+9 to +32 dBm

Limiter

RLM-521-2WL+

50Ω Broadband 0.5 to 520 MHz



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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	2W

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

Pin Connections

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

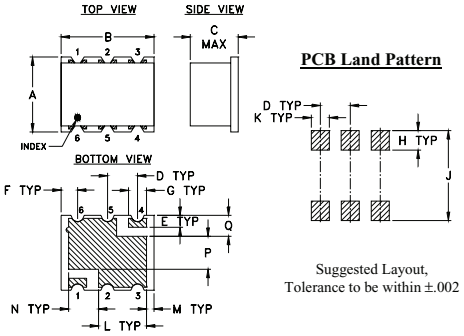
Features

- wideband, 0.5 to 520 MHz
- low insertion loss 0.2 dB typ.
- fast recovery time, 3.7 nsec typ.
- excellent VSWR 1.2:1 typ.
- low output power, 7 dBm typ.
- aqueous washable

Applications

- military, hi-rel applications
- stabilizing generator outputs
- reducing amplitude variations
- protects low noise amplifiers and other devices from ESD or input power damage

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

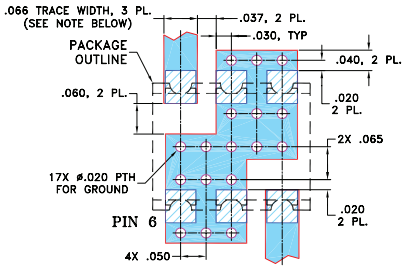
Electrical Specifications

Parameter	Condition	Min.	Typ.	Max.	Units
Frequency Range		0.5	—	520	MHz
Linear Range					
Max Input Power	less than 0.1 dB compression	—	—	-10	dBm
Insertion Loss	less than -10 dBm input power	—	0.2	0.7	dB
VSWR	less than -10 dBm input power	—	1.2	1.78	:1
Limiting Range					
Input Power	>1dB compression filtered signal frequency	+9	—	+32	dBm
Output Power		—	+7	—	dBm
Δ Output/ Δ 1dB Input	Input Power Range (dBm)				dB/dB
	9 to 20	—	0.2	—	
	20 to 25	—	0.3	—	
	25 to 30	—	0.3	—	
	30 to 32	—	0.3	—	
Recovery Time	1 watt pulse 50 µsec pw 1kHz duty cycle recovery to within 90% of final value.	—	3.7	—	nsec
Response Time	-30 to +30 dBm input 50 µsec PW 1 kHz duty cycle	—	5.8	—	nsec

Typical Performance Data

Freq. (MHz)	I. Loss (dB) in Linear Range at -10 dBm	VSWR (:1) in Linear Range at -10 dBm	Power Output (dBm) +9 dBm Input	+20 dBm Input	+25 dBm Input	+30 dBm Input	+32dBm Input	Δ Output / Δ 1dB Input +9 to +20 dBm Input	+20 to +25 dBm Input	+25 to +30 dBm Input	+30 to +33 dBm Input
0.50	0.08	1.15	-0.14	2.93	4.33	6.54	7.67	0.28	0.28	0.44	0.57
0.60	0.07	1.12	-0.11	2.73	4.12	6.05	7.02	0.26	0.28	0.39	0.49
0.70	0.08	1.10	-0.08	2.61	3.97	5.76	6.67	0.24	0.27	0.36	0.46
0.80	0.07	1.07	-0.07	2.53	3.88	5.58	6.47	0.24	0.27	0.34	0.45
0.90	0.06	1.02	-0.06	2.50	3.81	5.46	6.34	0.23	0.26	0.33	0.44
1.00	0.05	1.02	-0.05	2.45	3.80	5.37	6.22	0.23	0.27	0.31	0.43
3.00	0.05	1.02	0.35	2.36	3.66	5.07	5.87	0.18	0.26	0.28	0.40
5.00	0.07	1.04	0.59	2.39	3.70	5.18	5.98	0.16	0.26	0.30	0.40
7.00	0.10	1.07	0.73	2.46	3.79	5.35	6.18	0.16	0.27	0.31	0.42
10.00	0.10	1.08	0.81	2.59	4.02	5.79	6.69	0.16	0.29	0.35	0.45
60.00	0.13	1.12	0.65	2.26	3.54	4.68	5.42	0.19	0.26	0.23	0.37
100.00	0.17	1.17	0.75	2.70	4.16	6.70	7.83	0.14	0.29	0.51	0.57
250.00	0.20	1.22	0.59	2.78	4.23	5.64	6.33	0.18	0.29	0.28	0.35
300.00	0.24	1.27	0.58	2.40	3.66	5.03	5.60	0.15	0.25	0.27	0.29
400.00	0.28	1.33	0.53	2.75	4.06	5.29	5.70	0.22	0.26	0.25	0.21
500.00	0.33	1.39	0.53	2.97	4.31	5.25	5.50	0.19	0.27	0.19	0.13
520.00	0.38	1.45	0.48	2.99	4.25	5.19	5.35	0.22	0.26	0.19	0.08

