



# (LUMPED LC) SURFACE MOUNT Bandpass Filter

## BPF-BY250+

50Ω 150 to 350 MHz

### KEY FEATURES

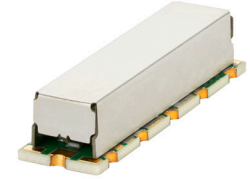
- Low Insertion Loss, 1.5 dB Typ.
- Return Loss, 18 dB Typ.
- Stop Band Rejection, 55 dB Typ.
- Miniature Shielded Package.

### APPLICATIONS

- Test and Measurement.
- Transmitter/Receivers.
- Harmonic Rejection.

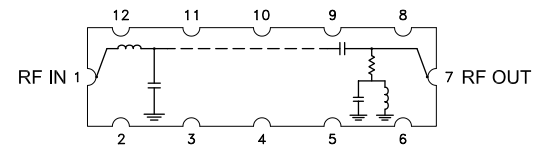
### PRODUCT OVERVIEW

Mini-Circuits' Model-BPF-BY250+ is a Lumped LC filter that offer a good insertion loss and high rejection. This bandpass filter covers from 150 to 350MHz. This filter has high Q capacitors and inductors to achieve a low insertion loss. It has repeatable performance across production lots .



Generic photo used for illustration purposes only

### FUNCTIONAL DIAGRAM



### ELECTRICAL SPECIFICATIONS<sup>1,2</sup> AT +25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units	
Passband	Center Frequency <sup>3</sup>	Fc	—	250	—	MHz	
	Insertion Loss	F1-F2	—	1.5	2.5	dB	
	Return Loss	F1-F2	150 - 350	10	18	—	dB
Stop Band, Lower	Rejection	DC-F3	DC - 50	45	58	—	dB
		F3-F4	50 - 75	20	30	—	dB
Stop Band, Upper	Rejection	F5-F6	444 - 500	20	30	—	dB
		F6-F7	500 - 1500	45	55	—	dB
		F7-F8	1500 - 4000	—	30	—	dB

1. Tested in Evaluation Board P/N TB-BPF-BY250+.

2. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.

3. Typical variation ± 2%

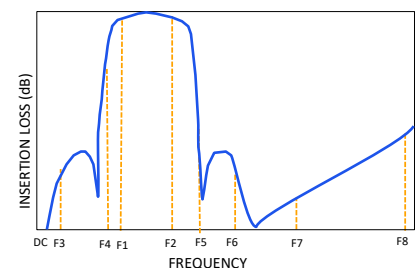
### ABSOLUTE MAXIMUM RATINGS<sup>4</sup>

Parameter	Ratings
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-55 °C to +100 °C
Input Power <sup>5</sup>	0.5 W

