Surface Mount

Directional Coupler

SYDC20-171VHP+

50Ω 20 dB Coupling 30 to 174 MHz 100 Watt

Generic photo used for illustration purposes only

CASE STYLE: PD1647-3

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

Maximum Ratings

Operating Temperature	-40°C to 50°C Case*
Storage Temperature	-55°C to 100°C

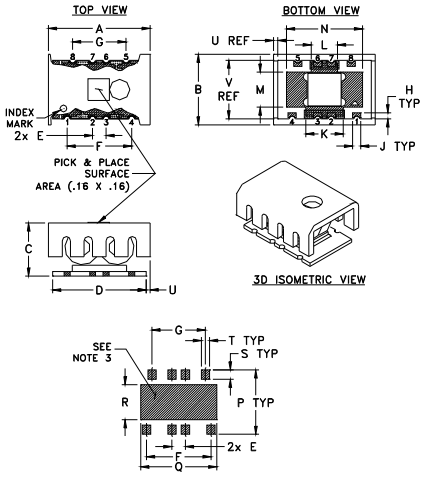
* Case temperature is defined as temperature on ground leads. Permanent damage may occur if any of these limits are exceeded.

Pad Connections

INPUT	1
OUTPUT	8
COUPLED	4
50Ω TERM EXTERNAL*	5
GROUND	2,3,6,7

* External termination must be able to handle 250 mW min.

Outline Drawing

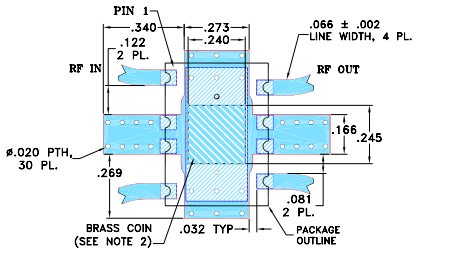


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L
.750	.520	.39	.690	.100	.476	.394	.045	.060	.276	.194
19.05	13.21	9.91	17.53	2.54	12.09	10.01	1.14	1.52	7.01	4.93

M	N	P	Q	R	S	T	U	V	wt
.257	.560	.475	.561	.258	.069	.061	.030	.433	grams
6.53	14.22	12.07	14.25	6.55	1.75	1.55	0.76	11.00	2.60

Demo Board MCL P/N: TB-630+
Suggested PCB Layout (PL-351)
Refer to Application Note: AN-00-017



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. SUGGEST TO PROVIDE BRASS COIN FOR BETTER HEAT TRANSFER FROM THE UNIT. OTHERWISE PROVIDE ARRAY OF THERMAL VIAS ADEQUATE TO LIMIT TEMPERATURE OF GROUND CONNECTIONS UNDER THE UNIT TO 65°C.
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
DENOTES BRASS COIN.

Features

- high power, 100W max. with output load VSWR 1.5 max
- high power, 20W max. with output open or short
- low mainline loss, 0.25 dB typ.
- good VSWR, 1.05 typ.

Applications

- military mobile

Electrical Specifications at 25°C

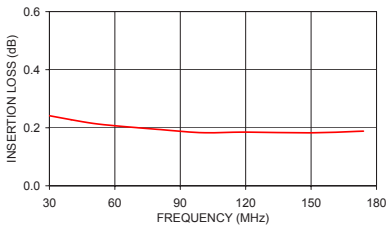
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		30	—	174	MHz
Mainline Loss[1] (above theoretical 0.04 dB)	30	—	0.24	0.4	dB
	100	—	.19	.35	
	174	—	.20	.4	
Coupling	30-174	—	20.7	—	dB
	30	20.2	20.5	21.3	
	100	20	20.6	21.5	
	174	19.8	20.7	21.5	
Coupling Flatness(±)	30-174	—	0.1	0.3	dB
Directivity	30	20	23	—	dB
	100	14	18	—	
	174	10	14	—	
Return Loss (Input)	30	20	26	—	dB
	100	22	35	—	
	174	20	30	—	
Return Loss (Output)	30	20	27	—	dB
	100	23	38	—	
	174	20	31	—	
Return Loss (Coupling)	30	20	29	—	dB
	100	22	31	—	
	174	18	22	—	
Input Power[1]	30-174	—	—	100	W

1. The user must provide adequate means of heat removal to limit the temperature of ground connections under the PCB to 50°C, in order to ensure proper performance. At 25°C ambient temperature this requires thermal resistance of the user's PC board heat sink to be 3.5°C/W power derate linearly to 75 Watt at 50°C.

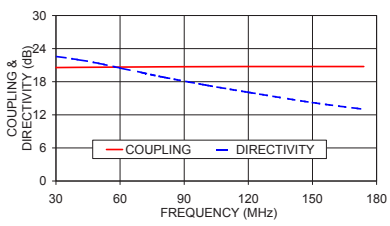
Typical Performance Data

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
30.00	0.24	20.57	22.60	26.52	26.99	28.53
40.00	0.23	20.60	22.01	28.55	29.54	32.23
50.00	0.21	20.63	21.32	30.47	31.88	36.38
60.00	0.21	20.66	20.49	32.36	34.30	41.29
70.00	0.20	20.68	19.66	34.22	37.26	43.12
80.00	0.19	20.70	18.84	35.93	40.59	39.23
100.00	0.18	20.73	17.39	37.79	46.50	33.19
120.00	0.18	20.75	16.07	37.22	40.53	29.63
150.00	0.18	20.76	14.22	32.78	33.13	26.14
174.00	0.19	20.75	13.01	30.56	30.60	24.13

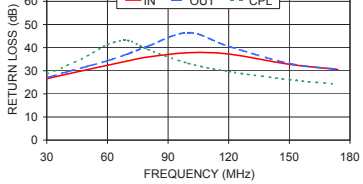
SYDC20-171VHP+
INSERTION LOSS



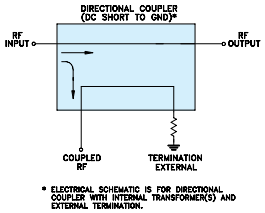
SYDC20-171VHP+
COUPLING & DIRECTIVITY



SYDC20-171VHP+
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

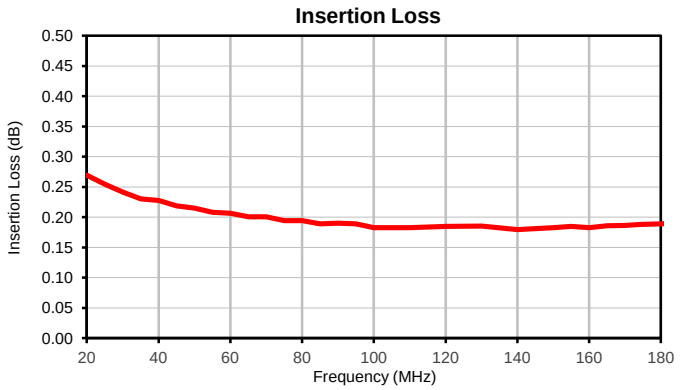
Directional Coupler SYDC20-171VHP+

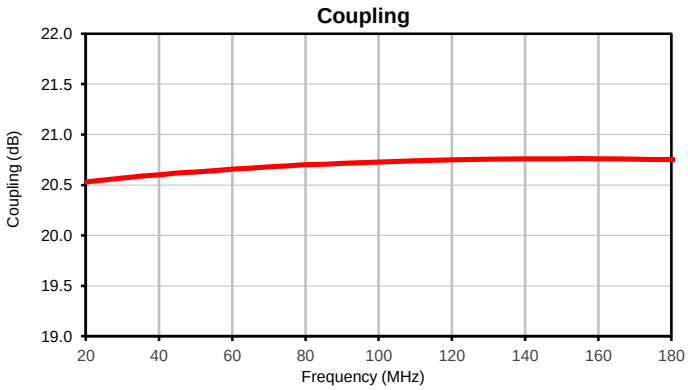
Typical Performance Data

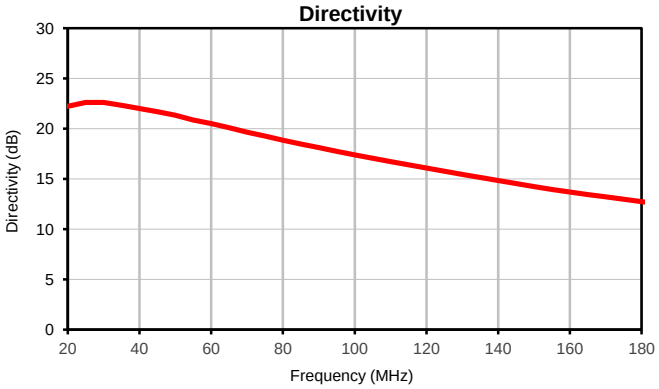
FREQUENCY (MHz)	INSERTION LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		
				IN	OUT	CPL
20.0	0.27	20.53	22.23	23.67	23.90	24.59
25.0	0.25	20.55	22.61	25.17	25.52	26.64
30.0	0.24	20.57	22.60	26.52	26.99	28.53
35.0	0.23	20.59	22.34	27.59	28.39	30.36
40.0	0.23	20.60	22.01	28.55	29.54	32.23
45.0	0.22	20.62	21.68	29.55	30.80	34.22
50.0	0.21	20.63	21.32	30.47	31.88	36.38
55.0	0.21	20.64	20.87	31.39	33.18	38.76
60.0	0.21	20.66	20.49	32.36	34.30	41.29
65.0	0.20	20.67	20.08	33.36	35.72	43.16
70.0	0.20	20.68	19.66	34.22	37.26	43.12
75.0	0.19	20.69	19.25	35.16	38.64	41.33
80.0	0.19	20.70	18.84	35.93	40.59	39.23
85.0	0.19	20.71	18.48	36.68	42.26	37.34
90.0	0.19	20.72	18.10	37.17	44.52	35.74
95.0	0.19	20.72	17.75	37.55	45.93	34.37
100.0	0.18	20.73	17.39	37.79	46.50	33.19
110.0	0.18	20.74	16.73	37.73	43.97	31.22
120.0	0.18	20.75	16.07	37.22	40.53	29.63
130.0	0.19	20.75	15.44	35.97	37.71	28.30
140.0	0.18	20.76	14.82	34.28	35.13	27.15
150.0	0.18	20.76	14.22	32.78	33.13	26.14
155.0	0.18	20.76	13.95	32.23	32.53	25.68
160.0	0.18	20.76	13.70	31.72	31.90	25.24
165.0	0.19	20.76	13.44	31.32	31.38	24.83
170.0	0.19	20.76	13.20	30.88	30.96	24.43
174.0	0.19	20.75	13.01	30.56	30.60	24.13
180.0	0.19	20.75	12.73	30.02	30.10	23.70
190.0	0.19	20.74	12.25	29.03	29.15	23.02
200.0	0.19	20.74	11.79	28.01	28.28	22.39

