

50Ω

DC to 500 MHz

The Big Deal

- Good passband Insertion loss, 1.2 dB typical
- High rejection, 50 dB typical from 650-4000 MHz
- Fast roll-off
- Good VSWR, 1.3:1 typical in passband
- Miniature shielded package



CASE STYLE: HZ1198

Product Overview

The LPF-B500+ is a lowpass filter in a shielded package (size of 0.472" x 0.826" x .22") fabricated using SMT technology. Covering DC-500 MHz band width, these units offer good matching within the passband and high rejection. This unit uses a miniature high Q capacitors and wire welded inductors for high reliability. In addition it has repeatable performance across production lots and consistent performance across temperature.

Key Features

Feature	Advantages
Low frequency and good passband Insertion loss, 1.2 dB typical	Low insertion loss will be used in designs optimized for high performance applications.
Fast roll-off	Fast roll-off, this will attenuate frequencies closer to the passband with good rejection value of 72 dB.
Good ultimate rejection	This enables the filters to attenuate spurious signals and reject harmonics for broadband frequency.
Good VSWR, 1.3:1 typical in passband	The model has very good return loss for this bandwidth and provides good interface when used with others devices.

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 Low Pass Filter

50Ω DC to 500 MHz

LPF-B500+



CASE STYLE: HZ1198

Features

- High rejection, 31 dB typical
- Sharp insertion loss roll-off
- Miniature shielded case
- Aqueous washable

Applications

- Defence communications
- Transmitters / receivers
- Harmonic rejection

Electrical Specifications at 25°C

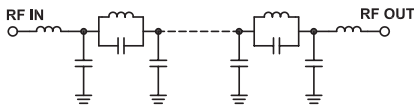
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	DC-F1	DC-500	—	1.2	2 dB
	Freq. Cut-Off	F2	515	—	3	dB
	VSWR	DC-F1	DC-500	—	1.3	1.7 :1
Stop Band	Rejection Loss	F3-F4	585-4500	20	31	dB
	VSWR	F3-F4	585-4500	—	24	— :1

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	1.25 W max.

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

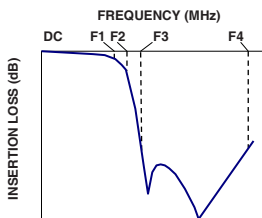
Functional Schematic



Typical Performance Data at 25°C

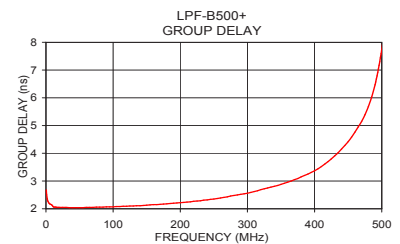
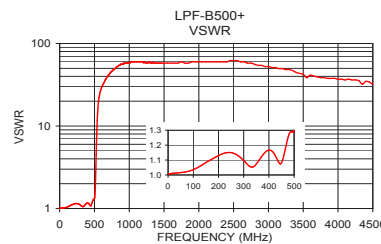
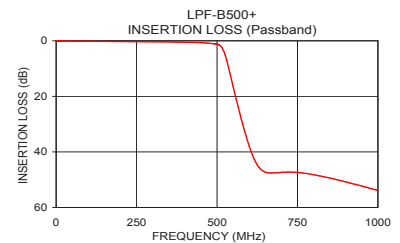
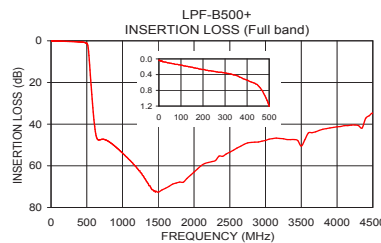
Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	0.03	1.01	1	2.52
5	0.04	1.01	5	2.19
50	0.11	1.02	10	2.10
150	0.21	1.08	50	2.04
250	0.32	1.15	150	2.13
400	0.54	1.17	200	2.22
500	1.22	1.31	250	2.35
515	2.40	2.21	275	2.46
530	7.00	6.49	300	2.56
550	16.46	16.72	325	2.72
570	25.75	23.18	350	2.88
585	32.17	26.33	375	3.09
750	47.41	45.72	400	3.37
1000	53.88	57.91	410	3.52
1500	72.66	57.91	430	3.91
2000	63.00	59.91	450	4.42
2500	53.46	62.05	470	5.15
3000	47.81	52.65	480	5.68
4000	41.29	36.97	490	6.47
4500	34.78	32.18	500	7.75

Typical Frequency Response



+RoHS Compliant

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



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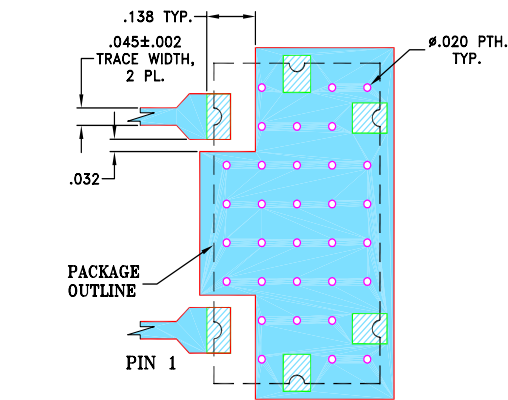
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REV. A
M151121
BPF-B500+
EDR-10270AU
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Page 2 of 3

Pad Connections

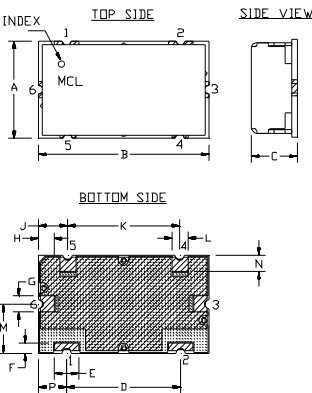
INPUT	1
OUTPUT	2
GROUND	3,4,5,6

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

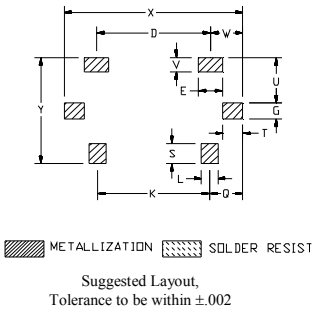


- NOTES:
- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.002". COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
 - BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
-  DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Outline Drawing



PCB Land Pattern



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	1.93	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

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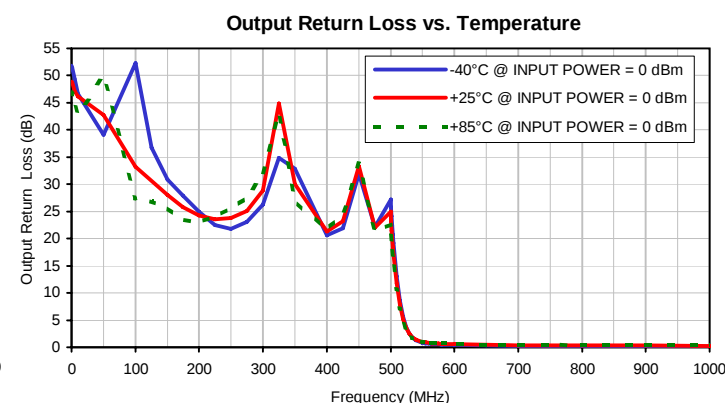
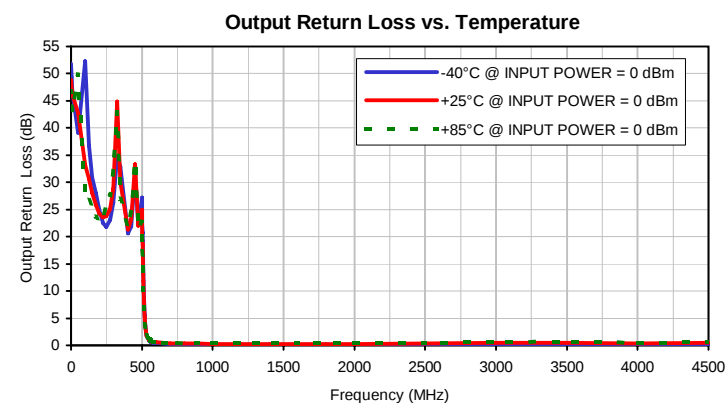
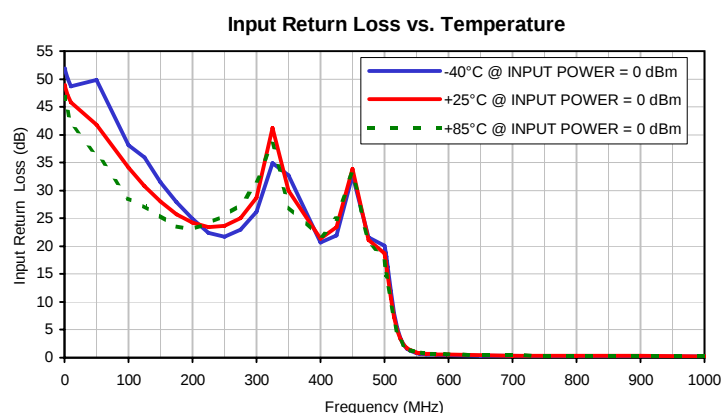
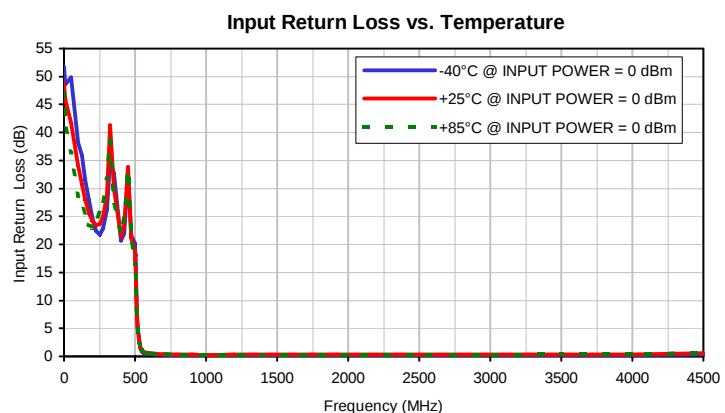
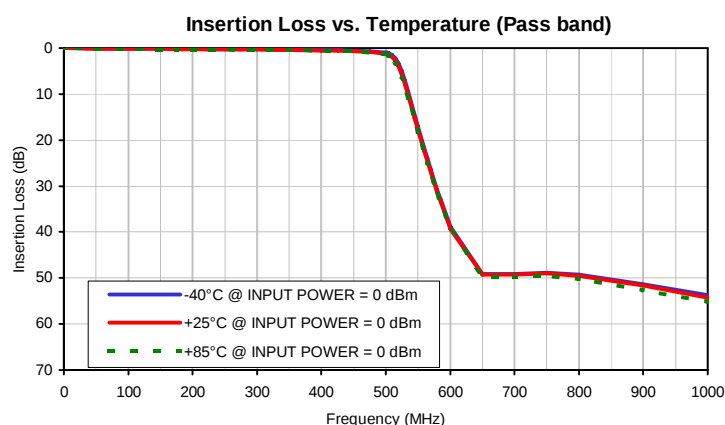
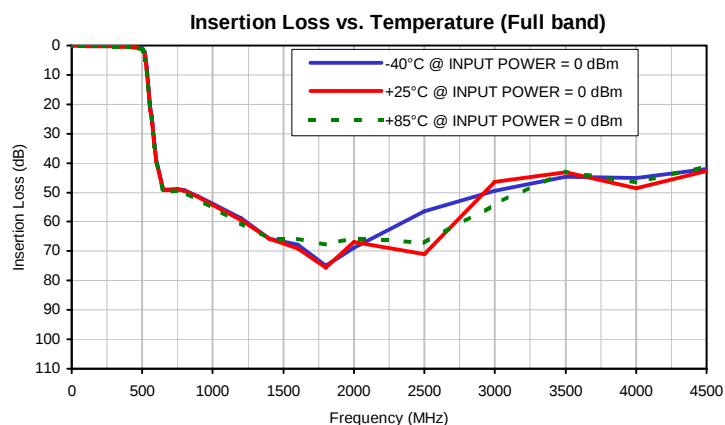
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
0.5	0.02	0.03	0.04	51.85	48.87	46.90	51.81	48.82	46.81
1.0	0.02	0.04	0.05	51.58	48.62	46.53	51.43	48.70	46.61
5.0	0.04	0.04	0.05	50.10	47.08	44.08	49.38	47.16	44.71
10.0	0.04	0.05	0.06	48.65	45.86	41.57	46.58	46.13	42.93
50.0	0.08	0.09	0.11	49.81	41.74	36.41	39.11	42.76	49.81
100.0	0.11	0.14	0.16	38.16	34.11	28.55	52.32	33.24	27.40
125.0	0.12	0.17	0.19	35.96	30.79	27.23	36.77	30.64	26.90
150.0	0.14	0.19	0.21	31.51	28.00	25.45	30.91	28.05	25.63
175.0	0.16	0.22	0.26	27.88	25.67	23.56	27.87	25.74	23.57
200.0	0.19	0.25	0.28	24.88	24.19	23.10	24.97	24.26	23.02
225.0	0.22	0.28	0.30	22.42	23.45	23.97	22.49	23.52	24.02
250.0	0.23	0.28	0.32	21.74	23.67	25.59	21.81	23.79	25.71
275.0	0.25	0.31	0.35	22.91	25.06	27.47	23.05	25.14	27.56
300.0	0.24	0.32	0.35	26.16	28.71	31.63	26.24	28.80	32.06
325.0	0.26	0.35	0.39	34.88	41.27	38.63	34.83	44.92	42.98
350.0	0.29	0.40	0.44	32.74	29.97	27.17	32.80	29.99	26.98
400.0	0.41	0.53	0.58	20.66	21.39	21.68	20.61	21.32	21.64
425.0	0.45	0.57	0.64	21.93	23.38	24.80	21.86	23.21	24.54
450.0	0.51	0.66	0.74	32.69	33.86	33.29	31.97	33.28	33.76
475.0	0.66	0.85	0.96	21.56	21.13	20.43	22.16	21.99	21.44
500.0	0.96	1.24	1.43	20.11	18.77	17.31	27.21	25.02	22.57
501.0	0.99	1.28	1.48	19.55	18.06	16.55	25.81	23.21	20.87
502.0	1.02	1.32	1.53	18.87	17.28	15.74	24.12	21.48	19.31
503.0	1.06	1.37	1.60	18.09	16.46	14.91	22.42	19.91	17.90
504.0	1.09	1.42	1.66	17.24	15.59	14.09	20.77	18.46	16.60
505.0	1.13	1.48	1.74	16.35	14.73	13.27	19.22	17.12	15.40
510.0	1.49	1.94	2.31	11.90	10.68	9.54	13.06	11.76	10.59
515.0	2.23	2.82	3.34	7.98	7.21	6.46	8.61	7.85	7.10
520.0	3.37	4.09	4.75	5.29	4.86	4.41	5.63	5.24	4.80
525.0	5.01	5.84	6.58	3.48	3.29	3.05	3.67	3.53	3.31
530.0	7.09	7.96	8.74	2.32	2.30	2.19	2.45	2.46	2.37
535.0	9.47	10.33	11.10	1.65	1.70	1.67	1.71	1.80	1.79
540.0	11.95	12.78	13.51	1.24	1.33	1.34	1.28	1.41	1.44
545.0	14.46	15.25	15.94	0.99	1.10	1.13	1.01	1.16	1.22
550.0	16.93	17.69	18.33	0.84	0.95	1.00	0.85	1.00	1.07
555.0	19.33	20.04	20.66	0.74	0.86	0.91	0.74	0.90	0.97
560.0	21.68	22.35	22.96	0.67	0.78	0.84	0.66	0.82	0.89
565.0	23.99	24.63	25.20	0.62	0.73	0.78	0.60	0.76	0.83
570.0	26.27	26.88	27.43	0.58	0.69	0.74	0.56	0.71	0.79
575.0	28.52	29.12	29.64	0.55	0.66	0.71	0.53	0.67	0.75
580.0	30.78	31.31	31.83	0.52	0.63	0.68	0.50	0.64	0.72
585.0	32.95	33.48	33.98	0.50	0.61	0.66	0.47	0.61	0.69
600.0	38.84	39.32	39.81	0.45	0.55	0.60	0.42	0.56	0.63
650.0	49.08	49.25	49.70	0.35	0.44	0.49	0.32	0.45	0.52
700.0	49.11	49.21	49.62	0.29	0.37	0.41	0.27	0.40	0.46
750.0	48.88	48.99	49.55	0.25	0.34	0.37	0.23	0.36	0.42
800.0	49.29	49.54	50.20	0.22	0.31	0.34	0.20	0.33	0.40
900.0	51.33	51.63	52.56	0.19	0.29	0.31	0.16	0.30	0.35
1000.0	53.73	54.21	55.14	0.19	0.28	0.30	0.15	0.29	0.34
1200.0	58.89	59.54	60.57	0.20	0.29	0.31	0.11	0.27	0.32
1400.0	65.85	65.68	65.80	0.21	0.31	0.33	0.11	0.28	0.34
1600.0	67.66	69.07	65.85	0.22	0.32	0.34	0.10	0.28	0.36
1800.0	74.91	75.57	67.71	0.21	0.34	0.36	0.09	0.28	0.38
2000.0	68.77	66.96	65.60	0.21	0.33	0.37	0.10	0.28	0.39
2500.0	56.43	70.94	67.00	0.17	0.31	0.36	0.09	0.35	0.42
3000.0	49.39	46.47	54.09	0.14	0.30	0.36	0.05	0.42	0.56
3500.0	44.62	43.13	42.96	0.14	0.35	0.41	0.14	0.44	0.68
4000.0	45.18	48.65	46.51	0.21	0.38	0.47	0.10	0.34	0.47
4500.0	41.96	42.75	41.16	0.36	0.52	0.56	0.14	0.50	0.63

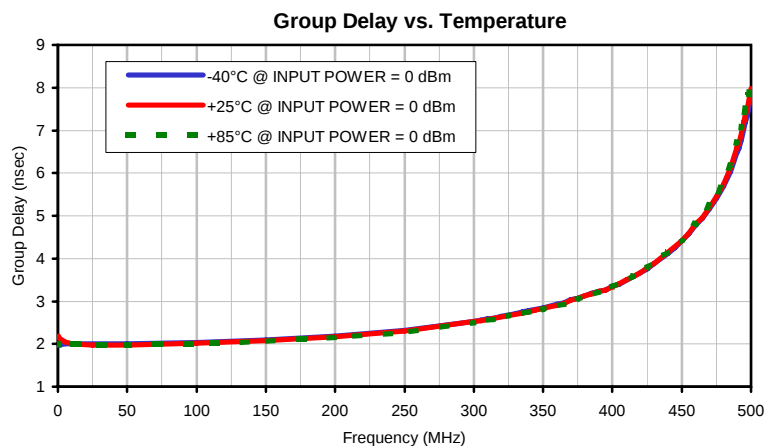
Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
0.5	1.99	2.18	2.00
1.0	1.98	2.14	1.98
5.0	2.01	2.05	2.00
10.0	2.00	2.00	1.99
25.0	2.00	1.98	1.97
50.0	2.00	1.97	1.97
100.0	2.03	2.02	2.00
150.0	2.09	2.08	2.06
200.0	2.19	2.17	2.15
250.0	2.32	2.30	2.28
300.0	2.53	2.53	2.50
305.0	2.56	2.55	2.54
310.0	2.59	2.57	2.56
315.0	2.61	2.60	2.58
320.0	2.65	2.63	2.62
325.0	2.68	2.66	2.66
330.0	2.71	2.70	2.69
335.0	2.75	2.73	2.72
340.0	2.78	2.76	2.75
345.0	2.81	2.80	2.78
350.0	2.85	2.83	2.82
355.0	2.89	2.88	2.88
360.0	2.93	2.91	2.90
365.0	2.97	2.95	2.94
370.0	3.04	3.02	3.00
375.0	3.07	3.06	3.05
380.0	3.12	3.12	3.10
385.0	3.18	3.17	3.16
390.0	3.23	3.23	3.22
395.0	3.26	3.26	3.25
400.0	3.35	3.34	3.33
405.0	3.40	3.41	3.41
410.0	3.49	3.50	3.49
415.0	3.58	3.58	3.59
420.0	3.67	3.67	3.69
425.0	3.76	3.78	3.79
430.0	3.87	3.88	3.90
435.0	4.00	4.01	4.04
440.0	4.12	4.14	4.15
445.0	4.25	4.28	4.29
450.0	4.41	4.42	4.44
455.0	4.58	4.59	4.61
460.0	4.77	4.80	4.80
465.0	4.94	4.96	4.99
470.0	5.17	5.20	5.24
475.0	5.40	5.45	5.49
480.0	5.69	5.74	5.81
485.0	6.03	6.12	6.19
490.0	6.48	6.60	6.72
491.0	6.57	6.70	6.83
492.0	6.68	6.81	6.95
493.0	6.79	6.93	7.08
494.0	6.92	7.07	7.23
495.0	7.05	7.22	7.37
496.0	7.18	7.35	7.51
497.0	7.34	7.50	7.67
498.0	7.47	7.65	7.83
499.0	7.65	7.83	8.00
500.0	7.79	7.98	8.16

Typical Performance Curves



Typical Performance Curves

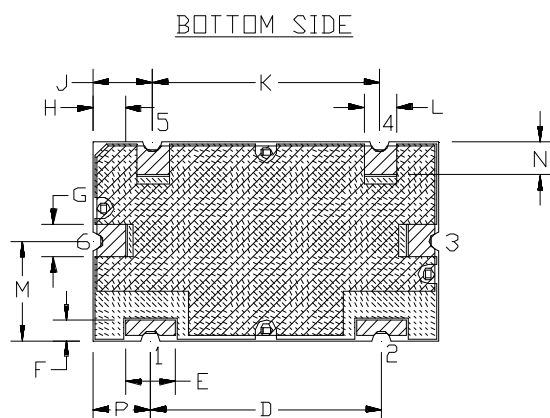
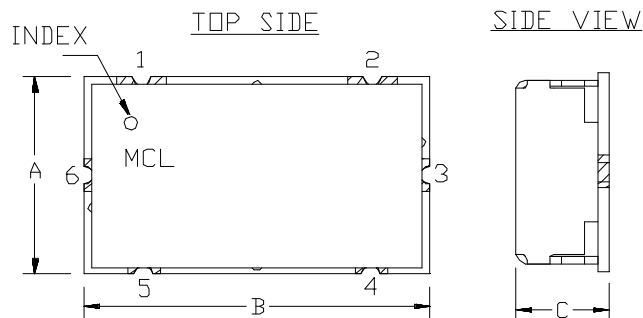


Case Style

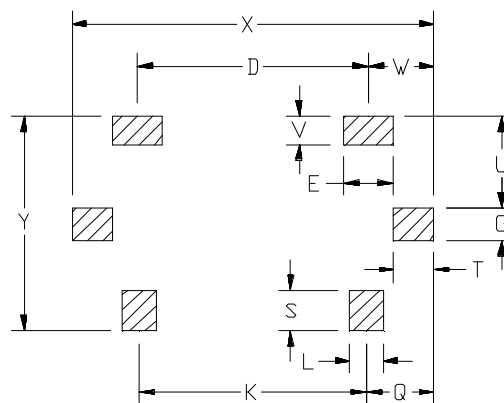
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Outline Dimensions

HZ1198



PCB Land Pattern



 METALLIZATION  SOLDER RESIST

Suggested Layout,
Tolerance to be within $\pm .002$

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

Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED

ALL NEW
minicircuits.com

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

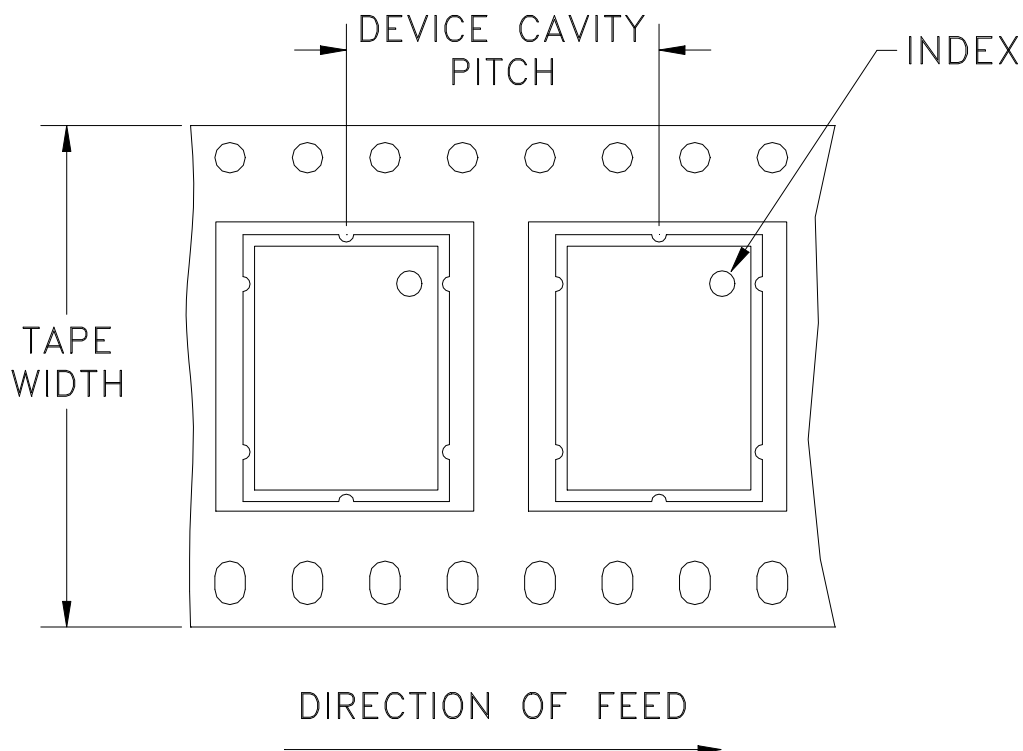


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RF/IF MICROWAVE COMPONENTS

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



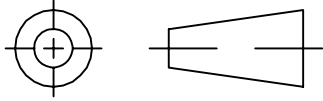
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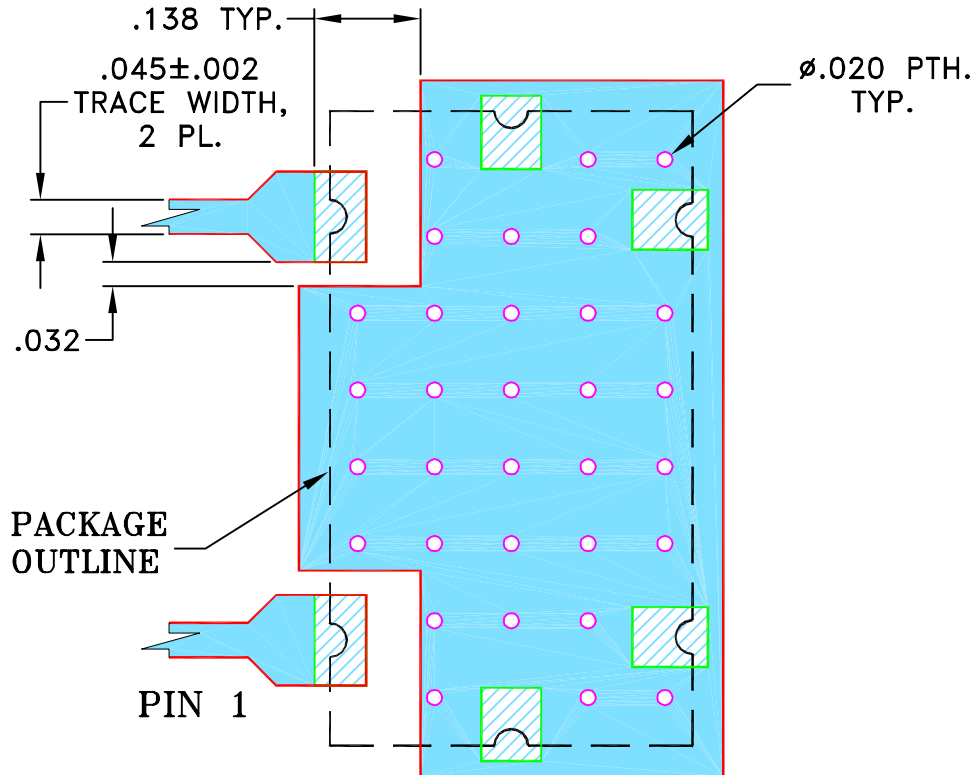
THIRD ANGLE PROJECTION



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:

- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS $.025 \pm .002$ ". COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- 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

TOLERANCES ON:

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

DRAWN

DK (RAVON)

14 NOV 06

CHECKED

RZ (RAVON)

14 NOV 06

APPROVED

HH (RAVON)

14 NOV 06



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, rg, HZ1198, DPLX, TB-400+
50 Ω

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-247

REV:

OR

FILE:

98PL247

SCALE:

4:1

SHEET:

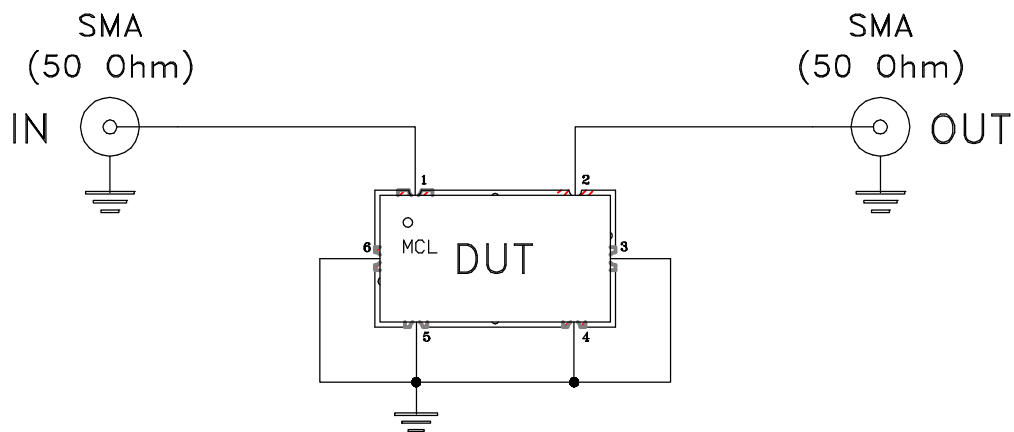
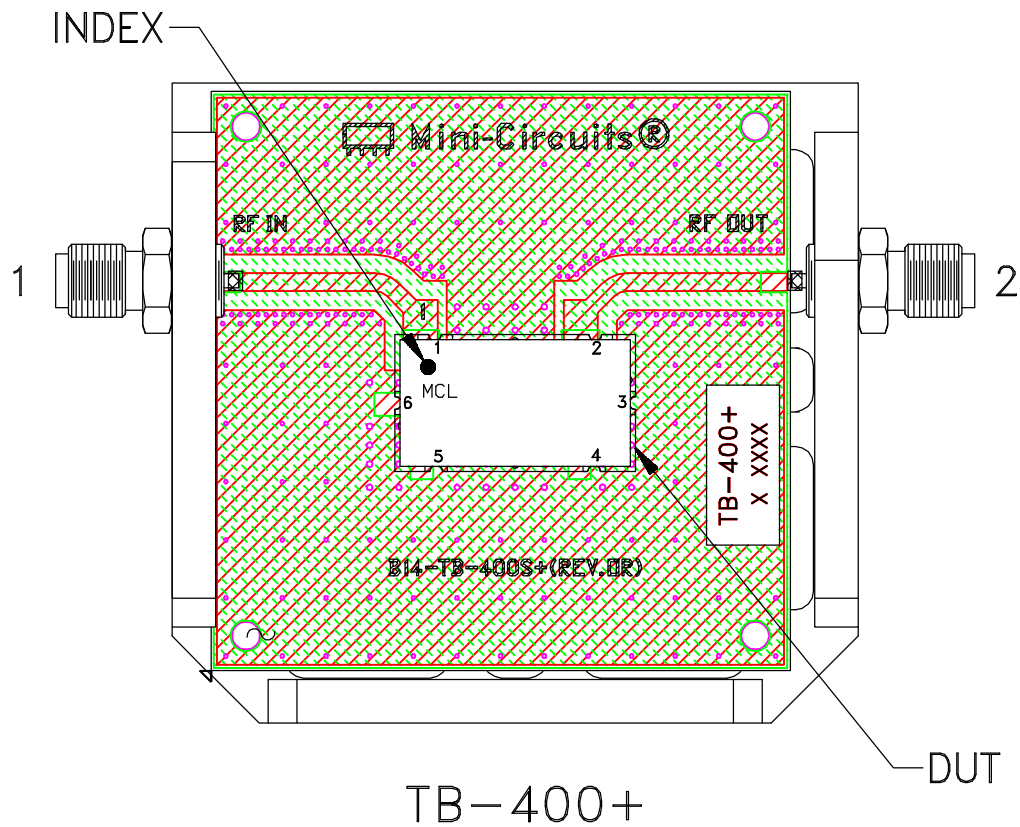
1 OF 1

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

Evaluation Board and Circuit



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: 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	-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