SURFACE MOUNT top hat

Directional Coupler

RDC-20-232-75X+

75Ω 20dB 5 to 2350 MHz

THE BIG DEAL

- Wideband 5-2350 MHz
- Low mainline loss, 0.8 dB typ. at 1800 MHz
- Good Dirctivity, 16 dB typ. at 1800 MHz
- Excellent Return Loss, 27 dB typ.
- Supports DOCSIS® 3.1 / 4.0 Systems
- Aqueous washable

APPLICATIONS

- DOCSIS 3.1 / 4.0
- L-Band

Generic photo used for illustration purposes only

CASE STYLE: TT2315

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

PRODUCT OVERVIEW

Mini-Circuits RDC-20-232-75X+ surface-mount directional coupler provides 20 dB coupling with high directivity, low mainline loss, and good return loss for 75Ω applications from 5 to 2350 MHz, supporting a variety of broadband applications including DOCSIS 3.1/4.0 systems and equipment. This model features core and wire construction with wrap-around terminations for good solderability and easy visual inspection.

KEY FEATURES

Feature	Advantages
Broadband, 5 to 2350 MHz	Supports bandwidth requirements for DOCSIS 3.1/4.0 systems and equipment.
Low mainline loss, 0.8 dB at 1800 MHz	Provides excellent through-path signal transmission and maintains low heat dissipation, avoiding the need for special heat sinking methods.
Power handling, up to 1W	Usable in systems with a variety of signal power requirements.
Excellent return loss, 27 dB typ.	Provides excellent matching for 75Ω systems.
Top Hat® feature	Improves speed and accuracy of pick and place assembly.

REV. F
ECO-025774
RDC-20-232-75X+
MCL NY
250604

ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		5		2350	MHz
Mainline Loss[1]	5	—	0.95	1.3	dB
	40	—	0.55	0.9	
	1218	—	0.65	1.0	
	1800	—	0.85	1.1	
	2350	—	1.10	1.4	
Nominal Coupling	5-1218	—	21±1.5	—	dB
	40-1800	—	20.5±1.0	—	
	40-2350	—	20.2±1.3	—	
Coupling Flatness(±)	5-1218	—	1.2	1.9	dB
	40-1800	—	1.0	2.0	
	40-2350	—	1.0	2.4	
Directivity	5	8	11	—	dB
	40	18	22	—	
	1218	15	22	—	
	1800	10	16	—	
	2350	7	12	—	
Return Loss (Input)	5-40	10	14	—	dB
	40-1800	14	26	—	
	1800-2350	12	20	—	
Return Loss (Output)	5-40	11	14	—	dB
	40-1800	19	24	—	
	1800-2350	15	22	—	
Return Loss (Coupled)	5-40	10	20	—	dB
	40-1800	12	26	—	
	1800-2350	10	24	—	
Input Power	5 - 2350			1	W

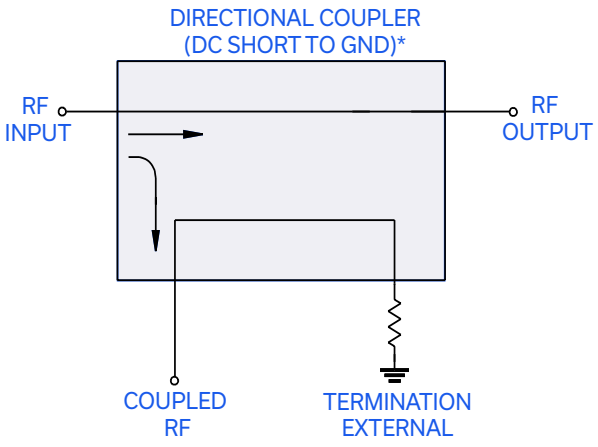
1. Mainline loss includes theoretical power loss at coupled port.

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C

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

ELECTRICAL SCHEMATIC



*Electrical schematic is for Directional coupler with internal transformer(s) and external termination

SURFACE MOUNT top hat

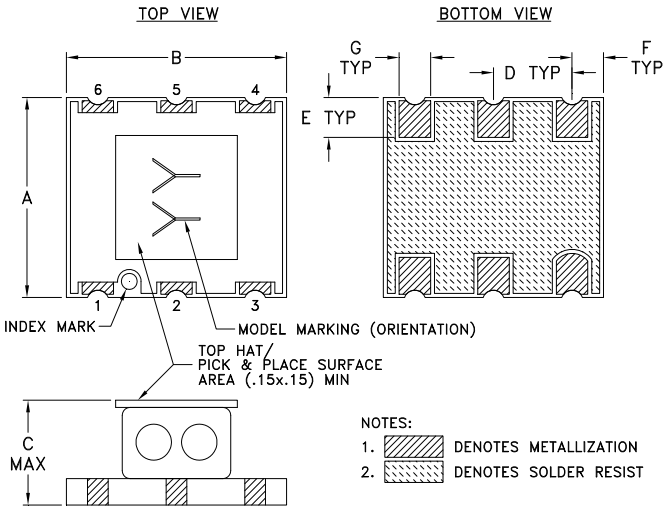
Directional Coupler RDC-20-232-75X+

75Ω 20dB 5 to 2350 MHz

PIN CONNECTIONS

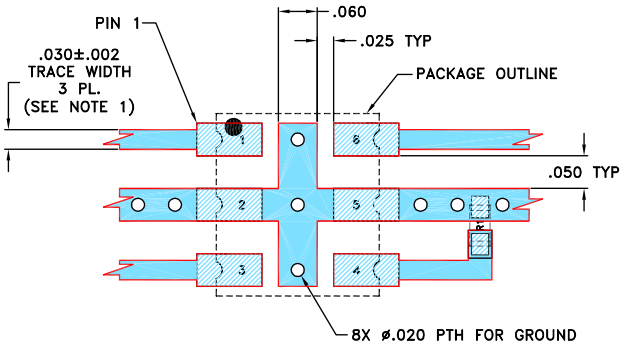
Function	Pad Number
INPUT	1
OUTPUT	6
COUPLED	3
GROUND	2,5
75Ω TERM EXTERNAL	4

OUTLINE DRAWING



PRODUCT MARKING: WW or BL

DEMO BOARD MCL P/N: TB-917+
SUGGESTED PCB LAYOUT (PL-452)

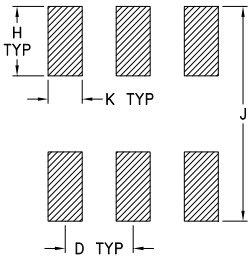


NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0603 SIZE CHIP RESISTOR FOOT PRINT SHOWN FOR REFERENCE, FOR RESISTOR VALUE REFER TO TB-917+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

PCB Land Pattern



Suggested Layout,
Tolerance to be within±.002

OUTLINE DIMENSIONS (Inches / mm)

