

Double-Balanced Mixer

18 - 46 GHz



MAMX-011074

Rev. V2

Features

- Low Conversion Loss: 7 - 9 dB
- High Linearity: 20 dBm IIP3
- Wide IF Bandwidth: DC to 20 GHz
- High Isolation
- Lead-Free 3 mm, 12-lead PQFN package
- RoHS* Compliant

Applications

- Test & Measurement
- Microwave Radio
- Radar

Description

MAMX-011074 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 Ω matching simplifies its application.

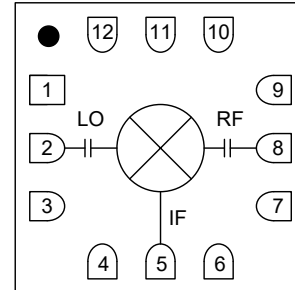
This mixer is well suited for applications such as test and measurement, microwave radio and radar.

Ordering Information^{1,2}

| Part Number | Package |
|--------------------|-----------------------------|
| MAMX-011074 | Bulk |
| MAMX-011074-TR0500 | 500 Piece Reel ¹ |
| MAMX-011074-SB1 | Sample Board ² |

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 ³ |
| 13 | GND 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, compliant to current RoHS EU directive.

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Electrical Specifications⁵: $F_{IF} = 1 \text{ GHz}$, $P_{LO} = 16 \text{ dBm}$, $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---------------------|--|-------|------|----------------|--------------------|
| LO and RF Frequency | — | GHz | 18 | — | 46 |
| IF Frequency | — | GHz | 0 | — | 20 |
| LO Power | — | dBm | — | 16 | — |
| Conversion Loss | 18 - 24 GHz 24 - 40 GHz 40 - 46 GHz | dB | — | 9 7 7 | 12.5 12 10.5 |
| Input P1dB | 18 - 24 GHz 24 - 40 GHz 40 - 46 GHz | dBm | — | 10 12 10 | — |
| Input IP3 | $P_{RF} = -10 \text{ dBm/tone}$, $\Delta f = 1 \text{ MHz}$ | dBm | — | 20 | — |
| Input IP2 | $P_{RF} = -10 \text{ dBm/tone}$, $\Delta f = 1 \text{ MHz}$ | dBm | — | 50 | — |
| LO-to-RF Isolation | 18 - 46 GHz | dB | — | 35 | — |
| LO-to-IF Isolation | 18 - 24 GHz 24 - 40 GHz 40 - 46 GHz | dB | — | 40 40 40 | — |
| RF-to-IF Isolation | 18 - 24 GHz 24 - 40 GHz 40 - 46 GHz | dB | — | 9 30 35 | — |
| RF Return Loss | RF = 40 GHz | dB | — | 10 | — |
| IF Return Loss | IF = 1 GHz | dB | — | 12 | — |

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. Thermal resistance, Θ_{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 JEDEC rating:

HBM Class 1B
CDM Class 3C

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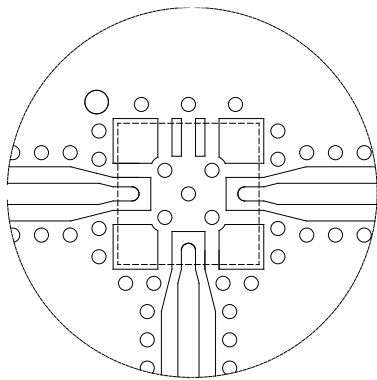
MxN Spurious Rejection at IF Port (dBc IF)

RF = 24 GHz @ -10 dBm

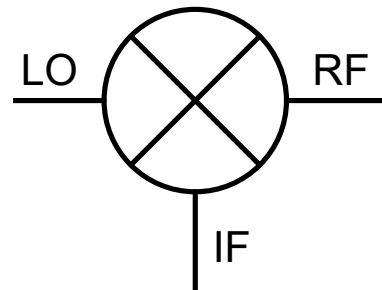
LO = 23 GHz @ +16 dBm

| mxRF | nxLO | | | | |
|------|------|----|----|----|----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | x | 4 | 44 | x | x |
| 1 | 7 | 0 | 64 | 47 | x |
| 2 | 68 | 61 | 60 | 70 | 71 |
| 3 | x | x | 83 | x | 34 |
| 4 | x | x | x | x | 99 |

