Surface Mount

Bandpass Filter

BPF-B48+

50Ω 47 to 49 MHz

Generic photo used for illustration purposes only

CASE STYLE: HZ1198

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.15W Max.

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

Pin Connections

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

Features

- High rejection
- Good VSWR, 1.2:1 typ @ passband
- Shielded case
- Aqueous washable

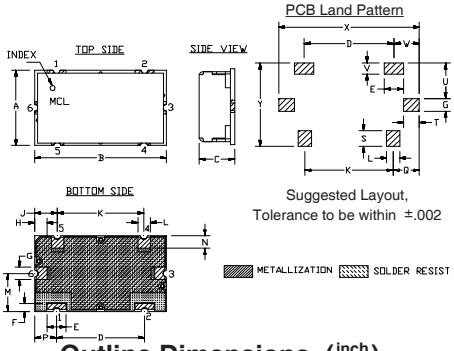
Applications

- Military
- Lab
- Harmonic rejection
- Transmitters/receivers

+RoHS Compliant

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

Outline Drawing



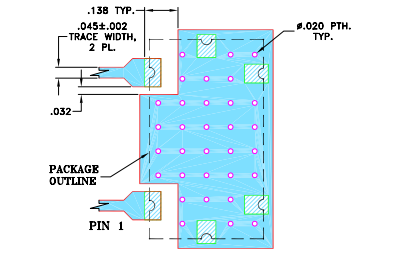
Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M
.472"	.826"	.220"	.551"	.118"	.047"	.078"	.076"	.142"	.543"	.078"	.236"
11.99	20.98	5.59	14.00	3.00	1.19	1.98	1.92	3.61	13.79	1.98	5.99

N	P	Q	S	T	U	V	W	X	Y	wt
.079"	.138"	.162"	.098"	.096"	.217"	.067"	.157"	.866"	.512"	grams
2.01	3.51	4.11	2.49	2.44	5.51	1.70	3.99	22.00	13.00	6.0

Note: Please refer to case style drawing for details

Demo Board MCL P/N: TB-400+
Suggested PCB Layout (PL-247)



NOTES:
1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.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.

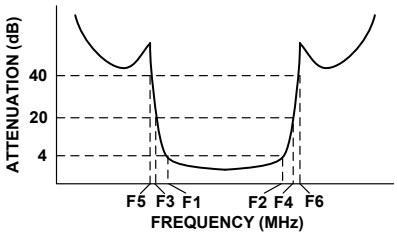
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

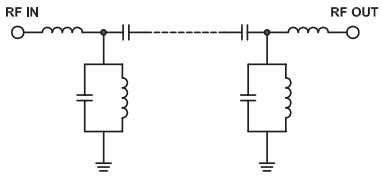
Bandpass Filter Electrical Specifications (T_{AMB}= 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 4dB)	STOPBANDS (MHz)				VSWR (:1)		
		Loss > 20dB		Loss > 40dB		Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Typ.	Max.	Typ.
48	47 - 49	41	56	37	64 - 2400	1.2	1.5	20

