



GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 1.7 - 2.2 GHz

Typical Applications

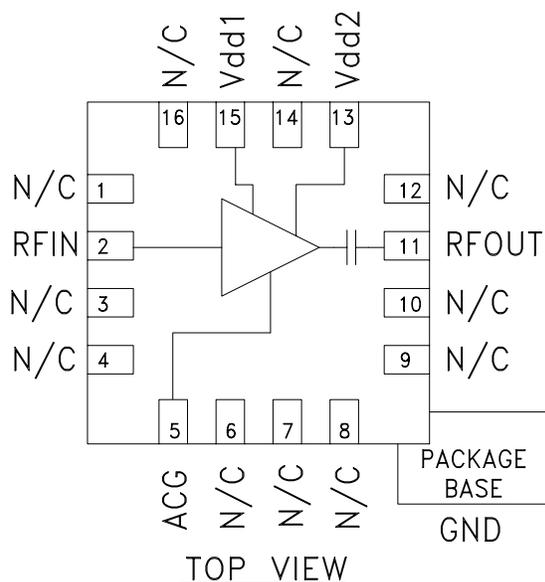
The HMC375LP3 / HMC375LP3E is ideal for basestation receivers:

- GSM, GPRS & EDGE
- CDMA & W-CDMA
- DECT

Features

- Noise Figure: 0.9 dB
- Output IP3: +34 dBm
- Gain: 17 dB
- Very Stable Gain vs. Supply & Temperature
- Single Supply: +5V @ 136 mA
- 50 Ohm Matched Output

Functional Diagram



General Description

The HMC375LP3 & HMC375LP3E high dynamic range GaAs PHEMT MMIC Low Noise Amplifiers are ideal for GSM & CDMA cellular basestation front-end receivers operating between 1.7 and 2.2 GHz. This LNA has been optimized to provide 0.9 dB noise figure, 17 dB gain and +33 dBm output IP3 from a single supply of +5V @ 136mA. Input and output return losses are 14 dB typical with the LNA requiring minimal external components to optimize the RF input match, RF ground and DC bias. For applications which require improved noise figure, please see the HMC618LP3(E).

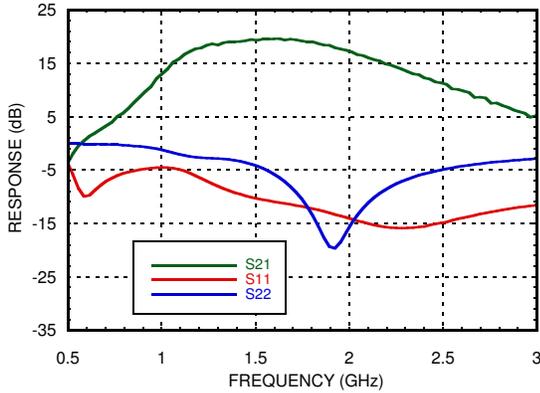
Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_s = +5\text{V}$

| Parameter | Min. | Typ. | Max. | Units |
|---|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-------|
| Frequency Range | 1.8 - 1.9 | | | 1.9 - 2.0 | | | 2.0 - 2.1 | | | 2.1 - 2.2 | | | GHz |
| Gain | 16.5 | 18.5 | | 15.5 | 17.5 | | 15 | 17 | | 13 | 15 | | dB |
| Gain Variation Over Temperature | | 0.014 | 0.021 | | 0.014 | 0.021 | | 0.014 | 0.021 | | 0.014 | 0.021 | dB/°C |
| Noise Figure | | 1.0 | 1.35 | | 0.95 | 1.2 | | 0.9 | 1.2 | | 0.9 | 1.3 | dB |
| Input Return Loss | | 12 | | | 13 | | | 14 | | | 15 | | dB |
| Output Return Loss | | 13 | | | 16 | | | 11 | | | 8 | | dB |
| Reverse Isolation | | 35 | | | 34 | | | 34 | | | 34 | | dB |
| Output Power for 1dB Compression (P1dB) | 16 | 18.5 | | 16 | 18.5 | | 15 | 18 | | 14.5 | 17.5 | | dBm |
| Saturated Output Power (P _{sat}) | | 19.5 | | | 19.5 | | | 19.5 | | | 19.5 | | dBm |
| Output Third Order Intercept (IP3) (-20 dBm Input Power per tone, 1 MHz tone spacing) | | 34 | | | 33.5 | | | 33 | | | 32.5 | | dBm |
| Supply Current (I _{dd}) | | 136 | | | 136 | | | 136 | | | 136 | | mA |

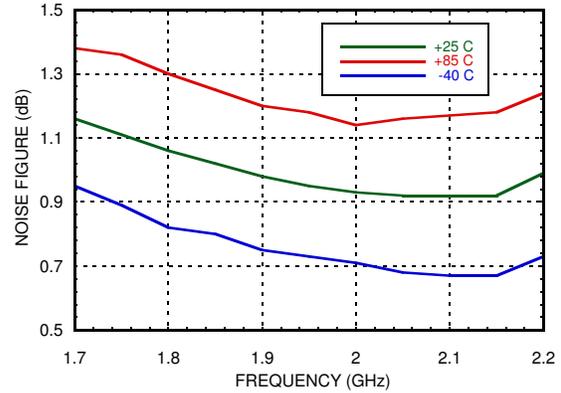


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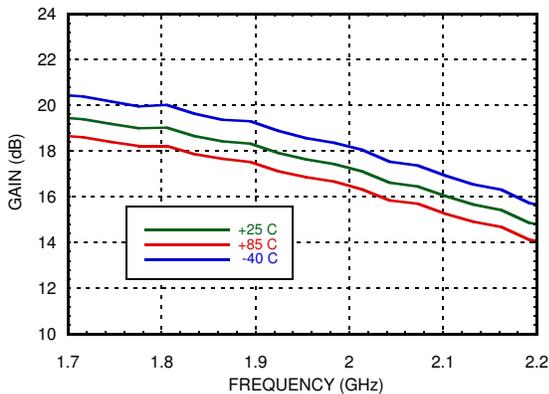
Broadband Gain & Return Loss



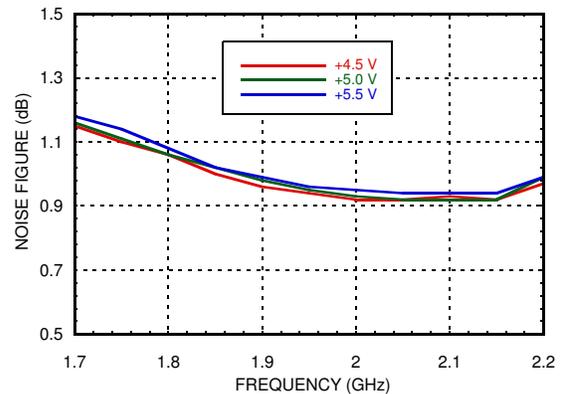
Noise Figure vs. Temperature



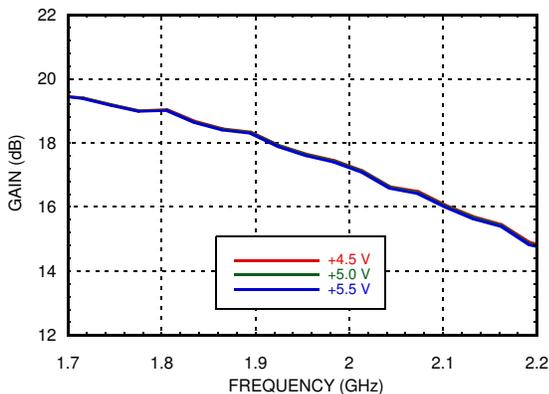
Gain vs. Temperature



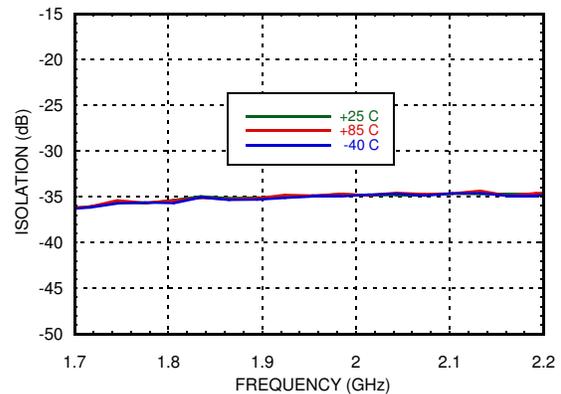
Noise Figure vs. Vdd



Gain vs. Vdd



Reverse Isolation vs. Temperature

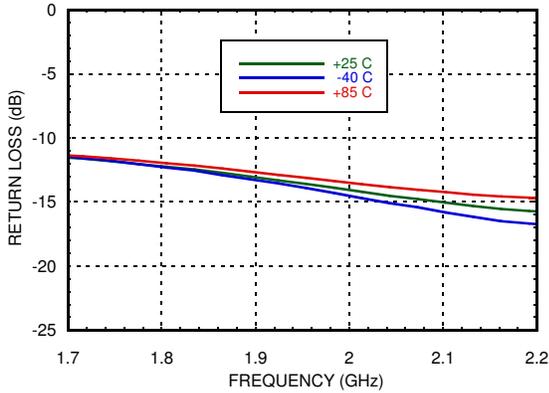




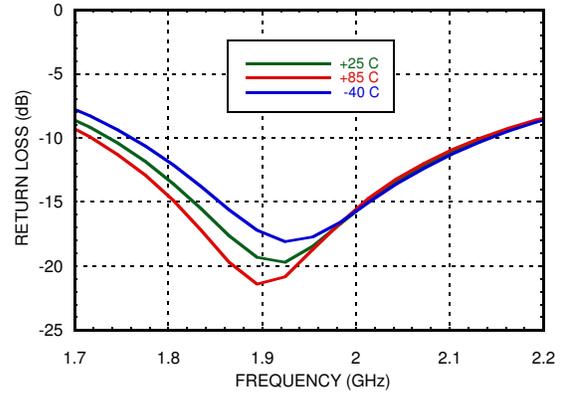
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AMPLIFIERS - LOW NOISE - SMT

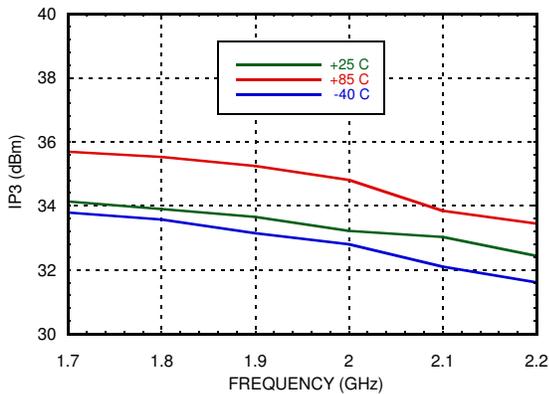
Input Return Loss vs. Temperature



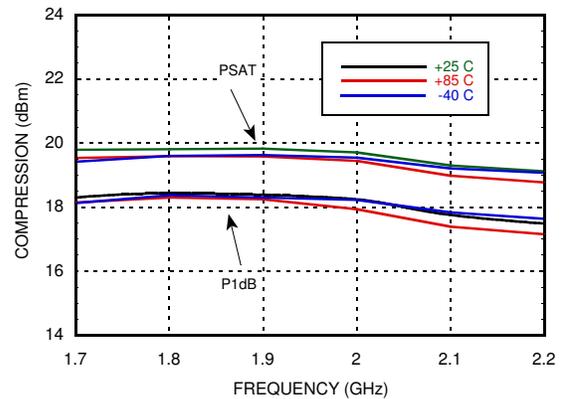
Output Return Loss vs. Temperature



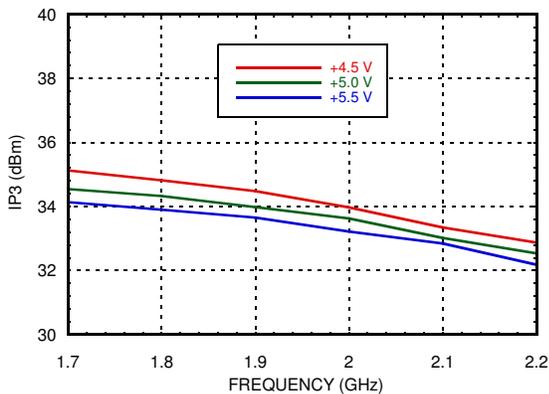
Output IP3 vs. Temperature



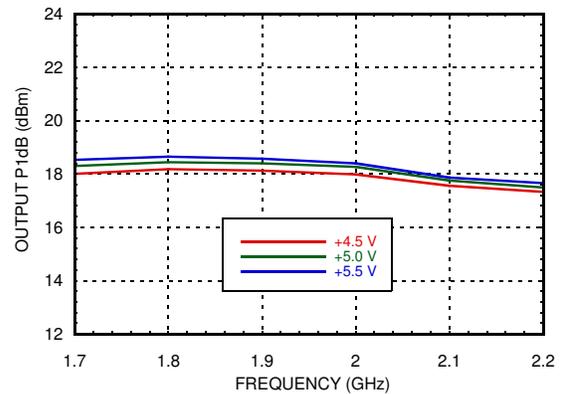
P1dB & PSAT vs. Temperature



Output IP3 vs. Vdd



P1dB vs. Vdd





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Absolute Maximum Ratings

| | |
|---|----------------|
| Drain Bias Voltage (Vdd1, Vdd2) | +8.0 Vdc |
| RF Input Power (RFIN)(Vs = +5.0 Vdc) | +10 dBm |
| Channel Temperature | 150 °C |
| Continuous P _{diss} (T = 85 °C) (derate 15.6 mW/°C above 85 °C) | 1.015 W |
| Thermal Resistance (channel to ground paddle) | 64.1 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

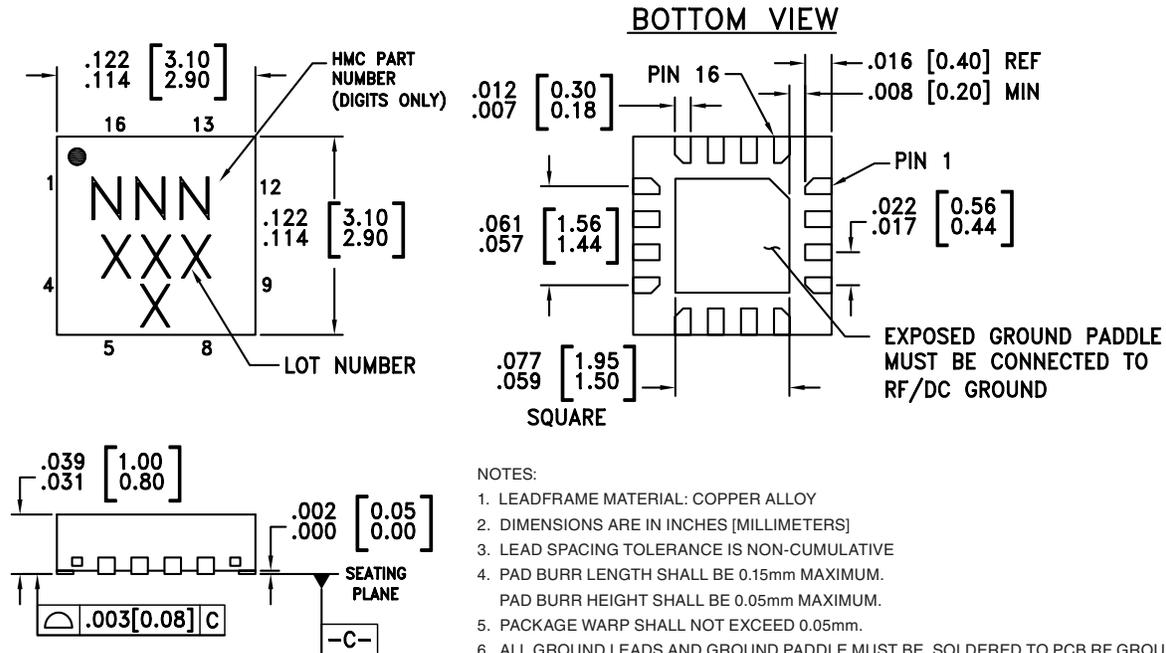
Typical Supply Current vs. Vdd

| Vdd (Vdc) | I _{dd} (mA) |
|-----------|----------------------|
| +4.5 | 135 |
| +5.0 | 136 |
| +5.5 | 137 |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|--------------|--|---------------|---------------------|--------------------------------|
| HMC375LP3 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL3 ^[1] | 375 XXXX |
| HMC375LP3TR | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL3 ^[1] | 375 XXXX |
| HMC375LP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 ^[2] | 375 XXXX |
| HMC375LP3ETR | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 ^[2] | 375 XXXX |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

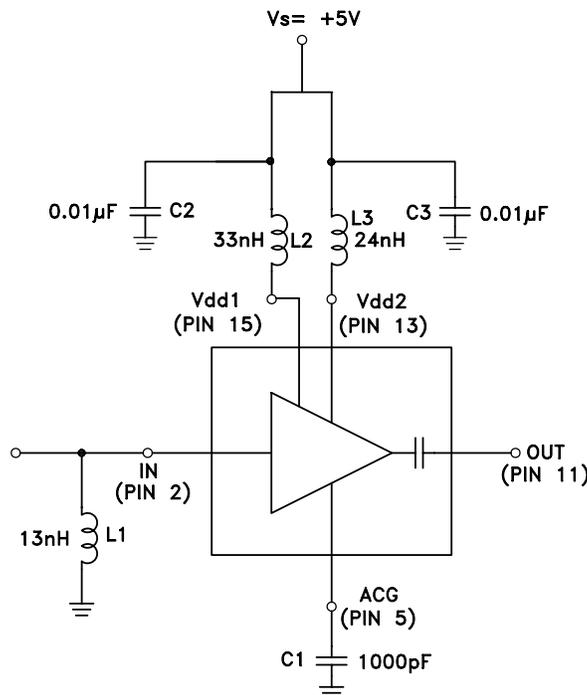


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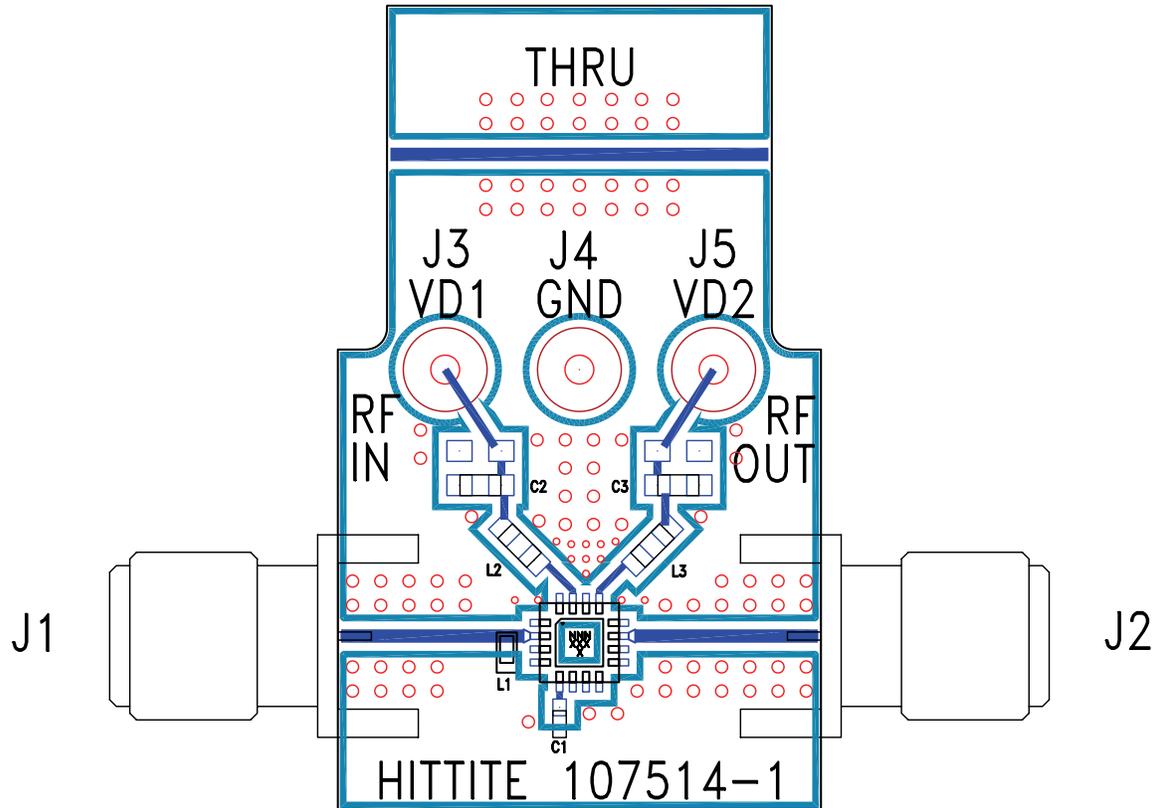
Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---------------------------|------------|---|---------------------|
| 1, 3, 4, 6-10, 12, 14, 16 | N/C | No connection necessary. These pins may be connected to RF/DC ground. | |
| 2 | RFIN | This pin is matched to 50 Ohms with a 13 nH inductor to ground. See Application Circuit. | RFIN ○ — |
| 5 | ACG | AC Ground - An external capacitor of 0.01μF to ground is required for low frequency bypassing. See Application Circuit for further details. | |
| 11 | RFOUT | This pin is AC coupled and matched to 50 Ohms. | — ○ RFOUT |
| 13,15 | Vdd2, Vdd1 | Power supply voltage. Choke inductor and bypass capacitor are required. See application circuit. | |
| | GND | Package bottom must be connected to RF/DC ground. | ○ GND |

Application Circuit



Note: L1, L2, L3 and C1 should be located as close to pins as possible.

Evaluation PCB

List of Materials for Evaluation PCB 107726 [1]

| Item | Description |
|---------|----------------------------------|
| J1 - J2 | PCB Mount SMA RF Connector |
| J3 - J4 | DC Pin |
| C1 | 1000 pF Capacitor, 0402 Pkg. |
| C2, C3 | 10000 pF Capacitor, 0603 Pkg. |
| L1 | 13nH Inductor, 0402 Pkg. |
| L2 | 33nH Inductor, 0603 Pkg. |
| L3 | 24nH Inductor, 0402 Pkg. |
| U1 | HMC375LP3 / HMC375LP3E Amplifier |
| PCB [2] | 107514 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 circuit board shown is available from Analog Devices, upon request.