Surface Mount

Bandpass Filter

BPF-A1600+

50Ω 1400 to 1800 MHz

Generic photo used for illustration purposes only
CASE STYLE: HQ1157

The Big Deal

- Wide bandwidth
- Better rejection
- Miniature shielded package

Product Overview

The BPF-A1600+ is a 50Ω bandpass filter fabricated using SMT technology. This bandpass filter covers from 1400-1800 MHz. This filter is built with high Q capacitors and air-coil inductors for superior performance. This filter is developed for square kilometer array telescope systems for radio astronomy. It has repeatable performance across lots and consistent performance across temperature.

Key Features

Feature	Advantages
Low insertion loss	Can be used in high performance applications such as radio astronomy.
Good rejection	This enables the filter to attenuate spurious signals and reject harmonics for broad frequency band.
Shielded case	Reduced interference with and from the surrounding components.

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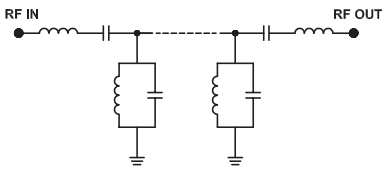
Features

- Wide bandwidth
- Better rejection
- Miniature shielded package

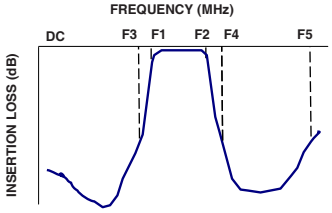
Applications

- Radio telescope applications
- Public cellular networks (GSM)
- International mobile telecommunication
- Weather instruments / Radar / Satellite

Functional Schematic



Typical Frequency Response



+RoHS Compliant

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

Electrical Specifications at 25°C

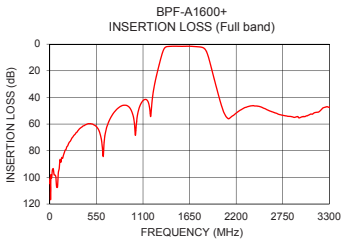
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	—	1600	—	MHz
	Insertion Loss	F1-F2	1400-1800	—	3.0	4.0	dB
	VSWR	F1-F2	1400-1800	—	1.5	1.9	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-1220	20	30	—	dB
	VSWR	DC-F3	DC-1220	—	11	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	1980-3300	20	30	—	dB
	VSWR	F4-F5	1980-3300	—	5.0	—	:1

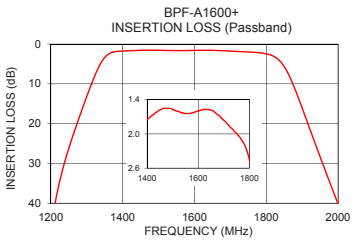
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	1 W

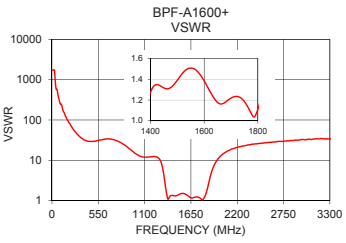
Permanent damage may occur if any of these limits are exceeded.

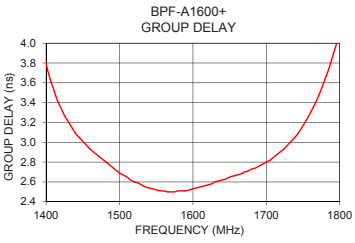
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	102.63	1737.18	1400	3.79
750	51.91	31.60	1420	3.35
1220	36.36	12.35	1440	3.09
1280	18.19	10.50	1460	2.93
1315	9.62	6.26	1480	2.81
1340	4.67	2.92	1500	2.69
1370	2.12	1.21	1520	2.60
1400	1.75	1.27	1540	2.54
1500	1.57	1.39	1560	2.51
1600	1.60	1.38	1600	2.53
1700	1.76	1.22	1620	2.57
1800	2.45	1.11	1630	2.60
1845	5.02	1.96	1650	2.65
1875	10.23	3.61	1670	2.70
1930	23.49	7.83	1690	2.76
1980	35.53	11.38	1700	2.80
2200	51.78	20.95	1730	2.98
2760	53.52	29.96	1760	3.30
3010	54.45	32.18	1780	3.64
3300	47.40	34.07	1800	4.11









