

Surface Mount Bandpass Filter

BPF-A535+

50Ω 460 to 610 MHz



Generic photo used for illustration purposes only

CASE STYLE: HQ1157

The Big Deal

- Sharp roll-off
- Low passband IL
- Miniature shielded package

Product Overview

The BPF-A535+ is a 50Ω bandpass filter in a shielded package (size of 0.365" x 1.360" x 0.35") fabricated using SMT technology. Covering 535 MHz ± 75 MHz band width, these units offer good matching within the passband and low IL in the passband. This unit uses a miniature high Q capacitors and wire welded inductors for high reliability. In addition it has consistent performance across temperature.

Key Features

Feature	Advantages
Good VSWR, 1.25:1 typical over passband	Good return loss over the passband which provides better impedance matching when cascaded with other devices.
Sharp roll-off	Sharp roll-off helps in adjacent channel rejection and hence increased selectivity.
Shielded case	Reduced interference with the surrounding components.

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



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Features

- Sharp roll-off
- Low passband IL
- Shielded case

Applications

- Biomedical telemetry devices
- Wireless microphones
- Television broadcasting

Electrical Specifications at 25°C

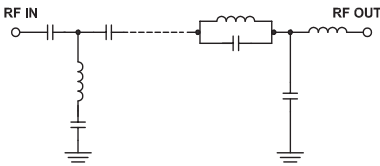
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Pass Band	Center Frequency	—	—	535	—	MHz	
	Insertion Loss	F1-F2	460 - 610	—	1.3	2.0	dB
	VSWR	F1-F2	460 - 610	—	1.25	1.5	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 380	30	40	—	dB
	VSWR	DC-F3	DC - 380	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	700 - 1600	20	30	—	dB
	VSWR	F4-F5	700 - 1600	—	20	—	:1

Maximum Ratings

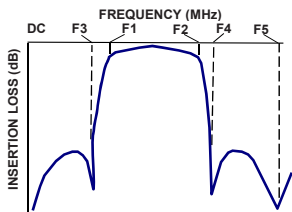
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5 W Max.

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

Functional Schematic



Typical Frequency Response

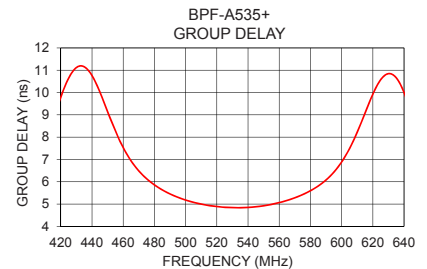
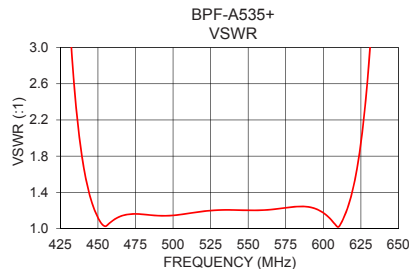
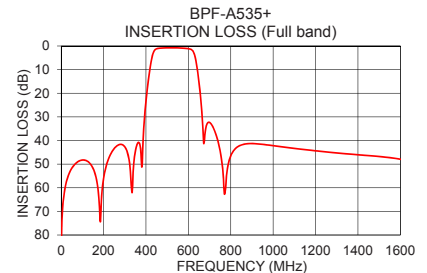
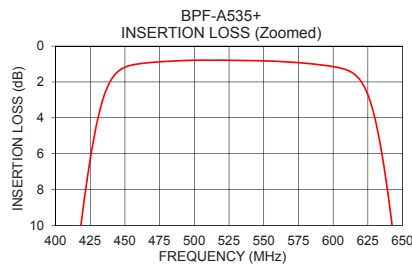


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1.0	84.13	566.36	460	7.53
50.0	51.74	1151.52	470	6.49
100.0	48.26	933.46	480	5.86
380.0	51.11	41.88	490	5.45
392.5	30.98	32.72	500	5.18
395.0	28.19	30.71	510	5.00
402.5	21.26	24.46	520	4.89
432.5	3.41	2.95	525	4.86
437.5	2.27	2.03	530	4.84
460.0	0.99	1.09	535	4.84
535.0	0.80	1.21	540	4.85
610.0	1.34	1.02	550	4.92
625.0	2.71	1.94	560	5.07
630.0	3.99	2.76	570	5.28
655.0	19.19	10.96	580	5.60
665.0	29.64	12.86	590	6.08
700.0	32.35	15.96	595	6.43
1000.0	42.19	32.63	600	6.88
1300.0	45.28	27.29	605	7.48
1600.0	47.92	28.53	610	8.22

+RoHS Compliant

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



Notes

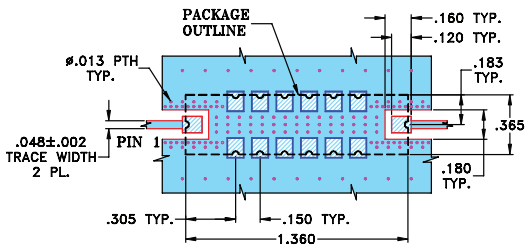
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Pad Connections

INPUT	1
OUTPUT	8
GROUND	2,3,4,5,6,7,9,10,11,12,13,14

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

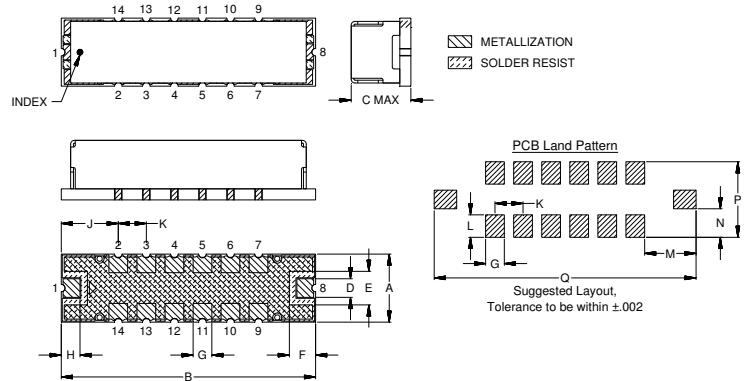


NOTE:

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
.365	1.360	.35	.100	.180	.140	.100	.100
9.27	34.54	8.89	2.54	4.57	3.56	2.54	2.54
J	K	L	M	N	P	Q	Wt.
.305	.150	.120	.275	.152	.405	1.400	grams
7.75	3.81	3.05	6.99	3.86	10.29	35.56	4.0

Note: Please refer to case style drawing for details

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Typical Performance Data

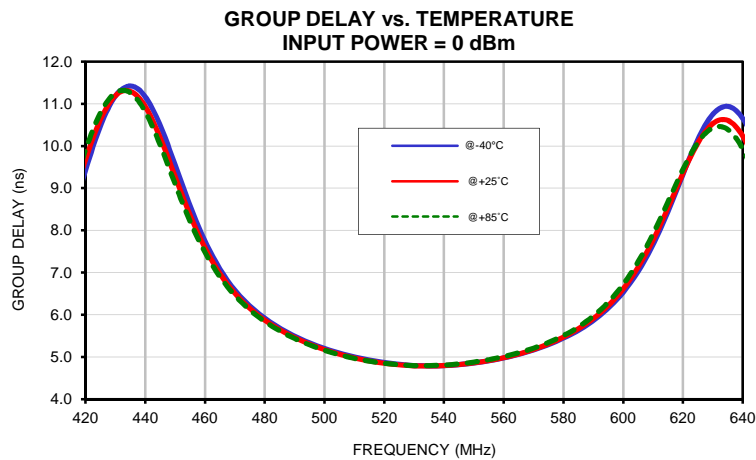
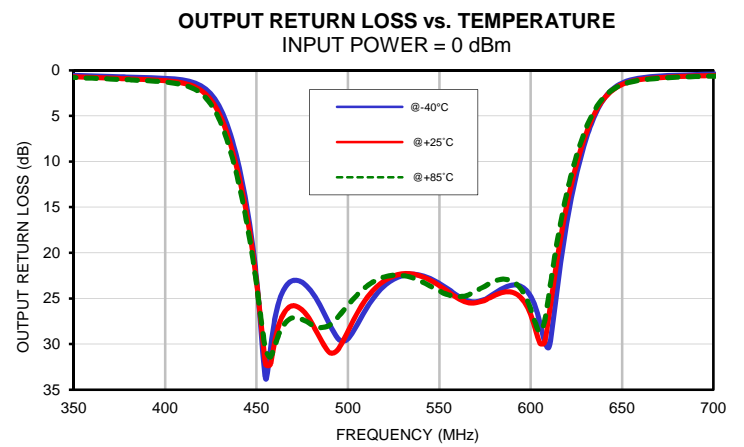
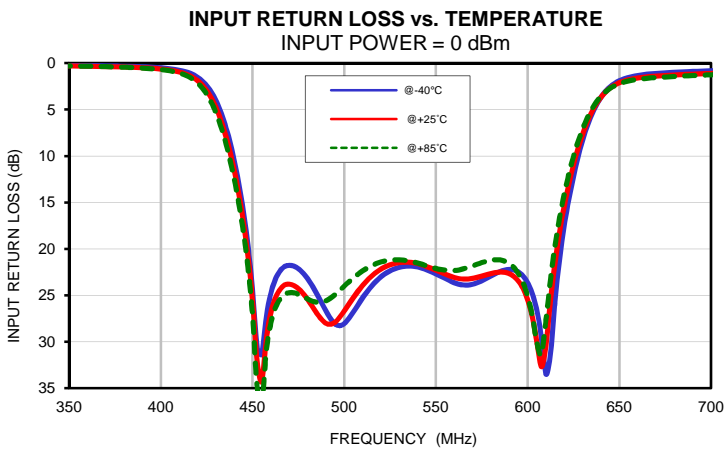
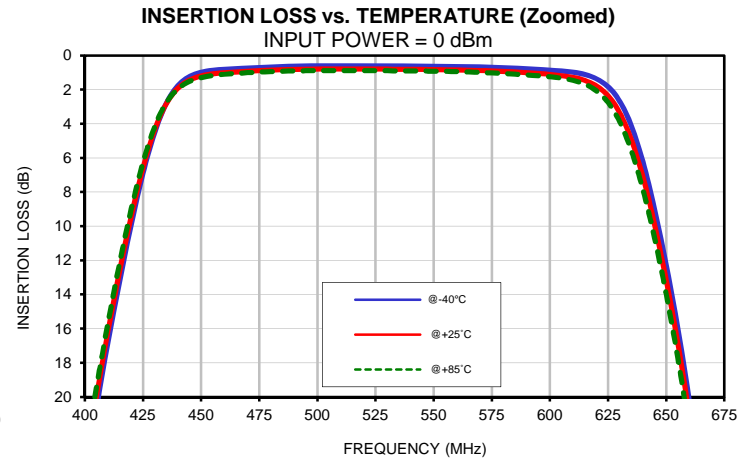
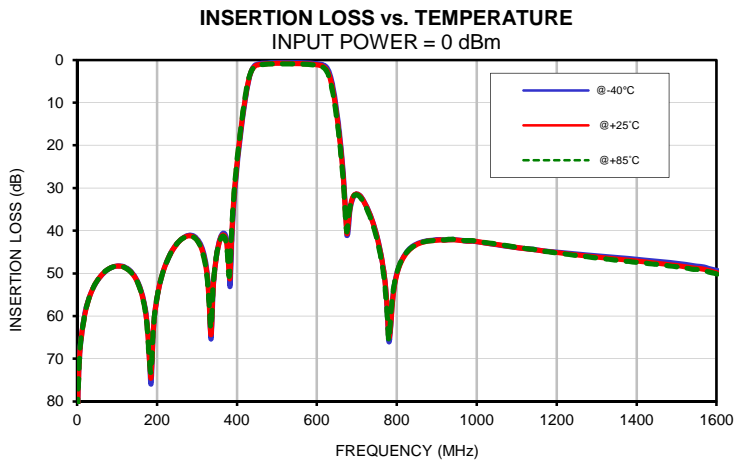
FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1.0	84.44	85.44	84.36	0.10	0.10	0.10	0.05	0.05	0.05
5.0	71.17	71.24	71.18	0.17	0.17	0.17	0.03	0.04	0.04
10.0	65.01	65.20	65.08	0.17	0.17	0.17	0.05	0.05	0.05
50.0	51.84	51.74	51.75	0.09	0.11	0.10	0.05	0.07	0.07
100.0	48.28	48.33	48.27	0.06	0.08	0.08	0.12	0.18	0.20
150.0	51.64	51.82	51.90	0.04	0.08	0.08	0.24	0.32	0.36
200.0	55.80	55.68	55.60	0.05	0.09	0.10	0.32	0.41	0.45
250.0	43.01	43.04	43.02	0.08	0.12	0.13	0.31	0.43	0.48
300.0	41.87	42.14	42.26	0.13	0.18	0.19	0.34	0.47	0.54
380.0	47.90	49.66	50.62	0.33	0.41	0.44	0.74	0.94	1.04
390.0	36.87	35.40	34.48	0.39	0.49	0.53	0.80	1.03	1.14
392.5	33.25	32.06	31.30	0.41	0.52	0.56	0.82	1.05	1.17
395.0	30.19	29.18	28.52	0.44	0.55	0.59	0.84	1.08	1.21
402.5	22.80	22.04	21.51	0.54	0.68	0.75	0.92	1.19	1.34
405.0	20.69	19.97	19.46	0.59	0.75	0.83	0.96	1.24	1.41
430.0	4.52	4.37	4.18	3.99	4.72	5.30	4.09	4.91	5.56
432.5	3.57	3.52	3.39	5.14	5.98	6.66	5.18	6.10	6.83
437.5	2.21	2.31	2.30	8.33	9.33	10.20	8.21	9.25	10.11
450.0	0.98	1.20	1.29	24.41	25.50	27.05	22.74	23.06	23.42
460.0	0.81	1.01	1.10	24.79	26.88	28.01	27.30	29.71	30.22
535.0	0.61	0.81	0.90	21.84	21.43	21.29	22.35	22.31	22.71
610.0	0.99	1.28	1.46	33.48	30.35	27.61	30.32	26.97	24.52
625.0	1.82	2.36	2.75	12.16	10.94	10.05	11.46	10.35	9.42
630.0	2.68	3.35	3.87	8.29	7.64	7.06	7.71	7.10	6.48
632.5	3.31	4.05	4.65	6.77	6.33	5.90	6.23	5.81	5.33
655.0	15.98	16.85	17.72	1.53	1.78	1.92	1.05	1.22	1.27
660.0	20.26	21.15	22.07	1.32	1.59	1.74	0.85	1.02	1.08
