

Surface Mount

Power Splitter/Combiner

SYPS-2-33+

2 Way-0° 50Ω 400 to 3000 MHz



CASE STYLE: AH202

The Big Deal

- Low amplitude unbalance, 0.1 dB typ.
- Low phase unbalance, 1° typ.
- Low insertion loss, 0.7 dB typ.

Product Overview

Mini-Circuits SYPS-2-33+ is a wideband, 2 way, 0° surface mount splitter/combiner. This model provides very low amplitude and phase unbalance with good isolation and insertion loss over the full frequency range. It handles up to 0.5W of input power and comes in a small plastic case with excellent thermal performance (- 40°C to 85°C operating).

Key Features

Feature	Advantages
Wideband	Wide frequency coverage from 400 to 3000 MHz supports many applications.
Low AU and PU	SYPS-2-33+ produces nearly equal output signals.
Good insertion loss: • 0.6 dB typ, 700 – 2700 MHz • 1.0 dB typ., 400 – 3000 MHz	Well matched for 50Ω systems.
Good isolation • 21 dB typ., 400 – 3000 MHz	Good isolation over the entire band minimizes effect of load changes at one output port on another output port.
0.5W max. input power	High power handling accommodates a wide range of system power requirements.
Small size, 0.38 x 0.50 x 0.25 in.	Accommodates dense PCB layouts.

*Does not include coupling loss

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



2 Way-0° 50Ω 400 to 3000 MHz

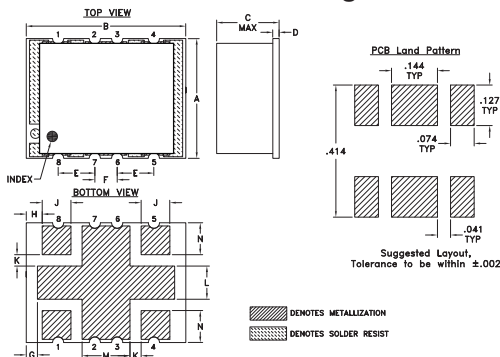
Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	0.5W max.
Internal Dissipation	0.05W max.
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

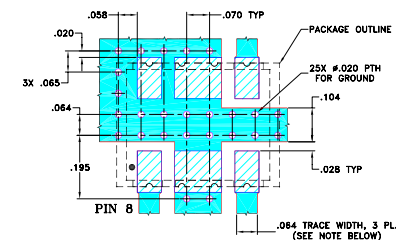
SUM PORT	8
PORT 1	5
PORT 2	4
GROUND	1,2,3,6,7

Outline Drawing



Outline Dimensions (inch)

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

Demo Board MCL P/N: TB-427
Suggested PCB Layout (PL-274)

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.
Legend: Blue hatched area DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), Yellow hatched area DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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Features

- wideband, 400 to 3000 MHz
- low amplitude unbalance, 0.1 dB typ.
- low phase unbalance, 1.0 deg. typ.
- low insertion loss, 0.7dB typ.

Applications

- VHF/UHF
- cellular, GPS, PCS
- communication systems
- receivers & transmitters
- instrumentation
- CATV



Generic photo used for illustration purposes only

CASE STYLE: AH202

+RoHS Compliant

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

Available Tape and Reel at no extra cost

Reel Size: 13" Devices/Reel: 200

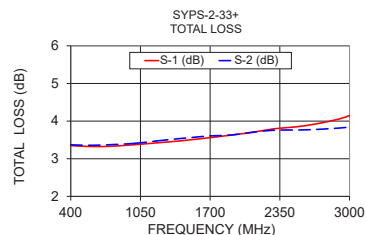
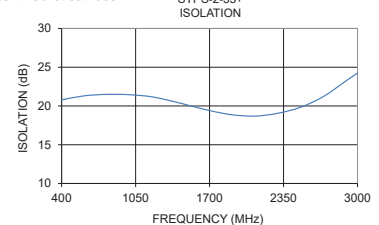
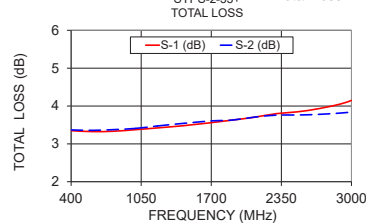
Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency		400		3000	MHz
Insertion Loss (above theoretical 3.0 dB)	700-2700 400-3000	— —	0.6 1.0	1.6 2.1	dB
Isolation	400-3000	14	21	—	dB
Phase Unbalance	700-2700 400-3000	— —	1.0 2.0	6 7	Degree
Amplitude Unbalance	700-2700 400-3000	— —	0.1 0.3	0.6 0.9	dB
VSWR (Port S)	700-2700 400-3000	— —	1.4 1.4	1.75 1.85	:1
VSWR (Port 1-2)	700-2700 400-3000	— —	1.2 1.25	1.5 1.6	:1

Typical Performance Data

Frequency (MHz)	Total Loss ¹ (dB)	Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1 S-2						
400	3.35 3.37	0.02	20.79	0.32	1.43	1.35	1.34
600	3.32 3.36	0.03	21.31	0.46	1.31	1.25	1.25
800	3.33 3.38	0.04	21.49	0.67	1.25	1.21	1.19
1000	3.38 3.41	0.03	21.45	0.45	1.24	1.18	1.17
1200	3.42 3.47	0.05	21.16	0.46	1.25	1.15	1.15
1400	3.47 3.53	0.06	20.51	0.32	1.27	1.13	1.13
1500	3.50 3.56	0.06	20.14	0.26	1.29	1.11	1.12
1700	3.56 3.61	0.05	19.40	0.18	1.32	1.10	1.09
1900	3.63 3.63	0.00	18.86	0.20	1.37	1.10	1.10
2100	3.70 3.71	0.00	18.70	0.65	1.38	1.11	1.10
2300	3.80 3.76	0.04	19.06	0.74	1.35	1.12	1.07
2500	3.85 3.76	0.08	19.84	1.00	1.30	1.11	1.04
2700	3.93 3.78	0.15	21.21	1.25	1.19	1.09	1.03
2900	4.05 3.81	0.24	23.24	1.39	1.05	1.08	1.10
3000	4.15 3.84	0.31	24.25	1.46	1.04	1.09	1.15

1. Total Loss = Insertion Loss + 3dB splitter theoretical loss.



Electrical Schematic



Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS ¹ (dB)		AMPLITUDE UNBALANCE (dB)	ISOLATION (dB) 1-2	PHASE UNBALANCE (deg.)	FREQUENCY (MHz)	VSWR		
	S-1	S-2					S	(:1) 1	2
200	3.64	3.64	0.00	19.35	0.14	200	1.89	1.66	1.65
250	3.50	3.50	0.01	19.89	0.20	250	1.69	1.53	1.53
300	3.42	3.43	0.01	20.30	0.26	300	1.57	1.45	1.44
350	3.38	3.39	0.02	20.56	0.29	350	1.49	1.39	1.38
400	3.35	3.37	0.02	20.79	0.32	400	1.43	1.35	1.34
450	3.33	3.36	0.02	20.95	0.35	450	1.38	1.31	1.31
500	3.33	3.36	0.03	21.14	0.39	500	1.35	1.29	1.29
550	3.33	3.36	0.03	21.30	0.44	550	1.32	1.27	1.27
600	3.32	3.36	0.03	21.31	0.46	600	1.31	1.25	1.25
650	3.32	3.36	0.04	21.38	0.50	650	1.29	1.24	1.23
700	3.32	3.36	0.04	21.39	0.54	700	1.27	1.22	1.21
750	3.33	3.38	0.05	21.44	0.58	750	1.26	1.22	1.20
800	3.33	3.38	0.04	21.49	0.67	800	1.25	1.21	1.19
850	3.35	3.38	0.03	21.51	0.67	850	1.25	1.20	1.18
900	3.36	3.38	0.02	21.52	0.60	900	1.24	1.19	1.18
950	3.37	3.39	0.03	21.47	0.53	950	1.24	1.18	1.17
1000	3.38	3.41	0.03	21.45	0.45	1000	1.24	1.18	1.17
1050	3.38	3.43	0.05	21.41	0.47	1050	1.24	1.17	1.16
1100	3.40	3.44	0.04	21.34	0.46	1100	1.24	1.17	1.16
1150	3.41	3.46	0.05	21.26	0.45	1150	1.25	1.16	1.16
1200	3.42	3.47	0.05	21.16	0.46	1200	1.25	1.15	1.15
1250	3.44	3.49	0.05	21.01	0.41	1250	1.25	1.14	1.14
1300	3.44	3.50	0.06	20.85	0.39	1300	1.26	1.14	1.14
1350	3.46	3.52	0.06	20.65	0.36	1350	1.26	1.13	1.13
1400	3.47	3.53	0.06	20.51	0.32	1400	1.27	1.13	1.13
1450	3.48	3.54	0.06	20.33	0.30	1450	1.27	1.12	1.12
1500	3.50	3.56	0.06	20.14	0.26	1500	1.29	1.11	1.12
1550	3.51	3.57	0.06	19.92	0.23	1550	1.29	1.11	1.11
1600	3.53	3.59	0.06	19.75	0.21	1600	1.30	1.10	1.10
1650	3.54	3.60	0.05	19.56	0.19	1650	1.31	1.10	1.10
1700	3.56	3.61	0.05	19.40	0.18	1700	1.32	1.10	1.09
1750	3.58	3.61	0.04	19.24	0.14	1750	1.34	1.10	1.10
1800	3.60	3.62	0.02	19.09	0.06	1800	1.35	1.10	1.09
1850	3.62	3.62	0.01	18.93	0.07	1850	1.37	1.10	1.09
1900	3.63	3.63	0.00	18.86	0.20	1900	1.37	1.10	1.10
1950	3.65	3.64	0.01	18.78	0.34	1950	1.37	1.11	1.09
2000	3.66	3.66	0.00	18.72	0.48	2000	1.38	1.11	1.10
2050	3.68	3.68	0.00	18.71	0.55	2050	1.38	1.11	1.10
2100	3.70	3.71	0.00	18.70	0.65	2100	1.38	1.11	1.10
2150	3.73	3.74	0.02	18.83	0.60	2150	1.37	1.11	1.09
2200	3.73	3.73	0.01	18.86	0.57	2200	1.37	1.12	1.08
2250	3.76	3.73	0.03	18.89	0.66	2250	1.37	1.12	1.08
2300	3.80	3.76	0.04	19.06	0.74	2300	1.35	1.12	1.07
2350	3.81	3.76	0.05	19.19	0.84	2350	1.34	1.11	1.06
2400	3.81	3.75	0.06	19.38	0.90	2400	1.33	1.11	1.06
2450	3.83	3.76	0.07	19.54	0.94	2450	1.31	1.11	1.04
2500	3.85	3.76	0.08	19.84	1.00	2500	1.30	1.11	1.04
2550	3.87	3.77	0.10	20.11	1.03	2550	1.27	1.10	1.03
2600	3.89	3.76	0.12	20.45	1.11	2600	1.25	1.10	1.01
2650	3.91	3.78	0.14	20.81	1.20	2650	1.22	1.09	1.02
2700	3.93	3.78	0.15	21.21	1.25	2700	1.19	1.09	1.03
2750	3.97	3.79	0.18	21.67	1.31	2750	1.16	1.08	1.03
2800	3.99	3.80	0.19	22.17	1.36	2800	1.12	1.08	1.06
2850	4.02	3.81	0.21	22.67	1.36	2850	1.09	1.08	1.08
2900	4.05	3.81	0.24	23.24	1.39	2900	1.05	1.08	1.10
2950	4.10	3.83	0.27	23.73	1.41	2950	1.02	1.09	1.13
3000	4.15	3.84	0.31	24.25	1.46	3000	1.04	1.09	1.15
3100	4.28	3.92	0.36	24.87	1.59	3100	1.12	1.11	1.21
3200	4.46	4.06	0.40	24.45	1.63	3200	1.23	1.13	1.26

¹Total Loss = Insertion Loss + 3dB Splitter Loss



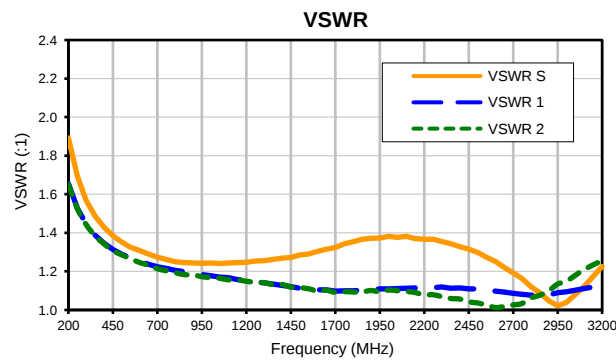
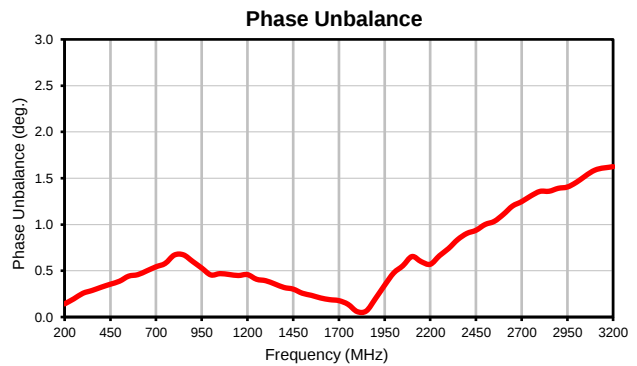
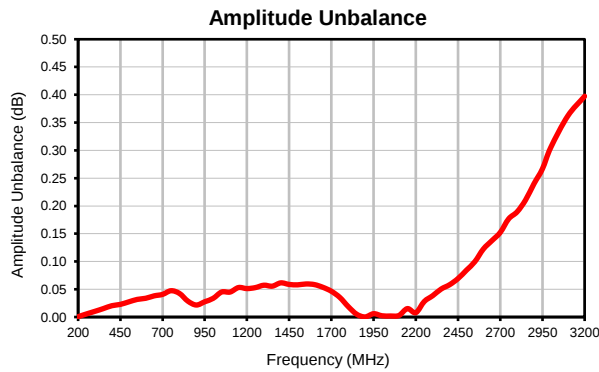
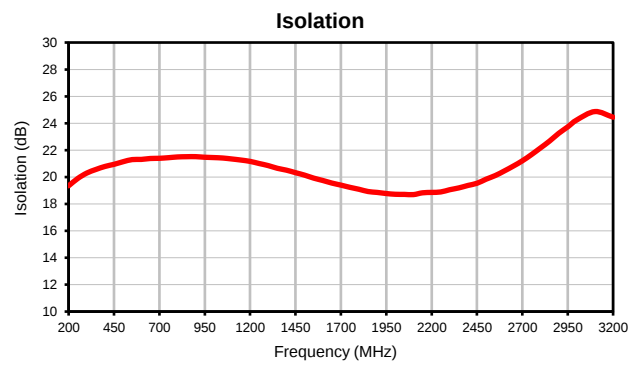
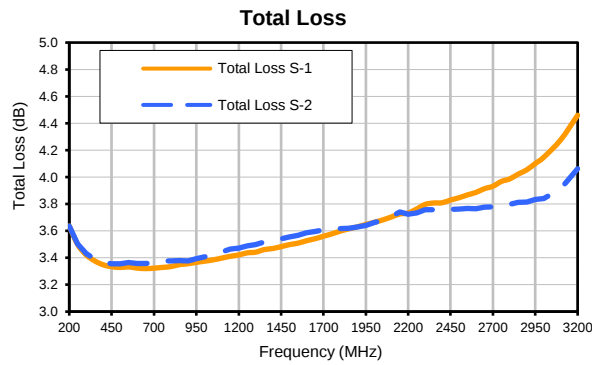
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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com



IF/RF MICROWAVE COMPONENTS

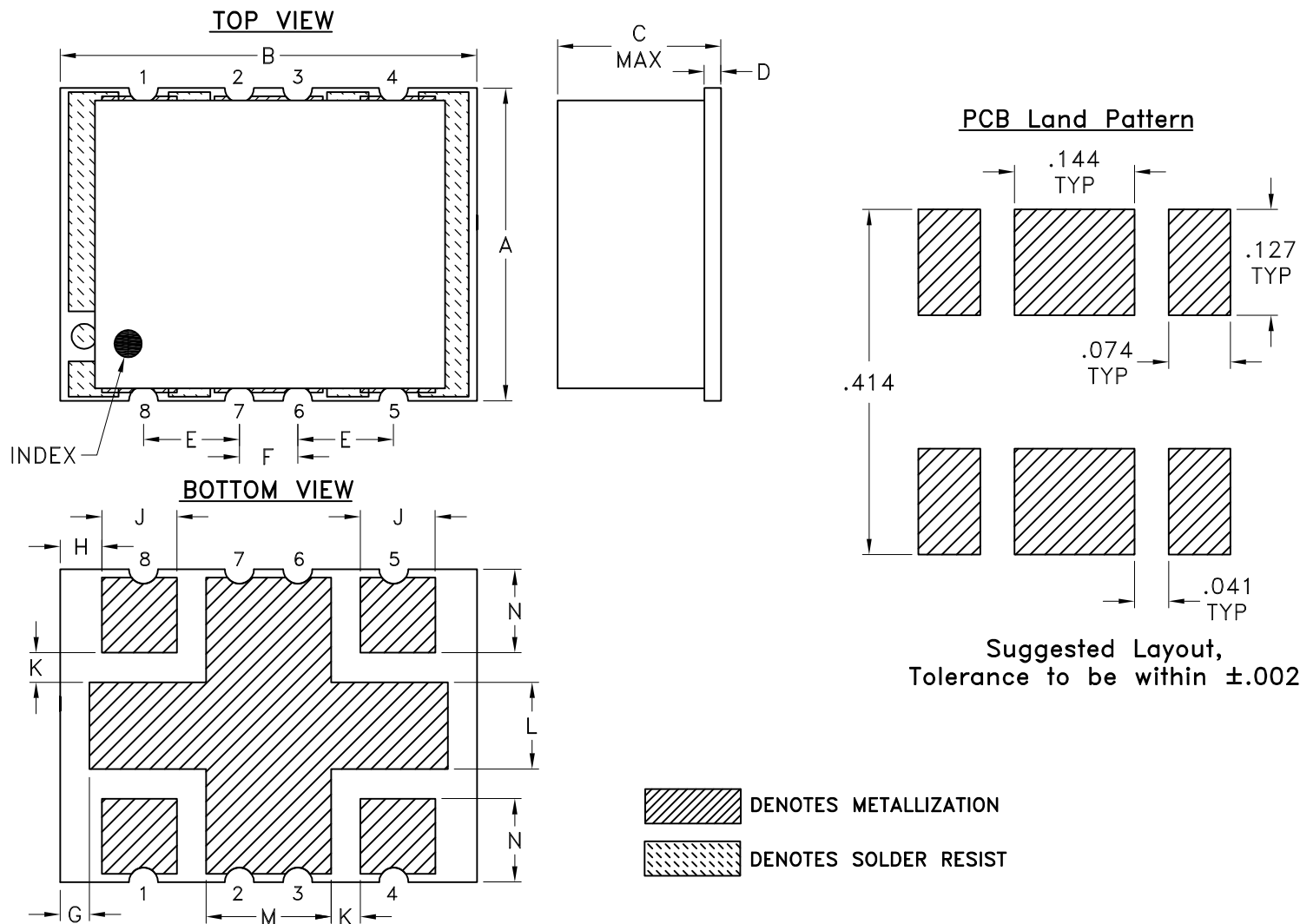
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SYPS-2-33+
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Page 1 of 1

Typical Performance Curves



Outline Dimensions

AH202



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	WT, GRAM
AH202	.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. $\pm .01$; 3 Pl. $\pm .005$

Notes:

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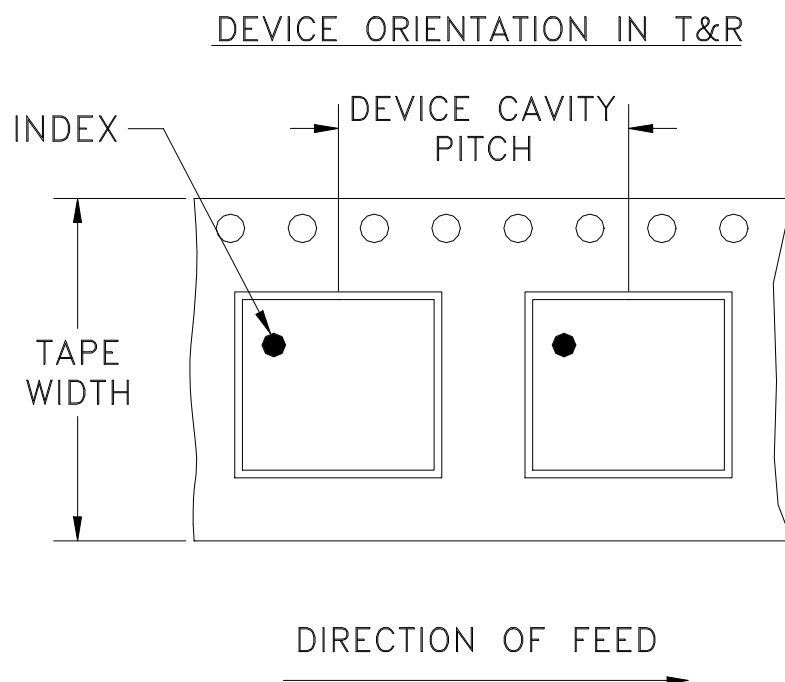
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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

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



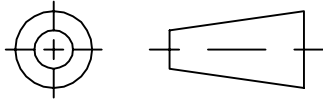
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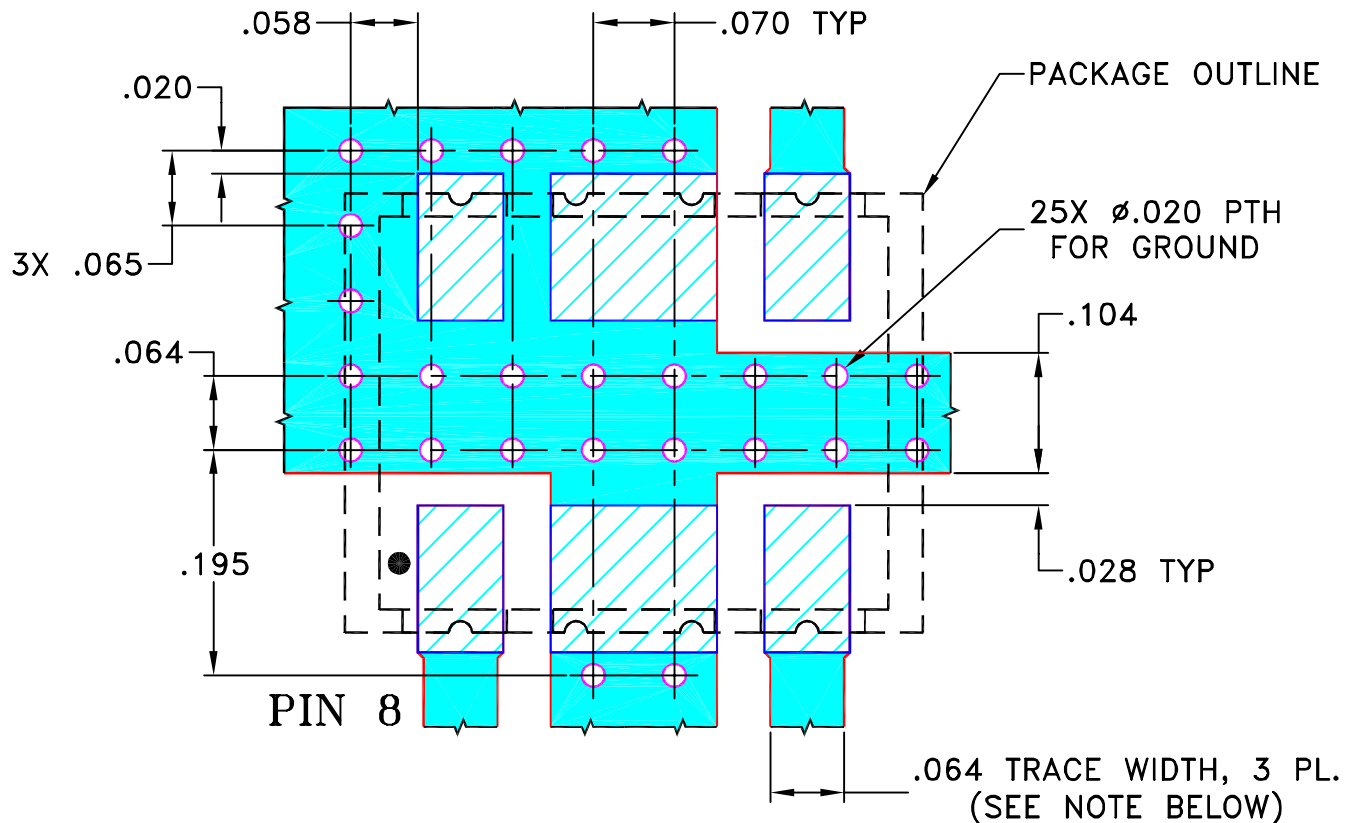
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M110938	NEW RELEASE	04/12/07	AV	HY

SUGGESTED MOUNTING CONFIGURATION FOR
AH202-2 CASE STYLE, "sb" PIN CONNECTION



- NOTES: 1. 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.
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

04/11/07

TOLERANCES ON:

CHECKED

IL

04/12/07

2 PL DECIMALS $\pm$

APPROVED

HY

04/12/07

3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

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



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, sb, AH202-2, SYPS-2, TB-427+

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-274

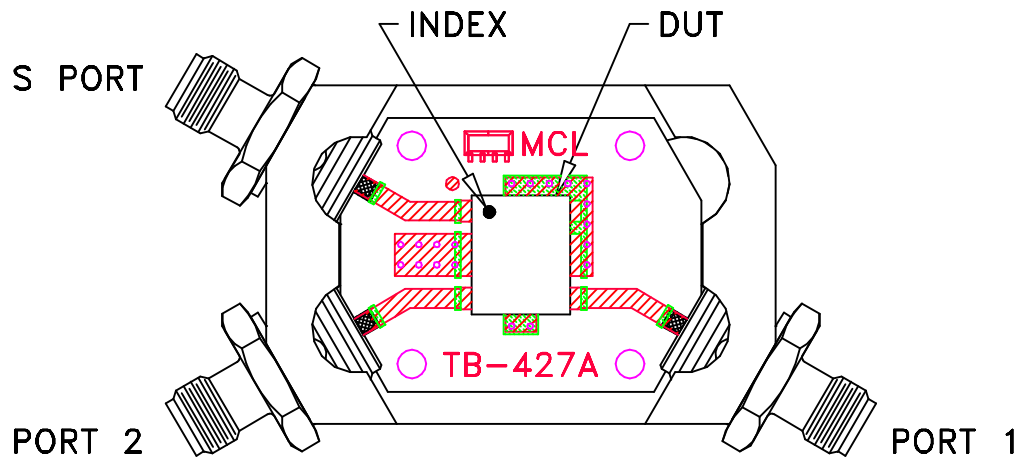
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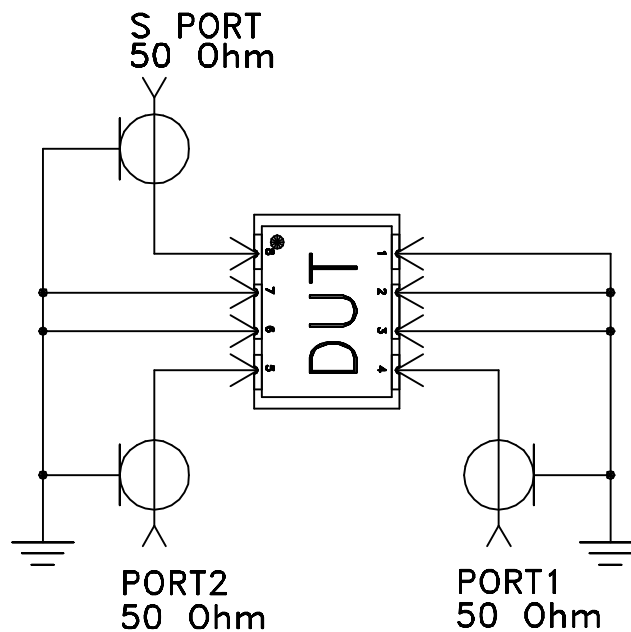
SCALE: 6:1

SHEET: 1 OF 1

Evaluation Board and Circuit



TB-427+



Schematic Diagram

Notes:

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

 **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