# HMC441LC3B

v02.0907

## GaAs PHEMT MMIC MEDIUM POWER AMPLIFIER, 6 - 18 GHz

### Typical Applications

The HMC441LC3B is ideal for use as a medium power amplifier for:

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

### Features

Gain: 14 dB

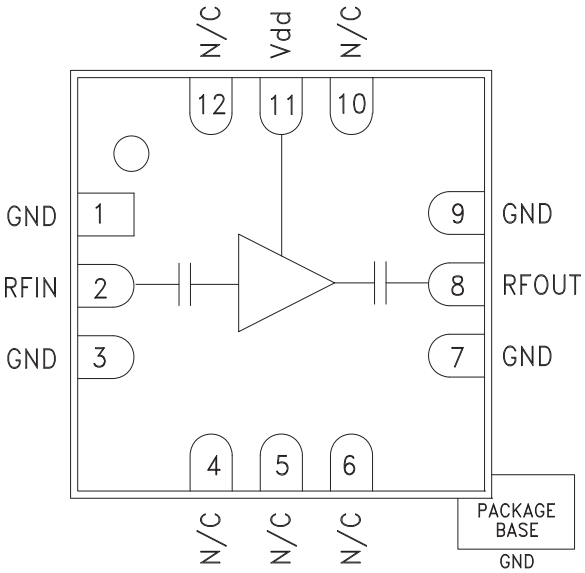
Saturated Output Power: +21.5 dBm @ 27% PAE

Single Positive Supply: +5V @ 90 mA

50 Ohm Matched Input/Output

12 Lead Ceramic 3x3mm SMT Package: $9mm^2$

### Functional Diagram



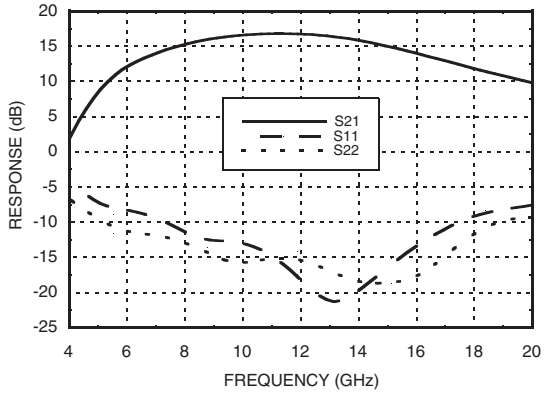

### General Description

The HMC441LC3B is an efficient GaAs PHEMT MMIC Medium Power Amplifier housed in a leadless RoHS compliant SMT package. Operating between 6 and 18 GHz, the amplifier provides 14 dB of gain, +21.5 dBm of saturated power and 27% PAE from a +5V supply. This 50 Ohm matched amplifier does not require any external components and operates from a single positive supply, making it an ideal linear gain block or driver for HMC SMT mixers. The HMC441LC3B is compatible with high volume surface mount manufacturing techniques, and the I/Os are DC blocked for further ease of integration.

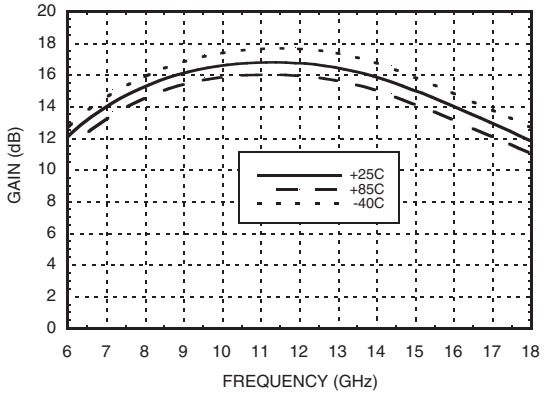
### Electrical Specifications, $T_A$ = +25° C, Vdd = +5V

