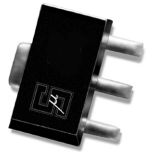
SCA-5

DC-3 GHz, Cascadable GaAs HBT MMIC Amplifier

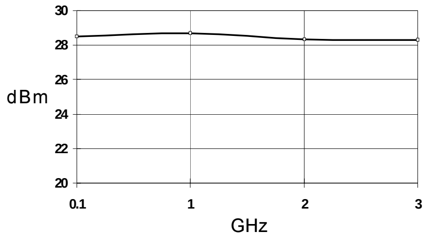


Product Description

Sirenza Microdevices' SCA-5 is a high performance Gallium Arsenide Heterojunction Bipolar Transistor MMIC Amplifier. A Darlington configuration is utilized for broadband performance up to 3 GHz. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Typical IP3 at 50mA is +28dBm.

These unconditionally stable amplifiers provides up to 12dB of gain and +13.5dBm of 1dB compressed power and requires only a single positive voltage supply. Only 2 DC-blocking capacitors, a bias resistor and an optional inductor are needed for operation.

Output IP3 vs. Frequency



Product Features

- **High Output IP3 : +29dBm**
- **Flat Gain : +/- 0.5dB Over Full Band**
- **Cascadable 50 Ohm : 1.5:1 VSWR**
- **Patented GaAsHBT Technology**
- **Operates From Single Supply**
- **Low Thermal Resistance Package**

Applications

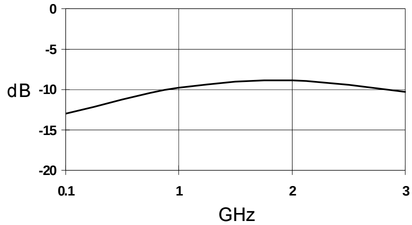
- **PA Driver Amplifier**
- **Cellular, PCS, GSM, UMTS**
- **IF Amplifier**
- **Wireless Data, Satellite**

Symbol	Parameter	Units	Frequency	Min.	Typ.	Max.
G_P	Small Signal Power Gain	dB dB dB	850 MHz 1950 MHz 2400 MHz	10.0	12.0 11.0 10.5	13.2
G_F	Gain Flatness	dB	0.1-2.0 GHz		+/- 0.5	
P_{1dB}	Output Power at 1dB Compression	dBm	1950 MHz		13.5	
OIP_3	Output Third Order Intercept Point	dBm	1950 MHz		28.0	
NF	Noise Figure	dB	1950 MHz		6.0	
VSWR	Input / Output	-	0.1-3.0 GHz		1.5:1	
ISOL	Reverse Isolation	dB	0.1-3.0 GHz		16	
V_D	Device Operating Voltage	V		3.3	3.8	4.3
I_D	Device Operating Current	mA		45	50	55
dG/dT	Device Gain Temperature Coefficient	dB/°C			-0.0015	
R_{TH}, j-l	Thermal Resistance (junction to lead)	°C/W			510	

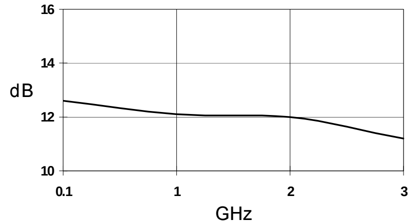
Test Conditions: V_S = 8 V, R_{BIAS} = 82 Ohms; I_D = 50 mA Typ., T_L = 25ºC; OIP_3 Tone Spacing = 1 MHz, Pout per tone = -15 dBm, $Z_S = Z_L$ = 50 Ohms

Typical Performance at 25°C (Vds = 3.8V, Ids = 50mA)

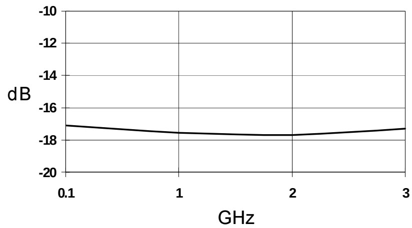
|S11| vs. Frequency



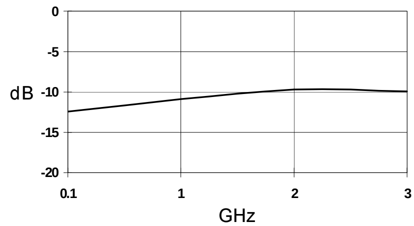
|S21| vs. Frequency



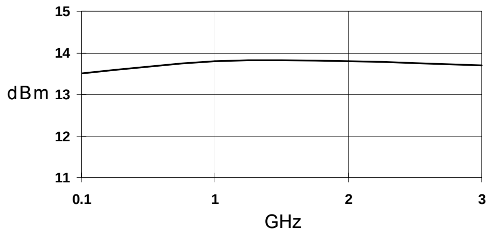
|S12| vs. Frequency



|S22| vs. Frequency



Output Power vs. Frequency



Typical S-Parameters Vds = 3.8V, Id = 50mA

Freq GHz	|S11|	S11 Ang	|S21|	S21 Ang	|S12|	S12 Ang	|S22|	S22 Ang
.100	0.284	125	4.182	152	0.143	-24	0.235	131
.500	0.297	119	4.170	138	0.139	-33	0.249	119
.900	0.320	73	4.042	107	0.135	-58	0.276	75
1.00	0.327	62	4.025	98	0.136	-64	0.285	63
1.50	0.354	8	3.948	60	0.133	-96	0.319	10
2.00	0.360	-44	3.983	21	0.130	-125	0.338	-43
2.50	0.344	-97	3.777	-20	0.133	-157	0.339	-97
3.00	0.307	-152	3.618	-55	0.137	-167	0.320	-151

(S-Parameters include the effects of two 1.0 mil diameter bond wires, each 20 mils long, connected to the gate and drain pads on the die)

SIRENZA MICRODEVICES

SCA-5 DC-3 GHz Cascadable MMIC Amplifier

Absolute Maximum Ratings

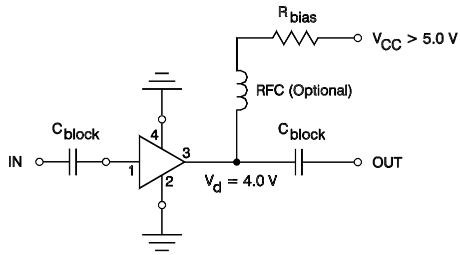
Parameter	Absolute Limit
Max. Device Current (I_D)	75 mA
Max. Device Voltage (V_D)	6 V
Max. RF Input Power	+20 dBm
Max. Junction Temp. (T_J)	+150°C
Operating Temp. Range (T_L)	-40°C to +85°C
Max. Storage Temp.	+150°C

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias Conditions should also satisfy the following expression:

$I_D V_D < (T_J - T_L) / R_{TH}$, j-l

Typical Biasing Configuration



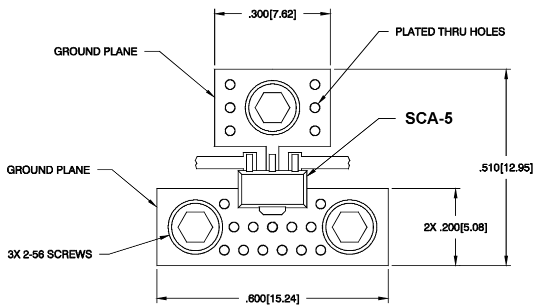
Recommended Bias Resistor Values						
Supply Voltage (Vs)	5V	7.5V	9V	12V	15V	20V
Rbias (Ohms)	20	70	100	160	220	320

Mounting Instructions

The data shown was taken on a 31mil thick FR-4 board with 1 ounce of copper on both sides.
The board was mounted to a baseplate with 3 screws as shown. The screws bring the top side copper temperature to the same value as the baseplate.

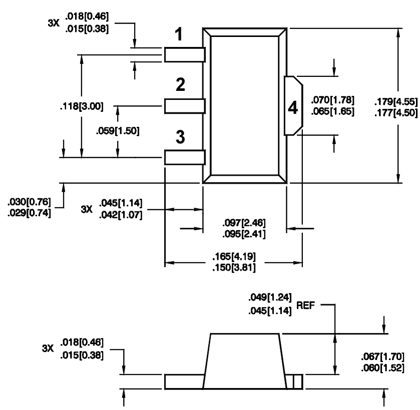
1. Use 1 or 2 ounce copper, if possible.
2. Solder the copper pad on the backside of the device package to the ground plane.
3. Use a large ground pad area with many plated through-holes as shown.
4. If possible, use at least one screw no more than 0.2 inch from the device package to provide a low thermal resistance path to the baseplate of the package.
5. Thermal resistance from ground lead to screws is 2 deg. C/W.

Pin Designation	
1	RF in
2	GND
3	RF out and Bias
4	GND



DIMENSIONS ARE IN INCHES [MM]

Outline Drawing



DIMENSIONS ARE IN INCHES [MM]
Pin assignments shown for reference only, not marked on part