# HMC490LP5 / 490LP5E

v04.0213

## GaAs pHEMT MMIC LOW NOISE HIGH IP3 AMPLIFIER, 12 - 16 GHz

### Typical Applications

The HMC490LP5(E) is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- VSAT
- Military EW, ECM & C³I

### Features

Noise Figure: 2.5 dB

P1dB Output Power: +25 dBm

Gain: 23 dB

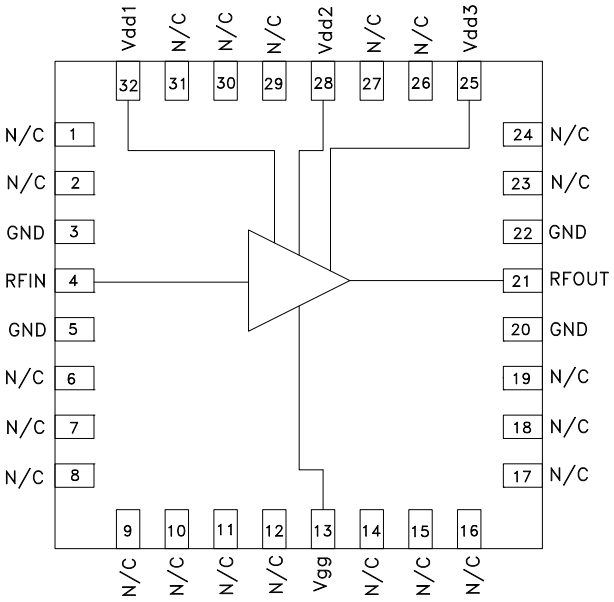
Output IP3: +34 dBm

+5V Supply

50 Ohm Matched Input/Output

32 Lead 5x5mm SMT Package: 25mm²

### Functional Diagram




### General Description

The HMC490LP5(E) is a high dynamic range GaAs pHEMT MMIC Low Noise Amplifier which operates between 12 and 16 GHz. The HMC490LP5(E) provides 23 dB of gain, 2.5 dB noise figure and an output IP3 of +34 dBm from a +5V supply voltage. This versatile amplifier combines excellent, stable +25 dBm P1dB output power with very low noise figure making it ideal for receive and transmit applications. The amplifier is packaged in a leadless 5x5 mm QFN surface mount package.

### Electrical Specifications, $T_A$ = +25° C, Vdd = 5V, Idd = 200 mA*

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Frequency Range | | 12 - 16 | | GHz |
| Gain | 20 | 23 | | dB |
| Gain Variation Over Temperature | | 0.03 | 0.04 | dB/ °C |
| Noise Figure | | 2.5 | 3.5 | dB |
| Input Return Loss | | 8 | | dB |
| Output Return Loss | | 8 | | dB |
| Output Power for 1 dB Compression (P1dB) | 22 | 25 | | dBm |
| Saturated Output Power (Psat) | | 27 | | dBm |
| Output Third Order Intercept (IP3) | | 34 | | dBm |
| Supply Current (Idd)(Vdd = 5V, Vgg = -0.8V Typ.) | | 200 | | mA |

