SGA-9189
SGA-9189Z

RoHS Compliant & Green Package

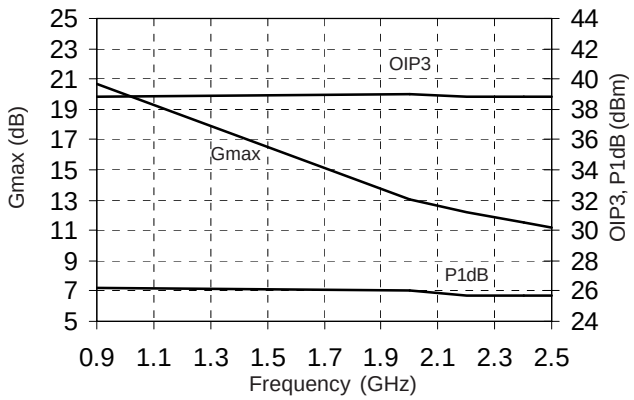
Medium Power Discrete SiGe Transistor

Product Description

Sirenza Microdevices' SGA-9189 is a high performance transistor designed for operation to 3 GHz. With optimal matching at 2 GHz, OIP3=39 dBm and P1dB=25.5 dBm. This RF device is based on a Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) process. The SGA-9189 is cost-effective for applications requiring high linearity even at moderate biasing levels. It is well suited for operation at both 5V and 3V.

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.

Typical Gmax, OIP3, P1dB @ 5V,180mA



Product Features

- **Available in RoHS compliant Green packaging**
- **50-3000 MHz Operation**
- **39 dBm Ouput IP3 Typical at 1.96 GHz**
- **12.2 dB Gain Typical at 1.96 GHz**
- **25.5 dBm P1dB Typical at 1.96 GHz**
- **2.1 dB NF Typical at 0.9 GHz**
- **Cost Effective**
- **3-5 V Operation**

Applications

- **Wireless Infrastructure Driver Amplifiers**
- **CATV Amplifiers**
- **Wireless Data, WLL Amplifiers**
- **AN-021 contains detailed application circuits**

Symbol	Device Characteristics, T = 25ºC V_{CE} = 5V, I_{CQ} =180mA (unless otherwise noted)	Test Frequency [1] 100% Tested [2] Sample Tested	Units	Min.	Typ.	Max.
G_{MAX}	Maximum Available Gain $Z_S=Z_S^*$, $Z_L=Z_L^*$	f = 900 MHz f = 1960 MHz	dB		20.5 13.2	
G	Power Gain $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$	f = 900 MHz [1] f = 1960 MHz [2]	dB	17.5 11.2	19.0 12.2	20.5 13.2
P1dB	Output 1dB Compression Point $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$	f = 900 MHz f = 1960 MHz [2]	dBm	23.5	25.8 25.5	
OIP_3	Output Third Order Intercept Point $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$, P_{OUT}= +10 dBm per tone	f = 900 MHz f = 1960 MHz [2]	dBm	36.5	40.0 39.0	
NF	Noise Figure $Z_S=Z_{SOPT}$, $Z_L=Z_{LOPT}$	f = 900 MHz f = 1960 MHz	dB		2.1 2.6	
BV_{CEO}	Collector - Emitter Breakdown Voltage		V	7.5	8.5	
h_{FE}	DC current gain			100	180	300
Rth	Thermal Resistance (junction-to-lead)		ºC/W		47	
V_{CE}	Operating Voltage (collector-to-emitter)		V			5.5
I	Operating Current		mA	155	180	195

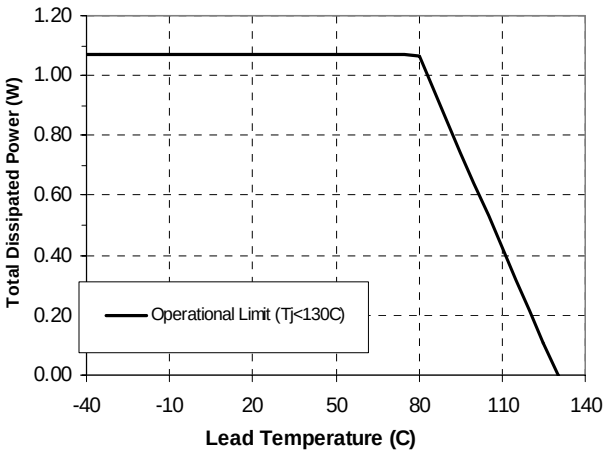
Absolute Maximum Ratings

Parameter	Absolute Limit
Max Base Current (I_B)	5 mA
Max Device Current (I_{CE})	200 mA
Max Collector-Emitter Voltage (V_{CEO})	7 V
Max Collector-Base Voltage (V_{CBO})	20 V
Max Emitter-Base Voltage (V_{EBO})	4.8 V
Max. Junction Temp. (T_J)	+150°C
Operating Temp. Range (T_L)	See Graph
Max. Storage Temp.	+150°C

***Note:** Load condition, Z_L = 50 Ohms

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

Maximum Recommended Operational Dissipated Power



Typical Performance - Engineering Application Circuits (See AN-021)

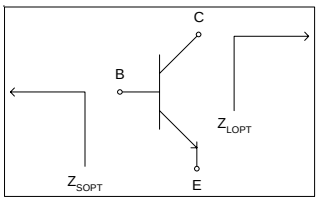
Freq (MHz)	V_{CE} (V)	I_{CQ} (mA)	P1dB (dBm)	OIP3[1] (dBm)	Gain (dB)	S11 (dB)	S22 (dB)	NF (dB)	Z_{SOPT} (Ω)	Z_{LOPT} (Ω)
945	5	184	25.8	39.5	18.8	-14	-26	2.1	6.8 - j0.85	16 + j5.9
1960	5	179	25.5	40.0	12.2	-23	-21	2.4	7.6 - j11.2	22.8 + j0.7
2140	5	180	25.4	39.0	11.3	-20	-14	2.6	18.1 + j3.4	23.8 - j9.0
2440	5	180	25.4	40.0	10.2	-20	-17	2.7	5.6 - j15.1	23.1 - j2.7

[1] P_{OUT}= +10 dBm per tone for V_{CE}=5V, 1 MHz tone spacing

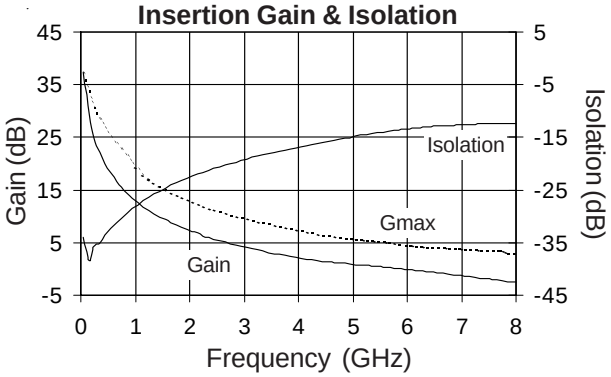
Freq (MHz)	V_{CE} (V)	I_{CQ} (mA)	P1dB (dBm)	OIP3[2] (dBm)	Gain (dB)	S11 (dB)	S22 (dB)	NF (dB)	Z_{SOPT} (Ω)	Z_{LOPT} (Ω)
945	3	165	22.1	34.3	17.7	-18	-11	2.1	9.6 - j1.6	11.0 + j1.4
1960	3	162	22.4	35.0	11.8	-18	-16	2.2	7.8 - j13.1	19.3 - j2.9
2440	3	165	23.2	35.3	9.9	-20	-15	2.6	8.1 - j16.0	21.0 - j6.5

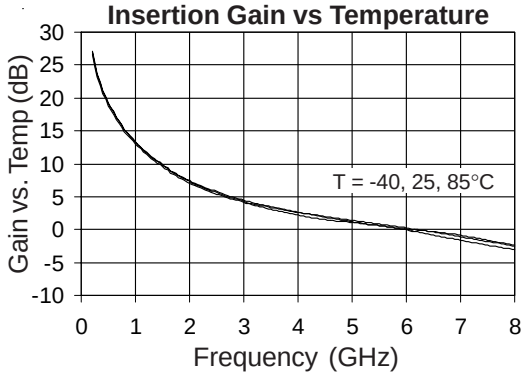
[2] P_{OUT}= +6 dBm per tone for V_{CE}=3V, 1 MHz tone spacing

