



## SURFACE MOUNT, HIGH POWER

# Bi-Directional Coupler

## SYDC-20-12UHP+

50Ω 1 to 150 MHz 20 dB Coupling Up to 150 Watts

### KEY FEATURES

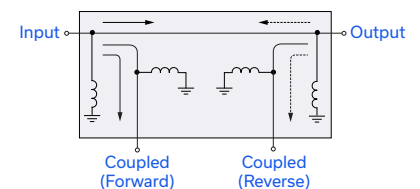
- High Power Handling, Up to 150 Watts
- Very Low Mainline Loss, 0.20 dB Typ.
- Great Return Loss, 29 dB Typ.



Generic photo used for illustration purposes only

### FUNCTIONAL DIAGRAM

BI-DIRECTIONAL COUPLER\*



\*Electrical schematic is for Bi-Directional coupler with internal transformer(s) that routes DC from all ports to ground.

### APPLICATIONS

- Military Mobile

### PRODUCT OVERVIEW

Mini-Circuits' SYDC-20-12UHP+ surface mount bi-directional coupler provides exceptionally high-power handling up to 150 W and low mainline loss of 0.18 dB for applications from 1 to 150 MHz. This model features a unique heat sink design that enables reliable operation at high power without overheating, making it an ideal choice for systems where high-power capability and small size are desired. The coupler features core and wire construction mounted on an 8-lead printed laminate base with wraparound terminations for excellent solderability. This unit measures 0.690x0.433x0.028", accommodating dense circuit board layouts.

### ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		1		150	MHz
Mainline Loss (Above Theoretical Loss 0.05 dB)	10-30		0.12	0.17	dB
	5-50		0.13	0.19	
	1-150		0.20	0.29	
Nominal Coupling	1-150		20.3±1		dB
Coupling Flatness (±)	1-150		±0.16	±0.35	dB
Directivity	1-50	24	34		dB
	50-100	18	27		
	100-150	15	24		
Return Loss (Input & Output)	1-150	19	26		dB
Return Loss (CPL)	1-150	19	29		dB
Input Power <sup>2</sup>	10-30		150		W
	5-50		100		
	1-150		50		

1. Tested on Eval Board TB-SYDC2012UHP+.

2. The user must provide adequate means of heat removal to limit the temperature of ground under the PCB to +65°C. To ensure proper performance. At +25°C ambient temperature this requires thermal resistance of the user's PC board heat sink to be 16°C/W or less when the unit is driven at maximum specified RF input power 150 W. At high ambient temperature, with the same heat sink, input power in watts must not exceed 150 W x (+65°C - Ambient) ÷ +40°C.

### ABSOLUTE MAXIMUM RATINGS<sup>3</sup>

Operating Case Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Input Power	Up to 150 W

