

## LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz

### Typical Applications

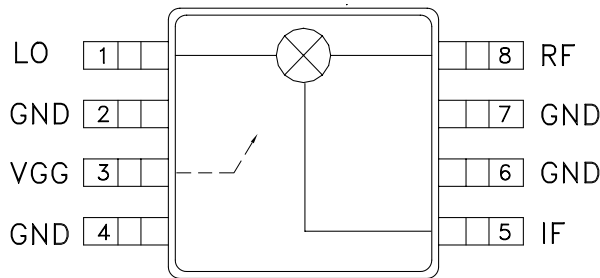
The HMC296MS8 is ideal for:

- Miniature Basestations
- PCMCIA
- Portable Wireless
- WirelessLAN

### Features

- IP3 (Input): +24 dBm @ +11 dBm LO
- LO Range = +3 to +11 dBm
- Conversion Loss: 7 dB
- LO/RF Isolation: 40 dB

### Functional Diagram



### General Description

The HMC296MS8 is a low LO drive, high IP3 double-balanced FET mixer in an 8 lead plastic surface mount MSOP package. This MMIC mixer is constructed of switched GaAs FETs and novel planar transformer baluns on the chip. The device can be used as an up or downconverter for 1.1 to 1.7 GHz applications. The consistent MMIC performance will improve system operation. The package dimensions are 0.118" x 0.192" (3.0mm x 4.9mm).

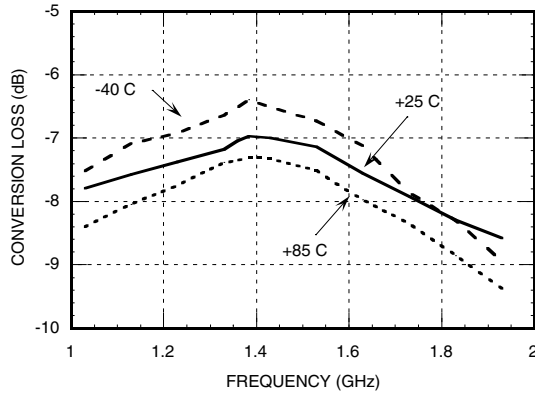
### Electrical Specifications, $T_A = +25^\circ C$ , As a Function of LO Drive, $V_{gg} = -1.5 V_{dc}$

Parameter	LO = +11 dBm			LO = +7 dBm			LO = +3 dBm			Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range, RF & LO	1.1 - 1.7			1.1 - 1.7			1.2 - 1.6			GHz
Frequency Range, IF	DC - 0.7			DC - 0.5			DC - 0.4			GHz
Conversion Loss		7	10		7.5	10.5		7.5	11.5	dB
Noise Figure (SSB)		7	10		7.5	10.5		7.5	11.5	dB
LO to RF Isolation	30	40		35	40		35	40		dB
LO to IF Isolation	21	26		22	26		22	26		dB
IP3 (Input)	20	24		15	18		11	14		dBm
1 dB Gain Compression (Input)	10	14		6	9		2	4		dBm

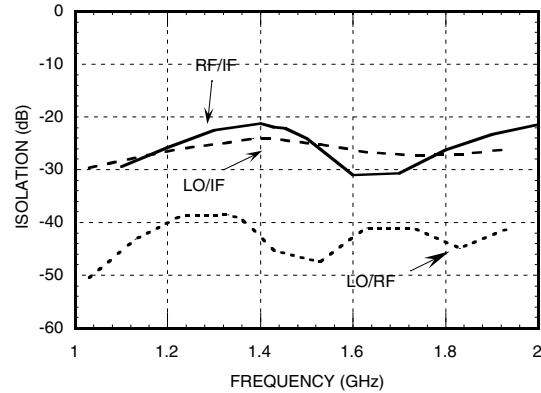
\*Unless otherwise noted, all measurements performed as downconverter, IF= 70 MHz.

## LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz

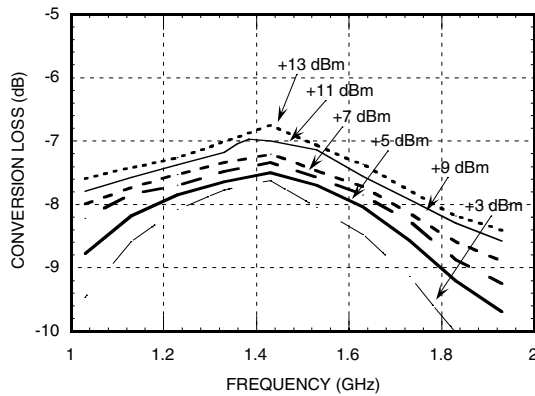
**Conversion Loss vs.  
Temperature @ LO = 11 dBm**



