![SIRENZA MICRODEVICES]

Product Description

Sirenza Microdevices' SXE-1089Z is a high performance pHEMT MMIC amplifier utilizing a patented self-bias Darlington topology housed in a low-cost, surface mountable SOT-89 package. The active bias network provides stable current over temperature and process threshold voltage variations. Designed to run directly from a 5V supply, the SXE-1089Z does not require a dropping resistor as compared to typical Darlington amplifiers. The SXE-1089Z 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.
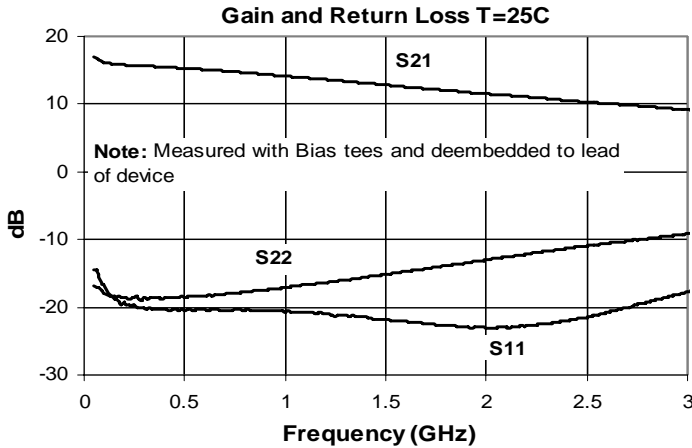
SXE-1089Z

0.05-3 GHz, Cascadable pHEMT MMIC Amplifier

Pb RoHS Compliant & Green Package
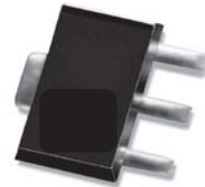
Product Features

- **Excellent ACP -65dBc with 9.5dBm Ch. Pwr. @ 2140 MHz**
- **OIP3 = 38.5 dBm @ 2140 MHz**
- **P1dB = 22.6 dBm @ 2140 MHz**
- **Gain = 11.7 dB @ 1960 MHz**
- **NF = 3.2 dB @ 1960 MHz**
- **Single-supply operation: 5V @ Idq=128mA**
- **Broadband internal matching, no dropping resistor**
- **Patented Self-Bias Darlington Topology**
- **Consistent current vs. temperature**
- **Insensitive to process threshold voltage variation**

Applications

- **PA Driver Amplifier, Multi-carrier Applications**
- **GSM, CDMA, TDSCDMA, WCDMA**

Gain and Return Loss T=25C

Note: Measured with Bias tees and deembedded to lead of device

Symbol	Parameters		Units	Frequency	Min.	Typ.	Max.
S_{21}	Small Signal Gain		dB	880 MHz		14.2	
				1960 MHz		11.7	
				2140 MHz		11.2	
P_{1dB}	Output Power at 1 dB Compression		dBm	880 MHz		22.4	
				1960 MHz		22.9	
				2140 MHz		22.6	
OIP_3	Output Third Order Intercept Point 5 dBm per tone, 1MHz spacing		dBm	880 MHz		38.0	
				1960 MHz		38.5	
				2140 MHz		38.5	
ACP	IS-95 Channel Power tested with 9 Channels FWD	-65dBc ACP	dBm	880MHz		13.2	
		-45dBc ACP				17	
	WCDMA Channel Power tested with 64 Channels FWD	-65dBc ACP	dBm	2140MHz		9.5	
		-45dBc ACP				14.5	
S_{11}	Input Return Loss		dB	2140 MHz		-21.5	
S_{22}	Output Return Loss		dB	2140 MHz		-23.0	
NF	Noise Figure		dB	2140 MHz		3.2	
V_D	Device Operating Voltage		V			5	
I_D	Device Operating Current		mA			128	
R_{TH}, j-l	Thermal Resistance (junction - lead)		°C/W			45	

Test Conditions: V_D = 5V I_{DQ} = 128mA Typ.

