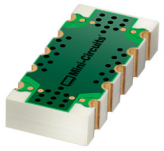
*DC Pass, High Power*

# Bi-Directional Coupler SCBD-28-82HP+

50Ω Up to 100W 600 to 820 MHz

## The Big Deal

- High power handling, 100W
- Very low mainline loss, 0.1 dB
- High directivity, 23 dB
- Excellent return loss, 30 dB (input/output/coupling)



CASE STYLE: JB1233-1

## Product Overview

Mini-Circuits' SCBD-16-562HP+ surface-mount bi-directional coupler provides high-power handling up to 75W, low mainline loss and good input and output return loss over wideband. Covering frequencies from 2700 to 5600 MHz, this model supports a wide variety of applications from cellular and ISM to defense communications and more. The coupler is designed into an open printed laminate (0.70 x 0.32 x 0.20") with wrap-around terminations for good solderability and easy visual inspection.

## Key Features

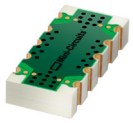
| Feature | Advantages |
|---|---|
| Low mainline loss, 0.1 dB | Provides excellent through-path signal power transmission. |
| Good coupling flatness, 28 ±1.3 dB | SCBD-28-82HP+ provides consistent coupling performance across its full specified operating frequency range. |
| High directivity, 23 dB | High directivity allows accurate signal sampling through the coupled port with minimal measurement error. |
| Excellent return loss, 30 dB (input/output/coupling) | Provides excellent matching for 50Ω systems and minimal signal reflection. |
| High power handling, 100W | Usable in systems with a wide range of high-power requirements. |
| DC current passing up to 2A | Suitable for use in systems where DC power is needed through the RF line. |

## DC Pass, High Power

# Bi-Directional Coupler

# SCBD-28-82HP+

50Ω Up to 100W 600 to 820 MHz



*Generic photo used for illustration purposes only*

CASE STYLE: JB1233-1

***+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 |
|---|---|
| 13" | 500 |

## Maximum Ratings

| | |
|---|---|
| Operating Temperature, case | -55°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| DC Current | 2A |

*Case temperature is defined as temperature on ground leads. Permanent damage may occur if any of these limits are exceeded.

## Pad Connections

| | |
|---|---|
| INPUT | 1,2,3,4 |
| OUTPUT | 2,1,4,3 |
| COUPLED IN | 4,3,2,1 |
| COUPLED OUT | 3,4,1,2 |
| GROUND | 5 |

**Product Marking:** SCBD-01+

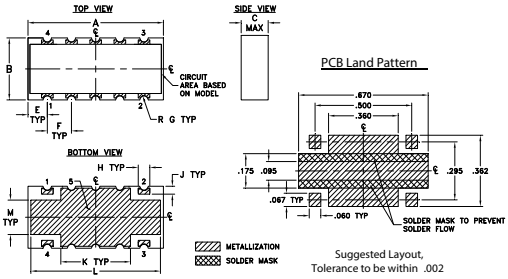
## Features

- wide frequency range, 600 to 820 MHz
- high directivity, 23 dB typ.
- good return loss
- high power, up to 100W
- DC current pass through input to output

## Applications

- VHF / UHF
- SMR

## Outline Drawing




## Outline Dimensions (inch / mm)

| A | B | C | E | F | G |
|---|---|---|---|---|---|
| .70 | .32 | .14 | .100 | .125 | .022 |
| 17.78 | 8.13 | 3.56 | 2.54 | 3.18 | 0.56 |

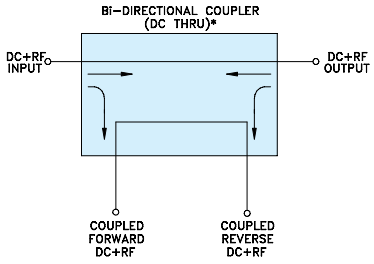
| H | J | K | L | M | wt |
|---|---|---|---|---|---|
| .060 | .040 | .360 | .670 | .175 | grams |
| 1.52 | 1.02 | 9.14 | 17.02 | 4.45 | 0.80 |

## Electrical Specifications at 25°C

| Parameter | Condition (MHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| **Frequency Range** | | 600 | | 820 | MHz |
| **Mainline Loss**[1] | 600-820 | — | 0.1 | 0.2 | dB |
| **Coupling** | 600-820 | — | 28.0±1.3 | — | dB |
| **Coupling Flatness (±)** | 600-820 | — | 1.3 | 1.6 | dB |
| **Directivity** | 600-820 | 20 | 23 | — | dB |
| **Return Loss (Input)** | 600-820 | 20 | 30 | — | dB |
| **Return Loss (Output)** | 600-820 | 20 | 30 | — | dB |
| **Return Loss (Coupling)** | 600-820 | 20 | 30 | — | dB |
| **Input Power**[2] **(up to +65°C case temp.)** | 600-820 | — | — | 100 | W |
| **Input Power (up to +85°C case temp.)** | 600-820 | — | — | 64 | |