4. Permanent damage may occur if any of these limits are exceeded.

5. Power rating applies only to signals within the passband.

### TYPICAL FREQUENCY RESPONSE AT +25°C



REV. OR  
ECO-020982  
BPF-BY250+  
EDU4702  
URJ  
240224





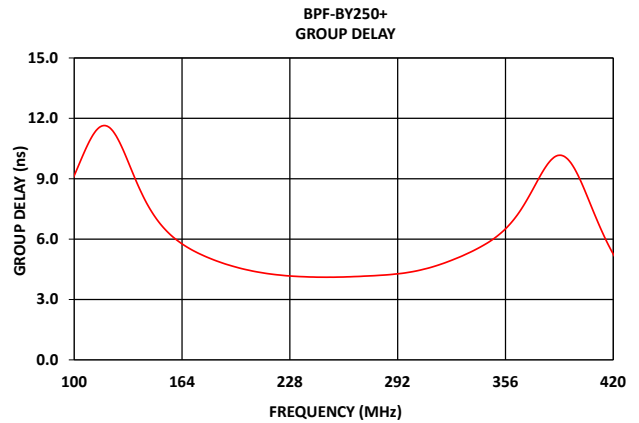
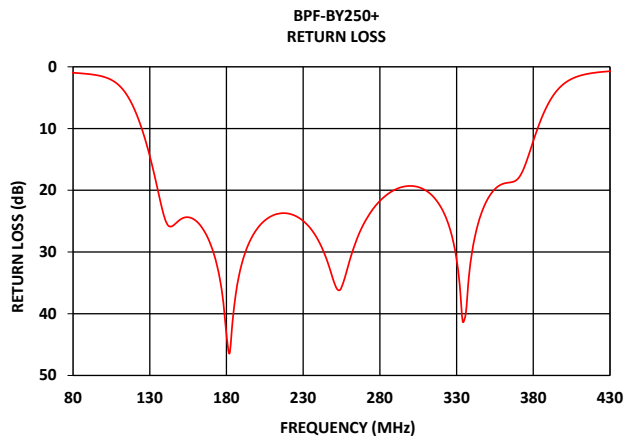
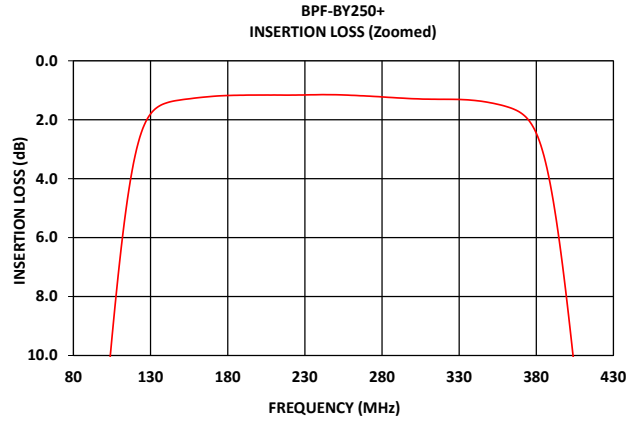
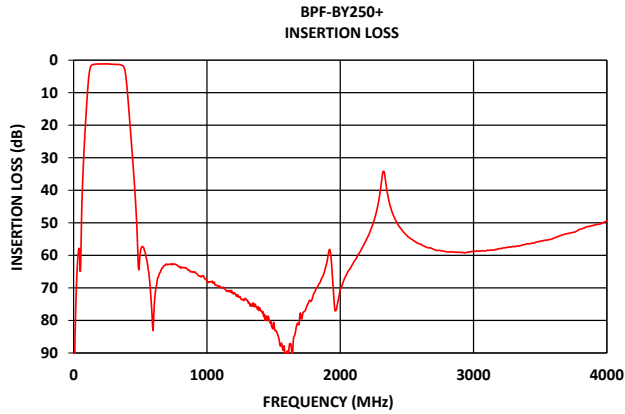
# (LUMPED LC) SURFACE MOUNT Bandpass Filter

## BPF-BY250+

Mini-Circuits

50Ω 150 to 350 MHz

### TYPICAL PERFORMANCE GRAPHS AT +25°C





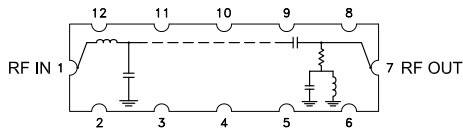
# (LUMPED LC) SURFACE MOUNT Bandpass Filter

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50Ω 150 to 350 MHz

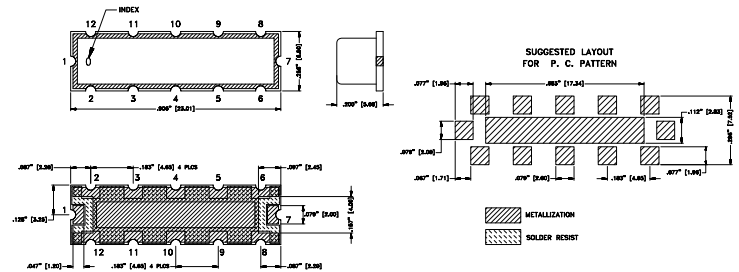
### FUNCTIONAL DIAGRAM



### PAD DESCRIPTION

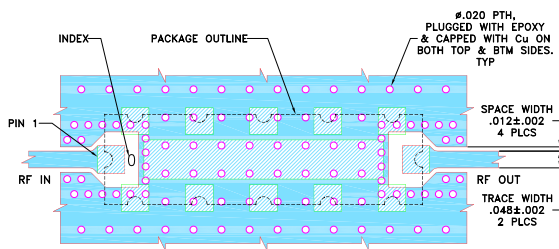
Function	Pad Number	Description
RF1	1	Connects to RF Input Port
RF2	7	Connects to RF Output Port
GROUND	2-6,8-12	Connects to Ground on PCB, (See drawing PL-773)

### CASE STYLE DRAWING



Unit weight: 1.5 grams  
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl.±.015

### SUGGESTED PCB LAYOUT (PL-773) SUGGESTED MOUNTING CONFIGURATION FOR ZV3471 CASE STYLE



#### NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS .030±.002. COPPER: 1/2 Oz. EACH SIDE.  
FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
  2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
■ DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

Figure 2. Suggested PCB Layout PL-773



(LUMPED LC) SURFACE MOUNT

# Bandpass Filter

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Mini-Circuits

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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.