Typical Frequency Response



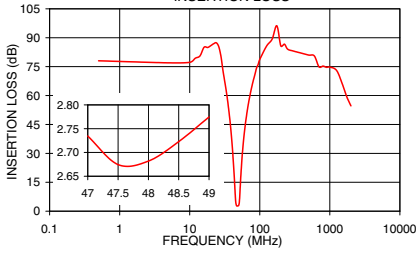
Functional Schematic



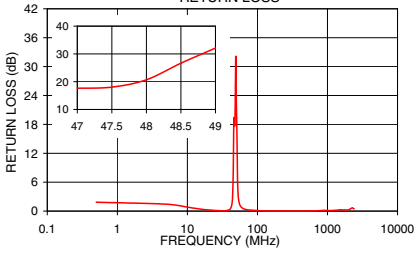
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB) $\bar{x}$	Insertion Loss (dB) σ	Return Loss (dB)	Frequency (MHz)	Group Delay (nsec)
0.5	78.03	4.46	1.85	46.00	167.71
37.0	49.10	0.39	0.12	46.25	161.42
41.0	30.99	0.52	0.47	46.50	154.52
44.0	12.42	0.63	2.64	47.00	142.38
45.0	6.45	0.44	6.93	47.25	137.66
46.0	3.43	0.15	19.20	47.50	134.06
47.0	2.73	0.03	17.62	47.75	131.25
47.5	2.67	0.02	18.05	48.00	129.14
48.0	2.68	0.02	20.70	48.25	127.37
48.5	2.72	0.03	26.66	48.50	126.62
49.0	2.77	0.03	32.10	48.75	126.57
51.0	4.54	0.37	15.56	49.00	127.40
52.0	9.10	0.73	6.47	49.25	129.07
53.0	14.81	0.76	3.42	49.50	132.10
56.0	28.44	0.55	1.32	49.75	136.34
64.0	48.44	0.36	0.45	50.00	142.10
500.0	80.99	2.23	0.03	50.25	148.26
2400.0	47.70	0.53	0.47	50.50	154.45

