LUMPED LC SURFACE MOUNT

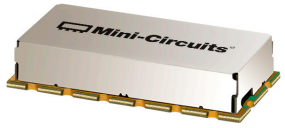
Bandpass Filter

BPF-BV440+

50Ω 410 to 470 MHz

KEY FEATURES

- Low Insertion Loss, 1.9 dB Typ.
- High Rejection, 62 dB Typ.
- Wide Stopband Rejection, Up to 3 GHz
- Miniature Shielded Package

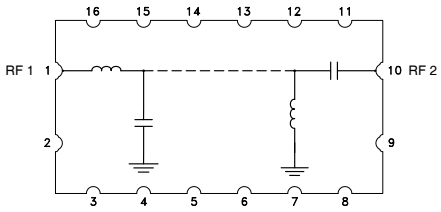


Generic photo used for illustration purposes only

APPLICATIONS

- Train Communication
- Telecom

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' Model BPF-BV440+ is a Lumped LC filter that offer a good insertion loss and high rejection. This bandpass filter covers from 410 to 470 MHz. This filter has high Q capacitors and inductors to achieve a low insertion loss. It has repeatable performance across production lots.

ELECTRICAL SPECIFICATIONS[1,2,3] AT +25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Center Frequency	Fc	—	—	440	—	MHz
	Insertion Loss	F1-F2	410 - 470	—	1.9	2.5	dB
	Return Loss	F1-F2	410 - 470	10	16	—	dB
Stopband, Lower	Rejection	DC-F3	DC - 300	45	52	—	dB
		F3-F4	300 - 375	20	32	—	
Stopband, Upper	Rejection	F5-F6	520 - 700	20	32	—	dB
		F6-F7	700 - 1800	50	62	—	
		F7-F8	1800 - 3000	30	54	—	

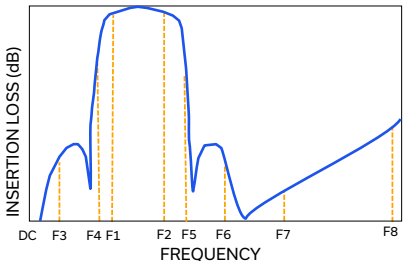
1. Tested in Evaluation Board P/N TB-BPF-BV440+.
2. This filter is bi-directional RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.
3. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Input Power[5]	1 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-026999
BPF-BV440+
EDU5078
URJ
250916

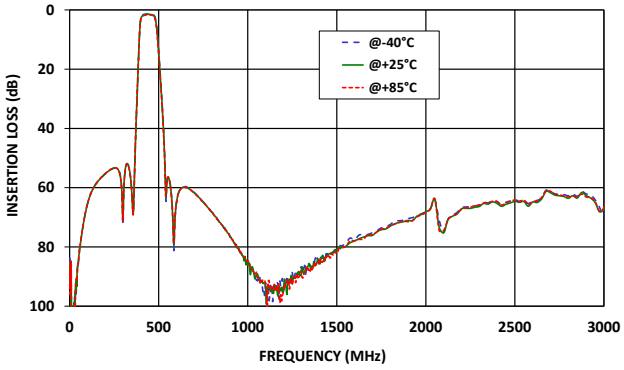
Bandpass Filter

BPF-BV440+

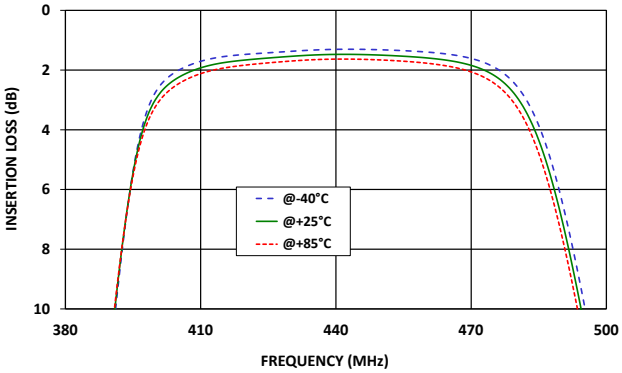
50Ω 410 to 470 MHz

TYPICAL PERFORMANCE GRAPHS

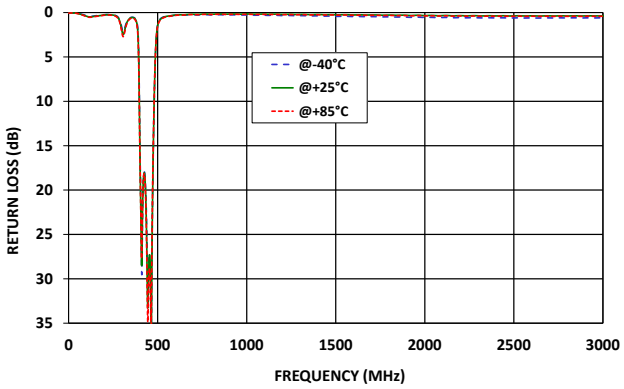
BPF-BV440+
INSERTION LOSS



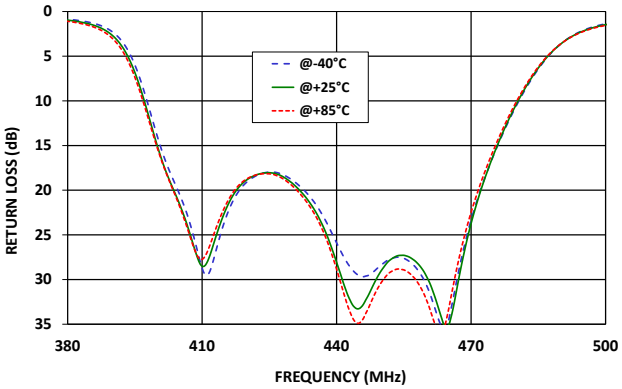
BPF-BV440+
INSERTION LOSS (Zoomed)



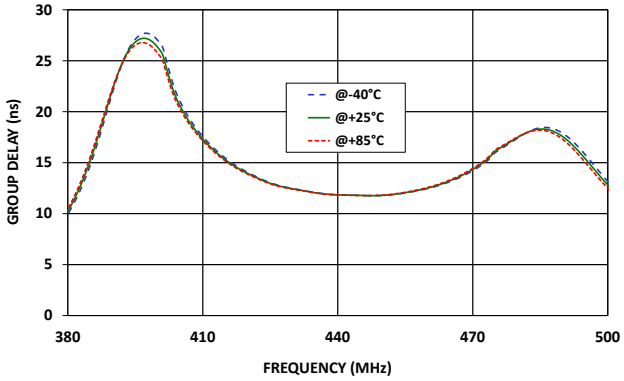
BPF-BV440+
RETURN LOSS



BPF-BV440+
RETURN LOSS (Zoomed)



BPF-BV440+
GROUP DELAY



LUMPED LC SURFACE MOUNT

Bandpass Filter

BPF-BV440+

50Ω 410 to 470 MHz

FUNCTIONAL DIAGRAM

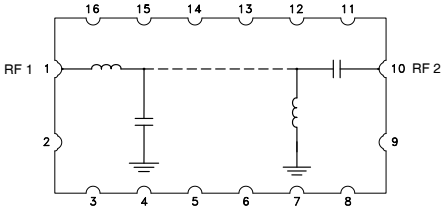
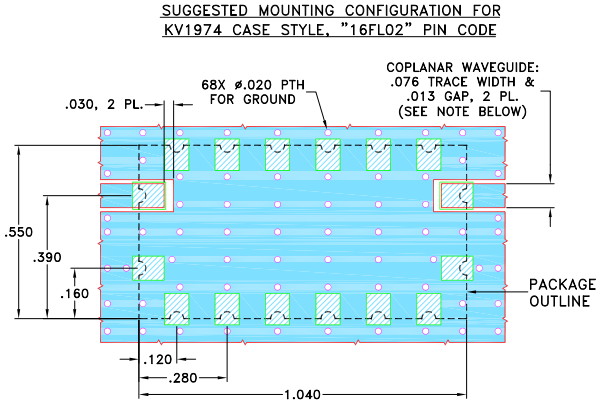


Figure 1. BPF-BV440+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1	1	Connects to RF Input Port
RF2	10	Connects to RF Output Port
GROUND	2-9,11-16	Connects to Ground on PCB, (See drawing PL-507)

SUGGESTED PCB LAYOUT



NOTE:

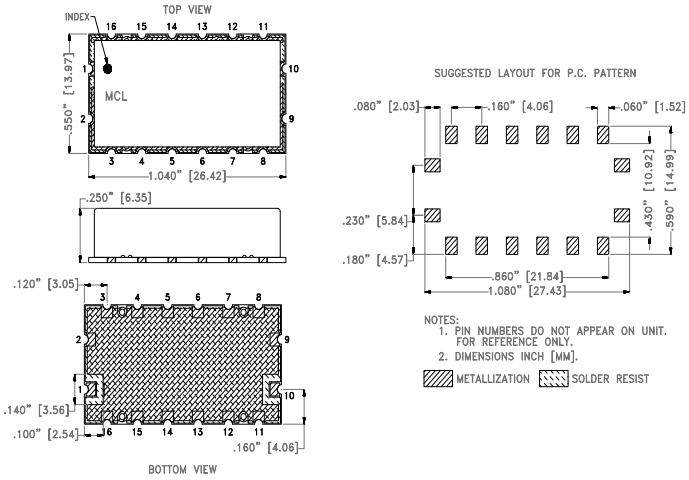
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .060" ± .004"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Figure 2. Suggested PCB Layout

CASE STYLE DRAWING



Unit Weight: 2.5gram

Dimenions are in inches [mm]. Tolerances: 2Pl. ± .03; 3Pl. ± .015

PRODUCT MARKING*: BPF-BV440

*Marking may contain other features or characters for internal lot control.

Bandpass Filter

BPF-BV440+

50Ω 410 to 470 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data and Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	KV1974-1 Lead Finish: Gold over Nickel Plate
RoHS/REACH Status	Compliant
Tape and Reel	F005
Suggested Layout for PCB Design	PL-507
Evaluation Board	TB-BPF-BV440+
	Gerber File
Environmental Rating	ENV02T1
MSL Level	MSL1

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

Surface mount Band Pass Filter BPF-BV440+

Typical Performance Data

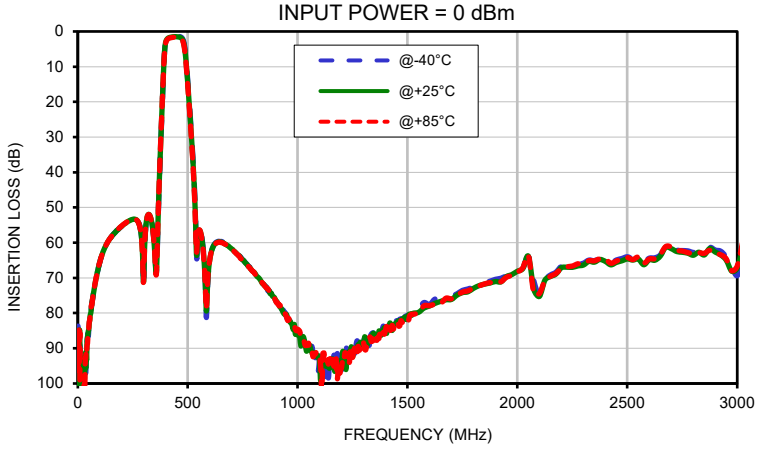
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
10	107.13	101.76	112.02	0.04	0.04	0.04	0.03	0.03	0.03
14	109.00	113.49	109.73	0.04	0.04	0.04	0.03	0.03	0.03
20	100.08	108.26	106.75	0.04	0.04	0.04	0.03	0.03	0.04
22	106.46	109.01	108.93	0.04	0.04	0.05	0.03	0.03	0.04
20	100.08	108.26	106.75	0.04	0.04	0.04	0.03	0.03	0.04
26	102.82	98.66	105.37	0.04	0.04	0.05	0.03	0.03	0.03
30	98.82	98.91	99.36	0.04	0.05	0.05	0.03	0.03	0.03
36	97.08	95.67	92.97	0.05	0.06	0.06	0.02	0.03	0.03
40	89.59	93.38	91.15	0.06	0.07	0.07	0.02	0.03	0.03
46	85.78	86.01	86.45	0.07	0.08	0.09	0.02	0.02	0.02
50	84.38	84.71	84.26	0.09	0.10	0.11	0.02	0.02	0.02
52	83.34	82.86	82.36	0.10	0.11	0.12	0.02	0.02	0.02
54	81.56	82.15	82.18	0.10	0.12	0.13	0.02	0.02	0.02
60	79.50	79.61	78.80	0.13	0.15	0.17	0.02	0.02	0.03
64	76.92	77.27	77.72	0.15	0.17	0.19	0.02	0.03	0.03
70	75.08	74.73	74.68	0.17	0.20	0.23	0.02	0.03	0.03
80	71.40	71.05	71.24	0.22	0.26	0.29	0.02	0.03	0.03
90	68.18	68.06	68.05	0.29	0.33	0.37	0.02	0.03	0.03
100	65.52	65.54	65.58	0.35	0.41	0.45	0.02	0.03	0.03
120	61.78	61.83	61.79	0.43	0.49	0.53	0.01	0.02	0.03
140	59.37	59.46	59.43	0.39	0.44	0.48	0.02	0.03	0.05
160	57.74	57.72	57.74	0.34	0.38	0.41	0.03	0.04	0.05
200	55.34	55.30	55.19	0.25	0.27	0.30	0.04	0.05	0.07
300	72.67	70.88	69.48	1.80	2.10	2.33	0.16	0.18	0.20
375	35.69	35.12	34.72	0.70	0.76	0.86	0.76	0.90	1.00
384	21.08	20.61	20.28	1.13	1.29	1.46	1.35	1.59	1.82
390	11.65	11.35	11.18	2.28	2.69	3.02	2.81	3.32	3.80
398	3.41	3.62	3.83	10.52	11.57	12.00	13.75	15.33	16.57
400	2.74	2.98	3.21	13.97	15.04	15.28	19.49	21.69	22.89
410	1.71	1.93	2.12	28.73	28.51	27.74	32.67	33.89	34.04
420	1.47	1.66	1.83	19.08	18.83	18.72	20.84	21.33	21.27
424	1.43	1.61	1.77	18.04	18.07	18.15	19.46	20.22	20.32
426	1.41	1.58	1.75	17.97	18.10	18.26	19.33	20.21	20.35
430	1.37	1.54	1.70	18.82	19.17	19.46	19.88	21.00	21.17
432	1.35	1.52	1.68	19.65	20.14	20.50	20.46	21.69	21.85
435	1.33	1.50	1.65	21.34	22.15	22.61	21.53	22.87	22.95
440	1.31	1.47	1.63	25.90	28.07	28.85	23.24	24.29	24.18
442	1.30	1.47	1.63	27.82	31.08	32.20	23.62	24.38	24.26
444	1.30	1.48	1.64	29.18	33.10	34.65	23.77	24.24	24.18
446	1.31	1.48	1.64	29.68	32.75	34.33	23.78	23.98	24.02
450	1.32	1.50	1.66	28.35	28.97	30.31	23.87	23.73	24.06
460	1.40	1.59	1.77	30.58	29.59	32.23	28.88	28.08	29.58
470	1.61	1.84	2.06	23.34	23.72	22.47	24.61	24.77	23.61
482	2.94	3.35	3.72	8.80	8.63	8.42	10.14	10.02	9.99
510	22.67	23.39	24.05	0.83	0.91	0.99	1.69	1.92	2.10
520	32.14	32.92	33.62	0.63	0.68	0.75	1.48	1.71	1.88
600	64.98	65.02	64.95	0.30	0.28	0.32	0.64	0.71	0.80
700	61.60	61.79	61.91	0.25	0.19	0.22	0.40	0.43	0.49
800	68.43	68.32	68.26	0.26	0.19	0.22	0.40	0.46	0.51
1000	85.63	86.24	84.58	0.27	0.16	0.19	0.42	0.51	0.57
1500	80.62	81.08	81.74	0.42	0.25	0.28	0.43	0.40	0.47
1800	72.46	72.97	72.89	0.48	0.28	0.32	0.44	0.42	0.49
2000	68.11	68.10	68.39	0.55	0.34	0.38	0.41	0.44	0.49
2100	74.97	75.28	74.44	0.55	0.34	0.37	0.38	0.43	0.49
2200	66.71	67.13	67.33	0.57	0.34	0.38	0.34	0.41	0.48
2500	64.01	64.62	64.21	0.60	0.37	0.41	0.29	0.43	0.51
2600	64.40	64.83	64.62	0.60	0.37	0.41	0.30	0.45	0.54
2700	61.24	61.70	61.21	0.60	0.37	0.41	0.35	0.49	0.59
2900	62.09	62.67	63.12	0.60	0.38	0.18	0.53	0.62	0.74
3000	69.37	67.24	66.63	0.59	0.37	0.41	0.68	0.72	0.85

