Surface Mount

Bandpass Filter

BPF-C650+

50Ω 560 to 780 MHz

Generic photo used for illustration purposes only

CASE STYLE: HU1186

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

Features

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

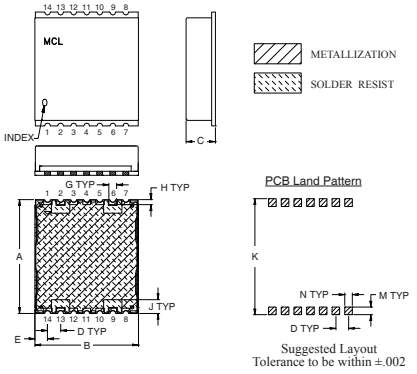
Applications

- Receivers / transmitters
- Wireless communication systems

+RoHS Compliant

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

Outline Drawing

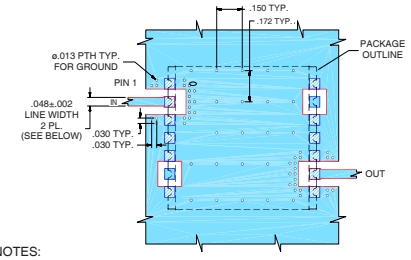


Outline Dimensions (inch / mm)

A	B	C	D	E	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:

1. 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.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

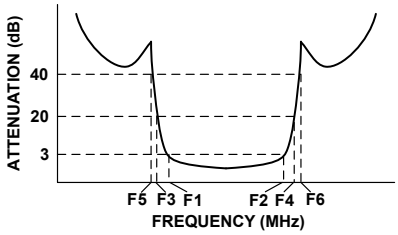
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

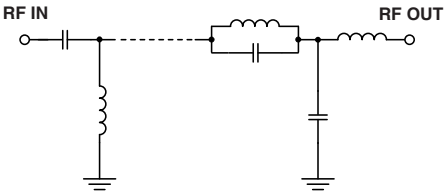
Bandpass Filter Electrical Specifications (T_{AMB}= 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 3dB)	STOPBANDS (MHz)				VSWR (:1)		
		Loss > 20dB		Loss > 40dB		Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Typ.	Max.	Typ.
650	560 - 780	280	890	185	920 - 1600	1.4	1.8	18

Typical Frequency Response

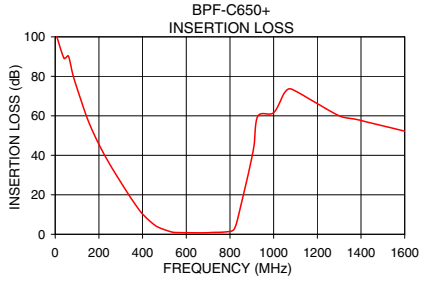


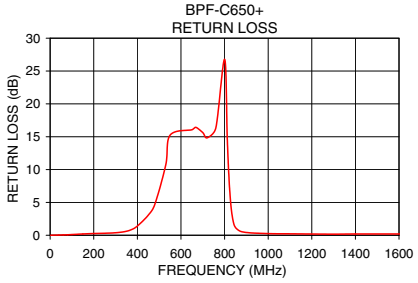
Functional Schematic

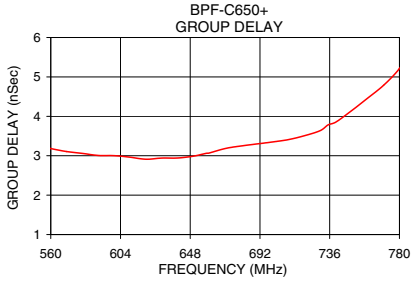


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB) $\bar{x}$	Insertion Loss (dB) σ	Return Loss (dB)	Frequency (MHz)	Group Delay (nSec)
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







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

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REV.B
M174392
EDR-8665/1UF1
BPF-C650+
URJ/RAV
190824