** Adjust Vgg between -2 to 0V to achieve Idd = 200 mA typical.*



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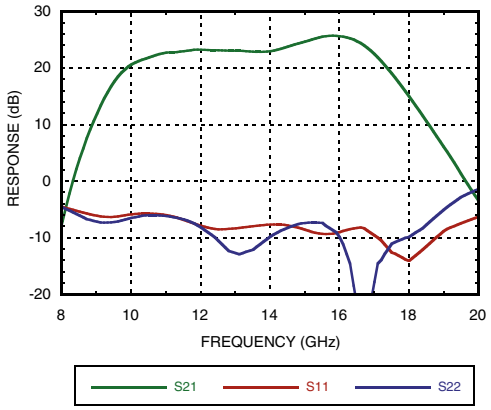
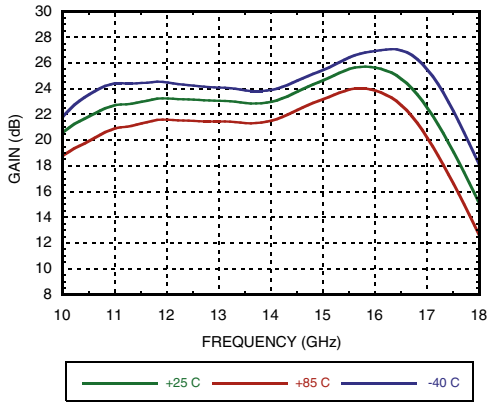
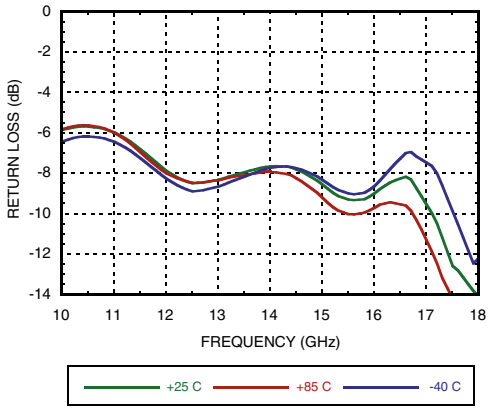
### Broadband Gain & Return Loss



