v00.1204

# HMC516LC5

## SMT PHEMT LOW NOISE AMPLIFIER, 9 - 18 GHz

### Typical Applications

The HMC516LC5 is ideal for use as a LNA or driver amplifier for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios & VSAT
- Test Equipment and Sensors
- Military

### Features

Noise Figure: 2.0 dB

Gain: 20 dB

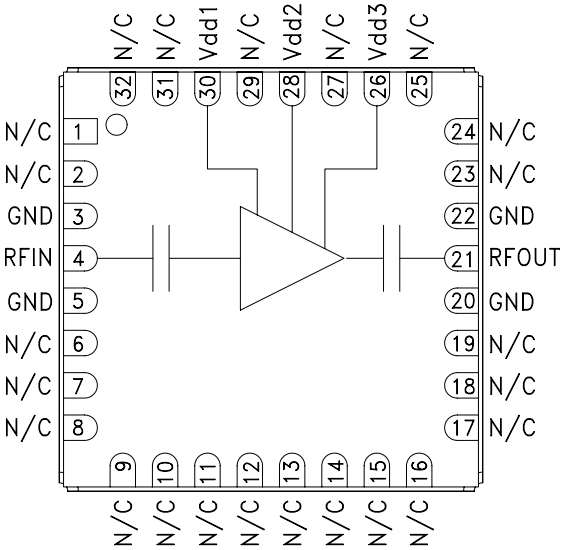
OIP3: +25 dBm

Single Supply: +3V @ 65 mA

50 Ohm Matched Input/Output

RoHS Compliant 5 X 5 mm Package

### Functional Diagram



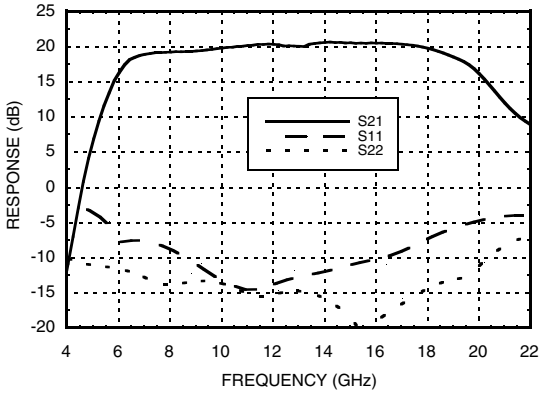

### General Description

The HMC516LC5 is a high dynamic range GaAs PHEMT MMIC Low Noise Amplifier (LNA) housed in a leadless “Pb free” RoHS compliant SMT package. The HMC516LC5 provides 20 dB of small signal gain, 2.0 dB of noise figure and has an output IP3 of +25 dBm. The P1dB output power of +13 dBm enables the LNA to also function as a LO driver for balanced, I/Q or image reject mixers. The HMC516LC5 allows the use of surface mount manufacturing techniques.

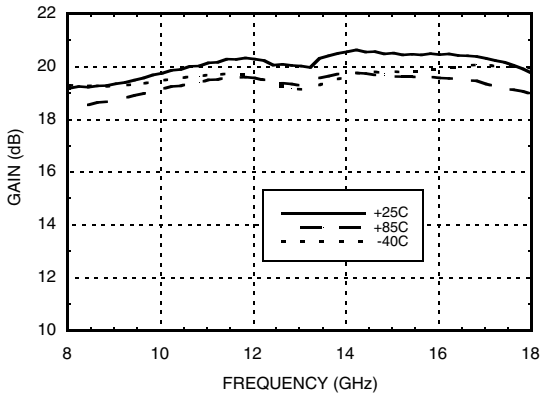
### Electrical Specifications, $T_A$ = +25° C, Vdd 1, 2, 3 = +3V

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 9 - 12 | | | 12 - 18 | | GHz |
| Gain | 17.5 | 20 | | 18 | 20.5 | | dB |
| Gain Variation Over Temperature | | 0.015 | 0.025 | | 0.015 | 0.025 | dB/ °C |
| Noise Figure | | 2.0 | 2.5 | | 2.0 | 2.5 | dB |
| Input Return Loss | | 10 | | | 10 | | dB |
| Output Return Loss | | 12 | | | 12 | | dB |
| Output Power for 1 dB Compression (P1dB) | | 13 | | | 14 | | dBm |
| Saturated Output Power (Psat) | | 15 | | | 16 | | dBm |
| Output Third Order Intercept (IP3) | | 25 | | | 25 | | dBm |
| Supply Current (Idd)(Vdd = +3V) | | 65 | | | 65 | | mA |

