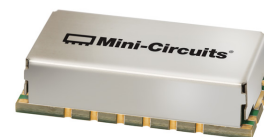


Surface Mount Bandpass Filter

BPF-F150+

50Ω 145 to 155 MHz



Generic photo used for illustration purposes only
CASE STYLE: HP1156

The Big Deal

- Narrow bandwidth
- High Rejection
- Good VSWR
- Shielded package

Product Overview

BPF-F150+ is a 50Ω bandpass filter in a shielded package fabricated using SMT technology. This bandpass filter covers from 145 to 155 MHz. This unit uses a miniature high Q capacitors and wire welded inductors for high reliability. It has repeatable performance across production lots and consistent performance across temperature.

Key Features

Feature	Advantages
Narrow bandwidth filter	Narrow bandwidth with fast roll-off, this will attenuate frequencies closer to the passband with good rejection value of > 40 dB which increases selectivity on the adjacent channel
Good rejection	This enables the filter attenuate spurious signals and reject harmonics for broad frequency band.
Shielded package	The small surface mount package enables the BPF-F150+ to used in compact design

Notes

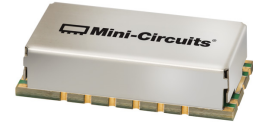
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-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/MCLStore/terms.jsp



Surface Mount Bandpass Filter

50Ω 145 to 155 MHz

BPF-F150+



Features

- Narrow bandwidth
- Sharper cut-off
- Shielded package

Generic photo used for illustration purposes only
CASE STYLE: HP1156

Electrical Specifications at 25°C

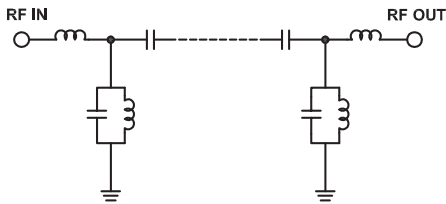
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	—	150	—	MHz
	Insertion Loss	F1-F2	145-155	—	6	7	dB
	VSWR	F1-F2	145-155	—	1.58	1.92	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-133	40	45	—	dB
	VSWR	DC-F3	DC-133	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	170-1400	40	44	—	dB
	VSWR	F4-F5	170-1400	—	20	—	:1

Maximum Ratings

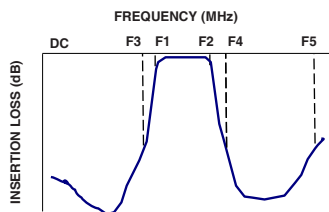
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	1 W

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

Functional Schematic



Typical Frequency Response

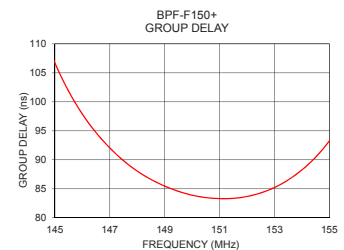
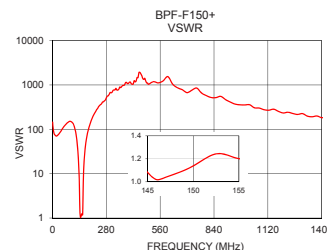
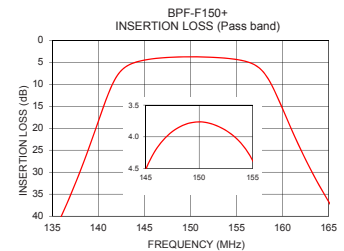
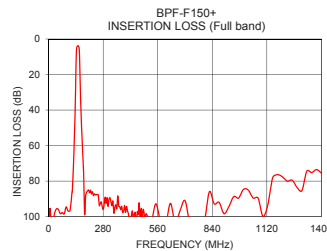


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	103.38	145.02	145.0	106.68
100	96.90	146.11	145.5	101.81
130	63.40	42.10	146.0	97.88
133	52.70	28.78	146.5	94.67
135	44.47	21.05	147.0	92.04
138	29.99	11.09	147.5	89.84
140	21.46	6.88	148.0	88.05
141	12.65	3.37	148.5	86.61
142	8.22	1.92	149.0	85.46
145	4.52	1.08	149.5	84.56
150	3.76	1.14	150.0	83.90
155	4.37	1.20	150.5	83.48
160	15.64	5.26	151.0	83.31
161	20.47	7.95	151.5	83.35
162	25.04	10.83	152.0	83.67
163	29.25	13.82	152.5	84.28
170	51.78	36.57	153.0	85.22
200	85.49	149.51	153.5	86.54
700	91.01	670.66	154.0	88.25
1400	75.43	182.92	155.0	93.28

+RoHS Compliant

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



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-Circuits' applicable established test performance criteria and measurement instructions.
- 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/MCLStore/terms.jsp



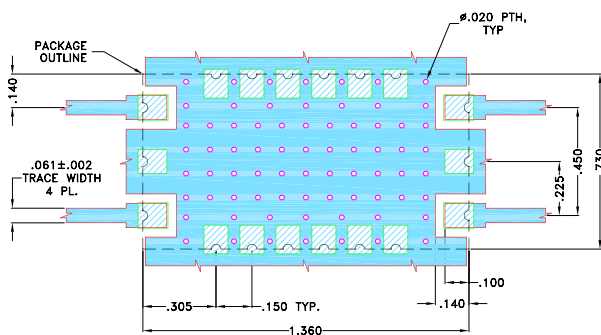
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

