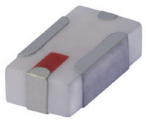
# LTCC Bandpass Filter BFCN-8650+

50Ω 8550 to 8750 MHz



CASE STYLE: FV1206-4

## The Big Deal

- Small size 3.2mm x 1.6mm
- Pass band (8550-8750 MHz)
- Low Insertion Loss (2.0 dB typical)
- Sharp rejection peaks close to stop band

## Product Overview

The BFCN-8650+ LTCC Band Pass Filter is constructed with 5 layers in order to achieve a miniature size and high repeatability of performance. Wrap-around terminations minimize variations in performance due to parasitics. Covering 8650 MHz ±100 MHz, these units offer low insertion loss and good rejection at the band reject edges.

## Key Features

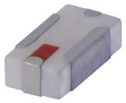
| Feature | Advantages |
|---|---|
| Small Size (3.20mm x1.6 mm) | Allows for high layout density of circuit boards, while minimizing affects of parasitics. |
| Rejection peaks close to pass band | Provides good rejection of signals close to the pass band, for improved system performance. |
| Wrap around termination | Provides excellent solderability and easy visual inspection capability. |
| LTCC construction | Provides a rugged package that is well suited for tough environments including high humidity and high temperature extremes. |

*Ceramic*

# Bandpass Filter

## BFCN-8650+

50Ω 8550 to 8750 MHz



*Generic photo used for illustration purposes only*

CASE STYLE: FV1206-4

**+RoHS Compliant**

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

*Available Tape and Reel at no extra cost*

| Reel Size | Devices/Reel |
|---|---|
| 7" | 20, 50, 100, 200, 500,1000, 3000 |

### Maximum Ratings

| | |
|---|---|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature | -55°C to 100°C |
| RF Power Input* | 2W max. at 25°C |

*Passband rating, derate linearly to 0.5W at 100°C ambient
Permanent damage may occur if any of these limits are exceeded.

### Pin Connections

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

**Product Marking:** 50

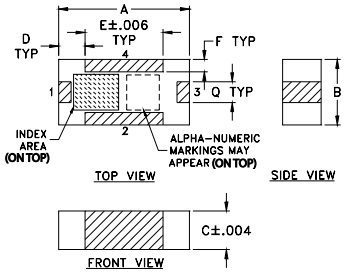
### Features

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

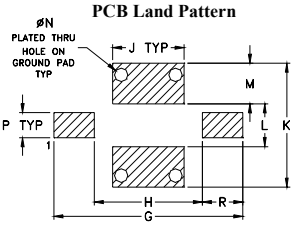
### Applications

- Harmonic Rejection
- Transmitters / Receivers

### Outline Drawing




### PCB Land Pattern



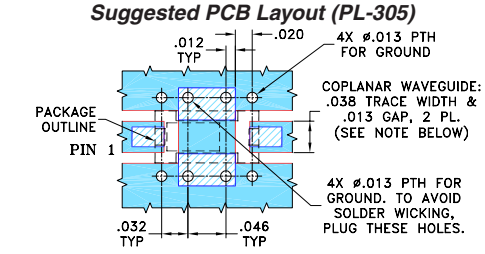

Suggested Layout,
Tolerance to be within ±.002

### Outline Dimensions (inch / mm)

| A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|
| .126 | .063 | .037 | .026 | .075 | .012 | .182 | .104 | .069 |
| 3.20 | 1.60 | 0.94 | 0.66 | 1.91 | 0.30 | 4.62 | 2.64 | 1.75 |

| K | L | M | N | P | Q | R | wt |
|---|---|---|---|---|---|---|---|
| .119 | .041 | .039 | .013 | .024 | .020 | .039 | grams |
| 3.02 | 1.04 | 0.99 | 0.33 | 0.61 | 0.51 | 0.99 | .020 |

### Demo Board MCL P/N: TB-518+
### Suggested PCB Layout (PL-305)




NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE 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)

