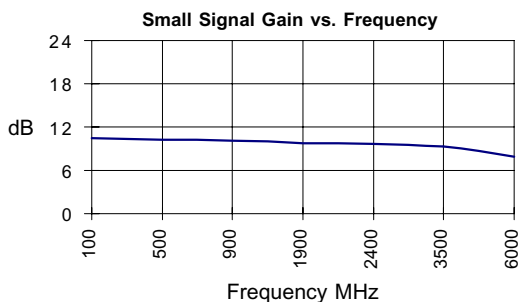


## Product Description

Stanford Microdevices' SGA-2163 is a high performance cascadeable 50-ohm amplifier designed for operation from a 2.2-volt supply. 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-2163 requires only DC blocking and bypass capacitors for external components.



**Preliminary**

## SGA-2163

### DC-5000 MHz Silicon Germanium HBT Cascadeable Gain Block



### Product Features

- DC-5000 MHz Operation
- 2.2V Single Voltage Supply
- High Output Intercept: +20dBm typ. at 850 MHz
- Low Power Consumption: 20mA
- Low Bias Operation: Can operate with 2V supply

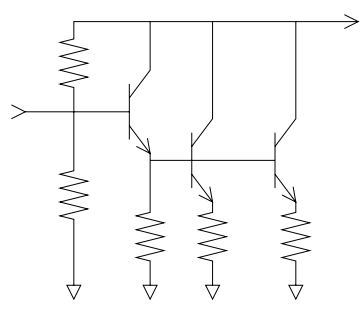
### Applications

- Broadband Gain Blocks
- Cordless Phones
- IF/ RF Buffer Amplifier
- Drivers for CATV Amplifiers

Symbol	Parameters: Test Conditions: $Z_0 = 50 \text{ Ohms}$ , $I_d = 20 \text{ mA}$ , $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
$P_{1dB}$	Output Power at 1dB Compression	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$	dBm dBm		7.1 6.2	
$S_{21}$	Small Signal Gain	$f = \text{DC} - 1000 \text{ MHz}$ $f = 1000 - 2000 \text{ MHz}$ $f = 2000 - 5000 \text{ MHz}$	dB dB dB	9.3	10.3 9.9 9.0	
$S_{12}$	Reverse Isolation	$f = \text{DC} - 1000 \text{ MHz}$ $f = 1000 - 2000 \text{ MHz}$ $f = 2000 - 5000 \text{ MHz}$	dB dB dB		15.5 15.9 16.8	
$S_{11}$	Input VSWR	$f = \text{DC} - 2400 \text{ MHz}$ $f = 2400 - 5000 \text{ MHz}$	-		1.2:1 1.2:1	
$S_{22}$	Output VSWR	$f = \text{DC} - 2400 \text{ MHz}$ $f = 2400 - 5000 \text{ MHz}$	-		1.2:1 1.2:1	
$IP_3$	Third Order Intercept Point Power out per Tone = -10 dBm	$f = 850 \text{ MHz}$ $f = 1950 \text{ MHz}$	dBm dBm		20.0 18.9	
NF	Noise Figure	$f = \text{DC} - 1000 \text{ MHz}$ $f = 1000 - 2400 \text{ MHz}$	dB dB		4.1 4.4	
$T_D$	Group Delay	$f = 1000 \text{ MHz}$	pS		84	
$V_D$	Device Voltage		V	1.9	2.2	2.5

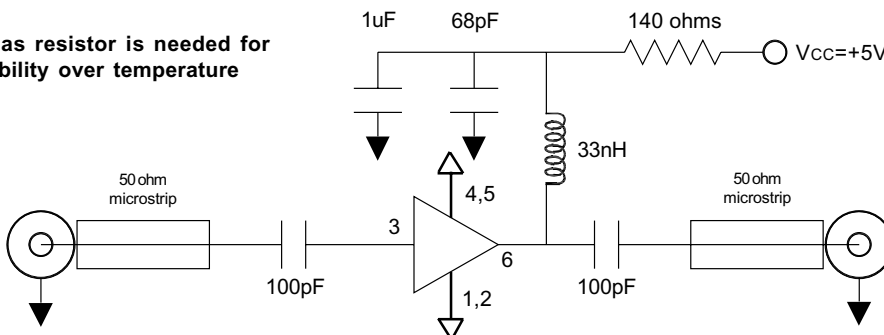
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Parameter	Specification			Unit	Test Condition
	Min	Typ.	Max.		
<b>Device Bias</b>					T= 25C
Operating Voltage		2.2		V	
Operating Current		20.0		mA	
<b>500 MHz</b>					T= 25C
Gain		10.3		dB	
Noise Figure		4.2		dB	
Output IP3		20.9		dBm	
Output P1dB		7.2		dBm	
Input Return Loss		20.0		dB	
Isolation		15.3		dB	
<b>850 MHz</b>					T= 25C
Gain		10.2		dB	
Noise Figure		4.1		dB	
Output IP3		21.0		dBm	
Output P1dB		7.1		dBm	
Input Return Loss		20.6		dB	
Isolation		15.4		dB	
<b>1950 MHz</b>					T= 25C
Gain		9.8		dB	
Noise Figure		4.4		dB	
Output IP3		18.9		dBm	
Output P1dB		6.2		dBm	
Input Return Loss		19.4		dB	
Isolation		16.1		dB	
<b>2400 MHz</b>					T= 25C
Gain		9.6		dB	
Noise Figure		4.8		dB	
Output IP3		16.9		dBm	
Output P1dB		5.6		dBm	
Input Return Loss		17.6		dB	
Isolation		16.4		dB	

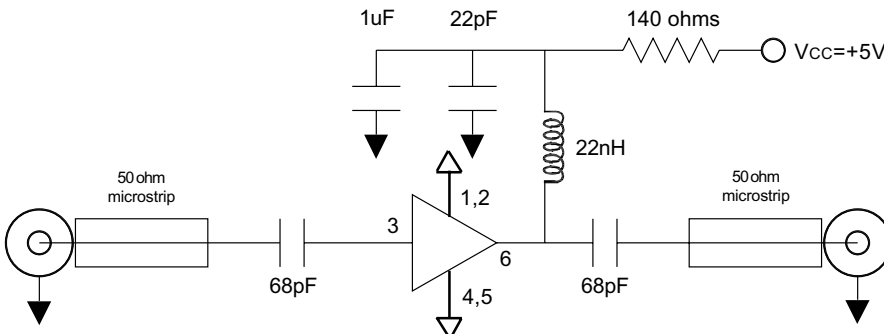
Pin #	Function	Description	Device Schematic
1	GND	Connection to ground. Use via holes for best performance to reduce lead inductance as close to ground leads as possible.	
2	GND	Sames as Pin 1	
3	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency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

**Note: A bias resistor is needed for stability over temperature**

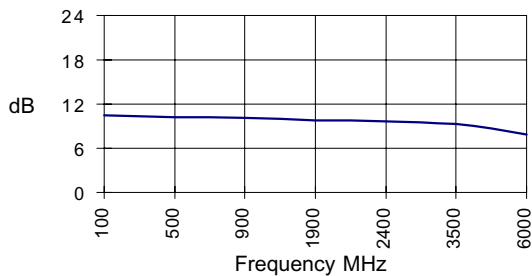


### Application Schematic for +5V Operation at 1900 MHz

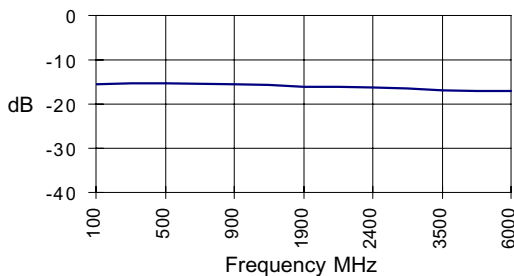


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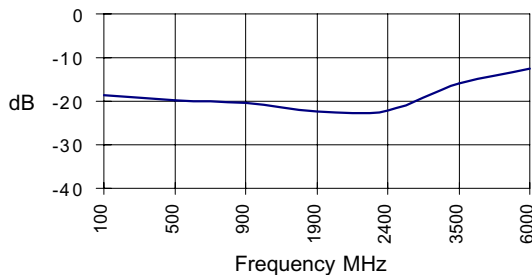
S21, Id =20mA, T=+25C



