

# Bi-Directional Coupler

## BDCN-14-342+

50Ω 14 dB Coupling DC Pass 1700 to 3400 MHz

### Maximum Ratings

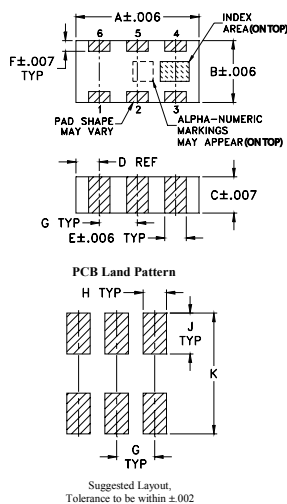
|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -55°C to 100°C |
| Storage Temperature                                             | -55°C to 100°C |
| DC Current                                                      | 0.5A           |
| Permanent damage may occur if any of these limits are exceeded. |                |

### Pin Connections

|                   |     |
|-------------------|-----|
| INPUT             | 1   |
| OUTPUT            | 4   |
| COUPLED (forward) | 6   |
| COUPLED (reverse) | 3   |
| GROUND            | 2,5 |

### Product Marking: CF

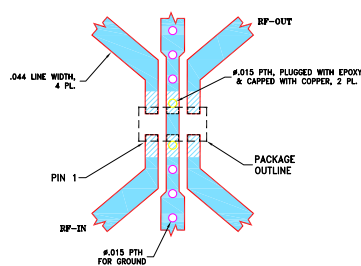
### Outline Drawing



### Outline Dimensions (inch/mm)

| A    | B    | C    | D    | E    | F     |
|------|------|------|------|------|-------|
| .126 | .063 | .035 | .024 | .022 | .011  |
| 3.20 | 1.60 | 0.89 | 0.61 | 0.56 | 0.28  |
| G    | H    | J    | K    | L    | wt    |
| .039 | .024 | .042 | .123 |      | grams |
| 0.99 | 0.61 | 1.07 | 3.12 |      | .020  |

### Demo Board MCL P/N: TB-1127+ Suggested PCB Layout (PL-669)



NOTES:  
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020"±.0015".  
2. COPPER: 1/2 OZ. EACH SIDE.  
3. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
4. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.  
5. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).  
6. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

#### 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-Circuit's 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-Circuit's website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

### Features

- four-port coupler
- wideband, 1700 to 3400 MHz
- excellent return loss, all ports
- ultra small size, hermetically sealed
- minimal variation with temperature variation
- protected by US Patent 7,049,905
- DC current through input to output 0.5A Max. at 1.0 watt RF input power

### Applications

- UMTS • CDMA
- PCS • ISM
- GPS • DCS
- TDMA

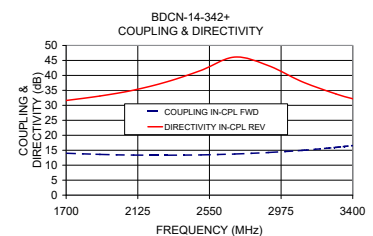
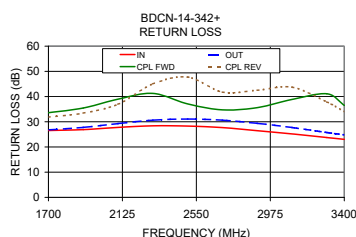
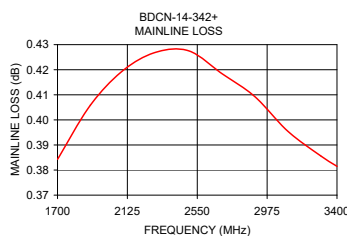
### Electrical Specifications at 25°C

| Parameter                | Condition (MHz)                     | Min.        | Typ.               | Max.                | Unit |
|--------------------------|-------------------------------------|-------------|--------------------|---------------------|------|
| Frequency Range          |                                     | 1700        | —                  | 3400                | MHz  |
| Mainline Loss            | 1700-2100<br>2100-2700<br>2700-3400 | —<br>—<br>— | 0.4<br>0.45<br>0.4 | 0.55<br>0.6<br>0.55 | dB   |
| Nominal Coupling         | 1700-2100<br>2100-2700<br>2700-3400 | —<br>—<br>— | 14<br>13<br>15.5   | —<br>—<br>—         | dB   |
| Coupling Flatness(±)     | 1700-2100<br>2100-2700<br>2700-3400 | —<br>—<br>— | 0.4<br>0.4<br>2.1  | —<br>—<br>—         | dB   |
| Directivity              | 1700-2100<br>2100-2700<br>2700-3400 | 8<br>8<br>6 | 15<br>20<br>15     | —<br>—<br>—         | dB   |
| Return Loss (Input)      | 1700-3400                           | —           | 20                 | —                   | dB   |
| Return Loss (Output)     | 1700-3400                           | —           | 20                 | —                   | dB   |
| Return Loss (Coupling)   | 1700-3400                           | —           | 20                 | —                   | dB   |
| Input Power <sup>1</sup> | 1700-3400                           | —           | —                  | 16                  | W    |