T_L = 25°C $Z_S = Z_L$ = 50 Ohms Tested with Broadband Application Circuit

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EDS-105333 Rev B

Typical RF Performance at Key Operating Frequencies (with Broadband Application Circuit)

Symbol	Parameter	Unit	Frequency (MHz)						
			500	880	1570	1960	2140	2440	3000
S_{21}	Small Signal Gain	dB	14.7	14.2	12.6	11.7	11.2	10.5	9.1
OIP_3	Output Third Order Intercept Point 5 dBm per tone, 1MHz spacing	dBm	38	38	38.5	38.5	38.5	38.5	37
ACP^1	Channel Power at -65dBc	dBm		13.2			9.5		
P_{1dB}	Output Power at 1dB Compression	dBm	20.6	22.4	23	22.9	22.6	22.3	21.3
S_{11}	Input Return Loss	dB	-23.5	-13.5	-15.5	-19	-21.5	-31.5	-23
S_{22}	Output Return Loss	dB	-9	-13	-19.5	-24	-23	-18.5	-13
S_{12}	Reverse Isolation	dB	-21	-20	-18.5	-18	-17.5	-17	-16
NF	Noise Figure	dB	3.2	3.2	3.2	3.2	3.2	3.2	3.4

Test Conditions: V_D = 5V I_{DQ} = 128mA Typ. ACP^1 = 880MHz tested with IS-95 9 Ch. FWD
T_L = 25°C $Z_S = Z_L$ = 50 Ohms   2140MHz tested with WCDMA 64 Ch. FWD

Note: OIP3 can be improved to 39-40 dBm by lowering the output choke and/or increasing the output DC block. These changes will reduce P1dB and ACPR

Absolute Maximum Ratings	
Parameter	**Absolute Limit**
Max Device Current (I_D)	170mA
Max Device Voltage (V_D)	5.5V
Max. RF Input Power* (See Note)	25dBm
Max. Junction Temp. (T_J)	+150°C
Operating Temp. Range (T_L)	-40°C to +85°C
Max. Storage Temp.	+150°C

*Note: Load condition, Z_L = 50 Ohms

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.

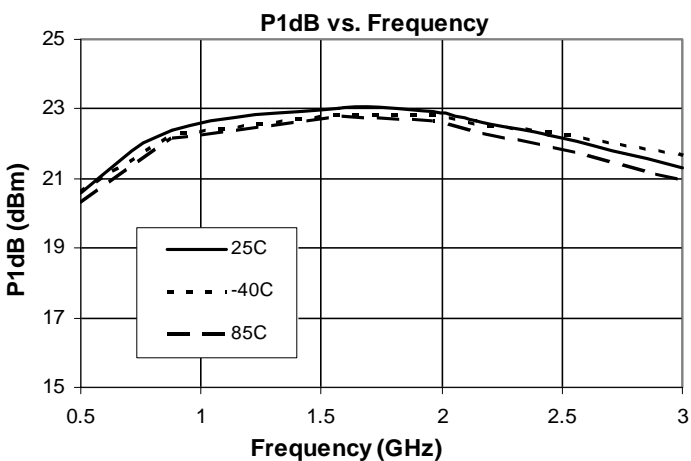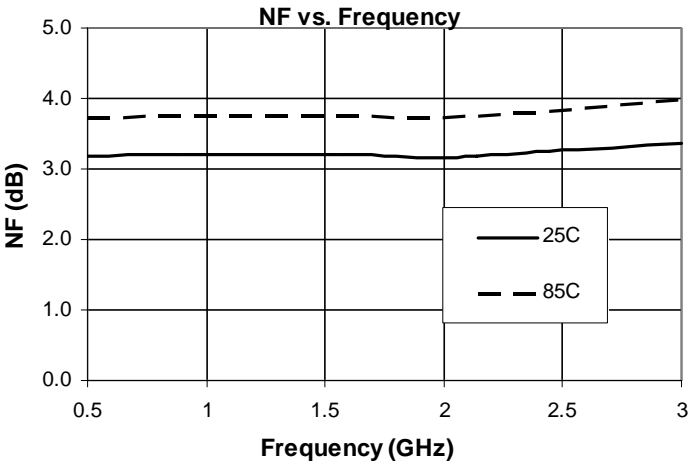Bias Conditions should also satisfy the following expression:
$I_D V_D < (T_J - T_L) / R_{TH}$, j-l $T_L = T_{LEAD}$

