Surface Mount

Bandpass Filter

BPF-F184+

50Ω 154.32 to 214.32 MHz

Generic photo used for illustration purposes only
CASE STYLE: HP1156

The Big Deal

- Broad bandwidth
- High Rejection
- Good VSWR
- Miniature shielded package

Product Overview

BPF-F184+ is a 50Ω bandpass filter in a shielded package fabricated using SMT technology. This bandpass filter covers from 154.32 to 214.32 MHz. This is broad filter and finds extensive application in television networks.

Key Features

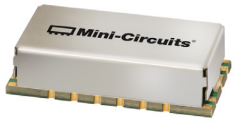
Feature	Advantages
Low insertion loss	Broad bandwidth and it can be used in television networks.
Good rejection	This enables the filter attenuate spurious signals and reject harmonics for broad frequency band
Shielded package	The small surface mount package enables the BPF-F184+ to used in compact design

Surface Mount

Bandpass Filter

BPF-F184+

50Ω 154.32 to 214.32 MHz



Generic photo used for illustration purposes only

CASE STYLE: HP1156

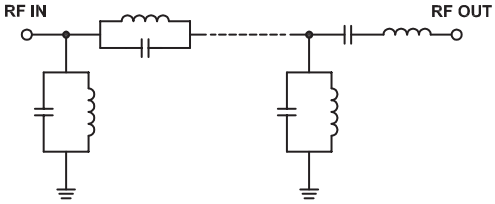
Features

- Broad bandwidth
- High rejection
- Miniature shielded package

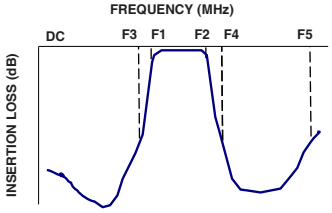
Applications

- Digital television networks
- Biomedical telemetry devise
- Wireless microphone
- Test and measurement

Functional Schematic



Typical Frequency Response



+RoHS Compliant

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

Electrical Specifications at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	—	184	—	MHz
	Insertion Loss	F1-F2	154.32- 214.32	—	1.90	3.00	dB
	VSWR	F1-F2	154.32 - 214.32	—	1.43	1.92	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 139	20	30	—	dB
	VSWR	DC-F3	DC - 139	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	242 - 2800	20	27	—	dB
	VSWR	F4-F5	242 - 2800	—	20	—	:1

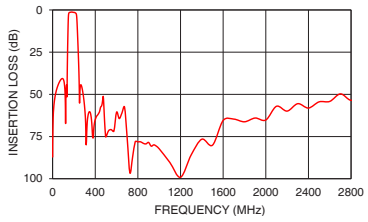
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	2 W

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

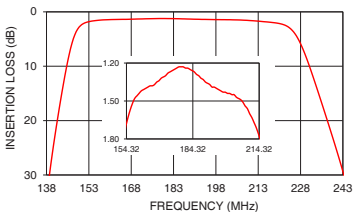
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1.00	77.68	1737.18	154.32	30.64
50.00	44.73	289.53	155.00	28.90
100.00	41.04	144.77	156.00	26.81
139.00	30.13	32.18	158.00	23.67
140.00	26.26	28.49	160.00	21.41
141.00	22.71	24.48	164.00	18.31
142.00	19.38	20.45	168.00	16.42
145.00	10.40	8.81	173.00	15.12
149.00	3.20	2.02	178.00	14.40
154.32	1.68	1.08	184.00	13.82
184.00	1.26	1.15	188.00	13.57
214.32	1.78	1.28	193.00	13.52
225.00	3.38	2.45	198.00	13.88
233.00	12.82	15.53	202.00	14.50
238.00	20.82	29.96	205.00	15.13
242.00	27.56	40.41	208.00	15.87
244.00	31.21	45.72	210.00	16.44
500.00	75.22	115.81	212.00	17.13
1800.00	66.26	82.73	214.00	17.99
2800.00	53.53	29.46	214.32	18.17

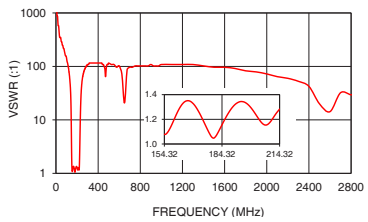
BPF-F184+
INSERTION LOSS (Full band)



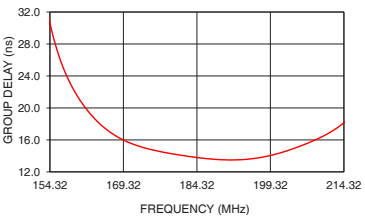
BPF-F184+
INSERTION LOSS (Pass band)



