HMC369LP3

SMT GaAs HBT MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 9.9 - 12.7 GHz OUTPUT

Typical Applications

Active Multiplier for X Band Applications:

- OC-192 Clock Recovery
- Microwave Radio & VSAT
- Military Radios, Radar & ECM
- Test Instrumentation

Features

Output Power: +4 dBm

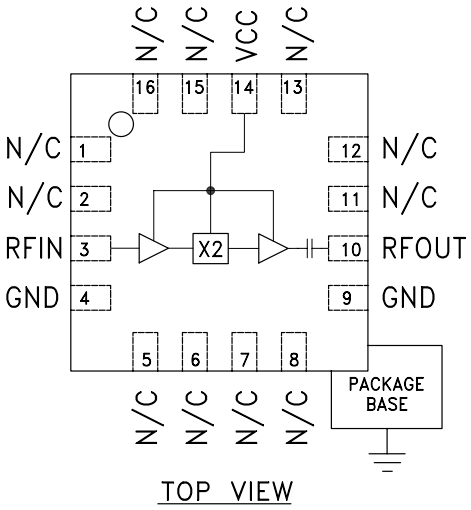
Sub-Harmonic Suppression: 30 dBc

SSB Phase Noise: -142 dBc/Hz

Single Supply: 5V@ 46 mA

9 mm^2 Leadless SMT Package

Functional Diagram



TOP VIEW

General Description

The HMC369LP3 is an active miniature x2 frequency multiplier utilizing InGaP GaAs HBT technology in a 3 mm x 3 mm leadless QFN surface mount package. Power output is +4 dBm typical from a single +5.0V supply and varies little vs. input power, temperature and supply voltage. Suppression of undesired fundamental and sub-harmonics is 30 dBc typical with respect to output signal level. The low additive SSB phase noise of -142 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance. The HMC369LP3 is ideal for use in LO multiplier chains allowing reduced parts count versus traditional approaches. The HMC369LP3 is also useful for OC-192 clock recovery. The application of 10 GBPS data to the input generates a -7 dBm clock tone at the output with spurious signals suppressed by 25 dB.

Electrical Specifications, T_A = +25° C, Vcc= 5.0V

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, Input		4.95 - 5.3			5.3 - 6.35		GHz
Frequency Range, Output		9.9 - 10.6			10.6 - 12.7		GHz
Input Power Range	-5		+5	-5		+5	dBm
Output Power	-1	3		0	4		dBm
Sub-Harmonic Suppression		30			30		dBc
Input Return Loss		17			16		dB
Output Return Loss		5.5			6		dB
SSB Phase Noise (100 kHz Offset) Pin= 0 dBm		-142			-142		dBc/Hz
Supply Current (Icc)		46			46		mA

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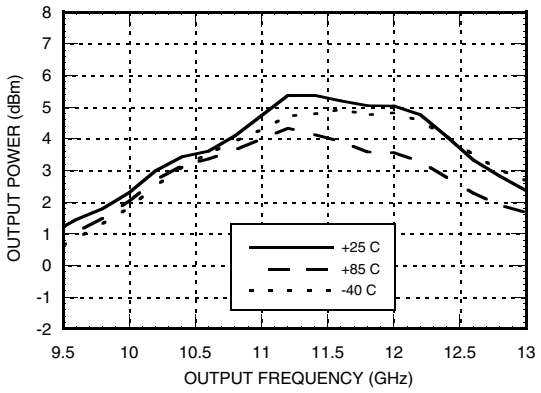
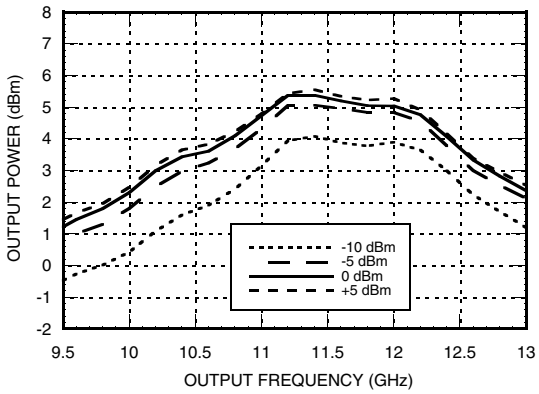
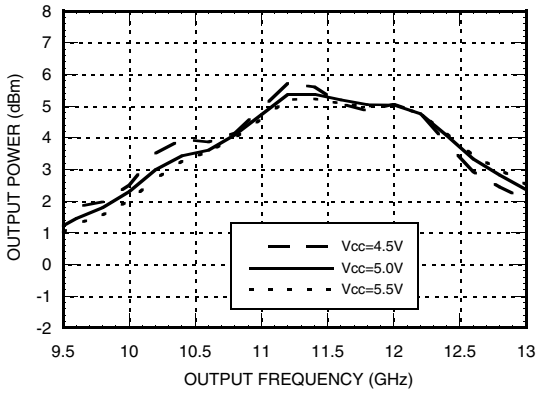
Output Power vs. Temperature @ 0 dBm Drive Level



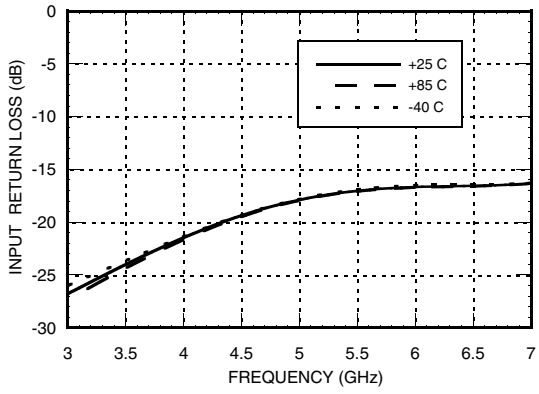
Output Power vs. Drive Level



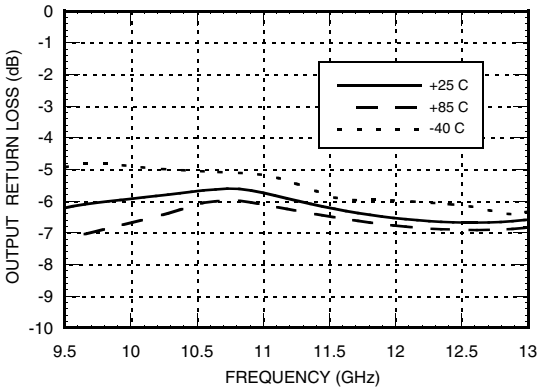
Output Power vs. Supply Voltage @ 0 dBm Drive Level



Input Return Loss vs. Temperature



Output Return Loss vs. Temperature



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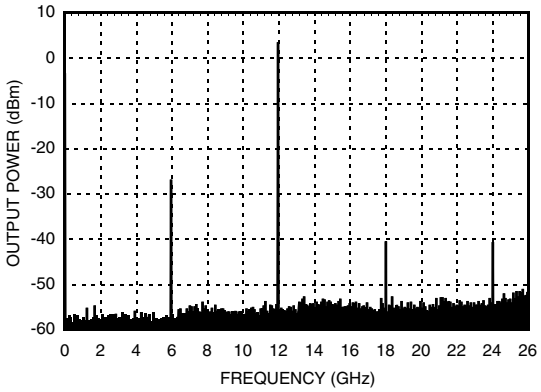
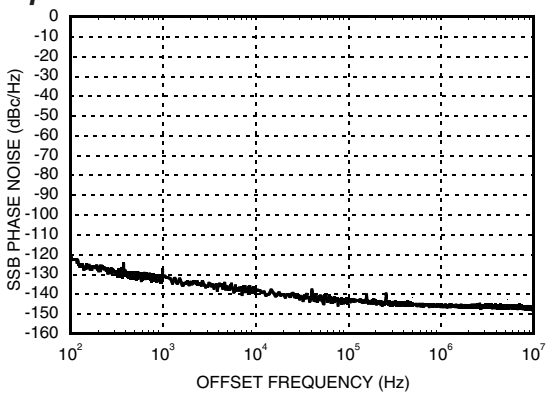
Output Spectrum



