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FPD3000

2W POWER pHEMT

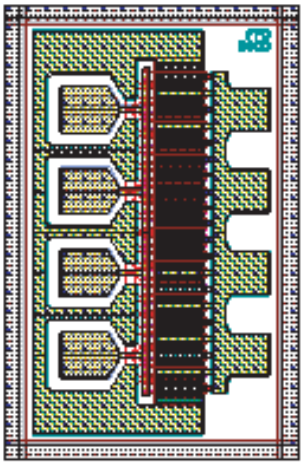
Package Style: Bare Die

Product Description

The FPD3000 is an AlGaAs/InGaAs pseudomorphic High Electron Mobility Transistor (pHEMT), featuring a 0.25µmx3000µm Schottky barrier gate, defined by high - resolution stepper-based photolithography. The recessed gate structure minimizes parasitics to optimize performance. The epitaxial structure and processing have been optimized for reliable high-power applications. The FPD3000 is also available in the low-cost plastic SOT89 package.

Optimum Technology Matching® Applied

- ☐ GaAs HBT
- ☐ GaAs MESFET
- ☐ InGaP HBT
- ☐ SiGe BiCMOS
- ☐ Si BiCMOS
- ☐ SiGe HBT
- ☑ GaAs pHEMT
- ☐ Si CMOS
- ☐ Si BJT
- ☐ GaN HEMT
- ☐ InP HBT
- ☐ RF MEMS
- ☐ LDMOS



Features

- 32.5dBm Linear Output Power at 12GHz
- 6.5dB Power Gain at 12GHz
- 8dB Max Stable Gain at 12GHz
- 42dBm O_{IP3}
- 30% Power-Added Efficiency

Applications

- Narrowband and Broadband High-Performance Amplifiers
- SATCOM Uplink Transmitters
- PCS/Cellular Low-Voltage High-Efficiency Output Amplifiers
- Medium-Haul Digital Radio Transmitters

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Electrical Specifications					
P_{1dB} Gain Compression	31.5	32.5		dBm	V_{DS}=8V, I_{DS}=50% I_{DSS}
Maximum Stable Gain (S21/S12)	7.0	8.0		dB	V_{DS}=8V, I_{DS}=50% I_{DSS}
Power Gain at P_{1dB} (G_{1dB})	6.0	6.5		dB	V_{DS}=8V, I_{DS}=50% I_{DSS}
Power-Added Efficiency (PAE)		30		%	V_{DS}=8V, I_{DS}=50% I_{DSS}, P_{OUT}=P_{1dB}
OIP_3		42		dBm	V_{DS}=8V, I_{DS}=50% I_{DSS}
		44		dBm	Matched for optimal power, tuned for best IP_3
Saturated Drain-Source Current (I_{DSS})	750	930	1100	mA	V_{DS}=1.3V, V_{GS}=0V
Maximum Drain-Source Current (I_{MAX})		1.5		A	V_{DS}=1.3V, V_{GS}≈+1V
Transconductance (G_M)		800		ms	V_{DS}=1.3V, V_{GS}=0 V
Gate-Source Leakage Current (I_{GSO})		10		µA	V_{GS}=-5V
Pinch-Off Voltage (V_P)		|1.0|		V	V_{DS}=1.3V, I_{DS}=3mA
Gate-Source Breakdown Voltage (V_{BDGS})	|12.0|	|14.0|		V	I_{GS}=3mA
Gate-Drain Breakdown Voltage (V_{BDGD})	|14.5|	|16.0|		V	I_{GD}=3mA
Thermal Resistivity (θJC)		20		°C/W	V_{DS}>6V

Note: $T_{AMBIENT}$=22 °C, RF specifications measured at f=12GHz using CW signal.

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Absolute Maximum Ratings[1]

Parameter	Rating	Unit
Drain-Source Voltage (V_{DS}) ($-3V<V_{GS}<-0.5V$)[2]	10	V
Gate-Source Voltage (V_{GS}) ($0V<V_{DS}<+8V$)	-3	V
Drain-Source Current (I_{DS}) (For $V_{DS}<2V$)	I_{DSS}	
Gate Current (I_G) (Forward or reverse current)	25	mA
RF Input Power (P_{IN}) (Under any acceptable bias state)	600	mW
Channel Operating Temperature (T_{CH}) (Under any acceptable bias state)	175	°C
Storage Temperature (T_{STG}) (Non-Operating Storage)	-65 to 150	°C
Total Power Dissipation (P_{TOT})[3, 4, 5]	7.3	W
Simultaneous Combination of Limits[6] (2 or more max. limits)	80	%

Notes:

[1] $T_{AMBIENT}=22$ °C unless otherwise noted; exceeding any one of these absolute maximum ratings may cause permanent damage to the device.

