

Ceramic Low Pass Filter

LFCW-612+

50Ω 10 to 6100 MHz

The Big Deal

- Very good rejection, 36 dB typical
- Rugged, ceramic construction
- Tiny size, 0.063" x 0.032" x 0.024" (0603)
- Good power handling



CASE STYLE: JC0603C-1

Product Overview

Mini-Circuits' LFCW-612+ is a LTCC low pass filter with a passband from 10 to 6100 MHz, supporting a variety of applications. This model provides 1.0 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
Ultra-wide stopband	The LTCC lowpass filter provides a very good stopband rejection suitable for high end applications.
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



Ceramic Low Pass Filter

50Ω 10 to 6100 MHz

LFCW-612+



Generic photo used for illustration purposes only

CASE STYLE: JC0603C-1

Features

- Miniature size 0603
- Low cost
- Aqueous washable

Applications

- ISM Band
- WLAN
- Bluetooth
- 5G sub 6GHz

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

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

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Pass Band	Insertion Loss	DC-F1	DC - 6100	—	1.0	1.5	dB
	Freq. Cut-Off	F2	6700	—	2.0	—	dB
	Return Loss	DC-F1	DC - 6100	9.5	—	—	dB
Stop Band	Rejection Loss	F3-F4	9300 - 12600	25	36	—	dB

1. Tested on Evaluation Board TB-LFCW-612+

2. In application where DC voltage is present at either input or poutput port, coupling capacitors are required.

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

2. Refer to product storage temperature after installation

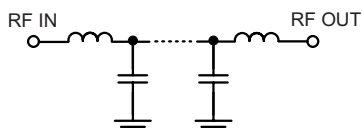
Suggestion for T&R unused product storage condition:

+5 ~ +35 °C, Humidity 45~75%RH, 12 month Max

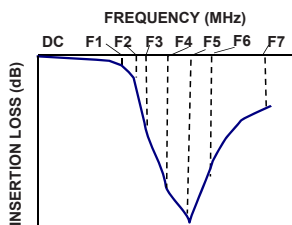
3. Derate linearly to 0.5W at 125°C.

Permanent damage may occur if any of these limits exceeded.

Functional Schematic



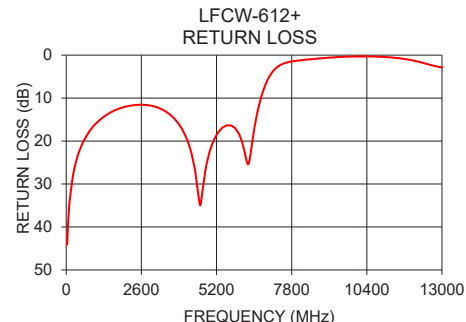
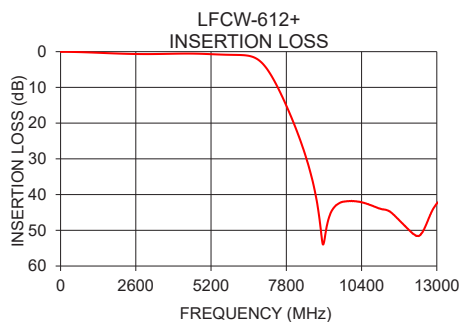
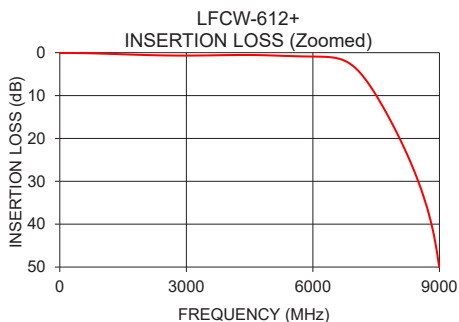
Typical Frequency Response



Typical Performance Data⁴ at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	0.06	44.22
100	0.06	35.34
1000	0.22	16.09
1500	0.38	13.47
2000	0.53	12.08
2500	0.64	11.57
3000	0.68	11.86
4000	0.56	17.14
5000	0.64	21.62
6000	0.90	18.71
7000	3.50	5.33
8000	18.88	1.28
9300	45.85	0.53
10000	41.82	0.30
11000	43.87	0.43
11500	45.57	0.71
12000	49.60	1.25
12100	50.39	1.41
12600	49.00	2.28

