Preliminary

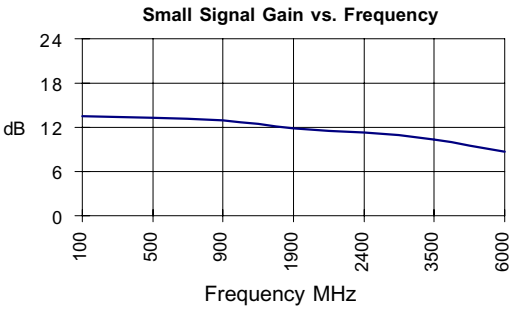
SGA-5225

DC-4000 MHz Silicon Germanium HBT Cascadeable Gain Block

Product Description

Stanford Microdevices' SGA-5225 is a high performance cascadeable 50-ohm amplifier designed for operation at voltages as low as 3.4V. 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-5225 requires only DC blocking and bypass capacitors for external components.



Product Features

- **DC-4000 MHz Operation**
- **Single Voltage Supply**
- **High Output Intercept: +30.2dBm typ. at 850 MHz**
- **Low Current Draw: 60mA typ. at 3.4V**
- **Low Input/Output VSWR**

Applications

- **Oscillator Amplifiers**
- **Broadband Gain Blocks**
- **IF/ RF Buffer Amplifier**
- **Drivers for CATV Amplifiers**

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, Id = 60 mA, T = 25°C		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz	dBm dBm		15.4 14.4	
S_{21}	Small Signal Gain	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 4000 MHz	dB dB dB	11.9	13.2 12.2 10.4	
S_{12}	Reverse Isolation	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 4000 MHz	dB dB dB		18.2 18.9 18.9	
S_{11}	Input VSWR	f = DC - 2400 MHz f = 2400 - 4000 MHz	-		1.3:1 1.2:1	
S_{22}	Output VSWR	f = DC - 2400 MHz f = 2400 - 4000 MHz	-		1.1:1 1.3:1	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz	dBm dBm		30.2 27.3	
NF	Noise Figure	f = DC - 1000 MHz f = 1000 - 2400 MHz	dB dB		4.3 4.4	
T_D	Group Delay	f = 1000 MHz	pS		75	
V_D	Device Voltage		V	3.1	3.4	3.7

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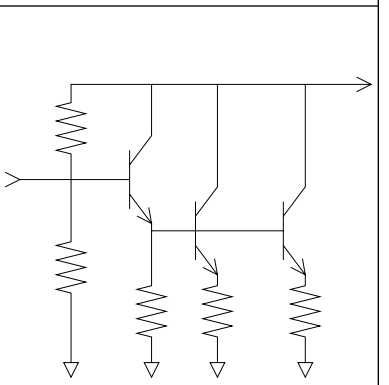
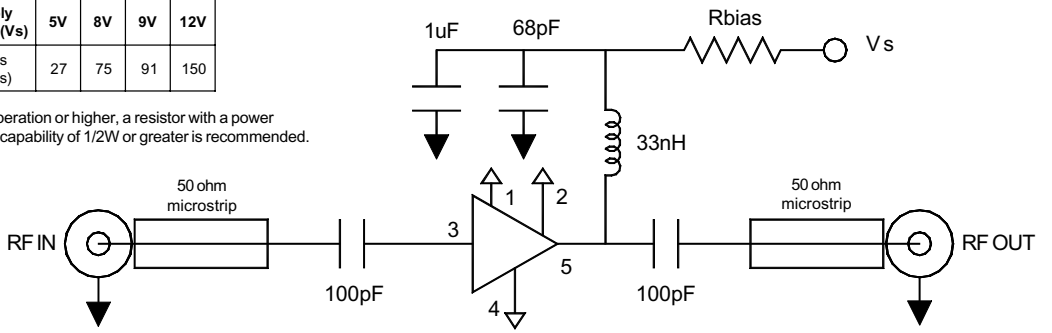
Parameter	Specification				Test Condition
	Min	Typ.	Max.	Unit	
Device Bias					T= 25C
Operating Voltage		3.4		V	
Operating Current		60		mA	
500 MHz					T= 25C
Gain		13.4		dB	
Noise Figure		4.4		dB	
Output IP3		31.6		dBm	
Output P1dB		15.7		dBm	
Input Return Loss		19.5		dB	
Isolation		18.1		dB	
850 MHz					T= 25C
Gain		13.0		dB	
Noise Figure		4.3		dB	
Output IP3		30.2		dBm	
Output P1dB		15.4		dBm	
Input Return Loss		17.6		dB	
Isolation		18.3		dB	
1950 MHz					T= 25C
Gain		12.0		dB	
Noise Figure		3.9		dB	
Output IP3		27.3		dBm	
Output P1dB		14.4		dBm	
Input Return Loss		17.2		dB	
Isolation		19.3		dB	
2400 MHz					T= 25C
Gain		11.4		dB	
Noise Figure		4.8		dB	
Output IP3		26.9		dBm	
Output P1dB		13.3		dBm	
Input Return Loss		19.2		dB	
Isolation		19.5		dB	

Pin #	Function	Description	Device Schematic
1	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.	
2	GND	Same as Pin 1	
3	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
4	GND	Same as Pin 1	
5	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.	

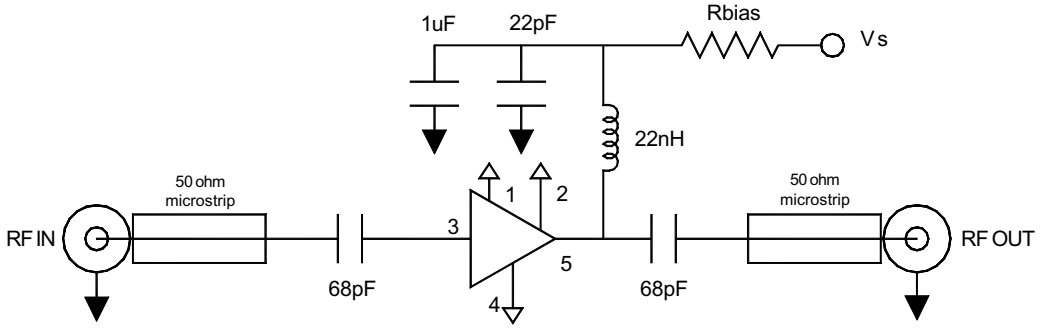
Application Schematic for Operation at 900 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	8V	9V	12V
Rbias (Ohms)	27	75	91	150

For 8V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.

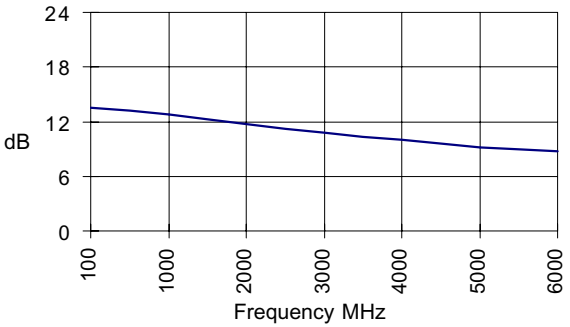


Application Schematic for Operation at 1900 MHz

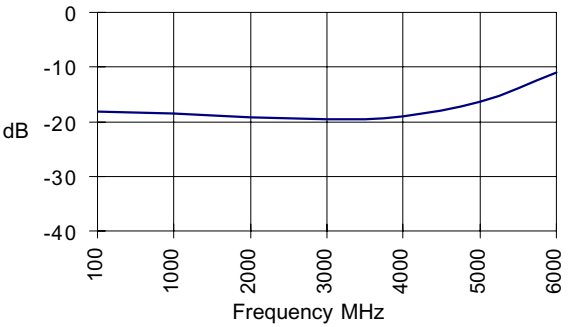


SGA-5225 DC-4000 MHz 3.4V SiGe Amplifier

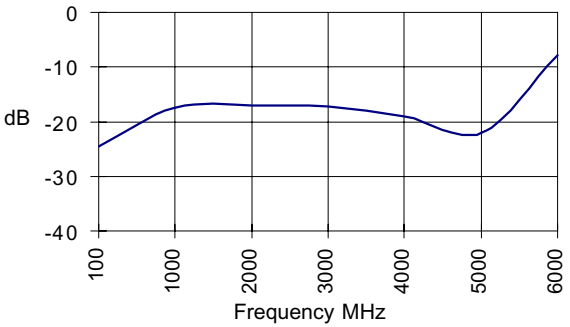
S21, Id =60mA, T=+25C



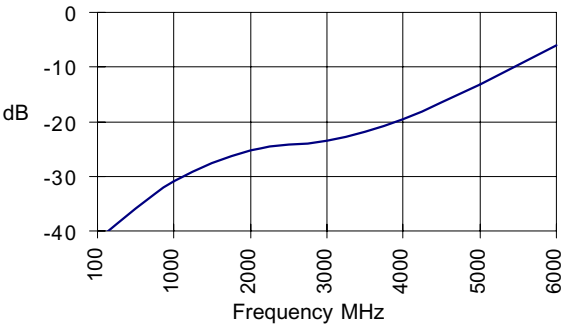
S12, Id =60mA, T=+25C



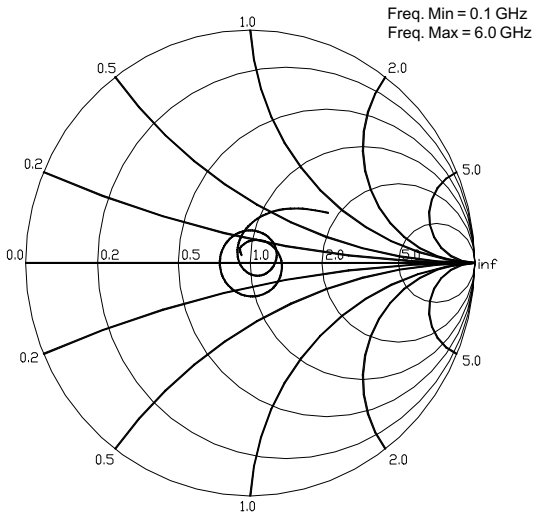
S11, Id =60mA, T=+25C



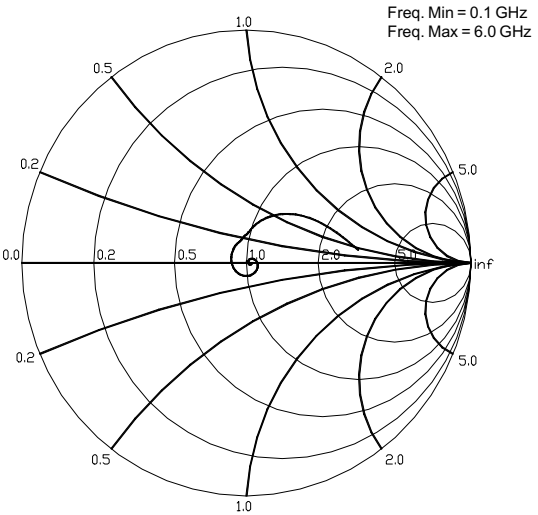
S22, Id =60mA, T=+25C



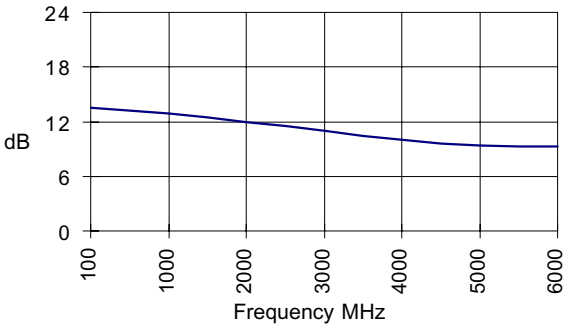
S11, Id=60mA, Ta= +25C



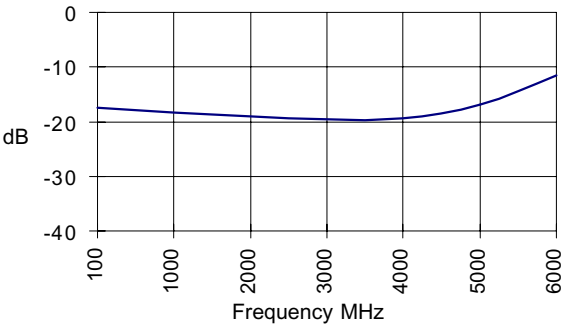
S22, Id=60mA, Ta= +25C



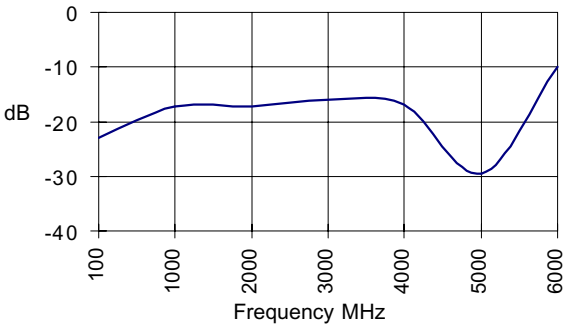
S21, Id =60mA, T=-40C



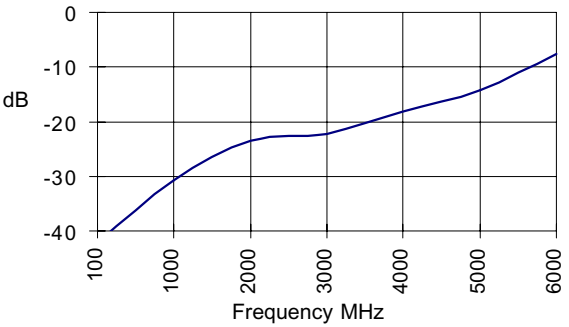
S12, Id =60mA, T=-40C



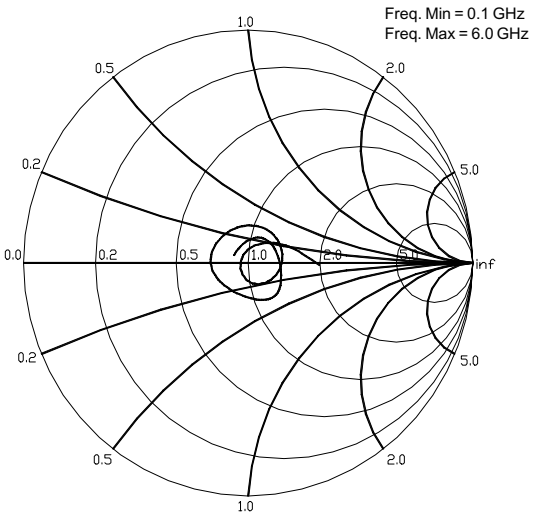
S11, Id =60mA, T=-40C



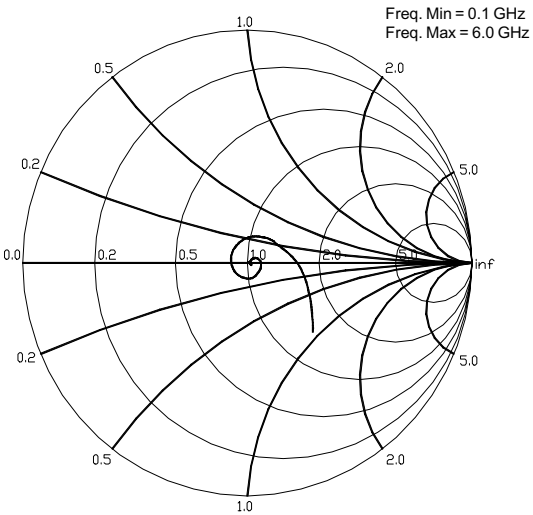
S22, Id =60mA, T=-40C



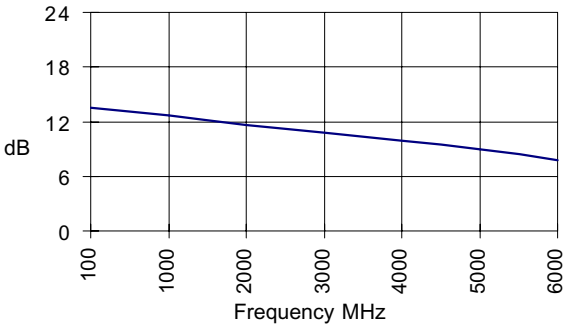
S11, Id=60mA, Ta= -40C



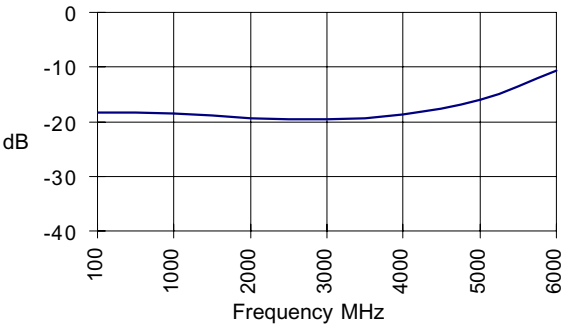
S22, Id=60mA, Ta= -40C



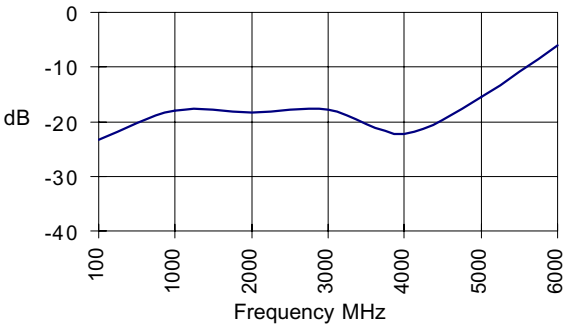
S21, Id =60mA, T=85C



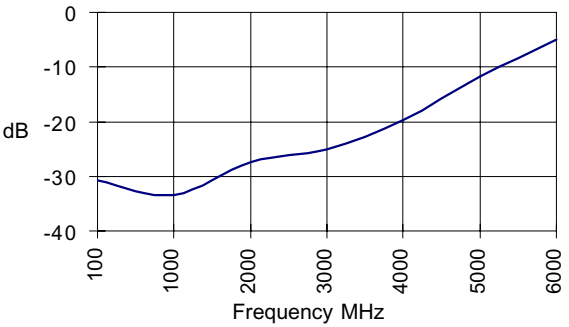
S12, Id =60mA, T=85C



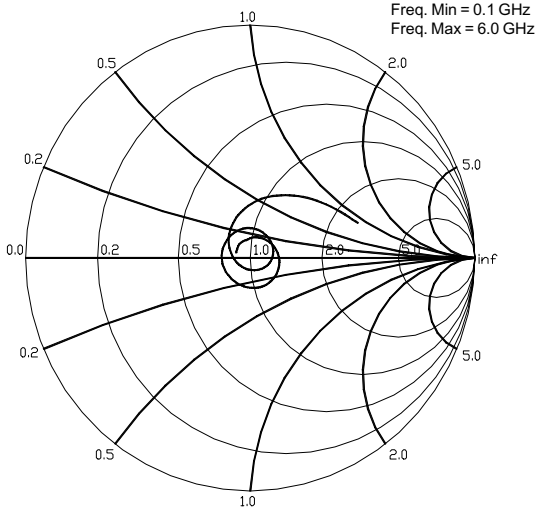
S11, Id =60mA, T=85C



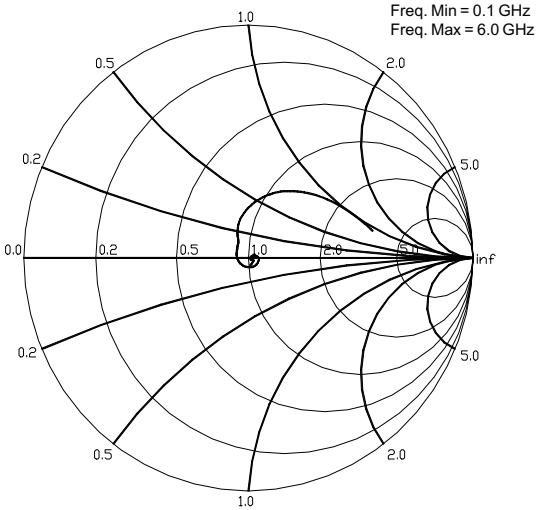
S22, Id =60mA, T=85C



S11, Id=60mA, Ta= 85C



S22, Id=60mA, Ta= 85C



Absolute Maximum Ratings

Parameter	Value	Unit
Supply Current	120	mA
Device Voltage	6.0	V