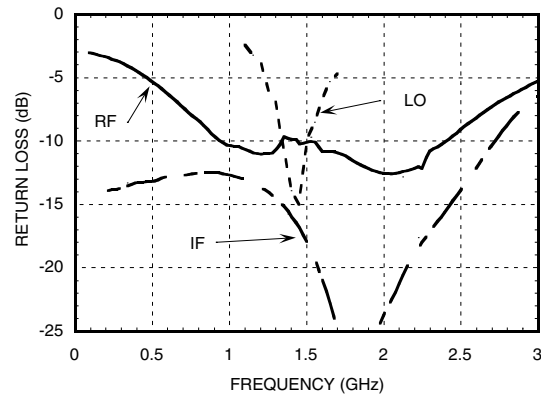
**Isolation @ LO = 11 dBm**



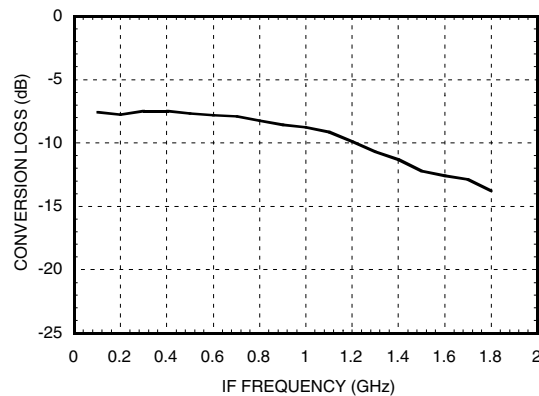
**Conversion Loss vs. LO Drive**



**Return Loss @ LO = 11 dBm**

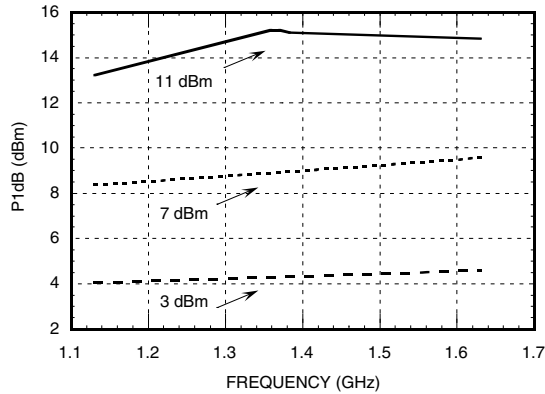


**If Bandwidth @ LO = 11 dBm**

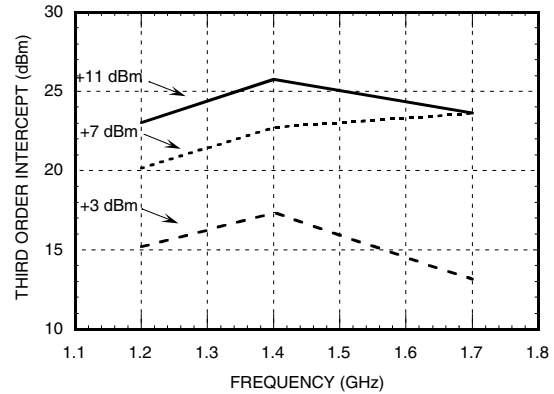


## LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz

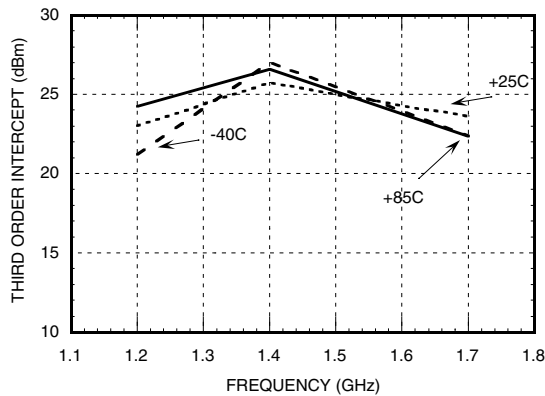
**P1dB vs. LO Level, V<sub>gg</sub> = -1.5V**



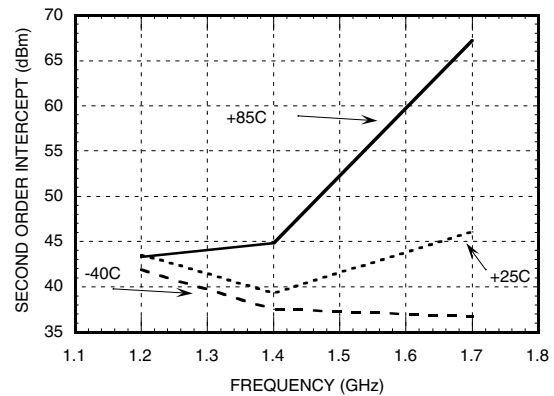
**Input IP3 vs. LO Drive \***



**Input IP3 vs. Temperature @ LO = 11 dBm\***



**Input IP2 vs. Temperature @ LO = +11 dBm\***



**MxN Spurious Outputs**

mRF	nLO				
	0	1	2	3	4
0	xx	-35	0	29	18
1	17	0	33	14	34
2	48	67	47	55	51
3	79	76	70	89	72
4	>105	>106	>102	99	92

RF = 1.47 GHz @ -10 dBm  
LO = 1.4 GHz @ 11 dBm, V<sub>gg</sub> = -1.5V  
All values in dBc relative to the IF

**Harmonics of LO**

LO Frequency (GHz)	nLO Spur at RF Port			
	1	2	3	4
1	41	27	47	45
1.2	27	25	41	47
1.4	30	22	42	44
1.6	29	23	54	52
1.8	36	29	57	57
2	27	29	60	59

LO = 11 dBm, V<sub>gg</sub> = -1.5V  
Values in dBc below input LO level measured at the RF port.

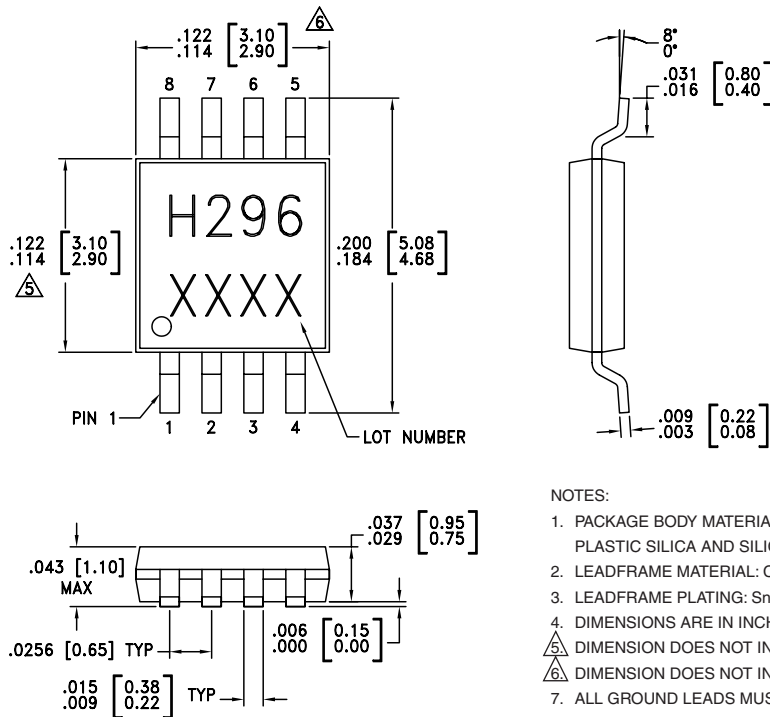
\* Two-tone input power = 0 dBm each tone, 1 MHz spacing.

## LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz

### Absolute Maximum Ratings

RF / IF Input	+20 dBm
LO Drive	+27 dBm
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
V <sub>gg</sub>	-10V

### Outline Drawing

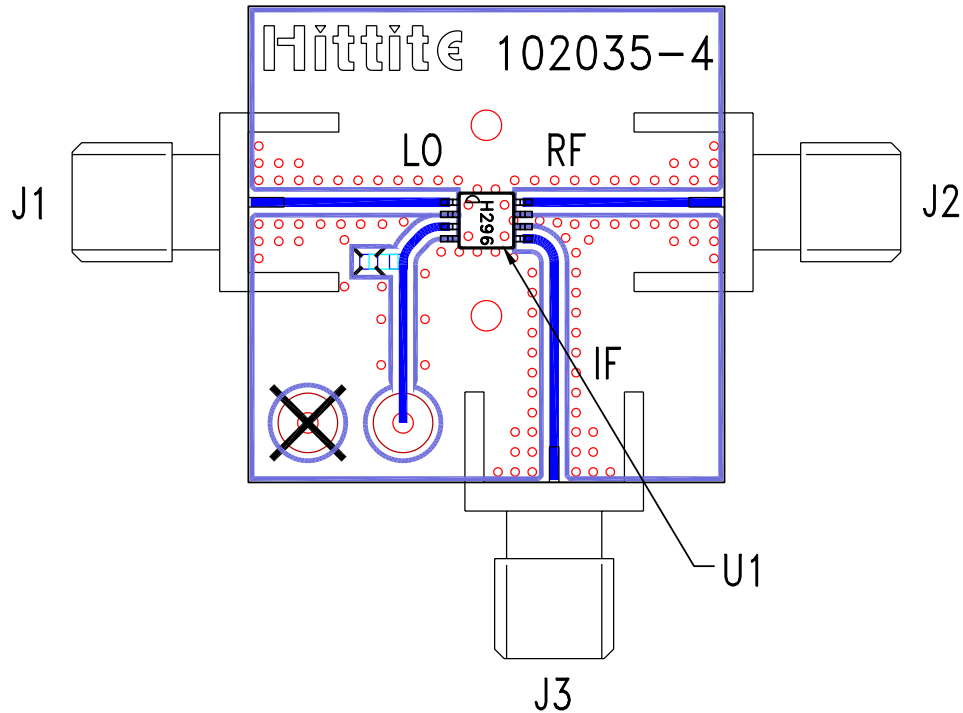


NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. 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.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

## LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz

### Evaluation PCB



### List of Material

Item	Description
J1 - J3	PC Mount SMA F Connector
U1	HMC296MS8 Mixer
PCB*	102035 Eval Board
* Circuit Board Material: FR4	

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 and exposed paddle 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.

## **LOW LO DRIVE DOUBLE-BALANCED FET MIXER, 1.1 - 1.7 GHz**

**Notes:**