



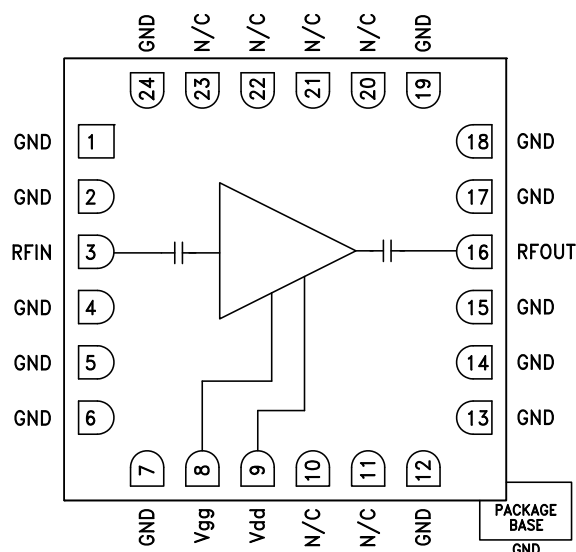
## GaAs HEMT MMIC LOW NOISE AMPLIFIER, 2 - 12 GHz

### Typical Applications

This HMC772LC4 is ideal for:

- Wideband Communication Systems
- Surveillance Systems
- Point-to-Point Radios
- Point-to-Multi-Point Radios
- Military & Space
- Test Instrumentation

### Functional Diagram



### Features

Noise Figure: 1.8 dB

Gain: 15 dB

Output IP3: +25 dBm

P1dB Output Power: +13 dBm

50 Ohm Matched Input/Output

Supply Voltage: +4V @ 45 mA

24 Lead Ceramic 4x4mm SMT Package: 16mm<sup>2</sup>

### General Description

The HMC772LC4 is a GaAs MMIC HEMT Low Noise Wideband Amplifier which operates between 2 and 12 GHz. The amplifier provides 15 dB of gain, 1.8 dB noise figure up to 12 GHz and output IP3 of +25 dBm, while requiring only 45 mA from a +4V supply voltage. The Psat output power of up to +15 dBm enables the LNA to function as a LO driver for many of Hittite's balanced, I/Q or image reject mixers. The HMC772LC4 also features I/Os that are DC blocked and internally matched to 50 Ohms, making it ideal for SMT based high capacity microwave radio applications. The HMC772LC4 is housed in a RoHS compliant 4x4 mm QFN leadless ceramic package.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , $V_{dd} = +4\text{V}$ , $I_{dd} = 45\text{mA}^*$

| Parameter  | Min.   | Typ. | Max. | Units   |
|--|--------|------|------|---------|
| Frequency Range                                    | 2 - 12 |      |      | GHz     |
| Gain   | 14     | 15   |      | dB      |
| Gain Variation over Temperature                    |        | 0.01 |      | dB / °C |
| Noise Figure                                       |        | 1.8  | 2.5  | dB      |
| Input Return Loss                                  |        | 15   |      | dB      |
| Output Return Loss                                 |        | 15   |      | dB      |
| Output Power for 1 dB Compression                  |        | 13   |      | dBm     |
| Output Third Order Intercept (IP3)                 |        | 25   |      | dBm     |
| Supply Current (Idd) (Vdd = 4V, Vgg = -0.2V Typ.)* |        | 45   |      | mA      |

\* Adjust Vgg between -1 to 0.3V to achieve Idd = 45mA typical.

# HMC772\* PRODUCT PAGE QUICK LINKS

Last Content Update: 02/23/2017

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## COMPARABLE PARTS

View a parametric search of comparable parts.

## EVALUATION KITS

- HMC772LC4 Evaluation Board

## DOCUMENTATION

### Application Notes

- AN-1363: Meeting Biasing Requirements of Externally Biased RF/Microwave Amplifiers with Active Bias Controllers
- Broadband Biasing of Amplifiers General Application Note
- MMIC Amplifier Biasing Procedure Application Note
- Thermal Management for Surface Mount Components General Application Note

### Data Sheet

- HMC772 Data Sheet

## TOOLS AND SIMULATIONS

- HMC772 S-Parameter

## DESIGN RESOURCES

- HMC772 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

## DISCUSSIONS

View all HMC772 EngineerZone Discussions.

