# CMD251C3

## 4-8.5 GHz Fundamental Mixer

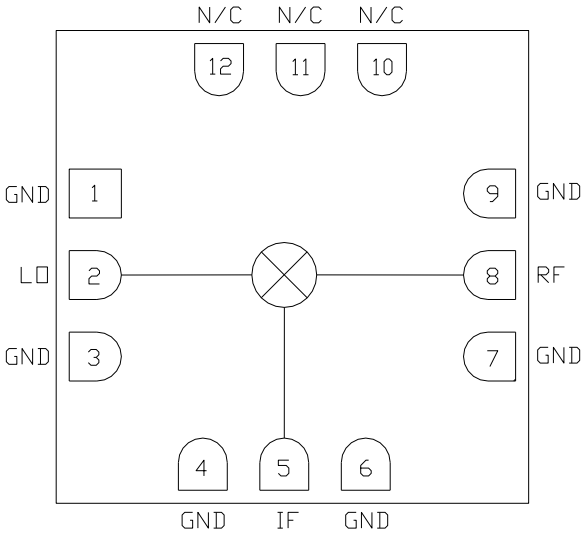
### Features

- ► Low conversion loss
- ► High isolation
- ► Wide IF bandwidth
- ► Passive double balanced topology
- ► Pb-free RoHs compliant 3x3 mm SMT package

### Description

The CMD251C3 is a general purpose double balanced mixer in a leadless surface mount package that can be used for up- and downconverting applications between 4 and 8.5 GHz. The CMD251C3 has very high isolation to both the RF and IF ports due to the optimized balun structures, and can operate with an LO drive level as low as +15 dBm. The CMD251C3 can easily be configured as an image reject mixer or single sideband modulator with external hybrids and power splitters.

### Functional Block Diagram




### *Electrical Performance* – IF = 100 MHz, LO = +17 dBm , $T_A$ = 25 °C, F = 6 GHz

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency Range, RF & LO | | 4 – 8.5 | | GHz |
| Frequency Range, IF | DC | | 2.2 | GHz |
| Conversion Loss | | 7 | | dB |
| LO to RF Isolation | | 45 | | dB |
| LO to IF Isolation | | 36 | | dB |
| RF to IF Isolation | | 25 | | dB |
| Input IP3 | | 21 | | dBm |

Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz



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## *Specifications*

### Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| RF / IF Input Power | +25 dBm |
| LO Drive | +25 dBm |
| Operating Temperature | -40 to 85 °C |
| Storage Temperature | -55 to 150 °C |
| Thermal resistance, $\Theta_{JC}$ | 280.4 ºC/ W |

Operation of this device outside the maximum ratings may cause permanent damage.

### Electrical Specifications – IF = 100 MHz, LO = +17 dBm, $T_A$ = 25 °C

| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range, RF & LO | 4 – 7 | | | 7 – 8.5 | | | GHz |
| Frequency Range, IF | DC | | 2.2 | DC | | 2.2 | GHz |
| Conversion Loss | | 7 | 8.5 | | 8.5 | 10 | dB |
| Noise Figure (SSB) | | 7 | 8.5 | | 8.5 | 10 | dB |
| LO to RF Isolation | 40 | 45 | | 40 | 45 | | dB |
| LO to IF Isolation | 30 | 40 | | 42 | 50 | | dB |
| RF to IF Isolation | 15 | 25 | | 30 | 35 | | dB |
| Input P1dB | | 16 | | | 17 | | dBm |
| Input IP3 | | 22 | | | 25 | | dBm |

Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz



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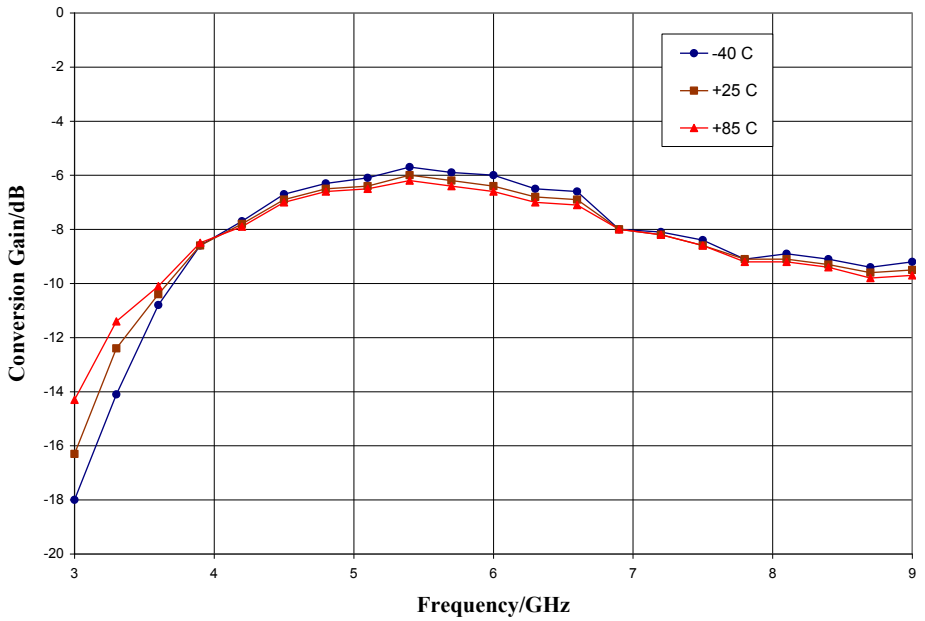
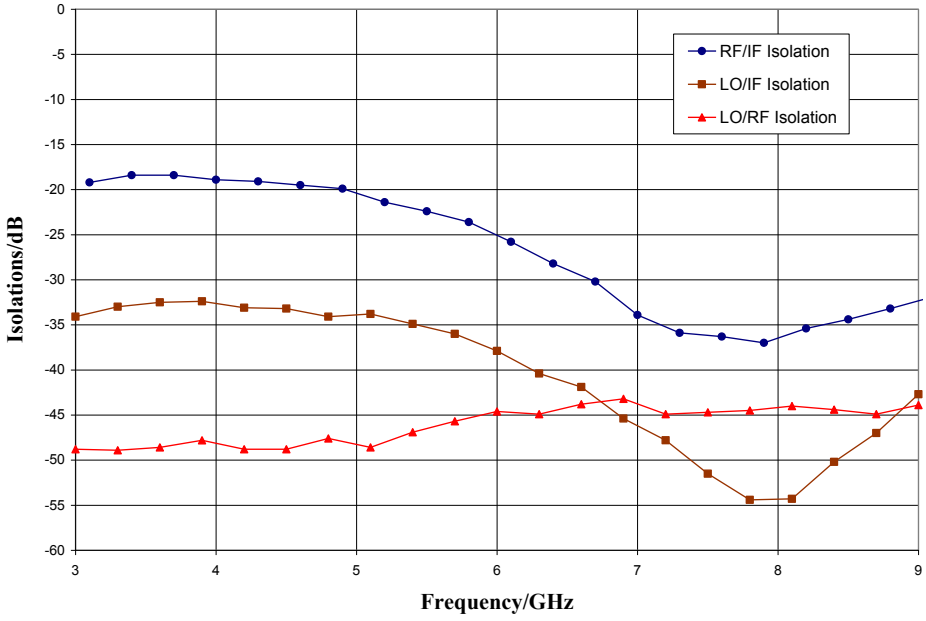
## *Typical Performance*

