

Surface Mount

Bandpass Filter

BPF-C450+

50Ω

400 to 510 MHz

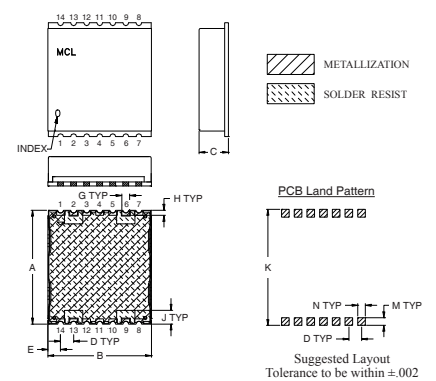
Maximum Ratings

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

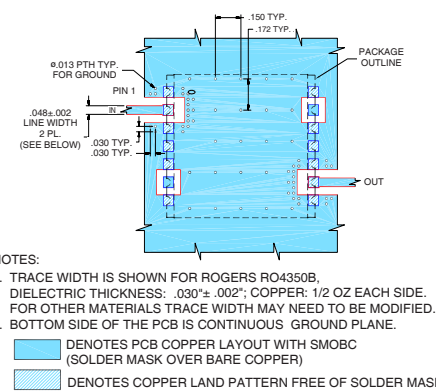


Outline Dimensions (inch mm)

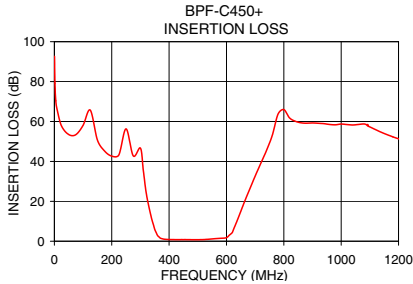
A	B	C	D	E	G	H	J	K	M	N	wt.
.870	.800	.25	.100	.097	.060	.040	.105	.910	.060	.060	grams
22.10	20.32	6.35	2.54	2.46	1.52	1.02	2.67	23.11	1.52	1.52	2.85

Note: Please refer to case style drawing for details

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



- NOTES:
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



- 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

Features

- Good VSWR, 1.3:1 typ @ passband
- High rejection
- Shielded case
- Aqueous washable

Applications

- Military and avionics
- Receivers / transmitters
- Harmonic rejection



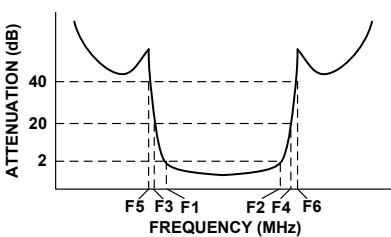
Generic photo used for illustration purposes only
CASE STYLE: HU1186

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

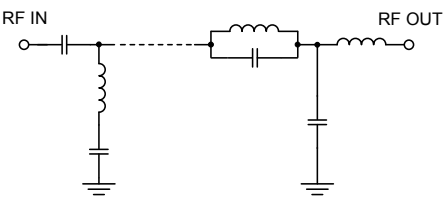
Bandpass Filter Electrical Specifications (T_{AMB} = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 2dB)	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.
450	400 - 510	310	700	150	760 - 1200	1.3	1.7	18

Typical Frequency Response

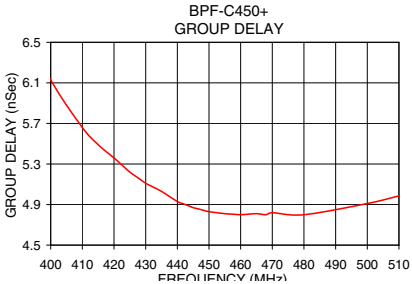
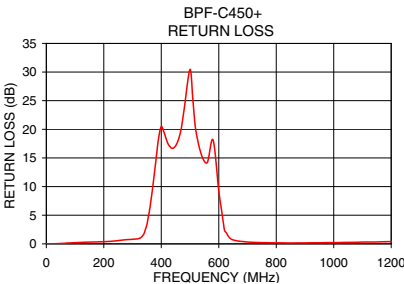


