# HMC519LC4

v04.1017

## GAAS PHEMT MMIC LOW NOISE AMPLIFIER, 18 - 31 GHz

### Typical Applications

The HMC519LC4 is ideal for:

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

### Features

Noise Figure: 3.5 dB

Gain: 14 dB

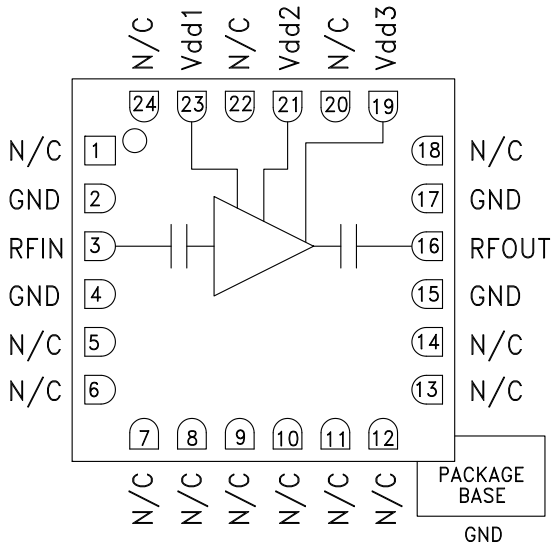
Output IP3: +23 dBm

Single Supply: +3V @ 75 mA

50 Ohm Matched Input/Output

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

### Functional Diagram




### General Description

The HMC519LC4 is a high dynamic range GaAs pHEMT MMIC Low Noise Amplifier (LNA) housed in a leadless 4 x 4 mm ceramic surface mount package. The amplifier operates between 18 and 31 GHz, providing 14 dB of small signal gain, 3.5 dB noise figure and output IP3 of +23 dBm, while requiring only 75 mA from a +3V single supply. The P1dB output power of +11 dBm, enables the LNA to function as a LO driver for balanced, I/Q or image reject mixers. The HMC519LC4 also features I/Os that are DC blocked and internally matched to 50 Ohms, making it ideal for microwave radio and VSAT applications.

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

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 18 - 28 | | | 28 - 31 | | GHz |
| Gain | 11.4 | 14.4 | | 10.2 | 13.2 | | dB |
| Gain Variation Over Temperature | | 0.016 | 0.026 | | 0.016 | 0.026 | dB/ °C |
| Noise Figure | | 3.5 | 5.5 | | 3 | 5 | dB |
| Input Return Loss | | 15 | | | 17 | | dB |
| Output Return Loss | | 20 | | | 22 | | dB |
| Output Power for 1 dB Compression (P1dB) | 8 | 11 | | 9.2 | 12.2 | | dBm |
| Saturated Output Power (Psat) | | 14 | | | 15.4 | | dBm |
| Output Third Order Intercept (IP3) | | 23 | | | 24 | | dBm |
| Supply Current (Idd) | | 75 | 95 | | 75 | 95 | mA |



*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
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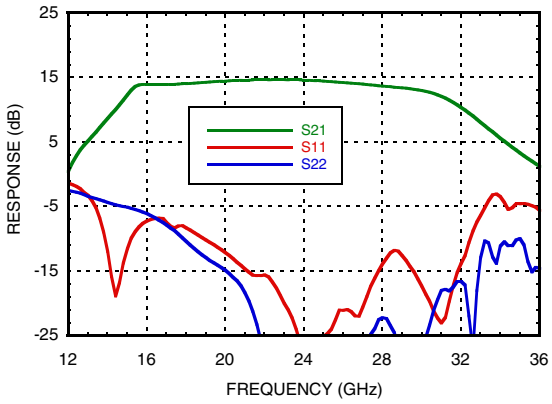
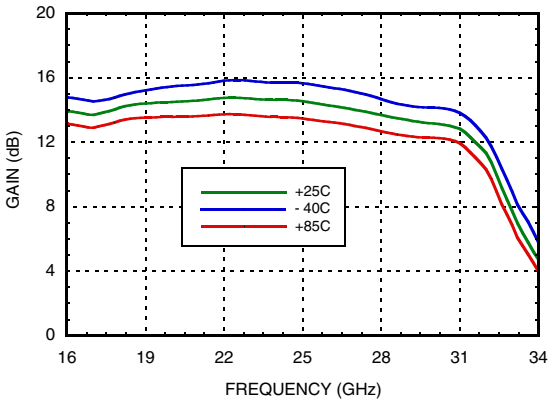
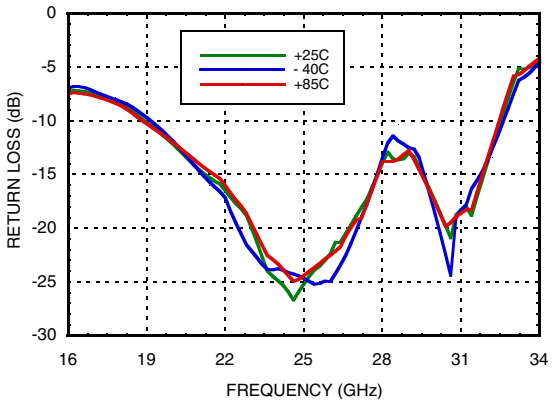
### Broadband Gain & Return Loss



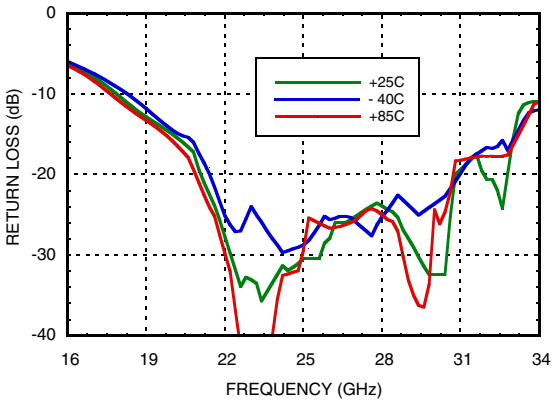

### Gain vs. Temperature



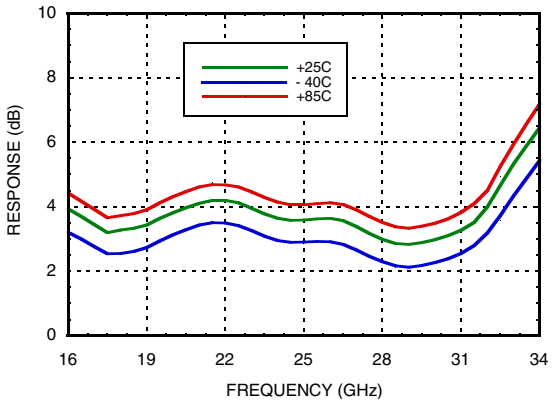

### Input Return Loss vs. Temperature



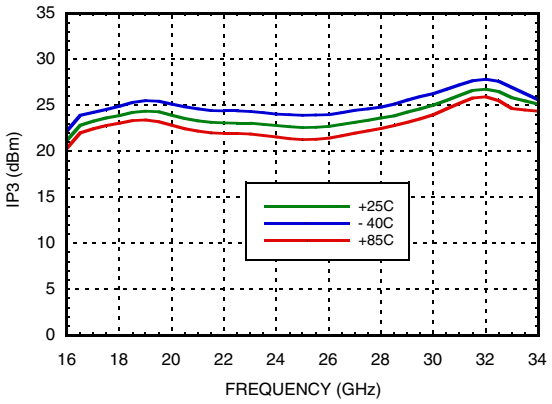

### Output Return Loss vs. Temperature



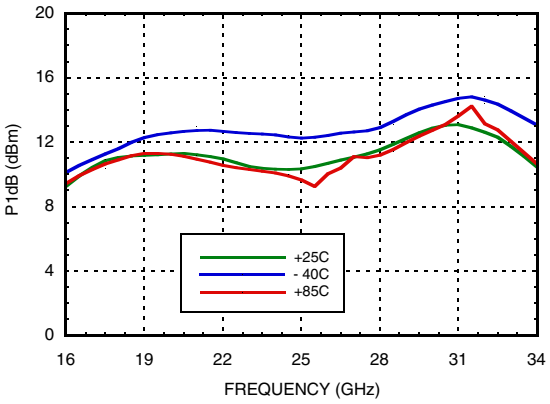

### Noise Figure vs. Temperature



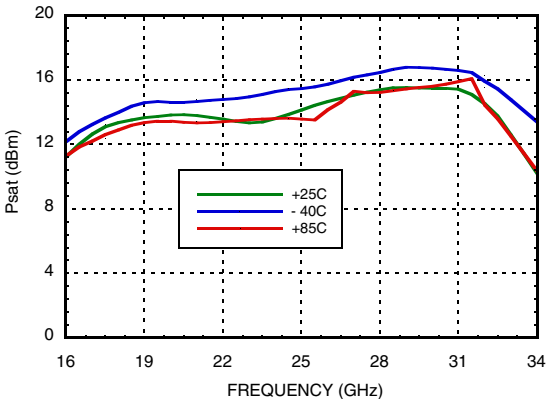

### Output IP3 vs. Temperature



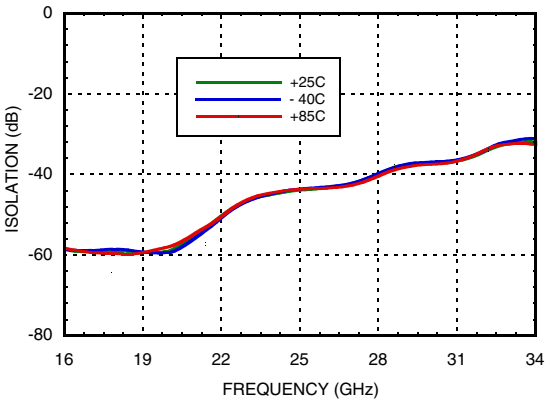
### P1dB vs. Temperature



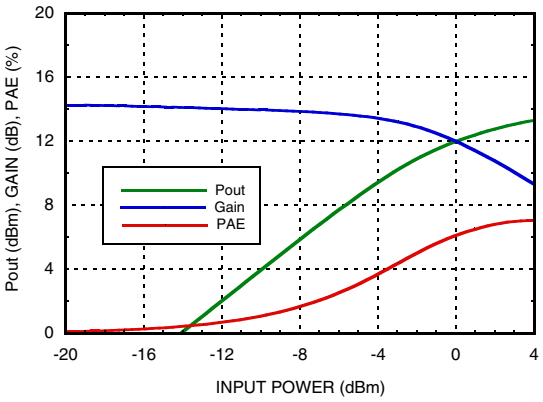

### Psat vs. Temperature



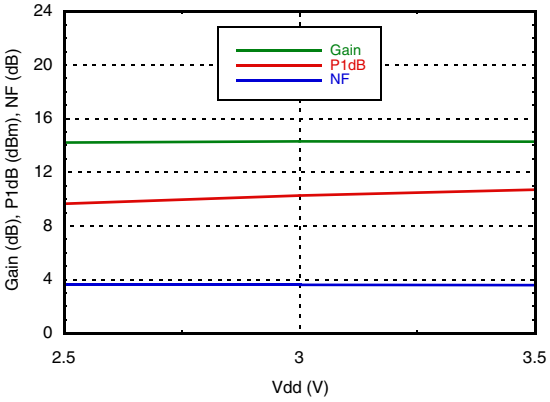

### Reverse Isolation vs. Temperature



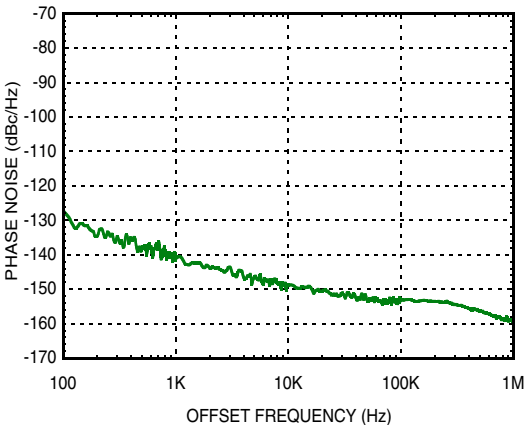

### Power Compression @ 24 GHz




### Gain, Noise Figure & Power vs. Supply Voltage @ 24 GHz




### Additive Phase Noise Vs Offset Frequency, RF Frequency = 26.5 GHz, RF Input Power = 5 dBm (Psat)



## Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vdd1, Vdd2, Vdd3) | +3.5 Vdc |
| RF Input Power (RFIN)(Vdd = +3.0 Vdc) | +20 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T= 85 °C) (derate 13 mW/°C above 85 °C) | 1.2 W |
| Thermal Resistance (channel to package bottom) | 76.9 °C/W |
| Storage Temperature | -65 to 150 °C |
| Operating Temperature | -40 to 85 °C |
| ESD Sensitivity (HBM) | Class 1B |

