

Analog Devices Welcomes Hittite Microwave Corporation

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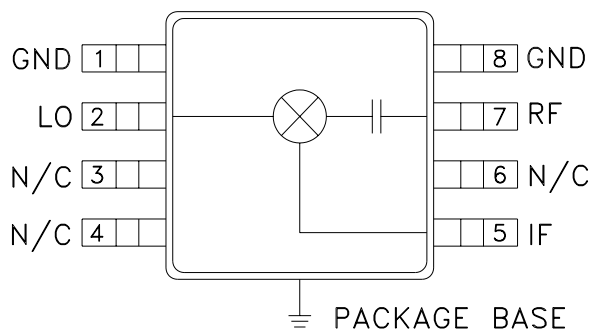

**GaAs MMIC DOUBLE-BALANCED
 HIGH IP3 MIXER, 9 - 15 GHz**
Typical Applications

The HMC410MS8G / HMC410MS8GE is ideal for:

- Long Haul Radio Platforms
- Microwave Radio
- VSAT

Features

- Conversion Loss: 8 dB
- LO/RF Isolation: 40 dB
- LO/IF Isolation: 37 dB
- Input IP3: +24 dBm
- No External Components
- MSOP8G SMT Package

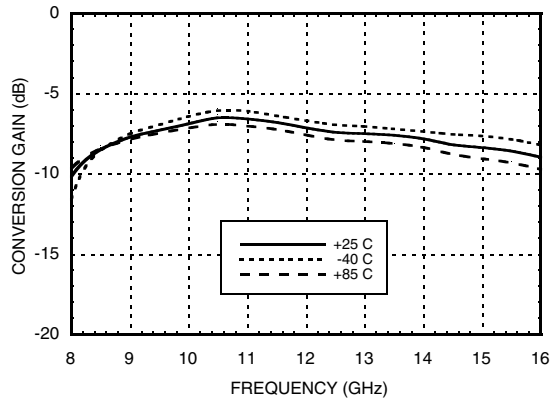
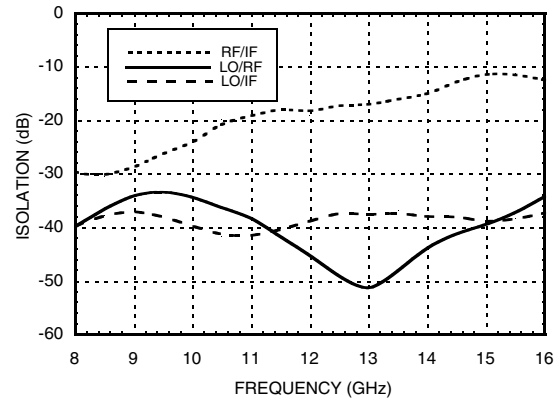
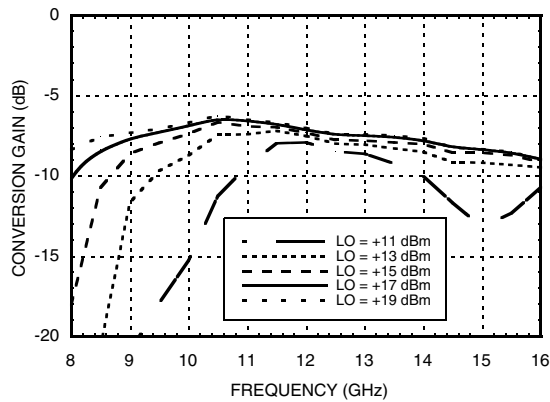
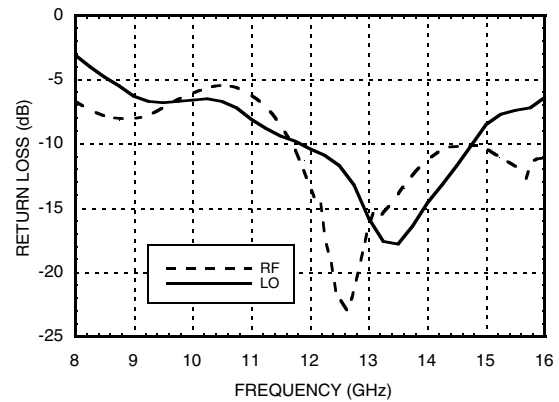
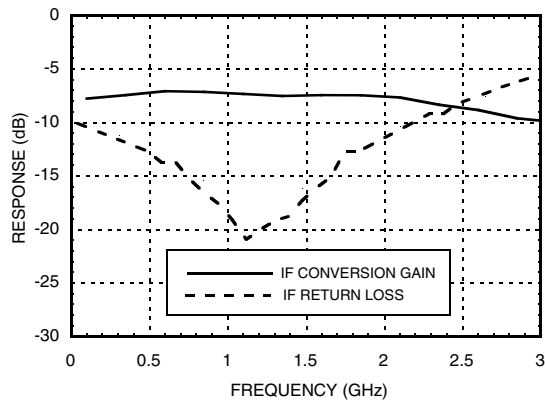
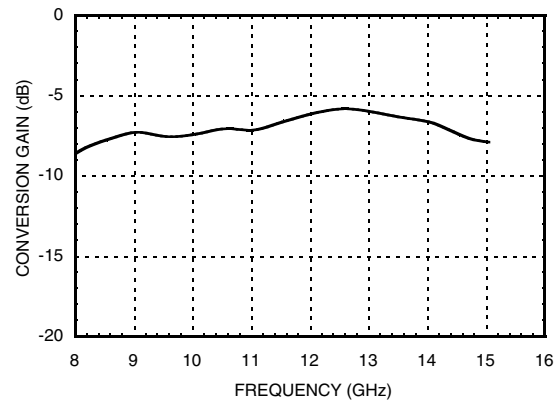
Functional Diagram

General Description

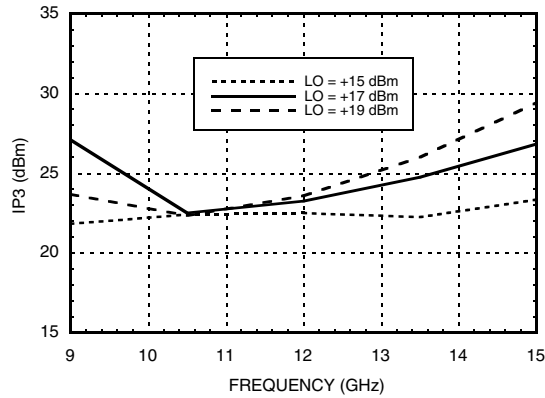
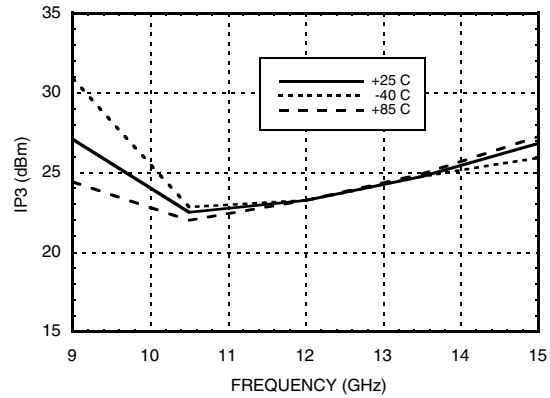
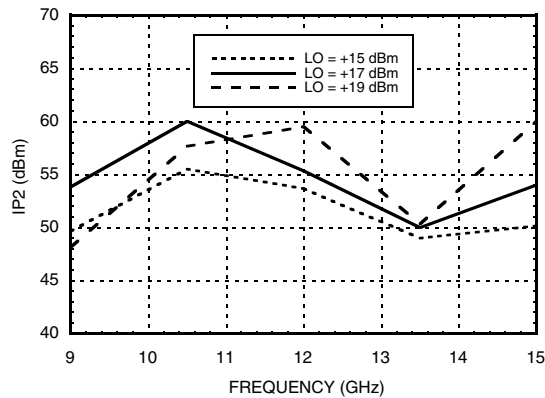
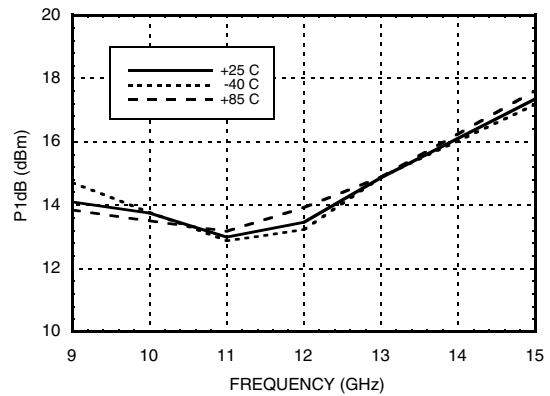
The HMC410MS8G & HMC410MS8GE are passive double balanced high IP3 mixers that operate between 9 GHz and 15 GHz. The HMC410MS8G & HMC410MS8GE operate with LO drive levels between +13 dBm and +19 dBm, and provide 8 dB conversion loss across the entire specified frequency band. These mixers require no external components or bias.

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

| Parameter | IF = 1.45 GHz LO = +17 dBm | | | Units |
|--------------------------|-------------------------------|---------|------|-------|
| | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 9.0 - 15.0 | | | GHz |
| Frequency Range, IF | DC - 2.5 | | | GHz |
| Conversion Loss | | 8 | 11 | dB |
| Noise Figure (SSB) | | 8 | 11 | dB |
| LO to RF Isolation | 30 | 40 - 45 | | dB |
| LO to IF Isolation | 30 | 37 | | dB |
| RF to IF Isolation | 8 | 17 | | dB |
| IP3 (Input) | 20 | 24 | | dBm |
| 1 dB Compression (Input) | 11 | 14 | | dBm |

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


**GaAs MMIC DOUBLE-BALANCED
HIGH IP3 MIXER, 9 - 15 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

**Upconverter Performance
Conversion Gain @ LO = +17 dBm**


**GaAs MMIC DOUBLE-BALANCED
HIGH IP3 MIXER, 9 - 15 GHz**
Input IP3 vs. LO Drive*

**Input IP3 vs.
Temperature @ LO = +17 dBm***

Input IP2 vs. LO Drive *

**Input P1dB vs.
Temperature @ LO = +17 dBm**

MxN Spurious @ IF Port

| mRF | nLO | | | | |
|-----|-----|-----|-----|-----|-----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | XX | 4 | 28 | 23 | N/A |
| 1 | 15 | 0 | 40 | 62 | 46 |
| 2 | 85 | 70 | 67 | 78 | 83 |
| 3 | >90 | >90 | >90 | 79 | >90 |
| 4 | N/A | >90 | >90 | >90 | >90 |

RF = 14.45 GHz @ -10 dBm
 LO = 13 GHz @ +17 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 | 34 | 28 | 46 | 60 |
| 10.5 | 37 | 37 | 50 | 69 |
| 12 | 44 | 45 | 46 | 60 |
| 13.5 | 47 | 46 | 62 | N/A |
| 15 | 40 | 56 | 58 | N/A |
| 16.5 | 34 | 47 | 51 | N/A |

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

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



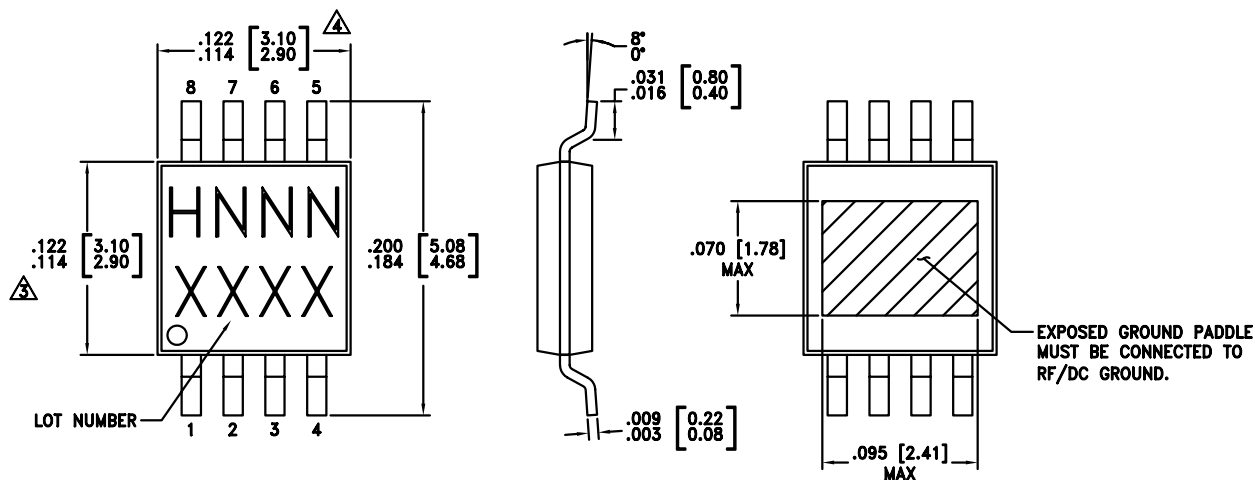
Absolute Maximum Ratings

| | |
|-----------------------|----------------|
| RF / IF Input | +20 dBm |
| LO Drive | +27 dBm |
| IF DC Current | ±4 mA |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1A |



**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 AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.


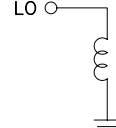
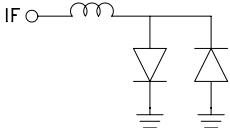
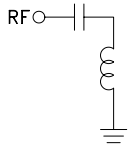
Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC410MS8G | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H410 XXXX |
| HMC410MS8GE | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H410 XXXX |

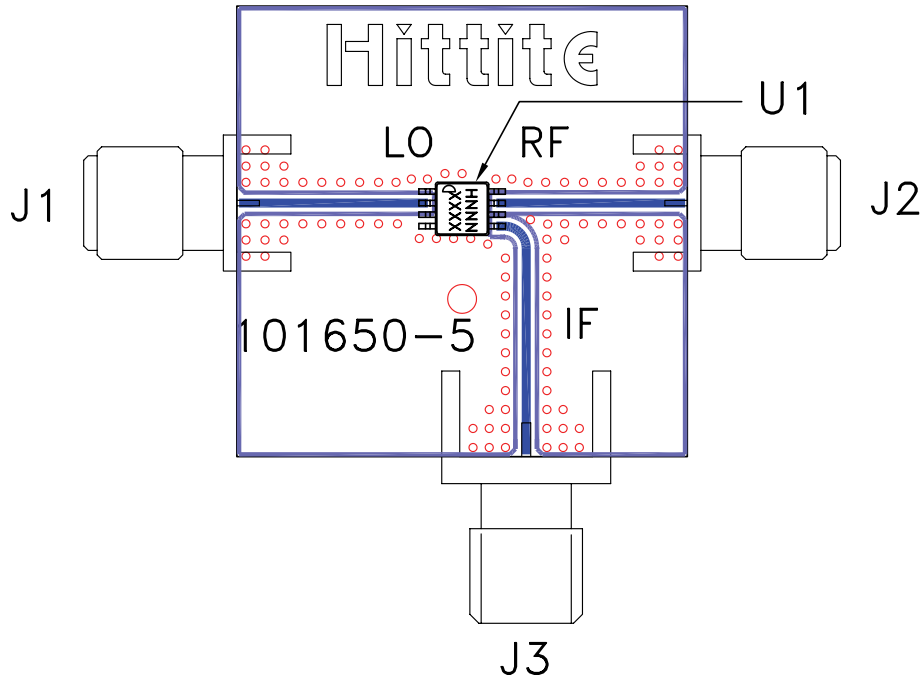
[1] Max peak reflow temperature of 235 °C
 [2] Max peak reflow temperature of 260 °C
 [3] 4-Digit lot number XXXX



Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|--|--|
| 1, 8 | GND | Pins and exposed ground slug must be connected to RF ground. |  |
| 2 | LO | This pin is AC coupled & matched to 50 Ohms from 9.0 to 15.0 GHz. |  |
| 3, 4, 6 | N/C | Not connected. | |
| 5 | IF | 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 4mA of current or die non-funcion and possible die failure will result. |  |
| 7 | RF | This pin is DC coupled & matched to 50 Ohms from 9.0 to 15.0 GHz. |  |

Evaluation PCB



List of Materials for Evaluation PCB 103350 [1]

| Item | Description |
|---------|----------------------------------|
| J1 - J2 | PCB Mount SMA RF Connector, SRI |
| J3 | PCB Mount SMA Connector, Johnson |
| U1 | HMC410MS8G / HMC410MS8GE |
| 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 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.