

Double-Balanced Mixer 18 to 46 GHz

Rev. V1

Features

- Low conversion loss: 6.5 dB
- High linearity: 20 dBm IIP3
- Wide IF bandwidth: DC to 20 GHz
- High isolation
- 3 mm 12-lead AQFN package
- Lead-free and RoHS* compliant

Description

MAMX-011054 is a double-balanced passive diode mixer housed in a 3 mm, 12-lead AQFN 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.

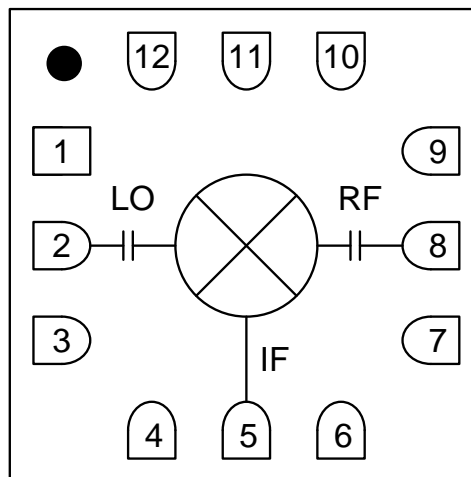
MAMX-011054 is also available in die form. Refer to datasheet MAMX-011037-DIE.

Ordering Information^{1,2}

Part Number	Package
MAMX-011054	Bulk
MAMX-011054-TR0500	500 Piece Reel
MAMX-011054-SMBPPR	Sample Board

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

Functional Schematic



Pin Configuration³

Pin No.	Function	Pin No.	Function
1	Ground	7	Ground
2	LO	8	RF
3	Ground	9	Ground
4	Ground	10	No Connection ³
5	IF	11	No Connection ³
6	Ground	12	No Connection ³
		13	Paddle ⁴

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.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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Electrical Specifications⁵: $F_{IF} = 1 \text{ GHz}$, $P_{LO} = 15 \text{ dBm}$, $T_A = 25^\circ\text{C}$, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
LO and RF Frequency	—	GHz	18	—	46
IF Frequency	—	GHz	0	—	20
LO Power	—	dBm	—	15	—
Conversion Loss	18 - 24 GHz	dB	—	6.5	—
	24 - 40 GHz			6.5	11.5
	40 - 46 GHz			7.5	13.5
Input P1dB	18 - 24 GHz	dBm	—	10	—
	24 - 40 GHz			12	
	40 - 46 GHz			10	
Input IP3	$P_{RF} = -10 \text{ dBm/tone}$, $\Delta f = 1 \text{ MHz}$	dBm	—	20	—
	18 - 24 GHz			21	
	24 - 40 GHz			19	
	40 - 46 GHz			19	
Input IP2	$P_{RF} = -10 \text{ dBm/tone}$, $\Delta f = 1 \text{ MHz}$	dBm	—	50	—
LO-to-RF Isolation	—	dB	—	35	—
LO-to-IF Isolation	18 - 24 GHz	dB	—	38	—
	24 - 40 GHz			45	
	40 - 46 GHz			45	
RF-to-IF Isolation	18 - 24 GHz	dB	—	9	—
	24 - 40 GHz			30	
	40 - 46 GHz			35	
RF Return Loss	RF = 40 GHz	dB	—	8	—
IF Return Loss	RF = 1 GHz	dB	—	16	—

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

Absolute Maximum Ratings^{6,7}

Parameter	Absolute Maximum
LO Power	23 dBm
RF or IF Power	20 dBm
Junction Temperature ⁸	+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 $\text{MTTF} > 1 \times 10^6$ hours.

Handling Procedures

Please observe the following precautions to avoid damage:

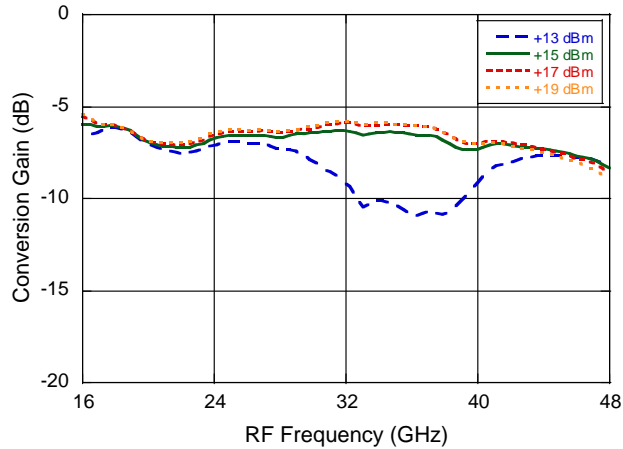
Static Sensitivity

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:

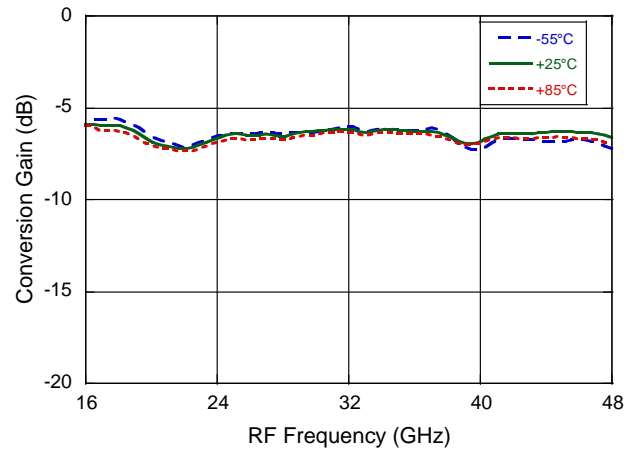
HBM Class 1B
CDM Class C3

Typical Performance Curves

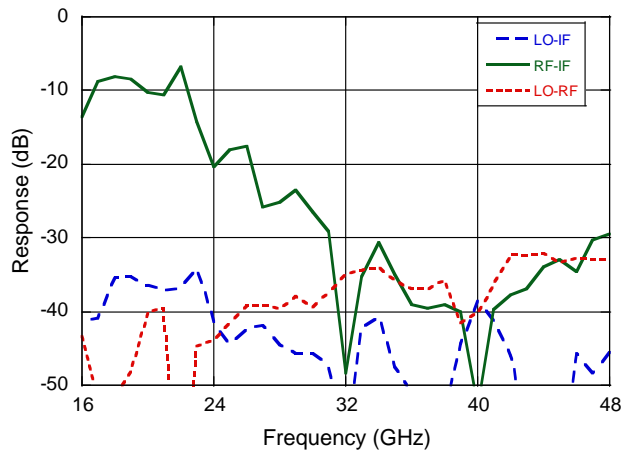
Conversion Gain vs. LO Drive



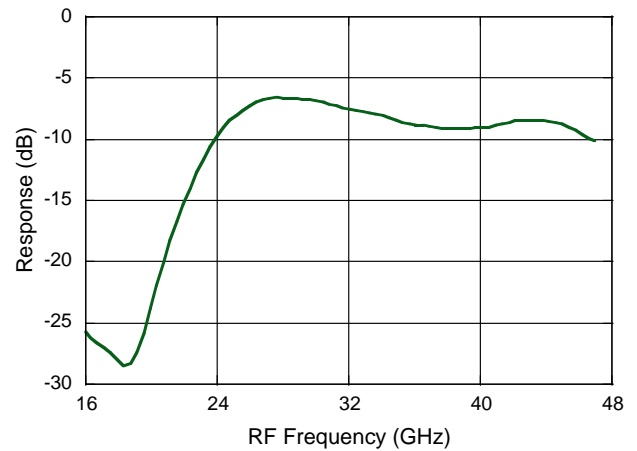
Conversion Gain vs. Temperature



