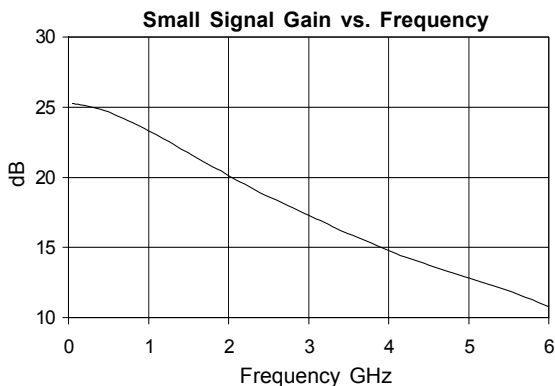


Product Description

Stanford Microdevices' SGA-5589 is a high performance cascadeable 50-ohm amplifier designed for operation at voltages as low as 3.9V. This RFIC uses the latest Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) process featuring 1 micron emitters with f_T up to 50 GHz.

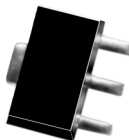
This circuit uses a darlington pair topology with resistive feedback for broadband performance as well as stability over its entire temperature range. Internally matched to 50 ohm impedance, the SGA-5589 requires only DC blocking and bypass capacitors for external components.



Preliminary

SGA-5589

DC-4000 MHz Silicon Germanium HBT Cascadeable Gain Block



Product Features

- DC-4000 MHz Operation
- Single Voltage Supply
- High Output Intercept: +33 dBm typ. at 850 MHz
- Low Current Draw: 60mA at 3.9V typ.
- Low Noise Figure: 3dB typ. at 850 MHz

Applications

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

Symbol	Parameters: Test Conditions: $Z_0 = 50 \text{ Ohms}$, $I_b = 60 \text{ mA}$, $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$ $f = 2400 \text{ MHz}$	 dBm dBm		18.2 16.2 15.1	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$ $f = 2400 \text{ MHz}$	 dBm dBm dBm		32.9 29.2 27.7	
S_{21}	Small Signal Gain	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$ $f = 2400 \text{ MHz}$	 dB dB dB		24.1 20.8 19.5	
Bandwidth	(Determined by S_{11} , S_{22} Values)		MHz		4000	
S_{11}	Input VSWR	$f = \text{DC-4000 MHz}$	-		1.6:1	
S_{22}	Output VSWR	$f = \text{DC-4000 MHz}$	-		1.6:1	
S_{12}	Reverse Isolation	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$ $f = 2400 \text{ MHz}$	 dB dB dB		27.3 25.5 24.1	
NF	Noise Figure, $Z_s = 50 \text{ Ohms}$	$f = 1950 \text{ MHz}$	dB		3.4	
V_D	Device Voltage		V		3.9	
$R_{th,j-l}$	Thermal Resistance (junction - lead)		$^\circ\text{C/W}$		97	

The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.

Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.

Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

Absolute Maximum Ratings

Operation of this device above any one of these parameters may cause permanent damage.

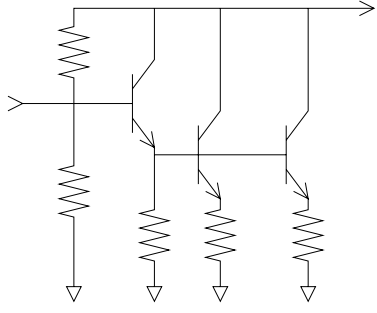
Bias Conditions should also satisfy the following expression:

$$I_D V_D (\text{max}) < (T_J - T_{OP})/R_{th, j-l}$$

Parameter	Value	Unit
Supply Current	120	mA
Operating Temperature	-40 to +85	C
Maximum Input Power	+5	dBm
Storage Temperature Range	-40 to +150	C
Operating Junction Temperature	+150	C

Key parameters, at typical operating frequencies:

