

X7 Frequency Multiplier

RMK-7-81+

50Ω Output 52.5 to 80.5 MHz

The Big Deal

- High rejection of adjacent harmonics, >45 dBc
- 50 Ω in/out, no tuning necessary



CASE STYLE: TT1224

Product Overview

The RMK-7-81+ is a cost-effective X7 frequency multiplier that utilizes specially selected silicon Schottky diodes and compatible filter circuitry to achieve a low conversion loss, yet have a high rejection of unwanted harmonics near its F7 output. It makes the RMK-7-81+ ideal for a wide range of applications. The tiny plastic case, 0.25" x 0.31" x 0.16" high, is aqueous washable and RoHS compliant.

Feature	Advantages
<30 dB conversion loss	Efficient choice for converting 7.5 MHz source to 52.5 MHz output while maintaining useful signal power, especially for reference crystal oscillators. Only 12 dBm input required for -10 dBm output, especially useful for low-loss systems such as instrumentation
>45 dB rejection of F6 and F8	Proprietary internal circuitry achieves high suppression and minimizes filter requirements for undesired signals, as in wireless Tx/Rx for military applications, aircraft, cordless telephones, remote control and PMR.
Internally balanced to 50Ω in/out, no DC power required	Saves PCB space and simplifies application design, with no external matching or biasing circuits required
Small surface mount package	Easily integrated in systems with minimal PCB area available

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
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X7 Frequency Multiplier

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50Ω Output 52.5 to 80.5 MHz

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	20 dBm

Permanent damage may occur if any of these limits are exceeded.

Pin Connections

INPUT	1
OUTPUT	4
GROUND	2,3,5,6

Features

- low conversion loss, 27 dB typ.
- high adjacent harmonic rejection, 45 dBc typ.
- aqueous washable

Applications

- synthesizers
- local oscillators
- satellite up and down converters

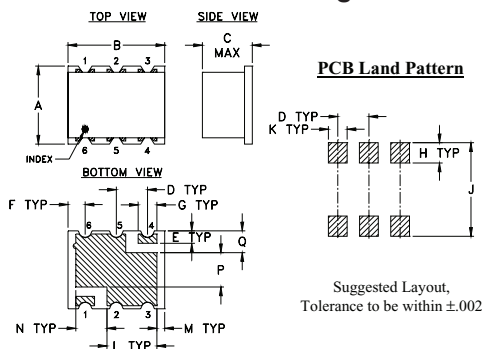


Generic photo used for illustration purposes only
CASE STYLE: TT1224

+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Available Tape and Reel at no extra cost	
Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500

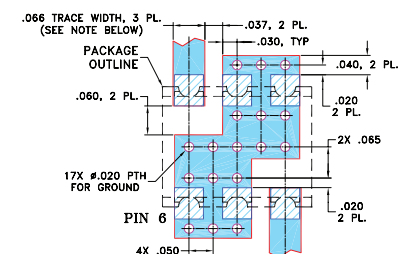
Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
.25	.31	.16	.100	.040	.055	.060	.065
6.35	7.87	4.06	2.54	1.02	1.40	1.52	1.65
J	K	L	M	N	P	Q	wt.
.300	.060	.160	.025	.100	.110	.070	grams
7.62	1.52	4.06	0.64	2.54	2.79	1.78	0.16

Demo Board MCL P/N: TB-393 Suggested PCB Layout (PL-258)



Electrical Specifications at 25°C

Parameter	Min.	Typ.	Max.	Unit
Multiplier Factor		7		
Frequency Range, Input (F1)	7.5	—	11.5	MHz
Frequency Range, Output (F7)	52.5	—	80.5	MHz
Input Power	8	—	12	dBm
Conversion Loss	—	27	30	dB
Harmonic Output*	F1	-5	3	—
	F2	36	55	—
	F3	-10	-5	—
	F4	28	48	—
	F5	-10	-5	—
	F6	26	47	—
	F7	25	45	—
	F8			

