LTCC SURFACE MOUNT

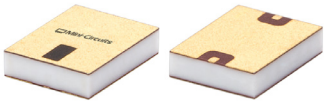
Low Pass Filter

LFCV-1752+

50Ω DC to 17.5 GHz

THE BIG DEAL

- Low Insertion Loss, 1 dB Typ.
- Pass Band Return Loss, 14 dB Typ.
- Stop Band Rejection, 38 dB Typ.
- 1210 Surface Mount Footprint
- Power Handling: 4.5 Watts

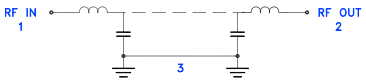


Generic photo used for illustration purposes only

APPLICATIONS

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

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' LFCV-1752+ is a miniature low temperature co-fired ceramic (LTCC) low pass filter with a DC to 17.5 GHz passband supporting a variety of applications. This model provides 1dB typical insertion loss over a wide band due to its rugged monolithic construction. Housed in an 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
Ultra-wide stopband	The LTCC lowpass filter provides a very good stopband rejection to 40 GHz suitable for wide band applications.
LTCC Construction	Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes.
Small size, 1210	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Rugged Power handling, 4.5 Watts	Handles up to 4.5 Watts in a small 1210 package.

Low Pass Filter

LFCV-1752+

50Ω DC to 17.5 GHz

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

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Pass Band	Insertion Loss	DC-F1	DC - 17.5	—	1	1.9	dB
	Freq. Cut-Off[4]	F2	19.3	—	3	—	dB
	Return Loss	DC-F1	DC - 17.5	—	14	—	dB
Stop Band	Rejection	F3-F4	22.8 - 25	20	37	—	dB
		F4-F5	25 - 30	28	38	—	
		F5-F6	30 - 40	—	28	—	

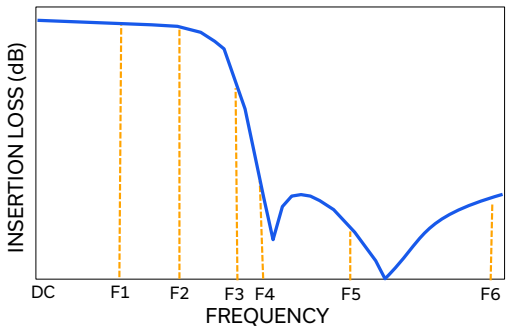
1. Tested in Evaluation Board P/N TB-LFCV-1752+
2. This filter is bi-directional RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.
3. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
4. Typical variation ± 5%

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
Input Power[6]	4.5W @25°C

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 1.6 W at +125°C.

TYPICAL FREQUENCY RESPONSE



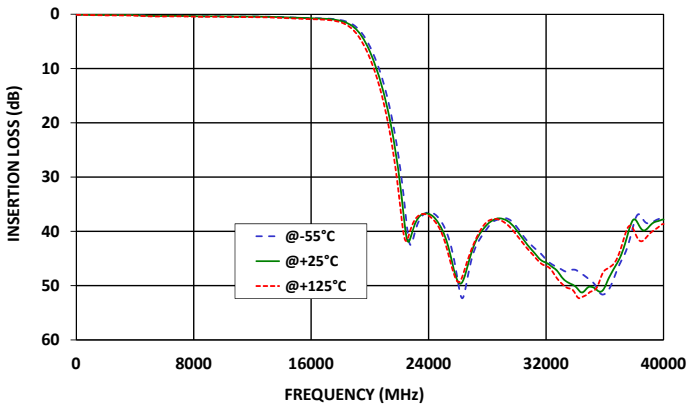
Low Pass Filter

LFCV-1752+

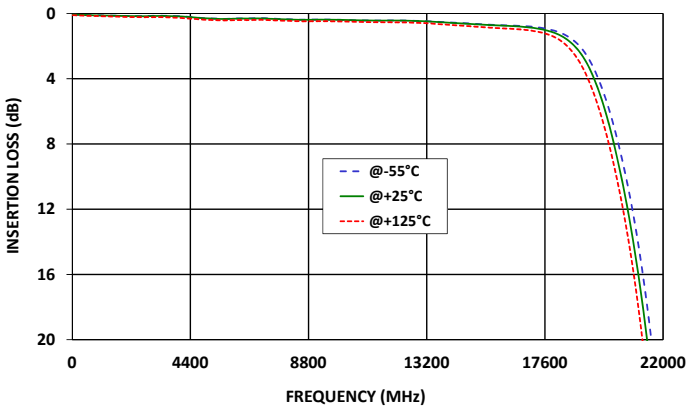
50Ω DC to 17.5 GHz

TYPICAL PERFORMANCE GRAPHS

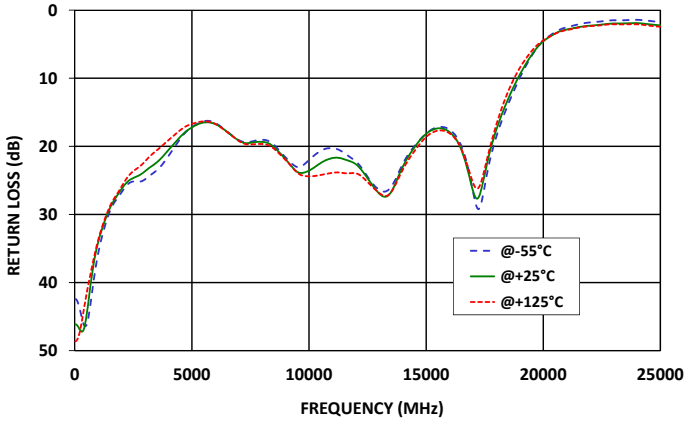
LFCV-1752+
INSERTION LOSS



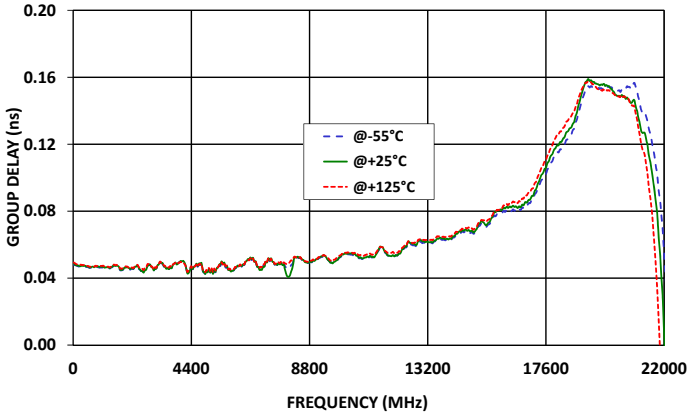
LFCV-1752+
INSERTION LOSS (Zoomed)



LFCV-1752+
RETURN LOSS



LFCV-1752+
GROUP DELAY



Low Pass Filter

LFCV-1752+

50Ω DC to 17.5 GHz

FUNCTIONAL DIAGRAM

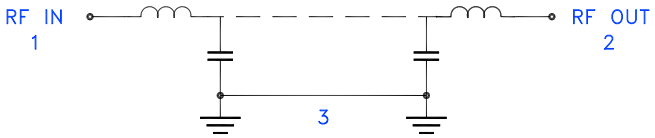
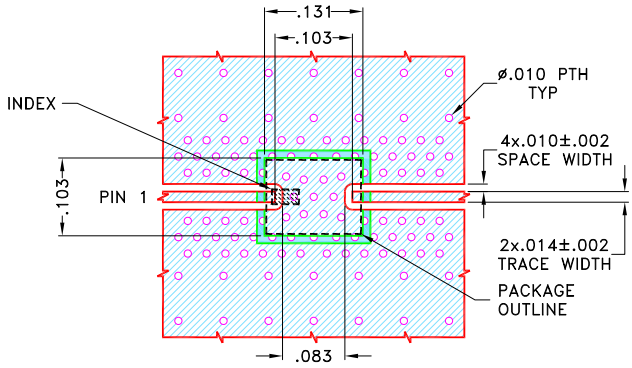


Figure 1. LFCV-1752+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1 (Note 2)	1	Connects to RF Input Port
RF2 (Note 2)	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-679)
NC	—	No connection, not used internally. See drawing PL-679 for connection to PCB

SUGGESTED PCB LAYOUT (PL-679)



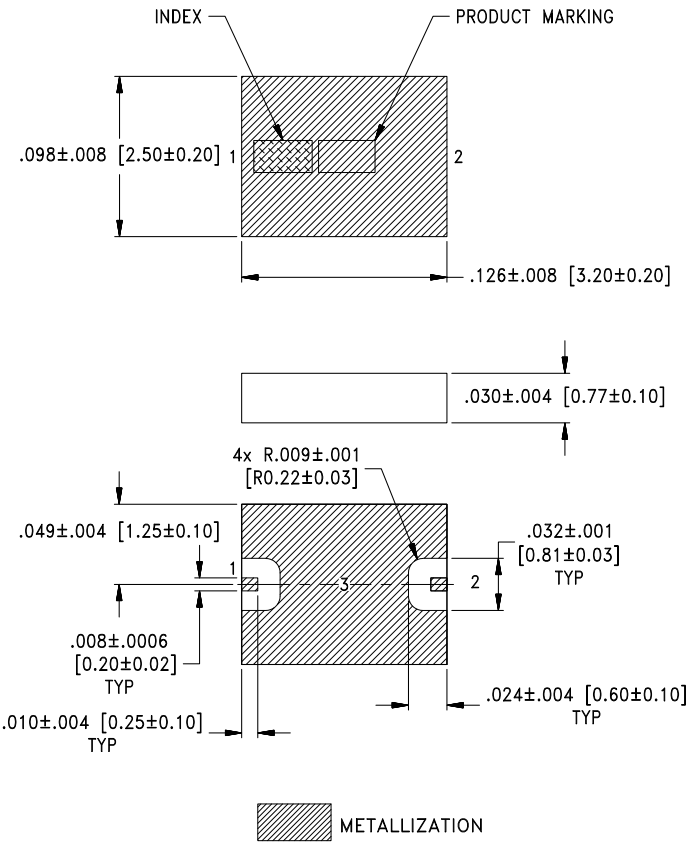
NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4835 Lo Pro) WITH DIELECTRIC THICKNESS .0073±.0007. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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: .024 grams

