# HMC368LP4

## SMT GaAs PHEMT MMIC AMP-DOUBLER-AMP, 9.0 - 16.0 GHz OUTPUT

### Typical Applications

- Microwave Radios & VSAT
- Fiber Optic Infrastructure
- Military Communications & Radar

### Features

Output Power: +15 dBm

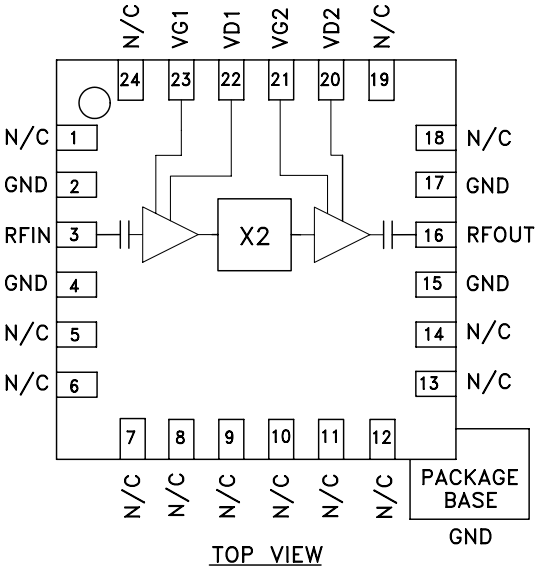
Wide Input Power Range: 0 to +10 dBm

100 kHz SSB Phase Noise: -140 dBc/Hz

+5V @ 75 mA Supply

16 mm² Leadless QFN SMT Package

### Functional Diagram




### General Description

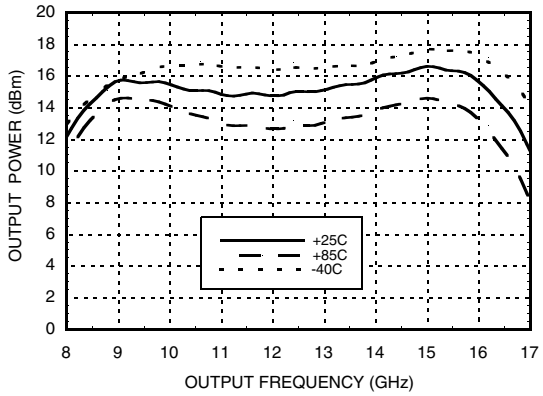
The HMC368LP4 is a miniature amp-doubler-amp utilizing GaAs PHEMT technology in a 4 mm x 4 mm leadless surface mount package. When driven by a +2 dBm signal, the multiplier provides +15 dBm typical output power from 9 to 16 GHz. The Fo and the 3Fo isolations are 18 dB typical. The low additive SSB phase noise of -140 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance. The HMC368LP4 is ideal for use in LO multiplier chains allowing reduced parts count vs. traditional approaches.

### Electrical Specifications, $T_A$ = +25° C, Vd1 = Vd2 = +5.0 Vdc, +2 dBm Drive Level

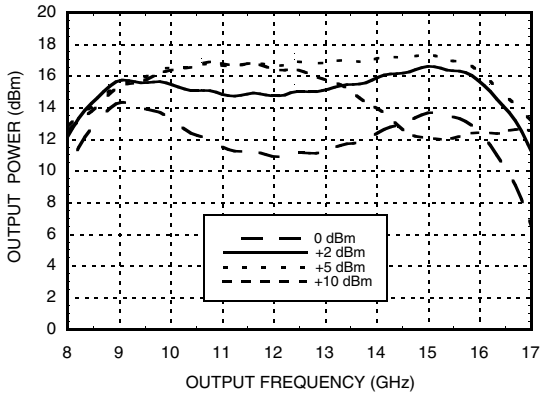
| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Frequency Range, Input | | 4.5 - 8.0 | | GHz |
| Frequency Range, Output | | 9.0 - 16.0 | | GHz |
| Output Power | 12 | 15 | | dBm |
| Fo Isolation (with respect to output level) | | 18 | | dB |
| 3Fo Isolation (with respect to output level) | | 18 | | dB |
| Input Return Loss | | 10 | | dB |
| Output Return Loss | | 10 | | dB |
| SSB Phase Noise (Fout = 13 GHz, 100 kHz Offset) Pin = +2 dBm | | -140 | | dBc/Hz |
| Supply Current (Idd)* | | 75 | | mA |