* Harmonics of input frequency below the power level of F7

Typical Performance Data

Input (MHz)	Output (MHz)	Conv. Loss (dB) F7	Harmonic Rejection Below F7 (dBc) at RF Input Power 8 dBm							
			F1	F2	F3	F4	F5	F6	F8	
7.5	52.5	25.96	10.53	66.11	2.71	52.37	0.46	47.38	46.47	
8.0	56.0	25.51	9.76	71.85	1.96	72.52	0.99	68.21	62.54	
8.5	59.5	25.27	8.84	70.16	1.11	74.97	1.58	69.19	63.37	
9.0	63.0	25.43	7.65	69.88	0.01	74.79	2.32	64.97	61.80	
9.5	66.5	25.90	6.31	69.69	1.32	73.85	3.16	62.39	61.23	
10.0	70.0	26.18	5.14	68.54	2.49	74.25	3.85	61.23	60.96	
10.5	73.5	26.19	4.25	67.43	3.36	73.07	4.32	59.86	60.21	
11.0	77.0	26.28	3.32	65.99	4.24	73.54	4.74	59.19	60.08	
11.5	80.5	27.07	1.84	63.71	5.59	80.83	5.36	60.71	61.83	

at RF Input Power 12 dBm

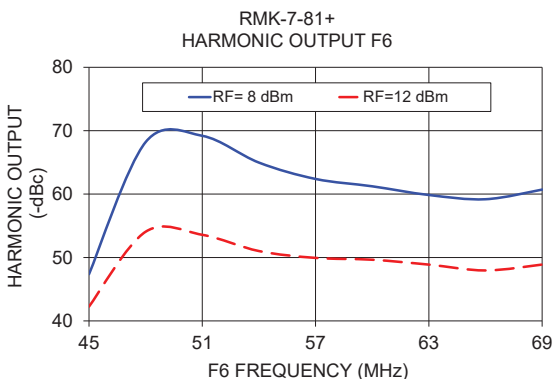
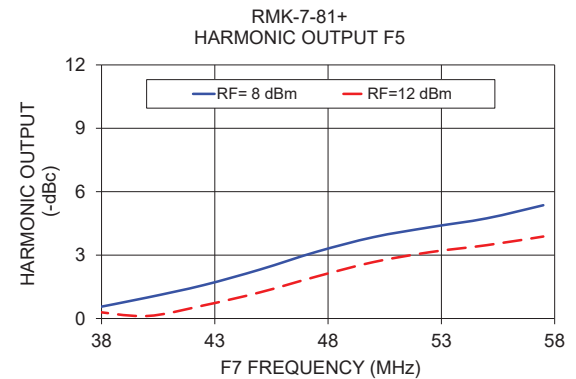