## SAMPLE AND BUY

Visit the product page to see pricing options.

## TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

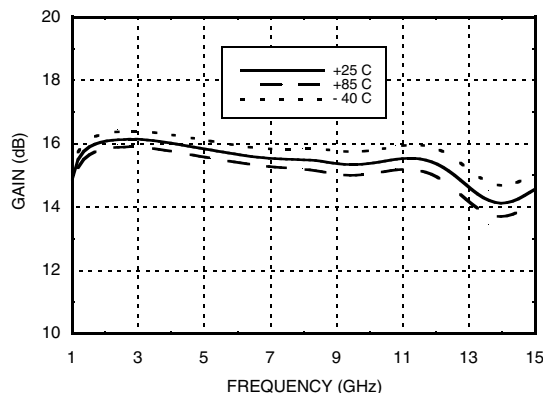
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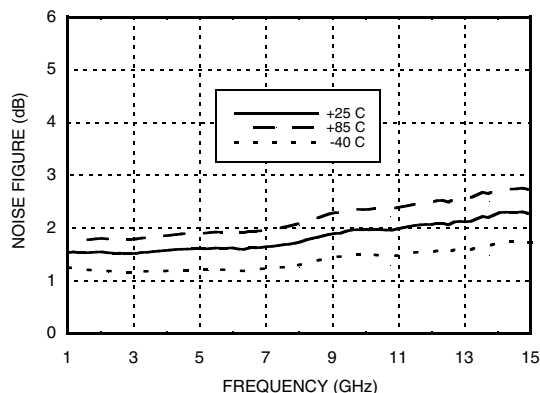


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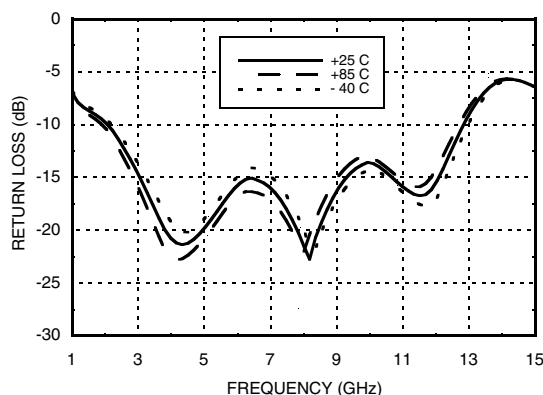
**Gain vs. Temperature**



