# HMC634LC4

v03.0514

## GaAs PHEMT MMIC DRIVER AMPLIFIER, 5 - 20 GHz

### Typical Applications

The HMC634LC4 is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios & VSAT
- LO Driver for Mixers
- Military & Space

### Features

Gain: 21 dB

P1dB: +22 dBm

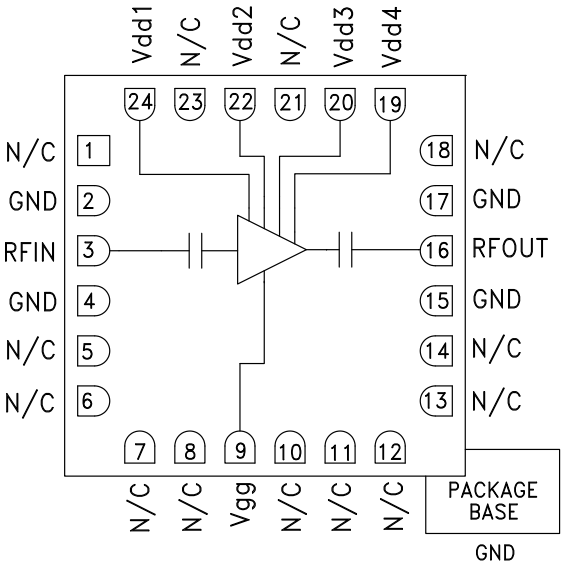
Saturated Power: +23 dBm @ 17% PAE

Single Supply Voltage: +5V @180 mA

50 Ohm Matched Input/Output

24 Lead 4x4mm SMT Package: $16mm^2$

### Functional Diagram




### General Description

The HMC634LC4 is a GaAs PHEMT MMIC Driver Amplifier in a leadless 4 x 4 mm ceramic surface mount package which operates between 5 and 20 GHz The amplifier provides up to 21 dB of gain, +29 dBm Output IP3, and +22 dBm of output power at 1 dB gain compression, while requiring 180 mA from a +5V supply. The HMC634LC4 is an ideal driver amplifier for microwave radio applications from 5 to 20 GHz, and may be biased at +5V, 130 mA to provide lower gain with optimized PAE. The amplifier's I/Os are DC blocked and matched to 50 Ohms with no external matching required.

### Electrical Specifications, $T_A$ = +25° C, $Vdd_{1-4}$= 5V, Idd= 180 mA [1]

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 5 - 16 | | | 16 - 20 | | GHz |
| Gain | 18 | 21 | | 17 | 20 | | dB |
| Gain Variation Over Temperature | | 0.025 | 0.035 | | 0.020 | 0.030 | dB/ °C |
| Input Return Loss | | 18 | | | 14 | | dB |
| Output Return Loss | | 14 | | | 13 | | dB |
| Output Power for 1 dB Compression (P1dB) | 19 | 22 | | 16 | 20 | | dBm |
| Saturated Output Power (Psat) | | 23 | | | 20.5 | | dBm |
| Output Third Order Intercept (IP3) | | 29 | | | 28 | | dBm |
| Noise Figure | | 7.5 | | | 7.5 | | dB |
| Supply Current (Idd) (Idd = $Idd_1$ + $Idd_2$ + $Idd_3$ + $Idd_4$) | | 180 | | | 180 | | mA |

[1] Adjust Vgg between -2 to 0V to achieve Idd= 180 mA Typical.



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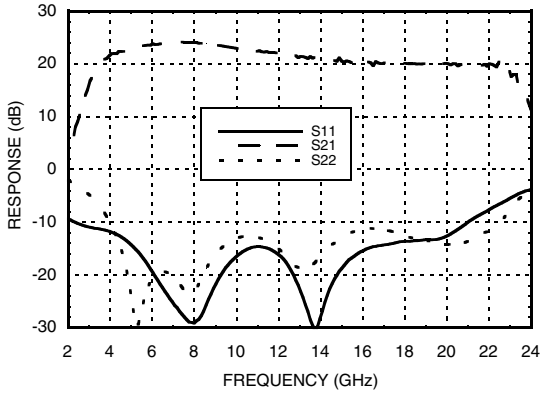
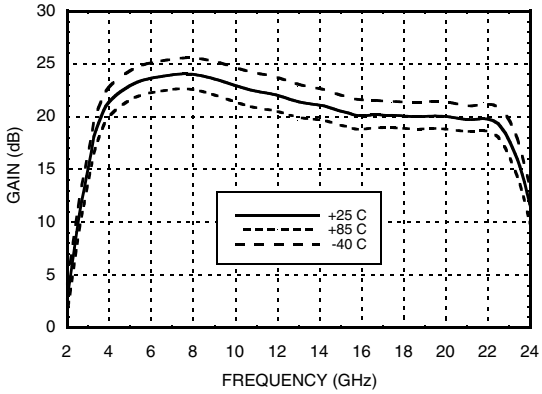
## GaAs PHEMT MMIC DRIVER AMPLIFIER, 5 - 20 GHz

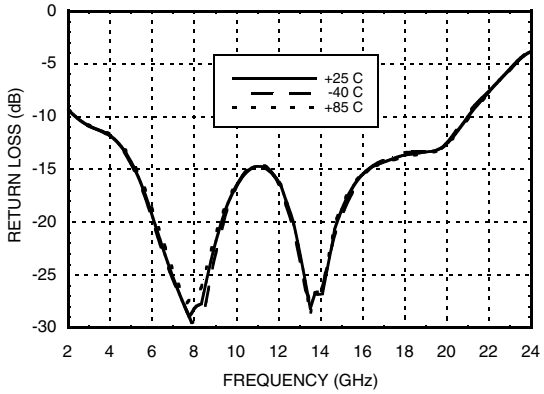
### Broadband Gain & Return Loss



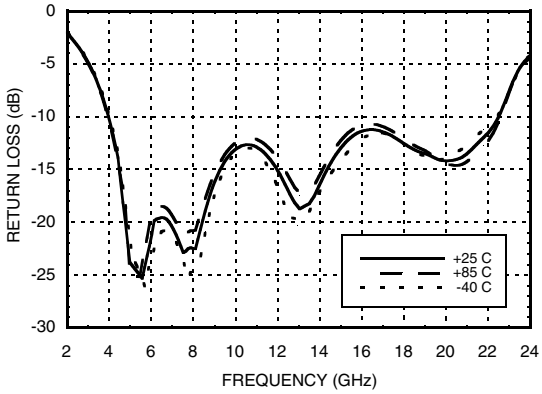

### Gain vs. Temperature



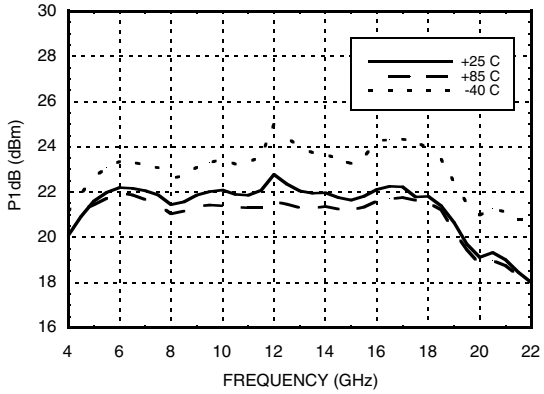

### Input Return Loss vs. Temperature



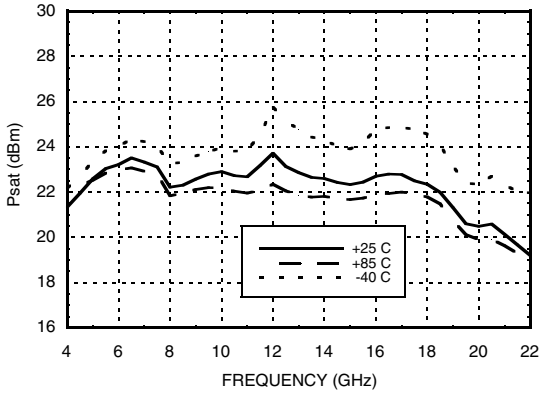

### Output Return Loss vs. Temperature




### P1dB vs. Temperature




### Psat vs. Temperature





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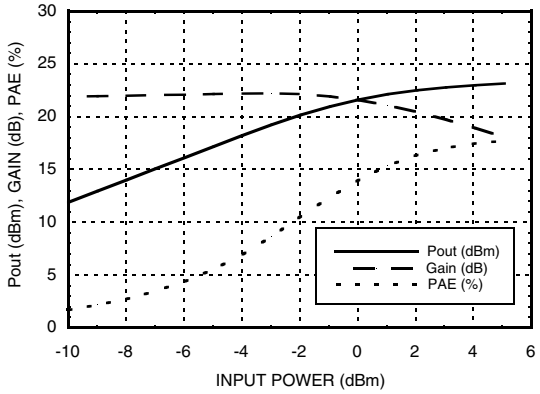
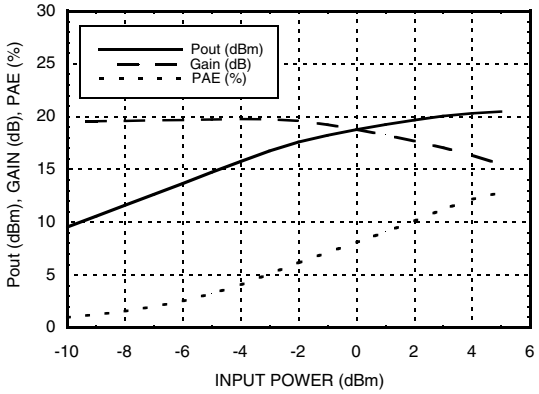
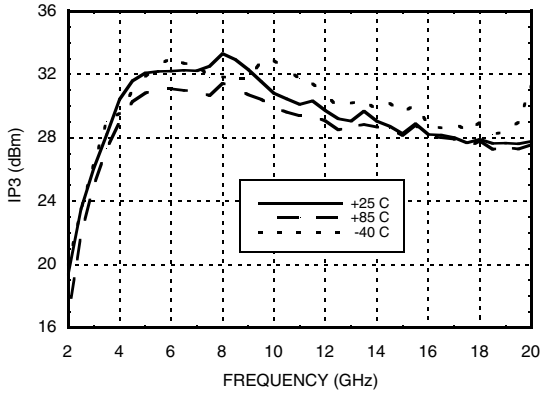
### Power Compression @ 12.5 GHz



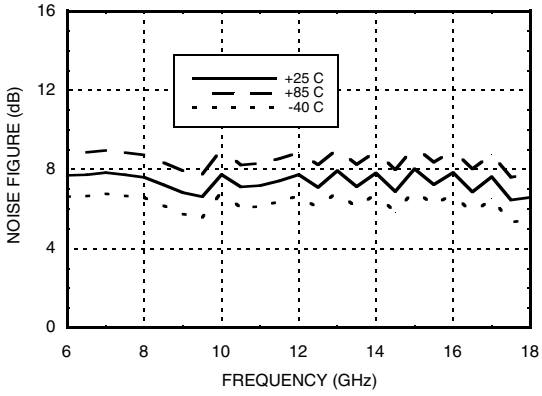

### Power Compression @ 20 GHz



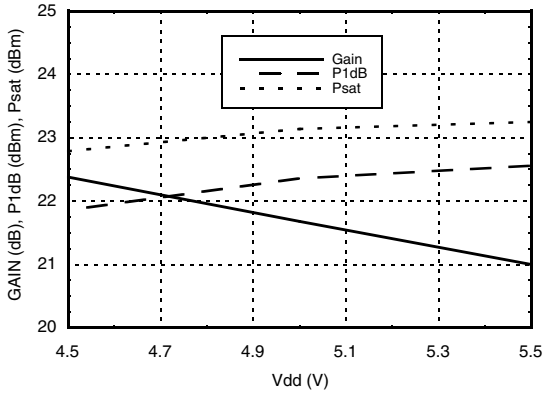

### Output IP3 vs. Temperature



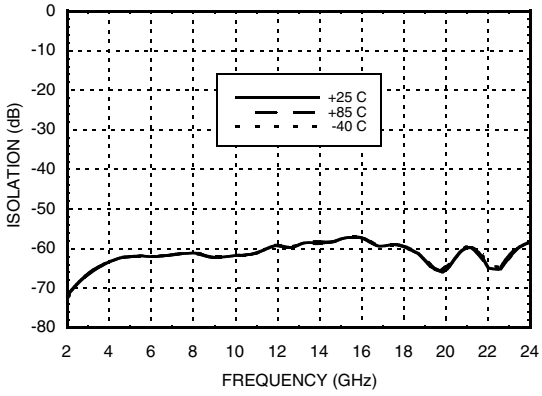

### Noise Figure vs. Temperature




### Gain & Power vs. Supply Voltage @ 12.5 GHz




### Reverse Isolation vs. Temperature



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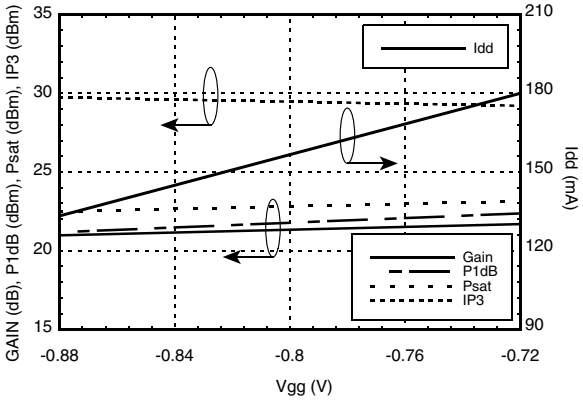
# GaAs PHEMT MMIC DRIVER AMPLIFIER, 5 - 20 GHz