4. Measured with Agilent E5071B network analyzer using port extension.



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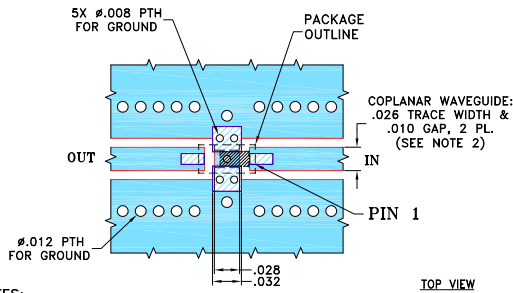


Pad Connections



INPUT	1
OUTPUT	3
GROUND	2,4

Product Marking: N/A

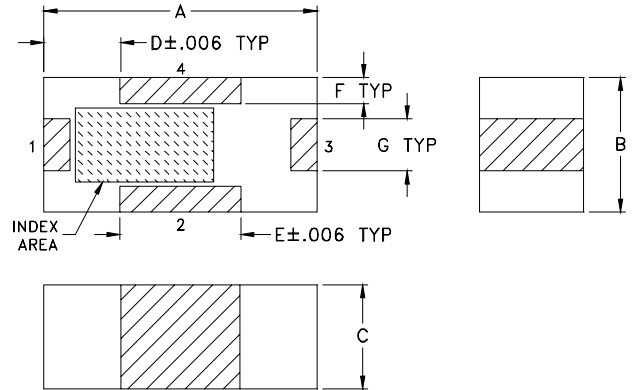
Evaluation Board MCL P/N: TB-LFCW-612+
Suggested PCB Layout (PL-564)



NOTES:

- PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
 - TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR FR4 WITH DIELECTRIC THICKNESS $.003 \pm .0005$; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
 - 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	G	wt
.063	.031	.024	.018	.028	.006	.012	grams
1.60	0.79	0.61	0.46	0.71	0.15	0.30	0.005

