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. Custom integrated assembly with LNA in greatly simplifying system integration. They can be realized in small form factors with high-quality, precise machining for applications where size is critical. 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.

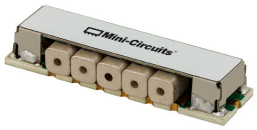
Mini-Circuits®
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Surface Mount

Bandpass Filter

50Ω 1030 to 1090 MHz

CBP-1060Q+



Generic photo used for illustration purposes only

CASE STYLE: HQ2299

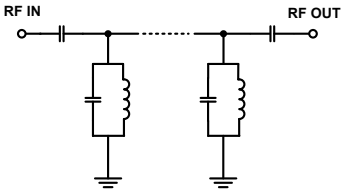
Features

- Broad stopband performance up to 20 GHz
- High selectivity
- Miniature shielded package

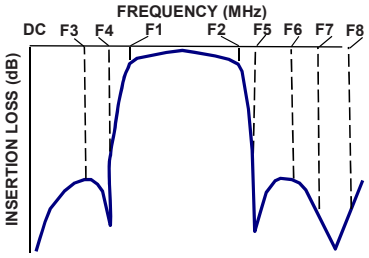
Applications

- Aeronautical radio navigation
- Fixed satellite
- Radio astronomy
- Radar and navigation systems

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

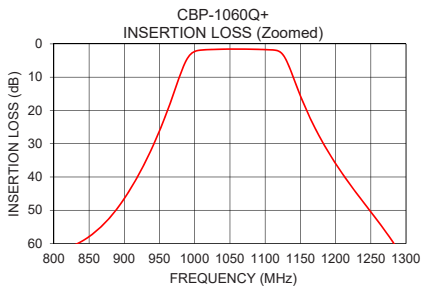
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	1060	-	MHz
	Insertion Loss	F1-F2	1030-1090	-	1.6	2.5	dB
	VSWR	F1-F2	1030-1090	-	1.3	1.7	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-500	60	68	-	dB
		F3-F4	500-930	20	32	-	dB
	VSWR	DC-F4	DC-930	-	20	-	:1
Stop Band, Upper	Insertion Loss	F5-F6	1190-1400	20	30	-	dB
		F6-F7	1400-2800	45	52	-	dB
		F7-F8	2800-20000	-	20	-	dB
	VSWR	F5-F8	1190-20000	-	8	-	:1

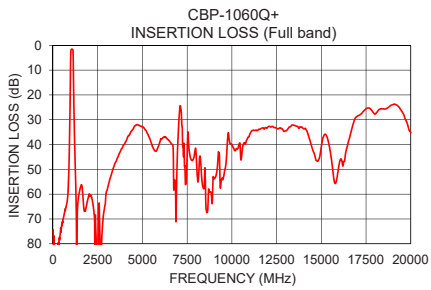
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	8 W Max.

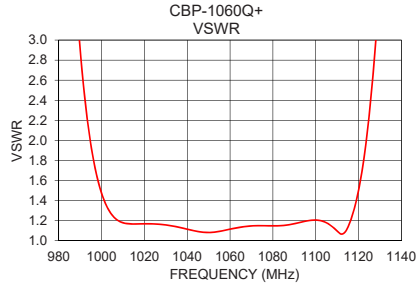
Passband rating , derate linearly to 3.5W at 85°C ambient.
Permanent damage may occur if any of these limits are exceeded.

