

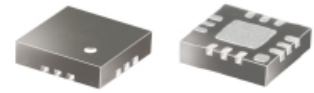
## Engineering Development Model

# Power Splitter/Combiner WP4-ED12616A/2\_05

### 4 Way-0°

#### Important Note

This model has been designed, built and tested in our engineering department. Performance data represents model capability. At present it is a non-catalog model. On request, we can supply a final specification sheet, part number and price/delivery information.



Please click "Back", and then click "Contact Us" for Applications support.

CASE STYLE : DQ1225

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                 |      |       |            |
|---------------------------------------|-----------------|------|-------|------------|
| Parameter                             |                 | Min. | Typ.  | Max. Units |
| Frequency                             |                 | 1215 |       | 1900 MHz   |
| Isolation                             | 1215 - 1900 MHz |      | 24    | dB         |
| Insertion Loss Above 6.0 dB           | 1215 - 1900 MHz |      | 0.60  | dB         |
| Phase Unbalance                       | 1215 - 1900 MHz |      | 0.991 | deg.       |
| Amplitude Unbalance                   | 1215 - 1900 MHz |      | 0.161 | dB         |
| VSWR                                  | SUM Port        |      | 1.20  | (:1)       |
|                                       | OUT Ports       |      | 1.35  | (:1)       |

| MAXIMUM RATINGS       |                |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -65°C to 150°C |

| PIN CONNECTIONS |                       |
|-----------------|-----------------------|
| SUM PORT        | 2                     |
| PORT 1          | 12                    |
| PORT 2          | 10                    |
| PORT 3          | 6                     |
| PORT 4          | 4                     |
| GROUND          | 1,3,5,7,8,9,11,paddle |

#### Functional Diagram



# 4 Way-0° Power Splitter/Combiner WP4-ED12616A/2\_05

## 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-3   | S-4   |                        | 1-2               | 2-3   | 3-4   |                           |                | S            | 1    | 2    | 3    | 4    |
| 500.0          | 21.78                           | 22.07 | 22.04 | 21.75 | 0.32                   | 12.32             | 11.88 | 12.57 | 6.69                      | 500.0          | 26.74        | 1.72 | 1.62 | 1.66 | 1.73 |
| 1000.0         | 9.23                            | 9.43  | 9.39  | 9.20  | 0.23                   | 17.12             | 16.10 | 17.54 | 2.18                      | 1000.0         | 3.94         | 1.65 | 1.63 | 1.65 | 1.67 |
| 1215.0         | 7.19                            | 7.35  | 7.32  | 7.16  | 0.20                   | 25.05             | 22.77 | 26.29 | 1.15                      | 1215.0         | 1.82         | 1.50 | 1.50 | 1.51 | 1.51 |
| 1220.0         | 7.16                            | 7.32  | 7.29  | 7.13  | 0.20                   | 25.32             | 22.98 | 26.60 | 1.15                      | 1220.0         | 1.80         | 1.50 | 1.49 | 1.51 | 1.51 |
| 1230.0         | 7.11                            | 7.27  | 7.23  | 7.08  | 0.20                   | 25.87             | 23.40 | 27.27 | 1.11                      | 1230.0         | 1.74         | 1.49 | 1.49 | 1.50 | 1.50 |
| 1240.0         | 7.06                            | 7.22  | 7.18  | 7.03  | 0.19                   | 26.41             | 23.84 | 27.94 | 1.07                      | 1240.0         | 1.69         | 1.48 | 1.48 | 1.49 | 1.49 |
| 1250.0         | 7.01                            | 7.17  | 7.14  | 6.98  | 0.19                   | 26.96             | 24.26 | 28.63 | 1.04                      | 1250.0         | 1.64         | 1.47 | 1.47 | 1.48 | 1.49 |
| 1260.0         | 6.97                            | 7.13  | 7.09  | 6.94  | 0.19                   | 27.52             | 24.70 | 29.35 | 1.00                      | 1260.0         | 1.60         | 1.47 | 1.46 | 1.48 | 1.48 |
| 1270.0         | 6.93                            | 7.09  | 7.05  | 6.90  | 0.19                   | 28.06             | 25.12 | 30.06 | 0.96                      | 1270.0         | 1.55         | 1.46 | 1.46 | 1.47 | 1.47 |
| 1280.0         | 6.89                            | 7.05  | 7.01  | 6.86  | 0.19                   | 28.59             | 25.55 | 30.76 | 0.91                      | 1280.0         | 1.51         | 1.45 | 1.45 | 1.46 | 1.47 |
| 1290.0         | 6.86                            | 7.01  | 6.97  | 6.83  | 0.19                   | 29.08             | 25.96 | 31.38 | 0.88                      | 1290.0         | 1.47         | 1.45 | 1.45 | 1.46 | 1.46 |
| 1300.0         | 6.82                            | 6.98  | 6.94  | 6.79  | 0.18                   | 29.50             | 26.35 | 31.94 | 0.84                      | 1300.0         | 1.43         | 1.44 | 1.44 | 1.45 | 1.45 |
| 1310.0         | 6.80                            | 6.95  | 6.91  | 6.76  | 0.18                   | 29.85             | 26.70 | 32.34 | 0.80                      | 1310.0         | 1.40         | 1.44 | 1.44 | 1.44 | 1.45 |
| 1320.0         | 6.77                            | 6.92  | 6.88  | 6.74  | 0.18                   | 30.10             | 27.01 | 32.56 | 0.76                      | 1320.0         | 1.36         | 1.43 | 1.43 | 1.44 | 1.44 |
| 1330.0         | 6.74                            | 6.89  | 6.85  | 6.71  | 0.18                   | 30.25             | 27.28 | 32.60 | 0.73                      | 1330.0         | 1.33         | 1.43 | 1.42 | 1.43 | 1.44 |
| 1340.0         | 6.72                            | 6.86  | 6.83  | 6.68  | 0.18                   | 30.28             | 27.49 | 32.45 | 0.70                      | 1340.0         | 1.30         | 1.42 | 1.42 | 1.43 | 1.43 |
| 1350.0         | 6.69                            | 6.84  | 6.80  | 6.66  | 0.18                   | 30.21             | 27.64 | 32.13 | 0.66                      | 1350.0         | 1.27         | 1.42 | 1.41 | 1.42 | 1.43 |
