Surface Mount

Directional Coupler

ADC-20-12+

50Ω 100 to 1200 MHz



Generic photo used for illustration purposes only

CASE STYLE: CD542

+RoHS Compliant

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

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	20, 50, 100, 200
13"	500, 1000

Maximum 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.

Pin Connections

INPUT	1
OUTPUT	6
COUPLED	3
GROUND	2
50Ω TERM EXTERNAL	4
ISOLATE (DO NOT USE)	5

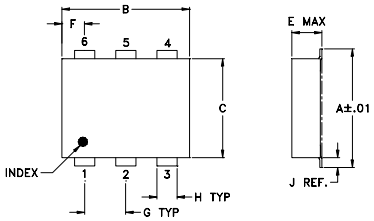
Features

- useable to 1500 MHz
- low mainline loss, 0.5 dB typ.
- high directivity, 26 dB typ.
- aqueous washable
- protected by U.S Patents 6,133,525 & 6,140,887

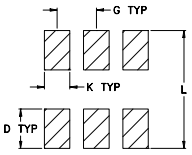
Applications

- cable tv

Outline Drawing



PCB Land Pattern



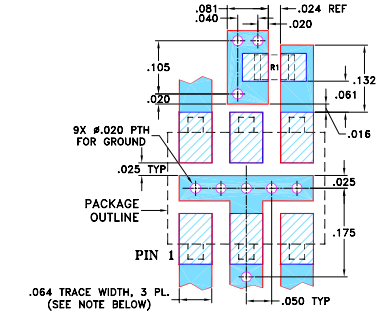
Suggested Layout,
Tolerance to be within ±.002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.272	.310	.220	.100	.112	.055	.100
6.91	7.87	5.59	2.54	2.84	1.40	2.54

H	J	K	L	wt
.030	.026	.065	.300	grams
0.76	0.66	1.65	7.62	0.20

Demo Board MCL P/N: TB-05
Suggested PCB Layout (PL-095)



RESISTOR R1: 49.9 Ohm, 0805 SIZE.

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. 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

Directional Coupler Electrical Specifications

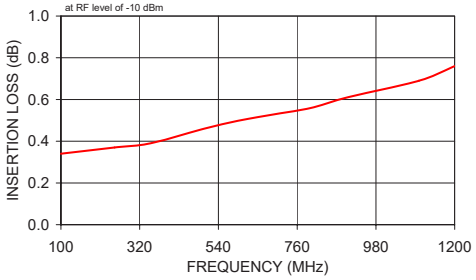
FREQ. (MHz)	COUPLING (dB)		MAINLINE LOSS[1] (dB)		DIRECTIVITY (dB)		VSWR (:1)	POWER INPUT, W	
f_L-f_U	Nom.	Flatness	Typ.	Max.	Typ.	Min.	Typ.	L Max.	MU Max.
100-1200	20±0.75	±0.7	0.5	1.1	26	13	1.17	1.0	1.0

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

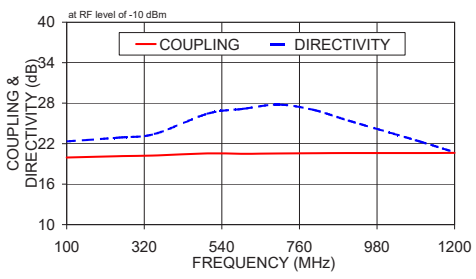
Typical Performance Data

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Directivity (dB)	Return Loss (dB) In	Return Loss (dB) Out	Return Loss (dB) Cpl
100.00	0.34	19.94	22.33	29.24	25.01	30.72
250.00	0.37	20.14	22.91	26.99	24.13	28.60
350.00	0.39	20.24	23.45	25.38	22.81	26.88
500.00	0.46	20.56	26.44	23.21	21.05	24.55
600.00	0.50	20.50	27.16	22.03	19.94	23.24
700.00	0.53	20.55	27.78	21.02	18.96	22.06
800.00	0.56	20.58	27.00	20.17	18.09	21.12
900.00	0.61	20.61	25.40	19.23	17.25	20.16
1100.00	0.69	20.61	22.34	17.44	15.64	18.19
1200.00	0.76	20.63	20.72	16.56	14.90	17.35

