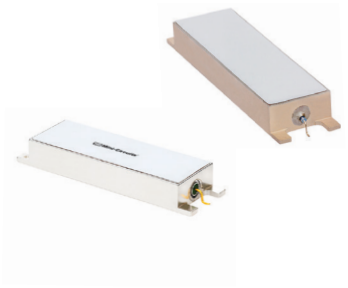
Surface Mount

Gross-Leak-Sealed Metal Package Filters

50Ω DC to 6 GHz



The Big Deal

- Gross-leak-sealed package
- Excellent rejection
- Sharp roll-off
- Resistant to vibration
- Can modify for Hermeticity

Product Overview

Mini-Circuits' *Gross-Leak-Sealed Metal Package filters* offer low insertion loss and wide stop band in a very small form factor. Bandpass and Low pass designs use these construction technique. Small package size combined with sharp roll-off and excellent rejection characteristics make these filters ideal for military or other high performance applications. The product line is standardized by design and package to provide engineers with filters that ideally suit their high performance requirement.

All our Gross-leak-sealed metal package filters are built with durable construction. Excellent repeatability across units is achieved through precise tuning and process control.

All our Gross-leak-sealed metal package filters can be modified to meet fine-leak specification.

Key Features

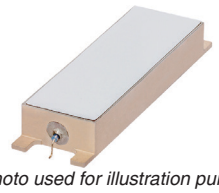
Feature	Advantages
Gross-leak-sealed metal package	Water and dust resistance; can modify for resistance to fine-leak.
Sharp roll-off	Sharp roll-off helps in adjacent channel rejection and hence increased selectivity
Excellent rejection	Rejects unwanted spurious in the adjacent band
Resistant to vibration	Withstand harsh environmental condition
Small Size	Very well suited for high performance applications where small package size is required.
Temperature stability	Very minimal change in electrical performance across temperature makes these filters suitable for a wide range of operating conditions and applications.

Surface Mount - Sealed Metal Package

Bandpass Filter

MBPA-693+

50Ω 673 to 713 MHz



Generic photo used for illustration purposes only

CASE STYLE: QN2178-3

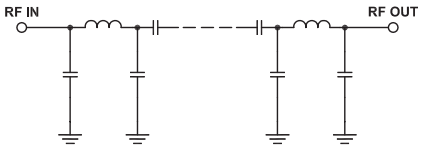
Features

- Low passband IL , 2.2 dB typ.
- Fast Rejection roll-off
- Excellent rejection floor, 80 dB typ.
- Wider stopband performance up to 5GHz
- Good Return loss, 18 dB typ.
- Rugged Metal package
- Gross Leak Sealed

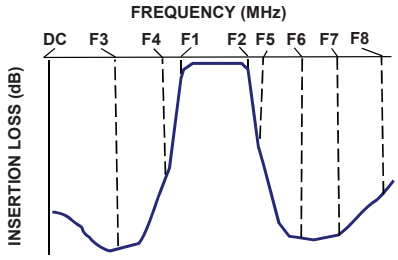
Applications

- Defense systems
- Transmitters and receivers

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

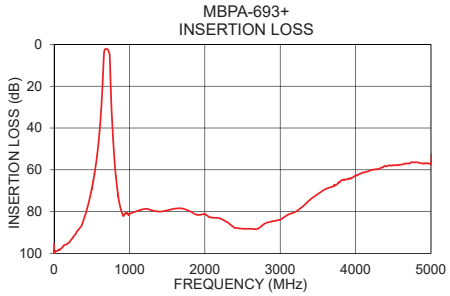
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	693	-	MHz
	Insertion Loss	F1-F2	673 - 713	-	2.2	3.0	dB
	VSWR	F1-F2	673 - 713	-	1.3	1.8	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 450	60	80	-	dB
		F3-F4	450 - 575	40	60	-	dB
Stop Band, Upper	Insertion Loss	F5-F6	790 - 900	40	60	-	dB
		F6-F7	900 - 2500	60	80	-	dB
		F7-F8	2500 - 5000	40	60	-	dB

