



**SURFACE MOUNT**

# Bi-Directional Coupler

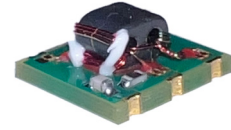
# RBDC9-182-75+

Mini-Circuits

75Ω 5 to 1800 MHz 9 dB 1 Watt

### KEY FEATURES

- Low Mainline Loss, 1.7 dB typ at 1800 MHz
- Good Return Loss, 20 dB typ at Input.
- Excellent Isolation between In-CPLR 40 dB typ in the range 100-700 MHz.
- Supports DOCSIS® 4.0 Systems

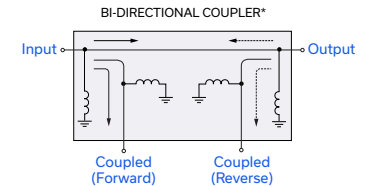


Generic photo used for illustration purposes only

### APPLICATIONS

- DOCSIS® 4.0
- CABLE TV

### ELECTRICAL SCHEMATIC



\*Electrical schematic is for Bi-Directional coupler with internal transformer(s) that routes DC from all ports to ground

### PRODUCT OVERVIEW

Mini-Circuits' RBDC9-182-75+ surface-mount bi-directional coupler provides 9 dB coupling with low mainline loss, high isolation between In-CPLR ports, and good return loss for 75 ohms applications from 5 to 1800 MHz, supporting a variety of broadband applications including DOCSIS® 4.0 systems and equipment. This model features core and wire construction is good for solderability and easy visual inspection.

### ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range	-	5	-	1800	MHz
Mainline Loss <sup>1</sup>	5	-	1.3	1.5	dB
	684	-	1.3	1.6	
	1218	-	1.5	1.8	
	1800	-	1.7	2.2	
Coupling Nominal (In - CPLF)	5 - 1800	-	10±0.5	-	dB
Coupling Nominal (Out - CPLR)	5 - 1800	-	9±0.5	-	
Coupling Flatness (±) (In - CPLF)	5 - 1800	-	0.5	0.9	dB
Coupling Flatness (±) (Out - CPLR)	5 - 1800	-	0.8	1.3	
Isolation (In - CPLR)	5 - 100	35	40		dB
	100 - 700	30	35		
Return Loss (Input)	700 - 1800	17	22		dB
	5 - 1218	-	22		
	1218 - 1800	-	20		
Return Loss (Output)	5 - 1800	-	18		dB
Return Loss (Coupled)	5 - 1800	-	14		dB

1. Mainline Loss includes coupling loss.

### ABSOLUTE MAXIMUM RATINGS<sup>2</sup>

Operating Case Temperature	-40 °C to +85 °C
Storage Temperature	-55 °C to +100 °C
Input Power	1 W