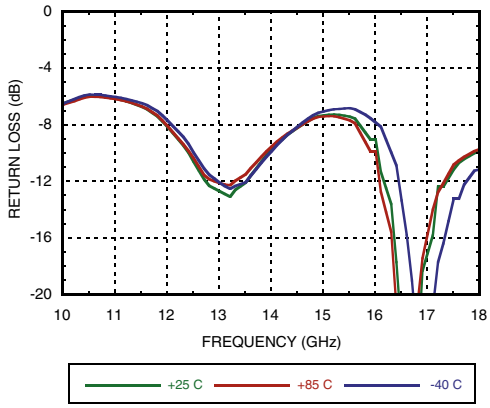

### Gain vs. Temperature



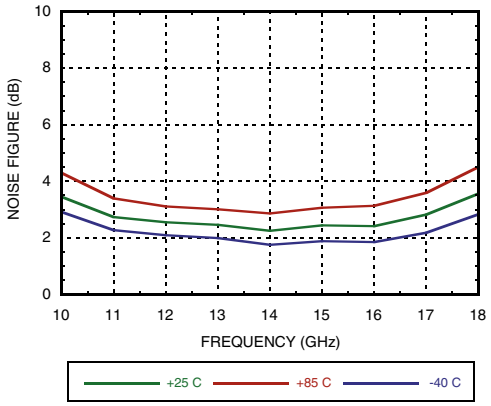

### Input Return Loss vs. Temperature



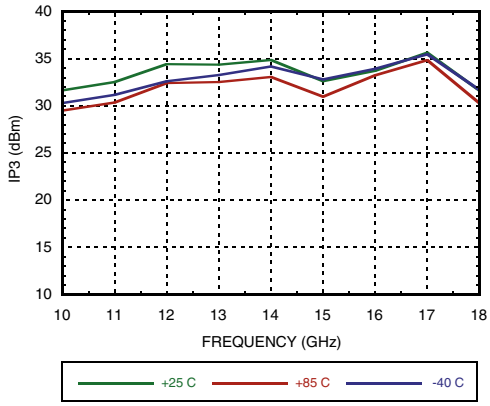

### Output Return Loss vs. Temperature




### Noise Figure vs. Temperature




### Output IP3 vs. Temperature





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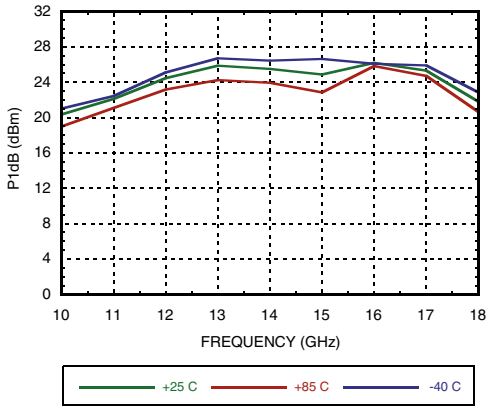
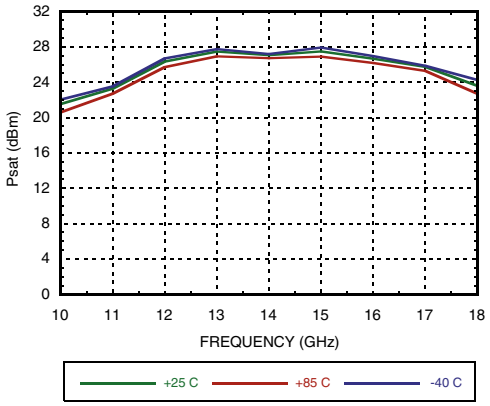
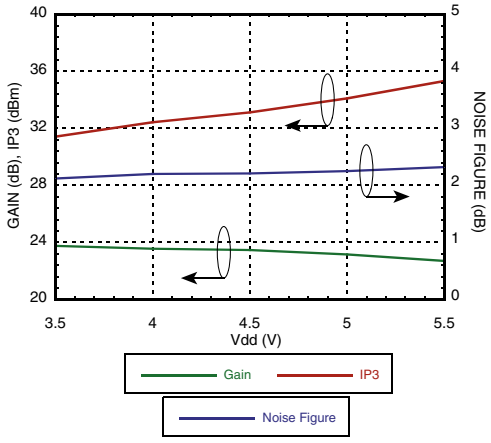
### P1dB vs. Temperature



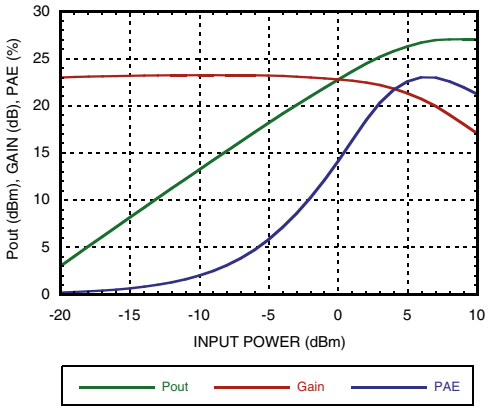

### Psat vs. Temperature



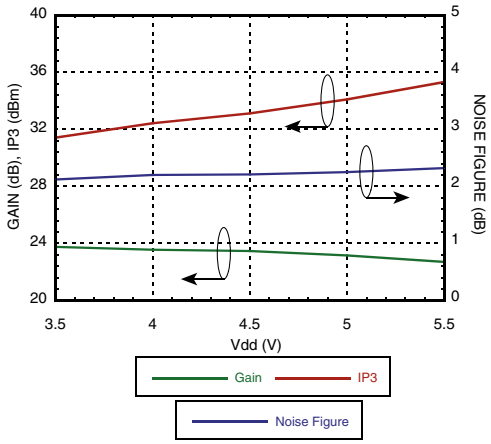

### Gain, Noise Figure & OIP3 vs. Supply Voltage @ 14 GHz, Idd= 200 mA



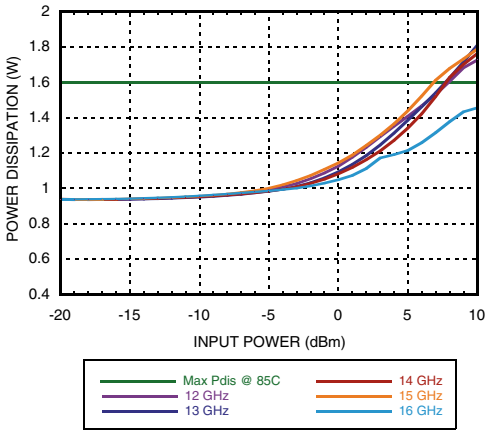

### Power Compression @ 14 GHz




### Gain, Noise Figure & IP3 vs. Supply Current @ 14 GHz, Vdd= 5V*




### Power Dissipation




** Idd is controlled by varying Vgg*



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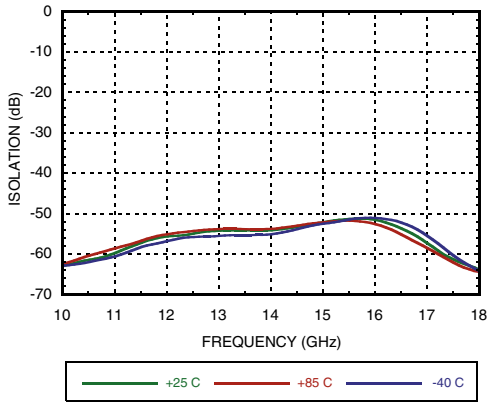
### Reverse Isolation vs. Temperature




### Absolute Maximum Ratings

| | |
|---|---|
| Drain Bias Voltage (Vdd1, Vdd2, Vdd3) | +5.5V |
| Gate Bias Voltage (Vgg) | -4 to 0V |
| RF Input Power (RFIN)(Vdd = +5V) | +10 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T = 85 °C) (derate 17.9 mW/°C above 85 °C) | 1.6 W |
| Thermal Resistance (channel to ground paddle) | 56 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

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### Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| +3.0 | 140 |
| +3.5 | 154 |
| +4.0 | 168 |
| +4.5 | 188 |
| +5.0 | 200 |
| +5.5 | 208 |

*Note: Amplifier will operate over full voltage ranges shown above.*



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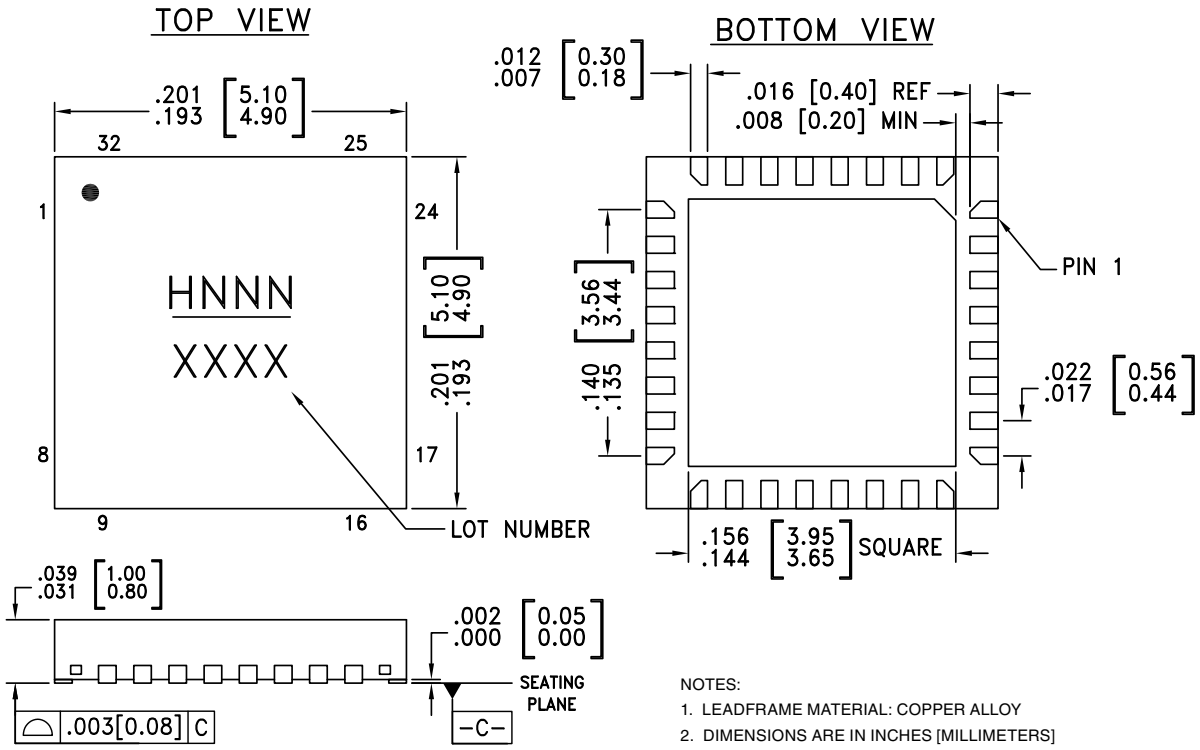
## GaAs pHEMT MMIC LOW NOISE HIGH IP3 AMPLIFIER, 12 - 16 GHz

