

Double-Balanced Mixer

5.5 - 19.0 GHz



MAMX-011144

Rev. V1

Features

- Low Conversion Loss: 6 dB
- LO Drive Level: +15 dBm
- IIP3: +20 dBm @ 15dBm LO Drive
- Wide IF Bandwidth: DC to 6 GHz
- High Isolation
- Lead-Free 3 mm 12-lead AQFN package
- RoHS* Compliant

Applications

- Test & Measurement
- Microwave Radio
- Radar

Description

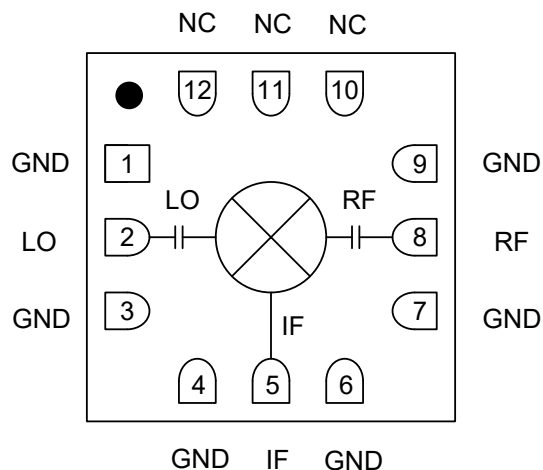
MAMX-011144 is a GaAs double-balanced passive diode mixer housed in a 3 mm, 12-lead AQFN package. The mixer offers excellent low conversion loss, and wide IF bandwidth. The double-balanced circuit configuration provides excellent port isolation. In addition, internal 50 Ω matching leads to optimal performance and small application footprint.

Ordering Information¹

Part Number	Package
MAMX-011144	Cut Tape or Tray
MAMX-011144-TR0100	100 Piece Reel
MAMX-011144-TR0500	500 Piece Reel
MAMX-011144-SB1	Sample Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Descriptions

Pin #	Description
1, 3, 4, 6, 7, 9	Ground Connection pads. Connected to PCB ground.
2	LO input matched and DC open, AC coupled.
5	DC coupled to diodes and IF matched.
8	RF matched and DC open, AC coupled.
10 - 12 ²	No internal connection. Recommended these pins are connected to PCB ground.
GND Paddle ³	Package ground paddle. Must be connected to RF and DC ground to ensure best possible RF performance.

2. MACOM recommends connecting non connect or unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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Rev. V1

Electrical Specifications⁴: $F_{IF} = 100$ MHz, $P_{LO} = +15$ dBm, $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
LO and RF Frequency	—	GHz	5.5	—	19
IF Frequency	—	GHz	0	—	6
LO Power	—	dBm	—	15	—
Conversion Loss	5.5 - 19 GHz	dB	—	6	8
Input P1dB	5.5 - 10 GHz 10 - 19 GHz	dBm	—	8 11	—
Input IP3	$P_{RF} = -10$ dBm/tone, $\Delta f = 1$ MHz 5.5 - 10 GHz 10 - 19 GHz	dBm	—	18 20	—
Input IP2	$P_{RF} = -10$ dBm/tone, $\Delta f = 1$ MHz 5.5 - 10 GHz 10 - 19 GHz	dBm	—	45 45	—
LO-to-RF Isolation	5.5 - 10 GHz 10 - 19 GHz	dB	—	38 34	—
LO-to-IF Isolation	5.5 - 10 GHz 10 - 19 GHz	dB	—	40 45	—
RF-to-IF Isolation	5.5 - 10 GHz 10 - 19 GHz	dB	—	15 30	—

4. All specifications refer to down-conversion operation,

Recommended Operating Conditions

Parameter	Minimum	Nominal	Maximum
LO Power	+11 dBm	+15 dBm	+18 dBm
RF/IF Power		-10 dBm	+8 dBm
Temperature	-55°C	+25°C	+85°C

Absolute Maximum Ratings^{5,6}

Parameter	Absolute Maximum
LO Power	+23 dBm
RF or IF Power	+20 dBm
Junction Temperature ⁷	+150°C
Storage Temperature	-65°C to +150°C

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 1C devices.

- 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.

