

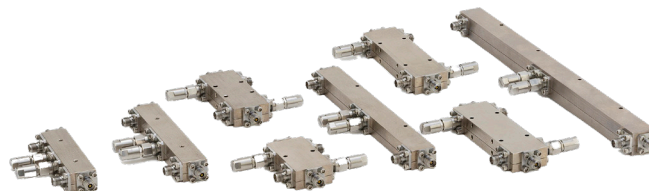
# Dual Directional Couplers

ZDDC-Series

50Ω 10, 20 and 30 dB Up to 20W 0.5 to 40 GHz

## The Big Deal

- Wideband, 0.5, 1, 2, 6, or 18 to 40 GHz
- Excellent Coupling Flatness,  $\pm 0.3$  to  $\pm 1.0$  dB typ.
- Power Handling up to 20W



ZDDC Model Series

## Product Overview

The Mini-Circuits ZDDC family of wideband Dual-Directional Couplers offers exceptional performance spanning frequencies from 0.5, 1, 2, 6, or 18 to 40 GHz. Available in models with 10, 20, and 30 dB coupling, these couplers provide excellent coupling flatness, good directivity, and power handling up to 20 W. They are ideal for lab testing applications as well as for power monitoring over wide bands, among other applications

## Key Features

| Feature   | Advantages  |
|---|---|
| Family of models<br>Wide bandwidth and choice of coupling <ul style="list-style-type: none"> <li>• Up to 40 GHz</li> <li>• 10, 20, or 30 dB coupling</li> </ul> | 10 dB coupling:<br>ZDDC10-K5R44W+ (0.5-40 GHz), ZDDC10-K0144+ (1-40 GHz), ZDDC10-K0244+ (2-40 GHz), ZDDC10-K0644+ (6-40 GHz), ZDDC10-K1844+ (18-40 GHz)<br><br>20 dB coupling:<br>ZDDC20-K0144+ (1-40 GHz), ZDDC20-K0244+ (2-40 GHz), ZDDC20-K0644+ (6-40 GHz), ZDDC20-K1844+ (18-40 GHz)<br><br>30 dB coupling:<br>ZDDC30-K0144+ (1-40 GHz), ZDDC30-K0244+ (2-40 GHz), ZDDC30-K0644+ (6-40 GHz), ZDDC30-K1844+ (18-40 GHz) |
| Dual-Directional Coupler  | Ideally suited for simultaneous monitoring of both forward and reverse power of a system and reflectometer measurements.  |
| Good Directivity <ul style="list-style-type: none"> <li>• 13 to 22 dB typ. up to 40 GHz</li> </ul>  | High directivity allows sampling of input powers with minimal detrimental effects due to output mismatches.   |
| Excellent coupling flatness <ul style="list-style-type: none"> <li>• <math>\pm 0.3</math> to <math>\pm 1.0</math> dB typ.</li> </ul>                            | Excellent coupling flatness over the entire frequency range minimizes the need for compensation circuits in most cases.   |
| Great Return Loss (In & Thru) <ul style="list-style-type: none"> <li>• 17 to 23 dB typ. up to 40 GHz</li> </ul>   | Good return loss over operating band minimizes undesired reflections and resulting amplitude ripple.  |

Wideband, DC Pass

# Dual Directional Coupler

ZDDC20-K0644+

50Ω 20 dB Up to 20W 6 to 40 GHz

## Features

- Wide frequency range, 6 to 40 GHz
- Excellent coupling flatness,  $\pm 0.4$  dB typ.
- Great directivity, 16 dB typ. up to 40 GHz
- Great return loss, 19 dB typ. up to 40 GHz
- DC current pass through input to output

## Applications

- 5G
- Mobile
- Fixed satellite
- Lab use

## Electrical Specifications at 25°C

| Parameter                  | Frequency (GHz) | Min. | Typ. | Max. | Units |
|----------------------------|-----------------|------|------|------|-------|
| Frequency Range            |                 | 6    |      | 40   | GHz   |
| Coupling                   | 6 - 40          | —    | 20±2 | —    | dB    |
| Coupling Flatness (±)      | 6 - 40          | —    | ±0.4 | ±1.0 | dB    |
| Mainline Loss <sup>1</sup> | 6 - 18          | —    | 0.4  | 0.8  | dB    |
|                            | 18 - 26.5       | —    | 0.6  | 1.1  |       |
|                            | 26.5 - 40       | —    | 0.8  | 1.4  |       |
| Directivity <sup>2</sup>   | 6 - 18          | 14   | 29   | —    | dB    |
|                            | 18 - 26.5       | 12   | 25   | —    |       |
|                            | 26.5 - 40       | 10   | 24   | —    |       |
| Return Loss (In & Thru)    | 6 - 18          | 13.9 | 30   | —    | dB    |
|                            | 18 - 26.5       | 12.7 | 29   | —    |       |
|                            | 26.5 - 40       | 11.7 | 27   | —    |       |
| Return Loss (Coupling)     | 6 - 18          | 13.9 | 31   | —    | dB    |
|                            | 18 - 26.5       | 12.7 | 24   | —    |       |
|                            | 26.5 - 40       | 11.7 | 25   | —    |       |
| Input Power <sup>3</sup>   | 6 - 40          | —    | —    | 20   | W     |

1. Mainline loss includes coupling loss

2. Directivity (dB) = -RF-OUT to COUP1 (dBm) + RF-IN to COUP1 (dBm) or -RF-IN to COUP2 (dBm) + RF-OUT to COUP2 (dBm)

3. Up to 25°C, derates linearly to 10W at 100°C.

## Maximum Ratings

| Parameter                         | Ratings        |
|-----------------------------------|----------------|
| Operating Temperature             | -55°C to 100°C |
| Storage Temperature               | -55°C to 100°C |
| Supplied Termination <sup>4</sup> | 1W             |
| DC Current                        | 0.63A          |

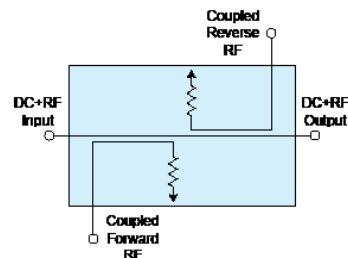
4. Up to 25°C, derates linearly to 325mW at 100°C.

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

## Configuration

| Port Markings | Function                        |
|---------------|---------------------------------|
| IN            | RF-IN                           |
| THRU          | RF-OUT                          |
| COUP1         | Couples power applied at RF-IN  |
| COUP2         | Couples power applied at RF-OUT |

## Electrical Schematic



\* Mainline is DC Coupled.

\* Coupling ports are DC Coupled to internal terminations.



Generic photo used for illustration purposes only

CASE STYLE: HT3105-2

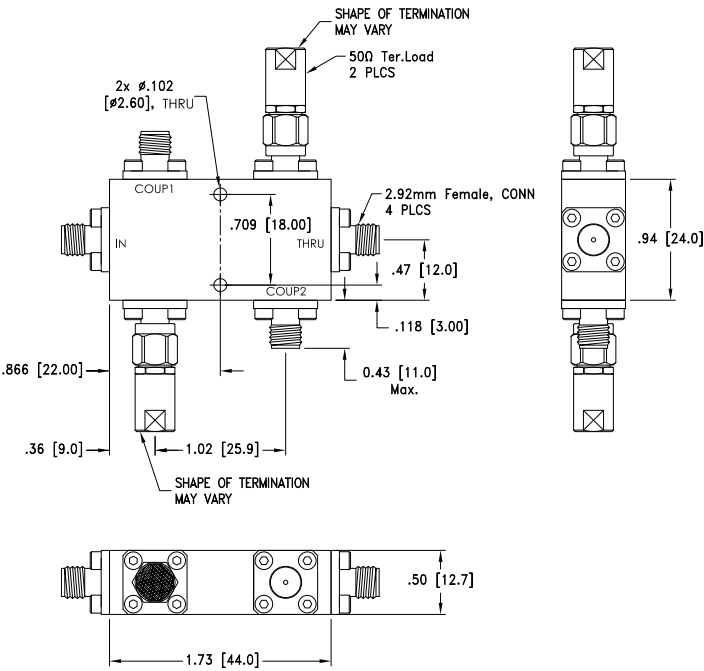
| Connectors    | Model         |
|---------------|---------------|
| 2.92mm Female | ZDDC20-K0644+ |