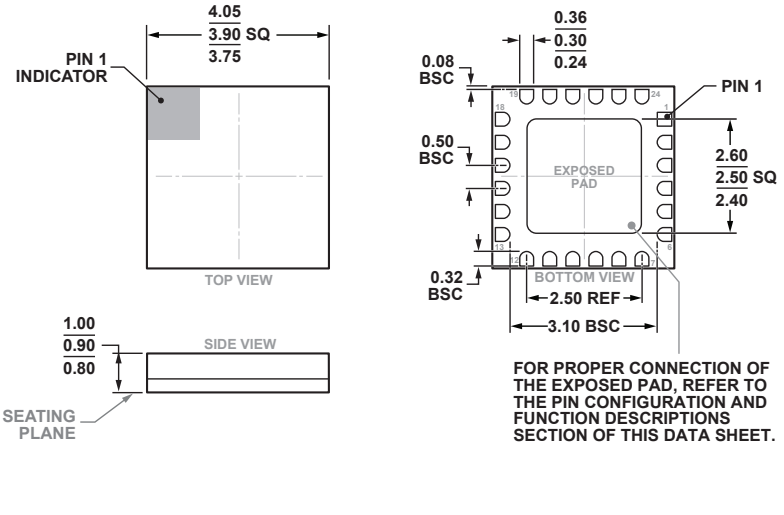
## Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| 2.5 | 72 |
| 3.0 | 75 |
| 3.5 | 78 |

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

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

## Outline Drawing



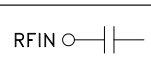
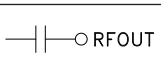
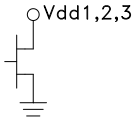

24-Terminal Ceramic Leadless Chip Carrier [LCC]
(E-24-1)
Dimensions shown in millimeters.

## Package Information

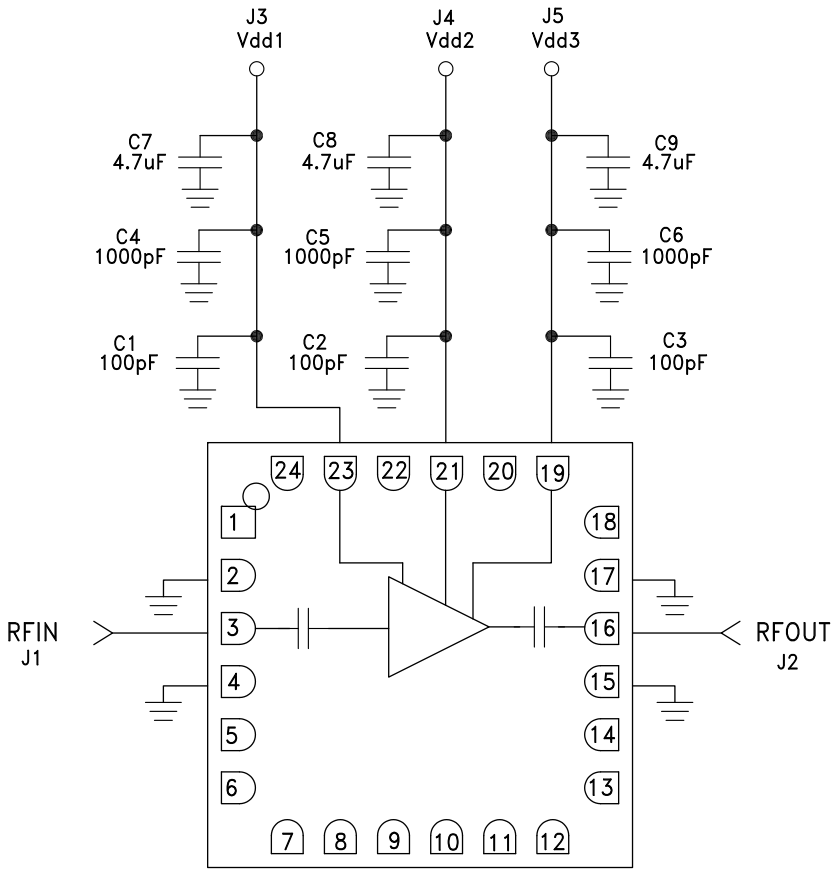
| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|---|---|---|---|---|
| HMC519LC4 | Alumina, White | Gold over Nickel | MSL3 [1] | H519<br>XXXX |

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

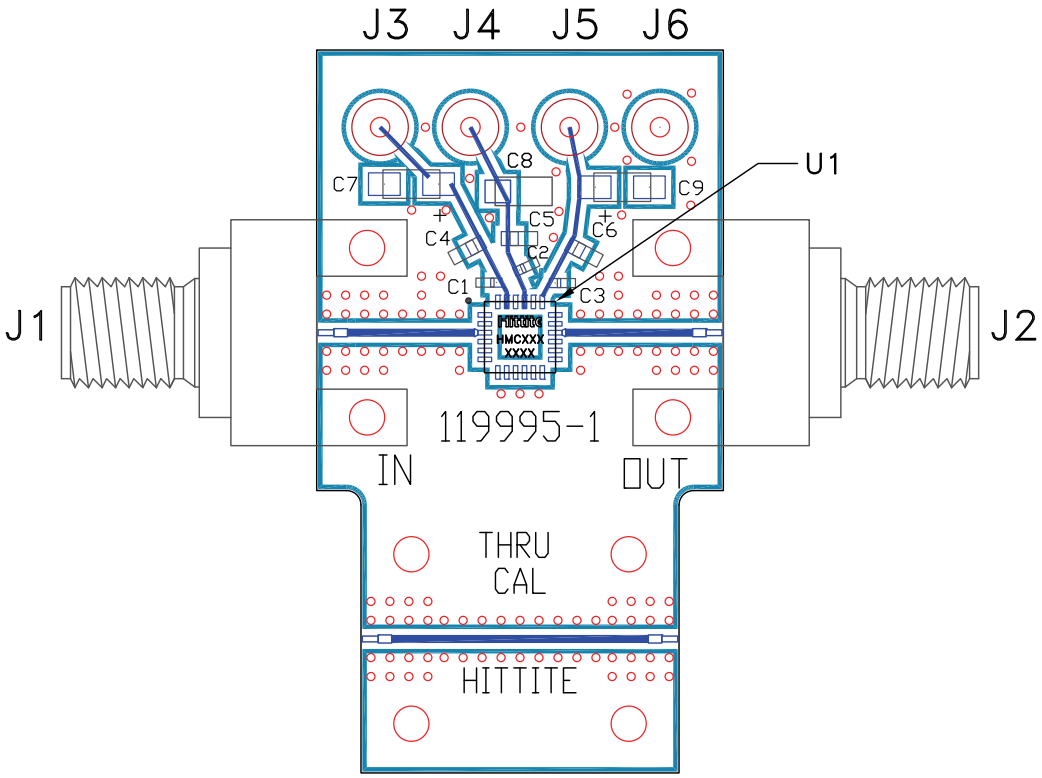
## Pad Descriptions

| Pad Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 5 - 14, 18, 20, 22, 24 | N/C | Not Connected | |
| 2, 4, 15, 17 | GND | Package bottom has exposed metal paddle that must be connected to RF/DC ground. |   |
| 3 | RFIN | This pad is AC coupled and matched to 50 Ohms |   |
| 16 | RFOUT | This pad is AC coupled and matched to 50 Ohms |   |
| 19, 21, 23 | Vdd3, Vdd2, Vdd1 | Power Supply Voltage for the amplifier. See application circuit for required external components. |   |

## Application Circuit



### Evaluation PCB




### List of Material for Evaluation PCB 119667 [1]

| Item | Description |
|---|---|
| J1, J2 | 2.92mm PCB mount K-Connector |
| J3 - J6 | DC Pin |
| C1, C2, C3 | 100pF Capacitor, 0402 Pkg. |
| C4, C5, C6 | 1000pF Capacitor, 0603 Pkg. |
| C7, C8, C9 | 4.7 µF Capacitor, Tantalum |
| U1 | HMC519LC4 Amplifier |
| PCB [2] | 11995 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350.

The circuit board used in this 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 Analog Devices, upon request.

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