



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

### Typical Applications

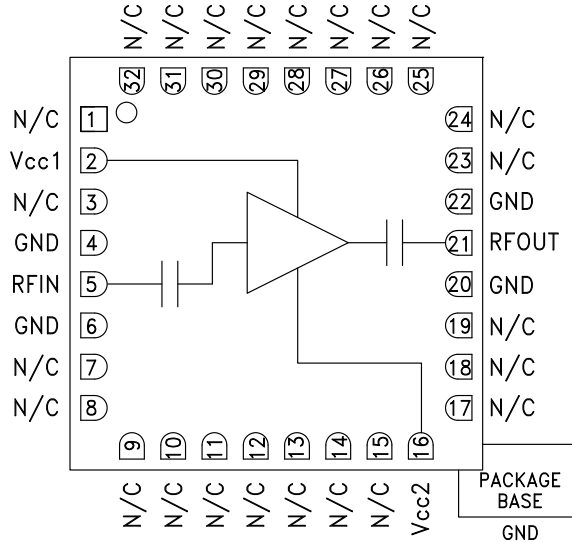
The HMC606LC5 is ideal for:

- 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<sup>2</sup>

### 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, $T_A = +25^\circ\text{C}$ , $V_{cc1} = V_{cc2} = 5\text{V}$

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

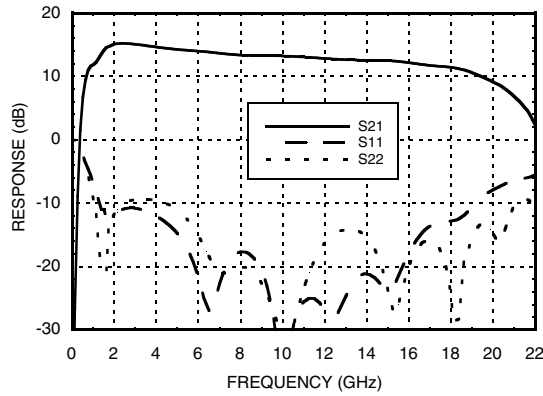
For price, delivery and to place orders: Hittite Microwave Corporation, 2 Elizabeth Drive, Chelmsford, MA 01824

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

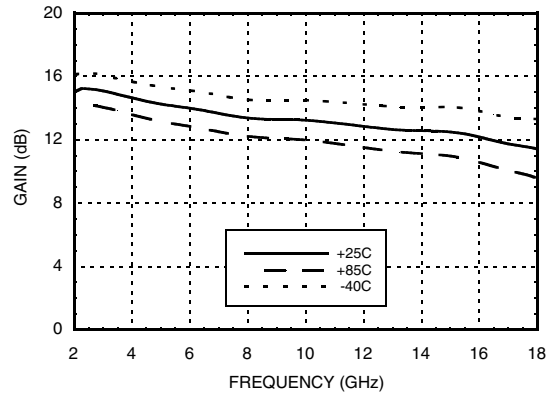
Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)

