

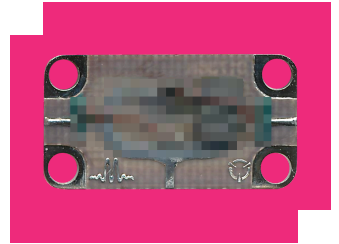
# M1-0412ME-1

## Double-Balanced 4 - 12 GHz Mixers

### DEVICE OVERVIEW

#### General Description

M1 double balanced mixers are hybrid assemblies that have been hand-tuned to feature low conversion loss and high isolations and a DC IF response. M1 mixers have generally been replaced with MM1 mixers with superior performance, repeatability, and availability. M1 mixers are still used in legacy systems and are suitable for laboratory use.



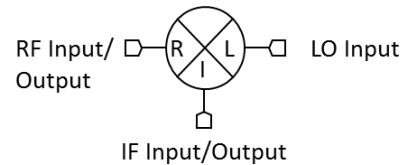
#### Features

- LO/RF 4.0 to 12.0 GHz
- IF DC to 4.0 GHz
- 5.0 dB Typical Conversion Loss
- 40 dB Typical LO to RF Isolation
- Very-Broadband LO and RF

#### Applications

N/A

#### Functional Block Diagram



#### Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
<a href="#">M1-0412HE-2</a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	End of Life	EAR99	<a href="#">MM1-0312HSM-2</a>
<a href="#">M1-0412ME-2</a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	Not Recommended for New Design	EAR99	<a href="#">MM1-0312HSM-2</a> <a href="#">2MM1-0222LSM-2</a>
<a href="#">M1-0412NE-2</a>	Double-Balanced 4 - 12 GHz Mixers	E	<a href="#">Consult Factory</a>	Obsolete	EAR99	<a href="#">MM1-0312HSM-2</a>
<a href="#">M1-0412NE-1</a>	Double-Balanced 4 - 12 GHz Mixers	E	<a href="#">Consult Factory</a>	End of Life	EAR99	<a href="#">MM1-0312HSM-2</a>
<a href="#">M1-0412LE-1</a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	Not Recommended for New Design	EAR99	<a href="#">MM1-0312HSM-2</a> <a href="#">2MM1-0222LSM-2</a>
M1-0412ME-1	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	Not Recommended for New Design	EAR99	<a href="#">MM1-0312HSM-2</a> <a href="#">2MM1-0222LSM-2</a>
<a href="#">M1-0412LE-2</a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	Not Recommended for New Design	EAR99	<a href="#">MM1-0312HSM-2</a> <a href="#">2MM1-0222LSM-2</a>

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification	Recommended Replacement
<a href="#"><u>M1-0412LE-2</u></a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	Not Recommended for New Design	EAR99	<a href="#"><u>MM1-0312HSM-2</u></a> <a href="#"><u>MM1-0222LSM-2</u></a>
<a href="#"><u>M1-0412HE-1</u></a>	Double-Balanced 4 - 12 GHz Mixers	E	Non-RoHS	End of Life	EAR99	<a href="#"><u>MM1-0312HSM-2</u></a>

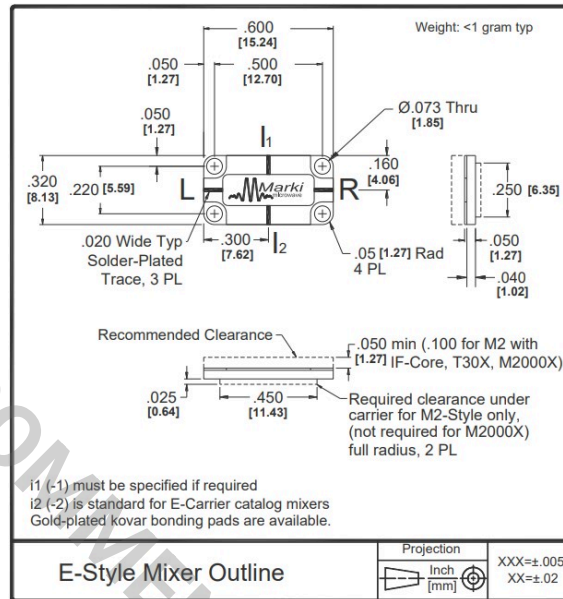
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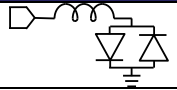
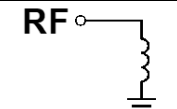
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## Port Configuration and Functions

### Port Diagram



### Port Functions

Port	Function	Description	Equivalent Circuit for Package
IF	IF	The IF port is DC coupled to the diodes and AC matched to 50 Ohms from 0 to 4 GHz. Blocking capacitor is optional.	
LO	LO	The LO port is DC coupled to ground and AC matched to 50 Ohms from 4 to 12 GHz. Blocking capacitor is optional.	-
RF	RF	The RF port is DC coupled to ground and AC matched to 50 Ohms from 4 to 12 GHz. Blocking capacitor is optional.	

**Specifications**

**Package Information**

Parameter	Details	Rating
Weight	Package name: E	1g
Dimensions	-	15.24 x 8.13 mm

**Recommended Operating Conditions**

Parameter	Min	Nominal	Max	Unit
LO Input Power	10	-	13	-

NOT RECOMMENDED FOR NEW DESIGN

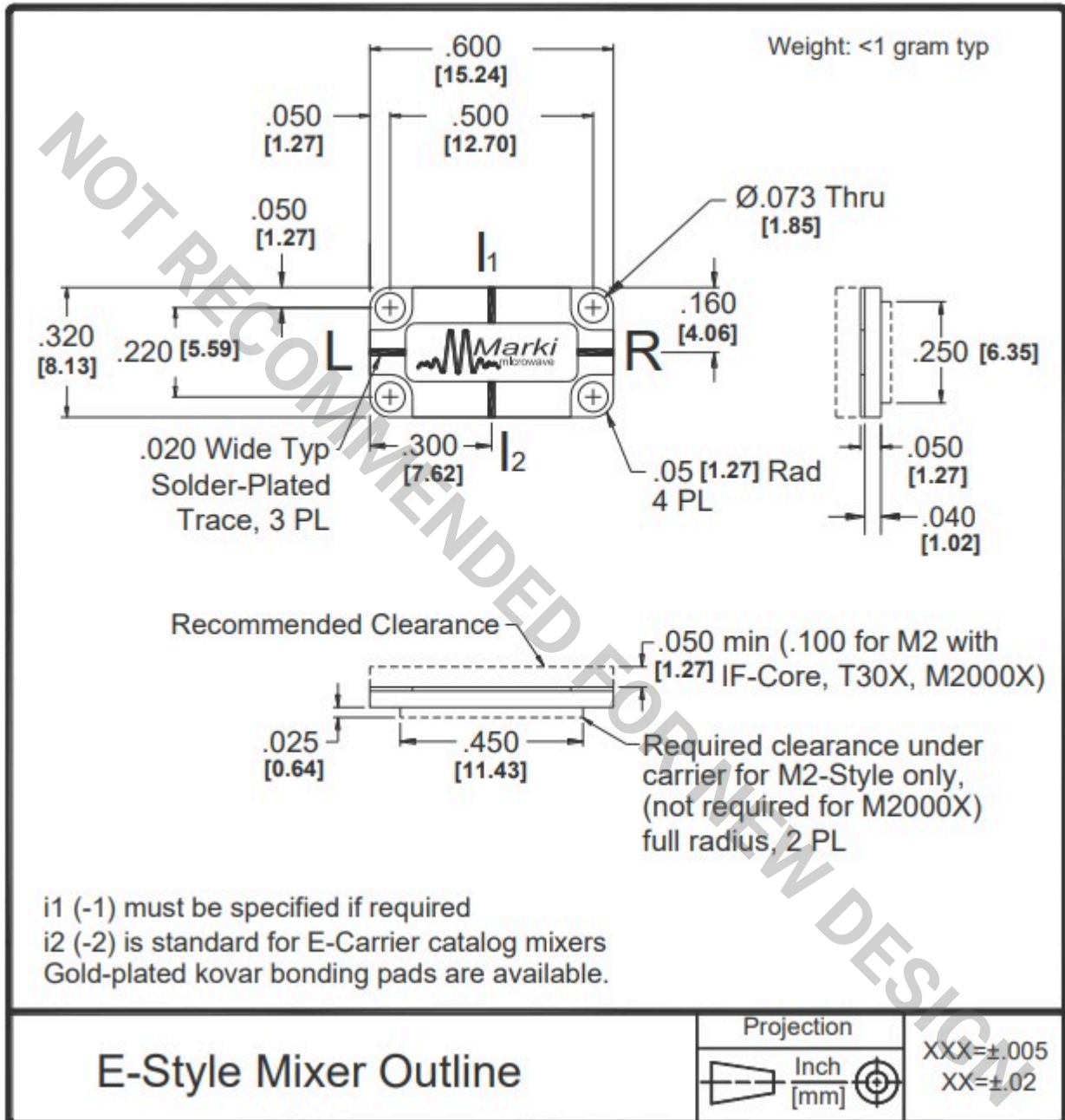
## Electrical Specifications

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

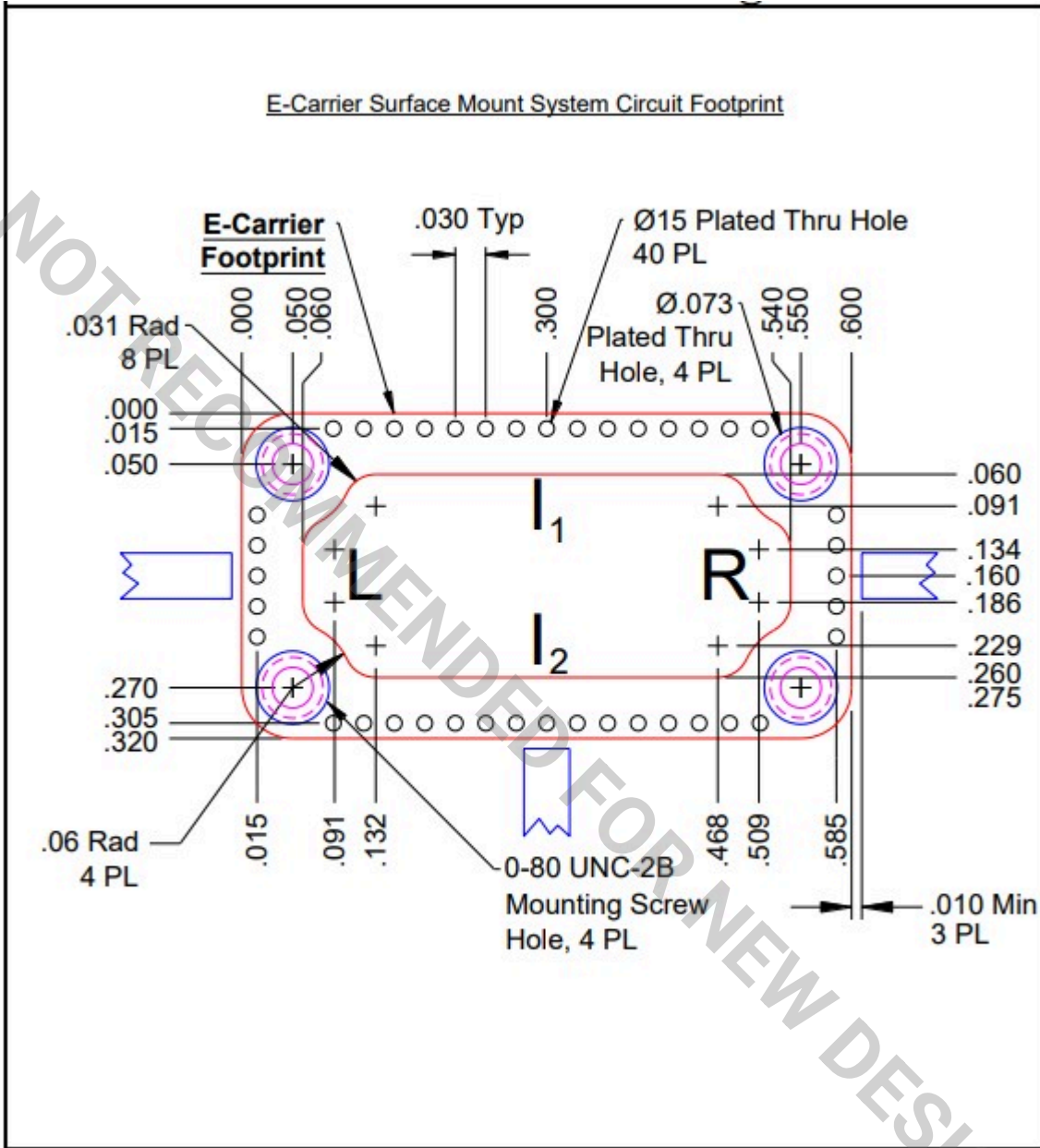
Parameter	Test Conditions	Min	Typ	Max	Unit
Conversion Loss	LO/RF=4-12 GHz IF=1-4 GHz	-	6	8.5	dB
Conversion Loss	LO/RF=4-12 GHz IF=DC-1 GHz	-	5	8	dB
Input 1 dB Compression	LO/RF=4-12 GHz LO drive level, M Diode Option=10-13 dBm	-	5	-	dBm
Input IP3	LO/RF=4-12 GHz LO drive level, M Diode Option=10-13 dBm	-	15	-	dBm
Isolation, LO to IF	LO/RF=4-12 GHz	-	30	-	dB
Isolation, LO to RF	LO/RF=4-12 GHz	25	40	-	dB
Isolation, RF to IF	LO/RF=4-12 GHz	-	25	-	dB
IF Frequency Range	-	0	-	4	GHz
Input 1 dB Compression	-	-	5	-	dBm
Input IP3	-	-	15	-	dBm
RF Frequency Range	-	4	-	12	GHz

Mechanical Data

Outline Drawing



**Footprint Image**



## 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. Maximum input power is +23 dBm at +25°C, derated linearly to +20 dBm at +100°C.
6. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
7. Standard configuration for A, B, and C outlines are with connectors and bottom spacer.
8. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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