LTCC SURFACE MOUNT

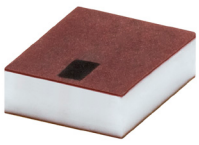
Thru-Line

TPCV-333+

50Ω DC to 33 GHz

THE BIG DEAL

- Low Insertion Loss, 0.4 dB Typ.
- Return Loss, 13 dB Typ.
- 1210 Surface Mount Footprint
- Versatile "Place Holder" for Mini-Circuits LTCC Filters
- Power Handling: 6 W



Generic photo used for illustration purposes only

APPLICATIONS

- Test and Measurement Equipment
- Communication, EW, Radar, and ECM Defense Systems
- 5G MIMO and Back Haul Radio Systems
- Satellite Communications

FUNCTIONAL DIAGRAM

PRODUCT OVERVIEW

TPCV-333+ is a miniature low temperature co-fired ceramic (LTCC) 50 Ohm transmission line, with low insertion loss through 33 GHz that supports a variety of applications. This model provides 0.4 dB typical insertion loss over a wide band due to its rugged monolithic construction. Housed in a 1210 ceramic form factor which 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

Features	Advantages
Footprint Compatible "Thru-Line"	Enables system designers the flexibility to plan to add LTCC filters to the PCB layout at a later stage in the design process, after system test results are available. Compatible with Mini-Circuits low pass filters (LFCV series), with identical case style and pad connections.
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.
Small Size, 1210	1210 package allows for space to be saved in dense circuit board layouts, while also minimizing the effects of parasitics.
Rugged Power Handling, 6 W	Handles up to 6 Watts in a small 1210 package.

REV. OR
ECO-019637
TPCV-333+
EDU4335
URJ
231213

Thru-Line

TPCV-333+

50Ω DC to 33 GHz

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

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC-F1	DC - 19	—	0.3	0.7	dB
		F1-F2	19 - 28	—	0.4	0.9	
		F2-F3	28 - 33	—	0.8	—	
	Return Loss	DC-F1	DC - 19	—	16	—	dB
		F1-F2	19 - 28	—	13	—	
		F2-F3	28 - 33	—	13	—	
	Group Delay	DC-F3	DC - 33	—	25	—	psec

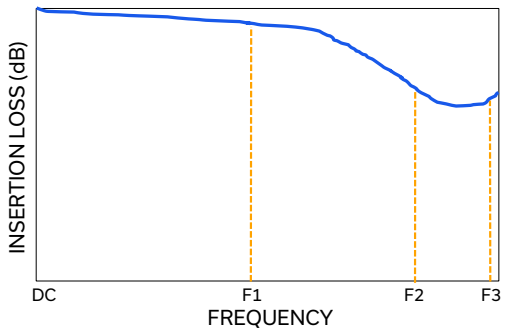
1. Tested on Evaluation Board P/N TB-TPCV-333+
2. Bi-directional RF1 and RF2 ports can be interchanged.

ABSOLUTE MAXIMUM RATINGS[3]

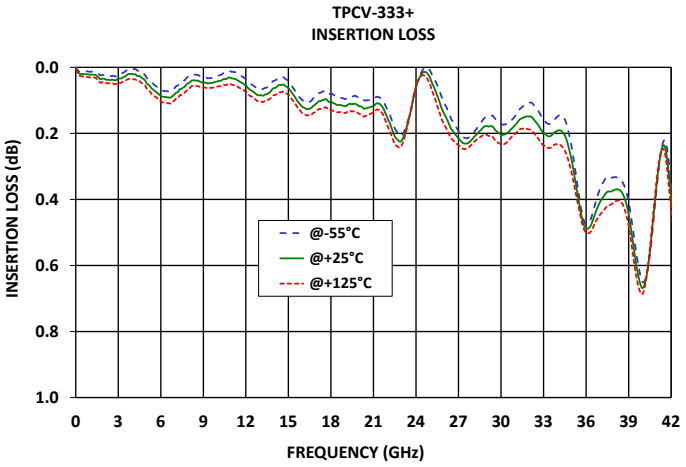
Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power[4]	6 W @ +25°C