| 1360.0         | 6.68                            | 6.83  | 6.79  | 6.65  | 0.18                   | 30.02             | 27.71 | 31.69 | 0.62                      | 1360.0         | 1.24         | 1.41 | 1.41 | 1.41 | 1.42 |
| 1370.0         | 6.66                            | 6.81  | 6.77  | 6.63  | 0.18                   | 29.75             | 27.73 | 31.17 | 0.59                      | 1370.0         | 1.21         | 1.41 | 1.40 | 1.41 | 1.42 |
| 1380.0         | 6.65                            | 6.79  | 6.75  | 6.62  | 0.17                   | 29.42             | 27.68 | 30.62 | 0.56                      | 1380.0         | 1.19         | 1.40 | 1.39 | 1.40 | 1.41 |
| 1390.0         | 6.63                            | 6.77  | 6.73  | 6.60  | 0.17                   | 29.05             | 27.57 | 30.03 | 0.53                      | 1390.0         | 1.17         | 1.40 | 1.39 | 1.40 | 1.41 |
| 1400.0         | 6.62                            | 6.76  | 6.72  | 6.59  | 0.17                   | 28.66             | 27.42 | 29.48 | 0.53                      | 1400.0         | 1.15         | 1.39 | 1.39 | 1.39 | 1.40 |
| 1420.0         | 6.60                            | 6.73  | 6.69  | 6.57  | 0.17                   | 27.83             | 26.99 | 28.35 | 0.54                      | 1420.0         | 1.11         | 1.38 | 1.38 | 1.38 | 1.39 |
| 1430.0         | 6.59                            | 6.72  | 6.68  | 6.56  | 0.17                   | 27.40             | 26.72 | 27.82 | 0.55                      | 1430.0         | 1.10         | 1.38 | 1.37 | 1.38 | 1.39 |
| 1440.0         | 6.58                            | 6.71  | 6.67  | 6.55  | 0.17                   | 26.98             | 26.44 | 27.32 | 0.55                      | 1440.0         | 1.10         | 1.38 | 1.37 | 1.37 | 1.39 |
| 1450.0         | 6.57                            | 6.71  | 6.66  | 6.54  | 0.16                   | 26.57             | 26.14 | 26.84 | 0.56                      | 1450.0         | 1.09         | 1.37 | 1.37 | 1.37 | 1.38 |
| 1460.0         | 6.57                            | 6.70  | 6.66  | 6.54  | 0.16                   | 26.18             | 25.83 | 26.40 | 0.59                      | 1460.0         | 1.10         | 1.37 | 1.36 | 1.37 | 1.38 |
| 1470.0         | 6.57                            | 6.70  | 6.66  | 6.54  | 0.16                   | 25.81             | 25.52 | 25.98 | 0.64                      | 1470.0         | 1.10         | 1.37 | 1.36 | 1.36 | 1.38 |
| 1480.0         | 6.57                            | 6.69  | 6.65  | 6.54  | 0.16                   | 25.44             | 25.21 | 25.58 | 0.68                      | 1480.0         | 1.11         | 1.36 | 1.35 | 1.36 | 1.37 |
| 1490.0         | 6.56                            | 6.69  | 6.65  | 6.53  | 0.16                   | 25.09             | 24.90 | 25.19 | 0.73                      | 1490.0         | 1.13         | 1.36 | 1.35 | 1.35 | 1.37 |
| 1500.0         | 6.56                            | 6.69  | 6.65  | 6.53  | 0.16                   | 24.76             | 24.59 | 24.83 | 0.77                      | 1500.0         | 1.14         | 1.36 | 1.34 | 1.35 | 1.37 |
| 1510.0         | 6.56                            | 6.68  | 6.64  | 6.53  | 0.15                   | 24.44             | 24.30 | 24.49 | 0.80                      | 1510.0         | 1.16         | 1.36 | 1.34 | 1.35 | 1.37 |
| 1520.0         | 6.56                            | 6.68  | 6.64  | 6.53  | 0.15                   | 24.14             | 24.01 | 24.17 | 0.84                      | 1520.0         | 1.17         | 1.35 | 1.34 | 1.34 | 1.37 |
| 1530.0         | 6.56                            | 6.68  | 6.64  | 6.53  | 0.15                   | 23.85             | 23.73 | 23.87 | 0.88                      | 1530.0         | 1.19         | 1.35 | 1.34 | 1.34 | 1.36 |
| 1540.0         | 6.56                            | 6.68  | 6.64  | 6.53  | 0.15                   | 23.57             | 23.46 | 23.57 | 0.92                      | 1540.0         | 1.21         | 1.35 | 1.33 | 1.34 | 1.36 |
| 1550.0         | 6.56                            | 6.68  | 6.64  | 6.53  | 0.15                   | 23.30             | 23.19 | 23.29 | 0.96                      | 1550.0         | 1.23         | 1.35 | 1.33 | 1.34 | 1.36 |
| 1560.0         | 6.57                            | 6.68  | 6.64  | 6.53  | 0.15                   | 23.03             | 22.93 | 23.01 | 0.99                      | 1560.0         | 1.25         | 1.35 | 1.33 | 1.33 | 1.36 |
| 1570.0         | 6.57                            | 6.68  | 6.64  | 6.54  | 0.15                   | 22.78             | 22.67 | 22.75 | 1.03                      | 1570.0         | 1.26         | 1.35 | 1.33 | 1.33 | 1.36 |
| 1580.0         | 6.57                            | 6.69  | 6.64  | 6.54  | 0.15                   | 22.55             | 22.43 | 22.51 | 1.07                      | 1580.0         | 1.28         | 1.34 | 1.32 | 1.33 | 1.36 |
| 1590.0         | 6.58                            | 6.69  | 6.65  | 6.54  | 0.14                   | 22.32             | 22.19 | 22.28 | 1.11                      | 1590.0         | 1.30         | 1.34 | 1.32 | 1.33 | 1.35 |
| 1600.0         | 6.59                            | 6.70  | 6.66  | 6.56  | 0.14                   | 22.11             | 21.97 | 22.06 | 1.16                      | 1600.0         | 1.32         | 1.34 | 1.32 | 1.32 | 1.35 |
| 1620.0         | 6.60                            | 6.71  | 6.67  | 6.57  | 0.14                   | 21.70             | 21.54 | 21.64 | 1.26                      | 1620.0         | 1.36         | 1.34 | 1.31 | 1.32 | 1.35 |
| 1630.0         | 6.61                            | 6.71  | 6.67  | 6.57  | 0.14                   | 21.51             | 21.34 | 21.45 | 1.31                      | 1630.0         | 1.38         | 1.34 | 1.31 | 1.32 | 1.35 |
| 1640.0         | 6.61                            | 6.72  | 6.67  | 6.58  | 0.14                   | 21.33             | 21.14 | 21.25 | 1.34                      | 1640.0         | 1.39         | 1.34 | 1.31 | 1.32 | 1.35 |
| 1650.0         | 6.62                            | 6.72  | 6.68  | 6.59  | 0.14                   | 21.15             | 20.95 | 21.08 | 1.37                      | 1650.0         | 1.41         | 1.34 | 1.31 | 1.32 | 1.35 |
| 1660.0         | 6.63                            | 6.73  | 6.68  | 6.59  | 0.14                   | 20.98             | 20.77 | 20.90 | 1.41                      | 1660.0         | 1.43         | 1.34 | 1.31 | 1.32 | 1.35 |
| 1700.0         | 6.66                            | 6.75  | 6.71  | 6.62  | 0.13                   | 20.35             | 20.08 | 20.27 | 1.57                      | 1700.0         | 1.51         | 1.34 | 1.30 | 1.31 | 1.35 |
| 1750.0         | 6.71                            | 6.80  | 6.75  | 6.67  | 0.12                   | 19.70             | 19.35 | 19.61 | 1.78                      | 1750.0         | 1.60         | 1.34 | 1.30 | 1.31 | 1.35 |
| 1800.0         | 6.76                            | 6.83  | 6.79  | 6.72  | 0.12                   | 19.14             | 18.71 | 19.04 | 1.94                      | 1800.0         | 1.68         | 1.34 | 1.30 | 1.31 | 1.35 |
| 1900.0         | 6.85                            | 6.92  | 6.87  | 6.81  | 0.10                   | 18.25             | 17.66 | 18.13 | 2.31                      | 1900.0         | 1.85         | 1.35 | 1.30 | 1.31 | 1.37 |
| 2000.0         | 6.96                            | 7.01  | 6.96  | 6.92  | 0.09                   | 17.59             | 16.83 | 17.46 | 2.66                      | 2000.0         | 2.01         | 1.37 | 1.31 | 1.32 | 1.38 |
| 3000.0         | 7.93                            | 7.82  | 7.69  | 7.85  | 0.24                   | 15.49             | 12.52 | 15.08 | 5.88                      | 3000.0         | 3.10         | 1.48 | 1.43 | 1.41 | 1.48 |
| 4100.0         | 8.55                            | 8.40  | 8.25  | 8.33  | 0.30                   | 12.79             | 9.89  | 12.25 | 8.64                      | 4100.0         | 3.71         | 1.56 | 1.62 | 1.56 | 1.46 |

<sup>1</sup>Total Loss = Insertion Loss +6dB Splitter Loss

REV. X2  
WP4-ED12616A/2\_05  
100714  
Page 1 of 1



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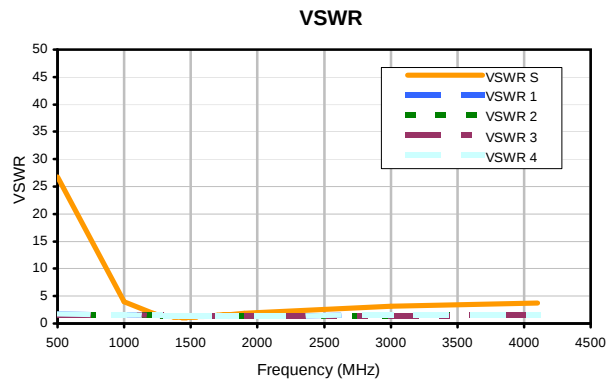
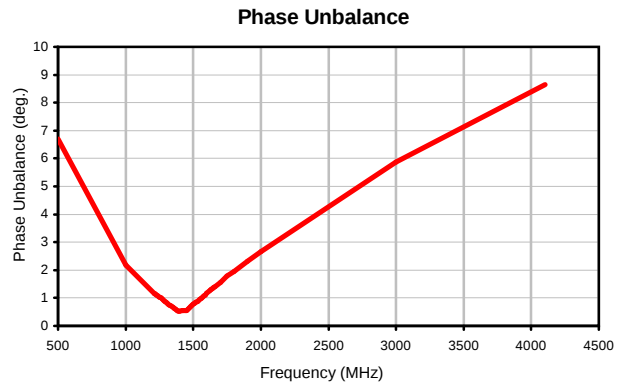
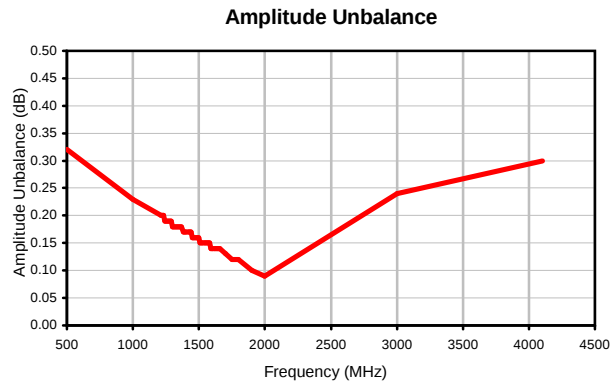
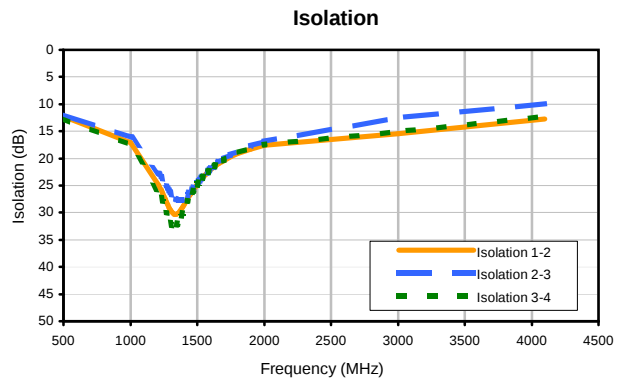
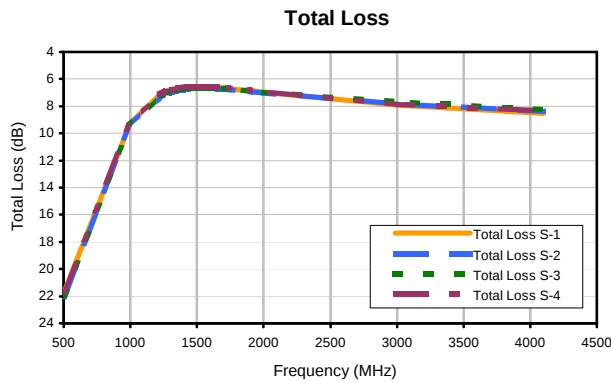


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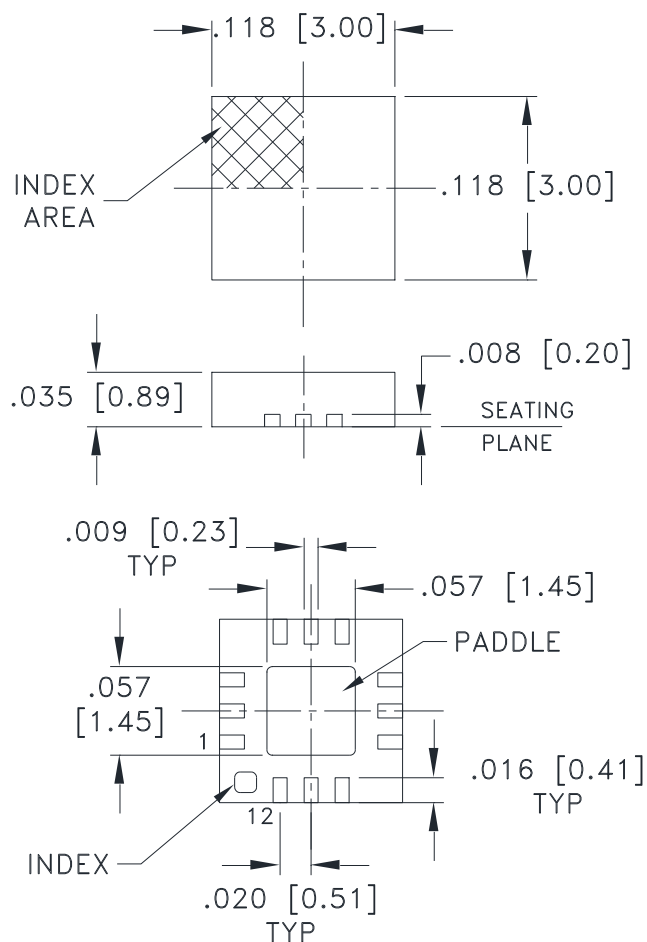


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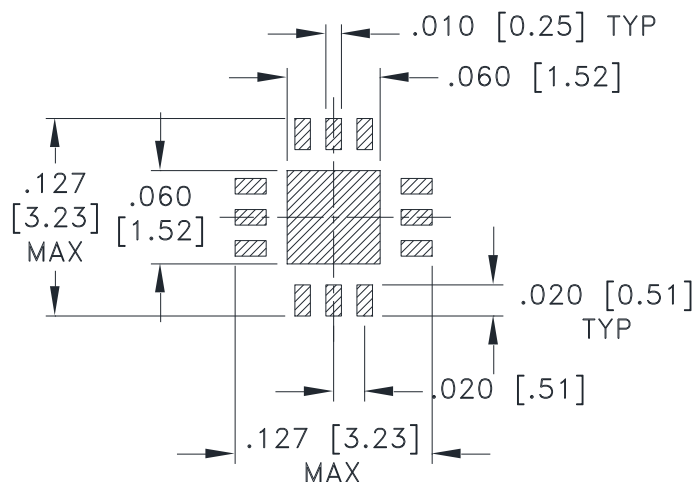
## Typical Performance Curves



## Outline Dimensions



## PCB Land Pattern



SUGGESTED LAYOUT,  
TOLERANCE TO BE WITHIN  $\pm 0.002$

**Weight: .02 Grams**

**Dimensions are in inches (mm). Tolerances: 2Pl.  $\pm .01$ ; 3 Pl.  $\pm .004$**

### Notes:

1. Case material: Plastic.
2. Termination finish:  
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. All models, (+) suffix.  
See Data sheet.  
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.



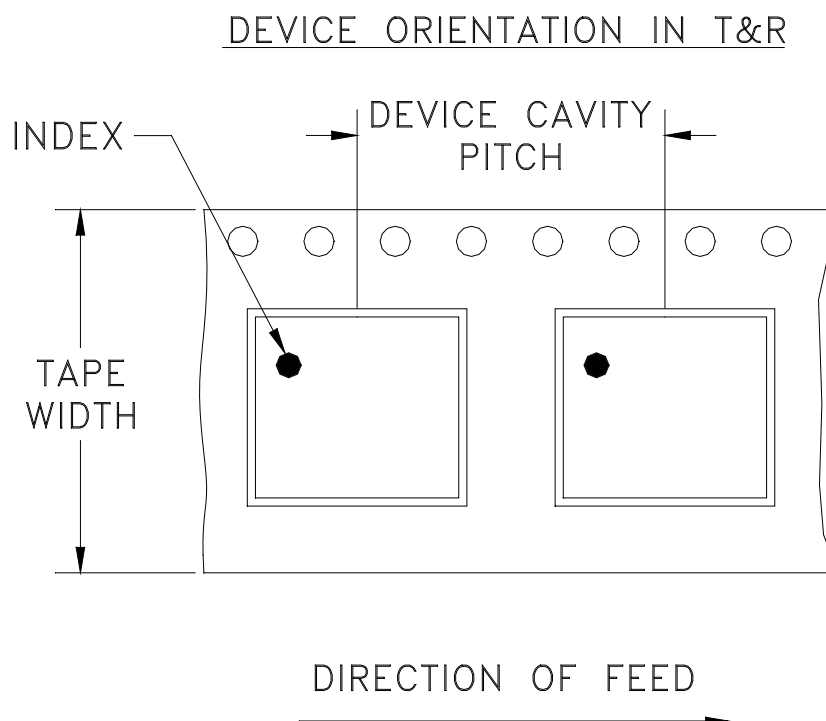
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# Tape & Reel Packaging TR-F66



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note  |                  |
|-------------------|----------------------------|----------------------|-------------------------------|------------------|
| 8                 | 4                          | 7                    | Small<br>quantity<br>standard | 20               |
|                   |                            |                      |                               | 50               |
|                   |                            |                      |                               | 100              |
|                   |                            |                      |                               | 200              |
|                   |                            |                      |                               | 500              |
|                   |                            | 7                    | Standard                      | 1000, 2000, 3000 |

