

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 0.6 - 1.3 GHz



Typical Applications

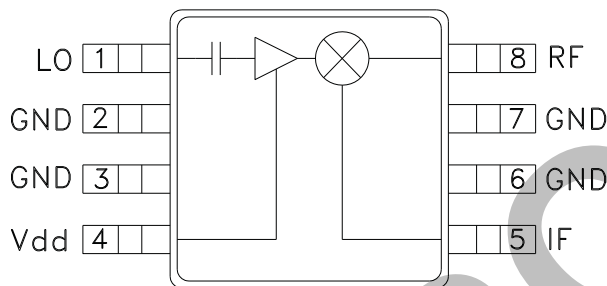
The HMC423MS8 / HMC423MS8E is ideal for:

- Base Stations
- Portable Wireless
- CATV/DBS
- ISM

Features

- Integrated LO Amplifier w/ P_{diss} <50 mW
- Conversion Loss / Noise Figure: 8 dB
- Low LO Drive: 0 dBm
- Input IP3: +15 dBm
- Single Positive Supply: 3V, 15 mA

Functional Diagram



General Description

The HMC423MS8 & HMC423MS8E are double balanced mixer ICs with integrated LO amplifiers. This mixer can operate as an upconverter or downconverter between 0.6 GHz and 1.3 GHz. With the integrated LO amplifier, the mixer requires an LO drive level of only 0 dBm, and requires only 15mA from a single positive +3V rail. The mixer has 8 dB of conversion loss, an input P_{1dB} of +8 dBm and an input third order intercept point of +15 dBm at 1.3 GHz.

Electrical Specifications, T_A = +25° C

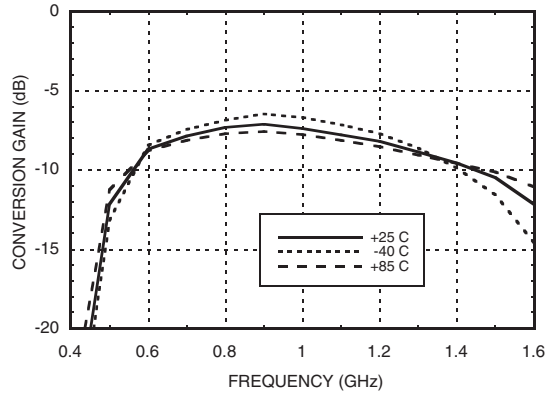
| Parameter | IF = 100 MHz LO = 0 dBm, Vdd = 3V | | | Units |
|-------------------------------------|--------------------------------------|------|------|-------|
| | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 0.6 - 1.3 | | | GHz |
| Frequency Range, IF | DC - 0.4 | | | GHz |
| Conversion Loss | | 8 | 11 | dB |
| Noise Figure (SSB) | | 8 | 11 | dB |
| LO to RF Isolation | 25 | 35 | | dB |
| LO to IF Isolation | 15 | 25 | | dB |
| RF to IF Isolation | 12 | 20 | | dB |
| IP3 (Input) | 13 | 15 | | dBm |
| 1 dB Compression (I _{dd}) | 6.5 | 8 | | dBm |
| Supply Current (I _{dd}) | | 15 | | mA |

* Unless otherwise noted, all measurements performed as downconverter, IF= 100 MHz.

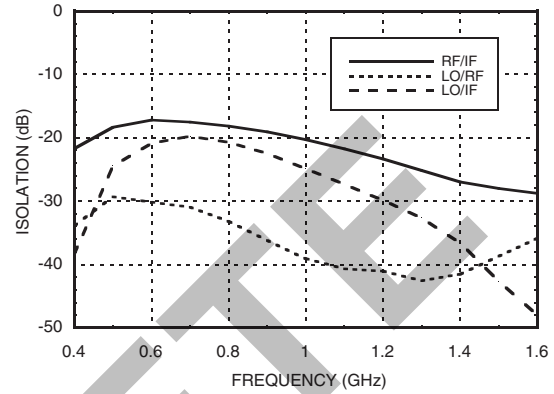
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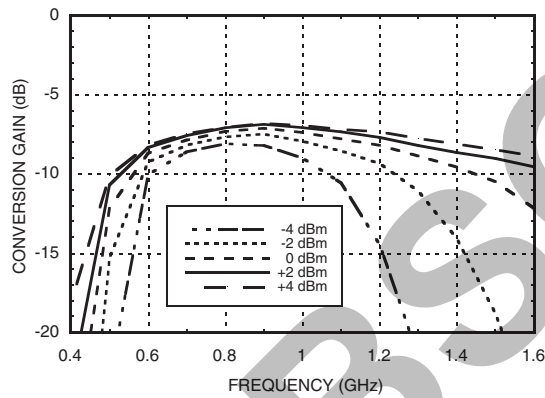
Conversion Gain vs. Temperature @ LO = 0 dBm