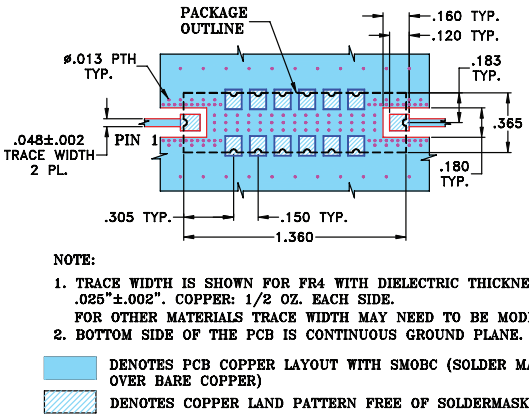
Notes

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

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)



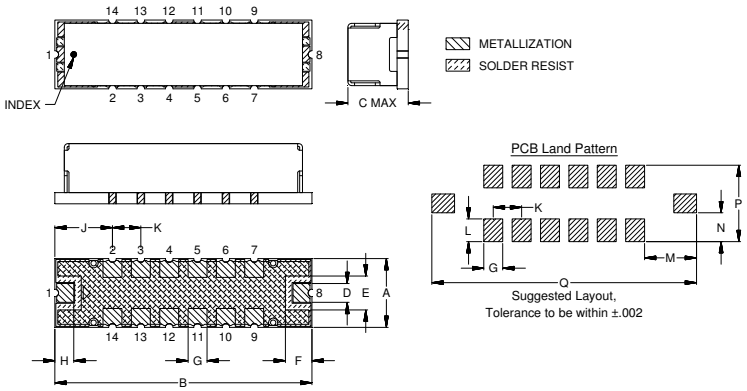
NOTE:

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

Band Pass Filter BPF-A1600+

Typical Performance Data

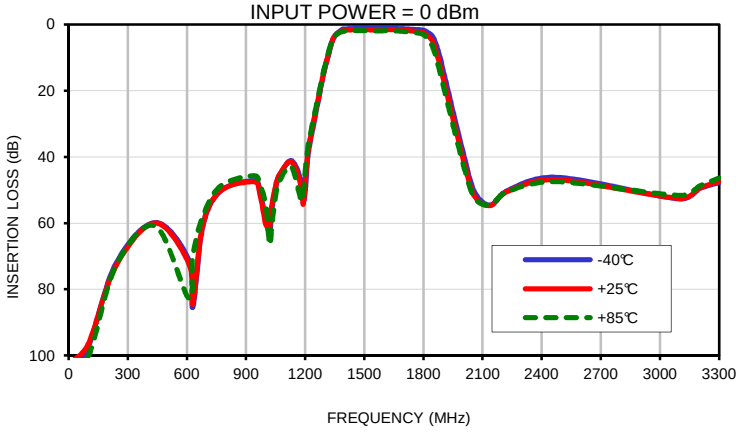
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40℃	@+25˚C	@+85˚C	@-40℃	@+25˚C	@+85˚C	@-40℃	@+25˚C	@+85˚C
1	105.62	102.63	101.88	0.00	0.00	0.00	0.01	0.01	0.01
100	97.28	96.48	100.20	0.01	0.03	0.04	0.04	0.07	0.08
240	72.21	72.92	72.80	0.04	0.08	0.11	0.21	0.27	0.30
440	59.84	59.97	60.90	0.11	0.16	0.20	0.48	0.59	0.66
610	71.20	72.20	82.75	0.19	0.25	0.29	0.39	0.53	0.64
630	85.37	84.31	69.92	0.21	0.26	0.30	0.38	0.52	0.63
680	61.17	60.84	58.18	0.24	0.30	0.34	0.37	0.51	0.63
770	50.33	50.32	48.82	0.30	0.38	0.44	0.42	0.57	0.68
940	47.19	47.51	45.69	0.35	0.51	0.66	0.76	0.97	1.12
970	50.60	51.06	48.42	0.35	0.53	0.68	0.86	1.09	1.27
1000	58.75	60.40	54.40	0.35	0.53	0.69	0.95	1.21	1.42
1020	63.33	61.01	66.42	0.35	0.54	0.69	1.00	1.29	1.52
1030	56.18	55.11	61.44	0.35	0.54	0.69	1.02	1.32	1.56
1050	49.34	48.93	51.75	0.36	0.54	0.69	1.06	1.38	1.64
1070	45.55	45.37	47.27	0.36	0.55	0.70	1.08	1.43	1.70
1130	41.15	41.45	43.00	0.39	0.56	0.69	1.08	1.45	1.75
1180	47.29	48.85	53.14	0.43	0.58	0.70	1.05	1.42	1.70
1190	53.45	54.33	51.84	0.44	0.59	0.71	1.04	1.41	1.69
1200	50.73	47.77	44.41	0.46	0.60	0.71	1.04	1.41	1.68
1210	42.66	41.11	39.12	0.47	0.61	0.73	1.04	1.40	1.68
1220	37.35	36.36	35.01	0.49	0.63	0.74	1.04	1.41	1.68
1290	16.03	15.66	15.14	0.91	1.10	1.28	1.41	1.82	2.15
1315	9.95	9.62	9.14	1.68	2.05	2.45	2.22	2.80	3.34
1345	4.01	3.97	3.84	5.34	6.51	7.89	6.09	7.48	8.99
1390	1.44	1.80	2.07	23.07	20.98	19.30	26.50	21.69	19.48
1400	1.38	1.75	2.02	20.01	18.51	17.72	20.15	18.45	17.59
1460	1.22	1.56	1.83	18.90	20.87	22.63	17.17	17.50	17.44
1550	1.22	1.64	1.97	16.09	14.83	13.92	15.18	13.88	13.05
1585	1.21	1.62	1.93	16.84	15.62	14.98	15.99	14.81	14.21
1615	1.18	1.58	1.88	19.63	18.45	18.15	18.43	17.33	16.94
1630	1.18	1.57	1.87	21.91	20.78	20.72	20.31	19.23	18.92
1640	1.18	1.57	1.88	23.53	22.52	22.58	21.67	20.59	20.25
1685	1.27	1.69	2.04	20.61	20.33	19.58	21.89	21.20	20.10
1720	1.38	1.85	2.24	17.53	17.27	16.79	20.09	19.56	18.73
1780	1.61	2.18	2.66	20.72	21.96	23.29	28.65	32.30	38.35
1800	1.78	2.45	3.06	21.27	21.33	19.44	24.74	25.63	23.58
1805	1.85	2.55	3.22	20.14	19.39	17.22	22.86	22.95	20.94
1840	3.13	4.47	5.84	9.01	7.79	6.70	12.03	11.01	9.87
1855	4.63	6.41	8.17	5.60	4.95	4.41	8.30	7.74	7.16
1865	6.13	8.16	10.11	3.98	3.68	3.43	6.36	6.14	5.86
1870	7.04	9.16	11.17	3.36	3.20	3.06	5.57	5.49	5.34
1880	9.09	11.33	13.42	2.44	2.49	2.51	4.33	4.47	4.51
1885	10.21	12.49	14.60	2.11	2.23	2.31	3.85	4.08	4.17
1900	13.80	16.10	18.20	1.46	1.72	1.89	2.83	3.19	3.41
1920	18.80	21.03	23.07	1.07	1.37	1.58	2.07	2.48	2.76
1930	21.31	23.49	25.48	0.96	1.26	1.49	1.82	2.23	2.52
1950	26.26	28.37	30.26	0.83	1.12	1.34	1.47	1.87	2.17
1960	28.71	30.78	32.62	0.79	1.08	1.29	1.34	1.74	2.04
1970	31.14	33.17	34.96	0.76	1.04	1.25	1.24	1.62	1.92
1980	33.54	35.53	37.27	0.73	1.01	1.22	1.15	1.53	1.82
1990	35.94	37.89	39.55	0.71	0.98	1.18	1.08	1.44	1.74
2000	38.33	40.23	41.78	0.69	0.95	1.16	1.02	1.37	1.66
2010	40.65	42.51	43.95	0.68	0.93	1.13	0.96	1.31	1.59
2060	50.75	51.96	52.47	0.64	0.87	1.05	0.78	1.10	1.37
2140	54.58	54.69	54.45	0.64	0.85	1.01	0.63	0.91	1.14
2230	50.11	50.36	50.37	0.71	0.94	1.11	0.55	0.80	1.01
2480	46.18	46.87	47.50	1.34	1.82	2.24	0.45	0.66	0.83
3100	52.69	52.57	51.67	0.54	0.81	1.04	0.33	0.52	0.66
3200	49.55	49.53	48.85	0.55	0.86	1.14	0.32	0.50	0.65
3300	47.83	47.40	46.39	0.61	0.99	1.34	0.32	0.51	0.66

Typical Performance Data

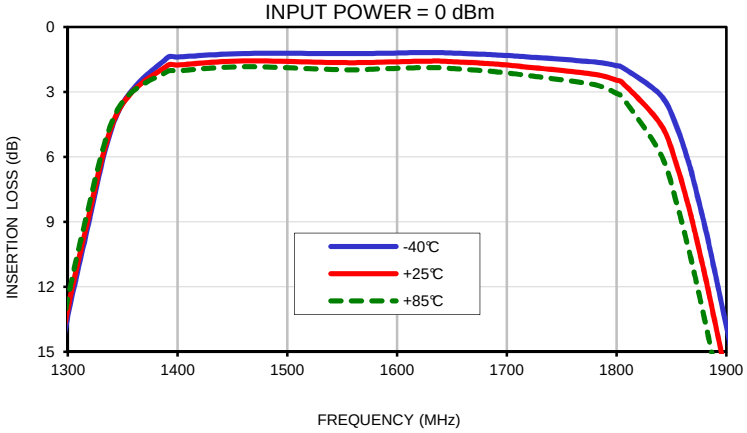
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
1400	3.89	3.79	3.63
1405	3.74	3.65	3.52
1435	3.17	3.15	3.11
1440	3.11	3.09	3.10
1445	3.06	3.05	3.02
1450	3.02	3.01	3.00
1455	2.98	2.97	2.95
1460	2.94	2.93	2.92
1490	2.76	2.75	2.74
1520	2.62	2.60	2.59
1525	2.60	2.59	2.56
1530	2.58	2.57	2.56
1535	2.57	2.55	2.53
1540	2.56	2.54	2.52
1545	2.54	2.53	2.51
1550	2.53	2.52	2.50
1555	2.52	2.51	2.51
1560	2.52	2.51	2.49
1565	2.51	2.50	2.51
1570	2.51	2.50	2.49
1575	2.51	2.50	2.51
1580	2.51	2.51	2.52
1590	2.51	2.51	2.53
1600	2.52	2.53	2.54
1615	2.54	2.56	2.61
1625	2.56	2.58	2.61
1630	2.57	2.60	2.63
1640	2.59	2.62	2.64
1645	2.60	2.63	2.68
1650	2.61	2.65	2.68
1655	2.63	2.66	2.69
1660	2.64	2.67	2.71
1665	2.65	2.68	2.72
1670	2.66	2.70	2.74
1675	2.68	2.71	2.75
1680	2.69	2.73	2.78
1685	2.71	2.74	2.77
1690	2.72	2.76	2.79
1695	2.74	2.78	2.80
1700	2.76	2.80	2.83
1705	2.78	2.82	2.86
1710	2.80	2.85	2.88
1715	2.83	2.88	2.92
1720	2.86	2.91	2.96
1725	2.89	2.94	2.98
1730	2.92	2.98	3.03
1735	2.96	3.02	3.08
1740	3.00	3.06	3.12
1745	3.04	3.11	3.19
1750	3.09	3.17	3.23
1755	3.15	3.23	3.29
1760	3.20	3.30	3.40
1765	3.27	3.37	3.47
1770	3.34	3.45	3.56
1775	3.42	3.54	3.67
1780	3.51	3.64	3.77
1785	3.60	3.74	3.89
1790	3.70	3.86	4.02
1795	3.81	3.98	4.13
1800	3.93	4.11	4.28

Typical Performance Curves

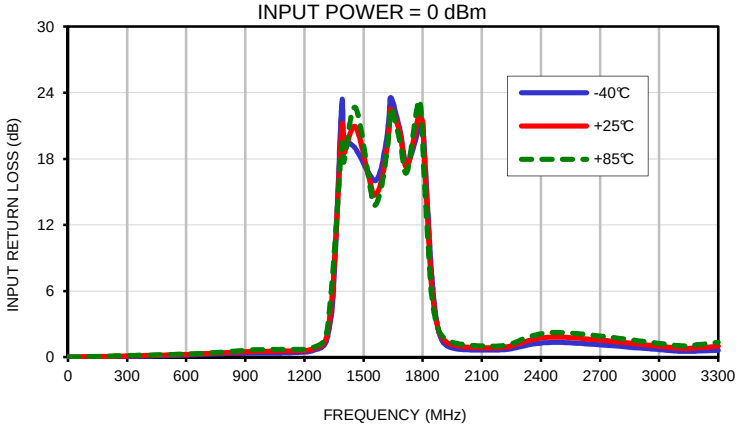
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



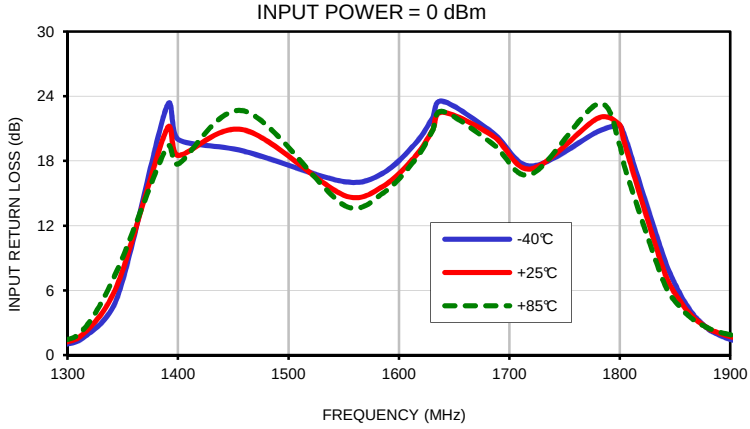
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



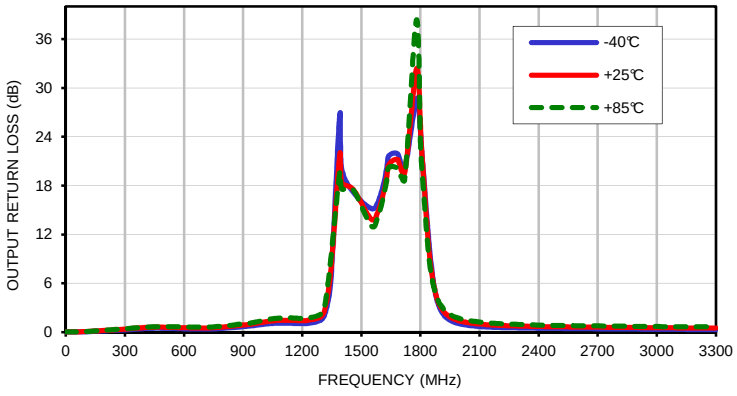
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



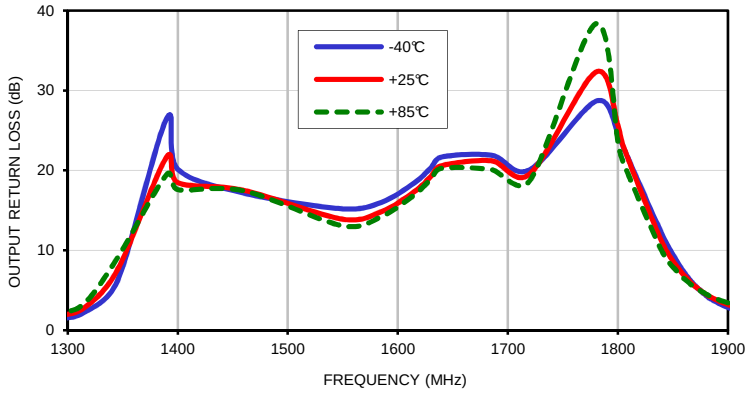
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



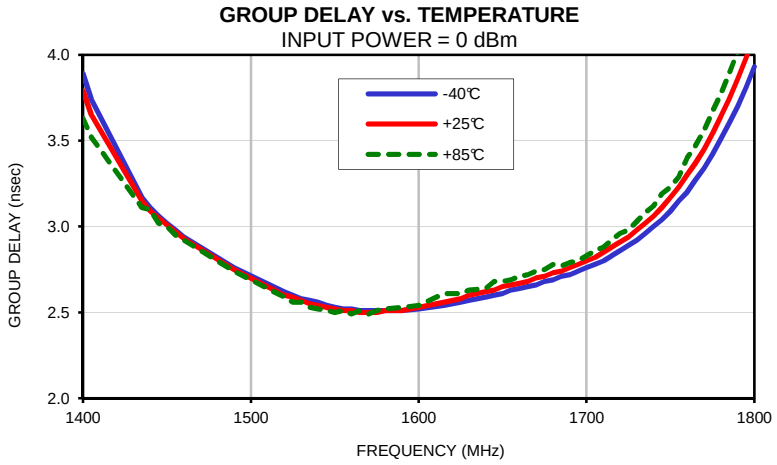
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



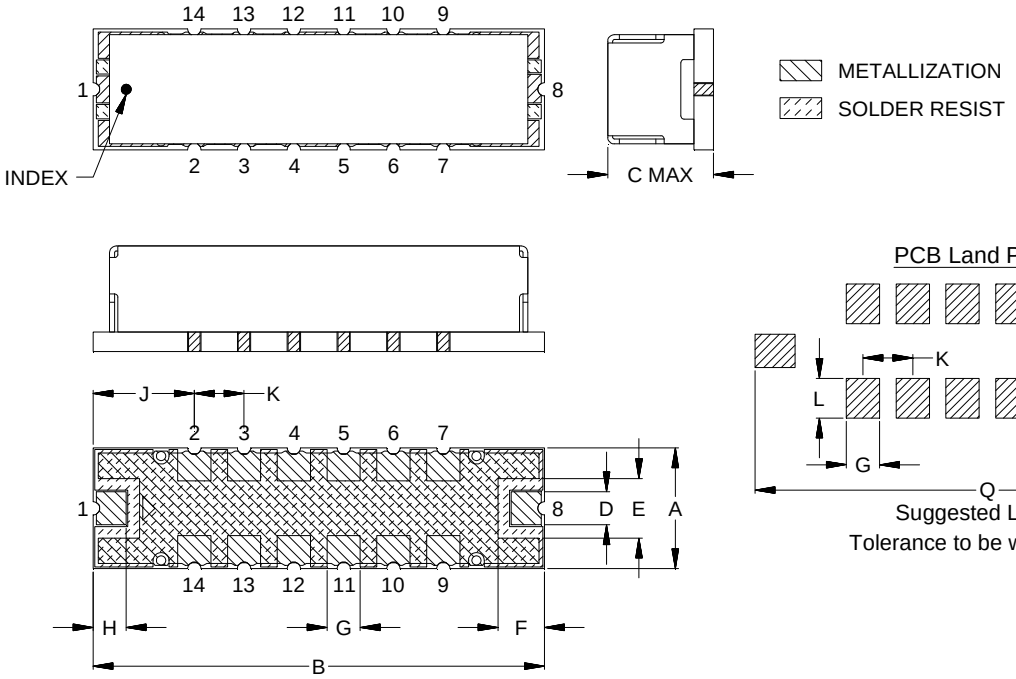
Typical Performance Curves



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

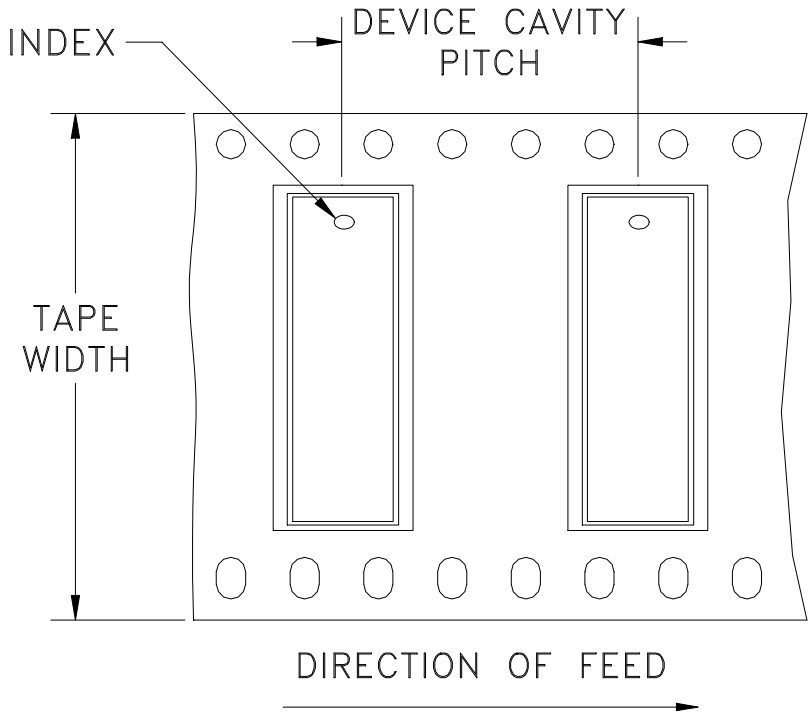
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

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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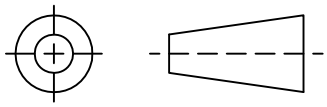
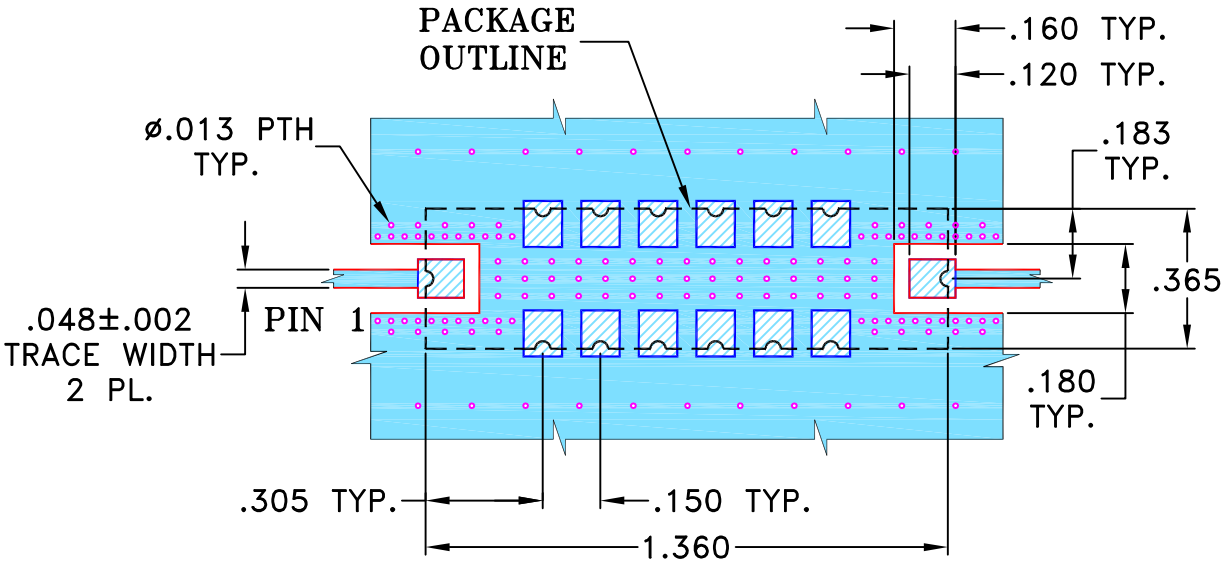
THIRD ANGLE PROJECTION



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

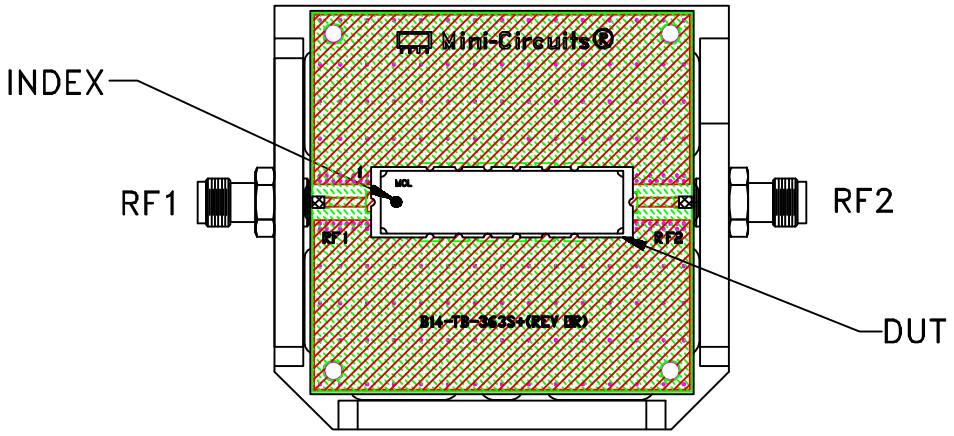
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

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

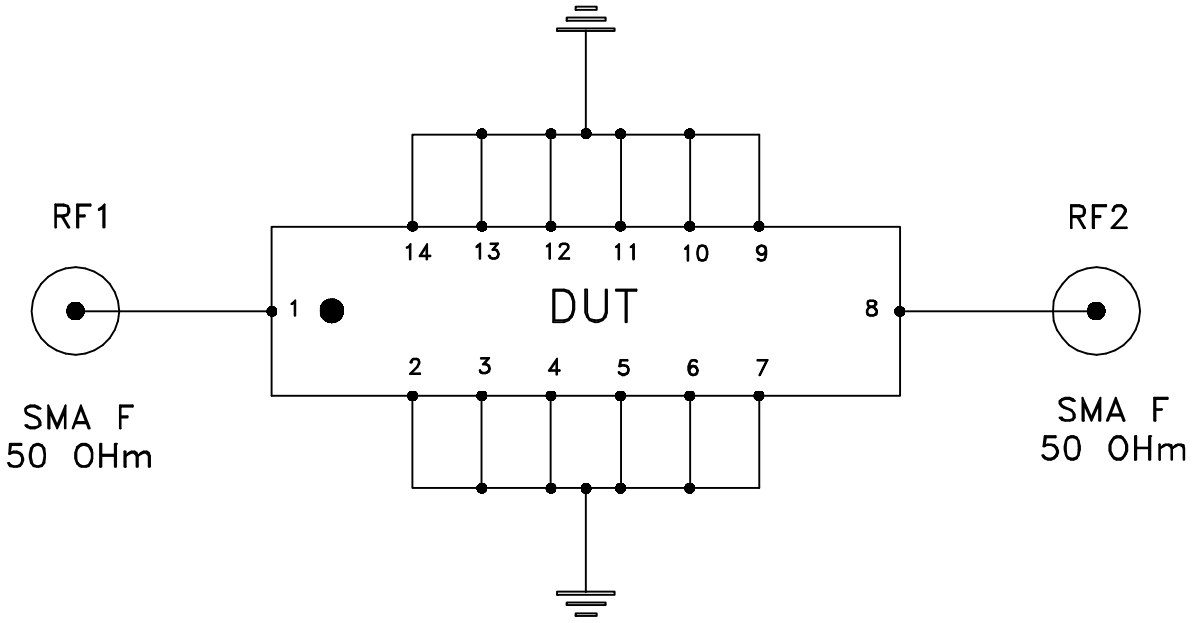
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-227	C

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