

Surface Mount Bandpass Filter

BPF-F1950+

50Ω 1450 to 2450 MHz



Generic photo used for illustration purposes only
CASE STYLE: HP1156

The Big Deal

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

Product Overview

BPF-F1950+ is a 50Ω bandpass filter in a shielded package fabricated using SMT technology. This bandpass filter covers from 1450 to 2450 MHz. This filter offers low insertion loss and VSWR in the passband for use in digital cable TV networks and 4G LTE networks.

Key Features

Feature	Advantages
Low insertion loss	Can be used in digital cable TV networks and 4G LTE 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-F1950+ to used in compact design.

Notes

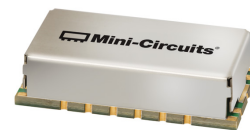
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Surface Mount Bandpass Filter

50Ω 1450 to 2450 MHz

BPF-F1950+



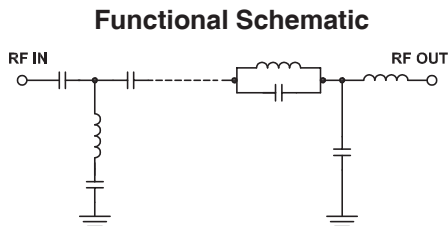
Generic photo used for illustration purposes only
CASE STYLE: HP1156

Features

- Broad bandwidth
- Sharper cut-off
- Shielded package

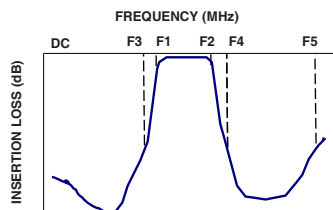
Applications

- Digital television
- Broad band wireless 4G LTE band
- Biomedical telemetry device
- Wireless microphone



Functional Schematic

Typical Frequency Response



Electrical Specifications at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	1950	—	MHz
	Insertion Loss	F1-F2	—	2.0	3.0	dB
	VSWR	F1-F2	—	1.5	1.78	:1
Stop Band, Lower	Insertion Loss	DC-F3	30	40	—	dB
	VSWR	DC-F3	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	30	40	—	dB
	VSWR	F4-F5	—	20	—	:1

Maximum Ratings

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

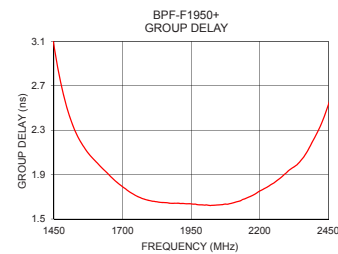
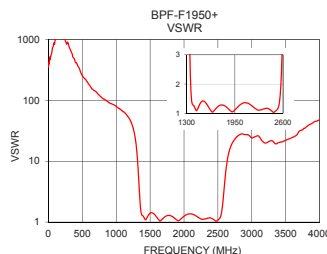
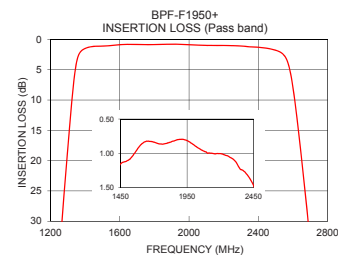
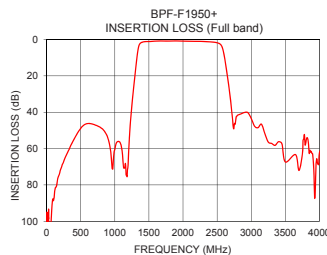
Permanent damage may occur if any of these limits are exceeded.

Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	102.28	350.21	1450	3.06
100	88.67	991.99	1500	2.48
500	48.85	255.74	1550	2.18
1100	59.60	65.45	1600	2.02
1200	64.16	48.88	1650	1.90
1265	30.51	29.95	1700	1.79
1295	19.81	18.28	1750	1.71
1325	9.75	6.92	1800	1.67
1355	3.25	1.91	1850	1.65
1450	1.15	1.16	1950	1.64
1950	0.81	1.11	2000	1.63
2450	1.47	1.07	2050	1.63
2560	3.14	1.59	2100	1.64
2605	9.07	5.09	2150	1.69
2650	19.91	12.21	2200	1.75
2685	29.56	16.92	2250	1.82
2750	47.40	22.95	2300	1.92
3000	43.42	24.20	2350	2.03
3500	67.36	22.12	2400	2.23
4000	62.41	47.79	2450	2.53