BPF-F184+
VSWR



BPF-F184+
GROUP DELAY



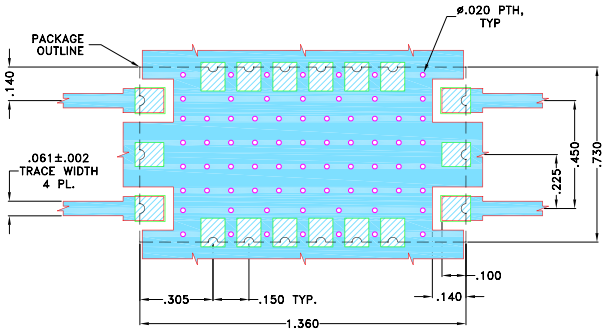
Notes

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

Pad Connections

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

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

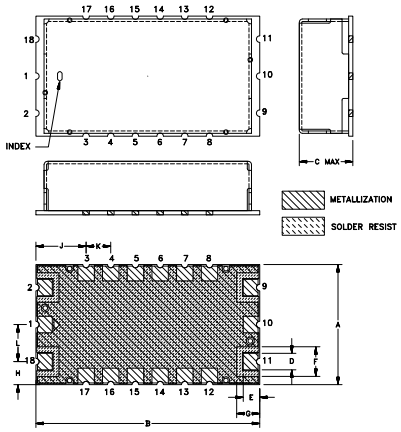


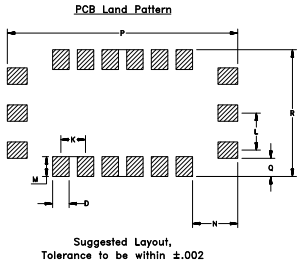
NOTES:
1. TRACE WIDTH IS SHOWN FOR OAK-602, WITH DIELECTRIC THICKNESS .022"±.0015". COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Outline Drawing





Outline Dimensions (inch / 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

Band Pass Filter BPF-F184+

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
0.30	88.82	87.12	86.58	0.01	0.01	0.01	0.31	0.39	0.44
1.00	77.23	77.68	77.44	0.00	0.00	0.01	0.31	0.39	0.45
15.00	54.97	54.93	54.97	0.02	0.02	0.03	0.51	0.60	0.66
60.00	43.09	43.19	43.23	0.06	0.07	0.08	0.80	0.91	0.97
122.00	69.46	67.28	66.13	0.19	0.21	0.24	0.61	0.70	0.75
135.00	52.17	51.47	50.88	0.33	0.38	0.42	0.68	0.80	0.86
139.00	30.87	30.13	29.68	0.46	0.54	0.59	0.89	1.05	1.14
141.00	23.29	22.71	22.34	0.60	0.71	0.78	1.14	1.34	1.47
142.00	19.91	19.38	19.03	0.72	0.85	0.93	1.34	1.59	1.73
144.00	13.63	13.21	12.92	1.19	1.42	1.56	2.11	2.49	2.72
147.00	5.92	5.81	5.71	3.80	4.39	4.77	5.91	6.78	7.36
149.00	3.10	3.20	3.23	8.48	9.45	10.09	13.14	14.76	15.88
151.00	2.00	2.18	2.27	15.56	17.22	18.32	28.57	37.44	38.84
153.00	1.62	1.81	1.90	22.97	26.01	27.78	22.45	22.84	22.94
154.32	1.49	1.68	1.77	26.78	28.47	28.15	21.98	22.56	23.00
158.00	1.30	1.48	1.58	25.16	23.11	21.84	33.56	35.71	39.96
166.00	1.23	1.38	1.46	16.33	16.54	16.56	16.93	17.12	17.17
171.00	1.17	1.31	1.39	17.29	17.87	18.19	16.20	16.51	16.70
173.00	1.14	1.28	1.36	18.71	19.45	19.89	16.84	17.20	17.45
176.00	1.10	1.25	1.33	22.52	23.58	24.16	18.80	19.26	19.64
182.00	1.08	1.24	1.33	32.27	27.71	25.72	27.94	29.77	31.76
184.00	1.10	1.26	1.35	25.20	23.35	22.28	29.73	31.65	33.49
186.00	1.12	1.29	1.38	21.66	20.61	19.95	26.47	27.01	27.36
187.00	1.13	1.30	1.39	20.45	19.61	19.08	24.70	24.98	25.18
196.00	1.24	1.41	1.51	17.00	16.77	16.78	18.04	17.90	18.04
201.00	1.26	1.44	1.54	19.08	18.78	18.96	18.58	18.20	18.33
207.00	1.31	1.51	1.62	24.48	22.95	22.74	22.83	21.77	21.72
211.00	1.42	1.63	1.75	21.21	20.34	19.94	25.69	24.92	24.55
214.00	1.53	1.76	1.89	18.75	18.39	18.20	24.73	25.35	25.21
214.32	1.49	1.49	1.49	18.68	18.68	18.68	24.42	24.42	24.42
216.00	1.62	1.85	1.99	18.34	18.21	18.19	24.57	25.88	26.10
220.00	1.82	2.10	2.26	22.86	22.62	22.95	36.82	41.32	35.59
223.00	2.22	2.58	2.81	17.25	15.99	15.21	19.16	18.32	17.54
224.00	2.50	2.91	3.17	13.44	12.56	11.94	15.37	14.91	14.38
226.00	3.49	4.01	4.36	7.99	7.54	7.19	10.06	10.03	9.81
228.00	5.23	5.86	6.29	4.62	4.42	4.25	6.75	6.95	6.93
229.00	6.37	7.04	7.50	3.51	3.39	3.29	5.64	5.92	5.96
233.00	12.10	12.82	13.32	1.32	1.35	1.36	3.40	3.79	3.96
237.00	18.48	19.20	19.69	0.68	0.73	0.76	2.68	3.05	3.24
238.00	20.11	20.82	21.32	0.60	0.65	0.68	2.58	2.94	3.13
240.00	23.41	24.13	24.64	0.49	0.54	0.57	2.43	2.77	2.96
242.00	26.82	27.56	28.08	0.42	0.46	0.50	2.32	2.64	2.83
274.00	45.24	45.65	45.90	0.17	0.20	0.23	1.72	1.94	2.07
350.00	59.83	60.44	60.79	0.12	0.15	0.18	5.76	7.30	8.36
375.00	74.07	75.05	76.50	0.12	0.15	0.17	7.07	7.02	6.84
470.00	53.46	53.20	52.98	0.16	0.20	0.24	0.93	1.07	1.14
495.00	72.51	73.15	73.60	0.13	0.16	0.19	0.82	0.94	1.01
625.00	64.32	64.36	64.30	0.14	0.17	0.20	0.52	0.61	0.66
725.00	102.06	96.54	95.70	0.14	0.18	0.20	0.41	0.50	0.54
775.00	77.57	78.09	77.54	0.13	0.17	0.19	0.36	0.45	0.50
1050.00	86.42	89.34	89.12	0.12	0.16	0.18	0.25	0.35	0.38
1200.00	93.38	99.13	93.79	0.11	0.16	0.18	0.23	0.33	0.36
1400.00	76.75	76.57	76.63	0.10	0.16	0.19	0.23	0.32	0.36
1500.00	79.87	80.11	79.78	0.09	0.17	0.19	0.23	0.32	0.36
1850.00	66.52	66.70	67.18	0.10	0.20	0.23	0.25	0.34	0.37
2100.00	59.17	57.07	55.70	0.12	0.24	0.28	0.26	0.36	0.38
2225.00	58.03	58.40	58.22	0.14	0.26	0.31	0.27	0.36	0.39
2350.00	60.01	59.66	58.70	0.18	0.31	0.35	0.26	0.36	0.40
2550.00	53.03	52.30	51.90	0.38	0.53	0.58	0.31	0.43	0.45
2800.00	53.75	53.53	52.29	0.39	0.54	0.59	0.29	0.42	0.45