REV.A
M174392
BPF-F150+
EDU2619/1
URJ
180828
Page 2 of 3

Pad Connections

INPUT	18
OUTPUT	9
GROUND	1,3,4,5,6,7,8,10,12,13,14,15,16,17
NO CONNECTION	2,11

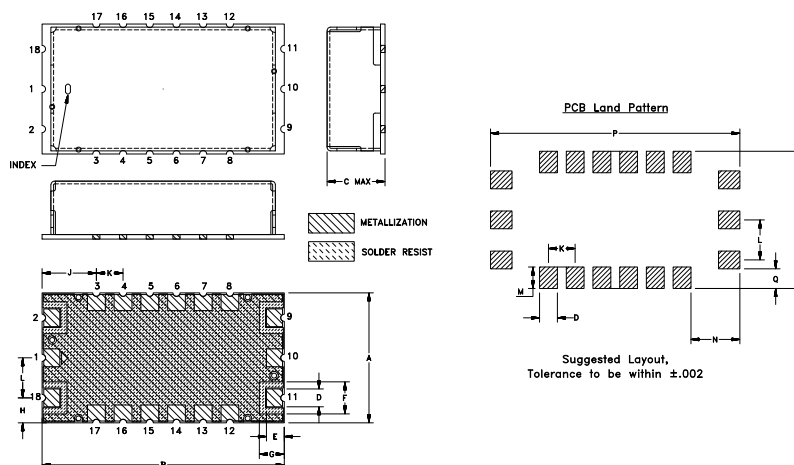
**Demo Board MCL P/N: TB-695+
Suggested PCB Layout (PL-418)**



NOTES:

- NOTES:
1. TRACE WIDTH IS SHOWN FOR OAK-602, WITH DIELECTRIC THICKNESS .022"±.0015". COPPER 1/2 OZ. EACH SIDE.
 2. FOR OTHER MATERIALS, TRACE WIDTH NEED TO BE MODIFIED.
 3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
 4.  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 5.  DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Outline Drawing



Outline Dimensions ($\frac{\text{inch}}{\text{mm}}$)

A	B	C	D	E	F	G	H	J
.730	1.360	.350	.100	.100	.180	.140	.140	.305
18.54	34.54	8.89	2.54	2.54	4.57	3.56	3.56	7.75
K	L	M	N	P	Q	R		Wt.
.150	.225	.120	.275	1.400	.110	.770		grams
3.81	5.72	3.05	6.99	35.56	2.79	19.56		6.0

