*High Power*

# Bi-Directional Coupler

## ZABDC50-51HP+

50Ω  Up to 100W  1 to 50 MHz


*Generic photo used for illustration purposes only*

CASE STYLE: HHH141

| Connectors | Model |
|---|---|
| **N-Type/SMA** | ZABDC50-51HP+ |

### Maximum Ratings

| | |
|---|---|
| Operating Temperature | -55°C to 75°C |
| Storage Temperature | -55°C to 100°C |

Permanent damage may occur if any of these limits are exceeded.

### Coaxial Connections

| | |
|---|---|
| INPUT | 1 (N-Type) |
| OUTPUT | 4 (N-Type) |
| COUPLED (forward) | 2 (SMA) |
| COUPLED (reverse) | 3 (SMA) |

### Features

- high directivity, 25 dB typ.
- excellent VSWR, 1.07:1 typ.
- high power, up to 100W
- extremely low insertion loss, 0.05 dB typ.

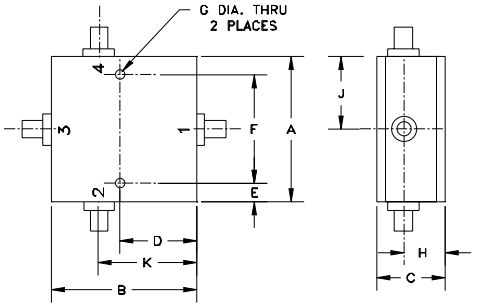
### Applications

- HF radios
- AM radio, amateur radio, medical ultrasound
- military mobile
- instrumentation
- communication receivers & transmitters

***+RoHS Compliant***

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

### Outline Drawing




### Outline Dimensions (inch / mm)

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| 2.00 | 2.00 | .95 | 1.062 | .125 | 1.75 |
| 50.80 | 50.80 | 24.13 | 26.97 | 3.18 | 44.45 |

| G | H | J | K | wt |
|---|---|---|---|---|
| .125 | .575 | 1.00 | 1.35 | grams |
| 3.18 | 14.61 | 25.40 | 34.29 | 200 |

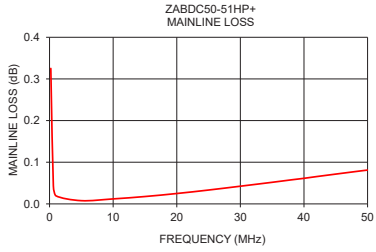
### Electrical Specifications at 25°C

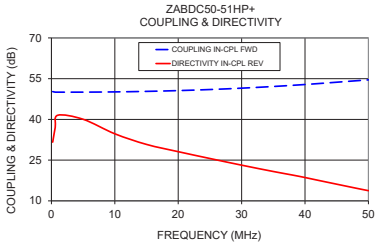
| Parameter | Condition (MHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **Frequency Range** | | 1 | — | 50 | MHz |
| **Mainline Loss**[1] | 1-30<br>30-50 | —<br>— | 0.02<br>0.06 | 0.15<br>0.2 | dB |
| **Nominal Coupling** | 1-30<br>30-50 | —<br>— | 49.5±1<br>51.5±1.5 | —<br>— | dB |
| **Coupling Flatness(±)** | 1-30<br>30-50 | —<br>— | 0.8<br>1.5 | 1.5<br>2.0 | dB |
| **Directivity** | 1-30<br>30-50 | 17<br>10 | 30<br>20 | —<br>— | dB |
| **Return Loss (Input)** | 1-50 | 17 | 30 | — | dB |
| **Return Loss (Output)** | 1-50 | 17 | 30 | — | dB |
| **Return Loss (Coupling)** | 1-50 | 30 | 45 | — | dB |
| **Input Power**[2] | 1-30<br>30-50 | —<br>— | —<br>— | 100<br>50 | W |

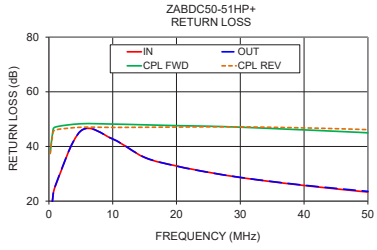
1. Include Coupling Loss.
2. At 25°C. Derate linearly to 60W (1-30MHz), 25W (30-50MHz) at 75°C.

### Typical Performance Data

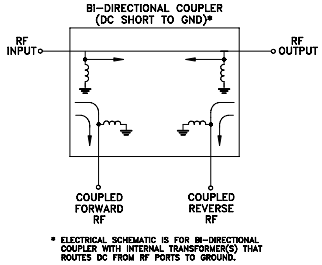
| Frequency (MHz) | Mainline Loss (dB) | Coupling (dB) | | Directivity (dB) | | Return Loss (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | In-Out | In-Cpl Fwd | Out-Cpl Rev | Out-Cpl Fwd | In-Cpl Rev | In | Out | Cpl Fwd | Cpl Rev |
| 1.0 | 0.02 | 50.02 | 50.03 | 37.28 | 41.53 | 25.42 | 25.64 | 47.09 | 46.03 |
| 10.0 | 0.01 | 50.12 | 50.12 | 35.61 | 34.70 | 42.72 | 42.73 | 48.19 | 46.97 |
| 20.0 | 0.02 | 50.60 | 50.60 | 30.40 | 28.11 | 32.87 | 32.81 | 47.62 | 47.09 |
| 30.0 | 0.04 | 51.50 | 51.49 | 25.83 | 23.15 | 28.63 | 28.68 | 47.05 | 47.16 |
| 35.0 | 0.05 | 52.11 | 52.12 | 23.86 | 20.82 | 27.09 | 27.16 | 46.57 | 47.01 |
| 38.0 | 0.06 | 52.54 | 52.57 | 22.46 | 19.52 | 26.25 | 26.34 | 46.25 | 46.90 |
| 40.0 | 0.06 | 52.85 | 52.90 | 21.67 | 18.60 | 25.73 | 25.83 | 46.07 | 46.78 |
| 42.0 | 0.07 | 53.17 | 53.26 | 20.80 | 17.60 | 25.21 | 25.34 | 45.86 | 46.69 |
| 48.0 | 0.08 | 54.21 | 54.51 | 18.12 | 14.69 | 23.76 | 24.00 | 45.23 | 46.31 |
| 50.0 | 0.08 | 54.55 | 54.98 | 17.19 | 13.75 | 23.32 | 23.58 | 44.99 | 46.13 |




### Electrical Schematic




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

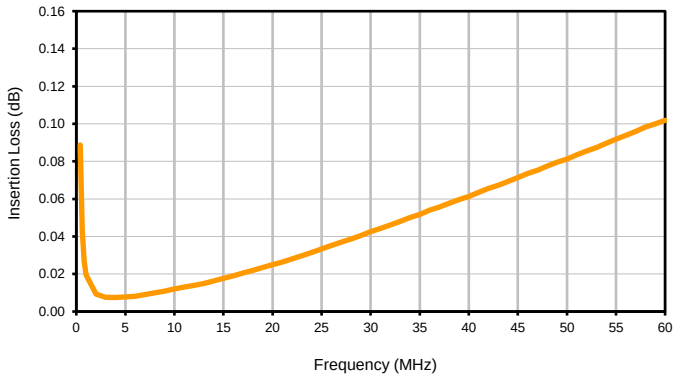
# Bi-Directional Coupler ZABDC50-51HP+

*Typical Performance Data*

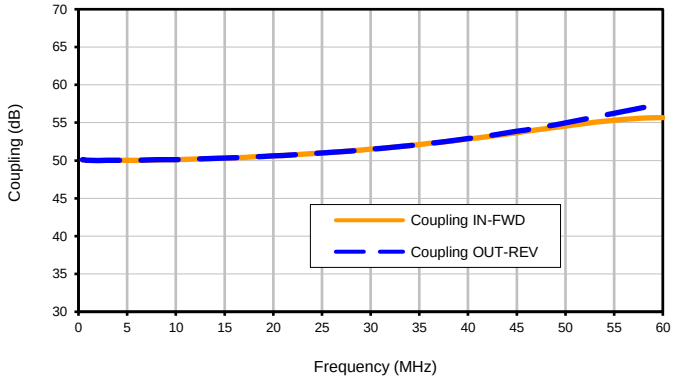
| FREQ. (MHz) | INSERTION LOSS (dB) | COUPLING (dB) | | DIRECTIVITY (dB) | | RETURN LOSS (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | IN-OUT | IN-FWD | OUT-REV | IN-REV | OUT-FWD | IN | OUT | FWD | REV |
| 0.4 | 0.09 | 50.06 | 50.11 | 35.49 | 35.16 | 17.51 | 17.56 | 43.32 | 42.73 |
| 0.6 | 0.04 | 50.03 | 50.09 | 37.05 | 37.23 | 20.97 | 21.13 | 45.26 | 44.47 |
| 0.8 | 0.03 | 50.02 | 50.02 | 42.20 | 39.19 | 23.47 | 23.70 | 46.41 | 45.42 |
| 1.0 | 0.02 | 50.02 | 50.03 | 41.53 | 37.28 | 25.42 | 25.64 | 47.09 | 46.03 |
| 2.0 | 0.01 | 49.97 | 50.00 | 43.72 | 44.86 | 32.06 | 32.36 | 48.18 | 46.75 |
| 3.0 | 0.01 | 50.01 | 50.02 | 41.62 | 43.61 | 36.70 | 36.76 | 48.32 | 46.95 |
| 4.0 | 0.01 | 50.03 | 50.03 | 42.71 | 40.73 | 40.65 | 40.69 | 48.52 | 47.06 |
| 5.0 | 0.01 | 50.03 | 50.04 | 40.04 | 40.93 | 45.67 | 45.70 | 48.30 | 47.02 |
| 6.0 | 0.01 | 50.01 | 50.03 | 37.26 | 38.77 | 53.89 | 54.30 | 48.24 | 46.95 |
| 8.0 | 0.01 | 50.06 | 50.10 | 37.03 | 38.32 | 49.92 | 50.80 | 48.16 | 46.91 |
| 9.0 | 0.01 | 50.10 | 50.10 | 34.83 | 36.67 | 45.49 | 45.73 | 48.18 | 46.94 |
| 10 | 0.01 | 50.12 | 50.12 | 34.70 | 35.61 | 42.72 | 42.73 | 48.19 | 46.97 |
| 11 | 0.01 | 50.16 | 50.15 | 33.86 | 35.38 | 40.75 | 40.62 | 48.10 | 46.99 |
| 12 | 0.01 | 50.19 | 50.19 | 32.99 | 34.74 | 39.18 | 39.15 | 48.05 | 47.03 |
| 13 | 0.01 | 50.23 | 50.23 | 32.22 | 33.99 | 37.92 | 37.92 | 48.04 | 47.04 |
| 14 | 0.02 | 50.27 | 50.27 | 31.44 | 33.30 | 36.87 | 36.87 | 47.89 | 46.99 |
| 15 | 0.02 | 50.31 | 50.31 | 30.78 | 33.00 | 35.95 | 36.02 | 47.92 | 47.02 |