PCB Layout



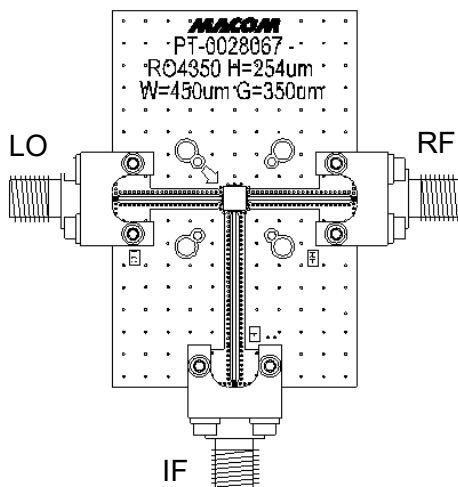
Application Schematic



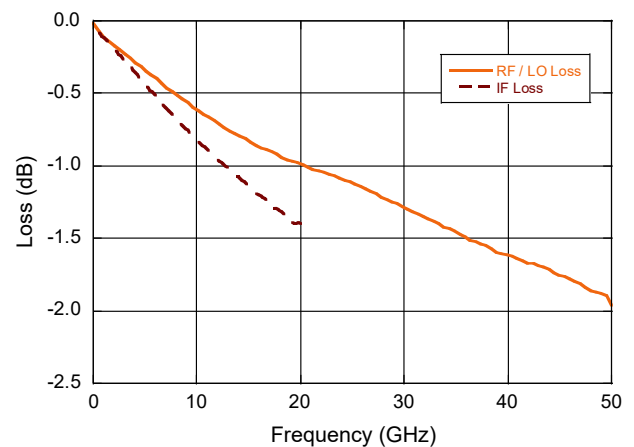
DXF available on request based on 10 mil RO4350 substrate.

No external parts required for operation of MAMX-011074.

