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SXE1089Z

0.05GHz to 3GHz, CASCADABLE pHEMT MMIC AMPLIFIER

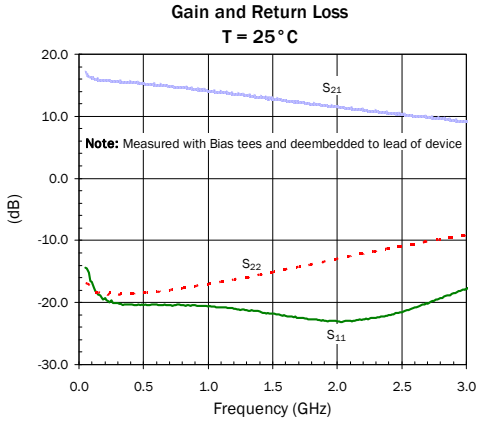
Package: SOT-89

Product Description

RFMD's SXE1089Z is a high performance pHEMT MMIC amplifier utilizing a patented self-bias Darlington topology housed in a lowcost, surface mountable SOT-89 package. The active bias network provides stable current over temperature and process thereshold voltage variations. Designed to run directly from a 5V supply, the SXE1089Z does not require a dropping resistor as compared to typical Darlington amplifiers. The SXE1089Z product is designed for high linearity 5V gain block applications that require small size and minimal external components. It is internally matched to 50Ω.

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

- Excellent ACP -65dBc with 9.5dBm Channel Power at 2140MHz
- OIP_3=38.5dBm at 2140MHz
- P_{1dB}=22.6dBm at 2140MHz
- Gain=11.7dB at 1960MHz
- NF=3.2dB at 1960MHz
- Single-Supply Operation: 5V at I_{DQ}=128mA
- Broadband Internal Matching, No Dropping Resistor
- Patented Self-Bias Darlington Topology
- Consistent Current versus Temperature
- Insensitive to Process Threshold Voltage Variation

Applications

- PA Driver Amplifier, Multi-Carrier Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Small Signal Gain		14.2		dB	880MHz
		11.7		dB	1960MHz
	9.6	11.1	12.6	dB	2140MHz
Output Power at 1dB Compression		22.4		dBm	880MHz
		22.9		dBm	1960MHz
	20.7	22.2		dBm	2140MHz
Output Third Order Intercept Point		38.0		dBm	880MHz, 5dBm per tone, 1MHz spacing,
		38.5		dBm	1960MHz, 5dBm per tone, 1MHz spacing,
	36.6	38.6		dBm	2140MHz, 5dBm per tone, 1MHz spacing,
IS-95 Channel Power		13.2		dBm	880MHz, -65dBc ACP, tested with 9 Channels FWD
		17.0		dBm	880MHz, -45dBc ACP
WCDMA Channel Power		9.5		dBm	2140MHz, -65dBc ACP, tested with 64 Channels FWD
		14.5		dBm	2140MHz, -45dBc ACP
Input Return Loss	16.0	20.0		dB	2140MHz
Output Return Loss	11.7	15.7		dB	2140MHz
Noise Figure		3.2	4.2	dB	2140MHz
Device Operating Voltage		5.0		V	
Device Operating Current	118	128	138	mA	
Thermal Resistance		45.0		°C/W	junction - lead

Test Conditions: V_D=5V, I_{DQ}=128mA Typ. , T_L=25°C, Z_S=Z_L=50Ω, Tested with Broadband Application Circuit

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Absolute Maximum Ratings

Parameter	Rating	Unit
Device Current (I_D)	170	mA
Device Voltage (V_D)	5.5	V
RF Input Power* (See Note)	25	dBm
Junction Temp (T_J)	+150	°C
Operating Temp Range (T_L)	-40 to +85	°C
Storage Temp	+150	°C
ESD Rating - Human Body Model (HBM)	Class 1B	
Moisture Sensitivity Level	MSL 2	

*Note: Load condition Z_L=50Ω.

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:
$I_DV_D < (T_J-T_L)/R_{TH}$, 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.

RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

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

Parameter	Unit	500 MHz	880 MHz	1570 MHz	1960 MHz	2140 MHz	2440 MHz	3000 MHz
Small Signal Gain (S_{21})	dB	14.7	14.2	12.6	11.7	11.2	10.5	9.1
Output Third Order Intercept Point, 5dBm per tone, 1MHz spacing (OIP_3)	dBm	38.0	38.0	38.5	38.5	38.5	38.5	37.0
Channel Power at -65dBc (ACP[1])	dBm		13.2			9.5		
Output Power at 1dB Compression (P_{1dB})	dBm	20.6	22.4	23.0	22.9	22.6	22.3	21.3
Input Return Loss	dB	23.5	13.5	15.5	19.0	21.5	31.5	23.0
Output Return Loss	dB	9.0	13.0	19.5	24.0	23.0	18.5	13.0
Reverse Isolation (S_{12})	dB	-21.0	-20.0	-18.5	-18.0	-17.5	-17.0	-16.0
Noise Figure (NF)	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 Ch. FWD
T_L=25°C $Z_S=Z_L$=50Ω 2140MHz tested with WCDMA 64 Ch. FWD

Note: OIP_3 can be improved to 39-40dBm by lowering the output choke and/or increasing the output DC block. These changes will reduce P_{1dB} and ACPR.

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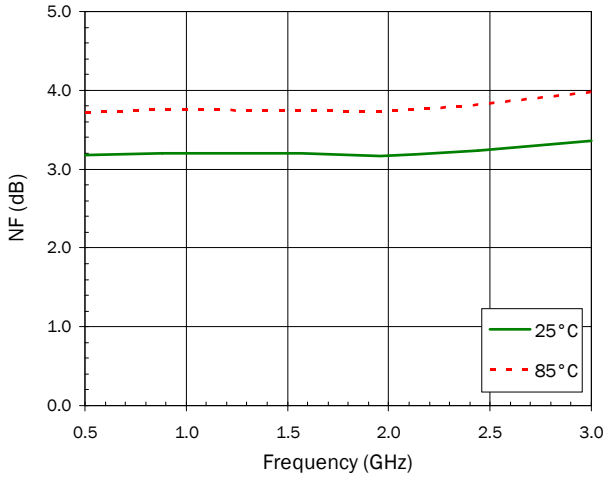
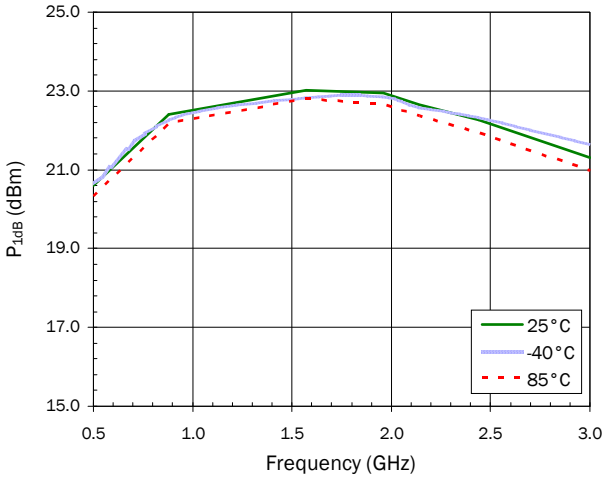
Typical RF Performance (with Broadband Application Circuit)

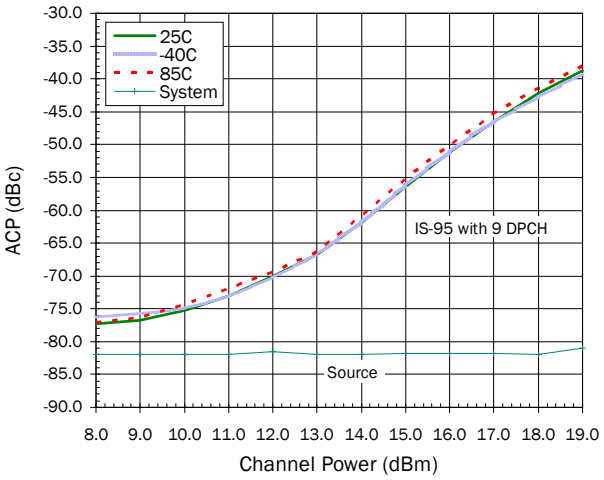
NF versus Frequency



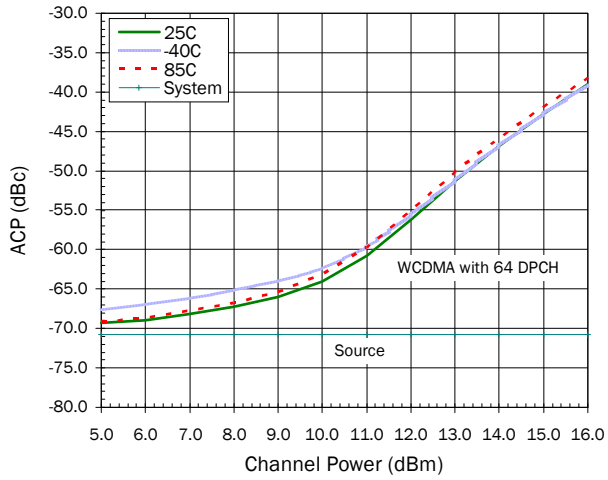
P_{1dB} versus Frequency



ACP versus Channel Power @ 880MHz

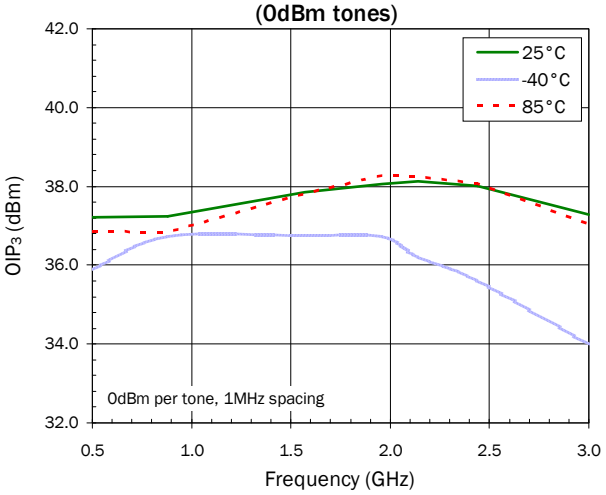


ACP versus Channel Power @ 2140MHz

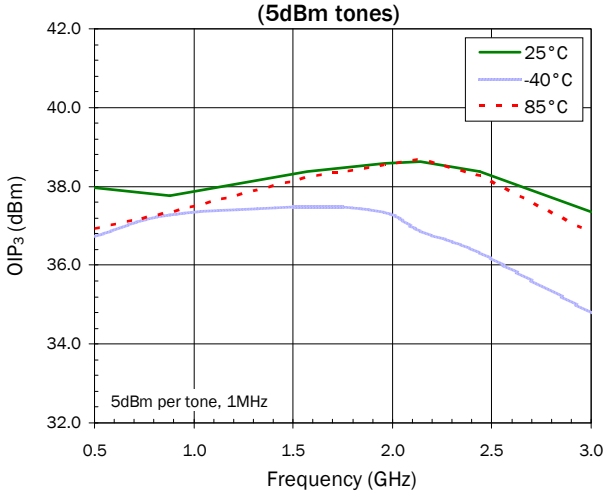


Typical RF Perfromance (With Broadband Application Circuit)

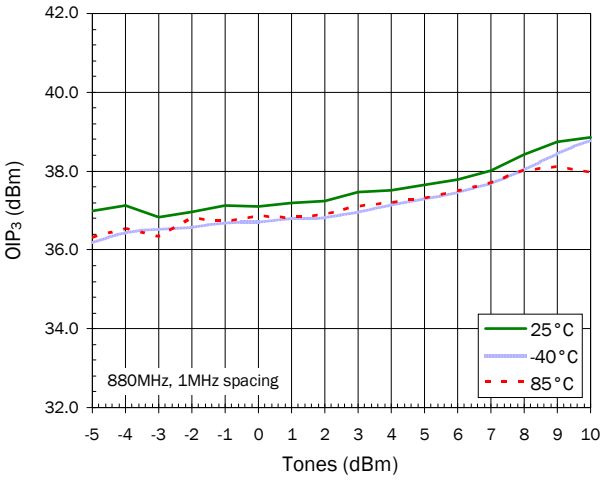
OIP_3 versus Frequency (0dBm tones)



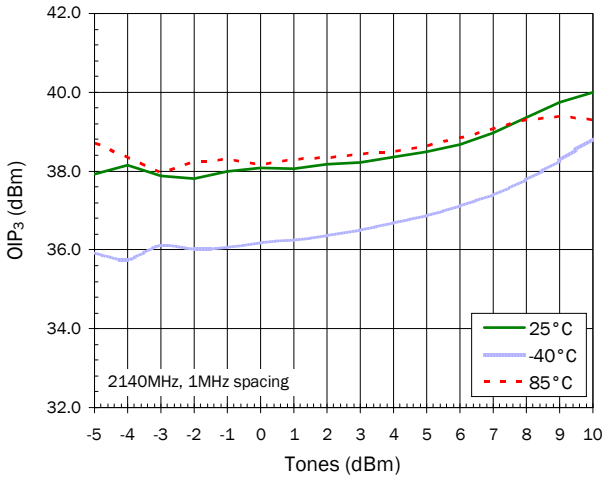
OIP_3 versus Frequency (5dBm tones)



OIP_3 versus Tone Power @ 880MHz, 1MHz



OIP_3 versus Tone Power @ 2140MHz, 1MHz



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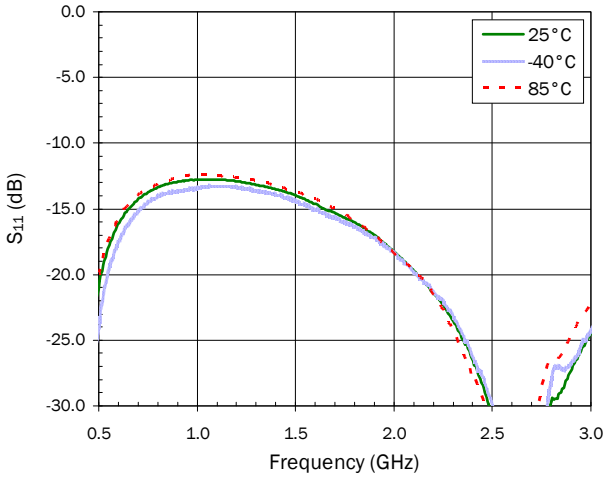
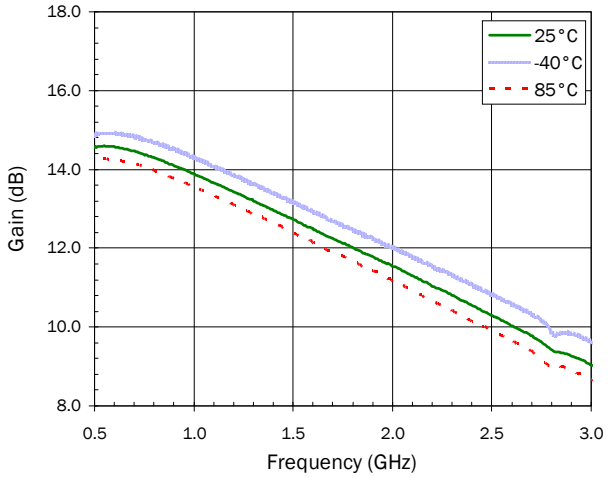
S-Parameters over Temperature (With Broadband Application Circuit)

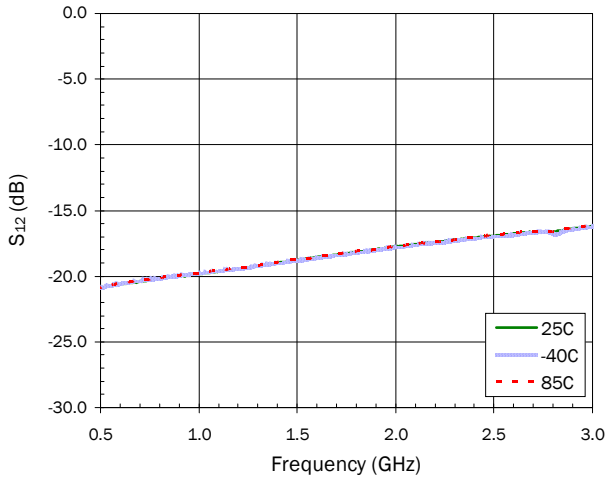
S_{11} over Temperature



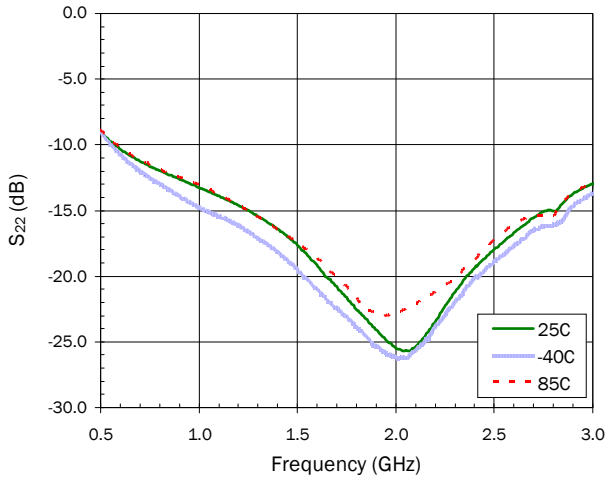
S_{21} over Temperature



S_{12} over Temperature

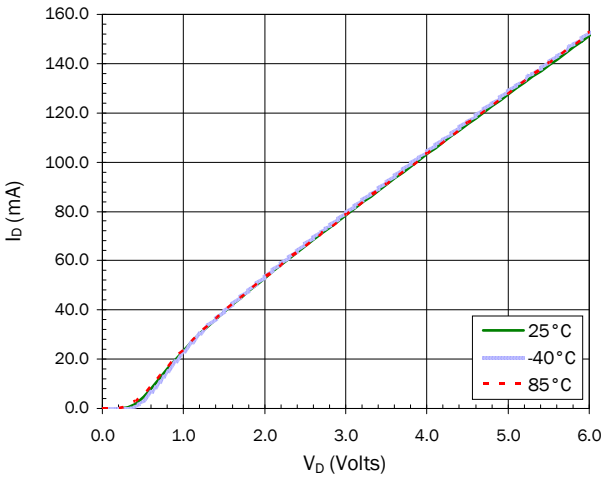


S_{22} over Temperature

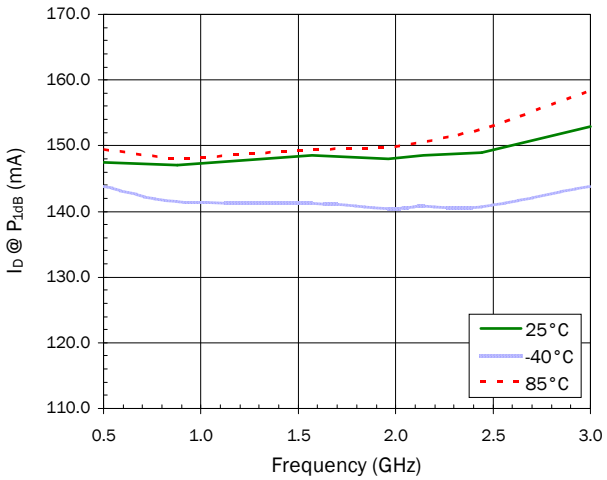


Device Current over Temperature

DCIV versus Temperature

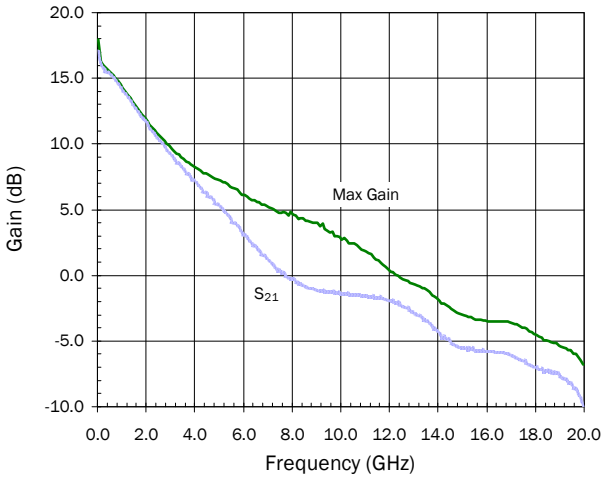


Current at P_{1dB} versus Frequency



Typical Performance - De-embedded S-Parameters

Max Gain versus Frequency



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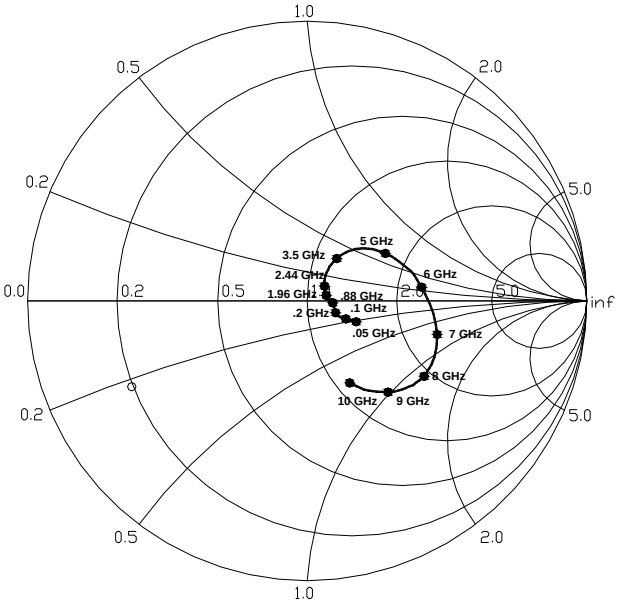
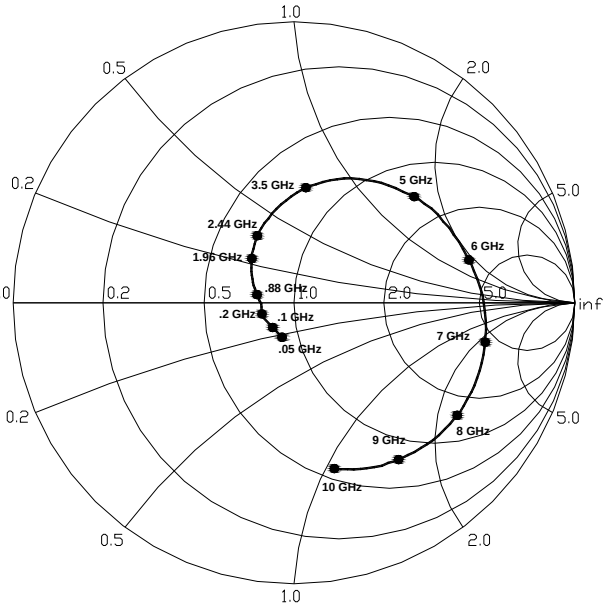
S11 versus Frequency



S22 versus Frequency

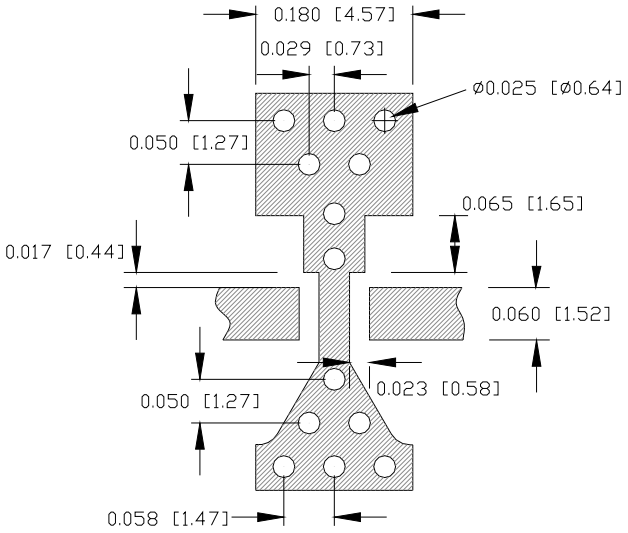


Note:

S-parameters are de-embedded to the device leads with ZS=ZL=50Ω. De-embedded S-parameters can be downloaded from our website (www.rfmd.com)

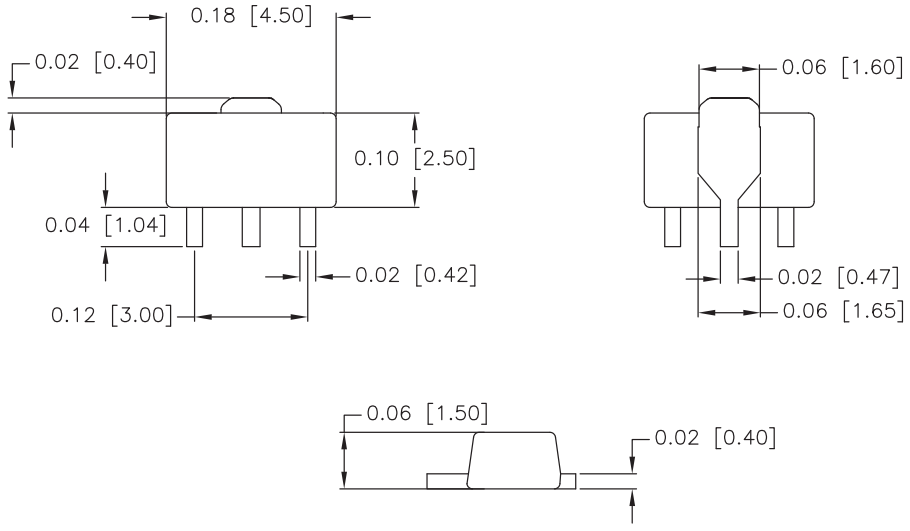
Pin	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads and acieve optimum RF performance.
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.

Suggested Pad Layout



Package Drawing

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



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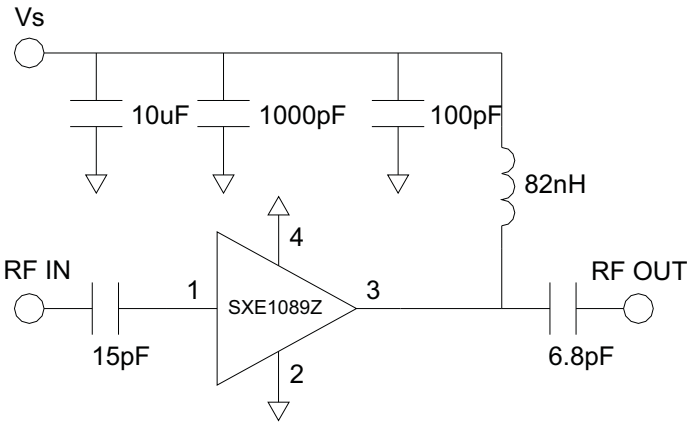
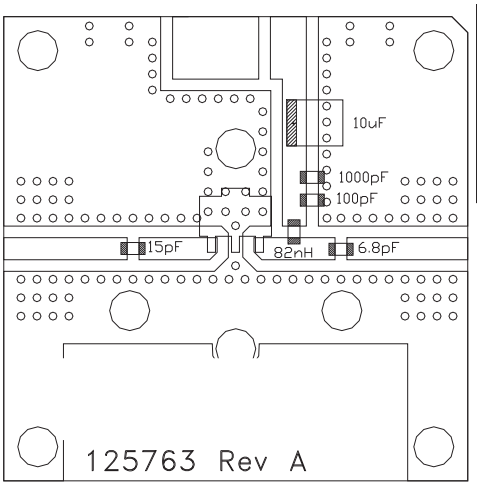
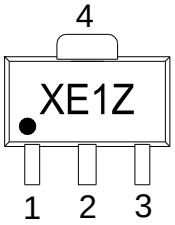
Application Schematic



Evaluation Board Layout



Part Identification



Alternate marking: “SXE1089Z” on line one with Trace Code on line two.

Ordering Information

Ordering Code	Description
SXE1089Z	7” Reel with 1000 pieces
SXE1089ZSQ	Sample Bag with 25 pieces
SXE1089ZSR	7” Reel with 100 pieces
SXE1089Z-PCK1	500MHz to 2500MHz PCBA with 5-piece sample bag

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