Band Pass Filter BPF-F184+

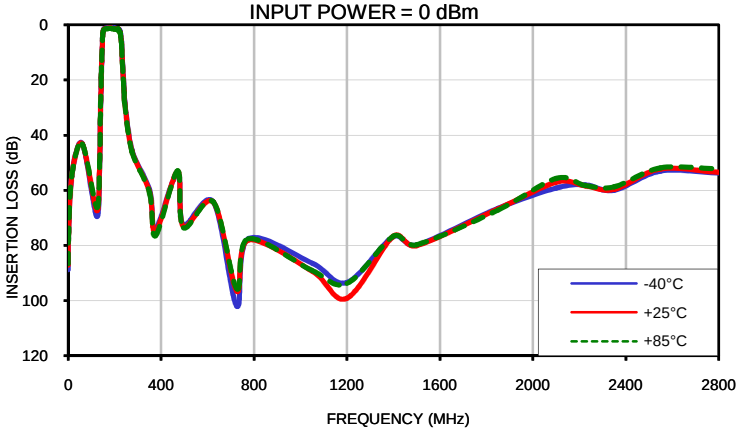
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
154.32	31.32	30.64	30.22
155.00	29.48	28.90	28.54
156.00	27.28	26.81	26.51
157.00	25.49	25.09	24.85
158.00	24.01	23.67	23.46
159.00	22.75	22.46	22.28
160.00	21.67	21.41	21.25
161.00	20.71	20.49	20.35
162.00	19.87	19.68	19.56
163.00	19.11	18.96	18.86
164.00	18.44	18.31	18.23
165.00	17.85	17.74	17.68
166.00	17.33	17.25	17.19
167.00	16.87	16.81	16.77
168.00	16.47	16.42	16.39
169.00	16.12	16.09	16.07
170.00	15.81	15.79	15.78
171.00	15.55	15.54	15.54
172.00	15.33	15.32	15.33
173.00	15.12	15.12	15.13
174.00	14.95	14.94	14.95
175.00	14.79	14.79	14.80
176.00	14.66	14.65	14.65
177.00	14.53	14.52	14.53
178.00	14.41	14.40	14.41
179.00	14.30	14.29	14.29
180.00	14.20	14.19	14.19
181.00	14.10	14.09	14.09
182.00	14.01	14.00	14.00
183.00	13.92	13.91	13.91
184.00	13.84	13.82	13.82
186.00	13.69	13.68	13.68
187.00	13.63	13.62	13.62
188.00	13.57	13.57	13.58
189.00	13.53	13.53	13.54
190.00	13.51	13.51	13.52
191.00	13.48	13.49	13.51
193.00	13.49	13.52	13.54
194.00	13.53	13.55	13.58
195.00	13.57	13.61	13.65
196.00	13.64	13.68	13.72
197.00	13.72	13.77	13.82
198.00	13.83	13.88	13.94
199.00	13.95	14.01	14.07
200.00	14.10	14.16	14.22
201.00	14.25	14.32	14.39
202.00	14.43	14.50	14.57
203.00	14.62	14.69	14.78
204.00	14.83	14.91	14.98
205.00	15.05	15.13	15.21
206.00	15.28	15.37	15.45
207.00	15.52	15.61	15.70
208.00	15.78	15.87	15.95
209.00	16.05	16.15	16.25
210.00	16.34	16.44	16.54
211.00	16.65	16.77	16.87
212.00	17.00	17.13	17.24
213.00	17.38	17.53	17.66
214.00	17.83	17.99	18.13
214.32	17.97	17.97	17.97

