



GaAs PHEMT MMIC MEDIUM POWER AMPLIFIER, 17.5 - 25.5 GHz

Typical Applications

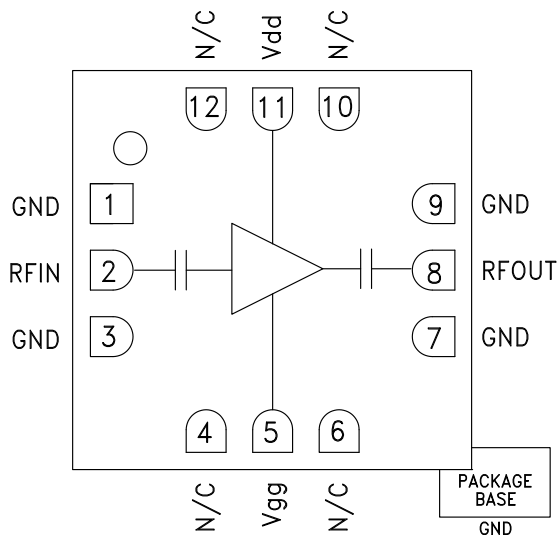
The HMC442LC3B is an ideal gain block or driver amplifier for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- LO Driver for HMC Mixers
- Military EW & ECM

Features

- Gain: 13 dB
- Saturated Power: +23 dBm @ 26% PAE
- Supply Voltage: +5V
- 50 Ohm Matched Input/Output
- RoHS Compliant 3 x 3 mm SMT package

Functional Diagram



General Description

The HMC442LC3B is an efficient GaAs PHEMT MMIC Medium Power Amplifier housed in a leadless "Pb free" RoHS compliant SMT package. Operating between 17.5 and 25.5 GHz, the amplifier provides 13 dB of gain, +23 dBm of saturated power and 26% PAE from a +5V supply voltage. This 50 Ohm matched amplifier does not require any external components, making it an ideal linear gain block or driver for HMC SMT mixers. The HMC442LC3B allows the use of surface mount manufacturing techniques.

Electrical Specifications, $T_A = +25^\circ C$, $V_{dd} = +5V$, $I_{dd} = 84 mA^*$

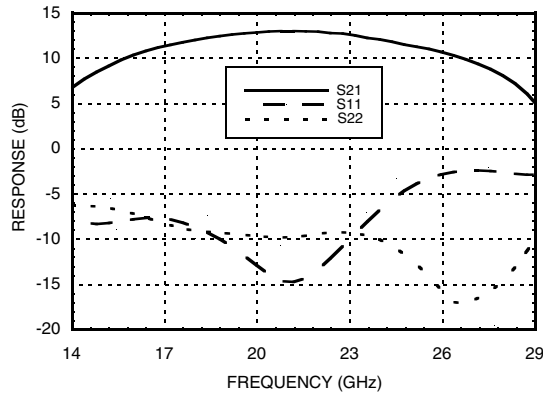
| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|-------------|------|------|-------------|------|------|-------------|------|------|-------|
| Frequency Range | 17.5 - 21.0 | | | 21.0 - 24.0 | | | 24.0 - 25.5 | | | GHz |
| Gain | 10 | 13 | | 10 | 13 | | 8 | 11 | | dB |
| Gain Variation Over Temperature | | 0.02 | 0.03 | | 0.02 | 0.03 | | 0.02 | 0.03 | dB/°C |
| Input Return Loss | | 10 | | | 10 | | | 5 | | dB |
| Output Return Loss | | 9 | | | 9 | | | 12 | | dB |
| Output Power for 1 dB Compression (P1dB) | 18 | 21 | | 19 | 22 | | 19 | 22 | | dBm |
| Saturated Output Power (P _{sat}) | | 23 | | | 23.5 | | | 23 | | dBm |
| Output Third Order Intercept (IP3) | | 27 | | | 26 | | | 26 | | dBm |
| Noise Figure | | 8 | | | 8 | | | 9 | | dB |
| Supply Current (I _{dd})(V _{dd} = 5V, V _{gg} = -1V Typ.) | | 84 | | | 84 | | | 84 | | mA |

*Adjust V_{gg} between -1.5 to -0.5V to achieve I_{dd} = 84 mA typical.