Dimensions are in inches (mm). Tolerances: 2 Pl.±.010; 3 Pl. ±.005

PRODUCT MARKING*: WD

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

Low Pass Filter

LFCV-1752+

50Ω DC to 17.5 GHz

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-13 Lead Finish: Electroless Nickel-Gold
RoHS Status	Compliant
Tape and Reel	TR-F74
Suggested Layout for PCB Design	98-PL-679
Evaluation Board	TB-LFCV-1752+
	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 Low Pass Filter LFCV-1752+

Typical Performance Data

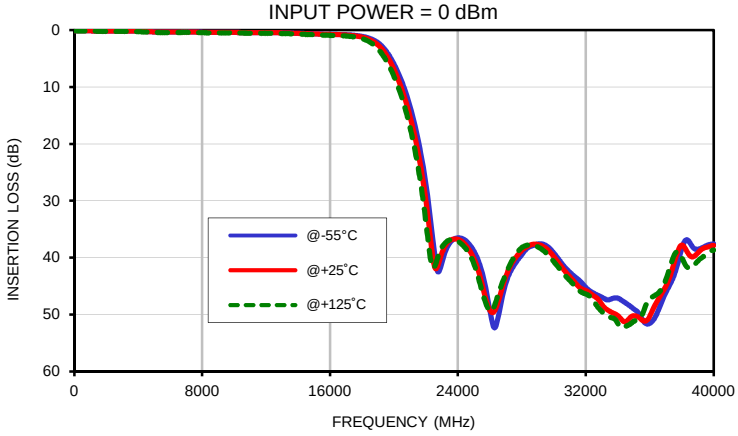
FREQ. (MHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
25	0.07	0.07	0.11	42.44	46.14	48.63	41.31	44.77	45.04
50	0.07	0.07	0.11	42.46	46.15	48.59	41.33	44.79	45.04
100	0.08	0.07	0.11	42.70	46.31	48.41	41.53	45.06	45.11
200	0.08	0.08	0.12	43.74	46.84	47.43	42.45	46.10	45.25
300	0.09	0.08	0.12	45.18	47.22	45.72	43.97	47.41	45.15
400	0.10	0.09	0.13	46.31	46.69	43.68	45.70	47.94	44.51
500	0.10	0.10	0.14	46.23	44.88	41.71	46.57	46.77	43.25
1000	0.11	0.12	0.16	35.68	34.00	33.72	37.12	36.00	35.56
1500	0.13	0.13	0.18	29.51	29.06	28.79	29.69	29.27	29.34
2000	0.15	0.15	0.21	26.73	26.24	25.89	25.41	25.23	24.97
2500	0.16	0.17	0.22	25.17	24.64	23.64	23.02	22.76	22.28
3000	0.14	0.16	0.22	24.84	23.65	22.20	21.38	21.06	20.27
3500	0.14	0.16	0.23	23.52	22.36	20.59	20.55	20.17	19.21
4000	0.17	0.18	0.27	21.41	20.53	19.09	19.81	19.51	18.56
4500	0.23	0.24	0.33	18.91	18.62	17.63	18.65	18.65	17.96
5000	0.30	0.30	0.38	17.18	17.22	16.71	17.58	17.81	17.53
6000	0.31	0.32	0.41	16.57	16.73	16.71	17.31	17.57	17.78
7000	0.28	0.30	0.39	19.09	19.17	19.20	19.28	19.32	19.40
8000	0.35	0.36	0.45	19.04	19.34	19.66	18.87	19.14	19.39
9000	0.38	0.38	0.48	21.64	21.90	22.01	21.40	21.84	21.96
10000	0.39	0.39	0.49	22.01	23.57	24.40	21.84	23.21	24.14
11000	0.43	0.43	0.52	20.27	21.72	23.89	20.21	21.47	23.46
12000	0.43	0.43	0.55	22.22	22.63	23.97	22.04	22.29	23.22
13000	0.46	0.47	0.58	26.39	26.96	26.87	24.12	24.53	24.35
14000	0.54	0.56	0.69	22.59	22.99	23.43	21.85	22.49	23.26
15000	0.64	0.66	0.81	18.13	18.16	18.62	19.14	19.33	20.51
16000	0.72	0.74	0.91	17.55	17.91	18.10	18.12	18.56	19.01
17500	0.89	0.97	1.17	25.83	24.09	23.29	27.31	26.44	26.96
19300	2.98	3.50	4.39	7.92	7.67	6.91	7.88	7.54	6.90
20500	9.13	10.46	11.93	3.24	3.44	3.47	3.69	3.87	4.13
21400	17.85	19.96	22.44	2.17	2.57	2.64	2.81	3.12	3.40
22000	27.08	30.03	33.83	1.80	2.28	2.35	2.42	2.80	3.04
22800	42.47	40.91	39.45	1.53	2.01	2.10	2.07	2.48	2.77
23000	40.85	39.14	38.16	1.48	1.97	2.07	2.02	2.44	2.74
23500	37.35	36.97	36.86	1.48	1.94	2.09	1.97	2.39	2.74
23700	36.81	36.73	36.81	1.44	1.92	2.07	1.98	2.40	2.77
24000	36.51	36.77	37.11	1.42	1.90	2.08	2.02	2.45	2.85
24200	36.57	37.04	37.53	1.46	1.95	2.14	2.07	2.50	2.92
24400	36.82	37.50	38.10	1.52	2.02	2.22	2.13	2.58	3.02
24600	37.29	38.19	38.83	1.60	2.10	2.31	2.20	2.66	3.13
24800	37.97	39.07	39.79	1.68	2.18	2.39	2.28	2.74	3.24
25000	38.84	40.16	41.07	1.72	2.24	2.43	2.35	2.82	3.33
25200	40.00	41.58	42.78	1.73	2.27	2.43	2.40	2.90	3.40
25400	41.53	43.44	44.79	1.74	2.26	2.43	2.45	2.95	3.44
25600	43.54	45.67	46.76	1.73	2.23	2.39	2.47	2.97	3.44
25800	46.15	47.82	48.41	1.68	2.20	2.32	2.46	2.97	3.41
26000	49.30	49.25	49.33	1.61	2.14	2.23	2.44	2.96	3.35
26200	51.95	49.62	48.96	1.54	2.05	2.14	2.40	2.93	3.29
26400	51.81	48.73	47.49	1.48	1.99	2.07	2.36	2.89	3.24
26600	49.29	46.95	45.77	1.42	1.95	1.99	2.33	2.87	3.20
27000	44.45	43.27	42.80	1.28	1.78	1.83	2.31	2.88	3.26
27500	41.37	40.40	39.93	1.17	1.73	1.73	2.50	3.15	3.72
28000	39.42	38.71	38.21	1.12	1.62	1.67	3.07	3.86	4.85
28500	38.05	37.79	37.71	1.14	1.66	1.71	4.16	5.15	6.41
29000	37.59	37.67	38.10	1.33	1.85	1.94	5.26	6.06	6.48
29500	37.83	38.33	39.11	1.43	1.94	2.10	4.79	5.12	5.02
30000	39.18	39.81	40.69	1.64	2.21	2.41	3.64	3.90	3.98
32000	45.20	45.77	46.38	1.79	2.38	2.47	2.42	2.93	3.46
35000	48.99	50.19	51.15	1.65	2.34	2.72	1.81	2.29	2.81
40000	37.58	37.83	38.66	2.40	2.87	3.24	1.63	2.11	2.63

