

# Ceramic High Pass Filter

## HFCW-422+

50Ω 4200 to 9000 MHz

### The Big Deal

- Very good rejection, 17.8 dB typical
- Rugged, ceramic construction
- Tiny size, 0.063" x 0.032" x 0.024" (0603)
- Good power handling, 2W



CASE STYLE: JC0603C-7

### Product Overview

Mini-Circuits' HFCW-422+ is a LTCC High Pass Filter with a passband from 4200 to 9000 MHz, supporting a variety of applications. This model provides 1.2 dB typical passband insertion loss and provides a very good stopband rejection due to strategically constructed layout with minimal interaction between components. It provides a wide operating temperature range from -55 to +125°C. Housed in a tiny 0603 ceramic form factor with wrap-around terminations, the filter is ideal for dense PCB layouts and with minimal performance variation due to parasitics.

### Key Features

Feature	Advantages
LTCC Construction	Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes.
Tiny size (0.063 x 0.032 x 0.024")	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Good power handling	Supports a wide range of system power requirements.
Wrap-around terminations	Provides excellent solderability and easy visual inspection

#### 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](http://www.minicircuits.com/MCLStore/terms.jsp)



# Ceramic High Pass Filter

50Ω 4200 to 9000 MHz

## HFCW-422+



Generic photo used for illustration purposes only

CASE STYLE: JC0603C-7

### Features

- Miniature size 0603
- High stop band rejections
- Low cost
- Aqueous washable

### Applications

- ISM Band
- WLAN

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

### Electrical Specifications<sup>1,2</sup> at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
<b>Stop Band</b>	Rejection Loss	DC-F1	10 - 2600	17.8	25	—	dB
	Freq. Cut-Off	F2	3800	—	2.5	—	dB
<b>Pass Band</b>	Insertion Loss	F4-F5	4200 - 9000	—	1.2	2.0	dB
	Return Loss	F4-F5	4200 - 9000	—	13.5	—	dB

1. Tested on Evaluation Board TB-HFCW-422+

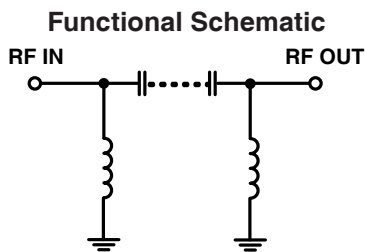
2. In Application where DC voltage is present at either input or output ports, coupling capacitors are required.

### Maximum Ratings

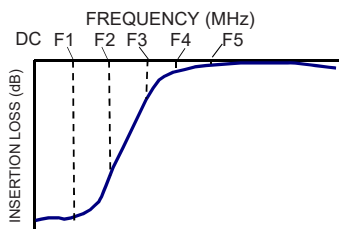
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input <sup>3</sup>	2W at 25°C

3. Passband rating, derate linearly to 0.5W at 125°C ambient.

Permanent damage may occur if any of these limits exceeded.

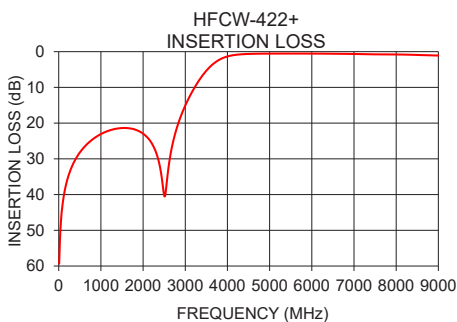
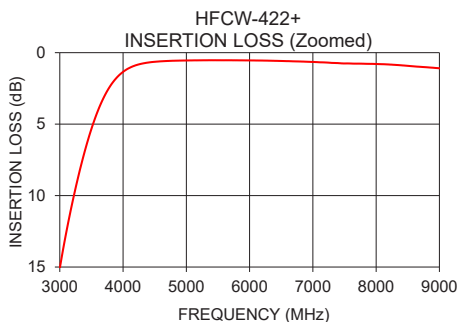


