LTCC SURFACE MOUNT

Low Pass Filter

LFCV-2402+

50Ω DC to 23.8 GHz

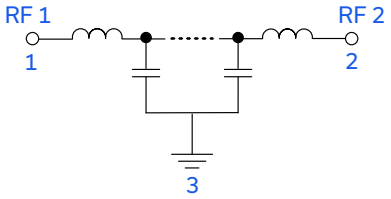
THE BIG DEAL

- Stop Band Rejection, up to 38dB Typ.
- Pass Band Return Loss, 13dB Typ.
- Rugged Ceramic Construction
- Small Size, 1210 Surface Mount Footprint



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- Radar, EW, and ECM Defense Systems
- Test & Measurement Equipment

PRODUCT OVERVIEW

Mini-Circuits' LFCV-2402+ is a miniature low-temperature co-fired ceramic (LTCC) low pass filter with a DC to 23.8GHz passband that supports a variety of applications. This model provides 2.8dB typical insertion loss over a wide band due to its rugged monolithic construction. Housed in a small 1210 ceramic form factor, the filter is ideal for dense signal chain PCB layouts, where it complements MMIC size and performance. The LTCC fabrication process assures minimal RF performance variation while delivering a product that is well-suited for environmental extremes of high humidity and temperature.

KEY FEATURES

Feature	Advantages
Ultra-wide Stopband	Provides excellent stopband rejection to 56GHz and beyond, suitable for wide band applications.
LTCC Construction	The use of LTCC technology allows for repeatable performance in a rugged ceramic package, well suited for tough environments such as high humidity and temperature extremes. See Mini-Circuits Environmental Rating ENV06T10 for more information.
Excellent Performance for Size	Offers best-in-class performance relative to larger-size alternative technologies. This mmWave multi-layer surface mount LTCC filter in a 1210 package allows for space to be saved in dense circuit board layouts, while also minimizing the effects of parasitics.

REV. OR
ECO-019263
LFCV-2402+
MCL NY
230927

Low Pass Filter

LFCV-2402+

50Ω DC to 23.8 GHz

ELECTRICAL SPECIFICATIONS[1,2,3] AT 25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC-F1	DC - 23.8	—	2.8	4	dB
	Freq. Cut-Off[4]	Fc	24	—	3	—	
	Return Loss	DC-F1	DC - 23.8	—	13	—	
Stop Band	Rejection	F2-F3	33 - 48	33	38	—	dB
		F3-F4	48 - 56	29	34	—	
		F4-F5	56 - 67	—	24	—	

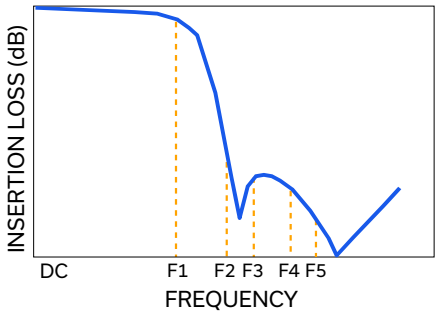
1. Tested on Evaluation Board P/N TB-LFCV-2402C+ with the connector and feedline effects de-embedded using the 2XThru IEEE P370 method.
2. Bi-directional RF1 and RF2 ports can be interchanged.
3. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
4. Typical variation ±3%

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
RF Power Input[6]	1W

5. Permanent damage may occur if any of these limits are exceeded.
6. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 0.5W at +125°C.

