

Surface Mount Bandpass Filter

BPF-A535+

50Ω 460 to 610 MHz

The Big Deal

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



Generic photo used for illustration purposes only
CASE STYLE: HQ1157

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 $\pm$ 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

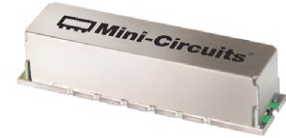
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CASE STYLE: HQ1157

Features

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

Applications

- Biomedical telemetry devices
- Wireless microphones
- Television broadcasting

Electrical Specifications at 25°C

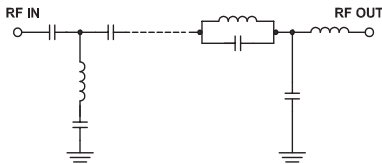
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	—	535	—	MHz
	Insertion Loss	F1-F2	460 - 610	—	1.3	2.0	dB
	VSWR	F1-F2	460 - 610	—	1.25	1.5	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 380	30	40	—	dB
	VSWR	DC-F3	DC - 380	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5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

Maximum Ratings

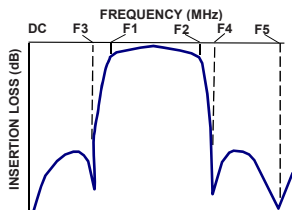
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5 W Max.

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

Functional Schematic



Typical Frequency Response

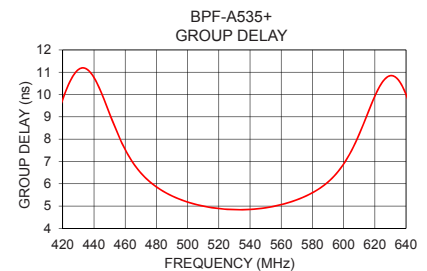
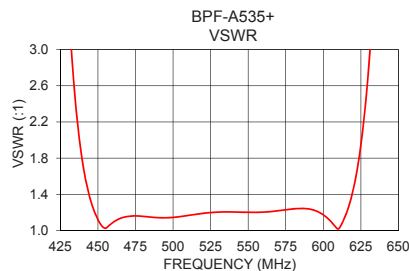
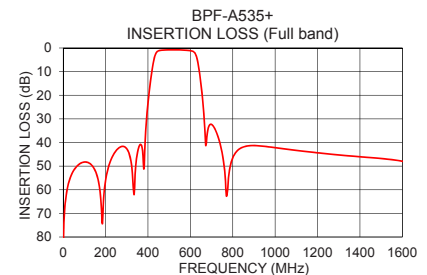
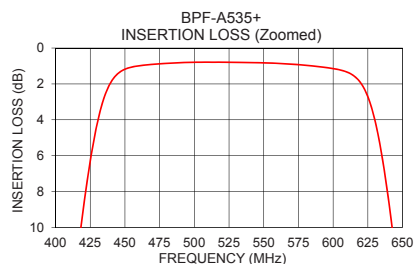


+RoHS Compliant

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

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



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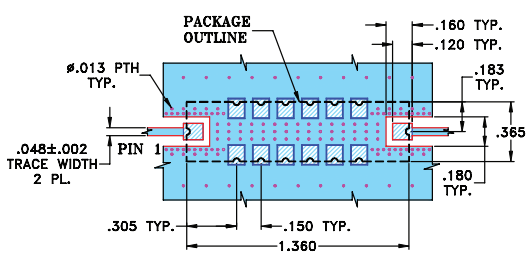
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Page 1 of 2

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)

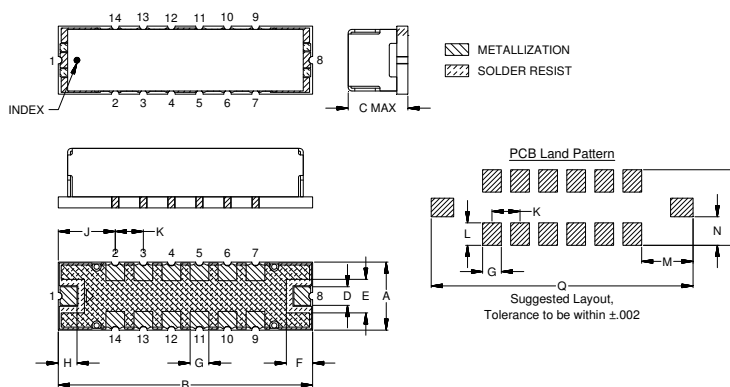


NOTE:

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 ($\frac{\text{inch}}{\text{mm}}$)

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	1.405	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

Notes

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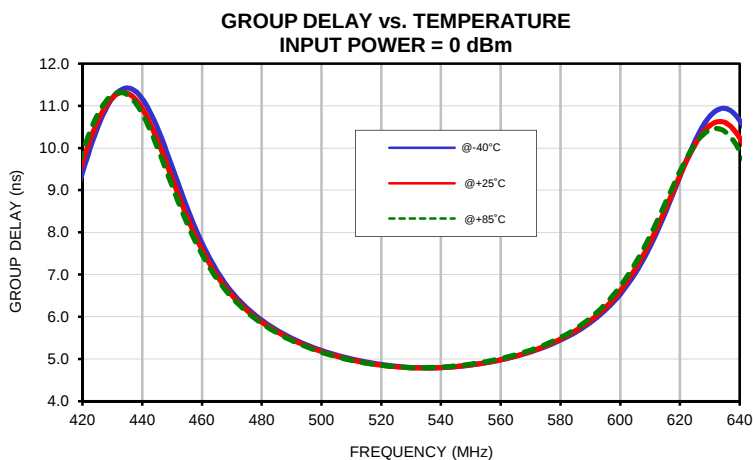
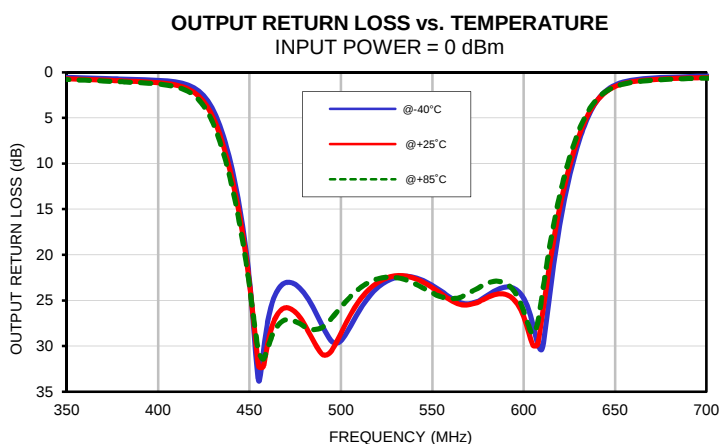
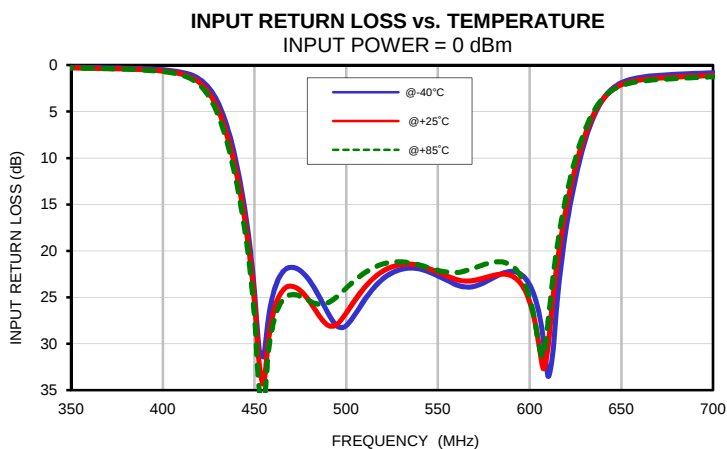
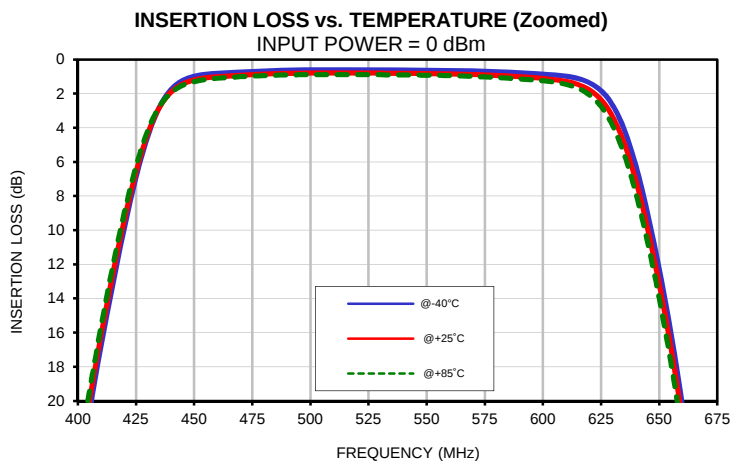
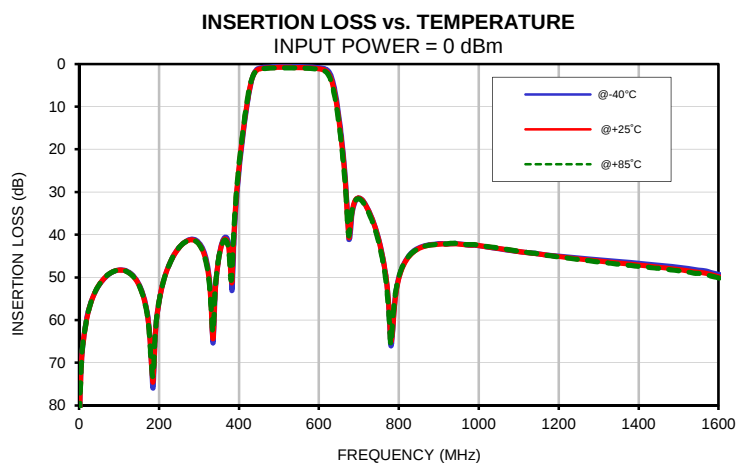
Typical Performance Data

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
1.0	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

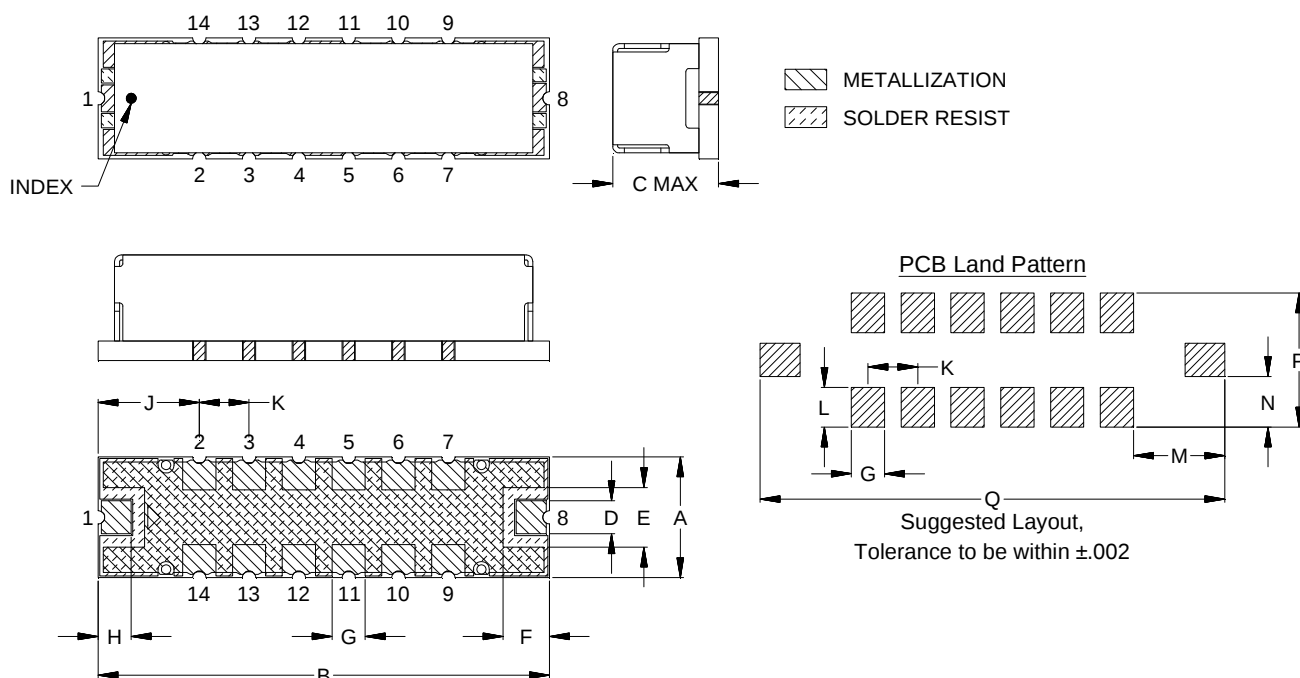
FREQ. (MHz)	GROUP DELAY		
	(ns)		
	@-40°C	@+25°C	@+85°C
460.0	7.74	7.58	7.48
462.5	7.39	7.26	7.17
465.0	7.08	6.97	6.90
467.5	6.81	6.72	6.66
470.0	6.58	6.51	6.46
472.5	6.38	6.32	6.27
475.0	6.21	6.15	6.11
477.5	6.05	6.00	5.97
480.0	5.92	5.87	5.84
482.5	5.79	5.75	5.72
485.0	5.68	5.64	5.62
487.5	5.58	5.55	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



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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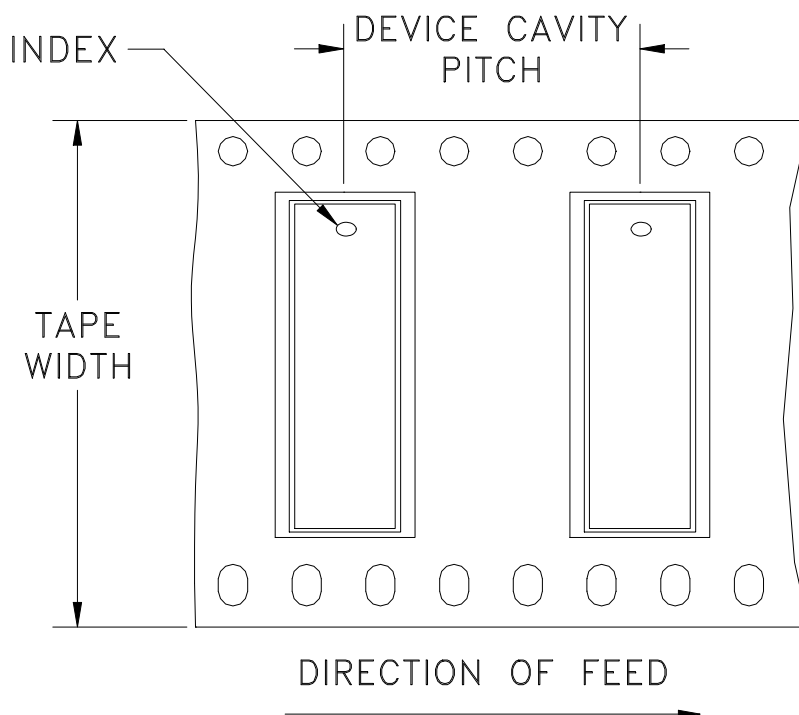


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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F83

DEVICE ORIENTATION IN T&R



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

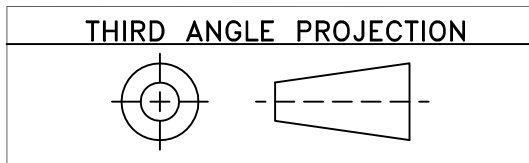


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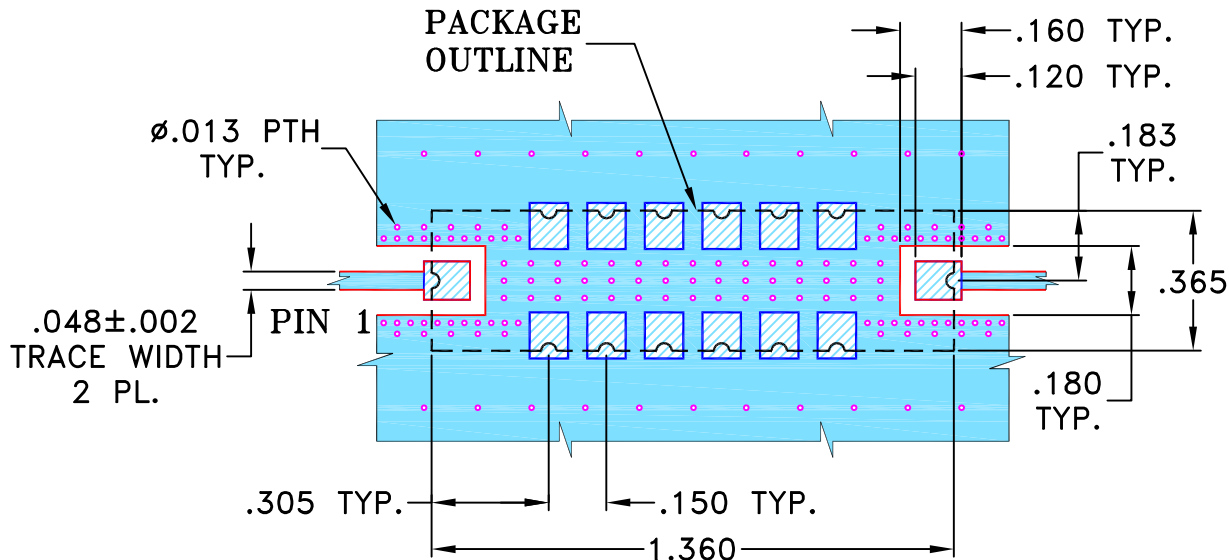
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REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M101212	NEW RELEASE (FROM RAVON)	11/05	DK	YB
A	M108938	SWITCH HATCHES	12/06	DK	HH
B	M118075	CHANGE LINE PLACES	06/08	HB	HH
C	M173459	CORRECTED CASE STYLE & TB PART#	03/27/19	ITG	IL

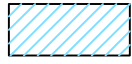
**SUGGESTED MOUNTING CONFIGURATION
FOR HQ1157 CASE STYLE, rf PIN CONNECTION**



NOTE:

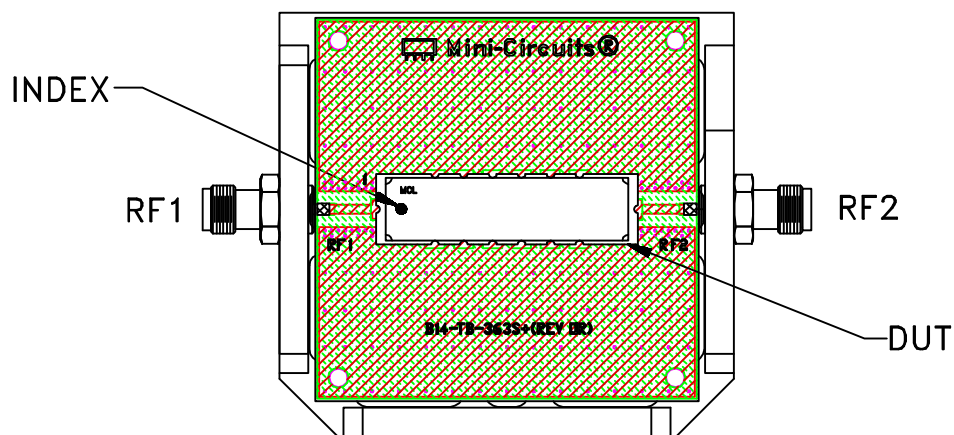
- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.002". COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

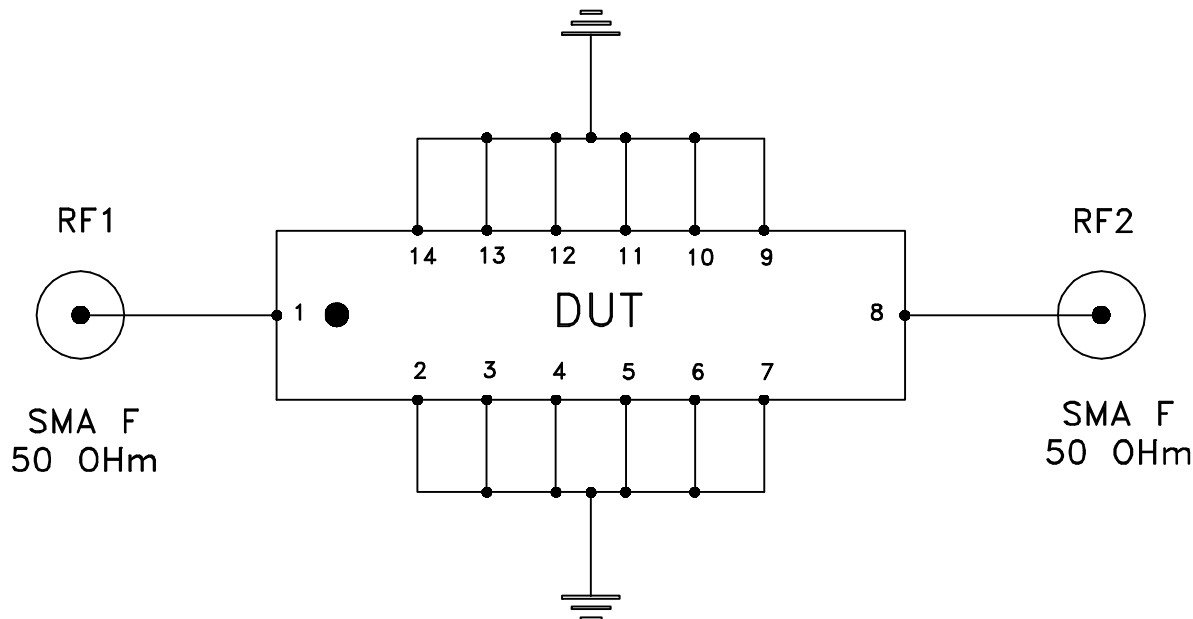
 DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS		DATE		Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235									
DIMENSIONS ARE IN INCHES		DRAWN	HB (RAVON)	12 JUN 2008		PL, rf, HQ1157, TB-363+, 50 OHM									
TOLERANCES ON:		CHECKED	RZ (RAVON)	12 JUN 2008											
2 PL DECIMALS ±		APPROVED	HH (RAVON)	12 JUN 2008											
3 PL DECIMALS ± .005															
ANGLES ±															
FRACTIONS ±															
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ASHEETA1.DWG REV:A DATE:01/12/95						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