

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

FEBRUARY 2000

### 900 MHz Performance

ULTRA SMALL PACKAGE: MSOP8

CONVERSION LOSS: 8 dB

LO/RF ISOLATION: 42 dB

IP3 (INPUT) : +17 dBm

### General Description

The HMC208MS8 is an ultra miniature double-balanced mixer in an 8 lead plastic surface mount Mini Small Outline Package (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 a up, or downconverter, bi-phase (de)modulator or phase comparator for 900, 1500, or 1900 MHz applications. It is especially suited for miniature basestations, PCMCIA transceivers, cable modems, and portable wireless applications because of its high dynamic input signal range, small size, and zero DC bias requirement. The consistent MMIC performance will improve system operation and assure regulatory compliance. The MSOP8 package is the smallest footprint available for a complete double-balanced mixer, 0.118" x 0.190" (3.0mm x 4.9mm). At a height of 0.040" (1.0mm) this is the *thinnest* mixer package available today.



### Guaranteed Performance As a Function of LO Drive , -40 to +85 deg C

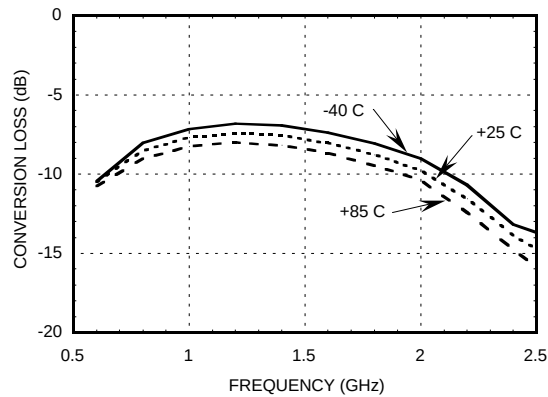
| Parameter                     | LO = +13 dBm<br>IF = 70 MHz |           |      | LO = +10 dBm<br>IF = 70 MHz |           |      | Units |
|-------------------------------|-----------------------------|-----------|------|-----------------------------|-----------|------|-------|
|                               | 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   |
| Local Oscillator Drive Level  | 8                           |           | 17   | 8                           |           | 17   | dBm   |



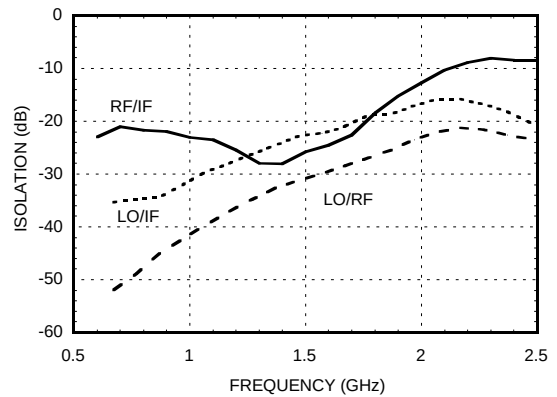
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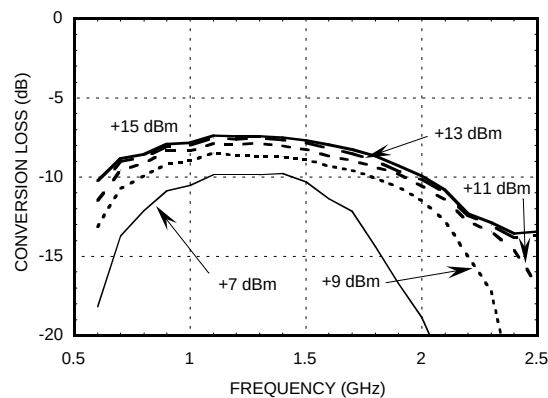
**Conversion Loss vs.  
Temperature @ LO = +13 dBm**



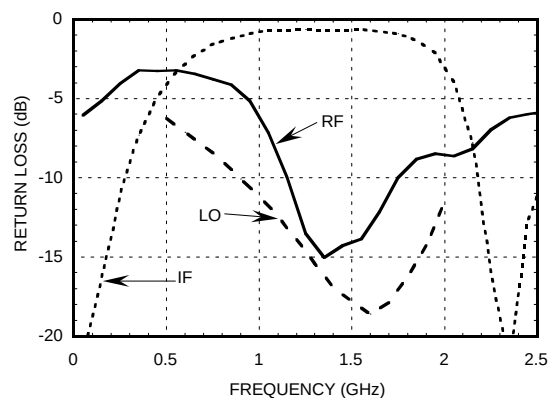
**Isolation @ LO = +13 dBm**



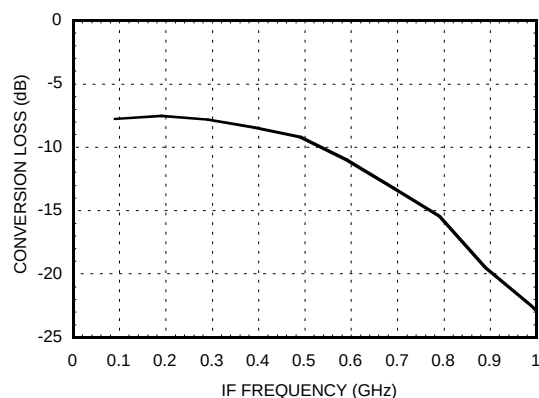
**Conversion Loss vs. LO Drive**



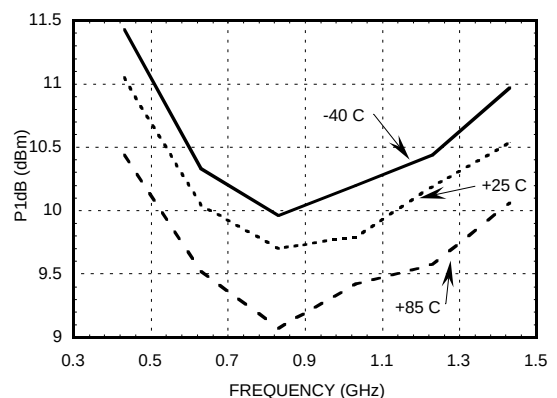
**Return Loss @ LO = +13 dBm**



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



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



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MIXERS

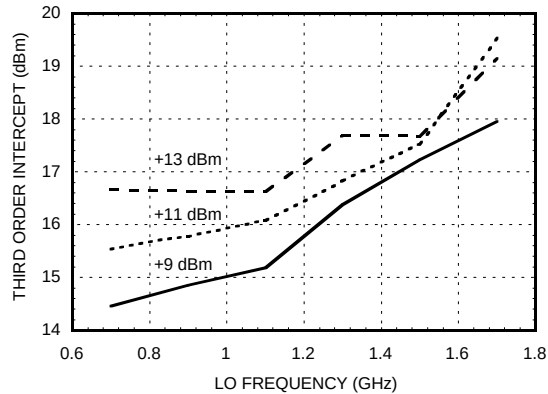
SMT



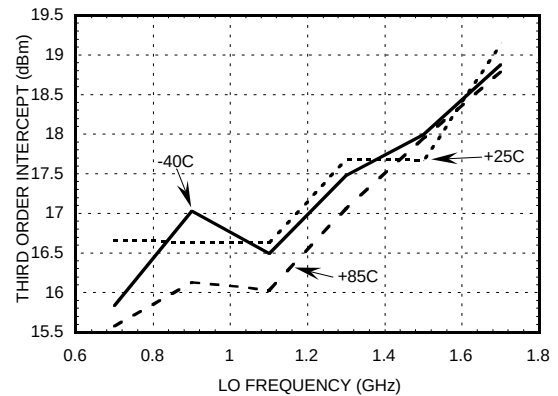
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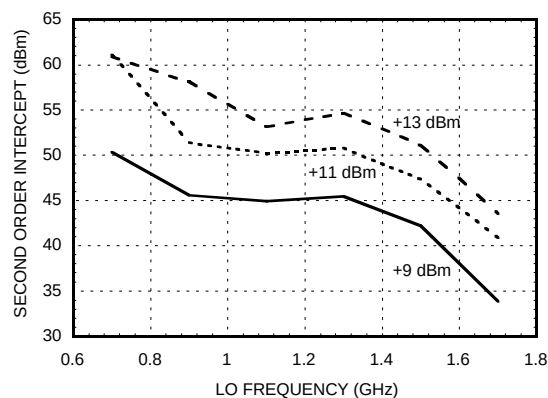
### Input IP3 vs. LO Drive



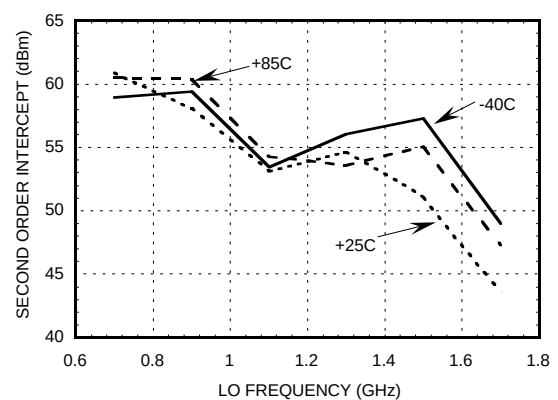
### Input IP3 vs. Temperature @ LO = +13 dBm



### 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

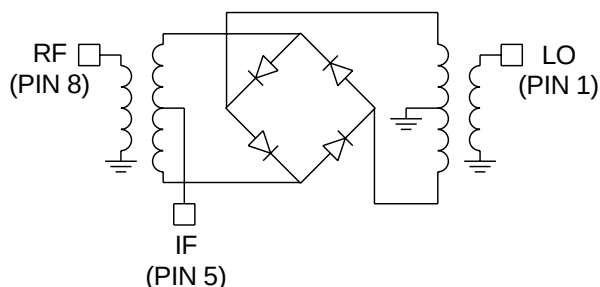
| LO Frequency (GHz) | nLO Spur at RF Port |    |    |    |
|--------------------|---------------------|----|----|----|
|                    | 1                   | 2  | 3  | 4  |
| 0.7                | 50                  | 40 | 47 | 61 |
| 0.9                | 46                  | 54 | 56 | 71 |
| 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 the RF port

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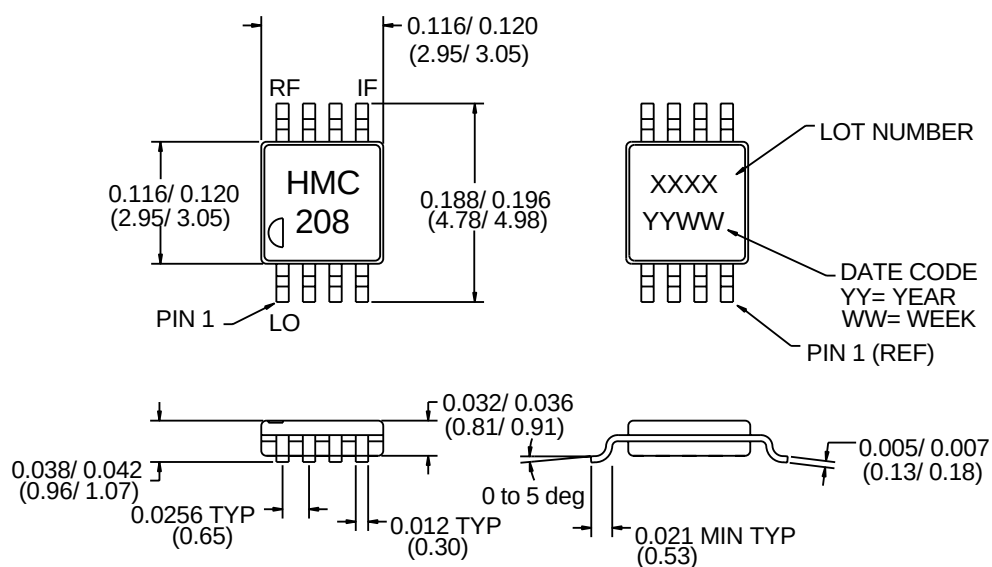
### Schematic



### Absolute Maximum Ratings

|                       |                   |
|-----------------------|-------------------|
| RF / IF Input         | +13 dBm           |
| LO Drive              | +27 dBm           |
| Storage Temperature   | -65 to +150 deg C |
| Operating Temperature | -55 to +85 deg C  |

### Outline Drawing



- MATERIAL:
  - PACKAGE BODY - LOW STRESS INJECTION-MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED.
  - LEADFRAME MATERIAL: COPPER ALLOY
- PLATING: LEAD-TIN SOLDER PLATE
- DIMENSIONS ARE IN INCHES (MILLIMETERS), UNLESS OTHERWISE SPECIFIED TOL. ARE  $\pm 0.005$  ( $\pm 0.13$ )
- ALL UNLABELED LEADS ARE GROUND

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