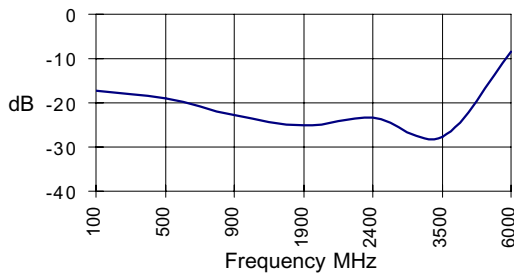
S12, Id =20mA, T=+25C



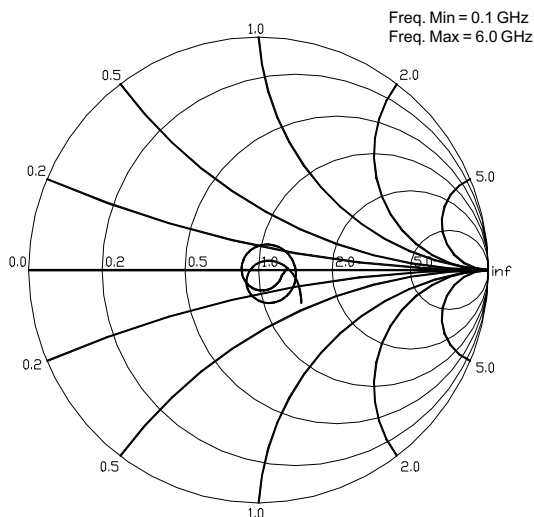
S11, Id =20mA, T=+25C



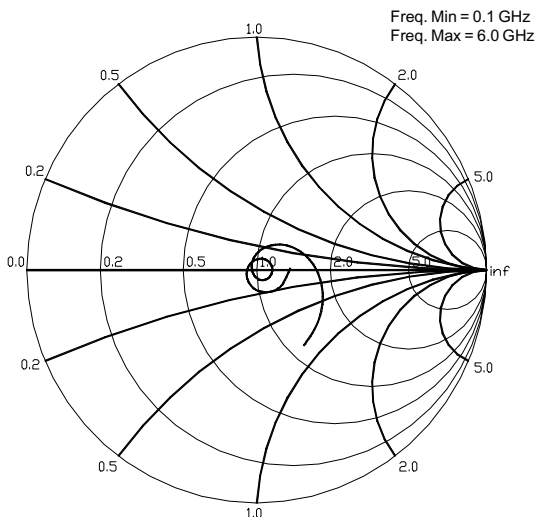
S22, Id =20mA, T=+25C



S11, Id=20mA, Ta= +25C

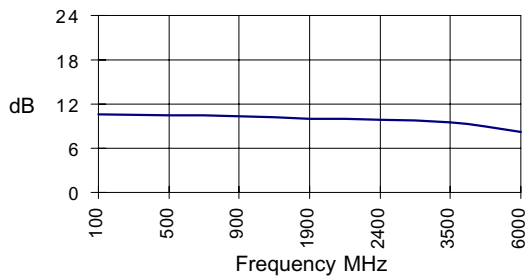


S22, Id=20mA, Ta= +25C

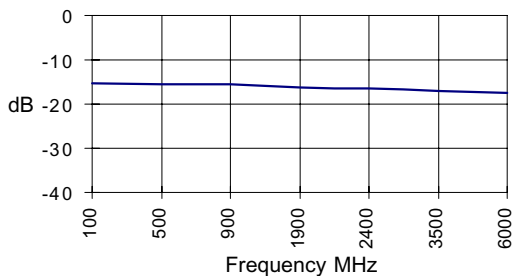


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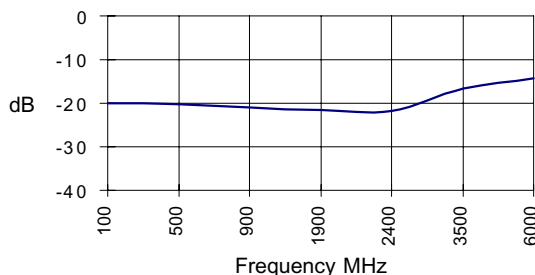
S21, Id =20mA, T=-40C



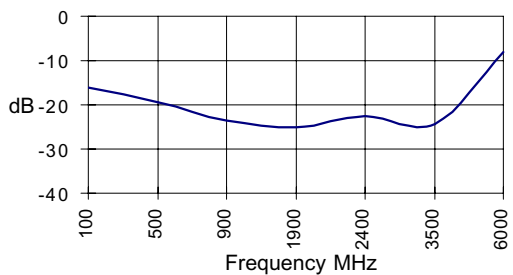
S12, Id =20mA, T=-40C



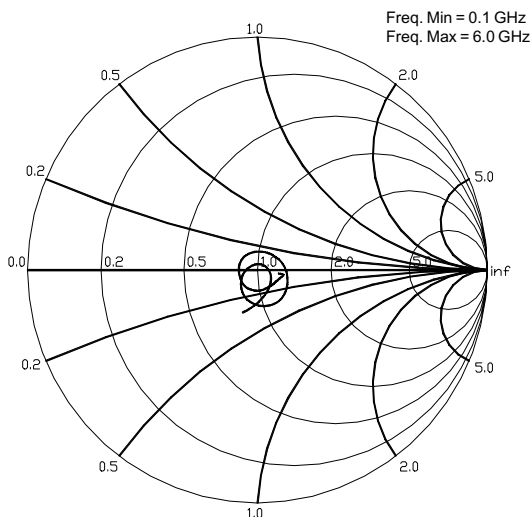
S11, Id =20mA, T=-40C



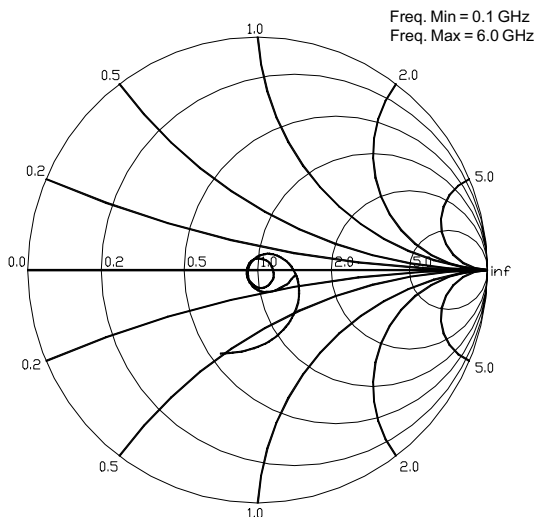
S22, Id =20mA, T=-40C



S11, Id=20mA, T=-40C

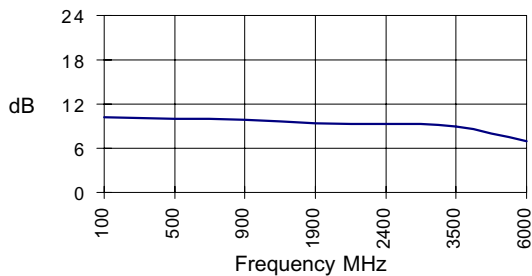


S22, Id=20mA, T=-40C

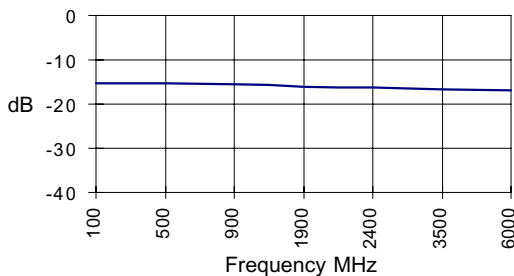


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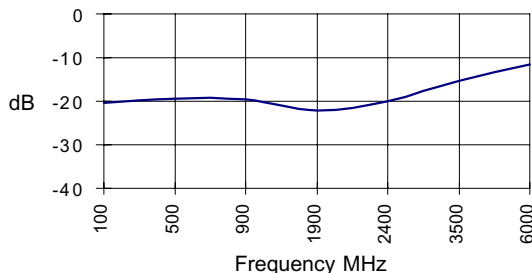
S21, Id =20mA, T=+85C



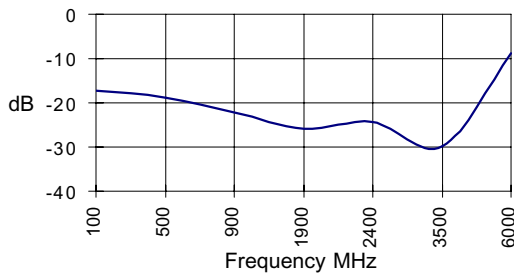
S12, Id =20mA, T=+85C



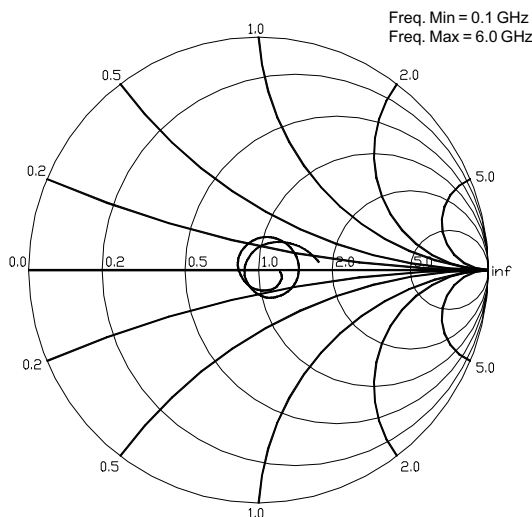
S11, Id =20mA, T=+85C



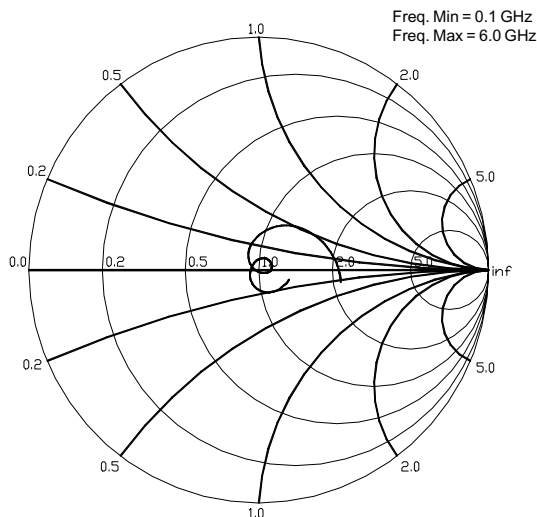
S22, Id =20mA, T=+85C



S11, Id=20mA, T=+85C



S22, Id=20mA, T=+85C



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### Absolute Maximum Ratings

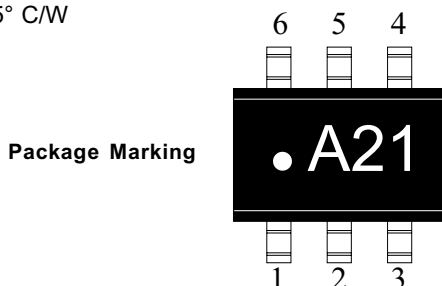
Parameter	Value	Unit
Supply Current	40	mA
Operating Temperature	-40 to +85	C
Maximum Input Power	+2	dBm
Storage Temperature Range	-40 to +85	C
Operating Junction Temperature	+125	C

### Caution:

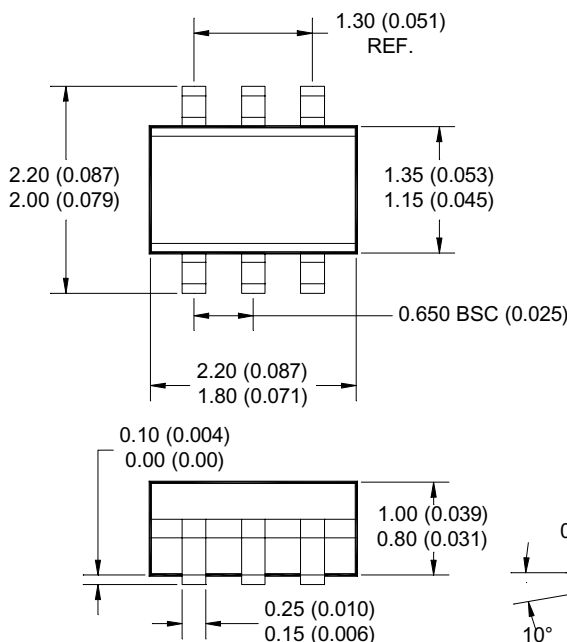


Operation of this device above any one of these parameters may cause permanent damage. Appropriate precautions in handling, packaging and testing devices must be observed.

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



### Package Dimensions



### Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-2163-TR1	7"	3000

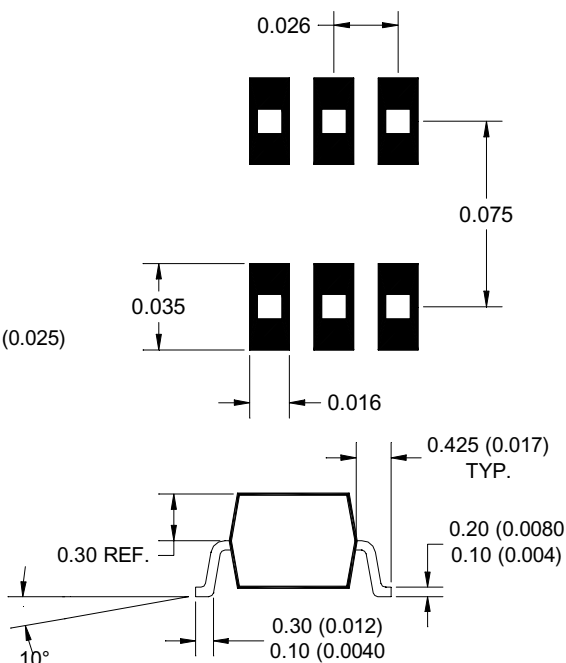
### Recommended Bias Resistor Values

Supply Voltage(Vs)	3V	5V	7.5V	9V	12V
Rbias (Ohms)	40	140	265	340	490

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

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

### Pad Layout



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