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Typical Applications

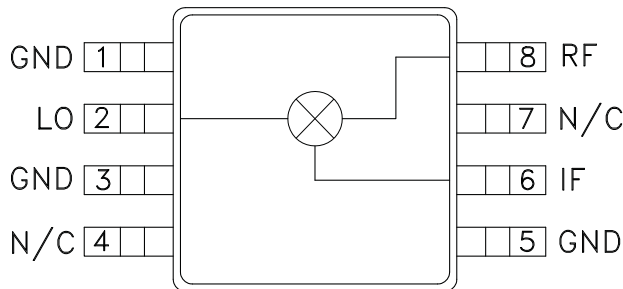
The HMC304MS8 / HMC304MS8E is ideal for:

- PCS & 3G
- 2.4 GHz ISM
- MMDS

Features

- High Dynamic Range: +30 dBm IIP3
- No External Components or Bias Required
- LO/RF Isolation: 30 dB
- Ultra Small MSOP8 Package: 14.8 mm²

Functional Diagram



General Description

The HMC304MS8 & HMC304MS8E are passive high IP3 mixers in 8 lead plastic surface mount Mini Small Outline Packages (MSOP). This miniature single balanced MMIC mixer is constructed of GaAs Schottky diodes and novel planar transformer baluns on the chip while not requiring any external components. The RF port is balanced via the MMIC balun while the LO port is connected directly to the diodes. LO isolations are typically 20 to 30 dB. Excellent input IP3 performance of +27 to +32 dBm make the HMC304MS8(E) ideal for high dynamic range applications.

Electrical Specifications*, $T_A = +25^\circ\text{C}$

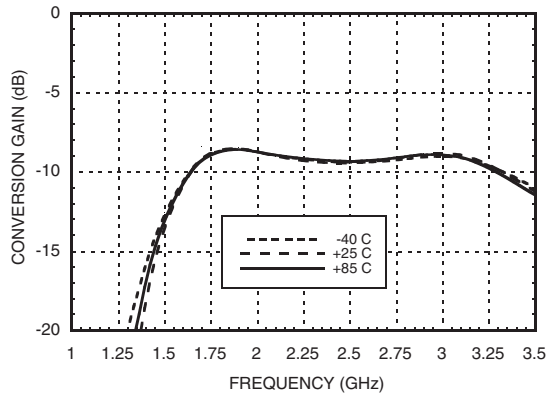
| Parameter | LO = +17 dBm IF = 100 MHz | | | LO = +17 dBm IF = 100 MHz | | | Units |
|-------------------------------|------------------------------|------|------|------------------------------|------|------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 1.7 - 3.0 | | | 2.2 - 2.7 | | | GHz |
| Frequency Range, IF | DC - 0.8 | | | DC - 0.8 | | | GHz |
| Conversion Loss | | 9 | 11 | | 9 | 10.5 | dB |
| Noise Figure (SSB) | | 9 | 11 | | 9 | 10.5 | dB |
| LO to RF Isolation | 20 | 30 | | 23 | 32 | | dB |
| LO to IF Isolation | 12 | 20 | | 17 | 25 | | dB |
| IP3 (Input) | 25 | 30 | | 27 | 32 | | dBm |
| 1 dB Gain Compression (Input) | 15 | 19 | | 18 | 19.5 | | dBm |

*Specifications are for downconverter performance. Similar results are achieved when using mixer as an upconverter with a resulting input IP3 of 5dB less.

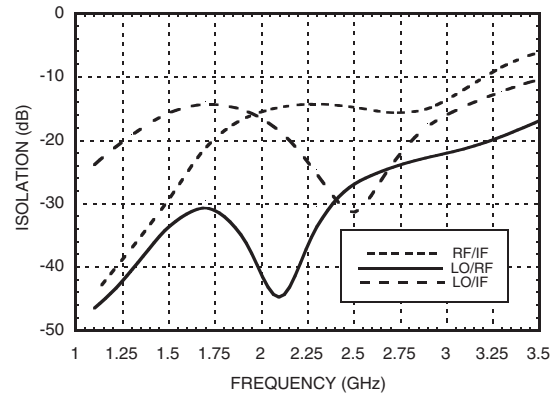


GaAs MMIC HIGH IP3 SINGLE-BALANCED SMT MIXER, 1.7 - 3 GHz

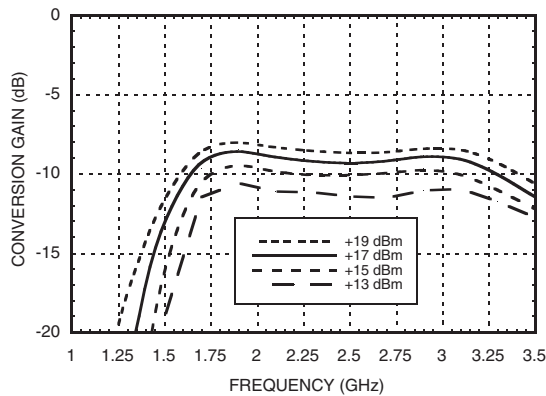
Conversion Gain vs. Temperature @ LO = +17 dBm