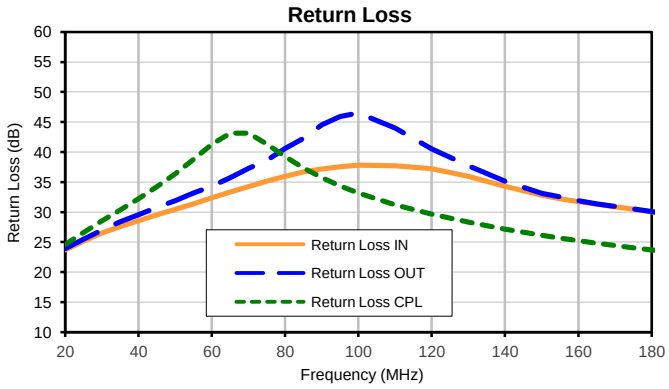
Directional Coupler SYDC20-171VHP+

Typical Performance Curves





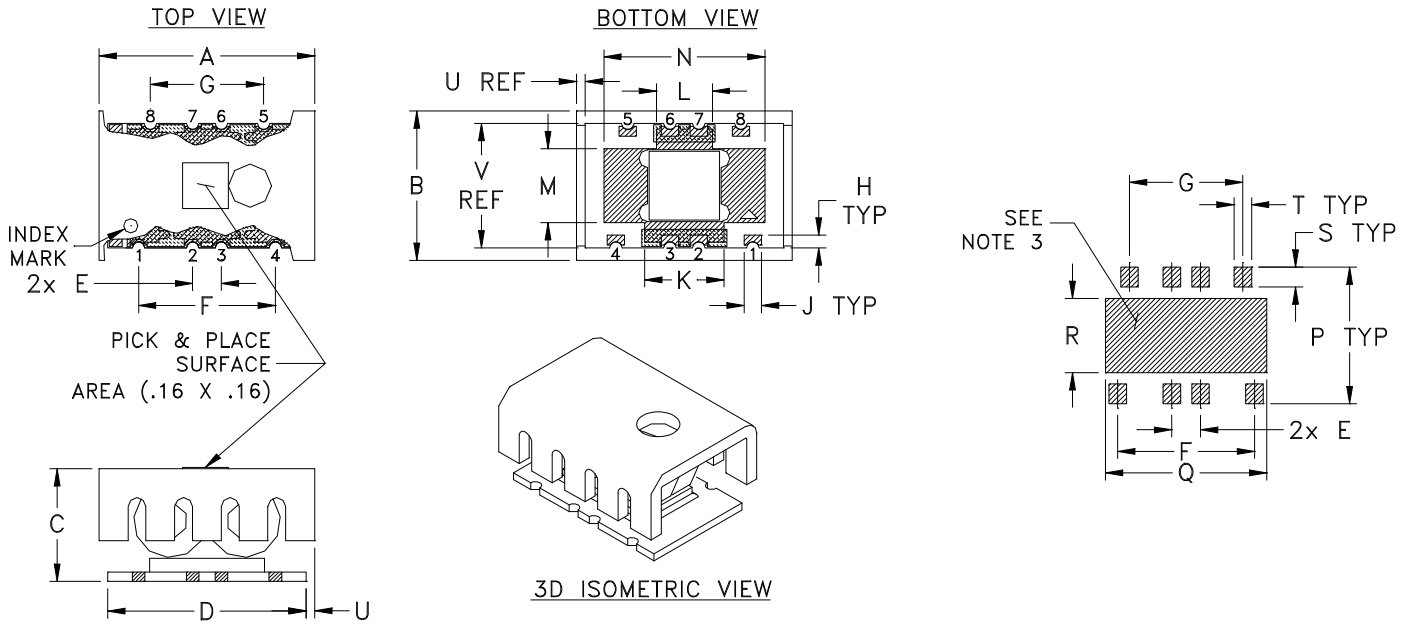




Case Style PD

PD1647-3

Outline Dimensions



CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
PD1647-3	.750 (19.05)	.520 (13.21)	.39 (9.91)	.690 (17.53)	.100 (2.54)	.476 (12.09)	.394 (10.01)	.045 (1.14)	.060 (1.52)	.276 (7.01)	.194 (4.93)	.257 (6.53)	.560 (14.22)

CASE #	P	Q	R	S	T	U	V	WT, GRAM
PD1647-3	.475 (12.07)	.561 (14.25)	.258 (6.55)	.069 (1.75)	.061 (1.55)	.030 (0.76)	.433 (11.00)	2.60

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3 Pl. ± .015

Notes:

1. Heat sink material: Black anodized aluminum alloy.
2. Base material: Printed wiring laminate.
3. Termination finish: Tin copper solder alloy up to 0.07% Nickel. All models, (+) suffix.

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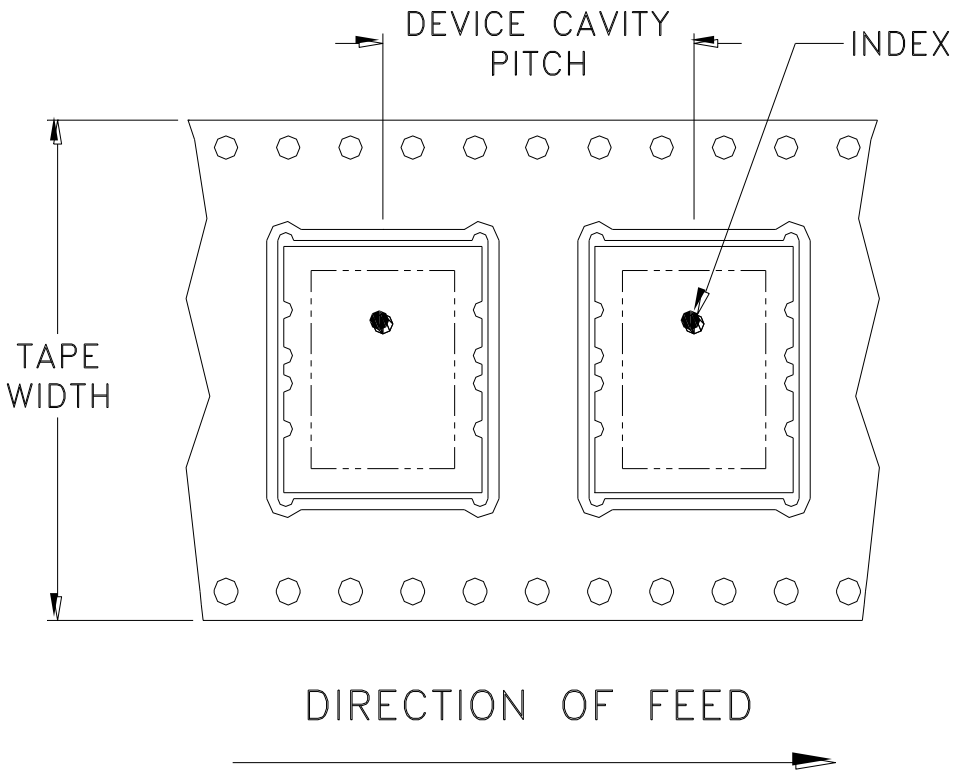
Tape & Reel Packaging TR-F107

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
32	20	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200

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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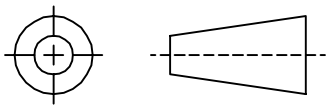
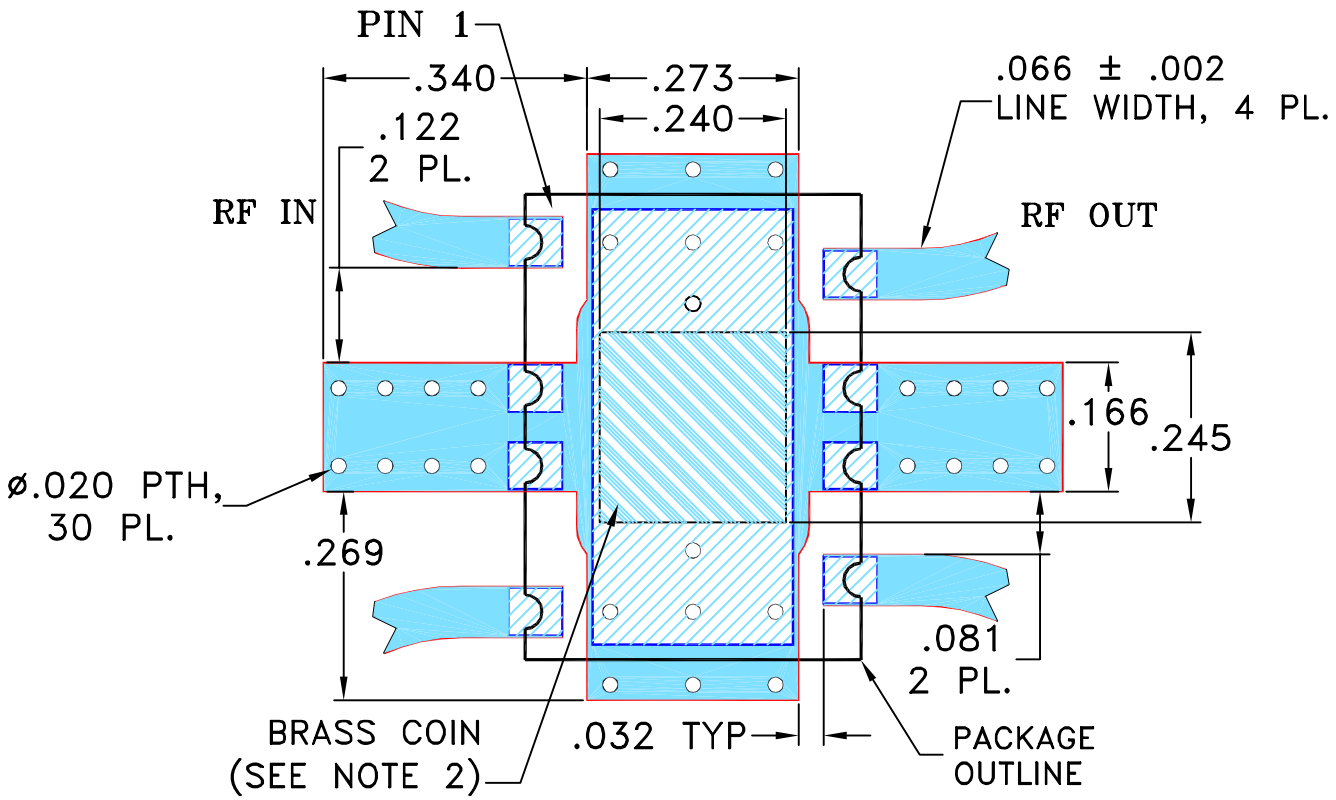
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M133287	NEW RELEASE	08/26/11	GF	WP

SUGGESTED MOUNTING CONFIGURATION FOR AH1647 CASE STYLE, "08DC05" 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. SUGGEST TO PROVIDE BRASS COIN FOR BETTER HEAT TRANSFER FROM THE UNIT. OTHERWISE PROVIDE ARRAY OF THERMAL VIAS ADEQUATE TO LIMIT TEMPERATURE OF GROUND CONNECTIONS UNDER THE UNIT TO 65°C.
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

DENOTES BRASS COIN.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	GF	08/22/11
TOLERANCES ON:	CHECKED	IL	08/25/11
2 PL DECIMALS ±	APPROVED	WP	08/26/11
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

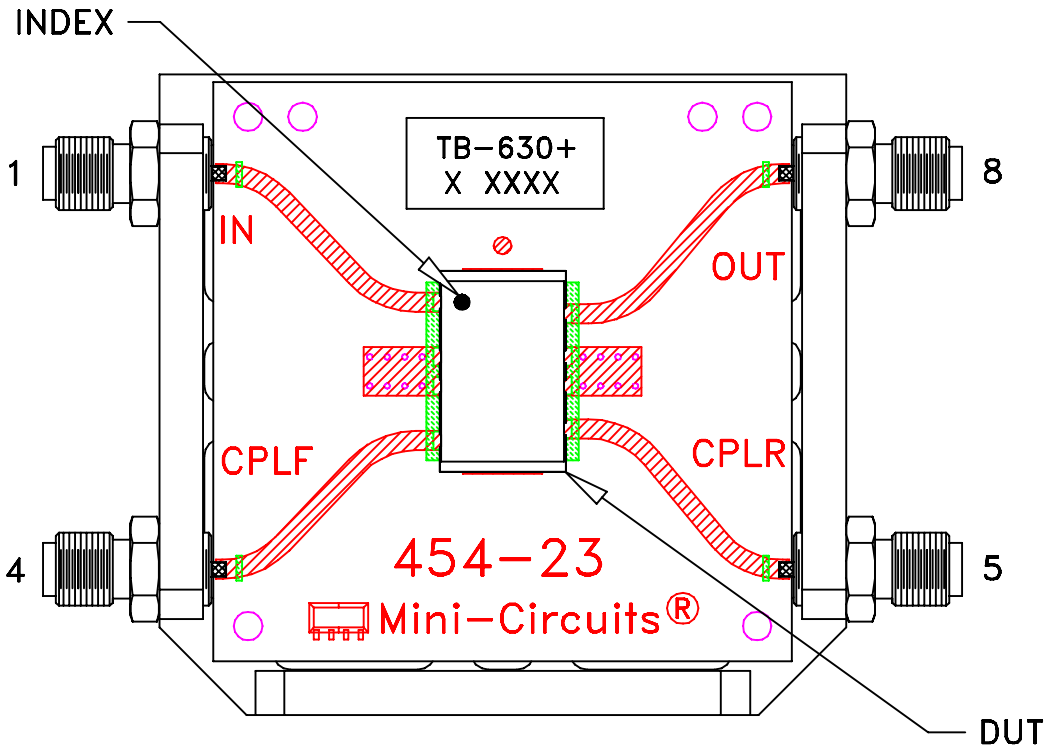
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 08DC05, AH1647, TB-630+

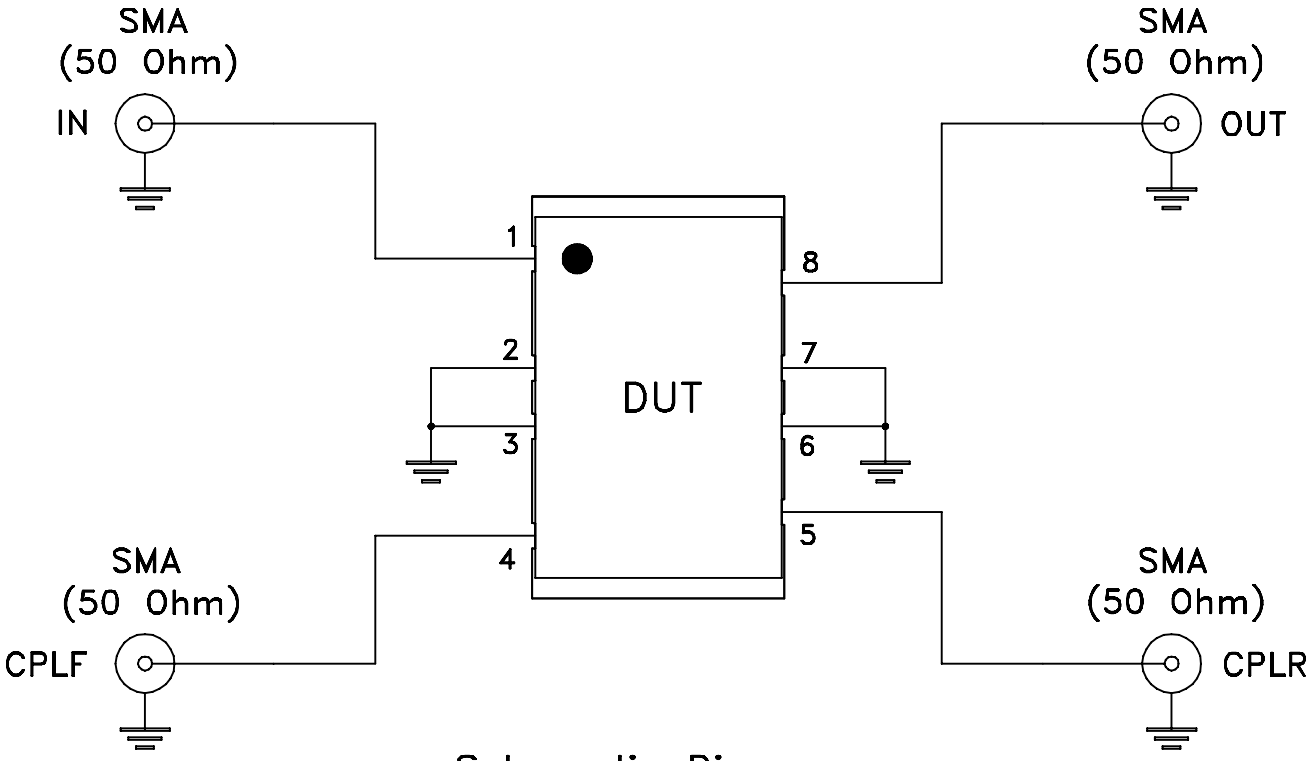
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-351	OR

FILE:	SCALE:	SHEET:
98PL351	4:1	1 OF 1

Evaluation Board and Circuit



TB-630+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent.
   Dielectric Constant=3.5, Thickness=.030 inch.

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Environmental Specifications **ENV02T4**

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 65° C Case 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, Para 4.2.5, Test S, 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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