

### Typical Applications

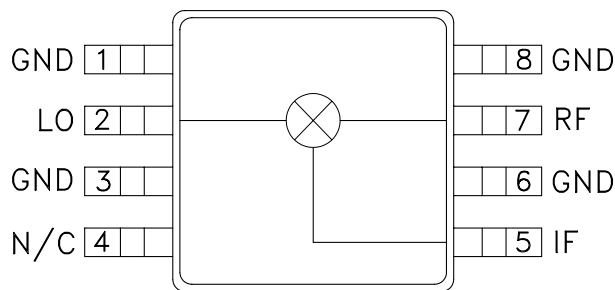
The HMC213MS8(E) is ideal for:

- LTE/4G/WiMAX Infrastructure
- Base Stations and Repeaters
- Private Land Mobile Radio (PLMR)
- ISM, Maritime & SatCom Terminals
- Microwave and Military Radios

### Features

- Excellent LO to RF Isolation: 40 dB
- Excellent 2x2 Spurious Suppression: -71 dBc
- Low Conversion Loss: 8 dB
- No DC Bias & No External Matching Required
- Ideal for Upconversion & Downconversion
- MSOP8 SMT Package, 14.8 mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC213MS8(E) is a wideband double-balanced mixer in an 8 lead plastic surface mount package. This fully integrated MMIC mixer is fabricated in a GaAs MESFET process and requires no DC bias and no external matching components. The HMC213MS8(E) mixer integrates Schottky diode mixing elements and on-chip balun transformers to deliver excellent isolation from LO to RF and from LO to IF. The wide IF bandwidth of DC to 1.5 GHz enables this mixer to be used in a wide range of general purpose applications including upconverters, downconverters, biphas modulators, demodulators, and phase comparators. The HMC213MS8(E) operates with LO drive levels as low as +10 dBm, and exhibits excellent 2x2 spurious suppression for demanding downconversion applications.

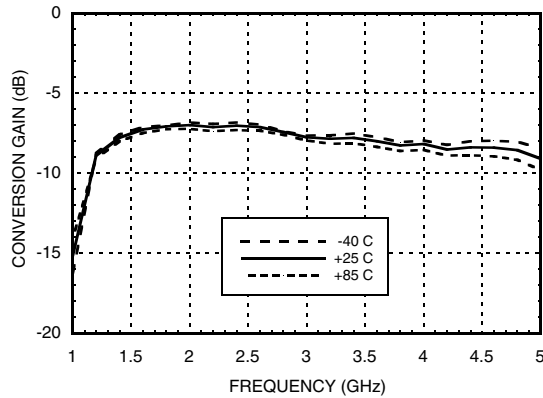
### Electrical Specifications, $T_A = +25^\circ \text{C}$ , As a Function of LO Drive

Parameter	LO = +13 dBm IF = 100 MHz			LO = +10 dBm IF = 100 MHz			Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range, RF & LO	1.5 - 4.5			1.7 - 3.6			GHz
Frequency Range, IF	DC - 1.5			DC - 1.5			GHz
Conversion Loss		8	10		9	10.5	dB
Noise Figure (SSB)		8.5	10		9	10.5	dB
LO to RF Isolation	29	40		32	40		dB
LO to IF Isolation	27	35		26	35		dB
IP3 (Input)	16	19		14	18		dBm
1 dB Gain Compression (Input)	7	10		5	8		dBm

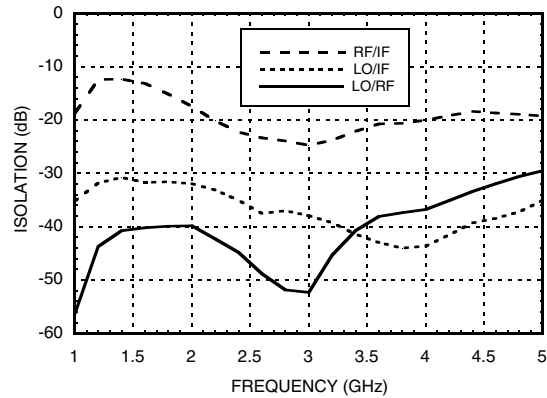


## GaAs MMIC SMT DOUBLE-BALANCED MIXER, 1.5 - 4.5 GHz

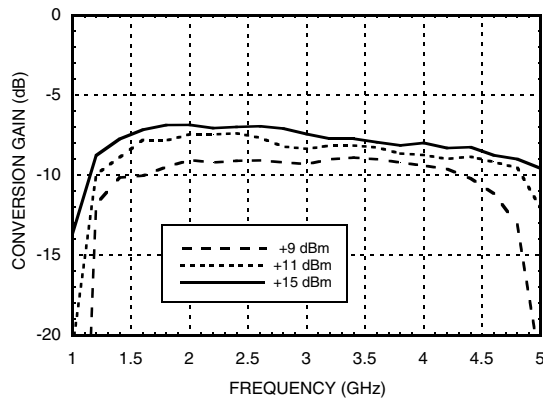
**Conversion Gain vs. Temperature @ LO = +13 dBm**



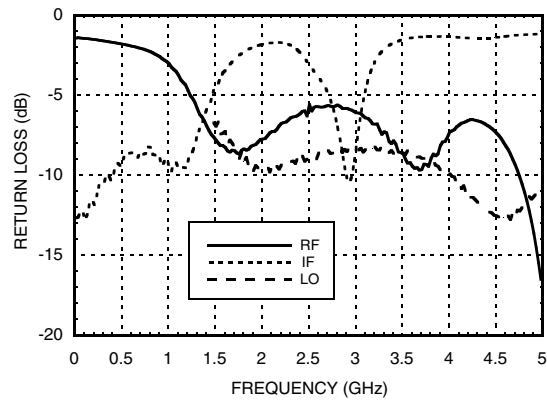
**Isolation @ LO = +13 dBm**



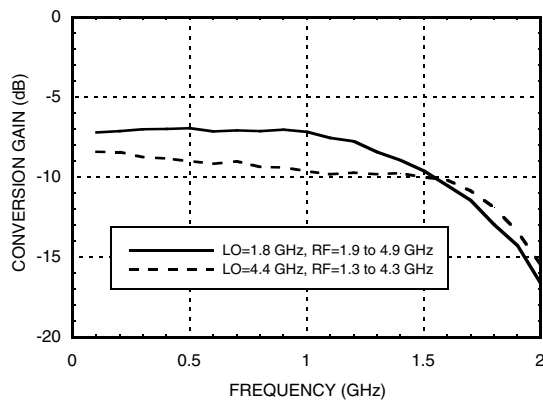
**Conversion Gain vs. LO Drive**



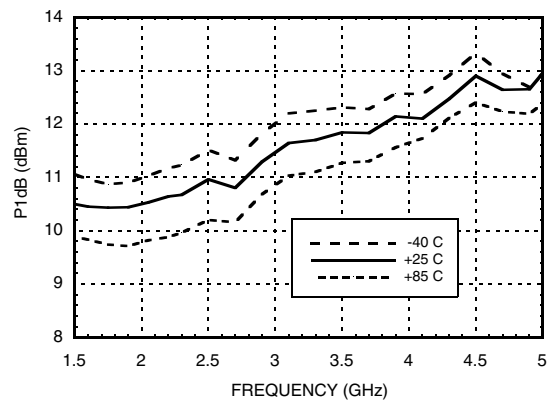
**Return Loss @ LO = +13 dBm**



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



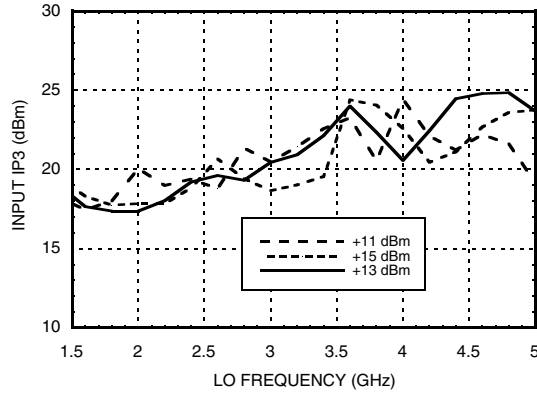
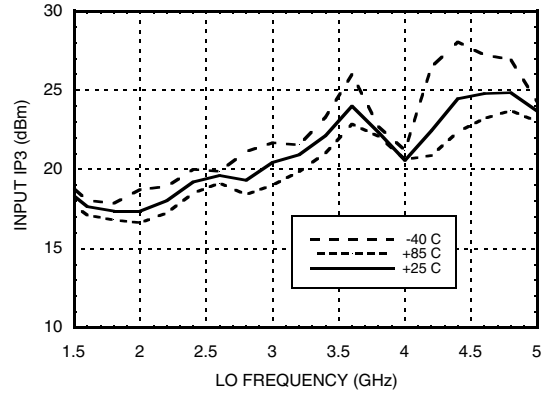
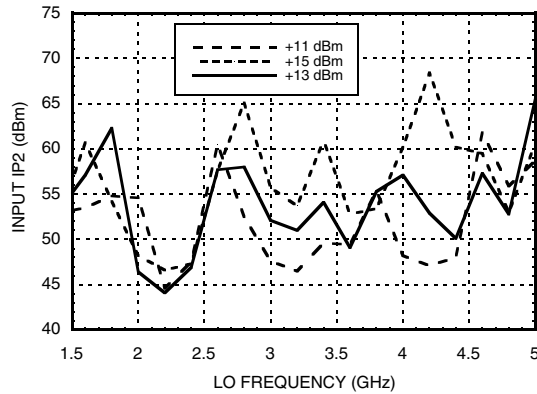
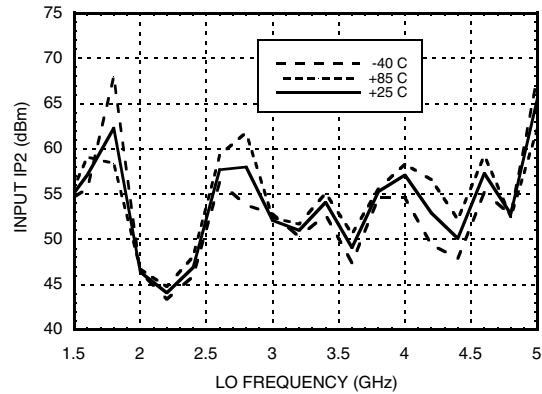
**P1dB vs. Temperature @ LO = +13 dBm**





# HMC213MS8 / 213MS8E

## GaAs MMIC SMT DOUBLE - BALANCED MIXER, 1.5 - 4.5 GHz

**Input IP3 vs. LO Drive**

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

**Input IP2 vs. LO Drive**

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




## GaAs MMIC SMT DOUBLE - BALANCED MIXER, 1.5 - 4.5 GHz

### MxN Spurious Outputs

mRF	nLO				
	0	1	2	3	4
0	xx	12	22	19	52
1	13	0	44	37	60
2	74	76	71	85	71
3	94	90	92	74	84
4	>105	>105	>105	>105	>105

RF = 3.5 GHz @ -10 dBm  
LO = 3.6 GHz @ +13 dBm  
All values in dBc below IF power level (-1RF + 1LO)

### Harmonics of LO @ RF Port

LO Freq. (GHz)	nLO Spur			
	1	2	3	4
1.5	41	34	54	53
2.0	40	29	59	59
2.5	47	29	35	62
3.0	51	34	34	62
3.5	41	43	47	65
4.0	36	47	58	70
4.5	32	52	62	72
5.0	30	53	66	70

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

### Absolute Maximum Ratings

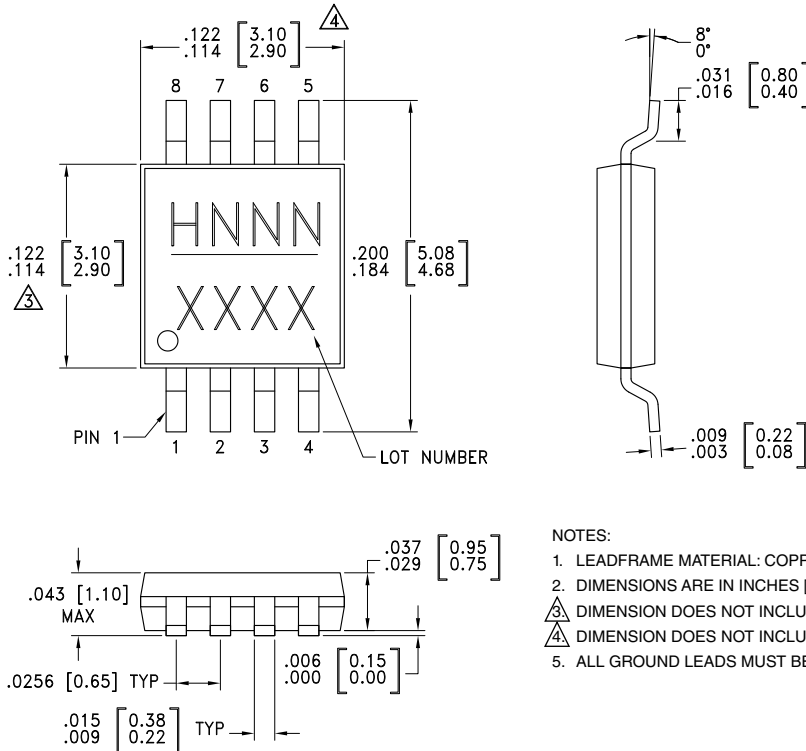
RF / IF Input	+13 dBm
LO Drive	+27 dBm
Continuous Pdiss (T = 85 °C) (derate 10.6 mW/°C above 85 °C)	0.69 W
Thermal Resistance (Channel to package lead)	93.7 °C/W
Junction Temperature	150 °C
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**



### Outline Drawing



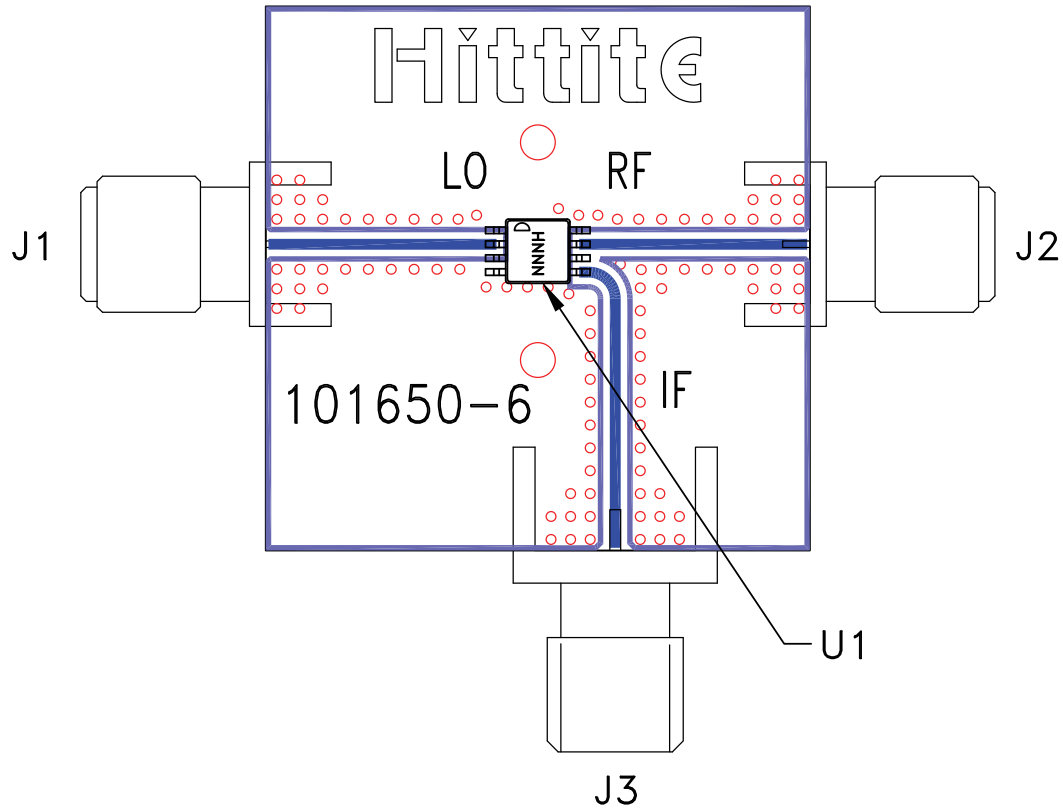
- NOTES:
- LEADFRAME MATERIAL: COPPER ALLOY
  - DIMENSIONS ARE IN INCHES [MILLIMETERS].
  - $\triangle$  DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
  - $\triangle$  DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
  - ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[3]</sup>
HMC213MS8	Low Stress Injection Molding Plastic	Sn/Pb Solder	MSL1 <sup>[1]</sup>	H213 XXXX
HMC213MS8E	RoHS-compliant Low Stress Injection Molding Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H213 XXXX

[1] Max peak reflow temperature of 235 °C  
 [2] Max peak reflow temperature of 260 °C  
 [3] 4-Digit lot number XXXX

**Evaluation PCB**



**List of Materials for Evaluation PCB 103350 [1]**

Item	Description
J1 - J3	PCB Mount SMA RF Connector
U1	HMC213MS8(E) Mixer
PCB [2]	101650 Evaluation Board

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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.