

### Typical Applications

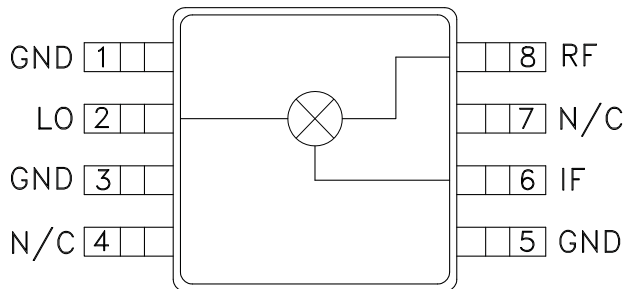
The HMC304MS8 / HMC304MS8E is ideal for:

- 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 mm<sup>2</sup>

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

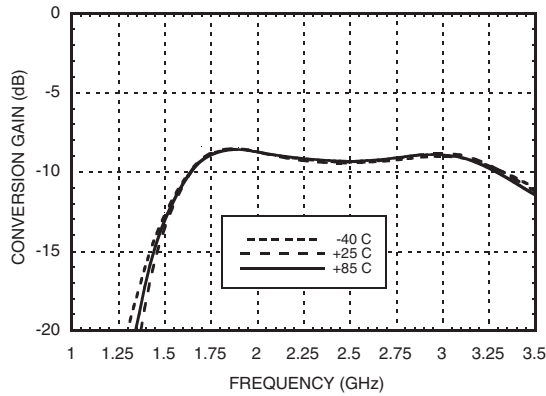
Parameter	LO = +17 dBm IF = 100 MHz			LO = +17 dBm IF = 100 MHz			Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range, RF & LO	1.7 - 3.0			2.2 - 2.7			GHz
Frequency Range, IF	DC - 0.8			DC - 0.8			GHz
Conversion Loss		9	11		9	10.5	dB
Noise Figure (SSB)		9	11		9	10.5	dB
LO to RF Isolation	20	30		23	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.

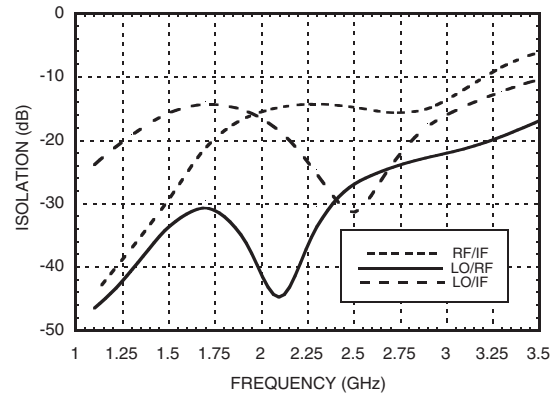


**GaAs MMIC HIGH IP3 SINGLE-BALANCED SMT MIXER, 1.7 - 3 GHz**

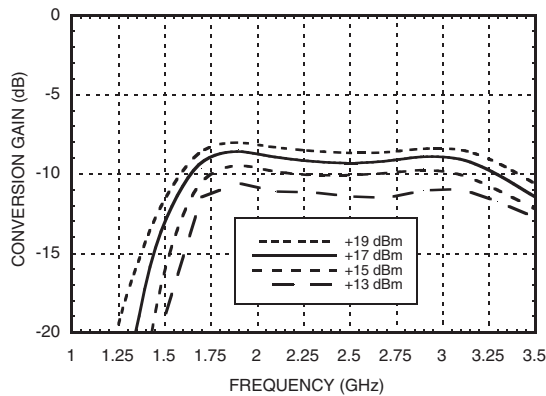
**Conversion Gain vs. Temperature @ LO = +17 dBm**