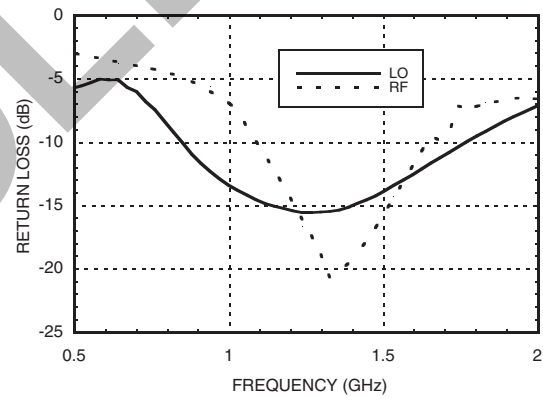
Isolation @ LO = 0 dBm



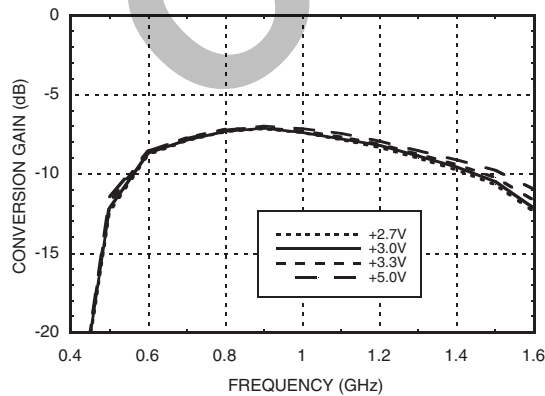
Conversion Gain vs. LO Drive



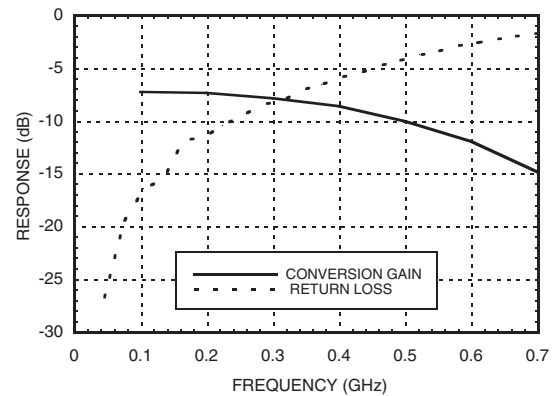
Return Loss @ LO = 0 dBm



Conversion Gain vs. Vdd @ LO = 0 dBm



IF Bandwidth @ LO = 0 dBm



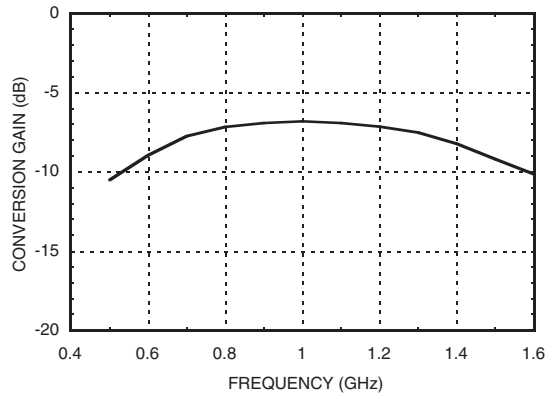
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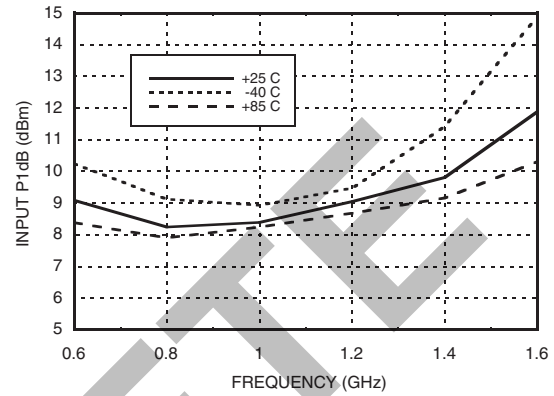


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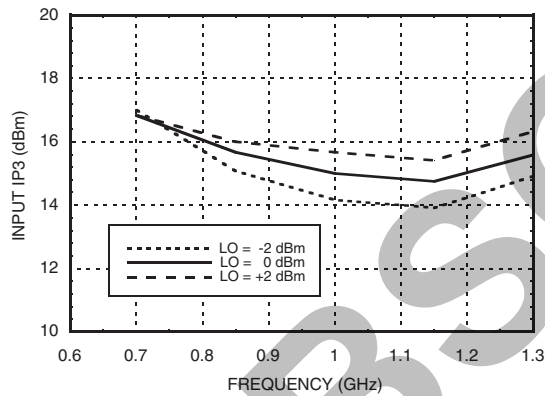
**Upconverter Performance
Conversion Gain @ LO = 0 dBm**



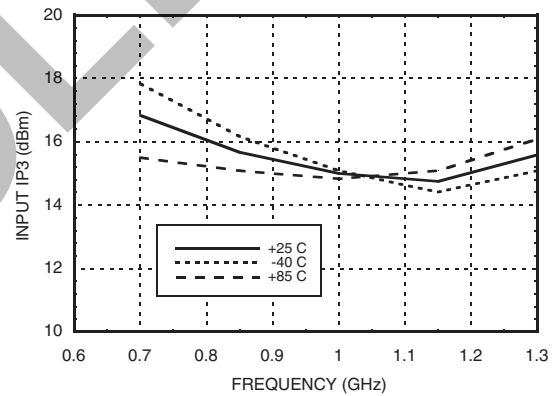
**Input P1dB vs.
Temperature @ LO = 0 dBm**



Input IP3 vs. LO Drive*



**Input IP3 vs.
Temperature @ LO = 0 dBm***



MxN Spurious @ IF Port

| mRF | nLO | | | | |
|-----|-----|-----|-----|-----|-----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | XX | 5 | 25 | 27 | 26 |
| 1 | 12 | 0 | 31 | 45 | 57 |
| 2 | 70 | 61 | 70 | 49 | 78 |
| 3 | >92 | 89 | 87 | 73 | 77 |
| 4 | >92 | >92 | >92 | >92 | >92 |

RF = 1.0 GHz @ -10 dBm
LO = 0.9 GHz @ 0 dBm
All values in dBc relative to the IF.
Measured as downconverter.

Harmonics of LO

| LO Freq. (GHz) | nLO Spur @ RF Port | | | |
|----------------|--------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| 0.7 | 30 | 15 | 42 | 40 |
| 0.85 | 34 | 16 | 50 | 42 |
| 1 | 38 | 19 | 48 | 52 |
| 1.15 | 40 | 22 | 54 | 58 |
| 1.3 | 42 | 26 | 44 | 59 |
| 1.45 | 39 | 31 | 50 | 60 |

LO = 0 dBm
All values in dBc below input LO level @ RF port.

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

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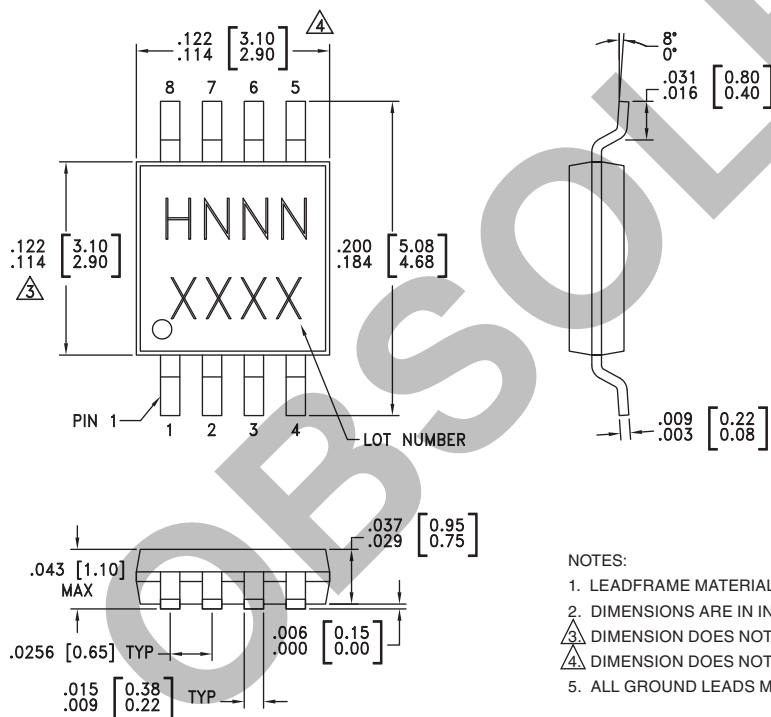
Absolute Maximum Ratings

| | |
|--|----------------|
| RF / IF Input (Vdd = +3V) | +13 dBm |
| LO Drive (Vdd = +3V) | +13 dBm |
| Vdd | +7 Vdc |
| IF DC Current | ±18 mA |
| Channel Temperature (Tc) | 150 °C |
| Continuous Pdiss (T = 85°C) (Derate 4.8 mW/°C above 85 C) | 0.32 W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |



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 MUST BE SOLDERED TO PCB RF GROUND.

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC423MS8 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H423 XXXX |
| HMC423MS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H423 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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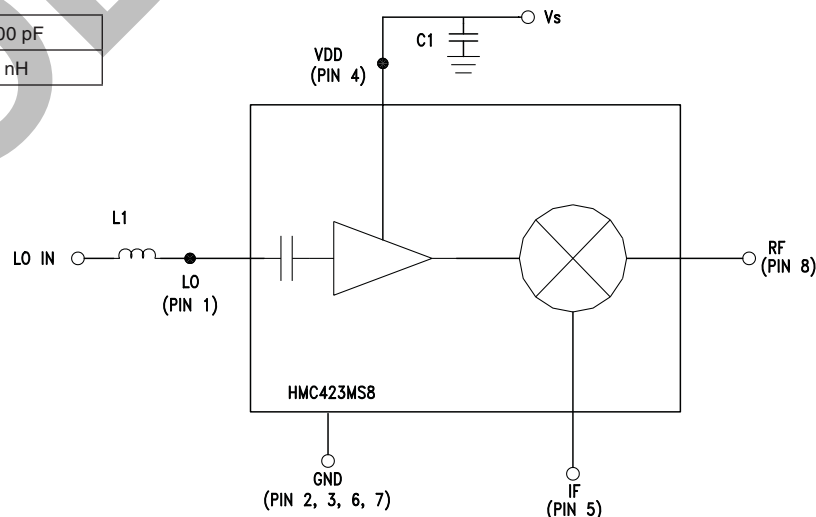


Pin Description

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|--|---------------------|
| 1 | LO | This pin is AC coupled and matched to 50 Ohm from 0.6 - 1.3 GHz. | |
| 2, 3, 6, 7 | GND | Pins must connect to RF ground. | |
| 4 | Vdd | Power supply for the LO Amplifier. One external RF bypass capacitor (10,000 pF) is required. | |
| 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 18 mA of current or die non-function and possible die failure will result. | |
| 8 | RF | This pin is DC coupled and matched to 50 Ohm from 0.6 - 1.3 GHz | |

Application Circuit

| | |
|----|-----------|
| C1 | 10,000 pF |
| L1 | 4.7 nH |

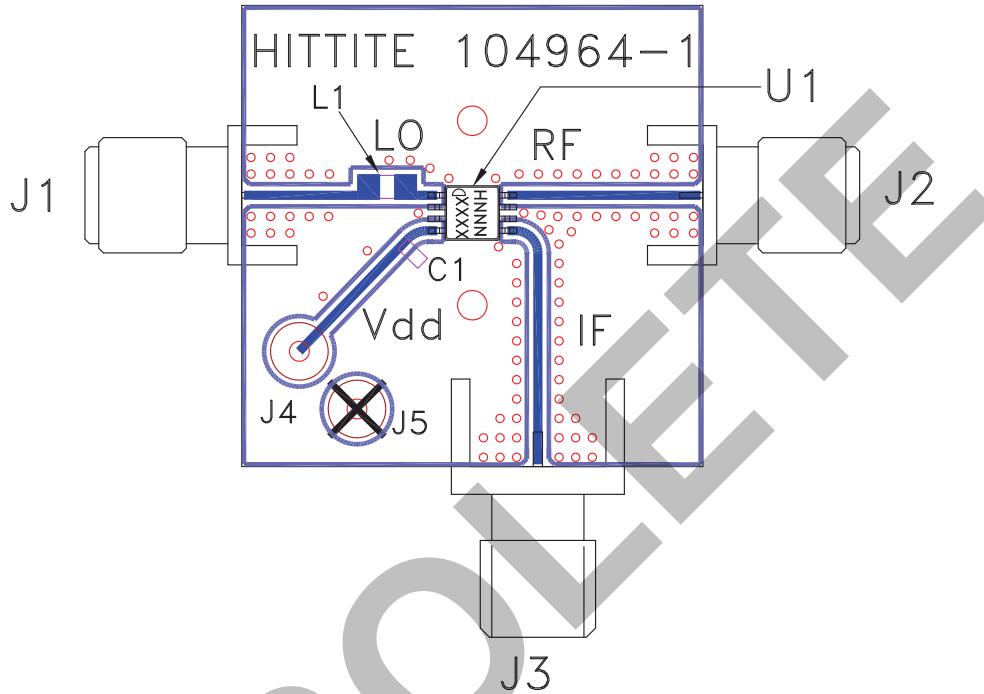


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Evaluation PCB



List of Materials for Evaluation PCB 105190 [1]

| Item | Description |
|---------|--|
| J1 - J3 | PCB Mount SMA Connector, Johnson |
| J4, J5 | DC Pin |
| C1 | 10k pF Chip Capacitor, 0603 Pkg. |
| L1 | 4.7 nH Inductor, 0805 Pkg. |
| U1 | HMC423MS8 / HMC423MS8E Mixer |
| PCB [2] | 104964 Evaluation Board, 1.00" x 1.00" |

[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 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.