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

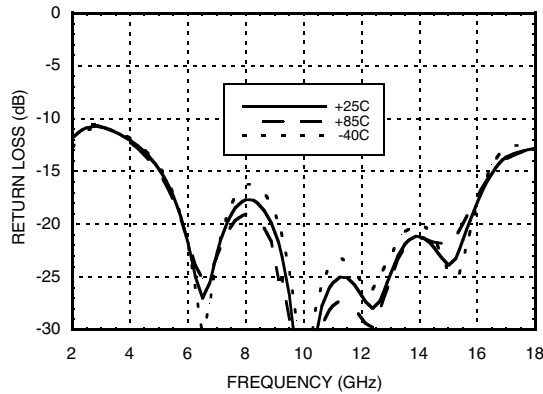
**Gain & Return Loss**



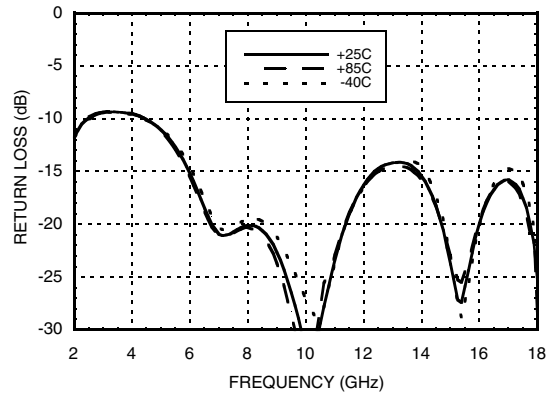
**Gain vs. Temperature**



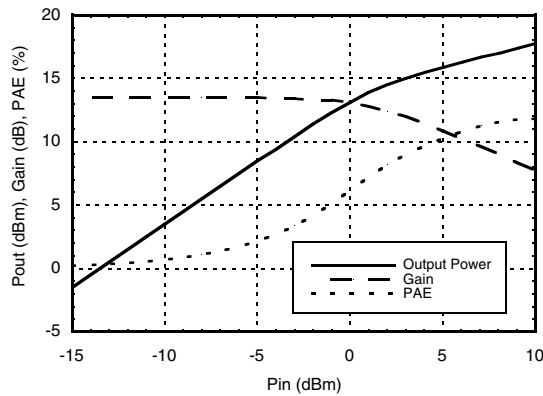
**Input Return Loss vs. Temperature**



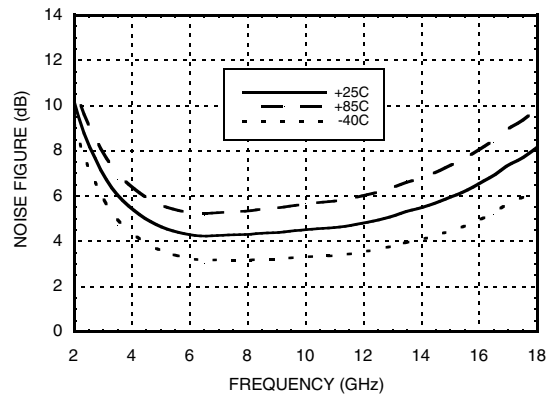
**Output Return Loss vs. Temperature**



**Power Compression**



**Noise Figure vs. Temperature**

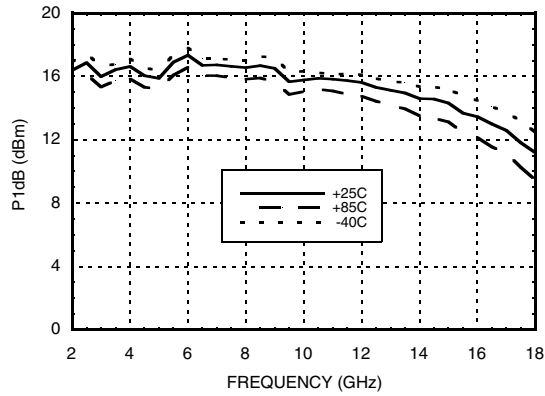




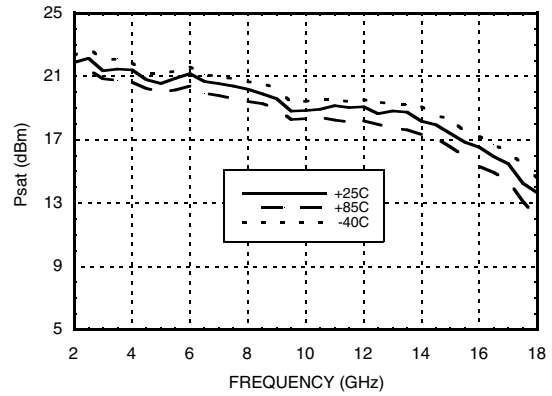
## GaAs InGaP HBT MMIC ULTRA LOW PHASE NOISE, DISTRIBUTED AMPLIFIER, 2 - 18 GHz

