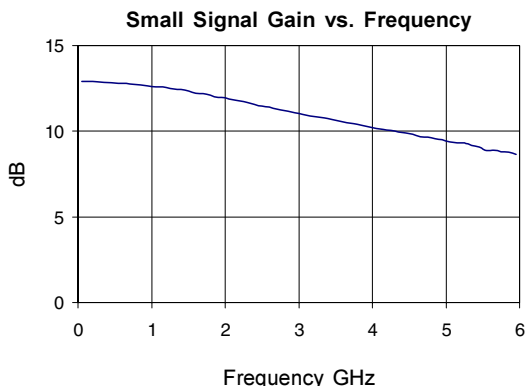


## Product Description

Stanford Microdevices' SGA-0163 is a high performance cascadeable 50-ohm amplifier designed for operation at voltages as low as 2.1V. 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-0163 requires only DC blocking and bypass capacitors for external components.



Preliminary

## SGA-0163

### DC-4500 MHz, Silicon Germanium Cascadeable Gain Block



### Product Features

- DC-4500 MHz Operation
- Single Voltage Supply
- Low Current Draw: 8mA at 2.1V typ.
- High Output Intercept: 10 dBm typ. at 1950MHz

### Applications

- Oscillator Amplifiers
- Broadband Gain Blocks
- IF/RF Buffer Amplifiers

Symbol	Parameters: Test Conditions: $Z_0 = 50 \text{ Ohms}$ , $I_D = 8 \text{ mA}$ , $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
$P_{1dB}$	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		-1.8 -1.8 -2.4	
$IP_3$	Third Order Intercept Point Power out per tone = -17 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		9.4 9.8 9.2	
$S_{21}$	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		12.7 12.0 11.6	
$BW_{3dB}$	3dB Bandwidth		MHz		4500	
$S_{11}$	Input VSWR	f = DC - 4500MHz	-		1.6:1	
$S_{22}$	Output VSWR	f = DC - 4500MHz	-		1.3:1	
$S_{12}$	Reverse Isolation	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		17.6 18.1 18.3	
NF	Noise Figure	f = 1950 MHz	dB		4.6	
$V_D$	Device Voltage		V		2.1	
$R_{th, j-l}$	Thermal Resistance (junction - lead)		$^\circ\text{C/W}$		255	

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**SGA-0163 DC-4.5 GHz 2.1V SiGe Amplifier**
**Absolute Maximum Ratings**

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

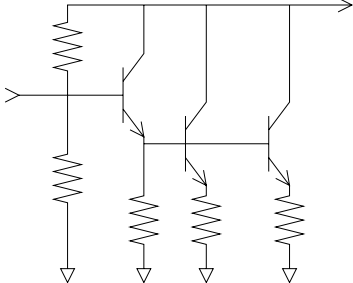
Bias Conditions should also satisfy the following expression:  $I_D V_D (\text{max}) < (T_J - T_{OP})/R_{th,j-l}$

Parameter	Value	Unit
Supply Current	16	mA
Device Voltage	6	V
Operating Temperature	-40 to +85	°C
Maximum Input Power	-4	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 ( $I_D = 8\text{mA}$ , unless otherwise noted)
<b>100 MHz</b>			
Gain	12.9	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.4	dBm	
Output P1dB	-1.5	dBm	
Input Return Loss	12.5	dB	
Reverse Isolation	17.3	dB	
Noise Figure	4.6	dB	$Z_s = 50\text{ Ohms}$
<b>500 MHz</b>			
Gain	12.8	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.5	dBm	
Output P1dB	-1.5	dBm	
Input Return Loss	12.7	dB	
Reverse Isolation	17.4	dB	
Noise Figure	4.6	dB	$Z_s = 50\text{ Ohms}$
<b>850 MHz</b>			
Gain	12.7	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.4	dBm	
Output P1dB	-1.8	dBm	
Input Return Loss	12.8	dB	
Reverse Isolation	17.6	dB	
Noise Figure	4.7	dB	$Z_s = 50\text{ Ohms}$
<b>1950 MHz</b>			
Gain	12.0	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.8	dBm	
Output P1dB	-1.8	dBm	
Input Return Loss	12.4	dB	
Reverse Isolation	18.1	dB	
Noise Figure	4.6	dB	$Z_s = 50\text{ Ohms}$
<b>2400 MHz</b>			
Gain	11.6	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.2	dBm	
Output P1dB	-2.5	dBm	
Input Return Loss	12.1	dB	
Reverse Isolation	18.3	dB	
<b>3500 MHz</b>			
Gain	10.6	dB	Tone spacing = 1 MHz, Pout per tone = -17dBm
Output IP3	9.3	dBm	
Output P1dB	-2.7	dBm	
Input Return Loss	11.8	dB	
Reverse Isolation	18.5	dB	