[2] Operating at absolute maximum V_D continuously is not recommended. If operation at 10V is considered then I_{DS} must be reduced in order to keep the part within its thermal power dissipation limits. Therefore V_{GS} is restricted to <-0.5V.

[3] Total Power Dissipation to be de-rated as follows above 22 °C: $P_{TOT}=7.3-(0.05W/°C)xT_{HS}$, where T_{HS}=heatsink or ambient temperature above 22 °C.
Example: For a 85 °C carrier temperature: $P_{TOT}=7.3-(0.05x(85-22))=4.2W$

[4] Total Power Dissipation (P_{TOT}) defined as $(P_{DC}+P_{IN})-P_{OUT}$, where P_{DC}: DC Bias Power, P_{IN}: RF Input Power, P_{OUT}: RF Output Power.

[5] Users should avoid exceeding 80% of 2 or more Limits simultaneously.

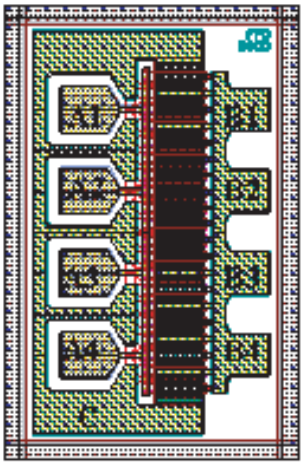
[6] Thermal Resistivity specification assumes a Au/Sn eutectic die attach onto an Au-plated copper heatsink or rib.

Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

Pad Layout



Pad	Description	Pin Coordinates (μm)
A1	Gate Pad	125, 625
A2	Gate Pad	125, 475
A3	Gate Pad	125, 325
A4	Gate Pad	125, 175
B1	Drain Pad	375, 625
B2	Drain Pad	375, 475
B3	Drain Pad	375, 325
B4	Drain Pad	375, 175
C	Source Pad	

Note: Coordinates are referenced from the bottom left hand corner of the die to the center of the bond pad opening.

Die Size (μm)	Die Thickness (μm)	Min. Bond Pad Opening (μmxμm)
470x830	75	68x77

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Preferred Assembly Instructions

GaAs devices are fragile and should be handled with great care. Specially designed collets should be used where possible.

The back of the die is metallized and the recommended mounting method is by the use of conductive epoxy. Epoxy should be applied to the attachment surface uniformly and sparingly to avoid encroachment of epoxy onto the top face of the die. Ideally it should not exceed half the chip height. For automated dispense Ablestick LMISR4 is recommended and for manual dispense Ablestick 84-1 LMI or 84-1 LMIT are recommended. These should be cured at a temperature of 150°C for one hour in an oven especially set aside for epoxy curing only. If possible the curing oven should be flushed with dry nitrogen. The gold-tin (80% Au 20% Sn) eutectic die attach has a melting point of approximately 280 °C but the absolute temperature being used depends on the leadframe material used and the particular application. The maximum time at used should be kept to a minimum.

This part has gold (Au) bond pads requiring the use of gold (99.99% pure) bondwire. It is recommended that 25.4mm diameter gold wire be used. Recommended lead bond technique is thermocompression wedge bonding with 0.001" (25µm) diameter wire. Bond force, time stage temperature and ultrasonics are all critical parameters and the settings are dependent on the setup and application being used. Ultrasonic or thermosonic bonding is not recommended.

Bonds should be made from the die first and then to the mounting substrate or package. The physical length of the bondwires should be minimized especially when making RF or ground connections.

Handling Precautions

To avoid damage to the devices, care should be exercised during handling. Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing.

ESD/MSL Rating

These devices should be treated as Class 0 (0V to 250V) using the human body model as defined in JEDEC Standard No. 22-A114. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263. This is an unpackaged part and therefore no MSL rating applies.

Application Notes and Design Data

Application Notes and design data including S-parameters and device model are available on request from www.rfmd.com.

Reliability

An MTTF of 4.2 million hours at a channel temperature of 150 °C is achieved for the process used to manufacture this device.

Disclaimers

This product is not designed for use in any space-based or life-sustaining/supporting equipment.

Ordering Information

Delivery Quantity	Ordering Code
Full Pack (100)	FPD3000-000
Small Quantity (25)	FPD3000-000SQ
Sample Quantity (3)	FPD3000-000S3

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