+5 to +30 dBm

Limiter

RLM-23-1WL+

50Ω Broadband 100 to 2500 MHz

Generic photo used for illustration purposes only

CASE STYLE: CK1246-1

+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	1.5W

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

Pin Connections

INPUT	2
OUTPUT	10
GROUND	all others

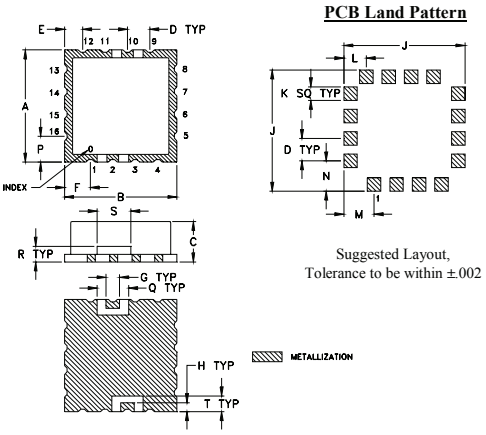
Features

- low insertion loss, 0.7 dB typ.
- very low output power 0 dBm typ. at 30 dBm input
- low cost
- 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

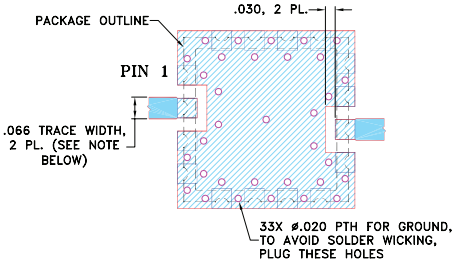


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K
.500	.500	.180	.100	.080	.115	.060	.040	.540	.060
12.70	12.70	4.57	2.54	2.03	2.92	1.52	1.02	13.72	1.52

L	M	N	P	Q	R	S	T	wt.
.100	.135	.135	.115	.140	.070	.150	.070	grams
2.54	3.43	3.43	2.92	3.56	1.78	3.81	1.78	1.0

Demo Board MCL P/N: TB-613+
Suggested PCB Layout (PL-343)



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

Electrical Specifications

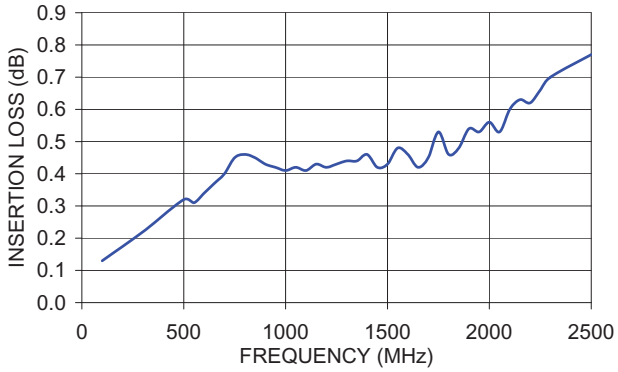
Parameter	Condition	Min.	Typ.	Max.	Units
Frequency Range		100	—	2500	MHz
Linear Range					
Max Input Power	less than 0.1 dB compression	—	—	-10	dBm
Insertion Loss	less than -10 dBm input power	—	0.7	1.3	dB
VSWR	less than -10 dBm input power	—	1.35	1.6	:1
Limiting Range					
Input Power	>1dB compression filtered signal frequency	+5	—	+30	dBm
Output Power		—	0	—	dBm
Δ Output/ Δ 1dB Input	Input Power Range (dBm)				dB/dB
	5 to 10	—	0.1	—	
	10 to 20	—	0.05	—	
	20 to 30	—	0.1	—	
Recovery Time	1 watt pulse 50 µsec pw 1kHz duty cycle recovery to within 90% of final value.	—	8	—	nsec
Response Time	-30 to +30 dBm input 50 µsec PW 1 kHz duty cycle	—	2	—	nsec

Typical Performance Data

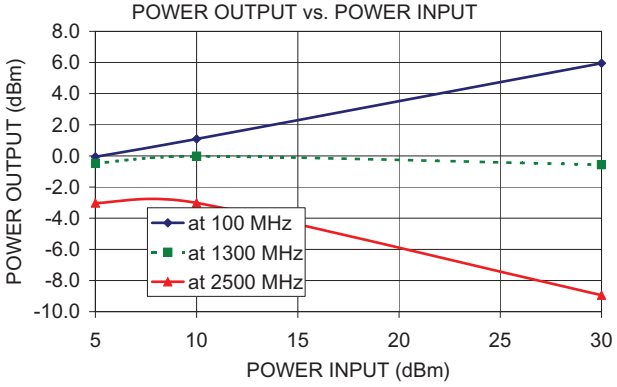
Freq. (MHz)	I. Loss (dB) in Linear Range at -10 dBm	VSWR (:1) in Linear Range at -10 dBm	Power Output (dBm) +5 dBm Input	+10 dBm Input	+20 dBm Input	+30dBm Input	Δ Output / Δ 1dB Input +5 to +10 dBm Input	+10 to +20 dBm Input	+20 to +30 dBm Input
100.00	0.13	1.13	-0.06	1.09	3.26	5.95	0.23	0.22	0.27
300.00	0.22	1.18	-0.18	0.95	2.57	3.37	0.23	0.16	0.08
500.00	0.32	1.27	-0.19	0.94	1.76	2.16	0.23	0.08	0.04
700.00	0.40	1.33	-0.25	0.80	1.31	1.26	0.21	0.05	-0.01
900.00	0.43	1.36	-0.30	0.61	0.96	0.65	0.18	0.04	-0.03
1000.00	0.41	1.35	-0.33	0.54	0.74	0.17	0.17	0.02	-0.06
1200.00	0.42	1.31	-0.41	0.37	0.26	-0.28	0.16	-0.01	-0.05
1300.00	0.44	1.27	-0.48	-0.02	0.02	-0.56	0.09	0.00	-0.06
1500.00	0.43	1.20	-0.77	-0.42	-0.58	-1.34	0.07	-0.02	-0.08
1700.00	0.45	1.17	-1.09	-0.84	-1.49	-1.70	0.05	-0.07	-0.02
1900.00	0.54	1.20	-1.54	-1.39	-1.85	-3.11	0.03	-0.05	-0.13
2000.00	0.56	1.23	-1.84	-1.61	-1.99	-3.09	0.05	-0.04	-0.11
2200.00	0.62	1.25	-2.34	-2.23	-3.13	-4.89	0.02	-0.09	-0.18
2300.00	0.70	1.24	-2.53	-2.54	-2.89	-4.34	0.00	-0.04	-0.15
2500.00	0.77	1.16	-3.02	-3.02	-3.69	-8.94	0.00	-0.07	-0.53

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

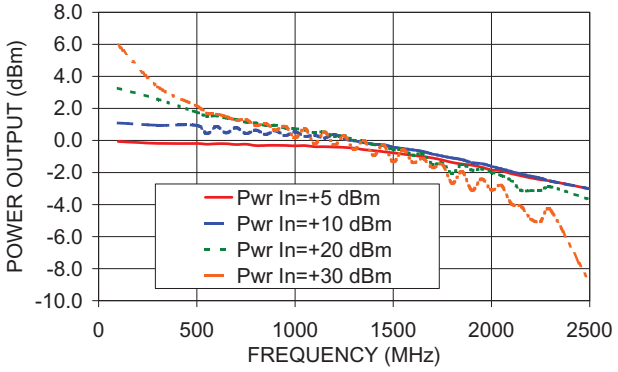
RLM-23-1WL+
LOW INPUT POWER INSERTION LOSS



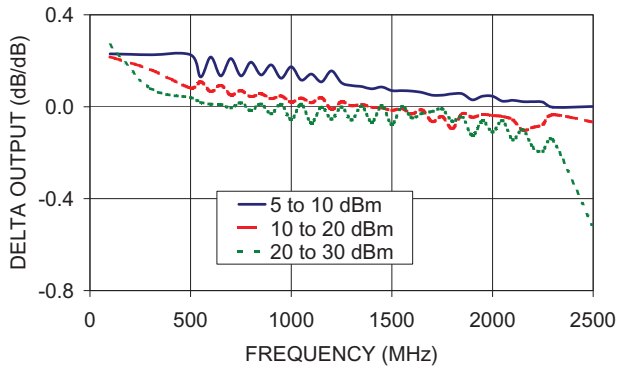
RLM-23-1WL+
POWER OUTPUT vs. POWER INPUT



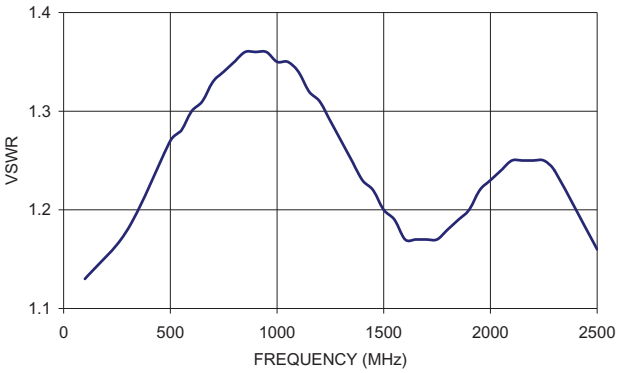
RLM-23-1WL+
POWER OUTPUT vs. FREQUENCY



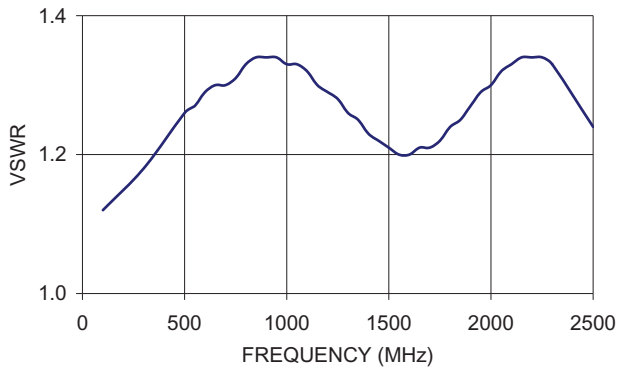
RLM-23-1WL+
DELTA OUTPUT/DELTA 1dB INPUT



RLM-23-1WL+
INPUT VSWR IN LINEAR RANGE



RLM-23-1WL+
OUTPUT VSWR IN LINEAR RANGE



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Surface Mount Limiter RLM-23-1WL+

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)	+5 dBm INPUT	+10 dBm INPUT	+20 dBm INPUT	+30 dBm INPUT	+5 to +10 dBm INPUT	+10 to +20 dBm INPUT	+20 to +30 dBm INPUT
100.0	0.13	1.13	1.12	-0.06	1.09	3.26	5.95	0.23	0.22	0.27
300.0	0.22	1.18	1.18	-0.18	0.95	2.57	3.37	0.23	0.16	0.08
500.0	0.32	1.27	1.26	-0.19	0.94	1.76	2.16	0.23	0.08	0.04
550.0	0.31	1.28	1.27	-0.23	0.42	1.51	1.70	0.13	0.11	0.02
600.0	0.34	1.30	1.29	-0.20	0.88	1.54	1.65	0.22	0.07	0.01
650.0	0.37	1.31	1.30	-0.20	0.47	1.40	1.50	0.13	0.09	0.01
700.0	0.40	1.33	1.30	-0.25	0.80	1.31	1.26	0.21	0.05	-0.01
750.0	0.45	1.34	1.31	-0.23	0.44	1.14	1.31	0.13	0.07	0.02
800.0	0.46	1.35	1.33	-0.32	0.65	1.09	0.93	0.19	0.04	-0.02
850.0	0.45	1.36	1.34	-0.31	0.38	0.94	1.06	0.14	0.06	0.01
900.0	0.43	1.36	1.34	-0.30	0.61	0.96	0.65	0.18	0.04	-0.03
950.0	0.42	1.36	1.34	-0.31	0.31	0.78	0.89	0.12	0.05	0.01
1000.0	0.41	1.35	1.33	-0.33	0.54	0.74	0.17	0.17	0.02	-0.06
1050.0	0.42	1.35	1.33	-0.32	0.26	0.64	0.75	0.12	0.04	0.01
1100.0	0.41	1.34	1.32	-0.39	0.32	0.49	-0.22	0.14	0.02	-0.07
1150.0	0.43	1.32	1.30	-0.39	0.15	0.54	0.53	0.11	0.04	0.00
1200.0	0.42	1.31	1.29	-0.41	0.37	0.26	-0.28	0.16	-0.01	-0.05
1250.0	0.43	1.29	1.28	-0.43	0.09	0.30	0.29	0.10	0.02	0.00
1300.0	0.44	1.27	1.26	-0.48	-0.02	0.02	-0.56	0.09	0.00	-0.06
1350.0	0.44	1.25	1.25	-0.57	-0.13	-0.03	0.00	0.09	0.01	0.00
1400.0	0.46	1.23	1.23	-0.63	-0.24	-0.26	-0.93	0.08	0.00	-0.07
1450.0	0.42	1.22	1.22	-0.70	-0.27	-0.32	-0.27	0.09	-0.01	0.01
1500.0	0.43	1.20	1.21	-0.77	-0.42	-0.58	-1.34	0.07	-0.02	-0.08
1550.0	0.48	1.19	1.20	-0.85	-0.50	-0.58	-0.57	0.07	-0.01	0.00
1600.0	0.46	1.17	1.20	-0.93	-0.59	-0.90	-1.38	0.07	-0.03	-0.05
1650.0	0.42	1.17	1.21	-1.00	-0.69	-0.83	-1.12	0.06	-0.01	-0.03
1700.0	0.45	1.17	1.21	-1.09	-0.84	-1.49	-1.70	0.05	-0.07	-0.02
1750.0	0.53	1.17	1.22	-1.22	-0.97	-1.40	-1.50	0.05	-0.04	-0.01
1800.0	0.46	1.18	1.24	-1.37	-1.09	-2.04	-2.67	0.06	-0.10	-0.06
1850.0	0.48	1.19	1.25	-1.47	-1.19	-1.49	-1.94	0.06	-0.03	-0.05
1900.0	0.54	1.20	1.27	-1.54	-1.39	-1.85	-3.11	0.03	-0.05	-0.13
1950.0	0.53	1.22	1.29	-1.67	-1.44	-1.78	-2.40	0.05	-0.03	-0.06
2000.0	0.56	1.23	1.30	-1.84	-1.61	-1.99	-3.09	0.05	-0.04	-0.11
2050.0	0.53	1.24	1.32	-1.89	-1.77	-2.19	-2.80	0.02	-0.04	-0.06
2100.0	0.60	1.25	1.33	-2.07	-1.93	-2.50	-3.94	0.03	-0.06	-0.14
2150.0	0.63	1.25	1.34	-2.20	-2.09	-3.11	-4.11	0.02	-0.10	-0.10
2200.0	0.62	1.25	1.34	-2.34	-2.23	-3.13	-4.89	0.02	-0.09	-0.18
2250.0	0.66	1.25	1.34	-2.45	-2.35	-3.12	-5.06	0.02	-0.08	-0.19
2300.0	0.70	1.24	1.33	-2.53	-2.54	-2.89	-4.34	0.00	-0.04	-0.15
2500.0	0.77	1.16	1.24	-3.02	-3.02	-3.69	-8.94	0.00	-0.07	-0.53

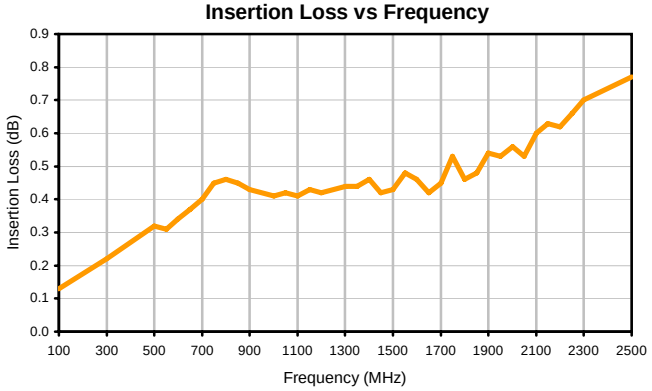
Typical Performance Data

POWER INPUT	POWER OUTPUT	POWER INPUT	POWER OUTPUT	POWER INPUT	POWER OUTPUT
@ 100 MHz		@ 1300 MHz		@ 2500 MHz	
(dBM)		(dBM)		(dBM)	
5	-0.06	5	-0.48	5	-3.02
10	1.09	10	-0.02	10	-3.02
20	3.26	20	0.02	20	-3.69
30	5.95	30	-0.56	30	-8.94

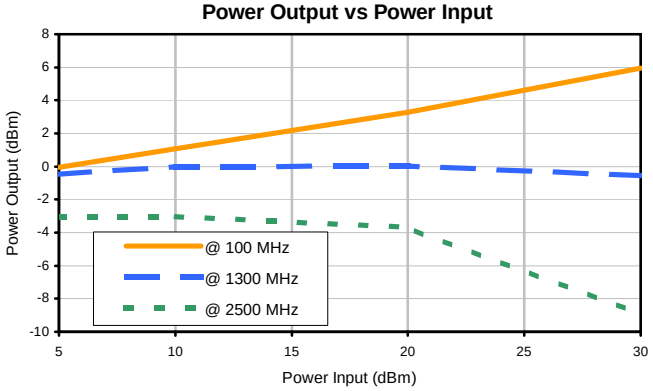
Surface Mount Limiter RLM-23-1WL+

Typical Performance Curves

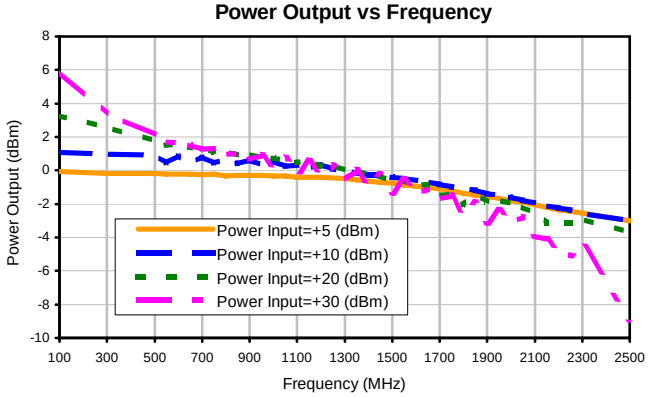
Insertion Loss vs Frequency



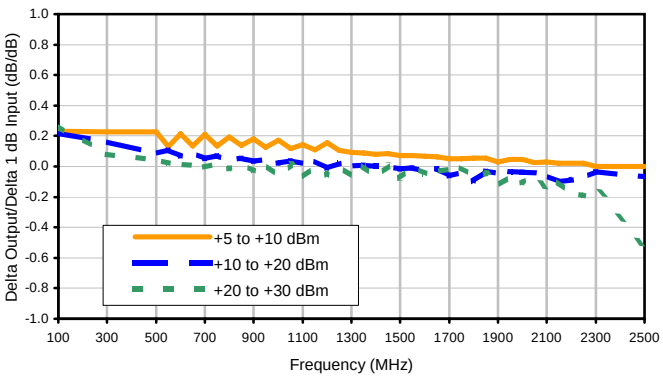
Power Output vs Power Input



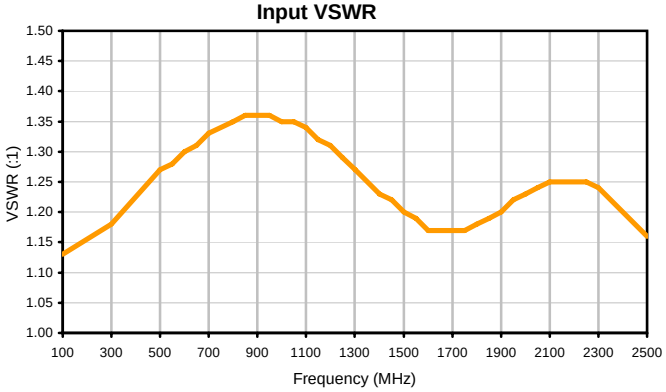
Power Output vs Frequency



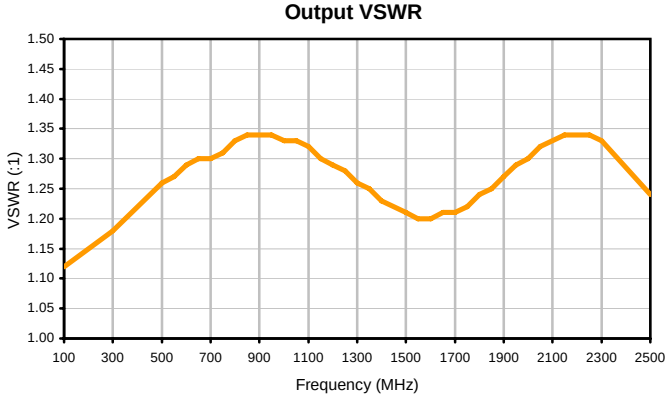
Delta Output / Delta 1dB Input



Input VSWR



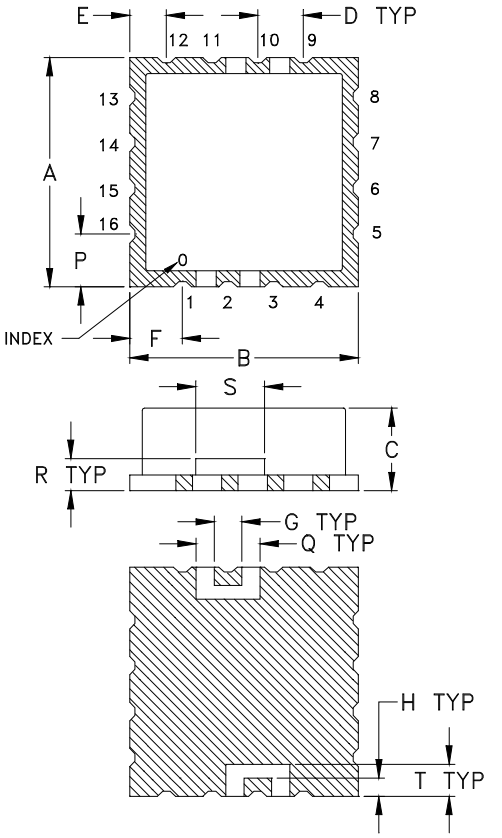
Output VSWR