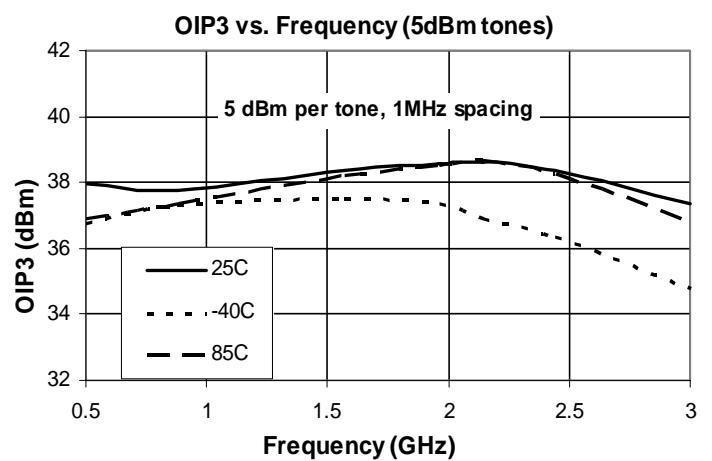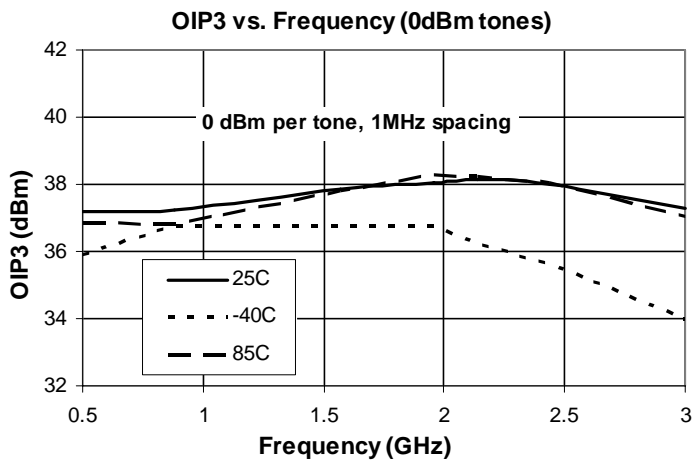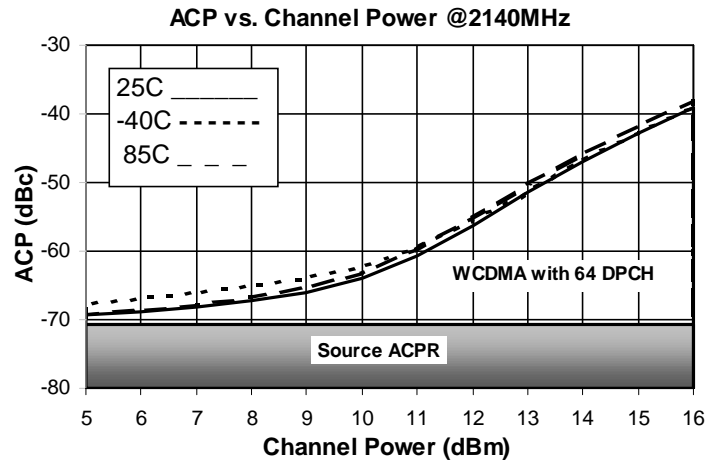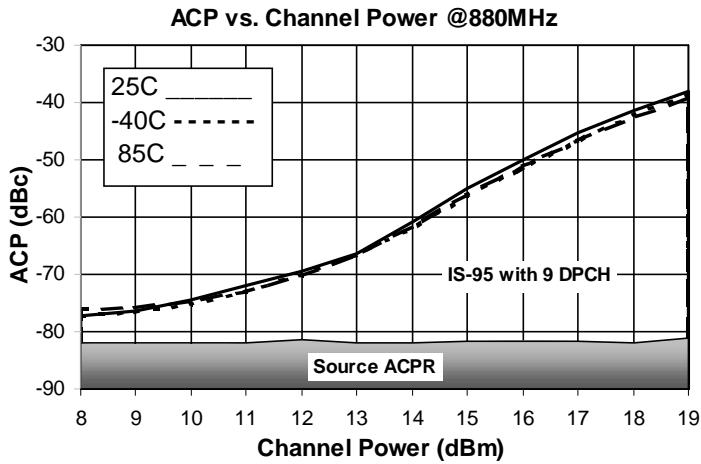| Reliability & Qualification Information	
Parameter	**Rating**
ESD Rating - Human Body Model (HBM)	Class 1B
Moisture Sensitivity Level	MSL1
This product qualification report can be downloaded at	
www.sirenza.com	

