Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com
General Support: info@markimicrowave.com

ML1-0110LSM-2

Microlithic™ Double-Balanced Mixer

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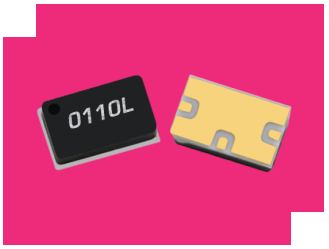
DEVICE OVERVIEW

General Description

The ML1-0110SM 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 ML1-0110SM is a lead free, RoHS compliant package compatible with standard leaded and lead-free solder reflows. SMA connectorized evaluation packages are available. The ML1-0110SM is an excellent alternative to Marki Microwave M1 and M3 mixers packaged in surface mount packages such as the EZ package.



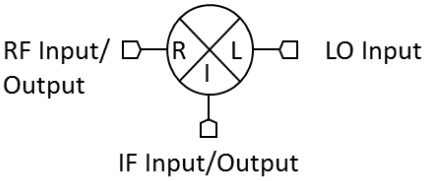
Features

- 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
- Fully nonlinear software models available with Marki PDK for Microwave Office
- RoHS Compliant

Applications

N/A

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
ML1-0110LSM-1	Microlithic™ Double-Balanced Mixer	SMT	REACH RoHS	End of Life	EAR99	-
ML1-0110LSM-2	Microlithic™ Double-Balanced Mixer	SMT	REACH RoHS	End of Life	EAR99	-
ML1-0110HSM-1	Microlithic™ Double-Balanced Mixer	SMT	REACH RoHS	End of Life	EAR99	-
ML1-0110HSM-2	Microlithic™ Double-Balanced Mixer	SMT	REACH RoHS	End of Life	EAR99	-
ML1-0110SSM-2	Microlithic™ Double-Balanced Mixer	SMT	REACH RoHS	Obsolete	EAR99	-
ML1-0110SSM-1	Microlithic™	SMT	REACH	Obsolete	EAR99	-

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Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
	Balanced Mixer					
EVAL-ML1-0110S	Evaluation Board, Microlithic™ Double-Balanced 1.5 - 10 GHz Mixer	EVAL	REACH RoHS	Obsolete	EAR99	-

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Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
EVAL-ML1-0110S	Evaluation Board, Microlithic™ Double-Balanced 1.5 - 10 GHz Mixer	EVAL	REACH RoHS	Obsolete	EAR99	-
EVAL-ML1-0110L	Evaluation Board, Microlithic Double-balanced 1.5 - 10 GHz Mixer	EVAL	REACH RoHS	End of Life	EAR99	-
EVAL-ML1-0110H	Evaluation Board, Microlithic™ Double-Balanced Mixer	EVAL	REACH RoHS	End of Life	EAR99	-

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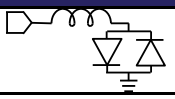
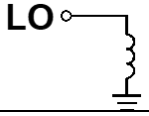
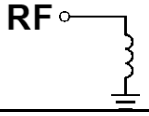
Port Configuration and Functions

Port Functions

Port	Function	Description	Equivalent Circuit for Package
IF	IF Input/Output	The IF port is DC coupled to the diodes. Blocking capacitor is optional.	
LO	LO Input	The LO port is DC short to ground and AC matched to 50 Ohms from 1.5 to 10 GHz. Blocking capacitor is optional.	
RF	RF Input / Output	The RF port is DC short to ground and AC matched to 50 Ohms from 1.5 to 10 GHz. Blocking capacitor is optional.	

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Specifications

Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
IF DC Current	50	mA
LO DC Current	1	Amp
Maximum Operating Temperature	-55	°C
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Storage Temperature	-65	°C
RF DC Current	1	Amp
RF Power Handling (RF+LO), 100°C	20	dBm
RF Power Handling (RF+LO), 25°C	25	dBm

Package Information

Parameter	Details	Rating
Dimensions	-	3.86x2.29mm
Moisture Sensitivity Level	-	MSL 1