TYPICAL FREQUENCY RESPONSE AT 25°C



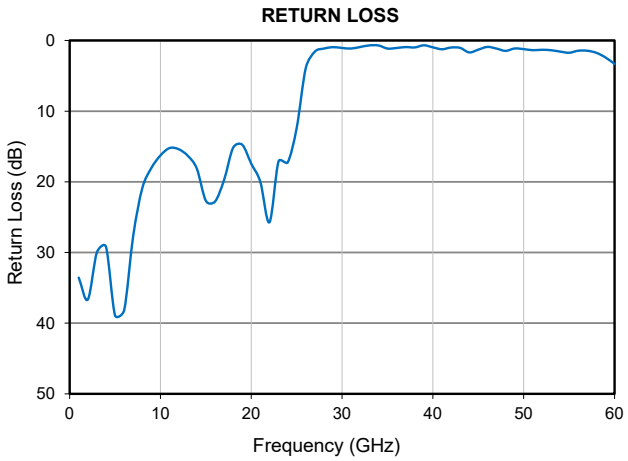
Low Pass Filter

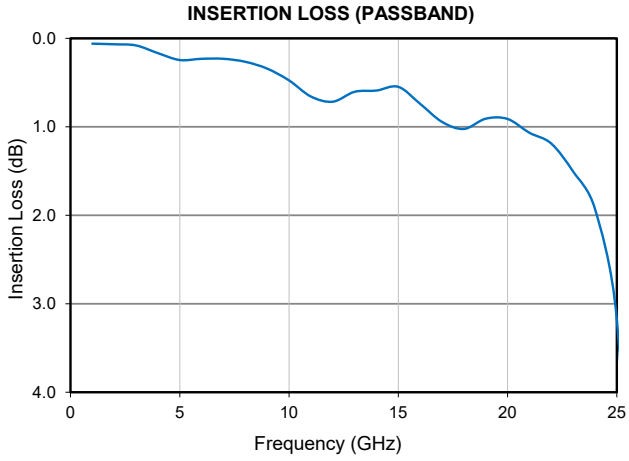
LFCV-2402+

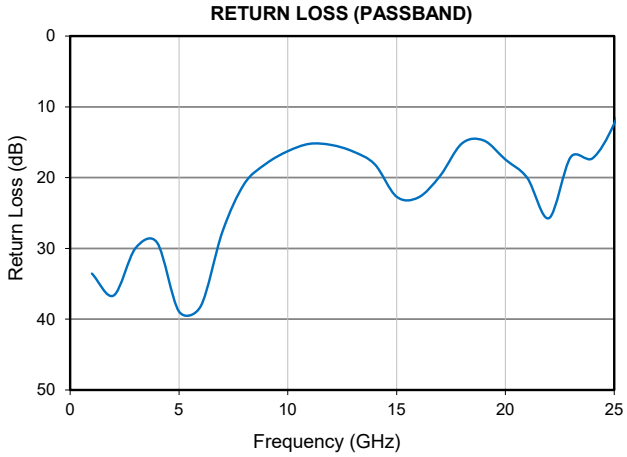
50Ω DC to 23.8 GHz

TYPICAL PERFORMANCE GRAPHS AT 25°C









Low Pass Filter

LFCV-2402+

50Ω DC to 23.8 GHz

FUNCTIONAL DIAGRAM

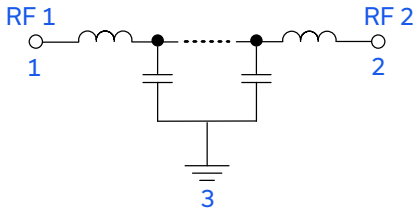
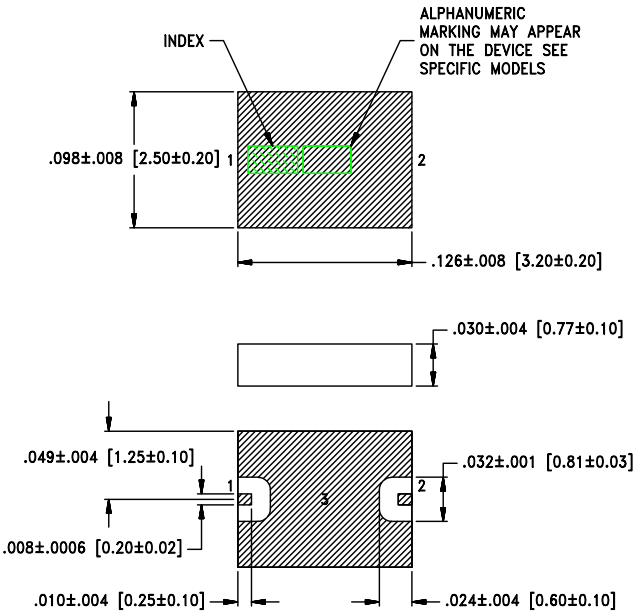


Figure 1. LFCV-2402+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1[2]	1	Connects to RF Input Port
RF2[2]	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-743)

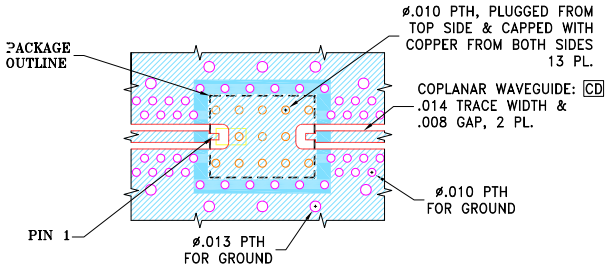
OUTLINE DRAWING



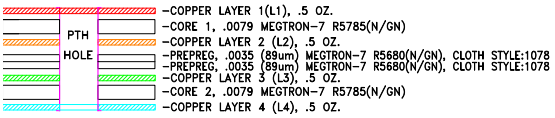
Weight: .024 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.010; 3 Pl. ±.005

SUGGESTED PCB LAYOUT (PL-743)



STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.026 ± 10%.
2. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
3. INDICATED ON TOP VIEW PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
4. L2, L3 AND L4 ARE CONTINUOUS GROUND PLANES.

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON-7 R-5785(N/GN), WITH DIELECTRIC THICKNESS .0079; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Figure 2. Suggested PCB Layout PL-743

PRODUCT MARKING*: WK

*Marking may contain other features or characters for internal lot control.

Low Pass Filter

LFCV-2402+

50Ω DC to 23.8 GHz

ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	JV1210C-13 Lead Finish: Gold Plate over Nickel Plate
RoHS Status	Compliant
Tape and Reel	F74
Suggested Layout for PCB Design	PL-743
Evaluation Board	TB-LFCV-2402C+ Gerber File
Environmental Ratings	ENV06T10

