

# X5 Frequency Multiplier

## RMK-5-13+

50Ω Output 750 to 1000 MHz

### The Big Deal

- Broadband, 750 to 1000 MHz output
- Good harmonic suppression:  
F4, 63 dBc; F6, 68 dBc
- Small size, 0.25 x 0.31 x 0.16"



CASE STYLE: TT1224

### Product Overview

i-Circuits' RMK-5-13+ frequency multiplier provides a multiplication factor of 5, converting input frequencies from 150 to 200 MHz into output frequencies from 750 to 1000 MHz, supporting applications including synthesizers, local oscillators, satellite up and down converters and more. The unit supports signal input power of +17 dBm with 21.2 dB conversion loss and very good harmonic suppression. The multiplier comes housed in a miniature surface-mount package (0.25 x 0.31 x 0.16") ideal for dense circuit board layouts.

### Key Features

Feature	Advantages
Low conversion loss, 21.2 dB	With a low conversion loss, the unit produces higher output power, reducing the need for amplification.
Very good harmonic suppression <ul style="list-style-type: none"><li>• F4, 63 dBc</li><li>• F6, 68 dBc</li></ul>	Reduces spurious signals and the need for additional filtering.
Low cost	Provides an easy, cost-effective solution for generating high-frequency signals from a lower frequency signal source.
Small size	Measuring only 0.25 x 0.31 x 0.16", the RMK-5-13+ saves space in crowded PCB layouts.

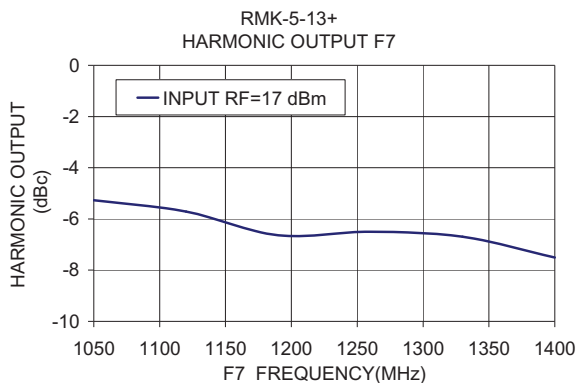
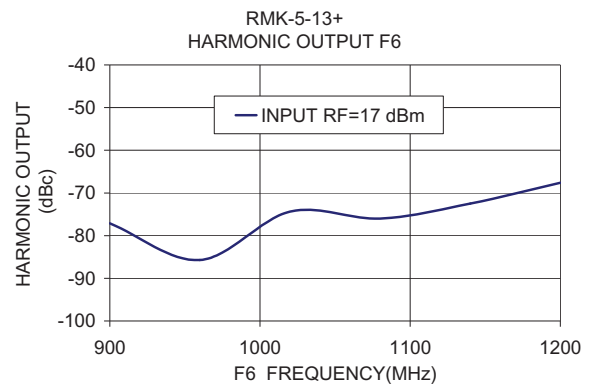
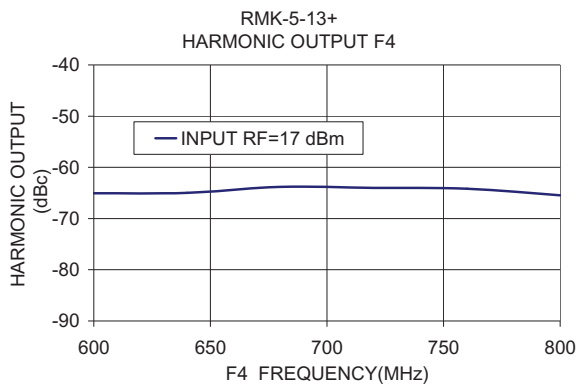
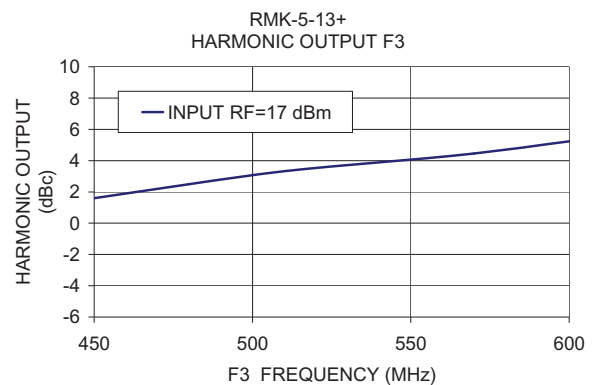
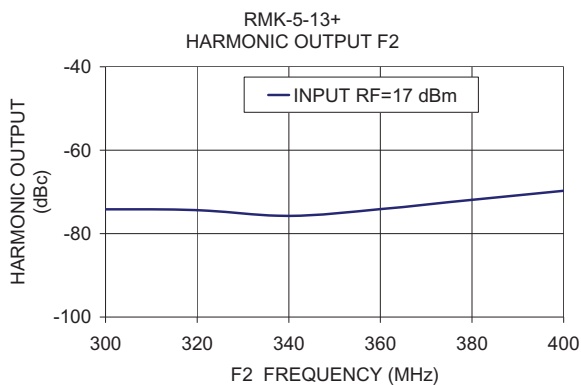
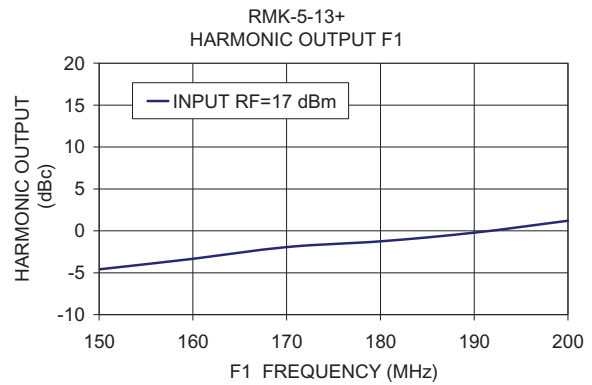
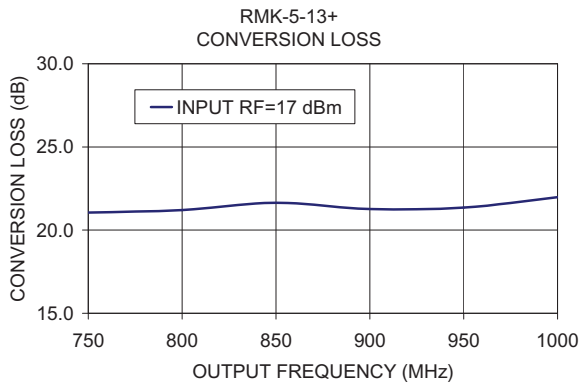
#### Notes

