

# Surface Mount Directional Coupler

## ADC-17-122-75+

75Ω    17dB    5 to 1250 MHz

### The Big Deal

- Covers DOCSIS® 3.1 Bandwidth Requirements
- Low mainline loss, 0.8 dB
- Excellent coupling flatness,  $\pm 0.4$  dB up to 1000 MHz
- Good VSWR: 1.15:1



CASE STYLE: CD542

### Product Overview

Mini-Circuits' ADC-17-122-75+ is a 75Ω surface-mount directional coupler providing 17 dB coupling from 5 to 1250 MHz, supporting bandwidth requirements for DOCSIS 3.1 systems and equipment. This model, provides excellent coupling flatness, low mainline loss, good VSWR and RF input power handling up to 1W. The unit comes housed in a miniature 6-lead plastic package (0.27 x 0.31 x 0.11"), saving space in dense PCB layouts.

### Key Features

Feature	Advantages
Wideband, 5 to 1250 MHz	The ADC-17-122-75+ supports a variety of 75Ω applications, including DOCSIS 3.1 compliant systems.
Good coupling flatness, $\pm 0.4$ dB up to 1000 MHz	Provides consistent coupling performance across frequency.
High power handling, 1W	Usable in systems with a wide range of high-power requirements.
Low mainline loss, 0.8 dB	Provides excellent through-path signal power transmission.
Small size, 0.27 x 0.31 x 0.11"	Provides high power capability while saving space in systems with tight layouts.

# Surface Mount Directional Coupler

75Ω 17dB 5 to 1250 MHz

## ADC-17-122-75+



Generic photo used for illustration purposes only  
CASE STYLE: CD542

### Features

- wideband, 5-1250 MHz
- low mainline loss, 0.8 dB typ.
- good VSWR, 1.15:1 typ.
- excellent coupling flatness,  $\pm 0.4$  dB typ. up to 1000 MHz
- aqueous washable
- protected by U.S. Patents 6,133,525 & 6,140,887

### Applications

- cable tv
- cellular
- DOCSIS 3.1 system
- VHF/UHF

### +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

### Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		5		1250	MHz
Mainline Loss <sup>1</sup>	5 - 1000	—	0.8	1.2	dB
	1000 - 1250	—	1.0	1.4	
Coupling	5 - 1250	—	17 $\pm$ 0.5	—	dB
Coupling Flatness ( $\pm$ )	5 - 1000	—	0.4	0.9	dB
	5 - 1250	—	0.6	1.0	
Isolation	5 - 50	30	48	—	dB
	50 - 870	22	30	—	
	870 - 1250	20	25	—	
Return Loss (Input)	5 - 1250	18	23	—	dB
Return Loss (Output)	5 - 1250	19	25	—	dB
Return Loss (Coupling)	5 - 1250	18	22	—	dB
Input Power	5 - 1250	—	—	1.0	W

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

### Maximum Ratings

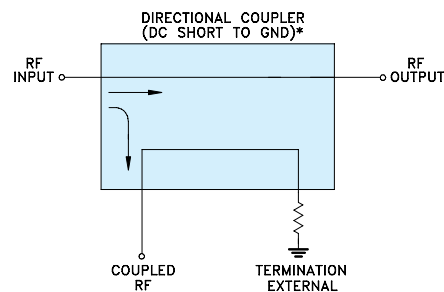
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C

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

### Pin Connections

Function	Pin Number
INPUT	1
OUTPUT	6
COUPLED	3
GROUND	2
75Ω TERM EXTERNAL	4
ISOLATE (DO NOT USE)	5

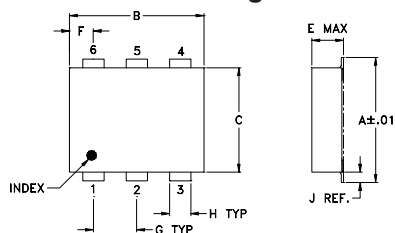
### Electrical Schematic



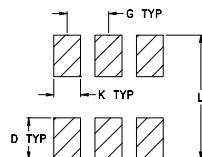
\* ELECTRICAL SCHEMATIC IS FOR DIRECTIONAL COUPLER WITH INTERNAL TRANSFORMER(S) AND EXTERNAL TERMINATION.



## Outline Drawing



## PCB Land Pattern

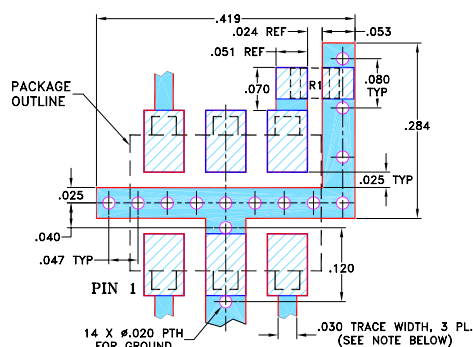


Suggested Layout,  
Tolerance to be within  $\pm 0.002$

## 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		

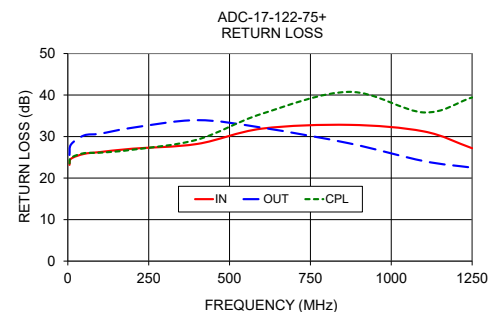
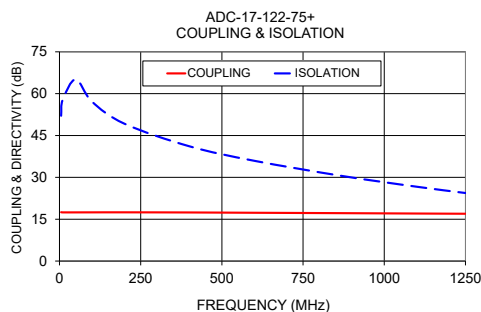
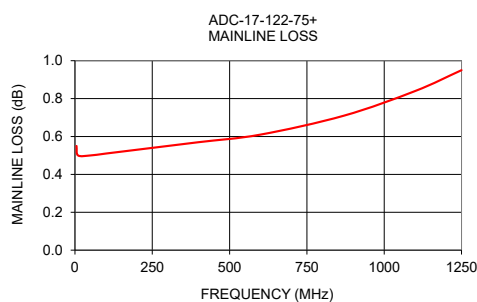
## Demo Board MCL P/N: TB-08 Suggested PCB Layout (PL-042)



RESISTOR R1: 75 Ohm, 0805 SIZE.  
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .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

## Typical Performance Data

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Isolation (dB)	In	Return Loss (dB) Out	Cpl
5	0.55	17.51	52.07	23.18	25.57	23.52
10	0.50	17.45	57.83	24.67	28.11	24.90
50	0.50	17.45	65.11	25.82	30.27	26.00
100	0.51	17.46	57.14	26.27	30.69	26.12
200	0.53	17.47	49.22	27.08	32.13	26.83
400	0.57	17.42	41.13	28.22	33.95	29.26
600	0.61	17.31	35.93	31.91	32.14	35.49
870	0.71	17.17	30.50	32.82	28.37	40.77
1100	0.84	17.04	26.64	31.25	24.10	35.81
1250	0.95	16.96	24.39	27.19	22.51	39.42