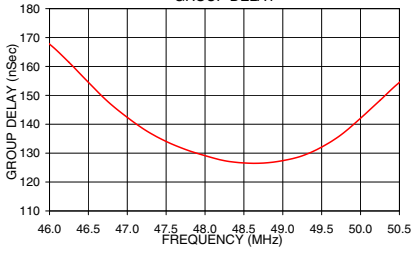
BPF-B48+
INSERTION LOSS



BPF-B48+
RETURN LOSS



BPF-B48+
GROUP DELAY



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

Surface Mount Band Pass Filter BPF-B48+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURNLOSS (dB)		
	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C
0.5	97.05	93.14	96.19	1.39	1.82	2.19	1.38	1.82	2.19
10.0	83.58	83.52	80.94	0.60	0.77	0.90	0.60	0.76	0.89
20.0	94.30	85.64	91.29	0.19	0.23	0.27	0.18	0.22	0.26
30.0	70.45	72.15	70.81	0.08	0.09	0.10	0.08	0.09	0.10
36.0	52.04	51.92	51.49	0.10	0.13	0.14	0.11	0.14	0.17
37.0	48.32	48.00	47.73	0.13	0.15	0.18	0.14	0.18	0.22
38.0	44.28	44.03	43.66	0.17	0.20	0.23	0.20	0.25	0.31
39.0	39.98	39.70	39.33	0.23	0.27	0.31	0.27	0.34	0.41
40.0	35.29	34.96	34.62	0.32	0.38	0.45	0.38	0.48	0.58
41.0	30.07	29.76	29.42	0.47	0.57	0.67	0.58	0.72	0.87
42.0	24.29	23.99	23.68	0.74	0.89	1.06	0.93	1.15	1.38
43.0	17.83	17.57	17.33	1.30	1.56	1.84	1.62	1.98	2.36
44.0	10.83	10.76	10.67	2.74	3.25	3.81	3.39	4.00	4.64
45.0	5.07	5.22	5.40	7.59	8.64	9.81	8.65	9.59	10.56
46.0	2.77	3.04	3.33	20.35	23.35	26.97	16.78	17.05	17.66
47.0	2.34	2.64	2.96	37.11	31.41	28.78	20.56	20.83	21.65
47.5	2.29	2.61	2.93	37.27	35.63	35.48	23.87	24.62	26.02
48.0	2.29	2.61	2.96	38.01	36.72	33.76	29.65	31.95	33.76
48.5	2.32	2.65	3.00	28.87	26.39	24.38	43.39	39.85	33.73
49.0	2.37	2.72	3.07	24.05	22.06	20.59	40.64	34.38	31.83
50.0	2.72	3.12	3.59	19.06	18.22	17.58	23.50	22.93	21.30
51.0	4.60	5.33	6.16	9.47	9.35	9.25	9.11	8.83	8.46
52.0	9.33	10.28	11.25	4.31	4.53	4.73	3.95	4.10	4.20
53.0	14.96	15.86	16.69	2.53	2.79	3.01	2.27	2.51	2.69
55.0	24.61	25.24	25.83	1.36	1.55	1.71	1.23	1.42	1.58
56.0	28.52	29.08	29.55	1.11	1.26	1.40	0.99	1.17	1.31
60.0	40.32	40.66	40.94	0.62	0.72	0.80	0.56	0.67	0.77
64.0	48.37	48.74	48.89	0.41	0.48	0.54	0.38	0.46	0.54
70.0	57.32	57.47	57.50	0.28	0.32	0.36	0.26	0.32	0.38
80.0	67.11	67.98	66.99	0.17	0.20	0.22	0.16	0.21	0.24
90.0	73.92	75.14	71.98	0.12	0.15	0.16	0.11	0.15	0.18
100.0	78.42	77.96	79.91	0.10	0.13	0.14	0.08	0.12	0.16
200.0	91.20	90.29	85.11	0.03	0.06	0.07	0.01	0.05	0.07
300.0	97.55	90.16	80.68	0.02	0.06	0.06	0.00	0.05	0.08
400.0	89.96	86.01	87.38	0.02	0.06	0.08	0.00	0.07	0.10
500.0	85.54	92.48	82.10	0.05	0.09	0.11	0.00	0.10	0.13
600.0	82.71	81.98	87.98	0.06	0.13	0.14	0.03	0.13	0.16
700.0	81.05	83.05	93.44	0.07	0.14	0.16	0.04	0.15	0.19
800.0	83.80	82.82	81.22	0.09	0.16	0.19	0.07	0.19	0.24
900.0	77.27	85.88	80.17	0.11	0.17	0.21	0.09	0.21	0.24
1000.0	85.71	81.43	78.07	0.12	0.19	0.22	0.09	0.22	0.25
1100.0	75.11	83.42	77.88	0.14	0.21	0.24	0.09	0.23	0.27
1200.0	83.59	78.04	80.40	0.15	0.22	0.25	0.08	0.23	0.28
1300.0	73.02	72.21	73.05	0.16	0.23	0.26	0.09	0.25	0.32
1400.0	74.78	72.53	72.40	0.16	0.24	0.27	0.08	0.26	0.33
1500.0	80.62	78.45	80.00	0.17	0.26	0.31	0.09	0.26	0.38
1600.0	78.47	67.18	71.07	0.19	0.28	0.31	0.22	0.33	0.42
1700.0	67.97	63.86	63.15	0.15	0.26	0.30	0.02	0.24	0.37
1800.0	62.68	61.90	66.38	0.15	0.24	0.32	0.04	0.24	0.37
1900.0	53.01	54.31	54.14	0.14	0.25	0.31	0.01	0.24	0.37
2000.0	61.08	58.80	61.46	0.11	0.26	0.33	0.03	0.26	0.40
2100.0	53.89	53.38	57.45	0.15	0.28	0.39	0.03	0.30	0.45
2200.0	57.27	52.56	54.18	0.22	0.46	0.59	0.20	0.62	0.79
2300.0	63.35	64.86	67.35	1.32	1.18	1.12	1.55	0.99	0.98
2400.0	51.39	52.65	52.05	0.30	0.37	0.49	0.13	0.37	0.50

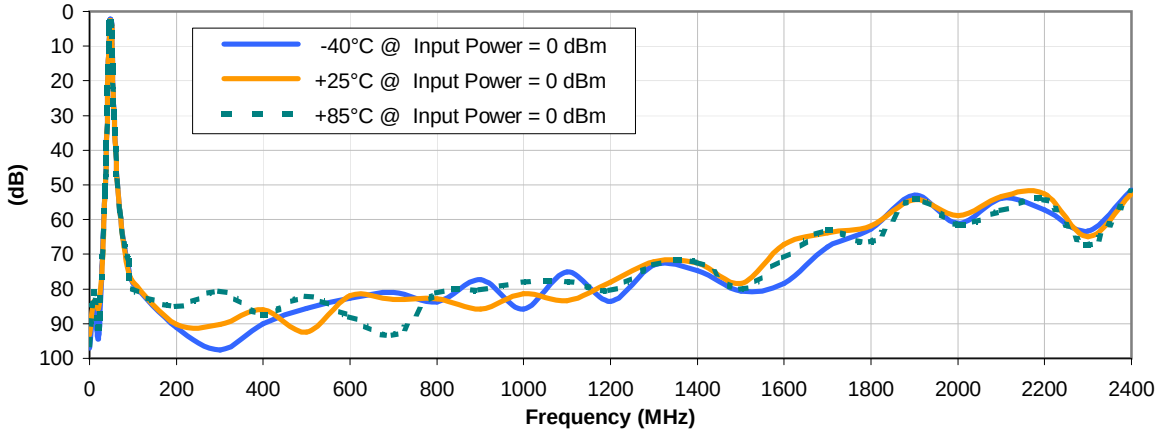
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
47.0	136.78	136.37	135.59
47.1	135.26	134.64	134.01
47.2	134.13	133.38	132.91
47.3	132.67	132.15	131.45
47.4	131.58	130.68	130.27
47.5	130.69	129.86	129.58
47.6	129.37	129.20	128.41
47.7	128.45	128.25	127.77
47.8	127.87	127.78	126.92
47.9	128.17	127.75	126.86
48.0	127.42	126.92	126.51
48.1	127.30	126.65	126.49
48.2	126.34	126.50	125.98
48.3	126.48	126.22	126.24
48.4	125.92	126.09	126.03
48.5	126.08	126.20	126.54
48.6	126.34	126.72	126.99
48.7	127.44	127.35	128.14
48.8	127.40	127.80	128.69
48.9	128.06	128.78	129.96
49.0	128.36	129.71	130.21

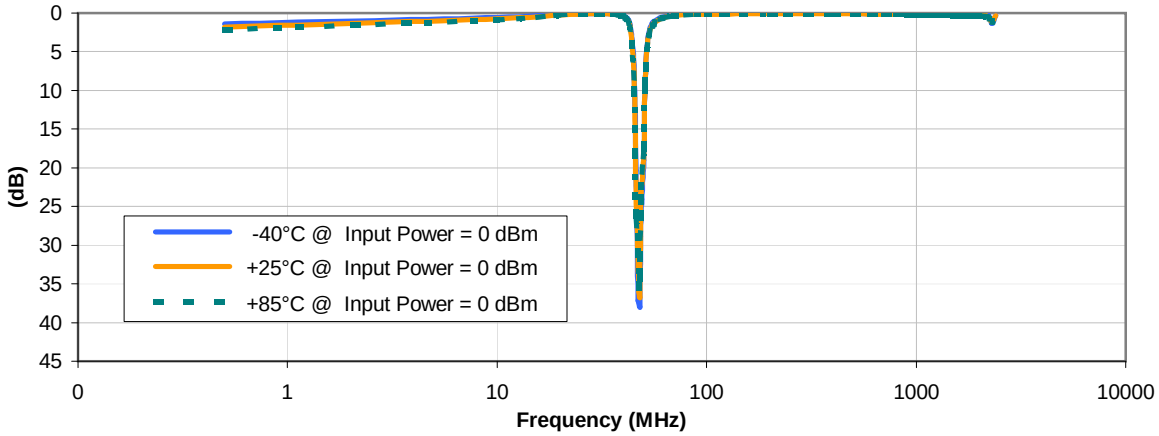
Surface Mount Band Pass Filter BPF-B48+

Typical Performance Curves

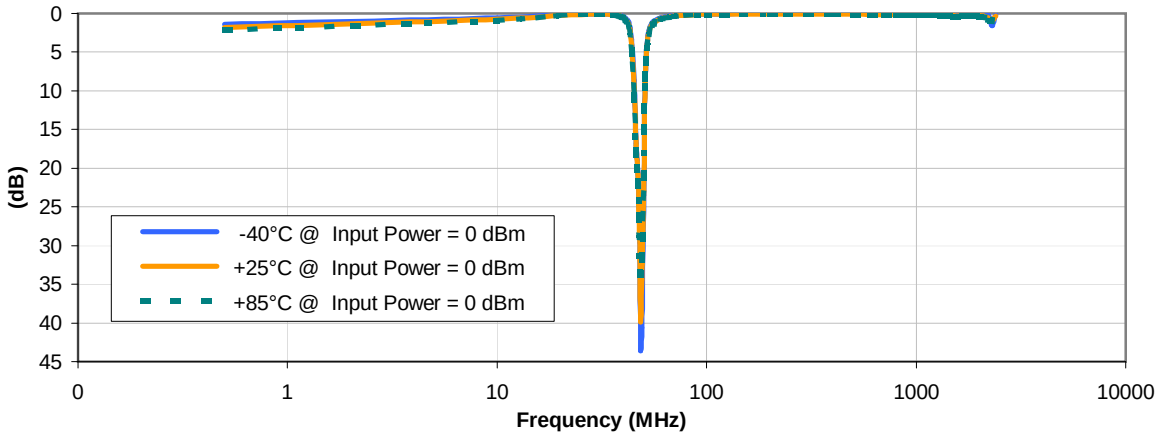
INSERTION LOSS vs. TEMPERATURE



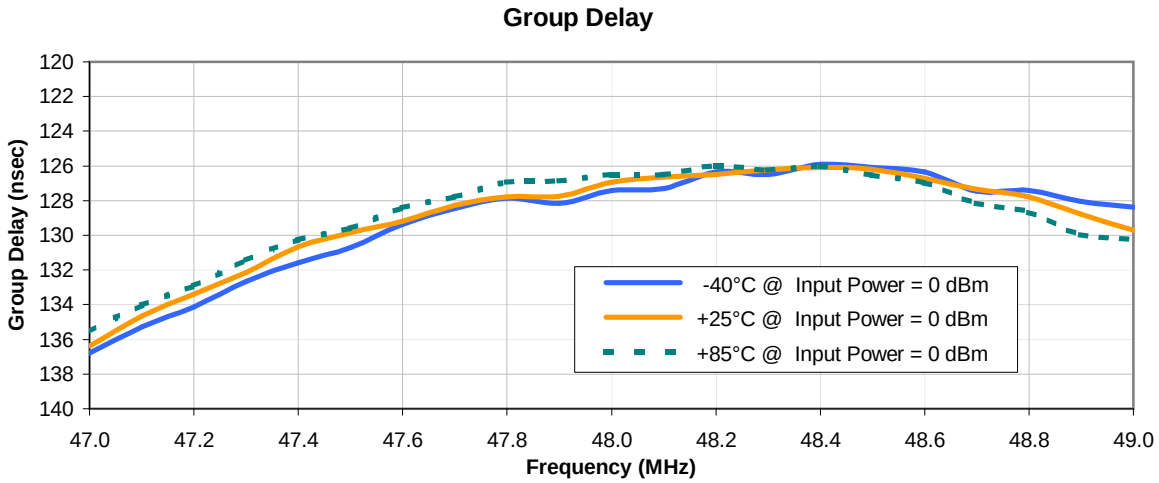
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



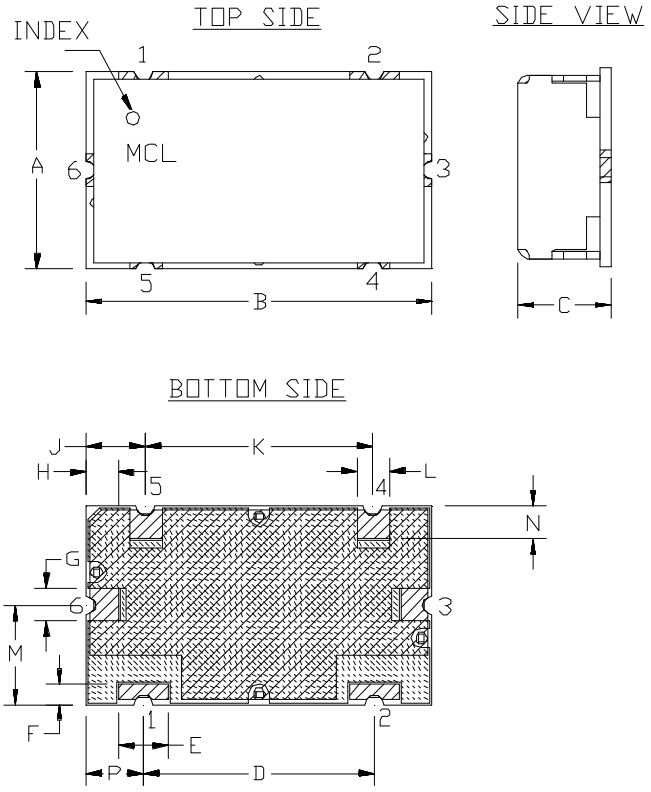
Typical Performance Curves



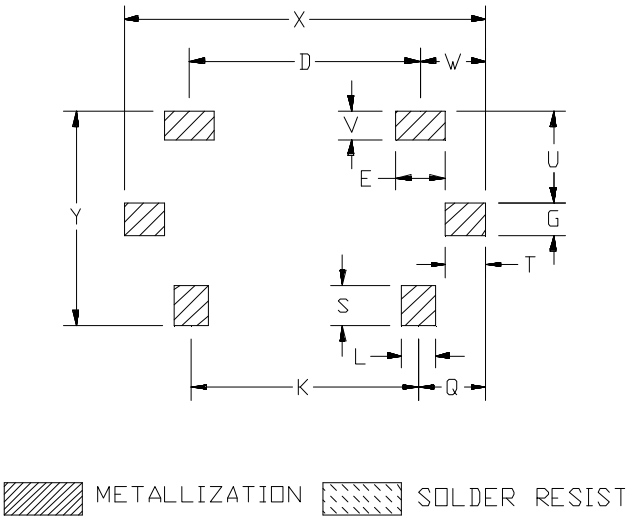
Case Style HZ

Outline Dimensions

HZ1198



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	M
HZ1198	.472" (11.99)	.826" (20.98)	.220" (5.59)	.551" (14.00)	.118" (3.00)	.047" (1.19)	.078" (1.98)	.076" (1.92)	.142" (3.61)	.543" (13.79)	.078" (1.98)	.236" (5.99)

CASE #	N	P	Q	S	T	U	V	W	X	Y	WT GRAMS	NOTES
HZ1198	.079" (2.01)	.138" (3.51)	.162" (4.11)	.098" (2.49)	.096" (2.44)	.217" (5.51)	.067" (1.70)	.157" (3.99)	.866" (22.00)	.512" (13.00)	6.0	A35

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

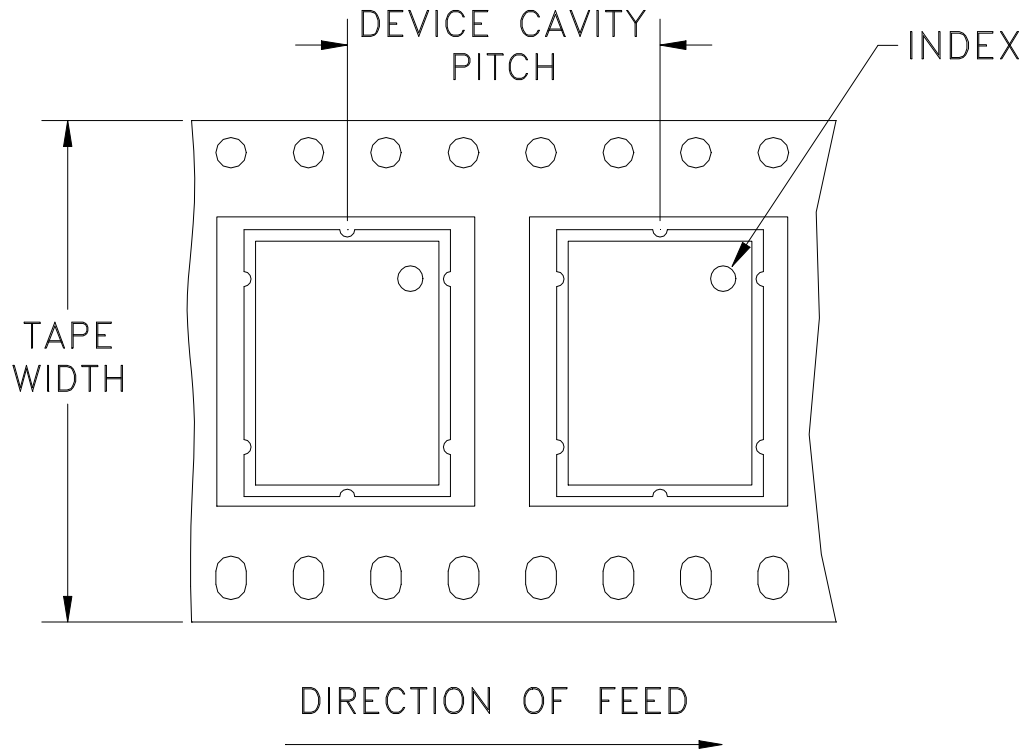
Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

   For RoHS Case Styles: 3-5 µinch (.08-.13 microns) Gold over 120-240 µinch (3.05-6.10 microns) Nickel plate.
   For RoHS-5 Case Styles: Tin-Lead plate.

Tape & Reel Packaging TR-F6

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	16	13	500

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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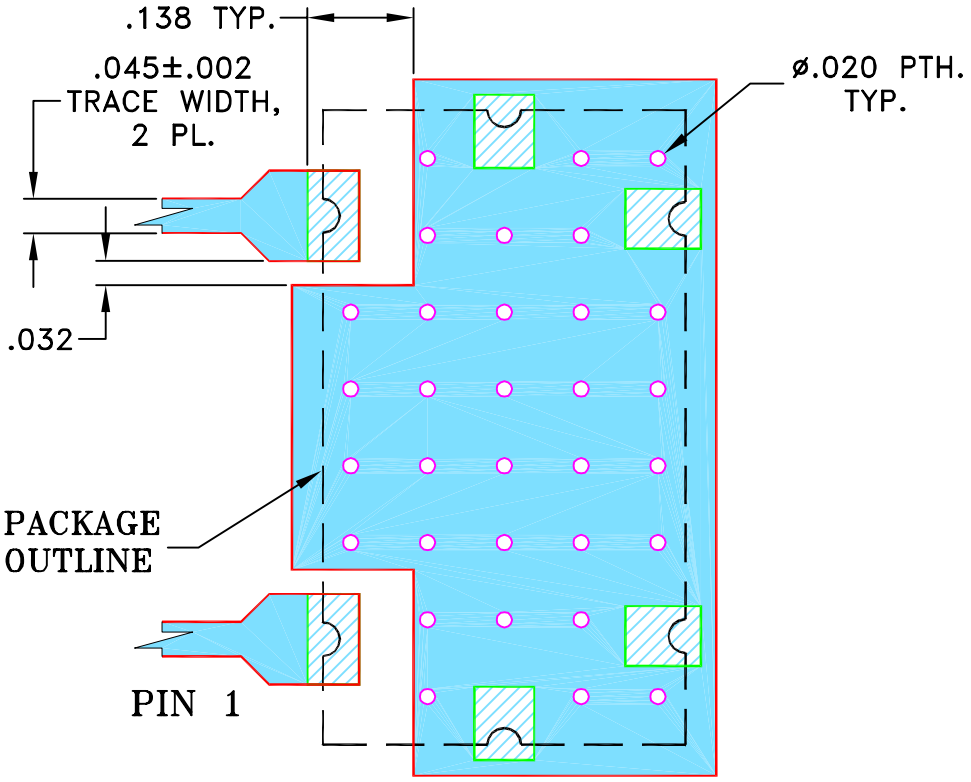
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M107879	NEW RELEASE (FROM RAVON)	11/06	DK	HH
OR	R66100	NEW RELEASE (FROM RAVON)	11/06	DK	HH

SUGGESTED MOUNTING CONFIGURATION FOR HZ1198 CASE STYLE, "rg" PIN CONNECTION, 50 Ω



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DK (RAVON)	14 NOV 06
TOLERANCES ON:	CHECKED	RZ (RAVON)	14 NOV 06
2 PL DECIMALS ±	APPROVED	HH (RAVON)	14 NOV 06
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

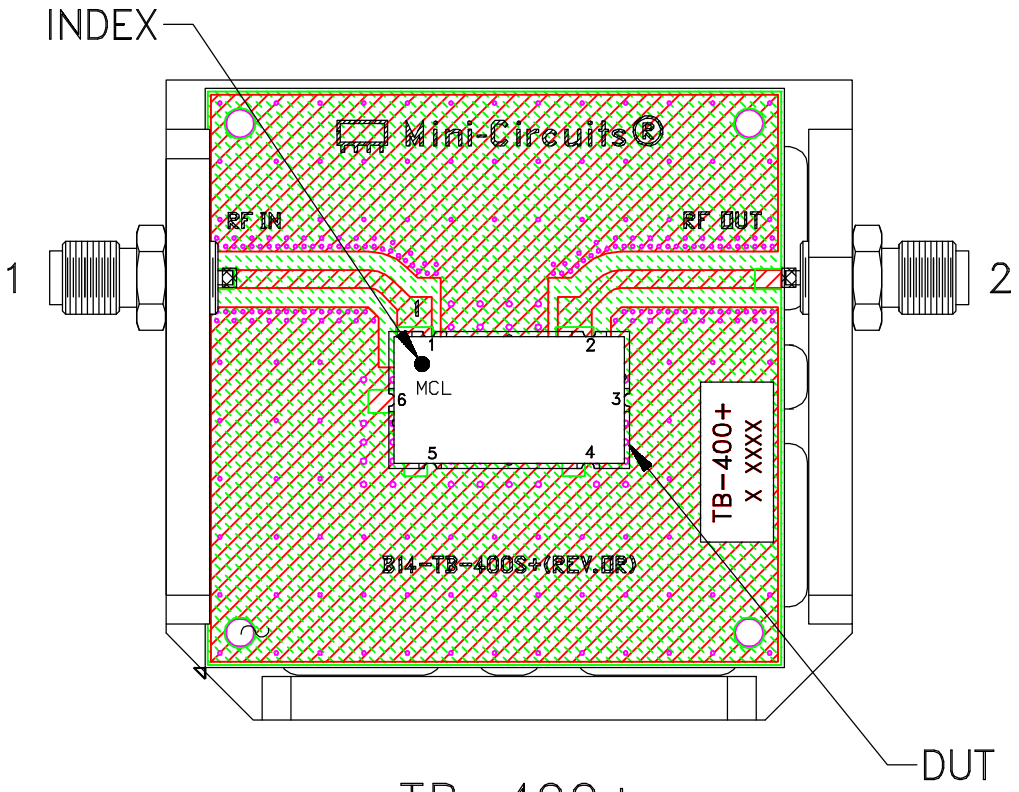
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, rg, HZ1198, DPLX, TB-400+
50 Ω

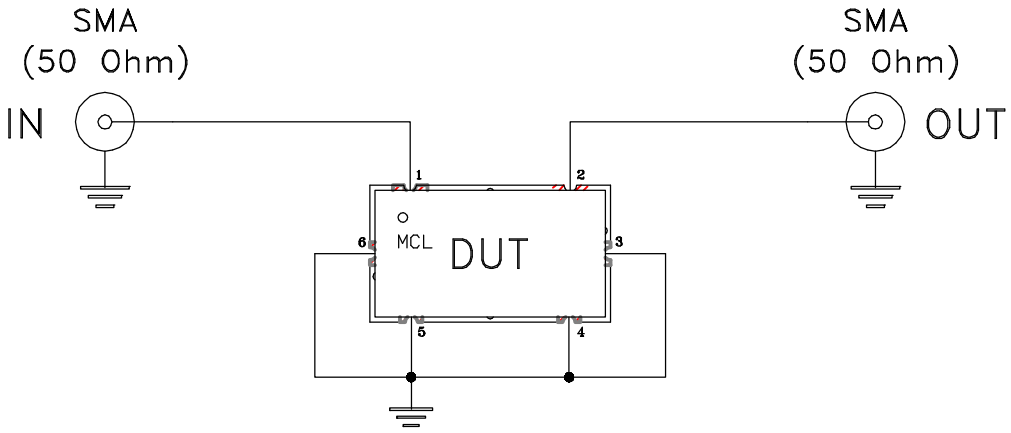
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-247	OR

FILE:	SCALE:	SHEET:
98PL247	4:1	1 OF 1

Evaluation Board and Circuit



TB-400+



Schematic Diagram

Notes:

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

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Environmental Specifications ENV12

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	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
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