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.

REV. OR
ECO-015196
CBP4-1875Q+
EDU4470
URJ
221003

SURFACE MOUNT CERAMIC RESONATOR

Bandpass Filter

CBP4-1875Q+

50Ω 1825 to 1925 MHz

FEATURES

- High rejection, 60dB typ.
- Narrow band and fast roll-off
- Good insertion loss, 2.5dB typ.

Generic photo used for illustration purposes only

CASE STYLE: HQ2299

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

APPLICATIONS

- Defense / Military
- International Mobile Telecommunication

ELECTRICAL SPECIFICATIONS AT 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Passband	Center Frequency	—	—	—	1875	—	MHz
	Insertion Loss	F1-F2	1825 - 1925	—	2.5	3.2	dB
	Return Loss	F1-F2	1825 - 1925	10	15	—	dB
Stop Band, Lower	Rejection	DC-F3	DC - 1680	60	70	—	dB
		F3-F4	1680 - 1775	20	30	—	
Stop Band, Upper	Rejection	F5-F6	1971 - 2100	20	29	—	dB
		F6-F7	2100 - 3000	48	60	—	

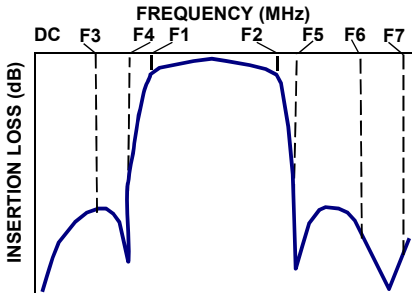
1. Measured on Mini-Circuits Test Board TB-CBP4-1875Q+

MAXIMUM RATINGS

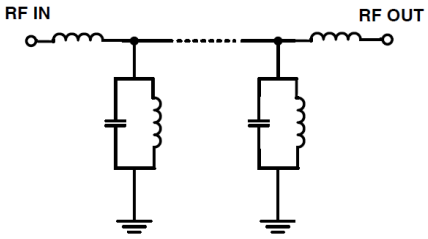
Parameter	Ratings
Operating temperature	-40°C to +85°C
Storage temperature	-55°C to +100°C
RF Power Input *	7W at 25°C

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

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC



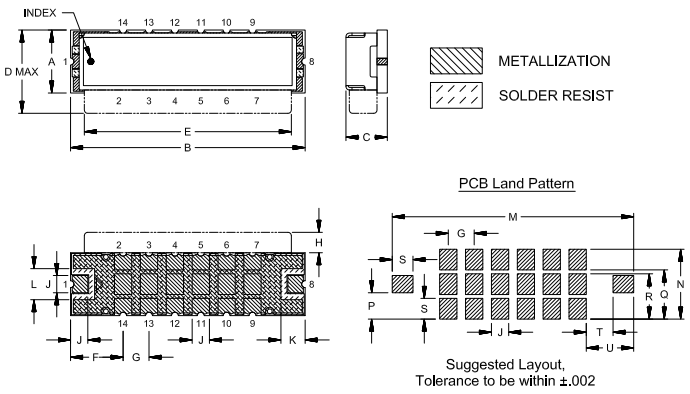
Bandpass Filter

CBP4-1875Q+

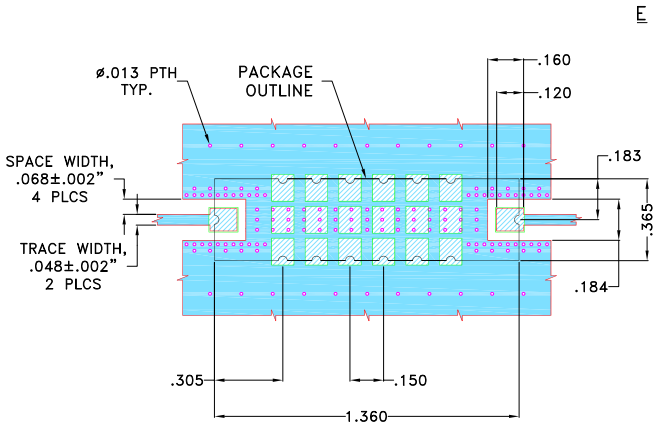
PAD CONNECTIONS

RF IN	1
RF OUT	8
GROUND	2-7,9-14

OUTLINE DRAWING



DEMO BOARD MCL P/N: TB-CBP4-1875Q+
SUGGESTED PCB LAYOUT (PL-543)



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, IT180A 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 DIMENSIONS (Inches / mm)

A	B	C		D	E	F	G	H	J	K
-	-	Min	Max	-	-	-	-	-	-	-
.365	1.360	.240	.270	.483	1.200	.305	.150	.118	.100	.140
9.27	34.54	6.10	6.86	12.27	30.48	7.75	3.81	3.00	2.54	3.56

L	M	N	P	Q	R	S	T	U	
-	-	-	-	-	-	-	-	-	Wt.
.180	1.400	.405	.153	.285	.263	.120	.155	.275	grams
4.57	35.56	10.29	3.87	7.24	6.67	3.05	3.94	6.99	5.0

Note: Please refer to case style drawing for details

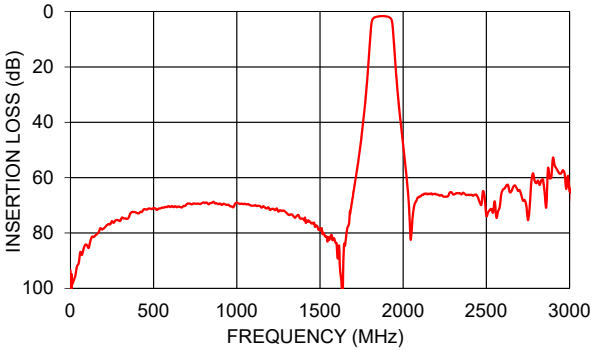
Bandpass Filter

CBP4-1875Q+

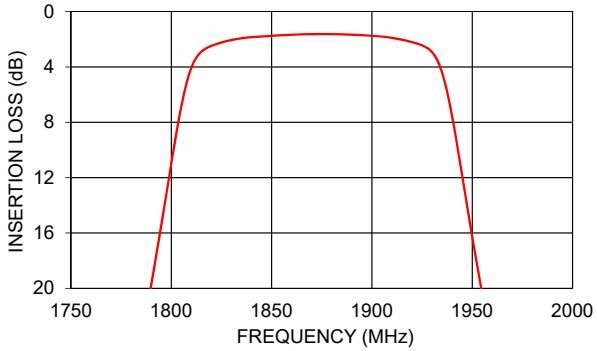
TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Frequency (MHz)	Group Delay (ns)
5	103.11	0.05	1825	15.25
100	84.44	0.06	1833	13.45
1680	72.29	0.22	1839	12.65
1775	30.79	0.53	1845	12.06
1789	20.55	0.97	1851	11.66
1813	3.22	17.22	1857	11.41
1825	2.23	18.84	1863	11.28
1875	1.63	29.87	1869	11.21
1905	1.81	29.56	1875	11.22
1925	2.44	18.92	1883	11.35
1931	3.12	15.89	1891	11.61
1955	20.45	1.04	1899	12.08
1971	31.90	0.64	1905	12.61
2100	66.75	0.31	1915	13.95
3000	65.05	0.09	1925	16.98

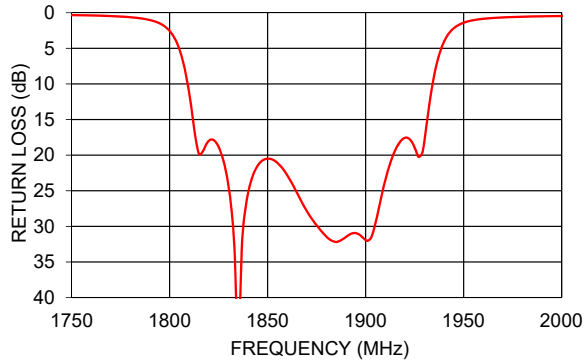
CBP4-1875Q+
INSERTION LOSS



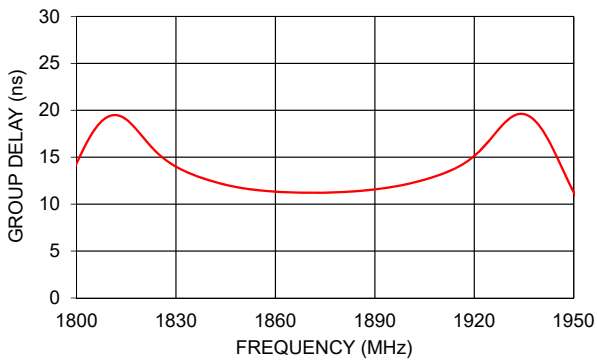
CBP4-1875Q+
INSERTION LOSS (Zoomed)