### Typical Frequency Response



### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	59.36	0.05
500	28.23	0.02
1000	23.06	0.05
1500	21.38	0.08
2000	22.95	0.11
2600	32.66	0.20
3000	15.09	0.51
3800	2.32	6.37
4200	0.88	15.50
4500	0.64	23.44
5000	0.55	21.34
5500	0.53	20.79
6000	0.54	20.52
6500	0.58	19.53
7000	0.65	19.40
7500	0.75	21.66
8000	0.79	28.12
8300	0.85	22.89
8600	0.96	18.39
9000	1.09	15.95



### 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](http://www.minicircuits.com/MCLStore/terms.jsp)

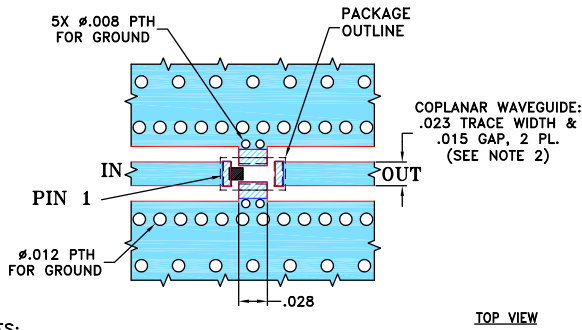


## Pad Connections

INPUT	1
OUTPUT	3
GROUND	2,4

## Product Marking: N/A

Evaluation Board MCL P/N: TB-HFCW-422+  
Suggested PCB Layout (PL-565)



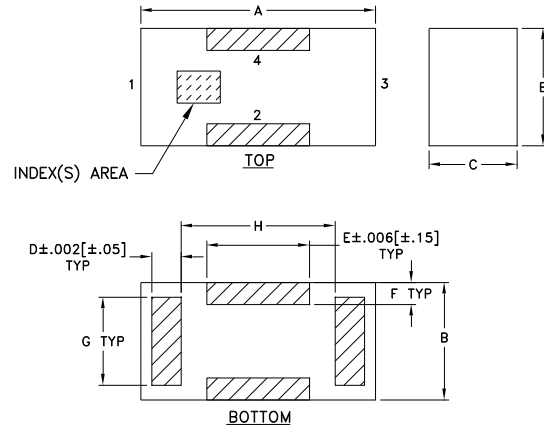
### NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR FR4 WITH DIELECTRIC THICKNESS  $.008 \pm .001$ "; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. LAYER 3 AND LAYER 4 OF THE PCB ARE CONTINUOUS GROUND PLANES.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

## Outline Drawing



METALLIZATION

## Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	wt
.063	.032	.024	.008	.028	.006	.024	.041	grams
1.60	0.81	0.61	0.20	0.71	0.15	0.6096	1.04	.005

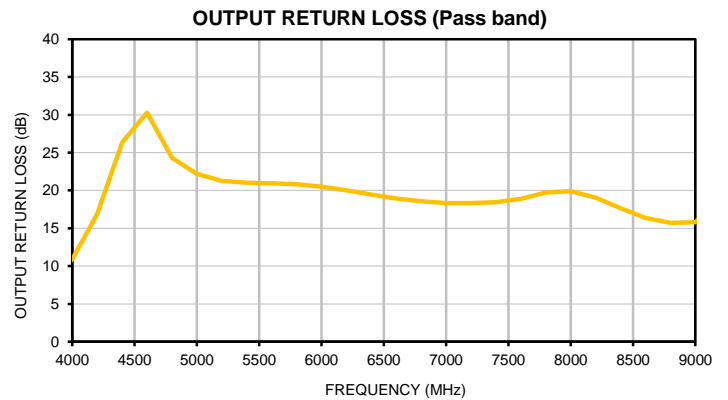
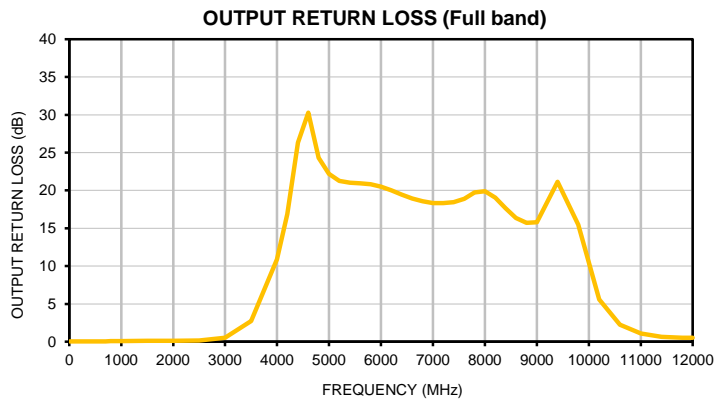
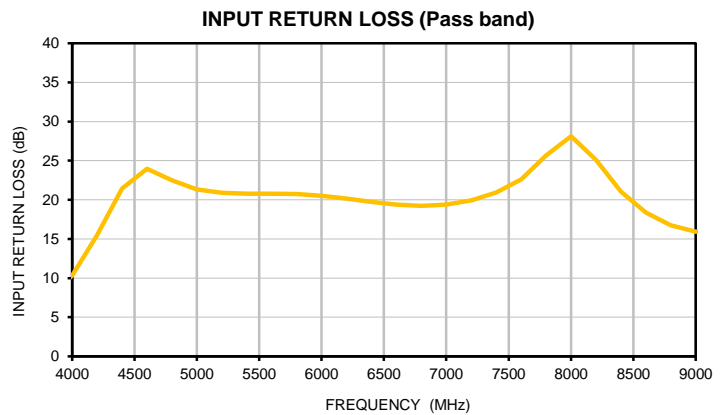
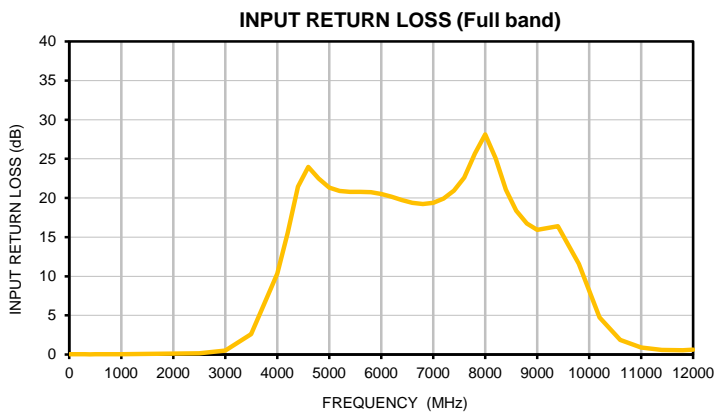
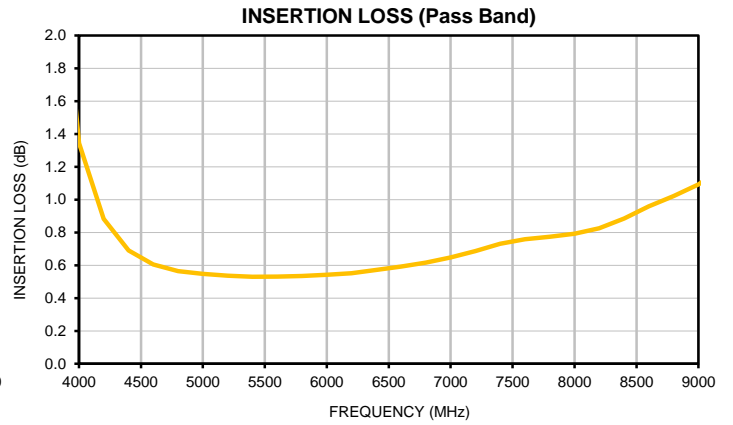
### Notes

- 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](http://www.minicircuits.com/MCLStore/terms.jsp)

## Typical Performance Data

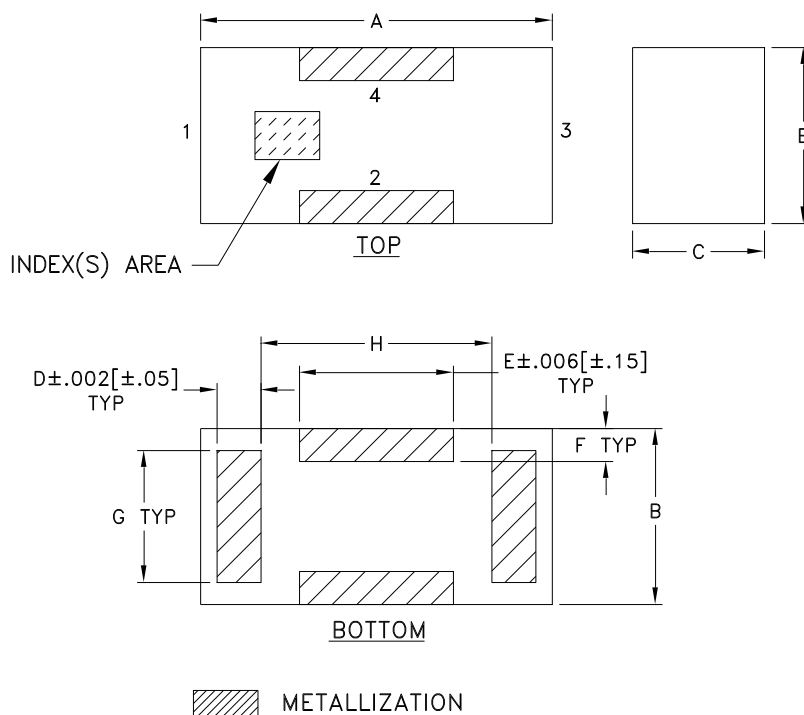
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	59.36	0.05	0.05
20	56.07	0.05	0.05
30	52.31	0.05	0.04
40	49.95	0.05	0.05
50	48.03	0.06	0.05
60	46.33	0.05	0.05
70	44.90	0.05	0.04
80	43.95	0.05	0.04
90	42.87	0.04	0.04
100	41.96	0.04	0.04
200	35.93	0.02	0.03
300	32.51	0.03	0.03
400	30.09	0.02	0.04
500	28.23	0.02	0.04
600	26.77	0.03	0.05
700	25.57	0.03	0.05
800	24.59	0.04	0.06
900	23.75	0.04	0.07
1000	23.06	0.05	0.08
1500	21.38	0.08	0.11
2000	22.95	0.11	0.13
2500	40.25	0.17	0.17
3000	15.09	0.51	0.53
3500	5.33	2.62	2.72
4000	1.34	10.32	10.90
4200	0.88	15.50	16.88
4400	0.69	21.43	26.34
4600	0.60	23.96	30.29
4800	0.57	22.50	24.34
5000	0.55	21.34	22.18
5200	0.54	20.88	21.28
5400	0.53	20.78	21.03
5600	0.53	20.79	20.94
5800	0.54	20.76	20.82
6000	0.54	20.52	20.51
6200	0.55	20.15	20.03
6400	0.57	19.74	19.47
6600	0.59	19.40	18.93
6800	0.62	19.24	18.55
7000	0.65	19.40	18.33
7200	0.69	19.92	18.31
7400	0.73	20.95	18.44
7600	0.76	22.59	18.88
7800	0.77	25.67	19.73
8000	0.79	28.12	19.90
8200	0.83	25.08	19.05
8400	0.88	21.04	17.63
8600	0.96	18.39	16.36
8800	1.02	16.75	15.72
9000	1.09	15.95	15.78
9400	1.29	16.41	21.16
9800	1.87	11.60	15.49
10200	4.07	4.75	5.60
10600	7.97	1.88	2.24
11000	12.29	0.90	1.07
11400	16.42	0.59	0.64
11800	20.51	0.57	0.51
12000	23.06	0.63	0.51

## Typical Performance Curves

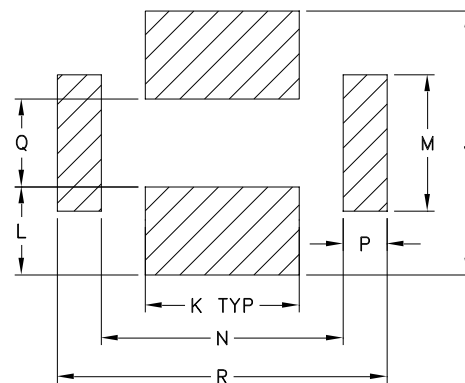


## Outline Dimensions

JC0603C-7



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L
JC0603C-7	.063 (1.60)	.032 (.80)	.024 (.60)	.008 (.20)	.028 (.70)	.006 (.15)	.024 (.60)	.041 (1.05)	.047 (1.20)	.028 (.70)	.016 (.40)

CASE#	M*	N	P	Q	R	WT.GRAMS
JC0603C-7	.024 (.62)	.043 (1.10)	.008 (.20)	.016 (.40)	.059 (1.50)	.005

Dimensions are in inches (mm). Tolerances: 3 Pl.  $\pm .004$

### Notes:

- Open style, ceramic base.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
- Line width should be designed to match 50 OHMS characteristic impedance, depending on PCB material & thickness.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F114

## DEVICE ORIENTATION IN T&R



ILLUSTRATION 1

Applicable Case Styles	
GE0805C	JC0603C
GE0805C-1	JC0603C-4
GE0805C-1AP	JC0603C-6
GE0805C-7	
GE0805C-9	
GE0805C-10	
GE0805C-11	
GE0805C-12	



ILLUSTRATION 2

Applicable Case Styles	
GE0805C-2	JC0603C-1
GE0805C-3	JC0603C-2
GE0805C-4	JC0603C-3
GE0805C-5	JC0603C-5
GE0805C-6	JC0603C-7
GE0805C-8	
GE0805C-15	

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
				1000
			Standard	4000

Note: Please Consult individual model data sheet to determine device per reel availability.

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



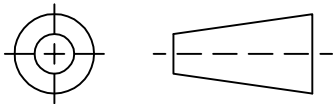
INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

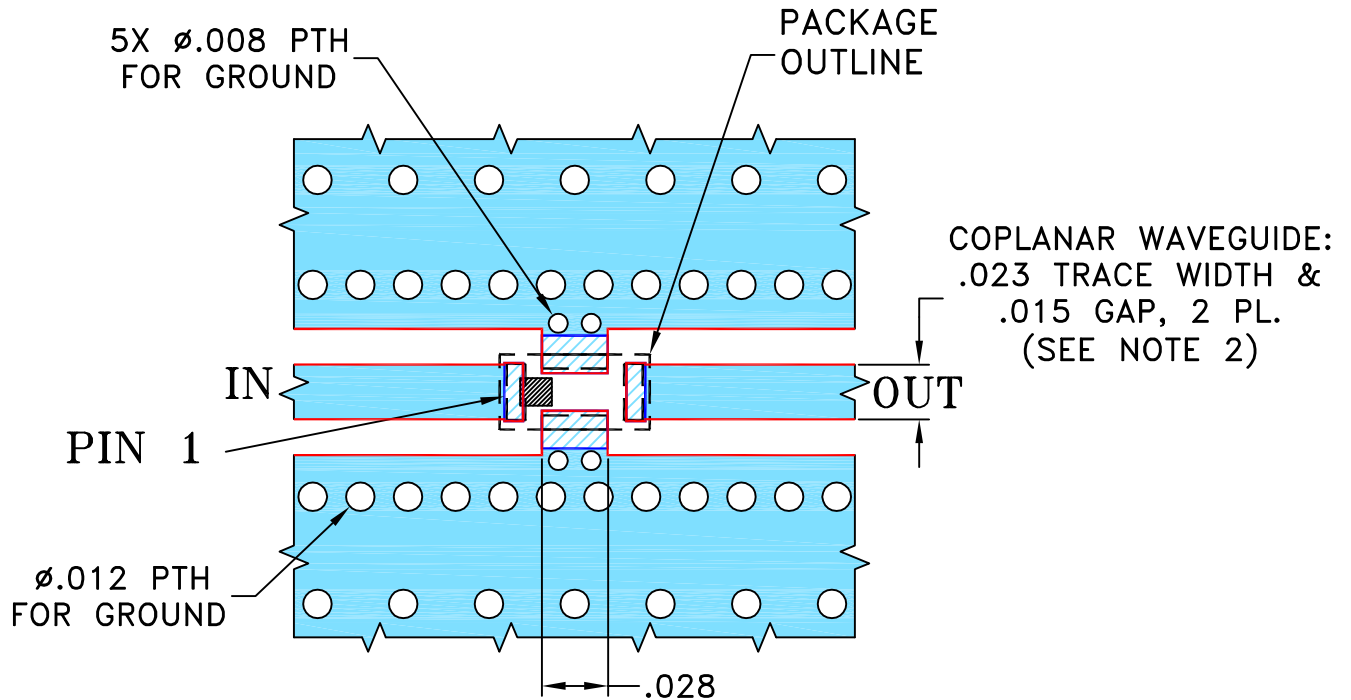
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL
A	M173497	MOVED PIN 1	04/02/19	NP	CM

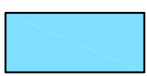
SUGGESTED MOUNTING CONFIGURATION  
FOR JC0603C-7 CASE STYLE, "04FL02" PIN CODE



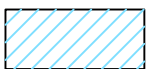
TOP VIEW

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .008"±.001"; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. LAYER 3 AND LAYER 4 OF THE PCB ARE CONTINUOUS GROUND PLANES.



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



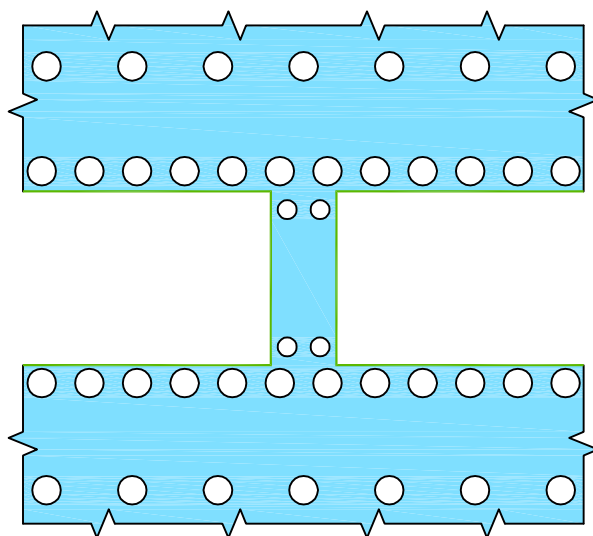
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	NP 05/30/18
	CHECKED	GF 05/30/18
	APPROVED	SL 05/31/18

PL, 04FL02, JC0603C-7, TB-1027+

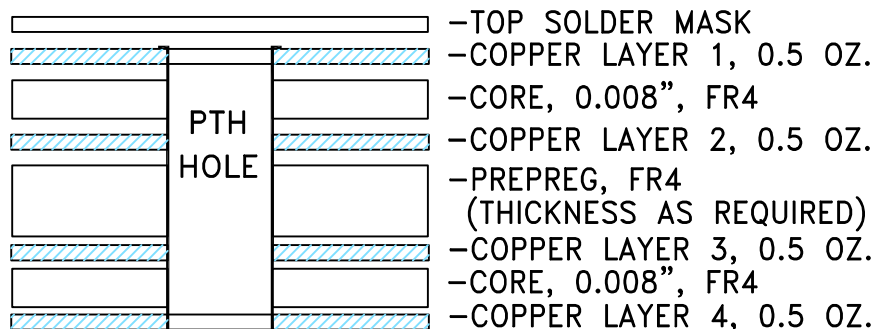
SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-565	REV: A
FILE: 98PL565	SCALE: 12:1	SHEET: 1 OF 2	

Mini-Circuits®  
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.  
ASHEETA1.DWG REV:A DATE:01/12/95

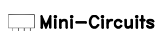


LAYER 2

STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.020" ± 10%.
2. PTH HOLES PRESENT FROM COPPER LAYER 1 TO 4.

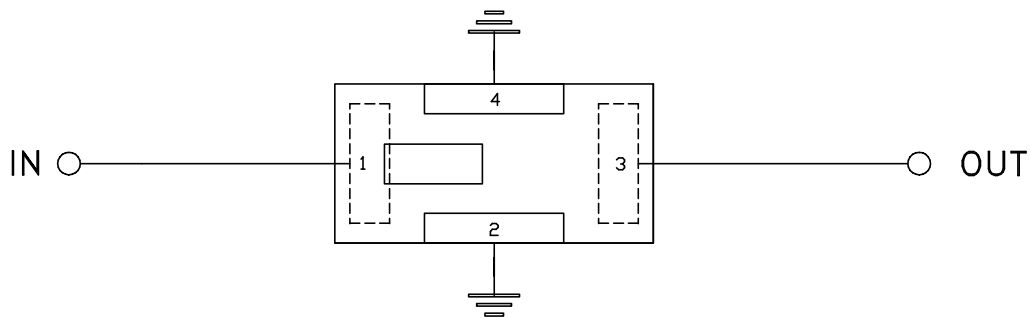
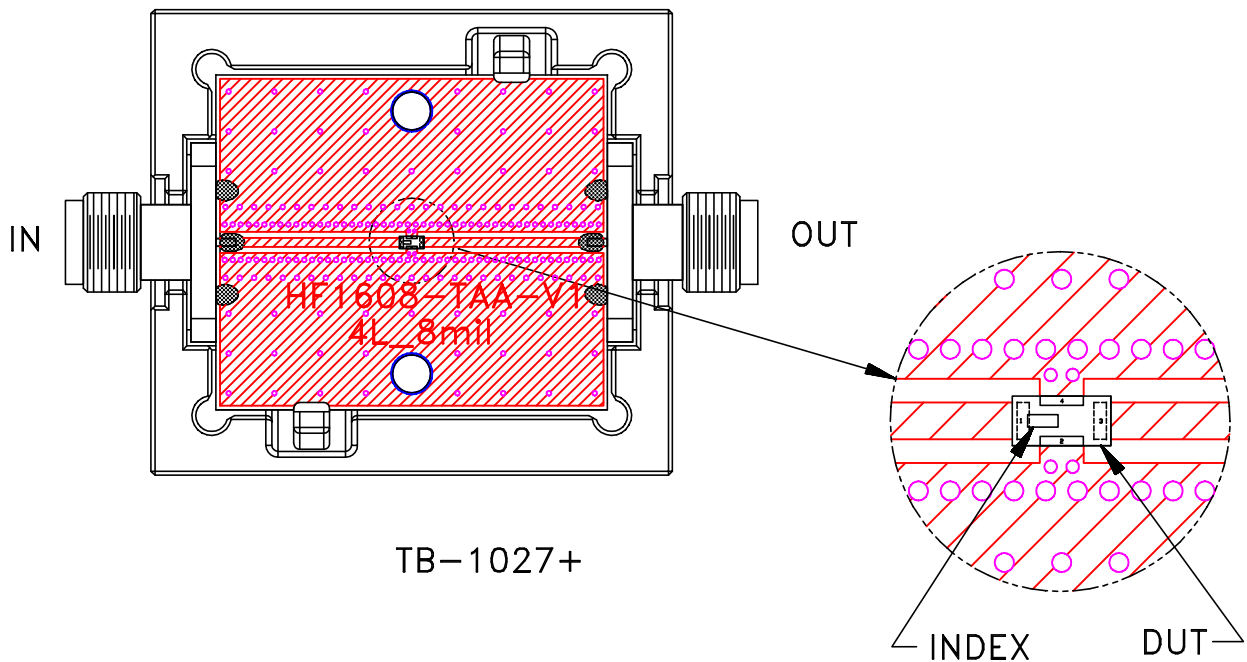


THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

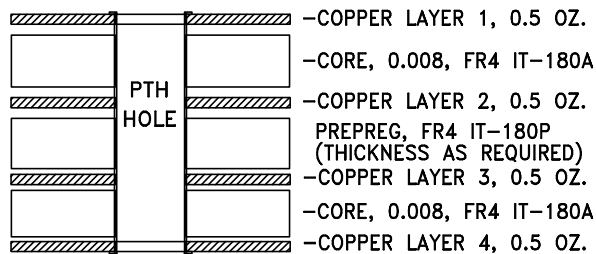
ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-565	REV: A
FILE: 98PL565	SCALE: 12:1	SHEET: 2 OF 2	

# Evaluation Board and Circuit




Schematic Diagram



Stack-up Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,  
Dielectric Constant=4.5,  
Total finished Thickness = .025 inch.

 Mini-Circuits®



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	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process: 250°C peak	J-STD-020C, 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, 12 times in each of three perpendicular directions (total 36)	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