MICROLITHIC™ DOUBLE-BALANCED MIXER ML1-0832SM

The ML1-0832SM is a Surface Mount Microlithic™ double balanced mixer. As with all Microlithic™ mixers, it features excellent conversion loss, isolation, and spurious performance across a broad bandwidth and in a miniaturized form factor. Accurate, nonlinear software models are available for Microwave Office through the Marki Microwave PDK. The ML1-0832SM is a lead free, RoHS compliant package compatible with standard leaded and lead-free solder reflows. SMA connectorized evaluation packages are available. The ML1-0832SM is an excellent alternative to Marki Microwave M1 and M3 mixers packaged in surface mount packages such as the EZ package.

Features

- Compact SMT Style Package (0.152” x 0.090”x0.045”)
- CAD Optimized for Superior Isolation and Spurious Response
- Broadband Performance
- Excellent Unit-to-Unit Repeatability
- Wire Bondable Chip Alternatives: ML1-0732 and ML1-0936
- Fully nonlinear software models available with Marki PDK for Microwave Office
- RoHS Compliant

Mixer Line	Suitable Alternative for Models
M1	M1-0818, M1-1020

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

Parameter	LO (GHz)	RF (GHz)	IF (GHz)	Min	Typ	Max	Diode Option[1] LO drive level (dBm)
Conversion Loss (dB)	8-32		DC-10		7	12	
Isolation (dB) LO-RF LO-IF RF-IF					See Plots		
Input 1 dB Compression (dBm)					+3 +9		L (+10 to +13) I (+15 to +19)
Input Two-Tone Third Order Intercept Point (dBm)					+12 +18		L (+10 to +13) I (+15 to +19)

[1]Contact factory for other diode options.

Part Number Options

Model Number	Description
ML1-0832LSM-2, ML1-0832LSM-1 [1]	Surface Mount, L-Diode, I Port Configuration -2 or Configuration -1
ML1-0832ISM-2, ML1-0832ISM-1 [1]	Surface Mount, I-Diode, I Port Configuration -2 or Configuration -1
EVAL-ML1-0832L	Connectorized Evaluation Fixture, L-Diode
EVAL-ML1-0832I	Connectorized Evaluation Fixture, I-Diode

[1]See -2 and -1 configuration options on page 4.

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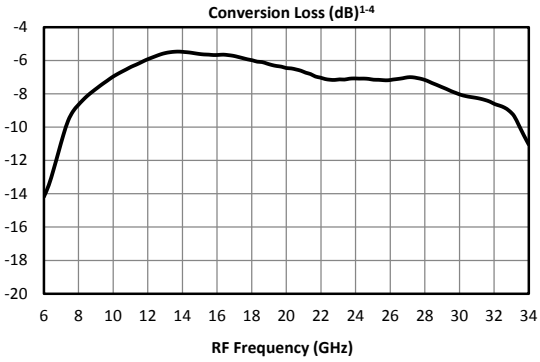
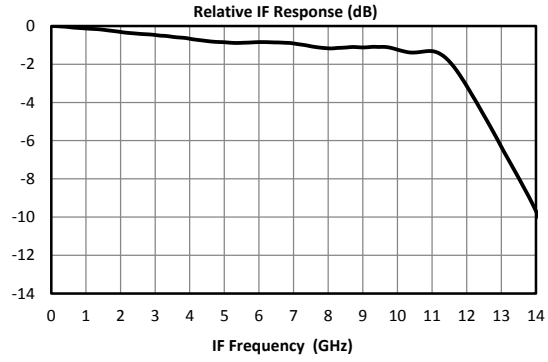
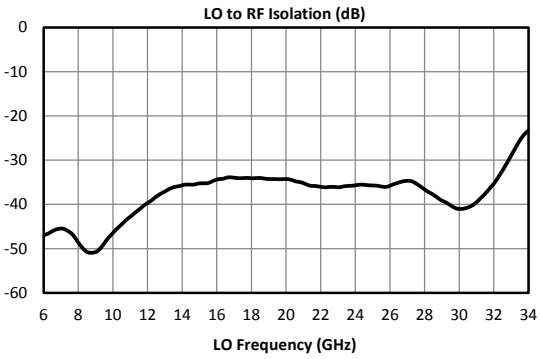
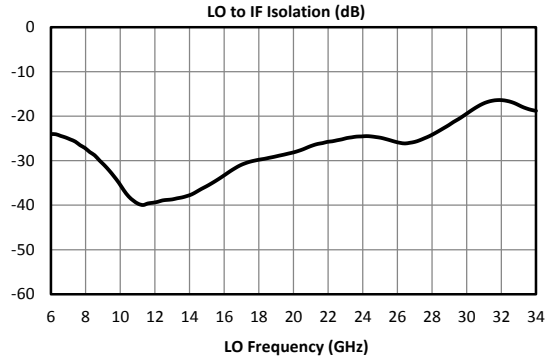
LO/RF 8 to 32 GHz
IF DC to 10 GHz

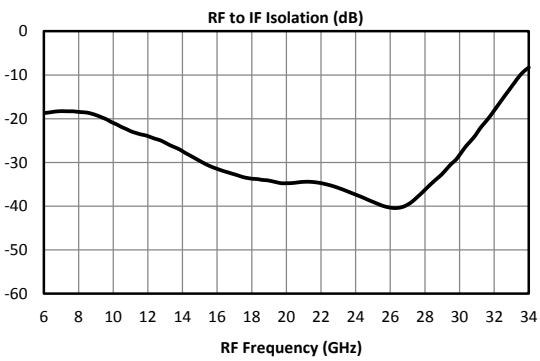
Typical Performance

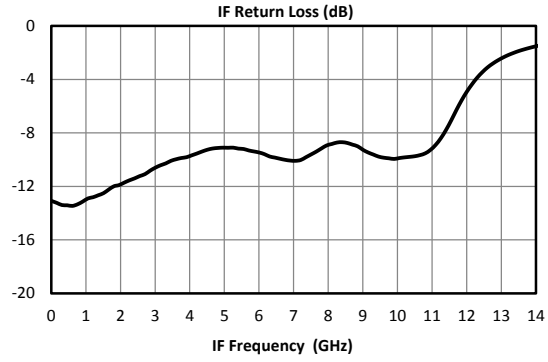


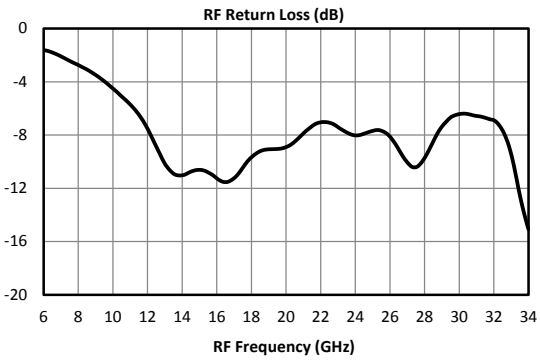


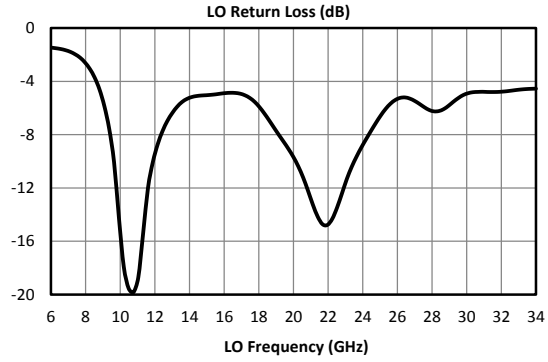












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LO/RF 8 to 32 GHz
IF DC to 10 GHz

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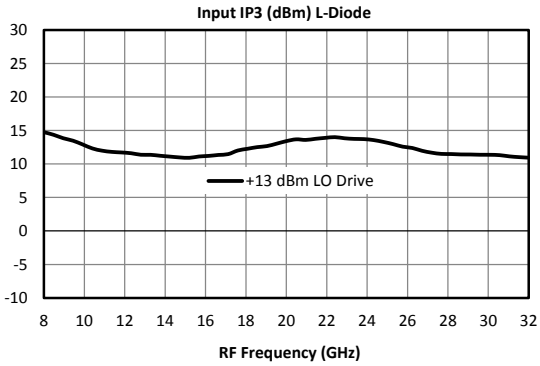

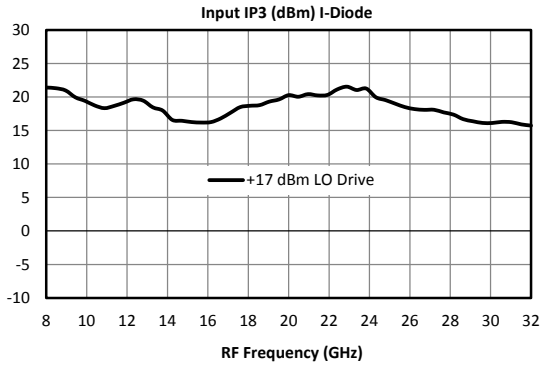

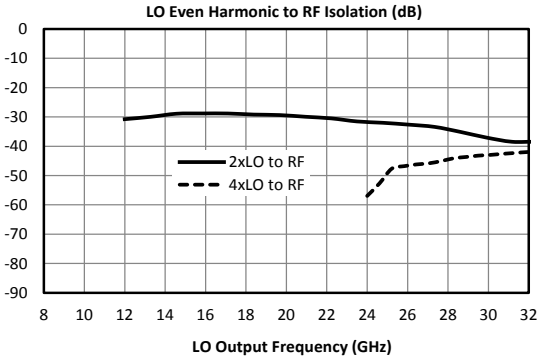

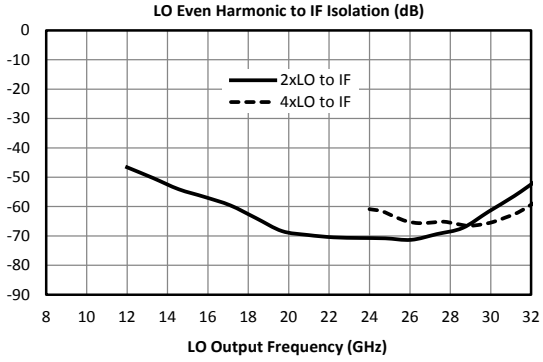

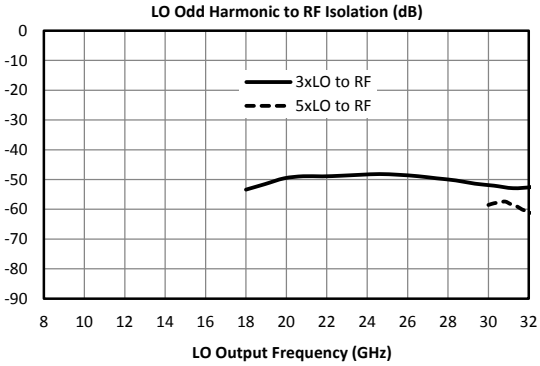

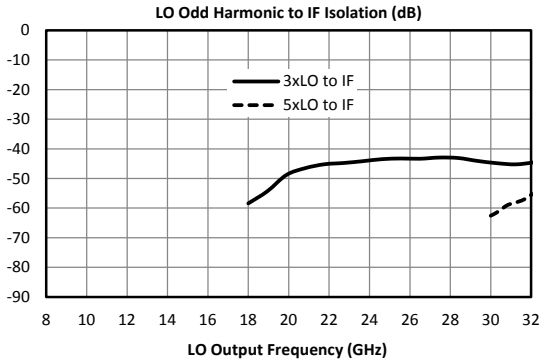

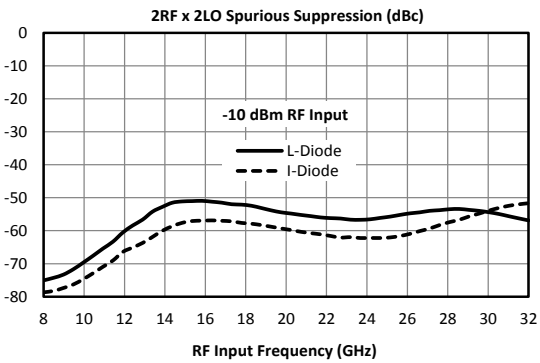

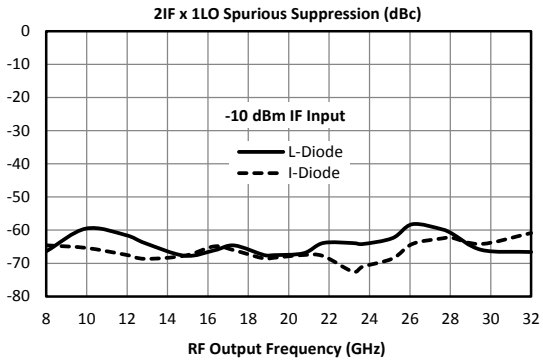

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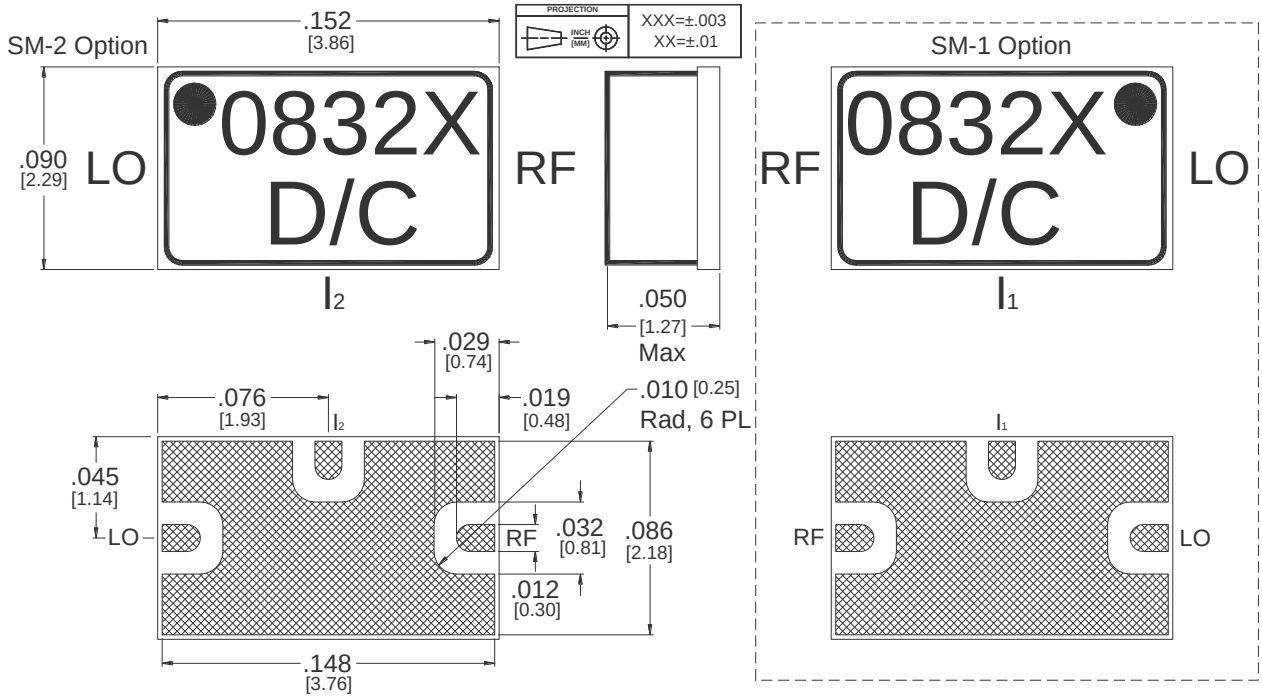
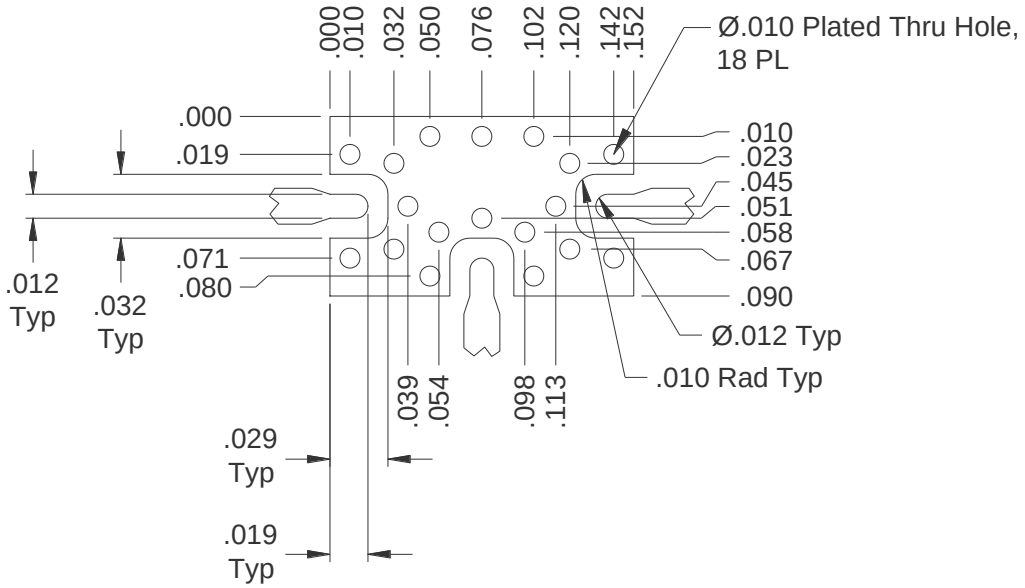
LO/RF 8 to 32 GHz
IF DC to 10 GHz



I/O traces and ground plane finish is TiWNiAu, 0.5 microns Au max over 0.15 microns Ni.

Outline Drawing – SM-2 and SM-1 Packages



SM-Package Surface-Mount System Circuit Footprint
Click here for a DXF of the above layout.
Click here for leaded solder reflow. Click here for lead-free solder reflow.

Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (±mLO±nRF) within the RF/LO bands, to create a spurious output within the IF band. 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 for the I-Diode option is typically 62 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 72 dBc.

Typical Downconversion Spurious Suppression (dBc): I-Diode (L-diode) [5]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	24 (22)	Reference	27 (25)	12 (13)	35 (34)	21 (22)
2xRF	66 (63)	64 (58)	61 (57)	57 (52)	66 (63)	58 (56)
3xRF	97 (87)	63 (49)	80 (70)	68 (57)	80 (70)	66 (56)
4xRF	117 (111)	104 (92)	100 (88)	113 (94)	111 (92)	110 (92)
5xRF	124 (119)	113 (100)	126 (105)	120 (96)	128 (107)	122 (96)

Upconversion Spurious Suppression

Spurious data is taken by mixing an input within the IF band, with LO frequencies (±mLO±nIF), to create a spurious output within the RF output 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 for the I-Diode option is typically 66 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 76 dBc.

Typical Upconversion Spurious Suppression (dBc): I-Diode (L-diode) [5]

-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	16 (15)	Reference	23 (25)	11 (11)	35 (35)	25 (24)
2xIF	54 (49)	66 (64)	57 (48)	65 (60)	56 (52)	66 (62)
3xIF	80 (67)	75 (62)	77 (66)	75 (64)	82 (72)	70 (58)
4xIF	119 (101)	110 (97)	102 (87)	117 (108)	113 (99)	111 (98)
5xIF	135 (124)	121 (100)	122 (106)	132 (110)	129 (115)	128 (111)

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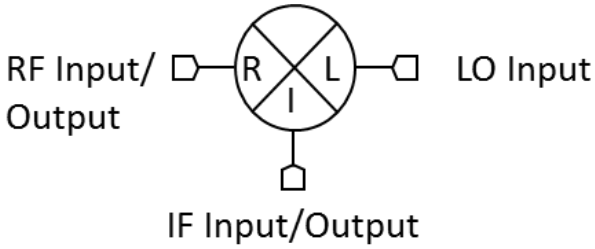
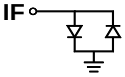


Port	Description	DC Interface Schematic
LO	The LO port is DC short to ground and AC matched to 50 Ohms from 8 to 32 GHz. Blocking capacitor is optional.	
RF	The RF port is DC short to ground and AC matched to 50 Ohms from 8 to 32 GHz. Blocking capacitor is optional.	
IF	The IF port is DC coupled to the 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)	+25 dBm at +25°C, derated linearly to +20 dBm at +100°C
Operating Temperature	-55ºC to +100ºC
Storage Temperature	-65ºC to +125ºC

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. Unless otherwise specified L diode data taken with +10 dBm LO drive.
6. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
7. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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