

# Coaxial Directional Coupler

50Ω

0.5 to 500 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. |                |

## Coaxial Connections

|         |   |
|---------|---|
| INPUT   | 3 |
| OUTPUT  | 2 |
| COUPLED | 1 |

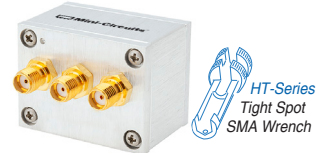
## Features

- excellent mainline loss, 0.65 dB typ.
- excellent directivity, 32 dB typ.
- rugged shielded case

## Applications

- HF/VHF/UHF
- amateur radio
- instrumentation

ZMDC-10-1+



Generic photo used for illustration purposes only

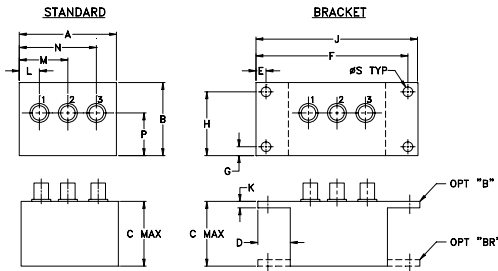
CASE STYLE: M21

|                       |            |
|-----------------------|------------|
| Connectors            | Model      |
| SMA                   | ZMDC-10-1+ |
| BRACKET (OPTION "B")  |            |
| BRACKET (OPTION "BR") |            |

## +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     | G    | H     |
| 1.50  | 1.13  | 1.00  | .50   | .155  | 2.345 | .138 | .987  |
| 38.10 | 28.70 | 25.40 | 12.70 | 3.94  | 59.56 | 3.51 | 25.07 |
| J     | K     | L     | M     | N     | P     | S    | Wt    |
| 2.50  | .10   | .31   | .75   | 1.19  | .66   | .150 | grams |
| 63.50 | 2.54  | 7.87  | 19.05 | 30.23 | 16.76 | 3.81 | 40.0  |

## Directional Coupler Electrical Specifications

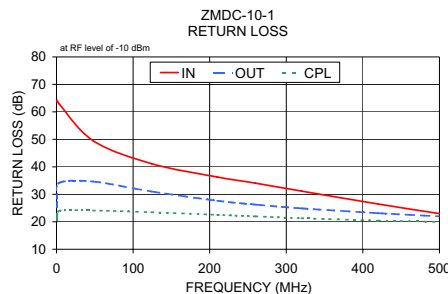
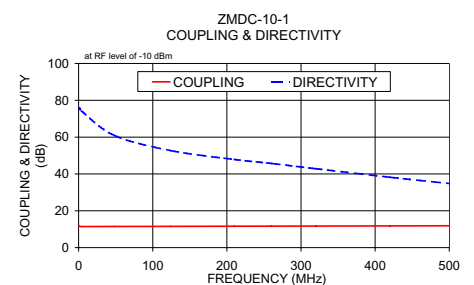
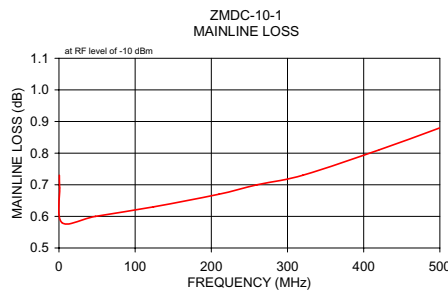
| FREQ.<br>RANGE<br>(MHz) | COUPLING<br>(dB)               |      | MAINLINE LOSS <sup>1</sup><br>(dB) |      |      |      |      |      | DIRECTIVITY<br>(dB) |      |      |      |      |      | VSWR<br>(:1) | POWER<br>INPUT<br>(W) |      |
|-------------------------|--------------------------------|------|------------------------------------|------|------|------|------|------|---------------------|------|------|------|------|------|--------------|-----------------------|------|
|                         |                                |      | 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. |
| 0.5-500                 | 11.5±0.5                       | ±0.6 | 0.85                               | 1.3  | 0.65 | 1.0  | 0.85 | 1.3  | 32                  | 25   | 32   | 25   | 22   | 15   | 1.2          | 1.5                   | 3.0  |

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  $f_U$ ]

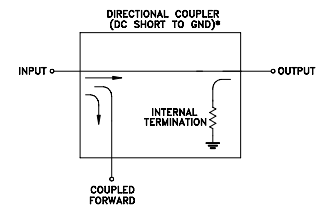
1. Mainline loss includes theoretical power loss at coupled port.

## Typical Performance Data

| Frequency (MHz) | Mainline Loss (dB) In-Out | Coupling (dB) In-Cpl | Directivity (dB) | Return Loss (dB) |       |       |
|-----------------|---------------------------|----------------------|------------------|------------------|-------|-------|
|                 |                           |                      |                  | In               | Out   | Cpl   |
| 0.50            | 0.73                      | 11.62                | 75.22            | 63.60            | 25.33 | 20.56 |
| 0.90            | 0.69                      | 11.57                | 75.75            | 64.18            | 28.71 | 21.79 |
| 4.00            | 0.58                      | 11.45                | 74.20            | 62.75            | 34.21 | 24.05 |
| 48.00           | 0.60                      | 11.49                | 60.95            | 49.46            | 34.66 | 24.10 |
| 124.00          | 0.63                      | 11.55                | 52.70            | 41.15            | 31.03 | 23.50 |
| 210.00          | 0.67                      | 11.62                | 47.91            | 36.29            | 27.67 | 22.54 |
| 260.00          | 0.70                      | 11.66                | 45.71            | 34.05            | 26.27 | 21.97 |
| 320.00          | 0.73                      | 11.71                | 42.88            | 31.17            | 24.90 | 21.32 |
| 420.00          | 0.81                      | 11.80                | 38.25            | 26.46            | 23.14 | 20.45 |
| 500.00          | 0.88                      | 11.86                | 34.83            | 22.98            | 21.97 | 19.97 |



## Electrical Schematic



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



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M151777  
ZMDC-10-1  
WZ/TD/CP/AM  
200804  
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# Directional Coupler

## ZMDC-10-1+

### Typical Performance Data

| FREQUENCY<br>(MHz) | INSERTION<br>LOSS<br>(dB) | COUPLING<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS |       |       |
|--------------------|---------------------------|------------------|---------------------|-------------|-------|-------|
|                    |                           |                  |                     | IN          | OUT   | CPL   |
| 0.5                | 0.73                      | 11.62            | 75.22               | 63.60       | 25.33 | 20.56 |
| 0.6                | 0.72                      | 11.60            | 75.08               | 63.47       | 26.48 | 20.97 |
| 0.7                | 0.71                      | 11.59            | 72.59               | 61.00       | 27.37 | 21.28 |
| 0.8                | 0.69                      | 11.57            | 73.84               | 62.27       | 28.08 | 21.55 |
| 0.9                | 0.69                      | 11.57            | 75.75               | 64.18       | 28.71 | 21.79 |
| 1.0                | 0.68                      | 11.56            | 73.40               | 61.84       | 29.25 | 22.00 |
| 2.0                | 0.61                      | 11.49            | 73.85               | 62.36       | 32.37 | 23.26 |
| 3.0                | 0.59                      | 11.47            | 73.94               | 62.47       | 33.59 | 23.78 |
| 4.0                | 0.58                      | 11.45            | 74.20               | 62.75       | 34.21 | 24.05 |
| 5.0                | 0.57                      | 11.45            | 72.92               | 61.46       | 34.52 | 24.18 |
| 10.0               | 0.57                      | 11.45            | 70.39               | 58.94       | 35.01 | 24.39 |
| 29.0               | 0.58                      | 11.46            | 64.49               | 53.03       | 35.17 | 24.27 |
| 48.0               | 0.60                      | 11.49            | 60.95               | 49.46       | 34.66 | 24.10 |
| 67.0               | 0.61                      | 11.50            | 57.54               | 46.04       | 33.73 | 23.96 |
| 86.0               | 0.62                      | 11.52            | 56.14               | 44.62       | 32.75 | 23.82 |
| 105.0              | 0.63                      | 11.53            | 54.35               | 42.82       | 31.82 | 23.67 |
| 124.0              | 0.63                      | 11.55            | 52.70               | 41.15       | 31.03 | 23.50 |
| 143.0              | 0.64                      | 11.55            | 51.44               | 39.89       | 30.24 | 23.30 |
| 162.0              | 0.65                      | 11.57            | 50.44               | 38.87       | 29.50 | 23.08 |
| 181.0              | 0.66                      | 11.58            | 49.41               | 37.83       | 28.69 | 22.87 |
| 200.0              | 0.67                      | 11.60            | 48.42               | 36.82       | 28.03 | 22.65 |
| 210.0              | 0.67                      | 11.62            | 47.91               | 36.29       | 27.67 | 22.54 |
| 220.0              | 0.67                      | 11.63            | 47.40               | 35.77       | 27.38 | 22.42 |
| 230.0              | 0.68                      | 11.63            | 46.99               | 35.36       | 27.07 | 22.31 |
| 240.0              | 0.69                      | 11.65            | 46.62               | 34.98       | 26.80 | 22.20 |
| 250.0              | 0.70                      | 11.65            | 46.03               | 34.37       | 26.52 | 22.08 |
| 260.0              | 0.70                      | 11.66            | 45.71               | 34.05       | 26.27 | 21.97 |
| 270.0              | 0.71                      | 11.67            | 45.10               | 33.43       | 26.03 | 21.85 |
| 280.0              | 0.72                      | 11.69            | 44.75               | 33.06       | 25.78 | 21.74 |
| 290.0              | 0.72                      | 11.70            | 44.24               | 32.54       | 25.55 | 21.63 |
| 300.0              | 0.72                      | 11.70            | 43.78               | 32.08       | 25.34 | 21.53 |
| 320.0              | 0.73                      | 11.71            | 42.88               | 31.17       | 24.90 | 21.32 |
| 340.0              | 0.75                      | 11.73            | 41.91               | 30.18       | 24.49 | 21.14 |
| 360.0              | 0.78                      | 11.75            | 41.01               | 29.26       | 24.13 | 20.95 |
| 380.0              | 0.78                      | 11.78            | 40.15               | 28.37       | 23.78 | 20.78 |
| 400.0              | 0.78                      | 11.79            | 39.23               | 27.44       | 23.45 | 20.60 |
| 420.0              | 0.81                      | 11.80            | 38.25               | 26.46       | 23.14 | 20.45 |
| 440.0              | 0.84                      | 11.81            | 37.47               | 25.66       | 22.84 | 20.31 |
| 460.0              | 0.86                      | 11.83            | 36.52               | 24.69       | 22.55 | 20.20 |
| 480.0              | 0.86                      | 11.86            | 35.68               | 23.82       | 22.26 | 20.08 |
| 500.0              | 0.88                      | 11.86            | 34.83               | 22.98       | 21.97 | 19.97 |

