*Ceramic*

# LTCC Bandpass Filter

## BFCV-2610+

50Ω 2000 to 3220 MHz

*Generic photo used for illustration purposes only*

CASE STYLE: JV1210C

## The Big Deal

- Small size 3.2mm x 2.5mm
- Wide passband (2000-3220 MHz)
- Low Insertion Loss (1.9 dB typical)
- Wide stopband rejection up to 8 GHz

## Product Overview

The BFCV-2610+ LTCC Band Pass Filter is constructed with multiple layers in order to achieve a miniature size and high repeatability of performance. Wrap-around terminations minimize variations in performance due to parasitics. These units offer low insertion loss and very good wide band rejection.

## Key Features

| Feature | Advantages |
|---|---|
| Small Size (3.20mm x2.5 mm) | Allows for high layout density of circuit boards, while minimizing effects of parasitics. |
| Wrap around termination | Provides excellent solderability and easy visual inspection capability. |
| Wide bandwidth | Enables high data rate in communication systems. |
| LTCC construction | Provides a rugged package that is well suited for tough environments including high humidity and high temperature extremes. |

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# Bandpass Filter

50Ω 2000 to 3220 MHz

## BFCV-2610+

*Generic photo used for illustration purposes only*

CASE STYLE: JV1210C

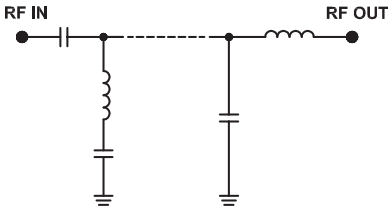
### Features

- Small size
- Temperature stable
- Hermetically sealed
- LTCC construction

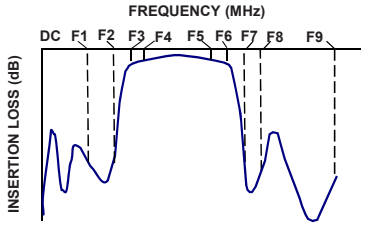
### Applications

- Software defined radio
- WLAN
- Cellular network

### Functional Schematic




### Typical Frequency Response




### Electrical Specifications[1,2] at 25°C

| Parameter | | F# | Frequency (MHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Pass Band | Center Frequency | — | — | — | 2610 | — | MHz |
| | Insertion Loss | F3-F6 | 2000-3220 | — | 1.9 | — | dB |
| | | F4-F5 | 2100-3120 | — | 1.9 | 3.8 | dB |
| | VSWR | F3-F6 | 2000-3220 | — | 2.1 | — | :1 |
| Stop Band, Lower | Insertion Loss | DC-F1 | DC-1550 | 15 | 17 | — | dB |
| | | F2 | 1610 | — | 17 | — | dB |
| | VSWR | DC-F1 | DC-1550 | — | 20 | — | :1 |
| Stop Band, Upper | Insertion Loss | F7 | 4000 | — | 16 | — | dB |
| | | F8-F9 | 4500-8000 | 15 | 20 | — | dB |
| | VSWR | F8-F9 | 4500-8000 | — | 20 | — | :1 |

*1. Measured on Mini-Circuits Characterization Test Board TB-946+*

*2. This filter is not intended for use as a DC Blocking circuit element. In Application where DC voltage is present at either input or output ports, blocking capacitors are required at the corresponding RF port.*

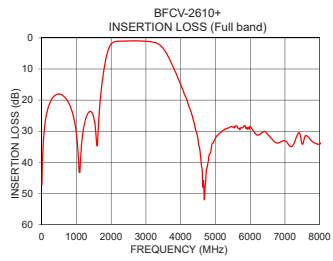
| Maximum Ratings | |
|---|---|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature | -55°C to 100°C |
| RF Power Input* | 4 W max @ +25°C |

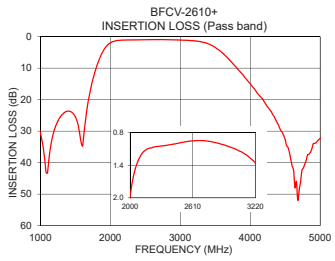
*Passband rating, derate linearly to 0.25W at 100°C ambient

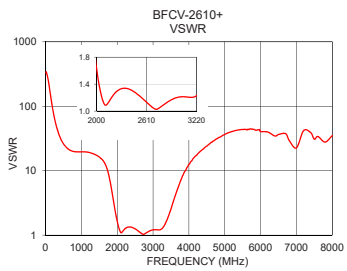
Permanent damage may occur if any of these limits are exceeded.