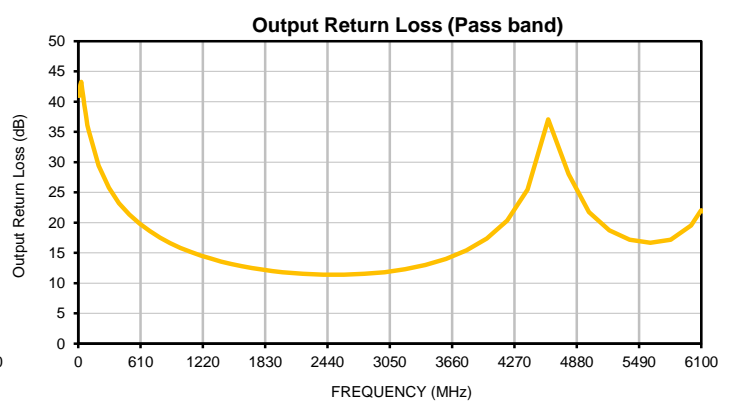
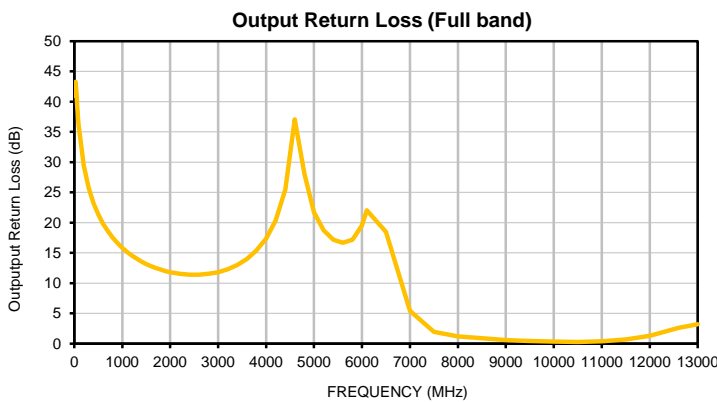
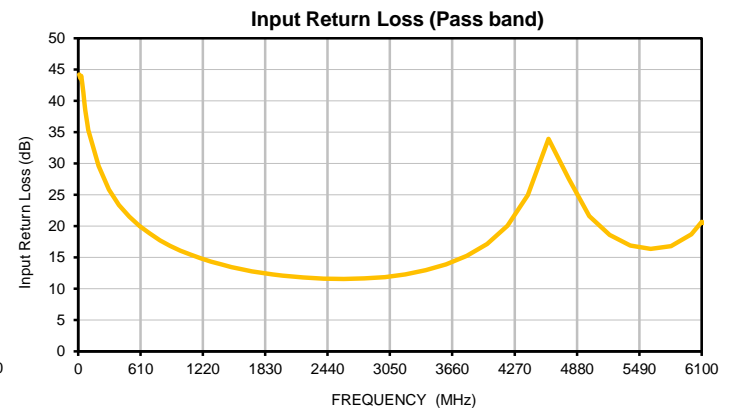
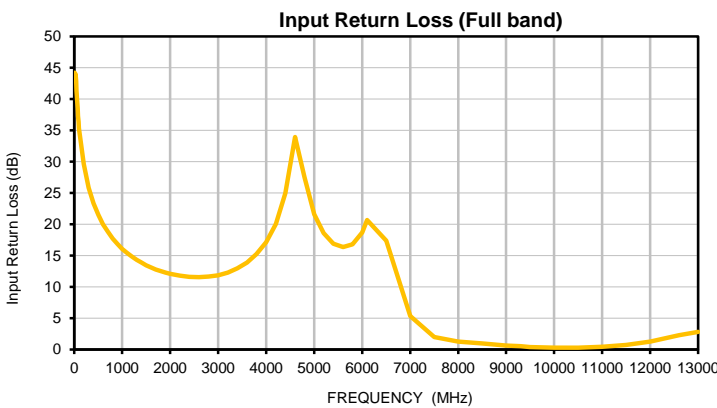
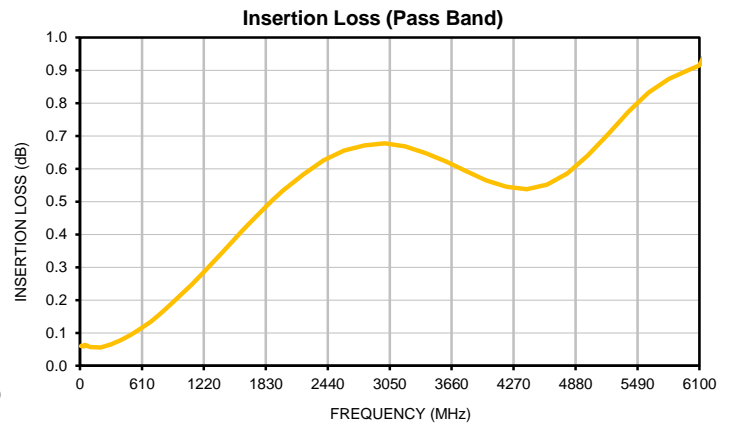
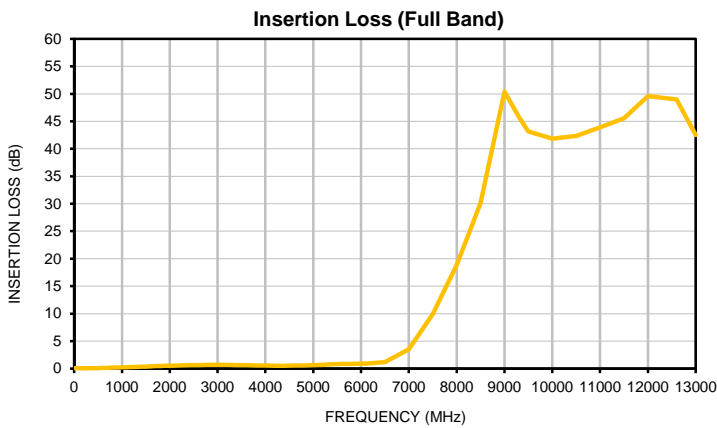
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Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	0.06	44.22	40.95
20	0.06	43.58	42.75
30	0.06	43.99	43.28
40	0.06	42.88	42.04
50	0.06	41.30	40.68
60	0.06	39.85	39.50
70	0.06	38.53	38.22
80	0.06	37.28	37.22
90	0.06	36.36	36.14
100	0.06	35.34	35.30
200	0.06	29.61	29.44
300	0.06	25.85	25.77
400	0.08	23.34	23.20
500	0.09	21.53	21.33
600	0.11	20.03	19.85
700	0.14	18.84	18.63
800	0.16	17.74	17.55
900	0.19	16.87	16.64
1000	0.22	16.09	15.82
1100	0.25	15.45	15.16
1200	0.28	14.87	14.58
1300	0.31	14.34	14.04
1400	0.34	13.88	13.58
1500	0.38	13.47	13.17
1600	0.41	13.12	12.81
1700	0.44	12.79	12.50
1800	0.47	12.53	12.24
1900	0.50	12.31	12.01
2000	0.53	12.08	11.82
2000	0.53	12.08	11.82
2200	0.58	11.80	11.56
2400	0.63	11.60	11.41
2600	0.65	11.55	11.40
2800	0.67	11.65	11.54
3000	0.68	11.86	11.81
3200	0.67	12.30	12.29
3400	0.65	12.95	13.02
3600	0.62	13.88	14.01
3800	0.59	15.25	15.40
4000	0.56	17.14	17.36
4200	0.55	20.03	20.33
4400	0.54	24.94	25.48
4600	0.55	33.93	37.10
4800	0.59	27.51	28.01
5000	0.64	21.62	21.78
5200	0.71	18.61	18.75
5400	0.77	16.90	17.19
5600	0.83	16.35	16.66
5800	0.87	16.81	17.16
6000	0.90	18.71	19.52
6100	0.91	20.67	22.08
6500	1.16	17.37	18.49
7000	3.50	5.33	5.42
7500	9.95	2.00	1.97
8000	18.88	1.28	1.19
8500	30.10	0.95	0.89
9000	50.41	0.64	0.61
9300	45.85	0.53	0.49
9500	43.15	0.41	0.44
10000	41.82	0.30	0.33
10500	42.34	0.31	0.28
11000	43.87	0.43	0.40
11500	45.57	0.71	0.70
12000	49.60	1.25	1.32
12600	49.00	2.28	2.62
13000	42.53	2.83	3.21