Functional Schematic



Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)		Return Loss (dB)	Frequency (MHz)	Group Delay (nSec)
	$\bar{x}$	σ			
0.5	92.65	1.56	0.01	400.0	6.13
150.0	50.75	0.54	0.31	410.0	5.66
310.0	35.49	5.18	0.84	415.0	5.49
340.0	10.85	1.26	1.78	420.0	5.36
355.0	4.37	0.28	4.74	425.0	5.22
365.0	2.16	0.06	7.97	430.0	5.11
400.0	0.86	0.03	20.46	435.0	5.03
430.0	0.81	0.03	16.97	440.0	4.93
450.0	0.81	0.03	17.12	445.0	4.87
470.0	0.80	0.03	20.27	448.0	4.85
510.0	0.80	0.03	25.18	450.0	4.83
580.0	1.48	0.26	18.15	455.0	4.81
610.0	3.03	1.32	5.80	460.0	4.80
625.0	6.05	2.32	2.01	465.0	4.81
640.0	11.26	2.70	0.94	470.0	4.82
700.0	32.58	2.46	0.33	480.0	4.80
760.0	53.15	4.33	0.21	500.0	4.91
1200.0	51.38	2.35	0.39	510.0	4.99



Surface Mount Band Pass Filter

BPF-C450+

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	87.31	86.82	93.63	0.01	0.01	0.01	0.01	0.00	0.01
10	64.89	65.00	64.90	0.00	0.00	0.00	0.01	0.01	0.01
20	59.26	59.10	59.15	0.00	0.00	0.00	0.00	0.02	0.02
30	55.90	55.95	56.02	0.00	0.00	0.00	0.00	0.03	0.05
40	53.98	54.00	53.86	0.00	0.01	0.01	0.01	0.05	0.07
50	52.93	52.71	52.83	0.00	0.01	0.01	0.03	0.07	0.10
100	54.91	55.09	55.24	0.01	0.03	0.04	0.16	0.21	0.24
150	54.63	54.64	54.70	0.05	0.08	0.10	0.24	0.30	0.34
200	44.48	44.60	44.72	0.12	0.16	0.17	0.28	0.37	0.44
250	57.04	58.15	59.32	0.20	0.25	0.27	0.40	0.56	0.66
300	41.60	42.21	42.83	0.31	0.39	0.43	0.67	0.83	0.94
310	47.59	45.41	43.52	0.36	0.44	0.49	0.68	0.84	0.95
320	30.54	29.92	29.24	0.41	0.51	0.57	0.68	0.85	0.96
330	21.89	21.45	20.92	0.51	0.63	0.72	0.72	0.91	1.04
340	15.17	14.79	14.30	0.75	0.92	1.07	0.90	1.13	1.31
350	9.40	9.09	8.66	1.45	1.73	2.02	1.52	1.86	2.18
355	6.89	6.66	6.31	2.22	2.59	3.01	2.23	2.66	3.11
360	4.76	4.64	4.41	3.50	4.00	4.58	3.43	3.98	4.58
365	3.12	3.12	3.02	5.54	6.15	6.90	5.33	5.98	6.72
370	2.02	2.12	2.13	8.52	9.20	10.08	8.04	8.73	9.55
380	1.06	1.23	1.33	18.16	18.61	19.31	15.36	15.74	16.32
