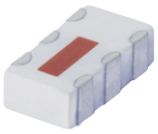
*High Power*

# Bi-Directional Coupler

## BDCN-17-25+

50Ω 17dB Coupling DC Pass 824 to 2525 MHz



*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 |

### 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 |

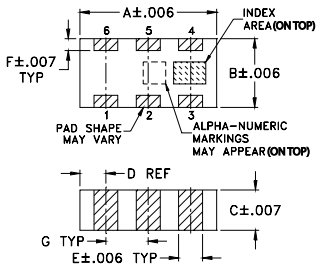
### Features

- four-port coupler
- wideband, 824 to 2525 MHz
- excellent VSWR, 1.2:1 typ., 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

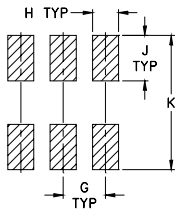
### Applications

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

### Outline Drawing




PCB Land Pattern



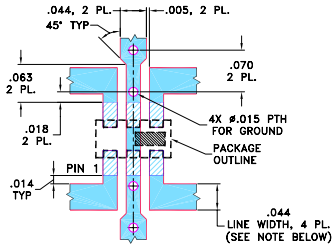

Suggested Layout,
Tolerance to be within ±.002

### 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 | wt |
|---|---|---|---|---|
| .039 | .024 | .042 | .123 | grams |
| 0.99 | 0.61 | 1.07 | 3.12 | .020 |

*Demo Board MCL P/N: TB-255+*
*Suggested PCB Layout (PL-131)*




NOTES: 1.TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; 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

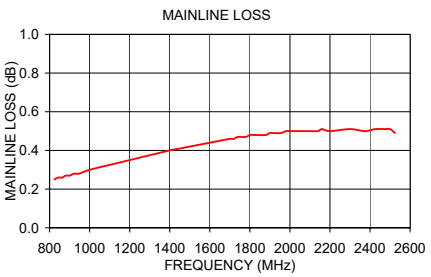
### Bi-Directional Coupler Electrical Specifications

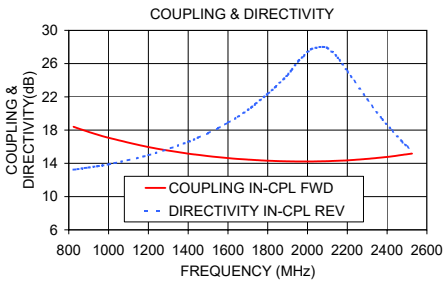
| FREQUENCY (MHz) | COUPLING (dB) | | MAINLINE LOSS[1] (dB) | | DIRECTIVITY (dB) | | VSWR (:1) | POWER INPUT[2] (W) |
|---|---|---|---|---|---|---|---|---|
| $f_L$-$f_U$ | Nom. | Max. Flatness | Typ. | Max. | Typ. | Min. | Typ. | Max. |
| **824-2525** | **16.8±2.0** | **±3.0** | **0.6** | **0.9** | **13** | **10** | **1.2** | **16** |
| 824-894 | 18.3±0.6 | ±0.6 | 0.3 | 0.8 | 13 | 10 | 1.2 | 16 |
| 880-960 | 17.6±0.6 | ±0.6 | 0.3 | 0.8 | 13 | 10 | 1.2 | 16 |
| 1710-1880 | 14.3±0.6 | ±0.4 | 0.5 | 0.9 | 22 | 17 | 1.2 | 16 |
| 1850-1990 | 14.3±0.6 | ±0.4 | 0.5 | 0.9 | 22 | 17 | 1.2 | 16 |
| 2110-2170 | 14.3±0.6 | ±0.5 | 0.5 | 0.9 | 25 | 20 | 1.2 | 16 |
| 2375-2525 | 15.0±0.6 | ±0.8 | 0.5 | 0.9 | 15 | 11 | 1.2 | 16 |