Note: Please refer to case style drawing for details

Notes

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/MCStore/terms.jsp

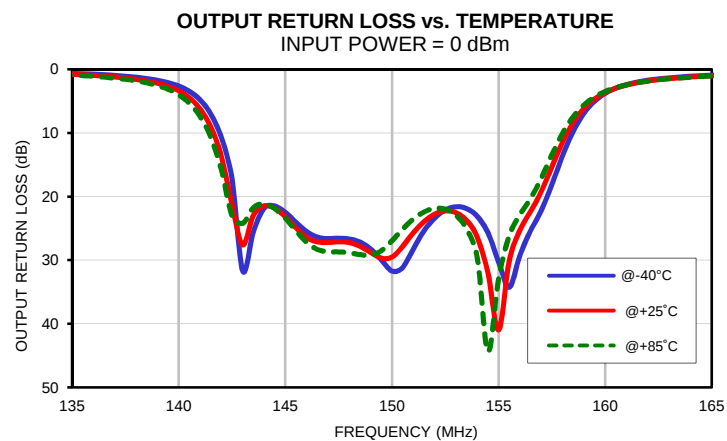
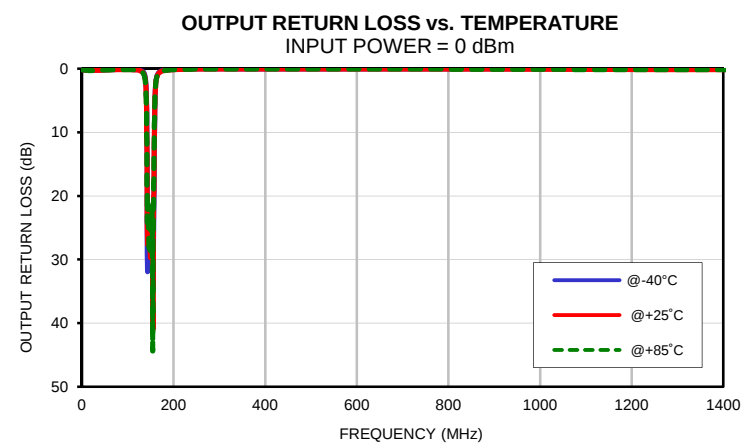
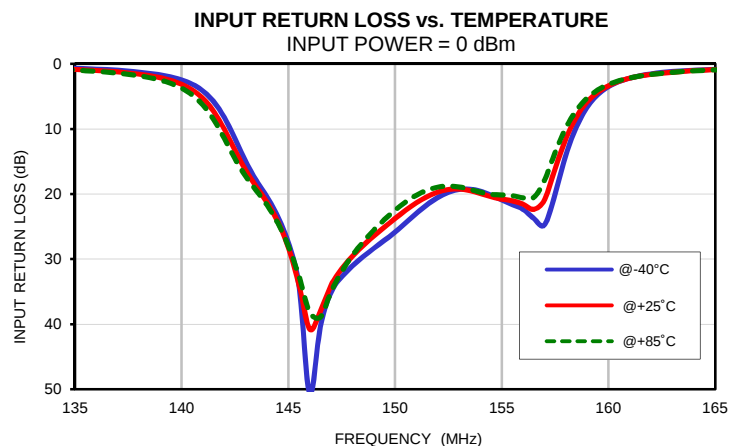
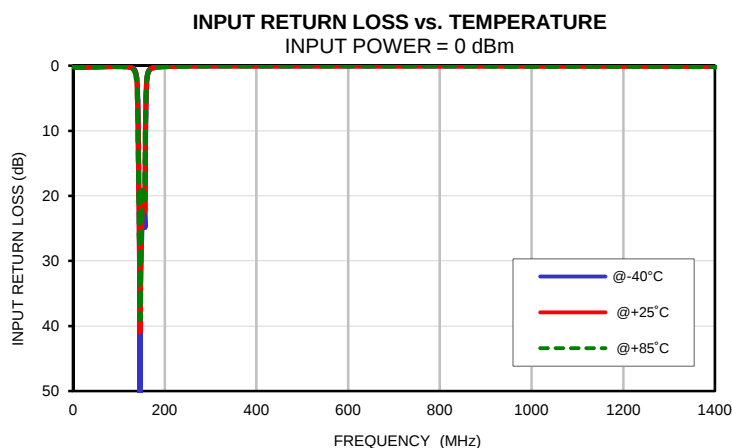
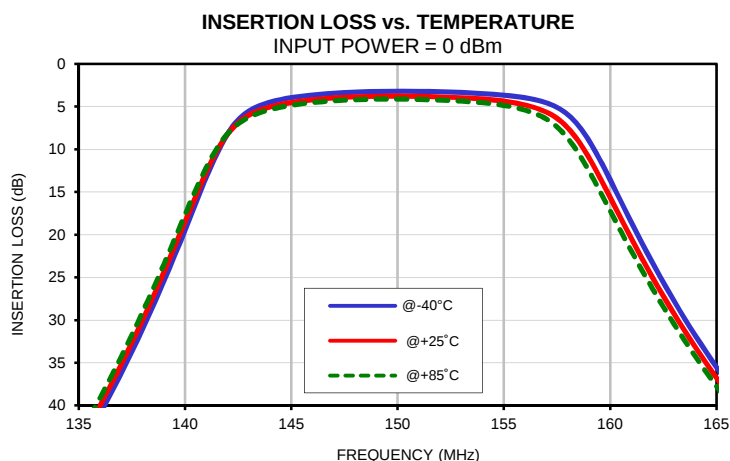
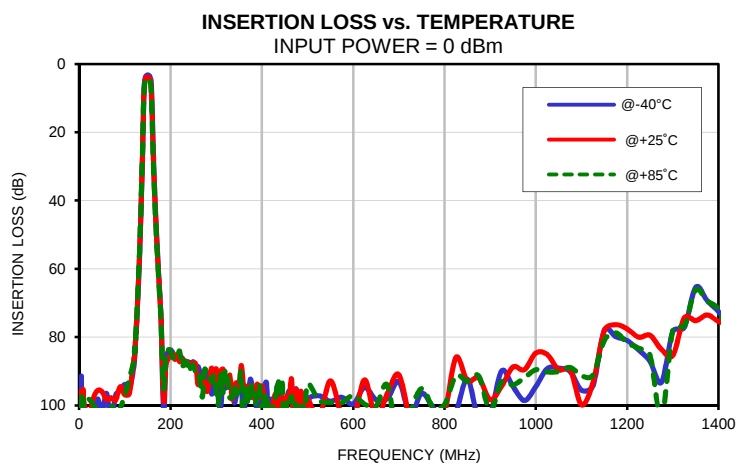
Typical Performance Data

