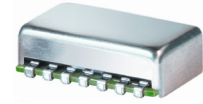


# Surface Mount Power Splitter/Combiner

## JSPQ-65W+

2 Way-90° 50Ω 5 to 65 MHz



CASE STYLE: BK276

### Maximum Ratings

|   |                |
|---|----------------|
| Operating Temperature   | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| Power Input (as a splitter)                                     | 1W max.        |
| Permanent damage may occur if any of these limits are exceeded. |                |

### Pin Connections

|              |                            |
|--------------|----------------------------|
| SUM PORT     | 2                          |
| PORT 1 (0°)  | 6                          |
| PORT 2 (90°) | 9                          |
| GROUND       | 1,3,4,5,7,8,10,11,12,13,14 |

### Features

- wideband, 5 to 65 MHz
- excellent isolation, 33 dB typ.
- low insertion loss, 0.7 dB typ.
- aqueous washable

### Applications

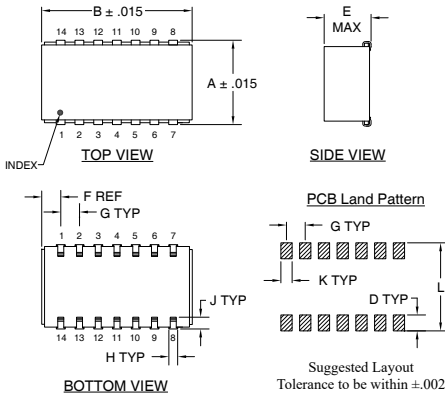
- LMDS base station
- instrumentation
- modulators

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

### Splitter Electrical Specifications

| FREQ. RANGE (MHz) | ISOLATION (dB) |      | INSERTION LOSS (dB)<br>Avg. of coupled outputs less 3 dB |      | PHASE UNBALANCE (Degrees) | AMPLITUDE UNBALANCE (dB) |
|-------------------|----------------|------|--|------|---------------------------|--------------------------|
|                   | Typ.           | Min. | Typ.   | Max. | Max.                      | Max.                     |
| $f_L - f_U$       |                |      |  |      |                           |                          |
| 5 - 65            | 33             | 25   | 0.7  | 1.5  | 5                         | 0.7                      |

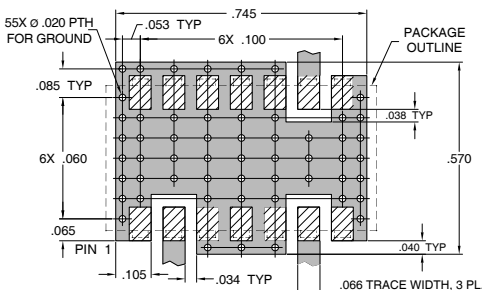
### Outline Drawing



### Outline Dimensions (inch/mm)

| A     | B     | C    | D    | E     | F     |
|-------|-------|------|------|-------|-------|
| .450  | .803  | --   | .100 | .250  | .102  |
| 11.43 | 20.40 | --   | 2.54 | 6.35  | 2.59  |
| G     | H     | J    | K    | L     | wt.   |
| .100  | .047  | .065 | .065 | .470  | grams |
| 2.54  | 1.19  | 1.65 | 1.65 | 11.94 | 3.0   |

### Demo Board MCL P/N: TB-444+ Suggested PCB Layout (PL-272)



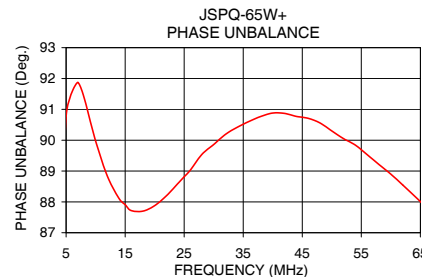
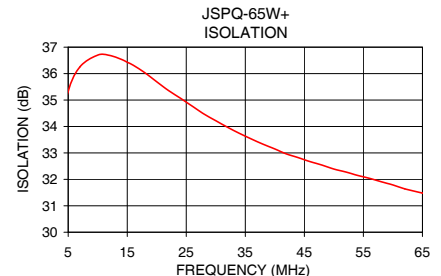
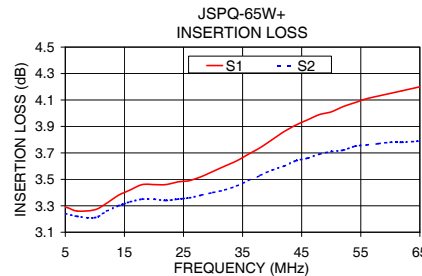
- NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS 0.030±.002", COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- ▨ DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

#### NOTES:

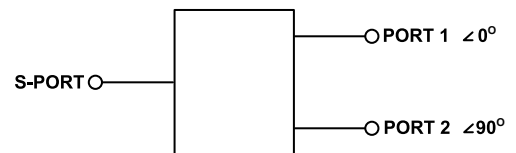
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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 <https://www.minicircuits.com/terms/viewterm.html>

### Typical Performance Data

| Frequency (MHz) | Insertion Loss (dB) |      | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR S | VSWR 1 | VSWR 2 |
|-----------------|---------------------|------|--------------------------|----------------|------------------------|--------|--------|--------|
|                 | S-1                 | S-2  |                          |                |                        |        |        |        |
| 5.00            | 3.29                | 3.24 | 0.05                     | 35.32          | 90.78                  | 1.10   | 1.26   | 1.12   |
| 10.00           | 3.27                | 3.21 | 0.06                     | 36.70          | 89.97                  | 1.09   | 1.21   | 1.05   |
| 15.00           | 3.40                | 3.32 | 0.09                     | 36.43          | 87.91                  | 1.12   | 1.22   | 1.06   |
| 20.00           | 3.46                | 3.35 | 0.11                     | 35.69          | 87.88                  | 1.19   | 1.27   | 1.15   |
| 25.00           | 3.49                | 3.36 | 0.13                     | 34.92          | 88.82                  | 1.27   | 1.36   | 1.23   |
| 30.00           | 3.56                | 3.40 | 0.16                     | 34.22          | 89.86                  | 1.35   | 1.44   | 1.31   |
| 32.00           | 3.60                | 3.42 | 0.18                     | 33.97          | 90.19                  | 1.38   | 1.47   | 1.33   |
| 34.00           | 3.64                | 3.45 | 0.19                     | 33.74          | 90.42                  | 1.41   | 1.50   | 1.36   |
| 36.00           | 3.69                | 3.49 | 0.20                     | 33.53          | 90.61                  | 1.43   | 1.53   | 1.38   |
| 40.00           | 3.80                | 3.57 | 0.22                     | 33.15          | 90.88                  | 1.48   | 1.59   | 1.41   |
| 45.00           | 3.93                | 3.65 | 0.28                     | 32.75          | 90.74                  | 1.53   | 1.65   | 1.45   |
| 50.00           | 4.01                | 3.71 | 0.31                     | 32.39          | 90.30                  | 1.57   | 1.70   | 1.47   |
| 55.00           | 4.10                | 3.76 | 0.35                     | 32.10          | 89.69                  | 1.60   | 1.75   | 1.48   |
| 60.00           | 4.15                | 3.78 | 0.37                     | 31.79          | 88.90                  | 1.63   | 1.80   | 1.49   |
| 65.00           | 4.20                | 3.79 | 0.40                     | 31.48          | 88.01                  | 1.66   | 1.84   | 1.49   |



### functional schematic



# 2 Way-90° Power Splitter/Combiner

# JSPQ-65W+

## Typical Performance Data

| FREQ.<br>(MHz) | TOTAL LOSS <sup>1</sup><br>(dB) |      | AMP.<br>UNBAL.<br>(dB) | ISOLATION<br>(dB) | PHASE<br>UNBAL.<br>(deg.) | FREQ.<br>(MHz) | VSWR<br>(:1) |      |      |
|----------------|---------------------------------|------|------------------------|-------------------|---------------------------|----------------|--------------|------|------|
|                | S-1                             | S-2  |                        |                   |                           |                | S            | 1    | 2    |
| 3.0            | 3.28                            | 3.27 | 0.01                   | 32.78             | 80.68                     | 3.0            | 1.11         | 1.15 | 1.15 |
| 3.5            | 3.29                            | 3.27 | 0.02                   | 33.48             | 84.92                     | 3.5            | 1.11         | 1.14 | 1.14 |
| 4.0            | 3.29                            | 3.27 | 0.02                   | 34.06             | 87.81                     | 4.0            | 1.11         | 1.14 | 1.14 |
| 4.5            | 3.30                            | 3.27 | 0.03                   | 34.57             | 89.72                     | 4.5            | 1.11         | 1.13 | 1.13 |
| 5.0            | 3.31                            | 3.28 | 0.03                   | 34.94             | 90.94                     | 5.0            | 1.11         | 1.13 | 1.13 |
| 7.0            | 3.33                            | 3.29 | 0.03                   | 35.87             | 91.98                     | 7.0            | 1.10         | 1.10 | 1.10 |
| 10.0           | 3.36                            | 3.32 | 0.04                   | 36.35             | 90.06                     | 10.0           | 1.09         | 1.05 | 1.05 |
| 12.0           | 3.39                            | 3.34 | 0.05                   | 36.35             | 88.85                     | 12.0           | 1.09         | 1.02 | 1.03 |
| 14.0           | 3.42                            | 3.36 | 0.06                   | 36.22             | 88.11                     | 14.0           | 1.10         | 1.04 | 1.04 |
| 15.0           | 3.43                            | 3.37 | 0.07                   | 36.13             | 87.89                     | 15.0           | 1.11         | 1.06 | 1.06 |
| 17.0           | 3.47                            | 3.40 | 0.07                   | 35.91             | 87.76                     | 17.0           | 1.13         | 1.10 | 1.10 |
| 20.0           | 3.52                            | 3.43 | 0.09                   | 35.53             | 88.00                     | 20.0           | 1.18         | 1.15 | 1.15 |
| 22.0           | 3.56                            | 3.46 | 0.09                   | 35.27             | 88.37                     | 22.0           | 1.21         | 1.19 | 1.19 |
| 25.0           | 3.62                            | 3.50 | 0.12                   | 34.89             | 88.96                     | 25.0           | 1.26         | 1.24 | 1.23 |
| 27.0           | 3.65                            | 3.52 | 0.14                   | 34.62             | 89.40                     | 27.0           | 1.29         | 1.27 | 1.27 |
| 30.0           | 3.71                            | 3.55 | 0.16                   | 34.27             | 89.94                     | 30.0           | 1.33         | 1.31 | 1.31 |
| 32.0           | 3.75                            | 3.58 | 0.17                   | 34.07             | 90.27                     | 32.0           | 1.36         | 1.34 | 1.33 |
| 34.0           | 3.78                            | 3.60 | 0.19                   | 33.85             | 90.53                     | 34.0           | 1.39         | 1.36 | 1.36 |
| 35.0           | 3.80                            | 3.61 | 0.19                   | 33.75             | 90.64                     | 35.0           | 1.40         | 1.37 | 1.37 |
| 36.0           | 3.82                            | 3.62 | 0.20                   | 33.65             | 90.71                     | 36.0           | 1.42         | 1.38 | 1.38 |
| 38.0           | 3.86                            | 3.64 | 0.22                   | 33.46             | 90.83                     | 38.0           | 1.44         | 1.40 | 1.40 |
| 40.0           | 3.89                            | 3.66 | 0.23                   | 33.28             | 90.89                     | 40.0           | 1.46         | 1.42 | 1.42 |
| 42.0           | 3.92                            | 3.67 | 0.25                   | 33.10             | 90.91                     | 42.0           | 1.48         | 1.43 | 1.43 |
| 45.0           | 3.98                            | 3.71 | 0.27                   | 32.85             | 90.81                     | 45.0           | 1.51         | 1.45 | 1.45 |
| 47.0           | 4.00                            | 3.72 | 0.28                   | 32.69             | 90.71                     | 47.0           | 1.53         | 1.46 | 1.46 |
| 50.0           | 4.04                            | 3.74 | 0.30                   | 32.45             | 90.43                     | 50.0           | 1.56         | 1.47 | 1.47 |
| 52.0           | 4.07                            | 3.75 | 0.32                   | 32.29             | 90.20                     | 52.0           | 1.57         | 1.48 | 1.48 |
| 55.0           | 4.11                            | 3.77 | 0.34                   | 32.08             | 89.83                     | 55.0           | 1.59         | 1.48 | 1.49 |
| 57.0           | 4.13                            | 3.78 | 0.35                   | 31.95             | 89.51                     | 57.0           | 1.60         | 1.49 | 1.49 |
| 60.0           | 4.17                            | 3.80 | 0.37                   | 31.74             | 89.05                     | 60.0           | 1.62         | 1.49 | 1.49 |
| 62.0           | 4.19                            | 3.80 | 0.39                   | 31.61             | 88.70                     | 62.0           | 1.63         | 1.49 | 1.49 |
| 65.0           | 4.22                            | 3.83 | 0.39                   | 31.42             | 88.14                     | 65.0           | 1.64         | 1.48 | 1.49 |
| 67.0           | 4.24                            | 3.84 | 0.40                   | 31.30             | 87.83                     | 67.0           | 1.65         | 1.48 | 1.49 |
| 70.0           | 4.26                            | 3.85 | 0.41                   | 31.10             | 87.17                     | 70.0           | 1.66         | 1.48 | 1.48 |
| 72.0           | 4.28                            | 3.86 | 0.42                   | 31.00             | 86.82                     | 72.0           | 1.67         | 1.47 | 1.48 |
| 75.0           | 4.32                            | 3.88 | 0.44                   | 30.85             | 86.19                     | 75.0           | 1.68         | 1.47 | 1.47 |
| 80.0           | 4.37                            | 3.91 | 0.46                   | 30.57             | 85.20                     | 80.0           | 1.69         | 1.46 | 1.46 |
| 85.0           | 4.40                            | 3.93 | 0.48                   | 30.31             | 84.23                     | 85.0           | 1.71         | 1.46 | 1.46 |
| 90.0           | 4.44                            | 3.95 | 0.49                   | 30.07             | 83.32                     | 90.0           | 1.72         | 1.46 | 1.46 |
| 95.0           | 4.47                            | 3.98 | 0.50                   | 29.84             | 82.41                     | 95.0           | 1.73         | 1.46 | 1.47 |
| 100.0          | 4.50                            | 4.00 | 0.51                   | 29.62             | 81.57                     | 100.0          | 1.74         | 1.48 | 1.48 |
| 105.0          | 4.52                            | 4.03 | 0.50                   | 29.39             | 80.68                     | 105.0          | 1.75         | 1.50 | 1.50 |
| 110.0          | 4.56                            | 4.06 | 0.49                   | 29.20             | 79.84                     | 110.0          | 1.76         | 1.53 | 1.52 |
| 115.0          | 4.58                            | 4.10 | 0.48                   | 28.99             | 79.09                     | 115.0          | 1.77         | 1.56 | 1.56 |
| 120.0          | 4.59                            | 4.14 | 0.45                   | 28.79             | 78.43                     | 120.0          | 1.78         | 1.60 | 1.60 |
| 125.0          | 4.59                            | 4.17 | 0.42                   | 28.63             | 77.79                     | 125.0          | 1.78         | 1.65 | 1.64 |
| 130.0          | 4.60                            | 4.22 | 0.38                   | 28.43             | 77.20                     | 130.0          | 1.79         | 1.70 | 1.69 |

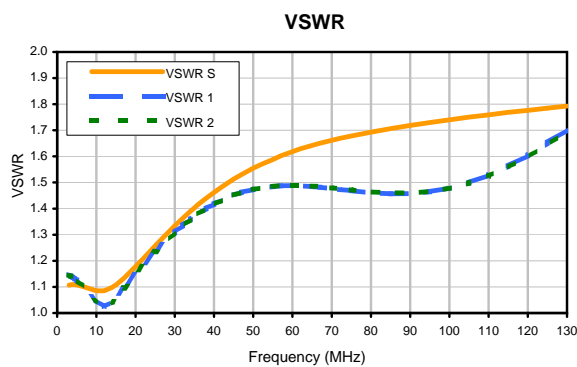
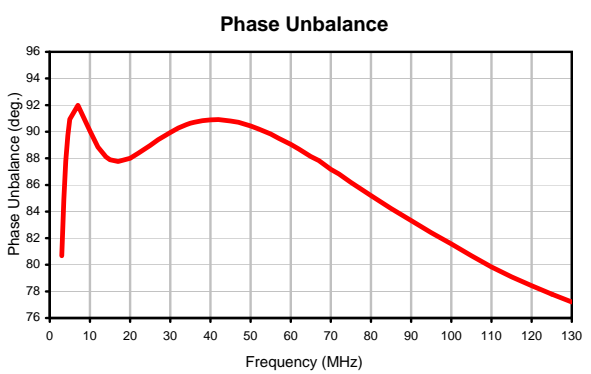
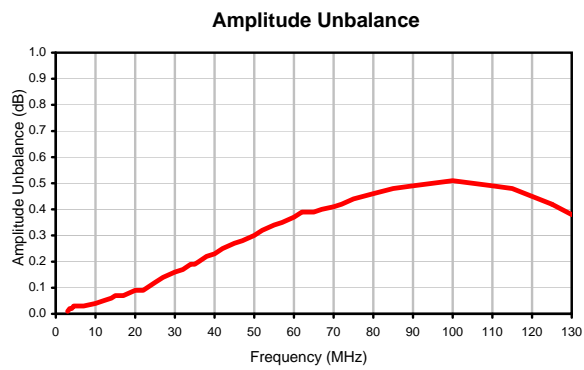
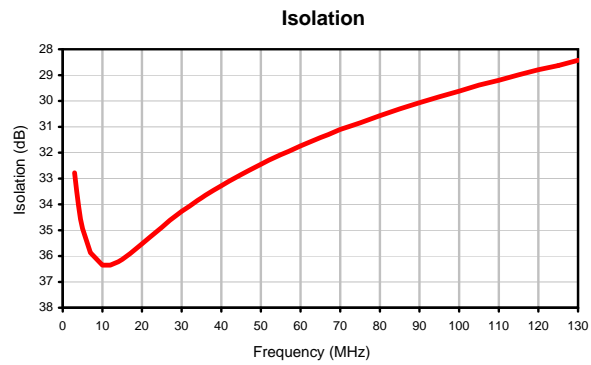
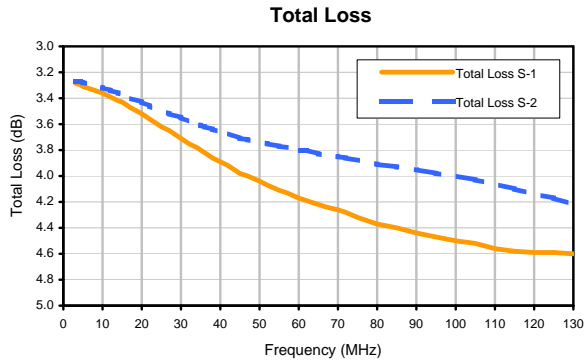
<sup>1</sup>Total Loss = Insertion Loss + 3dB Splitter Loss



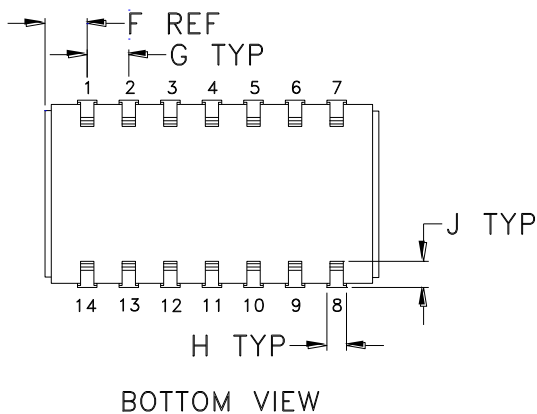
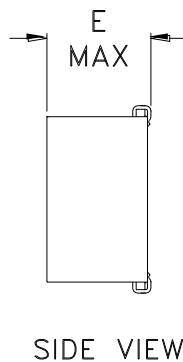
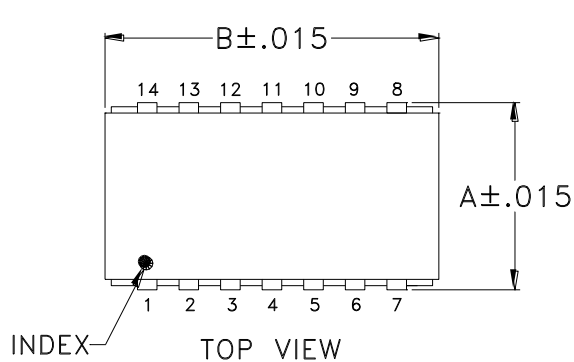
# 2 Way-90° Power Splitter/Combiner

