Double-Balanced Mixer
18 - 46 GHz

Features
- Low Conversion Loss: 6.5 dB
- High Linearity: 20 dBm IIP3
- Wide IF Bandwidth: DC to 20 GHz
- High Isolation
- Die Size: 1.15 × 0.97 × 0.10 mm
- RoHS* Compliant

Description
MAMX-011037-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-011037-DIE is also available in a 3 mm QFN package. Refer to datasheet MAMX-011054.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAMX-011037-DIE</td>
<td>Vacuum Release Gel Pack¹</td>
</tr>
<tr>
<td>MAMX-011037-SB2</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

¹ Die quantity varies.

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Electrical Specifications:
\( F_{IF} = 1\,\text{GHz}, \, P_{LO} = +15\,\text{dBm}, \, T_{A} = 25^\circ\text{C}, \, Z_0 = 50\,\Omega \)

<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>18</td>
<td>—</td>
<td>46</td>
</tr>
<tr>
<td>IF Frequency</td>
<td>—</td>
<td>GHz</td>
<td>0</td>
<td>—</td>
<td>20</td>
</tr>
<tr>
<td>LO Power</td>
<td>18 - 24 GHz, 24 - 40 GHz, 40 - 46 GHz</td>
<td>dB</td>
<td>—</td>
<td>6.5</td>
<td>12</td>
</tr>
<tr>
<td>Conversion Loss</td>
<td>—</td>
<td>dB</td>
<td>—</td>
<td>6.5</td>
<td>10</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>—</td>
<td>dBm</td>
<td>—</td>
<td>12</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>20</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>50</td>
<td>—</td>
</tr>
<tr>
<td>LO-to-RF Isolation</td>
<td>—</td>
<td>dB</td>
<td>—</td>
<td>35</td>
<td>—</td>
</tr>
<tr>
<td>LO-to-IF Isolation</td>
<td>18 - 24 GHz, 24 - 40 GHz, 40 - 46 GHz</td>
<td>dB</td>
<td>25</td>
<td>37</td>
<td>—</td>
</tr>
<tr>
<td>RF-to-IF Isolation</td>
<td>18 - 24 GHz, 24 - 40 GHz, 40 - 46 GHz</td>
<td>dB</td>
<td>—</td>
<td>10</td>
<td>—</td>
</tr>
<tr>
<td>RF Return Loss</td>
<td>RF = 40 GHz</td>
<td>dB</td>
<td>—</td>
<td>5</td>
<td>—</td>
</tr>
<tr>
<td>IF Return Loss</td>
<td>IF = 1 GHz</td>
<td>dB</td>
<td>—</td>
<td>15</td>
<td>—</td>
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</table>

4. 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 (^7)</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, $T_A = 25^\circ C$

**IF Bandwidth & Return Loss**

![IF Bandwidth & Return Loss Graph](image)

**Isolation**

![Isolation Graph](image)

**RF Return Loss**

![RF Return Loss Graph](image)
Typical Performance Curves vs. LO Power, $T_A = 25°C$

**Conversion Gain**

Input $P_{1dB}$

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

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

**Up Conversion Gain**

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) vs. RF Frequency (GHz)
- Temperature conditions: $+25^\circ C$, $+55^\circ C$, $+85^\circ C$

**Input IP3**

- Input IP3 (dBm) vs. RF Frequency (GHz)
- Temperature conditions: $+25^\circ C$, $+55^\circ C$, $+85^\circ C$

**Input IP2**

- Input IP2 (dBm) vs. RF Frequency (GHz)
- Temperature conditions: $+25^\circ C$, $+55^\circ C$, $+85^\circ C$

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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MxN Spurious Rejection @ IF Port (dBc IF)
RF = 24 GHz @ -10 dBm
LO = 25 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>14</td>
<td>24</td>
<td>x</td>
<td>x</td>
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<tr>
<td>1</td>
<td>4</td>
<td>0</td>
<td>22</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>61</td>
<td>67</td>
<td>66</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>x</td>
<td>86</td>
<td>66</td>
<td>71</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
<td>x</td>
<td>88</td>
<td>99</td>
<td>95</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.
Outline Drawing

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.