Double-Balanced Mixer
5 - 20 GHz

Features
- Low Conversion Loss: 6 dB
- Wide IF Bandwidth: DC to 6 GHz
- IIP3 +21 dBm @ 15 dBm LO Drive
- High Isolation
- Lead-Free 3 mm 12-lead QFN Package
- RoHS* Compliant

Applications
- Test & Measurement
- Microwave Radio
- Radar

Description
MAMX-011067 is a GaAs double-balanced passive diode mixer housed in a lead-free 3 mm, 12-lead QFN package. The mixer offers low conversion loss, high linearity and a wide IF bandwidth. The double-balanced circuit configuration provides excellent port isolation while internal 50 Ω matching simplifies its application.

This mixer is well suited for applications such as test and measurement, microwave radio and radar.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAMX-011067</td>
<td>Bulk</td>
</tr>
<tr>
<td>MAMX-011067-TR0500</td>
<td>500 Piece Reel1</td>
</tr>
<tr>
<td>MAMX-011067-SB1</td>
<td>Sample Board2</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

Functional Schematic

Pin Configuration

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3,4,6,7,9</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>LO</td>
</tr>
<tr>
<td>5</td>
<td>IF</td>
</tr>
<tr>
<td>8</td>
<td>RF</td>
</tr>
<tr>
<td>10 - 12</td>
<td>NC3</td>
</tr>
<tr>
<td>13</td>
<td>GND4</td>
</tr>
</tbody>
</table>

3. MACOM recommends connecting unused package pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
### Electrical Specifications

5: $F_{IF} = 100\, \text{MHz}, P_{LO} = 15\, \text{dBm}, T_A = +25\, ^\circ\text{C}, Z_0 = 50\, \Omega$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO and RF Frequency</td>
<td>—</td>
<td>GHz</td>
<td>5</td>
<td>—</td>
<td>20</td>
</tr>
<tr>
<td>IF Frequency</td>
<td>—</td>
<td>GHz</td>
<td>0</td>
<td>—</td>
<td>6</td>
</tr>
<tr>
<td>LO Power</td>
<td>—</td>
<td>dBm</td>
<td>—</td>
<td>15</td>
<td>—</td>
</tr>
<tr>
<td>Conversion Loss</td>
<td>5 - 20 GHz</td>
<td>dB</td>
<td>—</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>5 - 10 GHz, 10 - 20 GHz</td>
<td>dBm</td>
<td>—</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Input IP3</td>
<td>$P_{RF} = -10, \text{dBm/tone}, \Delta f = 1, \text{MHz}$</td>
<td>dBm</td>
<td>—</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Input IP2</td>
<td>$P_{RF} = -10, \text{dBm/tone}, \Delta f = 1, \text{MHz}$</td>
<td>dBm</td>
<td>—</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>LO-to-RF Isolation</td>
<td>5 - 10 GHz, 10 - 20 GHz</td>
<td>dB</td>
<td>—</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>LO-to-IF Isolation</td>
<td>5 - 10 GHz, 10 - 20 GHz</td>
<td>dB</td>
<td>25</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>RF-to-IF Isolation</td>
<td>5 - 10 GHz, 10 - 20 GHz</td>
<td>dB</td>
<td>—</td>
<td>16</td>
<td>31</td>
</tr>
</tbody>
</table>

5. All specifications refer to down-conversion operation, unless otherwise noted.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO Power</td>
<td>23 dBm</td>
</tr>
<tr>
<td>RF or IF Power</td>
<td>20 dBm</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>+150°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

6. Exceeding any one or combination of these limits may cause permanent damage to this device.

7. MACOM does not recommend sustained operation near these survivability limits.

8. Operating at nominal conditions with $T_J \leq +150\, ^\circ\text{C}$ will ensure $MTTF > 1 \times 10^9$ hours. Thermal resistance, $\Theta_{JC}$ is $+85\, ^\circ\text{C/W}$.

### Handling Procedures

Please observe the following precautions to avoid damage:

#### Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices with the following rating:

- HBM Class 1B
- CDM Class C3
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MAMX-011067
Rev. V1

MxN Spurious Rejection at IF Port (dBc IF)
RF = 10.1 GHz @ -10 dBm
LO = 10.0 GHz @ +15 dBm

<table>
<thead>
<tr>
<th>mxRF</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>10</td>
<td>32</td>
<td>23</td>
<td>36</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>0</td>
<td>43</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>94</td>
<td>66</td>
<td>64</td>
<td>76</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>91</td>
<td>104</td>
<td>110</td>
<td>81</td>
<td>88</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>110</td>
</tr>
</tbody>
</table>

PCB Layout

Application Schematic

DXF available on request based on 10 mil RO4350 substrate.

No external parts required for operation of MAMX-011067.
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Typical Performance Curves

**Conversion Loss USB (Down Conversion)**
@ +25°C, \( I_F = 100 \text{ MHz} \)

![Conversion Loss USB (Down Conversion) Graph]

**Conversion Loss USB (Up Conversion)**
@ +25°C, \( I_F = 100 \text{ MHz} \)

![Conversion Loss USB (Up Conversion) Graph]

**Conversion Loss Over Temperature, \( I_F = 100 \text{ MHz} \)**

![Conversion Loss Over Temperature Graph]

**IF Bandwidth**
@ +25°C, \( F_{LO} = 10 \text{ GHz}, P_{LO} = 15 \text{ dBm} \)

![IF Bandwidth Graph]

For further information and support please visit: https://www.macom.com/support
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Typical Performance Curves

IIP3 @ LO Power, IF = 100 MHz

IIP3 over Temperature @ P_LO = 15 dBm, IF = 100 MHz

IIP2 @ LO Power, IF = 100 MHz

IIP2 over Temperature @ P_LO = 15 dBm, IF = 100 MHz

P1dB @ LO Power, IF = 100 MHz
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Typical Performance Curves

**Isolation (Down Conversion)**
@ IF = 100 MHz, P\text{LO} = 15 dBm; P\text{RF} = -10 dBm

**Isolation (Up Conversion)**
@ IF = 100 MHz, P\text{LO} = 15 dBm; P\text{RF} = -10 dBm

**RF Return Loss**
@ +25°C, F\text{LO} = 10 GHz, P\text{LO} = 15 dBm

**IF Return Loss**
@ +25°C, F\text{LO} = 10 GHz, P\text{LO} = 15 dBm
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Lead-Free 3 mm 12-Lead QFN†

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.
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