

GaAs MMIC SINGLE-BALANCED MIXER, 10.0 - 15.0 GHz

Typical Applications

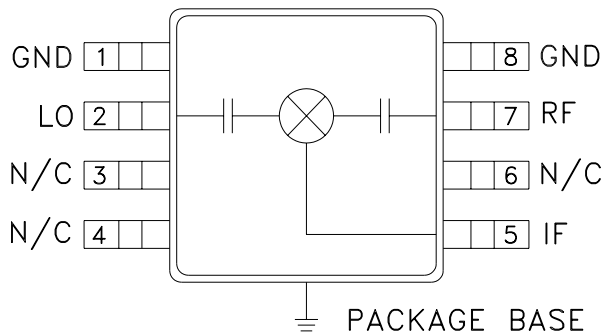
The HMC411MS8G is ideal for:

- Long Haul Radio Platforms
- Microwave Radio
- VSAT

Features

- Conversion Loss: 9.0 dB
- LO/RF Isolation: 27 dB
- LO/IF Isolation: 30 dB
- Input IP3: +16 dBm
- No External Components
- MSOP8G SMT Package

Functional Diagram



General Description

The HMC411MS8G is a passive single balanced mixer that operates between 10 GHz and 15 GHz. The HMC411MS8G operates with LO drive levels between +9 dBm and +15 dBm, and provides 9 dB conversion loss across the entire specified frequency band. This mixer requires no external components or bias.

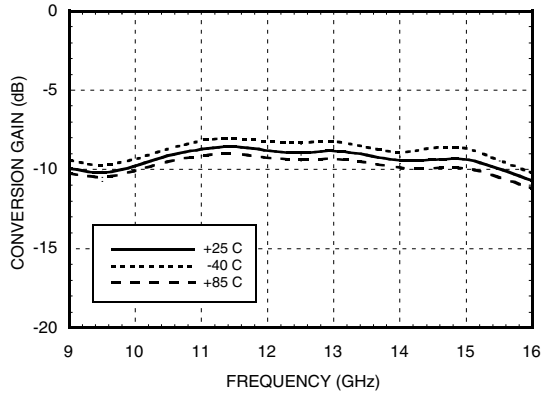
Electrical Specifications, $T_A = +25^\circ C$

Parameter	IF = 1.45 GHz LO = +13 dBm			Units
	Min.	Typ.	Max.	
Frequency Range, RF & LO	10.0 - 15.0			GHz
Frequency Range, IF	DC - 3			GHz
Conversion Loss		9	12	dB
Noise Figure (SSB)		9	12	dB
LO to RF Isolation	20	27		dB
LO to IF Isolation	20	30		dB
RF to IF Isolation	8	15 - 20		dB
IP3 (Input)	11	16		dBm
1 dB Compression (Input)	5	9		dBm

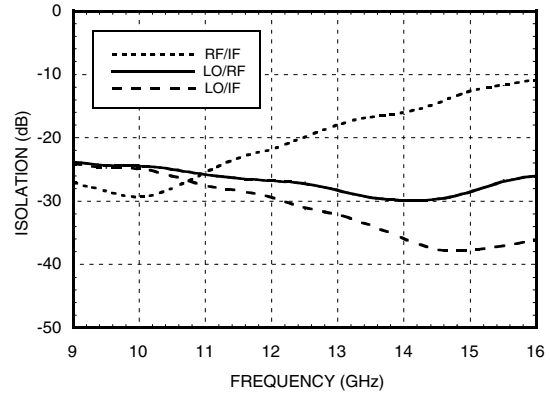
* Unless otherwise noted, all measurements performed as downconverter, IF= 1.45 GHz.

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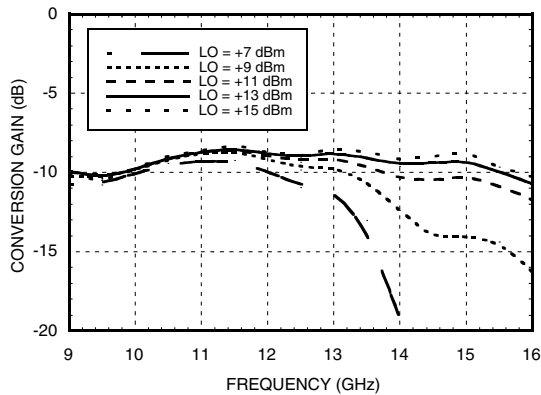
Conversion Gain vs. Temperature @ LO = +13 dBm



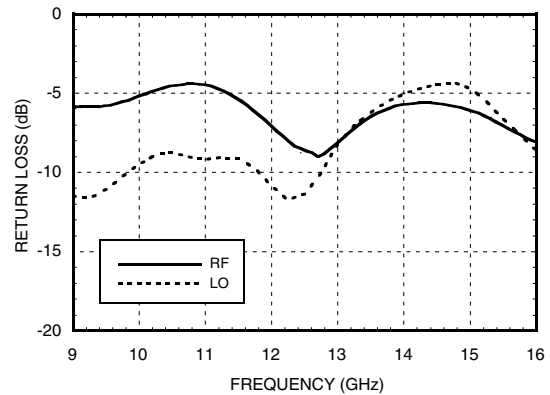
Isolation @ LO = +13 dBm



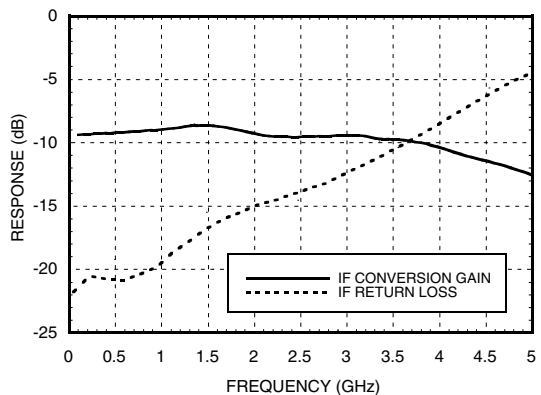
Conversion Gain vs. LO Drive



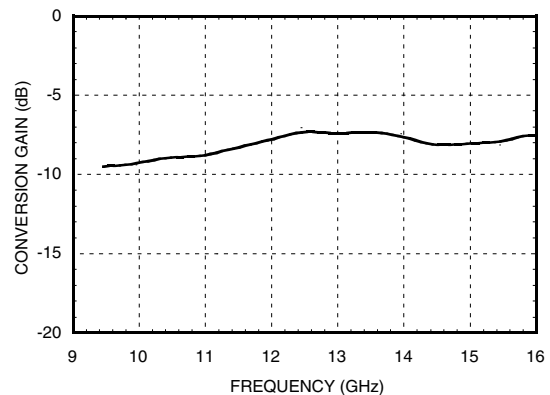
Return Loss @ LO = +13 dBm



IF Bandwidth @ LO = +13 dBm

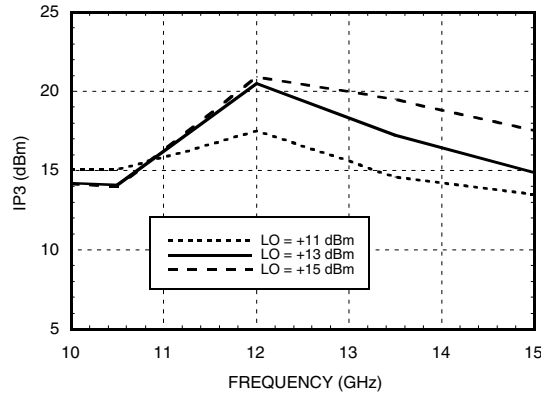


Upconverter Performance Conversion Gain @ LO = +13 dBm

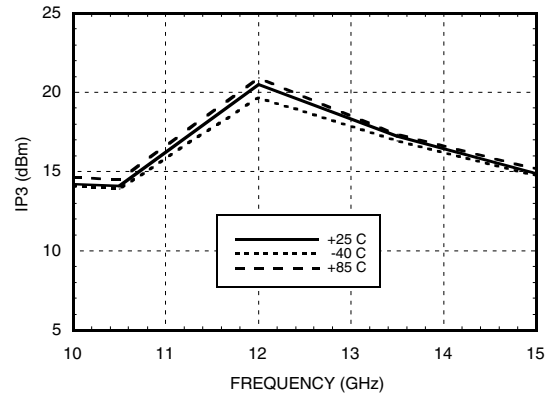


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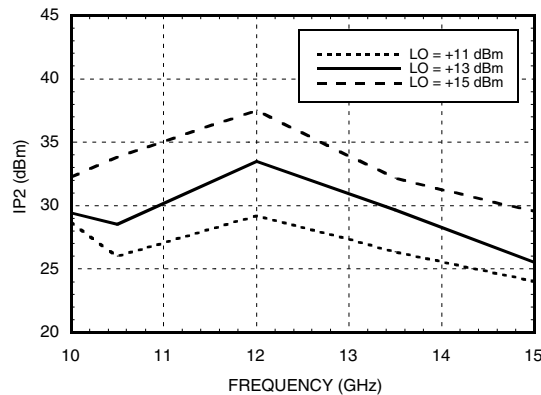
Input IP3 vs. LO Drive*



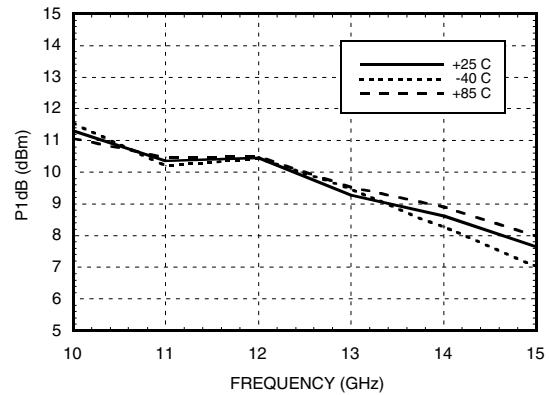
Input IP3 vs. Temperature @ LO = +13 dBm*



Input IP2 vs. LO Drive *



Input P1dB vs. Temperature @ LO = +13 dBm



MxN Spurious @ IF Port

mRF	nLO				
	0	1	2	3	4
0	XX	0	5	37	N/A
1	7	0	49	42	54
2	47	66	44	56	57
3	>95	>95	>95	58	77
4	N/A	>95	>95	>95	>95

RF = 14.45 GHz @ -10 dBm
LO = 13 GHz @ +13 dBm
All values in dBc relative to the IF power level.
Measured as downconverter.

Harmonics of LO

LO Freq. (GHz)	nLO Spur @ RF Port			
	1	2	3	4
9	25	18	46	53
10.5	25	20	52	66
12	27	24	47	63
13.5	27	33	61	N/A
15	27	47	67	N/A
16.5	24	52	63	N/A

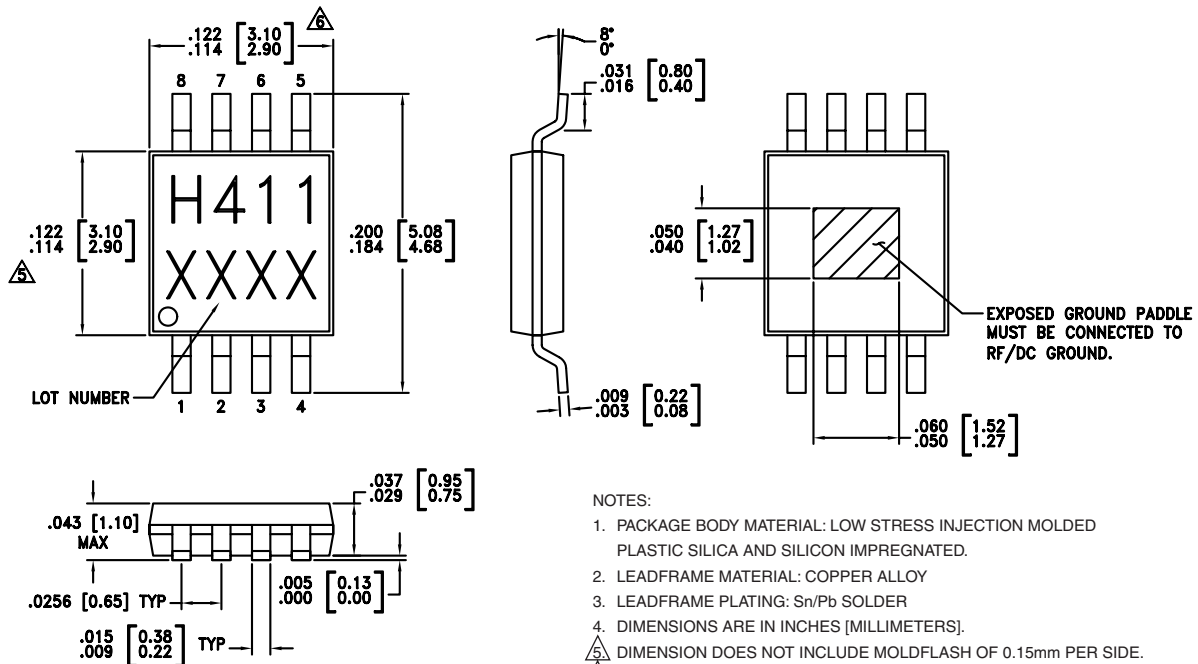
LO = +13 dBm
All values in dBc below input LO level @ RF port.

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

Absolute Maximum Ratings

RF / IF Input	+15 dBm
LO Drive	+27 dBm
IF DC Current	±2 mA
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Outline Drawing


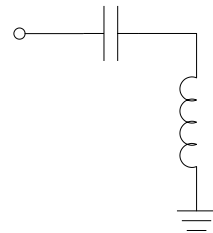
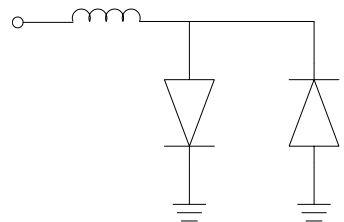
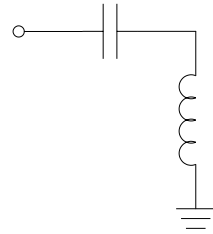


NOTES:

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].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

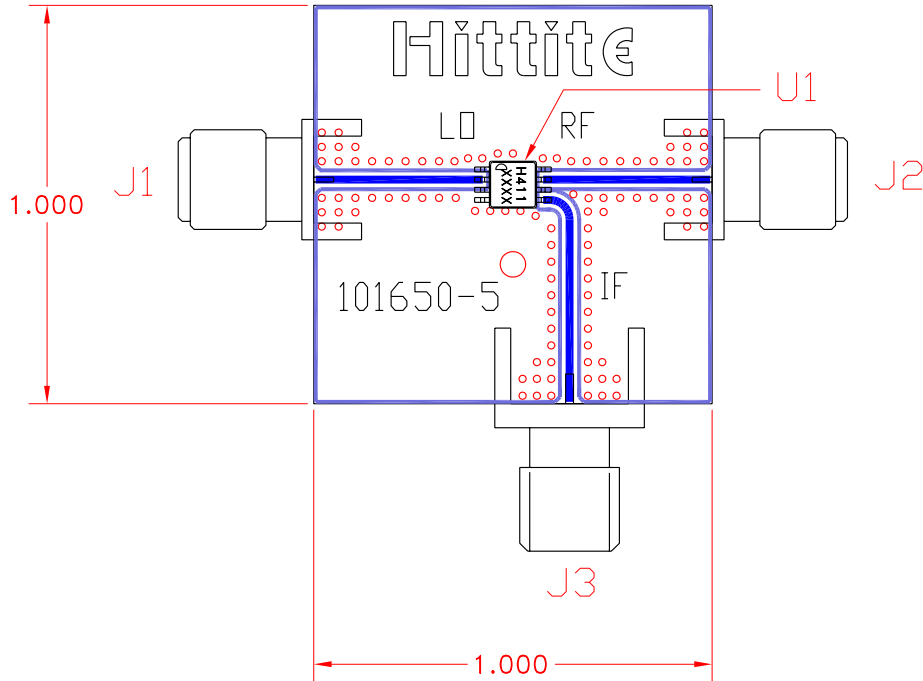
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Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 8	GND	Pins and exposed ground slug must connect to RF ground.	
2	LO Port	This pin is aC coupled and matched to 50 Ohm from 10.0 - 15.0 GHz	
3, 4, 6	N/C	Not Connected	
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 whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source/sink more than 2 mA of current or die non-function and possible die failure will result.	
7	RF Port	This pin is AC coupled and matched to 50 Ohm from 10.0 - 15.0 GHz	

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Evaluation PCB



List of Material

Item	Description
J1 - J2	PC Mount SMA RF Connector, SRI
J3	PC Mount SMA Connector, Johnson
U1	HMC411MS8G
PCB*	101650 Evaluation Board
* 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.