

Surface Mount

Phase Shifter

SPHSA-251+

50Ω 180° Voltage Variable 150 to 250 MHz

The Big Deal

- Low insertion loss, 1.5 dB typ.
- Wide phase shift, 180°
- Low frequency and small size



CASE STYLE: JW1441

Product Overview

Mini-Circuits' SPHSA-251+ is a voltage variable phase shifter providing 180° phase control from 150 to 250 MHz in a miniature surface mount package. This model has a control bandwidth of DC to 30 kHz and a control voltage range from 0 to +15V. Housed in a shielded, 12-lead package with wrap-around terminations, the unit measures only 0.44 x 0.74 x 0.19", offering a space efficient, low-cost alternative to larger, expensive connectorized phase shifters typical for low frequency operation.

Feature	Advantages
Low insertion loss, 1.5 dB typ.	Enables good transmission of signal power from input to output and minimizes effect on system noise figure.
Wide phase shift, 180°	In test environments, 180° phase control allows the user to experiment with various incident phases. This can be used to test residual phase noise of amplifiers and to determine the influence of phase between two mismatched components in a system.
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Notes

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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



Phase Shifter

50Ω 180° Voltage Variable 150 to 250 MHz

SPHSA-251+



CASE STYLE: JW1441

Maximum Ratings

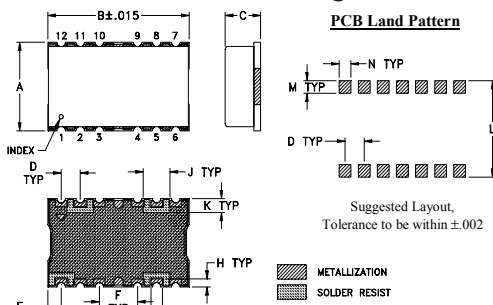
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	20 dBm max.
Control Voltage	20V
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

IN	2
OUT	5
BIAS	8, 12 [^]
GROUND	1, 3, 4, 6, 7, 9, 10, 11

[^] proper operation is achieved with pins 8 or 12 or both connected to BIAS.

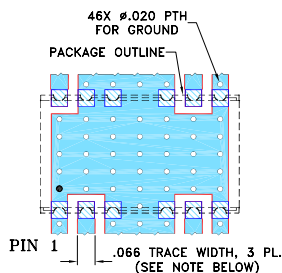
Outline Drawing



Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H
.440	.740	.19	.100	.070	.200	.060	.040
11.18	18.80	4.83	2.54	1.78	5.08	1.52	1.02
J	K	L	M	N	P	wt	
.140	.070	.480	.063	.061	--	grams	
3.56	1.78	12.19	1.60	1.55	--	grams	2.5

Demo Board MCL P/N: TB-524+ Suggested PCB Layout (PL-408)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350 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.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Features

- low insertion loss, 1.5 dB typ.
- wide phase shift, 180°
- aqueous washable

Applications

- cellular
- communication

Electrical Specifications at 25°C

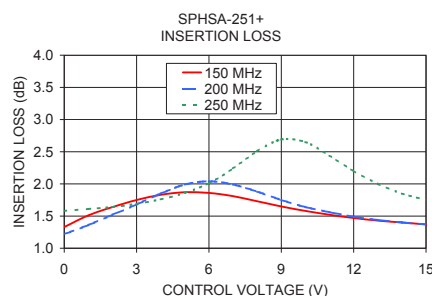
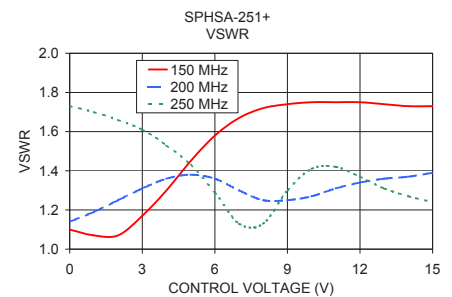
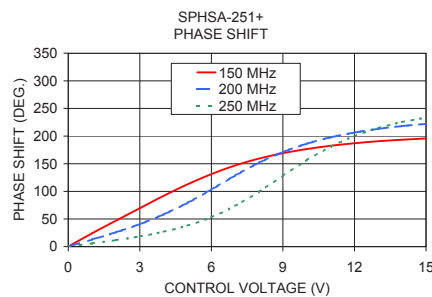
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		150		250	MHz
Phase Range	150 - 250	180	—	—	Degrees
Insertion Loss	150 - 250	—	1.5	3.5	dB
Control Voltage	150 - 250	—	0-15	—	V
Control Bandwidth	150 - 250	—	DC-30	—	kHz
VSWR	150 - 250	—	1.6	2.5	:1

DC input resistance at Control port: 2000 ohms typ.

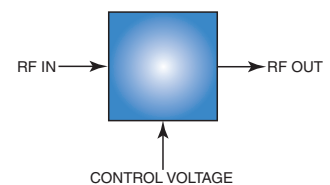
Typical Performance Data

Control Voltage (V)	Phase Shift* (Degrees)			VSWR (:1)			Insertion Loss (dB)		
	150 MHz	200 MHz	250 MHz	150 MHz	200 MHz	250 MHz	150 MHz	200 MHz	250 MHz
0.0	0.01	0.01	0.01	1.10	1.14	1.73	1.33	1.22	1.58
1.0	24.23	12.87	5.88	1.07	1.19	1.73	1.51	1.36	1.61
2.0	46.91	25.98	11.76	1.07	1.25	1.66	1.64	1.52	1.64
3.0	69.53	40.70	18.54	1.17	1.31	1.61	1.75	1.68	1.69
4.0	91.78	58.22	27.01	1.30	1.36	1.53	1.83	1.85	1.76
5.0	112.67	79.19	38.16	1.45	1.38	1.43	1.87	1.99	1.86
6.0	131.26	103.36	53.33	1.58	1.36	1.29	1.86	2.04	2.01
7.0	146.85	128.64	73.76	1.67	1.30	1.13	1.81	1.99	2.24
8.0	159.33	151.94	99.51	1.72	1.25	1.13	1.73	1.88	2.51
9.0	169.05	171.21	128.38	1.74	1.25	1.30	1.65	1.75	2.69
10.0	176.58	186.24	156.49	1.74	1.27	1.41	1.58	1.64	2.65
11.0	182.48	197.74	180.79	1.75	1.31	1.42	1.52	1.56	2.44
12.0	187.09	206.48	200.05	1.75	1.34	1.37	1.47	1.49	2.20
13.0	190.71	213.11	214.63	1.74	1.36	1.31	1.43	1.44	2.00
14.0	193.55	218.17	225.44	1.73	1.37	1.27	1.40	1.40	1.85
15.0	195.79	222.07	233.49	1.73	1.39	1.24	1.37	1.37	1.75

* Normalized at control voltage = 0V



electrical schematic



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