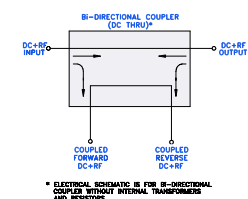
1. Derate linearly 8W at 100°C

### Typical Performance Data

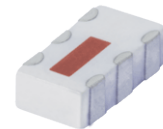
| Frequency (MHz) | Mainline Loss (dB) |            | Coupling (dB) |             | Directivity (dB) |      | Return Loss (dB) |         |         |
|-----------------|--------------------|------------|---------------|-------------|------------------|------|------------------|---------|---------|
|                 | In-Out             | In-Cpl Fwd | Out-Cpl Rev   | Out-Cpl Fwd | In-Cpl Rev       | In   | Out              | Cpl Fwd | Cpl Rev |
| 1700.0          | 0.38               | 14.0       | 14.0          | 31.7        | 31.6             | 26.5 | 26.8             | 33.6    | 31.9    |
| 1900.0          | 0.41               | 13.6       | 13.6          | 33.4        | 33.1             | 26.9 | 27.8             | 35.4    | 33.5    |
| 2100.0          | 0.42               | 13.4       | 13.4          | 36.0        | 35.1             | 27.8 | 29.3             | 39.0    | 37.0    |
| 2300.0          | 0.43               | 13.3       | 13.3          | 40.2        | 37.9             | 28.4 | 30.6             | 41.2    | 45.0    |
| 2500.0          | 0.43               | 13.4       | 13.4          | 48.1        | 41.7             | 28.3 | 31.1             | 37.1    | 47.7    |
| 2700.0          | 0.42               | 13.7       | 13.7          | 52.6        | 46.1             | 27.7 | 30.6             | 34.7    | 41.8    |
| 2900.0          | 0.41               | 14.2       | 14.2          | 41.1        | 43.3             | 26.5 | 29.4             | 35.6    | 42.5    |
| 3100.0          | 0.40               | 14.9       | 14.9          | 36.1        | 37.9             | 25.2 | 27.7             | 38.9    | 43.7    |
| 3300.0          | 0.39               | 15.9       | 15.9          | 32.5        | 33.8             | 23.7 | 25.7             | 41.1    | 37.9    |
| 3400.0          | 0.38               | 16.6       | 16.5          | 31.1        | 32.2             | 23.0 | 24.8             | 36.5    | 34.0    |



### Electrical Schematic



\* ELECTRICAL SCHEMATIC IS FOR BI-DIRECTIONAL COUPLER WITHOUT INTERNAL TRANSFORMERS AND RESISTORS.



Generic photo used for illustration purposes only

CASE STYLE: FV1206-1

+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 |

# Bi-Directional Coupler

BDCN-14-342+

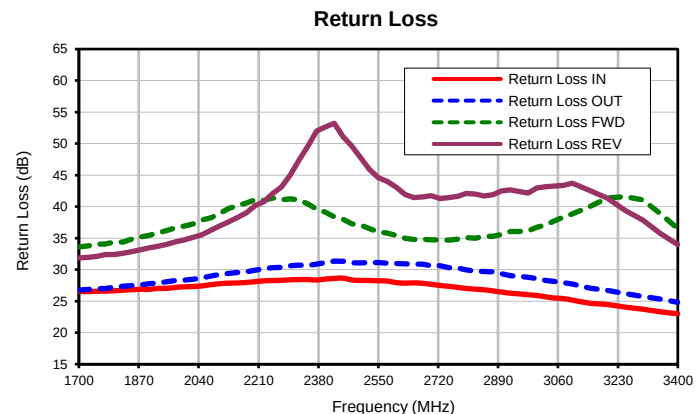
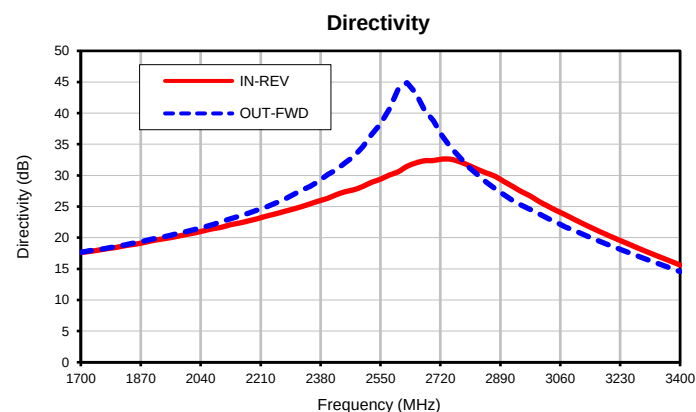
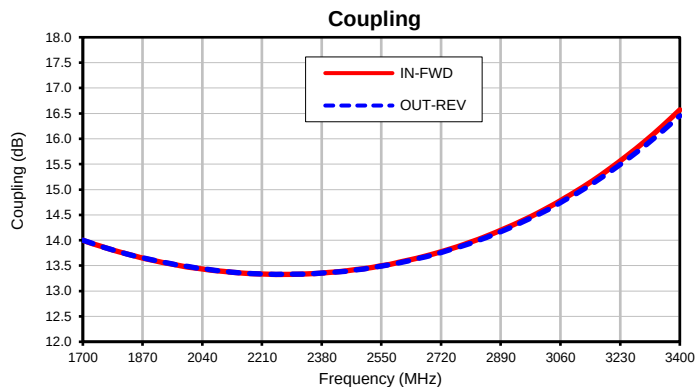
## Typical Performance Data