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





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# Bi-Directional Coupler

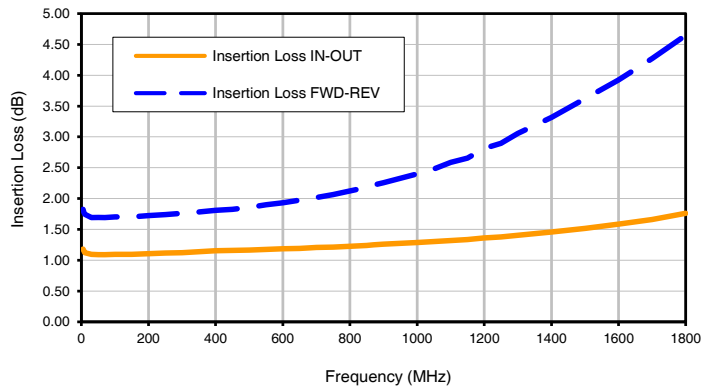
## RBDC9-182-75+

Mini-Circuits

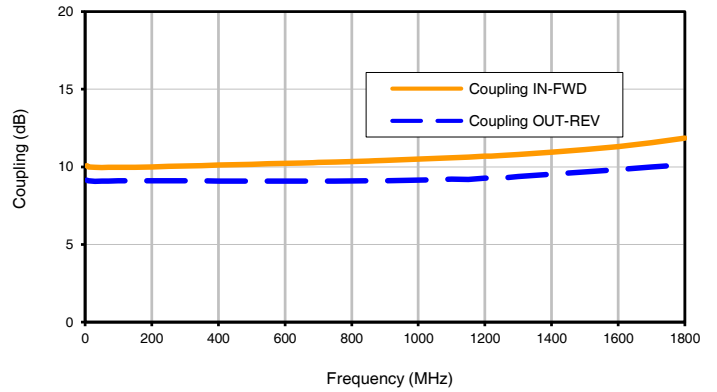
75Ω 5 to 1800 MHz 9 dB 1 Watt

### TYPICAL PERFORMANCE GRAPHS

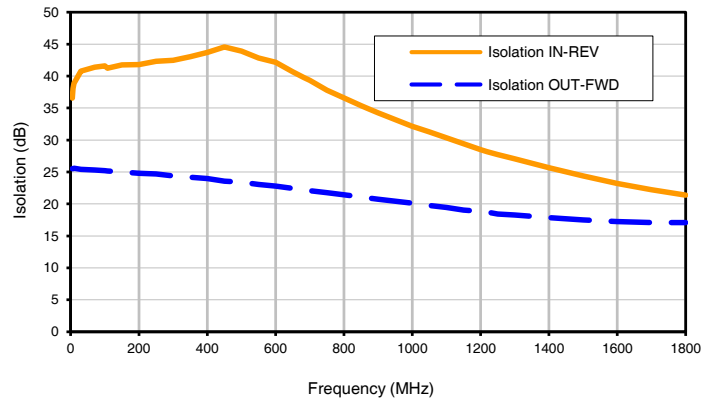
#### Insertion Loss



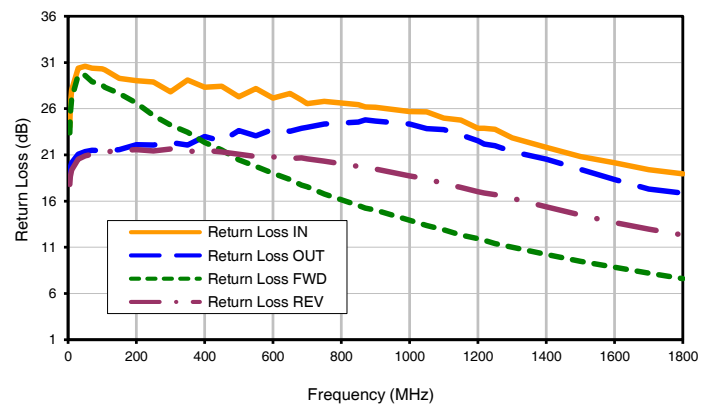
#### Coupling



#### Isolation



#### Return Loss





# SURFACE MOUNT

# Bi-Directional Coupler

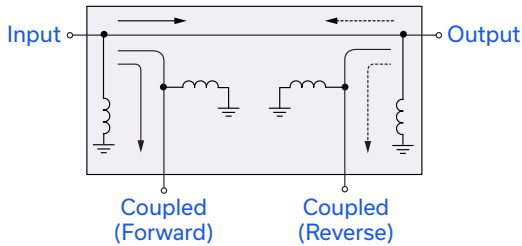
# RBDC9-182-75+

Mini-Circuits

75Ω 5 to 1800 MHz 9 dB 1 Watt

## ELECTRICAL SCHEMATIC

BI-DIRECTIONAL COUPLER\*



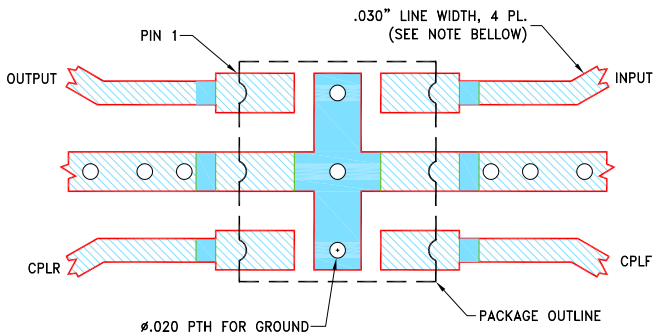
\*Electrical schematic is for Bi-Directional coupler with internal transformer(s) that routes DC from all ports to ground