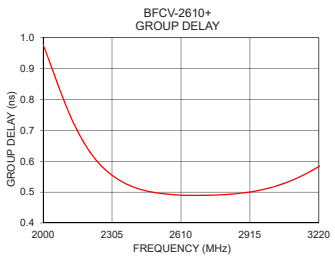
### Typical Performance Data at 25°C

| Frequency (MHz) | Insertion Loss (dB) | VSWR (:1) | Frequency (MHz) | Group Delay (nsec) |
|---|---|---|---|---|
| 10 | 47.22 | 329.19 | 2000 | 0.98 |
| 1550 | 29.40 | 15.41 | 2060 | 0.86 |
| 1610 | 33.47 | 14.22 | 2100 | 0.78 |
| 1640 | 27.21 | 13.42 | 2200 | 0.64 |
| 1680 | 20.88 | 12.11 | 2300 | 0.56 |
| 1800 | 9.71 | 6.86 | 2400 | 0.52 |
| 1940 | 3.13 | 2.41 | 2500 | 0.50 |
| 2000 | 1.96 | 1.63 | 2600 | 0.49 |
| 2100 | 1.23 | 1.09 | 2610 | 0.49 |
| 2610 | 0.95 | 1.13 | 2660 | 0.49 |
| 3120 | 1.20 | 1.21 | 2700 | 0.49 |
| 3220 | 1.37 | 1.23 | 2760 | 0.49 |
| 3480 | 3.14 | 2.37 | 2800 | 0.49 |
| 3800 | 9.73 | 7.71 | 2820 | 0.49 |
| 4000 | 14.94 | 12.55 | 2900 | 0.50 |
| 4200 | 20.69 | 17.14 | 2960 | 0.51 |
| 4460 | 30.48 | 23.32 | 3000 | 0.51 |
| 4500 | 32.69 | 24.09 | 3100 | 0.54 |
| 7000 | 33.07 | 22.59 | 3120 | 0.54 |
| 8000 | 34.17 | 34.86 | 3220 | 0.58 |




***+RoHS Compliant***

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

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.

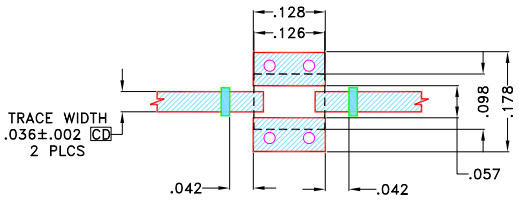
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

## Pad Connections

| | |
|---|---|
| RF IN | 1 |
| RF OUT | 3 |
| GROUND | 2,4 |

**Product Marking:** JG

***Demo Board MCL P/N: TB-946+***
***Suggested PCB Layout (PL-502)***



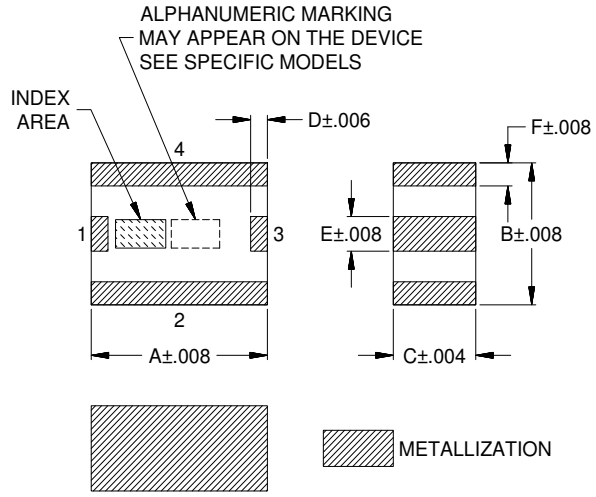

NOTES:

