# HMC606LC5

v02.1207

## GaAs InGaP HBT MMIC ULTRA LOW PHASE NOISE, DISTRIBUTED AMPLIFIER, 2 - 18 GHz

### Typical Applications

The HMC606LC5 is ideal for:

- Radar, EW & ECM
- Microwave Radio
- Test Instrumentation
- Military & Space
- Fiber Optic Systems

### Features

Ultra Low Phase Noise: -160 dBc/Hz @ 10 kHz

P1dB Output Power: +15 dBm

Gain: 13.5 dB

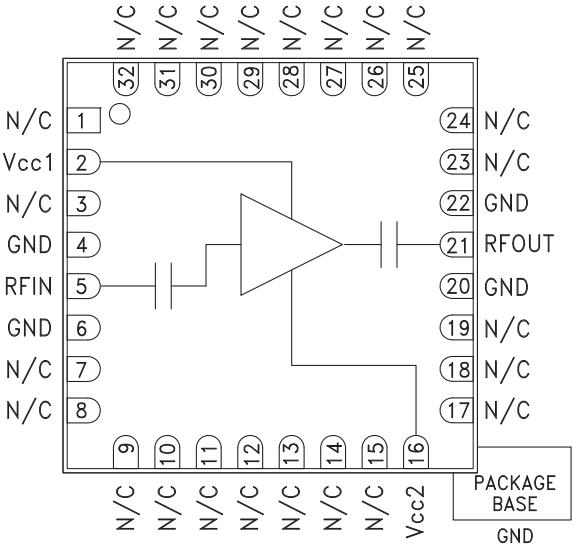
Output IP3: +27 dBm

Supply Voltage: +5V @ 64 mA

50 Ohm Matched Input/Output

32 Lead Ceramic 5x5mm SMT Package: $25mm^2$

### Functional Diagram



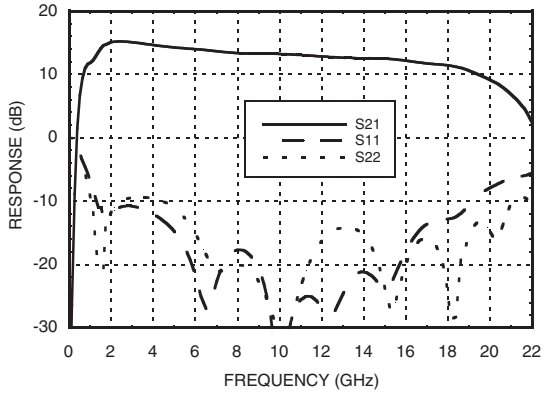

### General Description

The HMC606LC5 is a GaAs InGaP HBT MMIC Distributed Amplifier housed in a leadless 5x5 mm surface mount package which operates between 2 and 18 GHz. With an input signal of 12 GHz, the amplifier provides ultra low phase noise performance of -160 dBc/Hz at 10 kHz offset, representing a significant improvement over FET-based distributed amplifiers. The HMC606LC5 provides 13.5 dB of small signal gain, +27 dBm output IP3 and +15 dBm of output power at 1 dB gain compression while requiring 64 mA from a +5V supply. The HMC606LC5 amplifier I/Os are internally matched to 50 Ohms and are internally DC blocked.

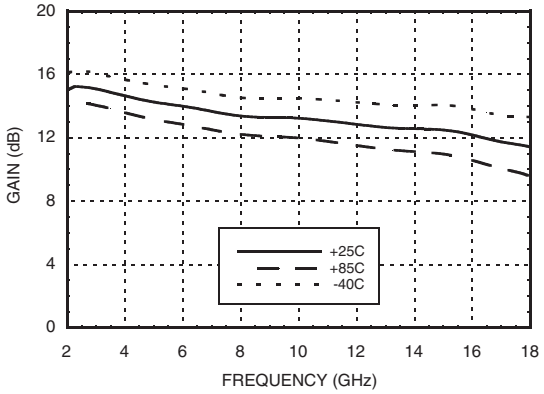
### Electrical Specifications, $T_A$ = +25° C, Vcc1= Vcc2= 5V

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 2 - 12 | | | 2 - 18 | | GHz |
| Gain | 10.5 | 13.5 | | 9.5 | 12.5 | | dB |
| Gain Flatness | | ±1.0 | | | ±1.0 | | dB |
| Gain Variation Over Temperature | | 0.021 | | | 0.024 | | dB/ °C |
| Noise Figure | | 5 | | | 7 | | dB |
| Input Return Loss | | 20 | | | 18 | | dB |
| Output Return Loss | | 15 | | | 15 | | dB |
| Output Power for 1 dB Compression (P1dB) | 12 | 15 | | 10 | 13 | | dBm |
| Saturated Output Power (Psat) | | 17 | | | 15 | | dBm |
| Output Third Order Intercept (IP3) | | 27 | | | 22 | | dBm |
| Phase Noise @ 100 Hz | | -140 | | | -140 | | dBc/Hz |
| Phase Noise @ 1 kHz | | -150 | | | -150 | | dBc/Hz |
| Phase Noise @ 10 kHz | | -160 | | | -160 | | dBc/Hz |
| Phase Noise @ 1 MHz | | -170 | | | -170 | | dBc/Hz |
| Supply Current | | 64 | 95 | | 64 | 95 | mA |

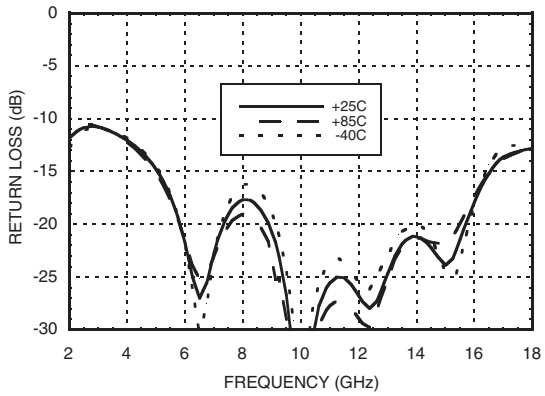
### Gain & Return Loss



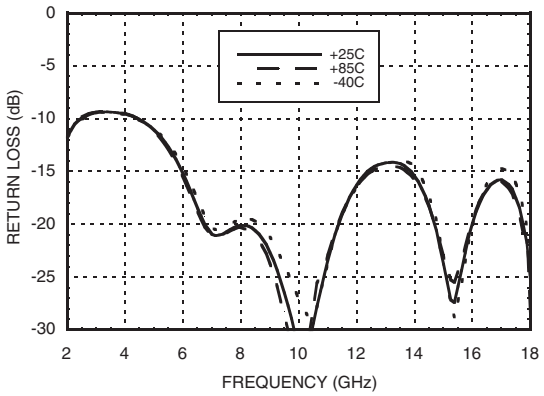

### Gain vs. Temperature



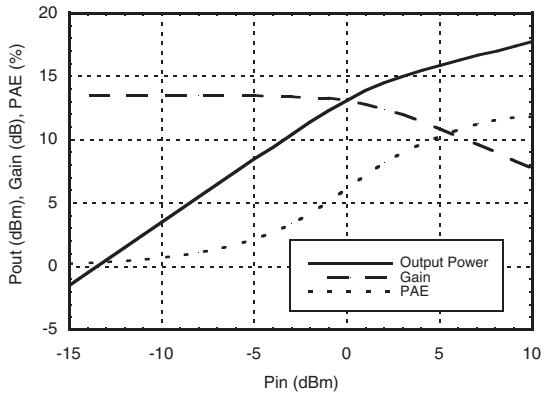

### Input Return Loss vs. Temperature



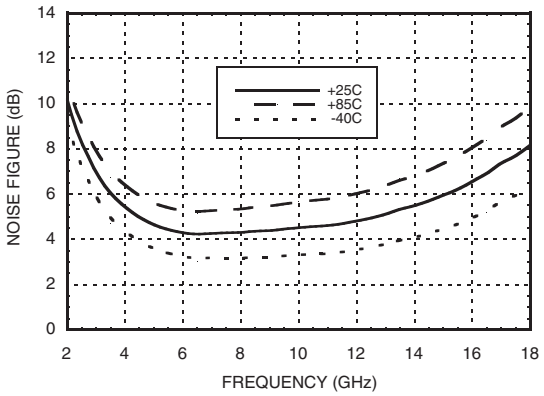

### Output Return Loss vs. Temperature



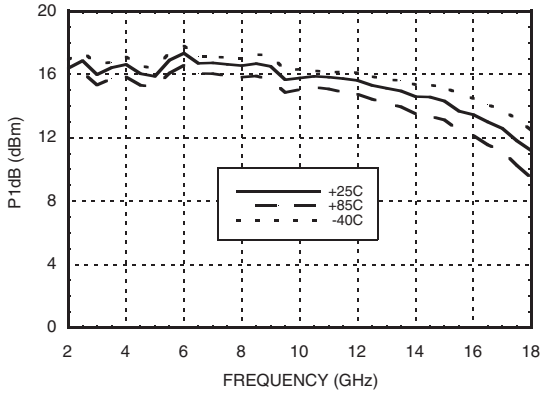

### Power Compression



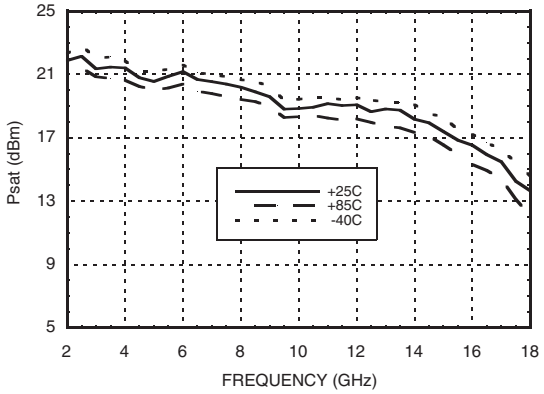

### Noise Figure vs. Temperature



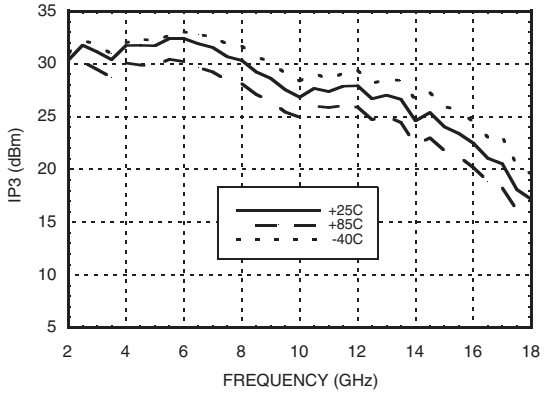
### P1dB vs. Temperature



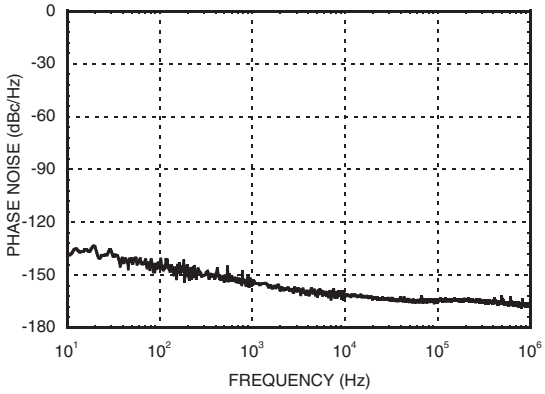