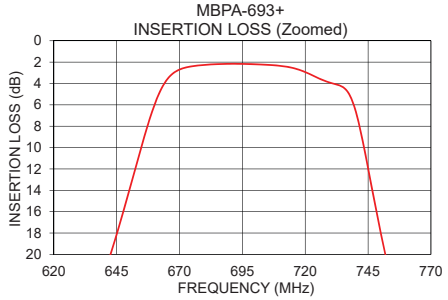
Maximum Ratings[2]	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 105°C
RF Power Input[1]	5W max. @25°C

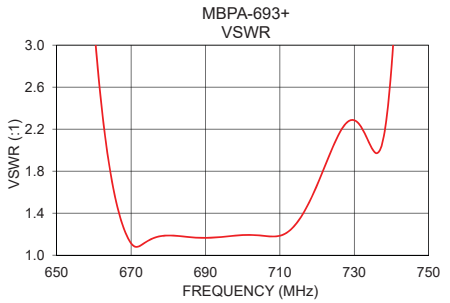
1. Passband rating derates linearly to 1.25W at 85°C ambient.
2. Permanent damage may occur if any of these limits are exceeded.

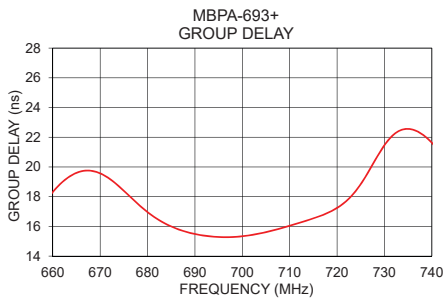
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	95.38	321.11	673	18.96
50	98.65	450.40	675	18.40
450	77.06	54.17	677	17.79
575	51.88	46.94	679	17.22
626	30.87	29.70	681	16.72
641	21.17	18.56	683	16.32
666	3.36	1.51	685	16.00
673	2.47	1.10	687	15.75
680	2.26	1.19	689	15.56
693	2.16	1.17	691	15.43
700	2.20	1.19	693	15.34
713	2.44	1.25	695	15.29
724	3.36	2.01	697	15.28
753	21.27	13.70	699	15.31
763	30.75	20.01	701	15.38
790	49.08	29.76	703	15.48
900	80.45	45.04	705	15.61
2500	88.19	73.45	707	15.78
4000	62.88	112.12	709	15.95
5000	57.42	68.83	713	16.34









Notes

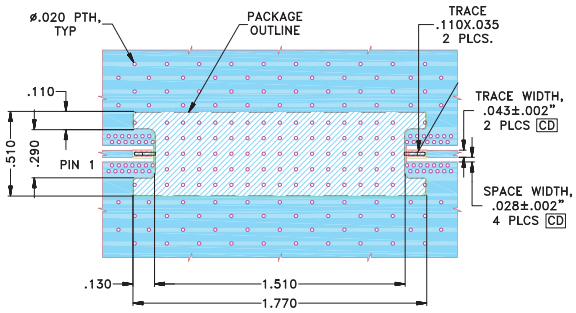
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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	2

Demo Board MCL P/N: TB-MBPA-693+
Suggested PCB Layout (PL-701)

SUGGESTED MOUNTING CONFIGURATION FOR QN2178-3 CASE STYLE



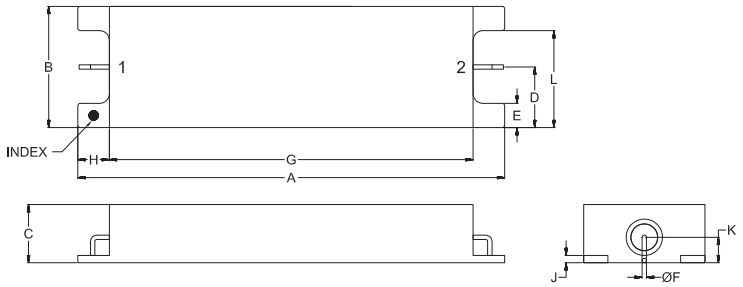
NOTES:

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
		Min	Max						
1.76	**.50**	**.24**	**.26**	**.25**	**.10**	**.018**	**1.50**	**.13**	**.03**
44.70	12.70	6.10	6.60	6.35	2.54	0.46	38.10	3.30	.76

K	L	Wt.
.11	**.40**	grams
2.79	10.16	14(APPROX)

Note: Please refer to case style drawing for details

Surface mount Bandpass Filter MBPA-693+

Typical Performance Data

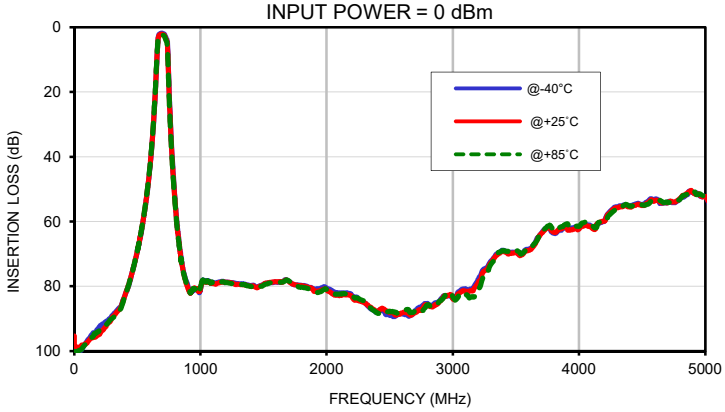
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	105.43	95.38	100.33	0.05	0.05	0.05	0.05	0.05	0.05
5	105.28	99.77	102.82	0.05	0.05	0.05	0.04	0.04	0.04
10	102.79	99.03	101.28	0.04	0.04	0.04	0.04	0.04	0.04
50	99.98	98.65	99.74	0.04	0.04	0.04	0.03	0.04	0.04
100	97.07	97.55	97.44	0.05	0.06	0.07	0.04	0.06	0.07
200	92.49	94.88	93.68	0.15	0.17	0.19	0.13	0.16	0.18
250	91.01	92.52	91.95	0.19	0.22	0.24	0.17	0.21	0.23
300	89.13	89.67	89.99	0.22	0.26	0.28	0.20	0.24	0.26
440	78.67	78.44	78.41	0.26	0.32	0.36	0.23	0.29	0.32
450	77.16	77.06	76.96	0.26	0.32	0.36	0.23	0.29	0.32
500	69.13	69.09	68.92	0.27	0.33	0.37	0.23	0.30	0.34
550	58.89	58.74	58.57	0.28	0.35	0.39	0.24	0.32	0.36
575	52.07	51.88	51.65	0.30	0.37	0.42	0.27	0.34	0.39
620	34.39	34.12	33.75	0.42	0.52	0.59	0.39	0.48	0.55
640	22.28	21.90	21.40	0.73	0.89	1.01	0.67	0.82	0.93
650	14.44	14.03	13.50	1.38	1.67	1.92	1.25	1.52	1.75
660	6.18	6.03	5.78	4.72	5.60	6.44	4.32	5.11	5.88
665	3.52	3.64	3.66	10.39	11.94	13.39	9.40	10.68	11.89
670	2.43	2.69	2.83	23.11	25.40	26.50	18.35	19.41	20.28
673	2.20	2.47	2.63	28.57	26.27	25.06	22.18	21.88	21.87
675	2.11	2.39	2.55	24.29	23.35	22.91	21.97	21.55	21.53
680	1.98	2.26	2.43	21.19	21.34	21.49	20.94	21.08	21.31
690	1.89	2.16	2.33	22.17	22.37	22.09	22.93	23.27	23.17
693	1.88	2.16	2.34	22.05	22.15	21.73	23.21	23.51	23.23
700	1.91	2.20	2.39	21.09	21.17	20.82	23.01	23.46	23.32
705	1.96	2.25	2.45	21.25	21.39	21.17	24.71	25.88	26.59
710	2.03	2.35	2.56	21.95	21.44	20.67	38.67	41.13	33.97
713	2.11	2.44	2.68	20.26	19.21	18.10	28.22	25.14	22.70
750	16.73	17.94	19.09	1.50	1.56	1.56	1.69	1.76	1.75
755	22.31	23.35	24.35	1.05	1.14	1.18	1.12	1.23	1.27
765	31.59	32.41	33.20	0.73	0.83	0.88	0.73	0.84	0.89
770	35.55	36.29	37.02	0.66	0.75	0.80	0.64	0.75	0.80
775	39.16	39.85	40.53	0.61	0.69	0.74	0.58	0.68	0.73
780	42.49	43.13	43.77	0.56	0.65	0.70	0.53	0.63	0.67
790	48.49	49.08	49.65	0.50	0.58	0.63	0.46	0.55	0.60
800	53.88	54.29	54.79	0.46	0.54	0.59	0.42	0.50	0.55
825	64.41	64.58	65.34	0.39	0.47	0.52	0.35	0.43	0.48
850	72.09	72.77	72.28	0.36	0.43	0.48	0.32	0.40	0.44
900	79.82	80.45	80.22	0.31	0.39	0.43	0.27	0.35	0.39
1000	81.05	81.03	80.33	0.26	0.34	0.38	0.22	0.31	0.35
1200	78.77	78.72	78.90	0.19	0.28	0.32	0.16	0.25	0.29
1400	79.86	80.00	80.05	0.15	0.24	0.29	0.13	0.22	0.27
1600	78.72	78.61	78.73	0.15	0.24	0.29	0.12	0.22	0.25
1800	79.75	79.81	80.30	0.16	0.25	0.29	0.12	0.21	0.25
2000	80.55	81.08	80.99	0.17	0.25	0.29	0.12	0.21	0.25
2200	82.71	83.24	82.60	0.17	0.25	0.28	0.11	0.20	0.23
2400	87.87	87.75	88.28	0.17	0.24	0.27	0.10	0.18	0.21
2500	89.01	88.19	87.71	0.16	0.24	0.26	0.09	0.17	0.20
2800	85.32	85.66	85.73	0.12	0.20	0.23	0.05	0.14	0.17
3000	83.76	83.82	83.21	0.08	0.17	0.20	0.02	0.11	0.15
3400	68.87	69.24	68.98	0.05	0.15	0.19	0.03	0.08	0.12
3800	63.64	63.33	62.65	0.04	0.16	0.21	0.00	0.12	0.16
4000	62.12	62.31	61.52	0.02	0.15	0.23	0.01	0.13	0.19
4200	59.98	59.91	59.83	0.02	0.16	0.24	0.00	0.13	0.19
4500	54.71	55.08	54.87	0.07	0.21	0.27	0.07	0.20	0.25
4600	53.11	53.65	54.08	0.08	0.22	0.27	0.10	0.23	0.31
4700	54.18	54.22	54.02	0.09	0.22	0.27	0.15	0.28	0.33
4800	53.07	52.93	53.12	0.09	0.22	0.28	0.28	0.43	0.50
4900	50.97	51.00	50.33	0.11	0.24	0.29	0.80	1.01	1.14
5000	52.31	52.28	52.28	0.13	0.25	0.31	3.56	3.72	3.71

Typical Performance Data

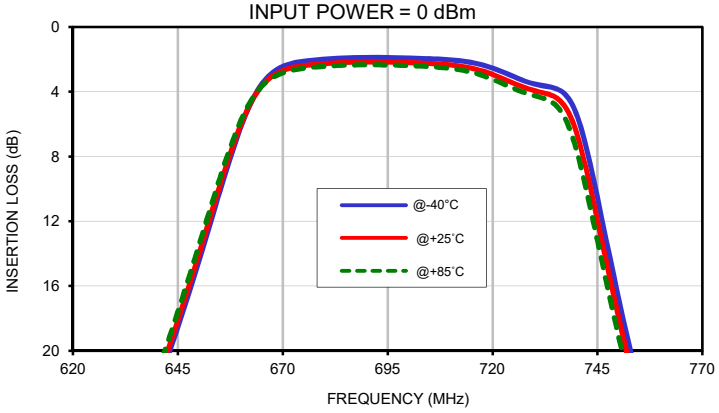
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25˚C	@+85˚C
655	15.43	15.80	16.19
656	16.06	16.39	16.74
657	16.66	16.94	17.24
658	17.20	17.45	17.71
660	18.16	18.32	18.48
670	19.81	19.57	19.34
673	19.27	18.96	18.67
675	18.71	18.40	18.10
677	18.09	17.79	17.53
679	17.47	17.22	16.99
681	16.93	16.72	16.54
683	16.47	16.32	16.18
685	16.12	16.00	15.89
687	15.84	15.75	15.67
689	15.63	15.56	15.50
691	15.47	15.43	15.39
693	15.37	15.34	15.31
695	15.30	15.29	15.28
697	15.28	15.28	15.29
699	15.29	15.31	15.33
701	15.35	15.38	15.42
703	15.44	15.48	15.53
705	15.57	15.61	15.68
707	15.72	15.78	15.85
709	15.90	15.95	16.03
711	16.08	16.14	16.22
713	16.28	16.34	16.41
715	16.48	16.54	16.63
717	16.69	16.77	16.88
719	16.95	17.06	17.21
721	17.29	17.46	17.67
723	17.79	18.04	18.33
725	18.51	18.84	19.23
727	19.51	19.89	20.28
729	20.68	20.98	21.28
731	21.76	21.88	22.00
733	22.49	22.42	22.35
735	22.80	22.56	22.35
737	22.75	22.39	22.05
740	22.13	21.63	21.15
745	19.91	19.18	18.42