Evaluation Board

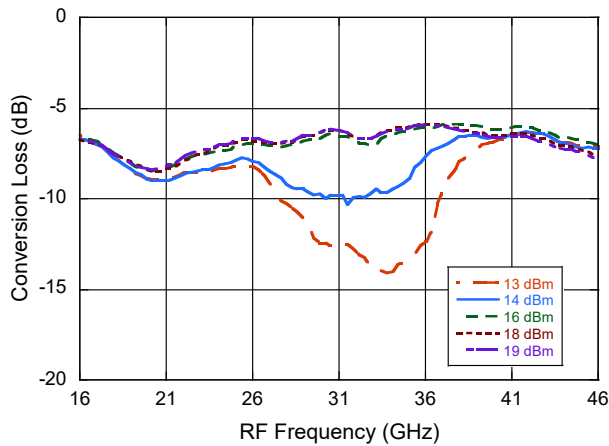


Evaluation Board Losses

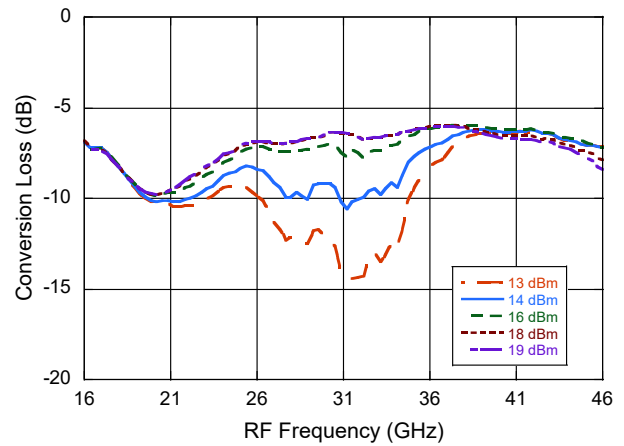


Typical Performance Curves

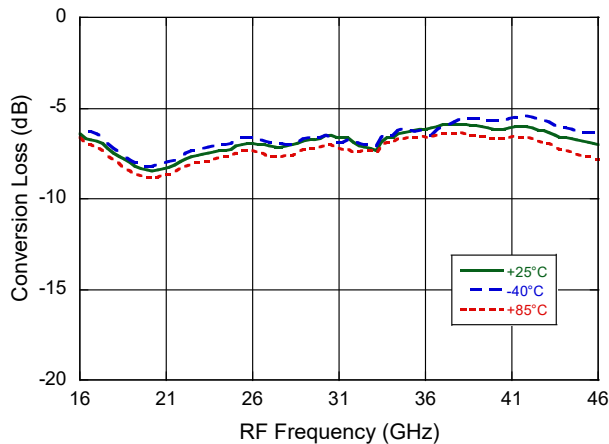
Conversion Loss USB (Down Conversion)
@ +25°C, $I_F = 1$ GHz



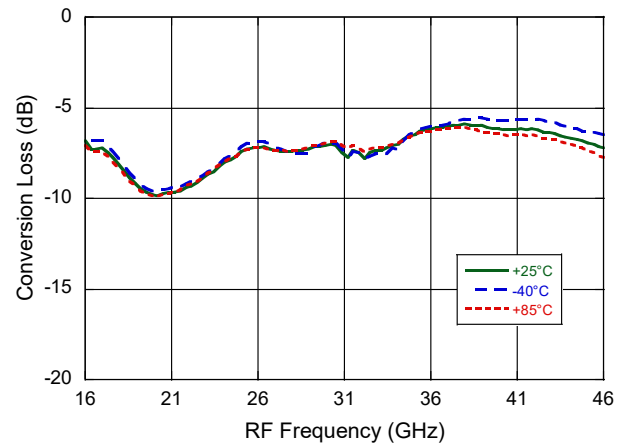
Conversion Loss LSB (Down Conversion)
@ +25°C, $I_F = 1$ GHz



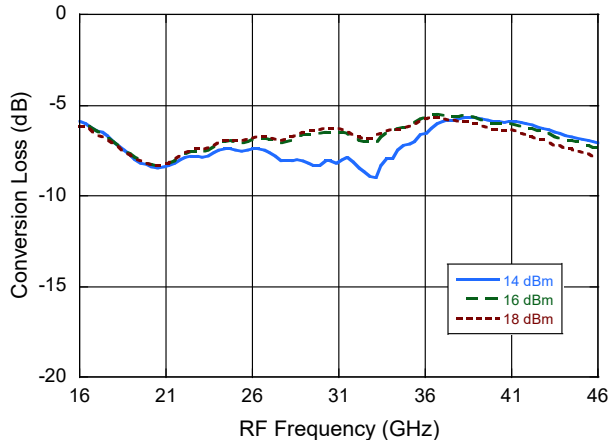
Conversion Loss USB Over Temperature
@ $P_{LO} = 16$ dBm, $I_F = 1$ GHz



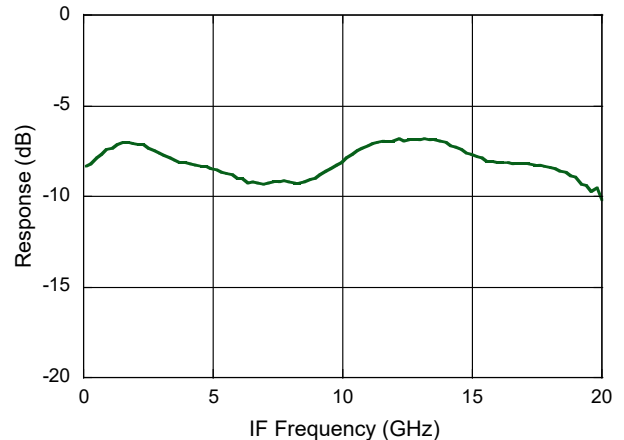
Conversion Loss LSB Over Temperature
@ $P_{LO} = 16$ dBm, $I_F = 1$ GHz



Conversion Loss USB (Up Conversion)
@ +25°C, $I_F = 1$ GHz

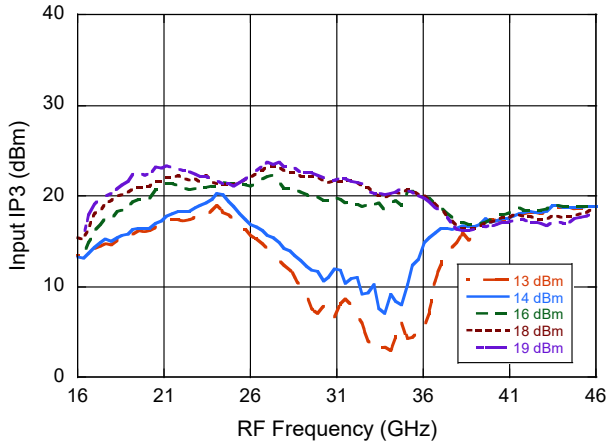


IF Bandwidth
@ +25°C, $F_{LO} = 24$ GHz, $P_{LO} = 16$ dBm

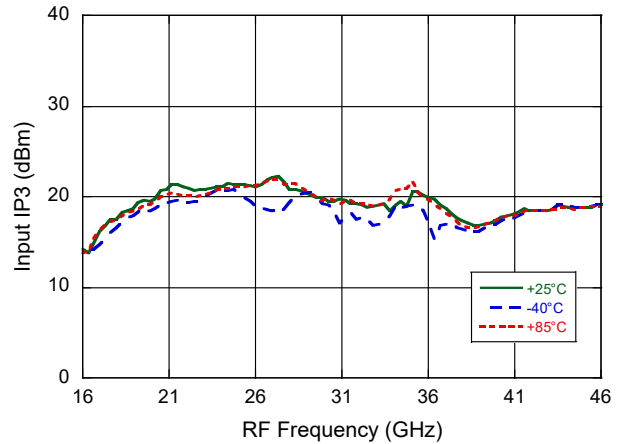


Typical Performance Curves

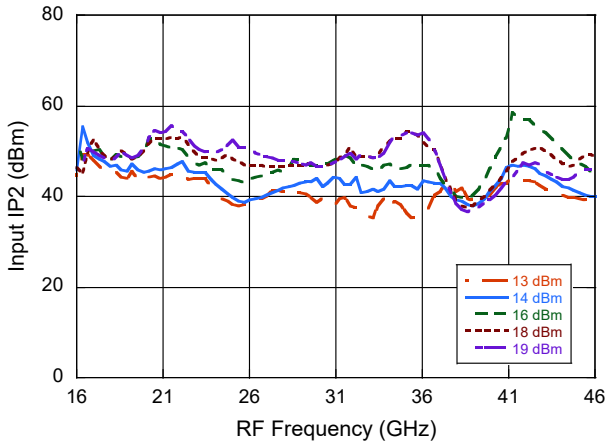
IIP3 vs. LO Drive, $I_F = 1$ GHz



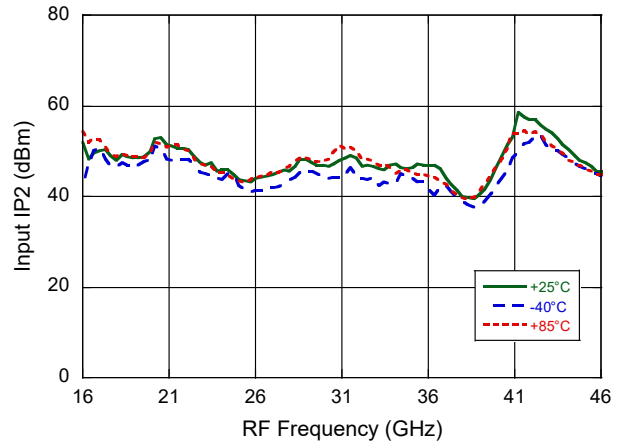
IIP3 vs. Temperature @ $P_{LO} = 16$ dBm, $I_F = 1$ GHz



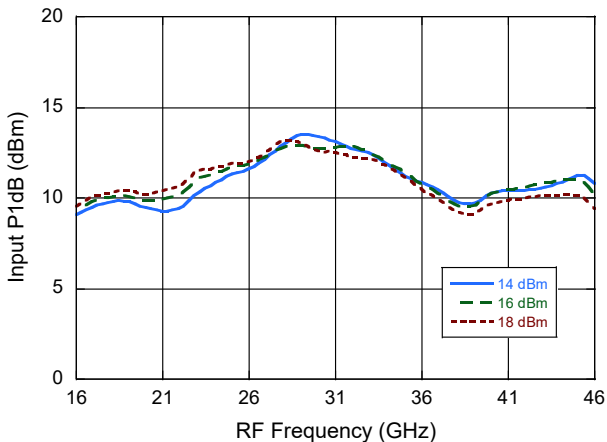
IIP2 vs. LO Drive $I_F = 1$ GHz



IIP2 vs. Temperature @ $P_{LO} = 16$ dBm, $I_F = 1$ GHz

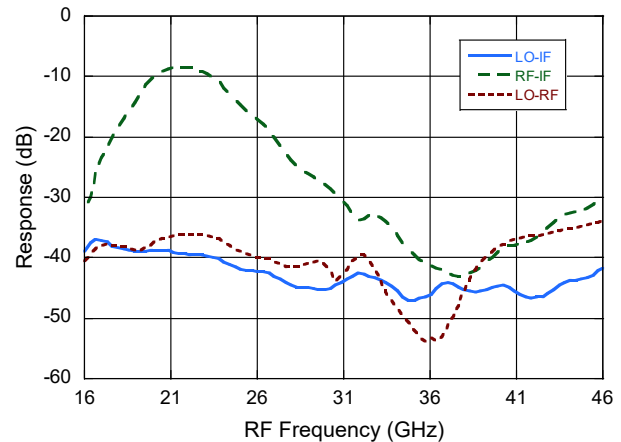


P1dB vs. LO Drive, $I_F = 1$ GHz



Isolation (Down Conversion)

@ $I_F = 1$ GHz, $P_{LO} = 16$ dBm; $P_{RF} = -10$ dBm



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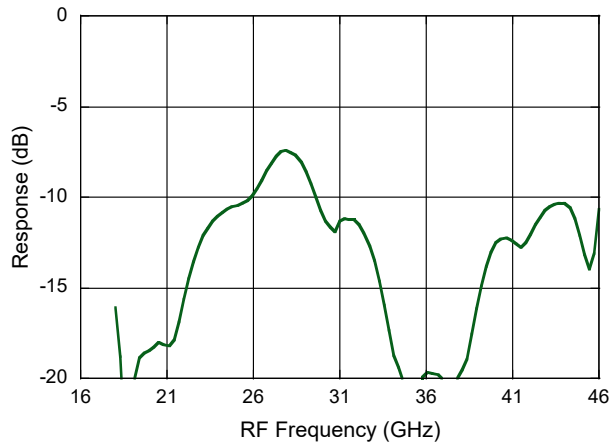
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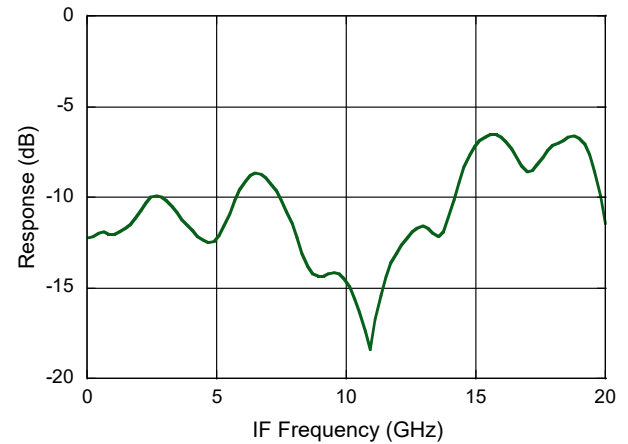
RF Return Loss

@ +25°C, $F_{LO} = 28$ GHz, $P_{LO} = 16$ dBm



IF Return Loss

@ +25°C, $F_{LO} = 28$ GHz, $P_{LO} = 16$ dBm



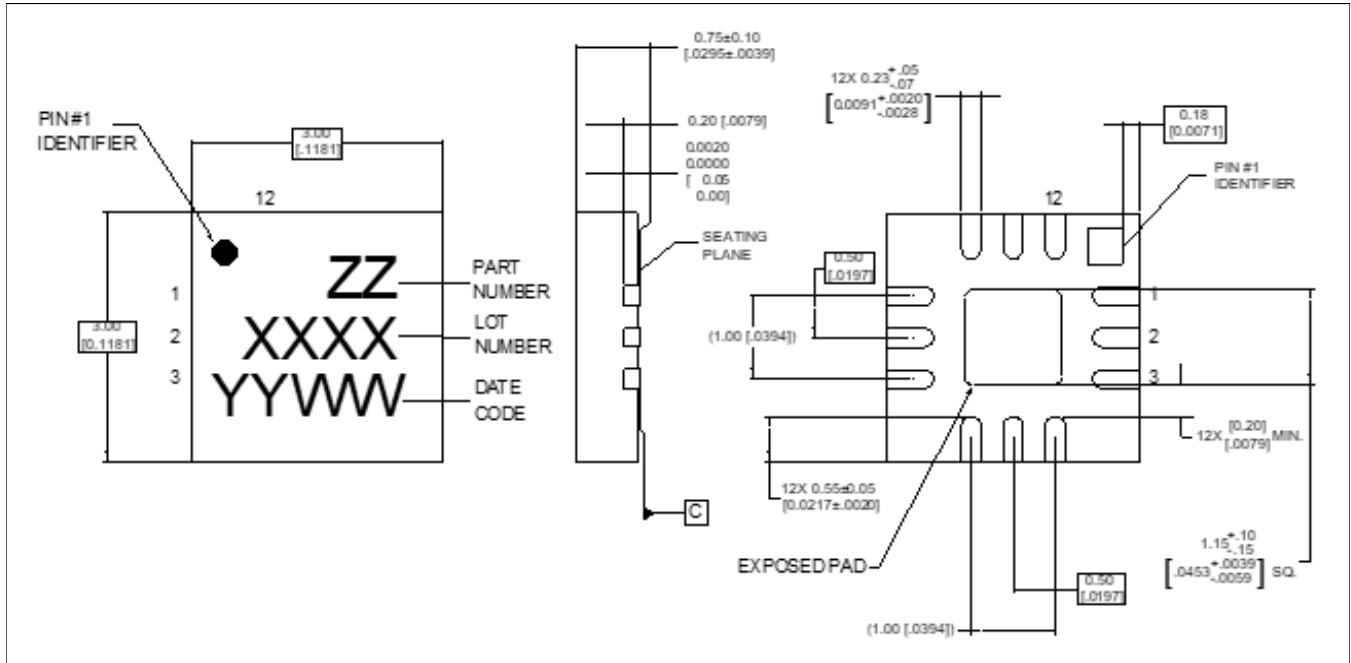
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Lead-Free 3 mm 12-Lead QFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

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