Figure 1. RBDC9-182-75+ Electrical Schematic

## PAD DESCRIPTION/CONFIGURATION

Function	Pad Number	Description
Input	6	Connects to RF Input Port
Output	1	Connects to RF Output Port
CPL F	4	Connects to Coupled Ports
CPL R	3	
Ground	2;5	Connects to Ground

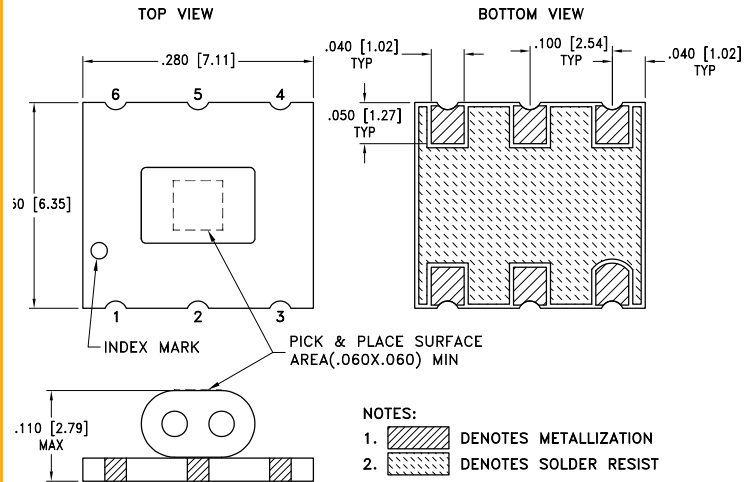
## SUGGESTED PCB LAYOUT (PL-795)



- NOTES:
- LINE WIDTH IS SHOWN FOR ROGERS RO4350B, DIELECTRIC THICKNESS: .030±.002"; COPPER: 1/2 Oz EACH SIDE. FOR OTHER MATERIALS LINE WIDTH MAY NEED TO BE MODIFIED.
  - 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.

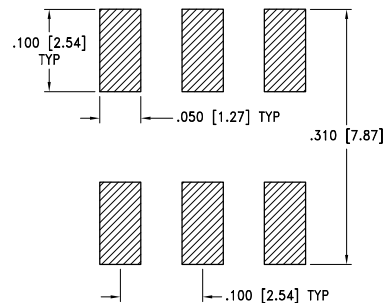
Figure 2. Suggested PCB Layout PL-795

## CASE STYLE DRAWING



- NOTES:
- DENOTES METALLIZATION
  - DENOTES SOLDER RESIST

## PCB Land Pattern



## SUGGESTED LAYOUT FOR PC PATTERN

TOLERANCE TO BE WITHIN ±.002

Weight: .361 grams  
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005 Inch

## PRODUCT MARKING\*: N/A

\*Marking may contain other features or characters for internal lot control.



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# Bi-Directional Coupler

## RBDC9-182-75+

**Mini-Circuits**

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**ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.**

**CLICK HERE**

<b>Performance Data &amp; Graphs</b>	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
<b>Case Style</b>	TT1491-8
<b>RoHS Status</b>	Compliant
<b>Tape and Reel</b>	F2
<b>Suggested Layout for PCB Design</b>	PL-795
<b>Evaluation Board</b>	TB-RBDC918275+ Gerber File
<b>Environmental Rating</b>	ENV02T1

**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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



# Bi-Directional Coupler

# RBDC9-182-75+

## Typical Performance Data

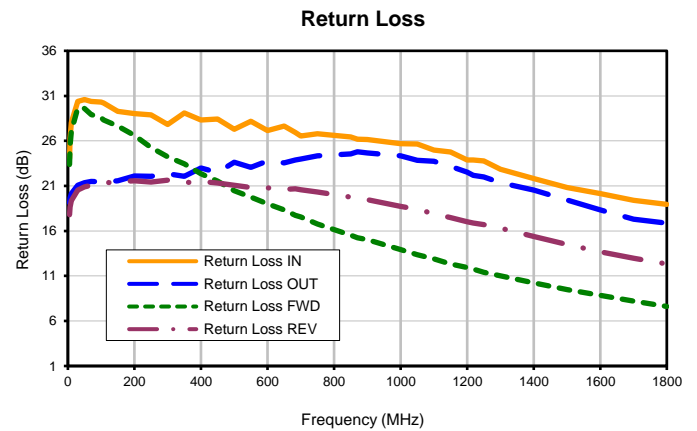
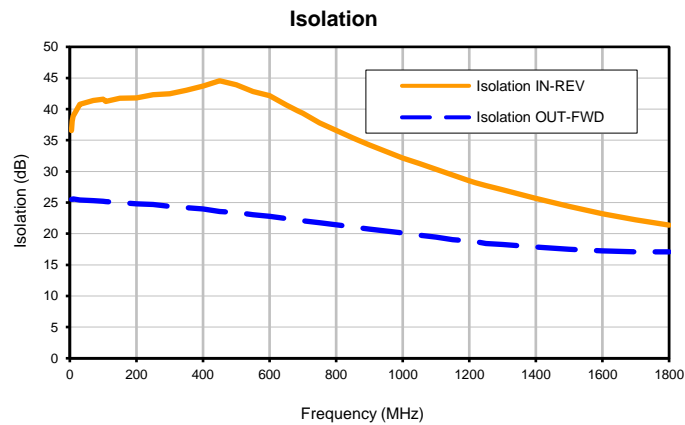
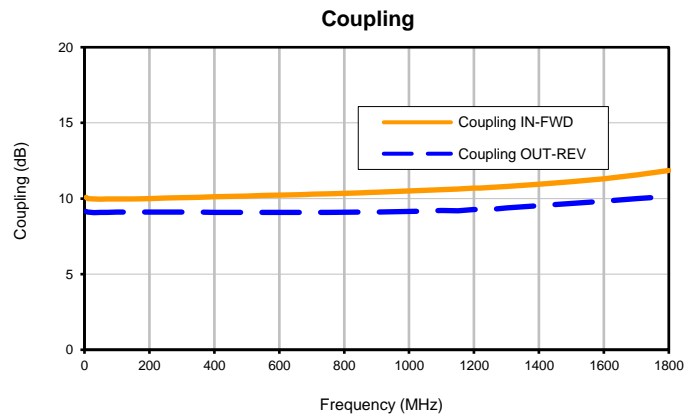
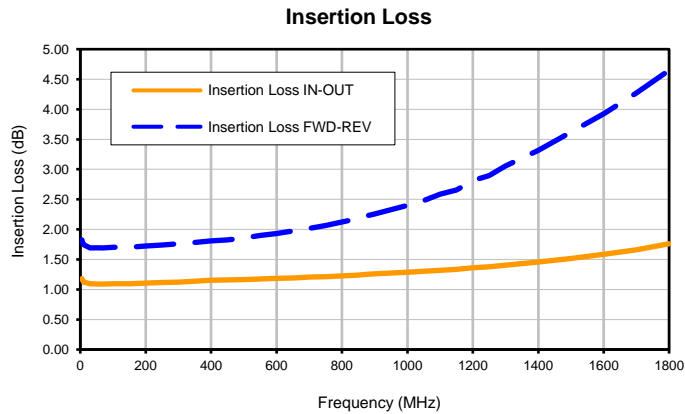
FREQ. (MHz)	INSERTION LOSS <sup>(1)</sup>		COUPLING		ISOLATION		RETURN LOSS			
	(dB)		(dB)		(dB)		(dB)			
	IN-OUT	FWD-REV	IN-FWD	OUT-REV	IN-REV	OUT-FWD	IN	OUT	FWD	REV
5	1.18	1.82	10.08	9.15	36.58	25.54	24.06	19.10	23.38	17.79
7	1.15	1.78	10.05	9.13	38.03	25.54	26.29	19.66	25.46	18.64
10	1.12	1.74	10.00	9.11	38.87	25.59	28.04	20.15	27.08	19.36
30	1.09	1.69	9.97	9.07	40.79	25.43	30.37	21.07	29.65	20.54
50	1.09	1.69	9.95	9.08	41.07	25.34	30.59	21.35	29.60	20.90
70	1.09	1.69	9.96	9.08	41.41	25.29	30.38	21.50	28.91	21.08
100	1.10	1.70	9.97	9.09	41.61	25.20	30.32	21.47	28.55	21.26
108	1.10	1.70	9.97	9.09	41.26	25.13	30.20	21.41	28.33	21.31
150	1.09	1.70	9.98	9.09	41.73	24.99	29.28	21.58	27.63	21.46
200	1.11	1.72	10.00	9.10	41.82	24.80	29.04	22.10	26.62	21.55
250	1.12	1.74	10.02	9.10	42.32	24.69	28.88	22.07	25.25	21.42
300	1.12	1.76	10.06	9.10	42.46	24.40	27.81	22.35	24.22	21.64
350	1.14	1.78	10.08	9.10	43.03	24.16	29.10	22.08	23.44	21.34
400	1.15	1.81	10.12	9.09	43.69	23.99	28.31	22.97	22.36	21.51
450	1.16	1.83	10.13	9.08	44.56	23.57	28.43	22.50	21.52	21.33
500	1.16	1.86	10.17	9.08	43.90	23.43	27.27	23.62	20.46	21.07
550	1.17	1.90	10.20	9.09	42.84	23.04	28.18	23.05	19.77	20.82
600	1.18	1.93	10.21	9.08	42.18	22.77	27.13	23.76	19.00	20.78
650	1.19	1.97	10.24	9.08	40.65	22.46	27.65	23.56	18.33	20.61
684	1.20	2.01	10.27	9.08	39.73	22.15	26.93	23.89	17.75	20.67
700	1.21	2.02	10.28	9.08	39.31	22.06	26.54	23.99	17.54	20.56
750	1.21	2.07	10.31	9.09	37.81	21.75	26.79	24.34	16.75	20.32
850	1.24	2.18	10.37	9.10	35.37	21.09	26.43	24.57	15.51	19.77
870	1.25	2.22	10.40	9.12	34.90	20.96	26.19	24.79	15.25	19.72
900	1.26	2.26	10.41	9.11	34.23	20.74	26.14	24.67	15.03	19.46
1000	1.29	2.40	10.49	9.14	32.15	20.10	25.70	24.34	13.92	18.72
1050	1.30	2.48	10.54	9.16	31.29	19.74	25.66	23.84	13.36	18.39
1100	1.32	2.59	10.57	9.20	30.34	19.43	24.98	23.74	12.89	17.91
1150	1.33	2.66	10.62	9.19	29.44	19.06	24.78	23.16	12.31	17.49
1200	1.36	2.81	10.68	9.27	28.49	18.85	23.88	22.51	11.93	17.02
1218	1.37	2.84	10.70	9.27	28.21	18.72	23.88	22.15	11.77	16.87
1250	1.38	2.89	10.74	9.28	27.74	18.43	23.77	22.00	11.42	16.70
1300	1.41	3.06	10.80	9.39	27.05	18.29	22.85	21.35	11.03	16.31
1400	1.46	3.32	10.94	9.53	25.65	17.88	21.81	20.53	10.22	15.40
1500	1.52	3.62	11.11	9.67	24.39	17.50	20.81	19.43	9.50	14.51
1600	1.59	3.92	11.31	9.82	23.22	17.23	20.14	18.32	8.85	13.68
1700	1.66	4.27	11.56	10.00	22.25	17.09	19.40	17.30	8.22	12.98
1800	1.76	4.65	11.85	10.14	21.38	17.09	18.95	16.86	7.61	12.33

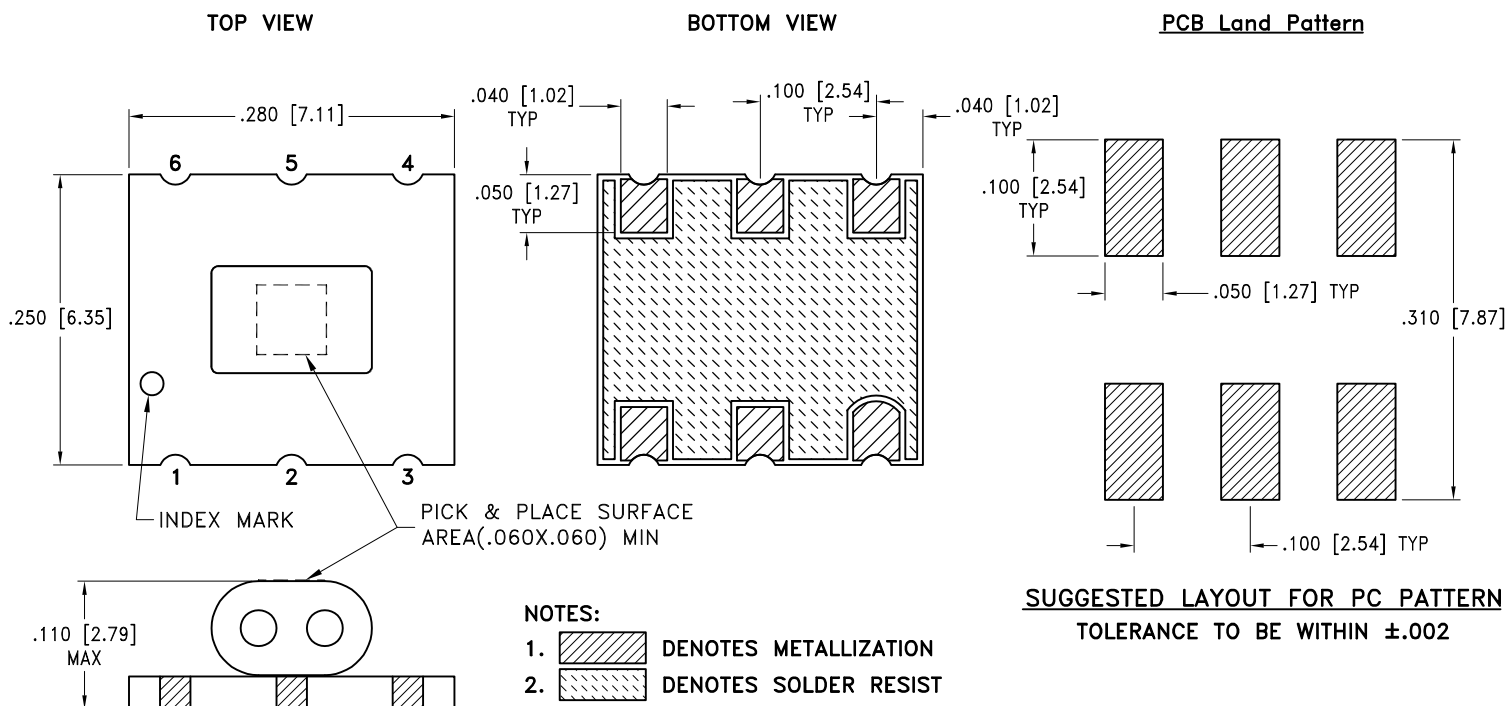
<sup>(1)</sup> Does not include coupling loss

# Bi-Directional Coupler

## Typical Performance Curves

RBDC9-182-75+





Weight: .361 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.  $\pm 0.01$ ; 3 Pl.  $\pm 0.005$  Inch

**Notes:**

1. Open style, Base material: Printed wiring laminate.
2. Termination finish: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate  
All models, (+) suffix.



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

# Tape & Reel Packaging TR-F34



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
16	12	7	Small quantity standard (see note)	20
				50
				100
				200
		13	Standard	500
				1000

Note: Availability of small reel quantity varies by model.  
Refer to pricing and availability on individual model dashboard.

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.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



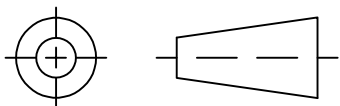
INTERNET <http://www.minicircuits.com>

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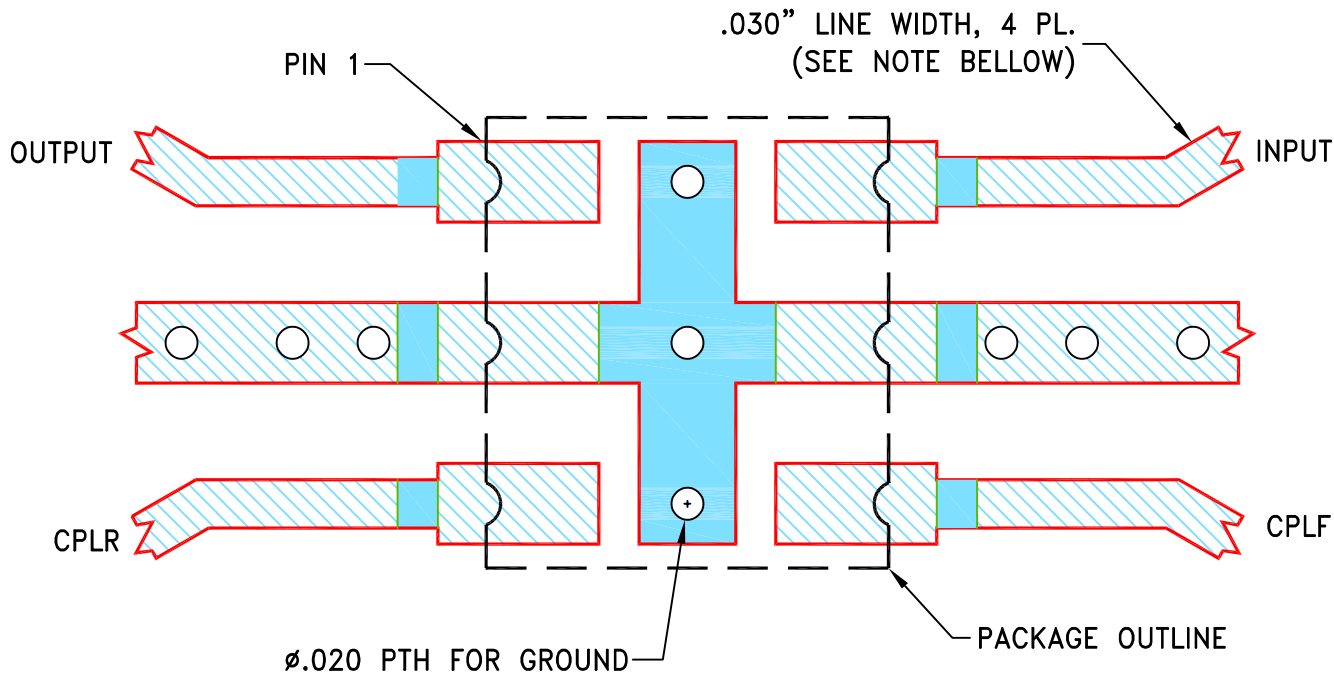
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-023000	NEW RELEASE	09/16/24	ITG	IL

SUGGESTED MOUNTING CONFIGURATION  
FOR TT1491-8 CASE STYLE

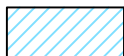


**NOTES:**

1. LINE WIDTH IS SHOWN FOR ROGERS RO4350B, DIELECTRIC THICKNESS:  $.030 \pm .002$ ";  
COPPER: 1/2 Oz EACH SIDE. FOR OTHER MATERIALS LINE 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.

UNLESS OTHERWISE SPECIFIED	INITIALS		DATE
DIMENSIONS ARE IN INCHES	DRAWN	ITG	09/10/24
TOLERANCES ON:	CHECKED	GF	09/10/24
2 PL DECIMALS $\pm$	APPROVED	IL	09/10/24
3 PL DECIMALS $\pm$ .005			
ANGLES $\pm$			
FRACTIONS $\pm$			



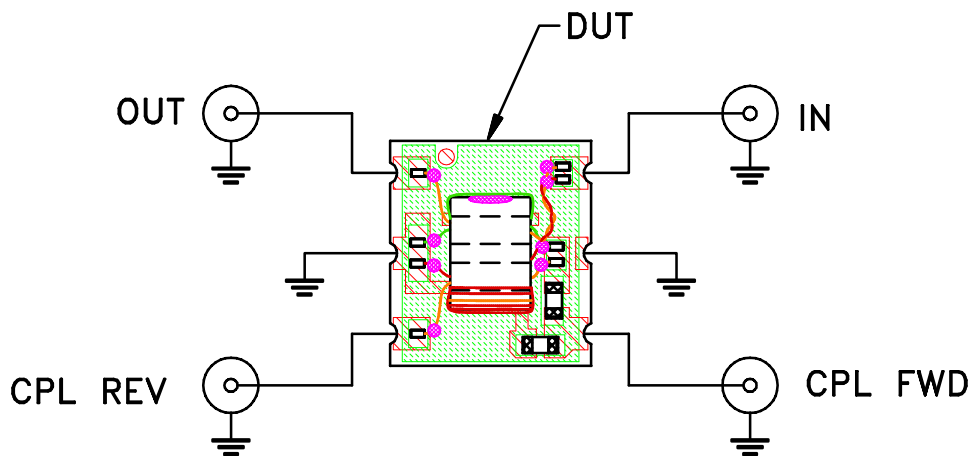
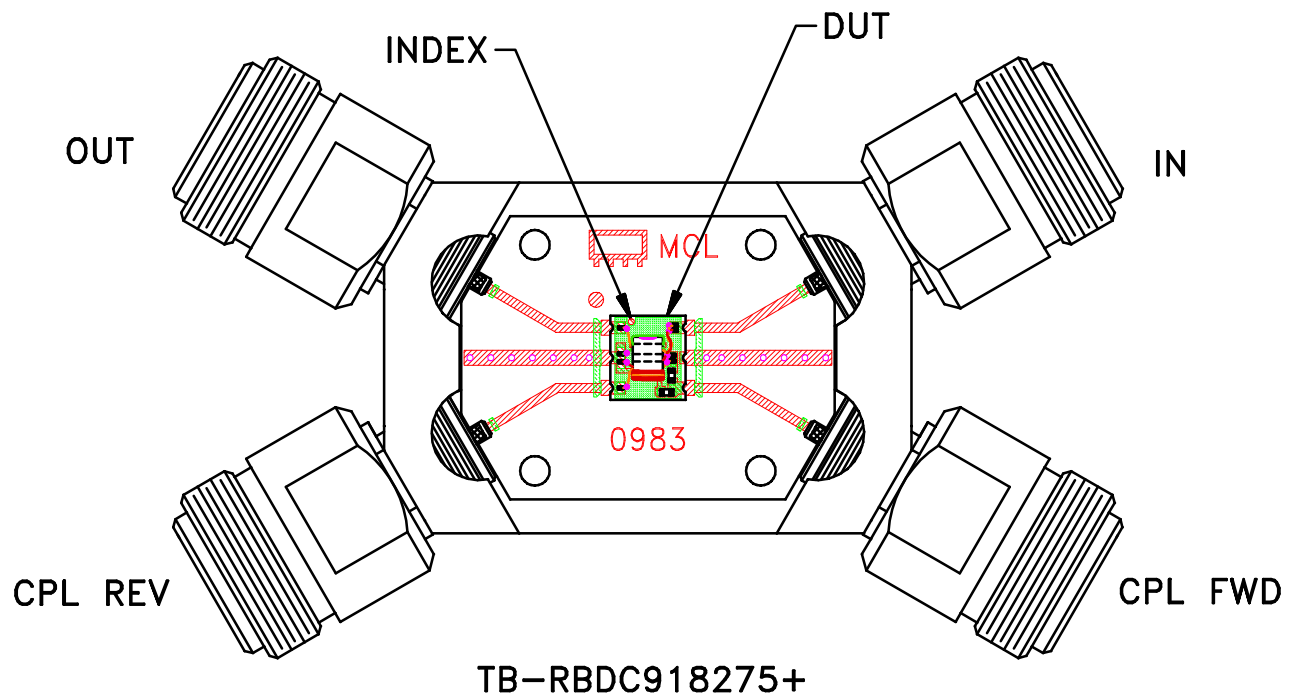
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13 Neptune Avenue  
Brooklyn NY 11235

PL, TT1491-8, TB-RBDC918275X+

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-795	REV: OR
FILE: 98PL795	SCALE: 8:1	SHEET: 1 OF 1	

# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. 75 Ohm N-TYPE Female connectors.

2. PCB Material: ROGERS R04350B or equivalent,

Dielectric Constant= $0.030 \pm 0.002$ , Thickness= $0.030$  inch.

Mini-Circuits®



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 Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C 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 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; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215