

50Ω

5 to 1000 MHz



Maximum Ratings

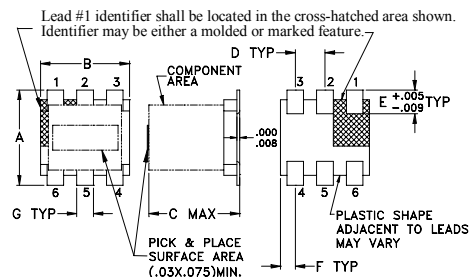
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C

* Case temperature is defined as temperature on ground leads.
Permanent damage may occur if any of these limits are exceeded.

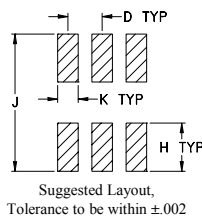
Pin Connections

INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
50Ω TERM EXTERNAL	6
NOT USED	5

Outline Drawing



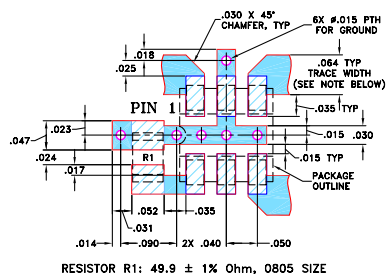
PCB Land Pattern



Outline Dimensions (inch)

A	B	C	D	E	F
.160	.150	.160	.050	.040	.025
4.06	3.81	4.06	1.27	1.02	0.64
G	H	J	K	wt	
.028	.065	.190	.030	grams	
0.71	1.65	4.83	0.76	0.15	

Demo Board MCL P/N: TB-71
Suggested PCB Layout (PL-009)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± 0.002"; 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.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Features

- wideband, 5 to 1000 MHz
- low mainline loss, 0.7 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

Applications

- VHF/UHF
- CATV
- cellular

CASE STYLE: DB714

PRICE: Contact Sales Dept.

Electrical Specifications

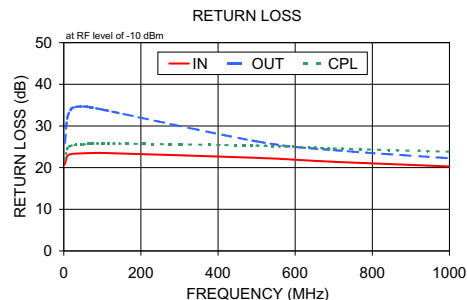
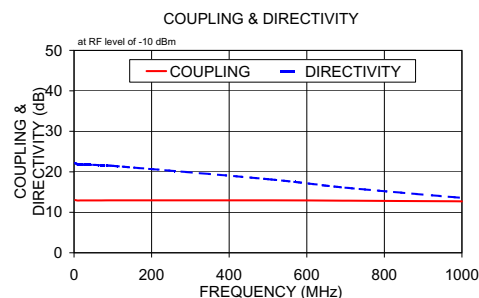
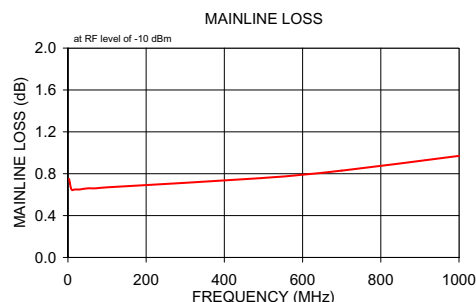
FREQ. RANGE (MHz)	COUPLING (dB)		MAINLINE LOSS ¹ (dB)						DIRECTIVITY (dB)						VSWR (:1)	POWER INPUT, W	
			L		M		U		L		M		U				
			Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.			
f_L - f_U	Nom.	Flatness															
5-1000	13.0±0.5	±0.6	0.7	1.3	0.7	1.3	0.8	1.5	21	17	18	12	15	—	1.20	0.5	1.0

L = low range [f_L to $10 f_L$] M = mid range [$10 f_L$ to $f_U/2$] U = upper range [$f_U/2$ to f_U]

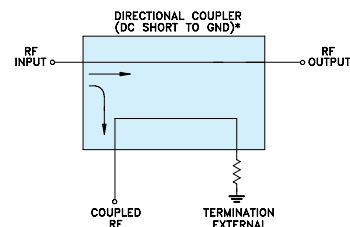
1. Mainline loss includes theoretical power loss at coupled port.