390	0.82	0.99	1.10	25.01	25.50	25.63	19.34	19.71	20.20
400	0.74	0.89	1.00	21.28	22.39	23.48	19.33	20.28	21.37
410	0.67	0.83	0.93	21.92	23.19	24.49	20.99	22.41	24.03
420	0.62	0.78	0.88	25.25	26.27	26.59	25.33	27.15	28.27
430	0.59	0.76	0.87	27.40	26.57	24.97	28.78	28.02	25.96
440	0.59	0.76	0.86	23.21	22.71	21.76	23.20	22.73	21.72
450	0.62	0.78	0.88	19.64	19.77	19.58	19.26	19.43	19.26
460	0.64	0.80	0.90	17.62	18.10	18.46	17.17	17.69	18.08
470	0.66	0.81	0.90	16.74	17.44	18.21	16.28	17.04	17.88
480	0.66	0.81	0.90	16.76	17.61	18.71	16.33	17.29	18.58
490	0.65	0.81	0.90	17.58	18.53	19.83	17.30	18.51	20.23
500	0.64	0.80	0.91	19.08	19.96	20.94	19.18	20.65	22.50
510	0.63	0.81	0.94	20.30	20.48	20.22	21.30	22.25	22.36
520	0.68	0.87	1.01	18.84	18.27	17.38	20.03	19.60	18.49
550	1.18	1.41	1.58	10.21	10.12	9.94	10.14	10.07	9.81
580	1.90	2.09	2.21	7.01	7.23	7.49	6.77	7.01	7.22
600	1.76	1.94	2.03	8.20	8.77	9.52	8.07	8.72	9.52
610	1.46	1.69	1.87	11.72	12.83	14.23	12.12	13.78	16.14
620	1.51	1.96	2.39	16.99	14.72	12.60	22.84	17.97	14.30
625	2.04	2.64	3.26	10.97	9.54	8.23	11.64	10.04	8.48
640	6.46	7.31	8.19	2.84	2.80	2.69	2.57	2.52	2.36
650	10.50	11.31	12.16	1.51	1.63	1.68	1.19	1.29	1.30
700	28.60	29.23	29.89	0.59	0.75	0.85	0.22	0.36	0.43
750	47.02	47.78	48.68	0.51	0.65	0.73	0.11	0.25	0.33
760	52.44	53.75	54.86	0.50	0.64	0.71	0.10	0.24	0.32
800	54.93	54.42	54.01	0.47	0.59	0.66	0.06	0.21	0.29
850	50.38	50.20	50.24	0.42	0.53	0.60	0.04	0.19	0.27
900	49.62	49.46	49.37	0.36	0.47	0.55	0.02	0.18	0.26
950	49.57	49.17	49.42	0.33	0.44	0.51	0.00	0.17	0.26
1000	49.18	49.19	49.02	0.30	0.41	0.50	0.00	0.16	0.26
1050	48.95	49.00	49.00	0.28	0.40	0.50	0.01	0.17	0.27
1100	48.65	48.66	48.57	0.27	0.41	0.51	0.01	0.17	0.27
1150	48.08	48.01	48.01	0.26	0.41	0.53	0.01	0.18	0.28
1200	47.16	47.13	47.08	0.26	0.43	0.57	0.00	0.19	0.29

REV. X1

BPF-C450+

100105

Page 1 of 2



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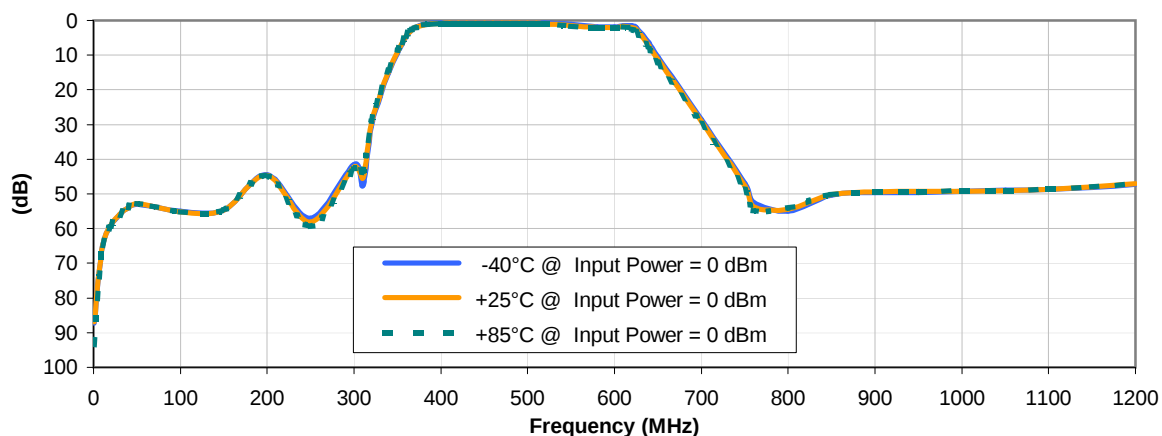


