

Ceramic High Pass Filter

HFCE-452+

50Ω 4500to 8500 MHz

The Big Deal

- Rugged, ceramic construction
- Tiny size
- Good power handling



CASE STYLE: SC0202C

Product Overview

Mini-Circuits' HFCE-452+ is a LTCC High Pass Filter with a passband from 4500 to 8500 MHz, supporting a variety of applications. This model provides good 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 0202 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	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Good power handling	Supports a wide range of system power requirements.

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



Ceramic High Pass Filter

50Ω 4500 to 8500 MHz

HFCE-452+



Generic photo used for illustration purposes only

CASE STYLE: SC0202C

Features

- Miniature size 0202 (0.026"[0.65mm] x 0.020"[0.5mm] x 0.015"[0.37mm])
- Low Insertion Loss
- Low cost
- Aqueous washable

+RoHS Compliant

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

Applications

- ISM Band
- WLAN

Electrical Specifications^{1,2} at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Stop Band	Rejection Loss	DC-F1	DC - 2500	15	22	--	dB
	Insertion Loss	F4-F5	4500 - 8500	--	0.7	1.3	dB
Pass Band	Freq. Cut-Off	F3	4000	--	2	--	dB
	Return Loss	F4-F5	4500 - 8500	--	15	--	dB

1. Tested on Evaluation Board TB-HFCE-452+

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

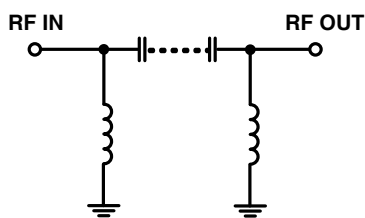
Maximum Ratings

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

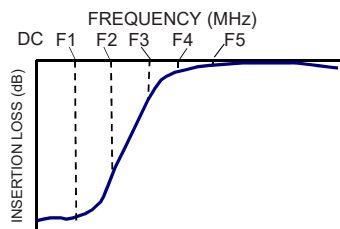
3. Passband rating, derate linearly to 0.5W at 125°C ambient.

Permanent damage may occur if any of these limits exceeded.

Functional Schematic

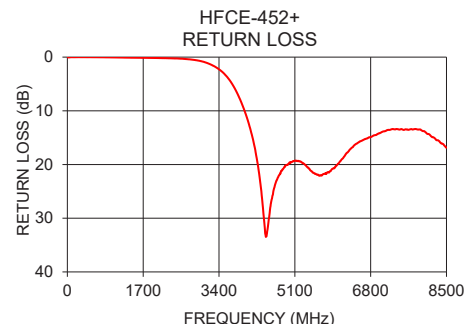
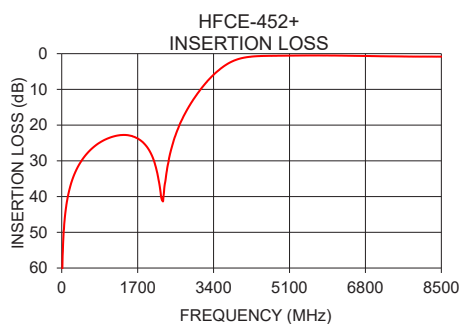
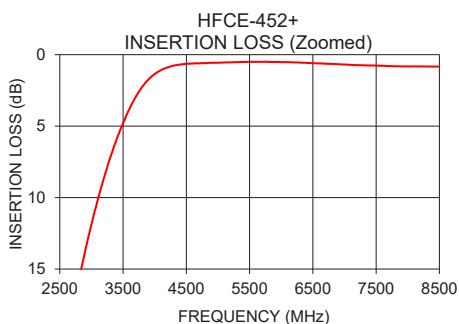


