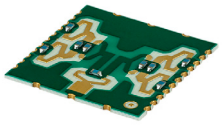
Surface Mount

Power Splitter/Combiner SEPS-8-153+

8 Way-0° 50Ω 6 to 15 GHz DC Pass

The Big Deal

- >2 octave bandwidth, 6 to 15 GHz
- Low insertion loss, 1.6 dB at 12.5 GHz
- High power handling, 4W as a splitter
- High isolation, 25 dB typ.
- Small size, 0.63 x 0.65 x 0.02”



CASE STYLE: RS1539

Product Overview

Mini-Circuits’ SEPS-8-153+ is a 50Ω 8-way 0˚ surface mount splitter/combiner covering the 6 to 15 GHz frequency range, supporting a wide variety of applications. This model can handle up to 4W RF input power as a splitter and provides low insertion loss, low amplitude unbalance, and good isolation. It comes housed mounted on a miniature, printed laminate (0.63 x 0.65 x 0.02”) with wrap-around terminations for excellent solderability.

Key Features

Feature	Advantages
Wideband, 6 to 15 GHz	>2 octave bandwidth supports a wide range of broadband applications.
Low insertion loss, 1.6 dB at 12.5 GHz	The combination of 4W power handling and low insertion loss makes this model a suitable candidate for distributing signals while maintaining signal power.
High power handling, 4W as a splitter	Supports a wide range of power requirements.
Low amplitude unbalance, 0.3 dB typ.	SEPS-8-153+ produces nearly equal output signals, ideal for parallel path / multichannel systems.
Good isolation, 25 dB	Minimizes interference between input ports.
Small size, 0.63 x 0.65 x 0.02”	Saves space in crowded PCB layouts.

Notes
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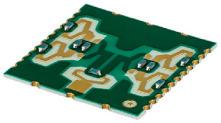
Surface Mount

Power Splitter/Combiner

SEPS-8-153+

8 Way-0° 50Ω 6 to 15 GHz DC Pass



CASE STYLE: RS1539

+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	Devices/Reel
13"	250

Maximum Ratings

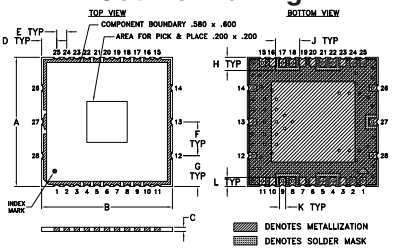
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	4W max.
Internal Dissipation	0.875W max.
DC Current	560 (70 mA each port)

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

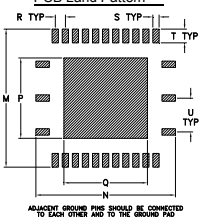
Pad Connections

SUM PORT	27	PORT 5	17
PORT 1	4	PORT 6	18
PORT 2	5	PORT 7	21
PORT 3	8	PORT 8	22
PORT 4	9	GROUND	all other

Outline Drawing



PCB Land Pattern



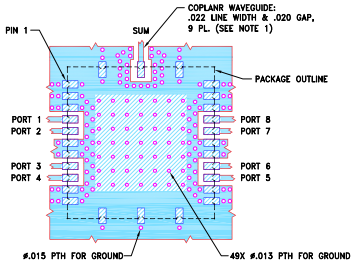
Suggested Layout,
Tolerance to be within±002

Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L
.630	.650	.020	.075	.050	.165	.150	.064	.120	.030	.044
16.00	16.51	0.51	1.91	1.27	4.19	3.81	1.63	3.05	0.76	1.12

M	N	P	Q	R	S	T	U	V	wt
.673	.693	.392	.415	.050	.031	.067	.165	--	grams
17.09	17.60	9.96	10.54	1.27	0.79	1.70	4.19	--	0.35

Demo Board MCL P/N: TB-590+
Suggested PCB Layout (PL-534)



NOTE:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP 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

Features

- wideband, 6 to 15 GHz
- good isolation, 25 dB typ.
- aqueous washable
- model can be rated to 5 GHz