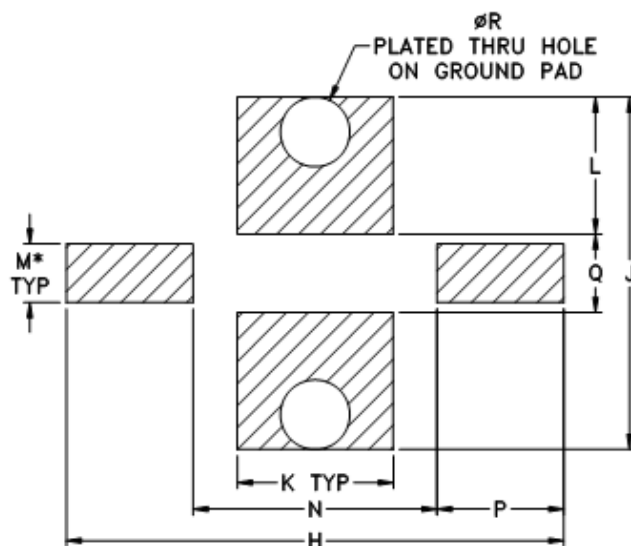
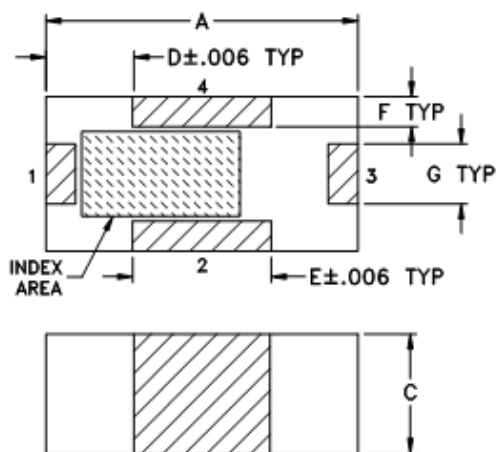
Typical Performance Curves