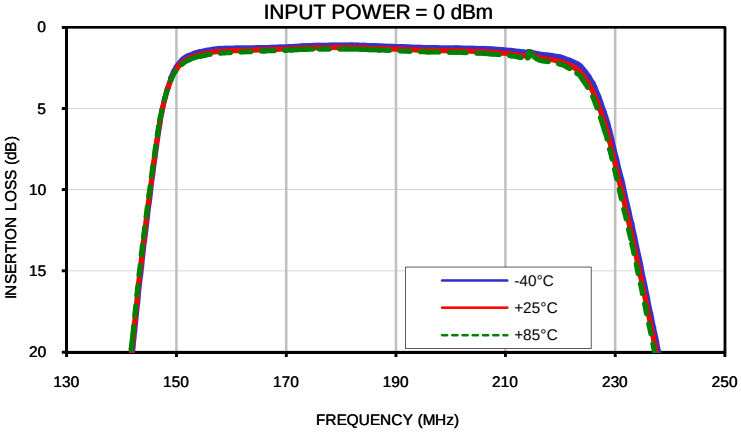
Band Pass Filter BPF-F184+

Typical Performance Curves

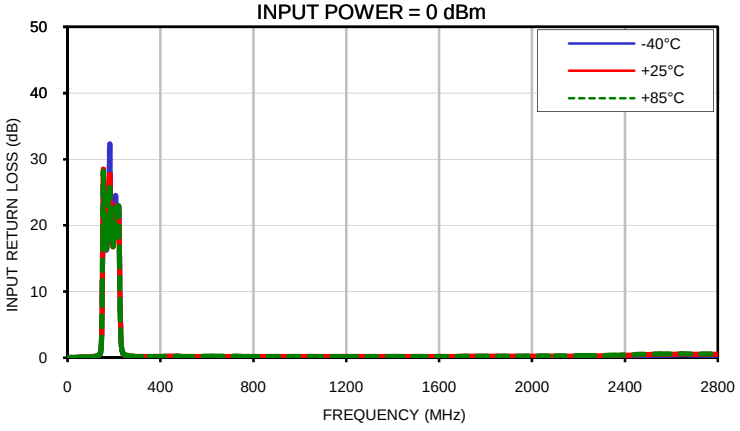
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



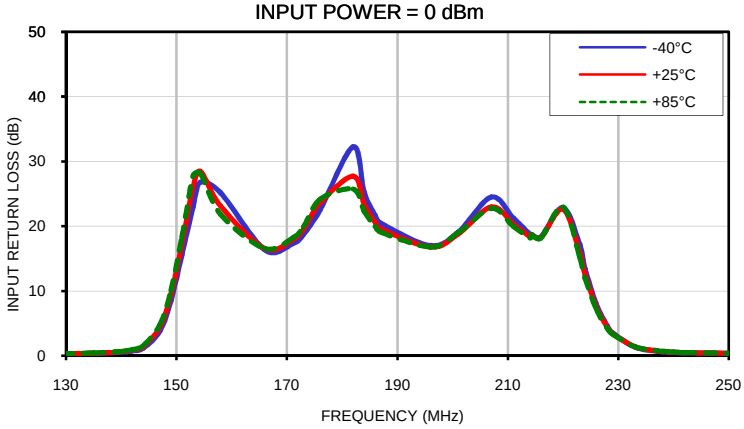
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