+RoHS Compliant

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



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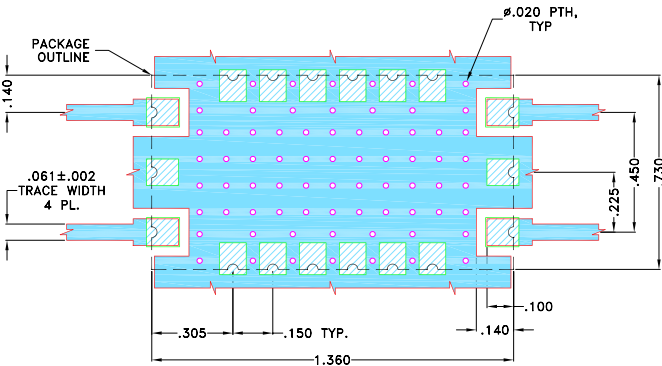
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Pad Connections

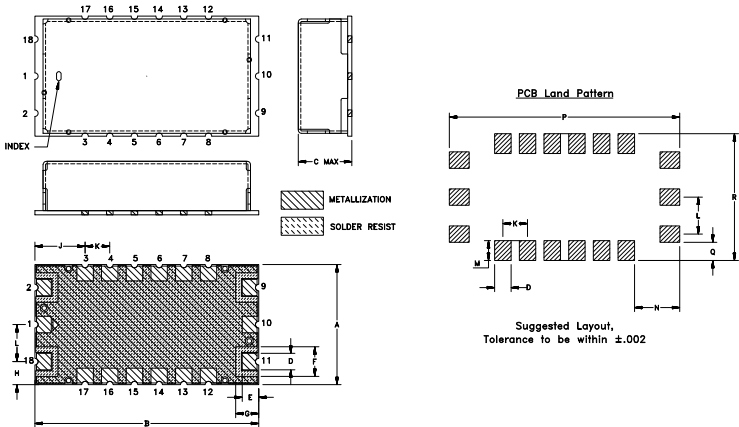
INPUT	18
OUTPUT	11
GROUND	1,3,4,5,6,7,8,10,12,13,14,15,16,17
NO CONNECTION	2,9