LOW NOISE AMPLIFIERS - SMT

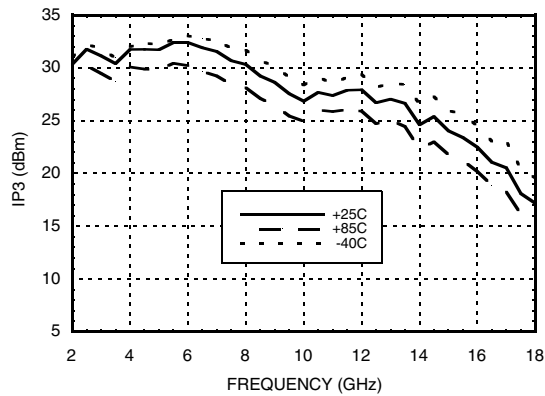
**P1dB vs. Temperature**



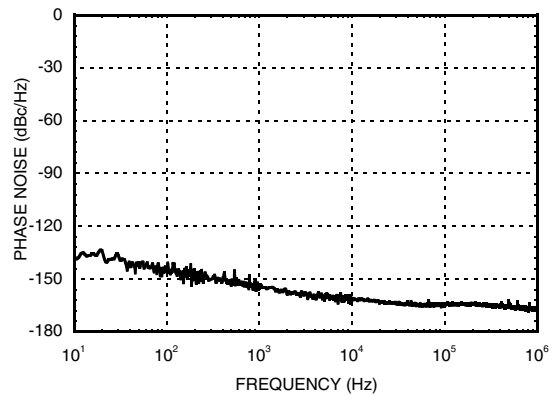
**Psat vs. Temperature**



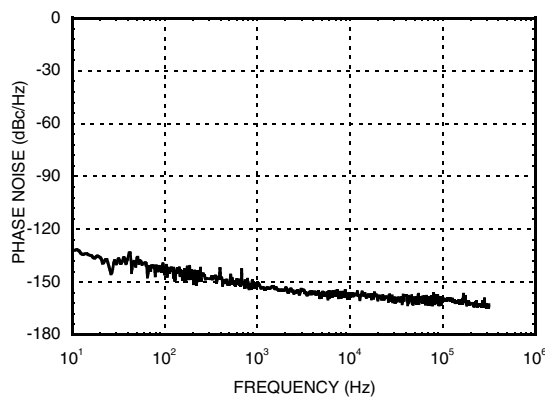
**Output IP3 vs. Temperature**



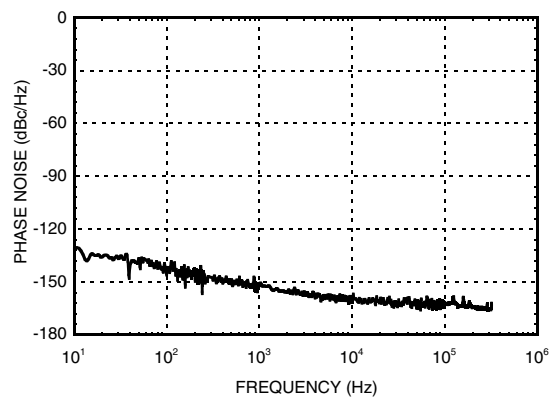
**Phase Noise @ 12 GHz**



**Phase Noise at P1dB @ 12 GHz**



**Phase Noise at Psat @ 12 GHz**





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

### Absolute Maximum Ratings

Vcc1= Vcc2	7V
RF Input Power (RFIN)	+15 dBm
Channel Temperature	175 °C
Continuous P <sub>diss</sub> (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
ESD Sensitivity (HBM)	Class 0, Pass 100V