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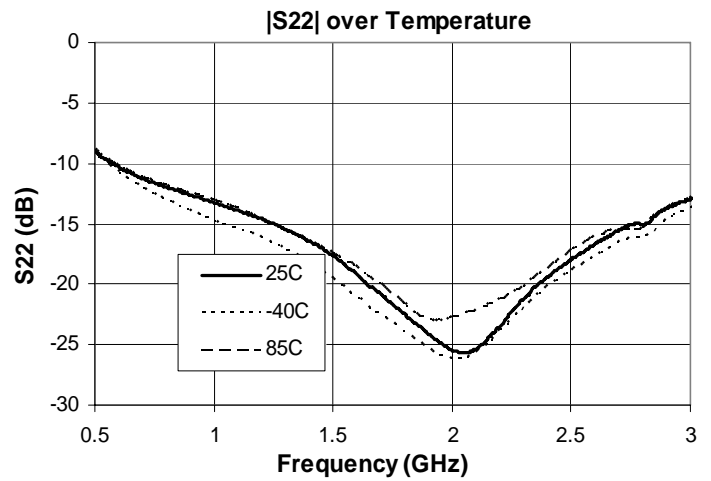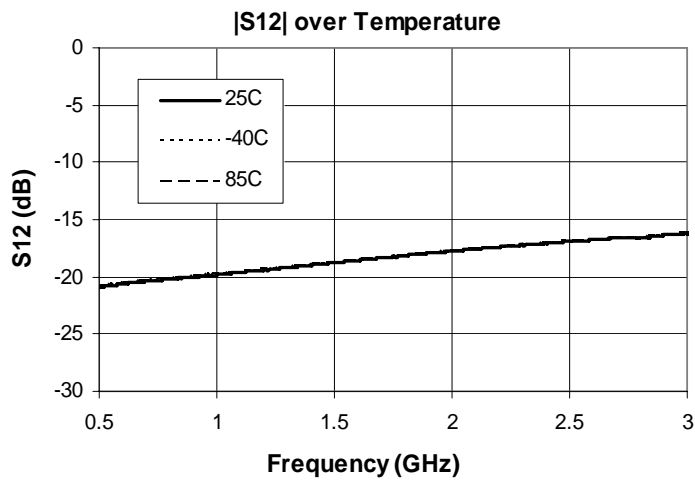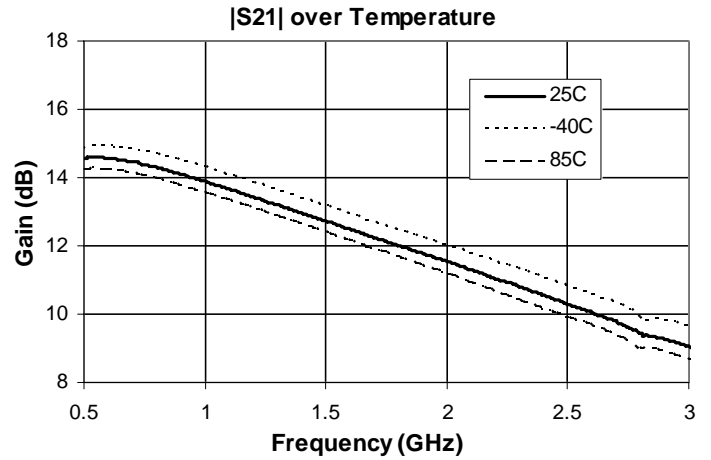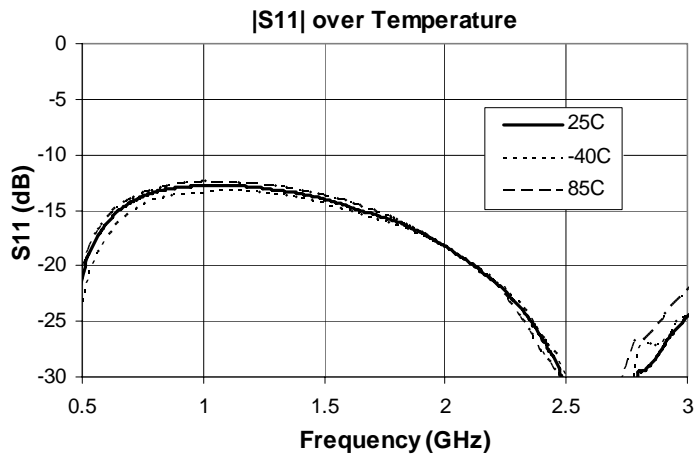Appropriate precautions in handling, packaging and testing devices must be observed.

Typical RF Performance (with Broadband Application Circuit)

NF vs. Frequency

P1dB vs. Frequency
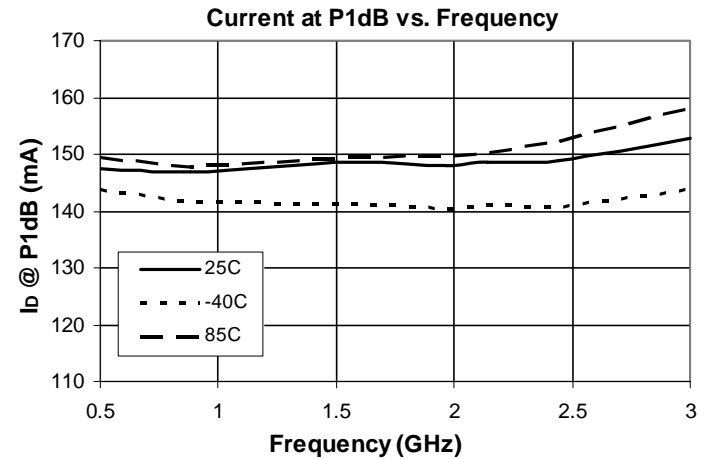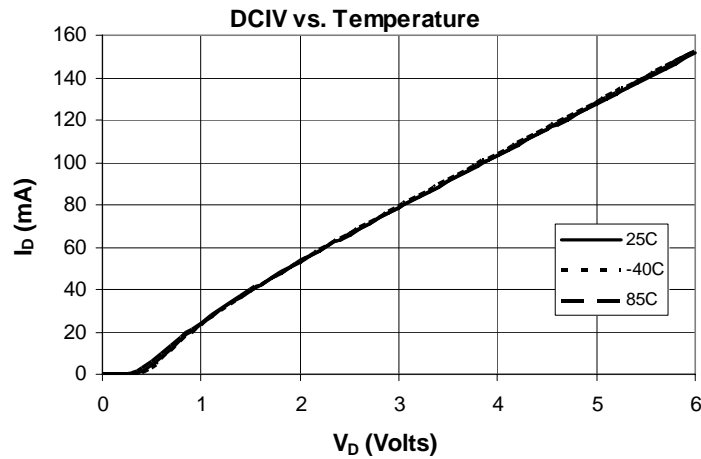
Typical RF Performance (with Broadband Application Circuit)

ACP vs. Channel Power @880MHz

ACP vs. Channel Power @2140MHz

OIP3 vs. Frequency (0dBm tones)

OIP3 vs. Frequency (5dBm tones)

OIP3 vs. Tone Power @ 880MHz, 1MHz

OIP3 vs. Tone Power @ 2140MHz, 1MHz
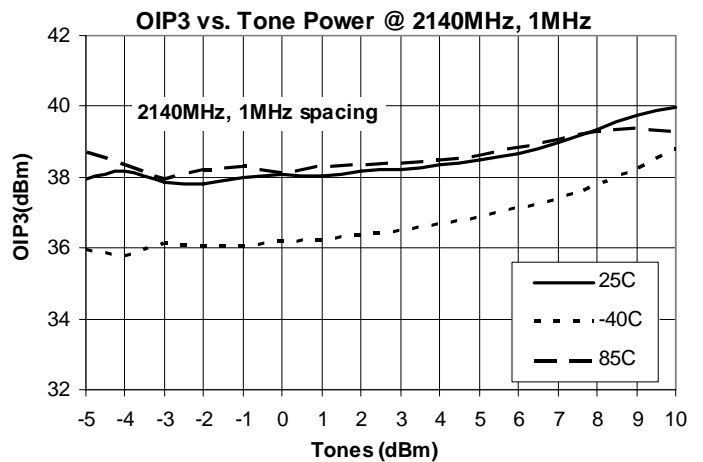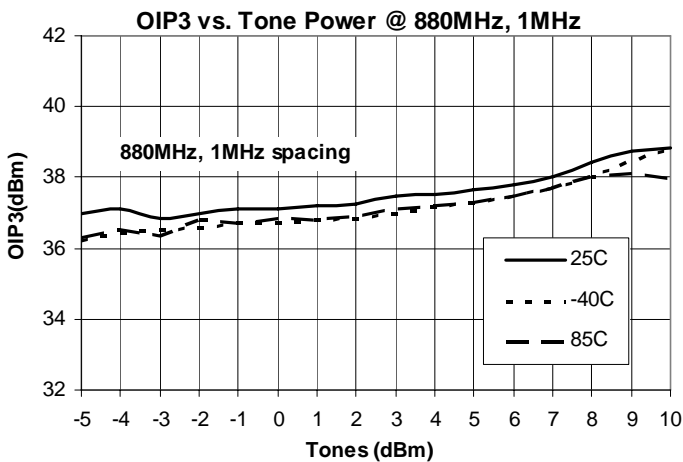
S-Parameters over Temperature (with Broadband Application Circuit)