| 16 | 0.02 | 50.37 | 50.37 | 30.19 | 32.42 | 35.18 | 35.26 | 47.82 | 47.02 |
| 17 | 0.02 | 50.42 | 50.42 | 29.68 | 31.77 | 34.53 | 34.55 | 47.78 | 47.01 |
| 18 | 0.02 | 50.48 | 50.48 | 29.12 | 31.39 | 33.91 | 33.93 | 47.74 | 47.08 |
| 19 | 0.02 | 50.54 | 50.53 | 28.55 | 30.88 | 33.37 | 33.36 | 47.67 | 47.10 |
| 20 | 0.02 | 50.60 | 50.60 | 28.11 | 30.40 | 32.87 | 32.81 | 47.62 | 47.09 |
| 21 | 0.03 | 50.68 | 50.67 | 27.52 | 29.95 | 32.37 | 32.31 | 47.59 | 47.09 |
| 22 | 0.03 | 50.75 | 50.74 | 27.18 | 29.52 | 31.91 | 31.84 | 47.55 | 47.12 |
| 23 | 0.03 | 50.83 | 50.82 | 26.58 | 29.13 | 31.43 | 31.38 | 47.44 | 47.13 |
| 24 | 0.03 | 50.91 | 50.90 | 26.06 | 28.55 | 30.98 | 30.95 | 47.43 | 47.13 |
| 25 | 0.03 | 50.99 | 50.99 | 25.60 | 28.07 | 30.56 | 30.53 | 47.41 | 47.18 |
| 26 | 0.04 | 51.09 | 51.08 | 25.10 | 27.76 | 30.13 | 30.13 | 47.33 | 47.14 |
| 27 | 0.04 | 51.19 | 51.17 | 24.61 | 27.36 | 29.75 | 29.75 | 47.24 | 47.18 |
| 28 | 0.04 | 51.28 | 51.27 | 24.09 | 26.89 | 29.35 | 29.38 | 47.20 | 47.19 |
| 29 | 0.04 | 51.39 | 51.37 | 23.68 | 26.36 | 28.99 | 29.03 | 47.11 | 47.18 |
| 30 | 0.04 | 51.50 | 51.49 | 23.15 | 25.83 | 28.63 | 28.68 | 47.05 | 47.16 |
| 31 | 0.04 | 51.61 | 51.60 | 22.78 | 25.47 | 28.30 | 28.37 | 46.92 | 47.11 |
| 32 | 0.05 | 51.73 | 51.72 | 22.28 | 25.14 | 27.99 | 28.06 | 46.86 | 47.13 |
| 33 | 0.05 | 51.85 | 51.85 | 21.79 | 24.63 | 27.68 | 27.75 | 46.71 | 47.07 |
| 34 | 0.05 | 51.99 | 51.98 | 21.40 | 24.14 | 27.38 | 27.45 | 46.65 | 47.02 |
| 35 | 0.05 | 52.11 | 52.12 | 20.82 | 23.86 | 27.09 | 27.16 | 46.57 | 47.01 |
| 36 | 0.05 | 52.26 | 52.26 | 20.41 | 23.34 | 26.81 | 26.87 | 46.47 | 46.98 |
| 37 | 0.06 | 52.39 | 52.41 | 19.94 | 22.98 | 26.53 | 26.60 | 46.34 | 46.90 |
| 38 | 0.06 | 52.54 | 52.57 | 19.52 | 22.46 | 26.25 | 26.34 | 46.25 | 46.90 |
| 39 | 0.06 | 52.69 | 52.73 | 19.06 | 22.12 | 25.99 | 26.09 | 46.14 | 46.85 |
| 40 | 0.06 | 52.85 | 52.90 | 18.60 | 21.67 | 25.73 | 25.83 | 46.07 | 46.78 |
| 41 | 0.06 | 53.01 | 53.07 | 18.09 | 21.28 | 25.47 | 25.58 | 45.96 | 46.77 |
| 42 | 0.07 | 53.17 | 53.26 | 17.60 | 20.80 | 25.21 | 25.34 | 45.86 | 46.69 |
| 43 | 0.07 | 53.34 | 53.44 | 17.15 | 20.32 | 24.96 | 25.11 | 45.74 | 46.64 |
| 44 | 0.07 | 53.51 | 53.65 | 16.68 | 19.87 | 24.71 | 24.88 | 45.63 | 46.61 |
| 45 | 0.07 | 53.68 | 53.85 | 16.19 | 19.47 | 24.46 | 24.65 | 45.51 | 46.51 |
| 46 | 0.07 | 53.86 | 54.06 | 15.72 | 18.99 | 24.23 | 24.43 | 45.41 | 46.45 |
| 47 | 0.08 | 54.03 | 54.28 | 15.25 | 18.51 | 24.00 | 24.21 | 45.33 | 46.40 |
| 48 | 0.08 | 54.21 | 54.51 | 14.69 | 18.12 | 23.76 | 24.00 | 45.23 | 46.31 |
| 49 | 0.08 | 54.39 | 54.74 | 14.18 | 17.60 | 23.54 | 23.78 | 45.13 | 46.22 |
| 50 | 0.08 | 54.55 | 54.98 | 13.75 | 17.19 | 23.32 | 23.58 | 44.99 | 46.13 |
| 51 | 0.08 | 54.72 | 55.22 | 13.21 | 16.72 | 23.10 | 23.37 | 44.88 | 46.01 |
| 52 | 0.09 | 54.89 | 55.48 | 12.70 | 16.34 | 22.89 | 23.17 | 44.78 | 45.91 |
| 53 | 0.09 | 55.04 | 55.73 | 12.17 | 15.91 | 22.69 | 22.97 | 44.63 | 45.80 |
| 54 | 0.09 | 55.18 | 55.98 | 11.66 | 15.46 | 22.48 | 22.77 | 44.49 | 45.68 |
| 55 | 0.09 | 55.31 | 56.24 | 11.20 | 15.05 | 22.28 | 22.58 | 44.39 | 45.59 |
| 56 | 0.09 | 55.43 | 56.49 | 10.66 | 14.69 | 22.08 | 22.38 | 44.30 | 45.53 |
| 57 | 0.10 | 55.52 | 56.75 | 10.14 | 14.32 | 21.88 | 22.19 | 44.18 | 45.40 |
| 58 | 0.10 | 55.60 | 56.99 | 9.65 | 13.96 | 21.69 | 22.00 | 44.05 | 45.25 |
| 59 | 0.10 | 55.65 | 57.21 | 9.21 | 13.63 | 21.50 | 21.81 | 43.95 | 45.15 |
| 60 | 0.10 | 55.66 | 57.41 | 8.75 | 13.34 | 21.31 | 21.63 | 43.81 | 44.99 |

