Surface Mount

Bandpass Filter

BPF-A410+

50Ω 365 to 455 MHz

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input*	0.5W at 25°C

*Passband rating, derate linearly to 0.25W at 100°C ambient. Permanent damage may occur if any of these limits are exceeded.

Pin Connections

RF IN	1
RF OUT	8
GROUND	2,3,4,5,6,7,9,10,11,12,13,14

Features

- Linear phase, up to ±8 deg typ @ Fc ± 45 MHz
- High rejection
- Shielded case
- Aqueous washable

Applications

- Military communications
- Harmonic rejection
- Transmitters/receivers

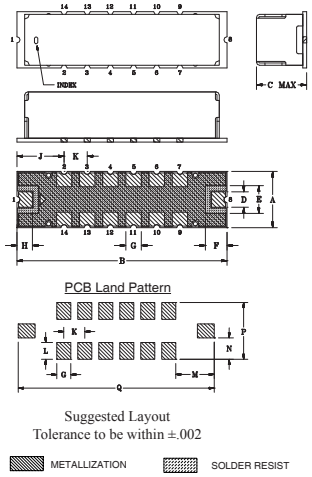
Generic photo used for illustration purposes only

CASE STYLE: HQ1157

+RoHS Compliant

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

Outline Drawing



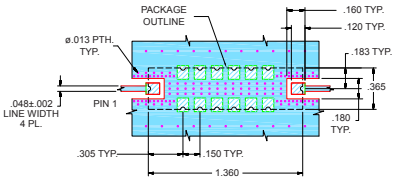
Outline Dimensions (inch / mm)

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

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



NOTES: 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.

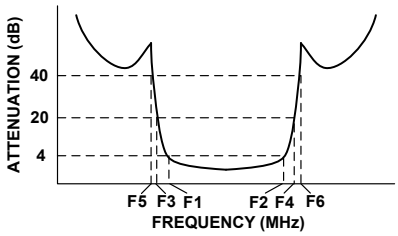
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

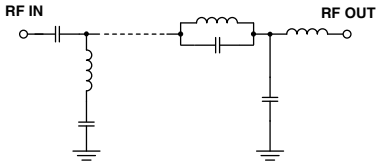
Bandpass Filter Electrical Specifications (T_{AMB} = 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz)	STOPBANDS (MHz)				MAXIMUM DEVIATION FROM LINEAR PHASE (deg.)	VSWR (:1)		
	(Loss < 4dB)	Loss > 20dB		Loss > 40dB			Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Fc ± 45MHz	Typ.	Max.	Typ.
410	365 - 455	300	515	275	535-2200	±15	1.5	1.9	20

Typical Frequency Response

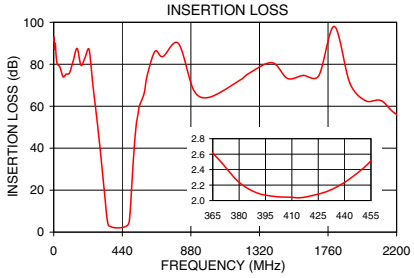


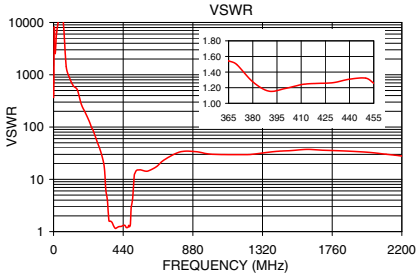
Functional Schematic

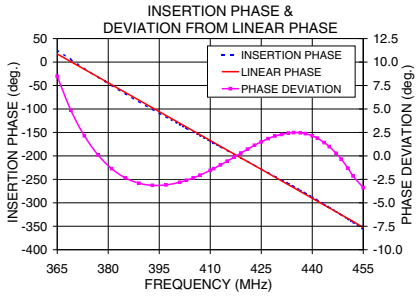


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Deviation from Linear Phase (deg.)
0.5	91.09	366.11	365.0	8.48
275	55.04	52.96	370.0	4.11
300	37.87	32.29	375.0	1.57
320	23.09	17.31	380.0	-0.69
330	15.36	6.44	390.0	-2.91
340	7.64	4.00	395.0	-3.16
365	2.61	1.54	400.0	-2.97
380	2.24	1.28	405.0	-2.41
410	2.04	1.24	410.0	-1.63
430	2.12	1.26	415.0	-0.66
455	2.51	1.26	419.0	0.19
485	5.28	1.36	425.0	1.41
490	9.11	2.80	430.0	2.18
495	15.26	3.43	435.0	2.48
515	38.52	13.23	440.0	2.14
535	53.84	15.14	445.0	0.99
1000	64.28	30.17	450.0	-1.06
2200	56.09	27.88	455.0	-4.08







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 Band Pass Filter BPF-A410+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURNLOSS (dB)		
	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C	@ -40° C	@ +25° C	@ +85° C
0.5	87.19	107.46	98.68	0.01	0.00	0.01	0.00	0.00	0.00
10	87.41	84.17	88.83	0.00	0.01	0.00	0.01	0.02	0.02
50	74.54	75.71	75.72	0.01	0.01	0.02	0.30	0.39	0.44
100	78.41	76.85	79.07	0.01	0.04	0.05	0.92	1.10	1.22
200	82.25	81.38	82.09	0.09	0.14	0.16	0.56	0.70	0.79
250	69.26	69.39	69.59	0.19	0.24	0.28	1.50	1.84	2.06
260	64.87	64.86	64.42	0.23	0.28	0.32	1.63	2.02	2.31
270	59.12	59.13	58.87	0.26	0.32	0.36	1.67	2.07	2.38
275	56.35	56.15	56.07	0.29	0.35	0.38	1.64	2.03	2.31
280	53.31	53.17	53.05	0.31	0.38	0.42	1.58	1.95	2.21
290	46.97	46.89	46.82	0.37	0.45	0.49	1.42	1.73	1.94
300	40.46	40.38	40.27	0.47	0.55	0.61	1.25	1.53	1.70
310	33.64	33.55	33.42	0.59	0.70	0.78	1.19	1.46	1.62
320	26.42	26.31	26.15	0.80	0.96	1.07	1.34	1.63	1.81
330	18.68	18.53	18.33	1.25	1.50	1.71	1.88	2.30	2.57
340	10.66	10.57	10.42	2.66	3.19	3.71	3.56	4.42	5.10
350	4.58	4.87	5.04	8.13	9.27	10.54	9.24	10.85	12.43
360	2.58	3.04	3.36	22.61	24.84	28.91	18.50	18.01	17.73
365	2.30	2.74	3.06	39.22	36.71	29.52	21.34	19.51	18.18
370	2.14	2.57	2.89	27.35	24.39	21.83	22.01	19.55	17.71
380	1.97	2.38	2.68	21.17	19.90	18.58	19.88	18.49	17.21
390	1.86	2.25	2.53	21.73	21.47	20.66	22.35	22.22	21.98
400	1.82	2.21	2.50	20.91	20.37	19.20	31.86	32.69	29.49
410	1.88	2.28	2.58	16.35	15.70	14.89	18.63	17.77	16.81
420	1.95	2.36	2.66	14.50	14.08	13.60	15.10	14.56	13.99
430	1.94	2.36	2.64	15.96	15.96	15.79	15.84	15.67	15.39
440	1.93	2.36	2.66	22.50	22.79	22.40	23.21	23.94	23.91
450	2.07	2.56	2.90	19.26	17.80	16.70	22.87	20.52	18.74
455	2.21	2.72	3.08	16.34	15.47	14.76	17.70	16.55	15.47
460	2.35	2.88	3.25	15.28	14.96	14.65	15.48	14.88	14.18
470	2.63	3.22	3.63	19.66	21.94	24.34	15.63	15.60	15.26
480	3.28	4.11	4.72	20.81	19.65	18.83	14.94	13.68	12.73
485	4.13	5.26	6.13	21.70	21.54	22.11	11.99	10.58	9.66
490	6.57	8.28	9.63	11.14	10.63	10.02	6.74	6.09	5.62
495	11.95	14.00	15.59	4.80	4.93	4.86	3.31	3.36	3.34
500	18.68	20.66	22.21	2.70	2.97	3.05	2.12	2.36	2.47
515	37.15	38.74	39.98	1.29	1.53	1.64	1.38	1.65	1.79
535	54.41	55.34	56.10	1.01	1.22	1.33	1.23	1.50	1.66
600	69.14	69.32	70.06	1.06	1.35	1.52	1.57	2.00	2.36
700	80.47	78.80	79.51	0.67	0.91	1.03	2.08	2.53	2.77
800	76.25	72.49	76.77	0.45	0.64	0.70	2.37	3.03	3.67
900	69.48	70.42	69.84	0.41	0.57	0.62	1.56	1.75	1.87
1000	70.40	70.74	69.76	0.43	0.59	0.64	0.75	1.00	1.20
1100	69.89	67.95	70.71	0.44	0.65	0.73	0.60	0.90	1.12
1200	71.07	67.59	70.93	0.43	0.72	0.85	0.53	0.88	1.10
1300	66.30	70.29	67.77	0.44	0.79	0.96	0.50	0.89	1.10
1400	69.81	72.73	73.07	0.45	0.83	1.03	0.48	0.89	1.09
1500	77.75	81.68	81.25	0.46	0.85	1.05	0.46	0.88	1.07
1600	94.69	88.16	83.38	0.46	0.84	1.03	0.44	0.88	1.06
1700	94.52	93.19	86.49	0.48	0.84	1.02	0.41	0.86	1.05
1800	79.19	77.12	79.59	0.47	0.81	0.98	0.38	0.84	1.05
1900	82.24	83.53	81.76	0.46	0.79	0.94	0.35	0.81	1.04
2000	62.88	65.14	64.28	0.45	0.76	0.92	0.34	0.79	1.05
2100	66.61	71.41	68.18	0.43	0.74	0.89	0.30	0.75	1.03
2200	75.41	62.88	69.55	0.41	0.74	0.88	0.28	0.72	1.02

