HMC606LC5

v05.0514

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

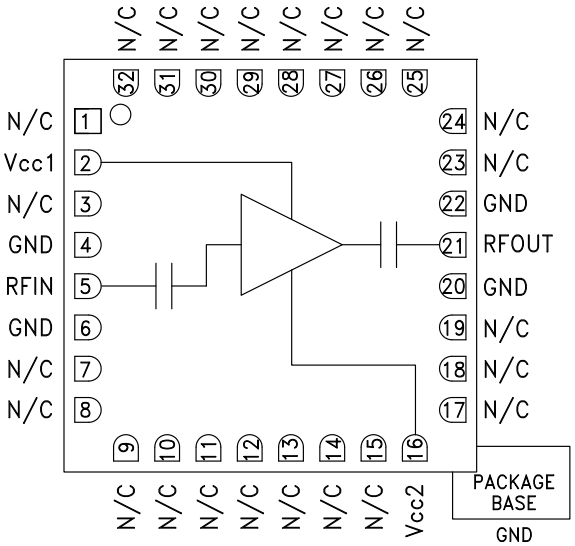
Output IP3: +27 dBm

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

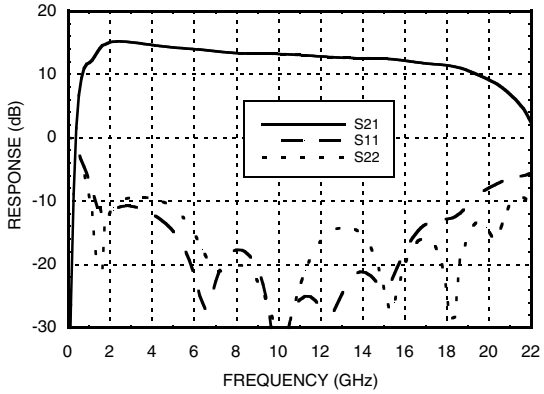
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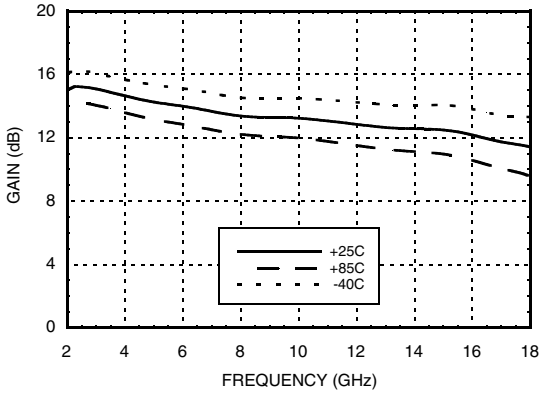
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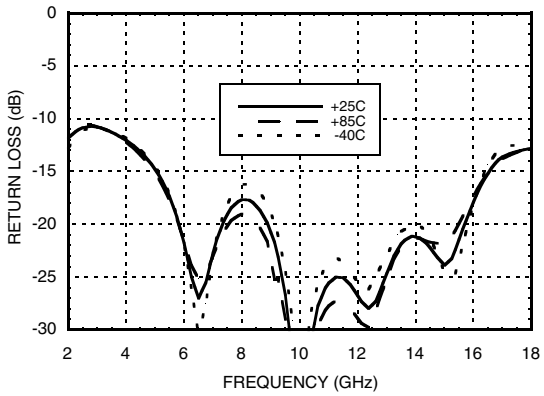
Gain & Return Loss



