

# Surface Mount Bandpass Filter

## BPF-C45+

50Ω 30 to 70 MHz

### Maximum Ratings

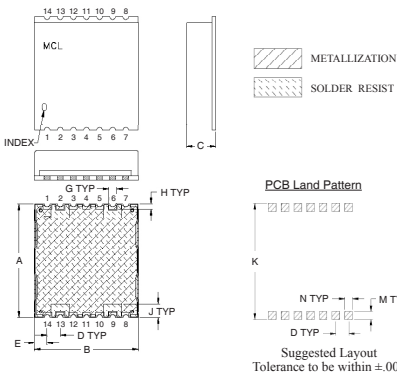
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W Max.

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

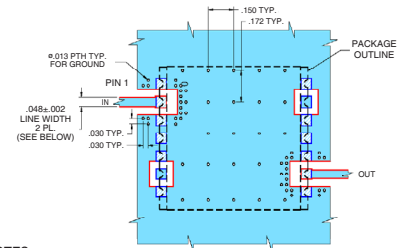


### Outline Dimensions (inch/mm)

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 R04350B, 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

- High Rejection
- Good VSWR, 1.2:1 Typ @ Passband
- Shielded case
- Aqueous washable

### Applications

- Military communications
- Receivers / Transmitters
- Harmonic rejection



Generic photo used for illustration purposes only  
CASE STYLE: HU1186

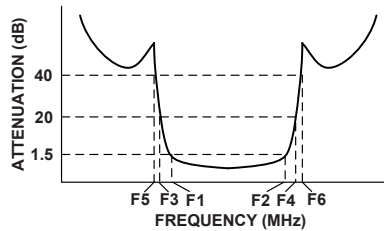
**+RoHS Compliant**

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

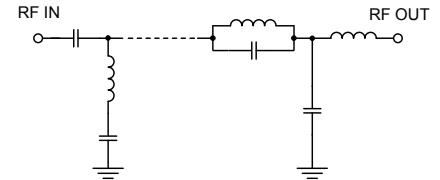
### Bandpass Filter Electrical Specifications (T<sub>AMB</sub> = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 1.5dB)	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.
45	30 - 70	23	95	21	120 - 2500	1.2	1.5	18

### Typical Frequency Response

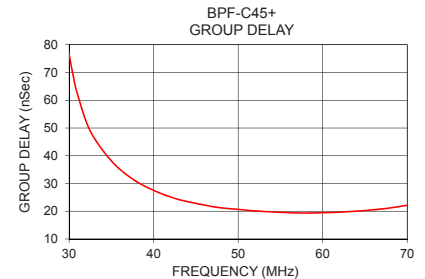
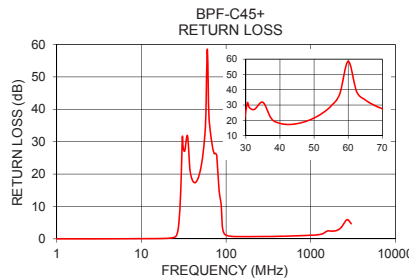
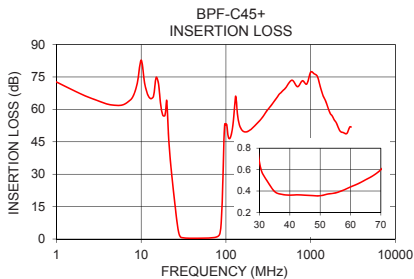


### Functional Schematic



### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Frequency (MHz)	Group Delay (nSec)
	$\bar{x}$	$\sigma$		
0.5	78.80	1.42	30.0	76.63
5.0	61.88	0.25	30.5	68.58
23.0	29.29	1.18	31.0	62.06
26.0	10.40	1.15	35.0	38.15
27.0	5.46	1.00	37.5	31.64
29.0	1.02	0.21	40.0	27.53
30.0	0.67	0.05	42.5	24.63
40.0	0.36	0.03	45.0	22.83
45.0	0.36	0.03	47.5	21.42
60.0	0.44	0.03	50.0	20.68
70.0	0.60	0.02	52.5	19.99
80.0	1.18	0.13	55.0	19.62
87.5	6.28	4.17	57.5	19.36
90.0	15.44	6.96	60.0	19.46
95.0	47.02	8.60	62.5	19.74
120.0	51.78	3.04	65.0	20.27
500.0	69.64	3.27	67.5	21.00
2500.0	49.02	1.51	70.0	22.16



### 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.
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REV. B  
M174392  
EDR-9409U  
BPF-C45+  
URJ/RAV  
190808  
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# Surface Mount Band Pass Filter

# BPF-C45+

## 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	78.86	78.98	79.07	0.00	0.00	0.00	0.00	0.00	0.00
5.0	62.13	62.09	62.26	0.01	0.00	0.01	0.02	0.02	0.03
15.0	73.17	73.01	74.55	0.07	0.07	0.07	0.20	0.24	0.27
20.0	60.92	61.81	62.11	0.16	0.16	0.17	0.34	0.37	0.39
21.0	51.55	51.04	50.86	0.19	0.19	0.21	0.36	0.39	0.41
22.0	39.18	38.92	38.81	0.24	0.24	0.25	0.38	0.41	0.43
23.0	30.80	30.58	30.48	0.29	0.30	0.32	0.42	0.44	0.47
24.0	23.76	23.56	23.46	0.39	0.39	0.42	0.47	0.49	0.53
25.0	17.38	17.17	17.06	0.58	0.59	0.63	0.60	0.64	0.68
26.0	11.40	11.20	11.07	1.06	1.09	1.16	0.99	1.06	1.13
27.0	6.10	5.94	5.84	2.50	2.60	2.74	2.29	2.44	2.61
28.0	2.45	2.39	2.38	6.53	6.78	7.07	6.02	6.35	6.66
29.0	0.98	0.99	1.03	15.45	15.88	16.40	13.78	14.33	14.87
30.0	0.65	0.67	0.71	25.43	26.67	28.37	21.59	22.32	23.33
40.0	0.35	0.38	0.40	23.61	24.21	24.44	24.71	25.32	25.64
45.0	0.34	0.37	0.39	22.77	23.94	25.33	22.94	24.09	25.56
50.0	0.33	0.36	0.39	33.68	36.15	38.82	31.57	34.45	40.44
55.0	0.36	0.40	0.44	27.66	27.44	26.64	30.22	29.80	28.40
60.0	0.43	0.46	0.50	22.10	22.62	22.82	23.05	23.46	23.40
65.0	0.49	0.53	0.58	21.86	22.49	22.92	21.92	22.40	22.59
70.0	0.58	0.64	0.68	23.69	24.10	24.45	22.60	22.93	23.20
75.0	0.75	0.81	0.87	23.49	24.40	25.41	23.04	23.99	25.17
80.0	1.05	1.14	1.23	29.14	30.93	31.42	34.31	41.57	39.07
85.0	2.02	2.21	2.42	19.63	18.91	18.37	26.45	26.98	27.91
87.5	4.88	5.41	5.94	7.39	7.02	6.74	8.90	8.39	7.99
88.0	6.24	6.87	7.49	5.67	5.42	5.24	6.77	6.40	6.13
89.0	9.98	10.76	11.49	3.41	3.36	3.33	4.03	3.89	3.80
90.0	14.70	15.54	16.32	2.29	2.32	2.37	2.65	2.62	2.61
95.0	48.41	49.62	50.66	1.01	1.08	1.15	1.01	1.05	1.09
100.0	56.68	56.07	55.49	0.76	0.82	0.87	0.68	0.73	0.76
110.0	44.92	45.11	45.21	0.61	0.65	0.68	0.47	0.51	0.53
120.0	50.83	51.17	51.43	0.57	0.60	0.63	0.39	0.42	0.44
130.0	67.42	66.98	66.38	0.56	0.59	0.61	0.33	0.37	0.38
140.0	53.59	53.74	53.56	0.57	0.60	0.61	0.30	0.34	0.36
150.0	50.25	50.25	50.26	0.57	0.60	0.62	0.28	0.32	0.34
160.0	49.21	49.13	49.10	0.57	0.60	0.63	0.26	0.31	0.33
170.0	48.93	48.89	48.78	0.57	0.61	0.64	0.24	0.29	0.32
180.0	49.05	49.04	48.97	0.57	0.62	0.65	0.23	0.29	0.32
190.0	49.52	49.50	49.47	0.57	0.62	0.65	0.22	0.28	0.30
200.0	50.11	50.06	50.01	0.57	0.63	0.67	0.22	0.27	0.29
250.0	53.64	53.40	53.48	0.55	0.64	0.71	0.18	0.26	0.30
300.0	56.82	56.73	56.79	0.56	0.67	0.75	0.18	0.26	0.29
350.0	59.65	59.72	59.52	0.59	0.70	0.79	0.17	0.27	0.31
400.0	61.67	61.88	62.24	0.61	0.74	0.83	0.18	0.28	0.32
450.0	63.54	64.01	63.70	0.64	0.79	0.88	0.18	0.29	0.34
500.0	64.65	64.60	64.92	0.67	0.83	0.94	0.18	0.30	0.35
600.0	67.28	67.27	67.54	0.74	0.93	1.05	0.19	0.34	0.39
700.0	67.75	68.89	68.63	0.82	1.04	1.18	0.21	0.37	0.44
1000.0	73.39	70.72	72.95	1.05	1.31	1.50	0.30	0.50	0.58
1500.0	75.86	60.19	75.83	1.54	1.83	1.99	0.44	0.75	0.90
2000.0	58.18	62.06	61.51	1.46	1.77	2.00	0.57	0.93	1.18
2500.0	55.95	56.25	64.65	3.08	3.35	3.43	0.69	1.07	1.25

REV. X1  
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# Surface Mount Band Pass Filter

# BPF-C45+

## Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
30.00	72.86	72.41	71.80
30.50	64.80	64.34	64.35
30.75	60.65	61.09	60.08
31.00	58.54	58.27	58.00
31.50	54.23	54.31	53.62
31.75	51.63	52.09	52.17
32.00	49.66	49.16	49.83
32.50	47.84	47.82	47.69
33.00	44.84	44.57	44.46
33.50	43.10	43.22	43.09
34.00	40.94	40.96	40.71
34.50	39.43	39.35	39.16
35.00	37.54	37.74	37.53
35.50	36.57	36.56	36.56
36.00	34.81	34.54	34.53
36.50	33.85	33.65	33.58
37.00	32.83	32.66	32.40
37.50	31.36	31.67	31.61
38.00	30.86	30.39	30.49
38.50	29.61	29.45	29.83
39.00	28.73	28.70	28.72
39.50	27.73	27.87	27.74
40.00	27.56	27.28	27.62
40.50	27.23	27.47	27.08
41.00	26.47	26.38	26.38
42.00	25.45	25.43	25.31
43.00	24.51	24.65	24.59
44.00	23.65	23.63	23.70
45.00	22.87	22.93	22.90
46.00	22.38	22.33	22.26
47.00	21.71	22.00	21.88
48.00	21.54	21.46	21.42
49.00	21.05	21.10	21.02
50.00	21.05	20.99	20.89
51.00	20.40	20.42	20.36
52.00	20.20	20.23	20.13
53.00	19.79	19.91	19.94
54.00	19.63	19.70	19.64
55.00	19.66	19.62	19.63
56.00	19.55	19.38	19.38
57.00	19.42	19.41	19.53
58.00	19.28	19.28	19.31
59.00	19.28	19.50	19.39
60.00	19.34	19.31	19.39
61.00	19.57	19.45	19.65
62.00	19.59	19.55	19.67
63.00	19.57	19.48	19.60
64.00	19.81	20.04	19.94
65.00	20.20	20.31	20.24
66.00	20.60	20.54	20.71
67.00	20.77	20.70	20.84
68.00	21.10	21.23	21.32
69.00	21.50	21.62	21.73
70.00	21.98	22.11	22.07

