



Mini-Circuits

SURFACE MOUNT

## Power Splitter/Combiner

SP-2P1+

2 Way-0° 50Ω 1350 to 2250 MHz

## FEATURES

- Wide bandwidth
- Low insertion loss, 0.5 dB typ.
- Good isolation, 20 dB typ.
- Excellent output VSWR, 1.2:1 typ.
- Excellent power handling, 1.5W
- Small size
- Aqueous washable



Generic photo used for illustration purposes only

CASE STYLE: CA531

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance.  
See our website for methodologies and qualifications

## APPLICATIONS

- PCS/DCS
- Communication systems
- Mobile
- PDC
- GPS
- GSM

## ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter                     | Frequency (MHz) | Min. | Typ. | Max. | Units |
|-------------------------------|-----------------|------|------|------|-------|
| Frequency Range               |                 | 1350 |      | 2250 | MHz   |
| Insertion Loss (above 3.0 dB) | 1350-2250       | —    | 0.5  | 1.1  | dB    |
| Isolation                     | 1350-2250       | 9    | 20   | —    | dB    |
| Amplitude Unbalance           | 1350-2250       | —    | —    | 0.2  | dB    |
| Phase Unbalance               | 1350-2250       | —    | —    | 4    | deg.  |
| VSWR (Port S)                 | 1350-2250       | —    | 1.3  | —    | :1    |
| VSWR (Port 1)                 | 1350-2250       | —    | 1.2  | —    | :1    |
| VSWR (Port 2)                 | 1350-2250       | —    | 1.2  | —    | :1    |

## MAXIMUM RATINGS

| Parameter                   | Ratings           |
|-----------------------------|-------------------|
| Operating Temperature       | -40 °C to +85 °C  |
| Storage Temperature         | -65 °C to +150 °C |
| Input Power (as a splitter) | 1.5 W max.        |
| Internal Dissipation        | 0.75W max.        |

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

## ELECTRICAL SCHEMATIC



Mini-Circuits

[www.minicircuits.com](http://www.minicircuits.com) P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 [sales@minicircuits.com](mailto:sales@minicircuits.com)

REV. D  
ECO-015048  
SP-2P1+  
RS/LC/CP/AM  
220912

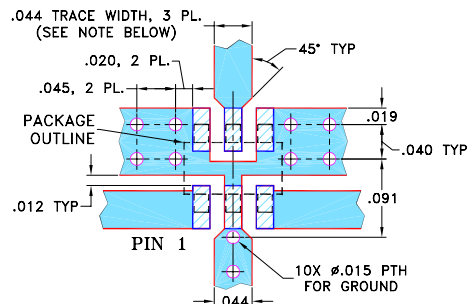
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## PIN CONNECTIONS

|          |       |
|----------|-------|
| SUM PORT | 5     |
| PORT 1   | 1     |
| PORT 2   | 3     |
| GROUND   | 2,4,6 |

**PRODUCT MARKING:** N/A

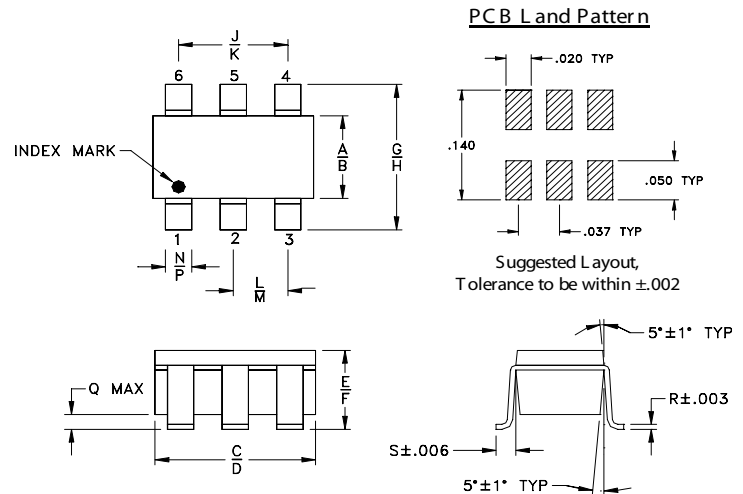
**DEMOBOARD MCL P/N:** TB-374  
**SUGGESTED PCB LAYOUT** (PL-232)



- NOTES:** 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

## OUTLINE DRAWING



## OUTLINE DIMENSIONS (Inch/mm)

|      |      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|------|-------|
| A    | B    | C    | D    | E    | F    | G    | H    | J     |
| .052 | .067 | .106 | .122 | .035 | .064 | .087 | .118 | .067  |
| 1.32 | 1.70 | 2.69 | 3.10 | 0.89 | 1.63 | 2.21 | 3.00 | 1.70  |
| K    | L    | M    | N    | P    | Q    | R    | S    | wt    |
| .083 | .033 | .042 | .012 | .020 | .012 | .006 | .018 | grams |
| 2.11 | 0.84 | 1.07 | 0.30 | 0.51 | 0.30 | 0.15 | 0.46 | 0.020 |

### TAPE & REEL INFORMATION: F31



Mini-Circuits

SURFACE MOUNT

## Power Splitter/Combiner

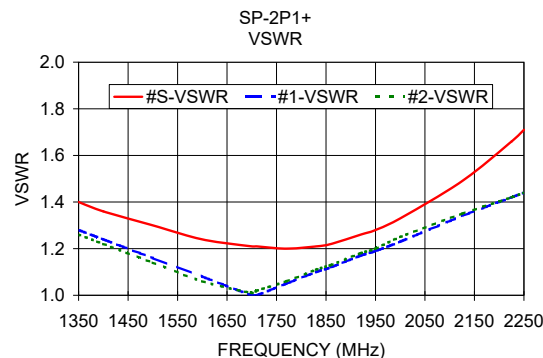
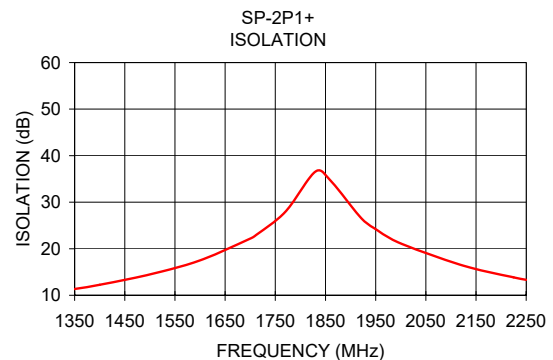
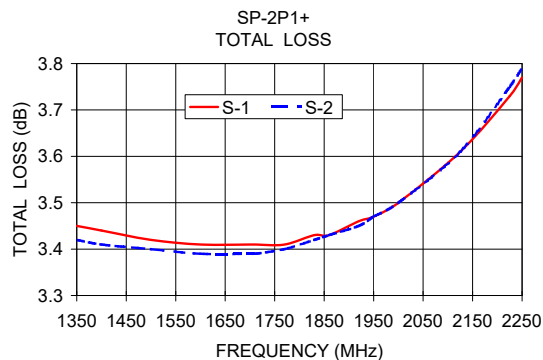
SP-2P1+

