

50Ω

5 to 1000 MHz



CASE STYLE: DB714

PRICE: Contact Sales Dept.

## Maximum Ratings

Operating Temperature -40°C to 85°C

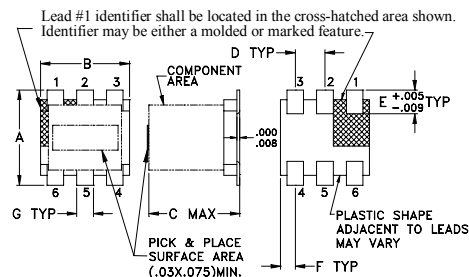
Storage Temperature -55°C to 100°C

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

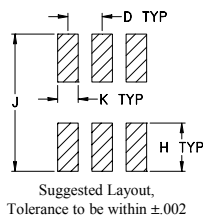
## Pin Connections

|                   |   |
|-------------------|---|
| INPUT             | 3 |
| OUTPUT            | 4 |
| COUPLED           | 1 |
| GROUND            | 2 |
| 50Ω TERM EXTERNAL | 6 |
| NOT USED          | 5 |

## Outline Drawing



## PCB Land Pattern

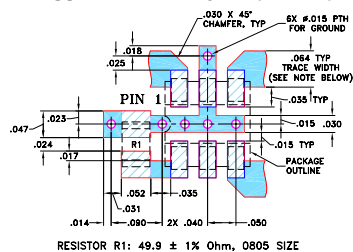


## Outline Dimensions (inch)

| A    | B    | C    | D    | E     | F    |
|------|------|------|------|-------|------|
| .160 | .150 | .160 | .050 | .040  | .025 |
| 4.06 | 3.81 | 4.06 | 1.27 | 1.02  | 0.64 |
| G    | H    | J    | K    | wt    |      |
| .028 | .065 | .190 | .030 | grams |      |
| 0.71 | 1.65 | 4.83 | 0.76 | 0.15  |      |

## Demo Board MCL P/N: TB-71

## Suggested PCB Layout (PL-009)



NOTES: 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

## 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

## Features

- wideband, 5 to 1000 MHz
- low mainline loss, 0.4 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

## Applications

- VHF/UHF
- communications
- cellular
- signal processing

## Directional Coupler Electrical Specifications

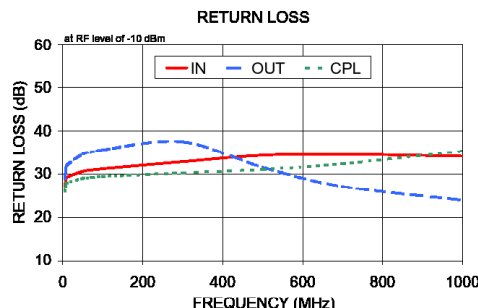
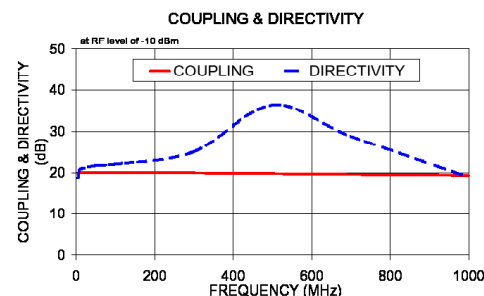
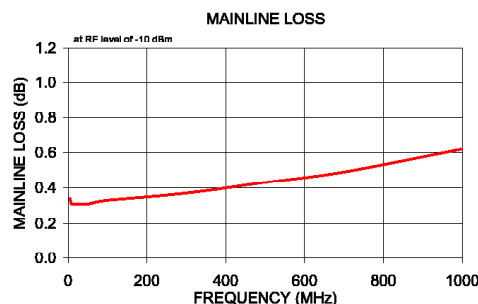
| FREQ.<br>RANGE<br>(MHz) | COUPLING<br>(dB) |          | MAINLINE LOSS <sup>1</sup><br>(dB) |      |      |      |      |      | DIRECTIVITY<br>(dB) |      |      |      |      |      | VSWR<br>(:1) | POWER<br>INPUT, W |      |
|-------------------------|------------------|----------|------------------------------------|------|------|------|------|------|---------------------|------|------|------|------|------|--------------|-------------------|------|
|                         |                  |          | L                                  |      | M    |      | U    |      | L                   |      | M    |      | U    |      |              | Max.              | Min. |
|                         |                  |          | Typ.                               | Max. | Typ. | Max. | Typ. | Max. | Typ.                | Min. | Typ. | Min. | Typ. | Min. |              |                   |      |
| $f_L$ - $f_U$           | Nom.             | Flatness |                                    |      |      |      |      |      |                     |      |      |      |      |      |              |                   |      |
| 5-1000                  | 20.0±0.5         | ±0.8     | 0.3                                | 0.9  | 0.4  | 0.8  | 0.7  | 1.1  | 20                  | 11   | 21   | 15   | 15   | —    | 1.20         | 1.0               | 1.0  |

L = low range [ $f_L$  to  $10 f_L$ ] M = mid range [ $10 f_L$  to  $f_U/2$ ] U = upper range [ $f_U/2$  to  $f_U$ ]

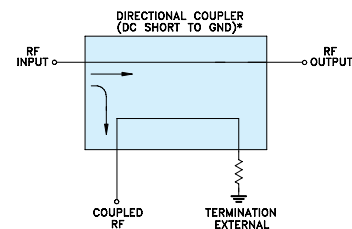
1. Mainline loss includes theoretical power loss at coupled port.

