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

### Typical Applications

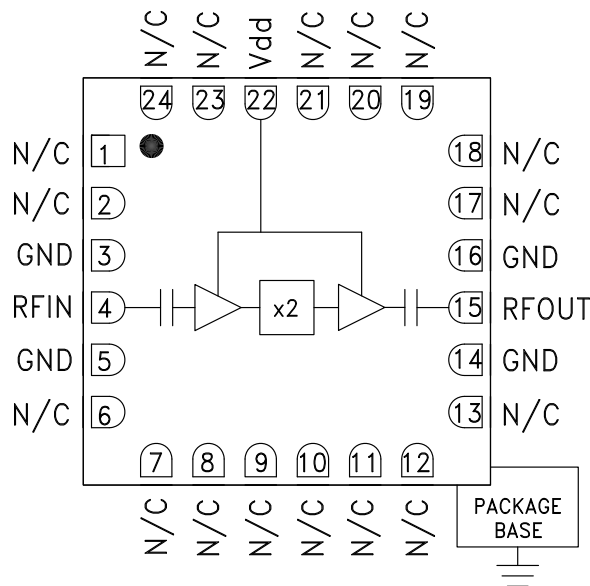
The HMC577LC4B is suitable for:

- Clock Generation Applications:  
SONET OC-192 & SDH STM-64
- Point-to-Point & VSAT Radios
- Test Instrumentation
- Military & Space

### Features

- Very High Output Power: +20 dBm
- Low Input Power Drive: -2 to +6 dBm
- Very High Fo, 3Fo Isolation:  
>55 dBc @ Fout= 29 GHz
- 100 KHz SSB Phase Noise: -128 dBc/Hz
- Single Supply: +5V @ 213 mA
- 24 Lead 4x4mm QFN Package: 16mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC577LC4B is a x2 active broadband frequency multiplier utilizing GaAs PHEMT technology in a leadless RoHS compliant SMT package. When driven by a +5 dBm signal, the multiplier provides +20 dBm typical output power from 27 to 31 GHz. The Fo and 3Fo isolations are >55 dBc at 29 GHz. The HMC577LC4B is ideal for use in LO multiplier chains for Pt-to-Pt & VSAT Radios yielding reduced parts count vs. traditional approaches. The low additive SSB Phase Noise of -128 dBc/Hz at 100 kHz offset helps maintain good system noise performance. The RoHS packaged HMC577LC4B eliminates the need for wire bonding, and allows the use of surface mount manufacturing techniques.

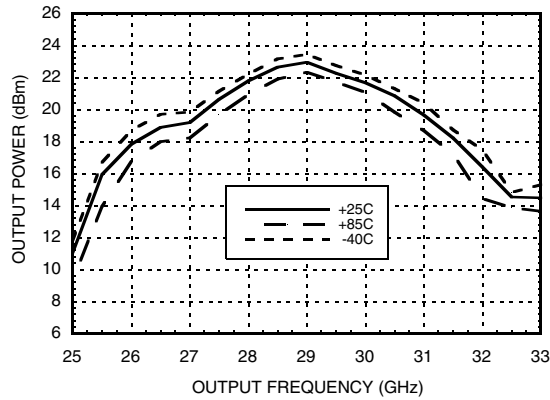
### Electrical Specifications, $T_A = +25^\circ C$ , $V_{dd} = +5V$ , 5 dBm Drive Level

| Parameter                                    | Min.        | Typ. | Max. | Units  |
|--|-------------|------|------|--------|
| Frequency Range, Input                       | 13.5 - 15.5 |      |      | GHz    |
| Frequency Range, Output                      | 27 - 31     |      |      | GHz    |
| Output Power                                 | 15          | 20   |      | dBm    |
| Fo Isolation (with respect to output level)  |             | 60   |      | dBc    |
| 3Fo Isolation (with respect to output level) |             | 55   |      | dBc    |
| Input Return Loss                            |             | 20   |      | dB     |
| Output Return Loss                           |             | 7    |      | dB     |
| SSB Phase Noise (100 kHz Offset)             |             | -128 |      | dBc/Hz |
| Supply Current (I <sub>dd</sub> )            |             | 213  |      | mA     |

