

Features

- -5 to +5 dBm LO Drive Level
- High Isolation, 28 dB LO to RF
- Lead Free SOT-26 package
- Halogen-Free “Green” Mold Compound
- 260°C Re-flow Compatible
- RoHS* Compliant Version of MD57-0001

Description

The MAMX-008611 utilizes a patented “floating-FET” mixer architecture with an on-chip LO amplifier allowing it to operate with as little as -5 dBm of LO drive. This makes it an ideal choice for low power portable designs.

The MAMX-008611 is ideally suited for cellular band communications handsets that can provide only minimal amounts of LO drive. Typical applications include frequency up/down conversion and IQ modulation and demodulation in digital receivers and transmitters.

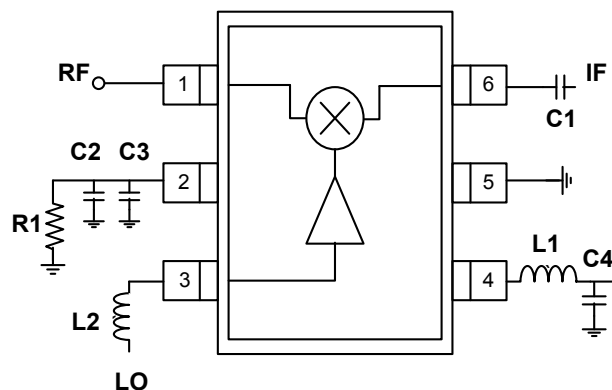
The MAMX-008611 is fabricated using MACOM’s 0.5 micron low noise GaAs MESFET process. This process features full passivation for increased performance and reliability. The device is 100% RF tested to ensure superior performance specification compliance.

Ordering Information¹

| Part Number | Package |
|--------------------|-----------------|
| MAMX-008611-000000 | SOT-26 |
| MAMX-008611-TR3000 | 3000 piece reel |

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

| Pin No. | Pin Name | Description |
|---------|-----------------|------------------------------|
| 1 | RF Port | RF Input / Output |
| 2 | Bias | LO Amplifier Bias Resistor |
| 3 | LO Port | LO Input |
| 4 | V _{DD} | LO Amplifier V _{DD} |
| 5 | GND | Ground |
| 6 | IF Port | IF Input / Output |

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

MMIC Mixer with Local Oscillator Amplifier 0.8 - 1.0 GHz

Rev. V2

**Electrical Specifications²: $T_A = +25^\circ\text{C}$, $V_{DD} = 2.7\text{ V}$, Typical $I_{DD} = 5\text{ mA}$,
RF = 900 MHz (-15 dBm), LO = 730 MHz (-5 dBm), IF = 170 MHz**

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|------------------------|--|-------|---------------|-------------------------|------|
| Conversion Loss | — | dB | — | 9.3 | 11 |
| Isolation | LO to RF LO to IF RF to IF | dB | 20 10 — | 28 12 20 | — |
| VSWR | RF Port LO Port IF Port | Ratio | — | 2.0:1 2.0:1 2.0:1 | — |
| Input 1 dB Compression | RF Freq = 900 MHz, LO = -5 dBm | dBm | — | 14 | — |
| Two Tone IM Ratio | Two tones @ -10 dBm each; Two spacing = 1 MHz, IF = 170 MHz | dBc | — | 59 | — |

2. IMR vs. RF drive can be calculated by the formula: $\text{IMR} = [44 - 1.5 (\text{PIN})]$

Absolute Maximum Ratings^{3,4}

| Parameter | Absolute Maximum |
|---------------------------------|---|
| Input RF/IF Power ⁵ | 27 dBm |
| Input LO Power ⁵ | 17 dBm |
| Operating Voltages ⁵ | $V_{DD} = 6\text{ V}$ |
| Operating Temperature | -30°C to $+80^\circ\text{C}$ |
| Storing Temperature | -65°C to $+150^\circ\text{C}$ |

- 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.
- Typical Thermal Resistance (θ_{jc}) = 108°C/W at nominal bias.

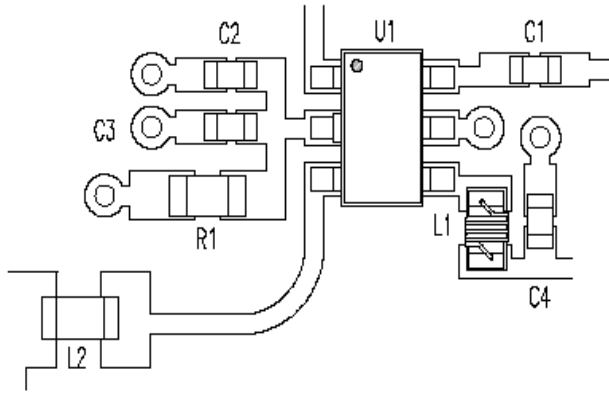
Spurious Table^{6,7,8,9}

| LO Harmonic (n) | | RF Harmonic (m) | | | | |
|-----------------|---------|-----------------|------|------|------|------|
| | | 0X | 1X | 2X | 3X | 4X |
| 0X | -10 dBm | X | 4.1 | 44.9 | 69.5 | 79.7 |
| | 0 dBm | X | 3.9 | 31.9 | 48.4 | 70.0 |
| 1X | -10 dBm | 13.8 | 0 | 47.6 | 82.0 | 76.6 |
| | 0 dBm | 22.9 | 0 | 35.1 | 73.0 | 83.8 |
| 2X | -10 dBm | 10.8 | 18.9 | 46.5 | 70.6 | 78.0 |
| | 0 dBm | 20.4 | 18.9 | 36.6 | 55.9 | 84.0 |
| 3X | -10 dBm | 12.1 | 23.8 | 41.5 | 76.9 | 77.1 |
| | 0 dBm | 22.7 | 23.8 | 31.0 | 63.1 | 74.0 |
| 4X | -10 dBm | 13.6 | 50.9 | 68.5 | 64.5 | 80.6 |
| | 0 dBm | 24.0 | 49.4 | 58.9 | 45.4 | 63.4 |

- The spurious table shows the spurious signals resulting from the mixing of the RF and LO input signals assuming down conversion.
- Mixing products are indicated relative to the IF level.
- The lower frequency mixing term is shown for two different RF input levels.
- The RF frequency is 900 MHz, the LO frequency is 730 MHz.

[nFRF - mFLO] RF = -10 dBm
[nFRF - mFLO] RF = 0 dBm

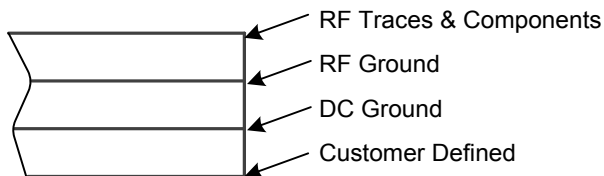
Recommended PCB Configuration



External Circuitry Parts List

| Part | Value | Purpose |
|------|--------------|----------------------------|
| R1 | 200 Ω | LO Amplifier Bias Resistor |
| L1 | 22 nH | LO Amplifier Bias Input |
| L2 | 10 nH | LO Port Matching |
| C1 | 10 nF | IF Port Matching |
| C2 | 10 nF | IF Bypass Capacitor |
| C3 | 22 pF | RF Bypass Capacitor |
| C4 | 47 pF | V_{DD} Bypass |

PCB Cross Section View



PCB dielectric between RF traces and RF ground layers should be chosen to reduce RF discontinuities between 50 Ω lines and package pins. MACOM recommends an FR-4 dielectric thickness of 0.008" (0.2 mm) yielding a 50 Ω line width of 0.015" (0.38 mm). The recommended metallization thickness is 1 oz. copper.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

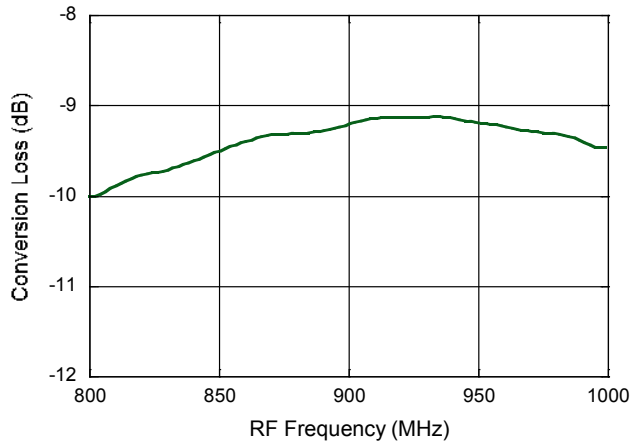
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Data

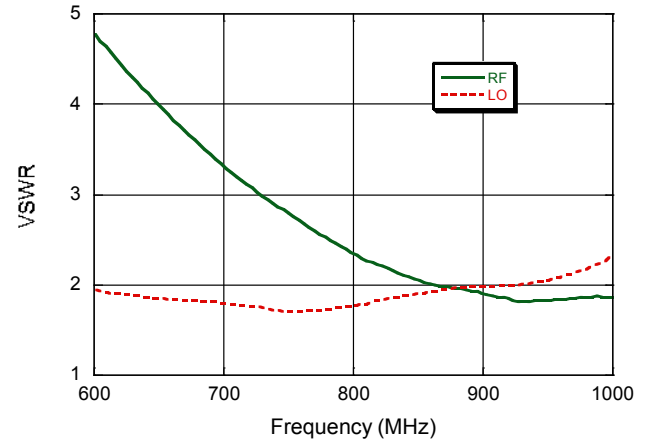
Down Converter Application Test Conditions:

RF = 900 MHz, IF = 170 MHz, LO = 730 MHz (LO Power = -5 dBm)