## Gain, Power & Output IP3 vs. Gate Voltage @ 12.5 GHz




## Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| 4.5 | 177 |
| 5.0 | 180 |
| 5.5 | 183 |

*Note: Amplifier will operate over full voltage ranges shown above*

## Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vdd1, Vdd2, Vdd3, Vdd4) | +5.5 Vdc |
| Gate Bias Voltage (Vgg) | -3 to 0 Vdc |
| RF Input Power (RFIN)(Vdd = +5 Vdc) | +10 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T= 85 °C) (derate 11.17 mW/°C above 85 °C) | 1 W |
| Thermal Resistance (channel to package bottom) | 89.46 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS





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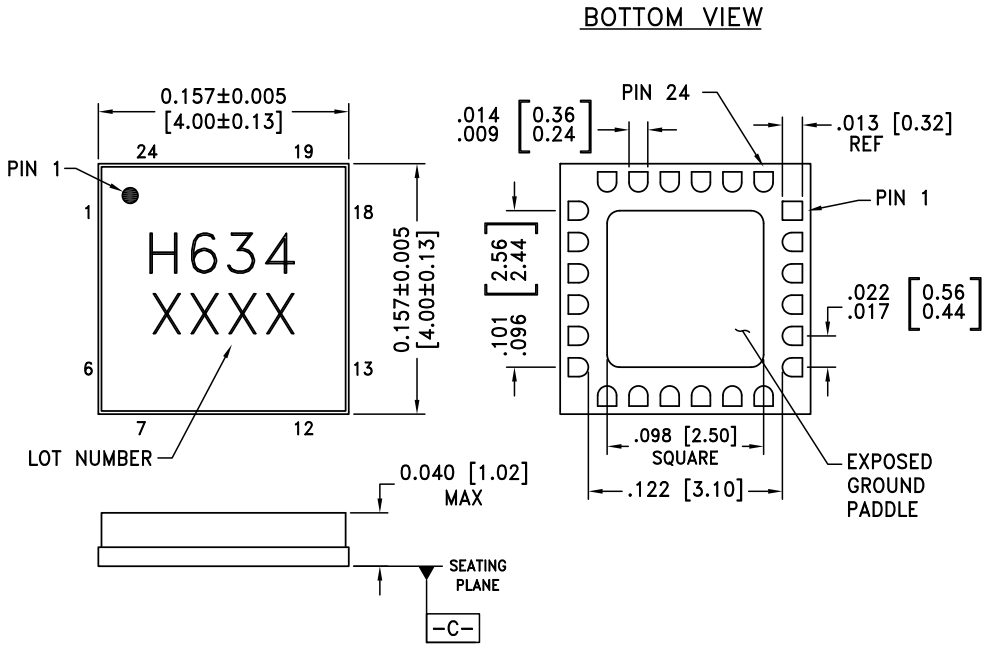
## Outline Drawing




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] |
|---|---|---|---|---|
| HMC634LC4 | Alumina, White | Gold over Nickel | MSL3 [1] | H634<br>XXXX |