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency Range | | 6.0 - 8.5 | | | 8.5 - 12.5 | | | 12.5 - 14.0 | | | 14.0 - 18.0 | | GHz |
| Gain | 10 | 14 | | 13 | 17 | | 14 | 17 | | 10 | 14 | | dB |
| Gain Variation Over Temperature | | 0.015 | 0.02 | | 0.015 | 0.02 | | 0.015 | 0.02 | | 0.015 | 0.02 | dB/ °C |
| Input Return Loss | | 10 | | | 13 | | | 20 | | | 13 | | dB |
| Output Return Loss | | 12 | | | 15 | | | 17 | | | 14 | | dB |
| Output Power for 1 dB Compression (P1dB) | 16 | 19 | | 17 | 20 | | 17 | 20 | | 17 | 20 | | dBm |
| Saturated Output Power (Psat) | | 20 | | | 21.5 | | | 22.5 | | | 21.5 | | dBm |
| Output Third Order Intercept (IP3) | | 30 | | | 32 | | | 32 | | | 32 | | dBm |
| Noise Figure | | 4.5 | | | 4.5 | | | 4.5 | | | 4.5 | | dB |
| Supply Current (Idd) | | 90 | 115 | | 90 | 115 | | 90 | 115 | | 90 | 115 | mA |

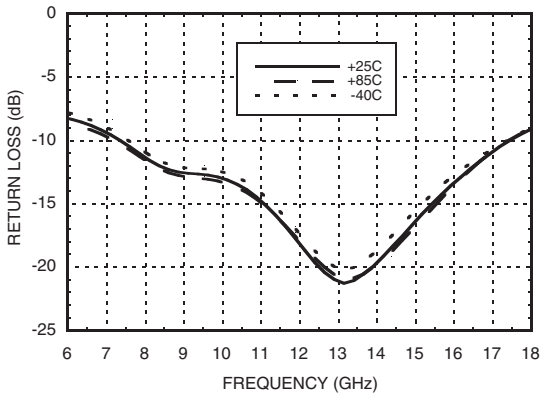
### Broadband Gain & Return Loss



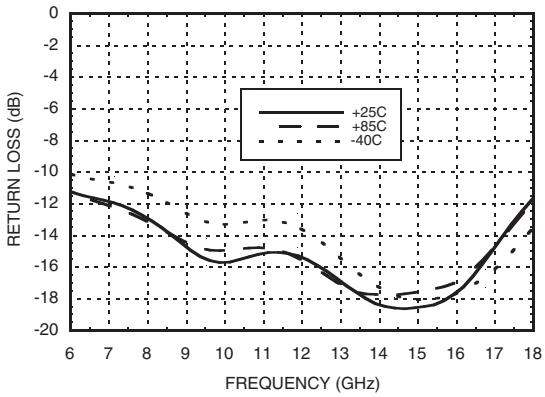

### Gain vs. Temperature



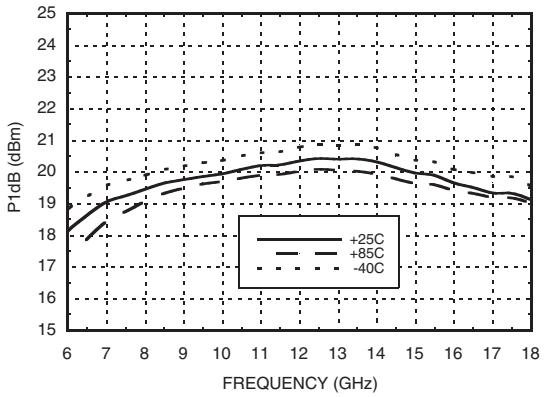

### Input Return Loss vs. Temperature



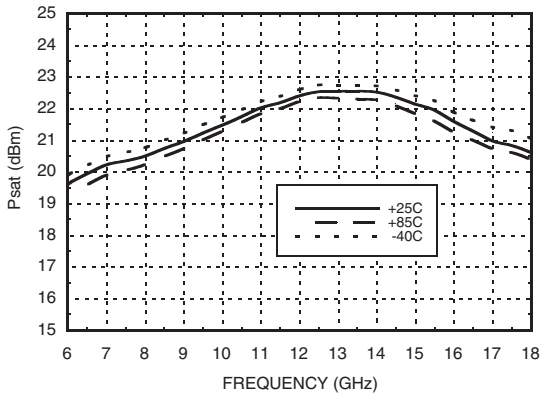

### Output Return Loss vs. Temperature



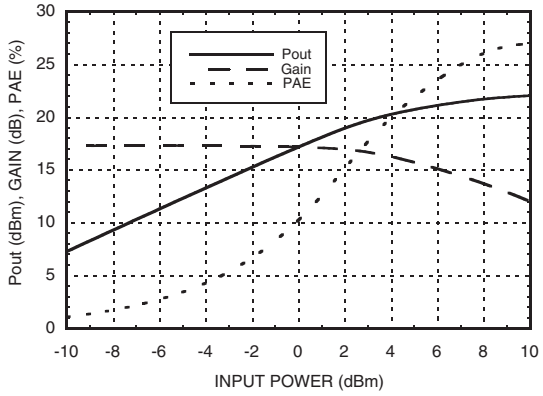

### P1dB vs. Temperature



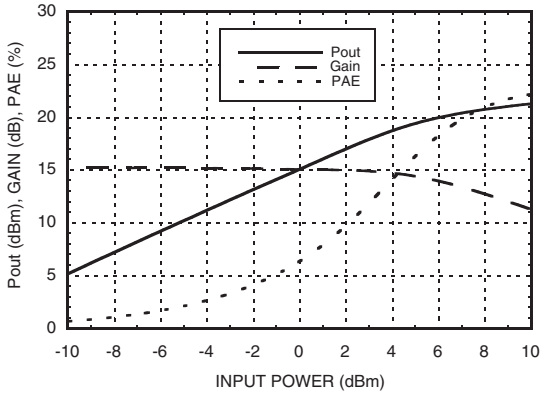

### Psat vs. Temperature



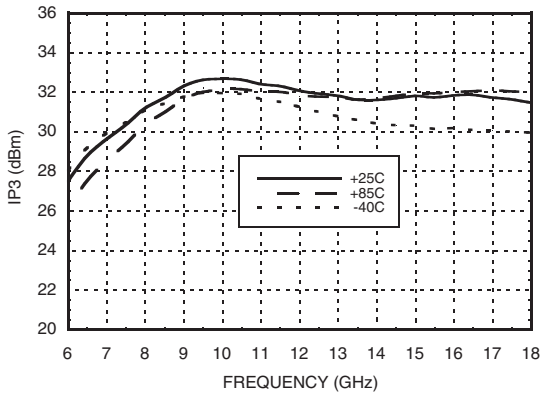
### Power Compression @ 11 GHz



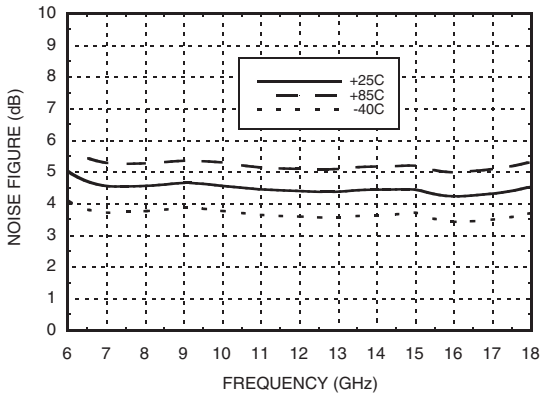

### Power Compression @ 15 GHz



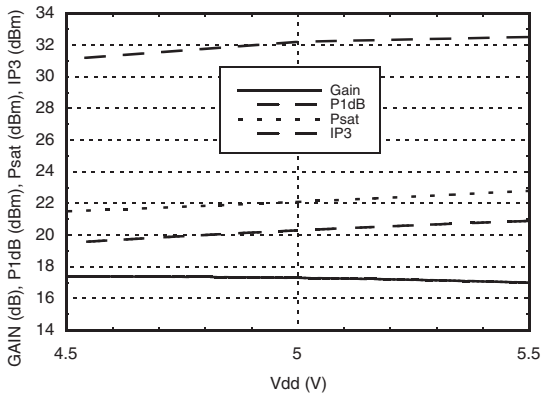

### Output IP3 vs. Temperature



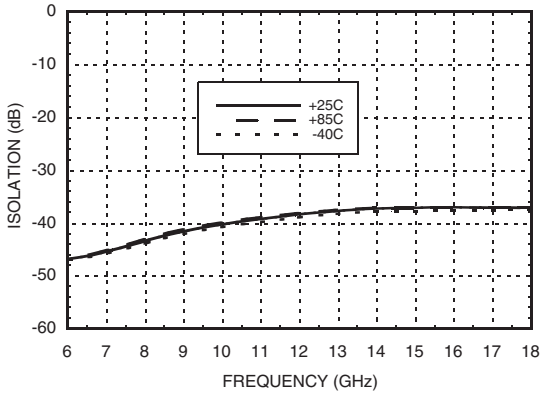

### Noise Figure vs. Temperature




### Gain, Power & Output IP3 vs. Supply Voltage @ 11 GHz




### Reverse Isolation vs. Temperature



## Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vdd) | +6 Vdc |
| RF Input Power (RFIN)(Vdd = +5 Vdc) | +15 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T = 85 °C) (derate 6.8 mW/°C above 85 °C) | 0.61 W |
| Thermal Resistance (channel to ground paddle) | 147 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

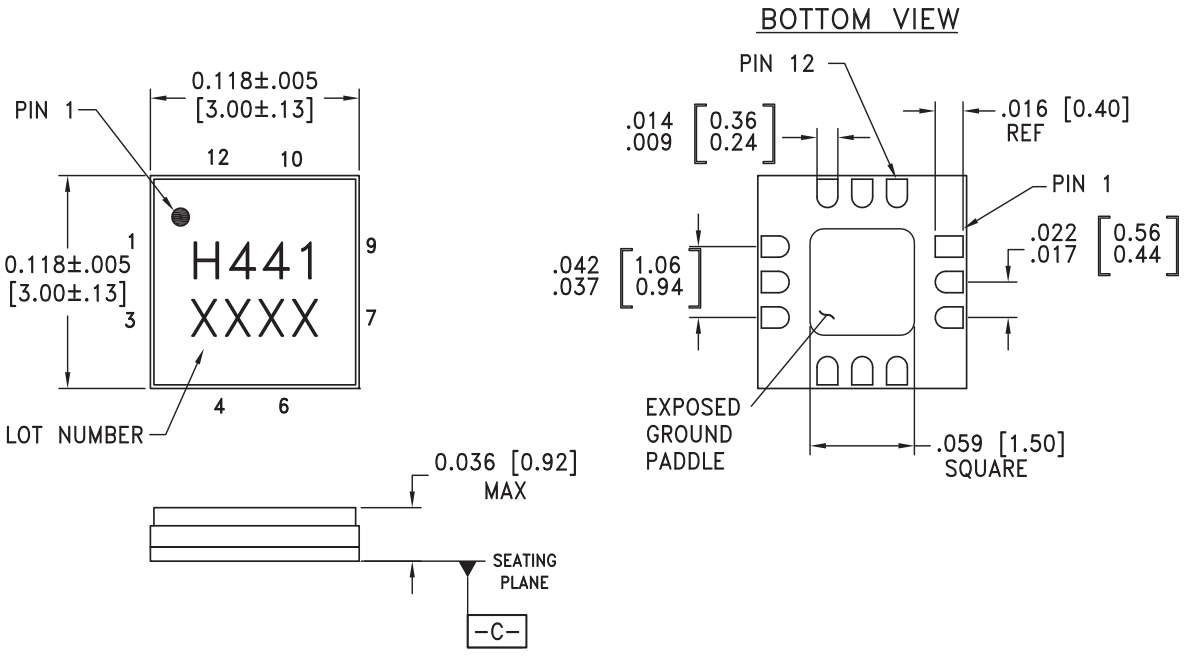
## Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| +5.5 | 92 |
| +5.0 | 90 |
| +4.5 | 88 |

Note: Amplifier will operate over full voltage range shown above

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

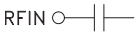
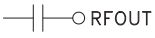
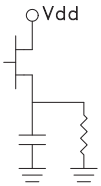
## Outline Drawing




NOTES:

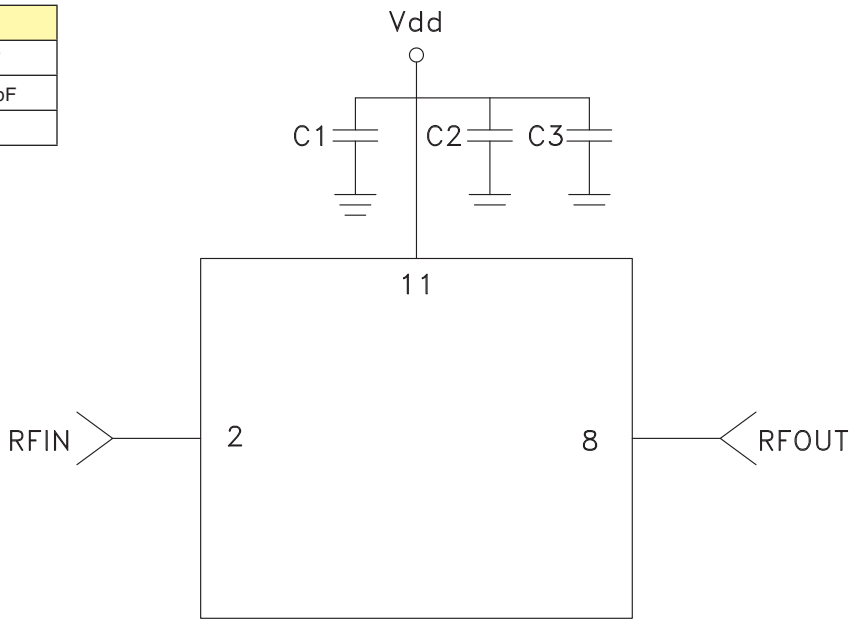
1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: GOLD FLASH OVER Ni.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

## Pin Descriptions

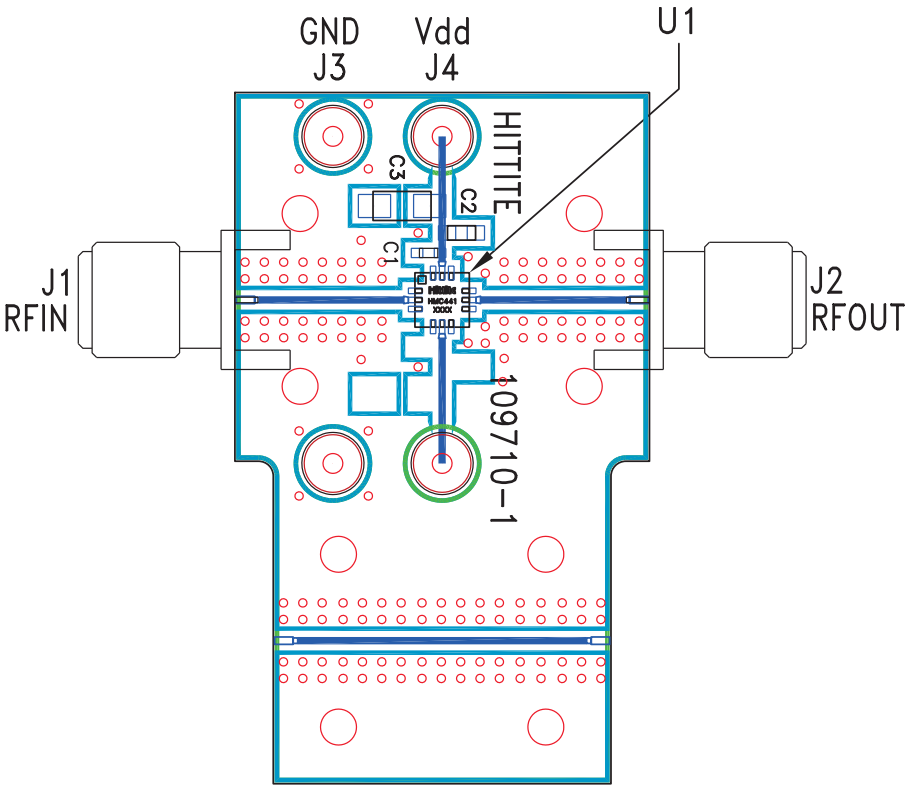
| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 3, 7, 9 | GND | Package bottom must also be connected to RF/DC ground |   |
| 2 | RFIN | This pin is AC coupled and matched to 50 Ohms. |   |
| 4 - 6<br>10, 12 | N/C | This pin may be connected to RF/DC ground. Performance will not be affected. | |
| 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 | 100 pF |
| C2 | 1,000 pF |
| C3 | 2.2 µF |



## Evaluation PCB




## List of Materials for Evaluation PCB 109712 [1]

| Item | Description |
|---|---|
| J1 - J2 | PCB Mount SMA Connector |
| J3 - J4 | DC Pin |
| C1 | 100 pF Capacitor, 0402 Pkg. |
| C2 | 1000 pF Capacitor, 0603 Pkg. |
| C3 | 2.2 µF Capacitor, Tantalum |
| U1 | HMC441LC3B Amplifier |
| PCB [2] | 109710 Evaluation PCB, 10 mils |

[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.