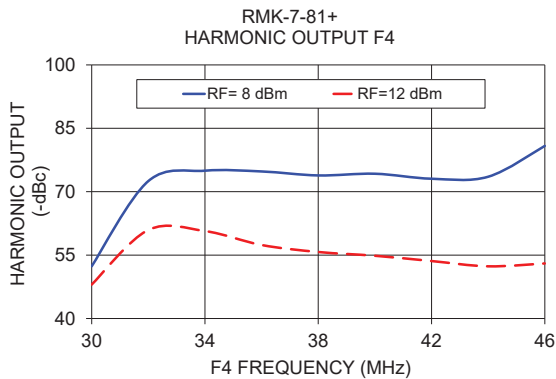
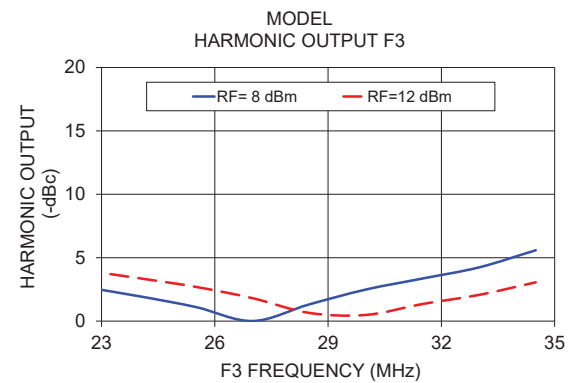
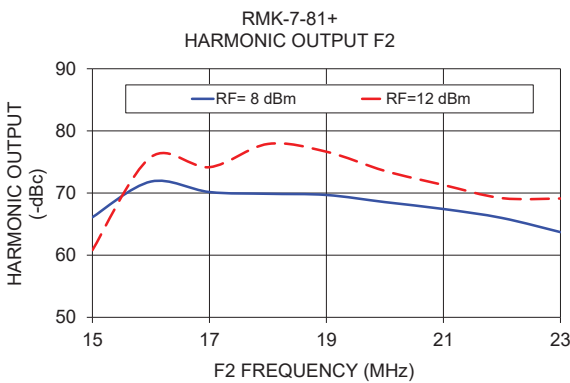
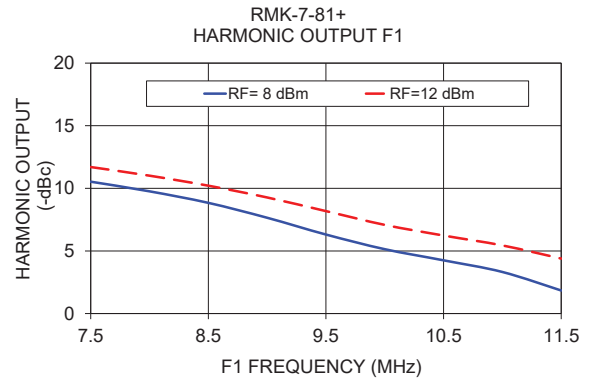
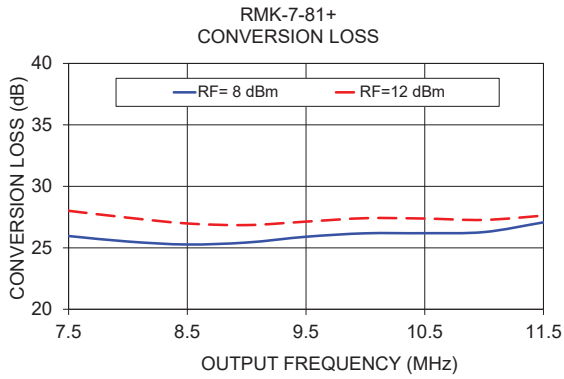
7.5	52.5	28.01	11.70	60.82	4.02	48.04	0.36	42.27	40.62
8.0	56.0	27.45	11.01	75.79	3.38	60.96	0.12	54.07	51.87
8.5	59.5	26.98	10.21	74.16	2.70	60.69	0.62	53.58	51.78
9.0	63.0	26.85	9.27	77.90	1.81	57.39	1.24	51.02	50.10
9.5	66.5	27.13	8.18	76.65	0.65	55.74	1.99	49.94	49.83
10.0	70.0	27.41	7.08	73.56	0.49	54.85	2.67	49.65	50.10
10.5	73.5	27.38	6.23	71.30	1.35	53.60	3.14	48.88	49.62
11.0	77.0	27.27	5.44	69.18	2.07	52.35	3.47	47.96	48.83
11.5	80.5	27.62	4.39	69.12	3.06	53.03	3.88	48.89	49.96

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RMK-7-81+



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Frequency Multiplier (X7)

RMK-7-81+

Typical Performance Data

FREQUENCY (MHz)								CONVERSION LOSS (dB)	RF IN = +8 dBm HARMONIC OUTPUT* (-dBc)							
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X6 OUTPUT	X7 OUTPUT	X8 OUTPUT	X7 OUTPUT	X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X6 OUTPUT	X8 OUTPUT	
7.0	14.0	21.0	28.0	35.0	42.0	49.0	56.0	26.53	11.17	57.06	3.40	48.78	0.04	43.61	42.54	
7.5	15.0	22.5	30.0	37.5	45.0	52.5	60.0	25.96	10.53	66.11	2.71	52.37	-0.46	47.38	46.47	
8.0	16.0	24.0	32.0	40.0	48.0	56.0	64.0	25.51	9.76	71.85	1.96	72.52	-0.99	68.21	62.54	
8.5	17.0	25.5	34.0	42.5	51.0	59.5	68.0	25.27	8.84	70.16	1.11	74.97	-1.58	69.19	63.37	
9.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	25.43	7.65	69.88	-0.01	74.79	-2.32	64.97	61.80	
9.5	19.0	28.5	38.0	47.5	57.0	66.5	76.0	25.90	6.31	69.69	-1.32	73.85	-3.16	62.39	61.23	
10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	26.18	5.14	68.54	-2.49	74.25	-3.85	61.23	60.96	
10.5	21.0	31.5	42.0	52.5	63.0	73.5	84.0	26.19	4.25	67.43	-3.36	73.07	-4.32	59.86	60.21	
11.0	22.0	33.0	44.0	55.0	66.0	77.0	88.0	26.28	3.32	65.99	-4.24	73.54	-4.74	59.19	60.08	
11.5	23.0	34.5	46.0	57.5	69.0	80.5	92.0	27.07	1.84	63.71	-5.59	80.83	-5.36	60.71	61.83	
12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	28.17	0.13	61.50	-7.14	66.15	-6.06	62.37	64.15	
12.5	25.0	37.5	50.0	62.5	75.0	87.5	100.0	29.09	-1.40	59.47	-8.51	61.75	-6.62	62.81	65.50	
13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	30.36	-3.27	57.18	-10.13	57.68	-7.31	62.32	66.31	

* Harmonic Output below power level of X7 Output.

FREQUENCY (MHz)								CONVERSION LOSS (dB)	RF IN = +12 dBm HARMONIC OUTPUT* (-dBc)							
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X6 OUTPUT	X7 OUTPUT	X8 OUTPUT	X7 OUTPUT	X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X5 OUTPUT	X6 OUTPUT	X8 OUTPUT	
7.0	14.0	21.0	28.0	35.0	42.0	49.0	56.0	28.52	12.38	54.98	4.77	46.79	0.93	41.22	39.30	
7.5	15.0	22.5	30.0	37.5	45.0	52.5	60.0	28.01	11.70	60.82	4.02	48.04	0.36	42.27	40.62	
8.0	16.0	24.0	32.0	40.0	48.0	56.0	64.0	27.45	11.01	75.79	3.38	60.96	-0.12	54.07	51.87	
8.5	17.0	25.5	34.0	42.5	51.0	59.5	68.0	26.98	10.21	74.16	2.70	60.69	-0.62	53.58	51.78	
9.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	26.85	9.27	77.90	1.81	57.39	-1.24	51.02	50.10	
9.5	19.0	28.5	38.0	47.5	57.0	66.5	76.0	27.13	8.18	76.65	0.65	55.74	-1.99	49.94	49.83	
10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	27.41	7.08	73.56	-0.49	54.85	-2.67	49.65	50.10	
10.5	21.0	31.5	42.0	52.5	63.0	73.5	84.0	27.38	6.23	71.30	-1.35	53.60	-3.14	48.88	49.62	
11.0	22.0	33.0	44.0	55.0	66.0	77.0	88.0	27.27	5.44	69.18	-2.07	52.35	-3.47	47.96	48.83	
11.5	23.0	34.5	46.0	57.5	69.0	80.5	92.0	27.62	4.39	69.12	-3.06	53.03	-3.88	48.89	49.96	
12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	28.27	3.17	68.26	-4.24	55.01	-4.34	50.79	52.15	
12.5	25.0	37.5	50.0	62.5	75.0	87.5	100.0	28.84	2.03	66.28	-5.32	56.63	-4.72	52.27	53.84	
13.0	26.0	39.0	52.0	65.0	78.0	91.0	104.0	29.64	0.70	64.05	-6.54	59.22	-5.16	54.07	56.07	

* Harmonic Output below power level of X7 Output.



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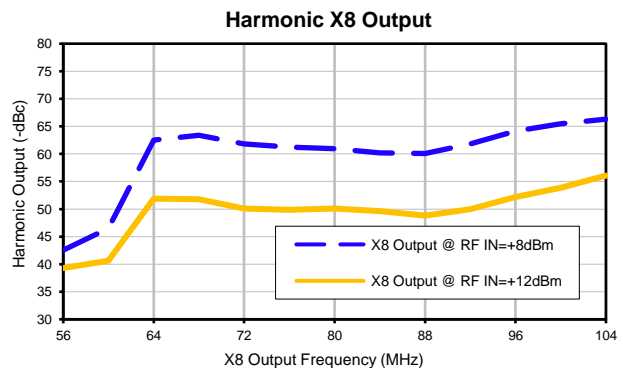
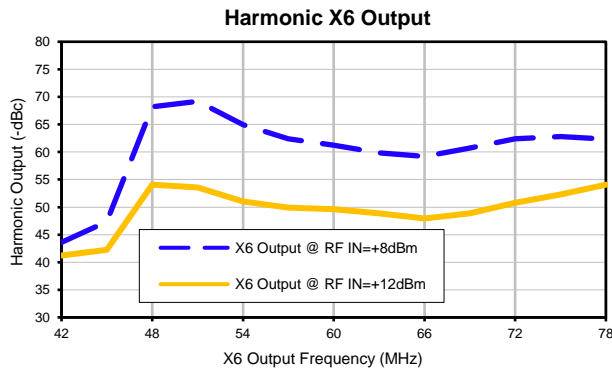
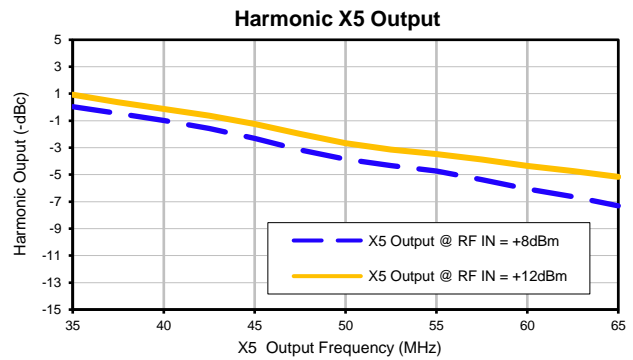
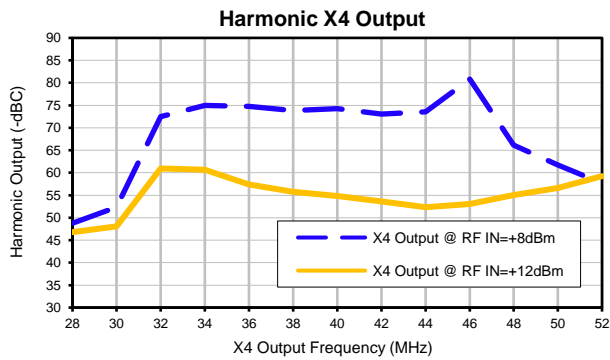
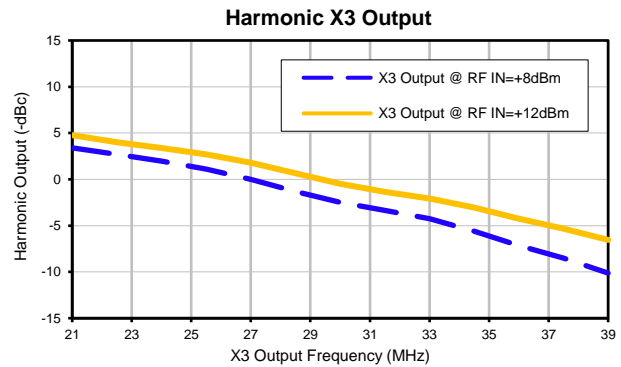
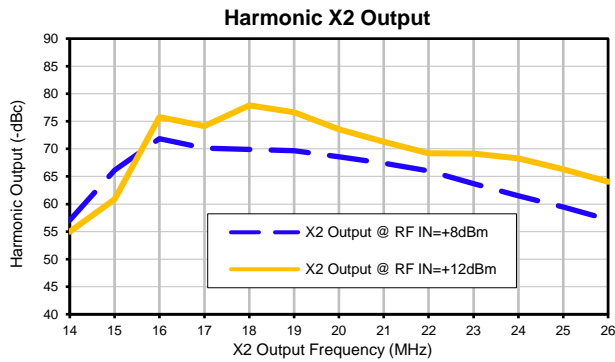
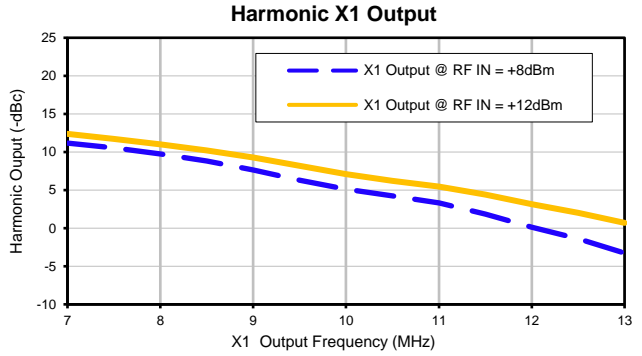
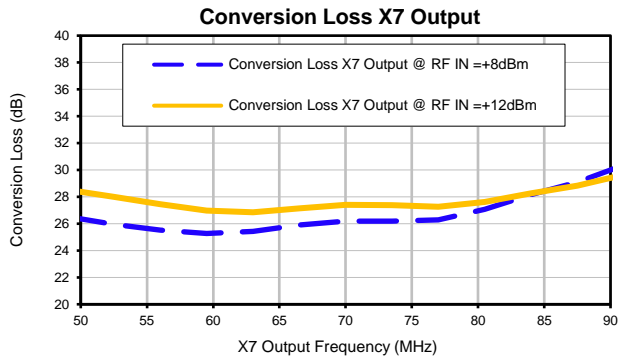
IF/RF MICROWAVE COMPONENTS