Typical Performance Data

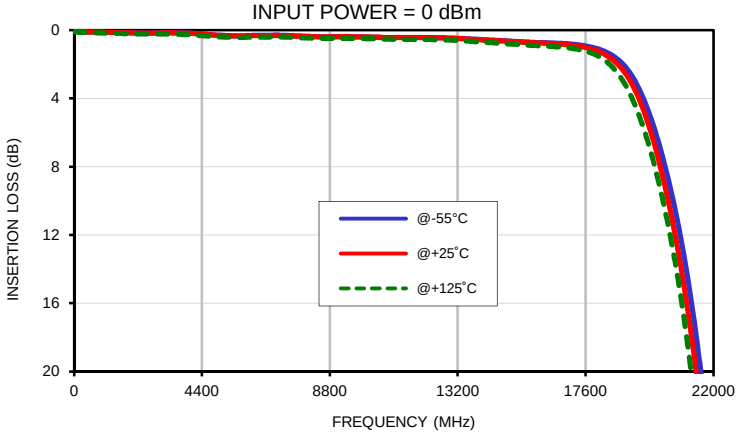
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-55°C	@+25°C	@+125°C
25	0.05	0.05	0.05
50	0.05	0.05	0.05
100	0.05	0.05	0.05
200	0.05	0.05	0.05
300	0.05	0.05	0.05
400	0.05	0.05	0.05
500	0.05	0.05	0.05
1000	0.05	0.05	0.05
1500	0.05	0.05	0.05
2000	0.05	0.05	0.05
2500	0.04	0.04	0.05
3000	0.04	0.04	0.05
3500	0.05	0.05	0.05
4000	0.05	0.05	0.05
4500	0.05	0.05	0.05
5000	0.04	0.04	0.04
5500	0.05	0.05	0.05
6000	0.05	0.05	0.05
6500	0.05	0.05	0.05
7000	0.05	0.05	0.05
7500	0.05	0.05	0.05
8000	0.05	0.04	0.05
8500	0.05	0.05	0.05
9000	0.05	0.05	0.05
9500	0.05	0.05	0.05
10000	0.05	0.05	0.05
10500	0.05	0.05	0.05
11000	0.05	0.05	0.05
11500	0.06	0.06	0.06
12000	0.05	0.05	0.06
12500	0.06	0.06	0.06
13000	0.06	0.06	0.06
13500	0.06	0.06	0.06
14000	0.06	0.06	0.06
14500	0.07	0.07	0.07
15000	0.07	0.07	0.07
15500	0.07	0.07	0.08
16000	0.08	0.08	0.08
16500	0.08	0.08	0.09
17500	0.10	0.10	0.11

Typical Performance Curves

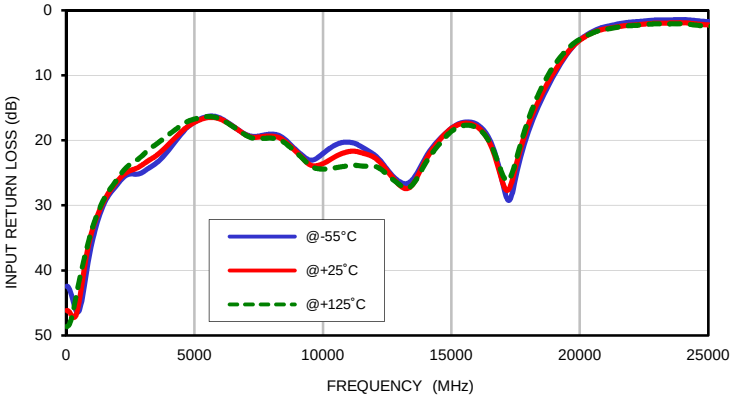
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



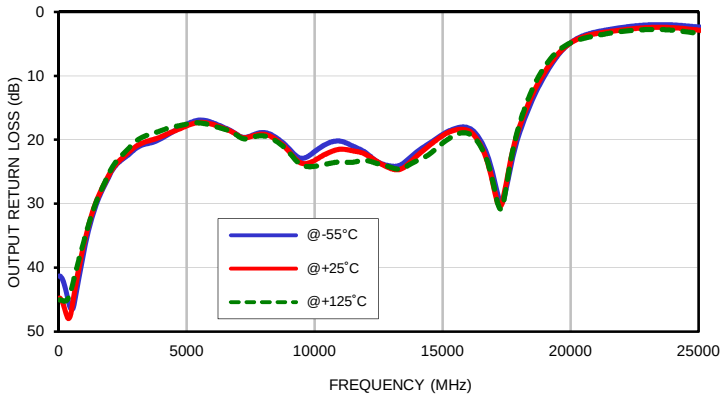
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



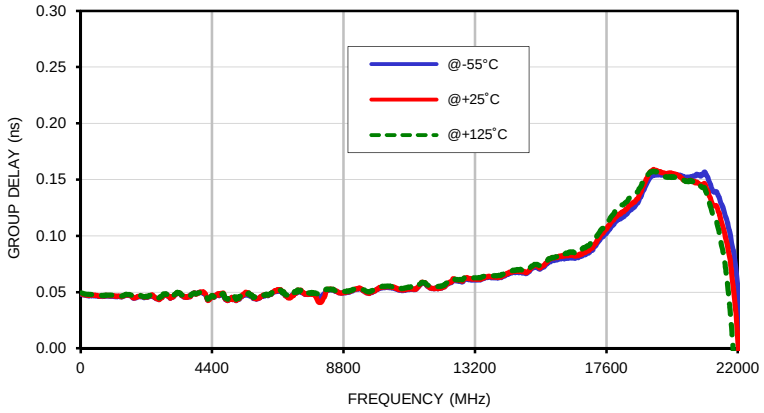
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



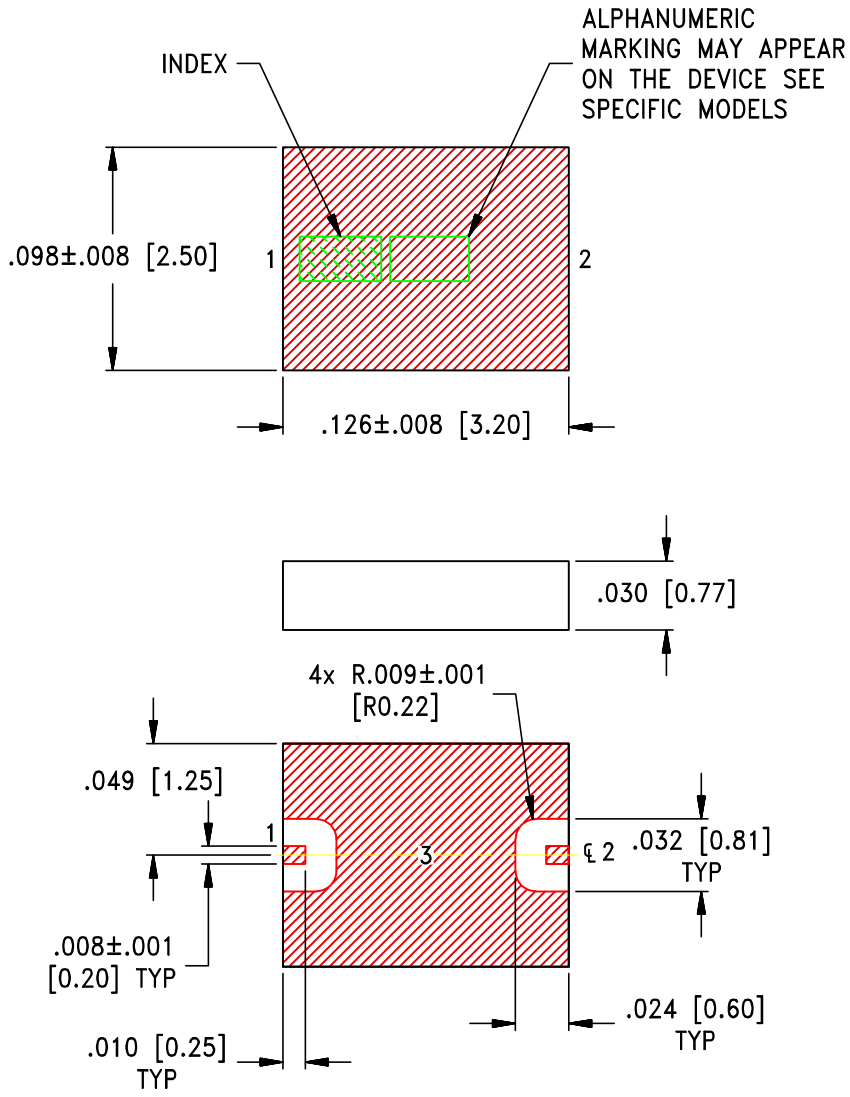
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style JV

Outline Dimensions

JV1210C-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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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com
RF/IF MICROWAVE COMPONENTS

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Tape & Reel Packaging TR-F74

DEVICE ORIENTATION IN T&R

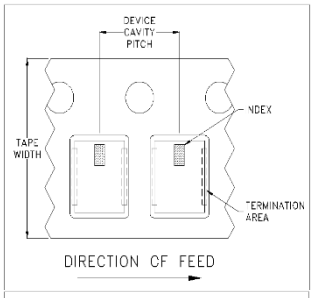


ILLUSTRATION 1

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

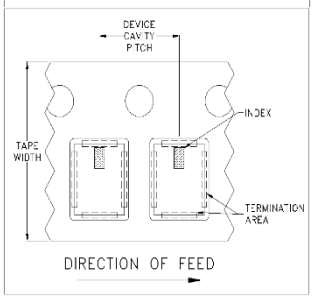


ILLUSTRATION 2

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

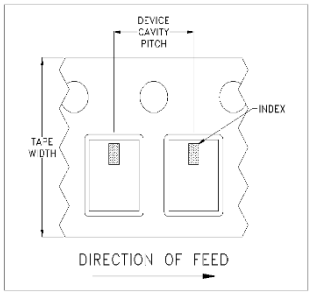


ILLUSTRATION 3

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

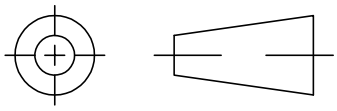
Note: Small reel availability varies by model. Refer to pricing and availability on individual model dashboard.