SSB Phase Noise Performance, Fout= 10.66 GHz, Input Power= 0 dBm



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Absolute Maximum Ratings

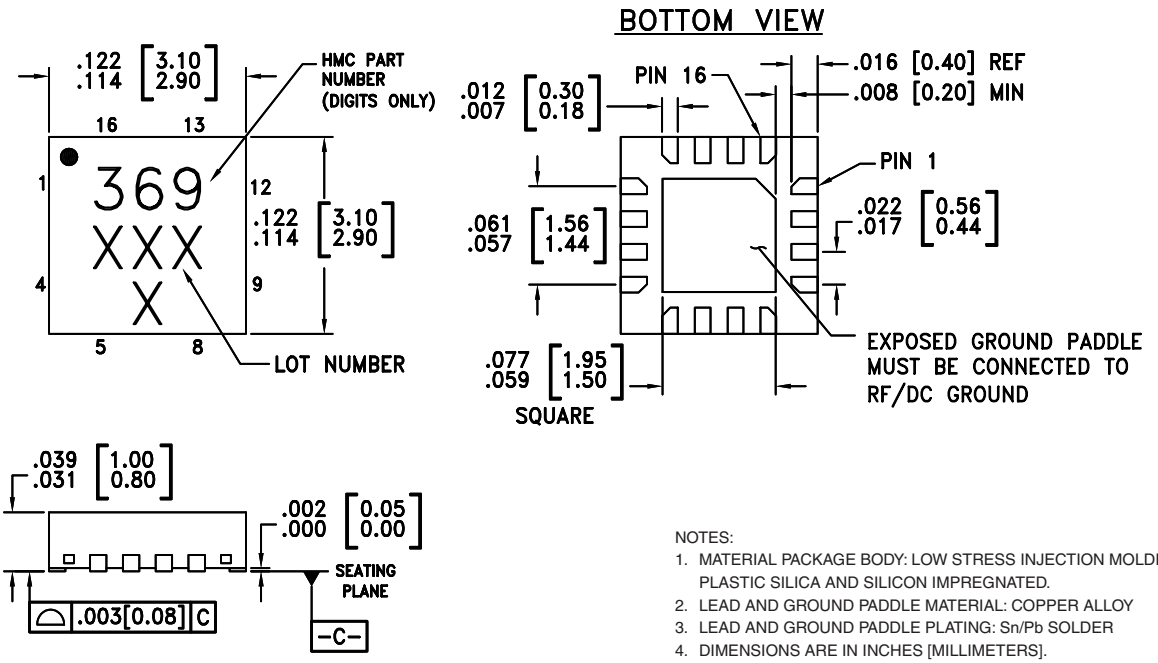
RF Input (Vcc= +5V)	+20 dBm
Vcc	+6.0V
Channel Temperature	150 °C
Continuous Pdiss (T=85 °C) (derate 7 mW/°C above 85 °C)	450 mW
Thermal Resistance (R_{th}) (junction to ground paddle)	145 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Typical Supply Current vs. Vcc

Vcc (V)	Icc (mA)
4.5	45
5.0	46
5.5	47

Note: Multiplier will operate over full voltage range shown above.

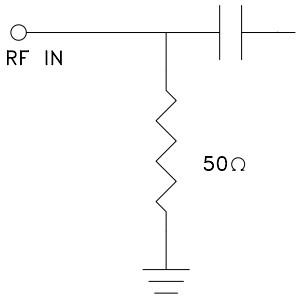
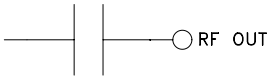
Pin Locations & Outline Drawing



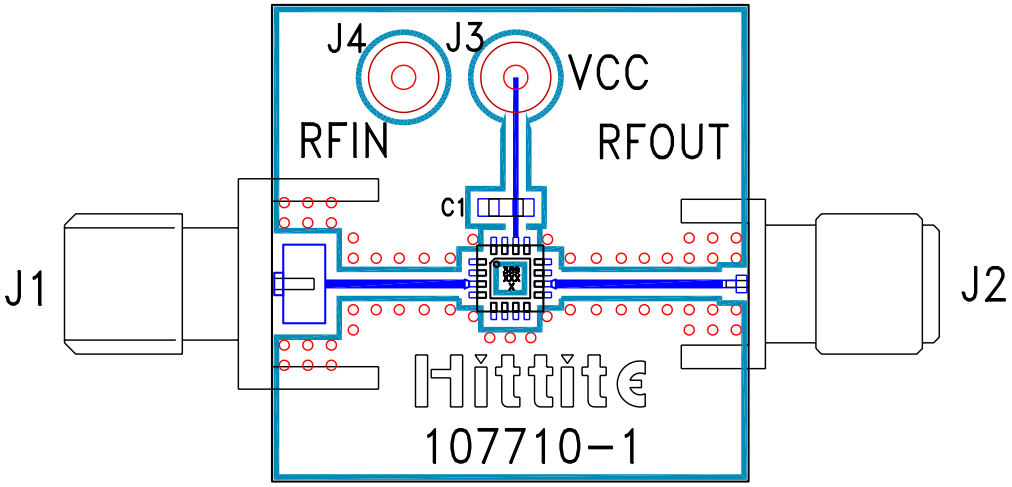
NOTES:

1. MATERIAL PACKAGE BODY: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
6. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
7. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
9. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

Pin Description

Pin Number	Function	Description	Interface Schematic
1, 2, 5-8, 11-13, 15, 16	N/C	No Connection. These pins may be connected to RF ground if desired. Performance will not be affected.	
3	RF IN	RF input needs to be DC blocked only if there is an external DC voltage applied to RF IN.	
4, 9	GND	All ground leads and ground paddle must be soldered to PCB RF/DC ground.	
10	RF OUT	Multiplied Output. AC coupled. No external DC blocks necessary.	
14	Vcc	Supply voltage 5V ± 0.5V.	

Evaluation PCB



The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. The evaluation circuit board shown is available from Hittite upon request.

List of Materials

Item	Description
J1, J2	PC Mount SMA Connector
J3, J4	DC Pin
C1	0.01 µF Capacitor, 0603 Pkg.
U1	HMC369LP3, x2 Active Multiplier
PCB*	107710 Eval Board
* Circuit Board Material: Rogers 4350	