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

CBP2-1300BV+

50Ω 1200 to 1400 MHz

Generic photo used for illustration purposes only

CASE STYLE: WA3176-1

Features

- Good Insertion loss, 2.1dB typ.
- Excellent Rejection, 55dB typ.
- Wide Stop band Rejection, 15*fc
- Low-profile shielded package

Applications

- Defense/Military
- Telecommunications & Broadband wireless

Electrical Specifications[1] at 25°C

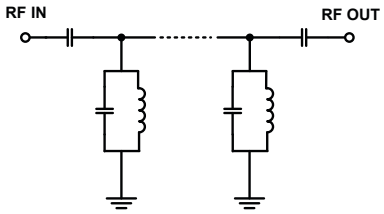
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	1300	-	MHz
	Insertion Loss	F1-F2	1200 - 1400	-	2.1	3	dB
	VSWR	F1-F2	1200 - 1400	-	1.39	1.92	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 1000	55	65	-	dB
		F3-F4	1000 - 1090	20	27	-	dB
Stop Band, Upper	Insertion Loss	F5-F6	1515 - 1680	20	28	-	dB
		F6-F7	1680 - 3900	-	35	-	dB
		F7-F8	3900 - 20000	-	20	-	dB

1. Measured on Mini-Circuits Characterization Test Board TB-CBP2-1300BV+

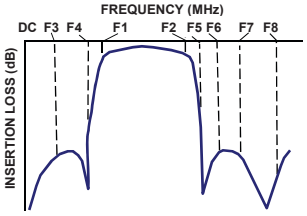
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input*	6 W at 25°C

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

Functional Schematic

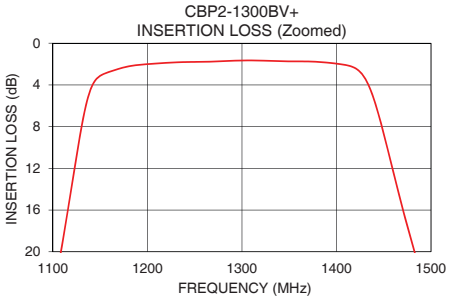


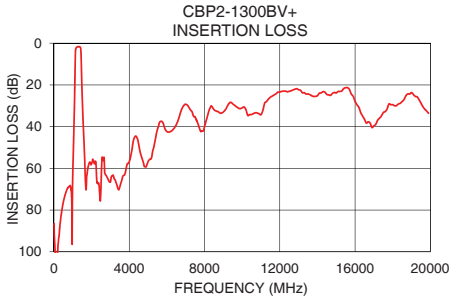
Typical Frequency Response

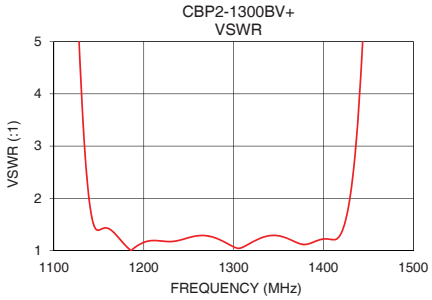


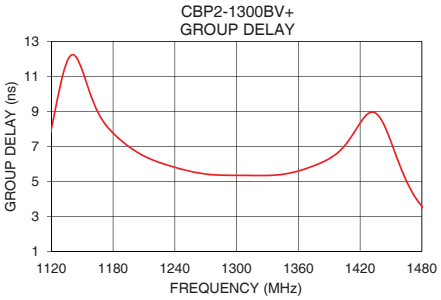
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
10	86.71	607.62	1200	6.80
54	98.37	814.43	1210	6.46
104	106.16	1026.70	1220	6.19
500	76.00	357.37	1230	5.99
1000	62.74	60.46	1240	5.81
1090	28.91	23.58	1250	5.65
1108	20.24	15.01	1260	5.52
1152	3.03	1.41	1270	5.42
1200	2.01	1.16	1280	5.37
1250	1.80	1.25	1290	5.35
1300	1.66	1.07	1300	5.35
1350	1.74	1.28	1310	5.34
1400	1.96	1.22	1320	5.34
1428	3.08	1.86	1330	5.34
1484	20.49	29.63	1340	5.38
1515	29.39	48.03	1350	5.46
1680	67.40	81.00	1360	5.60
3900	57.75	7.45	1370	5.78
5000	56.80	7.61	1380	6.01
20000	33.42	2.54	1400	6.73









+RoHS Compliant

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

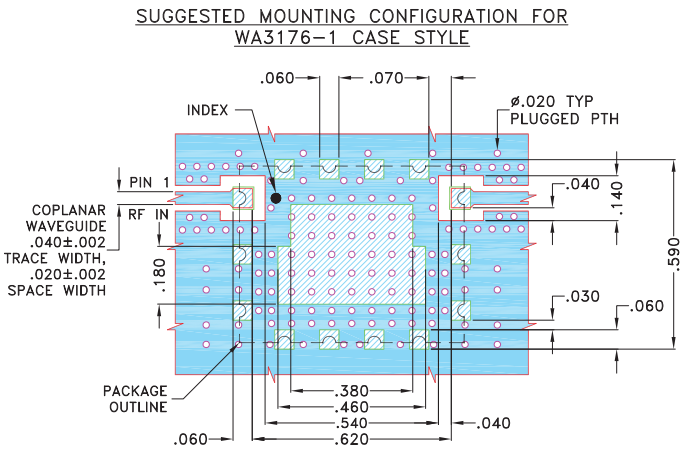
Notes

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

Demo Board MCL P/N: TB-CPB2-1300BV+
Suggested PCB Layout (PL-722)

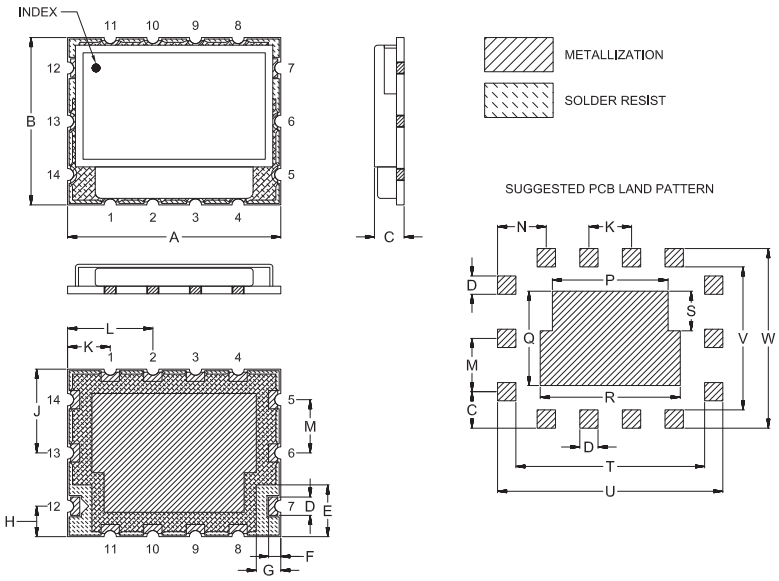


NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .020±.0015. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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
.700	**.550**	**.120**	**.060**	**.170**	**.040**	**.080**	**.100**	**.275**	**.140**	**.280**	**.175**
17.78	13.97	3.05	1.52	4.32	1.02	2.03	2.54	6.99	3.56	7.11	4.45

N	P	Q	R	S	T	U	V	W			Wt.
.160	**.380**	**.310**	**.460**	**.130**	**.620**	**.740**	**.470**	**.590**			grams
4.06	9.65	7.87	11.68	3.30	15.75	18.80	11.94	14.99			1.3

Note: Please refer to case style drawing for details

Surface mount Band Pass Filter CBP2-1300BV+

Typical Performance Data

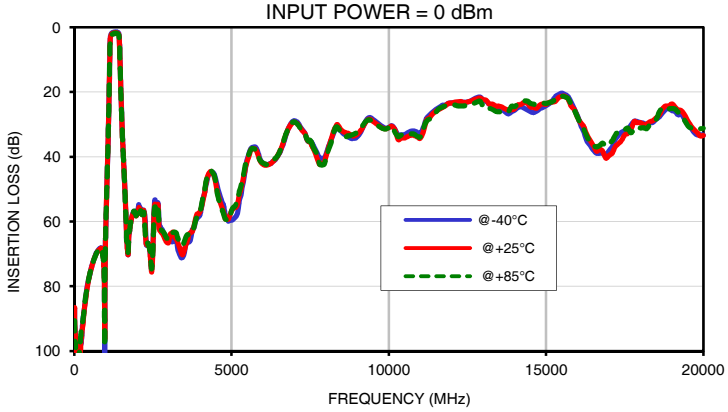
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
10	86.99	86.71	90.68	0.03	0.03	0.03	0.04	0.04	0.04
54	99.54	98.37	100.41	0.02	0.02	0.02	0.04	0.04	0.05
104	104.09	106.16	105.36	0.01	0.02	0.02	0.05	0.06	0.07
154	99.72	105.73	101.86	0.01	0.02	0.02	0.07	0.09	0.11
204	98.02	99.52	95.16	0.01	0.02	0.03	0.10	0.14	0.17
254	92.62	93.35	91.59	0.01	0.02	0.04	0.15	0.20	0.24
304	87.85	88.65	88.47	0.01	0.03	0.04	0.21	0.27	0.32
410	79.88	80.62	80.21	0.01	0.03	0.05	0.37	0.46	0.53
500	76.14	76.00	75.91	0.02	0.05	0.07	0.53	0.64	0.73
600	72.49	72.48	72.53	0.03	0.06	0.09	0.70	0.84	0.95
700	69.75	69.94	69.94	0.04	0.09	0.12	0.82	0.98	1.11
750	69.00	69.10	69.13	0.06	0.10	0.13	0.85	1.01	1.14
800	68.42	68.76	68.82	0.07	0.12	0.15	0.84	1.01	1.14
850	68.07	68.22	68.36	0.09	0.14	0.18	0.82	0.98	1.10
880	68.58	68.73	68.80	0.11	0.16	0.20	0.80	0.95	1.07
900	69.29	69.47	69.64	0.12	0.17	0.21	0.77	0.92	1.04
920	70.82	70.54	71.01	0.13	0.19	0.23	0.75	0.89	1.01
940	73.18	73.61	73.67	0.15	0.21	0.25	0.74	0.88	0.99
960	81.10	82.94	83.57	0.17	0.23	0.27	0.73	0.86	0.98
980	75.34	74.68	74.30	0.19	0.26	0.30	0.72	0.85	0.96
1000	63.09	62.74	62.44	0.22	0.29	0.33	0.71	0.84	0.95
1090	29.12	28.91	28.75	0.61	0.74	0.83	1.01	1.19	1.34
1108	20.46	20.24	20.08	0.97	1.16	1.30	1.42	1.66	1.86
1126	10.40	10.30	10.25	2.58	2.99	3.31	3.29	3.82	4.25
1152	2.71	3.03	3.27	15.49	15.47	15.55	17.92	17.47	17.30
1200	1.76	2.01	2.20	22.51	22.78	23.11	19.46	19.44	19.52
1220	1.65	1.89	2.07	20.88	21.56	22.17	18.22	18.39	18.56
1240	1.58	1.81	1.99	20.57	20.91	21.18	17.88	17.91	17.99
1260	1.56	1.78	1.95	17.83	18.12	18.38	16.46	16.60	16.78
1280	1.51	1.73	1.89	18.84	19.40	19.89	17.43	17.75	18.09
1300	1.44	1.66	1.83	27.40	29.31	31.22	22.05	22.41	22.74
1320	1.44	1.67	1.84	23.12	22.87	22.69	21.40	21.22	21.11
1340	1.50	1.72	1.90	17.97	18.08	18.19	18.14	18.28	18.45
1360	1.51	1.75	1.92	19.30	19.69	19.96	20.19	20.74	21.26
1380	1.54	1.79	1.98	25.65	25.14	24.52	46.74	42.94	38.14
1400	1.69	1.96	2.16	20.39	20.02	19.71	22.48	22.22	21.93
1428	2.66	3.08	3.36	10.78	10.44	10.31	13.60	13.40	13.41
1454	9.58	10.12	10.44	1.71	1.80	1.88	2.85	3.07	3.25
1484	20.06	20.49	20.72	0.49	0.59	0.65	1.46	1.67	1.85
1515	29.05	29.39	29.57	0.28	0.36	0.41	1.25	1.46	1.63
1680	66.05	67.40	67.19	0.15	0.21	0.26	1.75	2.07	2.36
2000	56.92	57.76	57.57	0.16	0.24	0.29	2.67	2.94	3.19
3000	66.15	66.53	64.81	1.66	1.96	2.23	0.55	0.66	0.75
3900	59.10	57.75	58.62	2.05	2.35	2.55	0.32	0.43	0.53
5000	59.59	56.80	56.62	2.02	2.30	2.44	0.23	0.31	0.37
5500	40.72	41.28	40.66	0.70	0.81	0.95	0.20	0.29	0.35
6000	42.10	42.33	41.93	0.35	0.52	0.68	0.16	0.27	0.35
7000	28.86	29.28	29.22	2.49	2.92	3.16	0.19	0.34	0.49
8000	39.43	39.93	40.67	3.18	3.07	3.12	0.32	0.47	0.62
8500	32.26	31.79	32.58	0.70	0.81	0.89	0.67	0.74	0.76
9000	33.78	33.02	32.27	0.84	1.15	1.37	0.62	0.79	0.80
9500	28.48	29.10	29.31	3.78	4.02	4.29	0.15	0.28	0.37
10000	30.93	31.02	31.00	1.35	1.67	1.96	0.12	0.29	0.43
11000	32.90	34.29	33.84	1.70	2.01	2.26	0.60	0.82	1.06
12000	23.37	23.43	24.08	4.84	6.18	7.35	1.15	1.36	1.56
13000	22.41	22.31	24.34	3.79	4.21	4.22	1.35	1.31	1.52
14000	25.64	25.17	24.49	2.63	2.76	3.18	1.44	2.53	2.53
15000	24.24	23.84	23.51	4.56	4.97	5.35	4.64	4.41	5.25
18000	29.46	29.47	31.11	8.73	7.87	7.47	3.99	4.88	5.33
20000	33.34	33.42	31.19	6.56	7.24	8.01	5.69	6.73	6.96

Typical Performance Data

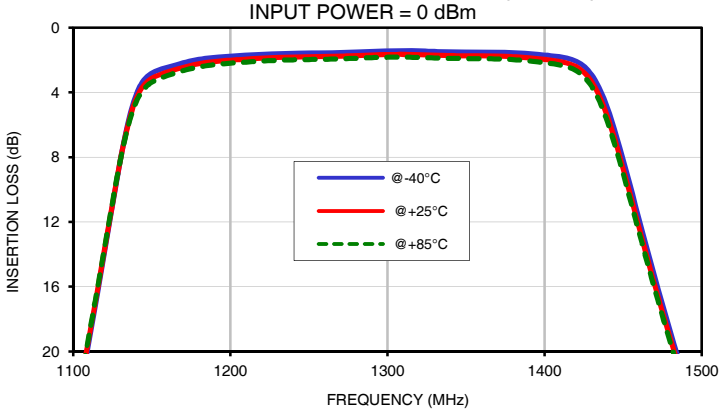
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
1200	6.83	6.80	6.78
1204	6.68	6.65	6.63
1208	6.54	6.52	6.50
1212	6.42	6.40	6.38
1216	6.31	6.29	6.28
1220	6.21	6.19	6.18
1224	6.12	6.11	6.10
1228	6.04	6.03	6.01
1232	5.96	5.95	5.94
1236	5.89	5.88	5.87
1240	5.82	5.81	5.80
1244	5.75	5.74	5.73
1248	5.69	5.68	5.67
1252	5.63	5.62	5.61
1256	5.57	5.57	5.56
1260	5.52	5.52	5.51
1264	5.48	5.47	5.47
1268	5.44	5.44	5.44
1272	5.41	5.41	5.41
1276	5.39	5.39	5.39
1280	5.37	5.37	5.37
1284	5.36	5.36	5.36
1288	5.35	5.35	5.36
1292	5.35	5.35	5.35
1296	5.35	5.35	5.35
1300	5.35	5.35	5.35
1304	5.34	5.35	5.35
1308	5.34	5.35	5.34
1312	5.34	5.34	5.34
1316	5.34	5.34	5.34
1320	5.34	5.34	5.34
1324	5.34	5.34	5.34
1328	5.34	5.34	5.34
1332	5.34	5.35	5.35
1336	5.35	5.36	5.36
1340	5.37	5.38	5.38
1344	5.39	5.40	5.41
1348	5.43	5.44	5.45
1352	5.47	5.48	5.49
1356	5.52	5.54	5.55
1360	5.58	5.60	5.61
1364	5.65	5.67	5.68
1368	5.72	5.74	5.75
1372	5.81	5.83	5.84
1376	5.90	5.92	5.92
1380	5.99	6.01	6.02
1384	6.10	6.12	6.13
1388	6.21	6.24	6.24
1392	6.35	6.37	6.38
1396	6.50	6.54	6.55
1400	6.70	6.73	6.75

Typical Performance Curves

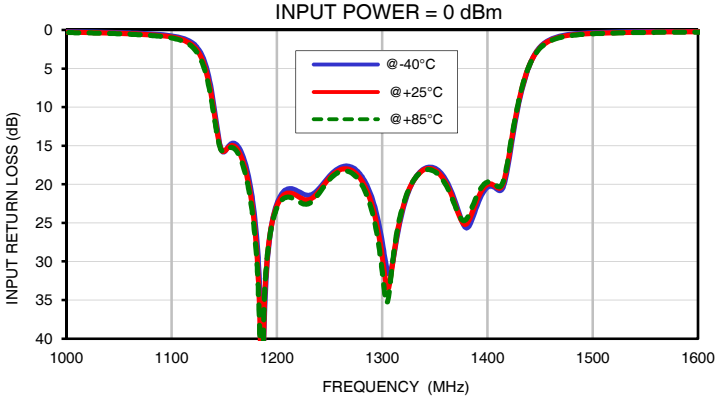
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



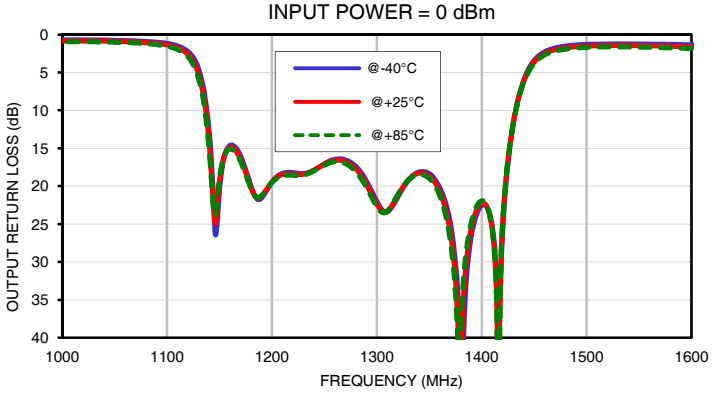
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



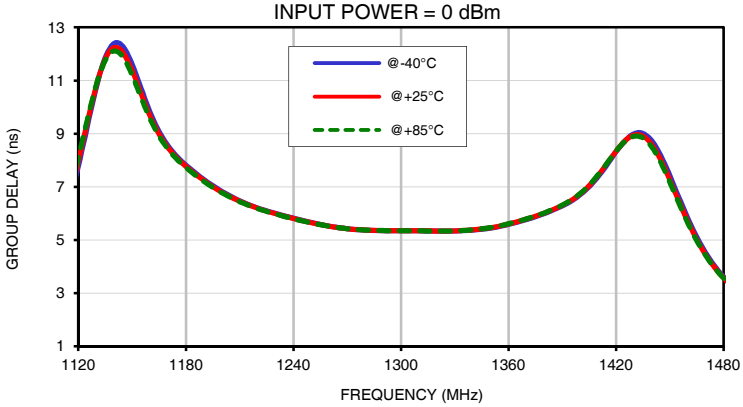
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



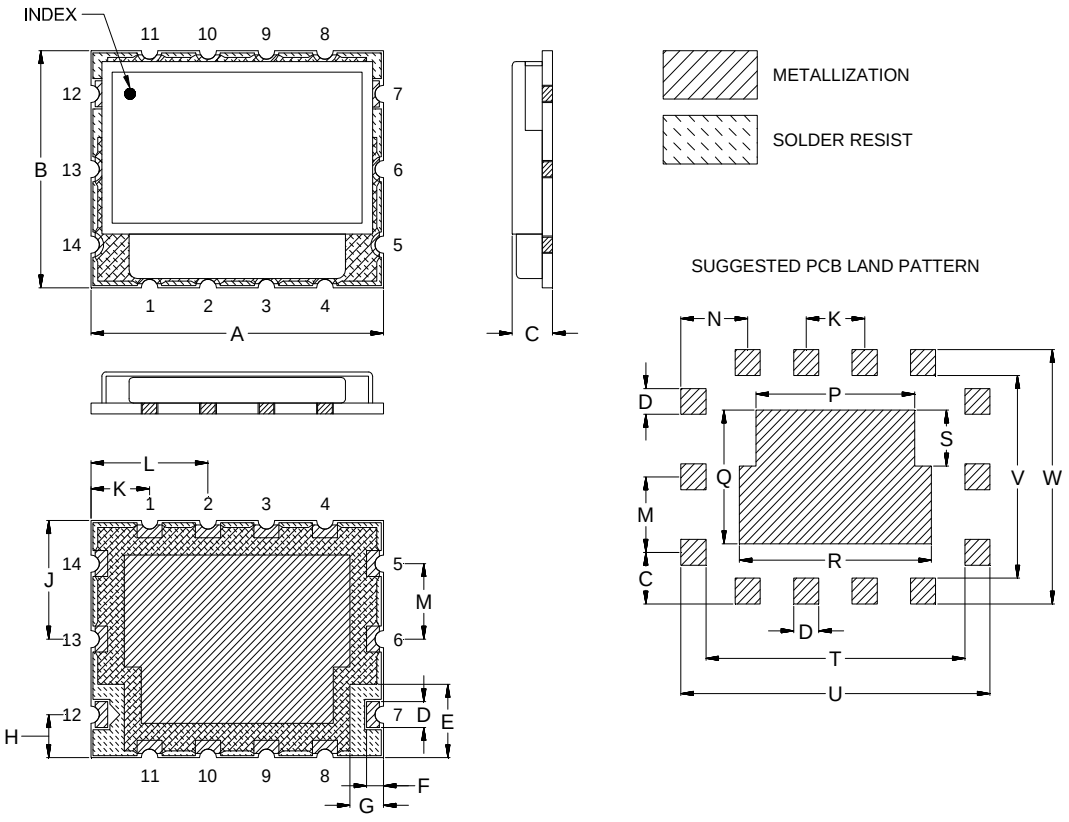
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style WA

Outline Dimensions

WA3176-1



CASE#	A	B	C	D	E	F	G	H	J	K	L	M
WA3176-1	.700 (17.78)	.550 (13.97	.120 (3.05)	.060 (1.52)	.170 (4.32)	.040 (1.02)	.080 (2.03)	.100 (2.54)	.275 (6.99)	.140 (3.56)	.280 (7.11)	.175 (4.45)

CASE#	N	P	Q	R	S	T	U	V	W	WT.GRAMS
WA176-1	.160 (4.06)	.380 (9.65)	.310 (7.87)	.460 (11.68)	.130 (3.30)	.620 (15.75)	.740 (18.80)	.470 (11.94)	.590 (14.99)	1.3

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

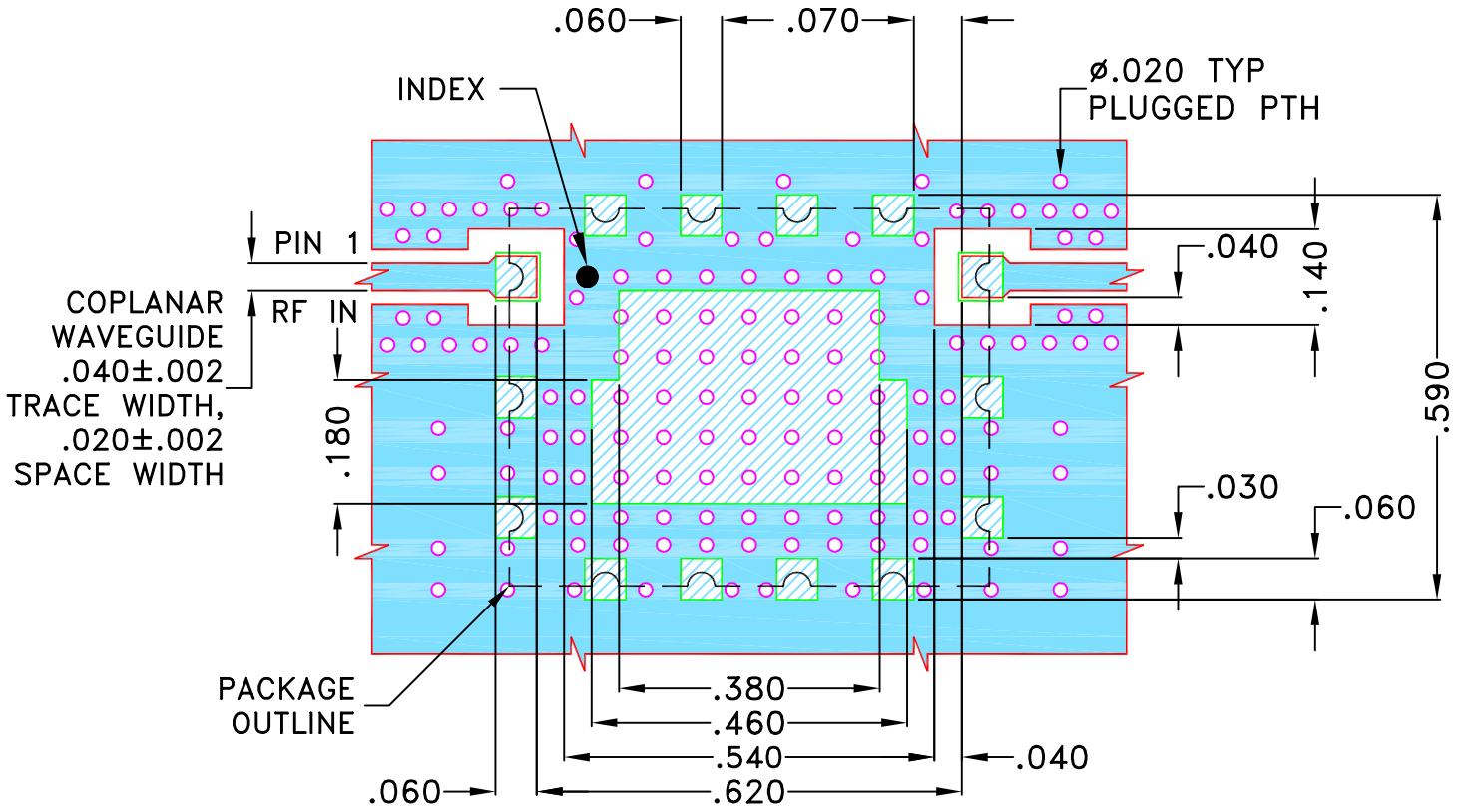
Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: 3-5 µ inch Gold over 120-240 µ inch Nickel plate.
   For RoHS-5 Case Styles: Tin-Lead plate.

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-010788	NEW RELEASE	NOV 21	DDR	VC

SUGGESTED MOUNTING CONFIGURATION FOR WA3176-1 CASE STYLE



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .020±.0015. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
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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	DDR	23 NOV 21
TOLERANCES ON:	CHECKED	DDR	23 NOV 21
2 PL DECIMALS ±	APPROVED	KN	23 NOV 21
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

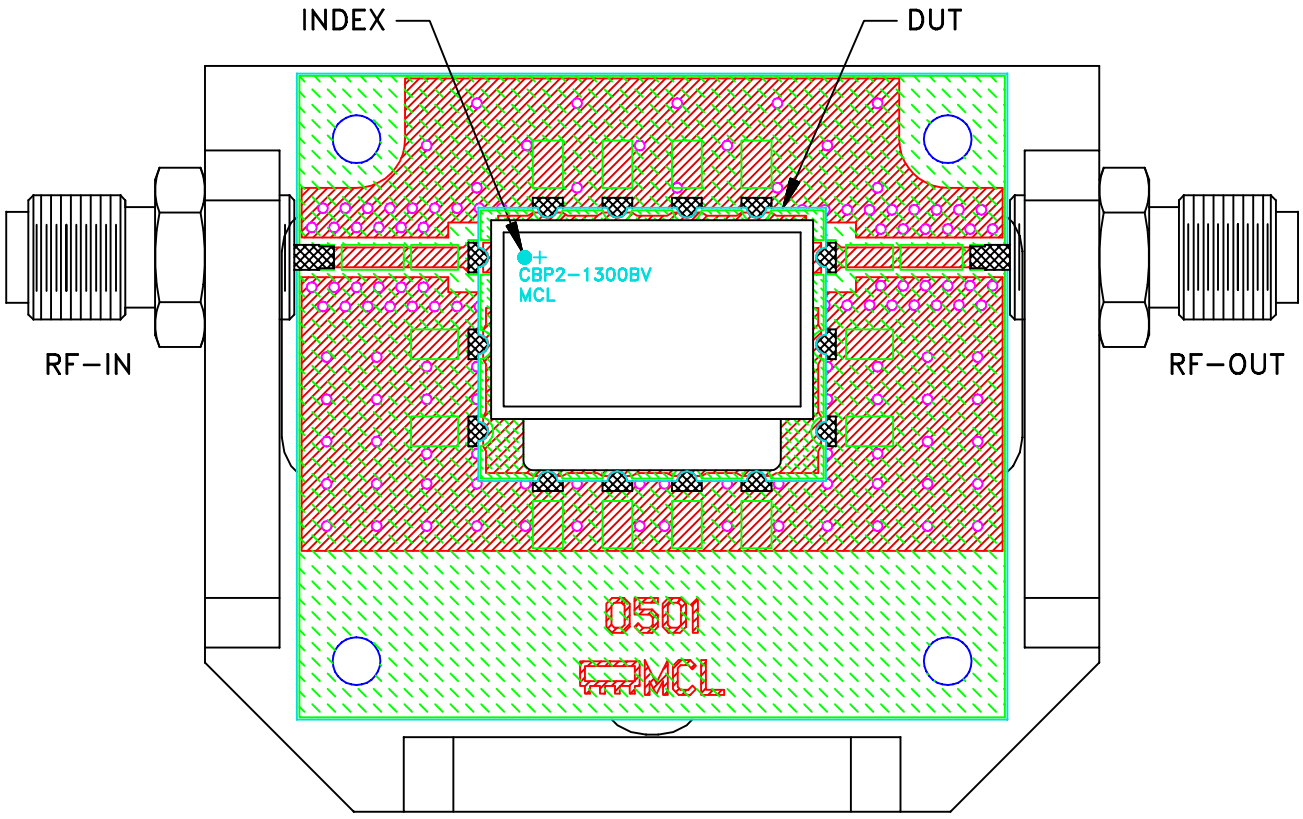
PL DWG WA3176-1 C.S 50 OHM CBP2

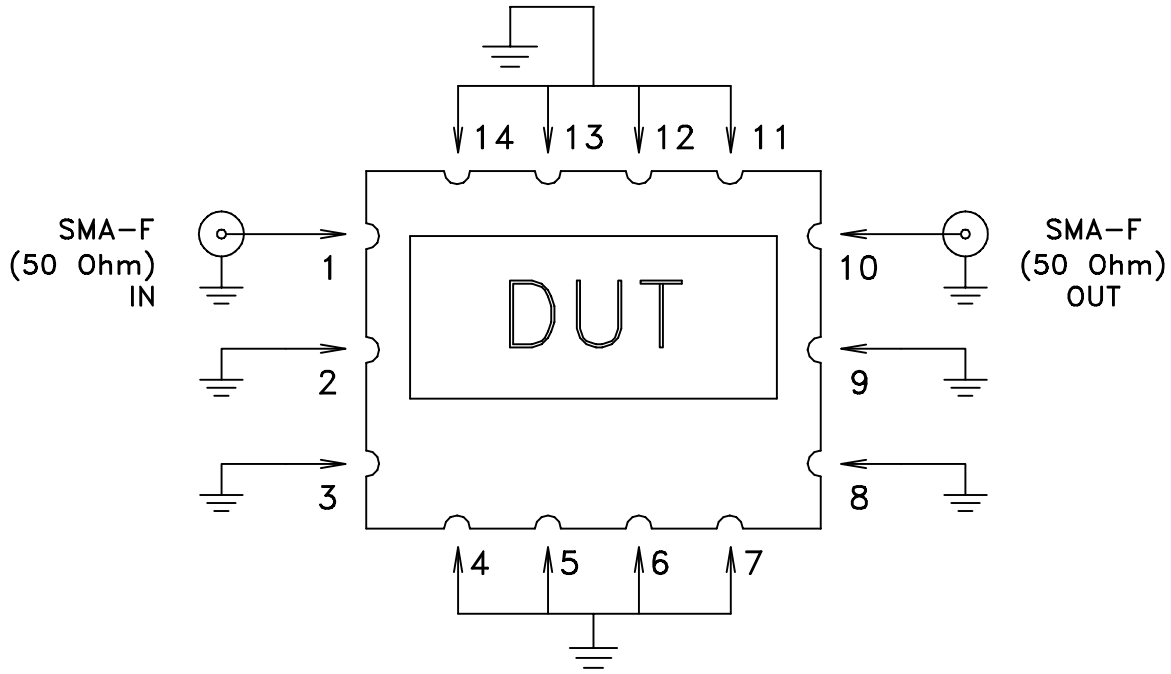
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-722	OR

FILE:	SCALE:	SHEET:
98-PL-722	3.5:1	1 OF 1

Evaluation Board and Circuit

TB-CBP2-1300BV+





Schematic diagram

Notes:

1. 50 Ohm SMA female connectors.
2. PCB Material: RO4350B OR Equivalent
   Dielectric Constant=3.48±.05, Thickness=.020 inch.

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Environmental Specifications ENV117

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
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process: 245°C peak	J-STD-020C, 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