Preliminary

SGA-1163

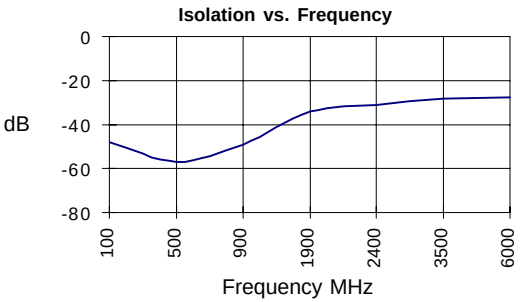
DC-6000 MHz Silicon Germanium HBT Cascadeable Gain Block

Product Description

Stanford Microdevices' SGA-1163 is a Silicon Germanium HBT Heterostructure Bipolar Transistor (SiGe HBT) amplifier that offers excellent isolation and flat gain response for applications to 6 GHz.

This RFIC is a 2-stage design that provides high isolation of up to 40dB at 2 GHz and is fabricated using the latest SiGe HBT 50 GHz F_T process, featuring 1 micron emitters with Vceo > 7V.

These unconditionally stable amplifiers have less than 1dB gain drift over 125ºC operating range (-40C to +85C) and are ideal for use as buffer amplifiers in oscillator applications covering cellular, ISM and narrowband PCS bands.



Product Features

- **DC-6000 MHz Operation**
- **Excellent Isolation, >50 dB at 900 MHz**
- **Single Supply Voltage**
- **Unconditionally Stable**
- **50 Ohms In/Out, Broadband Match for Operation from DC - 6 GHz**

Applications

- **Buffer Amplifier for Oscillator Applications**
- **Broadband, High Isolation**

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, Id = 12 mA, T = 25ºC		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz	dBm dBm		-3.3 -4.6	
S_{21}	Small Signal Gain	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 6000 MHz	dB dB dB	10.5	11.7 11.2 9.5	
S_{12}	Reverse Isolation	f = DC - 1000 MHz f = 1000 - 2000 MHz f = 2000 - 6000 MHz	dB dB dB		53.3 38.3 28.5	
S_{11}	Input VSWR	f = DC - 2400 MHz f = 2400 - 6000 MHz	-		1.3:1 1.8:1	
S_{22}	Output VSWR	f = DC - 2400 MHz f = 2400 - 6000 MHz	-		2.1:1 2.2:1	
IP_3	Third Order Intercept Point Power out per Tone = -20 dBm	f = 850 MHz f = 1950 MHz	dBm dBm		7.9 6.3	
NF	Noise Figure	f = DC - 1000 MHz f = 1000 - 2400 MHz	dB dB		3.1 3.4	
T_D	Group Delay	f = 1000 MHz	pS		118	
V_D	Device Voltage		V	4.2	4.6	5.0

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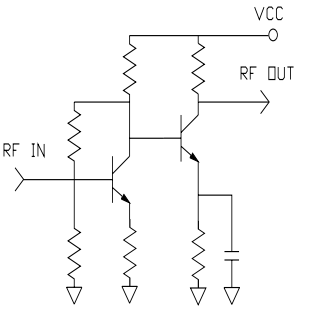
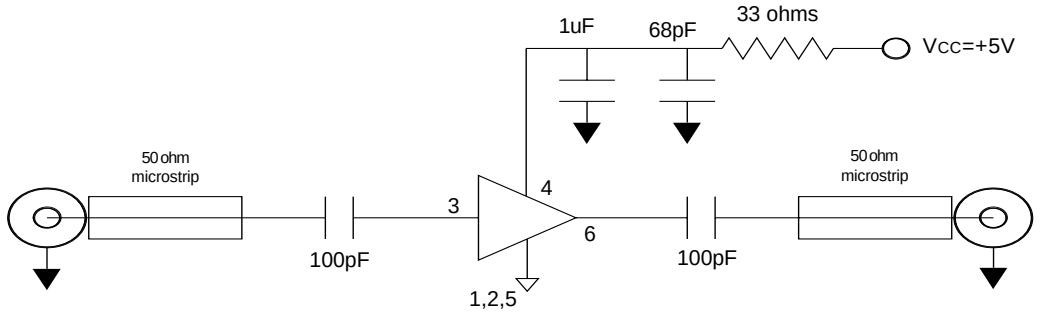
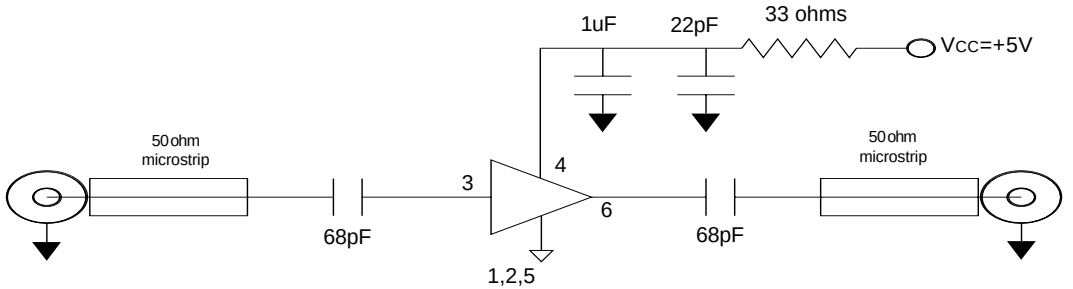
Parameter	Specification				Test Condition
	Min	Typ.	Max.	Unit	
Bandwidth					T= 25C
Frequency Range	DC		6000	MHz	
Device Bias					T= 25C
Operating Voltage		4.6		V	
Operating Current		12		mA	
500 MHz					T= 25C
Gain		11.8		dB	
Noise Figure		3.1		dB	
Output IP3		8.7		dBm	
Output P1dB		-3.8		dBm	
Input Return Loss		31.9		dB	
Isolation		62.3		dB	
850 MHz					T= 25C
Gain		11.5		dB	
Noise Figure		3.1		dB	
Output IP3		7.9		dBm	
Output P1dB		-3.3		dBm	
Input Return Loss		33.1		dB	
Isolation		47.6		dB	
1950 MHz					T= 25C
Gain		11.2		dB	
Noise Figure		3.4		dB	
Output IP3		6.3		dBm	
Output P1dB		-4.6		dBm	
Input Return Loss		15.7		dB	
Isolation		34.3		dB	
2400 MHz					T= 25C
Gain		11.4		dB	
Noise Figure		3.4		dB	
Output IP3		5.7		dBm	
Output P1dB		-4.4		dBm	
Input Return Loss		17.8		dB	
Isolation		30.2		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	Sames 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	Vcc	Supply connection. This pin should be bypassed with a suitable capacitor(s).	
5	GND	Sames as Pin 1	
6	RF OUT	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.	

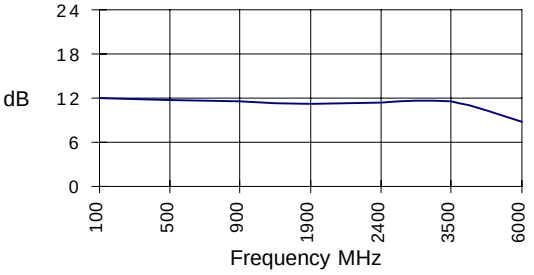
Application Schematic for +5V Operation at 900 MHz



Application Schematic for +5V Operation at 1900 MHz



S21, Id =12mA, T=+25C



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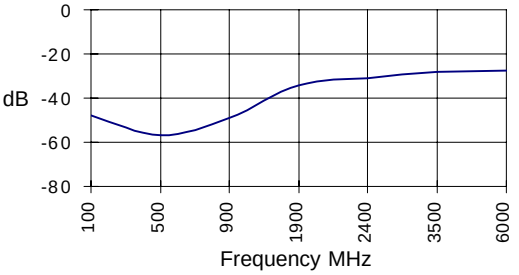

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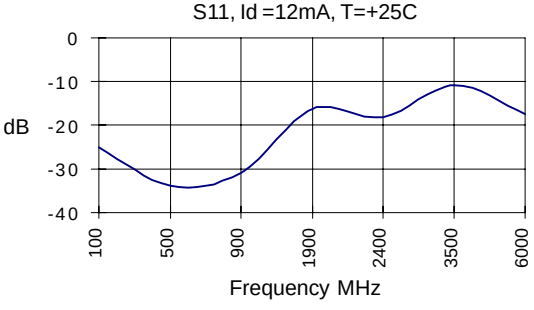
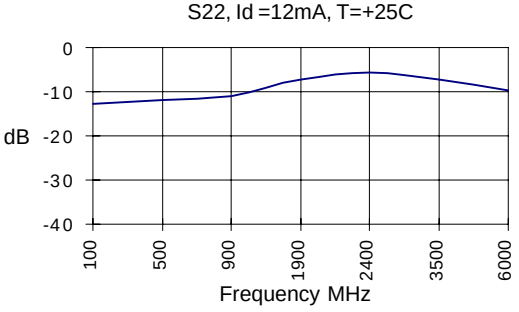
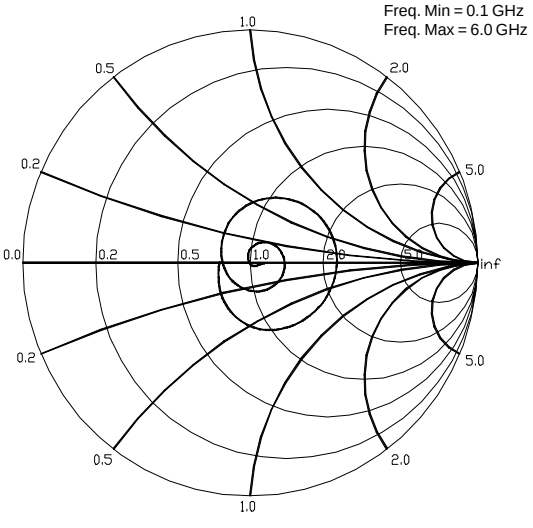


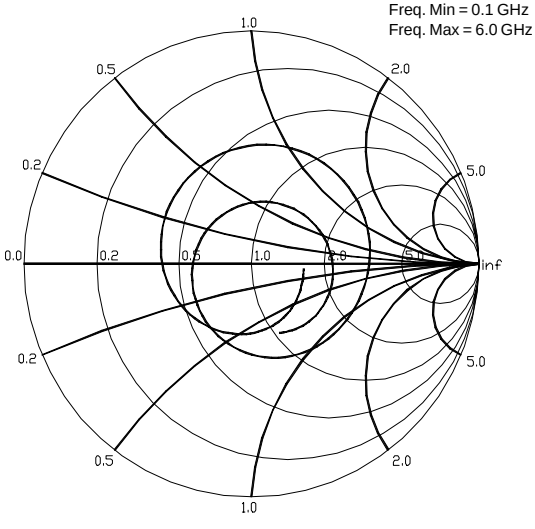
S22, Id =12mA, T=+25C



S11, Id=12mA, Ta= +25C



S22, Id=12mA, Ta= +25C



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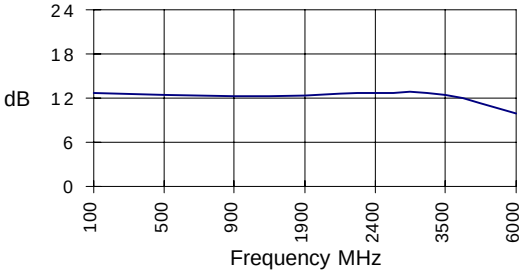
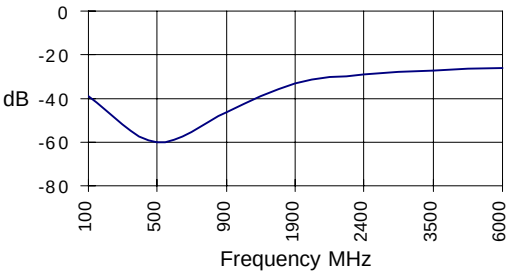


S12, Id =12mA, T=-40C



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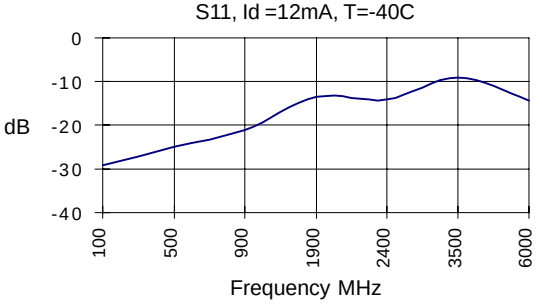

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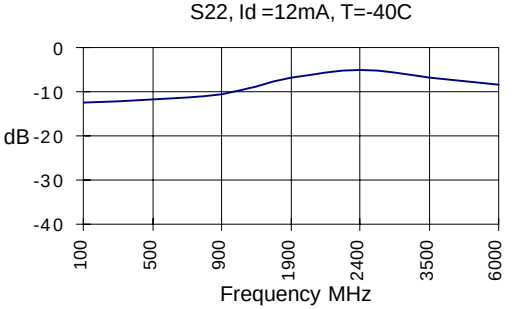

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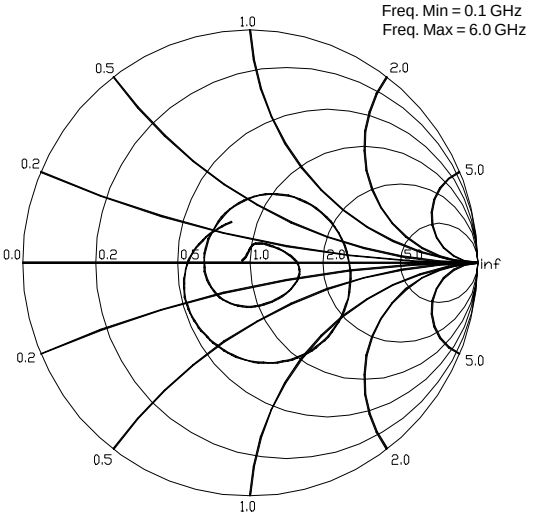
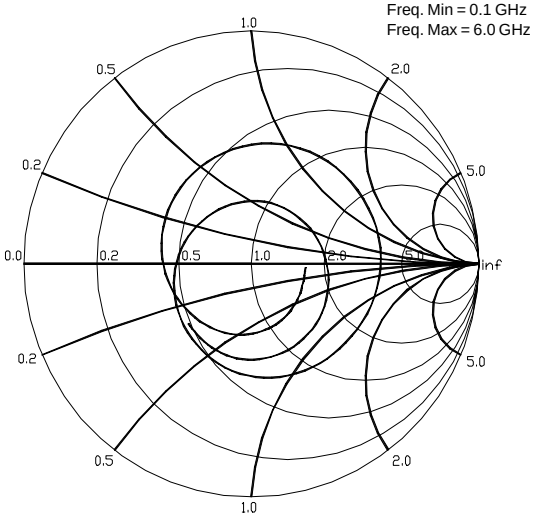
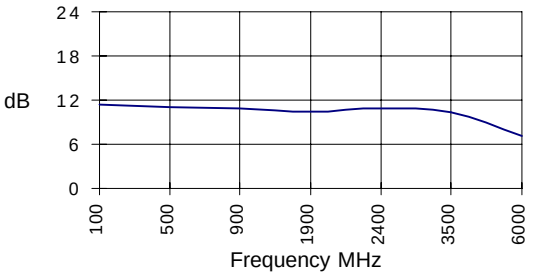


S22, Id=12mA, T=-40C



S21, Id =12mA, T=+85C



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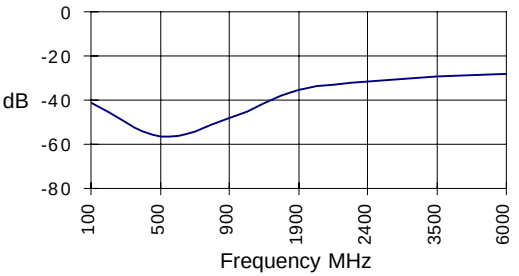

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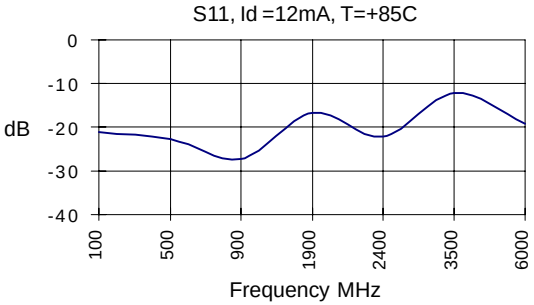

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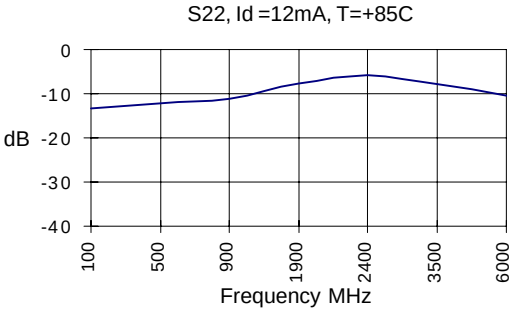

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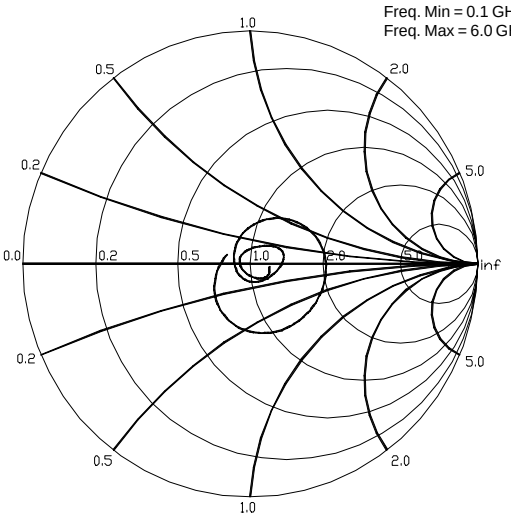

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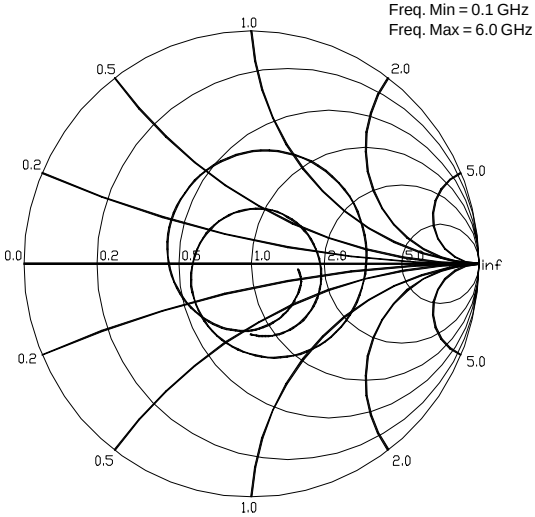


Absolute Maximum Ratings

Parameter	Value	Unit
Supply Current	24	mA
Operating Temperature	-40 to +85	C
Maximum Input Power	-9	dBm
Storage Temperature Range	-40 to +85	C
Operating Junction Temperature	+125	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.

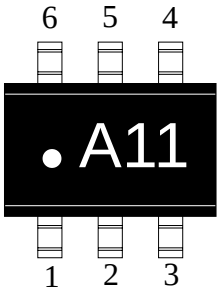
Thermal Resistance (Lead-Junction):
255° C/W

Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-1163-TR1	7"	3000

Recommended Bias Resistor Values					
Supply Voltage(Vs)	5V	6V	7.5V	9V	12V
Rbias (Ohms)	33	117	242	367	617

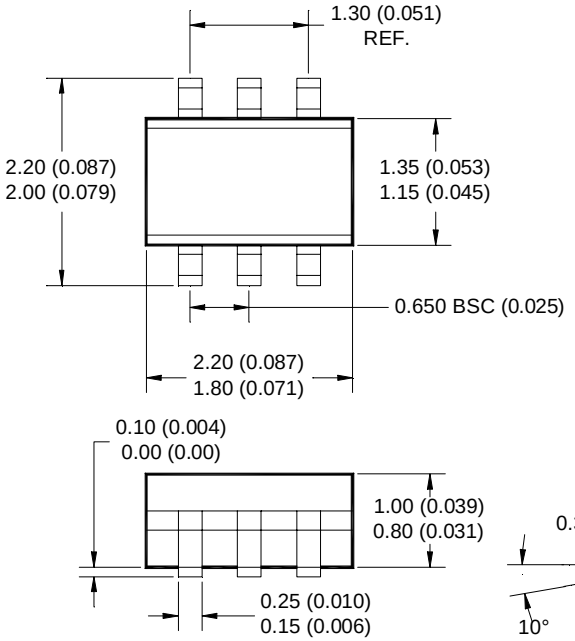
Package Marking



Pin Designation	
1	GND
2	GND
3	RF in
4	Vcc
5	GND
6	RF out

Note: Pin 1 is on lower left when you can read package marking

Package Dimensions



Pad Layout