LTCC SURFACE MOUNT

Thru-Line

TPCV-3002+

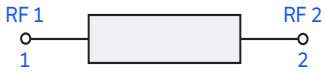
50Ω DC to 30 GHz

THE BIG DEAL

- Ultra-wideband DC to 30 GHz Performance
- Return Loss, 16 dB typical
- Standard 1210 Case Style
- Suitable for High-Volume Production

Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- RF Signal Routing and Interconnection
- Placeholder Element for JV1210C-14 Footprint Components
- Broadband Signal Transmission Paths from DC to 30 GHz
- Prototyping and Evaluation of RF Signal Chains

PRODUCT OVERVIEW

The TPCV-3002+ is a low temperature co-fired ceramic (LTCC) 50Ω transmission line with low insertion loss through 30 GHz acting as a placeholder for Mini-Circuits JV1210C-14 package style. This transmission line is ideal for dense signal chain PCB layouts. 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

Features	Advantages
Surface Mountable	Suitable for very high volume automated assembly process.
Small Size, 1210	Allows for high layout density of circuit boards, while minimizing effects of parasitics.
Cost Effective	LTCC is scalable technology that is cost effective due to ease of product in high quantities.

Thru-Line

TPCV-3002+

50Ω DC to 30 GHz

ELECTRICAL SPECIFICATIONS[1,2] AT +25 °C, Z_0 = 50Ω

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC–F1	DC–10	–	0.4	0.7	dB
		F1–F2	10–20	–	1.2	1.6	
		F2–F3	20–30	–	1.4	1.9	
	Return Loss	DC–F1	DC–10	10	16	–	dB
		F1–F2	10–20	10	15	–	
		F2–F3	20–30	–	11	–	
	Group Delay	DC–F3	DC–30	–	60	–	psec

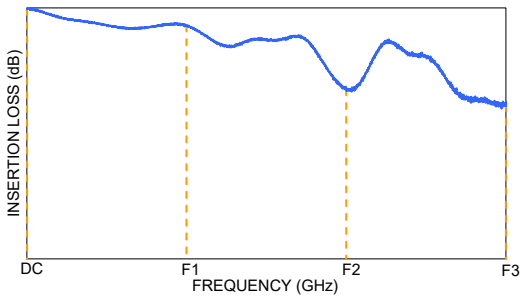
1. Tested in Evaluation Board P/N TB-TPCV-3002C+ with the connector and feedline effects de-embedded using the 2X Thru IEEE P370 method.
2. Bi-directional, RF1 and RF2 ports can be interchanged, see S-Parameters for performance.

ABSOLUTE MAXIMUM RATINGS[3]

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power[4]	10 W

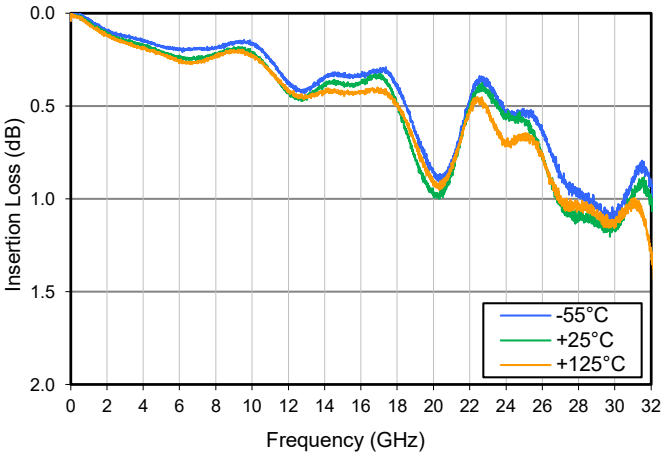
3. Permanent damage may occur if any of these limits are exceeded.
4. Power rating applies only to signals within the passband. Power rating above +25 °C operating temperature decreases linearly to 4 W at +125 °C.