| FREQ.<br>(MHz) | INSERTION<br>LOSS<br>(dB)<br>IN-OUT | COUPLING<br>(dB) |         | DIRECTIVITY<br>(dB) |         | RETURN LOSS<br>(dB) |       |       |       |
|----------------|-------------------------------------|------------------|---------|---------------------|---------|---------------------|-------|-------|-------|
|                |                                     | IN-FWD           | OUT-REV | IN-REV              | OUT-FWD | IN                  | OUT   | FWD   | REV   |
|                |                                     |                  |         |                     |         |                     |       |       |       |
| 1700           | 0.38                                | 14.00            | 14.00   | 17.63               | 17.66   | 26.54               | 26.78 | 33.60 | 31.87 |
| 1725           | 0.39                                | 13.94            | 13.94   | 17.79               | 17.90   | 26.53               | 26.88 | 33.78 | 31.94 |
| 1750           | 0.39                                | 13.88            | 13.88   | 18.01               | 18.08   | 26.58               | 26.95 | 34.01 | 32.08 |
| 1775           | 0.39                                | 13.83            | 13.83   | 18.25               | 18.32   | 26.61               | 27.02 | 34.08 | 32.39 |
| 1800           | 0.40                                | 13.78            | 13.78   | 18.44               | 18.60   | 26.65               | 27.23 | 34.38 | 32.41 |
| 1825           | 0.40                                | 13.73            | 13.73   | 18.72               | 18.84   | 26.74               | 27.36 | 34.40 | 32.59 |
| 1850           | 0.40                                | 13.69            | 13.69   | 18.93               | 19.17   | 26.82               | 27.49 | 34.84 | 32.87 |
| 1875           | 0.41                                | 13.64            | 13.65   | 19.17               | 19.39   | 26.89               | 27.59 | 35.22 | 33.18 |
| 1900           | 0.41                                | 13.60            | 13.61   | 19.49               | 19.75   | 26.88               | 27.77 | 35.45 | 33.45 |
| 1925           | 0.41                                | 13.57            | 13.57   | 19.74               | 20.04   | 27.04               | 27.88 | 35.83 | 33.72 |
| 1950           | 0.41                                | 13.54            | 13.54   | 19.97               | 20.34   | 27.04               | 28.11 | 36.20 | 34.04 |
| 1975           | 0.41                                | 13.50            | 13.51   | 20.24               | 20.68   | 27.19               | 28.27 | 36.64 | 34.42 |
| 2000           | 0.41                                | 13.47            | 13.48   | 20.52               | 21.00   | 27.29               | 28.36 | 36.92 | 34.74 |
| 2025           | 0.42                                | 13.45            | 13.45   | 20.79               | 21.36   | 27.34               | 28.48 | 37.28 | 35.15 |
| 2050           | 0.42                                | 13.42            | 13.43   | 21.13               | 21.73   | 27.43               | 28.71 | 37.86 | 35.53 |
| 2075           | 0.42                                | 13.40            | 13.41   | 21.45               | 22.12   | 27.63               | 29.02 | 38.26 | 36.24 |
| 2100           | 0.42                                | 13.39            | 13.39   | 21.69               | 22.57   | 27.77               | 29.27 | 38.97 | 36.97 |
| 2125           | 0.42                                | 13.37            | 13.37   | 22.09               | 23.04   | 27.87               | 29.42 | 39.73 | 37.57 |
| 2150           | 0.42                                | 13.36            | 13.36   | 22.35               | 23.45   | 27.89               | 29.53 | 40.15 | 38.29 |
| 2175           | 0.42                                | 13.34            | 13.35   | 22.69               | 23.91   | 27.97               | 29.64 | 40.58 | 39.01 |
| 2200           | 0.42                                | 13.34            | 13.34   | 23.03               | 24.43   | 28.09               | 29.90 | 41.07 | 40.17 |
| 2225           | 0.43                                | 13.33            | 13.33   | 23.45               | 24.92   | 28.24               | 30.16 | 41.00 | 40.78 |
| 2250           | 0.43                                | 13.33            | 13.33   | 23.80               | 25.49   | 28.28               | 30.32 | 41.37 | 42.09 |
| 2275           | 0.43                                | 13.33            | 13.33   | 24.18               | 26.09   | 28.32               | 30.38 | 41.07 | 43.10 |
| 2300           | 0.43                                | 13.33            | 13.33   | 24.56               | 26.84   | 28.40               | 30.64 | 41.25 | 45.03 |
| 2325           | 0.43                                | 13.33            | 13.33   | 24.97               | 27.57   | 28.43               | 30.72 | 41.08 | 47.39 |
| 2350           | 0.43                                | 13.34            | 13.34   | 25.43               | 28.26   | 28.44               | 30.65 | 40.42 | 49.59 |
| 2375           | 0.43                                | 13.35            | 13.35   | 25.90               | 29.08   | 28.36               | 30.88 | 39.61 | 52.00 |
| 2400           | 0.43                                | 13.37            | 13.36   | 26.32               | 30.12   | 28.52               | 31.14 | 39.09 | 52.64 |
| 2425           | 0.43                                | 13.38            | 13.38   | 26.91               | 30.93   | 28.61               | 31.35 | 38.40 | 53.22 |
