

## Knob Potentiometer With Switch



The P16S is a revolutionary concept in panel mounted potentiometers. This unique design consists of a knob driving and incorporating a cermet potentiometer. Only the mounting hardware and terminals are situated on the back side of the panel reducing to a minimum the required clearance.

QUICK REFERENCE DATA	
Multiple module	No
Switch module	Yes
Detent module	Yes
Special electrical laws	A: linear, L: logarithmic, F: reverse logarithmic
Sealing level	IP 67
Lifespan	10K cycles (switch), 50K cycles (track)

### FEATURES

- **P16S** - version for military, professional and industrial applications (cermet): 1 W at 40 °C
- **PA16S** - version for professional audio applications (conductive plastic): 0.5 W at 40 °C
- Compact (integrated)
- Detent and electric cut off at beginning of travel
- Fully sealed and panel sealed
- Metallic or plastic knob options
- Custom knob on request
- Test according to CECC 41000 or IEC 60393-1
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

DIMENSIONS in millimeters ( $\pm 0.5$ mm)		
<p><b>P16SNP</b></p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p><b>P16SNM</b></p> <p>Thickness nut 2 mm washer 1.5 mm</p>	<p><b>PANEL CUTOUT</b></p>

ELECTRICAL SPECIFICATIONS		
	P16S	PA16S
Resistive element	Cermet	Conductive plastic
Electrical travel	$220^{\circ} \pm 10^{\circ}$	$220^{\circ} \pm 10^{\circ}$
Power rating chart		
Circuit diagram		
Taper		
Resistance range	linear law logarithmic laws	22 $\Omega$ to 10 M $\Omega$ 100 $\Omega$ to 2.2 M $\Omega$
Standard series e3		1 - 2.2 - 4.7 and on request 1 - 2 - 5
Tolerance	standard on request	$\pm 20\%$ $\pm 10\%$
Power rating	linear logarithmic	1 W at +40 $^{\circ}$ C 0.5 W at +40 $^{\circ}$ C
Temperature coefficient (typical)		$\pm 150$ ppm
Dielectric strength (RMS)		2500 V
Limiting element voltage (linear law)		350 V
Contact resistance variation		3 % Rn or 3 $\Omega$
End resistance (typical)		1 $\Omega$
Insulation resistance (500 V <sub>DC</sub> )		10 <sup>6</sup> M $\Omega$



MECHANICAL SPECIFICATIONS	
Mechanical travel	300° ± 5°
Operating torque	2 Ncm typical
End stop torque	25 Ncm maximum
Tightening torque of mounting nut	180 Ncm maximum
Unit weight	4.5 g typical

ENVIRONMENTAL SPECIFICATIONS		
	METALLIC KNOB	PLASTIC KNOB
Temperature range	-40 °C to +125 °C	-40 °C to +85 °C
Climatic category	40/100/56	40/85/56
Sealing	Sealed container and panel sealed	
Protection grades	IP67	

SWITCH ELECTRICAL AND MECHANICAL SPECIFICATIONS		
ON / OFF switch	Actuation in counter clockwise position (between terminal a and terminal b)	
Switching current	P16S	100 mA max.
	PA16S	1 mA max.
Switch actuation torque	3 Ncm typical	
Switch actuation travel	30° ± 5°	
Dielectric strength terminal to terminal (RMS)	1000 V	
Insulation resistance between contacts	10 <sup>6</sup> MΩ	
Switch mechanical endurance	10 000 cycles	
1 cycle	ON-OFF-ON	

**Note**

- Nothing stated herein shall be construed as a guarantee of quality or durability

MARKING
<ul style="list-style-type: none"> <li>• Ohmic value code, tolerance, code and taper</li> <li>• Manufacturing date code</li> </ul>

PACKAGING
<ul style="list-style-type: none"> <li>• Carton box of 20 pieces</li> </ul>

CONTROL KNOB
Black metallic knob (NM). Black plastic knob (NP). For white and blue color see ordering information. Other dimensions, shapes, colors of control knobs are manufactured on request - please consult Vishay. Other reference marks (shapes, colors) and legends can be printed on plastic knob on request - please consult Vishay.

STANDARD RESISTANCE ELEMENT DATA												
STANDARD RESISTANCE VALUES	P16S CERMET						PA16S CONDUCTIVE PLASTIC					
	LINEAR TAPER			LOGARITHMIC TAPER			LINEAR TAPER			LOGARITHMIC TAPER		
	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER	MAX. POWER AT 40 °C	MAX. VOLTAGE	MAX. CUR. THROUGH WIPER
Ω	W	V	mA	W	V	mA	W	V	mA	W	V	mA
22	1	4.69	213									
47	1	6.85	146									
100	1	10	100	0.5	7.1	71						
220	1	14.8	67.4	0.5	10.5	48						
470	1	21.7	46.1	0.5	15.3	32.6				0.25	10.8	23.1
1K	1	31.6	31.6	0.5	22.4	22.4	0.5	22.4	22.4	0.25	15.8	16
2.2K	1	46.9	21.3	0.5	33.2	15.1	0.5	33.2	15.1	0.25	23.5	11
4.7K	1	68.5	14.6	0.5	48.5	10.3	0.5	48.5	10.3	0.25	34.3	7
10K	1	100	10	0.5	70.7	7.07	0.5	70.7	7.07	0.25	50	5
22K	1	148	6.74	0.5	105	4.77	0.5	105	4.77	0.25	74	3.4
47K	1	217	4.61	0.5	153	3.26	0.5	153	3.26	0.25	108	2.3
100K	1	316	3.16	0.5	224	2.24	0.5	224	2.24	0.25	158	1.6
220K	0.56	350	1.59	0.5	332	1.51	0.5	332	1.51	0.25	235	1.1
470K	0.26	350	0.75	0.26	350	0.74	0.26	350	0.74	0.25	343	0.7
1M	0.12	350	0.35	0.12	350	0.35	0.12	350	0.35			
2.2M	0.05	350	0.16	0.056	350	0.16						
4.7M	0.02	350	0.07									
10M	0.01	350	0.012									



<b>PERFORMANCE</b>				
TESTS	CONDITIONS	TYPICAL VALUES AND DRIFTS		
		$\Delta R_T/R_T$ (%)	$\Delta R_{1-2}/R_{1-2}$ (%)	OTHER
Electrical endurance	1000 h at rated power 90'/30' cycle at +40 °C	± 5 %	-	Insulation resistance: > 10 <sup>4</sup> MΩ Contact res. variation: < 2 % Rn
Damp heat, steady state	56 days 40 °C, 93 % HR	± 2 %	± 1 %	Insulation resistance: > 10 <sup>4</sup> MΩ
Mechanical endurance	50 000 cycles	± 5 %	-	Contact res. variation: < 2 % Rn
Shock	50 g's at 11 ms 3 successive shocks in 3 dimensions	± 0.2 %	± 0.5 %	-
Vibration	10 Hz to 55 Hz 0.75 mm or 10 g's during 6 h	± 0.2 %	-	$\Delta V_{1-2}/\Delta V_{1-3} \leq \pm 0.5 \%$

<b>ORDERING INFORMATION</b>																	
P	1	6	S	N	P	2	2	3	M	A	B	1	5				
MODEL	STYLE			OHMIC VALUE		TOLERANCE		TAPER			PACKAGING CODE		SPECIAL NUMBER				
<b>P16S</b> = cermet <b>PA16S</b> = conductive plastic	<b>NM</b> : metallic black <b>NP</b> : plastic black <b>WM</b> : metallic white <b>WP</b> : plastic white <b>BP</b> : plastic blue			<b>223</b> = 22 kΩ for ohmic value range see electrical specification		<b>M</b> = ± 20 % On request: <b>K</b> = ± 10 %		<b>A</b> : linear <b>L</b> : clockwise logarithmic <b>F</b> : inverse clockwise logarithmic			<b>B15</b> = Box of 20 pieces		(If applicable) Given by Vishay for custom design				

<b>PART NUMBER DESCRIPTION</b> (for information only)								
P16S	NP	22 kΩ	20 %	A		BO20		e3
MODEL	STYLE	OHMIC VALUE	TOLERANCE	TAPER	SPECIAL	PACKAGING	SPECIAL	LEAD (Pb)-FREE

<b>RELATED DOCUMENTS</b>	
<b>APPLICATION NOTES</b>	
Potentiometers and Trimmers	<a href="http://www.vishay.com/doc?51001">www.vishay.com/doc?51001</a>
Guidelines for Vishay Sfernice Resistive and Inductive Components	<a href="http://www.vishay.com/doc?52029">www.vishay.com/doc?52029</a>



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