



v02.1201

# HMC188MS8

## GaAs MMIC SMT PASSIVE FREQUENCY DOUBLER, 1.25 - 3.0 GHz INPUT

### Typical Applications

The HMC188MS8 is suitable for:

- Wireless Local Loop
- LMDS, VSAT, and Pt to Pt Radios
- UNII & HiperLAN
- Test Equipment

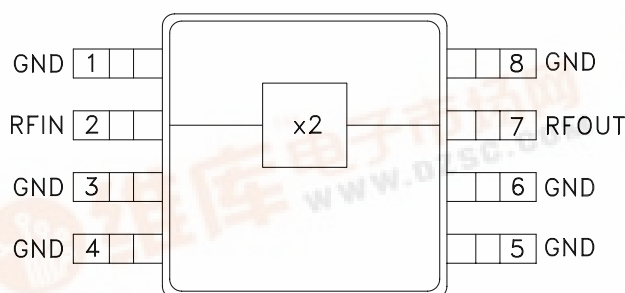
### Features

Conversion Loss: 15 dB

Fo, 3Fo, 4Fo Isolation: 45 dB

Input Drive Level: 10 to 20 dBm

### Functional Diagram



### General Description

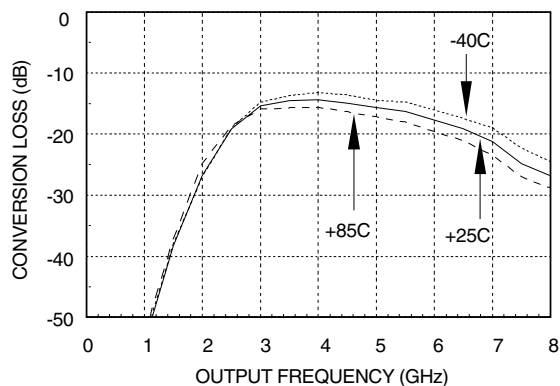
The HMC188MS8 is a miniature frequency doubler in a plastic 8-lead MSOP package. The suppression of undesired fundamental and higher order harmonics is 45 dB typical with respect to input signal levels. The doubler uses the same diode/balun technology used in Hittite MMIC mixers. The doubler is ideal for high volume applications where frequency doubling of a lower frequency is more economical than directly generating a higher frequency. The passive Schottky diode doubler technology contributes no measurable additive phase noise onto the multiplied signal.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , As a Function of Drive Level

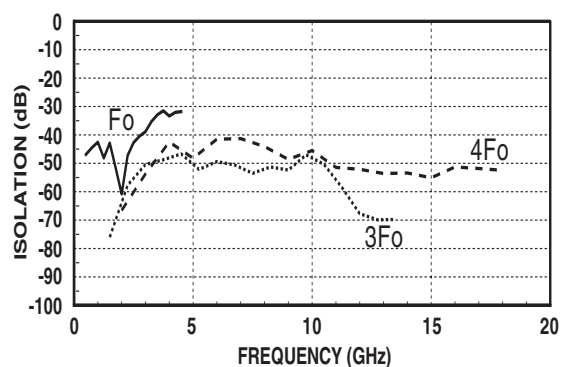
| Parameter                                      | Input = +10 dBm |      |      | Input = +15 dBm |      |      | Input = +20 dBm |      |      | Units |
|------------------------------------------------|-----------------|------|------|-----------------|------|------|-----------------|------|------|-------|
|                                                | Min.            | Typ. | Max. | Min.            | Typ. | Max. | Min.            | Typ. | Max. |       |
| Frequency Range, Input                         | 1.75 - 2.75     |      |      | 1.5 - 2.5       |      |      | 1.25 - 3.0      |      |      | GHz   |
| Frequency Range, Output                        | 3.5 - 5.5       |      |      | 3.0 - 5.0       |      |      | 2.5 - 6.0       |      |      | GHz   |
| Conversion Loss                                |                 | 19   | 22   |                 | 15   | 18   |                 | 16   | 19   | dB    |
| FO Isolation<br>(with respect to input level)  |                 |      |      | 35              | 45   |      |                 |      |      | dB    |
| 3FO Isolation<br>(with respect to input level) |                 |      |      | 43              | 50   |      |                 |      |      | dB    |
| 4FO Isolation<br>(with respect to input level) |                 |      |      | 38              | 45   |      |                 |      |      | dB    |

## GaAs MMIC SMT FREQUENCY DOUBLER, 1.25 - 3.0 GHz INPUT

**Conversion Loss @ +15 dBm Drive Level**

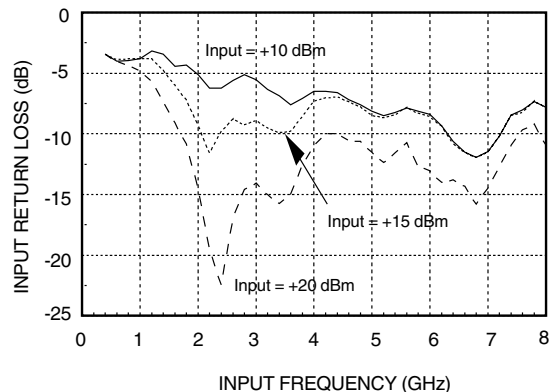


**Isolation @ +15 dBm Drive Level\***

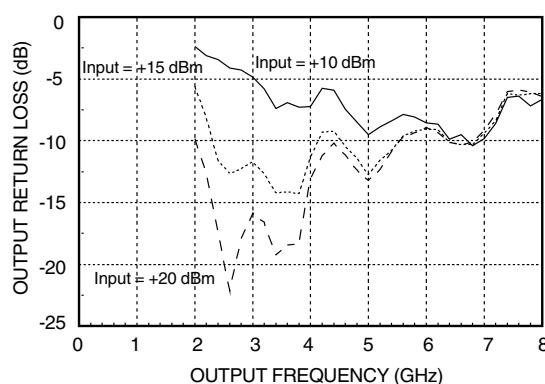


\*With respect to input level

**Input Return Loss vs. Drive Level**

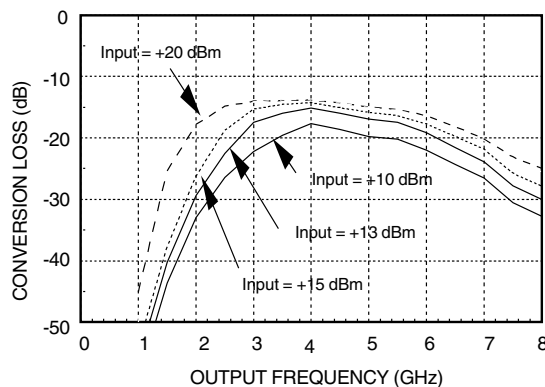


**Output Return Loss vs. Drive Level**



Note: Output return loss measured at 2f<sub>0</sub>, with +10dBm, +15 dBm, and +20 dBm drive levels on input of doubler.

**Conversion Loss vs. Drive Level**

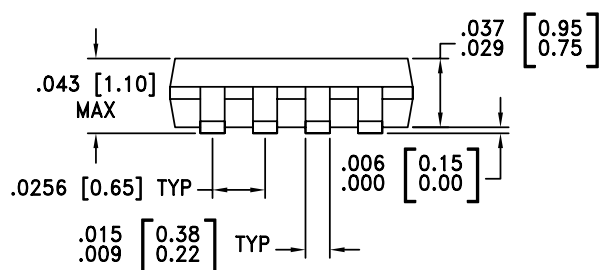
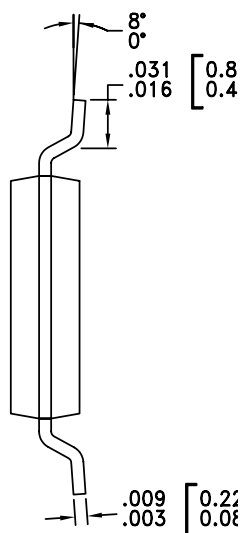
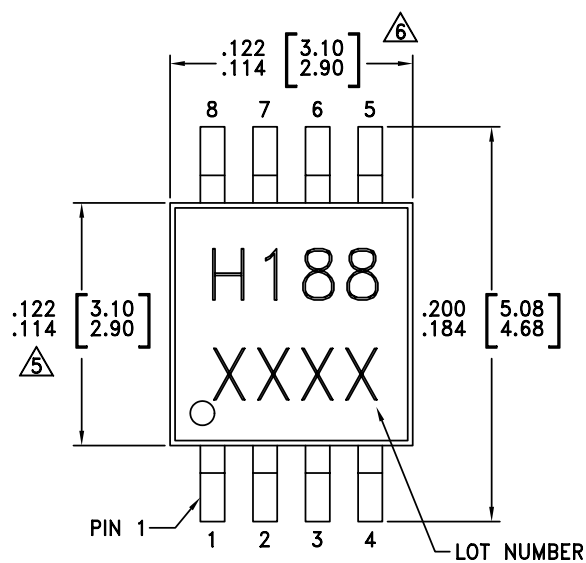


## GaAs MMIC SMT FREQUENCY DOUBLER, 1.25 - 3.0 GHz INPUT

### Absolute Maximum Ratings

|                       |                |
|-----------------------|----------------|
| Input Drive           | +27 dBm        |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C  |

### Outline Drawing

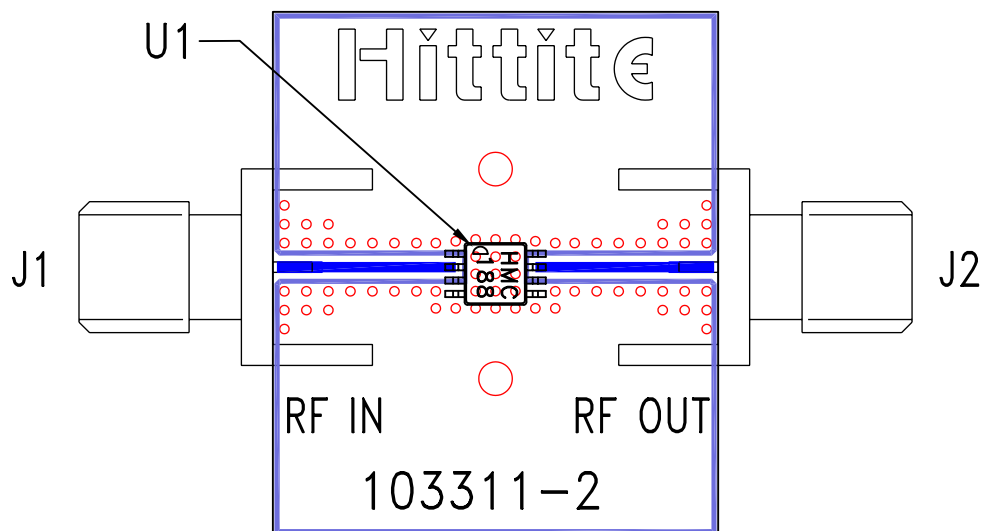


#### NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
- △ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15 mm PER SIDE.
- △ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25 mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB PF GROUND.

## *GaAs MMIC SMT FREQUENCY DOUBLER, 1.25 - 3.0 GHz INPUT*

### **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                                    | HMC443LP4, x4 Active Multiplier |
| PCB*                                  | 104610 Eval Board               |
| * Circuit Board Material: Rogers 4350 |                                 |