

Surface Mount

Directional Coupler

10 to 1000 MHz

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

Pin Connections

INPUT	3
OUTPUT	4
COUPLED	1
GROUND	2
75Ω TERM EXTERNAL	6
NOT USED	5

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

1 2 3
B
A
D TYP
COMPONENT AREA
3 2 1
E $\pm .005$ TYP
6 5 4
G TYP
C MAX
PICK & PLACE SURFACE AREA (.03X.075) MIN.
F TYP
PLASTIC SHAPE ADJACENT TO LEADS MAY VARY

Suggested Layout,
Tolerance to be within ± 0.02

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	

Figure 1: Dimensions of the 0805 size resistor. The diagram shows a top-down view of a rectangular resistor with various dimensions and labels. Key dimensions include: overall width .085, overall height .035, pin width .018, pin spacing .052, package width .030, package height .015, and a central rectangular area .023 by .047. A note indicates "PIN 1" on the left side. A note indicates "PACKAGE OUTLINE" with a dashed line. A note indicates "TRACE WIDTH (SEE NOTE BELOW)" with a dimension of .030. A note indicates "7X #.015 PTH FOR GROUND" with a dimension of .017. A note indicates "RESISTOR R1: 75 ± 1% Ohm, 0805 SIZE" at the bottom. A note indicates "4K .0475" at the bottom center.

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

- wideband, 10 to 1000 MHz
- low mainline loss, 0.7 dB typ.
- aqueous washable
- leads for excellent solderability
- protected by US Patent 6,140,887

- VHF/UHF
- CATV
- cellular

FREQ. RANGE (MHz)	COUPLING (dB)		MAINLINE LOSS¹						DIRECTIVITY						VSWR (:1)	POWER INPUT, W	
			(dB)						(dB)							L	MU
			L		M		U		L		M		U			Max.	Min.
f _L -f _U	Norm.	Flatness	Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Min.
10-1000	18.0±0.5	±0.9	0.9	1.3	0.7	1.2	0.8	1.3	20	15	22	15	18	—	1.20	1.0	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.

Frequency (MHz)	Mainline Loss (dB) In-Out	Coupling (dB) In-Cpl	Directivity (dB)	In	Return Loss (dB) Out	Cpl
10.00	0.80	18.25	24.89	19.65	21.19	19.31
30.00	0.75	18.09	28.81	21.21	23.47	21.05
50.00	0.75	18.07	29.10	21.46	23.88	21.36
90.00	0.75	18.05	28.90	21.60	23.98	21.20
100.00	0.75	18.05	28.77	21.62	23.96	21.20
300.00	0.73	18.00	25.91	21.12	23.00	22.63
500.00	0.75	17.87	23.32	20.19	21.20	25.64
700.00	0.75	17.64	21.87	20.17	20.48	28.73
900.00	0.79	17.44	21.22	21.04	20.47	32.11
1000.00	0.81	17.34	21.19	21.96	20.60	31.73

at RF level of -10 dBm

FREQUENCY (MHz)	MAINLINE LOSS (dB)
0	0.80
100	0.75
200	0.75
300	0.74
400	0.75
500	0.76
600	0.76
700	0.75
800	0.78
900	0.80
1000	0.82

Graph showing Coupling & Directivity (dB) versus Frequency (MHz) for the 10 dBm RF level. The Coupling (red solid line) is constant at approximately 18 dB. The Directivity (blue dashed line) starts at approximately 25 dB at 0 MHz, peaks at approximately 30 dB around 50 MHz, and then decreases to approximately 22 dB at 1000 MHz.

Frequency (MHz)	Coupling (dB)	Directivity (dB)
0	18	25
50	18	30
100	18	29
200	18	28
400	18	25
600	18	23
800	18	22
1000	18	22

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

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WZ/TD/CP/AM
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Directional Coupler

TCD-18-4-75

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	(dB) OUT	CPL
10	0.75	17.89	32.71	21.43	23.65	21.29
15	0.75	17.89	32.47	21.61	23.96	21.50
20	0.75	17.89	32.10	21.71	24.13	21.62
25	0.76	17.90	31.62	21.74	24.16	21.66
50	0.77	17.93	31.66	21.84	24.20	21.73
75	0.78	17.94	31.61	21.89	24.29	21.83
100	0.79	17.95	31.43	21.88	24.39	21.96
125	0.79	17.96	31.94	21.97	24.46	22.07
150	0.80	17.96	31.87	21.86	24.47	22.22
175	0.80	17.97	31.83	21.92	24.50	22.42
200	0.80	17.97	31.58	21.91	24.47	22.62
250	0.81	17.97	31.01	21.81	24.34	23.02
300	0.81	17.98	30.62	21.56	24.08	23.48
350	0.82	17.98	29.03	21.33	23.79	24.02
400	0.83	17.97	27.95	21.25	23.52	24.53
425	0.83	17.98	27.16	21.09	23.34	24.83
450	0.83	17.98	26.36	21.28	23.24	25.10
475	0.84	17.97	26.06	21.04	23.12	25.40
500	0.85	17.98	24.81	21.08	23.03	25.66
550	0.86	17.97	23.54	20.86	22.80	26.17
575	0.87	17.97	23.45	21.10	22.79	26.34
600	0.88	17.99	22.23	21.01	22.74	26.54
650	0.89	17.99	21.34	21.39	22.76	26.73
700	0.91	17.99	20.63	21.60	22.86	26.76
750	0.92	17.99	19.98	21.60	23.03	26.61
800	0.94	18.00	19.30	22.26	23.38	26.35
850	0.94	18.00	18.59	23.16	23.84	25.93
900	0.95	18.01	17.93	23.92	24.49	25.47
950	0.96	18.00	17.48	24.37	25.13	25.00
975	0.96	17.98	17.61	25.31	25.67	24.82
1000	0.97	17.98	17.49	25.47	26.09	24.60
1050	0.98	17.97	17.30	26.66	27.17	24.20
1075	0.97	17.98	16.49	27.36	27.69	24.04
1100	0.98	17.98	16.71	28.47	28.32	23.88
1200	1.00	17.90	15.70	30.76	31.60	23.45
1300	1.04	17.86	14.04	33.42	34.78	23.25
1400	1.08	17.73	12.30	34.52	34.76	23.40
1500	1.13	17.51	11.11	31.04	31.78	23.56
1600	1.16	17.28	9.26	31.21	30.17	23.88
1700	1.18	17.05	8.41	29.19	28.65	23.99
1800	1.19	16.87	7.47	30.63	28.35	23.97
1900	1.24	16.71	7.19	29.80	28.30	23.54
2000	1.28	16.65	6.98	31.57	29.13	22.77
2100	1.37	16.57	7.24	31.76	30.18	21.82
2200	1.44	16.51	8.07	33.89	31.84	20.57
2300	1.53	16.42	8.61	31.74	32.54	19.54
2400	1.61	16.32	8.72	30.54	33.47	18.45
2500	1.72	16.09	7.94	27.42	32.46	17.52
2600	1.81	15.85	7.17	26.45	33.04	16.81
2700	1.96	15.34	5.27	25.89	33.75	16.35
2800	2.11	14.90	4.59	25.99	36.20	16.01
2900	2.23	14.80	4.03	25.87	36.98	15.93
3000	2.31	14.87	3.29	25.26	39.22	16.14