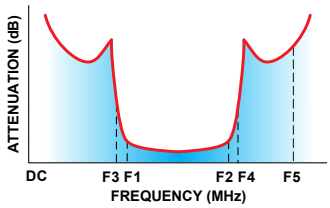
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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

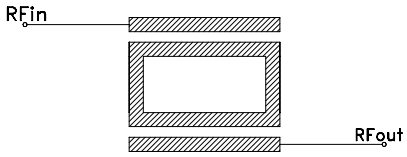
| Parameter | | F# | Frequency (MHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Pass Band | Center Frequency | — | — | — | 8650 | — | MHz |
| | Insertion Loss | F1-F2 | 8550-8750 | — | 2.0 | 3.5 | dB |
| | VSWR | F1-F2 | 8550-8750 | — | 1.5 | | :1 |
| Stop Band, Lower | Insertion Loss | DC-F3 | DC-7650 | — | 15 | — | dB |
| | VSWR | DC-F3 | DC-7650 | — | 30 | — | :1 |
| Stop Band, Upper | Insertion Loss | F4-F5 | 10000-15000 | — | 15 | — | dB |
| | VSWR | F4-F5 | 10000-15000 | — | 30 | — | :1 |

*1. Measured on Mini-Circuits Characterization Test Board TB-518+.*
*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.*

### Typical Frequency Response



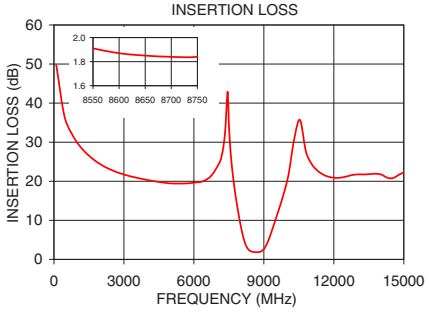

### Functional Schematic



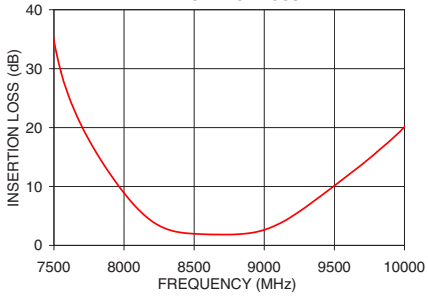

### Typical Performance Data at 25°C

| Frequency (MHz) | Insertion Loss (dB) | VSWR (:1) |
|---|---|---|
| 100.00 | 49.75 | 1737.18 |
| 800.00 | 31.75 | 1737.18 |
| 1500.00 | 26.54 | 124.09 |
| 2200.00 | 23.65 | 78.97 |
| 3600.00 | 20.83 | 52.65 |
| 4300.00 | 20.02 | 42.38 |
| 6050.00 | 19.68 | 22.29 |
| 6750.00 | 21.46 | 19.11 |
| 7500.00 | 34.78 | 20.22 |
| 7700.00 | 20.14 | 16.89 |
| 8550.00 | 1.91 | 1.30 |
| 10050.00 | 21.51 | 18.30 |
| 13550.00 | 21.83 | 9.48 |
| 14050.00 | 21.68 | 8.64 |
| 15050.00 | 22.42 | 8.95 |

