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

50Ω 824 to 849 MHz

CBP4-836C+

Generic photo used for illustration purposes only

CASE STYLE: MP1766

Features

- Low Insertion loss, 1dB typ.
- High rejection, 60dB typ.
- Miniature shielded package

Applications

- Public mobile
- Private land mobile

Electrical Specifications[1] at 25°C

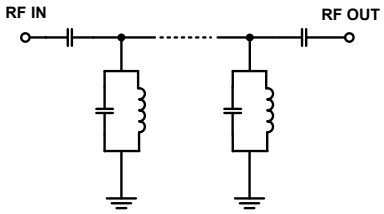
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	836	-	MHz
	Insertion Loss	F1-F2	824 - 849	-	1.0	1.7	dB
	VSWR	F1-F2	824 - 849	-	1.29	1.67	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 600	65	75	-	dB
		F3-F4	600 - 760	20	26	-	dB
Stop Band, Upper	Insertion Loss	F5-F6	915 - 1080	20	27	-	dB
		F6-F7	1080 - 1600	48	60	-	dB

1. Measured on Mini-Circuits Characterization Test Board TB-CBP4-836C+

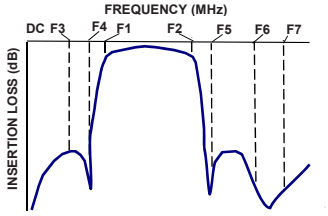
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5W at 25°C

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

Functional Schematic



Typical Frequency Response

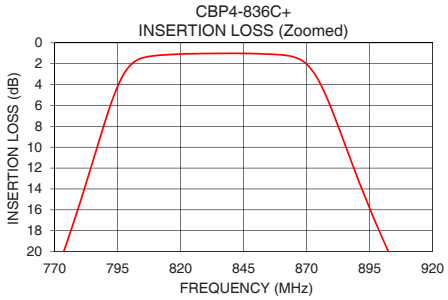


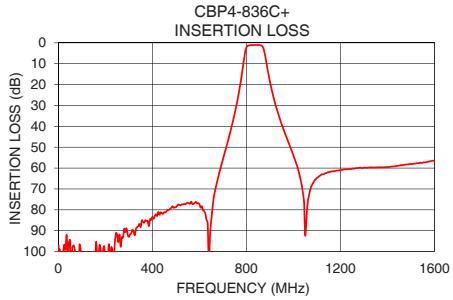
+RoHS Compliant

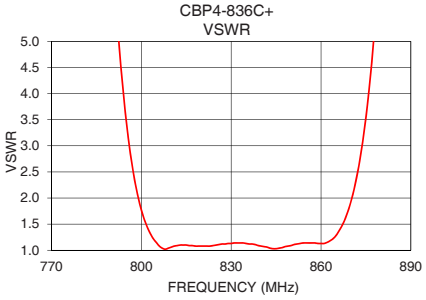
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

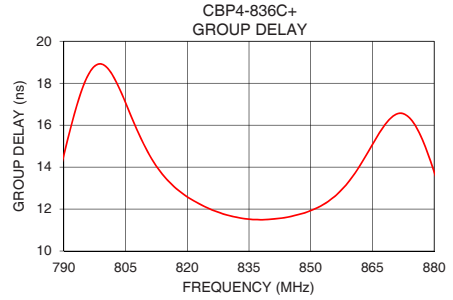
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
1	97.10	2977.88	824	12.14
10	108.18	12943.40	826	11.96
600	77.34	189.17	828	11.82
760	28.49	43.79	829	11.75
773	20.41	28.52	830	11.70
787	9.90	10.21	831	11.65
797	3.17	2.60	832	11.61
824	1.04	1.09	833	11.57
830	1.02	1.13	834	11.54
836	1.01	1.12	835	11.52
840	1.00	1.08	836	11.50
849	1.03	1.08	837	11.50
874	3.28	3.11	838	11.49
886	10.23	14.07	839	11.50
915	26.04	67.56	840	11.51
925	30.21	82.40	842	11.55
1080	67.85	104.62	844	11.60
1300	59.81	72.72	845	11.64
1500	58.13	58.57	847	11.74
1600	56.33	52.94	849	11.85









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.

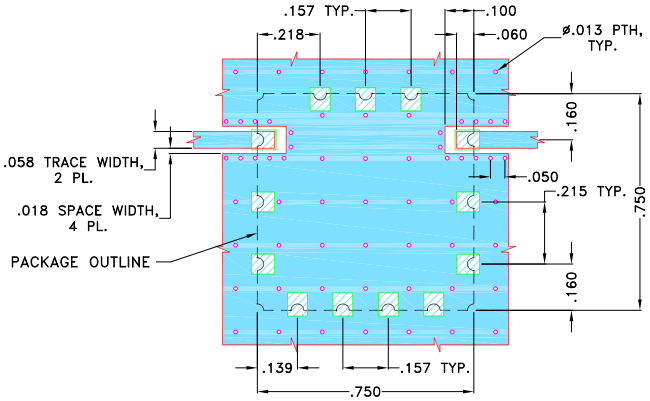
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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

Demo Board MCL P/N: TB-CBP4-836C+
Suggested PCB Layout (PL-373)



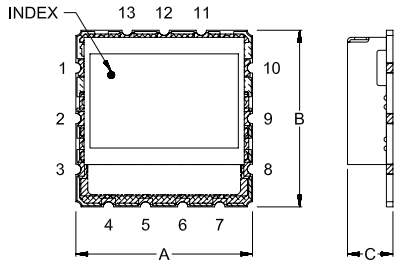
NOTES:

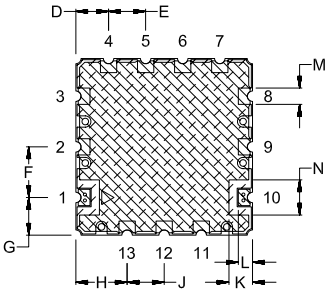
1. TRACE WIDTH IS SHOWN FOR OAK (OAK-602) WITH DIELECTRIC THICKNESS .022"±.0015". COPPER: 1/2 OZ. EACH SIDE.
   FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

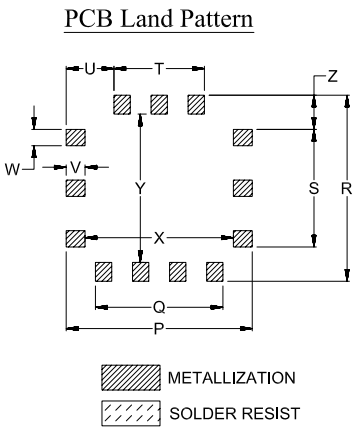
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

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	N
.750	**.750**	**.210**	**.139**	**.157**	**.215**	**.160**	**.218**	**.157**	**.100**	**.060**	**.069**	**.149**
19.05	19.05	5.33	3.53	3.99	5.46	4.06	5.54	3.99	2.54	1.52	1.75	3.78

P	Q	R	S	T	U	V	W	X	Y	Z		wt,
.790	**.541**	**.790**	**.499**	**.384**	**.203**	**.080**	**.069**	**.630**	**.630**	**.145**		grams
20.07	13.74	20.07	12.67	9.75	5.16	2.03	1.75	16.00	16.00	3.68		4.6

Note: Please refer to case style drawing for details

Surface mount Band Pass Filter CBP4-836C+

Typical Performance Data

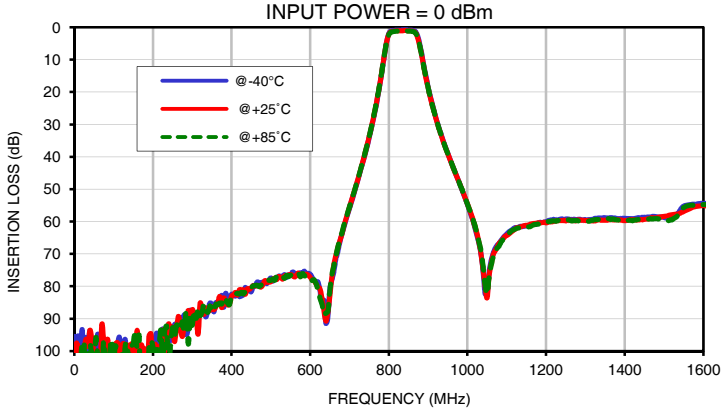
FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	95.50	108.11	103.99	0.01	0.01	0.01	0.01	0.01	0.01
10	95.60	102.91	104.88	0.00	0.00	0.00	0.01	0.01	0.01
100	101.64	100.50	102.71	0.01	0.02	0.02	0.02	0.02	0.02
150	107.64	102.22	97.89	0.01	0.02	0.02	0.02	0.03	0.03
200	101.97	104.23	98.52	0.01	0.03	0.03	0.02	0.03	0.04
250	93.13	92.66	92.81	0.02	0.04	0.05	0.03	0.04	0.06
280	88.84	91.69	93.74	0.02	0.04	0.06	0.03	0.05	0.06
300	90.90	87.32	92.05	0.02	0.04	0.05	0.03	0.05	0.07
350	85.53	86.34	87.46	0.04	0.06	0.08	0.04	0.07	0.08
380	86.49	83.60	83.49	0.03	0.06	0.08	0.05	0.07	0.09
400	82.49	83.11	83.03	0.04	0.07	0.09	0.06	0.08	0.10
420	83.17	81.08	82.40	0.05	0.08	0.10	0.06	0.09	0.10
470	78.84	80.00	80.09	0.06	0.10	0.11	0.08	0.11	0.13
500	77.44	78.59	78.17	0.08	0.11	0.13	0.08	0.12	0.13
550	76.72	76.36	76.61	0.10	0.13	0.16	0.12	0.15	0.17
600	76.29	77.21	78.13	0.11	0.15	0.18	0.14	0.18	0.20
650	80.92	83.07	81.42	0.16	0.20	0.23	0.16	0.21	0.23
700	55.86	55.60	55.51	0.20	0.26	0.29	0.22	0.28	0.31
757	30.48	30.18	30.09	0.36	0.45	0.50	0.39	0.48	0.53
760	28.80	28.51	28.41	0.38	0.48	0.53	0.41	0.50	0.56
773	20.73	20.43	20.32	0.56	0.69	0.76	0.57	0.70	0.77
787	10.13	9.91	9.85	1.47	1.77	1.91	1.47	1.75	1.92
797	3.08	3.18	3.28	6.34	7.08	7.37	6.22	6.94	7.28
800	1.98	2.17	2.30	10.22	11.12	11.42	9.91	10.78	11.16
820	0.88	1.10	1.20	27.54	28.85	29.43	28.77	30.75	32.06
824	0.86	1.07	1.17	26.90	27.69	27.40	27.37	28.39	28.22
826	0.85	1.06	1.16	25.52	26.28	25.94	25.53	26.37	26.13
828	0.84	1.05	1.15	24.30	25.13	24.82	24.04	24.87	24.67
830	0.84	1.05	1.14	23.46	24.41	24.19	22.97	23.86	23.72
832	0.84	1.05	1.14	23.04	24.13	23.99	22.34	23.32	23.25
834	0.84	1.04	1.14	23.05	24.34	24.29	22.11	23.19	23.18
836	0.84	1.04	1.13	23.54	25.08	25.15	22.25	23.47	23.52
840	0.83	1.03	1.12	26.17	28.70	29.25	23.52	25.00	25.21
844	0.83	1.03	1.13	31.20	35.42	38.13	25.40	26.68	26.96
846	0.83	1.04	1.13	31.88	33.24	33.85	25.82	26.62	26.78
849	0.84	1.06	1.15	27.96	27.69	27.48	25.17	25.36	25.30
874	2.88	3.33	3.40	5.87	5.75	6.02	6.12	5.96	6.21
886	9.82	10.27	10.26	1.16	1.26	1.38	1.19	1.29	1.40
903	20.02	20.32	20.27	0.33	0.43	0.49	0.35	0.45	0.50
915	25.86	26.08	26.02	0.23	0.32	0.37	0.26	0.34	0.39
925	30.08	30.26	30.19	0.21	0.28	0.33	0.22	0.30	0.34
970	45.16	45.28	45.19	0.19	0.24	0.29	0.20	0.26	0.29
1080	66.82	66.80	67.66	0.21	0.26	0.30	0.22	0.28	0.31
1120	61.93	62.50	62.43	0.22	0.27	0.31	0.25	0.30	0.33
1140	61.58	61.46	61.72	0.23	0.28	0.32	0.25	0.30	0.34
1180	60.50	60.41	60.83	0.24	0.29	0.33	0.26	0.31	0.34
1200	60.04	60.40	60.29	0.24	0.29	0.33	0.27	0.32	0.35
1240	59.17	59.75	59.72	0.26	0.31	0.35	0.27	0.32	0.35
1280	59.42	59.53	59.74	0.26	0.31	0.34	0.28	0.33	0.36
1300	59.44	59.71	59.99	0.27	0.32	0.36	0.28	0.33	0.36
1320	59.27	59.76	59.58	0.28	0.33	0.37	0.29	0.34	0.37
1360	58.86	59.46	59.17	0.28	0.32	0.36	0.29	0.35	0.38
1380	59.06	59.39	59.47	0.29	0.34	0.37	0.29	0.35	0.38
1400	58.99	59.66	59.53	0.29	0.33	0.37	0.30	0.36	0.39
1420	59.12	59.52	59.76	0.28	0.34	0.37	0.31	0.36	0.40
1460	58.60	59.23	59.26	0.30	0.35	0.39	0.31	0.37	0.40
1500	58.78	58.43	59.35	0.29	0.35	0.38	0.32	0.37	0.41
1520	59.10	57.93	59.50	0.30	0.36	0.39	0.31	0.37	0.41
1560	54.88	56.37	55.15	0.30	0.35	0.40	0.33	0.39	0.43
1600	54.48	55.06	54.79	0.30	0.36	0.40	0.32	0.39	0.42

Typical Performance Data

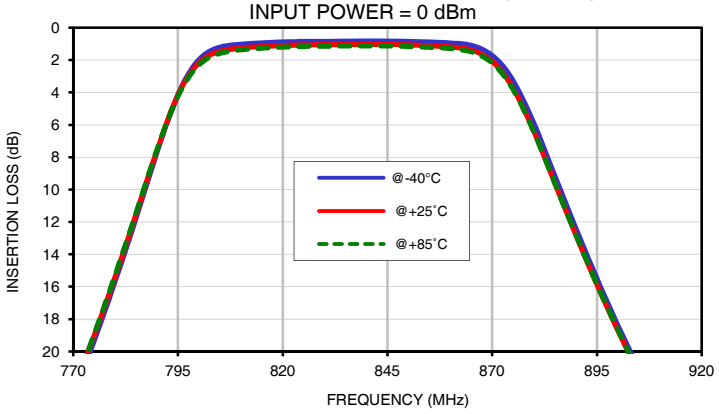
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
807	16.47	16.28	15.96
808	15.98	15.82	15.52
809	15.53	15.38	15.12
810	15.10	14.98	14.75
811	14.72	14.61	14.41
812	14.38	14.29	14.10
813	14.07	13.99	13.82
814	13.79	13.72	13.57
815	13.56	13.49	13.35
816	13.34	13.28	13.15
817	13.15	13.09	12.97
818	12.98	12.92	12.81
819	12.83	12.77	12.67
820	12.68	12.63	12.54
821	12.56	12.50	12.41
822	12.44	12.39	12.30
823	12.34	12.28	12.20
824	12.24	12.18	12.10
825	12.14	12.09	12.01
826	12.05	12.00	11.93
827	11.97	11.92	11.85
828	11.89	11.85	11.78
829	11.82	11.78	11.71
830	11.76	11.72	11.65
831	11.71	11.67	11.61
832	11.66	11.63	11.57
833	11.62	11.58	11.53
834	11.59	11.55	11.50
835	11.56	11.53	11.48
836	11.54	11.52	11.47
837	11.53	11.50	11.46
838	11.53	11.50	11.46
839	11.53	11.50	11.47
840	11.54	11.51	11.48
841	11.56	11.53	11.50
842	11.58	11.55	11.52
843	11.60	11.57	11.54
844	11.64	11.60	11.58
845	11.68	11.64	11.61
846	11.72	11.68	11.66
847	11.77	11.73	11.71
848	11.83	11.79	11.76
849	11.89	11.85	11.83
850	11.96	11.92	11.90
851	12.04	12.00	11.98
852	12.13	12.09	12.08
853	12.23	12.19	12.18
854	12.35	12.31	12.31
855	12.48	12.45	12.44
856	12.63	12.61	12.60
857	12.81	12.78	12.78

Typical Performance Curves

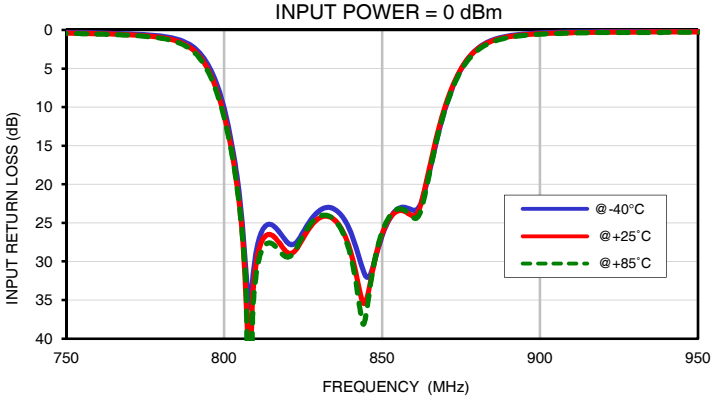
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



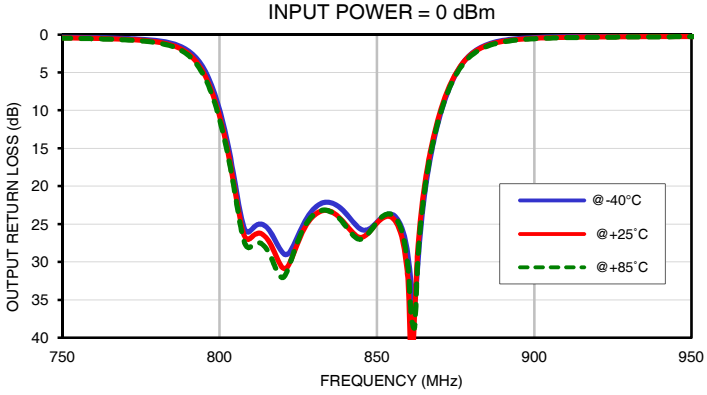
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



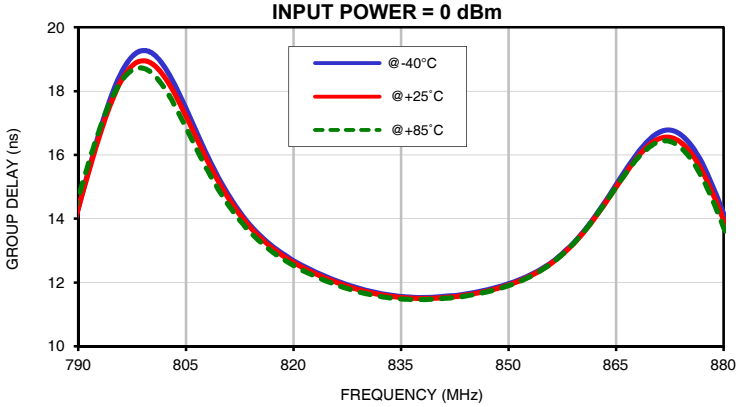
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



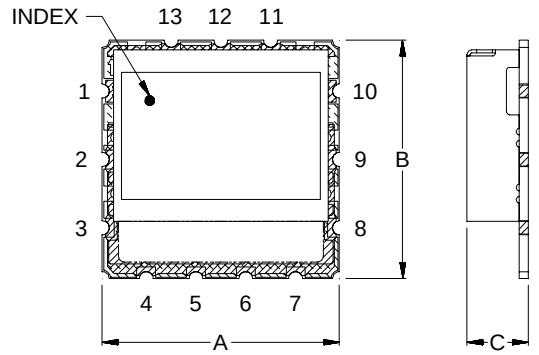
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm

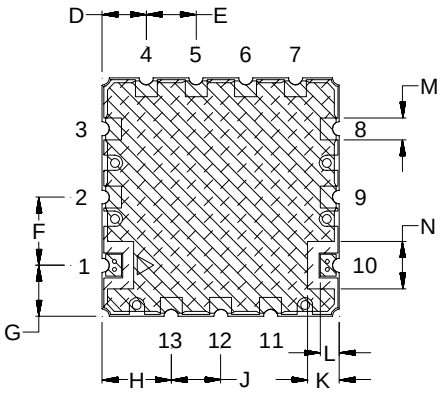


Case Style MP

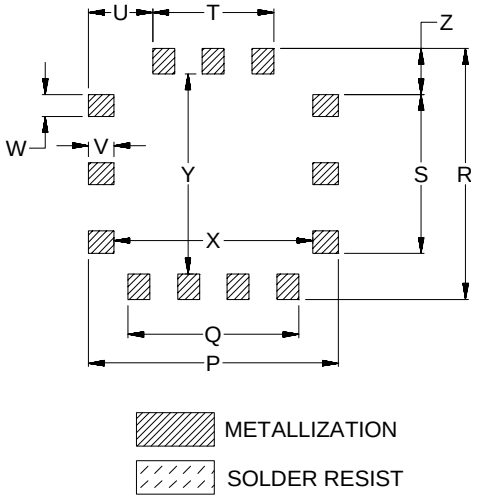
Outline Dimensions

MP1766





PCB Land Pattern



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
MP1766	.750 (19.05)	.750 (19.05)	.210 (5.33)	.139 (3.53)	.157 (3.99)	.215 (5.46)	.160 (4.06)	.218 (5.54)	.157 (3.99)	.100 (2.54)	.060 (1.52)	.069 (1.75)	.149 (3.78)

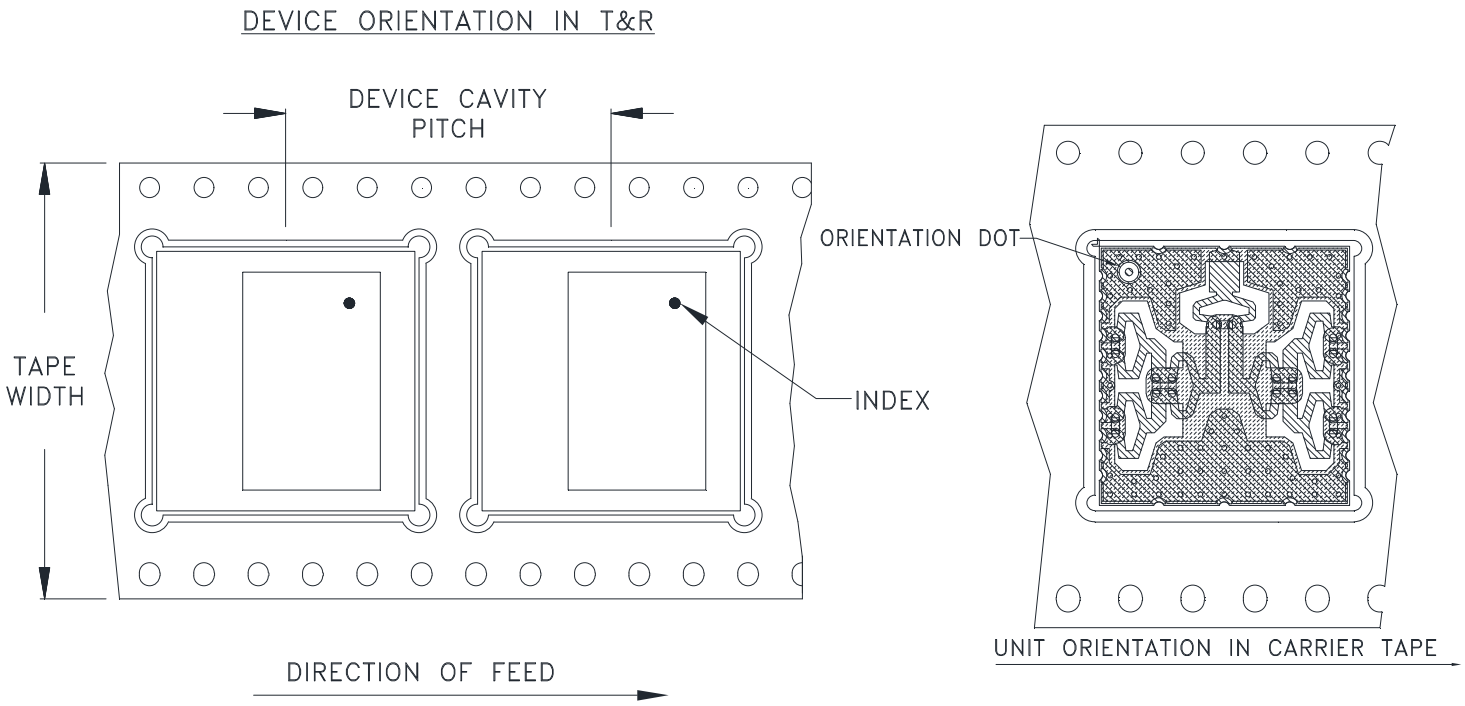
CASE#	P	Q	R	S	T	U	V	W	X	Y	Z	WT.GRAMS
MP1766	.790 (20.07)	.541 (13.74)	.790 (20.07)	.499 (12.67)	.384 (9.75)	.203 (5.16)	.080 (2.03)	.069 (1.75)	.630 (16.00)	.630 (16.00)	.145 (3.68)	4.6

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: 2-5 µ inch (.05-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate.
   All models, (+) suffix.

Tape & Reel Packaging TR-F111



Applicable Case styles:

Applicable Case styles:RS1539

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	24	13	250

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

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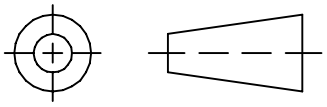
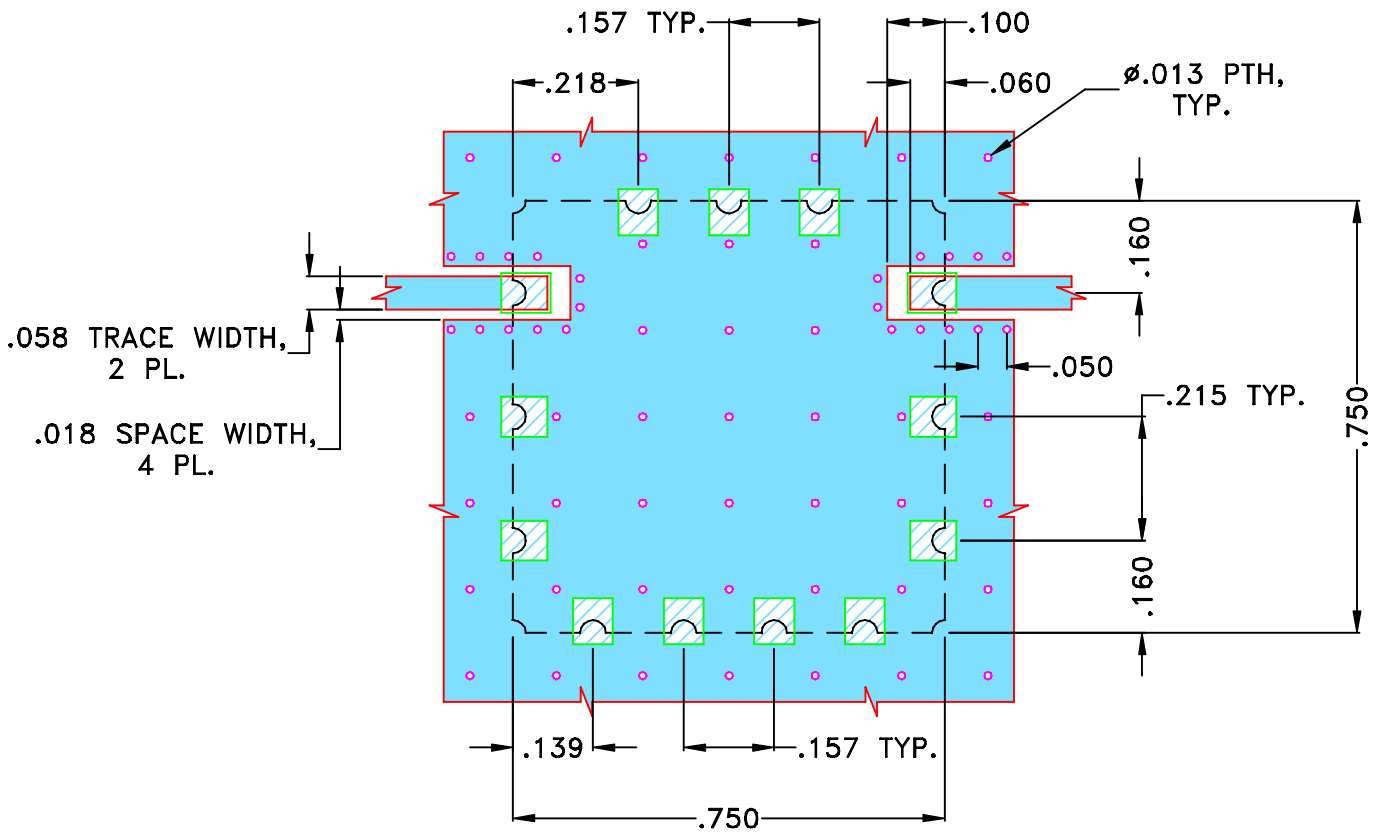
THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M137721	NEW RELEASE	JUN 12	DDR	KG

SUGGESTED MOUNTING CONFIGURATION FOR MP1766 CASE STYLE "13FL01" PIN CODE



NOTES:

1. TRACE WIDTH IS SHOWN FOR OAK (OAK-602) WITH DIELECTRIC THICKNESS .022"±.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	DDR	22 JUN 12
TOLERANCES ON:	CHECKED	MD	22 JUN 12
2 PL DECIMALS ±	APPROVED	GM	22 JUN 12
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

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

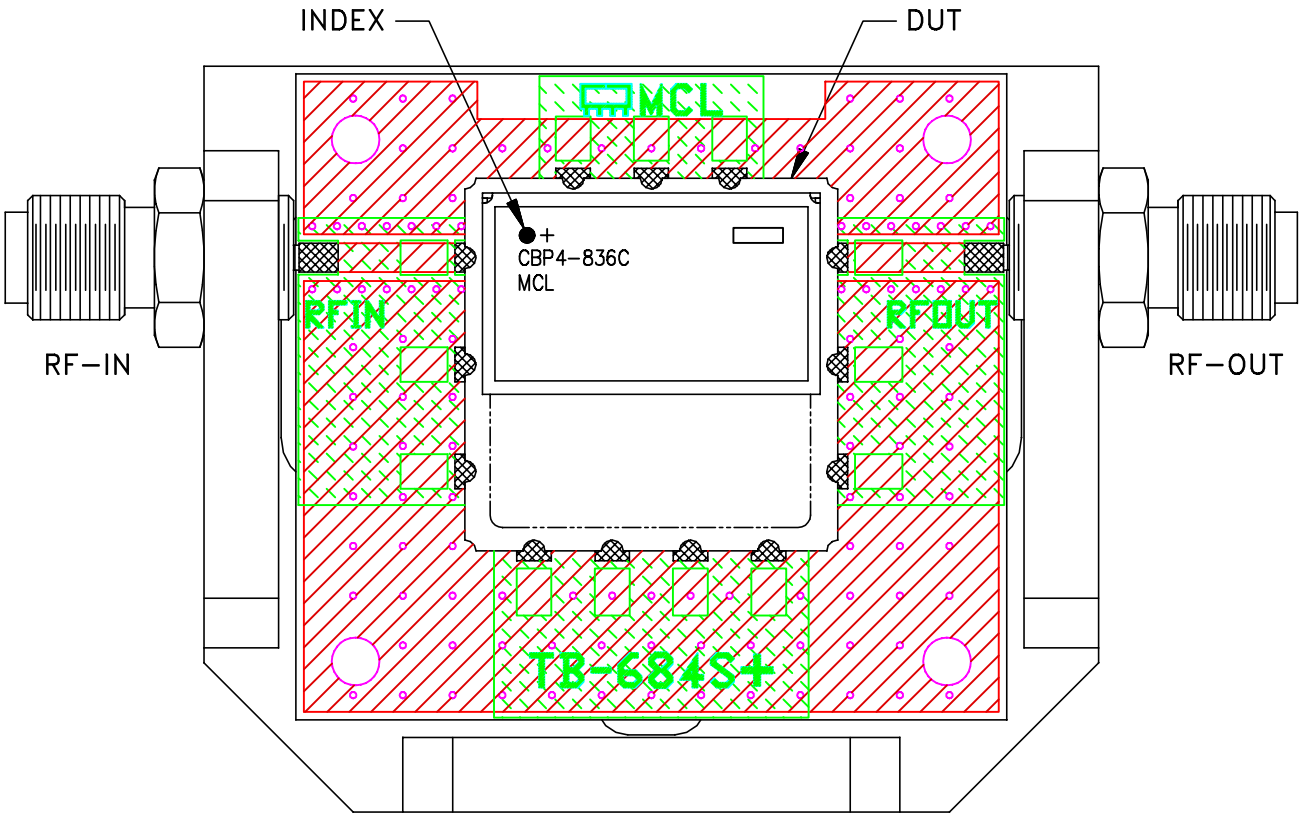
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

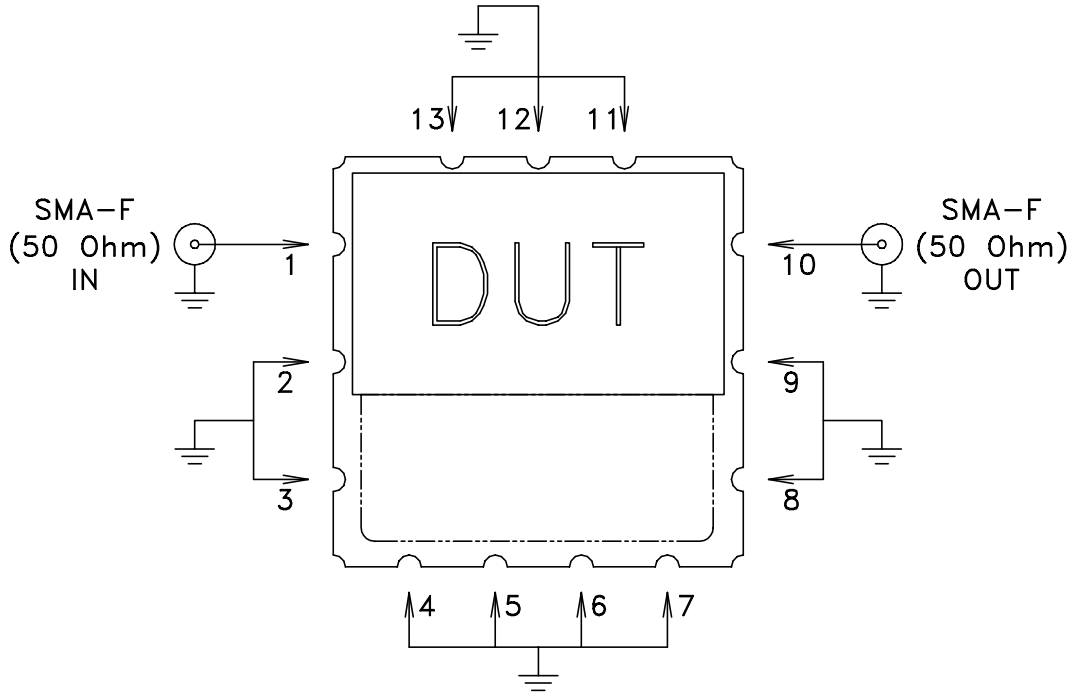
PL, 13FL01, MP1766, BPF, TB-684+, 50 Ohm

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-373	OR
FILE: 98PL373	SCALE: 4:1	SHEET: 1 OF 1	

Evaluation Board and Circuit

TB-CBP4-836C+





Schematic diagram

Notes:

1. 50 Ohm SMA female connectors.
2. PCB Material: OAK-602 OR Equivalent
   Dielectric Constant=2.50±.04, Thickness=.022 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