

## DOUBLE-BALANCED MIXERS

**M1-0008**



### Features

- LO/RF .01 to 8.0 GHz
- IF DC to 2.0 GHz
- 7.5 dB Typical Conversion Loss
- Ultra-Broadband RF, LO, and IF
- For a list of recommended LO driver amps for all mixers and IQ mixers, see [here](#).

**Electrical Specifications** - Specifications guaranteed from -55 to +100°C, measured in a 50-Ohm system.

| Parameter                                           | LO<br>(GHz) | RF<br>(GHz) | IF<br>(GHz) | Min | Typ          | Max  | Diode Option<br>LO drive level (dBm) |
|-----------------------------------------------------|-------------|-------------|-------------|-----|--------------|------|--------------------------------------|
| Conversion Loss (dB)                                | .01-8.0     | .01-8.0     | DC-2.0      |     | 7.5          | 11.0 |                                      |
| Isolation (dB)                                      |             |             |             |     |              |      |                                      |
| LO-RF                                               | .01-8.0     | .01-8.0     |             |     | See<br>Plots |      |                                      |
| LO-IF                                               | .01-8.0     | .01-8.0     |             |     |              |      |                                      |
| RF-IF                                               | .01-8.0     | .01-8.0     |             |     |              |      |                                      |
| Input 1 dB Compression (dBm)                        | .01-8.0     | .01-8.0     |             |     | +4           |      | L (+10 to +13)                       |
| Input Two-Tone Third Order<br>Intercept Point (dBm) | .01-8.0     | .01-8.0     |             |     | See<br>Plot  |      | L (+10 to +13)                       |

### Part Number Options

| Please specify diode level and package style by adding to model number. |                    |                           |                               |                        |                                        |
|-------------------------------------------------------------------------|--------------------|---------------------------|-------------------------------|------------------------|----------------------------------------|
| Package Styles                                                          |                    | Example                   |                               |                        |                                        |
| Connectorized                                                           | <a href="#">QP</a> | M1-0008LQP                |                               |                        |                                        |
|                                                                         |                    | <u>M1-0008</u><br>(Model) | <u>L</u><br>(Diode<br>Option) | <u>QP</u><br>(Package) | <u>-2</u><br>(I-Port<br>Configuration) |

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## DOUBLE-BALANCED MIXERS

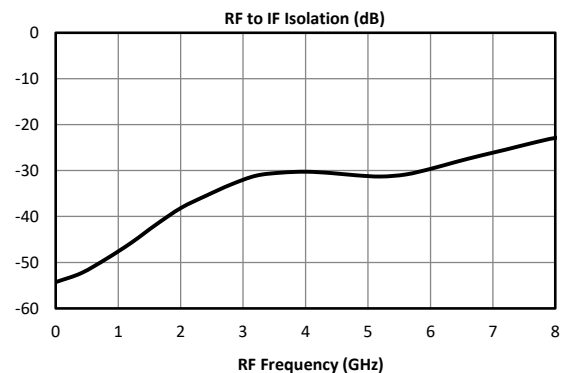
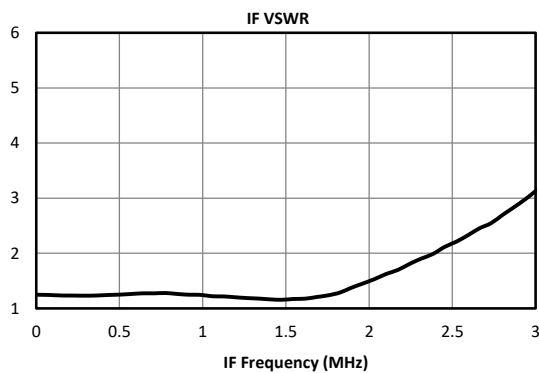
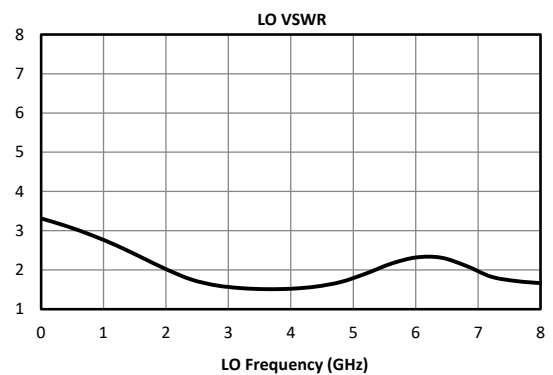
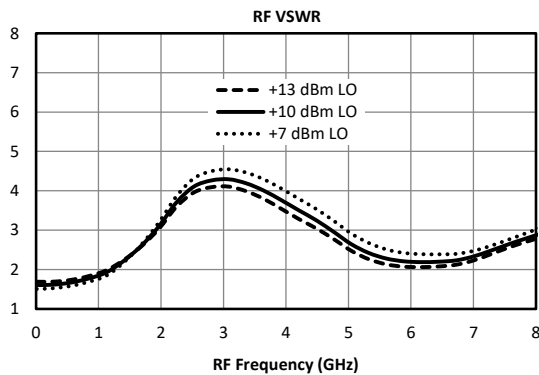
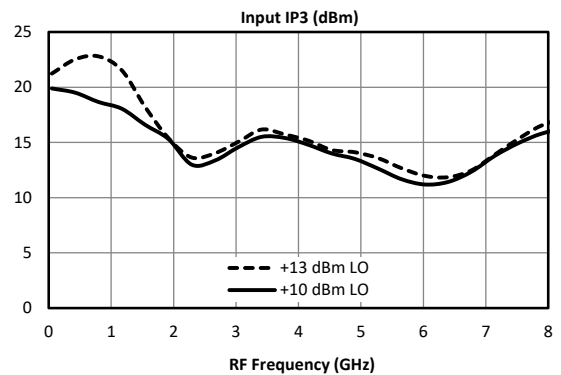
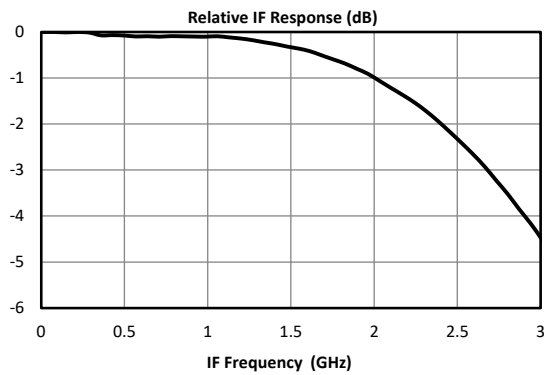
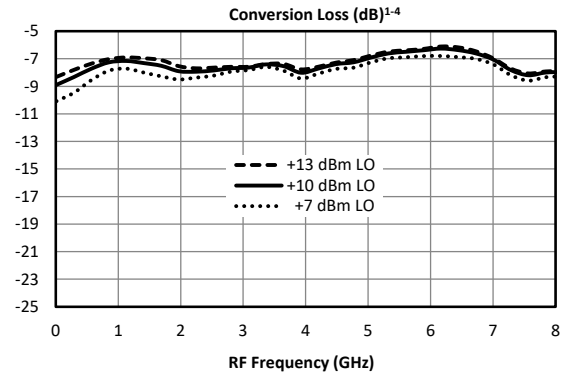
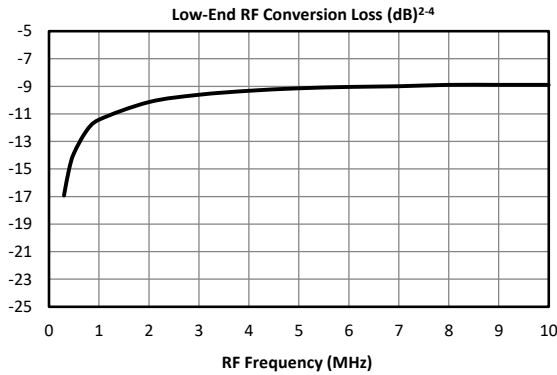
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LO/RF .01 to 8.0 GHz

IF DC to 2.0 GHz

Typical Performance



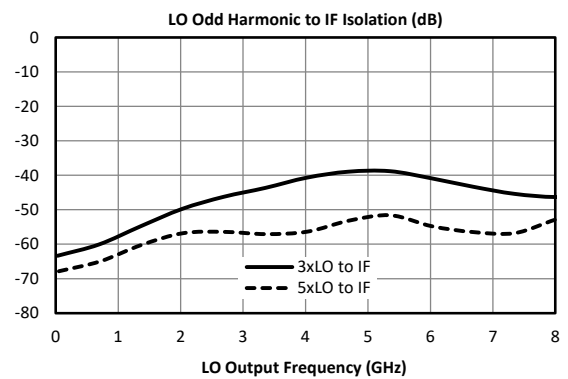
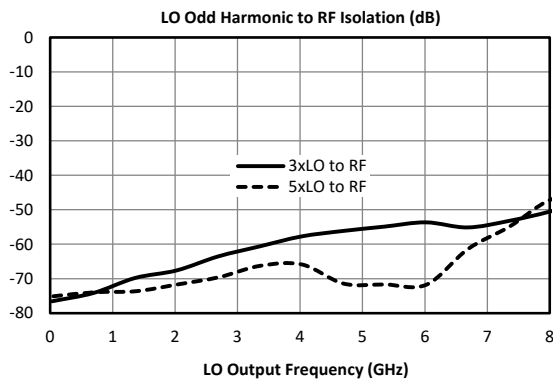
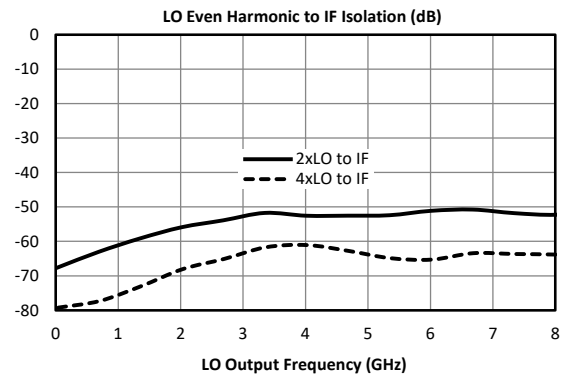
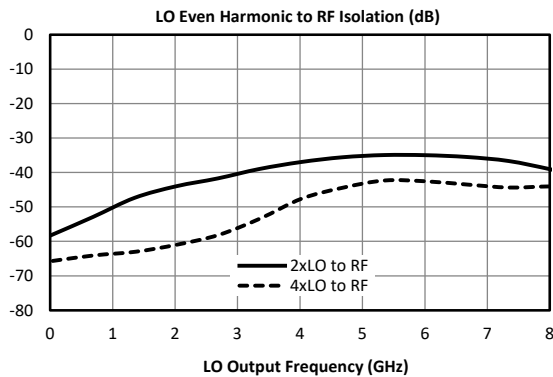
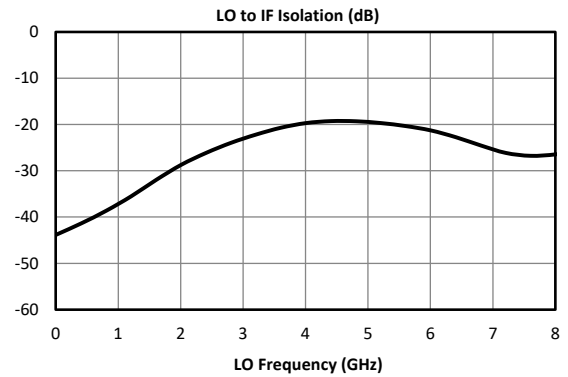
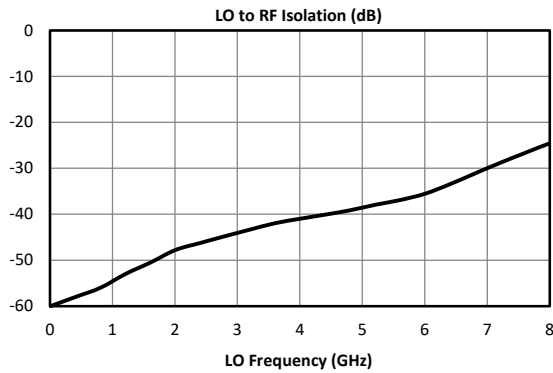
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LO/RF .01 to 8.0 GHz  
IF DC to 2.0 GHz

Typical Performance



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**LO/RF .01 to 8.0 GHz  
IF DC to 2.0 GHz**

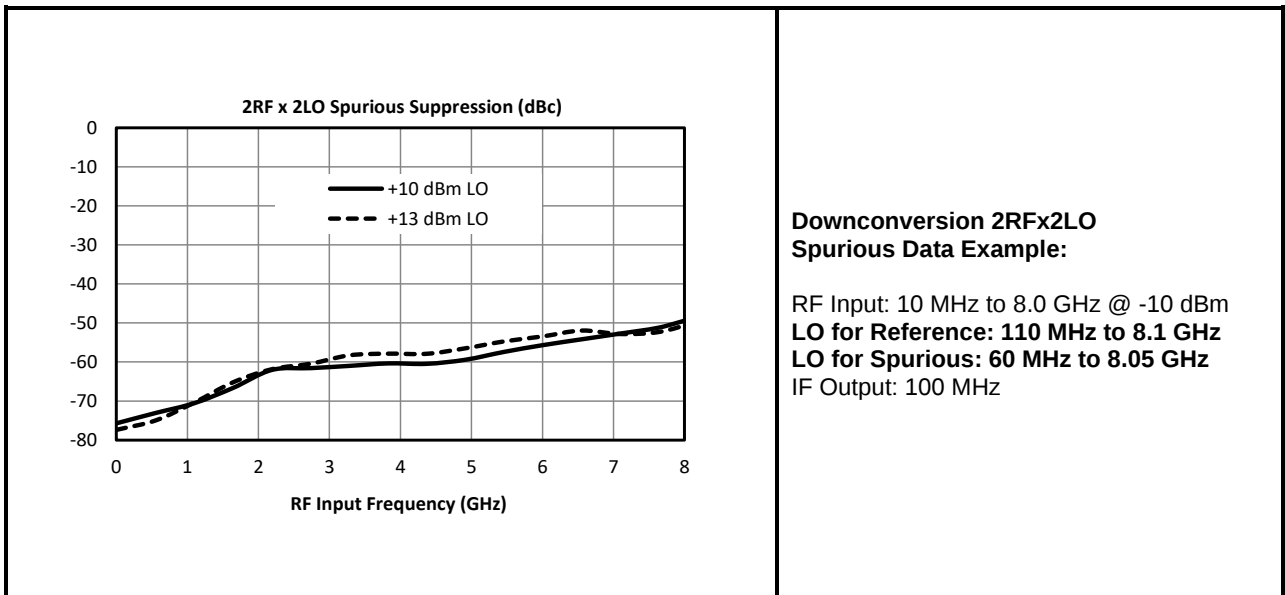
### Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies ( $\pm m\text{LO} \pm n\text{RF}$ ) 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 61 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is  $(2-1) \times (-10 \text{ dB})$  dB lower, or 71 dBc.

### **Typical Downconversion Spurious Suppression (dBc): +10 dBm 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             | 25    | Reference                                                             | 30   | 13   | 40   | 25   |
| 2xRF             | 57    | 54                                                                    | 61   | 52   | 68   | 52   |
| 3xRF             | 70    | 57                                                                    | 73   | 59   | 72   | 61   |
| 4xRF             | 102   | 90                                                                    | 93   | 88   | 92   | 88   |
| 5xRF             | 115   | 96                                                                    | 103  | 95   | 107  | 96   |

A sample downconversion spurious sweep is shown below. An LO which is 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 .01 to 8.0 GHz  
IF DC to 2.0 GHz**

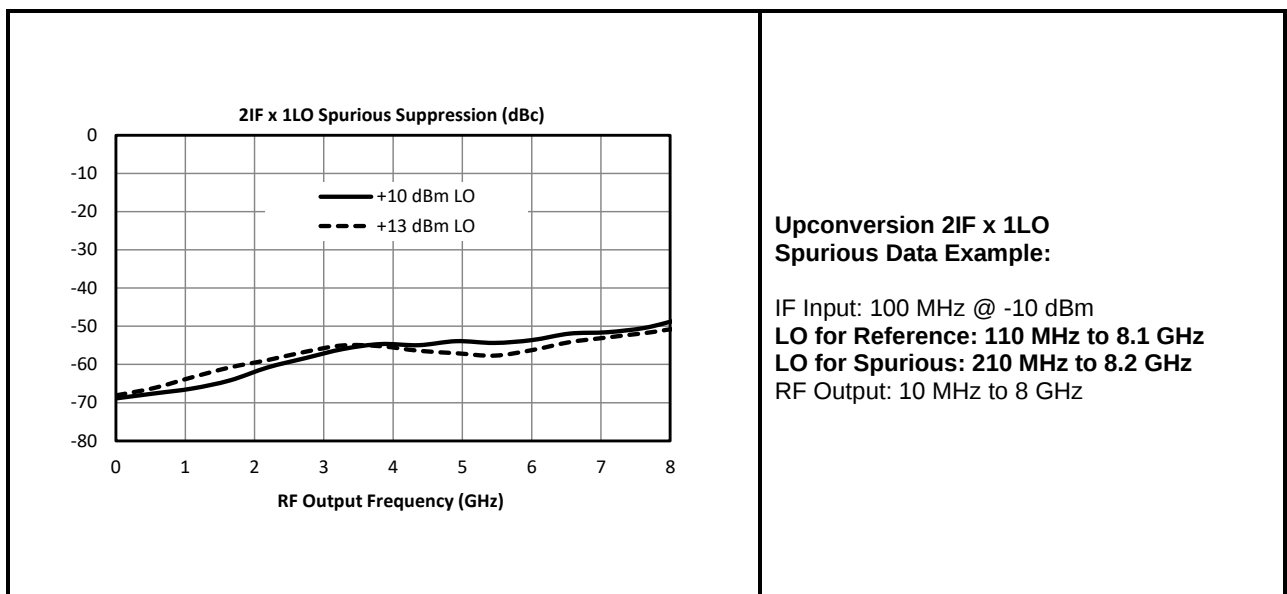
### Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies ( $\pm m\text{LO} \pm n\text{IF}$ ) which create 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 57 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 67 dBc.

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

| -10 dBm IF Input | 0xLO  | 1xLO                                                                  | 2xLO | 3xLO | 4xLO | 5xLO |
|------------------|-------|-----------------------------------------------------------------------|------|------|------|------|
| 0xIF             | ----- | See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3) |      |      |      |      |
| 1xIF             | 23    | Reference                                                             | 29   | 13   | 38   | 28   |
| 2xIF             | 63    | 57                                                                    | 49   | 62   | 53   | 67   |
| 3xIF             | 98    | 62                                                                    | 64   | 51   | 68   | 55   |
| 4xIF             | 113   | 95                                                                    | 85   | 94   | 84   | 93   |
| 5xIF             | 123   | 92                                                                    | 103  | 87   | 97   | 87   |

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.



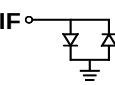


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**LO/RF .01 to 8.0 GHz**  
**IF DC to 2.0 GHz**

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

| Absolute Maximum Ratings  |                                                         |
|---------------------------|---------------------------------------------------------|
| Parameter                 | Maximum Rating                                          |
| RF DC Current             | 1 Amp                                                   |
| LO DC Current             | 1 Amp                                                   |
| IF DC Current             | 50 mA                                                   |
| RF Power Handling (RF+LO) | +23 dBm at +25°C, derated linearly to +20 dBm at +100°C |
| Operating Temperature     | -55°C to +100°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 for LO drives 2 dB below the lowest and 3 dB above highest nominal LO drive levels.
4. Conversion Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.
5. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
6. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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