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
1.0	106.52	103.38	101.18	0.11	0.12	0.13	0.11	0.12	0.13
10.0	100.87	98.55	97.44	0.20	0.22	0.24	0.20	0.23	0.25
100.0	93.85	96.90	97.02	0.10	0.12	0.13	0.09	0.12	0.12
110.0	95.12	96.55	92.32	0.11	0.13	0.15	0.10	0.13	0.14
120.0	88.56	86.25	86.94	0.16	0.19	0.21	0.14	0.18	0.20
125.0	78.74	77.80	76.31	0.21	0.26	0.29	0.19	0.24	0.27
130.0	63.91	63.40	62.51	0.34	0.41	0.47	0.30	0.38	0.43
131.0	60.69	59.84	59.18	0.38	0.46	0.53	0.34	0.43	0.49
132.0	57.25	56.37	55.57	0.43	0.53	0.60	0.39	0.49	0.55
133.0	53.59	52.70	51.86	0.49	0.60	0.69	0.44	0.56	0.64
134.0	49.60	48.68	47.86	0.57	0.70	0.80	0.52	0.65	0.74
135.0	45.42	44.47	43.61	0.67	0.83	0.95	0.61	0.78	0.89
136.0	40.97	39.98	39.10	0.80	0.99	1.14	0.75	0.94	1.08
137.0	36.19	35.17	34.26	0.98	1.23	1.42	0.93	1.18	1.36
138.0	31.04	29.99	29.06	1.25	1.57	1.83	1.22	1.55	1.79
139.0	25.44	24.40	23.48	1.68	2.12	2.49	1.69	2.16	2.52
140.0	19.41	18.47	17.65	2.45	3.13	3.72	2.61	3.37	3.98
141.0	13.25	12.65	12.13	4.15	5.32	6.32	4.76	6.19	7.36
142.0	8.17	8.22	8.19	8.23	10.04	11.45	10.72	13.60	15.76
143.0	5.52	6.00	6.25	14.98	16.35	17.26	31.69	27.59	24.22
144.0	4.47	5.04	5.36	20.47	21.27	21.68	21.85	21.45	21.16
145.0	3.95	4.52	4.85	27.51	28.21	27.97	22.48	23.17	23.43
147.0	3.44	3.99	4.32	35.11	34.00	35.03	26.61	27.21	28.67
150.0	3.20	3.76	4.12	25.82	23.76	22.47	31.72	29.52	26.95
153.0	3.35	3.96	4.36	19.28	19.22	18.90	21.60	22.52	22.92
155.0	3.66	4.37	4.87	20.90	20.77	20.14	30.31	40.97	32.89
156.0	3.98	4.81	5.41	22.35	21.56	20.57	29.23	25.27	22.84
158.0	5.93	7.47	8.70	14.04	11.54	9.87	13.55	11.42	10.02
160.0	13.56	15.64	17.21	3.50	3.34	3.15	3.76	3.63	3.46
161.0	18.57	20.47	21.92	2.16	2.20	2.15	2.39	2.44	2.41
162.0	23.34	25.04	26.35	1.53	1.61	1.61	1.70	1.81	1.82
163.0	27.75	29.25	30.45	1.17	1.26	1.28	1.31	1.42	1.46
164.0	31.79	33.15	34.23	0.94	1.03	1.06	1.06	1.17	1.20
165.0	35.52	36.75	37.75	0.79	0.87	0.90	0.88	0.98	1.02
166.0	38.98	40.10	41.04	0.67	0.75	0.78	0.75	0.85	0.88
170.0	50.90	51.78	52.52	0.42	0.48	0.50	0.46	0.53	0.56
200.0	83.72	85.49	84.06	0.09	0.12	0.13	0.09	0.12	0.13
250.0	87.24	87.54	88.19	0.03	0.05	0.05	0.02	0.05	0.05
300.0	91.06	89.27	95.86	0.01	0.03	0.03	0.00	0.03	0.03
350.0	93.41	95.56	94.95	0.00	0.02	0.02	0.01	0.02	0.02
400.0	95.11	94.29	103.06	0.01	0.02	0.02	0.01	0.02	0.02
450.0	100.30	105.70	118.84	0.01	0.01	0.01	0.03	0.01	0.02
500.0	98.64	98.31	93.80	0.01	0.02	0.02	0.02	0.02	0.02
550.0	98.78	92.81	99.12	0.01	0.02	0.02	0.02	0.02	0.03
600.0	99.62	104.72	97.09	0.02	0.01	0.02	0.03	0.02	0.03
650.0	98.34	103.64	100.26	0.01	0.02	0.03	0.02	0.03	0.04
700.0	93.02	91.01	112.12	0.01	0.03	0.04	0.02	0.04	0.04
750.0	96.47	109.42	95.09	0.01	0.02	0.03	0.02	0.04	0.05
800.0	103.79	102.00	99.83	0.01	0.03	0.04	0.01	0.05	0.06
850.0	92.33	92.83	92.93	0.00	0.03	0.05	0.01	0.05	0.06
900.0	102.60	98.34	101.57	0.00	0.04	0.05	0.01	0.06	0.07
950.0	94.48	88.75	94.00	0.01	0.05	0.06	0.00	0.07	0.08
1000.0	94.49	84.66	89.56	0.01	0.05	0.06	0.01	0.08	0.09
1050.0	89.12	89.59	90.10	0.02	0.06	0.07	0.02	0.08	0.10
1100.0	95.58	99.86	91.31	0.02	0.06	0.08	0.03	0.09	0.11
1150.0	77.94	78.03	80.96	0.02	0.06	0.07	0.03	0.10	0.11
1200.0	80.98	77.62	81.69	0.03	0.07	0.09	0.04	0.11	0.12
1250.0	87.15	79.48	85.35	0.03	0.08	0.09	0.04	0.11	0.13
1300.0	78.37	85.34	77.69	0.03	0.08	0.09	0.05	0.12	0.14
1400.0	72.52	75.43	71.89	0.05	0.09	0.11	0.06	0.13	0.15