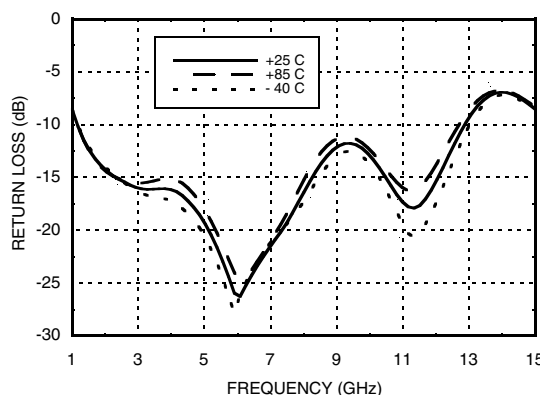
**Noise Figure vs. Temperature**



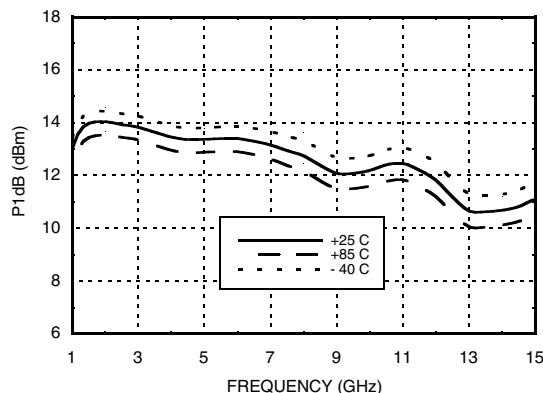
**Output Return Loss vs. Temperature**



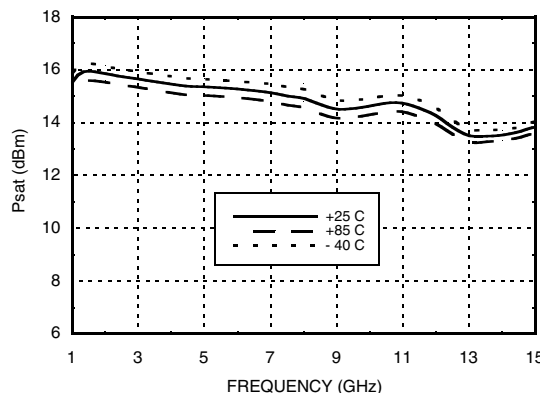
**Input Return Loss vs. Temperature**



**Output P1dB vs. Temperature**

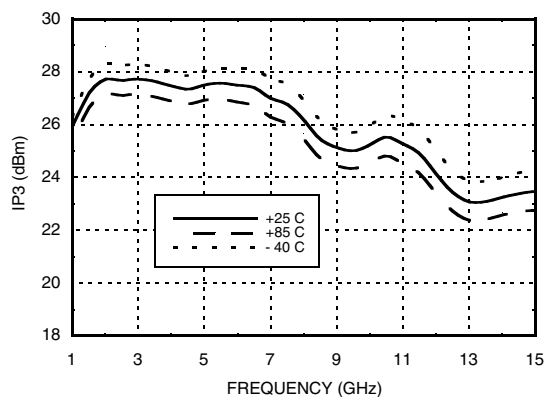


**Output Psat vs. Temperature**

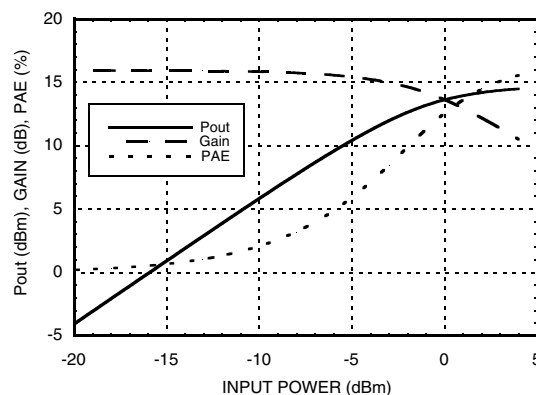


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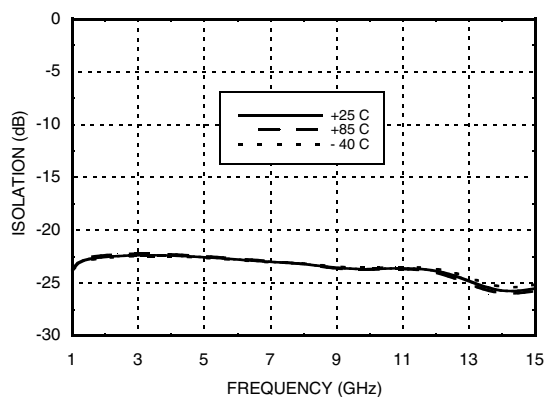
**Output IP3 vs. Temperature**



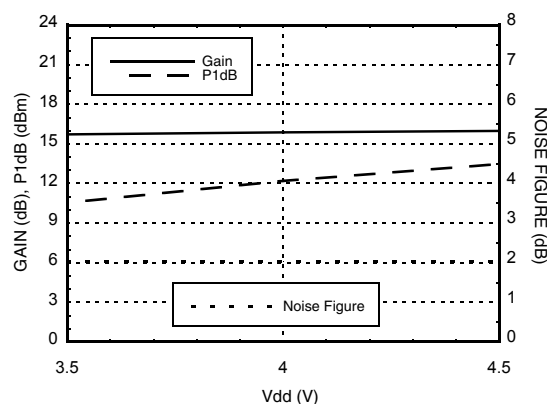
**Power Compression @ 12 GHz**



**Reverse Isolation vs. Temperature**



**Gain, Noise Figure & Power vs.  
Supply Voltage @ 12 GHz**





## GaAs HEMT MMIC LOW NOISE AMPLIFIER, 2 - 12 GHz

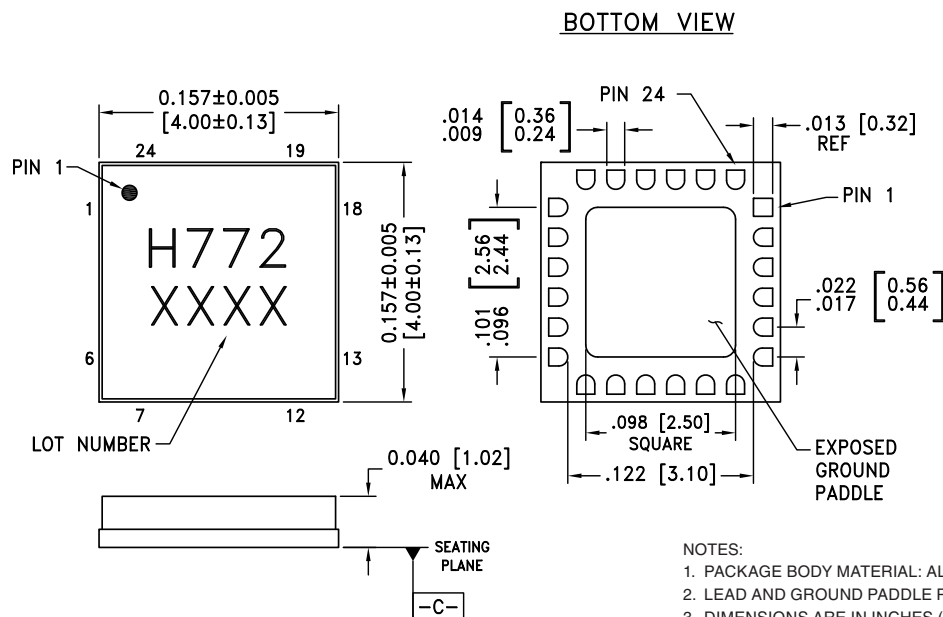
### Absolute Maximum Ratings

|  |                |
|--|----------------|
| Drain Bias Voltage   | +5V            |
| Drain Bias Current   | 60 mA          |
| RF Input Power   | 5 dBm          |
| Gate Bias Voltage  | -1 to 0.3 V    |
| Continuous P <sub>diss</sub> (T = 85 °C)<br>(derate 5.8 mW/°C above 85 °C) | 0.55 W         |
| Thermal Resistance<br>(Channel to ground paddle)                           | 172 °C/W       |
| Channel Temperature  | 180 °C         |
| Storage Temperature  | -65 to +150 °C |
| Operating Temperature  | -40 to +85 °C  |



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



#### NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA.
2. LEAD AND GROUND PADDLE PLATING: GOLD FLASH OVER NICKEL.
3. DIMENSIONS ARE IN INCHES (MILLIMETERS).
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
5. PACKAGE WARP SHALL NOT EXCEED 0.05MM DATUM  $\square-C-$
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC772LC4   | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H772<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

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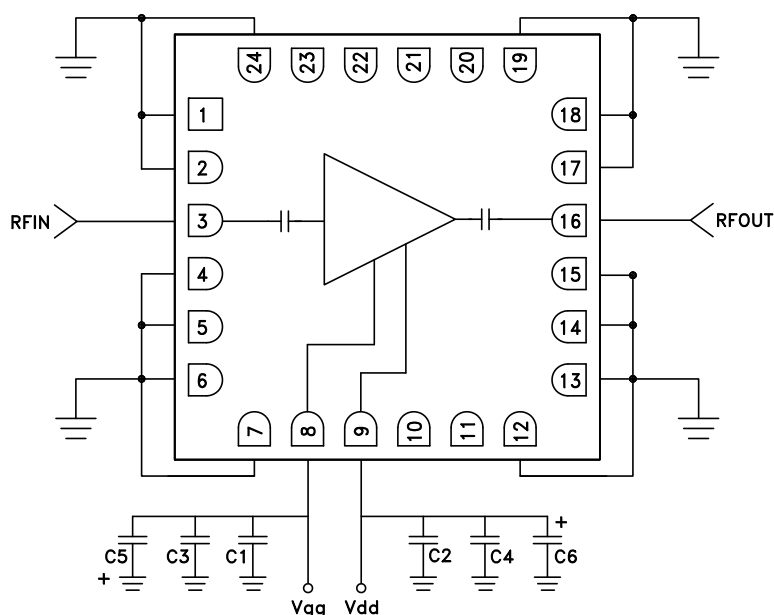


**GaAs HEMT MMIC LOW NOISE  
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**Pin Descriptions**

| Pin Number                           | Function | Description  | Interface Schematic |
|--------------------------------------|----------|--|---------------------|
| 1, 2, 4 - 7, 12 - 15,<br>17 - 19, 24 | GND      | These pins and ground paddle must be connected to RF/DC ground.  |                     |
| 3                                    | RFIN     | This pin is AC coupled and matched to 50 Ohms.   |                     |
| 8                                    | Vgg      | Gate control for amplifier. Please follow "MMIC Amplifier Biasing Procedure" application note. See application circuit for required external components. |                     |
| 9                                    | Vdd      | Power Supply Voltage for the amplifier. See application circuit for required external components.  |                     |
| 10, 11, 20 - 23                      | N/C      | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally.                 |                     |
| 16                                   | RFOUT    | This pin is AC coupled and matched to 50 Ohms.   |                     |

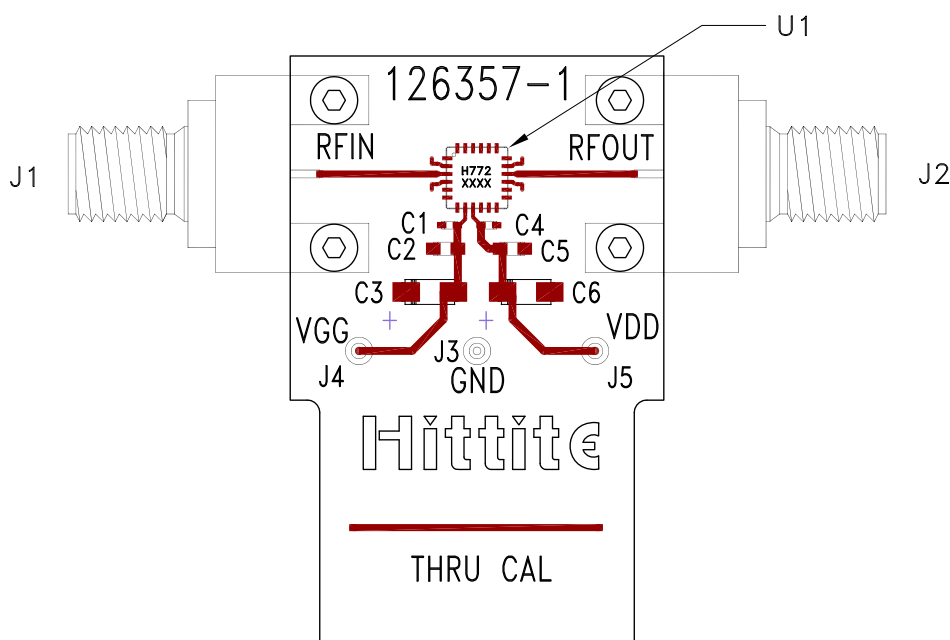
**Application Circuit**





## GaAs HEMT MMIC LOW NOISE AMPLIFIER, 2 - 12 GHz

### Evaluation PCB



### List of Materials for Evaluation PCB 126359 <sup>[1]</sup>

| Item    | Description                     |
|---------|---------------------------------|
| J1, J2  | PCB Mount 2.92mm K-Connector    |
| J3 - J5 | DC Pin                          |
| C1, C4  | 100 pF Capacitor, 0402 Pkg.     |
| C2, C5  | 1000 pF Capacitor, 0603 Pkg.    |
| C3, C6  | 4.7 $\mu$ F Capacitor, Tantalum |
| U1      | HMC772LC4 Amplifier             |
| PCB [2] | 126357 Evaluation PCB           |

[1] Reference this number when ordering complete evaluation PCB

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

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 Hittite upon request.