



GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 1.7 - 2.2 GHz

Typical Applications

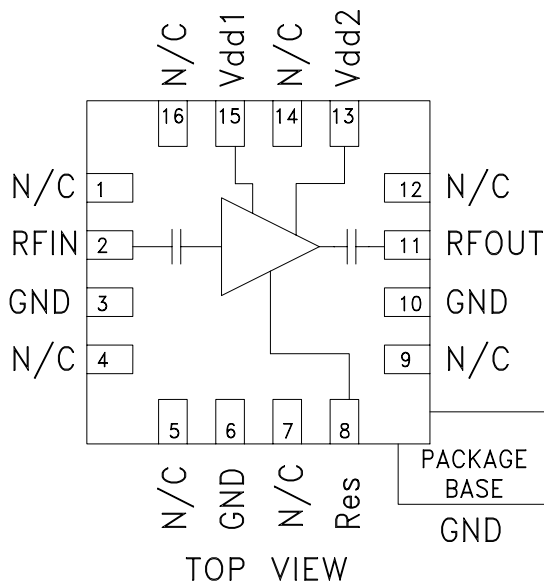
The HMC382LP3 / HMC382LP3E is ideal for:

- Cellular/3G Infrastructure
- Base Stations & Repeaters
- CDMA, W-CDMA, & TD-SCDMA
- GSM/GPRS & EDGE

Features

- Noise Figure: 1 dB
- Output IP3: +30 dBm
- Gain: 17 dB
- Externally Adjustable Supply Current
- Single Positive Supply: +5V
- 50 Ohm Matched Input/Output

Functional Diagram



General Description

The HMC382LP3 & HMC382LP3E 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 1.0 dB noise figure, 17 dB gain and +30 dBm output IP3 from a single supply of +5V. The HMC382LP3 & HMC382LP3E feature an externally adjustable supply current which allows the designer to tailor the linearity performance of the LNA for each application. For applications which require improved noise figure, please see the HMC618LP3(E).

Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{dd1}, V_{dd2} = +5\text{V}$, $R_{bias} = 16\text{ Ohms}^*$

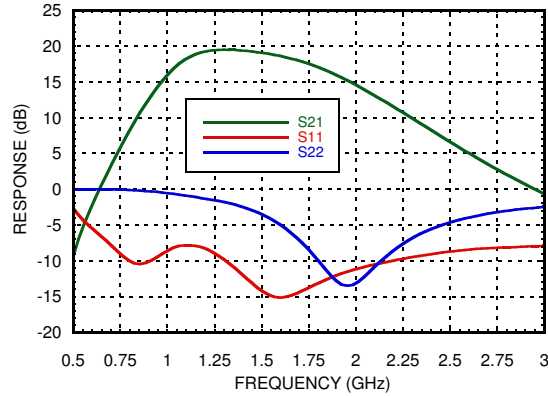
| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|-----------|------|-------|-----------|------|-------|-----------|------|-------|-----------|------|-------|-------|
| Frequency Range | 1.7 - 1.9 | | | 1.9 - 2.0 | | | 2.0 - 2.1 | | | 2.1 - 2.2 | | | GHz |
| Gain | 14 | 17 | | 12 | 15 | | 11 | 14 | | 9 | 12 | | dB |
| Gain Variation Over Temperature | | 0.01 | 0.015 | | 0.01 | 0.015 | | 0.01 | 0.015 | | 0.01 | 0.015 | dB/°C |
| Noise Figure | | 1.0 | 1.3 | | 1.05 | 1.35 | | 1.15 | 1.45 | | 1.2 | 1.5 | dB |
| Input Return Loss | | 13 | | | 12 | | | 11 | | | 10 | | dB |
| Output Return Loss | | 10 | | | 13 | | | 12 | | | 9 | | dB |
| Reverse Isolation | | 37 | | | 36 | | | 35 | | | 35 | | dB |
| Output Power for 1dB Compression (P1dB) | | 16 | | | 16 | | | 15.5 | | | 14 | | dBm |
| Output Third Order Intercept (IP3) (-20 dBm Input Power per tone, 1 MHz tone spacing) | | 29.5 | | | 30 | | | 30 | | | 29.5 | | dBm |
| Supply Current (I _{dd}) | | 67 | | | 67 | | | 67 | | | 67 | | mA |

* R_{bias} resistor value sets current. See application circuit herein.