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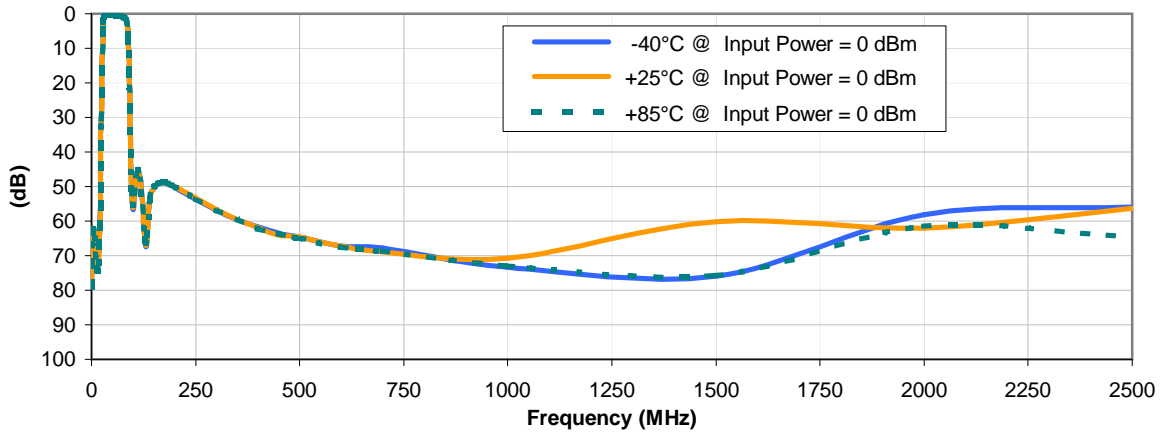


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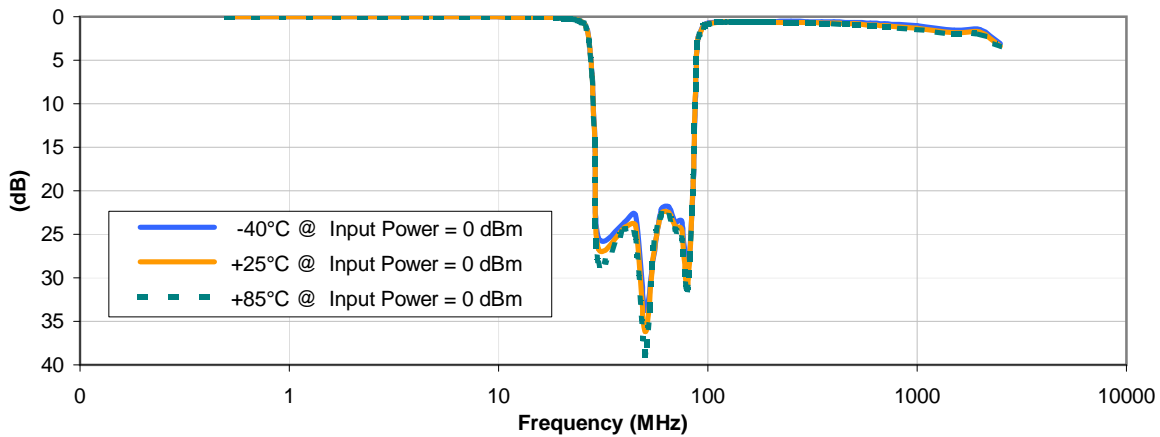