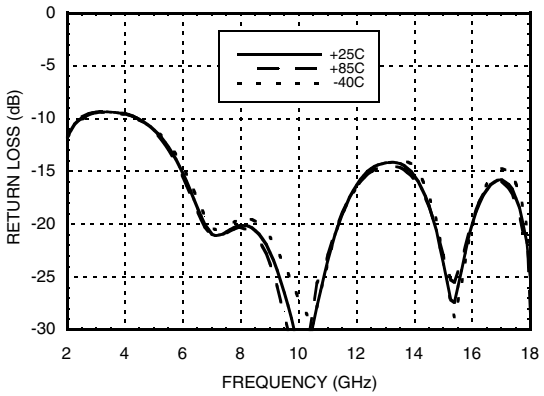
Gain vs. Temperature



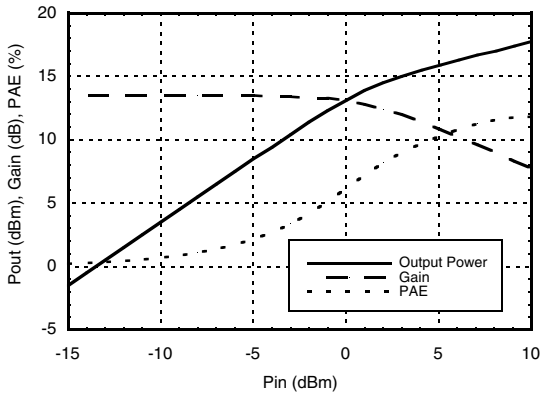
Input Return Loss vs. Temperature



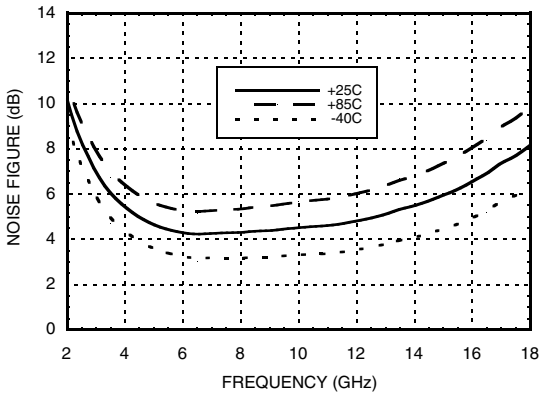
Output Return Loss vs. Temperature



Power Compression



Noise Figure vs. Temperature



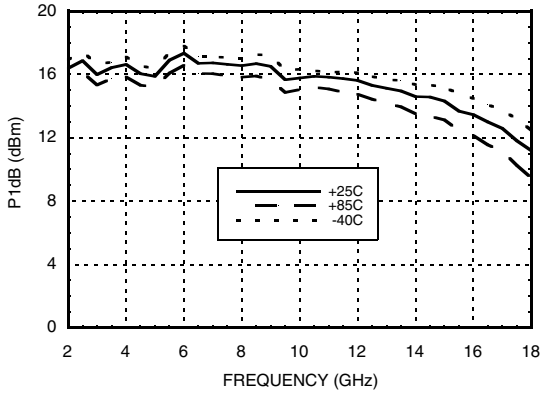
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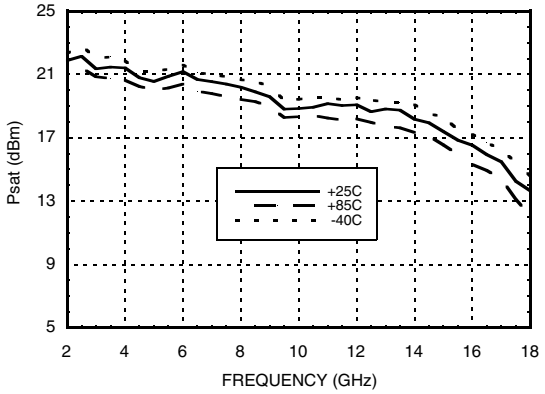
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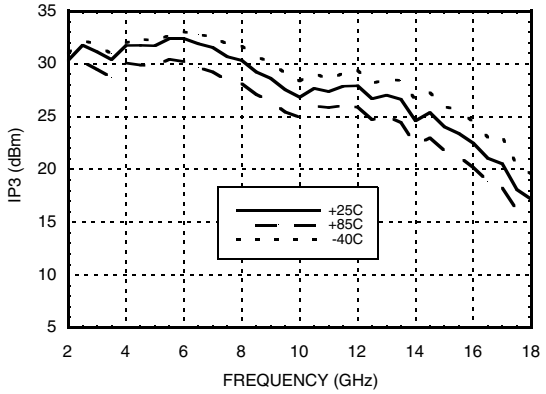
P1dB vs. Temperature