Typical Performance Data

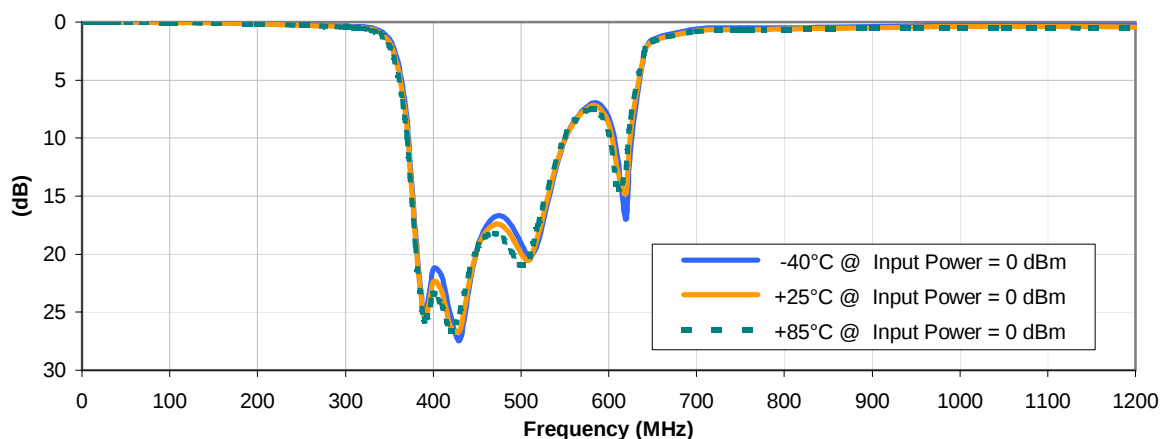
FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
400	7.09	7.00	6.89
405	6.66	6.59	6.51
410	6.32	6.27	6.20
415	6.06	6.01	5.95
420	5.85	5.81	5.75
425	5.68	5.64	5.59
430	5.53	5.49	5.44
435	5.40	5.36	5.31
440	5.28	5.24	5.20
445	5.18	5.14	5.10
450	5.08	5.05	5.01
455	5.00	4.97	4.94
460	4.93	4.91	4.88
465	4.87	4.86	4.84
470	4.83	4.82	4.81
475	4.80	4.79	4.79
480	4.79	4.78	4.78
485	4.79	4.78	4.78
490	4.80	4.79	4.80
495	4.82	4.81	4.82
500	4.84	4.84	4.84
505	4.88	4.88	4.87
510	4.93	4.92	4.91

Typical Performance Curves

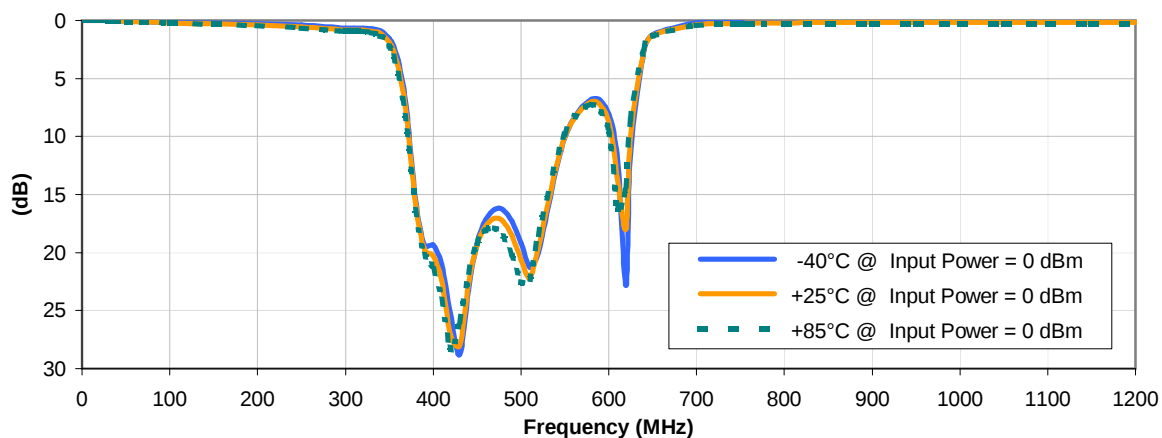
INSERTION LOSS vs. TEMPERATURE



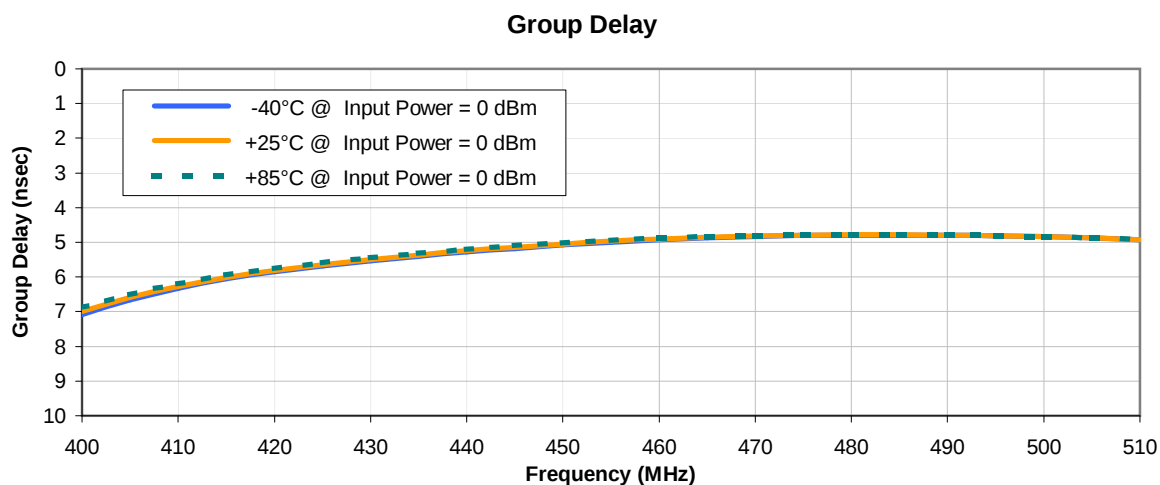
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE

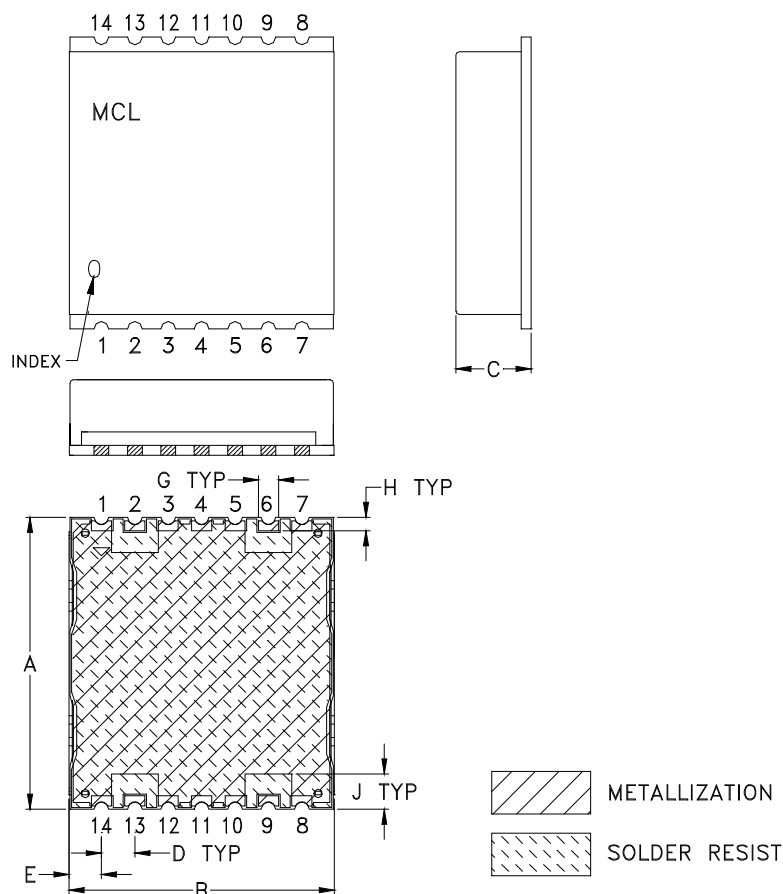


Typical Performance Curves

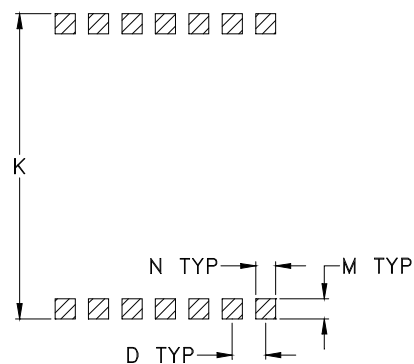


Outline Dimensions

HU1186



PCB Land Pattern



Suggested Layout,
Tolerance to be within ± 0.002

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.

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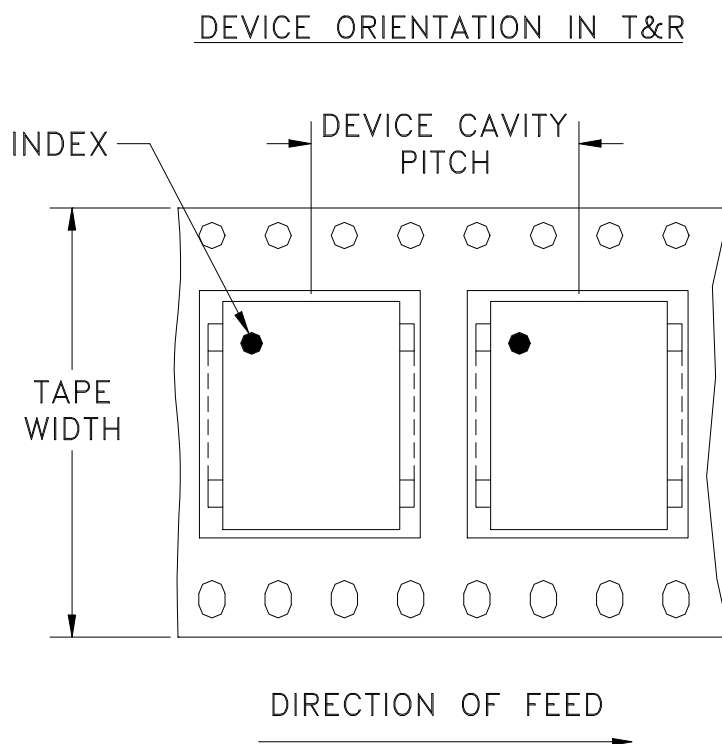
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Tape & Reel Packaging TR-F21



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

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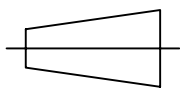
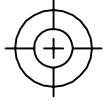
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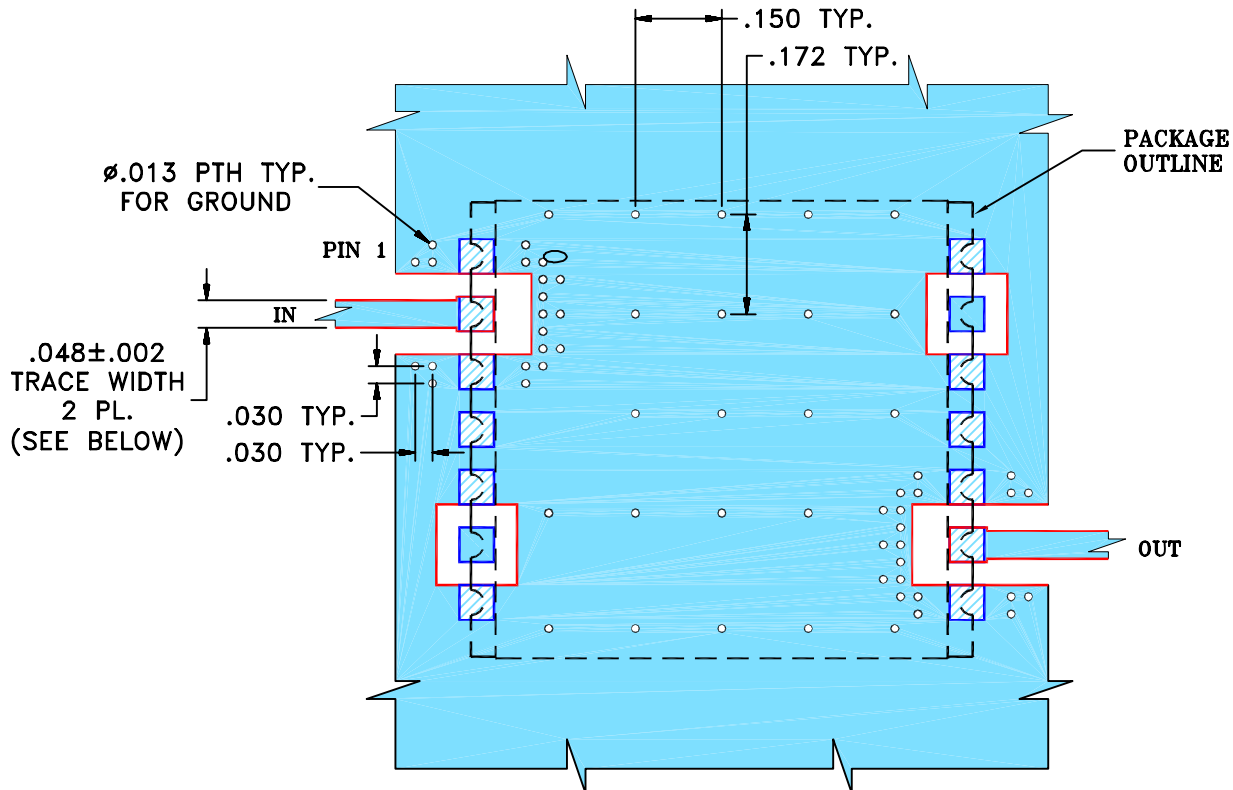
THIRD ANGLE PROJECTION



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



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

**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:

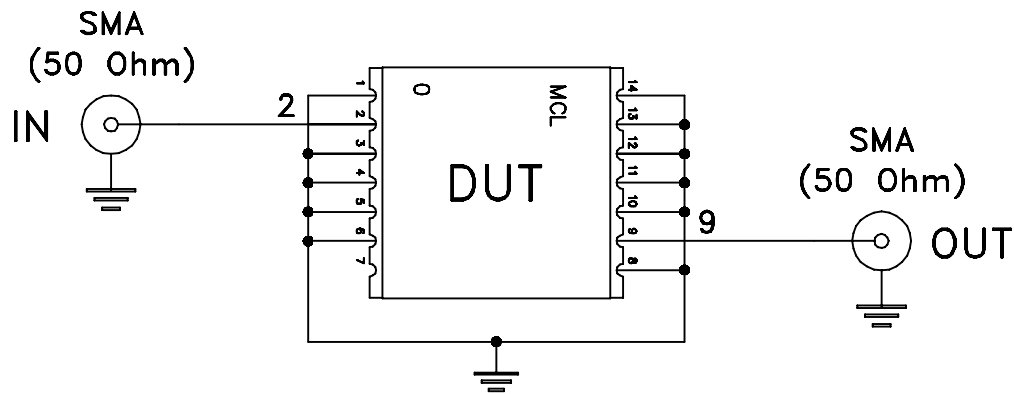
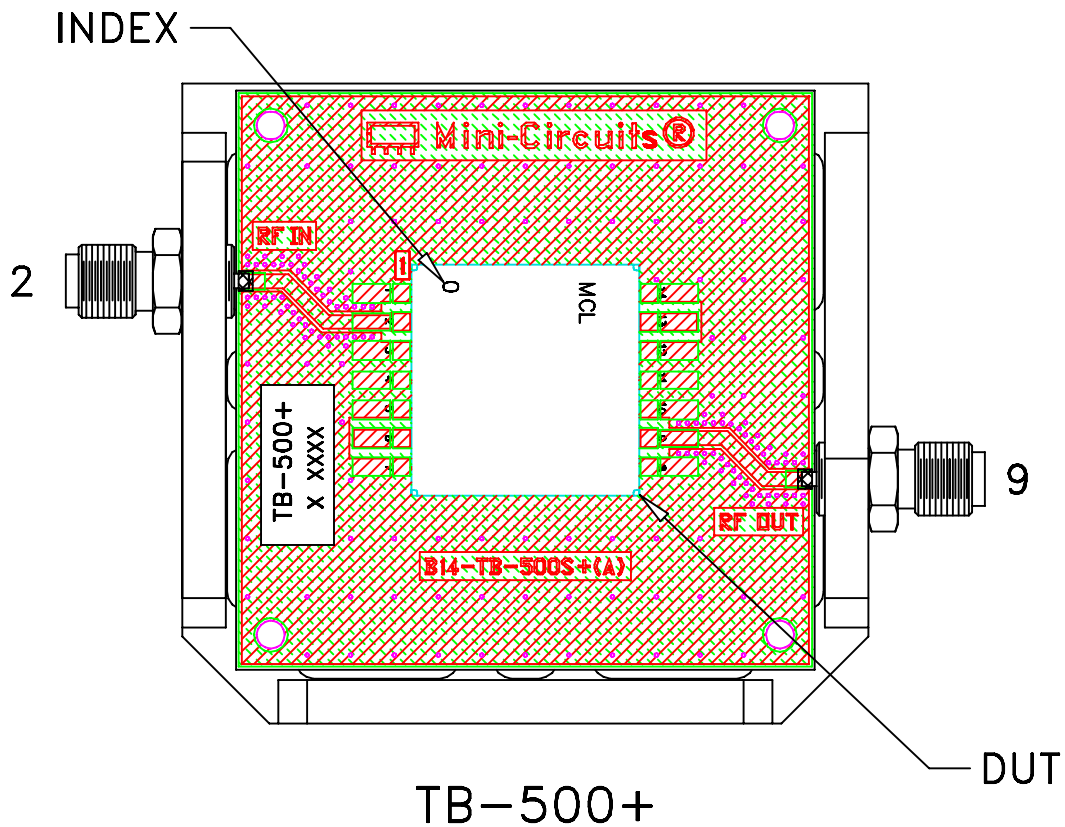
1 OF 1

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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