TYPICAL FREQUENCY RESPONSE

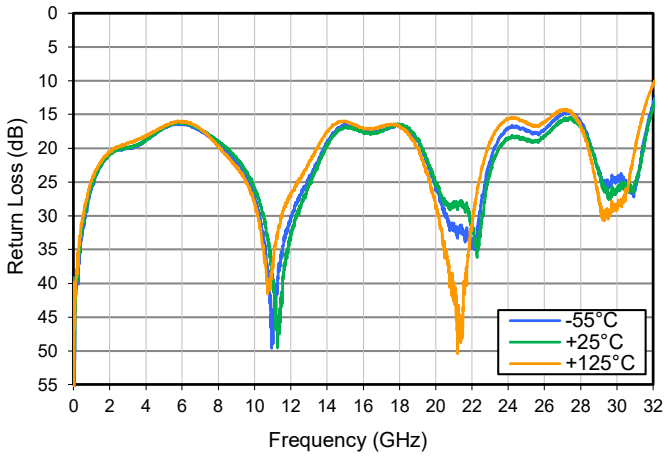


TYPICAL PERFORMANCE GRAPHS

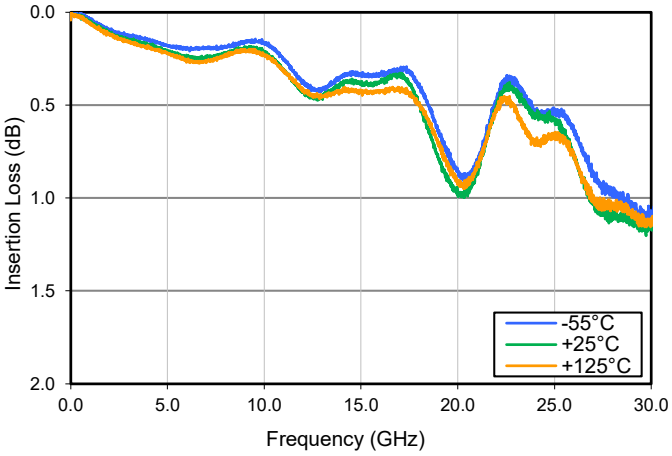
INSERTION LOSS



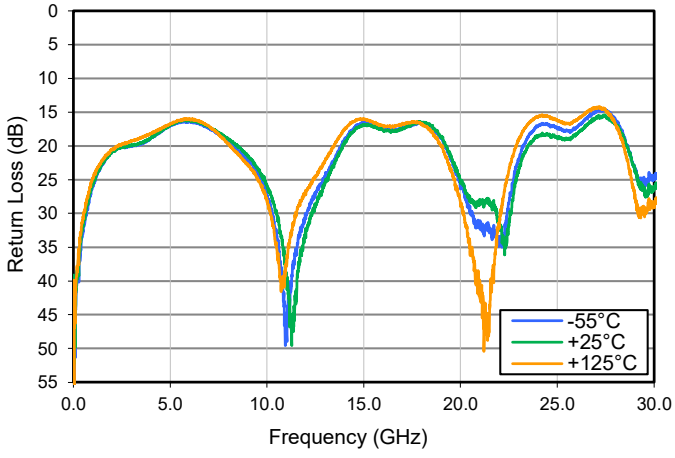
RETURN LOSS



INSERTION LOSS (PASSBAND)



RETURN LOSS (PASSBAND)



FUNCTIONAL DIAGRAM

Figure 1. TPCV-3002+ 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-822)

SUGGESTED PCB LAYOUT (PL-822)