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



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B 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.

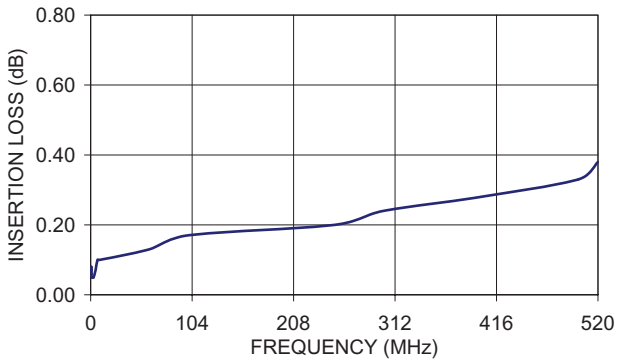
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

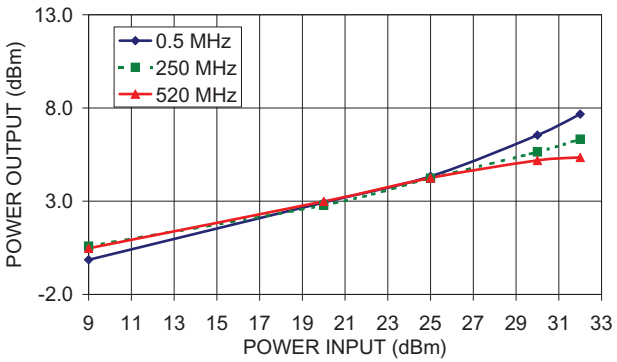
Notes

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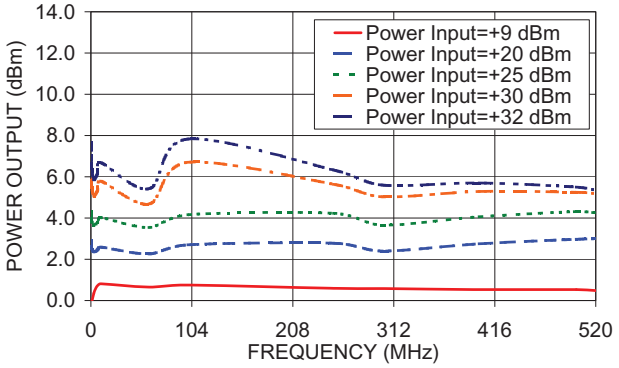
RLM-521-2WL+
INSERTION LOSS IN LINEAR RANGE



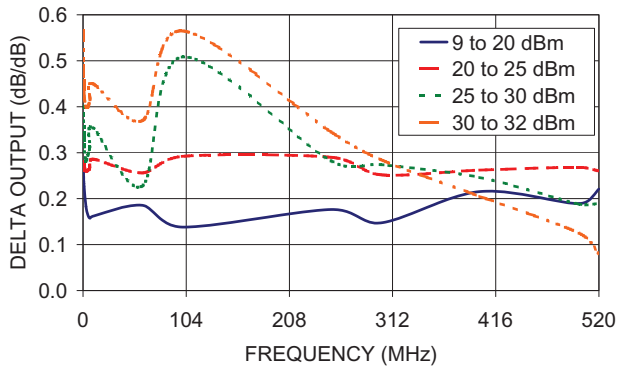
RLM-521-2WL+
POWER OUTPUT vs. POWER INPUT



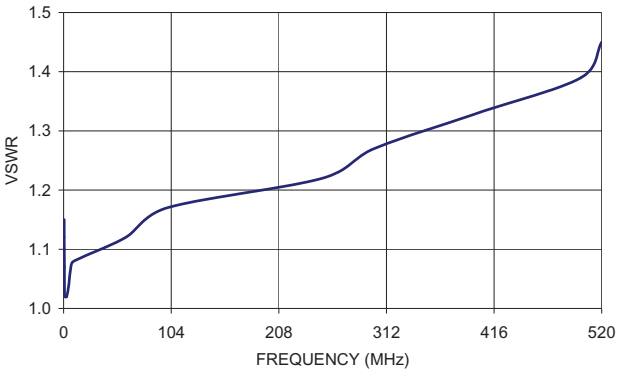
RLM-521-2WL+
POWER OUTPUT vs. FREQUENCY



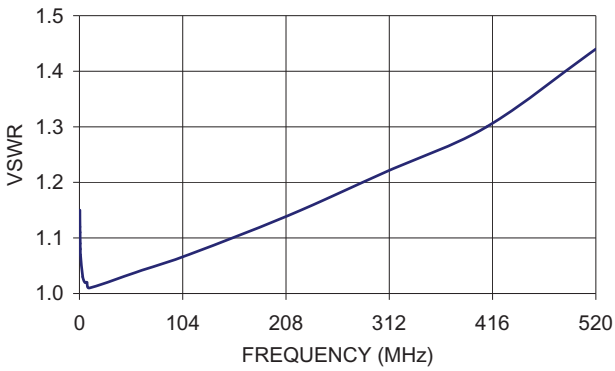
RLM-521-2WL+
DELTA OUTPUT/DELTA 1dB INPUT



RLM-521-2WL+
INPUT VSWR IN LINEAR RANGE



RLM-521-2WL+
OUTPUT VSWR IN LINEAR RANGE



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Surface Mount Limiter

RLM-521-2WL+

Typical Performance Data

FREQUENCY	LOW INPUT POWER			POWER OUTPUT (dBm)					DELTA OUTPUT/1dB DELTA INPUT (dB/dB)			
	INSERTION LOSS	VSWR										
(MHz)	(dB)	Input (:1)	Output (:1)	+9 dBm INPUT	+20 dBm INPUT	+25 dBm INPUT	+30 dBm INPUT	+32 dBm INPUT	+9 to +20 dBm INPUT	+20 to +25 dBm INPUT	+25 to +30 dBm INPUT	+30 to +32 dBm INPUT
0.5	0.08	1.15	1.15	-0.14	2.93	4.33	6.54	7.67	0.28	0.28	0.44	0.57
0.6	0.07	1.12	1.12	-0.11	2.73	4.12	6.05	7.02	0.26	0.28	0.39	0.49
0.7	0.08	1.10	1.11	-0.08	2.61	3.97	5.76	6.67	0.24	0.27	0.36	0.46
0.8	0.07	1.07	1.09	-0.07	2.53	3.88	5.58	6.47	0.24	0.27	0.34	0.45
0.9	0.06	1.02	1.08	-0.06	2.50	3.81	5.46	6.34	0.23	0.26	0.33	0.44
1.0	0.05	1.02	1.07	-0.05	2.45	3.80	5.37	6.22	0.23	0.27	0.31	0.43
3.0	0.05	1.02	1.03	0.35	2.36	3.66	5.07	5.87	0.18	0.26	0.28	0.40
5.0	0.07	1.04	1.02	0.59	2.39	3.70	5.18	5.98	0.16	0.26	0.30	0.40
7.0	0.10	1.07	1.02	0.73	2.46	3.79	5.35	6.18	0.16	0.27	0.31	0.42
10.0	0.10	1.08	1.01	0.81	2.59	4.02	5.79	6.69	0.16	0.29	0.35	0.45
60.0	0.13	1.12	1.04	0.65	2.26	3.54	4.68	5.42	0.19	0.26	0.23	0.37
100.0	0.17	1.17	1.07	0.75	2.70	4.16	6.70	7.83	0.14	0.29	0.51	0.57
250.0	0.20	1.22	1.14	0.59	2.78	4.23	5.64	6.33	0.18	0.29	0.28	0.35
300.0	0.24	1.27	1.22	0.58	2.40	3.66	5.03	5.60	0.15	0.25	0.27	0.29
400.0	0.28	1.33	1.30	0.53	2.75	4.06	5.29	5.70	0.22	0.26	0.25	0.21
500.0	0.33	1.39	1.39	0.53	2.97	4.31	5.25	5.50	0.19	0.27	0.19	0.13
520.0	0.38	1.45	1.44	0.48	2.99	4.25	5.19	5.35	0.22	0.26	0.19	0.08

