

SMT GaAs HBT MMIC x16 ACTIVE FREQUENCY MULTIPLIER, 9.9 - 11.0 GHz OUTPUT

Typical Applications

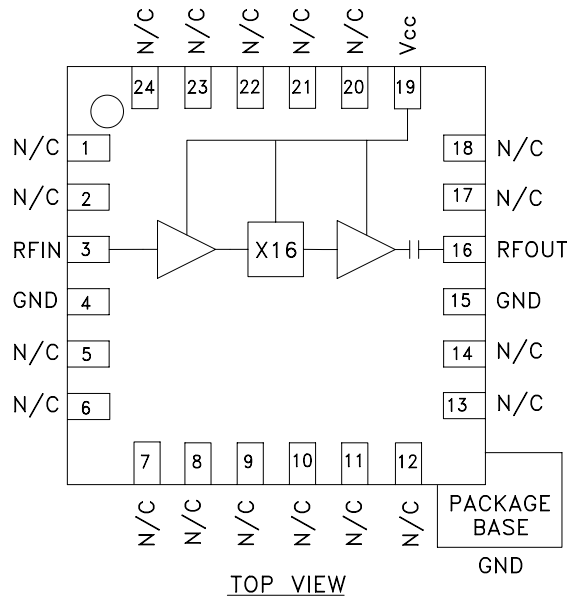
Active Multiplier for X Band Applications:

- Fiber Optic
- Pt to Pt Radios
- Military Radar

Features

- Output Power: +7 dBm
- Sub-Harmonic Suppression: >25 dBc
- SSB Phase Noise: -130 dBc/Hz
- Single Supply: 5V @ 78 mA
- 16 mm² Leadless SMT Package

Functional Diagram



General Description

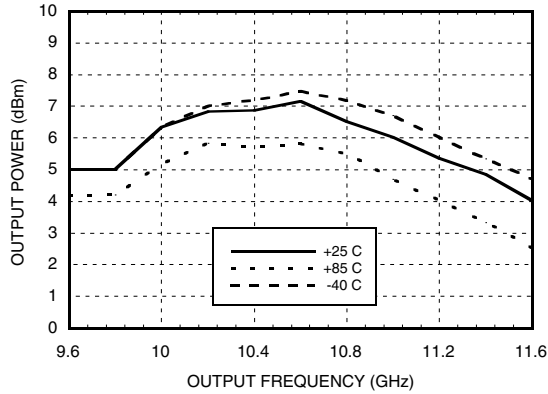
The HMC445LP4 is an active miniature x16 frequency multiplier utilizing InGaP GaAs HBT technology in a 4 mm x 4 mm leadless surface mount package. Power output is +7 dBm typical from a 5.0V supply voltage and varies little vs. input power, temperature and supply voltage. Suppression of undesired fundamental and sub-harmonics is >25 dBc typical with respect to output signal level. The low additive SSB phase noise of -130 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance. The HMC445LP4 is ideal for use in LO multiplier chains allowing reduced parts count vs. traditional approaches.

Electrical Specifications, $T_A = +25^\circ C, V_{CC} = 5.0V$

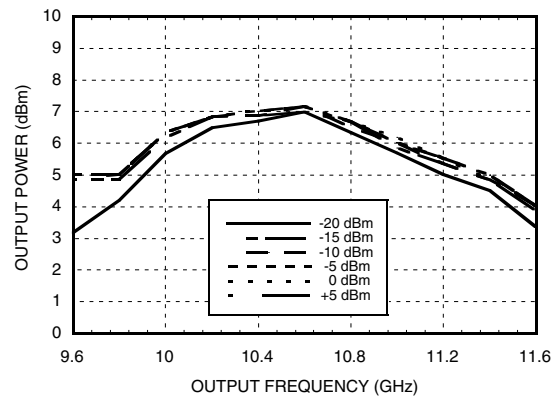
| Parameter | Min. | Typ. | Max. | Units |
|-----------------------------------|-----------------|------|------|--------|
| Frequency Range, Input | 618.75 - 687.50 | | | MHz |
| Frequency Range, Output | 9.9 - 11.0 | | | GHz |
| Input Power Range | -15 | | 5 | dBm |
| Output Power | 4 | 7 | | dBm |
| Sub-Harmonic Suppression | | 25 | | dBc |
| Input Return Loss | | 28 | | dB |
| Output Return Loss | | 7 | | dB |
| SSB Phase Noise (100 kHz Offset) | Pin= 0 dBm | -130 | | dBc/Hz |
| Supply Current (I _{cc}) | | 78 | | mA |

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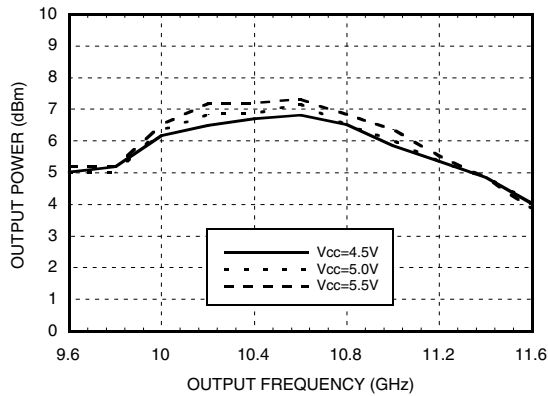
Output Power vs. Temperature @ -10 dBm Drive Level



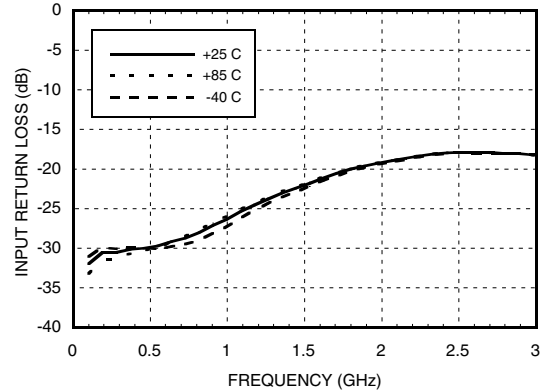
Output Power vs. Drive Level



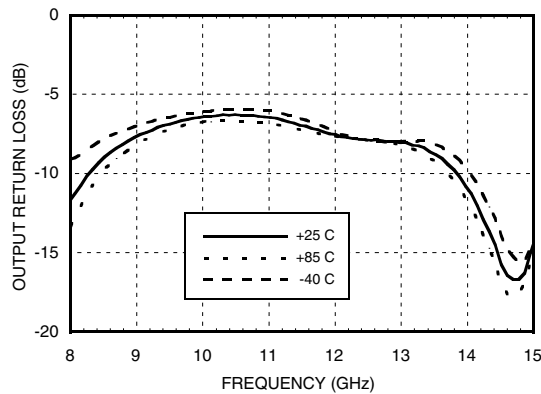
Output Power vs. Supply Voltage @ -10 dBm Drive Level



Input Return Loss vs. Temperature

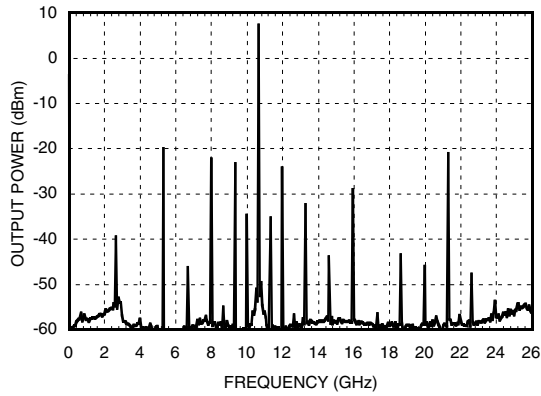


Output Return Loss vs. Temperature

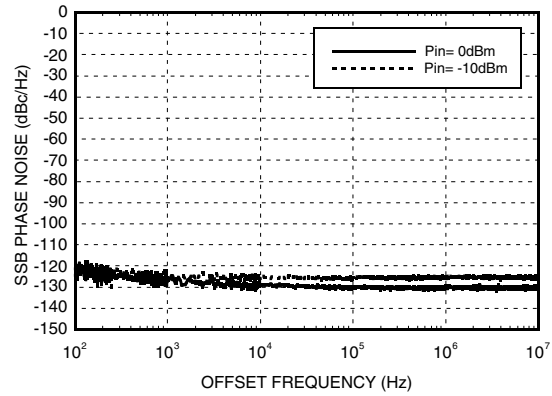


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Output Spectrum



**SSB Phase Noise
Performance, $F_{out} = 10.5$ GHz**



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Absolute Maximum Ratings

| | |
|-----------------------|----------------|
| RF Input (Vcc= +5V) | +20 dBm |
| Vcc | +6.0V |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

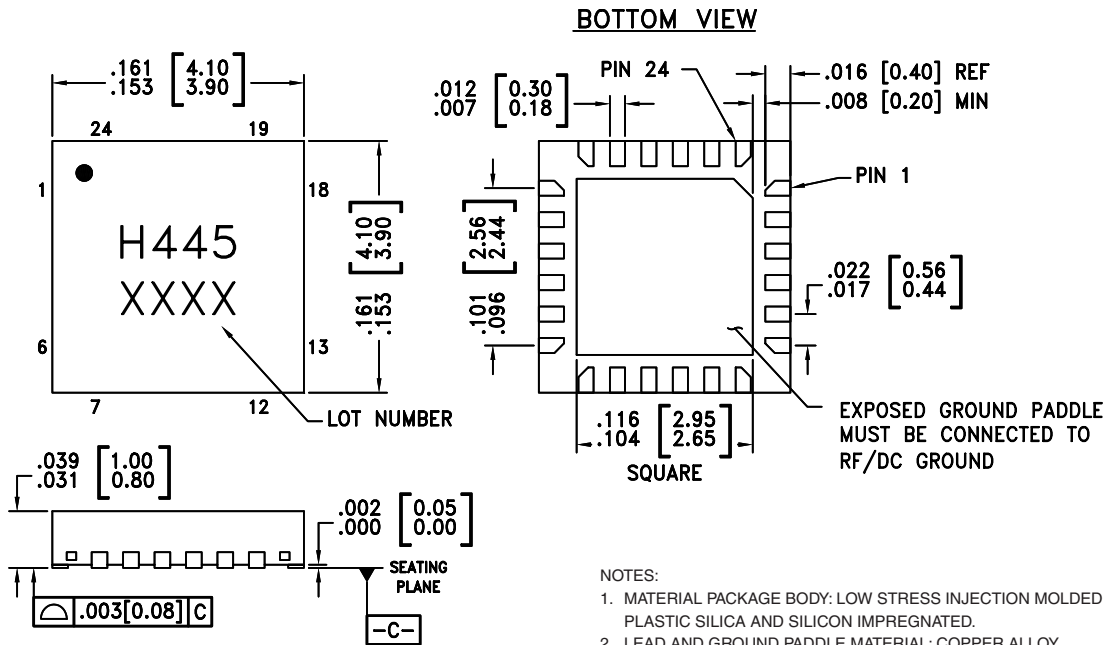
Typical Supply Current vs. Vcc

| Vcc (V) | Icc (mA) |
|---------|----------|
| 4.5 | 75 |
| 5.0 | 78 |
| 5.5 | 80 |

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

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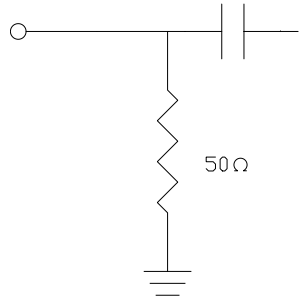


Pin Locations & Outline Drawing



FREQ. MULTIPLIERS - SMT

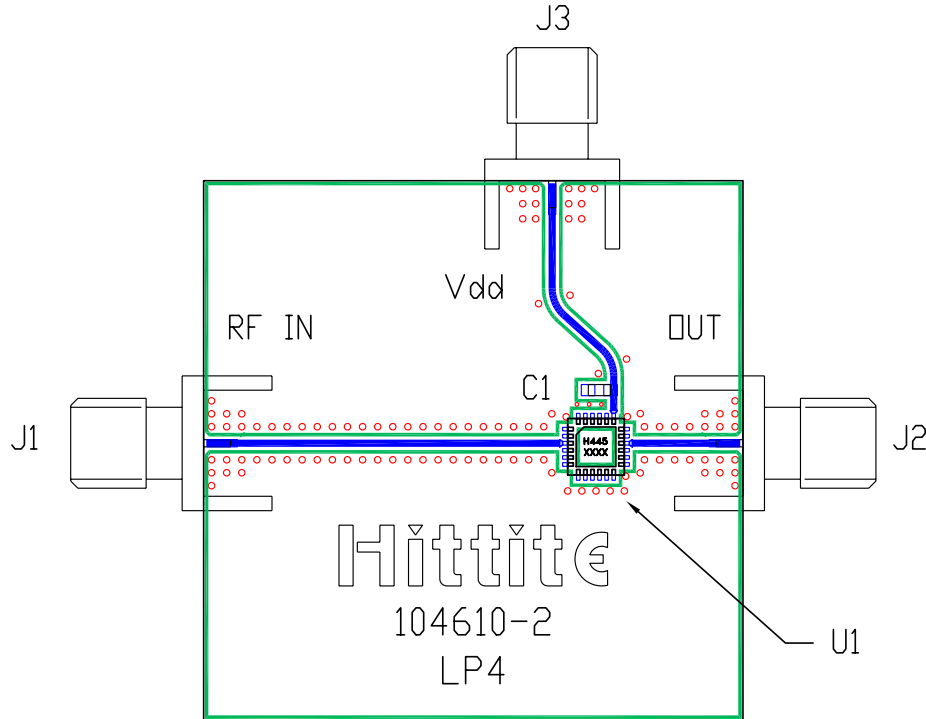
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Pin Description

| Pin Number | Function | Description | Interface Schematic |
|---------------------------|----------|---|---|
| 1, 2, 5-14, 17, 18, 20-24 | N/C | No Connection | |
| 3 | RF IN | RF input needs to be DC blocked only if there is an external DC voltage applied to RF IN. |  |
| 4, 15 | 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. |  |
| 19 | Vcc | Supply voltage 5V ± 0.5V. | |

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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

| Item | Description |
|---------------------------------------|----------------------------------|
| J1 - J3 | PC Mount SMA Connector |
| C1 | 1,000 pF Capacitor, 0603 Pkg. |
| U1 | HMC445LP4, x16 Active Multiplier |
| PCB* | 104610 Eval Board |
| * Circuit Board Material: Rogers 4350 | |