1. TRACE WIDTH & SPACE WIDTH IS SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .0166"±.0015". COPPER 1/2 Oz. EACH SIDE
   FOR OTHER MATERIALS TRACE WIDTH & SPACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

## Outline Drawing




## Outline Dimensions ( inch / mm )

| A | B | C | D | E | F | Wt. |
|---|---|---|---|---|---|---|
| **.126** | **.098** | **.059** | **.012** | **.024** | **.016** | grams |
| 3.2 | 2.5 | 1.5 | .3 | .6 | .4 | .03 |

*Note: Please refer to case style drawing for details*

# Surface Mount Band Pass Filter BFCV-2610+

## *Typical Performance Data*

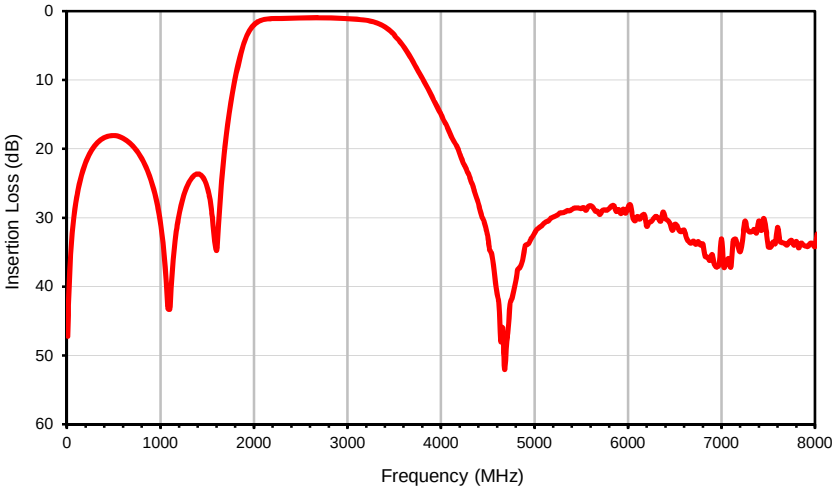
| FREQUENCY (MHz) | INSERTION LOSS (dB) | RETURN LOSS (dB) |
|---|---|---|
| 10 | 47.22 | 0.05 |
| 20 | 41.19 | 0.05 |
| 40 | 35.18 | 0.05 |
| 60 | 31.71 | 0.05 |
| 100 | 27.40 | 0.05 |
| 200 | 22.01 | 0.08 |
| 400 | 18.35 | 0.13 |
| 600 | 18.45 | 0.16 |
| 800 | 21.38 | 0.18 |
| 1000 | 30.67 | 0.21 |
| 1200 | 29.51 | 0.29 |
| 1500 | 25.53 | 0.49 |
| 1550 | 29.40 | 0.54 |
| 1600 | 34.77 | 0.60 |
| 1610 | 33.47 | 0.62 |
| 1620 | 31.40 | 0.64 |
| 1630 | 29.23 | 0.66 |
| 1650 | 25.39 | 0.71 |
| 1680 | 20.88 | 0.81 |
| 1690 | 19.62 | 0.85 |
| 1700 | 18.45 | 0.89 |
| 1750 | 13.53 | 1.23 |
| 1800 | 9.71 | 1.85 |
| 1820 | 8.41 | 2.21 |
| 1840 | 7.23 | 2.66 |
| 1850 | 6.69 | 2.92 |
| 1900 | 4.42 | 4.70 |
| 1920 | 3.72 | 5.67 |
| 1940 | 3.13 | 6.80 |
| 1950 | 2.88 | 7.43 |
| 2000 | 1.96 | 11.38 |
| 2100 | 1.23 | 29.07 |
| 2610 | 0.95 | 20.59 |
| 3120 | 1.20 | 17.87 |
| 3220 | 1.37 | 15.29 |
| 3400 | 2.28 | 8.41 |
| 3500 | 3.43 | 5.42 |
| 3700 | 7.31 | 2.11 |
| 3900 | 12.24 | 1.00 |
| 4000 | 14.94 | 0.74 |
| 4200 | 20.69 | 0.52 |
| 4260 | 22.58 | 0.48 |
| 4400 | 27.92 | 0.45 |
| 4480 | 31.51 | 0.39 |
| 4500 | 32.69 | 0.40 |
| 4600 | 41.14 | 0.36 |
| 4700 | 48.64 | 0.35 |
| 5000 | 32.27 | 0.38 |
| 5500 | 28.66 | 0.29 |
| 5800 | 28.65 | 0.19 |
| 6000 | 28.49 | 0.21 |
| 6200 | 31.23 | 0.24 |
| 6400 | 30.10 | 0.34 |
| 6500 | 30.97 | 0.37 |
| 6600 | 31.80 | 0.49 |
| 6800 | 33.81 | 0.98 |
| 7000 | 33.07 | 3.06 |
| 7400 | 30.45 | 2.19 |
| 7500 | 34.19 | 1.31 |
| 8000 | 34.17 | 0.45 |