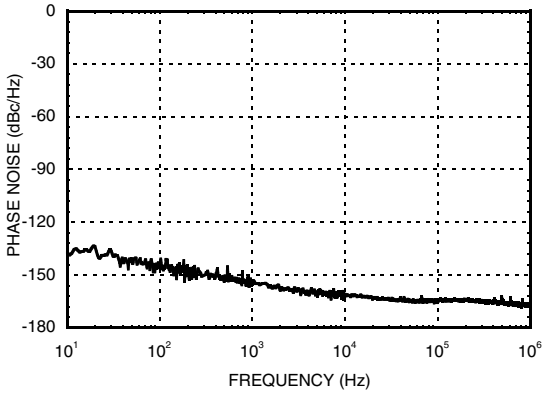
Psat vs. Temperature



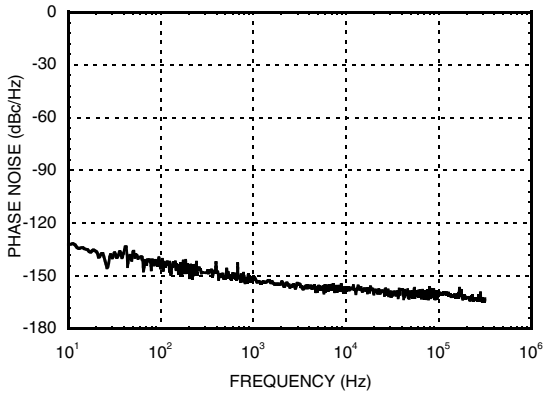
Output IP3 vs. Temperature



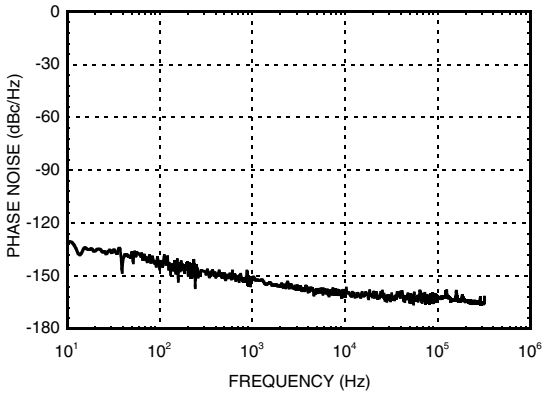
Phase Noise @ 12 GHz



Phase Noise at P1dB @ 12 GHz



Phase Noise at Psat @ 12 GHz



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Absolute Maximum Ratings

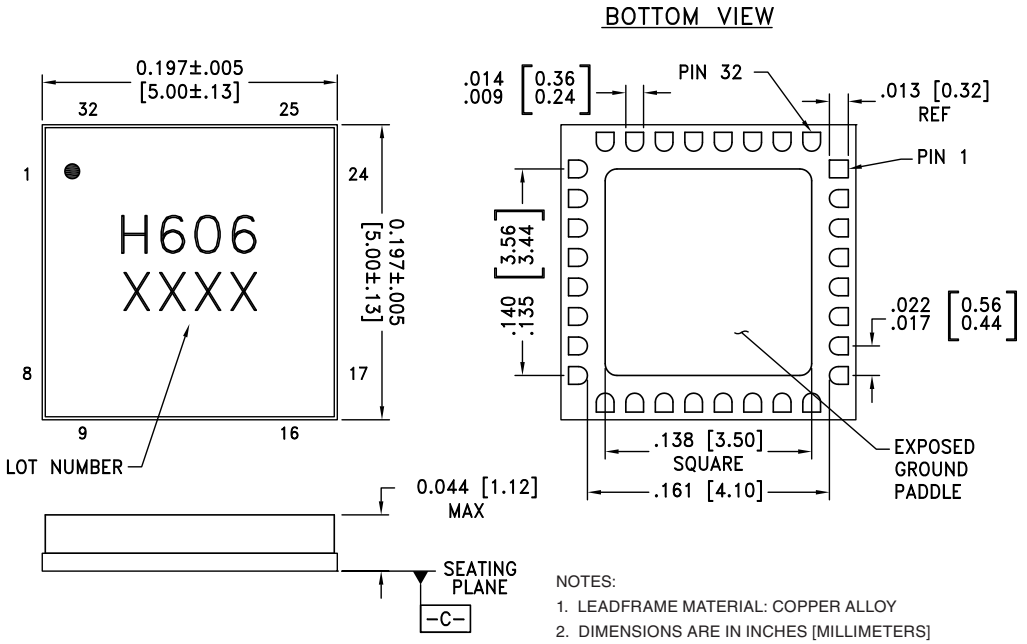
Vcc1= Vcc2	7V
RF Input Power (RFIN)	+15 dBm
Channel Temperature	175 °C
Continuous Pdiss (T = 85 °C) (derate 6 mW/°C above 85 °C)	0.55 W
Thermal Resistance (channel to ground paddle)	169.5 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 0, Pass 100V

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



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 [2]
HMC606LC5	Alumina, White	Gold over Nickel	MSL3 [1]	H606 XXXX

[1] Max peak reflow temperature of 260 °C
[2] 4-Digit lot number XXXX

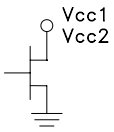
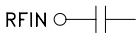
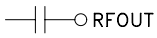
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Pin Descriptions

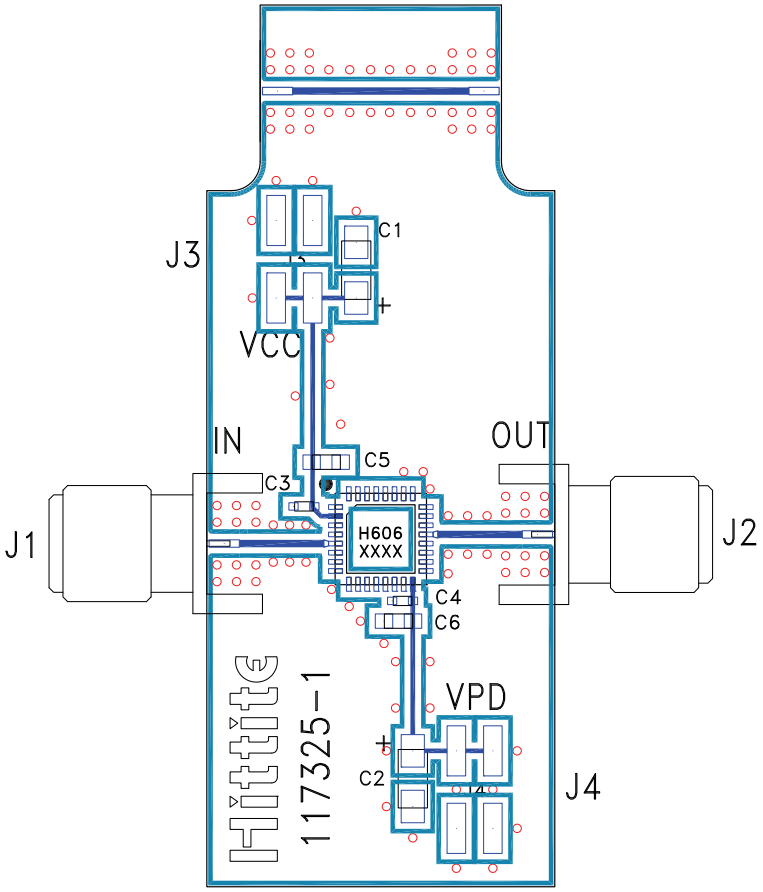
Pin Number	Function	Description	Interface Schematic
1, 3, 7 - 15, 17 - 19, 23 - 32	N/C	No connection. These pins may be connected to RF ground. Performance will not be affected.	
2, 16	Vcc1, Vcc2	Power supply voltage for the amplifier.	
4, 6, 20, 22 Ground Paddle	GND	Ground paddle must be connected to 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.	

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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 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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