MAMX-011035

Double-Balanced Mixer
5.5 to 19 GHz

Features

- Low conversion loss: 6 dB
- Wide IF bandwidth: DC to 6 GHz
- IIP3 +21 dBm at 15 dBm LO drive
- High isolation
- Lead-Free 3 mm 12-lead QFN package
- Lead-free and RoHS* Compliant

Description

MAMX-011035 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-011035</td>
<td>Bulk</td>
</tr>
<tr>
<td>MAMX-011035-TR0100</td>
<td>100 Piece Reel</td>
</tr>
<tr>
<td>MAMX-011035-TR0500</td>
<td>500 Piece Reel</td>
</tr>
<tr>
<td>MAMX-011035-SB1</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

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>

2. MACOM recommends connecting unused package pins to ground.
3. 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.
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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>5.5</td>
<td>—</td>
<td>19</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>5.5 - 19 GHz</td>
<td>dB</td>
<td>—</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>5.5 - 10 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>5.5 - 10 GHz</td>
<td>dB</td>
<td>—</td>
<td>38</td>
<td>34</td>
</tr>
<tr>
<td>LO-to-IF Isolation</td>
<td>5.5 - 10 GHz</td>
<td>dB</td>
<td>28</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>RF-to-IF Isolation</td>
<td>5.5 - 10 GHz</td>
<td>dB</td>
<td>10</td>
<td>21</td>
<td>15</td>
</tr>
</tbody>
</table>

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

Absolute Maximum Ratings\(^6,7\)

<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(^8)</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>

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 C5

Assembly Information
- Do not subject the device to excessive force, especially at elevated temperatures > 60°C.
- No-clean flux is required for assembly. Post SMT washing is not recommended.

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DC-0011165
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Typical Performance Curves

Conversion Loss USB (Down Conversion)
@ +25°C, IF = 100 MHz

Conversion Loss USB (Up Conversion)
@ +25°C, IF = 100 MHz

Conversion Loss Over Temperature, IF = 100 MHz

IF Bandwidth
@ +25°C, F_LO = 10 GHz, P_LO = 15 dBm

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Typical Performance Curves

**IIP3 @ LO Power, IF = 100 MHz**

- RF Frequency (GHz) vs. IIP3 (dBm)
  - 9 dBm
  - 12 dBm
  - 15 dBm
  - 18 dBm

**IIP3 over temperature @ P_LO = 15 dBm, IF = 100 MHz**

- RF Frequency (GHz) vs. IIP3 (dBm)
  - +25°C
  - -40°C
  - +85°C

**IIP2 @ LO Power, IF = 100 MHz**

- RF Frequency (GHz) vs. IIP2 (dBm)
  - 9 dBm
  - 12 dBm
  - 15 dBm
  - 18 dBm

**IIP2 over temperature @ P_LO = 15 dBm, IF = 100 MHz**

- RF Frequency (GHz) vs. IIP2 (dBm)
  - +25°C
  - -40°C
  - +85°C

**P1dB @ LO Power, IF = 100 MHz**

- RF Frequency (GHz) vs. P1dB (dBm)
  - 9 dBm
  - 12 dBm
  - 15 dBm
  - 18 dBm
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Typical Performance Curves

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

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

RF Return Loss
@ +25°C, f_{LO} = 10 GHz, P_{LO} = 15 dBm

IF Return Loss
@ +25°C, f_{LO} = 10 GHz, P_{LO} = 15 dBm
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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>N0</th>
<th>N1</th>
<th>N2</th>
<th>N3</th>
<th>N4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>16</td>
<td>42</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>0</td>
<td>44</td>
<td>61</td>
<td>49</td>
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<tr>
<td>2</td>
<td>91</td>
<td>84</td>
<td>75</td>
<td>78</td>
<td>91</td>
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<tr>
<td>3</td>
<td>80</td>
<td>97</td>
<td>83</td>
<td>74</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>92</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-011035.
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**Lead-Free 3x3 mm 12-Lead AQFN†**

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements.
Plating is NiPdAu