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Directivity (dB)	Return Loss (dB)		
				In	Out	Cpl
3.00	0.75	13.03	22.20	20.84	25.98	21.97
9.00	0.65	12.92	21.84	22.79	31.81	24.61
18.00	0.65	12.93	21.83	23.21	33.94	25.22
30.00	0.65	12.93	21.74	23.36	34.53	25.43
50.00	0.66	12.94	21.71	23.44	34.67	25.58
70.00	0.66	12.94	21.62	23.49	34.47	25.69
100.00	0.67	12.96	21.48	23.51	33.94	25.79
500.00	0.76	12.96	18.19	22.34	26.31	25.28
700.00	0.83	12.87	16.07	21.40	24.21	24.61
1000.00	0.97	12.71	13.56	20.29	22.25	23.79



Electrical Schematic



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

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ED-7875A/1
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120110

Directional Coupler

TCD-13-4

Typical Performance Data

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

FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS		
				IN	OUT	CPL
5	0.67	12.85	20.89	22.16	28.58	23.85
10	0.66	12.85	20.95	22.47	30.10	24.22
20	0.64	12.85	21.07	23.09	33.13	24.95
50	0.66	12.87	21.08	23.36	34.31	25.30
100	0.67	12.90	20.93	23.50	33.60	25.43
150	0.69	12.91	20.68	23.56	32.28	25.41
200	0.70	12.92	20.32	23.56	31.05	25.28
250	0.71	12.92	19.93	23.44	29.95	25.06
300	0.73	12.92	19.46	23.34	28.96	24.79
350	0.74	12.92	18.99	23.24	28.04	24.54
400	0.75	12.91	18.48	23.12	27.20	24.28
450	0.76	12.89	17.98	22.94	26.55	24.01
500	0.78	12.88	17.46	22.76	26.05	23.74
550	0.80	12.86	16.94	22.61	25.51	23.50
600	0.82	12.83	16.39	22.50	25.02	23.27
650	0.84	12.80	15.89	22.30	24.60	23.03
700	0.86	12.77	15.39	22.12	24.29	22.82
750	0.88	12.74	14.89	21.96	23.98	22.66
800	0.91	12.71	14.41	21.88	23.70	22.51
850	0.94	12.67	13.96	21.82	23.41	22.37
900	0.96	12.63	13.52	21.68	23.21	22.27
950	0.99	12.58	13.12	21.60	23.02	22.19
1000	1.03	12.53	12.73	21.55	22.77	22.13
1050	1.06	12.48	12.35	21.55	22.60	22.09
1100	1.09	12.42	12.02	21.57	22.48	22.08
1200	1.17	12.30	11.37	21.60	22.15	22.13
1300	1.26	12.17	10.85	21.84	21.86	22.29
1400	1.36	12.03	10.38	22.09	21.49	22.54
1500	1.48	11.88	10.03	22.45	21.09	22.88
1600	1.61	11.74	9.74	22.92	20.64	23.35
1700	1.77	11.62	9.52	23.52	20.09	23.89
1800	1.95	11.51	9.40	24.05	19.42	24.57
1900	2.14	11.42	9.35	24.64	18.70	25.37
2000	2.36	11.37	9.33	25.00	18.00	26.16
2250	2.98	11.43	9.69	23.70	16.16	27.33
2500	3.63	11.83	10.38	20.52	14.51	26.34
2750	4.20	12.56	11.18	17.88	13.31	24.90
3000	4.70	13.51	11.43	16.21	12.61	23.83
3250	5.11	14.54	11.03	15.33	12.32	21.62
3500	5.47	15.54	10.39	14.92	12.46	18.16
3750	5.87	16.20	10.74	14.39	12.97	14.73
4000	6.33	16.39	11.78	13.43	13.70	11.94
4250	6.93	15.99	12.11	11.89	14.97	9.88
4500	7.78	15.44	11.30	10.25	15.57	8.43
4750	8.81	14.76	9.87	8.83	15.23	7.57
5000	10.05	14.15	9.06	7.77	14.23	7.07
5250	11.56	13.60	9.04	7.15	12.79	6.91
5500	13.10	13.12	9.02	6.81	11.54	7.00
5750	14.61	12.76	9.02	6.99	10.58	7.33
6000	16.01	12.25	9.46	6.94	9.87	7.58
6250	17.21	12.27	9.16	7.35	9.34	7.69
6500	18.15	12.00	8.68	7.29	8.86	7.83
6750	18.78	11.97	7.26	7.33	8.70	7.55
7000	19.00	12.48	5.59	7.21	8.60	7.21