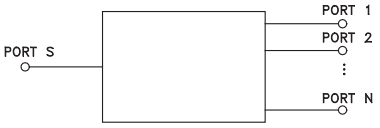
Applications

- WiMAX
- ISM
- instrumentation
- radar
- WLAN
- LTE

Electrical Specifications at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		6		15	GHz
Insertion Loss (above theoretical 9.0 dB)	6 - 9	—	0.9	1.8	dB
	9 - 12.5	—	1.6	2.8	
	12.5 - 15	—	3.5	4.8	
Isolation	6 - 9	10	16	—	dB
	9 - 12.5	16	25	—	
	12.5 - 15	15	22	—	
Phase Unbalance	6-15	—	—	—	Degree
Amplitude Unbalance	6 - 9	—	0.2	0.8	dB
	9 - 12.5	—	0.3	1.2	
	12.5 - 15	—	1.1	1.9	
VSWR (Port S)	6 - 9	—	1.5	—	:1
	9 - 12.5	—	1.6	—	
	12.5 - 15	—	1.9	—	
VSWR (Port 1-8)	6 - 9	—	1.4	—	:1
	9 - 12.5	—	1.6	—	
	12.5 - 15	—	2.3	—	

Electrical Schematic



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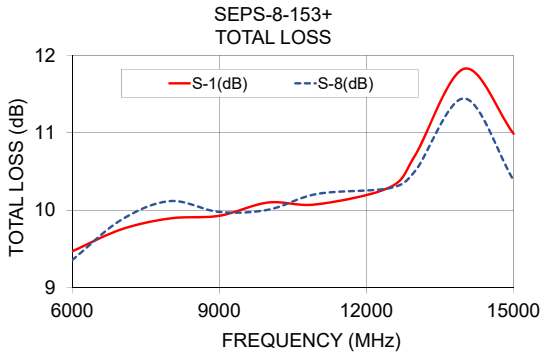
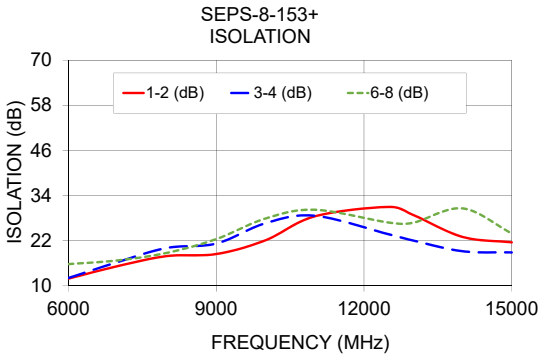
REV. OR
M164587
ED-17102502
SEPS-8-153+
WZ/CP/AM
200511

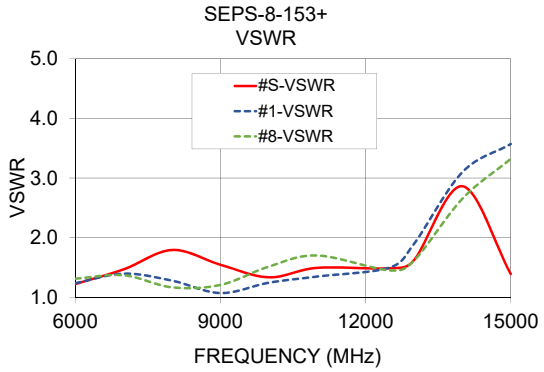
Typical Performance Data

Freq. (MHz)	Total Loss[1] (dB)						Ampl. Unbl. (dB)	Isolation (dB)				VSWR S	VSWR 1	VSWR 8
	S-1	S-2	S-3	S-4	S-6	S-8		1-2	1-3	3-4	6-8			
6000	9.47	9.17	9.67	9.84	9.49	9.35	0.30	11.89	15.79	12.05	15.75	1.22	1.24	1.31
7000	9.75	9.46	9.62	9.68	9.59	9.87	0.29	15.21	16.62	16.30	16.73	1.47	1.40	1.37
8000	9.89	9.71	9.95	9.84	9.95	10.12	0.18	17.88	18.61	20.05	18.74	1.79	1.28	1.17
9000	9.93	9.86	9.99	9.94	9.84	9.98	0.07	18.42	22.25	21.21	22.39	1.54	1.07	1.21
10000	10.10	10.06	9.96	10.12	9.75	10.01	0.03	22.08	27.84	26.62	27.87	1.33	1.24	1.51
11000	10.08	10.14	10.48	10.50	10.10	10.21	0.06	28.44	30.78	28.62	30.20	1.49	1.35	1.70
12500	10.30	10.53	10.47	10.19	10.19	10.29	0.23	30.96	27.62	23.69	26.81	1.49	1.50	1.45
13000	10.72	10.88	10.48	10.14	10.24	10.51	0.16	28.82	27.59	22.02	26.75	1.62	1.90	1.61
14000	11.83	12.08	11.50	11.00	11.38	11.44	0.25	22.98	31.06	19.18	30.57	2.86	3.10	2.65
15000	10.99	12.11	10.87	9.87	10.55	10.39	1.12	21.53	24.65	18.85	23.92	1.39	3.57	3.32

1. Total Loss = Insertion Loss + 9dB splitter theoretical loss.







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8 Way-0° Power Splitter/Combiner SEPS-8-153+

Typical Performance Data

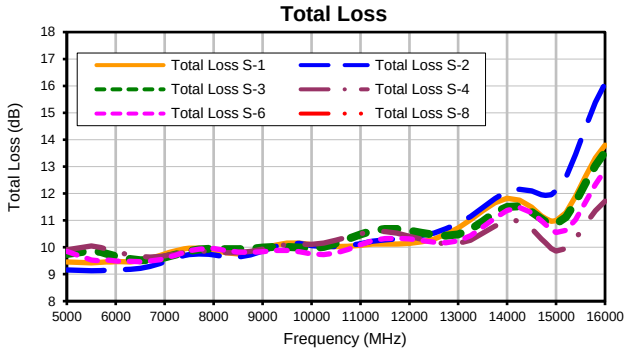
FREQ. (MHz)	TOTAL LOSS[1] (dB)						AMP. UNBAL. (dB)	ISOLATION (dB)				PHASE UNBAL. (deg.)
	S-1	S-2	S-3	S-4	S-6	S-8		1-2	1-3	3-4	6-8	
5000	9.46	9.16	9.75	9.91	9.85	9.42	0.30	8.65	15.60	8.78	15.75	8.72
5500	9.42	9.13	9.87	10.06	9.53	9.16	0.29	10.03	15.65	10.21	15.66	8.19
5700	9.45	9.13	9.83	9.99	9.50	9.23	0.32	10.74	15.77	10.88	15.68	8.78
5800	9.45	9.14	9.77	9.93	9.53	9.28	0.31	11.12	15.78	11.25	15.70	9.05
5900	9.46	9.16	9.72	9.88	9.51	9.31	0.30	11.50	15.78	11.65	15.73	9.28
6000	9.47	9.17	9.67	9.84	9.49	9.35	0.30	11.89	15.79	12.05	15.75	9.38
6100	9.47	9.17	9.63	9.79	9.48	9.42	0.30	12.26	15.82	12.46	15.77	9.43
6300	9.46	9.19	9.56	9.72	9.48	9.49	0.28	12.99	15.91	13.29	15.92	9.27
6500	9.51	9.22	9.52	9.66	9.47	9.58	0.29	13.68	16.06	14.14	16.09	9.36
6700	9.58	9.29	9.53	9.64	9.50	9.68	0.29	14.32	16.25	15.00	16.32	9.84
6900	9.69	9.40	9.58	9.66	9.54	9.81	0.29	14.90	16.50	15.84	16.61	10.22
7000	9.75	9.46	9.62	9.68	9.59	9.87	0.29	15.21	16.62	16.30	16.73	10.34
7100	9.81	9.53	9.67	9.71	9.64	9.94	0.28	15.51	16.76	16.75	16.88	10.41
7200	9.87	9.59	9.72	9.75	9.69	10.01	0.27	15.80	16.91	17.19	17.04	10.45
7400	9.94	9.69	9.82	9.81	9.82	10.12	0.25	16.38	17.28	18.04	17.40	10.48
7500	9.97	9.73	9.86	9.83	9.87	10.15	0.24	16.65	17.50	18.44	17.62	10.66
7700	9.97	9.76	9.93	9.86	9.94	10.18	0.21	17.25	17.90	19.23	18.02	11.01
7900	9.93	9.74	9.95	9.85	9.96	10.15	0.19	17.66	18.39	19.77	18.51	11.15
8000	9.89	9.71	9.95	9.84	9.95	10.12	0.18	17.88	18.61	20.05	18.74	11.14
8250	9.80	9.64	9.93	9.81	9.89	10.02	0.15	18.09	19.35	20.34	19.48	11.01
8500	9.75	9.63	9.93	9.80	9.83	9.95	0.12	18.15	20.24	20.56	20.38	10.78
8750	9.81	9.72	9.95	9.85	9.81	9.93	0.09	18.20	21.21	20.79	21.36	10.72
9000	9.93	9.86	9.99	9.94	9.84	9.98	0.07	18.42	22.25	21.21	22.39	11.20
9250	10.07	10.02	10.02	10.05	9.88	10.07	0.05	18.98	23.68	22.11	23.87	11.58
9500	10.16	10.14	10.01	10.10	9.89	10.09	0.02	19.77	24.99	23.26	25.16	11.90
9750	10.16	10.14	9.99	10.12	9.83	10.06	0.01	20.67	26.29	24.65	26.40	12.09
10000	10.10	10.06	9.96	10.12	9.75	10.01	0.03	22.08	27.84	26.62	27.87	12.02
10250	10.04	10.02	10.01	10.16	9.74	9.98	0.02	23.35	28.91	28.26	28.78	11.81
10500	10.03	10.03	10.14	10.26	9.79	10.01	0.01	24.86	29.71	29.23	29.43	11.54
10750	10.03	10.06	10.32	10.39	9.92	10.10	0.03	26.57	30.37	29.28	29.92	11.34
11000	10.08	10.14	10.48	10.50	10.10	10.21	0.06	28.44	30.78	28.62	30.20	11.09
11250	10.12	10.23	10.62	10.60	10.25	10.29	0.11	29.77	30.79	27.27	30.15	10.83
11500	10.13	10.28	10.68	10.59	10.33	10.32	0.15	30.46	30.13	26.50	29.43	11.25
11750	10.12	10.32	10.68	10.52	10.34	10.30	0.19	31.29	29.65	25.75	28.89	11.91
12000	10.15	10.37	10.62	10.41	10.31	10.26	0.22	31.29	28.96	24.97	28.21	12.48
12250	10.21	10.44	10.54	10.30	10.25	10.25	0.24	31.02	28.29	24.24	27.51	12.83
12500	10.30	10.53	10.47	10.19	10.19	10.29	0.23	30.96	27.62	23.69	26.81	12.95
12750	10.49	10.69	10.43	10.12	10.17	10.36	0.20	30.27	27.44	22.89	26.62	12.93
13000	10.72	10.88	10.48	10.14	10.24	10.51	0.16	28.82	27.59	22.02	26.75	12.75
13250	11.02	11.15	10.67	10.27	10.43	10.71	0.13	27.27	28.26	21.10	27.43	12.43
13500	11.36	11.48	10.97	10.52	10.75	10.97	0.12	25.53	29.36	20.27	28.60	11.94
13750	11.66	11.81	11.29	10.79	11.09	11.26	0.15	24.06	30.47	19.62	29.84	12.08
14000	11.83	12.08	11.50	11.00	11.38	11.44	0.25	22.98	31.06	19.18	30.57	13.51
14250	11.76	12.16	11.53	10.99	11.48	11.42	0.40	22.24	30.31	18.91	29.90	14.60
14500	11.49	12.10	11.31	10.69	11.28	11.19	0.61	21.62	29.15	18.63	28.70	15.46
14700	11.17	11.95	11.07	10.32	10.99	10.83	0.78	21.39	27.36	18.57	26.79	16.42
14780	11.07	11.93	10.96	10.17	10.84	10.70	0.86	21.28	26.55	18.53	25.97	16.75
14900	10.97	11.95	10.86	9.95	10.67	10.49	0.98	21.38	25.51	18.69	24.84	17.53
15000	10.99	12.11	10.87	9.87	10.55	10.39	1.12	21.53	24.65	18.85	23.92	18.15
15200	11.29	12.60	11.13	9.95	10.63	10.50	1.31	21.89	23.82	19.18	23.00	19.12
15400	11.90	13.45	11.68	10.32	11.03	10.92	1.55	22.22	23.27	19.51	22.32	19.87
15600	12.63	14.45	12.39	10.86	11.68	11.62	1.82	22.21	23.01	19.57	21.95	20.27
15800	13.32	15.39	13.04	11.36	12.34	12.34	2.07	21.76	22.86	19.20	21.69	20.29
16000	13.80	16.09	13.55	11.72	12.87	12.92	2.29	21.10	22.67	18.52	21.41	19.78

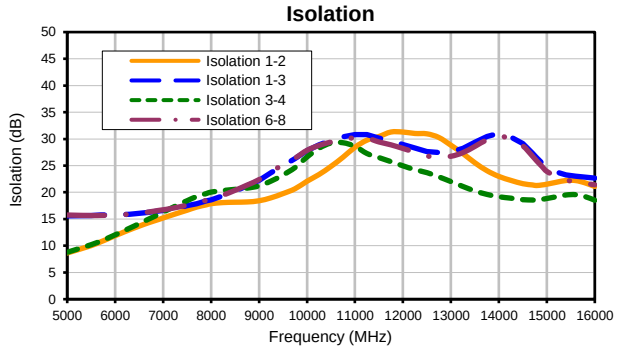
FREQ. (MHz)	VSWR (:1)		
	S	1	8
5000	1.49	1.12	1.22
5500	1.30	1.15	1.27
5700	1.28	1.18	1.28
5800	1.27	1.20	1.29
5900	1.25	1.22	1.30
6000	1.22	1.24	1.31
6100	1.18	1.26	1.32
6300	1.11	1.30	1.35
6500	1.11	1.34	1.36
6700	1.20	1.37	1.37
6900	1.38	1.39	1.38
7000	1.47	1.40	1.37
7100	1.56	1.40	1.36
7200	1.65	1.40	1.35
7400	1.80	1.39	1.32
7500	1.85	1.38	1.30
7700	1.89	1.35	1.26
7900	1.84	1.31	1.19
8000	1.79	1.28	1.17
8250	1.64	1.19	1.08
8500	1.52	1.09	1.05
8750	1.50	1.03	1.11
9000	1.54	1.07	1.21
9250	1.60	1.15	1.33
9500	1.58	1.19	1.40
9750	1.47	1.23	1.47
10000	1.33	1.24	1.51
10250	1.24	1.28	1.57
10500	1.27	1.32	1.62
10750	1.38	1.34	1.69
11000	1.49	1.35	1.70
11250	1.57	1.37	1.70
11500	1.58	1.36	1.70
11750	1.56	1.35	1.63
12000	1.52	1.36	1.55
12250	1.48	1.41	1.50
12500	1.49	1.50	1.45
12750	1.51	1.66	1.49
13000	1.62	1.90	1.61
13250	1.85	2.16	1.80
13500	2.18	2.49	2.03
13750	2.58	2.80	2.36
14000	2.86	3.10	2.65
14250	2.83	3.38	2.92
14500	2.46	3.60	3.21
14700	1.99	3.61	3.27
14780	1.79	3.63	3.33
14900	1.52	3.63	3.33
15000	1.39	3.57	3.32
15200	1.52	3.61	3.43
15400	2.03	3.68	3.45
15600	2.77	3.59	3.49
15800	3.55	3.54	3.39
16000	4.17	3.33	3.33

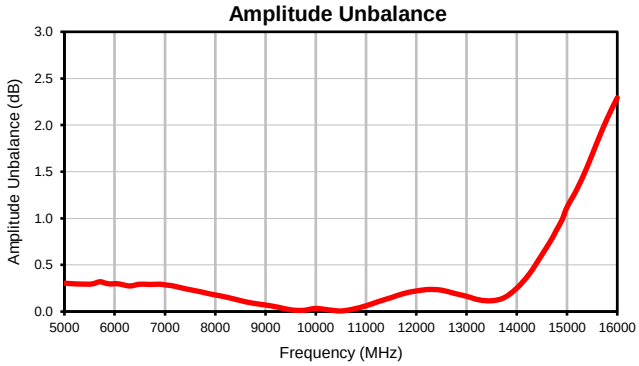
[1]Total Loss = Insertion Loss + 9dB Splitter Loss

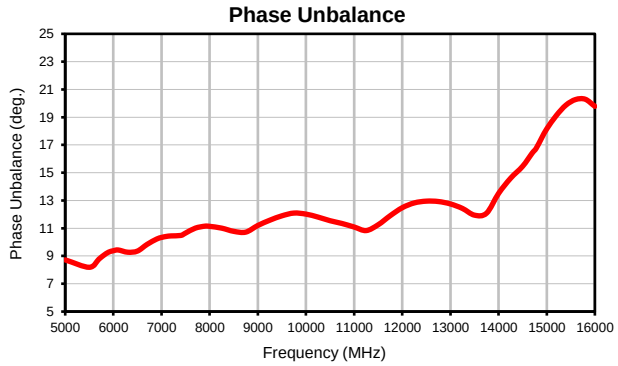
8 Way-0° Power Splitter/Combiner SEPS-8-153+

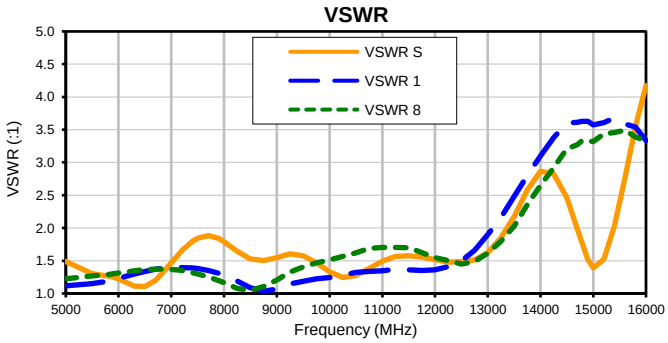
Typical Performance Curves









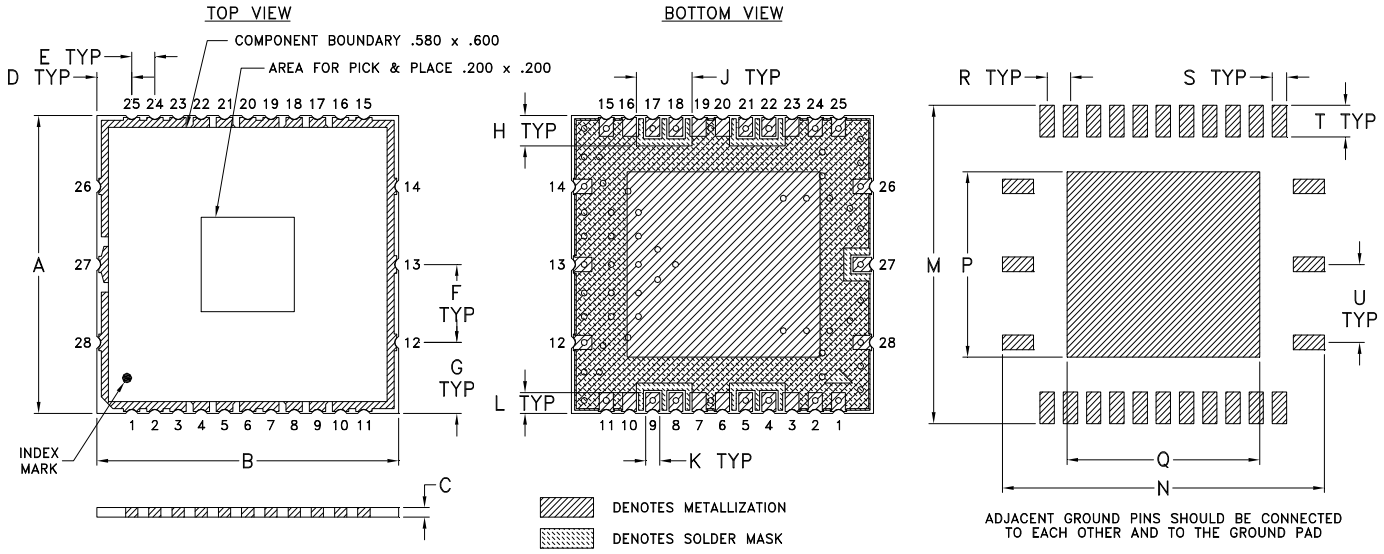


Case Style RS

Outline Dimensions

RS1539

PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L
RS1539	.630 (16.00)	.650 (16.51)	.020 (0.51)	.075 (1.91)	.050 (1.27)	.165 (4.19)	.150 (3.81)	.064 (1.63)	.120 (3.05)	.030 (0.76)	.044 (1.12)

CASE#	M	N	P	Q	R	S	T	U	V	WT.GRAMS
RS1539	.673 (17.09)	.693 (17.60)	.392 (9.96)	.415 (10.54)	.050 (1.27)	.031 (0.79)	.067 (1.70)	.165 (4.19)	-- --	.35

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .05; 3 Pl. ± .015

Notes:

1. Base material: Printed wiring laminate.
2. Termination finish:
   For RoHS Case Styles: 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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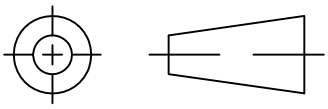
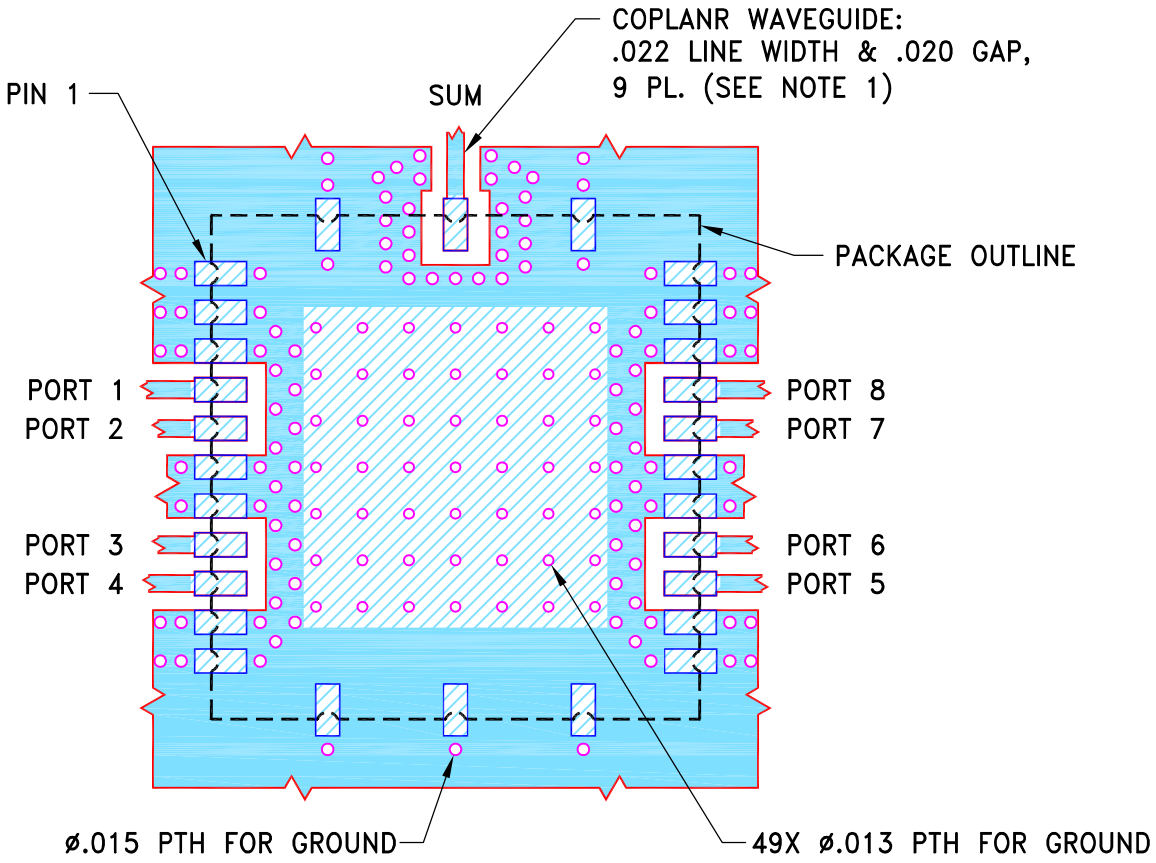
THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M164657	NEW RELEASE	11/17/17	ITG	WP

SUGGESTED MOUNTING CONFIGURATION FOR RS1539 CASE STYLE, "28SP01" PIN CODE



NOTE:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP 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	ITG	11/15/17
TOLERANCES ON:	CHECKED	GF	11/17/17
2 PL DECIMALS ±	APPROVED	WP	11/17/17
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

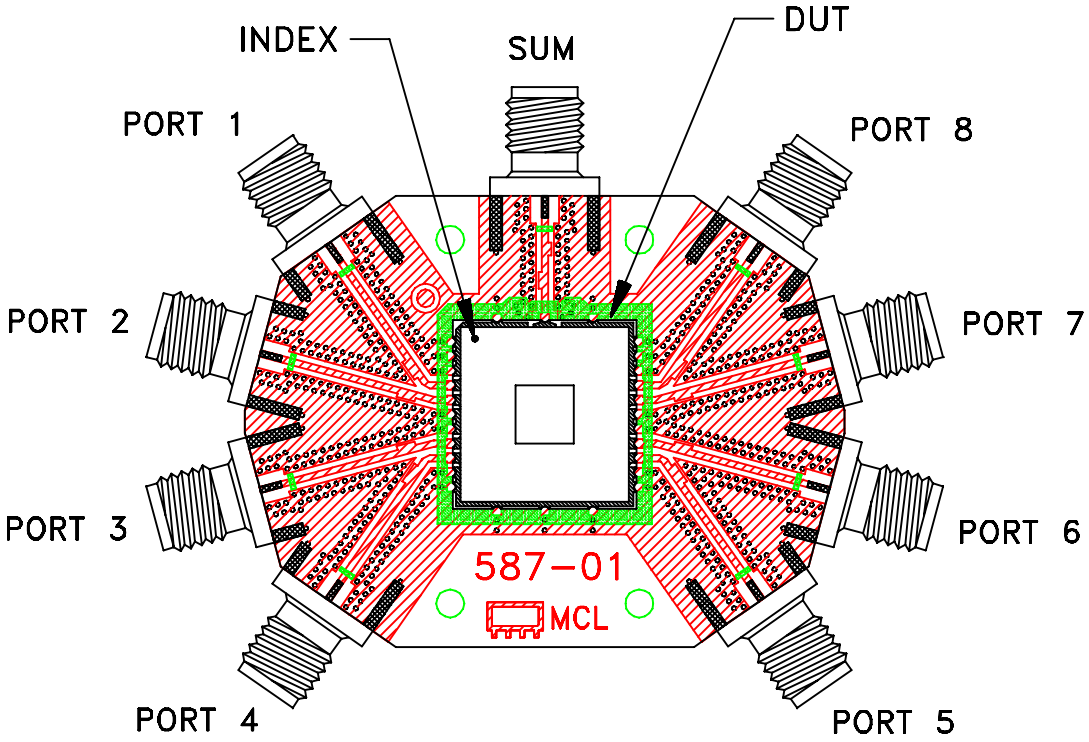
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 28SP01, RS1539, TB-590+

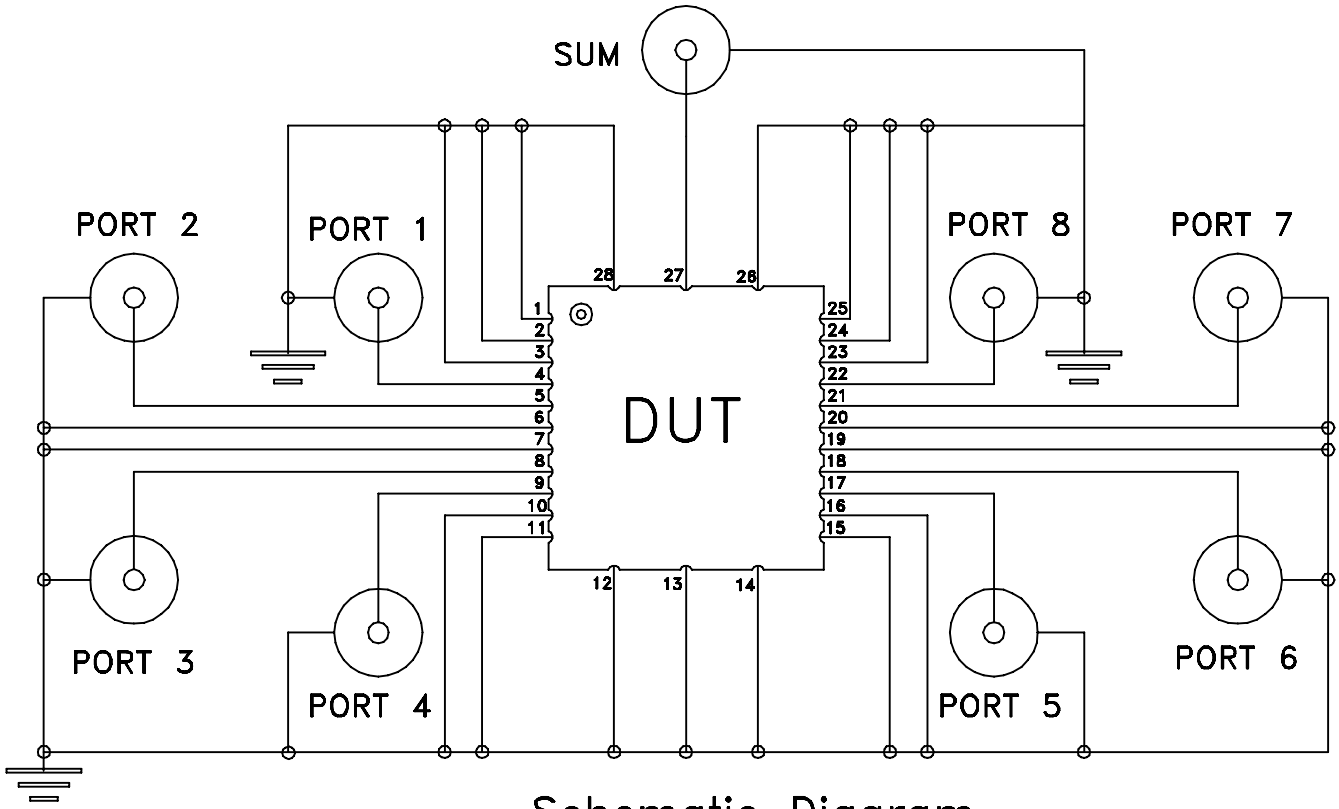
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-534	OR

FILE:	SCALE:	SHEET:
98PL534	4:1	1 OF 1

Evaluation Board and Circuit



TB-590+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

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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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