

HIGH-LINEARITY TRIPLE-BALANCED MIXERS

T3-1040G

The T3-1040G is a high performance mixer featuring LO/RF from 10 to 40 GHz and IF from 1 to 18 GHz. As with all T3 mixers, this mixer offers unparalleled nonlinear performance in terms of IIP3, P_{1dB}, and spurious performance with a flexible LO drive requirement from +13 dBm to +25 dBm. The T3-1040G is offered in connectorized and drop-in style packaging, suitable for any type of system level integration. The T3-1040G is a form fit function replacement for the obsolete T3-1040, built with GaAs diodes instead of Si. For a list of recommended LO driver amps for all mixers and IQ mixers, see [here](#).



Features

- LO/RF 10.0 to 40.0 GHz
- IF 1.0 to 18.0 GHz
- 8 dB Typical Conversion Loss
- Ultra-Broadband RF, LO, and IF
- 2.92 mm Connectors

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

| Parameter | LO (GHz) | RF (GHz) | IF (GHz) | Min | Typ | Max | Diode Option LO drive level (dBm) |
|--|-----------|-----------|-----------|-----|--------------|------|--------------------------------------|
| Conversion Loss (dB) | 10.0-40.0 | 10.0-40.0 | 1.0-15.0 | | 8.0 | 15.0 | |
| | 10.0-40.0 | 10.0-40.0 | 15.0-18.0 | | 13.0 | 17.0 | |
| Isolation (dB) | 10.0-40.0 | 10.0-40.0 | | | See Plots | | |
| | 10.0-40.0 | 10.0-40.0 | | | | | |
| | 10.0-40.0 | 10.0-40.0 | | | | | |
| Input 1 dB Compression (dBm) | 10.0-40.0 | 10.0-40.0 | | | See Plot | | L (+13 to +25) |
| Input Two-Tone Third Order Intercept Point (dBm) | 10.0-40.0 | 10.0-40.0 | | | See Plot | | L (+13 to +25) |

Part Number Options

| Please specify diode level and package style by adding to model number. | | | | | | | |
|---|--------------------|--|--------------------------|--|-------------------|--|-------------------|
| Package Styles | | | Examples | | | | |
| | | | T3-1040GLN | | | | |
| Connectorized | N | | T3-1040G | | L | | N |
| Microstrip ^{1,2} | ES | | (Model) | | (Diode Option) | | (Package) |

¹Connectorized test fixtures available for most microstrip and surface mount packages. Consult factory.

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

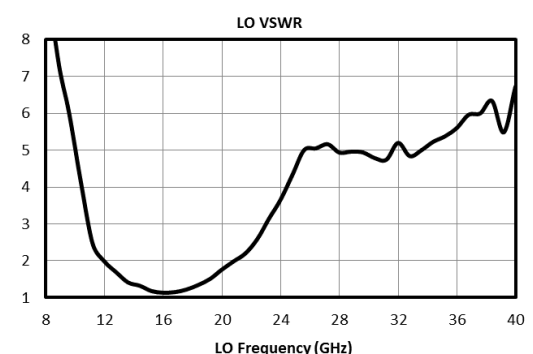
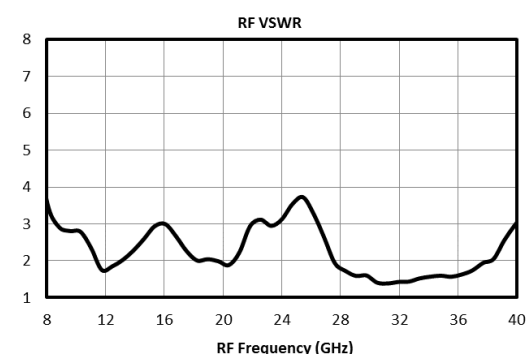
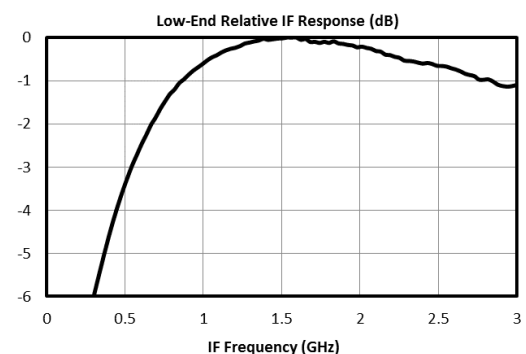
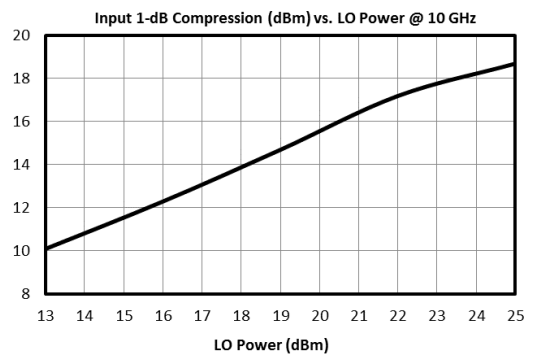
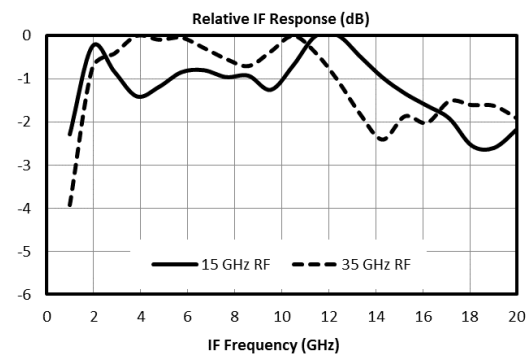
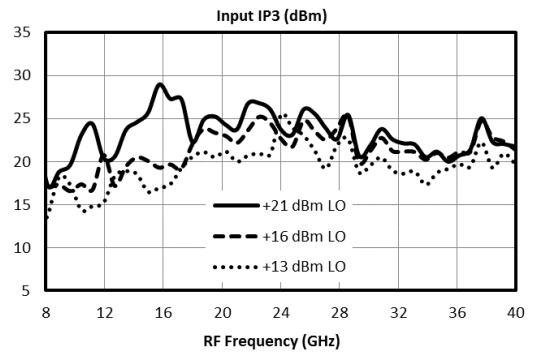
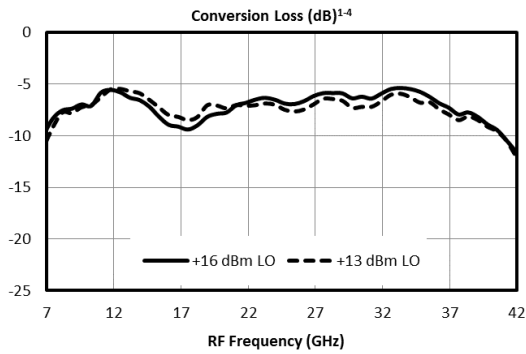
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LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz

Typical Performance



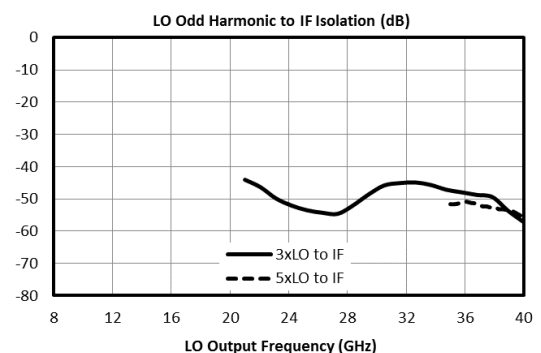
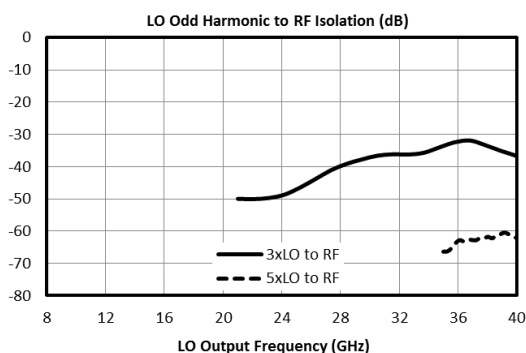
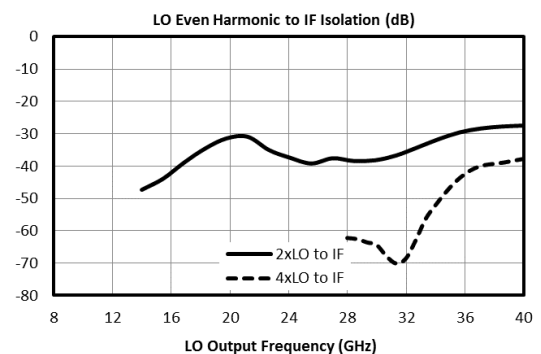
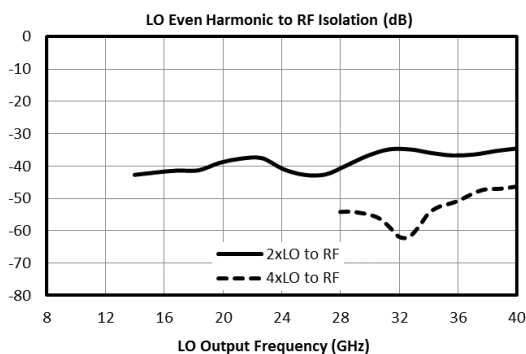
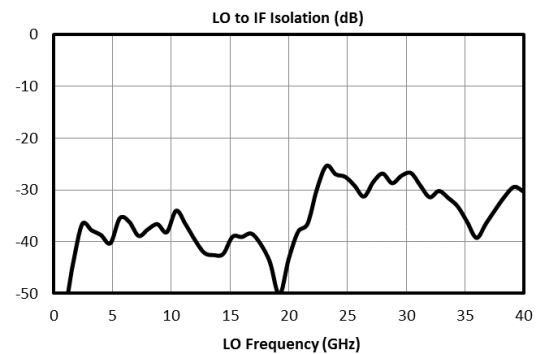
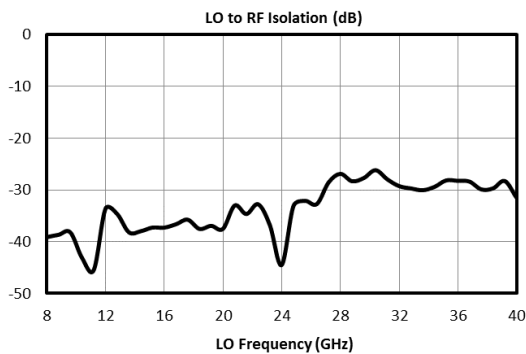
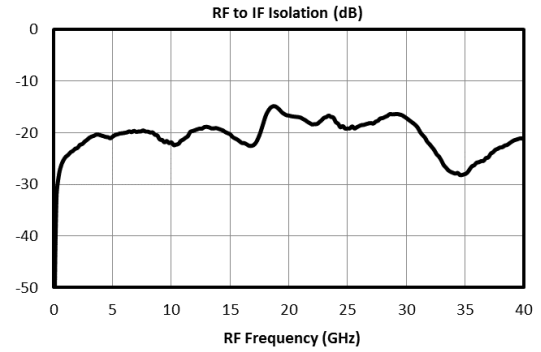
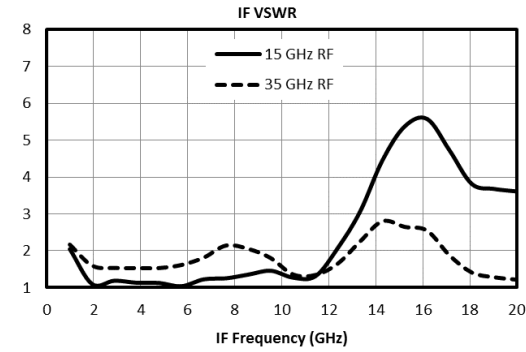
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LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz

Typical Performance





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LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz

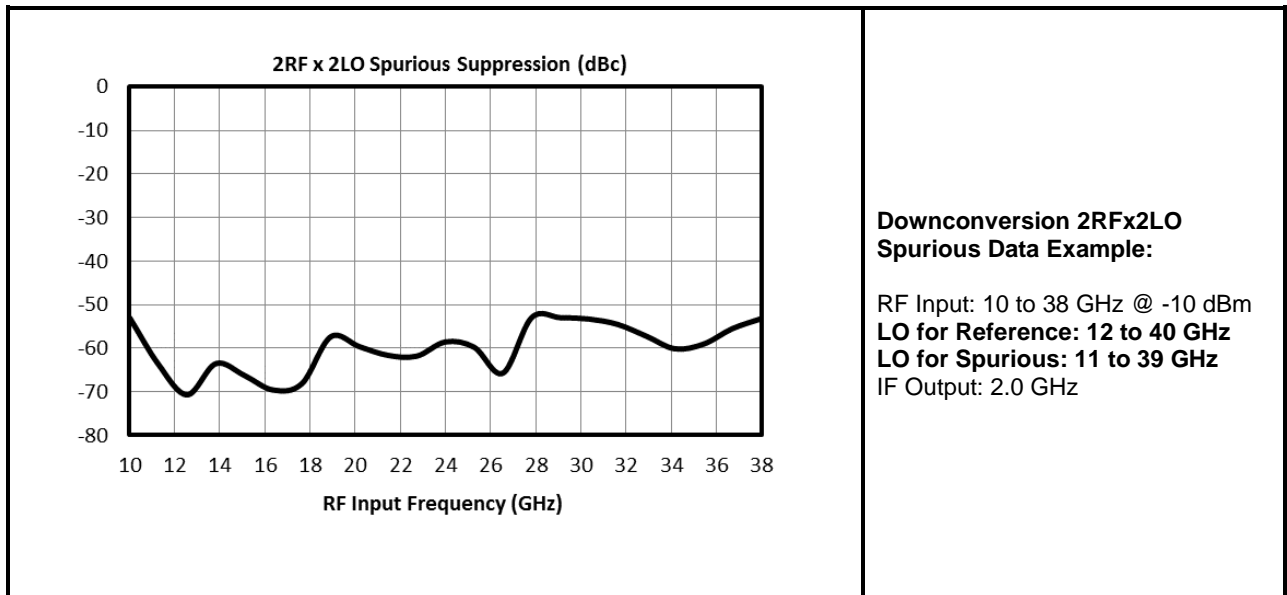
Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies ($\pm mLO \pm nRF$) within the 10 to 40 GHz RF/LO bands, which create a 2.0 GHz IF spurious output. The mixer is swept across the 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 62 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 72 dBc.

Typical Downconversion Spurious Suppression (dBc): L-Diode⁵

| -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 | 13 | Reference | 23 | 25 | 31 | 18 |
| 2xRF | 67 | 62 | 62 | 59 | 61 | 68 |
| 3xRF | 98 | 65 | 80 | 73 | 83 | 74 |
| 4xRF | 135 | 110 | 113 | 116 | 113 | 114 |
| 5xRF | 152 | 130 | 146 | 143 | 138 | 133 |

A sample downconversion spurious sweep is shown below. An LO which is 2.0 GHz higher than the RF is used to create a 2.0 GHz reference IF. A second LO is used to create a 2x2 spurious IF, also at 2.0 GHz (1.0 GHz fundamental IF). The difference between these two output levels is the spurious suppression in dBc. The mean value across the 10 to 38 GHz RF input band is the number shown in the table above.



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LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz

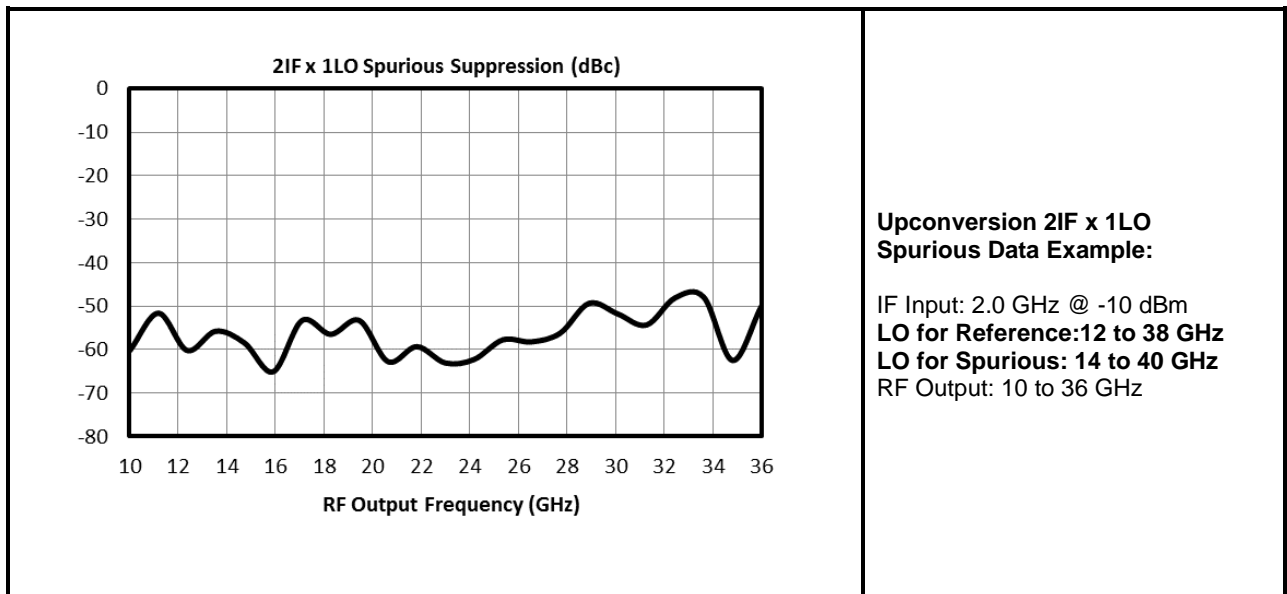
Upconversion Spurious Suppression

Spurious data is taken by mixing a 2.0 GHz IF with LO frequencies ($\pm mLO \pm nIF$) which create an RF within the 10 to 40 GHz RF band. The mixer is swept across the 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 56 dBc for a -10 dBm input, so a -20 dBm IF input creates a spur that is $(2-1) \times (-10 \text{ dB})$ dB lower, or 66 dBc.

Typical Upconversion Spurious Suppression (dBc): L-Diode⁵

| -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 | 11 | Reference | 20 | 21 | 36 | 22 |
| 2xIF | 53 | 56 | 65 | 55 | 75 | 70 |
| 3xIF | 70 | 70 | 82 | 74 | 89 | 85 |
| 4xIF | 96 | 92 | 112 | 103 | 123 | 125 |
| 5xIF | 110 | 104 | 128 | 120 | 139 | 135 |

A sample upconversion spurious sweep is shown below. A 2.0 GHz reference IF input is used to create an RF output that is 2.0 GHz below the LO input ($LO-IF=RF$). A second LO (2.0 GHz higher) is combined with the same 2.0 GHz IF input ($LO-2xIF=RF$) to create the same 10 to 36 GHz RF output band. The difference between these two output levels is the spurious suppression in dBc. The mean value across the RF output band is the number shown in the table above.



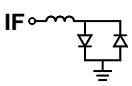


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LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz

| Port | Description | DC Interface Schematic |
|------|---|---|
| LO | The LO port is DC coupled to ground and AC matched to 50 Ohms from 10 to 40 GHz. Blocking capacitor is optional. |  |
| RF | The RF port is DC coupled to ground and AC matched to 50 Ohms from 10 to 40 GHz. Blocking capacitor is optional. |  |
| IF | The IF port is DC coupled to the diodes and AC matched to 50 Ohms from 1.0 to 18 GHz. 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) | +25 dBm (L-Version) |
| Operating Temperature | -55°C to +100°C |
| Storage Temperature | -65°C to +125°C |
| ESD Sensitivity (HBM) | Class 1A |

DATA SHEET NOTES:

- Mixer Conversion Loss Plot IF frequency is 2.0 GHz.
- Mixer Noise Figure typically measures within 0.5 dB of conversion loss.
- 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.
- Conversion Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.
- Unless otherwise specified, L-diode data is taken with +20 dBm LO drive.
- Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
- Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.



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**LO/RF 10.0 to 40.0 GHz
IF 1.0 to 18.0 GHz**

Revision History

| Revision code | Revision Date | Comment |
|---------------|---------------|---------------------------|
| - | January 2021 | Datasheet Initial Release |

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