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/terms/viewterm.html

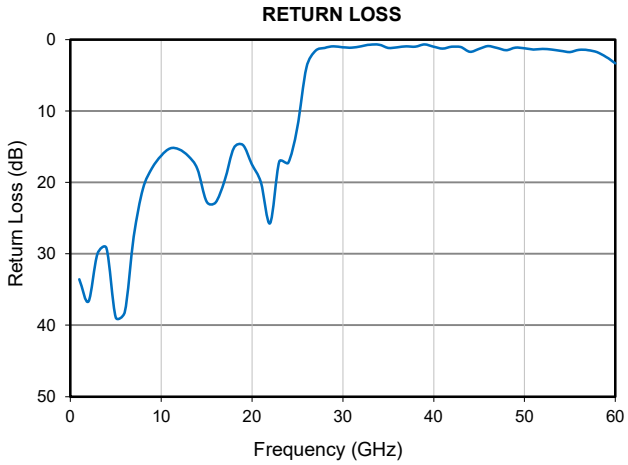
Low Pass Filter LFCV-2402+

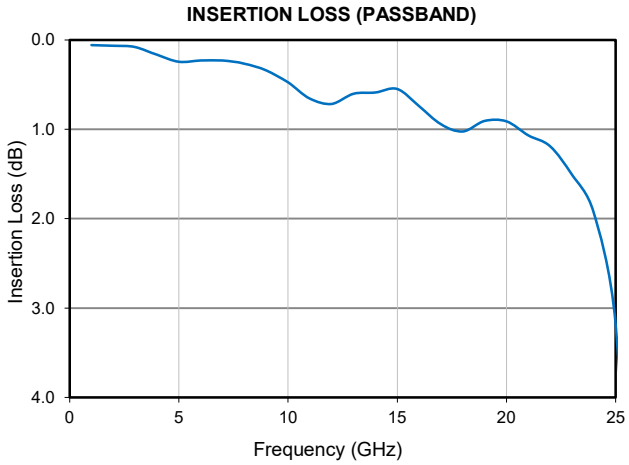
Typical Performance Data

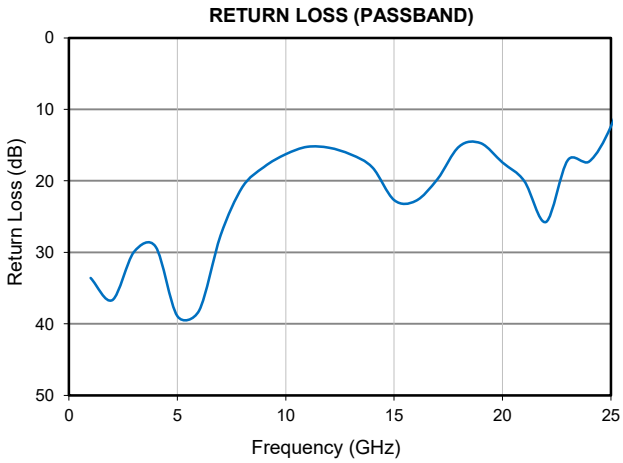
FREQUENCY (GHz)	INSERTION LOSS (dB)	RETURN LOSS (dB)
1	0.06	33.56
2	0.07	36.65
3	0.08	29.97
4	0.17	29.20
5	0.25	38.91
6	0.23	38.17
7	0.23	27.62
8	0.27	20.89
9	0.34	18.04
10	0.48	16.27
11	0.66	15.22
12	0.72	15.39
13	0.60	16.31
14	0.59	18.13
15	0.55	22.69
16	0.74	22.80
17	0.94	19.75
18	1.02	15.18
19	0.91	14.75
20	0.91	17.45
21	1.07	20.03
22	1.19	25.73
23	1.51	17.10
24	1.93	17.28
25	3.18	12.36
26	7.57	3.89
27	14.62	1.58
28	21.98	1.15
29	29.12	0.95
30	35.47	1.06
31	41.19	1.14
32	45.69	0.92
33	50.23	0.70
34	61.37	0.71
35	57.63	1.15
36	51.46	1.07
37	47.95	0.94
38	45.61	0.99
39	43.37	0.69
40	42.11	0.97
41	40.86	1.25
42	39.86	1.00
43	38.98	1.05
44	40.48	1.70
45	41.48	1.30
46	39.83	0.91
47	39.17	1.15
48	38.61	1.47
49	38.75	1.14
50	39.79	1.23
51	39.48	1.38
52	34.51	1.32
53	35.21	1.38
54	35.17	1.57
55	35.11	1.74
56	35.28	1.45
57	37.02	1.46
58	40.35	1.75
59	49.92	2.40
60	43.44	3.32