## Additional 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

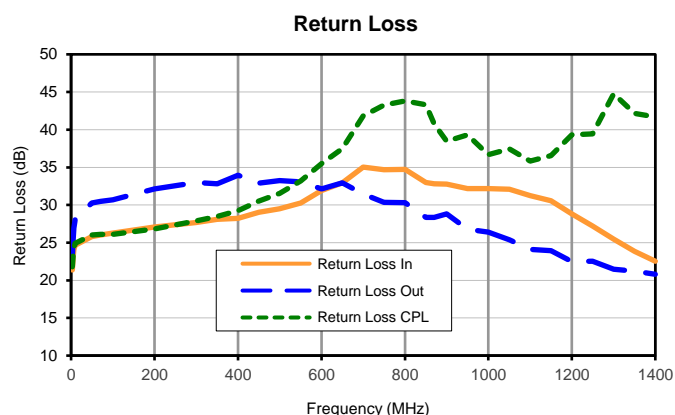
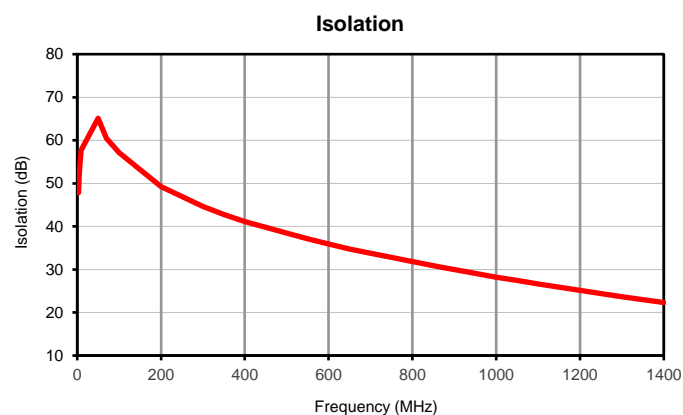
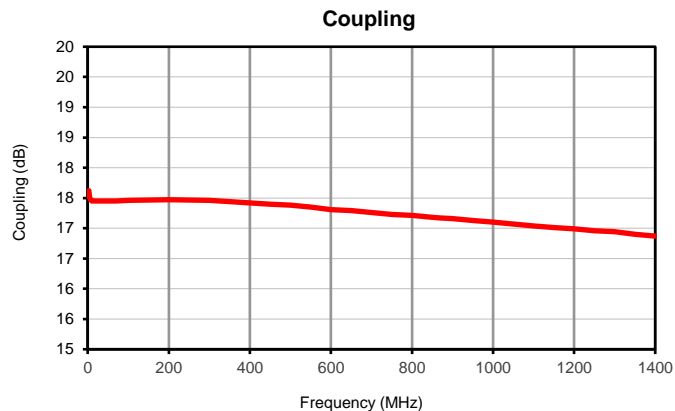
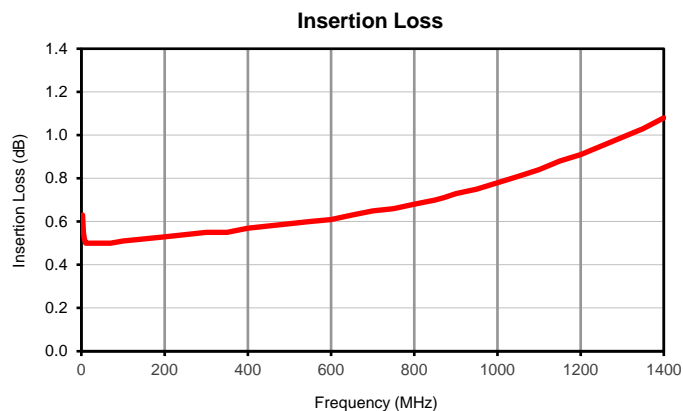
# Directional Coupler