|S11| over Temperature

|S21| over Temperature

|S12| over Temperature

|S22| over Temperature

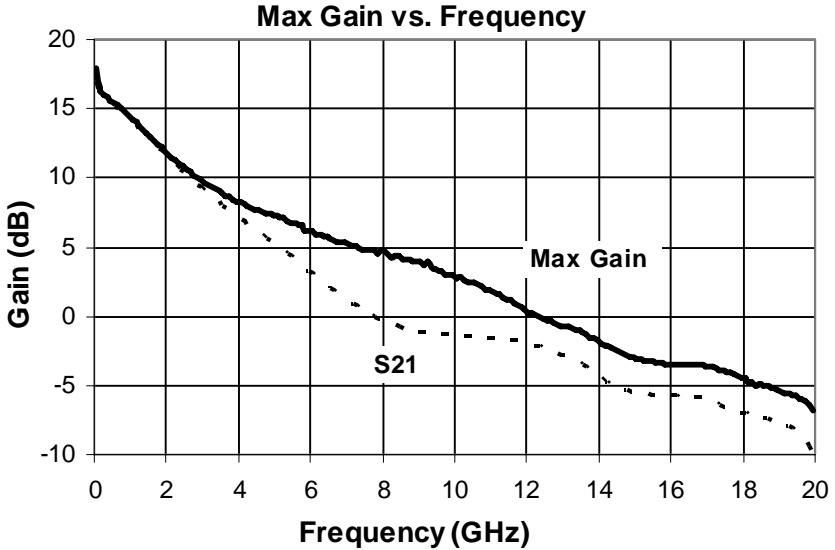## Device Current over Temperature

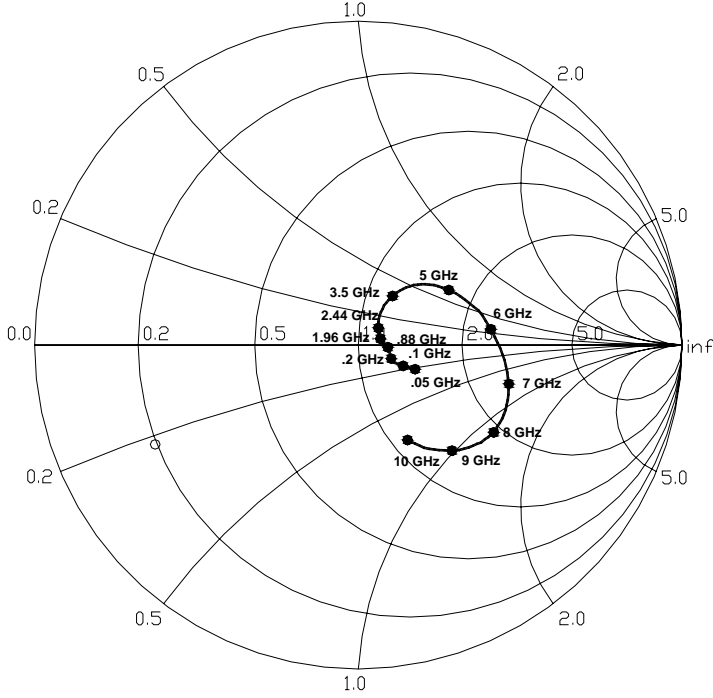**DCIV vs. Temperature**

Current at P1dB vs. Frequency
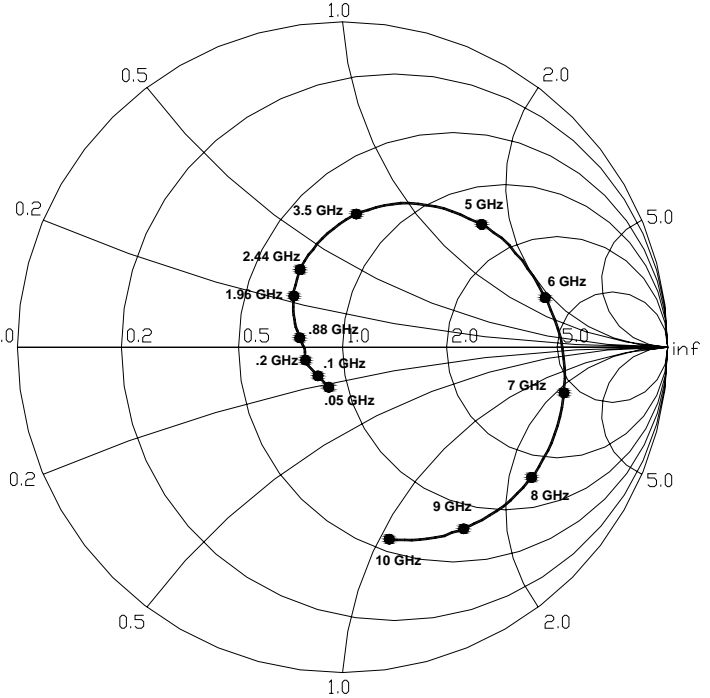
Typical Performance - De-embedded S-parameters

Note: S-parameters are de-embedded to the device leads with $Z_S=Z_L=50\Omega$. The device was mounted on Sirenza's recommended evaluation board. De-embedded S-parameters can be downloaded from our website (www.sirenza.com)

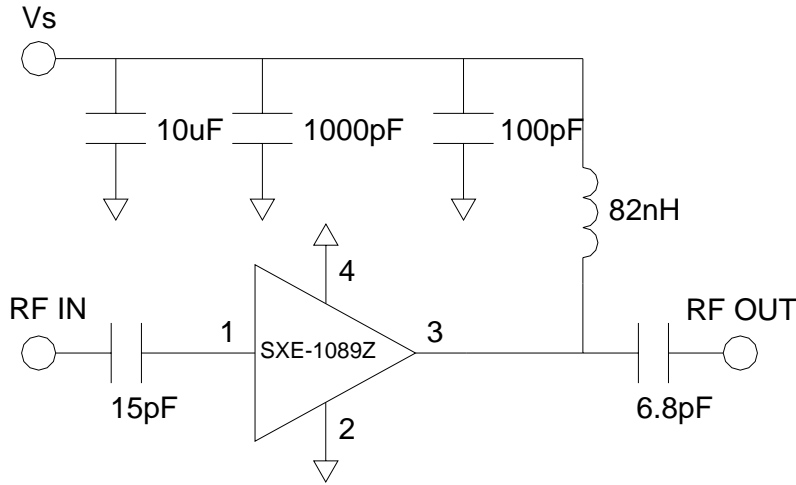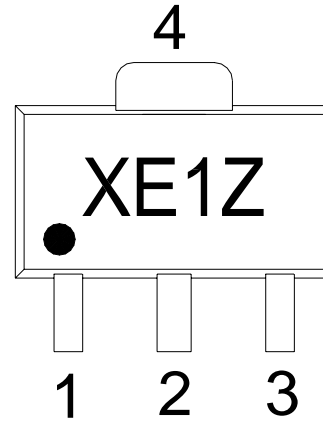**Max Gain vs. Frequency**

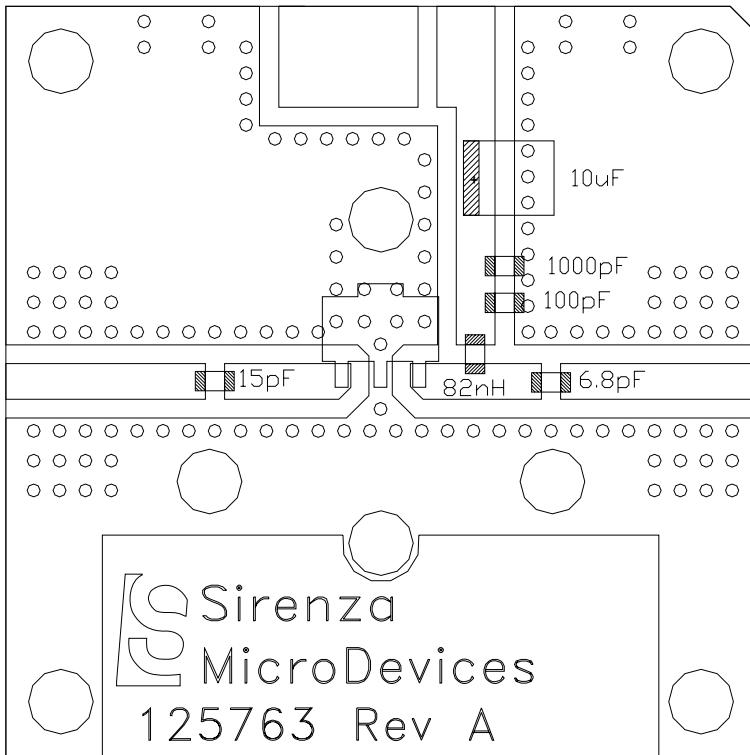**S11 Vs. Frequency**

S22 Vs. Frequency

Broadband Application Schematic (500 - 2500MHz)

Part Identification Marking & Pinout

Evaluation Board Layout

| 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.

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

Part Number Ordering Information

Part Number	Reel Size	Devices / Reel
SXE-1089Z	7"	1000

Suggested PCB Pad Layout

Dimensions in inches [millimeters]

0.177 [4.48]

∅0.020 [∅0.51]

0.151 [3.83]
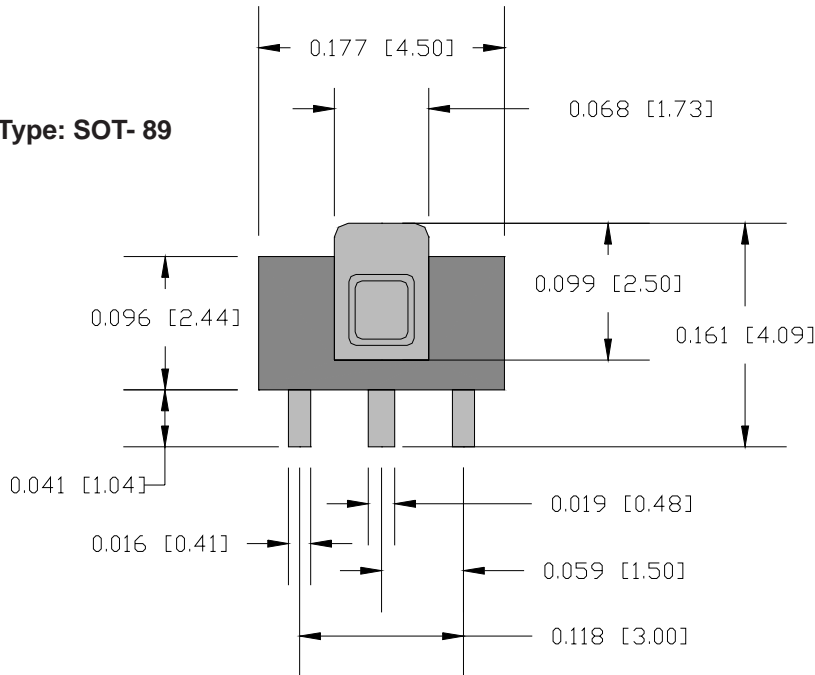
0.050 [1.27]

0.029 [0.74]

0.113 [2.87]   0.099 [2.51]

0.055 [1.40]
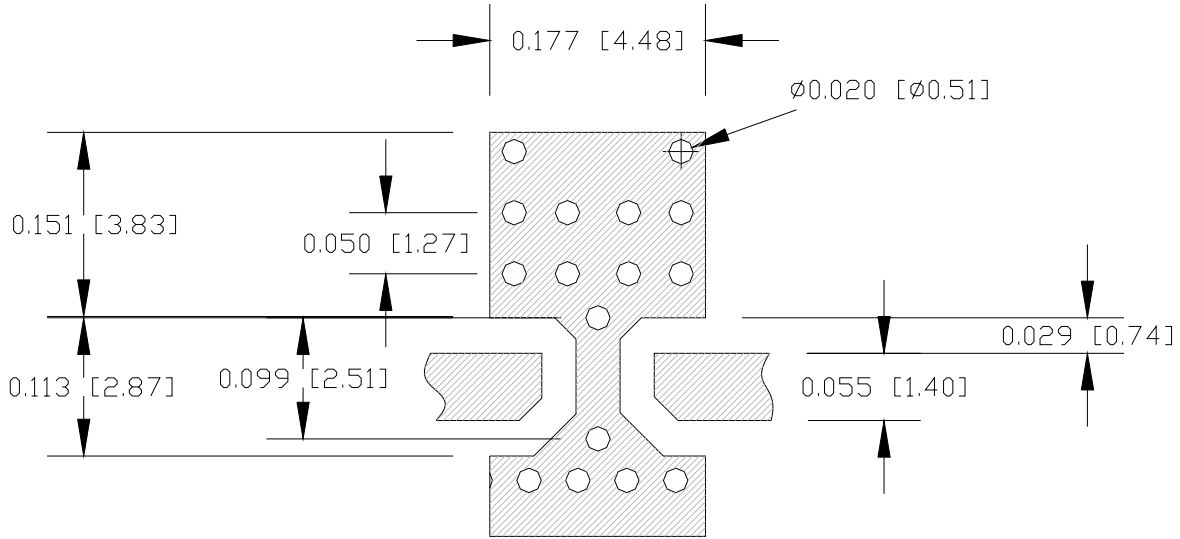
Nominal Package Dimensions

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

Bottom View

Package Type: SOT- 89

Side View

0.177 [4.50]

0.068 [1.73]

0.096 [2.44]

0.099 [2.50]

0.161 [4.09]

5°

0.041 [1.04]

0.019 [0.48]

0.016 [0.41]

0.059 [1.50]

0.015 [0.38]

0.118 [3.00]