



Mini-Circuits®

SURFACE MOUNT

Bi-Directional Coupler

SYDC-18-23+

50Ω 18 dB Coupling 10 to 2000 MHz

FEATURES

- High Directivity, 20 dB Typ.
- Wideband Frequency, 10 to 2000 MHz
- Excellent VSWR, 1.25:1 Typ.

APPLICATIONS

- Cellular
- Instrumentation
- Communications
- GPS



Generic photo used for illustration purposes only

CASE STYLE: AH202-1

+RoHS Compliant

The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualificationsELECTRICAL SPECIFICATIONS AT +25°C¹

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		10		2000	MHz
Mainline Loss	10		0.8	1.2	dB
	30		0.7	1.0	
	1000		0.6	0.9	
	2000		1.0	1.5	
Coupling	10-2000		17.8±0.8		dB
Coupling Flatness (±)	10-300		±0.2	±0.4	dB
	300-1000		±0.3	±0.5	
	1000-2000		±0.4	±0.9	
Directivity	10	14	17		dB
	30	18	21		
	1000	15	20		
	2000	14	20		
Return Loss (Input)	10		18		dB
	30		21		
	1000		20		
	2000		14		
Return Loss (Output)	10		18		dB
	30		22		
	1000		20		
	2000		16		
Return Loss (Coupling)	10		18		dB
	30		21		
	1000		20		
	2000		16		
Input Power ²	10			1	W
	30-1000			2	
	1000-2000			2	

1. Tested on Evaluation Board TB-SYDC-18-23+.

2. The user must provide adequate means of heat removal to limit the temperature of ground connections 2,3,6,7 to +85°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 27°C/W or less when the unit is driven at maximum specified RF input power, X W.

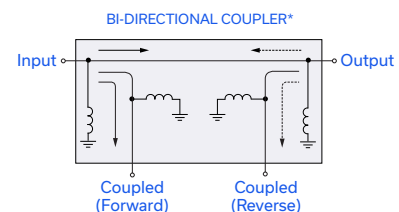
At higher ambient temperature, with the same heat sink. Input power in watts must not exceed $X W \times (+85^{\circ}\text{C} - T_{\text{ambient}}) \div +60^{\circ}\text{C}$, where X = 1 at 10 MHz and 2 over 30 to 2000 MHz.

ABSOLUTE 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.

ELECTRICAL SCHEMATIC



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

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MCL NY
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Bi-Directional Coupler

SYDC-18-23+

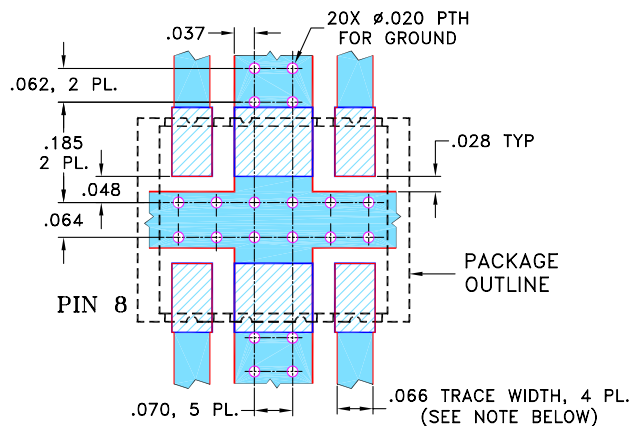
50Ω 18 dB Coupling 10 to 2000 MHz

PAD CONNECTIONS

INPUT	8
OUTPUT	1
COUPLED (FORWARD)	5
COUPLED (REVERSE)	4
GROUND	2, 3, 6, 7

***PRODUCT MARKING:** SYDC-18-23

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

DEMO BOARD MCL P/N: TB-SYDC-18-23+
SUGGESTED PCB LAYOUT (PL-246)


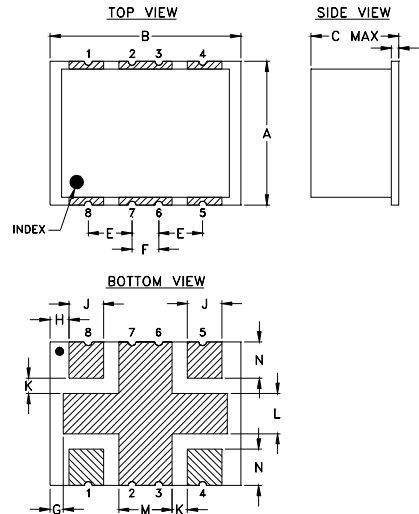
NOTES:

- 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.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

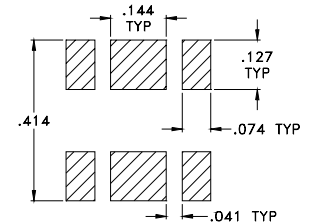

 DENOTES PCB COPPER LAYOUT WITH SMOBC
 (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

OUTLINE DRAWING



PCB Land Pattern


 Suggested Layout,
 Tolerance to be within ±.002

OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F	G
.38	.50	.25	.020	.115	.070	.035
9.65	12.70	6.35	0.51	2.92	1.78	0.89
H	J	K	L	M	N	wt
.050	.090	.040	.105	.140	.095	grams
1.27	2.29	1.02	2.67	3.56	2.41	0.80

TAPE & REEL INFORMATION: F61



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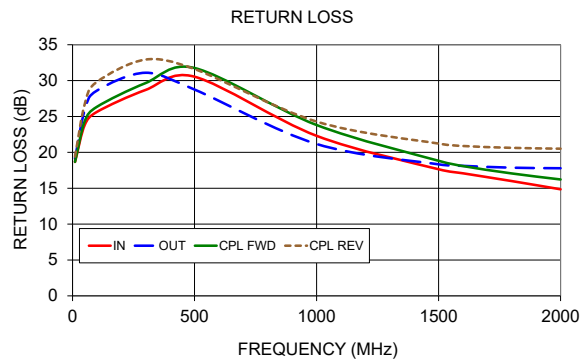
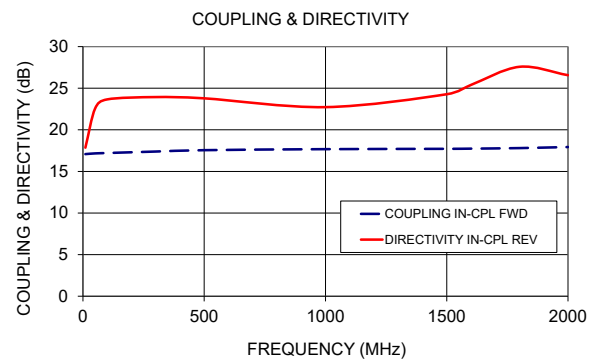
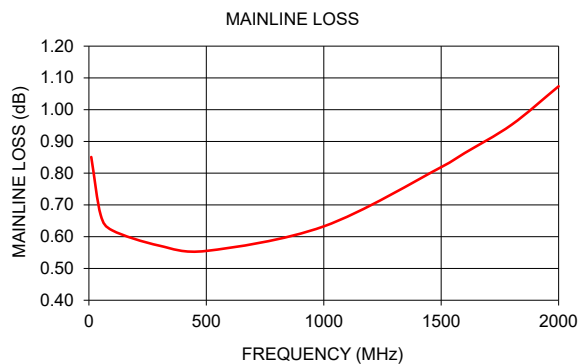
Bi-Directional Coupler

SYDC-18-23+

50Ω 18 dB Coupling 10 to 2000 MHz

TYPICAL PERFORMANCE DATA

Frequency (MHz)	Mainline Loss (dB)	Coupling (dB)		Directivity (dB)		Return Loss (dB)			
	In-Out	In-Cpl Fwd	Out-Cpl Rev	Out-Cpl Fwd	In-Cpl Rev	In	Out	Cpl Fwd	Cpl Rev
10	0.85	17.08	18.41	19.19	17.85	18.66	19.15	18.68	19.40
50	0.67	17.17	18.09	23.85	22.55	23.83	25.90	24.36	26.73
100	0.62	17.21	18.02	24.93	23.66	25.64	28.61	26.35	29.82
300	0.57	17.39	18.04	25.38	23.94	28.71	31.10	29.67	32.94
500	0.56	17.55	18.17	24.50	23.78	30.54	28.75	31.76	31.61
1000	0.63	17.68	18.34	21.40	22.73	22.31	21.17	23.81	24.29
1500	0.82	17.71	18.25	23.73	24.28	17.65	18.33	18.83	21.22
1600	0.86	17.74	18.22	24.84	25.40	17.08	18.12	18.09	20.89
1800	0.95	17.80	18.19	28.37	27.57	16.00	17.86	17.06	20.63
2000	1.07	17.93	18.16	39.90	26.56	14.85	17.79	16.22	20.51