| FREQUENCY (MHz) | GROUP DELAY (nsec) |
|---|---|
| 2000 | 0.98 |
| 2020 | 0.94 |
| 2040 | 0.90 |
| 2060 | 0.86 |
| 2080 | 0.82 |
| 2100 | 0.78 |
| 2120 | 0.75 |
| 2140 | 0.72 |
| 2160 | 0.69 |
| 2180 | 0.66 |
| 2200 | 0.64 |
| 2220 | 0.62 |
| 2240 | 0.60 |
| 2260 | 0.58 |
| 2280 | 0.57 |
| 2300 | 0.56 |
| 2320 | 0.55 |
| 2340 | 0.54 |
| 2360 | 0.53 |
| 2380 | 0.52 |
| 2400 | 0.52 |
| 2420 | 0.51 |
| 2440 | 0.51 |
| 2460 | 0.50 |
| 2480 | 0.50 |
| 2500 | 0.50 |
| 2520 | 0.50 |
| 2540 | 0.49 |
| 2560 | 0.49 |
| 2580 | 0.49 |
| 2600 | 0.49 |
| 2620 | 0.49 |
| 2640 | 0.49 |
| 2660 | 0.49 |
| 2680 | 0.49 |
| 2700 | 0.49 |
| 2720 | 0.49 |
| 2740 | 0.49 |
| 2760 | 0.49 |
| 2780 | 0.49 |
| 2800 | 0.49 |
| 2820 | 0.49 |
| 2840 | 0.49 |
| 2860 | 0.50 |
| 2880 | 0.50 |
| 2900 | 0.50 |
| 2920 | 0.50 |
| 2940 | 0.50 |
| 2960 | 0.51 |
| 2980 | 0.51 |
| 3000 | 0.51 |
| 3020 | 0.52 |
| 3040 | 0.52 |
| 3060 | 0.53 |
| 3080 | 0.53 |
| 3100 | 0.54 |
| 3120 | 0.54 |
| 3140 | 0.55 |
| 3160 | 0.56 |
| 3200 | 0.57 |

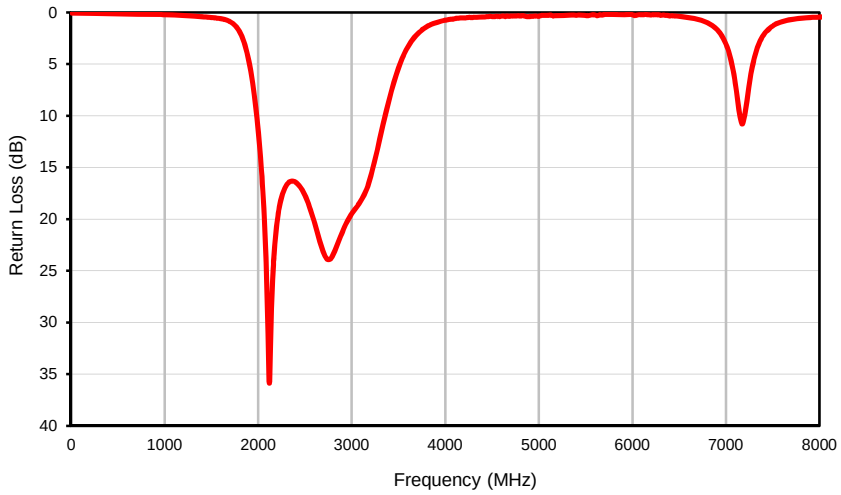
# Surface Mount Band Pass Filter BFCV-2610+

## *Typical Performance Curves*

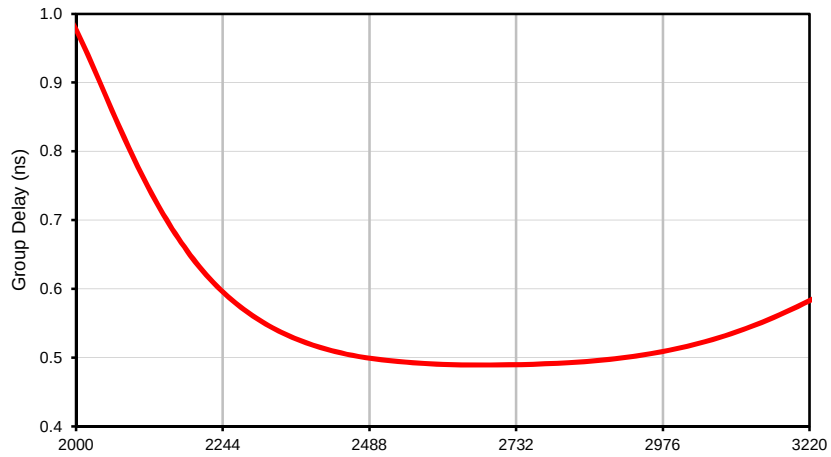
**Insertion Loss**




**Return Loss**




**Group Delay**

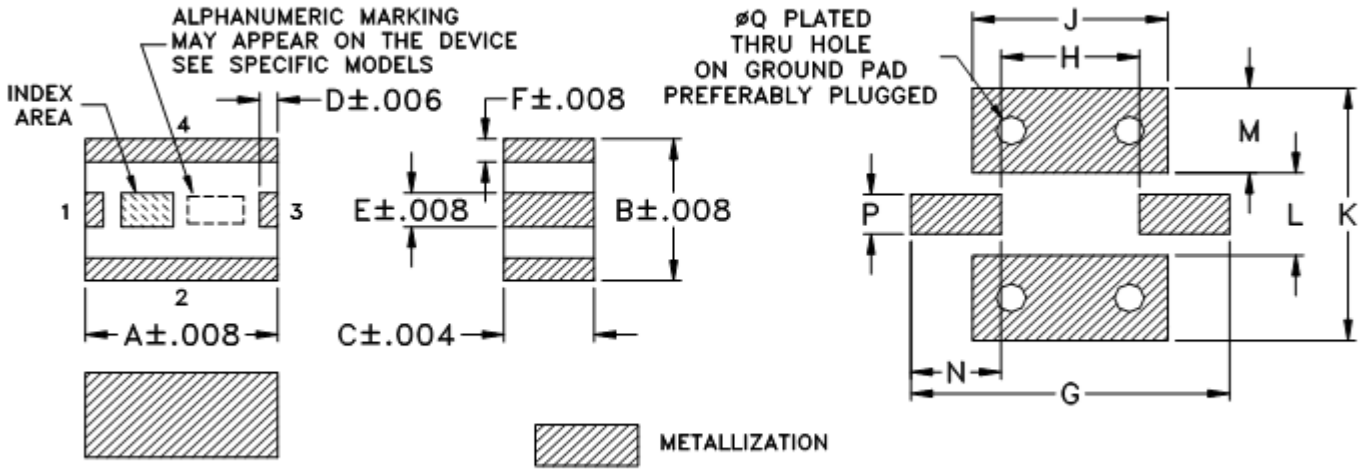


# Case Style JV

## Outline Dimensions

**JV1210C**

### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

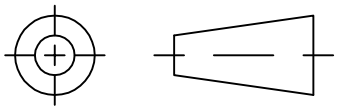
| CASE # | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | WT. GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JV1210C | .126 (3.2) | .098 (2.5) | .059 (1.5) | .012 (.3) | .024 (.6) | .016 (.4) | .209 (5.3) | .091 (2.3) | .128 (3.25) | .175 (4.45) | .057 (1.45) | .059 (1.5) | .059 (1.5) | .028 (.7) | .020 (.5) | .03 |

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

**Notes:**

1. Open style, ceramic base.
2. Termination finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.
3. Pad tolerance is non-cumulative. Minimum spacing between each pad is .004.

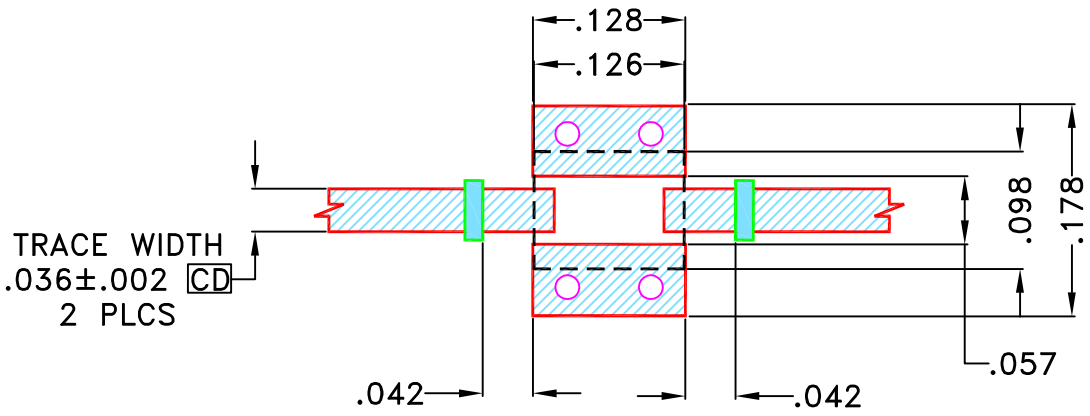
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|---|---|---|---|---|---|
| OR | M160679 | NEW RELEASE | MAR 17 | TM | MD |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR JV1210C CASE STYLE




## NOTES:

1. TRACE WIDTH & SPACE WIDTH IS SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .0166"±.0015". COPPER 1/2 Oz. EACH SIDE
   FOR OTHER MATERIALS TRACE WIDTH & SPACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

| UNLESS OTHERWISE SPECIFIED | | INITIALS | DATE |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | TM | 8 MAR 17 |
| TOLERANCES ON: | CHECKED | MD | 8 MAR 17 |
| 2 PL DECIMALS ± | APPROVED | RV | 8 MAR 17 |
| 3 PL DECIMALS ± .005" | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

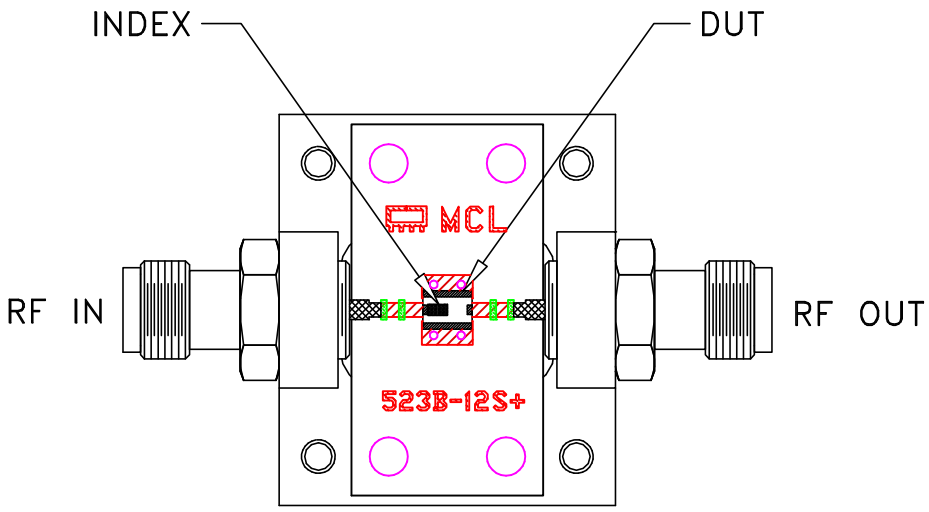
Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, JV1210C, BFCV-4085+, BFCV-2895+, BFCV-3350+, BFCV-2610+, TB-946+
50 OHM

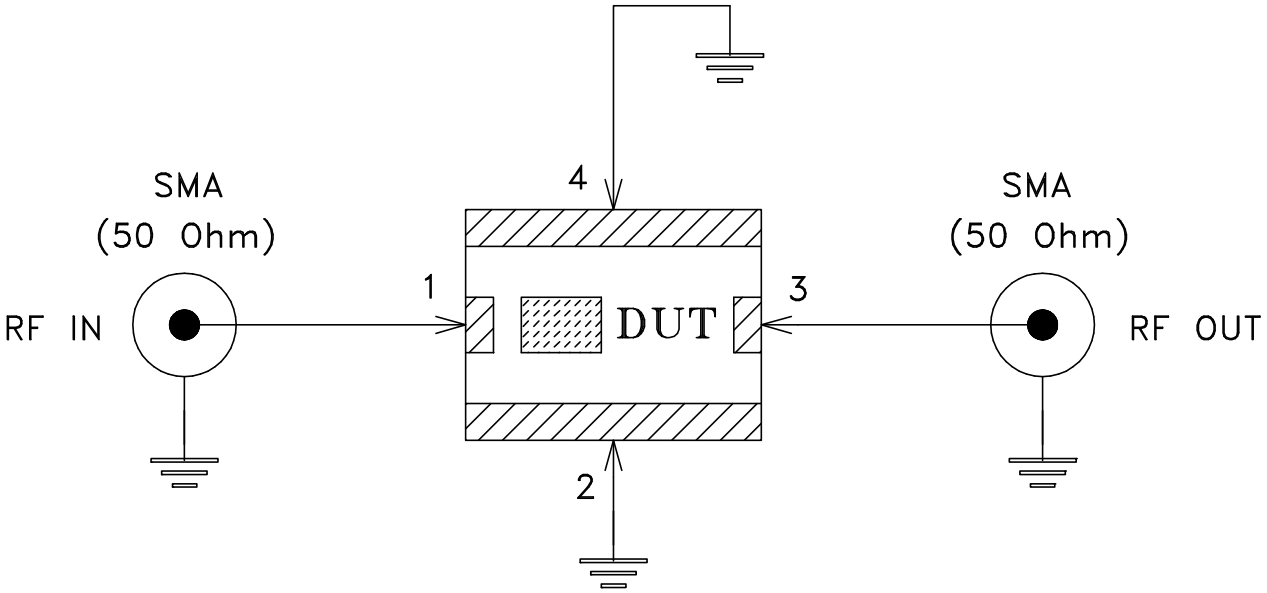
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-502 | OR |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL502 | 6:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-946+




Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.48, Thickness=.0166 inch.

Mini-Circuits®

Mini-Circuits

# Environmental Specifications ENV02T1

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 | -40° to 85°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>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 |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Solder Reflow Heat | Sn-Pb Eutetic Process: 225°C peak<br>Pb-Free Process 245° - 250°C peak | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1 |
| Solderability | 10X Magnification | J-STD-002, 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 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |