HMC442LM1

v01.0807

GaAs PHEMT MMIC MEDIUM POWER AMPLIFIER, 17.5 - 24.0 GHz

Typical Applications

The HMC442LM1 is an ideal gain block or driver amplifier for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- VSAT

Features

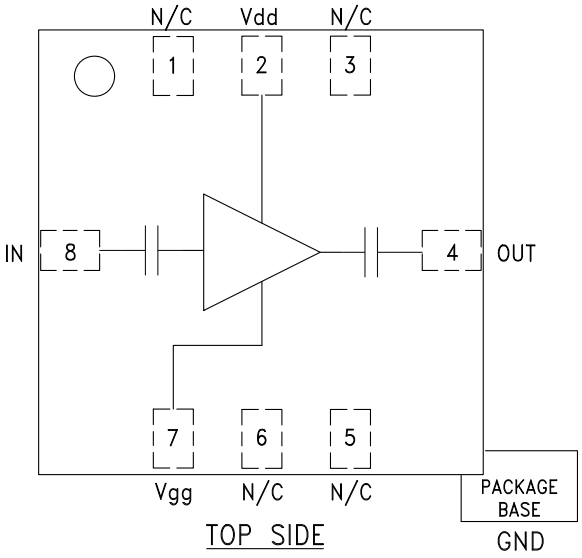
Saturated Power: +23 dBm @ 27% PAE

Gain: 14 dB

Supply Voltage: +5V

50 Ohm Matched Input/Output

Functional Diagram



General Description

The HMC442LM1 is a broadband 17.5 to 24 GHz GaAs PHEMT MMIC Medium Power Amplifier in a SMT leadless chip carrier package. The LM1 is a true surface mount broadband millimeterwave package offering low loss & excellent I/O match, preserving MMIC chip performance. The amplifier provides 14 dB of gain and +23 dBm of saturated power at 27% PAE from a +5V supply voltage. This 50 Ohm matched amplifier has integrated DC blocks on RF in and out and makes an ideal linear gain block, transmit chain driver or LO driver for HMC SMT mixers. As an alternative to chip-and-wire hybrid assemblies the HMC442LM1 eliminates the need for wirebonding, thereby providing a consistent connection interface for the customer.

Electrical Specifications, T_A = +25° C, Vdd = 5V, Idd = 85 mA*

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range		17.5 - 21.0			21.0 - 24.0		GHz
Gain	10.5	13		10.5	14		dB
Gain Variation Over Temperature		0.02	0.03		0.02	0.03	dB/ °C
Input Return Loss		10			10		dB
Output Return Loss		7			8		dB
Output Power for 1 dB Compression (P1dB)	17	20		18.5	21.5		dBm
Saturated Output Power (Psat)		23			23.5		dBm
Output Third Order Intercept (IP3)		28			27		dBm
Noise Figure		7			6.5		dB
Supply Current (Idd)(Vdd = 5V, Vgg = -1V Typ.)		85			85		mA

Adjust Vgg between -1.5 to -0.5V to achieve Idd = 85 mA typical.

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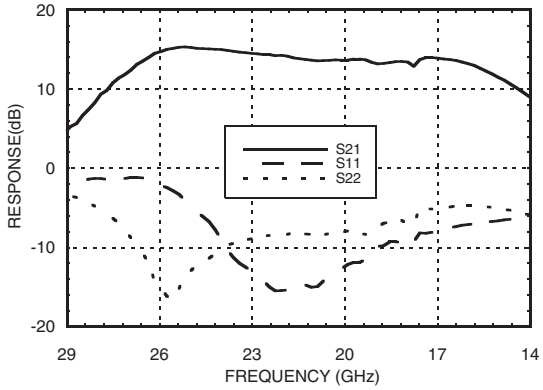
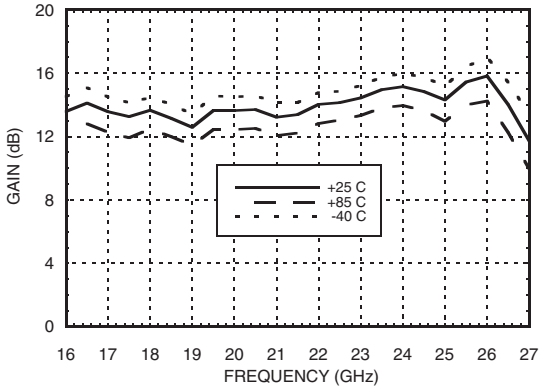
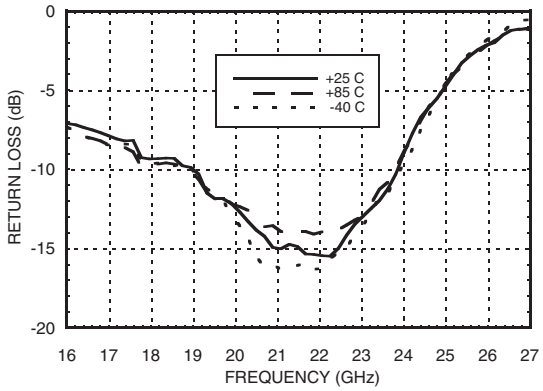
Broadband Gain & Return Loss



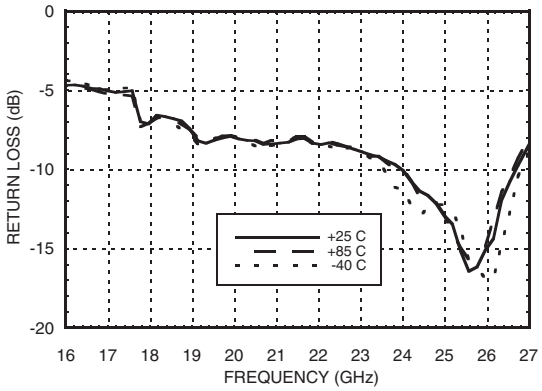
Gain vs. Temperature



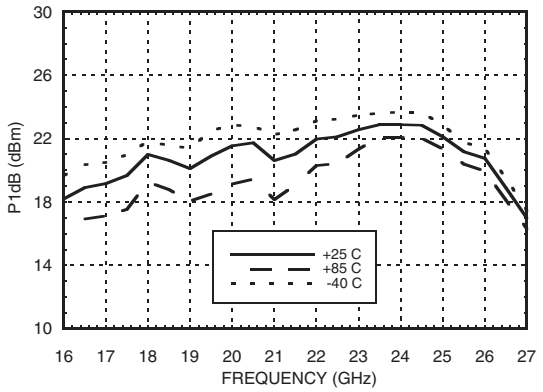
Input Return Loss vs. Temperature



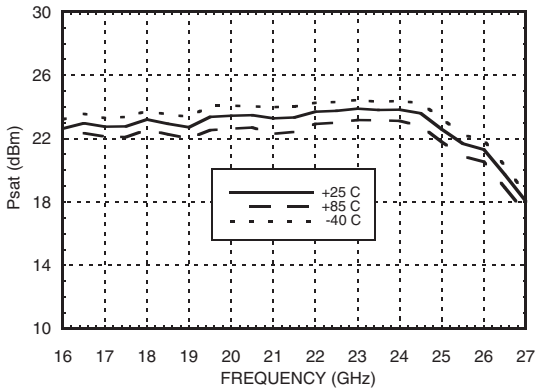
Output Return Loss vs. Temperature



P1dB vs. Temperature



Psat vs. Temperature



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RoHS✓ EARTH FRIENDLY

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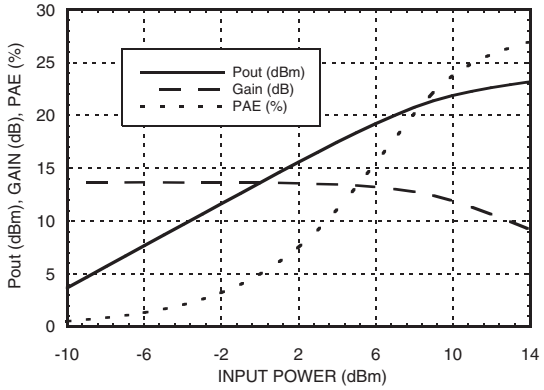
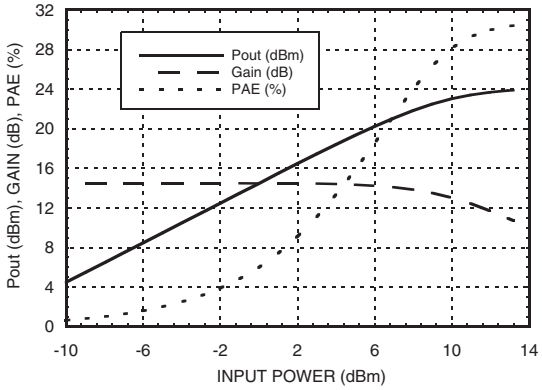
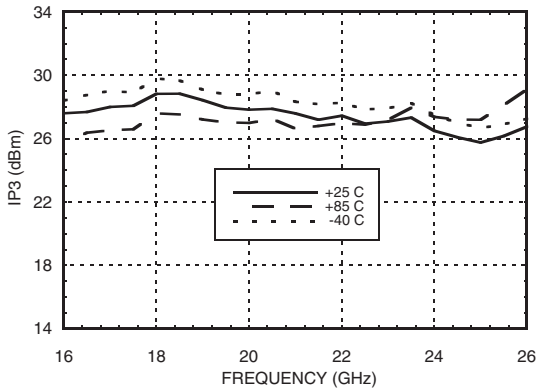
Power Compression @ 18 GHz