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Directional Coupler

TCD-13-4

Typical Performance Data

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

FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS		
				IN	OUT	CPL
5	0.85	12.98	20.57	18.70	21.53	20.32
10	0.77	12.91	20.59	20.08	24.23	21.76
20	0.62	12.79	20.63	22.84	29.63	24.64
50	0.56	12.76	20.91	24.64	33.84	26.61
100	0.57	12.78	20.70	24.59	33.93	26.53
150	0.58	12.78	20.48	24.51	33.02	26.48
200	0.59	12.77	20.30	24.43	30.85	26.24
250	0.60	12.76	19.87	24.02	29.51	25.64
300	0.61	12.75	19.54	23.92	28.49	25.31
350	0.62	12.74	19.09	23.58	27.44	24.76
400	0.63	12.73	18.65	23.33	26.61	24.37
450	0.65	12.70	18.20	22.91	25.77	23.88
500	0.66	12.68	17.70	22.60	25.18	23.53
550	0.68	12.66	17.27	22.34	24.52	23.10
600	0.69	12.62	16.78	22.11	23.95	22.74
650	0.71	12.59	16.32	21.74	23.44	22.46
700	0.73	12.56	15.81	21.46	23.09	22.15
750	0.75	12.52	15.37	21.25	22.75	21.91
800	0.77	12.48	14.93	21.00	22.31	21.67
850	0.80	12.43	14.51	20.82	21.95	21.47
900	0.82	12.38	14.09	20.52	21.60	21.26
950	0.85	12.32	13.65	20.34	21.36	21.13
1000	0.88	12.27	13.29	20.32	21.17	20.94
1050	0.91	12.22	12.93	20.23	20.98	20.76
1100	0.94	12.15	12.58	20.19	20.88	20.71
1200	1.01	12.03	11.93	20.11	20.61	20.50
1300	1.10	11.90	11.27	20.06	20.23	20.81
1400	1.20	11.75	10.77	20.13	19.86	20.89
1500	1.31	11.60	10.32	20.08	19.37	21.18
1600	1.44	11.45	9.98	20.91	19.33	21.56
1700	1.60	11.32	9.76	21.11	18.84	21.93
1800	1.78	11.20	9.60	21.64	18.39	22.47
1900	1.98	11.10	9.49	22.03	17.78	22.92
2000	2.20	11.04	9.48	22.64	17.27	23.33
2250	2.87	11.12	9.88	21.79	15.15	24.20
2500	3.56	11.58	10.96	19.57	13.51	23.19
2750	4.14	12.43	12.38	17.09	12.04	22.41
3000	4.55	13.52	12.81	15.76	11.49	22.47
3250	4.85	14.70	11.56	15.20	11.24	23.98
3500	5.11	15.79	10.21	15.16	11.30	20.38
3750	5.39	16.40	10.31	15.08	11.83	15.71
4000	5.75	16.42	11.64	14.03	12.63	12.16
4250	6.23	15.79	12.87	12.54	14.42	9.96
4500	7.04	15.12	12.85	10.39	15.96	8.31
4750	8.00	14.24	11.18	8.81	16.61	7.31
5000	9.19	13.73	9.62	7.58	15.81	6.79
5250	10.51	13.14	9.34	6.97	14.10	6.56
5500	11.98	12.57	9.47	6.49	12.27	6.69
5750	13.64	12.22	9.22	6.64	11.16	6.82
6000	15.28	11.95	8.97	6.65	10.16	7.12
6250	16.41	11.72	9.48	6.93	9.49	7.29
6500	17.14	11.47	8.33	6.86	8.83	7.26
6750	17.71	11.37	6.80	6.88	8.66	7.07
7000	17.80	12.09	5.24	6.60	8.79	6.85

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Typical Performance Data

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

FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING LOSS (dB)	DIRECTIVITY (dB)	RETURN LOSS		
				IN	OUT	CPL
5	0.82	13.02	21.63	20.81	26.82	22.79
10	0.81	13.02	21.59	20.98	27.50	22.99
20	0.80	13.02	21.50	21.33	28.86	23.39
50	0.81	13.04	21.24	21.35	29.70	23.38
100	0.82	13.07	21.10	21.70	29.35	23.75
150	0.83	13.09	20.81	21.99	28.62	23.95
200	0.85	13.11	20.20	21.96	28.69	23.80
250	0.85	13.12	19.81	22.13	28.44	23.96
300	0.87	13.13	19.28	22.12	27.91	23.79
350	0.88	13.14	18.70	22.07	27.51	23.67
400	0.89	13.15	18.14	22.11	27.00	23.59
450	0.91	13.15	17.58	22.04	26.54	23.41
500	0.93	13.15	16.99	21.99	26.27	23.28
550	0.94	13.16	16.43	21.98	25.90	23.17
600	0.96	13.15	15.85	21.97	25.55	23.06
650	0.98	13.15	15.32	21.86	25.28	22.95
700	1.00	13.14	14.79	21.76	25.04	22.83
750	1.02	13.13	14.28	21.66	24.78	22.75
800	1.05	13.11	13.78	21.67	24.56	22.67
850	1.07	13.08	13.34	21.71	24.36	22.61
900	1.09	13.06	12.92	21.70	24.24	22.58
950	1.13	13.02	12.54	21.72	24.11	22.53
1000	1.16	12.99	12.20	21.78	23.87	22.52
1050	1.19	12.95	11.86	21.81	23.67	22.51
1100	1.22	12.90	11.56	21.82	23.43	22.52
1200	1.30	12.80	10.98	21.77	22.88	22.59
1300	1.38	12.69	10.53	22.02	22.48	22.59
1400	1.48	12.57	10.11	22.08	21.89	22.68
1500	1.59	12.45	9.77	22.29	21.43	22.94
1600	1.71	12.33	9.47	22.58	21.03	23.30
1700	1.85	12.23	9.19	22.96	20.56	23.73
1800	2.00	12.14	9.00	23.16	19.90	24.17
1900	2.17	12.05	8.89	23.42	19.28	24.97
2000	2.35	11.99	8.70	23.39	18.67	25.87
2250	2.85	11.98	8.50	22.58	17.43	27.41
2500	3.41	12.17	8.48	20.42	16.14	26.76
2750	3.99	12.58	8.59	17.86	14.97	23.82
3000	4.57	13.16	8.94	15.96	14.16	21.39
3250	5.14	13.84	9.55	14.71	13.43	19.24
3500	5.70	14.55	10.58	13.86	12.88	17.50
3750	6.25	15.18	12.62	13.49	12.58	15.51
4000	6.81	15.59	15.02	13.08	12.59	13.55
4250	7.48	15.63	15.37	11.93	12.57	11.45
4500	8.21	15.41	12.34	10.81	12.57	9.71
4750	9.02	14.90	9.91	9.58	12.45	8.33
5000	9.91	14.48	7.82	8.48	12.66	7.41
5250	10.87	13.93	6.76	7.71	12.38	6.78
5500	12.03	13.42	6.17	7.16	12.02	6.51
5750	13.36	13.12	5.97	6.92	11.48	6.62
6000	14.61	12.54	6.46	6.86	10.88	6.88
6250	16.21	11.98	7.72	6.90	10.64	7.19
6500	17.77	11.10	8.78	7.37	10.10	7.75
6750	19.70	10.46	11.16	8.39	9.99	8.34
7000	22.04	9.51	15.07	8.79	9.48	8.50

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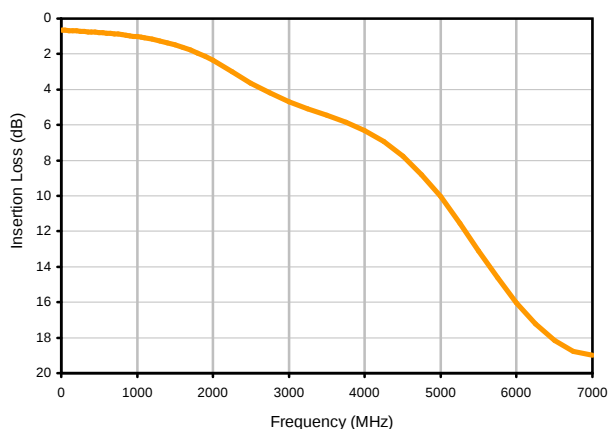


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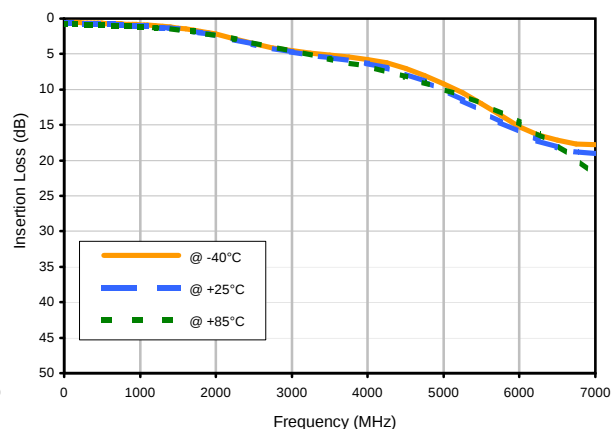
Typical Performance Curves