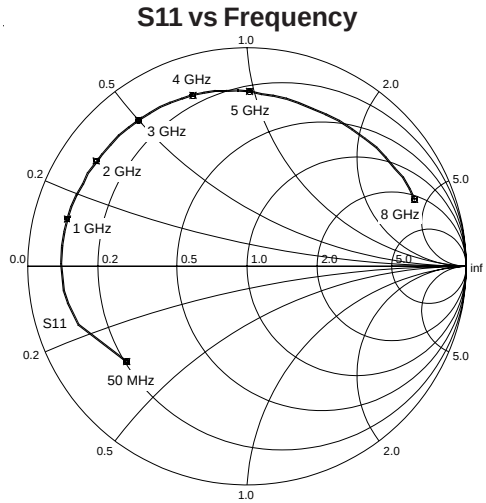
Data above represents typical performance of the application circuits noted in Application Note AN-021. Refer to the application note for additional RF data, PCB layouts, and BOMs for each application circuit. The application note also includes biasing instructions and other key issues to be considered. For the latest application notes please visit our site at www.sirenza.com or call your local sales representative.

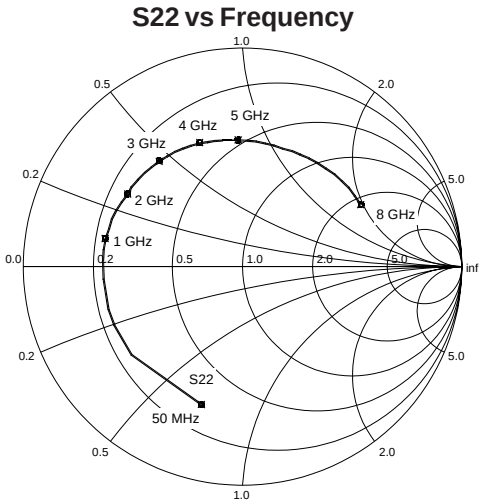


De-embedded S-Parameters (Z_S=Z_L=50 Ohms, V_{CE}=5V, I_{CQ}=185mA, 25°C)

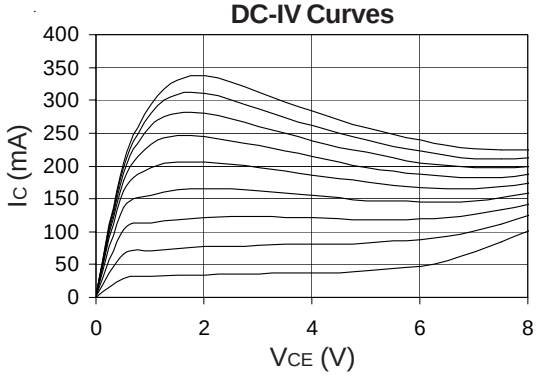








Note: S-parameters are de-embedded to the device leads with Z_S=Z_L=50Ω. The data represents typical performace of the device. De-embedded s-parameters can be downloaded from our website (www.sirenza.com).



I_b = 0.4 - 3.6 mA , 0.4 mA steps
T=25C

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

Pin Description

Pin #	Function	Description
1	Base	RF Input
2	Emitter	Connection to ground. Use via holes to reduce lead inductance. Place vias as close to ground leads as possible.
3	Collector	RF Output
4	Emitter	Same as Pin 2

Mounting and Thermal Considerations

It is very important that adequate heat sinking be provided to minimize the device junction temperature. The following items should be implemented to maximize MTTF and RF performance.

1. Multiple solder-filled vias are required directly below the ground tab (pin 4). [CRITICAL]
2. Incorporate a large ground pad area with multiple plated-through vias around pin 4 of the device. [CRITICAL]
3. Use two point board seating to lower the thermal resistance between the PCB and mounting plate. Place machine screws as close to the ground tab (pin 4) as possible. [RECOMMENDED]
4. Use 2 ounce copper to improve the PCB's heat spreading capability. [RECOMMENDED]

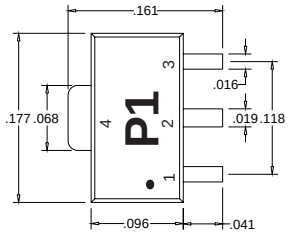
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-9189	13"	3000
SGA-9189Z	13"	3000

Part Symbolization

The part will be symbolized with the "P1" ("P1Z" for RoHS version) designator and a dot signifying pin 1 on the top surface of the package.

Package Dimensions



DIMENSIONS ARE IN INCHES

Recommended Mounting Configuration for Optimum RF and Thermal Performance