Typical Performance Data

POWER INPUT	POWER OUTPUT
@ .5 MHz	
(dBM)	
-10	-10.08
0	-0.08
9	-0.14
20	2.93
25	4.33
30	6.54
32	7.67

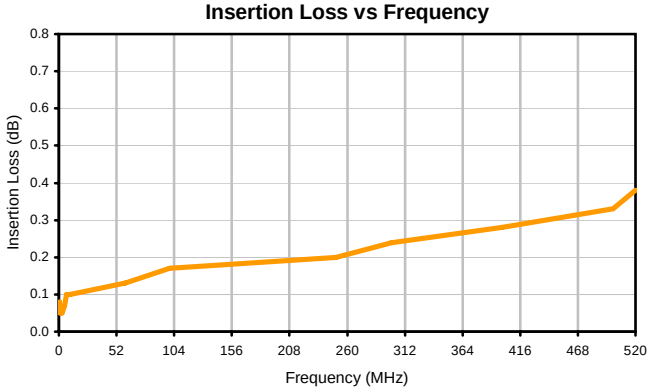
POWER INPUT	POWER OUTPUT
@ 250 MHz	
(dBM)	
-10	-10.21
0	-0.21
9	0.59
20	2.78
25	4.23
30	5.64
32	6.33

POWER INPUT	POWER OUTPUT
@ 520 MHz	
(dBM)	
-10	-10.40
0	-0.40
9	0.48
20	2.99
25	4.25
30	5.19
32	5.35

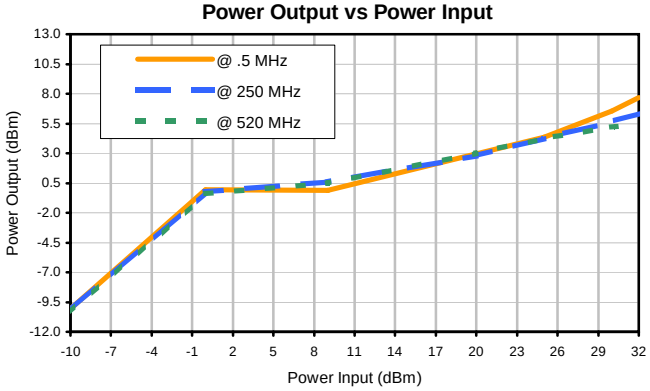
Surface Mount Limiter RLM-521-2WL+

Typical Performance Curves

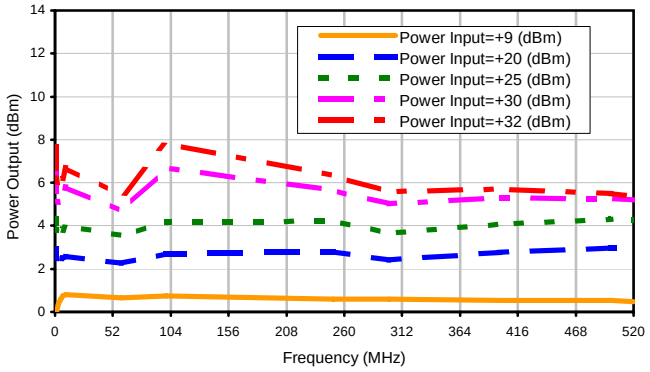
Insertion Loss vs Frequency



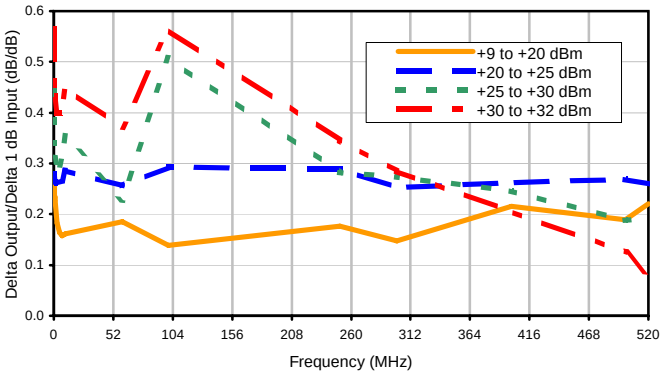
Power Output vs Power Input



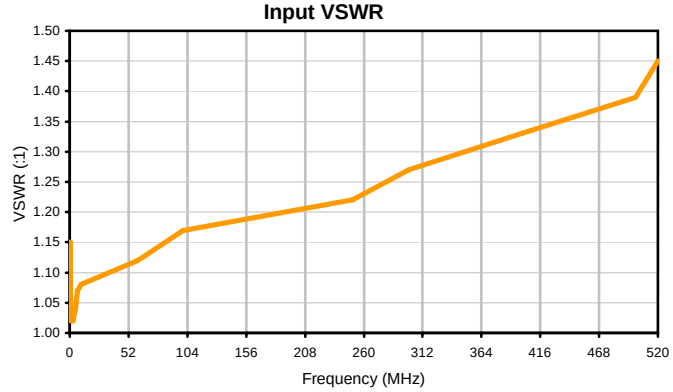
Power Output vs Frequency



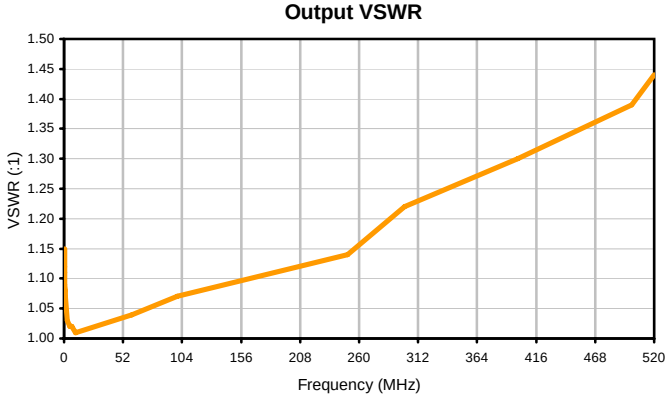
Delta Output / Delta 1dB Input



Input VSWR



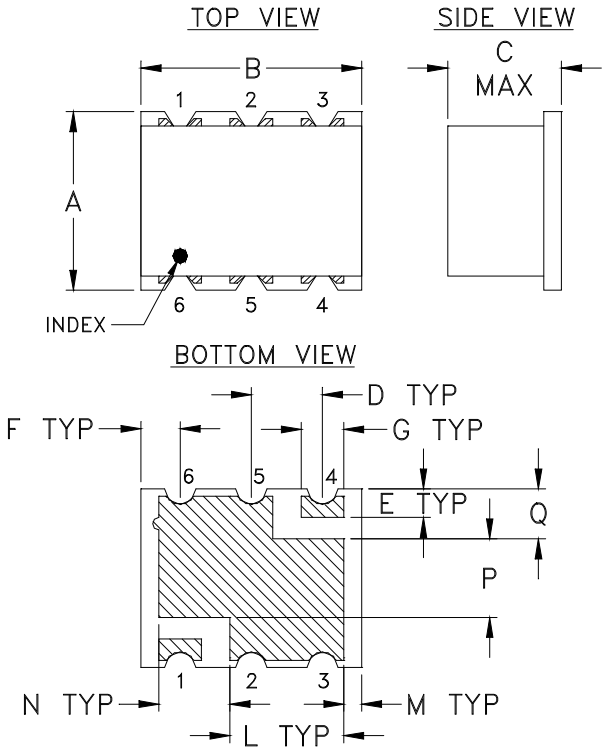
Output VSWR



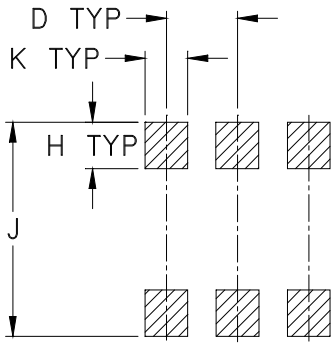
Case Style TT

TT1224

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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