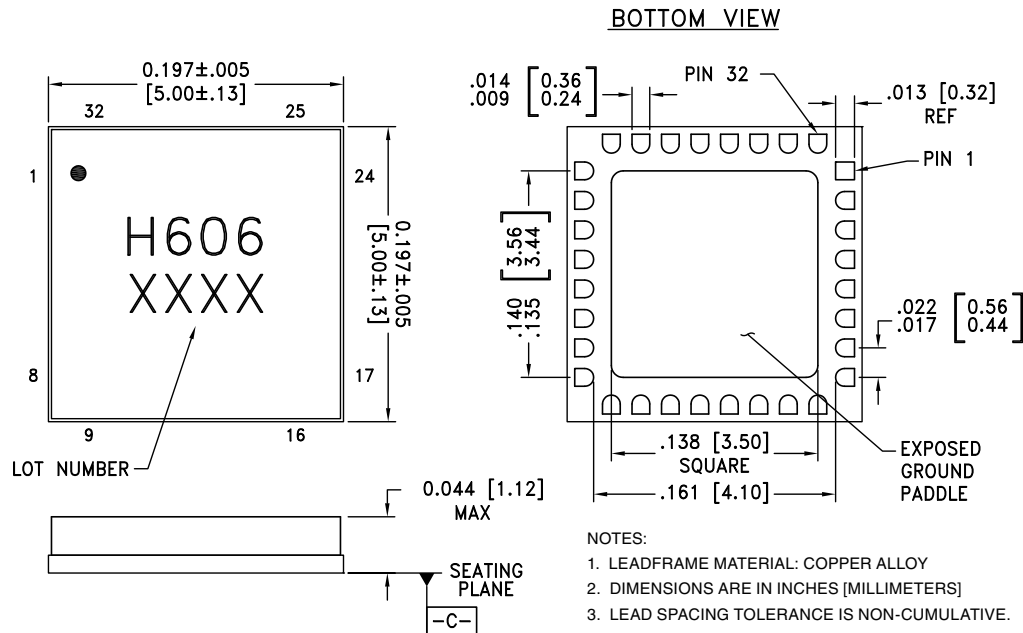
### Typical Supply Current vs. Vcc1, Vcc2

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



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

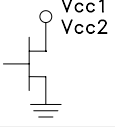

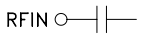
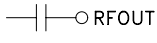
### Outline Drawing





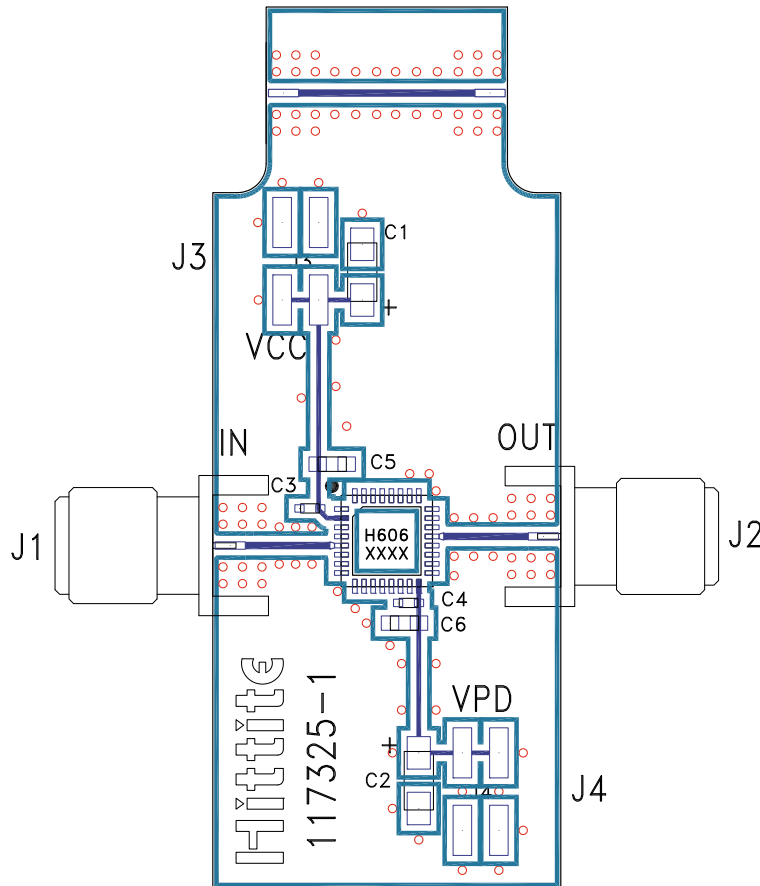
**GaAs InGaP HBT MMIC ULTRA LOW  
PHASE NOISE, DISTRIBUTED AMPLIFIER, 2 - 18 GHz**

**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.	



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

**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 $\mu$ F 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 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.