## *Typical Performance Curves*

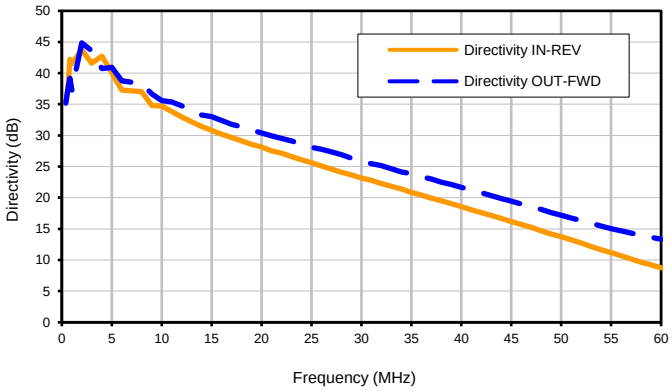
### Insertion Loss



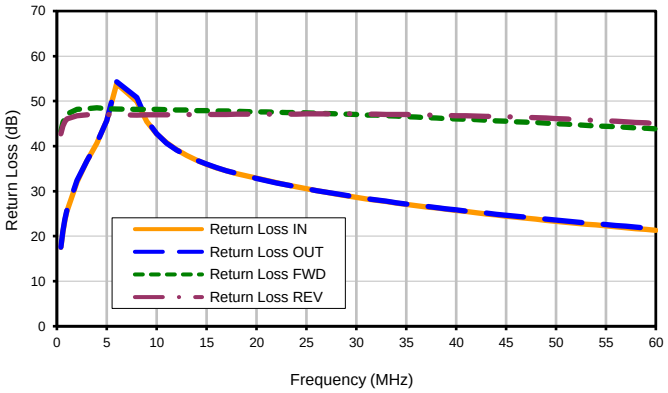

### Coupling




### Directivity



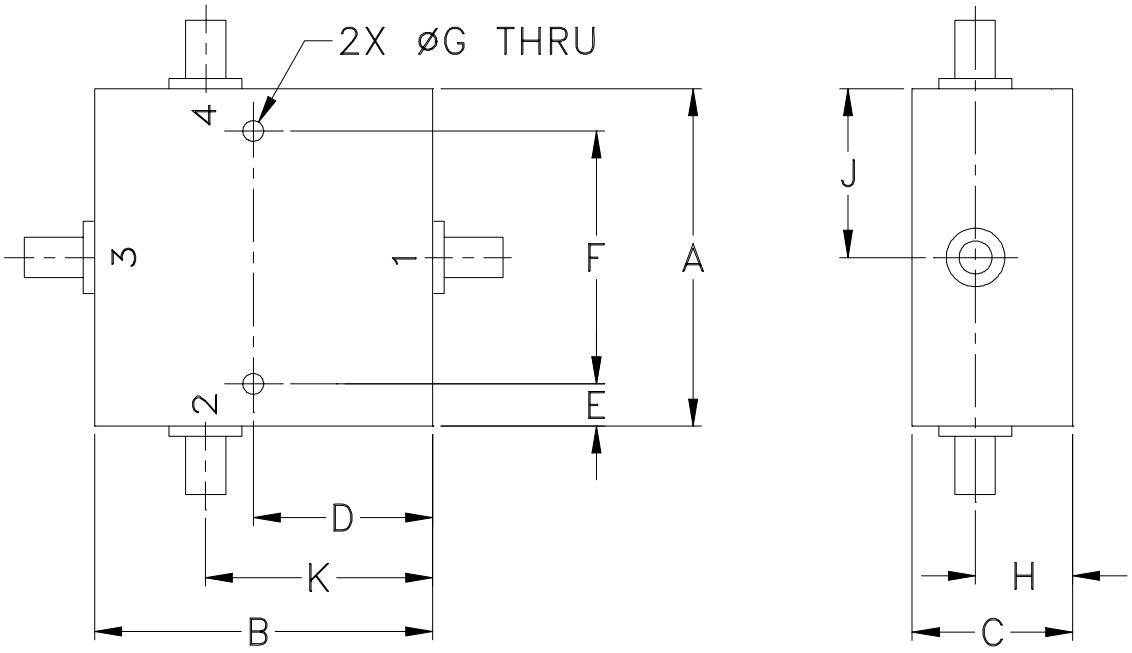

### Return Loss



# Case Style HHH

**HHH141**

## Outline Dimensions




| CASE# | A | B | C | D | E | F | G | H | J | K | WT. GRAM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HHH141 | 2.00 (50.80) | 2.00 (50.80) | .95 (24.13) | 1.062 (26.98) | .125 (3.18) | 1.75 (44.45) | .125 (3.18) | .575 (14.60) | 1.00 (25.4) | 1.35 (34.29) | 200 |

**Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3 Pl. ± .015**

**Notes:**

1. Case material: Aluminum alloy.
2. Case finish:
   For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.


Mini-Circuits®
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**Environmental Specifications** **ENV28T13**

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 | -55° to 75°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103 |
| Thermal Shock | -65° to 125°C, 5 cycles | MIL-STD-202, Method 107, Condition B |
| 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 | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18) | MIL-STD-202, Method 213, Condition I |