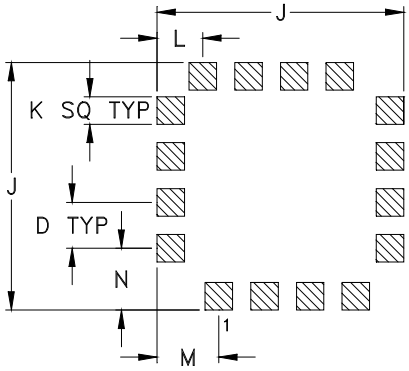
Case Style CK

Outline Dimensions

CK1246-1



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

METALLIZATION

CASE #	A	B	C	D	E	F	G	H	J	K
CK1246-1	.500 (12.70)	.500 (12.70)	.180 (4.57)	.100 (2.54)	.080 (2.03)	.115 (2.92)	.060 (1.52)	.040 (1.02)	.540 (13.72)	.060 (1.52)

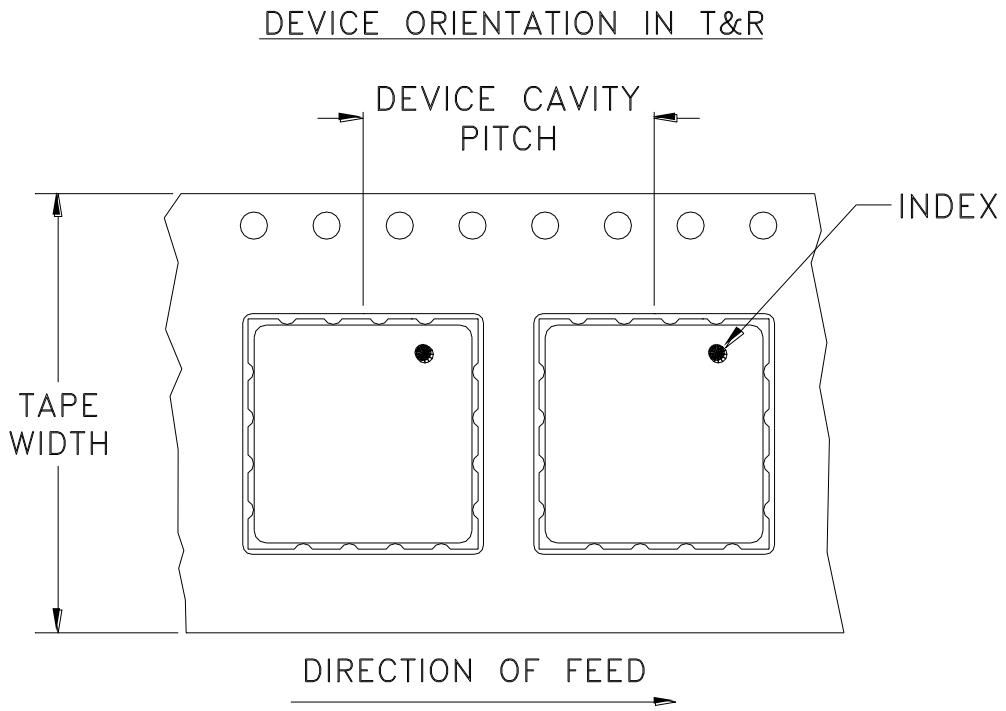
CASE #	L	M	N	P	Q	R	S	T	WT. GRAM
CK1246-1	.100 (2.54)	.135 (3.43)	.135 (3.43)	.115 (2.92)	.140 (3.56)	.070 (1.78)	.150 (3.81)	.070 (1.78)	1.0

