# HMC220MS8 / 220MS8E

v03.1111

## GaAs MMIC SMT DOUBLE - BALANCED MIXER, 5 - 12 GHz

### Typical Applications

The HMC220MS8(E) is ideal for:

- VSAT & Mobile SatCom Terminals
- Microwave & Military Radio
- Wireless Backhaul Equipment
- Automotive, DSRC and IVHS
- Military RADAR, EW, and ECM Subsystems

### Features

Wide IF Frequency Range: DC - 4 GHz

Excellent LO to RF Isolation: 25 dB

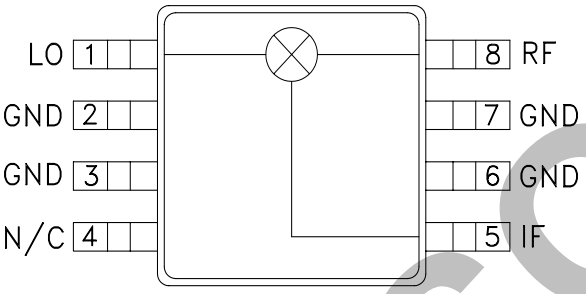
Low Conversion Loss: 7 dB

No DC Bias & No External Matching Required

Ideal for Upconversion & Downconversion

MSOP8 SMT Package, 14.8 mm²

### Functional Diagram




### General Description

The HMC220MS8(E) is a wideband double-balanced mixer in an 8 lead plastic surface mount package. This fully integrated MMIC mixer is fabricated in a GaAs MESFET process and requires no DC bias and no external matching components. The HMC220MS8(E) mixer integrates Schottky diode mixing elements and on-chip balun transformers to deliver excellent isolation from LO to RF and from LO to IF. The wide IF bandwidth of DC to 4 GHz enables this mixer to be used in a wide range of general purpose applications including upconverters, downconverters, biphase modulators, demodulators, and phase comparators. The HMC220MS8(E) operates with LO drive levels as low as +7 dBm, and exhibits only 7 dB typical conversion loss.



### Electrical Specifications, $T_A$ = +25° C, As a Function of LO Drive

| Parameter | LO = +13 dBm IF = 100 MHz | | | LO = +13 dBm IF = 100 MHz | | | LO = +10 dBm IF = 100 MHz | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 5 - 10 | | | 10 - 12 | | | 5.9 - 10 | | | GHz |
| Frequency Range, IF | DC - 4 | | | DC - 4 | | | DC - 3.5 | | | GHz |
| Conversion Loss | | 7.0 | 10 | | 8.5 | 10.5 | | 7.5 | 10 | dB |
| Noise Figure (SSB) | | 7.0 | 10 | | 8.5 | 10.5 | | 7.5 | 10 | dB |
| LO to RF Isolation | 17 | 25 | | 13 | 18 | | 17 | 25 | | dB |
| LO to IF Isolation | 20 | 28 | | 14 | 20 | | 20 | 28 | | dB |
| IP3 (Input) | 14 | 17 | | 16 | 21 | | 13 | 16 | | dBm |
| 1 dB Gain Compression (Input) | 4 | 8 | | 4 | 8 | | 5 | 8 | | dBm |



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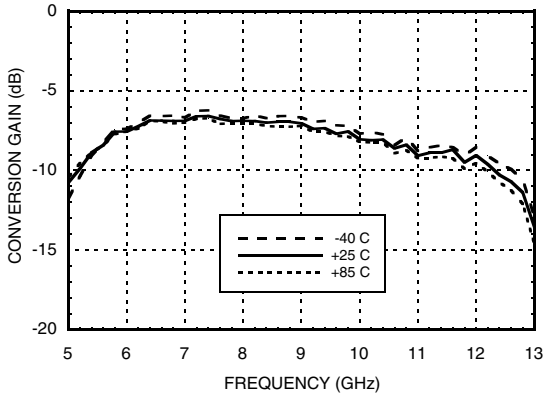
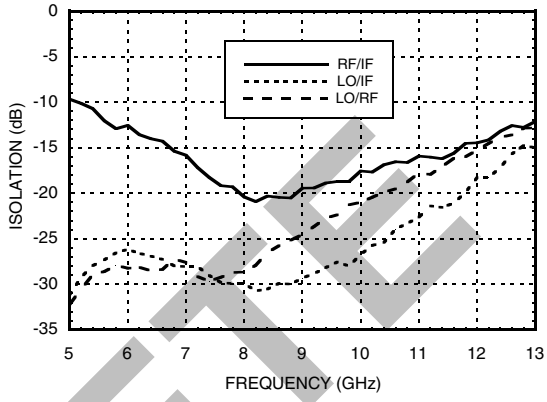
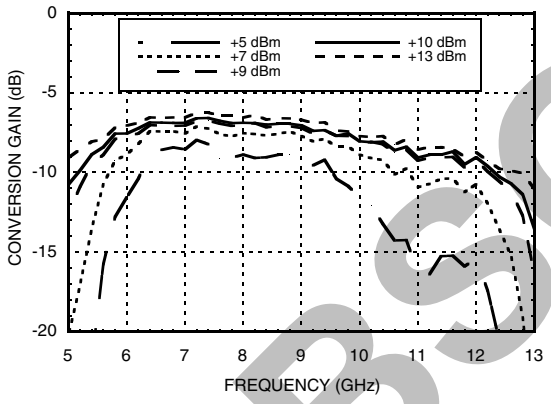
### Conversion Gain vs Temperature @ LO = +10 dBm



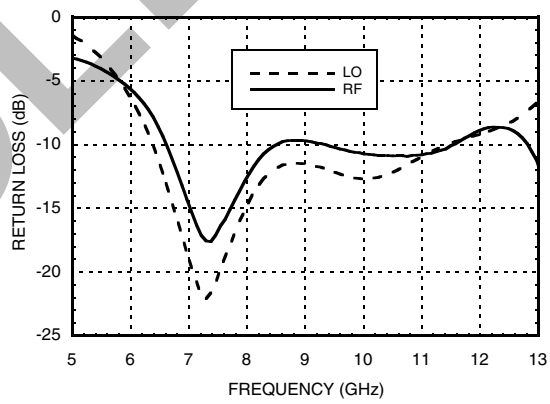

### Isolation @ LO = +10 dBm



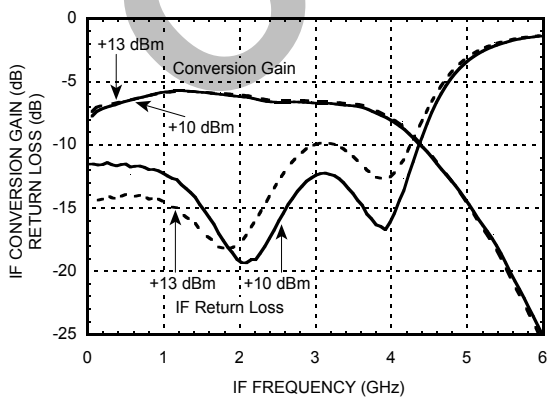

### Conversion Gain vs. LO Drive



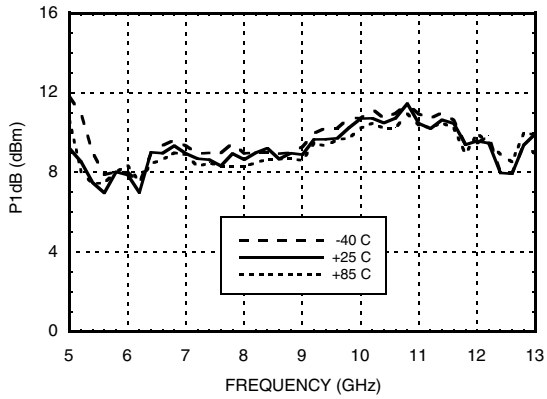

### Return Loss @ LO = +10 dBm




### IF Bandwidth vs LO Drive Conversion Gain and Return Loss




### P1dB vs. Temperature LO = +10 dBm







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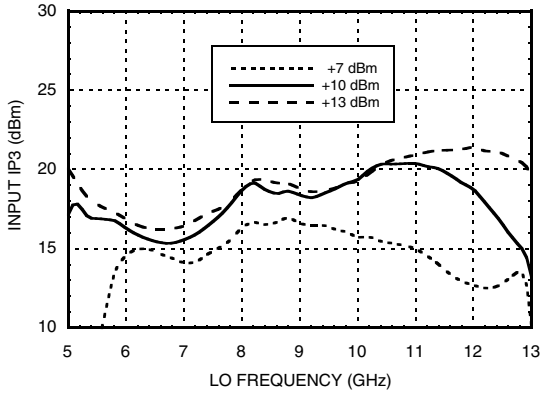
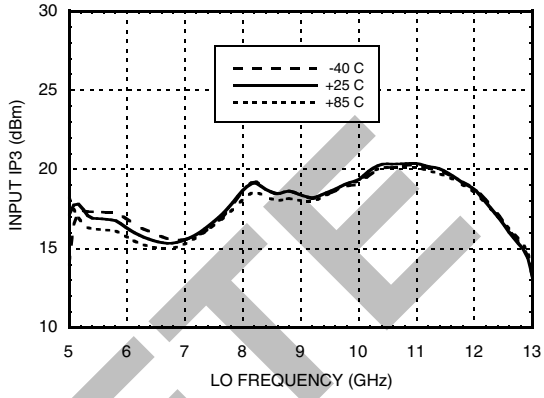
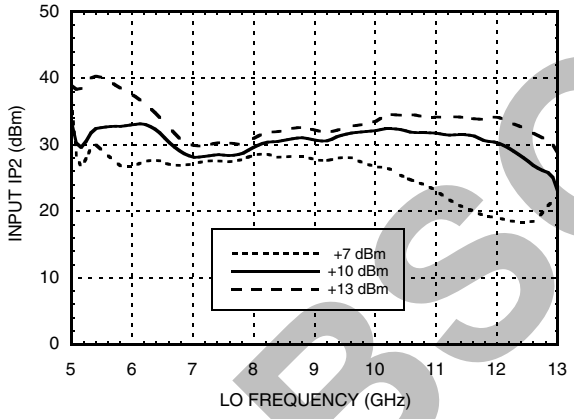
### Input IP3 vs. LO Drive



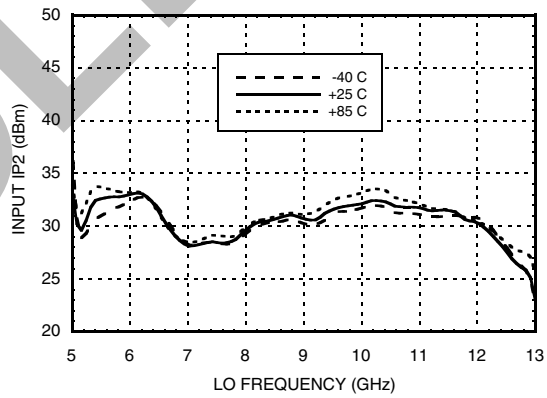

### Input IP3 vs. Temperature @ LO = +10 dBm




### Input IP2 vs. LO Drive




### Input IP2 vs. Temperature @ LO = +10 dBm





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## MxN Spurious Outputs

| | nLO | | | | |
|---|---|---|---|---|---|
| mRF | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | 4 | 12 | 17 | 36 |
| 1 | 12 | 0 | 29 | 40 | 34 |
| 2 | 62 | 58 | 45 | 57 | 62 |
| 3 | 71 | 78 | 73 | 65 | 75 |
| 4 | > 85 | > 85 | > 85 | > 85 | > 85 |

RF = 7.5 GHz @ -10 dBm
LO = 7.6 GHz @ +10 dBm
All values in dBc below the IF power level (-1RF + 1LO)

## Harmonics of LO

| LO Freq. (GHz) | nLO Spur at RF Port | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 5.5 | 28 | 27 | 34 | 67 |
| 7 | 29 | 25 | 39 | 61 |
| 8.5 | 26 | 30 | 55 | 60 |
| 10 | 21 | 43 | 59 | 62 |
| 11.5 | 17 | 51 | 50 | xx |
| 13 | 13 | 48 | 50 | xx |

LO = +10 dBm
Values in dBc below input LO level measured at the RF port.

## Absolute Maximum Ratings

| | |
|---|---|
| RF / IF Input | +13 dBm |
| LO Drive | +27 dBm |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1A |

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS







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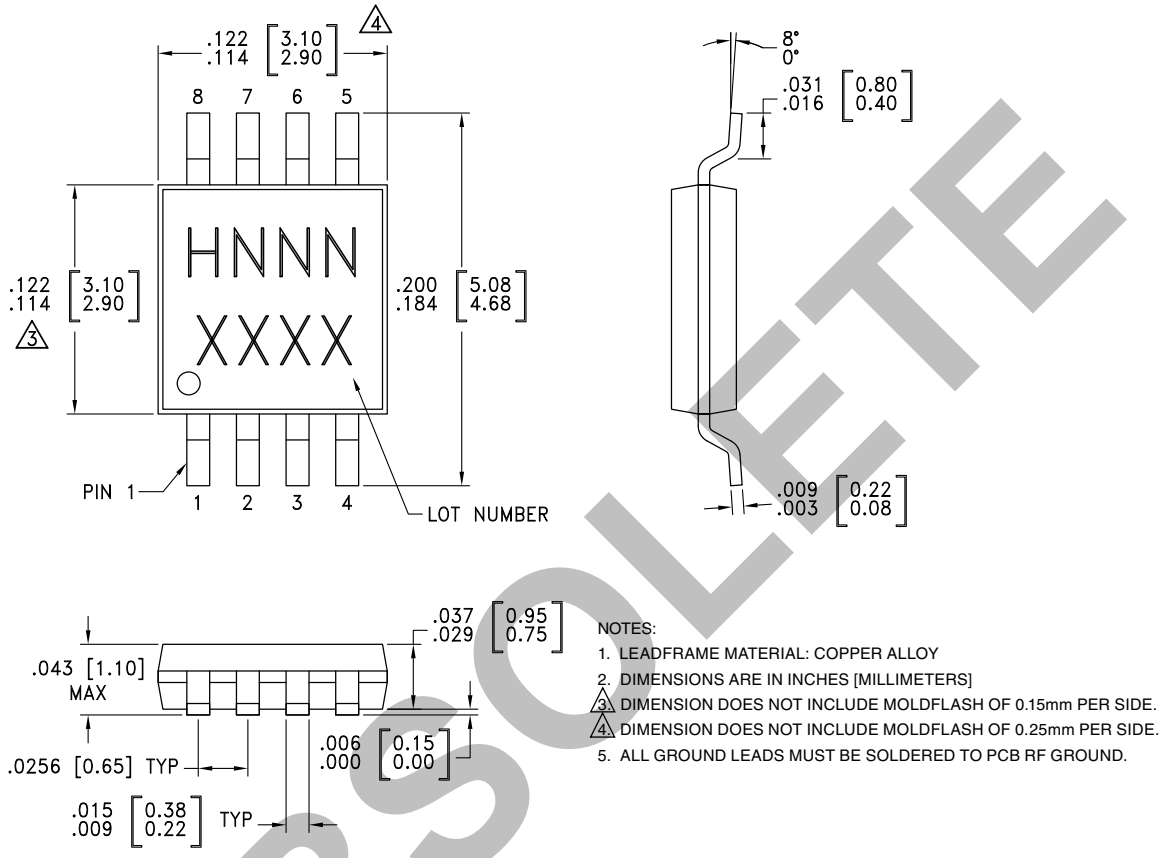
### Outline Drawing




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] |
|---|---|---|---|---|
| HMC220MS8 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 [1] | H220<br>XXXX |
| HMC220MS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H220<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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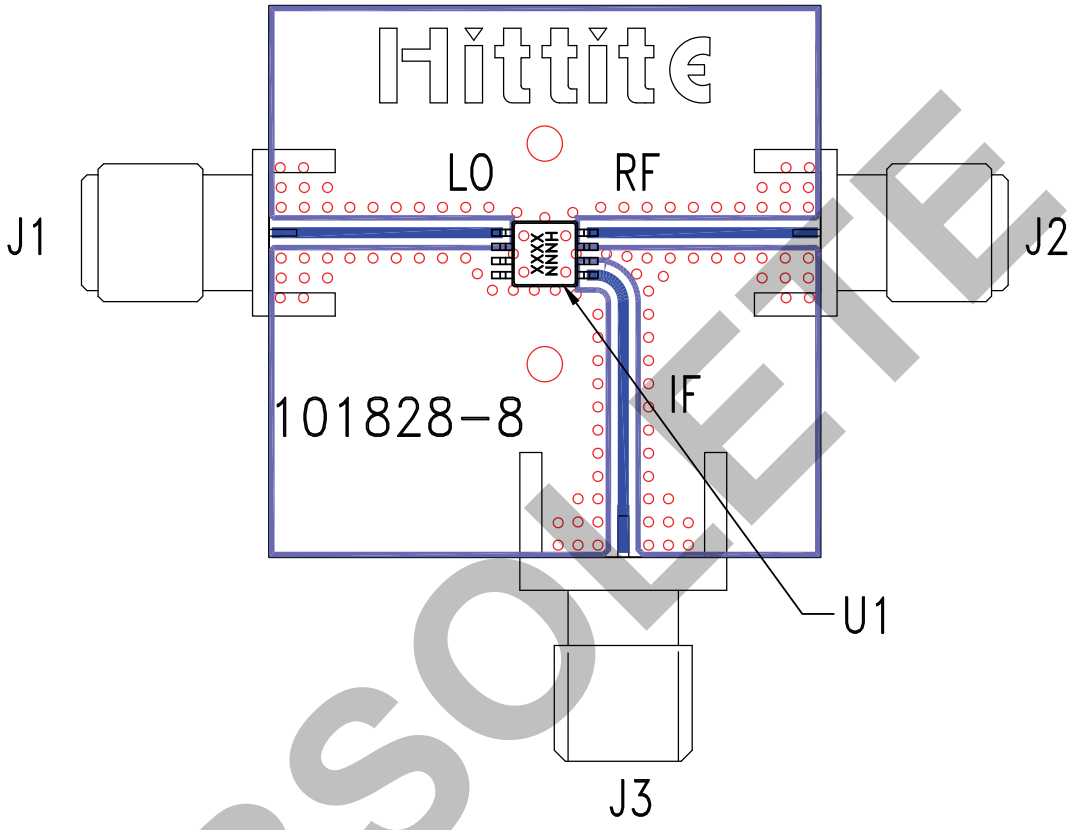
## Evaluation Circuit Board






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

| Item | Description |
|---|---|
| J1 - J3 | PCB Mount SMA RF Connector |
| U1 | HMC220MS8 / HMC220MS8E Mixer |
| PCB [2] | 101828 Evaluation Board |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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.



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