

GaAs SMT pHEMT LOW NOISE AMPLIFIER, 7 - 14 GHz



Typical Applications

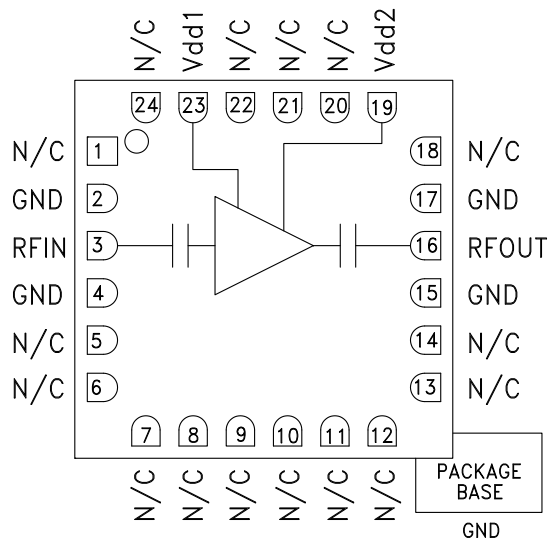
The HMC564LC4 is ideal for use as a LNA or driver amplifier for:

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

Features

- Noise Figure: 1.8 dB
- Gain: 17 dB
- OIP3: 25 dBm
- Single Supply: +3V @ 51 mA
- 50 Ohm Matched Input/Output
- RoHS Compliant 4 x 4 mm Package

Functional Diagram



General Description

The HMC564LC4 is a high dynamic range GaAs pHEMT MMIC Low Noise Amplifier housed in a leadless RoHS compliant 4x4 mm SMT package. Operating from 7 to 14 GHz, the HMC564LC4 features extremely flat small signal gain of 17 dB as well as 1.8 dB noise figure and +25 dBm output IP3 across the operating band. This self-biased LNA is ideal for microwave radios due to its consistent output power, single +3V supply operation, and DC blocked RF I/O's.

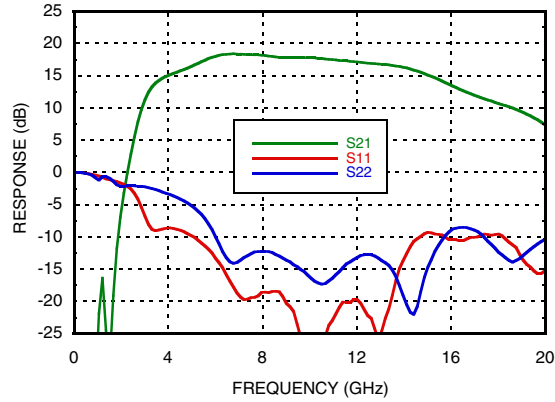
Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{dd\ 1, 2} = +3V$

| Parameter | Min. | Typ. | Max. | Units |
|--|--------|------|------|--------|
| Frequency Range | 7 - 14 | | | GHz |
| Gain | 14 | 17 | | dB |
| Gain Variation Over Temperature | | 0.02 | 0.03 | dB/ °C |
| Noise Figure | | 1.8 | 2.2 | dB |
| Input Return Loss | | 15 | | dB |
| Output Return Loss | | 14 | | dB |
| Output Power for 1 dB Compression (P1dB) | 10 | 13 | | dBm |
| Saturated Output Power (P _{sat}) | | 14.5 | | dBm |
| Output Third Order Intercept (IP3) | | 25 | | dBm |
| Supply Current (I _{dd})(V _{dd} = +3V) | | 51 | 75 | mA |

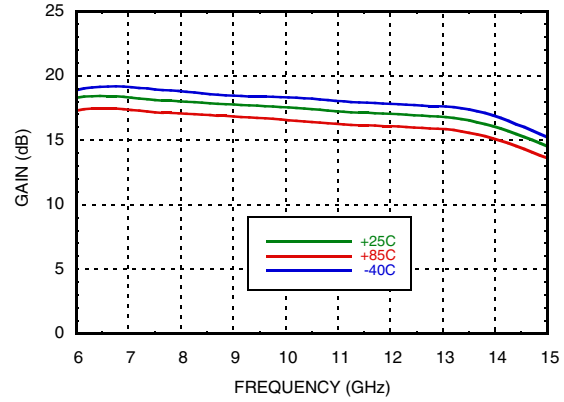


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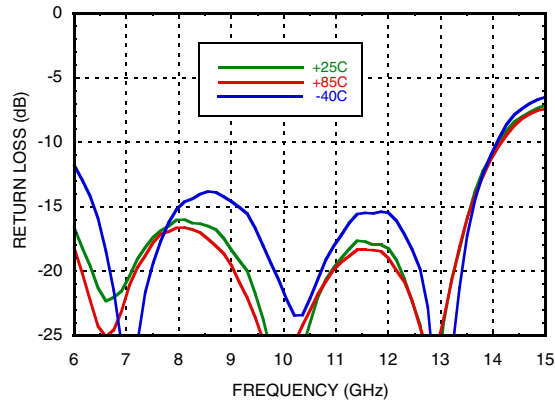
Broadband Gain & Return Loss



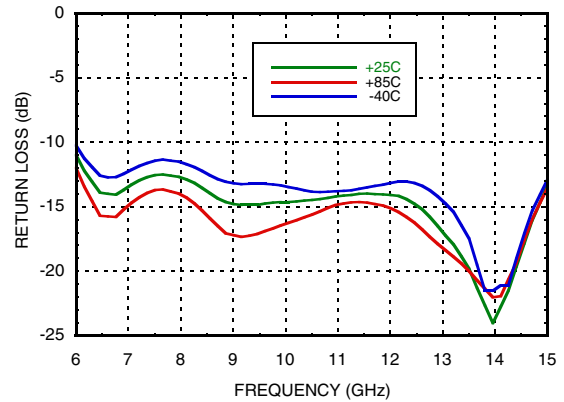
Gain vs. Temperature



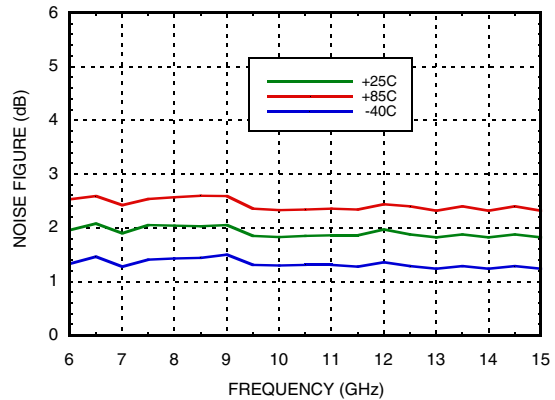
Input Return Loss vs. Temperature



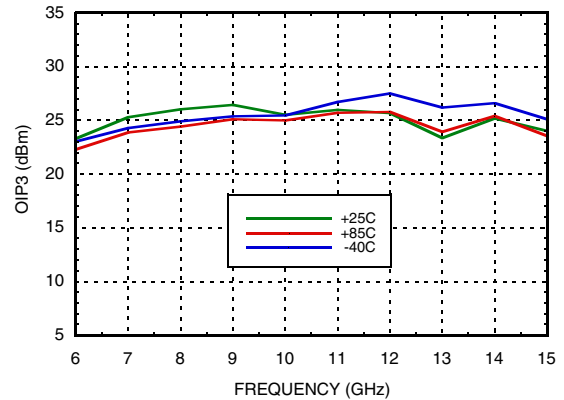
Output Return Loss vs. Temperature



Noise Figure vs. Temperature



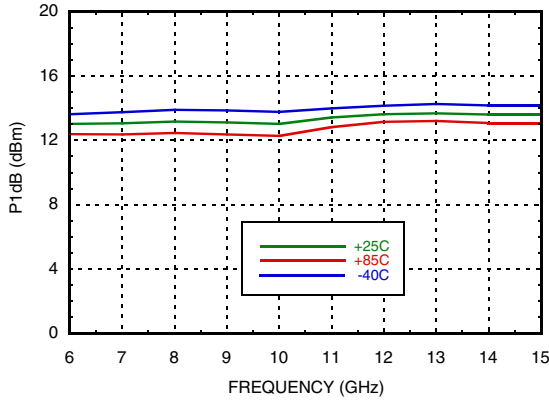
Output IP3 vs. Temperature



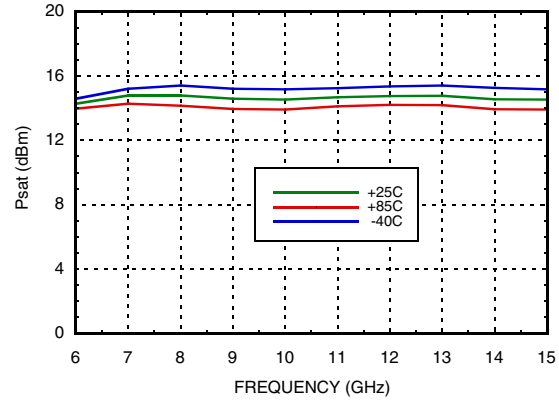


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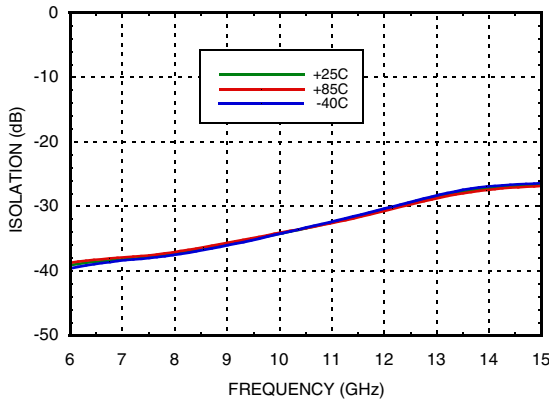
P1dB vs. Temperature



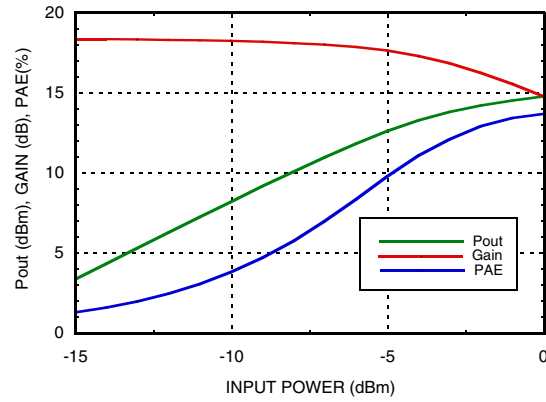
Psat vs. Temperature



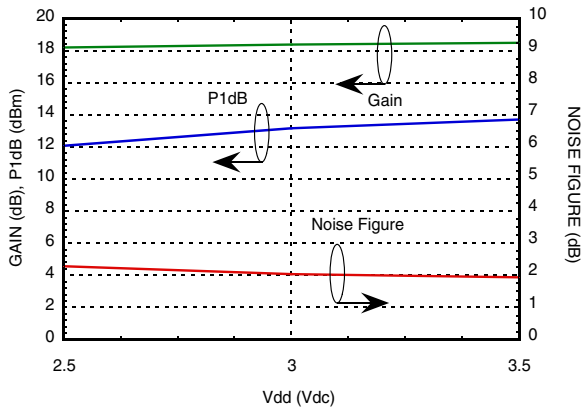
Reverse Isolation vs. Temperature



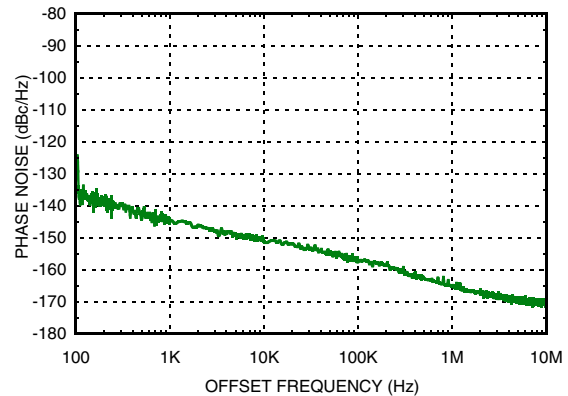
Power Compression @ 8 GHz



Gain, Power & Noise Figure vs. Supply Voltage @ 8 GHz



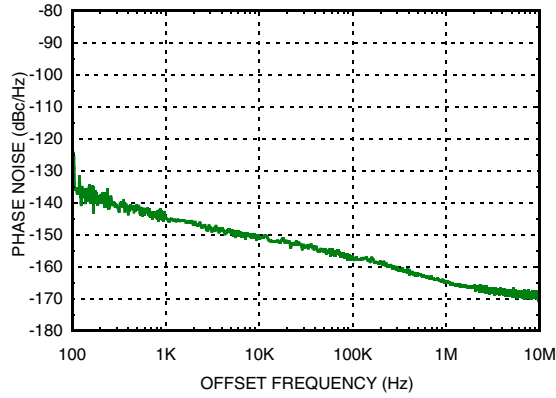
Additive Phase Noise Vs Offset Frequency, RF Frequency = 11 GHz, RF Input Power = 2.5 dBm (Psat)





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**Additive Phase Noise Vs Offset Frequency,
RF Frequency = 11 GHz,
RF Input Power = -4 dBm (P1dB)**



Notes:



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Absolute Maximum Ratings

| | |
|---|----------------|
| Drain Bias Voltage (Vdd1, Vdd2) | +3.5 Vdc |
| RF Input Power (RFIN) (Vdd = +3.0 Vdc) | +20 dBm |
| Channel Temperature | 175 °C |
| Continuous P _{diss} (T = 85 °C) (derate 12.9 mW/°C above 85 °C) | 1.16 W |
| Thermal Resistance (channel to ground paddle) | 77.5 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1A |

Typical Supply Current vs. Vdd

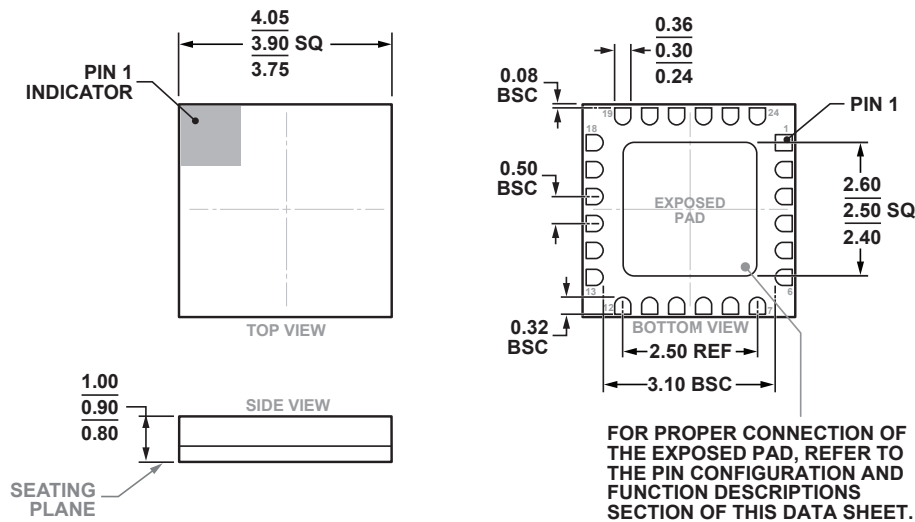
| Vdd (V) | I _{dd} (mA) |
|---------|----------------------|
| 2.5 | 49 |
| 3.0 | 51 |
| 3.5 | 53 |

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] |
|----------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC564LC4 | Alumina, White | Gold over Nickel | MSL3 ^[1] | H564 XXXX |
| HMC564LC4TR | Alumina, White | Gold over Nickel | MSL3 ^[1] | H564 XXXX |
| HMC564LC4TR-R5 | Alumina, White | Gold over Nickel | MSL3 ^[1] | H564 XXXX |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX



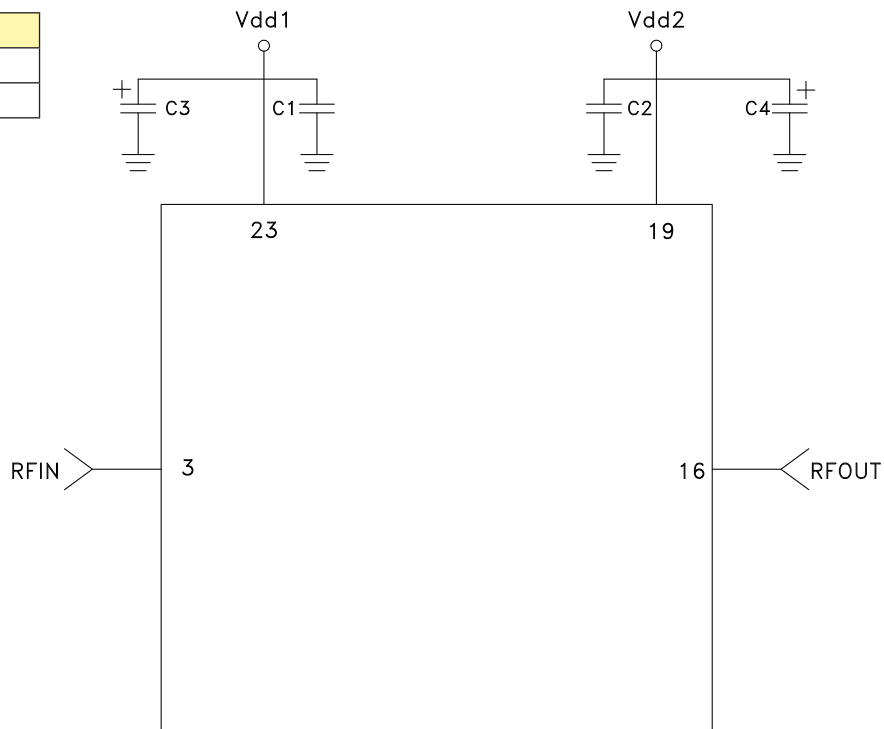
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Pin Descriptions

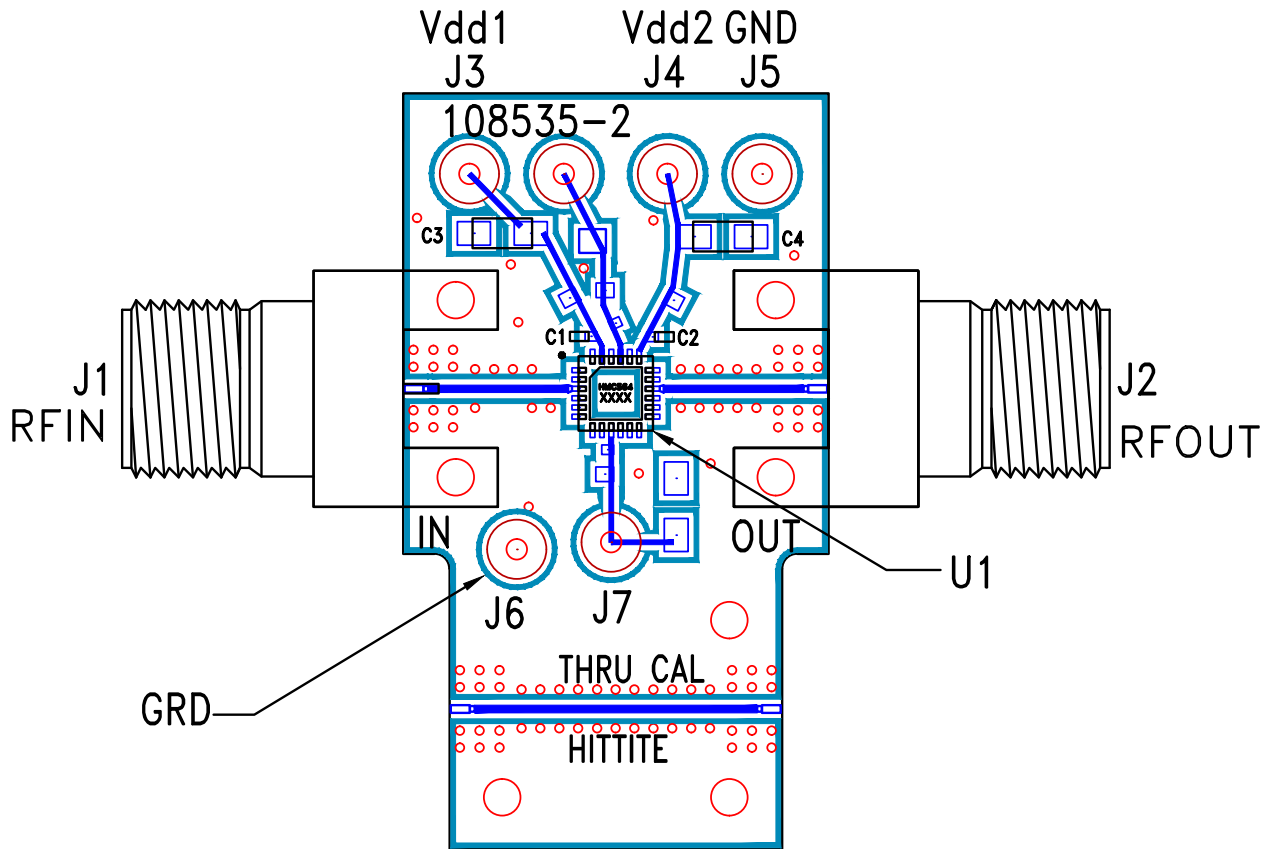
| Pin Number | Function | Description | Interface Schematic |
|------------------------------|------------|--|---------------------|
| 1, 5 -14, 18, 20, 21, 22, 24 | N/C | No connection required. These pins may be connected to RF/DC ground without affecting performance. | |
| 2, 4, 15, 17 | GND | These pins and package bottom must be connected to RF/DC ground. | |
| 3 | RFIN | This pin is AC coupled and matched to 50 Ohms. | |
| 16 | RFOUT | This pin is AC coupled and matched to 50 Ohms. | |
| 19, 23 | Vdd1, Vdd2 | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF, and 2.2 μF are required. | |

Application Circuit

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



Evaluation PCB



List of Material for Evaluation PCB 116156-HMC564LC4 [1]

| Item | Description |
|---------|------------------------------|
| J1, J2 | PCB Mount K Connectorbvv |
| J3 - J7 | DC Pin |
| C1 - C2 | 100 pF capacitor, 0402 Pkg.. |
| C3 - C4 | 2.2μF Capacitor, Tantalum |
| U1 | HMC564LC4 Amplifier |
| PCB [2] | 108535 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.