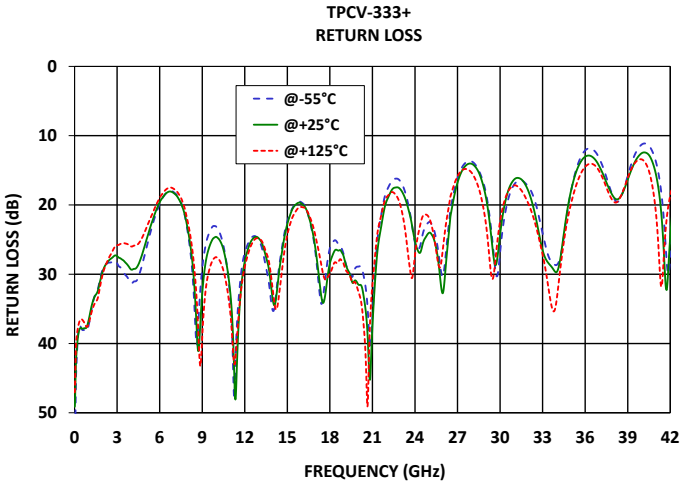
3. Permanent damage may occur if any of these limits are exceeded.
4. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 1.5 W at +125°C.

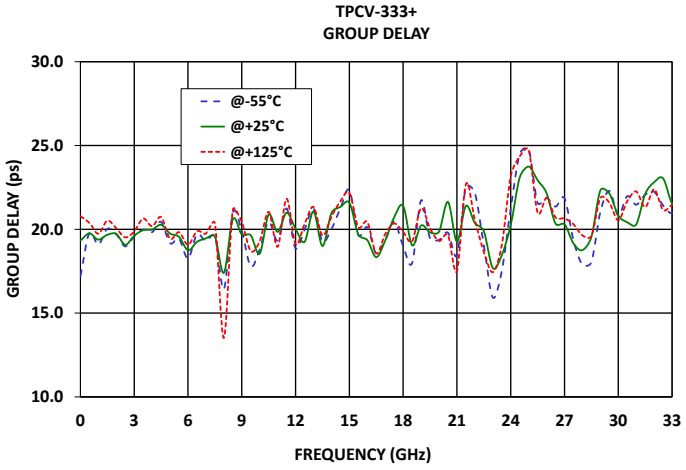
TYPICAL FREQUENCY RESPONSE AT +25°C



TYPICAL PERFORMANCE GRAPHS







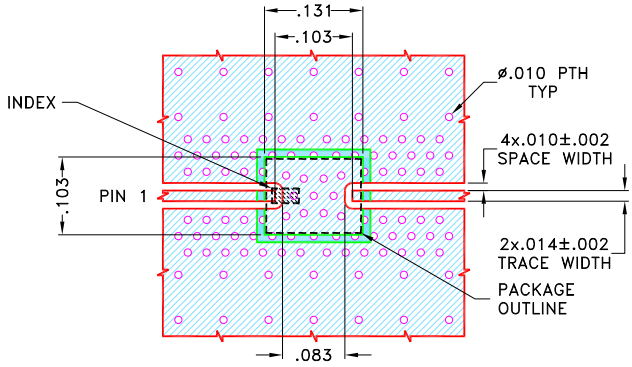
FUNCTIONAL DIAGRAM

Figure 1. TPCV-333+ 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-679)

SUGGESTED PCB LAYOUT (PL-679)