## Typical Performance Data

| Frequency (MHz) | Mainline Loss (dB) In-Out | Coupling (dB) In-Cpl | Directivity (dB) | Return Loss (dB) |       |       |
|-----------------|---------------------------|----------------------|------------------|------------------|-------|-------|
|                 |                           |                      |                  | In               | Out   | Cpl   |
| 5.00            | 0.34                      | 20.10                | 18.84            | 27.09            | 28.80 | 25.84 |
| 7.00            | 0.32                      | 20.07                | 20.01            | 28.28            | 30.52 | 26.99 |
| 10.00           | 0.31                      | 20.06                | 20.88            | 29.20            | 32.01 | 27.84 |
| 50.00           | 0.31                      | 20.09                | 21.80            | 30.62            | 34.67 | 28.98 |
| 70.00           | 0.32                      | 20.10                | 21.88            | 30.88            | 35.14 | 29.17 |
| 100.00          | 0.33                      | 20.10                | 22.10            | 31.23            | 35.70 | 29.43 |
| 300.00          | 0.37                      | 20.04                | 25.05            | 32.86            | 37.54 | 30.26 |
| 500.00          | 0.43                      | 19.88                | 36.45            | 34.37            | 31.56 | 31.08 |
| 700.00          | 0.49                      | 19.70                | 28.77            | 34.61            | 27.04 | 32.38 |
| 1000.00         | 0.62                      | 19.48                | 19.03            | 34.14            | 23.85 | 35.39 |



## Electrical Schematic



\* ELECTRICAL SCHEMATIC IS FOR DIRECTIONAL COUPLER WITH INTERNAL TRANSFORMER(S) AND EXTERNAL TERMINATION.

# Directional Coupler

# TCD-20-4

## Typical Performance Data

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

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | COUPLING<br>LOSS<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS |       |       |
|--------------------|---------------------------|--------------------------|---------------------|-------------|-------|-------|
|                    |                           |                          |                     | IN          | OUT   | CPL   |
| 5                  | 0.32                      | 20.07                    | 22.79               | 28.19       | 30.76 | 26.86 |
| 10                 | 0.31                      | 20.06                    | 22.87               | 29.19       | 32.43 | 27.71 |
| 20                 | 0.31                      | 20.06                    | 22.93               | 30.04       | 33.66 | 28.32 |
| 25                 | 0.31                      | 20.06                    | 22.90               | 30.16       | 33.77 | 28.34 |
| 30                 | 0.32                      | 20.06                    | 22.89               | 30.23       | 33.82 | 28.35 |
| 40                 | 0.32                      | 20.07                    | 22.90               | 30.33       | 33.82 | 28.36 |
| 45                 | 0.32                      | 20.08                    | 22.91               | 30.38       | 33.85 | 28.38 |
| 50                 | 0.33                      | 20.08                    | 22.94               | 30.42       | 33.90 | 28.39 |
| 100                | 0.34                      | 20.10                    | 23.35               | 30.68       | 33.75 | 28.52 |
| 125                | 0.35                      | 20.11                    | 23.64               | 30.74       | 33.67 | 28.51 |
| 150                | 0.35                      | 20.11                    | 24.07               | 30.77       | 33.41 | 28.44 |
| 200                | 0.37                      | 20.11                    | 25.17               | 30.79       | 32.94 | 28.26 |
| 225                | 0.38                      | 20.11                    | 25.91               | 30.73       | 32.61 | 28.13 |
| 250                | 0.38                      | 20.10                    | 26.77               | 30.79       | 32.33 | 27.99 |
| 275                | 0.39                      | 20.09                    | 27.79               | 30.69       | 32.01 | 27.81 |
| 300                | 0.40                      | 20.09                    | 29.06               | 30.72       | 31.80 | 27.64 |
| 325                | 0.41                      | 20.08                    | 30.60               | 30.60       | 31.63 | 27.47 |
| 350                | 0.42                      | 20.07                    | 32.39               | 30.56       | 31.41 | 27.34 |