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3Pl. ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.

Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
				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

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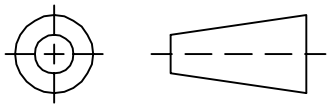
Mini-Circuits ISO 9001 & ISO 14001 Certified

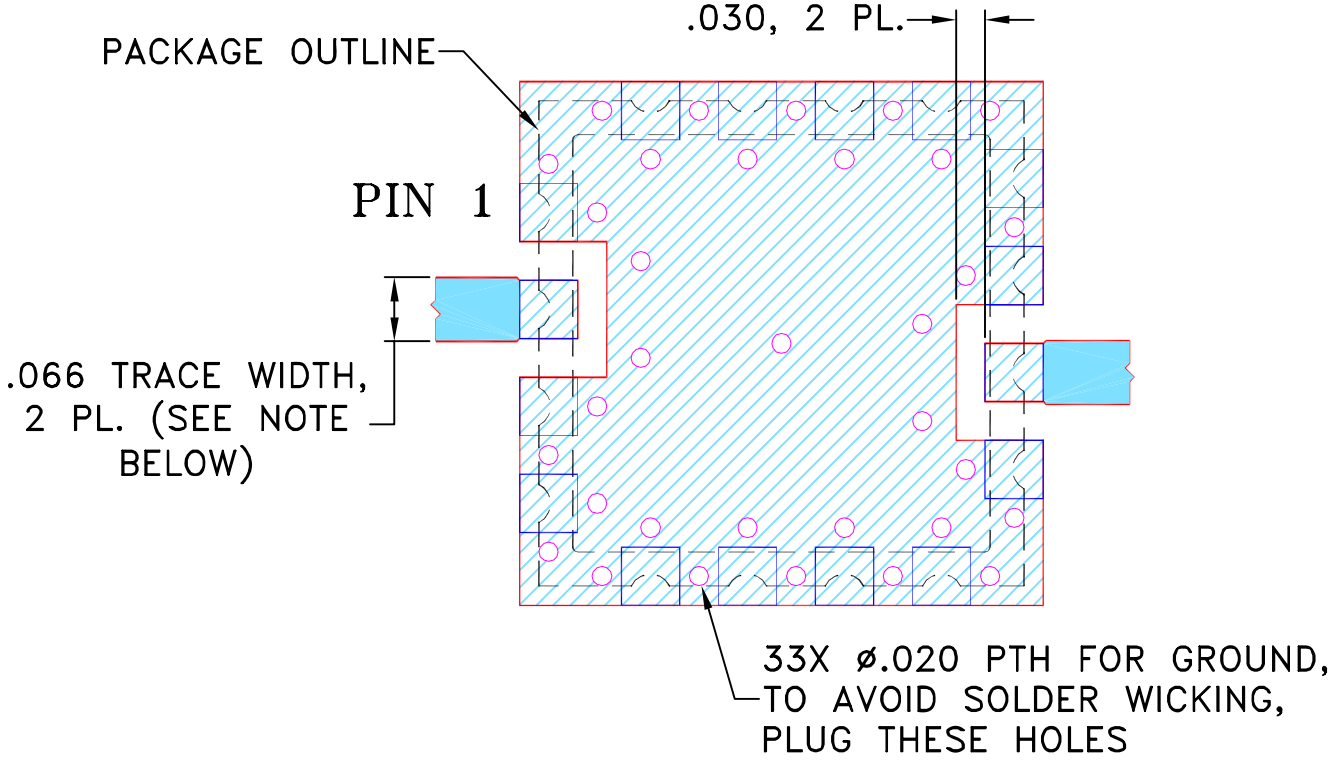
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M131034	NEW RELEASE	03/16/11	PW	DJ

SUGGESTED MOUNTING CONFIGURATION FOR CK1246-1 CASE STYLE, "16LM01" 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	PW	03/10/11
TOLERANCES ON:	CHECKED	IL	03/16/11
2 PL DECIMALS ±	APPROVED	DJ	03/16/11
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

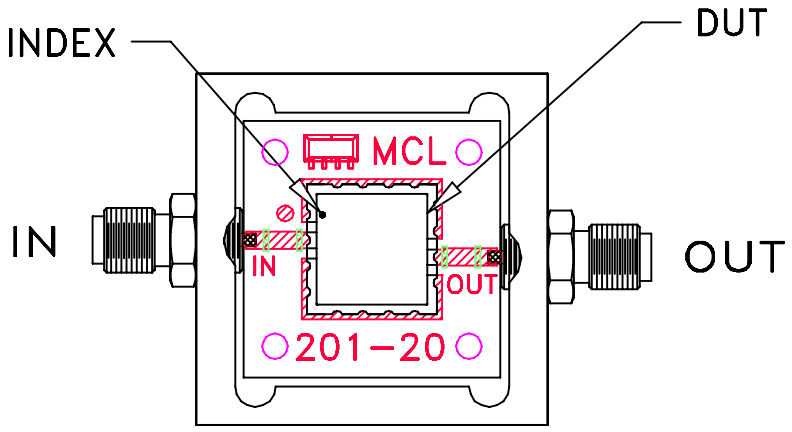
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 16LM01, CK1246-1, TB-613+

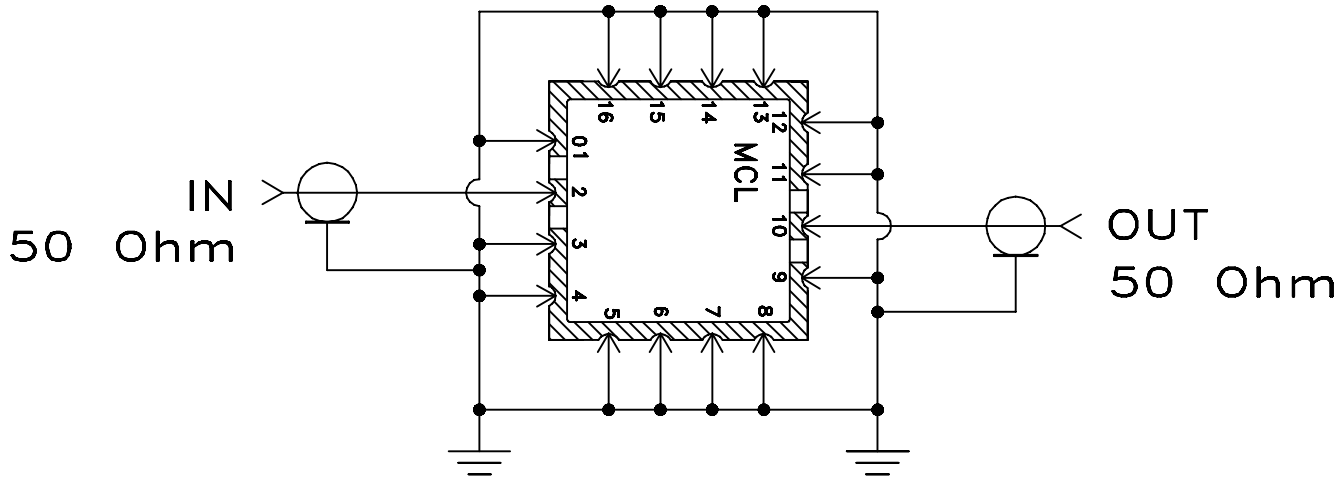
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-343	OR

FILE:	SCALE:	SHEET:
98PL343	5:1	1 OF 1

Evaluation Board and Circuit



TB-613+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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Environmental Specifications ENV03T2

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
HAST	130°C, 85% RH, 96 hours	JESD22-A110
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 Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (High Frequency)	20g peak, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
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