XM1003-BD

Image Reject Mixer
32.0-42.0 GHz

Features
- Sub-harmonic Image Reject Mixer
- GaAs HBT Technology
- 9.0 dB Conversion Loss
- 18.0 dB Image Rejection
- 100% On-Wafer RF Testing
- 100% Visual Inspection to MIL-STD-883 Method 2010
- RoHS* Compliant and 260°C Reflow Compatible

Description
M/A-COM Tech’s 32.0-42.0 GHz GaAs MMIC sub-harmonic image reject mixer can be used as an up- or down-converter. The device has a conversion loss of 9.0 dB with 18.0 dB image rejection across the band. I and Q mixer outputs are provided and an external 90 degree hybrid is required to select the desired sideband. This MMIC uses M/A-COM Tech’s GaAs HBT device model technology, and is based upon electron beam lithography to ensure high repeatability and uniformity. The chip has surface passivation to protect and provide a rugged part with backside via holes and gold metallization to allow either a conductive epoxy or eutectic solder die attach process. This device is well suited for Millimeter-wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>XM1003-BD-000V</td>
<td>“V” - vacuum release gel paks</td>
</tr>
<tr>
<td>XM1003-BD-EV1</td>
<td>evaluation module</td>
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</table>

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power (RF Pin)</td>
<td>+20.0 dBm</td>
</tr>
<tr>
<td>Input Power (IF Pin)</td>
<td>+20.0 dBm</td>
</tr>
<tr>
<td>Storage Temperature (Tstg)</td>
<td>-65 °C to +165 °C</td>
</tr>
<tr>
<td>Operating Temperature (Ta)</td>
<td>-55 °C to +125 °C</td>
</tr>
</tbody>
</table>

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## Electrical Specifications: 34-42 GHz (Upper Side Band) (Ambient Temperature T = 25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
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<tbody>
<tr>
<td>Frequency Range (RF) Lower Side Band</td>
<td>GHz</td>
<td>32.0</td>
<td>-</td>
<td>42.0</td>
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<tr>
<td>Frequency Range (LO)</td>
<td>GHz</td>
<td>15.0</td>
<td>-</td>
<td>23.0</td>
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<tr>
<td>Frequency Range (IF)</td>
<td>GHz</td>
<td>DC</td>
<td>-</td>
<td>4.0</td>
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<tr>
<td>RF Return Loss (S11)</td>
<td>dB</td>
<td>-</td>
<td>10.0</td>
<td>-</td>
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<tr>
<td>IF1/IF2 Return Loss (S22)</td>
<td>dB</td>
<td>-</td>
<td>TBD</td>
<td>-</td>
</tr>
<tr>
<td>LO Return Loss (S33)</td>
<td>dB</td>
<td>-</td>
<td>TBD</td>
<td>-</td>
</tr>
<tr>
<td>Conversion Loss (S21)</td>
<td>dB</td>
<td>-</td>
<td>9.0</td>
<td>-</td>
</tr>
<tr>
<td>LO Input Drive (P_{LO})</td>
<td>dBm</td>
<td>-</td>
<td>+12.0</td>
<td>-</td>
</tr>
<tr>
<td>Image Rejection</td>
<td>dBc</td>
<td>-</td>
<td>18.0</td>
<td>-</td>
</tr>
<tr>
<td>Isolation LO/RF</td>
<td>dBc</td>
<td>-</td>
<td>-40.0</td>
<td>-</td>
</tr>
<tr>
<td>Isolation LO/IF</td>
<td>dB</td>
<td>-</td>
<td>TBD</td>
<td>-</td>
</tr>
<tr>
<td>Isolation RF/IF</td>
<td>dB</td>
<td>-</td>
<td>TBD</td>
<td>-</td>
</tr>
<tr>
<td>Input Third Order Intercept (IIP3)</td>
<td>dBm</td>
<td>-</td>
<td>+14.0</td>
<td>-</td>
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</table>
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Typical Performance Curves (Down Conversion)

XM1003-BD (USB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): USB Conversion Loss (dB) vs. RF freq (GHz)

XM1003-BD (LSB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): LSB Conversion Loss (dB) vs. RF freq (GHz)