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

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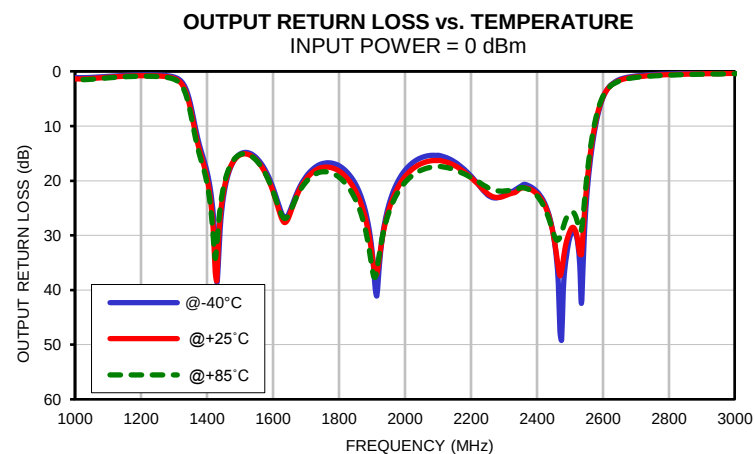
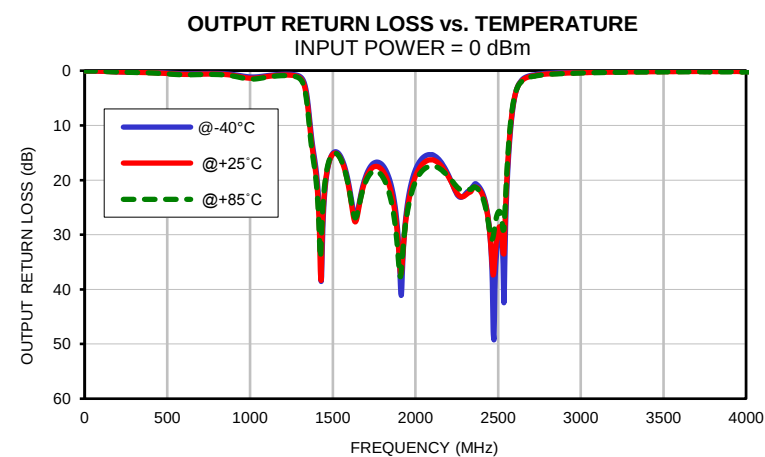
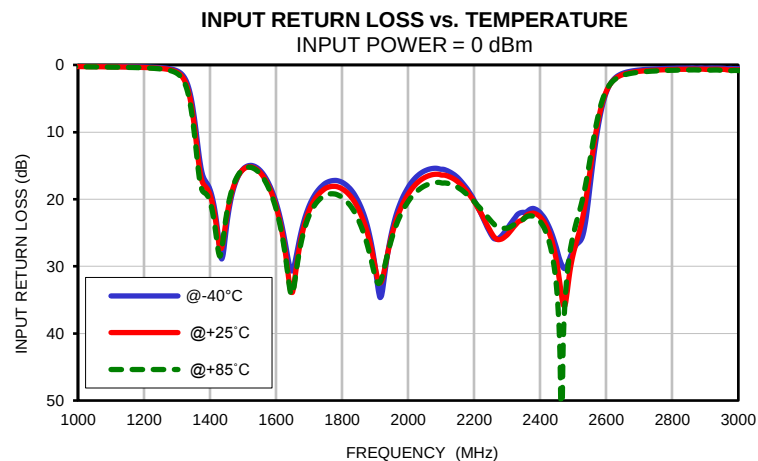
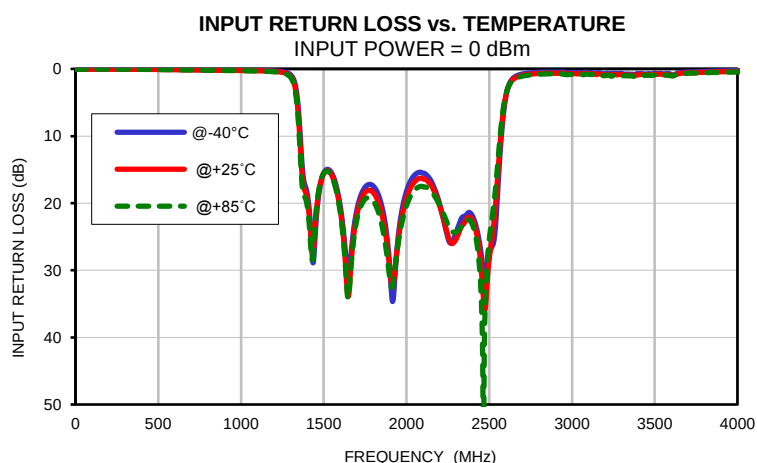
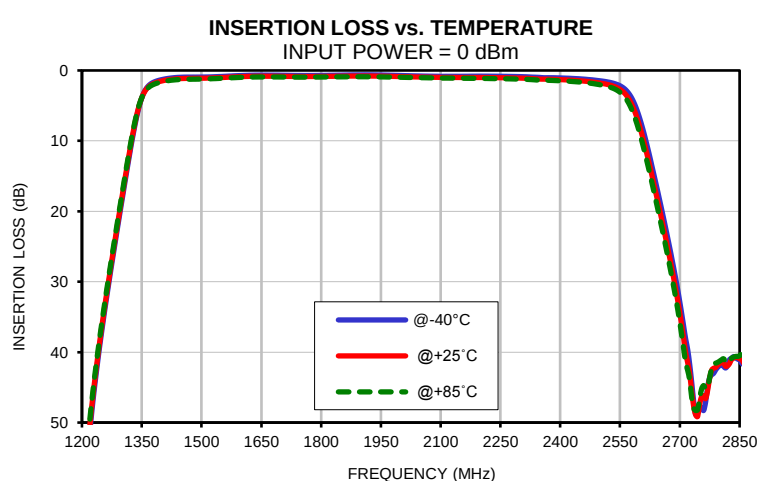
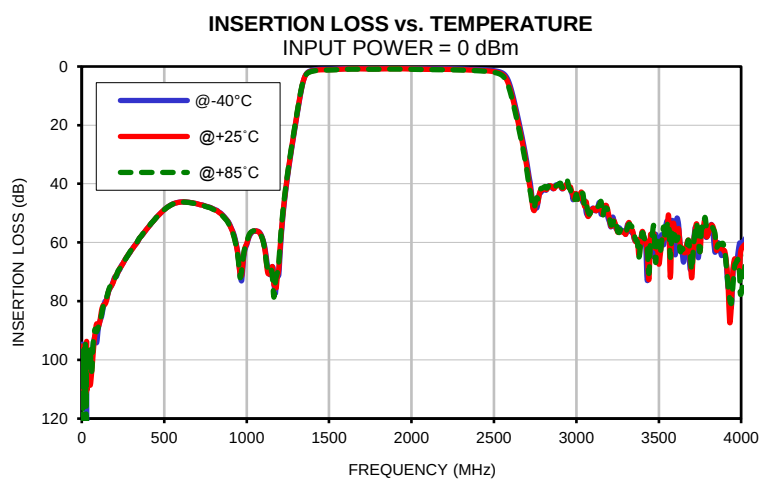
Typical Performance Data

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	100.15	102.28	103.02	0.05	0.05	0.05	0.05	0.05	0.05
50	97.53	108.65	96.63	0.03	0.03	0.03	0.04	0.04	0.05
100	89.31	88.67	88.80	0.01	0.02	0.02	0.06	0.08	0.09
200	71.75	72.06	72.33	0.00	0.01	0.01	0.18	0.21	0.22
250	67.18	67.09	67.15	0.00	0.02	0.02	0.22	0.25	0.26
500	48.82	48.85	48.85	0.04	0.07	0.08	0.41	0.50	0.56
750	47.62	47.62	47.70	0.10	0.14	0.16	0.49	0.59	0.66
1000	60.88	60.49	60.00	0.16	0.22	0.24	1.12	1.36	1.51
1100	59.22	59.60	59.63	0.20	0.27	0.30	0.90	1.06	1.18
1250	36.83	36.26	35.75	0.38	0.49	0.57	0.66	0.82	0.93
1265	31.03	30.51	30.06	0.45	0.58	0.67	0.70	0.87	0.99
1290	22.03	21.55	21.16	0.68	0.85	0.99	0.87	1.08	1.23
1295	20.28	19.81	19.42	0.76	0.95	1.10	0.94	1.16	1.31
1300	18.54	18.08	17.70	0.86	1.08	1.24	1.02	1.25	1.42
1325	10.12	9.75	9.47	2.07	2.53	2.90	2.00	2.42	2.74
1350	3.90	3.88	3.86	7.00	8.17	9.16	5.96	6.84	7.55
1400	1.31	1.50	1.63	18.56	19.32	20.36	18.30	19.47	20.41
1425	1.07	1.26	1.38	25.51	25.95	27.72	31.42	36.56	34.23
1450	0.96	1.15	1.28	24.07	22.79	22.28	22.99	22.10	21.23
1500	0.94	1.10	1.22	15.50	15.57	15.53	15.13	15.29	15.22
1600	0.72	0.88	0.98	20.48	21.04	21.42	21.25	21.93	21.90
1750	0.71	0.86	0.95	17.59	18.36	19.35	16.87	17.56	18.37
1950	0.65	0.81	0.92	24.98	25.53	25.94	24.71	25.57	26.06
2000	0.72	0.87	0.97	18.23	19.25	20.35	18.12	19.27	20.33
2150	0.83	1.00	1.11	16.75	17.36	18.21	16.53	17.21	17.98
2250	0.83	1.03	1.17	25.12	24.79	23.16	22.56	22.33	21.22
2350	1.00	1.23	1.38	21.95	22.87	22.94	21.06	21.41	21.32
2450	1.20	1.47	1.65	27.34	29.27	33.21	29.90	29.96	29.56
2500	1.47	1.79	2.03	27.58	28.24	25.39	30.34	29.27	25.89
2550	2.17	2.68	3.10	18.63	16.27	14.45	23.82	21.61	20.12
2560	2.54	3.14	3.64	14.55	12.85	11.54	17.35	16.01	15.01
2570	3.12	3.84	4.45	10.97	9.80	8.89	12.72	11.83	11.12
2600	6.90	8.06	9.00	4.16	3.98	3.82	4.86	4.73	4.58
2650	18.54	19.91	20.99	1.24	1.43	1.54	1.48	1.65	1.75
2660	21.15	22.52	23.63	1.08	1.27	1.39	1.27	1.43	1.53
2670	23.84	25.24	26.38	0.96	1.16	1.28	1.12	1.28	1.39
2680	26.65	28.08	29.24	0.86	1.07	1.19	1.01	1.17	1.27
2690	29.61	31.09	32.30	0.79	0.99	1.12	0.91	1.07	1.18
2700	32.83	34.37	35.67	0.74	0.93	1.06	0.83	0.99	1.09
2750	47.82	47.40	46.54	0.57	0.76	0.87	0.58	0.73	0.83
2800	41.90	41.64	41.26	0.48	0.66	0.77	0.45	0.58	0.67
2850	40.99	40.92	40.51	0.45	0.62	0.72	0.37	0.50	0.57
2900	39.89	40.16	39.84	0.47	0.63	0.74	0.32	0.44	0.51
2950	40.51	40.21	40.15	0.46	0.64	0.79	0.29	0.41	0.48
3000	44.36	43.42	43.65	0.54	0.72	0.81	0.24	0.35	0.41
3200	52.87	51.78	51.33	0.69	0.88	0.98	0.14	0.24	0.29
3250	55.36	56.44	56.22	0.64	0.83	0.94	0.13	0.23	0.27
3300	57.11	57.19	56.64	0.66	0.80	0.90	0.11	0.21	0.25
3350	58.66	58.23	57.16	0.77	0.90	1.03	0.09	0.19	0.23
3400	56.59	56.23	56.69	0.71	0.85	0.95	0.08	0.18	0.22
3450	58.36	57.29	58.79	0.72	0.83	0.92	0.07	0.16	0.21
3500	66.53	67.36	63.42	0.66	0.79	0.88	0.06	0.16	0.20
3550	52.64	56.11	54.20	0.73	0.79	0.88	0.06	0.16	0.20
3600	64.24	59.29	59.14	0.82	0.92	1.01	0.04	0.14	0.19
3650	66.73	63.33	62.56	0.52	0.66	0.73	0.02	0.13	0.18
3700	67.68	72.04	69.43	0.43	0.56	0.63	0.02	0.13	0.18
3750	55.28	63.08	63.10	0.40	0.53	0.60	0.03	0.15	0.20
3800	57.06	56.99	55.36	0.35	0.48	0.56	0.02	0.13	0.20
3900	63.75	62.93	62.64	0.27	0.40	0.48	0.01	0.11	0.20
4000	60.44	62.41	77.33	0.22	0.36	0.45	0.01	0.14	0.21

