

# Surface Mount Bandpass Filter

## BPF-C450+

50Ω 400 to 510 MHz

### Maximum Ratings

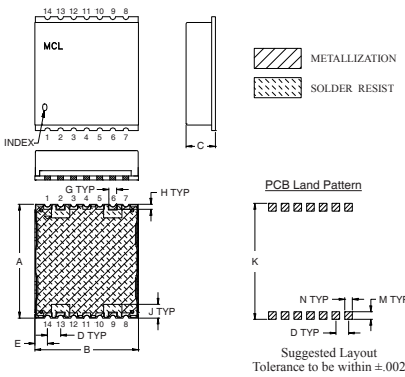
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W Max.

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

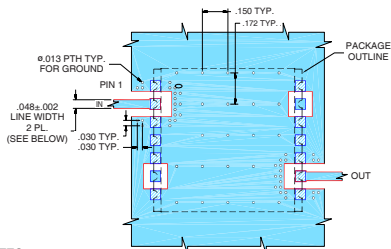


### Outline Dimensions (inch/mm)

	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:

- 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

### 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

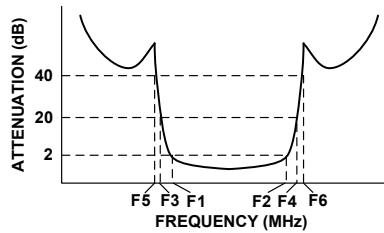
### +RoHS Compliant

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

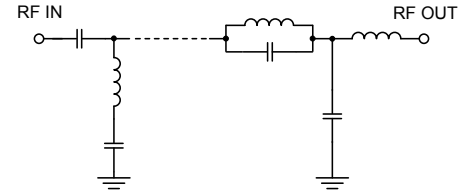
### Bandpass Filter Electrical Specifications (T<sub>AMB</sub> = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 2dB)	STOPBANDS (MHz)				VSWR (:1)		
		Loss > 20dB		Loss > 40dB		Passband		Stopband
F <sub>c</sub>	F <sub>1</sub> - F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>	F <sub>6</sub>	Typ.	Max.	Typ.
450	400 - 510	310	700	150	760 - 1200	1.3	1.7	18

### Typical Frequency Response

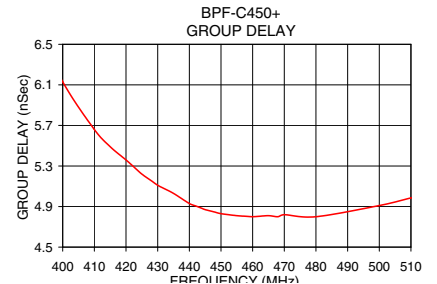
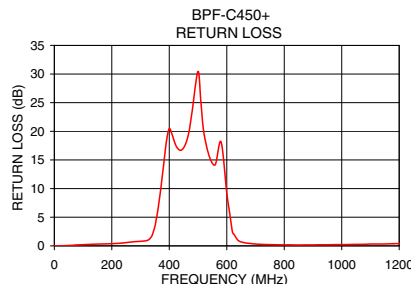
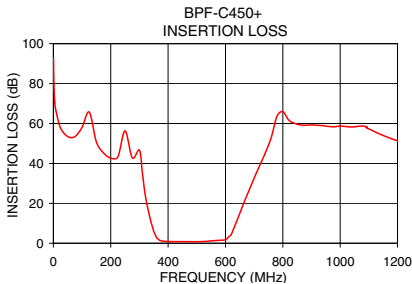


### Functional Schematic



### Typical Performance Data at 25°C

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



#### Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)



[www.minicircuits.com](http://www.minicircuits.com) P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

REV. B  
M174392  
EDR-9335UF1  
BPF-C450+  
URJ/RAV  
190817  
Page 1 of 1

# 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



The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED • RoHS compliant  
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

# Surface Mount Band Pass Filter

# BPF-C450+

## 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

REV. X1  
BPF-C450+  
100105  
Page 2 of 2



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED RoHS compliant  
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

