Surface Mount

Bandpass Filter

BPF-F598+

50Ω 410 to 785 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-F598+ is a 50Ω bandpass filter in a shielded package fabricated using SMT technology. This bandpass filter covers from 410 to 785 MHz.

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-F598+ to used in compact design

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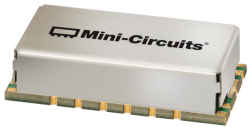


Generic photo used for illustration purposes only

CASE STYLE: HP1156

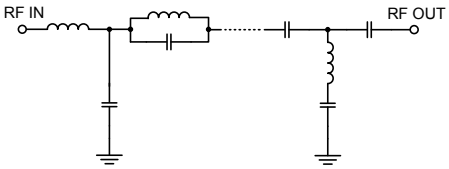
Features

- Broad bandwidth
- Sharper cut-off
- Miniature shielded package

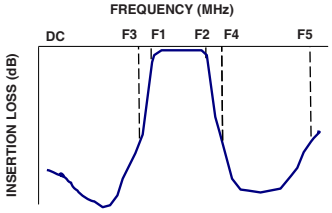
Applications

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

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	—	—	—	598	—	MHz
	Insertion Loss	F1-F2	410-785	—	2.70	4.50	dB
	VSWR	F1-F2	410-785	—	1.46	1.92	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-385	20	34	—	dB
	VSWR	DC-F3	DC-385	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	825-1600	20	35	—	dB
	VSWR	F4-F5	825-1600	—	20	—	:1

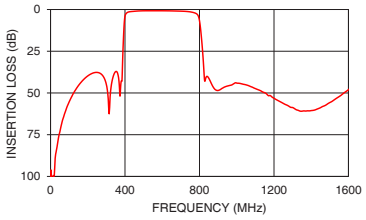
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	1 W

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

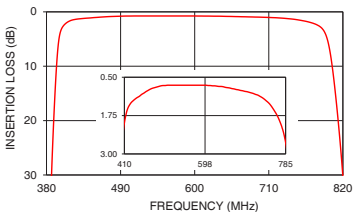
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	102.77	347.44	410	15.16
250	37.70	42.38	414	12.74
315	62.49	38.61	418	10.96
355	37.20	23.49	420	9.75
372	50.61	15.96	430	8.39
385	39.05	9.79	440	6.98
387	31.54	8.68	450	5.89
390	21.83	6.73	460	5.20
394	11.72	3.82	480	4.38
402	3.21	1.20	500	3.87
410	1.99	1.16	598	3.14
598	0.76	1.26	650	3.36
785	2.63	1.18	700	4.04
789	3.04	1.15	720	4.60
806	11.84	3.96	740	5.46
813	20.05	6.39	760	6.93
820	30.25	8.60	770	7.94
825	39.25	9.96	775	8.42
1015	44.24	54.29	780	10.27
1600	48.03	193.02	785	11.95

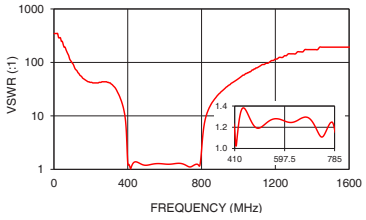
BPF-F598+
INSERTION LOSS (Full band)



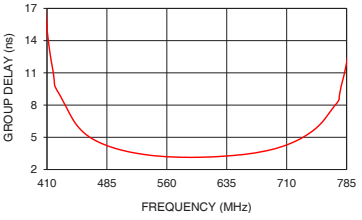
BPF-F598+
INSERTION LOSS (Pass band)



BPF-F598+
VSWR



BPF-F598+
GROUP DELAY



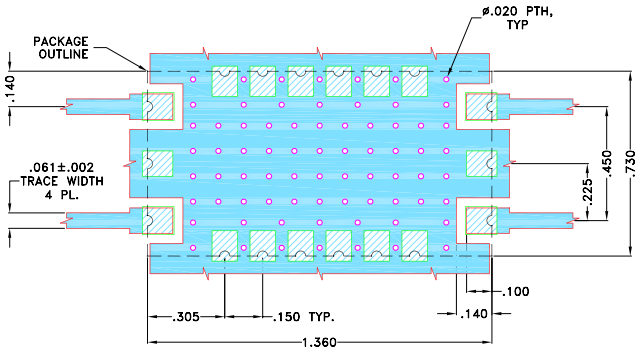
Notes

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)