2 Way-0° 50Ω 1350 to 2250 MHz

## TYPICAL PERFORMANCE DATA AND CHARTS

| Frequency (MHz) | Total Loss <sup>1</sup> (dB) |      | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR (:1) |      |      |
|-----------------|------------------------------|------|--------------------------|----------------|------------------------|-----------|------|------|
|                 | S-1                          | S-2  |                          |                |                        | S         | 1    | 2    |
| 1350.00         | 3.45                         | 3.42 | 0.03                     | 11.34          | 0.43                   | 1.40      | 1.28 | 1.26 |
| 1400.00         | 3.44                         | 3.41 | 0.03                     | 12.25          | 0.42                   | 1.36      | 1.24 | 1.22 |
| 1500.00         | 3.42                         | 3.40 | 0.02                     | 14.49          | 0.42                   | 1.30      | 1.16 | 1.14 |
| 1600.00         | 3.41                         | 3.39 | 0.02                     | 17.51          | 0.42                   | 1.24      | 1.08 | 1.06 |
| 1700.00         | 3.41                         | 3.39 | 0.01                     | 22.19          | 0.43                   | 1.21      | 1.00 | 1.01 |
| 1710.00         | 3.41                         | 3.39 | 0.01                     | 22.82          | 0.43                   | 1.21      | 1.00 | 1.02 |
| 1770.00         | 3.41                         | 3.40 | 0.01                     | 27.94          | 0.44                   | 1.20      | 1.05 | 1.06 |
| 1830.00         | 3.43                         | 3.42 | 0.01                     | 36.58          | 0.47                   | 1.21      | 1.10 | 1.11 |
| 1860.00         | 3.43                         | 3.43 | 0.01                     | 34.67          | 0.48                   | 1.22      | 1.12 | 1.13 |
| 1920.00         | 3.46                         | 3.45 | 0.00                     | 26.70          | 0.50                   | 1.26      | 1.17 | 1.18 |
| 1950.00         | 3.47                         | 3.47 | 0.00                     | 24.20          | 0.52                   | 1.28      | 1.19 | 1.20 |
| 2000.00         | 3.50                         | 3.50 | 0.00                     | 21.14          | 0.55                   | 1.33      | 1.23 | 1.25 |
| 2125.00         | 3.61                         | 3.61 | 0.01                     | 16.35          | 0.65                   | 1.49      | 1.34 | 1.35 |
| 2225.00         | 3.73                         | 3.75 | 0.01                     | 13.84          | 0.75                   | 1.66      | 1.42 | 1.42 |
| 2250.00         | 3.77                         | 3.79 | 0.01                     | 13.32          | 0.74                   | 1.71      | 1.44 | 1.44 |

1. Total Loss = Insertion Loss + 3dB splitter loss.



## ESD Rating

Human Body Model (HBM): Class 1A (250 v to <500 v) in accordance with ANSI/ESD STM 5.1 - 2001  
Machine Model (MM): Class M1 (< 100 v) in accordance with ANSI/ESD STM 5.2 - 1999 (pass 50V)

## 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



# 2 Way-0° Power Splitter/Combiner

SP-2P1+

## Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +25°C

| FREQ.<br>(MHz) | TOTAL LOSS <sup>1</sup><br>(dB) |      | AMP.<br>UNBAL.<br>(dB) | PHASE<br>UNBAL.<br>(deg.) | ISOLATION<br>(dB) | VSWR |           |      |
|----------------|---------------------------------|------|------------------------|---------------------------|-------------------|------|-----------|------|
|                | S-1                             | S-2  |                        |                           |                   | S    | (:1)<br>1 | 2    |
| 900            | 3.56                            | 3.49 | 0.07                   | 0.48                      | 6.29              | 1.67 | 1.66      | 1.63 |
| 950            | 3.54                            | 3.48 | 0.06                   | 0.49                      | 6.63              | 1.64 | 1.63      | 1.60 |
| 1000           | 3.53                            | 3.46 | 0.07                   | 0.48                      | 7.01              | 1.62 | 1.60      | 1.57 |
| 1100           | 3.51                            | 3.43 | 0.08                   | 0.46                      | 7.89              | 1.56 | 1.52      | 1.49 |
| 1150           | 3.49                            | 3.42 | 0.07                   | 0.47                      | 8.40              | 1.53 | 1.49      | 1.46 |
| 1200           | 3.48                            | 3.41 | 0.07                   | 0.47                      | 8.97              | 1.50 | 1.45      | 1.42 |
| 1250           | 3.47                            | 3.39 | 0.08                   | 0.44                      | 9.61              | 1.47 | 1.41      | 1.38 |
| 1300           | 3.45                            | 3.38 | 0.07                   | 0.44                      | 10.31             | 1.44 | 1.37      | 1.34 |
| 1350           | 3.44                            | 3.37 | 0.07                   | 0.43                      | 11.08             | 1.40 | 1.32      | 1.30 |
| 1400           | 3.42                            | 3.36 | 0.06                   | 0.45                      | 11.96             | 1.37 | 1.28      | 1.25 |
| 1500           | 3.40                            | 3.34 | 0.06                   | 0.42                      | 14.07             | 1.30 | 1.19      | 1.17 |
| 1550           | 3.40                            | 3.34 | 0.06                   | 0.41                      | 15.38             | 1.27 | 1.15      | 1.13 |
| 1600           | 3.39                            | 3.34 | 0.05                   | 0.42                      | 16.91             | 1.25 | 1.11      | 1.08 |
| 1650           | 3.38                            | 3.33 | 0.05                   | 0.44                      | 18.79             | 1.23 | 1.06      | 1.04 |
| 1700           | 3.38                            | 3.34 | 0.04                   | 0.45                      | 21.15             | 1.21 | 1.02      | 1.01 |
