



## GaAs MMIC SMT PASSIVE FREQUENCY DOUBLER, 0.85 - 2.0 GHz INPUT

### Typical Applications

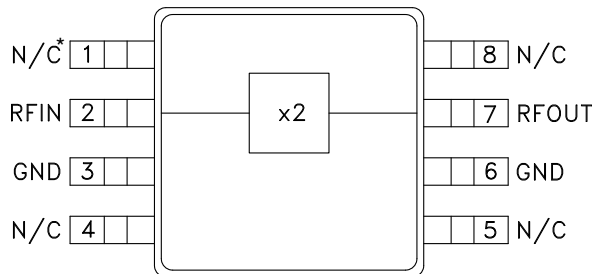
The HMC187AMS8(E) is ideal for:

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

### Features

- Conversion Loss: 15 dB
- Fo, 3Fo, 4Fo Isolation: 40 dB
- Input Drive Level: 10 to 20 dBm

### Functional Diagram



### General Description

The HMC187AMS8(E) is a miniature frequency doubler MMIC in plastic 8-lead MSOP package. The suppression of undesired fundamental and higher order harmonics is 40 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

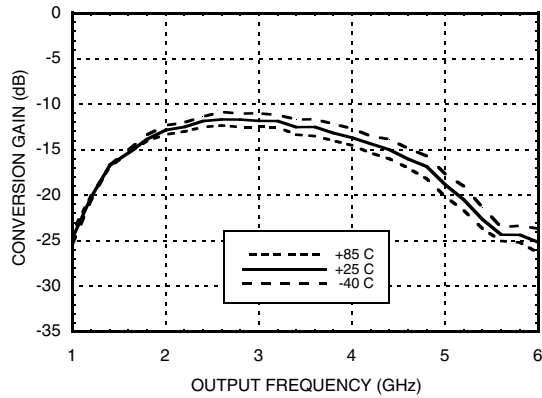
| Parameter                                      | Input = +10 dBm |      |      | Input = +15 dBm |      |      | Input = +20 dBm |      |      | Units |
|--|-----------------|------|------|-----------------|------|------|-----------------|------|------|-------|
|  | Min.            | Typ. | Max. | Min.            | Typ. | Max. | Min.            | Typ. | Max. |       |
| Frequency Range, Input                         | 1.25 - 1.75     |      |      | 1.0 - 1.75      |      |      | 0.85 - 2.0      |      |      | GHz   |
| Frequency Range, Output                        | 2.5 - 3.5       |      |      | 2.0 - 3.5       |      |      | 1.7 - 4.0       |      |      | GHz   |
| Conversion Loss                                |                 | 18   | 22   |                 | 14   | 17   |                 | 15   | 18   | dB    |
| FO Isolation<br>(with respect to input level)  |                 |      |      | 35              | 45   |      |                 |      |      | dB    |
| 3FO Isolation<br>(with respect to input level) |                 |      |      | 42              | 46   |      |                 |      |      | dB    |
| 4FO Isolation<br>(with respect to input level) |                 |      |      | 30              | 40   |      |                 |      |      | dB    |

\* N/C denotes no internal connection, however, it is recommended to connect these pins to ground.

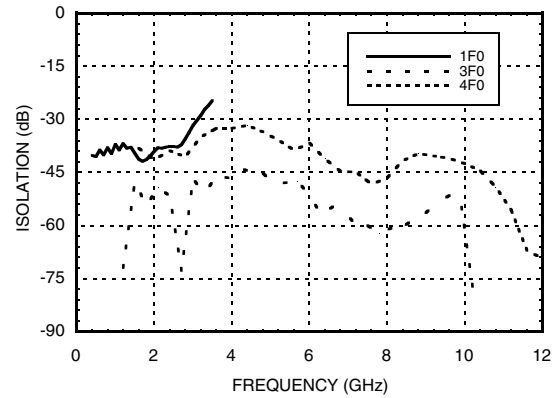


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**Conversion Gain @ +15 dBm Drive Level**

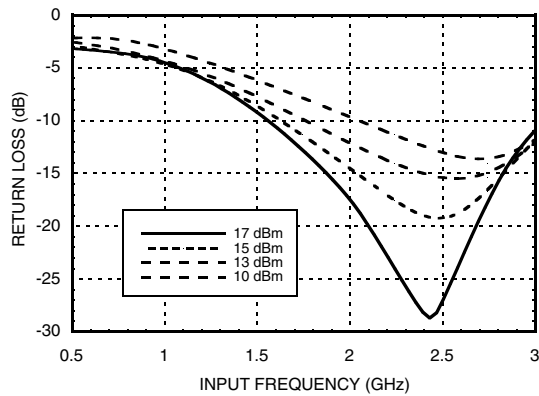


**Isolation @ +15 dBm Drive Level\***

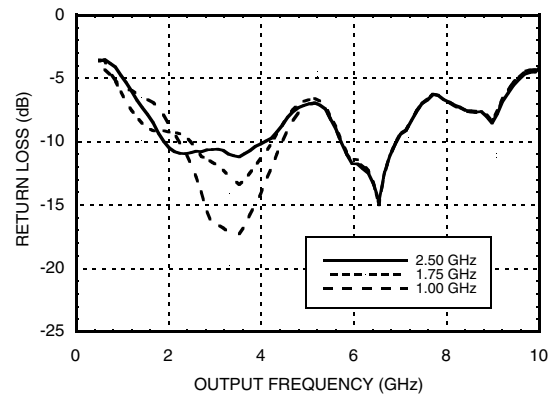


\*With respect to input level

**Input Return Loss vs. Drive Level**



**Output Return Loss  
for Several Input Frequencies**



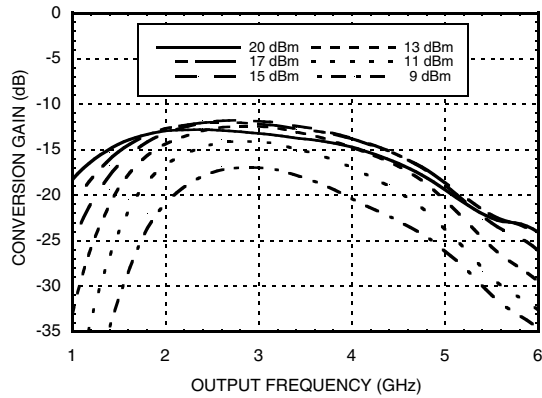
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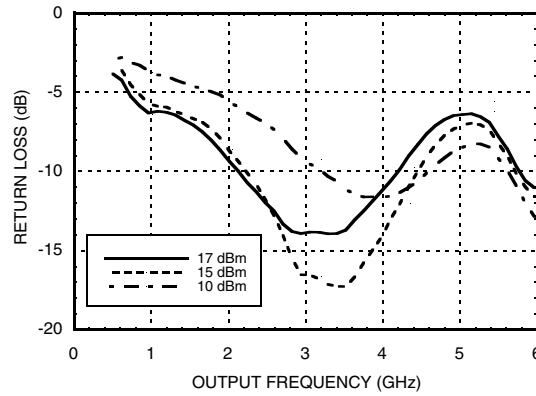


**GaAs MMIC SMT PASSIVE FREQUENCY DOUBLER, 0.85 - 2.0 GHz INPUT**

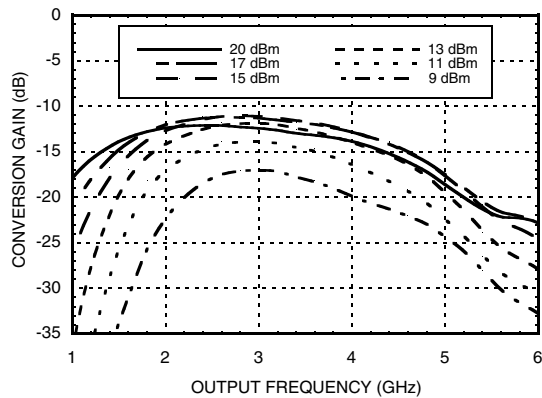
**Conversion Gain @ 25°C vs. Drive Level**