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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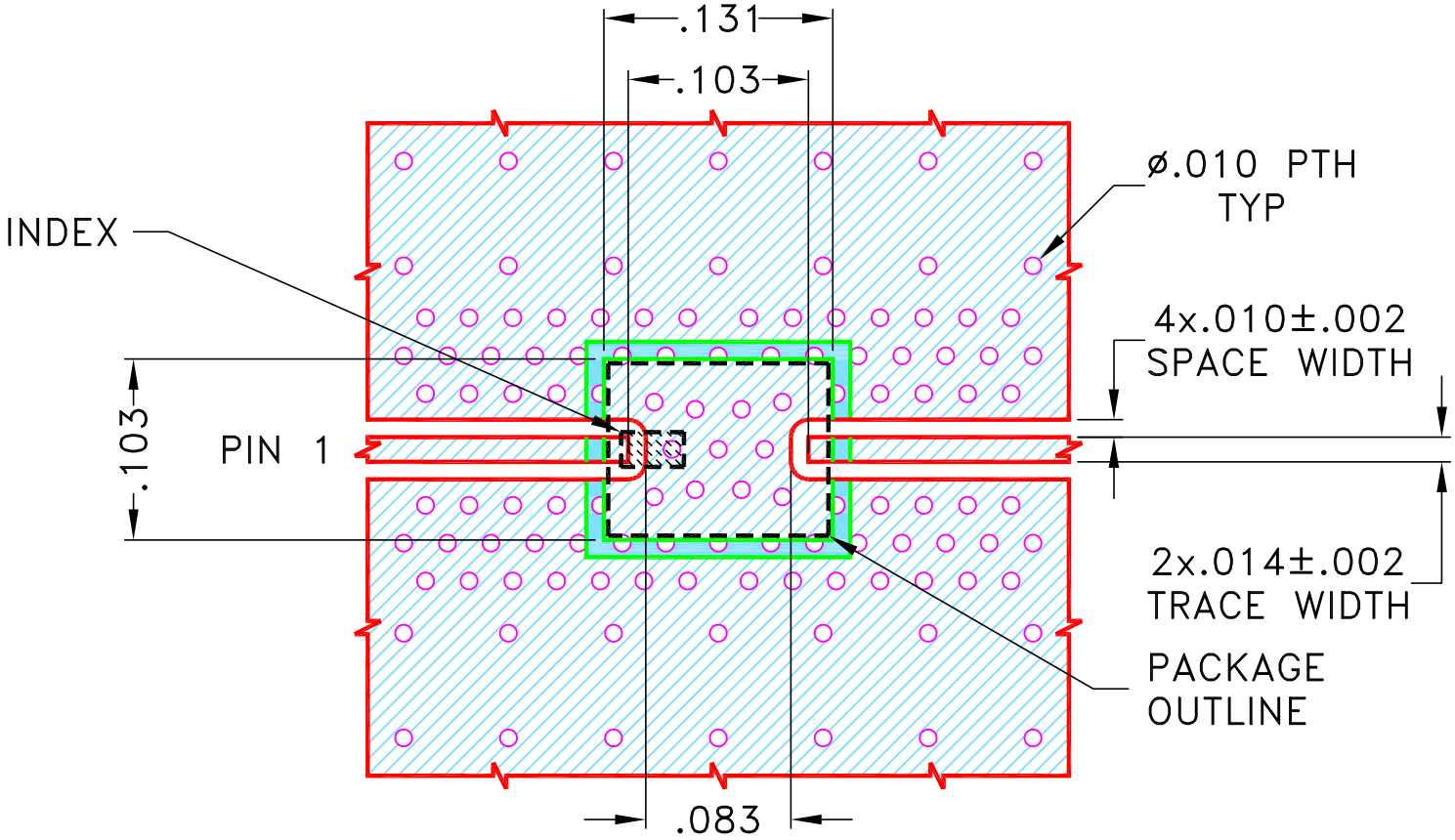
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-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



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

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 ±			

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

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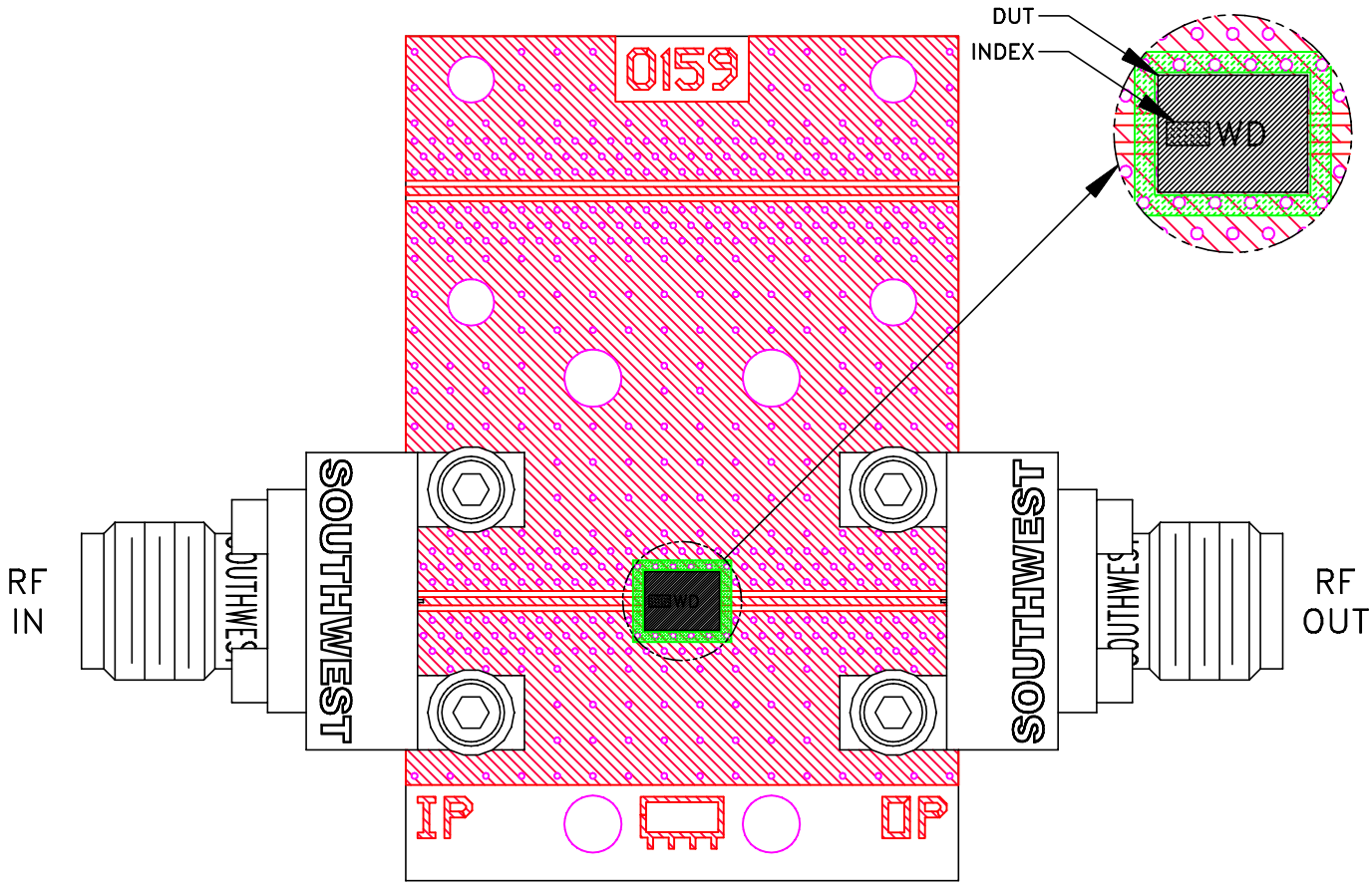
PL, JV1210C-7, JV1210C-13, TB-LFCV-X+

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

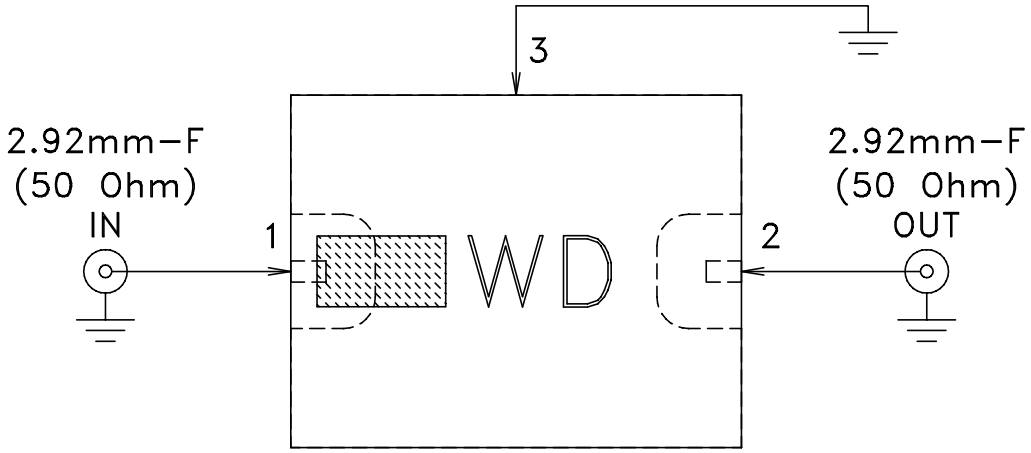
FILE:	SCALE:	SHEET:
98PL679	9:1	1 OF 1

Evaluation Board and Circuit

TB-LFCV-1752+



Schematic diagram



Notes:

1. PCB Material: ROGERS (RO4835 Lo Pro) OR Equivalent, Dielectric Constant=3.48±.05
Dielectric Thickness: .0073
2. 50 Ohm 2.92mm Female Connectors.
3. Connectors on the test board shall not be subjected to temperature greater than 200°C to avoid permanent damage to the connectors.

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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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