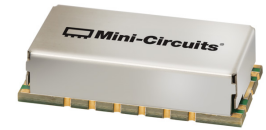


# Surface Mount Bandpass Filter

## BPF-F100+

50Ω 95 to 105 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-F100+ is a 50Ω bandpass filter in a shielded package fabricated using SMT technology. This bandpass filter covers from 95 to 105 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-F100+ to used in compact design

#### Notes

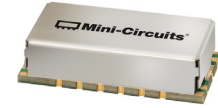
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C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. 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](http://www.minicircuits.com/MCLStore/terms.jsp)



# Surface Mount Bandpass Filter

## BPF-F100+

50Ω 95 to 105 MHz



Generic photo used for illustration purposes only  
CASE STYLE: HP1156

### Features

- Narrow bandwidth
- Sharper cut-off
- Shielded package

### Applications

- Radio test equipment
- Receiver \ Transmitter
- Harmonic rejection

### Electrical Specifications at 25°C

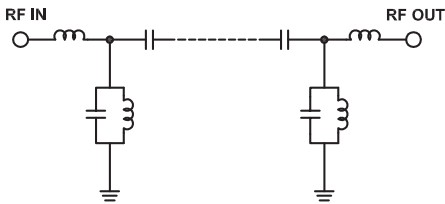
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	100	—	MHz
	Insertion Loss	F1-F2	95-105	5	6	dB
	VSWR	F1-F2	95-105	—	1.58	1.92
Stop Band, Lower	Insertion Loss	DC-F3	DC-85	40	45	dB
	VSWR	DC-F3	DC-85	—	20	—
Stop Band, Upper	Insertion Loss	F4-F5	120-900	40	44	dB
	VSWR	F4-F5	120-900	—	20	—

### Maximum Ratings

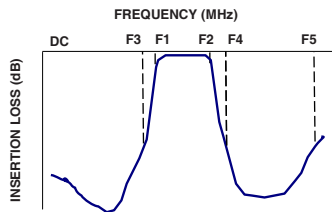
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	1 W

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

### Functional Schematic



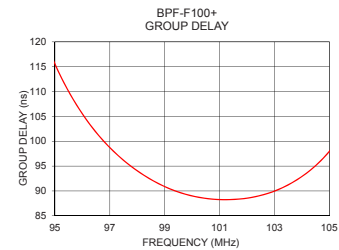
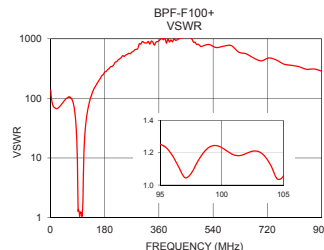
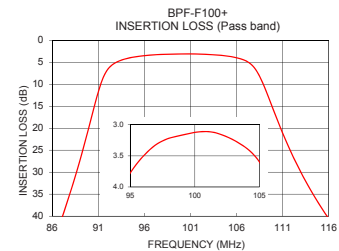
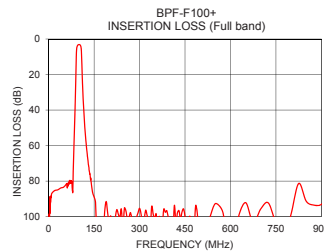
### Typical Frequency Response



### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1.0	104.96	138.75	95.0	115.55
50.0	83.35	96.51	95.5	110.00
85.0	52.26	35.19	96.0	105.51
88.5	30.98	14.40	96.5	101.78
89.5	23.60	9.11	97.0	98.71
90.0	19.64	6.69	97.5	96.16
92.0	6.69	1.26	98.0	94.05
95.0	3.78	1.25	98.5	92.29
100.0	3.12	1.23	99.0	90.87
105.0	3.60	1.06	99.5	89.78
108.0	6.46	1.98	100.0	88.99
110.5	18.56	9.15	100.5	88.50
111.0	21.13	11.14	101.0	88.26
112.0	25.88	15.20	101.5	88.29
113.0	30.12	19.30	102.0	88.54
116.0	40.59	31.70	102.5	89.10
120.0	51.10	48.50	103.0	89.96
300.0	95.33	817.79	103.5	91.23
500.0	103.03	744.47	104.0	92.91
900.0	93.09	286.61	105.0	97.97

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



#### Notes

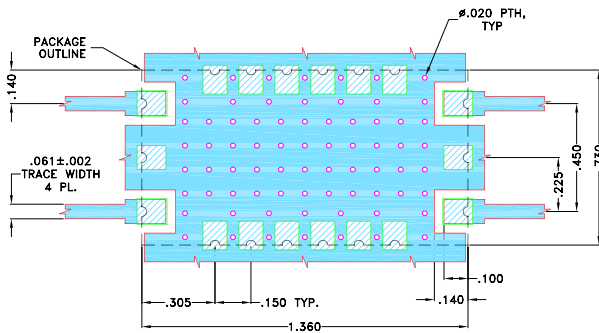
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## Pad Connections

