

## Knob Potentiometer With Switch



### 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

### LINKS TO ADDITIONAL RESOURCES



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)

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> <p>Panel thickness max.: 3 mm</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	$22 \Omega$ to $10 \text{ M}\Omega$	$1 \text{ k}\Omega$ to $1 \text{ M}\Omega$
	logarithmic laws	$100 \Omega$ to $2.2 \text{ M}\Omega$	$470 \Omega$ to $500 \text{ k}\Omega$
Standard series e3	1 - 2.2 - 4.7 and on request 1 - 2 - 5		1 - 2.2 - 4.7
Tolerance	standard	$\pm 20 \%$	$\pm 20 \%$
	on request	$\pm 10 \%$	$\pm 10 \%$ ( $1 \text{ k}\Omega$ to $100 \text{ k}\Omega$ )
Power rating	linear	1 W at $+40^{\circ}\text{C}$	0.5 W at $+40^{\circ}\text{C}$
	logarithmic	0.5 W at $+40^{\circ}\text{C}$	0.25 W at $+40^{\circ}\text{C}$
Temperature coefficient (typical)	$\pm 150 \text{ ppm}$		$\pm 500 \text{ ppm}$
Dielectric strength (RMS)	2500 V		2500 V
Limiting element voltage (linear law)	350 V		350 V
Contact resistance variation	$3 \%$ $R_n$ or $3 \Omega$		$2 \%$ $R_n$ or $3 \Omega$
End resistance (typical)	$1 \Omega$		$1 \Omega$
Insulation resistance ( $500 \text{ V}_{\text{DC}}$ )	$10^6 \text{ M}\Omega$		$10^6 \text{ M}\Omega$



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, blue, red, and yellow color see ordering information.

Other dimensions, shape, marking, 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									



PERFORMANCE				
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 %	-	$\Delta V_{1-2}/\Delta V_{1-3} \leq \pm 0.5 \%$

ORDERING INFORMATION																	
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>RP</b> : plastic red <b>YP</b> : plastic yellow			<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			

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

RELATED DOCUMENTS	
APPLICATION NOTES	
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>



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.