## Typical Performance Curves

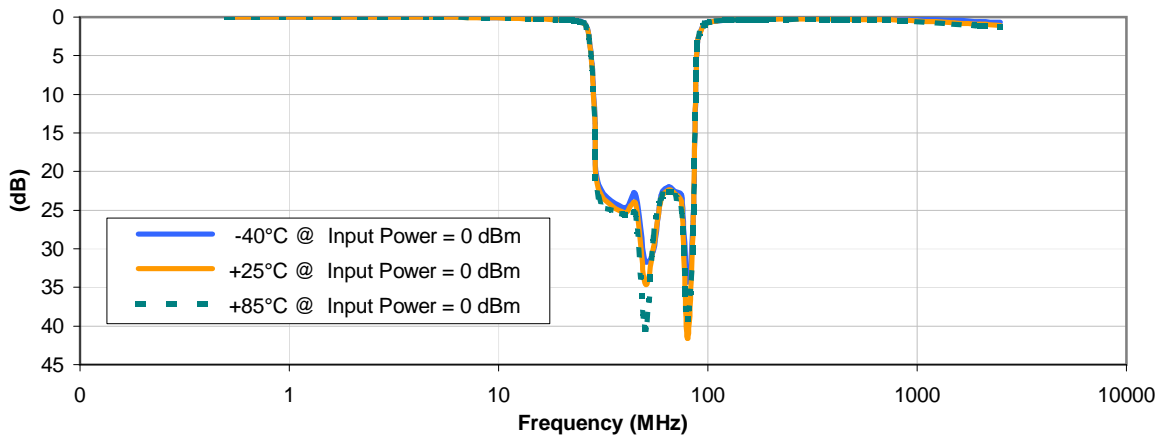
### INSERTION LOSS vs. TEMPERATURE



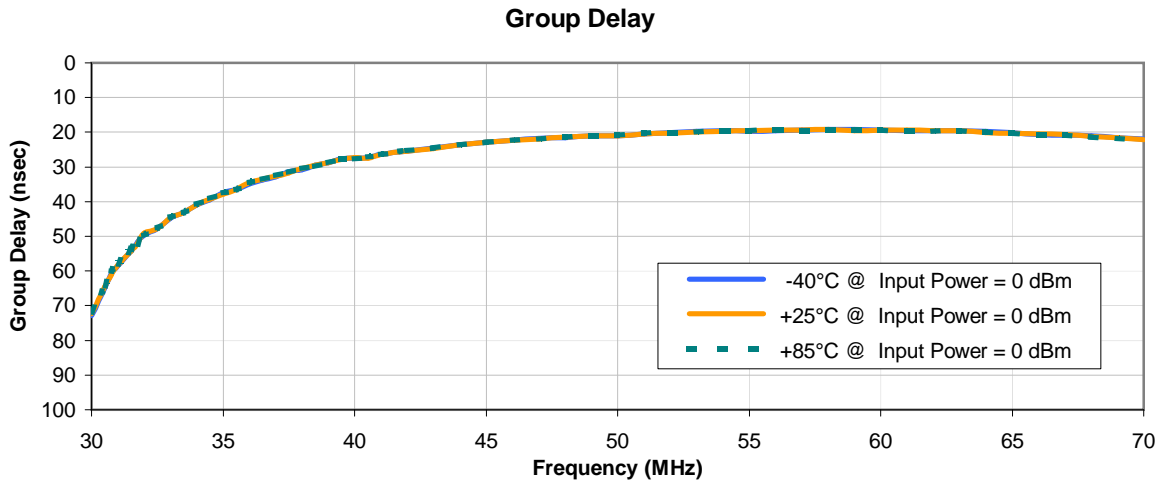
### INPUT RETURN LOSS vs. TEMPERATURE



### OUTPUT RETURN LOSS vs. TEMPERATURE

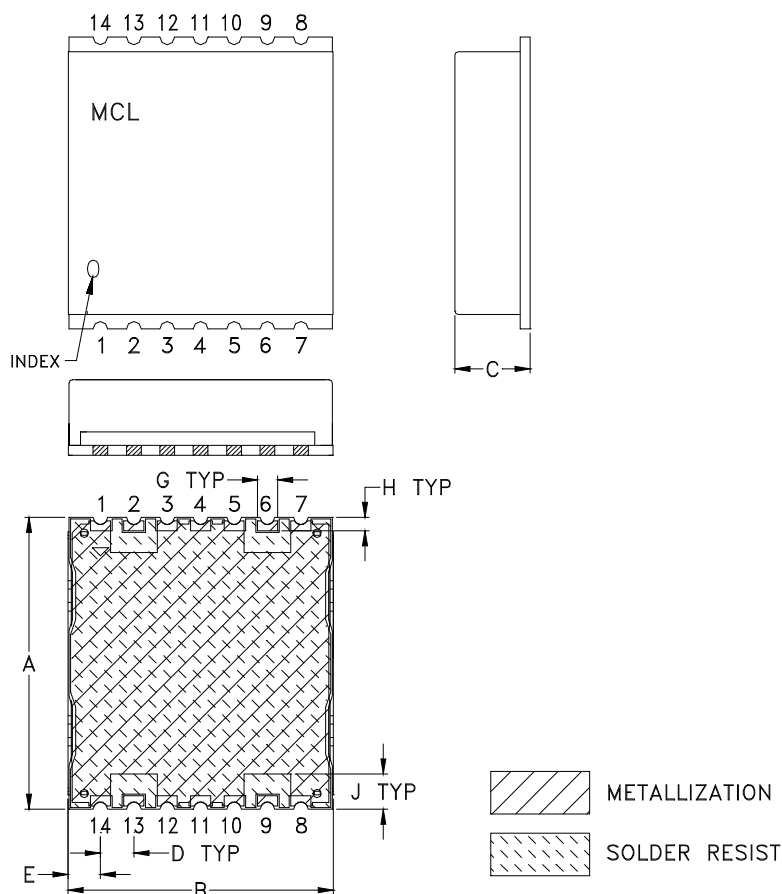


## Typical Performance Curves

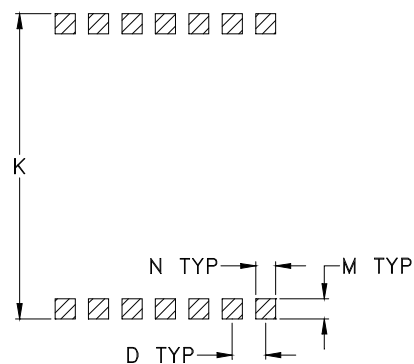