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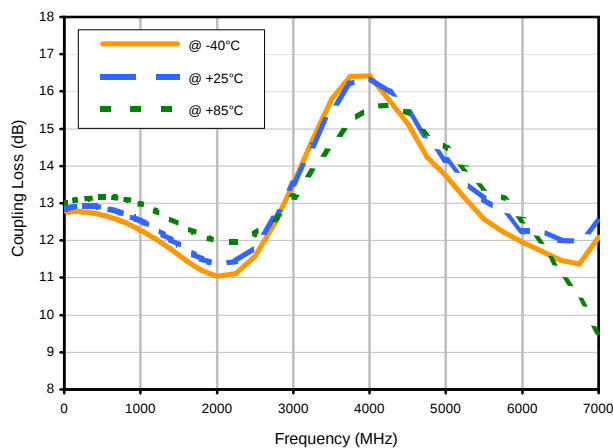
Insertion Loss



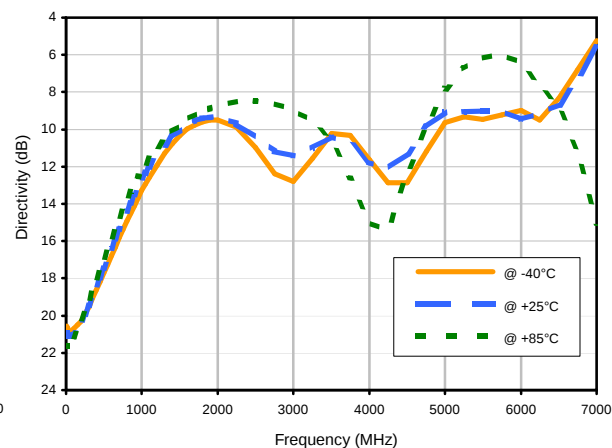
Insertion Loss vs. TEMPERATURE



Coupling Loss vs. TEMPERATURE



Directivity vs. TEMPERATURE



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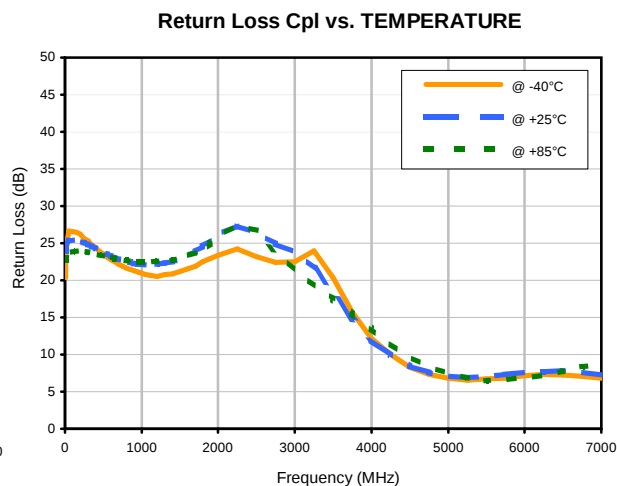
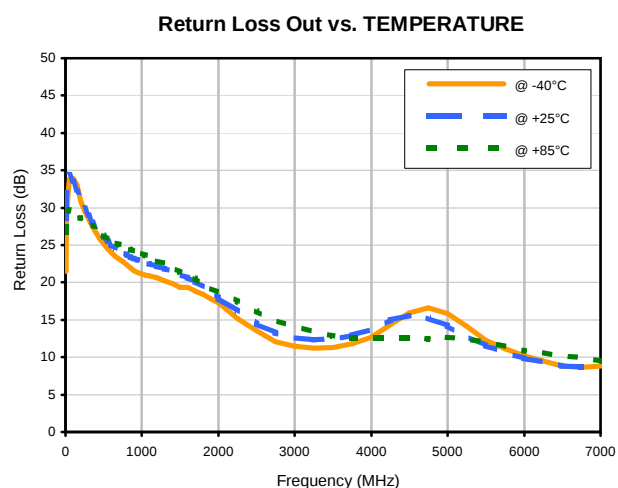
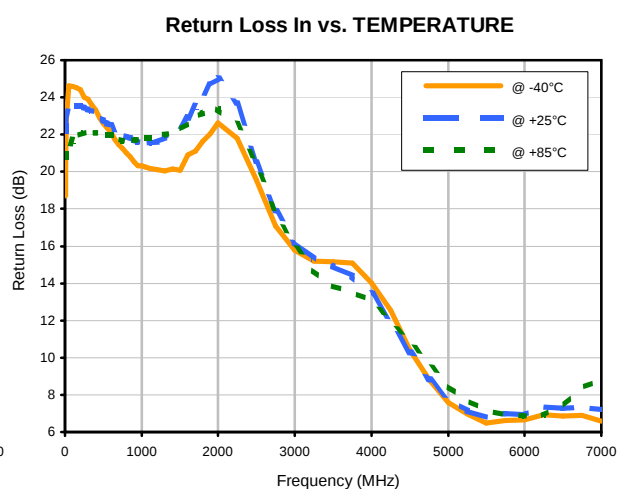
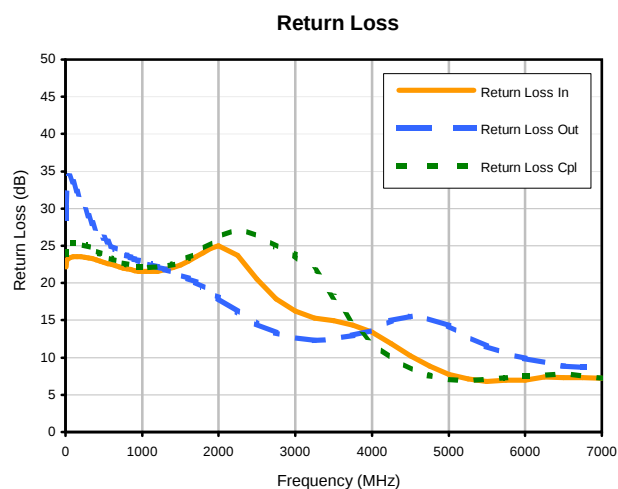
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Directional Coupler

Typical Performance Curves

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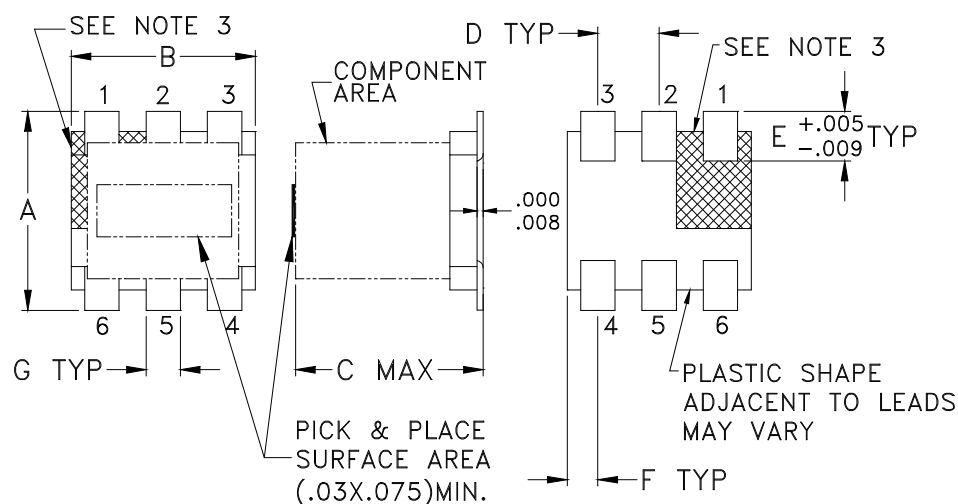
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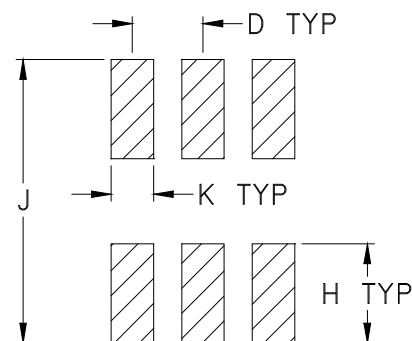
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Outline Dimensions

DB714



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAM
DB714	.160 (4.06)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (0.64)	.028 (0.71)	.065 (1.65)	.190 (4.83)	.030 (0.76)	.15

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

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.
- Lead #1 identifier shall be located in the cross-hatched area shown.
Identifier may be either a molded or marked feature.



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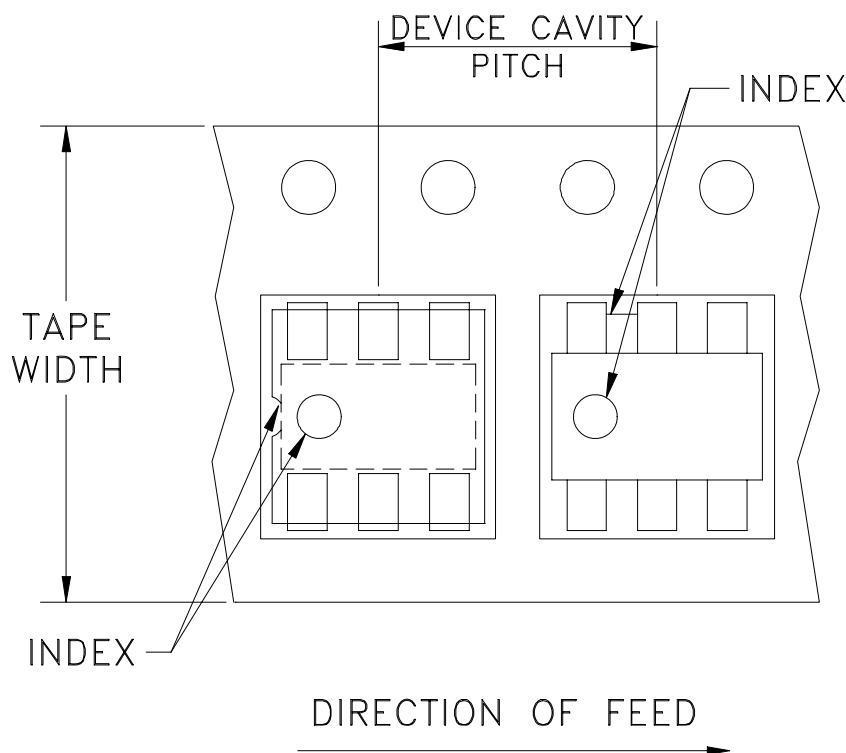


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F47

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
12	8	13	1000, 2000
		7	20, 50, 100, 200, 500

Note: Please consult individual model data sheet to determine device per reel availability.

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



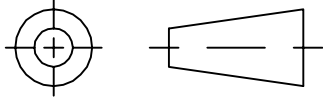
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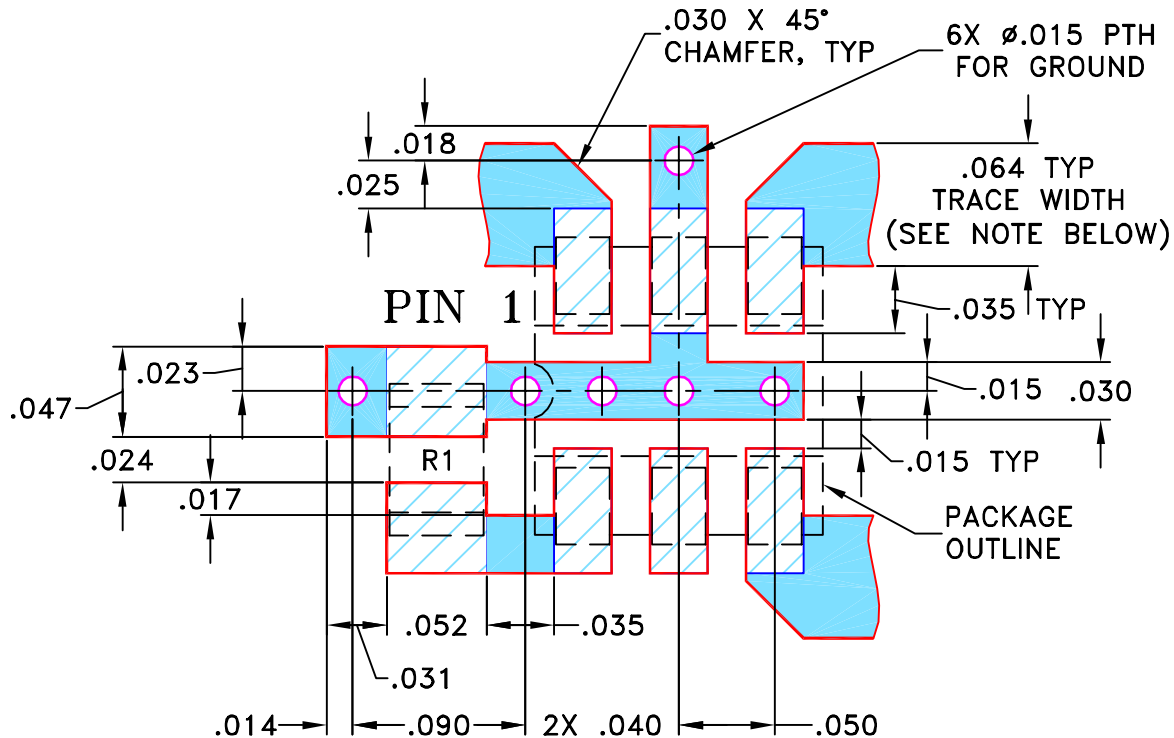
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M73159	NEW RELEASE	08/00	IL	DB
A	M82377	UPDATED DRAWING	07/21/02	AV	LC
B	M102713	UPDATED NOTES	01/12/08	GF	IL

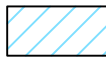
SUGGESTED MOUNTING CONFIGURATION FOR DB714 CASE STYLE, "mm" PIN CONNECTION



RESISTOR R1: $49.9 \pm 1\%$ Ohm, 0805 SIZE

NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS $0.030'' \pm 0.002''$; 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

TOLERANCES ON:
2 PL DECIMALS $\pm .005$
3 PL DECIMALS $\pm$
ANGLES $\pm$
FRACTIONS $\pm$

DRAWN

IL

08/03/00

CHECKED

WP

08/08/00

APPROVED

DB

08/08/00

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



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, mm, DB714, TCD, TB-71

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-009

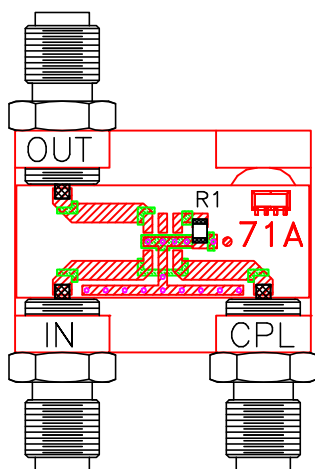
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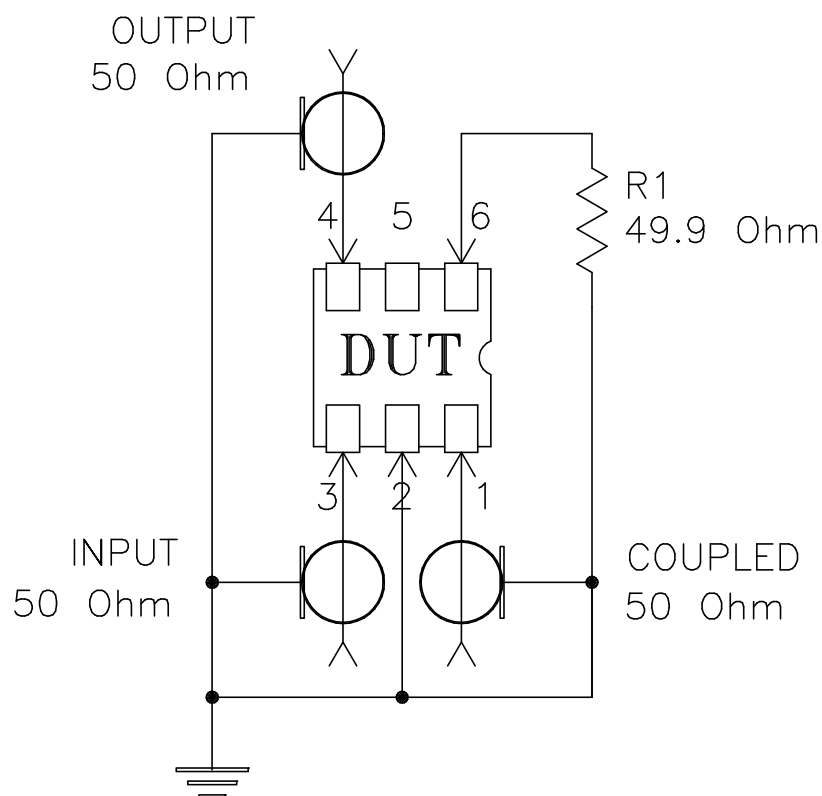
SCALE: 10:1

SHEET: 1 OF 1

Evaluation Board and Circuit



TB-71



Schematic Diagram

Notes:

1. SMA 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