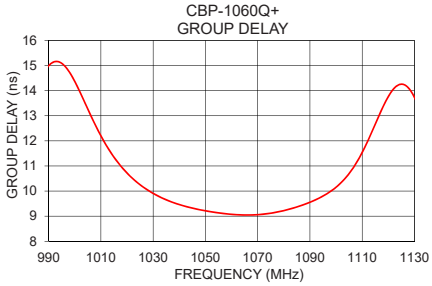
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
10	74.37	362.04	1030	9.91
100	90.40	303.37	1032	9.80
500	72.71	40.93	1034	9.70
930	35.44	18.49	1036	9.61
940	31.00	18.17	1038	9.53
960	20.77	15.72	1040	9.46
990	4.22	2.90	1042	9.40
1030	1.65	1.16	1044	9.35
1060	1.57	1.11	1046	9.30
1090	1.64	1.17	1048	9.25
1130	4.94	3.59	1050	9.21
1160	20.56	12.18	1052	9.18
1180	28.97	13.69	1054	9.15
1190	32.62	14.09	1056	9.12
1400	62.89	16.03	1060	9.07
2800	69.84	26.38	1066	9.05
7100	24.49	3.59	1070	9.06
10000	40.07	18.84	1080	9.22
15000	40.75	2.39	1086	9.40
20000	35.21	1.49	1090	9.55









Notes

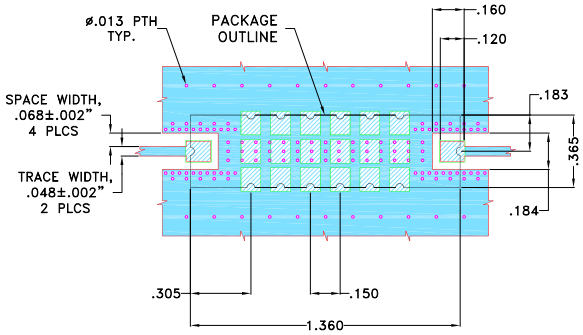
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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	8
GROUND	2,3,4,5,6,7,9,10,11,12,13,14

Demo Board MCL P/N: TB-1006+
Suggested PCB Layout (PL-543)

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



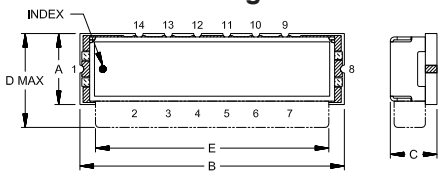
NOTES:

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.

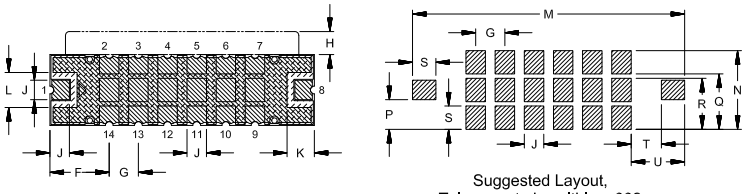
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

Outline Drawing



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch / 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

Surface mount Band Pass Filter CBP-1060Q+

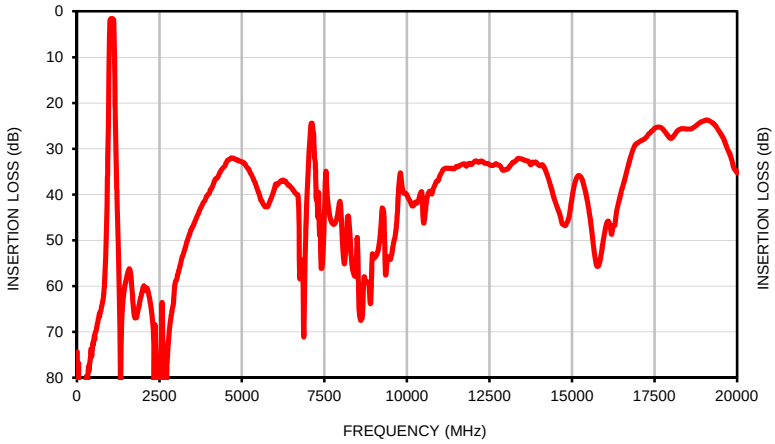
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	74.37	0.05	0.05
20	79.43	0.04	0.05
50	76.87	0.05	0.06
100	90.40	0.06	0.07
250	89.93	0.15	0.17
500	72.71	0.42	0.42
750	64.41	0.76	0.89
800	62.65	0.83	0.98
850	57.94	0.89	1.03
930	35.44	0.94	0.92
940	31.00	0.96	0.91
950	26.12	1.00	0.92
954	24.04	1.03	0.94
960	20.77	1.11	1.01
964	18.49	1.19	1.08
970	14.93	1.42	1.31
974	12.50	1.70	1.59
976	11.29	1.91	1.80
980	8.93	2.52	2.42
984	6.76	3.54	3.48
986	5.80	4.26	4.24
990	4.22	6.24	6.35
994	3.13	9.00	9.44
996	2.76	10.65	11.40
998	2.48	12.46	13.70
1000	2.28	14.37	16.40
1010	1.84	21.75	25.63
1020	1.72	22.21	18.69
1030	1.65	22.78	17.44
1040	1.60	25.34	19.08
1050	1.56	28.14	24.60
1060	1.57	25.31	32.08
1070	1.59	23.30	23.38
1080	1.61	23.25	20.17
1090	1.64	22.17	19.05
1126	3.49	7.45	7.76
1140	10.10	2.32	2.68
1150	15.59	1.64	1.96
1160	20.56	1.43	1.69
1180	28.97	1.27	1.44
1184	30.47	1.26	1.40
1190	32.62	1.24	1.35
1200	35.99	1.21	1.29
1300	66.68	1.05	0.87
1400	62.89	1.09	0.75
1500	58.37	1.49	1.03
2000	60.52	1.09	1.02
2800	69.84	0.66	0.47
4000	39.82	0.16	0.41
5000	32.86	0.87	1.22
6000	38.36	3.22	0.29
7000	35.73	2.94	0.64
8000	43.59	0.85	0.16
9000	53.85	0.42	0.12
10000	40.07	0.92	1.00
11000	35.85	1.16	0.94
12500	33.46	0.73	0.11
15000	40.75	7.75	0.47
17500	25.56	1.54	0.97
20000	35.21	14.12	4.54

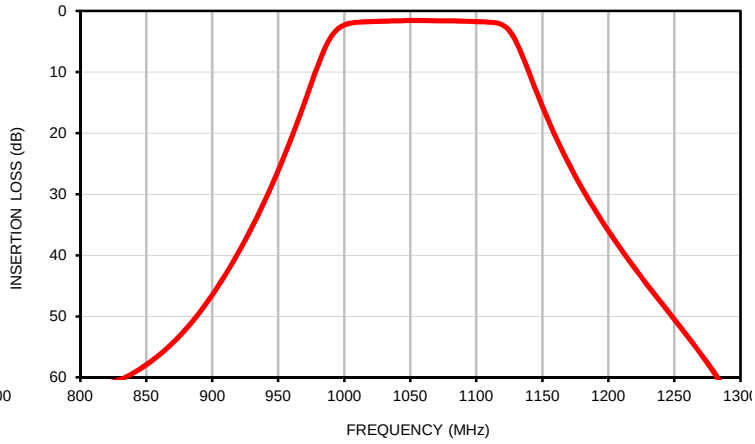
FREQ. (MHz)	GROUP DELAY (ns)
1020	10.72
1022	10.52
1024	10.33
1026	10.17
1028	10.03
1030	9.91
1032	9.80
1034	9.70
1036	9.61
1038	9.53
1040	9.46
1042	9.40
1044	9.35
1046	9.30
1048	9.25
1050	9.21
1052	9.18
1054	9.15
1056	9.12
1058	9.09
1060	9.07
1062	9.06
1064	9.05
1066	9.05
1068	9.05
1070	9.06
1072	9.08
1074	9.10
1076	9.14
1078	9.17
1080	9.22
1082	9.27
1084	9.33
1086	9.40
1088	9.47
1090	9.55
1092	9.64
1094	9.74
1096	9.86
1098	9.99
1100	10.15
1102	10.34
1104	10.57
1106	10.84
1108	11.16
1110	11.54
1112	11.96
1114	12.42
1116	12.91
1118	13.36
1120	13.76
1122	14.07
1124	14.23
1126	14.24
1128	14.07
1130	13.73
1132	13.22
1134	12.58
1136	11.85
1138	11.05

Typical Performance Curves

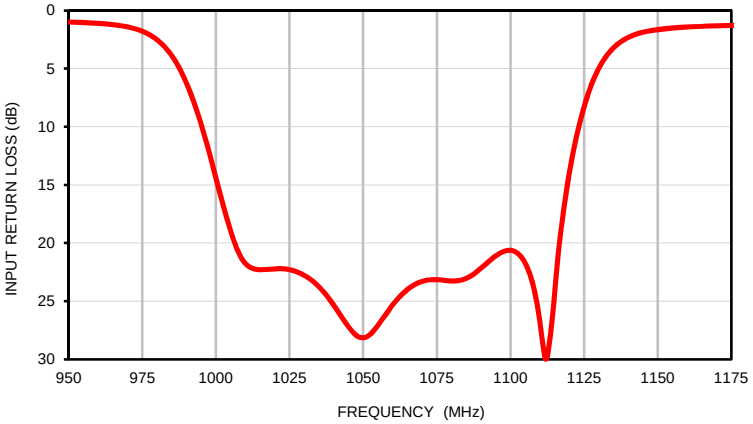
INSERTION LOSS
INPUT POWER = 0 dBm



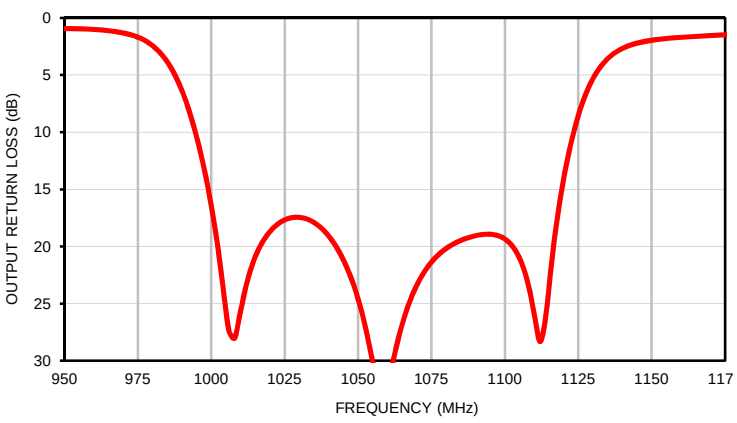
INSERTION LOSS (Zoomed)
INPUT POWER = 0 dBm



INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm

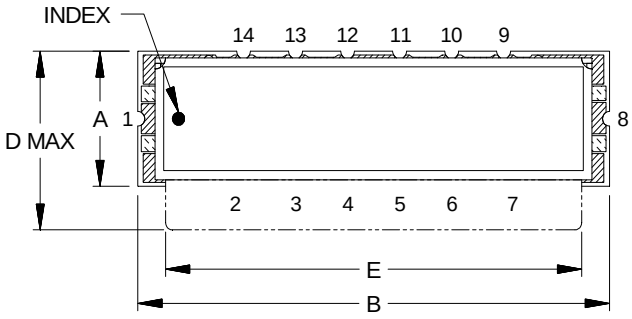


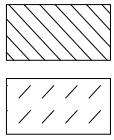
GROUP DELAY
INPUT POWER = 0 dBm

Case Style HQ

Outline Dimensions

HQ2299

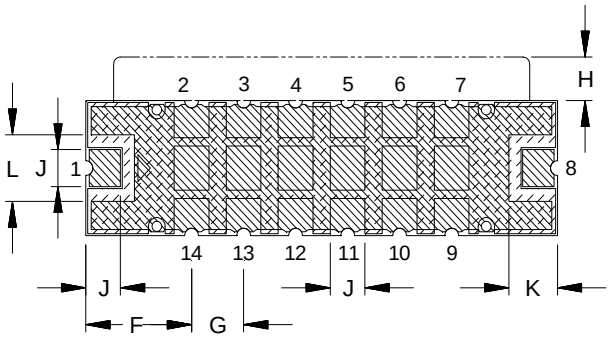


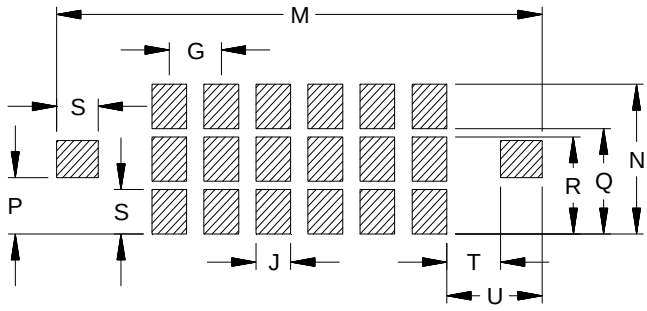


METALLIZATION

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

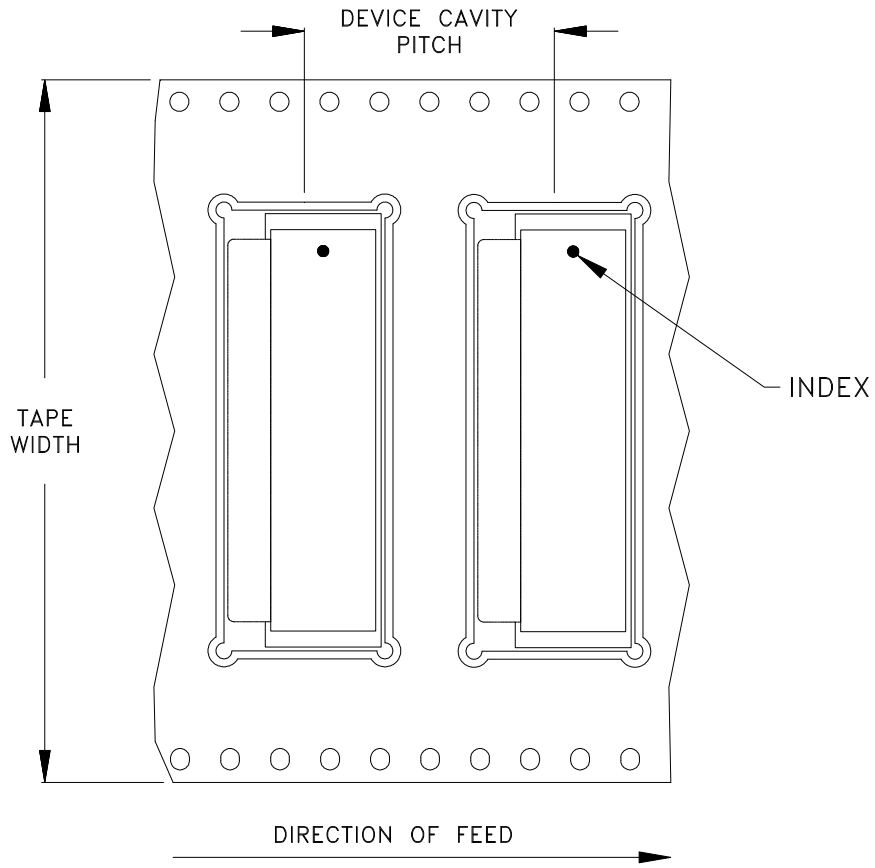
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

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

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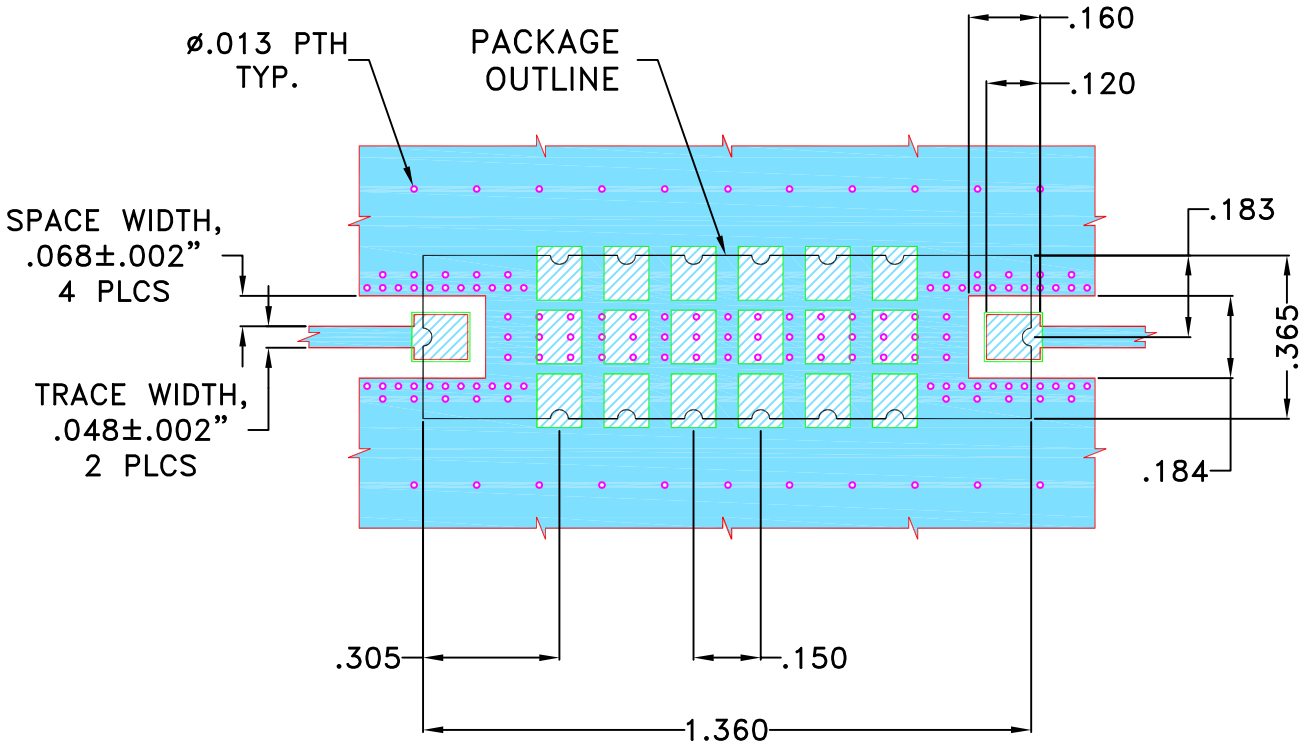
THIRD ANGLE PROJECTION

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

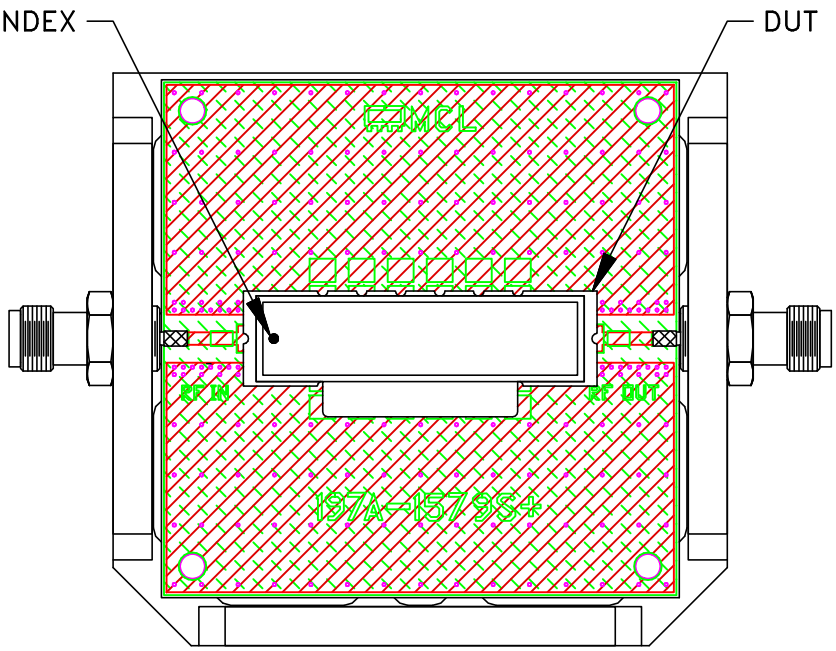
PL,14FL01,HQ2218, HQ2299,CBP TB-1006+, 50 Ohm

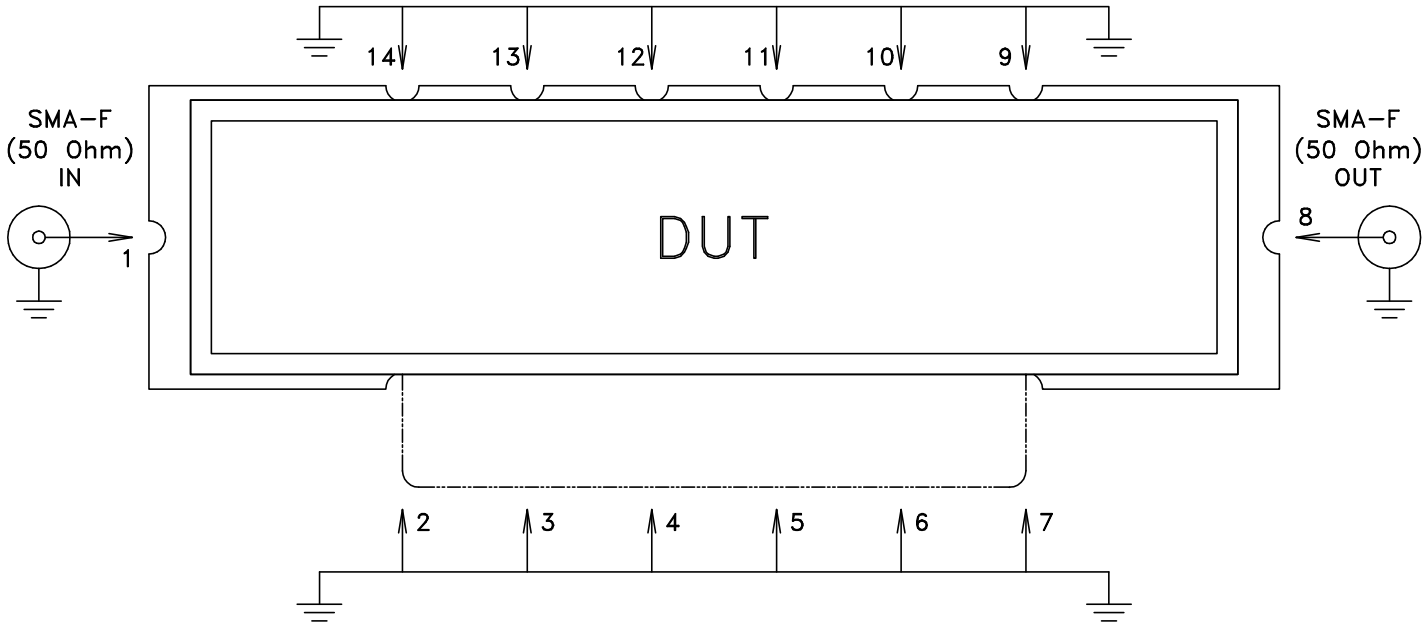
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-543	OR

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

Evaluation Board and Circuit

TB-1006+





Schematic Diagram

Notes:

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

Mini-Circuits®

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