REV. X1
TCD-18-4-75
081006
Page 1 of 3



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Directional Coupler

TCD-18-4-75

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	(dB) OUT	CPL
10	0.76	17.64	26.91	19.83	20.93	19.64
15	0.70	17.55	31.10	21.53	22.87	21.39
20	0.65	17.50	34.73	22.81	24.30	22.71
25	0.64	17.49	37.81	23.66	25.20	23.61
50	0.61	17.50	42.81	26.25	27.01	26.07
75	0.60	17.51	40.30	26.51	27.91	26.26
100	0.60	17.51	38.31	25.20	28.53	25.04
125	0.61	17.52	34.97	24.40	28.83	24.53
150	0.61	17.51	33.96	24.32	28.79	25.14
175	0.61	17.52	32.28	24.98	28.68	26.11
200	0.62	17.52	31.31	24.87	28.44	25.93
250	0.63	17.51	29.14	23.03	27.48	24.45
300	0.64	17.51	27.87	22.66	26.12	25.03
350	0.64	17.51	26.45	21.83	24.85	24.70
400	0.65	17.49	25.47	21.12	23.78	24.59
425	0.66	17.49	24.83	20.86	23.29	24.63
450	0.66	17.49	24.33	20.88	22.95	24.46
475	0.67	17.48	24.00	20.32	22.59	24.33
500	0.67	17.49	23.01	20.13	22.31	24.44
550	0.68	17.47	22.35	19.75	21.88	24.57
575	0.69	17.46	22.28	19.80	21.77	24.16
600	0.70	17.47	21.34	19.55	21.62	23.83
650	0.71	17.47	20.72	19.96	21.48	23.91
700	0.73	17.44	20.51	20.11	21.46	23.57
750	0.74	17.41	20.13	20.29	21.53	23.16
800	0.74	17.40	19.72	21.79	21.91	23.24
850	0.75	17.37	19.34	22.99	22.55	22.83
900	0.76	17.35	19.05	24.70	23.57	22.89
950	0.77	17.32	19.12	26.79	24.83	22.85
975	0.78	17.28	20.36	29.51	25.97	22.81
1000	0.78	17.31	19.31	29.75	26.42	22.77
1050	0.78	17.26	20.02	35.27	28.85	23.01
1075	0.78	17.26	19.19	38.43	30.02	23.02
1100	0.78	17.23	19.94	37.26	31.72	23.23
1200	0.81	17.15	19.23	28.60	36.59	25.41
1300	0.87	17.11	16.95	23.46	30.79	29.50
1400	0.92	16.99	14.29	22.93	27.93	32.92
1500	0.96	16.78	12.54	22.66	26.52	29.80
1600	0.98	16.54	10.35	26.60	26.50	24.06
1700	0.97	16.32	9.30	30.32	26.31	20.03
1800	0.97	16.15	8.27	29.98	26.07	18.16
1900	1.03	15.99	8.00	25.19	25.86	17.11
2000	1.11	15.96	8.05	20.30	25.89	17.56
2100	1.20	15.93	8.32	19.36	27.18	19.55
2200	1.29	15.90	9.52	17.91	28.65	21.03
2300	1.34	15.84	10.15	17.93	28.15	28.91
2400	1.43	15.75	10.05	16.77	26.08	26.98
2500	1.59	15.51	8.62	17.03	24.30	19.95
2600	1.73	15.23	7.50	16.11	24.72	15.08
2700	1.85	14.73	5.36	15.83	27.01	12.59
2800	1.96	14.31	4.38	15.20	33.34	11.06
2900	2.03	14.22	3.98	14.67	39.08	10.24
3000	2.11	14.42	3.20	14.85	29.73	9.97

REV. X1
TCD-18-4-75
081006
Page 2 of 3



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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	(dB) OUT	CPL
10	1.00	18.37	25.82	19.40	21.26	19.27
15	1.01	18.38	26.04	19.38	21.37	19.27
20	1.01	18.39	26.19	19.31	21.43	19.21
25	1.02	18.39	26.26	19.19	21.44	19.10
50	1.03	18.40	26.40	18.69	21.43	18.57
75	1.04	18.42	26.74	18.66	21.45	18.64
100	1.04	18.43	27.24	19.21	21.45	19.32
125	1.04	18.43	28.15	19.97	21.49	20.00
150	1.04	18.43	28.87	19.99	21.60	20.15
175	1.03	18.43	30.34	19.83	21.76	20.04
200	1.03	18.43	31.15	19.76	21.90	20.28
250	1.03	18.44	33.01	20.59	22.14	21.63
300	1.04	18.46	35.24	20.72	22.43	22.20
350	1.04	18.48	34.32	20.61	22.69	23.00
400	1.05	18.50	31.71	21.27	22.98	24.35
425	1.05	18.52	30.14	21.30	23.06	24.83
450	1.06	18.54	28.51	21.63	23.22	25.30
475	1.06	18.55	27.51	21.38	23.28	25.75
500	1.07	18.58	25.57	21.58	23.38	26.37
550	1.08	18.61	23.77	21.66	23.46	27.71
575	1.08	18.63	23.21	22.07	23.59	28.23
600	1.09	18.66	21.60	21.84	23.59	28.55
650	1.10	18.71	20.26	22.02	23.65	29.16
700	1.11	18.75	19.20	22.06	23.67	29.66
750	1.12	18.77	18.19	21.66	23.65	29.47
800	1.13	18.81	17.35	21.69	23.68	28.74
850	1.14	18.84	16.62	22.00	23.84	28.17
900	1.14	18.86	15.86	22.14	24.11	27.22
950	1.15	18.85	15.34	22.03	24.27	25.89
975	1.21	18.94	15.43	22.56	24.96	25.45
1000	1.16	18.89	14.93	22.31	24.52	24.98
1050	1.16	18.86	14.90	22.81	25.09	23.96
1075	1.16	18.88	14.16	23.11	25.26	23.48
1100	1.17	18.86	14.42	24.06	25.74	23.08
1200	1.19	18.79	13.57	25.74	27.57	22.01
1300	1.22	18.73	12.40	31.91	30.93	21.52
1400	1.27	18.58	11.15	44.67	34.46	21.77
1500	1.32	18.36	10.25	31.14	33.79	22.87
1600	1.36	18.12	8.71	26.93	30.12	25.25
1700	1.39	17.91	7.99	23.60	27.24	29.35
1800	1.40	17.73	7.10	22.76	25.80	31.15
1900	1.44	17.57	6.87	21.64	25.00	25.94
2000	1.48	17.49	6.77	22.65	25.20	21.72
2100	1.54	17.44	6.88	22.29	25.97	19.19
2200	1.59	17.38	7.71	24.38	27.49	17.68
2300	1.69	17.29	8.23	24.66	29.34	16.81
2400	1.77	17.21	8.38	28.12	32.27	16.63
2500	1.89	17.01	7.69	29.76	33.80	16.94
2600	1.98	16.81	6.98	33.80	35.30	17.64
2700	2.11	16.28	5.17	32.06	33.55	18.62
2800	2.26	15.83	4.57	26.05	31.78	19.22
2900	2.38	15.66	4.01	23.57	28.86	19.00
3000	2.42	15.68	3.27	20.23	26.78	18.16

REV. X1
TCD-18-4-75
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Page 3 of 3



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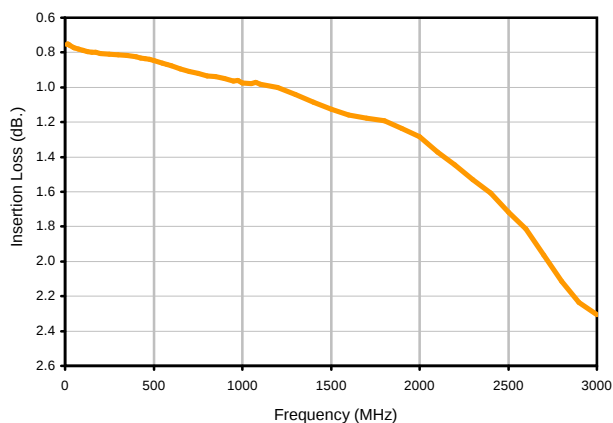


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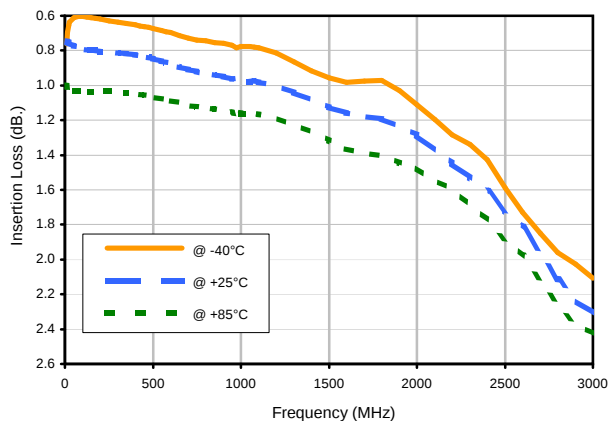
Typical Performance Curves

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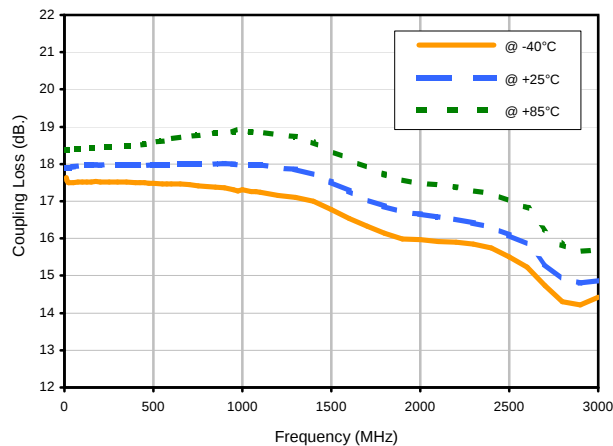
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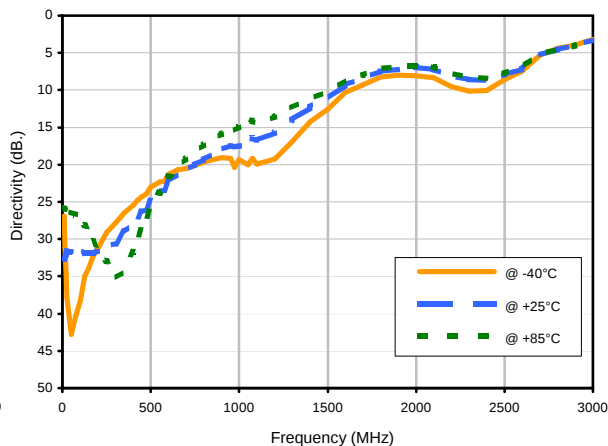
Insertion Loss vs. TEMPERATURE



Coupling Loss vs. TEMPERATURE



Directivity vs. TEMPERATURE



REV. X1
TCD-18-4-75
081006
Page 1 of 2

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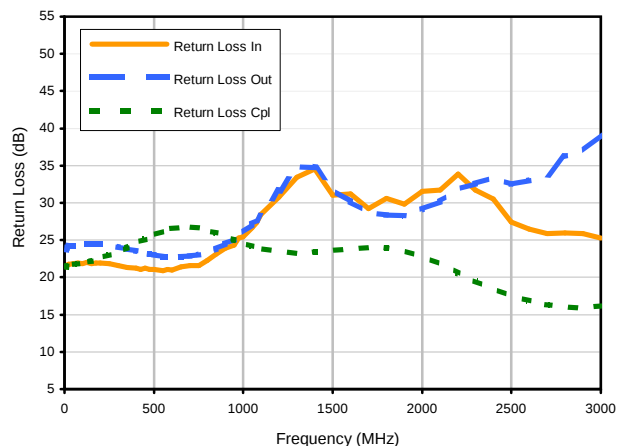


Directional Coupler

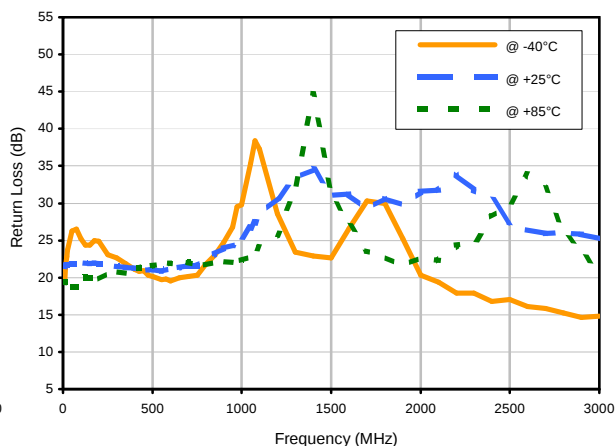
Typical Performance Curves

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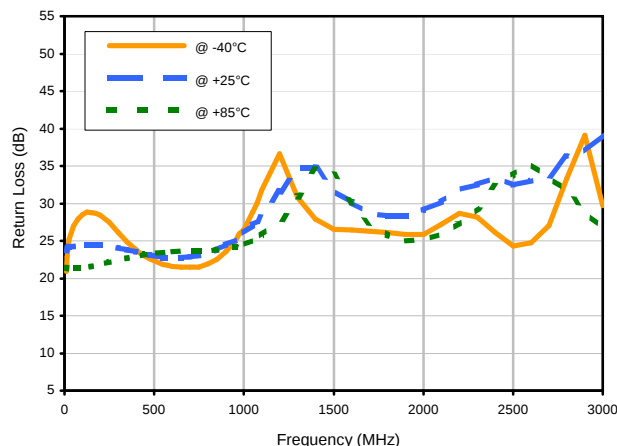
Return Loss