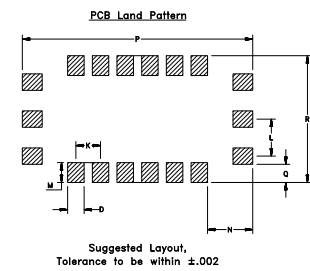
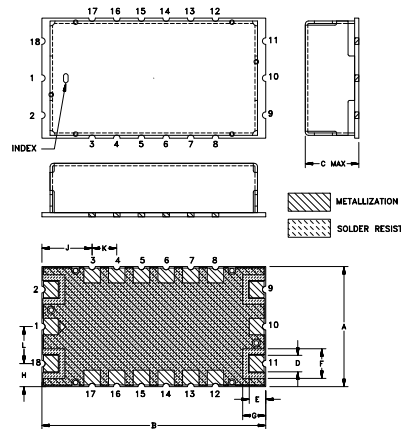
INPUT	18
OUTPUT	9
GROUND	1,3,4,5,6,7,8,10,12,13,14,15,16,17
NO CONNECTION	2,11

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



- NOTES:**
- 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.
  - 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*

### Notes

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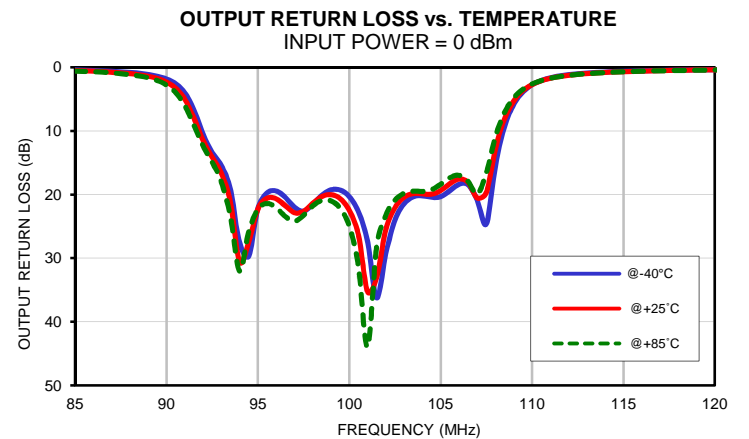
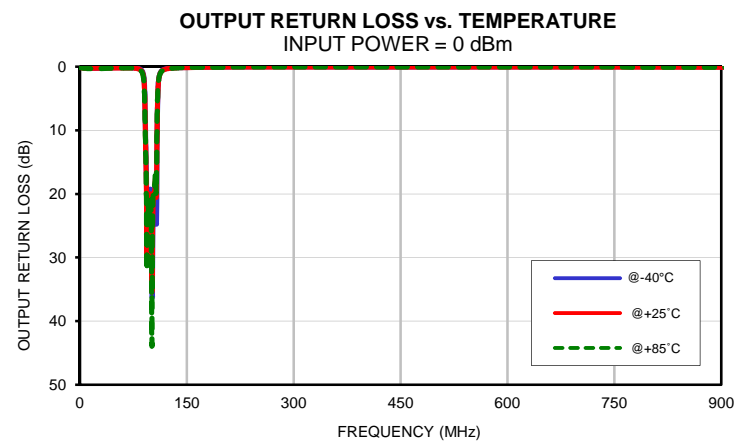
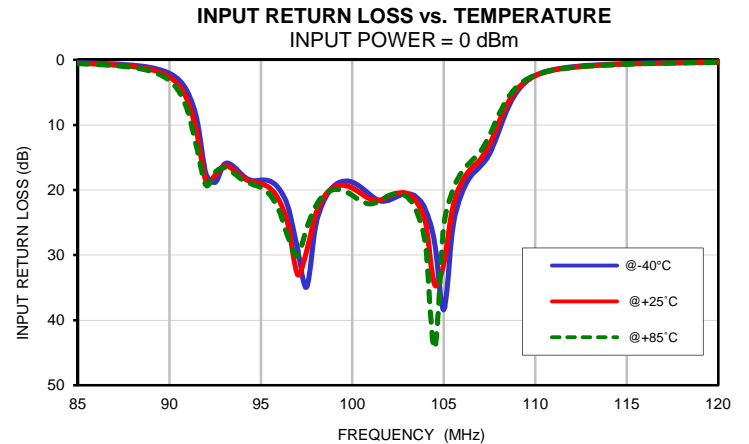
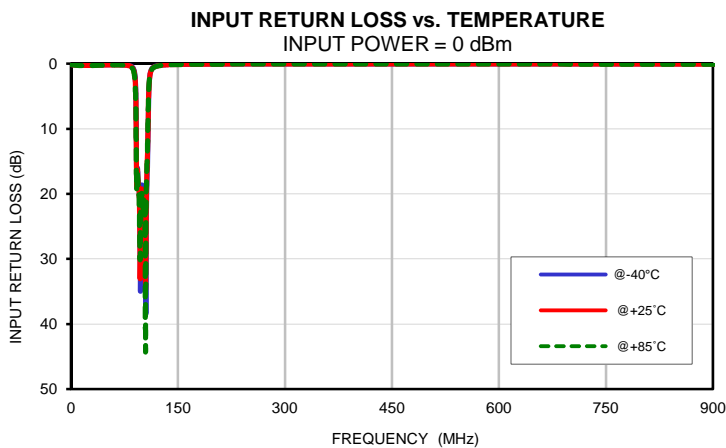
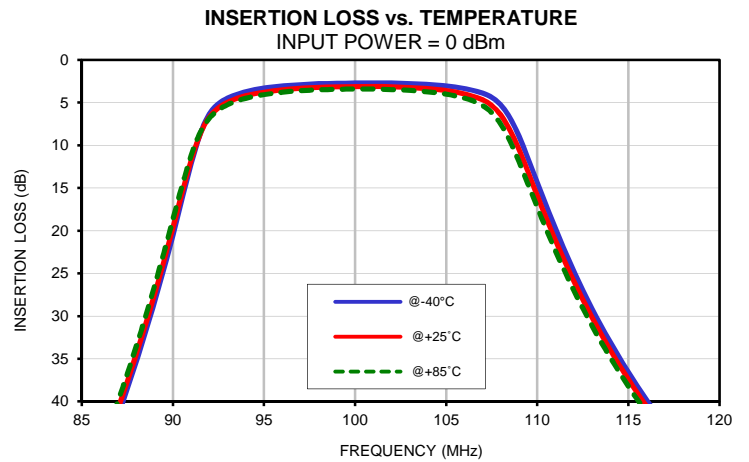
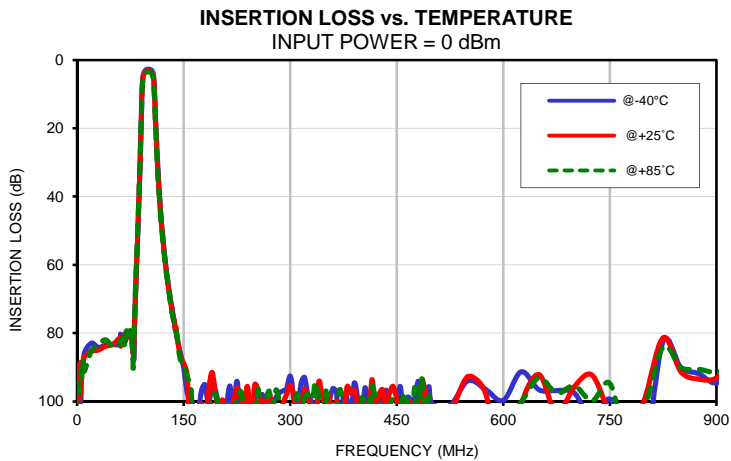
Typical Performance Data

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
1.0	97.69	104.96	103.56	0.11	0.13	0.13	0.11	0.12	0.13
10.0	85.94	87.07	91.22	0.21	0.24	0.26	0.21	0.24	0.26
20.0	82.96	85.34	85.22	0.23	0.26	0.28	0.23	0.25	0.28
30.0	84.25	84.94	83.37	0.21	0.24	0.26	0.21	0.24	0.26
40.0	83.47	83.89	81.96	0.19	0.21	0.22	0.18	0.20	0.23
50.0	83.33	83.35	83.88	0.16	0.18	0.19	0.16	0.18	0.20
60.0	83.18	81.37	83.43	0.15	0.16	0.18	0.14	0.16	0.18
70.0	79.89	79.60	79.52	0.15	0.18	0.18	0.15	0.17	0.19
80.0	87.81	85.38	84.15	0.23	0.27	0.30	0.22	0.27	0.30
81.0	77.04	75.45	74.86	0.25	0.30	0.32	0.25	0.29	0.33
82.0	69.66	69.21	68.40	0.27	0.33	0.36	0.27	0.32	0.37
83.0	64.08	63.19	62.52	0.31	0.37	0.41	0.30	0.36	0.42
84.0	58.52	57.73	56.91	0.35	0.42	0.47	0.35	0.42	0.48
85.0	53.04	52.26	51.48	0.41	0.49	0.56	0.40	0.49	0.56
86.0	47.42	46.66	45.82	0.49	0.60	0.68	0.48	0.59	0.68
87.0	41.58	40.76	39.88	0.62	0.76	0.86	0.60	0.74	0.85
88.0	35.24	34.38	33.45	0.82	1.01	1.17	0.78	0.96	1.12
88.5	31.86	30.98	30.01	0.98	1.21	1.41	0.92	1.14	1.33
89.0	28.28	27.39	26.40	1.20	1.49	1.76	1.11	1.38	1.62
90.0	20.49	19.64	18.68	2.06	2.61	3.18	1.81	2.29	2.75
91.0	12.18	11.75	11.20	4.96	6.33	7.85	3.98	4.99	5.98
92.0	6.34	6.69	6.83	17.52	18.67	19.24	10.46	11.48	12.34
93.0	4.47	4.97	5.25	16.03	16.25	16.54	15.44	16.64	17.99
94.0	3.71	4.20	4.50	17.74	18.08	18.44	27.63	30.56	32.02
95.0	3.32	3.78	4.07	18.47	19.00	19.61	22.15	22.25	22.31
98.0	2.79	3.22	3.50	25.44	23.69	22.47	21.54	21.38	21.79
100.0	2.71	3.12	3.41	18.78	19.67	20.80	20.32	22.47	24.98
103.0	2.78	3.24	3.58	20.56	20.55	21.09	21.42	20.43	19.78
105.0	3.05	3.60	4.01	38.38	31.37	25.49	20.31	19.36	18.36
107.0	3.90	4.68	5.34	16.35	15.30	14.11	20.90	20.55	19.90
108.0	5.27	6.46	7.54	10.98	9.69	8.45	15.35	12.74	10.83
109.0	8.95	10.52	11.93	4.89	4.53	4.11	5.78	5.27	4.77
110.0	14.35	15.88	17.26	2.41	2.42	2.33	2.73	2.69	2.59
111.0	19.79	21.13	22.36	1.49	1.56	1.56	1.64	1.70	1.70
111.5	22.32	23.57	24.73	1.24	1.32	1.34	1.35	1.42	1.44
112.0	24.71	25.88	26.96	1.06	1.14	1.16	1.15	1.22	1.25
113.0	29.09	30.12	31.11	0.82	0.90	0.93	0.88	0.95	0.99
113.5	31.11	32.09	33.01	0.74	0.82	0.84	0.79	0.86	0.89
115.0	36.57	37.41	38.21	0.57	0.63	0.66	0.60	0.66	0.69
120.0	50.51	51.10	51.63	0.32	0.36	0.38	0.33	0.37	0.40
130.0	68.17	68.65	68.80	0.17	0.20	0.21	0.17	0.20	0.22
150.0	90.09	88.89	88.74	0.09	0.11	0.11	0.09	0.11	0.12
175.0	96.97	100.70	101.30	0.05	0.07	0.07	0.05	0.07	0.08
200.0	101.95	102.28	103.15	0.03	0.05	0.06	0.03	0.05	0.06
225.0	94.11	96.05	99.08	0.02	0.04	0.04	0.02	0.04	0.05
250.0	99.12	95.19	104.96	0.01	0.03	0.04	0.01	0.03	0.04
300.0	92.59	95.33	103.74	0.00	0.02	0.03	0.01	0.02	0.03
350.0	104.82	101.17	96.97	0.00	0.02	0.02	0.01	0.02	0.03
400.0	107.19	107.34	98.38	0.01	0.02	0.02	0.01	0.02	0.03
450.0	101.02	99.86	104.20	0.01	0.02	0.02	0.01	0.02	0.02
500.0	100.79	103.03	101.25	0.01	0.02	0.03	0.01	0.02	0.03
550.0	93.97	92.68	102.70	0.01	0.02	0.03	0.01	0.03	0.03
600.0	99.70	124.25	105.11	0.01	0.02	0.03	0.01	0.03	0.03
650.0	96.59	92.14	93.10	0.01	0.03	0.05	0.00	0.04	0.04
700.0	97.55	95.64	95.50	0.00	0.04	0.05	0.00	0.05	0.05
750.0	99.32	103.98	94.80	0.00	0.04	0.05	0.00	0.05	0.05
800.0	112.31	98.51	101.11	0.00	0.05	0.07	0.01	0.06	0.06
850.0	90.17	91.38	90.12	0.01	0.06	0.07	0.01	0.07	0.07
875.0	91.90	93.51	90.57	0.01	0.06	0.07	0.01	0.06	0.07
900.0	94.60	93.09	91.46	0.01	0.06	0.08	0.01	0.07	0.07

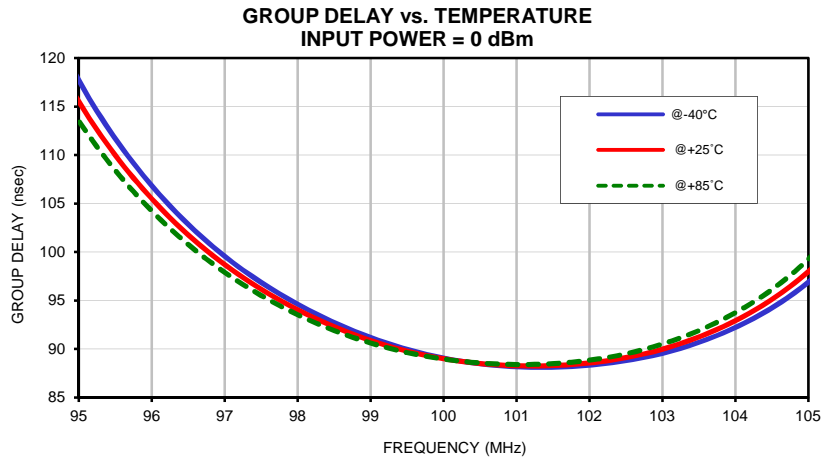
## Typical Performance Data

FREQ.  (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
95.0	117.76	115.55	113.55
95.5	111.72	110.00	108.44
96.0	106.86	105.51	104.25
96.5	102.86	101.78	100.78
97.0	99.57	98.71	97.91
97.5	96.87	96.16	95.52
98.0	94.62	94.05	93.53
98.5	92.73	92.29	91.90
99.0	91.18	90.87	90.61
99.5	89.96	89.78	89.63
100.0	89.04	88.99	88.96
100.5	88.47	88.50	88.55
101.0	88.16	88.26	88.39
101.5	88.13	88.29	88.49
102.0	88.33	88.54	88.83
102.5	88.79	89.10	89.49
103.0	89.55	89.96	90.50
103.5	90.68	91.23	91.89
104.0	92.21	92.91	93.73
104.5	94.23	95.11	96.11
105.0	96.86	97.97	99.25

## Typical Performance Curves

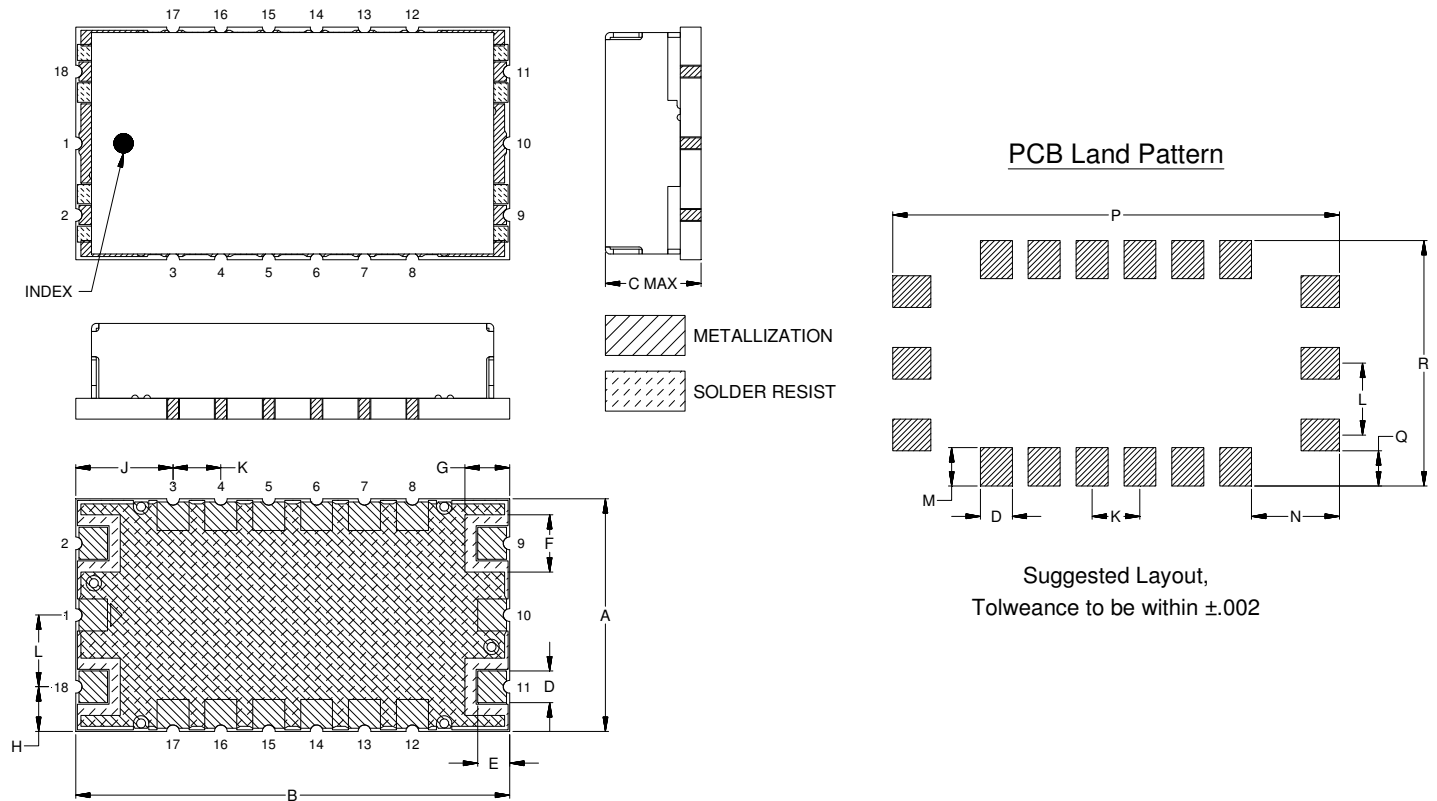


## Typical Performance Curves



## Outline Dimensions

HP1156



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 $\mu$ inch (.08-.13microns) Gold over 120-240 $\mu$ inch (3.05-6.10microns) Nickel plate.
  - For RoHS-5 Case Styles: Tin-Lead plate.

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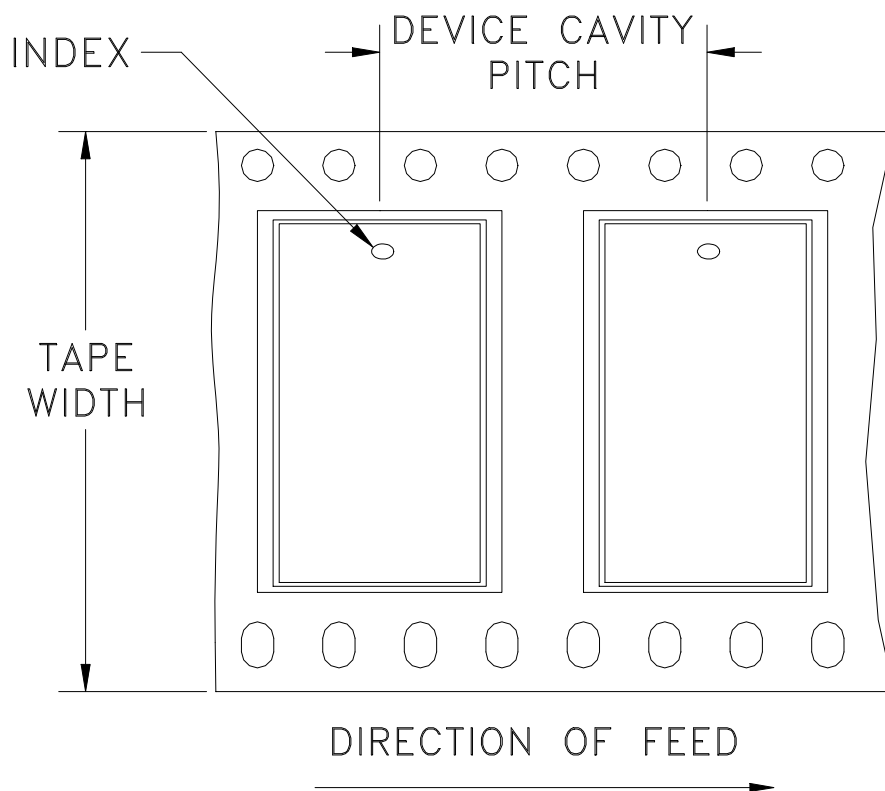
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



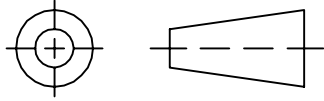
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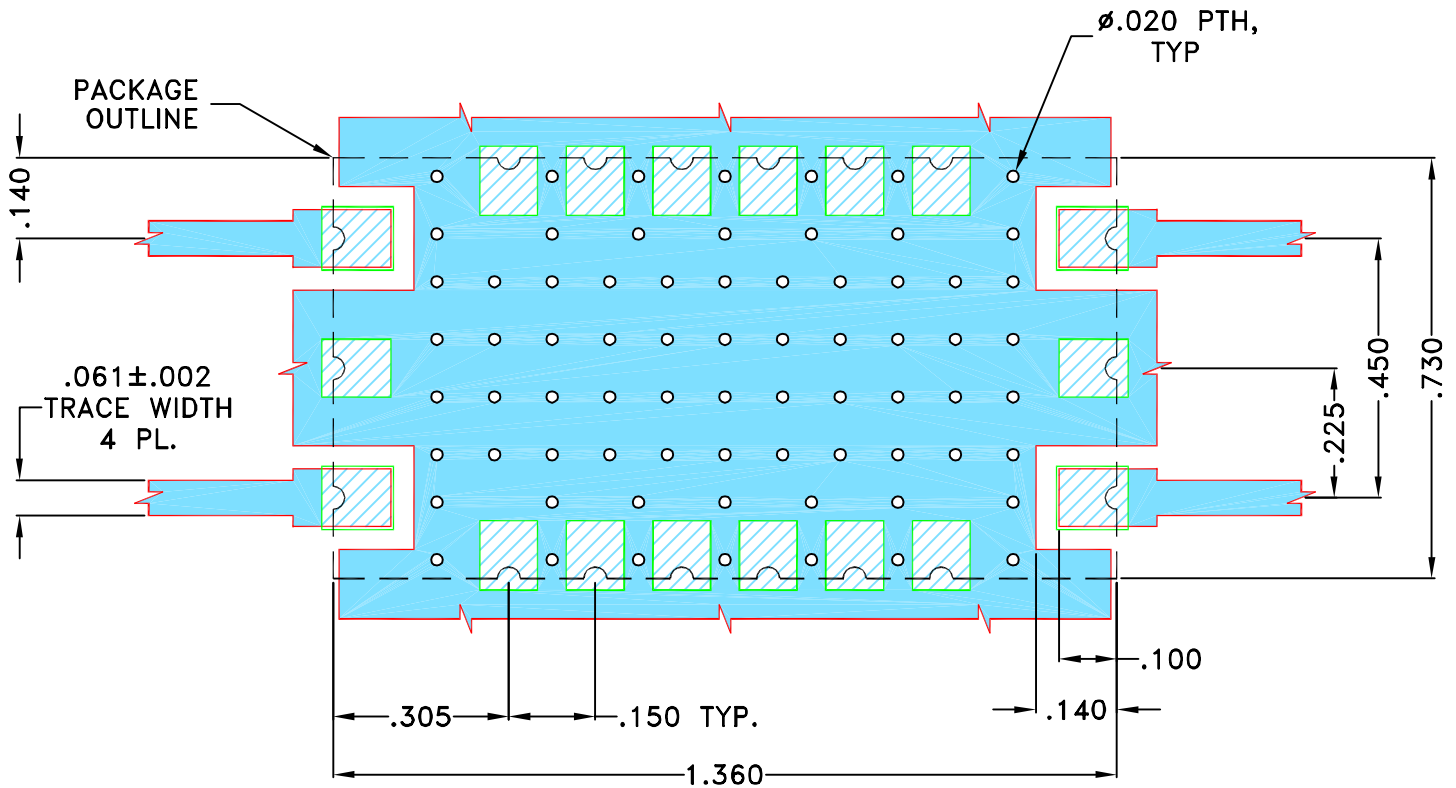
THIRD ANGLE PROJECTION



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 ± 3 PL DECIMALS ± .005" ANGLES ± FRACTIONS ±	DRAWN	DDR 14 MAR 14
	CHECKED	MD 14 MAR 14
	APPROVED	MD 14 MAR 14



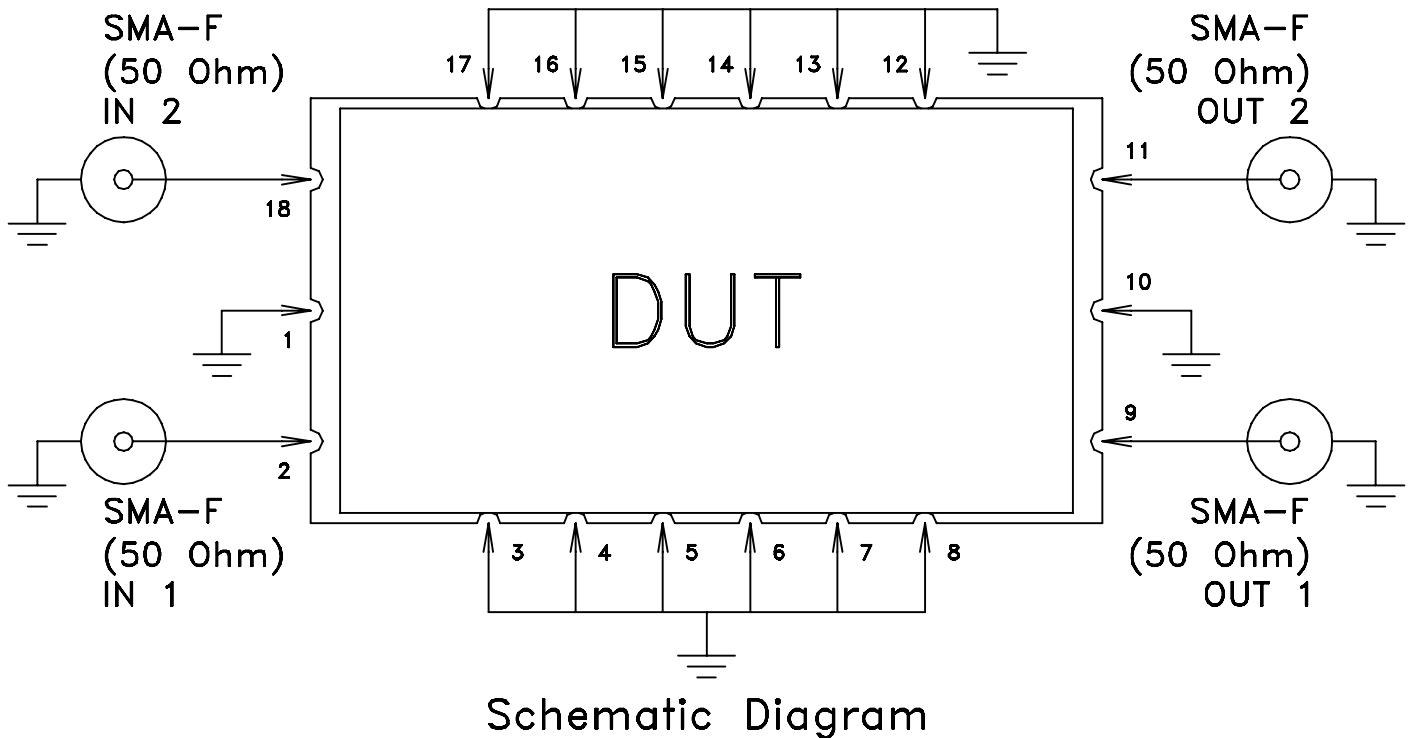
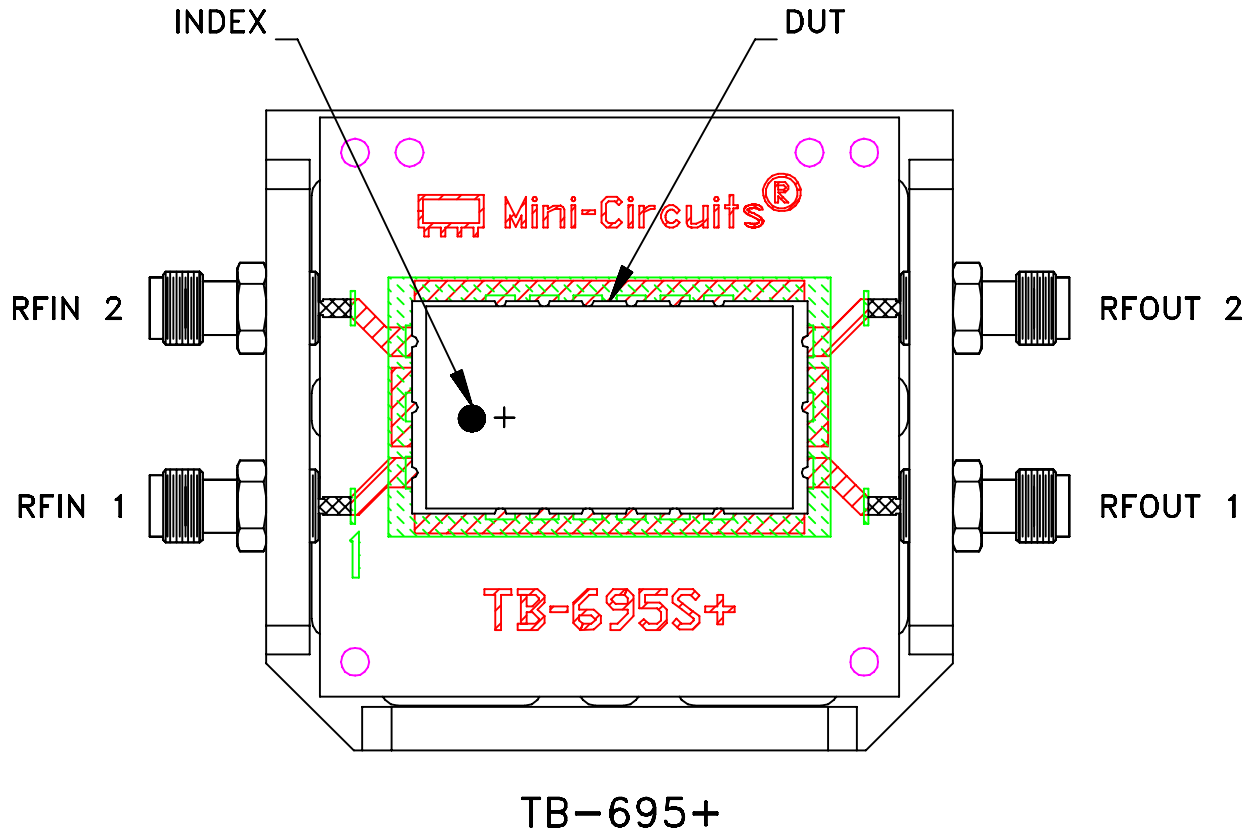
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**PL, 18FL01, HP1156, BPF  
TB-695+, 50 Ohm**

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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±.04, Thickness=.022 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	-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