Surface Mount

Bandpass Filter

BPF-A400+

50Ω 390 to 410 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 ±6 deg typ @ Fc ± 15 MHz
- High rejection
- Shielded case
- Aqueous washable

Applications

- Military communications
- Harmonic rejection
- Transmitters/receivers

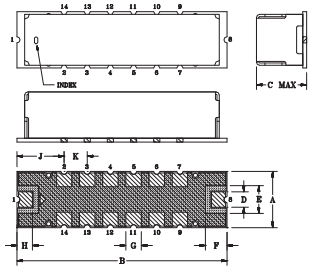
Generic photo used for illustration purposes only

CASE STYLE: HQ1157

+RoHS Compliant

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

Outline Drawing



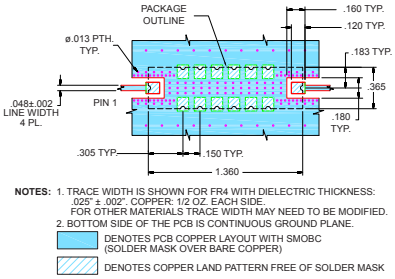
Outline Dimensions (inch / mm)

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.

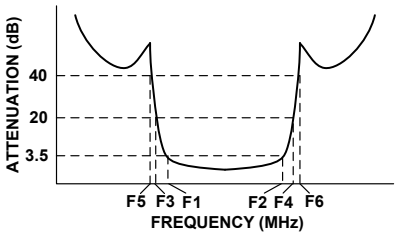
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

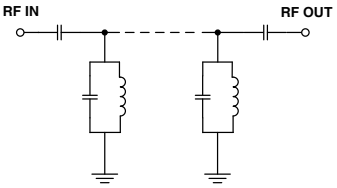
Bandpass Filter Electrical Specifications (T_{AMB}= 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz)	STOPBANDS (MHz)				MAXIMUM DEVIATION FROM LINEAR PHASE (deg.)	VSWR (:1)		
	(Loss < 3.5dB)	Loss > 20dB		Loss > 40dB			Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Fc ± 15MHz	Typ.	Max.	Typ.
400	390 - 410	350	490	320	600-2000	±13	1.5	1.9	20

Typical Frequency Response



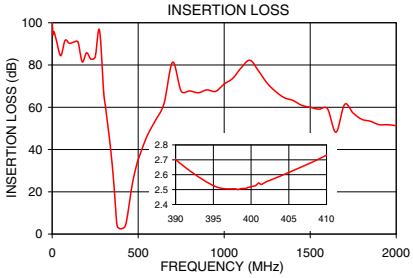
Functional Schematic



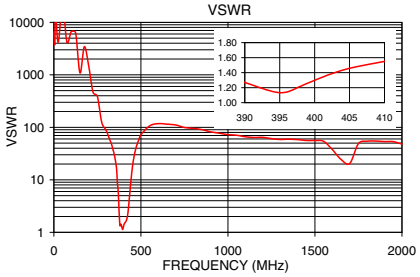
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Deviation from Linear Phase (deg.)
0.5	100.93	6634.72	385.0	6.26
320	53.72	59.78	386.0	5.03
350	31.89	27.00	388.0	3.12
360	22.26	16.63	390.0	1.72
370	10.66	5.88	392.0	0.70
375	5.46	2.34	394.0	-0.01
390	2.70	1.27	396.0	-0.43
395	2.53	1.13	398.0	-0.56
400	2.52	1.30	400.0	-0.42
405	2.62	1.46	401.0	-0.25
410	2.73	1.55	402.0	-0.08
430	5.17	3.22	404.0	0.25
440	9.94	7.75	406.0	0.92
460	20.71	26.92	408.0	1.74
490	32.37	60.49	410.0	2.57
600	53.76	117.41	412.0	3.36
1000	71.03	72.46	414.0	4.11
2000	51.29	47.99	415.0	4.49