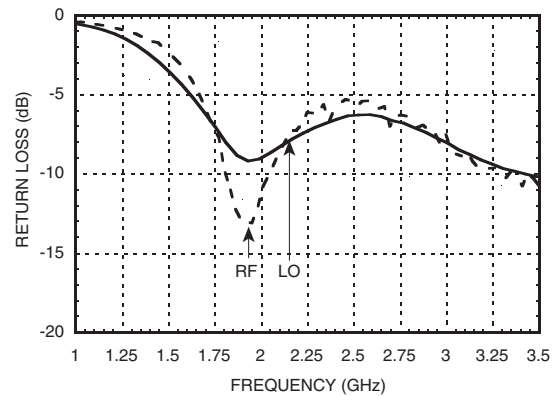
**Isolation @ LO = +17 dBm**



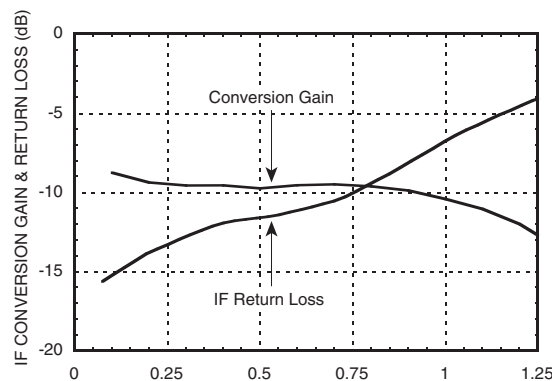
**Conversion Gain vs. LO Drive**



**Return Loss @ LO = +17 dBm**



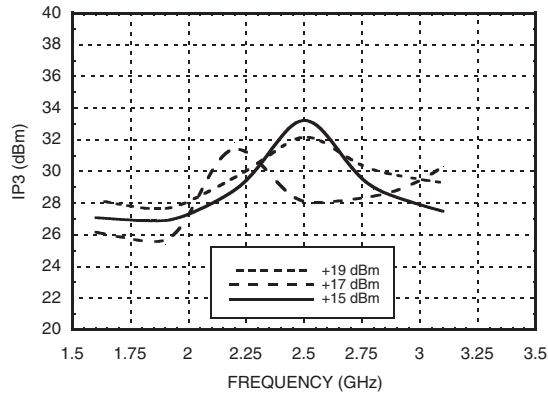
**If Bandwidth @ LO = +17 dBm**



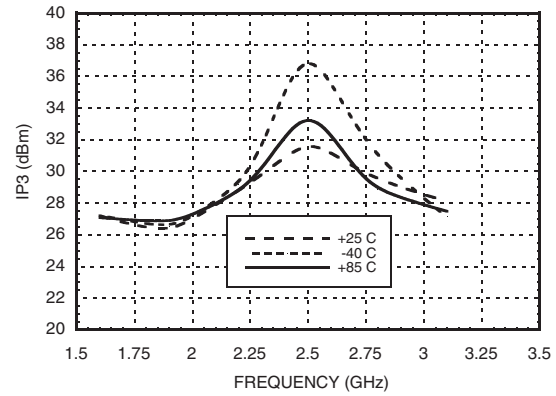


## GaAs MMIC HIGH IP3 SINGLE-BALANCED SMT MIXER, 1.7 - 3 GHz

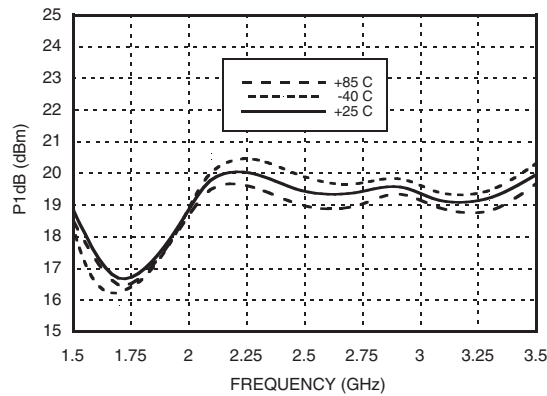
**Input IP3 vs. LO Drive**



**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.

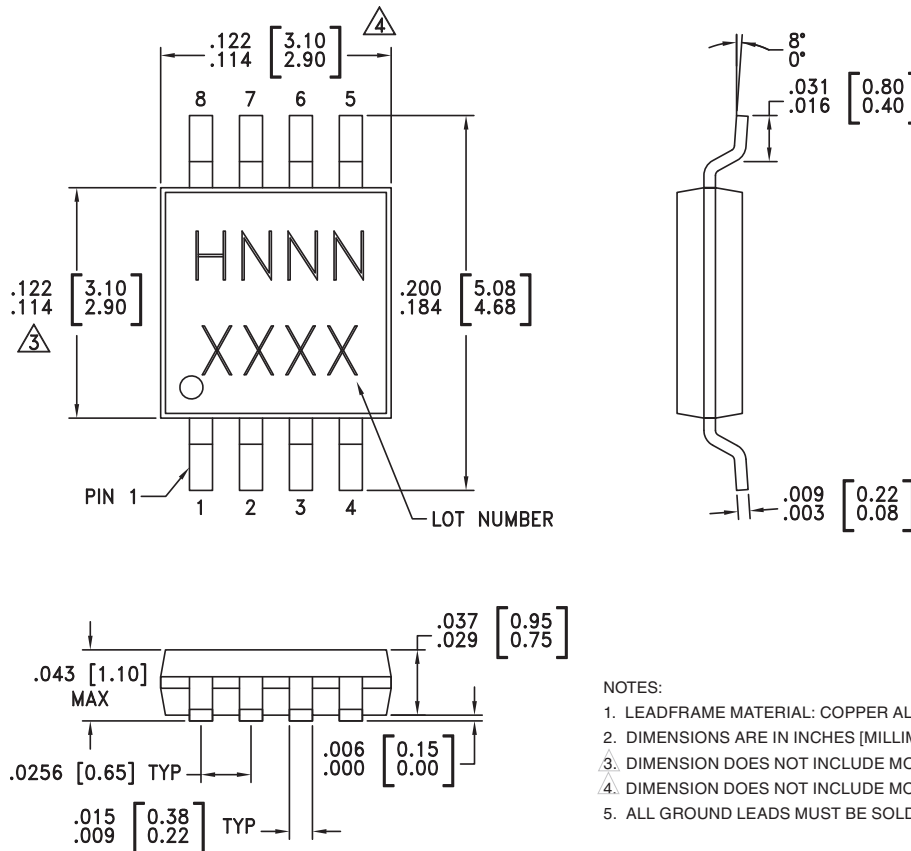
