# XM1003-BD

## Image Reject Mixer
## 32.0-42.0 GHz

Rev. V1

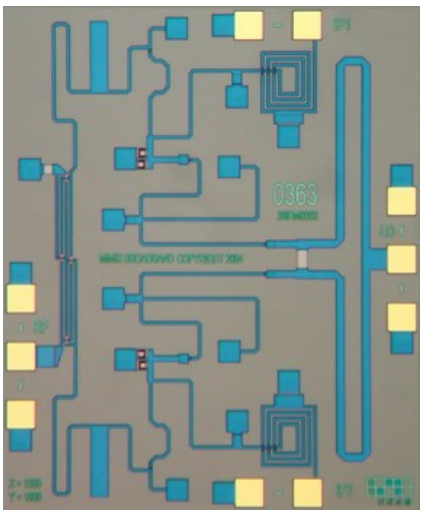
### Features

- 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.

### Chip Device Layout



### Absolute Maximum Ratings

| Parameter | Absolute Max. |
|---|---|
| Input Power (RF Pin) | +20.0 dBm |
| Input Power (IF Pin) | +20.0 dBm |
| Storage Temperature (Tstg) | -65 °C to +165 °C |
| Operating Temperature (Ta) | -55 °C to +125 °C |

### Ordering Information

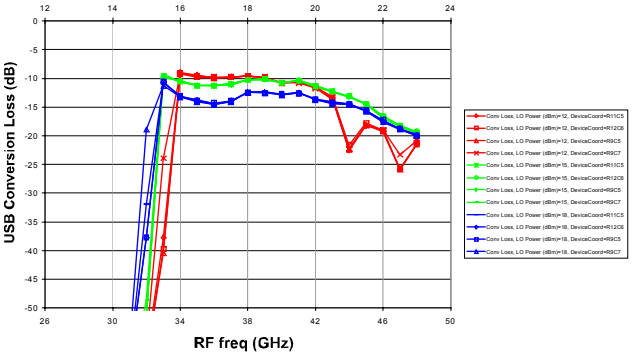
| Part Number | Package |
|---|---|
| XM1003-BD-000V | "V" - vacuum release gel paks |
| XM1003-BD-EV1 | evaluation module |

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

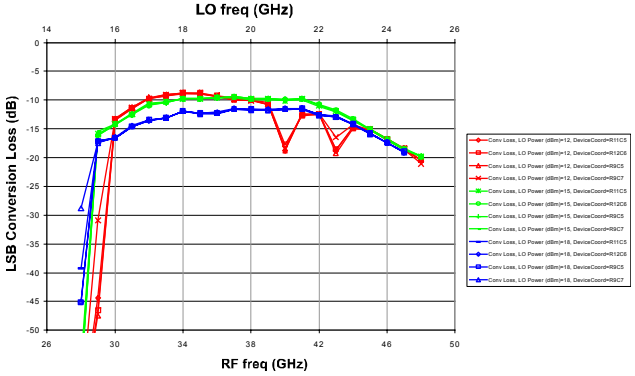
| Parameter | Units | Min. | Typ. | Max. |
|---|---|---|---|---|
| Frequency Range (RF) Lower Side Band | GHz | 32.0 | - | 42.0 |
| Frequency Range (LO) | GHz | 15.0 | - | 23.0 |
| Frequency Range (IF) | GHz | DC | - | 4.0 |
| RF Return Loss (S11) | dB | - | 10.0 | - |
| IF1/IF2 Return Loss (S22) | dB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

## Typical Performance Curves (Down Conversion)

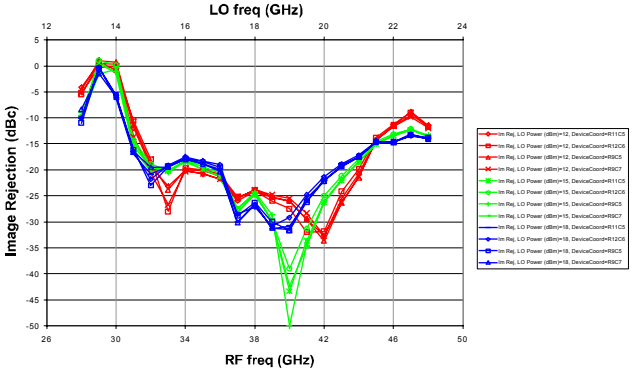
XM1003-BD (USB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): USB Conversion Loss (dB) vs. RF freq (GHz)