Typical Performance Curves

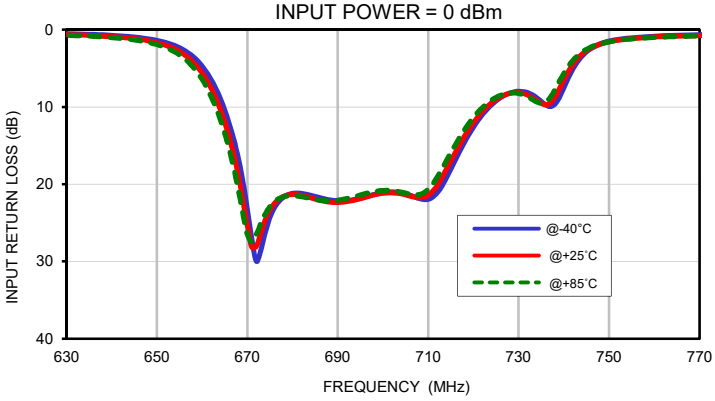
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



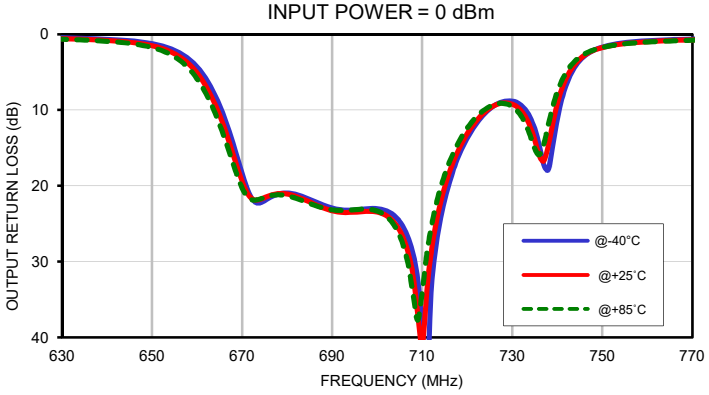
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



GROUP DELAY vs. TEMPERATURE
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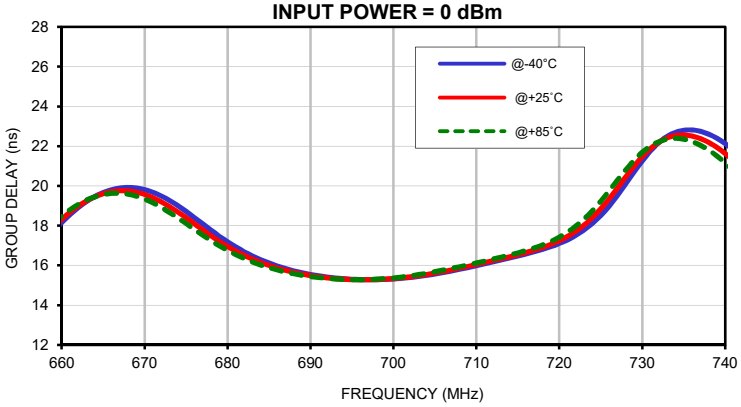
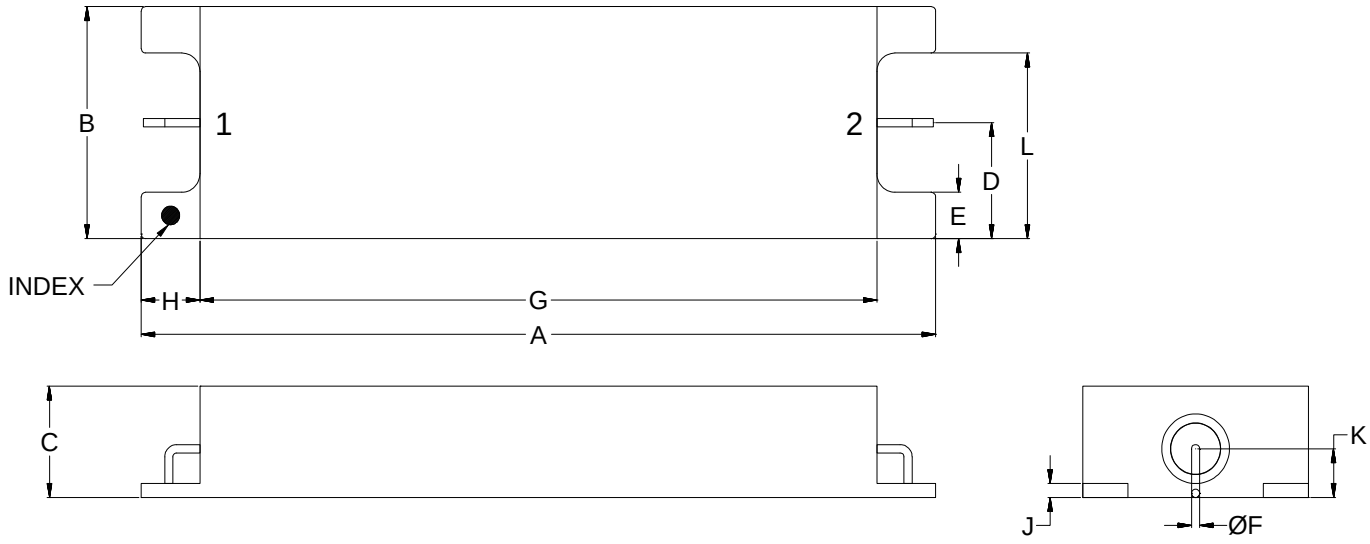


Case Style QN

Outline Dimensions

QN2178-3



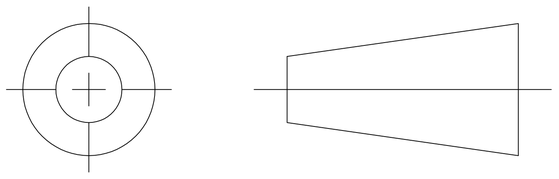
CASE#	A	B	C		D	E	F	G	H	J	K	L	WT. GRAM
			MIN	MAX									
QN2178-3	1.76 (44.70)	.50 (12.70)	.24 (6.10)	.26 (6.60)	.25 (6.35)	.10 (2.54)	.018 (0.46)	1.50 (38.10)	.13 (3.30)	.03 (.76)	.11 (2.79)	.40 (10.16)	14 APPROX

Dimensions are in inches (mm). Tolerances: 2Pl. ± .04; 3Pl. ± .015

Notes:

1. Case material: Silver plating over brass.
2. Pin finish: Gold plated over nickel.
3. Pin material: Kovar.

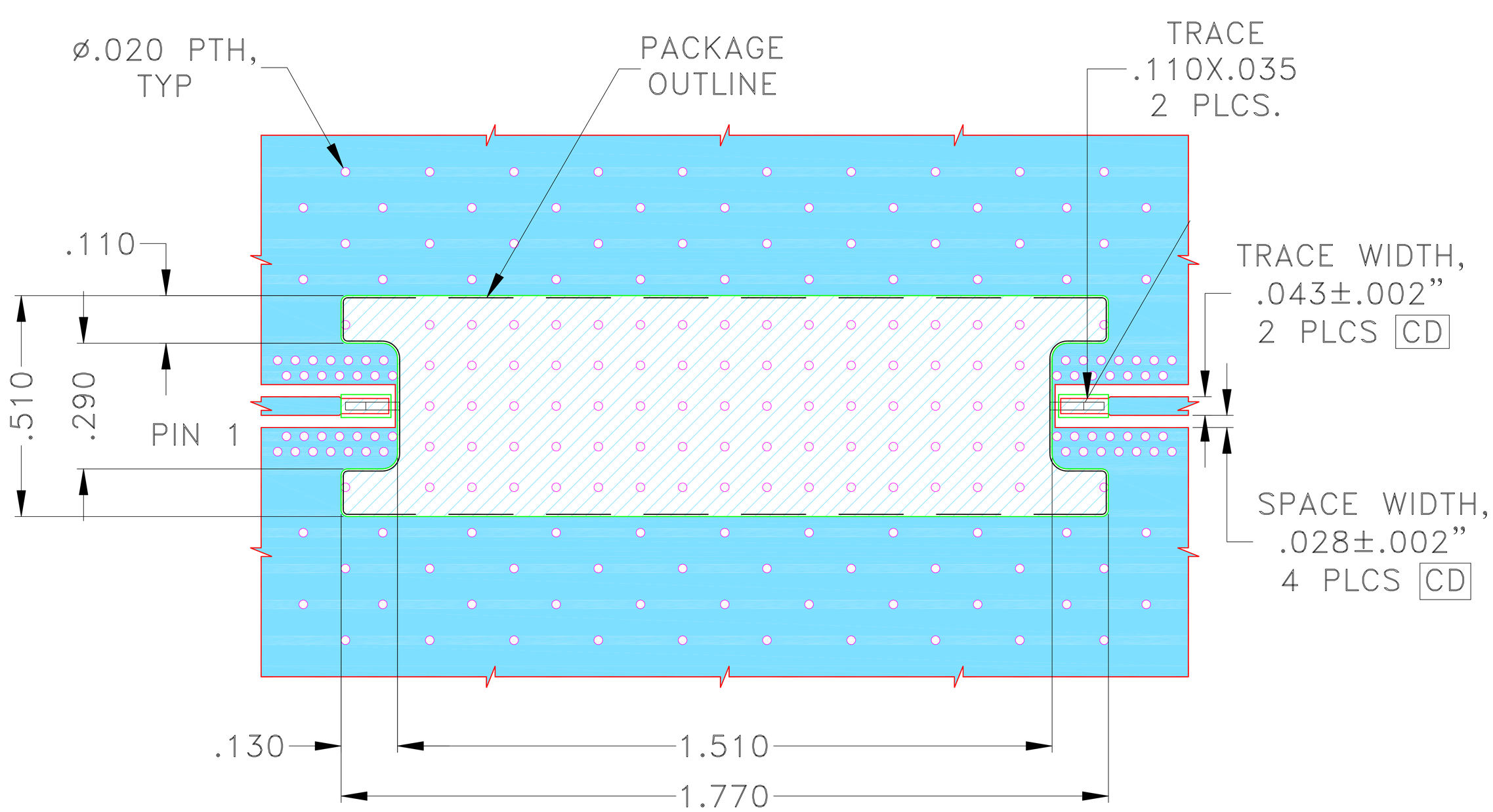
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-005339	NEW RELEASE	DEC 20	AP	VC

SUGGESTED MOUNTING CONFIGURATION FOR QN2178-3 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	AP	20 DEC 20
TOLERANCES ON:	CHECKED	MD	20 DEC 20
2 PL DECIMALS ±	APPROVED	MD	20 DEC 20
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, QN2178-3, MBPA TB-893+, 50 Ohm

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-701	OR

FILE:	SCALE:	SHEET:
98PL701	3:1	1 OF 1

Environmental Specifications ENV118

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°C to +85°C	
Storage Temperature	-55°C to +105°C	
Thermal Shock	-55°C to +105°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except + 105°C
Resistance to Soldering Heat	Peak Temperature 235 ± 5°C	MIL-STD-202, Method 210, Condition J
Seal	Gross leak - fluorocarbon liquid at 125°C	MIL-STD-202, Method 112, Condition D
Solderability	10 X Magnification	J-STD-002