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

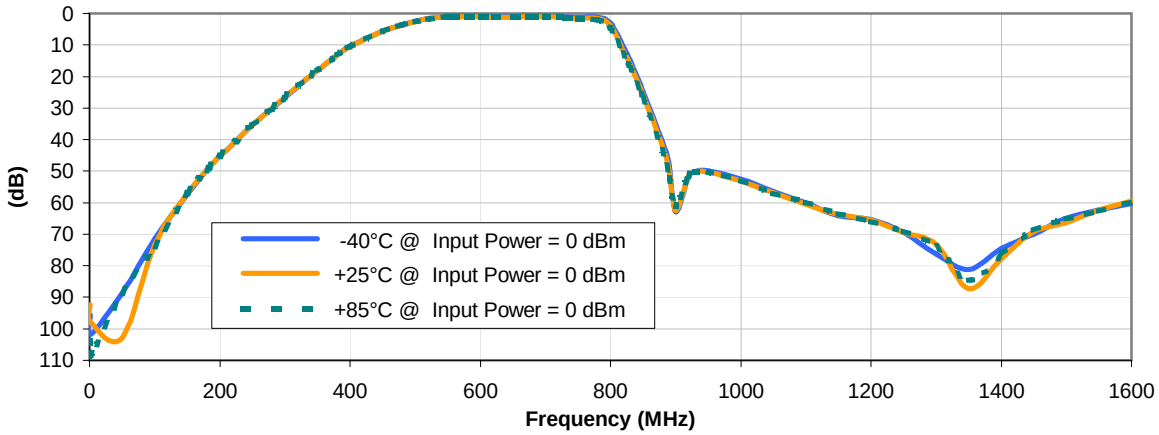
Typical Performance Data

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

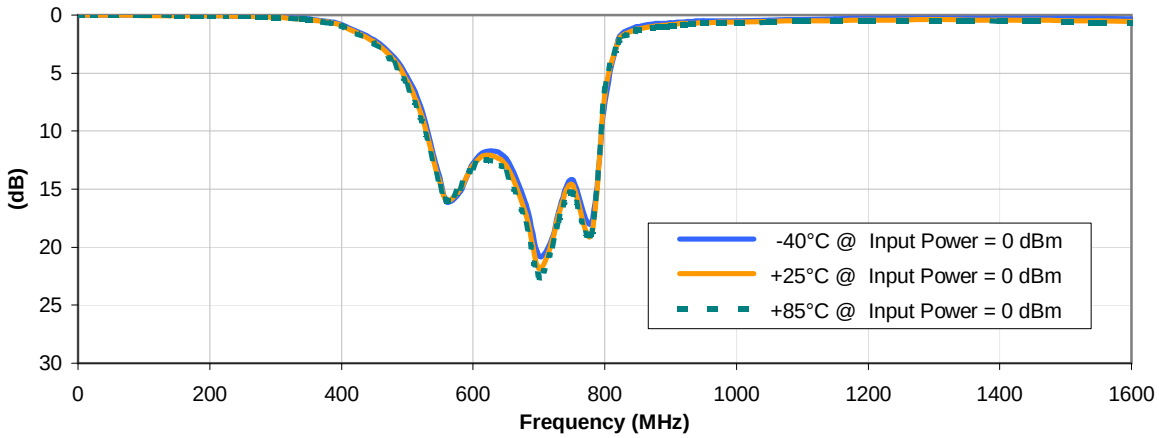
Surface Mount Band Pass Filter BPF-C650+