# ADC-17-122-75+

## Typical Performance Data

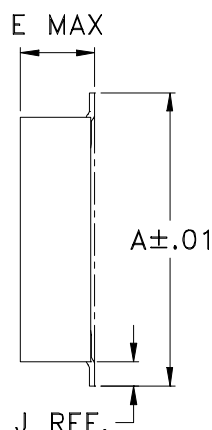
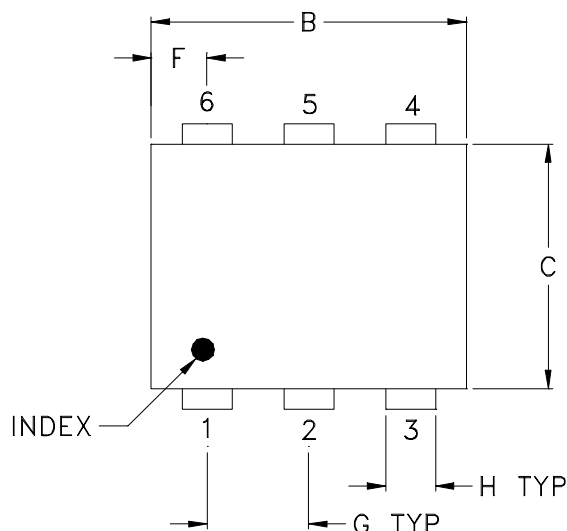
FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING (dB)	ISOLATION (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
3	0.63	17.62	47.84	21.37	23.08	21.79
5	0.55	17.51	52.07	23.18	25.57	23.52
7	0.52	17.47	55.13	24.04	26.94	24.28
9	0.51	17.46	57.62	24.54	27.75	24.73
10	0.50	17.45	57.83	24.67	28.11	24.90
50	0.50	17.45	65.11	25.82	30.27	26.00
70	0.50	17.45	60.44	26.01	30.49	26.10
100	0.51	17.46	57.14	26.27	30.69	26.12
200	0.53	17.47	49.22	27.08	32.13	26.83
300	0.55	17.46	44.62	27.68	32.98	27.87
350	0.55	17.44	42.78	28.11	32.80	28.46
400	0.57	17.42	41.13	28.22	33.95	29.26
450	0.58	17.40	39.79	29.03	32.88	30.51
500	0.59	17.38	38.42	29.50	33.22	31.53
550	0.60	17.35	37.09	30.28	33.06	33.19
600	0.61	17.31	35.93	31.91	32.14	35.49
650	0.63	17.29	34.77	32.92	32.93	37.50
700	0.65	17.26	33.76	35.03	31.45	41.84
750	0.66	17.23	32.80	34.67	30.33	43.27
800	0.68	17.21	31.81	34.74	30.32	43.82
850	0.70	17.18	30.85	32.99	28.36	43.32
870	0.71	17.17	30.50	32.82	28.37	40.77
900	0.73	17.16	29.99	32.79	28.80	38.45
950	0.75	17.13	29.10	32.19	26.78	39.31
1000	0.78	17.10	28.22	32.16	26.41	36.68
1050	0.81	17.07	27.42	32.09	25.36	37.44
1100	0.84	17.04	26.64	31.25	24.10	35.81
1150	0.88	17.01	25.86	30.55	23.95	36.54
1200	0.91	16.99	25.12	28.82	22.50	39.31
1250	0.95	16.96	24.39	27.19	22.51	39.42
1300	0.99	16.94	23.69	25.46	21.45	44.77
1350	1.03	16.90	22.98	23.84	21.20	42.15
1400	1.08	16.87	22.32	22.53	20.80	41.68

## Typical Performance Curves

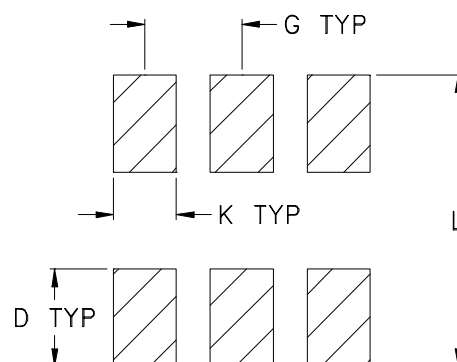


CD541  
CD542  
CD636  
CD637

## Outline Dimensions



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

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

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

## Notes:

- Case material: Plastic.
- 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.



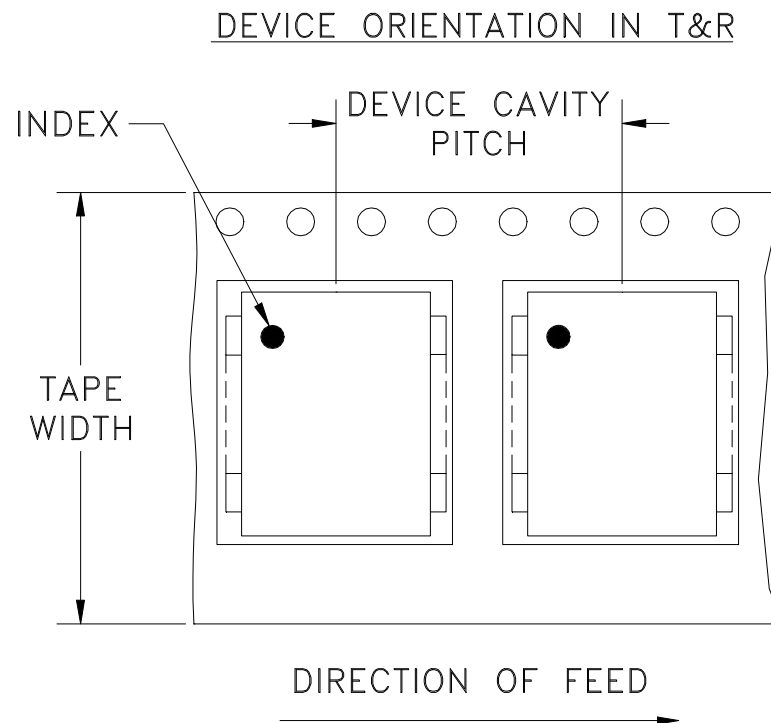
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Mini-Circuits ISO 9001 & ISO 14001 Certified