### Conversion Gain vs. Temperature, LO = +17 dBm, IF = 100 MHz USB




### Isolations, LO = +17 dBm



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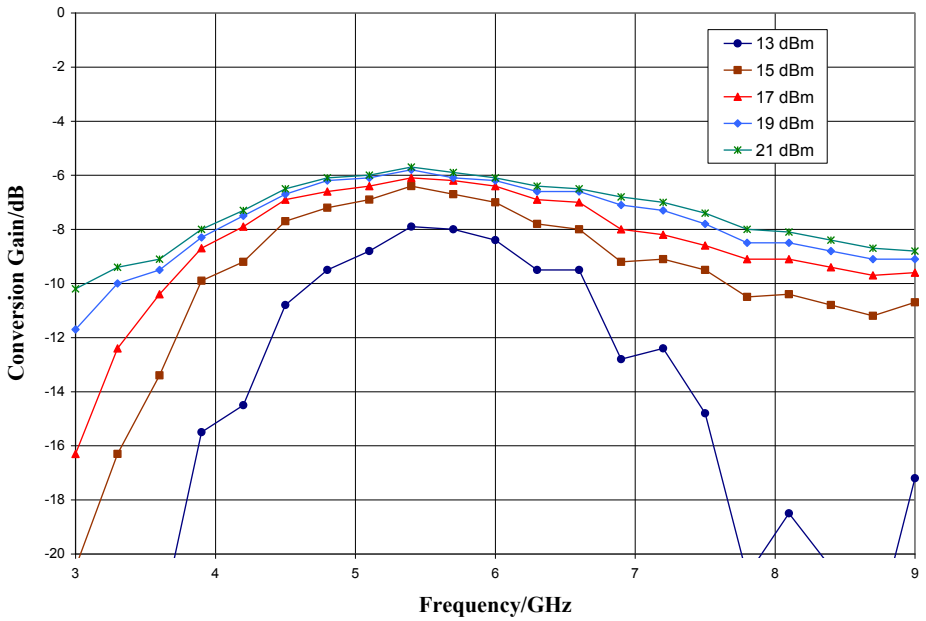
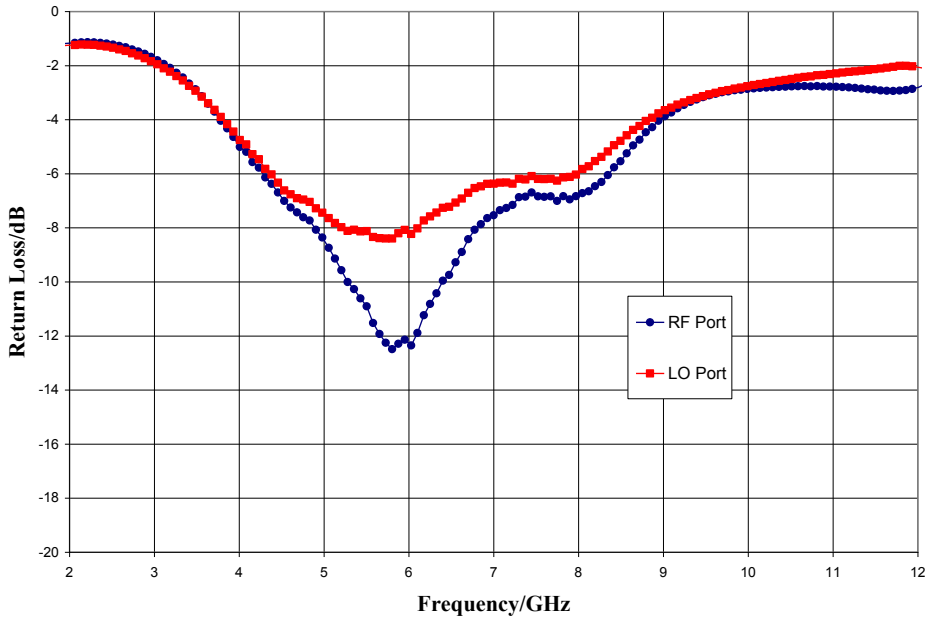
## *Typical Performance*

### Conversion Gain vs. LO Drive, IF = 100 MHz USB




### Return Loss, LO = + 17 dBm



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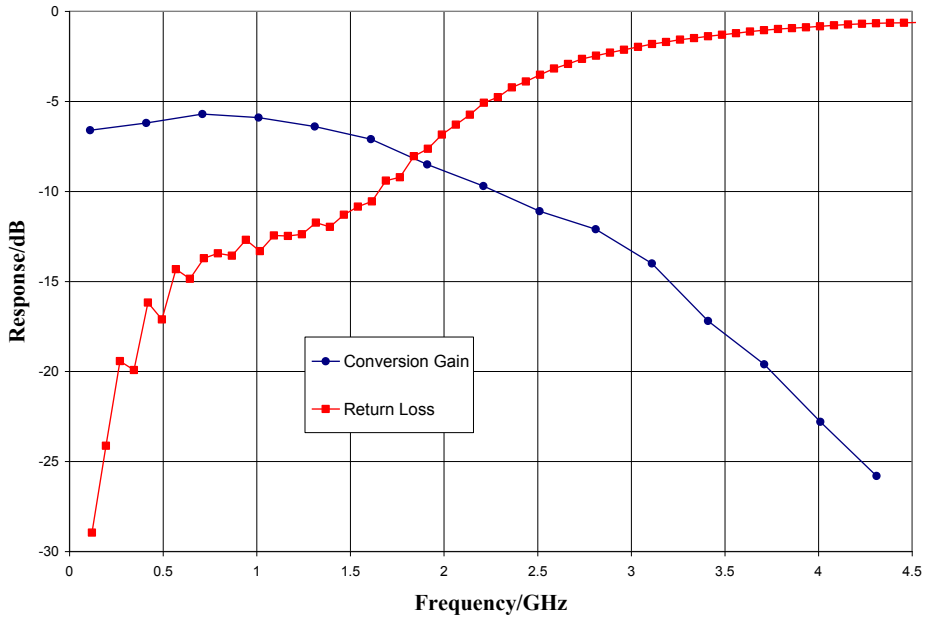
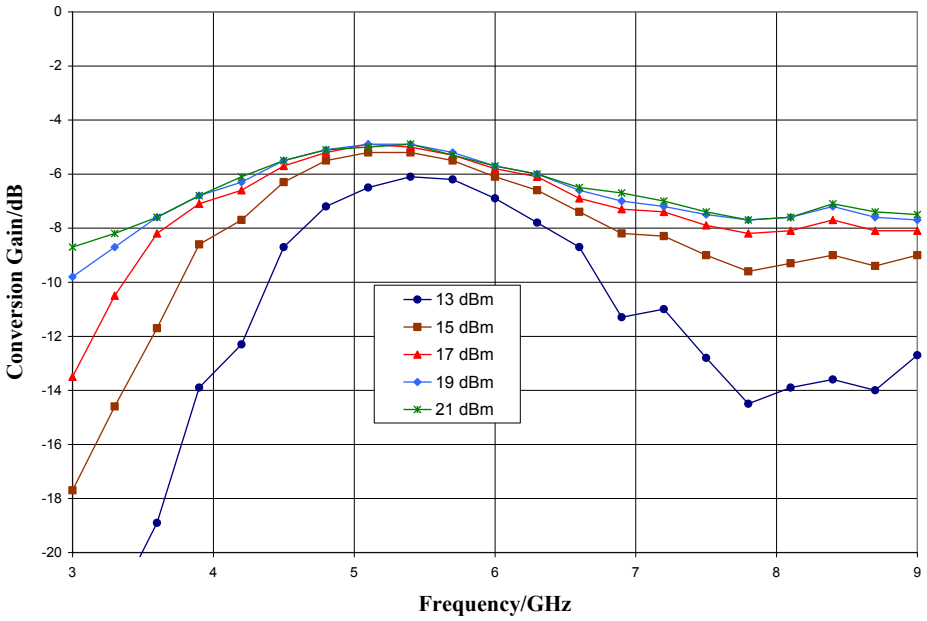
## *Typical Performance*

**IF Bandwidth, LO = +17 dBm**




**Upconverter Performance, Conversion Gain vs. LO Drive, IF input = 100 MHz**



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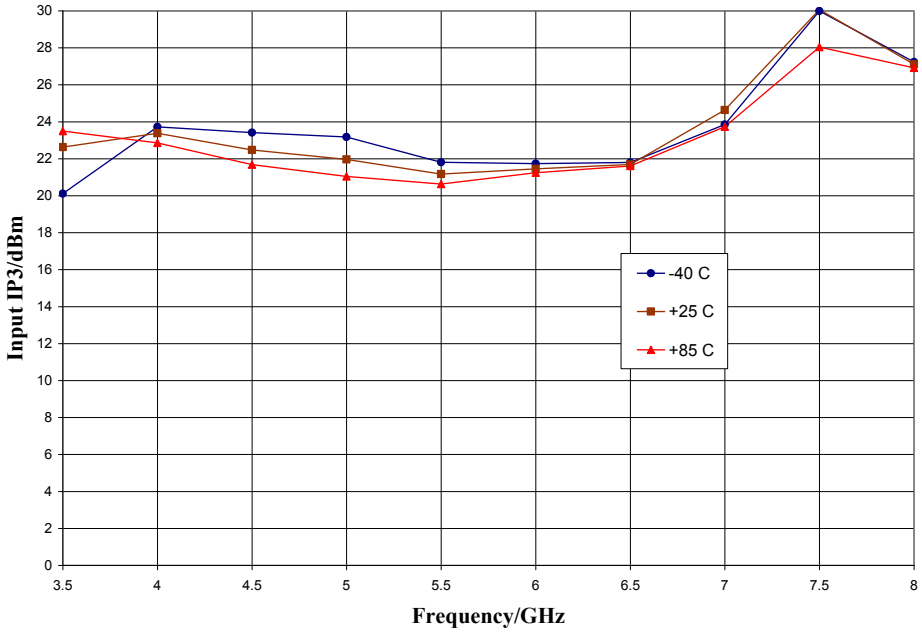
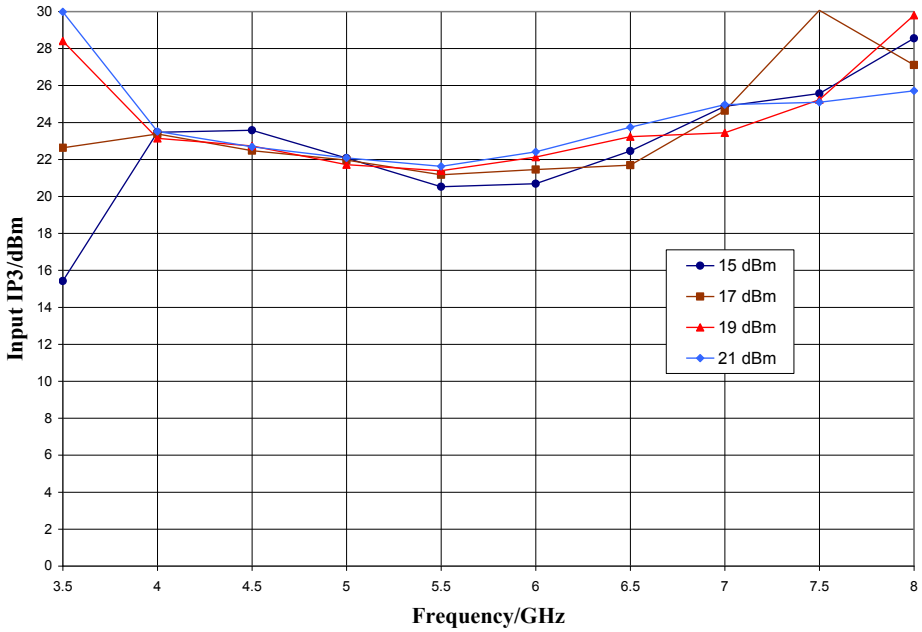
## *Typical Performance*

### Input IP3 vs. Temperature, LO = +17 dBm, IF = 100 MHz




### Input IP3 vs. LO Drive, IF = 100 MHz



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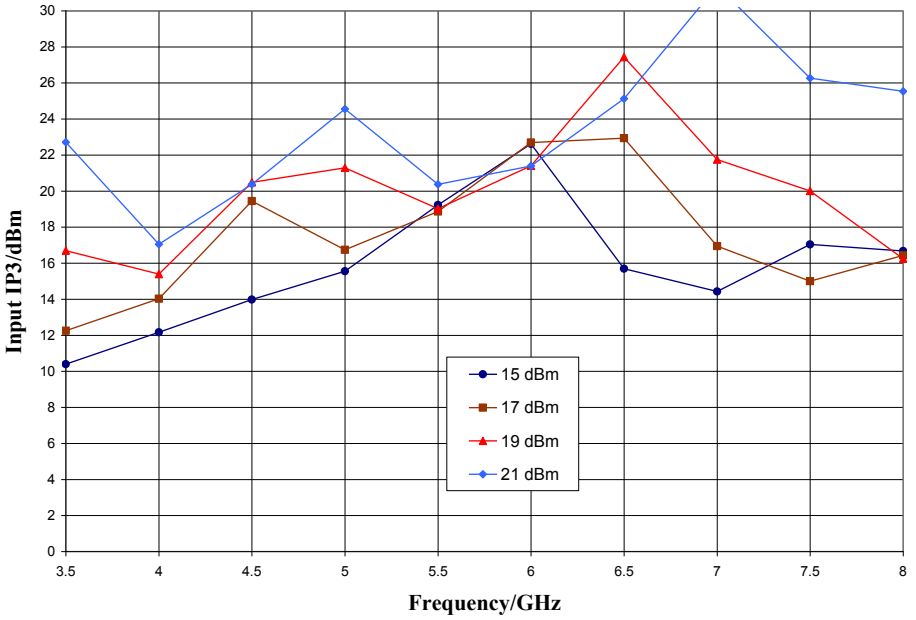
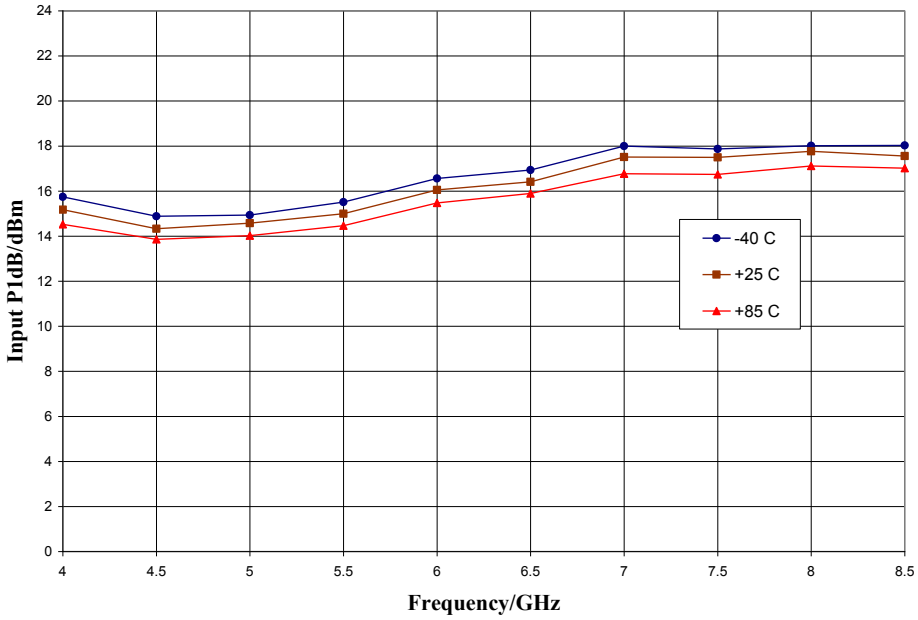
## *Typical Performance*

### Upconverter Performance, Input IP3 vs. LO Drive, IF = 100 MHz




### Input P1dB vs. Temperature, LO = +17 dBm, IF = 100 MHz USB

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## *Typical Performance*

**MxN Spurious Outputs**

| | nLO | | | | |
|---|---|---|---|---|---|
| mRF | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | 7 | 9 | 22 | 35 |
| 1 | 21 | 0 | 35 | 36 | 39 |
| 2 | 67 | > 80 | 70 | 71 | 68 |
| 3 | > 80 | > 80 | > 80 | > 80 | > 80 |
| 4 | > 80 | > 80 | > 80 | > 80 | > 80 |

RF = 6.1 GHz @ -10 dBm
LO = 6.0 GHz @ +17 dBm
All values in dBc below the IF output power level (1RF - 1LO)



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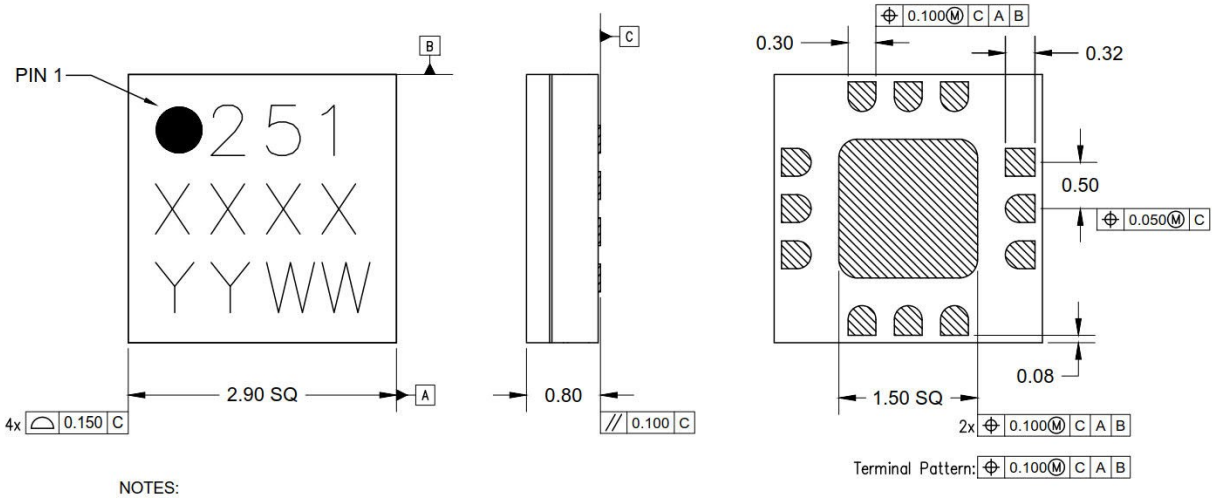
## *Mechanical Information*

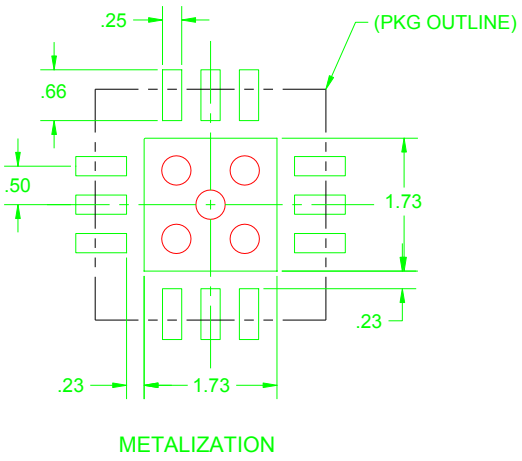
### Package Information and Dimensions



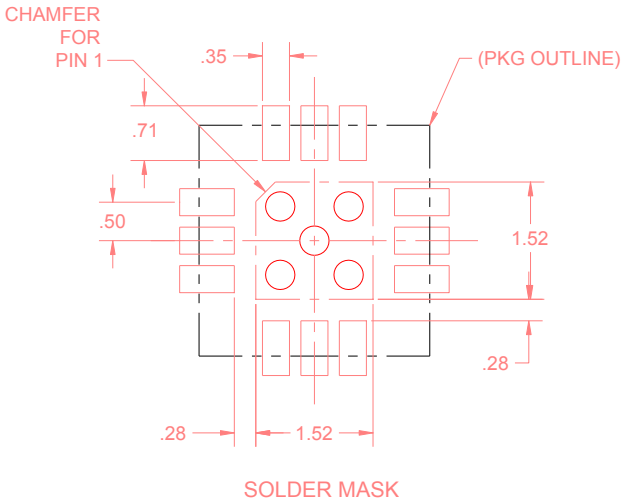

NOTES:

1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH:
   - 3.1. Ni: 8.89um MAX, 1.27um MIN
   - 3.2. Pd: 0.17um MAX, 0.07um MIN
   - 3.3. Au: 0.254um MAX, 0.03um MIN
4. MARKING: ALL MARKING SHALL BE PERMANENT AND LEGIBLE
5. ALTERNATE PIN #1 IDENTIFIER IS A SINGLE SQUARE PAD

### Recommended PCB Land Pattern




METALIZATION




SOLDER MASK



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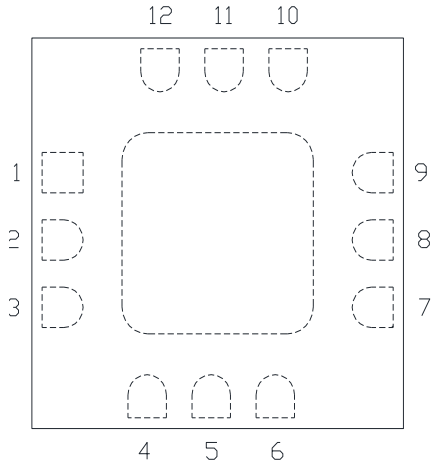
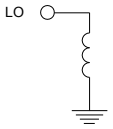
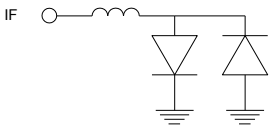
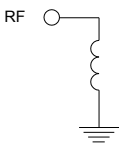
## Pin Description

### Pin Diagram




### Functional Description

| Pin | Function | Description | Schematic |
|---|---|---|---|
| 1,3,4,6,7,9 and die paddle | Ground | Connect to RF / DC ground. |   |
| 2 | LO | This pin is DC coupled and matched to 50 ohms. |   |
| 5 | IF | This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source or sink more than 16 mA of current or part non-function or part failure may result. |   |
| 8 | RF | This pin is DC coupled and matched to 50 ohms. |   |
| 10-12 | N/C | No connection required. These pins may be connected to RF/DC ground | |



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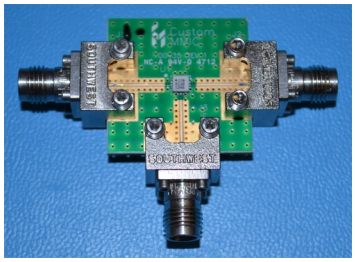
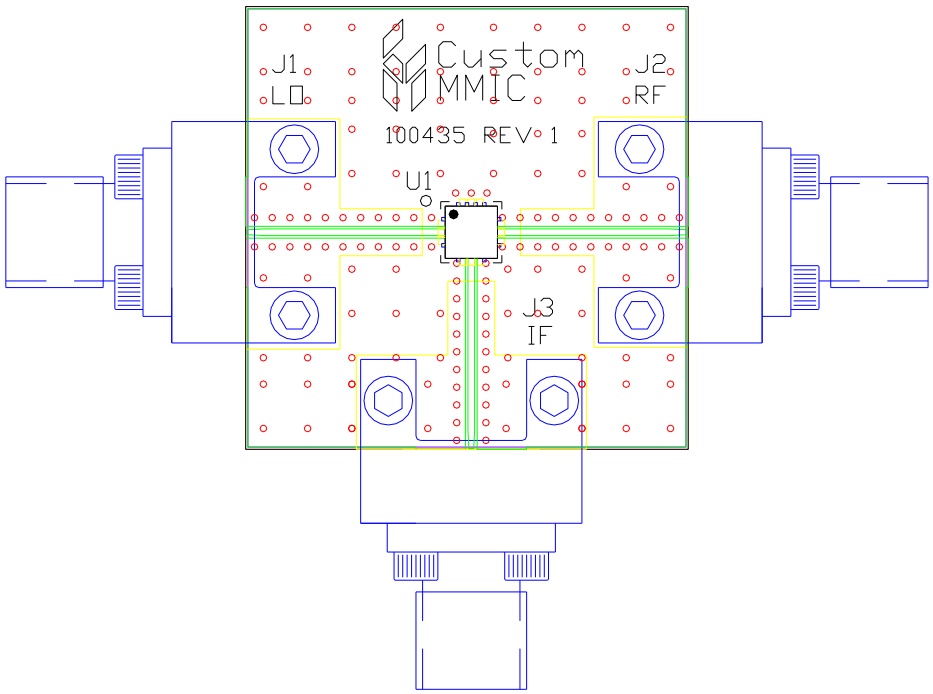
## *Applications Information*

### Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.






### Bill of Material

| Designator | Value | Description |
|---|---|---|
| J1 - J3 | | SMA End Launch Connector |
| U1 | | CMD251C3 Fundamental Mixer |
| PCB | | 100435 Evaluation PCB |

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

*Please note, all information contained in this data sheet is subject to change without notice.*



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