- 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.
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Bi-Directional Coupler

SYDC-18-23+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS		COUPLING		DIRECTIVITY		RETURN LOSS			
	(dB)		(dB)		(dB)		(dB)			
	IN-OUT	FWD-REV	IN-FWD	OUT-REV	IN-REV	OUT-FWD	IN	OUT	FWD	REV
5	0.79	0.76	16.90	18.24	14.34	15.37	14.94	14.80	14.59	14.68
6	0.82	0.80	16.97	18.30	15.58	16.79	16.24	16.29	16.09	16.32
7	0.84	0.83	17.02	18.36	16.41	17.73	17.13	17.32	17.08	17.46
8	0.85	0.85	17.05	18.39	17.01	18.34	17.77	18.07	17.75	18.27
9	0.85	0.86	17.07	18.41	17.47	18.82	18.26	18.67	18.27	18.89
10	0.85	0.86	17.08	18.41	17.85	19.19	18.66	19.15	18.68	19.40
20	0.78	0.79	17.13	18.28	20.12	21.49	21.01	22.09	21.31	22.60
30	0.72	0.74	17.14	18.18	21.33	22.71	22.31	23.86	22.81	24.50
40	0.69	0.71	17.16	18.13	22.02	23.39	23.18	25.04	23.68	25.82
50	0.67	0.69	17.17	18.09	22.55	23.85	23.83	25.90	24.36	26.73
70	0.64	0.67	17.19	18.05	23.22	24.43	24.77	27.14	25.29	28.20
90	0.63	0.65	17.20	18.02	23.52	24.80	25.37	28.12	26.05	29.33
100	0.62	0.65	17.21	18.02	23.66	24.93	25.64	28.61	26.35	29.82
300	0.57	0.61	17.39	18.04	23.94	25.38	28.71	31.10	29.67	32.94
500	0.56	0.59	17.55	18.17	23.78	24.50	30.54	28.75	31.76	31.61
700	0.57	0.59	17.65	18.29	23.64	23.23	27.59	25.05	28.71	27.71
900	0.60	0.61	17.68	18.33	23.09	21.66	23.78	22.07	25.17	25.17
1000	0.63	0.64	17.68	18.34	22.73	21.40	22.31	21.17	23.81	24.29
1100	0.67	0.66	17.68	18.33	22.62	21.41	20.89	20.22	22.48	23.01
1200	0.70	0.69	17.68	18.30	22.96	21.56	19.94	19.68	21.60	22.56
1300	0.74	0.72	17.70	18.29	23.00	21.89	19.03	19.07	20.62	22.00
1400	0.78	0.76	17.70	18.28	23.71	22.71	18.30	18.57	19.80	21.60
1500	0.82	0.79	17.71	18.25	24.28	23.73	17.65	18.33	18.83	21.22
1600	0.86	0.83	17.74	18.22	25.40	24.84	17.08	18.12	18.09	20.89
1700	0.91	0.87	17.77	18.20	26.51	26.40	16.55	17.96	17.47	20.47
1800	0.95	0.91	17.80	18.19	27.57	28.37	16.00	17.86	17.06	20.63
1900	1.01	0.95	17.86	18.18	27.59	32.11	15.39	17.63	16.71	20.52
2000	1.07	1.01	17.93	18.16	26.56	39.90	14.85	17.79	16.22	20.51
2100	1.14	1.07	18.09	18.16	26.87	40.36	14.32	18.05	15.76	20.88
2300	1.28	1.22	18.37	18.39	21.39	26.25	13.68	19.09	14.99	22.08
2400	1.36	1.28	18.50	18.40	19.64	21.01	13.42	19.56	14.83	22.00
2500	1.45	1.37	18.71	18.47	18.34	17.95	13.21	19.96	14.58	21.44
2600	1.54	1.45	18.87	18.56	16.87	15.55	13.02	20.26	14.68	21.41



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IF/RF MICROWAVE COMPONENTS

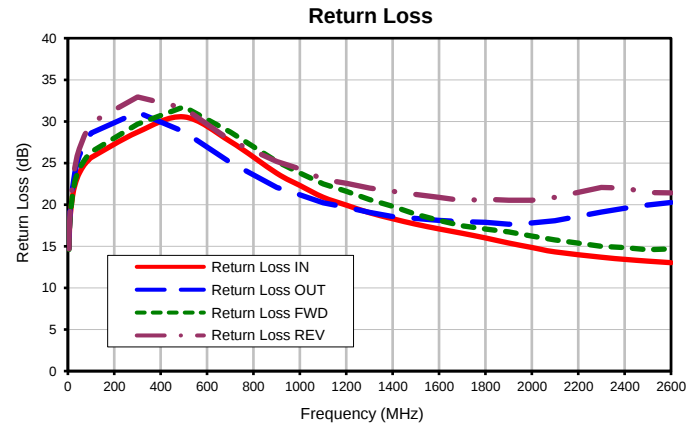
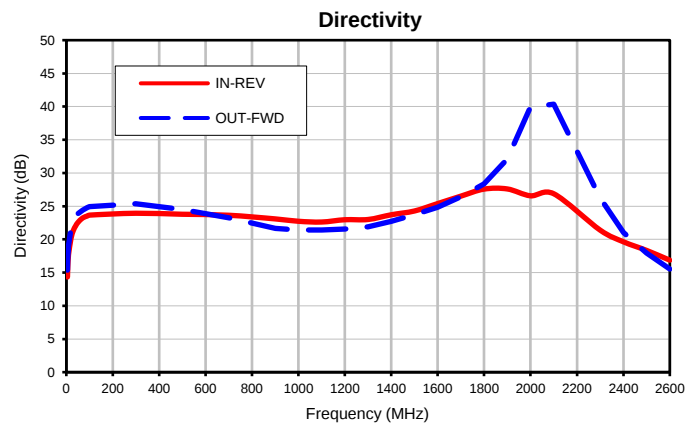
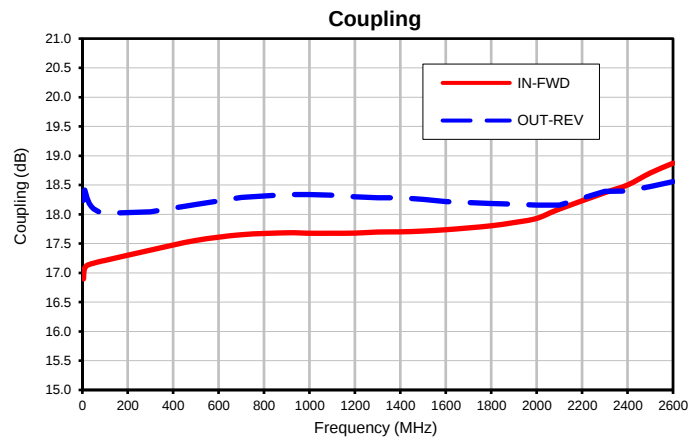