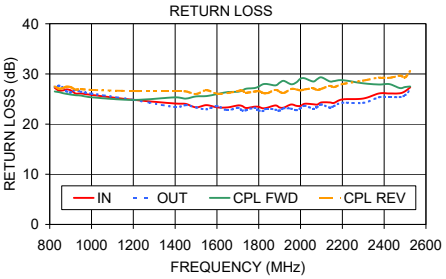
1. Includes theoretical power loss of 0.1 dB at 17 dB coupling.
2. Derate linearly 8W at 100°C

### Typical Performance Data

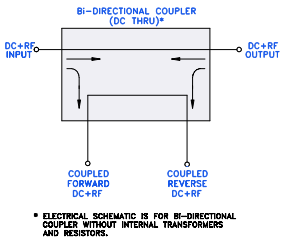
| Frequency (MHz) | Mainline Loss (dB) | Coupling (dB) | | Directivity (dB) | | Return Loss (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | In-Out | In-Cpl Fwd | Out-Cpl Rev | Out-Cpl Fwd | In-Cpl Rev | In | Out | Cpl Fwd | Cpl Rev |
| 824.00 | 0.25 | 18.40 | 18.40 | 13.19 | 13.24 | 27.22 | 27.34 | 26.50 | 27.52 |
| 1000.00 | 0.30 | 17.07 | 17.08 | 13.85 | 13.88 | 25.83 | 26.07 | 25.35 | 26.82 |
| 1500.00 | 0.42 | 14.87 | 14.88 | 17.67 | 17.63 | 23.35 | 23.34 | 25.52 | 25.99 |
| 1700.00 | 0.46 | 14.45 | 14.46 | 20.65 | 20.43 | 23.72 | 23.26 | 26.46 | 26.58 |
| 1800.00 | 0.48 | 14.32 | 14.33 | 22.72 | 22.36 | 23.44 | 22.72 | 27.48 | 26.58 |
| 1880.00 | 0.48 | 14.25 | 14.26 | 24.64 | 24.13 | 23.72 | 22.87 | 27.72 | 26.82 |
| 2000.00 | 0.50 | 14.22 | 14.23 | 27.94 | 27.40 | 23.63 | 23.17 | 29.06 | 26.72 |
| 2100.00 | 0.50 | 14.26 | 14.26 | 28.30 | 27.88 | 24.33 | 23.91 | 29.31 | 27.02 |
| 2300.00 | 0.51 | 14.54 | 14.53 | 21.69 | 21.71 | 25.09 | 24.22 | 28.13 | 28.67 |
| 2525.00 | 0.49 | 15.18 | 15.16 | 15.51 | 15.42 | 27.33 | 26.72 | 27.50 | 30.60 |




