



## TWO-TONE-TERMINATOR MIXER/LO-AMPLIFIER

## T3A-08

The T3A-08 is a versatile, robust, and broadband Two-Tone-Terminator mixer integrated with a sub 10 ps risetime square wave amplifier. The T3A-08 employs the most sophisticated mixer on the market today and offers unparalleled performance when compared to all other mixer technologies. The T3A-08 delivers exceptional IMD suppression with low conversion loss.

### Features

- Ultra-Broadband RF, LO, and IF
- Integrated Square-Wave LO Amplifier
- Industry Leading Spurious, IP3, and P<sub>1dB</sub> Performance for low LO Drive
- Application Note: [T3 Mixer Primer](#)
- Alternative Device: [T3A3-08](#)



**Electrical Specifications** - Specifications guaranteed from -30 to +70°C, measured in a 50Ω system.

| Parameter                                                                        | LO<br>(GHz)    | RF<br>(GHz)    | IF<br>(GHz)          | Min | Typ          | Max          |
|----------------------------------------------------------------------------------|----------------|----------------|----------------------|-----|--------------|--------------|
| Conversion Loss (dB)                                                             | .01-8<br>.01-8 | .01-8<br>.01-8 | .001-0.5<br>.001-4.0 |     | 7.5<br>8.0   | 10.0<br>11.5 |
| LO Drive Level (dBm)                                                             |                |                |                      | +10 |              | +15          |
| LO Leakage (dBm)                                                                 |                |                |                      |     |              |              |
| LO-RF                                                                            | .01-8          | .01-8          |                      |     | See<br>Plots |              |
| LO-IF                                                                            | .01-8          | .01-8          |                      |     |              |              |
| RF-IF Isolation (dB)                                                             | .01-8          | .01-8          |                      |     | See Plot     |              |
| Input 1 dB Compression (dBm)                                                     | .01-8          | .01-8          |                      |     | +16          |              |
| Input Two-Tone Third Order Intercept Point (dBm)                                 | .01-8          | .01-8          |                      |     | See<br>Plot  |              |
| Bias Requirements (mA) <sup>1</sup><br>+5.0 Volts DC (+7 V max)<br>-5.0 Volts DC |                |                |                      |     | 200<br>10    | 250<br>20    |

<sup>1</sup>It is required that the negative bias be applied before or concurrent with the positive bias to avoid damage.

**\*Note:** EZ-Carrier T3As are not suitable for in-line reflow solder. Manual assembly only.  
([Refer to EZ Installation Notes](#)).

### Part Number Options

| Please specify diode level and package style by adding to model number. |                     |                                |                               |                                           |  |
|-------------------------------------------------------------------------|---------------------|--------------------------------|-------------------------------|-------------------------------------------|--|
| Package Style                                                           |                     | Examples                       |                               |                                           |  |
| Connectorized                                                           | <a href="#">EZP</a> | T3A-08EZP, T3A-08EZ-2          |                               |                                           |  |
| Surface Mount <sup>1</sup>                                              | <a href="#">EZ</a>  | <a href="#">T3A-08</a> (Model) | <a href="#">EZP</a> (Package) | <a href="#">-2</a> (I-Port Configuration) |  |

<sup>1</sup>For non-connectorized packages, specify I-port configuration by adding -1 or -2 suffix to model number. Default is -2 configuration when not specified.

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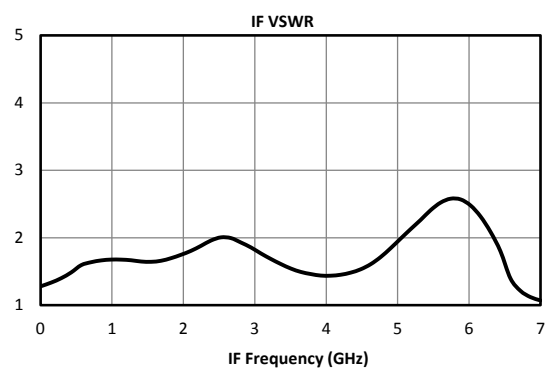
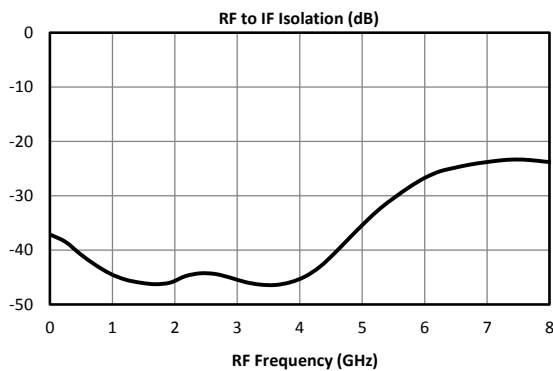
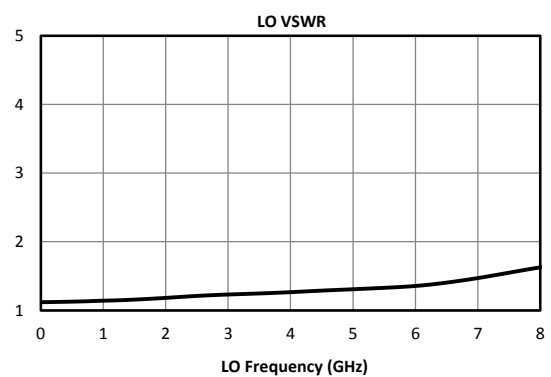
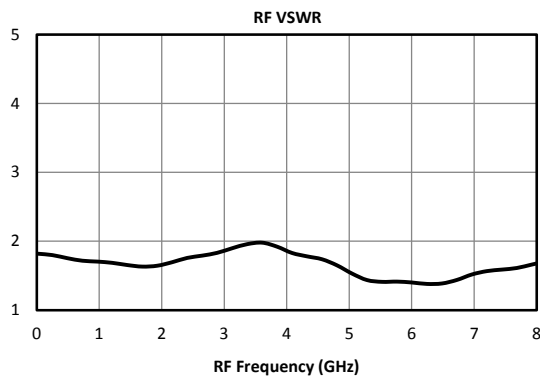
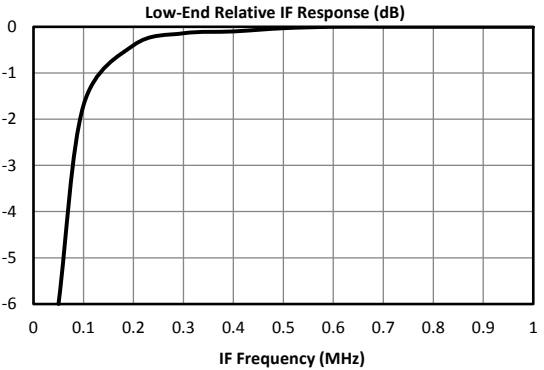
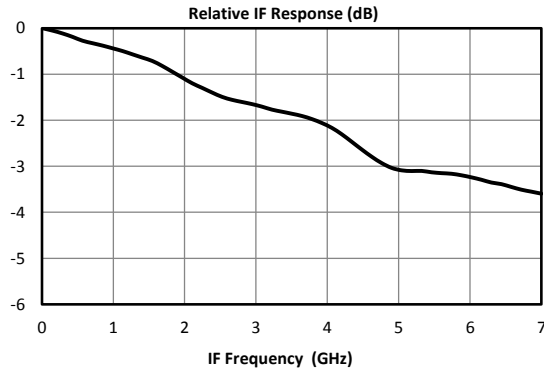
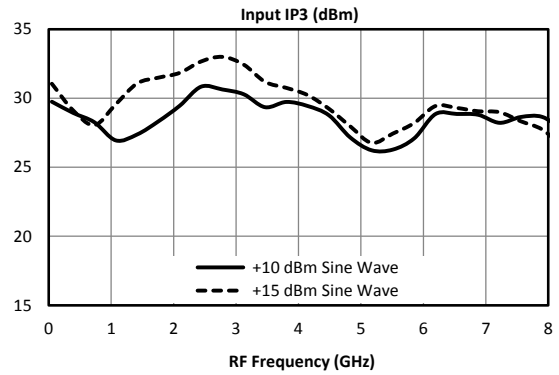
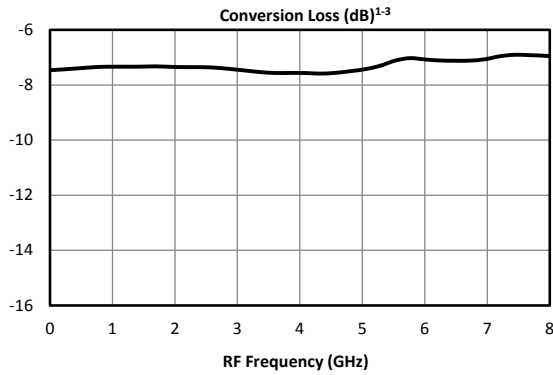
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LO/RF 10 MHz to 8 GHz  
IF 1 MHz to 4 GHz

Typical Performance



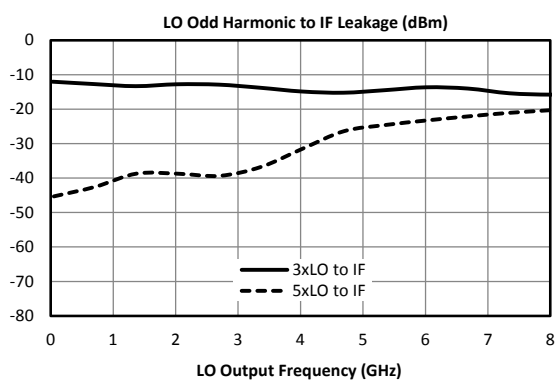
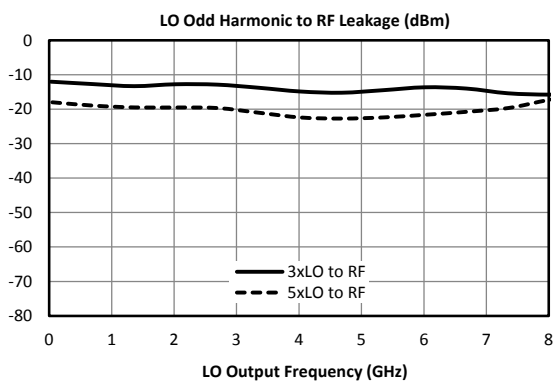
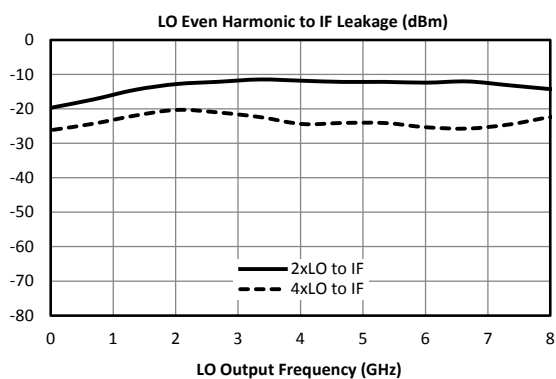
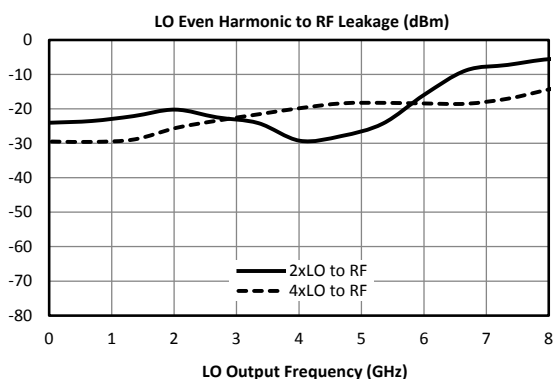
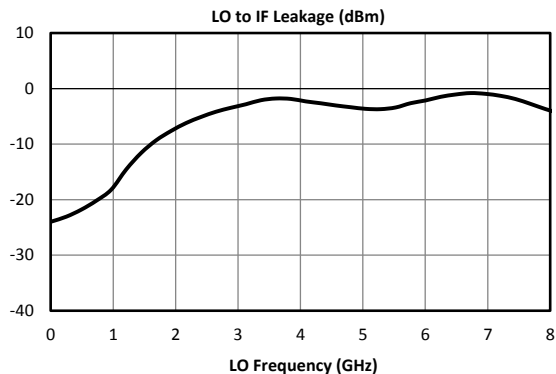
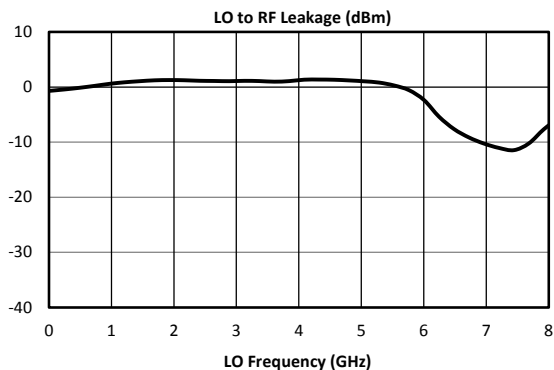
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LO/RF 10 MHz to 8 GHz  
IF 1 MHz to 4 GHz

Typical Performance



## TWO-TONE-TERMINATOR MIXER

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**LO/RF 10 MHz to 8 GHz  
IF 1 MHz to 4 GHz**

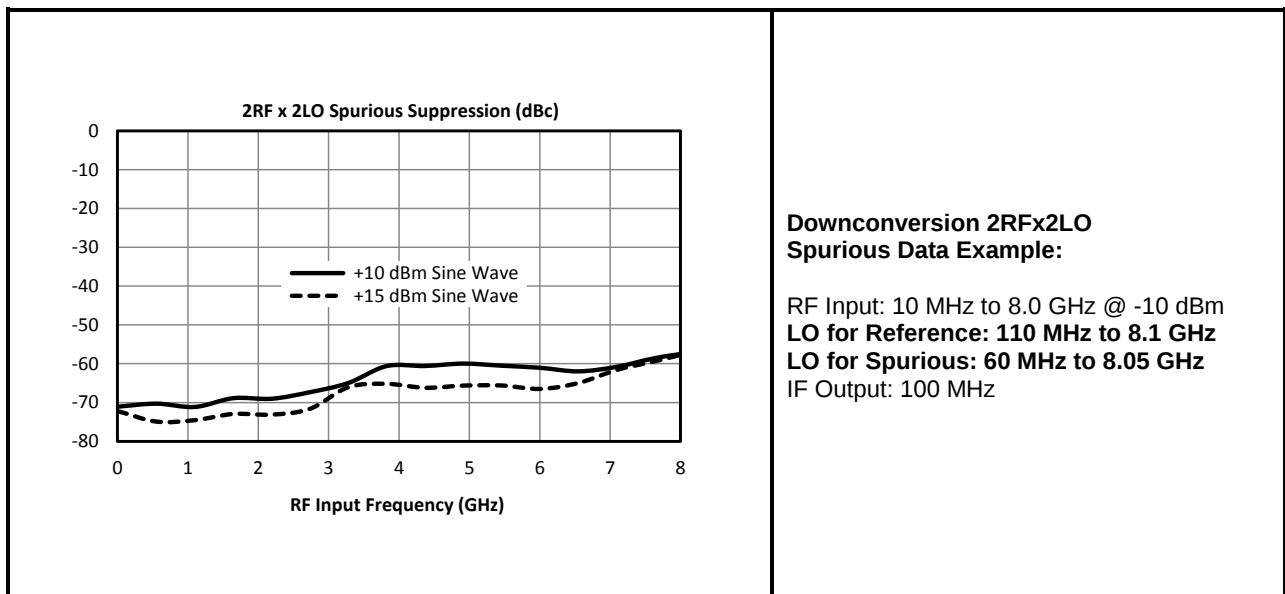
### Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies ( $\pm\text{mLO} \pm \text{nRF}$ ) within the 10 MHz to 8 GHz RF/LO bands, which create a 100 MHz IF spurious output. The mixer is swept across the full spurious band and the mean is calculated. The numbers shown in the table below are for a -10 dBm RF input. Spurious suppression is scaled for different RF power levels by (n-1), where "n" is the RF spur order. For example, the 2RFx2LO spur is 64 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 74 dBc.

### **Typical Downconversion Spurious Suppression (dBc): +10 (+15) dBm Sine Wave LO**

| -10 dBm RF Input | 0xLO      | 1xLO                                                                  | 2xLO    | 3xLO    | 4xLO    | 5xLO    |
|------------------|-----------|-----------------------------------------------------------------------|---------|---------|---------|---------|
| 0xRF             | -----     | See LO to IF Isolation and LO Harmonic to IF Isolation Plots (Page 3) |         |         |         |         |
| 1xRF             | 26 (26)   | Reference                                                             | 22 (32) | 10 (10) | 27 (32) | 17 (17) |
| 2xRF             | 67 (67)   | 65 (69)                                                               | 64 (68) | 60 (66) | 63 (68) | 58 (64) |
| 3xRF             | 102 (104) | 92 (93)                                                               | 93 (95) | 85 (89) | 90 (98) | 82 (88) |
| 4xRF             | >110      | >110                                                                  | >110    | >110    | >110    | >110    |
| 5xRF             | >120      | >120                                                                  | >120    | >120    | >120    | >120    |

A sample downconversion spurious sweep is shown below. An LO 100 MHz higher than the RF is used to create a 100 MHz reference IF. A second LO is used to create a 2x2 spurious IF, also at 100 MHz (50 MHz fundamental IF). The difference between these two output levels is the spurious suppression in dBc. The mean value across the full 10 MHz to 8 GHz RF input band is the number shown in the table above.



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**LO/RF 10 MHz to 8 GHz  
IF 1 MHz to 4 GHz**

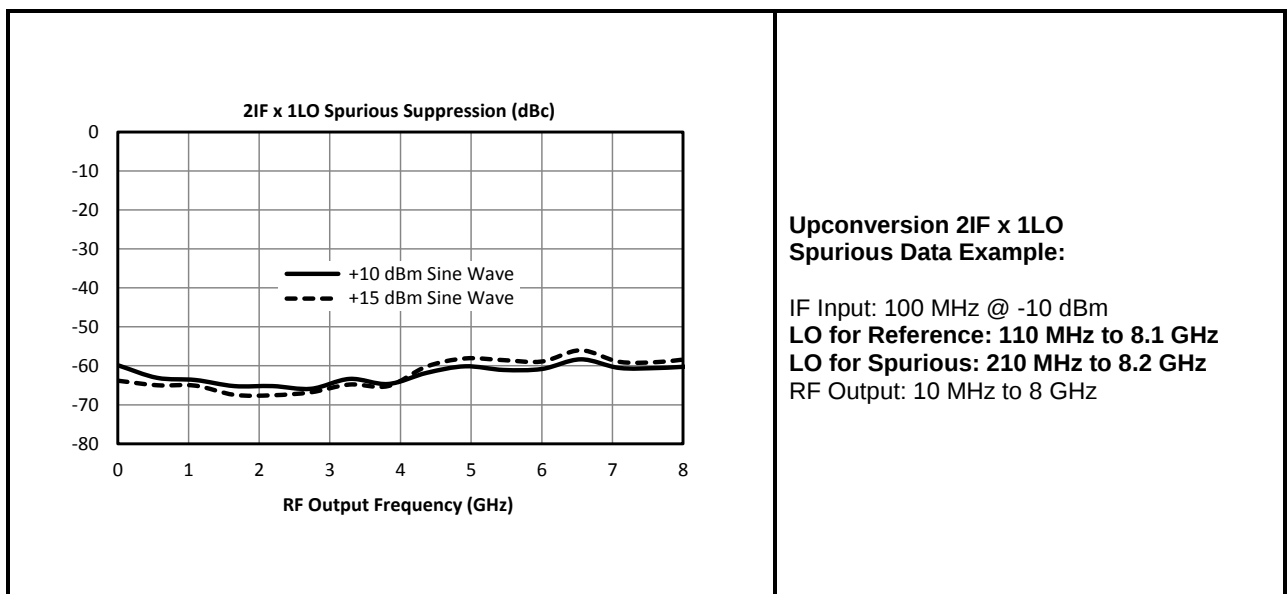
### Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies ( $\pm m\text{LO} \pm n\text{IF}$ ), which creates an RF within the 10 MHz to 8 GHz RF band. The mixer is swept across the full spurious output band and the mean is calculated. The numbers shown in the table below are for a -10 dBm IF input. Spurious suppression is scaled for different IF input power levels by (n-1), where "n" is the IF spur order. For example, the 2IFx1LO spur is typically 62 dBc for a -10 dBm input, so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) dB lower, or 72 dBc.

#### **Typical Upconversion Spurious Suppression (dBc): +10 (+15) dBm Sine Wave LO**

| -10 dBm RF Input | 0xLO    | 1xLO                                                                  | 2xLO    | 3xLO    | 4xLO    | 5xLO    |
|------------------|---------|-----------------------------------------------------------------------|---------|---------|---------|---------|
| 0xIF             | -----   | See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3) |         |         |         |         |
| 1xIF             | 25 (28) | Reference                                                             | 23 (30) | 10 (10) | 32 (32) | 17 (15) |
| 2xIF             | 62 (60) | 63 (63)                                                               | 63 (69) | 60 (65) | 64 (69) | 63 (64) |
| 3xIF             | 88 (95) | 85 (87)                                                               | 92 (97) | 82 (92) | 90 (94) | 82 (88) |
| 4xIF             | >110    | >110                                                                  | >110    | >110    | >110    | >110    |
| 5xIF             | >120    | >120                                                                  | >120    | >120    | >120    | >120    |

A sample upconversion spurious sweep is shown below. A 100 MHz reference IF input is used to create an RF output that is 100 MHz below the LO input ( $\text{LO} - \text{IF} = \text{RF}$ ). A second LO (100 MHz higher) is combined with the same 100 MHz IF input ( $\text{LO} - 2\text{xIF} = \text{RF}$ ) to create the same 10 MHz to 8 GHz RF output band. The difference between these two output levels is the spurious suppression in dBc. The mean value across the full RF output band is the number shown in the table above.

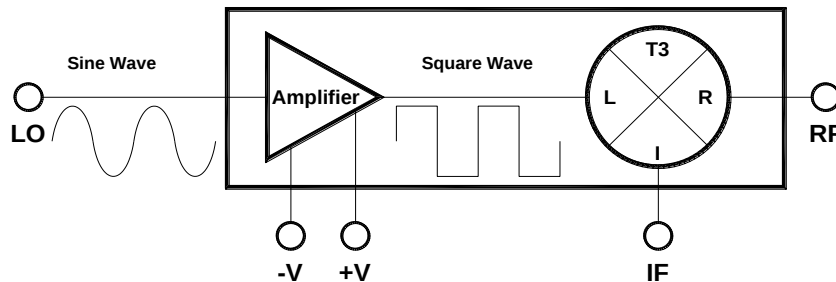


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LO/RF 10 MHz to 8 GHz  
IF 1 MHz to 4 GHz



| Port | Description                                                                                                       | DC Interface Schematic                                                                |
|------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| LO   | The LO port is DC blocked and AC matched to 50 Ohms from 10 MHz to 8 GHz.                                         |    |
| RF   | The RF port is DC short to ground and AC matched to 50 Ohms from 10 MHz to 8 GHz. Blocking capacitor is optional. |    |
| IF   | The IF port is DC blocked and AC matched to 50 Ohms from 1 MHz to 4 GHz.                                          |  |

| Absolute Maximum Ratings |                 |
|--------------------------|-----------------|
| Parameter                | Maximum Rating  |
| RF DC Current            | 1 Amp           |
| LO DC Current            | 1 Amp           |
| RF Power Handling        | +25 dBm         |
| LO Power Handling        | +20 dBm         |
| Operating Temperature    | -30°C to +70°C  |
| Storage Temperature      | -65°C to +125°C |
| ESD Sensitivity (HBM)    | Class 0         |

### DATA SHEET NOTES:

1. Mixer Conversion Loss Plot IF frequency is 100 MHz.
2. Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.
3. Conversion Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.
4. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
5. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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