REV. X1  
ZMDC-10-1+  
060718  
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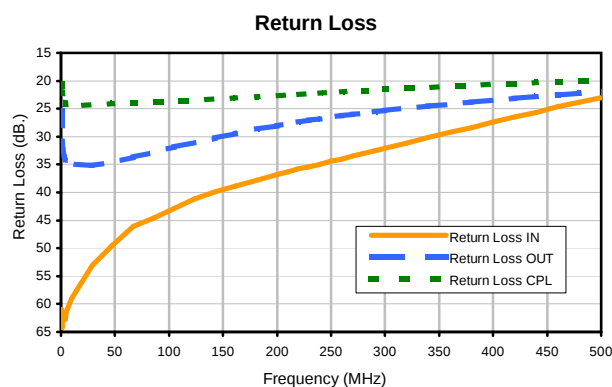
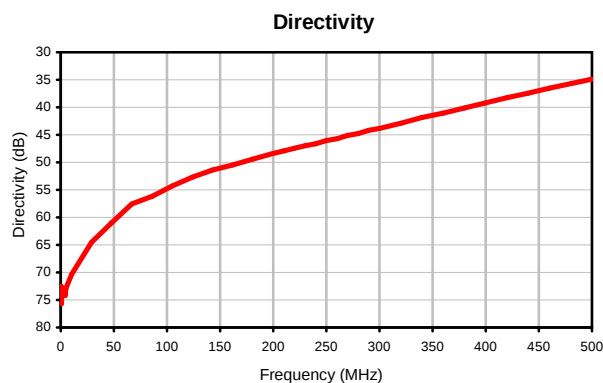
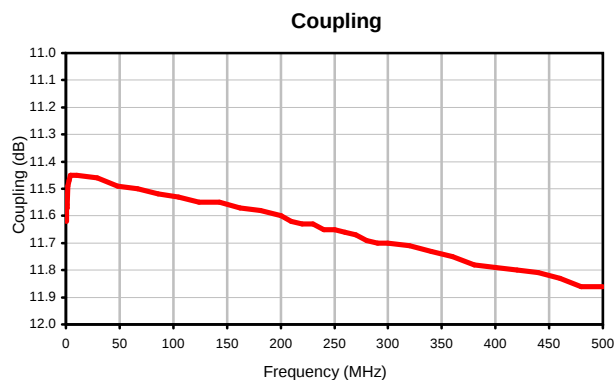
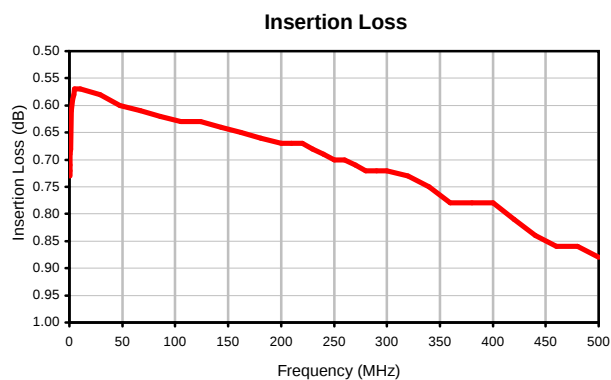
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



# Directional Coupler

## Typical Performance Curves

ZMDC-10-1+



## Outline Dimensions

M21

M22

M23



| CASE# | A               | B               | C               | D              | E              | F                | G              | H                | J               | K             | L              | M               | N               |
|-------|-----------------|-----------------|-----------------|----------------|----------------|------------------|----------------|------------------|-----------------|---------------|----------------|-----------------|-----------------|
| M21   | 1.50<br>(38.10) | 1.13<br>(28.70) | 1.00<br>(25.40) | .50<br>(12.70) | .155<br>(3.94) | 2.345<br>(59.56) | .138<br>(3.51) | .987<br>(25.07)  | 2.50<br>(63.50) | .10<br>(2.54) | .31<br>(7.87)  | .75<br>(19.05)  | 1.19<br>(30.23) |
| M22   | 2.25<br>(57.15) | 1.38<br>(35.05) | 1.24<br>(31.50) |                | .150<br>(3.81) | 3.100<br>(78.74) |                | 1.238<br>(31.45) | 3.25<br>(82.55) |               | .40<br>(10.16) | 1.15<br>(29.21) | 1.86<br>(47.24) |
| M23   | 2.25<br>(57.15) | 1.38<br>(35.05) | 1.24<br>(31.50) |                | .150<br>(3.81) | 3.100<br>(78.74) |                | 1.238<br>(31.45) | 3.25<br>(82.55) |               | .63<br>(16.00) | 1.06<br>(26.92) | 1.63<br>(41.40) |

| CASE# | P              | Q  | R  | S              | WT. GRAMS |
|-------|----------------|----|----|----------------|-----------|
| M21   | .66<br>(16.76) | -- | -- | .150<br>(3.81) | 40.0      |
| M22   | .64<br>(16.26) | -- | -- |                | 74.0      |
| M23   | .69<br>(17.53) | -- | -- |                | 70.0      |

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

### Notes:

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

Due to transition from non-RoHS to RoHS, models will be supplied with either case style finish until the non-RoHS case inventory is depleted.
- Mounting bracket available on request. For bracket mounted on connector end add suffix B to part number and add \$5.00 to unit cost. For bracket mounted on the rear, add suffix BR to part number and add \$1.50 to unit cost.



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 100°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 |