# 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)



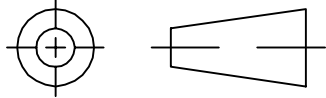
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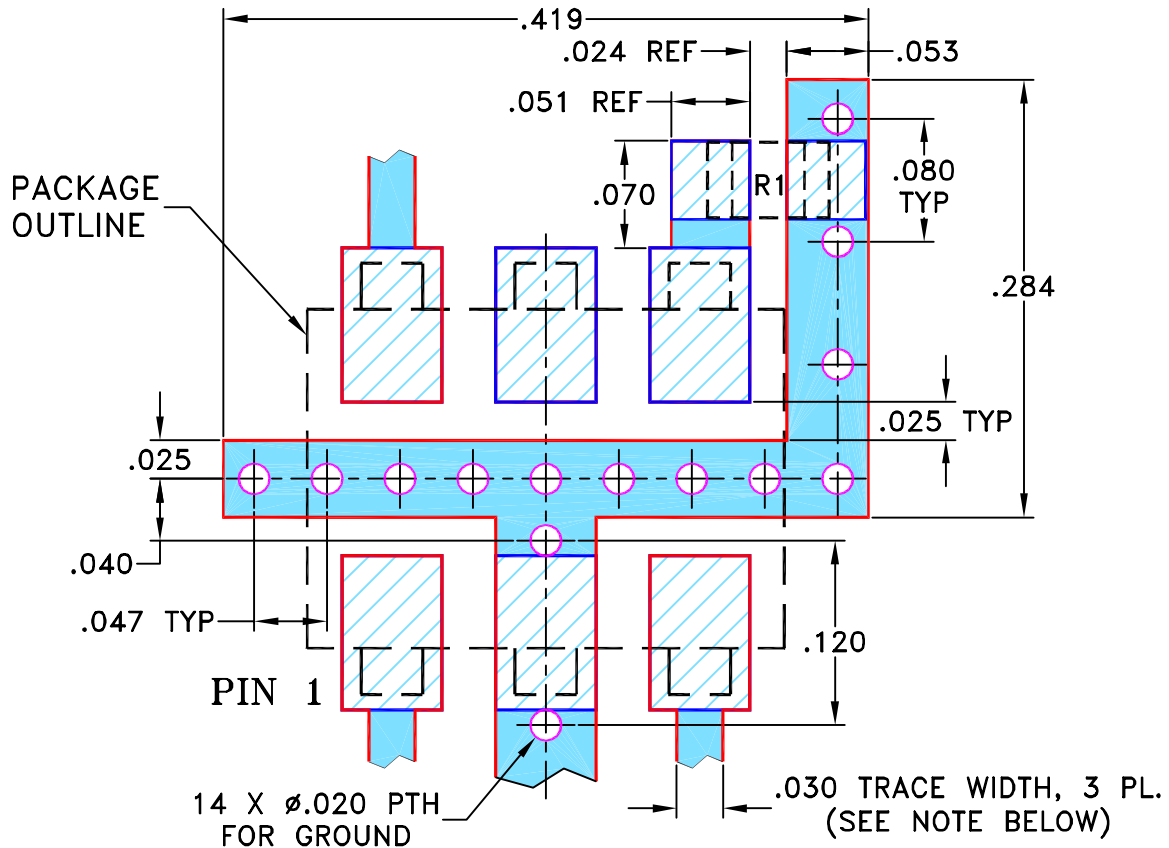
## THIRD ANGLE PROJECTION



## REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M81068	NEW RELEASE	07/22/02	GF	LC
A	M102713	ADDED NOTE 2 & "...WITH SMOBC"	01/17/06	MMG	IL

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



RESISTOR R1: 75 Ohm, 0805 SIZE.

- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .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

GF

06/21/02

TOLERANCES ON:

CHECKED

IL

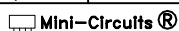
07/22/02

2 PL DECIMALS  $\pm$ 

APPROVED

LC

07/22/02

3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$ FRACTIONS  $\pm$ 

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



**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

**PL, kd, 75, CD542, ADC, TB-08**

SIZE  
A

CODE IDENT  
15542

DRAWING NO:  
98-PL-042

REV:  
A

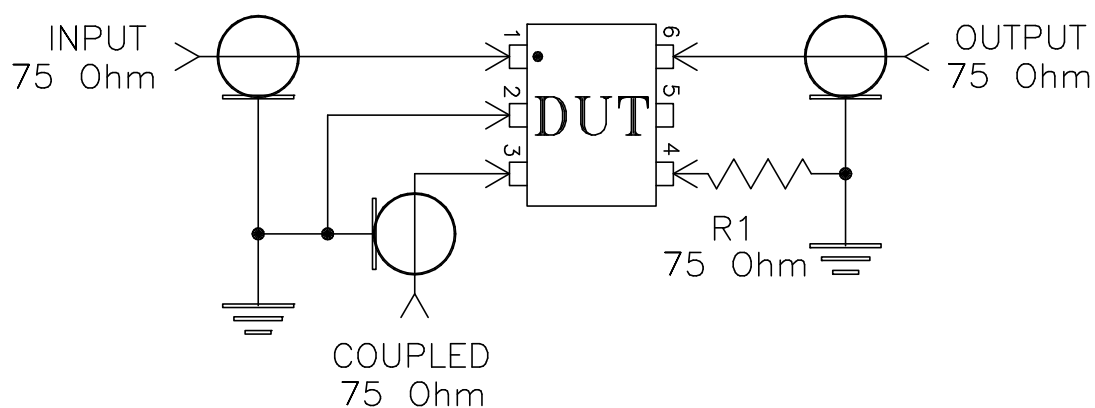
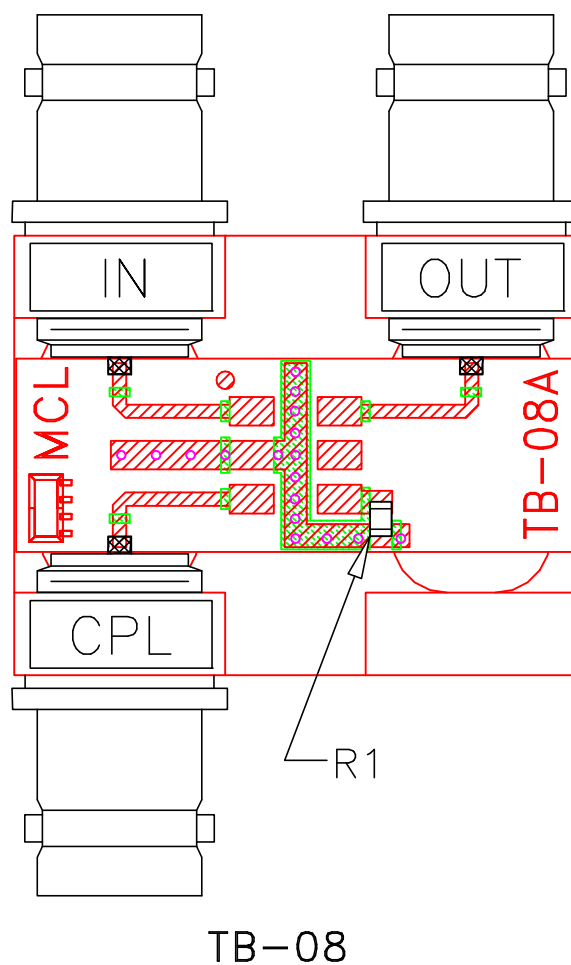
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SCALE: 8:1

SHEET: 1 OF 1




# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. 75 Ohm BNC Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.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