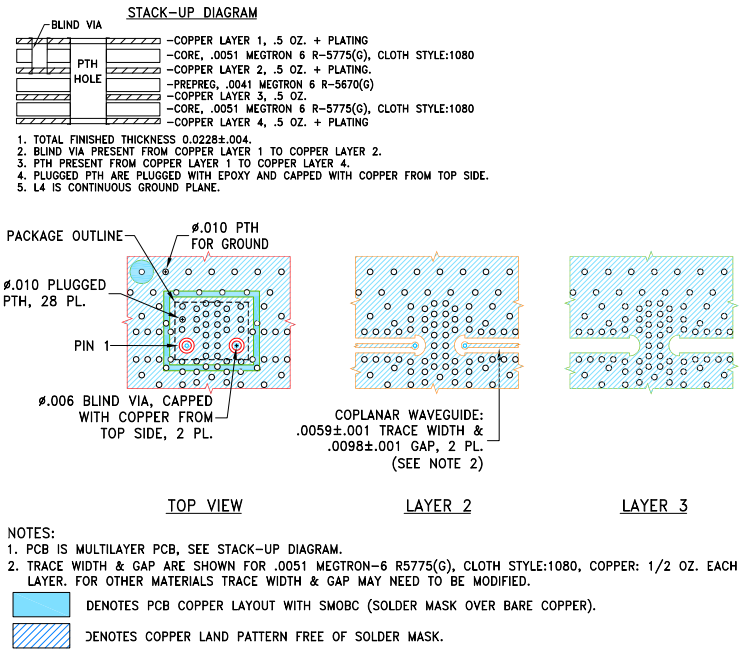
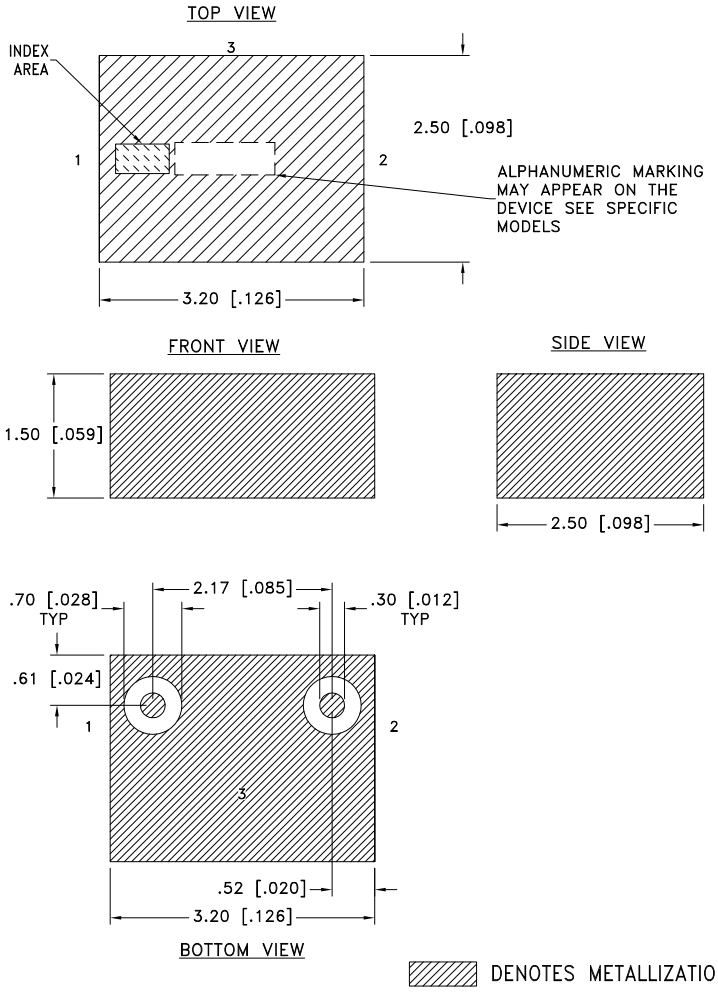


Figure 2. Suggested PCB Layout PL-822

CASE STYLE DRAWING



Weight: .040 grams

Dimensions are in mm [inches]. Tolerances: 2 Pl.± 0.05 mm

PRODUCT MARKING*: U9

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

ADDITIONAL DETAILED 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-14 Lead Finish: Tin plate over nickel plating
RoHS Status	Compliant
Tape and Reel	TR-F74
Suggested Layout for PCB Design	PL-822
Evaluation Board	TB-TPCV-3002C+ Gerber File
Environmental Rating	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-Circuits' 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

