

Surface Mount Bandpass Filter

50Ω 560 to 780 MHz

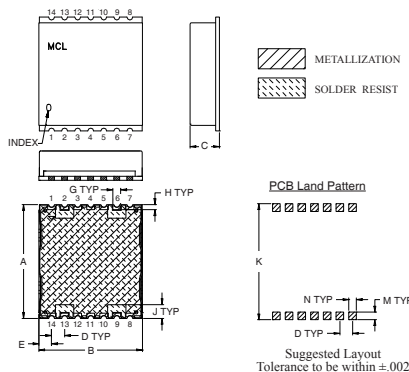
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W Max.
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

INPUT	2
OUTPUT	9
NOT CONNECTED	6, 13
GROUND	1, 3, 4, 5, 7, 8, 10, 11, 12, 14

Outline Drawing

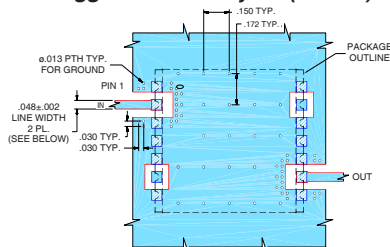


Outline Dimensions (inch mm)

A	B	C	D	E	G	H	J	K	M	N	wt.
.870	.800	.25	.100	.097	.060	.040	.105	.910	.060	.060	grams
22.10	20.32	6.35	2.54	2.46	1.52	1.02	2.67	23.11	1.52	1.52	2.85

Note: Please refer to case style drawing for details

Demo Board MCL P/N: TB-500+ Suggested PCB Layout (PL-294)



NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B, DIELECTRIC THICKNESS: .030±.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 SOLDER MASK

BPF-C650+

INSERTION LOSS



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



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BPF-C650+



Generic photo used for illustration purposes only
CASE STYLE: HU1186

+RoHS Compliant

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

Features

- Flat group delay
- High rejection
- Shielded case
- Aqueous washable

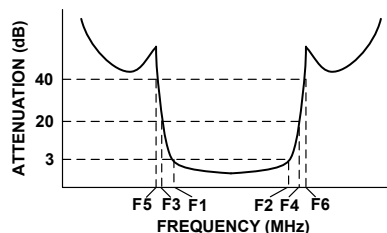
Applications

- Receivers / transmitters
- Wireless communication systems

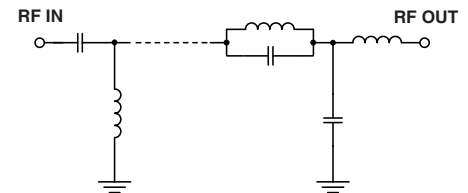
Bandpass Filter Electrical Specifications (T_{AMB} = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 3dB)	STOPBANDS (MHz)				VSWR (:1)		
		Loss > 20dB		Loss > 40dB		Passband		Stopband
F _c	F ₁ - F ₂	F ₃	F ₄	F ₅	F ₆	Typ.	Max.	Typ.
650	560 - 780	280	890	185	920 - 1600	1.4	1.8	18

Typical Frequency Response



Functional Schematic

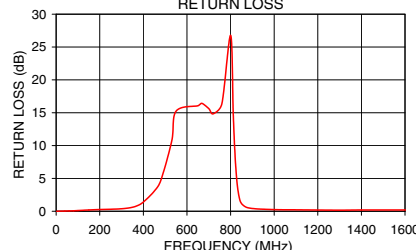


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)		Return Loss (dB)	Frequency (MHz)	Group Delay (nSec)
	$\bar{x}$	σ			
2.0	101.98	9.04	0.00	560.0	3.18
100.0	74.01	0.79	0.11	570.0	3.11
185.0	48.87	0.16	0.24	580.0	3.06
280.0	29.90	0.14	0.35	600.0	3.00
340.0	19.49	0.15	0.54	610.0	2.96
400.0	10.25	0.17	1.40	630.0	2.94
450.0	5.12	0.09	3.06	640.0	2.94
500.0	2.23	0.06	6.40	650.0	2.99
520.0	1.53	0.05	8.96	660.0	3.07
560.0	0.82	0.01	17.93	680.0	3.25
650.0	0.75	0.02	16.06	700.0	3.35
780.0	1.16	0.04	19.23	710.0	3.41
820.0	2.80	0.14	8.88	720.0	3.51
830.0	5.62	0.24	4.20	730.0	3.64
847.0	13.23	0.39	1.37	740.0	3.86
890.0	33.65	0.40	0.47	750.0	4.15
920.0	51.96	0.95	0.36	770.0	4.79
1600.0	53.63	1.11	0.19	780.0	5.21

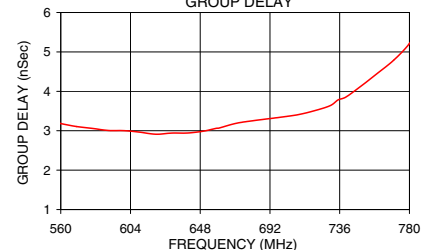
BPF-C650+

RETURN LOSS



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GROUP DELAY



Surface Mount Band Pass Filter

BPF-C650+

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	95.52	92.30	103.93	0.01	0.00	0.01	0.00	0.00	0.00
2	101.63	98.11	108.28	0.00	0.01	0.00	0.00	0.00	0.00
50	88.68	102.82	88.79	0.01	0.01	0.01	0.02	0.05	0.07
100	71.45	73.27	73.97	0.00	0.03	0.02	0.11	0.15	0.16
150	57.22	57.08	57.13	0.01	0.04	0.03	0.20	0.25	0.28
180	49.73	49.64	49.76	0.05	0.06	0.06	0.23	0.30	0.32
185	48.47	48.58	48.77	0.04	0.07	0.07	0.24	0.31	0.33
200	45.25	45.31	45.28	0.05	0.07	0.07	0.25	0.32	0.34
250	35.52	35.49	35.44	0.10	0.12	0.13	0.25	0.33	0.38
280	30.27	30.23	30.21	0.13	0.16	0.17	0.25	0.35	0.40
300	26.70	26.63	26.57	0.17	0.20	0.21	0.27	0.38	0.45
340	19.76	19.71	19.64	0.28	0.33	0.34	0.44	0.59	0.69
350	18.05	18.02	17.98	0.32	0.37	0.40	0.51	0.68	0.78
380	13.21	13.22	13.24	0.55	0.61	0.65	0.89	1.10	1.20
400	10.43	10.48	10.50	0.83	0.91	0.96	1.25	1.48	1.60
450	5.67	5.70	5.67	2.15	2.32	2.44	2.50	2.81	3.00
480	3.71	3.71	3.65	3.64	3.93	4.19	3.86	4.29	4.65
500	2.52	2.56	2.54	5.27	5.69	6.07	5.46	6.04	6.57
520	1.63	1.72	1.74	7.82	8.40	8.87	8.15	8.97	9.68
550	0.82	1.00	1.10	14.18	14.57	14.79	16.11	17.48	18.41
560	0.74	0.92	1.03	16.11	16.07	15.97	19.61	20.58	20.88
580	0.79	0.98	1.10	15.20	14.99	14.87	17.30	17.17	16.96
600	0.91	1.09	1.19	12.82	12.95	13.14	13.32	13.45	13.60
620	0.98	1.16	1.25	11.73	12.06	12.49	11.63	11.92	12.27
650	1.01	1.20	1.29	12.38	12.96	13.64	11.70	12.11	12.64
680	0.87	1.08	1.19	16.32	17.19	18.06	14.57	14.98	15.47
700	0.85	1.08	1.22	20.74	21.83	22.55	17.38	17.54	17.81
720	0.88	1.15	1.30	19.18	19.43	19.91	16.73	16.60	16.76
730	1.00	1.26	1.40	16.94	17.15	17.68	15.15	15.05	15.30
750	1.26	1.54	1.70	14.18	14.63	15.31	12.89	13.11	13.57
780	1.28	1.67	1.95	17.89	18.94	18.92	20.23	25.19	33.71
800	2.97	3.93	4.64	7.63	6.91	6.39	7.67	6.75	6.13
820	10.65	11.93	12.88	2.09	2.27	2.35	1.47	1.57	1.61
830	15.00	16.26	17.20	1.44	1.68	1.80	0.79	0.96	1.05
847	23.33	24.48	25.33	1.04	1.27	1.39	0.38	0.56	0.65
850	24.87	26.03	26.88	0.98	1.22	1.34	0.36	0.52	0.62
880	40.56	42.09	43.27	0.74	0.94	1.04	0.18	0.34	0.42
890	48.56	50.30	52.06	0.70	0.88	0.97	0.15	0.30	0.39
900	62.98	62.42	61.14	0.66	0.83	0.92	0.13	0.28	0.36
920	51.81	51.63	51.62	0.59	0.73	0.82	0.10	0.25	0.33
930	50.20	50.13	50.04	0.56	0.70	0.78	0.09	0.25	0.32
950	49.91	50.38	50.41	0.51	0.65	0.73	0.08	0.23	0.29
1000	52.65	53.16	53.07	0.51	0.62	0.70	0.11	0.26	0.33
1050	56.47	56.83	57.10	0.43	0.55	0.61	0.11	0.26	0.32
1100	60.04	60.49	59.89	0.38	0.49	0.56	0.12	0.27	0.32
1150	64.11	63.66	63.45	0.35	0.47	0.54	0.12	0.28	0.34
1200	65.35	65.51	65.99	0.30	0.43	0.50	0.15	0.31	0.38
1250	69.37	69.44	68.91	0.29	0.43	0.52	0.14	0.32	0.37
1300	76.23	73.30	73.90	0.27	0.41	0.50	0.20	0.37	0.42
1350	81.10	87.31	84.56	0.27	0.42	0.52	0.18	0.37	0.43
1400	74.44	77.64	76.32	0.26	0.43	0.54	0.22	0.40	0.47
1450	69.93	69.11	68.84	0.27	0.46	0.56	0.22	0.41	0.48
1500	64.86	66.29	65.23	0.28	0.48	0.60	0.24	0.45	0.52
1550	62.39	62.22	62.65	0.29	0.51	0.64	0.23	0.43	0.51
1600	60.21	59.54	59.73	0.32	0.53	0.68	0.25	0.47	0.57

REV. X1

BPF-C650+

091220

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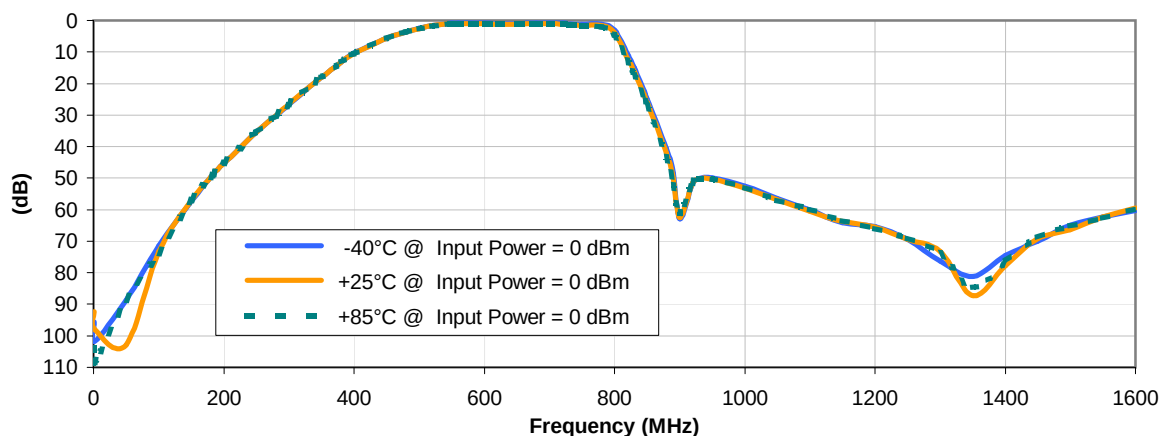


Typical Performance Data

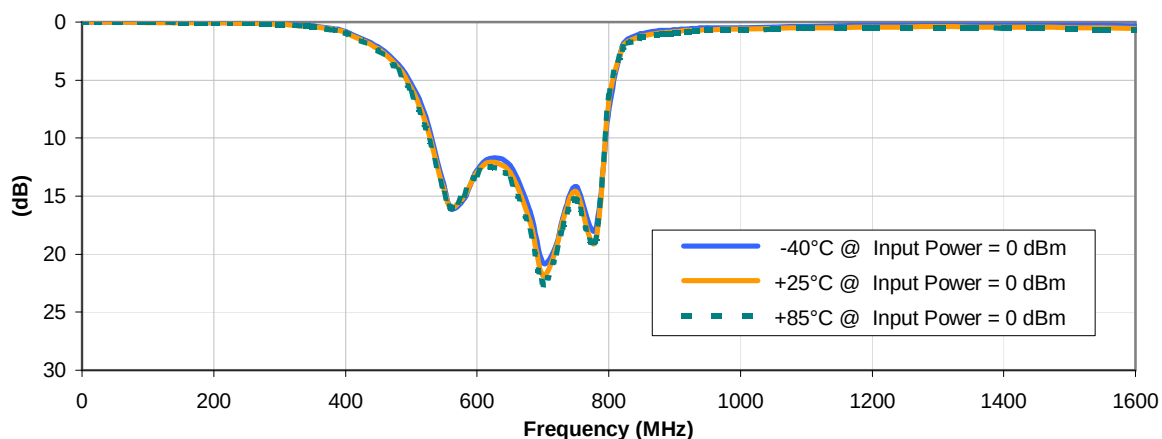
FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
560	3.79	3.75	3.70
565	3.75	3.71	3.66
570	3.74	3.69	3.65
575	3.67	3.64	3.60
580	3.60	3.57	3.53
590	3.54	3.51	3.49
600	3.49	3.47	3.44
610	3.43	3.41	3.40
620	3.40	3.39	3.39
630	3.38	3.39	3.39
640	3.41	3.42	3.42
650	3.48	3.49	3.49
660	3.55	3.57	3.57
670	3.66	3.67	3.68
680	3.80	3.80	3.81
690	3.92	3.94	3.94
700	4.06	4.07	4.07
710	4.23	4.24	4.24
720	4.40	4.41	4.42
730	4.58	4.61	4.63
740	4.75	4.79	4.83
750	4.94	5.00	5.06
755	5.16	5.24	5.32
760	5.45	5.55	5.64
765	5.81	5.93	6.05
770	6.17	6.33	6.48
776	6.53	6.75	6.87
777	6.81	7.07	7.23
778	7.09	7.34	7.55
779	7.27	7.55	7.74
780	7.41	7.69	7.88

Typical Performance Curves

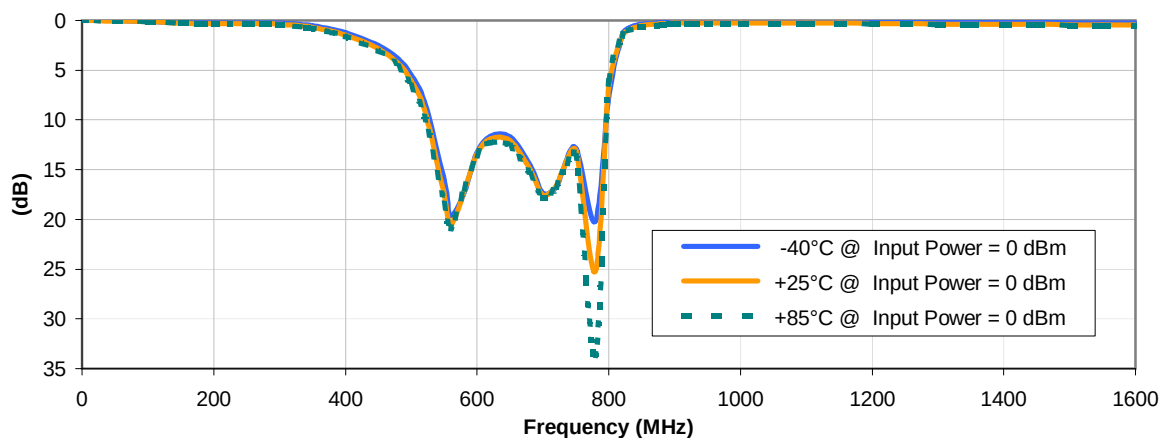
INSERTION LOSS vs. TEMPERATURE



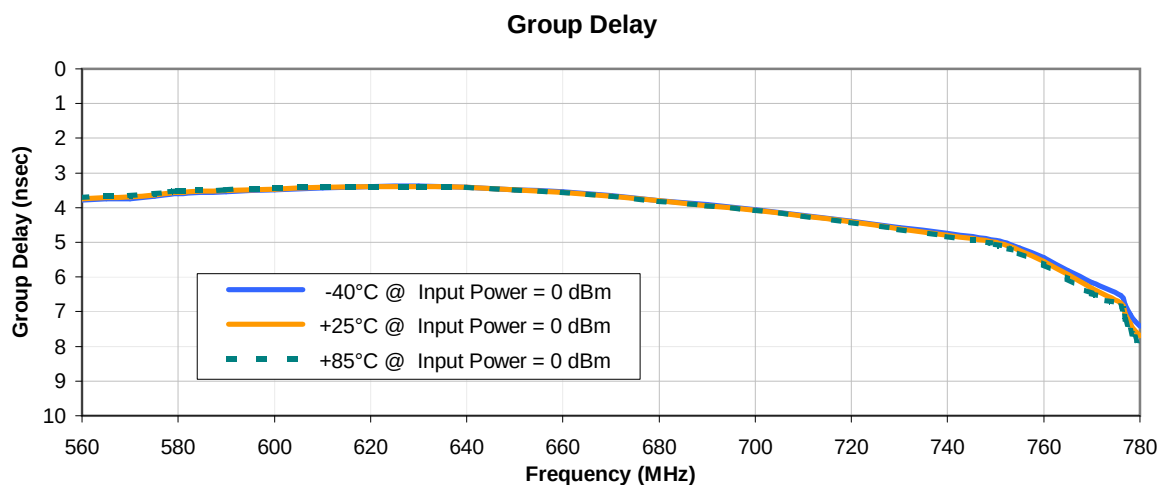
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



Typical Performance Curves



REV. X1
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091220
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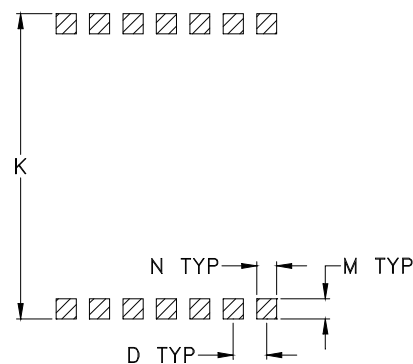


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HU

HU1186



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

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

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

For RoHS Case Styles: 2-5 μ inch (.05-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.
For RoHS-5 Case Styles: Tin-Lead plate.

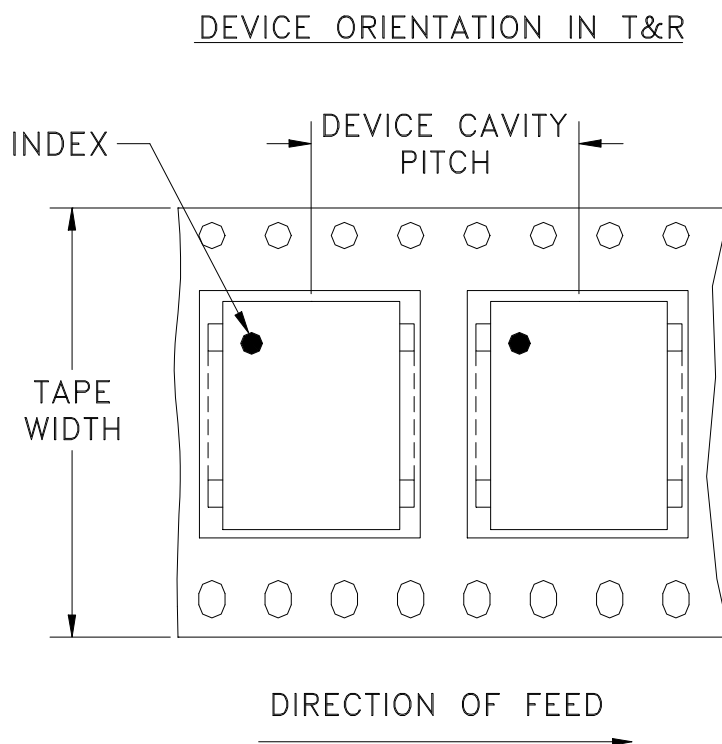


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Tape & Reel Packaging TR-F21



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	32	13	200

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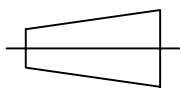
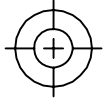
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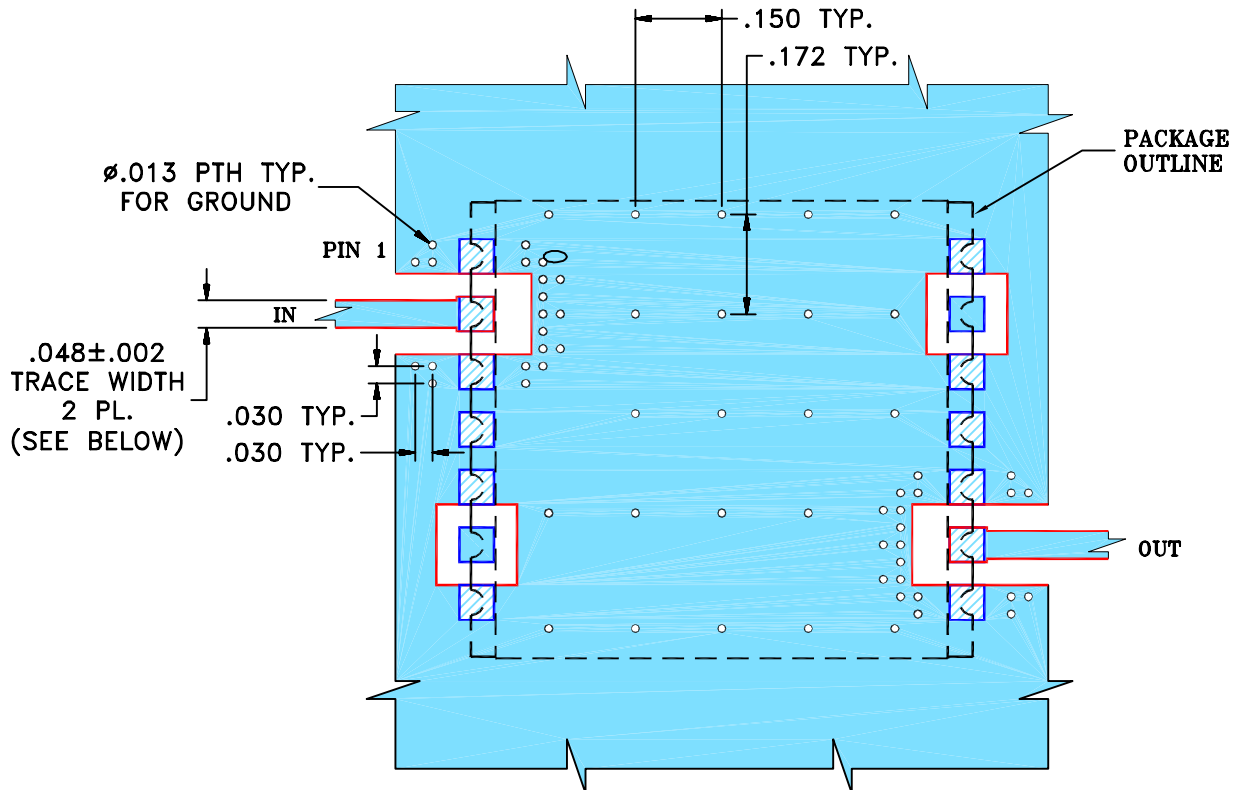
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M119979	NEW RELEASE (FROM RAVON)	11/08	DK	HH
OR	R74463	NEW RELEASE (FROM RAVON)	11/08	DK	HH

**SUGGESTED MOUNTING CONFIGURATION FOR
HU1186 CASE STYLE, "14FL03" PIN CODE**



NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS R04350B, DIELECTRIC THICKNESS: .030" $\pm$.002"; COPPER: 1/2 OZ ON 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)

02 NOV 08

CHECKED

DH (RAVON)

02 NOV 08

APPROVED

HH (RAVON)

02 NOV 08



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**PL, 14FL03, HU1186, BPF-C
TB-500+ (50 OHM)**

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-294

REV:

OR

FILE:

98PL294

SCALE:

3:1

SHEET:

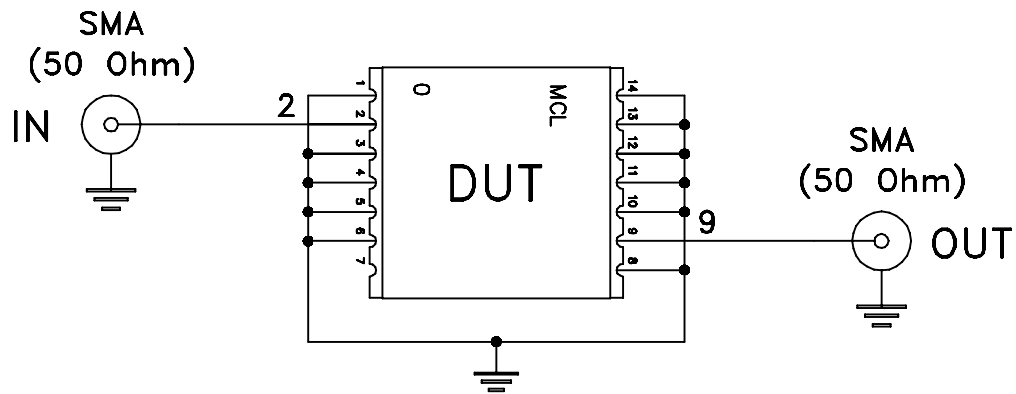
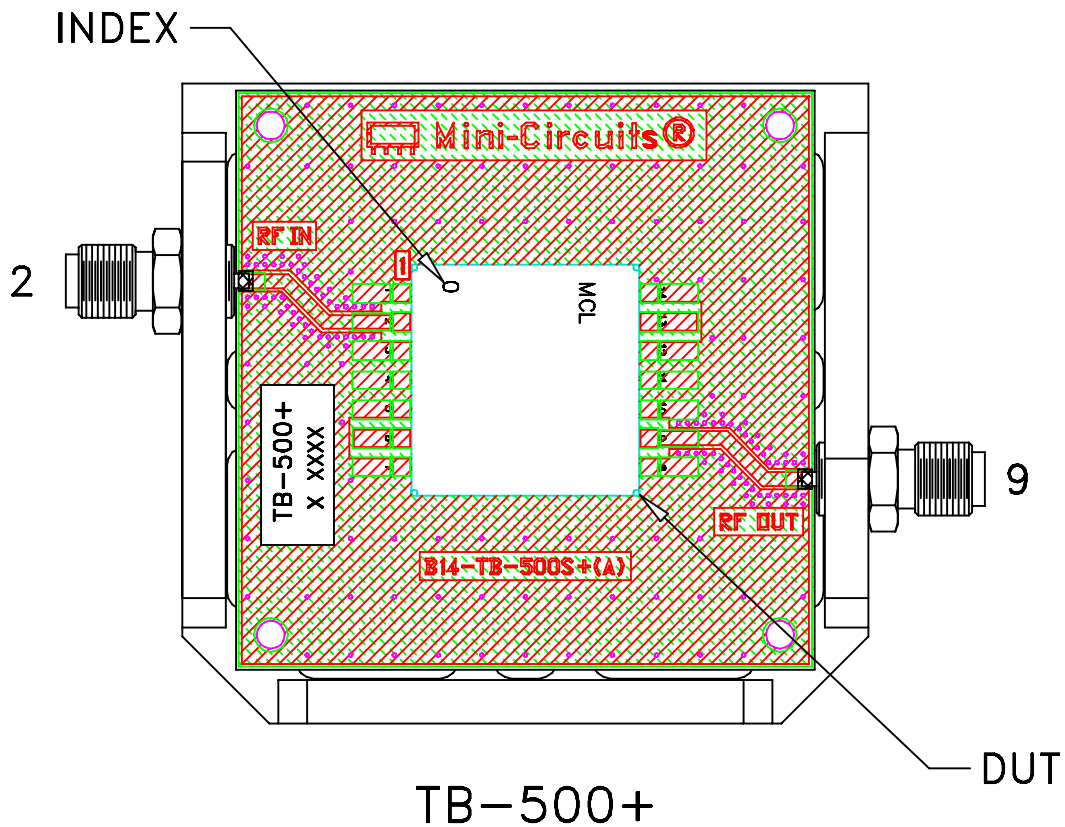
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ASHEETA1.DWG REV:A DATE:01/12/95

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.

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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