XM1003-BD (USB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): Image Rejection (dBc) vs. RF freq (GHz)

XM1003-BD (LSB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): Image Rejection (dBc) vs. RF freq (GHz)

XM1003-BD (USB, Down Conversion, IF=2GHz, IF1F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

XM1003-BD (LSB, Down Conversion, IF=2GHz, IF1-F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

-30 dBm, LO Power (dBm)=18, DeviceCoord=R9C5
-25 dBm, LO Power (dBm)=18, DeviceCoord=R9C7

XM1003-BD (USB, Down Conversion, IF=2GHz, IF1F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

XM1003-BD (LSB, Down Conversion, IF=2GHz, IF1-F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

XM1003-BD (USB, Down Conversion, IF=2GHz, IF1F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

XM1003-BD (LSB, Down Conversion, IF=2GHz, IF1-F2=100MHz, PRF=15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

-30 dBm, LO Power (dBm)=18, DeviceCoord=R9C5
-25 dBm, LO Power (dBm)=18, DeviceCoord=R9C7

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Typical Performance Curves (Up Conversion)

XM1003-BD (Up conversion, IF=-15dBm, IF=2GHz, USB, PLO=12dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)

XM1003-BD (Up conversion, IF=-15dBm, IF=2GHz, USB, PLO=12dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)

XM1003-BD (Up conversion, IF=-15dBm, IF=2GHz, USB, PLO=12dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)

XM1003-BD (Up conversion, IF=-15dBm, IF=2GHz, USB, PLO=12dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)
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Typical Performance Curves (Up Conversion) (cont.)

XM1003-BD (Up conversion, PIF=–15dBm, IF=2GHz, USB, PLO=+9,+12 and +15dBm): LOxharf to RF gain (dB) vs. RF freq (GHz)

XM1003-BD (LSB, Up conversion, PIF=–15dBm, IF=2GHz, LSB, PLO=+9,+12 and +15dBm): LOxharf to RF gain (dB) vs. LO freq (GHz)

XM1003-BD (Up Conv, IF=2GHz, IF1+IF2=1GHz, USB, Pout=–23dBm): OIP3 avg (dBm) vs. LO freq (GHz) & IIP3 (dBm) vs RF freq (GHz)

XM1003-BD (Up Conv, IF=2GHz, IF1+IF2=1GHz, LSB, Pout=–23dBm): OIP3 avg (dBm) vs. LO freq (GHz) & IIP3 (dBm) vs RF Freq

XM1003-BD (Up Conv, IF=2GHz, IF1+IF2=0.1GHz USB, Pout=–23dBm): IIP3 avg (dBm) vs. LO freq (GHz) & RF level (dBm) vs RF Freq (GHz)

XM1003-BD (Up Conv, IF=2GHz, IF1+IF2=0.1GHz LSB, Pout=–23dBm): IIP3 avg (dBm) vs. LO freq (GHz) & RF level (dBm) vs RF Freq (GHz)

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Mechanical Drawing

(Note: Engineering designator is 38IRM0363)

Units: millimeters (inches) Bond pad dimensions are shown to center of bond pad.
Thickness: 0.110 +/- 0.010 (0.0043 +/- 0.0004), Backside is ground, Bond Pad/Backside Metallization: Gold
All Bond Pads are 0.100 x 0.100 (0.004 x 0.004).
Bond pad centers are approximately 0.109 (0.004) from the edge of the chip.
Dicing tolerance: +/- 0.005 (+/- 0.0002), Approximate weight: 1.674 mg.

Bias Arrangement

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App Note [1] USB/LSB Selection

**For Upper Side Band Operation (USB):**
With IF1 and IF2 connected to the direct port (0°) and coupled port (90°) respectively as shown in the diagram, the USB signal will reside on the isolated port. The input port must be loaded with 50 ohms.

**For Lower Side Band Operation (LSB):**
With IF1 and IF2 connected to the direct port (0°) and coupled port (90°) respectively as shown in the diagram, the LSB signal will reside on the input port. The isolated port must be loaded with 50 ohms.

**Note:** The coupled port can be used as an alternative input but the port location of the Coupled and Direct ports reverse.

An alternate method of Selection of USB or LSB:
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 class 2 devices.
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