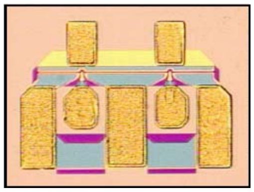
Preliminary

SPF-2000

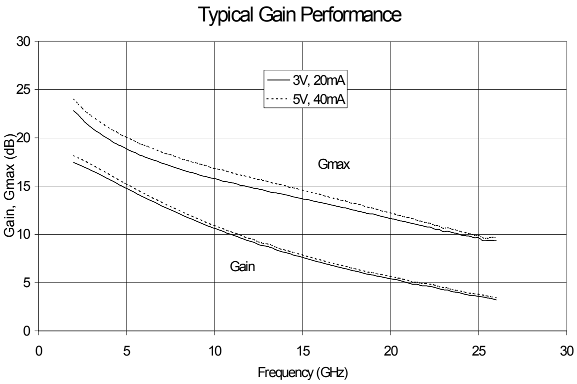
Low Noise High Linearity pHEMT GaAs FET

0.1 - 12 GHz Operation



Product Description

Sirenza Microdevices' SPF-2000 is a high linearity, low noise 0.25µm pHEMT. This 300µm device is ideally biased at 3V,20mA for lowest noise performance. At 5V,40mA the device delivers excellent output TOI of 32 dBm. It provides ideal performance as driver stages in many commercial, industrial and military LNA applications.



Product Features

- **15 dB Gmax at 12GHz**
- **1.25 dB F_{MIN} at 12 GHz**
- **+32 dBm Output IP3 at 12GHz**
- **+20 dBm Output Power at 1dB Compression**

Applications

- **High IP3 LNA for VSAT, LMDS, Cellular Systems and Instrumentation**
- **Broadband Amplifiers**

Symbol	Device Characteristics:	Test Conditions, Vds = 3V, Ids = 20mA, T = 25°C (unless otherwise noted)	Test Frequency	Units	Min.	Typ.	Max.
Gmax	Maximum Available Gain [2]	$Z_S = Z_S^*$, $Z_L = Z_L^*$	1.9 GHz 4.0 GHz 12.0 GHz	dB dB dB	- 21 13	25 23 15	- 25 17
S_{21}	Insertion Gain [2]	$Z_S = Z_L = 50$ Ohms	1.9 GHz	dB	16	18	20
NF_{MIN}	Minimum Noise Figure	Z_S = Gamma-opt, $Z_L = Z_L^*$	2.0 GHz 4.0 GHz 12.0 GHz	dB dB dB	- - -	0.5 0.6 1.2	- - -
P_{1dB}	Output 1dB Compression Point	V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA	2.0 GHz 2.0 GHz 12.0 GHz 12.0 GHz	dBm dBm dBm dBm	- - - -	20.0 15.0 21 18	- - - -
G_{1dB}	Gain at 1dB Compression Point	V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA	2.0 GHz 2.0 GHz 12.0 GHz 12.0 GHz	dBm dBm dBm dBm	- - - -	17.7 17.0 13.0 11.0	- - - -
OIP_3	Output Third Order Intercept Point	V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA V_{DS} = 5V, I_{DS} = 40 mA V_{DS} = 3V, I_{DS} = 20 mA	2.0 GHz 2.0 GHz 12.0 GHz 12.0 GHz	dBm dBm dBm dBm	- - - -	32 28 32 30	- - - -
I_{DSS}	Saturated Drain Current [2]			mA	30	85	140
V_P	Pinchoff Voltage [1]	V_{DS} = 2V, I_{DS} = 0.150 mA		V	-1.5	-1.0	-0.5
G_M	Transconductance	V_{GS} = -0.25V		mS	-	112	-
BV_{GS}	Gate to Source Breakdown Voltage [1]	I_{GS} = 0.3mA, drain open		V	-	-17	-8
BV_{GD}	Gate to Drain Breakdown Voltage [1]	I_{GD} = 0.3mA, V_{GS} = -3.0V		V	-	-17	-8
R_{TH}	Thermal Resistance			C/W		110	
V_{DS}	Operating Voltage [3]	Drain-source		V			5.5
I_{DQ}	Operating Current [3]	Drain-source, quiescent		mA			55
P_{DISS}	Power Dissipation [3]			W			0.2

[1] 100% tested - DC parameters tested on wafer.
[2] Sample tested - Samples pullled from each wafer lot. Sample test specifications are based on statistical data from sample test measurements.
[3] $V_{DS} * I_{DQ} < P_{DISS}$ is recommended for continuous reliable operation.

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 experssions:

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

where:

$P_{DC} = I_{DS} * V_{DS}$ (W)
P_{OUT} = RF Output Power (W)
T_J = Junction Temperature (°C)
T_L = Lead Temperature (pin 4) (°C)
R_{TH} = Thermal Resistance (°C/W)

Parameter	Symbol	Value	Unit
Drain Current	I_{DS}	I_{DSS}	mA
Forward Gate Current	I_{GSF}	0.3	mA
Reverse Gate Current	I_{GSR}	0.3	mA
Drain-to-Source Voltage	V_{DS}	+7	V
Gate-to-Drain Voltage	V_{GD}	-8	V
Gate-to-Source Voltage	V_{GS}	<-5 or >0	V
RF Input Power	P_{IN}	100	mW
Operating Temperature	T_{OP}	-40 to +85	°C
Storage Temperature Range	T_{stor}	-40 to +150	°C
Power Dissipation	P_{DISS}	600	mW
Channel Temperature	T_J	+150	°C

Assembly Instructions:

The recommended die attach is conductive epoxy or AuSn (80/20) solder with limited exposure to temperatures at or above 300C. The preferred wirebond method is thermo-compression wedge bond using 0.7 mil gold wire with a maximum stage temperature of 200C. Aluminum wire should not be used.

Design Data:

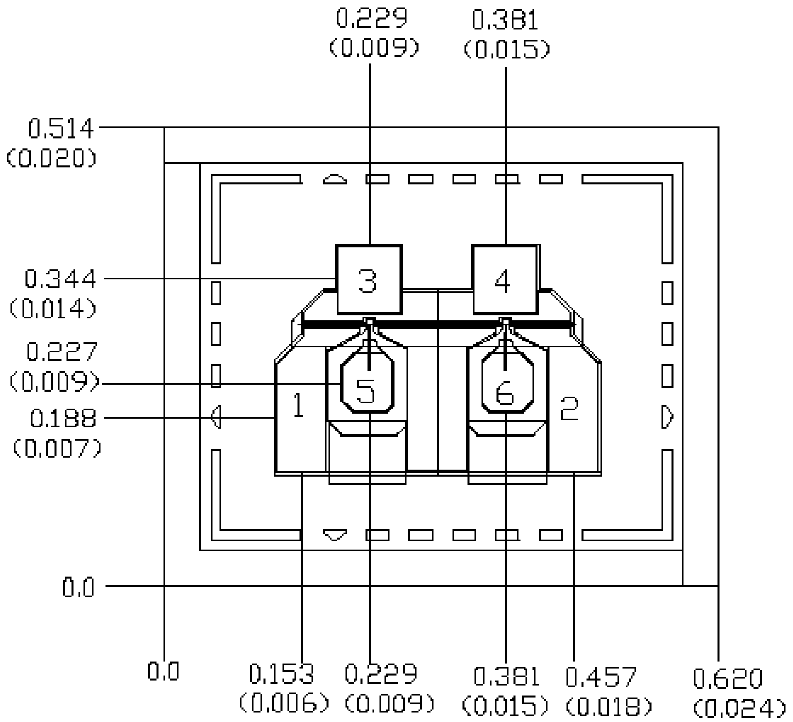
Complete design data including S-parameters, noise parameters, and large signal model are available upon request by contacting applications support at baredie-apps@sirenza.com

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

Part Number Ordering Information

Part Number	Reel Size	Devices/Pack
SPF-2000	Gel Pak	100

Mechanical Drawing



Units: millimeters (inches)
Thickness: 0.1016 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

Bond Pad #1,#2 (Source)	0.056 x 0.123	(0.002 x 0.005)
Bond Pad #3,#4 (Drain)	0.070 x 0.074	(0.003 x 0.003)
Bond Pad #5,#6 (Gate)	0.056 x 0.065	(0.002 x 0.003)