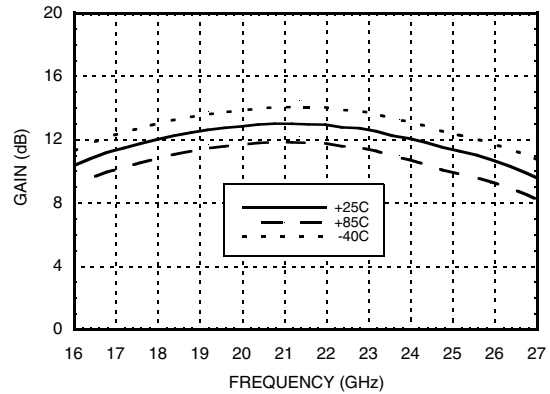


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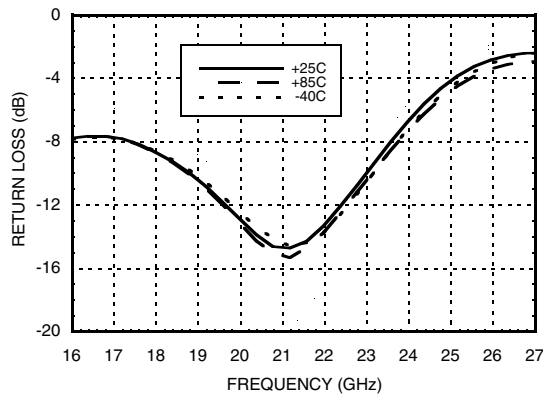
Broadband Gain & Return Loss



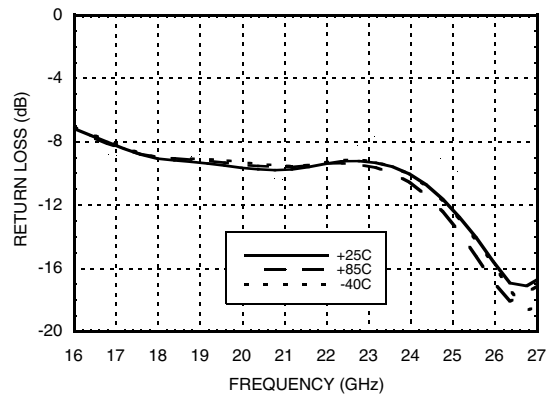
Gain vs. Temperature



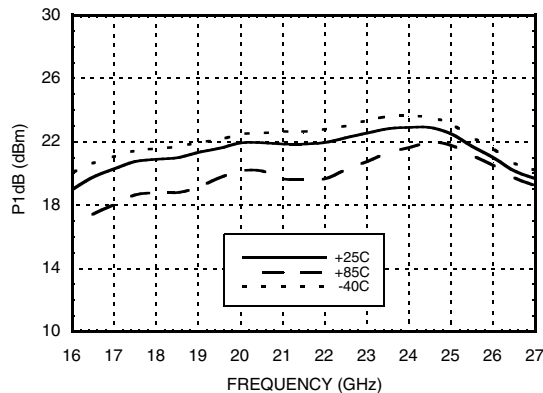
Input Return Loss vs. Temperature



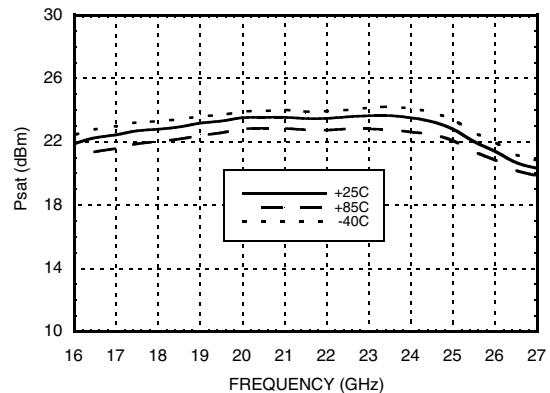
Output Return Loss vs. Temperature



P1dB vs. Temperature



Psat vs. Temperature



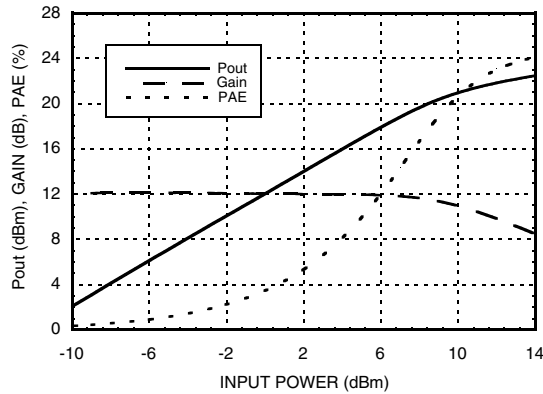
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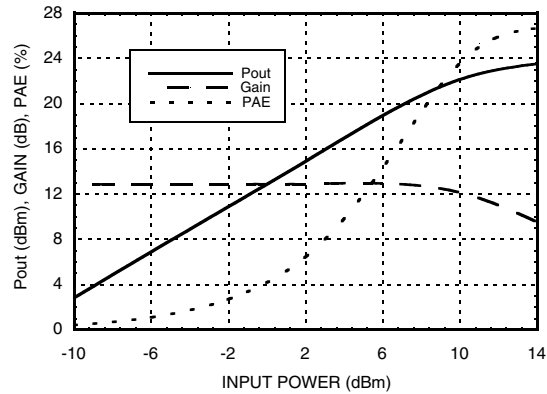


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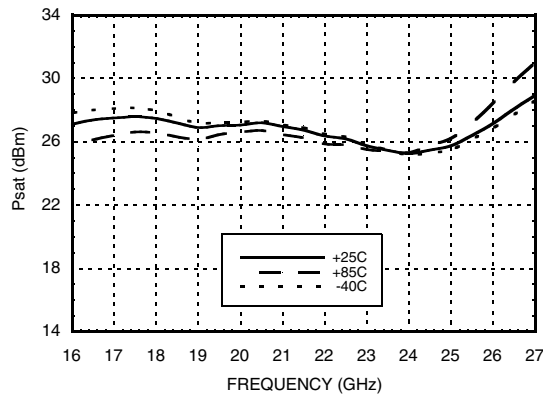
Power Compression @ 18 GHz



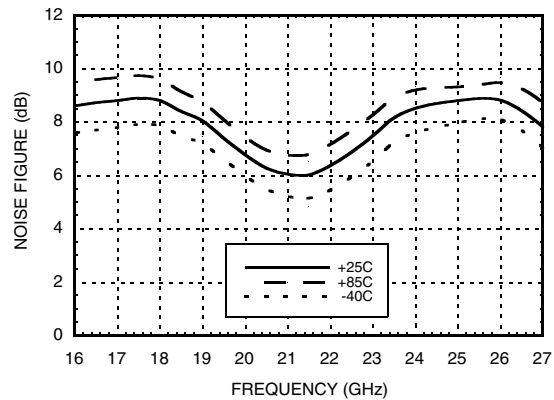
Power Compression @ 23 GHz



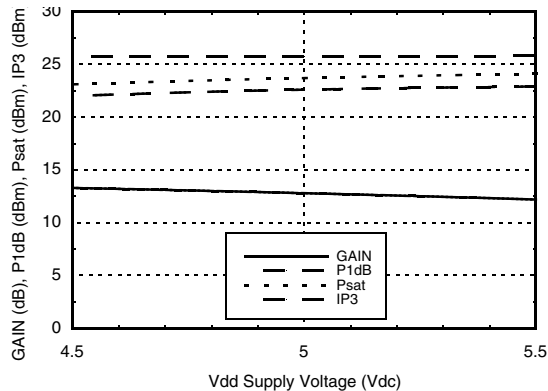
Output IP3 vs. Temperature



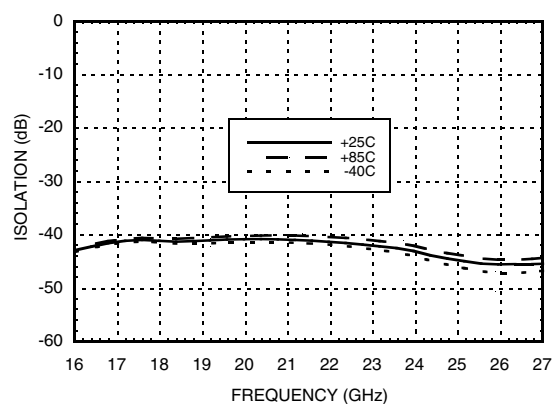
Noise Figure vs. Temperature



**Gain, Power and Output IP3 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 |
| ESD Sensitivity (HBM) | Class 1A |

Typical Supply Current vs. Vdd

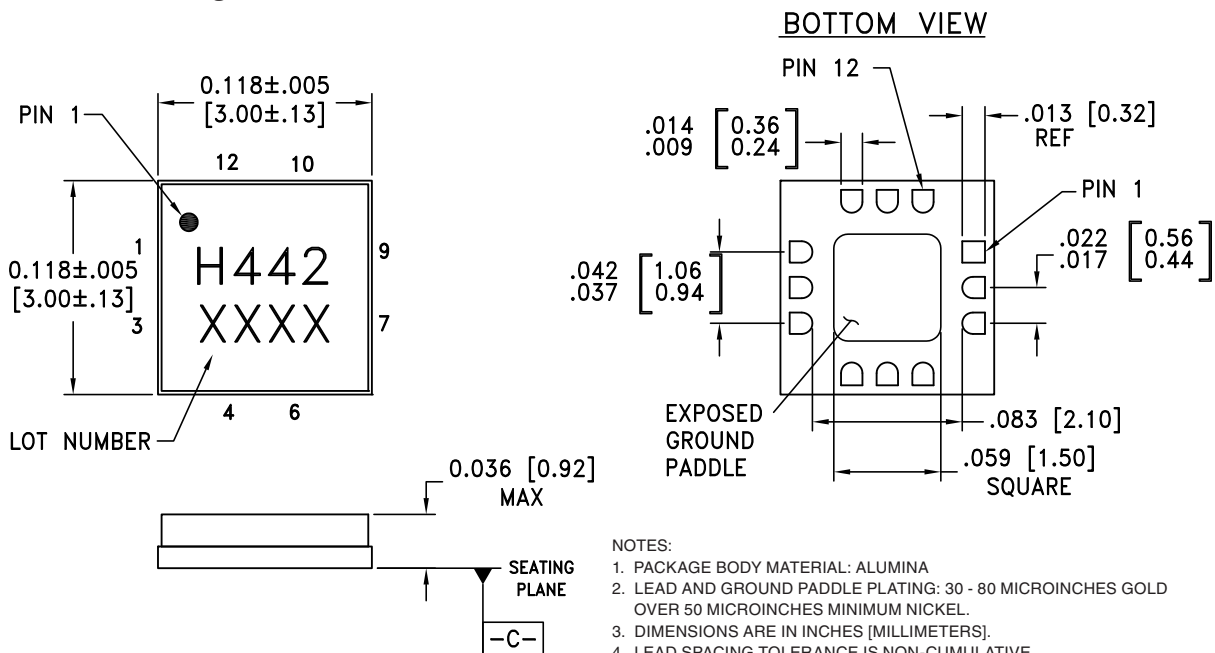
| Vdd (V) | Idd (mA) |
|---------|----------|
| +4.5 | 82 |
| +5.0 | 84 |
| +5.5 | 86 |

Note: Amplifier will operate over full voltage range shown above



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30 - 80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM -C-
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[2] |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC442LC3B | Alumina, White | Gold over Nickel | MSL3 ^[1] | H442 XXXX |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX



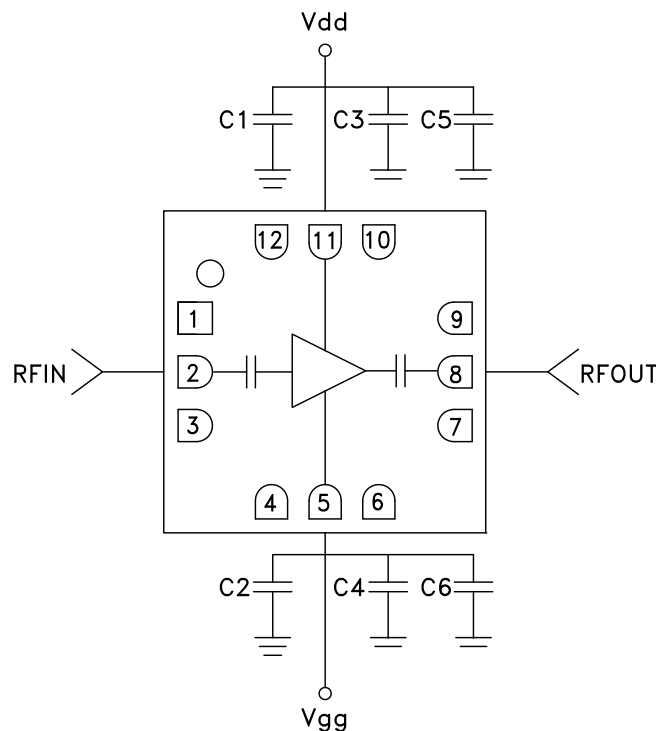
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Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|--------------|----------|---|---------------------|
| 1, 3, 7, 9 | GND | Package bottom must also be connected to RF/DC ground | |
| 2 | RFIN | This pin is AC coupled and matched to 50 Ohms. | |
| 4, 6, 10, 12 | N/C | This pin may be connected to RF/DC ground. Performance will not be affected. | |
| 5 | Vgg | Gate control for amplifier. Adjust to achieve Id of 84 mA. Please follow "MMIC Amplifier Biasing Procedure" Application Note. | |
| 8 | RFOUT | This pin is AC coupled and matched to 50 Ohms. | |
| 11 | Vdd | Power Supply Voltage for the amplifier. External bypass capacitors are required. | |

Application Circuit

| Component | Value |
|-----------|----------|
| C1, C2 | 100 pF |
| C3, C4 | 1,000 pF |
| C5, C6 | 2.2 μF |



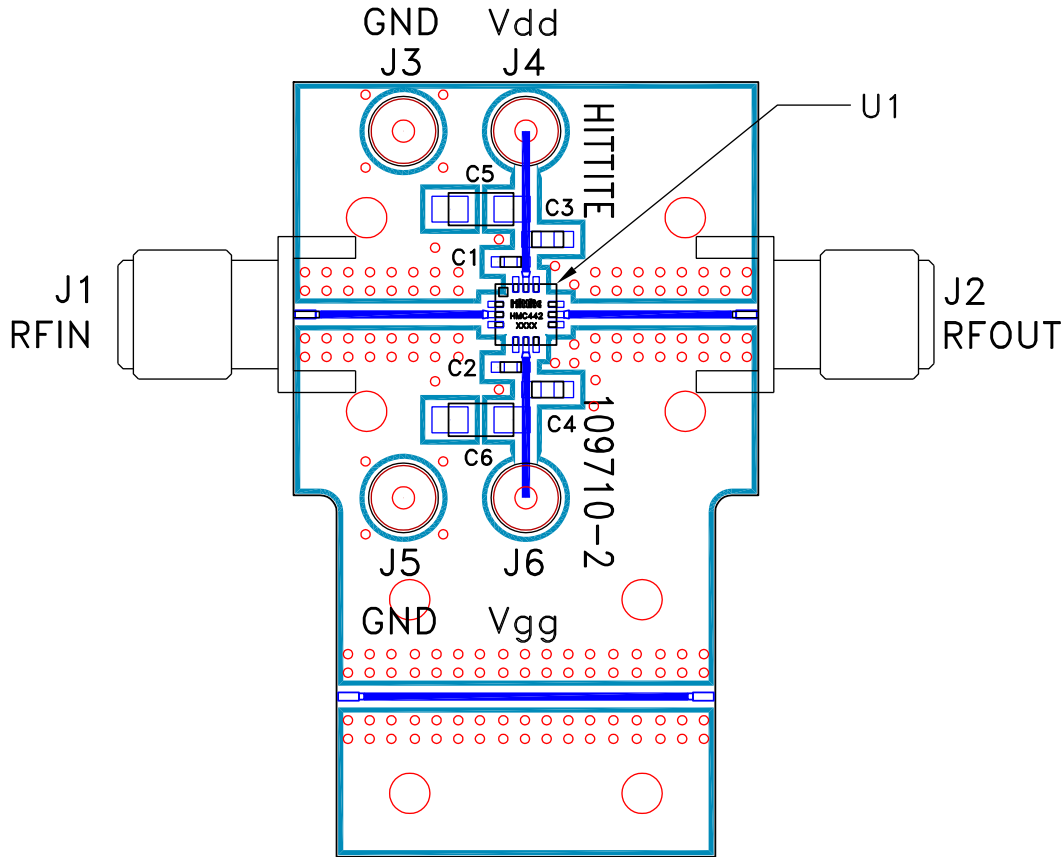
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Evaluation PCB



List of Materials for Evaluation PCB 109712 [1]

| Item | Description |
|---------|------------------------------|
| J1 - J2 | PCB Mount SMA Connector |
| J3 - J6 | DC Pin |
| C1 - C2 | 100 pF Capacitor, 0402 Pkg. |
| C3 - C4 | 1000 pF Capacitor, 0603 Pkg. |
| C5 - C6 | 2.2 μF Capacitor, Tantalum |
| U1 | HMC442LC3B Amplifier |
| PCB [2] | 109710 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.

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