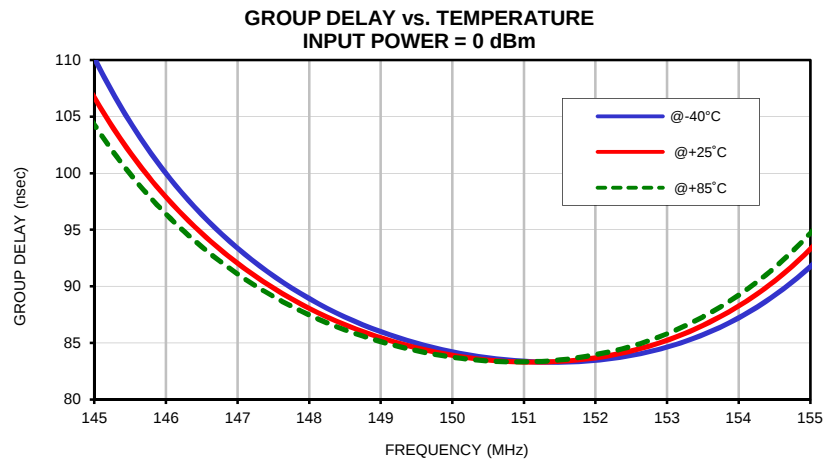
Typical Performance Data

FREQ.	GROUP DELAY		
(MHz)	(nsec)		
	@-40°C	@+25°C	@+85°C
145.0	110.15	106.68	104.28
145.5	104.50	101.81	99.93
146.0	99.97	97.88	96.39
146.5	96.33	94.67	93.49
147.0	93.37	92.04	91.08
147.5	90.92	89.84	89.10
148.0	88.92	88.05	87.47
148.5	87.29	86.61	86.15
149.0	85.99	85.46	85.11
149.5	84.97	84.56	84.31
150.0	84.20	83.90	83.74
150.5	83.67	83.48	83.40
151.0	83.37	83.31	83.32
151.5	83.29	83.35	83.48
152.0	83.46	83.67	83.95
152.5	83.87	84.28	84.69
153.0	84.62	85.22	85.80
153.5	85.72	86.54	87.29
154.0	87.22	88.25	89.21
154.5	89.19	90.45	91.64
155.0	91.74	93.28	94.69

Typical Performance Curves

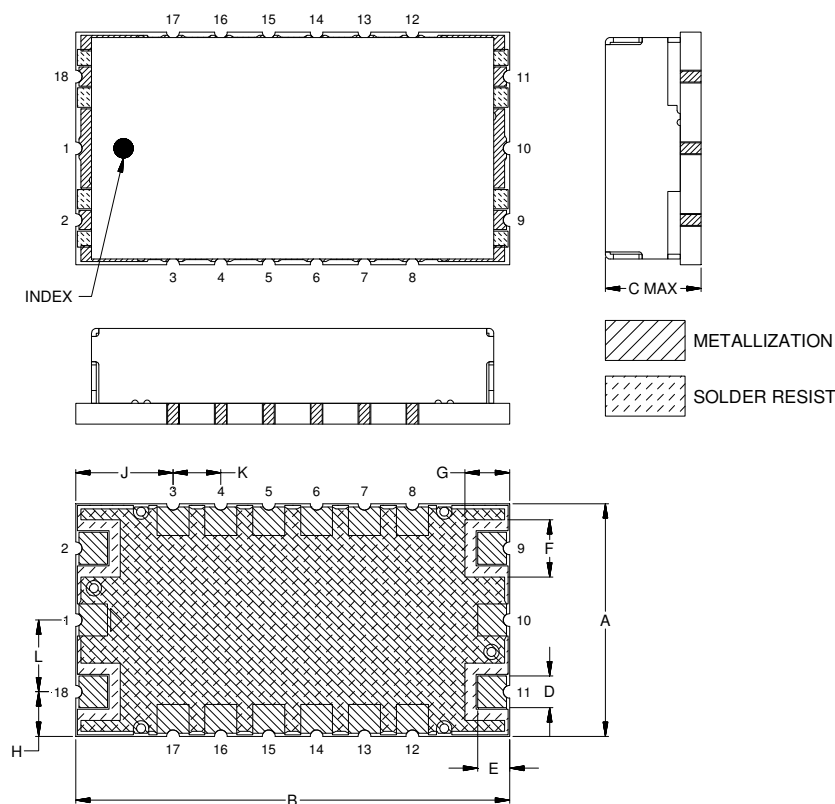


Typical Performance Curves

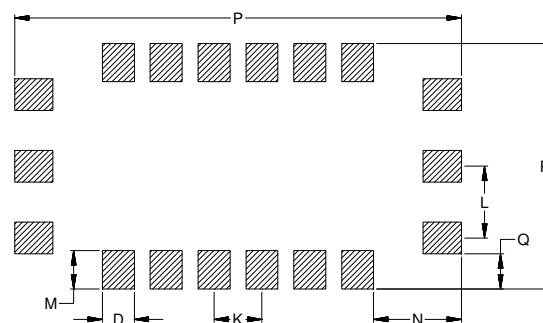


Outline Dimensions

HP1156



PCB Land Pattern



Suggested Layout,
Tolweance to be within $\pm .002$

CASE#	A	B	C	D	E	F	G	H	J	K	L	M
HP1156	.730 (18.54)	1.360 (34.54)	.350 (8.89)	.100 (2.54)	.100 (2.54)	.180 (4.57)	.140 (3.56)	.140 (3.56)	.305 (7.75)	.150 (3.81)	.225 (5.72)	.120 (3.05)