Typical Frequency Response



Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	61.74	0.05
400	30.84	0.01
800	25.31	0.03
1200	23.05	0.07
1600	23.20	0.12
2000	28.01	0.16
2500	24.63	0.27
2800	15.87	0.48
3200	8.60	1.32
3600	3.81	3.88
4000	1.35	10.63
4500	0.64	31.33
5200	0.54	19.42
5600	0.50	21.87
6000	0.52	20.54
6400	0.57	16.76
6800	0.65	14.87
7200	0.73	13.55
7600	0.77	13.48
8500	0.83	16.84



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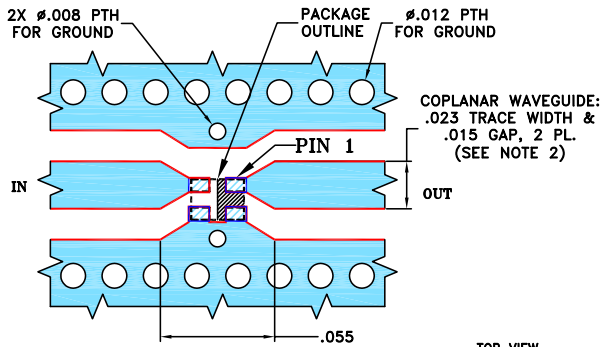
REV. A
ECO-005628
HFCE-452+
SL/CP/AM
210104
Page 2 of 3

Pad Connections

INPUT	2
OUTPUT	1
GROUND	3,4

Product Marking: N/A

Evaluation Board MCL P/N: **TB-HFCE-452+**
Suggested PCB Layout (PL-567)

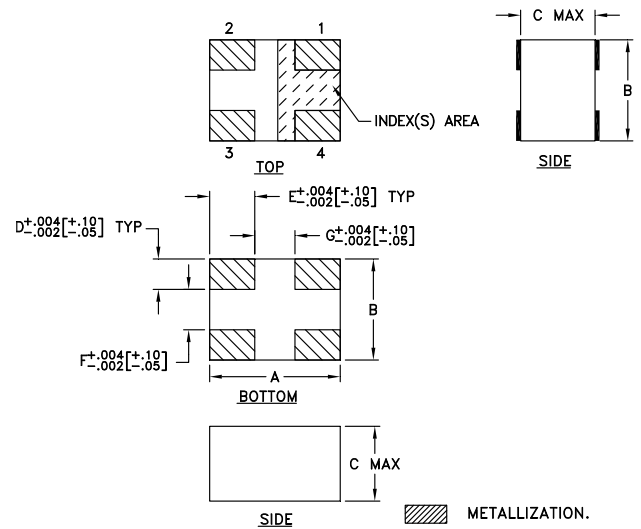


NOTES:

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



Outline Dimensions (inch mm)

A	B	C	D	E	F	wt
.026	.020	.015	.006	.009	.008	grams
0.66	0.51	0.38	0.15	0.23	0.20	0.0005