### Electrical Schematic




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

# Bi-Directional Coupler BDCN-17-25+

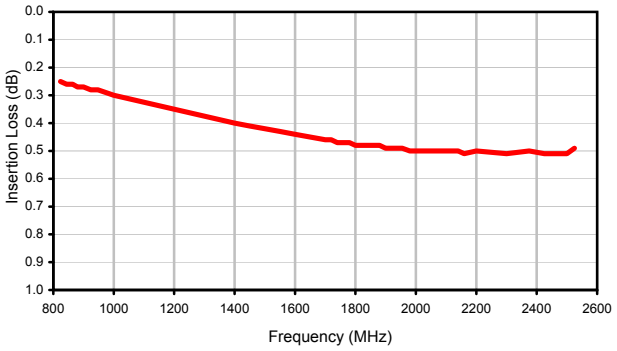
## *Typical Performance Data*

| FREQUENCY (MHz) | INSERTION LOSS (dB) | COUPLING (dB) | | DIRECTIVITY (dB) | | RETURN LOSS (dB) | | | TERM (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | | IN | OUT | IN | OUT | IN | OUT | CPL | |
| 824.0 | 0.25 | 18.40 | 18.40 | 13.24 | 13.19 | 27.22 | 27.34 | 26.50 | 27.52 |
| 844.0 | 0.26 | 18.23 | 18.23 | 13.30 | 13.24 | 26.68 | 27.65 | 26.37 | 27.07 |
| 864.0 | 0.26 | 18.07 | 18.07 | 13.37 | 13.31 | 26.73 | 27.23 | 26.16 | 27.20 |
| 880.0 | 0.27 | 17.94 | 17.94 | 13.44 | 13.37 | 26.92 | 26.55 | 26.03 | 27.45 |
| 900.0 | 0.27 | 17.78 | 17.78 | 13.50 | 13.44 | 26.74 | 26.31 | 25.89 | 27.38 |
| 924.0 | 0.28 | 17.60 | 17.60 | 13.59 | 13.53 | 26.09 | 26.83 | 25.76 | 26.86 |
| 948.0 | 0.28 | 17.43 | 17.43 | 13.67 | 13.62 | 26.11 | 26.47 | 25.70 | 26.97 |
| 1000.0 | 0.30 | 17.07 | 17.08 | 13.88 | 13.85 | 25.83 | 26.07 | 25.35 | 26.82 |
| 1200.0 | 0.35 | 15.96 | 15.97 | 14.99 | 14.98 | 24.85 | 24.85 | 24.83 | 26.59 |
| 1400.0 | 0.40 | 15.17 | 15.18 | 16.58 | 16.62 | 24.10 | 23.41 | 25.34 | 26.58 |
| 1450.0 | 0.41 | 15.02 | 15.03 | 17.09 | 17.14 | 24.04 | 23.79 | 25.08 | 26.53 |
| 1500.0 | 0.42 | 14.87 | 14.88 | 17.63 | 17.67 | 23.35 | 23.34 | 25.52 | 25.99 |
| 1550.0 | 0.43 | 14.75 | 14.75 | 18.23 | 18.33 | 23.79 | 22.95 | 25.58 | 26.74 |
| 1600.0 | 0.44 | 14.63 | 14.65 | 18.91 | 19.07 | 23.34 | 23.58 | 25.98 | 26.07 |
| 1650.0 | 0.45 | 14.53 | 14.54 | 19.59 | 19.81 | 23.33 | 22.75 | 26.38 | 26.18 |
| 1700.0 | 0.46 | 14.45 | 14.46 | 20.43 | 20.65 | 23.72 | 23.26 | 26.46 | 26.58 |
| 1720.0 | 0.46 | 14.42 | 14.43 | 20.78 | 21.01 | 23.62 | 22.75 | 26.68 | 26.71 |
| 1740.0 | 0.47 | 14.39 | 14.40 | 21.18 | 21.40 | 23.21 | 22.77 | 27.05 | 26.28 |
| 1780.0 | 0.47 | 14.34 | 14.35 | 21.97 | 22.28 | 23.47 | 23.26 | 27.19 | 26.48 |
| 1800.0 | 0.48 | 14.32 | 14.33 | 22.36 | 22.72 | 23.44 | 22.72 | 27.48 | 26.58 |
| 1820.0 | 0.48 | 14.30 | 14.31 | 22.76 | 23.19 | 23.16 | 22.60 | 27.94 | 26.24 |
| 1840.0 | 0.48 | 14.28 | 14.29 | 23.20 | 23.68 | 23.27 | 23.11 | 27.99 | 26.14 |
| 1880.0 | 0.48 | 14.25 | 14.26 | 24.13 | 24.64 | 23.72 | 22.87 | 27.72 | 26.82 |
| 1900.0 | 0.49 | 14.24 | 14.25 | 24.64 | 25.18 | 23.31 | 22.68 | 28.26 | 26.46 |
| 1920.0 | 0.49 | 14.23 | 14.24 | 25.24 | 25.80 | 23.29 | 23.14 | 28.62 | 26.21 |
| 1955.0 | 0.49 | 14.22 | 14.23 | 26.34 | 26.88 | 23.91 | 23.07 | 27.94 | 27.00 |
| 1980.0 | 0.50 | 14.22 | 14.23 | 26.89 | 27.42 | 23.65 | 22.78 | 28.32 | 26.92 |
| 2000.0 | 0.50 | 14.22 | 14.23 | 27.40 | 27.94 | 23.63 | 23.17 | 29.06 | 26.72 |
| 2020.0 | 0.50 | 14.22 | 14.23 | 27.76 | 28.29 | 24.05 | 23.66 | 29.13 | 26.91 |
| 2060.0 | 0.50 | 14.24 | 14.24 | 27.99 | 28.51 | 23.96 | 23.09 | 28.50 | 27.10 |
| 2080.0 | 0.50 | 14.25 | 14.25 | 28.01 | 28.49 | 23.90 | 23.40 | 28.97 | 26.80 |
| 2100.0 | 0.50 | 14.26 | 14.26 | 27.88 | 28.30 | 24.33 | 23.91 | 29.31 | 27.02 |
| 2140.0 | 0.50 | 14.30 | 14.30 | 27.01 | 27.21 | 24.32 | 23.29 | 28.51 | 27.63 |
| 2160.0 | 0.51 | 14.32 | 14.32 | 26.45 | 26.57 | 24.23 | 23.60 | 28.57 | 27.36 |
| 2200.0 | 0.50 | 14.36 | 14.36 | 25.10 | 25.16 | 24.93 | 24.26 | 28.76 | 27.98 |
| 2300.0 | 0.51 | 14.54 | 14.53 | 21.71 | 21.69 | 25.09 | 24.22 | 28.13 | 28.67 |
| 2375.0 | 0.50 | 14.71 | 14.70 | 19.33 | 19.34 | 26.11 | 25.35 | 27.90 | 29.27 |
| 2425.0 | 0.51 | 14.84 | 14.83 | 17.97 | 18.01 | 26.11 | 25.41 | 27.98 | 29.22 |
| 2475.0 | 0.51 | 15.01 | 14.99 | 16.63 | 16.69 | 26.14 | 25.38 | 27.19 | 29.67 |
| 2500.0 | 0.51 | 15.09 | 15.06 | 16.04 | 16.11 | 26.53 | 25.74 | 27.39 | 29.32 |
| 2525.0 | 0.49 | 15.18 | 15.16 | 15.42 | 15.51 | 27.33 | 26.72 | 27.50 | 30.60 |

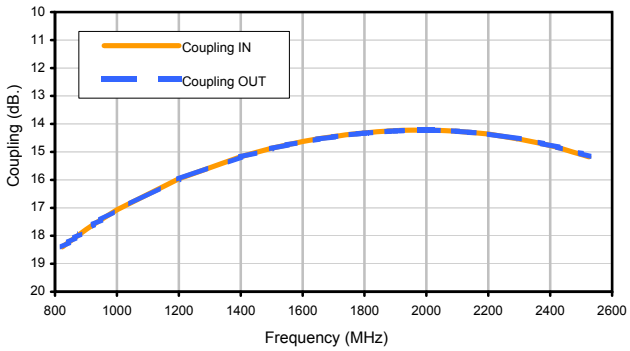
# Bi-Directional Coupler BDCN-17-25+

## *Typical Performance Curves*

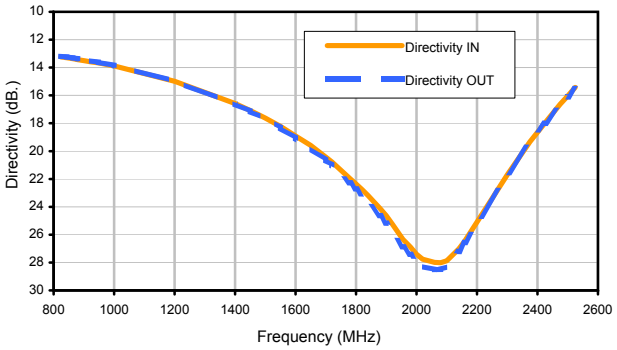
**Insertion Loss**



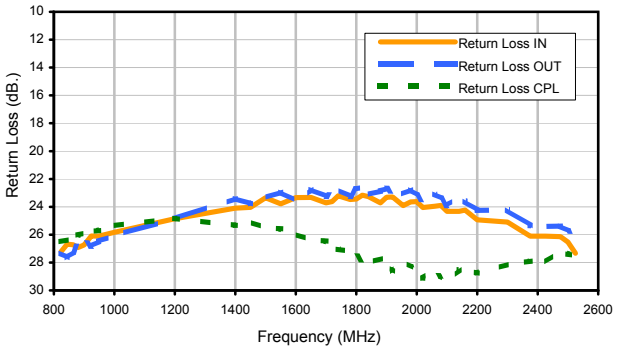

**Coupling**



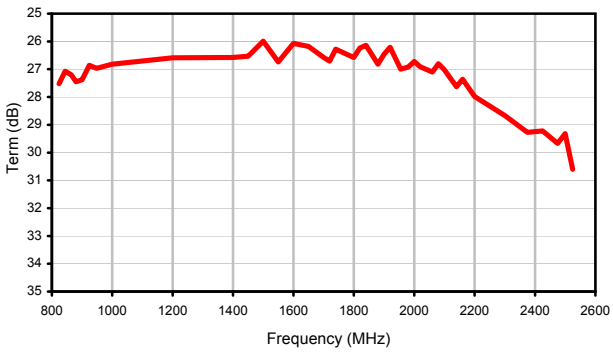

**Directivity**




**Return Loss**



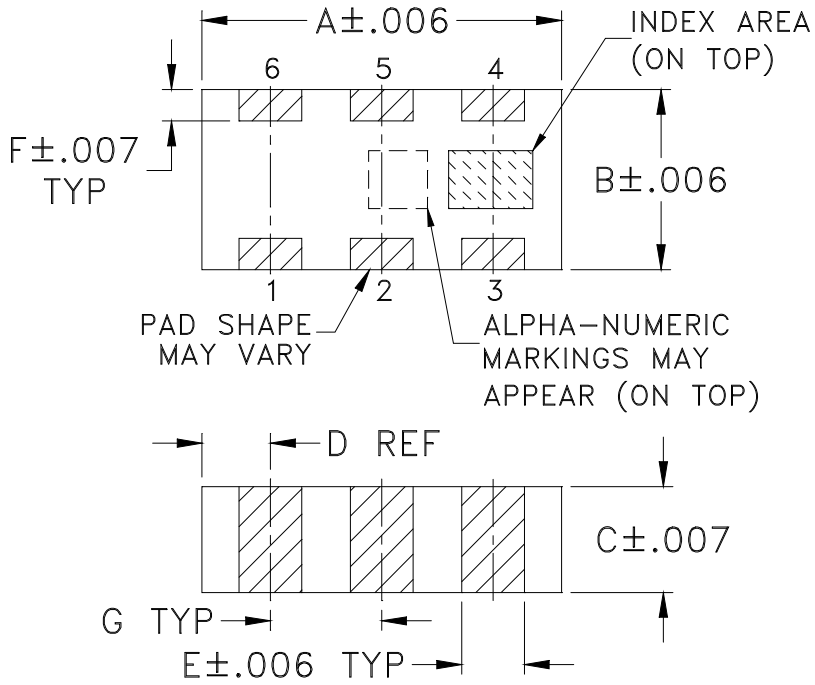

**Term**



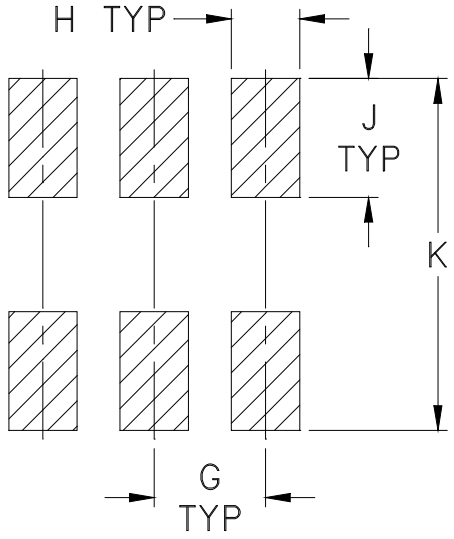
# Case Style FV

**FV1206-1**

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

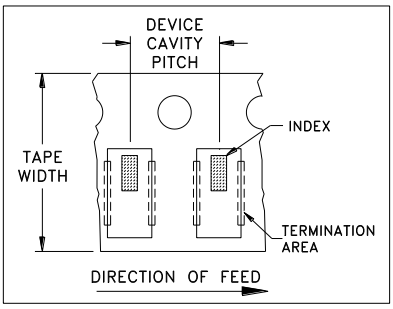



ILLUSTRATION 1

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

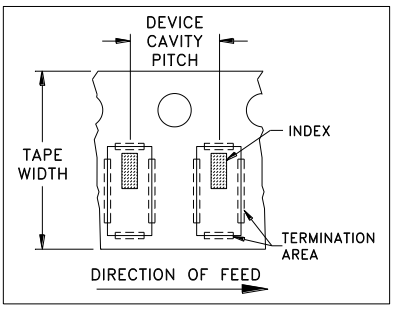



ILLUSTRATION 2

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

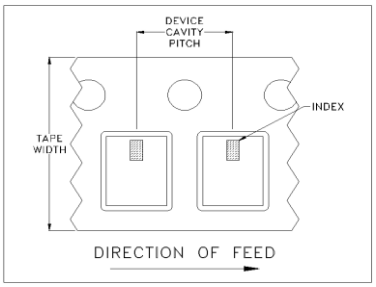



ILLUSTRATION 3

| 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.

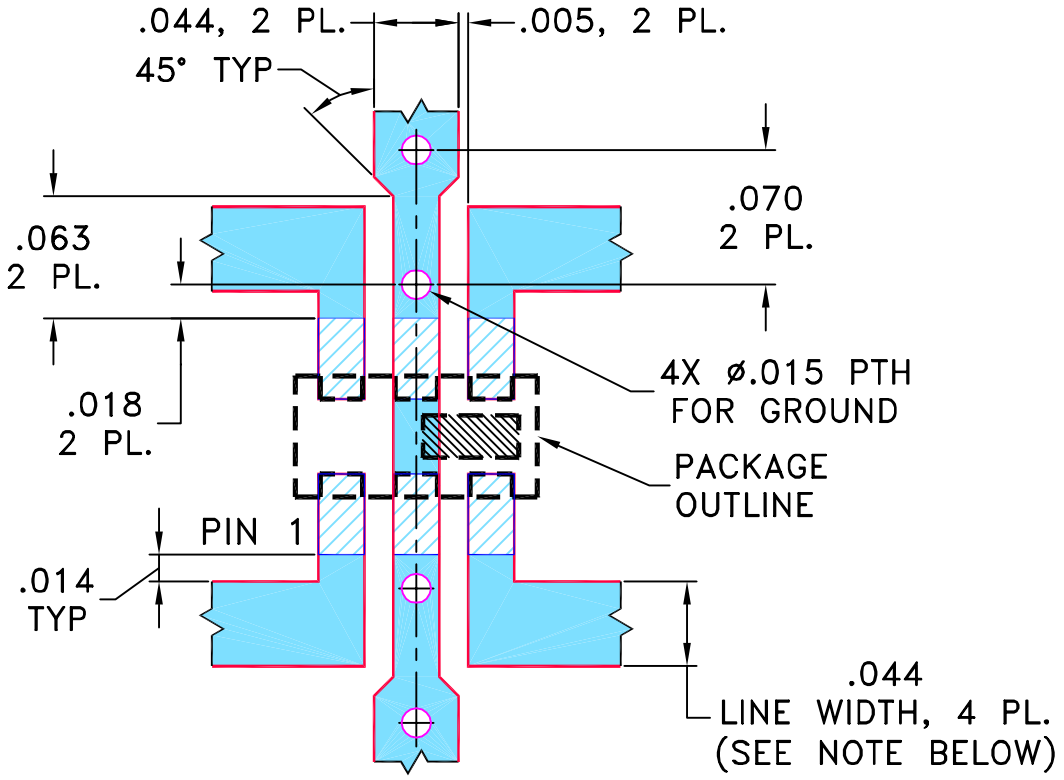
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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

THIRD ANGLE PROJECTION

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M87001 | NEW RELEASE | 05/20/03 | MMG | ABD |
| A | M87231 | CORRECTED DWG. | 05/28/03 | MMG | ABD |
| B | M91636 | ADDED "pn" PIN CONNECTION | 04/07/04 | AV | ABD |
| C | M102713 | ADDED"...WITH SMOBC" | 01/16/06 | GF | IL |

# SUGGESTED MOUNTING CONFIGURATION
# FOR FV1206-1 CASE STYLE, "pb/pn" PIN CONNECTIONS

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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 | MMG | 05/14/03 |
| TOLERANCES ON: | CHECKED | AV | 05/19/03 |
| 2 PL DECIMALS ± | APPROVED | ABD | 05/20/03 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

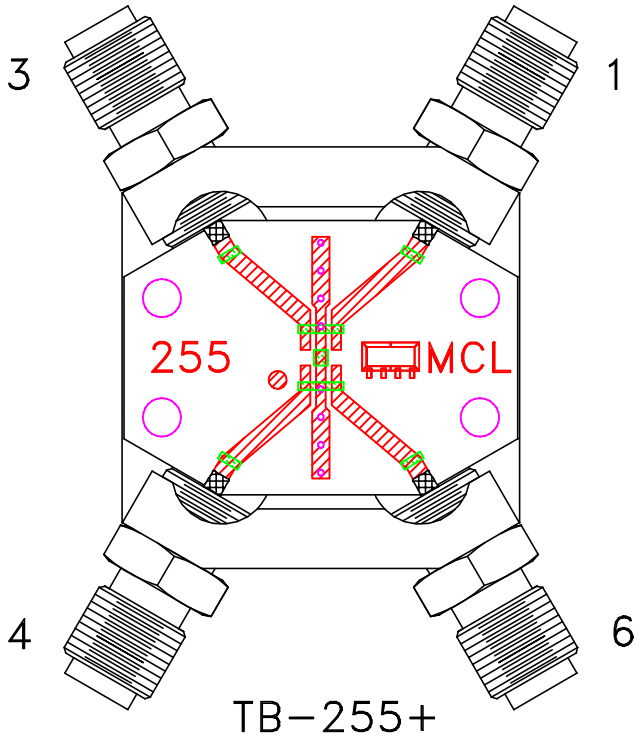
PL, pb/pn, FV1206-1, QCN/BDCN, TB-255

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-131 | C |

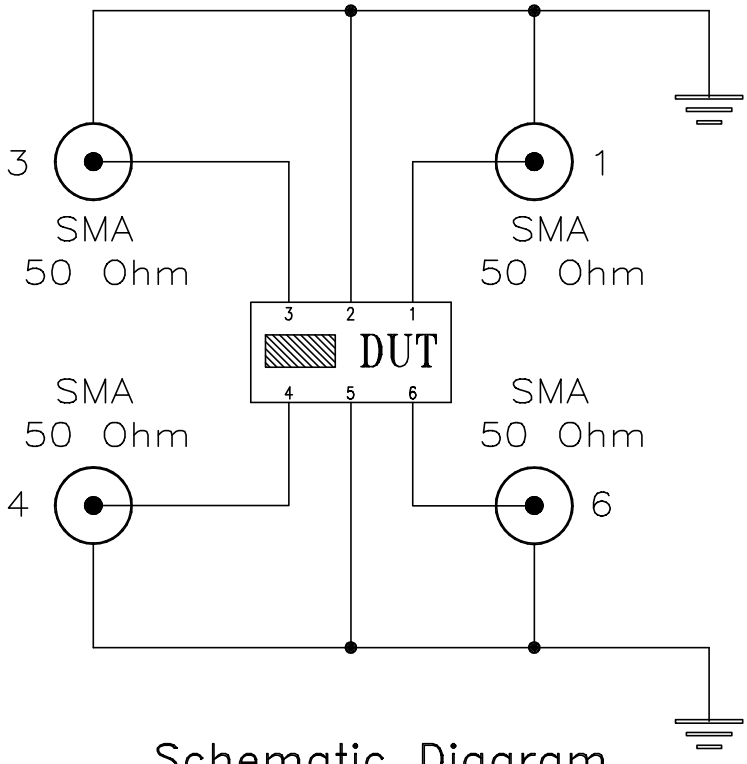
| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL131 | 10:1 | 1 OF 1 |

# Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT




TB-255+




Schematic Diagram

## Notes:

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

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# Environmental Specifications ENV06

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 |