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Electrical Specifications

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

Parameter	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	LO/RF=1.5-10 GHz ID=1-2 GHz	-	9	11	dB
Conversion Loss	LO/RF=1.5-10 GHz ID=DC-1 GHz	-	7	10	dB
Input IP3	LO/RF=1.5-10 GHz LO drive level, L Diode Option=8-13 dBm	-	12	-	dBm
Input 1 dB Compression	LO/RF=1.5-10 GHz LO drive level, L Diode Option=8-13 dBm	-	3	-	dBm

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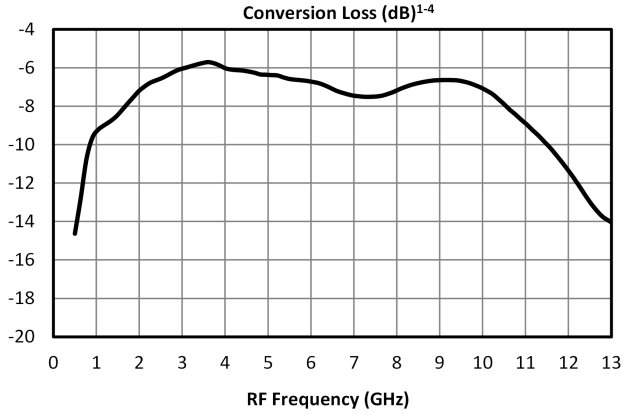
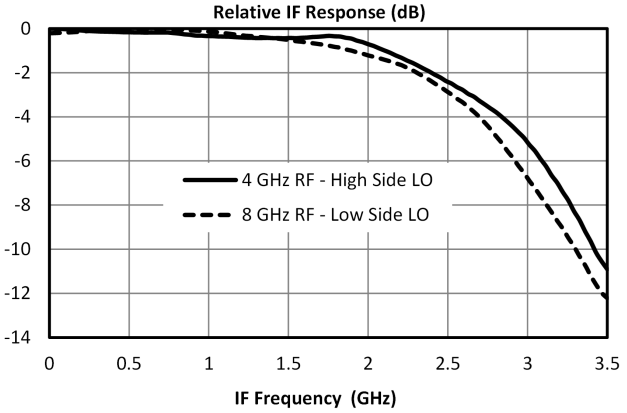
Typical Performance Plots

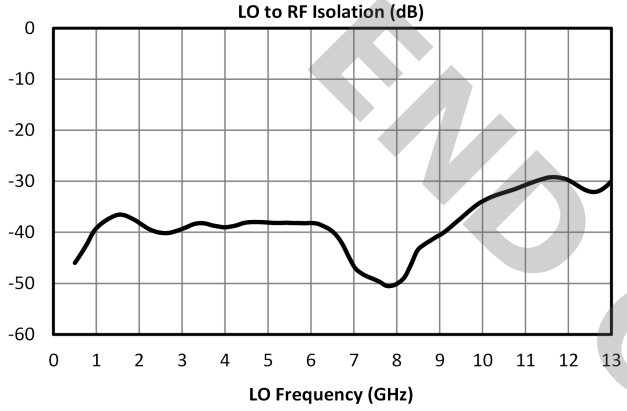
Conversion Loss (dB)[1-4]



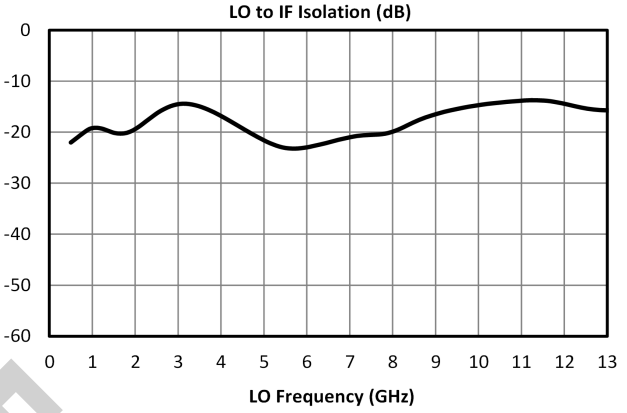
Relative IF Response (dB)