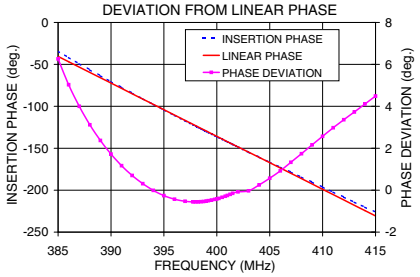
INSERTION LOSS



VSWR



INSERTION PHASE & DEVIATION FROM LINEAR PHASE



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-A400+

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	109.27	93.90	97.19	0.01	0.00	0.01	0.01	0.01	0.01
20	94.84	93.32	87.13	0.01	0.01	0.00	0.01	0.01	0.01
50	91.72	89.38	86.63	0.00	0.01	0.02	0.02	0.04	0.06
100	88.07	87.62	107.68	0.00	0.03	0.04	0.15	0.20	0.22
150	89.91	92.24	94.92	0.02	0.05	0.07	0.37	0.45	0.51
200	91.00	91.84	92.89	0.04	0.07	0.10	0.69	0.80	0.88
250	95.01	91.67	89.71	0.07	0.11	0.14	0.99	1.17	1.31
300	63.82	63.60	63.79	0.15	0.19	0.22	1.22	1.46	1.69
310	57.82	57.14	56.95	0.17	0.23	0.25	1.27	1.53	1.75
320	51.14	50.95	50.65	0.21	0.28	0.31	1.30	1.57	1.80
330	44.52	44.15	43.74	0.26	0.34	0.38	1.32	1.61	1.86
340	36.93	36.50	36.02	0.35	0.45	0.50	1.37	1.68	1.94
350	28.30	27.75	27.15	0.54	0.67	0.77	1.46	1.79	2.08
360	17.93	17.27	16.55	1.09	1.38	1.65	1.87	2.30	2.70
370	6.40	6.18	5.95	5.02	6.46	8.02	5.61	6.99	8.31
375	3.30	3.59	3.80	13.74	16.57	19.64	14.93	17.21	18.45
380	2.49	2.90	3.19	22.55	23.63	24.79	29.49	25.80	24.35
390	2.16	2.56	2.88	23.53	21.69	19.90	22.63	22.28	22.30
395	2.17	2.58	2.90	16.69	16.01	15.34	17.58	17.41	17.39
400	2.21	2.62	2.95	14.54	14.33	14.07	15.50	15.55	15.61
405	2.25	2.66	2.99	14.29	14.33	14.29	15.15	15.29	15.30
410	2.31	2.74	3.10	14.46	14.58	14.61	15.33	15.40	15.22
420	2.98	3.57	4.10	10.35	10.11	9.81	11.77	11.54	11.16
430	6.25	7.14	7.92	3.92	3.90	3.85	5.19	5.39	5.56
440	12.39	13.31	14.13	1.45	1.58	1.67	2.74	3.13	3.48
450	18.38	19.24	19.99	0.75	0.88	0.98	2.06	2.46	2.81
460	23.50	24.26	24.98	0.49	0.61	0.71	1.82	2.20	2.51
470	27.81	28.56	29.25	0.37	0.48	0.57	1.70	2.06	2.36
480	31.45	32.16	32.83	0.29	0.40	0.47	1.63	1.97	2.25
490	34.61	35.33	35.98	0.25	0.35	0.42	1.61	1.94	2.20
500	37.43	38.13	38.82	0.22	0.32	0.40	1.60	1.92	2.17
550	47.71	48.55	49.16	0.16	0.25	0.31	1.81	2.14	2.37
600	55.56	55.89	56.33	0.15	0.25	0.29	2.51	3.01	3.47
650	63.07	63.52	64.23	0.17	0.26	0.31	3.96	4.81	5.66
700	73.60	76.21	84.02	0.16	0.26	0.30	4.09	4.60	4.87
750	76.71	75.65	73.91	0.18	0.26	0.30	2.70	3.03	3.28
800	73.52	74.49	74.94	0.19	0.27	0.32	1.94	2.30	2.61
850	75.25	72.38	76.46	0.19	0.27	0.31	1.66	2.00	2.29
900	76.48	71.43	79.32	0.19	0.26	0.31	1.25	1.60	1.87
950	72.58	73.21	72.70	0.21	0.29	0.32	1.08	1.40	1.65
1000	76.51	75.90	81.94	0.20	0.27	0.31	0.92	1.22	1.43
1050	79.65	86.36	86.11	0.21	0.29	0.32	0.87	1.15	1.33
1100	90.42	87.48	87.65	0.23	0.29	0.33	0.76	1.03	1.20
1150	78.25	82.61	74.26	0.23	0.28	0.33	0.69	0.94	1.11
1200	78.78	78.70	77.27	0.24	0.31	0.35	0.62	0.86	1.01
1250	72.64	74.02	71.14	0.23	0.31	0.35	0.55	0.79	0.93
1300	75.27	74.79	75.04	0.23	0.31	0.36	0.52	0.74	0.90
1350	63.18	66.91	63.45	0.23	0.31	0.37	0.48	0.70	0.85
1400	66.96	69.12	68.47	0.23	0.33	0.38	0.45	0.66	0.82
1500	61.28	65.42	62.19	0.25	0.38	0.44	0.39	0.61	0.74
1600	58.58	56.39	53.78	1.40	2.08	2.68	0.34	0.56	0.71
1700	59.20	58.47	62.42	0.58	0.71	0.76	0.30	0.50	0.66
1800	65.19	67.43	69.01	0.26	0.46	0.59	0.26	0.46	0.61
1900	56.71	63.09	54.73	0.32	0.53	0.71	0.24	0.42	0.58
2000	65.10	69.73	64.17	0.44	0.74	0.96	0.23	0.43	0.57

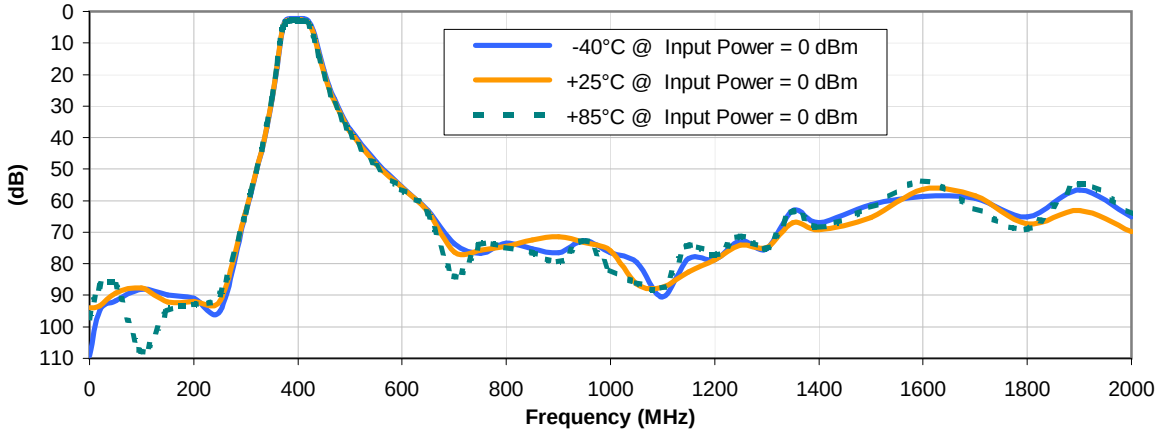
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@ -40° C	@ +25° C	@ +85° C
390.00	18.60	18.33	18.15
390.50	18.46	18.24	18.06
391.00	18.35	18.16	17.93
391.50	18.24	18.01	17.88
392.00	18.13	17.91	17.69
392.50	17.97	17.83	17.64
393.00	17.88	17.61	17.49
393.50	17.77	17.51	17.42
394.00	17.57	17.42	17.18
394.50	17.35	17.27	17.12
395.00	17.41	17.19	16.99
395.50	17.16	17.13	16.89
396.00	17.12	17.03	16.84
396.50	17.09	16.97	16.86
397.00	17.06	16.87	16.80
397.50	16.96	16.88	16.79
398.00	16.97	16.81	16.76
398.50	16.78	16.73	16.65
399.00	16.74	16.65	16.61
399.50	16.70	16.72	16.62
400.00	16.59	16.54	16.53
400.50	16.64	16.53	16.53
401.00	16.74	16.63	16.64
401.50	16.61	16.63	16.60
402.00	16.60	16.54	16.51
402.50	16.60	16.55	16.53
403.00	16.52	16.52	16.49
403.50	16.49	16.55	16.53
404.00	16.58	16.55	16.59
404.50	16.58	16.60	16.59
405.00	16.56	16.62	16.73
405.50	16.61	16.69	16.75
406.00	16.61	16.64	16.72
406.50	16.65	16.71	16.72
407.00	16.69	16.71	16.81
407.50	16.75	16.83	16.81
408.00	16.76	16.84	16.92
408.50	16.78	16.91	16.97
409.00	16.87	16.92	17.01
409.50	16.90	17.07	17.19
410.00	17.01	17.05	17.23