1. Include coupling loss.
2. At 65°C with no DC. Derate linearly to 50W at 65°C with 2A DC current.

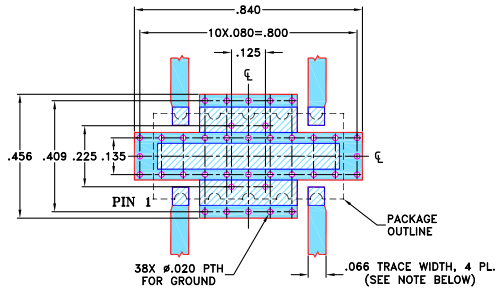
## Electrical Schematic




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

## *Demo Board MCL P/N: TB-774+*
## *Suggested PCB Layout (PL-423)***

*** Wraparound solder on ground pins may not be shown*




NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"±.002"; 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

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.
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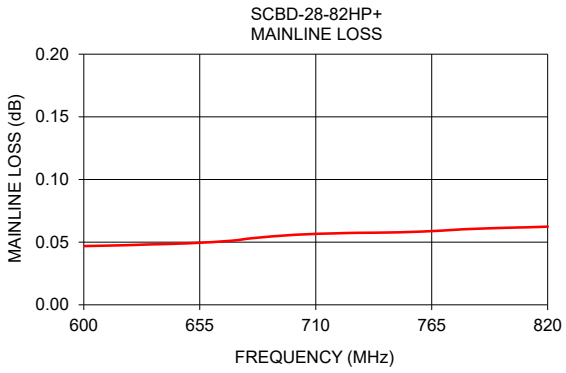
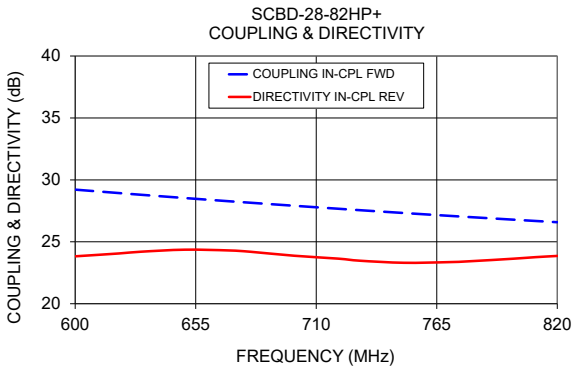
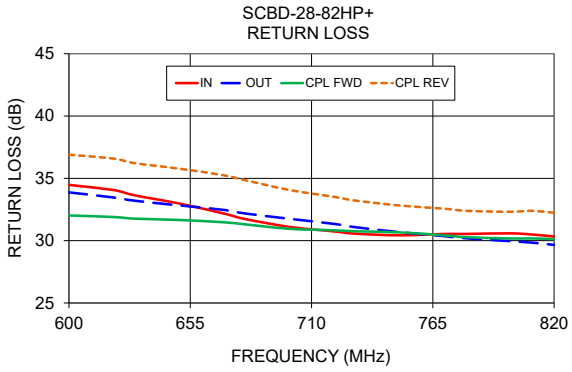
## Typical Performance Data

| 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 |
| 600 | 0.05 | 29.21 | 29.19 | 23.68 | 23.83 | 34.47 | 33.87 | 32.02 | 36.89 |
| 620 | 0.05 | 28.93 | 28.91 | 23.78 | 24.06 | 34.07 | 33.47 | 31.90 | 36.59 |
| 630 | 0.05 | 28.80 | 28.77 | 23.78 | 24.20 | 33.63 | 33.20 | 31.76 | 36.21 |
| 650 | 0.05 | 28.53 | 28.51 | 23.82 | 24.37 | 32.98 | 32.83 | 31.66 | 35.78 |
| 670 | 0.05 | 28.28 | 28.25 | 23.84 | 24.31 | 32.19 | 32.47 | 31.48 | 35.25 |
| 680 | 0.05 | 28.15 | 28.13 | 23.80 | 24.20 | 31.73 | 32.18 | 31.31 | 34.85 |
| 700 | 0.06 | 27.91 | 27.88 | 23.70 | 23.88 | 31.10 | 31.76 | 30.95 | 34.06 |
| 720 | 0.06 | 27.67 | 27.64 | 23.61 | 23.64 | 30.75 | 31.35 | 30.84 | 33.52 |
| 730 | 0.06 | 27.55 | 27.53 | 23.59 | 23.47 | 30.56 | 31.08 | 30.75 | 33.21 |
| 750 | 0.06 | 27.32 | 27.30 | 23.52 | 23.31 | 30.43 | 30.68 | 30.67 | 32.82 |
| 770 | 0.06 | 27.11 | 27.08 | 23.53 | 23.36 | 30.54 | 30.37 | 30.43 | 32.57 |
| 780 | 0.06 | 27.00 | 26.97 | 23.56 | 23.43 | 30.54 | 30.19 | 30.28 | 32.40 |
| 800 | 0.06 | 26.79 | 26.76 | 23.60 | 23.64 | 30.59 | 29.96 | 30.18 | 32.32 |
| 810 | 0.06 | 26.68 | 26.66 | 23.66 | 23.76 | 30.49 | 29.84 | 30.18 | 32.40 |
| 820 | 0.06 | 26.58 | 26.56 | 23.66 | 23.86 | 30.34 | 29.66 | 30.12 | 32.24 |

