

# Double-Balanced Mixer

## 5 - 20 GHz



MAMX-011067

Rev. V1

### 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  $\Omega$  matching simplifies its application.

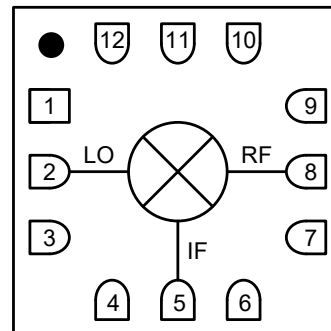
This mixer is well suited for applications such as test and measurement, microwave radio and radar.

### Ordering Information<sup>1,2</sup>

| Part Number        | Package                     |
|--------------------|-----------------------------|
| MAMX-011067        | Bulk                        |
| MAMX-011067-TR0500 | 500 Piece Reel <sup>1</sup> |
| MAMX-011067-SB1    | Sample Board <sup>2</sup>   |

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

### Functional Schematic



### Pin Configuration

| Pin #       | Function         |
|-------------|------------------|
| 1,3,4,6,7,9 | GND              |
| 2           | LO               |
| 5           | IF               |
| 8           | RF               |
| 10 - 12     | NC <sup>3</sup>  |
| 13          | GND <sup>4</sup> |

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.

<sup>1</sup> \* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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### Electrical Specifications<sup>5</sup>: $F_{IF} = 100 \text{ MHz}$ , $P_{LO} = 15 \text{ dBm}$ , $T_A = +25^\circ\text{C}$ , $Z_0 = 50 \Omega$

| Parameter           | Test Conditions   | Units | Min.     | Typ.     | Max. |
|---------------------|---|-------|----------|----------|------|
| LO and RF Frequency | —   | GHz   | 5        | —        | 20   |
| IF Frequency        | —   | GHz   | 0        | —        | 6    |
| LO Power            | —   | dBm   | —        | 15       | —    |
| Conversion Loss     | 5 - 20 GHz  | dB    | —        | 7        | 9    |
| Input P1dB          | 5 - 10 GHz<br>10 - 20 GHz   | dBm   | —        | 8<br>11  | —    |
| Input IP3           | $P_{RF} = -10 \text{ dBm/tone}$ , $\Delta f = 1 \text{ MHz}$<br>5 - 10 GHz<br>10 - 20 GHz | dBm   | —        | 18<br>20 | —    |
| Input IP2           | $P_{RF} = -10 \text{ dBm/tone}$ , $\Delta f = 1 \text{ MHz}$<br>5 - 10 GHz<br>10 - 20 GHz | dBm   | —        | 45<br>45 | —    |
| LO-to-RF Isolation  | 5 - 10 GHz<br>10 - 20 GHz   | dB    | —        | 34<br>30 | —    |
| LO-to-IF Isolation  | 5 - 10 GHz<br>10 - 20 GHz   | dB    | 25<br>28 | 35<br>40 | —    |
| RF-to-IF Isolation  | 5 - 10 GHz<br>10 - 20 GHz   | dB    | —        | 16<br>31 | —    |

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

### Absolute Maximum Ratings<sup>6,7</sup>

| Parameter                         | Absolute Maximum |
|-----------------------------------|------------------|
| LO Power                          | 23 dBm           |
| RF or IF Power                    | 20 dBm           |
| Junction Temperature <sup>8</sup> | +150°C           |
| Operating Temperature             | -55°C to +85°C   |
| Storage Temperature               | -65°C to +150°C  |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with  $T_J \leq +150^\circ\text{C}$  will ensure  $MTTF > 1 \times 10^6$  hours. Thermal resistance,  $\Theta_{JC}$  is +85°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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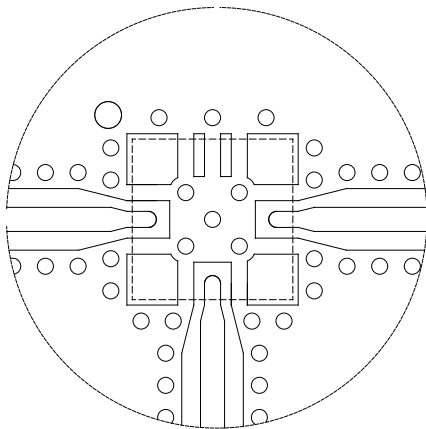
### MxN Spurious Rejection at IF Port (dBc IF)

RF = 10.1 GHz @ -10 dBm

LO = 10.0 GHz @ +15 dBm

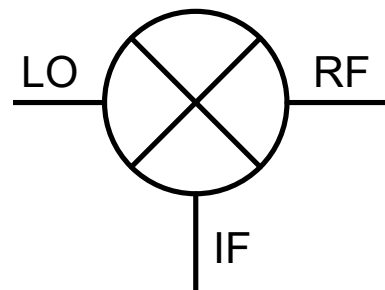
| mxRF | nxLO |     |     |    |     |
|------|------|-----|-----|----|-----|
|      | 0    | 1   | 2   | 3  | 4   |
| 0    | x    | 10  | 32  | 23 | 36  |
| 1    | 20   | 0   | 43  | 55 | 60  |
| 2    | 94   | 66  | 64  | 76 | 90  |
| 3    | 91   | 104 | 110 | 81 | 88  |
| 4    | x    | x   | x   | x  | 110 |

### PCB Layout



DXF available on request based on 10 mil RO4350 substrate.

### Application Schematic



No external parts required for operation of MAMX-011067.

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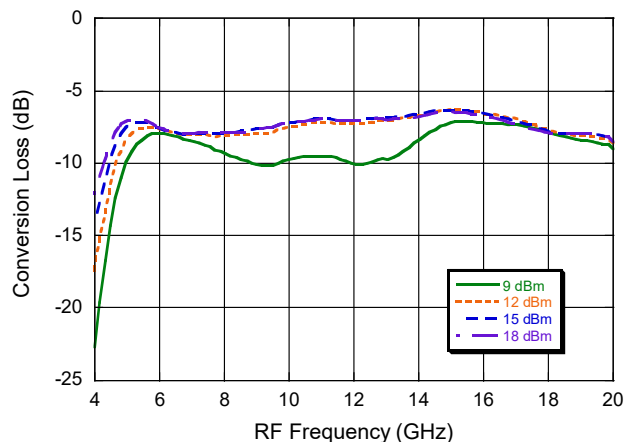


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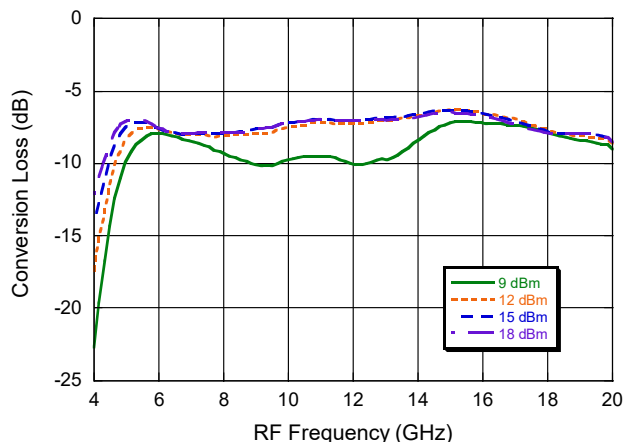
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### Typical Performance Curves

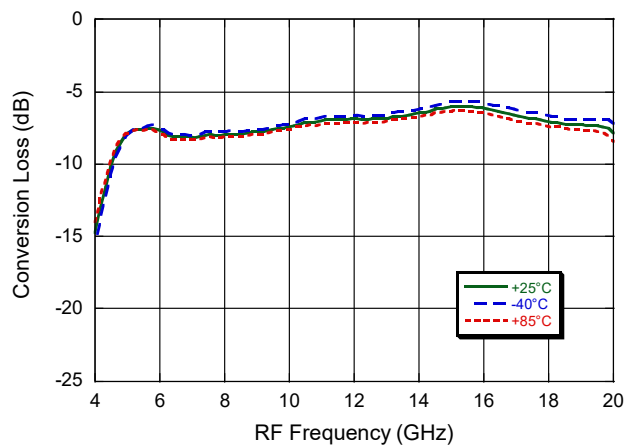
**Conversion Loss USB (Down Conversion)**  
@ +25°C,  $I_F = 100$  MHz



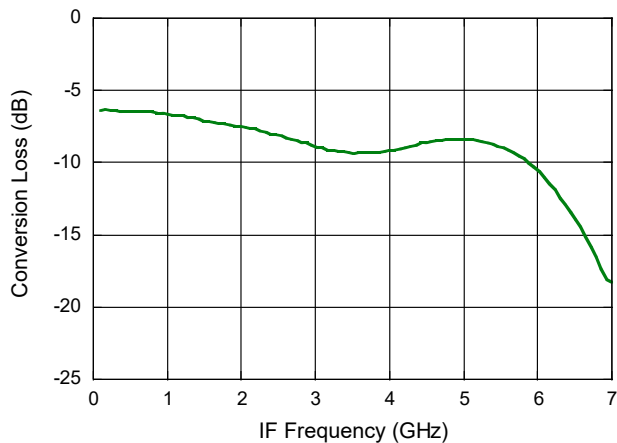
**Conversion Loss USB (Up Conversion)**  
@ +25°C,  $I_F = 100$  MHz



