

X3 Frequency Multiplier

RMK-3-722+

50Ω Output 4575 to 7200 MHz



CASE STYLE: TT1224

The Big Deal

- Broadband, output frequency 4575 to 7200 MHz
- High rejection of adjacent harmonics, 55dB below the carrier, F3
- Small package size, 0.25" x 0.3"
- Low cost \$6.45, quantity of 1000

Product Overview

The RMK-3-722+ is a self contained frequency tripler that does not require external components. It is constructed using a specially designed diode quad ring configuration to enable high rejection of adjacent harmonics. The tripler is packaged in a miniature 0.3" x 0.25" case, with wrap-around terminations to enable convenient high density assembly.

Key Features

Feature	Advantages
Broadband frequency tripler Input 1525 to 2400 MHz Output 4575 to 7200 MHz	Enables the use of low frequency VCO's and Synthesizers to provide high frequency sources at low cost.
Low conversion loss, 14 dB	Enables output power to be sufficiently high so that amplifier gain requirements following the tripler is reduced.
High rejection of adjacent harmonics, F2 and F4, 55 dB	Extremely high rejection of F2 and F4 harmonics enables a significant reduction of unwanted signals without the need for filters.
Low cost	Enables a practical solution to achieve high frequency sources from low cost, lower frequency VCO's and synthesizers.

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.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



X3 Frequency Multiplier

50Ω Output 4575 to 7200 MHz

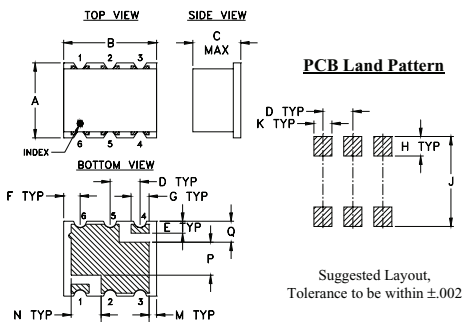
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	17 dBm
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

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

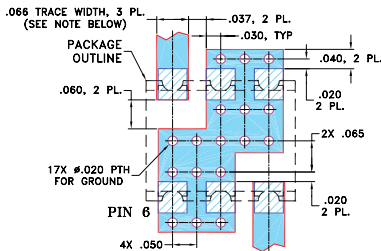
Outline Drawing



Outline Dimensions (inch)

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)



- 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.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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.
- C. The parts covered by this specification document are subject to Mini-Circuit's standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuit's website at www.minicircuits.com/MCLStore/terms.jsp

Features

- broadband
- low conversion loss, 14 dB typ.
- high rejection F2, 55 dBc typ.; F4, 55 dBc typ.
- low cost
- aqueous washable

Applications

- synthesizers
- local oscillators
- satellite up and down converters

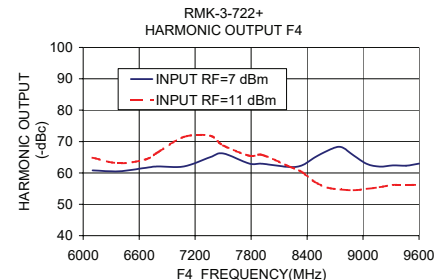
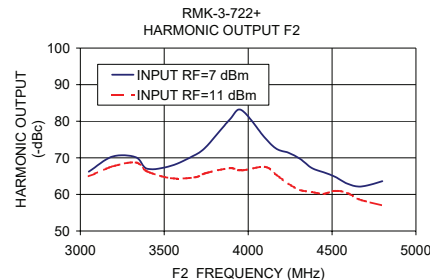
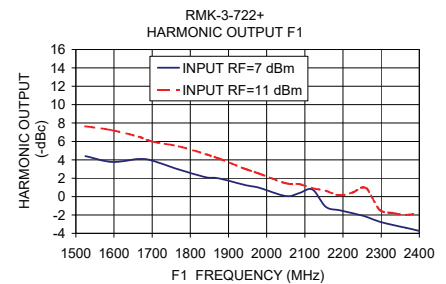
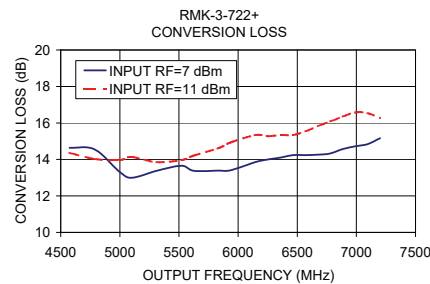
Electrical Specifications

MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)	*HARMONIC OUTPUT (dBc)					
	F1 Input	F3 Output	Min.	Max.		F1 Typ.	F2 Typ.	F3 Min.	F4 Typ.	F5 Min.	F6 Typ.
3	1525-2400	4575-7200	7	11	14 19	3	-7	55 35	55 35		