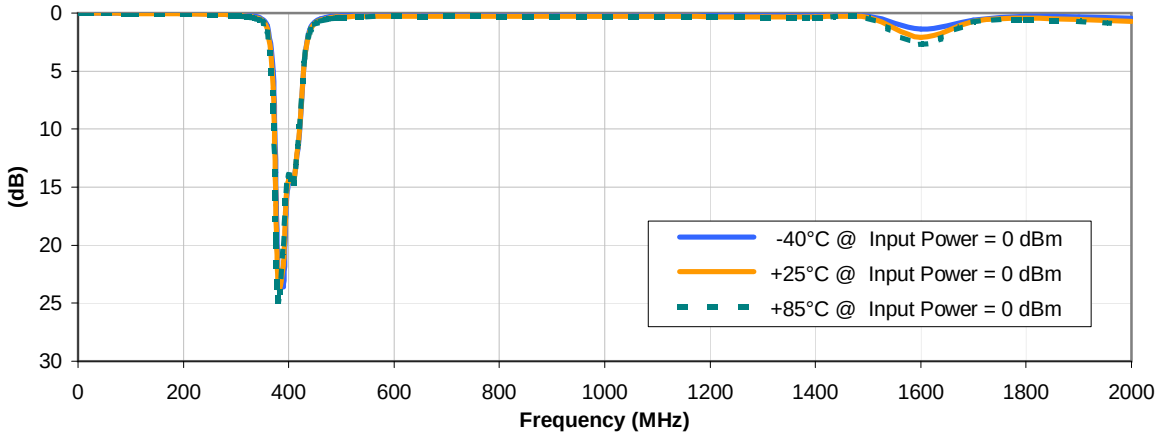
Surface Mount Band Pass Filter BPF-A400+