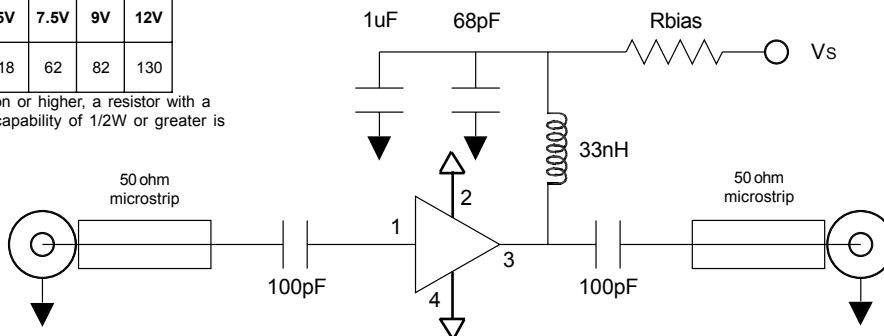
Parameter	Typical 25°C	Unit	Test Condition ($I_D = 60 \text{ mA}$, unless otherwise noted)
500 MHz			
Gain	24.9	dB	$Z_S = 50 \text{ Ohms}$ Tone spacing = 1 MHz, Pout per tone = 0 dBm
Noise Figure	2.8	dB	
Output IP3	31.6	dBm	
Output P1dB	17.9	dBm	
Input Return Loss	20.0	dB	
Reverse Isolation	27.2	dB	
850 MHz			
Gain	24.1	dB	$Z_S = 50 \text{ Ohms}$ Tone spacing = 1 MHz, Pout per tone = 0 dBm
Noise Figure	3.0	dB	
Output IP3	32.9	dBm	
Output P1dB	18.2	dBm	
Input Return Loss	16.9	dB	
Reverse Isolation	27.3	dB	
1950 MHz			
Gain	20.8	dB	$Z_S = 50 \text{ Ohms}$ Tone spacing = 1 MHz, Pout per tone = 0 dBm
Noise Figure	3.4	dB	
Output IP3	29.2	dBm	
Output P1dB	16.2	dBm	
Input Return Loss	13.2	dB	
Reverse Isolation	25.5	dB	
2400 MHz			
Gain	19.5	dB	$Z_S = 50 \text{ Ohms}$ Tone spacing = 1 MHz, Pout per tone = 0 dBm
Noise Figure	3.6	dB	
Output IP3	27.7	dBm	
Output P1dB	15.1	dBm	
Input Return Loss	12.5	dB	
Reverse Isolation	24.1	dB	

Pin #	Function	Description	Device Schematic
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
2	GND	Connection to ground. Use via holes for best performance to reduce lead inductance. Place vias as close to ground leads as possible.	
3	RF OUT/Vcc	RF output and bias pin. Bias should be supplied to this pin through an external series resistor and RF choke inductor. Because DC biasing is present on this pin, a DC blocking capacitor should be used in most applications (see application schematic). The supply side of the bias network should be well bypassed.	
4	GND	Same as Pin 2.	

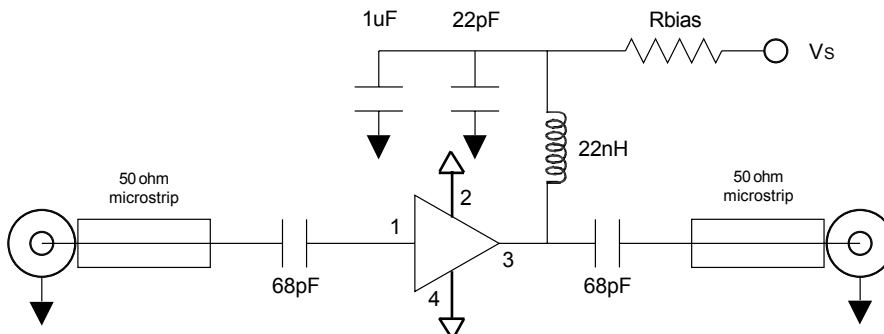
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	7.5V	9V	12V
Rbias (Ohms)	18	62	82	130

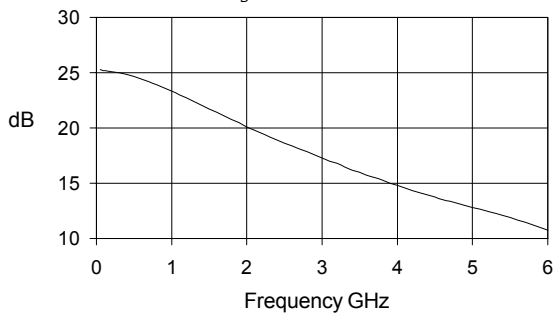
For 7.5V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.



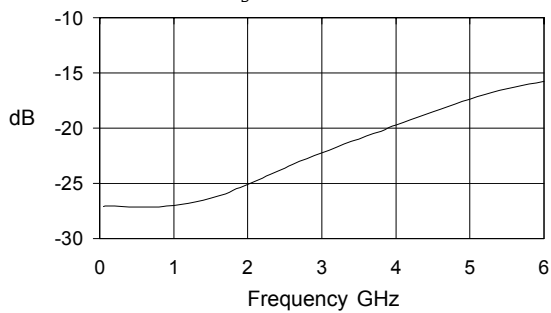
Application Schematic for Operation at 1950 MHz



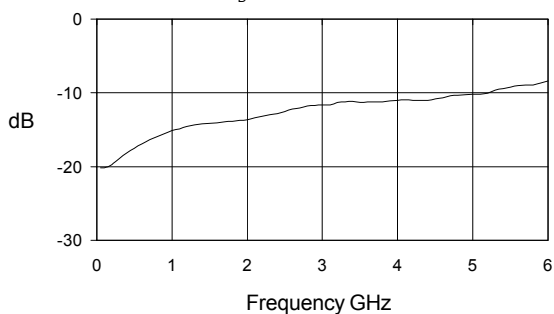
S21, $I_D = 60$ mA, $T = +25^\circ\text{C}$



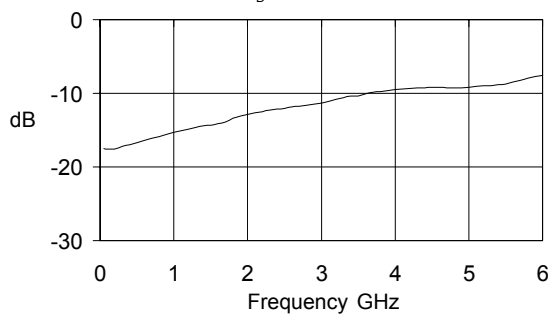
S12, $I_D = 60$ mA, $T = +25^\circ\text{C}$



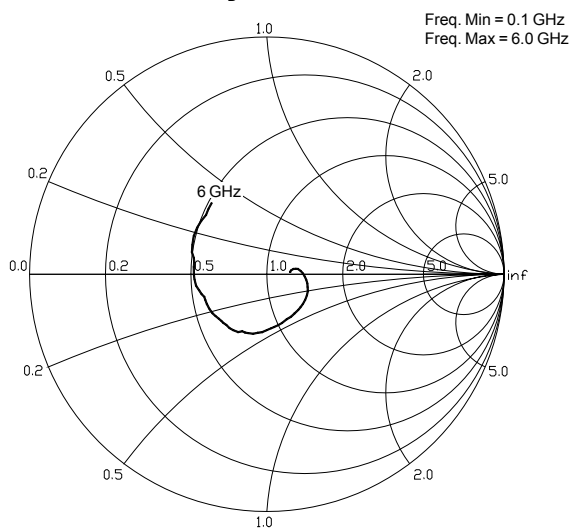
S11, $I_D = 60$ mA, $T = +25^\circ\text{C}$



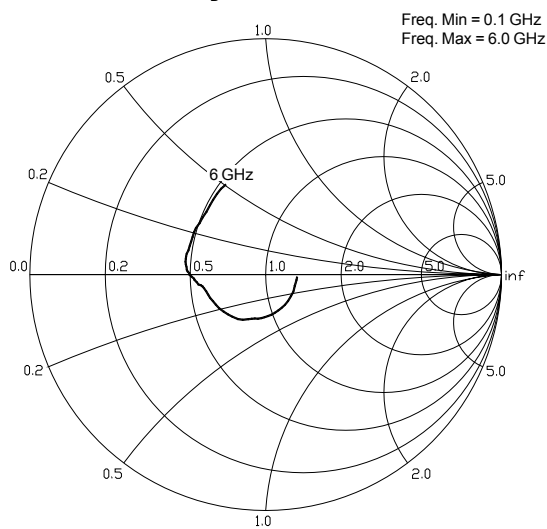
S22, $I_D = 60$ mA, $T = +25^\circ\text{C}$