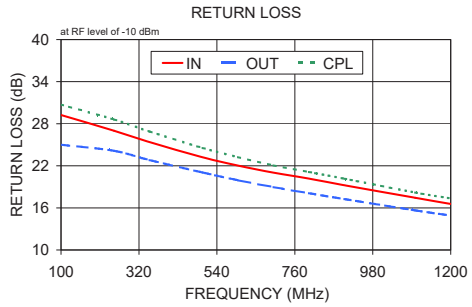
ADC-20-12+
MAINLINE LOSS



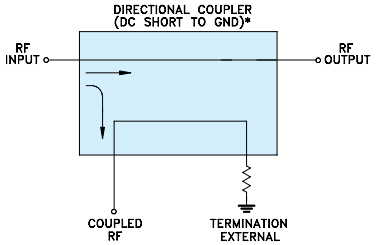
ADC-20-12+
COUPLING & DIRECTIVITY



ADC-20-12+
RETURN LOSS



Electrical Schematic



* ELECTRICAL SCHEMATIC IS FOR DIRECTIONAL COUPLER WITH INTERNAL TRANSFORMER(S) AND EXTERNAL TERMINATION.

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

REV. F
M151107
ED-7776/1
ADC-20-12+
WZ/TD/CP/AM
200414

Directional Coupler ADC-20-12+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =0 dBm @Temperature = +25°C

FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
10	0.44	19.44	19.32	21.23	21.44	18.21
25	0.39	19.52	20.85	25.45	26.15	22.41
50	0.38	19.59	21.18	27.41	28.41	24.59
75	0.38	19.65	21.24	27.95	29.10	25.48
100	0.38	19.69	21.33	27.91	29.05	25.84
125	0.39	19.72	21.50	27.54	28.67	25.87
150	0.40	19.76	21.63	27.06	28.22	25.75
175	0.40	19.78	21.84	26.54	27.70	25.50
200	0.41	19.81	22.00	25.97	27.15	25.21
250	0.43	19.87	22.42	24.89	26.12	24.54
300	0.44	19.92	22.97	23.94	25.10	23.80
350	0.46	19.95	23.60	23.06	24.20	23.12
400	0.47	19.99	24.31	22.28	23.40	22.44
450	0.49	20.02	24.99	21.56	22.64	21.80
475	0.50	20.03	25.46	21.24	22.29	21.51
500	0.51	20.04	25.71	20.91	21.94	21.22
550	0.52	20.05	26.28	20.34	21.33	20.68
600	0.54	20.06	26.94	19.81	20.79	20.18
650	0.56	20.06	26.84	19.32	20.23	19.72
700	0.58	20.05	26.44	18.86	19.77	19.29
750	0.60	20.03	25.31	18.41	19.32	18.90
800	0.62	20.01	24.78	18.03	18.92	18.54
850	0.64	19.98	23.88	17.68	18.61	18.21
900	0.66	19.94	22.72	17.31	18.25	17.88
950	0.68	19.90	21.70	16.98	17.95	17.59
1000	0.70	19.85	20.54	16.62	17.60	17.30
1025	0.71	19.86	20.20	16.56	17.54	17.18
1050	0.72	19.82	19.81	16.40	17.37	17.05
1075	0.73	19.79	19.41	16.23	17.23	16.92
1100	0.74	19.78	18.86	16.11	17.09	16.81
1150	0.76	19.70	18.26	15.79	16.80	16.56
1175	0.77	19.67	17.91	15.65	16.66	16.45
1200	0.79	19.66	17.34	15.53	16.54	16.35
1225	0.80	19.62	17.24	15.40	16.44	16.24
1250	0.81	19.59	16.84	15.27	16.30	16.13
1300	0.82	19.54	16.29	15.07	16.11	15.94
1400	0.86	19.40	15.11	14.59	15.68	15.61
1500	0.91	19.29	13.98	14.15	15.31	15.30
1600	0.95	19.11	13.31	13.70	14.96	15.02
1700	1.01	18.94	12.61	13.23	14.55	14.72
1800	1.07	18.81	11.78	12.86	14.27	14.48
1900	1.13	18.67	11.32	12.44	13.87	14.22
2000	1.19	18.51	10.62	12.08	13.57	14.00
2100	1.27	18.39	10.08	11.63	13.17	13.79
2200	1.33	18.26	9.65	11.24	12.87	13.56
2300	1.41	18.10	9.19	10.80	12.46	13.30
2400	1.49	17.94	8.80	10.36	12.11	13.06
2500	1.58	17.89	8.30	9.96	11.84	12.80
2600	1.69	17.78	8.24	9.50	11.48	12.48
2700	1.81	17.79	7.59	9.13	11.22	12.19
2800	1.90	17.69	7.21	8.76	10.94	11.93
2900	2.01	17.59	6.89	8.33	10.67	11.60
3000	2.15	17.44	6.85	7.95	10.43	11.19

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Directional Coupler ADC-20-12+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =0 dBm @Temperature = -40°C

FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
10	0.26	19.32	14.88	17.27	17.07	14.50
25	0.31	19.50	19.08	23.82	24.10	20.70
50	0.31	19.55	19.92	26.81	27.40	24.08
75	0.32	19.60	20.26	27.12	27.79	25.40
100	0.32	19.65	20.52	26.72	27.35	25.89
125	0.33	19.69	20.75	26.61	27.31	25.98
150	0.33	19.72	20.88	26.70	27.52	25.84
175	0.33	19.74	20.95	26.44	27.31	25.52
200	0.34	19.76	20.99	25.67	26.51	25.17
250	0.35	19.79	21.45	24.28	25.15	24.48
300	0.36	19.82	21.95	23.68	24.55	23.82
350	0.38	19.83	22.38	22.58	23.42	23.16
400	0.39	19.85	23.12	21.79	22.63	22.42
450	0.41	19.85	23.78	21.25	22.07	21.68
475	0.41	19.86	24.06	20.90	21.67	21.36
500	0.42	19.86	24.27	20.50	21.26	21.05
550	0.44	19.86	24.92	19.94	20.68	20.50
600	0.45	19.85	25.55	19.45	20.18	20.01
650	0.46	19.85	25.72	18.96	19.63	19.52
700	0.48	19.82	25.78	18.51	19.19	19.07
750	0.50	19.80	25.22	18.05	18.72	18.65
800	0.52	19.76	24.86	17.67	18.32	18.28
850	0.53	19.74	24.29	17.25	17.92	17.94
900	0.55	19.70	23.04	16.72	17.42	17.60
950	0.57	19.66	22.10	16.41	17.11	17.28
1000	0.60	19.61	21.06	16.15	16.85	16.97
1025	0.59	19.59	20.87	16.07	16.75	16.84
1050	0.60	19.56	20.44	15.92	16.59	16.71
1075	0.61	19.52	20.07	15.77	16.46	16.58
1100	0.62	19.50	19.62	15.67	16.34	16.46
1150	0.64	19.42	19.03	15.38	16.08	16.21
1175	0.65	19.39	18.64	15.23	15.92	16.09
1200	0.66	19.36	18.18	15.04	15.75	15.98
1225	0.68	19.32	17.84	14.86	15.57	15.87
1250	0.69	19.30	17.41	14.71	15.40	15.78
1300	0.70	19.23	16.88	14.61	15.30	15.61
1400	0.73	19.11	15.73	14.33	15.11	15.34
1500	0.78	18.96	14.67	13.80	14.67	15.03
1600	0.83	18.78	13.78	13.23	14.20	14.76
1700	0.87	18.61	12.99	12.99	14.00	14.51
1800	0.92	18.48	12.37	12.73	13.78	14.26
1900	0.98	18.36	11.64	12.19	13.35	14.07
2000	1.03	18.22	10.95	11.98	13.11	13.88
2100	1.12	18.12	10.42	11.42	12.68	13.70
2200	1.17	17.96	9.92	11.00	12.34	13.47
2300	1.22	17.77	9.58	10.76	12.10	13.25
2400	1.33	17.69	8.90	10.08	11.54	13.09
2500	1.41	17.56	8.51	9.84	11.30	12.80
2600	1.50	17.51	8.19	9.32	11.00	12.54
2700	1.58	17.43	8.17	9.09	10.81	12.20
2800	1.70	17.40	7.31	8.63	10.43	11.99
2900	1.81	17.30	7.02	8.20	10.08	11.63
3000	1.97	17.27	6.92	7.67	9.72	11.18

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Directional Coupler ADC-20-12+

Typical Performance Data

TEST CONDITIONS: INPUT POWER =0 dBm @Temperature = -85°C

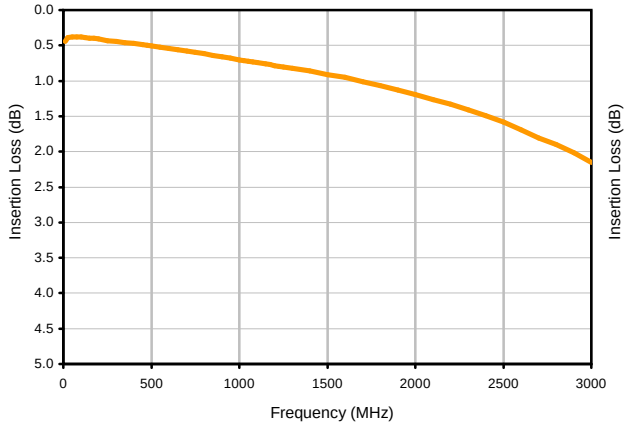
FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
10	0.50	19.50	22.11	23.76	24.42	20.26
25	0.46	19.57	22.60	26.32	27.47	22.99
50	0.46	19.63	22.84	27.29	28.61	24.07
75	0.46	19.68	22.90	27.66	29.18	24.29
100	0.46	19.73	22.89	27.75	29.37	24.33
125	0.47	19.78	22.88	27.39	28.95	24.28
150	0.48	19.83	22.96	26.74	28.16	24.22
175	0.48	19.88	23.22	26.12	27.46	24.12
200	0.49	19.93	23.47	25.68	27.08	24.00
250	0.50	20.02	23.98	24.98	26.59	23.64
300	0.52	20.12	24.55	24.02	25.54	23.14
350	0.54	20.19	25.34	23.21	24.71	22.60
400	0.55	20.26	26.18	22.59	24.10	22.06
450	0.57	20.31	26.73	21.86	23.34	21.54
475	0.58	20.34	27.20	21.54	22.98	21.31
500	0.59	20.36	27.40	21.24	22.65	21.08
550	0.61	20.41	27.68	20.74	22.13	20.65
600	0.62	20.42	27.61	20.15	21.54	20.22
650	0.64	20.45	26.71	19.68	20.99	19.81
700	0.67	20.45	25.78	19.24	20.58	19.42
750	0.68	20.45	24.49	18.80	20.14	19.06
800	0.71	20.44	23.47	18.43	19.76	18.72
850	0.72	20.43	22.58	18.13	19.50	18.40
900	0.74	20.41	21.45	17.77	19.18	18.08
950	0.76	20.37	20.51	17.42	18.87	17.81
1000	0.80	20.36	19.39	17.11	18.58	17.52
1025	0.79	20.33	19.12	16.95	18.41	17.40
1050	0.80	20.31	18.78	16.79	18.25	17.27
1075	0.81	20.28	18.38	16.61	18.08	17.14
1100	0.82	20.25	18.01	16.46	17.92	17.01
1150	0.84	20.19	17.39	16.08	17.57	16.76
1175	0.85	20.16	17.09	15.92	17.40	16.63
1200	0.87	20.14	16.68	15.80	17.29	16.52
1225	0.88	20.10	16.47	15.66	17.15	16.40
1250	0.89	20.07	16.19	15.51	17.01	16.29
1300	0.91	20.01	15.69	15.26	16.76	16.06
1400	0.96	19.89	14.53	14.71	16.26	15.68
1500	1.00	19.73	13.64	14.28	15.90	15.31
1600	1.05	19.55	13.00	13.76	15.46	14.98
1700	1.13	19.41	12.14	13.27	15.00	14.63
1800	1.18	19.25	11.70	12.80	14.63	14.30
1900	1.25	19.09	10.82	12.29	14.12	14.04
2000	1.31	18.93	10.30	11.95	13.87	13.77
2100	1.40	18.76	9.80	11.51	13.44	13.49
2200	1.46	18.60	9.43	11.11	13.12	13.23
2300	1.55	18.43	9.03	10.63	12.73	12.98
2400	1.64	18.28	8.54	10.27	12.46	12.74
2500	1.75	18.23	7.98	9.84	12.17	12.49
2600	1.85	18.06	7.75	9.44	11.87	12.24
2700	1.95	17.95	7.57	9.02	11.55	11.94
2800	2.07	17.85	6.89	8.68	11.42	11.77
2900	2.19	17.72	6.61	8.29	11.21	11.48
3000	2.31	17.70	6.43	8.08	11.11	11.17

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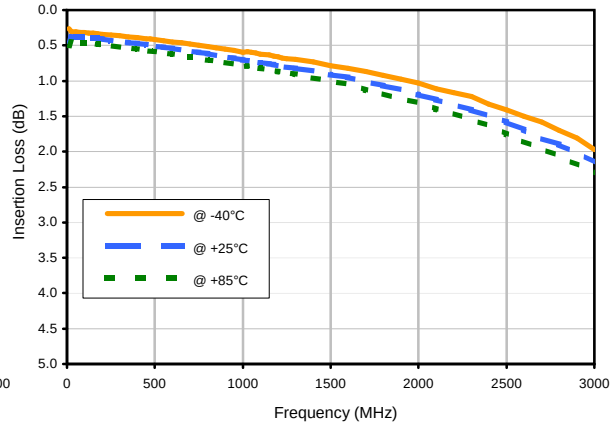
Directional Coupler ADC-20-12+

Typical Performance Curves

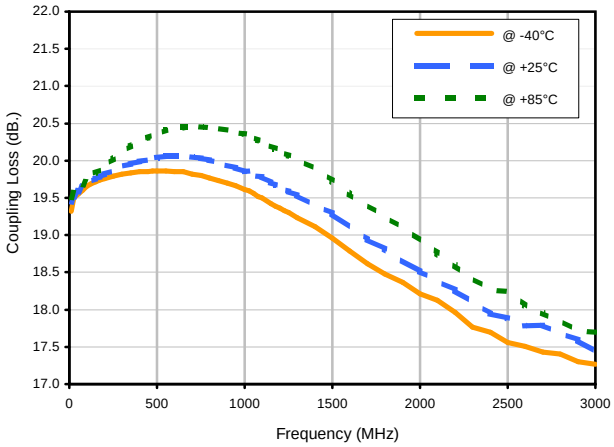
Insertion Loss



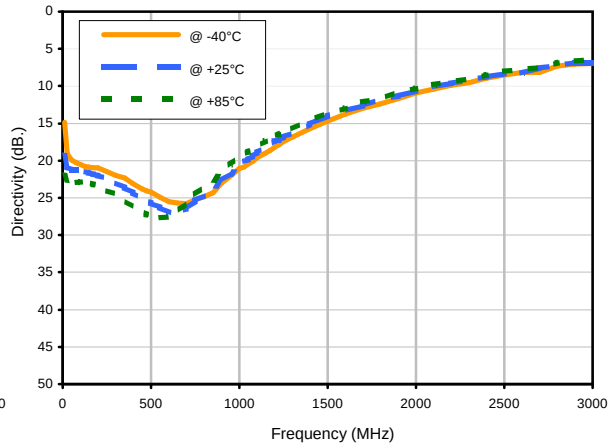
Insertion Loss vs. TEMPERATURE



Coupling Loss vs. TEMPERATURE



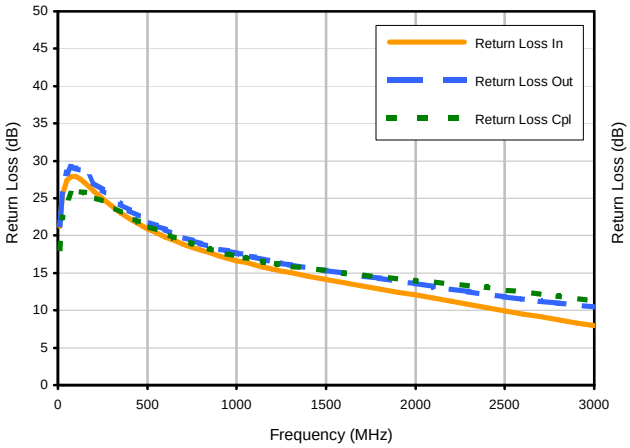
Directivity vs. TEMPERATURE



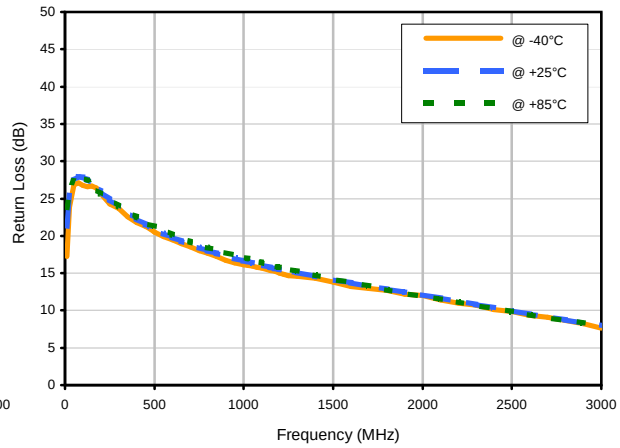
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Typical Performance Curves

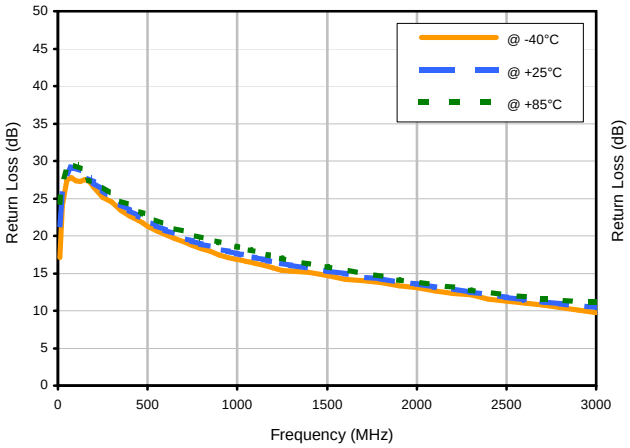
Return Loss



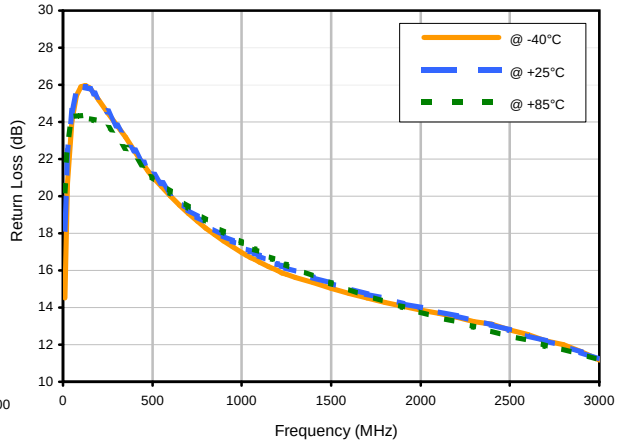
Return Loss In vs. TEMPERATURE



Return Loss Out vs. TEMPERATURE



Return Loss Cpl vs. TEMPERATURE

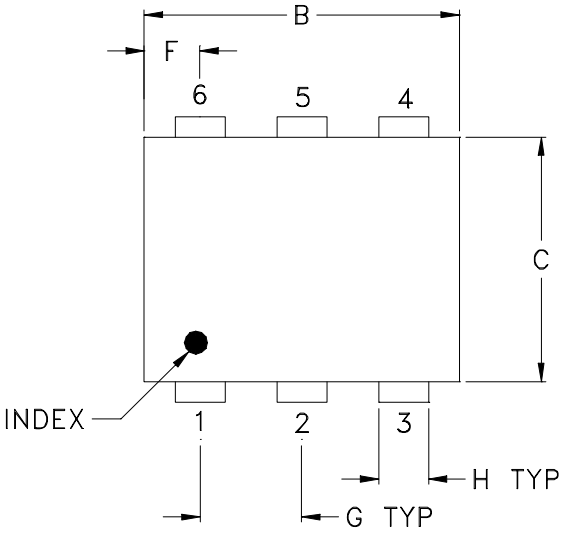


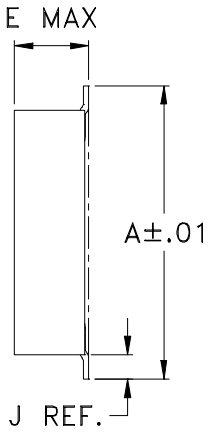
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Case Style CD

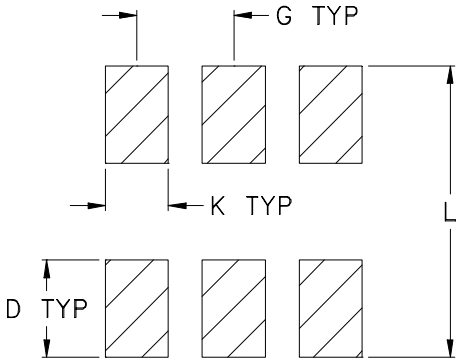
CD541
CD542
CD636
CD637

Outline Dimensions





PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
CD541	.272 (6.91)	.310 (7.87)	.220 (5.58)	.100 (2.54)	.082 (2.08)	.055 (1.40)	.100 (2.54)	.030 (0.76)	.026 (0.66)	.065 (1.65)	.300 (7.62)	.15
CD542					.112 (2.84)							.20
CD636					.162 (4.11)							.25
CD637					.206 (5.23)							.40

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

Notes:

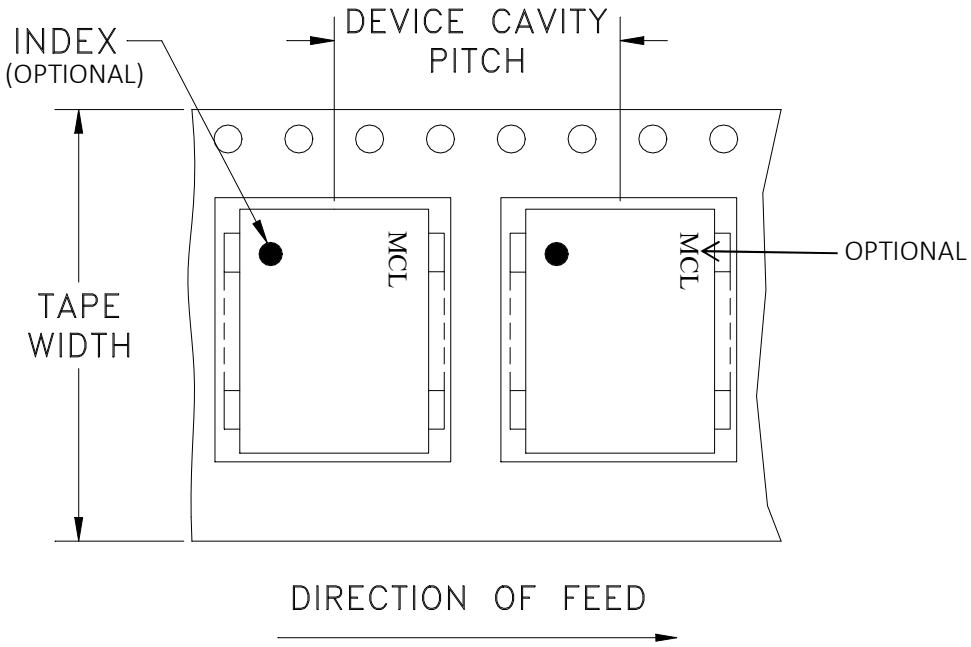
1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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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

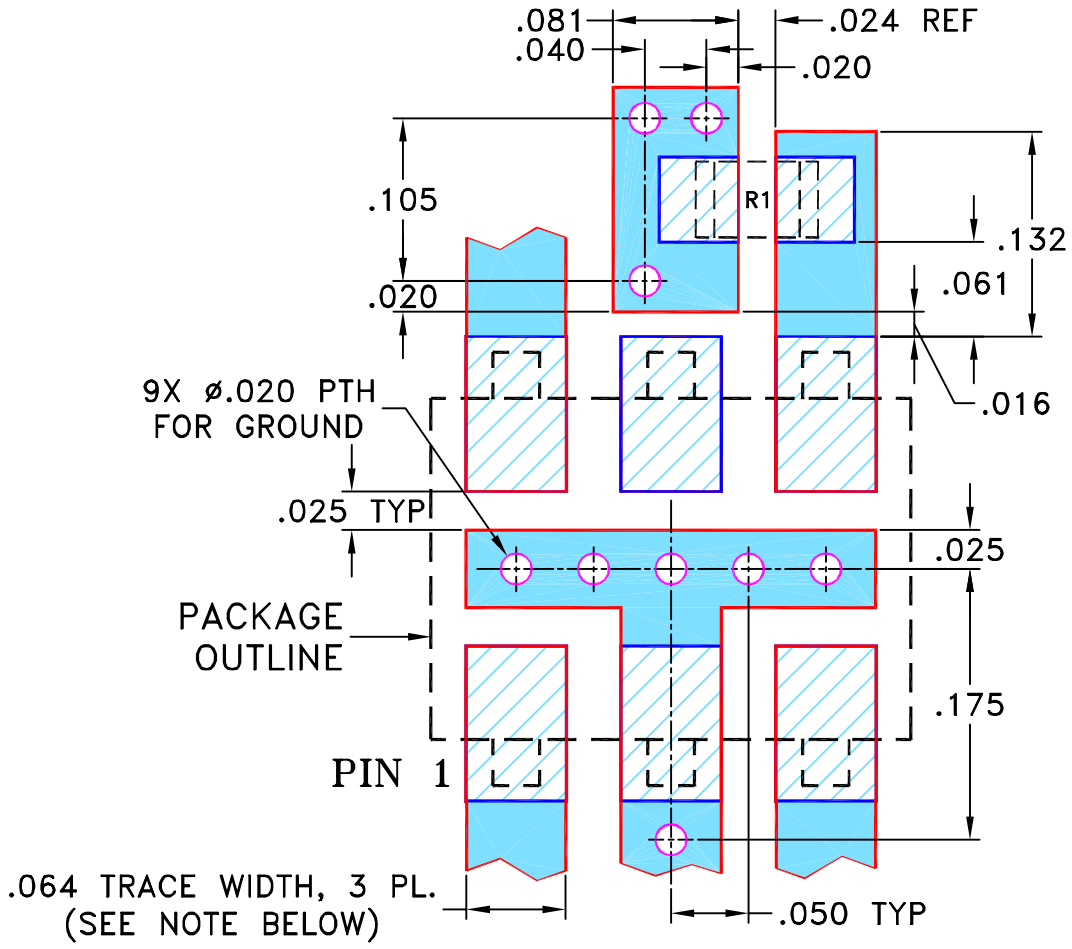
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/05/02	MMG	DJ
A	M102713	ADDED NOTE 2 & "...WITH SMOBC"	01/17/06	MMG	IL

SUGGESTED MOUNTING CONFIGURATION
FOR CD542 CASE STYLE "kd" PIN CONNECTION



RESISTOR R1: 49.9 Ohm, 0805 SIZE.

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. 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	MMG	07/23/02
TOLERANCES ON:	CHECKED	LC	08/01/02
2 PL DECIMALS ±	APPROVED	DJ	08/05/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

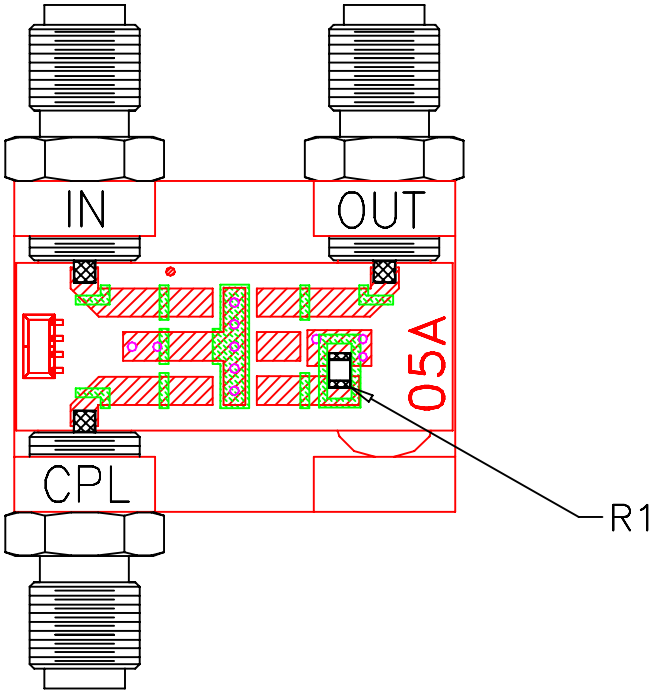
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, kd, CD542, ADC, TB-05

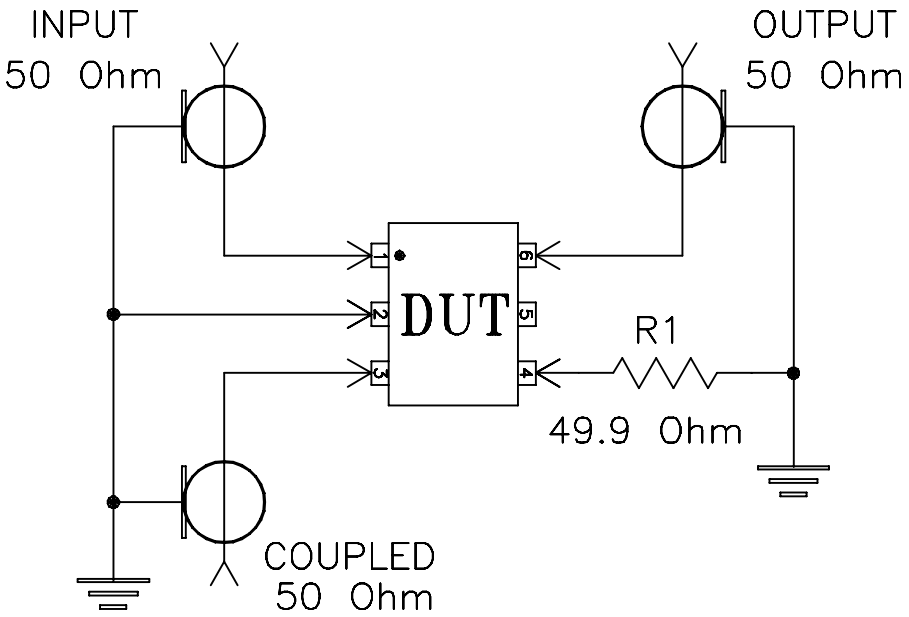
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-095	A

FILE:	SCALE:	SHEET:
98PL095	8:1	1 OF 1

Evaluation Board and Circuit



TB-05



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.

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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

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