

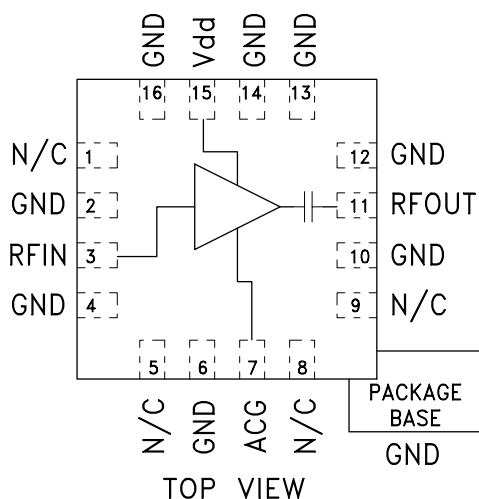
## GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz

### Typical Applications

The HMC372LP3 is ideal for basestation receivers:

- GSM, GPRS & EDGE
- CDMA & W-CDMA
- Private Land Mobile Radio

### Functional Diagram



### Features

Noise Figure: <1.0 dB

+34 dBm Output IP3

Gain: 15 dB

Very Stable Gain vs. Supply & Temperature

Single Supply: +5.0 V @ 100 mA

50 Ohm Matched Output

### General Description

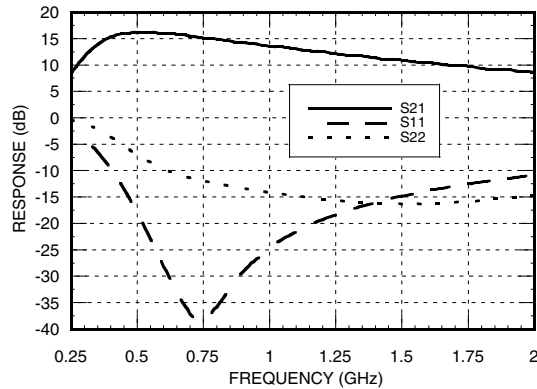
The HMC372LP3 is a GaAs PHEMT MMIC Low Noise Amplifier that is ideal for GSM & CDMA cellular basestation front-end receivers operating between 700 and 1000 MHz. The amplifier has been optimized to provide 1.0 dB noise figure, 15 dB gain and +34 dBm output IP3 from a single supply of +5.0V @ 100 mA. Input and output return losses are 25 and 14 dB respectively with the LNA requiring only four external components to optimize the RF Input match, RF ground and DC bias. The HMC372LP3 shares the same package and pinout with the HMC356LP3 high IP3 LNA. A low cost, leadless 3x3 mm (LP3) SMT QFN package houses the low noise amplifier.

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

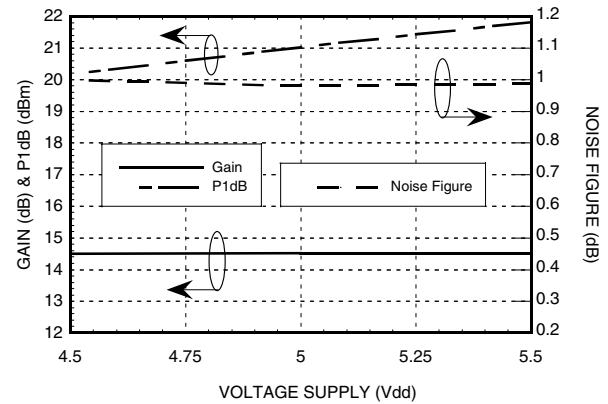
| Parameter                                                                                | Min.      | Typ.  | Max.  | Min.       | Typ.  | Max.  | Units   |
|------------------------------------------------------------------------------------------|-----------|-------|-------|------------|-------|-------|---------|
| Frequency Range                                                                          | 810 - 960 |       |       | 700 - 1000 |       |       | MHz     |
| Gain                                                                                     | 12.5      | 14.5  |       | 11.5       | 14.5  |       | dB      |
| Gain Variation Over Temperature                                                          |           | 0.008 | 0.015 |            | 0.008 | 0.015 | dB / °C |
| Noise Figure                                                                             |           | 1.0   | 1.3   |            | 1.0   | 1.3   | dB      |
| Input Return Loss                                                                        |           | 25    |       |            | 25    |       | dB      |
| Output Return Loss                                                                       |           | 14    |       |            | 12    |       | dB      |
| Reverse Isolation                                                                        |           | 20    |       |            | 22    |       | dB      |
| Output Power for 1dB Compression (P1dB)                                                  | 18        | 21    |       | 17         | 20    |       | dBm     |
| Saturated Output Power (Psat)                                                            |           | 23.5  |       |            | 22.5  |       | dBm     |
| Output Third Order Intercept (IP3)<br>(-20 dBm Input Power per tone, 1 MHz tone spacing) |           | 34    |       | 30         | 33    |       | dBm     |
| Supply Current (Idd)                                                                     |           | 100   |       |            | 100   |       | mA      |

## GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz

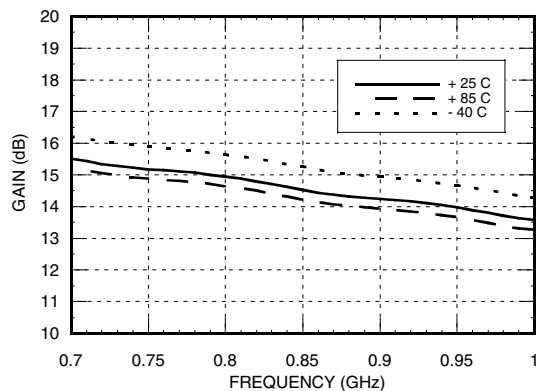
**Broadband Gain & Return Loss**



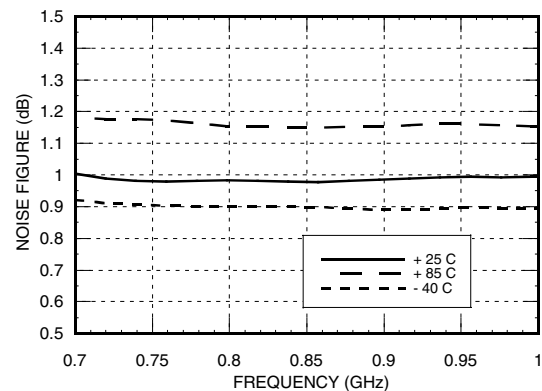
**Gain, Noise Figure & Power vs. Supply Voltage @ 850MHz**



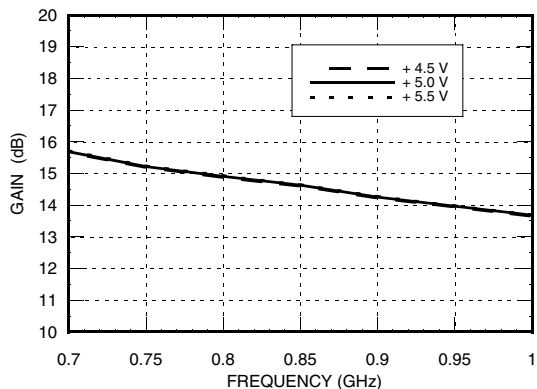
**Gain vs. Temperature**



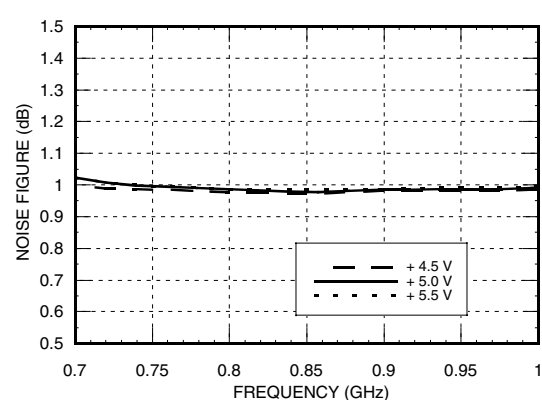
**Noise Figure vs. Temperature**



**Gain vs. V<sub>dd</sub>**



**Noise Figure vs. V<sub>dd</sub>**

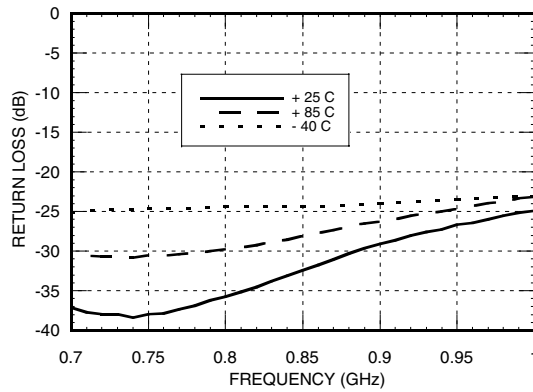


## GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz

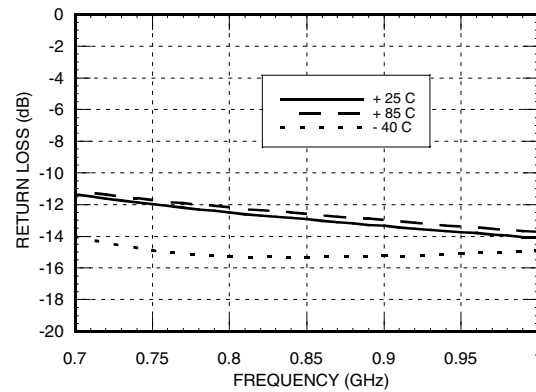
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AMPLIFIERS - SMT

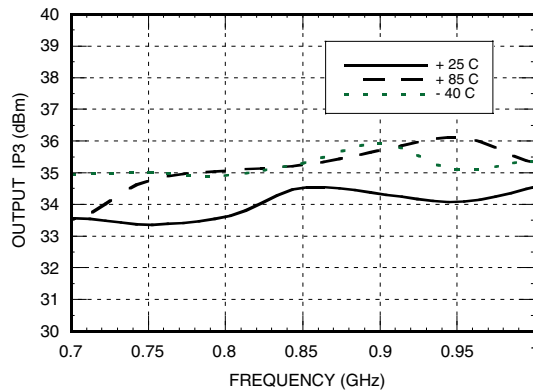
**Input Return Loss vs. Temperature**



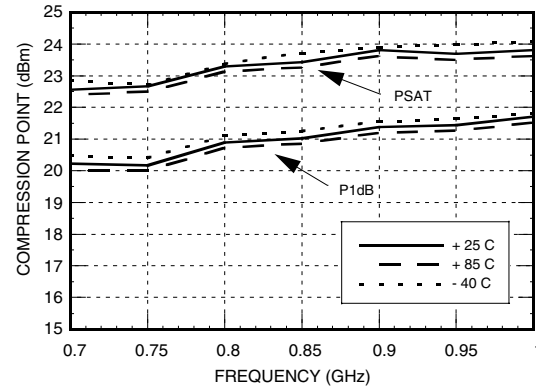
**Output Return Loss vs. Temperature**



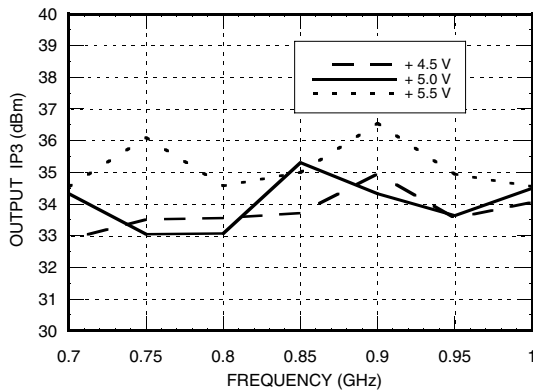
**Output IP3 vs. Temperature**



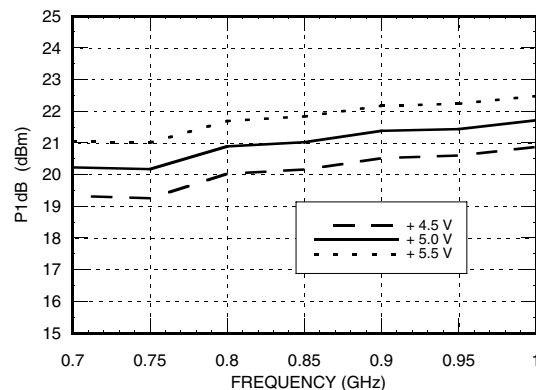
**P1dB & Psat vs. Temperature**



**Output IP3 vs. Vdd**

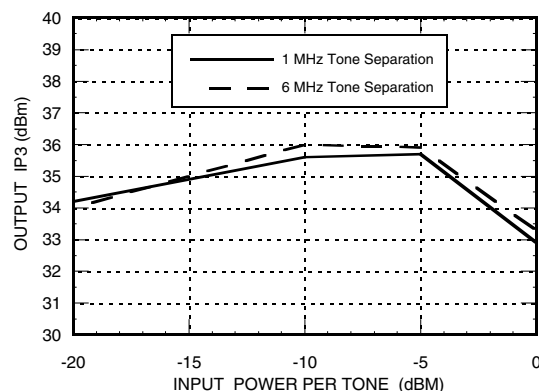


**P1dB vs. Vdd**

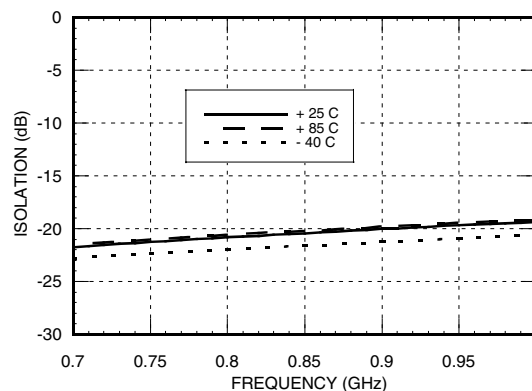


## GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz

**Output IP3 vs. Input Power @ 950 MHz**



**Reverse Isolation vs. Temperature**



### Absolute Maximum Ratings

|                                                                             |                |
|-----------------------------------------------------------------------------|----------------|
| Drain Bias Voltage (Vdd)                                                    | +8.0 Vdc       |
| RF Input Power (RFIn)(Vs = +5.0 Vdc)                                        | +15 dBm        |
| Channel Temperature                                                         | 150 °C         |