Typical Performance Curves

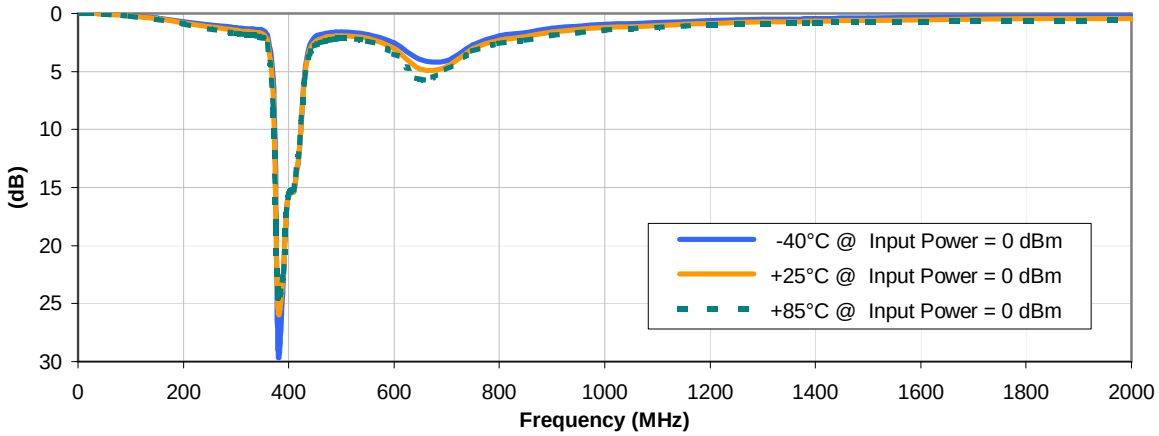
INSERTION LOSS vs. TEMPERATURE



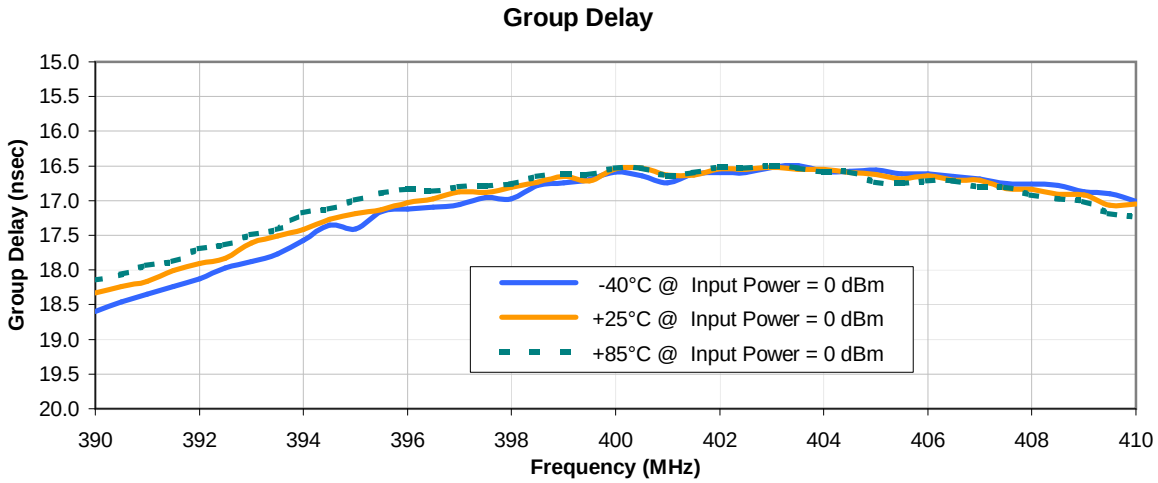
INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