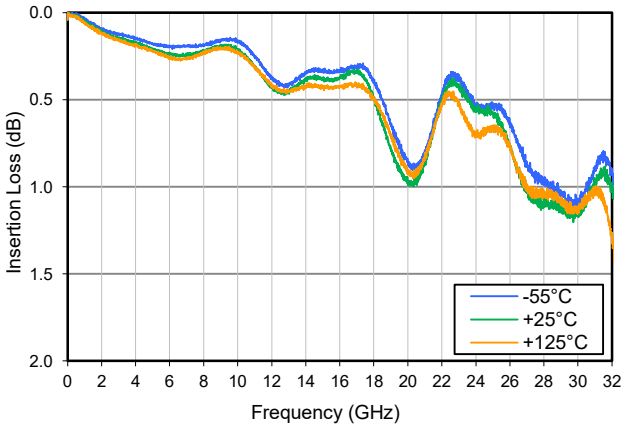
Ceramic Thru-Line TPCV-3002+

Typical Performance Data

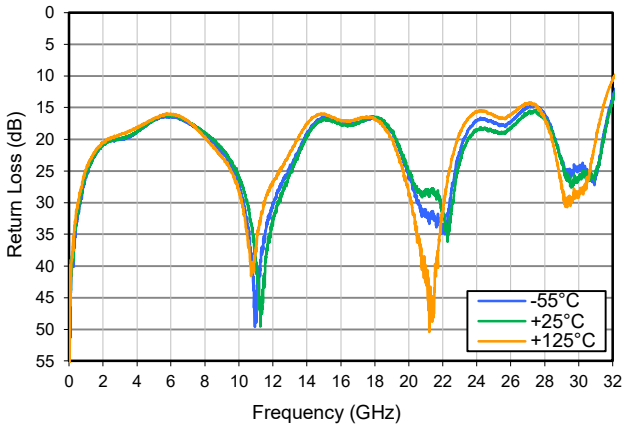
FREQUENCY (GHz)	INSERTION LOSS (dB)			RETURN LOSS (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
0.01	0.04	0.01	0.04	40.19	39.09	39.87
0.05	0.01	0.01	0.01	56.73	50.77	46.91
0.10	0.00	0.01	0.01	44.08	42.35	40.78
0.50	0.01	0.03	0.03	32.70	31.88	30.80
1.00	0.03	0.05	0.05	25.88	25.56	24.72
2.00	0.10	0.11	0.12	20.81	20.88	20.52
3.00	0.12	0.15	0.16	19.99	19.89	19.25
4.00	0.15	0.17	0.19	18.81	18.80	18.17
5.00	0.18	0.21	0.22	17.02	16.92	16.76
6.00	0.19	0.24	0.26	16.32	16.13	16.02
7.00	0.19	0.24	0.26	17.43	17.18	17.13
8.00	0.18	0.22	0.23	19.19	18.87	19.62
9.00	0.16	0.18	0.21	22.15	21.49	22.79
10.00	0.17	0.21	0.23	27.28	25.96	28.21
11.00	0.26	0.31	0.32	46.62	40.10	37.01
12.00	0.37	0.43	0.41	30.83	33.58	27.21
13.00	0.41	0.45	0.46	24.48	25.52	22.21
14.00	0.34	0.38	0.42	19.20	19.70	17.62
15.00	0.34	0.39	0.43	16.53	16.92	16.08
16.00	0.33	0.37	0.42	17.26	17.60	16.98
17.00	0.31	0.35	0.41	17.34	17.45	16.75
18.00	0.40	0.49	0.49	16.65	16.47	16.67
19.00	0.65	0.78	0.71	18.97	18.80	20.10
20.00	0.85	0.97	0.91	26.27	25.46	28.95
21.00	0.80	0.86	0.81	31.08	27.87	40.04
22.00	0.47	0.51	0.53	33.85	30.55	32.12
23.00	0.37	0.43	0.53	22.06	23.70	19.09
24.00	0.53	0.55	0.70	17.05	18.57	15.69
25.00	0.53	0.58	0.66	17.45	18.84	16.29
26.00	0.63	0.76	0.76	17.30	18.27	16.15
27.00	0.88	1.04	1.02	15.01	15.99	14.42
28.00	0.95	1.07	1.03	16.25	16.93	16.91
29.00	1.04	1.14	1.10	23.38	23.56	27.53
30.00	1.08	1.16	1.13	24.56	26.08	28.44
31.00	0.90	0.98	1.03	25.70	25.22	20.10
32.00	0.92	1.01	1.29	13.36	13.99	10.56

Typical Performance Data

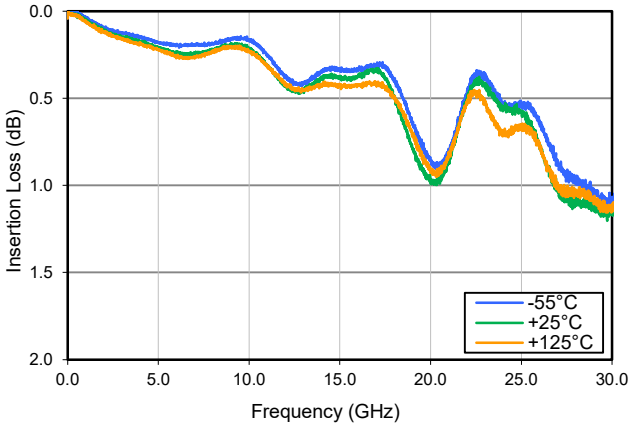
INSERTION LOSS



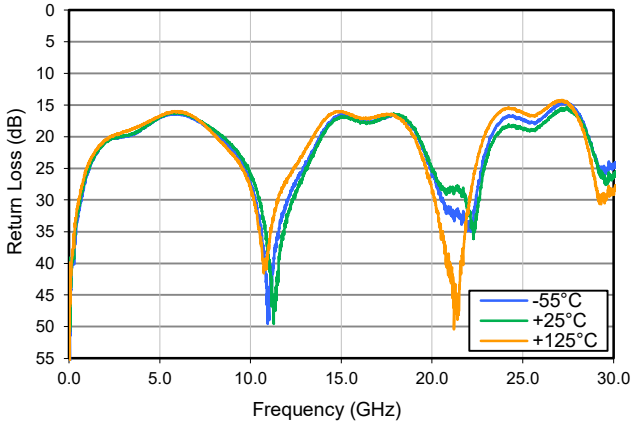
RETURN LOSS



INSERTION LOSS (PASSBAND)



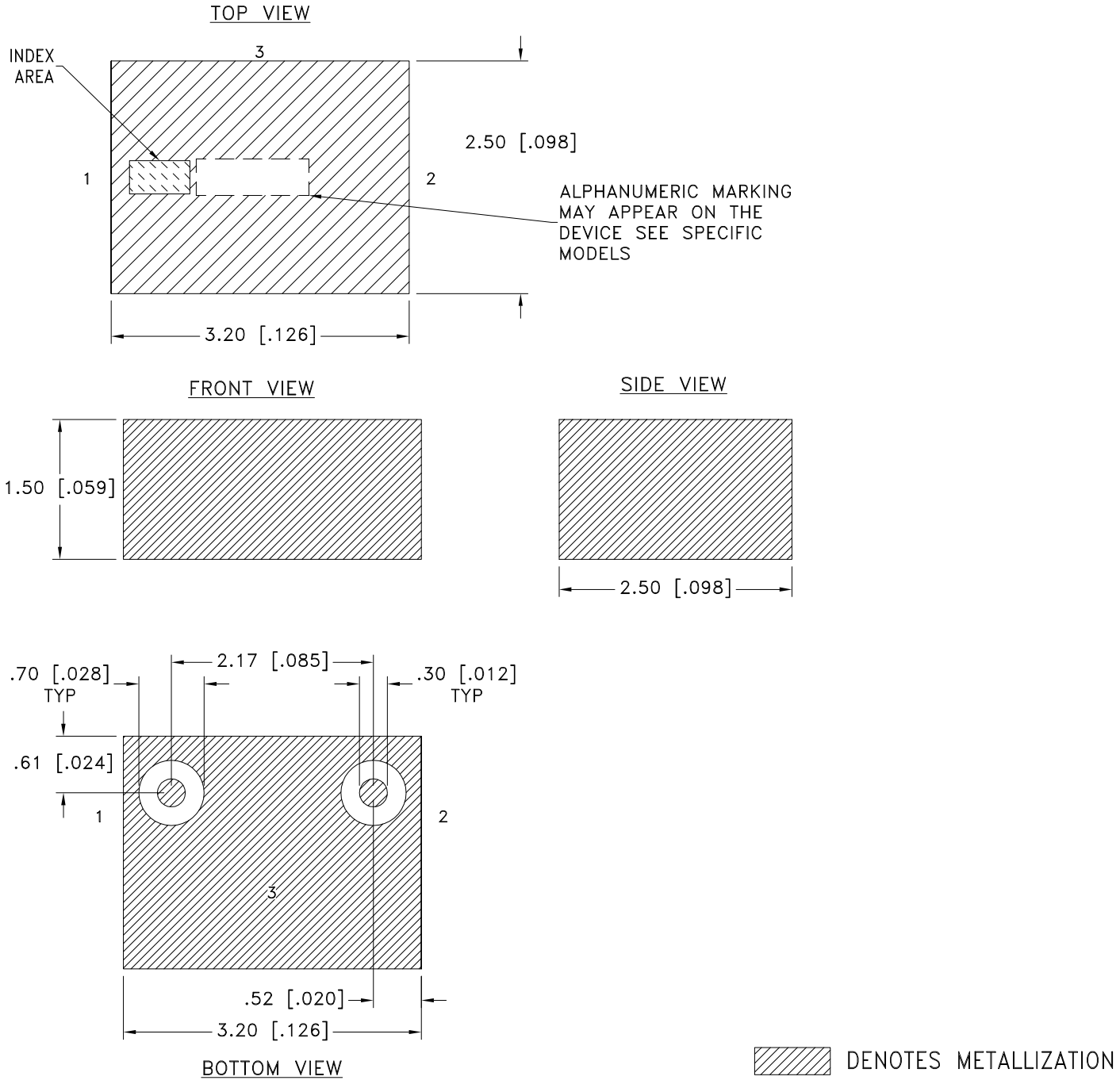
RETURN LOSS (PASSBAND)



Case Style JV

Outline Dimensions

JV1210C-14



Weight: .040 grams

Dimensions are in mm [inches]. Tolerances: 2 Pl.± 0.05 mm

Notes:

1. Case material: Ceramic.
2. Termination Finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Tin Plate over Nickel plate. All models, (+) suffix.

Tape & Reel Packaging TR-F74

DEVICE ORIENTATION IN T&R

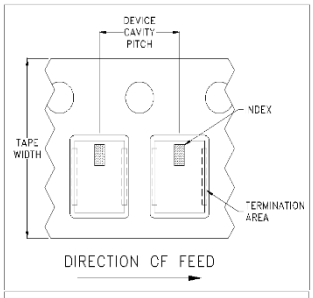


ILLUSTRATION 1

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

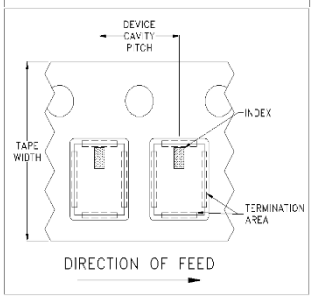


ILLUSTRATION 2

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

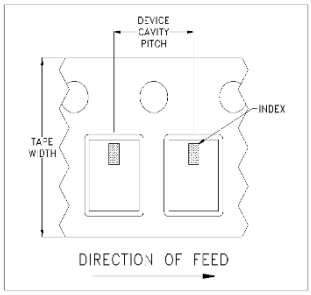


ILLUSTRATION 3

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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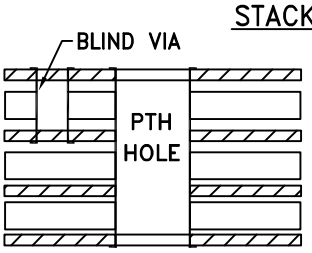
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-025395	NEW RELEASE	05/13/25	ITG	IL

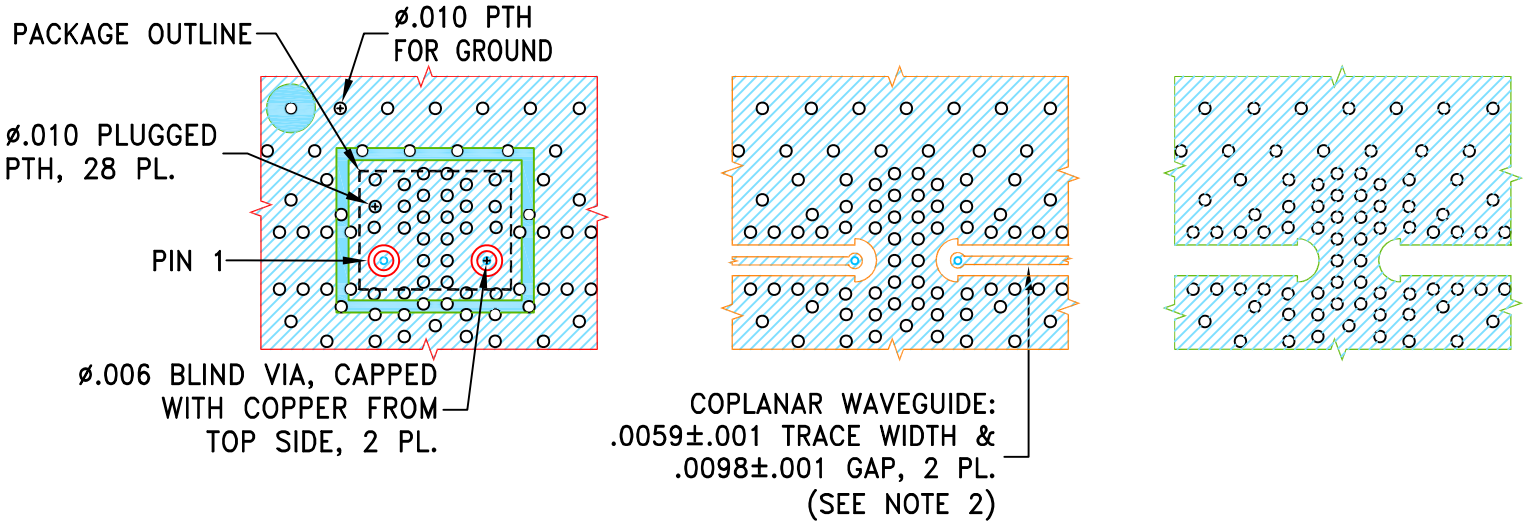
SUGGESTED MOUNTING CONFIGURATION FOR JV1210C-14 CASE STYLE

STACK-UP DIAGRAM



-COPPER LAYER 1, .5 OZ. + PLATING
-CORE, .0051 MEGTRON 6 R-5775(G), CLOTH STYLE:1080
-COPPER LAYER 2, .5 OZ. + PLATING.
-PREPREG, .0041 MEGTRON 6 R-5670(G)
-COPPER LAYER 3, .5 OZ.
-CORE, .0051 MEGTRON 6 R-5775(G), CLOTH STYLE:1080
-COPPER LAYER 4, .5 OZ. + PLATING

1. TOTAL FINISHED THICKNESS 0.0228±.004.
2. BLIND VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. PLUGGED PTH ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. L4 IS CONTINUOUS GROUND PLANE.



TOP VIEW LAYER 2 LAYER 3

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP ARE SHOWN FOR .0051 MEGTRON-6 R5775(G), CLOTH STYLE:1080, COPPER: 1/2 OZ. EACH LAYER. FOR OTHER MATERIALS TRACE WIDTH & 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	ITG	05/13/25
TOLERANCES ON:	CHECKED	GF	05/13/25
2 PL DECIMALS ±	APPROVED	IL	05/13/25
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