Typical Performance Data

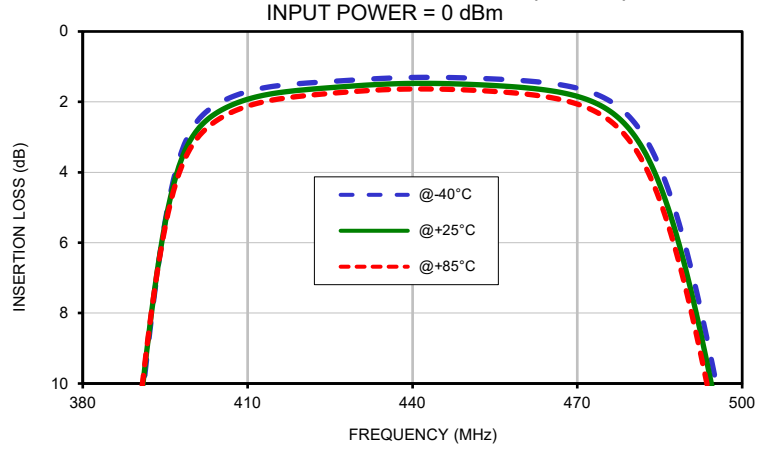
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
410	17.57	17.32	17.15
411	17.07	16.84	16.69
412	16.62	16.41	16.27
413	16.20	16.01	15.87
414	15.81	15.63	15.51
415	15.45	15.29	15.17
416	15.12	14.97	14.87
417	14.82	14.68	14.59
418	14.54	14.41	14.32
419	14.28	14.17	14.09
420	14.05	13.94	13.87
421	13.82	13.73	13.66
422	13.61	13.52	13.46
423	13.40	13.32	13.27
424	13.20	13.13	13.09
425	13.03	12.97	12.93
426	12.88	12.83	12.79
427	12.76	12.71	12.67
428	12.65	12.61	12.57
429	12.55	12.52	12.48
430	12.46	12.43	12.40
440	11.85	11.84	11.83
442	11.82	11.82	11.81
444	11.80	11.80	11.80
446	11.77	11.77	11.78
448	11.76	11.76	11.78
450	11.79	11.80	11.82
452	11.86	11.87	11.90
460	12.46	12.51	12.57
465	13.15	13.23	13.31
470	14.21	14.34	14.44

Typical Performance Curves

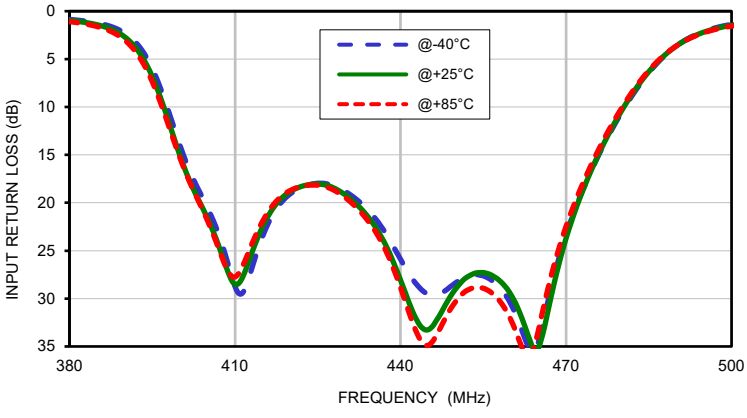
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



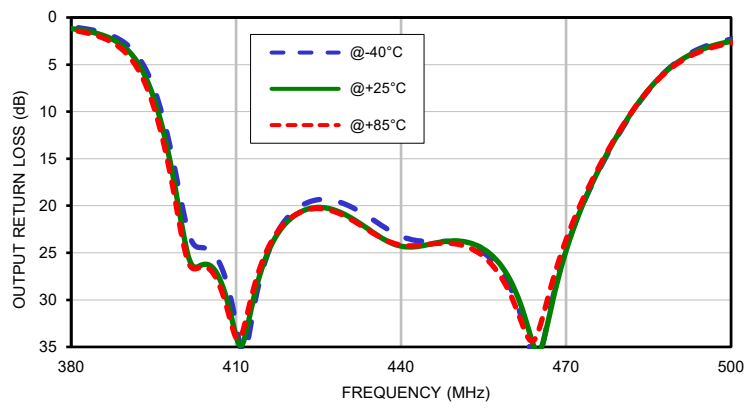
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



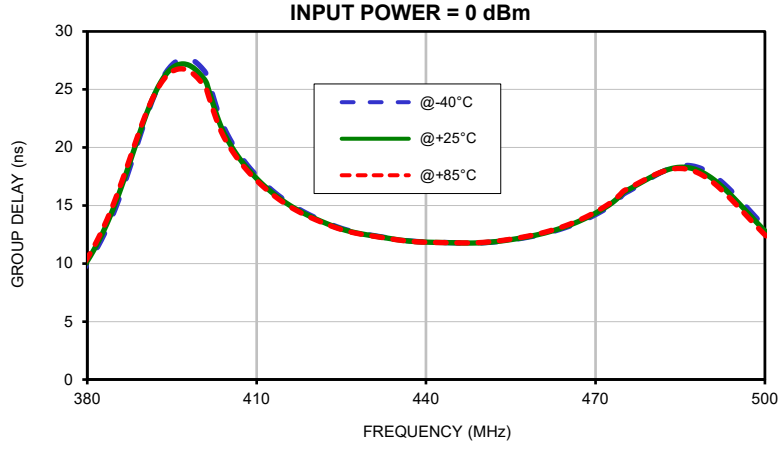
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



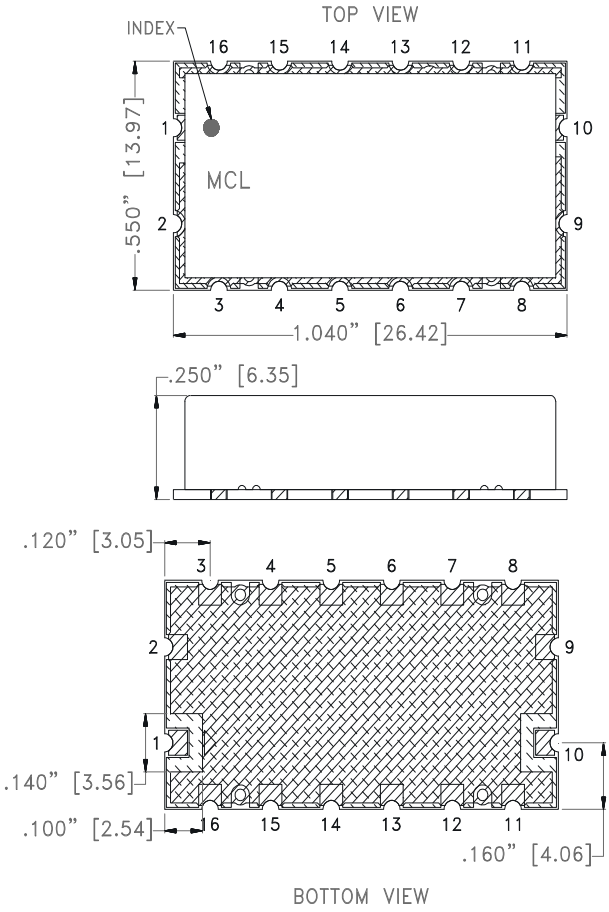
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm

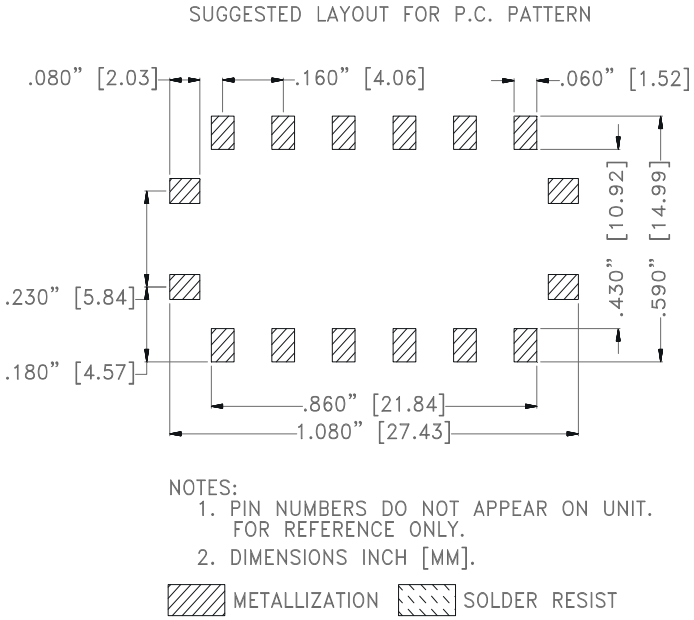


Case Style KV

Outline Dimension

KV1974-1



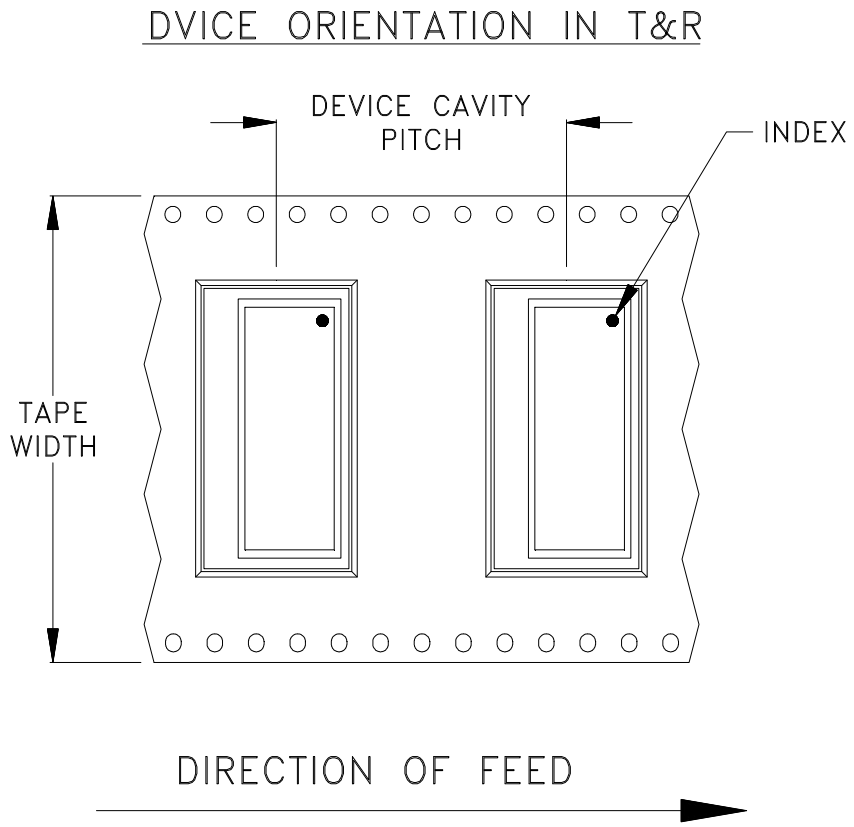


Dimensions are in inches [mm]. Tolerances: 2 Pl ± .03; 3 Pl ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Unit Weight: 2.5g
4. 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.
   All models, (+) suffix.

Tape & Reel Packaging TR-F005



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
44	28	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.

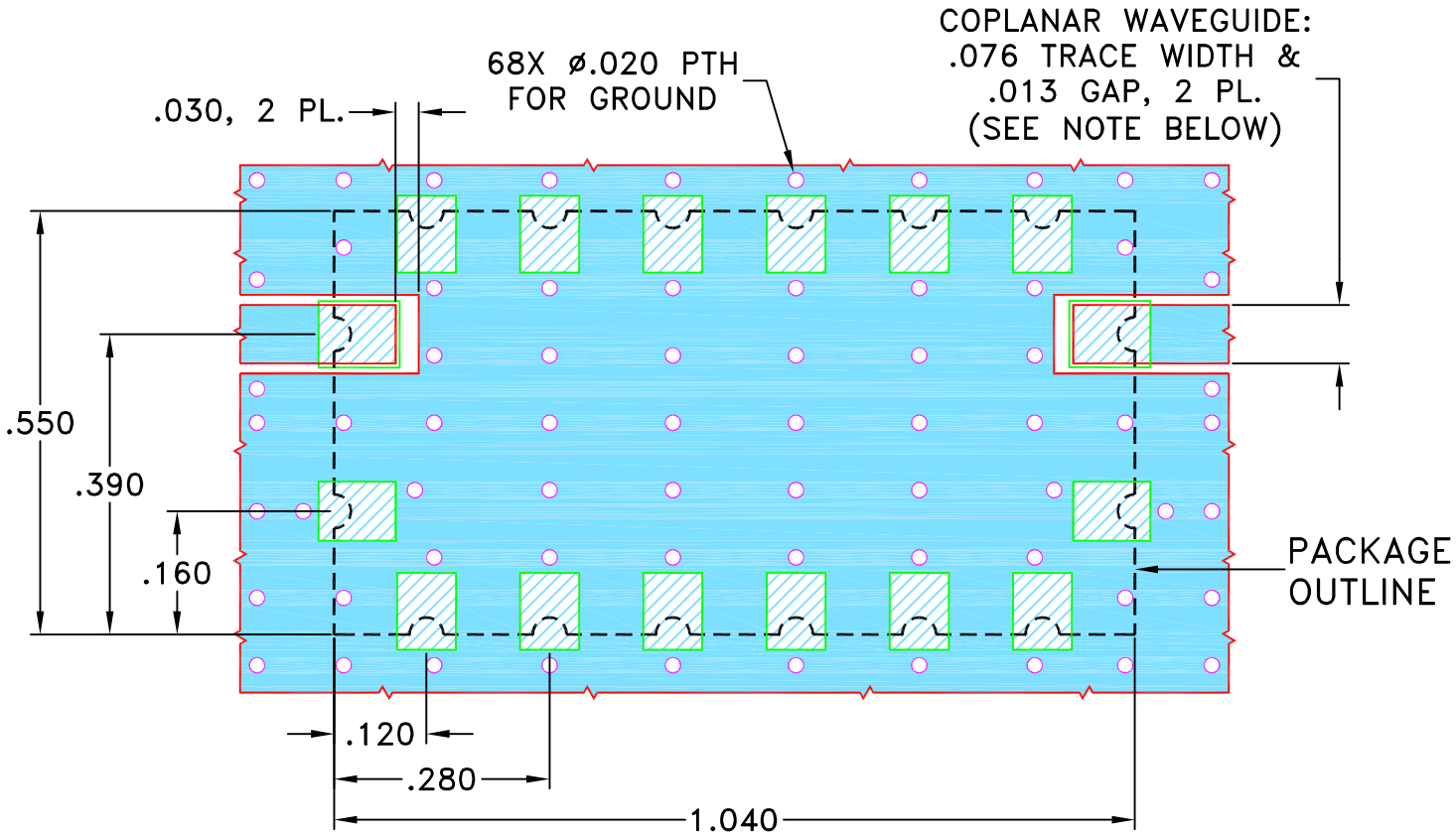
Go to: www.minicircuits.com/pages/pdfs/tape.pdf

Mini-Circuits®
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	M160945	NEW RELEASE	MAR 17	TM	MD

SUGGESTED MOUNTING CONFIGURATION FOR KV1974 CASE STYLE, "16FL02" PIN CODE



NOTE:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .060" ± .004"; 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

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	TM	24 MAR 17
TOLERANCES ON:	CHECKED	MD	24 MAR 17
2 PL DECIMALS ±	APPROVED	MD	24 MAR 17
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

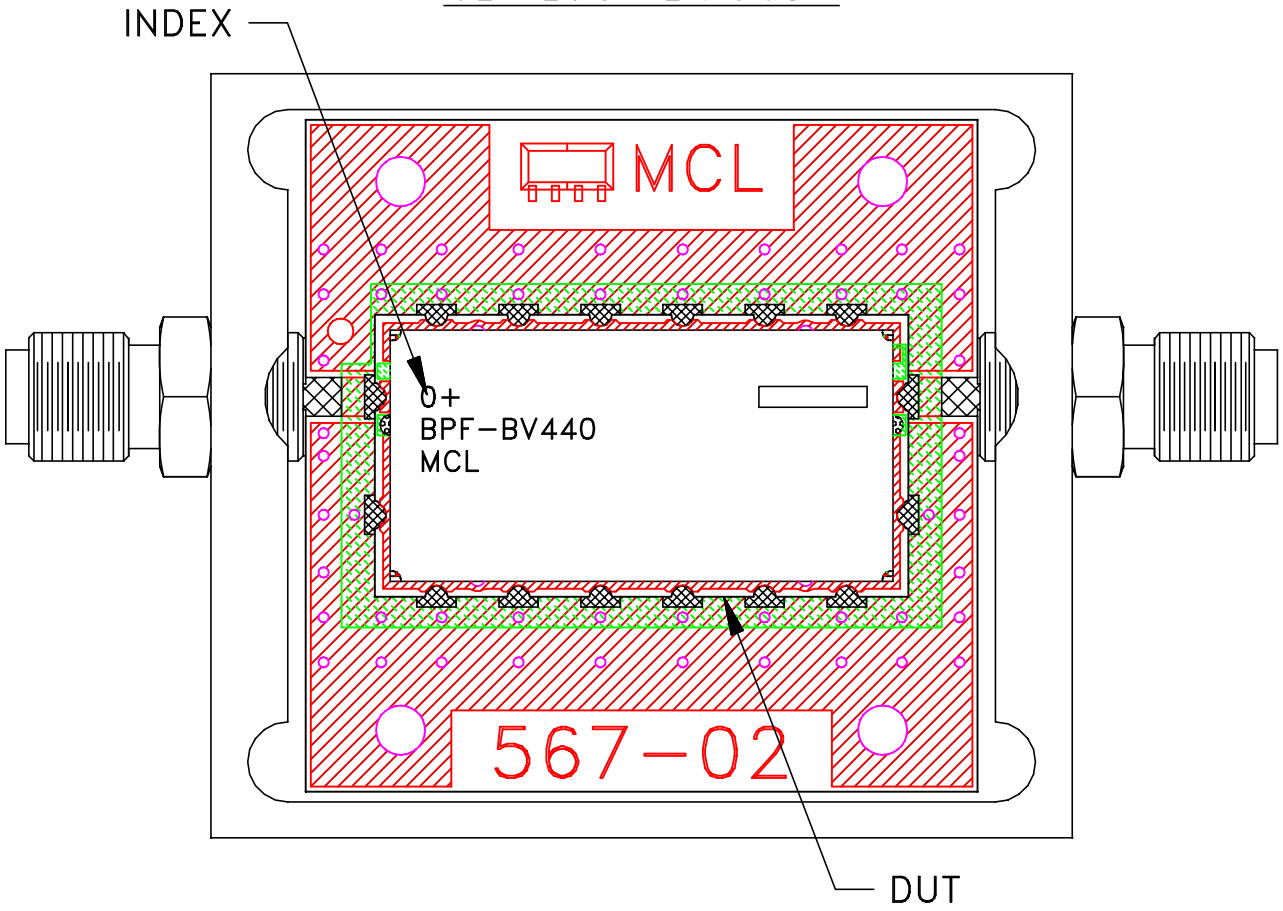
PL, 16FL02, KV1974, TB-953+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-507	OR

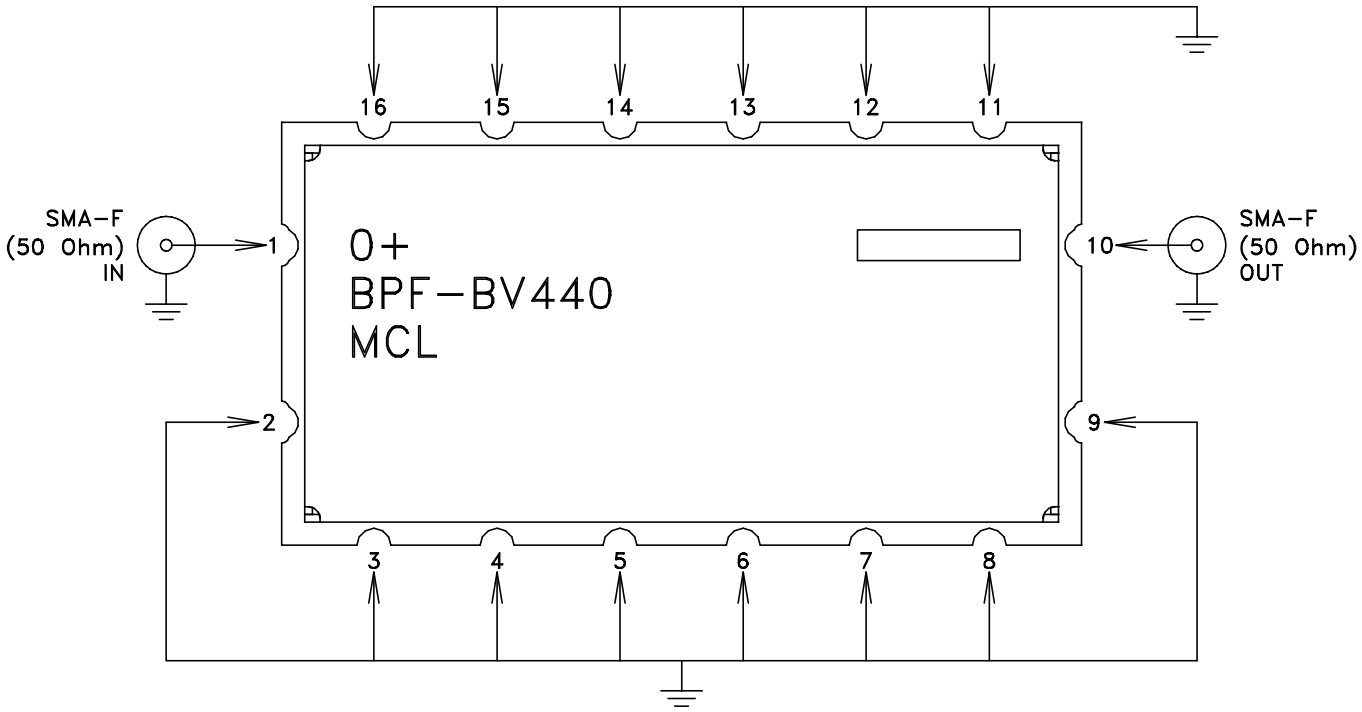
FILE:	SCALE:	SHEET:
98PL507	4:1	1 OF 1

Evaluation Board and Circuit

TB-BPF-BV440+



Schematic diagram



Notes:

1. PCB Material: ROGERS (RO4350B) OR Equivalent, Dielectric Constant=3.48±.05
Dielectric Thickness: .060±.004 inch
2. 50 Ohm SMA Female Connectors.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV02T1

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