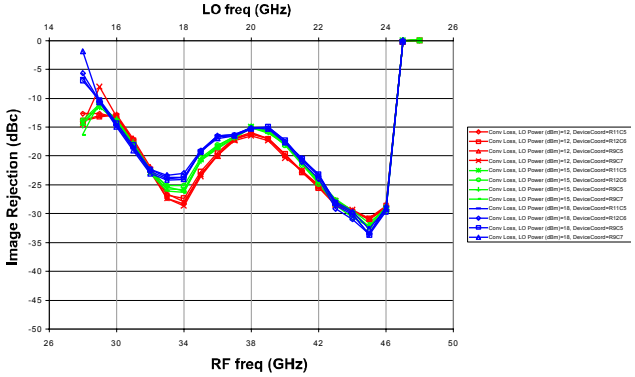

XM1003-BD (LSB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): LSB Conversion Loss (dB) vs. RF freq (GHz)



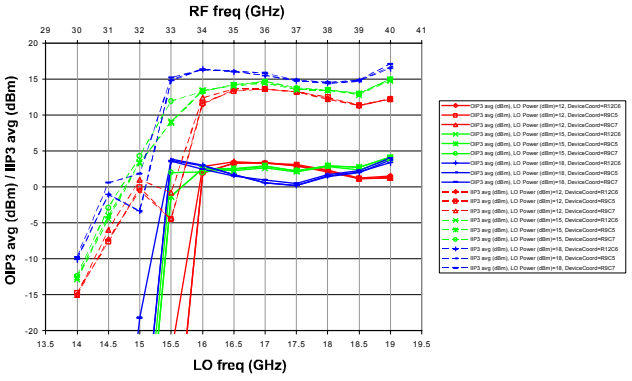

XM1003-BD (USB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): Image Rejection (dBc) vs. RF freq (GHz)



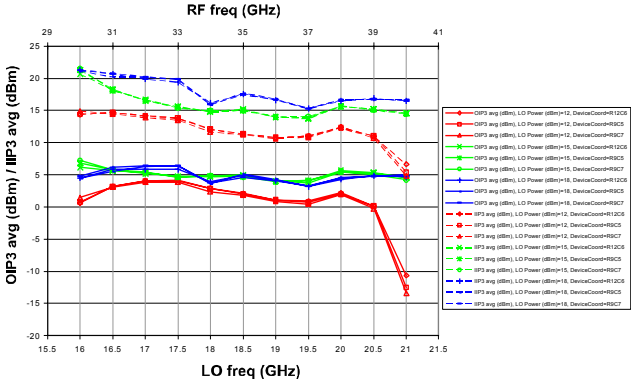

XM1003-BD(LSB, down conversion, IF=2GHz, PRF=-20dBm, PLO=+12,15 & 18dBm): Image Rejection (dBc) vs. RF freq (GHz)




XM1003-BD (USB, Down Conversion, IF=2GHz, IF1-IF2=100MHz, PRF=-15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

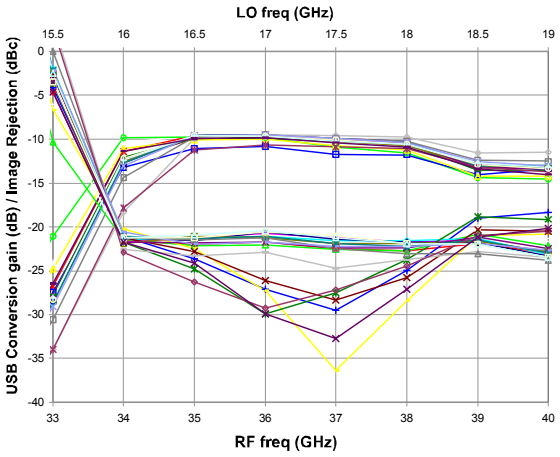



XM1003-BD (LSB, Down Conversion, IF=2GHz, IF1-IF2=100MHz, PRF=-15dBm, LO=12, 15 & 18 dBm): OIP3 avg (dBm) vs. LO freq (GHz), IIP3 avg (dBm) vs. RF freq (GHz)

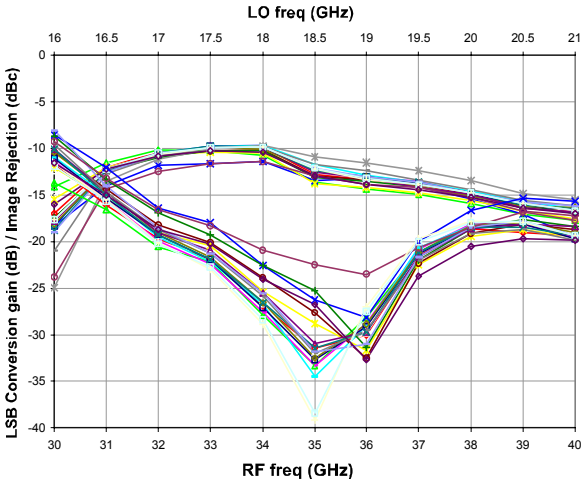


## Typical Performance Curves (Up Conversion)

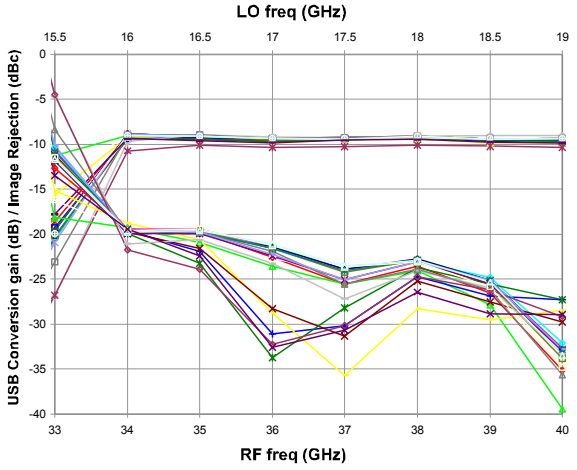
XM1003-BD (Up conversion, PIF=-15dBm, IF=2GHz, USB, PLO=+9dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)



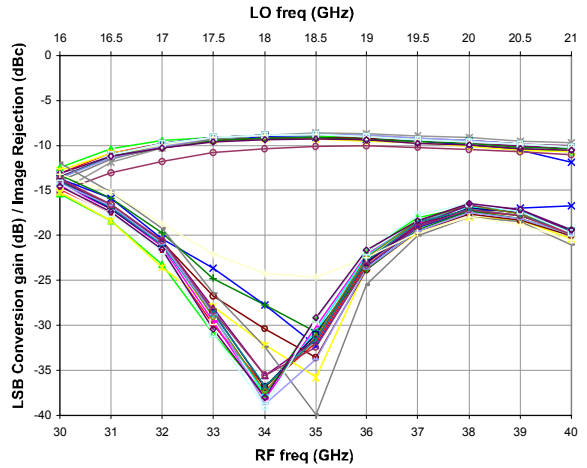

XM1003-BD (Up conversion, PIF=-15dBm, IF=2GHz, LSB, PLO=+9dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)



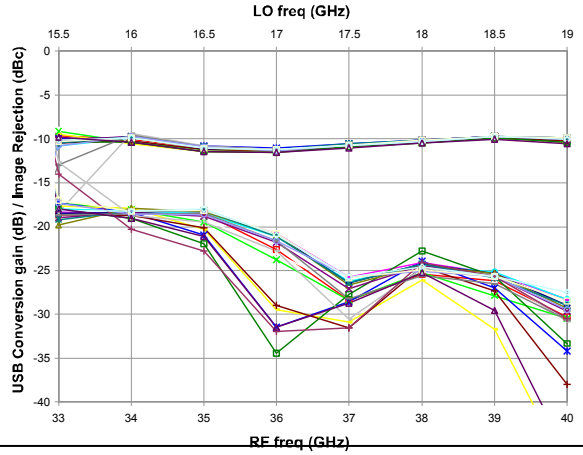

XM1003-BD (Up conversion, PIF=-15dBm, IF=2GHz, USB, PLO=+12dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)




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

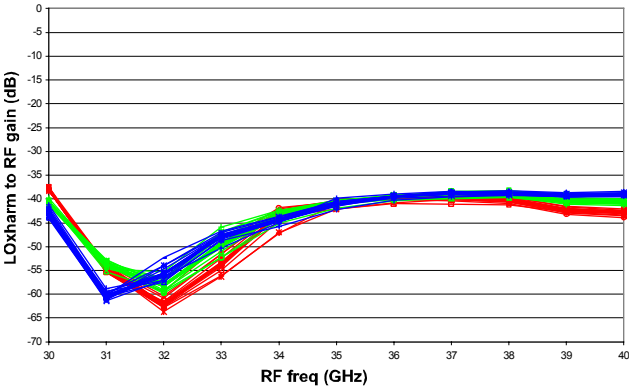



XM1003-BD (Up conversion, PIF=-15dBm, IF=2GHz, USB, PLO=+15dBm):
USB Conversion gain (dB) & Image Rejection (dBc) vs. RF freq (GHz) & LO freq (GHz)

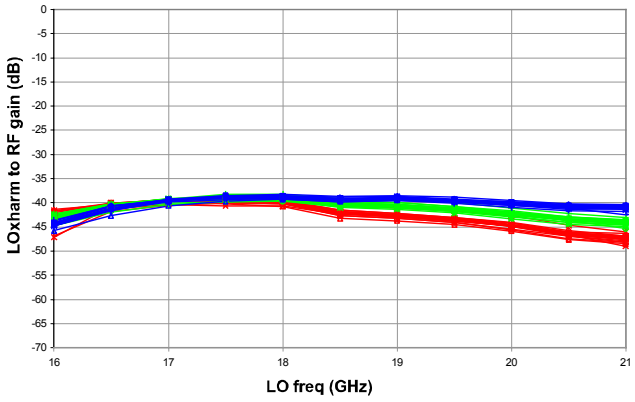


## Typical Performance Curves (Up Conversion) (cont.)

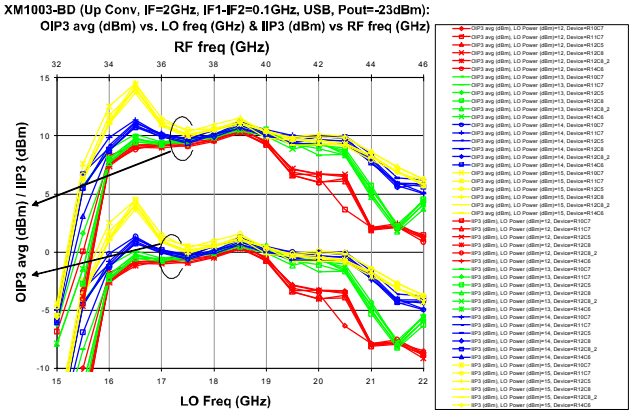
XM1003-BD (Up conversion, PIF=-15dBm, IF=2GHz, USB, PLO=+9,+12 and +15dBm): LOxharm to RF gain (dB) vs. RF freq (GHz)



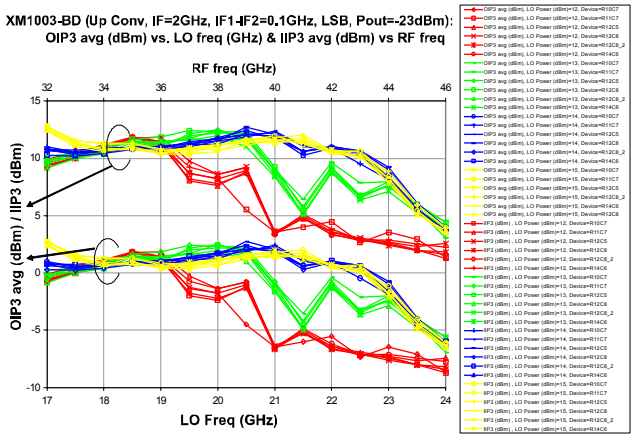

XM1003-BD (LSB,Up conversion, PIF=-15dBm, IF=2GHz, LSB, PLO=+9,+12 and 15dBm): LOxharm to RF gain (dB) vs. LO freq (GHz)