Outline Dimensions

JC0603C-1

PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	L
JC0603C-1	.063 (1.60)	.031 (0.80)	.024 (0.60)	.018 (0.45)	.028 (0.70)	.006 (0.15)	.012 (0.30)	.100 (2.54)	.071 (1.80)	.032 (0.80)	.028 (0.70)

CASE #	M*	N	P	Q	R	WT. GRAMS
JC0603C-1	.012 (0.30)	.049 (1.24)	.026 (0.65)	.016 (0.40)	.014 (0.35)	.005

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

Notes:

1. Open style, ceramic base.
2. Termination finish:
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
- 3.* - 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

RF/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



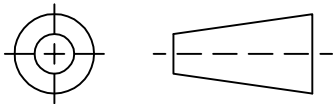
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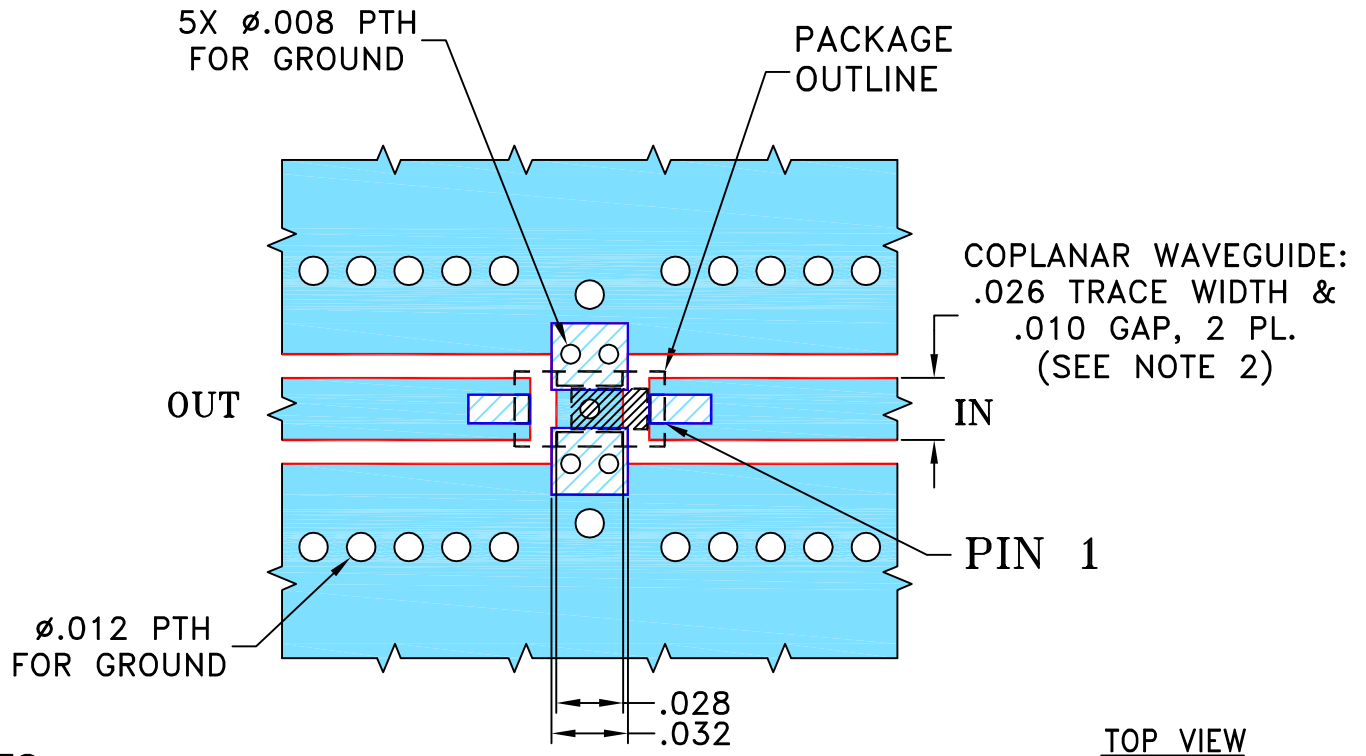
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL

SUGGESTED MOUNTING CONFIGURATION
FOR JC0603C-1 CASE STYLE, "04FL01" PIN CODE




NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR FR4 WITH DIELECTRIC THICKNESS ".003"±.0005"; 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.

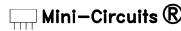
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-  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

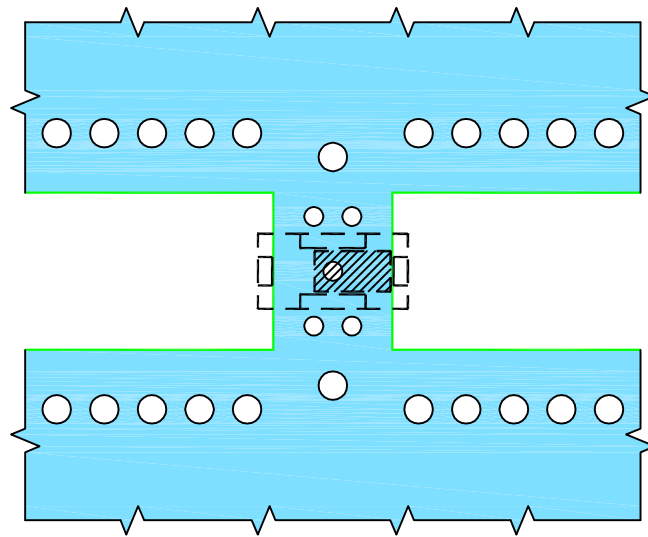
UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN NP	05/30/18
TOLERANCES ON:	CHECKED GF	05/30/18
2 PL DECIMALS ±	APPROVED SL	05/31/18
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

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Brooklyn NY 11235

PL, 04FL01, JC0603C-1, TB-1026+

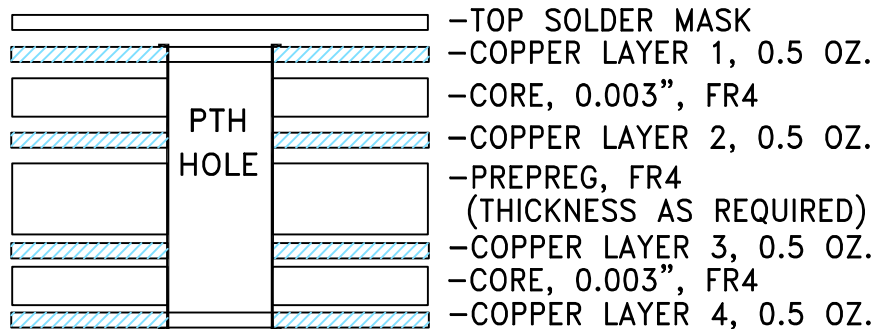
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FILE: 98PL564	SCALE: 12:1	SHEET: 1 OF 2	

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

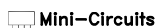


LAYER 2

STACK-UP DIAGRAM



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

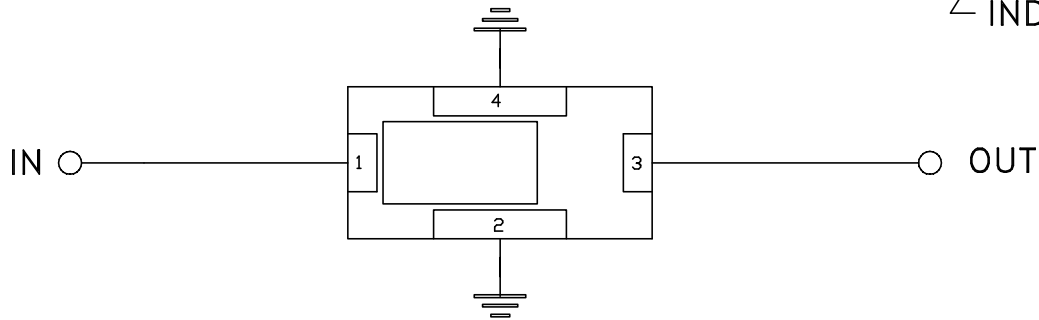
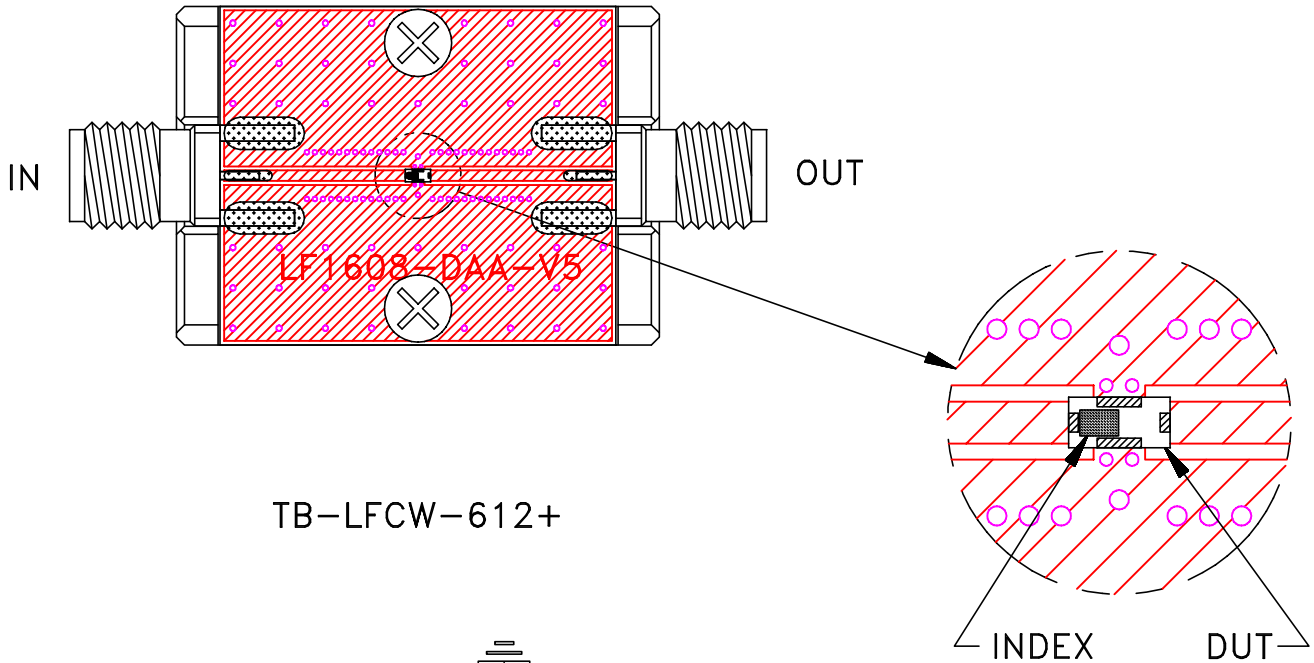


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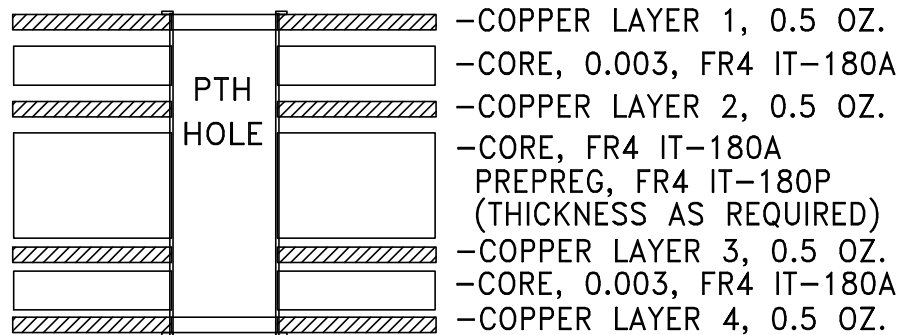
ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-564	REV: OR
FILE: 98PL564	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