REV. OR
RMK-7-81+
7/27/2015
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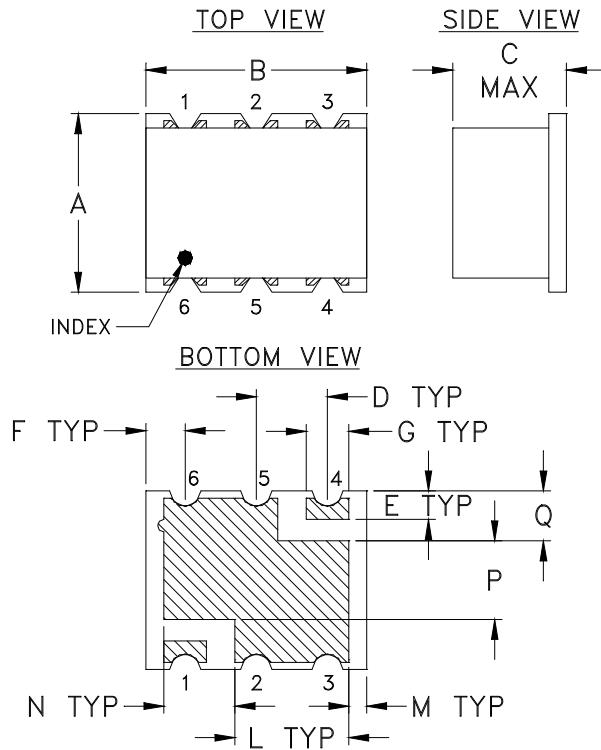
Frequency Multiplier (X7)

Typical Performance Curves

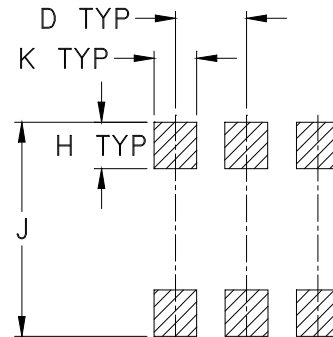
RMK-7-81+



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 μ inch (.05-.25 microns) Gold over 100-300 μ inch (2.54-7.62 microns) Nickel plate



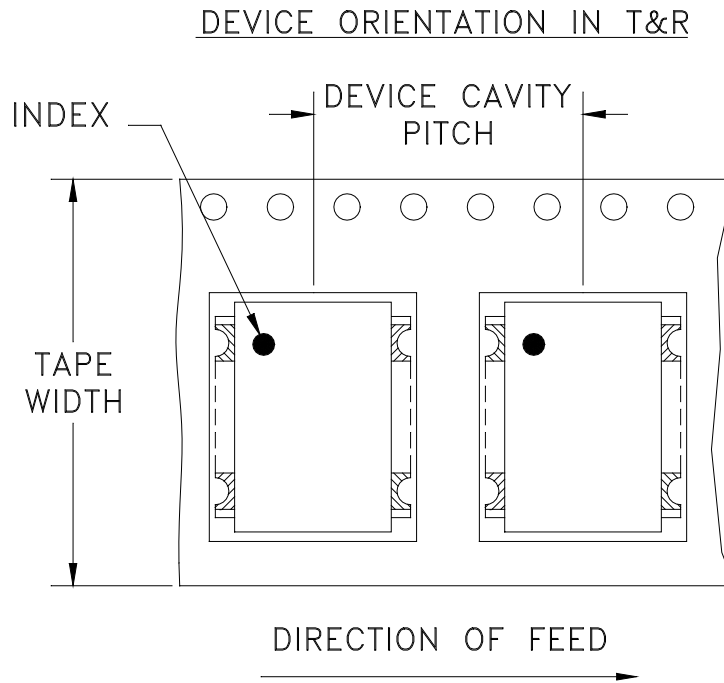
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RF/IF MICROWAVE COMPONENTS

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
			1000

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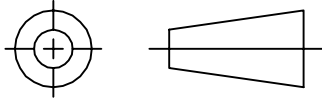
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THIRD ANGLE PROJECTION

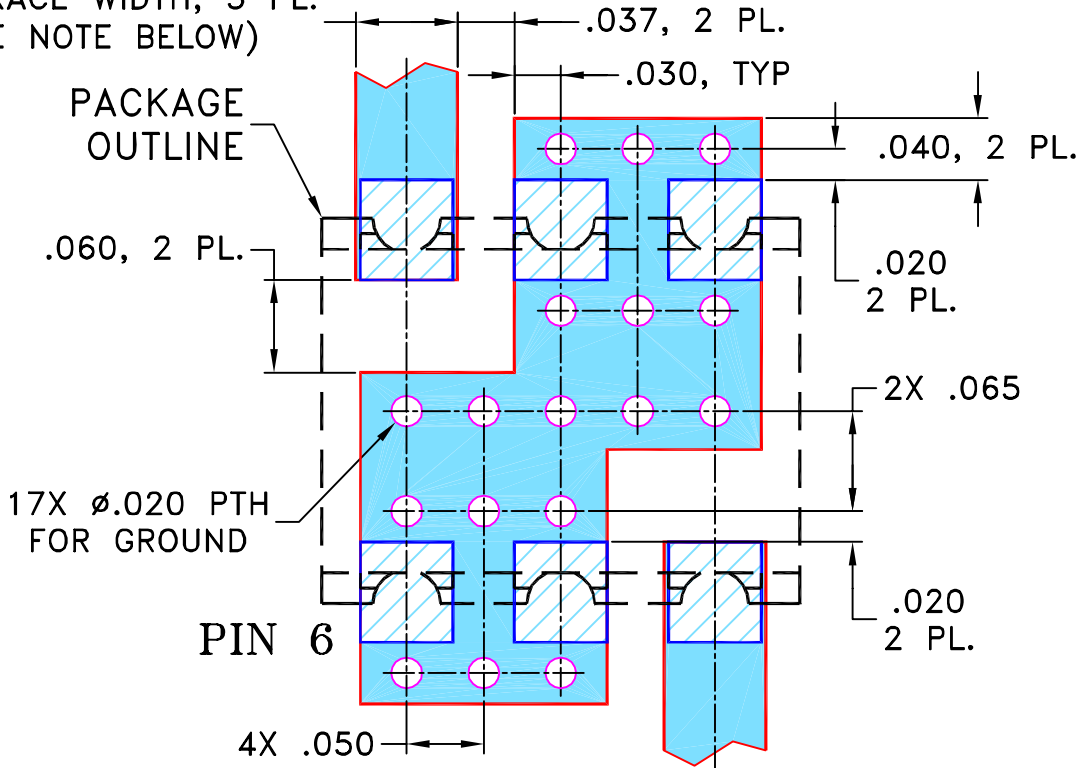


REVISIONS

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
DRAWN	AV	12/14/06
CHECKED	IL	01/04/07
APPROVED	DJ	01/04/07

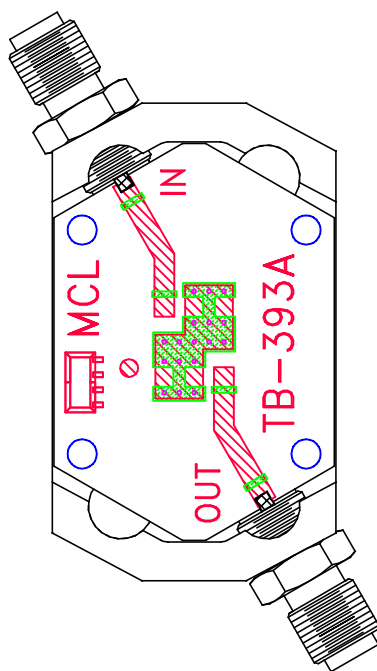
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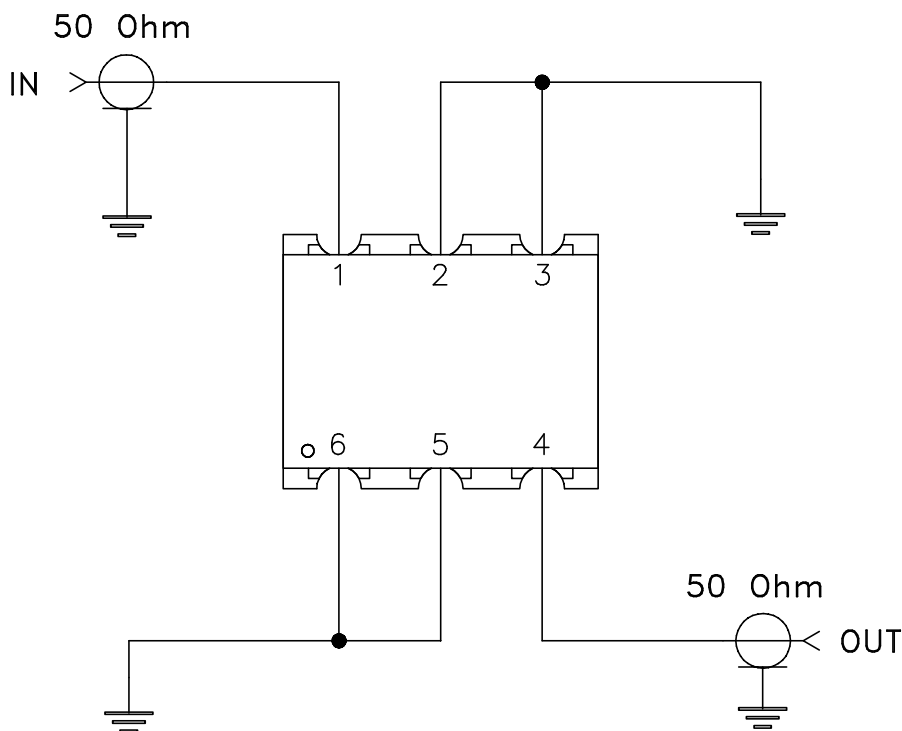
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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-258	OR
FILE:	98PL258	SCALE:	8:1
SHEET:	1	OF	1

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.

 Mini-Circuits®



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