Typical Performance Curves

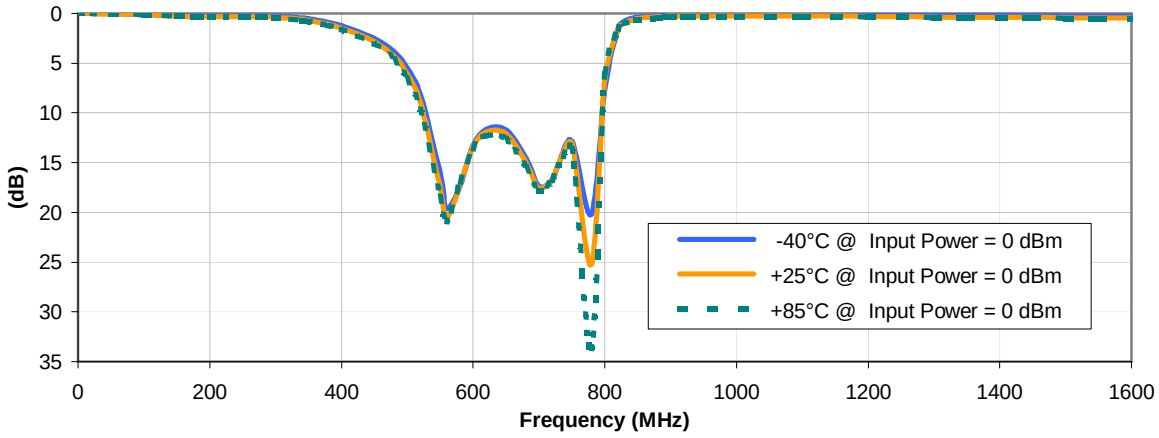
INSERTION LOSS vs. TEMPERATURE



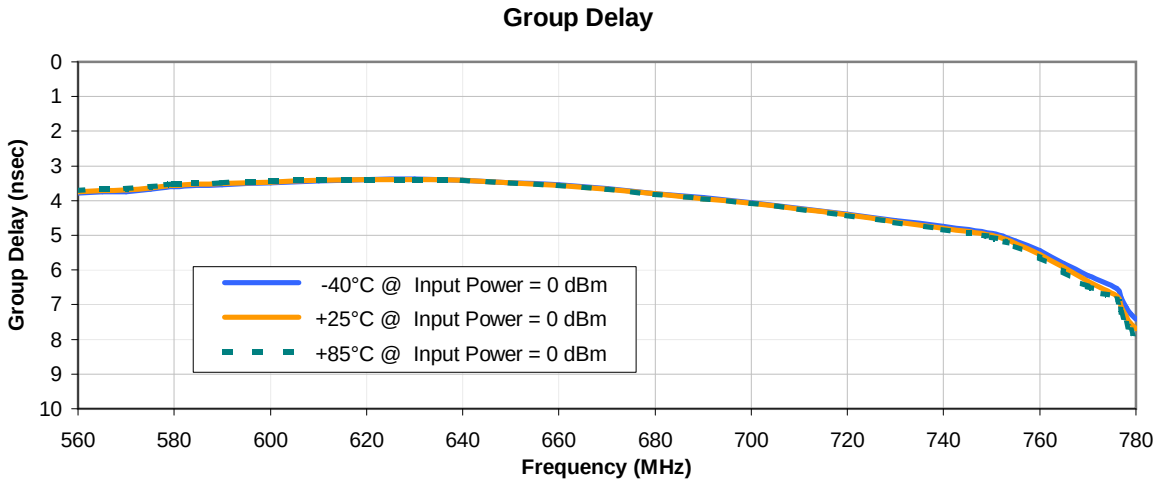
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



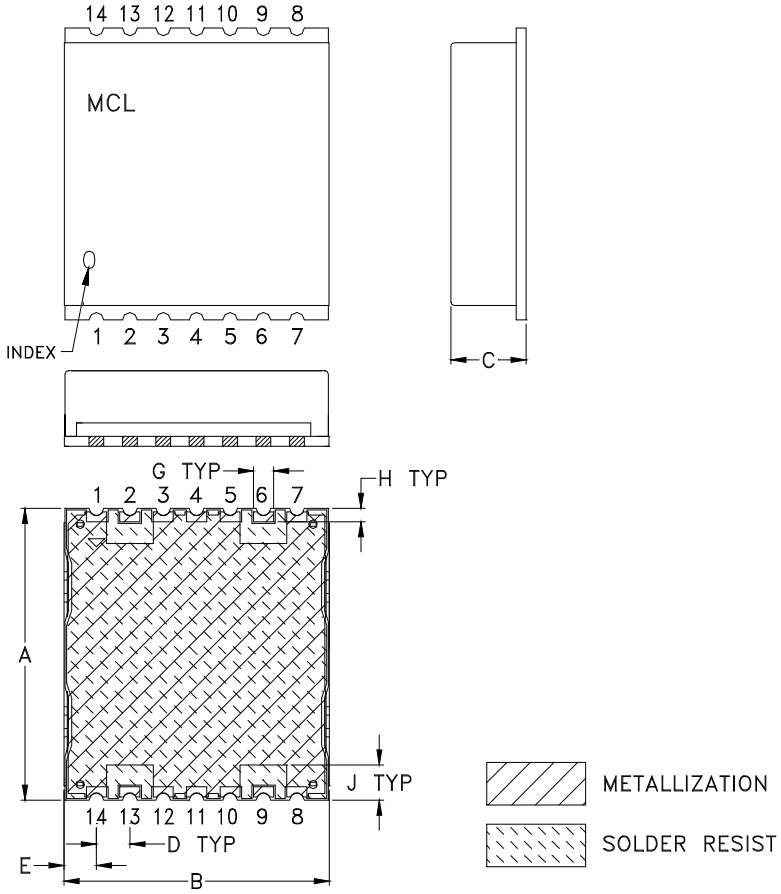
Typical Performance Curves



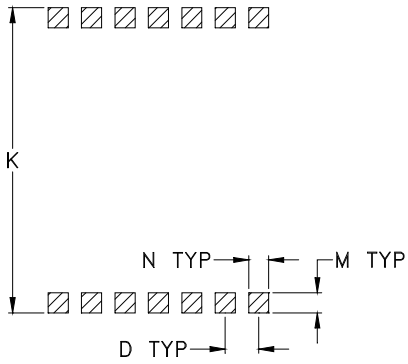
Case Style HU

Outline Dimensions

HU1186



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT, GRAM
HU1186	.870 (22.10)	.800 (20.32)	.25 (6.35)	.100 (2.54)	.097 (2.46)	- -	.060 (1.52)	.040 (1.02)	.105 (2.67)	.910 (23.11)	- -	.060 (1.52)	.060 (1.52)	- -	2.85

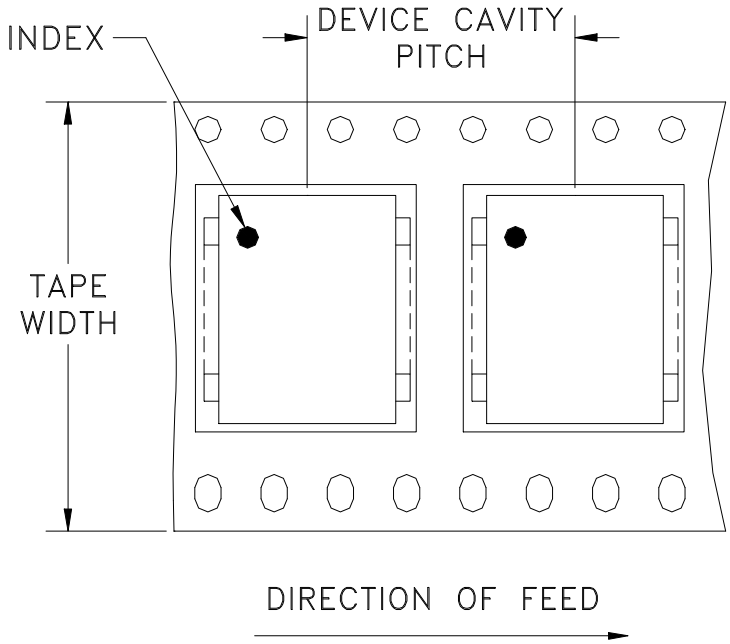
Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

Notes:

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

Tape & Reel Packaging TR-F21

DEVICE ORIENTATION IN T&R



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

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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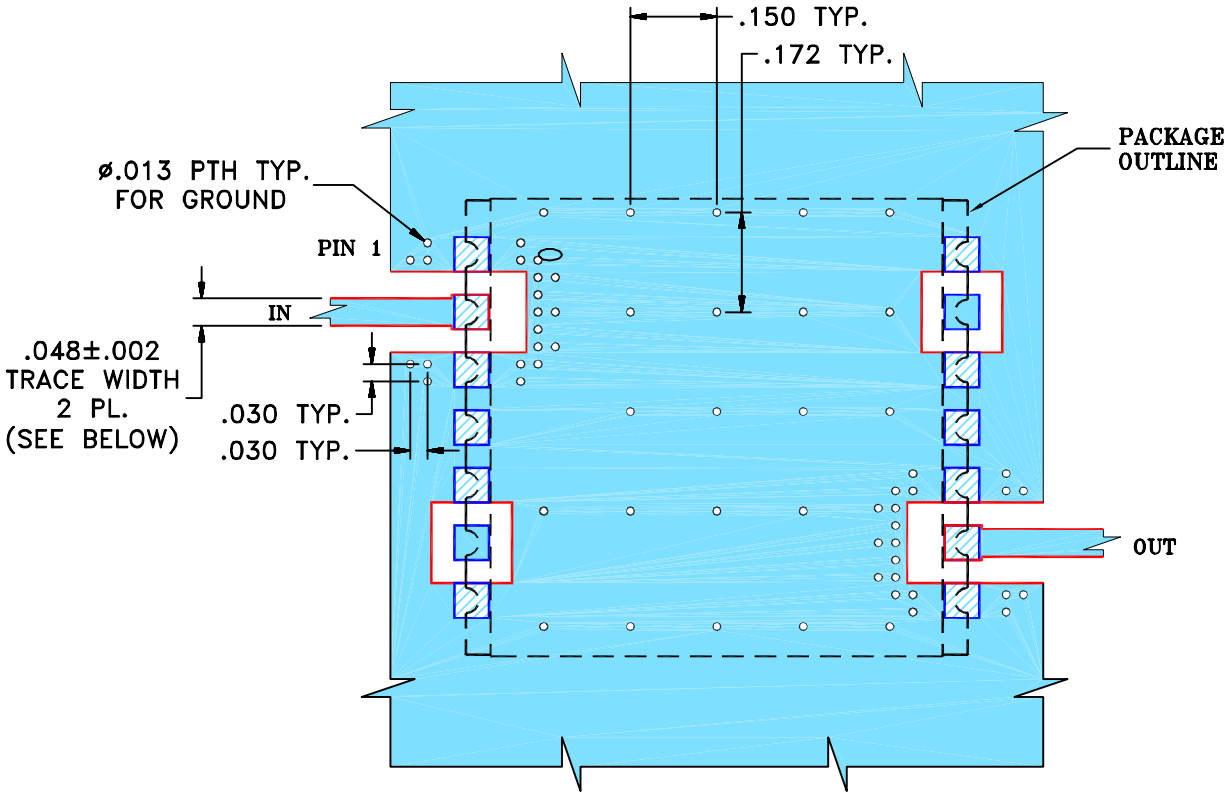
THIRD ANGLE PROJECTION

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:

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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)	02 NOV 08
TOLERANCES ON:	CHECKED	DH (RAVON)	02 NOV 08
2 PL DECIMALS ±	APPROVED	HH (RAVON)	02 NOV 08
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

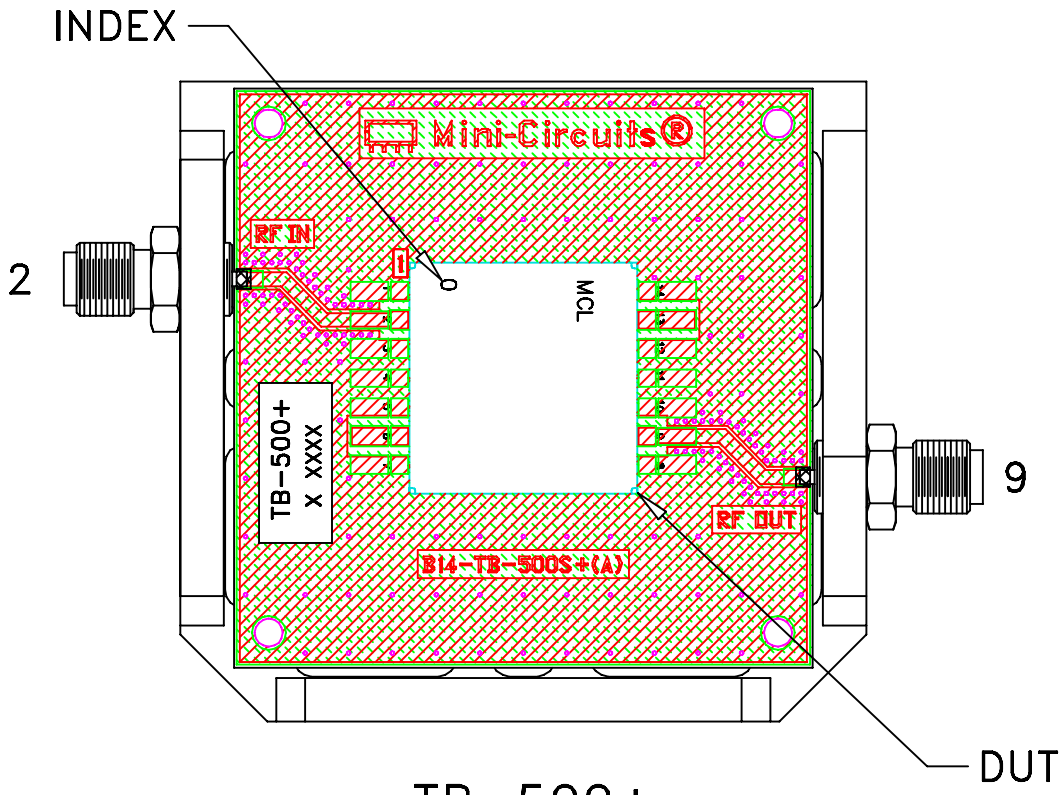
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

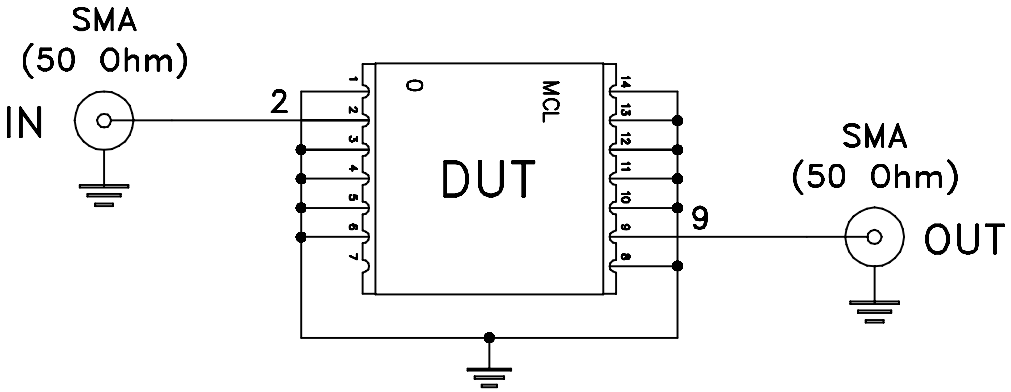
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-294	OR

FILE:	SCALE:	SHEET:
98PL294	3:1	1 OF 1

Evaluation Board and Circuit



TB-500+



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