* Harmonics of input frequency below the power level of F3

Typical Performance Data

INPUT RF= 7 dBm					INPUT RF= 11 dBm					
Input Frequency (MHz)	Conversion Loss (dB)	Harmonic Output Below F3 (-dBc)				Conversion Loss (dB)	Harmonic Output Below F3 (-dBc)			
	F3	F1	F2	F4		F3	F1	F2	F4	
1525	14.64	4.41	66.20	60.80	14.36	7.65	64.92	64.88		
1595	14.55	3.77	70.33	60.53	14.03	7.22	67.62	63.06		
1665	13.34	4.09	70.15	61.60	13.96	6.51	68.73	64.22		
1700	12.99	3.91	67.00	62.08	14.14	6.00	66.24	66.54		
1770	13.38	2.95	67.80	62.08	13.85	5.46	64.45	71.46		
1840	13.65	2.11	70.68	65.00	13.96	4.62	64.63	71.87		
1875	13.38	1.98	73.03	66.20	14.21	4.14	65.84	68.75		
1945	13.39	1.24	80.44	62.98	14.62	3.00	67.16	65.50		
1980	13.41	0.97	83.05	62.93	14.94	2.50	66.55	65.71		
2050	13.86	0.07	75.46	61.91	15.34	1.45	67.55	62.15		
2085	14.00	0.37	72.44	62.33	15.27	1.35	65.32	60.38		
2120	14.10	0.76	71.38	64.92	15.34	0.92	62.92	57.20		
2155	14.24	-1.11	69.70	67.06	15.34	0.63	61.18	55.31		
2190	14.24	-1.47	67.22	68.30	15.54	0.12	60.65	54.71		
2225	14.26	-1.81	66.05	65.52	15.82	0.44	60.15	54.46		
2260	14.33	-2.18	64.76	62.89	16.08	0.93	61.00	54.93		
2295	14.57	-2.72	62.98	62.03	16.35	-1.40	60.43	55.45		
2330	14.72	-3.08	62.15	62.39	16.57	-1.77	58.69	56.19		
2365	14.84	-3.40	62.66	62.31	16.54	-1.98	57.82	56.21		
2400	15.16	-3.74	63.61	62.98	16.26	-1.80	56.96	56.16		



www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

RMK-3-722+



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

Reel Size	Devices/Reel
7"	10, 20, 50, 100, 200
13"	500

REV. B
M151107
RMK-3-722+
ED-13615
DJ/CP/AM
200813
Page 2 of 2

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 7 dBm @ +25°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	15.32	3.96	68.30	63.37
1560.0	3120.0	4680.0	6240.0	14.38	4.40	65.39	62.47
1595.0	3190.0	4785.0	6380.0	14.37	3.94	68.41	61.03
1630.0	3260.0	4890.0	6520.0	14.02	3.88	70.82	61.59
1665.0	3330.0	4995.0	6660.0	13.61	3.85	67.27	61.31
1700.0	3400.0	5100.0	6800.0	14.84	2.41	71.58	59.57
1735.0	3470.0	5205.0	6940.0	13.78	3.06	75.01	60.26
1770.0	3540.0	5310.0	7080.0	13.76	2.72	68.51	61.21
1805.0	3610.0	5415.0	7220.0	13.45	2.66	70.46	63.33
1840.0	3680.0	5520.0	7360.0	13.48	2.22	75.25	63.84
1875.0	3750.0	5625.0	7500.0	13.60	1.94	72.81	65.97
1910.0	3820.0	5730.0	7640.0	13.40	1.67	76.97	64.36
1945.0	3890.0	5835.0	7780.0	13.42	1.29	84.90	64.12
1980.0	3960.0	5940.0	7920.0	13.60	0.86	80.71	62.69
2015.0	4030.0	6045.0	8060.0	13.93	0.16	77.64	63.15
2050.0	4100.0	6150.0	8200.0	14.00	-0.09	78.76	62.71
2085.0	4170.0	6255.0	8340.0	14.16	-0.62	74.89	64.34
2120.0	4240.0	6360.0	8480.0	14.09	-0.82	70.94	65.68
2155.0	4310.0	6465.0	8620.0	14.04	-1.04	70.63	68.13
2190.0	4380.0	6570.0	8760.0	14.78	-1.96	69.56	65.72
2225.0	4450.0	6675.0	8900.0	14.80	-2.14	66.58	68.50
2260.0	4520.0	6780.0	9040.0	14.49	-2.16	65.44	64.24
2295.0	4590.0	6885.0	9180.0	14.92	-2.89	63.67	61.89
2330.0	4660.0	6990.0	9320.0	15.16	-3.28	64.28	67.91
2365.0	4730.0	7095.0	9460.0	16.00	-4.22	62.72	66.57
2400.0	4800.0	7200.0	9600.0	14.93	-3.64	63.07	62.34

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

IF/RF MICROWAVE COMPONENTS



REV. X1
RMK-3-722+
9/15/2009
Page 1 of 6

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 7 dBm @ -40°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	15.33	3.50	64.03	63.10
1560.0	3120.0	4680.0	6240.0	14.12	4.17	61.57	60.94
1595.0	3190.0	4785.0	6380.0	14.20	3.63	63.75	58.93
1630.0	3260.0	4890.0	6520.0	13.74	3.65	66.77	60.16
1665.0	3330.0	4995.0	6660.0	13.29	3.73	63.11	58.29
1700.0	3400.0	5100.0	6800.0	15.13	1.73	65.94	57.43
1735.0	3470.0	5205.0	6940.0	13.53	2.89	70.88	56.55
1770.0	3540.0	5310.0	7080.0	13.56	2.45	64.09	54.74
1805.0	3610.0	5415.0	7220.0	12.92	2.69	65.86	56.02
1840.0	3680.0	5520.0	7360.0	12.90	2.29	71.44	58.56
1875.0	3750.0	5625.0	7500.0	13.09	1.93	68.07	62.17
1910.0	3820.0	5730.0	7640.0	12.72	1.78	70.19	62.33
1945.0	3890.0	5835.0	7780.0	12.71	1.44	70.29	62.24
1980.0	3960.0	5940.0	7920.0	12.84	1.07	66.92	58.87
2015.0	4030.0	6045.0	8060.0	13.21	0.36	65.58	58.16
2050.0	4100.0	6150.0	8200.0	13.34	0.01	64.79	57.59
2085.0	4170.0	6255.0	8340.0	13.54	-0.58	65.18	57.73
2120.0	4240.0	6360.0	8480.0	13.46	-0.77	68.31	57.83
2155.0	4310.0	6465.0	8620.0	13.38	-0.95	77.24	61.57
2190.0	4380.0	6570.0	8760.0	14.15	-1.90	76.26	62.46
2225.0	4450.0	6675.0	8900.0	14.15	-2.07	66.44	70.75
2260.0	4520.0	6780.0	9040.0	13.76	-2.02	65.99	63.48
2295.0	4590.0	6885.0	9180.0	14.21	-2.79	63.40	61.10
2330.0	4660.0	6990.0	9320.0	14.53	-3.27	60.10	70.44
2365.0	4730.0	7095.0	9460.0	15.94	-4.74	55.29	61.19
2400.0	4800.0	7200.0	9600.0	14.52	-3.78	61.15	61.13

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/MW MICROWAVE COMPONENTS



REV. X1
RMK-3-722+
9/15/2009
Page 2 of 6

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 7 dBm @ +85°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	15.31	4.36	73.85	63.35
1560.0	3120.0	4680.0	6240.0	14.65	4.51	72.35	63.58
1595.0	3190.0	4785.0	6380.0	14.59	4.13	75.21	62.93
1630.0	3260.0	4890.0	6520.0	14.32	4.02	75.95	63.26
1665.0	3330.0	4995.0	6660.0	14.00	3.90	73.76	63.74
1700.0	3400.0	5100.0	6800.0	14.83	2.83	78.77	62.60
1735.0	3470.0	5205.0	6940.0	14.15	3.16	77.13	63.79
1770.0	3540.0	5310.0	7080.0	14.15	2.77	72.97	64.80
1805.0	3610.0	5415.0	7220.0	14.00	2.58	75.73	66.04
1840.0	3680.0	5520.0	7360.0	14.00	2.18	78.46	65.61
1875.0	3750.0	5625.0	7500.0	14.14	1.91	76.98	66.47
1910.0	3820.0	5730.0	7640.0	14.03	1.50	82.26	66.01
1945.0	3890.0	5835.0	7780.0	14.06	1.17	81.47	66.50
1980.0	3960.0	5940.0	7920.0	14.26	0.75	82.79	65.78
2015.0	4030.0	6045.0	8060.0	14.51	0.11	75.91	66.47
2050.0	4100.0	6150.0	8200.0	14.59	-0.18	74.00	66.74
2085.0	4170.0	6255.0	8340.0	14.76	-0.73	74.10	68.08
2120.0	4240.0	6360.0	8480.0	14.73	-0.98	70.05	67.32
2155.0	4310.0	6465.0	8620.0	14.71	-1.19	69.60	68.22
2190.0	4380.0	6570.0	8760.0	15.41	-2.05	69.01	66.18
2225.0	4450.0	6675.0	8900.0	15.42	-2.21	66.55	67.19
2260.0	4520.0	6780.0	9040.0	15.08	-2.20	66.21	65.26
2295.0	4590.0	6885.0	9180.0	15.50	-2.91	64.93	63.29
2330.0	4660.0	6990.0	9320.0	15.61	-3.18	65.66	67.47
2365.0	4730.0	7095.0	9460.0	16.19	-3.93	63.64	68.35
2400.0	4800.0	7200.0	9600.0	15.39	-3.57	64.25	63.26

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/MW MICROWAVE COMPONENTS



REV. X1
RMK-3-722+
9/15/2009
Page 3 of 6

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 11 dBm @ +25°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	14.25	7.77	67.72	63.94
1560.0	3120.0	4680.0	6240.0	14.17	7.52	64.47	67.80
1595.0	3190.0	4785.0	6380.0	14.02	7.23	65.56	65.51
1630.0	3260.0	4890.0	6520.0	13.92	6.89	68.27	64.35
1665.0	3330.0	4995.0	6660.0	13.97	6.56	65.24	67.64
1700.0	3400.0	5100.0	6800.0	14.02	6.03	65.47	66.83
1735.0	3470.0	5205.0	6940.0	13.88	5.83	68.46	65.85
1770.0	3540.0	5310.0	7080.0	13.83	5.54	65.12	68.98
1805.0	3610.0	5415.0	7220.0	14.14	4.96	65.14	70.77
1840.0	3680.0	5520.0	7360.0	14.10	4.53	66.52	69.08
1875.0	3750.0	5625.0	7500.0	14.18	4.30	65.72	69.53
1910.0	3820.0	5730.0	7640.0	14.51	3.54	66.23	66.78
1945.0	3890.0	5835.0	7780.0	14.60	3.08	67.45	66.06
1980.0	3960.0	5940.0	7920.0	15.05	2.44	68.34	64.63
2015.0	4030.0	6045.0	8060.0	15.38	1.69	66.83	64.79
2050.0	4100.0	6150.0	8200.0	15.33	1.52	65.01	62.15
2085.0	4170.0	6255.0	8340.0	15.73	0.79	66.38	60.47
2120.0	4240.0	6360.0	8480.0	15.57	0.69	63.13	57.30
2155.0	4310.0	6465.0	8620.0	15.63	0.42	64.47	56.92
2190.0	4380.0	6570.0	8760.0	16.37	-0.54	61.86	54.70
2225.0	4450.0	6675.0	8900.0	15.94	-0.42	63.10	55.46
2260.0	4520.0	6780.0	9040.0	16.12	-0.81	60.40	55.09
2295.0	4590.0	6885.0	9180.0	16.75	-1.59	60.52	55.57
2330.0	4660.0	6990.0	9320.0	16.27	-1.35	61.35	56.84
2365.0	4730.0	7095.0	9460.0	16.21	-1.73	58.10	56.26
2400.0	4800.0	7200.0	9600.0	15.49	-1.54	54.38	55.81

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

IF/RF MICROWAVE COMPONENTS



REV. X1
RMK-3-722+
9/15/2009
Page 4 of 6

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 11 dBm @ -40°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	13.42	8.24	65.31	63.55
1560.0	3120.0	4680.0	6240.0	13.36	7.92	62.26	65.29
1595.0	3190.0	4785.0	6380.0	13.21	7.64	63.84	62.63
1630.0	3260.0	4890.0	6520.0	13.09	7.28	66.56	62.71
1665.0	3330.0	4995.0	6660.0	13.13	7.07	62.70	66.02
1700.0	3400.0	5100.0	6800.0	13.23	6.51	63.92	64.56
1735.0	3470.0	5205.0	6940.0	13.08	6.31	68.62	63.19
1770.0	3540.0	5310.0	7080.0	13.08	5.91	64.03	66.34
1805.0	3610.0	5415.0	7220.0	13.35	5.37	63.55	70.65
1840.0	3680.0	5520.0	7360.0	13.31	4.95	64.88	71.95
1875.0	3750.0	5625.0	7500.0	13.35	4.72	64.82	71.42
1910.0	3820.0	5730.0	7640.0	13.67	3.93	66.44	66.72
1945.0	3890.0	5835.0	7780.0	13.72	3.54	68.87	64.31
1980.0	3960.0	5940.0	7920.0	14.18	2.90	71.38	63.39
2015.0	4030.0	6045.0	8060.0	14.59	2.10	67.37	65.40
2050.0	4100.0	6150.0	8200.0	14.62	1.82	65.03	62.64
2085.0	4170.0	6255.0	8340.0	15.04	1.05	67.82	62.17
2120.0	4240.0	6360.0	8480.0	14.82	1.00	63.61	60.17
2155.0	4310.0	6465.0	8620.0	14.84	0.75	63.58	57.92
2190.0	4380.0	6570.0	8760.0	15.56	-0.19	61.54	53.75
2225.0	4450.0	6675.0	8900.0	14.99	0.08	65.19	54.00
2260.0	4520.0	6780.0	9040.0	15.36	-0.50	59.69	52.54
2295.0	4590.0	6885.0	9180.0	16.11	-1.42	59.54	54.67
2330.0	4660.0	6990.0	9320.0	15.59	-1.14	59.74	56.72
2365.0	4730.0	7095.0	9460.0	15.77	-1.77	57.05	55.90
2400.0	4800.0	7200.0	9600.0	14.79	-1.22	54.00	53.77

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/MW MICROWAVE COMPONENTS



REV. X1
RMK-3-722+
9/15/2009
Page 5 of 6

Frequency Multiplier (Tripler)

RMK-3-722+

Typical Performance Data

Test Conditions: RF Input Power = 11 dBm @ +85°C

FREQUENCY (MHz)				CONVERSION LOSS (dB)	HARMONIC OUTPUT* (-dBc)		
X1 OUTPUT	X2 OUTPUT	X3 OUTPUT	X4 OUTPUT	X3 OUTPUT	X1 OUTPUT	X2 OUTPUT	X4 OUTPUT
1525.0	3050.0	4575.0	6100.0	15.01	7.31	69.53	63.72
1560.0	3120.0	4680.0	6240.0	14.94	7.00	66.43	67.08
1595.0	3190.0	4785.0	6380.0	14.79	6.75	67.28	65.69
1630.0	3260.0	4890.0	6520.0	14.69	6.42	69.67	64.49
1665.0	3330.0	4995.0	6660.0	14.76	6.11	66.77	67.12
1700.0	3400.0	5100.0	6800.0	14.81	5.58	66.92	67.02
1735.0	3470.0	5205.0	6940.0	14.59	5.47	68.69	66.75
1770.0	3540.0	5310.0	7080.0	14.57	5.10	65.71	68.71
1805.0	3610.0	5415.0	7220.0	14.85	4.59	66.06	69.36
1840.0	3680.0	5520.0	7360.0	14.82	4.15	66.14	67.55
1875.0	3750.0	5625.0	7500.0	14.94	3.90	65.48	68.45
1910.0	3820.0	5730.0	7640.0	15.24	3.13	64.90	67.03
1945.0	3890.0	5835.0	7780.0	15.37	2.68	65.99	66.00
1980.0	3960.0	5940.0	7920.0	15.78	2.13	66.31	64.96
2015.0	4030.0	6045.0	8060.0	16.04	1.42	64.24	64.07
2050.0	4100.0	6150.0	8200.0	16.06	1.15	63.23	61.19
2085.0	4170.0	6255.0	8340.0	16.41	0.43	64.26	59.75
2120.0	4240.0	6360.0	8480.0	16.35	0.24	62.21	57.80
2155.0	4310.0	6465.0	8620.0	16.43	0.01	63.76	57.81
2190.0	4380.0	6570.0	8760.0	17.16	-0.93	61.82	56.61
2225.0	4450.0	6675.0	8900.0	16.80	-0.87	62.37	56.79
2260.0	4520.0	6780.0	9040.0	16.76	-1.07	59.93	56.49
2295.0	4590.0	6885.0	9180.0	17.38	-1.81	60.47	56.75
2330.0	4660.0	6990.0	9320.0	16.87	-1.51	61.50	57.69
2365.0	4730.0	7095.0	9460.0	16.68	-1.85	58.52	57.67
2400.0	4800.0	7200.0	9600.0	16.36	-2.03	55.32	57.89

* Harmonic Output below power level of X3 Output.



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

IF/RF MICROWAVE COMPONENTS



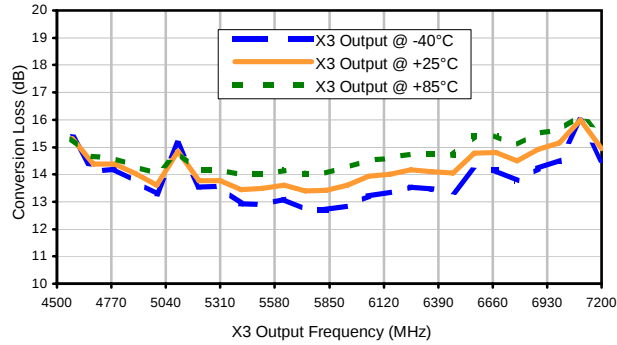
REV. X1
RMK-3-722+
9/15/2009
Page 6 of 6

Frequency Multiplier (Tripler)

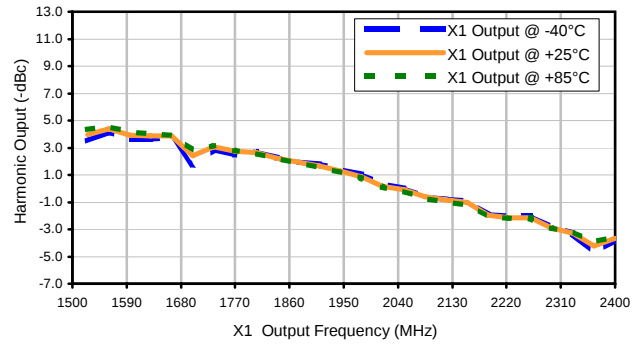
RMK-3-722+

Typical Performance Curves

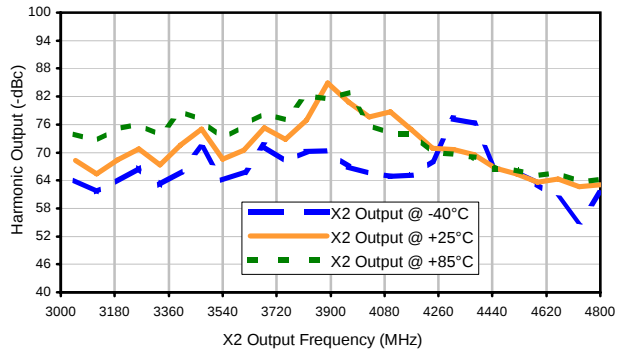
Conversion Loss X3 Output @ RF IN =7dBm



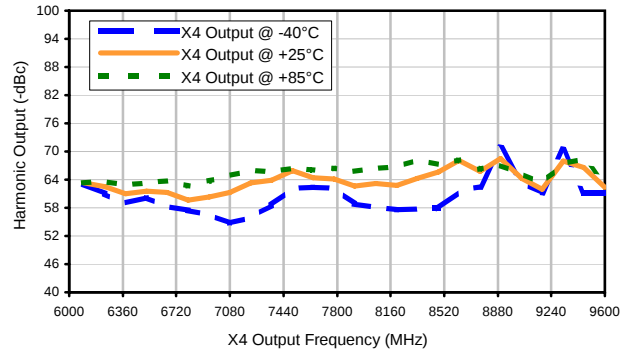
Harmonic X1 Output @ RF IN =7dBm



Harmonic X2 Output @ RF IN =7dBm



Harmonic X4 Output @ RF IN =7dBm



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

IF/RF MICROWAVE COMPONENTS



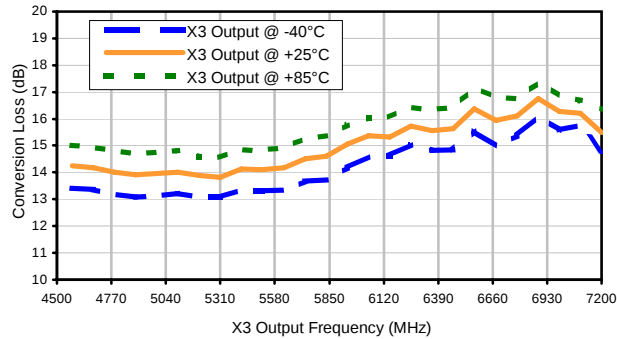
REV. X1
RMK-3-722+
9/15/2009
Page 1 of 2

Frequency Multiplier (Tripler)

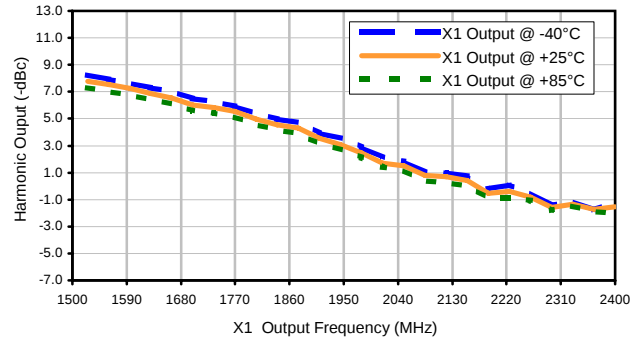
RMK-3-722+

Typical Performance Curves

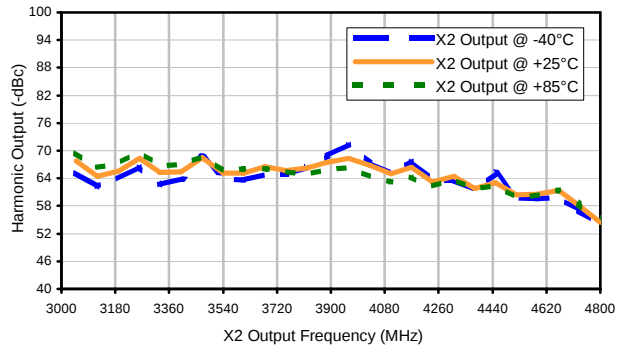
Conversion Loss X3 Output @ RF IN=11dBm



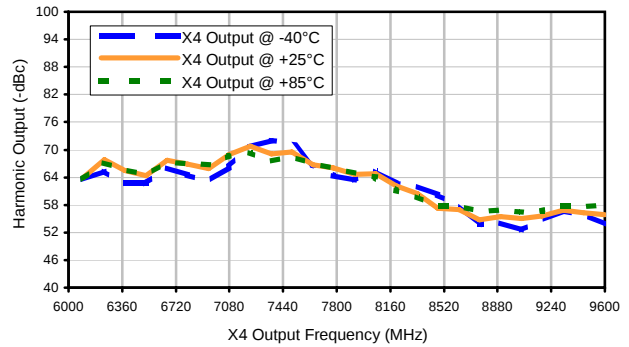
Harmonic X1 Output @ RF IN=11dBm



Harmonic X2 Output @ RF IN=11dBm



Harmonic X4 Output @ RF IN=11dBm



P.O. Box 350188, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4851 For detailed performance specs & shopping online see Mini-Circuits web site



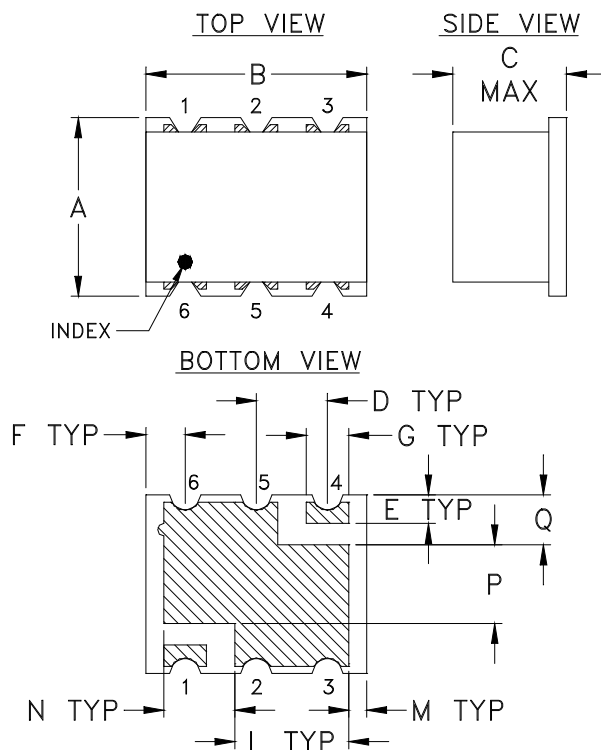
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

IF/RF MICROWAVE COMPONENTS

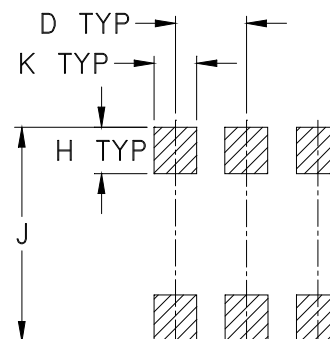


REV. X1
RMK-3-722+
9/15/2009
Page 2 of 2

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:

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



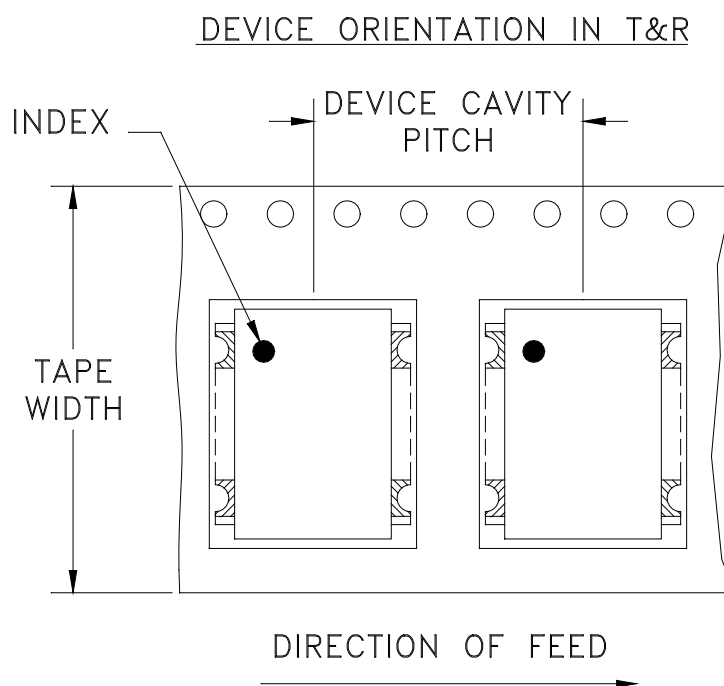
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

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

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



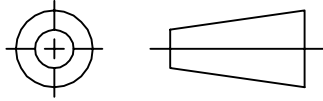
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

THIRD ANGLE PROJECTION

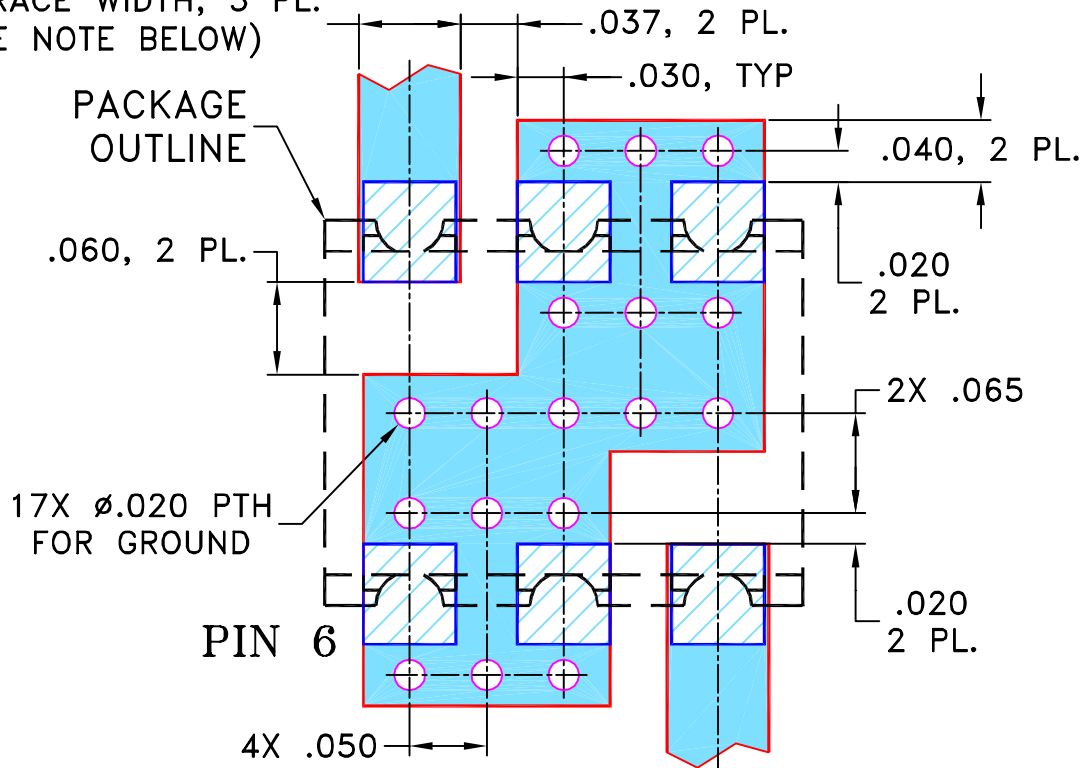


REVISIONS

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" $\pm$.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

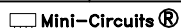
01/04/07

2 PL DECIMALS $\pm$

APPROVED

DJ

01/04/07

3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$ 

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

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

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-258

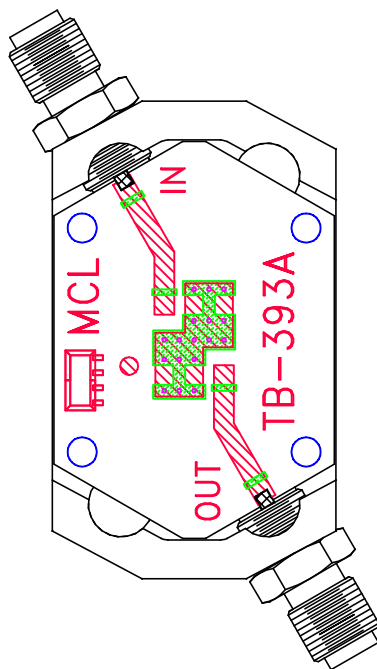
REV:
OR

FILE: 98PL258

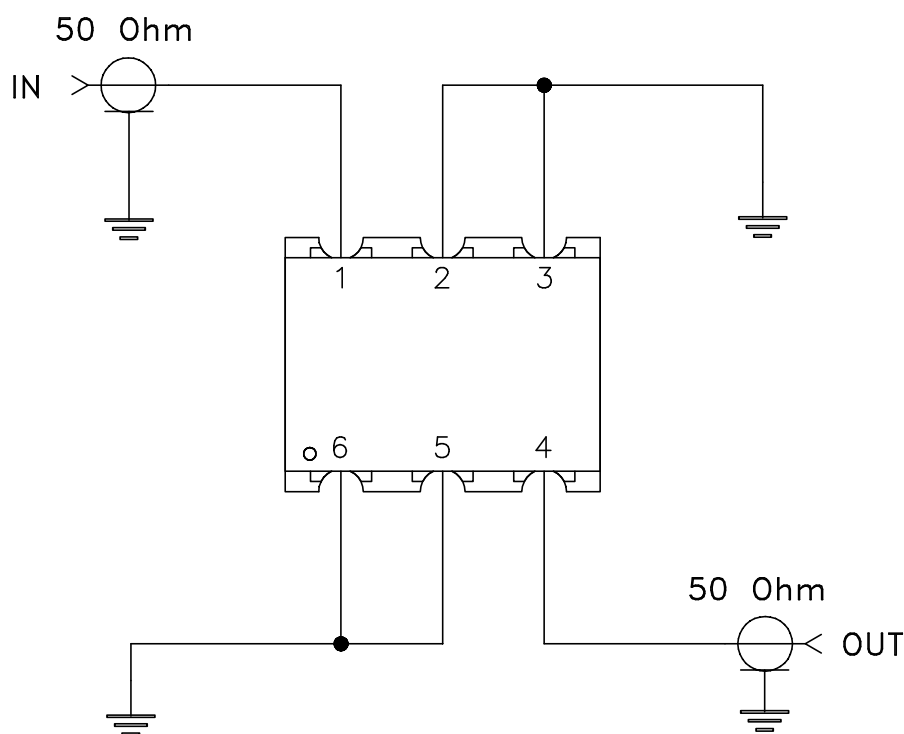
SCALE: 8:1

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