CASE#	N	P	Q	R	WT.GRAM
HP1156	.275 (6.99)	1.400 (35.56)	.110 (2.79)	.770 (19.56)	6.0

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

Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:
For RoHS Case Styles: 3-5 μ inch (.08-.13microns) Gold over 120-240 μ inch (3.05-6.10microns) Nickel plate.
For RoHS-5 Case Styles: Tin-Lead plate.

Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED

ALL NEW
minicircuits.com

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

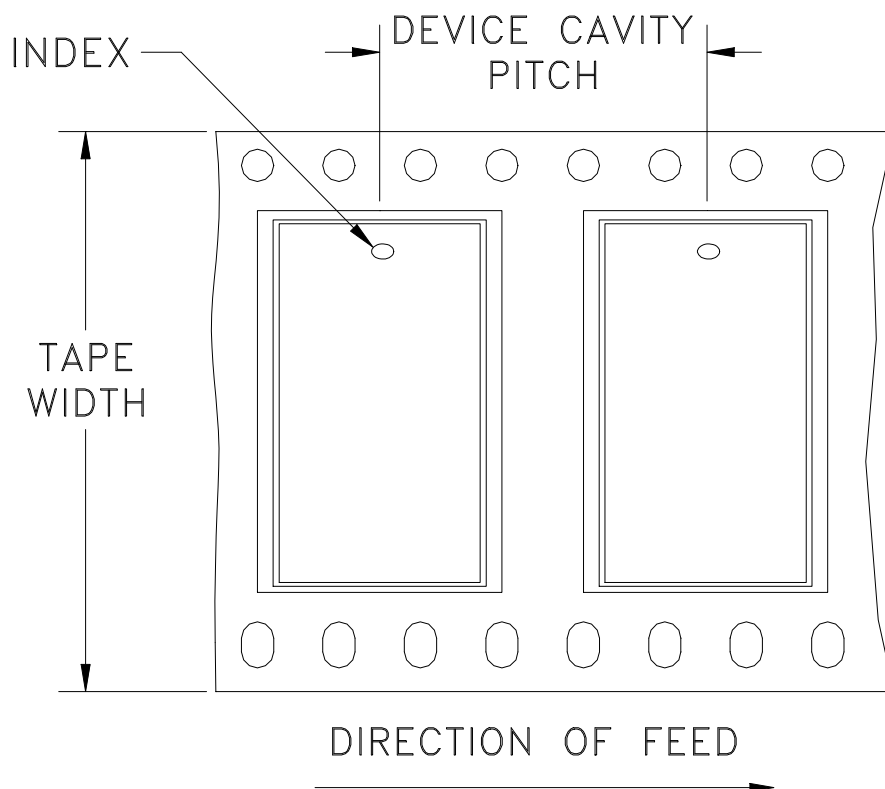


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F89

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
56	32	13	100

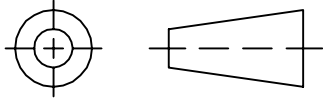
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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



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

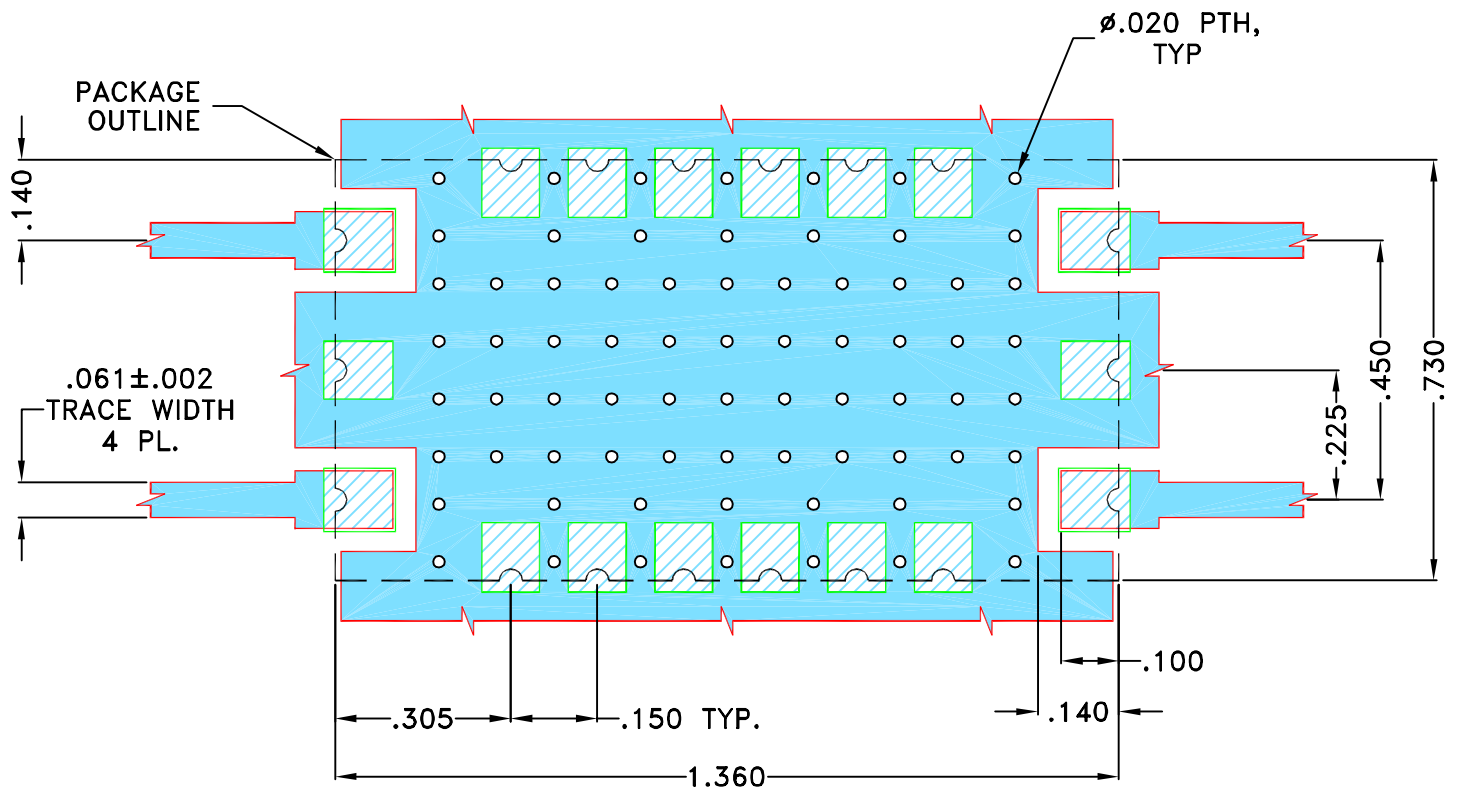
THIRD ANGLE PROJECTION



REVISIONS

REV OR	ECN No.	DESCRIPTION	DATE	DR	AUTH
	M145648	NEW RELEASE	MAR 14	DDR	MD

**SUGGESTED MOUNTING CONFIGURATION FOR
HP1156 CASE STYLE "18FL01" PIN CODE**



NOTES:

- TRACE WIDTH IS SHOWN FOR OAK-602, WITH DIELECTRIC THICKNESS $.022 \pm .0015$ ". 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:
2 PL DECIMALS $\pm$
3 PL DECIMALS $\pm$.005"
ANGLES $\pm$
FRACTIONS $\pm$