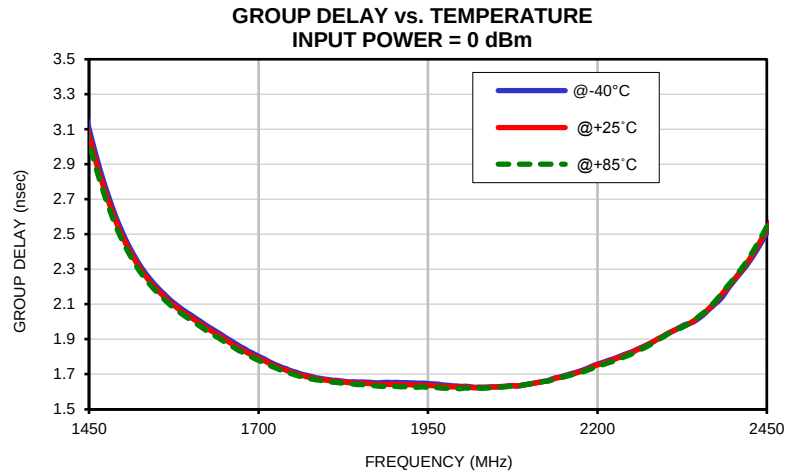
Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
1450	3.10	3.06	3.02
1465	2.88	2.85	2.81
1480	2.70	2.67	2.64
1495	2.55	2.52	2.50
1510	2.42	2.40	2.38
1525	2.32	2.31	2.29
1540	2.24	2.23	2.21
1555	2.18	2.16	2.15
1570	2.12	2.11	2.09
1585	2.08	2.06	2.05
1600	2.04	2.02	2.01
1615	2.00	1.99	1.97
1630	1.96	1.95	1.93
1645	1.93	1.91	1.90
1660	1.89	1.87	1.86
1675	1.85	1.84	1.83
1690	1.82	1.81	1.80
1705	1.79	1.78	1.77
1720	1.76	1.75	1.74
1735	1.74	1.73	1.72
1750	1.72	1.71	1.70
1765	1.70	1.69	1.69
1780	1.69	1.68	1.67
1795	1.67	1.67	1.66
1810	1.67	1.66	1.65
1825	1.66	1.66	1.65
1840	1.66	1.65	1.64
1855	1.66	1.65	1.64
1870	1.65	1.64	1.63
1885	1.65	1.64	1.63
1900	1.65	1.64	1.63
1915	1.65	1.64	1.63
1930	1.65	1.64	1.63
1950	1.65	1.64	1.62
1960	1.64	1.63	1.62
1975	1.64	1.63	1.62
1990	1.63	1.63	1.62
2005	1.63	1.63	1.62
2020	1.62	1.62	1.62
2035	1.63	1.62	1.62
2050	1.63	1.63	1.62
2065	1.63	1.63	1.63
2080	1.63	1.63	1.63
2095	1.64	1.64	1.64
2110	1.65	1.65	1.65
2125	1.66	1.66	1.66
2140	1.68	1.68	1.68
2155	1.70	1.69	1.69
2170	1.71	1.71	1.70
2185	1.73	1.73	1.72
2200	1.76	1.75	1.74
2215	1.78	1.77	1.76
2230	1.80	1.79	1.78
2250	1.83	1.82	1.81
2275	1.87	1.87	1.86
2300	1.92	1.92	1.92
2325	1.98	1.97	1.97
2350	2.02	2.03	2.03
2360	2.05	2.06	2.06
2400	2.22	2.23	2.24

Typical Performance Curves

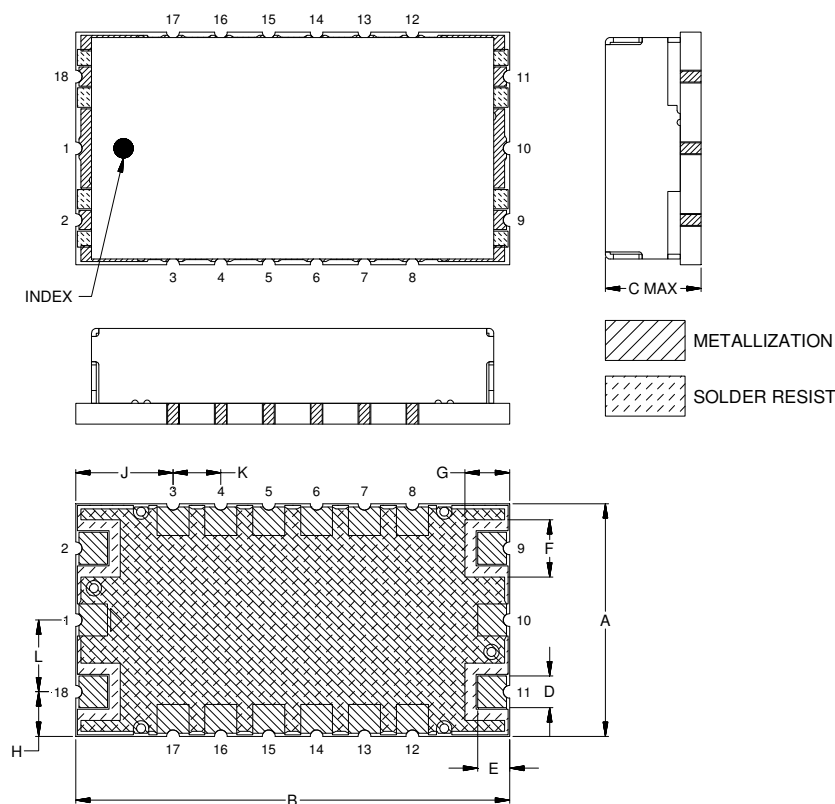


Typical Performance Curves

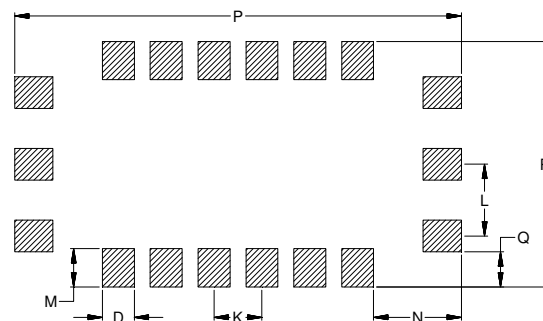


Outline Dimensions

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.

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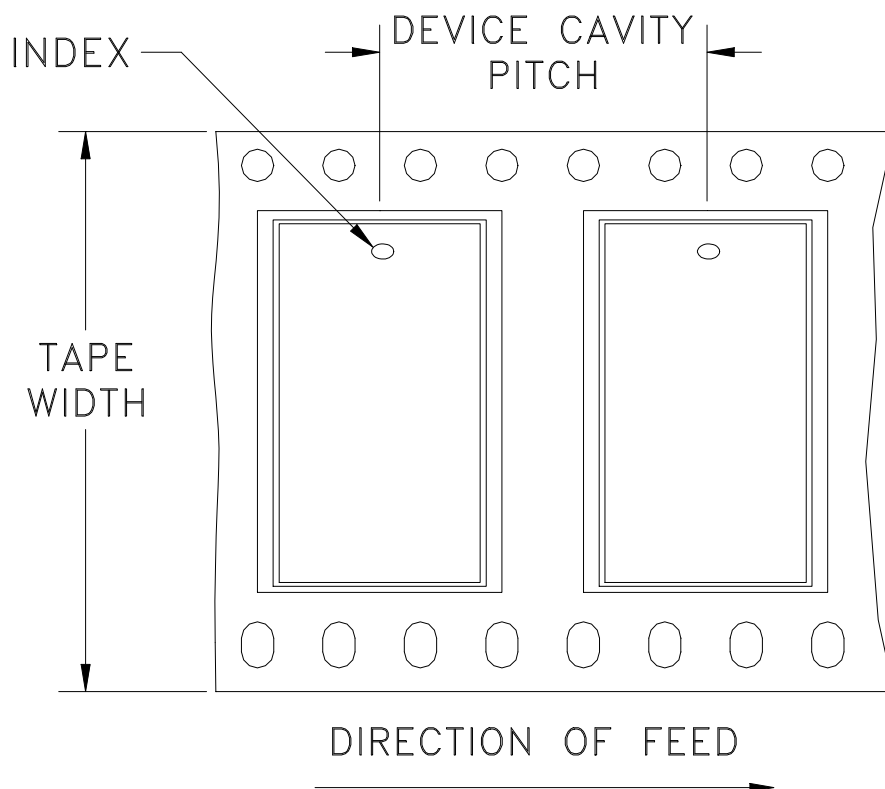


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RF/IF MICROWAVE COMPONENTS

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



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

[illegible]

 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 ±			

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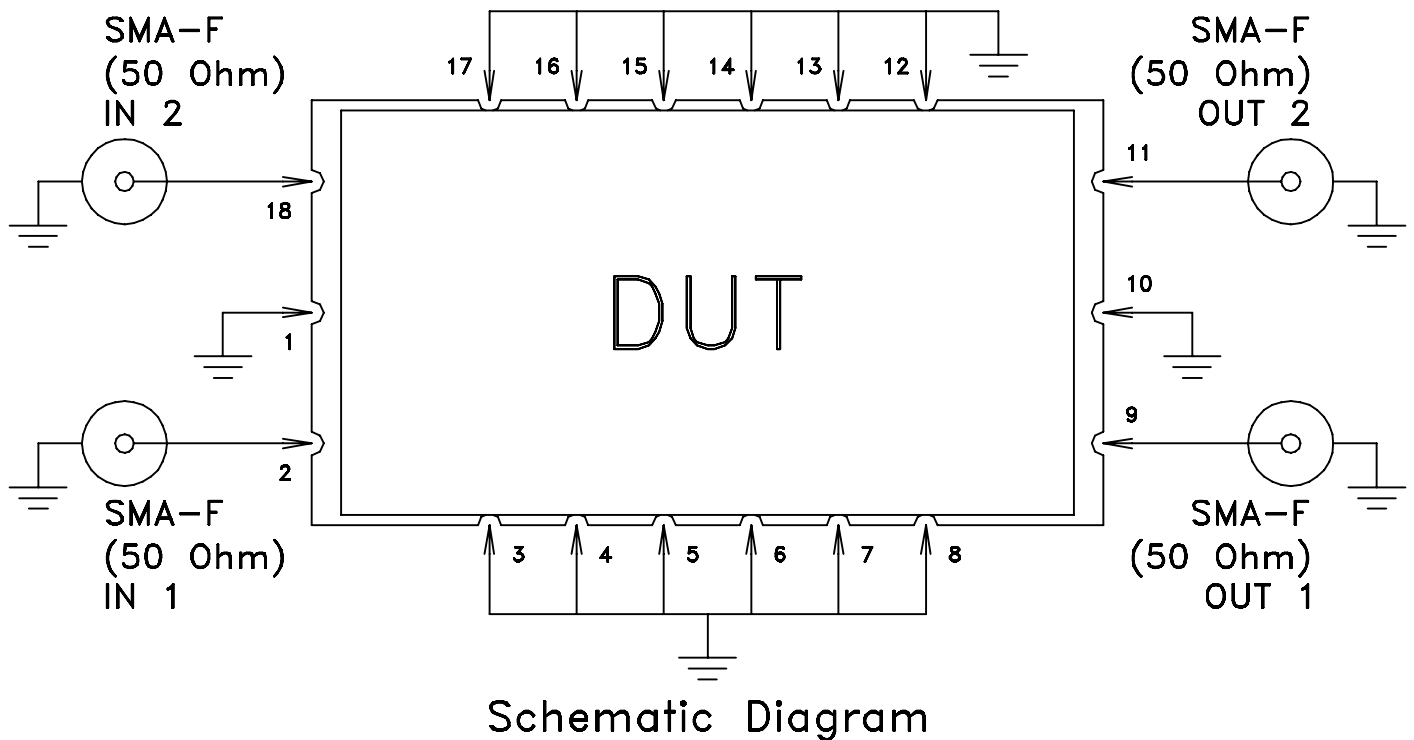
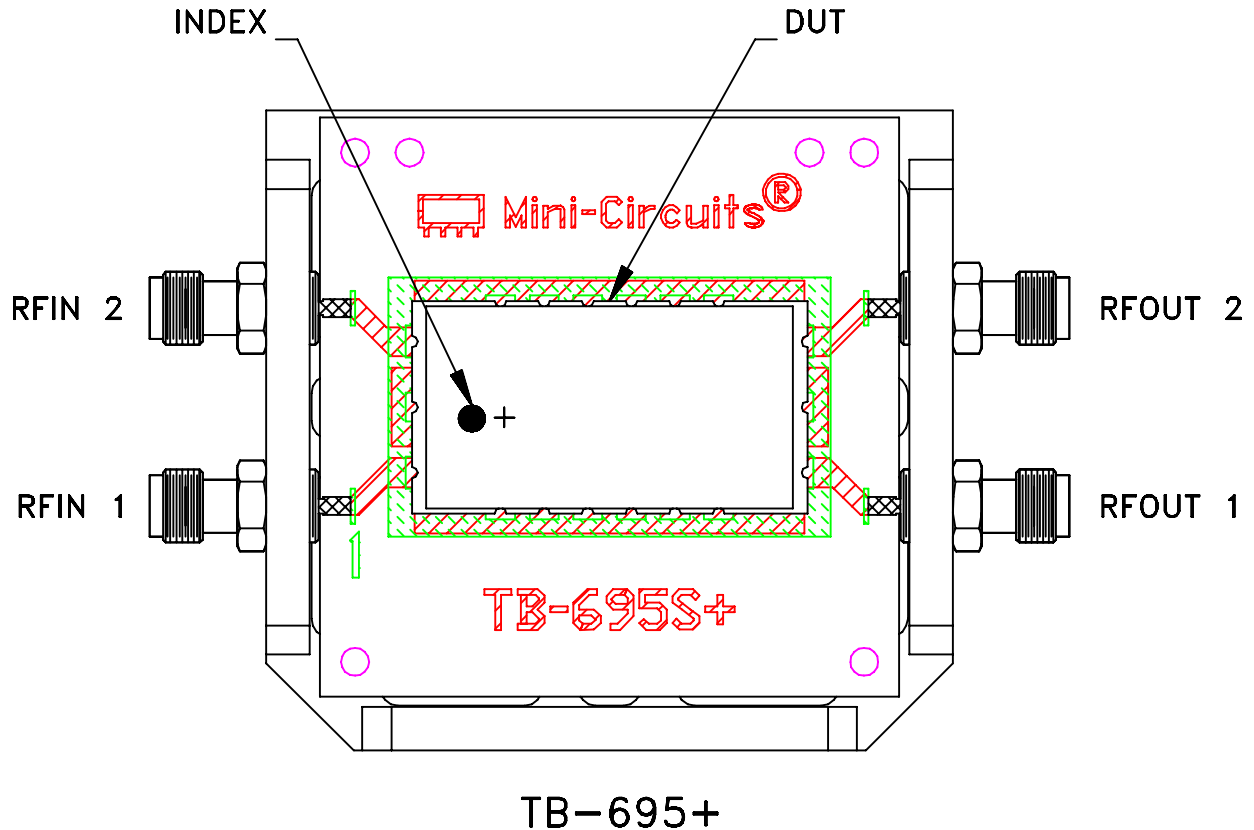


Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

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	-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