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# RMK-5-13+



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# Frequency Multiplier (X5)

RMK-5-13+

## Typical Performance Data

FREQUENCY (MHz)							CONVERSION LOSS (dB)	RF IN = +17 dBm						
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X6 OUTPUT	X7 OUTPUT		X5 OUTPUT	X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X6 OUTPUT	X7 OUTPUT
130	260	390	520	650	780	910	21.95	6.26	79.83	-0.24	64.11	67.24	4.59	
140	280	420	560	700	840	980	22.06	4.91	73.97	-1.09	64.09	74.11	5.39	
150	300	450	600	750	900	1050	21.06	4.59	74.17	-1.60	65.07	77.10	5.27	
160	320	480	640	800	960	1120	21.21	3.35	74.39	-2.49	64.97	85.69	5.71	
170	340	510	680	850	1020	1190	21.64	1.94	75.77	-3.32	63.82	74.36	6.64	
180	360	540	720	900	1080	1260	21.27	1.26	74.11	-3.89	64.03	76.02	6.50	
190	380	570	760	950	1140	1330	21.35	0.22	71.91	-4.45	64.16	72.50	6.69	
200	400	600	800	1000	1200	1400	21.98	-1.20	69.72	-5.23	65.48	67.62	7.51	
210	420	630	840	1050	1260	1470	22.10	-2.13	68.35	-5.81	64.91	65.38	7.67	
220	440	660	880	1100	1320	1540	22.11	-2.95	66.35	-6.17	65.04	64.84	7.56	

\* Harmonic Output below power level of X5 Output.



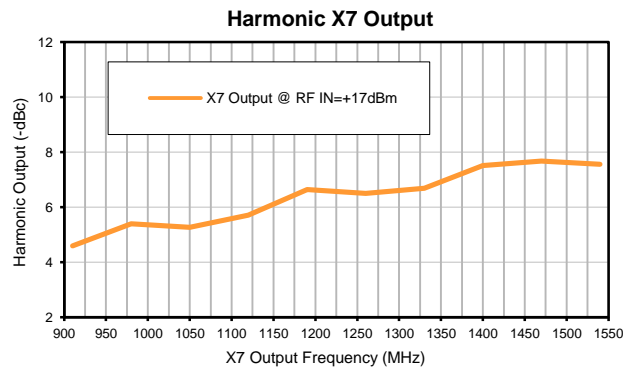
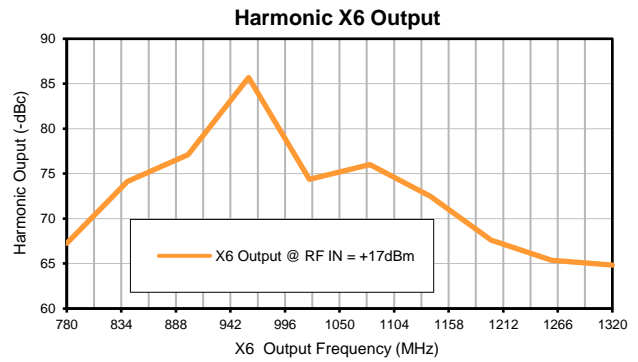
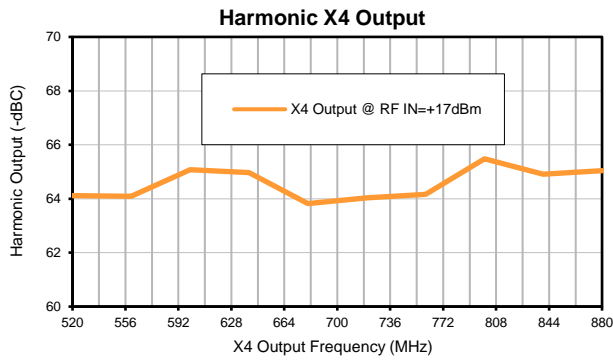
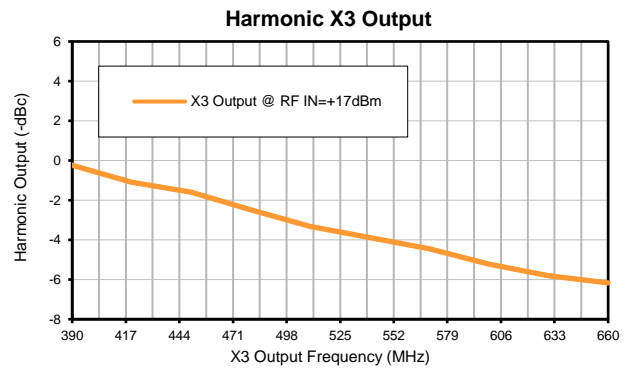
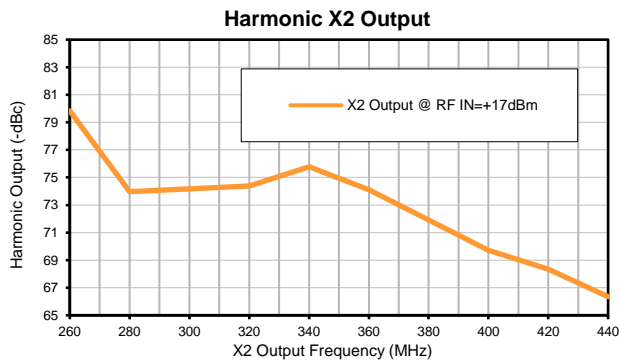
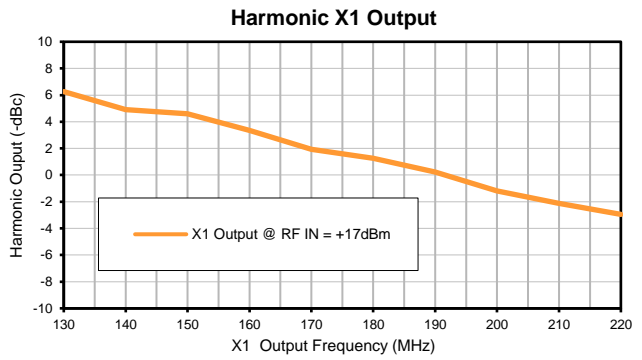
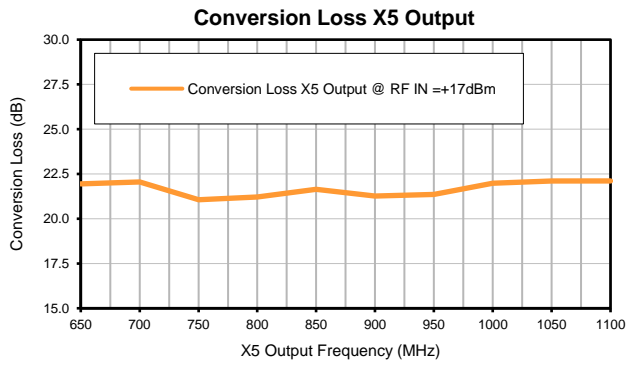
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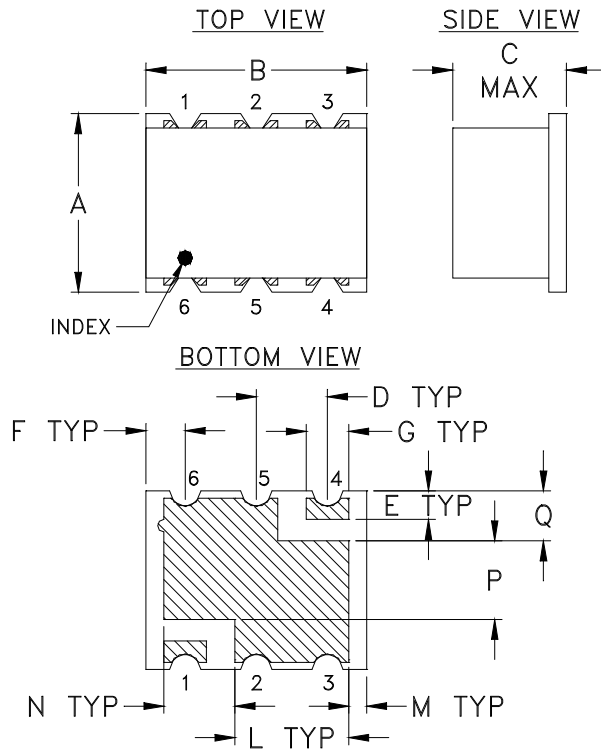
IF/RF MICROWAVE COMPONENTS

