

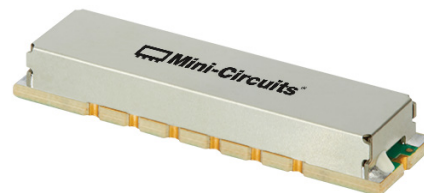
Surface Mount Bandpass Filter

BPF-A475+

50Ω 400 to 550 MHz

The Big Deal

- Sharp roll-off
- High rejection
- Wide stopband
- Miniature shielded package



Generic photo used for illustration purposes only
CASE STYLE: HQ2706

Product Overview

The BPF-A475+ is a 50Ω bandpass filter in a shielded package (size of 0.365" x 1.360" x 0.22") fabricated using SMT technology. Covering 475 MHz $\pm$ 75 MHz band width, these units offer good matching within the passband and high rejection in the stopband. Its wide stopband rejection will be suitable for application which needs far-frequency attenuation. In addition it has consistent performance across temperature.

Key Features

Feature	Advantages
High rejection	Rejects unwanted spurious in the adjacent band.
Sharp roll-off	Sharp roll-off helps in adjacent channel rejection and hence increased selectivity.
Shielded case	Reduced interference with the surrounding components.
Wide stopband	Rejects harmonics for a wide range of frequency.

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 400 to 550 MHz

BPF-A475+



Generic photo used for illustration purposes only

CASE STYLE: HQ2706

Features

- Sharp roll-off
- High rejection
- Wide stopband
- Shielded case

Applications

- Biomedical telemetry devices
- Wireless microphones
- Military radio

Electrical Specifications at 25°C

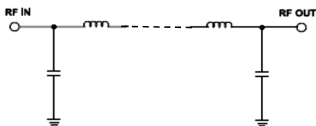
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	475	—	MHz
	Insertion Loss	F1-F2	400 - 550	1.4	2.0	dB
	VSWR	F1-F2	400 - 550	1.41	1.67	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 200	40	—	dB
		F3-F4	200 - 300	20	30	dB
	VSWR	DC-F4	DC - 300	—	20	:1
Stop Band, Upper	Insertion Loss	F5-F6	650 - 3800	40	48	dB
		F6-F7	3800 - 5000	—	30	dB
	VSWR	F5-F7	650 - 5000	—	20	:1

Maximum Ratings

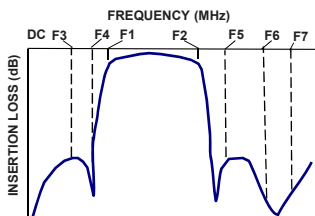
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5 W Max. @ 25°C

Permanent damage may occur if any of these limits are exceeded.
Max RF Power Input derate to 1.5 W @ 85°C

Functional Schematic



Typical Frequency Response

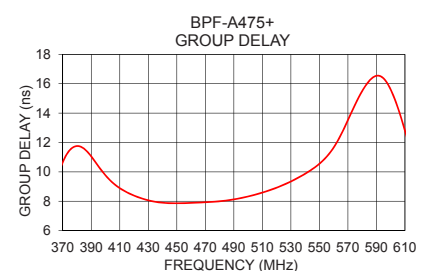
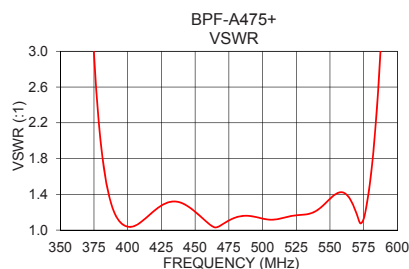
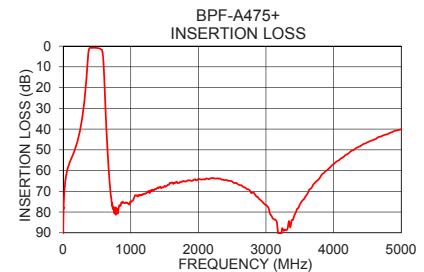
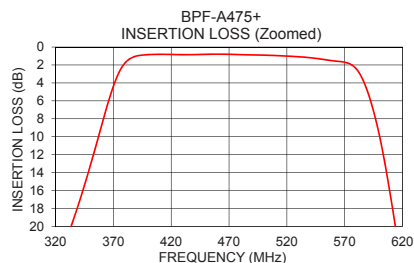


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1.0	99.92	180.04	400	9.76
100.0	55.84	411.40	405	9.26
200.0	47.30	188.77	410	8.89
300.0	30.34	91.22	415	8.61
330.0	21.28	52.26	420	8.38
372.5	3.52	3.72	425	8.20
400.0	0.84	1.04	430	8.07
475.0	0.83	1.11	435	7.96
500.0	0.90	1.13	440	7.90
550.0	1.35	1.35	475	7.96
585.0	3.46	2.40	480	8.00
615.0	20.98	25.11	490	8.12
627.5	31.00	37.40	495	8.22
650.0	46.45	56.08	500	8.33
1500.0	67.43	146.79	505	8.45
2700.0	68.39	36.30	510	8.59
3500.0	76.43	43.78	515	8.75
3800.0	63.36	55.80	520	8.92
4000.0	56.93	63.43	530	9.34
5000.0	40.13	59.42	550	10.55

+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-Circuit's 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

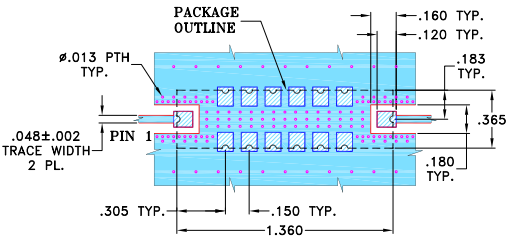
REV. OR
M174425
BPF-A475+
EDU3596
URJ
190814
Page 2 of 3

Pad Connections

INPUT	1
OUTPUT	8
GROUND	2-7,9-14

Demo Board MCL P/N: TB-363+
Suggested PCB Layout (PL-227)

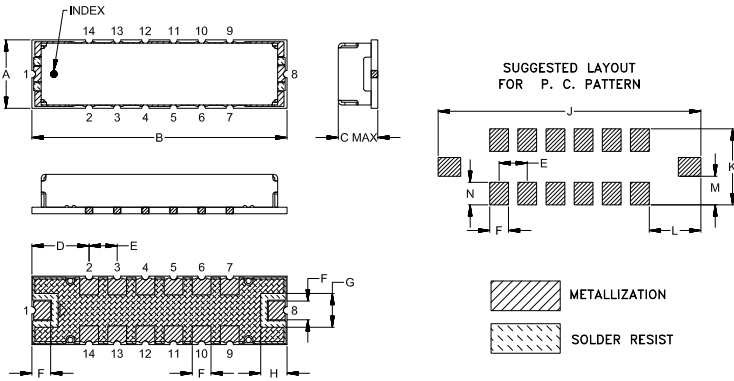
SUGGESTED MOUNTING CONFIGURATION
FOR HQ1157 AND HQ2706 CASE STYLES, of PIN CONNECTION



- NOTE:
- 1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.002". 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	K
.365	1.360	.220	.305	.150	.100	.180	.140	1.400	.405
9.27	34.54	5.59	7.75	3.81	2.54	4.57	3.56	35.56	10.29
L	M	N	Wt.						
.275	.153	.120	grams						
6.99	3.87	3.05	3.0						

Note: Please refer to case style drawing for details

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

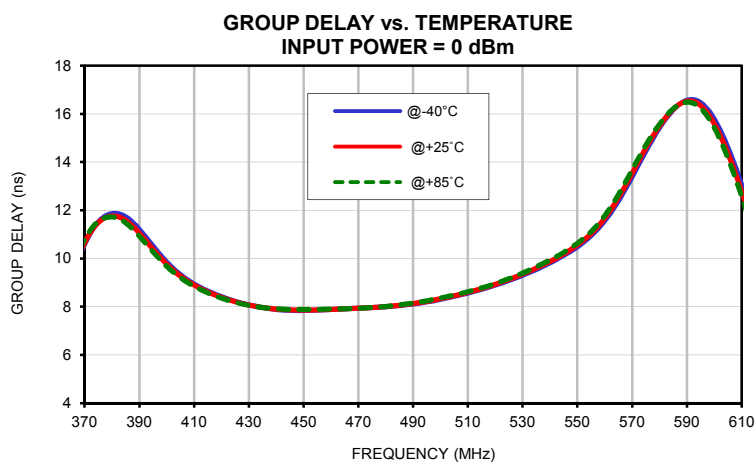
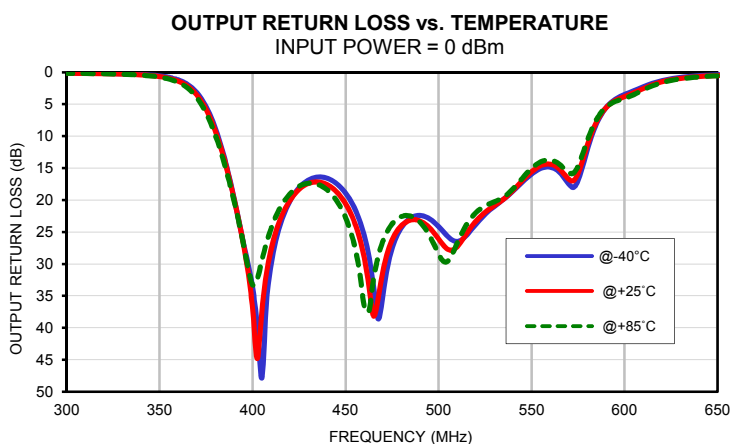
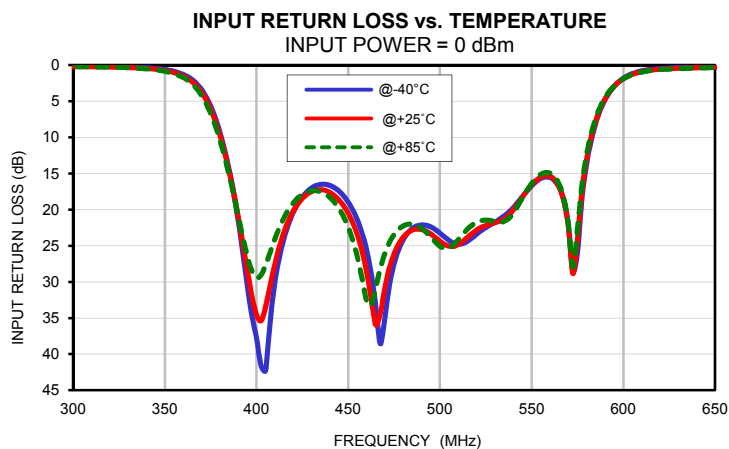
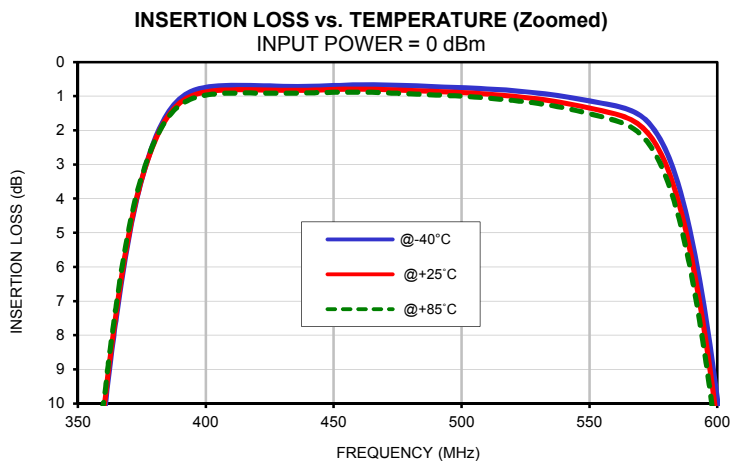
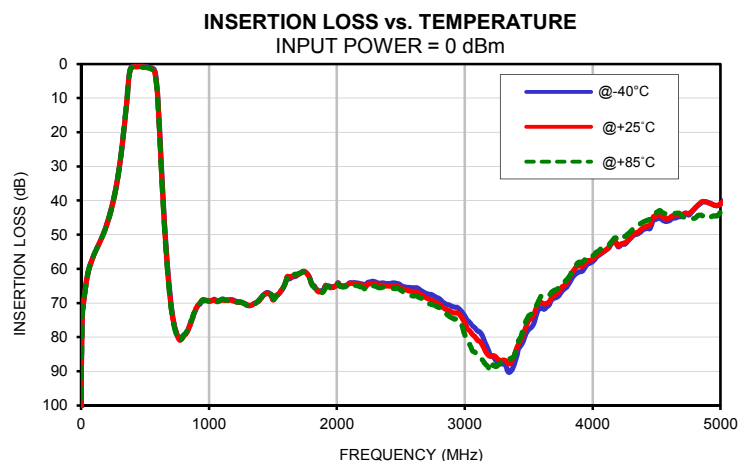
Typical Performance Data