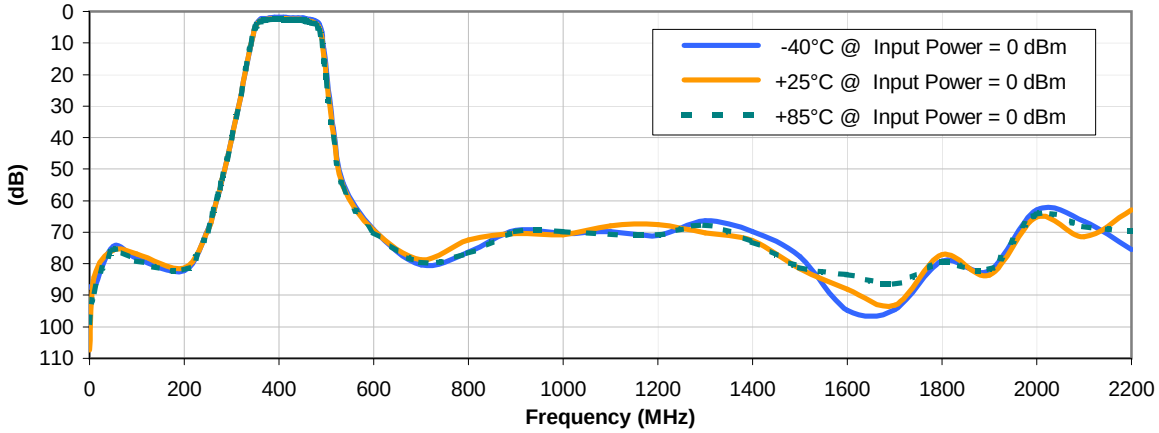
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
365	15.51	15.28	15.04
366	15.22	15.00	14.79
368	14.69	14.52	14.32
370	14.24	14.08	13.92
372	13.84	13.71	13.55
374	13.49	13.37	13.23
375	13.33	13.22	13.09
376	13.17	13.08	12.95
378	12.90	12.81	12.70
380	12.65	12.58	12.49
382	12.44	12.39	12.31
384	12.26	12.22	12.16
385	12.18	12.14	12.08
386	12.09	12.06	12.02
388	11.95	11.92	11.90
390	11.82	11.82	11.79
392	11.73	11.72	11.70
394	11.63	11.62	11.60
395	11.59	11.59	11.57
396	11.56	11.55	11.53
398	11.45	11.46	11.45
400	11.38	11.38	11.36
402	11.31	11.30	11.28
404	11.24	11.24	11.21
405	11.20	11.20	11.16
406	11.18	11.17	11.13
408	11.11	11.09	11.05
410	11.05	11.04	11.00
412	11.01	10.99	10.95
414	10.97	10.95	10.92
415	10.95	10.94	10.90
416	10.93	10.92	10.89
418	10.93	10.92	10.89
420	10.94	10.94	10.93
422	10.96	10.97	10.97
424	11.00	11.02	11.03
425	11.04	11.06	11.08
426	11.06	11.11	11.12
428	11.17	11.21	11.24
430	11.26	11.33	11.37
432	11.39	11.46	11.51
434	11.53	11.61	11.67
435	11.59	11.68	11.76
436	11.67	11.77	11.85
438	11.83	11.93	12.00
440	11.99	12.10	12.19
442	12.15	12.26	12.33
444	12.32	12.41	12.49
445	12.39	12.49	12.56
446	12.48	12.57	12.64
448	12.63	12.71	12.77
450	12.79	12.87	12.93
454	13.15	13.23	13.29
455	13.25	13.34	13.40

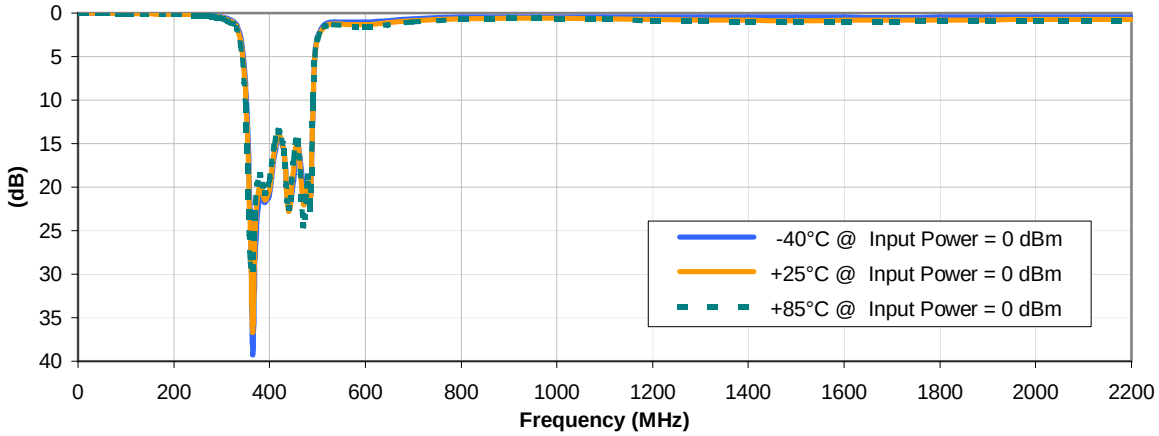
Surface Mount Band Pass Filter BPF-A410+

Typical Performance Curves

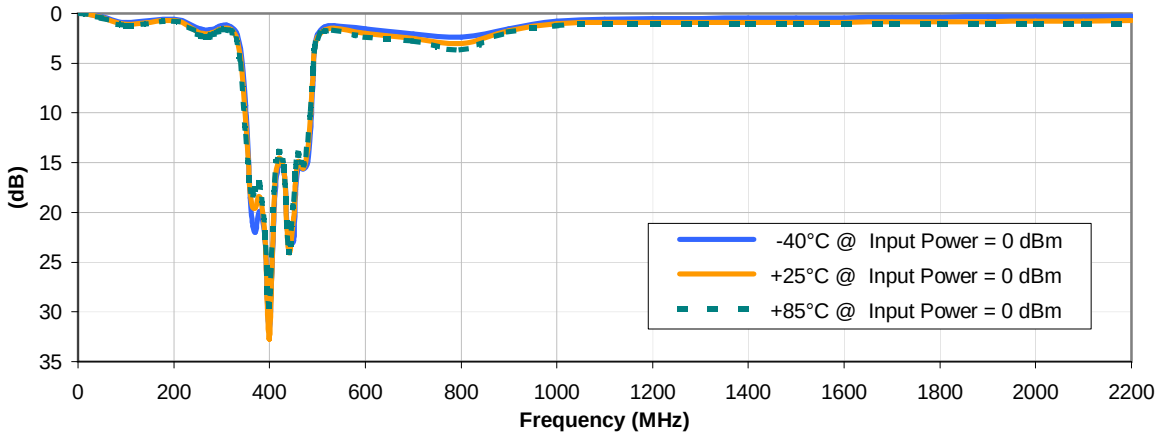
INSERTION LOSS vs. TEMPERATURE



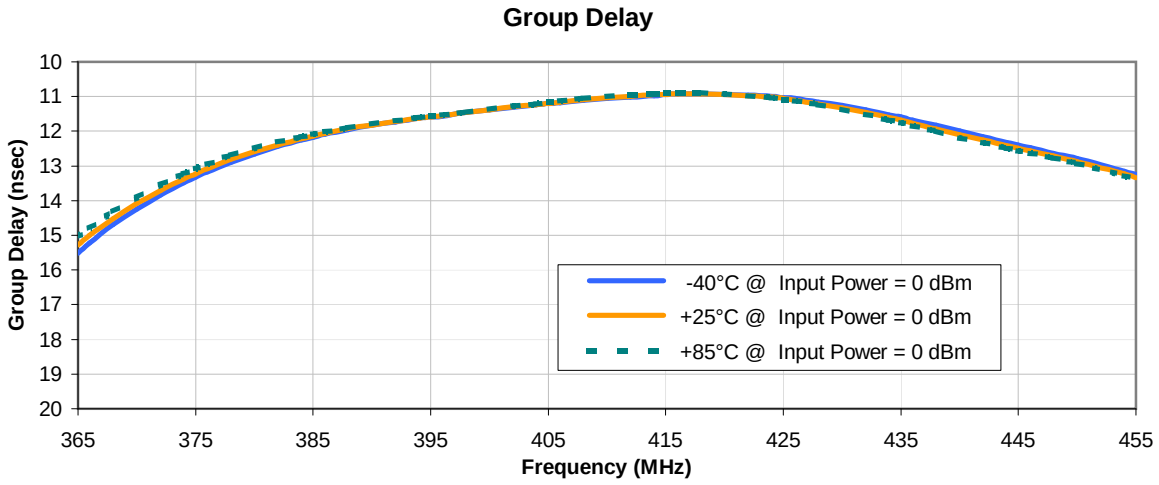
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



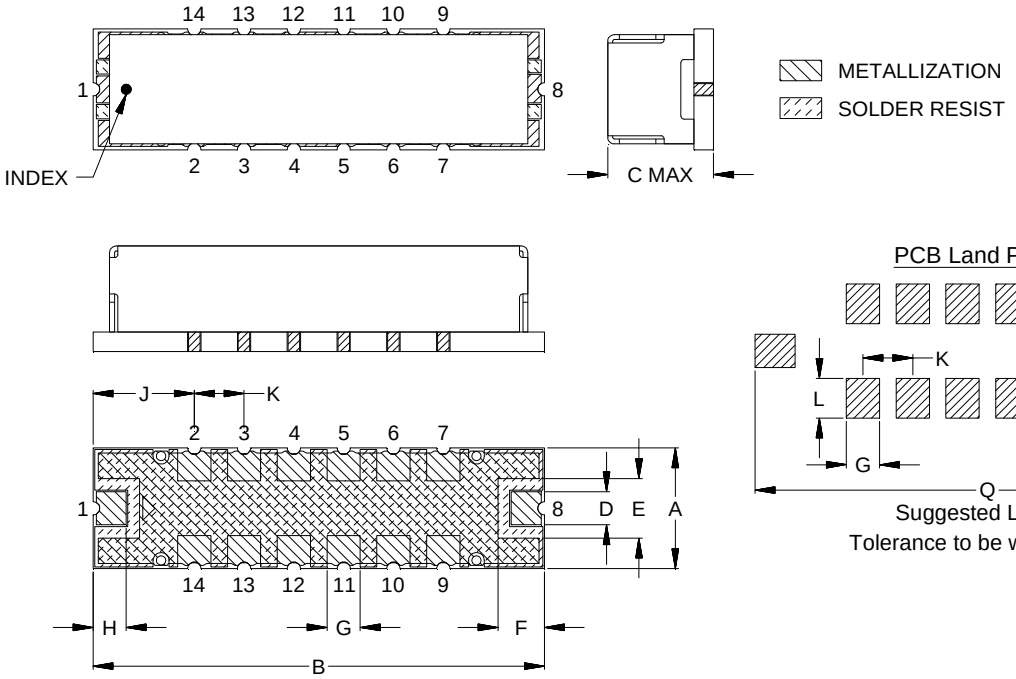
Typical Performance Curves



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

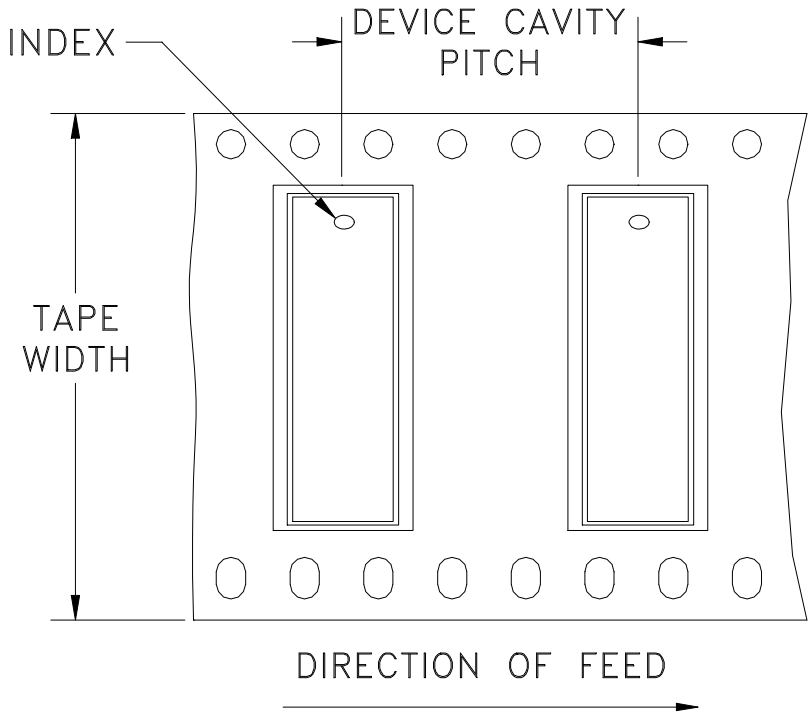
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. 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.

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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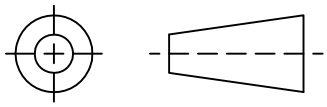
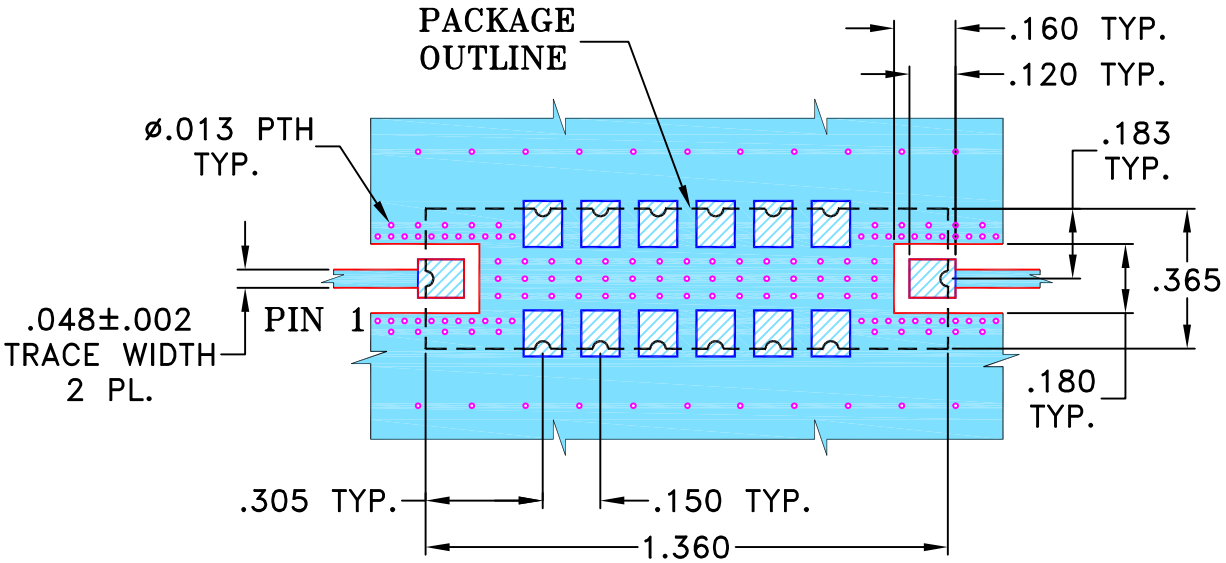
THIRD ANGLE PROJECTION



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 ±			

ASHEETA1.DWG REV:A DATE:01/12/95

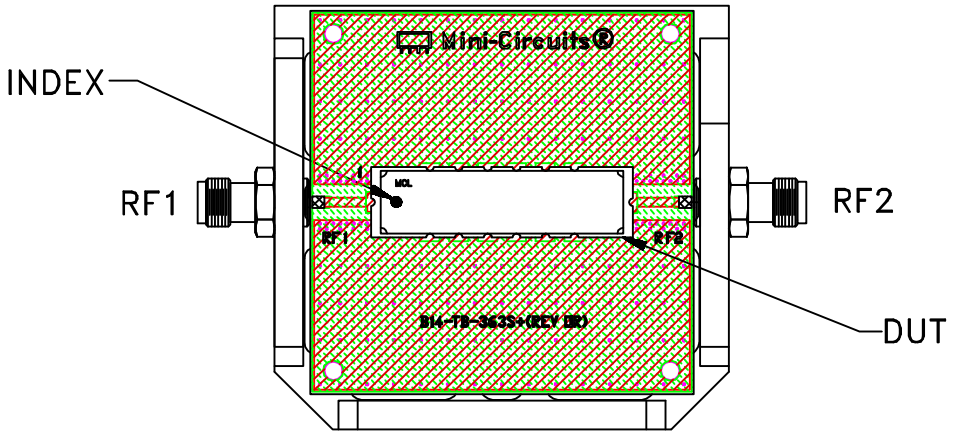
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

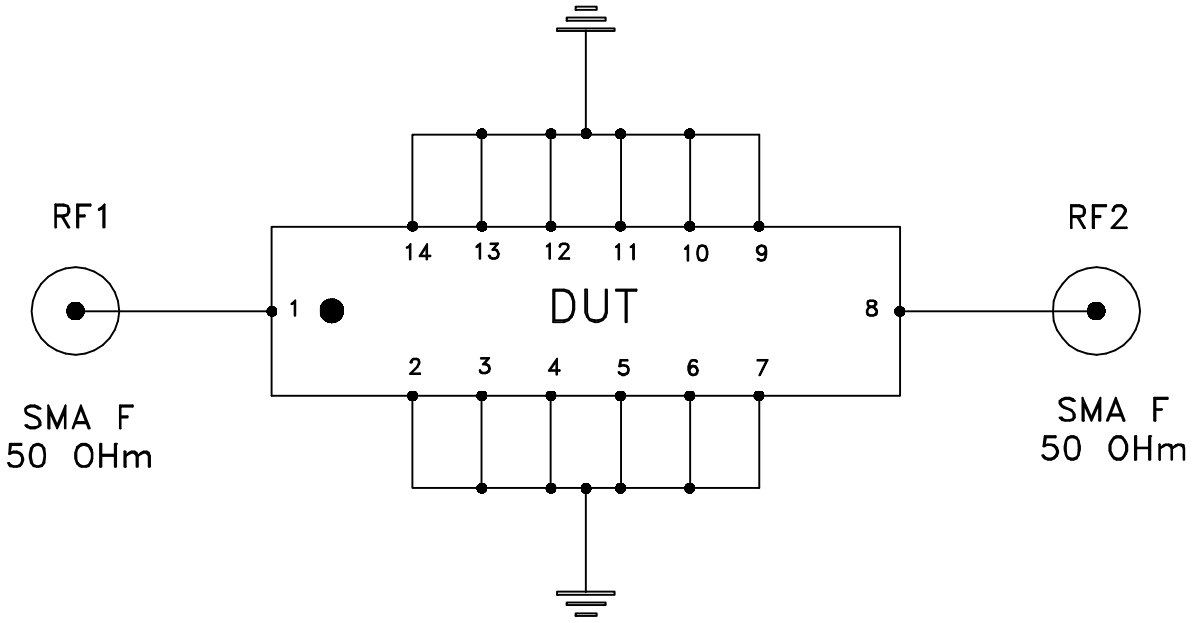
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-227	C

FILE:	SCALE:	SHEET:
98PL227	2:1	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.

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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