REV. OR  
 RMK-5-13+  
 1/29/2015  
 Page 1 of 1

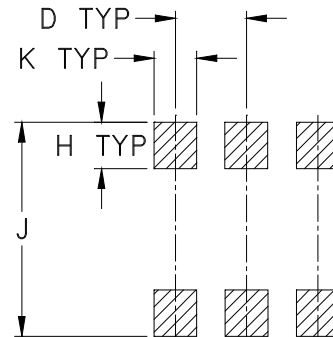
## Typical Performance Curves



### Outline Dimensions



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L
TT1224	.25 (6.35)	.31 (7.87)	.16 (4.06)	.100 (2.54)	.040 (1.02)	.055 (1.40)	.060 (1.52)	.065 (1.65)	.300 (7.62)	.060 (1.52)	.160 (4.06)

CASE #	M	N	P	Q	WT. GRAM
TT1224	.025 (.64)	.100 (2.54)	.110 (2.79)	.070 (1.78)	.16

Dimensions are in inches (mm). Tolerances: 2Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$

#### Notes:

1. Case material: Plastic.
2. Termination: 2-10  $\mu$  inch (.05-.25 microns) Gold over 100-300  $\mu$  inch (2.54-7.62 microns) Nickel plate



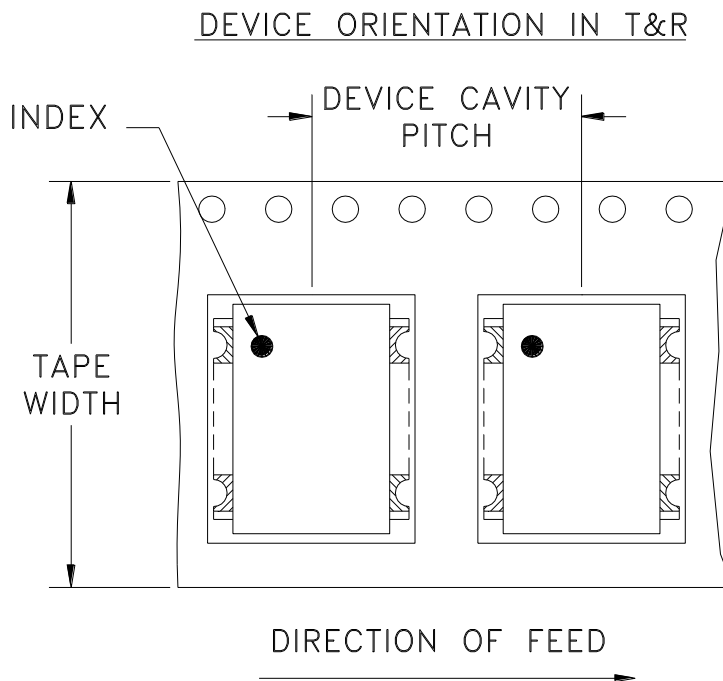
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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F2



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel See note
16	12	7	10
			20
			50
			100
		200	
		13	500

Note: Please consult individual model data sheet to determine device per reel availability

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



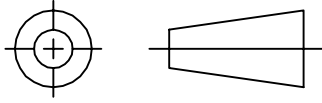
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THIRD ANGLE PROJECTION

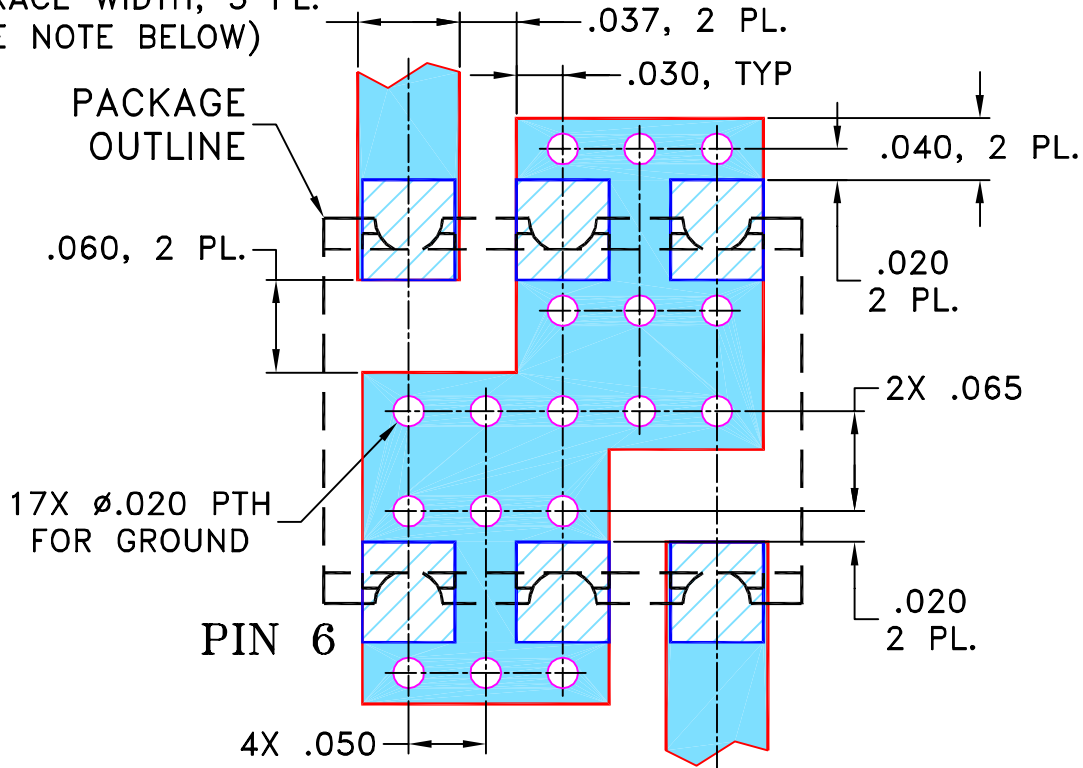


REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M108897	NEW RELEASE	01/04/07	AV	DJ