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Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	61.74	0.05	0.05
50	49.16	0.04	0.04
100	42.77	0.01	0.01
200	36.75	0.01	0.01
300	33.27	0.01	0.00
400	30.84	0.01	0.01
500	28.97	0.01	0.01
600	27.49	0.02	0.01
700	26.29	0.02	0.02
800	25.31	0.03	0.02
900	24.53	0.04	0.03
1000	23.90	0.05	0.04
1100	23.40	0.06	0.05
1200	23.05	0.07	0.06
1300	22.82	0.09	0.07
1400	22.76	0.10	0.09
1500	22.87	0.11	0.10
1600	23.20	0.12	0.11
1700	23.74	0.13	0.12
1800	24.62	0.14	0.13
1900	25.95	0.15	0.14
2000	28.01	0.16	0.15
2100	31.44	0.18	0.16
2200	37.60	0.19	0.17
2300	37.22	0.22	0.17
2400	29.53	0.24	0.19
2500	24.63	0.27	0.23
3000	11.88	0.76	0.69
3500	4.80	2.96	2.83
4000	1.35	10.63	9.96
4500	0.64	31.33	20.51
4600	0.62	25.77	20.11
4700	0.61	22.81	19.55
4800	0.60	21.19	19.04
4900	0.57	20.16	18.86
5000	0.56	19.66	18.83
5100	0.55	19.31	18.98
5200	0.54	19.42	19.40
5300	0.52	19.85	20.33
5400	0.51	20.57	21.74
5500	0.51	21.50	23.31
5600	0.50	21.87	24.82
5700	0.50	22.05	25.45
5800	0.51	21.69	24.84
5900	0.51	21.22	24.14
6000	0.52	20.54	22.89
6100	0.52	19.57	21.44
6200	0.54	18.57	19.89
6300	0.56	17.57	18.51
6400	0.57	16.76	17.50
6500	0.59	16.03	16.63
6600	0.61	15.56	16.08
6700	0.63	15.19	15.57
6800	0.65	14.87	15.14
6900	0.67	14.51	14.64
7000	0.69	14.18	14.25
7100	0.71	13.82	13.87
7200	0.73	13.55	13.64
7300	0.75	13.40	13.52
7400	0.75	13.41	13.47
7500	0.77	13.43	13.44
7600	0.77	13.48	13.40
7700	0.79	13.42	13.32
7800	0.81	13.39	13.23
7900	0.82	13.46	13.34
8000	0.82	13.79	13.64
8100	0.82	14.33	14.11
8200	0.82	14.90	14.66
8300	0.83	15.48	15.10
8400	0.84	16.12	15.75
8500	0.83	16.84	16.51



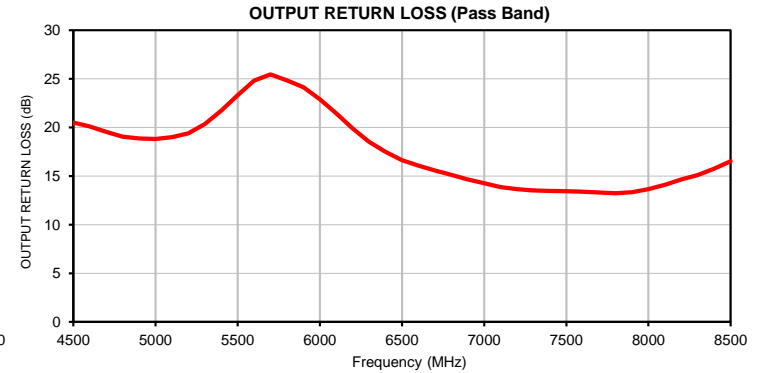
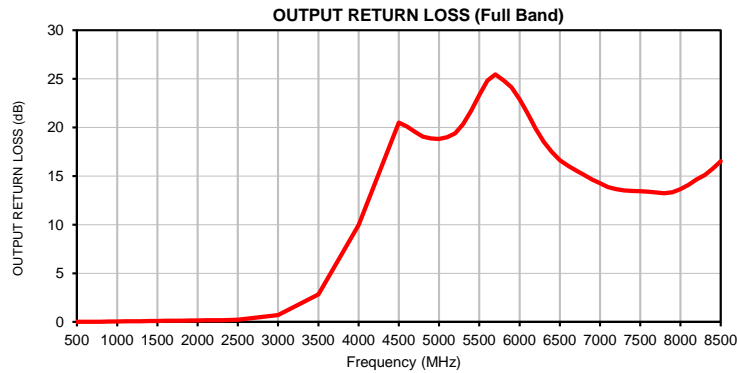
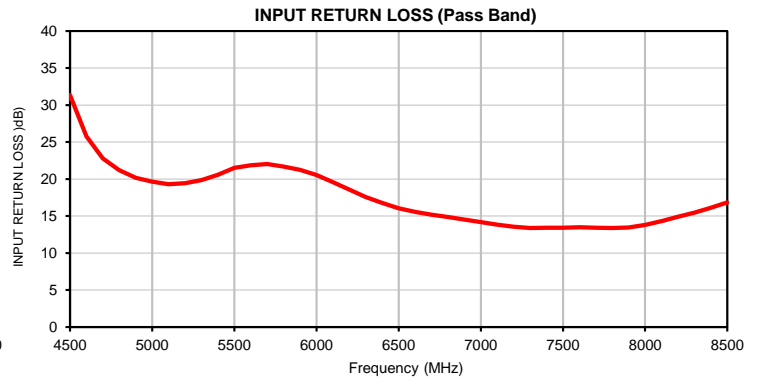
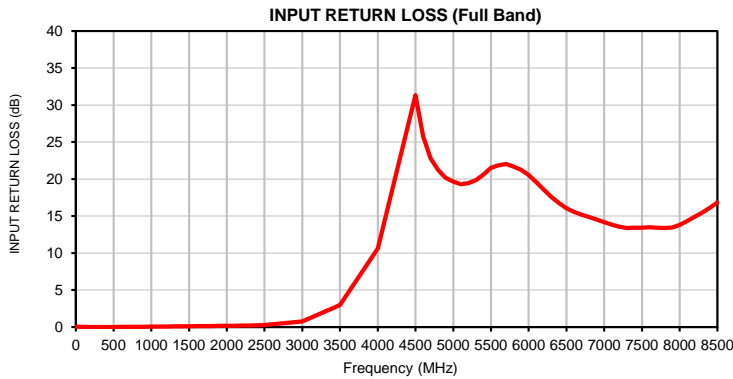
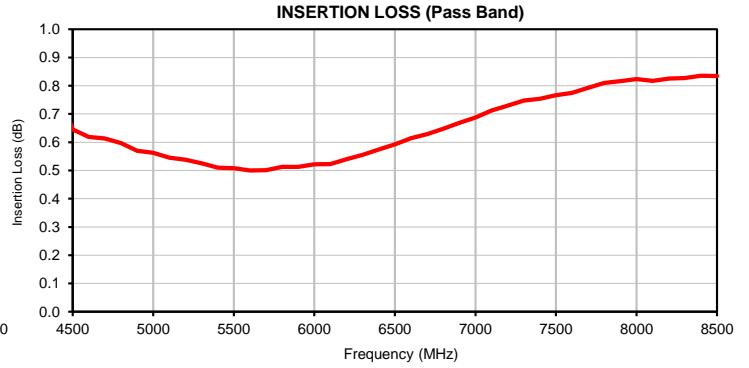
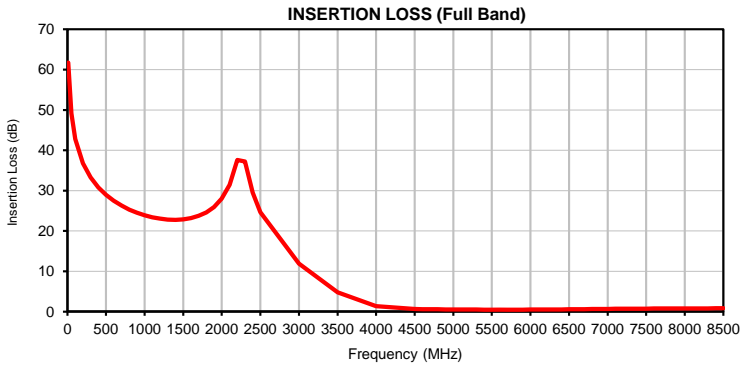
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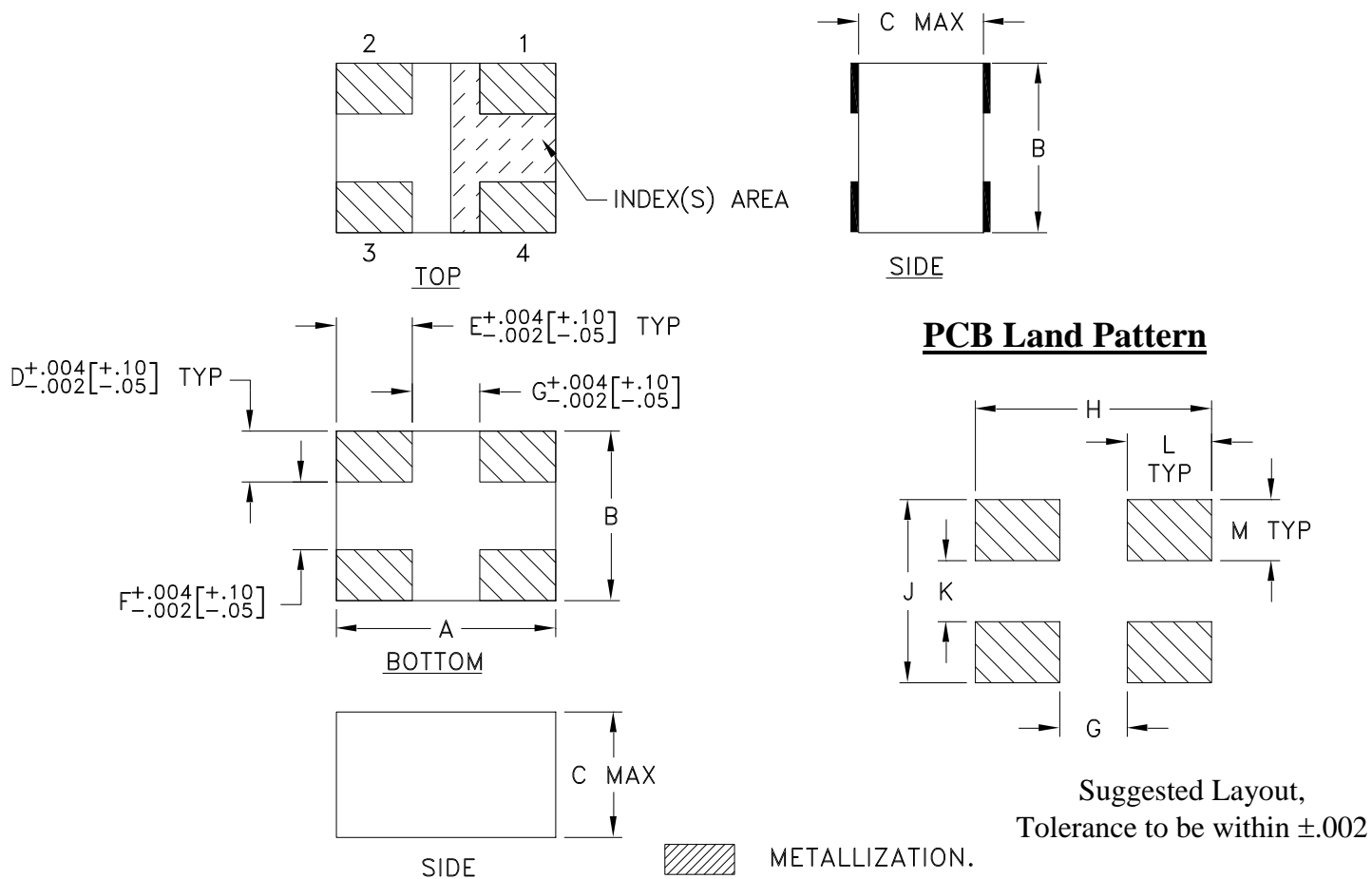
IF/RF MICROWAVE COMPONENTS