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

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

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



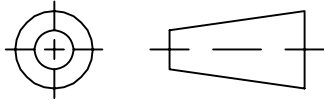
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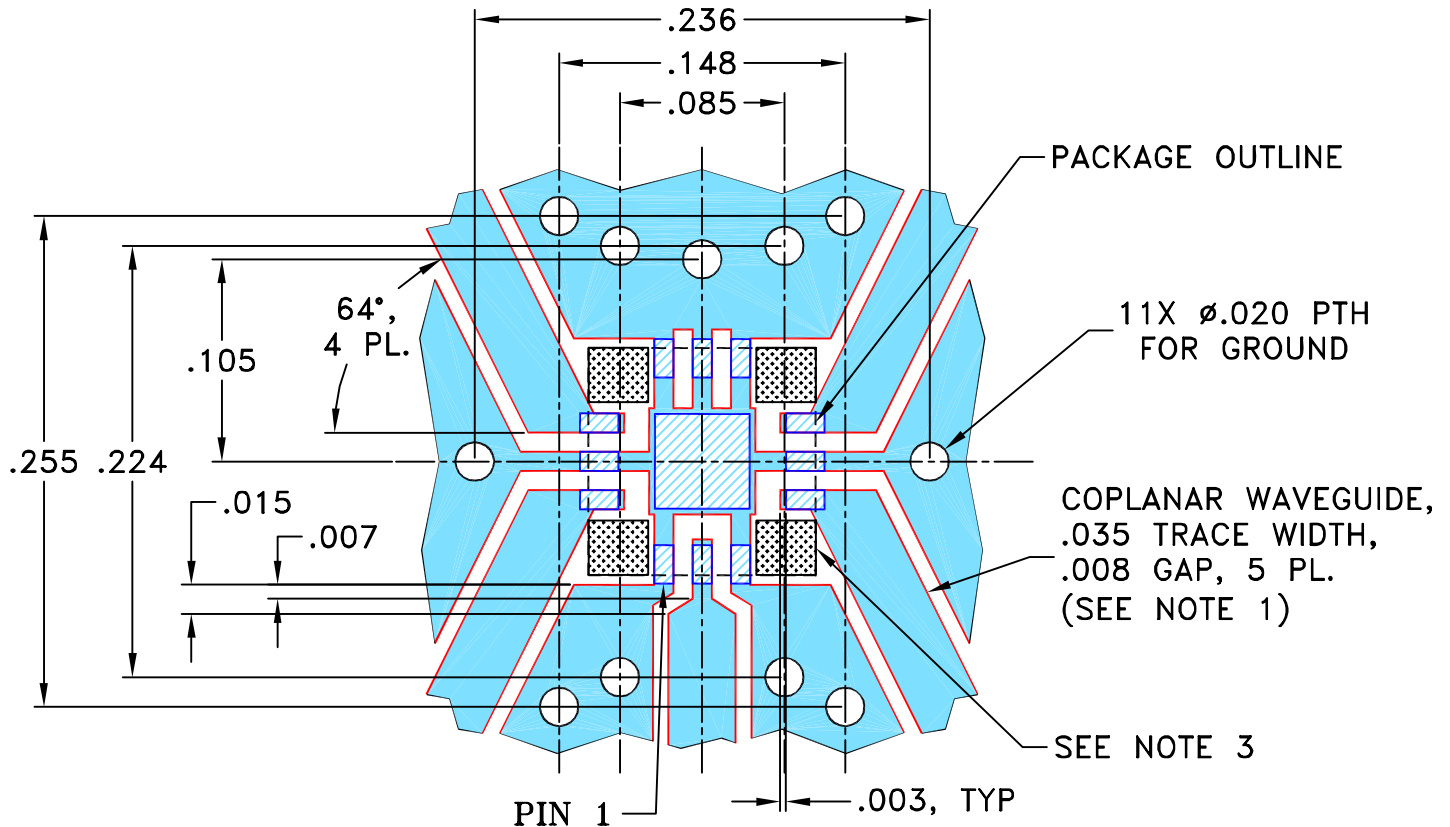
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION    | DATE     | DR | AUTH |
|-----|---------|----------------|----------|----|------|
| OR  | M109251 | NEW RELEASE    | 01/11/07 | PW | WP   |
| A   | M112849 | UPDATED NOTE 3 | 08/03/07 | AV | WP   |
|     |         |                |          |    |      |
|     |         |                |          |    |      |

### SUGGESTED MOUNTING CONFIGURATION FOR DQ1225 CASE STYLE, "rx" PIN CONNECTION



## NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020"  $\pm$  .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
3. SIGNAL TRACES ARE NOT ALLOWED INSIDE HATCHED AREAS (APPROX. .030 X .030) AT 4 PLACES AS SHOWN.



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

PW

01/10/07

TOLERANCES ON:

CHECKED

IL

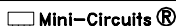
01/11/07

2 PL DECIMALS  $\pm$  .005

APPROVED

WP

01/11/07

3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$  1°FRACTIONS  $\pm$ 

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PL, rx, DQ1225, WP4, TB-395+

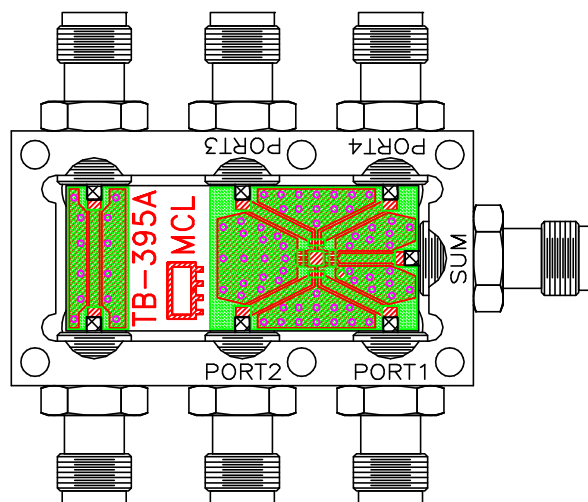
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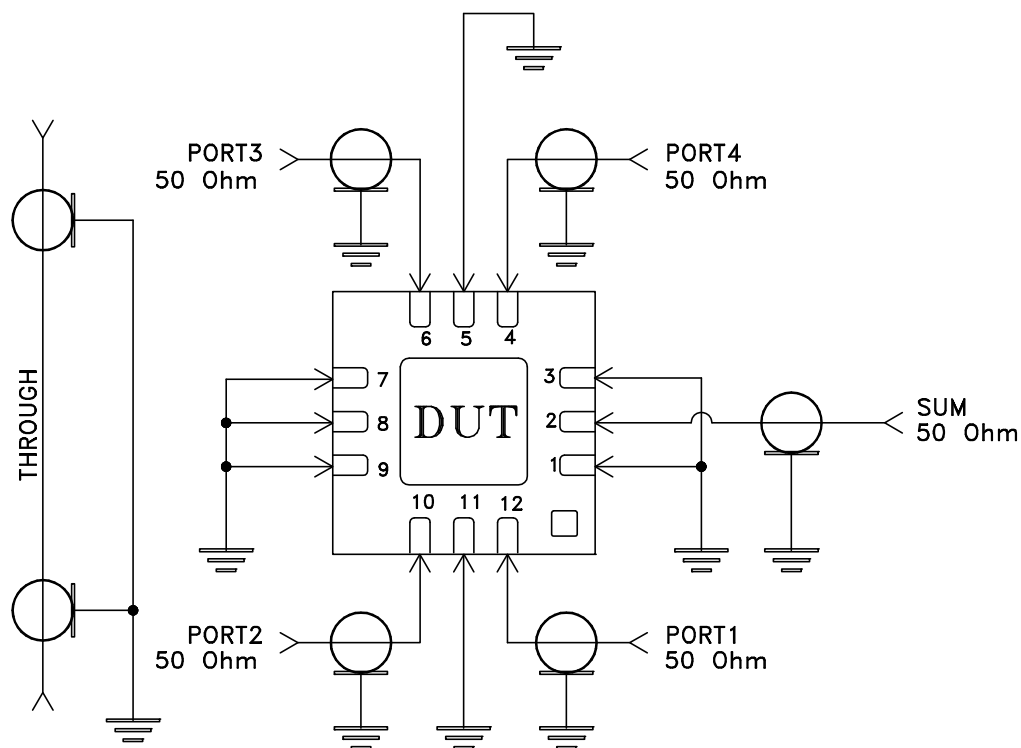
SCALE: 10:1

SHEET: 1 OF 1

# Evaluation Board and Circuit



TB-395+



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 inch.

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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          |