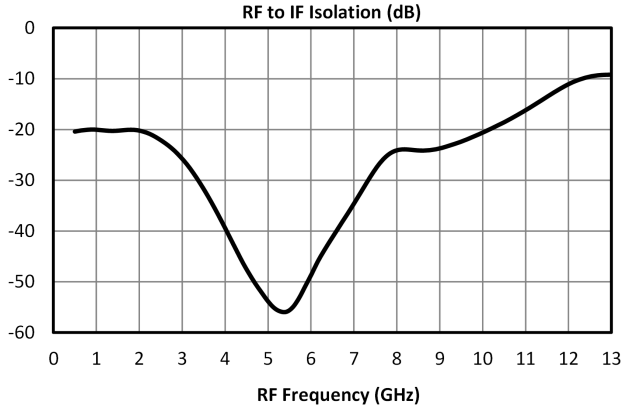
LO to RF Isolation (dB)



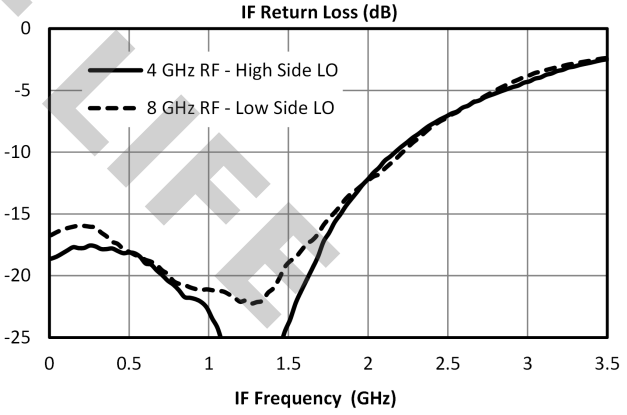
LO to IF Isolation (dB)



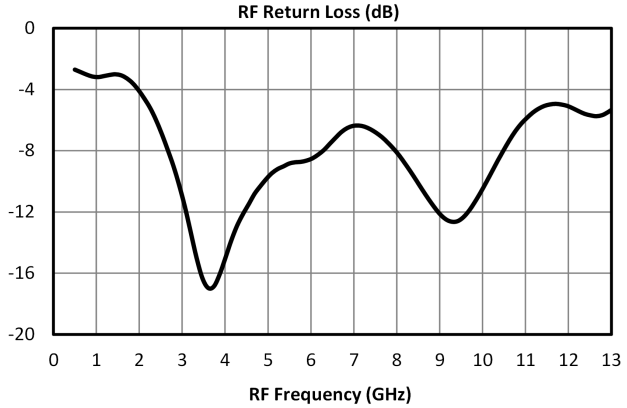
RF to IF Isolation (dB)



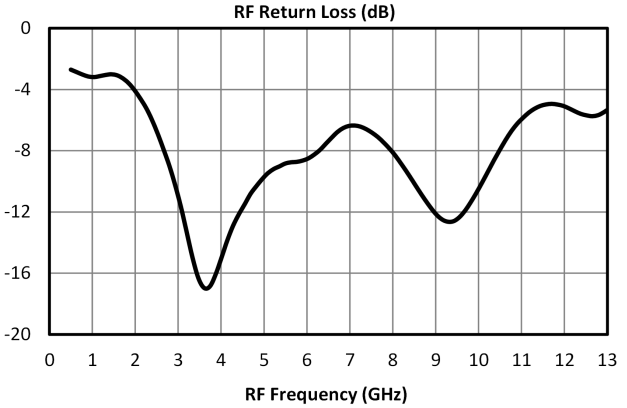
IF Return Loss (dB)



RF Return Loss (dB)



RF Return Loss (dB)



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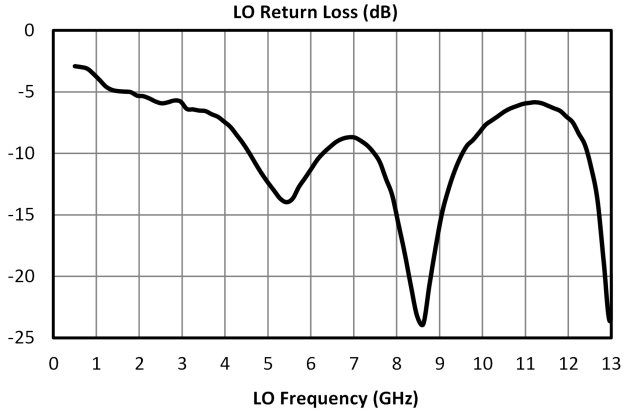
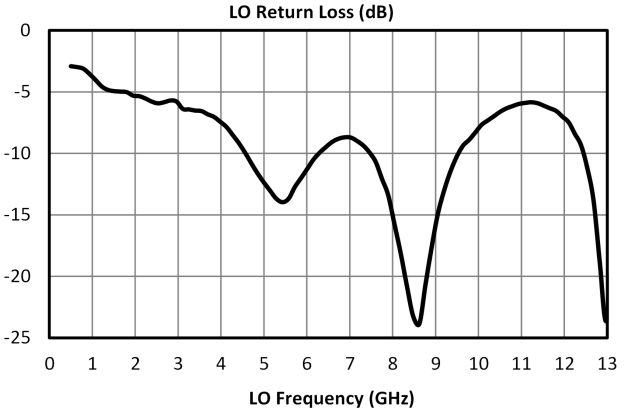
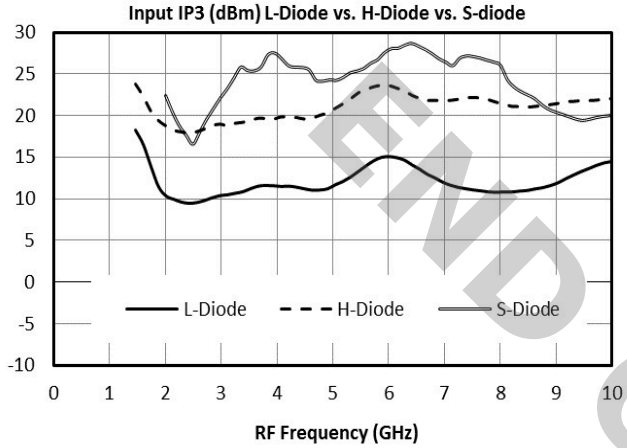
LO Return Loss (dB)



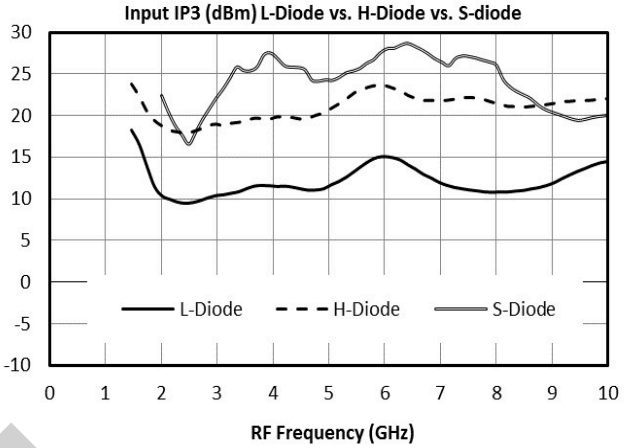
LO Return Loss (dB)



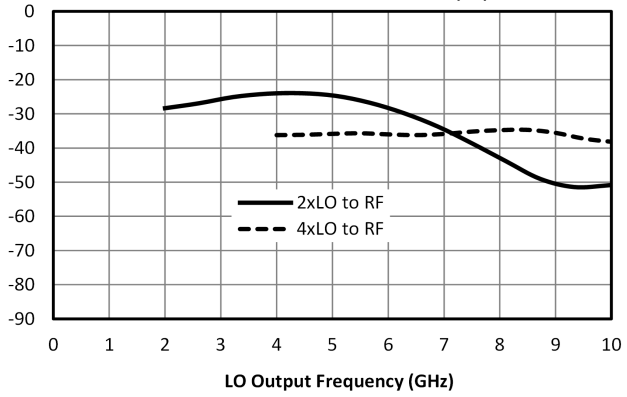
Input IP3 (dBm) L-Diode vs. H-Diode vs. S-diode



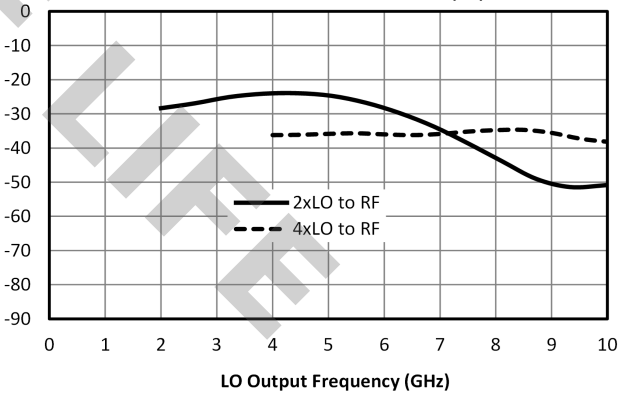
Input IP3 (dBm) L-Diode vs. H-Diode vs. S-diode



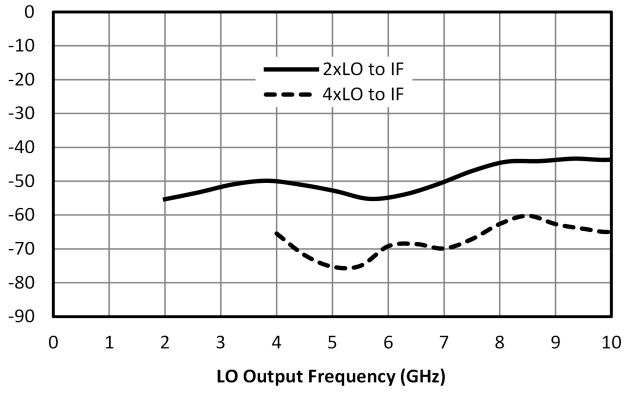
LO Even Harmonic to RF Isolation (dB)



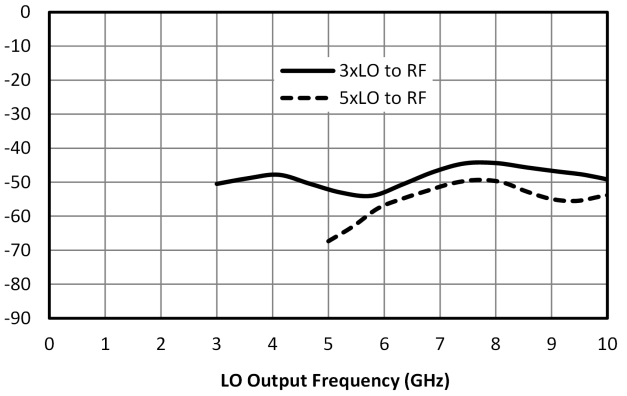
LO Even Harmonic to RF Isolation (dB)



LO Even Harmonic to IF Isolation (dB)



LO Odd Harmonic to RF Isolation (dB)



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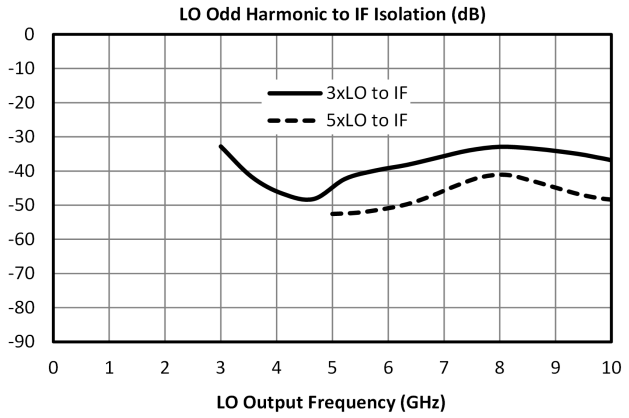