2

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DC-0030920

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MAMX-011144

Rev. V1

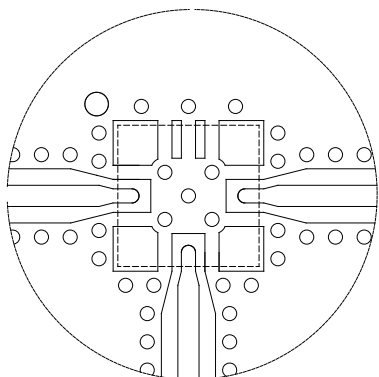
MxN Spurious Rejection at IF Port (dBc IF)

RF = 16.1 GHz @ -10 dBm

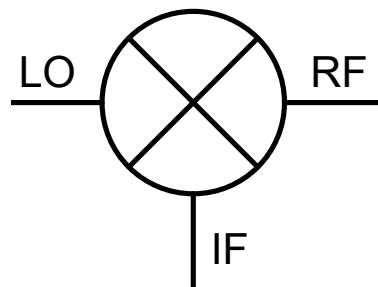
LO = 16 GHz @ +15 dBm

mxRF	nxLO				
	0	1	2	3	4
0	X	8	41	21	X
1	34	0	59	45	63
2	91	76	60	79	90
3	X	X	X	68	X
4	X	X	X	X	107

PCB Layout



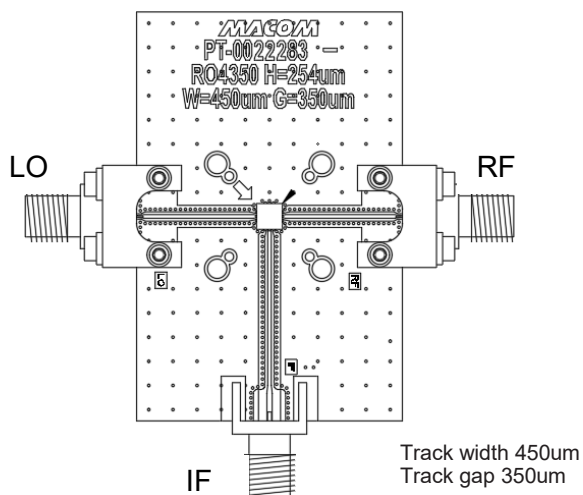
Application Schematic



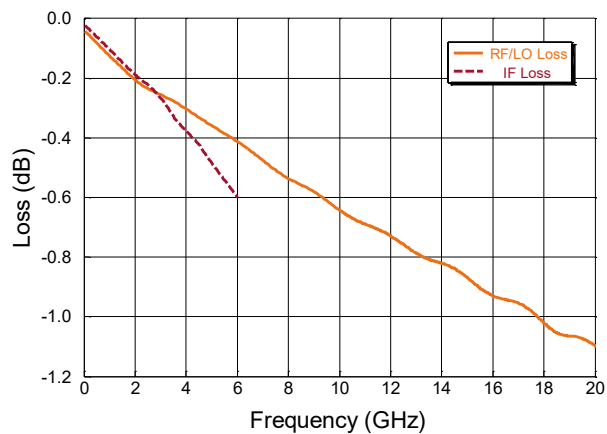
DXF/Gerber available on request based on 10 mil RO4350

No external parts required for operation of MAMX-011144.

Evaluation Board



Evaluation Board Losses



Double-Balanced Mixer

5.5 - 19.0 GHz

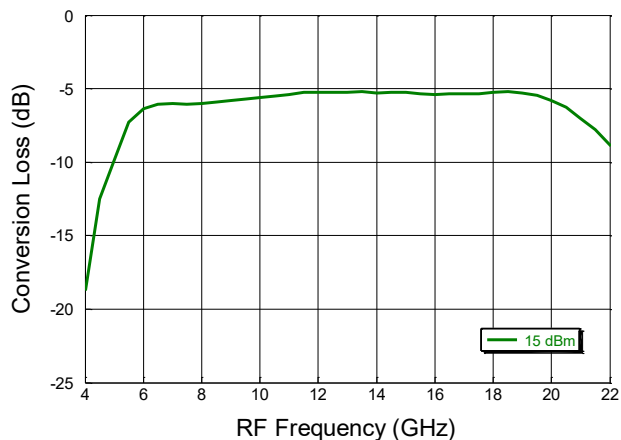


MAMX-011144

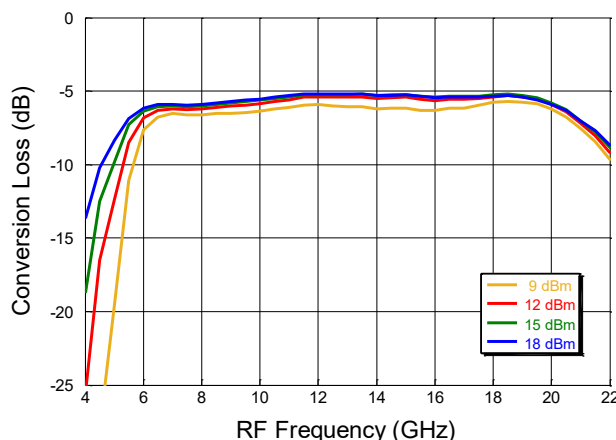
Rev. V1

Typical Performance Curves: Down Conversion Mode, RF -10dBm Upper Side Band (USB), Low Side LO @ 25°C. IF = 100 MHz

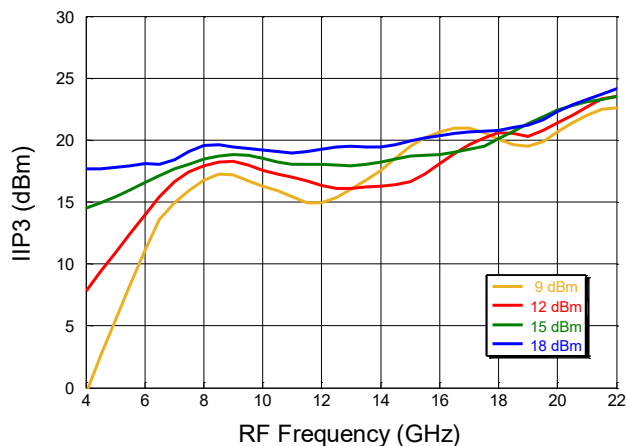
Conversion Loss vs. Frequency



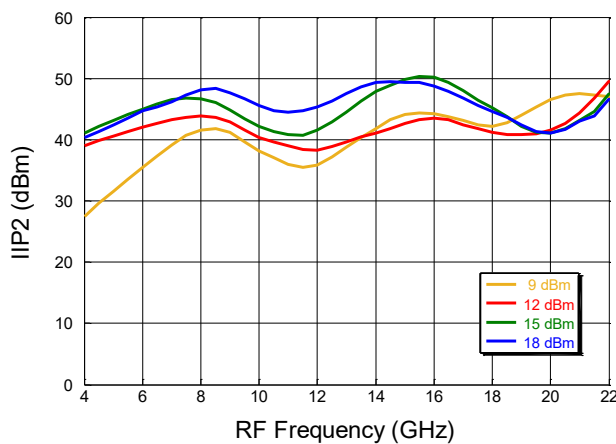
Conversion Loss over LO Drive



IIP3 over LO Drive vs. RF Frequency



IIP2 over LO Drive vs. RF Frequency



Double-Balanced Mixer

5.5 - 19.0 GHz

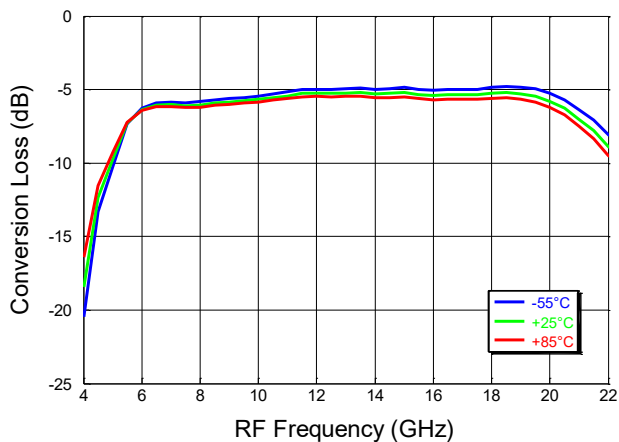


MAMX-011144

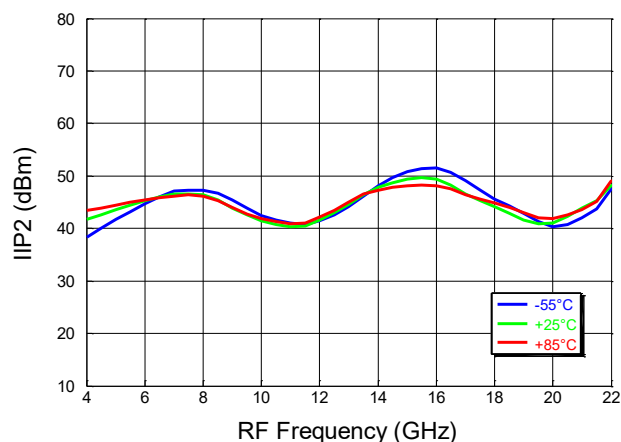
Rev. V1

Typical Performance Curves: Down Conversion Mode, RF -10dBm Upper Side Band (USB), Over Temperature. $IF = 100\text{ MHz}$