| 2450           | 0.43                                | 13.40            | 13.39   | 27.39               | 32.07   | 28.66               | 31.31 | 38.01 | 51.06 |
| 2475           | 0.43                                | 13.42            | 13.42   | 27.70               | 33.06   | 28.37               | 31.10 | 37.27 | 49.63 |
| 2500           | 0.43                                | 13.44            | 13.43   | 28.23               | 34.61   | 28.29               | 31.07 | 37.09 | 47.71 |
| 2525           | 0.42                                | 13.47            | 13.46   | 28.90               | 36.63   | 28.29               | 31.15 | 36.50 | 45.93 |
| 2550           | 0.43                                | 13.50            | 13.49   | 29.40               | 38.26   | 28.23               | 31.15 | 35.99 | 44.58 |
| 2575           | 0.42                                | 13.53            | 13.52   | 30.06               | 40.66   | 28.20               | 31.04 | 35.79 | 44.05 |
| 2600           | 0.42                                | 13.57            | 13.56   | 30.57               | 43.83   | 27.95               | 30.99 | 35.45 | 43.09 |
| 2625           | 0.42                                | 13.60            | 13.59   | 31.45               | 44.89   | 27.87               | 30.95 | 34.99 | 41.96 |
| 2650           | 0.42                                | 13.64            | 13.63   | 32.00               | 43.25   | 27.90               | 30.90 | 34.79 | 41.43 |
| 2675           | 0.42                                | 13.69            | 13.67   | 32.35               | 40.48   | 27.84               | 30.89 | 34.82 | 41.54 |
| 2700           | 0.42                                | 13.73            | 13.72   | 32.39               | 38.83   | 27.68               | 30.63 | 34.72 | 41.76 |
| 2725           | 0.42                                | 13.78            | 13.77   | 32.63               | 36.37   | 27.50               | 30.60 | 34.75 | 41.27 |
| 2750           | 0.42                                | 13.84            | 13.82   | 32.59               | 34.46   | 27.36               | 30.31 | 34.70 | 41.43 |
| 2775           | 0.42                                | 13.89            | 13.88   | 32.19               | 32.91   | 27.20               | 30.25 | 34.83 | 41.65 |
| 2800           | 0.42                                | 13.95            | 13.93   | 31.62               | 31.38   | 27.02               | 29.96 | 35.10 | 42.09 |
| 2825           | 0.41                                | 14.01            | 14.00   | 30.99               | 30.15   | 26.92               | 29.77 | 35.01 | 41.98 |
| 2850           | 0.41                                | 14.08            | 14.06   | 30.40               | 28.90   | 26.81               | 29.69 | 35.29 | 41.69 |
| 2875           | 0.41                                | 14.15            | 14.13   | 29.87               | 27.87   | 26.64               | 29.65 | 35.32 | 41.88 |
| 2900           | 0.41                                | 14.23            | 14.20   | 29.03               | 26.92   | 26.45               | 29.37 | 35.60 | 42.52 |
| 2925           | 0.41                                | 14.30            | 14.27   | 28.23               | 25.99   | 26.26               | 29.07 | 36.06 | 42.63 |
| 2950           | 0.41                                | 14.38            | 14.35   | 27.40               | 25.22   | 26.16               | 28.95 | 36.07 | 42.38 |
| 2975           | 0.40                                | 14.46            | 14.43   | 26.70               | 24.56   | 26.03               | 28.79 | 36.15 | 42.17 |
| 3000           | 0.40                                | 14.55            | 14.52   | 25.81               | 23.80   | 25.91               | 28.58 | 36.73 | 42.96 |
| 3025           | 0.40                                | 14.65            | 14.61   | 25.06               | 23.09   | 25.69               | 28.30 | 37.12 | 43.15 |
| 3050           | 0.40                                | 14.74            | 14.70   | 24.33               | 22.44   | 25.51               | 28.12 | 37.75 | 43.27 |
| 3075           | 0.40                                | 14.84            | 14.80   | 23.67               | 21.71   | 25.42               | 27.95 | 38.34 | 43.36 |
| 3100           | 0.40                                | 14.95            | 14.90   | 22.94               | 21.14   | 25.18               | 27.72 | 38.87 | 43.73 |
| 3150           | 0.39                                | 15.17            | 15.11   | 21.56               | 19.90   | 24.68               | 27.04 | 40.01 | 42.56 |
| 3200           | 0.39                                | 15.41            | 15.34   | 20.28               | 18.77   | 24.48               | 26.74 | 41.39 | 41.36 |
| 3250           | 0.39                                | 15.67            | 15.59   | 19.08               | 17.70   | 24.06               | 26.22 | 41.59 | 39.41 |
| 3300           | 0.39                                | 15.95            | 15.86   | 17.87               | 16.60   | 23.74               | 25.74 | 41.10 | 37.88 |
| 3350           | 0.38                                | 16.25            | 16.15   | 16.74               | 15.61   | 23.32               | 25.33 | 38.92 | 35.73 |
| 3400           | 0.38                                | 16.57            | 16.45   | 15.62               | 14.57   | 23.01               | 24.82 | 36.51 | 33.99 |

# Bi-Directional Coupler

## Typical Performance Curves

BDCN-14-342+



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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

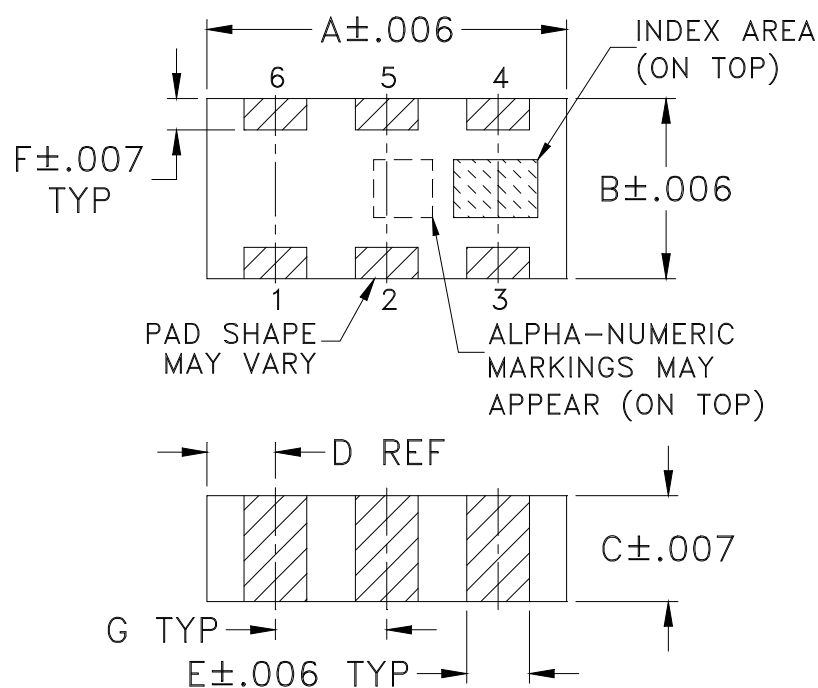


IF/RF MICROWAVE COMPONENTS

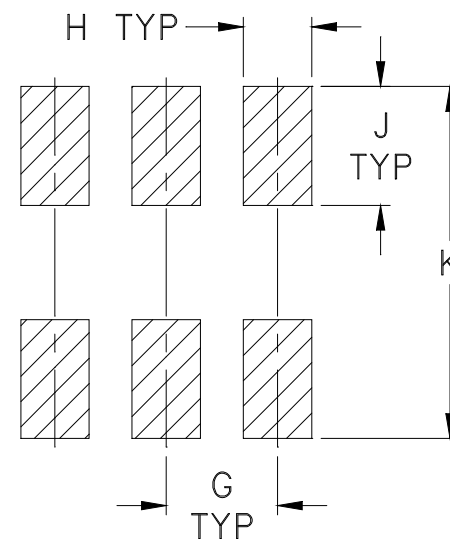


REV. A  
BDCN-14-342+  
10/14/2015  
Page 1 of 1

### Outline Dimensions



### 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  | WT. GRAM |
|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|----|----|----|----------|
| FV1206-1 | .126<br>(3.20) | .063<br>(1.60) | .035<br>(0.89) | .024<br>(0.61) | .022<br>(0.56) | .011<br>(0.28) | .039<br>(0.99) | .024<br>(0.61) | .042<br>(1.07) | .123<br>(3.12) | -- | -- | -- | -- | .020     |

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

#### Notes:

- Open style, ceramic base.
- 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.



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RF/IF MICROWAVE COMPONENTS

## DEVICE ORIENTATION IN T&R

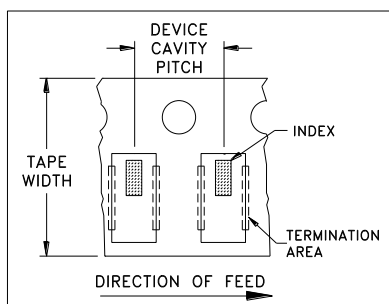


ILLUSTRATION 1

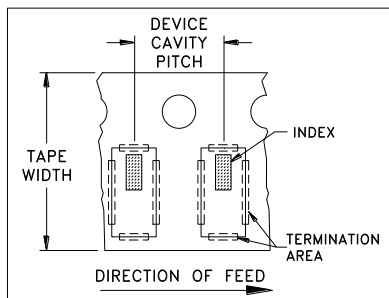


ILLUSTRATION 2

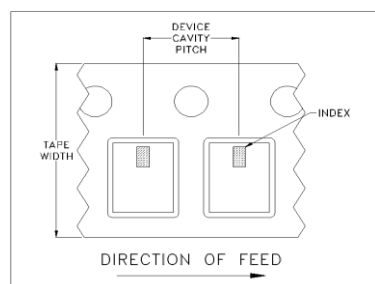


ILLUSTRATION 3

### Applicable Case Styles

FV1206-1  
FV1206-3

### Applicable Case Styles

FV1206-4  
FV1206-5  
FV1206-6  
FV1206-7  
FV1206-9

### Applicable Case Styles

FV1206-11  
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](http://www.minicircuits.com/pages/pdfs/tape.pdf)