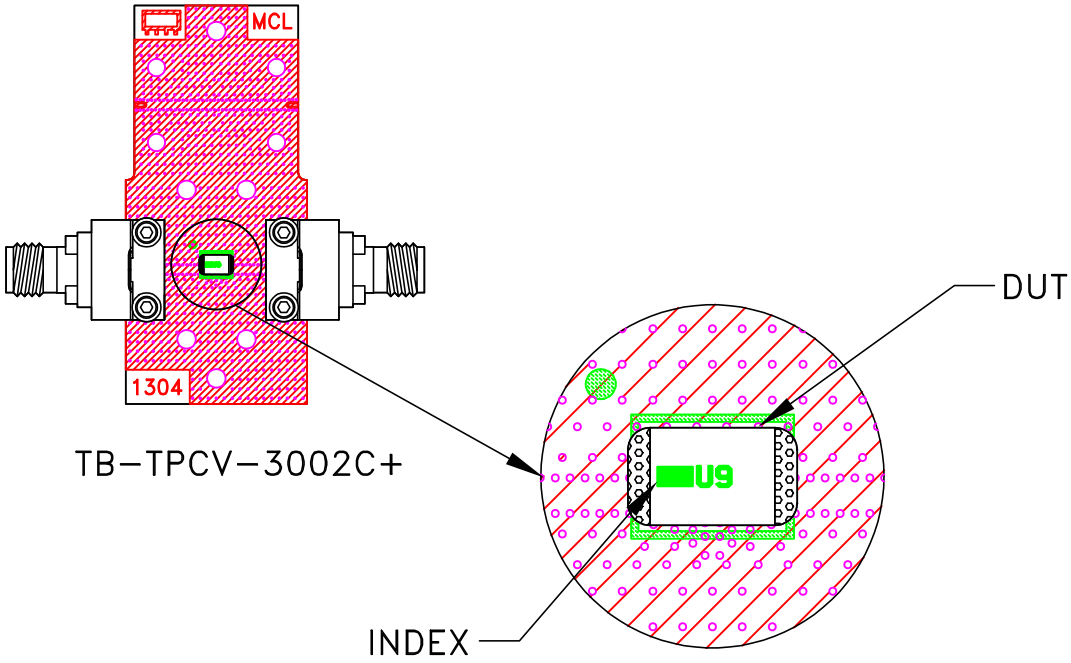
ASHEETA1.DWG REV:A DATE:01/12/95

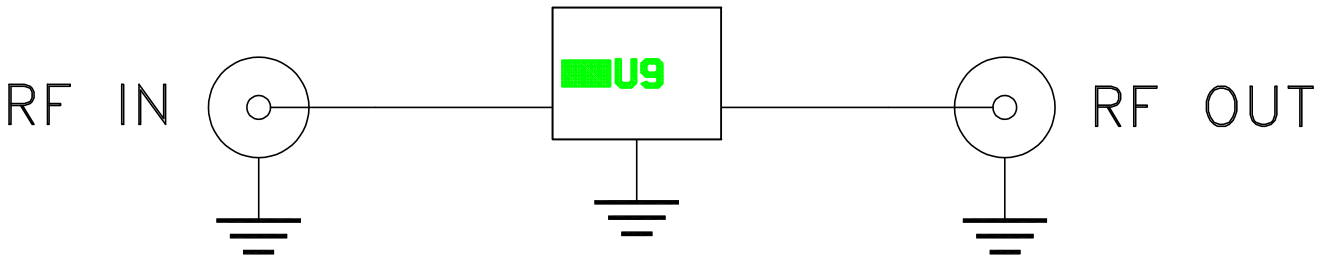
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, JV1210C-14, BFCV

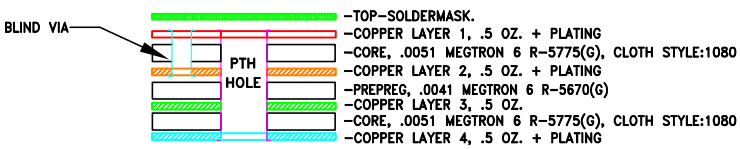
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-822	OR
FILE: 98PL822	SCALE: 6:1	SHEET: 1 OF 1	

Evaluation Board and Circuit





Schematic Diagram



STACK-UP DIAGRAM

Notes:

1. 2.92 mm Female End Launch Connector.
2. PCB Material: Megtron 6 R5775(N).
   Dielectric Constant=3.6.
3. Total finished thickness .023".

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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	---