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	99.81	97.62	93.29	0.05	0.05	0.05	0.05	0.05	0.05
10.0	72.33	72.68	72.36	0.04	0.04	0.04	0.04	0.04	0.04
50.0	61.85	61.90	61.81	0.02	0.03	0.03	0.02	0.02	0.03
60.0	60.26	60.24	60.17	0.02	0.02	0.03	0.02	0.03	0.03
80.0	57.84	57.79	57.73	0.01	0.03	0.03	0.01	0.02	0.03
100.0	55.94	55.91	55.87	0.01	0.03	0.03	0.01	0.02	0.03
120.0	54.27	54.29	54.28	0.01	0.04	0.05	0.01	0.03	0.04
140.0	52.63	52.72	52.73	0.02	0.04	0.05	0.02	0.04	0.04
160.0	50.92	51.05	51.09	0.03	0.05	0.06	0.02	0.04	0.05
180.0	49.08	49.24	49.28	0.04	0.06	0.07	0.03	0.05	0.06
200.0	47.01	47.16	47.24	0.05	0.07	0.08	0.04	0.06	0.07
220.0	44.63	44.77	44.86	0.06	0.08	0.09	0.05	0.07	0.08
230.0	43.30	43.43	43.52	0.07	0.09	0.10	0.06	0.08	0.08
240.0	41.87	41.98	42.06	0.07	0.09	0.10	0.06	0.08	0.09
260.0	38.63	38.68	38.74	0.09	0.11	0.12	0.08	0.10	0.11
280.0	34.78	34.75	34.77	0.10	0.14	0.15	0.09	0.12	0.13
300.0	30.12	30.00	29.96	0.13	0.17	0.19	0.12	0.15	0.17
310.0	27.42	27.25	27.16	0.16	0.20	0.22	0.14	0.18	0.20
330.0	21.01	20.76	20.58	0.25	0.32	0.36	0.23	0.28	0.32
350.0	13.79	13.54	13.30	0.61	0.73	0.83	0.55	0.67	0.76
375.0	3.44	3.43	3.35	5.64	6.11	6.69	5.38	5.83	6.38
400.0	0.74	0.87	0.97	37.76	34.57	29.41	33.67	36.94	33.29
475.0	0.68	0.82	0.92	27.49	26.11	23.46	27.60	26.28	23.76
500.0	0.75	0.90	1.00	23.24	24.35	25.06	24.15	26.10	28.46
520.0	0.84	1.00	1.12	23.40	22.83	21.75	23.81	23.33	22.00
550.0	1.14	1.35	1.51	16.69	16.58	16.38	15.92	15.56	15.05
580.0	2.60	3.02	3.38	13.60	12.92	12.30	12.10	11.41	10.67
615.0	20.18	21.07	21.87	0.59	0.70	0.75	1.74	1.96	2.12
627.5	29.89	30.80	31.62	0.36	0.46	0.51	0.91	1.06	1.14
650.0	45.46	46.26	47.02	0.22	0.30	0.34	0.39	0.50	0.55
900.0	71.78	71.49	71.54	0.01	0.05	0.07	0.00	0.05	0.07
1000.0	69.53	69.38	69.38	0.01	0.03	0.05	0.02	0.02	0.04
1200.0	69.33	69.52	69.55	0.03	0.02	0.04	0.04	0.00	0.03
1300.0	70.70	70.56	70.76	0.04	0.01	0.04	0.06	0.00	0.02
1700.0	61.57	61.57	61.39	0.04	0.08	0.15	0.05	0.06	0.12
1750.0	60.86	60.94	60.86	0.04	0.09	0.17	0.05	0.07	0.14
1800.0	64.14	64.28	64.18	0.03	0.11	0.20	0.04	0.09	0.17
1850.0	66.31	66.58	66.88	0.02	0.13	0.22	0.04	0.10	0.19
1900.0	65.72	65.95	66.39	0.01	0.15	0.26	0.03	0.12	0.22
1950.0	65.37	65.54	65.41	0.01	0.17	0.28	0.02	0.14	0.25
2000.0	64.71	64.75	64.83	0.01	0.20	0.32	0.02	0.16	0.28
2060.0	65.02	65.06	65.25	0.02	0.23	0.36	0.00	0.19	0.32
2120.0	64.10	64.24	64.37	0.04	0.26	0.40	0.01	0.22	0.36
2180.0	64.34	64.65	65.24	0.05	0.29	0.45	0.03	0.25	0.41
2240.0	64.05	64.58	65.11	0.07	0.32	0.49	0.04	0.28	0.45
2300.0	63.86	64.42	65.07	0.08	0.35	0.53	0.05	0.31	0.48
2360.0	64.12	64.74	65.31	0.10	0.38	0.56	0.07	0.34	0.52
2420.0	64.33	65.10	65.69	0.11	0.40	0.59	0.08	0.36	0.55
2480.0	64.38	65.15	65.75	0.13	0.43	0.63	0.10	0.38	0.58
2540.0	65.35	66.12	67.12	0.14	0.45	0.65	0.11	0.40	0.60
2600.0	65.55	66.63	67.97	0.15	0.46	0.66	0.12	0.42	0.62
2700.0	67.23	68.55	69.94	0.16	0.48	0.68	0.13	0.44	0.64
2720.0	67.51	68.87	70.17	0.16	0.47	0.68	0.14	0.44	0.64
3000.0	73.87	75.77	79.32	0.14	0.46	0.64	0.12	0.43	0.61
3300.0	87.81	86.72	87.06	0.10	0.39	0.54	0.08	0.37	0.53
3600.0	71.38	69.88	67.82	0.03	0.30	0.45	0.01	0.28	0.44
3700.0	68.58	67.82	66.28	0.01	0.27	0.42	0.01	0.26	0.42
3800.0	65.21	63.90	63.08	0.00	0.27	0.41	0.03	0.24	0.39
4000.0	57.89	57.26	56.26	0.02	0.24	0.42	0.05	0.21	0.38
5000.0	41.08	40.87	43.40	0.05	0.32	0.44	0.13	0.36	0.41

Typical Performance Data

FREQ.	GROUP DELAY		
(MHz)	(nsec)		
	@-40°C	@+25°C	@+85°C
400.0	9.85	9.76	9.68
402.5	9.57	9.50	9.43
405.0	9.33	9.26	9.21
407.5	9.12	9.06	9.01
410.0	8.94	8.89	8.85
412.5	8.78	8.74	8.70
415.0	8.65	8.61	8.57
417.5	8.53	8.49	8.46
420.0	8.41	8.39	8.35
422.5	8.32	8.29	8.27
425.0	8.23	8.21	8.19
427.5	8.14	8.13	8.11
430.0	8.07	8.07	8.06
432.5	8.01	8.01	8.01
435.0	7.96	7.96	7.96
437.5	7.92	7.93	7.93
440.0	7.89	7.90	7.91
442.5	7.86	7.88	7.89
445.0	7.85	7.87	7.88
447.5	7.85	7.86	7.88
450.0	7.84	7.86	7.88
452.5	7.85	7.86	7.88
455.0	7.86	7.87	7.89
457.5	7.87	7.88	7.89
460.0	7.88	7.89	7.90
462.5	7.90	7.90	7.91
465.0	7.91	7.91	7.92
467.5	7.92	7.92	7.93
470.0	7.94	7.94	7.94
472.5	7.95	7.95	7.95
475.0	7.96	7.96	7.97
477.5	7.98	7.98	7.99
480.0	8.00	8.00	8.01
482.5	8.02	8.03	8.04
485.0	8.05	8.06	8.07
487.5	8.08	8.09	8.11
490.0	8.11	8.13	8.15
492.5	8.15	8.17	8.20
495.0	8.20	8.22	8.25
497.5	8.24	8.27	8.30
500.0	8.30	8.33	8.36
502.5	8.36	8.39	8.42
505.0	8.43	8.45	8.48
507.5	8.49	8.52	8.55
510.0	8.57	8.59	8.62
512.5	8.64	8.67	8.70
515.0	8.72	8.75	8.78
517.5	8.80	8.83	8.86
520.0	8.89	8.92	8.96
522.5	8.99	9.02	9.06
550.0	10.48	10.55	10.63