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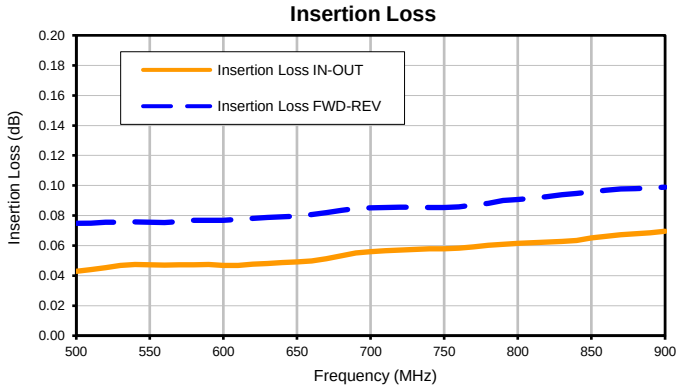
## *DC PASS*

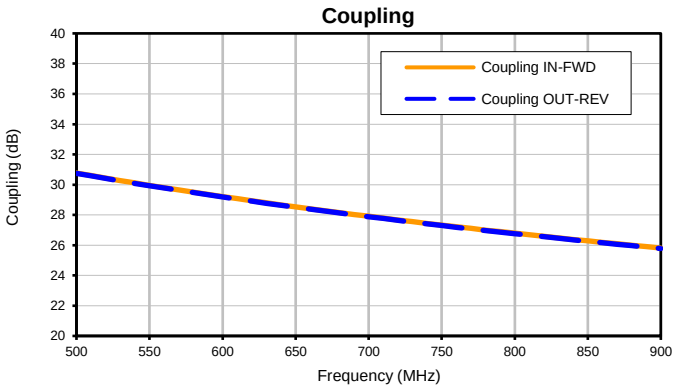
# Bi-Directional Coupler SCBD-28-82HP+

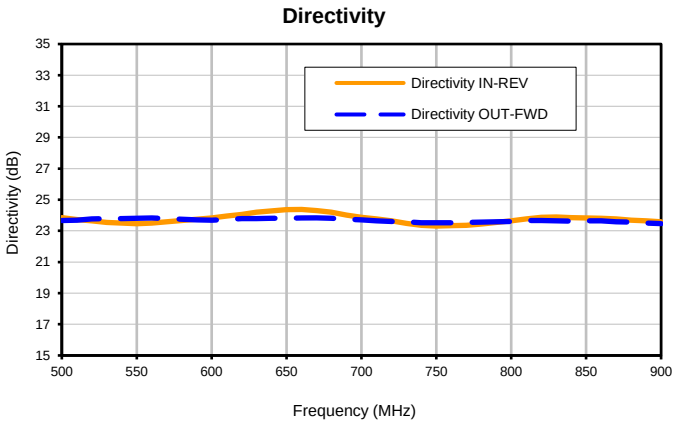
## *Typical Performance Data*

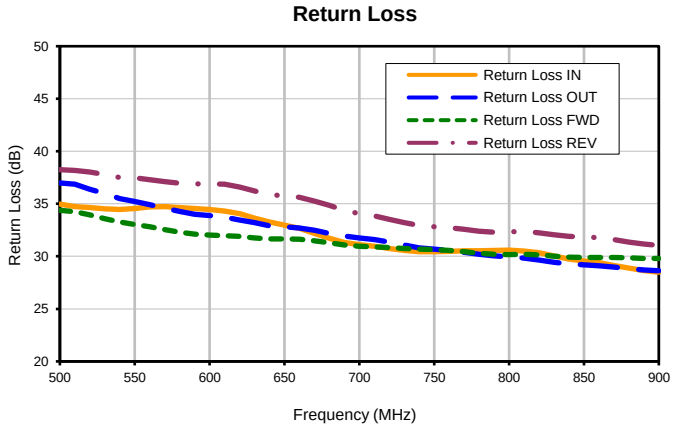
| FREQ. (MHz) | INSERTION LOSS (dB) | | COUPLING (dB) | | DIRECTIVITY (dB) | | RETURN LOSS (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | IN-OUT | FWD-REV | IN-FWD | OUT-REV | IN-REV | OUT-FWD | IN | OUT | FWD | REV |
| 500 | 0.04 | 0.07 | 30.77 | 30.74 | 23.86 | 23.66 | 34.97 | 36.99 | 34.38 | 38.25 |
| 510 | 0.04 | 0.07 | 30.60 | 30.57 | 23.73 | 23.68 | 34.75 | 36.85 | 34.24 | 38.19 |
| 520 | 0.05 | 0.08 | 30.44 | 30.41 | 23.65 | 23.76 | 34.64 | 36.39 | 33.94 | 38.03 |
| 530 | 0.05 | 0.08 | 30.27 | 30.25 | 23.54 | 23.79 | 34.52 | 35.97 | 33.58 | 37.77 |
| 540 | 0.05 | 0.08 | 30.11 | 30.09 | 23.49 | 23.79 | 34.45 | 35.50 | 33.27 | 37.51 |
| 550 | 0.05 | 0.08 | 29.95 | 29.93 | 23.47 | 23.80 | 34.56 | 35.22 | 33.03 | 37.48 |
| 560 | 0.05 | 0.08 | 29.80 | 29.77 | 23.51 | 23.84 | 34.71 | 34.92 | 32.81 | 37.31 |
| 570 | 0.05 | 0.08 | 29.65 | 29.62 | 23.58 | 23.78 | 34.72 | 34.58 | 32.55 | 37.10 |
| 580 | 0.05 | 0.08 | 29.50 | 29.48 | 23.66 | 23.75 | 34.64 | 34.27 | 32.29 | 36.95 |
| 590 | 0.05 | 0.08 | 29.36 | 29.33 | 23.75 | 23.71 | 34.54 | 34.00 | 32.12 | 36.90 |
| 600 | 0.05 | 0.08 | 29.21 | 29.19 | 23.83 | 23.68 | 34.47 | 33.87 | 32.02 | 36.89 |
| 610 | 0.05 | 0.08 | 29.07 | 29.05 | 23.95 | 23.74 | 34.32 | 33.72 | 31.97 | 36.88 |
| 620 | 0.05 | 0.08 | 28.93 | 28.91 | 24.06 | 23.78 | 34.07 | 33.47 | 31.90 | 36.59 |
| 630 | 0.05 | 0.08 | 28.80 | 28.77 | 24.20 | 23.78 | 33.63 | 33.20 | 31.76 | 36.21 |
| 640 | 0.05 | 0.08 | 28.67 | 28.64 | 24.28 | 23.80 | 33.28 | 32.91 | 31.67 | 35.87 |
| 650 | 0.05 | 0.08 | 28.53 | 28.51 | 24.37 | 23.82 | 32.98 | 32.83 | 31.66 | 35.78 |
| 660 | 0.05 | 0.08 | 28.40 | 28.38 | 24.38 | 23.83 | 32.65 | 32.69 | 31.63 | 35.62 |
| 670 | 0.05 | 0.08 | 28.28 | 28.25 | 24.31 | 23.84 | 32.19 | 32.47 | 31.48 | 35.25 |
| 680 | 0.05 | 0.08 | 28.15 | 28.13 | 24.20 | 23.80 | 31.73 | 32.18 | 31.31 | 34.85 |
| 690 | 0.06 | 0.08 | 28.03 | 28.00 | 24.02 | 23.74 | 31.33 | 31.92 | 31.08 | 34.36 |
| 700 | 0.06 | 0.09 | 27.91 | 27.88 | 23.88 | 23.70 | 31.10 | 31.76 | 30.95 | 34.06 |
| 710 | 0.06 | 0.09 | 27.79 | 27.76 | 23.77 | 23.65 | 30.94 | 31.60 | 30.90 | 33.86 |
| 720 | 0.06 | 0.09 | 27.67 | 27.64 | 23.64 | 23.61 | 30.75 | 31.35 | 30.84 | 33.52 |
| 730 | 0.06 | 0.09 | 27.55 | 27.53 | 23.47 | 23.59 | 30.56 | 31.08 | 30.75 | 33.21 |
| 740 | 0.06 | 0.09 | 27.44 | 27.41 | 23.36 | 23.52 | 30.45 | 30.82 | 30.68 | 32.94 |
| 750 | 0.06 | 0.09 | 27.32 | 27.30 | 23.31 | 23.52 | 30.43 | 30.68 | 30.67 | 32.82 |
| 760 | 0.06 | 0.09 | 27.21 | 27.18 | 23.33 | 23.52 | 30.48 | 30.58 | 30.57 | 32.74 |
| 770 | 0.06 | 0.09 | 27.11 | 27.08 | 23.36 | 23.53 | 30.54 | 30.37 | 30.43 | 32.57 |
| 780 | 0.06 | 0.09 | 27.00 | 26.97 | 23.43 | 23.56 | 30.54 | 30.19 | 30.28 | 32.40 |
| 790 | 0.06 | 0.09 | 26.89 | 26.87 | 23.54 | 23.58 | 30.55 | 30.05 | 30.20 | 32.31 |
| 800 | 0.06 | 0.09 | 26.79 | 26.76 | 23.64 | 23.60 | 30.59 | 29.96 | 30.18 | 32.32 |
| 810 | 0.06 | 0.09 | 26.68 | 26.66 | 23.76 | 23.66 | 30.49 | 29.84 | 30.18 | 32.40 |
| 820 | 0.06 | 0.09 | 26.58 | 26.56 | 23.86 | 23.66 | 30.34 | 29.66 | 30.12 | 32.24 |
| 830 | 0.06 | 0.09 | 26.48 | 26.46 | 23.88 | 23.65 | 30.04 | 29.45 | 30.01 | 32.05 |
| 840 | 0.06 | 0.09 | 26.38 | 26.36 | 23.85 | 23.63 | 29.75 | 29.28 | 29.91 | 31.90 |
| 850 | 0.07 | 0.10 | 26.28 | 26.26 | 23.83 | 23.64 | 29.56 | 29.20 | 29.90 | 31.83 |
| 860 | 0.07 | 0.10 | 26.19 | 26.16 | 23.80 | 23.64 | 29.39 | 29.11 | 29.90 | 31.79 |
| 870 | 0.07 | 0.10 | 26.09 | 26.06 | 23.76 | 23.59 | 29.15 | 28.96 | 29.89 | 31.60 |
| 880 | 0.07 | 0.10 | 26.00 | 25.97 | 23.68 | 23.56 | 28.88 | 28.82 | 29.86 | 31.35 |
| 890 | 0.07 | 0.10 | 25.90 | 25.87 | 23.65 | 23.51 | 28.64 | 28.70 | 29.80 | 31.17 |
| 900 | 0.07 | 0.10 | 25.81 | 25.78 | 23.58 | 23.47 | 28.49 | 28.63 | 29.81 | 31.04 |

*Typical Performance Curves*



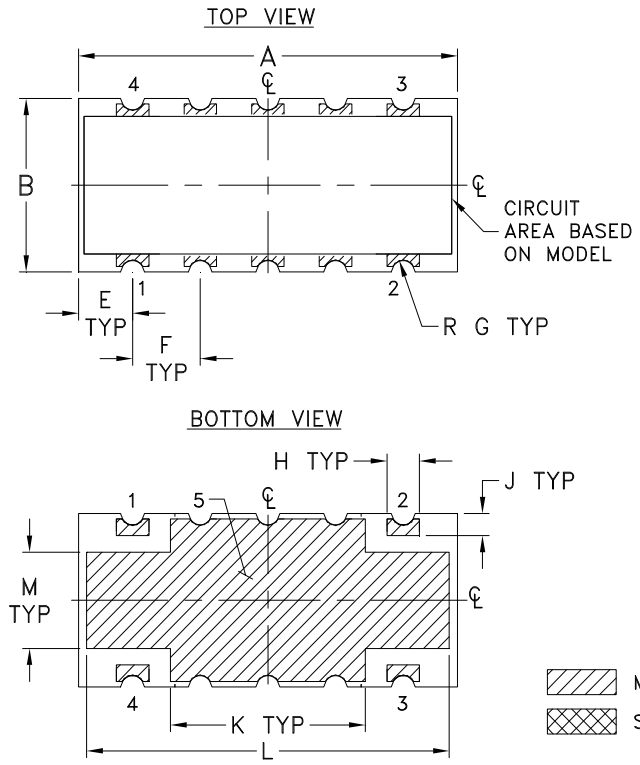



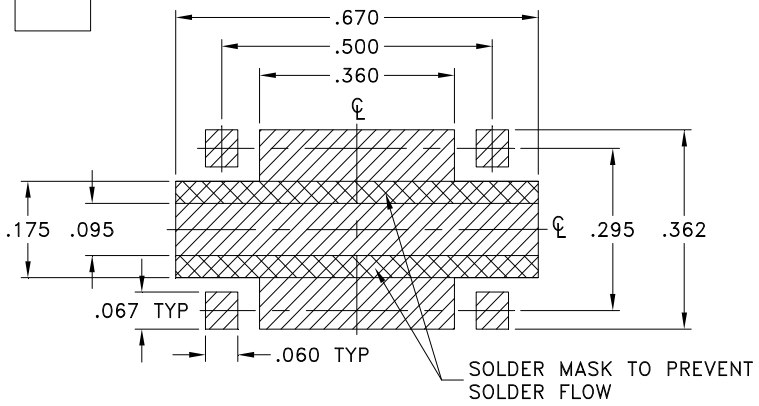
# Case Style JB

**JB1233-1**

## 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 | WT, GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JB1233-1 | .70<br>(17.78) | .32<br>(8.13) | .14<br>(3.56) | --<br>-- | .100<br>(2.54) | .125<br>(3.17) | .022<br>(0.56) | .060<br>(1.52) | .040<br>(1.02) | .360<br>(9.14) | .670<br>(17.02) | .175<br>(4.45) | 0.8 |

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

### Notes:

1. Open style, Base material: Printed wiring laminate.
2. Termination finish: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate.
   All models, (+) suffix.


Mini-Circuits®
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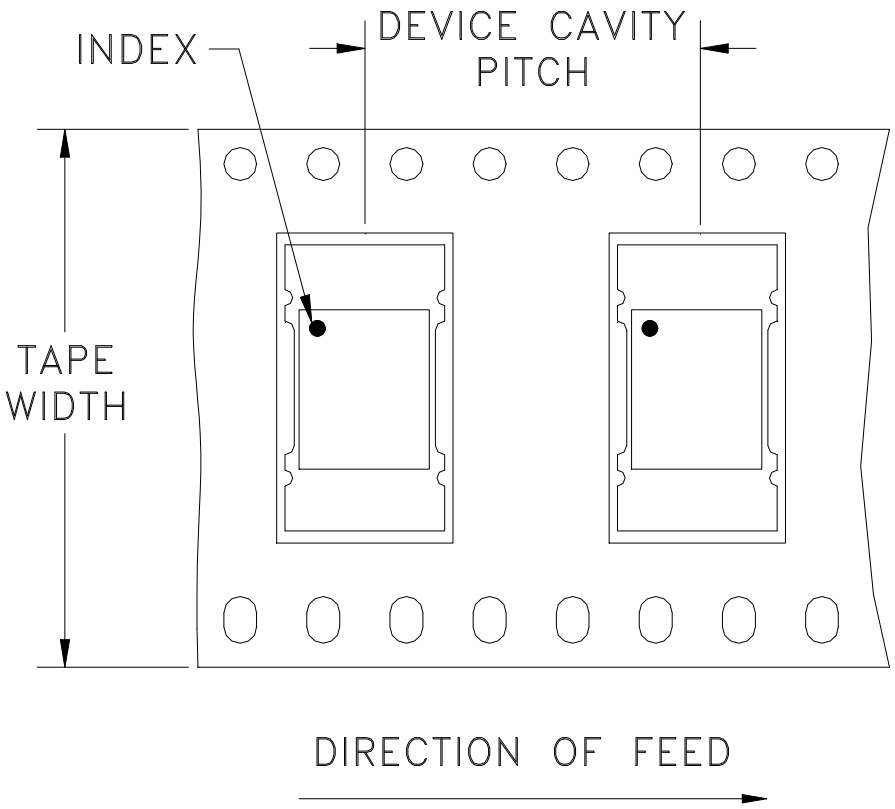
# Tape & Reel Packaging TR-F84

DEVICE ORIENTATION IN T&R




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel |
|---|---|---|---|
| 32 | 12 | 13 | 500 |