Typical Performance Data





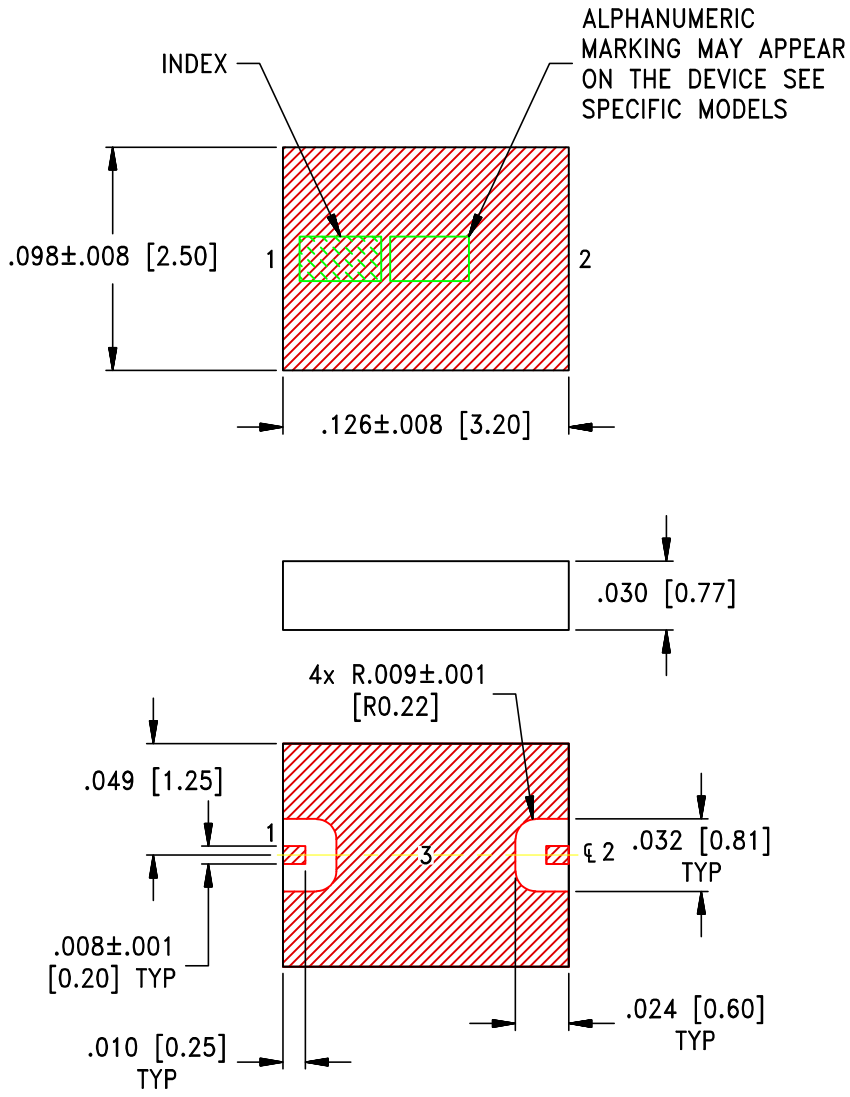




Case Style JV

Outline Dimensions

JV1210C-13



Weight: .024 grams

Dimensions are in inches [mm]. Tolerances: 3 Pl. ±.005 Inches

Notes:

1. Open style, Ceramic base.
2. Termination finish: **as shown below or indicated on Data Sheet**.
   For RoHS Case Styles: Gold plate over Nickel plate. All models, (+) suffix.
3. Primary dimensions are in Inches[millimeters]. Inch equivalents are calculated and subject to roundoff errors.

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RF/IF MICROWAVE COMPONENTS

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Tape & Reel Packaging TR-F74

DEVICE ORIENTATION IN T&R

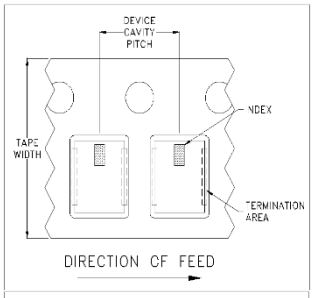


ILLUSTRATION 1

Applicable Case Styles
GE0805C-1
GE0805C-1AP
JV1210C-1
GU2939

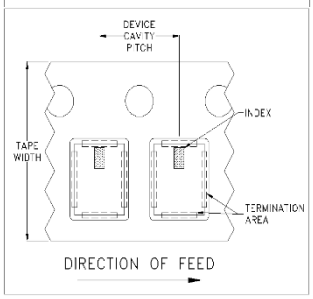


ILLUSTRATION 2

Applicable Case Styles
JV1210C
JV1210C-2
JV1210C-3
JV1210C-4
JV1210C-5
JV1210C-6
JV1210C-11

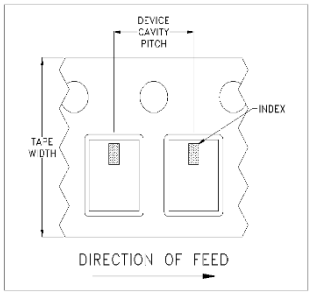


ILLUSTRATION 3

Applicable Case Styles
JC0603C-8
JC0603C-9
JV1210C-7
JV1210C-8
JV1210C-9
JV1210C-10
JV1210C-13
GE0805C-13
GE0805C-19
GE0805C-20

Tape Width, mm	Device Cavity Pitch, mm	Real Size, inches	Devices per Reel	
8	4	7	Small quantity standards **(see note)**	20
				50
				100
				200
				500
				1000
			Standard	2000
				4000

Note: Small reel availability varies by model. Refer to pricing and availability on individual model dashboard.

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

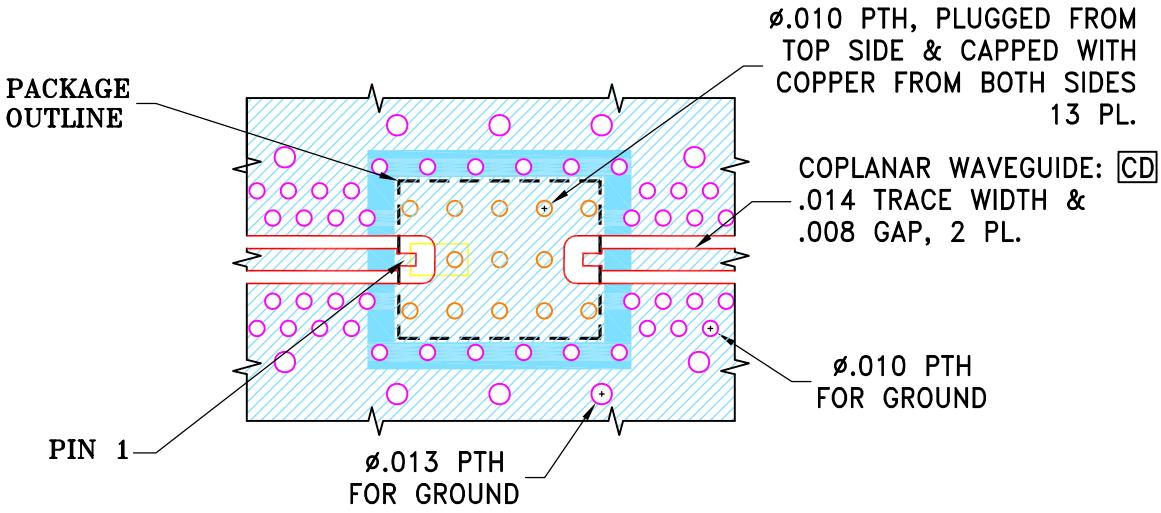
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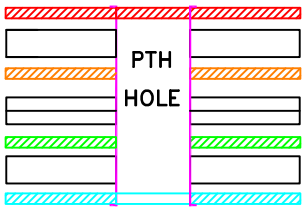
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-015970	NEW RELEASE	12/06/22	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR JV1210C-13 CASE STYLE



STACK-UP DIAGRAM



-COPPER LAYER 1(L1), .5 OZ.
-CORE 1, .0079 MEGTRON-7 R5785(N/GN)
-COPPER LAYER 2 (L2), .5 OZ.
-PREPREG, .0035 (89um) MEGTRON-7 R5680(N/GN), CLOTH STYLE:1078
-PREPREG, .0035 (89um) MEGTRON-7 R5680(N/GN), CLOTH STYLE:1078
-COPPER LAYER 3 (L3), .5 OZ.
-CORE 2, .0079 MEGTRON-7 R5785(N/GN)
-COPPER LAYER 4 (L4), .5 OZ.

1. TOTAL FINISHED THICKNESS 0.026 ± 10%. Ⓢ
2. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
3. INDICATED ON TOP VIEW PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
4. L2, L3 AND L4 ARE CONTINUOUS GROUND PLANES.

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON-7 R-5785(N/GN), WITH DIELECTRIC THICKNESS .0079; COPPER: 1/2 OZ. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.