A	B	C	D	E	F	G	H	J	K
.250	.280	.140	.100	.050	.040	.040	.100	.310	.050
6.35	7.11	3.56	2.54	1.27	1.02	1.02	2.54	7.87	1.27

Weight: 0.35 grams

TAPE & REEL INFORMATION: F34

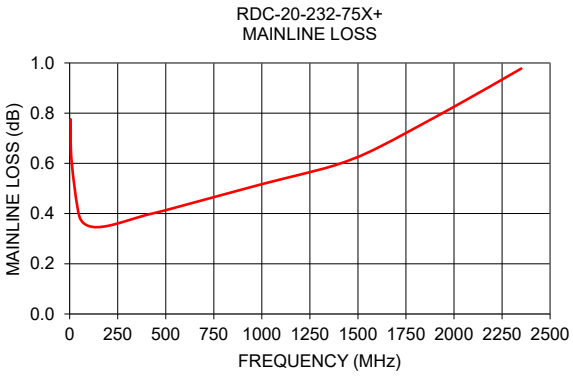
SURFACE MOUNT top hat

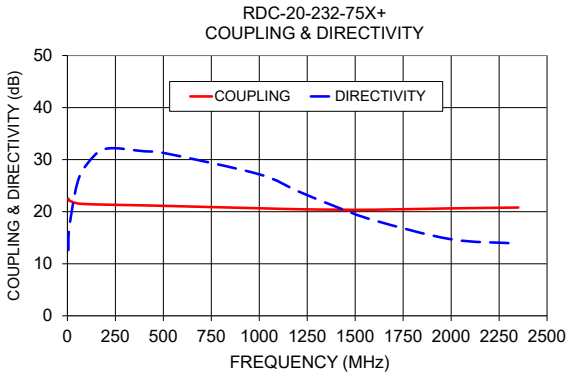
Directional Coupler RDC-20-232-75X+

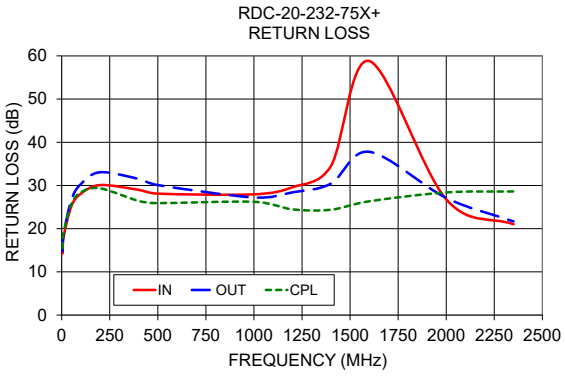
75Ω 20dB 5 to 2350 MHz

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Directivity (dB)	Return Loss (dB) In	Out	Cpl
5	0.78	22.51	12.63	14.26	14.78	15.48
10	0.61	22.13	16.96	18.04	18.71	19.06
50	0.39	21.61	25.27	25.14	26.62	25.59
100	0.35	21.46	29.03	28.09	30.33	28.41
200	0.35	21.35	32.08	30.10	33.07	29.34
400	0.39	21.21	31.60	28.99	31.52	26.42
500	0.41	21.12	31.30	28.11	30.09	25.91
1000	0.52	20.65	27.18	27.95	27.23	26.22
1200	0.56	20.48	23.96	29.58	28.41	24.47
1400	0.60	20.39	20.95	34.48	30.42	24.38
1600	0.66	20.38	18.33	58.81	37.79	26.34
2000	0.83	20.63	14.70	26.78	27.12	28.39
2350	0.98	20.80	13.88	21.01	21.68	28.61







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.

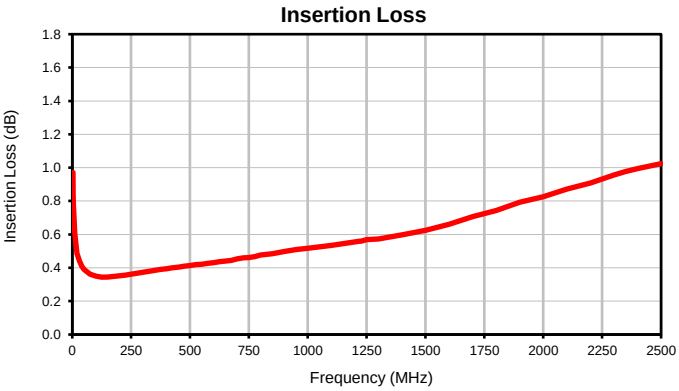
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

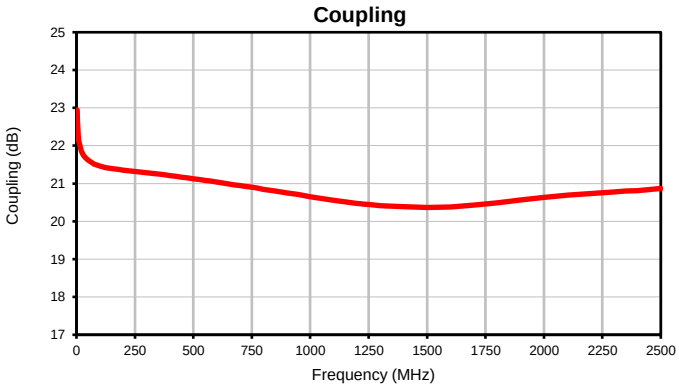
Directional Coupler RDC-20-232-75X+

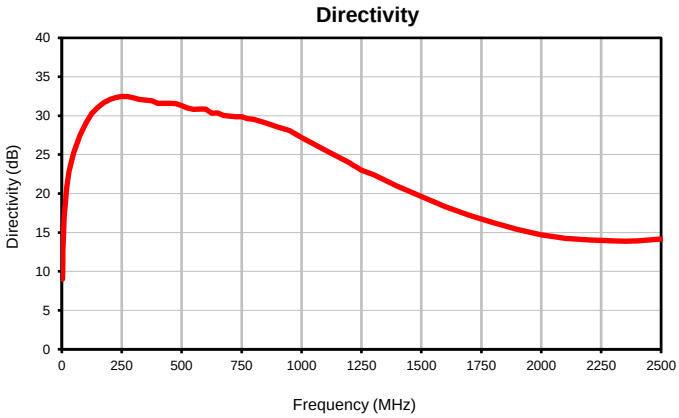
Typical Performance Data

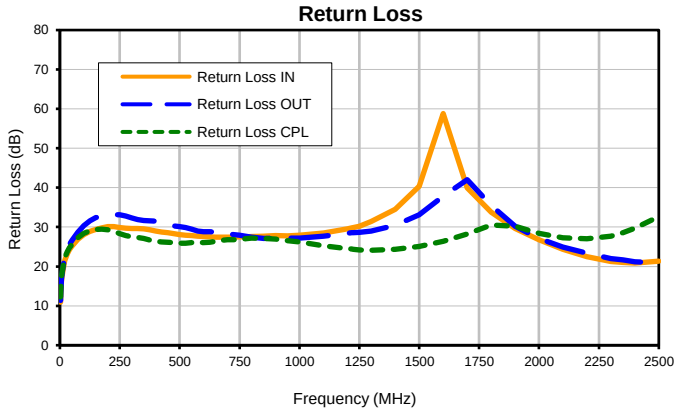
FREQ. (MHz)	INSERTION LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
3	0.97	22.94	9.01	10.92	11.37	12.26
4	0.84	22.65	11.10	12.87	13.34	14.13
5	0.78	22.51	12.63	14.26	14.78	15.48
7	0.69	22.33	14.76	16.17	16.76	17.30
10	0.61	22.13	16.96	18.04	18.71	19.06
20	0.49	21.86	20.77	21.41	22.37	22.18
30	0.44	21.74	22.80	23.11	24.26	23.67
40	0.41	21.67	24.16	24.24	25.56	24.73
50	0.39	21.61	25.27	25.14	26.62	25.59
75	0.36	21.51	27.43	26.85	28.69	27.26
100	0.35	21.46	29.03	28.09	30.33	28.41
125	0.34	21.42	30.28	28.90	31.60	29.08
150	0.35	21.40	31.06	29.39	32.42	29.39
175	0.35	21.37	31.67	29.80	32.83	29.47
200	0.35	21.35	32.08	30.10	33.07	29.34
225	0.36	21.33	32.33	30.12	33.12	28.92
250	0.36	21.32	32.47	29.87	33.10	28.30
275	0.37	21.30	32.45	29.70	32.82	27.80
300	0.37	21.28	32.29	29.62	32.33	27.53
325	0.38	21.26	32.08	29.59	31.88	27.35
350	0.39	21.25	32.02	29.54	31.65	27.09
375	0.39	21.23	31.91	29.30	31.60	26.71
400	0.39	21.21	31.60	28.99	31.52	26.42
425	0.40	21.19	31.58	28.74	31.11	26.26
450	0.40	21.17	31.58	28.55	30.62	26.16
475	0.41	21.15	31.56	28.33	30.26	26.02
500	0.41	21.12	31.30	28.11	30.09	25.91
525	0.42	21.10	30.99	27.96	29.87	25.93
550	0.42	21.08	30.80	27.83	29.43	26.01
575	0.43	21.06	30.85	27.68	28.99	26.06
600	0.43	21.04	30.85	27.56	28.80	26.05
625	0.44	21.01	30.31	27.48	28.84	26.14
650	0.44	20.99	30.34	27.44	28.76	26.35
675	0.44	20.97	30.03	27.42	28.51	26.61
700	0.45	20.95	29.96	27.40	28.24	26.76
725	0.46	20.92	29.85	27.42	28.06	26.80
750	0.46	20.91	29.86	27.48	27.91	26.90
775	0.47	20.87	29.63	27.51	27.71	27.06
800	0.48	20.85	29.54	27.56	27.43	27.20
850	0.48	20.80	29.08	27.69	27.13	27.15
900	0.50	20.75	28.55	27.83	27.19	26.97
950	0.51	20.71	28.12	27.74	27.20	26.57
1000	0.52	20.65	27.18	27.95	27.23	26.22
1100	0.53	20.56	25.56	28.48	27.72	25.24
1200	0.56	20.48	23.96	29.58	28.41	24.47
1218	0.56	20.47	23.59	29.80	28.54	24.40
1225	0.56	20.46	23.50	29.89	28.57	24.35
1250	0.57	20.45	23.02	30.19	28.63	24.19
1300	0.57	20.42	22.43	31.42	28.98	24.12
1400	0.60	20.39	20.95	34.48	30.42	24.38
1500	0.62	20.37	19.61	40.38	33.10	25.07
1600	0.66	20.38	18.33	58.81	37.79	26.34
1700	0.71	20.43	17.20	39.94	42.02	28.28
1800	0.74	20.49	16.25	33.77	35.46	30.54
1900	0.79	20.56	15.41	29.67	30.22	30.20
2000	0.83	20.63	14.70	26.78	27.12	28.39
2100	0.87	20.69	14.26	24.34	24.89	27.30
2200	0.91	20.74	14.05	22.45	23.35	27.06
2300	0.96	20.78	13.90	21.23	21.98	27.68
2350	0.98	20.80	13.88	21.01	21.68	28.61
2400	1.00	20.81	13.91	20.87	21.18	29.71
2500	1.02	20.87	14.18	21.35	20.97	32.66

Typical Performance Curves





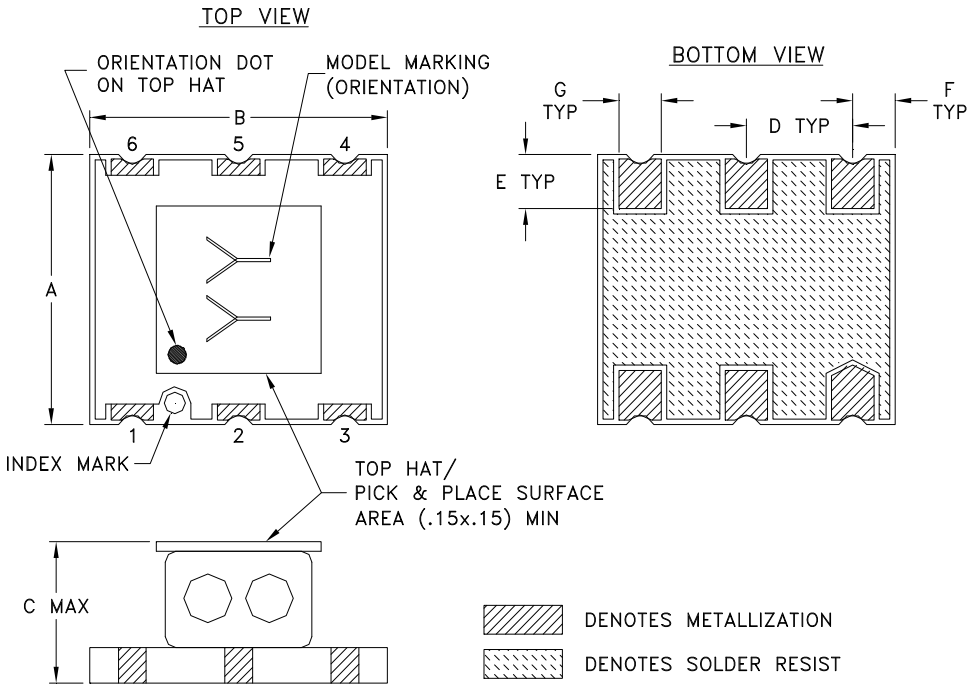




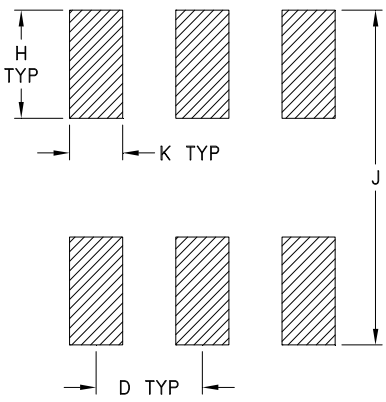
Case Style TT

TT2315

Outline Dimensions



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

CASE #	A		B	C	D	E	F	G	H	J	K	WT. GRAMS
TT2315	.250 (6.35)		.280 (7.11)	.140 (3.56)	.100 (2.54)	.050 (1.27)	.040 (1.02)	.040 (1.02)	.100 (2.54)	.310 (7.87)	.050 (1.27)	.35

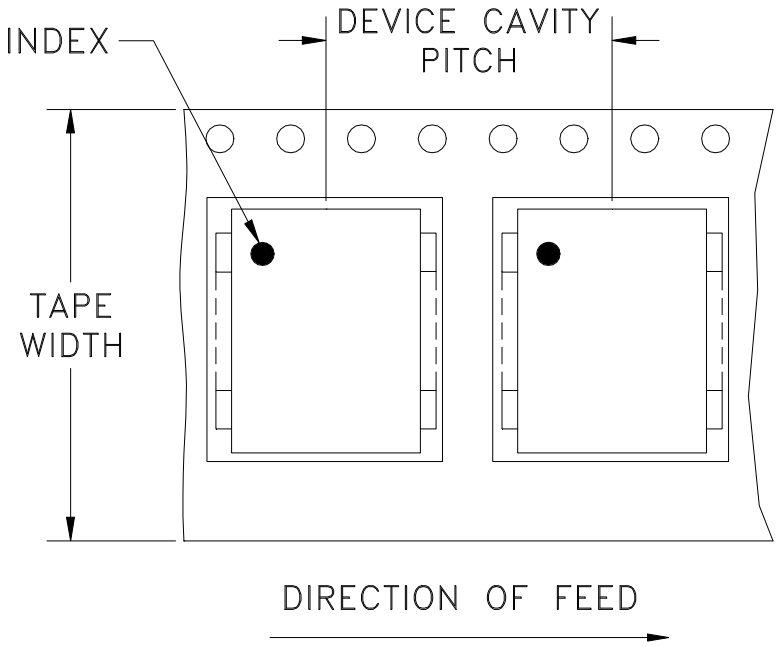
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3 Pl. ± .005

Notes:

1. Open style, Base material: Printed wiring laminate.
2. Termination finish: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
3. Top-Hat total thickness: .013 inches MAX.
4. Orientation Dot on Top Hat & PCB corresponds to Pin #1.

Tape & Reel Packaging TR-F34

DEVICE ORIENTATION IN T&R



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

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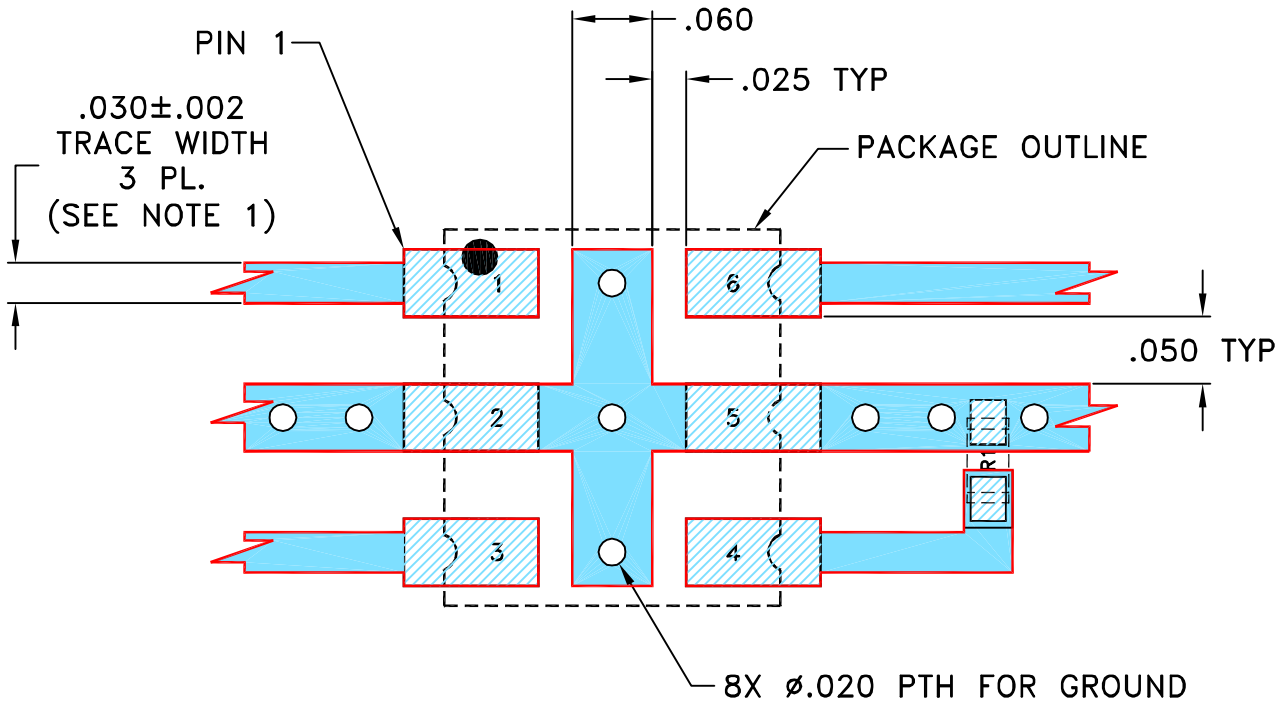
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M158078	NEW RELEASE	09/16/16	CA	IL

SUGGESTED MOUNTING CONFIGURATION
FOR TT2315 CASE STYLE, "06DC03" PIN CODE



NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE.
   FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0603 SIZE CHIP RESISTOR FOOT PRINT SHOWN FOR REFERENCE,
   FOR RESISTOR VALUE REFER TO TB-917+.
3. 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	CA	09/15/16
TOLERANCES ON:	CHECKED	IL	09/16/16
2 PL DECIMALS ±	APPROVED	YL	09/16/16
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

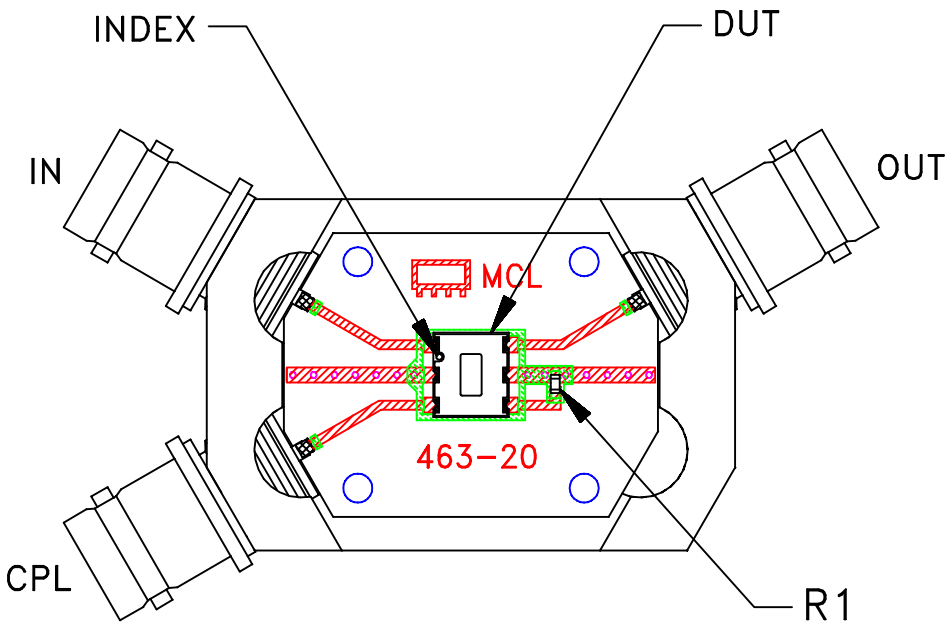
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

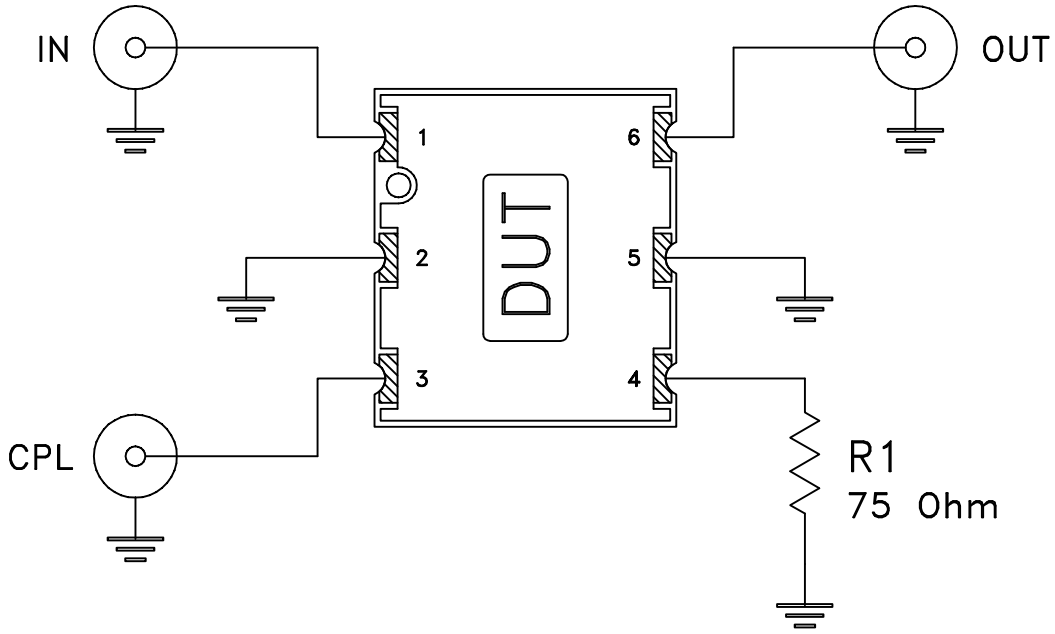
PL, 06DC03, TT2315,TB-917+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-452	OR
FILE: 98PL452	SCALE: 7:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-RDC2023275X+



Schematic Diagram

Notes:

1. 75 Ohm BNC connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications ENV02T1

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