| 1710           | 3.38                            | 3.34 | 0.04                   | 0.46                      | 21.69             | 1.21 | 1.02      | 1.01 |
| 1720           | 3.39                            | 3.34 | 0.05                   | 0.44                      | 22.27             | 1.21 | 1.01      | 1.02 |
| 1740           | 3.38                            | 3.35 | 0.03                   | 0.46                      | 23.57             | 1.21 | 1.01      | 1.03 |
| 1760           | 3.39                            | 3.35 | 0.04                   | 0.45                      | 25.04             | 1.21 | 1.03      | 1.05 |
| 1770           | 3.39                            | 3.35 | 0.04                   | 0.47                      | 25.86             | 1.21 | 1.03      | 1.05 |
| 1800           | 3.39                            | 3.36 | 0.03                   | 0.48                      | 28.74             | 1.22 | 1.06      | 1.08 |
| 1820           | 3.40                            | 3.37 | 0.03                   | 0.51                      | 30.99             | 1.22 | 1.08      | 1.09 |
| 1830           | 3.40                            | 3.37 | 0.03                   | 0.49                      | 32.14             | 1.23 | 1.08      | 1.10 |
| 1840           | 3.40                            | 3.38 | 0.02                   | 0.51                      | 33.12             | 1.23 | 1.09      | 1.11 |
| 1860           | 3.41                            | 3.38 | 0.03                   | 0.54                      | 33.82             | 1.24 | 1.11      | 1.13 |
| 1880           | 3.42                            | 3.39 | 0.03                   | 0.55                      | 32.32             | 1.26 | 1.13      | 1.15 |
| 1900           | 3.43                            | 3.40 | 0.03                   | 0.55                      | 30.01             | 1.27 | 1.15      | 1.16 |
| 1920           | 3.44                            | 3.41 | 0.03                   | 0.57                      | 27.87             | 1.29 | 1.16      | 1.18 |
| 1940           | 3.45                            | 3.43 | 0.02                   | 0.57                      | 26.04             | 1.31 | 1.18      | 1.20 |
| 1950           | 3.45                            | 3.43 | 0.02                   | 0.56                      | 25.22             | 1.32 | 1.19      | 1.21 |
| 1960           | 3.46                            | 3.44 | 0.02                   | 0.59                      | 24.46             | 1.33 | 1.20      | 1.22 |
| 1980           | 3.47                            | 3.45 | 0.02                   | 0.59                      | 23.09             | 1.35 | 1.22      | 1.24 |
| 1990           | 3.48                            | 3.46 | 0.02                   | 0.62                      | 22.48             | 1.36 | 1.23      | 1.24 |
| 2000           | 3.49                            | 3.47 | 0.02                   | 0.62                      | 21.91             | 1.37 | 1.24      | 1.25 |
| 2050           | 3.53                            | 3.51 | 0.02                   | 0.64                      | 19.51             | 1.43 | 1.29      | 1.30 |
| 2100           | 3.58                            | 3.57 | 0.01                   | 0.66                      | 17.62             | 1.50 | 1.33      | 1.35 |
| 2125           | 3.60                            | 3.60 | 0.00                   | 0.71                      | 16.80             | 1.54 | 1.36      | 1.37 |
| 2150           | 3.64                            | 3.63 | 0.01                   | 0.70                      | 16.06             | 1.58 | 1.38      | 1.39 |
| 2200           | 3.71                            | 3.70 | 0.01                   | 0.75                      | 14.76             | 1.68 | 1.43      | 1.44 |
| 2225           | 3.74                            | 3.74 | 0.00                   | 0.77                      | 14.17             | 1.72 | 1.46      | 1.46 |
| 2250           | 3.78                            | 3.78 | 0.00                   | 0.83                      | 13.62             | 1.77 | 1.48      | 1.48 |
| 2300           | 3.87                            | 3.87 | 0.00                   | 0.85                      | 12.63             | 1.89 | 1.52      | 1.53 |
| 2350           | 3.98                            | 3.97 | 0.01                   | 0.86                      | 11.74             | 2.01 | 1.57      | 1.57 |
| 2400           | 4.10                            | 4.10 | 0.00                   | 0.93                      | 10.95             | 2.15 | 1.62      | 1.62 |
| 2450           | 4.22                            | 4.22 | 0.00                   | 0.93                      | 10.22             | 2.30 | 1.66      | 1.66 |
| 2500           | 4.37                            | 4.37 | 0.00                   | 1.00                      | 9.56              | 2.47 | 1.70      | 1.70 |
| 2550           | 4.53                            | 4.53 | 0.00                   | 1.02                      | 8.94              | 2.66 | 1.74      | 1.74 |
| 2600           | 4.70                            | 4.70 | 0.00                   | 1.08                      | 8.37              | 2.86 | 1.78      | 1.77 |
| 2650           | 4.89                            | 4.88 | 0.01                   | 1.12                      | 7.84              | 3.10 | 1.82      | 1.81 |
| 2700           | 5.10                            | 5.10 | 0.00                   | 1.17                      | 7.36              | 3.35 | 1.85      | 1.84 |
| 2750           | 5.32                            | 5.32 | 0.00                   | 1.22                      | 6.90              | 3.62 | 1.88      | 1.87 |
| 2800           | 5.56                            | 5.56 | 0.00                   | 1.24                      | 6.48              | 3.93 | 1.91      | 1.90 |
| 2850           | 5.82                            | 5.81 | 0.01                   | 1.23                      | 6.08              | 4.27 | 1.93      | 1.92 |
| 2900           | 6.10                            | 6.08 | 0.02                   | 1.21                      | 5.71              | 4.63 | 1.96      | 1.94 |

<sup>1</sup> Total Loss = Insertion Loss+ 3dB Splitter Loss

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SP-2P1+  
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# 2 Way-0° Power Splitter/Combiner

SP-2P1+

## Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = -40°C

| FREQ.<br>(MHz) | TOTAL LOSS <sup>1</sup><br>(dB) |      | AMP.<br>UNBAL.<br>(dB) | PHASE<br>UNBAL.<br>(deg.) | ISOLATION<br>(dB) | VSWR<br>(:1) |      |      |
|----------------|---------------------------------|------|------------------------|---------------------------|-------------------|--------------|------|------|
|                | S-1                             | S-2  |                        |                           |                   | S            | 1    | 2    |
| 900            | 3.46                            | 3.38 | 0.08                   | 0.56                      | 6.14              | 1.68         | 1.69 | 1.66 |
| 950            | 3.44                            | 3.37 | 0.07                   | 0.56                      | 6.48              | 1.65         | 1.66 | 1.62 |
| 1000           | 3.42                            | 3.36 | 0.06                   | 0.53                      | 6.84              | 1.63         | 1.62 | 1.59 |
| 1100           | 3.38                            | 3.32 | 0.06                   | 0.65                      | 7.71              | 1.57         | 1.56 | 1.52 |
| 1150           | 3.36                            | 3.30 | 0.06                   | 0.60                      | 8.21              | 1.54         | 1.52 | 1.49 |
| 1200           | 3.35                            | 3.29 | 0.06                   | 0.64                      | 8.74              | 1.51         | 1.47 | 1.45 |
| 1250           | 3.33                            | 3.27 | 0.06                   | 0.62                      | 9.34              | 1.48         | 1.43 | 1.40 |
| 1300           | 3.31                            | 3.26 | 0.05                   | 0.60                      | 10.01             | 1.45         | 1.38 | 1.36 |
| 1350           | 3.29                            | 3.25 | 0.04                   | 0.68                      | 10.76             | 1.42         | 1.34 | 1.31 |
| 1400           | 3.28                            | 3.23 | 0.05                   | 0.70                      | 11.61             | 1.38         | 1.29 | 1.27 |
| 1500           | 3.25                            | 3.21 | 0.04                   | 0.71                      | 13.59             | 1.32         | 1.19 | 1.17 |
| 1550           | 3.24                            | 3.20 | 0.04                   | 0.70                      | 14.84             | 1.30         | 1.14 | 1.12 |
| 1600           | 3.23                            | 3.20 | 0.03                   | 0.75                      | 16.30             | 1.27         | 1.09 | 1.07 |
| 1650           | 3.23                            | 3.19 | 0.04                   | 0.75                      | 18.08             | 1.25         | 1.06 | 1.03 |
| 1700           | 3.22                            | 3.19 | 0.03                   | 0.76                      | 20.28             | 1.24         | 1.03 | 1.02 |
| 1710           | 3.22                            | 3.19 | 0.03                   | 0.77                      | 20.78             | 1.24         | 1.02 | 1.02 |
| 1720           | 3.23                            | 3.20 | 0.03                   | 0.74                      | 21.30             | 1.25         | 1.03 | 1.03 |
| 1740           | 3.22                            | 3.20 | 0.02                   | 0.77                      | 22.46             | 1.25         | 1.04 | 1.05 |
| 1760           | 3.23                            | 3.20 | 0.03                   | 0.77                      | 23.73             | 1.25         | 1.05 | 1.07 |
| 1770           | 3.23                            | 3.21 | 0.02                   | 0.79                      | 24.43             | 1.25         | 1.06 | 1.08 |
| 1800           | 3.23                            | 3.21 | 0.02                   | 0.80                      | 26.82             | 1.26         | 1.08 | 1.11 |
| 1820           | 3.24                            | 3.22 | 0.02                   | 0.82                      | 28.58             | 1.27         | 1.10 | 1.13 |
| 1830           | 3.24                            | 3.22 | 0.02                   | 0.79                      | 29.50             | 1.27         | 1.11 | 1.14 |
| 1840           | 3.24                            | 3.22 | 0.02                   | 0.83                      | 30.39             | 1.28         | 1.12 | 1.15 |
| 1860           | 3.25                            | 3.23 | 0.02                   | 0.84                      | 31.62             | 1.29         | 1.14 | 1.16 |
| 1880           | 3.25                            | 3.24 | 0.01                   | 0.84                      | 31.38             | 1.30         | 1.16 | 1.18 |
| 1900           | 3.26                            | 3.25 | 0.01                   | 0.85                      | 29.93             | 1.31         | 1.18 | 1.20 |
| 1920           | 3.26                            | 3.26 | 0.00                   | 0.86                      | 28.09             | 1.33         | 1.19 | 1.22 |
| 1940           | 3.27                            | 3.27 | 0.00                   | 0.86                      | 26.32             | 1.34         | 1.21 | 1.25 |
| 1950           | 3.28                            | 3.27 | 0.01                   | 0.86                      | 25.52             | 1.35         | 1.22 | 1.26 |
| 1960           | 3.28                            | 3.28 | 0.00                   | 0.85                      | 24.76             | 1.36         | 1.23 | 1.27 |
| 1980           | 3.30                            | 3.30 | 0.00                   | 0.87                      | 23.37             | 1.38         | 1.25 | 1.28 |
| 1990           | 3.30                            | 3.30 | 0.00                   | 0.90                      | 22.74             | 1.39         | 1.26 | 1.30 |
| 2000           | 3.31                            | 3.31 | 0.00                   | 0.89                      | 22.14             | 1.41         | 1.27 | 1.31 |
| 2050           | 3.34                            | 3.35 | 0.01                   | 0.91                      | 19.64             | 1.47         | 1.32 | 1.36 |
| 2100           | 3.38                            | 3.40 | 0.02                   | 0.94                      | 17.69             | 1.54         | 1.37 | 1.41 |
| 2125           | 3.41                            | 3.43 | 0.02                   | 0.97                      | 16.84             | 1.57         | 1.39 | 1.43 |
| 2150           | 3.43                            | 3.46 | 0.03                   | 0.96                      | 16.07             | 1.61         | 1.41 | 1.46 |
| 2200           | 3.48                            | 3.52 | 0.04                   | 1.09                      | 14.75             | 1.69         | 1.46 | 1.50 |
| 2225           | 3.51                            | 3.56 | 0.05                   | 1.15                      | 14.15             | 1.73         | 1.49 | 1.52 |
| 2250           | 3.55                            | 3.59 | 0.04                   | 1.25                      | 13.59             | 1.78         | 1.51 | 1.54 |
| 2300           | 3.63                            | 3.68 | 0.05                   | 1.26                      | 12.53             | 1.90         | 1.55 | 1.58 |
| 2350           | 3.72                            | 3.77 | 0.05                   | 1.34                      | 11.62             | 2.02         | 1.60 | 1.62 |
| 2400           | 3.83                            | 3.88 | 0.05                   | 1.47                      | 10.80             | 2.15         | 1.64 | 1.65 |
| 2450           | 3.94                            | 3.99 | 0.05                   | 1.50                      | 10.03             | 2.29         | 1.67 | 1.68 |
| 2500           | 4.06                            | 4.13 | 0.07                   | 1.60                      | 9.37              | 2.45         | 1.71 | 1.71 |
| 2550           | 4.20                            | 4.27 | 0.07                   | 1.72                      | 8.74              | 2.64         | 1.75 | 1.74 |
| 2600           | 4.36                            | 4.42 | 0.06                   | 1.93                      | 8.14              | 2.83         | 1.79 | 1.76 |
| 2650           | 4.54                            | 4.59 | 0.05                   | 2.02                      | 7.59              | 3.05         | 1.81 | 1.76 |
| 2700           | 4.74                            | 4.79 | 0.05                   | 2.17                      | 7.10              | 3.31         | 1.83 | 1.78 |
| 2750           | 4.95                            | 4.98 | 0.03                   | 2.24                      | 6.62              | 3.58         | 1.86 | 1.79 |
| 2800           | 5.18                            | 5.20 | 0.02                   | 2.25                      | 6.16              | 3.88         | 1.86 | 1.80 |
| 2850           | 5.42                            | 5.44 | 0.02                   | 2.32                      | 5.76              | 4.25         | 1.87 | 1.80 |
| 2900           | 5.69                            | 5.69 | 0.00                   | 2.34                      | 5.39              | 4.62         | 1.89 | 1.82 |

<sup>1</sup> Total Loss = Insertion Loss+ 3dB Splitter Loss

REV. X2

SP-2P1+

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RF/MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED • RoHS compliant

P.O. Box 350186, Brooklyn, New York 11235-0008 (718) 934-4500 Fax (718) 332-4661



The Design Engineers Search Engine finds the model you need, instantly • For detailed performance specs & shopping online see