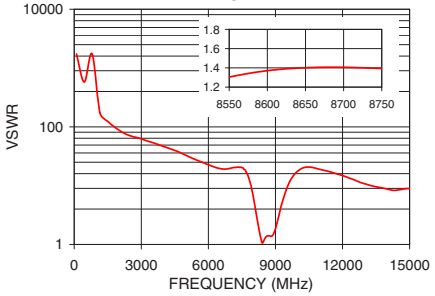
BFCN-8650+
INSERTION LOSS




BFCN-8650+
INSERTION LOSS




BFCN-8650+
VSWR




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

# Ceramic Bandpass Filter BFCN-8650+

*Typical Performance Data*

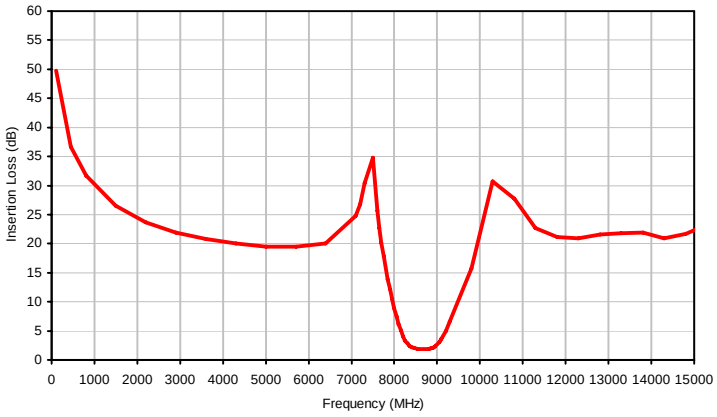
| FREQUENCY (MHz) | INSERTION LOSS (dB) | RETURN LOSS (dB) |
|---|---|---|
| 100.0 | 49.75 | 0.01 |
| 450.0 | 36.70 | 0.03 |
| 800.0 | 31.75 | 0.06 |
| 1500.0 | 26.54 | 0.14 |
| 2200.0 | 23.65 | 0.22 |
| 2900.0 | 21.92 | 0.27 |
| 3600.0 | 20.83 | 0.33 |
| 4300.0 | 20.02 | 0.41 |
| 5000.0 | 19.45 | 0.53 |
| 5700.0 | 19.45 | 0.69 |
| 6400.0 | 20.01 | 0.87 |
| 7100.0 | 24.79 | 0.86 |
| 7200.0 | 26.80 | 0.85 |
| 7300.0 | 30.37 | 0.84 |
| 7500.0 | 34.78 | 0.86 |
| 7600.0 | 25.68 | 0.92 |
| 7650.0 | 22.69 | 0.95 |
| 7700.0 | 20.14 | 1.03 |
| 7750.0 | 17.88 | 1.12 |
| 7800.0 | 15.84 | 1.26 |
| 7850.0 | 13.92 | 1.46 |
| 7900.0 | 12.15 | 1.71 |
| 7950.0 | 10.46 | 2.09 |
| 8000.0 | 8.90 | 2.60 |
| 8050.0 | 7.44 | 3.33 |
| 8100.0 | 6.16 | 4.31 |
| 8150.0 | 5.02 | 5.67 |
| 8200.0 | 4.09 | 7.52 |
| 8250.0 | 3.35 | 10.04 |
| 8300.0 | 2.82 | 13.54 |
| 8350.0 | 2.44 | 18.86 |
| 8400.0 | 2.21 | 29.76 |
| 8450.0 | 2.06 | 27.25 |
| 8500.0 | 1.96 | 20.48 |
| 8550.0 | 1.91 | 17.58 |
| 8600.0 | 1.87 | 16.12 |
| 8650.0 | 1.85 | 15.54 |
| 8700.0 | 1.84 | 15.45 |
| 8750.0 | 1.84 | 15.69 |
| 8800.0 | 1.88 | 15.91 |
| 8850.0 | 1.96 | 15.59 |
| 8900.0 | 2.10 | 14.37 |
| 8950.0 | 2.32 | 12.44 |
| 9000.0 | 2.63 | 10.52 |
| 9050.0 | 3.07 | 8.67 |
| 9100.0 | 3.61 | 7.13 |
| 9200.0 | 4.96 | 4.86 |
| 9300.0 | 6.58 | 3.41 |
| 9800.0 | 15.78 | 1.18 |
| 10300.0 | 30.77 | 0.85 |
| 10800.0 | 27.71 | 0.88 |
| 11300.0 | 22.70 | 0.98 |
| 11800.0 | 21.12 | 1.11 |
| 12300.0 | 20.92 | 1.29 |
| 12800.0 | 21.61 | 1.54 |
| 13300.0 | 21.75 | 1.75 |
| 13800.0 | 21.92 | 1.91 |
| 14300.0 | 20.89 | 2.10 |
| 14800.0 | 21.70 | 1.97 |
| 15050.0 | 22.42 | 1.95 |

| FREQUENCY (MHz) | GROUP DELAY (ns) |
|---|---|
| 100.0 | 0.24 |
| 450.0 | 0.24 |
| 800.0 | 0.24 |
| 1500.0 | 0.24 |
| 2200.0 | 0.25 |
| 2900.0 | 0.24 |
| 3600.0 | 0.24 |
| 4300.0 | 0.24 |
| 5000.0 | 0.25 |
| 5700.0 | 0.25 |
| 6400.0 | 0.27 |
| 7100.0 | 0.25 |
| 7200.0 | 0.23 |
| 7300.0 | 0.11 |
| 7600.0 | 0.19 |
| 7650.0 | 0.27 |
| 7700.0 | 0.33 |
| 7750.0 | 0.38 |
| 7800.0 | 0.41 |
| 7850.0 | 0.46 |
| 7900.0 | 0.49 |
| 7950.0 | 0.55 |
| 8000.0 | 0.58 |
| 8050.0 | 0.64 |
| 8100.0 | 0.68 |
| 8150.0 | 0.72 |
| 8200.0 | 0.74 |
| 8250.0 | 0.75 |
| 8300.0 | 0.74 |
| 8350.0 | 0.71 |
| 8400.0 | 0.68 |
| 8450.0 | 0.65 |
| 8500.0 | 0.63 |
| 8550.0 | 0.61 |
| 8600.0 | 0.60 |
| 8650.0 | 0.58 |
| 8700.0 | 0.59 |
| 8750.0 | 0.60 |
| 8800.0 | 0.60 |
| 8850.0 | 0.62 |
| 8900.0 | 0.63 |
| 8950.0 | 0.64 |
| 9000.0 | 0.65 |
| 9050.0 | 0.63 |
| 9100.0 | 0.61 |
| 9200.0 | 0.57 |
| 9300.0 | 0.53 |
| 9550.0 | 0.40 |
| 9800.0 | 0.34 |
| 10300.0 | 0.06 |
| 10800.0 | 0.17 |
| 11300.0 | 0.25 |
| 11800.0 | 0.25 |
| 12300.0 | 0.25 |
| 12800.0 | 0.20 |
| 13300.0 | 0.20 |
| 13800.0 | 0.17 |
| 14300.0 | 0.24 |
| 14800.0 | 0.21 |
| 15050.0 | 0.19 |

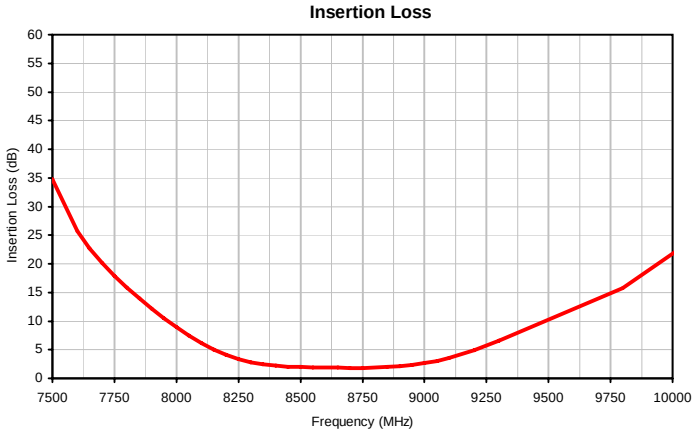
# Ceramic Bandpass Filter BFCN-8650+

## *Typical Performance Curves*

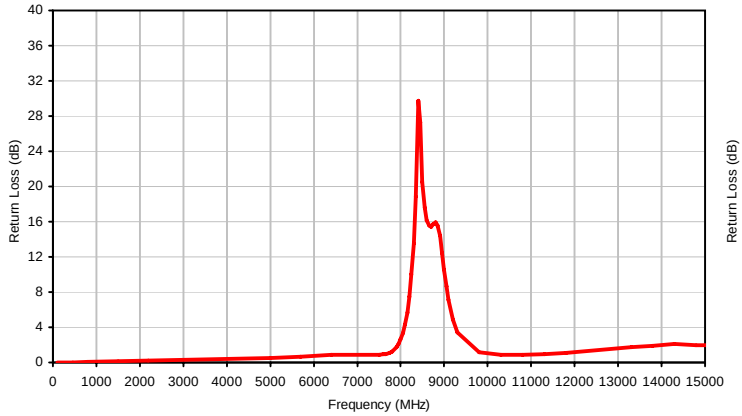
**Insertion Loss**



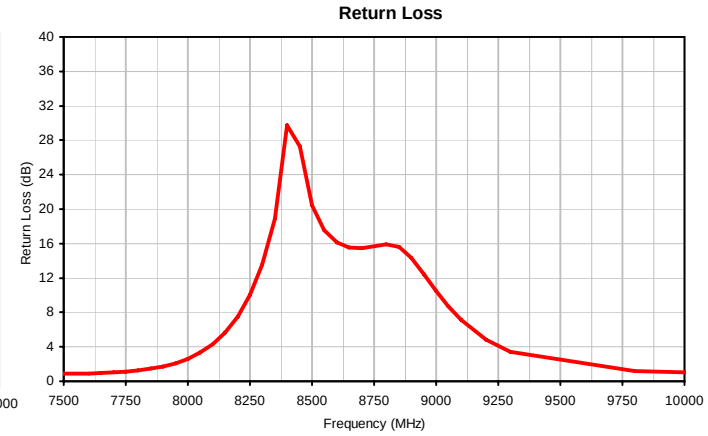

**Insertion Loss**



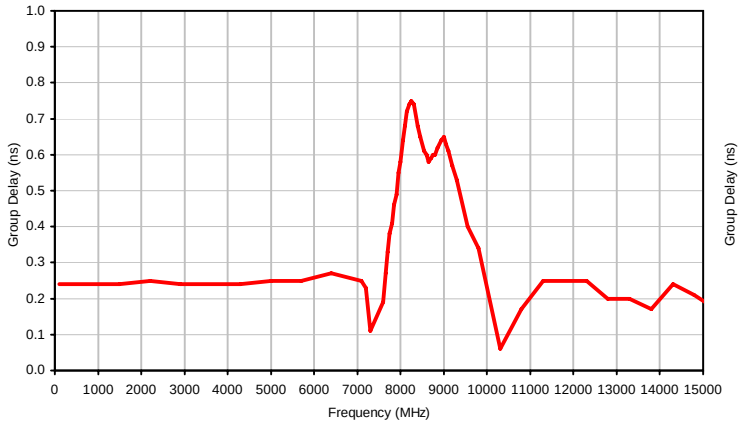

**Return Loss**



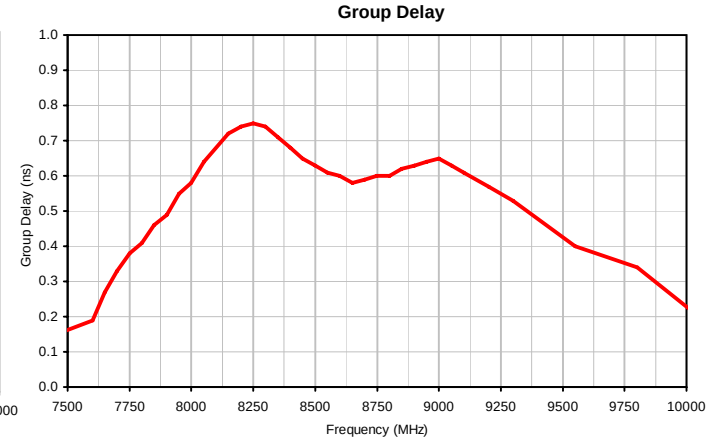

**Return Loss**




**Group Delay**



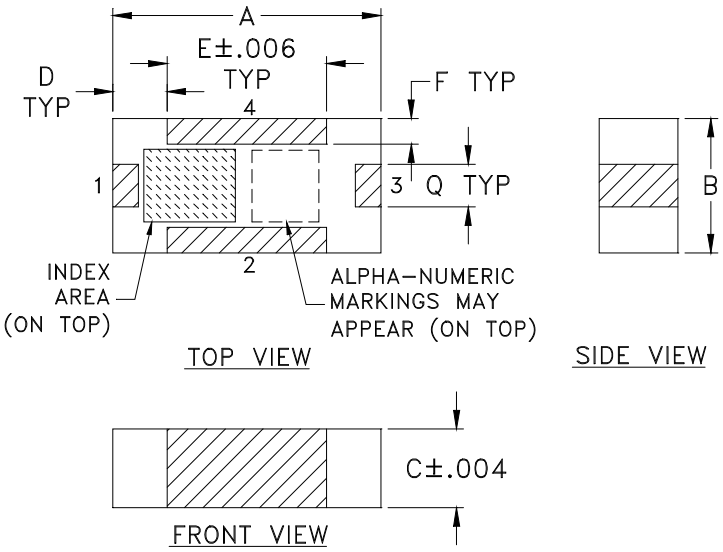

**Group Delay**



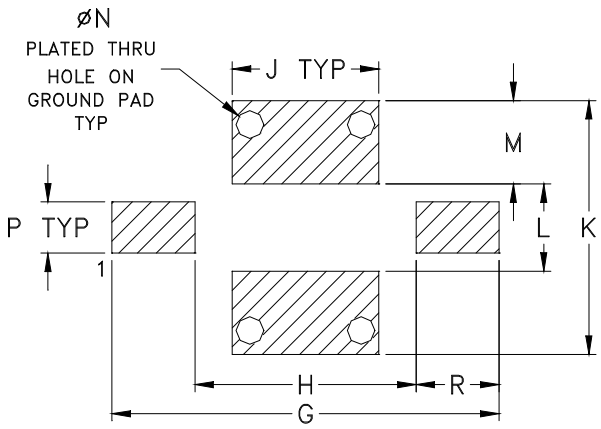
# Case Style FV

**FV1206-4**

## Outline Dimensions




### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

| CASE # | A | B | C | D | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FV1206-4 | .126 (3.20) | .063 (1.60) | .037 (0.94) | .026 (0.66) | .075 (1.91) | .012 (0.30) | .182 (4.62) | .104 (2.64) | .069 (1.75) | .119 (3.02) | .041 (1.04) | .039 (0.99) |

| CASE # | N | P | Q | R | WT. GRAM |
|---|---|---|---|---|---|
| FV1206-4 | .013 (0.33) | .024 (0.61) | .020 (0.51) | .039 (0.99) | .020 |

**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.

# Tape & Reel Packaging TR-F75

DEVICE ORIENTATION IN T&R

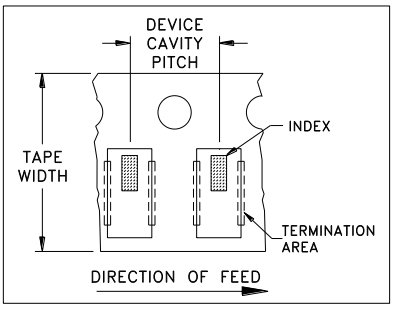



ILLUSTRATION 1

| Applicable Case Styles |
|---|
| FV1206-1 |
| FV1206-3 |

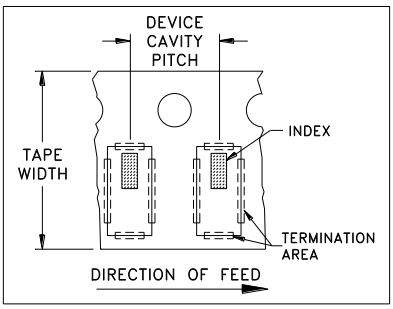



ILLUSTRATION 2

| Applicable Case Styles |
|---|
| FV1206-4 |
| FV1206-5 |
| FV1206-6 |
| FV1206-7 |
| FV1206-9 |

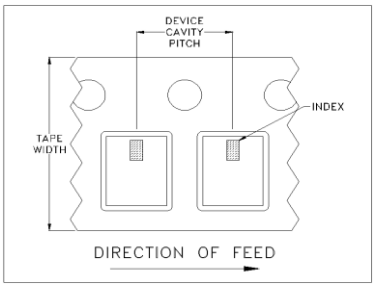



ILLUSTRATION 3

| Applicable Case Styles |
|---|
| FV1206-12 |
| GE0805C-18 |
| NL1008C-6 |
| NL1008C-7 |
| NL1008C-9 |
| NL1008C-10 |

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 8 | 4 | 7 | Small quantity standards (see note) | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | | | 1000 |
| | | | Standard | 3000 |

Note: Please consult individual model data sheet to determine device per reel availability.

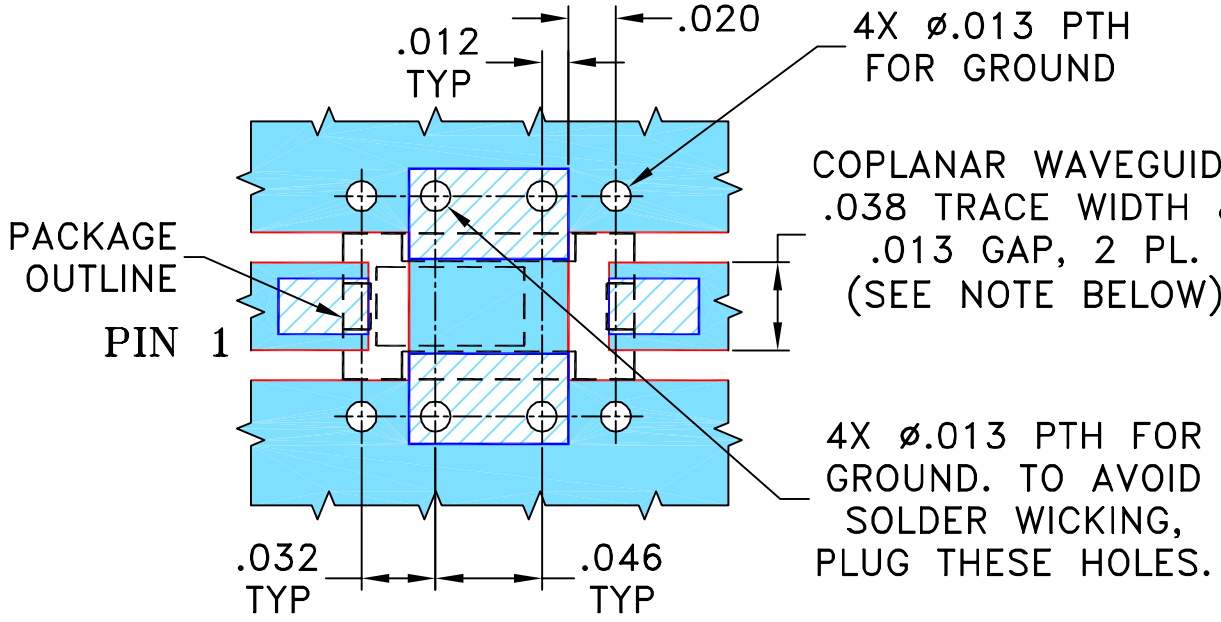
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M123589 | NEW RELEASE | 01/15/09 | AV | ABD |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION
# FOR FV1206-4 CASE STYLE, "04FL01" PIN CODE




NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE 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 SOLDER MASK

| UNLESS OTHERWISE SPECIFIED | | INITIALS | DATE |
|---|---|---|---|
| DIMENSIONS ARE IN INCHES | DRAWN | AV | 07/10/09 |
| TOLERANCES ON: | CHECKED | IL | 01/15/09 |
| 2 PL DECIMALS ± | APPROVED | ABD | 01/15/09 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



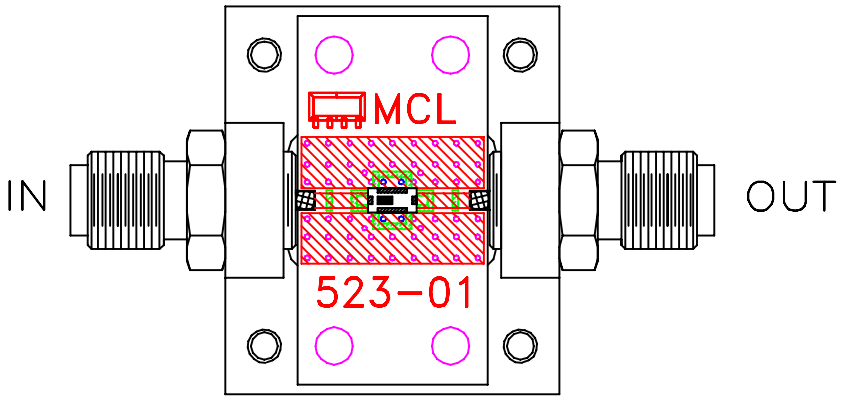
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

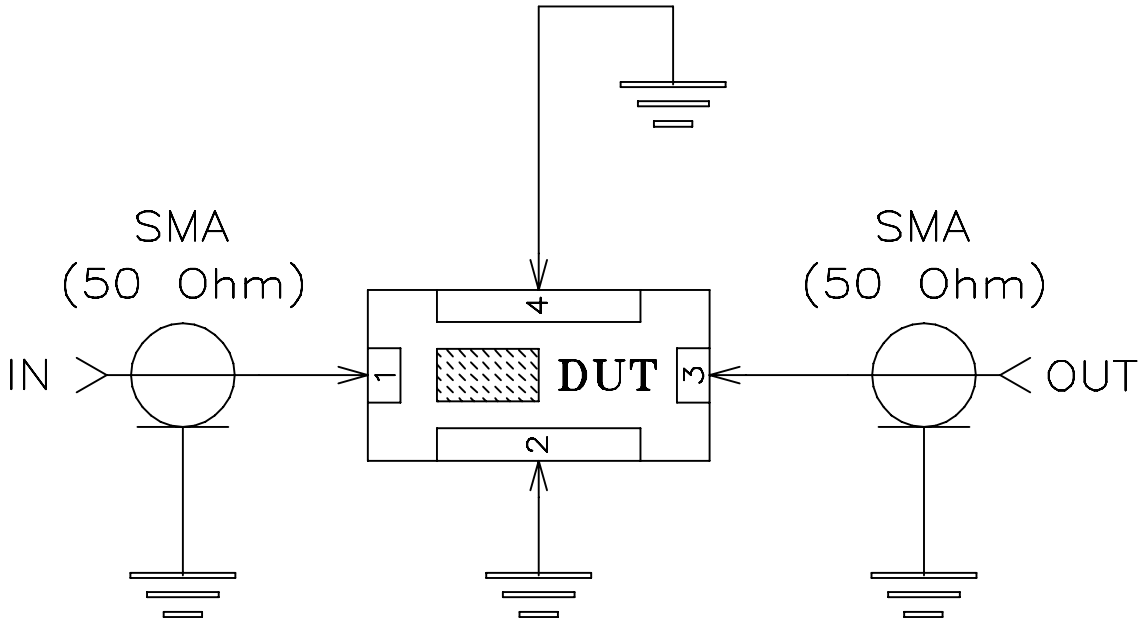
PL, 04FL01, FV1206-4, BFCN, TB-518+

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-305 | OR |
| FILE: 98PL305 | | SCALE: 12:1 | SHEET: 1 OF 1 |

# Evaluation Board and Circuit




TB-518+




Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
   Dielectric Constant=3.5, Thickness=.020 inch.

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Mini-Circuits

# Environmental Specifications ENV28

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 100°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103 |
| Thermal Shock | -65° to 125°C, 5 cycles | MIL-STD-202, Method 107, Condition B |
| 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 | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18) | MIL-STD-202, Method 213, Condition I |