| 375                | 0.43                      | 20.06                    | 34.72               | 30.45       | 31.20 | 27.15 |
| 400                | 0.44                      | 20.04                    | 37.33               | 30.39       | 30.92 | 27.00 |
| 425                | 0.45                      | 20.03                    | 38.85               | 30.36       | 30.67 | 26.82 |
| 450                | 0.46                      | 20.01                    | 37.38               | 30.34       | 30.51 | 26.64 |
| 475                | 0.47                      | 20.00                    | 34.32               | 30.44       | 30.22 | 26.48 |
| 500                | 0.48                      | 19.98                    | 31.83               | 30.44       | 30.08 | 26.32 |
| 550                | 0.50                      | 19.94                    | 27.72               | 30.23       | 29.69 | 26.01 |
| 600                | 0.53                      | 19.91                    | 24.71               | 30.17       | 29.44 | 25.73 |
| 650                | 0.56                      | 19.87                    | 22.33               | 30.24       | 28.90 | 25.47 |
| 700                | 0.58                      | 19.84                    | 20.37               | 30.40       | 28.57 | 25.27 |
| 750                | 0.61                      | 19.81                    | 18.75               | 30.39       | 28.34 | 25.09 |
| 800                | 0.64                      | 19.77                    | 17.29               | 30.52       | 28.15 | 24.95 |
| 850                | 0.67                      | 19.73                    | 16.07               | 30.53       | 27.85 | 24.86 |
| 900                | 0.70                      | 19.69                    | 15.02               | 30.72       | 27.58 | 24.78 |
| 950                | 0.73                      | 19.64                    | 14.06               | 30.88       | 27.42 | 24.71 |
| 1000               | 0.75                      | 19.60                    | 13.18               | 30.92       | 27.21 | 24.66 |
| 1100               | 0.81                      | 19.50                    | 11.68               | 31.38       | 26.76 | 24.60 |
| 1200               | 0.88                      | 19.40                    | 10.44               | 31.88       | 26.46 | 24.61 |
| 1300               | 0.93                      | 19.26                    | 9.42                | 32.73       | 26.05 | 24.67 |
| 1400               | 1.00                      | 19.15                    | 8.53                | 33.91       | 25.56 | 24.81 |
| 1500               | 1.08                      | 19.01                    | 7.77                | 35.17       | 24.97 | 25.06 |
| 1600               | 1.15                      | 18.88                    | 7.02                | 37.53       | 24.39 | 25.39 |
| 1700               | 1.22                      | 18.74                    | 6.44                | 40.47       | 23.89 | 25.61 |
| 1800               | 1.31                      | 18.59                    | 5.87                | 44.81       | 23.32 | 26.06 |
| 1900               | 1.40                      | 18.43                    | 5.48                | 49.66       | 22.75 | 26.43 |
| 2000               | 1.50                      | 18.29                    | 5.05                | 44.76       | 22.18 | 26.86 |
| 2100               | 1.62                      | 18.14                    | 4.78                | 38.92       | 21.60 | 27.09 |
| 2200               | 1.74                      | 18.01                    | 4.47                | 34.44       | 20.99 | 27.40 |
| 2300               | 1.87                      | 17.94                    | 3.97                | 31.24       | 20.03 | 27.60 |
| 2400               | 2.03                      | 17.83                    | 3.81                | 28.36       | 19.44 | 27.66 |
| 2500               | 2.21                      | 17.76                    | 3.51                | 26.17       | 18.44 | 26.68 |
| 2600               | 2.41                      | 17.64                    | 3.34                | 23.86       | 17.48 | 25.19 |
| 2700               | 2.64                      | 17.61                    | 3.18                | 21.91       | 16.46 | 23.37 |
| 2800               | 2.91                      | 17.57                    | 3.10                | 20.00       | 15.30 | 21.56 |
| 2900               | 3.26                      | 17.54                    | 3.19                | 18.26       | 14.28 | 19.81 |
| 3000               | 3.64                      | 17.50                    | 3.13                | 16.51       | 12.96 | 17.87 |

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# Directional Coupler

# TCD-20-4

## Typical Performance Data

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

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | COUPLING<br>LOSS<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS |       |       |
|--------------------|---------------------------|--------------------------|---------------------|-------------|-------|-------|
|                    |                           |                          |                     | IN          | OUT   | CPL   |
| 5                  | 0.40                      | 20.14                    | 21.22               | 24.37       | 25.70 | 22.95 |
| 10                 | 0.32                      | 19.98                    | 23.64               | 27.22       | 29.14 | 25.75 |
| 20                 | 0.26                      | 19.87                    | 25.40               | 30.48       | 33.00 | 28.79 |
| 25                 | 0.26                      | 19.87                    | 25.34               | 31.16       | 33.65 | 29.34 |
| 30                 | 0.26                      | 19.86                    | 25.24               | 31.70       | 34.09 | 29.79 |
| 40                 | 0.26                      | 19.87                    | 25.02               | 32.49       | 34.49 | 30.41 |
| 45                 | 0.26                      | 19.87                    | 24.96               | 32.79       | 34.61 | 30.64 |
| 50                 | 0.26                      | 19.87                    | 24.95               | 33.02       | 34.70 | 30.82 |
| 100                | 0.26                      | 19.88                    | 25.46               | 32.12       | 35.35 | 30.29 |
| 125                | 0.26                      | 19.88                    | 25.88               | 31.57       | 35.70 | 29.93 |
| 150                | 0.27                      | 19.88                    | 26.10               | 31.75       | 35.33 | 30.11 |
| 200                | 0.28                      | 19.87                    | 26.73               | 31.67       | 32.95 | 29.95 |
| 225                | 0.28                      | 19.87                    | 27.48               | 31.09       | 32.12 | 29.38 |
| 250                | 0.29                      | 19.86                    | 28.24               | 30.95       | 31.78 | 28.95 |
| 275                | 0.30                      | 19.85                    | 28.92               | 30.94       | 31.56 | 28.70 |
| 300                | 0.30                      | 19.84                    | 29.58               | 31.01       | 31.26 | 28.42 |
| 325                | 0.31                      | 19.84                    | 30.51               | 30.68       | 30.89 | 28.02 |
| 350                | 0.32                      | 19.82                    | 31.41               | 30.35       | 30.52 | 27.68 |
| 375                | 0.32                      | 19.81                    | 32.16               | 30.06       | 30.29 | 27.41 |
| 400                | 0.33                      | 19.80                    | 32.36               | 29.87       | 29.96 | 27.20 |
| 425                | 0.34                      | 19.79                    | 32.41               | 29.66       | 29.53 | 26.89 |
| 450                | 0.34                      | 19.78                    | 31.95               | 29.35       | 29.19 | 26.52 |
| 475                | 0.35                      | 19.76                    | 31.03               | 29.15       | 28.74 | 26.24 |
| 500                | 0.36                      | 19.75                    | 29.68               | 29.08       | 28.58 | 26.03 |
| 550                | 0.38                      | 19.72                    | 27.21               | 28.62       | 28.11 | 25.56 |
| 600                | 0.40                      | 19.69                    | 24.88               | 28.29       | 27.83 | 24.99 |
| 650                | 0.42                      | 19.66                    | 22.89               | 28.22       | 27.42 | 24.67 |
| 700                | 0.45                      | 19.63                    | 21.17               | 28.01       | 26.99 | 24.30 |
| 750                | 0.47                      | 19.60                    | 19.72               | 27.84       | 26.74 | 24.03 |
| 800                | 0.50                      | 19.56                    | 18.39               | 27.56       | 26.57 | 23.75 |
| 850                | 0.52                      | 19.52                    | 17.20               | 27.24       | 26.27 | 23.52 |
| 900                | 0.55                      | 19.48                    | 16.14               | 27.13       | 25.93 | 23.53 |
| 950                | 0.57                      | 19.44                    | 15.16               | 27.04       | 25.66 | 23.29 |
| 1000               | 0.61                      | 19.40                    | 14.27               | 26.83       | 25.54 | 23.06 |
| 1100               | 0.67                      | 19.32                    | 12.65               | 26.52       | 24.92 | 22.78 |
| 1200               | 0.74                      | 19.24                    | 11.34               | 26.26       | 24.98 | 23.11 |
| 1300               | 0.81                      | 19.14                    | 10.17               | 26.24       | 24.78 | 22.50 |
| 1400               | 0.90                      | 19.08                    | 9.11                | 26.76       | 24.43 | 22.81 |
| 1500               | 0.99                      | 19.00                    | 8.23                | 26.77       | 24.17 | 22.53 |
| 1600               | 1.07                      | 18.93                    | 7.29                | 28.07       | 23.71 | 22.69 |
| 1700               | 1.17                      | 18.88                    | 6.57                | 28.07       | 23.51 | 22.99 |
| 1800               | 1.28                      | 18.82                    | 5.89                | 28.60       | 23.22 | 23.32 |
| 1900               | 1.39                      | 18.76                    | 5.32                | 28.98       | 22.73 | 22.85 |
| 2000               | 1.51                      | 18.71                    | 4.78                | 28.65       | 22.71 | 24.28 |
| 2100               | 1.66                      | 18.67                    | 4.29                | 28.95       | 21.88 | 23.60 |
| 2200               | 1.81                      | 18.63                    | 3.91                | 30.82       | 21.23 | 24.58 |
| 2300               | 1.96                      | 18.67                    | 3.27                | 29.78       | 20.55 | 25.01 |
| 2400               | 2.14                      | 18.61                    | 2.99                | 28.32       | 20.13 | 26.55 |
| 2500               | 2.33                      | 18.64                    | 2.57                | 28.01       | 19.17 | 27.82 |
| 2600               | 2.54                      | 18.53                    | 2.38                | 27.42       | 18.27 | 29.72 |
| 2700               | 2.77                      | 18.49                    | 2.17                | 25.92       | 17.22 | 28.49 |
| 2800               | 3.03                      | 18.36                    | 2.08                | 24.06       | 16.26 | 26.30 |
| 2900               | 3.35                      | 18.12                    | 2.15                | 22.41       | 15.49 | 24.39 |
| 3000               | 3.69                      | 17.85                    | 2.14                | 20.44       | 14.12 | 20.60 |

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# Directional Coupler

# TCD-20-4

## Typical Performance Data

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

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | COUPLING<br>LOSS<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS |       |       |
|--------------------|---------------------------|--------------------------|---------------------|-------------|-------|-------|
|                    |                           |                          |                     | IN          | OUT   | CPL   |
| 5                  | 0.40                      | 20.30                    | 20.93               | 26.75       | 29.14 | 25.53 |
| 10                 | 0.40                      | 20.28                    | 21.13               | 27.32       | 30.06 | 26.00 |
| 20                 | 0.40                      | 20.28                    | 21.32               | 27.72       | 30.73 | 26.26 |
| 25                 | 0.41                      | 20.29                    | 21.37               | 27.73       | 30.84 | 26.21 |
| 30                 | 0.41                      | 20.29                    | 21.41               | 27.71       | 30.92 | 26.15 |
| 40                 | 0.42                      | 20.30                    | 21.51               | 27.64       | 31.04 | 26.04 |
| 45                 | 0.42                      | 20.31                    | 21.57               | 27.63       | 31.13 | 26.00 |
| 50                 | 0.43                      | 20.31                    | 21.63               | 27.61       | 31.22 | 25.96 |
| 100                | 0.44                      | 20.34                    | 22.09               | 28.29       | 31.06 | 26.33 |
| 125                | 0.45                      | 20.35                    | 22.41               | 28.75       | 30.81 | 26.62 |
| 150                | 0.45                      | 20.35                    | 22.97               | 28.91       | 30.73 | 26.66 |
| 200                | 0.47                      | 20.36                    | 24.56               | 28.89       | 31.43 | 26.48 |
| 225                | 0.48                      | 20.36                    | 25.43               | 29.08       | 31.65 | 26.56 |
| 250                | 0.48                      | 20.36                    | 26.39               | 29.42       | 31.72 | 26.65 |
| 275                | 0.50                      | 20.35                    | 27.60               | 29.53       | 31.64 | 26.65 |
| 300                | 0.50                      | 20.35                    | 29.23               | 29.62       | 31.70 | 26.57 |
| 325                | 0.52                      | 20.35                    | 31.27               | 29.55       | 31.85 | 26.47 |
| 350                | 0.52                      | 20.34                    | 34.06               | 29.63       | 31.97 | 26.46 |
| 375                | 0.53                      | 20.34                    | 38.21               | 29.74       | 32.04 | 26.41 |
| 400                | 0.54                      | 20.33                    | 44.21               | 29.85       | 31.95 | 26.39 |
| 425                | 0.56                      | 20.33                    | 41.07               | 29.99       | 31.82 | 26.31 |
| 450                | 0.57                      | 20.32                    | 35.50               | 30.10       | 31.89 | 26.21 |
| 475                | 0.58                      | 20.32                    | 31.50               | 30.30       | 31.72 | 26.14 |
| 500                | 0.59                      | 20.31                    | 28.89               | 30.53       | 31.83 | 26.06 |
| 550                | 0.62                      | 20.30                    | 24.96               | 30.71       | 31.79 | 25.96 |
| 600                | 0.65                      | 20.29                    | 22.15               | 31.00       | 31.85 | 25.90 |
| 650                | 0.67                      | 20.28                    | 19.97               | 31.50       | 31.49 | 25.87 |
| 700                | 0.70                      | 20.26                    | 18.17               | 32.07       | 31.21 | 25.79 |
| 750                | 0.73                      | 20.25                    | 16.68               | 32.46       | 30.97 | 25.70 |
| 800                | 0.75                      | 20.23                    | 15.39               | 33.27       | 30.76 | 25.74 |
| 850                | 0.77                      | 20.20                    | 14.31               | 33.87       | 30.39 | 25.80 |
| 900                | 0.79                      | 20.16                    | 13.38               | 34.74       | 30.10 | 25.84 |
| 950                | 0.82                      | 20.12                    | 12.55               | 35.45       | 29.93 | 25.91 |
| 1000               | 0.84                      | 20.07                    | 11.79               | 35.95       | 29.65 | 25.98 |
| 1100               | 0.90                      | 19.96                    | 10.51               | 36.89       | 29.10 | 26.02 |
| 1200               | 0.95                      | 19.83                    | 9.44                | 38.58       | 28.41 | 26.07 |
| 1300               | 1.00                      | 19.67                    | 8.57                | 41.55       | 27.72 | 26.44 |
| 1400               | 1.06                      | 19.51                    | 7.84                | 45.71       | 27.14 | 26.62 |
| 1500               | 1.13                      | 19.33                    | 7.24                | 47.46       | 26.62 | 27.20 |
| 1600               | 1.19                      | 19.16                    | 6.60                | 50.02       | 26.15 | 27.64 |
| 1700               | 1.25                      | 18.97                    | 6.12                | 48.93       | 25.67 | 28.07 |
| 1800               | 1.33                      | 18.78                    | 5.61                | 42.64       | 25.05 | 29.03 |
| 1900               | 1.41                      | 18.57                    | 5.31                | 38.61       | 24.47 | 29.66 |
| 2000               | 1.50                      | 18.41                    | 4.92                | 34.45       | 23.75 | 29.87 |
| 2100               | 1.61                      | 18.21                    | 4.75                | 33.26       | 23.19 | 31.31 |
| 2200               | 1.72                      | 18.05                    | 4.43                | 30.50       | 22.75 | 31.14 |
| 2300               | 1.84                      | 17.95                    | 3.98                | 28.28       | 21.57 | 30.98 |
| 2400               | 1.98                      | 17.82                    | 3.82                | 26.13       | 20.78 | 29.65 |
| 2500               | 2.14                      | 17.73                    | 3.56                | 24.29       | 19.59 | 27.85 |
| 2600               | 2.33                      | 17.60                    | 3.42                | 22.35       | 18.58 | 25.72 |
| 2700               | 2.54                      | 17.56                    | 3.21                | 20.67       | 17.36 | 23.83 |
| 2800               | 2.79                      | 17.52                    | 3.12                | 18.92       | 16.07 | 21.66 |
| 2900               | 3.09                      | 17.56                    | 3.14                | 17.39       | 14.87 | 19.98 |
| 3000               | 3.45                      | 17.57                    | 3.05                | 15.76       | 13.49 | 18.45 |

REV. X1  
TCD-20-4  
081007  
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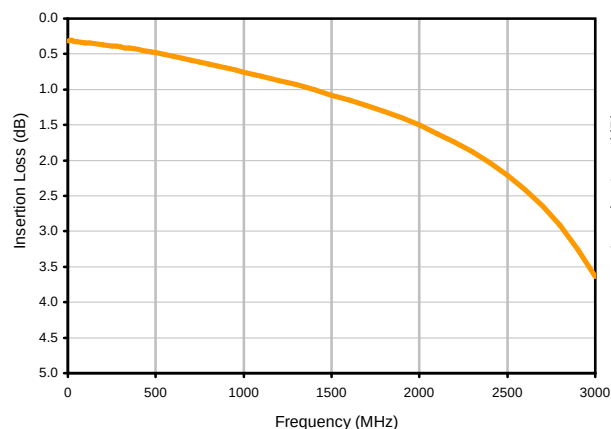


# Directional Coupler

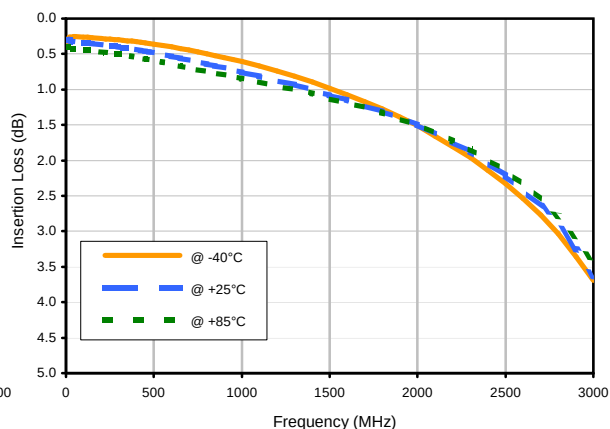
## Typical Performance Curves

TCD-20-4

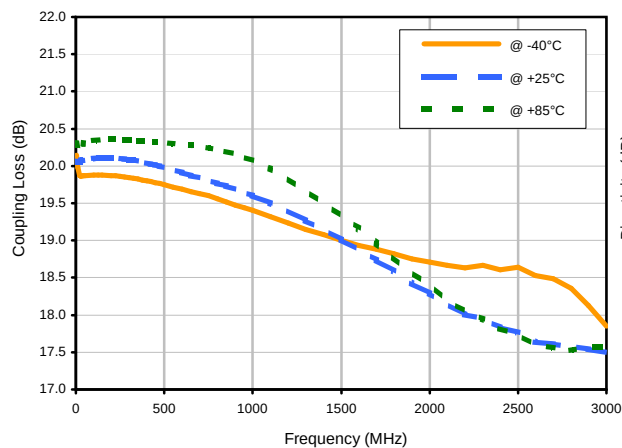
Insertion Loss



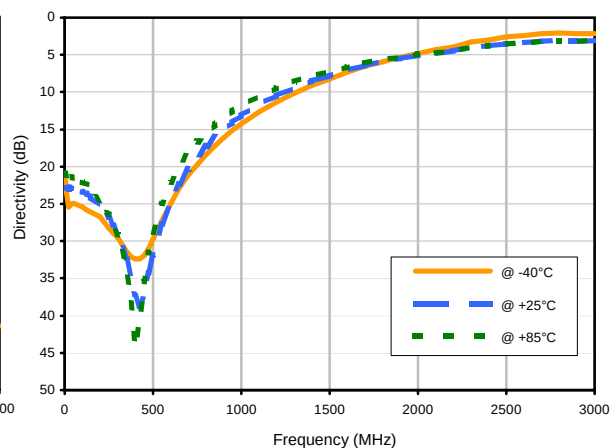
Insertion Loss vs. TEMPERATURE



Coupling Loss vs. TEMPERATURE



Directivity vs. TEMPERATURE



REV. X1  
TCD-20-4  
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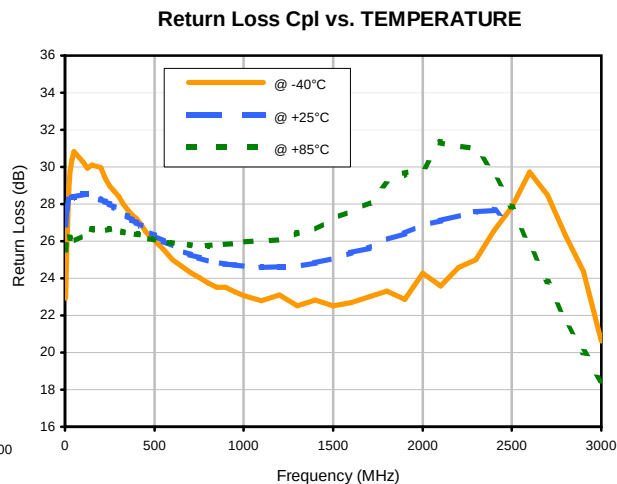
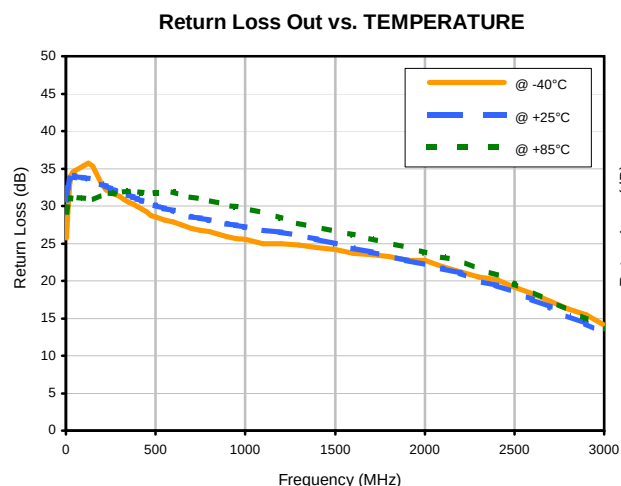
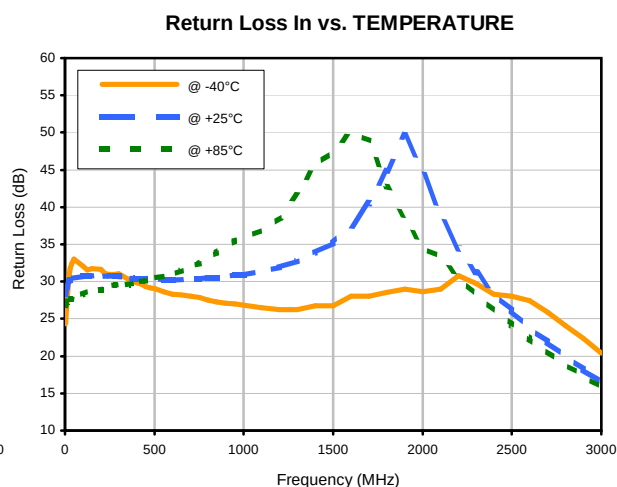
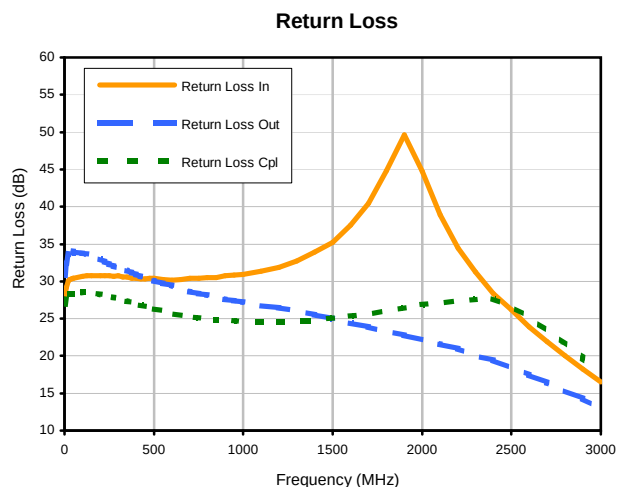
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# Directional Coupler

## Typical Performance Curves

TCD-20-4



REV. X1  
TCD-20-4  
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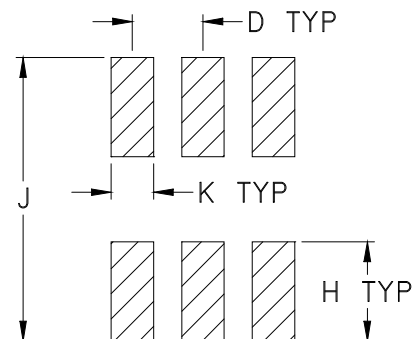
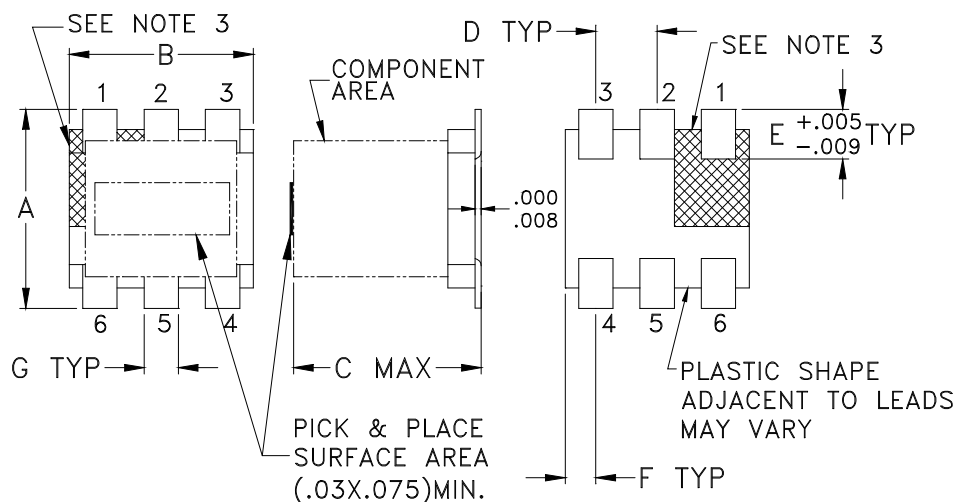
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## Outline Dimensions

DB714

## PCB Land Pattern



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

| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| DB714  | .160<br>(4.06) | .150<br>(3.81) | .160<br>(4.06) | .050<br>(1.27) | .040<br>(1.02) | .025<br>(0.64) | .028<br>(0.71) | .065<br>(1.65) | .190<br>(4.83) | .030<br>(0.76) | .15      |

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

### Notes:

- Case material: Plastic.
- 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.
- Lead #1 identifier shall be located in the cross-hatched area shown.  
Identifier may be either a molded or marked feature.



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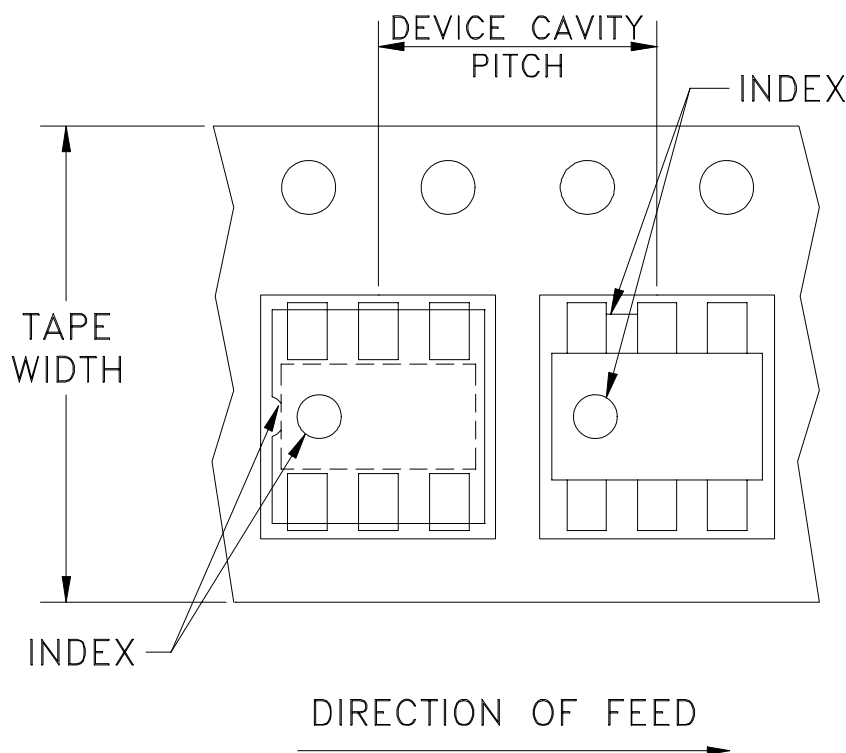
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RF/IF MICROWAVE COMPONENTS



# Tape & Reel Packaging TR-F47

## DEVICE ORIENTATION IN T&R



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note |
|-------------------|----------------------------|----------------------|------------------------------|
| 12                | 8                          | 13                   | 1000, 2000                   |
|                   |                            | 7                    | 20, 50, 100, 200, 500        |

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.

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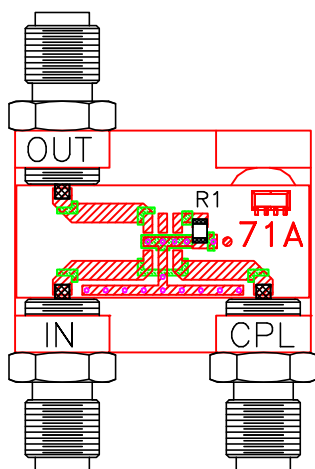
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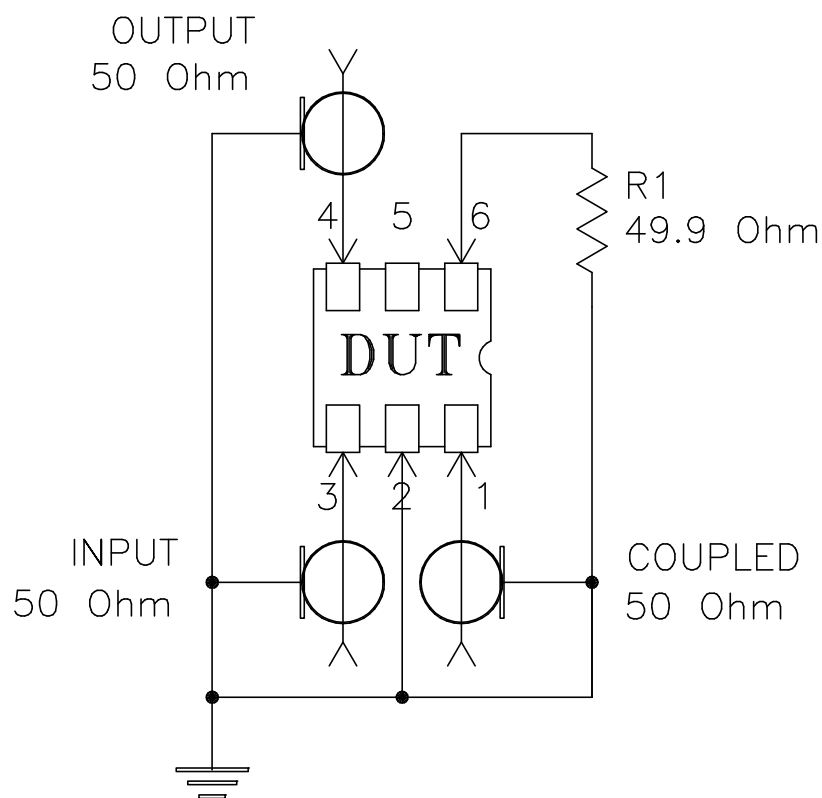




# Evaluation Board and Circuit



TB-71



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.030 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            | -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                                                                              |