



MICROWAVE CORPORATION v04.1010



# HMC462LP5 / 462LP5E

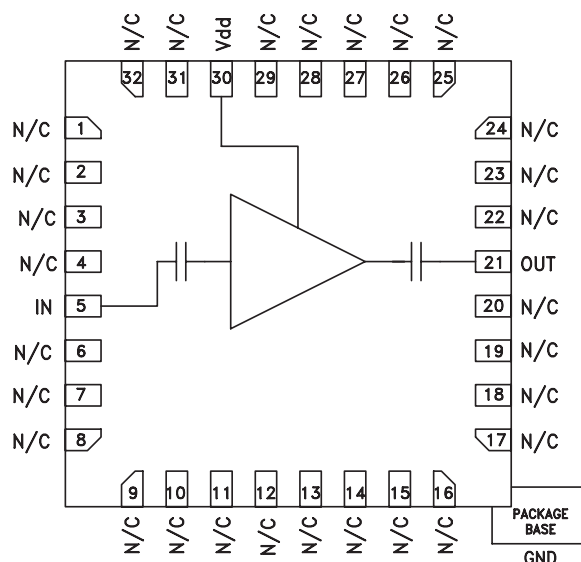
**GaAs pHEMT MMIC**  
**LOW NOISE AMPLIFIER, 2 - 20 GHz**

## Typical Applications

The HMC462LP5 / HMC462LP5E Wideband LNA is ideal for:

- Telecom Infrastructure
- Microwave Radio & VSAT
- Military EW, ECM & C<sup>3</sup>I
- Test Instrumentation
- Fiber Optics

## Functional Diagram



## Features

Noise Figure: 2.5 dB @ 10 GHz

Gain: 13 dB

P1dB Output Power: +14.5 dBm @ 10 GHz

Self-Biased: +5V @ 66mA

50 Ohm Matched Input/Output

25 mm<sup>2</sup> Leadless SMT Package

## General Description

The HMC462LP5 & HMC462LP5E are GaAs MMIC pHEMT Low Noise Distributed Amplifiers in leadless 5x5 mm surface mount packages which operate between 2 and 20 GHz. The self-biased amplifier provides 13 dB of gain, 2.5 to 3.5 dB noise figure and +14.5 dBm of output power at 1 dB gain compression while requiring only 66 mA from a single +5V supply. Gain flatness is excellent from 6 - 18 GHz making the HMC462LP5 & HMC462LP5E ideal for EW, ECM RADAR and test equipment applications. The wideband amplifier I/Os are internally matched to 50 Ohms and are internally DC blocked.

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

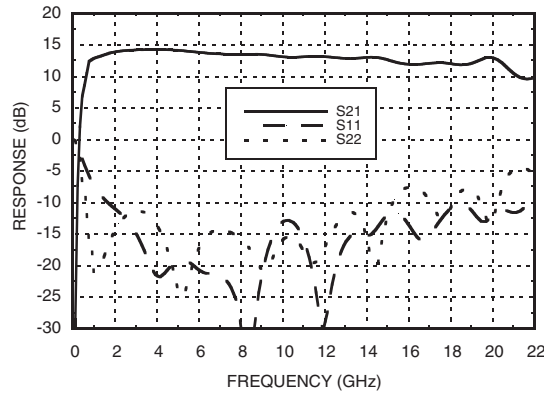
| Parameter                                                | Min.  | Typ.      | Max.  | Min.   | Typ.      | Max. | Min.    | Typ.      | Max. | Units |
|----------------------------------------------------------|-------|-----------|-------|--------|-----------|------|---------|-----------|------|-------|
| Frequency Range                                          | 2 - 6 |           |       | 6 - 14 |           |      | 14 - 20 |           |      | GHz   |
| Gain                                                     | 12    | 14        |       | 11     | 13        |      | 10      | 12        |      | dB    |
| Gain Flatness                                            |       | $\pm 0.5$ |       |        | $\pm 0.5$ |      |         | $\pm 0.5$ |      | dB    |
| Gain Variation Over Temperature                          |       | 0.015     | 0.025 |        | 0.02      | 0.03 |         | 0.03      | 0.04 | dB/°C |
| Noise Figure                                             |       | 3.0       | 4.0   |        | 2.5       | 4.0  |         | 4.0       | 6.0  | dB    |
| Input Return Loss                                        |       | 15        |       |        | 13        |      |         | 11        |      | dB    |
| Output Return Loss                                       |       | 12        |       |        | 12        |      |         | 8         |      | dB    |
| Output Power for 1 dB Compression (P1dB)                 | 12    | 15        |       | 11     | 14        |      | 9       | 12        |      | dBm   |
| Saturated Output Power (Psat)                            |       | 17        |       |        | 16        |      |         | 15        |      | dBm   |
| Output Third Order Intercept (IP3)                       |       | 26        |       |        | 25        |      |         | 22        |      | dBm   |
| Supply Current (I <sub>dd</sub> ) (V <sub>dd</sub> = 5V) |       | 66        | 85    |        | 66        | 85   |         | 66        | 85   | mA    |

For price, delivery and to place orders: Hittite Microwave Corporation, 20 Alpha Road, Chelmsford, MA 01824

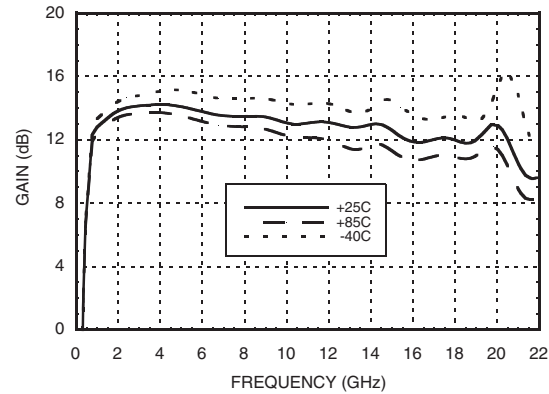
Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at [www.hittite.com](http://www.hittite.com)

Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)

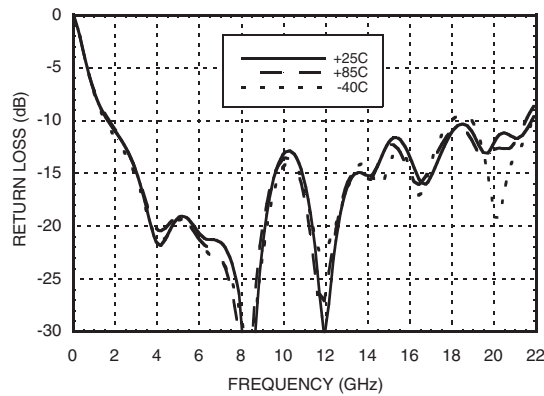
**Gain & Return Loss**



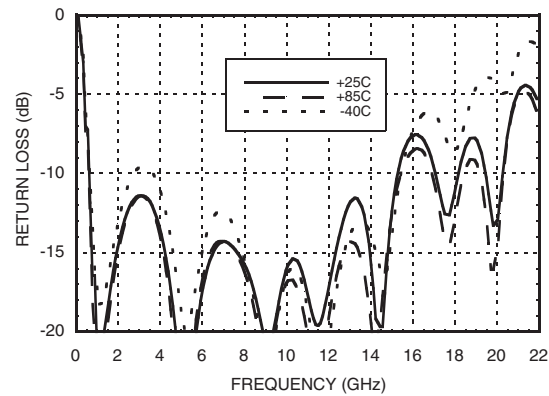
**Gain vs. Temperature**



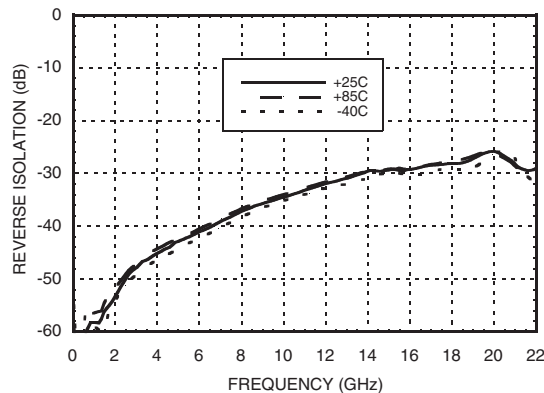
**Input Return Loss vs. Temperature**



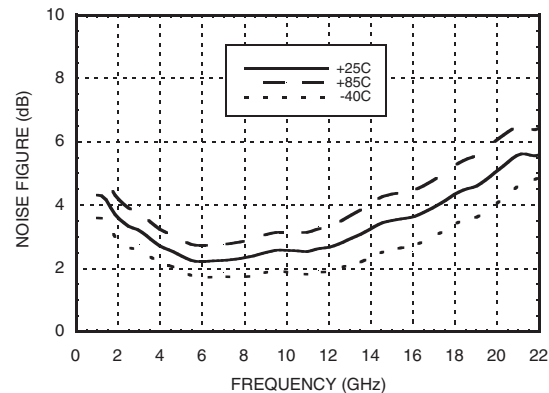
**Output Return Loss vs. Temperature**



**Reverse Isolation vs. Temperature**



**Noise Figure vs. Temperature**





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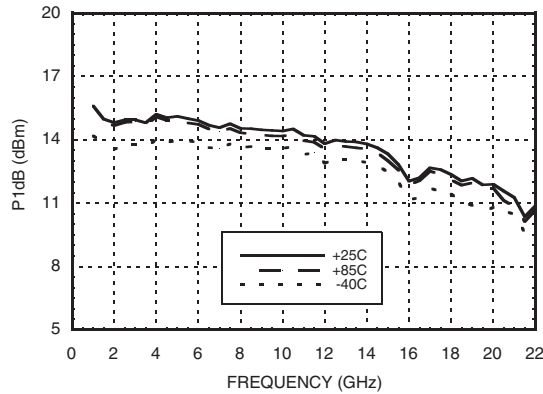
# HMC462LP5 / 462LP5E

## GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 2 - 20 GHz

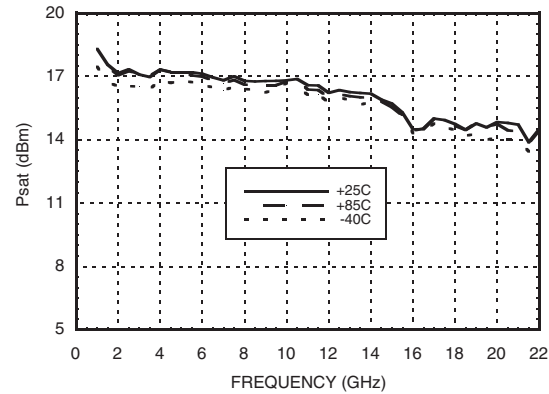
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AMPLIFIERS - LOW NOISE - SMT

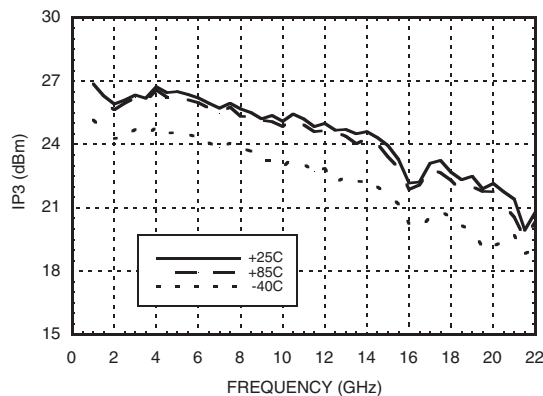
**P1dB vs. Temperature**



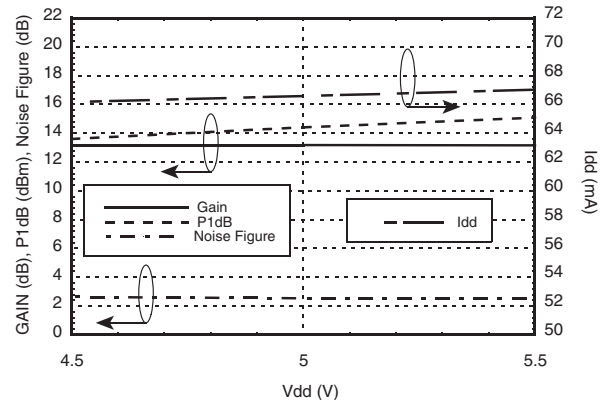
**Psat vs. Temperature**



**Output IP3 vs. Temperature**



**Gain, Power, Noise Figure & Supply Current vs. Supply Voltage @ 10 GHz**



### Absolute Maximum Ratings

|                                                                           |                |
|---------------------------------------------------------------------------|----------------|
| Drain Bias Voltage (Vdd)                                                  | +9 Vdc         |
| RF Input Power (RFIN)(Vdd = +5 Vdc)                                       | +18 dBm        |
| Channel Temperature                                                       | 150 °C         |
| Continuous P <sub>diss</sub> (T = 85 °C)<br>(derate 50 mW/°C above 85 °C) | 3.25 W         |
| Thermal Resistance<br>(channel to ground paddle)                          | 52 °C/W        |
| Storage Temperature                                                       | -65 to +150 °C |
| Operating Temperature                                                     | -40 to +85 °C  |

### Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---------|----------|
| +4.5    | 66       |
| +5.0    | 67       |
| +5.5    | 68       |
| +7.5    | 71       |
| +8.0    | 72       |
| +8.5    | 73       |



ELECTROSTATIC SENSITIVE DEVICE  
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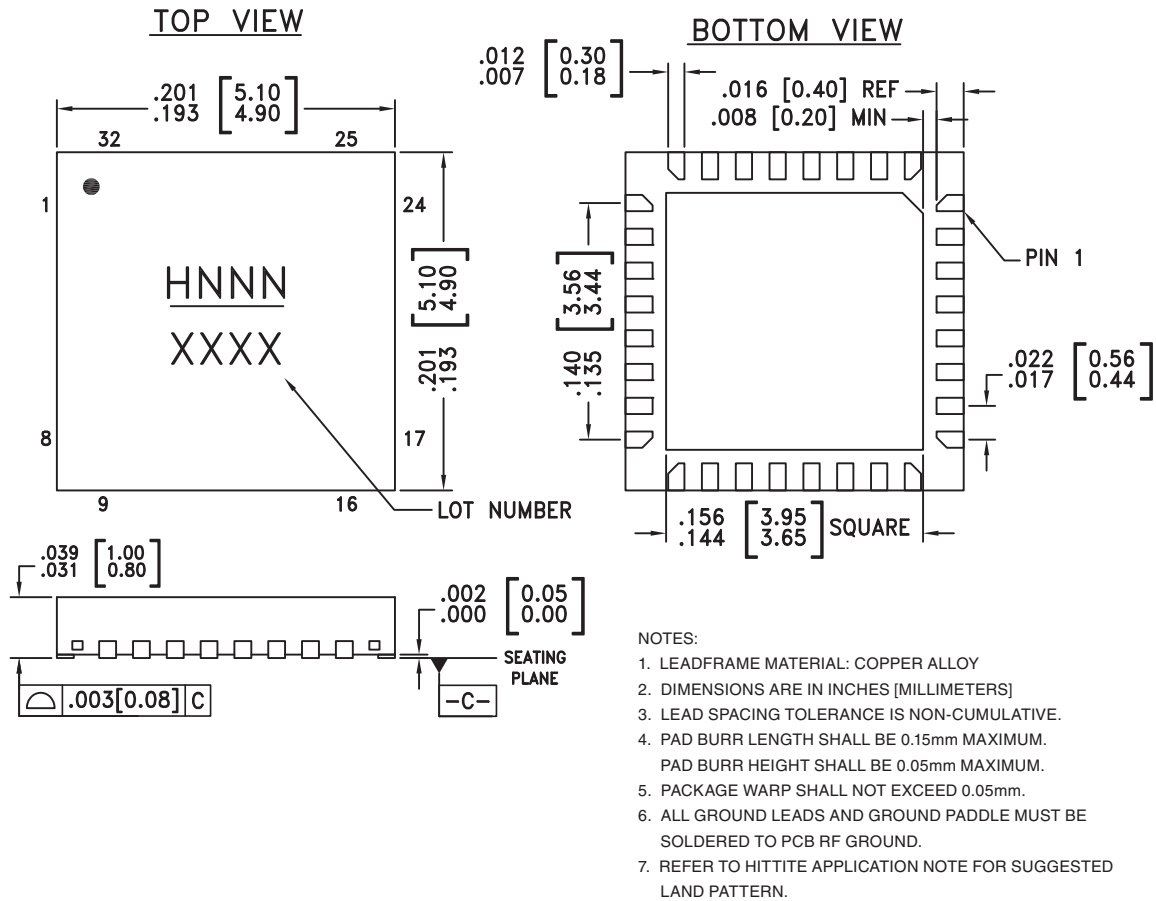
# HMC462LP5 / 462LP5E

## GaAs pHEMT MMIC

### LOW NOISE AMPLIFIER, 2 - 20 GHz

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#### Outline Drawing



#### Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC462LP5   | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H462<br>XXXX                   |
| HMC462LP5E  | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | H462<br>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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## GaAs pHEMT MMIC LOW NOISE AMPLIFIER, 2 - 20 GHz

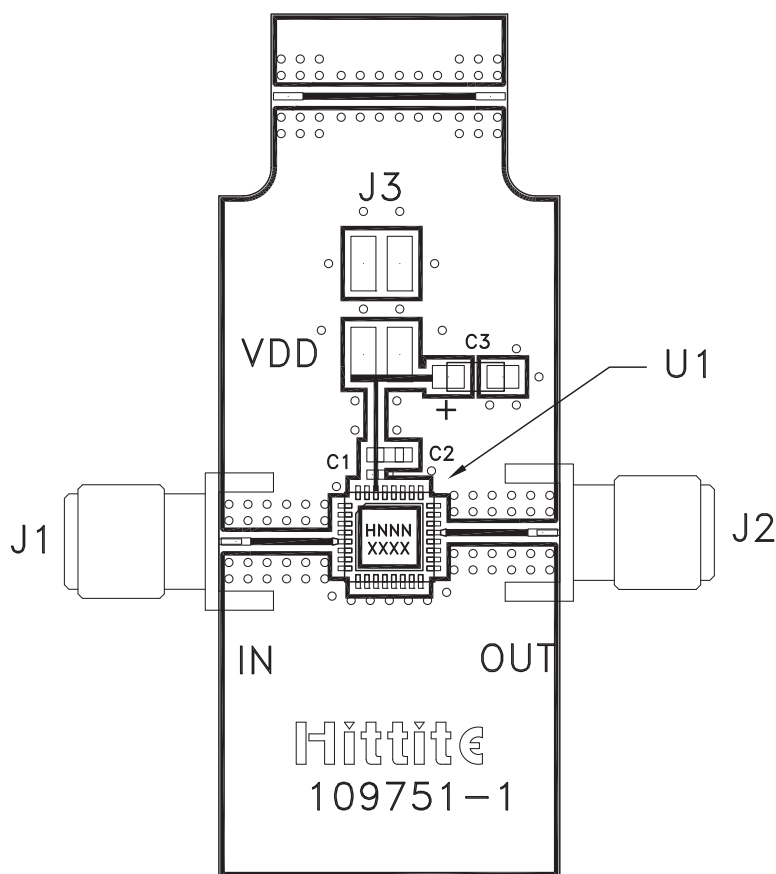
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AMPLIFIERS - LOW NOISE - SMT

### Pin Descriptions

| Pin Number                        | Function | Description                                                                                   | Interface Schematic |
|-----------------------------------|----------|-----------------------------------------------------------------------------------------------|---------------------|
| 1 - 4, 6 - 20,<br>22 - 29, 31, 32 | N/C      | No connection. These pins may be connected to RF ground.<br>Performance will not be affected. |                     |
| 5                                 | RFIN     | This pad is AC coupled<br>and matched to 50 Ohms.                                             | RFIN ○ —  —         |
| 21                                | RFOUT    | This pad is AC coupled<br>and matched to 50 Ohms.                                             | —  — ○ RFOUT        |
| 30                                | Vdd      | Power supply voltage for the amplifier.<br>External bypass capacitors are required.           |                     |
| Ground Paddle                     | GND      | Ground paddle must be connected to RF/DC ground.                                              |                     |

## Evaluation PCB



## List of Materials for Evaluation PCB 108338 <sup>[1]</sup>

| Item               | Description                  |
|--------------------|------------------------------|
| J1 - J2            | PCB Mount SMA Connector      |
| J3                 | 2 mm Molex Header            |
| C1                 | 100 pF Capacitor, 0402 Pkg.  |
| C2                 | 1000 pF Capacitor, 0603 Pkg. |
| C3                 | 4.7 µF Capacitor, Tantalum   |
| U1                 | HMC462LP5 / HMC462LP5E       |
| PCB <sup>[2]</sup> | 109751 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 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.



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