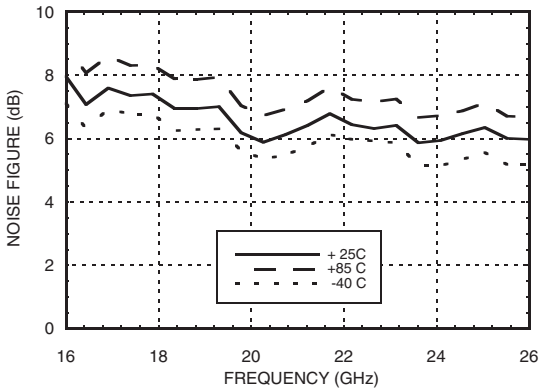
Power Compression @ 23 GHz



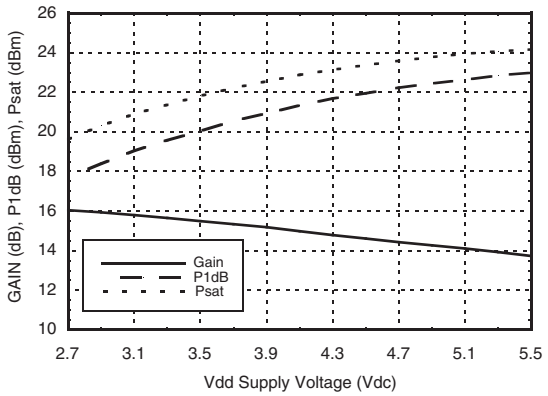
Output IP3 vs. Temperature



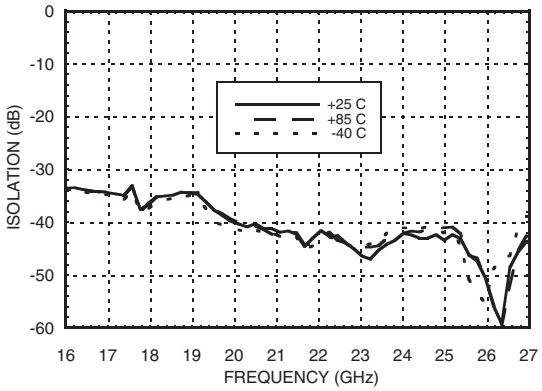
Noise Figure vs. Temperature



Gain & Power vs. Supply Voltage @ 23 GHz



Reverse Isolation vs. Temperature



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Absolute Maximum Ratings

Drain Bias Voltage (Vdd)	+5.5 Vdc
Gate Bias Voltage (Vgg)	-8.0 to 0 Vdc
RF Input Power (RFIN)(Vdd = +5Vdc, Idd = 85 mA)	+16 dBm
Channel Temperature	175 °C
Continuous Pdiss (T = 85 °C) (derate 5.46 mW/°C above 85 °C)	0.491 W
Thermal Resistance (channel to ground paddle)	183 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