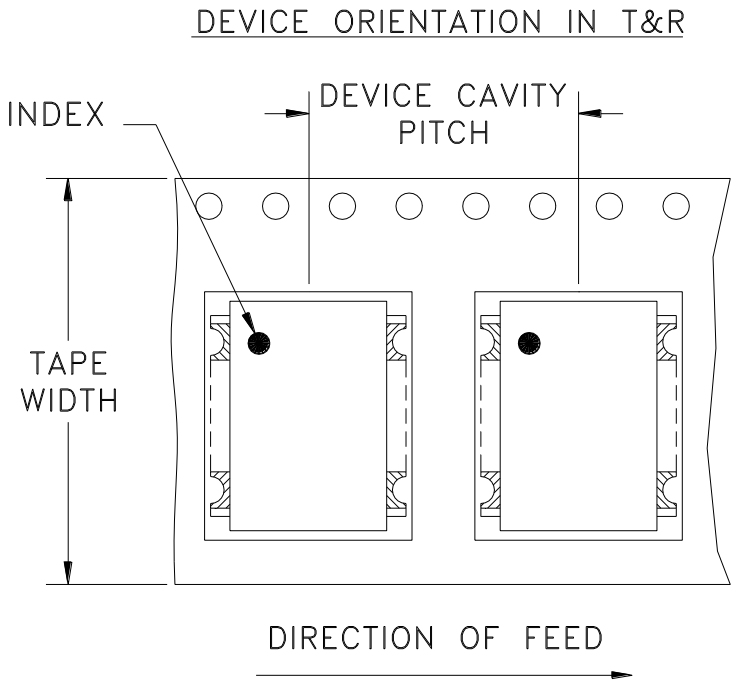
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3 Pl. ± .005

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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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.

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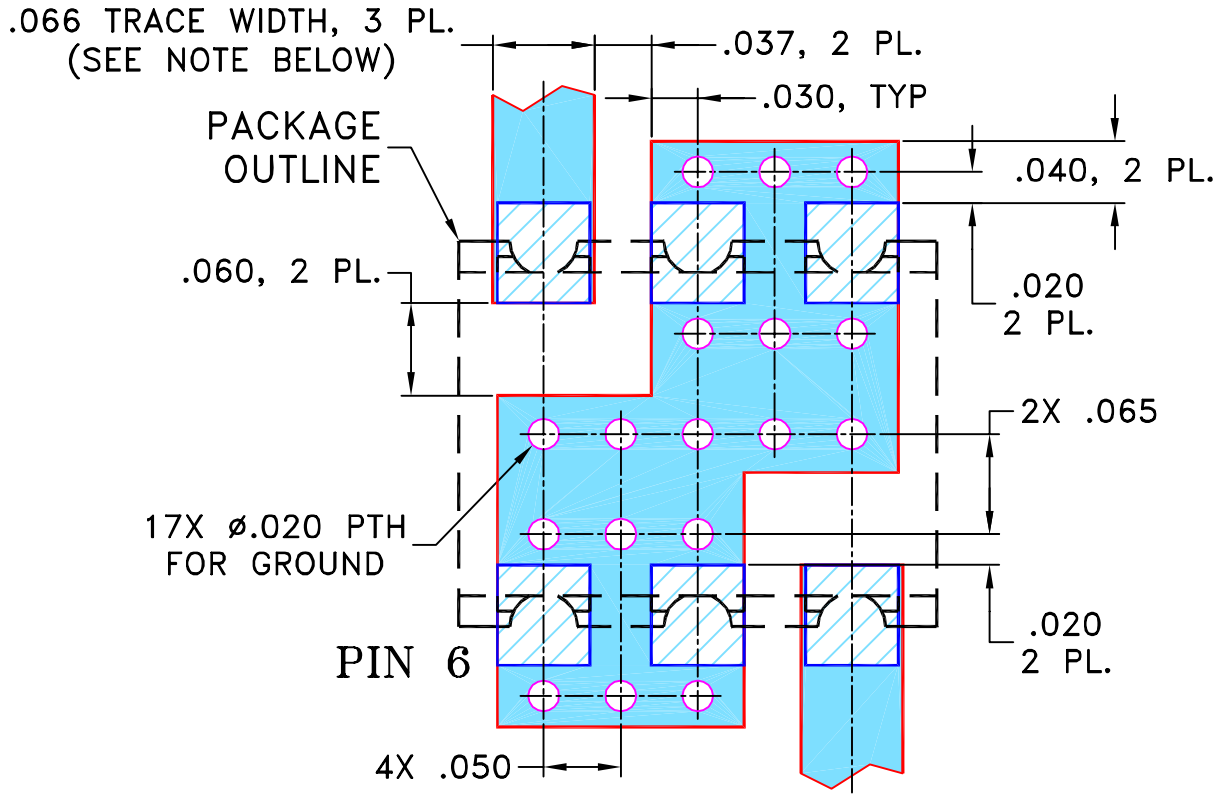
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THIRD ANGLE PROJECTION

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



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B 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 ±	APPROVED	DJ	01/04/07
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

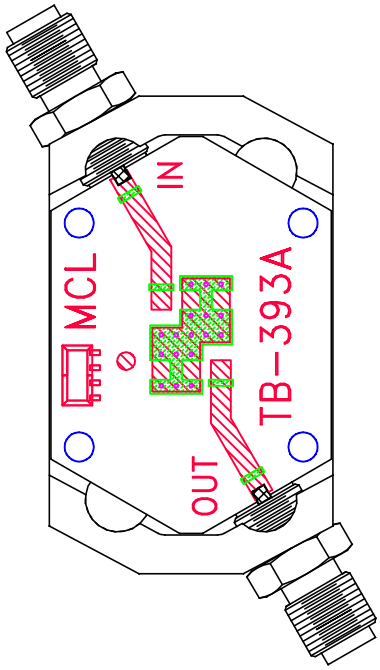
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

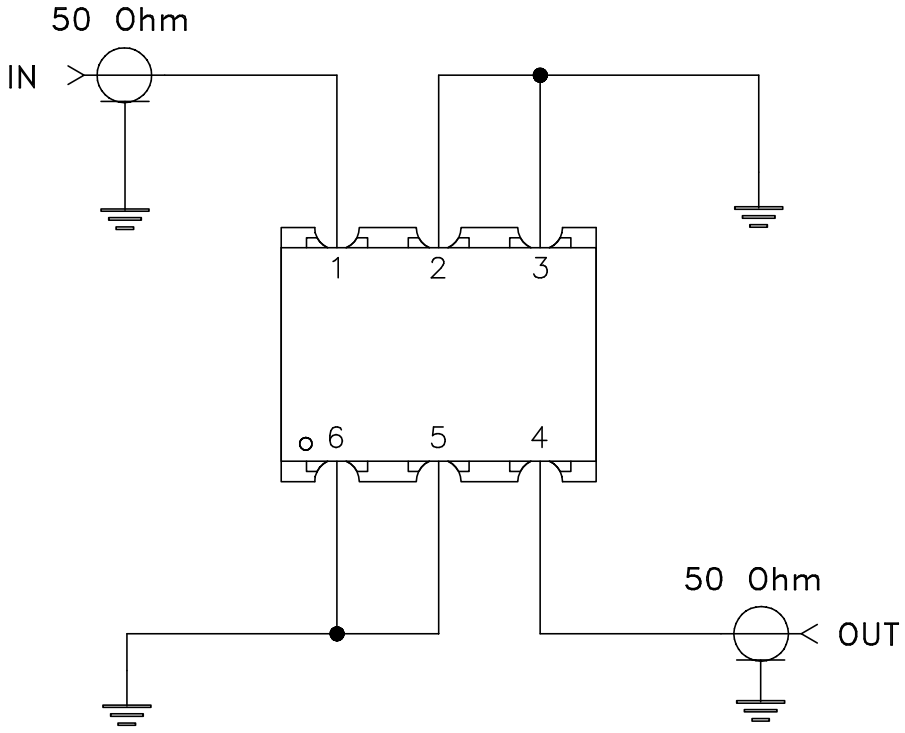
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-258	OR

FILE:	SCALE:	SHEET:
98PL258	8:1	1 OF 1

Evaluation Board and Circuit



TB-393



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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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

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