Operating Temperature	-40 to +85	C
Maximum Input Power	+20	dBm
Storage Temperature Range	-40 to +150	C
Operating Junction Temperature	+150	C

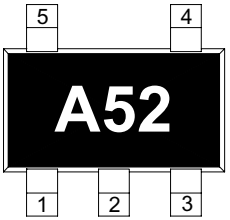
Caution:
Operation of this device above any one of these parameters may cause permanent damage. Appropriate precautions in handling, packaging and testing devices must be observed.

Thermal Resistance (Lead-Junction): 100° C/W

Part Number Ordering Information

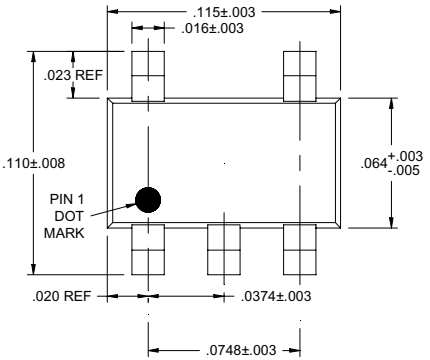
Part Number	Reel Size	Devices/Reel
SGA-5225	7"	3000

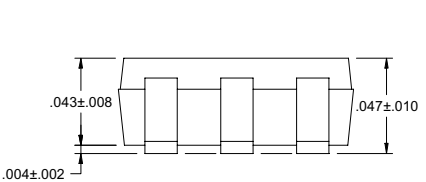
Package Marking



Pin Designation	
1	GND
2	GND
3	RF IN
4	GND
5	RF OUT/VCC

Package Dimensions





Pad Layout