

# Surface Mount Power Splitter/Combiner

## JSPQ-80+

2 Way-90° 50Ω 10 to 80 MHz



Generic photo used for illustration purposes only

CASE STYLE: BK276

**+RoHS Compliant**

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

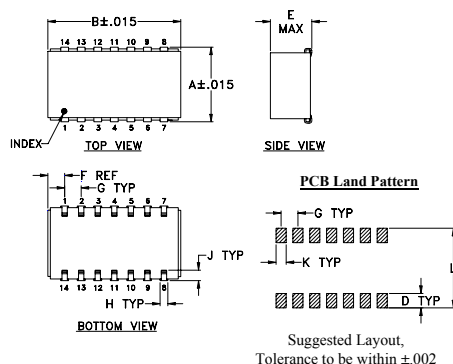
### Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| Power Input (as a splitter)                                     | 1W max.        |
| Internal Dissipation                                            | 0.125W max.    |
| Permanent damage may occur if any of these limits are exceeded. |                |

### Pin Connections

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

### Outline Drawing



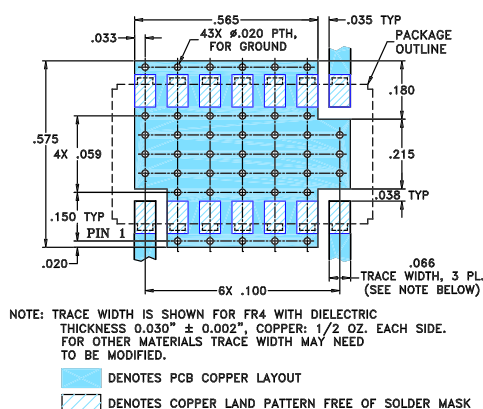
### Outline Dimensions (inch/mm)

| A     | B     | C  | D    | E    | F    | G    |
|-------|-------|----|------|------|------|------|
| .450  | .803  | -- | .100 | .250 | .102 | .100 |
| 11.43 | 20.40 | -- | 2.54 | 6.35 | 2.59 | 2.54 |

| H    | J    | K    | L     | wt    |
|------|------|------|-------|-------|
| .047 | .065 | .065 | .470  | grams |
| 1.19 | 1.65 | 1.65 | 11.94 | 3.0   |

### Demo Board MCL P/N: TB-217 Suggested PCB Layout (PL-099)



### Features

- low insertion loss, 0.45 dB typ.
- excellent isolation, 44 dB typ.
- aqueous washable

### Applications

- HF/VHF
- radio communications
- instrumentation

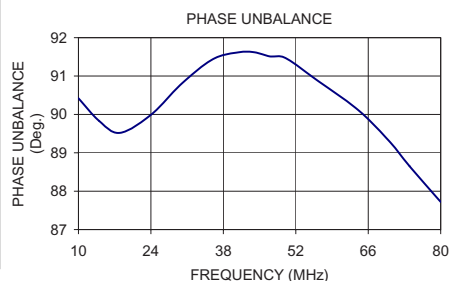
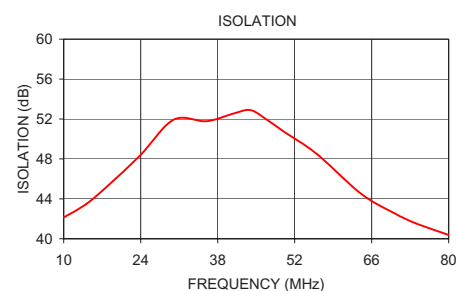
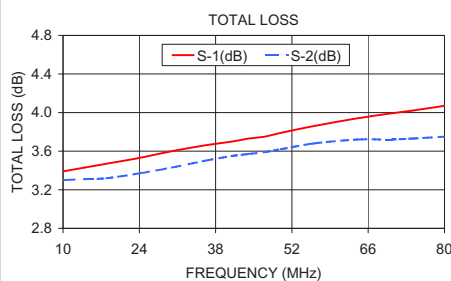
### Electrical Specifications

| FREQ. RANGE (MHz) | ISOLATION (dB) | INSERTION LOSS (dB)<br>Avg. of Coupled Outputs<br>ABOVE 3 dB | PHASE UNBALANCE (Degrees) | AMPLITUDE UNBALANCE (dB) |
|-------------------|----------------|--------------------------------------------------------------|---------------------------|--------------------------|
| $f_L$ - $f_U$     | Typ. Min.      | Typ. Max.                                                    | Max.                      | Max.                     |
| 10-80             | 44 30          | 0.45 1.4                                                     | 6                         | 0.6                      |

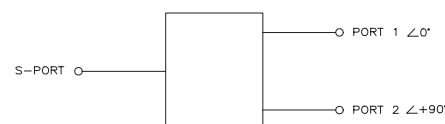
### Typical Performance Data

| Frequency (MHz) | Total Loss <sup>1</sup> (dB) | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR S | VSWR 1 | VSWR 2 |
|-----------------|------------------------------|--------------------------|----------------|------------------------|--------|--------|--------|
|                 | S-1                          | S-2                      |                |                        |        |        |        |
| 10.00           | 3.39                         | 3.30                     | 0.09           | 42.13                  | 1.10   | 1.17   | 1.20   |
| 14.00           | 3.43                         | 3.31                     | 0.12           | 43.44                  | 1.08   | 1.10   | 1.12   |
| 18.00           | 3.47                         | 3.32                     | 0.14           | 45.30                  | 1.07   | 1.06   | 1.03   |
| 24.00           | 3.53                         | 3.37                     | 0.16           | 48.41                  | 1.09   | 1.09   | 1.09   |
| 30.00           | 3.60                         | 3.43                     | 0.17           | 51.93                  | 1.12   | 1.15   | 1.21   |
| 36.00           | 3.66                         | 3.50                     | 0.16           | 51.78                  | 1.15   | 1.22   | 1.31   |
| 41.00           | 3.70                         | 3.55                     | 0.15           | 52.57                  | 1.19   | 1.27   | 1.38   |
| 44.00           | 3.73                         | 3.57                     | 0.16           | 52.89                  | 1.21   | 1.29   | 1.41   |
| 47.00           | 3.75                         | 3.59                     | 0.16           | 51.91                  | 1.22   | 1.32   | 1.45   |
| 50.00           | 3.79                         | 3.62                     | 0.17           | 50.75                  | 1.24   | 1.35   | 1.47   |
| 56.00           | 3.86                         | 3.68                     | 0.18           | 48.51                  | 1.26   | 1.40   | 1.51   |
| 64.00           | 3.94                         | 3.72                     | 0.22           | 44.54                  | 1.29   | 1.48   | 1.52   |
| 70.00           | 3.99                         | 3.72                     | 0.27           | 42.59                  | 1.32   | 1.53   | 1.52   |
| 74.00           | 4.02                         | 3.73                     | 0.29           | 41.55                  | 1.34   | 1.57   | 1.51   |
| 80.00           | 4.07                         | 3.75                     | 0.32           | 40.38                  | 1.36   | 1.62   | 1.49   |

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



### electrical schematic



### Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



[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. E  
ECO-006036  
JSPQ-80+  
LC/TD/CP/AM  
210202  
Page 1 of 1

# 2 Way-90° Power Splitter/Combiner

**JSPQ-80+**

## 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)<br>1-2 | VSWR<br>(:1) |      |      |
|----------------|---------------------------------|------|------|------------------------|---------------------------|--------------------------|--------------|------|------|
|                | S-1                             | S-2  | AVG. |                        |                           |                          | S            | 1    | 2    |
| 10             | 3.32                            | 3.29 | 3.30 | 0.03                   | 92.10                     | 38.90                    | 1.09         | 1.11 | 1.20 |
| 15             | 3.36                            | 3.28 | 3.32 | 0.08                   | 91.90                     | 39.92                    | 1.08         | 1.07 | 1.10 |
| 20             | 3.40                            | 3.29 | 3.34 | 0.11                   | 91.41                     | 40.50                    | 1.08         | 1.07 | 1.04 |
| 25             | 3.44                            | 3.33 | 3.39 | 0.11                   | 90.41                     | 40.80                    | 1.11         | 1.10 | 1.11 |
| 30             | 3.49                            | 3.38 | 3.43 | 0.11                   | 89.44                     | 40.96                    | 1.15         | 1.14 | 1.20 |
| 35             | 3.54                            | 3.43 | 3.49 | 0.10                   | 88.61                     | 40.99                    | 1.19         | 1.19 | 1.27 |
| 40             | 3.58                            | 3.50 | 3.54 | 0.08                   | 88.09                     | 40.92                    | 1.22         | 1.25 | 1.34 |
| 45             | 3.63                            | 3.53 | 3.58 | 0.10                   | 87.93                     | 40.73                    | 1.26         | 1.30 | 1.40 |
| 50             | 3.68                            | 3.59 | 3.63 | 0.09                   | 88.04                     | 40.52                    | 1.29         | 1.35 | 1.44 |
| 55             | 3.72                            | 3.62 | 3.67 | 0.10                   | 88.36                     | 40.16                    | 1.32         | 1.40 | 1.48 |
| 60             | 3.77                            | 3.65 | 3.71 | 0.12                   | 88.86                     | 39.80                    | 1.34         | 1.46 | 1.50 |
| 65             | 3.82                            | 3.68 | 3.75 | 0.14                   | 89.49                     | 39.46                    | 1.36         | 1.51 | 1.51 |
| 70             | 3.86                            | 3.70 | 3.78 | 0.16                   | 90.23                     | 38.94                    | 1.39         | 1.56 | 1.51 |
| 75             | 3.91                            | 3.71 | 3.81 | 0.20                   | 91.05                     | 38.64                    | 1.41         | 1.60 | 1.51 |
| 80             | 3.95                            | 3.73 | 3.84 | 0.22                   | 91.96                     | 38.27                    | 1.43         | 1.65 | 1.50 |
| 90             | 4.03                            | 3.74 | 3.88 | 0.29                   | 93.82                     | 37.80                    | 1.46         | 1.74 | 1.46 |
| 100            | 4.11                            | 3.76 | 3.94 | 0.35                   | 95.72                     | 37.62                    | 1.50         | 1.82 | 1.43 |
| 110            | 4.19                            | 3.77 | 3.98 | 0.42                   | 97.56                     | 37.37                    | 1.54         | 1.90 | 1.39 |
| 120            | 4.26                            | 3.79 | 4.02 | 0.47                   | 99.28                     | 37.07                    | 1.58         | 1.96 | 1.37 |

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

REV. X2

JSPQ-80+

100721

Page 1 of 3



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

P.O. Box 350166, Brooklyn, New York 11235-0003 (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-90° Power Splitter/Combiner

**JSPQ-80+**

## 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)<br>1-2 | VSWR<br>(:1) |      |      |
|----------------|---------------------------------|------|------|------------------------|---------------------------|--------------------------|--------------|------|------|
|                | S-1                             | S-2  | AVG. |                        |                           |                          | S            | 1    | 2    |
| 10             | 3.29                            | 3.27 | 3.28 | 0.02                   | 92.09                     | 34.58                    | 1.09         | 1.09 | 1.20 |
| 15             | 3.31                            | 3.24 | 3.28 | 0.07                   | 91.99                     | 37.75                    | 1.08         | 1.08 | 1.10 |
| 20             | 3.34                            | 3.25 | 3.29 | 0.09                   | 91.50                     | 40.45                    | 1.08         | 1.08 | 1.04 |
| 25             | 3.37                            | 3.28 | 3.33 | 0.09                   | 90.54                     | 42.80                    | 1.10         | 1.10 | 1.11 |
| 30             | 3.40                            | 3.31 | 3.36 | 0.09                   | 89.55                     | 45.09                    | 1.14         | 1.14 | 1.20 |
| 35             | 3.45                            | 3.36 | 3.41 | 0.09                   | 88.72                     | 47.34                    | 1.17         | 1.19 | 1.28 |
| 40             | 3.50                            | 3.43 | 3.47 | 0.07                   | 88.20                     | 50.64                    | 1.21         | 1.24 | 1.36 |
| 45             | 3.54                            | 3.46 | 3.50 | 0.07                   | 88.05                     | 54.73                    | 1.25         | 1.29 | 1.42 |
| 50             | 3.59                            | 3.52 | 3.55 | 0.07                   | 88.14                     | 61.02                    | 1.29         | 1.35 | 1.48 |
| 55             | 3.64                            | 3.55 | 3.60 | 0.09                   | 88.45                     | 57.35                    | 1.32         | 1.41 | 1.51 |
| 60             | 3.69                            | 3.58 | 3.64 | 0.11                   | 88.95                     | 51.62                    | 1.35         | 1.47 | 1.54 |
| 65             | 3.75                            | 3.61 | 3.68 | 0.14                   | 89.56                     | 47.82                    | 1.38         | 1.53 | 1.55 |
| 70             | 3.79                            | 3.63 | 3.71 | 0.16                   | 90.33                     | 44.96                    | 1.41         | 1.59 | 1.54 |
| 75             | 3.84                            | 3.63 | 3.73 | 0.21                   | 91.21                     | 43.20                    | 1.43         | 1.65 | 1.53 |
| 80             | 3.88                            | 3.64 | 3.76 | 0.24                   | 92.15                     | 41.76                    | 1.46         | 1.70 | 1.51 |
| 90             | 3.96                            | 3.65 | 3.80 | 0.31                   | 94.14                     | 39.87                    | 1.50         | 1.80 | 1.46 |
| 100            | 4.02                            | 3.65 | 3.84 | 0.37                   | 96.19                     | 38.96                    | 1.53         | 1.88 | 1.42 |
| 110            | 4.09                            | 3.67 | 3.88 | 0.42                   | 98.13                     | 38.41                    | 1.57         | 1.94 | 1.39 |
| 120            | 4.14                            | 3.68 | 3.91 | 0.46                   | 99.86                     | 38.25                    | 1.60         | 2.00 | 1.37 |

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

REV. X2

JSPQ-80+

100721

Page 2 of 3



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

P.O. Box 350166, Brooklyn, New York 11235-0003 (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-90° Power Splitter/Combiner

**JSPQ-80+**

## 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)<br>1-2 | VSWR<br>(:1) |      |      |
|----------------|---------------------------------|------|------|------------------------|---------------------------|--------------------------|--------------|------|------|
|                | S-1                             | S-2  | AVG. |                        |                           |                          | S            | 1    | 2    |
| 10             | 3.38                            | 3.35 | 3.37 | 0.03                   | 91.82                     | 35.15                    | 1.09         | 1.09 | 1.22 |
| 15             | 3.42                            | 3.34 | 3.38 | 0.08                   | 91.68                     | 34.95                    | 1.07         | 1.04 | 1.11 |
| 20             | 3.47                            | 3.36 | 3.41 | 0.11                   | 91.26                     | 34.78                    | 1.09         | 1.05 | 1.06 |
| 25             | 3.51                            | 3.41 | 3.46 | 0.10                   | 90.31                     | 34.60                    | 1.13         | 1.09 | 1.13 |
| 30             | 3.56                            | 3.46 | 3.51 | 0.10                   | 89.32                     | 34.37                    | 1.17         | 1.14 | 1.22 |
| 35             | 3.62                            | 3.53 | 3.58 | 0.08                   | 88.47                     | 34.13                    | 1.21         | 1.20 | 1.30 |
| 40             | 3.66                            | 3.59 | 3.63 | 0.07                   | 87.93                     | 33.94                    | 1.25         | 1.25 | 1.35 |
| 45             | 3.71                            | 3.63 | 3.67 | 0.08                   | 87.78                     | 33.73                    | 1.28         | 1.31 | 1.40 |
| 50             | 3.76                            | 3.68 | 3.72 | 0.08                   | 87.86                     | 33.57                    | 1.30         | 1.36 | 1.43 |
| 55             | 3.81                            | 3.71 | 3.76 | 0.10                   | 88.20                     | 33.42                    | 1.32         | 1.41 | 1.45 |
| 60             | 3.85                            | 3.73 | 3.79 | 0.12                   | 88.74                     | 33.38                    | 1.34         | 1.45 | 1.47 |
| 65             | 3.89                            | 3.76 | 3.82 | 0.13                   | 89.38                     | 33.40                    | 1.36         | 1.49 | 1.48 |
| 70             | 3.93                            | 3.78 | 3.86 | 0.15                   | 90.15                     | 33.37                    | 1.37         | 1.53 | 1.49 |
| 75             | 3.98                            | 3.80 | 3.89 | 0.18                   | 90.98                     | 33.50                    | 1.39         | 1.58 | 1.49 |
| 80             | 4.02                            | 3.81 | 3.91 | 0.21                   | 91.83                     | 33.63                    | 1.40         | 1.62 | 1.49 |
| 90             | 4.11                            | 3.84 | 3.97 | 0.27                   | 93.62                     | 34.11                    | 1.43         | 1.70 | 1.48 |
| 100            | 4.19                            | 3.85 | 4.02 | 0.34                   | 95.43                     | 34.78                    | 1.47         | 1.79 | 1.45 |
| 110            | 4.29                            | 3.87 | 4.08 | 0.42                   | 97.23                     | 35.27                    | 1.51         | 1.88 | 1.42 |
| 120            | 4.38                            | 3.90 | 4.14 | 0.48                   | 98.93                     | 35.36                    | 1.56         | 1.97 | 1.39 |

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

REV. X2

JSPQ-80+

100721

Page 3 of 3



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

P.O. Box 350166, Brooklyn, New York 11235-0003 (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

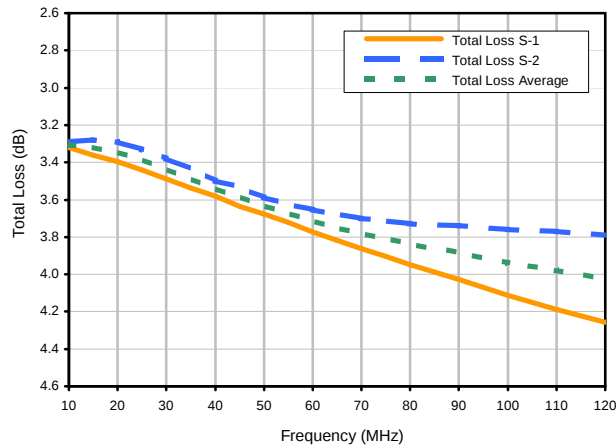


# 2 Way-90° Power Splitter/Combiner

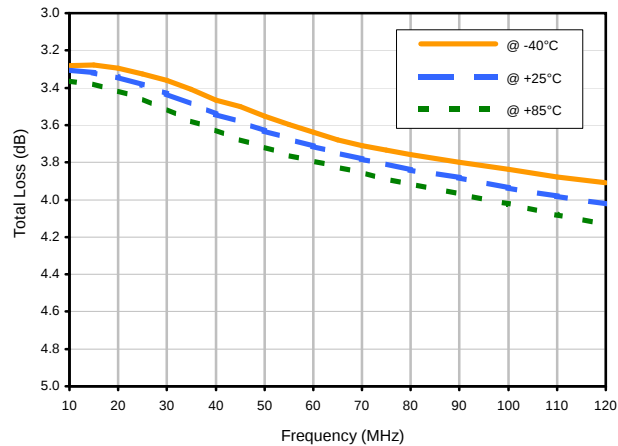
JSPQ-80+

## Typical Performance Curves

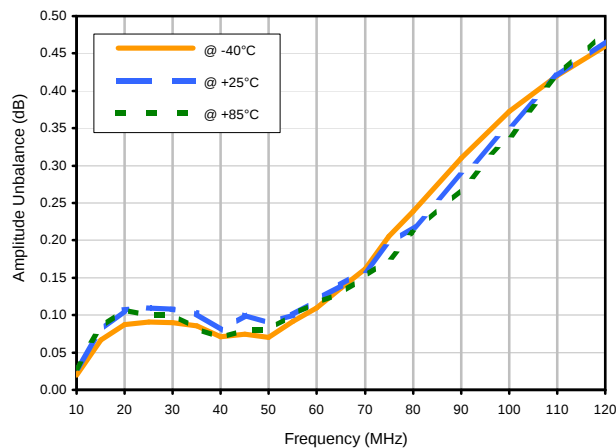
Total Loss



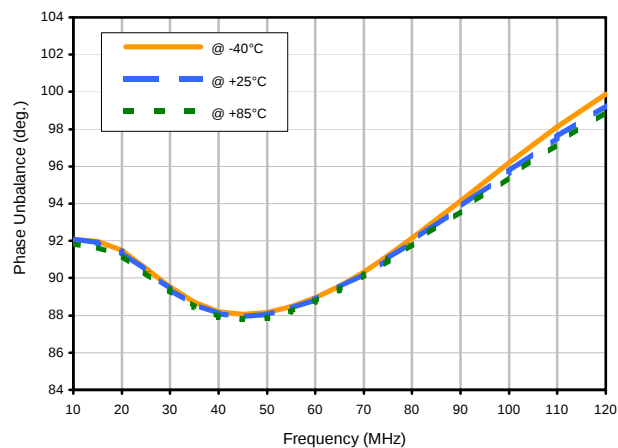
Average Total Loss vs. TEMPERATURE



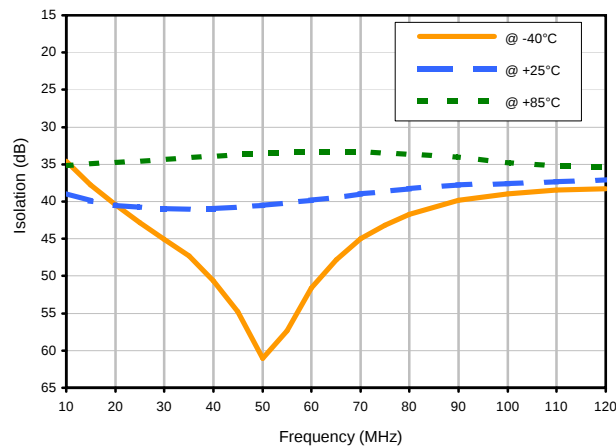
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS 9100 CERTIFIED • RoHS compliant  
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

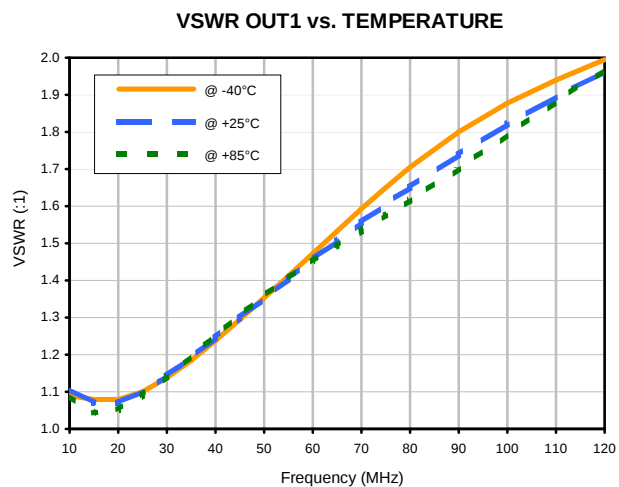
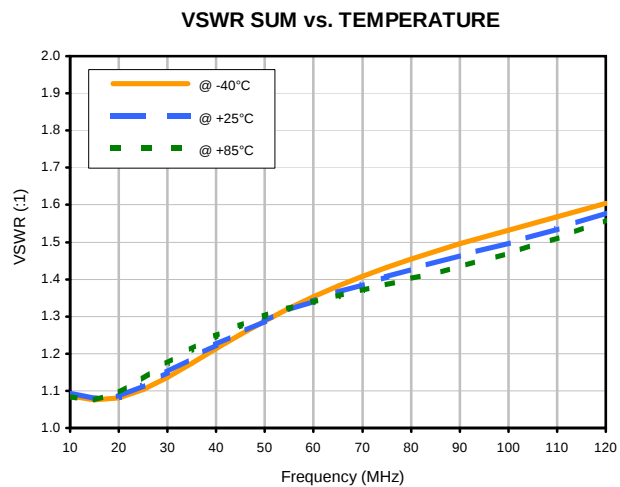
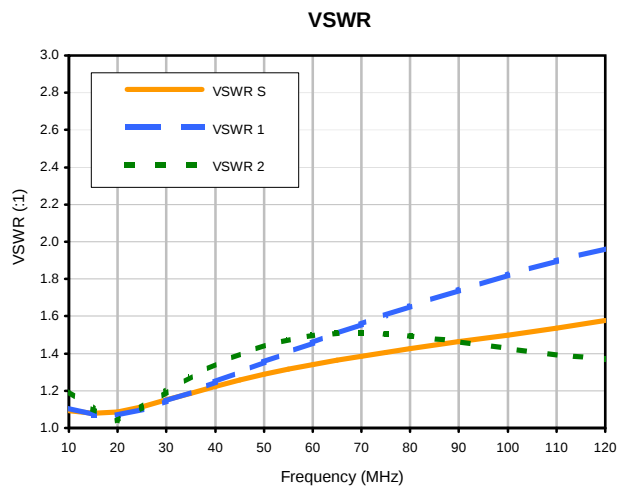


The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see

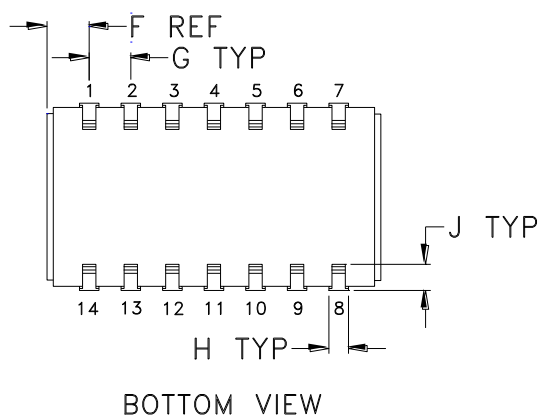
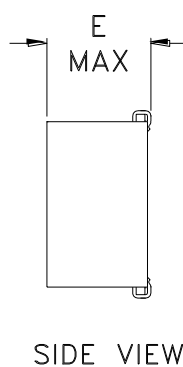
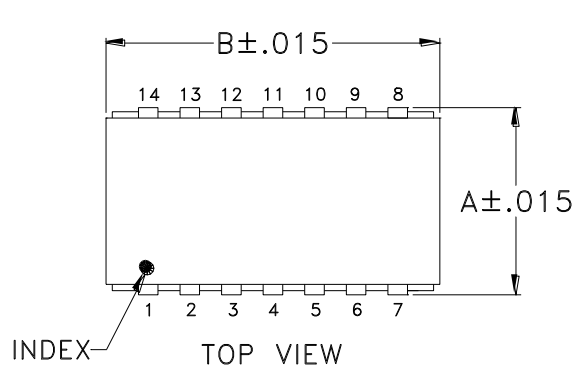


REV. X2  
JSPQ-80+  
100721  
Page 1 of 2

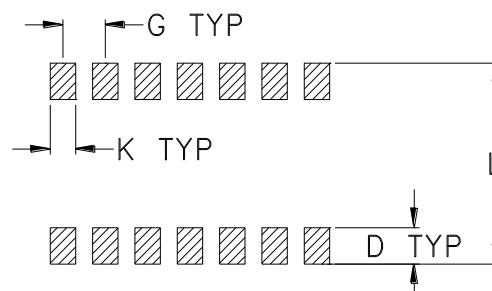
## Typical Performance Curves



### 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.



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

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

# 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.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



**Distribution Centers** NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

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

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

| REV | ECN No. | DESCRIPTION                           | DATE     | DR  | AUTH |
|-----|---------|---------------------------------------|----------|-----|------|
| OR  | M82550  | NEW RELEASE                           | 11/07/02 | MMG | HY   |
| A   | M102713 | MODIFIED NOTES, ADDED "...WITH SMOBC" | 01/16/06 | GT  | IL   |
|     |         |                                       |          |     |      |

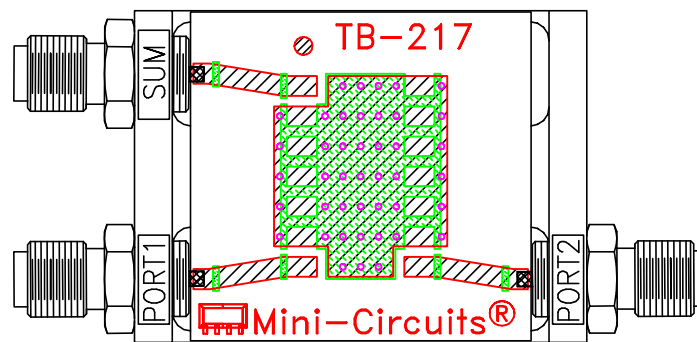
.033  
 .565  
 43X  $\phi$ .020 PTH,  
 FOR GROUND  
 .035 TYP  
 PACKAGE  
 OUTLINE  
 .180  
 .215  
 .038 TYP  
 .066  
 TRACE WIDTH, 3 PL.  
 (SEE NOTE BELOW)  
 .020  
 6X .100  
 .150 TYP  
 PIN 1  
 4X .059  
 .575

2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

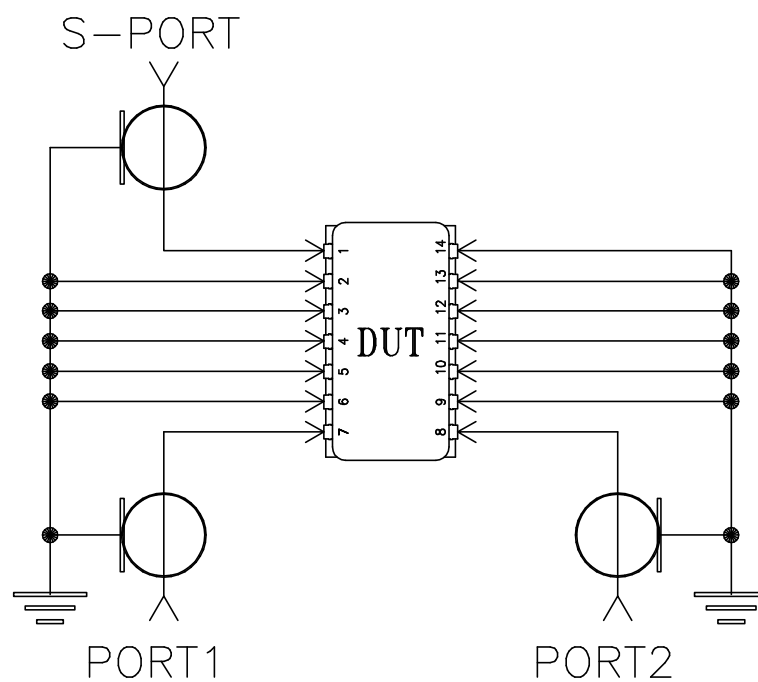
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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

# Evaluation Board and Circuit



TB-217



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 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                                                                              |