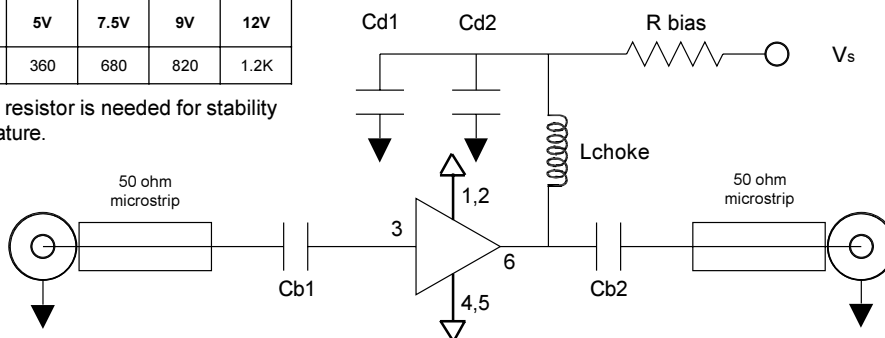
**SGA-0163 DC-4.5 GHz 2.1V SiGe Amplifier**

Pin #	Function	Description	Device Schematic
1	GND	Connection to ground. For best performance use via holes (as close to ground leads as possible) to reduce lead inductance.	
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	GND	Same as Pin 1	
6	RF OUT	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 this bias network should be well bypassed.	

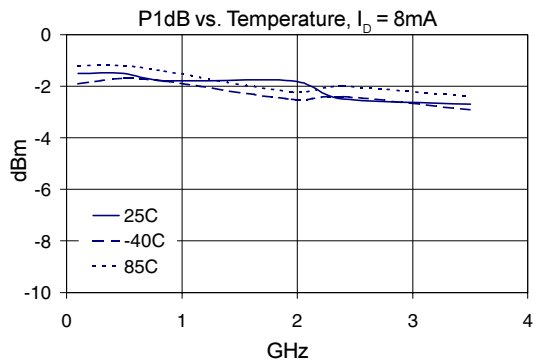
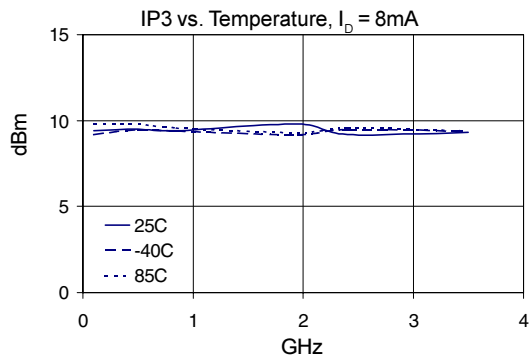
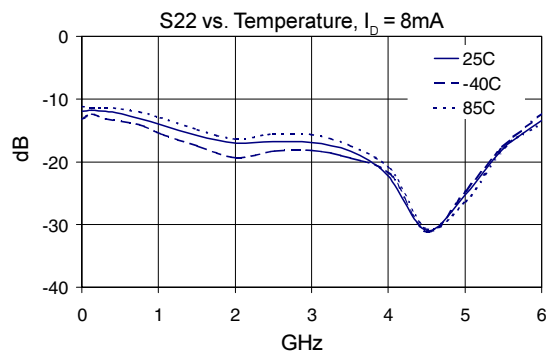
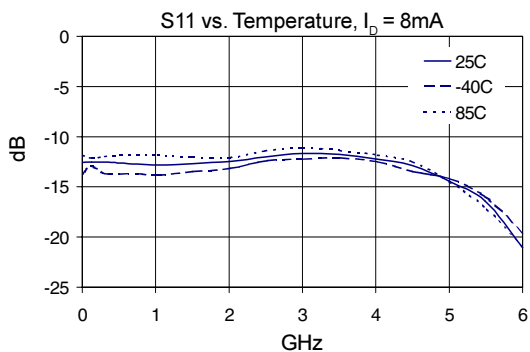
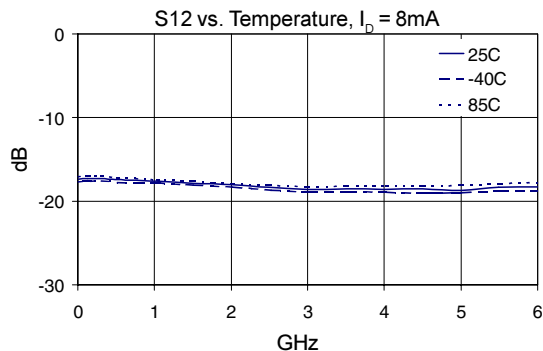
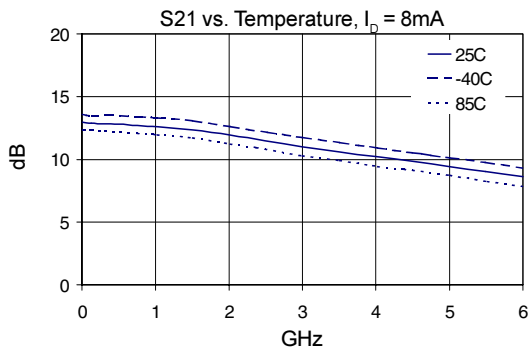
**Application Schematic**