**SUGGESTED MOUNTING CONFIGURATION  
FOR TT1224 CASE STYLE "rv" PIN CONNECTION**

.066 TRACE WIDTH, 3 PL.  
(SEE NOTE BELOW)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC  
(SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

12/14/06

TOLERANCES ON:

CHECKED

IL

01/04/07

2 PL DECIMALS ± .005

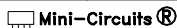
APPROVED

DJ

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ANGLES ±

FRACTIONS ±



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ASHEETA1.DWG REV:A DATE:01/12/95



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13 Neptune Avenue  
Brooklyn NY 11235

PL, rv, TT1224, RMK-3-662+, TB-393

SIZE  
A

CODE IDENT  
15542

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98-PL-258

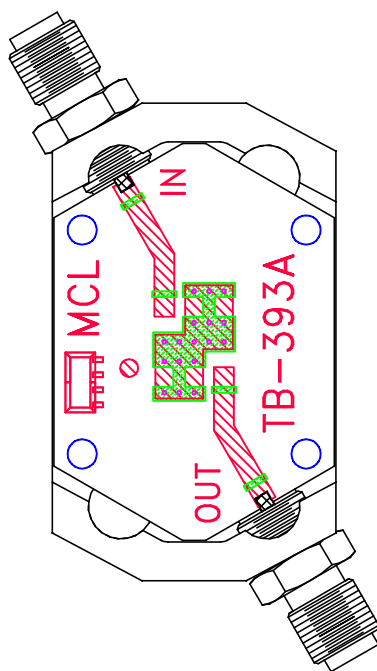
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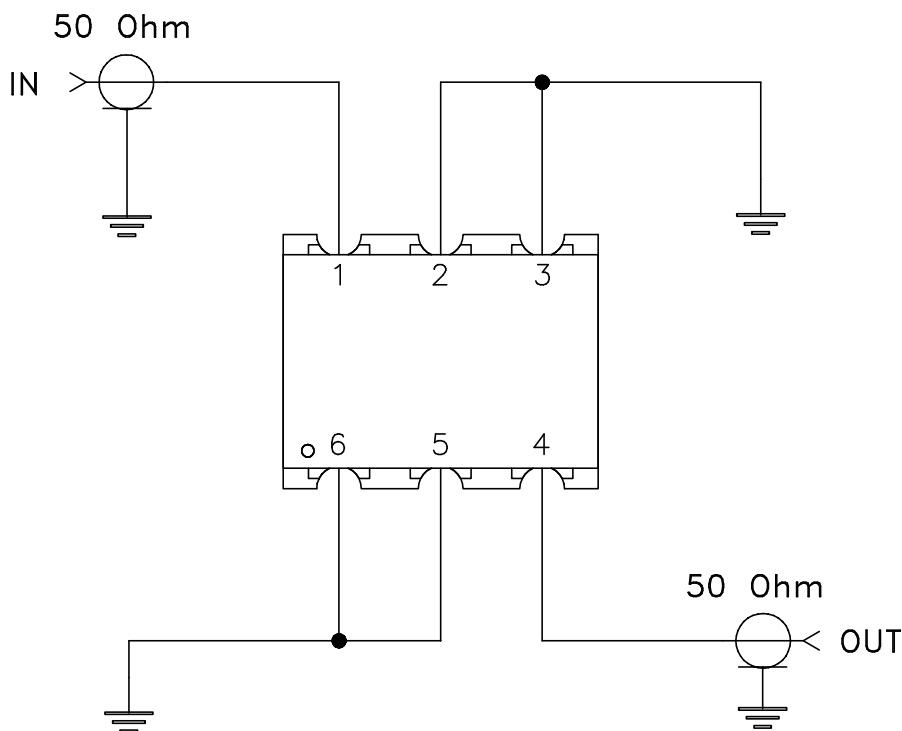
SCALE: 8:1

SHEET: 1 OF 1

# Evaluation Board and Circuit




TB-393



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215