[1] Max peak reflow temperature of 260 °C
[2] 4-Digit lot number XXXX



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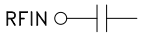
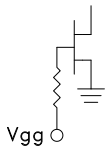
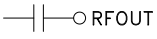
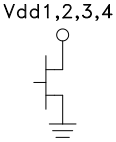
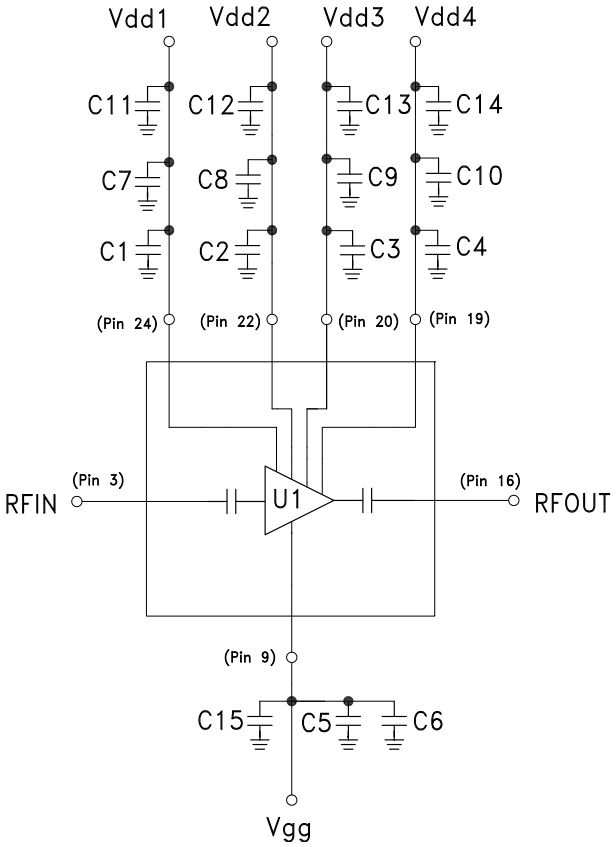
## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 5 - 8, 10 - 14, 18, 21, 23 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 2, 4, 15, 17 | GND | Package Bottom must be connected to RF/DC ground. |   |
| 3 | RFIN | This pin is AC coupled and matched to 50 Ohms. |   |
| 9 | Vgg | Gate control for amplifier, please follow "MMIC Amplifier Biasing Procedure" Application Note: See application circuit for required external components. |   |
| 16 | RFOUT | This pin is AC coupled and matched to 50 Ohms. |   |
| 24, 22, 20, 19 | Vdd1, Vdd2, Vdd3, Vdd4 | Power Supply Voltage for the amplifier. See application circuit for required external components. |   |

## Application Circuit

| Component | Value |
|---|---|
| C1 - C5 | 100 pF |
| C6 - C10 | 1000 pF |
| C11 - C15 | 2.2 µF |



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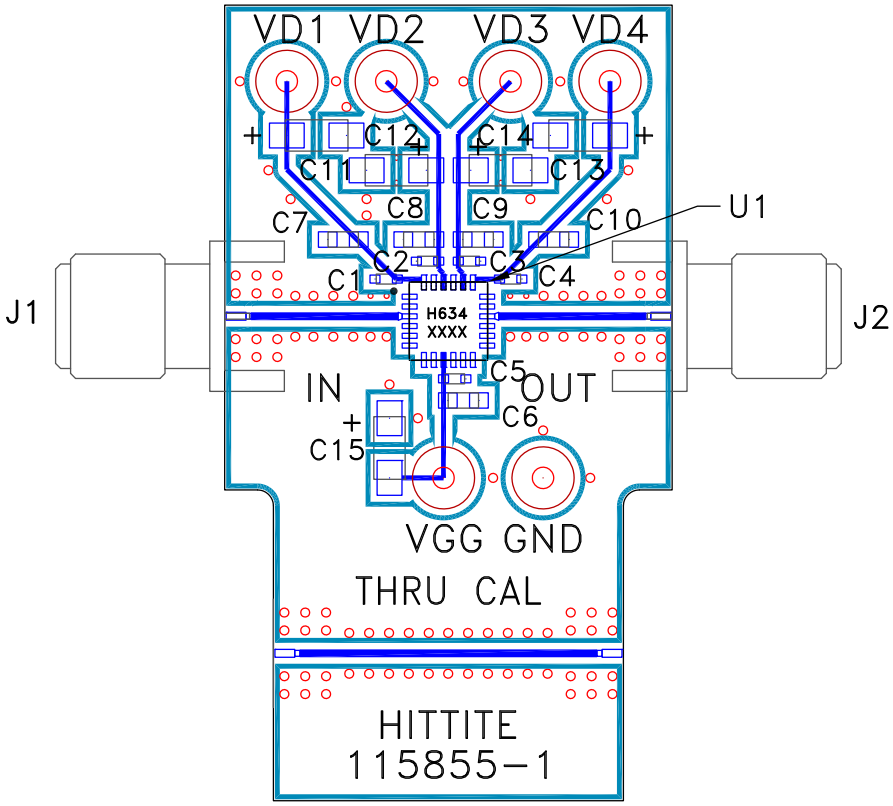
## Evaluation PCB




## List of Materials for Evaluation PCB 115857 [1]

| Item | Description |
|---|---|
| J1 - J2 | 2.92 mm PC Mount K-Connector |
| VD1 - VD4 | DC Pin |
| C1 - C5 | 100 pF Capacitor, 0402 Pkg. |
| C6 - C10 | 1000 pF Capacitor, 0603 Pkg. |
| C11 - C15 | 2.2 µF Capacitor, Tantalum |
| U1 | HMC634LC4 Driver Amplifier |
| PCB [2] | 115855 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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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