

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. |

### Notes

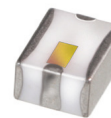
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C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. 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](http://www.minicircuits.com/MCLStore/terms.jsp)



# Ceramic 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

### Electrical Specifications<sup>1,2</sup> 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   |
|                  | VSWR             | F3-F6           | 2000-3220 | —    | 2.1  | :1   |
| Stop Band, Lower | Insertion Loss   | DC-F1           | DC-1550   | 15   | 17   | dB   |
|                  | VSWR             | F2              | 1610      | —    | 17   | dB   |
| Stop Band, Upper | Insertion Loss   | DC-F1           | DC-1550   | —    | 20   | :1   |
|                  | VSWR             | F7              | 4000      | —    | 16   | dB   |
| Stop Band, Upper | Insertion Loss   | 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.

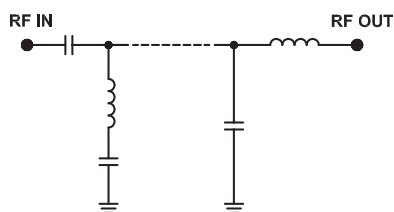
### Maximum Ratings

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

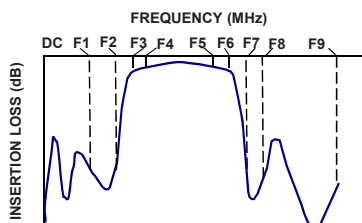
\*Passband rating, derate linearly to 0.25W at 100°C ambient

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

### Functional Schematic



### Typical Frequency Response

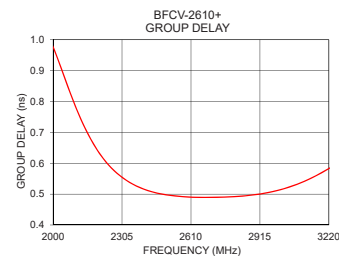
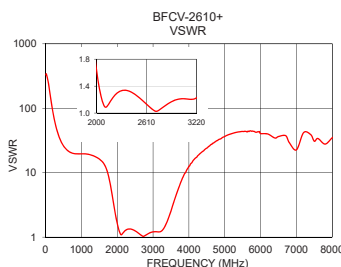
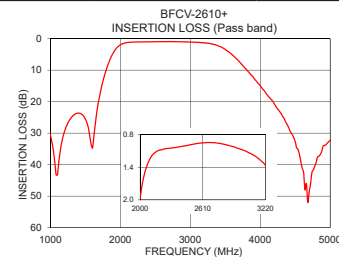
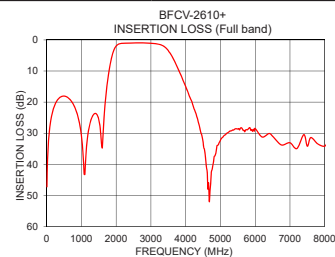


### Typical Performance Data at 25°C

| 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



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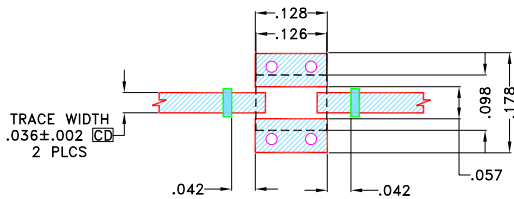


## Pad Connections

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

Product Marking: JG

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

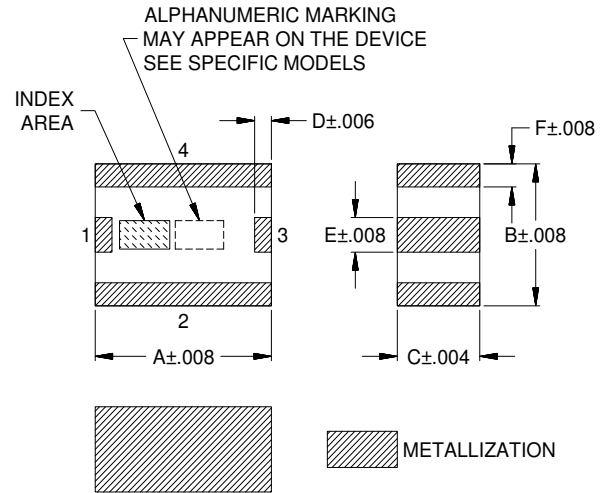


### NOTES:

- TRACE WIDTH & SPACE WIDTH IS SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS  $.0166 \pm .0015$ ". COPPER 1/2 OZ. EACH SIDE FOR OTHER MATERIALS TRACE WIDTH & SPACE WIDTH MAY NEED TO BE MODIFIED.
- 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 ( $\frac{\text{inch}}{\text{min}}$ )

| 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

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# Surface Mount Band Pass Filter

# BFCV-2610+

## Typical Performance Data

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | RETURN<br>LOSS<br>(dB) | FREQUENCY<br>(MHz) | GROUP<br>DELAY<br>(nsec) |
|--------------------|---------------------------|------------------------|--------------------|--------------------------|
| 10                 | 47.22                     | 0.05                   | 2000               | 0.98                     |
| 20                 | 41.19                     | 0.05                   | 2020               | 0.94                     |
| 40                 | 35.18                     | 0.05                   | 2040               | 0.90                     |
| 60                 | 31.71                     | 0.05                   | 2060               | 0.86                     |
| 100                | 27.40                     | 0.05                   | 2080               | 0.82                     |
| 200                | 22.01                     | 0.08                   | 2100               | 0.78                     |
| 400                | 18.35                     | 0.13                   | 2120               | 0.75                     |
| 600                | 18.45                     | 0.16                   | 2140               | 0.72                     |
| 800                | 21.38                     | 0.18                   | 2160               | 0.69                     |
| 1000               | 30.67                     | 0.21                   | 2180               | 0.66                     |
| 1200               | 29.51                     | 0.29                   | 2200               | 0.64                     |
| 1500               | 25.53                     | 0.49                   | 2220               | 0.62                     |
| 1550               | 29.40                     | 0.54                   | 2240               | 0.60                     |
| 1600               | 34.77                     | 0.60                   | 2260               | 0.58                     |
| 1610               | 33.47                     | 0.62                   | 2280               | 0.57                     |
| 1620               | 31.40                     | 0.64                   | 2300               | 0.56                     |
| 1630               | 29.23                     | 0.66                   | 2320               | 0.55                     |
| 1650               | 25.39                     | 0.71                   | 2340               | 0.54                     |
| 1680               | 20.88                     | 0.81                   | 2360               | 0.53                     |
| 1690               | 19.62                     | 0.85                   | 2380               | 0.52                     |
| 1700               | 18.45                     | 0.89                   | 2400               | 0.52                     |
| 1750               | 13.53                     | 1.23                   | 2420               | 0.51                     |
| 1800               | 9.71                      | 1.85                   | 2440               | 0.51                     |
| 1820               | 8.41                      | 2.21                   | 2460               | 0.50                     |
| 1840               | 7.23                      | 2.66                   | 2480               | 0.50                     |
| 1850               | 6.69                      | 2.92                   | 2500               | 0.50                     |
| 1900               | 4.42                      | 4.70                   | 2520               | 0.50                     |
| 1920               | 3.72                      | 5.67                   | 2540               | 0.49                     |
| 1940               | 3.13                      | 6.80                   | 2560               | 0.49                     |
| 1950               | 2.88                      | 7.43                   | 2580               | 0.49                     |
| 2000               | 1.96                      | 11.38                  | 2600               | 0.49                     |
| 2100               | 1.23                      | 29.07                  | 2620               | 0.49                     |
| 2610               | 0.95                      | 20.59                  | 2640               | 0.49                     |
| 3120               | 1.20                      | 17.87                  | 2660               | 0.49                     |
| 3220               | 1.37                      | 15.29                  | 2680               | 0.49                     |
| 3400               | 2.28                      | 8.41                   | 2700               | 0.49                     |
| 3500               | 3.43                      | 5.42                   | 2720               | 0.49                     |
| 3700               | 7.31                      | 2.11                   | 2740               | 0.49                     |
| 3900               | 12.24                     | 1.00                   | 2760               | 0.49                     |
| 4000               | 14.94                     | 0.74                   | 2780               | 0.49                     |
| 4200               | 20.69                     | 0.52                   | 2800               | 0.49                     |
| 4260               | 22.58                     | 0.48                   | 2820               | 0.49                     |
| 4400               | 27.92                     | 0.45                   | 2840               | 0.49                     |
| 4480               | 31.51                     | 0.39                   | 2860               | 0.50                     |
| 4500               | 32.69                     | 0.40                   | 2880               | 0.50                     |
| 4600               | 41.14                     | 0.36                   | 2900               | 0.50                     |
| 4700               | 48.64                     | 0.35                   | 2920               | 0.50                     |
| 5000               | 32.27                     | 0.38                   | 2940               | 0.50                     |
| 5500               | 28.66                     | 0.29                   | 2960               | 0.51                     |
| 5800               | 28.65                     | 0.19                   | 2980               | 0.51                     |
| 6000               | 28.49                     | 0.21                   | 3000               | 0.51                     |
| 6200               | 31.23                     | 0.24                   | 3020               | 0.52                     |
| 6400               | 30.10                     | 0.34                   | 3040               | 0.52                     |
| 6500               | 30.97                     | 0.37                   | 3060               | 0.53                     |
| 6600               | 31.80                     | 0.49                   | 3080               | 0.53                     |
| 6800               | 33.81                     | 0.98                   | 3100               | 0.54                     |
| 7000               | 33.07                     | 3.06                   | 3120               | 0.54                     |
| 7400               | 30.45                     | 2.19                   | 3140               | 0.55                     |
| 7500               | 34.19                     | 1.31                   | 3160               | 0.56                     |
| 8000               | 34.17                     | 0.45                   | 3200               | 0.57                     |