| Continuous P <sub>diss</sub> (T = 85 °C)<br>(derate 15.6 mW/°C above 85 °C) | 1.015 W        |
| Thermal Resistance<br>(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

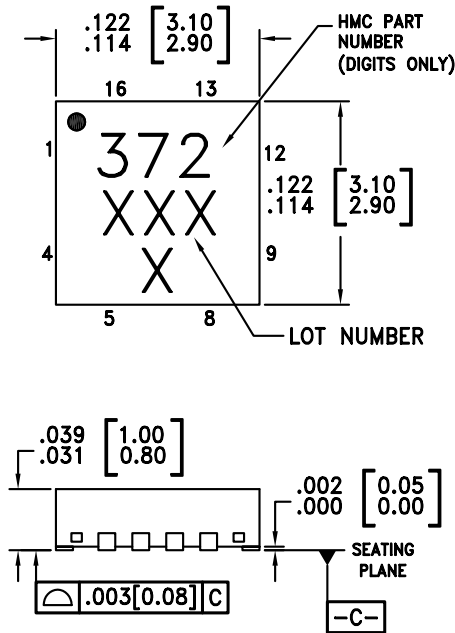
| Vdd (Vdc) | I <sub>dd</sub> (mA) |
|-----------|----------------------|
| +4.5      | 98                   |
| +5.0      | 100                  |
| +5.5      | 102                  |

## GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz

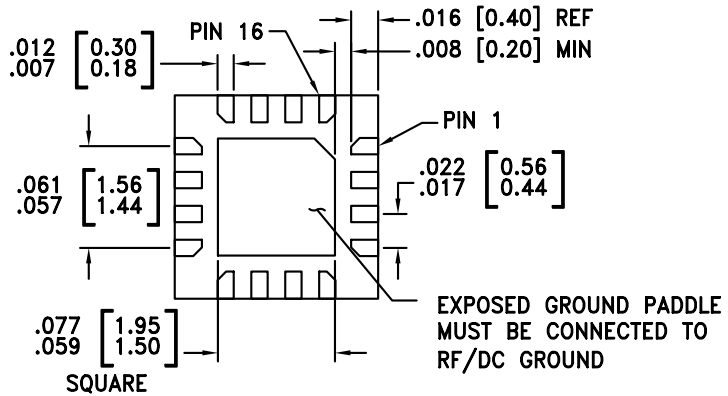
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AMPLIFIERS - SMT

### Outline Drawing



### BOTTOM VIEW

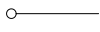
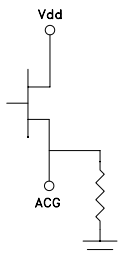
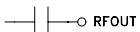
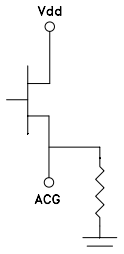


#### NOTES:

1. MATERIAL PACKAGE BODY: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
6. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.  
PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
7. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
9. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN

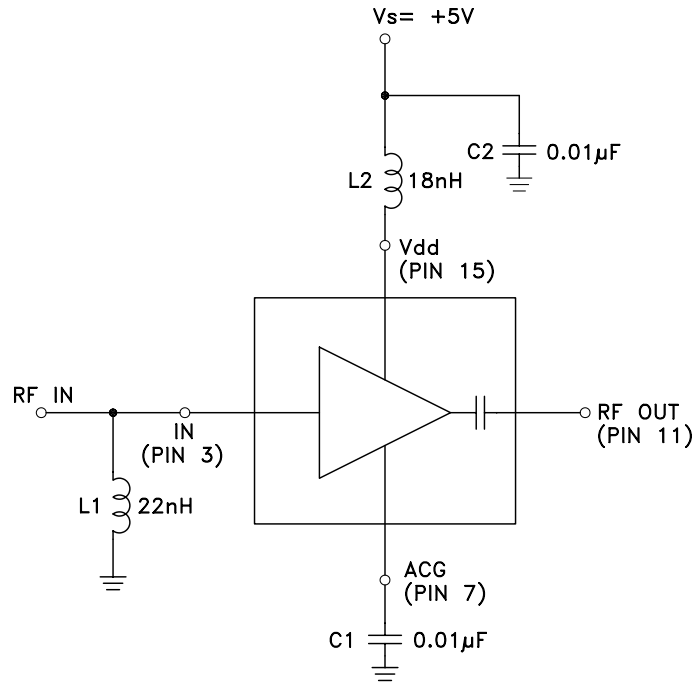
## *GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz*

### **Pin Descriptions**

| Pin Number                     | Function | Description                                                                                                                                 | Interface Schematic                                                                      |
|--------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1, 5, 8, 9                     | N/C      | No connection necessary.<br>These pins may be connected to RF/DC ground.                                                                    |                                                                                          |
| 2, 4, 6, 10, 12,<br>13, 14, 16 | GND      | These pins must be connected to RF/DC ground.                                                                                               |       |
| 3                              | RF IN    | This pin is matched to 50 Ohms with a 22 nH inductor to ground. See Application Circuit.                                                    | RFIN  |
| 7                              | ACG      | AC Ground - An external capacitor of 0.01μF to ground is required for low frequency bypassing. See Application Circuit for further details. |       |
| 11                             | RF OUT   | This pin is AC coupled and matched to 50 Ohms.                                                                                              |      |
| 15                             | Vdd      | Power supply voltage. Choke inductor and bypass capacitor are required. See application circuit.                                            |     |

## *GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 700 - 1000 MHz*

### *Application Circuit*

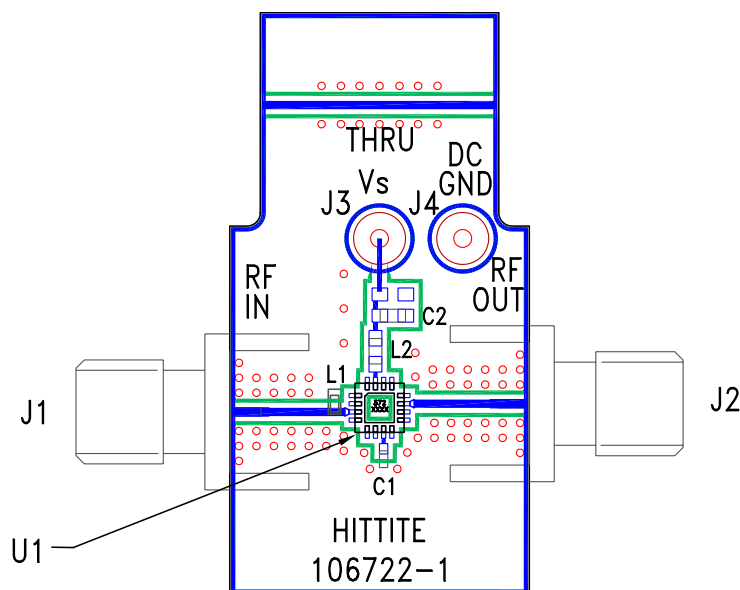


Note 1: Choose value of capacitor C1 for low frequency bypassing. A 0.01  $\mu\text{F} \pm 10\%$  capacitor is recommended.

Note 2: L1, L2 and C1 should be located as close to the pins as possible.

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### Evaluation PCB



### List of Material

| Item                                  | Description                   |
|---------------------------------------|-------------------------------|
| J1 - J2                               | PC Mount SMA RF Connector     |
| J3 - J4                               | DC Pin                        |
| C1                                    | 10000 pF Capacitor, 0402 Pkg. |
| C2                                    | 10000 pF Capacitor, 0060 Pkg. |
| L1                                    | 22nH Inductor, 0402 Pkg.      |
| L2                                    | 18nH Inductor, 0603 Pkg.      |
| U1                                    | HMC372LP3 Amplifier           |
| PCB*                                  | 106722 Eval Board             |
| * Circuit Board Material: Rogers 4350 |                               |

The circuit board used in the final 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 Hittite upon request.