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





SURFACE MOUNT, HIGH POWER

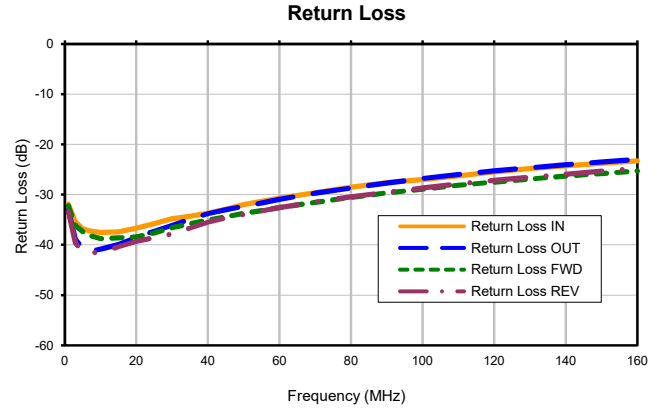
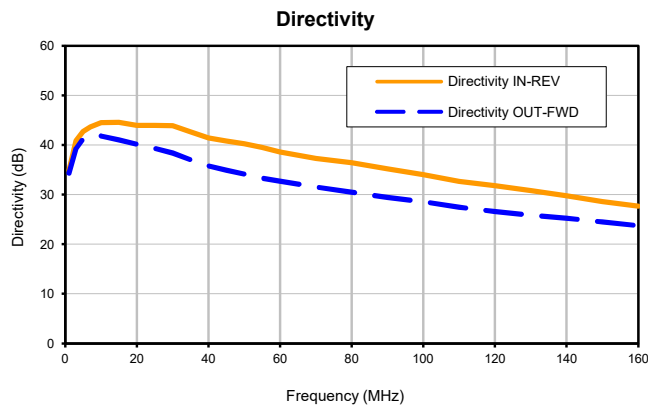
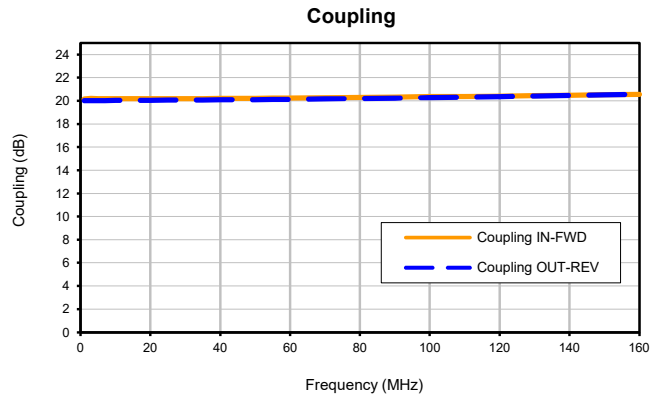
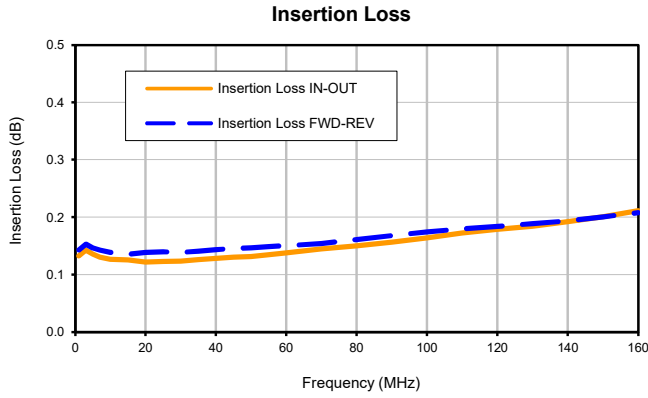
# Bi-Directional Coupler

## SYDC-20-12UHP+

Mini-Circuits

50Ω 1 to 150 MHz 20 dB Coupling Up to 150 Watts

### TYPICAL PERFORMANCE GRAPHS





### FUNCTIONAL DIAGRAM

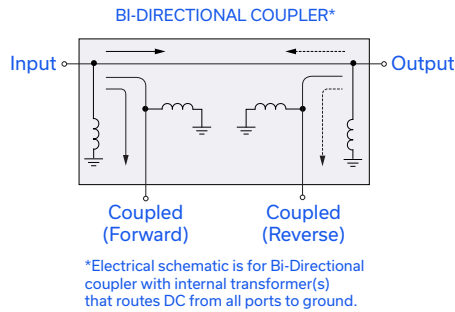
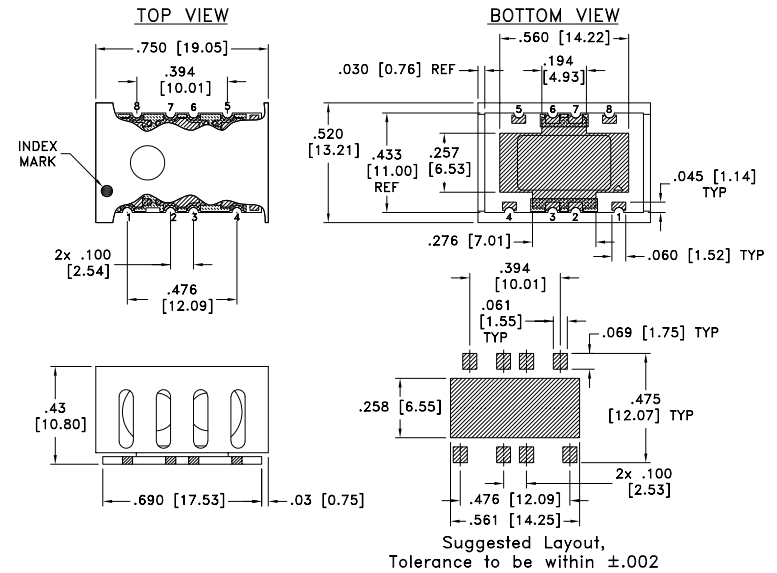


Figure 1. SYDC-20-12UHP+ Functional Diagram

### PAD DESCRIPTION/CONFIGURATION

Function	Pad Number	Description
Input	1	Connects to RF Input Port
Output	8	Connects to RF Output Port
Coupled Forward	4	Connects to Coupled Forward Port
Coupled Reverse	5	Connects to Coupled Reverse Port
Ground	2,3,6,7	Connects to Ground

### CASE STYLE DRAWING

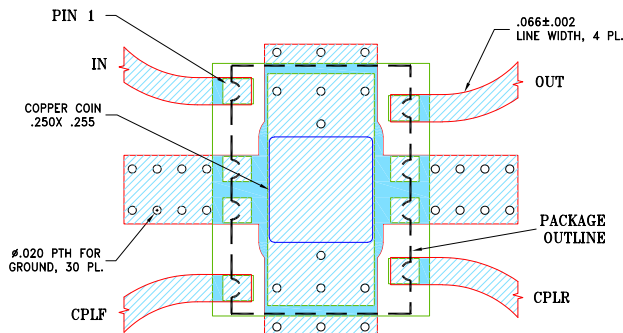


DENOTES METALLIZATION  
 DENOTES SOLDER RESIST

Weight: 2.6 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl.±.005 Inches

### SUGGESTED PCB LAYOUT (PL-843)



**NOTES:**

1. LINE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030±.002; COPPER: 1/2 OZ. FOR OTHER MATERIALS LINE 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

Figure 2. Suggested PCB Layout PL-843

### PRODUCT MARKING\*: N/A

\*Marking may contain other features or characters for internal lot control.



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# SYDC-20-12UHP+

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**ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.**

**CLICK HERE**

<b>Performance Data &amp; Graphs</b>	Data Graphs S-Parameter (SXP Files) Data Set (.zip file) De-embedded to device pads
<b>Case Style</b>	PD1647-6 Lead Finish: ENIG
<b>RoHS Status</b>	Compliant
<b>Tape and Reel</b>	F115
<b>Suggested Layout for PCB Design</b>	PL-843
<b>Evaluation Board</b>	TB-SYDC2012UHP+
	Gerber File
<b>Environmental Rating</b>	ENV02T1

- 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.
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# Bi-Directional Coupler

# SYDC-20-12UHP+

## Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB)		COUPLING (dB)		DIRECTIVITY (dB)		RETURN LOSS (dB)			
	IN-OUT	FWD-REV	IN-FWD	OUT-REV	IN-REV	OUT-FWD	IN	OUT	FWD	REV
1.00	0.13	0.14	20.17	20.02	34.87	34.30	31.89	33.05	32.19	33.32
3.00	0.14	0.15	20.21	20.03	40.83	39.33	35.41	38.94	36.14	39.60
5.00	0.14	0.15	20.19	20.04	42.70	41.32	36.80	40.64	37.34	41.41
7.00	0.13	0.14	20.19	20.04	43.61	41.52	37.25	41.21	38.13	41.44
10.00	0.13	0.14	20.18	20.04	44.48	41.83	37.51	40.82	38.73	41.54
15.00	0.13	0.14	20.18	20.05	44.58	41.05	37.42	39.90	38.60	40.32
20.00	0.12	0.14	20.18	20.06	43.95	40.20	36.67	38.48	38.40	39.33
25.00	0.12	0.14	20.18	20.07	43.95	39.30	35.75	37.23	37.58	38.53
30.00	0.12	0.14	20.18	20.08	43.89	38.40	34.77	36.09	36.54	37.75
35.00	0.13	0.14	20.19	20.09	42.67	37.02	34.29	34.84	35.74	36.63
40.00	0.13	0.14	20.20	20.10	41.39	35.83	33.71	33.73	35.03	35.48
45.00	0.13	0.15	20.21	20.11	40.81	34.92	32.89	32.97	34.36	34.63
50.00	0.13	0.15	20.22	20.12	40.22	34.10	32.00	32.30	33.72	33.94
55.00	0.13	0.15	20.23	20.13	39.52	33.36	31.30	31.62	33.15	33.23
60.00	0.14	0.15	20.23	20.14	38.59	32.71	30.71	30.92	32.56	32.54
70.00	0.14	0.15	20.26	20.17	37.28	31.52	29.61	29.67	31.49	31.43
80.00	0.15	0.16	20.28	20.21	36.43	30.47	28.51	28.67	30.51	30.38
90.00	0.16	0.17	20.31	20.24	35.19	29.45	27.59	27.68	29.62	29.49
100.00	0.16	0.17	20.36	20.29	34.01	28.61	27.00	26.73	28.90	28.62
110.00	0.17	0.18	20.37	20.32	32.67	27.49	26.26	25.94	28.10	27.86
120.00	0.18	0.18	20.41	20.36	31.82	26.61	25.48	25.26	27.47	27.13
130.00	0.18	0.19	20.44	20.41	30.81	25.88	24.82	24.65	26.86	26.51
140.00	0.19	0.19	20.48	20.46	29.75	25.23	24.26	24.04	26.29	25.87
150.00	0.20	0.20	20.53	20.52	28.61	24.50	23.75	23.47	25.78	25.29
160.00	0.21	0.21	20.58	20.58	27.66	23.74	23.24	22.93	25.25	24.78



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



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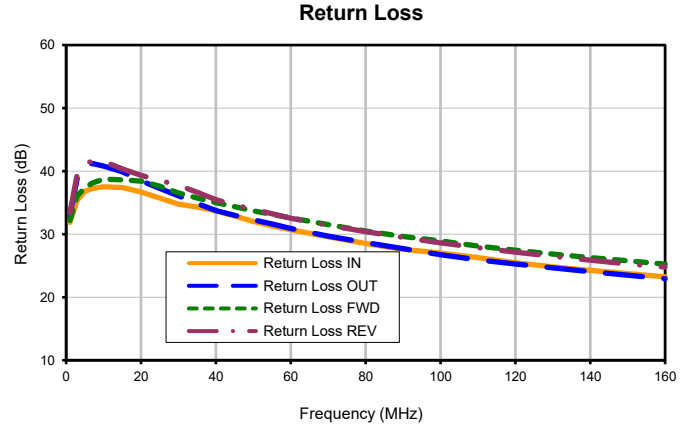
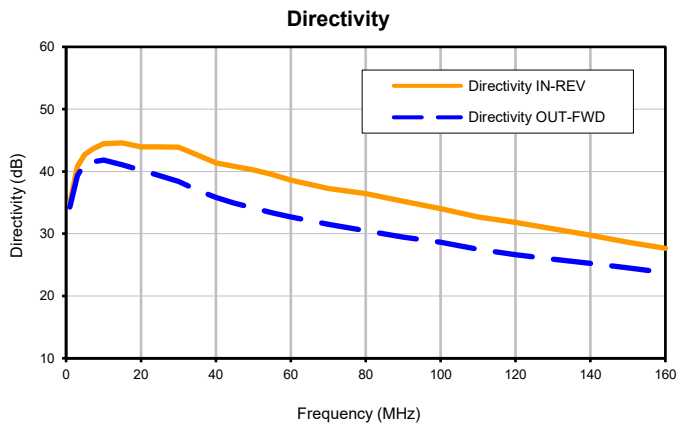
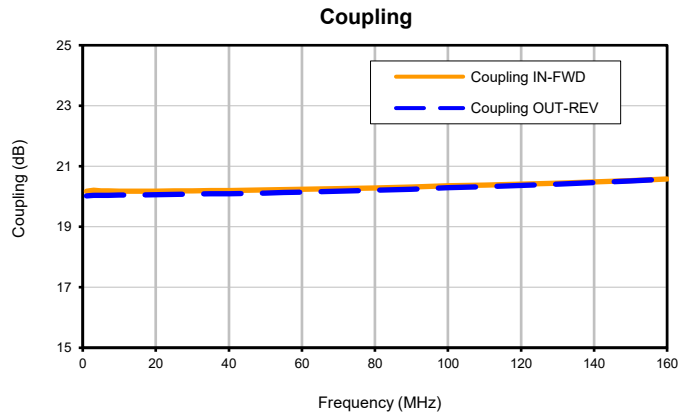
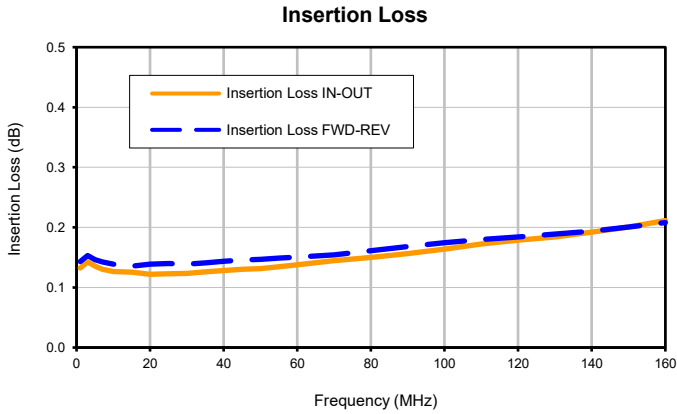
IF/RF MICROWAVE COMPONENTS

REV. OR  
SYDC-20-12UHP+  
1/27/2026  
Page 1 of 1

# Bi-Directional Coupler

## Typical Performance Curves

SYDC-20-12UHP+

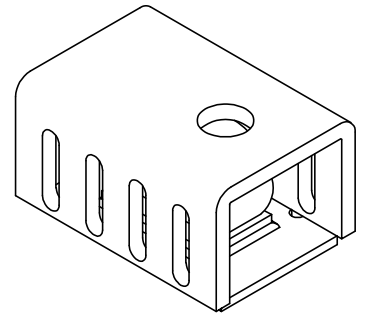


# Case Style

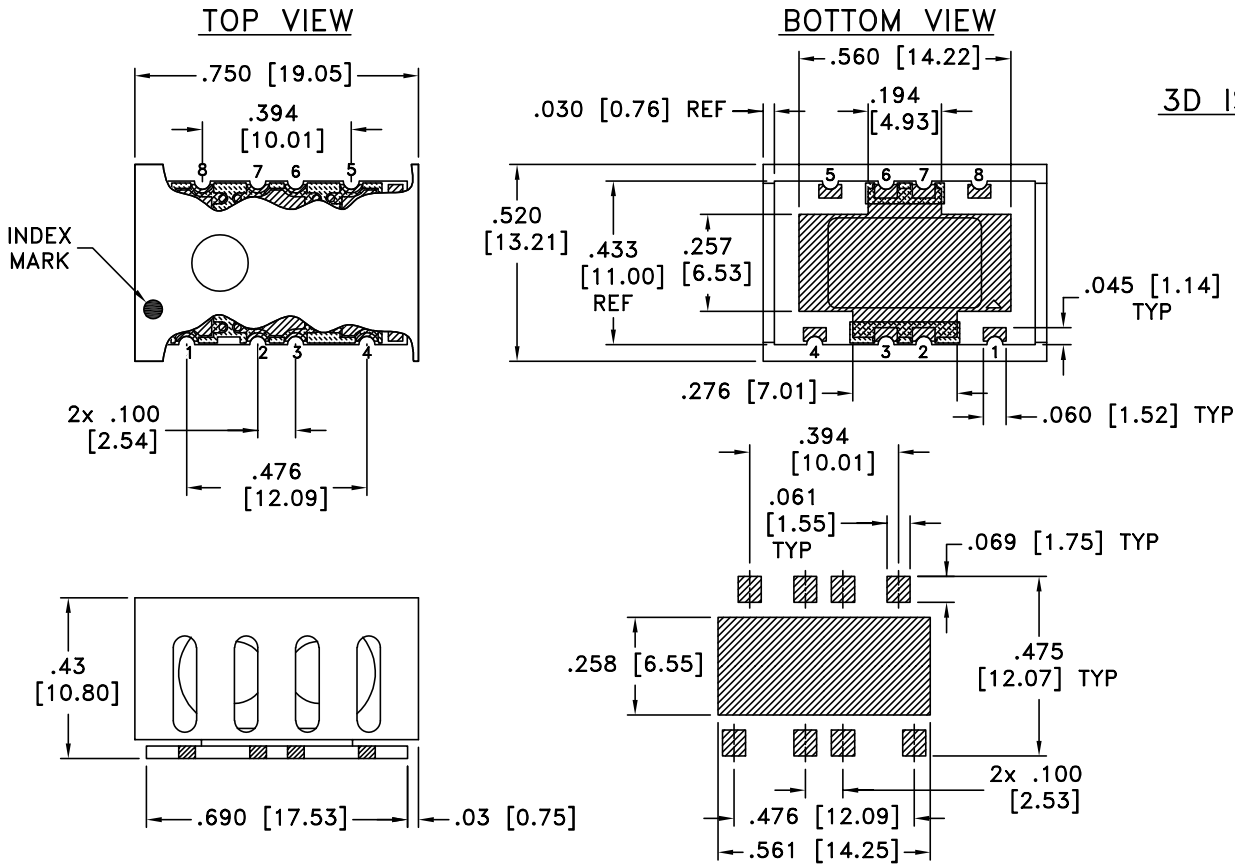
## Outline Dimensions

PD

PD1647-6



3D ISOMETRIC VIEW



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

- DENOTES METALLIZATION
- DENOTES SOLDER RESIST

Weight: 2.6 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$  Inches

### 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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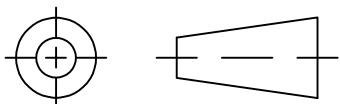
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RF/MICROWAVE COMPONENTS

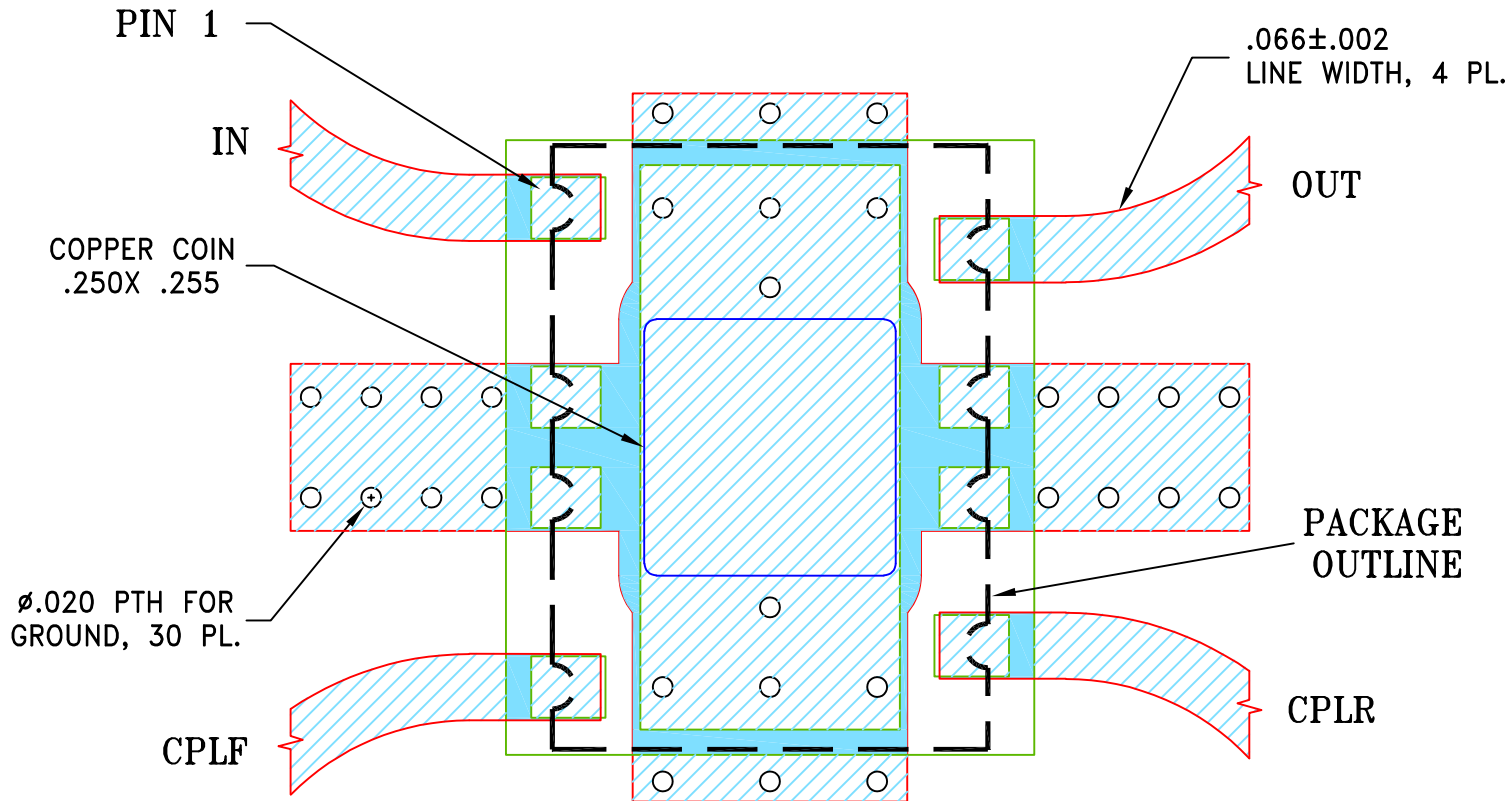
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-028575	NEW RELEASE	02/19/25	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR  
PD1647-6 CASE STYLE

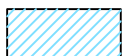


NOTES:

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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON:  
2 PL DECIMALS  $\pm$   
3 PL DECIMALS  $\pm$  .005  
ANGLES  $\pm$   
FRACTIONS  $\pm$

	INITIALS	DATE
DRAWN	ITG	02/19/25
CHECKED	NP	02/19/25
APPROVED	IL	02/19/25



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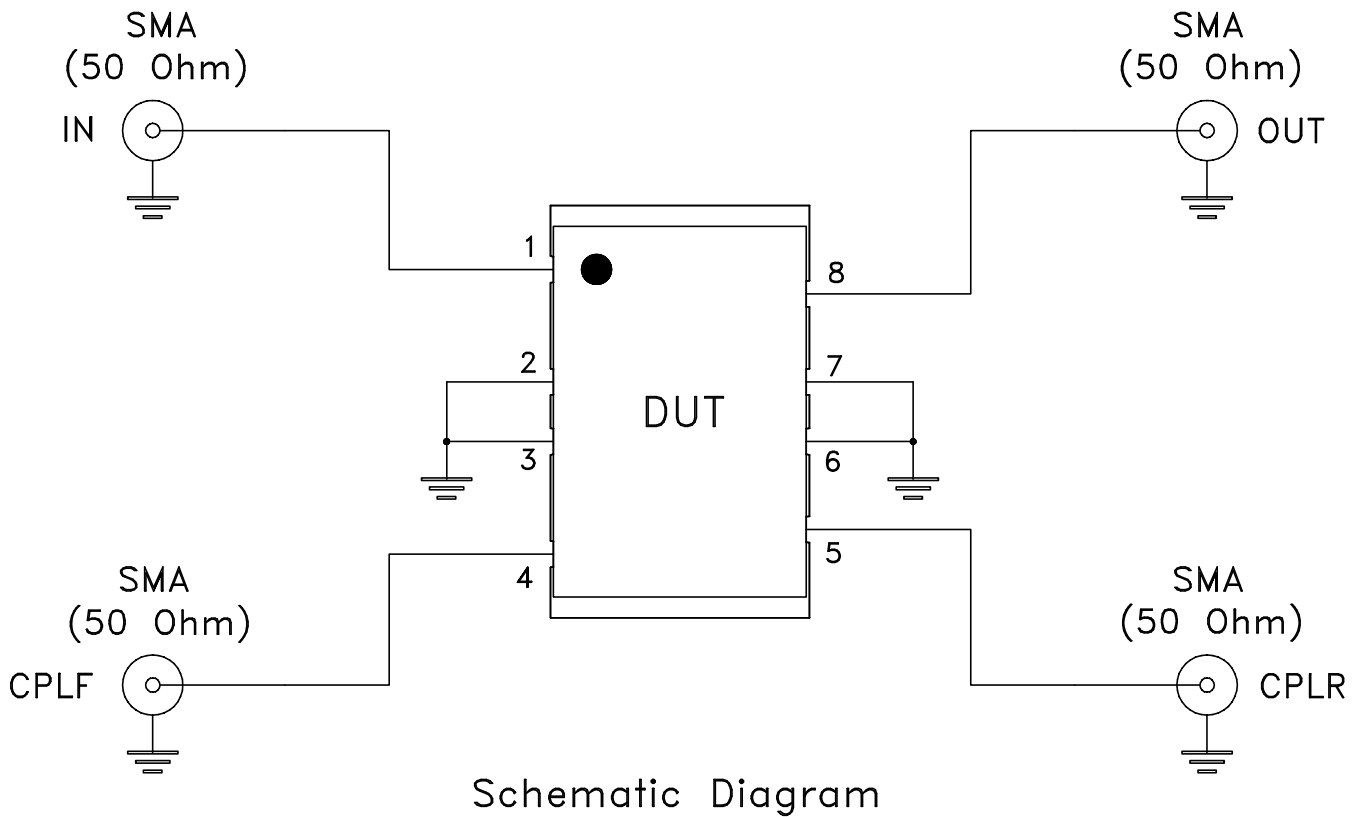
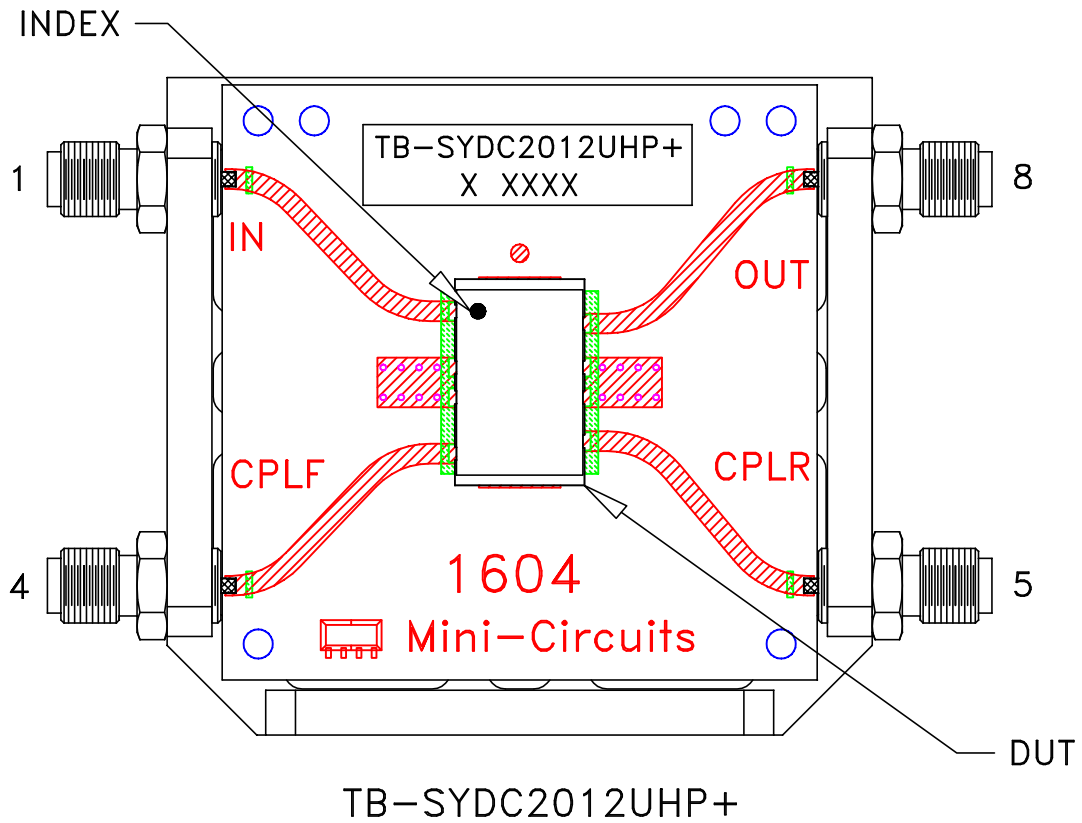
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PL, PD1647-6, TB-SYDC2012UHP+

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-843	REV: OR
FILE: 98PL843	SCALE: 5:1	SHEET: 1 OF 1	

# Evaluation Board and Circuit



## Notes:

- 50 Ohm SMA Female connectors.
- PCB Material: R04350B or equivalent.  
Dielectric Constant=3.5, Thickness=.030±.002 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 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