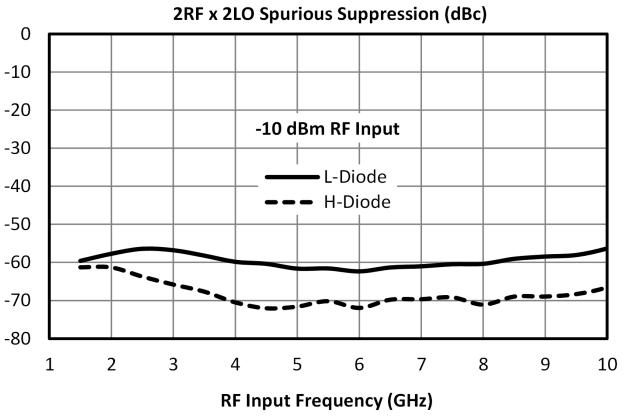

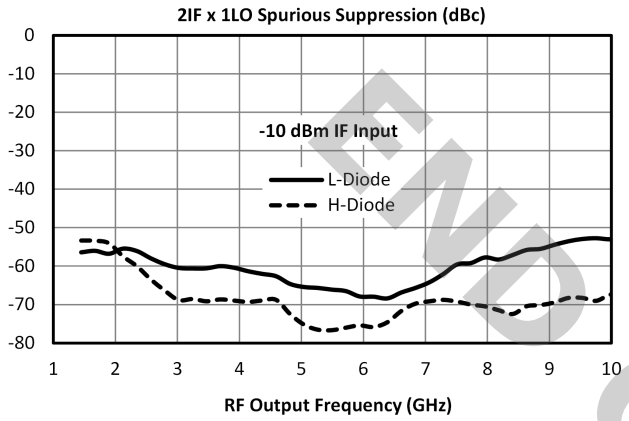

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Spur Table

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 is 68 dBc for the H-diode version for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 78 dBc.

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xRF	18 (18)	Reference	29 (31)	12 (11)	30 (31)	25 (23)
2xRF	68 (63)	55 (49)	68 (59)	56 (48)	65 (59)	54 (51)
3xRF	90 (75)	66 (50)	79 (65)	72 (56)	80 (64)	70 (54)
4xRF	96 (87)	112 (86)	109 (88)	107 (83)	111 (93)	106 (85)
5xRF	112 (96)	119 (91)	126 (99)	119 (84)	129 (102)	122 (93)

Unless otherwise specified L diode data taken with +10 dBm LO drive, H diode data is taken with +17 dBm LO drive, S diode data is taken with +17 dBm LO drive.

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 is typically 68 dBc for the H-diode version for a -10 dBm input, so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) dB lower, or 78 dBc.

-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
1xIF	13 (14)	Reference	29 (30)	11 (11)	29 (32)	20 (20)
2xIF	57 (51)	68 (61)	55 (50)	58 (53)	42 (38)	58 (54)
3xIF	89 (75)	74 (61)	81 (69)	65 (53)	71 (60)	62 (50)
4xIF	117 (98)	113 (94)	106 (90)	101 (92)	88 (77)	95 (88)
5xIF	132 (115)	118 (93)	124 (108)	110 (91)	116 (100)	102 (92)

Unless otherwise specified L diode data taken with +10 dBm LO drive, H diode data is taken with +17 dBm LO drive, S diode data is taken with +17 dBm LO drive.

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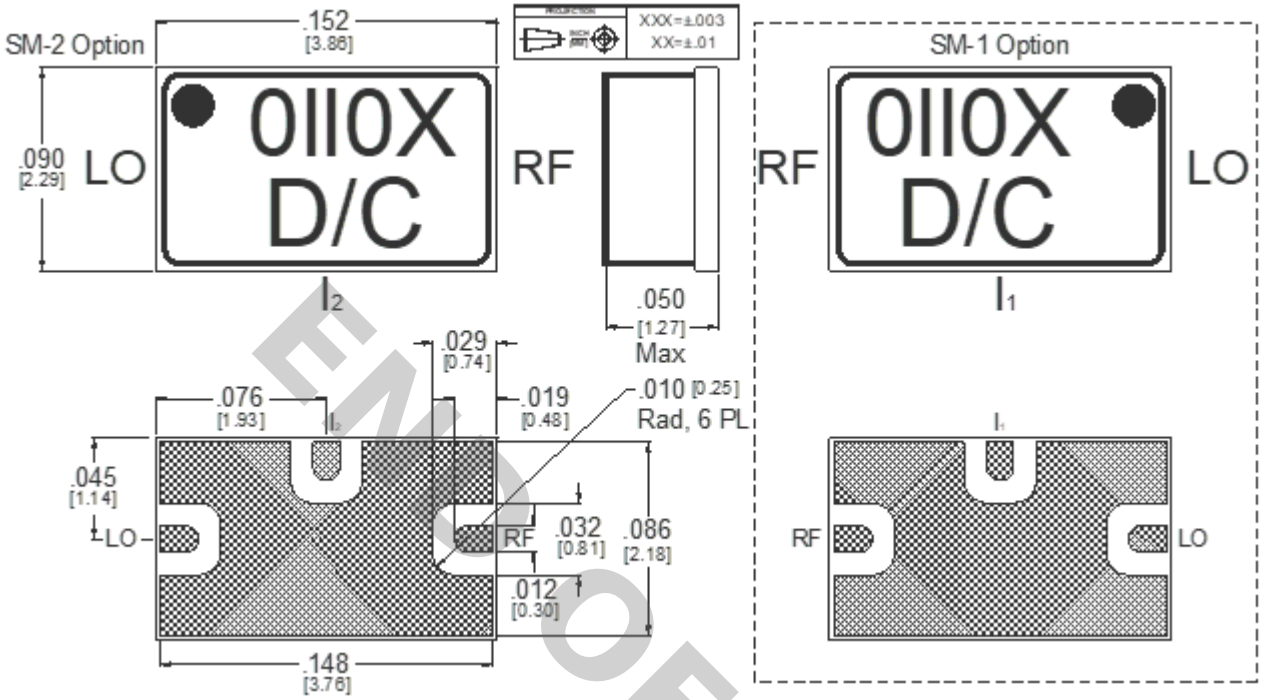
Mechanical Data

Outline Drawing

Download : Outline 2D Drawing | Outline 3D Drawing | Outline 3D STP



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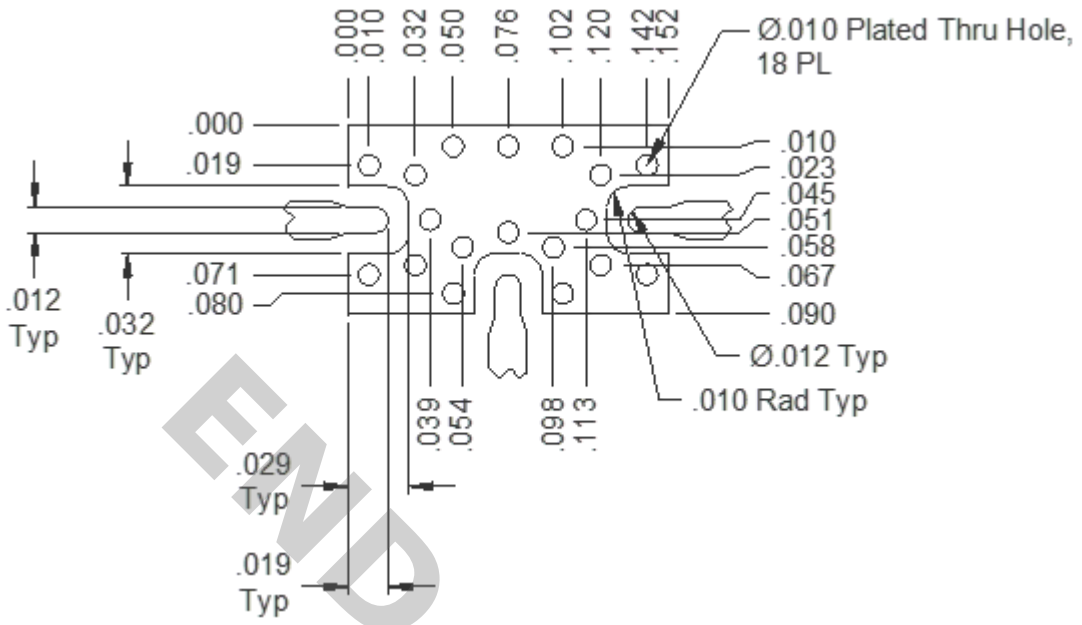
Footprint Image

Download : Footprint Drawing



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Notes

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, H diode data is taken with +17 dBm LO drive, S diode data is taken with +17 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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