Typical Performance Curves



Outline Dimensions

SC0202C



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT. GRAMS
SC0202C	.026 (0.65)	.020 (0.50)	.015 (0.37)	.006 (0.15)	.009 (0.225)	.008 (0.20)	.008 (0.20)	.028 (0.70)	.021 (0.54)	.007 (0.18)	.010 (0.25)	.007 (0.18)	.0005

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .002$

Notes:

1. Open style, ceramic base.
2. Termination finish:
For RoHS Case Styles: Matte Tin over Nickel plating. Models with (+) suffix.
3. *Line width should be designed to match 50 Ω characteristic impedance, depending on PCB material and thickness



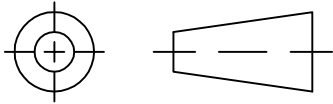
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RF/IF MICROWAVE COMPONENTS

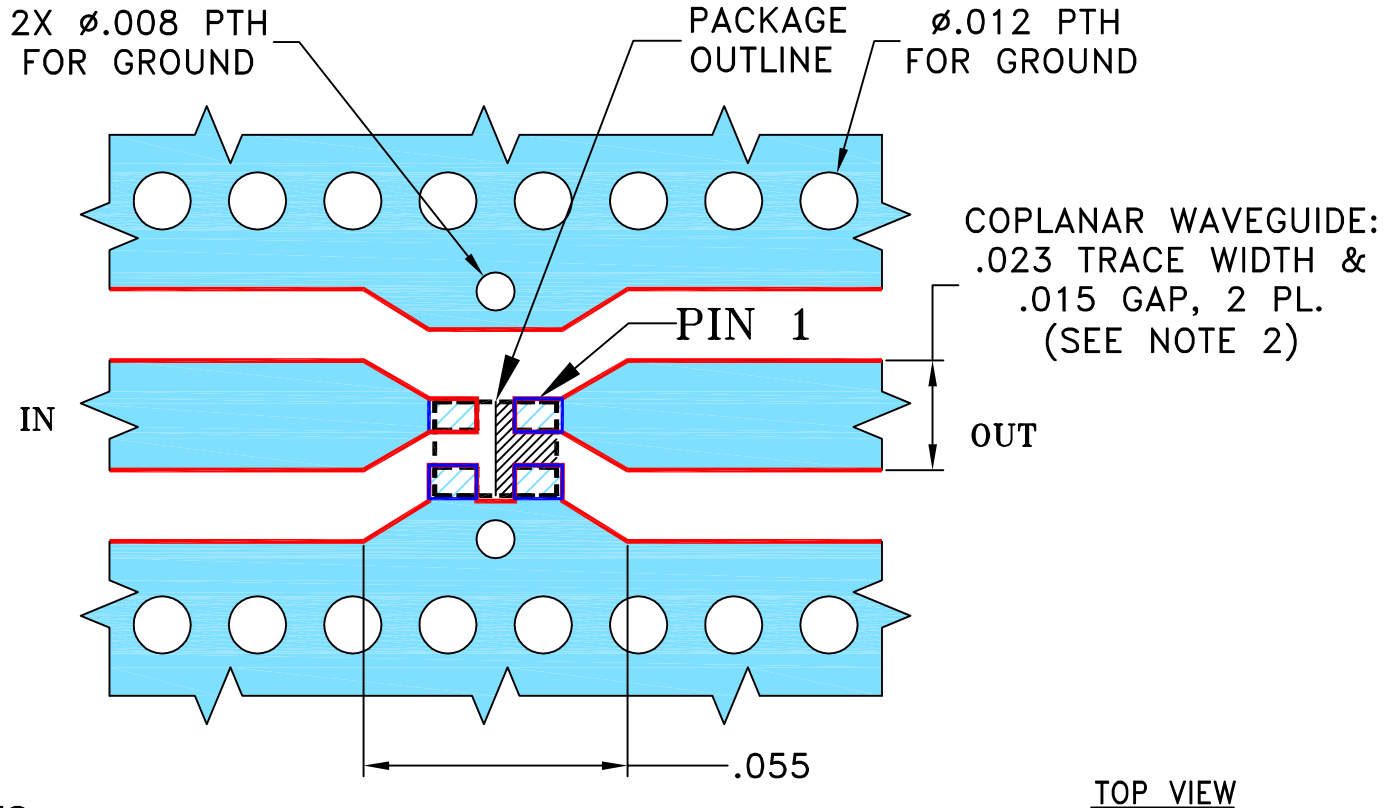
THIRD ANGLE PROJECTION



REVISIONS

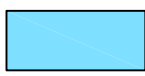
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OR	M168200	NEW RELEASE	05/31/18	NP	SL