# 2 Way-0° Power Splitter/Combiner

SP-2P1+

## Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +85°C

| FREQ.<br>(MHz) | TOTAL LOSS <sup>1</sup><br>(dB) |      | AMP.<br>UNBAL.<br>(dB) | PHASE<br>UNBAL.<br>(deg.) | ISOLATION<br>(dB) | VSWR |           |      |
|----------------|---------------------------------|------|------------------------|---------------------------|-------------------|------|-----------|------|
|                | S-1                             | S-2  |                        |                           |                   | S    | (:1)<br>1 | 2    |
| 900            | 3.61                            | 3.53 | 0.08                   | 0.50                      | 6.38              | 1.66 | 1.64      | 1.60 |
| 950            | 3.60                            | 3.51 | 0.09                   | 0.51                      | 6.74              | 1.64 | 1.61      | 1.57 |
| 1000           | 3.59                            | 3.50 | 0.09                   | 0.48                      | 7.13              | 1.61 | 1.58      | 1.54 |
| 1100           | 3.57                            | 3.48 | 0.09                   | 0.37                      | 8.05              | 1.55 | 1.51      | 1.47 |
| 1150           | 3.56                            | 3.47 | 0.09                   | 0.39                      | 8.58              | 1.52 | 1.48      | 1.44 |
| 1200           | 3.55                            | 3.46 | 0.09                   | 0.35                      | 9.17              | 1.49 | 1.44      | 1.40 |
| 1250           | 3.53                            | 3.45 | 0.08                   | 0.32                      | 9.84              | 1.46 | 1.41      | 1.36 |
| 1300           | 3.52                            | 3.44 | 0.08                   | 0.29                      | 10.57             | 1.42 | 1.37      | 1.33 |
| 1350           | 3.51                            | 3.43 | 0.08                   | 0.26                      | 11.37             | 1.39 | 1.33      | 1.29 |
| 1400           | 3.50                            | 3.42 | 0.08                   | 0.27                      | 12.29             | 1.36 | 1.29      | 1.25 |
| 1500           | 3.48                            | 3.41 | 0.07                   | 0.23                      | 14.49             | 1.29 | 1.20      | 1.18 |
| 1550           | 3.47                            | 3.41 | 0.06                   | 0.23                      | 15.86             | 1.25 | 1.16      | 1.14 |
| 1600           | 3.46                            | 3.41 | 0.05                   | 0.25                      | 17.47             | 1.22 | 1.12      | 1.11 |
| 1650           | 3.46                            | 3.41 | 0.05                   | 0.26                      | 19.44             | 1.20 | 1.08      | 1.08 |
| 1700           | 3.46                            | 3.42 | 0.04                   | 0.31                      | 22.00             | 1.18 | 1.04      | 1.05 |
| 1710           | 3.46                            | 3.42 | 0.04                   | 0.33                      | 22.59             | 1.17 | 1.04      | 1.05 |
| 1720           | 3.46                            | 3.42 | 0.04                   | 0.31                      | 23.23             | 1.17 | 1.03      | 1.04 |
| 1740           | 3.46                            | 3.43 | 0.03                   | 0.34                      | 24.69             | 1.17 | 1.01      | 1.04 |
| 1760           | 3.46                            | 3.43 | 0.03                   | 0.32                      | 26.39             | 1.17 | 1.00      | 1.05 |
| 1770           | 3.46                            | 3.43 | 0.03                   | 0.35                      | 27.35             | 1.17 | 1.01      | 1.05 |
| 1800           | 3.47                            | 3.44 | 0.03                   | 0.37                      | 30.94             | 1.17 | 1.03      | 1.06 |
| 1820           | 3.48                            | 3.45 | 0.03                   | 0.39                      | 33.88             | 1.18 | 1.05      | 1.07 |
| 1830           | 3.48                            | 3.45 | 0.03                   | 0.39                      | 35.28             | 1.18 | 1.06      | 1.08 |
| 1840           | 3.48                            | 3.46 | 0.02                   | 0.41                      | 36.19             | 1.19 | 1.07      | 1.08 |
| 1860           | 3.49                            | 3.46 | 0.03                   | 0.44                      | 35.18             | 1.20 | 1.08      | 1.09 |
| 1880           | 3.49                            | 3.47 | 0.02                   | 0.45                      | 32.26             | 1.21 | 1.10      | 1.11 |
| 1900           | 3.50                            | 3.48 | 0.02                   | 0.48                      | 29.50             | 1.23 | 1.12      | 1.12 |
| 1920           | 3.51                            | 3.49 | 0.02                   | 0.53                      | 27.32             | 1.24 | 1.13      | 1.14 |
| 1940           | 3.52                            | 3.51 | 0.01                   | 0.52                      | 25.54             | 1.26 | 1.15      | 1.15 |
| 1950           | 3.53                            | 3.51 | 0.02                   | 0.56                      | 24.75             | 1.27 | 1.16      | 1.16 |
| 1960           | 3.54                            | 3.52 | 0.02                   | 0.55                      | 24.01             | 1.28 | 1.17      | 1.17 |
| 1980           | 3.56                            | 3.53 | 0.03                   | 0.57                      | 22.71             | 1.31 | 1.19      | 1.18 |
| 1990           | 3.56                            | 3.54 | 0.02                   | 0.60                      | 22.13             | 1.32 | 1.20      | 1.19 |
| 2000           | 3.57                            | 3.55 | 0.02                   | 0.61                      | 21.59             | 1.33 | 1.21      | 1.20 |
| 2050           | 3.62                            | 3.60 | 0.02                   | 0.65                      | 19.30             | 1.40 | 1.25      | 1.24 |
| 2100           | 3.67                            | 3.65 | 0.02                   | 0.70                      | 17.46             | 1.47 | 1.30      | 1.28 |
| 2125           | 3.71                            | 3.68 | 0.03                   | 0.74                      | 16.67             | 1.51 | 1.33      | 1.30 |
| 2150           | 3.74                            | 3.71 | 0.03                   | 0.73                      | 15.97             | 1.56 | 1.35      | 1.32 |
| 2200           | 3.82                            | 3.79 | 0.03                   | 0.77                      | 14.69             | 1.65 | 1.40      | 1.37 |
| 2225           | 3.87                            | 3.83 | 0.04                   | 0.77                      | 14.11             | 1.70 | 1.43      | 1.39 |
| 2250           | 3.91                            | 3.88 | 0.03                   | 0.84                      | 13.58             | 1.76 | 1.45      | 1.41 |
| 2300           | 4.01                            | 3.97 | 0.04                   | 0.83                      | 12.62             | 1.87 | 1.50      | 1.46 |
| 2350           | 4.13                            | 4.08 | 0.05                   | 0.83                      | 11.77             | 2.00 | 1.55      | 1.51 |
| 2400           | 4.27                            | 4.21 | 0.06                   | 0.87                      | 11.00             | 2.15 | 1.60      | 1.56 |
| 2450           | 4.42                            | 4.35 | 0.07                   | 0.83                      | 10.29             | 2.31 | 1.65      | 1.61 |
| 2500           | 4.58                            | 4.50 | 0.08                   | 0.81                      | 9.64              | 2.49 | 1.71      | 1.66 |
| 2550           | 4.76                            | 4.67 | 0.09                   | 0.75                      | 9.04              | 2.69 | 1.75      | 1.71 |
| 2600           | 4.95                            | 4.86 | 0.09                   | 0.73                      | 8.50              | 2.91 | 1.80      | 1.76 |
| 2650           | 5.16                            | 5.07 | 0.09                   | 0.67                      | 7.99              | 3.15 | 1.84      | 1.82 |
| 2700           | 5.39                            | 5.31 | 0.08                   | 0.61                      | 7.53              | 3.42 | 1.89      | 1.87 |
| 2750           | 5.63                            | 5.55 | 0.08                   | 0.52                      | 7.09              | 3.70 | 1.93      | 1.92 |
| 2800           | 5.89                            | 5.81 | 0.08                   | 0.49                      | 6.68              | 4.01 | 1.97      | 1.97 |
| 2850           | 6.16                            | 6.09 | 0.07                   | 0.39                      | 6.32              | 4.38 | 2.01      | 2.02 |
| 2900           | 6.45                            | 6.38 | 0.07                   | 0.31                      | 5.96              | 4.75 | 2.04      | 2.06 |

<sup>1</sup> Total Loss = Insertion Loss+ 3dB Splitter Loss

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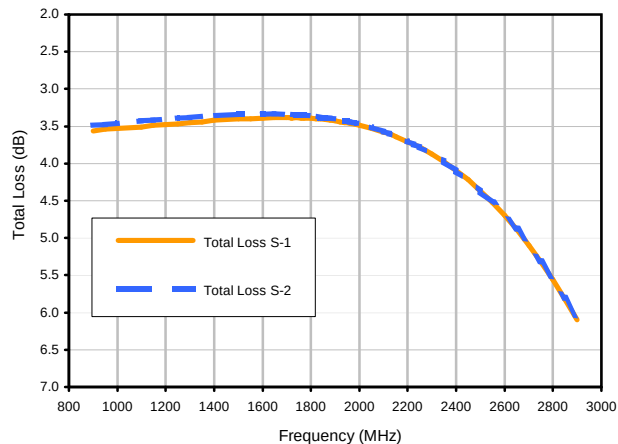
Page 3 of 3

# 2 Way-0° Power Splitter/Combiner

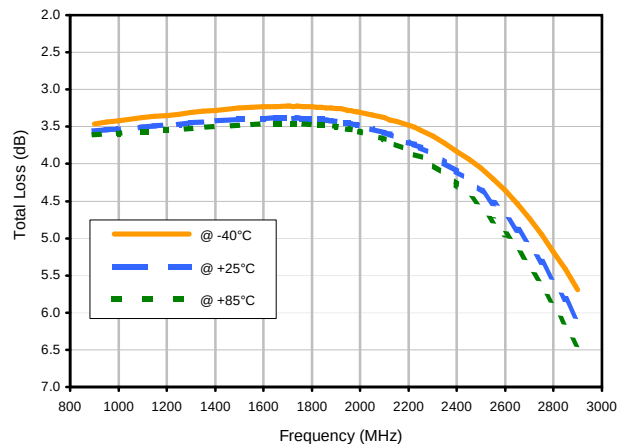
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## Typical Performance Curves

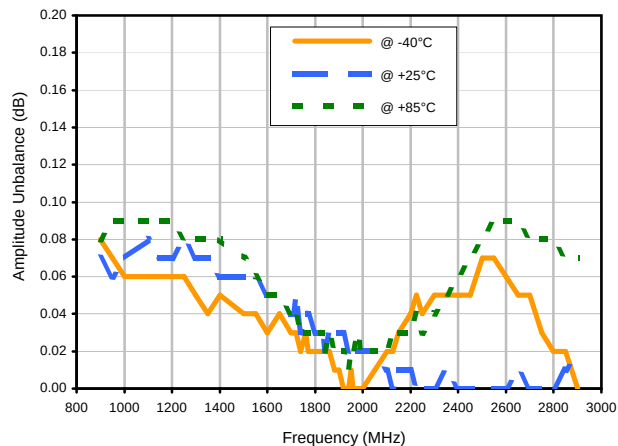
Total Loss



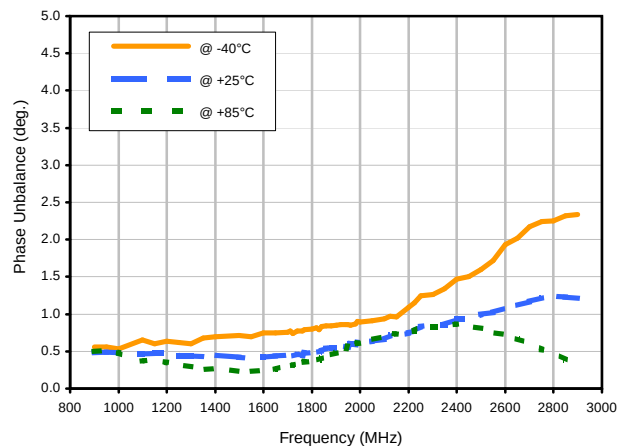
Total Loss S-1 vs. TEMPERATURE



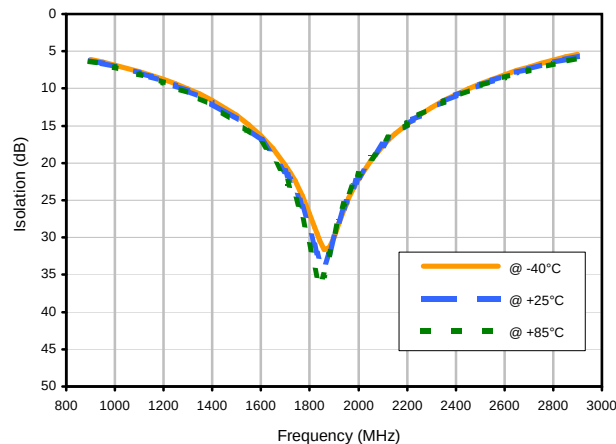
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE

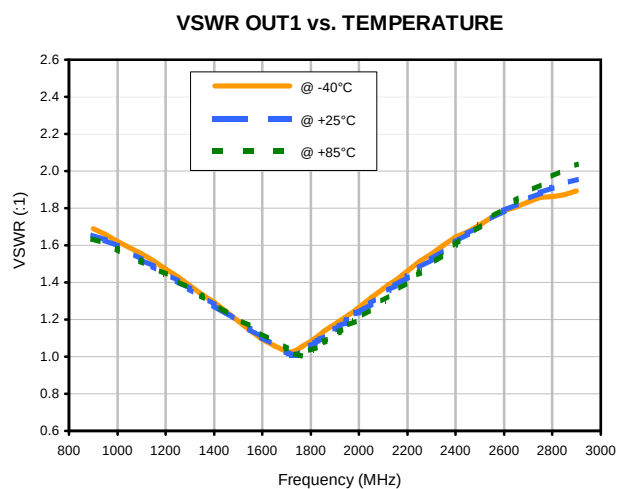
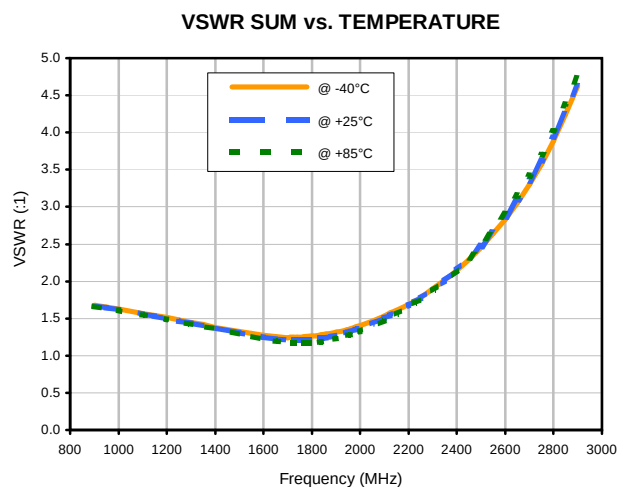
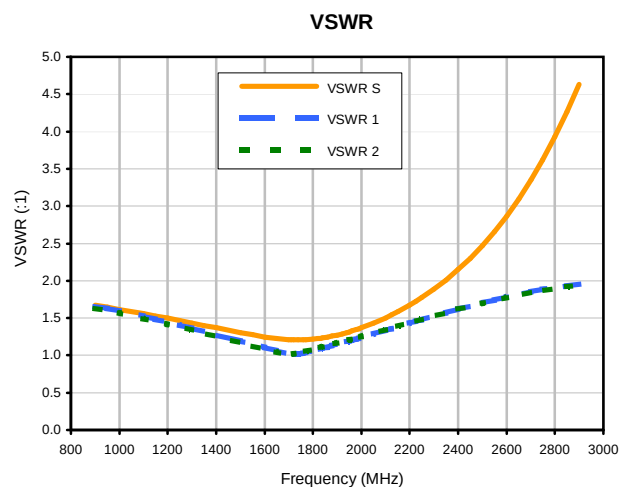


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# 2 Way-0° Power Splitter/Combiner

SP-2P1+

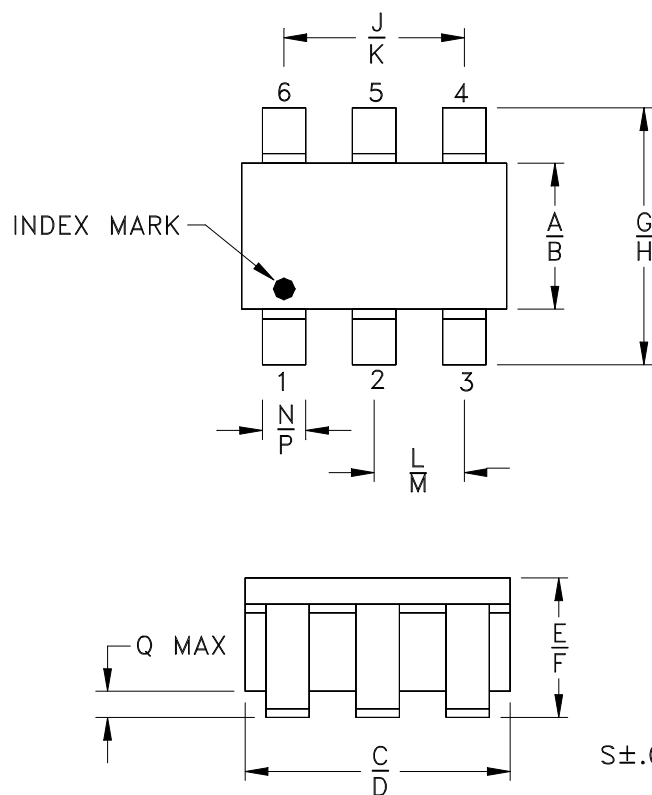
## Typical Performance Curves



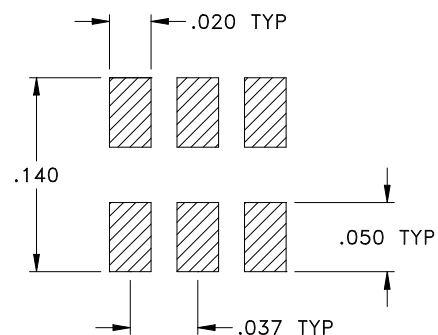
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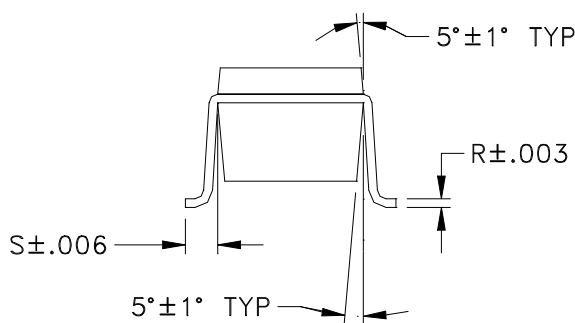
### Outline Dimensions



### PCB Land Pattern



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



| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| CA531  | .052<br>(1.32) | .067<br>(1.70) | .106<br>(2.69) | .122<br>(3.10) | .035<br>(0.89) | .064<br>(1.63) | .087<br>(2.21) | .118<br>(3.00) | .067<br>(1.70) | .083<br>(2.11) |

| CASE # | L              | M              | N              | P              | Q              | R              | S              | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| CA531  | .033<br>(0.84) | .042<br>(1.07) | .012<br>(0.30) | .020<br>(0.51) | .012<br>(0.30) | .006<br>(0.15) | .018<br>(0.46) | .020     |

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

#### Notes:

- Case material: Plastic.
- Termination finish:  
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier.  
(Unless stated otherwise on Data sheet).



INTERNET <http://www.minicircuits.com>

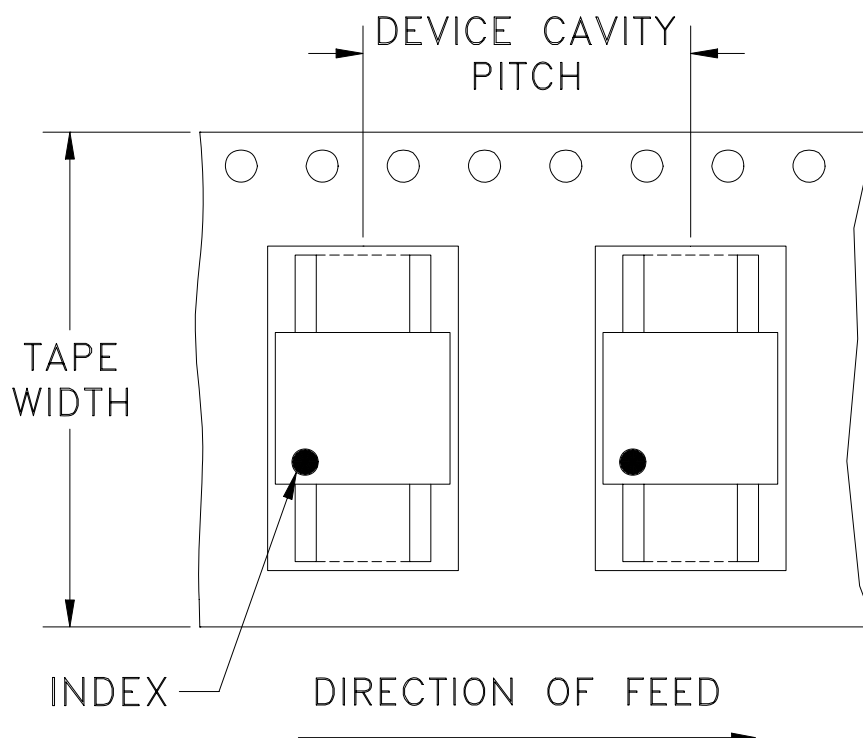
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# Tape & Reel Packaging TR-F31

## DEVICE ORIENTATION IN T&R



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

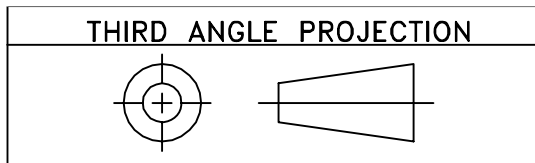
Note: Please Consult individual model data sheet to determine device per reel availability

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)

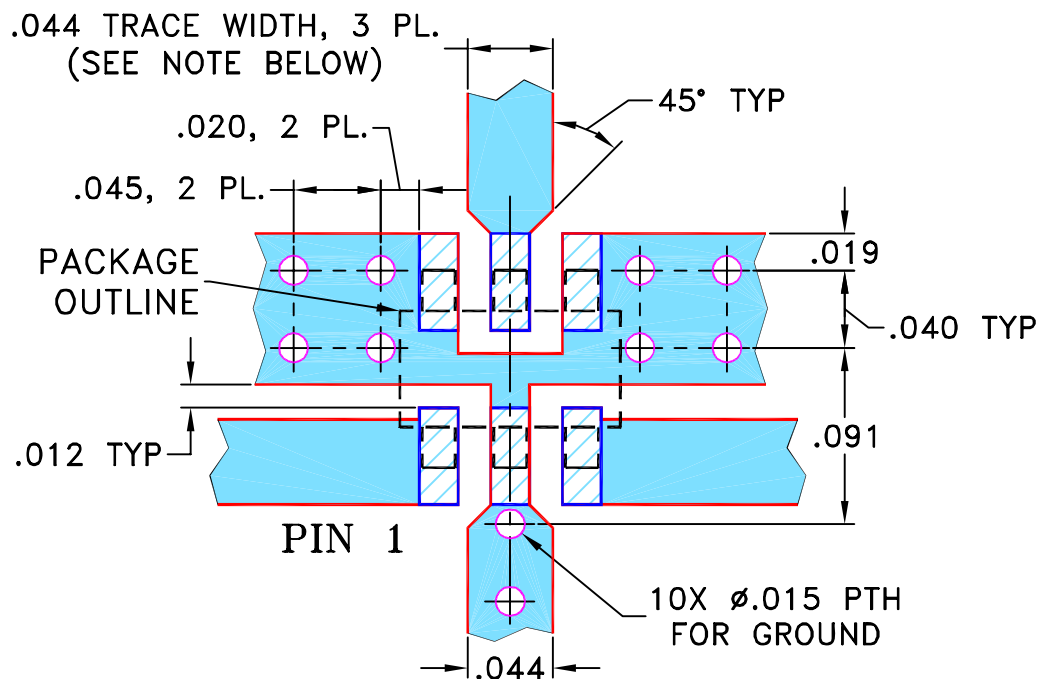


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| REVISIONS |         |             |          |     |      |
|-----------|---------|-------------|----------|-----|------|
| REV OR    | ECN No. | DESCRIPTION | DATE     | DR  | AUTH |
|           | M102559 | NEW RELEASE | 02/23/06 | MMG | HY   |
|           |         |             |          |     |      |
|           |         |             |          |     |      |
|           |         |             |          |     |      |

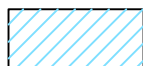
## SUGGESTED MOUNTING CONFIGURATION FOR CA531 CASE STYLE, "jk" PIN CONNECTION



- NOTES:** 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020"  $\pm$  .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<br>TOLERANCES ON:<br>2 PL DECIMALS $\pm$<br>3 PL DECIMALS $\pm$ .005<br>ANGLES $\pm$<br>FRACTIONS $\pm$ | DRAWN    | MMG | 02/22/06 |
|                                                                                                                                  | CHECKED  | AV  | 02/23/06 |
|                                                                                                                                  | APPROVED | HY  | 02/23/06 |
|                                                                                                                                  |          |     |          |



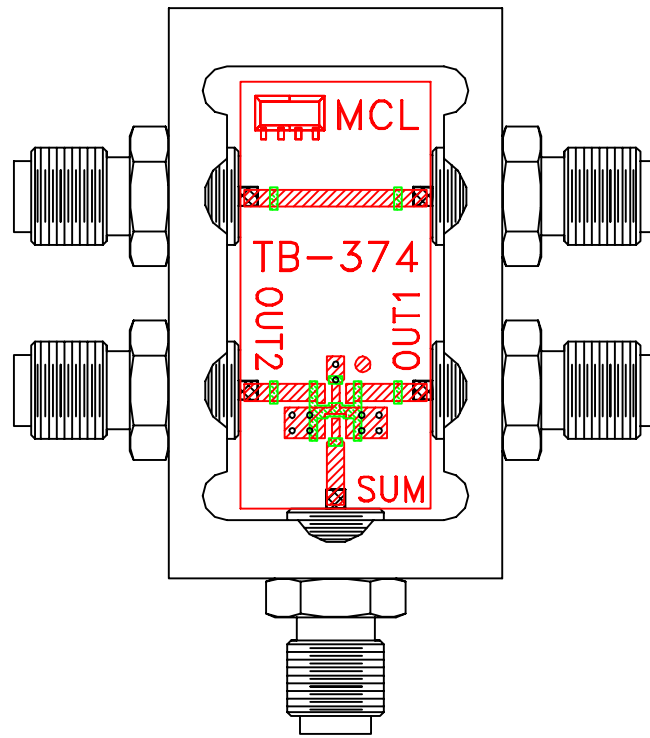
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Brooklyn NY 11235

PL, jk, CA531, SP-2C+ (P+, U+), TB-374

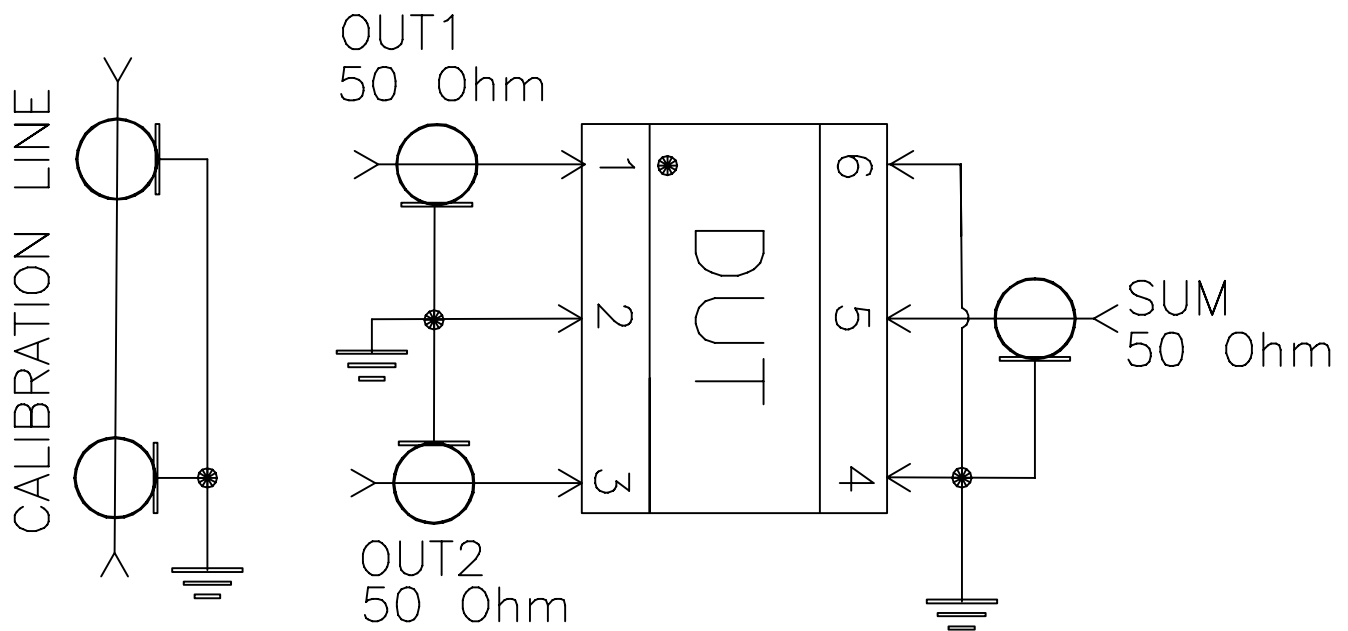
|                                                                                                                                                                                                                                                                                                           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

| SIZE   | CODE IDENT | DRAWING NO: | REV: |
|--------|------------|-------------|------|
| A      | 15542      | 98-PL-232   | OR   |
| FILE:  | 98PL232    | SCALE:      | 10:1 |
| SHEET: |            | 1 OF 1      |      |

# Evaluation Board and Circuit



TB-374



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers R04350B or its equivalent,  Mini-Circuits®  
Dielectric Constant=3.5, Thickness=.020"



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           | -65° to 150° C<br>Ambient Environment                                                                                     | Individual Model Data Sheet                   |
| Autoclave                     | 15 psig, 100% RH, 121°C, 96 hours                                                                                         | JESD22-A102-C, Condition C                    |
| Temperature Cycling           | -65° to 150°C, 100 cycles                                                                                                 | JESD22-A104                                   |
| Temperature Humidity          | 85°C/ 85% RH, 168 hours                                                                                                   | JESD22-113                                    |
| Solder Reflow Heat            | Sn-Pb Eutetic Process: 240°C peak<br>Pb-Free Process: 260°C peak                                                          | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1 |
| Moisture Sensitivity: Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS) | J-STD-020                                     |
| Solderability                 | 10X magnification, 95% coverage                                                                                           | JESD22-B102, Method 1: Dip and Look Test      |
| Mechanical Shock              | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                                                         | MIL-STD-202, Method 213, Condition A          |
| 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          |