[CLICK HERE](#)

Performance Data and Graphs	Data
	Graphs
	S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	ZV3471 Lead Finish: Gold over Nickel Plate
RoHs Status	Compliant
Tape and Reel	TR-F010
Suggested Layout for PCB Design	PL-773
Evaluation Board	TB-BPF-BY250+
	Gerber File
Environmental Rating	ENV02T1

### 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-Circuits' 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



Typical Performance Data

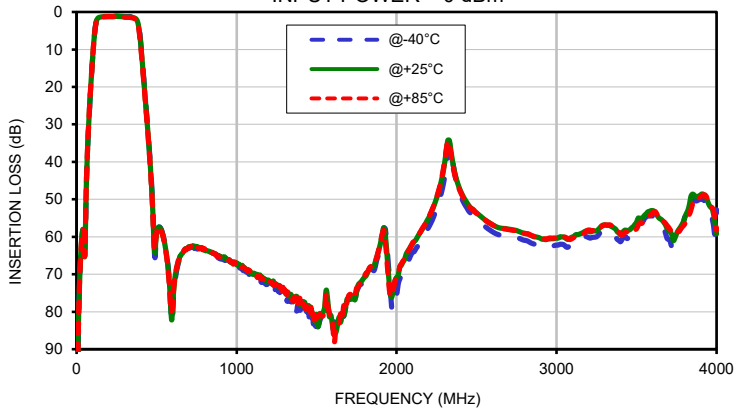
FREQ.  (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	108.16	100.24	107.36	0.05	0.05	0.05	2.27	2.27	2.27
5	93.26	102.83	102.91	0.05	0.05	0.05	2.26	2.26	2.26
10	89.12	86.08	87.09	0.05	0.05	0.05	2.25	2.25	2.26
15	77.64	77.69	76.76	0.06	0.06	0.07	2.23	2.24	2.24
20	70.84	70.56	70.16	0.08	0.08	0.09	2.21	2.22	2.22
25	65.66	65.42	65.33	0.10	0.11	0.12	2.18	2.19	2.19
35	59.32	59.08	59.26	0.18	0.20	0.22	2.10	2.12	2.12
40	58.05	58.00	58.01	0.23	0.26	0.29	2.05	2.07	2.08
45	58.67	58.75	58.81	0.30	0.34	0.37	2.00	2.02	2.03
50	65.51	65.35	65.28	0.37	0.42	0.47	1.94	1.96	1.97
55	59.17	58.60	57.86	0.45	0.51	0.57	1.87	1.90	1.91
60	47.88	47.59	47.30	0.53	0.61	0.68	1.80	1.82	1.84
75	30.57	30.46	30.32	0.79	0.90	0.99	1.54	1.58	1.60
100	12.38	12.34	12.28	1.49	1.65	1.79	1.37	1.45	1.52
120	3.15	3.24	3.30	6.57	6.90	7.21	5.59	5.83	6.05
140	1.35	1.46	1.55	23.81	24.75	25.70	20.38	19.49	18.88
150	1.25	1.35	1.44	23.56	24.83	26.10	19.16	18.67	18.24
180	1.12	1.21	1.28	43.80	43.96	49.08	20.04	20.03	20.04
200	1.11	1.19	1.26	25.24	26.26	26.78	26.38	25.15	24.36
250	1.09	1.18	1.26	33.65	35.08	34.13	19.90	19.48	18.89
270	1.13	1.23	1.31	24.94	25.15	24.55	18.74	19.00	18.85
290	1.19	1.29	1.37	19.12	19.87	20.21	19.46	20.40	20.85
300	1.22	1.32	1.40	18.37	19.28	19.90	20.80	22.10	22.98
320	1.23	1.34	1.43	21.31	22.82	24.50	27.45	29.01	29.62
340	1.24	1.38	1.50	31.98	30.01	27.65	23.38	23.13	22.29