### Outline Drawing




NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

### Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [3] |
|---|---|---|---|---|
| HMC490LP5 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 [1] | H490<br>XXXX |
| HMC490LP5E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H490<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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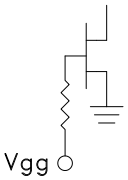
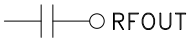
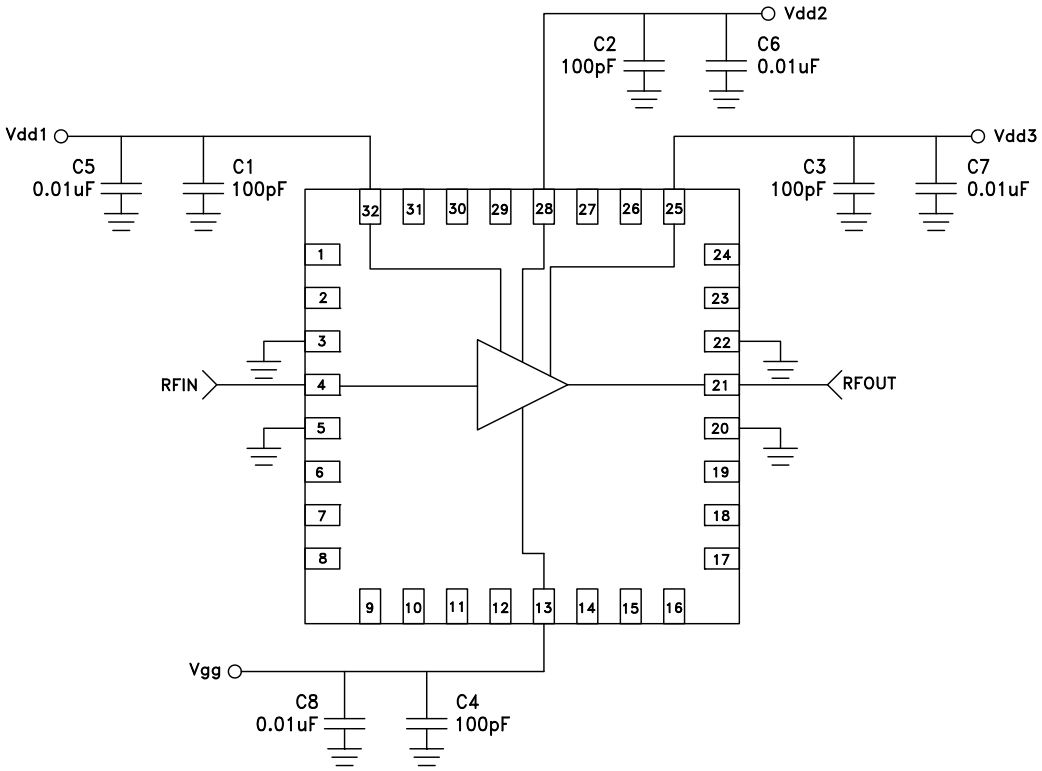
## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 2, 6 - 12, 14 - 19, 23, 24, 26, 27, 29 - 31 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 3, 5, 20, 22 | GND | Package bottom must also be connected to RF/DC ground. |   |
| 4 | RFIN | This pad is AC coupled and matched to 50 Ohms. |   |
| 13 | Vgg | Gate control for amplifier. Adjust to achieve Idd of 200 mA. Please follow “MMIC Amplifier Biasing Procedure” Application Note. External bypass capacitors of 100 pF and 0.01 µF are required. |   |
| 21 | RFOUT | This pad is AC coupled and matched to 50 Ohms. |   |
| 25, 28, 32 | Vdd3, 2, 1 | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF and 0.01 µF are required. | |