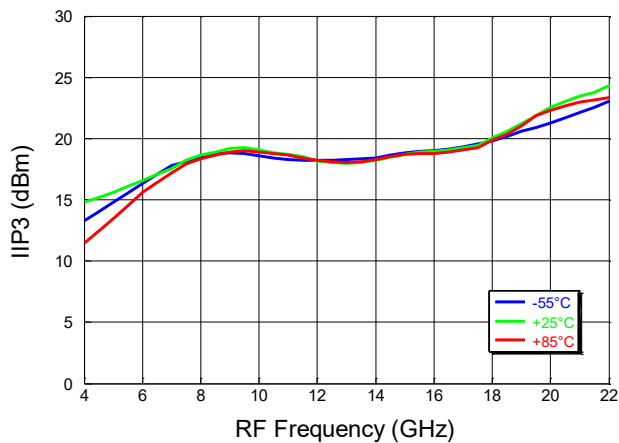
Conversion Loss over Temperature @ $P_{Lo} = +15\text{ dBm}$



IIP2 over Temperature @ $P_{Lo} = +15\text{ dBm}$



IIP3 over Temperature @ $P_{Lo} = +15\text{ dBm}$



Double-Balanced Mixer

5.5 - 19.0 GHz

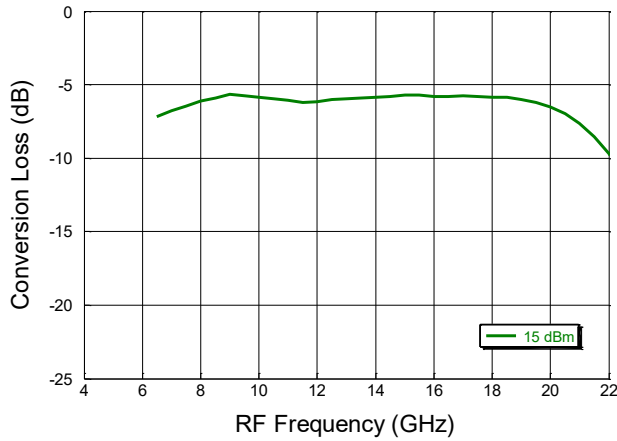


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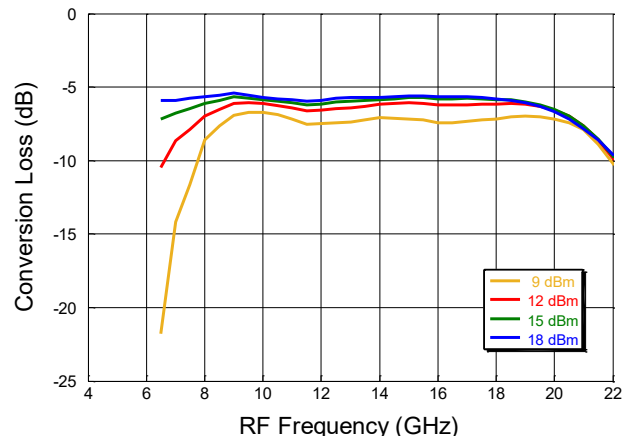
Rev. V1

Typical Performance Curves: Down Conversion Mode, RF -10dBm Upper Side Band (USB), Low Side LO @ 25°C. IF = 2.5 GHz