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Bi-Directional Coupler

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Typical Performance Curves



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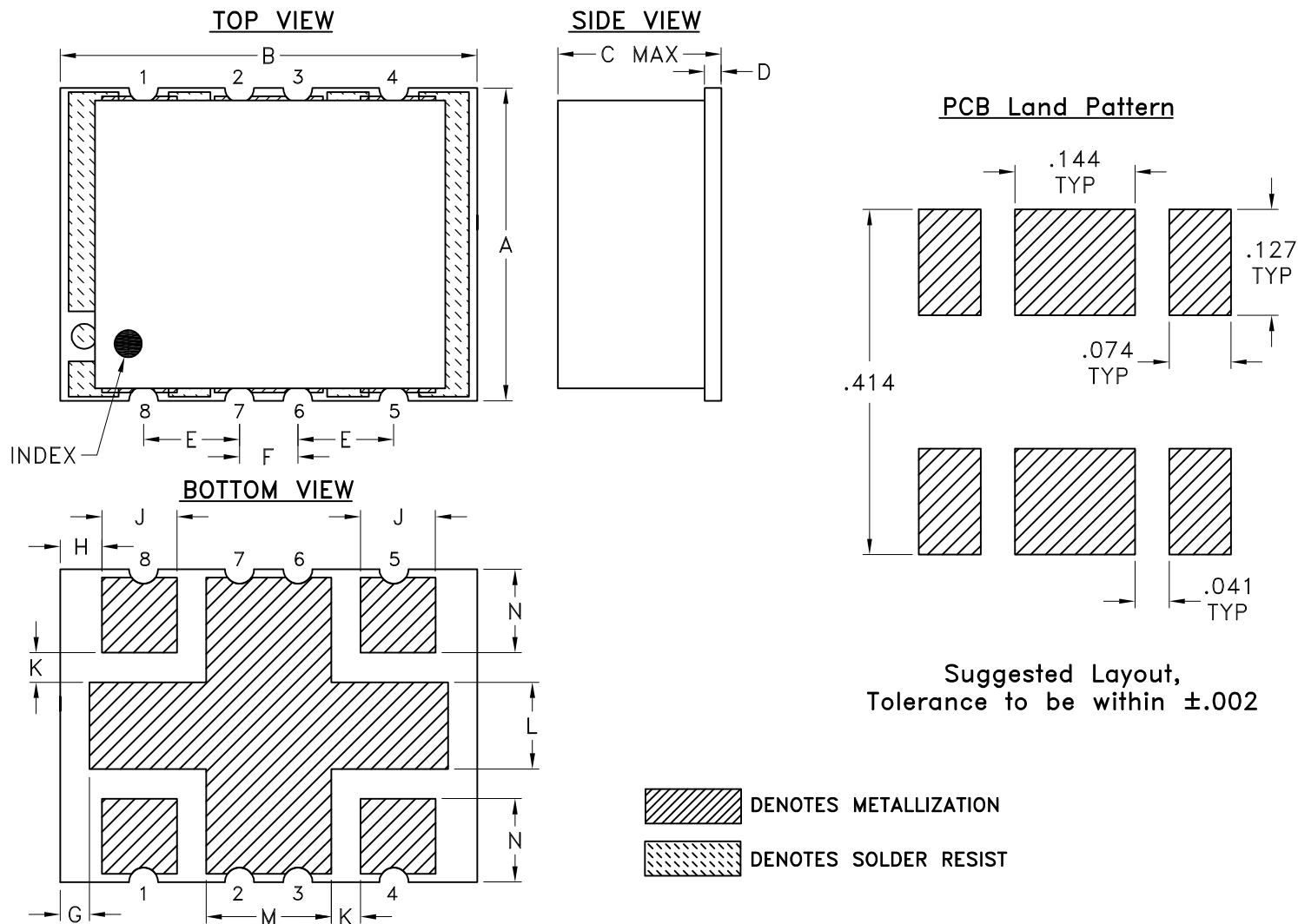
IF/RF MICROWAVE COMPONENTS



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Outline Dimensions

AH202-1



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	WT, GRAM
AH202-1	.38 (9.65)	.50 (12.70)	.25 (6.35)	.020 (0.51)	.115 (2.92)	.070 (1.78)	.035 (0.89)	.050 (1.27)	.090 (2.29)	.040 (1.02)	.105 (2.67)	.140 (3.56)	.095 (2.41)	.80

Dimensions are in inches (mm). Tolerances: 2 Pl. ± 0.01 ; 3 Pl. ± 0.005

Notes:

- Case material: Nickel Silver alloy.
- Base material: Printed wiring laminate.
- Termination finish:

For RoHS 3-5 μ inch (.08-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.

All models, (+) suffix.

For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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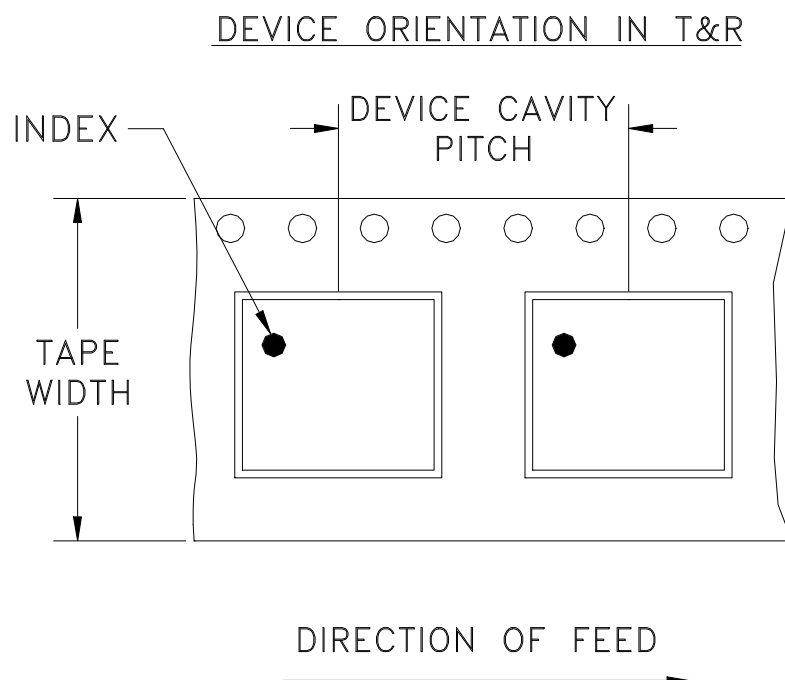
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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F61



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
24	12	13	200

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

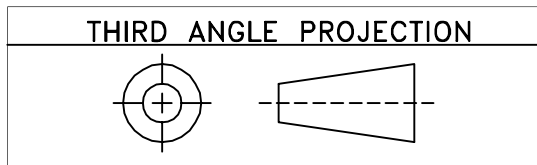


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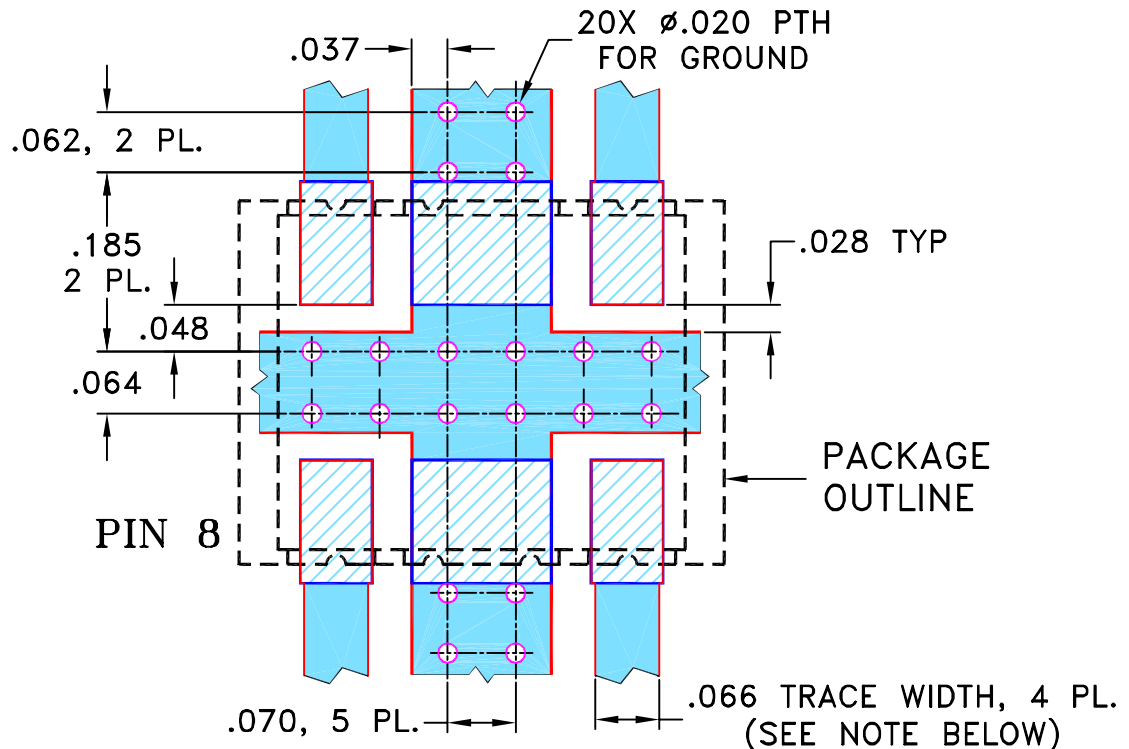
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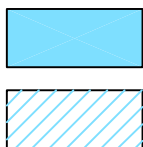
REVISIONS					
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	M107473	NEW RELEASE	09/25/06	AV	DY

**SUGGESTED MOUNTING CONFIGURATION
FOR AH202-1 CASE STYLE, "rr" PIN CONNECTION**



NOTES:

- 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.
- 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 $\pm$ 3 PL DECIMALS $\pm$.005 ANGLES $\pm$ FRACTIONS $\pm$	DRAWN	AV	09/19/06
	CHECKED	IL	09/25/06
	APPROVED	DY	09/25/06



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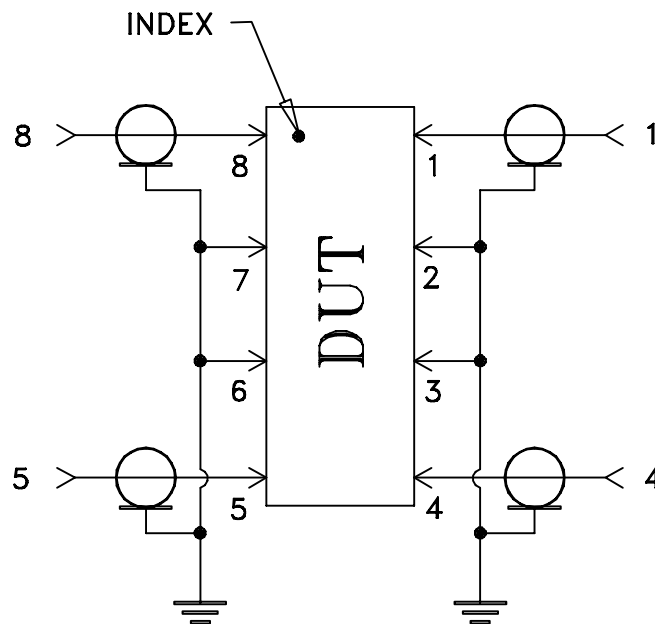
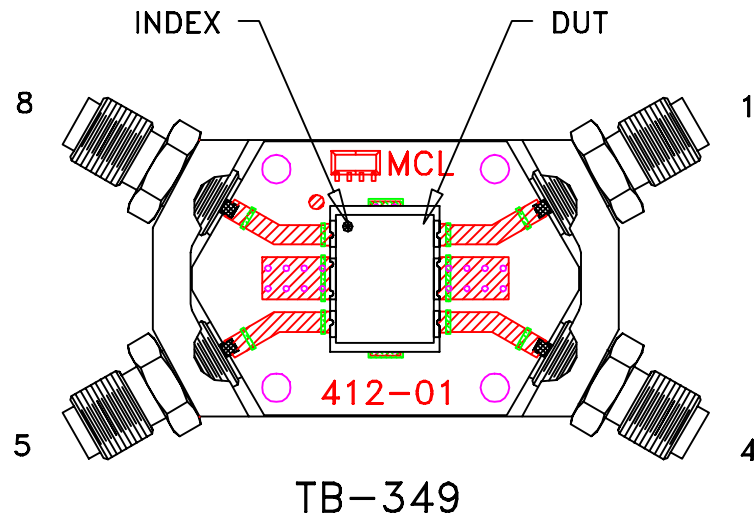
PL, rr, AH202-1, SYDC, TB-349

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-246	REV: OR
FILE: 98PL246	SCALE: 5:1	SHEET: 1 OF 1	

Evaluation Board and Circuit

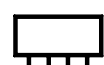
For Pin Connections refer to Data Sheet of the DUT



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,
Dielectric Constant=3.5, Thickness=.030 inch.

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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