HMC1086

v06.0318

25 WATT GAN MMIC POWER AMPLIFIER, 2 - 6 GHz

Typical Applications

The HMC1086 is ideal for:

- Test Instrumentation
- General Communications
- Radar

Features

High Psat: +44.5 dBm

Power Gain at Psat: 14 dB

High Output IP3: +48 dBm

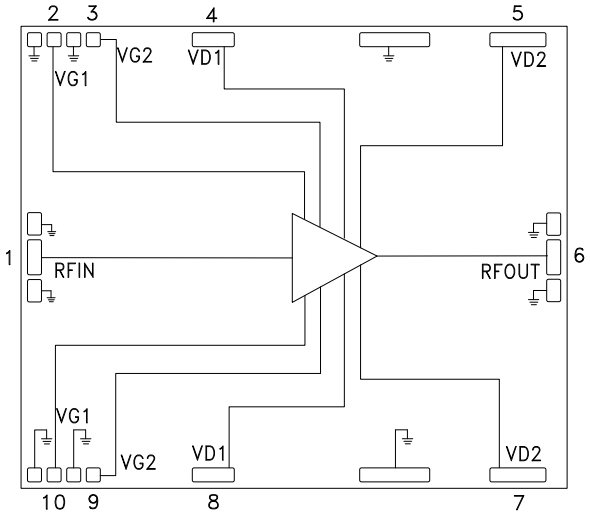
Small Signal Gain: 22 dB

Supply Voltage: +28 V @ 1.1 A

50 Ohm Matched Input/Output

Die Size: 3.4 x 4 x 0.1 mm^2

Functional Diagram



General Description

The HMC1086 is a 25W Gallium Nitride (GaN) Power Amplifier MMIC which operates between 2 and 6 GHz. The amplifier typically provides 22 dB of small signal gain, +44.5 dBm of saturated output power, and +48 dBm output IP3 at +33 dBm output power per tone. The HMC1086 draws 1100 mA quiescent current from a +28V DC supply. The RF I/Os are DC blocked and matched to 50 Ohms for ease of integration into Multi-Chip-Modules (MCM). All electrical performance data was acquired with die eutectically attached to 1.02 mm (40 mil) thick CuMo carrier with multiple 1.0 mil diameter ball bonds connecting the die to 50 Ohm transmission lines on alumina.

Electrical Specifications, T_A = +25 °C, Vdd = VD1 = VD2 = +28V, Idd = 1100 mA [1]

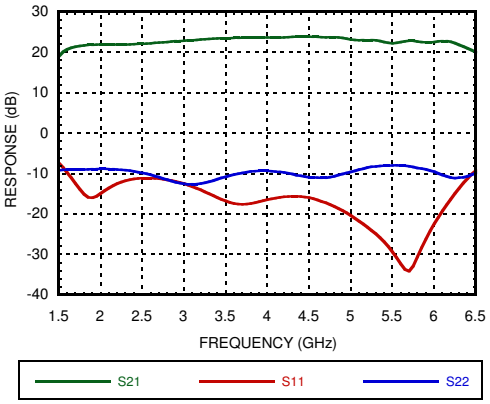
Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		2 - 3.5			3.5 - 5			5 - 6		GHz
Small Signal Gain	21	22		22	23		21	22		dB
Gain Flatness		±0.5			±0.5			±0.5		dB
Gain Variation Over Temperature		0.012			0.016			0.024		dB/ °C
Input Return Loss		10			15			15		dB
Output Return Loss		8			8			8		dB
Power Gain (Pin @ 25 dBm)		18			18			18		dB
Saturated Output Power (Psat)		44.5			45			44.5		dBm
Output Third Order Intercept (IP3) [2]		48			48			48		dBm
Power Added Efficiency		42			37			34		%
Quiescent Supply Current (Idd @ Vdd = +28V)		1100			1100			1100		mA

[1] Assumes eutectic attach of die to a 40 mil CuMo carrier, and 25 °C is maintained at the back of the carrier.

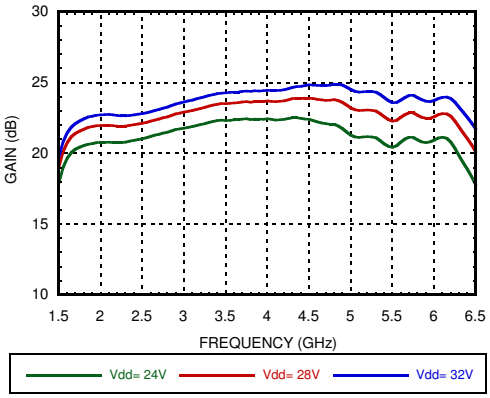
[2] Measurement taken at Pout / tone = +33 dBm.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

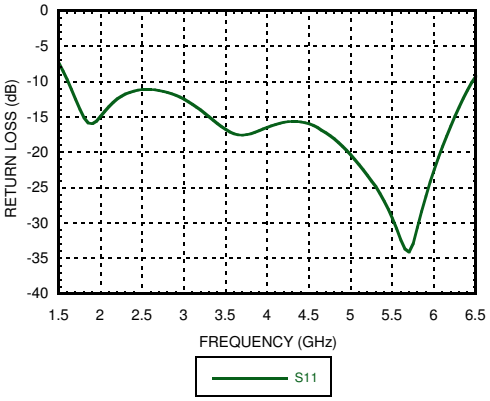
Gain and Return Loss



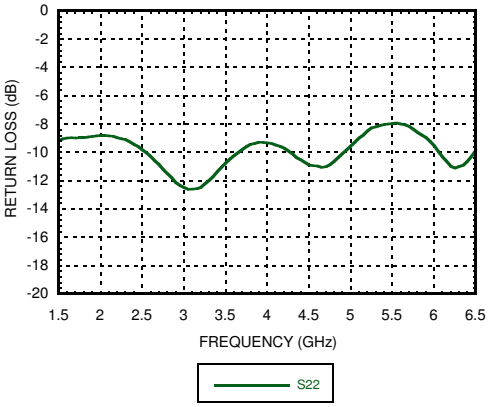
Gain vs. Vdd



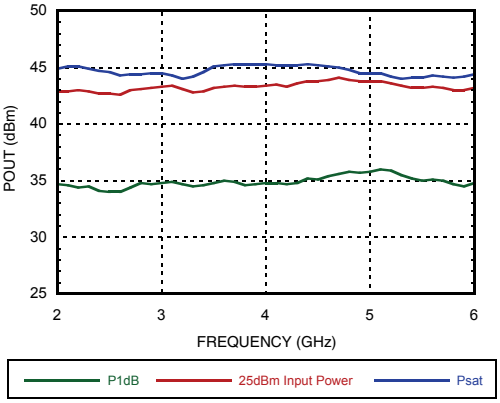
Input Return Loss



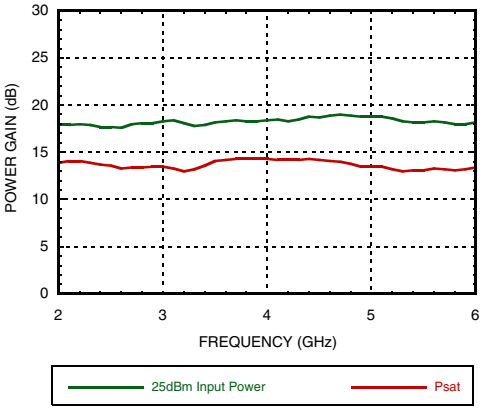
Output Return Loss



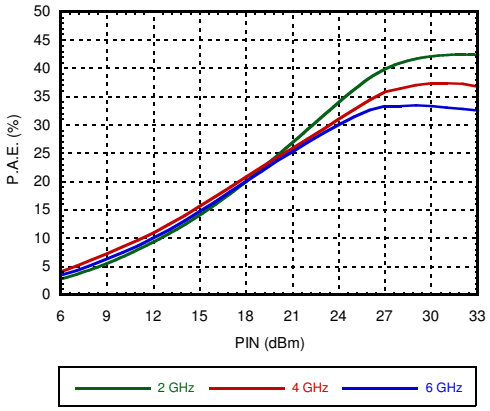
Pout vs. Frequency



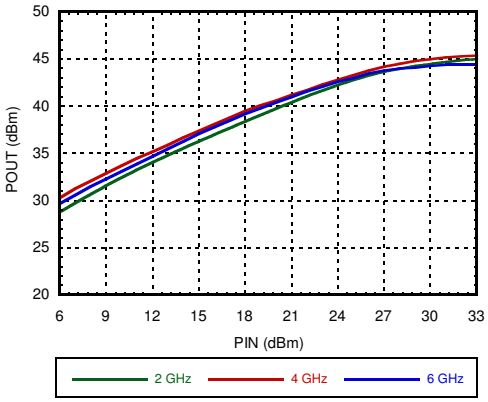
Power Gain vs. Frequency



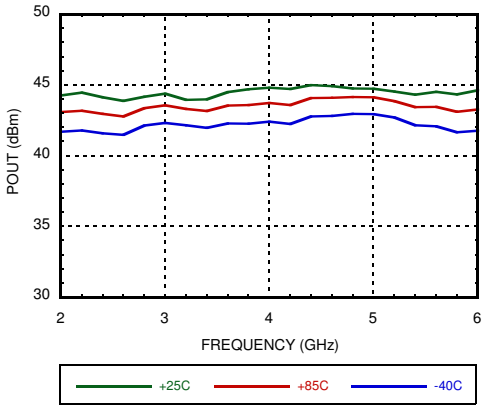
Power Added Efficiency vs. Pin



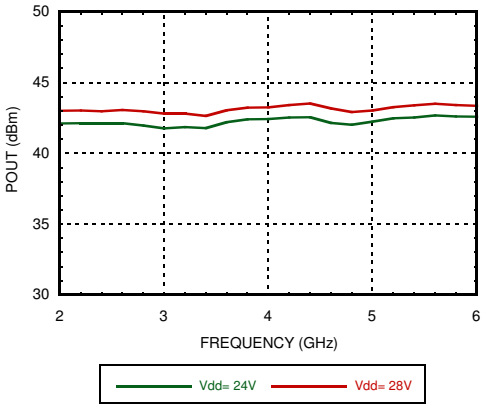
Pout vs. Pin



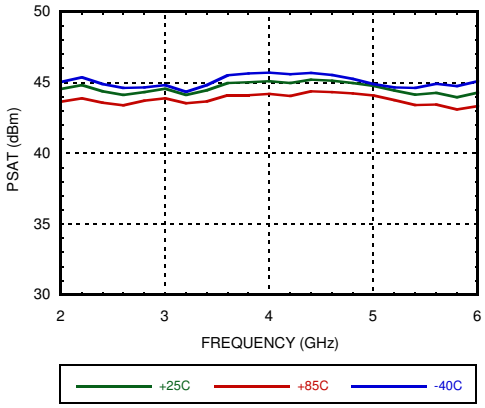
Pout vs. Temperature at Pin= 25dBm



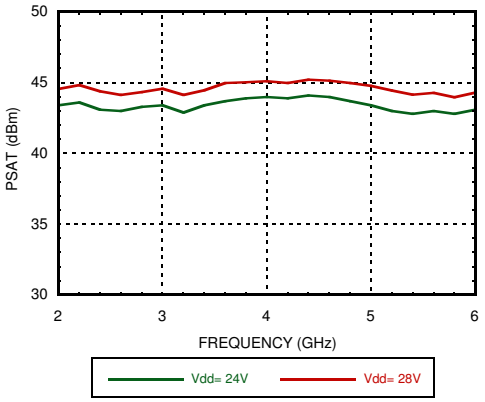
Pout vs. Vdd at Pin= 25dBm



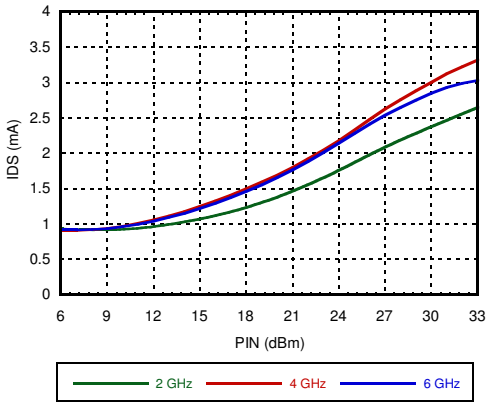
Psat vs. Temperature



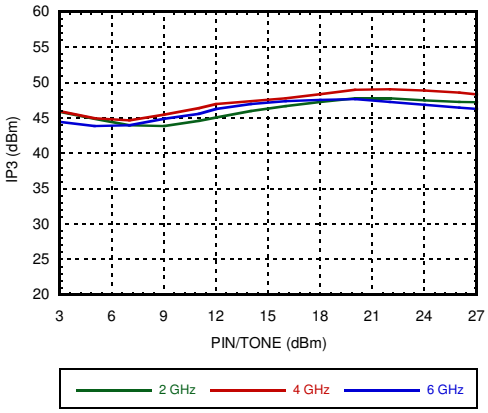
Psat vs. Vdd



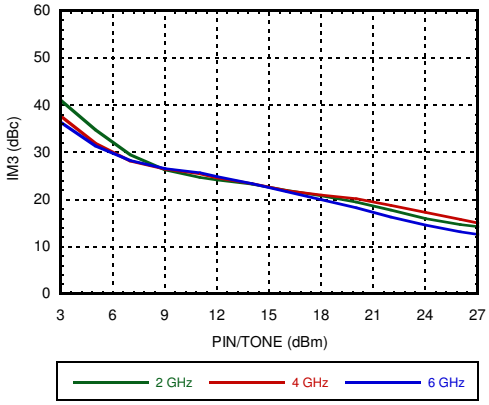
Drain Current vs. Pin



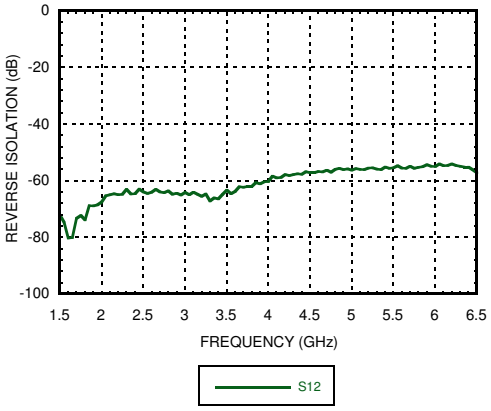
OIP3 vs Pin/Tone



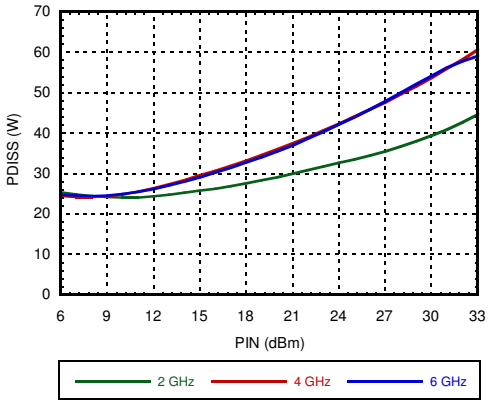
IM3 vs. Pin/Tone



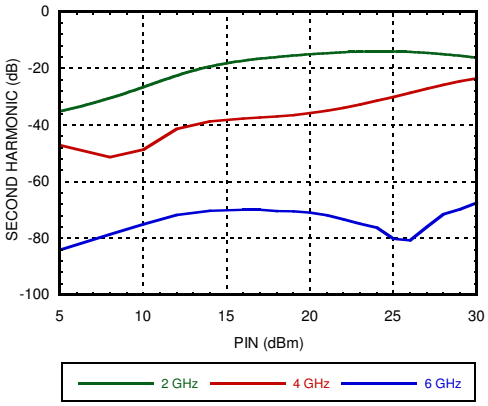
Reverse Isolation



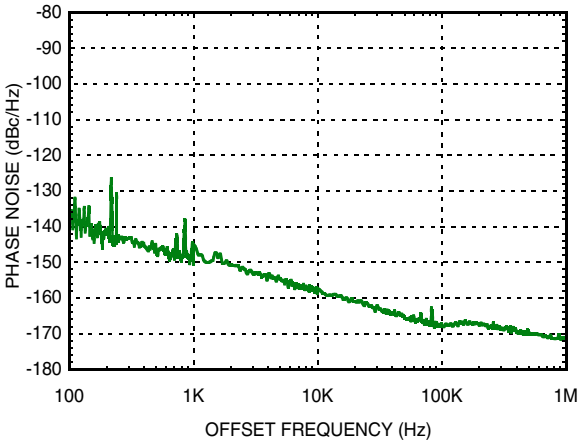
Power Dissipation vs. Pin



Second Harmonic vs. Pin



Additive Phase Noise Vs Offset Frequency,
RF Frequency = 4 GHz,
RF Input Power = 27 dBm (P1dB)



Notes:

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Absolute Maximum Ratings[1]

Drain Bias Voltage (Vdd)	+32V
Gate Bias Voltage (Vgg)	-8 V to 0V
Maximum Forward Gate Current	11 mA
Maximum RF Input Power (RFIN)	33 dBm
Maximum VSWR[3]	6:1
Maximum Junction Temperature (Tj)	225 °C
Maximum Pdiss (T = 85 °C) (Derate 455 mW/°C above 85 °C)	63.6W
Thermal Resistance (R_{TH})[2]	2.2°C/W
Operating Temperature	-40 °C to +85°C
Storage Temperature	-55 °C to 150 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

[1] Operation outside parameter ranges above can cause permanent damage to the device. These are maximum stress ratings only. Continuous operation of the device at these conditions is not implied.
[2] Assumes 0.5 mil AuSn die attach to a 40 mil CuMo Carrier with 85°C at the back of the carrier.
[3] Restricted by maximum power dissipation

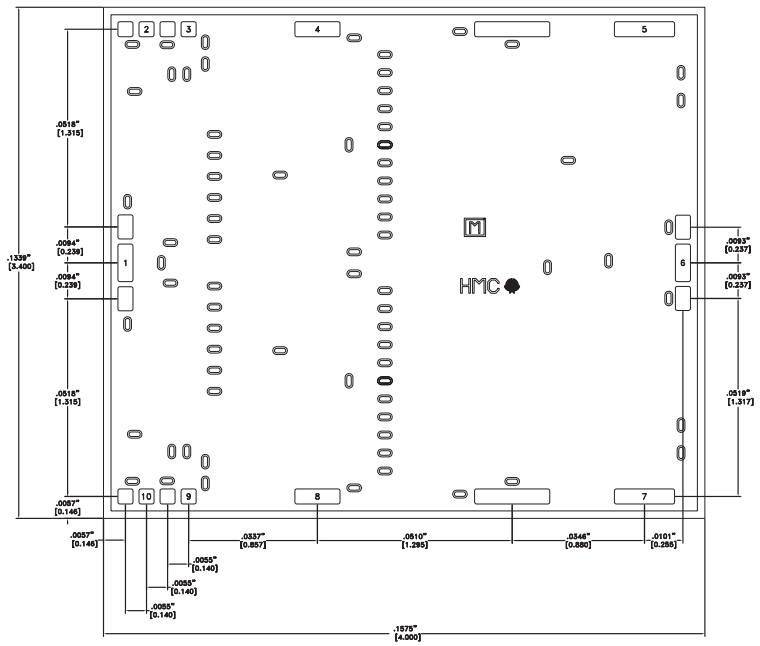
Die Packaging Information [1]

Standard	Alternate
GP-1 (Gel Pack)	[2]

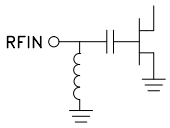
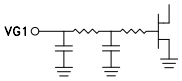
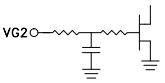
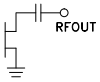
[1] Refer to the "Packaging Information" section for die packaging dimensions.
[2] For alternate packaging information contact Hittite Microwave Corporation.

NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MM]
2. DIE THICKNESS IS .004"
3. TYPICAL BOND PAD IS 0.0026" [0.066] SQUARE
4. BACKSIDE METALLIZATION: GOLD
5. BOND PAD METALLIZATION: GOLD
6. BACKSIDE METAL IS GROUND.
7. CONNECTION NOT REQUIRED FOR UNLABELED BOND PADS.
8. OVERALL DIE SIZE ± .002

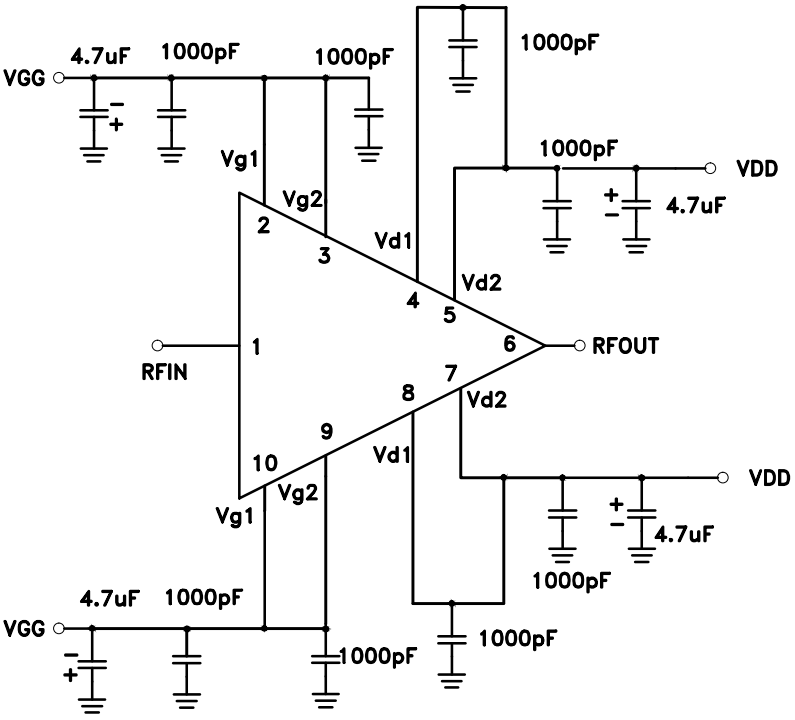
Outline Drawing



Pad Descriptions

Pad Number	Function	Description	Pin Schematic
1	RFIN	This Pad is RF coupled and is matched to 50 Ohms. The pad has zero Ohms DC resistance.	
2, 10	VG1	Gate control voltage for first stage.	
3, 9	VG2	Gate control voltage for second stage.	
4,8	VD1	Drain bias for first stage.	
5, 7	VD2	Drain bias for second stage.	
6	RFOUT	This Pad is RF coupled and is matched to 50 Ohms.	
Die Bottom	GND	Die Bottom must be connected to RF/DC ground.	

Application Circuit



Assembly Diagram