SUGGESTED MOUNTING CONFIGURATION
FOR SC0202 CASE STYLE, "04FL03" PIN CODE

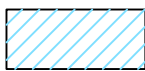


NOTES:

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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	DRAWN NP	05/30/18
TOLERANCES ON:	CHECKED GF	05/30/18
2 PL DECIMALS ±	APPROVED SL	05/31/18
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		



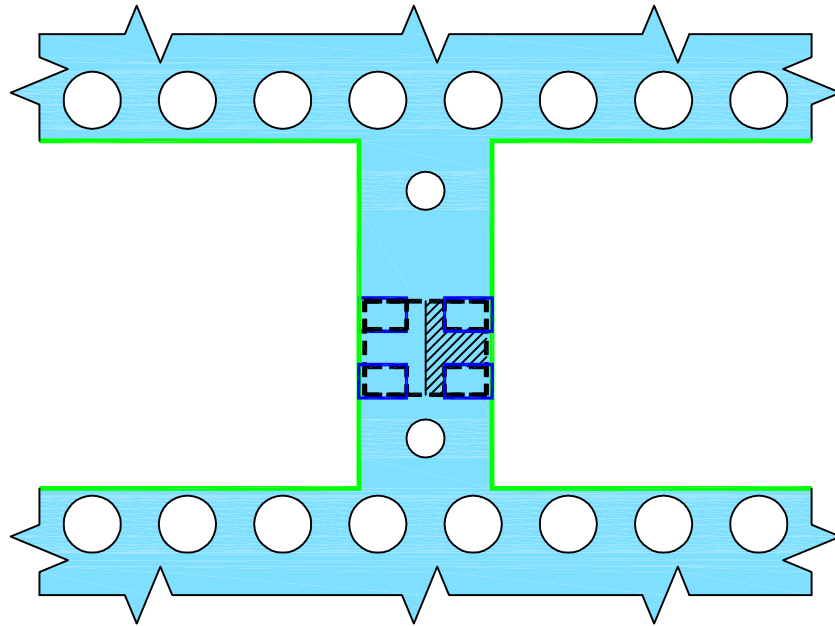
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PL, 04FL03, SC0202C, TB-1029+

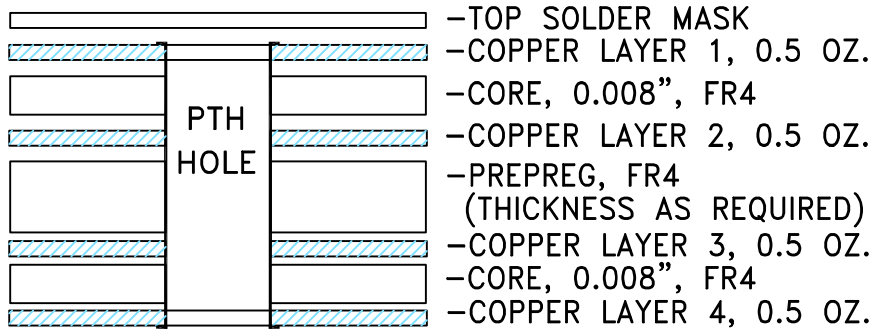
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FILE:	98PL567	SCALE: 24:1	SHEET: 1 OF 2

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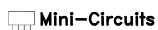


LAYER 2

STACK-UP DIAGRAM



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

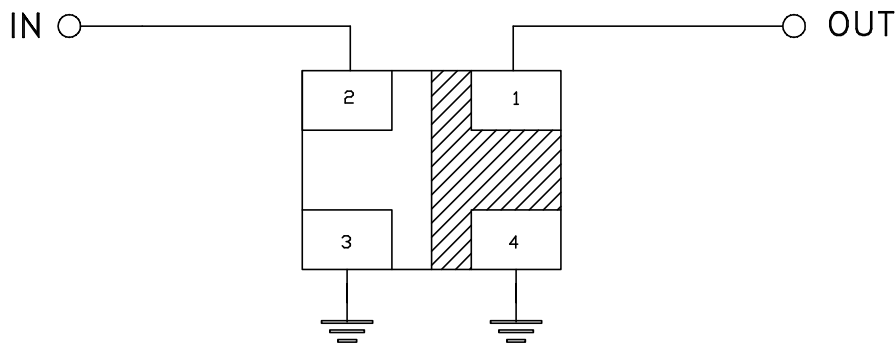
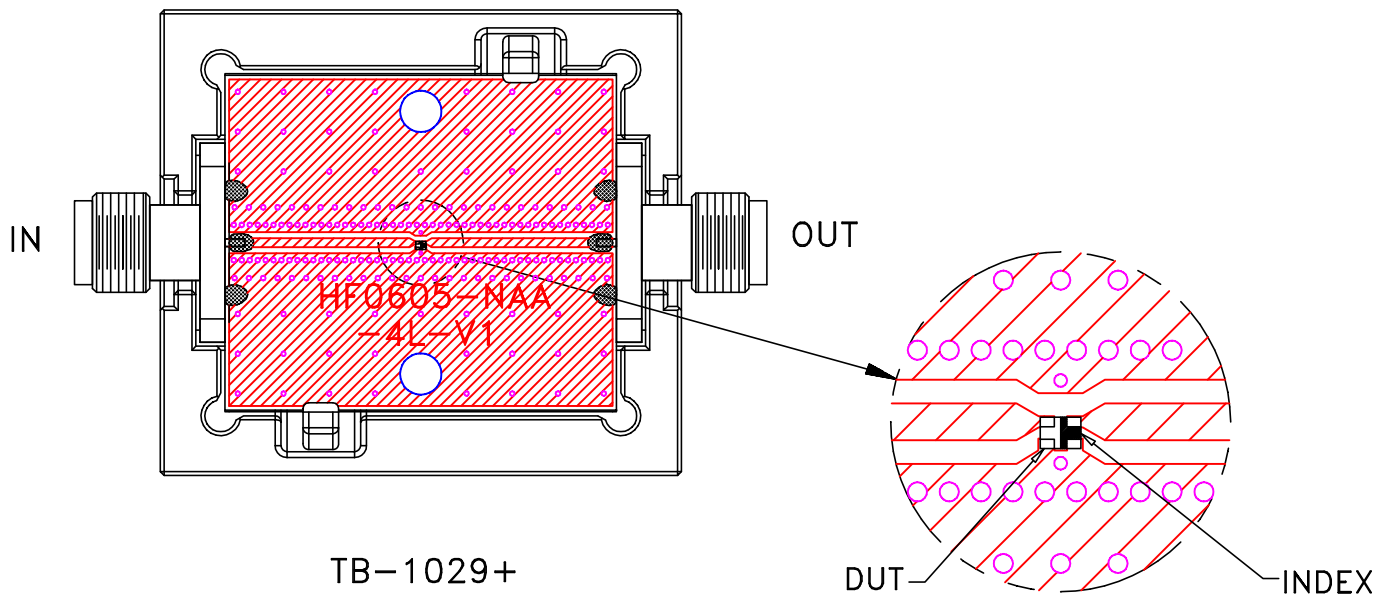


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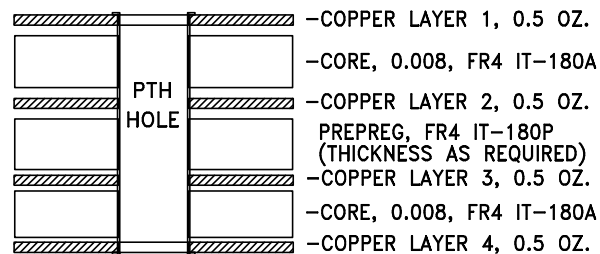
ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-567	REV: OR
FILE: 98PL567	SCALE: 24:1	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