DRAWN

DDR

14 MAR 14

CHECKED

MD

14 MAR 14

APPROVED

MD

14 MAR 14

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



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

**PL, 18FL01, HP1156, BPF
TB-695+, 50 Ohm**

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-418

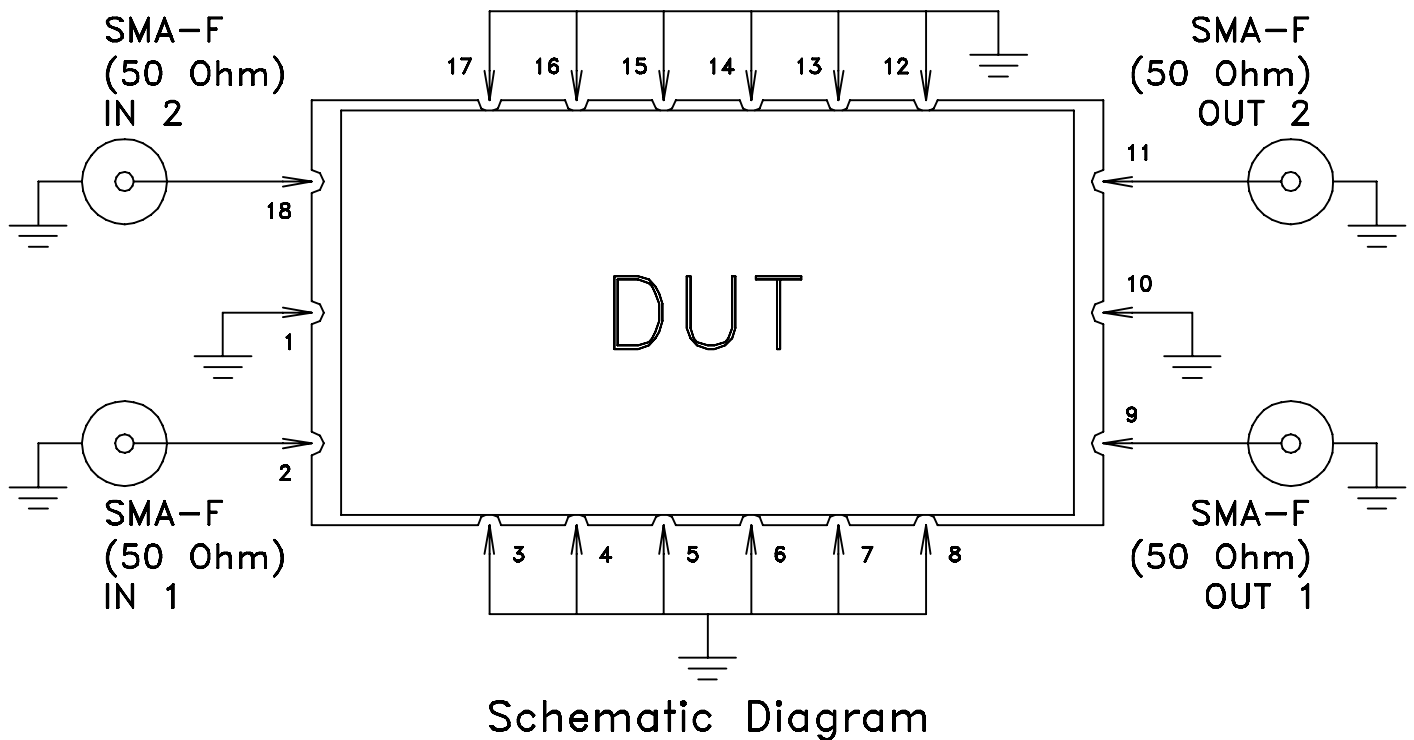
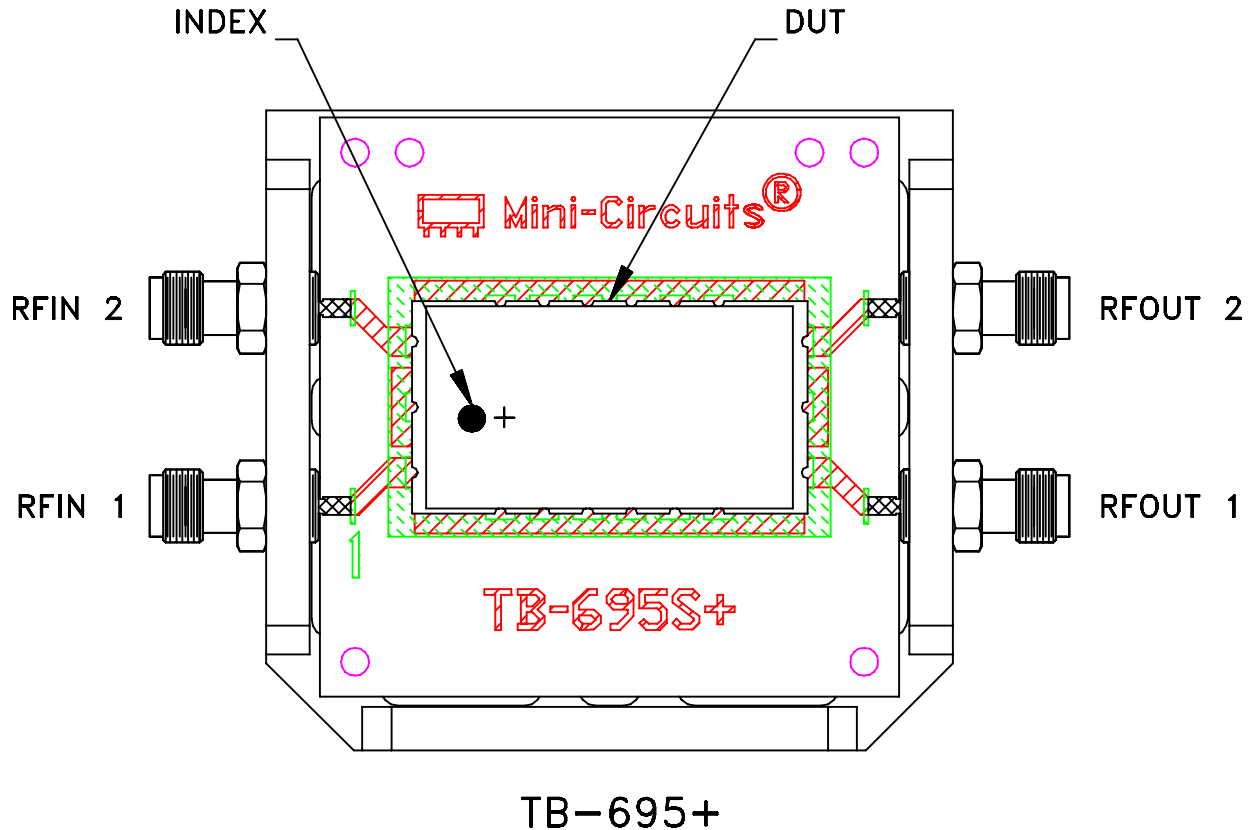
REV:
OR

FILE: 98PL418

SCALE: 3:1

SHEET: 1 OF 1

Evaluation Board and Circuit



Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: OAK-602 OR Equivalent
Dielectric Constant= $2.50 \pm .04$, Thickness=.022 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	-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