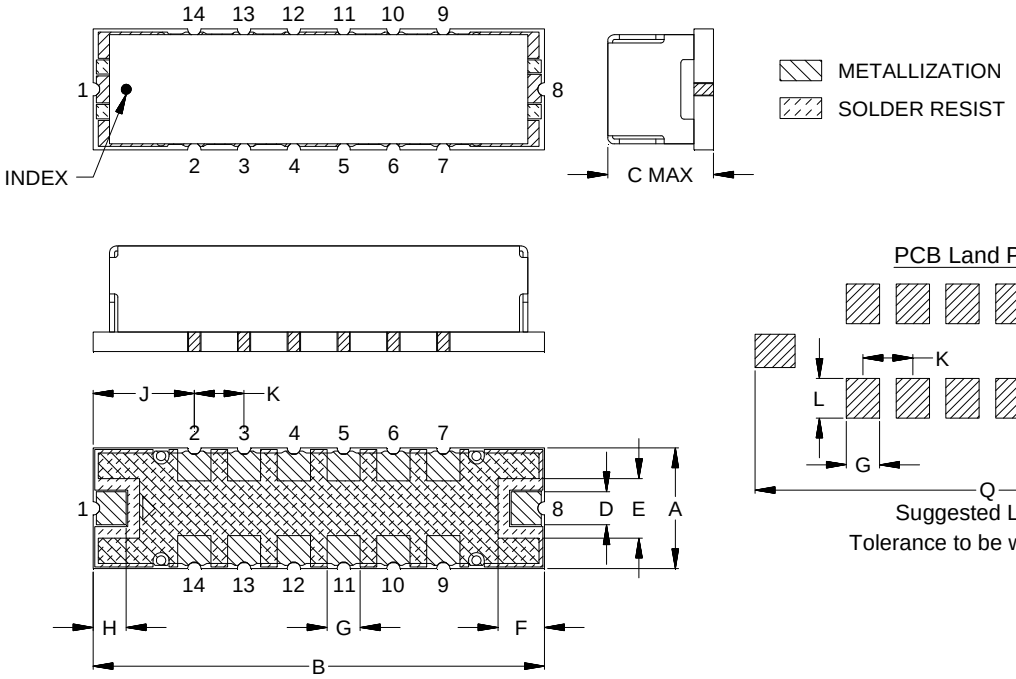
Typical Performance Curves



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

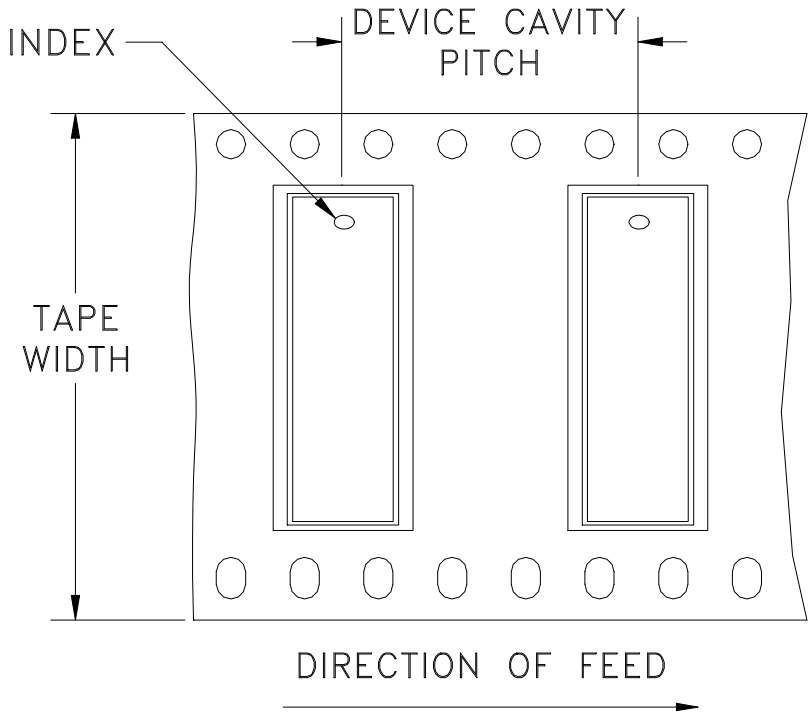
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

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.

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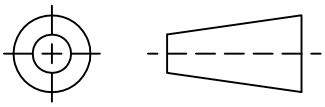
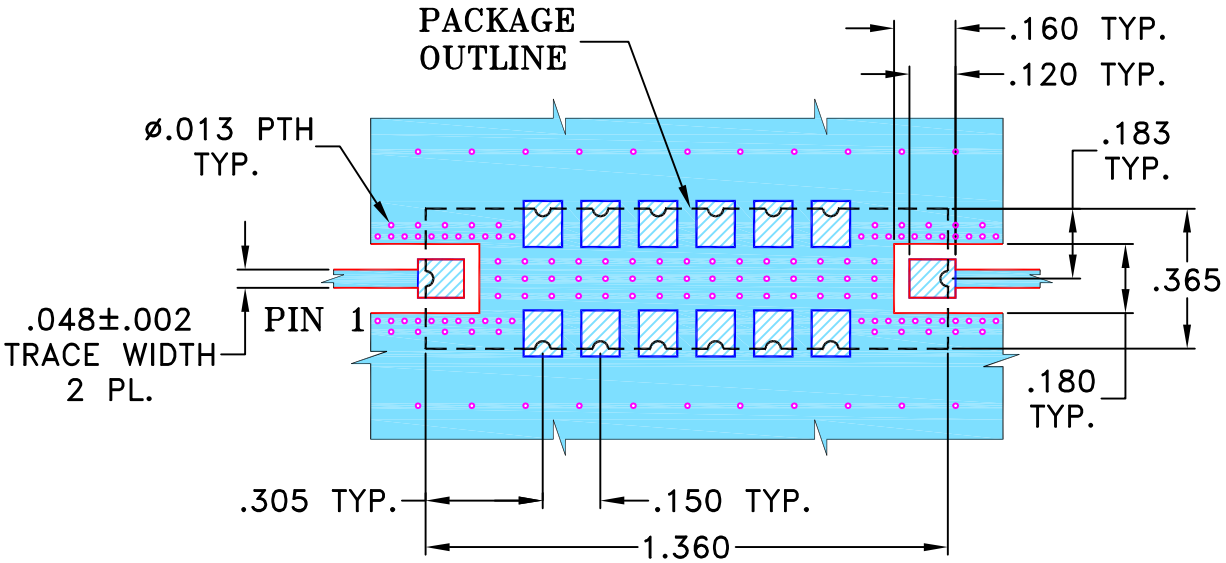
THIRD ANGLE PROJECTION



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

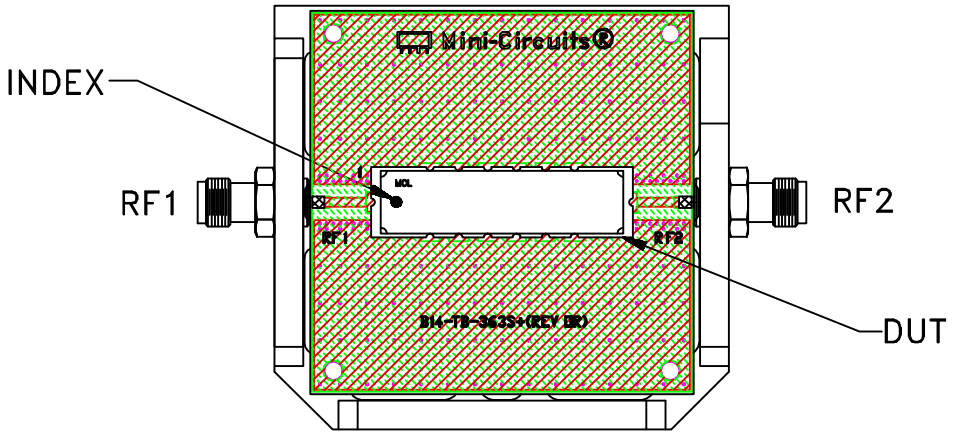
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

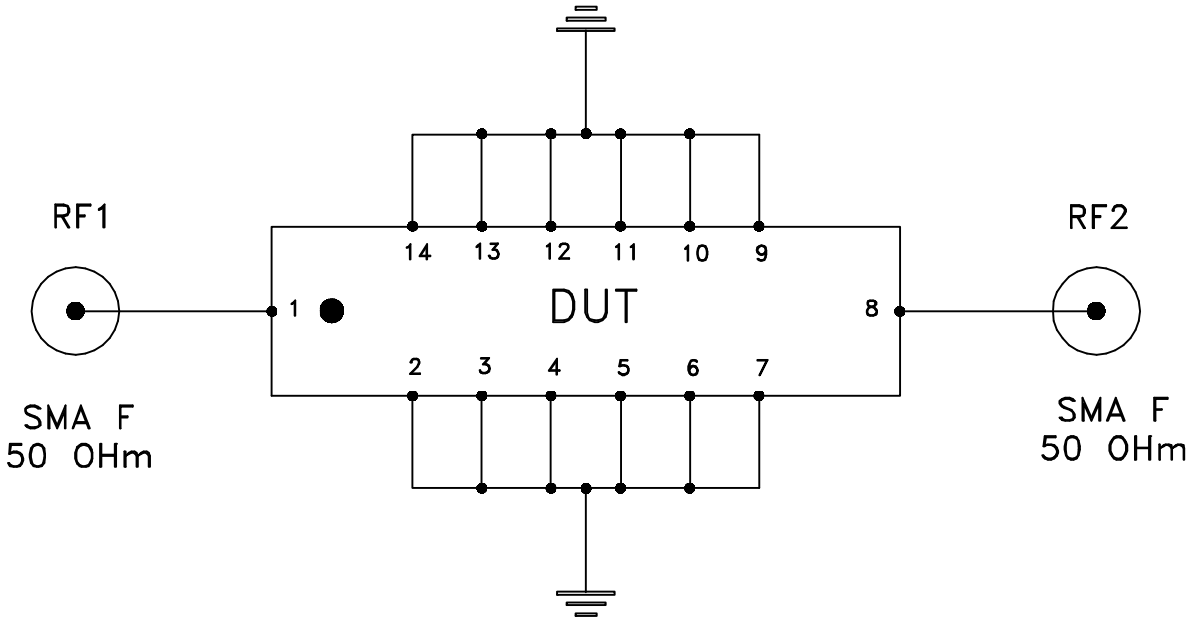
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-227	C

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