**Conversion Loss Over Temperature,  $I_F = 100$  MHz**



**IF Bandwidth**  
@ +25°C,  $F_{LO} = 10$  GHz,  $P_{LO} = 15$  dBm



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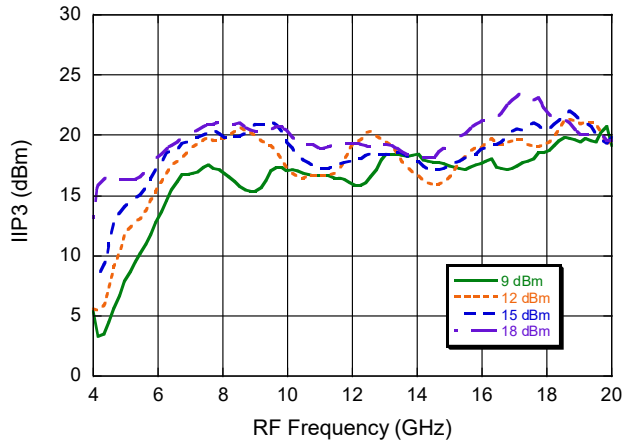


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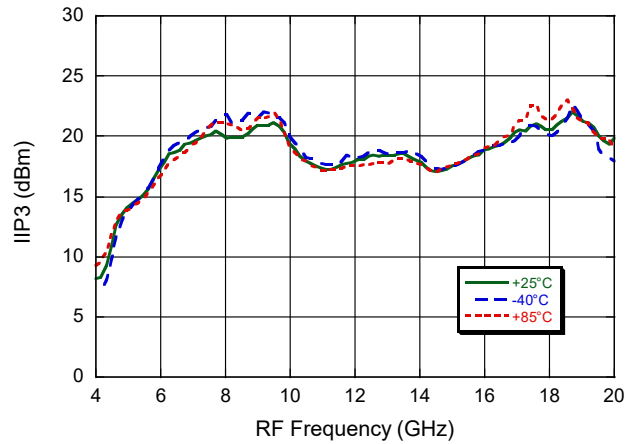
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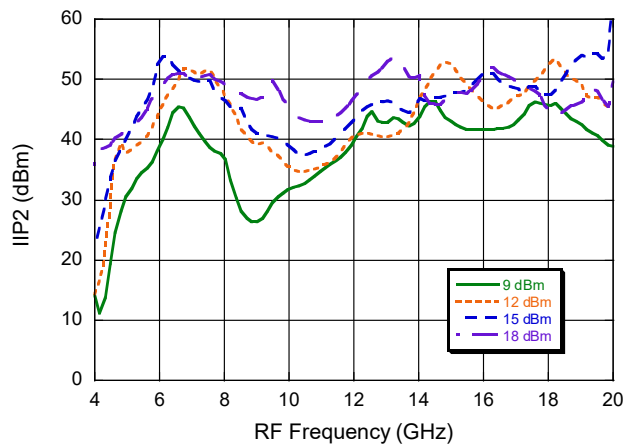
**IIP3 @ LO Power,  $I_F = 100$  MHz**



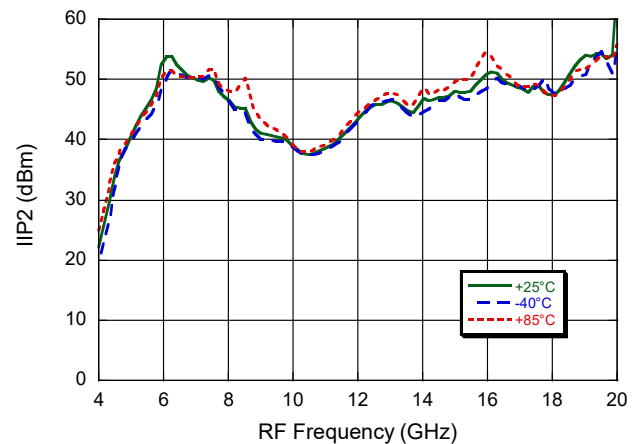
**IIP3 over Temperature @  $P_{LO} = 15$  dBm,  $I_F = 100$  MHz**



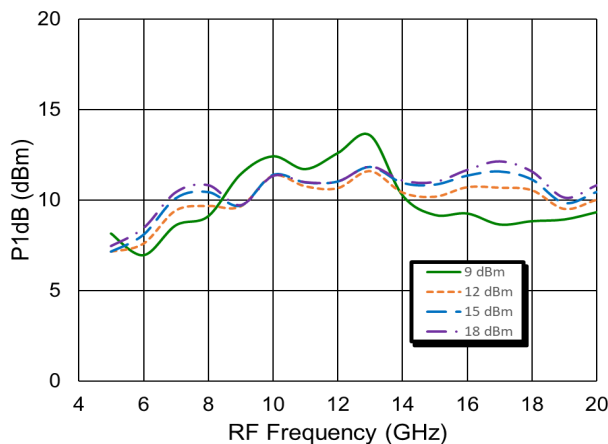
**IIP2 @ LO Power,  $I_F = 100$  MHz**



**IIP2 over Temperature @  $P_{LO} = 15$  dBm,  $I_F = 100$  MHz**



**P1dB @ LO Power,  $I_F = 100$  MHz**



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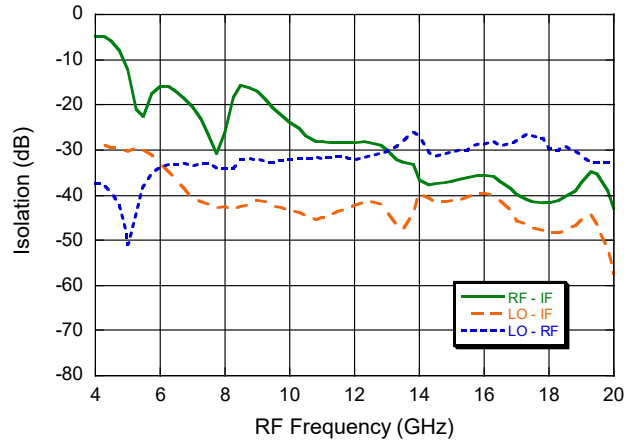
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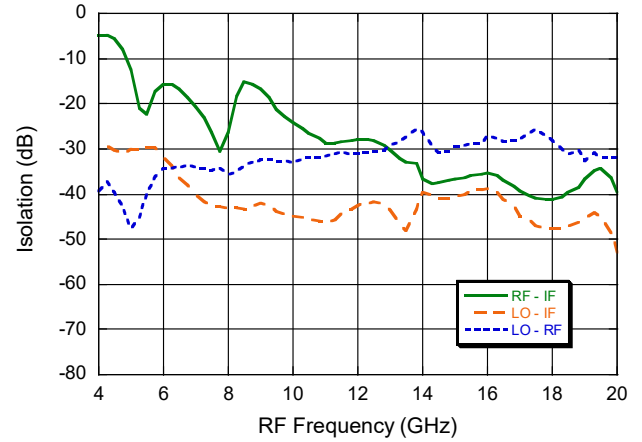
#### Isolation (Down Conversion)

@ IF = 100 MHz,  $P_{LO} = 15$  dBm;  $P_{RF} = -10$  dBm



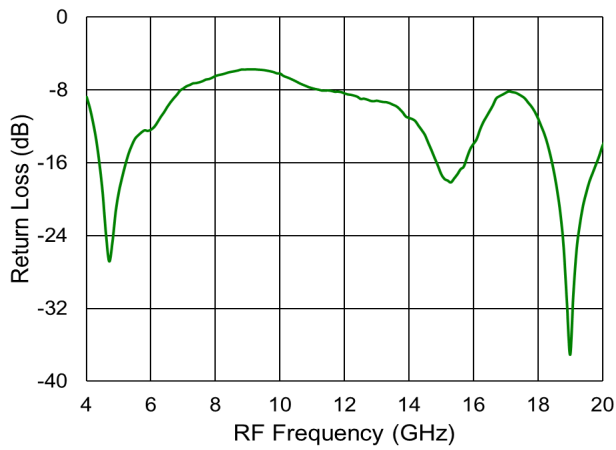
#### Isolation (Up Conversion)

@ IF = 100 MHz,  $P_{LO} = 15$  dBm;  $P_{RF} = -10$  dBm



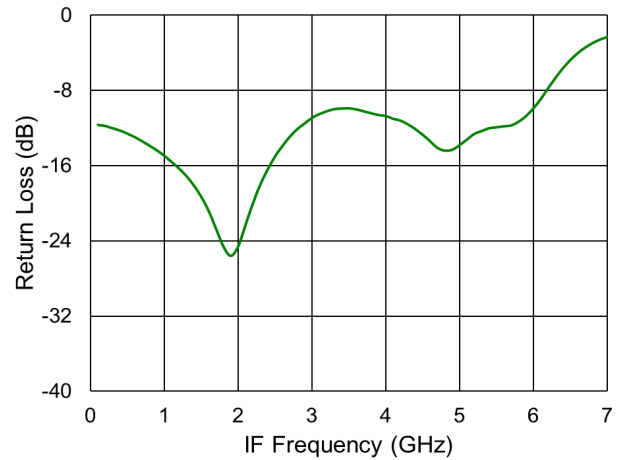
#### RF Return Loss

@ +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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