Surface Mount

Coaxial-Ceramic Resonator Filters and Multiplexers

50Ω DC to 6 GHz

The Big Deal

- Low insertion loss with excellent power handling
- Passbands up to 6 GHz
- Fractional bandwidth from <1 to 25%
- Low profile designs with min. height of 0.120”
- Excellent temperature stability
- Rugged construction to handle demanding environmental conditions

Product Overview

Mini-Circuits’ *Coaxial-Ceramic Resonator filters* offer low insertion loss in very small form factors, using ceramic material with high dielectric constant and superior Q factor. Bandpass and bandstop filters,diplexer and multiplexer designs can be constructed using this technology. Low insertion loss combined with excellent power handling makes these filters well suited for transmitter and receiver signal chains. Advanced filter design and construction can achieve stopband width greater than 3x the center frequency as high as 20 GHz.

All our coaxial-ceramic resonator filters are built with rugged construction, qualified to withstand multiple demanding reflow cycles. Excellent repeatability across units is achieved through precise tuning and process control.

Key Features

Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in signal chain
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stop band	Wide spur-free stopband results in better receiver sensitivity
Excellent power handling	Well suited for transmitter applications
Rugged Construction	These filter assemblies have been qualified over a wide range of thermal, mechanical and environmental conditions including withstanding the stress of extensive solder reflow cycles
Small Size	Very well suited for high performance applications where size is a constraint.
Temperature stability	Very minimal change in electrical performance across temperature makes these filters suitable for a wide range of operating conditions.

Surface Mount

Bandpass Filter

CBP-1476BD+

50Ω 1427 to 1525 MHz

Generic photo used for illustration purposes only
CASE STYLE: LW1611-1

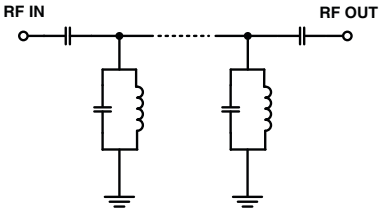
Features

- Low-profile shielded package
- Good VSWR, 1.38:1 typical in passband
- High rejection, 55 dB typ.
- Fast roll-off

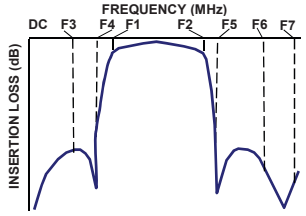
Applications

- Aeronautical radio navigation
- Aviation
- Transmitter/Receiver
- Digital audio broadcasting

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

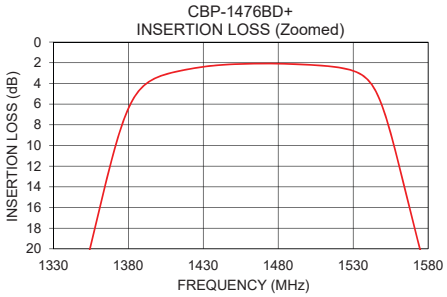
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	1476	-	MHz
	Insertion Loss	F1-F2	1427 - 1525	-	2.6	3.5	dB
	VSWR	F1-F2	1427 - 1525	-	1.38	1.67	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 1100	60	70	-	dB
		F3-F4	1100 - 1340	20	26	-	dB
Stop Band, Upper	Insertion Loss	F5-F6	1590 - 1680	20	26	-	dB
		F6-F7	1680 - 2500	50	55	-	dB

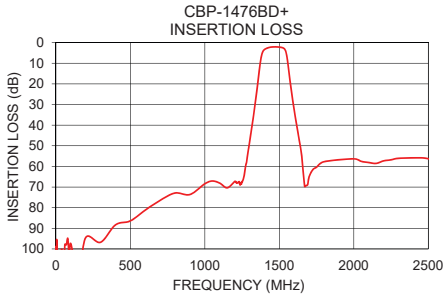
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5 W at 25°C

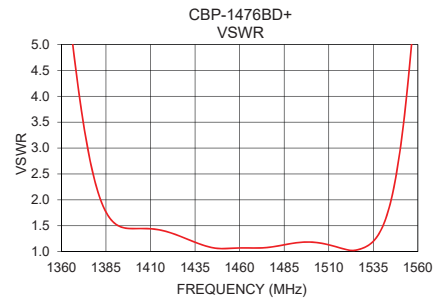
Permanent damage may occur if any of these limits are exceeded.

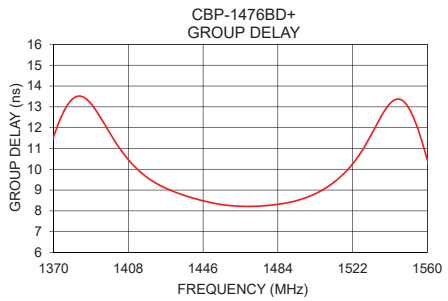
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
1	98.79	299.51	1427	9.09
10	110.07	434.30	1431	8.93
100	97.43	1085.74	1435	8.79
1100	68.11	78.26	1439	8.67
1250	67.42	43.77	1443	8.56
1331	33.22	17.64	1447	8.46
1340	28.36	14.34	1451	8.37
1407	3.04	1.45	1455	8.31
1427	2.46	1.29	1459	8.26
1451	2.14	1.06	1463	8.23
1476	2.08	1.08	1467	8.22
1501	2.20	1.18	1471	8.21
1525	2.58	1.03	1476	8.24
1535	3.11	1.20	1479	8.26
1590	28.08	22.95	1483	8.30
1600	32.82	28.54	1487	8.36
1680	69.26	58.40	1491	8.43
2000	56.32	86.00	1501	8.73
2300	56.08	89.09	1521	10.14
2500	56.28	78.61	1525	10.63









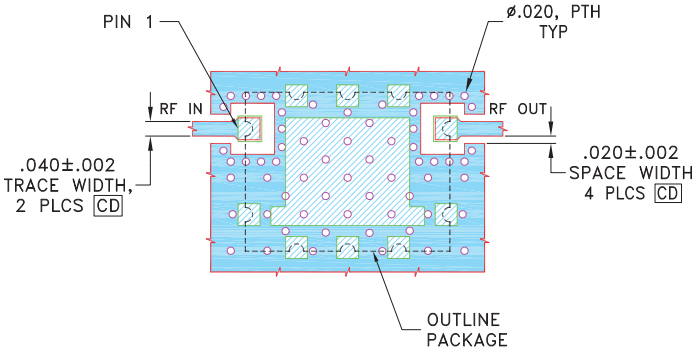
Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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	7
GROUND	2,3,4,5,6,8,9,10

Demo Board MCL P/N: TB-1100+
Suggested PCB Layout (PL-634)

SUGGESTED MOUNTING CONFIGURATION FOR LW1611-1 CASE STYLE



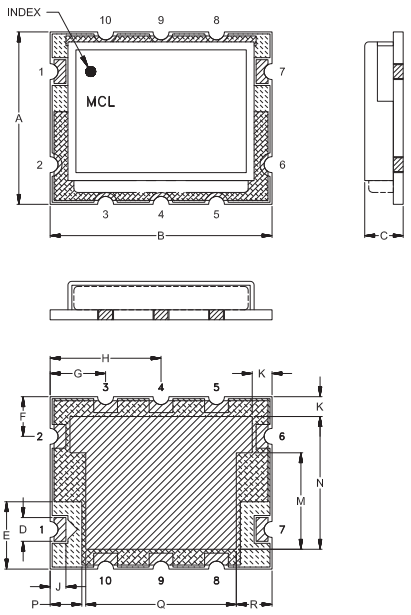
NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .020"±.0015". 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	J	K	L	M
-	-	-	-	-	-	-	-	-	-	-	-
.435	**.560**	**.120**	**.060**	**.170**	**.100**	**.140**	**.280**	**.040**	**.050**	**.160**	**.244**
11.05	14.22	3.05	1.52	4.32	2.54	3.56	7.11	1.02	1.27	4.06	6.19

N	P	Q	R	S	T	U	V	W	X	Y	
-	-	-	-	-	-	-	-	-	-	-	Wt.
.355	**.080**	**.380**	**.090**	**.420**	**.340**	**.600**	**.235**	**.355**	**.475**	**.295**	grams
8.51	2.03	9.65	2.29	10.67	8.64	15.24	5.97	9.02	12.07	7.49	1.0

Note: Please refer to case style drawing for details

Surface mount Band Pass Filter CBP-1476BD+

Typical Performance Data

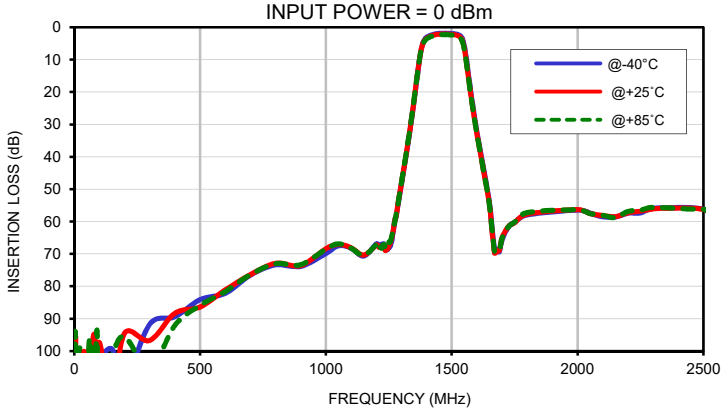
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	97.67	98.79	104.12	0.06	0.06	0.06	0.05	0.05	0.05
5	105.23	95.45	100.29	0.05	0.05	0.04	0.05	0.05	0.05
50	101.45	114.76	110.19	0.03	0.03	0.03	0.03	0.03	0.03
100	102.17	97.43	110.46	0.01	0.02	0.02	0.02	0.02	0.03
200	109.27	94.47	95.56	0.01	0.01	0.01	0.01	0.02	0.03
400	89.40	88.32	92.06	0.00	0.02	0.03	0.02	0.04	0.05
500	84.11	86.40	85.89	0.00	0.04	0.05	0.03	0.06	0.06
600	82.18	81.16	81.64	0.01	0.05	0.07	0.05	0.08	0.09
700	76.56	76.44	76.40	0.03	0.07	0.09	0.08	0.11	0.13
800	73.40	72.88	73.05	0.05	0.10	0.12	0.11	0.14	0.16
900	73.86	73.61	73.34	0.07	0.13	0.15	0.13	0.16	0.18
1000	69.89	68.40	68.50	0.11	0.17	0.19	0.16	0.19	0.22
1100	68.22	68.11	68.21	0.16	0.22	0.25	0.22	0.25	0.27
1220	67.10	67.91	68.04	0.26	0.33	0.37	0.33	0.38	0.41
1230	66.90	67.39	67.06	0.28	0.35	0.39	0.35	0.40	0.43
1240	68.55	68.69	67.85	0.29	0.37	0.41	0.37	0.42	0.46
1250	68.07	67.42	66.53	0.31	0.40	0.44	0.39	0.44	0.48
1301	48.22	47.81	47.68	0.51	0.62	0.67	0.58	0.66	0.71
1321	38.61	38.23	38.03	0.68	0.82	0.89	0.75	0.85	0.93
1335	31.52	31.10	30.90	0.91	1.07	1.18	0.96	1.10	1.20
1340	28.79	28.36	28.18	1.03	1.21	1.33	1.07	1.23	1.35
1355	20.09	19.65	19.54	1.69	1.99	2.18	1.67	1.94	2.12
1365	14.00	13.63	13.61	2.76	3.25	3.53	2.61	3.06	3.31
1375	8.50	8.36	8.49	5.27	6.13	6.53	4.81	5.56	5.91
1395	3.46	3.72	3.94	14.09	14.56	14.86	13.35	13.89	14.11
1407	2.77	3.04	3.23	14.66	14.77	15.10	15.07	15.14	15.41
1409	2.70	2.96	3.16	14.68	14.81	15.15	15.16	15.22	15.52
1427	2.21	2.46	2.64	17.28	17.89	18.44	17.86	18.38	18.94
1429	2.17	2.42	2.59	17.95	18.65	19.22	18.55	19.19	19.78
1437	2.04	2.28	2.46	21.71	22.86	23.49	22.73	24.05	24.80
1451	1.89	2.14	2.32	30.55	30.98	31.31	39.22	38.69	38.50
1476	1.83	2.08	2.26	27.52	28.09	27.81	25.49	25.28	24.88
1501	1.93	2.20	2.40	21.48	21.56	21.63	21.56	21.48	21.60
1511	2.01	2.30	2.51	24.38	24.74	25.03	24.54	24.71	25.35
1521	2.16	2.48	2.70	36.14	36.36	33.92	33.27	34.03	35.99
1525	2.25	2.58	2.82	39.19	37.26	33.46	39.15	42.14	44.17
1535	2.68	3.11	3.38	21.89	20.81	20.94	24.87	22.91	23.00
1559	10.11	11.01	11.33	2.84	2.90	3.07	2.92	2.96	3.12
1561	11.27	12.17	12.47	2.43	2.51	2.68	2.50	2.57	2.72
1563	12.45	13.34	13.63	2.09	2.20	2.36	2.17	2.25	2.40
1565	13.64	14.51	14.79	1.83	1.95	2.10	1.90	1.99	2.13
1567	14.82	15.68	15.94	1.62	1.74	1.88	1.67	1.78	1.91
1581	22.78	23.51	23.69	0.85	0.98	1.08	0.90	1.01	1.11
1590	27.41	28.08	28.23	0.64	0.76	0.84	0.71	0.80	0.89
1600	32.19	32.82	32.93	0.50	0.61	0.68	0.57	0.66	0.73
1640	49.48	50.04	50.05	0.30	0.39	0.44	0.35	0.41	0.46
1680	68.74	69.26	69.16	0.21	0.30	0.34	0.28	0.33	0.37
1700	65.65	65.01	65.13	0.19	0.27	0.31	0.26	0.30	0.34
1725	61.68	61.56	61.65	0.18	0.25	0.29	0.24	0.29	0.32
1750	60.23	60.37	60.19	0.16	0.24	0.27	0.24	0.28	0.32
1800	57.97	57.72	57.23	0.15	0.22	0.26	0.23	0.26	0.29
2000	56.47	56.32	56.40	0.13	0.20	0.24	0.20	0.24	0.27
2050	57.42	57.56	57.55	0.10	0.18	0.21	0.20	0.24	0.27
2100	58.55	58.11	58.07	0.11	0.19	0.22	0.20	0.24	0.28
2150	58.60	58.54	58.78	0.11	0.19	0.23	0.19	0.23	0.26
2200	57.43	57.31	56.90	0.10	0.18	0.22	0.19	0.24	0.27
2250	57.35	56.81	56.50	0.11	0.19	0.23	0.19	0.24	0.28
2300	55.94	56.08	55.64	0.11	0.20	0.23	0.19	0.24	0.28
2450	55.71	55.84	56.18	0.11	0.20	0.24	0.20	0.26	0.30
2500	56.20	56.28	56.19	0.12	0.22	0.27	0.21	0.27	0.32

Typical Performance Data

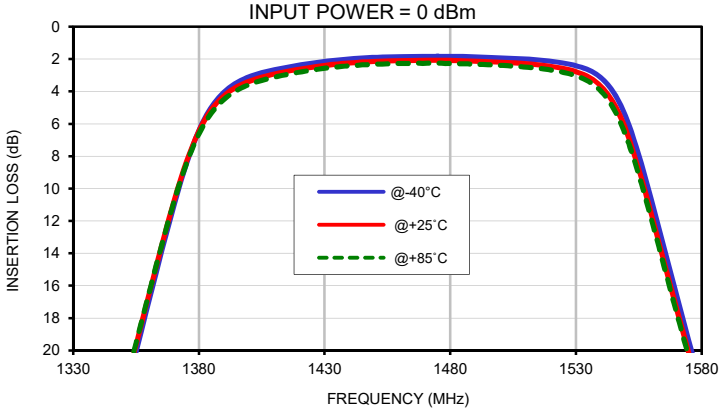
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
1427	9.15	9.09	9.05
1429	9.06	9.01	8.97
1431	8.98	8.93	8.89
1433	8.90	8.86	8.82
1435	8.83	8.79	8.75
1437	8.77	8.73	8.69
1439	8.71	8.67	8.63
1441	8.65	8.61	8.58
1443	8.59	8.56	8.52
1445	8.54	8.50	8.47
1447	8.49	8.46	8.43
1449	8.45	8.42	8.38
1451	8.41	8.37	8.34
1453	8.37	8.34	8.31
1455	8.34	8.31	8.28
1457	8.31	8.28	8.25
1459	8.28	8.26	8.23
1461	8.26	8.24	8.21
1463	8.25	8.23	8.20
1465	8.23	8.22	8.19
1467	8.23	8.22	8.19
1469	8.22	8.21	8.19
1471	8.22	8.21	8.19
1473	8.23	8.22	8.20
1475	8.23	8.23	8.21
1476	8.24	8.24	8.21
1479	8.26	8.26	8.23
1481	8.28	8.28	8.25
1483	8.30	8.30	8.28
1485	8.32	8.33	8.30
1487	8.35	8.36	8.33
1489	8.38	8.39	8.37
1491	8.42	8.43	8.41
1493	8.46	8.48	8.45
1495	8.51	8.53	8.51
1497	8.57	8.59	8.57
1499	8.63	8.66	8.64
1501	8.70	8.73	8.71
1503	8.78	8.82	8.80
1505	8.88	8.92	8.90
1507	8.98	9.02	9.00
1509	9.09	9.14	9.12
1511	9.21	9.26	9.25
1513	9.35	9.41	9.39
1515	9.50	9.56	9.55
1517	9.66	9.74	9.72
1519	9.85	9.93	9.91
1521	10.05	10.14	10.12
1523	10.27	10.37	10.35
1525	10.52	10.63	10.60

Typical Performance Curves

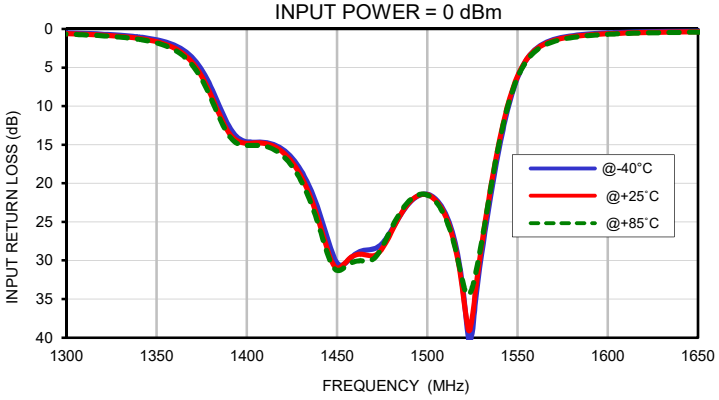
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



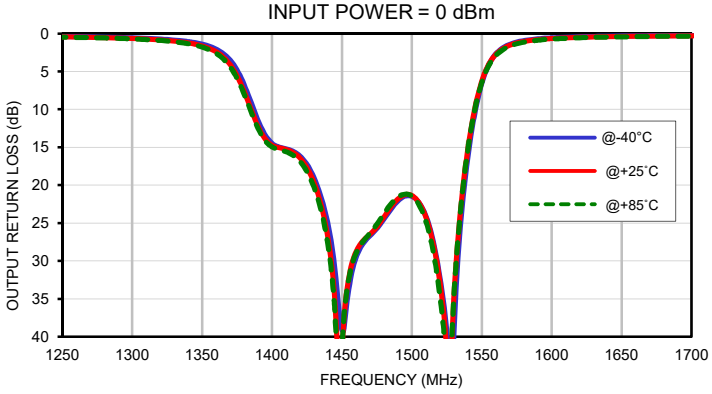
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



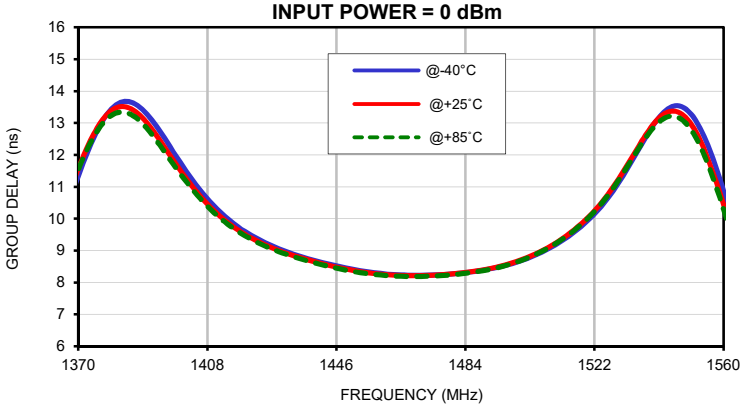
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

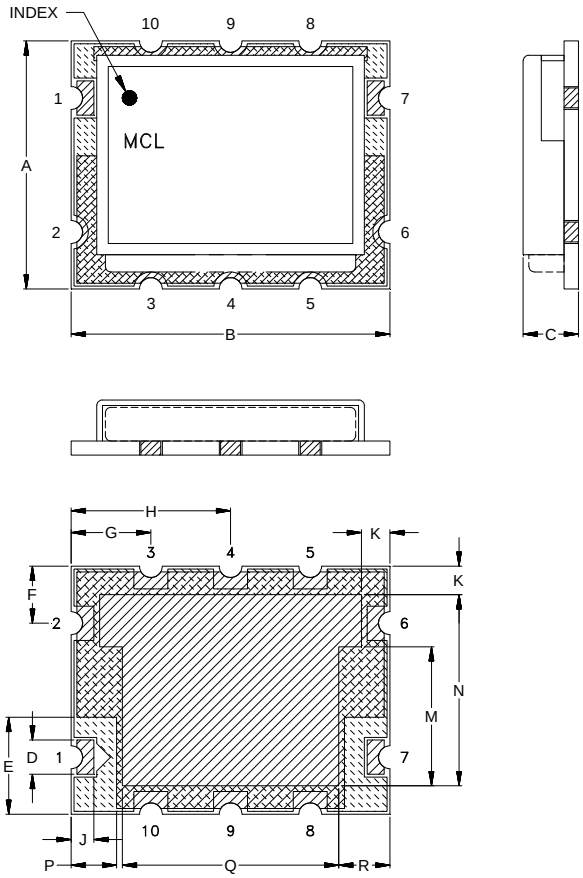


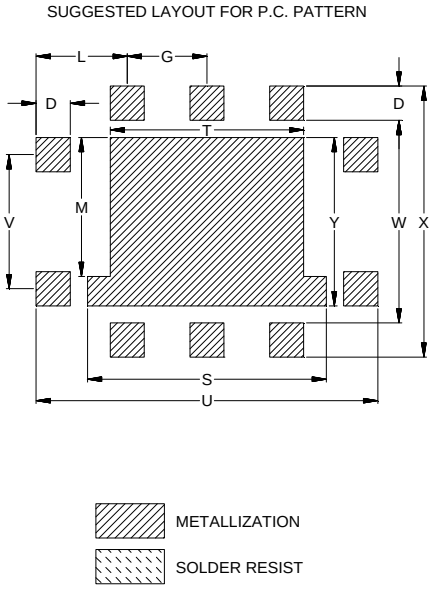
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style LW

Outline Dimensions LW1611-1





CASE#	A	B	C	D	E	F	G	H	J	K	L	M
LW1611-1	.435 (11.05)	.560 (14.22)	.120 (3.05)	.060 (1.52)	.170 (4.32)	.100 (2.54)	.140 (3.56)	.280 (7.11)	.040 (1.02)	.050 (1.27)	.160 (4.06)	.244 (6.19)

CASE#	N	P	Q	R	S	T	U	V	W	X	Y	WT.GRAM
LW1611-1	.335 (8.51)	.080 (2.03)	.380 (9.65)	.090 (2.29)	.420 (10.67)	.340 (8.64)	.600 (15.24)	.235 (5.97)	.355 (9.02)	.475 (12.07)	.295 (7.49)	1.0

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

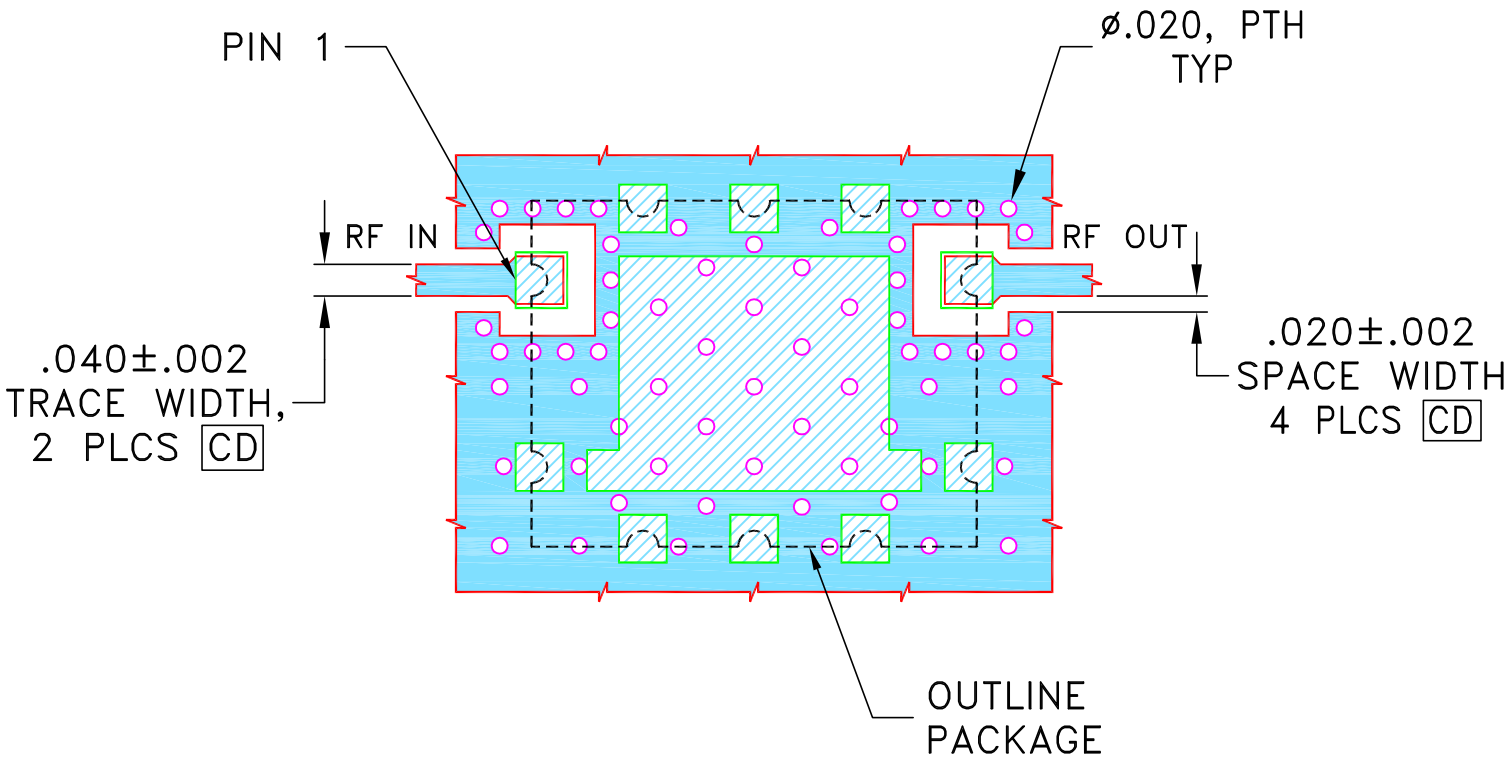
Notes:

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

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M174345	NEW RELEASE	JUN 19	TM	VC

SUGGESTED MOUNTING CONFIGURATION FOR LW1611-1 CASE STYLE



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .020"±.0015". 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	TM	13 JUN 19
TOLERANCES ON:	CHECKED	MD	13 JUN 19
2 PL DECIMALS ±	APPROVED	KN	13 JUN 19
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, LW1611-1, CBP, TB-1100+, 50 Ohm

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-634	OR
FILE: 98PL634	SCALE: 3.5:1	SHEET: 1 OF 2	

Mini-Circuits

Environmental Specifications ENV54

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, 96 hours, 40°C	MIL-STD-202, Method 103B, Condition B, Except 50°C
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (High Frequency)	20g peak, 10-2000 Hz, 4 times in each of three axes (total 12)	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