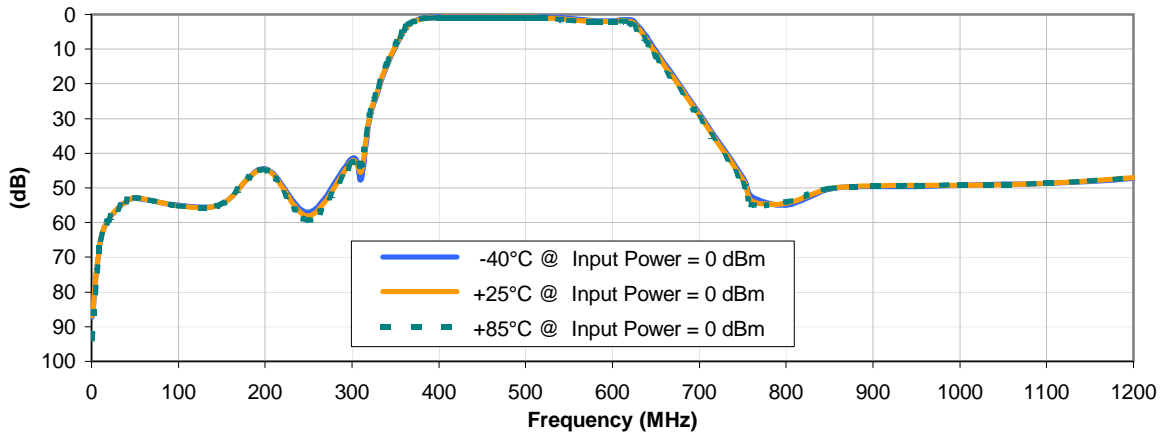


The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see

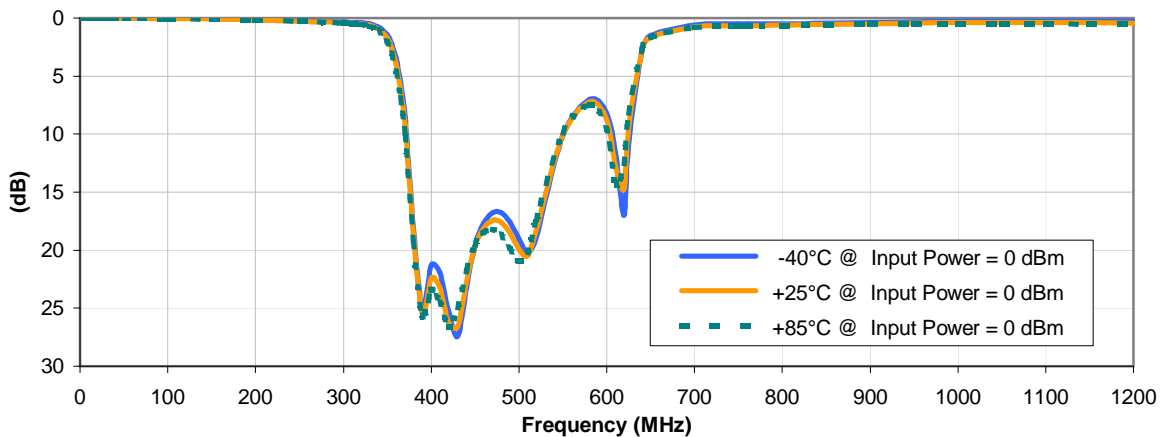


## Typical Performance Curves

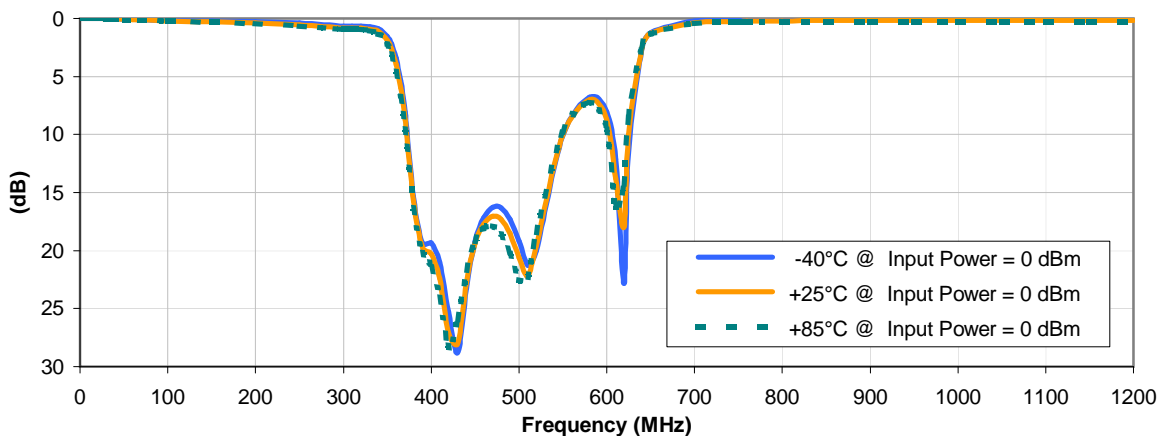
### INSERTION LOSS vs. TEMPERATURE



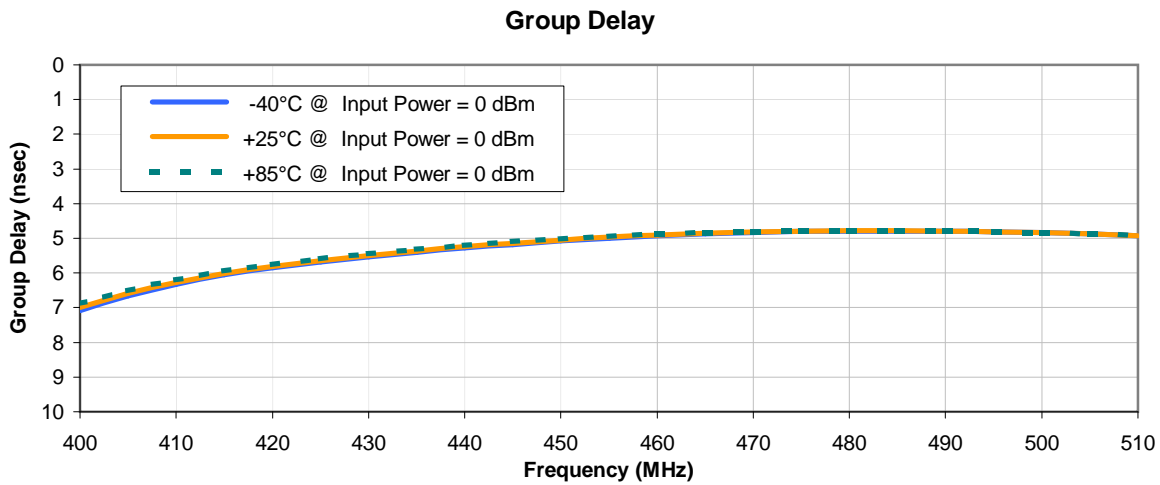
### INPUT RETURN LOSS vs. TEMPERATURE



### OUTPUT RETURN LOSS vs. TEMPERATURE

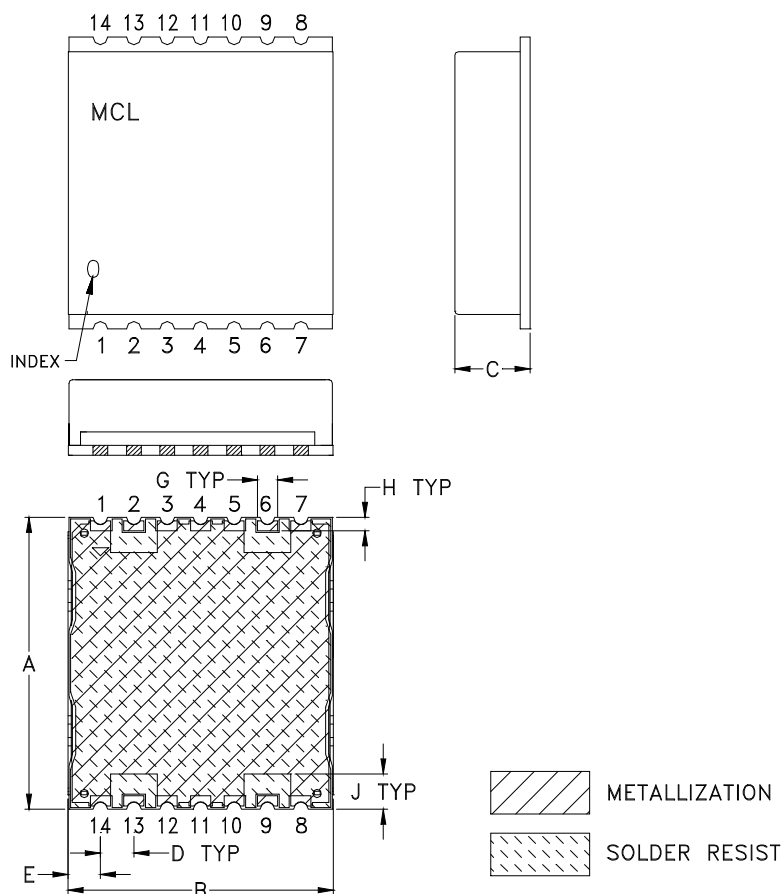


