



### Typical Applications

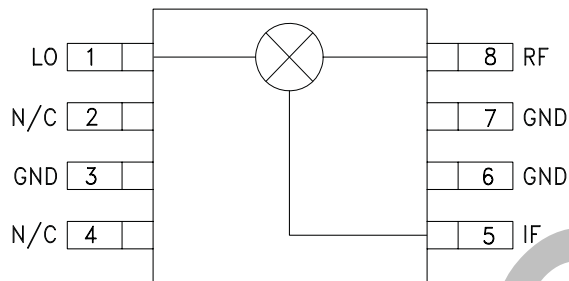
The HMC214MS8 / HMC214MS8E is ideal for:

- WiMAX, 802.16
- Fixed Wireless Access
- Wireless Local Loop

### Features

- Input IP3: +34 dBm
- LO to RF Isolation: 28 dB
- +22 dBm Input P1dB
- No External Components
- Ultra Small MSOP Package: 14.8mm<sup>2</sup>
- Included in the HMC-DK003 Designer's Kit

### Functional Diagram



### General Description

The HMC214MS8(E) is a general purpose high dynamic range passive MMIC mixer in plastic surface mount 8 lead Mini Small Outline Package (MSOP) covering 2.4 to 4 GHz. Excellent input IP3 performance of +34 dBm for downconversion and +31 dBm for upconversion is provided for WiMax and other 3.5 GHz applications at an LO drive of +17 dBm. With a 1dB compression of +22 dBm, the RF port will accept a wide range of input signal levels. Conversion loss is 10 dB typical and LO isolations are maintained at 25 to 30 dB. This miniature single-ended monolithic GaAs FET mixer does not require any external components or bias. The DC to 1 GHz IF frequency response will satisfy many transmit and receive frequency plans configured for low side LO. The HMC214MS8 & HMC214MS8E input IP3 performance coupled with its high P1dB rivals traditional active FET mixers while offering a much smaller 14.8mm<sup>2</sup> standard IC footprint and no DC bias.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , LO = +17dBm, IF = 200 MHz\*

| Parameter                      | Min. | Typ.       | Max. | Min. | Typ.       | Max. | Units |
|--------------------------------|------|------------|------|------|------------|------|-------|
| Frequency Range, RF            |      | 2.4 - 4.0  |      |      | 3.4 - 3.8  |      | GHz   |
| Frequency Range, LO            |      | 2.4 - 4.0  |      |      | 3.4 - 3.8  |      | GHz   |
| Frequency Range, IF            |      | DC - 1     |      |      | DC - 1     |      | GHz   |
| Conversion Loss                |      | 10         | 12   |      | 10         | 11.5 | dB    |
| Noise Figure (SSB)             |      | 10         | 12   |      | 10         | 11.5 | dB    |
| LO to RF Isolation             | 18   | 30         |      | 20   | 28         |      | dB    |
| LO to IF Isolation             | 12   | 25         |      | 22   | 30         |      | dB    |
| IP3 (Input)                    | 26   | 30         |      | 31   | 34         |      | dBm   |
| 1 dB Gain Compression (Input)  | 18   | 21         |      | 20   | 22         |      | dBm   |
| LO Input Drive Level (Typical) |      | +15 to +19 |      |      | +15 to +19 |      | dBm   |

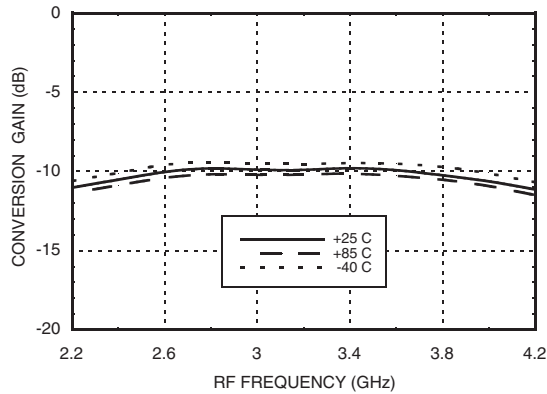
\*Unless otherwise noted, all measurements performed as a downconverter, with low side LO & IF = 200 MHz.

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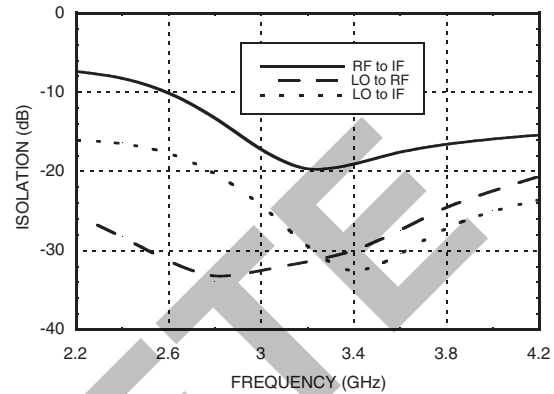
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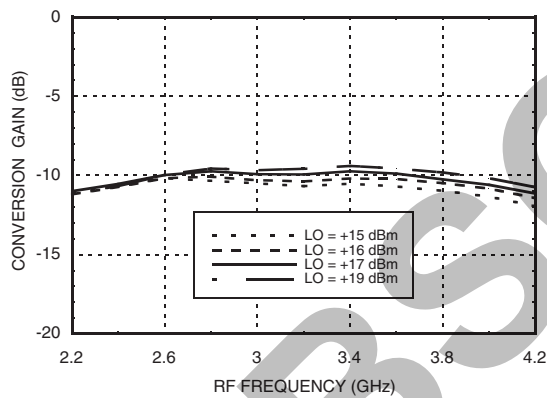
**Conversion Gain vs. Temperature @ LO = +17 dBm**



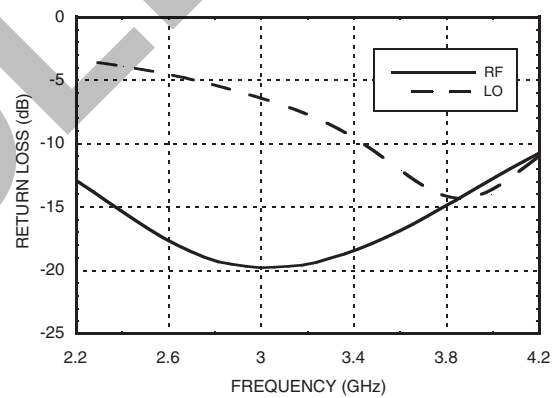
**Isolation @ LO = +17 dBm**



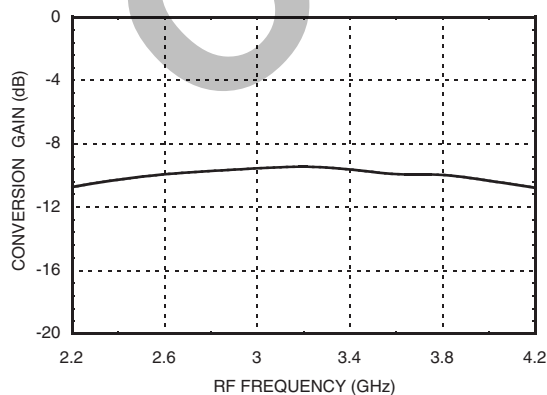
**Conversion Gain vs. LO Drive**



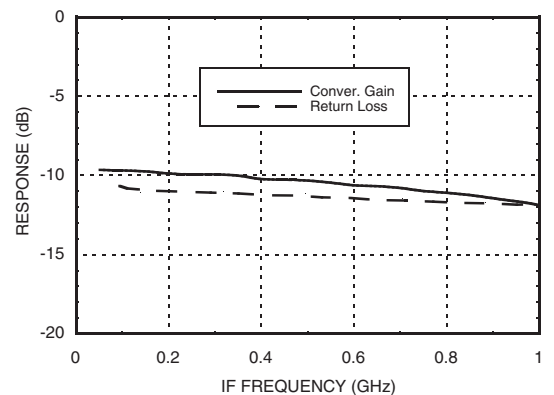
**Return Loss @ LO = +17 dBm**



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



**IF Bandwidth @ LO = +17 dBm**



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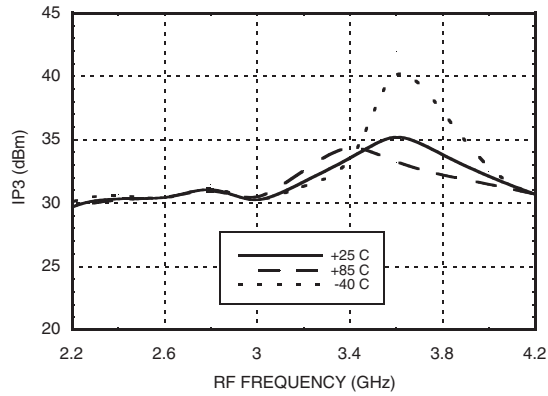
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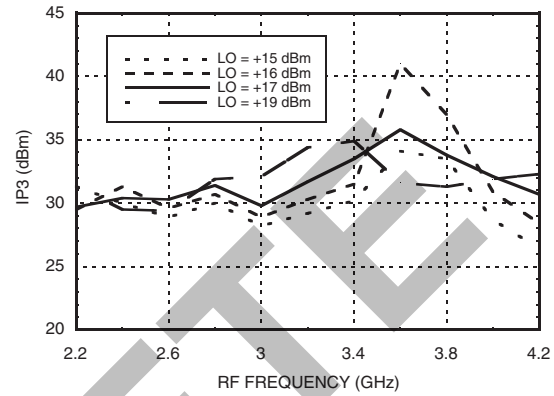
**HIGH IP3 GaAs MMIC MIXER, 2.4 - 4.0 GHz**



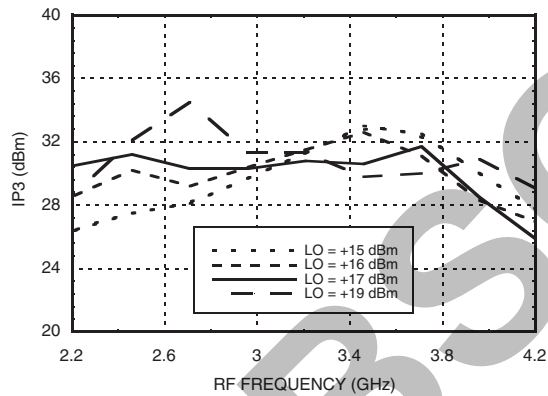
**Input IP3 vs. Temperature, LO = +17 dBm**



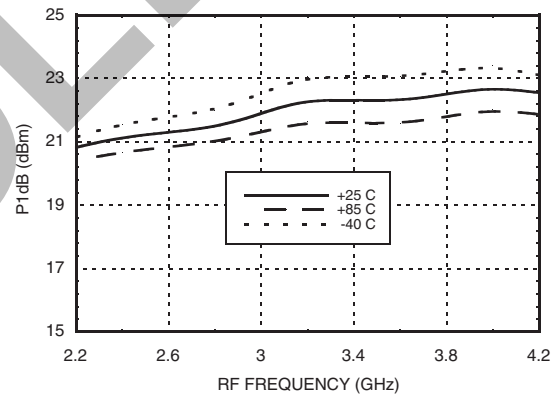
**Input IP3 vs. LO Drive**



**Upconverter IP3 vs. LO Drive, IF = 200 MHz**



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



**Harmonics of LO**

| LO Freq (GHz) | nLO Spur @ RF Port |    |    |    |
|---------------|--------------------|----|----|----|
|               | 1                  | 2  | 3  | 4  |
| 2.6           | 35                 | 26 | 42 | 39 |
| 2.8           | 30                 | 26 | 47 | 40 |
| 3.0           | 29                 | 26 | 46 | 42 |
| 3.2           | 28                 | 29 | 42 | xx |
| 3.4           | 25                 | 28 | 40 | xx |
| 3.6           | 24                 | 31 | 39 | xx |

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

**MxN Spurious Outputs**

| mRF | nLO |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
|     | 0   | 1   | 2   | 3   | 4   |
| 0   | xx  | -4  | -2  | 9   | xx  |
| 1   | 9   | 0   | 37  | 39  | 35  |
| 2   | 73  | 66  | 49  | 65  | 77  |
| 3   | 97  | 98  | 104 | 85  | 91  |
| 4   | xx  | 100 | 99  | 104 | 106 |

RF Freq = 3.5 GHz @ -10 dBm  
LO Freq = 3.3 GHz @ +17 dBm  
All values in dBc relative to the IF output power.

Unless otherwise noted, all measurements performed as a downconverter, with low side LO & IF = 200 MHz.

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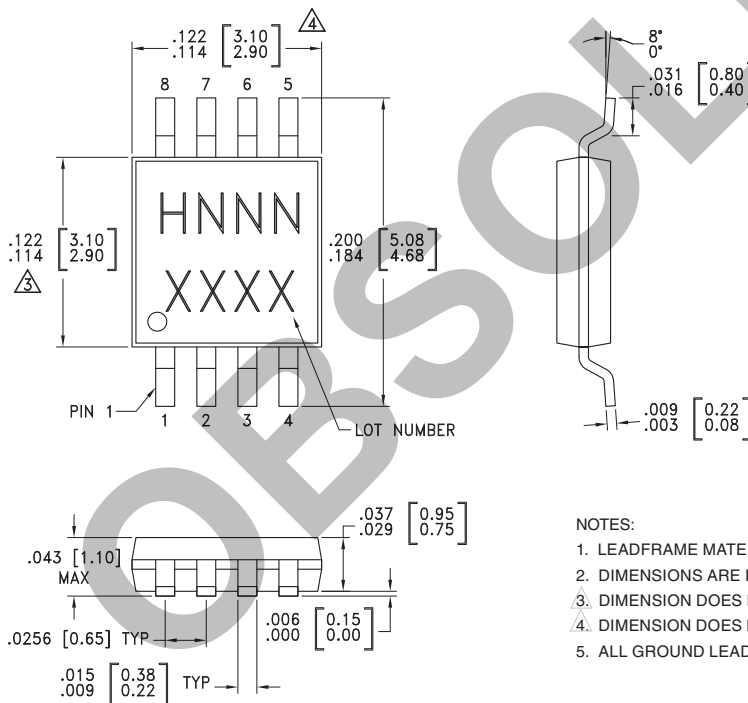
### Absolute Maximum Ratings

|   |                |
|---|----------------|
| RF/IF Input   | +27 dBm        |
| LO Drive  | +27 dBm        |
| IF DC Current   | ±40 mA         |
| Channel Temperature   | 150 °C         |
| Continuous P <sub>diss</sub> (T=85 °C)<br>(derate 3.69 mW/°C above 85 °C) | 240 mW         |
| Thermal Resistance (R <sub>TH</sub> )<br>(junction to lead)               | 270 °C/W       |
| 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 MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC214MS8   | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H214<br>XXXX                   |
| HMC214MS8E  | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | H214<br>XXXX                   |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

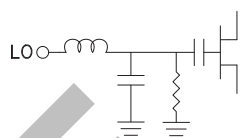

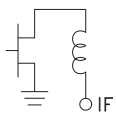
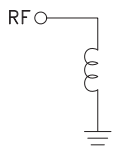
[3] 4-Digit lot number XXXX

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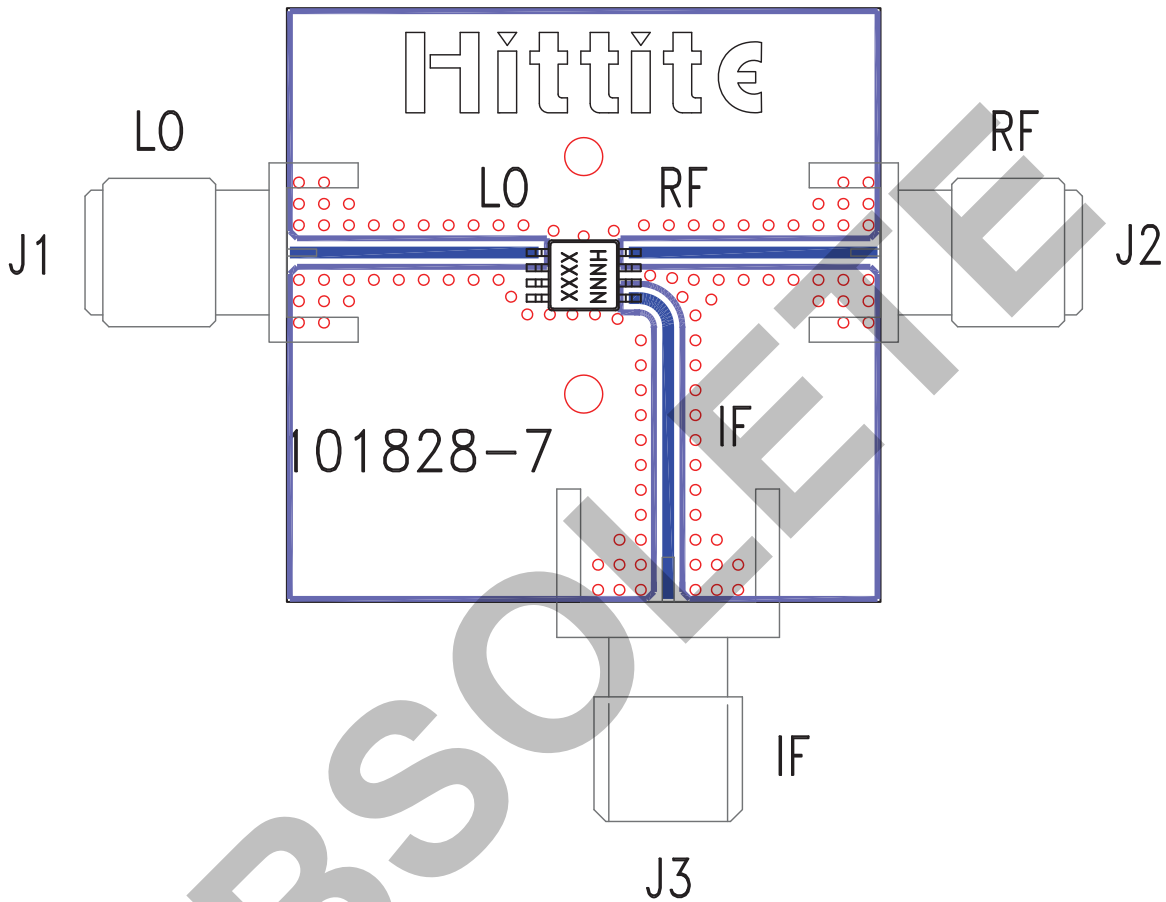
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**Pin Descriptions**

| Pin Number | Function | Description   | Interface Schematic  |
|------------|----------|---|--|
| 1          | LO       | This pin is DC coupled & matched to 50 Ohms. Blocking capacitors are required if line potential is not equal to 0V.   |   |
| 2, 4       | N/C      | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally.  |  |
| 3, 6, 7    | GND      | This pin must be connected to RF ground.  |   |
| 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. 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       | This pin is DC coupled and matched to 50 Ohms.  |  |



**Evaluation PCB**



**List of Materials for Evaluation PCB 101830 [1]**

| Item    | Description                  |
|---------|------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector   |
| U1      | HMC214MS8 / HMC214MS8E 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.