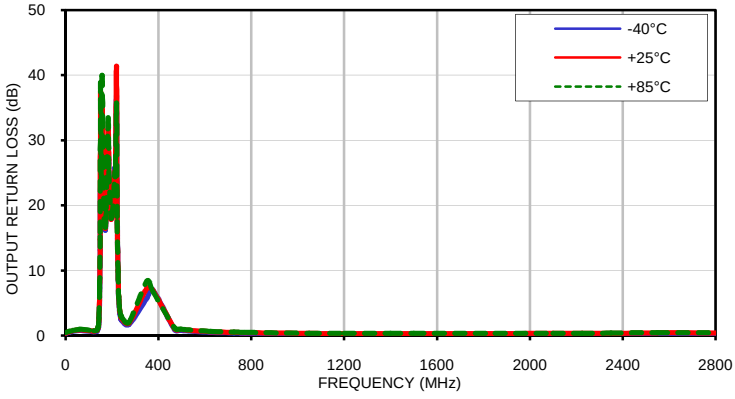
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



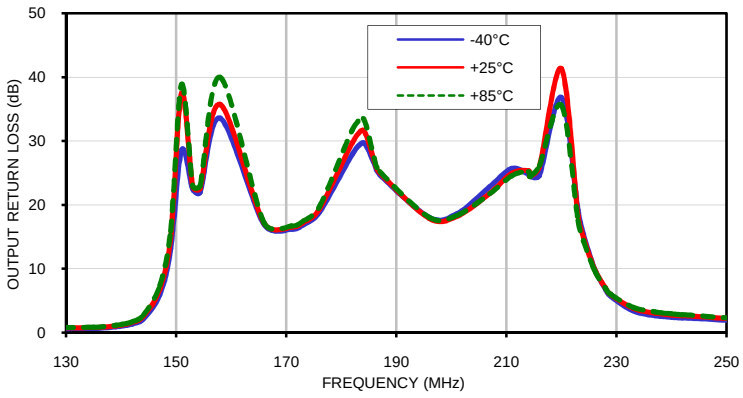
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



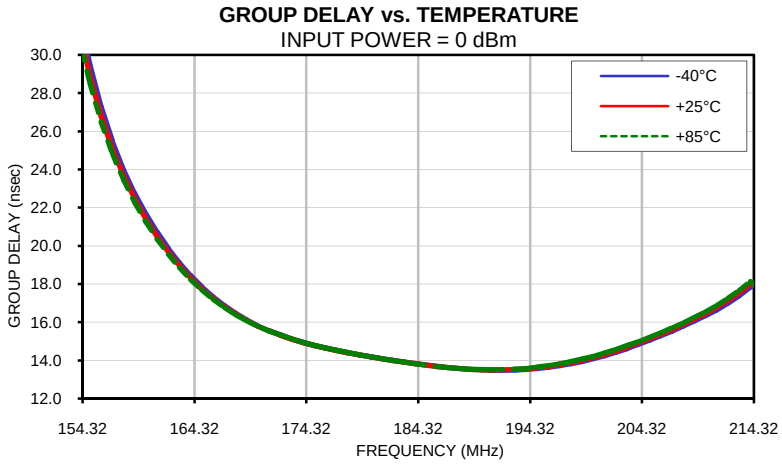
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

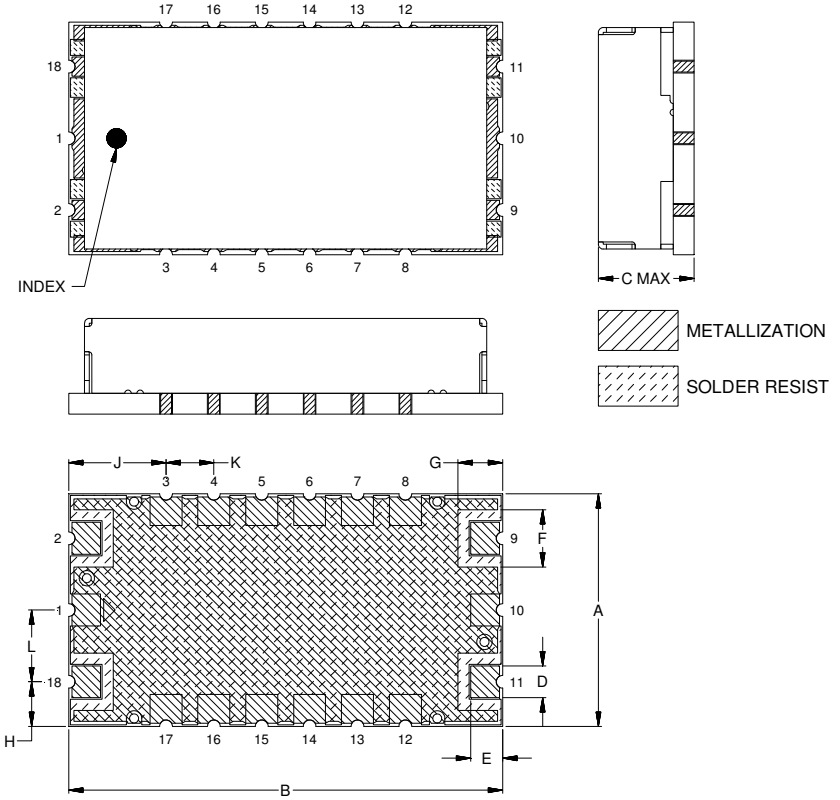


Typical Performance Curves

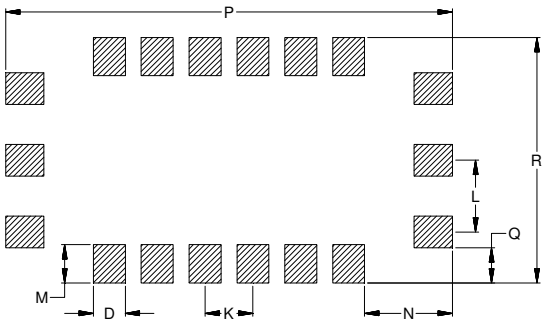


Case Style HP

Outline Dimensions HP1156



PCB Land Pattern



Suggested Layout,
Tolweance to be within ±.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

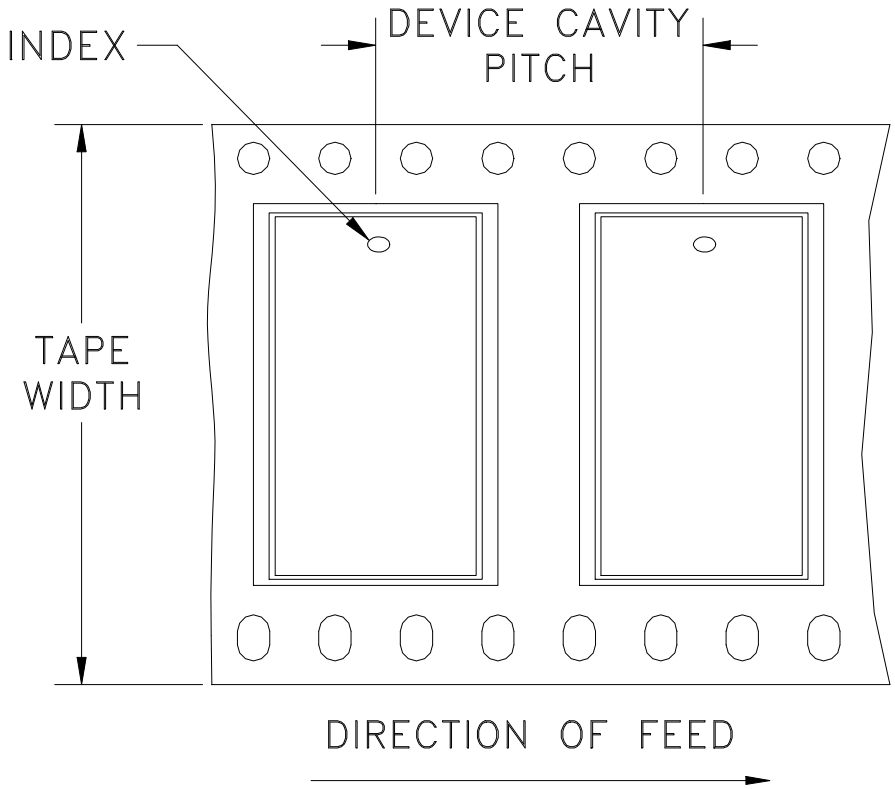
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

Notes:

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

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

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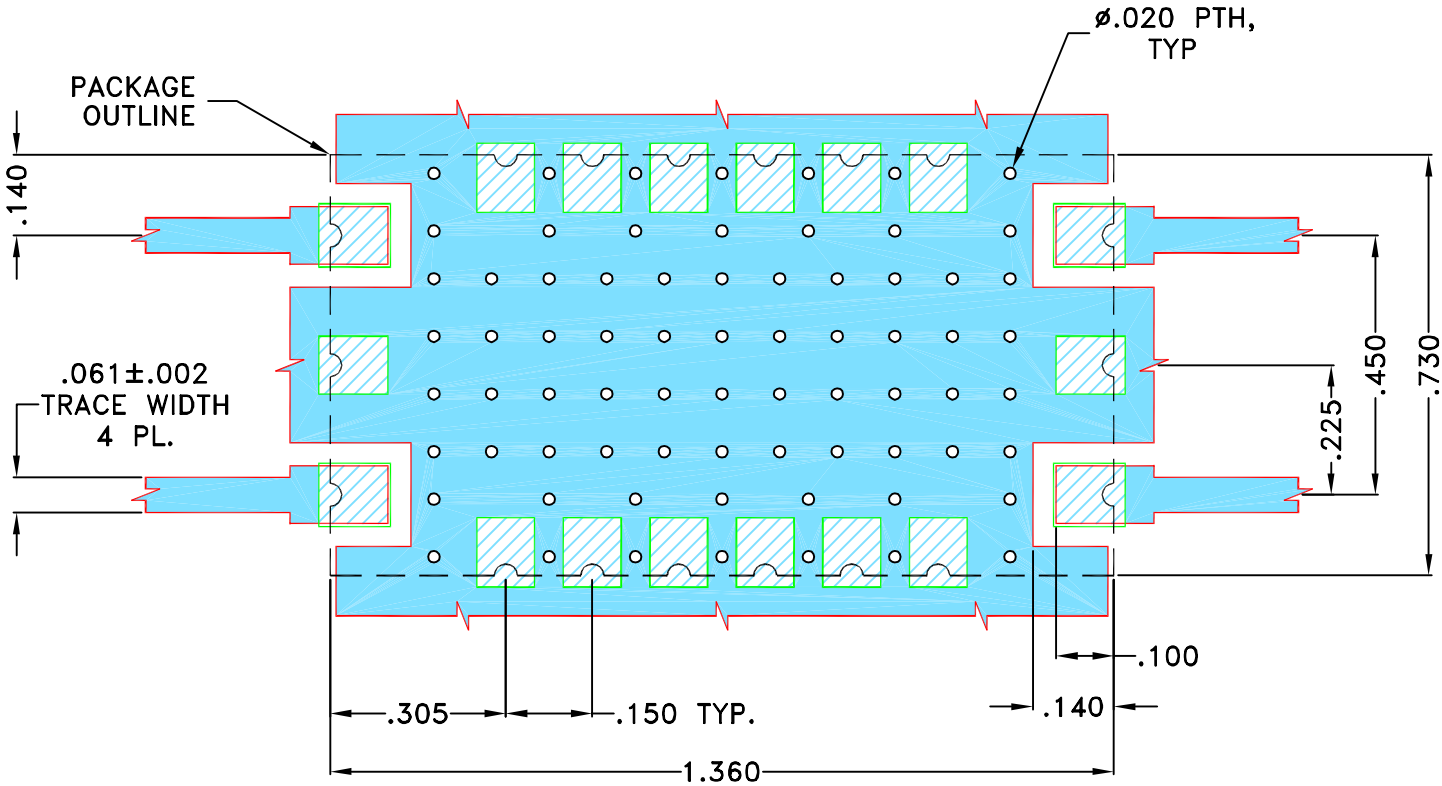
THIRD ANGLE PROJECTION

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

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



NOTES:

1. TRACE WIDTH IS SHOWN FOR OAK-602, WITH DIELECTRIC THICKNESS .022"±.0015". 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DDR	14 MAR 14
TOLERANCES ON:	CHECKED	MD	14 MAR 14
2 PL DECIMALS ±	APPROVED	MD	14 MAR 14
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

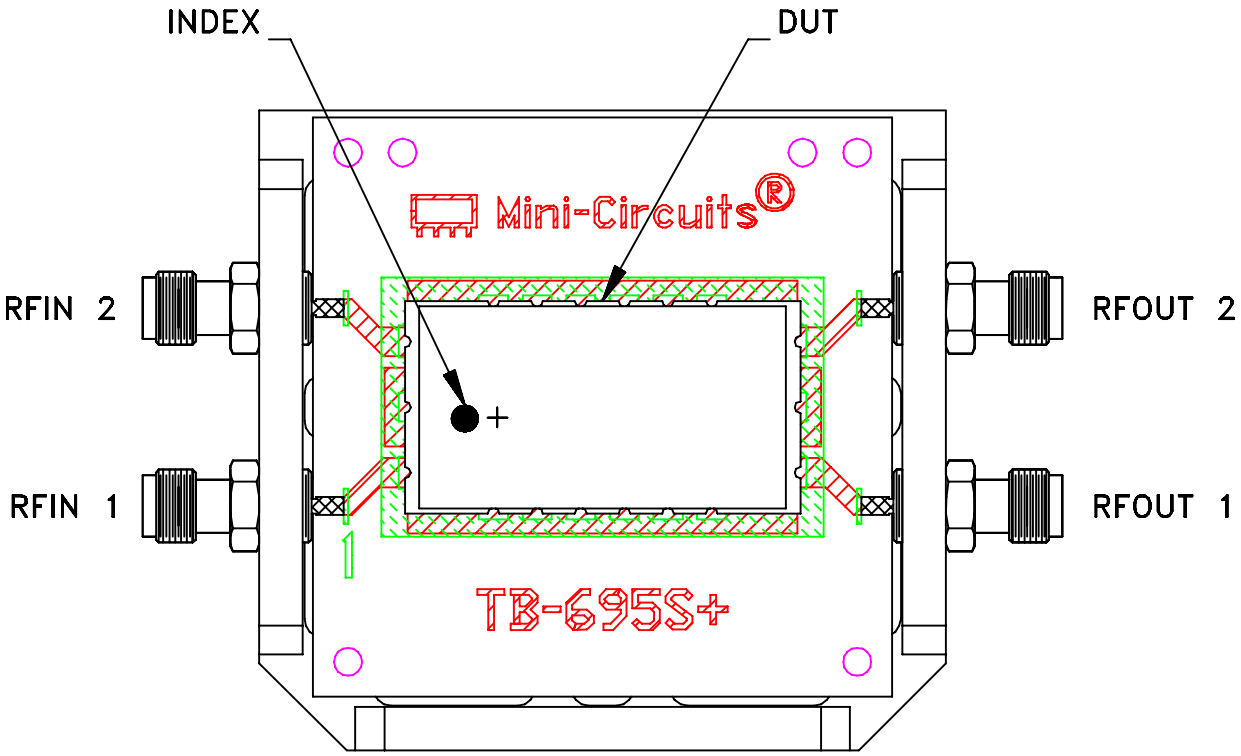
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

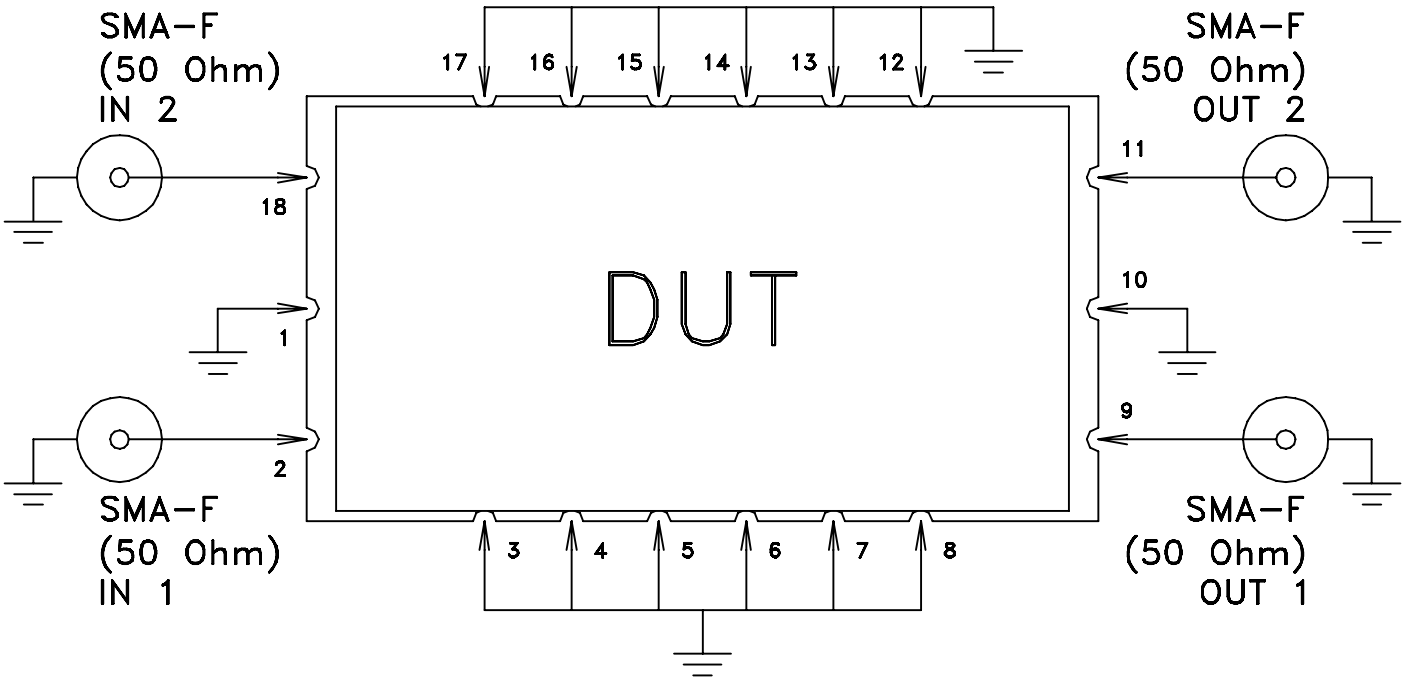
PL, 18FL01, HP1156, BPF TB-695+, 50 Ohm

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-418	OR
FILE: 98PL418	SCALE: 3:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-695+



Schematic Diagram

Notes:

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

Mini-Circuits®

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Environmental Specifications ENV12

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