## Application Circuit



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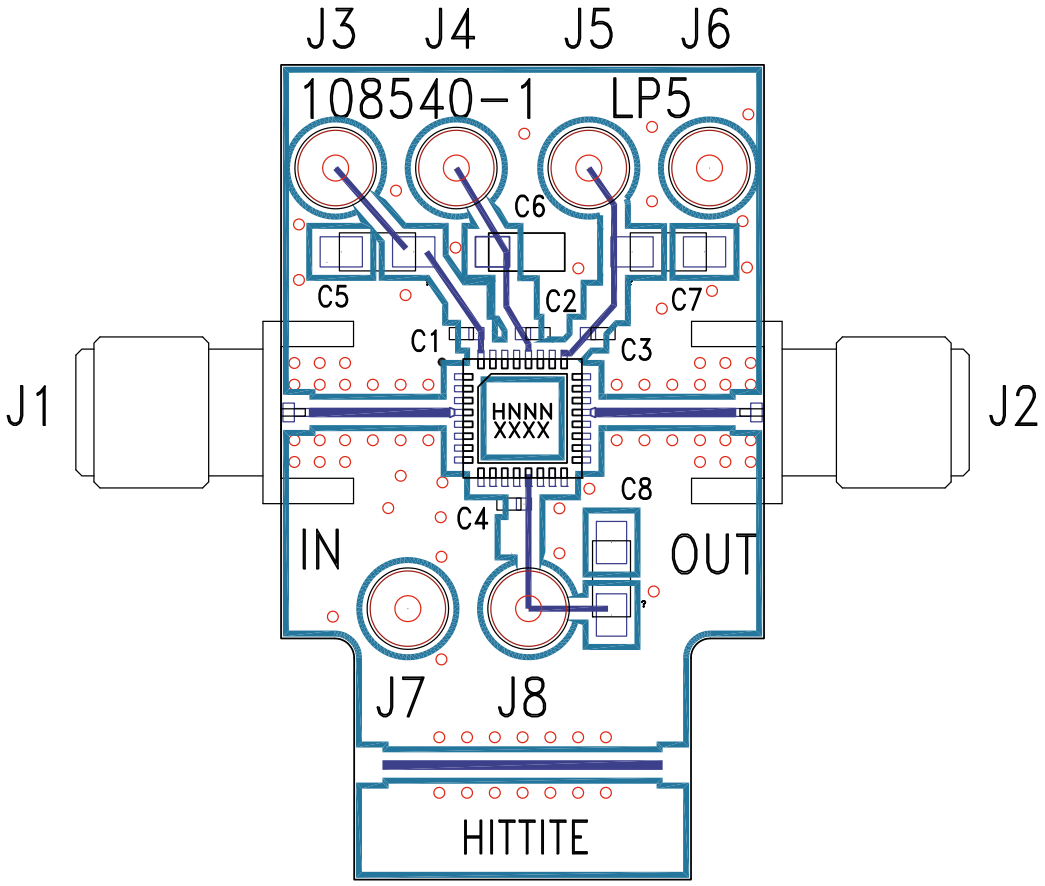
### Evaluation PCB




### List of Materials for Evaluation PCB 108402 [1]

| Item | Description |
|---|---|
| J1 - J2 | PCB Mount SMA Connector |
| J3 - J8 | DC Pin |
| C1 - C4 | 1000 pF Capacitor, 0402 Pkg. |
| C5 - C8 | 4.7 µF Capacitor, Tantalum |
| U1 | HMC490LP5 / HMC490LP5E |
| PCB [2] | 108540 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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**Notes:**





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