CBP4-1875Q+
RETURN LOSS



CBP4-1875Q+
GROUP DELAY



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 CBP4-1875Q+

Typical Performance Data

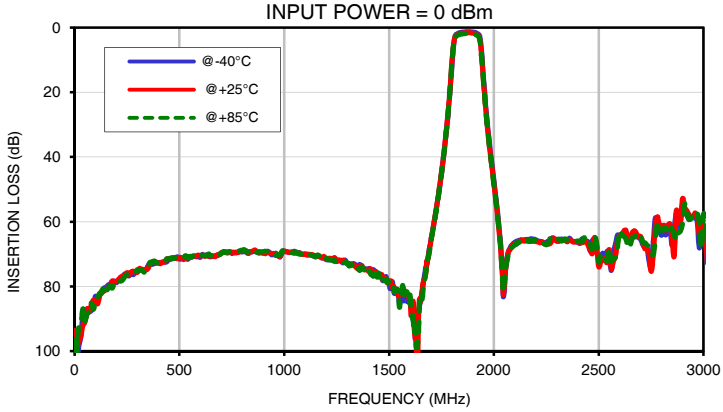
FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
5	98.51	103.11	103.09	0.05	0.05	0.05	0.05	0.05	0.06
20	98.53	97.18	92.78	0.05	0.05	0.06	0.05	0.05	0.06
30	95.77	95.40	92.14	0.05	0.05	0.05	0.05	0.06	0.06
50	90.34	90.98	90.52	0.05	0.05	0.06	0.06	0.07	0.07
100	83.03	84.44	84.62	0.07	0.06	0.06	0.07	0.08	0.08
150	80.36	80.91	81.39	0.07	0.07	0.07	0.06	0.08	0.09
200	78.84	78.36	78.68	0.06	0.07	0.07	0.06	0.08	0.09
250	76.38	75.74	76.34	0.05	0.07	0.07	0.04	0.07	0.08
300	75.46	75.62	74.79	0.04	0.06	0.07	0.03	0.06	0.07
350	73.68	74.50	74.46	0.03	0.06	0.07	0.02	0.05	0.07
400	72.58	72.76	72.57	0.02	0.05	0.07	0.01	0.05	0.07
450	71.60	71.41	71.47	0.01	0.04	0.07	0.00	0.04	0.06
500	71.53	70.99	71.18	0.00	0.04	0.07	0.00	0.04	0.06
600	70.98	70.62	70.41	0.01	0.04	0.08	0.02	0.03	0.06
700	69.82	69.55	69.63	0.03	0.04	0.09	0.03	0.03	0.07
800	69.36	68.97	68.76	0.04	0.04	0.10	0.04	0.03	0.09
1000	69.13	69.04	68.82	0.05	0.07	0.15	0.05	0.05	0.13
1200	71.66	71.66	71.30	0.04	0.11	0.21	0.04	0.10	0.19
1400	74.66	74.92	75.98	0.02	0.15	0.27	0.02	0.13	0.24
1600	84.74	83.74	82.43	0.02	0.19	0.30	0.01	0.17	0.27
1680	73.28	72.29	74.02	0.06	0.22	0.33	0.05	0.20	0.30
1775	31.18	30.79	30.88	0.39	0.53	0.63	0.34	0.49	0.58
1789	21.20	20.55	20.53	0.76	0.97	1.10	0.68	0.88	1.01
1801	10.90	10.09	10.02	2.22	2.89	3.26	2.09	2.74	3.07
1813	3.12	3.22	3.45	13.97	17.22	17.96	13.66	16.57	17.02
1825	1.94	2.23	2.47	17.82	18.84	19.84	17.10	17.45	17.83
1835	1.63	1.93	2.16	28.09	46.50	30.54	21.56	21.62	20.56
1845	1.48	1.80	2.03	25.63	21.45	19.67	21.80	19.36	18.09
1855	1.40	1.71	1.93	22.68	21.10	20.54	21.73	20.64	20.32
1865	1.34	1.64	1.86	25.22	25.31	25.68	25.17	26.84	29.76
1875	1.32	1.63	1.85	28.19	29.87	27.92	28.64	38.40	37.87
1885	1.34	1.64	1.86	26.88	32.20	30.80	27.49	38.36	35.48
1895	1.38	1.70	1.92	25.67	30.95	34.47	26.99	34.86	41.70
1905	1.46	1.81	2.04	30.03	29.56	30.96	35.66	31.55	32.49
1915	1.67	2.03	2.26	18.54	19.35	21.22	18.70	19.38	21.03
1925	2.02	2.44	2.70	16.23	18.92	20.45	16.35	18.79	19.84
1931	2.45	3.12	3.41	19.10	15.89	15.96	19.29	15.75	15.60
1943	8.72	10.10	10.13	2.79	2.71	3.08	2.81	2.71	3.05
1955	19.32	20.45	20.39	0.80	1.04	1.28	0.81	1.04	1.26
1971	30.98	31.90	31.88	0.39	0.64	0.85	0.40	0.64	0.82
2000	47.50	48.35	48.38	0.20	0.45	0.64	0.20	0.44	0.61
2050	81.38	79.81	78.46	0.12	0.35	0.53	0.11	0.34	0.50
2100	66.76	66.75	67.20	0.08	0.31	0.47	0.07	0.28	0.43
2150	65.51	65.86	65.70	0.06	0.29	0.44	0.05	0.26	0.40
2200	65.56	66.12	65.79	0.05	0.27	0.42	0.04	0.24	0.39
2250	66.36	66.86	67.13	0.04	0.25	0.40	0.02	0.22	0.36
2300	65.53	66.05	65.48	0.04	0.24	0.39	0.02	0.21	0.35
2350	66.20	66.05	65.64	0.03	0.23	0.37	0.01	0.20	0.33
2400	66.17	66.30	65.98	0.02	0.21	0.35	0.00	0.18	0.31
2450	66.37	67.28	65.28	0.01	0.20	0.34	0.01	0.18	0.31
2500	70.72	73.84	72.45	0.01	0.19	0.33	0.02	0.16	0.29
2550	70.76	68.60	68.50	0.00	0.19	0.32	0.03	0.15	0.28
2600	64.44	64.30	62.95	0.01	0.17	0.30	0.03	0.15	0.27
2650	65.60	64.99	67.42	0.03	0.16	0.29	0.05	0.13	0.25
2700	65.42	64.56	64.79	0.04	0.15	0.28	0.06	0.12	0.24
2750	74.23	75.34	69.84	0.05	0.13	0.26	0.07	0.10	0.23
2800	64.15	62.02	62.76	0.06	0.13	0.26	0.08	0.09	0.21
2850	67.31	65.49	62.43	0.06	0.12	0.25	0.09	0.09	0.20
2900	54.35	52.86	60.39	0.07	0.12	0.25	0.08	0.09	0.21
3000	64.46	65.05	57.70	0.09	0.09	0.23	0.11	0.06	0.17

Typical Performance Data

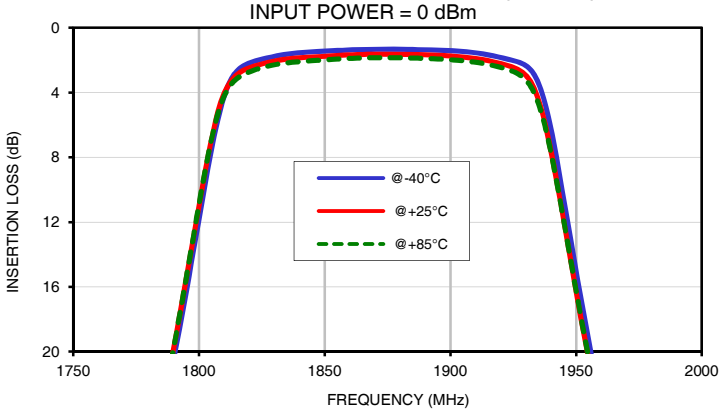
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
1825	15.71	15.25	15.13
1827	15.04	14.68	14.59
1829	14.48	14.20	14.13
1831	14.02	13.80	13.73
1833	13.64	13.45	13.39
1835	13.32	13.16	13.10
1837	13.04	12.89	12.83
1839	12.79	12.65	12.58
1841	12.57	12.44	12.38
1843	12.36	12.24	12.17
1845	12.17	12.06	12.00
1847	12.01	11.90	11.85
1849	11.87	11.77	11.72
1851	11.74	11.66	11.62
1853	11.62	11.55	11.52
1855	11.53	11.48	11.46
1857	11.45	11.41	11.39
1859	11.38	11.35	11.33
1861	11.32	11.30	11.29
1863	11.29	11.28	11.26
1865	11.25	11.25	11.23
1867	11.22	11.23	11.21
1869	11.21	11.21	11.20
1871	11.20	11.22	11.19
1873	11.20	11.21	11.18
1875	11.21	11.22	11.20
1877	11.22	11.24	11.21
1879	11.25	11.27	11.25
1881	11.26	11.30	11.27
1883	11.31	11.35	11.32
1885	11.35	11.39	11.37
1889	11.47	11.53	11.50
1893	11.64	11.71	11.68
1897	11.86	11.94	11.90
1901	12.15	12.24	12.20
1905	12.50	12.61	12.56
1909	12.92	13.05	13.00
1913	13.42	13.60	13.56
1917	14.07	14.36	14.31
1921	15.04	15.45	15.36
1925	16.50	16.98	16.81

Typical Performance Curves

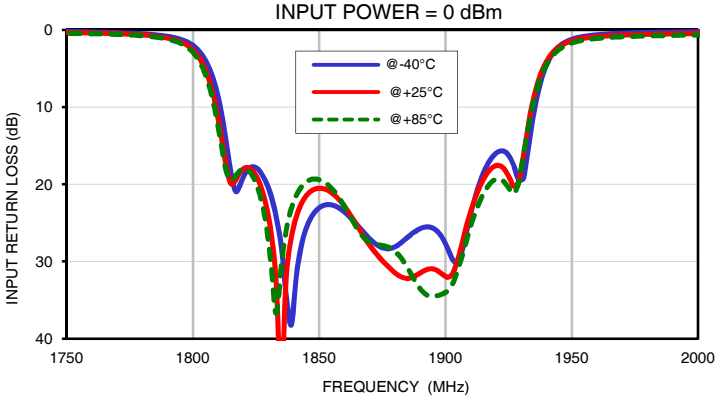
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



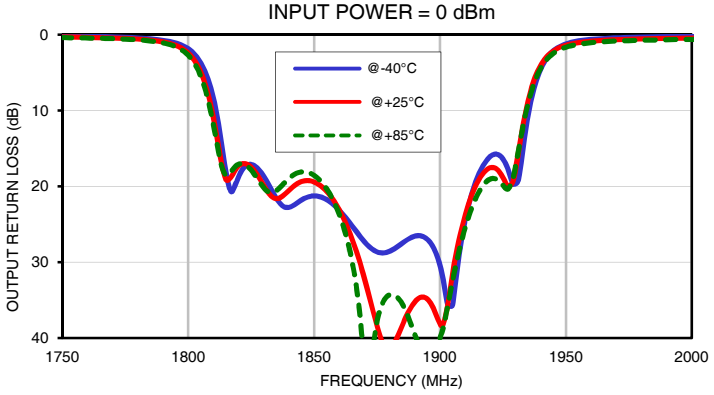
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



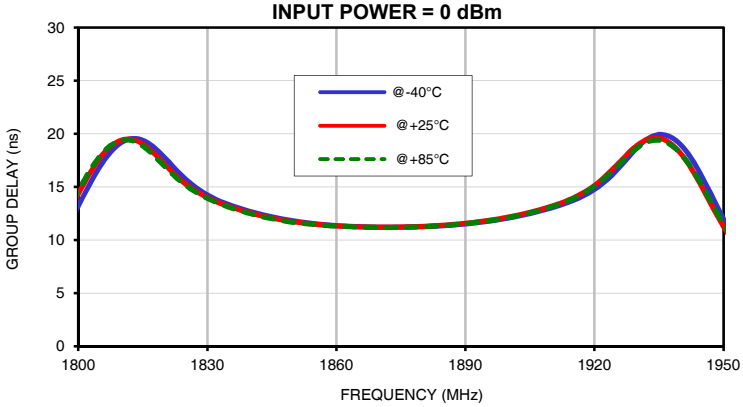
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



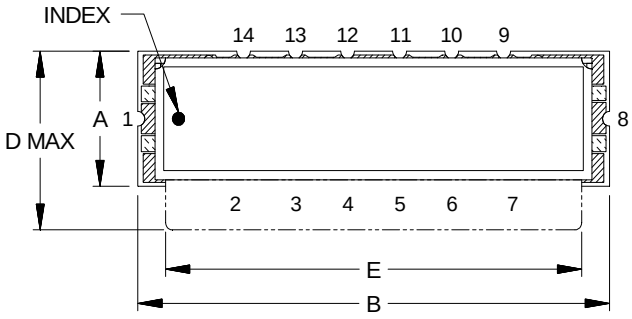
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm

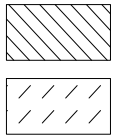


Case Style HQ

Outline Dimensions

HQ2299

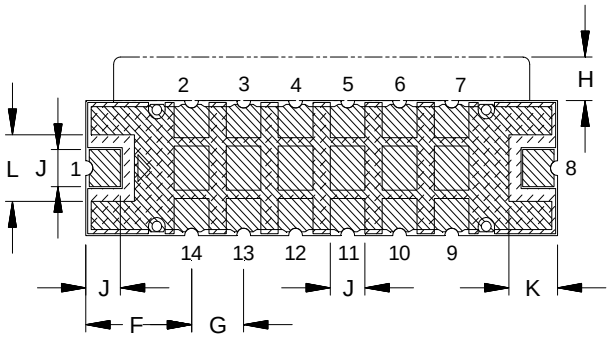


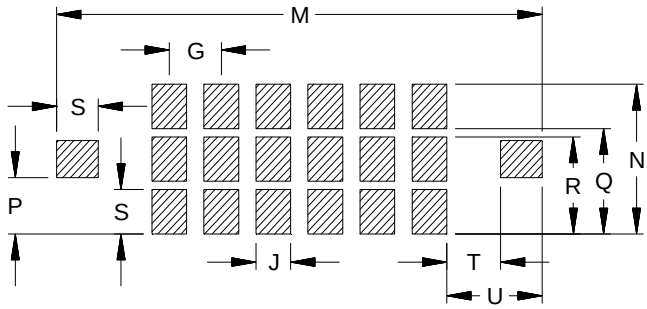


METALLIZATION

SOLDER RESIST

PCB Land Pattern





CASE#	A	B	C		D	E	F	G	H	J	K	L
			MIN	MAX								
HQ2299	.365 (9.27)	1.360 (34.54)	.240 (6.10)	.270 (6.86)	.483 (12.27)	1.200 (30.48)	.305 (7.75)	.150 (3.81)	.118 (3.00)	.100 (2.54)	.140 (3.56)	.180 (4.57)

CASE#	M	N	P	Q	R	S	T	U	WT.GRAMS
HQ2299	1.400 (35.56)	.405 (10.29)	.153 (3.87)	.285 (7.24)	.263 (6.67)	.120 (3.05)	.155 (3.94)	.275 (6.99)	5.0

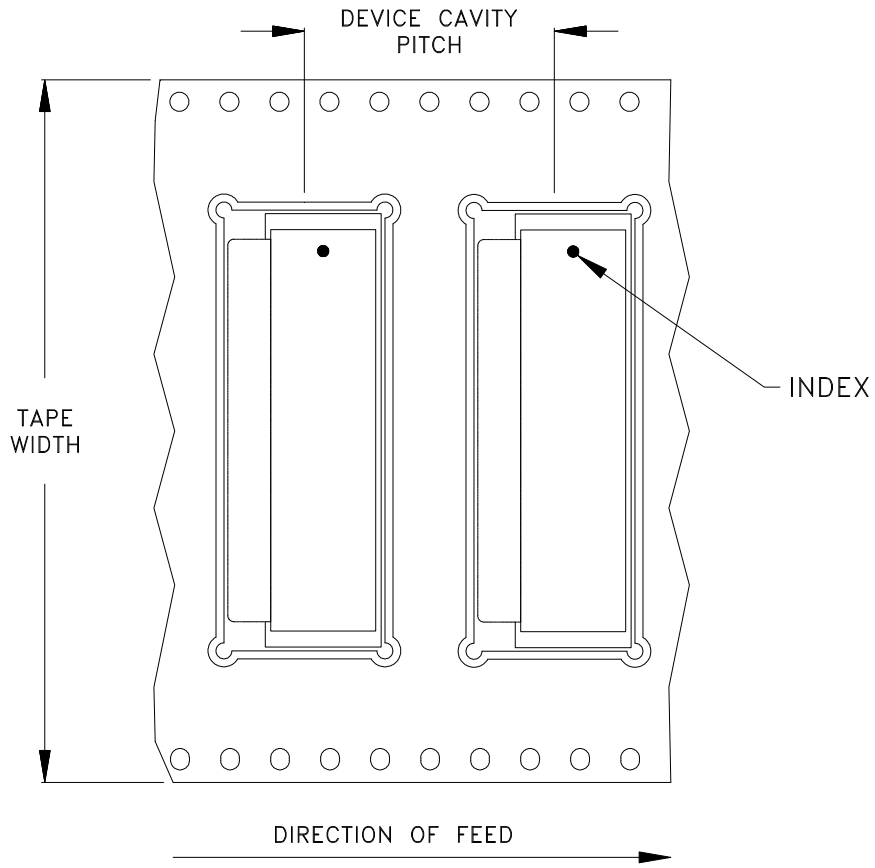
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

Notes:

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

Tape & Reel Packaging TR-F121

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
56	20	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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
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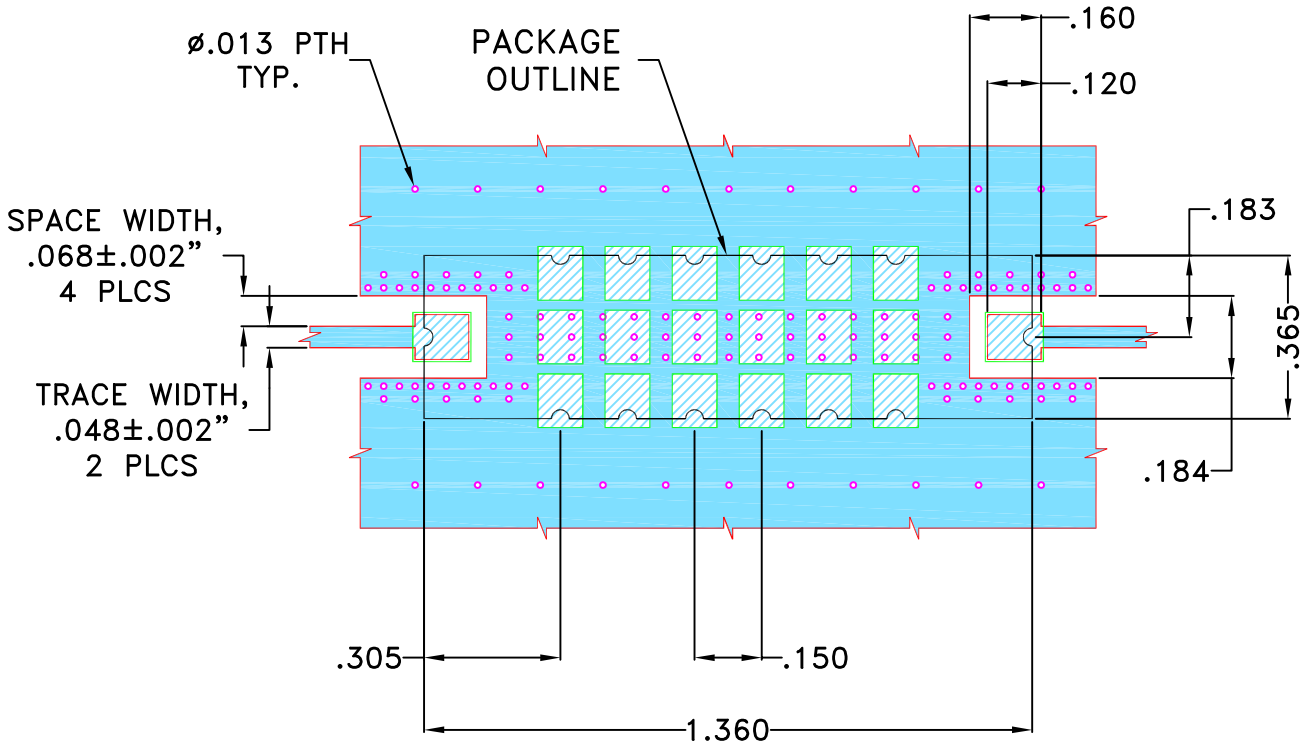
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M165612	NEW RELEASE	MAR 18	TM	MD

SUGGESTED MOUNTING CONFIGURATION FOR HQ2218 & HQ2299 CASE STYLE "14FL01" PIN CODE



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, IT180A 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	TM	12 MAR 18
TOLERANCES ON:	CHECKED	MD	12 MAR 18
2 PL DECIMALS ±	APPROVED	PTB	12 MAR 18
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

