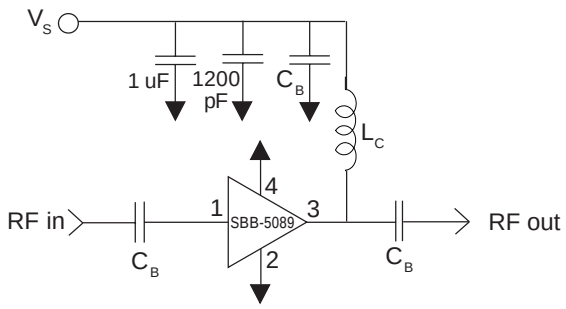


Device Current over Temperature (w/App. Ckt.)





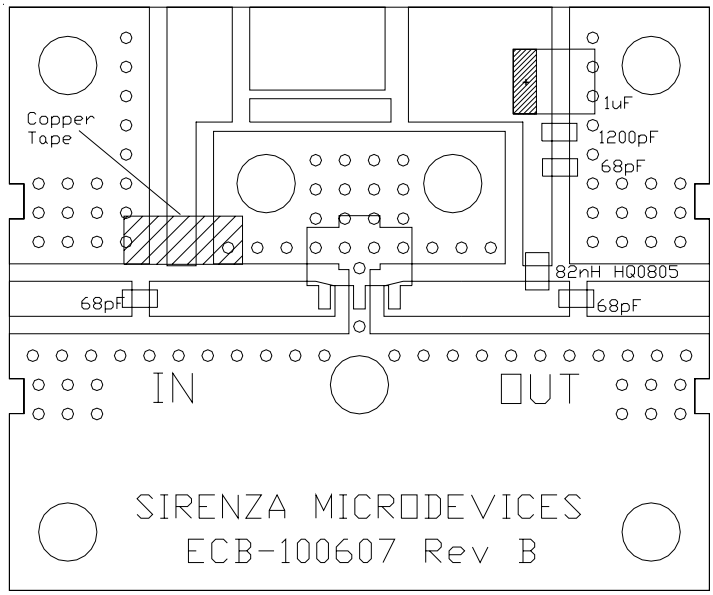
Application Schematic



Application Circuit Element Values

Reference Designator	Frequency (MHz) 500 to 3500
C_B	68pF
L_C	82nH HQ

Evaluation Board Layout



Absolute Maximum Ratings

Parameter	Absolute Limit
Ma. Dvice Current (I_D)	100 mA
Max Device Voltage (V_D)	5.5 V
Max. RF Input Power	+12 dBm
Max. Operating Dissipated Power	0.55 W
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 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:
$I_D V_D < (T_J - T_L) / R_{TH, j-l}$ $T_L = T_{LEAD}$

ESD Class 1C
Appropriate precautions in handling, packaging and testing devices must be observed.

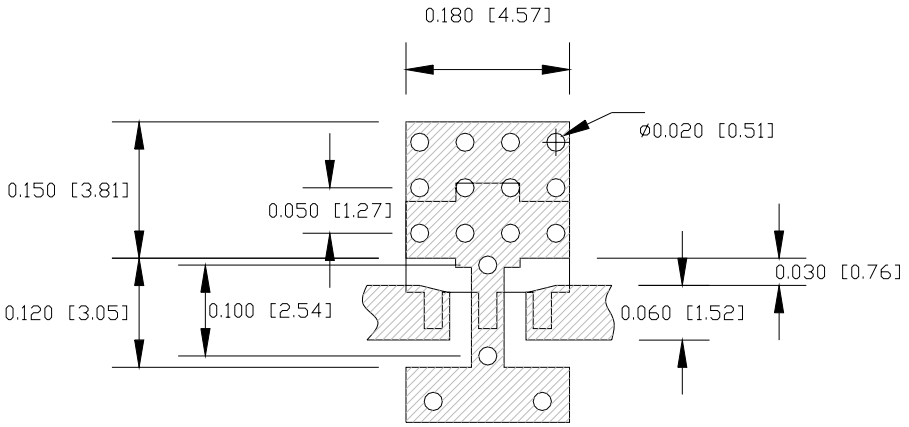
Mounting Instructions

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. Measurement for this datasheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.

MSL (Moisture Sensitivity Level) **Rating: Level 1**

Suggested PCB Pad Layout

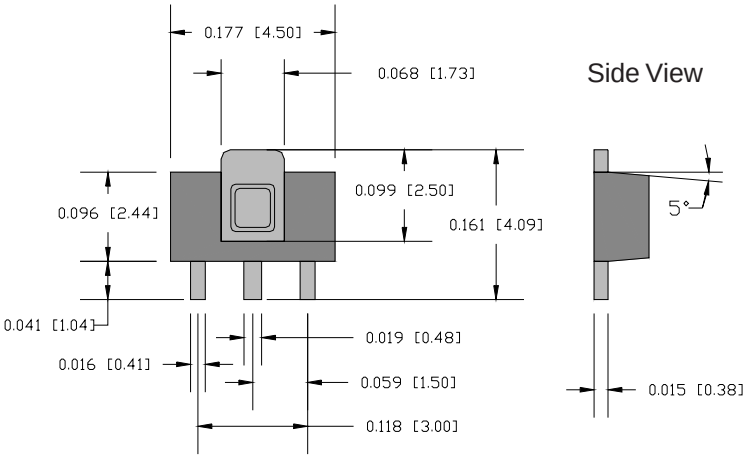
Dimensions in inches [millimeters]



Nominal Package Dimensions

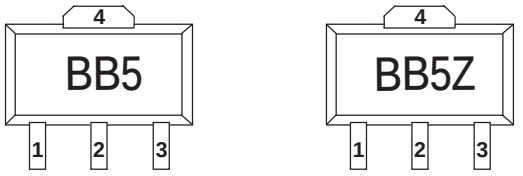
Dimensions in inches (millimeters)
Refer to package drawing posted at www.sirenza.com for tolerances

Bottom View



Side View

Package Marking



Tin-Lead Lead Free

Part Number Ordering Information

Part Number	Reel Size	Devices / Reel
SBB-5089	7"	1000
SBB-5089Z	7"	1000

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.