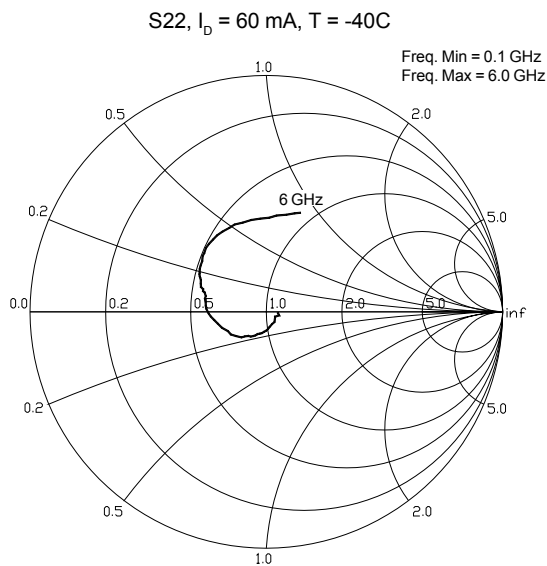
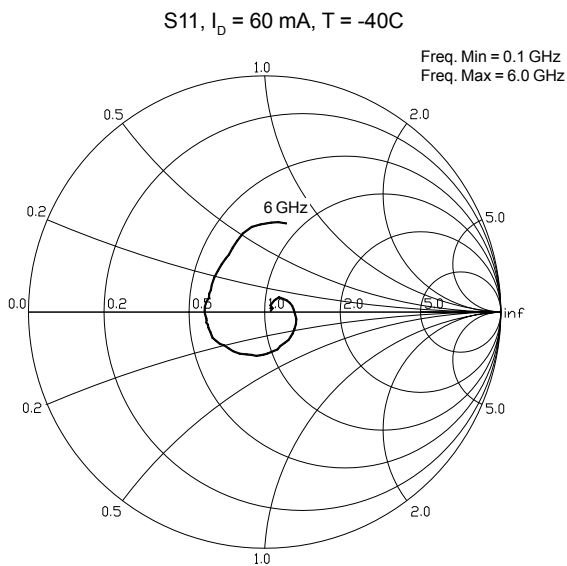
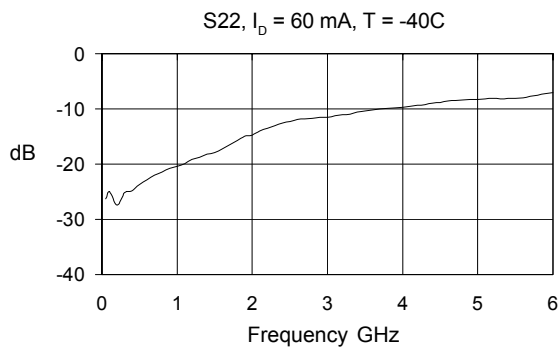
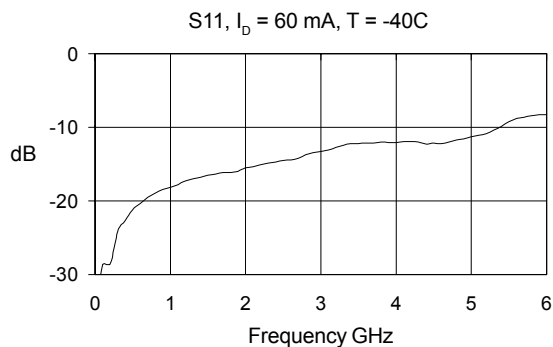
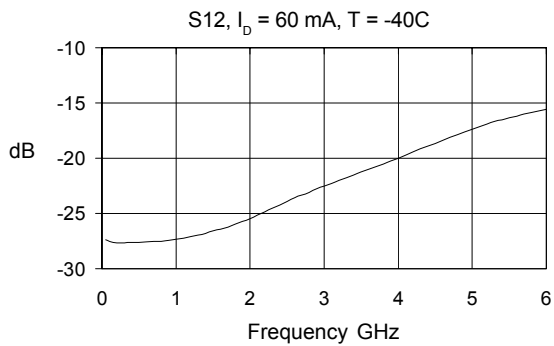
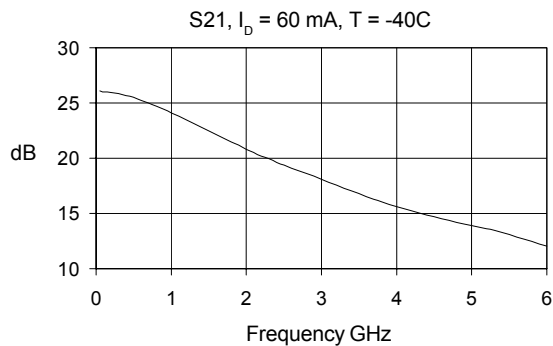