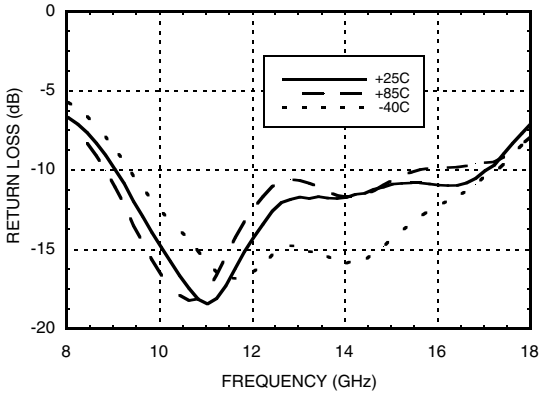
### Broadband Gain & Return Loss



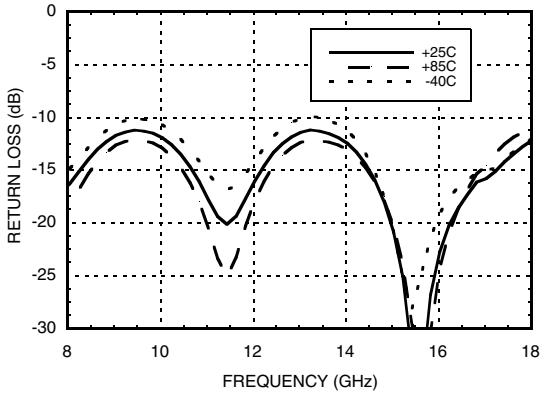

### Gain vs. Temperature



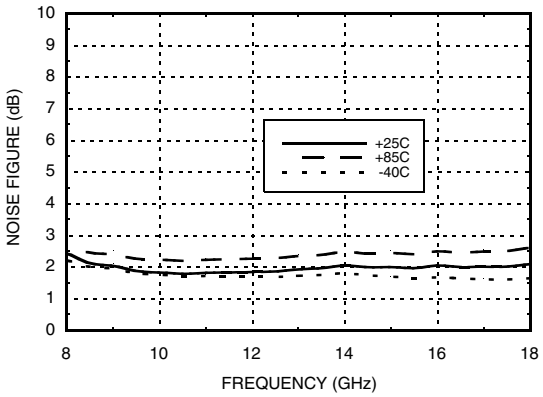

### Input Return Loss vs. Temperature



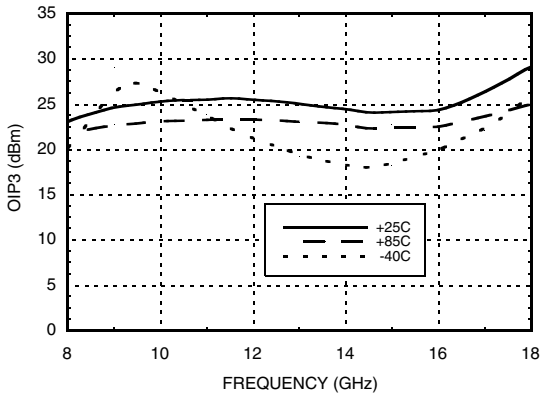

### Output Return Loss vs. Temperature



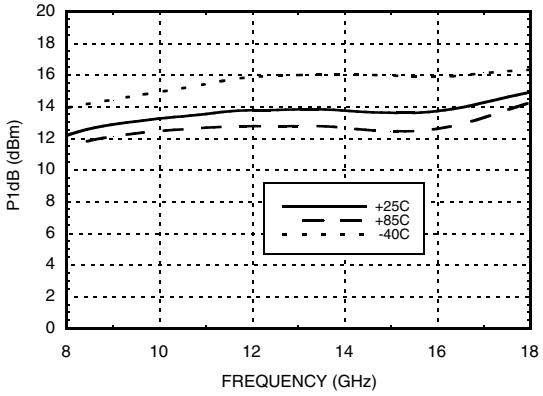

### Noise Figure vs. Temperature



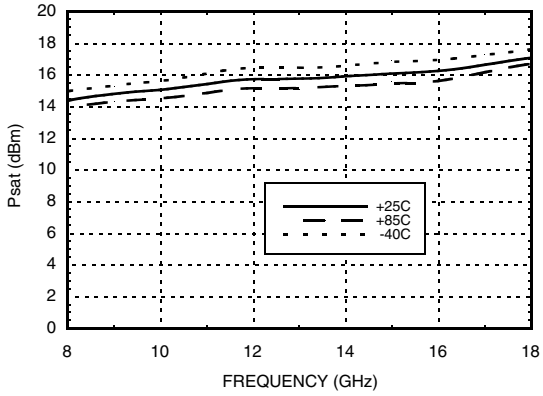

### Output IP3 vs. Temperature



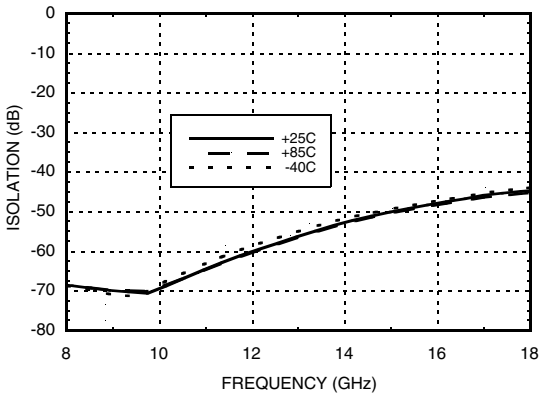
### P1dB vs. Temperature



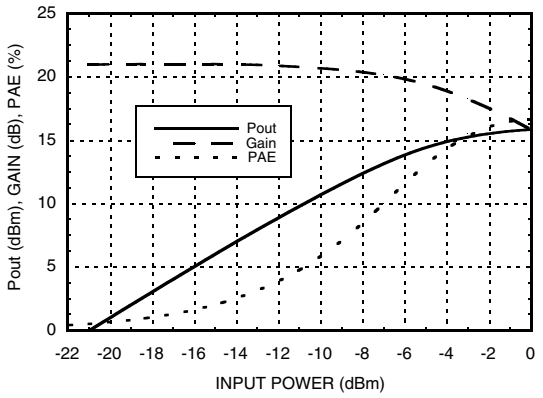