*Adjust Vg1, Vg2 between -2V to 0V to achieve Idd = 75 mA typical

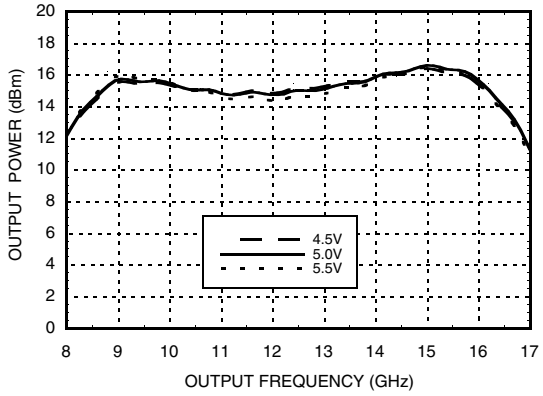
### Output Power vs. Temperature @ +2 dBm Drive Level



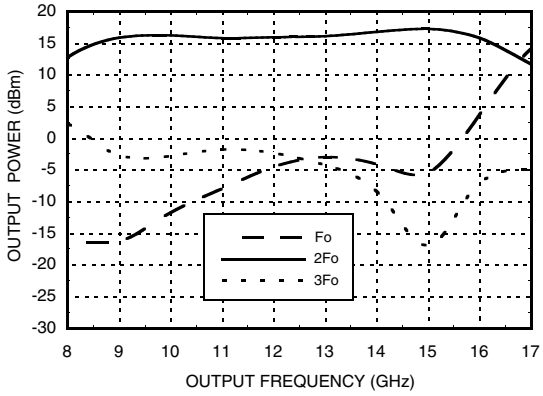

### Output Power vs. Drive Level



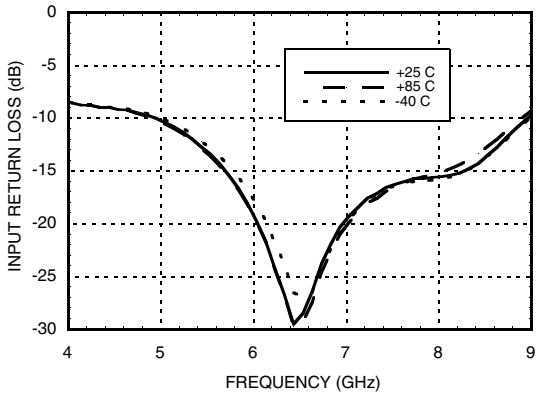

### Output Power vs. Supply Voltage @ +2 dBm Drive Level



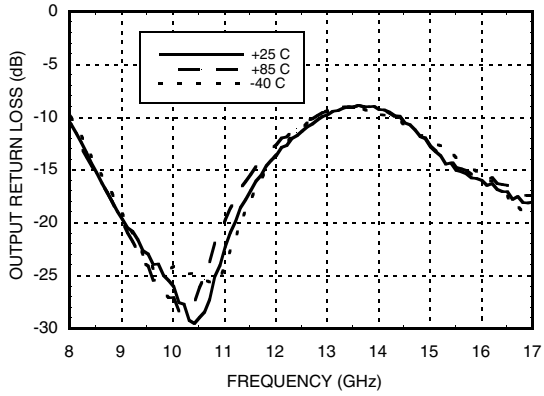

### Isolation @ +2 dBm Drive Level




### Input Return Loss vs. Temperature

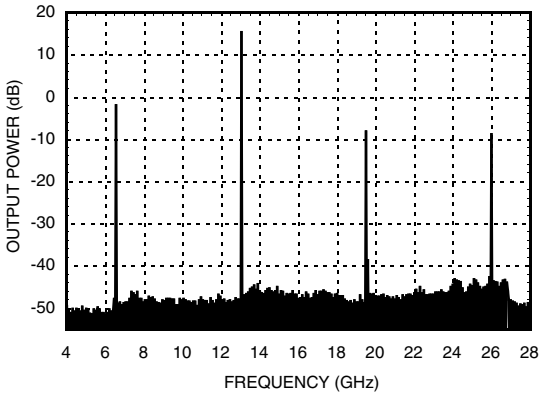



### Output Return Loss vs. Temperature

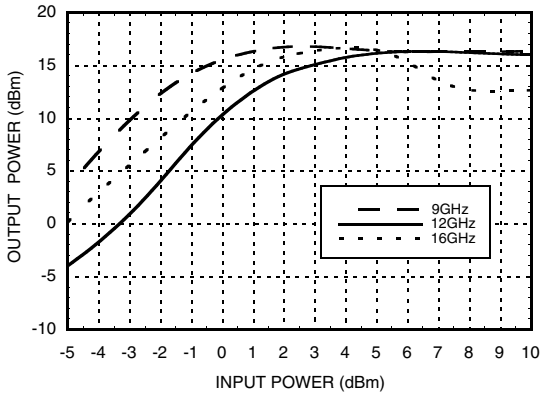


## SMT GaAs PHEMT MMIC AMP-DOUBLER-AMP, 9.0 - 16.0 GHz OUTPUT

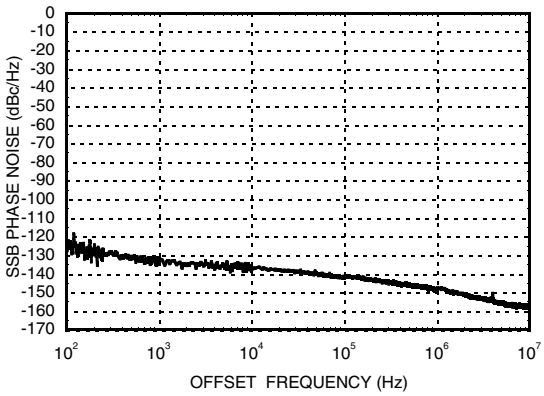
