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GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 28 - 36 GHz

7

AMPLIFIERS - LOW NOISE - SMT

Typical Applications

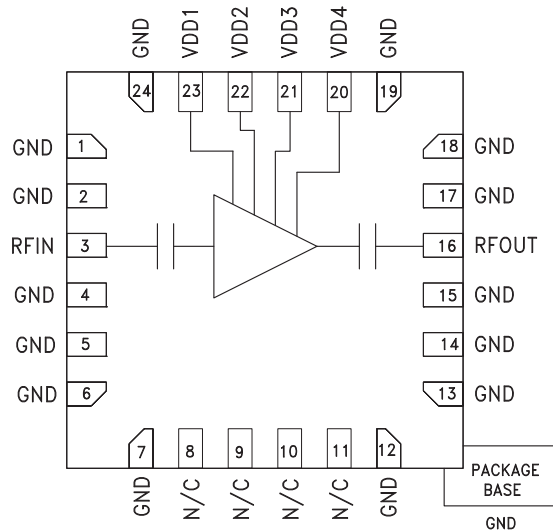
The HMC566LP4E is ideal for:

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

Features

- Low Noise Figure: 2.8 dB
- High Gain: 21 dB
- High OIP3: +24 dBm
- Single Positive Supply: +3V @ 82 mA
- 50 Ohm Matched & DC Blocked I/Os
- 24 Lead 4x4mm QFN Package: 16mm²

Functional Diagram



General Description

The HMC566LP4E is a high dynamic range GaAs pHEMT MMIC Low Noise Amplifier (LNA) in a 4x4 mm SMT package which operates from 28 to 36 GHz. The HMC566LP4E provides 21 dB of small signal gain, 2.8 dB of noise figure and output IP3 of 24 dBm. This self-biased LNA is ideal for hybrid and MCM assemblies due to its compact size, single +3V supply operation, and DC blocked RF I/O's. The RoHS packaged HMC566LP4E eliminates the need for wirebonding and allows the use of high volume surface mount manufacturing techniques. The HMC566LP4E is also available in chip form as the HMC566.

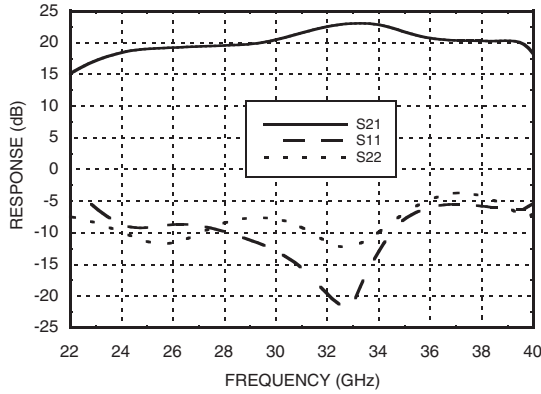
Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{dd\ 1, 2, 3, 4} = +3\text{V}$

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|--|-----------|------|------|-------------|------|------|-----------|------|------|--------|
| Frequency Range | 28 - 31.5 | | | 31.5 - 33.5 | | | 33.5 - 36 | | | GHz |
| Gain | 18 | 21 | | 19.5 | 22.5 | | 18 | 21 | | dB |
| Gain Variation Over Temperature | | 0.03 | | | 0.03 | | | 0.03 | | dB/ °C |
| Noise Figure | | 2.8 | 3.6 | | 2.8 | 3.6 | | 3.3 | 4.3 | dB |
| Input Return Loss | | 14 | | | 18 | | | 12 | | dB |
| Output Return Loss | | 8 | | | 10 | | | 7 | | dB |
| Output Power for 1 dB Compression (P1dB) | | 11 | | | 12 | | | 11 | | dBm |
| Saturated Output Power (P _{sat}) | | 13 | | | 14 | | | 13 | | dBm |
| Output Third Order Intercept (IP3) | | 23.5 | | | 24.5 | | | 24.5 | | dBm |
| Supply Current (I _{dd1} +I _{dd2} +I _{dd3} +I _{dd4}) | 50 | 82 | 106 | 50 | 82 | 106 | 50 | 82 | 106 | mA |

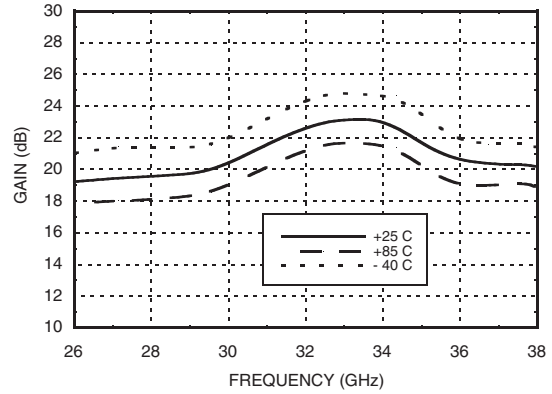


GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 28 - 36 GHz

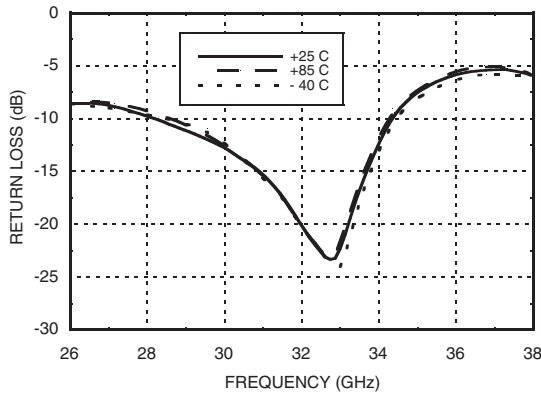
Broadband Gain & Return Loss



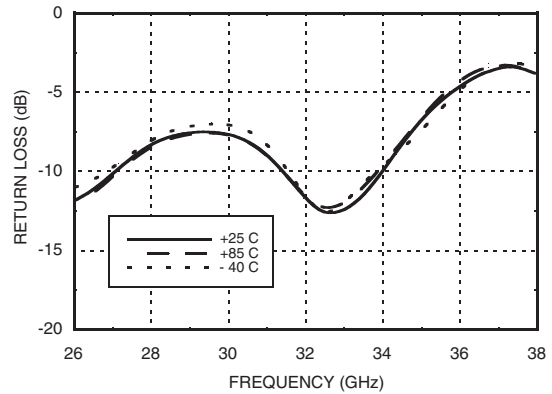
Gain vs. Temperature



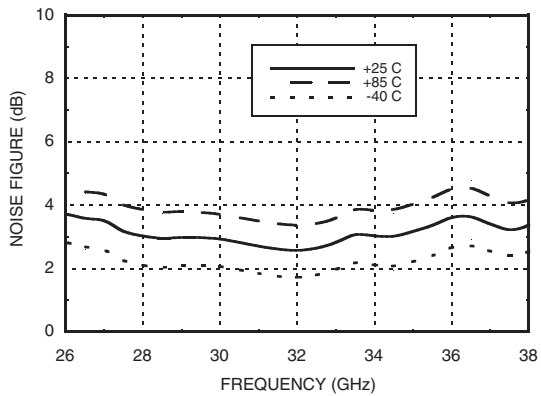
Input Return Loss vs. Temperature



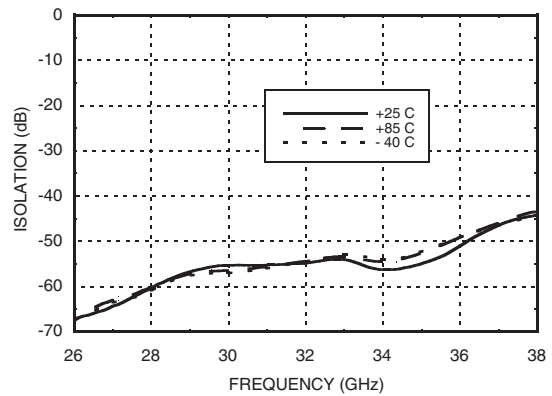
Output Return Loss vs. Temperature



Noise Figure vs. Temperature



Reverse Isolation vs. Temperature



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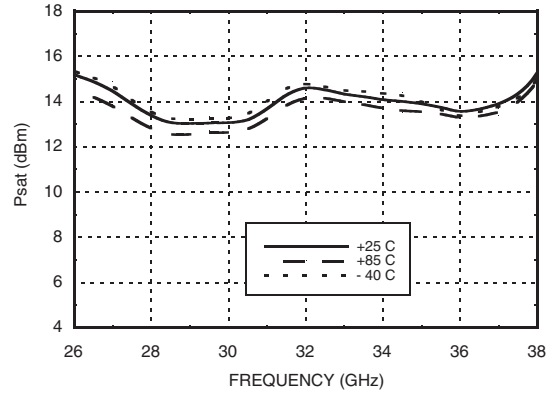


GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 28 - 36 GHz

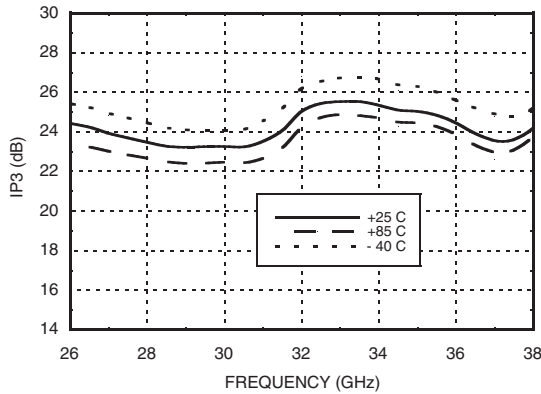
P1dB vs. Temperature



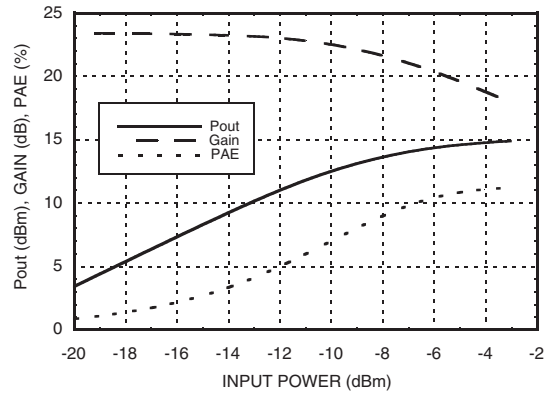
Psat vs. Temperature



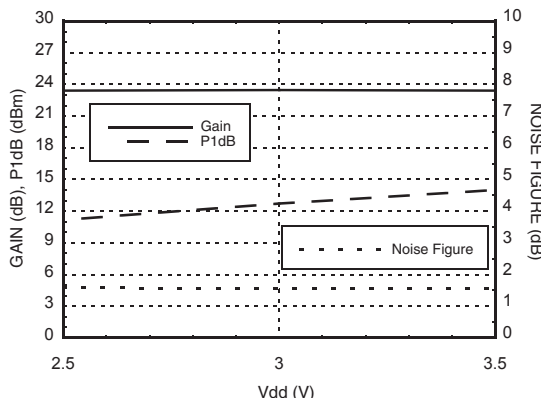
Output IP3 vs. Temperature



Power Compression @ 32 GHz



Gain, Noise Figure & Power vs. Supply Voltage @ 32 GHz



Absolute Maximum Ratings

| | |
|---|----------------|
| Drain Bias Voltage (Vdd1, 2, 3, 4) | +3.5 V |
| RF Input Power (RFIN)(Vdd = +3 Vdc) | +5 dBm |
| Channel Temperature | 175 °C |
| Continuous P _{diss} (T= 85 °C) (derate 9.6 mW/°C above 85 °C) | 0.8 W |
| Thermal Resistance (channel to ground paddle) | 104 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |



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Typical Supply Current vs. Vdd

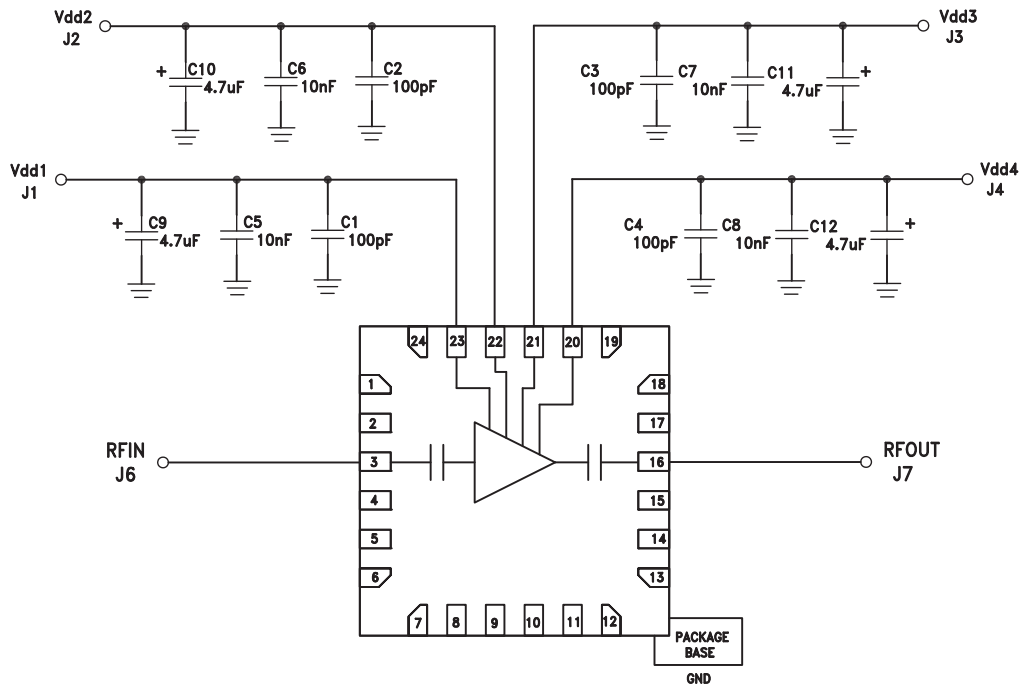
| Vdd (V) | Idd (mA) |
|---------|----------|
| +2.5 | 79 |
| +3.0 | 82 |
| +3.5 | 85 |

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

Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|-----------------------------------|---------------|--|---------------------|
| 1, 2, 4 - 7, 12 - 15, 17 - 19, 24 | GND | This pins and exposed ground paddle must be connected to RF/DC ground. | |
| 3 | RFIN | This pin is AC coupled and matched to 50 Ohms. | |
| 8 - 11 | N/C | No Connection | |
| 16 | RFOUT | This pin is AC coupled and matched to 50 Ohms. | |
| 23, 22, 21, 20 | Vdd1, 2, 3, 4 | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF, 10 nF and 4.7 μF are required. | |

Application Circuit

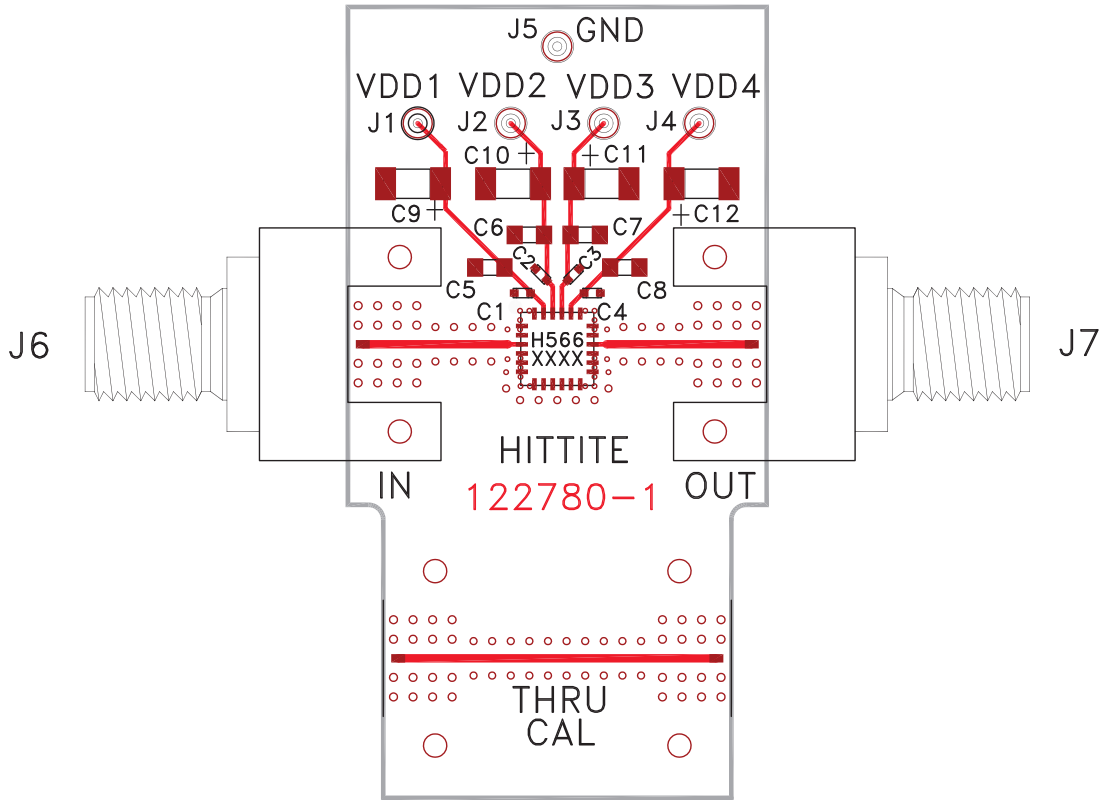


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Evaluation PCB



List of Materials for Evaluation PCB 122782 [1]

| Item | Description |
|----------|-----------------------------|
| J1 - J5 | DC Pin |
| J6 - J7 | PCB Mount K Connector |
| C1 - C4 | 100 pF Capacitor, 0402 Pkg. |
| C5 - C8 | 10 nF Capacitor, 0603 Pkg. |
| C9 - C12 | 4.7 μF Capacitor, Tantalum |
| U1 | HMC566LP4E |
| PCB [2] | 122780 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon 25 FR

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 package bottom 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.