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

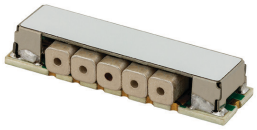
Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in signal chain
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stop band	Wide spur-free stopband results in better receiver sensitivity
Excellent power handling	Well suited 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.

Surface Mount

Bandpass Filter

50Ω 1280 to 1360 MHz

CBP-1320Q+



Generic photo used for illustration purposes only
CASE STYLE: HQ2299

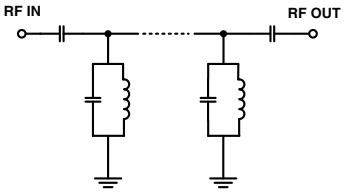
Features

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

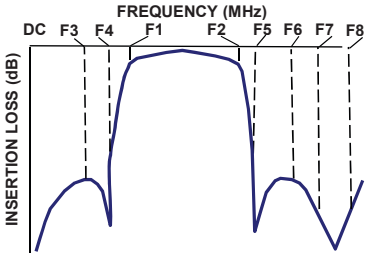
Applications

- Aviation
- Mobile radio
- Broadband
- 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

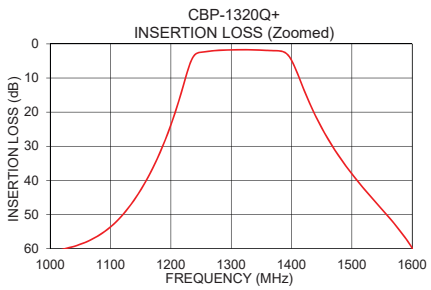
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	1320	-	MHz
	Insertion Loss	F1-F2	1280-1360	-	1.9	3.0	dB
	VSWR	F1-F2	1280-1360	-	1.5	1.7	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-900	50	60	-	dB
		F3-F4	900-1170	20	35	-	dB
	VSWR	DC-F4	DC-1170	-	20	-	:1
Stop Band, Upper	Insertion Loss	F5-F6	1490-1700	20	30	-	dB
		F6-F7	1700-3000	45	50	-	dB
		F7-F8	3000-20000	-	20	-	dB
	VSWR	F5-F8	1490-20000	-	8	-	:1

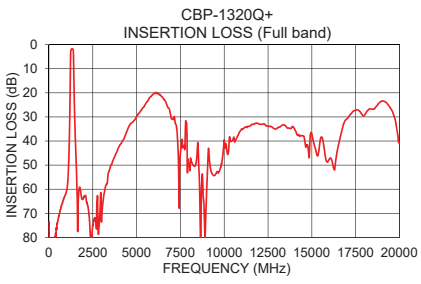
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	8 W Max.

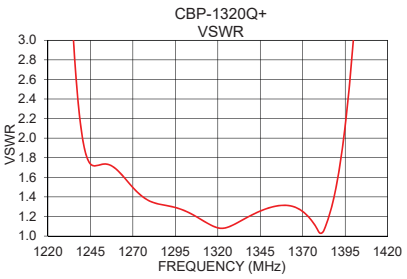
Passband rating , derate linearly to 3.5W at 85°C ambient.
Permanent damage may occur if any of these limits are exceeded.

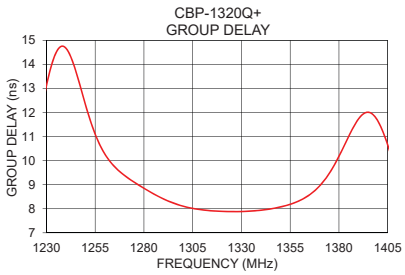
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
10	73.58	442.37	1280	8.85
100	89.96	255.06	1284	8.66
900	62.98	22.46	1288	8.49
1170	36.39	22.08	1292	8.34
1180	32.63	21.79	1296	8.21
1210	18.51	16.41	1300	8.11
1240	3.13	2.04	1304	8.03
1280	1.87	1.36	1308	7.97
1320	1.70	1.08	1312	7.94
1360	1.92	1.31	1316	7.91
1400	4.80	3.04	1320	7.89
1440	21.17	11.05	1324	7.89
1470	30.62	13.15	1328	7.88
1490	35.75	13.91	1332	7.89
1700	61.12	7.55	1336	7.91
3000	73.63	25.27	1340	7.94
6075	19.94	3.80	1344	7.98
10000	39.52	12.64	1348	8.04
15000	37.22	4.96	1352	8.11
20000	40.47	1.27	1360	8.35









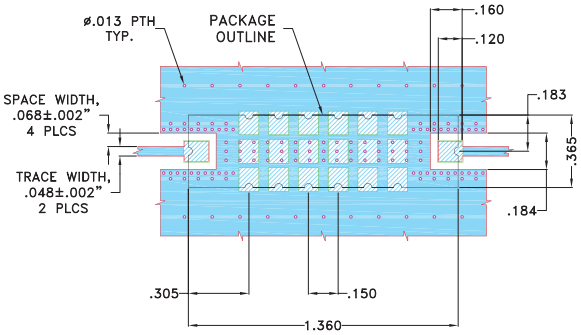
Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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



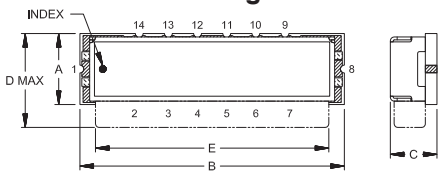
NOTES:

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.

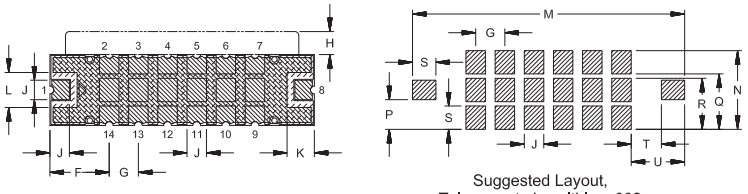
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

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-1320Q+

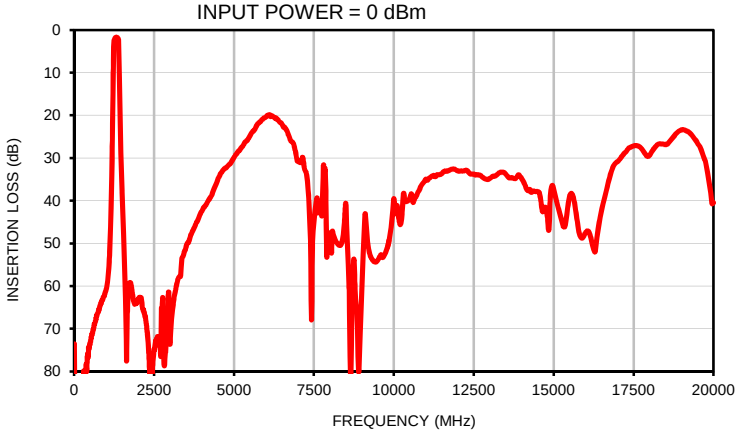
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	73.58	0.04	0.04
20	91.71	0.03	0.04
50	85.08	0.06	0.03
100	89.96	0.07	0.03
250	87.34	0.00	0.12
500	73.56	0.24	0.37
750	66.22	0.55	0.63
800	64.87	0.62	0.69
900	62.98	0.77	0.79
1000	60.83	0.85	0.86
1140	45.55	0.80	0.87
1170	36.39	0.79	0.90
1180	32.63	0.80	0.92
1200	23.78	0.89	1.10
1220	12.60	1.57	2.11
1240	3.13	9.33	16.36
1260	2.23	11.86	13.27
1280	1.87	16.41	22.23
1300	1.77	18.71	21.78
1320	1.70	27.90	30.25
1340	1.77	20.25	24.21
1360	1.92	17.35	17.75
1380	2.05	36.22	22.90
1400	4.80	5.94	5.86
1420	13.18	2.16	2.01
1440	21.17	1.58	1.43
1460	27.75	1.38	1.24
1480	33.27	1.28	1.14
1490	35.75	1.25	1.11
1500	38.09	1.23	1.09
1550	48.54	1.24	1.05
1600	59.90	1.43	1.14
1650	72.24	1.82	1.48
1700	61.12	2.31	2.36
1750	59.20	2.64	4.34
1800	60.49	2.57	5.77
1850	63.19	2.22	4.13
1900	64.25	1.84	2.82
1950	63.99	1.52	2.19
2000	63.07	1.30	1.89
2500	74.86	1.40	0.70
3000	73.63	0.69	0.24
4000	42.40	0.20	0.13
5000	29.86	0.74	0.85
6000	20.35	4.03	3.79
7000	30.85	5.89	6.73
8000	50.44	1.72	1.08
9000	60.20	0.93	0.56
10000	39.52	1.38	0.95
11000	34.98	1.69	1.38
12000	33.04	1.25	1.11
13000	34.79	0.98	0.70
14000	34.81	1.14	0.65
15000	37.22	3.55	2.35
16000	47.47	3.97	5.91
17000	30.82	2.41	1.65
18000	29.37	2.64	1.89
19000	23.38	4.26	3.68
19500	26.53	6.38	5.93
20000	40.47	18.35	14.62

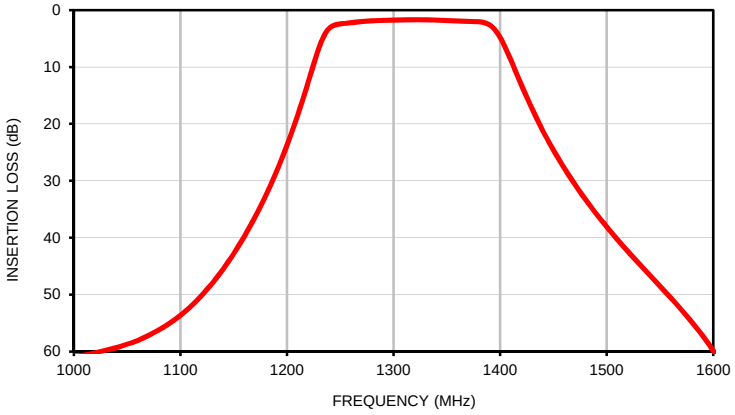
FREQ. (MHz)	GROUP DELAY (ns)
1264	9.83
1266	9.66
1268	9.52
1270	9.39
1272	9.27
1274	9.16
1276	9.05
1278	8.95
1280	8.85
1282	8.76
1284	8.66
1286	8.57
1288	8.49
1290	8.41
1292	8.34
1294	8.27
1296	8.21
1298	8.16
1300	8.11
1302	8.07
1304	8.03
1306	8.00
1308	7.97
1310	7.95
1312	7.94
1314	7.92
1316	7.91
1318	7.90
1320	7.89
1322	7.89
1324	7.89
1326	7.88
1328	7.88
1330	7.89
1332	7.89
1334	7.90
1336	7.91
1338	7.92
1340	7.94
1342	7.96
1344	7.98
1346	8.01
1348	8.04
1350	8.08
1352	8.11
1354	8.16
1356	8.21
1358	8.28
1360	8.35
1362	8.43
1364	8.53
1366	8.65
1368	8.78
1370	8.94
1372	9.13
1374	9.35
1376	9.60
1378	9.87
1380	10.18
1382	10.51

Typical Performance Curves

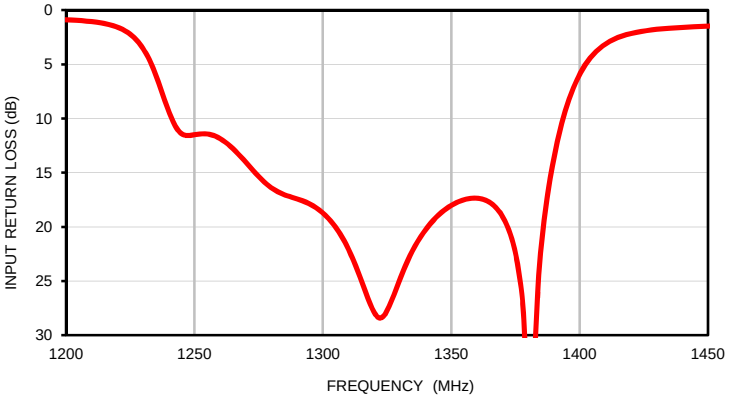
INSERTION LOSS
INPUT POWER = 0 dBm



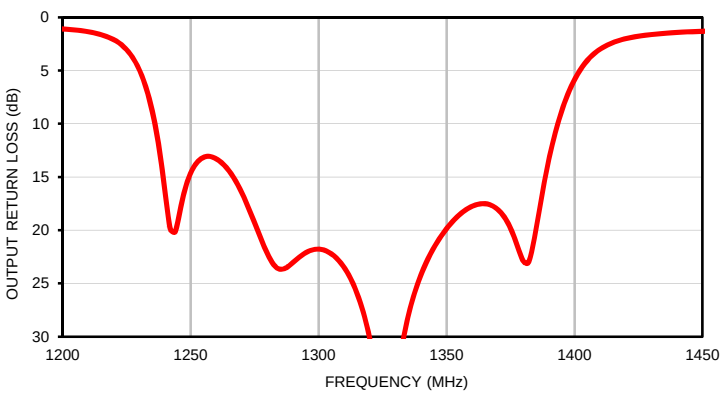
INSERTION LOSS (Zoomed)
INPUT POWER = 0 dBm



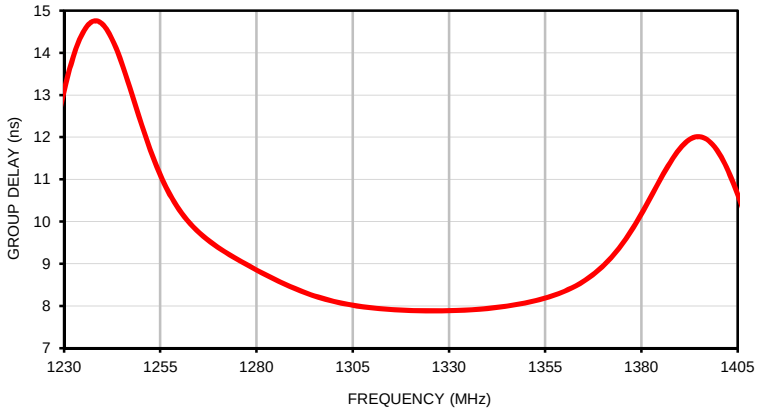
INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm



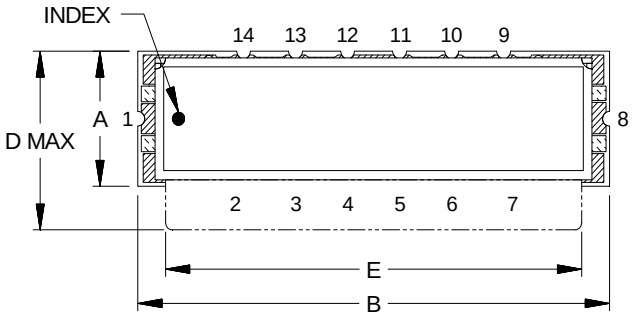
GROUP DELAY
INPUT POWER = 0 dBm

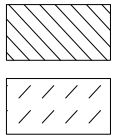


Case Style HQ

Outline Dimensions

HQ2299

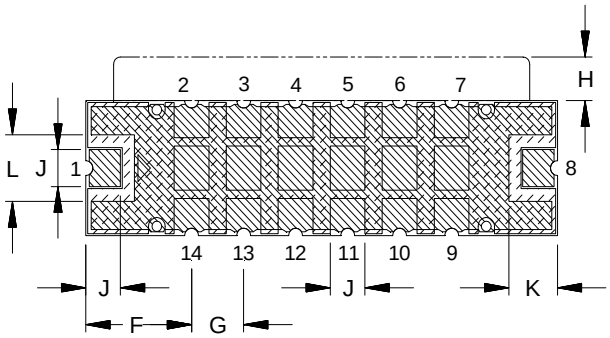


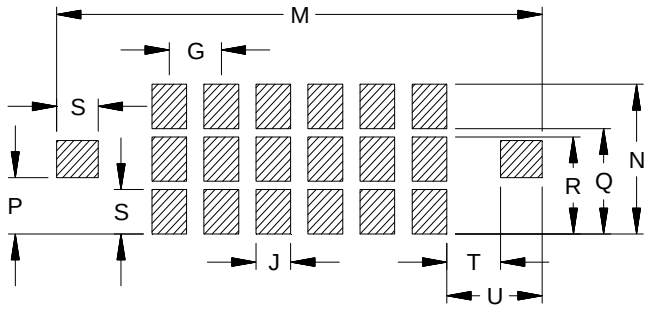


METALLIZATION

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

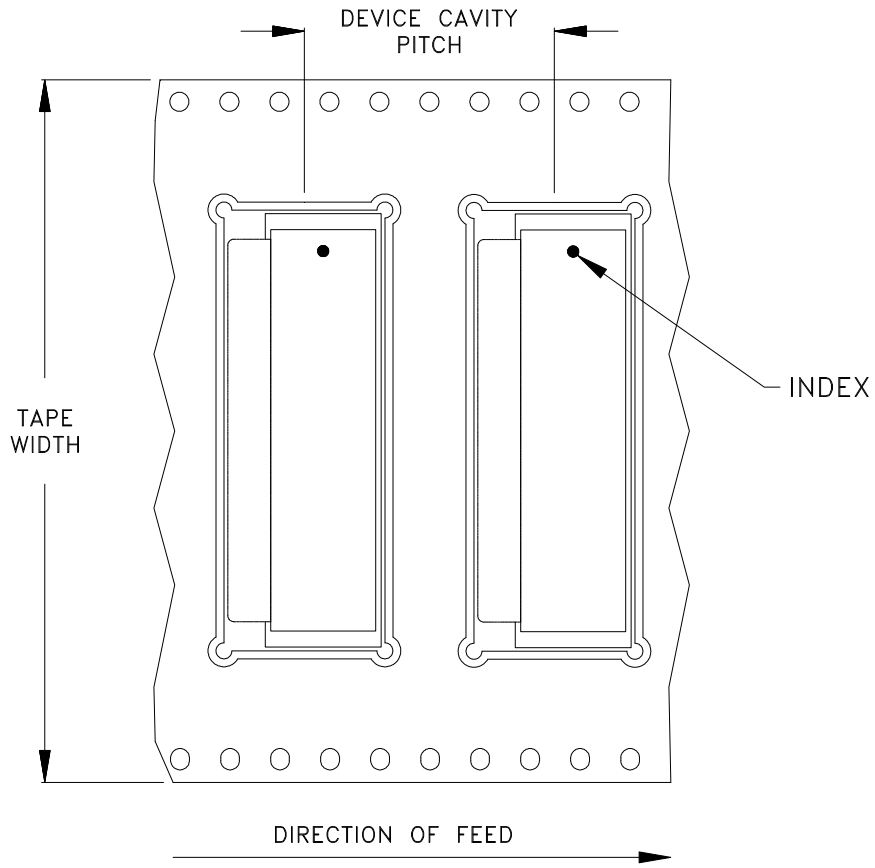
Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015

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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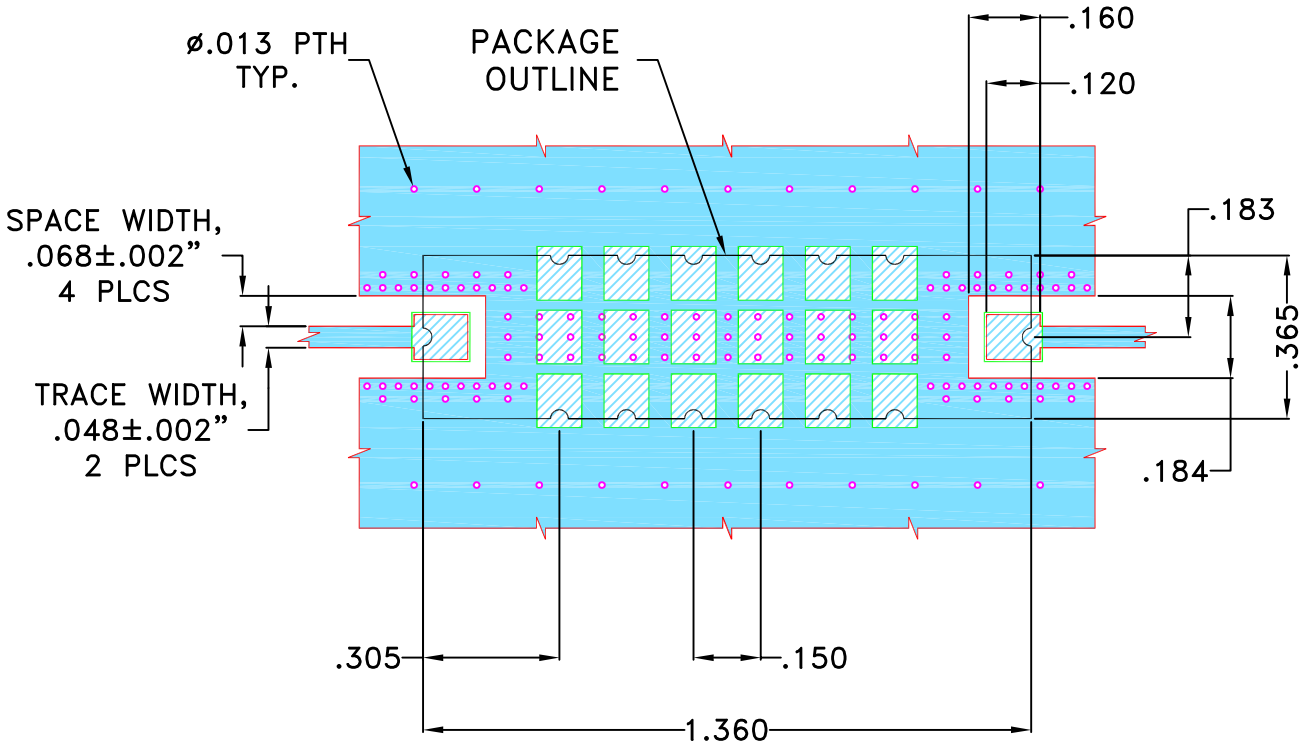
THIRD ANGLE PROJECTION

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

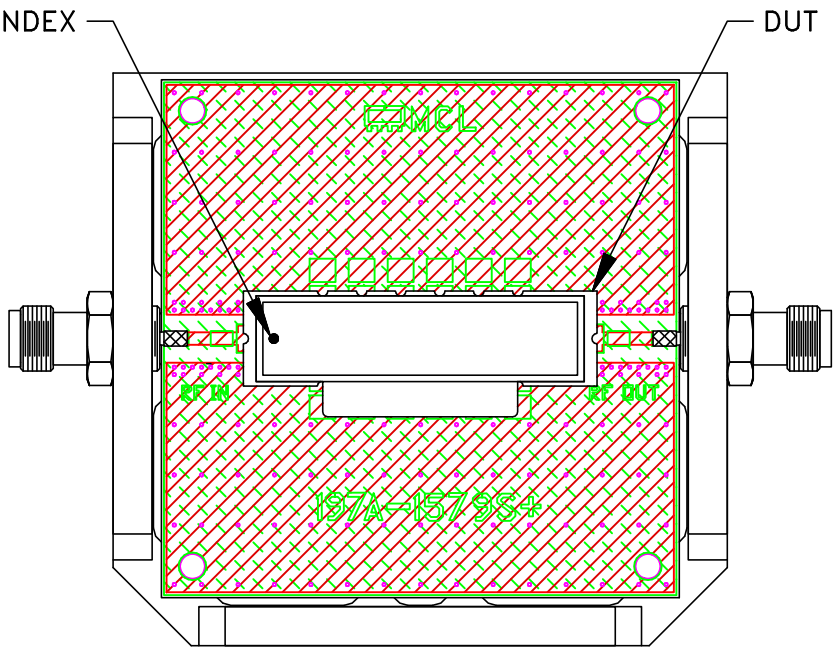
PL,14FL01,HQ2218, HQ2299,CBP TB-1006+, 50 Ohm

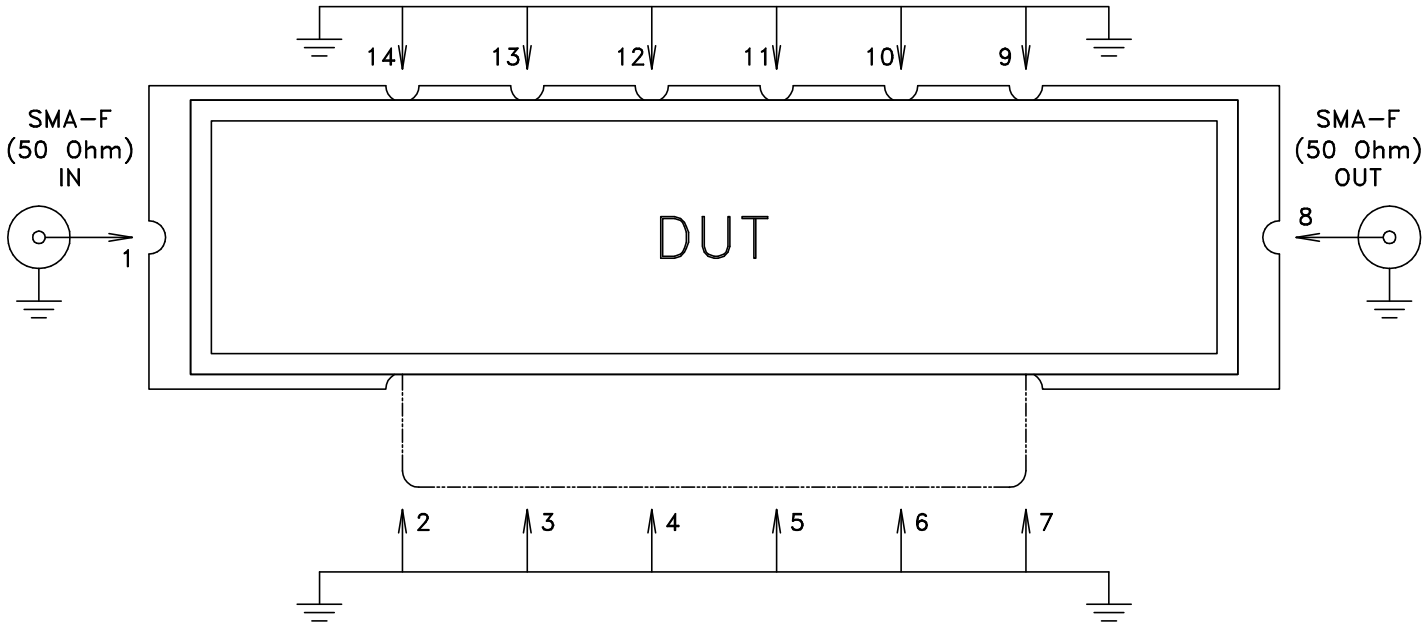
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-543	OR

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