### +RoHS Compliant

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



Outline Drawing



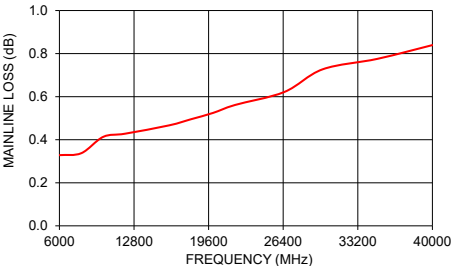
Weight: 85 grams;  
Dimensions are in inches (mm). Tolerances: 2 Pl.±.03; 3 Pl.±.015

Typical Performance Data

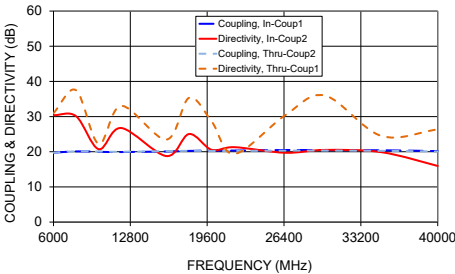
| Frequency<br>(MHz) | Mainline Loss <sup>1</sup><br>(dB) | Coupling<br>(dB) |            | Directivity<br>(dB) |          | Return Loss<br>(dB) |       |       |       |
|--------------------|------------------------------------|------------------|------------|---------------------|----------|---------------------|-------|-------|-------|
|                    | In-Thru1                           | In-Coup1         | Thru-Coup2 | Thru-Coup1          | In-Coup2 | In                  | Thru  | Coup1 | Coup2 |
| 6000               | 0.33                               | 19.72            | 19.74      | 31.00               | 30.40    | 23.21               | 23.72 | 32.15 | 28.71 |
| 8000               | 0.34                               | 20.10            | 20.13      | 37.47               | 30.10    | 35.72               | 34.45 | 33.63 | 44.10 |
| 10000              | 0.41                               | 19.99            | 20.05      | 22.22               | 20.73    | 21.21               | 21.16 | 27.64 | 33.21 |
| 12000              | 0.43                               | 19.92            | 19.99      | 33.06               | 26.75    | 24.62               | 24.15 | 33.33 | 42.80 |
| 16000              | 0.47                               | 20.09            | 20.18      | 23.47               | 18.77    | 31.82               | 28.66 | 26.10 | 25.14 |
| 18000              | 0.50                               | 20.24            | 20.26      | 35.34               | 25.04    | 31.05               | 28.54 | 22.65 | 20.78 |
| 20000              | 0.52                               | 20.34            | 20.23      | 28.59               | 20.53    | 35.37               | 38.83 | 26.70 | 33.81 |
| 22000              | 0.56                               | 20.34            | 20.24      | 19.38               | 21.30    | 27.58               | 28.92 | 21.29 | 20.27 |
| 26500              | 0.62                               | 20.49            | 20.32      | 30.37               | 19.71    | 32.64               | 29.96 | 26.51 | 25.36 |
| 30000              | 0.73                               | 20.46            | 20.33      | 35.99               | 20.52    | 20.43               | 19.33 | 32.83 | 35.59 |
| 35000              | 0.78                               | 20.42            | 20.27      | 24.51               | 19.89    | 29.26               | 33.53 | 21.26 | 19.82 |
| 40000              | 0.84                               | 20.18            | 20.08      | 26.34               | 15.95    | 21.59               | 21.49 | 19.95 | 17.59 |