## Outline Dimensions

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:

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



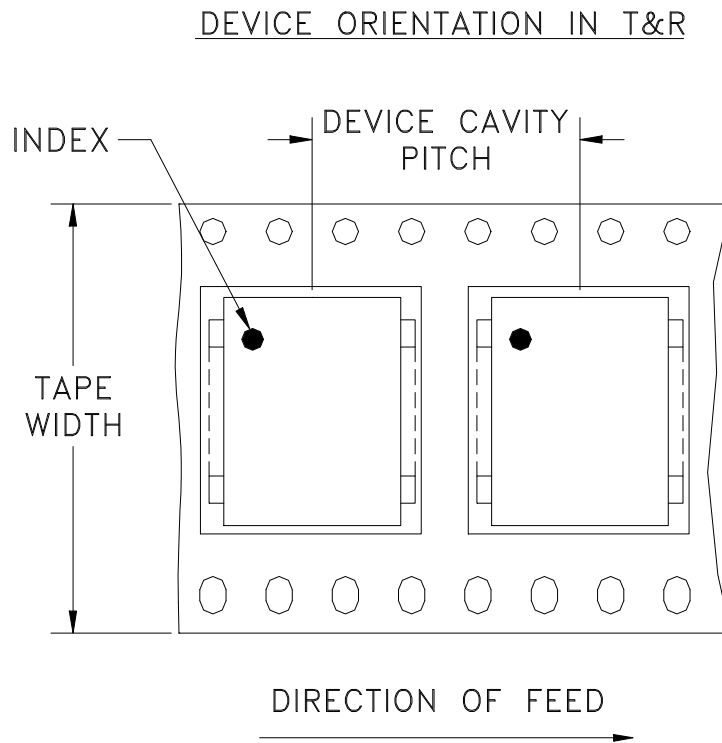
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# Tape & Reel Packaging TR-F21



<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.

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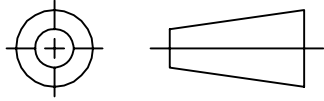
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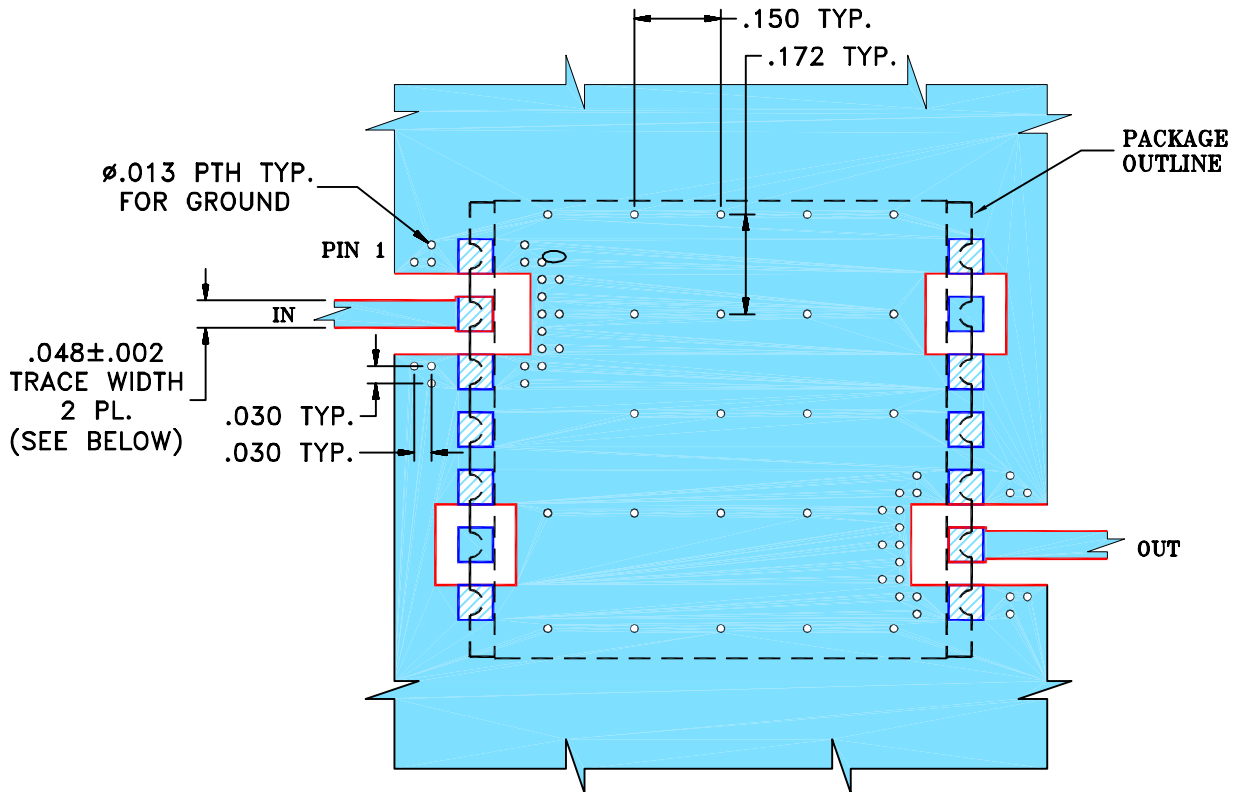
THIRD ANGLE PROJECTION



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" ± .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