# JSPQ-65W+

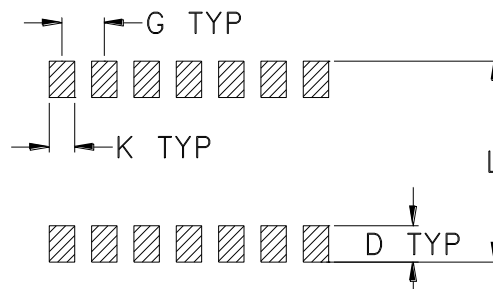
## Typical Performance Curves



### 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               | WT. GRAM    |
|--------|-----------------|-----------------|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-------------|
| BK276  | .450<br>(11.43) | .803<br>(20.40) | --<br>-- | .100<br>(2.54) | .250<br>(6.35) | .102<br>(2.59) | .100<br>(2.54) | .047<br>(1.19) | .065<br>(1.65) | .065<br>(1.65) | .470<br>(11.94) | 2.0<br>MAX. |

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

#### Notes:

- Case material: Copper Nickel alloy.
- Base material: Printed wiring laminate.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.  
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.



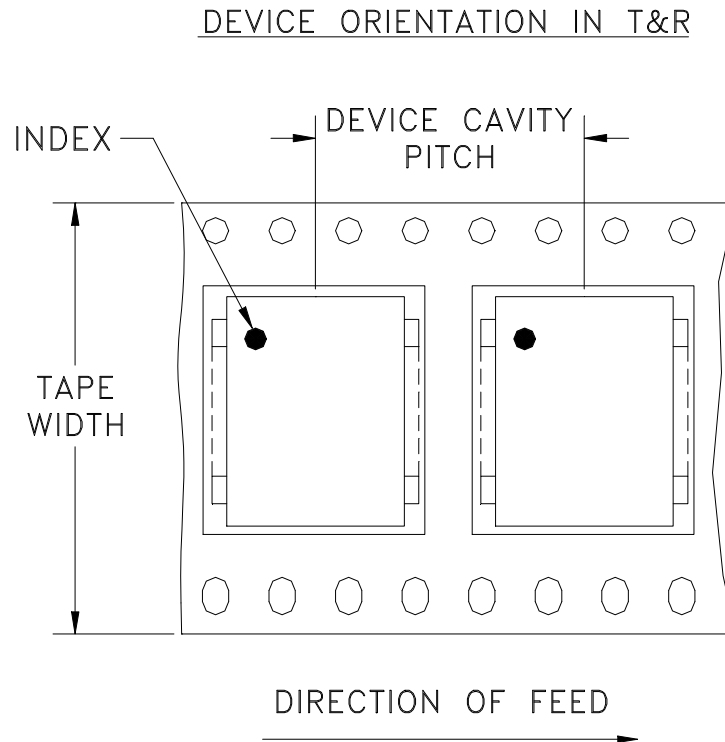
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# Tape & Reel Packaging TR-F5



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel |
|-------------------|----------------------------|----------------------|------------------|
| 32                | 16                         | 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.

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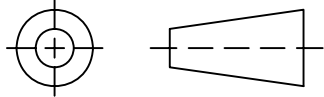
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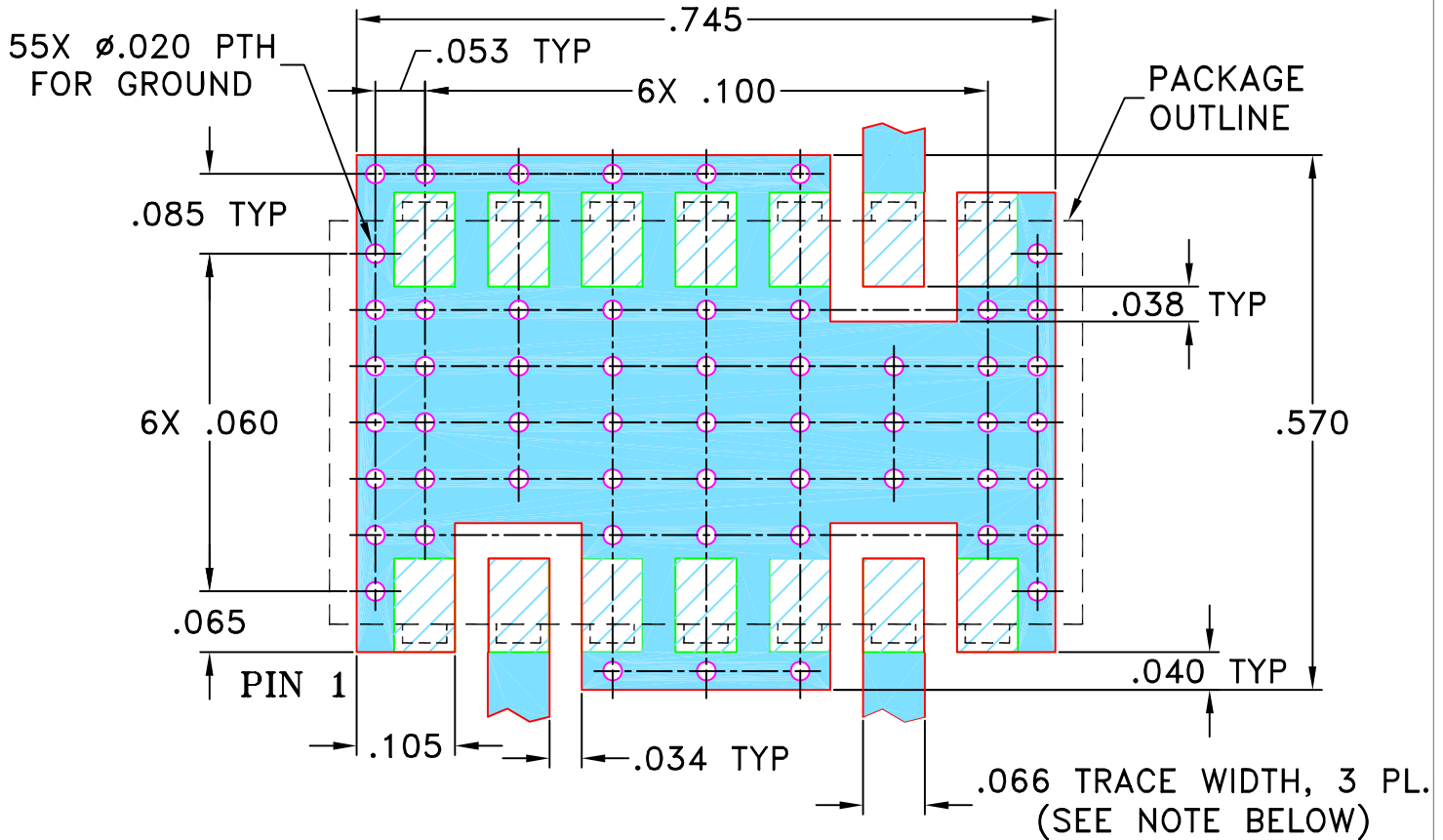
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE  | DR | AUTH |
|-----|---------|-------------|-------|----|------|
| OR  | M110405 | NEW RELEASE | 03/07 | DK | HH   |
| OR  | R68082  | NEW RELEASE | 03/07 | DK | HH   |
|     |         |             |       |    |      |

SUGGESTED MOUNTING CONFIGURATION FOR BK276 CASE STYLE, "sd" PIN CONNECTION



NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002", 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

| UNLESS OTHERWISE SPECIFIED | INITIALS    | DATE      |
|----------------------------|-------------|-----------|
| DIMENSIONS ARE IN INCHES   | DRAWN DK    | 18 MAR 07 |
| TOLERANCES ON:             | CHECKED RZ  | 18 MAR 07 |
| 2 PL DECIMALS ±            | APPROVED HH | 18 MAR 07 |
| 3 PL DECIMALS ± .005       |             |           |
| ANGLES ±                   |             |           |
| FRACTIONS ±                |             |           |

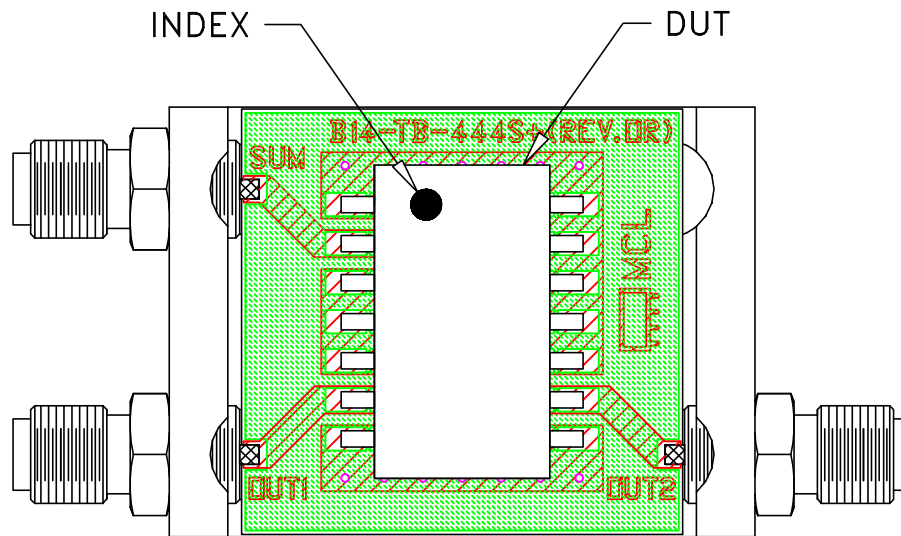
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PL, sd, BK276, JSPQ, TB-444+

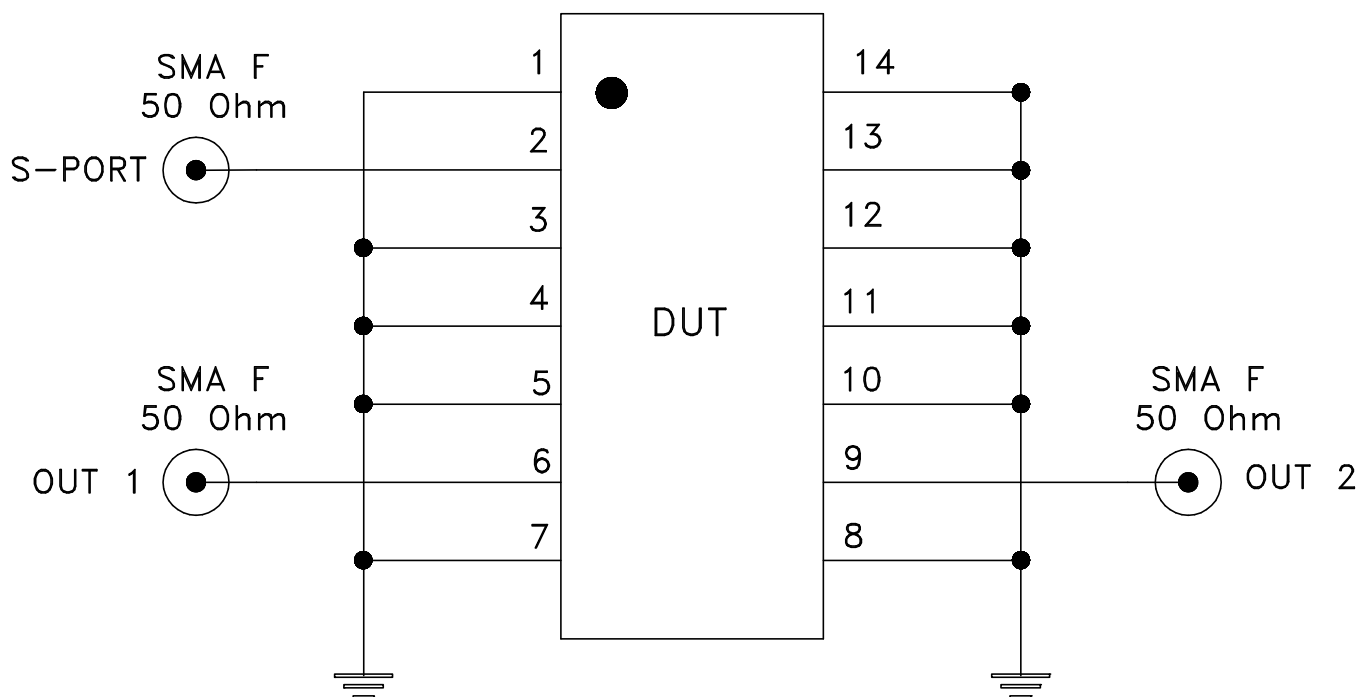
| SIZE  | CODE IDENT | DRAWING NO: | REV:          |
|-------|------------|-------------|---------------|
| A     | 15542      | 98-PL-272   | OR            |
| FILE: | 98PL272    | SCALE: 5:1  | SHEET: 1 OF 1 |

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# Evaluation Board and Circuit




TB-444+



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: ROGERS R04350B or equivalent,  
Dielectric Constant=3.5, Thickness=.030 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          | -40° to 85°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 |
| 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, 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  |