1. Mainline loss includes coupling loss

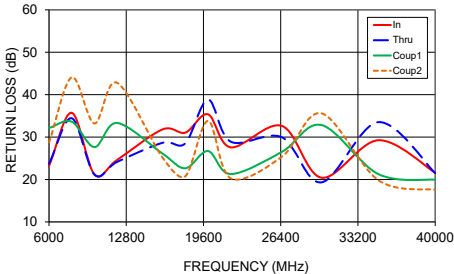
ZDDC20-K0644+  
MAINLINE LOSS



ZDDC20-K0644+  
COUPLING & DIRECTIVITY



ZDDC20-K0644+  
RETURN LOSS



Additional 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-Circuits' 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)

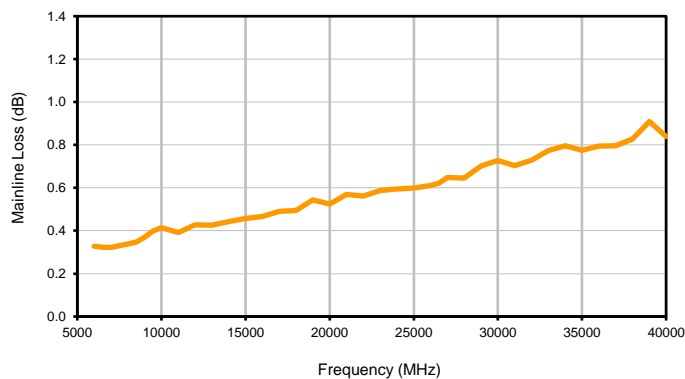
## Typical Performance Data

| FREQ.<br>(MHz) | MAINLINE<br>LOSS <sup>(1)</sup> | COUPLING  |             | DIRECTIVITY |           | RETURN LOSS |       |        |        |
|----------------|---------------------------------|-----------|-------------|-------------|-----------|-------------|-------|--------|--------|
|                | (dB)                            | (dB)      |             | (dB)        |           | (dB)        |       |        |        |
|                | IN-THRU                         | IN-COUP 1 | THRU-COUP 2 | THRU-COUP 1 | IN-COUP 2 | IN          | THRU  | COUP 1 | COUP 2 |
| 6000           | 0.33                            | 19.72     | 19.74       | 31.00       | 30.40     | 23.21       | 23.72 | 32.15  | 28.71  |
| 6500           | 0.32                            | 19.83     | 19.86       | 32.11       | 38.46     | 25.78       | 26.58 | 37.97  | 33.24  |
| 7000           | 0.32                            | 19.95     | 19.98       | 34.84       | 37.80     | 34.80       | 36.46 | 39.32  | 39.95  |
| 7500           | 0.33                            | 20.05     | 20.08       | 38.64       | 30.79     | 39.14       | 38.29 | 52.32  | 40.63  |
| 8000           | 0.34                            | 20.10     | 20.13       | 37.47       | 30.10     | 35.72       | 34.45 | 33.63  | 44.10  |
| 8500           | 0.35                            | 20.11     | 20.14       | 30.65       | 28.30     | 46.02       | 33.97 | 28.59  | 31.74  |
| 9000           | 0.37                            | 20.07     | 20.11       | 25.95       | 23.87     | 27.41       | 25.99 | 30.01  | 30.13  |
| 9500           | 0.40                            | 20.04     | 20.09       | 23.22       | 21.15     | 22.40       | 21.94 | 48.16  | 38.13  |
| 10000          | 0.41                            | 19.99     | 20.05       | 22.22       | 20.73     | 21.21       | 21.16 | 27.64  | 33.21  |
| 11000          | 0.39                            | 19.88     | 19.96       | 25.58       | 26.98     | 33.21       | 34.99 | 26.47  | 26.71  |
| 12000          | 0.43                            | 19.92     | 19.99       | 33.06       | 26.75     | 24.62       | 24.15 | 33.33  | 42.80  |
| 13000          | 0.43                            | 19.99     | 20.10       | 32.01       | 33.92     | 28.84       | 30.16 | 29.25  | 36.44  |
| 14000          | 0.44                            | 20.04     | 20.17       | 38.82       | 25.03     | 28.16       | 27.47 | 30.29  | 26.55  |
| 15000          | 0.46                            | 20.09     | 20.20       | 28.40       | 37.57     | 28.27       | 29.76 | 24.73  | 30.24  |
| 16000          | 0.47                            | 20.09     | 20.18       | 23.47       | 18.77     | 31.82       | 28.66 | 26.10  | 25.14  |
| 17000          | 0.49                            | 20.12     | 20.17       | 24.04       | 20.52     | 27.28       | 26.78 | 24.33  | 24.65  |
| 18000          | 0.50                            | 20.24     | 20.26       | 35.34       | 25.04     | 31.05       | 28.54 | 22.65  | 20.78  |
| 19000          | 0.54                            | 20.32     | 20.30       | 32.50       | 21.01     | 21.53       | 21.09 | 32.75  | 28.45  |
| 20000          | 0.52                            | 20.34     | 20.23       | 28.59       | 20.53     | 35.37       | 38.83 | 26.70  | 33.81  |
| 21000          | 0.57                            | 20.31     | 20.19       | 20.52       | 19.58     | 22.32       | 21.58 | 24.43  | 20.34  |
| 22000          | 0.56                            | 20.34     | 20.24       | 19.38       | 21.30     | 27.58       | 28.92 | 21.29  | 20.27  |
| 23000          | 0.59                            | 20.41     | 20.22       | 21.46       | 15.07     | 25.57       | 23.62 | 24.28  | 19.41  |
| 24000          | 0.59                            | 20.42     | 20.19       | 26.01       | 19.48     | 25.88       | 25.88 | 23.57  | 23.73  |
| 25000          | 0.60                            | 20.52     | 20.39       | 25.86       | 23.49     | 32.55       | 28.33 | 20.50  | 20.47  |
| 26000          | 0.61                            | 20.52     | 20.41       | 25.52       | 24.06     | 36.52       | 32.47 | 20.48  | 20.95  |
| 26500          | 0.62                            | 20.49     | 20.32       | 30.37       | 19.71     | 32.64       | 29.96 | 26.51  | 25.36  |
| 27000          | 0.65                            | 20.46     | 20.20       | 29.52       | 17.26     | 25.20       | 23.68 | 24.31  | 27.37  |
| 28000          | 0.65                            | 20.46     | 20.40       | 20.87       | 21.47     | 33.71       | 32.20 | 22.41  | 19.42  |
| 29000          | 0.70                            | 20.50     | 20.42       | 23.58       | 21.88     | 21.32       | 20.41 | 26.43  | 33.69  |
| 30000          | 0.73                            | 20.46     | 20.33       | 35.99       | 20.52     | 20.43       | 19.33 | 32.83  | 35.59  |
| 31000          | 0.70                            | 20.46     | 20.35       | 24.68       | 19.63     | 32.26       | 30.83 | 20.07  | 21.74  |
| 32000          | 0.73                            | 20.38     | 20.29       | 24.99       | 17.84     | 26.54       | 23.57 | 29.32  | 36.03  |
| 33000          | 0.77                            | 20.39     | 20.33       | 26.59       | 19.97     | 21.19       | 20.46 | 19.59  | 19.64  |
| 34000          | 0.80                            | 20.38     | 20.12       | 22.26       | 14.34     | 24.39       | 25.61 | 39.32  | 40.30  |
| 35000          | 0.78                            | 20.42     | 20.27       | 24.51       | 19.89     | 29.26       | 33.53 | 21.26  | 19.82  |
| 36000          | 0.79                            | 20.40     | 20.11       | 22.92       | 15.51     | 28.19       | 32.60 | 32.86  | 27.87  |
| 37000          | 0.80                            | 20.31     | 20.21       | 16.33       | 24.81     | 36.01       | 31.96 | 17.46  | 20.32  |
| 38000          | 0.83                            | 20.25     | 20.14       | 22.86       | 18.90     | 33.68       | 37.03 | 26.45  | 23.72  |
| 39000          | 0.91                            | 20.12     | 19.99       | 22.28       | 24.65     | 23.40       | 20.64 | 22.53  | 24.36  |
| 40000          | 0.84                            | 20.18     | 20.08       | 26.34       | 15.95     | 21.59       | 21.49 | 19.95  | 17.59  |

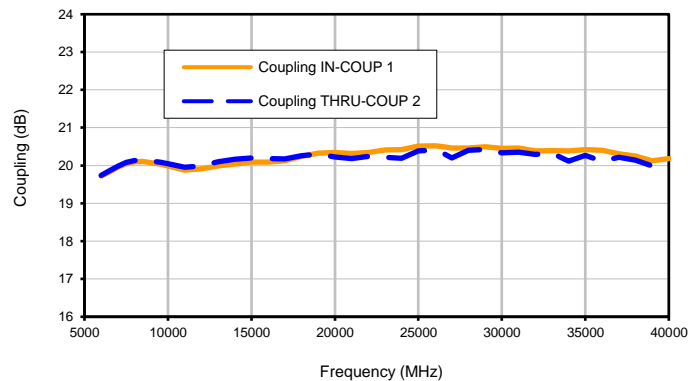
<sup>(1)</sup> Mainline loss includes coupling loss

## Typical Performance Curves

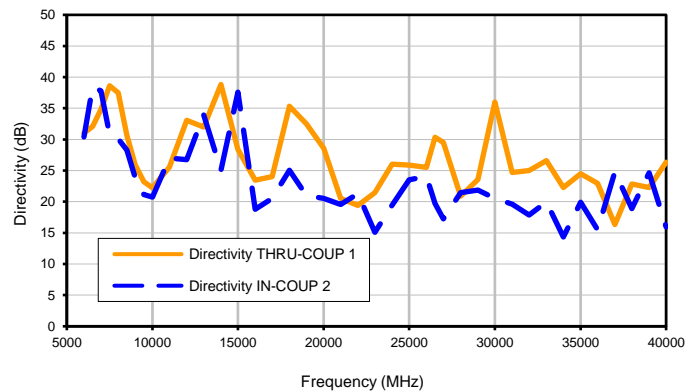
Mainline Loss



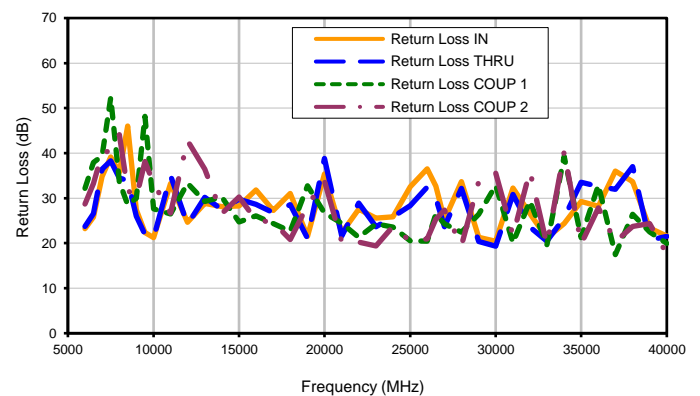
Coupling



Directivity

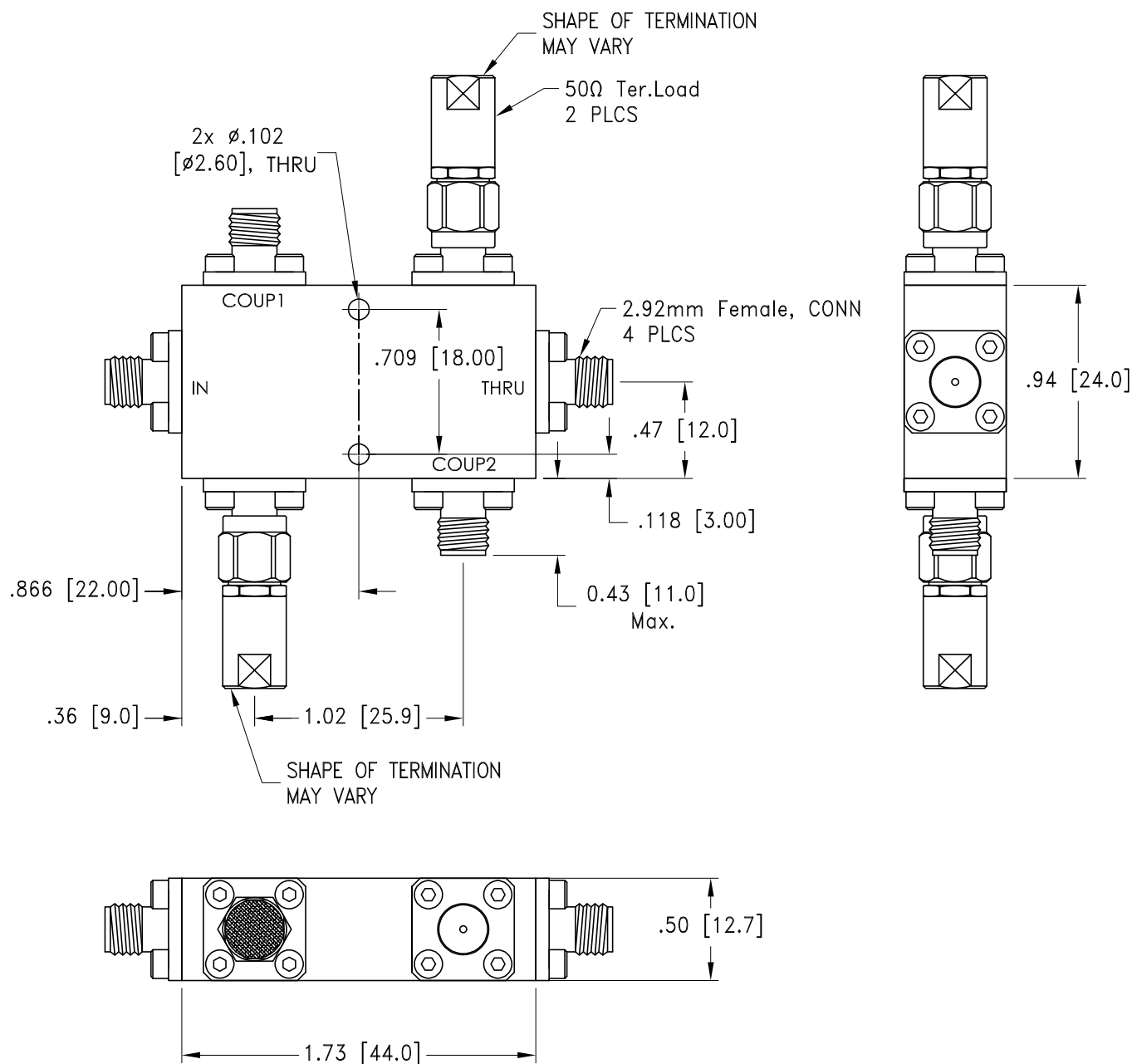


Return Loss



## Outline Dimensions

HT3105-2



Weight: 85 grams;

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

### Notes:

1. Case material: Aluminum Alloy
2. Case Finish: Nickel Plating

**Mini-Circuits®**  
ISO 9001 ISO 14001 CERTIFIED

ALL NEW  
minicircuits.com

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



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  |
| Thermal Shock              | -55° to 100°C, 25 cycles  | MIL-STD-202, Method 107, Condition A-1 except +100°C instead of 85°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           | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)                       | MIL-STD-202, Method 213, Condition I                                 |
| Connector Durability       | 500 mating/unmating cycles  | MIL-PRF-39012E, PARAGRAPH 4.6.12                                     |