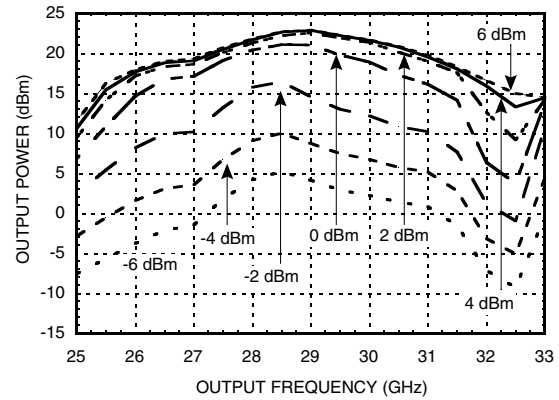


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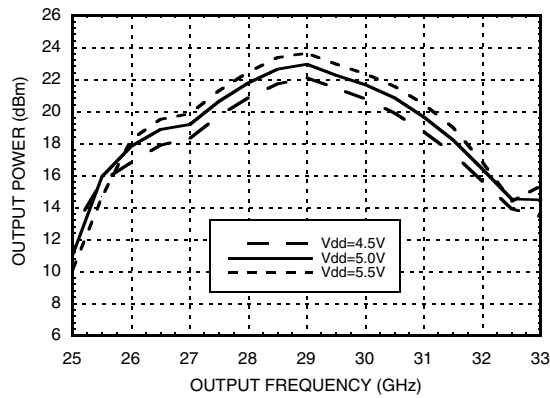
**Output Power vs. Temperature @ 5 dBm Drive Level**



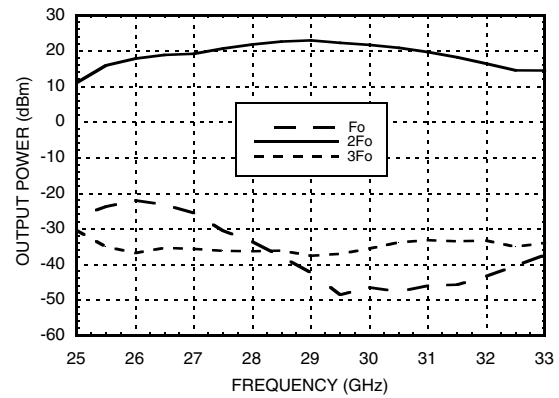
**Output Power vs. Drive Level**



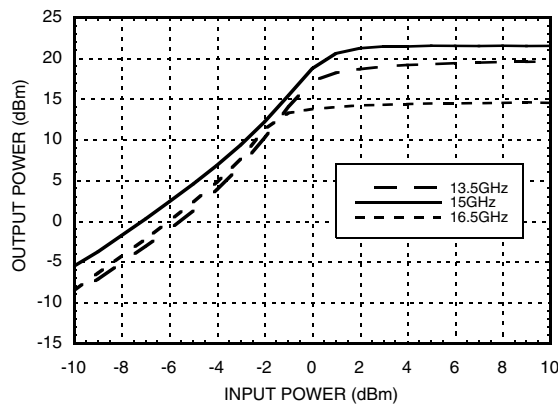
**Output Power vs. Supply Voltage @ 5 dBm Drive Level**

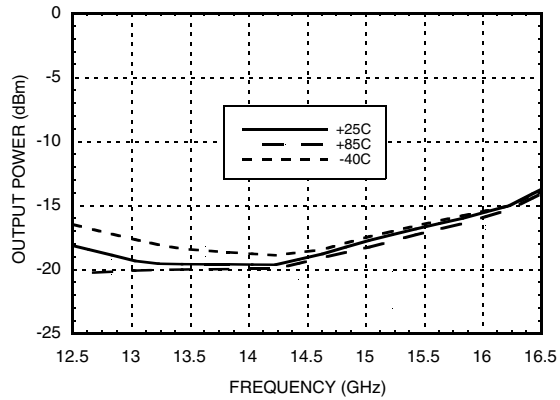
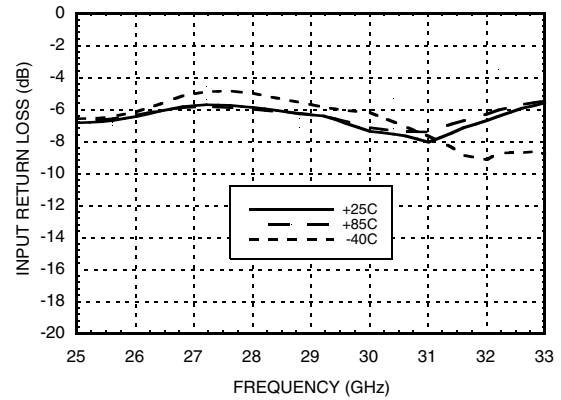


**Isolation @ 5 dBm Drive Level**



**Output Power vs. Input Power**



**SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT****Input Return Loss vs. Temperature****Output Return Loss vs. Temperature**

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

### Absolute Maximum Ratings

|  |                |
|--|----------------|
| RF Input (Vdd = +5V)   | +13 dBm        |
| Supply Voltage (Vdd)   | +6.0 V         |
| Channel Temperature  | 175 °C         |
| Continuous Pdiss (T= 85 °C)<br>(derate 13.8 mW/°C above 85 °C) | 1.24 W         |
| Thermal Resistance<br>(channel to ground paddle)               | 73 °C/W        |
| Storage Temperature  | -65 to +150 °C |
| Operating Temperature  | -40 to +85 °C  |

### Typical Supply Current vs. Vdd

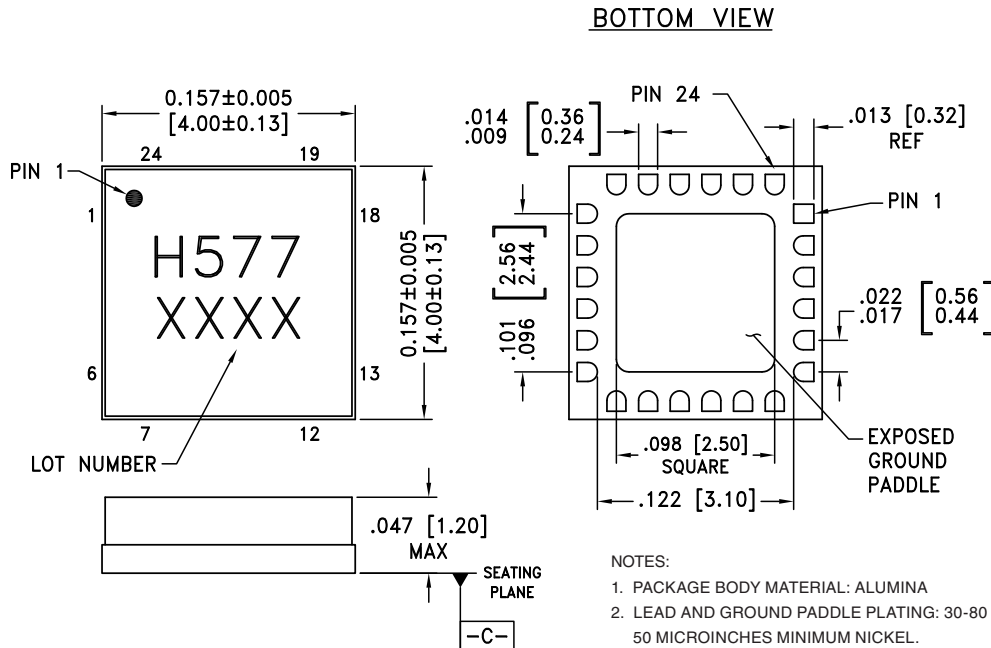
| Vdd (Vdc) | Idd (mA) |
|-----------|----------|
| 4.5       | 212      |
| 5.0       | 213      |
| 5.5       | 214      |

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.

### Package Information

| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC577LC4B  | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H577<br>XXXX                   |


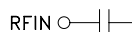
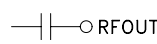
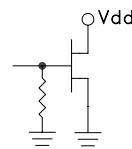
[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX



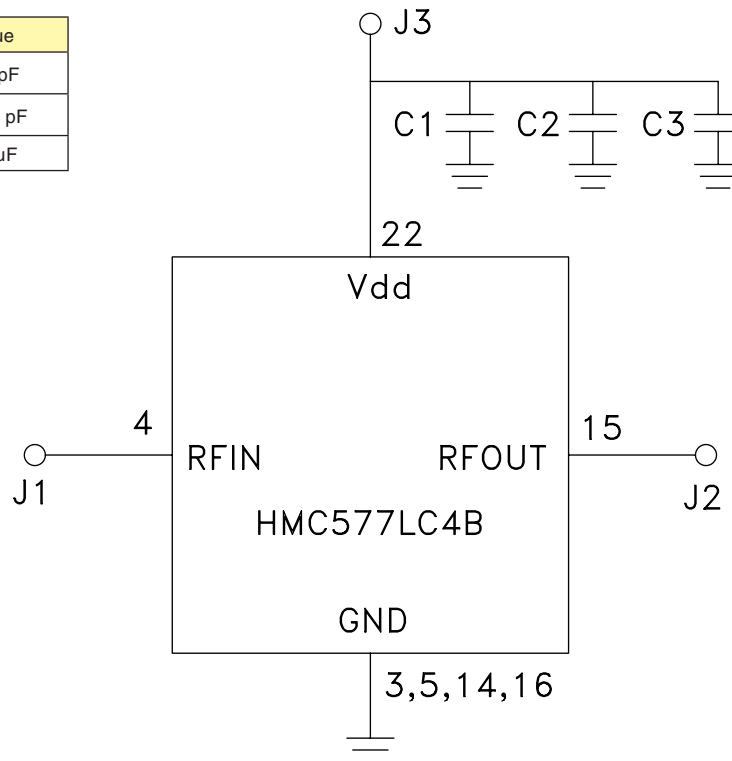
## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 27 - 31 GHz OUTPUT

### Pin Description

| Pin Number                    | Function | Description  | Interface Schematic   |
|-------------------------------|----------|--|---|
| 1, 2, 6 - 13, 17 - 21, 23, 24 | N/C      | These pins are internally not connected; however, this product was specified with these pins connected to RF/ DC ground. |   |
| 3, 5, 14, 16                  | GND      | Package bottom must also be connected to RF/DC ground.   |  |
| 4                             | RFIN     | Pin is AC coupled and matched to 50 Ohms.  |  |
| 15                            | RFOUT    | Pin is AC coupled and matched to 50 Ohms.  |  |
| 22                            | Vdd      | Supply voltage 5V ± 0.5V. External bypass capacitors of 100 pF, 1,000 pF and 2.2 μF are required.                        |  |

### Application Circuit

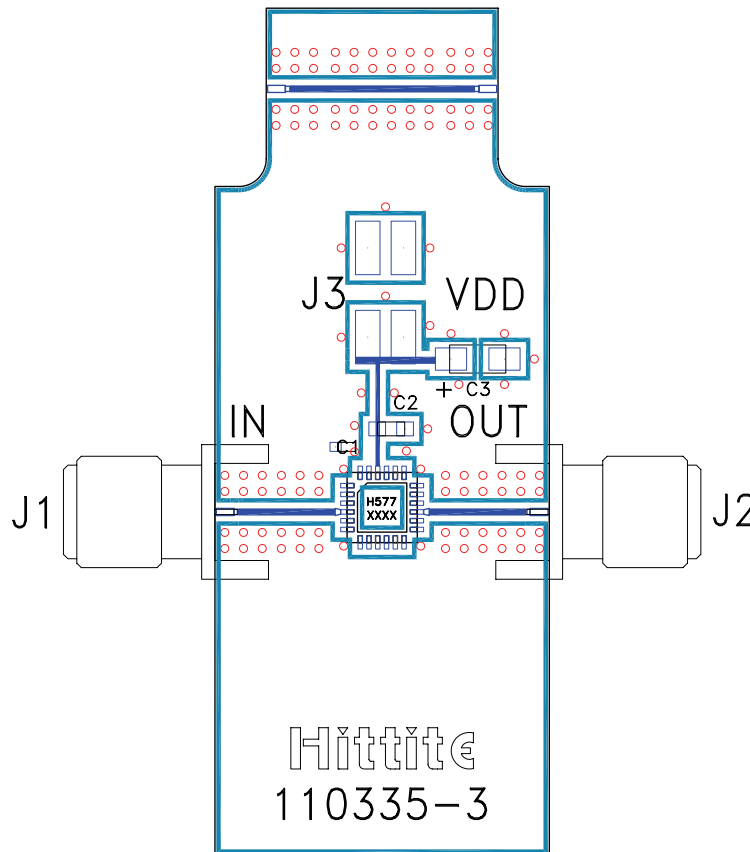
| Component | Value    |
|-----------|----------|
| C1        | 100 pF   |
| C2        | 1,000 pF |
| C3        | 2.2 μF   |





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

### Evaluation PCB



### List of Materials for Evaluation PCB 115223 [1]

| Item    | Description                     |
|---------|---------------------------------|
| J1, J2  | PCB Mount SRI K Connector       |
| J3      | Molex Header, 2mm               |
| C1      | 100 pF Capacitor, 0402 Pkg.     |
| C2      | 1,000 pF Capacitor, 0603 Pkg.   |
| C3      | 2.2 μF Tantalum Capacitor       |
| U1      | HMC577LC4B x2 Active Multiplier |
| PCB [2] | 110335 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. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Hittite upon request.



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