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	GF	12/06/22
TOLERANCES ON:	CHECKED	IL	12/06/22
2 PL DECIMALS ±	APPROVED	IL	12/06/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

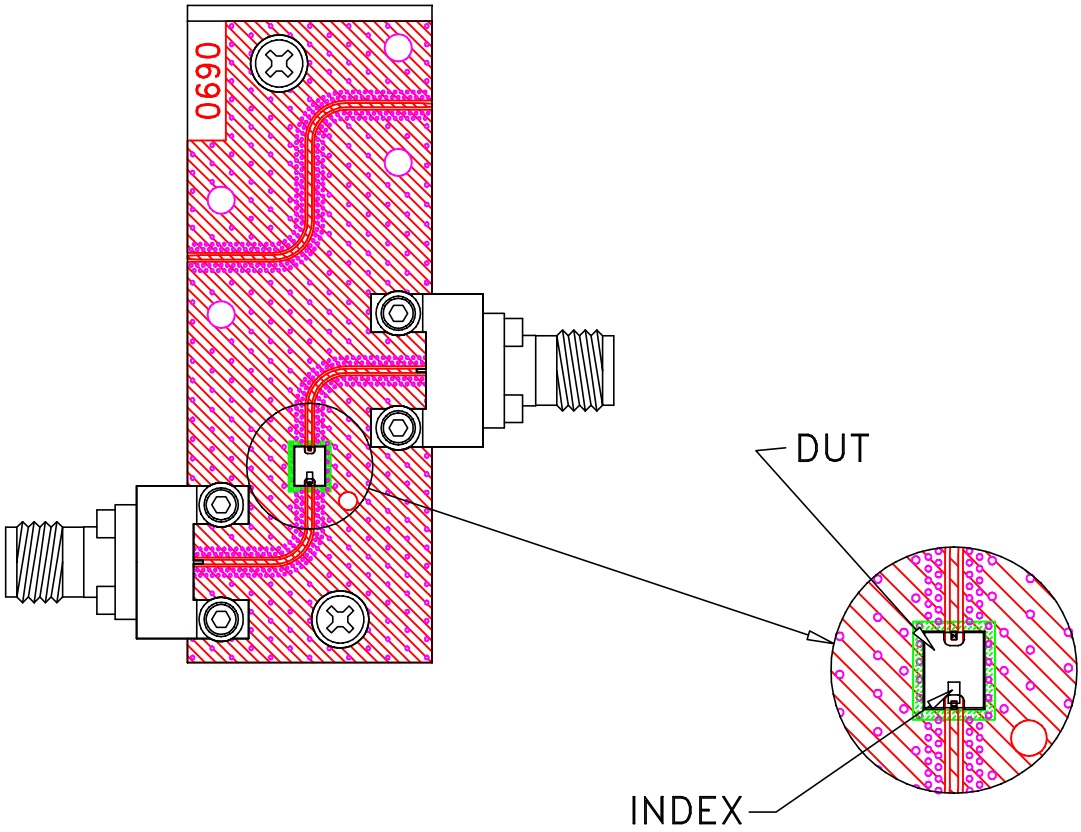
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, JV1210C-13, TB-HFCV-2002+

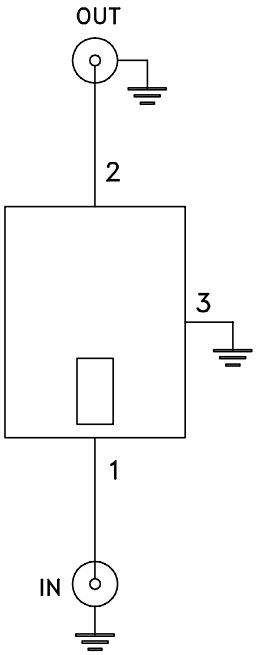
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-743	OR

FILE:	SCALE:	SHEET:
98PL743	8:1	1 OF 1

Evaluation Board and Circuit



TB-LFCV-2402C+



Schematic Diagram

1. 50 Ohm 1.85 End Launch Female connectors.
2. PCB Material: Megtron 7(N) or equivalent, Dielectric Constant=3.4, Thickness=.0079 inch.

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Environmental Specifications ENV06T10

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 245° - 250°C peak	J-STD-020C, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Test B,B1, 95% Coverage
Thermal Shock	-55° to +125°C, 15 min dwell,250 cycles	MIL-STD-202, Method 107
Bend Test	1mm, deflection for 5 seconds Span of bending: 2.75"	--
High Temp Storage	125°C to 1000 Hrs	---

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