### Psat vs. Temperature



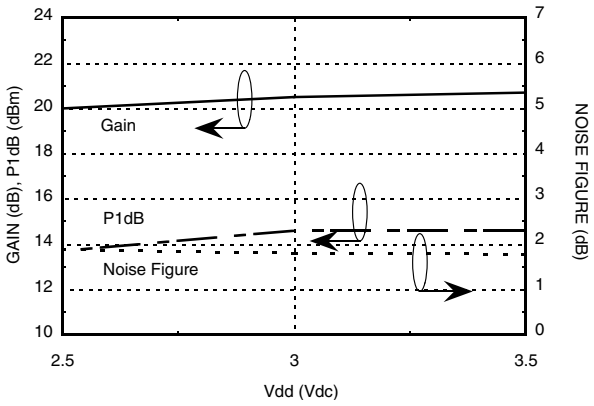

### Reverse Isolation vs. Temperature




### Power Compression @ 12 GHz




### Gain, Noise Figure & Power vs. Supply Voltage @ 12 GHz



## Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vdd1, Vdd2, Vdd3) | +4 Vdc |
| RF Input Power (RFin)(Vdd = +3.0 Vdc) | +10 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T= 85 °C) (derate 14 mW/°C above 85 °C) | 1.25 W |
| Thermal Resistance (channel to die bottom) | 71 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1A |

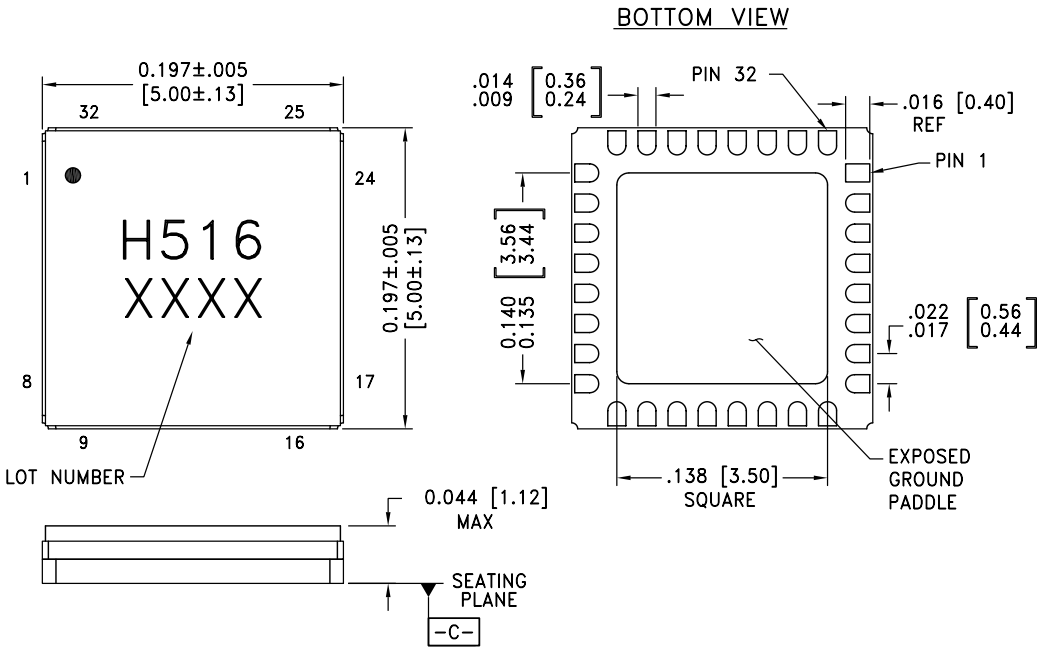
## Typical Supply Current vs. Vdd

| Vdd (Vdc) | Idd (mA) |
|---|---|
| +2.5 | 61 |
| +3.0 | 65 |
| +3.5 | 69 |

*Note: Amplifier will operate over full voltage range shown above.*

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

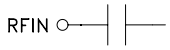
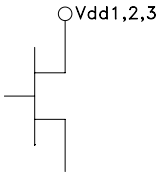
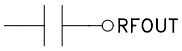
## Outline Drawing




NOTES:

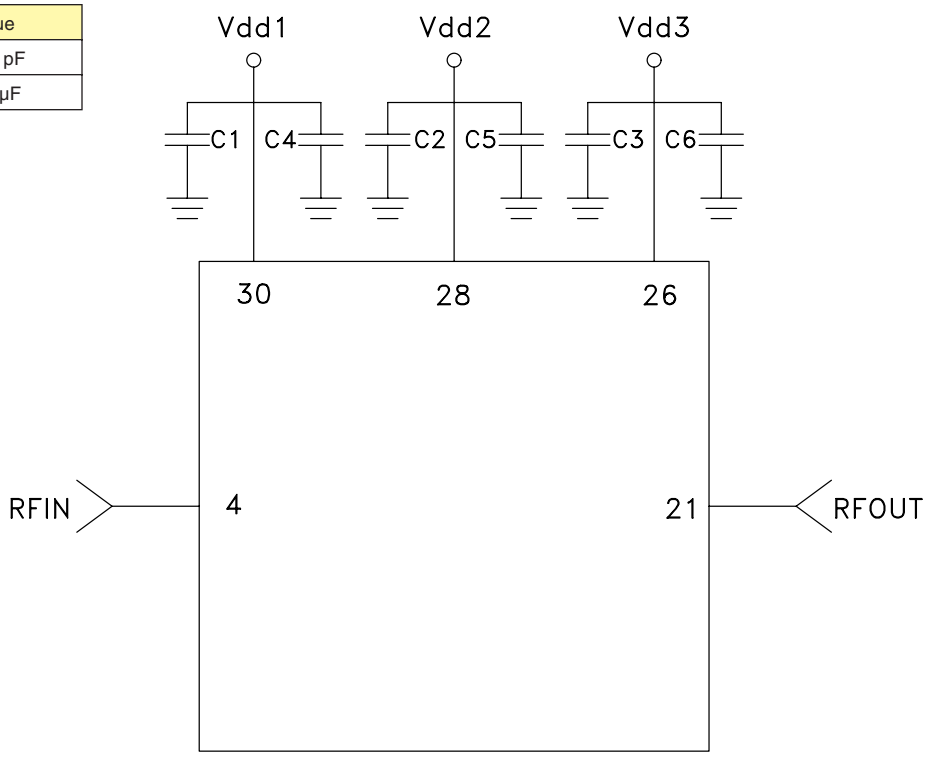
1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL
3. DIMENSIONS ARE IN INCHES [MILLIMETERS]
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM
6. ALL GROUND LEADS AND GROUND PADDLE MUST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

## Pin Descriptions

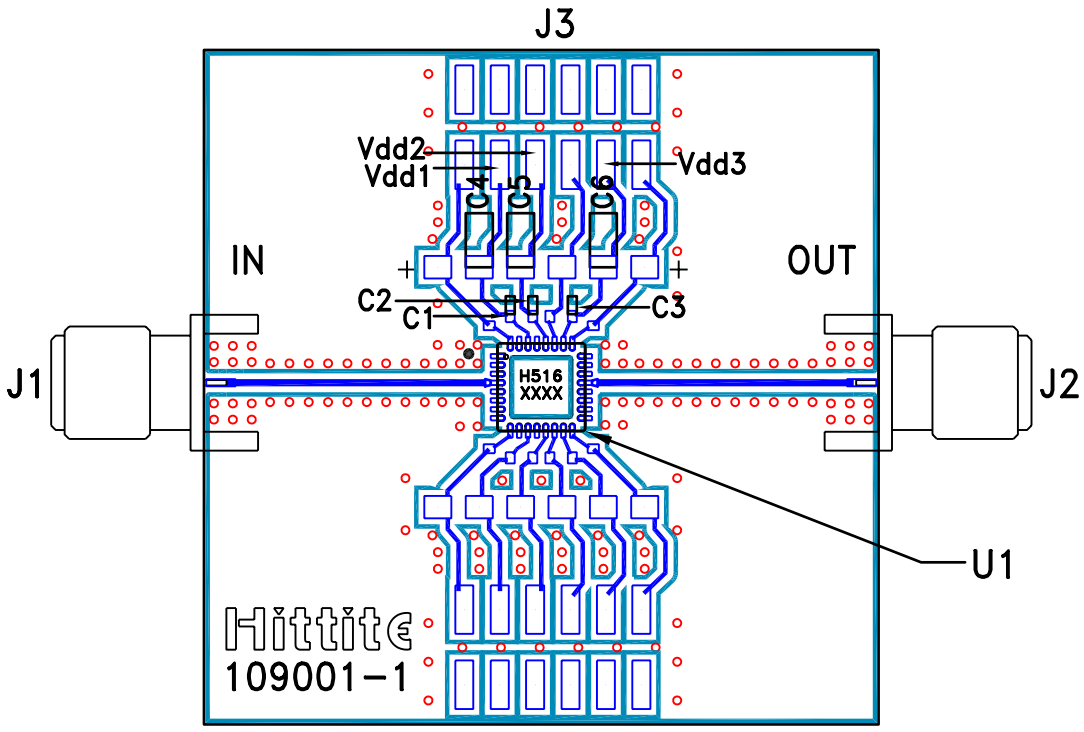
| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 2, 6-19, 23-25, 27, 29, 31, 32 | N/C | This pin may be connected to RF/DC ground. Performance will not be affected. | |
| 4 | RFIN | This pin is AC coupled and matched to 50 Ohms from 9 - 18 GHz. |   |
| 30, 28, 26 | Vdd1, 2, 3 | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF and 2.2 µF are required. |   |
| 21 | RFOUT | This pin is AC coupled and matched to 50 Ohms from 9 - 18 GHz. |   |
| 3, 5, 20, 22 | GND | These pins and package bottom must be connected to RF/DC ground. |  |

## Application Circuit

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



## Evaluation PCB




## List of Materials for Evaluation PCB 110431*

| Item | Description |
|---|---|
| J1 - J2 | PC Mount K Connector |
| J3 | 2 mm DC Header |
| C1 - C3 | 100 pF Capacitor, 0402 Pkg. |
| C4 - C6 | 2.2 µF Capacitor, Tantalum |
| U1 | HMC516LC5 Amplifier |
| PCB** | 109001 Evaluation PCB |
| ** Circuit Board Material: Rogers 4350 | |

* Reference this number when ordering complete evaluation PCB

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.