### Output Spectrum @ Fin = 6.5 GHz, Pin = +2 dBm




### Output Power vs. Input Power @ Three Frequencies




### SSB Phase Noise Performance, Fout = 13 GHz, Input Power = +2 dBm



## SMT GaAs PHEMT MMIC AMP-DOUBLER-AMP, 9.0 - 16.0 GHz OUTPUT

### Absolute Maximum Ratings

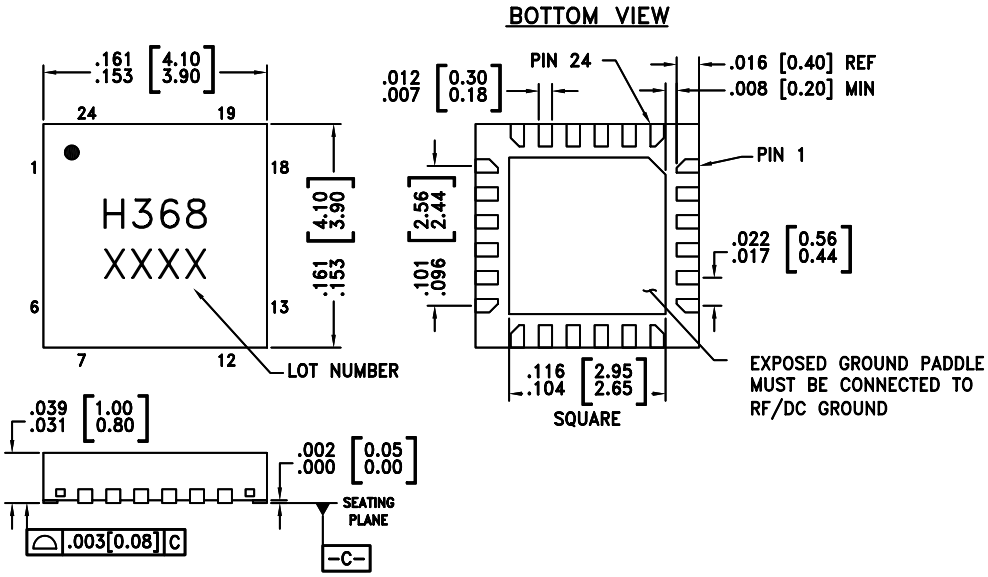
| | |
|---|---|
| RF Input (Vdd = +5V) | +20 dBm |
| Supply Voltage, Vd1, Vd2 | +6.0V |
| Gate Bias Voltage (Vg1, Vg2) | -4 to 0 Vdc |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T = 85 °C) (derate 12.5 mW/°C above 85 °C) | 812 mW |
| Thermal Resistance (junction to ground paddle) | 80 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

### Typical Supply Current vs. Vdd

| Vdd (V) | Idd (mA) |
|---|---|
| 4.5 | 73 |
| 5.0 | 75 |
| 5.5 | 77 |

*Note: Amp-Doubler-Amp will operate over full voltage range shown above.*

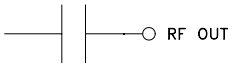
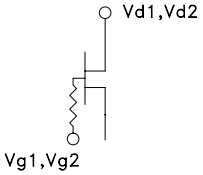
### Pin Locations & Outline Drawing




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, 5-14, 18, 19, 24 | N/C | No Connection. These pins may be connected to RF ground. Performance will not be affected. | |
| 3 | RF IN | Multiplier Input. AC Coupled. No external DC blocks required. |   |
| 2, 4, 15, 17 | GND | All ground leads and ground paddle must be soldered to PCB RF/DC ground. |  |
| 16 | RF OUT | Multiplied Output. AC coupled. No external DC blocks necessary. |   |
| 20, 22 | Vd2, Vd1 | Drain supply voltage 5V ± 0.5V. |   |
| 21, 23 | Vg2, Vg1 | Gate supply voltages. Adjust between -2 Vdc to 0 Vdc to achieve 75 mA drain current. | |



*For price, delivery, and to place orders, please contact Hittite Microwave Corporation:*
*12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373*
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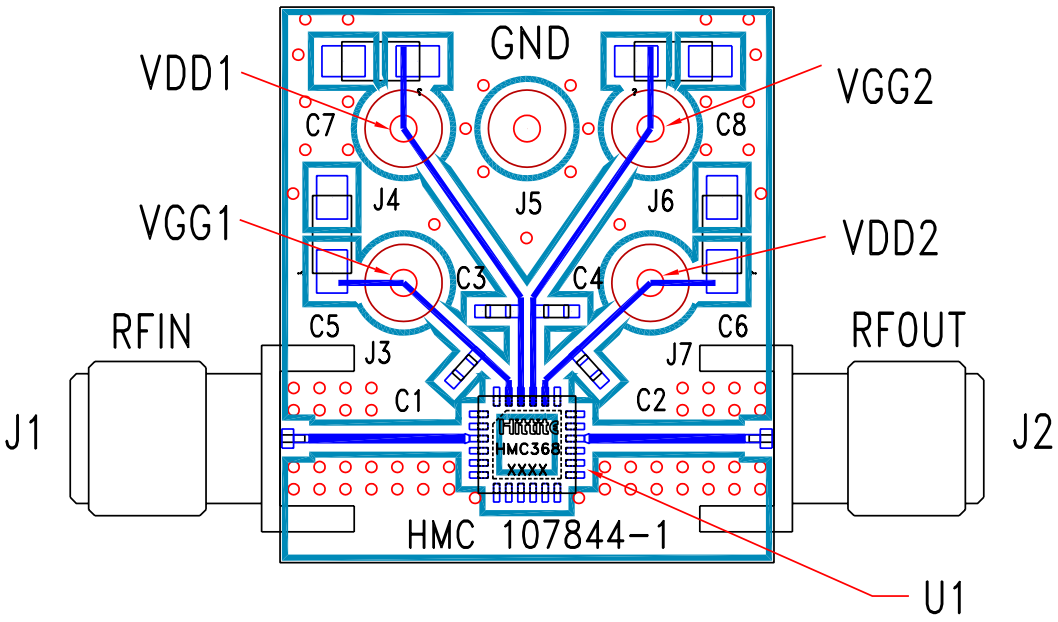
## Evaluation PCB




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 for Evaluation PCB 107846*

| Item | Description |
|---|---|
| J1 - J2 | PC Mount SMA Connector |
| J3 - J7 | DC Pin |
| C1 - C4 | 100 pF capacitor, 0402 Pkg. |
| C5 - C8 | 2.2 µF capacitor, case size A |
| U1 | HMC368LP4, Amp-x2-Amp |
| PCB** | 107844 PCB |
| ** Circuit Board Material: Rogers 4350 | |

*Reference this number when ordering complete evaluation PCB.