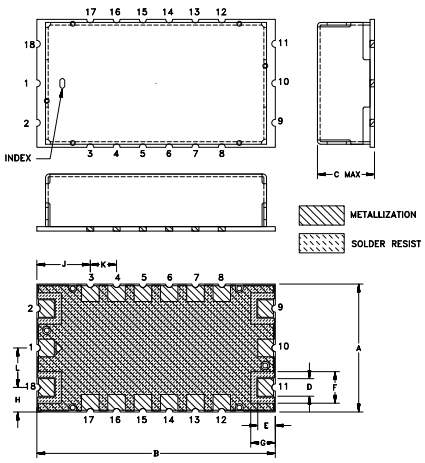


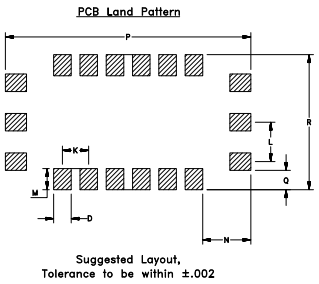
NOTES:
1. TRACE WIDTH IS SHOWN FOR OAK-602, WITH DIELECTRIC THICKNESS .022"±.0015". COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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-F598+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	110.87	102.77	102.24	0.05	0.05	0.05	0.05	0.05	0.05
20	95.23	99.80	96.84	0.05	0.05	0.05	0.04	0.04	0.04
80	61.04	61.11	60.91	0.11	0.13	0.14	0.03	0.03	0.03
190	40.60	40.68	40.72	0.34	0.40	0.43	0.08	0.10	0.11
245	37.61	37.68	37.74	0.34	0.41	0.45	0.16	0.19	0.21
290	41.31	41.49	41.65	0.33	0.41	0.46	0.26	0.31	0.33
315	63.33	62.49	61.26	0.36	0.45	0.51	0.35	0.41	0.45
325	47.09	46.66	46.26	0.39	0.49	0.56	0.40	0.47	0.51
350	37.09	37.20	37.27	0.55	0.68	0.77	0.57	0.67	0.74
372	48.94	50.61	51.13	0.88	1.09	1.22	0.88	1.06	1.20
380	43.27	42.86	42.67	1.14	1.41	1.59	1.13	1.39	1.59
383	43.17	43.04	41.60	1.29	1.60	1.83	1.28	1.58	1.83
385	43.19	39.05	35.51	1.42	1.78	2.04	1.41	1.76	2.06
389	28.32	24.82	22.32	1.84	2.36	2.79	1.83	2.37	2.86
390	24.97	21.83	19.53	2.00	2.60	3.11	1.99	2.62	3.21
391	21.88	19.03	16.92	2.22	2.91	3.53	2.21	2.95	3.67
394	13.78	11.72	10.25	3.37	4.66	5.91	3.39	4.78	6.21
401	3.50	3.54	3.54	17.50	19.81	20.06	18.41	21.57	21.49
402	3.08	3.21	3.26	20.56	20.68	19.98	21.74	21.83	20.72
405	2.37	2.58	2.69	19.88	19.60	19.56	19.69	19.45	19.62
410	1.78	1.99	2.11	21.00	22.76	24.25	20.39	22.18	24.32
415	1.44	1.64	1.77	32.66	39.03	34.40	29.30	32.40	32.57
419	1.28	1.48	1.61	29.14	26.54	24.40	27.96	25.59	23.58
425	1.15	1.34	1.47	19.90	19.58	18.95	19.76	19.23	18.45
435	1.05	1.21	1.33	16.00	16.33	16.26	15.94	16.13	15.96
440	1.01	1.16	1.27	15.47	15.93	15.99	15.45	15.80	15.79
495	0.65	0.78	0.87	20.74	21.18	21.51	20.66	21.06	21.33
550	0.63	0.76	0.85	17.86	18.40	18.50	17.22	17.72	17.78
565	0.63	0.76	0.86	17.65	18.20	18.38	17.32	17.92	18.13
590	0.62	0.76	0.86	18.22	18.60	18.85	18.63	19.33	19.82
595	0.62	0.76	0.86	18.43	18.74	18.99	19.03	19.73	20.26
598	0.62	0.76	0.86	18.58	18.836	19.074	19.3	19.97	20.524
600	0.62	0.76	0.86	18.68	18.90	19.13	19.48	20.13	20.70
735	0.96	1.21	1.39	24.60	25.73	25.37	22.02	21.85	21.03
745	1.06	1.33	1.53	24.73	24.70	24.08	20.89	20.31	19.52
755	1.20	1.51	1.73	22.94	21.95	21.51	19.31	18.49	17.89
765	1.38	1.74	2.01	21.00	19.89	19.63	18.03	17.18	16.75
770	1.51	1.89	2.18	20.28	19.30	19.11	17.65	16.88	16.54
783	1.97	2.49	2.90	20.77	20.68	20.83	18.89	18.84	18.90
785	2.08	2.63	3.09	21.67	21.72	21.77	19.80	19.91	19.93
788	2.28	2.92	3.47	23.81	23.26	22.08	21.67	21.43	20.47
789	2.37	3.04	3.63	24.55	23.17	21.33	22.26	21.41	19.85
807	10.57	12.89	14.89	4.20	4.11	3.98	3.59	3.42	3.26
809	12.71	15.13	17.21	3.47	3.52	3.48	2.91	2.87	2.81
814	18.79	21.37	23.62	2.39	2.61	2.68	1.93	2.06	2.12
815	20.12	22.72	25.01	2.25	2.48	2.57	1.81	1.96	2.02
820	27.43	30.25	32.74	1.78	2.03	2.15	1.41	1.59	1.68
822	30.79	33.70	36.21	1.66	1.91	2.02	1.30	1.49	1.59
825	36.50	39.25	41.02	1.50	1.75	1.87	1.19	1.38	1.48
840	39.83	40.07	40.31	1.07	1.27	1.38	0.87	1.05	1.14
846	40.04	40.53	40.95	0.96	1.15	1.26	0.81	0.98	1.07
885	47.85	48.02	48.13	0.60	0.73	0.81	0.63	0.77	0.85
1000	43.98	44.09	44.09	0.26	0.35	0.40	0.56	0.68	0.77
1150	49.87	49.84	49.80	0.10	0.18	0.22	0.48	0.65	0.77
1300	58.97	58.72	58.91	0.03	0.12	0.16	0.39	0.60	0.74
1400	60.64	60.56	60.71	0.01	0.10	0.15	0.37	0.59	0.72
1500	55.73	55.74	55.73	0.00	0.09	0.14	0.36	0.58	0.73
1580	49.61	49.65	49.57	0.00	0.09	0.14	0.37	0.59	0.74
1590	48.90	48.88	48.81	0.00	0.09	0.14	0.37	0.60	0.74
1600	48.04	48.03	47.93	0.00	0.09	0.14	0.38	0.60	0.74

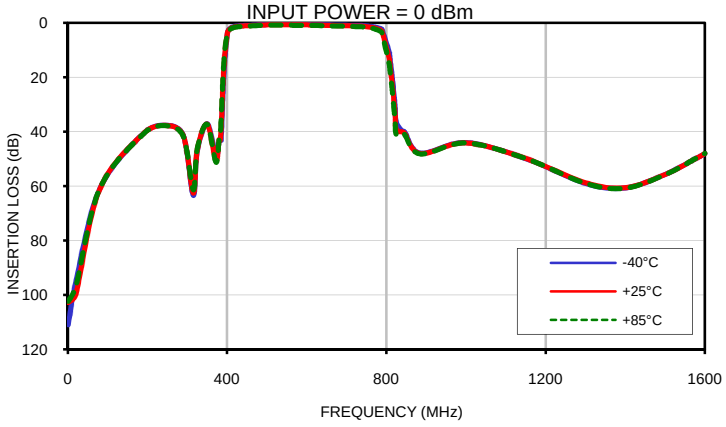
Typical Performance Data

FREQ.	GROUP DELAY		
	(nsec)		
(MHz)	@-40°C	@+25°C	@+85°C
410	16.09	15.16	14.50
411	15.28	14.45	13.87
412	14.56	13.83	13.30
413	13.92	13.26	12.78
414	13.34	12.74	12.31
415	12.83	12.27	11.86
416	12.34	11.82	11.45
417	11.90	11.42	11.07
418	11.40	10.96	10.63
419	10.78	10.38	10.09
420	10.10	9.75	9.49
430	8.64	8.39	8.19
440	7.14	6.98	6.86
450	5.98	5.89	5.82
460	5.26	5.20	5.16
470	4.77	4.73	4.70
480	4.41	4.38	4.35
490	4.13	4.10	4.08
500	3.90	3.87	3.85
510	3.71	3.69	3.68
520	3.56	3.54	3.53
530	3.44	3.42	3.41
540	3.33	3.32	3.32
550	3.25	3.25	3.24
560	3.19	3.19	3.19
570	3.16	3.16	3.16
580	3.14	3.14	3.15
590	3.13	3.13	3.14
595	3.13	3.14	3.14
598	3.14	3.14	3.15
600	3.14	3.14	3.15
610	3.16	3.16	3.17
620	3.19	3.19	3.20
630	3.23	3.24	3.25
640	3.28	3.29	3.30
650	3.35	3.36	3.37
660	3.43	3.44	3.45
670	3.53	3.54	3.56
680	3.66	3.68	3.70
690	3.81	3.84	3.87
700	4.01	4.04	4.08
710	4.24	4.29	4.34
720	4.54	4.60	4.66
730	4.91	4.98	5.05
740	5.36	5.46	5.54
745	5.64	5.74	5.84
750	5.95	6.07	6.18
760	6.77	6.93	7.09
770	7.71	7.94	8.16
775	8.17	8.42	8.69
776	8.59	8.88	9.18
777	8.98	9.30	9.63
778	9.32	9.68	10.04
779	9.60	9.99	10.38
780	9.85	10.27	10.68
781	10.10	10.55	11.00
782	10.38	10.87	11.33
783	10.69	11.20	11.70
784	11.01	11.57	12.09
785	11.35	11.95	12.52