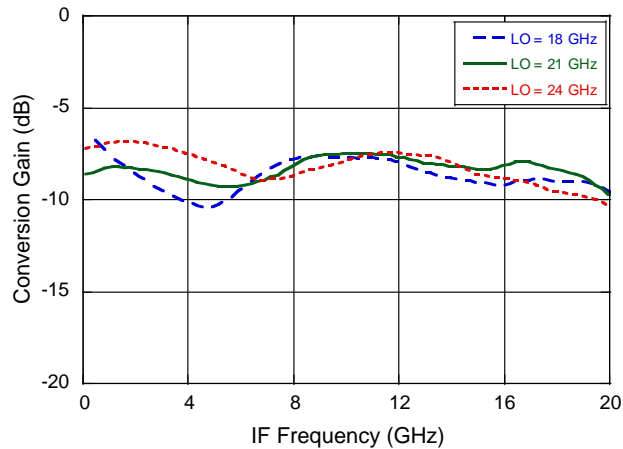
Isolation



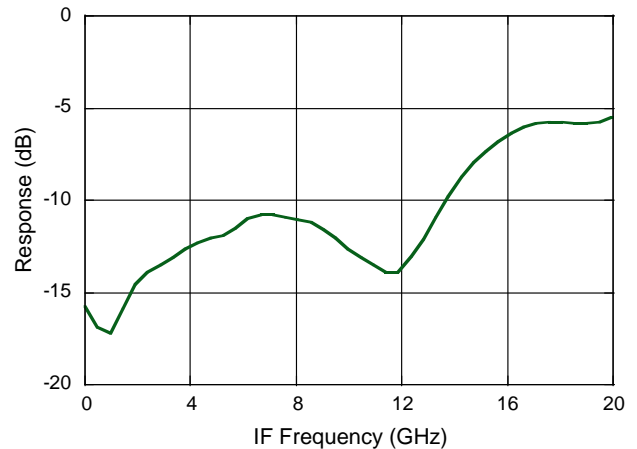
RF Return Loss



IF Bandwidth

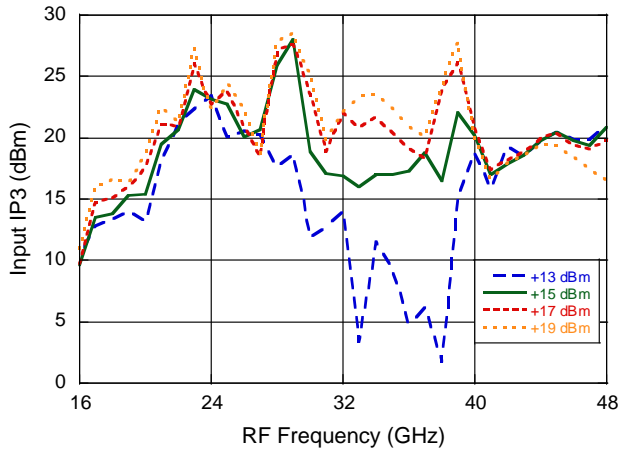


IF Return Loss

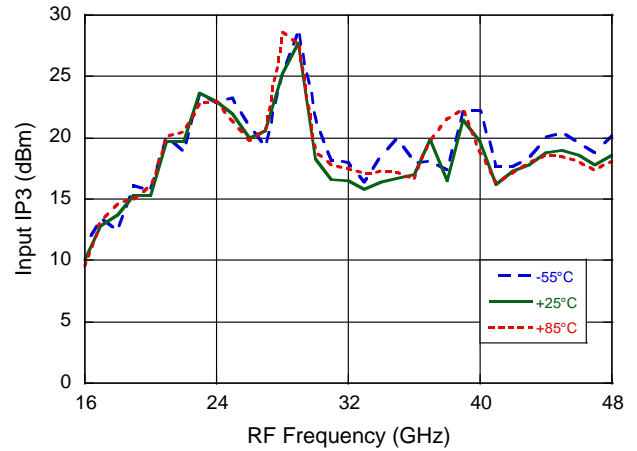


Typical Performance Curves

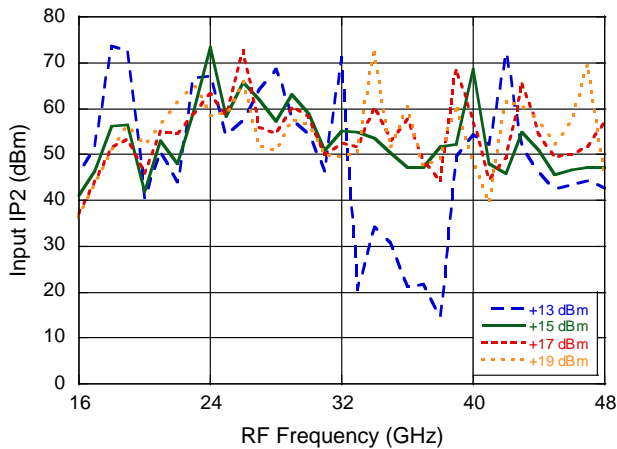
Input IP3 vs. LO Drive



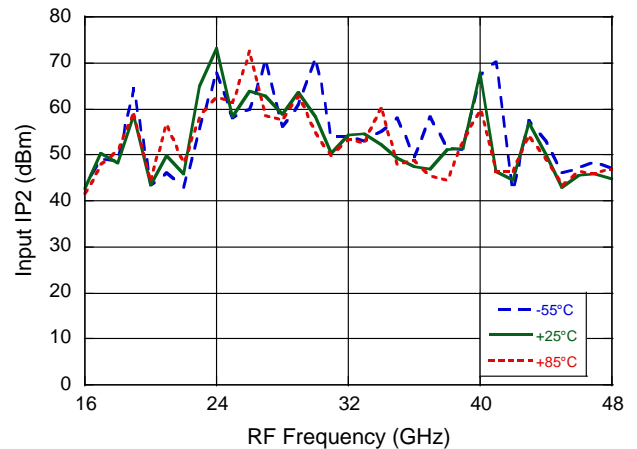
Input IP3 vs. Temperature



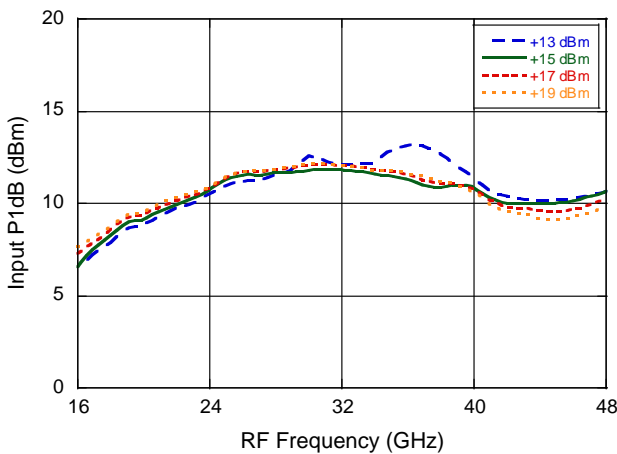
Input IP2 vs. LO Drive



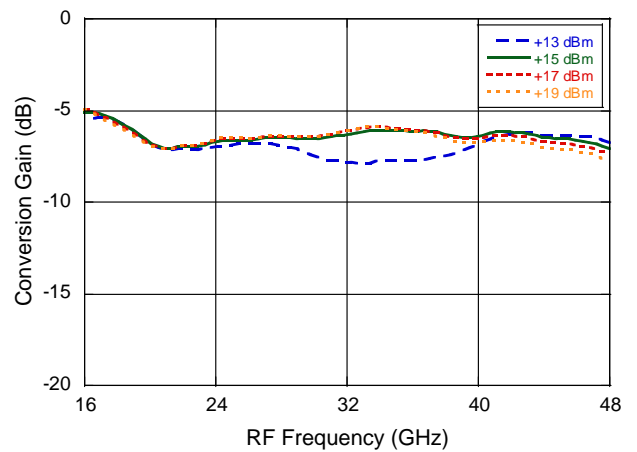
Input IP2 vs. Temperature



Input P1dB vs. LO Drive



Up Conversion Gain vs. LO Drive



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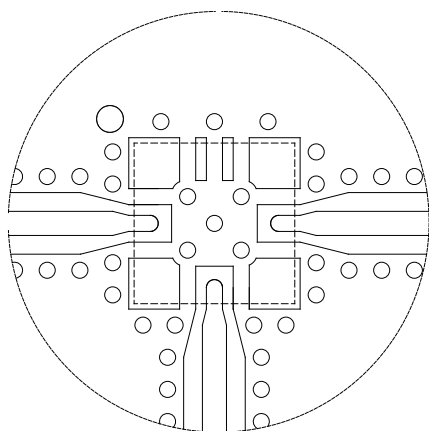
MxN Spurious Rejection at IF Port (dBc IF)

RF = 24 GHz at -10 dBm

LO = 25 GHz at +15 dBm

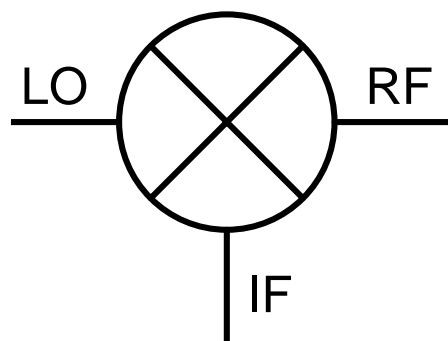
MxRF	NxLO				
	0	1	2	3	4
0	x	7	34	x	x
1	4	0	23	x	x
2	56	59	61	67	x
3	x	56	70	78	67
4	x	x	57	69	74

PCB Layout



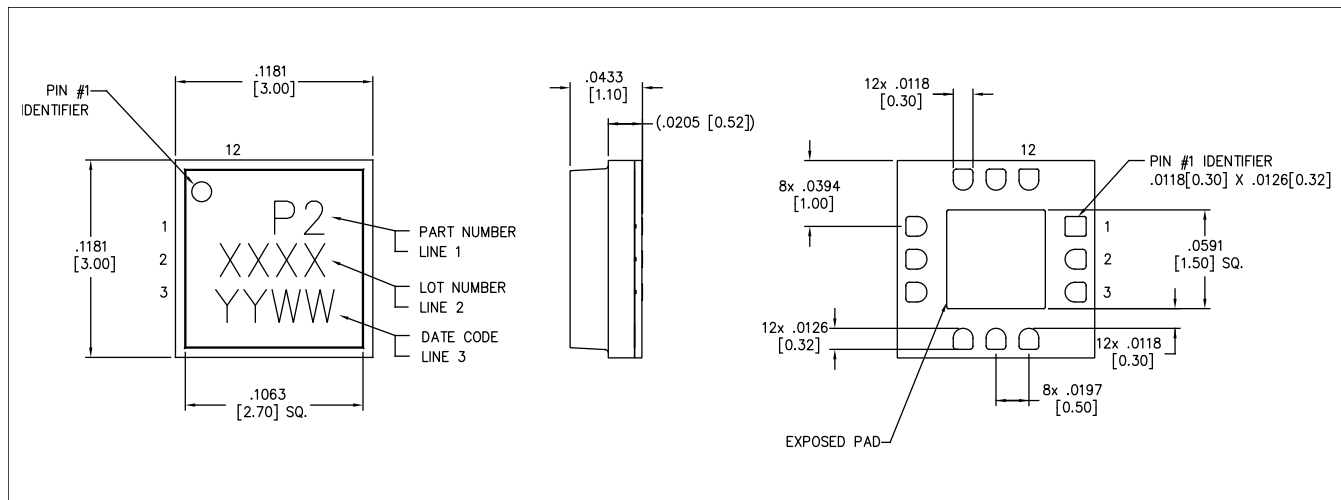
DXF available on request based on 10mil RO4350 substrate.

Application Schematic



No external parts required for operation of MAMX-011054.

Lead-Free 3 mm 12-Lead AQFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements.
Plating is NiPdAu.
All dimensions are inches [mm].

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