

## Typical Applications

The HMC220AMS8 / HMC220AMS8E is ideal for:

- Microwave Radios
- VSAT

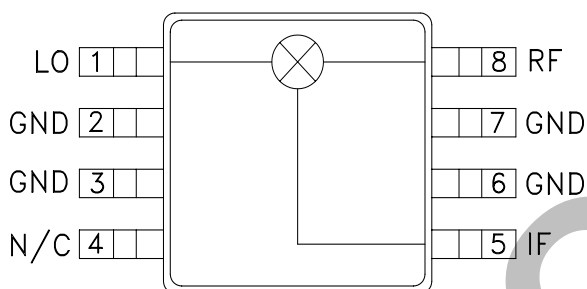
## Features

Ultra Small Package: MSOP8

Conversion Loss: 8.5 dB

Wideband IF: DC - 4 GHz

## Functional Diagram

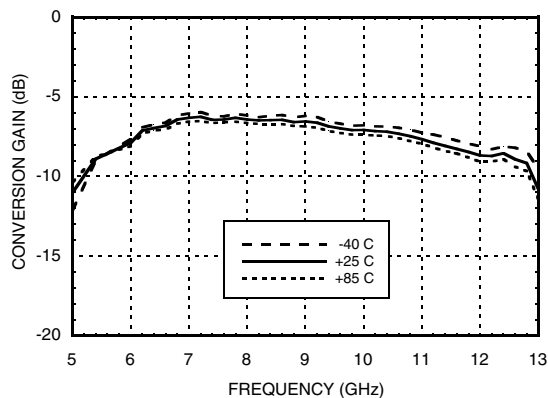
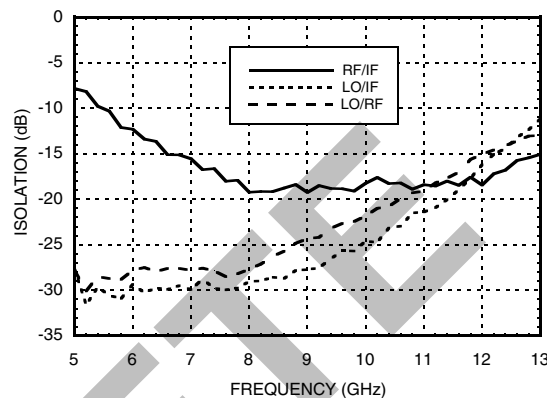
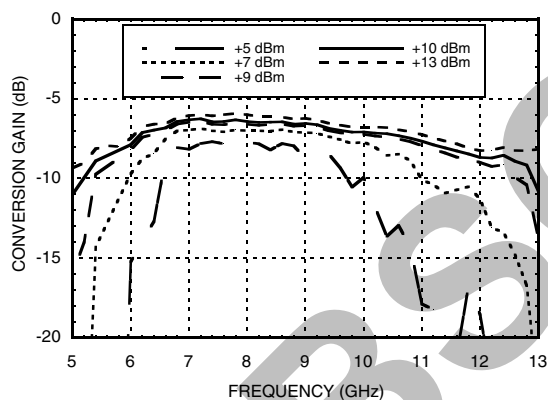
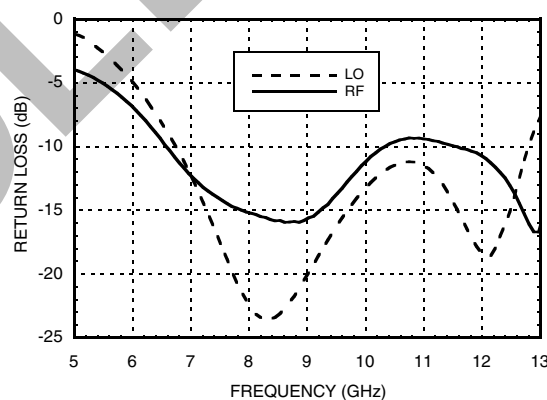
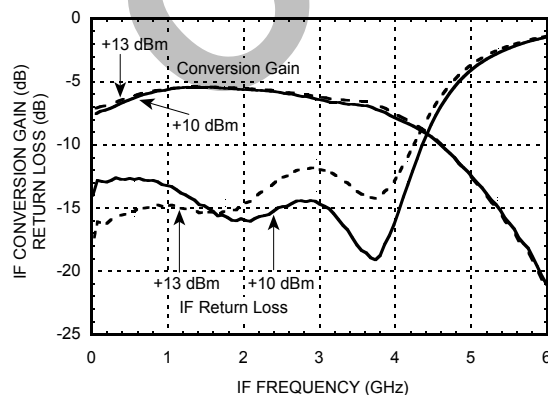
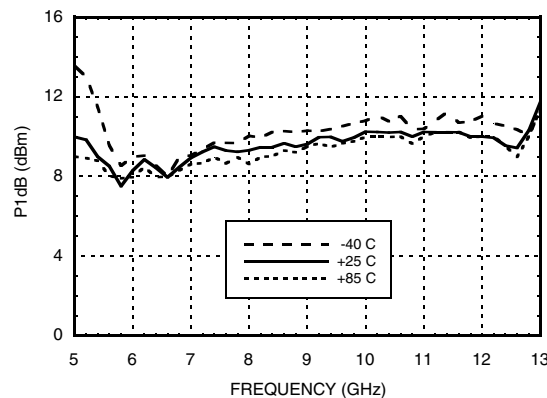


## General Description

The HMC220AMS8 & HMC220AMS8E are ultra miniature double-balanced mixers in 8 lead plastic surface mount packages (MSOP). This passive MMIC mixer is constructed of GaAs Schottky diodes and novel planar transformer baluns on the chip. The device can be used as an upconverter, downconverter, bi-phase (de)modulator, or phase comparator. The consistent MMIC performance will improve system operation and assure regulatory compliance.

## Electrical Specifications, $T_A = +25^\circ \text{C}$ , As a Function of LO Drive

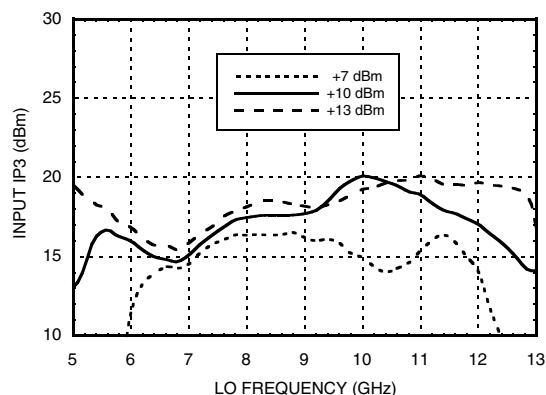
| Parameter                     | LO = +13 dBm<br>IF = 100 MHz |      |      | LO = +13 dBm<br>IF = 100 MHz |      |      | LO = +10 dBm<br>IF = 100 MHz |      |      | Units |
|-------------------------------|------------------------------|------|------|------------------------------|------|------|------------------------------|------|------|-------|
|                               | 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   |

**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**


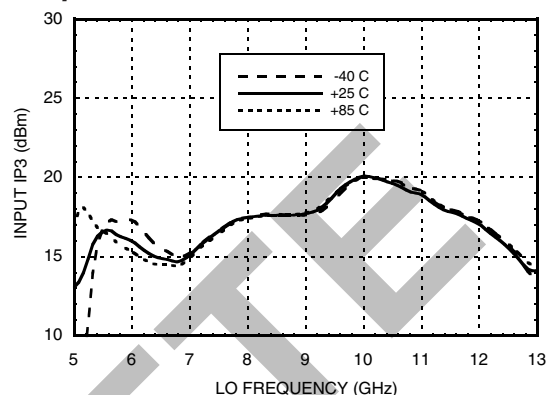
# HMC220AMS8 / 220AMS8E

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

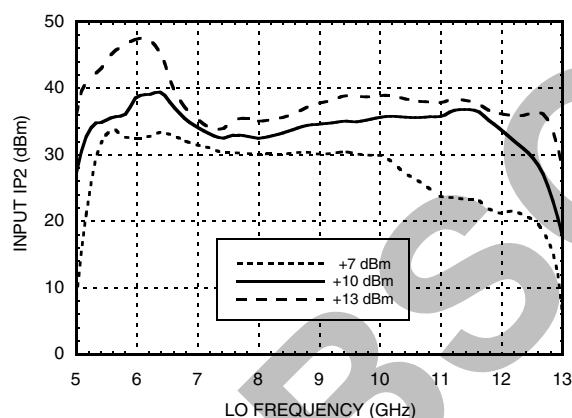
**Input IP3 vs. LO Drive**



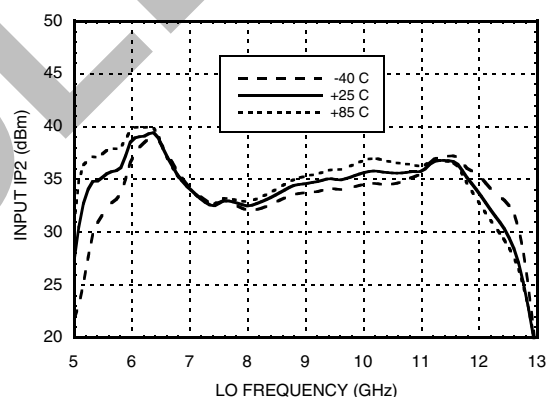
**Input IP3 vs. Temperature @ LO = +10 dBm**



**Input IP2 vs. LO Drive**



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



### MxN Spurious Outputs

| mRF | nLO  |      |      |      |      |
|-----|------|------|------|------|------|
|     | 0    | 1    | 2    | 3    | 4    |
| 0   | xx   | 3    | 10   | 7    | 54   |
| 1   | 11   | 0    | 28   | 31   | 35   |
| 2   | 53   | 62   | 53   | 58   | 61   |
| 3   | 73   | 69   | 74   | 66   | 73   |
| 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.<br>(GHz) | nLO Spur at RF Port |    |    |    |
|-------------------|---------------------|----|----|----|
|                   | 1                   | 2  | 3  | 4  |
| 5.5               | 29                  | 30 | 42 | 69 |
| 7                 | 29                  | 27 | 28 | 66 |
| 8.5               | 26                  | 35 | 47 | 70 |
| 10                | 22                  | 40 | 44 | 67 |
| 11.5              | 18                  | 49 | 51 | 66 |
| 13                | 13                  | 63 | 62 | xx |

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

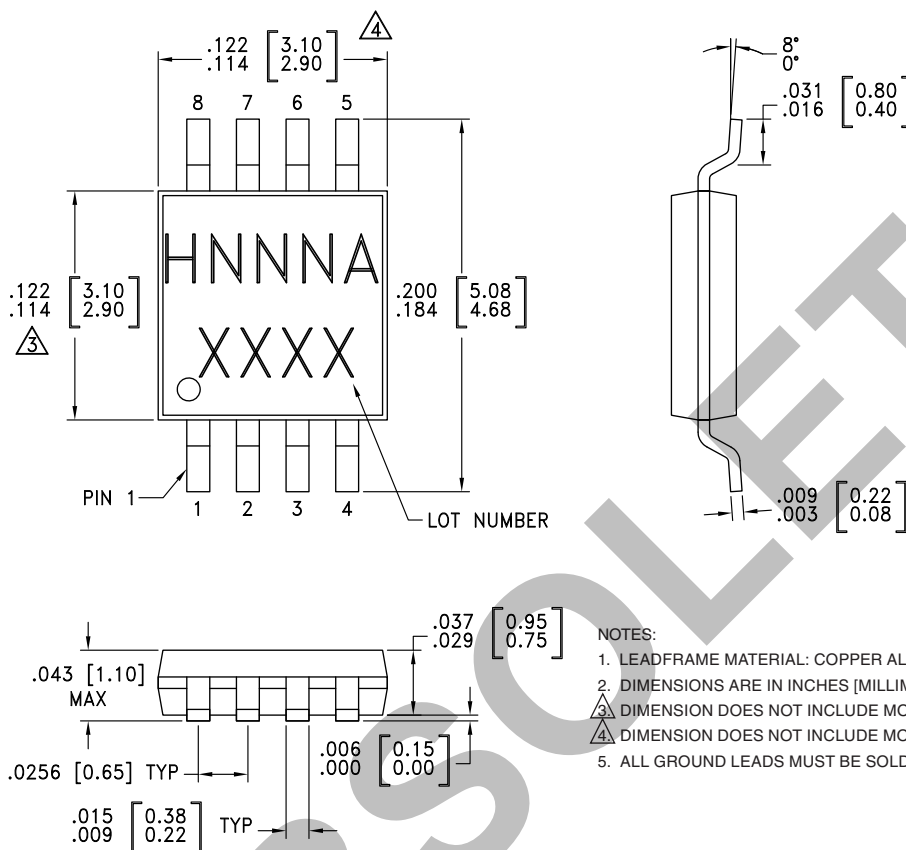
### Absolute Maximum Ratings

|                       |                |
|-----------------------|----------------|
| 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

**Outline Drawing**



**Package Information**

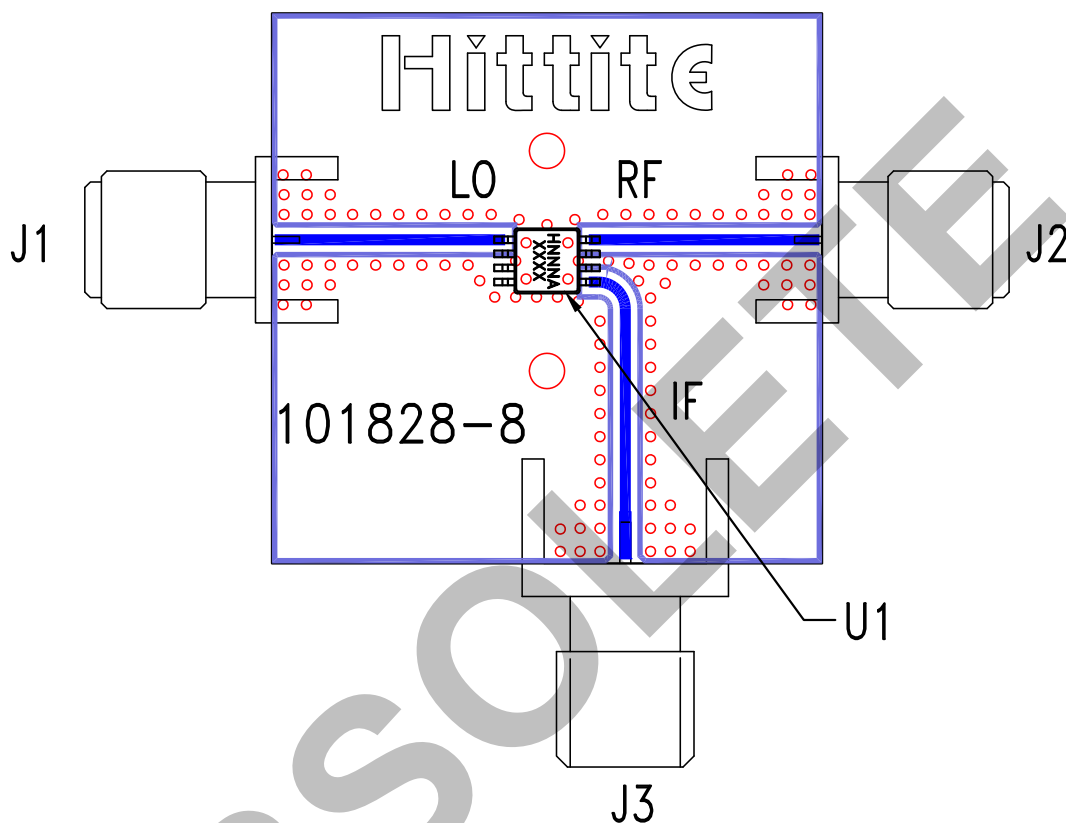
| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC220AMS8  | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H220A<br>XXXX                  |
| HMC220AMS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | H220A<br>XXXX                  |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

### Evaluation Circuit Board



### List of Materials for Evaluation PCB 101830 <sup>[1]</sup>

| Item               | Description                    |
|--------------------|--------------------------------|
| J1 - J3            | PCB Mount SMA RF Connector     |
| U1                 | HMC220AMS8 / HMC220AMS8E Mixer |
| PCB <sup>[2]</sup> | 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.