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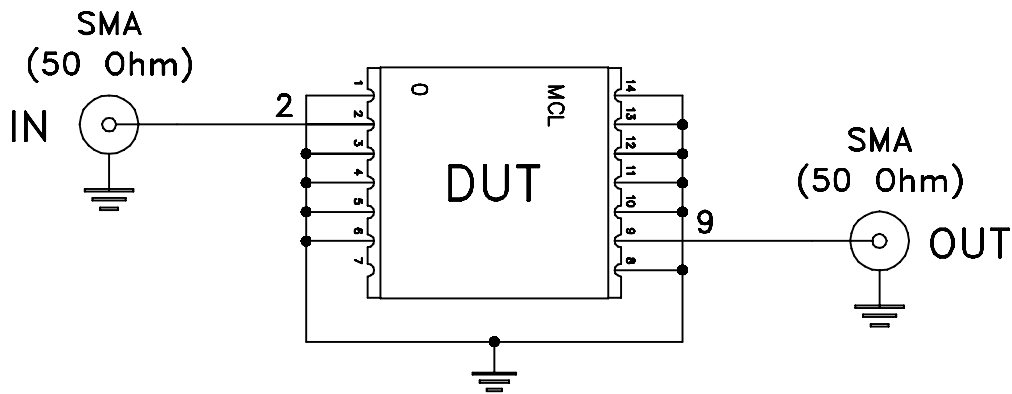
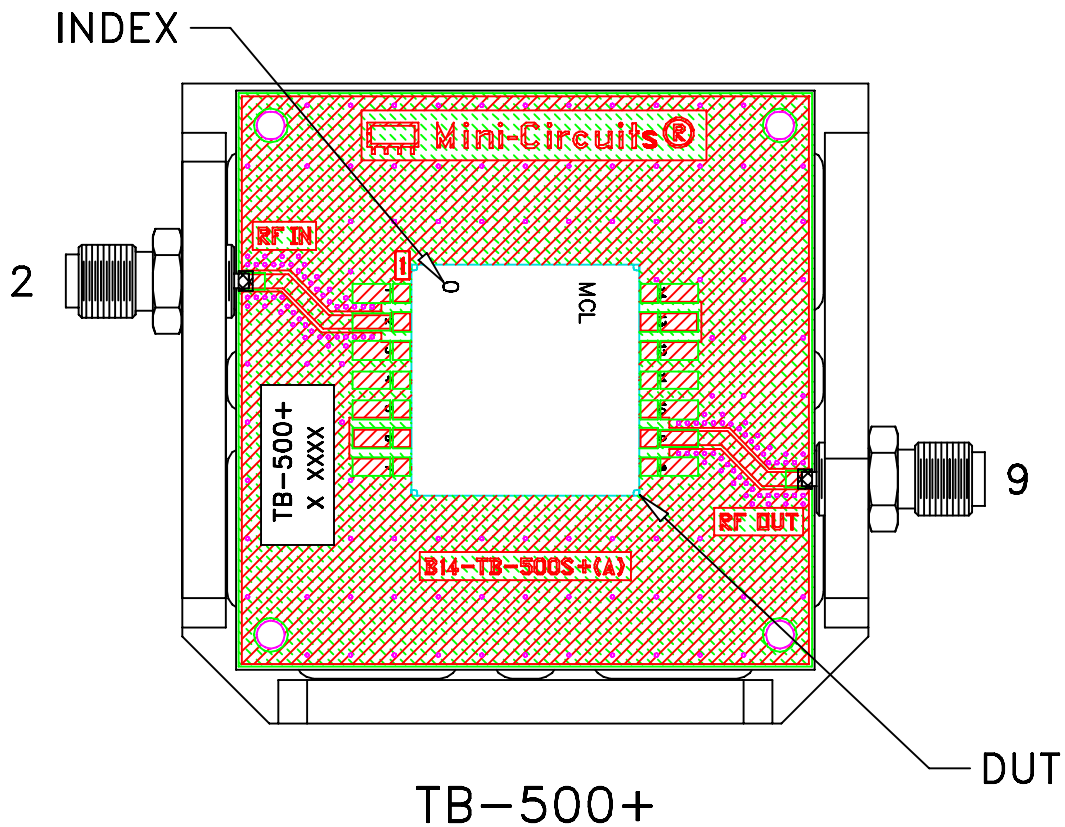
**PL, 14FL03, HU1186, BPF-C  
TB-500+ (50 OHM)**

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

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# 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