665.0	25.37	26.34	27.37	1.19	1.47	1.63	0.72	0.90	0.96
667.5	28.45	29.49	30.62	1.14	1.42	1.59	0.68	0.85	0.92
670.0	32.11	33.24	34.45	1.10	1.38	1.55	0.64	0.81	0.88
700.0	31.40	31.40	31.58	0.83	1.11	1.25	0.43	0.58	0.64
725.0	34.42	34.52	34.90	0.69	0.95	1.06	0.34	0.48	0.54
750.0	41.20	41.33	41.91	0.60	0.83	0.92	0.27	0.42	0.48
775.0	56.85	56.77	58.49	0.55	0.75	0.82	0.23	0.37	0.44
800.0	50.01	50.28	49.84	0.51	0.69	0.75	0.20	0.34	0.41
825.0	44.90	45.11	45.02	0.49	0.65	0.71	0.17	0.32	0.38
850.0	43.06	43.24	43.23	0.48	0.62	0.68	0.15	0.30	0.37
870.0	42.43	42.58	42.56	0.47	0.61	0.66	0.13	0.29	0.36
900.0	42.12	42.25	42.17	0.46	0.60	0.66	0.12	0.28	0.35
920.0	42.16	42.22	42.17	0.45	0.59	0.66	0.11	0.28	0.35
950.0	42.13	42.17	42.07	0.43	0.59	0.66	0.09	0.27	0.34
980.0	42.44	42.46	42.35	0.42	0.59	0.68	0.08	0.27	0.34
1000.0	42.57	42.54	42.49	0.40	0.59	0.69	0.07	0.27	0.34
1050.0	43.28	43.21	43.14	0.37	0.59	0.72	0.06	0.27	0.34
1100.0	43.96	43.94	43.89	0.33	0.60	0.74	0.05	0.27	0.35
1150.0	44.48	44.50	44.50	0.30	0.60	0.75	0.05	0.28	0.36
1200.0	45.04	45.12	45.20	0.28	0.60	0.75	0.05	0.28	0.36
1250.0	45.46	45.67	45.81	0.26	0.59	0.74	0.05	0.29	0.37
1300.0	45.86	46.16	46.39	0.25	0.58	0.73	0.05	0.30	0.38
1320.0	46.07	46.38	46.59	0.25	0.58	0.72	0.05	0.30	0.38
1340.0	46.21	46.58	46.79	0.24	0.58	0.71	0.06	0.31	0.39
1360.0	46.36	46.75	46.99	0.24	0.57	0.70	0.05	0.31	0.39
1380.0	46.54	46.96	47.20	0.24	0.57	0.70	0.05	0.31	0.39
1400.0	46.71	47.10	47.39	0.24	0.57	0.69	0.05	0.31	0.39
1420.0	46.86	47.27	47.55	0.23	0.56	0.68	0.05	0.31	0.39
1440.0	47.03	47.53	47.82	0.23	0.56	0.68	0.05	0.31	0.40
1460.0	47.25	47.71	47.98	0.23	0.55	0.67	0.05	0.32	0.40
1500.0	47.65	48.15	48.43	0.23	0.55	0.66	0.06	0.32	0.40
1550.0	48.28	48.81	49.08	0.23	0.54	0.65	0.06	0.32	0.41
1600.0	49.28	49.81	50.13	0.23	0.53	0.64	0.07	0.33	0.41



Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(ns)		
	@-40°C	@+25°C	@+85°C
460.0	7.74	7.58	7.48
462.5	7.39	7.26	7.17
465.0	7.08	6.97	6.90
467.5	6.81	6.72	6.66
470.0	6.58	6.51	6.46
472.5	6.38	6.32	6.27
475.0	6.21	6.15	6.11
477.5	6.05	6.00	5.97
480.0	5.92	5.87	5.84
482.5	5.79	5.75	5.72
485.0	5.68	5.64	5.62
487.5	5.58	5.55	5.52
490.0	5.49	5.46	5.44
492.5	5.41	5.38	5.36
495.0	5.34	5.30	5.29
497.5	5.27	5.24	5.22
500.0	5.20	5.17	5.16
502.5	5.15	5.12	5.10
505.0	5.09	5.06	5.05
507.5	5.04	5.02	5.01
510.0	5.00	4.98	4.97
512.5	4.96	4.94	4.93
515.0	4.92	4.90	4.90
517.5	4.89	4.87	4.87
520.0	4.86	4.85	4.85
522.5	4.84	4.83	4.83
525.0	4.82	4.81	4.82
527.5	4.81	4.80	4.80
530.0	4.80	4.79	4.80
532.5	4.79	4.78	4.79
535.0	4.79	4.78	4.79
537.5	4.79	4.79	4.80
540.0	4.79	4.79	4.81
542.5	4.80	4.80	4.82
545.0	4.82	4.82	4.84
547.5	4.83	4.83	4.85
550.0	4.85	4.86	4.88
552.5	4.88	4.88	4.90
555.0	4.91	4.91	4.93
557.5	4.94	4.95	4.97
560.0	4.98	4.98	5.01
562.5	5.02	5.02	5.05
565.0	5.06	5.07	5.10
567.5	5.11	5.12	5.15
570.0	5.17	5.18	5.21
572.5	5.23	5.24	5.27
575.0	5.29	5.31	5.34
577.5	5.36	5.39	5.42
580.0	5.45	5.47	5.51
582.5	5.53	5.56	5.60
585.0	5.63	5.66	5.71
587.5	5.74	5.78	5.83
590.0	5.86	5.91	5.97
592.5	6.00	6.05	6.12
595.0	6.16	6.22	6.30
597.5	6.33	6.40	6.50
600.0	6.53	6.61	6.72
602.5	6.76	6.85	6.97
605.0	7.03	7.13	7.26
610.0	7.66	7.77	7.92