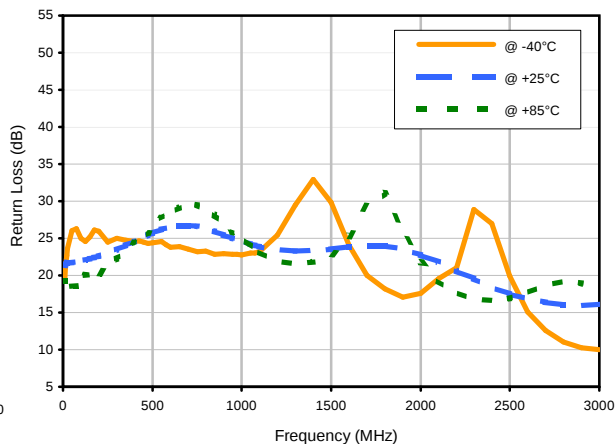
Return Loss In vs. TEMPERATURE



Return Loss Out vs. TEMPERATURE



Return Loss Cpl vs. TEMPERATURE



REV. X1
TCD-18-4-75
081006
Page 2 of 2



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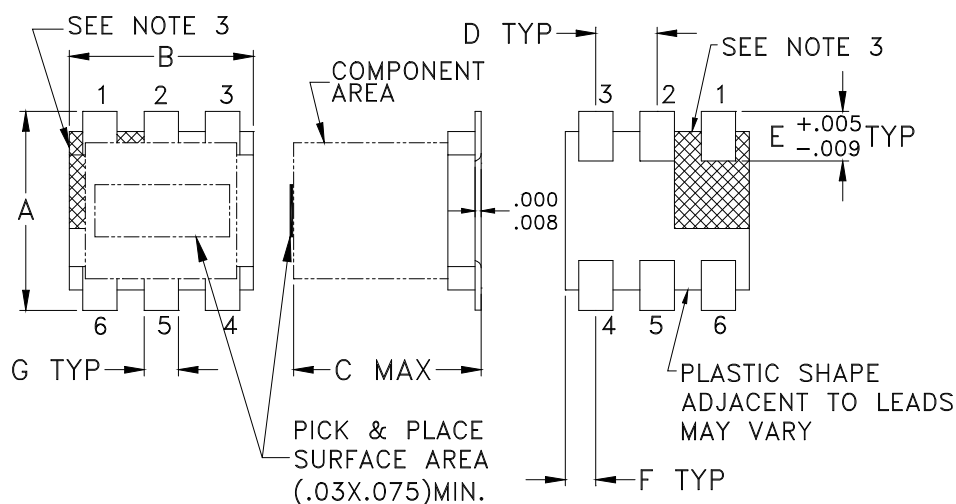
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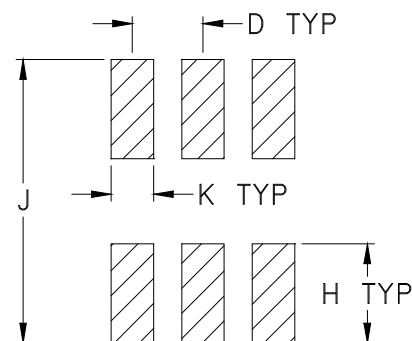


Outline Dimensions

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.



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

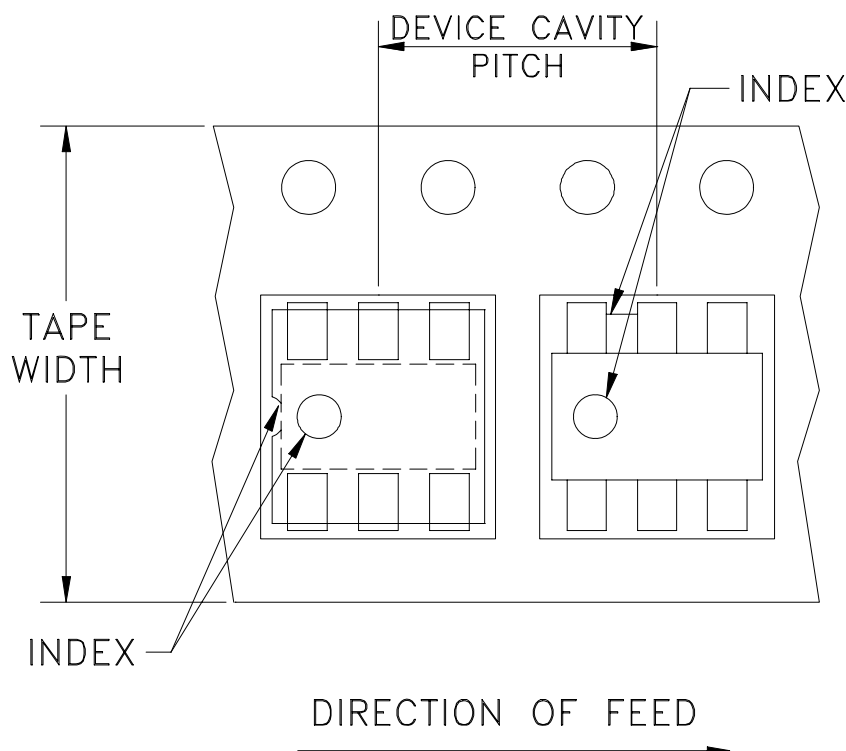


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

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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REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M73159	NEW RELEASE	08/00	IL	DB
A	M82377	UPDATED DRAWING	07/30/02	AV	LC
B	M102713	UPDATED NOTES	01/12/06	GF	IL

.018
 .010
 .085
 .052
 .035
 .030 TYP
 TRACE WIDTH
 (SEE NOTE BELOW)
 PACKAGE OUTLINE
 .015 TYP
 .015
 .030
 .047 TYP
 .023
 .024
 .030
 .108
 .017
 4X .0475
 .275
 .018
 PIN
 1
 R1
 7X ϕ .015 PTH FOR GROUND

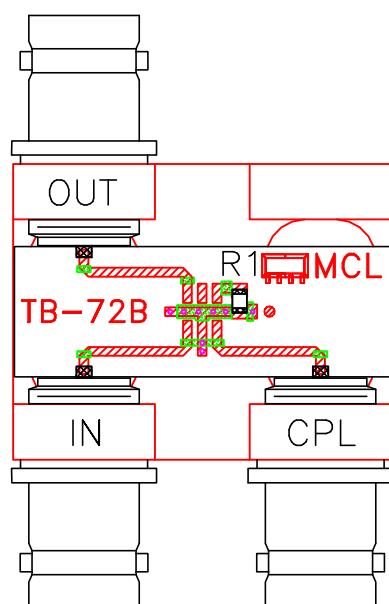
NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" $\pm$ 0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

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

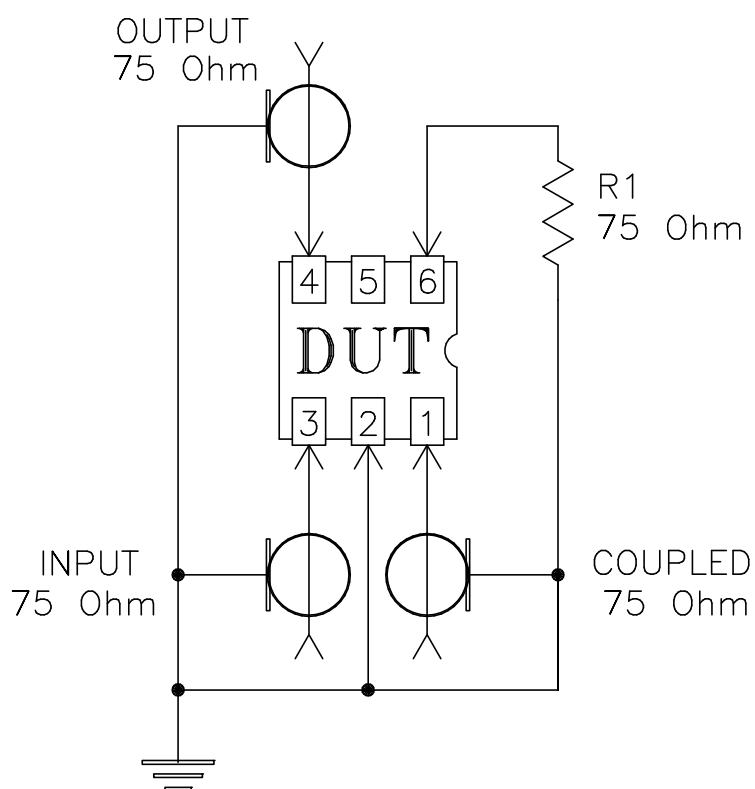
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

SHEET:	1 OF 1
--------	--------

Evaluation Board and Circuit



TB-72



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