

Plug-In

# Bi-Directional Coupler

50Ω 0.5 to 200 MHz

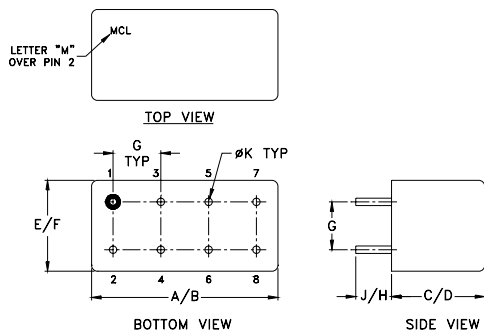
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -55°C to 100°C |
| Storage Temperature                                             | -55°C to 100°C |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|                   |         |
|-------------------|---------|
| INPUT             | 1       |
| OUTPUT            | 4       |
| COUPLED (forward) | 3       |
| COUPLED (reverse) | 6       |
| GROUND            | 2,5,7,8 |
| CASE GROUND       | 2,5,7,8 |

## Outline Drawing



## Outline Dimensions (inch/mm)

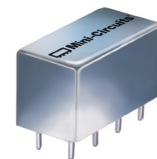
| A     | B     | C    | D     | E    | F     |
|-------|-------|------|-------|------|-------|
| .770  | .800  | .385 | .400  | .370 | .400  |
| 19.56 | 20.32 | 9.78 | 10.16 | 9.40 | 10.16 |
| G     | H     | J    | K     | wt   |       |
| .200  | .20   | .14  | .031  |      | grams |
| 5.08  | 5.08  | 3.56 | 0.79  |      | 5.2   |

## Features

- up to 5W power input
- excellent VSWR, 1.1:1 typ.
- very low mainline loss, 0.3 dB typ.
- excellent directivity, 35 dB typ.
- rugged welded construction, hermetically sealed

## Applications

- HF/UHF
- communication receivers & transmitters
- amateur radio



CASE STYLE: A01

## +RoHS Compliant

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

## Directional Coupler Electrical Specifications

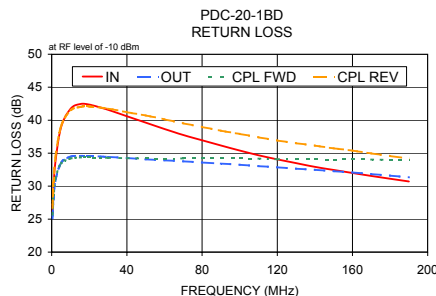
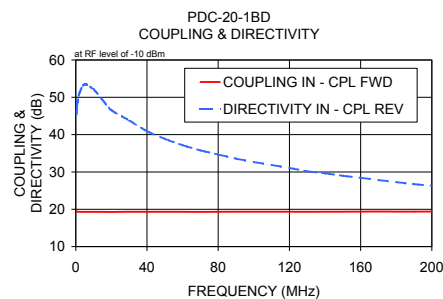
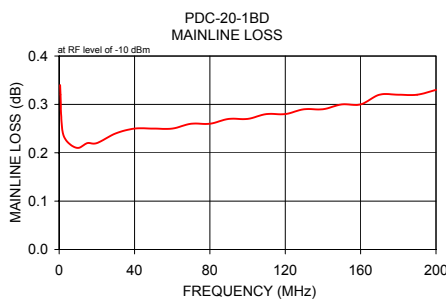
| FREQ.<br>(MHz) | COUPLING<br>(dB)               |      | MAINLINE LOSS <sup>1</sup><br>(dB) |      |      |      |      |      | DIRECTIVITY<br>(dB) |      |      |      |      |      | VSWR<br>(:1) | POWER<br>INPUT, W |      |
|----------------|--------------------------------|------|------------------------------------|------|------|------|------|------|---------------------|------|------|------|------|------|--------------|-------------------|------|
|                |                                |      | L                                  |      | M    |      | U    |      | L                   |      | M    |      | U    |      |              |                   |      |
|                | f <sub>L</sub> -f <sub>U</sub> | Nom. | Flatness                           | Typ. | Max. | Typ. | Max. | Typ. | Max.                | Typ. | Min. | Typ. | Min. | Typ. | Min.         | Typ.              | Max. |
| 0.5-200        | 19.2±0.5                       | ±0.5 | 0.3                                | 0.7  | 0.3  | 0.5  | 0.4  | 0.6  | 40                  | 30   | 35   | 20   | 22   | 18   | 1.1          | 3.0               | 5.0  |

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  $f_U$ ]

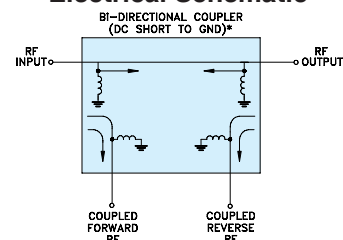
1. Mainline loss includes theoretical power loss at coupled port.

## Typical Performance Data

| Frequency<br>(MHz) | Mainline Loss<br>(dB) | Coupling<br>(dB) |             | Directivity<br>(dB) |            | Return Loss<br>(dB) |       |         |         |
|--------------------|-----------------------|------------------|-------------|---------------------|------------|---------------------|-------|---------|---------|
|                    | In-Out                | In-Cpl Fwd       | Out-Cpl Rev | Out-Cpl Fwd         | In-Cpl Rev | In                  | Out   | Cpl Fwd | Cpl Rev |
| 0.50               | 0.34                  | 19.38            | 19.40       | 60.80               | 45.48      | 26.08               | 25.12 | 25.68   | 26.72   |
| 1.00               | 0.28                  | 19.35            | 19.35       | 61.66               | 48.74      | 29.86               | 28.08 | 28.62   | 30.56   |
| 5.00               | 0.22                  | 19.30            | 19.31       | 59.50               | 53.47      | 38.93               | 33.54 | 33.43   | 39.10   |
| 10.00              | 0.21                  | 19.30            | 19.30       | 58.75               | 52.11      | 41.72               | 34.47 | 34.19   | 41.47   |
| 20.00              | 0.22                  | 19.29            | 19.29       | 57.01               | 46.56      | 42.36               | 34.57 | 34.35   | 42.07   |
| 50.00              | 0.25                  | 19.32            | 19.33       | 50.59               | 38.89      | 39.63               | 34.07 | 34.20   | 40.71   |
| 100.00             | 0.27                  | 19.35            | 19.39       | 42.93               | 32.65      | 35.40               | 33.24 | 34.20   | 37.92   |
| 130.00             | 0.29                  | 19.33            | 19.43       | 39.14               | 30.18      | 33.49               | 32.64 | 34.07   | 36.51   |
| 160.00             | 0.30                  | 19.38            | 19.47       | 35.48               | 28.44      | 31.99               | 32.08 | 34.04   | 35.39   |
| 200.00             | 0.33                  | 19.40            | 19.56       | 31.91               | 26.30      | 30.32               | 31.08 | 33.89   | 33.80   |



## Electrical Schematic



\* ELECTRICAL SCHEMATIC IS FOR BI-DIRECTIONAL COUPLER WITH INTERNAL TRANSFORMER(S) THAT ROUTES DC FROM RF PORTS TO GROUND.

## 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.
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REV. D  
M151107  
PDC-20-1BD  
WZ/TD/CP/AM  
150923

# Bi-Directional Coupler

PDC-20-1BD+

## Typical Performance Data

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | COUPLING<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS |       |       |
|--------------------|---------------------------|------------------|---------------------|-------------|-------|-------|
|                    |                           |                  |                     | IN          | OUT   | CPL   |
| 0.5                | 0.26                      | 19.39            | 60.21               | 24.59       | 23.97 | 24.37 |
| 0.6                | 0.26                      | 19.40            | 62.60               | 25.90       | 25.09 | 25.23 |
| 0.7                | 0.26                      | 19.40            | 62.35               | 26.90       | 25.91 | 25.81 |
| 0.8                | 0.26                      | 19.41            | 61.75               | 27.74       | 26.58 | 26.25 |
| 0.9                | 0.25                      | 19.40            | 65.22               | 28.44       | 27.12 | 26.60 |
| 1.0                | 0.25                      | 19.40            | 67.73               | 29.05       | 27.58 | 26.91 |
| 2.0                | 0.22                      | 19.36            | 60.94               | 32.92       | 30.35 | 28.96 |
| 3.0                | 0.21                      | 19.34            | 60.69               | 35.10       | 31.67 | 30.21 |
| 4.0                | 0.22                      | 19.33            | 59.47               | 36.43       | 32.35 | 30.95 |
| 5.0                | 0.20                      | 19.32            | 59.70               | 37.28       | 32.77 | 31.45 |
| 10.0               | 0.22                      | 19.32            | 57.50               | 38.36       | 33.28 | 32.38 |
| 19.0               | 0.22                      | 19.33            | 56.36               | 37.15       | 32.98 | 32.58 |
| 28.0               | 0.23                      | 19.33            | 53.75               | 35.40       | 32.35 | 32.38 |
| 37.0               | 0.23                      | 19.32            | 52.55               | 33.68       | 31.46 | 31.96 |
| 46.0               | 0.24                      | 19.31            | 49.07               | 32.16       | 30.56 | 31.52 |
| 55.0               | 0.25                      | 19.32            | 46.46               | 30.75       | 29.61 | 30.94 |
| 64.0               | 0.27                      | 19.31            | 44.29               | 29.56       | 28.73 | 30.41 |
| 73.0               | 0.27                      | 19.28            | 43.68               | 28.49       | 27.91 | 29.89 |
| 82.0               | 0.27                      | 19.26            | 41.87               | 27.51       | 27.12 | 29.35 |
| 91.0               | 0.27                      | 19.24            | 40.37               | 26.65       | 26.39 | 28.81 |
| 100.0              | 0.28                      | 19.24            | 38.69               | 25.86       | 25.72 | 28.33 |
| 105.0              | 0.31                      | 19.24            | 38.37               | 25.47       | 25.36 | 28.07 |
| 110.0              | 0.31                      | 19.23            | 37.32               | 25.08       | 25.02 | 27.83 |
| 115.0              | 0.33                      | 19.23            | 36.81               | 24.70       | 24.69 | 27.56 |
| 120.0              | 0.33                      | 19.22            | 36.03               | 24.35       | 24.37 | 27.31 |
| 125.0              | 0.33                      | 19.20            | 35.55               | 24.01       | 24.05 | 27.06 |
| 130.0              | 0.33                      | 19.18            | 34.83               | 23.67       | 23.76 | 26.85 |
| 135.0              | 0.32                      | 19.17            | 34.50               | 23.36       | 23.48 | 26.61 |
| 140.0              | 0.33                      | 19.15            | 33.88               | 23.05       | 23.19 | 26.40 |
| 145.0              | 0.32                      | 19.13            | 33.49               | 22.76       | 22.92 | 26.17 |
| 150.0              | 0.33                      | 19.11            | 32.88               | 22.48       | 22.66 | 25.97 |
| 155.0              | 0.32                      | 19.10            | 32.58               | 22.21       | 22.41 | 25.77 |
| 160.0              | 0.33                      | 19.07            | 32.07               | 21.95       | 22.16 | 25.57 |
| 165.0              | 0.32                      | 19.05            | 31.56               | 21.68       | 21.92 | 25.37 |
| 170.0              | 0.32                      | 19.03            | 31.19               | 21.44       | 21.68 | 25.17 |
| 175.0              | 0.31                      | 19.00            | 30.68               | 21.20       | 21.47 | 25.00 |
| 180.0              | 0.31                      | 18.97            | 30.28               | 20.97       | 21.24 | 24.82 |
| 185.0              | 0.31                      | 18.96            | 29.91               | 20.75       | 21.03 | 24.65 |
| 190.0              | 0.33                      | 18.97            | 29.42               | 20.53       | 20.82 | 24.50 |
| 195.0              | 0.37                      | 18.97            | 29.06               | 20.33       | 20.62 | 24.35 |
| 200.0              | 0.41                      | 18.99            | 28.76               | 20.13       | 20.43 | 24.19 |

REV. X1  
PDC-20-1BD+  
060718  
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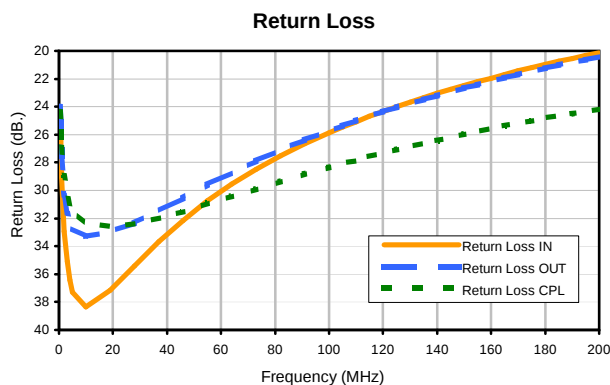
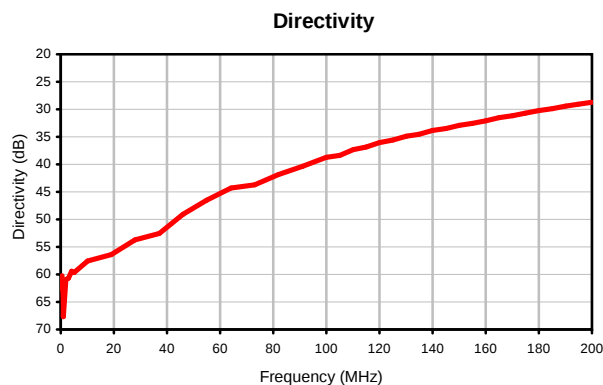
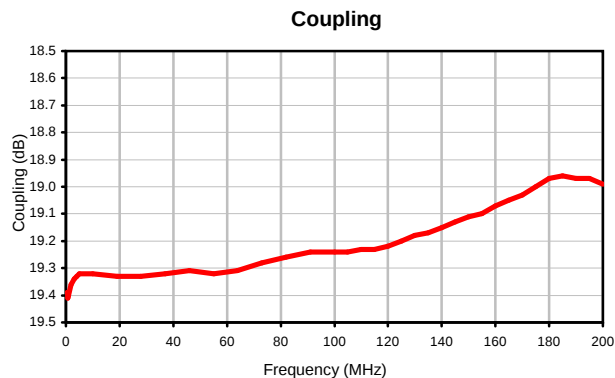
**Mini-Circuits®**



# Bi-Directional Coupler

## Typical Performance Curves

PDC-20-1BD+



REV. X1  
PDC-20-1BD+  
060718  
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A01  
A04  
A05  
A06

## Outline Dimensions



| CASE# | A               | B               | C              | D               | E              | F               | G              | H             | J             | K             | WT,<br>GRAM |
|-------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------------|---------------|---------------|-------------|
| A01   | .770<br>(19.56) | .800<br>(20.32) | .385<br>(9.78) | .400<br>(10.16) | .370<br>(9.40) | .400<br>(10.16) | .200<br>(5.08) | .20<br>(5.08) | .14<br>(3.56) | .031<br>(.79) | 5.2         |
| A04   |                 |                 | .200<br>(5.08) | .210<br>(5.33)  |                |                 |                |               |               |               | 3.7         |
| A05   |                 |                 | .240<br>(6.10) | .250<br>(6.35)  |                |                 |                |               |               |               | 3.7         |
| A06   |                 |                 | .285<br>(7.24) | .310<br>(7.87)  |                |                 |                |               |               |               | 5.2         |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

- Header material: C.R.S.  
Pin material: #52 alloy.  
Cover material: Cupro-Nickel.
- Pin finish: Electro Tin-Silver.
- Insulated spacer available. Request P/N B14-045-01.
- Tolerance on pin diameter  $\pm .005$  inch.
- Glass meniscus 0.015 inch max.
- Blue bead indicates Pin 1. Pin numbers do not appear on unit, for reference only.



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| Specification                  | Test/Inspection Condition                                                                                                                                       | Reference/Spec                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Operating Temperature          | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C                                                |
| 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                                                                 |
| Moisture Resistance            | 10 cycles, 24 hours per cycle                                                                                                                                   | MIL-STD-202, Method 106, Condition A, except 50°C and end point electrical test done within 12 hours |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, 95% Coverage                                                                              |
| Resistance to Solder Heat      | 260°C for 10 seconds                                                                                                                                            | MIL-STD-202, Method 210, Condition B                                                                 |
| 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                                                                              |
| Terminal Strength              | 4 1/2 Pound Pull                                                                                                                                                | MIL-STD-202, Method 211, Condition A                                                                 |



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| Specification       | Test/Inspection Condition | Reference/Spec                       |
|---------------------|---------------------------|--------------------------------------|
| Gross Leak          | 125°C Bubble Test         | MIL-STD-202, Method 112, Condition D |
| Barometric Pressure | 100,000 Feet              | MIL-STD-202, Method 105, Condition D |