### Psat vs. Temperature



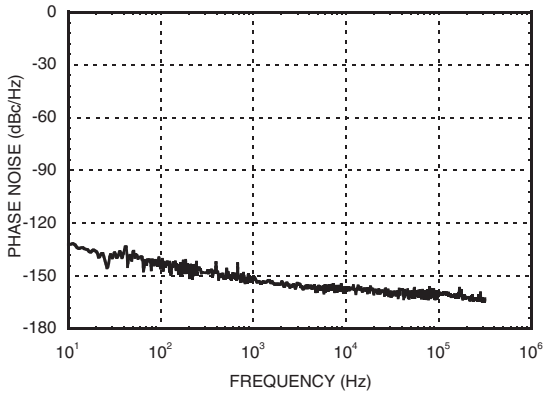

### Output IP3 vs. Temperature



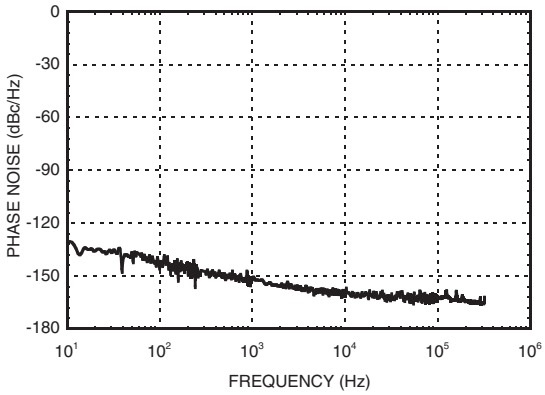

### Phase Noise @ 12 GHz




### Phase Noise at P1dB @ 12 GHz




### Phase Noise at Psat @ 12 GHz



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## Absolute Maximum Ratings

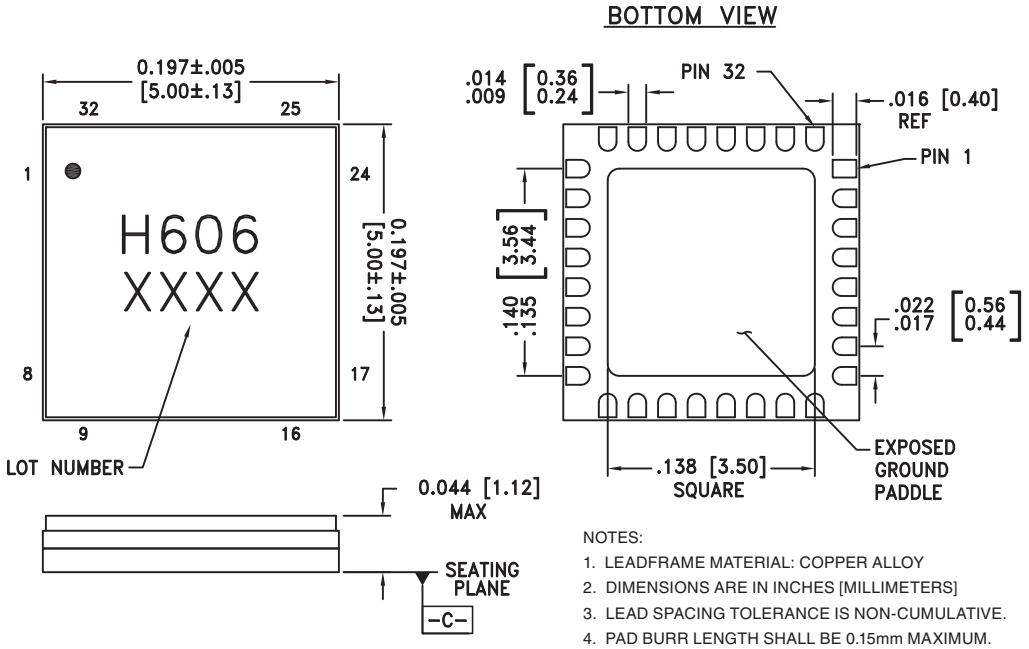
| | |
|---|---|
| Vcc1= Vcc2 | 7V |
| RF Input Power (RFIN) | +15 dBm |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T = 85 °C) (derate 6 mW/°C above 85 °C) | 0.55 W |
| Thermal Resistance (channel to ground paddle) | 169.5 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

## Typical Supply Current vs. Vcc1, Vcc2

| Vcc1, Vcc2 (V) | Icc1 + Icc2 (mA) |
|---|---|
| +4.5 | 53 |
| +5.0 | 64 |
| +5.5 | 71 |

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

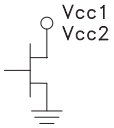
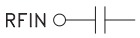
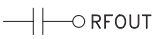
## Outline Drawing



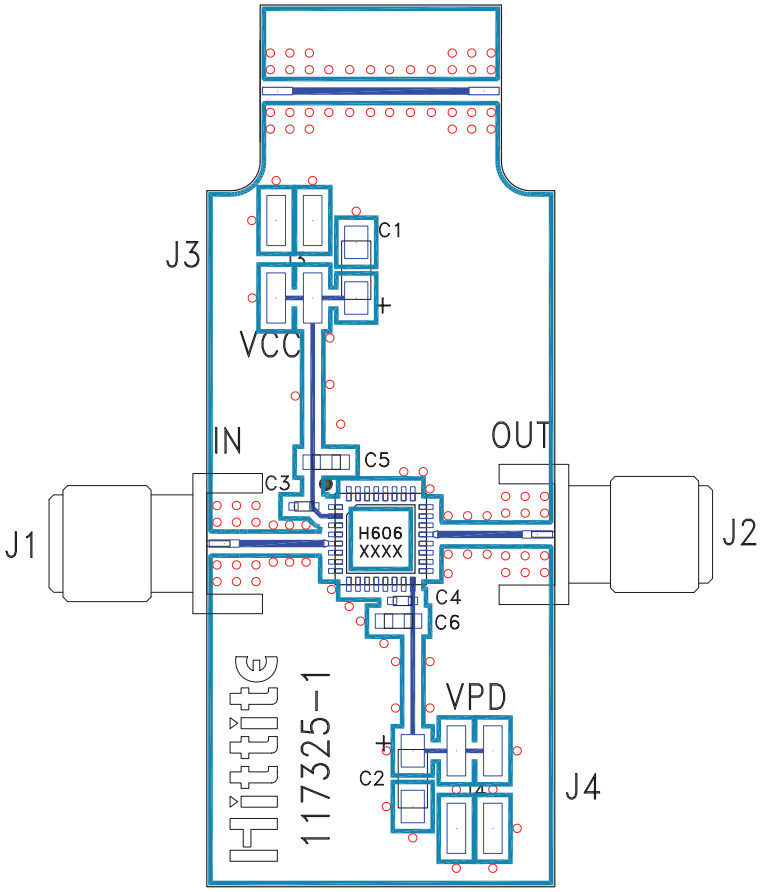

NOTES:

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.

## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 3, 7 - 15, 17 - 19, 23 - 32 | N/C | No connection. These pins may be connected to RF ground. Performance will not be affected. | |
| 2, 16 | Vcc1, Vcc2 | Power supply voltage for the amplifier. |   |
| 4, 6, 20, 22, Ground Paddle | GND | Ground paddle must be connected to RF/DC ground. |   |
| 5 | RFIN | This pin is AC coupled and matched to 50 Ohms. |   |
| 21 | RFOUT | This pin is AC coupled and matched to 50 Ohms. |   |

## Evaluation PCB




## List of Materials for Evaluation PCB 117156 [1]

| Item | Description |
|---|---|
| J1 - J2 | SRI K Connector |
| J3 - J4 | 2mm Molex Header |
| C1, C2 | 4.7 µF Capacitor, Tantalum |
| C3, C4 | 100 pF Capacitor, 0402 Pkg. |
| C5, C6 | 1000 pF Capacitor, 0603 Pkg. |
| U1 | HMC606LC5 |
| PCB [2] | 117325 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] 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 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.