### Absolute Maximum Ratings

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

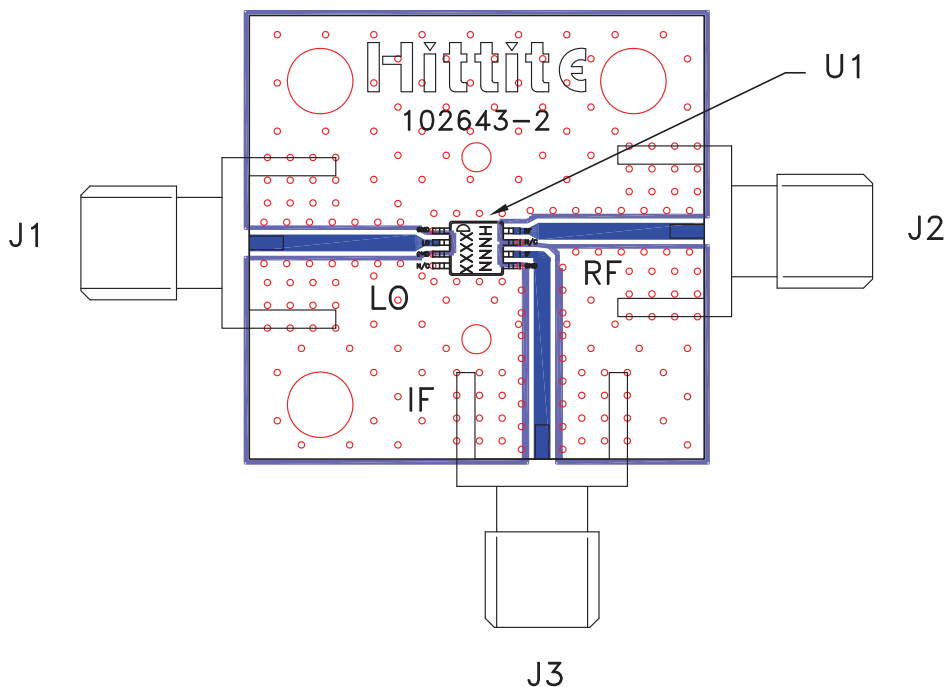
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC304MS8	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H304 XXXX
HMC304MS8E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H304 XXXX

[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](http://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

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

**Notes:**