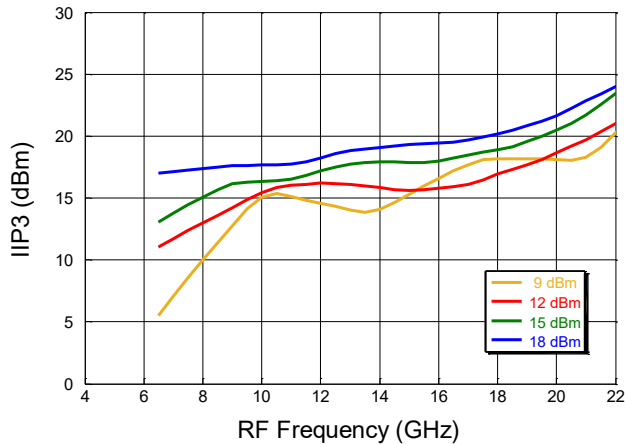
Conversion Loss vs. Frequency



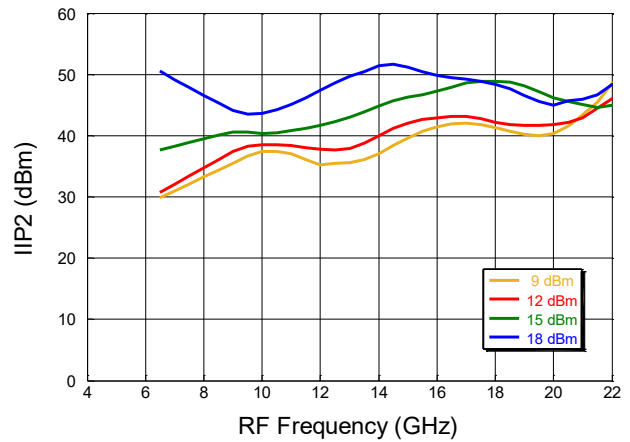
Conversion Loss over LO Drive



IIP3 over LO Drive vs. RF Frequency



IIP2 over LO Drive vs. RF Frequency



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5.5 - 19.0 GHz

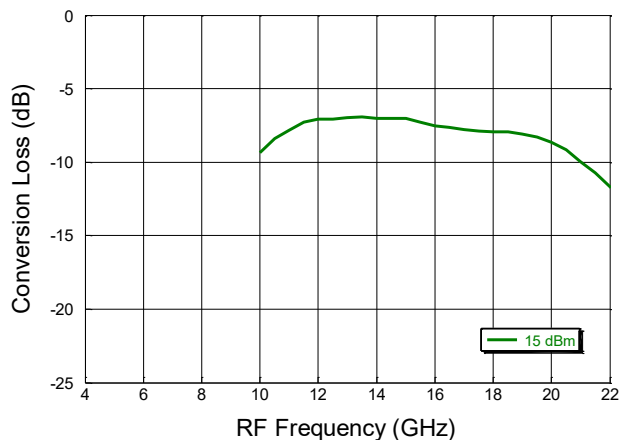


MAMX-011144

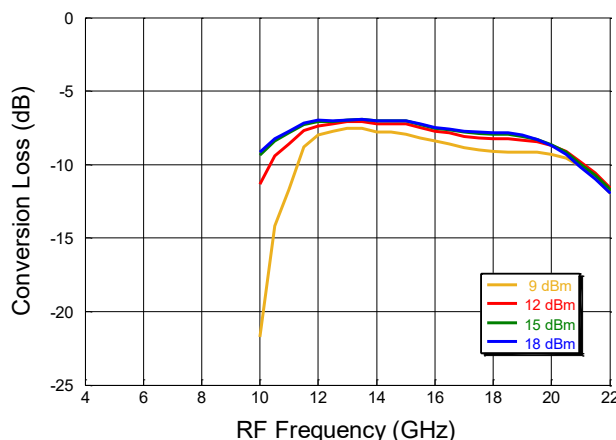
Rev. V1

Typical Performance Curves: Down Conversion Mode, RF -10dBm Upper Side Band (USB), Low Side LO @ 25°C. IF = 6 GHz

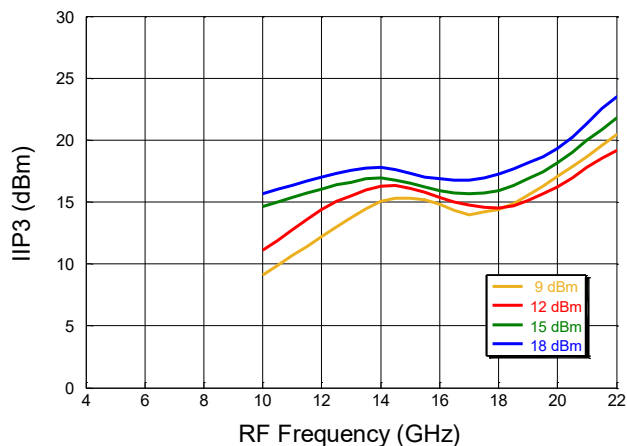
Conversion Loss vs. Frequency



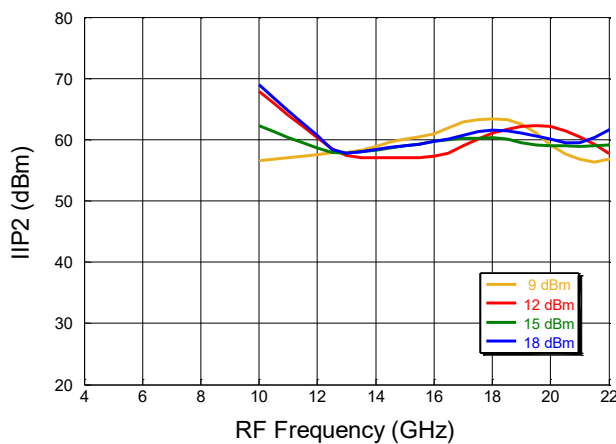
Conversion Loss over LO Drive



IIP3 over LO Drive vs. RF Frequency



IIP2 over LO Drive vs. RF Frequency



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5.5 - 19.0 GHz

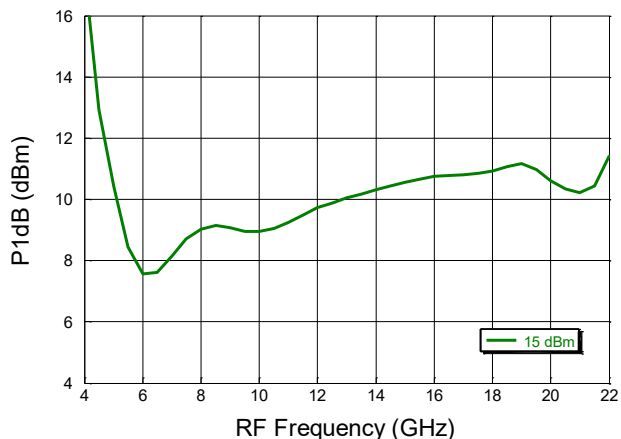


MAMX-011144

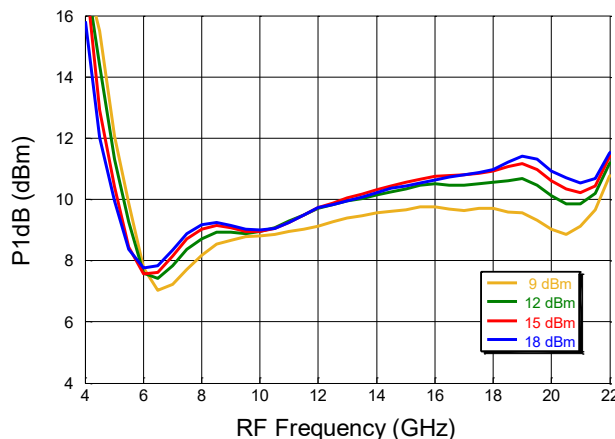
Rev. V1

Typical Performance Curves: Down Conversion Mode, Upper Side Band (USB), Low Side LO @ 25°C.

P1dB vs. RF Frequency

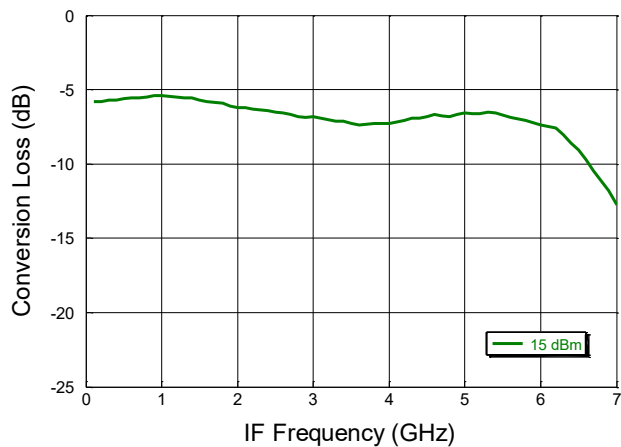


P1dB over LO drive



IF Bandwidth vs. IF Frequency

RF -10dBm USB, LO +15dBm @ 10GHz



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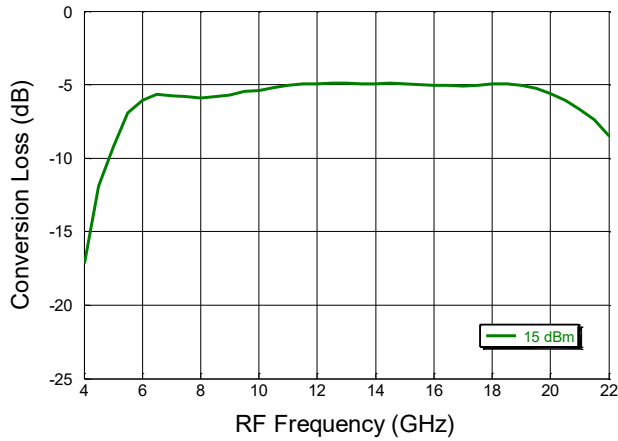


MAMX-011144

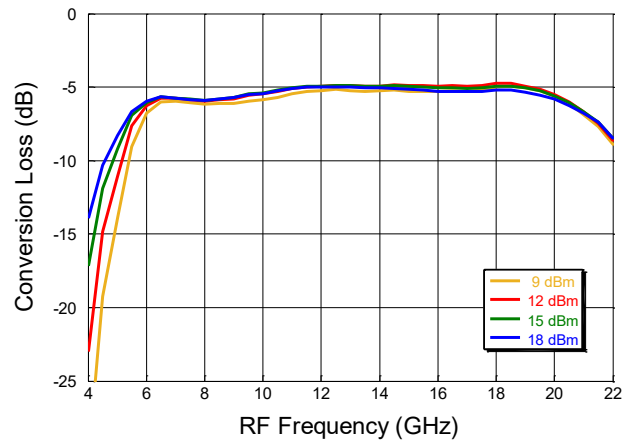
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**Typical Performance Curves: Up Conversion Mode, Upper Side Band (USB),
Low side LO @ 25°C. IF = 100 MHz**

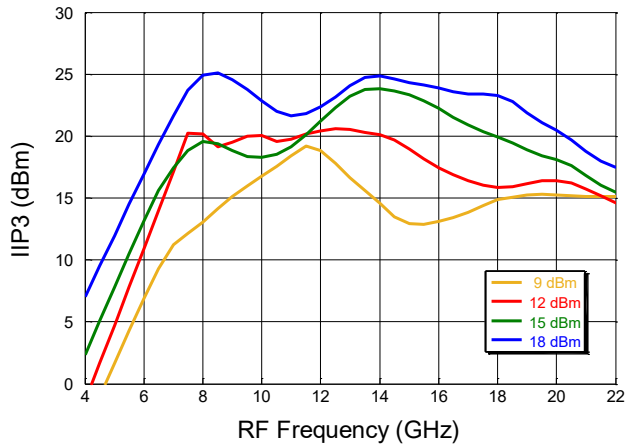
Conversion Loss vs. Frequency



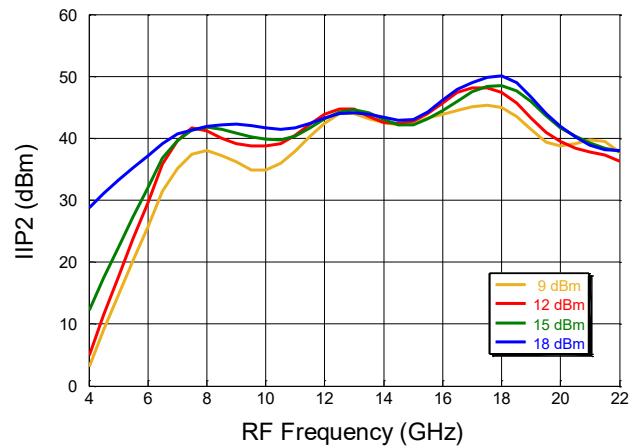
Conversion Loss over LO Drive



IIP3 over LO Drive vs. RF Frequency



IIP2 over LO Drive vs. RF Frequency



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5.5 - 19.0 GHz

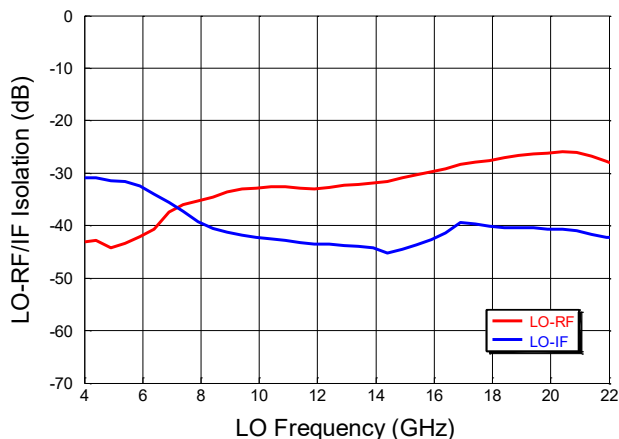


MAMX-011144

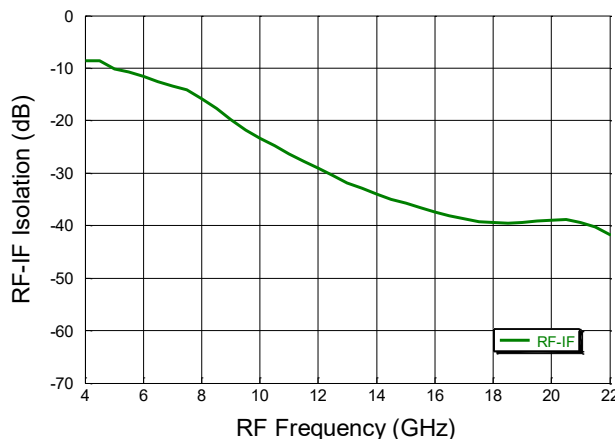
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Typical Performance Curves: LO +15dBm, RF -10dBm @ 25°C.

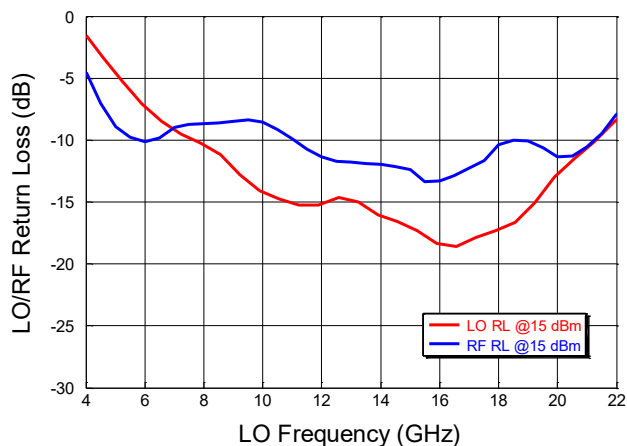
LO to RF/IF Isolation vs. LO Frequency



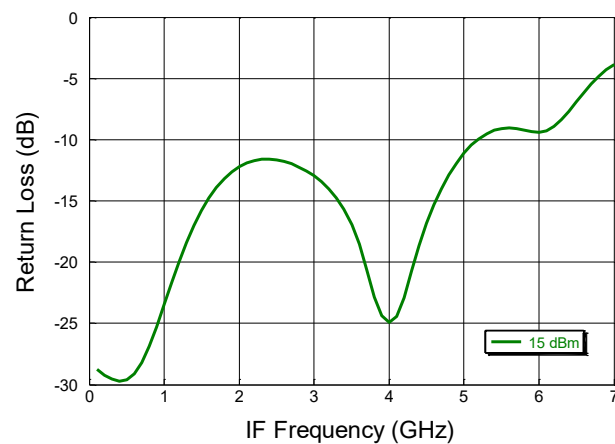
RF to IF Isolation vs. RF Frequency



LO/RF Return Loss vs. RF Frequency



IF Return Loss vs. RF Frequency



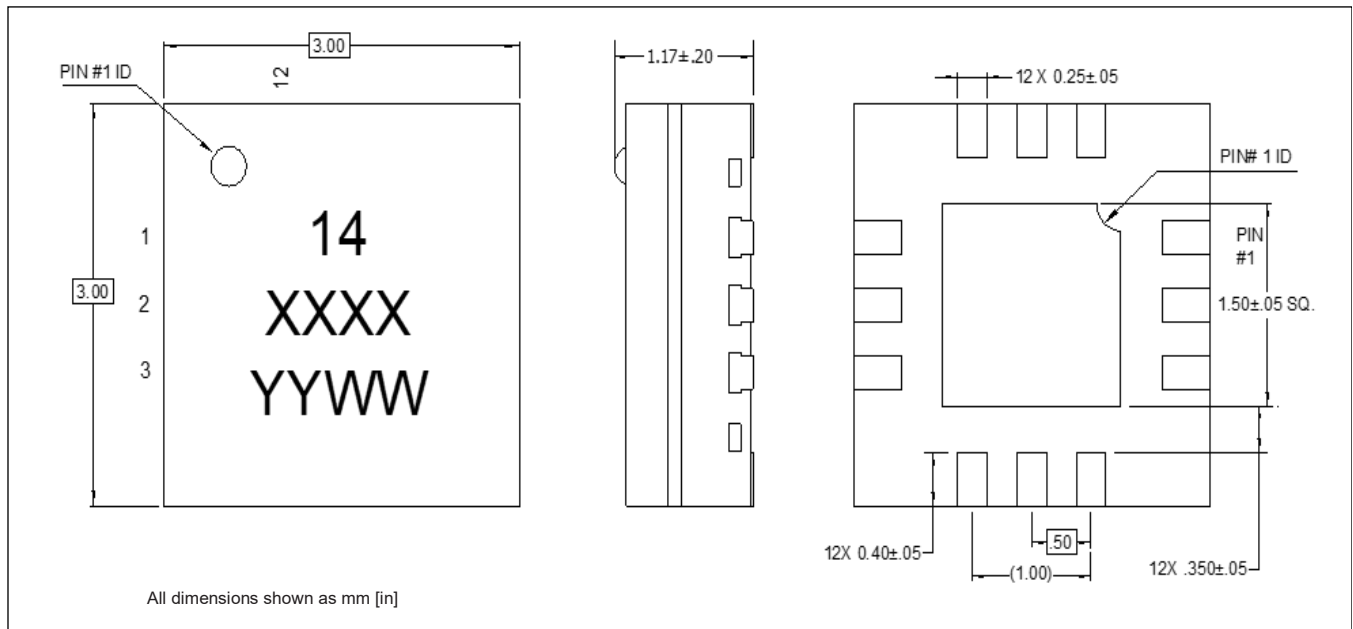
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5.5 - 19.0 GHz



MAMX-011144
Rev. V1

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.

Revision History

Rev	Date	Change Description
V1	Mar 2024	Production Release

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5.5 - 19.0 GHz



MAMX-011144

Rev. V1

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