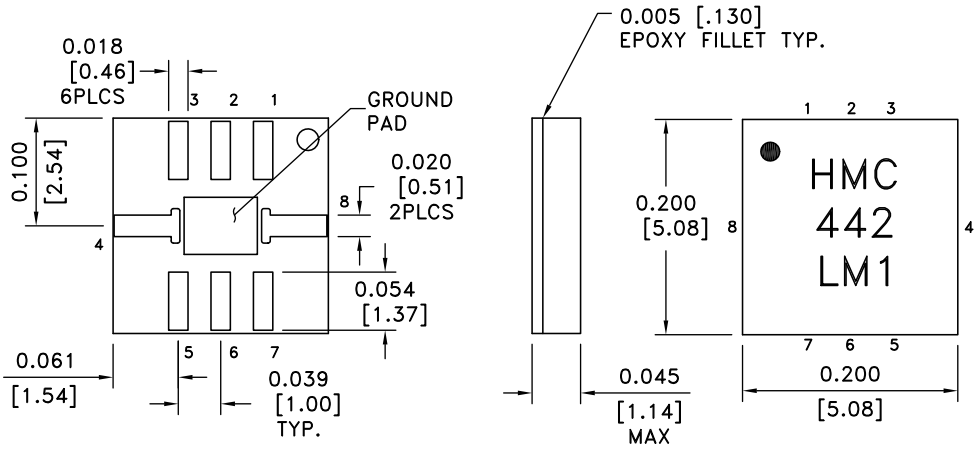
Typical Supply Current vs. Vdd

Vdd (V)	Idd (mA)
+4.5	82
+5.0	85
+5.5	87
+2.7	79
+3.0	83
+3.3	86

Note: Amplifier will operate over full voltage range shown above

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:
1. MATERIAL: PLASTIC
2. PLATING: GOLD OVER NICKEL
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. ALL TOLERANCES ARE ±0.005 [±0.13].
5. ALL GROUNDS MUST BE SOLDERED TO PCB RF GROUND.
6. • INDICATES PIN 1.

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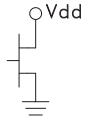
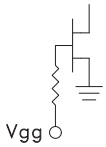
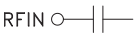
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 3, 5, 6	N/C	No connection	
2	Vdd	Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF and 0.01 µF are required.	
4	RFOUT	This pin is AC coupled and matched to 50 Ohms.	
7	Vgg	Gate control for amplifier. Adjust to achieve Id of 85 mA. Please follow “MMIC Amplifier Biasing Procedure” Application Note.	
8	RFIN	This pin is AC coupled and matched to 50 Ohms.	

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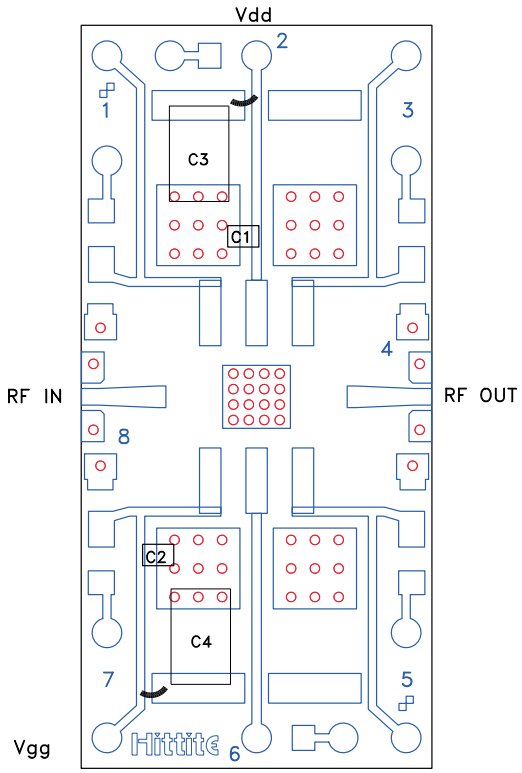
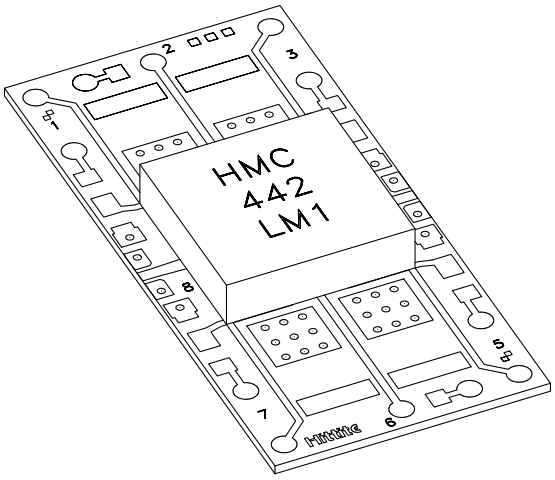
Evaluation PCB



The grounded Co-Planar Wave Guide (CPWG) PCB input/output transitions allow use of Ground-Signal-Ground (GSG) probes for testing. Suggested probe pitch is 400um (16 mils). Alternatively, the board can be mounted in a metal housing with 2.4mm coaxial connectors.

Evaluation Circuit Board Layout Design Details

Layout Technique	Micro Strip to CPWG
Material	Rogers 4003 with 1/2 oz, Cu
Dielectric Thickness	0.008" (0.20 mm)
Microstrip Line Width	0.018" (0.46 mm)
CPWG Line Width	0.016" (0.41 mm)
CPWG Line to GND Gap	0.005" (0.13 mm)
Ground VIA Hole Diameter	0.008" (0.20 mm)
C1 - C2	100 pF Capacitor, 0402 Pkg.
C3 - C4	33.000 pF Capacitor, 0805 Pkg.



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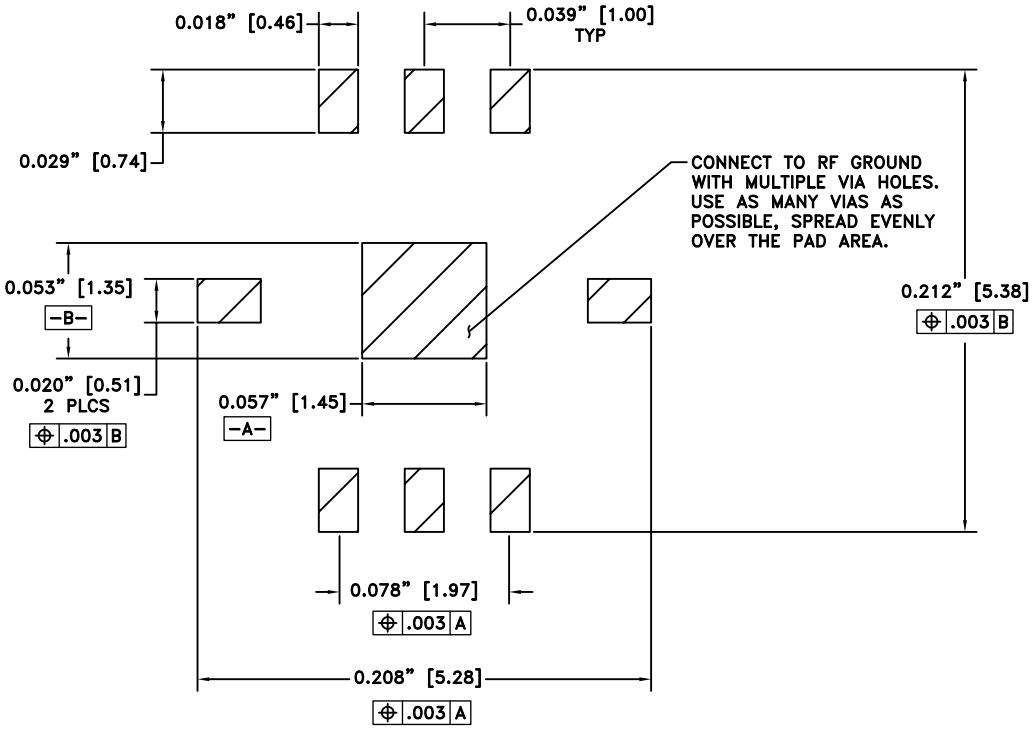
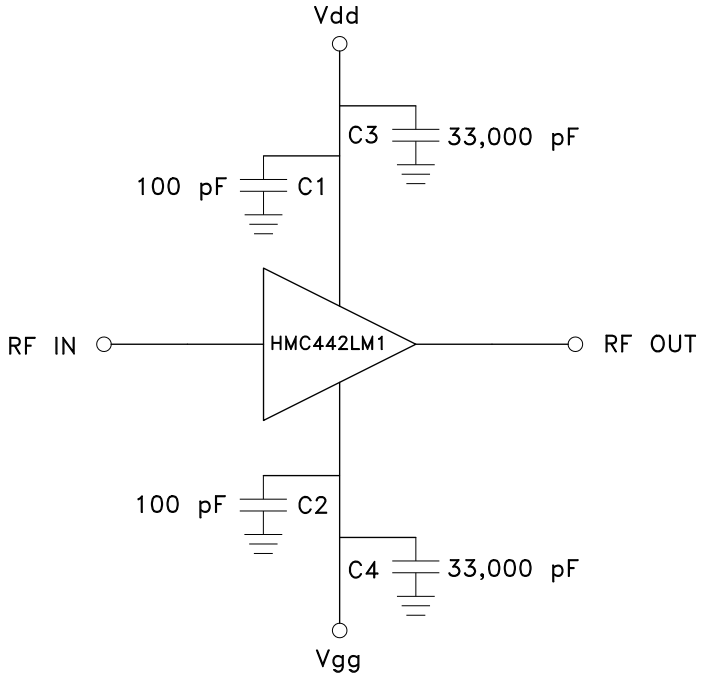
Suggested LM1 PCB Land Pattern Tolerance: ± 0.003" (± 0.08 mm)



Amplifier Application Circuit



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