Typical Performance Curves

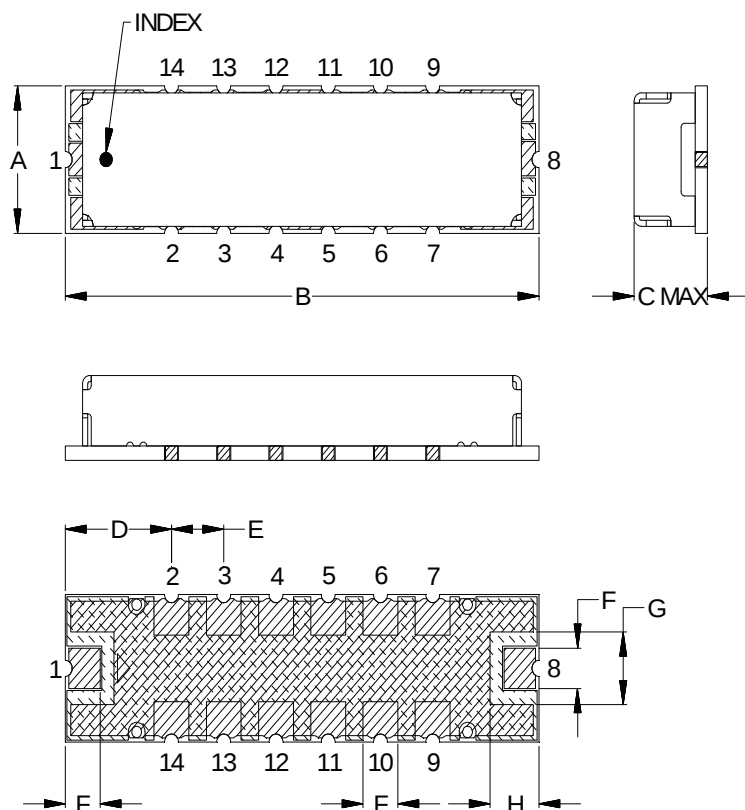


Case Style

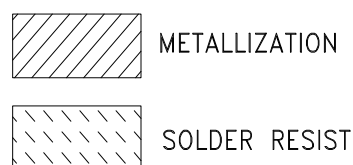
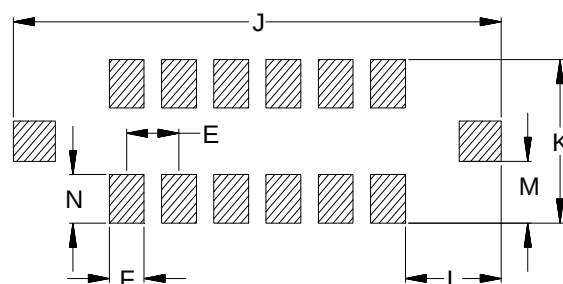
HQ

Outline Dimensions

HQ2706



SUGGESTED LAYOUT FOR P. C. PATTERN



CASE#	A	B	C	D	E	F	G	H	J	K	L
HQ2706	.365 (9.27)	1.360 (34.54)	.220 (5.59)	.305 (7.75)	.150 (3.81)	.100 (2.54)	.180 (4.57)	.140 (3.56)	1.400 (35.56)	.405 (10.29)	.275 (6.99)

CASE#	M	N	WT.GRAMS
HQ2706	.153 (3.87)	.120 (3.05)	3.0

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm .015$; 3Pl. $\pm .030$

Notes:

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

Mini-Circuits®
ISO 9001 ISO 14001 CERTIFIED

ALL NEW
minicircuits.com

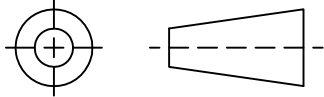
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

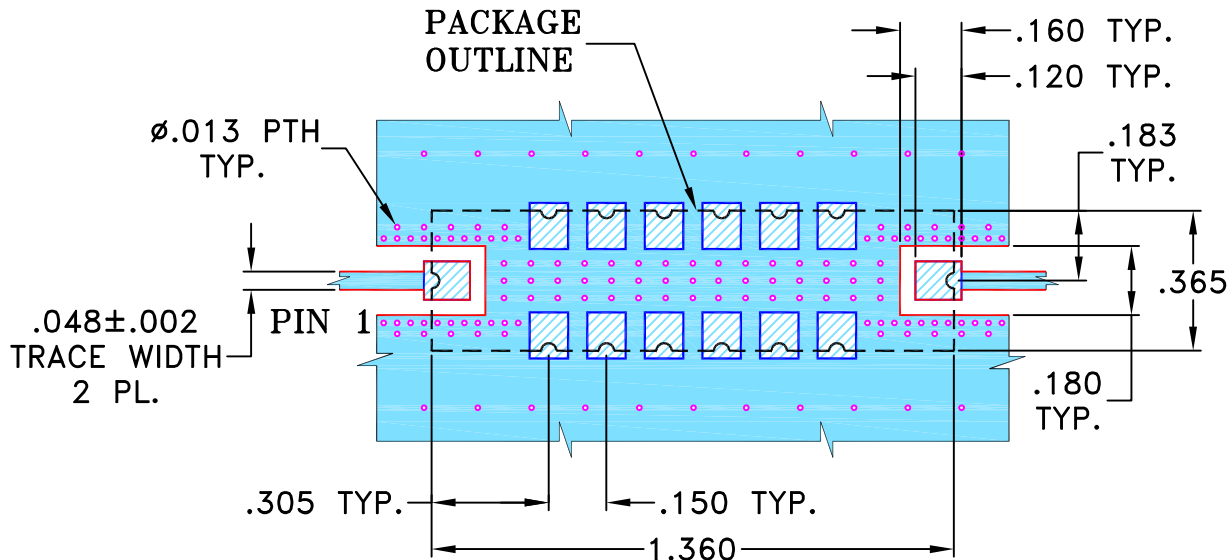
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M101212	NEW RELEASE (FROM RAVON)	11/05	DK	YB
A	M108938	SWITCH HATCHES	12/06	DK	HH
B	M118075	CHANGE LINE PLACES	06/08	HB	HH
C	M173459	CORRECTED CASE STYLE & TB PART#	03/27/19	ITG	IL

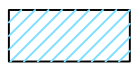
**SUGGESTED MOUNTING CONFIGURATION
FOR HQ1157 CASE STYLE, rf PIN CONNECTION**



NOTE:

- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS $.025" \pm .002"$. 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	DRAWN HB (RAVON)	12 JUN 2008
TOLERANCES ON:	CHECKED RZ (RAVON)	12 JUN 2008
2 PL DECIMALS $\pm$	APPROVED HH (RAVON)	12 JUN 2008
3 PL DECIMALS $\pm$.005		
ANGLES $\pm$		
FRACTIONS $\pm$		



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, rf, HQ1157, TB-363+, 50 OHM

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

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-227	C
FILE:	98PL227	SCALE: 2:1	SHEET: 1 OF 1

Evaluation Board and Circuit



TB-363+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: ROGERS R04350 or equivalent, Dielectric Constant=3.48, Thickness=.030 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