SURFACE MOUNT

Bi-Directional Coupler SYBDC-15-13HP+

50Ω 15 dB Coupling 100 to 1000 MHz 10 Watt

THE BIG DEAL

- High power handling, 10 W
- Full decade bandwidth
- Low mainline loss, 0.75 dB typ.
- High directivity, 23 dB typ.
- Excellent VSWR, 1.15:1 typ.

Generic photo used for illustration purposes only

CASE STYLE: AH202-1

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

APPLICATIONS

- VHF/UHF
- Signal monitoring
- Communications
- Military mobile
- Cellular

PRODUCT OVERVIEW

Mini-Circuits' SYBDC-15-13HP+ surface mount bi-directional coupler provides high power handling up to 10W and low mainline loss of 0.75 dB typically for applications from 100 to 1000 MHz. The coupler features core and wire construction mounted on an 8-lead printed laminate base with wrap-around terminations for excellent solderability. The unit measures 0.38 x 0.50 x 0.25", accommodating dense circuit board layouts.

KEY FEATURES

Feature	Advantages
High power handling, 10W	Usable in many systems with high-power requirements
Low mainline loss, 0.75 dB	Provides excellent through-path signal power transmission.
Good directivity, 23 dB typ.	High directivity allows accurate signal sampling through the coupled port with minimal measurement error.
Excellent VSWR, 1.15:1 dB typ. (input/output/coupling)	Provides excellent matching in 50Ω systems with minimal signal reflection.
Small size, 0.38 x 0.50 x 0.25"	Provides high power capability while saving space in systems with tight layouts.

SURFACE MOUNT

Bi-Directional Coupler SYBDC-15-13HP+

50Ω 15 dB Coupling 100 to 1000 MHz 10 Watt

ELECTRICAL SPECIFICATIONS AT 25°C[1]

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		100		1000	MHz
Mainline Loss[2]	100-500 500-1000	— —	0.65 0.75	0.9 1.1	
Nominal Coupling	100-1000	—	15.8±1.0	—	dB
Coupling Flatness (±)	100-500 100-1000	— —	0.3 0.7	0.5 1.0	dB
Directivity	100-500 500-1000	18 15	23 20	— —	dB
Return Loss (Input)	100-1000	18	21	—	dB
Return Loss (Output)	100-1000	18	22	—	dB
Return Loss (Coupling)	100-1000	18	22	—	dB
Input Power[3]	100-1000	—	—	10	W

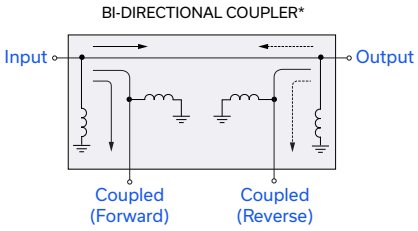
1. Tested on Evaluation Board TB-SYBDC1513HP+
2. Mainline Loss includes theoretical power loss at coupled port.
3. The user must provide adequate means of heat removal to limit the temperature of ground connections 2,3,6,7 to 85°C, in order to ensure proper performance. At 25°C ambient temperature this 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, 10W. At higher ambient temperature, with the same heat sink. Input power in watts must not exceed 10W x (85°C -Tambient)÷60°C.

MAXIMUM RATINGS

Parameter	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.

ELECTRICAL SCHEMATIC



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

SURFACE MOUNT

Bi-Directional Coupler SYBDC-15-13HP+

50Ω 15 dB Coupling 100 to 1000 MHz 10 Watt

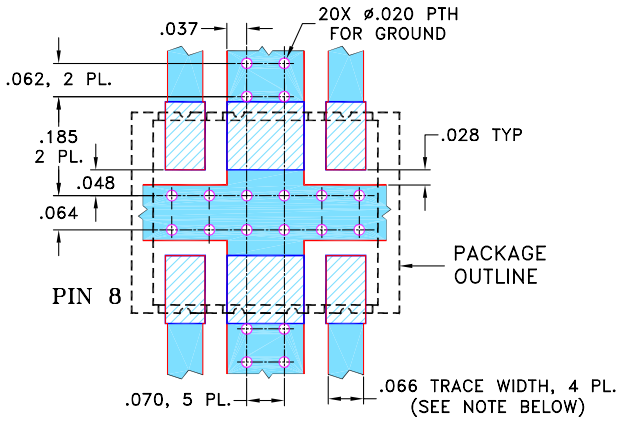
PAD CONNECTIONS

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

PRODUCT MARKING: SYBDC-15-13HP

Marking may contain other features or characters for internal lot control

SUGGESTED PCB LAYOUT (PL-246)



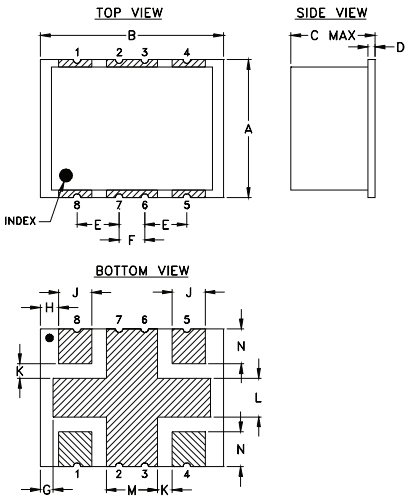
NOTES:

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. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

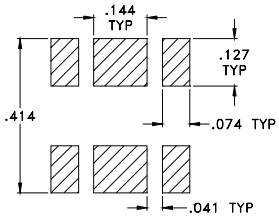
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

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 AND REEL INFORMATION: F61

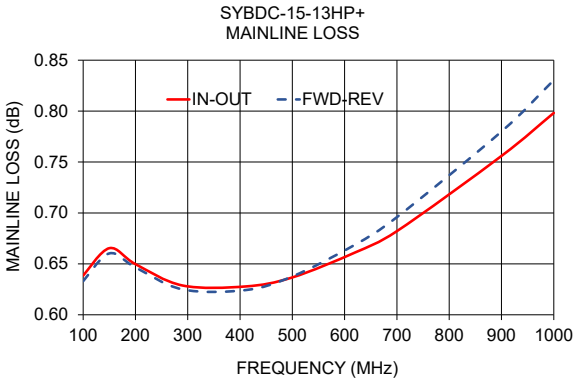
SURFACE MOUNT

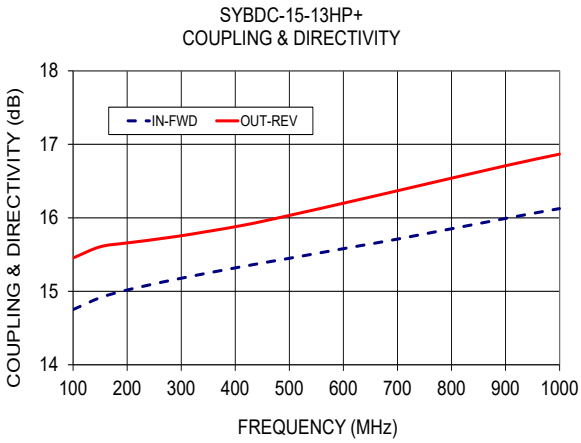
Bi-Directional Coupler SYBDC-15-13HP+

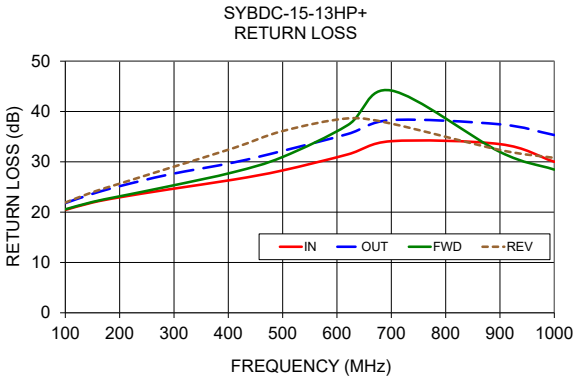
50Ω 15 dB Coupling 100 to 1000 MHz 10 Watt

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
100	0.64	14.75	15.45	20.70	21.60	20.44	21.80	20.56	21.89
150	0.67	14.91	15.61	21.82	22.76	21.91	23.64	22.02	23.97
200	0.65	15.02	15.66	22.93	23.67	22.95	25.16	23.15	25.66
290	0.63	15.16	15.74	23.63	24.79	24.51	27.46	25.12	28.71
410	0.63	15.33	15.89	24.05	25.27	26.47	29.87	27.95	32.75
500	0.64	15.45	16.03	24.28	25.59	28.29	32.18	30.96	36.11
620	0.66	15.61	16.23	24.38	25.58	31.48	35.53	37.31	38.63
700	0.68	15.71	16.37	24.19	25.65	34.10	38.30	44.17	37.59
900	0.76	15.99	16.71	23.48	25.04	33.51	37.45	31.96	32.36
1000	0.80	16.13	16.87	23.11	24.80	30.00	35.32	28.45	30.78







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/terms/viewterm.html

Bi-Directional Coupler SYBDC-15-13HP+

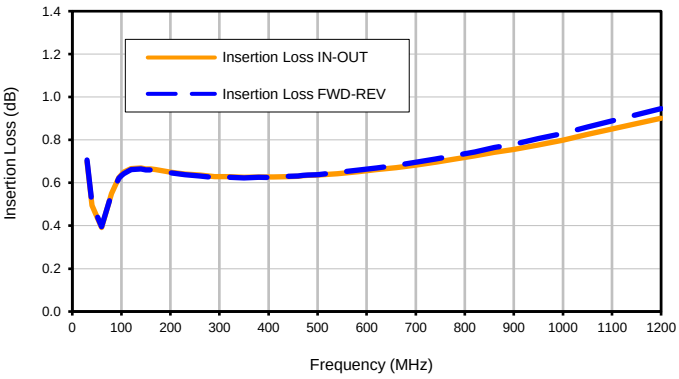
Typical Performance Data

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
30	0.70	0.71	14.40	15.85	10.80	12.27	10.37	9.92	10.33	9.92
40	0.49	0.50	14.54	15.41	13.55	14.43	12.90	12.44	12.85	12.43
60	0.39	0.40	14.63	15.07	18.05	18.48	17.29	16.94	17.19	16.91
80	0.55	0.55	14.67	15.27	20.50	21.06	20.01	20.51	19.91	20.52
95	0.63	0.62	14.73	15.42	20.72	21.53	20.40	21.55	20.45	21.64
100	0.64	0.63	14.75	15.45	20.70	21.60	20.44	21.80	20.56	21.89
105	0.65	0.64	14.77	15.48	20.73	21.69	20.49	22.02	20.68	22.13
120	0.67	0.66	14.82	15.54	21.40	22.10	21.01	22.69	21.09	22.67
140	0.67	0.66	14.88	15.59	21.81	22.54	21.68	23.39	21.72	23.54
150	0.67	0.66	14.91	15.61	21.82	22.76	21.91	23.64	22.02	23.97
160	0.67	0.66	14.94	15.62	21.99	22.97	22.10	23.91	22.25	24.32
170	0.66	0.66	14.96	15.63	22.26	23.18	22.33	24.22	22.51	24.69
200	0.65	0.65	15.02	15.66	22.93	23.67	22.95	25.16	23.15	25.66
230	0.64	0.64	15.07	15.69	23.28	24.02	23.47	25.90	23.78	26.61
260	0.64	0.63	15.12	15.72	23.43	24.41	23.93	26.64	24.35	27.56
290	0.63	0.62	15.16	15.74	23.63	24.79	24.51	27.46	25.12	28.71
320	0.63	0.63	15.21	15.78	23.79	25.08	24.97	28.07	25.78	29.69
350	0.63	0.62	15.25	15.81	23.98	25.21	25.49	28.75	26.53	30.88
380	0.63	0.63	15.29	15.85	24.13	25.31	26.05	29.32	27.21	31.67
410	0.63	0.62	15.33	15.89	24.05	25.27	26.47	29.87	27.95	32.75
440	0.63	0.63	15.37	15.94	24.19	25.47	27.04	30.67	28.89	33.99
460	0.63	0.63	15.40	15.97	24.21	25.51	27.36	30.99	29.43	34.59
470	0.63	0.63	15.41	15.99	24.23	25.54	27.58	31.29	29.79	35.05
480	0.63	0.64	15.42	16.00	24.27	25.59	27.82	31.57	30.21	35.46
500	0.64	0.64	15.45	16.03	24.28	25.59	28.29	32.18	30.96	36.11
540	0.64	0.65	15.50	16.10	24.46	25.65	29.41	33.29	32.72	37.25
580	0.65	0.66	15.55	16.17	24.44	25.65	30.34	34.42	34.67	38.44
620	0.66	0.67	15.61	16.23	24.38	25.58	31.48	35.53	37.31	38.63
660	0.67	0.68	15.66	16.30	24.34	25.64	32.85	36.89	40.65	38.50
700	0.68	0.70	15.71	16.37	24.19	25.65	34.10	38.30	44.17	37.59
740	0.70	0.71	15.76	16.44	24.26	25.60	35.71	39.29	43.51	36.07
780	0.71	0.73	15.82	16.50	24.08	25.48	35.98	39.47	39.41	35.00
820	0.73	0.74	15.88	16.57	23.89	25.33	35.64	39.15	36.35	34.10
860	0.74	0.77	15.94	16.64	23.62	25.09	34.61	38.50	33.59	33.25
900	0.76	0.78	15.99	16.71	23.48	25.04	33.51	37.45	31.96	32.36
950	0.78	0.81	16.05	16.80	23.56	24.97	31.58	36.39	29.93	31.37
1000	0.80	0.83	16.13	16.87	23.11	24.80	30.00	35.32	28.45	30.78
1050	0.83	0.86	16.21	16.95	22.65	24.37	28.53	34.20	27.18	30.15
1200	0.90	0.95	16.44	17.17	21.70	23.75	25.20	32.48	24.32	28.86

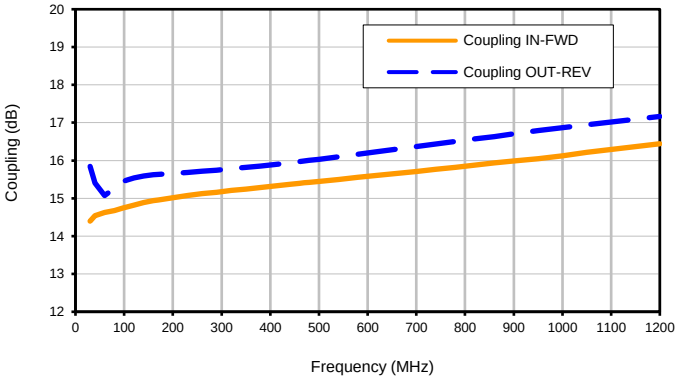
Bi-Directional Coupler SYBDC-15-13HP+

Typical Performance Curves

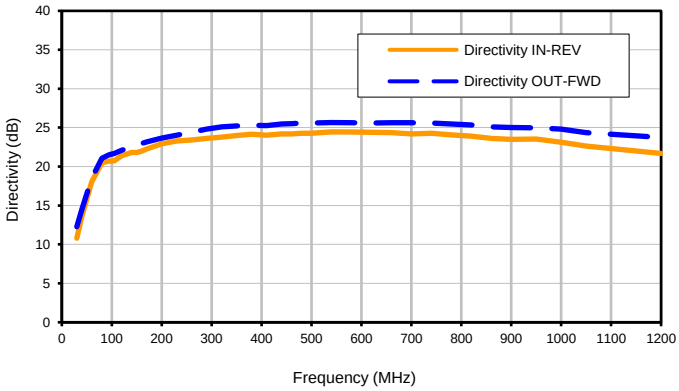
Insertion Loss



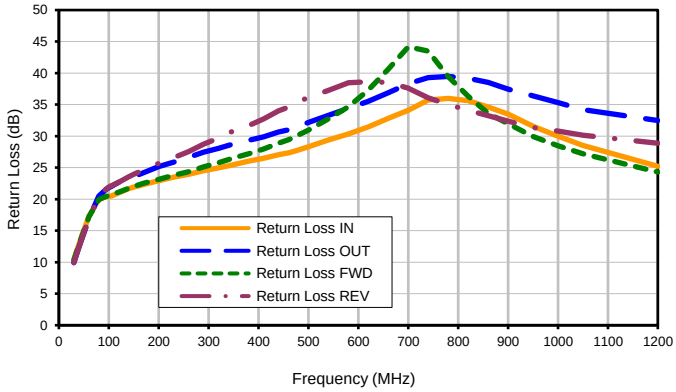
Coupling



Directivity



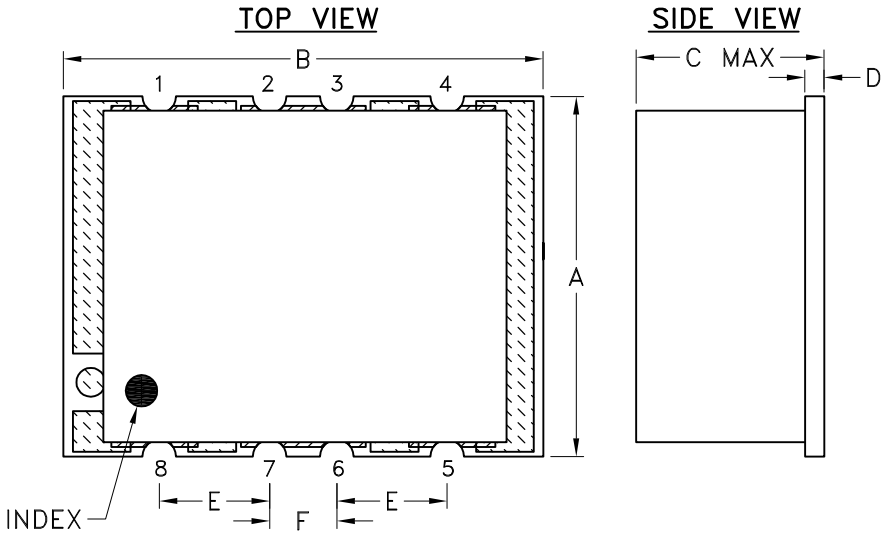
Return Loss

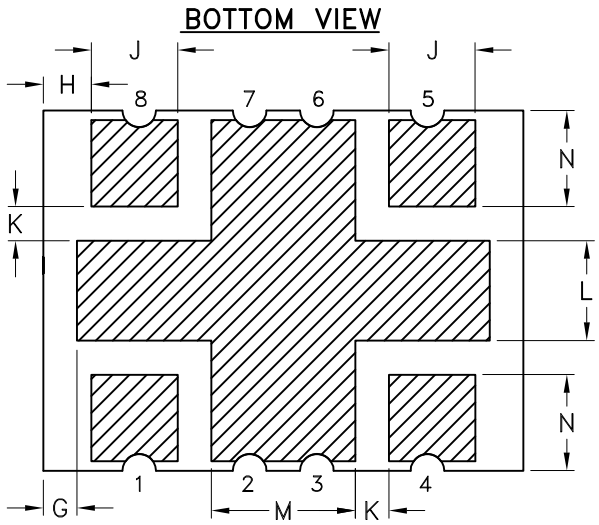


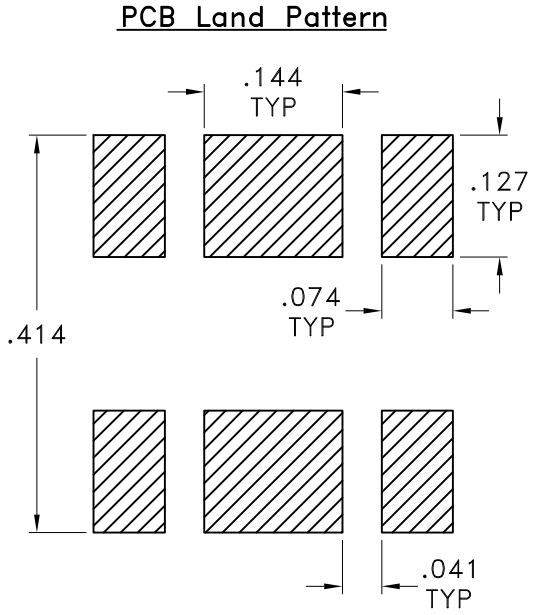
Case Style AH

Outline Dimensions

AH202-1







Suggested Layout,
Tolerance to be within ±.002

DENOTES METALLIZATION

DENOTES SOLDER RESIST

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.±.01; 3 Pl. ±.005

Notes:

1. Case material: Nickel Silver alloy.
2. Base material: Printed wiring laminate.
3. 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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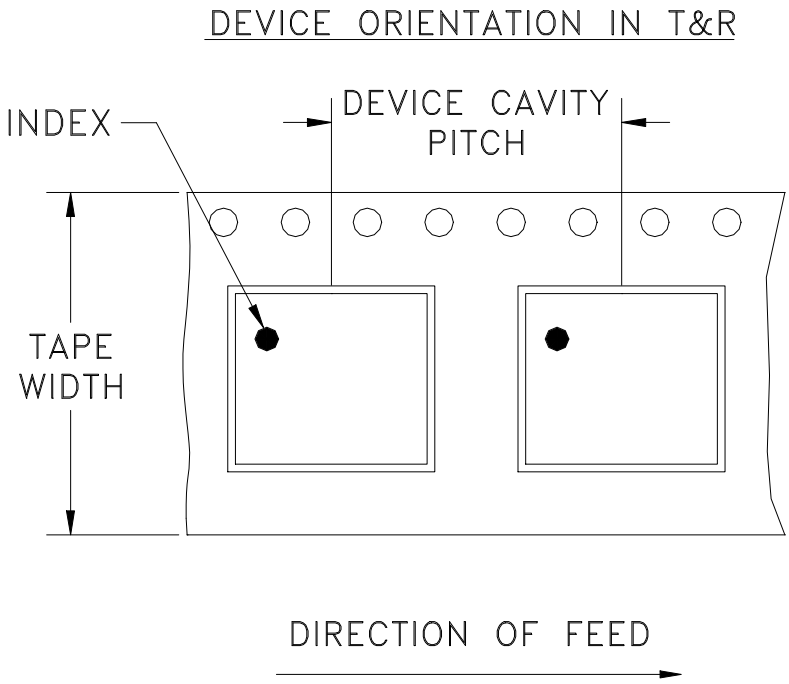
RF/IF MICROWAVE COMPONENTS

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.

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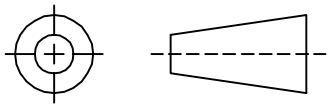
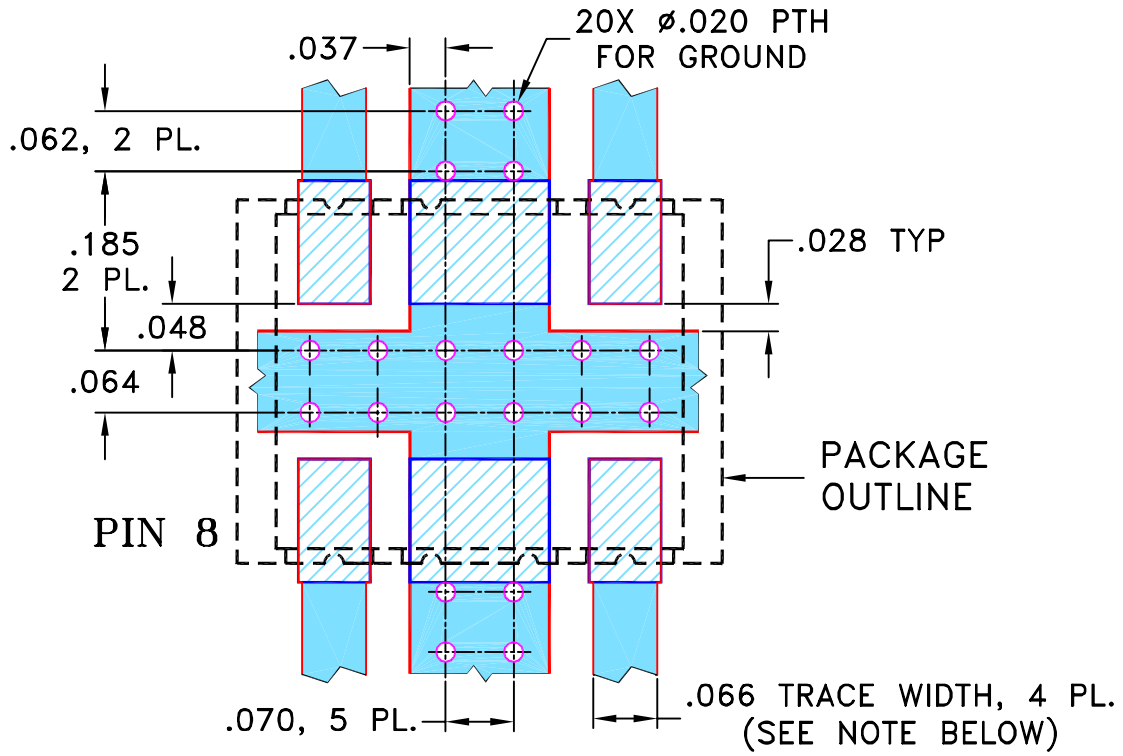
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M107473	NEW RELEASE	09/25/06	AV	DY

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



NOTES:

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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	DRAWN	AV	09/19/06
TOLERANCES ON:	CHECKED	IL	09/25/06
2 PL DECIMALS ±	APPROVED	DY	09/25/06
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

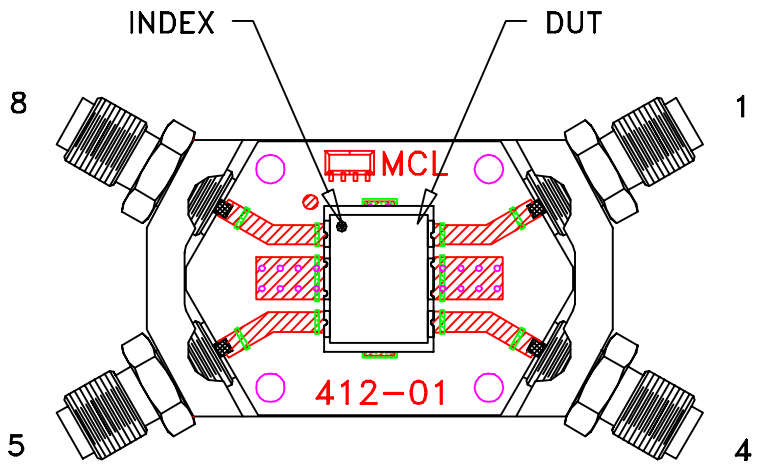
PL, rr, AH202-1, SYDC, TB-349

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-246	OR

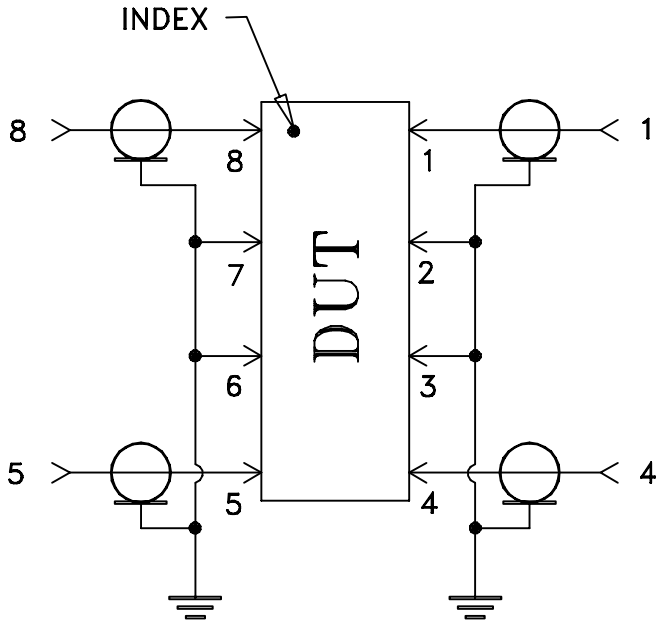
FILE:	SCALE:	SHEET:
98PL246	5:1	1 OF 1

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



TB-349



Schematic Diagram

Notes:

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

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Mini-Circuits

Environmental Specifications ENV02T1

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

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