**Typical Applications**
The HMC218BMS8GE is ideal for:
- Base stations, Repeaters & Access Points
- WiMAX, WiBro & Fixed Wireless
- Portables & Subscribers
- PLMR, Public Safety & Telematics

**Features**
- Passive Double-Balanced Topology
- Input IP3: +17 dBm
- Low Conversion Loss: 7 dB
- LO to RF Isolation: 38 dB
- LO to IF Isolation: 32 dB
- Up-converter & Down-converter Applications

**General Description**
The HMC218BMS8GE is an ultra miniature double-balanced mixers in an 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 up-converter, down-converter, bi-phase modulator / demodulator, or phase comparator. This mixer performs well when used as a down-converter from 3.5 to 8 GHz and as an up-converter from 4.5 to 8 GHz. The low conversion loss, high isolation and wide IF bandwidth make this mixer ideal for a variety of Rx and Tx frequency plans.

**Functional Diagram**

**Electrical Specifications, \( T_A = +25 ^\circ C, IF = 100 \) MHz, LO = +13 dBm, LSB \(^{[1]}\)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range, RF</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>GHz</td>
</tr>
<tr>
<td>Frequency Range, LO</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>3.5</td>
<td>-</td>
<td>6</td>
<td>GHz</td>
</tr>
<tr>
<td>Frequency Range, IF</td>
<td>DC</td>
<td>-1.6</td>
<td></td>
<td>DC</td>
<td>-1.6</td>
<td></td>
<td>DC</td>
<td>-1.6</td>
<td></td>
<td>GHz</td>
</tr>
<tr>
<td>Conversion Loss</td>
<td>9</td>
<td>12.5</td>
<td></td>
<td>7</td>
<td>8.5</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>IP3 (Input)</td>
<td>10</td>
<td>13</td>
<td>12.5</td>
<td>17</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>IP2 (Input)</td>
<td>45</td>
<td></td>
<td></td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>1 dB Gain Compression (Input)</td>
<td>10</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>LO to RF Isolation</td>
<td>42</td>
<td></td>
<td></td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>LO to IF Isolation</td>
<td>20</td>
<td>30</td>
<td>15</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dB</td>
</tr>
</tbody>
</table>

\(^{[1]}\) Unless otherwise noted, all measurements performed as down-converter with high side LO, IF = 100 MHz, RFIN = -10 dBm
**GaAs MMIC DOUBLE-BALANCED MIXER**

3.5 - 8 GHz

**High Side LO, Down-converter Performance, IF = 100 MHz**

**Conversion Loss vs. Temperature**

\[ \text{LO} = +13 \text{ dBm}, \ R\text{FIN} = -10 \text{ dBm}, \ \text{LSB} \]

**Conversion Loss vs. LO Drive**

\[ \text{RFIN} = -10 \text{ dBm}, \ \text{LSB} \]

**Input IP3 vs. Temperature**

\[ \text{LO} = +13 \text{ dBm}, \ R\text{FIN} = -10 \text{ dBm}, \ \text{LSB} \]

**Input IP3 vs. LO Drive**

\[ \text{RFIN} = -10 \text{ dBm}, \ \text{LSB} \]

**Input IP2 vs. Temperature**

\[ \text{LO} = +13 \text{ dBm}, \ R\text{FIN} = -10 \text{ dBm}, \ \text{LSB} \]

**Input IP2 vs. LO Drive**

\[ \text{RFIN} = -10 \text{ dBm}, \ \text{LSB} \]
GaAs MMIC DOUBLE-BALANCED MIXER
3.5 - 8 GHz

High Side LO, Down-converter Performance, IF = 100 MHz

Conversion Loss vs. IF
LO = +13 dBm, RFIN = -10 dBm, LSB

Input IP3 vs. IF
LO = +13 dBm, RFIN = -10 dBm, LSB

Input IP2 vs. IF
LO = +13 dBm, RFIN = -10 dBm, LSB

Conversion Loss over IF Bandwidth
@ LO = 6 GHz, LO Power = +13 dBm, LSB

Input IP3 over IF Bandwidth, LO = 6 GHz
LO Power = +13 dBm, LSB

LO to RF and LO to IF Isolation
LO Power = +13 dBm

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Application Support: Phone: 1-800-ANALOG-D
**Input P1dB vs. Temperature**

LO Power = +13 dBm, IF = 100 MHz

**Output P1dB vs. Temperature**

LO Power = +13 dBm, IF = 100 MHz

**Input P1dB vs. LO Power**

IF = 100 MHz

**Output P1dB vs. LO Power**

IF = 100 MHz

**RF, LO, IF Return Loss @ LO = 4.6GHz**

LO Power = +13 dBm

**M x N Spurious Outputs, IF = 100 MHz**

<table>
<thead>
<tr>
<th>LO</th>
<th>mRF 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.4</td>
<td>32.5</td>
<td>25.6</td>
<td>52.1</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>13.4</td>
<td>31.9</td>
<td>51.7</td>
<td>45.3</td>
<td>54.2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>67.3</td>
<td>45.9</td>
<td>60.5</td>
<td>51.6</td>
<td>76.3</td>
<td>72.1</td>
</tr>
<tr>
<td>3</td>
<td>82.1</td>
<td>92.4</td>
<td>70.8</td>
<td>52</td>
<td>73.5</td>
<td>93.2</td>
</tr>
<tr>
<td>4</td>
<td>86.9</td>
<td>90.6</td>
<td>93.9</td>
<td>75.7</td>
<td>88.6</td>
<td>82.3</td>
</tr>
<tr>
<td>5</td>
<td>84</td>
<td>89.2</td>
<td>88.3</td>
<td>93.4</td>
<td>96</td>
<td>78.2</td>
</tr>
</tbody>
</table>

RF = 5.15 GHz @ -10 dBm
LO = 5.25 GHz @ +13 dBm
All values in dBc below IF power level (LO - RF) LSB
Spur values are (M x RF) - (N x LO)
**HMC218BMS8GE**

**GaAs MMIC DOUBLE-BALANCED MIXER**

3.5 - 8 GHz

**Low Side LO, Up-converter Performance, IF = 100 MHz**

Conversion Loss vs. Temperature

LO = +13 dBm, RFIN = -10 dBm, USB

Input IP3 vs. Temperature

LO = +13 dBm, RFIN = -10 dBm, USB

Input IP2 vs. Temperature

LO = +13 dBm, RFIN = -10 dBm, USB

Conversion Loss vs. LO Drive

RFIN = -10 dBm, USB

Input IP3 vs. LO Drive

RFIN = -10 dBm, USB

Input IP2 vs. LO Drive

RFIN = -10 dBm, USB

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**Low Side LO, Up-converter Performance**

**Conversion Loss vs. IF**
LO = +13 dBm, RFIN = -10 dBm, USB

**Input IP3 vs. IF**
LO = +13 dBm, RFIN = -10 dBm, USB

**Input IP2 vs. IF**
LO = +13 dBm, RFIN = -10 dBm, USB
HMC218BMS8GE
GaAs MMIC DOUBLE-BALANCED MIXER
3.5 - 8 GHz

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Power Input</td>
<td>+13 dBm</td>
</tr>
<tr>
<td>LO Power</td>
<td>+27 dBm</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>150 °C</td>
</tr>
<tr>
<td>Thermal Resistance (R_{th})</td>
<td>120 °C/W</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to 150°C</td>
</tr>
<tr>
<td>ESD Sensitivity (HBM)</td>
<td>750 V (Class 1B)</td>
</tr>
<tr>
<td>ESD Sensitivity (CDM)</td>
<td>1000 V (Class C5)</td>
</tr>
</tbody>
</table>

Outline Drawing

Package Information

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC218BMS8GE</td>
<td>RoHS-compliant Low Stress Injection Molded Plastic</td>
<td>100% matte Sn</td>
<td>MSL1</td>
<td>H218B XXXX</td>
</tr>
</tbody>
</table>

[1] 4-Digit lot number XXXX

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**Pin Descriptions**

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Function</th>
<th>Description</th>
<th>Pin Schematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LO</td>
<td>This pin is DC coupled and matched to 50 Ohms.</td>
<td><img src="image" alt="LO schematic" /></td>
</tr>
<tr>
<td>2, 3, 6, 7</td>
<td>GND</td>
<td>These pins and package bottom must be connected to RF/DC ground.</td>
<td><img src="image" alt="GND schematic" /></td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No connection required. Pins are not connected internally. However, all data shown herein was measured with these pins connected to RF/DC ground internally.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IF</td>
<td>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 or sink more than 2 mA of current or part non-function and possible part failure will result.</td>
<td><img src="image" alt="IF schematic" /></td>
</tr>
<tr>
<td>8</td>
<td>RF</td>
<td>This pin is DC coupled and matched to 50 Ohms.</td>
<td><img src="image" alt="RF schematic" /></td>
</tr>
</tbody>
</table>
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 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.

List of Material for Evaluation PCB EV1HMC218BMS8G [1]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1, J3</td>
<td>PCB Mount SMA RF Connector</td>
</tr>
<tr>
<td>U1</td>
<td>HMC218BMS8GE</td>
</tr>
<tr>
<td>PCB [2]</td>
<td>101828 Evaluation Board</td>
</tr>
</tbody>
</table>

[1] Reference this number when ordering complete evaluation PCB
GaAs MMIC DOUBLE-BALANCED MIXER
3.5 - 8 GHz

Notes: