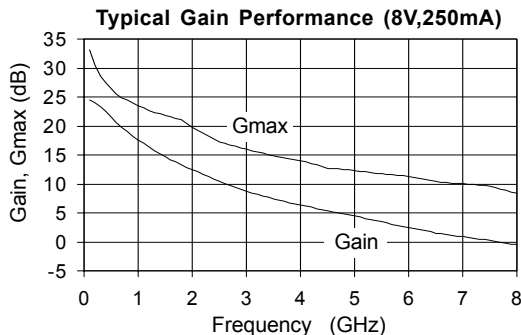


## Product Description

Sirenza Microdevices' SHF-0289 is a high performance AlGaAs/ GaAs Heterostructure FET (HFET) housed in a low-cost surface-mount plastic package. The HFET technology improves breakdown voltage while minimizing Schottky leakage current resulting in higher PAE and improved linearity.

Output power at 1dB compression for the SHF-0289 is +31dBm when biased for Class AB operation at 8V,250mA. The +46 dBm third order intercept makes it ideal for high dynamic range, high intercept point requirements. It is well suited for use in both analog and digital wireless communication infrastructure and subscriber equipment including 3G, cellular, PCS, fixed wireless, and pager systems.



## SHF-0289

**0.05 - 6 GHz, 1.0 Watt  
GaAs HFET**



## Product Features

- **+31 dBm Output Power at 1dB Compression**
- **+46 dBm Output IP3**
- **High Drain Efficiency**
- **16 dB Gain at 900 MHz (Application circuit)**
- **14.5 dB Gain at 1960 MHz (Application circuit)**
- **See App Note AN-032 for circuit details**

## Applications

- **Analog and Digital Wireless Systems**
- **3G, Cellular, PCS**
- **Fixed Wireless, Pager Systems**

Symbol	Device Characteristics, T = 25°C V <sub>DS</sub> =8V, I <sub>DQ</sub> =250mA	Test Frequency [1] = 100% Tested	Units	Min.	Typ.	Max.
G <sub>max</sub>	Maximum Available Gain Z <sub>S</sub> =Z <sub>S</sub> <sup>*</sup> , Z <sub>L</sub> =Z <sub>L</sub> <sup>*</sup>	f = 900 MHz f = 1960 MHz	dB dB	- -	23 20	- -
S <sub>21</sub>	Insertion Gain Z <sub>S</sub> =Z <sub>L</sub> = 50 Ohms	f = 900 MHz [1] f = 1960 MHz	dB dB	16.7 -	18.5 12.5	20.3 -
G	Power Gain Z <sub>S</sub> =Z <sub>SOPT</sub> , Z <sub>L</sub> =Z <sub>LOPT</sub>	f = 900 MHz f = 1960 MHz	dBm dBm	- -	16.0 14.4	- -
OIP3	Output Third Order Intercept Point Z <sub>S</sub> =Z <sub>SOPT</sub> , Z <sub>L</sub> =Z <sub>LOPT</sub> , P <sub>OUT</sub> = +16 dBm per tone	f = 900 MHz f = 1960 MHz	dBm dBm	- -	46 44.6	- -
P1dB	Output 1dB Compression Point Z <sub>S</sub> =Z <sub>SOPT</sub> , Z <sub>L</sub> =Z <sub>LOPT</sub>	f = 900 MHz f = 1960 MHz	dBm dBm	- -	30.7 31.4	- -
I <sub>DSS</sub>	Saturated Drain Current V <sub>DS</sub> = V <sub>DSP</sub> , V <sub>GS</sub> = 0V		mA	408	588	768
g <sub>m</sub>	Transconductance: V <sub>DS</sub> = V <sub>DSP</sub> , V <sub>GS</sub> = -0.25V		mS	288	396	504
V <sub>P</sub>	Pinch-Off Voltage: V <sub>DS</sub> = 2.0V, I <sub>D</sub> = 1.2mA	[1]	V	-3.0	-1.9	-1.0
BV <sub>GS</sub>	Gate-to-Source Breakdown Voltage I <sub>GS</sub> = 2.4mA, drain open	[1]	V	-	-17	-15
BV <sub>GD</sub>	Gate-to-Drain Breakdown Voltage I <sub>GD</sub> = 2.4mA, V <sub>GS</sub> = -5.0V	[1]	V	-	-22	-17
R <sub>th</sub>	Thermal Resistance, junction-to-lead		°C/W	-	20	-

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### Absolute Maximum Ratings

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

MTTF is inversely proportional to the device junction temperature. For junction temperature and MTTF considerations the operating conditions should also satisfy the following expressions:

$$P_{DC} - P_{OUT} < (T_J - T_L) / R_{TH}$$

where:

$$P_{DC} = I_{DS} * V_{DS} \text{ (W)}$$

$$P_{OUT} = \text{RF Output Power (W)}$$

$$T_J = \text{Junction Temperature (}^{\circ}\text{C)}$$

$$T_L = \text{Lead Temperature (pin 4) (}^{\circ}\text{C)}$$

$$R_{TH} = \text{Thermal Resistance (}^{\circ}\text{C/W)}$$

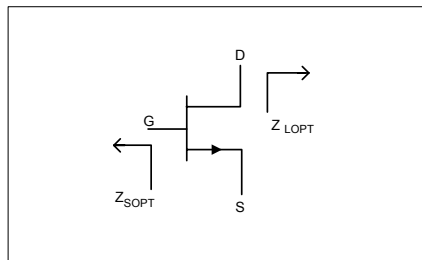
Parameter	Symbol	Value	Unit
Drain Current	$I_{DS}$	$I_{DSS}$	mA
Forward Gate Current	$I_{GSF}$	2.4	mA
Reverse Gate Current	$I_{GSR}$	2.4	mA
Drain-to-Source Voltage	$V_{DS}$	+12	V
Gate-to-Source Voltage	$V_{GS}$	<-5 or >0	V
RF Input Power	$P_{IN}$	400	mW
Operating Temperature	$T_{OP}$	-40 to +85	$^{\circ}\text{C}$
Storage Temperature Range	$T_{stor}$	-40 to +175	$^{\circ}\text{C}$
Power Dissipation	$P_{DISS}$	7.0	W
Channel Temperature	$T_J$	+175	$^{\circ}\text{C}$

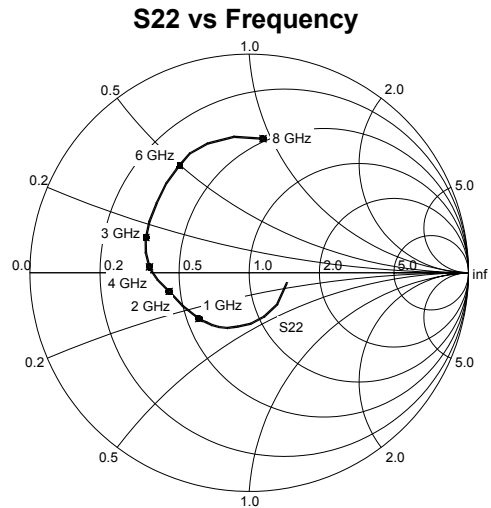
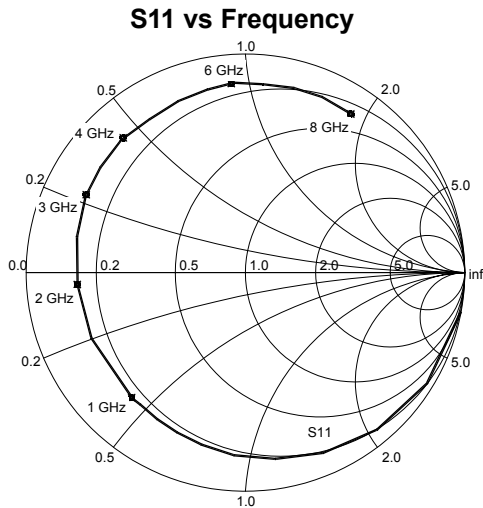
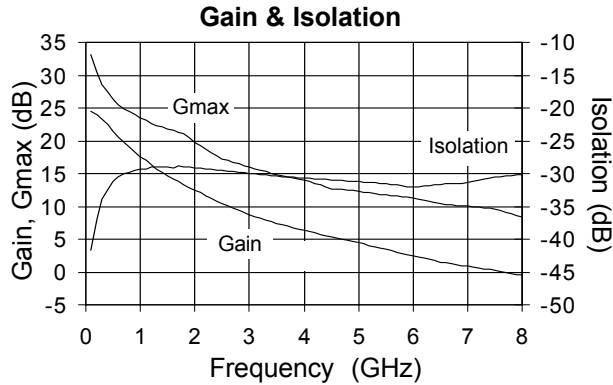
### Typical Performance - Engineering Application Circuits (See App Note AN-032)

Freq (MHz)	$V_{DS}$ (V)	$I_{DQ}$ (mA)	P1dB (dBm)	OIP3* (dBm)	Gain (dB)	S11 (dB)	S22 (dB)	NF (dB)	$Z_{SOPT}$ ( $\Omega$ )	$Z_{LOPT}$ ( $\Omega$ )
900	8	250	30.7	46	16.0	-23	-14	4.6	44.7 + j31.2	40.9 + j12.0
1960	8	250	31.4	44.5	14.5	-21	-8	3.9	13.5 + j7.5	11.0 + j3.0
2140	8	250	31.8	44.5	13.2	-25	-10	3.9	18.2 + j5.3	20.9 + j2.5
2450	8	250	30.7	47	11.1	-15	-7	4.1	18.5 + j3.5	42.5 - j9.5

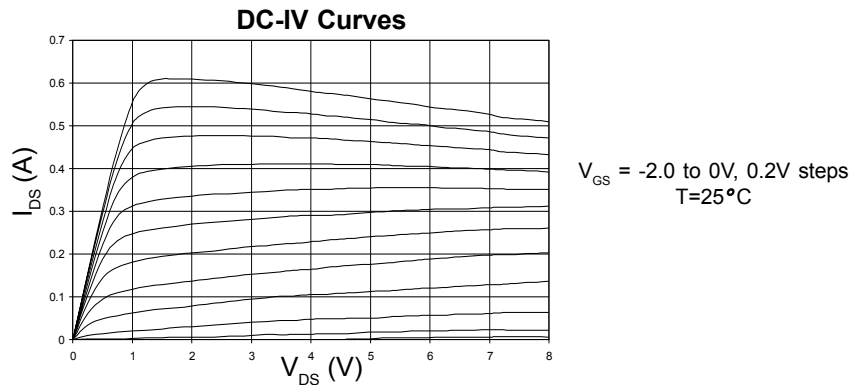
\*  $P_{OUT}$  = +16dBm per tone, 1MHz tone spacing

Data above represents typical performance of the application circuits noted in Application Note AN-032. 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](http://www.sirenza.com) or call your local sales representative.



**De-embedded S-Parameters ( $Z_s=Z_L=50\ \Omega$ ,  $V_{DS}=8V$ ,  $I_{DS}=250mA$ ,  $25^\circ C$ )**


Note: S-parameters are de-embedded to the device leads with  $Z_s=Z_L=50\ \Omega$ . The data represents typical performance of the device. De-embedded s-parameters can be downloaded from our website ([www.sirenza.com](http://www.sirenza.com)).





### Caution: ESD sensitive

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

## SHF-0289 1 Watt HFET

### Pin Description

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

### Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SHF-0289	7"	1000

### Part Symbolization

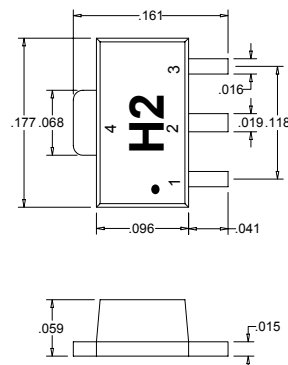
The part will be symbolized with the "H2" designator and a dot signifying pin 1 on the top surface of the package.

### 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]

### Package Dimensions



DIMENSIONS ARE IN INCHES

### Recommended Mounting Configuration for Optimum RF and Thermal Performance