## Typical Performance Curves

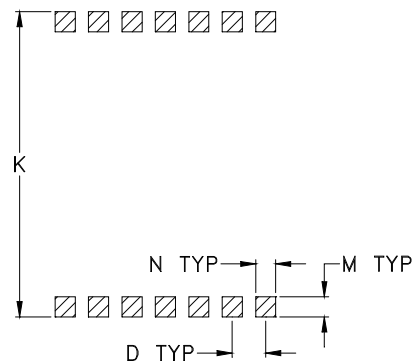


## Outline Dimensions

HU1186



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

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:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:  
For RoHS Case Styles: 2-5  $\mu$  inch (.05-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate.  
For RoHS-5 Case Styles: Tin-Lead plate.



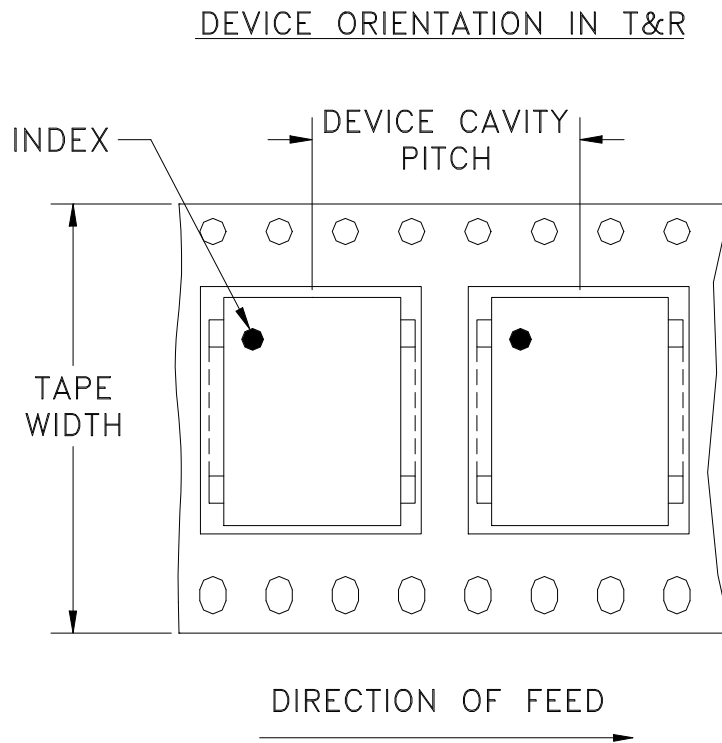
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F21



<b>Tape Width, mm</b>	<b>Device Cavity Pitch, mm</b>	<b>Reel Size, inches</b>	<b>Devices per Reel</b>
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.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



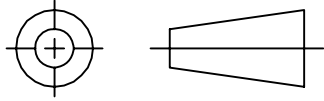
INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

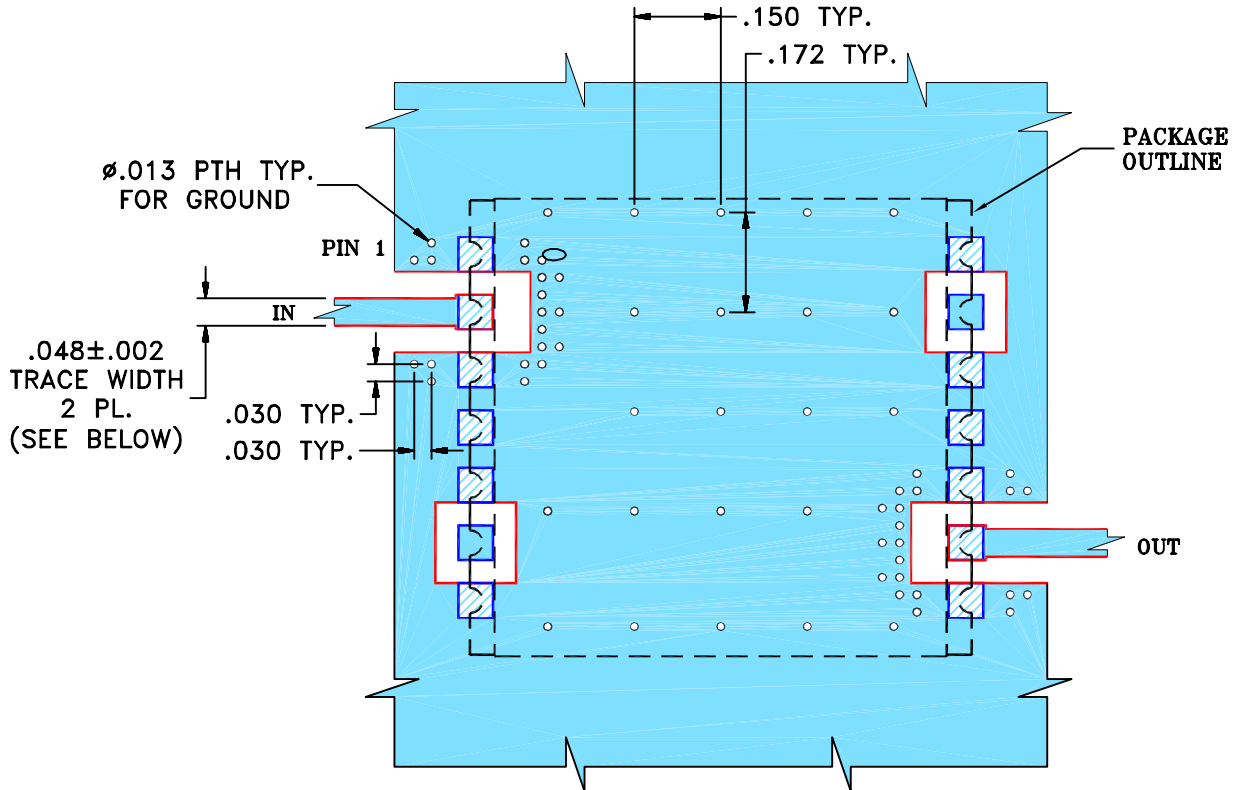
THIRD ANGLE PROJECTION



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" ± .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 ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	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)**

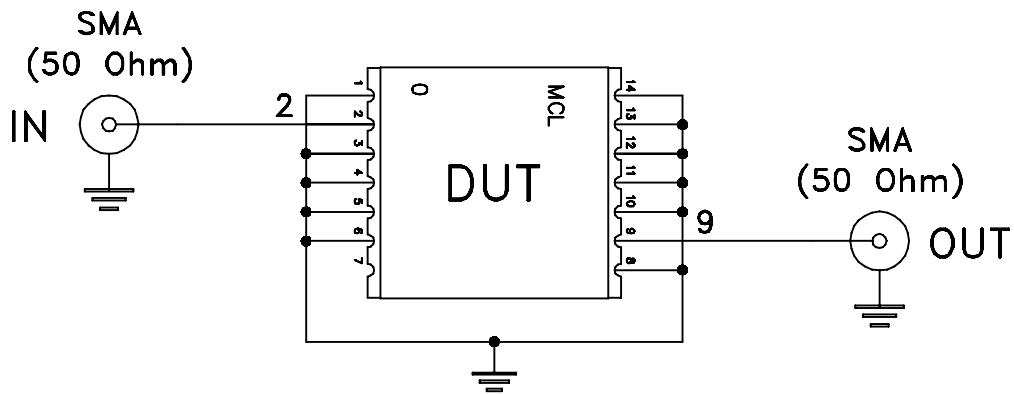
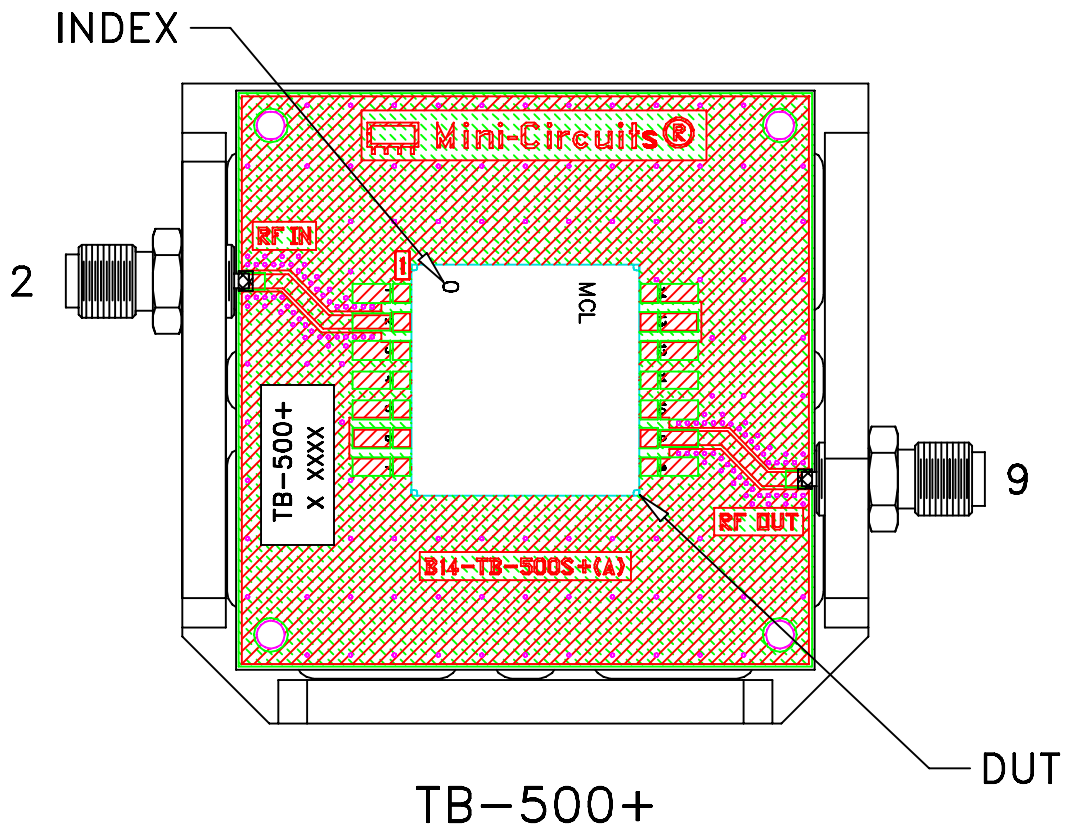
SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-294	REV: OR
FILE: 98PL294	SCALE: 3:1	SHEET: 1 OF 1	

Mini-Circuits®  
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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



# Evaluation Board and Circuit



## 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