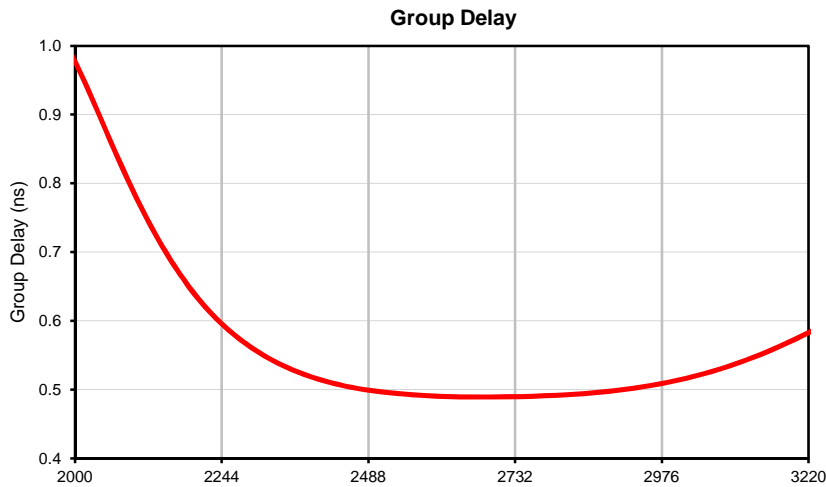
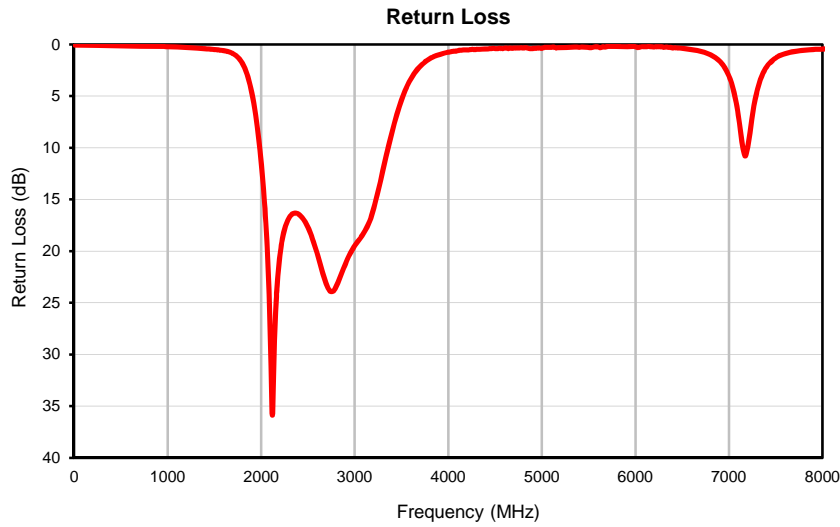
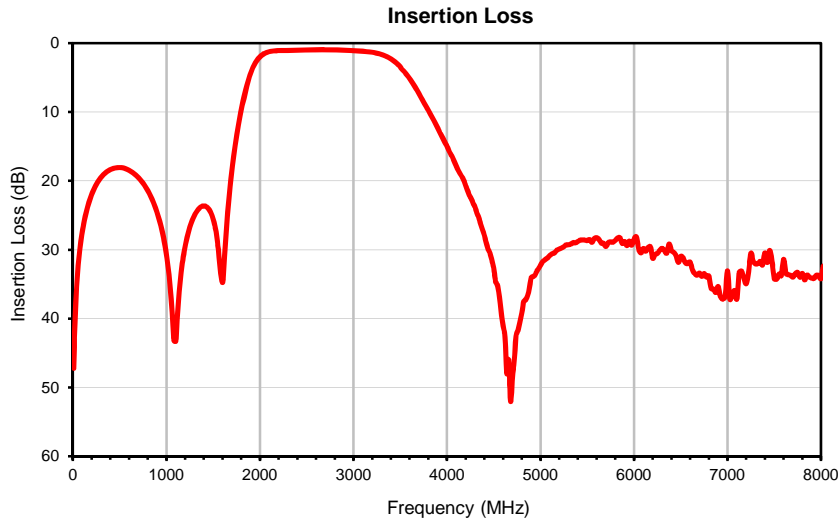
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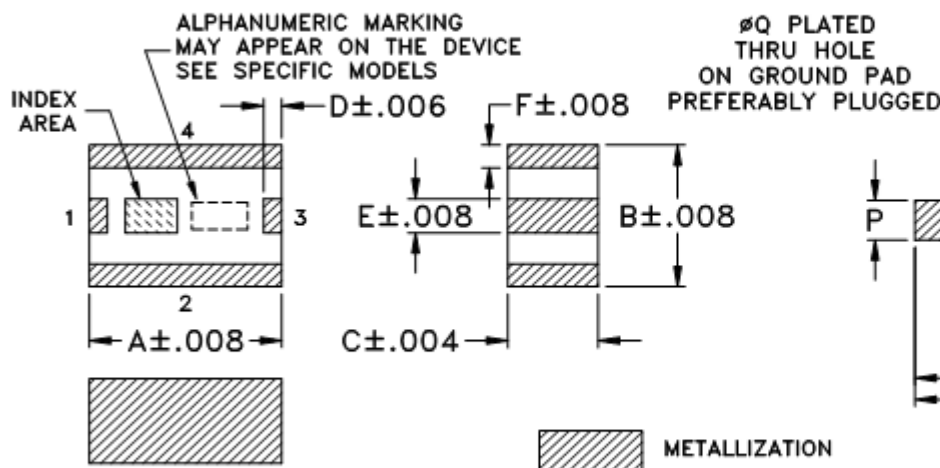
IF/RF MICROWAVE COMPONENTS

## Typical Performance Curves

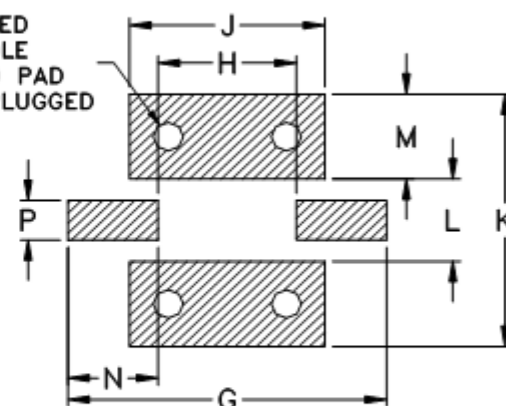


## Outline Dimensions

JV1210C



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

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

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

### 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.



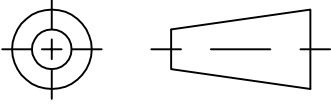
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RF/IF MICROWAVE COMPONENTS

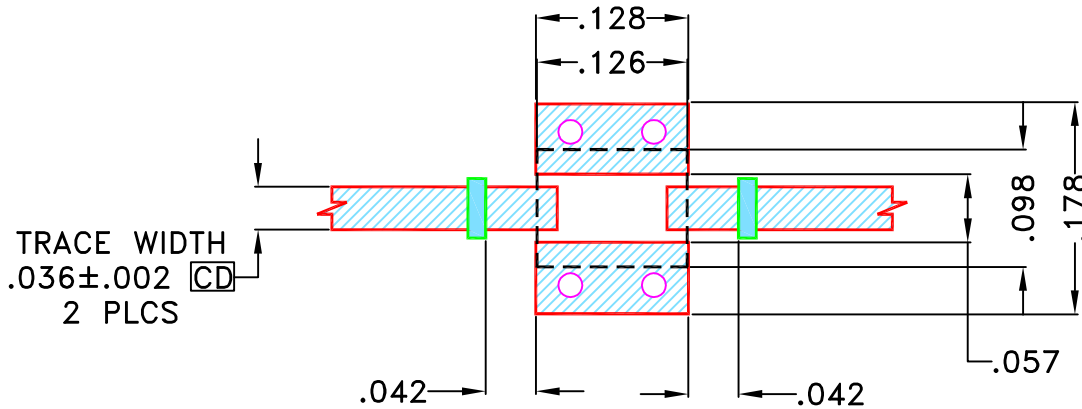
THIRD ANGLE PROJECTION



REVISIONS

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

SUGGESTED MOUNTING CONFIGURATION FOR JV1210C CASE STYLE



NOTES:

1. TRACE WIDTH & SPACE WIDTH IS SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS  $.0166 \pm .0015$ ". 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 ±                |          |    |          |

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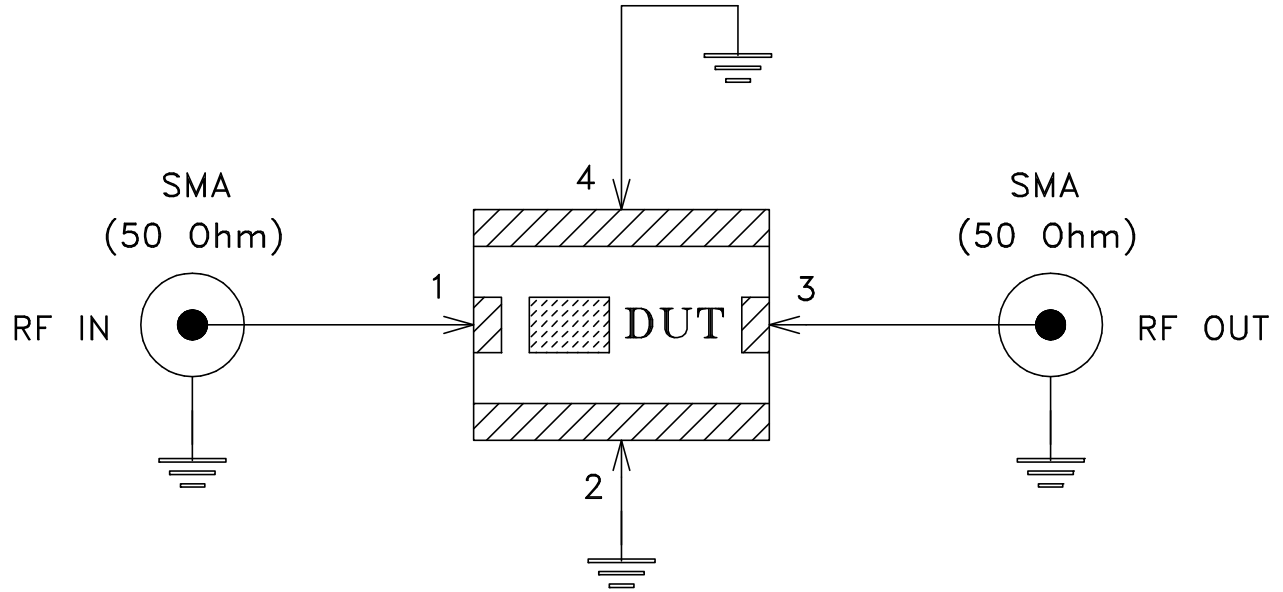
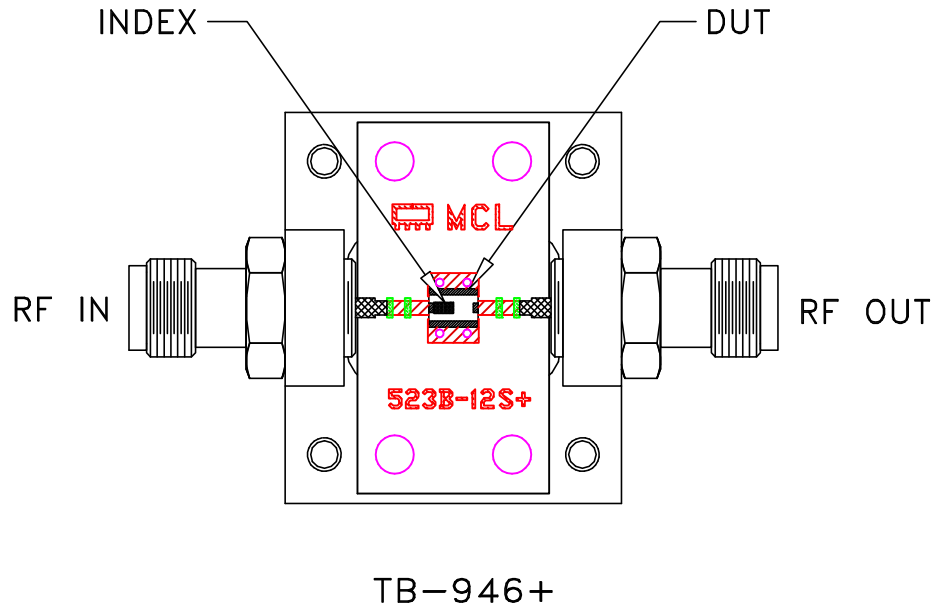
PL, JV1210C, BFCV-4085+, BFCV-2895+,  
BFCV-3350+, BFCV-2610+, TB-946+  
50 OHM

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|                  |                     |                          |            |
|------------------|---------------------|--------------------------|------------|
| SIZE<br>A        | CODE IDENT<br>15542 | DRAWING NO:<br>98-PL-502 | REV:<br>OR |
| FILE:<br>98PL502 | SCALE:<br>6:1       | SHEET:<br>1 OF 1         |            |


# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.48, Thickness=.0166 inch.

 **Mini-Circuits®**



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  |