HMC402MS8 / 402MS8E

v02.0705

HIGH IP3 GaAs MMIC MIXER, 1.8 - 2.2 GHz

Designer's Kit Available

Typical Applications

High Dynamic Range Infrastructure:

- GSM, GPRS & EDGE
- CDMA & W-CDMA
- Cable Modem Termination Systems

Features

Input IP3: +31 dBm

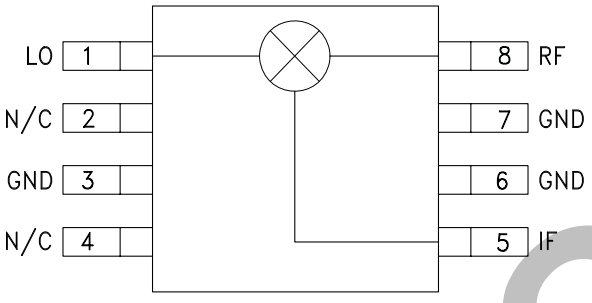
High Side LO

Ultra Small MSOP8 Package: 14.8mm²

No External Components

Included in the HMC-DK002 Designer's Kit

Functional Diagram



General Description

The HMC402MS8 & HMC402MS8E are high dynamic range passive MMIC mixers in plastic surface mount 8 lead Mini Small Outline Packages (MSOP) covering 1.8 to 2.2 GHz. Excellent input IP3 performance of +31 dBm for down conversion and +27 dBm for up conversion is provided for 2.5G & 3G GSM/CDMA based UMTS or PCS applications at an LO drive of +17dBm. With a 1dB compression of +21 dBm, the RF port will accept a wide range of input signal levels. Conversion loss is 8.5dB typical and LO isolations are maintained at 24 to 30 dB. This miniature single-ended monolithic GaAs FET mixer does not require any external components or bias. The broad 50 to 500 MHz IF frequency response will satisfy many UMTS/PCS transmit or receive frequency plans configured for high side LO. The HMC402MS8(E) input IP3 performance coupled with its high P1dB rivals traditional active FET mixers while offering a much smaller 14.8mm² standard IC footprint, and no DC bias.

Electrical Specifications, T_A =25 °C, LO = +17 dBm, IF = 300 MHz*

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF		1.8 - 2.0			2.0 - 2.2		GHz
Frequency Range, LO		1.85 - 2.5			2.05 - 2.53		GHz
Frequency Range, IF		DC - 500			DC - 330		MHz
Conversion Loss		8.8	10.5		8.5	10.5	dB
Noise Figure (SSB)		8.8	10.5		8.5	10.5	dB
LO to RF Isolation	24	30		21	25		dB
LO to IF Isolation	19	24		24	28		dB
IP3 (Input)	27	30		27	31		dBm
1 dB Gain Compression (Input)	18	21		18	22		dBm
LO Input Drive Level (Typical)		+16 to +18			+16 to +18		dBm

*Unless otherwise noted, all measurements performed as a downconverter with high side LO & IF = 300 MHz.

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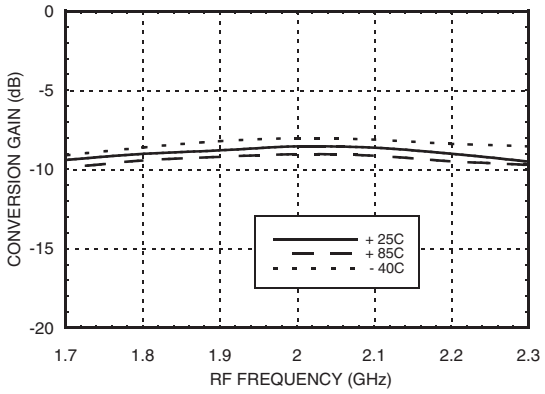
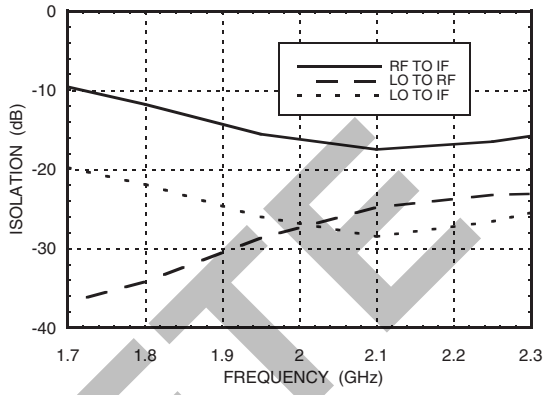
RoHS✓ EARTH FRIENDLY

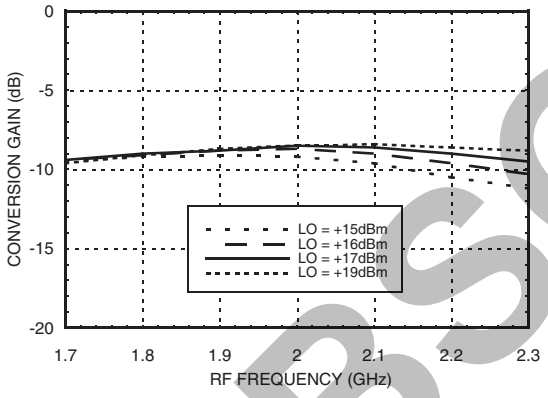
Conversion Gain vs. Temperature @ LO = +17 dBm



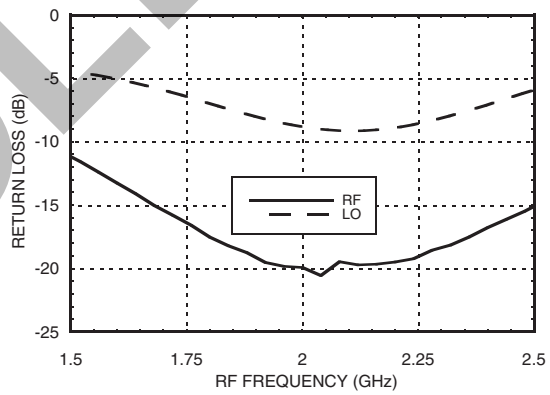
Isolation @ LO = +17 dBm



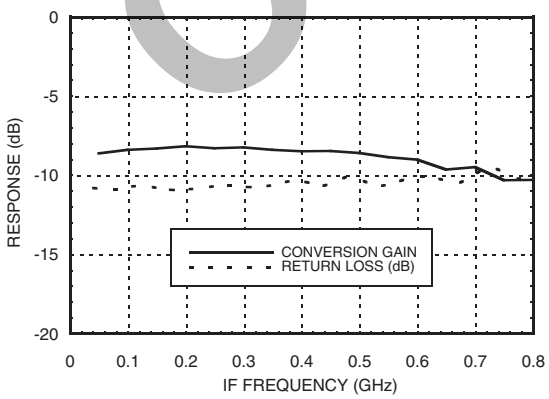
Conversion Gain vs. LO Drive



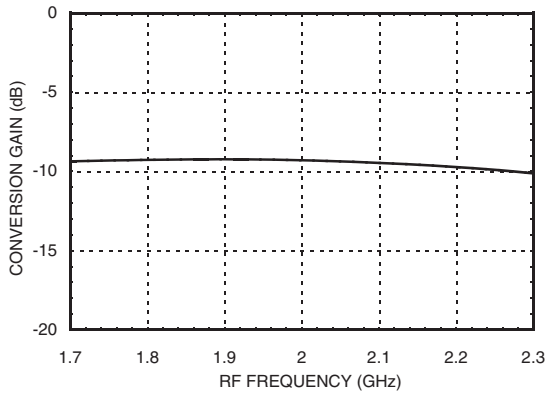
Return Loss @ LO = +17 dBm



IF Bandwidth @ LO = +17 dBm



Unconverter Performance Conversion Gain @ LO = +17 dBm



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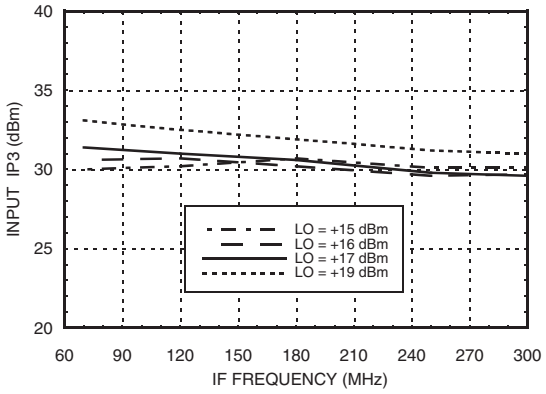
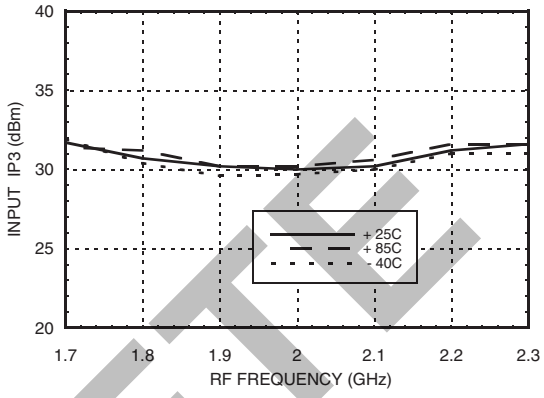
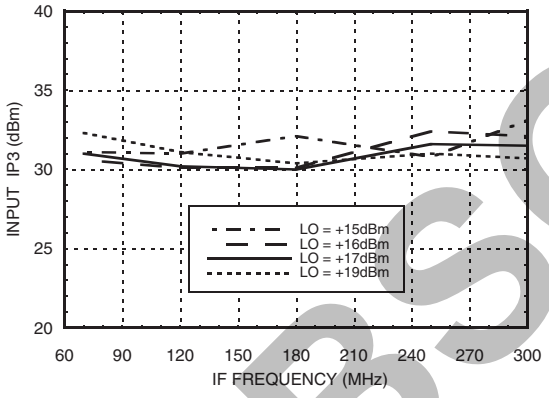
Input IP3 vs. IF Frequency, RF = 1.95 GHz



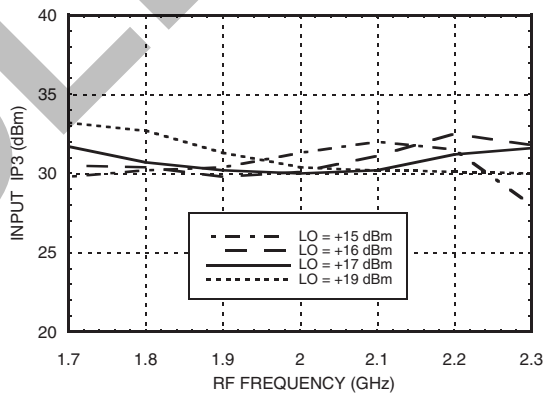
Input IP3 vs. Temperature @ LO = +17 dBm



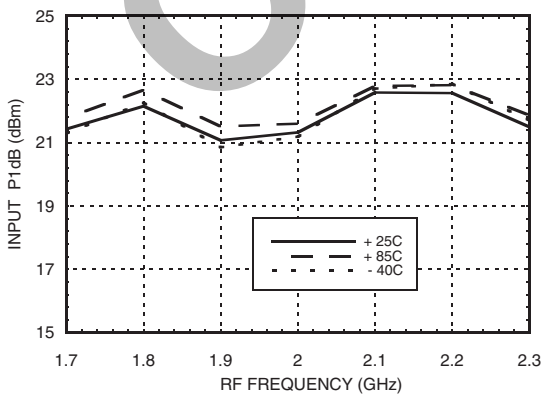
Input IP3 vs. IF Frequency, RF = 2.15 GHz



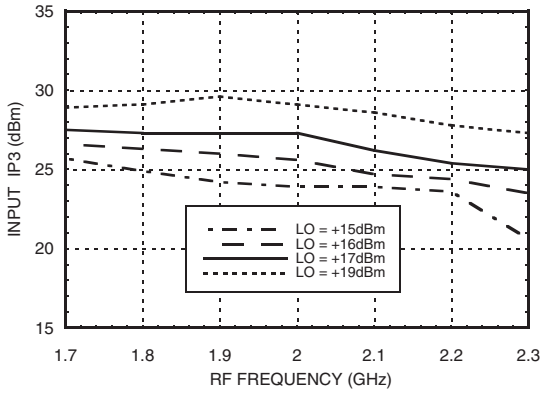
Input IP3 vs. LO Drive



Input P1dB vs. Temperature @ LO = +17 dBm



Upconverter IP3 vs. LO Drive, IF = 200 MHz



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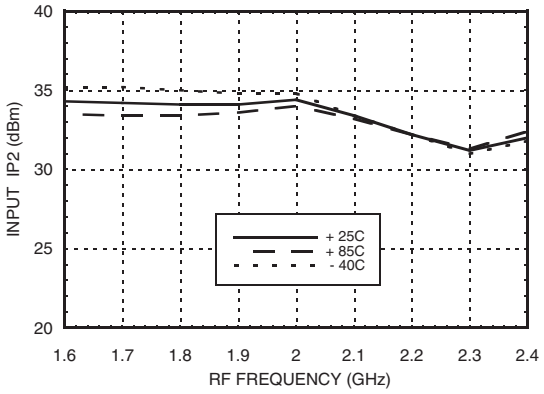
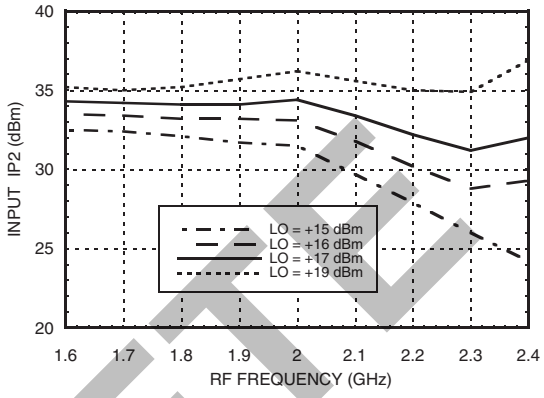
Input IP2 vs. Temperature @ LO = +17 dBm



Input IP2 vs. LO Drive



MxN Spurious Outputs

	nLO				
mRF	0	1	2	3	4
0	xx	-7	-3	-1	11
1	5	0	27	54	30
2	62	64	48	65	70
3	81	81	82	81	80
4	77	81	80	83	82

RF Freq = 1.9 GHz @ -10 dBm
LO Freq = 2.2 GHz @ +17 dBm
All values in dBc relative to the IF power level.
Measured as a downconverter.

Harmonics of LO

	nLO Spur @ RF Port			
LO Freq (GHz)	1	2	3	4
1.8	40	30	51	57
2	30	29	51	53
2.2	26	32	51	50
2.4	24	36	53	49
2.6	23	43	59	53
2.8	22	41	51	71

LO = +17 dBm
All values are in dBc below input LO level @ RF port.

Absolute Maximum Ratings

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

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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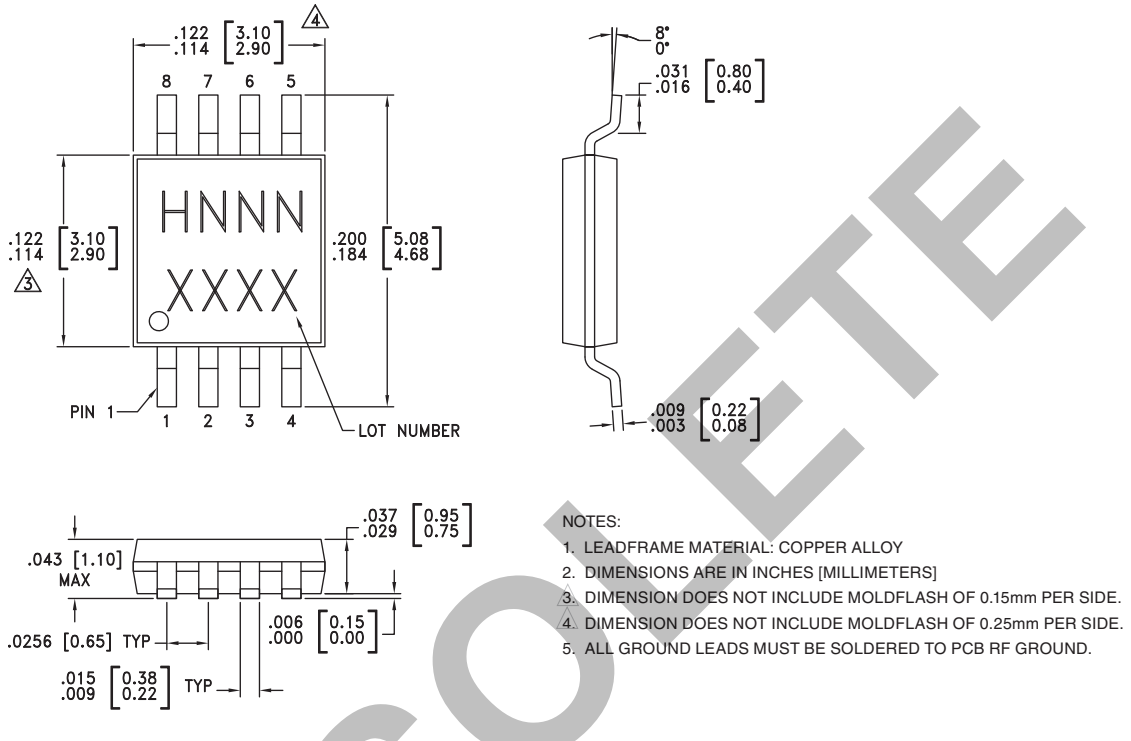
Outline Drawing



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]
HMC402MS8	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H402 XXXX
HMC402MS8E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H402 XXXX

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

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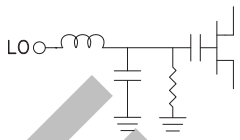
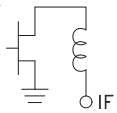
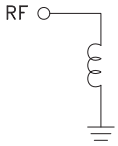
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	LO	This pin is AC coupled & matched to 50 Ohms from 1.8 to 2.2 GHz. Blocking capacitors are required if line potential is not equal to 0V.	
2, 4	N/C	Not connected.	
3, 6, 7	GND	This pin must be connected to RF ground.	
5	IF Port	This pin is DC coupled. For applications not requiring operation to DC this port should be DC blocked externally using a series capacitor. Choose value of capacitor to pass IF frequency desired. For operation to DC, this pin must not sink/source more than 40 mA of current or failure may result.	
8	RF Port	This pin is DC coupled & matched to 50 Ohms from 1.8 to 2.2 GHz	

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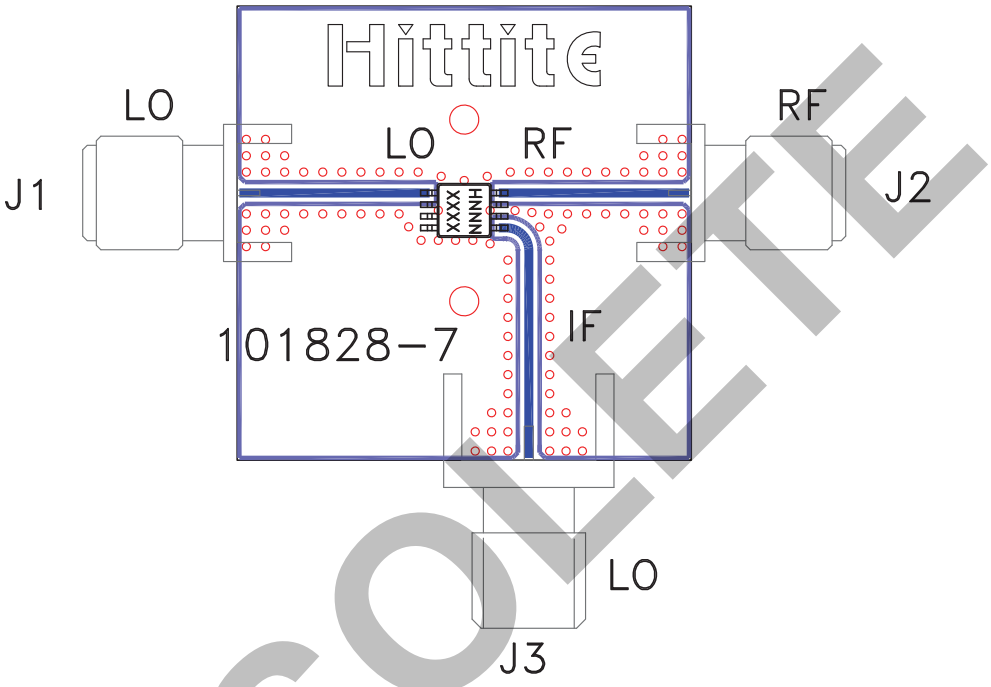
Evaluation PCB



List of Materials for Evaluation PCB 101830 [1]

Item	Description
J1 - J3	PCB Mount SMA RF Connector
U1	HMC402MS8 / HMC402MS8E Mixer
PCB [2]	101828 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 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.

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Notes:

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