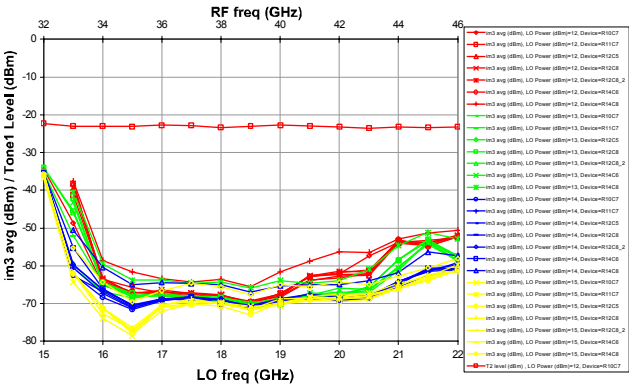

XM1003-BD (Up Conv, IF=2GHz, IF1-IF2=0.1GHz, USB, Pout=-23dBm): OIP3 avg (dBm) vs. LO freq (GHz) & IIP3 (dBm) vs RF freq (GHz)



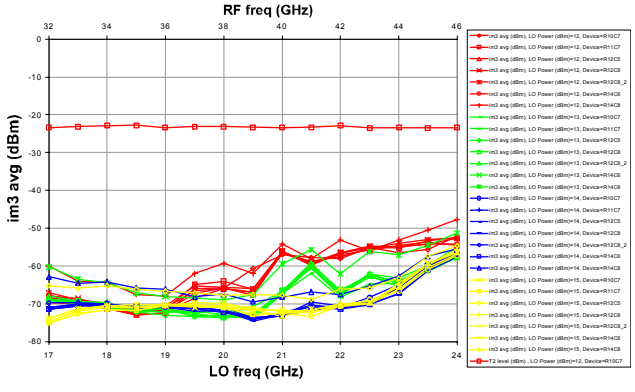

XM1003-BD (Up Conv, IF=2GHz, IF1-IF2=0.1GHz, LSB, Pout=-23dBm): OIP3 avg (dBm) vs. LO freq (GHz) & IIP3 avg (dBm) vs RF freq



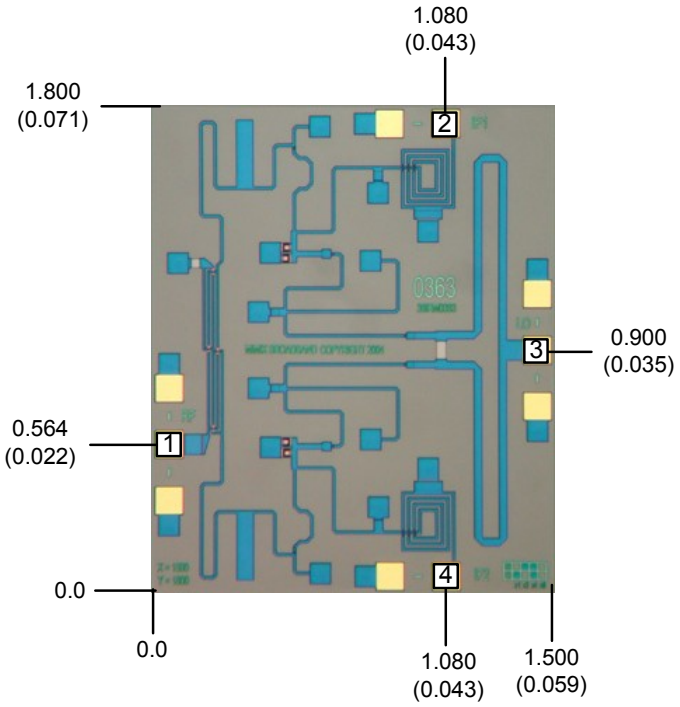

XM1003-BD (Up Conv, IF=2GHz, IF1-IF2=0.1GHz, USB, Pout=-23dBm): im3 avg (dBm) vs. LO freq (GHz) & RF level (dbm) vs RF Freq (GHz)




XM1003-BD (Up Conv, IF=2GHz, IF1-IF2=0.1GHz, LSB, Pout=-23dBm): im3 avg (dBm) vs. LO freq (GHz) & RF level (dbm) vs RF Freq (GHz)