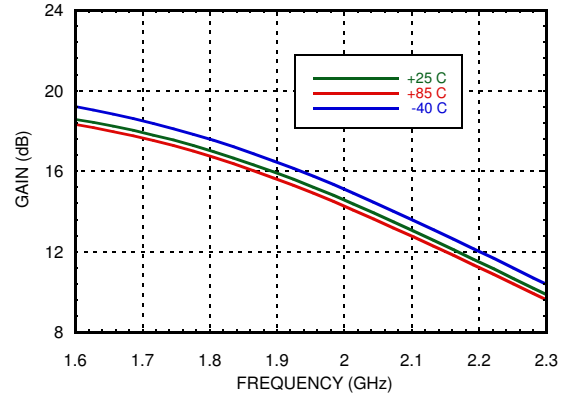


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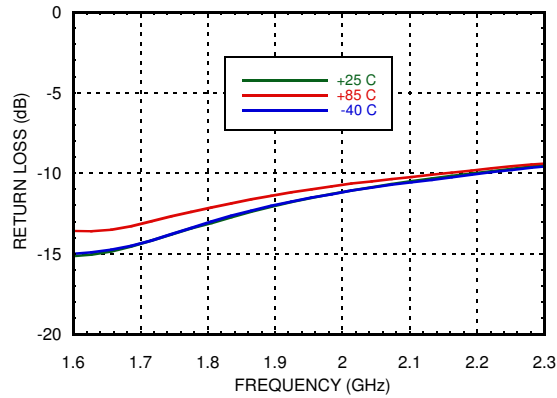
Broadband Gain & Return Loss