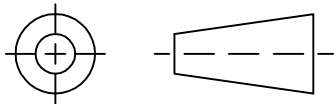


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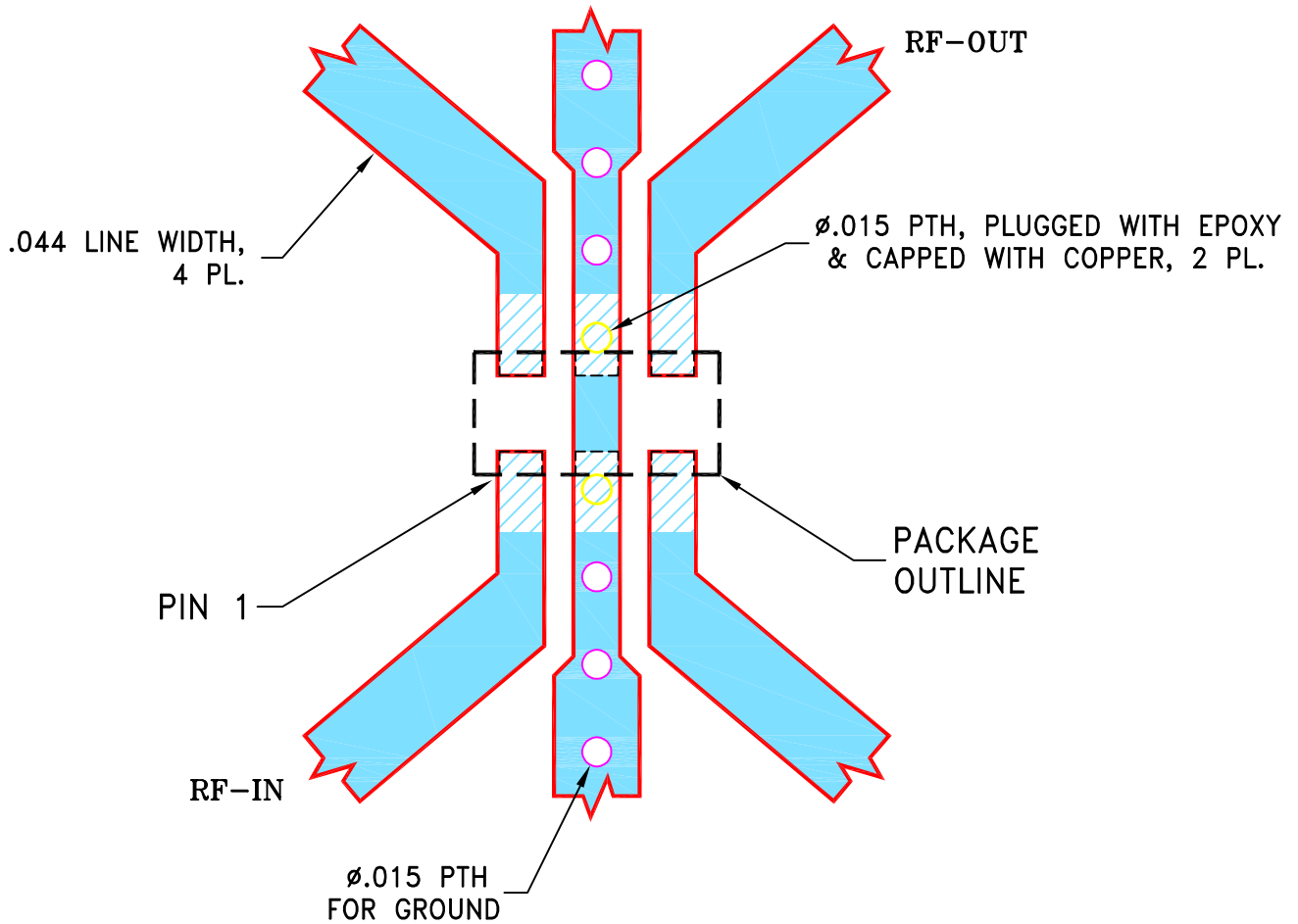
## THIRD ANGLE PROJECTION



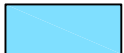
## REVISIONS

| REV | ECN No.    | DESCRIPTION | DATE     | DR  | AUTH |
|-----|------------|-------------|----------|-----|------|
| OR  | ECO-002173 | NEW RELEASE | 03/19/20 | ITG | SL   |
|     |            |             |          |     |      |
|     |            |             |          |     |      |
|     |            |             |          |     |      |

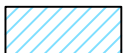
SUGGESTED MOUNTING CONFIGURATION  
FOR FV1206-1 CASE STYLE

**NOTES:**

- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.020'' \pm .0015''$ .  
COPPER: 1/2 OZ. EACH SIDE.  
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



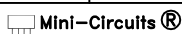
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

| UNLESS OTHERWISE SPECIFIED | INITIALS | DATE     |
|----------------------------|----------|----------|
| DRAWN                      | ITG      | 03/18/20 |
| CHECKED                    | GF       | 03/18/20 |
| APPROVED                   | SL       | 03/19/20 |

DIMENSIONS ARE IN INCHES  
TOLERANCES ON:  
2 PL DECIMALS  $\pm$   
3 PL DECIMALS  $\pm$  .005  
ANGLES  $\pm$   
FRACTIONS  $\pm$



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

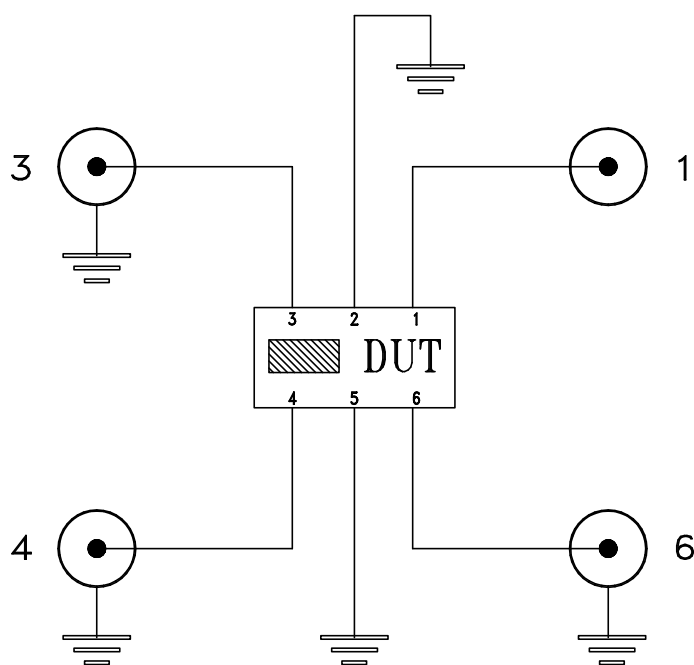
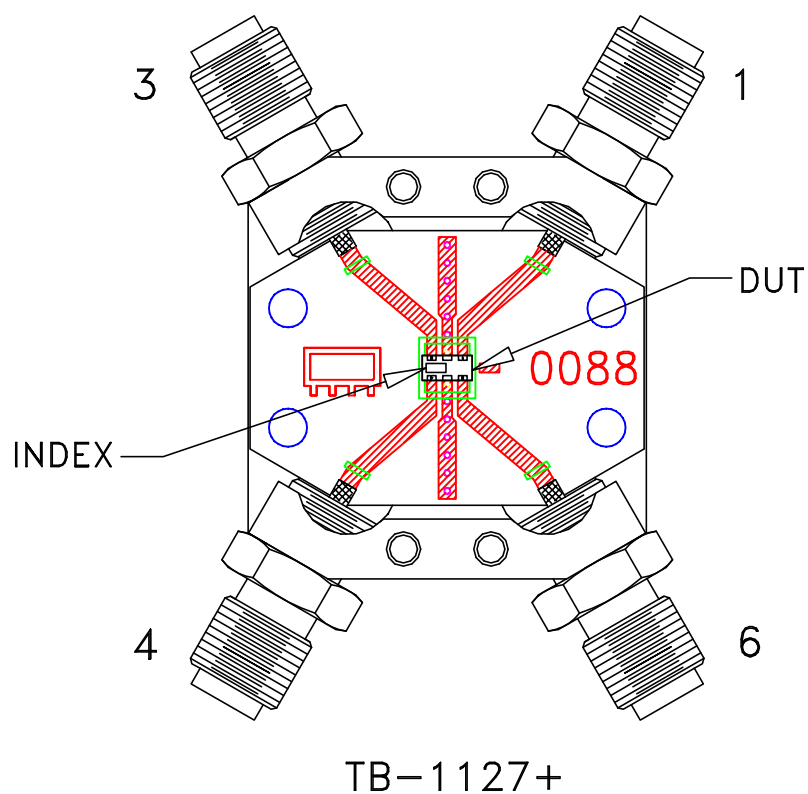


**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

**PL, FV1206-1, TB-1127+**

| SIZE  | CODE IDENT | DRAWING NO: | REV:          |
|-------|------------|-------------|---------------|
| A     | 15542      | 98-PL-669   | OR            |
| FILE: | 98PL669    | SCALE: 10:1 | SHEET: 1 OF 1 |

# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 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      | -55° to 100°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 |
| 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, Para 4.2.5, Test S, 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                                                                 |