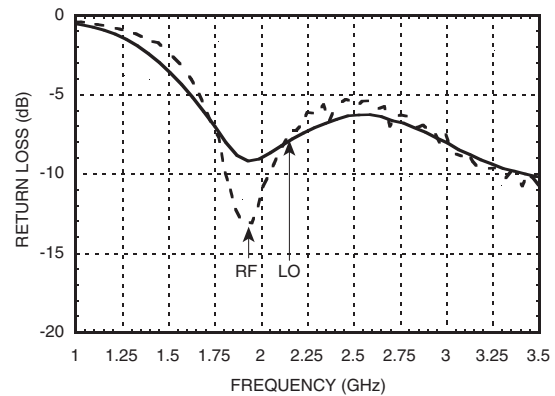
Isolation @ LO = +17 dBm



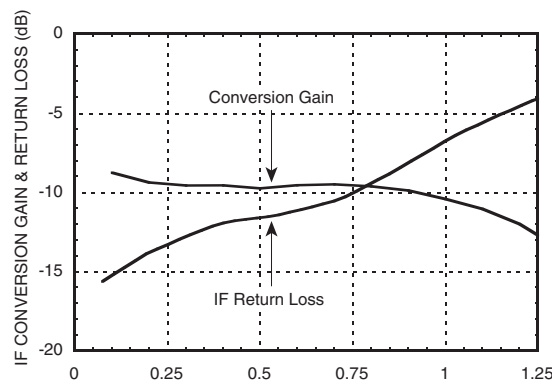
Conversion Gain vs. LO Drive



Return Loss @ LO = +17 dBm



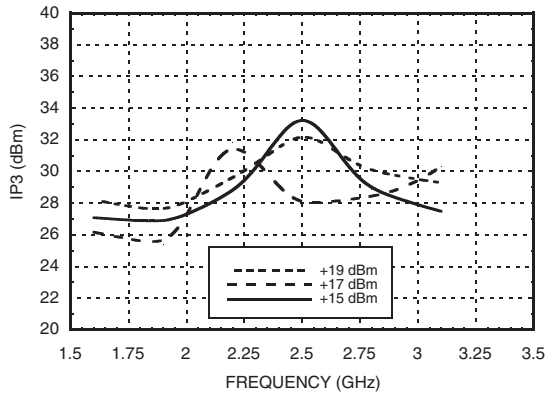
If Bandwidth @ LO = +17 dBm



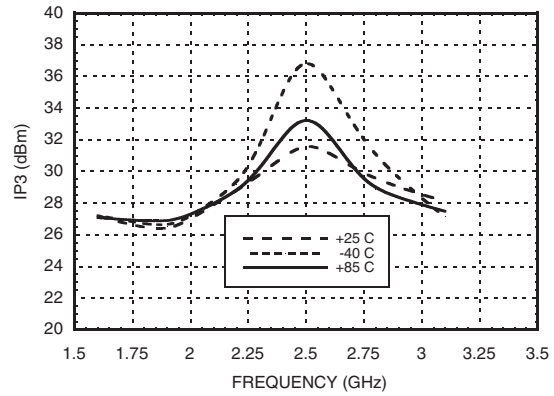


GaAs MMIC HIGH IP3 SINGLE-BALANCED SMT MIXER, 1.7 - 3 GHz

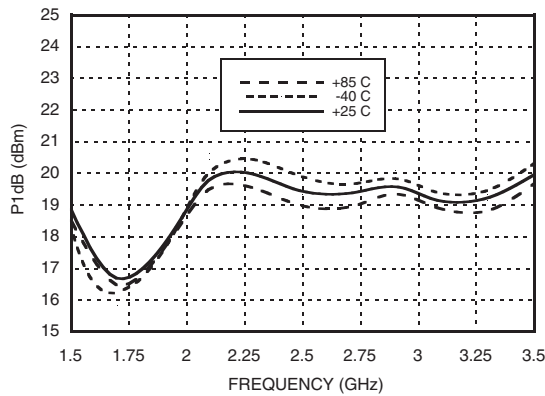
Input IP3 vs. LO Drive



Input IP3 vs. Temperature @ LO = +17dBm



P1dB vs. Temperature @ LO = +17 dBm



MxN Spurious Outputs

| mRF | nLO | | | | |
|-----|------|------|------|------|------|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | -20 | -11 | 2 | 7 |
| 1 | 10 | 0 | 32 | 29 | 31 |
| 2 | 50 | 61 | 62 | 52 | 59 |
| 3 | 89 | 90 | 93 | 85 | 81 |
| 4 | >107 | >107 | >107 | >107 | >107 |

RF = 2 GHz @ -10 dBm
 LO = 1.9 GHz @ +17 dBm
 All values in dBc relative to the IF power level.

Harmonics of LO

| LO Frequency (GHz) | nLO Spur at RF Port | | | |
|--------------------|---------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| 1.5 | 34 | 18 | 32 | 49 |
| 1.9 | 34 | 18 | 32 | 48 |
| 2.3 | 32 | 22 | 36 | 58 |
| 2.7 | 25 | 26 | 39 | 73 |
| 3.1 | 23 | 29 | 35 | 64 |
| 3.6 | 17 | 31 | 36 | 57 |

LO = +17 dBm
 Values in dBc below input LO level measured at the RF port.

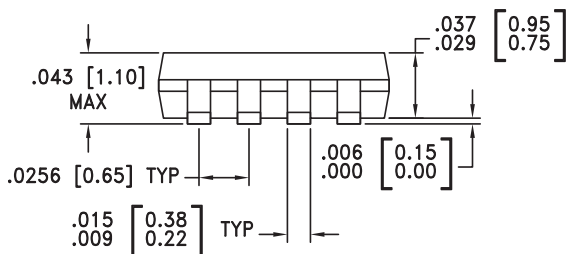
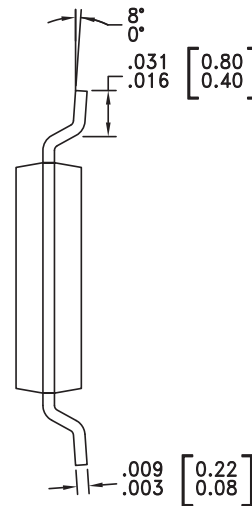
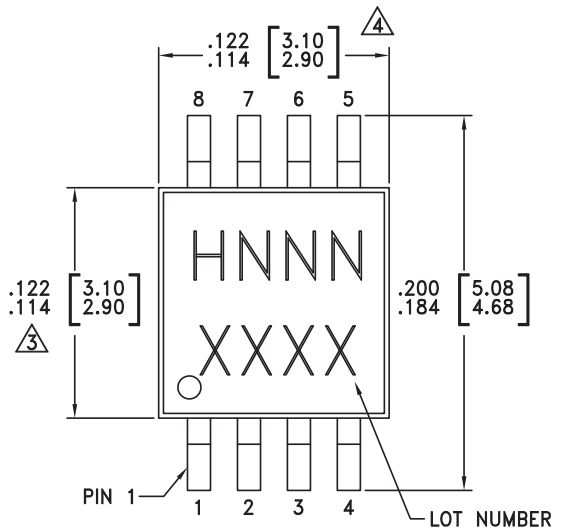
Absolute Maximum Ratings

| | |
|-------------------------|----------------|
| RF / IF Input | +27 dBm |
| LO Drive | +27 dBm |
| DC Current into IF Port | ±9 mA |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. 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 ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC304MS8 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H304 XXXX |
| HMC304MS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H304 XXXX |

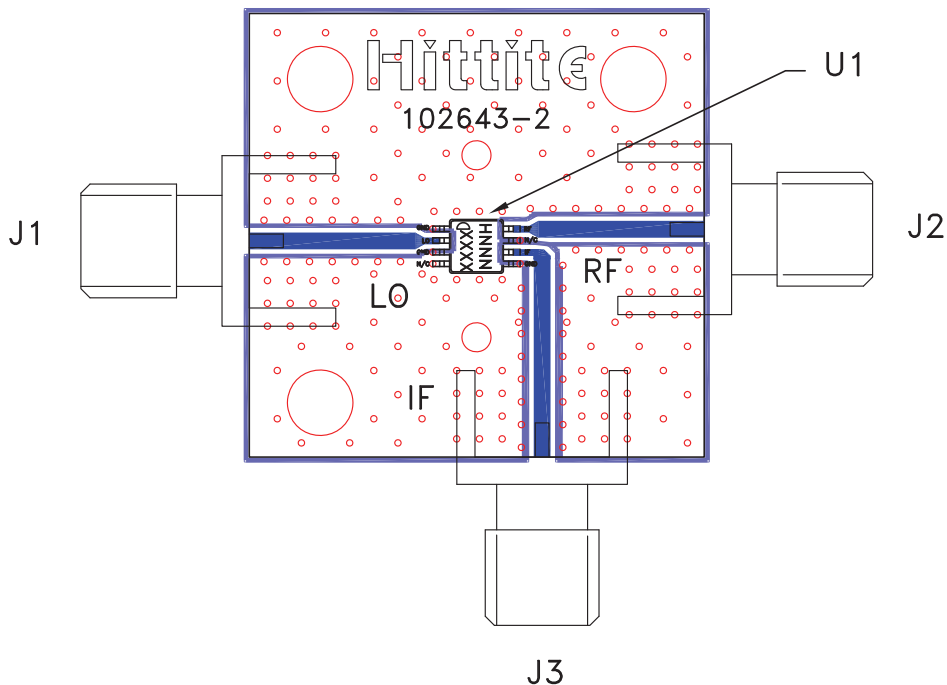
[1] Max peak reflow temperature of 235 °C

[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

Recommended PCB Layout



List of Materials for Evaluation PCB 102781 [1]

| Item | Description |
|------------|------------------------------|
| J1, J2, J3 | PCB Mount SMA RF Connector |
| U1 | HMC304MS8 / HMC304MS8E Mixer |
| PCB [2] | 102643 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 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 below. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board as shown is available from Hittite upon request.



HMC304MS8 / 304MS8E

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Notes: