

Surface Mount

Power Splitter/Combiner

SYMT-122-75+

2 Way-0°/180° 75Ω 5 to 1218 MHz



CASE STYLE:AH202-1

The Big Deal

- Low amplitude unbalance, 0.3 dB typ.
- Low phase unbalance, ±3° typ.

Product Overview

Mini-Circuits SYMT-122-75+ is a wideband, 2 way, 0°/180° surface mount magic T splitter/combiner. This model provides very low amplitude and phase unbalance with good isolation over the full frequency range. It handles up to 0.5W of input power and comes in a small case with excellent thermal performance (- 40°C to 85°C operating).

Key Features

Feature	Advantages
Wideband	Wide frequency coverage from 5 to 1218 MHz supports many applications DOCSIS 3.1
Low amplitude unbalance and phase unbalance 0.3 dB typ. for amplitude unbalance ±3° typ. for phase unbalance	0.3 dB typ for amplifier unbalance ±3° typ. for phase unbalance produces nearly equal output signals.
Good return loss: • 18 dB typ., for all ports	Well matched for 75Ω systems.
Good isolation • 20 dB typ., for ports 1 & 2 • 30 dB typ., for S, J - ports	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



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2 Way-0°/180° 75Ω

5 to 1218 MHz



Generic photo used for illustration purposes only

CASE STYLE: AH202-1

+RoHS Compliant

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

Maximum Ratings

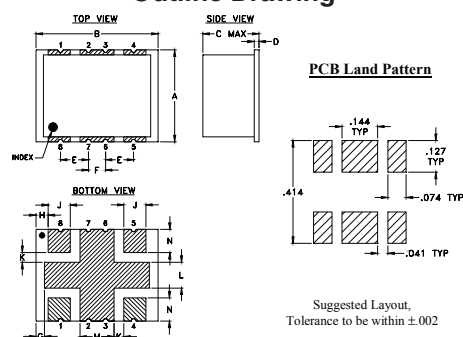
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	0.5W max.

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

Pin Connections

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

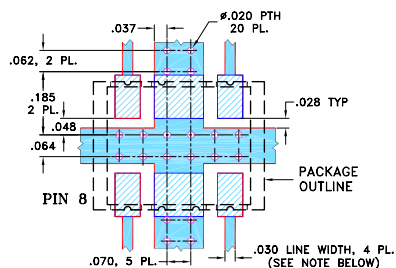
Outline Drawing



Outline Dimensions (inch/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

Demo Board MCL P/N: TB-361+ Suggested PCB Layout (PL-229)



NOTE:

- 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

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Features

- very good input VSWR, 1.3:1 typ. for all ports
- excellent amplitude unbalance, 0.3 dB typ.
- excellent phase unbalance, ±3° deg. typ.
- high isolation S-J ports, 30 dB typ.

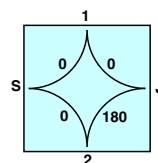
Applications

- DOCSIS 3.1 system
- cellular
- CATV
- VHF/UHF

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Frequency		5		1218	MHz	
Insertion Loss (above theoretical 3.0 dB)	S-1, S-2	5-684 684-1218	— —	0.8 1.8	1.3 3.3	dB
	J-1, J-2	5-684 684-1218	— —	2.3 3.6	2.9 4.2	
Isolation	S-J	5-684 684-1218	25 20	35 25	— —	dB
	1-2	5-684 684-1218	20 13	30 18	— —	
Phase Unbalance (°) ±	5-1218	—	3.0	7.0	Degree	
Amplitude Unbalance (dB) ±	5-1218	—	0.3	0.6	dB	
VSWR (Port J)	5-1218	—	1.40	—	:1	
VSWR (Port 1-2, Port S)	5-1218	—	1.30	—	:1	

Electrical Schematic



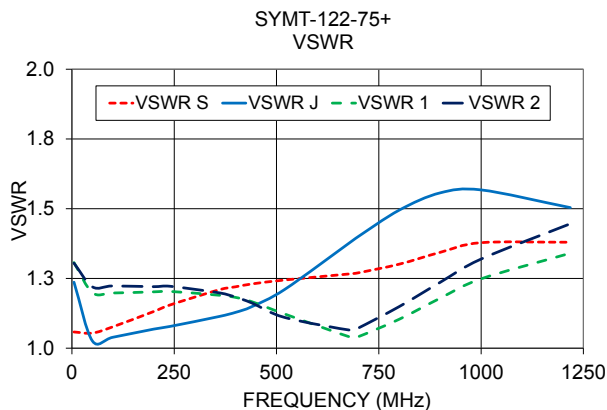
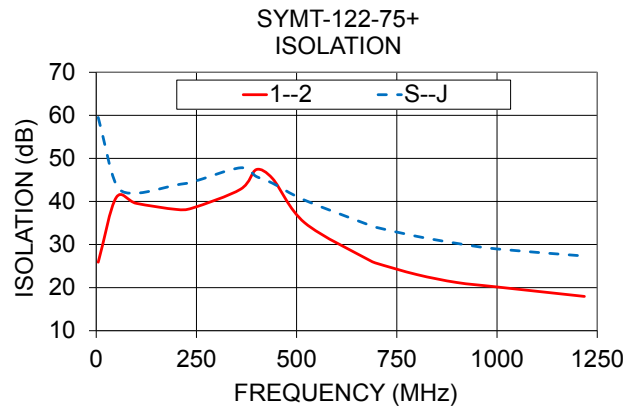
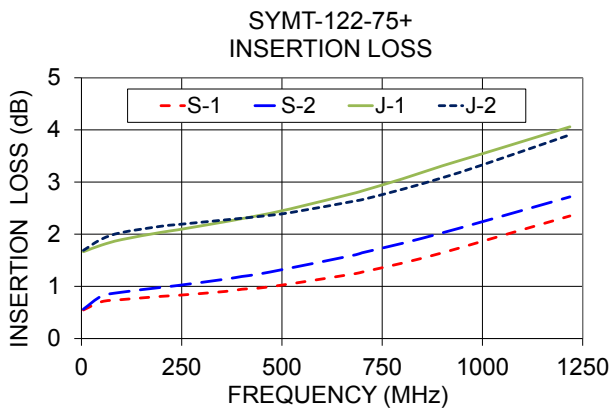
- S-J ports, isolation 30 typical
- Inphase ports, S-1 and S-2 insertion loss 1.5 dB typical
- Amplitude unbalance defined by input S or J ports to output 1 and 2



Typical Performance Data

Frequency (MHz)	Insertion Loss ¹ (dB)				Amplitude Unbalance (dB)			Isolation (dB)		Phase Unbalance (deg.)	VSWR S	VSWR J	VSWR 1	VSWR 2
	S-1	S-2	J-1	J-2	S1-S2	J1-J2	1-2	S-J	(S-1)-(S-2)					
5	0.55	0.56	1.66	1.69	0.02	0.03	25.90	59.52	0.08	179.84	1.06	1.24	1.31	1.30
50	0.71	0.81	1.79	1.90	0.11	0.11	40.93	43.88	0.32	179.33	1.05	1.03	1.20	1.22
100	0.75	0.89	1.90	2.03	0.14	0.14	39.57	41.94	0.18	179.17	1.08	1.04	1.20	1.22
200	0.81	0.98	2.04	2.15	0.17	0.12	38.15	43.84	0.02	178.73	1.13	1.07	1.20	1.22
240	0.83	1.02	2.08	2.19	0.19	0.10	38.47	44.52	0.06	178.55	1.15	1.08	1.20	1.22
360	0.90	1.14	2.24	2.28	0.24	0.03	42.84	47.82	0.31	178.02	1.21	1.11	1.19	1.20
400	0.94	1.19	2.30	2.31	0.24	0.01	47.43	45.77	0.36	177.86	1.22	1.13	1.18	1.18
440	0.96	1.23	2.35	2.34	0.27	0.02	45.32	44.24	0.51	177.77	1.23	1.15	1.17	1.16
520	1.05	1.35	2.48	2.41	0.30	0.07	35.06	40.31	0.72	177.48	1.24	1.21	1.12	1.11
684	1.25	1.61	2.79	2.64	0.36	0.15	26.24	34.43	1.36	177.23	1.27	1.38	1.04	1.06
700	1.27	1.64	2.83	2.66	0.37	0.17	25.63	33.96	1.45	177.19	1.27	1.40	1.04	1.07
800	1.45	1.83	3.06	2.86	0.38	0.20	23.02	31.90	1.86	177.14	1.30	1.49	1.10	1.15
900	1.64	2.03	3.31	3.08	0.38	0.23	21.18	30.26	2.13	177.13	1.34	1.56	1.18	1.24
1000	1.87	2.24	3.54	3.33	0.38	0.21	20.15	28.97	2.38	177.25	1.38	1.57	1.25	1.32
1218	2.35	2.72	4.06	3.91	0.37	0.15	17.95	27.33	2.72	177.09	1.38	1.50	1.34	1.45

1. Insertion Loss = Total Loss - splitter theoretical loss.



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2 Way-0°/180° Power Splitter/Combiner

SYMT-122-75+

Typical Performance Data

FREQUENCY (MHz)	TOTAL LOSS ¹ (dB)				AMPLITUDE UNBALANCE (dB)		ISOLATION (dB)		PHASE UNBALANCE (deg.)		FREQUENCY (MHz)	VSWR (:1)			
	S-1	S-2	J-1	J-2	S1-S2	J1-J2	1-2	S-J	(S-1)-(S-2)	(J-1)-(J-2)		S	J	1	2
1	0.61	0.61	2.29	2.29	0.00	0.00	20.73	71.18	0.03	179.95	1	1.15	1.65	1.57	1.57
3	0.53	0.55	1.86	1.87	0.02	0.01	23.54	64.66	0.04	179.92	3	1.07	1.34	1.38	1.37
5	0.55	0.56	1.66	1.69	0.02	0.03	25.90	59.52	0.08	179.84	5	1.06	1.24	1.31	1.30
7	0.57	0.59	1.61	1.64	0.02	0.02	27.85	56.72	0.15	179.76	7	1.05	1.18	1.27	1.27
10	0.60	0.62	1.61	1.65	0.03	0.04	30.33	53.55	0.25	179.66	10	1.05	1.13	1.24	1.24
30	0.67	0.75	1.73	1.81	0.08	0.08	38.86	45.68	0.36	179.41	30	1.05	1.04	1.20	1.22
50	0.71	0.81	1.79	1.90	0.11	0.11	40.93	43.88	0.32	179.33	50	1.05	1.03	1.20	1.22
70	0.73	0.85	1.84	1.97	0.12	0.13	40.75	42.63	0.27	179.29	70	1.06	1.03	1.20	1.22
90	0.74	0.88	1.88	2.01	0.14	0.13	39.79	42.25	0.23	179.19	90	1.07	1.04	1.20	1.22
100	0.75	0.89	1.90	2.03	0.14	0.14	39.57	41.94	0.18	179.17	100	1.08	1.04	1.20	1.22
108	0.74	0.89	1.91	2.04	0.15	0.14	39.33	42.20	0.18	179.12	108	1.08	1.04	1.20	1.22
120	0.75	0.90	1.93	2.06	0.15	0.14	39.12	42.14	0.13	179.10	120	1.09	1.05	1.20	1.22
160	0.79	0.96	1.98	2.12	0.17	0.13	38.25	42.87	0.07	178.91	160	1.11	1.06	1.20	1.22
200	0.81	0.98	2.04	2.15	0.17	0.12	38.15	43.84	0.02	178.73	200	1.13	1.07	1.20	1.22
240	0.83	1.02	2.08	2.19	0.19	0.10	38.47	44.52	0.06	178.55	240	1.15	1.08	1.20	1.22
280	0.86	1.07	2.14	2.22	0.20	0.08	39.13	44.87	0.14	178.36	280	1.18	1.09	1.21	1.22
320	0.88	1.09	2.19	2.25	0.22	0.06	40.28	46.88	0.23	178.17	320	1.19	1.10	1.20	1.21
360	0.90	1.14	2.24	2.28	0.24	0.03	42.84	47.82	0.31	178.02	360	1.21	1.11	1.19	1.20
400	0.94	1.19	2.30	2.31	0.24	0.01	47.43	45.77	0.36	177.86	400	1.22	1.13	1.18	1.18
440	0.96	1.23	2.35	2.34	0.27	0.02	45.32	44.24	0.51	177.77	440	1.23	1.15	1.17	1.16
480	1.01	1.29	2.41	2.37	0.29	0.04	39.64	42.01	0.62	177.59	480	1.24	1.18	1.14	1.14
520	1.05	1.35	2.48	2.41	0.30	0.07	35.06	40.31	0.72	177.48	520	1.24	1.21	1.12	1.11
560	1.09	1.41	2.55	2.46	0.32	0.09	32.22	38.67	0.87	177.44	560	1.25	1.25	1.10	1.08
600	1.14	1.47	2.63	2.51	0.33	0.12	29.90	37.24	1.01	177.31	600	1.25	1.29	1.07	1.06
640	1.19	1.54	2.70	2.57	0.35	0.14	28.01	35.65	1.17	177.24	640	1.26	1.33	1.05	1.05
680	1.24	1.60	2.79	2.63	0.36	0.15	26.37	34.41	1.37	177.25	680	1.27	1.38	1.04	1.06
684	1.25	1.61	2.79	2.64	0.36	0.15	26.24	34.43	1.36	177.23	684	1.27	1.38	1.04	1.06
700	1.27	1.64	2.83	2.66	0.37	0.17	25.63	33.96	1.45	177.19	700	1.27	1.40	1.04	1.07
750	1.36	1.74	2.94	2.75	0.37	0.19	24.14	32.85	1.64	177.17	750	1.29	1.45	1.07	1.11
800	1.45	1.83	3.06	2.86	0.38	0.20	23.02	31.90	1.86	177.14	800	1.30	1.49	1.10	1.15
850	1.56	1.94	3.18	2.97	0.38	0.21	21.98	31.00	2.00	177.12	850	1.32	1.53	1.14	1.19
900	1.64	2.03	3.31	3.08	0.38	0.23	21.18	30.26	2.13	177.13	900	1.34	1.56	1.18	1.24
950	1.78	2.17	3.42	3.20	0.39	0.22	20.63	29.61	2.24	177.21	950	1.36	1.57	1.22	1.28
1000	1.87	2.24	3.54	3.33	0.38	0.21	20.15	28.97	2.38	177.25	1000	1.38	1.57	1.25	1.32
1050	2.02	2.40	3.67	3.47	0.38	0.20	19.70	28.51	2.48	177.19	1050	1.39	1.56	1.28	1.36
1100	2.07	2.45	3.80	3.60	0.37	0.20	19.27	28.03	2.55	177.17	1100	1.39	1.54	1.30	1.39
1150	2.25	2.62	3.92	3.73	0.38	0.19	18.79	27.75	2.64	177.20	1150	1.39	1.52	1.33	1.42
1200	2.32	2.69	4.02	3.86	0.37	0.16	18.18	27.40	2.69	177.27	1200	1.38	1.50	1.34	1.44
1218	2.35	2.72	4.06	3.91	0.37	0.15	17.95	27.33	2.72	177.09	1218	1.38	1.50	1.34	1.45
1220	2.36	2.73	4.06	3.91	0.37	0.15	17.91	27.33	2.69	177.10	1220	1.38	1.50	1.34	1.45
1250	2.54	2.90	4.09	3.97	0.37	0.13	17.48	27.21	2.71	177.18	1250	1.38	1.51	1.33	1.45
1275	2.63	2.99	4.11	3.98	0.36	0.12	17.08	27.03	2.70	177.07	1275	1.38	1.52	1.31	1.44
1300	2.70	3.06	4.11	4.02	0.36	0.09	16.68	26.87	2.65	177.15	1300	1.38	1.54	1.28	1.41
1325	2.77	3.13	4.12	4.03	0.37	0.10	16.23	26.75	2.66	177.05	1325	1.39	1.57	1.26	1.38
1350	2.96	3.34	4.15	4.08	0.38	0.06	15.79	26.72	2.66	176.94	1350	1.41	1.61	1.24	1.35
1375	3.16	3.54	4.20	4.15	0.38	0.06	15.34	26.70	2.72	176.96	1375	1.43	1.65	1.24	1.33
1400	3.29	3.67	4.28	4.24	0.38	0.03	14.87	26.60	2.77	176.81	1400	1.46	1.68	1.25	1.32
1425	3.40	3.77	4.36	4.36	0.37	0.01	14.41	26.62	2.85	176.78	1425	1.49	1.71	1.28	1.33
1450	3.54	3.91	4.45	4.47	0.37	0.01	13.96	26.65	2.91	176.68	1450	1.54	1.74	1.31	1.35

¹Total Loss = Insertion Loss + 3dB Splitter Loss

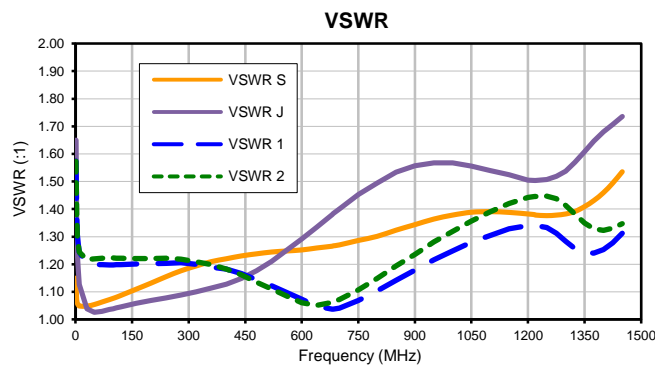
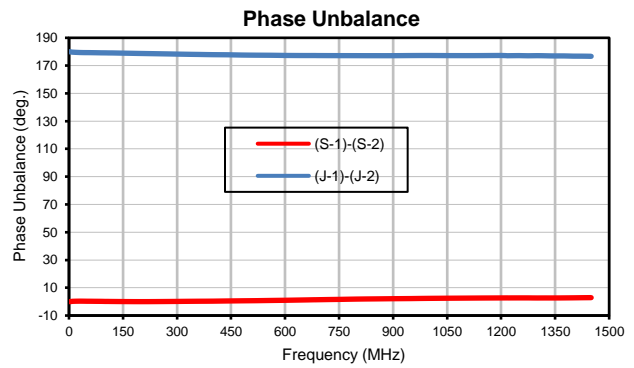
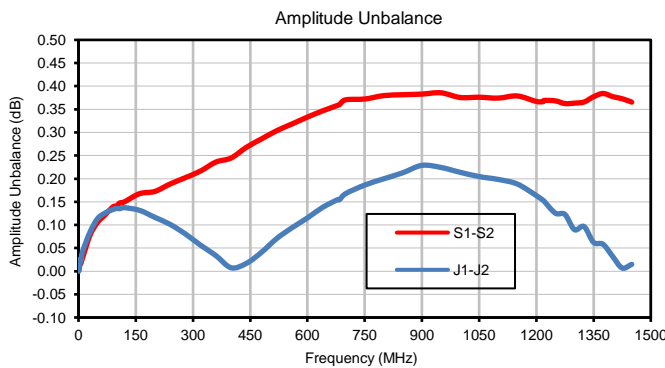
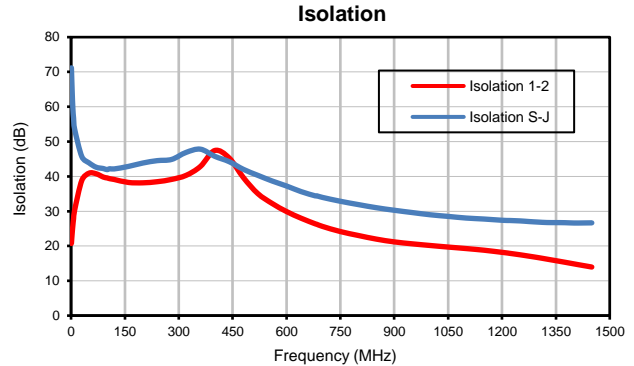
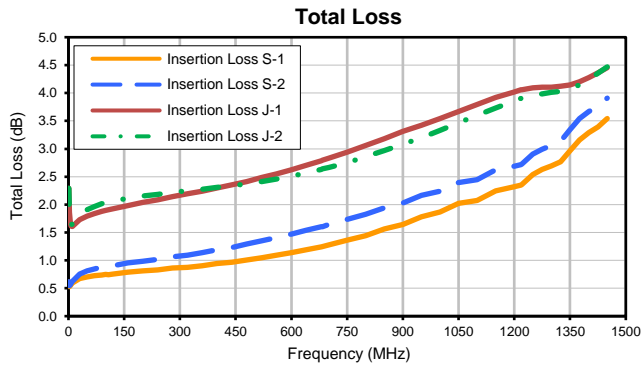


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 The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com



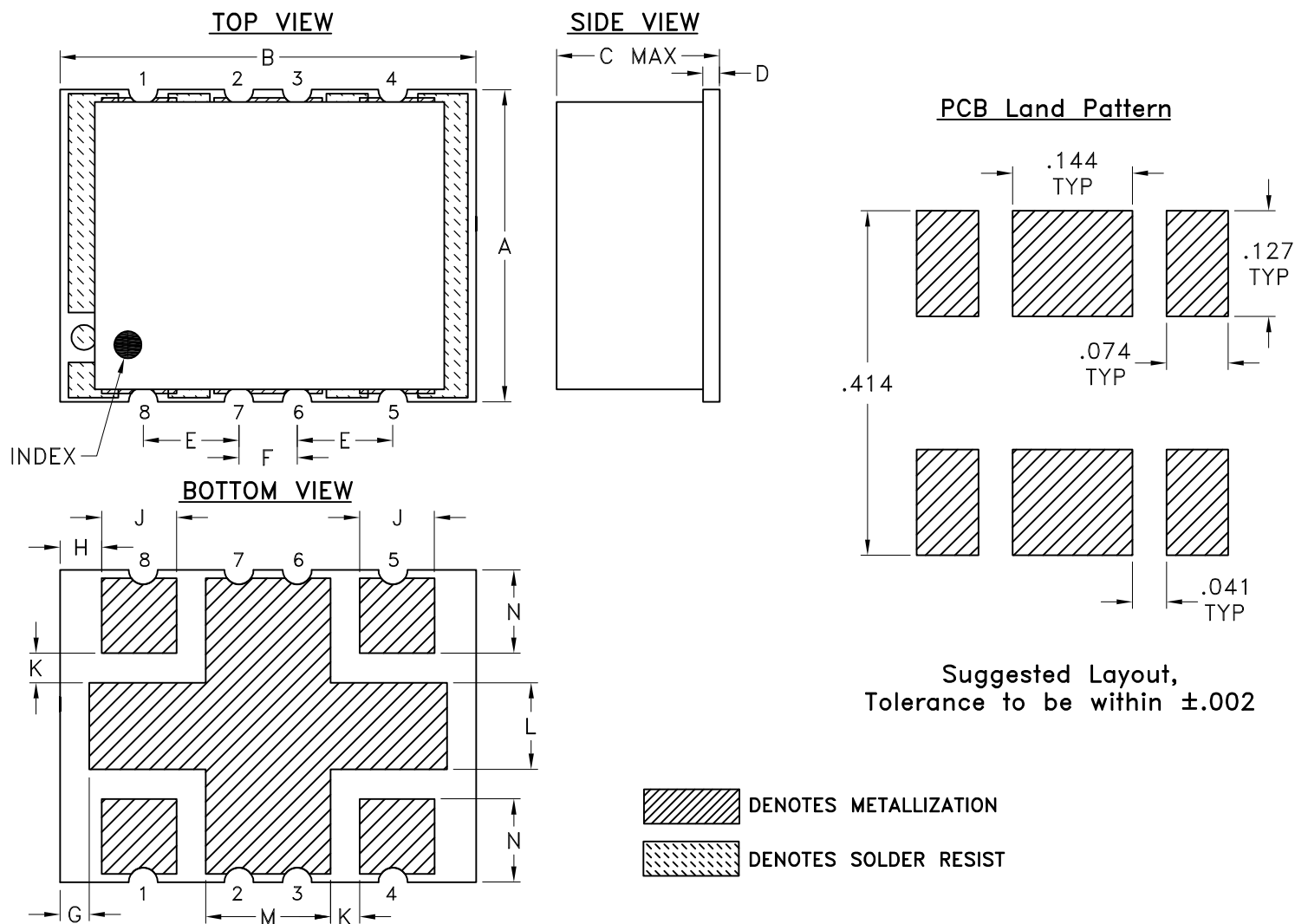
IR/RF MICROWAVE COMPONENTS

Typical Performance Curves



Outline Dimensions

AH202-1



Suggested Layout,
Tolerance to be within ± 0.002

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.

Mini-Circuits
 ISO 9001 ISO 14001 CERTIFIED

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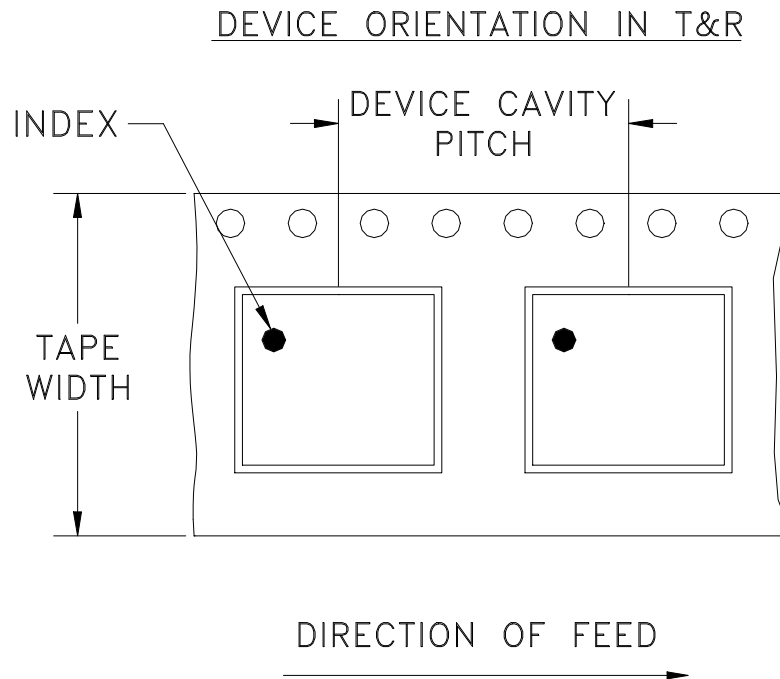
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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

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

 **Mini-Circuits**[®]

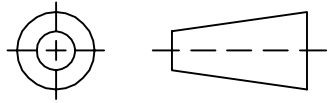
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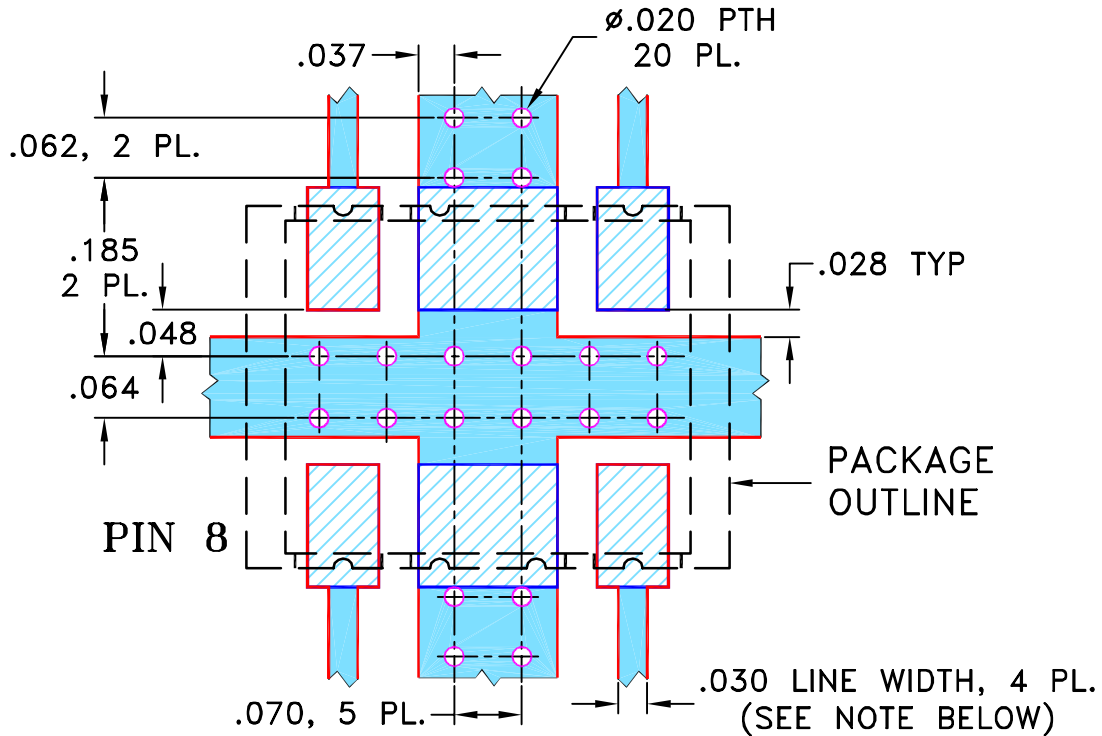
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M101377	NEW RELEASE	10/18/05	MMG	HY
A	M102713	ADDED "...WITH SMOBC"	01/12/06	GT	IL

**SUGGESTED MOUNTING CONFIGURATION
FOR AH202 CASE STYLE, "rd" PIN CONNECTION.**

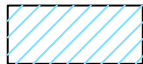


NOTE:

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

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

MMG

10/17/05

TOLERANCES ON:

CHECKED

IL

10/18/05

2 PL DECIMALS ±

APPROVED

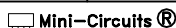
HY

10/18/05

3 PL DECIMALS ± .005

ANGLES ±

FRACTIONS ±



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL, rd, 75, AH202, SYPS-3, TB-361

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-229	REV: A
FILE: 98PL229	SCALE: 5:1	SHEET: 1 OF 1	



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