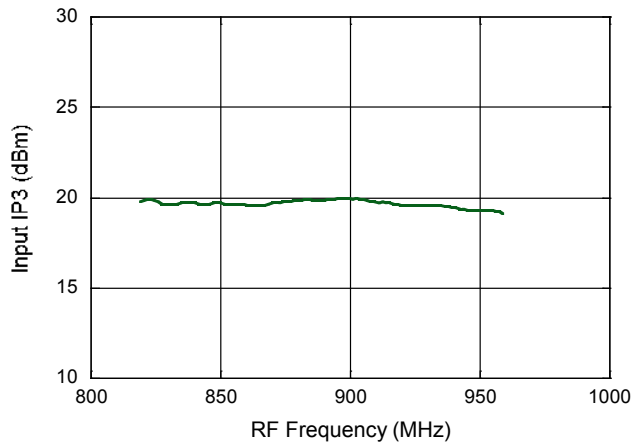
Conversion Loss vs. Frequency



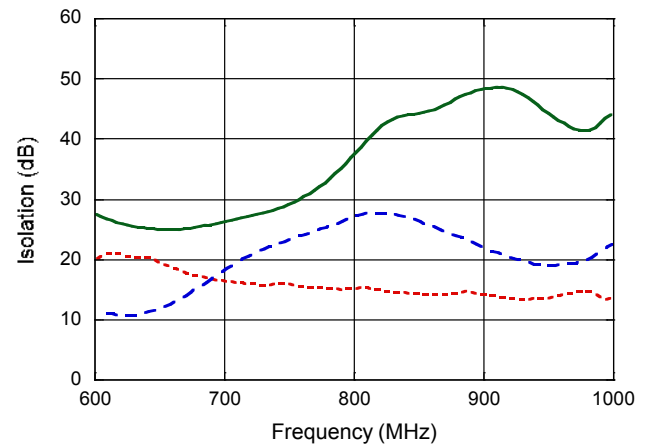
VSWR vs. Frequency



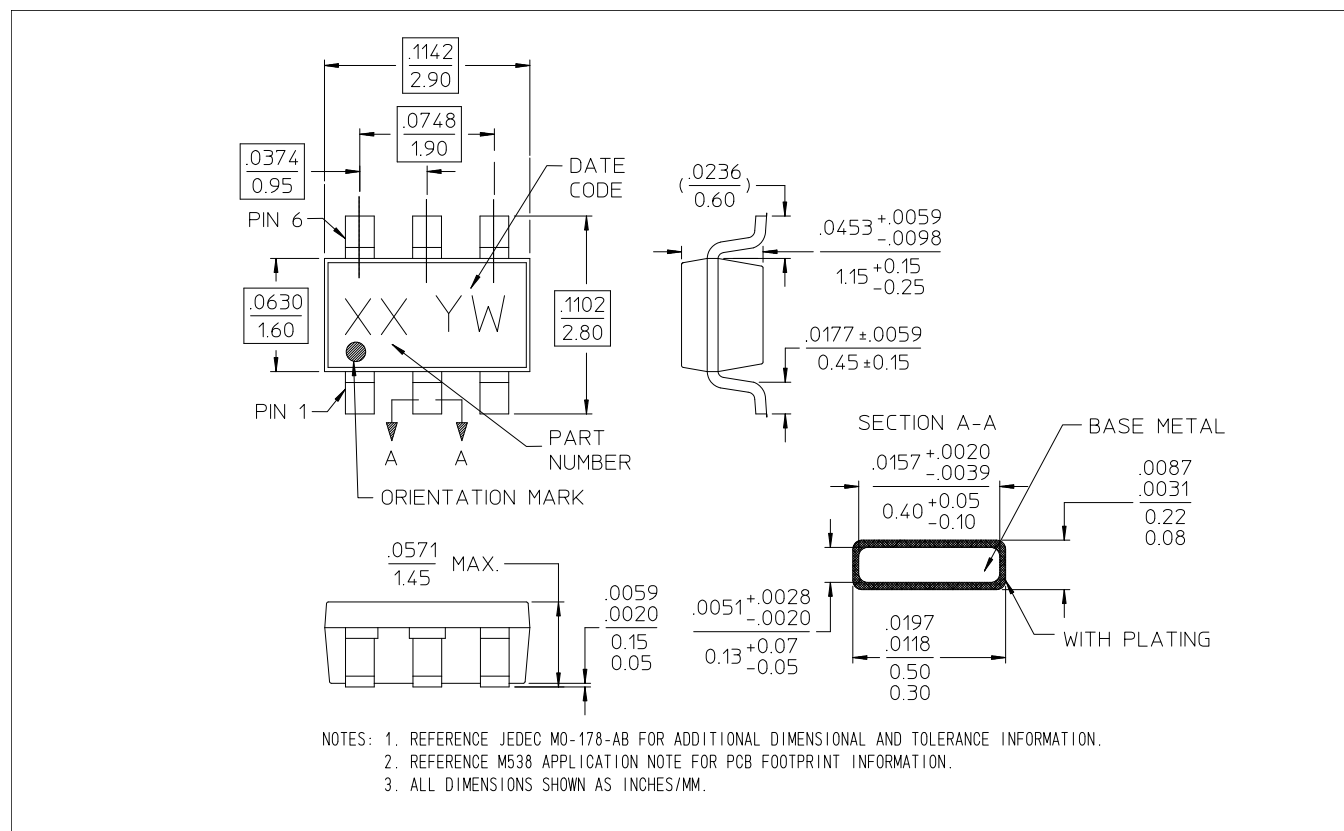
Input IP3 vs. Frequency



Isolations vs. Frequency



Lead-Free SOT-26 Plastic Package[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.
 Meets JEDEC moisture sensitivity level 1 requirements.
 Plating is 100% matte tin plating over copper.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.