S11, $I_D = 60$ mA, $T_a = 25^\circ\text{C}$

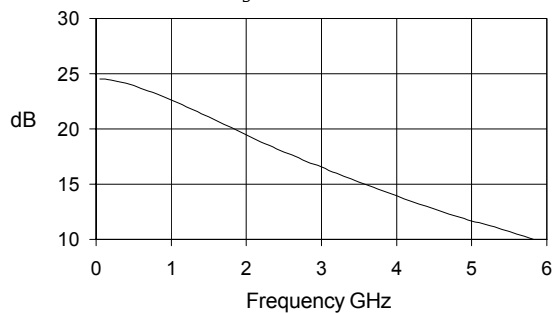


S22, $I_D = 60$ mA, $T_a = 25^\circ\text{C}$

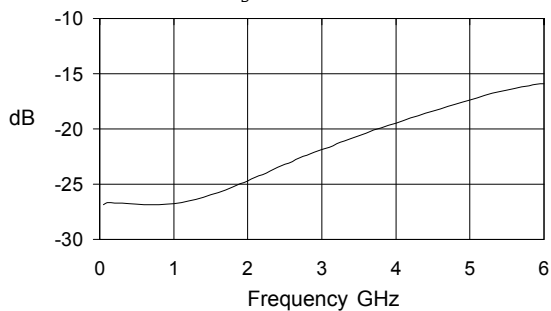




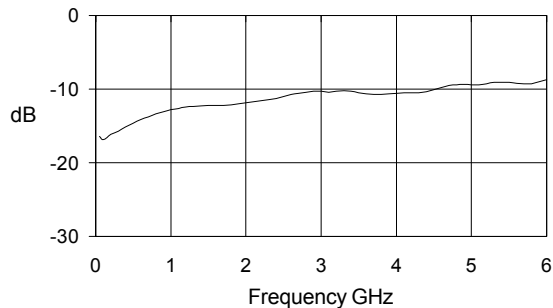
S21, $I_D = 60$ mA, $T = +85^\circ\text{C}$



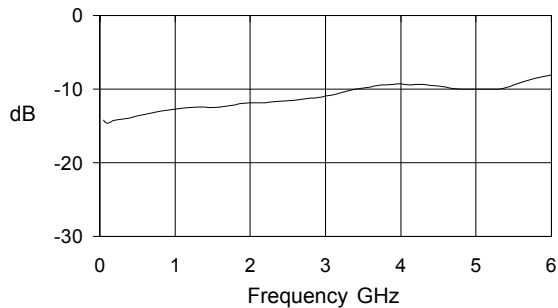
S12, $I_D = 60$ mA, $T = +85^\circ\text{C}$



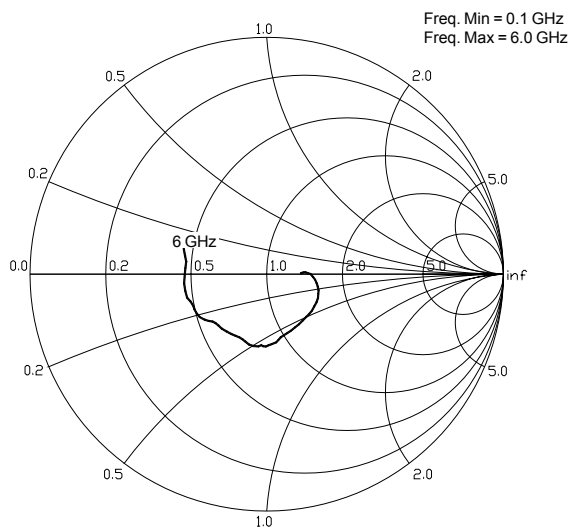
S11, $I_D = 60$ mA, $T = +85^\circ\text{C}$



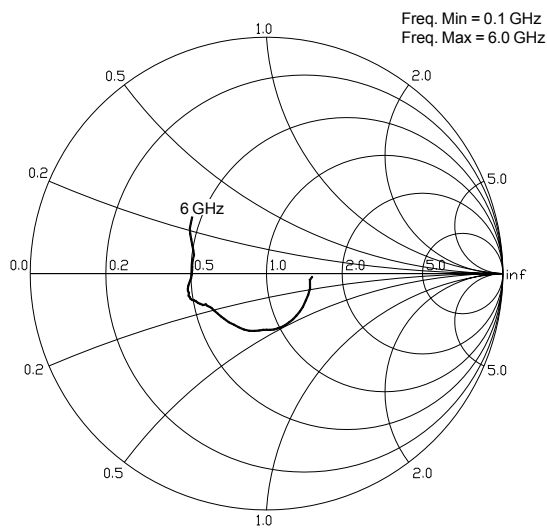
S22, $I_D = 60$ mA, $T = +85^\circ\text{C}$



S11, $I_D = 60$ mA, $T = +85^\circ\text{C}$



S22, $I_D = 60$ mA, $T = +85^\circ\text{C}$





Caution: ESD sensitive

Appropriate precautions in handling, packaging and testing devices must be observed.

Part Number Ordering Information

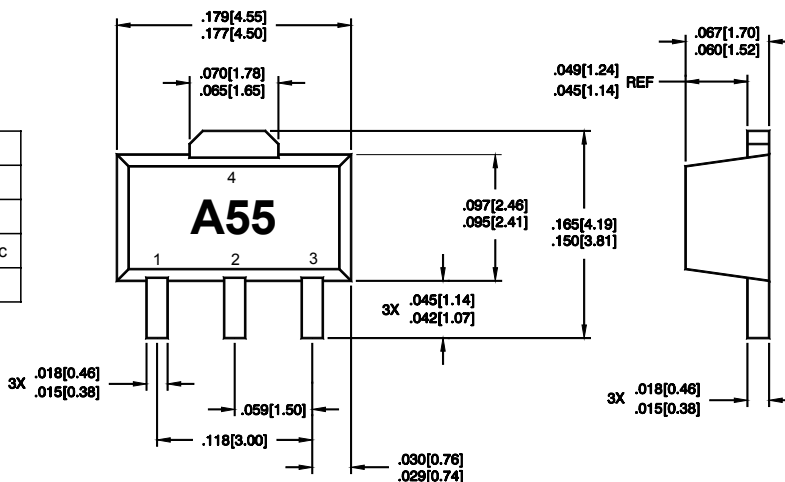
Part Number	Reel Size	Devices/Reel
SGA-5589	13"	3000

Part Symbolization

The part will be symbolized with "A55" designator on the top surface of the package.

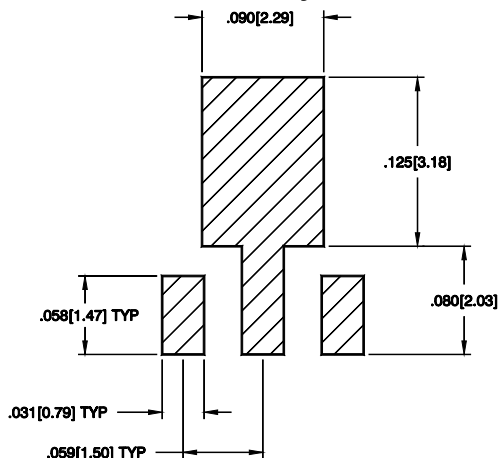
Package Dimensions

Pin #	Function
1	RFin
2	Gnd
3	RFout/Vcc
4	Gnd



Pin assignments shown for reference only, not marked on part

PCB Pad Layout



DIMENSIONS ARE IN INCHES [MM]