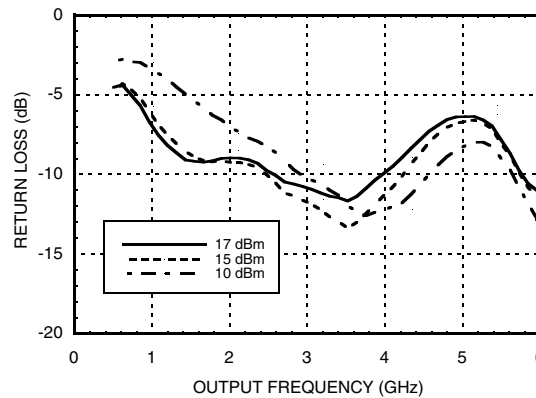
**Output Return Loss with 1 GHz Input**



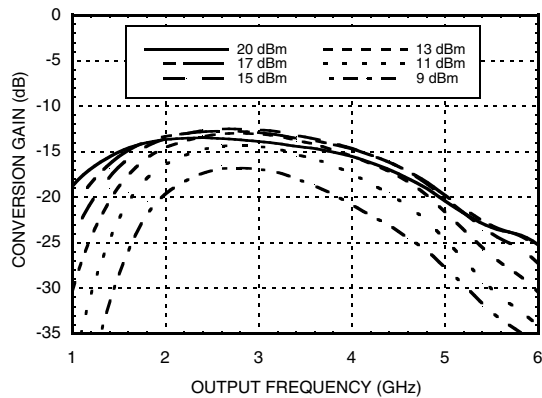
**Conversion Gain @ -40°C vs. Drive Level**



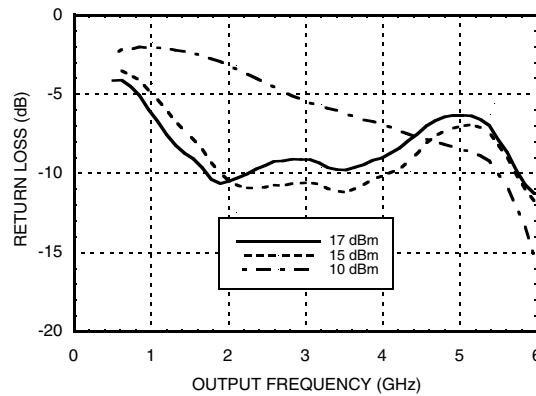
**Output Return Loss with 1.75 GHz Input**



**Conversion Gain @ +85°C vs. Drive Level**



**Output Return Loss with 2.5 GHz Input**



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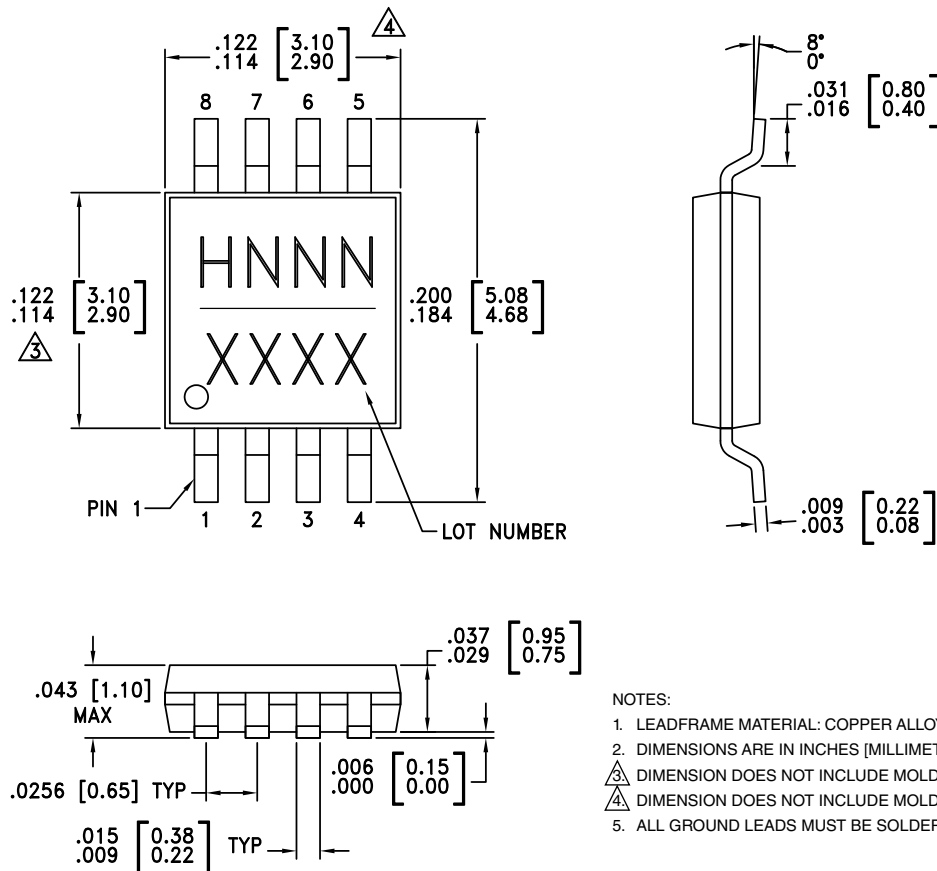
### Absolute Maximum Ratings

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



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



### Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC187AMS8  | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H187A<br>XXXX                  |
| HMC187AMS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | H187A<br>XXXX                  |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C


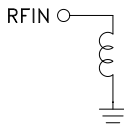
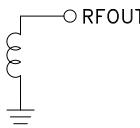
[3] 4-Digit lot number XXXX

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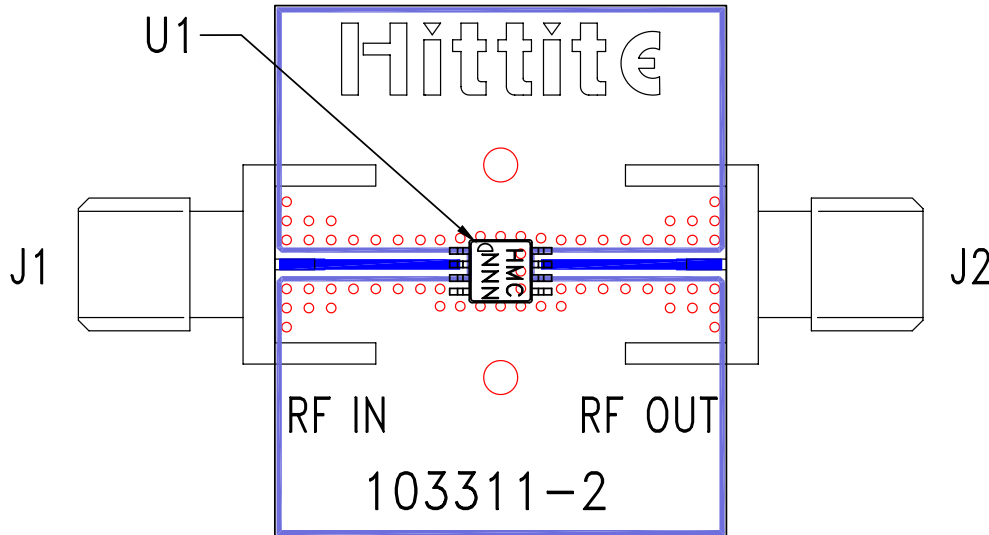
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**Pin Description**

| Pin Number | Function | Description  | Interface Schematic   |
|------------|----------|--|---|
| 1, 4, 5, 8 | N/C      | These pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. |   |
| 3, 6       | GND      | All ground leads must be soldered to PCB RF/DC ground.   |  |
| 2          | RFIN     | Pin is DC coupled and matched to 50 Ohms.  |  |
| 7          | RFOUT    | Pin is DC coupled and matched to 50 Ohms.  |  |



**Evaluation PCB**



**List of Materials for Evaluation PCB 103313 [1]**

| Item    | Description             |
|---------|-------------------------|
| J1, J2  | PCB Mount SMA Connector |
| U1      | HMC187AMS8(E) Doubler   |
| PCB [2] | 103311 Eval Board       |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the application should be generated with proper RF circuit design techniques. Signal lines should have 50 ohm impedance while the package N/C and ground leads should be connected directly to the ground plane similar to that shown. The evaluation circuit board shown is available from Hittite upon request.