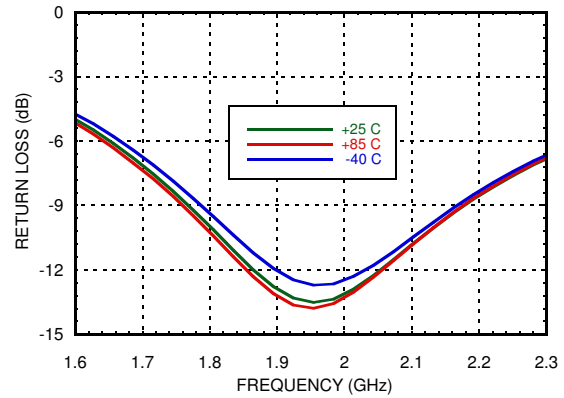
Gain vs. Temperature



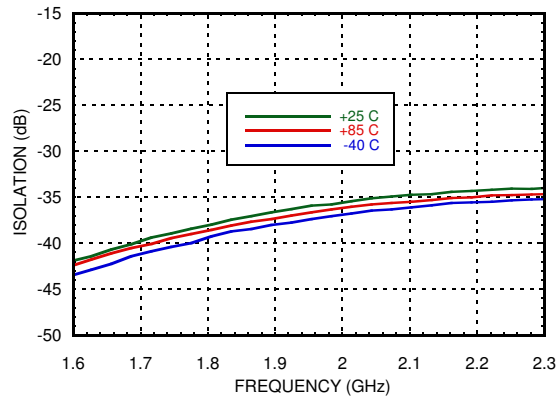
Input Return Loss vs. Temperature



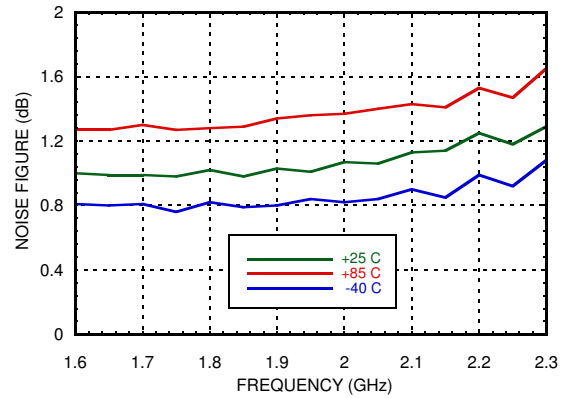
Output Return Loss vs. Temperature



Reverse Isolation vs. Temperature



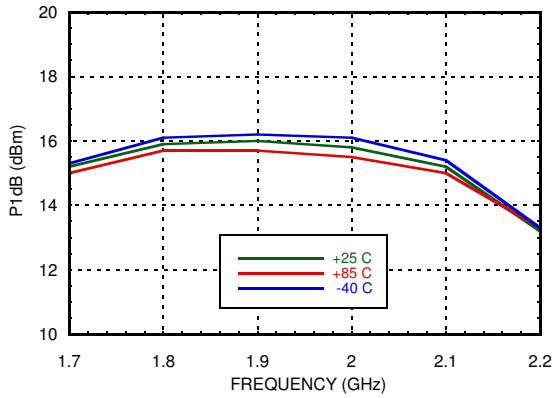
Noise Figure vs. Temperature



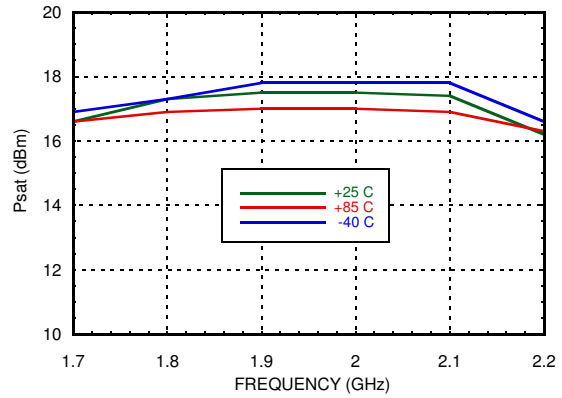


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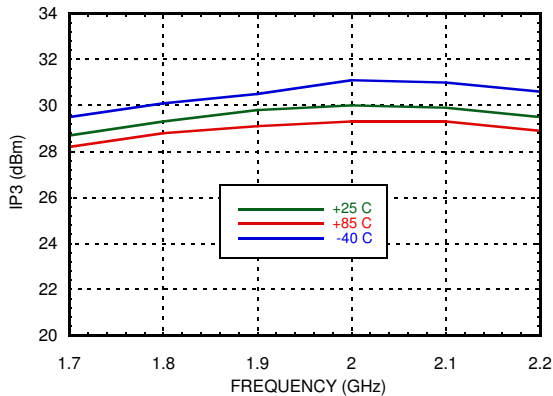
P1dB vs. Temperature @ I_{dd} = 67 mA



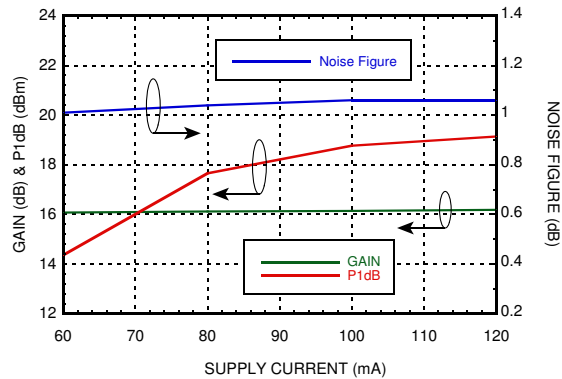
Psat vs. Temperature @ I_{dd} = 67 mA



Output IP3 vs. Temperature I_{dd} = @ 67 mA



Gain, Noise Figure & P1dB vs. Supply Current @ 1900 MHz





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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 6.94 mW/°C above 85 °C) | 0.451 W |
| Thermal Resistance (channel to ground paddle) | 144 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Typical Supply Current vs. Vdd

| Vdd (Vdc) | I _{dd} (mA) |
|-----------|----------------------|
| +4.5 | 67.2 |
| +5.0 | 67.2 |
| +5.5 | 67.2 |

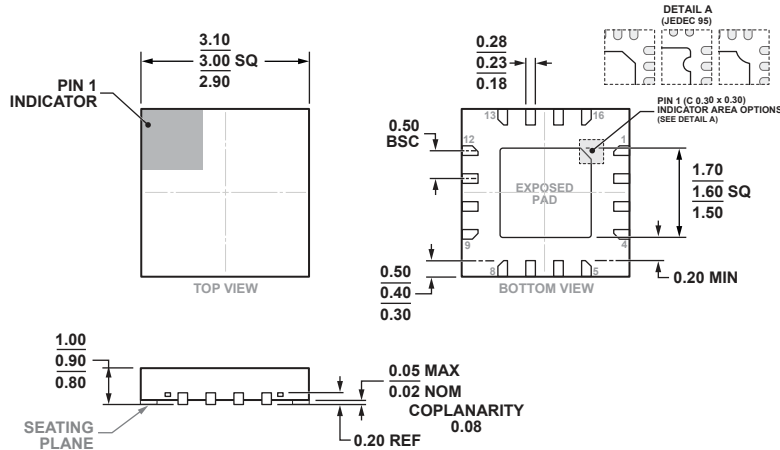
Recommended Bias Resistor Values for Various I_{dd1} & I_{dd2}

| I _{dd1} + I _{dd2} (mA) | R _{bias} (Ohms) |
|--|--------------------------|
| 60 | 27 |
| 70 | 16 |
| 80 | 13 |
| 100 | 8.2 |
| 120 | 3.9 |



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Outline Drawing



COMPLIANT WITH JEDEC STANDARDS MO-220-VEED-6.

16-Lead Lead Frame Chip Scale Package [LFCSP]
3 mm x 3 mm and 0.90 mm Package Height
(CP-16-54)
Dimensions shown in millimeters

Package Information


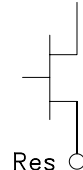

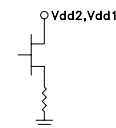

| Part Number | Package Body Material | Lead Finish | MSL Rating ^[1] | Package Marking ^[2] |
|--------------|--|---------------|---------------------------|--------------------------------|
| HMC382LP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 | 382 XXXX |
| HMC382LP3ETR | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 | 382 XXXX |

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

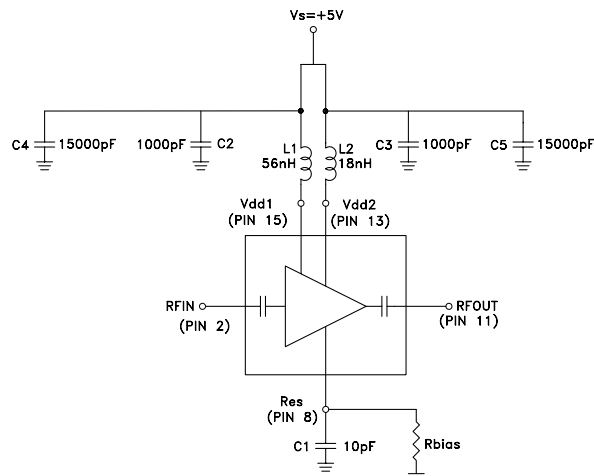


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Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---------------------------|------------|--|---|
| 1, 4, 5, 7, 9, 12, 14, 16 | N/C | No connection necessary. These pins may be connected to RF/DC ground. Performance will not be affected. | |
| 2 | RFIN | This pin is AC coupled and matched to 50 Ohms. | RFIN  |
| 8 | Res | This pin is used to set the DC current of the amplifier by selection of external bias resistor. See application circuit. |  Res |
| 11 | RFOUT | This pin is AC coupled and matched to 50 Ohms. |  RFOUT |
| 13,15 | Vdd2, Vdd1 | Power supply voltage. Choke inductor and bypass capacitors are required. See application circuit. |  Vdd2, Vdd1 |
| 3, 6, 10 | GND | These pins and package bottom must be connected to RF/DC ground. |  GND |