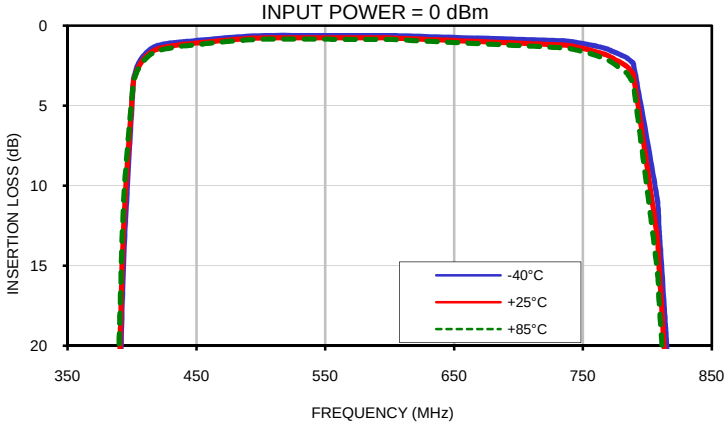
Band Pass Filter BPF-F598+

Typical Performance Curves

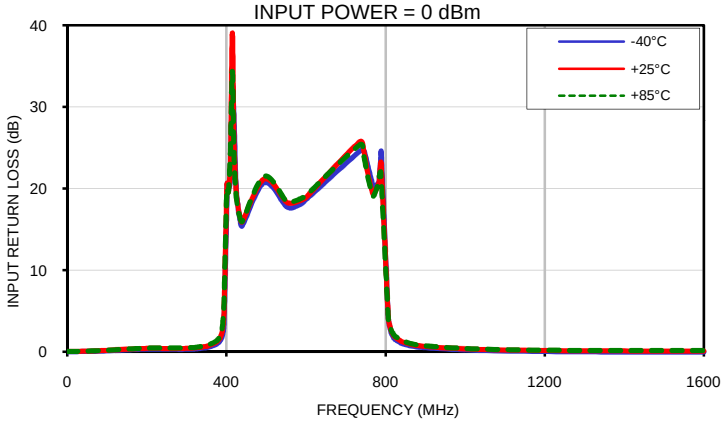
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



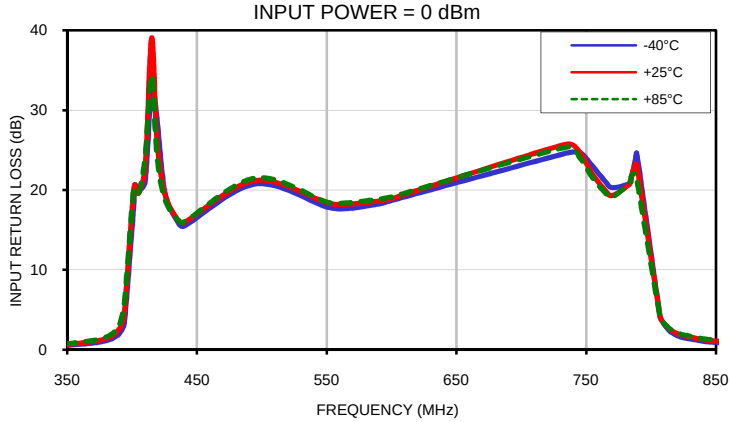
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



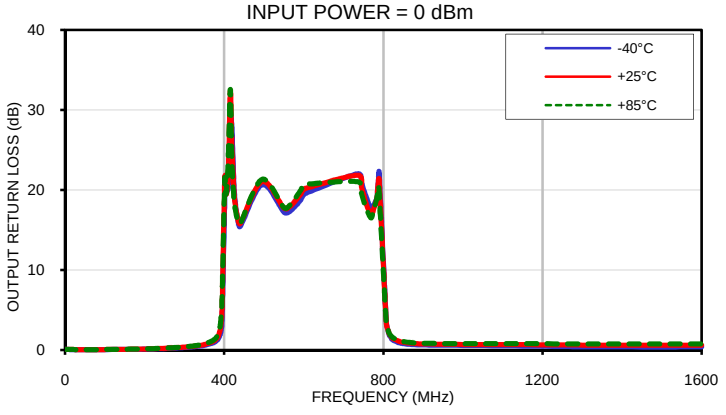
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



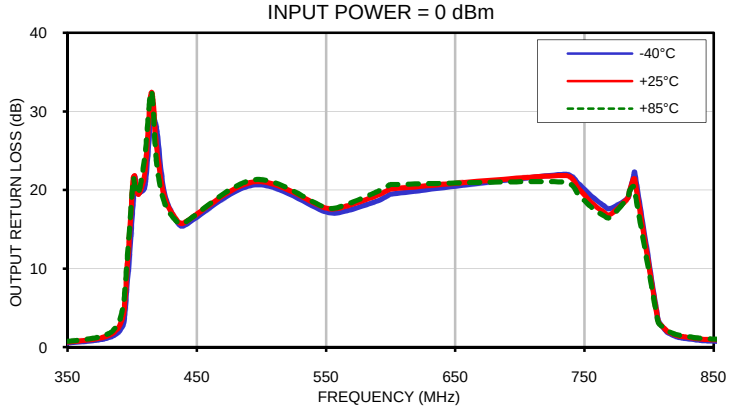
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



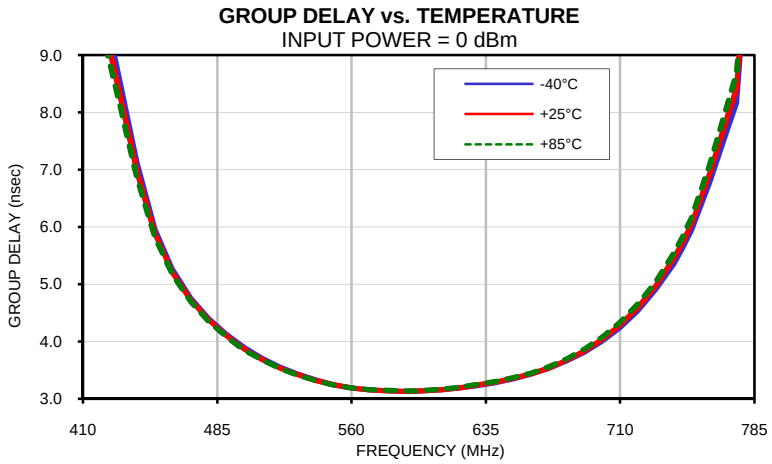
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

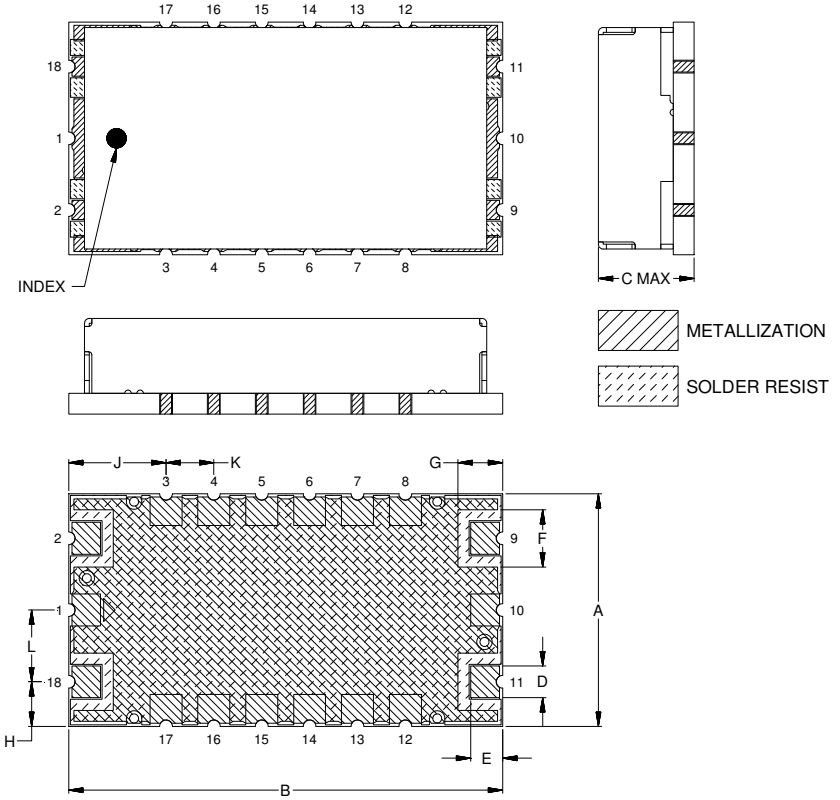


Typical Performance Curves

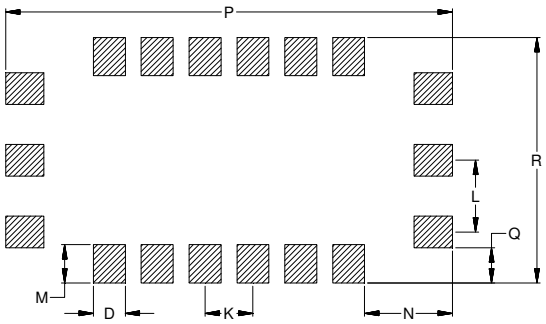


Case Style HP

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

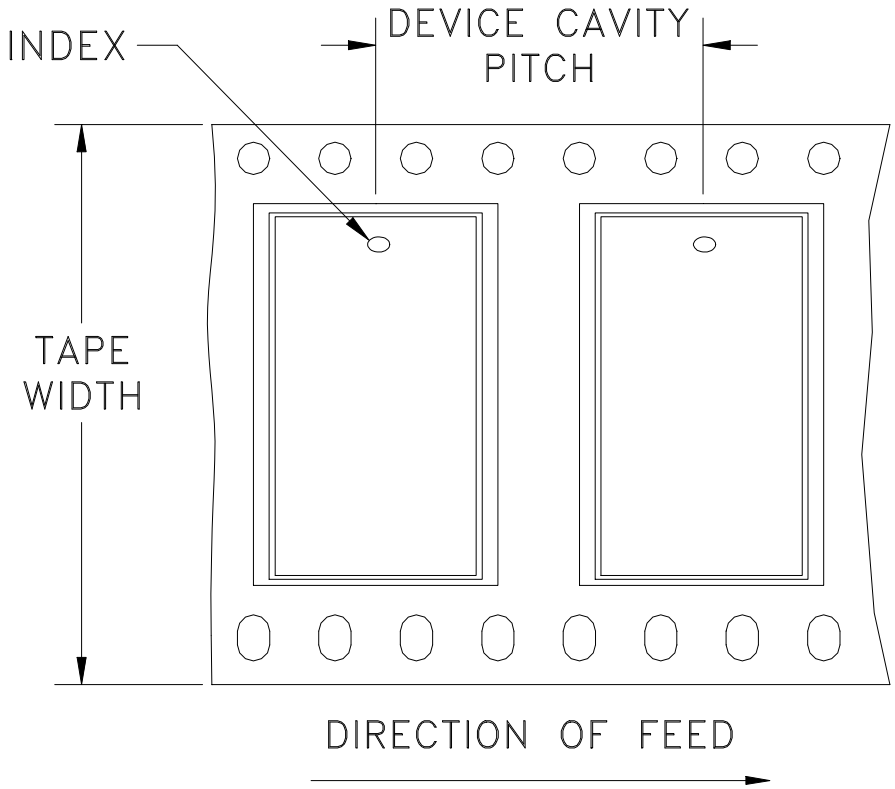
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

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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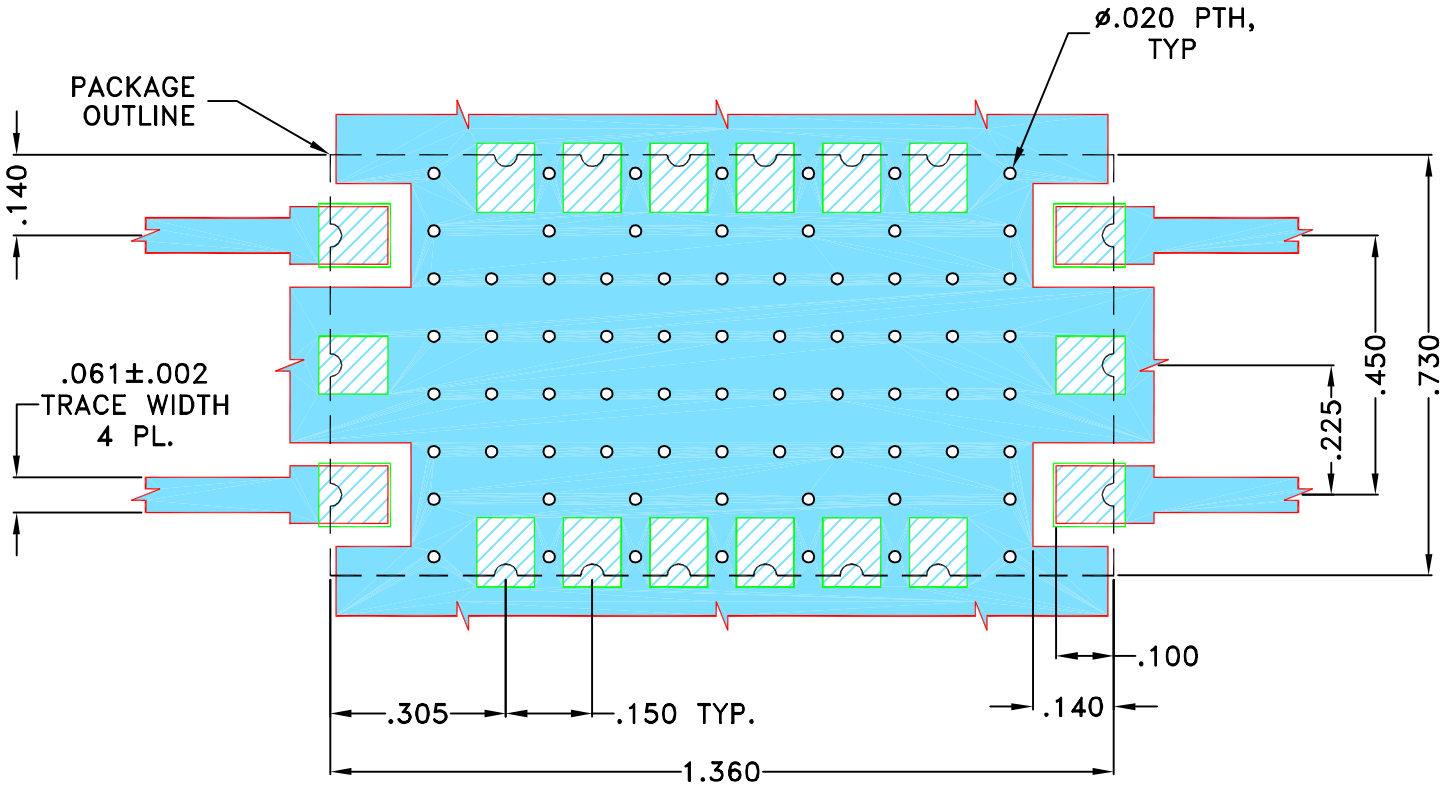
THIRD ANGLE PROJECTION

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®
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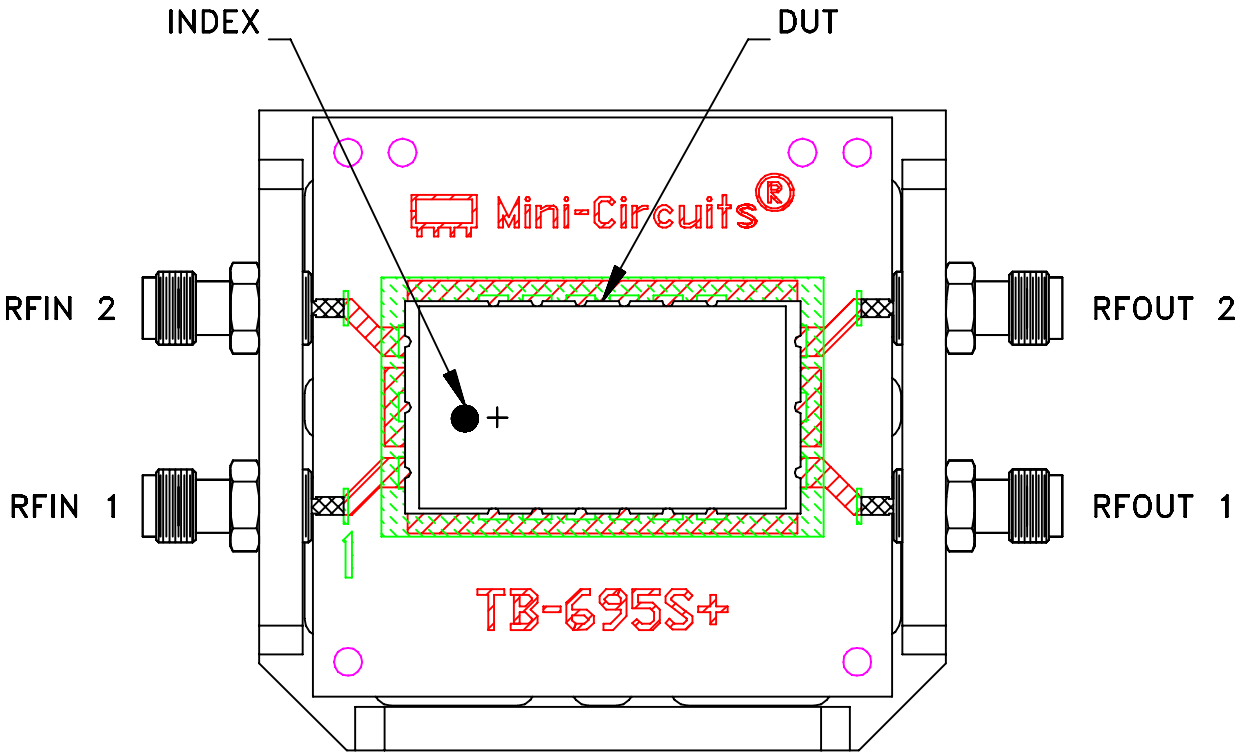
Brooklyn NY 11235

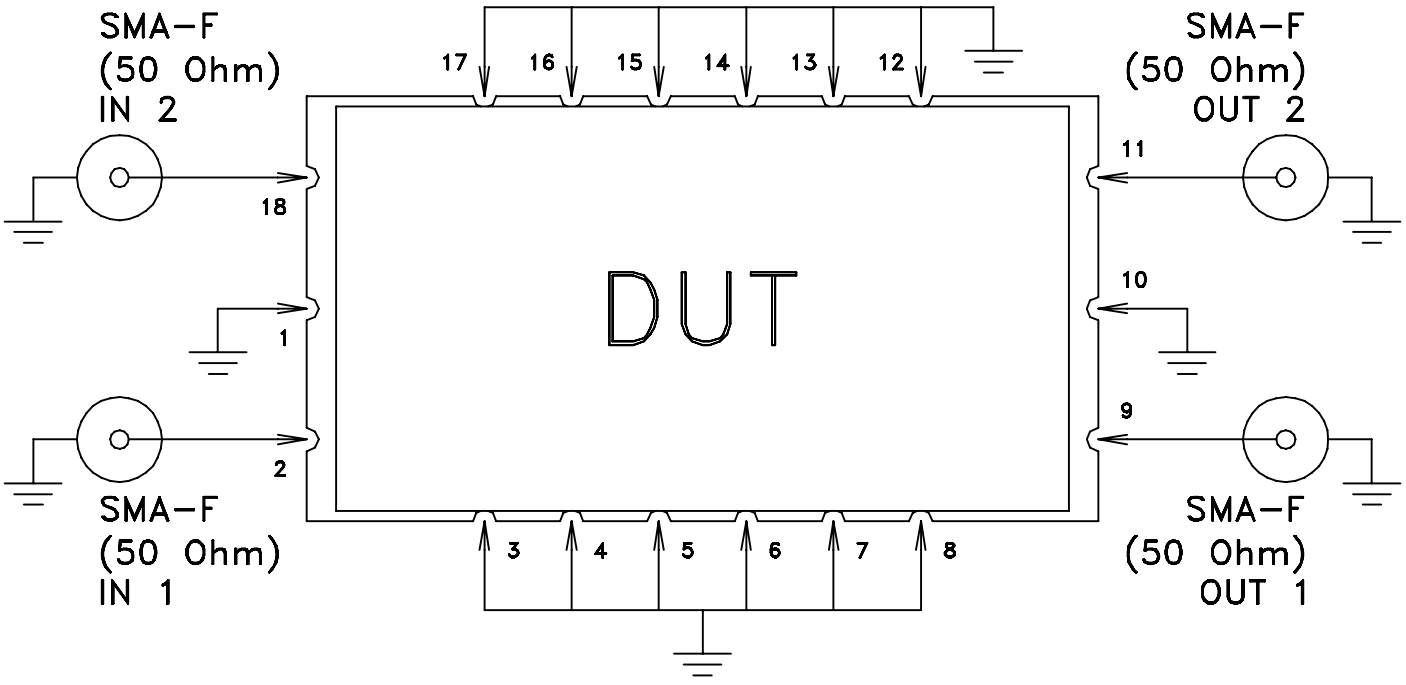
PL, 18FL01, HP1156, BPF TB-695+, 50 Ohm

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.

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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