## Features
- Passive Mixer (No Bias Required)
- Usable as IR Downconverter
- Usable as Single Sideband (SSB) Upconverter
- Low Conversion Loss: 9 dB
- Nominal LO drive of +14 dBm
- Operates at LO level of +10 dBm
- High Linearity: 17 dBm IIP3
- High Image Rejection: 25 dBc
- Wide IF Bandwidth: DC to 4 GHz
- High Isolation
- 4 mm AQFN Package
- RoHS* Compliant

## Applications
- Test & Measurement, Microwave Radio, & Radar

## Description
The MAMX-011075 is an image-reject passive diode mixer MMIC. The mixer offers low conversion loss, high linearity, high image rejection and a wide IF bandwidth. The image-reject 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.

## Pin Configuration

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 9, 11, 13 - 15, 17 - 22, 24</td>
<td>Ground</td>
</tr>
<tr>
<td>10</td>
<td>IF1</td>
</tr>
<tr>
<td>12</td>
<td>IF2</td>
</tr>
<tr>
<td>16</td>
<td>RF</td>
</tr>
<tr>
<td>23</td>
<td>LO</td>
</tr>
<tr>
<td>25</td>
<td>Ground Pad</td>
</tr>
</tbody>
</table>

3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

## Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAMX-011075</td>
<td>Bulk</td>
</tr>
<tr>
<td>MAMX-011075-TR0500</td>
<td>500 Piece Reel</td>
</tr>
<tr>
<td>MAMX-011075-SB1</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

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

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
Image Reject Mixer
8 - 26 GHz

Electrical Specifications⁴: \( F_{\text{IF}} = 100 \text{ MHz}, P_{\text{LO}} = +14 \text{ dBm}, T_{\text{A}} = +25^\circ\text{C}, Z_0 = 50 \Omega \)

<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>8</td>
<td>—</td>
<td>26</td>
</tr>
<tr>
<td>IF Frequency</td>
<td>—</td>
<td>GHz</td>
<td>0</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>LO Power</td>
<td>—</td>
<td>dBm</td>
<td>14</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Conversion Loss</td>
<td>8 - 12 GHz</td>
<td>dB</td>
<td>8.0</td>
<td>9.0</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>12 - 26 GHz</td>
<td></td>
<td>9.5</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Input P1dB</td>
<td>—</td>
<td>dBm</td>
<td>8</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Input IP3</td>
<td>( P_{\text{RF}} = -10 \text{ dBm/tone}, \Delta f = 1 \text{ MHz} )</td>
<td>dBm</td>
<td>17</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Input IP2</td>
<td>—</td>
<td>dBm</td>
<td>40</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Isolation</td>
<td>LO-to-RF, 8 - 26 GHz</td>
<td>dB</td>
<td>35</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>LO-to-IF, 8 - 26 GHz</td>
<td></td>
<td>35</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>RF-to-IF, 8 - 26 GHz</td>
<td></td>
<td>15</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Image Rejection</td>
<td>8 - 26 GHz</td>
<td>dBc</td>
<td>17</td>
<td>25</td>
<td>—</td>
</tr>
<tr>
<td>Amplitude Imbalance</td>
<td>8 - 26 GHz</td>
<td>dB</td>
<td>—</td>
<td>±2</td>
<td>—</td>
</tr>
<tr>
<td>Phase Imbalance</td>
<td>8 - 26 GHz</td>
<td>°</td>
<td>—</td>
<td>±10</td>
<td>—</td>
</tr>
<tr>
<td>RF Return Loss</td>
<td>8 - 26 GHz</td>
<td>dB</td>
<td>—</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>IF Return Loss</td>
<td>0.1 - 4.0 GHz</td>
<td>dB</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
</tbody>
</table>

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

Absolute Maximum Ratings⁵,⁶

<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 Temperature⁷</td>
<td>+150°C</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>
</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 JEDEC rating:
HBM Class 1A
CDM Class C3

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with \( T_J \leq +150^\circ\text{C} \) will ensure...
Image Reject Mixer
8 - 26 GHz

Typical Performance Curves: Lower Side Band (LSB), High Side LO
Data captured with 90° Hybrid @ 100 MHz IF

Down Conversion Gain over LO drive

Down Conversion Image Rejection over LO drive

Down Conversion Gain over temperature

Down Conversion Image Rejection over temperature

Amplitude Imbalance over LO drive

Phase Imbalance over LO drive
Typical Performance Curves: Lower Side Band (LSB), High Side LO
Data captured with 90° Hybrid @ 100 MHz IF

IIP3 over LO drive

IIP2 over LO drive

IIP3 over temperature

IIP2 over temperature

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.
Typical Performance Curves: Upper Side Band (USB), Low Side LO
Data captured with 90° Hybrid @ 100 MHz IF

**Down Conversion Gain over LO drive**

![Down Conversion Gain over LO drive graph](image)

**Down Conversion Image Rejection over LO drive**

![Down Conversion Image Rejection over LO drive graph](image)

**Down Conversion Gain over temperature**

![Down Conversion Gain over temperature graph](image)

**Down Conversion Image Rejection over temperature**

![Down Conversion Image Rejection over temperature graph](image)

**Amplitude Imbalance over LO drive**

![Amplitude Imbalance over LO drive graph](image)

**Phase Imbalance over LO drive**

![Phase Imbalance over LO drive graph](image)
Typical Performance Curves: Upper Side Band (USB), Low Side LO
Data captured with 90° Hybrid @ 100 MHz IF

**IIP3 over LO drive**

- IIP3 over temperature

**IIP2 over LO drive**

- IIP2 over temperature

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.
Typical Performance Curves: Lower Side Band (LSB), High Side LO
Data captured with 90° Hybrid @ 100 MHz IF

**Up Conversion Gain over LO drive**

![Graph showing Up Conversion Gain over LO drive]

**Up Conversion SSB over LO drive**

![Graph showing Up Conversion SSB over LO drive]

Typical Performance Curves: Upper Side Band (USB), Low Side LO
Data captured with 90° Hybrid @ 100 MHz IF

**Up Conversion Gain over LO drive**

![Graph showing Up Conversion Gain over LO drive]

**Up Conversion SSB over LO drive**

![Graph showing Up Conversion SSB over LO drive]
Typical Performance Curves: Lower Side Band (LSB), High Side LO
Data captured with 90° Hybrid @ 2 GHz IF

**Down Conversion Gain over LO drive**

![Graph](image1)

**Down Conversion Image Rejection over LO drive**

![Graph](image2)

**IIP3 over LO drive**

![Graph](image3)

**IIP2 over LO drive**

![Graph](image4)
Typical Performance Curves: Upper Side Band (USB), Low Side LO
Data captured with 90° Hybrid @ 2 GHz IF

**Down Conversion Gain over LO drive**

**Down Conversion Image Rejection over LO drive**

**IIP3 over LO drive**

**IIP2 over LO drive**
Typical Performance Curves

**Isolations**

- RF-IF
- LO-IF
- LO-RF

**IF Bandwidth**

**RF Return Loss**

**P1dB vs LO power**

**IF Return Loss**

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.

Visit www.macom.com for additional data sheets and product information.

For further information and support please visit: https://www.macom.com/support
Image Reject Mixer
8 - 26 GHz

MAMX-011075
Rev. V1

MxN Spurious Rejection @ IF port
RF 15.9 GHz @ -10 dBm, LO 16.0 GHz @ +14 dBm
All values in dBc below the IF output level

<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>6</td>
<td>18</td>
<td>30</td>
<td>x</td>
</tr>
<tr>
<td>1</td>
<td>17</td>
<td>0</td>
<td>43</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>60</td>
<td>46</td>
<td>61</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>x</td>
<td>90</td>
<td>66</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>102</td>
<td>80</td>
</tr>
</tbody>
</table>

LO Harmonics
LO +14 dBm
Values in dBc below input LO level measured at RF

<table>
<thead>
<tr>
<th>LO GHz</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>38</td>
<td>47</td>
<td>61</td>
<td>49</td>
</tr>
<tr>
<td>8</td>
<td>42</td>
<td>55</td>
<td>50</td>
<td>61</td>
</tr>
<tr>
<td>10</td>
<td>38</td>
<td>58</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>38</td>
<td>55</td>
<td>82</td>
<td>46</td>
</tr>
<tr>
<td>14</td>
<td>31</td>
<td>52</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>16</td>
<td>43</td>
<td>58</td>
<td>48</td>
<td>N/A</td>
</tr>
<tr>
<td>18</td>
<td>44</td>
<td>82</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>20</td>
<td>57</td>
<td>54</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>22</td>
<td>51</td>
<td>52</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>24</td>
<td>52</td>
<td>58</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>26</td>
<td>54</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Application Schematic

External Hybrid
- Down conversion and Up conversion data captured with external hybrid 90° coupler part number: Innovative IPP-2345.
- RF Upper Side Band (USB) mode connect hybrid 0° port to IF1 mixer port, 90° hybrid port to IF2 mixer port.
- RF Lower Side Band (LSB) mode connect hybrid 0° port to IF2 mixer port, 90° hybrid port to IF1 mixer port.
Sample Board

- Material: Rogers 4350B
- Dielectric thickness 0.254 mm
- Finished copper thickness 17 microns (0.5 oz) plated to 44 microns +/- 10 microns
- Finish both sides: ENIG, 0.05-0.15 μm gold over 3-6 μm nickel
- DXF available on request

Evaluation Board Losses

- RF / LO Loss
- IF Loss

**Loss (dB)**

**Frequency (GHz)**

0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0

0 10 20 30 40 50
Image Reject Mixer
8 - 26 GHz

Lead-Free 4 mm 24-Lead AQFN Package
MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.
These materials are provided in connection with MACOM’s products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.