MAMX-011036-DIE

Double-Balanced Mixer
8 to 43 GHz

Features
- Low Conversion Loss: 8 dB
- High Linearity: 22 dBm IIP3
- Wide IF Bandwidth: DC to 10 GHz
- High Isolation
- Die Size: $1.20 \times 0.97 \times 0.10$ mm
- RoHS* Compliant

Description
MAMX-011036-DIE is a double-balanced passive diode mixer MMIC. 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-ohm matching simplifies its application.

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

MAMX-011036-DIE is also available in a 3 mm QFN package. Refer to datasheet MAMX-011036.

Functional Schematic

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAMX-011036-DIE</td>
<td>Vacuum Release Gel Pack¹</td>
</tr>
<tr>
<td>MAMX-011036-SB2</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

¹. Die quantity varies.

2. These pads are internally connected to ground, and they can be left unconnected.
3. The backside of the die must be connected to RF, DC and thermal ground.

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Electrical Specifications⁴: \( F_{IF} = 500 \text{ MHz}, P_{LO} = +15 \text{ dBm}, T_A = 25°C, Z_0 = 50 \Omega \)

<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>43</td>
</tr>
<tr>
<td>IF Frequency</td>
<td>—</td>
<td>GHz</td>
<td>0</td>
<td>—</td>
<td>10</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>8 - 20 GHz 20 - 34 GHz 34 - 43 GHz</td>
<td>dB</td>
<td>8</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>—</td>
<td>dBm</td>
<td>—</td>
<td>13</td>
<td>—</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>22</td>
<td>—</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>—</td>
</tr>
<tr>
<td>LO-to-RF Isolation</td>
<td>—</td>
<td>dB</td>
<td>—</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>LO-to-IF Isolation</td>
<td>8 - 20 GHz 20 - 34 GHz 34 - 43 GHz</td>
<td>dB</td>
<td>26</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>RF-to-IF Isolation</td>
<td>8 - 20 GHz 20 - 34 GHz 34 - 43 GHz</td>
<td>dB</td>
<td>-</td>
<td>9</td>
<td>—</td>
</tr>
<tr>
<td>RF Return Loss</td>
<td>RF = 15 GHz</td>
<td>dB</td>
<td>—</td>
<td>5</td>
<td>—</td>
</tr>
<tr>
<td>IF Return Loss</td>
<td>IF = 500 MHz</td>
<td>dB</td>
<td>—</td>
<td>15</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>-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 HBM Class 1B devices.

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Typical Performance Curves, $P_{LO} = +15$ dBm, $T_A = 25^°C$

**IF Bandwidth & Return Loss**

![Graph of IF Bandwidth & Return Loss]

**Isolation**

![Graph of Isolation]

**RF Return Loss**

![Graph of RF Return Loss]
Typical Performance Curves vs. LO Power, $T_A = 25^\circ$C

**Conversion Gain**

![Conversion Gain graph](image1)

**Input P1dB**

![Input P1dB graph](image2)

**Input IP3 at $P_{LO} = +15$ dBm**

![Input IP3 graph](image3)

**Input IP2 at $P_{LO} = +15$ dBm**

![Input IP2 graph](image4)

**Up Conversion Gain**

![Up Conversion Gain graph](image5)

All performance curves refer to down-conversion operation, unless otherwise noted.

Two-tone input power = -10 dBm each tone, 1 MHz spacing.
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Typical Performance Curves vs. Temperature, $P_{LO} = +15$ dBm

Conversion Gain

Conversion Gain (dB)

Input IP3

IP3 (dBm)

Input IP2

IIP2 (dBm)

RF Frequency (GHz)

All performance curves refer to down-conversion operation, unless otherwise noted.
Two-tone input power = -10 dBm each tone, 1 MHz spacing.
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Rev. V1

MxN Spurious Rejection @ IF Port (dBc IF)
RF = 17.5 GHz @ -10 dBm
LO = 18.0 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>11</td>
<td>40</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0</td>
<td>28</td>
<td>42</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>77</td>
<td>65</td>
<td>52</td>
<td>65</td>
<td>80</td>
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<tr>
<td>3</td>
<td>x</td>
<td>90</td>
<td>73</td>
<td>76</td>
<td>77</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
<td>x</td>
<td>95</td>
<td>104</td>
<td>104</td>
</tr>
</tbody>
</table>

Assembly Guideline

Notes:
Attach bare die to PCB or carrier using conductive epoxy. Bond die signal pads to PCB 50 Ω traces using 1.0 mil gold wire. Two bond wires are recommended on each signal pad for optimal performance. There is no need to bond the die GND pads.
Notes:
Units are in microns with a tolerance of ±5 μm, except for die exterior dimensions which are street-center-to-street-center – nominal kerf, ±20 μm tolerance.
Die thickness is 100 ±10 μm.
RF, LO and IF Bond-pads are 160 x 100 μm.
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