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	7.5V	9V	12V
Rbias (Ohms)	360	680	820	1.2K

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



Reference Designator	Function	500 MHz	850 MHz	1950 MHz	2400 MHz
Cb1	DC Blocking	220 pF	100 pF	68 pF	56 pF
Cb2	DC Blocking	220 pF	100 pF	68 pF	56 pF
Cd1	Decoupling	1 uF	1 uF	1 uF	1 uF
Cd2	Decoupling	100 pF	68 pF	22 pF	22 pF
Lchoke	AC Blocking	68 nH	33 nH	22 nH	18 nH

**SGA-0163 DC-4.5 GHz 2.1V SiGe Amplifier**


# SGA-0163 DC-4.5 GHz 2.1V SiGe Amplifier



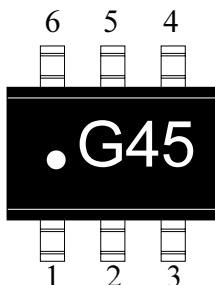
## Caution: ESD sensitive

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

## Part Number Ordering Information

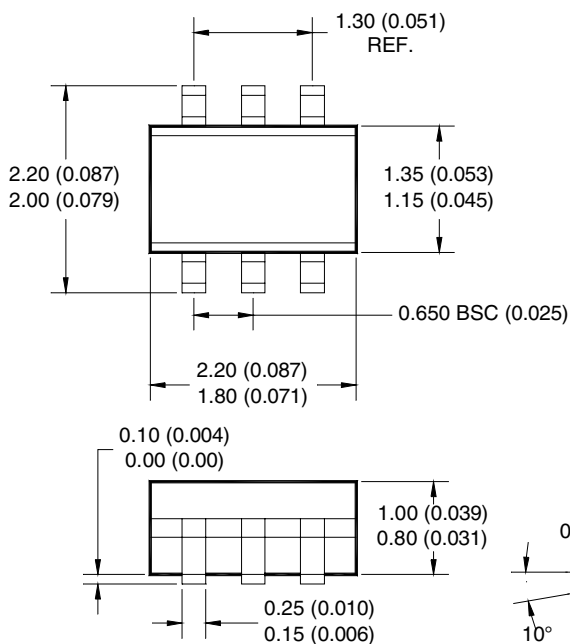
Part Number	Reel Size	Devices/Reel
SGA-0163	7"	3000

## Package Marking

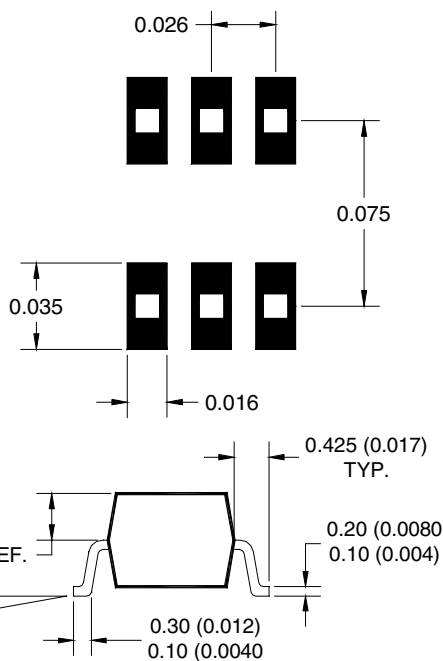


Note: Pin 1 is on lower left when you can read package marking

## Package Dimensions



## Pad Layout



DIMENSIONS ARE IN INCHES [MM]