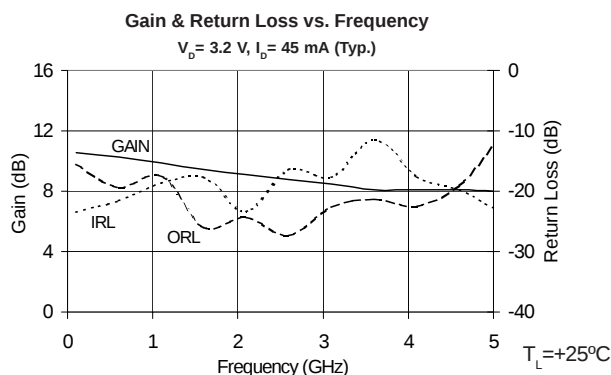




Product Description

The SGA-4186 is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration featuring 1 micron emitters provides high F_T and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Only 2 DC-blocking capacitors, a bias resistor and an optional RF choke are required for operation.

The matte tin finish on Sirenza's lead-free package utilizes a post annealing process to mitigate tin whisker formation and is RoHS compliant per EU Directive 2002/95. This package is also manufactured with green molding compounds that contain no antimony trioxide nor halogenated fire retardants.



SGA-4186

SGA-4186Z  RoHS Compliant & Green Package

**DC-5000 MHz, Cascadable
SiGe HBT MMIC Amplifier**



Product Features

- Now available in Lead Free, RoHS Compliant, & Green Packaging
- Broadband Operation: DC-5000 MHz
- Cascadable 50 Ohm
- Operates From Single Supply
- Low Thermal Resistance Package

Applications

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

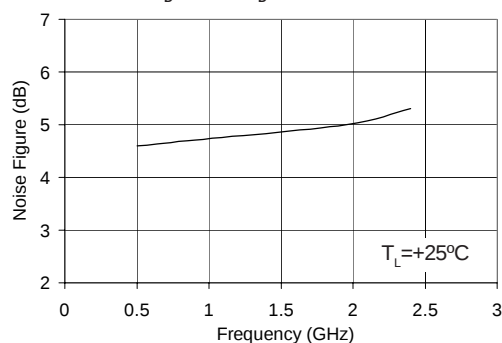
Symbol	Parameter	Units	Frequency	Min.	Typ.	Max.
G	Small Signal Gain	dB	850 MHz 1950 MHz 2400 MHz	9.0	10.0 9.2 8.9	11.0
P_{1dB}	Output Power at 1dB Compression	dBm	850 MHz 1950 MHz		14.6 12.4	
OIP_3	Output Third Order Intercept Point	dBm	850 MHz 1950 MHz		28.3 25.5	
Bandwidth	Determined by Return Loss (>10dB)	MHz			5000	
IRL	Input Return Loss	dB	1950 MHz		20.3	
ORL	Output Return Loss	dB	1950 MHz		24.4	
NF	Noise Figure	dB	1950 MHz		5.0	
V_D	Device Operating Voltage	V		2.9	3.2	3.5
I_D	Device Operating Current	mA		41	45	49
$R_{TH, j-l}$	Thermal Resistance (junction to lead)	°C/W			97	
Test Conditions:			$V_S = 8 \text{ V}$ $R_{BIAS} = 110 \text{ Ohms}$ $I_D = 45 \text{ mA Typ.}$ $T_L = 25^\circ\text{C}$ OIP_3 Tone Spacing = 1 MHz, P_{out} per tone = -5 dBm $Z_S = Z_L = 50 \text{ Ohms}$			

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Typical RF Performance at Key Operating Frequencies

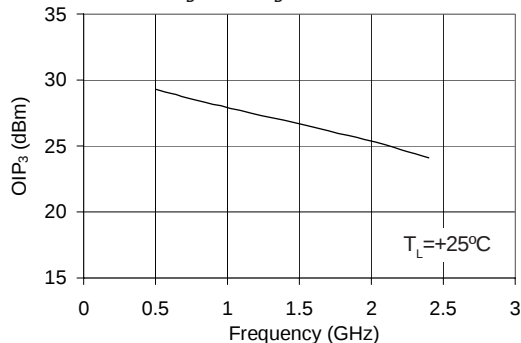
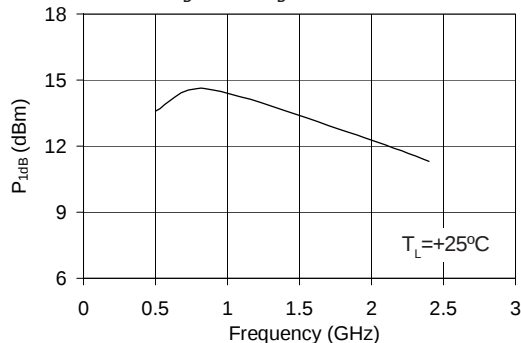
Symbol	Parameter	Unit	Frequency (MHz)					
			100	500	850	1950	2400	3500
G	Small Signal Gain	dB	10.5	10.4	10.0	9.2	8.9	8.1
OIP ₃	Output Third Order Intercept Point	dBm		29.3	28.3	25.5	24.1	
P _{1dB}	Output Power at 1dB Compression	dBm		13.6	14.6	12.4	11.3	
IRL	Input Return Loss	dB	23.6	25.6	16.2	20.3	22.7	11.7
ORL	Output Return Loss	dB	15.6	20.4	14.8	24.4	24.1	21.7
S ₁₂	Reverse Isolation	dB	15.8	16.0	16.5	17.9	18.2	19.2
NF	Noise Figure	dB		4.6	4.7	5.0	5.3	

Test Conditions: $V_S = 8\text{ V}$ $I_D = 45\text{ mA Typ.}$ OIP_3 Tone Spacing = 1 MHz, Pout per tone = -5 dBm
 $R_{BIAS} = 110\text{ Ohms}$ $T_L = 25^\circ\text{C}$ $Z_S = Z_L = 50\text{ Ohms}$

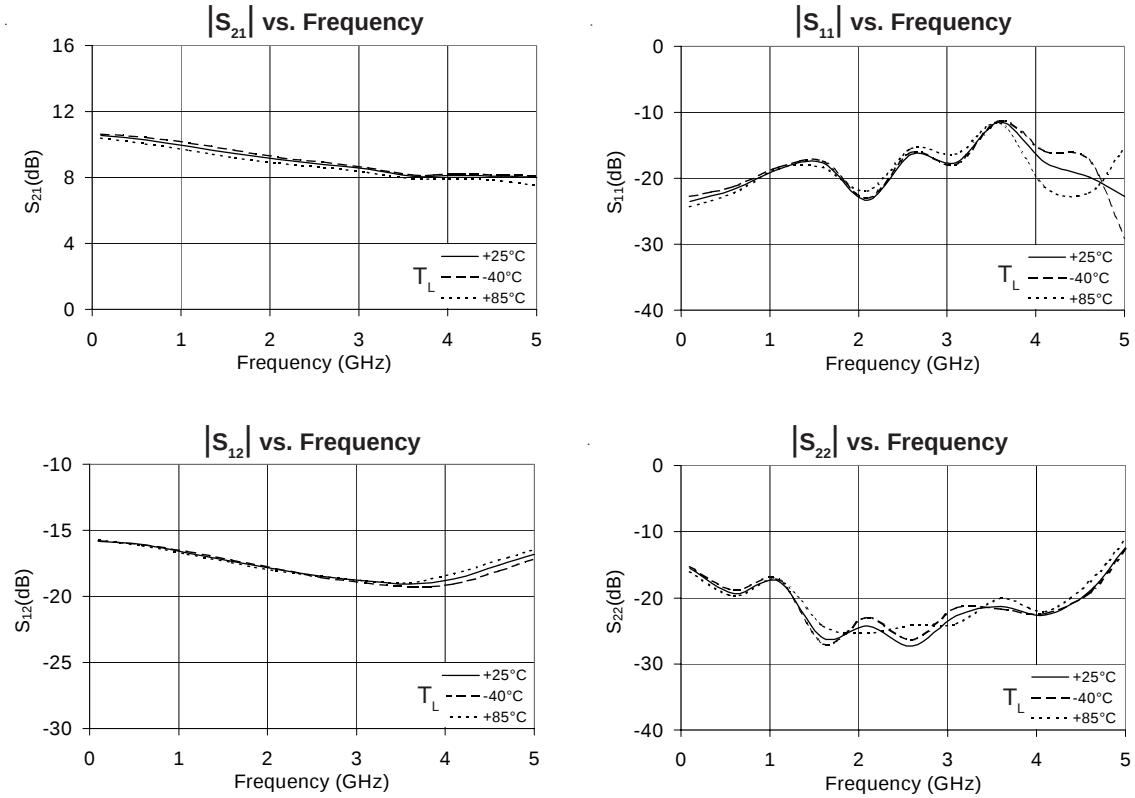
Noise Figure vs. Frequency
 $V_D = 3.2\text{ V}, I_D = 45\text{ mA (Typ.)}$

Absolute Maximum Ratings

Parameter	Absolute Limit
Max. Device Current (I_D)	90 mA
Max. Device Voltage (V_D)	5 V
Max. RF Input Power	+18 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 continuous 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:
 $I_D V_D < (T_J - T_L) / R_{TH}$

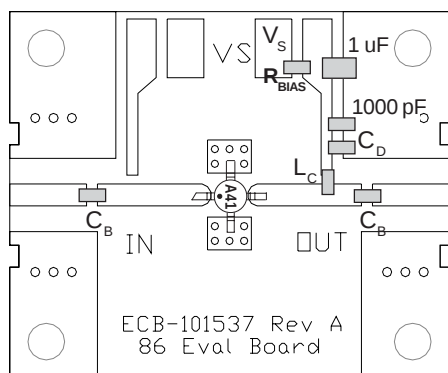
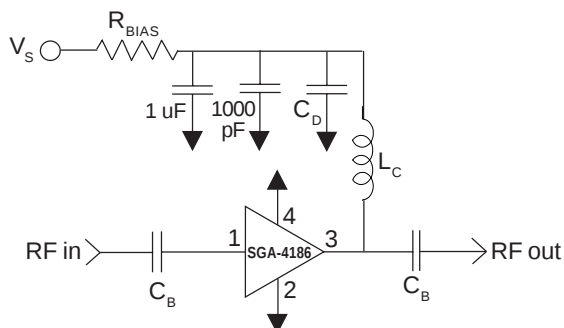
OIP₃ vs. Frequency
 $V_D = 3.2\text{ V}, I_D = 45\text{ mA (Typ.)}$

P_{1dB} vs. Frequency
 $V_D = 3.2\text{ V}, I_D = 45\text{ mA (Typ.)}$


Typical RF Performance Over Temperature (Bias: $V_D = 3.2$ V, $I_D = 45$ mA (Typ.))

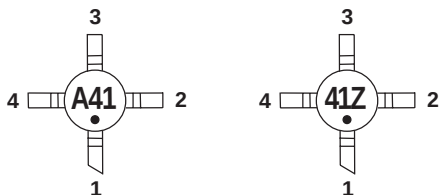


NOTE: Full S-parameter data available at www.sirenza.com

Basic Application Circuit



Part Identification Marking



Caution: ESD sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.

See Application Note AN-075
for Package Outline Drawing

Application Circuit Element Values

Reference Designator	Frequency (Mhz)				
	500	850	1950	2400	3500
C _B	220 pF	100 pF	68 pF	56 pF	39 pF
C _D	100 pF	68 pF	22 pF	22 pF	15 pF
L _C	68 nH	33 nH	22 nH	18 nH	15 nH

Recommended Bias Resistor Values for I_b=45mA

$$R_{BIAS} = (V_S - V_D) / I_b$$

Supply Voltage(V _S)	6 V	8 V	10 V	12 V
R _{BIAS}	62 Ω	110 Ω	150 Ω	200 Ω

Note: R_{BIAS} provides DC bias stability over temperature.

Mounting Instructions

1. Use a large ground pad area under device pins 2 and 4 with many plated through-holes as shown.
2. We recommend 1 or 2 ounce copper. Measurements for this data sheet were made on a 31 mil thick FR-4 board with 1 ounce copper on both sides.

Pin #	Function	Description
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. For optimum RF performance, use via holes as close to ground leads as possible to reduce lead inductance.
3	RF OUT/BIAS	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.

Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-4186	13"	3000
SGA-4186Z	13"	3000