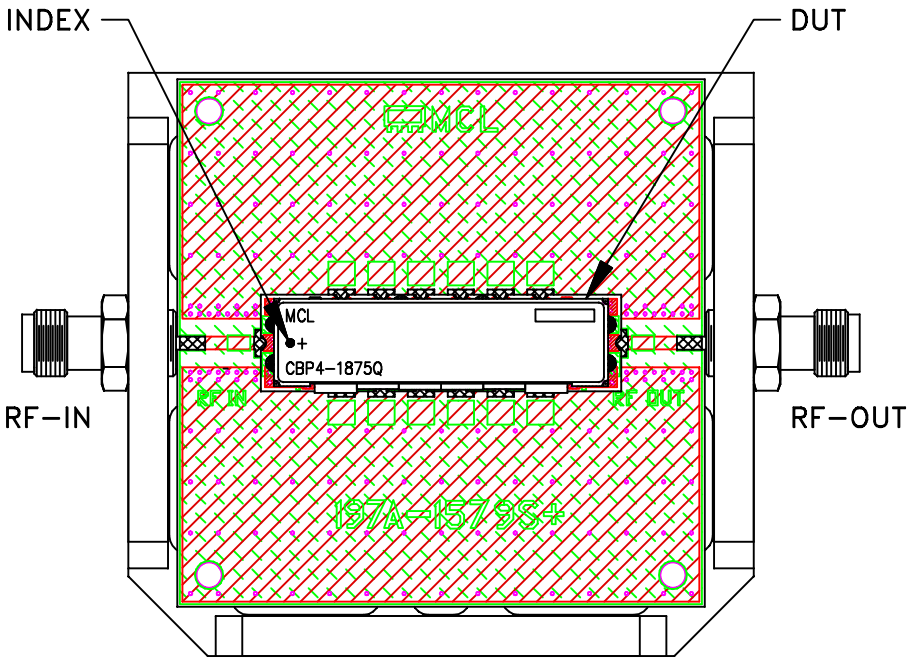
PL,14FL01,HQ2218, HQ2299,CBP TB-1006+, 50 Ohm

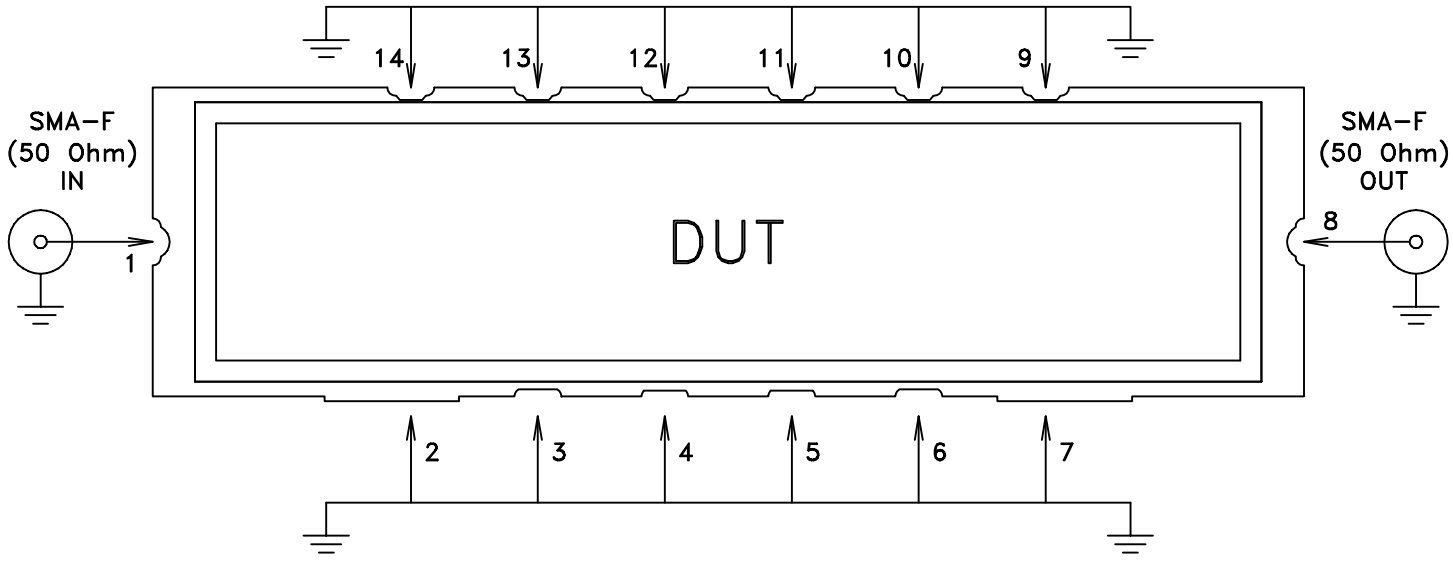
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-543	OR

FILE:	SCALE:	SHEET:
98PL543	2.25:1	1 OF 1

Evaluation Board and Circuit

TB-CBP4-1875Q+





Schematic Diagram

Notes:

1. PCB Material: FR4, GRADE IT-180A OR Equivalent
   Dielectric Constant=4.7, Thickness=.025 inch.

Mini-Circuits®

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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