

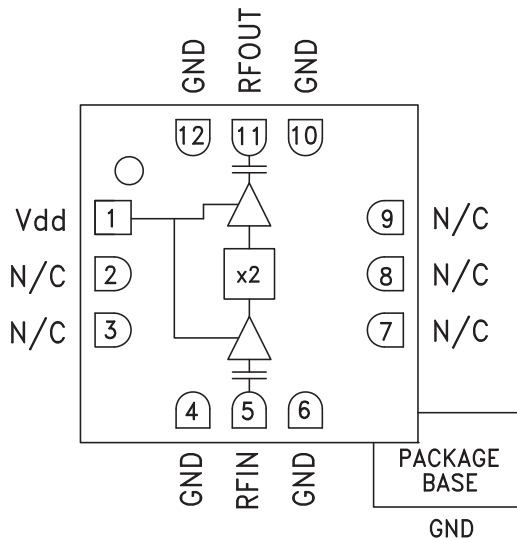
## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT

### Typical Applications

The HMC449LC3B is suitable for:

- Point-to-Point & Multi-Point Radios
- VSAT Radios
- Military EW, ECM, C<sup>3</sup>I
- Test Instrumentation
- Military & Space

### Functional Diagram



### Features

- Output Power: +9 dBm
- Wide Input Power Range: -4 to +6 dBm
- Fo Isolation: 30 dBc @ Fout= 28 GHz
- 100 kHz SSB Phase Noise: -132 dBc/Hz
- Single Supply: 5V@ 50 mA
- RoHS Compliant 3x3 mm SMT Package

### General Description

The HMC449LC3B is a x2 active broadband frequency multiplier utilizing GaAs PHEMT technology in a leadless RoHS SMT package. When driven by a 0 dBm signal the multiplier provides +9 dBm typical output power from 27 to 31 GHz. The Fo and 3Fo isolations are >25 dBc and >30 dBc respectively at 30 GHz. The HMC449LC3B is ideal for use in LO multiplier chains yielding a reduced parts count vs. traditional approaches. The low additive SSB Phase Noise of -132 dBc/Hz at 100 kHz offset helps maintain good system noise performance. The HMC449LC3B eliminates the need for wire bonding, allowing the use of surface mount manufacturing techniques.

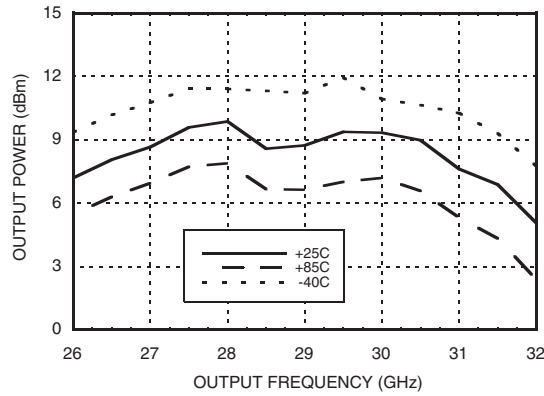
### Electrical Specifications, $T_A = +25^\circ C$ , $V_{dd} = +5V$ , 0 dBm Drive Level

| Parameter                                    | Min.        | Typ. | Max. | Units  |
|--|-------------|------|------|--------|
| Frequency Range, Input                       | 13.5 - 15.5 |      |      | GHz    |
| Frequency Range, Output                      | 27 - 31     |      |      | GHz    |
| Output Power                                 | 5           | 9    |      | dBm    |
| Fo Isolation (with respect to output level)  |             | 30   |      | dBc    |
| 3Fo Isolation (with respect to output level) |             | 25   |      | dBc    |
| Input Return Loss                            |             | 12   |      | dB     |
| Output Return Loss                           |             | 8    |      | dB     |
| SSB Phase Noise (100 kHz Offset)             |             | -132 |      | dBc/Hz |
| Supply Current (I <sub>dd</sub> )            |             | 50   |      | mA     |

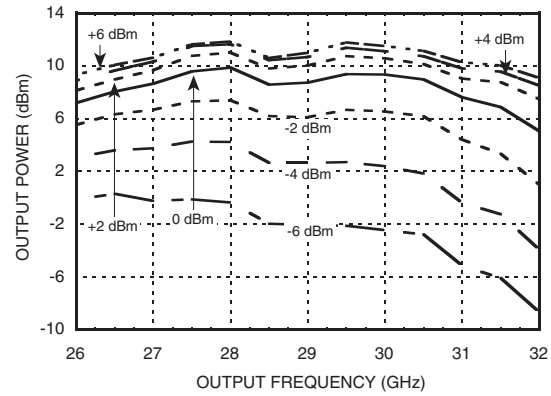
## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT



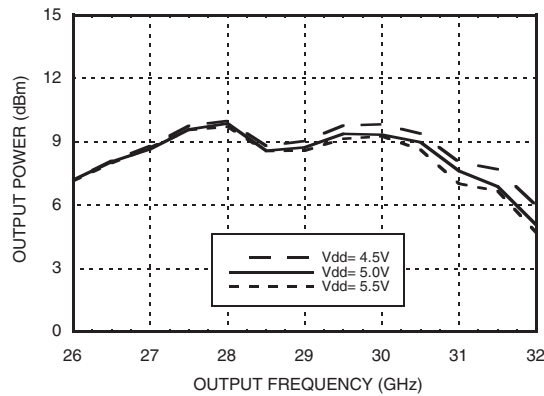
**Output Power vs. Temperature @ 0 dBm Drive Level**



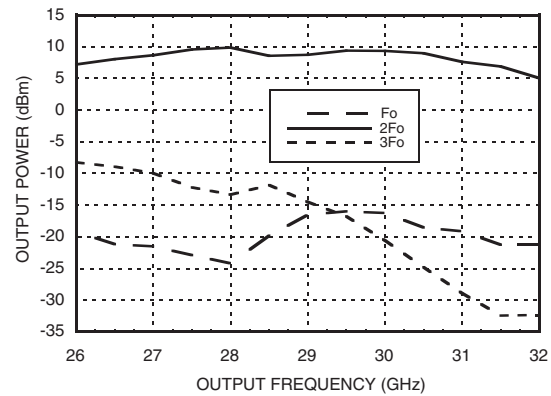
**Output Power vs. Drive Level**



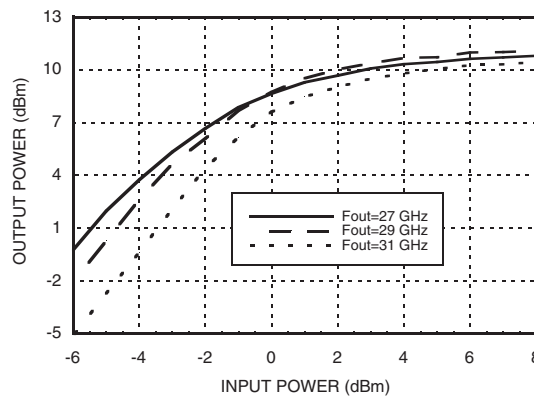
**Output Power vs. Supply Voltage @ 0 dBm Drive Level**



**Isolation @ 0 dBm Drive Level**



**Pin vs. Pout @ 3 Frequencies**



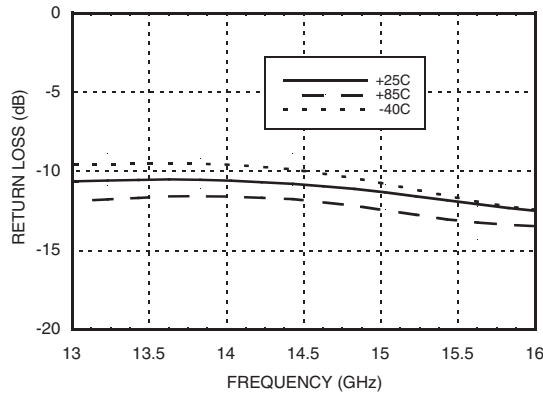


**SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT**

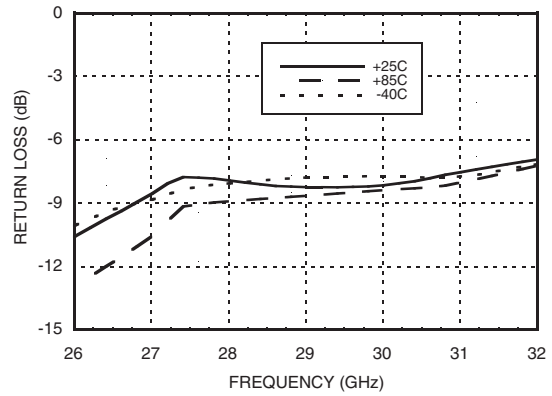
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FREQ. MULTIPLIERS - ACTIVE - SMT

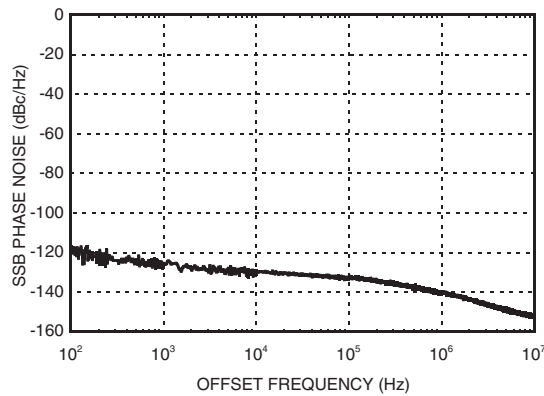
**Input Return Loss vs. Temperature**



**Output Return Loss vs. Temperature**



**SSB Phase Noise Performance, Fout = 27 GHz, Pin = 0 dBm**



## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT

### Absolute Maximum Ratings

|   |                |
|---|----------------|
| RF Input (Vcc= +5V)   | +20 dBm        |
| Supply Voltage (Vdd)  | +6.0 Vdc       |
| Channel Temperature   | 175 °C         |
| Continuous Pdiss (T= 85 °C)<br>(derate 8.3 mW/°C above 85 °C) | 744 mW         |
| Thermal Resistance<br>(channel to ground paddle)              | 121 °C/W       |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature   | -40 to +85 °C  |

### Typical Supply Current vs. Vdd

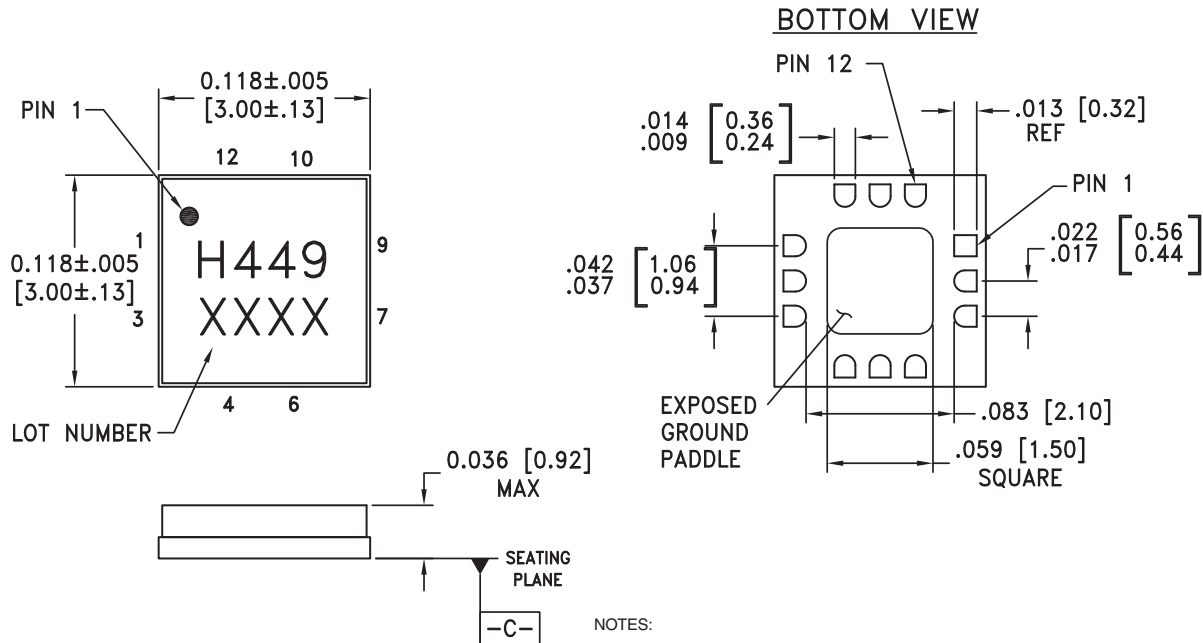
| Vdd (Vdc) | Idd (mA) |
|-----------|----------|
| 4.5       | 49       |
| 5.0       | 50       |
| 5.5       | 51       |

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



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



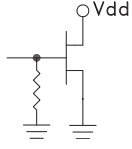

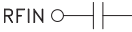
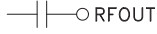
NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM [C-]
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. CLASSIFIED AS MOISTURE SENSITIVITY LEVEL (MSL) 1.



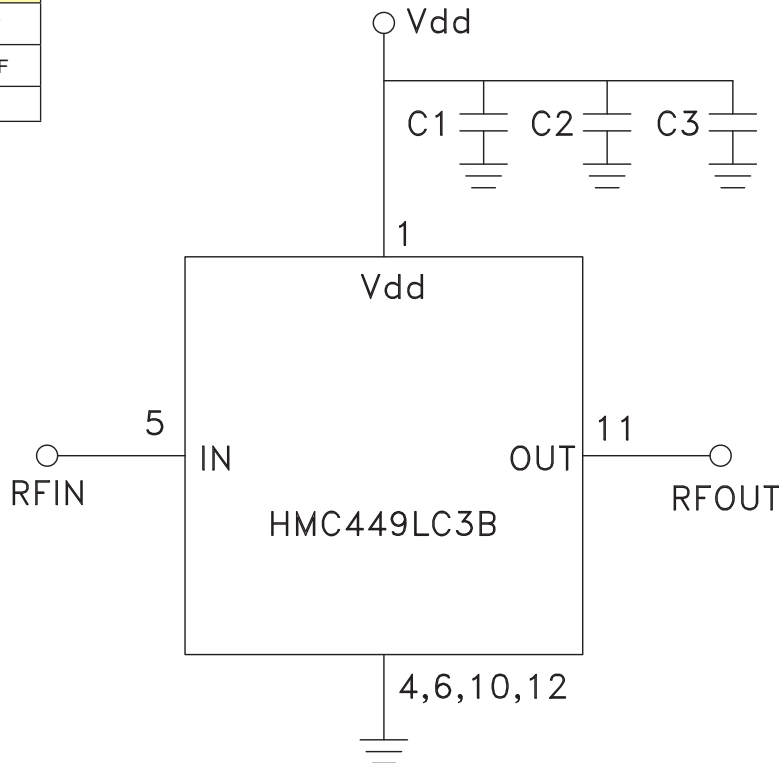
**SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT**

**Pin Description**

| Pin Number   | Function | Description   | Interface Schematic   |
|--------------|----------|---|---|
| 1            | Vdd      | Supply voltage $5V \pm 0.5V$ . External bypass capacitors of 100 pF, 1,000 pF and 2.2 $\mu F$ are required. |  |
| 2, 3, 7-9    | N/C      | This pin may be connected to RF/DC ground. Performance will not be affected.                                |   |
| 4, 6, 10, 12 | GND      | Package bottom must also be connected to RF/DC ground.  |  |
| 5            | RFIN     | Pin is AC coupled and matched to 50 Ohm from 13.5 - 15.5 GHz.   |  |
| 11           | RFOUT    | Pin is AC coupled and matched to 50 Ohm from 27 - 31 GHz.   |  |

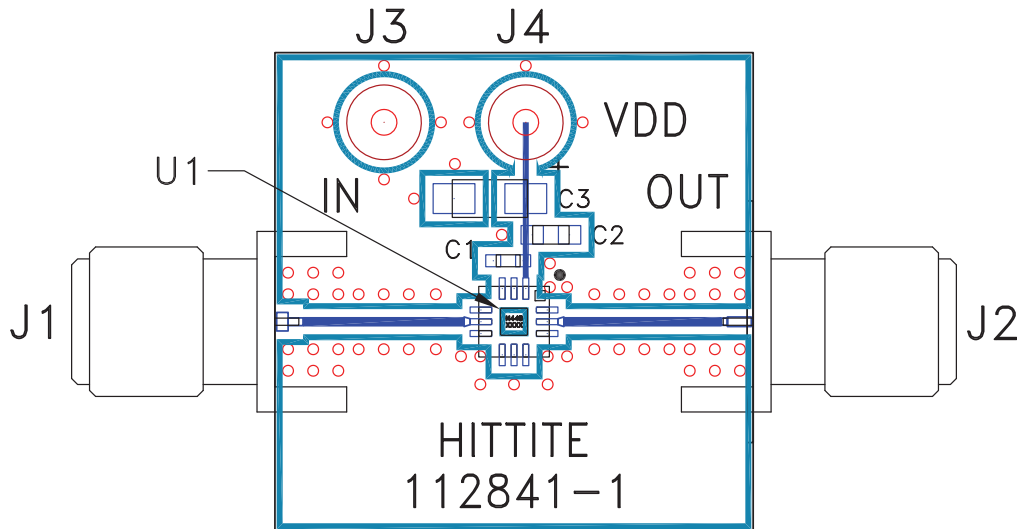
**Application Circuit**

| Component | Value       |
|-----------|-------------|
| C1        | 100 pF      |
| C2        | 1,000 pF    |
| C3        | 2.2 $\mu F$ |





**Evaluation PCB**



**List of Materials for Evaluation PCB 112697 [1]**

| Item    | Description                     |
|---------|---------------------------------|
| J1      | PCB Mount SRI SMA Connector     |
| J2      | PCB Mount SRI K Connector       |
| J3 - J4 | DC Pin                          |
| C1      | 100 pF Capacitor, 0402 Pkg.     |
| C2      | 1,000 pF Capacitor, 0603 Pkg.   |
| C3      | 2.2µF Tantalum Capacitor        |
| U1      | HMC449LC3B x2 Active Multiplier |
| PCB [2] | 112841 Eval Board               |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

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.