

# HMC208MS8 / 208MS8E

## GaAs MMIC SMT DOUBLE-BALANCED MIXER, 0.7 - 2.0 GHz

### Typical Applications

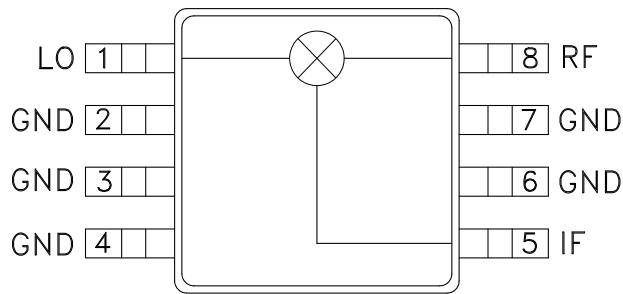
The HMC208MS8 / HMC208MS8E is ideal for:

- Base Stations
- PCMCIA Transceivers
- Cable Modems
- Portable Wireless

### Features

Ultra Small Package: MSOP8  
Conversion Loss: 9 dB  
LO / RF Isolation: 24 dB  
Input IP3: +17 dBm

### Functional Diagram



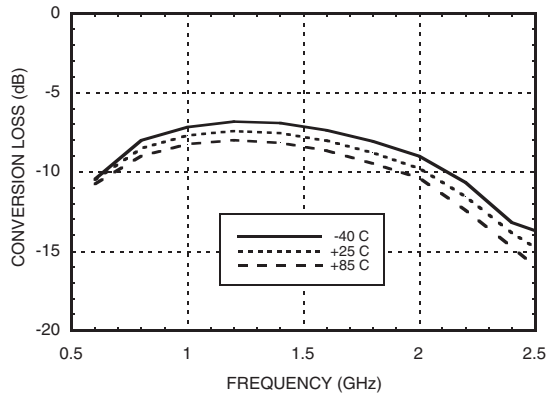
### General Description

The HMC208MS8 & HMC208MS8E are ultra miniature double-balanced mixers in 8 lead plastic surface mount packages (MSOP). This passive MMIC mixer is constructed of GaAs Schottky diodes and novel planar transformer baluns on the chip. The device can be used as an upconverter, downconverter, biphase (de)modulator, or phase comparator. The consistent MMIC performance will improve system operation and assure regulatory compliance.

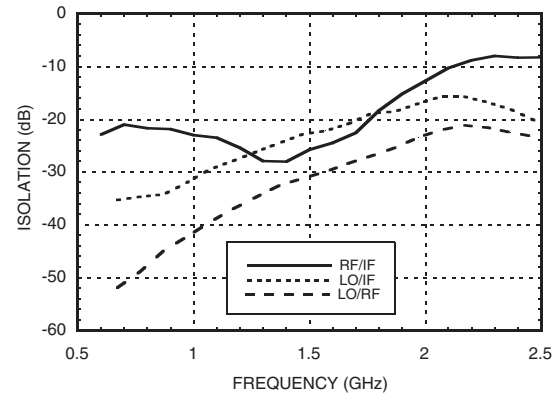
### Electrical Specifications, $T_A = +25^\circ \text{C}$ , As a Function of LO Drive

| Parameter                     | LO = +13 dBm<br>IF = 70 MHz |      |      | LO = +10 dBm<br>IF = 70 MHz |      |      | Units |
|-------------------------------|-----------------------------|------|------|-----------------------------|------|------|-------|
|                               | Min.                        | Typ. | Max. | Min.                        | Typ. | Max. |       |
| Frequency Range, RF & LO      | 0.7 - 2.0                   |      |      | 0.8 - 1.2                   |      |      | GHz   |
| Frequency Range, IF           | DC - 0.5                    |      |      | DC - 0.5                    |      |      | GHz   |
| Conversion Loss               |                             | 9    | 10.5 |                             | 8.5  | 10.5 | dB    |
| Noise Figure (SSB)            |                             | 9    | 10.5 |                             | 8.5  | 10.5 | dB    |
| LO to RF Isolation            | 20                          | 24   |      | 32                          | 40   |      | dB    |
| LO to IF Isolation            | 13                          | 17   |      | 22                          | 30   |      | dB    |
| RF to IF Isolation            | 10                          | 14   |      | 17                          | 22   |      | dB    |
| IP3 (Input)                   | 13                          | 17   |      | 12                          | 16   |      | dBm   |
| 1 dB Gain Compression (Input) | 7                           | 10   |      | 5                           | 8    |      | dBm   |

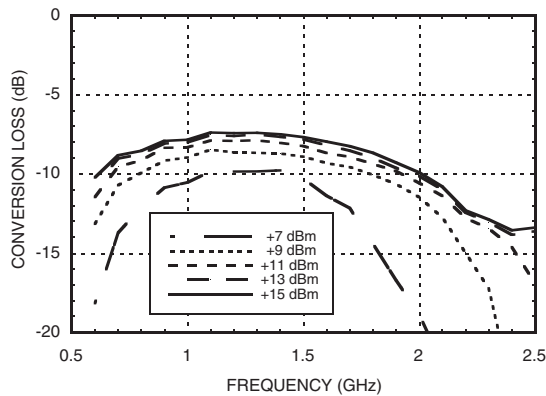
**Conversion Loss vs Temperature @ LO = +13 dBm**



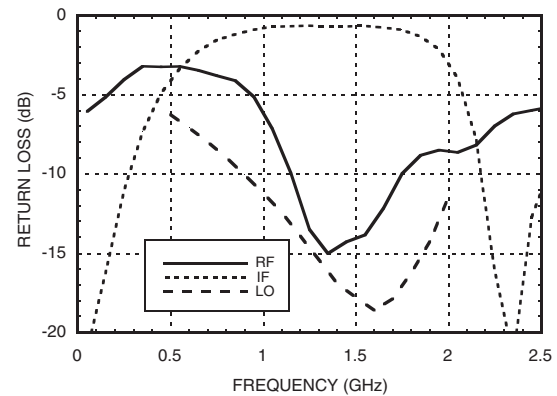
**Isolation @ LO = +13 dBm**



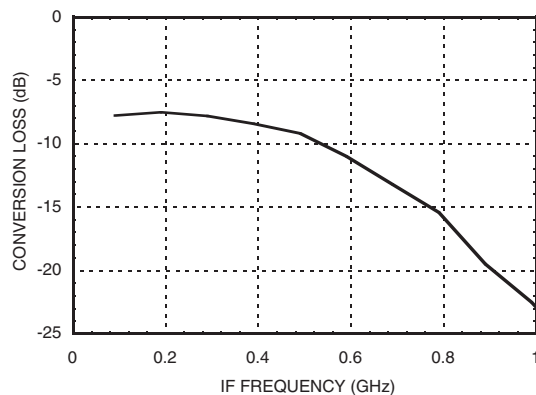
**Conversion Loss vs. LO Drive**



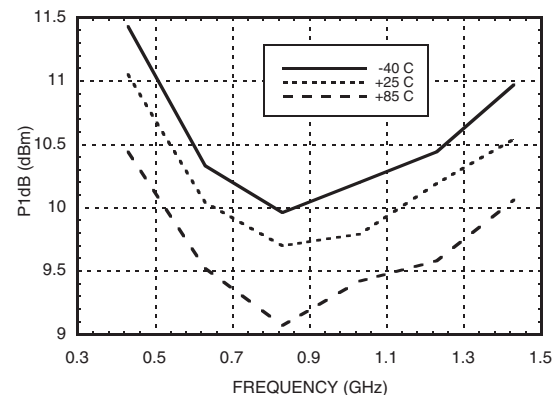
**Return Loss @ LO = +13 dBm**



**IF Bandwidth @ LO = +13 dBm**



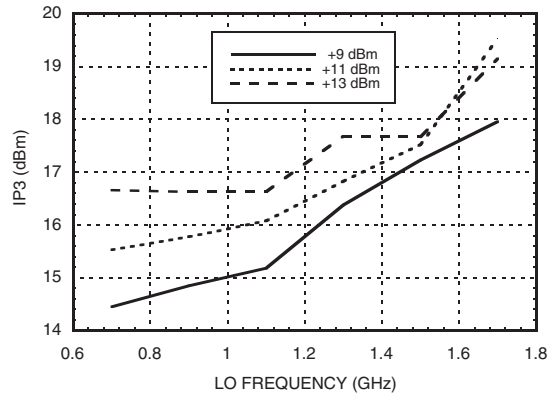
**P1dB vs. Temperature @ LO = +13 dBm**



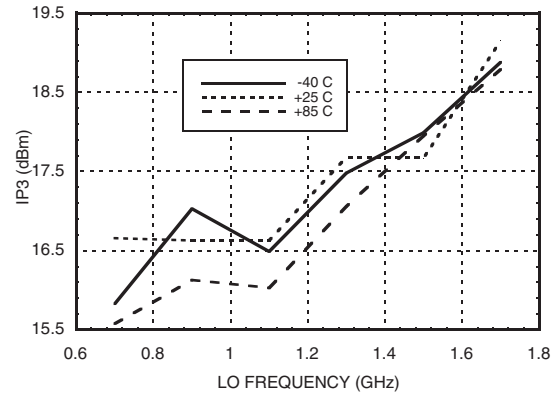
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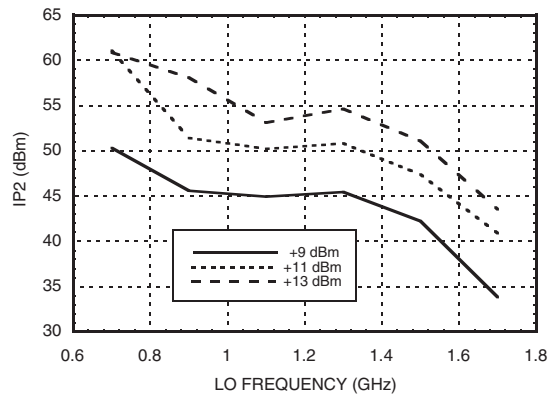
**Input IP3 vs. LO Drive**



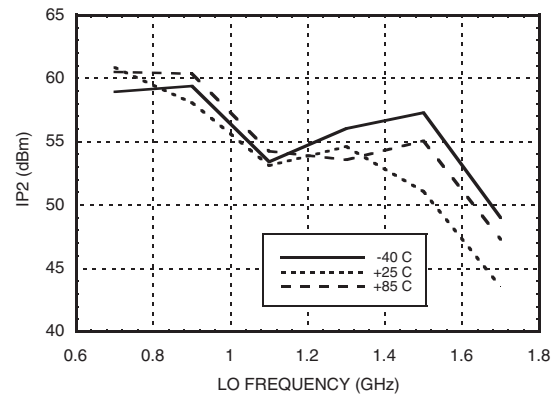
**Input IP3 vs. Temperature @ LO = +13 dBm**



**Input IP2 vs. LO Drive**



**Input IP2 vs. Temperature @ LO = +13 dBm**



**MxN Spurious Outputs**

| mRF | nLO  |      |      |     |      |
|-----|------|------|------|-----|------|
|     | 0    | 1    | 2    | 3   | 4    |
| 0   | xx   | 2    | 25   | 17  | 45   |
| 1   | 16   | 0    | 52   | 38  | 27   |
| 2   | 60   | 55   | 72   | 62  | 77   |
| 3   | 65   | 96   | 88   | 64  | 91   |
| 4   | >105 | >105 | >105 | 100 | >105 |

RF = 0.9 GHz @ -10 dBm  
LO = 0.97 GHz @ +13 dBm  
All values in dBc relative to the IF

**Harmonics of LO**

| LO Freq. (GHz) | nLO Spur at RF Port |    |    |    |
|----------------|---------------------|----|----|----|
|                | 1                   | 2  | 3  | 4  |
| 0.7            | 50                  | 40 | 47 | 61 |
| 0.9            | 46                  | 54 | 56 | 71 |
| 1.1            | 39                  | 54 | 51 | 72 |
| 1.3            | 34                  | 53 | 51 | 90 |
| 1.5            | 31                  | 50 | 65 | 87 |
| 1.7            | 28                  | 50 | 72 | 82 |

LO = +13 dBm  
Values in dBc below input LO level measured at RF Port.

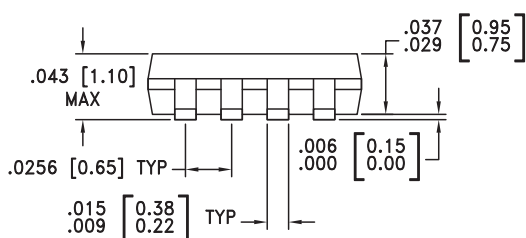
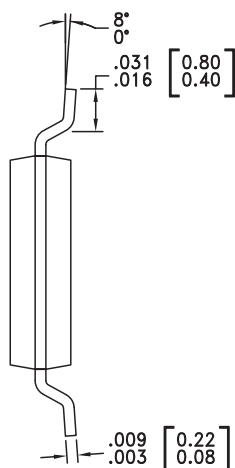
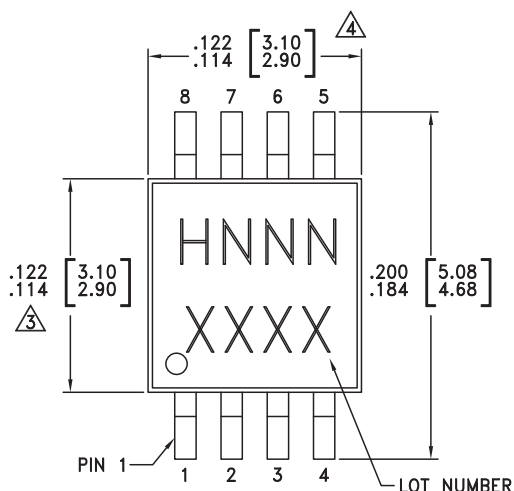
### Absolute Maximum Ratings

|                       |                |
|-----------------------|----------------|
| RF / Input            | +13 dBm        |
| LO Drive              | +27 dBm        |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C  |
| ESD Sensitivity (HBM) | Class 1A       |



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



#### NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
- △ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
- △ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC208MS8   | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H208<br>XXXX                   |
| HMC208MS8E  | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | <u>H208</u><br>XXXX            |

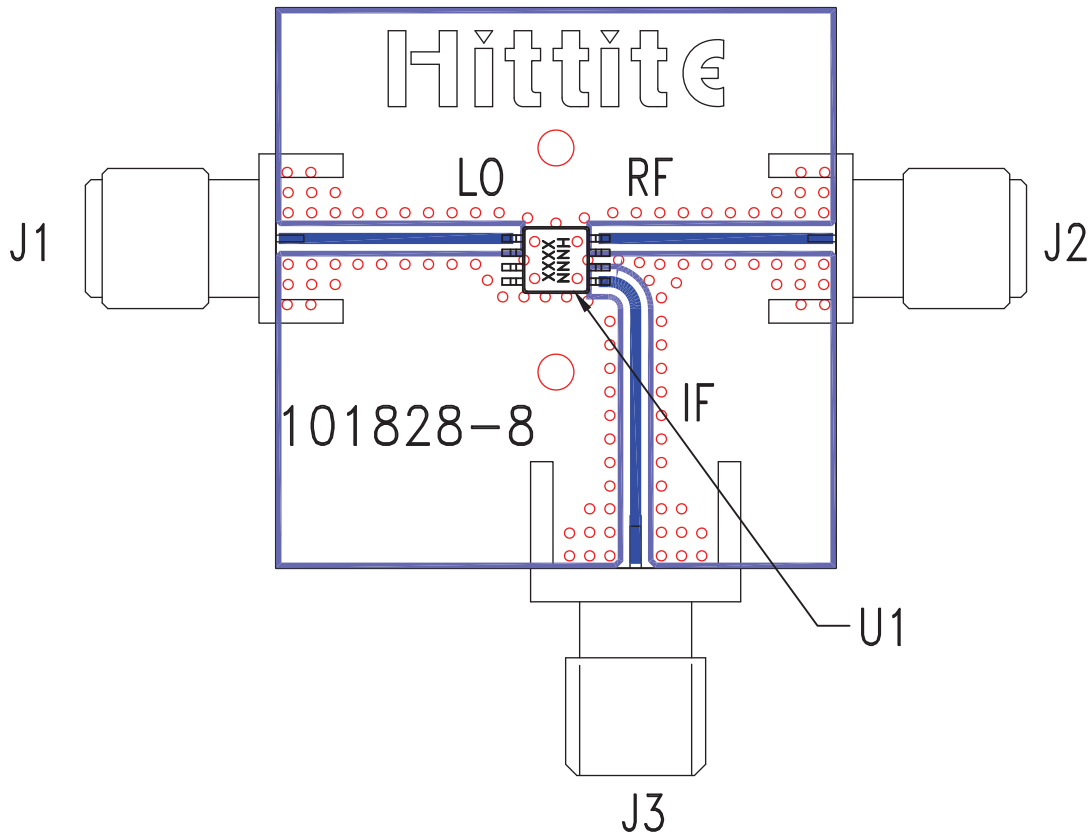
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:  
20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373  
Order On-line at [www.hittite.com](http://www.hittite.com)

### Evaluation PCB



### List of Materials for Evaluation PCB 101830 <sup>[1]</sup>

| Item    | Description                  |
|---------|------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector   |
| U1      | HMC208MS8 / HMC208MS8E Mixer |
| PCB [2] | 101828 Evaluation 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 use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads 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.



MICROWAVE CORPORATION

v02.0705



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### Notes: