# HMC578LC3B

v03.0514

## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 23 - 33 GHz

### Typical Applications

The HMC578LC3B is suitable for:

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

### Features

High Output Power: +15 dBm

Low Input Power Drive: 0 to +6 dBm

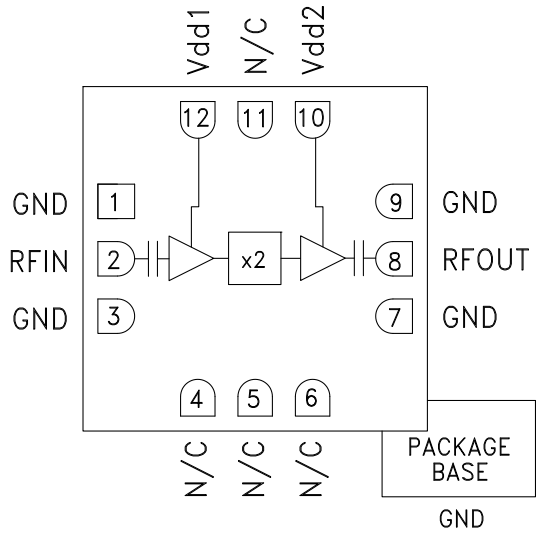
Fo Isolation: >20 dBc @ Fout= 28 GHz

100 KHz SSB Phase Noise: -132 dBc/Hz

Single Supply: +5V@ 81 mA

RoHS Compliant 3x3 mm SMT Package

### Functional Diagram




### General Description

The HMC578LC3B is a x2 active broadband frequency multiplier utilizing GaAs PHEMT technology in a leadless RoHS compliant SMT package. When driven by a +3 dBm signal, the multiplier provides +15 dBm typical output power from 23 to 33 GHz. The Fo and 3Fo isolations are >20 dBc and >30 dBc respectively at 28 GHz. The HMC578LC3B 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 -129 dBc/Hz at 100 kHz offset helps maintain good system noise performance. The RoHS packaged HMC578LC3B eliminates the need for wire bonding, and allows the use of surface mount manufacturing techniques.

### Electrical Specifications, $T_A$ = +25° C, Vdd1, Vdd2 = +5V, 3 dBm Drive Level

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Frequency Range, Input | | 11.5 - 16.5 | | GHz |
| Frequency Range, Output | | 23 - 33 | | GHz |
| Output Power | 10 | 15 | | dBm |
| Fo Isolation (with respect to output level) | | 20 | | dBc |
| 3Fo Isolation (with respect to output level) | | 30 | | dBc |
| Input Return Loss | | 10 | | dB |
| Output Return Loss | | 12 | | dB |
| SSB Phase Noise (100 kHz Offset) | | -132 | | dBc/Hz |
| Supply Current (Idd1 & Idd2) | | 81 | | mA |

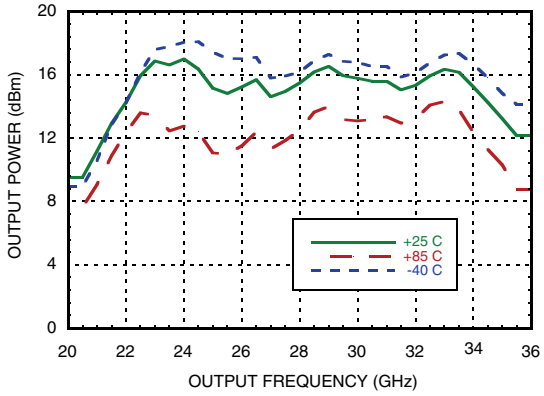
*Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.*

*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

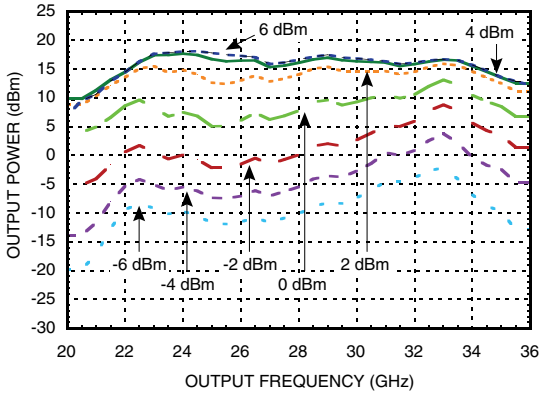
RoHS✓ EARTH FRIENDLY

## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 23 - 33 GHz

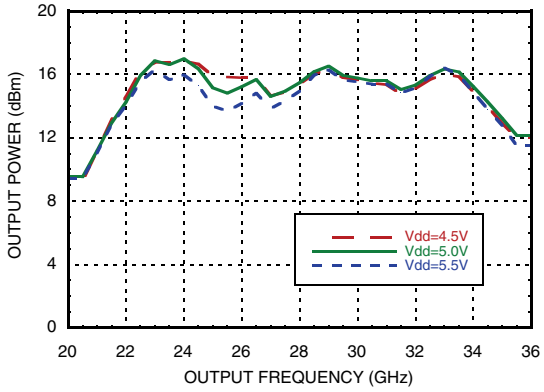
### Output Power vs. Temperature @ 3 dBm Drive Level



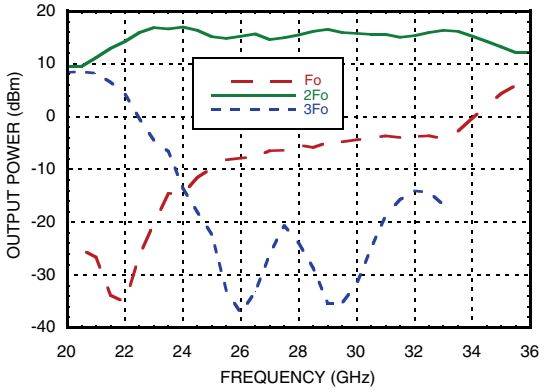

### Output Power vs. Drive Level



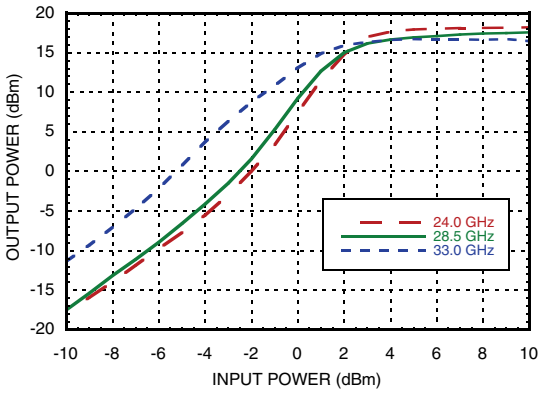

### Output Power vs. Supply Voltage @ 3 dBm Drive Level




### Isolation @ 3 dBm Drive Level




### Output Power vs. Input Power




*Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.*

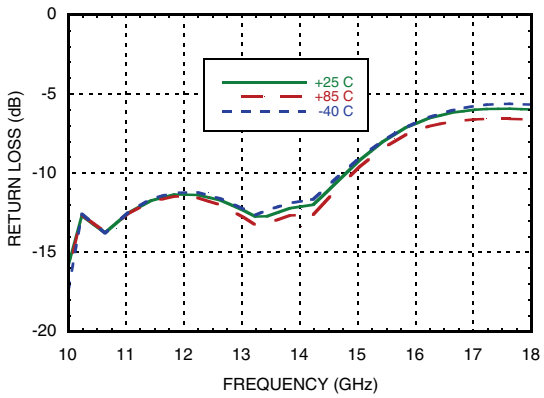
*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

RoHS✓ EARTH FRIENDLY

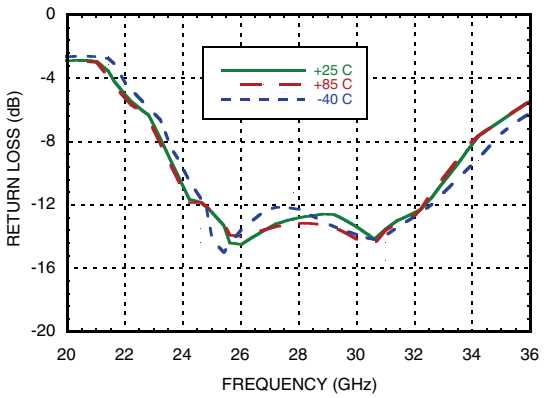
## SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 23 - 33 GHz



### Input Return Loss vs. Temperature




### Output Return Loss vs. Temperature




*Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.*

*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

# SMT GaAs MMIC x2 ACTIVE FREQUENCY MULTIPLIER, 23 - 33 GHz

## Absolute Maximum Ratings

| | |
|---|---|
| RF Input (Vdd = +5V) | +13 dBm |
| Supply Voltage (Vdd) | +6.0 Vdc |
| Channel Temperature | 175 °C |
| Continuous Pdiss (T= 85 °C) (derate 7.4 mW/°C above 85 °C) | 670 mW |
| Thermal Resistance (channel to ground paddle) | 135 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

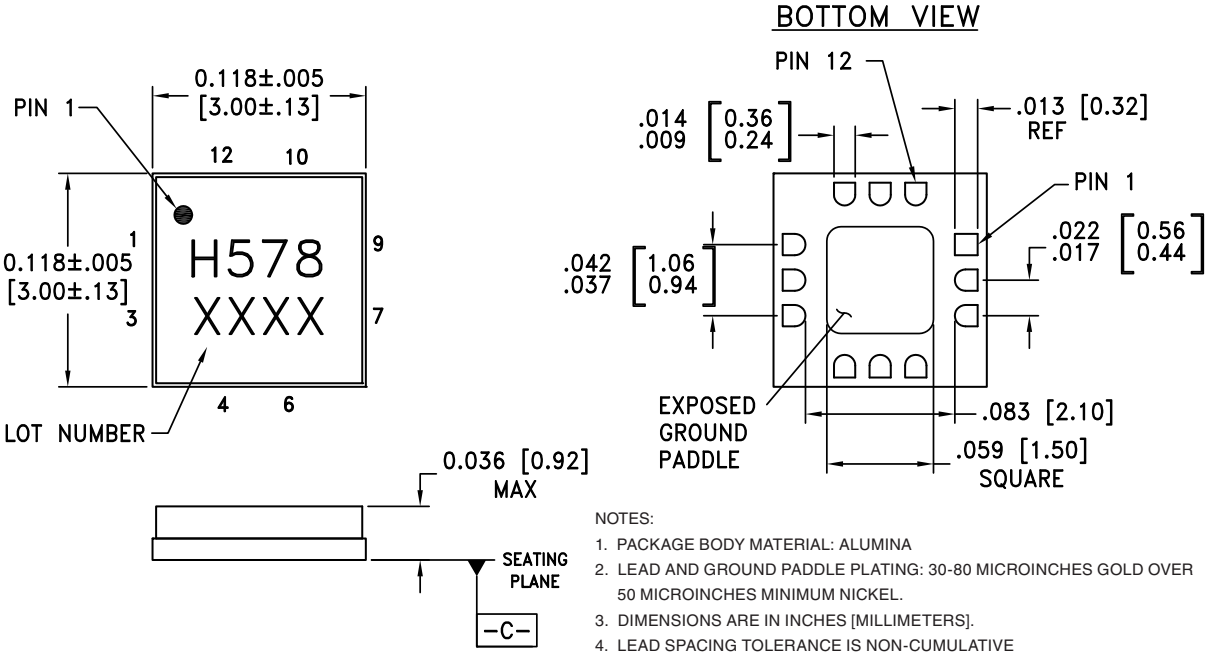
## Typical Supply Current vs. Vdd

| Vdd (Vdc) | Idd (mA) |
|---|---|
| 4.5 | 81 |
| 5.0 | 81 |
| 5.5 | 81 |

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

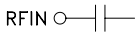
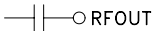
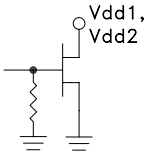
| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|---|---|---|---|---|
| HMC578LC3B | Alumina, White | Gold over Nickel | MSL3 [1] | H578<br>XXXX |

[1] Max peak reflow temperature of 260 °C
[2] 4-Digit lot number XXXX

*Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.*

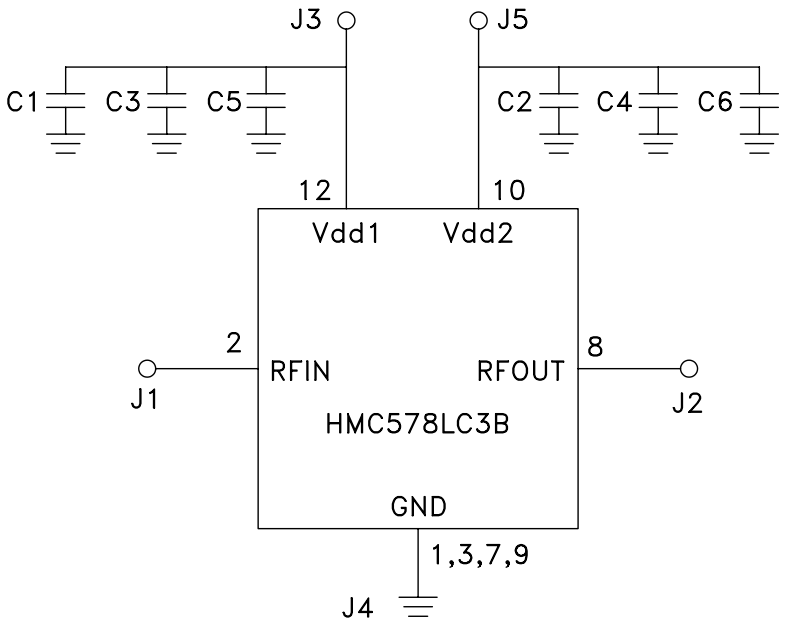
*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

## Pin Description

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 3, 7, 9 | GND | Package bottom must also be connected to RF/DC ground. |   |
| 2 | RFIN | Pin is AC coupled and matched to 50 Ohms. |   |
| 4 - 6, 11 | N/C | These pins are internally not connected; however, this product was specified with these pins connected to RF/ DC ground. | |
| 8 | RFOUT | Pin is AC coupled and matched to 50 Ohms. |   |
| 10, 12 | Vdd2, Vdd1 | Supply voltage 5V ± 0.5V. External bypass capacitors of 100 pF, 1,000 pF and 2.2 µF are required. |   |

## Application Circuit

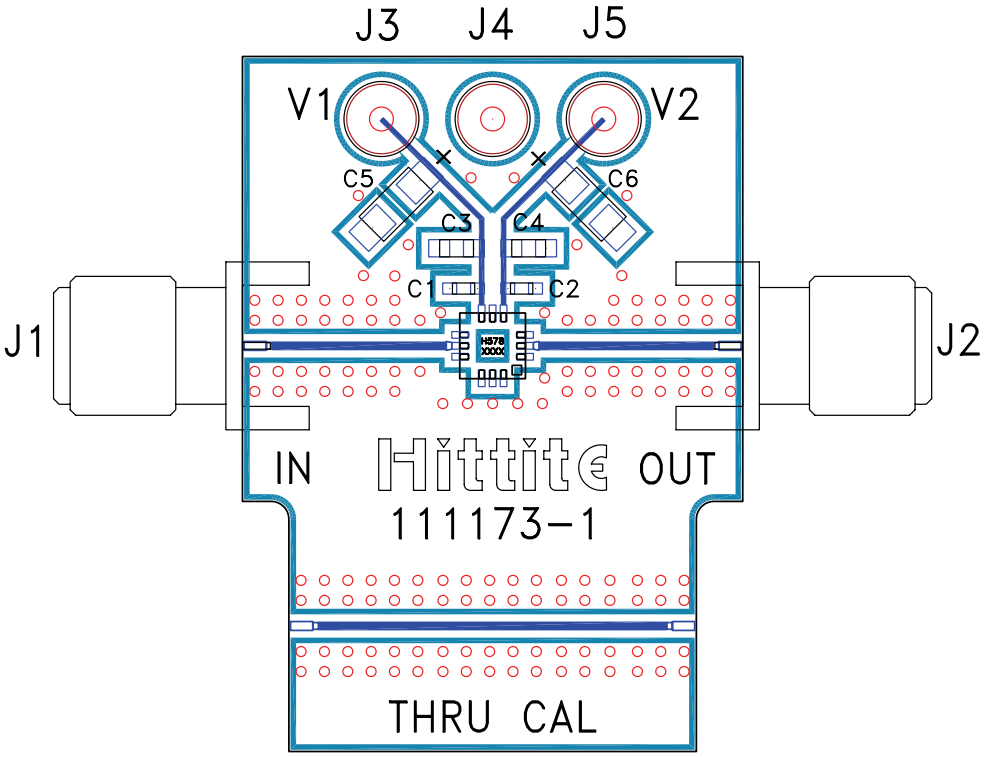
| Component | Value |
|---|---|
| C1, C2 | 100 pF |
| C3, C4 | 1,000 pF |
| C5, C6 | 2.2 µF |




Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

## Evaluation PCB




## List of Materials for Evaluation PCB 112409 [1]

| Item | Description |
|---|---|
| J1, J2 | PCB Mount SRI K Connector |
| J3 - J5 | DC Pin |
| C1, C2 | 100 pF Capacitor, 0402 Pkg. |
| C3, C4 | 1,000 pF Capacitor, 0603 Pkg. |
| C5, C6 | 2.2 µF Tantalum Capacitor |
| U1 | HMC578LC3B x2 Active Multiplier |
| PCB [2] | 111173 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.

*Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.*

*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*