Typical Performance Curves

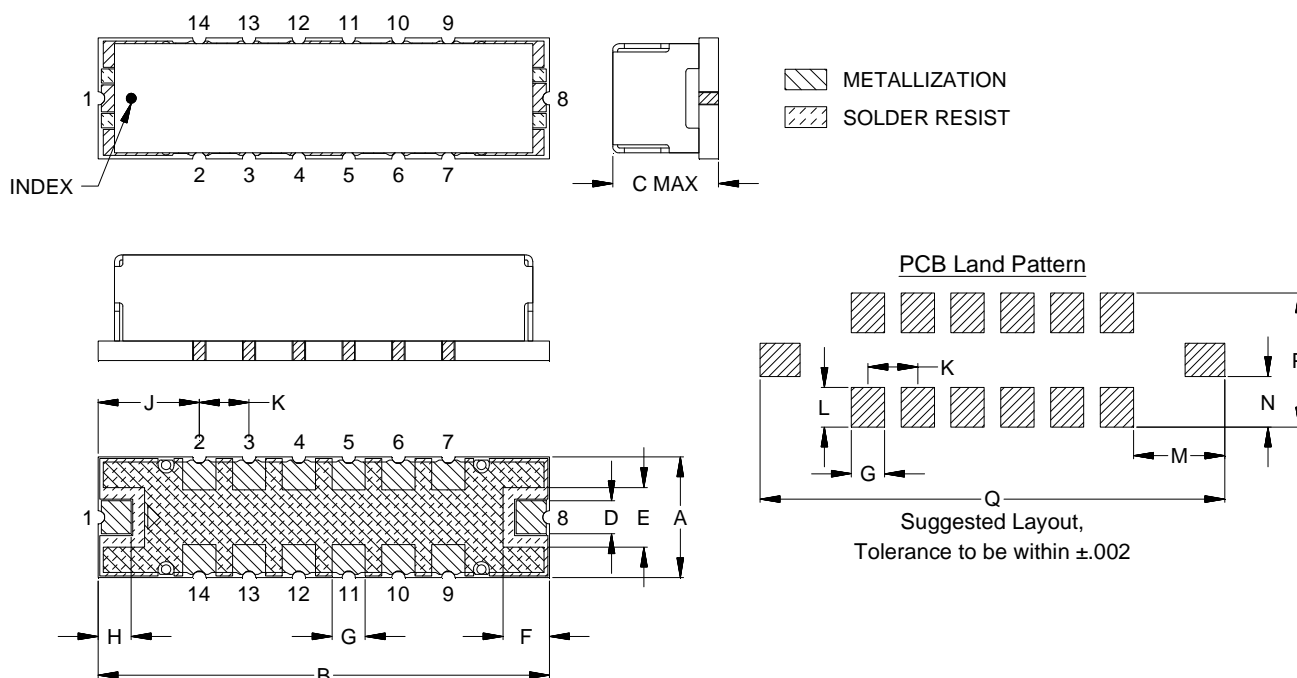


Case Style

HQ

Outline Dimensions

HQ1157



CASE#	A	B	C	D	E	F	G	H	J	K	L	M
HQ1157	.365 (9.27)	1.360 (34.54)	.350 (8.89)	.100 (2.54)	.180 (4.57)	.140 (3.56)	.100 (2.54)	.100 (2.54)	.305 (7.75)	.150 (3.81)	.120 (3.05)	.275 (6.99)

CASE#	N	P	Q	WT.GRAM
HQ1157	.152 (3.87)	.405 (10.29)	1.400 (35.56)	4.0

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

Notes:

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

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ISO 9001 ISO 14001 CERTIFIED

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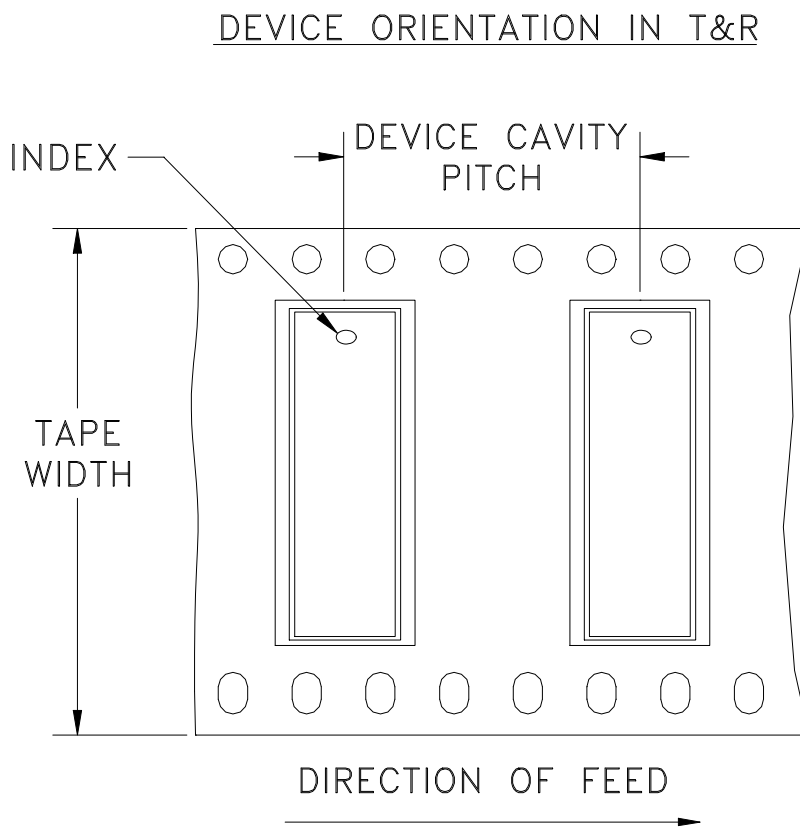
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F83



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
56	16	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



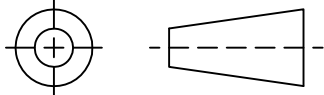
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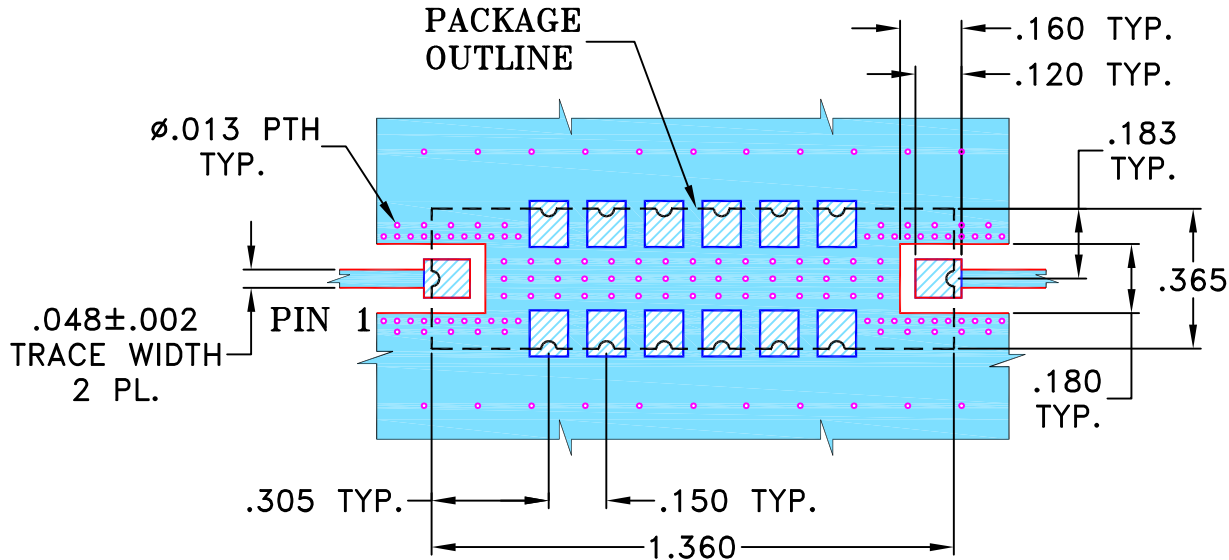
THIRD ANGLE PROJECTION



REVISIONS


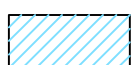
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M101212	NEW RELEASE (FROM RAVON)	11/05	DK	YB
A	M108938	SWITCH HATCHES	12/06	DK	HH
B	M118075	CHANGE LINE PLACES	06/08	HB	HH
C	M173459	CORRECTED CASE STYLE & TB PART#	03/27/19	ITG	IL

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



NOTE:

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.

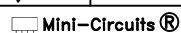
-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
-  DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

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 ±	APPROVED HH (RAVON)	12 JUN 2008
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

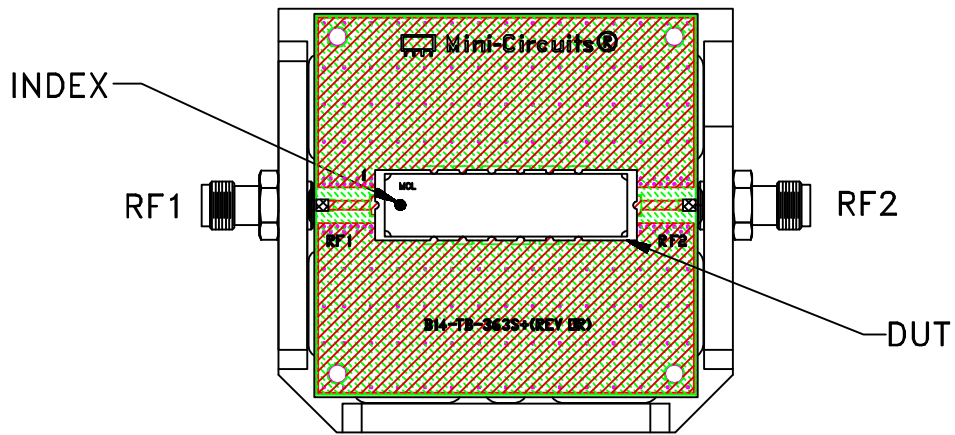

Mini-Circuits® 13 Neptune Avenue
 Brooklyn NY 11235

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

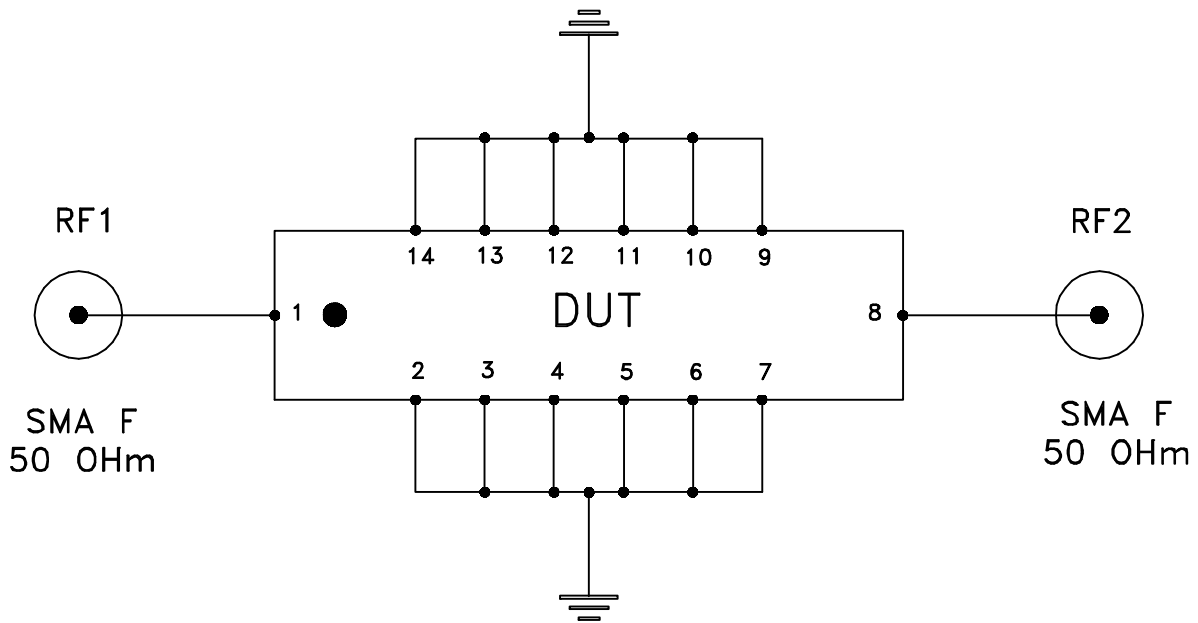
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-227	C
FILE:	98PL227	SCALE:	SHEET:
		2:1	1 OF 1


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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