350	1.30	1.45	1.59	21.65	21.47	20.83	20.26	20.68	20.48
380	2.13	2.48	2.80	12.99	12.07	11.32	16.39	15.28	14.35
384	2.65	3.07	3.45	9.84	9.23	8.69	11.75	11.19	10.63
424	19.95	20.42	20.86	0.78	0.88	0.94	1.45	1.62	1.75
442	29.60	30.07	30.48	0.52	0.60	0.66	1.50	1.64	1.76
444	30.70	31.18	31.59	0.51	0.58	0.64	1.52	1.65	1.77
500	59.61	59.32	58.80	0.29	0.34	0.39	2.01	2.08	2.15
1050	69.02	68.27	68.47	0.03	0.08	0.10	0.48	0.53	0.57
1100	70.10	70.02	69.51	0.03	0.07	0.10	0.39	0.44	0.48
1150	71.72	70.72	70.67	0.03	0.07	0.10	0.33	0.38	0.42
1200	73.04	71.58	71.65	0.02	0.06	0.09	0.28	0.34	0.39
1250	74.09	72.65	73.08	0.01	0.06	0.09	0.26	0.32	0.37
1300	75.95	74.14	74.11	0.01	0.05	0.09	0.26	0.32	0.38
1350	77.72	76.58	76.87	0.00	0.05	0.09	0.28	0.34	0.39
1400	79.43	78.37	78.04	0.00	0.05	0.08	0.31	0.37	0.43
1450	79.54	78.35	78.47	0.00	0.05	0.08	0.34	0.41	0.47
1500	83.92	80.75	81.49	0.00	0.05	0.08	0.39	0.46	0.52
1600	84.95	83.88	83.11	0.00	0.05	0.08	0.51	0.59	0.65
1700	76.26	76.79	75.78	0.01	0.04	0.08	0.64	0.73	0.79
1800	71.51	70.77	70.37	0.01	0.04	0.07	0.78	0.88	0.94
1900	62.42	61.59	61.38	0.01	0.04	0.07	0.96	1.07	1.15
2000	75.81	70.84	70.94	0.02	0.03	0.07	1.04	1.14	1.20
2200	57.49	55.00	54.86	0.02	0.03	0.07	1.26	1.36	1.42
2400	48.96	47.80	48.12	0.02	0.03	0.06	1.46	1.55	1.61
2600	58.68	56.80	56.84	0.04	0.01	0.04	1.62	1.70	1.75
2800	60.94	59.10	59.07	0.04	0.01	0.04	1.76	1.84	1.89
3000	62.23	60.33	60.33	0.04	0.02	0.05	1.87	1.96	2.00
3100	61.89	60.04	60.38	0.04	0.02	0.06	1.92	2.02	2.06
3200	60.20	58.54	58.19	0.03	0.03	0.06	1.98	2.07	2.11
3400	61.31	59.51	59.42	0.01	0.05	0.09	2.10	2.18	2.22
3600	54.47	53.02	53.60	0.00	0.07	0.11	2.18	2.28	2.33
3700	60.72	58.42	57.48	0.00	0.07	0.11	2.21	2.33	2.38
3800	54.88	55.02	56.63	0.01	0.08	0.13	2.25	2.38	2.45
3900	49.91	48.82	49.35	0.01	0.09	0.18	2.27	2.42	2.50
4000	52.81	59.24	58.23	0.03	0.10	0.13	2.30	2.46	2.55

## Typical Performance Data

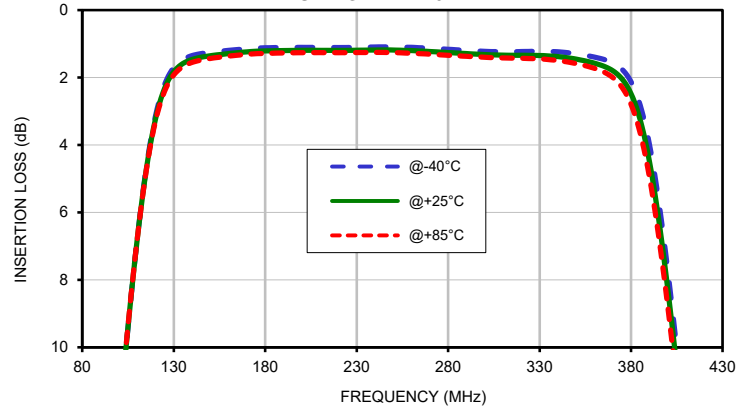
FREQ.  (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
150.00	6.91	6.87	6.84
152.00	6.70	6.67	6.64
156.00	6.33	6.31	6.28
158.00	6.18	6.15	6.13
160.00	6.03	6.01	5.99
164.00	5.79	5.76	5.75
168.00	5.57	5.55	5.54
170.00	5.48	5.46	5.44
174.00	5.30	5.28	5.27
178.00	5.15	5.13	5.12
180.00	5.08	5.06	5.05
184.00	4.95	4.93	4.92
190.00	4.77	4.76	4.75
194.00	4.67	4.66	4.65
198.00	4.58	4.57	4.56
200.00	4.53	4.52	4.52
202.00	4.49	4.49	4.48
208.00	4.39	4.38	4.37
210.00	4.36	4.35	4.34
212.00	4.33	4.32	4.32
214.00	4.30	4.30	4.29
216.00	4.28	4.27	4.27
218.00	4.25	4.25	4.25
250.00	4.11	4.11	4.10
252.00	4.11	4.11	4.10
254.00	4.11	4.11	4.10
260.00	4.12	4.12	4.11
262.00	4.13	4.12	4.12
270.00	4.15	4.15	4.14
272.00	4.16	4.16	4.15
280.00	4.19	4.19	4.19
282.00	4.20	4.20	4.21
290.00	4.25	4.26	4.27
292.00	4.27	4.28	4.28
300.00	4.36	4.38	4.39
310.00	4.54	4.56	4.57
312.00	4.58	4.61	4.62
320.00	4.80	4.82	4.84
330.00	5.13	5.15	5.17
340.00	5.53	5.55	5.57
350.00	6.04	6.08	6.11

## Typical Performance Curves

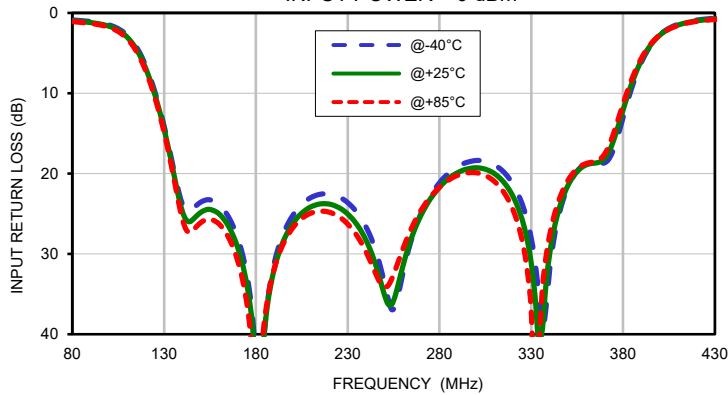
**INSERTION LOSS vs. TEMPERATURE**  
INPUT POWER = 0 dBm



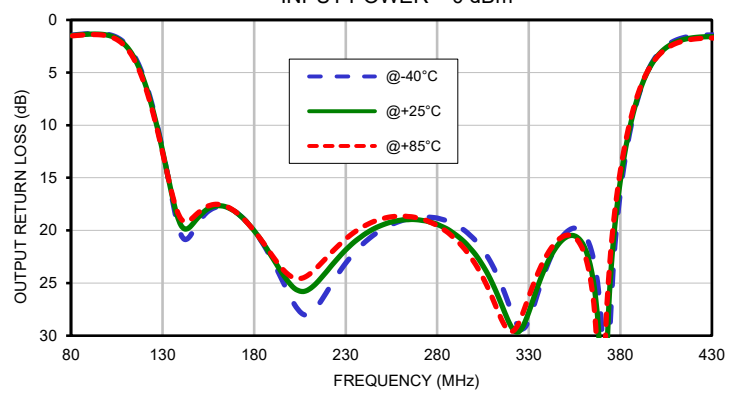
**INSERTION LOSS vs. TEMPERATURE (Zoomed)**  
INPUT POWER = 0 dBm



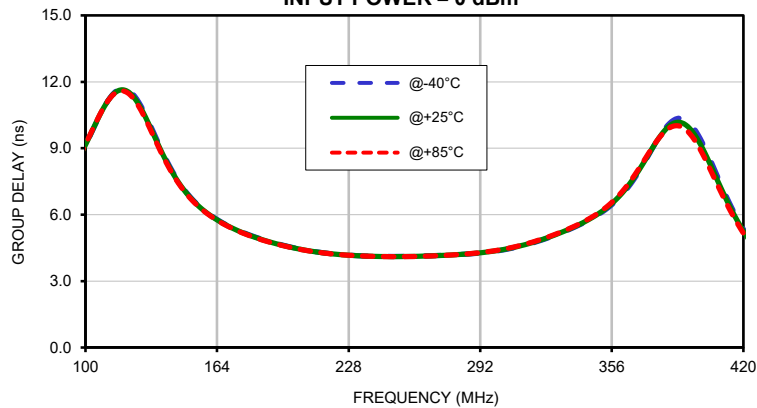
**INPUT RETURN LOSS vs. TEMPERATURE**  
INPUT POWER = 0 dBm



**OUTPUT RETURN LOSS vs. TEMPERATURE**  
INPUT POWER = 0 dBm

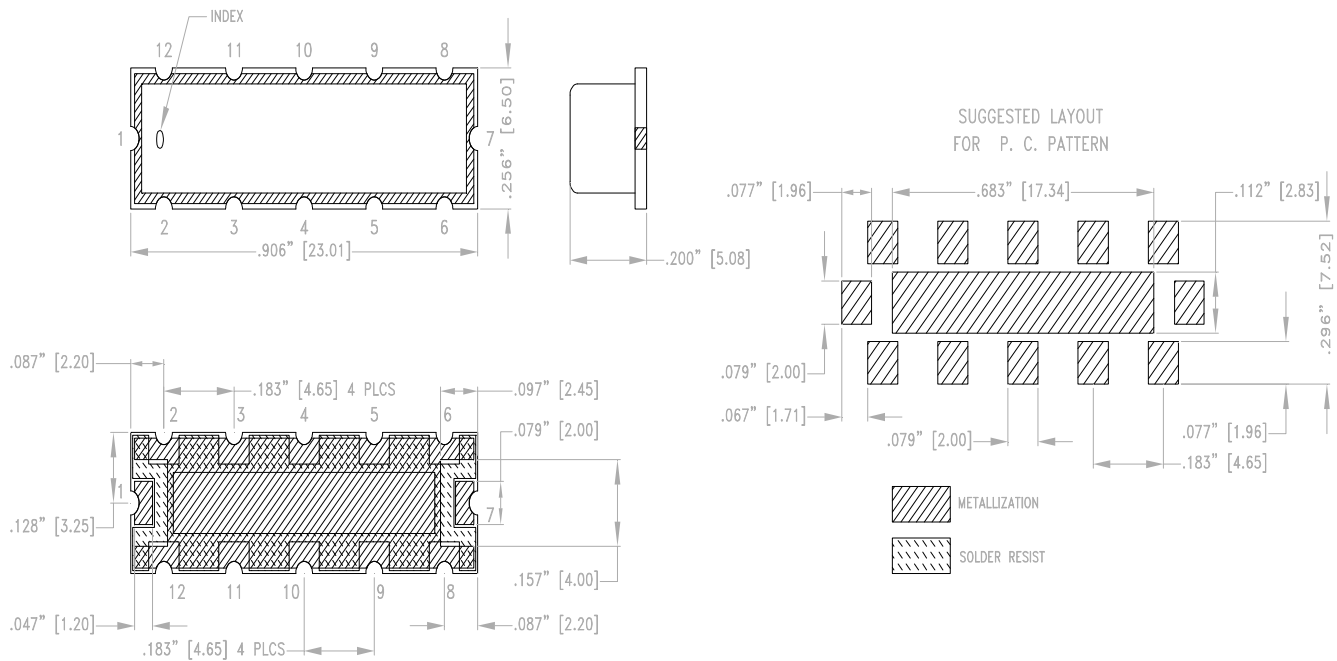


**GROUP DELAY vs. TEMPERATURE**  
INPUT POWER = 0 dBm



## Outline Dimensions

ZV3471



Dimensions are in inches [mm]. Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Unit Weight: 1.5 grams
4. 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.  
All models, (+) suffix.

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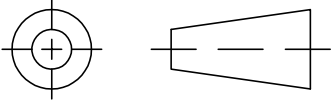


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RF/IF MICROWAVE COMPONENTS



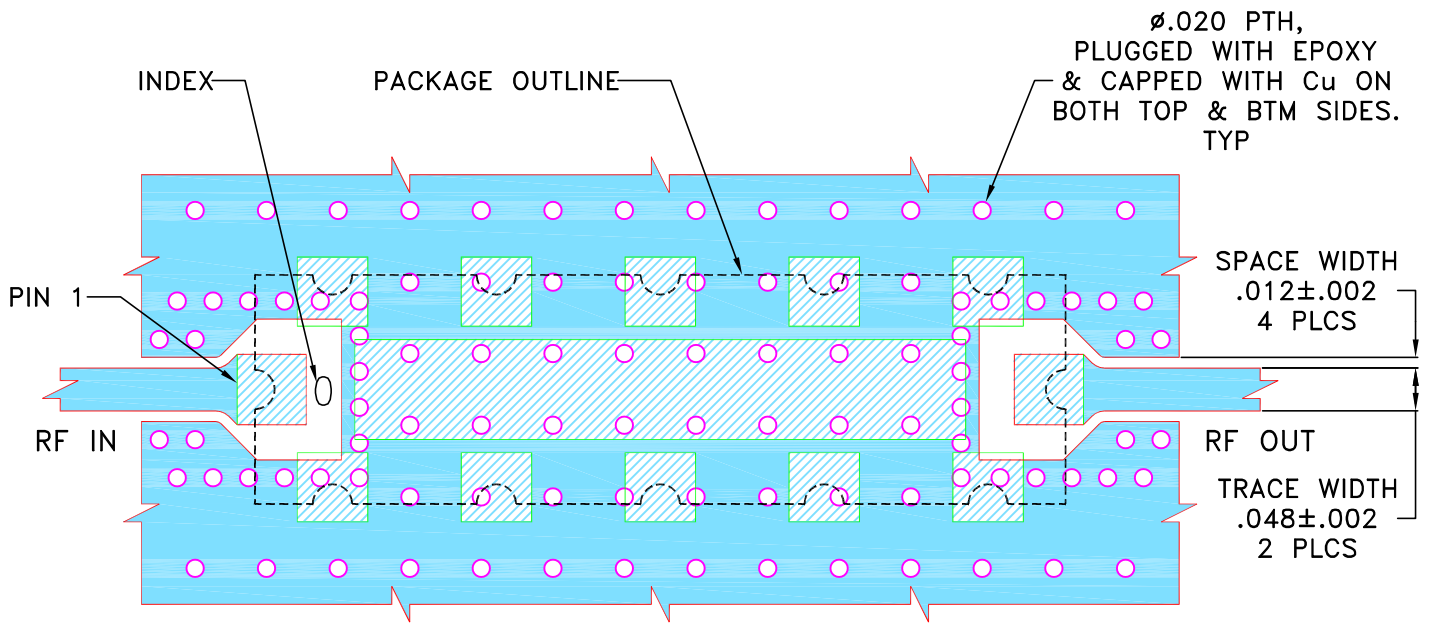
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	NPO-003975	NEW RELEASE	DEC 23	LK	VC

## SUGGESTED MOUNTING CONFIGURATION FOR ZV3471 CASE STYLE



### NOTES:

- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS  $.030 \pm .002$ . COPPER: 1/2 Oz. EACH SIDE.  
FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

- DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

UNLESS OTHERWISE SPECIFIED	INITIALS		DATE
DIMENSIONS ARE IN INCHES	DRAWN	LK	06 DEC 23
TOLERANCES ON:	CHECKED	DDR	06 DEC 23
2 PL DECIMALS ±	APPROVED	MD	07 DEC 23
3 PL DECIMALS ±			
ANGLES ±			
FRACTIONS ±			