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

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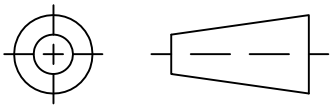
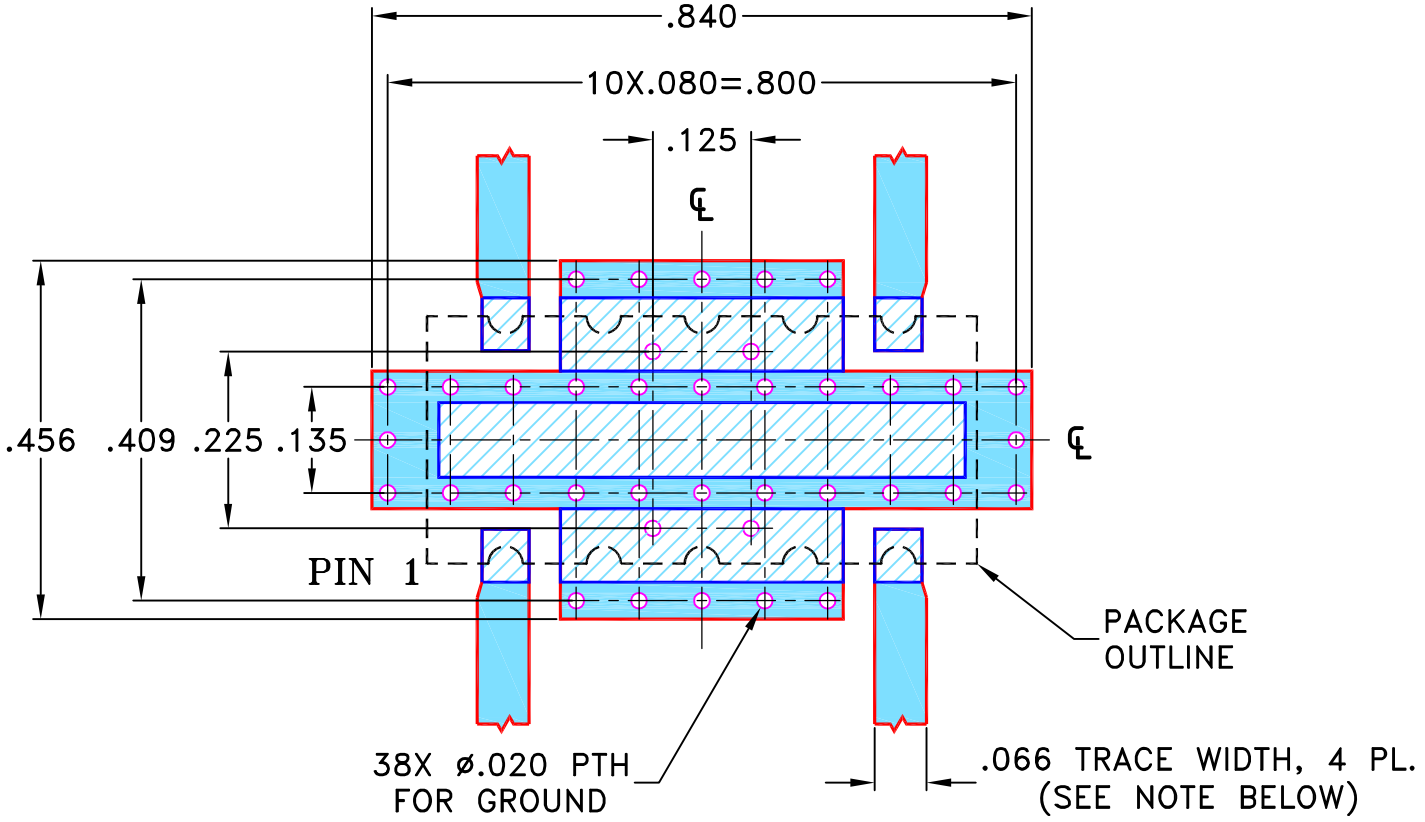
THIRD ANGLE PROJECTION



| REVISIONS | | | | | |
|---|---|---|---|---|---|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M147676 | NEW RELEASE | 07/31/14 | ITG | CH |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR JB1233-1 CASE STYLE, "05DC02" PIN CODE