Application Circuit

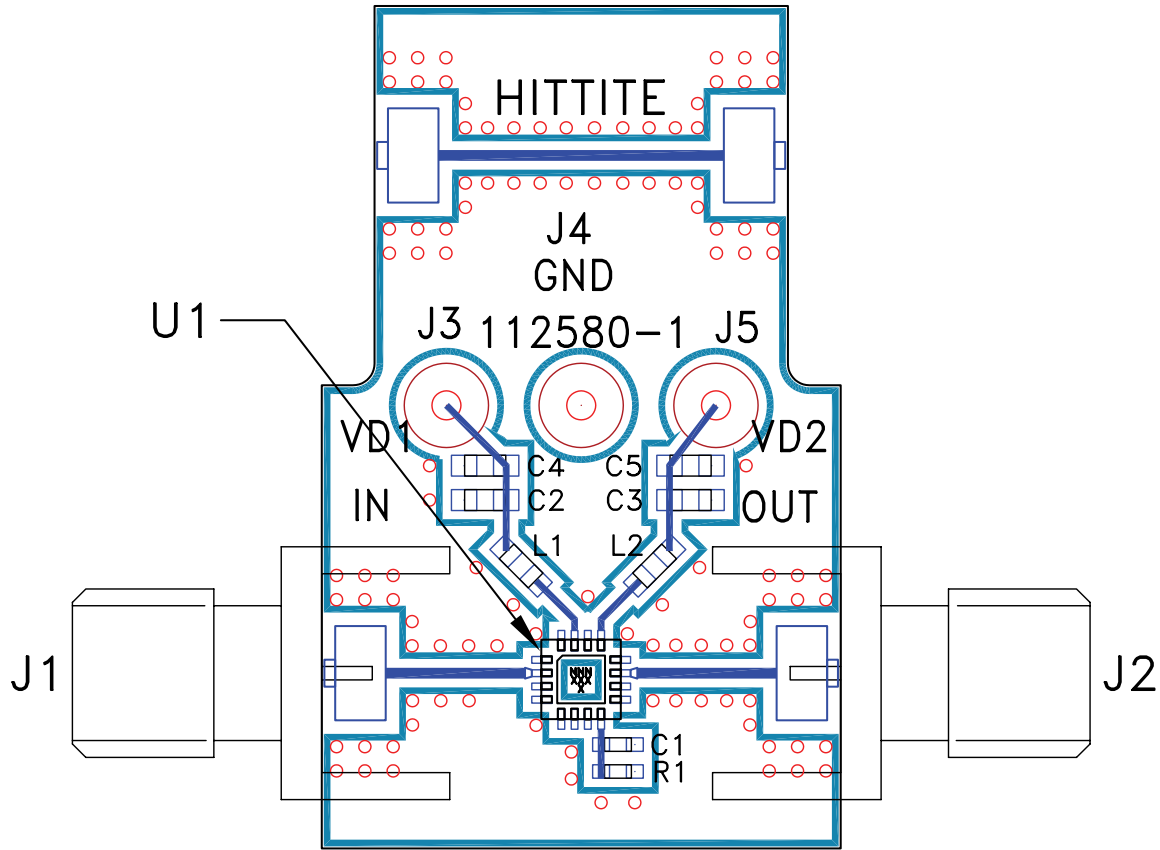


Note: L1, L2, L3 and C1 should be located as close to pins as possible.



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Evaluation PCB



List of Materials for Evaluation PCB 112582 [1]

| Item | Description |
|---------|----------------------------------|
| J1 - J2 | PCB Mount SMA RF Connector |
| J3 - J5 | DC Pin |
| C1 | 10 pF Capacitor, 0402 Pkg. |
| C2, C3 | 1000 pF Capacitor, 0603 Pkg. |
| C4, C5 | 15000 pF Capacitor, 0603 Pkg |
| L1 | 56nH Inductor, 0603 Pkg. |
| L2 | 18nH Inductor, 0603 Pkg. |
| R1 | Resistor, 0402 Pkg.. |
| U1 | HMC382LP3 / HMC382LP3E Amplifier |
| PCB [2] | 112580 Evaluation PCB |

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.

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350



HMC382LP3 / 382LP3E

v02.0320

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Notes