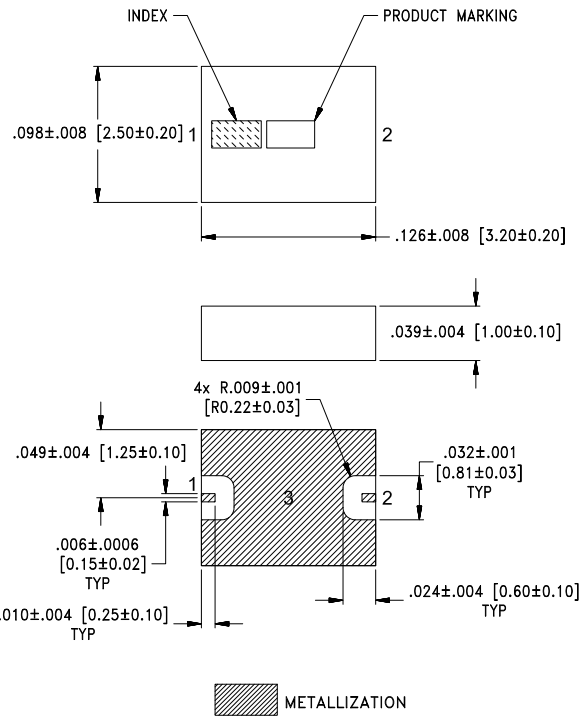


NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4835 Lo Pro) WITH DIELECTRIC THICKNESS .0073±.0007. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

Figure 2. Suggested PCB Layout PL-679

CASE STYLE DRAWING



Weight: .03 grams
Dimensions are in inches (mm). Tolerances: 2 Pl.±.01; 3 Pl. ±.005

PRODUCT MARKING*: WN

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

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD. CLICK HERE

Performance Data and Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads
Case Style	JV1210C-7 Lead Finish: Gold over Nickel Plating.
RoHS Status	Compliant
Tape and Reel	F74
Suggested Layout for PCB Design	PL-679
Evaluation Board	TB-TPCV-333+
	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

Typical Performance Data

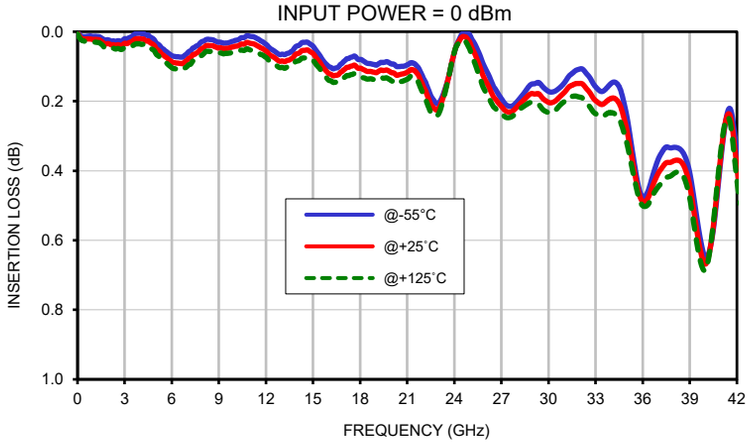
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(GHz)	(dB)			(dB)			(dB)		
	@-55°C	@+25˚C	@+125˚C	@-55°C	@+25˚C	@+125˚C	@-55°C	@+25˚C	@+125˚C
0.01	0.00	0.00	0.01	56.14	49.13	47.06	56.95	49.24	47.15
0.10	0.01	0.01	0.02	44.83	42.37	40.00	44.90	42.38	40.04
0.20	0.01	0.02	0.02	40.14	39.75	38.17	40.18	39.67	38.17
0.30	0.01	0.02	0.03	37.76	38.29	37.12	37.53	37.96	36.86
0.40	0.01	0.02	0.03	37.48	37.78	36.58	36.81	37.20	36.09
0.50	0.01	0.02	0.03	37.93	37.81	36.51	37.08	37.18	36.02
0.60	0.01	0.02	0.03	38.07	37.87	36.72	37.83	37.72	36.63
0.70	0.01	0.02	0.03	38.07	37.79	37.07	38.84	38.45	37.59
0.80	0.01	0.02	0.03	38.23	37.78	37.50	40.12	38.99	38.46
0.90	0.01	0.02	0.03	38.01	37.37	37.55	41.12	39.05	38.99
1.00	0.01	0.02	0.03	37.29	36.55	37.10	40.50	38.25	38.70
2.00	0.02	0.03	0.04	29.25	29.49	29.87	29.64	29.79	30.17
3.00	0.02	0.03	0.05	28.43	27.40	25.81	28.87	27.80	26.26
4.00	0.00	0.02	0.04	31.30	29.34	26.00	29.81	28.48	25.63
5.00	0.03	0.05	0.06	26.76	25.52	23.63	26.17	25.34	23.63
6.00	0.07	0.09	0.10	19.86	19.60	18.97	19.97	19.79	19.22
7.00	0.06	0.08	0.10	18.17	18.30	17.69	18.21	18.35	17.75
8.00	0.03	0.05	0.06	24.25	23.73	22.64	24.21	23.53	22.36
9.00	0.03	0.05	0.06	29.16	32.81	39.06	27.18	30.09	32.75
10.00	0.03	0.04	0.06	23.17	24.62	27.55	22.76	24.36	27.06
10.50	0.02	0.04	0.05	25.93	26.49	29.52	25.41	26.12	29.02
11.00	0.01	0.03	0.05	34.25	33.15	36.02	31.78	31.60	34.71
11.50	0.02	0.04	0.06	35.42	40.09	37.75	33.12	37.74	37.45
12.00	0.04	0.06	0.07	26.89	28.14	28.93	26.94	28.93	29.71
12.50	0.05	0.07	0.09	24.66	25.06	25.61	24.79	25.69	26.09
13.00	0.06	0.08	0.10	25.17	24.85	24.87	25.07	25.08	24.85
13.50	0.06	0.08	0.10	29.04	27.52	26.80	28.66	27.33	26.34
14.00	0.04	0.06	0.08	35.31	33.98	32.70	43.68	36.97	33.02
14.50	0.03	0.05	0.08	27.78	28.46	31.57	30.51	32.33	38.25
15.00	0.04	0.06	0.08	22.36	22.73	24.29	23.25	23.89	25.80
15.50	0.07	0.09	0.11	20.04	20.15	21.24	20.30	20.60	21.81
16.00	0.10	0.12	0.14	19.63	19.81	20.30	19.45	19.84	20.46
16.50	0.10	0.13	0.15	21.66	21.61	21.31	21.10	21.28	21.20
17.00	0.08	0.11	0.13	27.18	26.59	24.65	26.45	26.12	24.59
17.50	0.07	0.10	0.12	33.62	34.11	29.76	44.71	41.41	32.47
18.00	0.08	0.10	0.13	26.25	28.43	29.91	27.00	30.49	37.74
18.50	0.09	0.11	0.14	25.35	26.51	28.40	24.63	26.85	31.64
19.00	0.10	0.12	0.14	27.40	27.62	28.69	26.89	28.69	33.42
19.50	0.09	0.11	0.13	30.27	30.65	30.75	29.71	32.03	33.72
20.00	0.09	0.12	0.14	28.90	31.47	32.44	28.52	31.44	31.84
20.50	0.10	0.12	0.15	31.61	34.84	40.93	29.82	32.62	35.36
21.00	0.10	0.12	0.14	36.25	37.53	31.54	45.81	43.65	34.33
21.50	0.09	0.11	0.13	22.80	24.50	22.50	24.66	25.97	23.50
22.00	0.13	0.15	0.18	17.99	19.43	18.89	18.77	19.81	19.12
22.50	0.18	0.21	0.23	16.27	17.56	18.23	16.38	17.29	17.89
23.00	0.21	0.22	0.24	16.67	17.81	20.29	16.36	17.21	19.43
24.00	0.06	0.06	0.06	25.45	25.24	27.26	25.88	25.81	30.68
25.00	0.01	0.03	0.05	22.46	24.02	21.87	26.39	26.46	23.54
26.00	0.11	0.14	0.17	30.06	32.47	25.77	35.84	41.75	28.91
27.00	0.19	0.22	0.24	16.14	16.79	15.86	16.36	16.89	16.18
28.00	0.20	0.22	0.23	13.72	14.07	15.36	13.86	14.14	15.36
29.00	0.15	0.18	0.21	18.23	18.87	22.69	19.10	19.43	23.04
29.50	0.15	0.18	0.22	26.01	26.82	30.60	28.74	30.51	33.28
30.00	0.17	0.20	0.23	26.94	24.32	22.38	28.17	25.84	22.61
30.50	0.17	0.20	0.22	19.79	18.45	18.34	20.48	19.08	18.65
31.00	0.15	0.18	0.20	17.04	16.32	17.18	17.96	16.96	17.70
31.50	0.12	0.15	0.19	16.44	16.31	17.89	17.46	16.96	18.58
32.00	0.11	0.15	0.19	17.36	18.02	19.83	18.70	18.99	21.24
32.50	0.12	0.17	0.21	19.72	21.67	22.85	21.99	24.03	25.74
33.00	0.16	0.20	0.24	24.09	26.53	27.15	29.90	36.50	31.51

Typical Performance Data

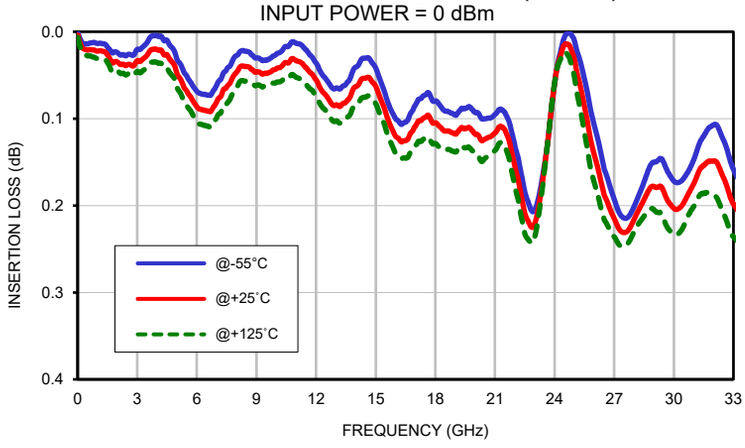
FREQ. (GHz)	GROUP DELAY (psec)		
	@-55°C	@+25°C	@+125°C
0.01	17.24	19.33	20.78
0.10	18.53	18.53	18.53
0.50	19.79	19.75	20.38
1.00	19.08	19.38	19.74
2.00	19.71	19.73	20.06
3.00	19.56	19.62	19.88
4.00	19.83	19.98	20.18
5.00	19.17	19.75	19.43
6.00	18.26	18.74	19.07
7.00	19.30	19.46	19.74
8.00	16.43	17.40	13.52
9.00	19.90	19.69	20.44
10.00	18.80	18.55	19.28
11.00	19.33	19.85	18.96
12.00	18.86	20.03	19.12
13.00	21.24	21.07	21.34
14.00	20.01	20.97	20.75
15.00	22.35	21.59	22.18
16.00	20.13	19.36	20.44
17.00	19.36	19.34	19.71
18.00	18.99	21.40	19.84
19.00	21.73	20.23	21.26
20.00	19.37	19.86	19.31
21.00	18.45	19.28	17.52
22.00	22.16	20.37	20.55
23.00	15.93	17.69	17.44
24.00	21.24	20.25	23.16
25.00	24.78	23.74	24.74
26.00	21.89	22.15	21.86
27.00	21.85	20.30	20.65
28.00	17.88	18.76	19.64
28.50	18.04	19.55	19.60
29.00	21.04	22.32	21.86
29.50	22.30	22.14	21.59
30.00	20.83	20.83	20.54
30.50	21.97	20.42	21.68
31.00	21.47	20.29	22.26
31.50	22.06	22.11	21.32
32.00	22.24	22.81	22.39
32.50	21.42	23.03	21.15
33.00	20.96	21.54	21.45

Typical Performance Curves

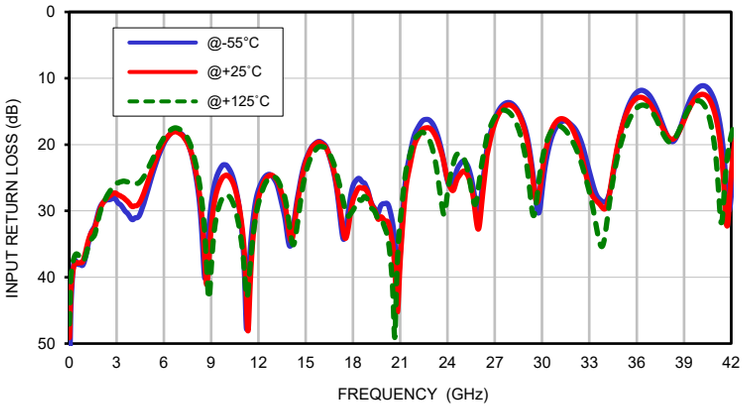
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



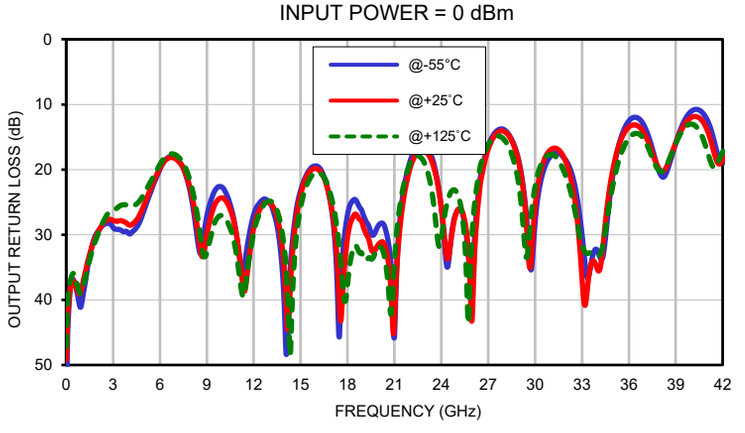
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



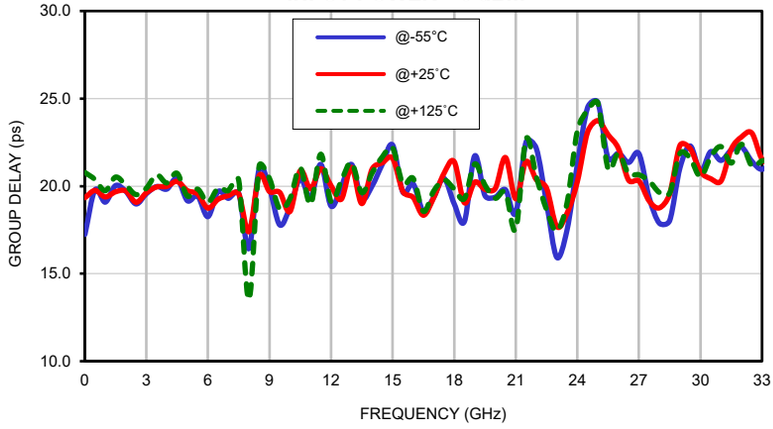
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

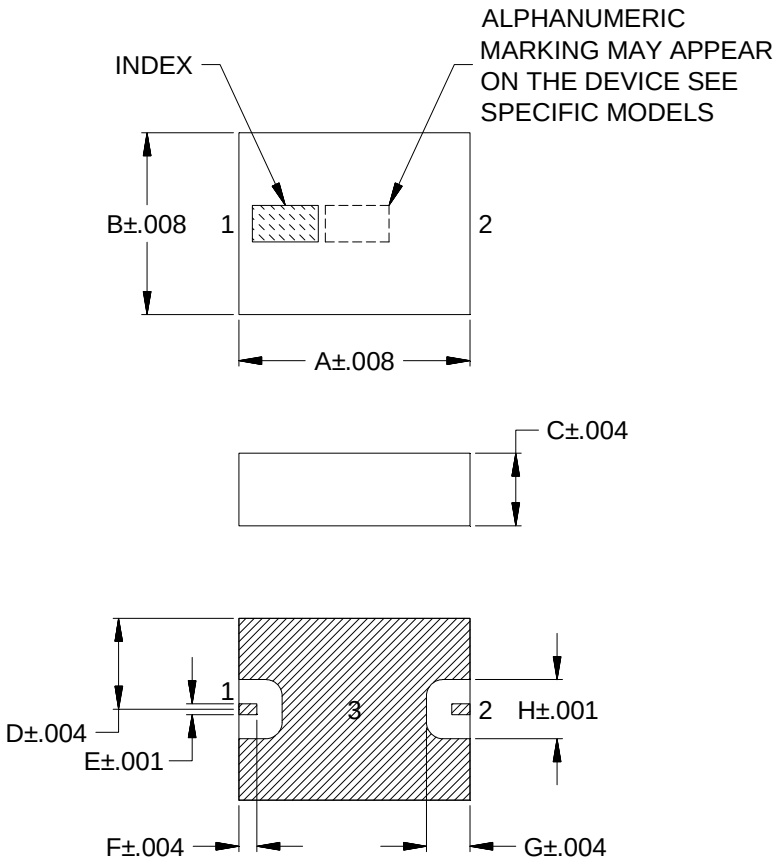


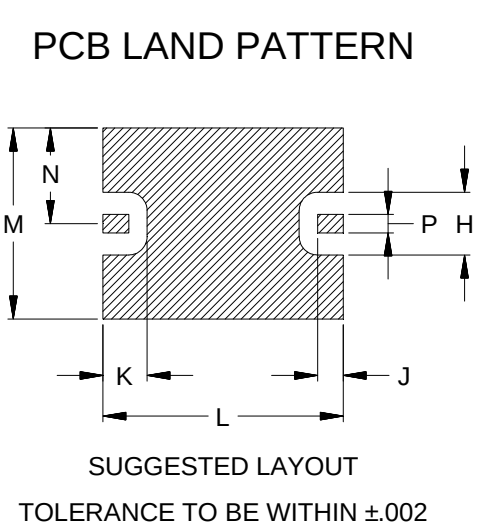
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style JV

Outline Dimensions JV1210C-7





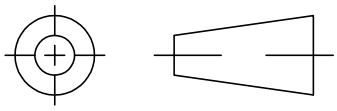
CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT.GRAM
JV1210C-7	.126 (3.20)	.098 (2.50)	.039 (1.00)	.049 (1.25)	.006 (0.15)	.010 (0.25)	.024 (0.60)	.032 (0.81)	.014 (0.36)	.024 (0.61)	.131 (3.33)	.103 (2.63)	.052 (1.31)	.010 (0.25)	0.03

Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3Pl. ± .005

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. Pad tolerance is non-cumulative. Minimum spacing between each pad is .004.

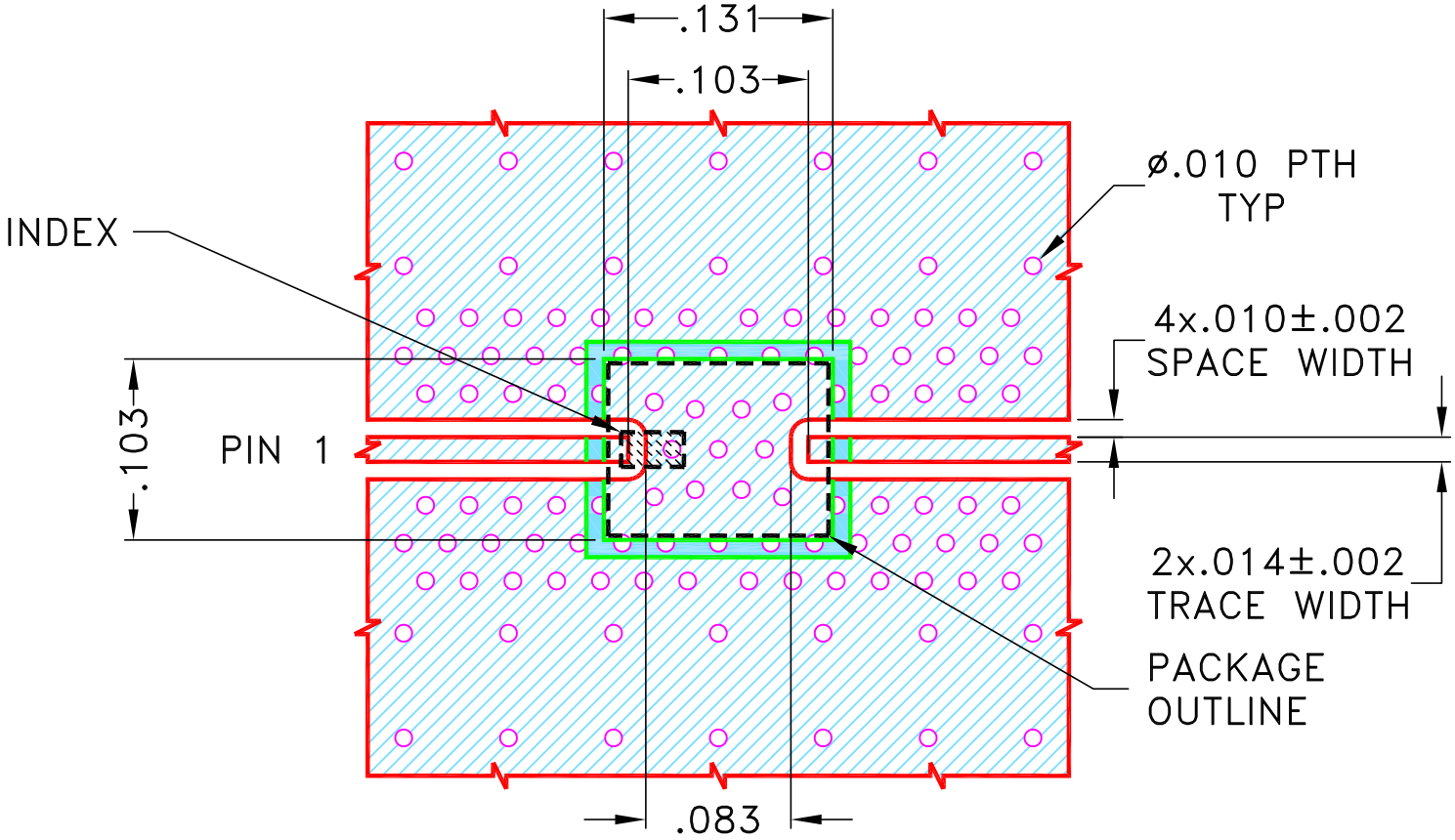
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-003129	NEW RELEASE	JUL 20	DDR	VC
OR1	ECO-019409	JV1210C-13 ADDED	OCT 23	AGS	VC

SUGGESTED MOUNTING CONFIGURATION FOR JV1210C-7, JV1210C-13 CASE STYLE



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2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DDR	02 JUL 20
TOLERANCES ON:	CHECKED	RV	02 JUL 20
2 PL DECIMALS ±	APPROVED	RKS	02 JUL 20
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, JV1210C-7, JV1210C-13, TB-LFCV-X+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-679	OR1

FILE:	SCALE:	SHEET:
98PL679	9:1	1 OF 1

Mini-Circuits

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	---