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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 | ITG | 07/30/14 |
| TOLERANCES ON: | CHECKED | GF | 07/31/14 |
| 2 PL DECIMALS ± | APPROVED | CH | 07/31/14 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |

Mini-Circuits®



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

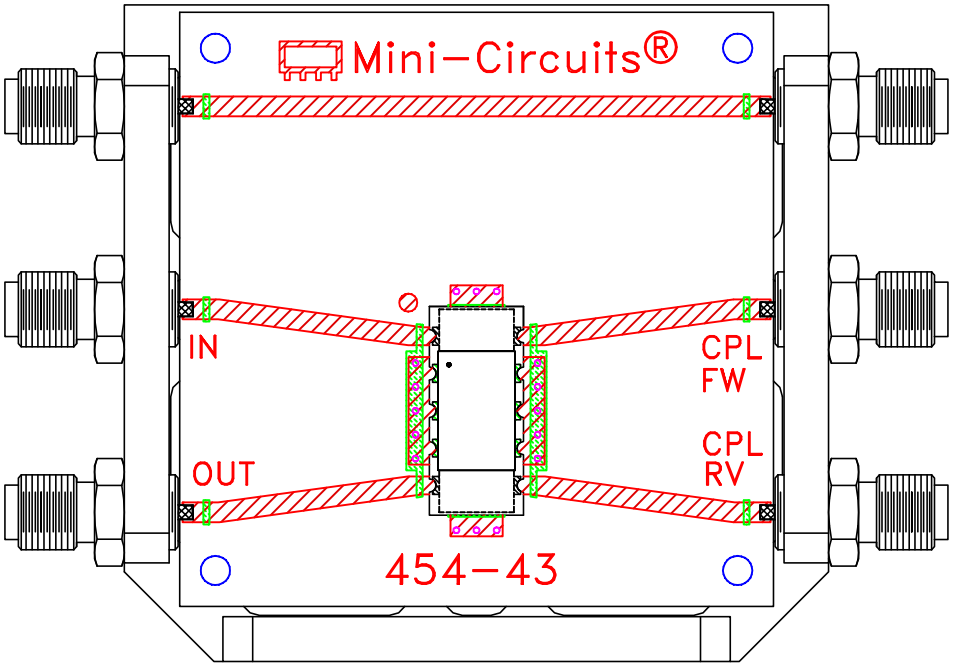
Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, 05DC02, JB1233-1, TB-774+

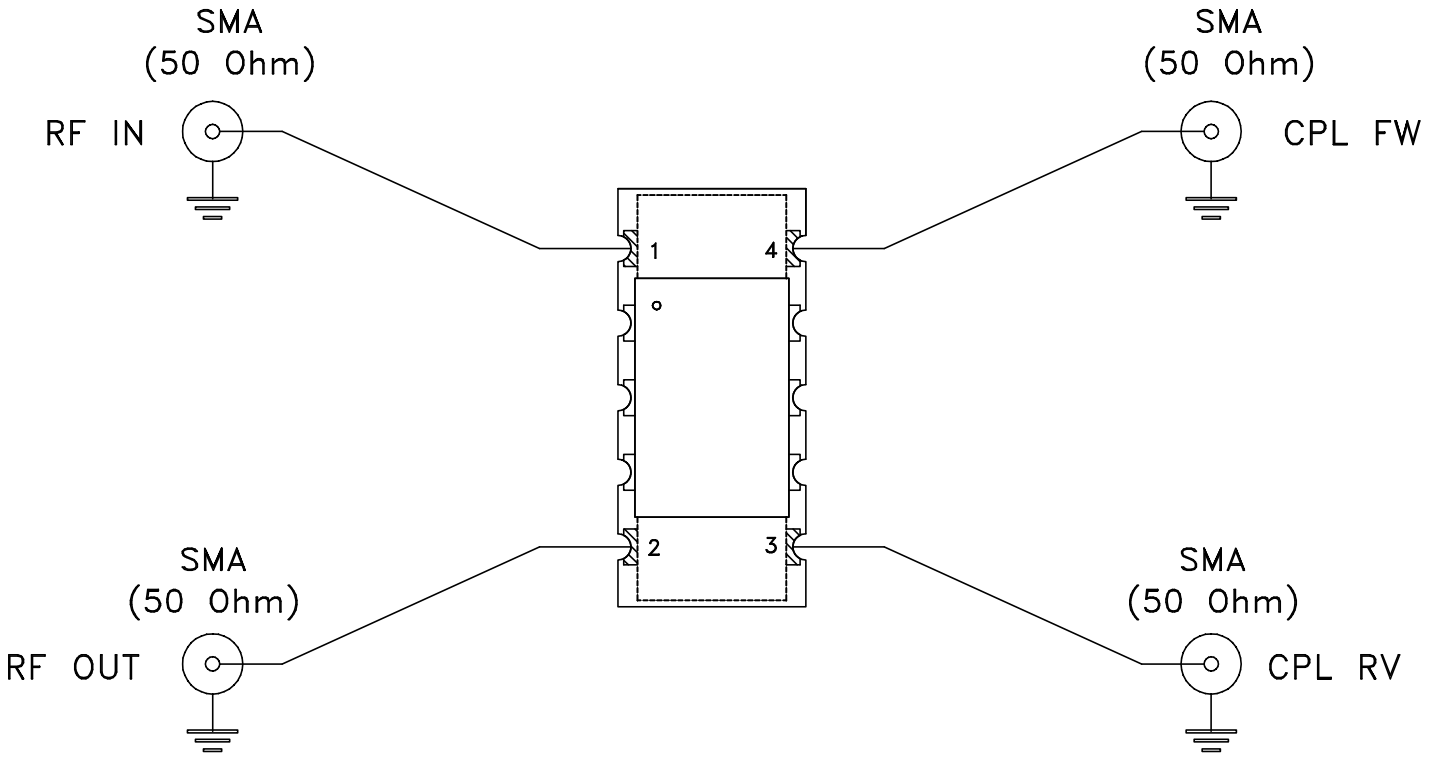
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-423 | OR |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL423 | 4:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-774+




Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: RO4350 or equivalent.
   Dielectric Constant=3.5, Thickness=.030 inch.

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**Environmental Specifications** **ENV02T7**

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 65° C<br>Case 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, 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 |
| 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 |