**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

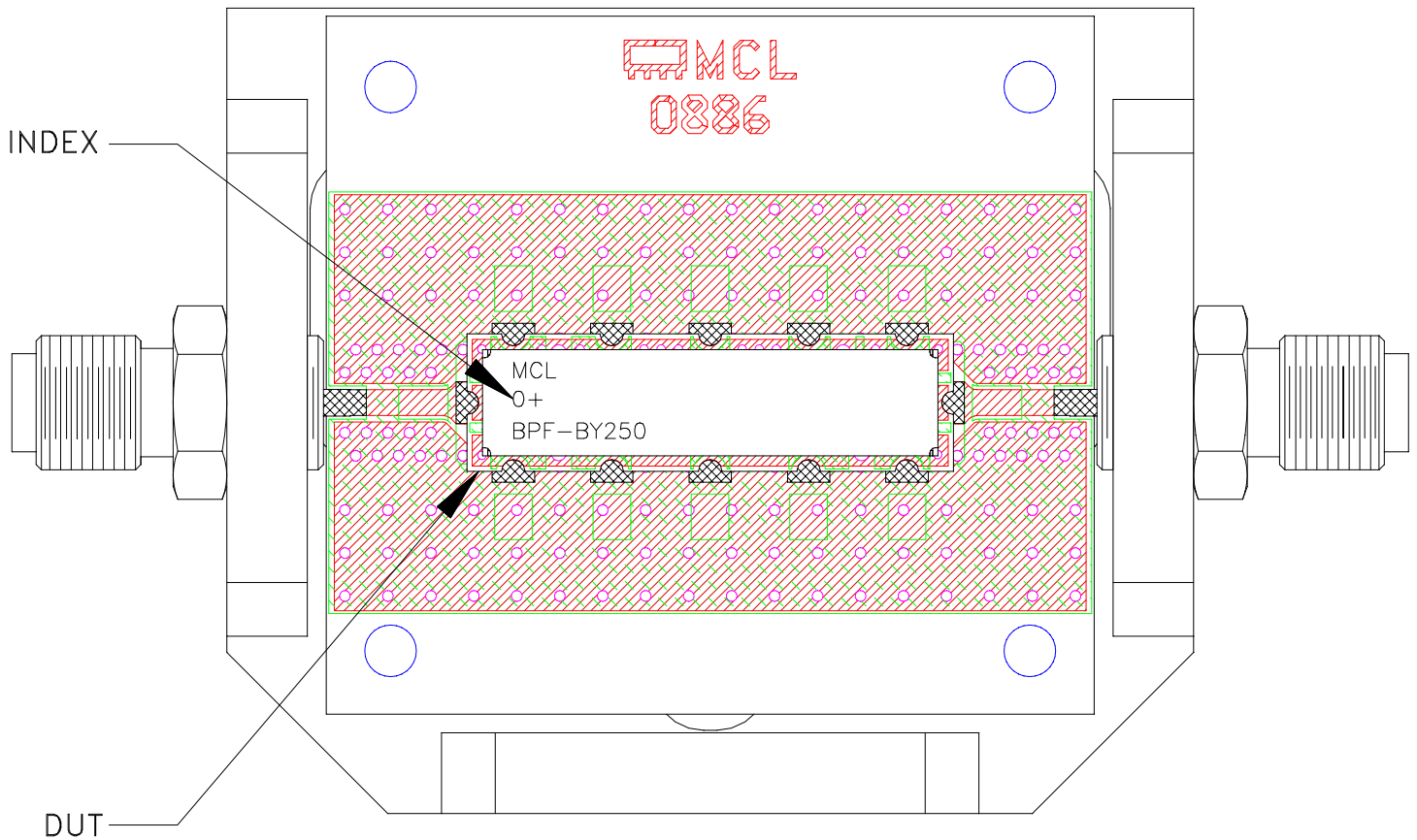
# PL, ZV3471, TB-1259

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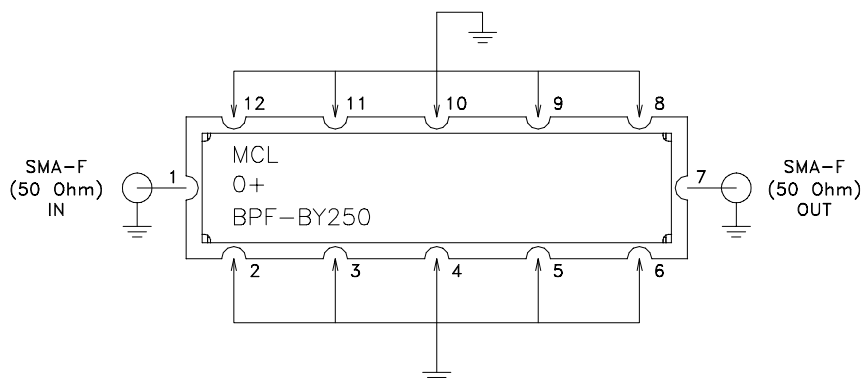
SIZE <b>A</b>	CODE IDENT <b>15542</b>	DRAWING NO: <b>98-PL-773</b>	REV: <b>OR</b>
FILE: <b>98-PL-773</b>	SCALE: <b>4.5:1</b>	SHEET: <b>1 OF 1</b>	

# Evaluation Board and Circuit

TB-BPF-BY250+



## Schematic diagram



### Notes:

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant= $3.48 \pm 0.05$   
Dielectric Thickness:  $.030 \pm .002$
2. 50 Ohm SMA Female Connectors.

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	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 95% Coverage
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
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215