## Mechanical Drawing

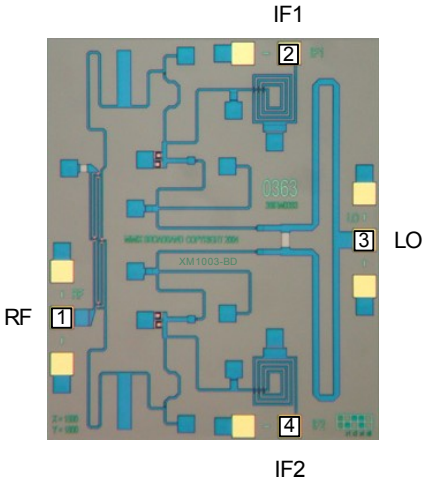



(Note: Engineering designator is 38IRM0363)

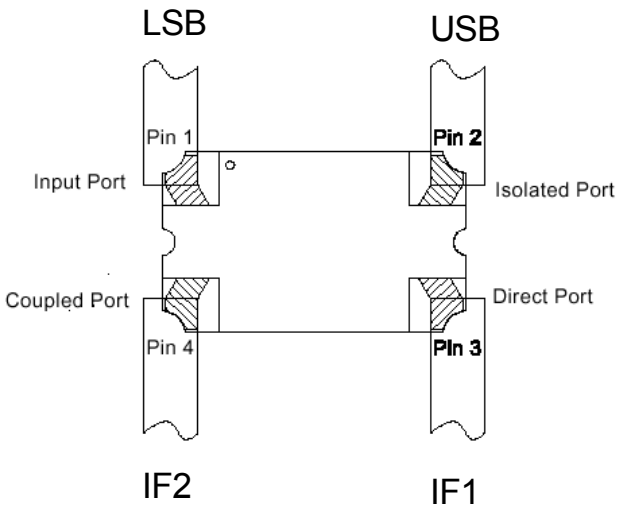
Units: millimeters (inches) Bond pad dimensions are shown to center of bond pad.
Thickness: 0.110 +/- 0.010 (0.0043 +/- 0.0004), Backside is ground, Bond Pad/Backside Metallization: Gold
All Bond Pads are 0.100 x 0.100 (0.004 x 0.004).
Bond pad centers are approximately 0.109 (0.004) from the edge of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

Bond Pad #1 (RF)
Bond Pad #2 (IF1)
Bond Pad #3 (LO)
Bond Pad #4 (IF2)

## Bias Arrangement



**App Note [1] USB/LSB Selection -**

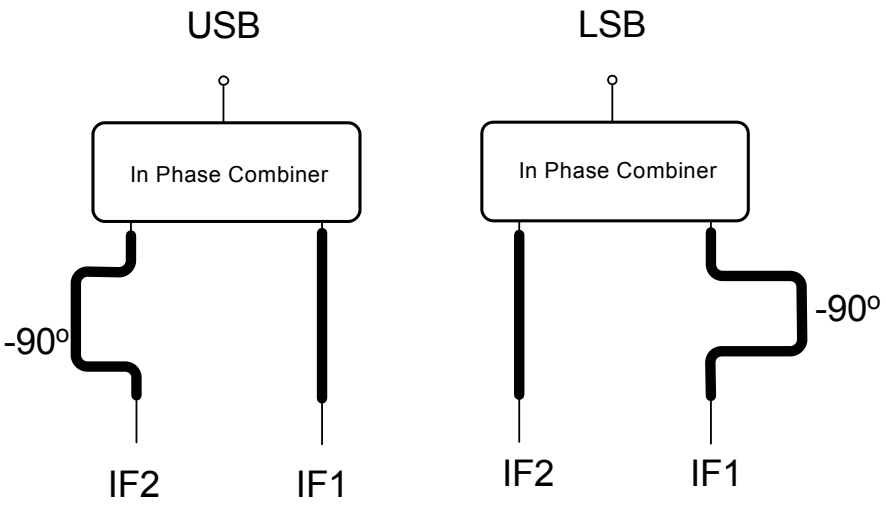



**For Upper Side Band Operation (USB):** With IF1 and IF2 connected to the direct port (0°) and coupled port (90°) respectively as shown in the diagram, the USB signal will reside on the isolated port. The input port must be loaded with 50 ohms.

**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.