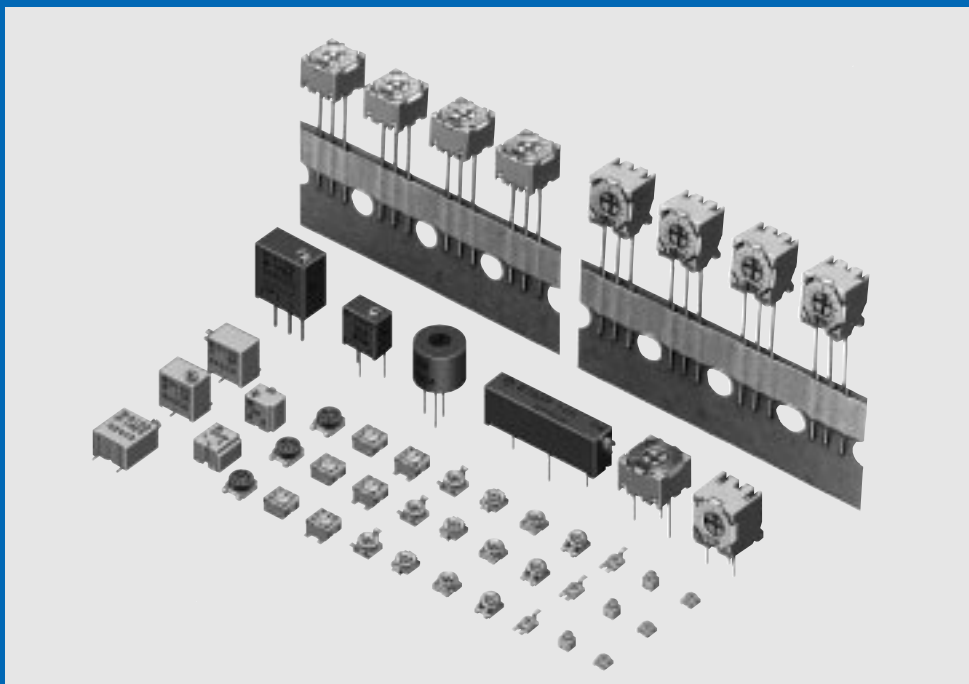


# Trimmer Potentiometers

## TRIMMER POTENTIO- METERS



**muRata** *Innovator  
in Electronics*

Murata  
Manufacturing Co., Ltd.

Cat.No.R50E-12

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● **Part Numbering** (The structure of the "Global Part Numbers" that have been adopted since June 2001 and the meaning of each code are described herein.)  
If you have any questions about details, inquire at your usual Murata sales office or distributor.

**Trimmer Potentiometers**

(Global Part Number) **PV** **Z3** **A** **103** **A01** **R00**  
① ② ③ ④ ⑤ ⑥

① Product ID

Product ID	
<b>PV</b>	Trimmer Potentiometers

② Series

③ Adjustment Direction /Lead Type

Code	Series	Code	Adjustment Direction/ Lead Type
<b>Z2</b>	SMD Open 2mm Size	<b>A</b>	Top
		<b>K</b>	Rear
<b>Z3</b>	SMD Open 3mm Size	<b>A</b>	Top
		<b>T</b>	Top
		<b>K</b>	Rear
		<b>R</b>	Rear
<b>S3</b>	SMD Open 3mm Size Stopper Low-profile	<b>A</b>	Top
<b>A3</b>	SMD Open 3mm Size	<b>A</b>	Top
<b>F2</b>	SMD Sealed type 2mm Size	<b>A</b>	Top
<b>G3</b>	SMD Sealed 3mm Size	<b>A</b>	Top, J-hook
		<b>G</b>	Top, Gull-wing
		<b>K</b>	Rear
<b>M4</b>	SMD Sealed 4mm Size	<b>A</b>	Top
<b>G5</b>	SMD Sealed 5mm Square 11-turns	<b>A</b>	Top
		<b>H</b>	Side
<b>01</b>	SMD Sealed 6mm Square 12-turns	<b>P</b>	Side
		<b>W</b>	Top
		<b>X</b>	Side
<b>C6</b>	Lead Sealed 6mm Square Single-turn	<b>A</b>	Top, Triangle
		<b>D</b>	Top, Triangle
		<b>E</b>	Side, Triangle
		<b>G</b>	Side, Triangle
		<b>H</b>	Side, Triangle
		<b>M</b>	Top, Inline
		<b>Q</b>	Side, Inline
<b>32</b>	Lead Sealed 6mm Round Single-turn	<b>H</b>	Top, Triangle
		<b>P</b>	Top, Triangle
		<b>R</b>	Top, Inline
		<b>N</b>	Side, Triangle
		<b>T</b>	Side, Triangle
		<b>S</b>	Side, Triangle
<b>34</b>	Lead Sealed 9mm Square Single-turn	<b>F</b>	Top, Triangle
		<b>P</b>	Top, Triangle
		<b>H</b>	Side, Triangle
		<b>X</b>	Side, Triangle
		<b>W</b>	Side, Inline
<b>12</b>	Lead Sealed 7mm Round 4-turns	<b>H</b>	Top, Triangle
		<b>P</b>	Top, Triangle
		<b>T</b>	Side, Triangle
		<b>S</b>	Side, Triangle

<b>22</b>	Lead Sealed 31mm Rectangular 22-turns	<b>L</b>	Side
		<b>S</b>	Side, Inline
		<b>Y</b>	Side, Triangle
<b>23</b>	Lead Sealed 19mm Rectangular 15-turns	<b>P</b>	Side, Triangle
		<b>Y</b>	Side, Triangle
<b>36</b>	Lead Sealed 10mm Square 25-turns	<b>W</b>	Top, Inline
		<b>Y</b>	Top, Triangle
		<b>P</b>	Side, Triangle
		<b>X</b>	Side, Inline
		<b>Z</b>	Side, Triangle
<b>37</b>	Lead Sealed 6mm Square 12-turns	<b>W</b>	Top, Triangle
		<b>Y</b>	Top, Inline
		<b>P</b>	Side, Triangle
		<b>X</b>	Side, Triangle
		<b>Z</b>	Side, Inline

④ Total Resistance

Expressed by three figures. The unit is ohm. The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

Ex.)

Code	Total Resistance
<b>100</b>	100ohm
<b>102</b>	1000ohm
<b>104</b>	10000ohm (=100kohm)

⑤ Individual Specification

Code	Series	Individual Specification Code
<b>A01</b>	—	Standard
<b>C01</b>	<b>PVZ3</b>	High heat Resistance Type
<b>B01</b>	<b>PVM4</b>	High-liability Type
<b>A31</b>	<b>PV36/PV37</b>	Radial Taping
<b>A04</b>	<b>PVC6</b>	Radial Taping
<b>A11</b>	<b>PVF2</b>	Standard Type (Resistance Change Characteristics : Linear)
<b>A41</b>	<b>PVF2</b>	Standard Type (Resistance Change Characteristics : Log curve)
<b>A81</b>	<b>PVF2</b>	Standard Type (Resistance Change Characteristics : Log curve)
<b>A51</b>	<b>PVF2</b>	Standard Type (Resistance Change Characteristics : Log-log curve)
<b>A91</b>	<b>PVF2</b>	Standard Type (Resistance Change Characteristics : Log-log curve)

⑥ Packaging

Code	Packaging
<b>A00</b>	Ammo Pack
<b>B00</b>	Bulk
<b>M00*</b>	Magazine
<b>R00</b>	Reel

\* M02 for PV01 series

\* M12 for PV36P Type and M15 for PV36W/Y/X/Z Type.

## Angle Sensing Potentiometers

(Global Part Number) 

<b>PV</b>	<b>S1</b>	<b>A</b>	<b>103</b>	<b>A01</b>	<b>R00</b>
-----------	-----------	----------	------------	------------	------------

  
① ② ③ ④ ⑤ ⑥

### ① Product ID

Product ID	
<b>PV</b>	Rotary Position Sensor

### ② Series

Code	Series
<b>S1</b>	Dust-proof Type 12mm Size

### ③ Terminal Shape

Code	Terminal Shape
<b>A</b>	SMD Type

### ④ Total Resistance

Expressed by three figures. The unit is ohm. The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

Ex.)

Code	Total Resistance
<b>103</b>	10000 ohm (=10k ohm)

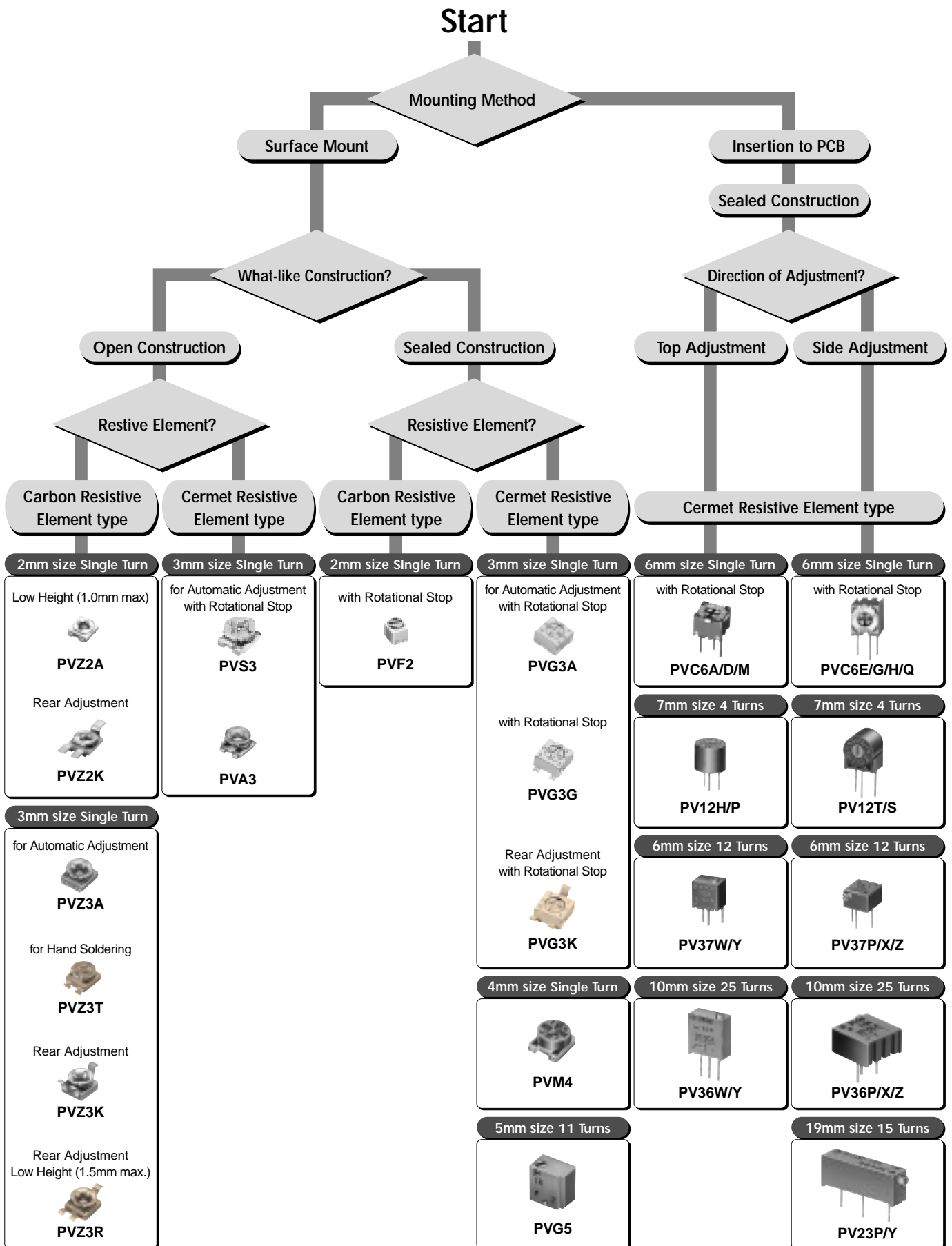
### ⑤ Individual Specification Code

Code	Individual Specification Code
<b>A01</b>	Standard

### ⑥ Packaging

Code	Packaging
<b>B00</b>	Bulk
<b>R00</b>	Reel

# Selection Guide of Trimmer Potentiometers



# Trimmer Potentiometers



## SMD Open Type 2mm Size PVZ2 Series

### ■ Features

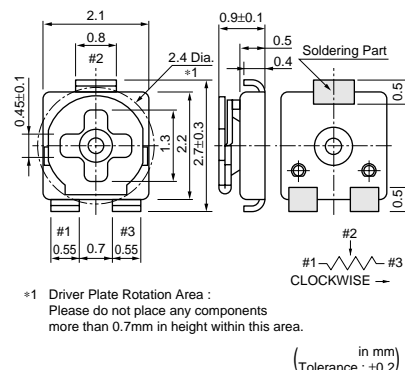
1. Ultra-small and thin external dimensions of 2.1 (W) x2.7 (L) x1.0 max. (T) mm.
2. Au plated termination achieve a high density P. C. B. mounting.
3. Cross-shaped driver slot allows for in-process automatic adjustment and it provides superior adjustability.
4. Two pieces parts construction achieve low cost and excellent quality.
5. Special resin substrate allow high peak temperature for reflow soldering.

### ■ Applications

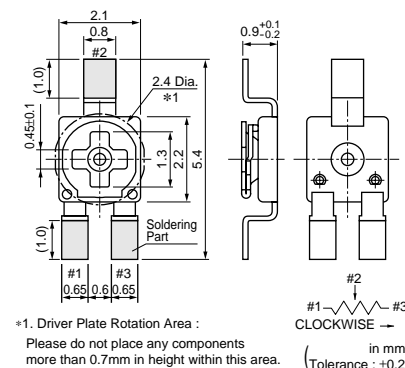
- |                   |                        |
|-------------------|------------------------|
| 1. Pick-up module | 2. LCD                 |
| 3. Cellular-phone | 4. PHS                 |
| 5. Pager          | 6. DVC                 |
| 7. Digital camera | 8. Portable audio, etc |



PVZ2A



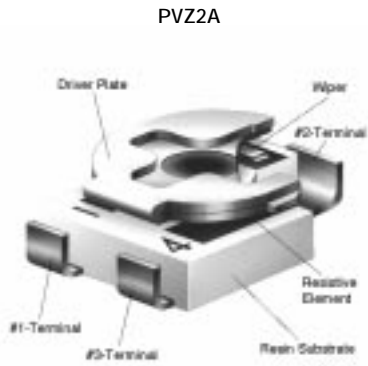
PVZ2K



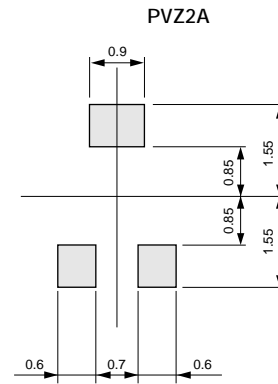
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVZ2□501A01	0.1(50°C)	Reflow	1(240°±10°)	500ohm ±30%	±500
PVZ2□102A01	0.1(50°C)	Reflow	1(240°±10°)	1k ohm ±30%	±500
PVZ2□202A01	0.1(50°C)	Reflow	1(240°±10°)	2k ohm ±30%	±500
PVZ2□302A01	0.1(50°C)	Reflow	1(240°±10°)	3k ohm ±30%	±500
PVZ2□502A01	0.1(50°C)	Reflow	1(240°±10°)	5k ohm ±30%	±500
PVZ2□103A01	0.1(50°C)	Reflow	1(240°±10°)	10k ohm ±30%	±500
PVZ2□203A01	0.1(50°C)	Reflow	1(240°±10°)	20k ohm ±30%	±500
PVZ2□303A01	0.1(50°C)	Reflow	1(240°±10°)	30k ohm ±30%	±500
PVZ2□503A01	0.1(50°C)	Reflow	1(240°±10°)	50k ohm ±30%	±500
PVZ2□104A01	0.1(50°C)	Reflow	1(240°±10°)	100k ohm ±30%	±500
PVZ2□204A01	0.1(50°C)	Reflow	1(240°±10°)	200k ohm ±30%	±500
PVZ2□304A01	0.1(50°C)	Reflow	1(240°±10°)	300k ohm ±30%	±500
PVZ2□504A01	0.1(50°C)	Reflow	1(240°±10°)	500k ohm ±30%	±500
PVZ2□105A01	0.1(50°C)	Reflow	1(240°±10°)	1M ohm ±30%	±500

The blank column is filled with the code of adjustment direction A (top) or K (rear).

■ Construction

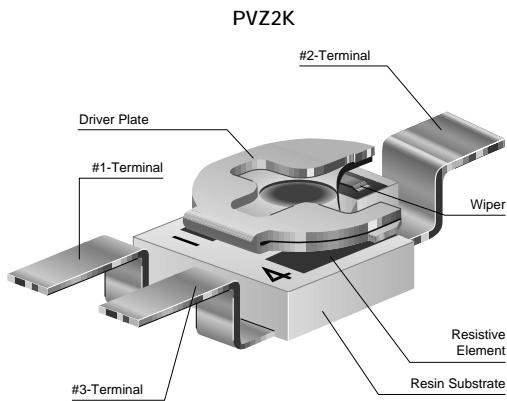


■ Standard Land Pattern

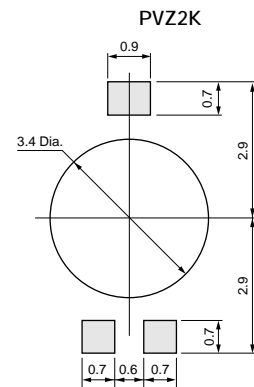


( in mm)  
 (Tolerance : ±0.1)

■ Construction



■ Standard Land Pattern



( in mm)  
 (Tolerance : ±0.1)

■ Characteristics

Humidity Exposure	Res. Change : +10, -2%
High Temperature Exposure	Res. Change : $R \leq 100\text{kohm} \dots +2, -10\%$ $100\text{kohm} < R \dots +2, -15\%$
Humidity Load Life	Res. Change : ±10%
Load Life	Res. Change : $R \leq 100\text{kohm} \dots +2, -10\%$ $100\text{kohm} < R \dots +2, -15\%$
Temperature Cycle	Res. Change : ±5%
Temperature Coefficient of Resistance	±500ppm/°C
Rotational Life	Res. Change : ±10% (10 cycles)

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

- (1) Reflow soldering and Soldering Iron are available. Can not be soldered using the flow soldering method. If you use the flow soldering method, the trimmer potentiometer may not function.
- (2) Use our standard land dimension. Excessive land area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.
- (3) Standard soldering condition
  - (a) Reflow soldering :  
Refer to the standard temperature profile.
  - (b) Soldering iron:
    - >Temperature of tip 260deg. C max.
    - >Soldering time 3sec. max.
    - >Diameter 1mm max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

- (4) Apply the appropriate amount of solder paste.  
The thickness of solder paste should be printed from 100micro m to 150micro m and the dimension

of land pattern should be used Murata's standard land pattern at reflow soldering.

Insufficient amounts of solder can lead to insufficient soldering strength on PCB.

Excessive amounts of solder may cause the bridging between the terminals.

- (5) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.

#### 2. Mounting

- (1) Do not apply excessive force (preferable 4.9N (Ref.; 500gf) max.), when the trimmer potentiometer is mounted to the PCB.
- (2) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.
- (3) In chip placers, the recommended size of the cylindrical pick-up nozzle should be outer dimension 1.5-1.8mm dia. and inner dimension 1.3mm dia..

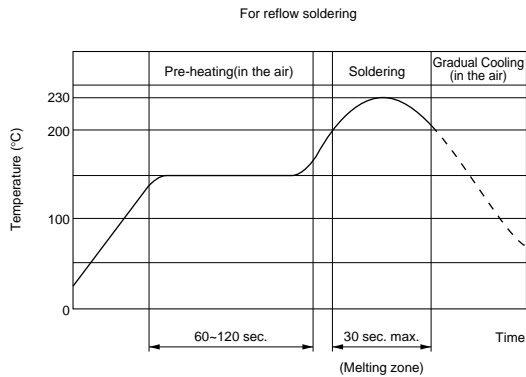
#### 3. Cleaning

- (1) In case there is flux on the resistive element, clean sufficiently by cleaning solvents and remove all residual flux perfectly.
- (2) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.



## PVZ2 Series Notice

### ■ Reflow Soldering Standard Profile



### ■ Notice (Handling)

1. Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdriver.  
\* Recommended screwdriver for manual adjustment  
Murata P/N : KMDR090
2. Don't apply more than 4.9N (Ref.; 500gf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is applied, the trimmer potentiometer may not function.

3. Please use within the effective rotational angle.  
The potentiometer does not have a mechanical stop for over rotation. In case out of effective rotational angle, the trimmer potentiometer may not function.
4. When using a lock paint to fix slot position, please consult with Murata factory representative prior to using to prevent corrosion and contact intermittence.

### ■ Notice (Other)

1. Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
2. Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

# Trimmer Potentiometers



## SMD Open Type 3mm Size PVZ3/PVS3/PVA3 Series

### PVZ3 Series

#### ■ Features

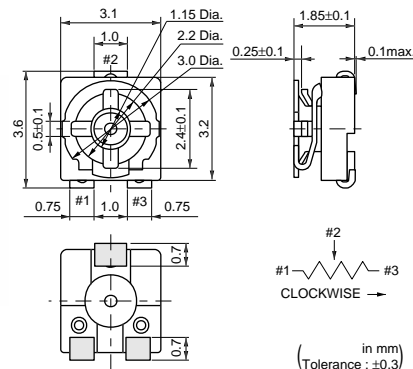
1. Excellent solderability characteristics are achieved via special plating techniques on each termination.
2. Specially designed substrate prevents wicking of flux onto the top of the part body.
3. Enlarged bottom termination enhance soldering strength while reducing the necessary land area required promoting high-density PCB mounting.
4. Funnel shaped adjustment slot allows for in-process automatic adjustment.
5. Flat surface is provided for smooth pick and place. (PVZ3K only)
6. Heat-Resistant type is available. (PVZ3AxxxB01)
7. The standard position of driver plate is adjusted at the center normally, but another position is also available.
8. This product meets Pb-free.

#### ■ Applications

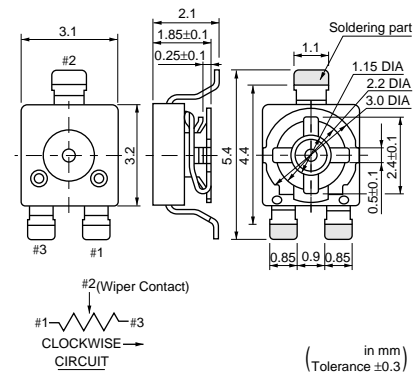
- |                      |                        |
|----------------------|------------------------|
| 1. Optical pick up   | 2. Cordless telephones |
| 3. CD players        | 4. FDD                 |
| 5. Motor             | 6. CD-ROMs             |
| 7. Car stereos       | 8. TFT-LCD TV sets     |
| 9. Headphone stereos |                        |



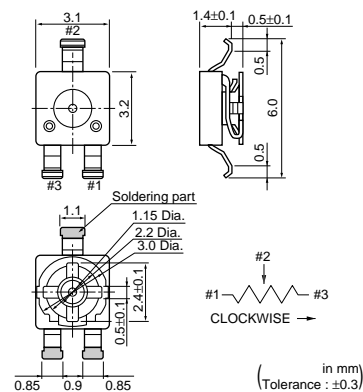
PVZ3A



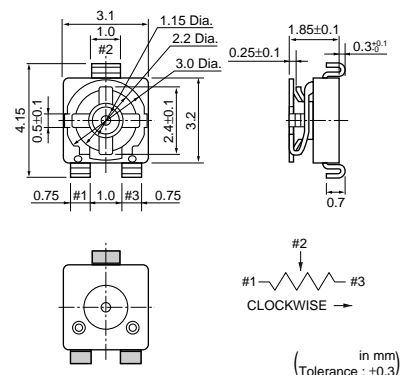
PVZ3K



PVZ3R



PVZ3T



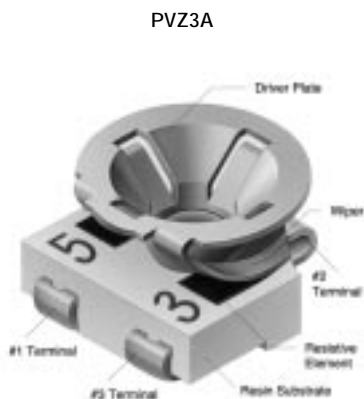
2

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVZ3□201A01	0.1(50°C)	Reflow	1(230°±10°)	200ohm ±30%	±500
PVZ3□301A01	0.1(50°C)	Reflow	1(230°±10°)	300ohm ±30%	±500
PVZ3□501A01	0.1(50°C)	Reflow	1(230°±10°)	500ohm ±30%	±500
PVZ3□102A01	0.1(50°C)	Reflow	1(230°±10°)	1k ohm ±30%	±500
PVZ3□202A01	0.1(50°C)	Reflow	1(230°±10°)	2k ohm ±30%	±500
PVZ3□302A01	0.1(50°C)	Reflow	1(230°±10°)	3k ohm ±30%	±500
PVZ3□502A01	0.1(50°C)	Reflow	1(230°±10°)	5k ohm ±30%	±500
PVZ3□103A01	0.1(50°C)	Reflow	1(230°±10°)	10k ohm ±30%	±500
PVZ3□203A01	0.1(50°C)	Reflow	1(230°±10°)	20k ohm ±30%	±500
PVZ3□303A01	0.1(50°C)	Reflow	1(230°±10°)	30k ohm ±30%	±500
PVZ3□503A01	0.1(50°C)	Reflow	1(230°±10°)	50k ohm ±30%	±500
PVZ3□104A01	0.1(50°C)	Reflow	1(230°±10°)	100k ohm ±30%	±500
PVZ3□204A01	0.1(50°C)	Reflow	1(230°±10°)	200k ohm ±30%	±500
PVZ3□304A01	0.1(50°C)	Reflow	1(230°±10°)	300k ohm ±30%	±500
PVZ3□504A01	0.1(50°C)	Reflow	1(230°±10°)	500k ohm ±30%	±500
PVZ3□105A01	0.1(50°C)	Reflow	1(230°±10°)	1M ohm ±30%	±500
PVZ3□205A01	0.1(50°C)	Reflow	1(230°±10°)	2M ohm ±30%	±500
PVZ3□201C01	0.1(50°C)	Reflow	1(230°±10°)	200ohm ±30%	±500
PVZ3□301C01	0.1(50°C)	Reflow	1(230°±10°)	300ohm ±30%	±500
PVZ3□501C01	0.1(50°C)	Reflow	1(230°±10°)	500ohm ±30%	±500
PVZ3□102C01	0.1(50°C)	Reflow	1(230°±10°)	1k ohm ±30%	±500
PVZ3□202C01	0.1(50°C)	Reflow	1(230°±10°)	2k ohm ±30%	±500
PVZ3□302C01	0.1(50°C)	Reflow	1(230°±10°)	3k ohm ±30%	±500
PVZ3□502C01	0.1(50°C)	Reflow	1(230°±10°)	5k ohm ±30%	±500
PVZ3□103C01	0.1(50°C)	Reflow	1(230°±10°)	10k ohm ±30%	±500
PVZ3□203C01	0.1(50°C)	Reflow	1(230°±10°)	20k ohm ±30%	±500
PVZ3□303C01	0.1(50°C)	Reflow	1(230°±10°)	30k ohm ±30%	±500
PVZ3□503C01	0.1(50°C)	Reflow	1(230°±10°)	50k ohm ±30%	±500
PVZ3□104C01	0.1(50°C)	Reflow	1(230°±10°)	100k ohm ±30%	±500
PVZ3□204C01	0.1(50°C)	Reflow	1(230°±10°)	200k ohm ±30%	±500
PVZ3□304C01	0.1(50°C)	Reflow	1(230°±10°)	300k ohm ±30%	±500
PVZ3□504C01	0.1(50°C)	Reflow	1(230°±10°)	500k ohm ±30%	±500
PVZ3□105C01	0.1(50°C)	Reflow	1(230°±10°)	1M ohm ±30%	±500
PVZ3□205C01	0.1(50°C)	Reflow	1(230°±10°)	2M ohm ±30%	±500

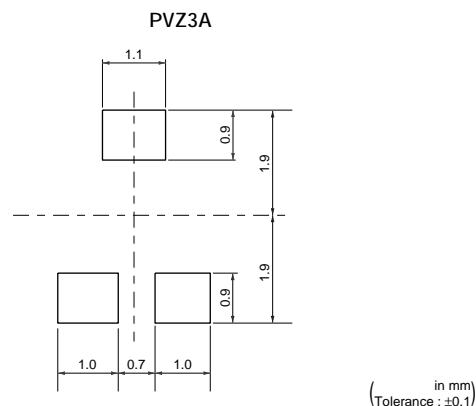
The blank column is filled with the code of adjustment direction A/T (top) or K/R (rear).

The last three digits express the individual specification codes. A01 for standard type and B01 for high-resistant type.

■ Construction



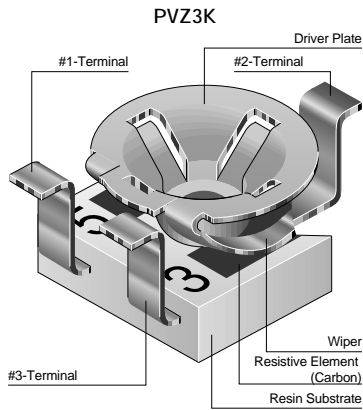
■ Standard Land Pattern



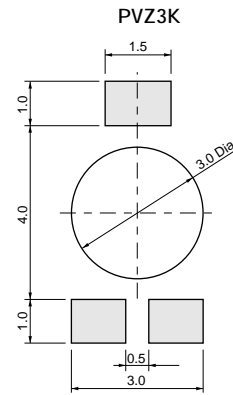
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Construction



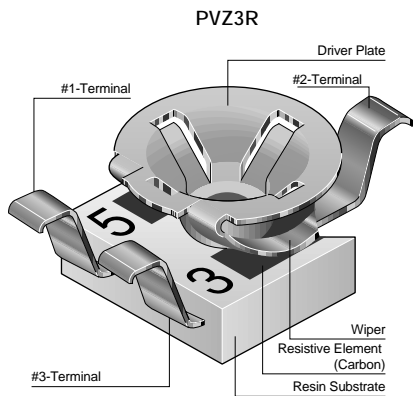
Standard Land Pattern



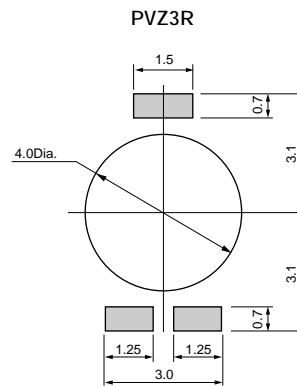
(in mm)  
(Tolerance : ±0.1)

2

Construction

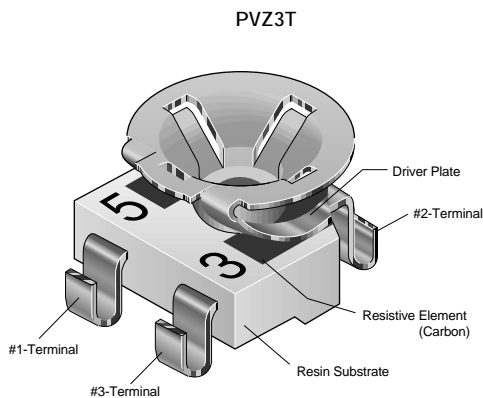


Standard Land Pattern

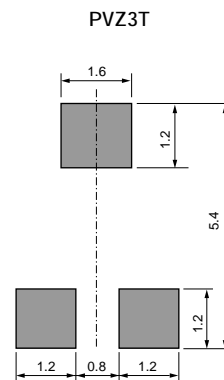


(in mm)

Construction



Standard Land Pattern



(in mm)  
(Tolerance : ±0.3)

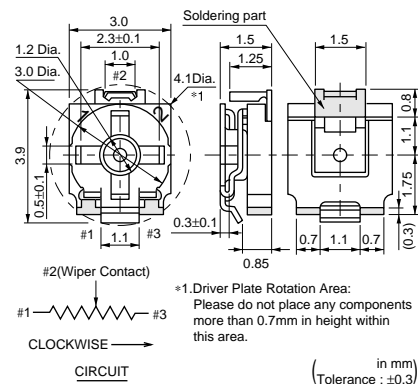
Characteristics

Humidity Exposure	Res. Change : +10, -2%
High Temperature Exposure	Res. Change : $R \leq 100\text{kohm} \dots +2, -10\%$ $100\text{kohm} < R \dots +2, -15\%$
Humidity Load Life	Res. Change : ±10%
Load Life	Res. Change : $R \leq 100\text{kohm} \dots +2, -10\%$ $100\text{kohm} < R \dots +2, -15\%$
Temperature Cycle	Res. Change : ±5%
Temperature Coefficient of Resistance	±500ppm/°C
Rotational Life	Res. Change : ±10% (10 cycles)

## PVS3 Series

### ■ Features

1. Funnel shaped slot allows for in-process automatic adjustment and it provides superior adjustability.
2. 3mm miniature package lead a high density PCB mounting.
3. Low profile of 1.5mm height with stopper.
4. Plated termination achieve a high resistance to solder leaching.
5. Available for adjusting by screwdrivers on the market.

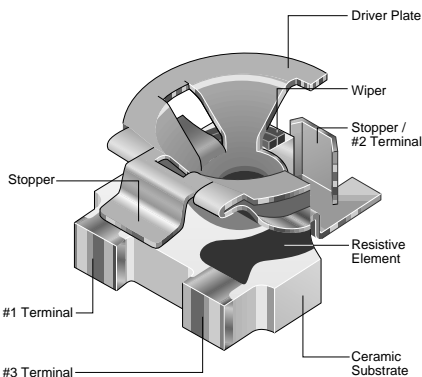


### ■ Applications

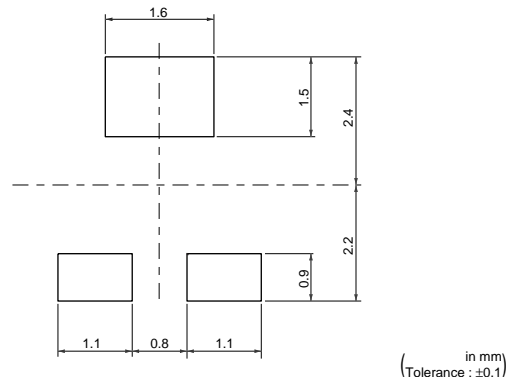
1. Camcorders
2. Video disk players
3. TFT-LCD TV sets
4. Headphone stereos
5. Cordless telephones
6. Micro-motors
7. Optical cameras

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVS3A101A01	0.1(70°C)	Reflow	1(270°±10°)	100ohm ±25%	±250
PVS3A201A01	0.1(70°C)	Reflow	1(270°±10°)	200ohm ±25%	±250
PVS3A301A01	0.1(70°C)	Reflow	1(270°±10°)	300ohm ±25%	±250
PVS3A501A01	0.1(70°C)	Reflow	1(270°±10°)	500ohm ±25%	±250
PVS3A102A01	0.1(70°C)	Reflow	1(270°±10°)	1k ohm ±25%	±250
PVS3A202A01	0.1(70°C)	Reflow	1(270°±10°)	2k ohm ±25%	±250
PVS3A302A01	0.1(70°C)	Reflow	1(270°±10°)	3k ohm ±25%	±250
PVS3A502A01	0.1(70°C)	Reflow	1(270°±10°)	5k ohm ±25%	±250
PVS3A103A01	0.1(70°C)	Reflow	1(270°±10°)	10k ohm ±25%	±250
PVS3A203A01	0.1(70°C)	Reflow	1(270°±10°)	20k ohm ±25%	±250
PVS3A303A01	0.1(70°C)	Reflow	1(270°±10°)	30k ohm ±25%	±250
PVS3A503A01	0.1(70°C)	Reflow	1(270°±10°)	50k ohm ±25%	±250
PVS3A104A01	0.1(70°C)	Reflow	1(270°±10°)	100k ohm ±25%	±250
PVS3A204A01	0.1(70°C)	Reflow	1(270°±10°)	200k ohm ±25%	±250
PVS3A304A01	0.1(70°C)	Reflow	1(270°±10°)	300k ohm ±25%	±250
PVS3A504A01	0.1(70°C)	Reflow	1(270°±10°)	500k ohm ±25%	±250
PVS3A105A01	0.1(70°C)	Reflow	1(270°±10°)	1M ohm ±25%	±250
PVS3A205A01	0.1(70°C)	Reflow	1(270°±10°)	2M ohm ±25%	±250

### ■ Construction



### ■ Standard Land Pattern



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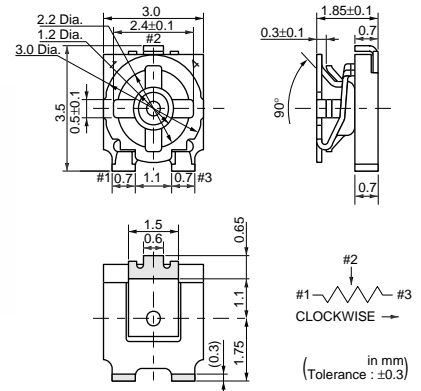
## ■ Characteristics

Humidity Exposure	Res. Change : $\pm 3\%$
High Temperature Exposure	Res. Change : $\pm 3\%$
Humidity Load Life	Res. Change : $\pm 3\%$
Load Life	Res. Change : $\pm 3\%$
Temperature Cycle	Res. Change : $\pm 3\%$
Temperature Coefficient of Resistance	$\pm 250\text{ppm}/^\circ\text{C}$
Rotational Life	Res. Change : $\pm 10\%$ (10 cycles)

## PVA3 Series

### ■ Features

1. Funnel shaped slot allows for in-process automatic adjustment and it provides superior adjustability.
2. 3mm miniature package lead a high density PCB mounting.
3. Plated termination achieve a high resistance to solder leaching.
4. Available for adjusting by screwdrivers on the market.
5. Recommended for both reflow and flow soldering method. (Need cleaning for flow soldering method)

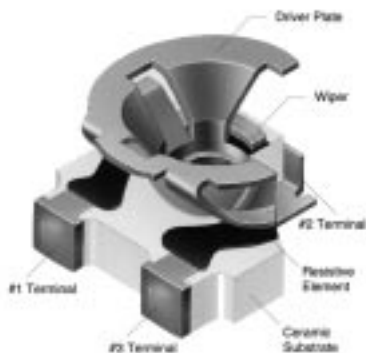


### ■ Applications

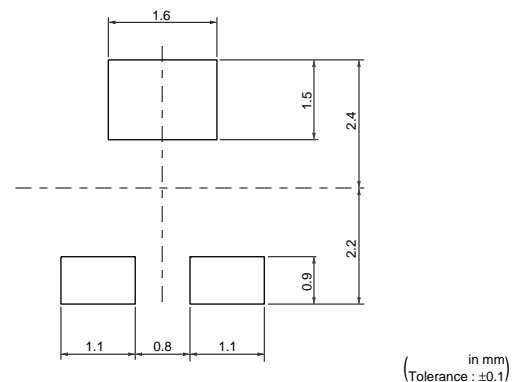
1. Camcorders
2. Video disk players
3. TFT-LCD TV sets
4. Headphone stereos
5. Cordless telephones
6. Micro-motors
7. Optical cameras

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVA3A101A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	100ohm ±25%	±250
PVA3A201A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	200ohm ±25%	±250
PVA3A301A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	300ohm ±25%	±250
PVA3A501A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	500ohm ±25%	±250
PVA3A102A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	1k ohm ±25%	±250
PVA3A202A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	2k ohm ±25%	±250
PVA3A302A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	3k ohm ±25%	±250
PVA3A502A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	5k ohm ±25%	±250
PVA3A103A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	10k ohm ±25%	±250
PVA3A203A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	20k ohm ±25%	±250
PVA3A303A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	30k ohm ±25%	±250
PVA3A503A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	50k ohm ±25%	±250
PVA3A104A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	100k ohm ±25%	±250
PVA3A204A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	200k ohm ±25%	±250
PVA3A304A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	300k ohm ±25%	±250
PVA3A504A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	500k ohm ±25%	±250
PVA3A105A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	1M ohm ±25%	±250
PVA3A205A01	0.1(70°C)	Flow/Reflow	1(270°±10°)	2M ohm ±25%	±250

### ■ Construction



### ■ Standard Land Pattern



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### ■ Characteristics

Humidity Exposure	Res. Change : $\pm 3\%$
High Temperature Exposure	Res. Change : $\pm 3\%$
Humidity Load Life	Res. Change : $\pm 3\%$
Load Life	Res. Change : $\pm 3\%$
Temperature Cycle	Res. Change : $\pm 3\%$
Temperature Coefficient of Resistance	$\pm 250\text{ppm}/^\circ\text{C}$
Rotational Life	Res. Change : $\pm 10\%$ (10 cycles)



## PVZ3/PVS3/PVA3 Series Notice

2

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.
4. If the trimmer potentiometer is used in DC and high humidity condition, please connect wiper (#2) for plus and resistive element (#1 or #3) for minus.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

##### (1) Standard soldering condition

###### (a) Reflow soldering :

Refer to the standard temperature profile.

###### (b) Soldering iron:

\*PVZ3AxxxA01, PVZ3KxxxA01, PVA3, PVS3 series

>Temperature of tip 260deg. C max.

>Soldering time 3sec. max.

>Diameter 1mm max.

>Wattage of iron 30W max.

\*PVZ3AxxxB01, PVZ3KxxxB01 series

>Temperature of tip 310deg. C max.

>Soldering time 5sec. max.

>Diameter 1mm max.

>Wattage of iron 30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

##### (2) Flow soldering is available for PVA3 series.

For PVZ3A, PVZ3K and PVS3, do not use flow soldering method (dipping).

If you use the flow soldering method, the trimmer potentiometer may not function.

(3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.

(4) Apply the appropriate amount of solder paste. The thickness of solder paste should be printed from 150micro m to 200micro m (PVZ3K series should be printed from 100micro m to 150micro m) and the dimension of land pattern should be used Murata's standard land pattern at reflow soldering. Insufficient amounts of solder can lead to insufficient soldering strength on PCB. Excessive amounts of solder may cause the bridging between the terminals.


#### 2. Mounting

(1) Use our standard land dimension. Excessive land area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.

(2) Do not apply excessive force (preferable 4.9N (Ref.; 500gf) max.), when the trimmer potentiometer is mounted to the PCB.

(3) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.

(4) In chip placers, the recommended size of the cylindrical pick-up nozzle should be outer

Continued on the following page. 

## PVZ3/PVS3/PVA3 Series Notice

Continued from the preceding page.

dimension 2.5-2.8mm dia. and inner dimension 2mm dia.

### 3. Cleaning

- (1) In case there is flux on the resistive element, clean sufficiently by cleaning solvents and

remove all residual flux perfectly.

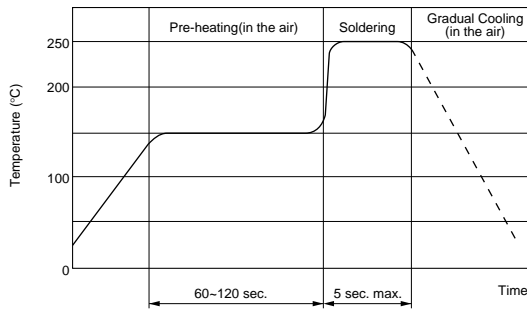
- (2) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.

2

### Flow Soldering Standard Profile

PVA3 Series Only

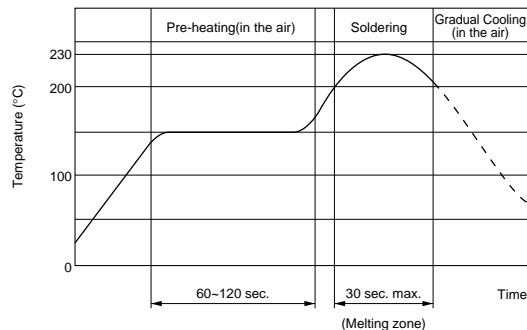
For flow soldering



### Reflow Soldering Standard Profile

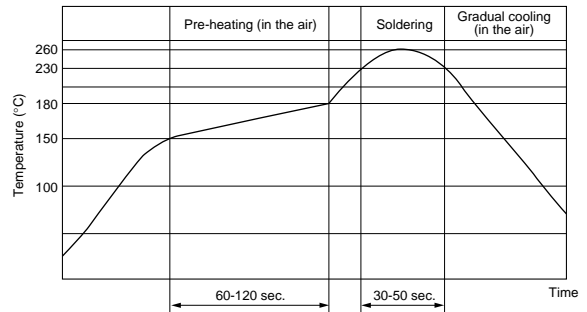
PVA3/PVS3/PVZ3\_A01 Series

For reflow soldering



PVZ3\_C01 Series

For reflow soldering



### Notice (Handling)

1. Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdrivers.
  - \* Recommended screwdriver for manual adjustment <PVZ3A/PVA3 series>  
VESSEL MFG. : NO.9000+1.7x30  
(Murata P/N : KMDR080)
  - <PVZ3A/PVA3/PVS3 series>  
TORAY MFG. : SA-2225  
(Murata P/N : KMDR070)
  - \* Recommended screwdriver for automatic adjustment  
TORAY MFG. : JB-2225  
(Murata P/N : KMBT070)
2. Don't apply more than 4.9N (Ref.; 500gf) of twist

and stress after mounted onto PCB to prevent contact intermittence. If excessive force is applied, the trimmer potentiometer may not function.

3. For PVZ3 and PVA3series, please use within the effective rotational angle.  
The potentiometer dose not have a mechanical stop for over rotation. In case out of effective rotational angle, the trimmer potentiometer may not function.
4. When using a lock paint to fix slot position, please consult with Murata factory representative prior to using to prevent corrosion and contact intermittence.

## PVZ3/PVS3/PVA3 Series Notice

### ■ Notice (Other)

1. Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
2. Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

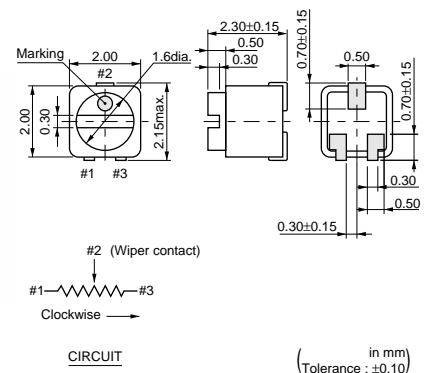
# Trimmer Potentiometers



## SMD Sealed Type 2mm Size PVF2 Series

### ■ Features

1. Ultra-compact size of "2 x 2 x 2.3mm".
2. A sealed structure prevents liquids (water, cleaning liquid, sweat, etc.) from entering.
3. As for the resistance change characteristics, both a log curve type and linear type are available.
4. A rotation service life of 100 cycles is guaranteed.
5. Can be automatically mounted using a chip placer, as well as mounted using reflow soldering.



### ■ Applications

1. Hearing aids
2. Ultra-compact sensors or the like.
3. Applications requiring ultra-compactness, and a sealed structure.

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVF2A501A11	0.001(50°C)	Reflow	1(210°±10°)	500ohm ±30%	±500
PVF2A102A11	0.001(50°C)	Reflow	1(210°±10°)	1k ohm ±30%	±500
PVF2A202A11	0.001(50°C)	Reflow	1(210°±10°)	2k ohm ±30%	±500
PVF2A502A11	0.001(50°C)	Reflow	1(210°±10°)	5k ohm ±30%	±500
PVF2A103A11	0.001(50°C)	Reflow	1(210°±10°)	10k ohm ±30%	±500
PVF2A203A11	0.001(50°C)	Reflow	1(210°±10°)	20k ohm ±30%	±500
PVF2A503A11	0.001(50°C)	Reflow	1(210°±10°)	50k ohm ±30%	±500
PVF2A104A11	0.001(50°C)	Reflow	1(210°±10°)	100k ohm ±30%	±500
PVF2A204A11	0.001(50°C)	Reflow	1(210°±10°)	200k ohm ±30%	±500
PVF2A504A11	0.001(50°C)	Reflow	1(210°±10°)	500k ohm ±30%	±500
PVF2A105A11	0.001(50°C)	Reflow	1(210°±10°)	1M ohm ±30%	±500
PVF2A102A41	0.001(50°C)	Reflow	1(210°±10°)	1k ohm ±30%	±500
PVF2A202A41	0.001(50°C)	Reflow	1(210°±10°)	2k ohm ±30%	±500
PVF2A502A41	0.001(50°C)	Reflow	1(210°±10°)	5k ohm ±30%	±500
PVF2A103A41	0.001(50°C)	Reflow	1(210°±10°)	10k ohm ±30%	±500
PVF2A203A41	0.001(50°C)	Reflow	1(210°±10°)	20k ohm ±30%	±500
PVF2A503A41	0.001(50°C)	Reflow	1(210°±10°)	50k ohm ±30%	±500
PVF2A104A41	0.001(50°C)	Reflow	1(210°±10°)	100k ohm ±30%	±500
PVF2A204A41	0.001(50°C)	Reflow	1(210°±10°)	200k ohm ±30%	±500
PVF2A504A41	0.001(50°C)	Reflow	1(210°±10°)	500k ohm ±30%	±500
PVF2A102A51	0.001(50°C)	Reflow	1(210°±10°)	1k ohm ±30%	±500
PVF2A202A51	0.001(50°C)	Reflow	1(210°±10°)	2k ohm ±30%	±500
PVF2A502A51	0.001(50°C)	Reflow	1(210°±10°)	5k ohm ±30%	±500
PVF2A103A51	0.001(50°C)	Reflow	1(210°±10°)	10k ohm ±30%	±500
PVF2A203A51	0.001(50°C)	Reflow	1(210°±10°)	20k ohm ±30%	±500
PVF2A503A51	0.001(50°C)	Reflow	1(210°±10°)	50k ohm ±30%	±500
PVF2A104A51	0.001(50°C)	Reflow	1(210°±10°)	100k ohm ±30%	±500
PVF2A204A51	0.001(50°C)	Reflow	1(210°±10°)	200k ohm ±30%	±500
PVF2A504A51	0.001(50°C)	Reflow	1(210°±10°)	500k ohm ±30%	±500
PVF2A102A81	0.001(50°C)	Reflow	1(210°±10°)	1k ohm ±30%	±500
PVF2A202A81	0.001(50°C)	Reflow	1(210°±10°)	2k ohm ±30%	±500
PVF2A502A81	0.001(50°C)	Reflow	1(210°±10°)	5k ohm ±30%	±500
PVF2A103A81	0.001(50°C)	Reflow	1(210°±10°)	10k ohm ±30%	±500
PVF2A203A81	0.001(50°C)	Reflow	1(210°±10°)	20k ohm ±30%	±500

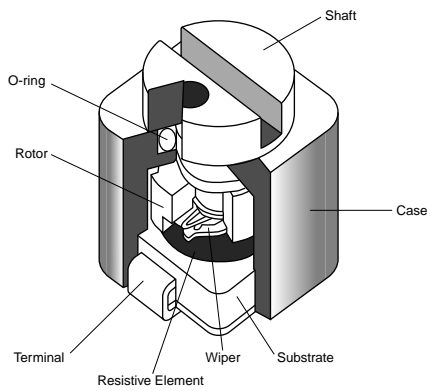
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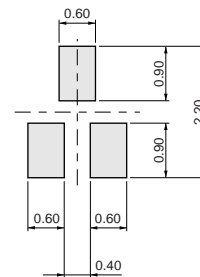
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVF2A503A81	0.001(50°C)	Reflow	1(210°±10°)	50k ohm ±30%	±500
PVF2A104A81	0.001(50°C)	Reflow	1(210°±10°)	100k ohm ±30%	±500
PVF2A204A81	0.001(50°C)	Reflow	1(210°±10°)	200k ohm ±30%	±500
PVF2A504A81	0.001(50°C)	Reflow	1(210°±10°)	500k ohm ±30%	±500
PVF2A102A91	0.001(50°C)	Reflow	1(210°±10°)	1k ohm ±30%	±500
PVF2A202A91	0.001(50°C)	Reflow	1(210°±10°)	2k ohm ±30%	±500
PVF2A502A91	0.001(50°C)	Reflow	1(210°±10°)	5k ohm ±30%	±500
PVF2A103A91	0.001(50°C)	Reflow	1(210°±10°)	10k ohm ±30%	±500
PVF2A203A91	0.001(50°C)	Reflow	1(210°±10°)	20k ohm ±30%	±500
PVF2A503A91	0.001(50°C)	Reflow	1(210°±10°)	50k ohm ±30%	±500
PVF2A104A91	0.001(50°C)	Reflow	1(210°±10°)	100k ohm ±30%	±500
PVF2A204A91	0.001(50°C)	Reflow	1(210°±10°)	200k ohm ±30%	±500
PVF2A504A91	0.001(50°C)	Reflow	1(210°±10°)	500k ohm ±30%	±500

The last three digits express the individual specification codes for Resistant Curve. Please refer to Resistant Curve below for each characteristics.

### Construction



### Standard Land Pattern



(in mm)  
 (Tolerance : ±0.10)

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3

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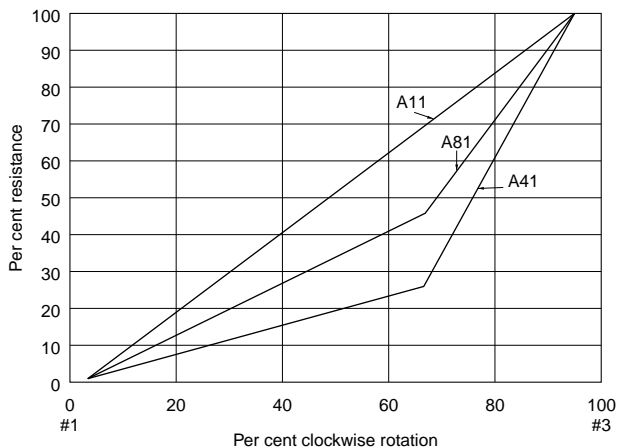
**Characteristics**

Temperature Cycle	$\Delta TR \pm 5\%$
Humidity	$\Delta TR \pm 15, -2\%$
Vibration	$\Delta V.S.S. \pm 5\%$
Shock (100G)	$\Delta V.S.S. \pm 5\%$
Temperature Load Life	$\Delta TR +2, -10\%$
Low Temperature Exposure	$\Delta TR \pm 3\%$
Rotational Life (100 cycles)	$\Delta TR \pm 10\%$

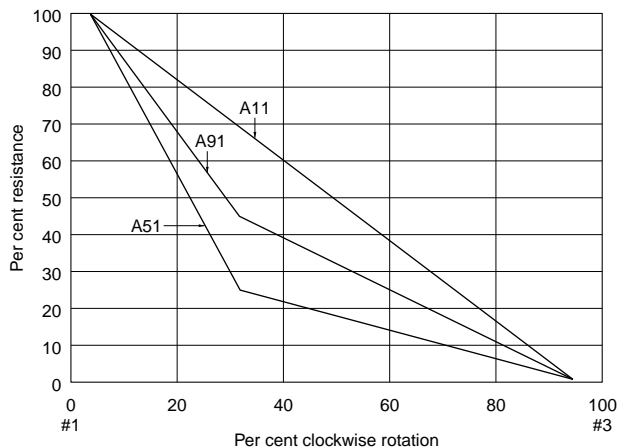
$\Delta TR$ : Total Resistance Change  
 $\Delta V.S.S.$  : Voltage Setting Stability

**Resistance Curve**

Linea-log. curve (Measured from terminal 1 to 2)



Linea-log. log. curve (Measured from terminal 2 to 3)



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## PVF2 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.
4. If the trimmer potentiometer is used in DC and high humidity condition, please connect wiper (#2) for plus and resistive element (#1 or #3) for minus.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

##### (1) Standard solder iron condition

- >Temperature of tip 260deg. C max.
- >Soldering time 3sec. max.
- >Diameter 1mm dia. max.
- >Wattage of iron 30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

- (2) Use our standard land dimension. Excessive land area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.
- (3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.
- (4) Can not be soldered using the flow soldering method. If you use the flow soldering method, the trimmer potentiometer may not function.

#### 2. Mounting

- (1) Use our standard land dimension. Excessive land

area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.


- (2) Do not apply excessive force (preferable 4.9N (Ref.; 500gf) max.), when the trimmer potentiometer is mounted to the PCB.
- (3) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.

#### 3. Cleaning

- (1) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.
- (2) The total cleaning time by cold dipping, vapor and ultrasonic washing (conditions as below) method shall be less than 3 minutes.
- (3) For ultra-sonic cleaning, the available condition is as follows.

- >Power : 600W (67liter) max.
- >Frequency : 28kHz
- >Temperature : Ambient temperature

Due to the ultra-sonic cleaning equipment peculiar self resonance point and the cleaning compatibility usually depends on the jig construction and/or the cleaning condition such as the depth of immersion, please check

Continued on the following page. 

## PVF2 Series Notice

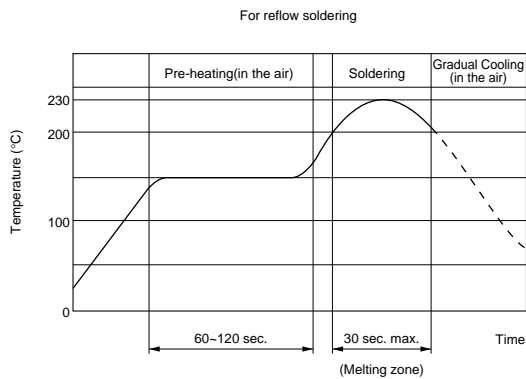
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the cleaning equipment to determine the suitable conditions.

If the trimmer potentiometer is cleaned by

other conditions, the trimmer potentiometer may be damaged.

### Reflow Soldering Standard Profile



### Notice (Handling)

- Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdriver.  
\* Recommended screwdriver for manual adjustment  
Murata P/N : KMDR140  
We can supply above screwdrivers.  
If you place order, please nominate Murata P/N.
- Don't apply more than 4.9N (Ref.; 500gf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is

applied, the trimmer potentiometer may not function.

- The rotational torque at the position of the adjustment range should not exceed the stop strength.
- When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### Notice (Other)

- Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
- Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.



# Trimmer Potentiometers



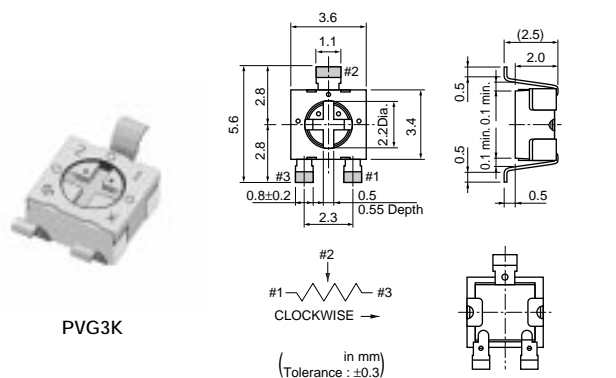
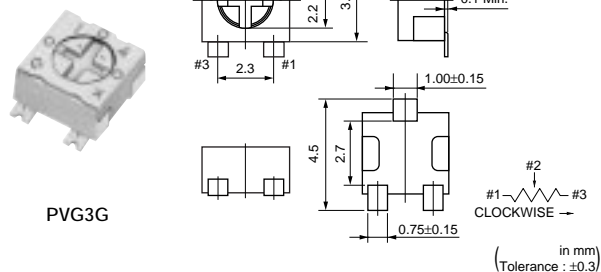
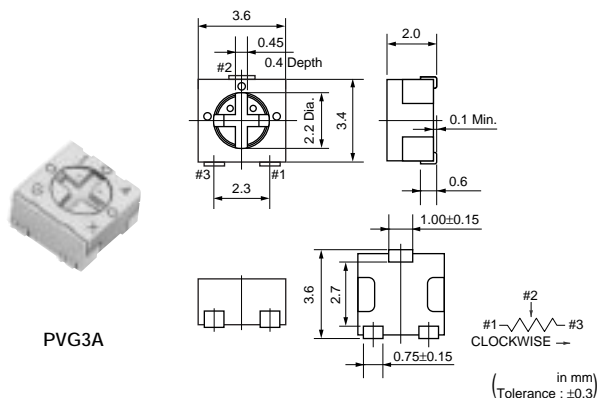
## SMD Sealed Type 3mm Size PVG3 Series

### ■ Features

1. Sealed construction protects the internal from dust and liquid, which achieves stable performance.
2. Driver plate with cross-slot is suitable for automatic adjustment.
3. Rotor with large diameter and deep groove improves driver insertion.
4. Regarding the terminal shape, both J-lead and gull wing type are available as standard ones.
5. 3mm and 4mm land pattern can be used without change. (Gull wing is suitable for 4mm size land pattern.)
6. Heat resistance performance enables high temperature peak re-flow soldering.
7. The lead terminals are plated with Sn, which achieves Pb free.

### ■ Applications

- |                         |                               |
|-------------------------|-------------------------------|
| 1. Small sensors        | 2. Optical Transceiver Module |
| 3. Copier               | 4. Printer                    |
| 5. Compact Power Supply | 6. Wireless Radio module      |



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVG3□100A01	0.25(70°C)	Reflow	1(210°±10°)	10ohm ±20%	±250
PVG3□200A01	0.25(70°C)	Reflow	1(210°±10)	20ohm ±20%	±250
PVG3□500A01	0.25(70°C)	Reflow	1(210°±10°)	50ohm ±20%	±250
PVG3□101A01	0.25(70°C)	Reflow	1(210°±10°)	100ohm ±20%	±250
PVG3□201A01	0.25(70°C)	Reflow	1(210°±10°)	200ohm ±20%	±100
PVG3□501A01	0.25(70°C)	Reflow	1(210°±10°)	500ohm ±20%	±100
PVG3□102A01	0.25(70°C)	Reflow	1(210°±10°)	1k ohm ±20%	±100
PVG3□202A01	0.25(70°C)	Reflow	1(210°±10°)	2k ohm ±20%	±100
PVG3□502A01	0.25(70°C)	Reflow	1(210°±10°)	5k ohm ±20%	±100
PVG3□103A01	0.25(70°C)	Reflow	1(210°±10°)	10k ohm ±20%	±100
PVG3□203A01	0.25(70°C)	Reflow	1(210°±10°)	20k ohm ±20%	±100
PVG3□503A01	0.25(70°C)	Reflow	1(210°±10°)	50k ohm ±20%	±100

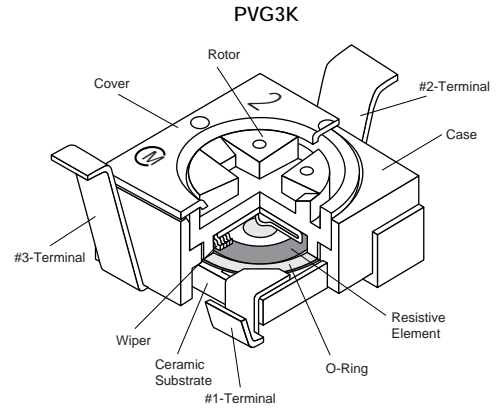
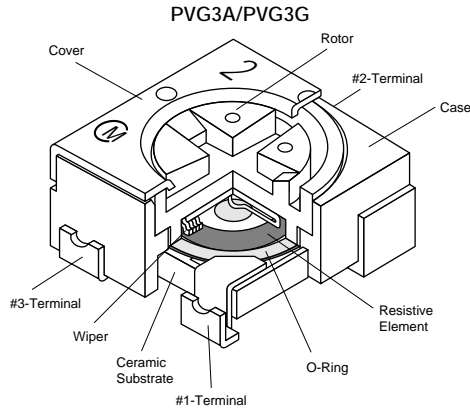
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Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVG3□104A01	0.25(70°C)	Reflow	1(210°±10°)	100k ohm ±20%	±100
PVG3□204A01	0.25(70°C)	Reflow	1(210°±10°)	200k ohm ±20%	±100
PVG3□504A01	0.25(70°C)	Reflow	1(210°±10°)	500k ohm ±20%	±100
PVG3□105A01	0.25(70°C)	Reflow	1(210°±10°)	1M ohm ±20%	±100
PVG3□205A01	0.25(70°C)	Reflow	1(210°±10°)	2M ohm ±20%	±100

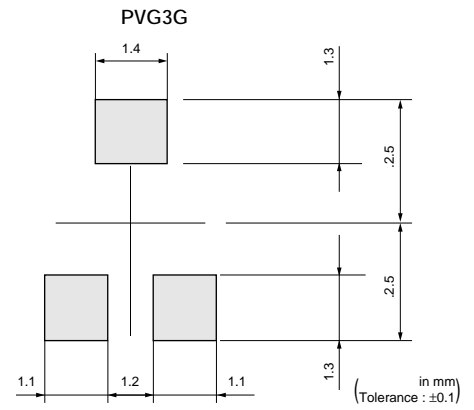
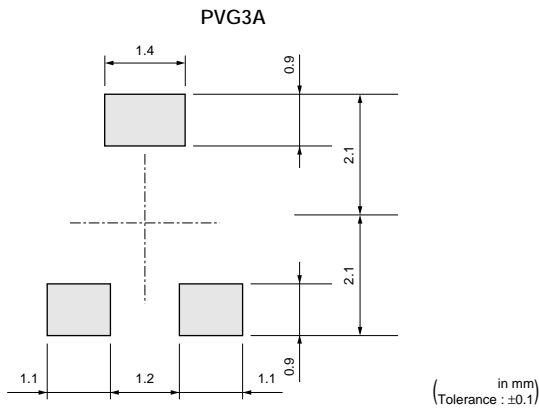
The blank column is filled with the code of adjustment direction and lead type A (top, J-hook), G (top, gull-wing), or K (rear).

### Construction



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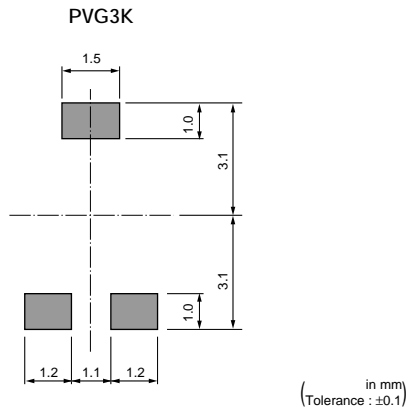
### Standard Land Pattern



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■ Standard Land Pattern



■ Characteristics

Temperature Cycle	$\Delta TR$ $\pm 2\%$ $\Delta V.S.S$ $\pm 1\%$
Humidity	$\Delta TR$ $\pm 2\%$ $\Delta V.S.S$ $\pm 1\%$ IR 10Mohm min.
Vibration (20G)	$\Delta TR$ $\pm 1\%$ $\Delta V.S.S$ $\pm 1\%$
Shock (100G)	$\Delta TR$ $\pm 1\%$ $\Delta V.S.S$ $\pm 1\%$
Temperature Load Life	$\Delta TR$ $\pm 3\%$ or 3ohm max., whichever is greater $\Delta V.S.S$ $\pm 1\%$
Low Temperature Exposure	$\Delta TR$ $\pm 2\%$ $\Delta V.S.S$ $\pm 2\%$
High Temperature Exposure	$\Delta TR$ $\pm 3\%$ $\Delta V.S.S$ $\pm 2\%$
Rotational Life (50cycles)	$\Delta TR$ $\pm 3\%$ or 2ohm max., whichever is greater

$\Delta TR$  : Total Resistance Change  
 $\Delta V.S.S$  : Voltage Setting Stability  
 IR : Insulation ResistanceR

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## PVG3 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

##### (1) Standard soldering condition

###### (a) Reflow soldering :

Refer to the standard temperature profile.

###### (b) Soldering iron

Temperature of tip : 260deg. C max.

Soldering time : 3sec. max.

Diameter of tip : 2mm dia. max.

Wattage of iron : 30W max.

Before using other soldering conditions more than those listed above, please consult with Murata factory representative prior to using.

If the soldering conditions are not suitable, e.g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.


- (2) Can not be soldered using the flow soldering method. If you use the flow soldering method, the trimmer potentiometer may not function.
- (3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.
- (4) Apply the appropriate amount of solder paste. If the amount of solder paste applied to the land is insufficient, the required adhesive strength cannot be obtained. If an excessive amount of solder paste is applied, solder bridging or flux overflow to the resistive element surface can occur.

#### 2. Mounting

- (1) Use our standard land dimension. Excessive land area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.
- (2) Do not apply excessive force (preferable 4.9N (Ref.; 500gf) max.), when the trimmer potentiometer is mounted to the PCB.
- (3) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.
- (4) In chip placers, the size of the cylindrical pick-up nozzle should be outer dimension 2.5-2.8mm dia. and inner dimension 2.0-2.5mm dia..

#### 3. Cleaning

- (1) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.
- (2) Less than 3 minutes of total cleaning time by dipping, vapor and ultra-sonic method.
- (3) In case of ultra-sonic cleaning method, cleaning condition should be as follows.
  - (a) Power : 600W (67lit.) max.
  - (b) Frequency : 28kHz
  - (c) Temperature : Ambient temperatureDue to ultra-sonic cleaning equipment peculiar self resonance point and cleaning compatibility usually depends on the jig construction and/or

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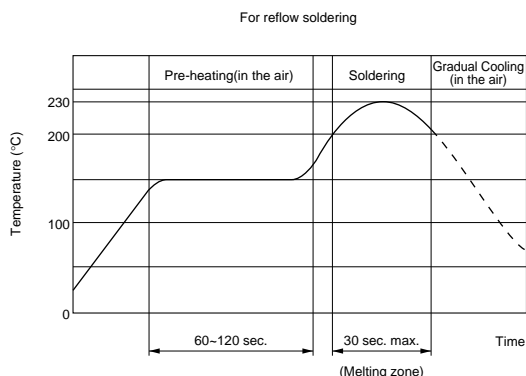
## PVG3 Series Notice

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the cleaning condition such as the depth of immersion, please check the cleaning equipment to determine the suitable conditions.

If the condition is not suitable, the trimmer potentiometer may deviate from specified characteristics.

### Reflow Soldering Standard Profile



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### Notice (Handling)

1. Use suitable screwdrivers that fit comfortably in driver slot.

\* Recommended screwdriver for manual adjustment  
TORAY INDUSTRIES, INC. : SA-2225  
(Murata P/N : KMDR070)

\* Recommended screwdriver bit for automatic adjustment  
TORAY INDUSTRIES, INC. : JB-2225  
(Murata P/N : KMBT070)

We can supply above screwdrivers.

If you place order, please nominate Murata P/N.

2. Don't apply more than 9.8N (Ref.; 1kgf) of twist and stress after mounted onto PCB to prevent contact intermittence.

3. When adjusting with an adjustment tool, the applied force to the adjustment screw should not exceed 4.9N (Ref.; 500gf). If excessive force is applied, the trimmer potentiometer may not function due to damage.

4. When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### Notice (Other)

1. Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.

2. Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

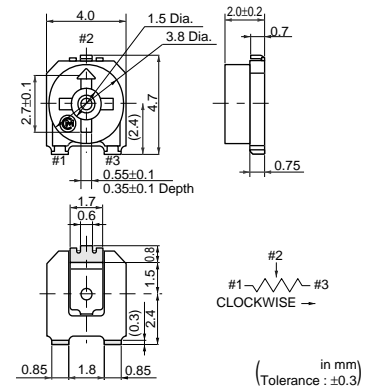
# Trimmer Potentiometers



## SMD Sealed Type 4mm Size PVM4 Series

### ■ Features

1. Available for flow and reflow soldering method while maintaining unique sealed construction.
2. Simple construction by 3 piece parts achieve high reliability.
3. Available for cleaning after soldering.
4. Plated termination achieve a high resistance to solder leaching.
5. High grade version is available (PVM4AxxxB01).



### ■ Applications

1. FDDs
2. HDDs
3. Measuring equipments
4. Encoders
5. Professional use cameras

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVM4A101A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	100ohm ±25%	±250
PVM4A201A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	200ohm ±25%	±250
PVM4A301A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	300ohm ±25%	±250
PVM4A501A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	500ohm ±25%	±250
PVM4A102A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	1k ohm ±25%	±250
PVM4A202A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	2k ohm ±25%	±250
PVM4A302A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	3k ohm ±25%	±250
PVM4A502A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	5k ohm ±25%	±250
PVM4A103A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	10k ohm ±25%	±250
PVM4A203A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	20k ohm ±25%	±250
PVM4A303A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	30k ohm ±25%	±250
PVM4A503A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	50k ohm ±25%	±250
PVM4A104A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	100k ohm ±25%	±250
PVM4A204A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	200k ohm ±25%	±250
PVM4A304A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	300k ohm ±25%	±250
PVM4A504A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	500k ohm ±25%	±250
PVM4A105A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	1M ohm ±25%	±250
PVM4A205A01	0.1(70°C)	Flow/Reflow	1(240°±10°)	2M ohm ±25%	±250
PVM4A101B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	100ohm ±20%	±150
PVM4A201B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	200ohm ±20%	±100
PVM4A301B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	300ohm ±20%	±100
PVM4A501B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	500ohm ±20%	±100
PVM4A102B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	1k ohm ±20%	±100
PVM4A202B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	2k ohm ±20%	±100
PVM4A302B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	3k ohm ±20%	±100
PVM4A502B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	5k ohm ±20%	±100
PVM4A103B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	10k ohm ±20%	±100
PVM4A203B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	20k ohm ±20%	±100
PVM4A303B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	30k ohm ±20%	±100
PVM4A503B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	50k ohm ±20%	±100
PVM4A104B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	100k ohm ±20%	±150
PVM4A204B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	200k ohm ±20%	±150
PVM4A304B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	300k ohm ±20%	±150
PVM4A504B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	500k ohm ±20%	±150
PVM4A105B01	0.25(70°C)	Flow/Reflow	1(240°±10°)	1M ohm ±20%	±150

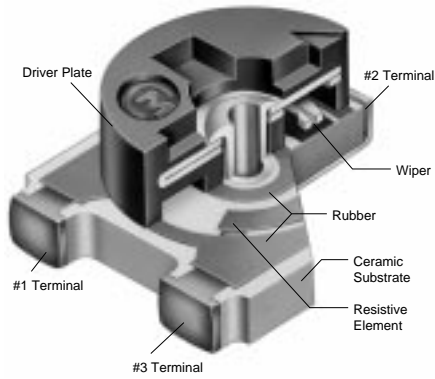
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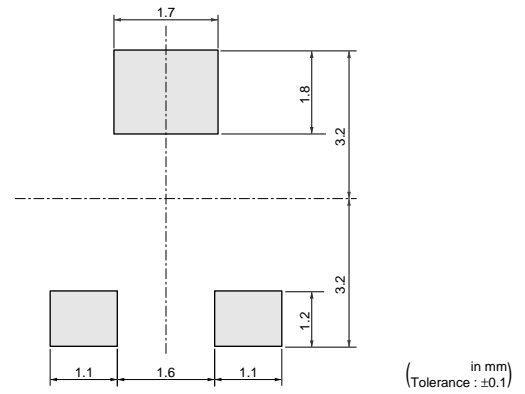
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
<b>PVM4A205B01</b>	0.25(70°C)	Flow/Reflow	1(240°±10°)	2M ohm ±20%	±150

The last three digits express the individual specification codes. A01 for standard type and B01 for high-liability type.

### Construction



### Standard Land Dimension



### Characteristics

Item	PVM4A□□□A01	PVM4A□□□B01
Humidity Exposure	Res. Change : ±3%	Res. Change : ±2%
High Temperature Exposure	Res. Change : ±3%	Res. Change : ±2%
Humidity Load Life	Res. Change : ±3%	Res. Change : ±3%
Temperature Load Life	Res. Change : ±3%	Res. Change : ±3%
Temperature Cycle	Res. Change : ±3%	Res. Change : ±2%
Rotational Life	Res. Change : ±10% (20 cycles)	Res. Change : ±5% (100 cycles)

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## PVM4 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

- (1) Can be soldered by reflow soldering method, flow soldering method, and soldering iron. (In case of flow soldering, it is necessary to clean after soldering.)
- (2) Use our standard land dimension. Excessive land area causes displacement due to effect of the surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.
- (3) Standard soldering condition
  - (a) Reflow and flow soldering :  
Refer to the standard temperature profile.
  - (b) Soldering iron:
    - >Temperature of tip 260deg.C max.
    - >Soldering time 3sec. max.
    - >Diameter 2mm dia. max.
    - >Wattage of iron 30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

- (4) Apply the appropriate amount of solder paste.  
The thickness of solder paste should be printed from 100micro m to 150micro m and the dimension of land pattern should be used Murata's standard land pattern at reflow soldering.

Insufficient amounts of solder can lead to insufficient soldering strength on PCB.

Excessive amounts of solder may cause the bridging between the terminals.


- (5) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.

#### 2. Mounting

- (1) Do not apply excessive force (preferable 9.8N (Ref.; 1kgf) max.), when the trimmer potentiometer is mounted to the PCB.
- (2) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.
- (3) In chip placers, the recommended size of the cylindrical pick-up nozzle should be outer dimension 4.0mm dia. and inner dimension 2.0mm dia..

#### 3. Cleaning

- (1) Isopropyl alcohol and Ethyl alcohol are available material for cleaning.  
For other materials, please consult with Murata factory representative prior to using.
- (2) The total cleaning time by cold dipping method shall be less than 5 minutes.  
The total cleaning time by hot dipping method shall be less than 2 minutes.  
The total cleaning time by ultrasonic washing (conditions as below) method shall be less than 1 minutes.

Continued on the following page. 



## PVM4 Series Notice

Continued from the preceding page.

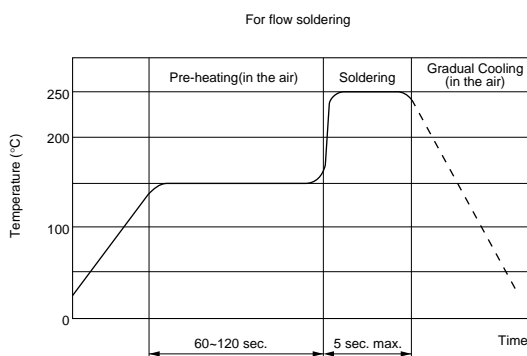
In case of the mixed conditions with hot dipping and ultrasonic washing, the cleaning time by hot dipping shall be less than 1 minutes and the cleaning time by ultrasonic washing shall be less than 1 minutes. In case of the mixed conditions with hot dipping, ultrasonic washing and vapor, the cleaning time by hot dipping shall be less than 1 minutes, the cleaning time by ultrasonic washing shall be less than 30 seconds and the cleaning time by vapor shall be less than 30 seconds.

If the trimmer potentiometer is cleaned by

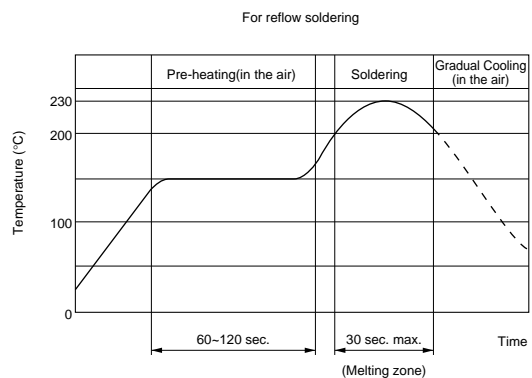
other conditions, the sealing construction may be damaged. Due to the ultra-sonic cleaning equipment peculiar self resonance point and the cleaning compatibility usually depends on the jig construction and/or the cleaning condition such as the depth of immersion, please check the cleaning equipment to determine the suitable conditions.

If the trimmer potentiometer is cleaned by other conditions, the trimmer potentiometer may be damaged.

### Flow Soldering Standard Profile



### Reflow Soldering Standard Profile



### Notice (Handling)

- Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdriver.  
\* Recommended screwdriver for manual adjustment  
VESSEL MFG.: NO. 9000-2.6x30  
(Murata P/N : KMDR120)  
We can supply above screwdrivers.  
If you place order, please nominate Murata P/N.
- Don't apply more than 4.9N (Ref.; 500gf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is

- applied, the trimmer potentiometer may not function.
- Please use within the effective rotational angle. The potentiometer does not have a mechanical stop for over rotation. In case out of effective rotational angle, the trimmer potentiometer may not function.
- When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### Notice (Other)

- Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
- Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

# Trimmer Potentiometers



## SMD Sealed Type Multi-turn Type PVG5/PV01 Series

### PVG5 Series

#### ■ Features

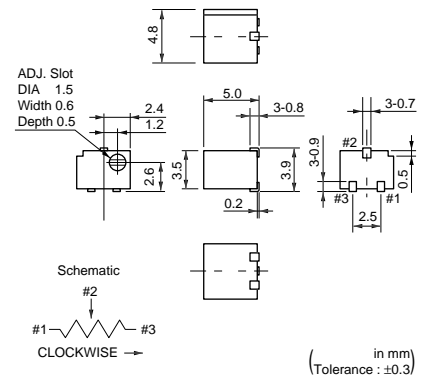
1. High resolution resulting from 11-turns design enables precise adjustment.
2. 5mm miniature size lead a high density PCB mounting.
3. Compatible with VPS reflow soldering method.
4. Compatible with ultrasonic cleaning.
5. Clutch mechanism prevents excessive wiper rotation.

#### ■ Applications

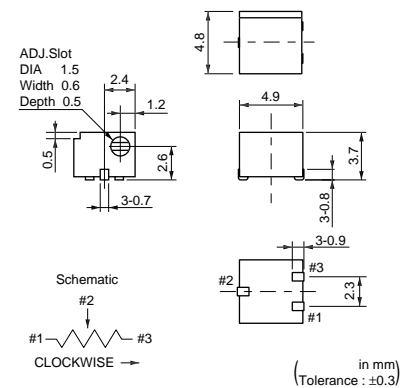
1. Measuring instruments
2. sensors
3. CPUs
4. Industrial machines



PVG5A



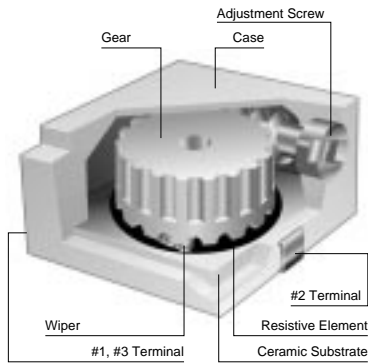
PVG5H



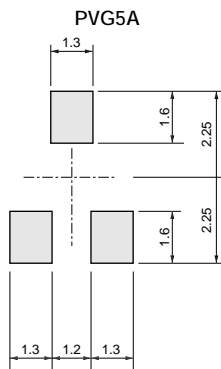
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVG5□100A01	0.25(70°C)	Reflow	11	10ohm ±10%	±200
PVG5□200A01	0.25(70°C)	Reflow	11	20ohm ±10%	±200
PVG5□500A01	0.25(70°C)	Reflow	11	50ohm ±10%	±200
PVG5□101A01	0.25(70°C)	Reflow	11	100ohm ±10%	±200
PVG5□201A01	0.25(70°C)	Reflow	11	200ohm ±10%	±100
PVG5□501A01	0.25(70°C)	Reflow	11	500ohm ±10%	±100
PVG5□102A01	0.25(70°C)	Reflow	11	1k ohm ±10%	±100
PVG5□202A01	0.25(70°C)	Reflow	11	2k ohm ±10%	±100
PVG5□502A01	0.25(70°C)	Reflow	11	5k ohm ±10%	±100
PVG5□103A01	0.25(70°C)	Reflow	11	10k ohm ±10%	±100
PVG5□203A01	0.25(70°C)	Reflow	11	20k ohm ±10%	±100
PVG5□503A01	0.25(70°C)	Reflow	11	50k ohm ±10%	±100
PVG5□104A01	0.25(70°C)	Reflow	11	100k ohm ±10%	±100
PVG5□204A01	0.25(70°C)	Reflow	11	200k ohm ±10%	±100
PVG5□504A01	0.25(70°C)	Reflow	11	500k ohm ±10%	±100
PVG5□105A01	0.25(70°C)	Reflow	11	1M ohm ±10%	±100
PVG5□205A01	0.25(70°C)	Reflow	11	2M ohm ±10%	±100

The blank column is filled with the code of adjustment direction A (top) or H (side).

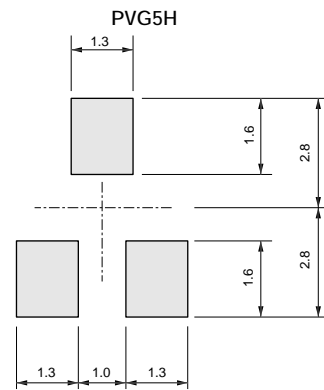
## Construction



## Standard Land Pattern



(Tolerance : ±0.1)  
in mm



(Tolerance : ±0.1)  
in mm

## Characteristics

Temperature Cycle	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	10Mohm min.
Vibration	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±3% or 3ohm max., whichever is greater
	$\Delta$ V.S.S.	±1%
Low Temperature Exposure	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Rotational Life (100 cycles)	$\Delta$ TR	±3% or 3ohm max., whichever is greater

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

## PV01 Series

### ■ Features

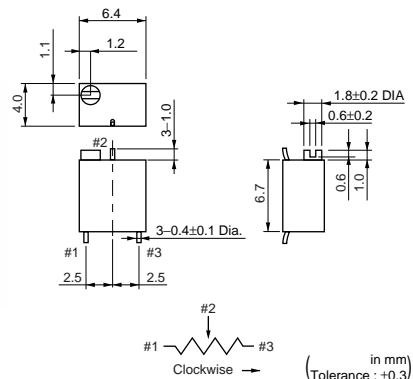
1. High resolution, resulting from 12-turns design enables precise adjustment.
2. Compatible with VPS reflow soldering method.
3. Small size. (6.35x6.35x4.3mm)
4. Compatible with ultrasonic cleaning.
5. Clutch mechanism prevents excessive wiper rotation.

### ■ Applications

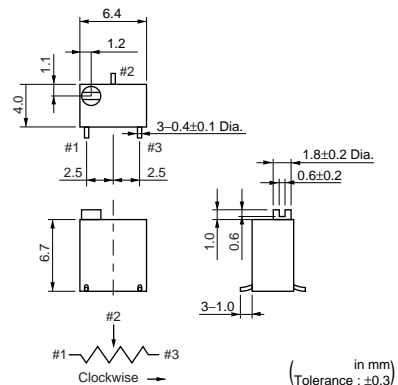
1. Measuring instruments
2. Facsimile machines
3. CPUs
4. PPCs
5. Printers
6. Sensors



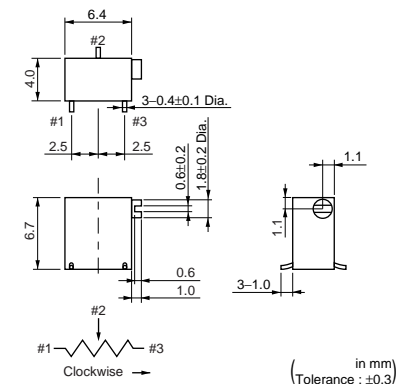
PV01P



PV01W



PV01X



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV01□100A01	0.25(85°C)	Reflow	12	10ohm ±10%	±100
PV01□200A01	0.25(85°C)	Reflow	12	20ohm ±10%	±100
PV01□500A01	0.25(85°C)	Reflow	12	50ohm ±10%	±100
PV01□101A01	0.25(85°C)	Reflow	12	100ohm ±10%	±100
PV01□201A01	0.25(85°C)	Reflow	12	200ohm ±10%	±100
PV01□501A01	0.25(85°C)	Reflow	12	500ohm ±10%	±100
PV01□102A01	0.25(85°C)	Reflow	12	1k ohm ±10%	±100
PV01□202A01	0.25(85°C)	Reflow	12	2k ohm ±10%	±100
PV01□502A01	0.25(85°C)	Reflow	12	5k ohm ±10%	±100
PV01□103A01	0.25(85°C)	Reflow	12	10k ohm ±10%	±100
PV01□203A01	0.25(85°C)	Reflow	12	20k ohm ±10%	±100
PV01□253A01	0.25(85°C)	Reflow	12	25k ohm ±10%	±100
PV01□503A01	0.25(85°C)	Reflow	12	50k ohm ±10%	±100
PV01□104A01	0.25(85°C)	Reflow	12	100k ohm ±10%	±100
PV01□204A01	0.25(85°C)	Reflow	12	200k ohm ±10%	±100
PV01□254A01	0.25(85°C)	Reflow	12	250k ohm ±10%	±100

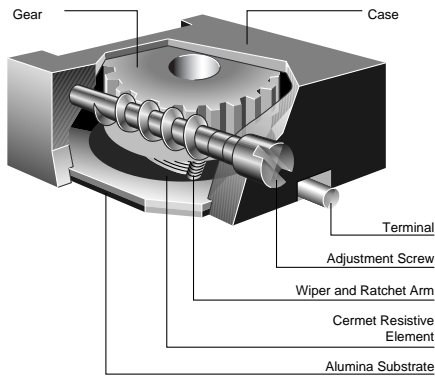
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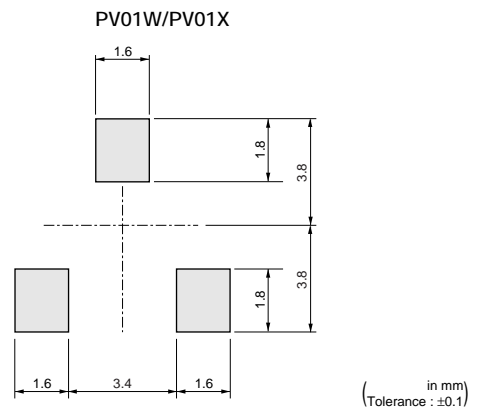
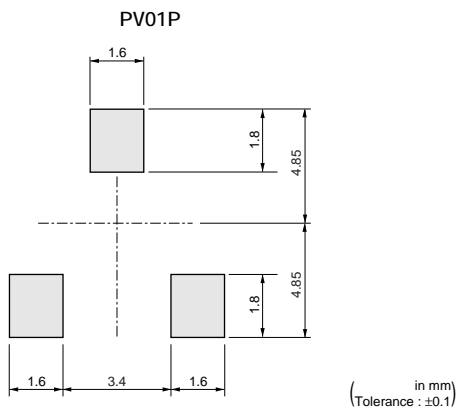
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV01□504A01	0.25(85°C)	Reflow	12	500k ohm ±10%	±100
PV01□105A01	0.25(85°C)	Reflow	12	1M ohm ±10%	±100

The blank column is filled with the code of adjustment direction P (side), W (top) or X (rear).  
 Magazine packaging is standard for PV01 series.

### Construction



### Standard Land Dimension



### Characteristics

Temperature Cycle	ΔTR	±1%
	ΔV.S.S.	±1%
Humidity	ΔTR	±2%
	IR	100Mohm min.
Vibration (20G)	ΔTR	±1%
	ΔV.S.S.	±1%
Shock (100G)	ΔTR	±1%
	ΔV.S.S.	±1%
Temperature Load Life	ΔTR	±2%
	ΔV.S.S.	±1%
Low Temperature Exposure	ΔTR	±1%
	ΔV.S.S.	±1%
High Temperature Exposure	ΔTR	±2%
	ΔV.S.S.	±1%
Rotational Life (200 cycles)	ΔTR	±2%

ΔTR : Total Resistance Change  
 ΔV.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

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## PVG5/PV01 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

- (1) Standard soldering condition
  - (a) Reflow and flow soldering :  
Refer to the standard temperature profile.
  - (b) Soldering iron :
    - >Temperature of tip 260 deg.C max.
    - >Soldering time 3sec. max.
    - >Diameter 2mm dia. max.
    - >Wattage of iron 30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer capacitor may deviate from the specified characteristics.

- (2) Can not be soldered using the flow soldering method. If you use the flow soldering method, the trimmer potentiometer may not function.
  - (3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.
  - (4) Insufficient amounts of solder can lead to insufficient soldering strength on PCB.  
Excessive amounts of solder may cause the bridging between the terminals.
- #### 2. Mounting
- (1) Use our standard land dimension. Excessive land area causes displacement due to effect of the

surface tension of the solder. Insufficient land area leads to insufficient soldering strength of the chip.

- (2) Do not apply excessive force (preferable 9.8N (Ref.; 1kgf) max.), when the trimmer potentiometer is mounted to the PCB.
- (3) Do not warp and/or bend PC board to prevent trimmer potentiometer from breakage.
- (4) In chip placers, the recommended size of the cylindrical pick-up nozzle should be outer dimension 4.0mm dia. and inner dimension 2.0mm dia..

#### 3. Cleaning

- (1) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.
- (2) The total cleaning time by cold dipping, vapor and ultrasonic washing (conditions as below) method shall be less than 3 minutes.
- (3) For ultra-sonic cleaning, the available condition is as follows.
  - >Power : 600W (67liter) max.
  - >Frequency : 28kHz
  - >Temperature : Ambient temperatureDue to the ultra-sonic cleaning equipment peculiar self resonance point and the cleaning compatibility usually depends on the jig construction and/or the cleaning condition such as the depth of immersion, please check the

## PVG5/PV01 Series Notice

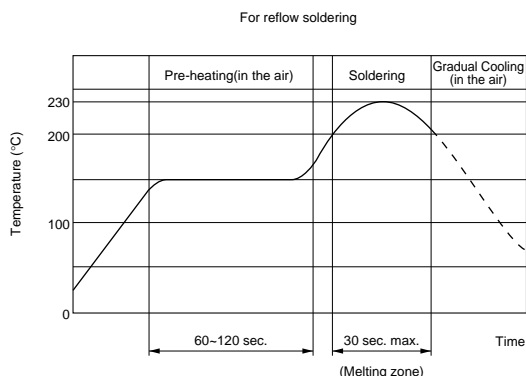
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cleaning equipment to determine the suitable conditions.

If the trimmer potentiometer is cleaned by other

conditions, the trimmer potentiometer may be damaged.

### Reflow Soldering Standard Profile



### Notice (Handling)

- Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdrivers.

\* Recommended screwdriver for manual adjustment

<PVG5 series>

VESSEL MFG. : NO. 9000-1.3x30

(Murata P/N : KMDR130)

<PV01 series>

VESSEL MFG. : NO. 9000-1.8x30

(Murata P/N : KMDR110)

We can supply above screwdrivers.

If you place order, please nominate Murata P/N.

- Don't apply more than 9.8N (Ref.; 1kgf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is applied, the trimmer potentiometer may not function.
- When adjusting with a screwdriver, do not apply excessive force (preferable 4.9N (Ref; 500gf) max.)
- When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### Notice (Other)

- Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
- Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

# Trimmer Potentiometers



## Lead Sealed Single-turn Type PVC6/PV32/PV34 Series

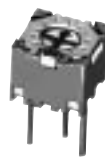
### PVC6 Series

#### ■ Features

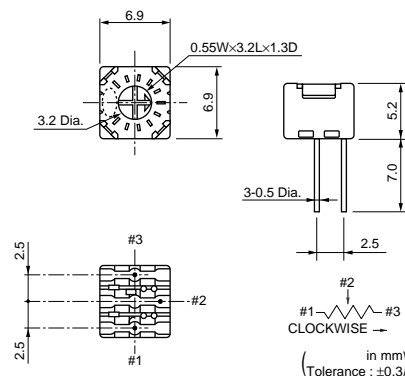
1. Enlarged rotor provides superior adjustability.
2. 11-scales are easy to see adjustment position.
3. Colored rotor provides superior adjustability.
4. Funnel shaped rotor allows for in-process automatic adjustment and it provides superior adjustability.
5. Available for "Zero" plus adjustment tool using.
6. Available for ultrasonic cleaning after soldering.

#### ■ Applications

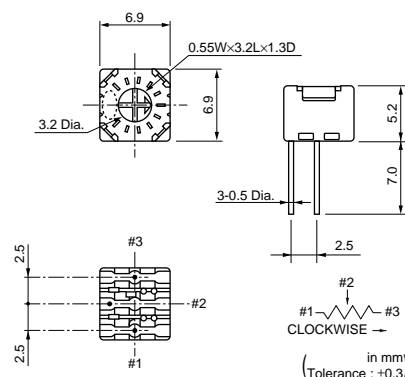
- |                         |                 |
|-------------------------|-----------------|
| 1. DY                   | 2. CRT display  |
| 3. Professional cameras | 4. CATV         |
| 5. FAX                  | 6. Power supply |
| 7. Printers             | 8. Sensors      |
| 9. Industrial machines  |                 |



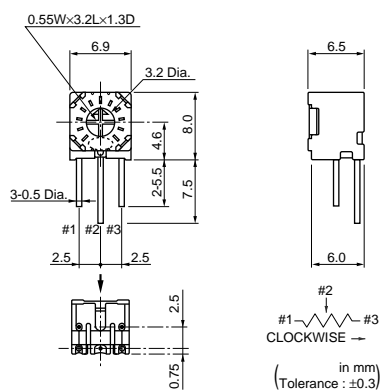
PVC6A



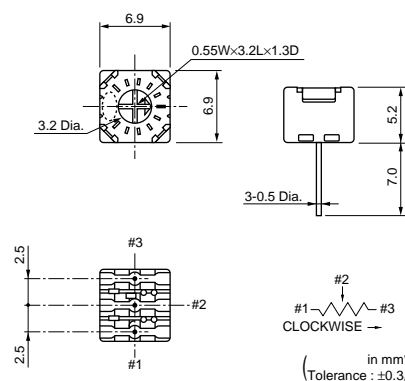
PVC6D



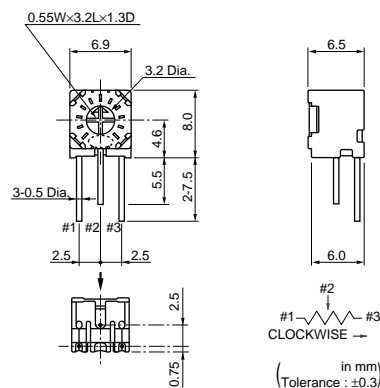
PVC6E



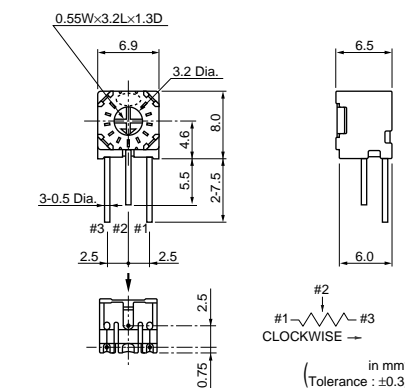
PVC6M



PVC6H



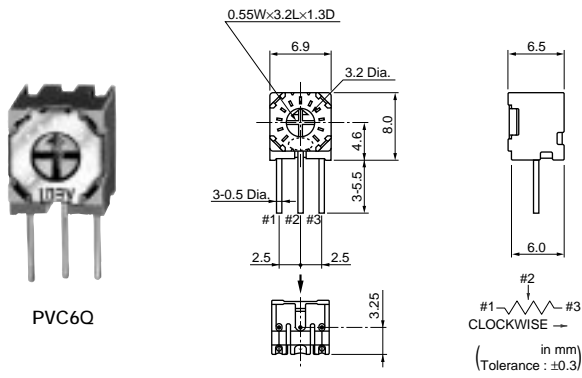
PVC6G



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Continued from the preceding page.



PVC6Q

Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVC6□100A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	10ohm ±10%	±100
PVC6□200A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	20ohm ±10%	±100
PVC6□250A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	25ohm ±10%	±100
PVC6□500A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	50ohm ±10%	±100
PVC6□101A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	100ohm ±10%	±100
PVC6□201A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	200ohm ±10%	±100
PVC6□251A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	250ohm ±10%	±100
PVC6□501A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	500ohm ±10%	±100
PVC6□102A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	1k ohm ±10%	±100
PVC6□202A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2k ohm ±10%	±100
PVC6□252A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2.5k ohm ±10%	±100
PVC6□502A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	5k ohm ±10%	±100
PVC6□103A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	10k ohm ±10%	±100
PVC6□203A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	20k ohm ±10%	±100
PVC6□253A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	25k ohm ±10%	±100
PVC6□503A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	50k ohm ±10%	±100
PVC6□104A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	100k ohm ±10%	±100
PVC6□204A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	200k ohm ±10%	±100
PVC6□254A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	250k ohm ±10%	±100
PVC6□504A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	500k ohm ±10%	±100
PVC6□105A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	1M ohm ±10%	±100
PVC6□205A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2M ohm ±10%	±100
PVC6□505A01	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	5M ohm ±10%	±100
PVC6□100A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	10ohm ±10%	±100
PVC6□200A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	20ohm ±10%	±100
PVC6□250A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	25ohm ±10%	±100
PVC6□500A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	50ohm ±10%	±100
PVC6□101A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	100ohm ±10%	±100
PVC6□201A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	200ohm ±10%	±100
PVC6□251A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	250ohm ±10%	±100
PVC6□501A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	500ohm ±10%	±100
PVC6□102A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	1k ohm ±10%	±100
PVC6□202A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2k ohm ±10%	±100
PVC6□252A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2.5k ohm ±10%	±100
PVC6□502A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	5k ohm ±10%	±100
PVC6□103A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	10k ohm ±10%	±100
PVC6□203A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	20k ohm ±10%	±100
PVC6□253A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	25k ohm ±10%	±100
PVC6□503A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	50k ohm ±10%	±100
PVC6□104A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	100k ohm ±10%	±100
PVC6□204A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	200k ohm ±10%	±100
PVC6□254A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	250k ohm ±10%	±100
PVC6□504A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	500k ohm ±10%	±100
PVC6□105A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	1M ohm ±10%	±100

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Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PVC6□205A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	2M ohm ±10%	±100
PVC6□505A04	0.5(70°C)	Flow/Soldering Iron	1(240°±5°)	5M ohm ±10%	±100

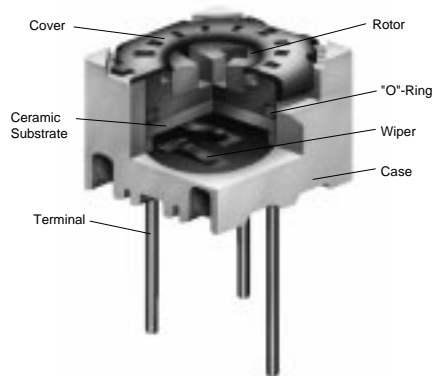
Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (A, D, E, G, H, M and Q).

The order quantity should be an integral multiple of the "Minimum Quantity" .

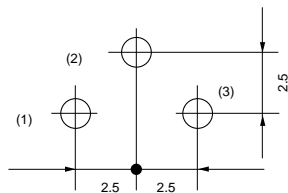
The last three digits express the individual specification codes. A01 for standard type and A04 for radial taping type (PVC6M/PVC6Q series only).

## Construction



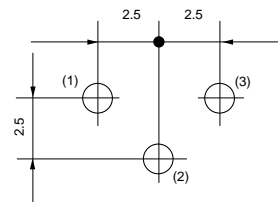
## Mounting Holes

PVC6A/PVC6E



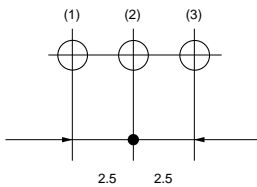
(Tolerance:±0.1 in mm)

PVC6D/PVC6H



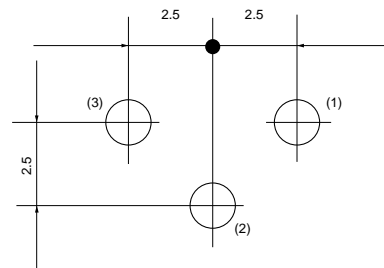
(Tolerance:±0.1 in mm)

PVC6M/PVC6Q



(Tolerance:±0.1 in mm)

PVC6G



(Tolerance:±0.1 in mm)

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## ■ Characteristics

Temperature Cycle	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 1\%$
Humidity	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 1\%$
	IR	100Mohm min.
Vibration (20G)	$\Delta TR$	$\pm 1\%$
	$\Delta V.S.S.$	$\pm 1\%$
Shock (100G)	$\Delta TR$	$\pm 1\%$
	$\Delta V.S.S.$	$\pm 1\%$
Temperature Load Life	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 2\%$
Low Temperature Exposure	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 1\%$
High Temperature Exposure	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 1\%$
Rotational Life (200 cycles)	$\Delta TR$	$\pm 4\%$

$\Delta TR$  : Total Resistance Change  
 $\Delta V.S.S.$  : Voltage Setting Stability  
 IR : Insulation Resistance

## PV32 Series

### ■ Features

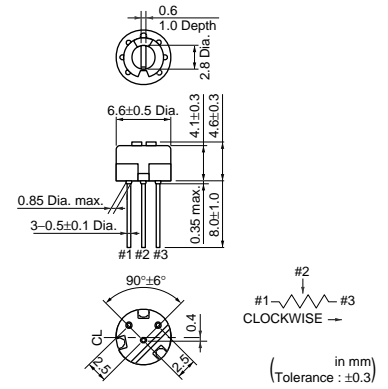
1. 6 standard terminal styles.
2. Compatible with ultrasonic cleaning
3. Single-turn cermet : 6.6mm round
4. 6mm miniature size.
5. Flammability : UL94V-0

### ■ Applications

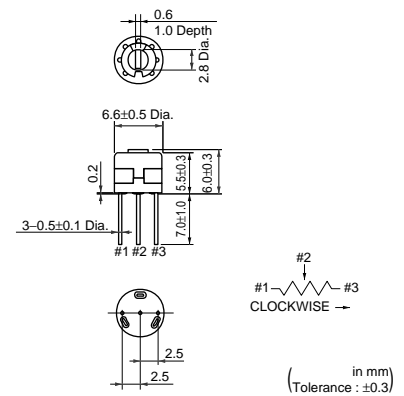
- |                             |             |
|-----------------------------|-------------|
| 1. TVs                      | 2. HDTVs    |
| 3. Professional cameras     | 4. CATV     |
| 5. Facsimile machines       | 6. Printers |
| 7. CPUs                     | 8. Sensors  |
| 9. Switching power supplies |             |



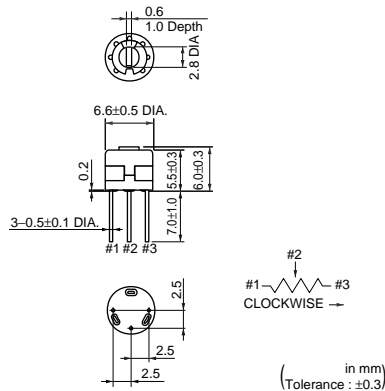
PV32H



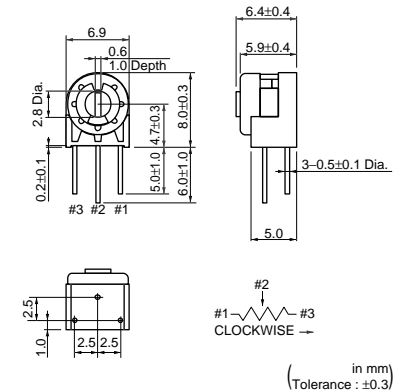
PV32R



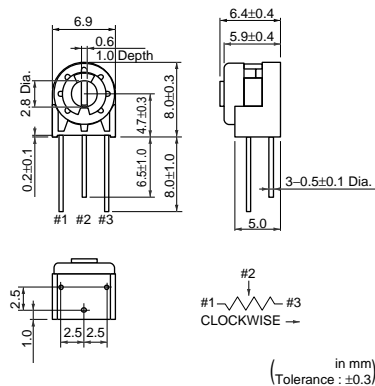
PV32P



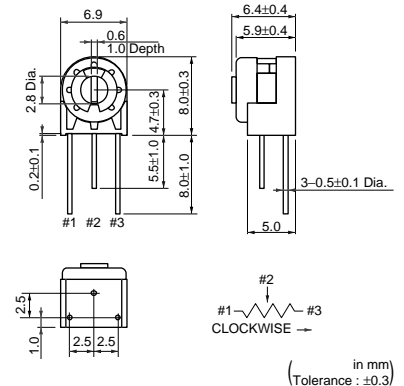
PV32N



PV32S



PV32T



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV32□100A01	0.5(70°C)	Flow/Soldering Iron	1(230±5°)	10ohm ±20%	±100
PV32□200A01	0.5(70°C)	Flow/Soldering Iron	1(230±5°)	20ohm ±20%	±100
PV32□250A01	0.5(70°C)	Flow/Soldering Iron	1(230±5°)	25ohm ±20%	±100

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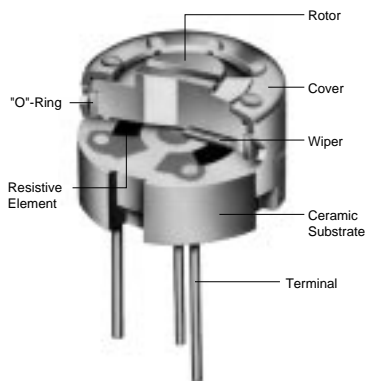
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV32□500A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	50ohm ±20%	±100
PV32□101A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	100ohm ±20%	±100
PV32□201A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	200ohm ±20%	±100
PV32□251A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	250ohm ±20%	±100
PV32□501A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	500ohm ±20%	±100
PV32□102A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	1k ohm ±20%	±100
PV32□202A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	2k ohm ±20%	±100
PV32□252A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	2.5k ohm ±20%	±100
PV32□502A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	5k ohm ±20%	±100
PV32□103A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	10k ohm ±20%	±100
PV32□203A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	20k ohm ±20%	±100
PV32□253A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	25k ohm ±20%	±100
PV32□503A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	50k ohm ±20%	±100
PV32□104A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	100k ohm ±20%	±100
PV32□204A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	200k ohm ±20%	±100
PV32□254A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	250k ohm ±20%	±100
PV32□504A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	500k ohm ±20%	±100
PV32□105A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	1M ohm ±20%	±100
PV32□205A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	2M ohm ±20%	±100
PV32□505A01	0.5(70°C)	Flow/Soldering Iron	1(230°±5°)	5M ohm ±20%	±100

Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (H, P, R, N, S and T).

The order quantity should be an integral multiple of the "Minimum Quantity" .

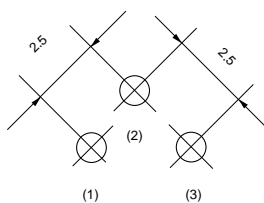
## Construction



7

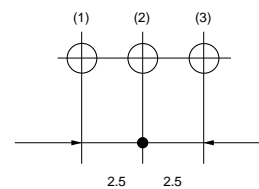
## Mounting Holes

PV32H



(Tolerance:±0.1 in mm)

PV32R



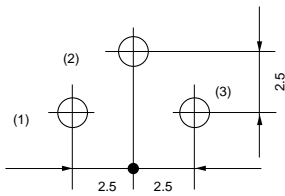
(Tolerance:±0.1 in mm)

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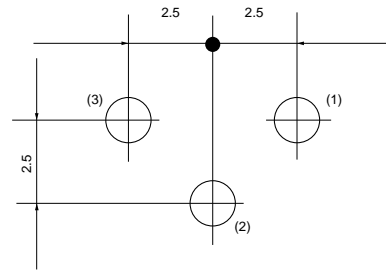
## ■ Mounting Holes

PV32P/PV32S



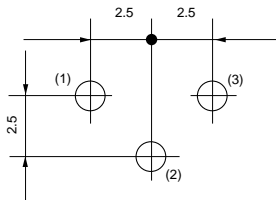
(Tolerance:±0.1  
in mm)

PV32N



(Tolerance ±0.1  
in mm)

PV32T



(Tolerance:±0.1  
in mm)

## ■ Characteristics

Temperature Cycle	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock (100G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±2%
Low Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Rotational Life (200 cycles)	$\Delta$ TR	±4%

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

## PV34 Series

### ■ Features

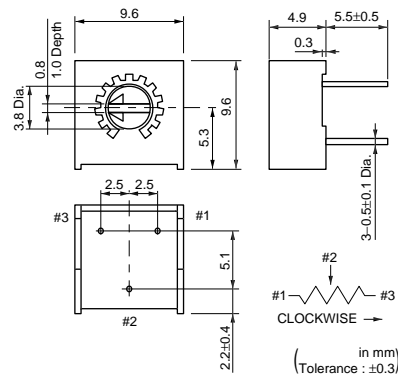
1. Single-turn, cermet construction in 9.6mm square.
2. Flammability : UL94V-0
3. Compatible with ultrasonic cleaning.

### ■ Applications

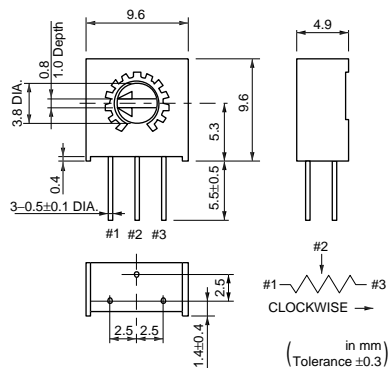
- |                             |             |
|-----------------------------|-------------|
| 1. TVs                      | 2. HDTVs    |
| 3. Professional cameras     | 4. CATV     |
| 5. Facsimile machines       | 6. Printers |
| 7. CPUs                     | 8. Sensors  |
| 9. Switching power supplies |             |



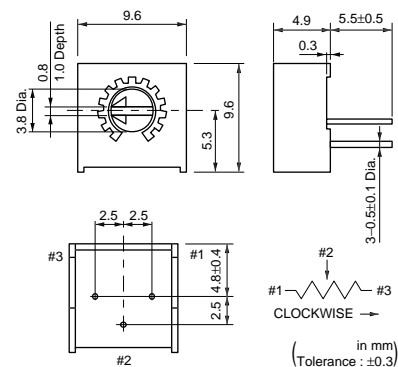
PV34F



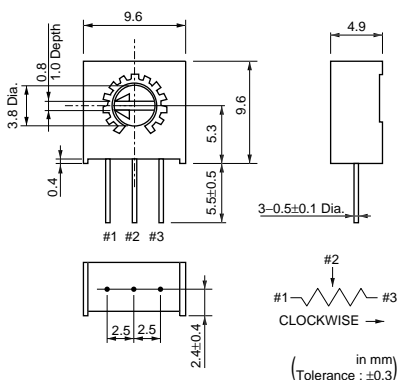
PV34H



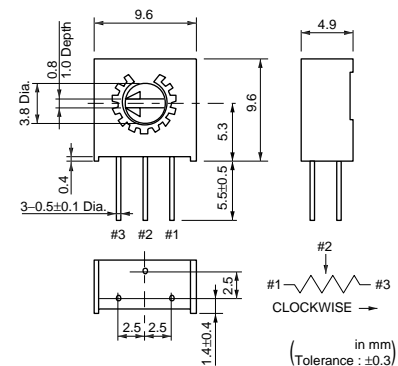
PV34P



PV34W



PV34X



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV34□100A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	10ohm ±10%	±100
PV34□200A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	20ohm ±10%	±100
PV34□500A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	50ohm ±10%	±100
PV34□101A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	100ohm ±10%	±100
PV34□201A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	200ohm ±10%	±100
PV34□501A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	500ohm ±10%	±100
PV34□102A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	1k ohm ±10%	±100
PV34□202A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	2k ohm ±10%	±100
PV34□502A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	5k ohm ±10%	±100
PV34□103A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	10k ohm ±10%	±100
PV34□203A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	20k ohm ±10%	±100
PV34□253A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	25k ohm ±10%	±100
PV34□503A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	50k ohm ±10%	±100
PV34□104A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	100k ohm ±10%	±100
PV34□204A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	200k ohm ±10%	±100
PV34□254A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	250k ohm ±10%	±100

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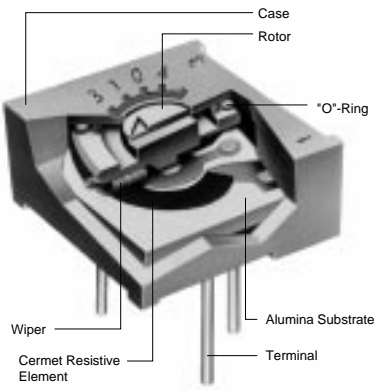
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV34□504A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	500k ohm ±10%	±100
PV34□105A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	1M ohm ±10%	±100
PV34□205A01	0.5(70°C)	Flow/Soldering Iron	1(280°±15°)	2M ohm ±10%	±100

Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (F, H, P, X and W).

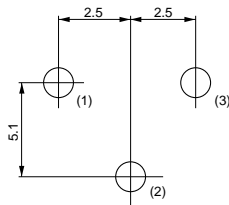
The order quantity should be an integral multiple of the "Minimum Quantity".

## Construction



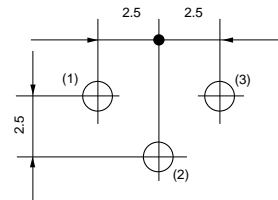
## Mounting Holes

PV34F



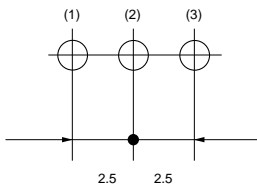
(Tolerance:±0.1 in mm)

PV34H/PV34P



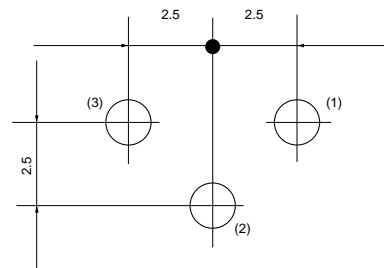
(Tolerance:±0.1 in mm)

PV34W



(Tolerance:±0.1 in mm)

PV34X



(Tolerance:±0.1 in mm)

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**Characteristics**

Temperature Cycle	$\Delta$ TR	$\pm 2\%$
	$\Delta$ V.S.S.	$\pm 1\%$
Humidity	$\Delta$ TR	$\pm 2\%$
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	$\pm 1\%$
	$\Delta$ V.S.S.	$\pm 1\%$
Shock (100G)	$\Delta$ TR	$\pm 1\%$
	$\Delta$ V.S.S.	$\pm 1\%$
Temperature Load Life	$\Delta$ TR	$\pm 2\%$
	$\Delta$ V.S.S.	$\pm 2\%$
Low Temperature Exposure	$\Delta$ TR	$\pm 1\%$
	$\Delta$ V.S.S.	$\pm 1\%$
High Temperature Exposure	$\Delta$ TR	$\pm 2\%$
	$\Delta$ V.S.S.	$\pm 1\%$
Rotational Life (200 cycles)	$\Delta$ TR	$\pm 3\%$

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

## PVC6/PV32/PV34 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

##### (1) Standard soldering condition

###### (a) Flow soldering :

- >Pre-heating temp. 80-100deg. C
- >Soldering temp. 260deg. C max.
- >Soldering time 3sec. max.

###### (b) Soldering iron :

- >Temperature of tip 300deg. C max.
- >Soldering time 3sec. max.
- >Wattage of iron 40W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

- (2) To minimize mechanical stress when adjusting, the trimmer potentiometer shall be mounted onto PCB without gap.
  - (3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.
- #### 2. Mounting
- (1) Use PCB hole to meet the pin of the trimmer potentiometer. If the trimmer potentiometer instools into insufficient PCB hole, the

trimmer potentiometer may be damaged by mechanical stress.

- (2) Do not apply excessive force (preferable 9.8N (Ref.; 1kgf) max.), when the trimmer potentiometer is mounted to the PCB.

#### 3. Cleaning

- (1) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.
- (2) The total cleaning time by cold dipping, vapor and ultrasonic washing (conditions as below) method shall be less than 3 minutes.
- (3) For ultra-sonic cleaning, the available condition is as follows.
  - >Power : 600W (67liter) max.
  - >Frequency : 28kHz
  - >Temperature : Ambient temperature

Due to the ultra-sonic cleaning equipment peculiar self resonance point and the cleaning compatibility usually depends on the jig construction and/or the cleaning condition such as the depth of immersion, please check the cleaning equipment to determine the suitable conditions.

If the trimmer potentiometer is cleaned by other conditions, the trimmer potentiometer may be damaged.

## PVC6/PV32/PV34 Series Notice

### ■ Notice (Handling)

1. Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdrivers.
  - \* Recommended screwdriver for manual adjustment
    - <PVC6 series>  
VESSEL MFG. : NO. 9000+0x30  
(Murata P/N : KMDR150)  
TORAY INDUSTRIES, INC. : SA-2225  
(Murata P/N : KMDR070)
    - <PV32/34 series>  
VESSEL MFG. : NO. 9000-1.8x30  
(Murata P/N : KMDR110)
  - \* Recommended screwdriver bit for automatic adjustment
    - <PVC6 series>  
VESSEL MFG. : NO. CA-10  
(Murata P/N : KMBT090)  
TORAY INDUSTRIES, INC. : JB-2225  
(Murata P/N : KMBT070)

- We can supply above screwdrivers.  
If you place order, please nominate Murata P/N.
2. Don't apply more than 9.8N (Ref.; 1kgf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is applied, the trimmer potentiometer may not function.
  3. When adjusting with an adjustment tool, the applied force to the adjustment screw should not exceed 4.9N (Ref.; 500gf). If excessive force is applied, the trimmer potentiometer may not function due to damage.
  4. The rotational torque at the position of the adjustment range should not exceed the stop strength.
  5. When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### ■ Notice (Other)

1. Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
2. Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

# Trimmer Potentiometers



## Lead Sealed Multi-turn Type PV12/PV37/PV23/PV22/PV36 Series

### PV12 Series

#### ■ Features

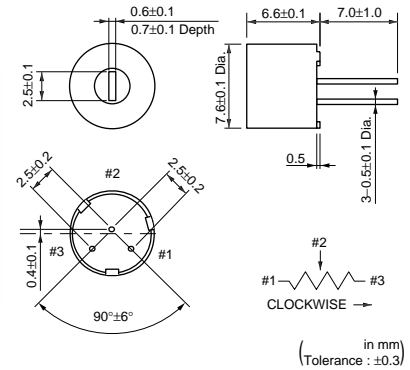
1. Cermet with 4-turns construction in 7.6mm round.
2. Unique planetary drive enables precise wiper setting.
3. Clutch mechanism prevents excessive wiper rotation.
4. Compatible with ultrasonic cleaning.

#### ■ Applications

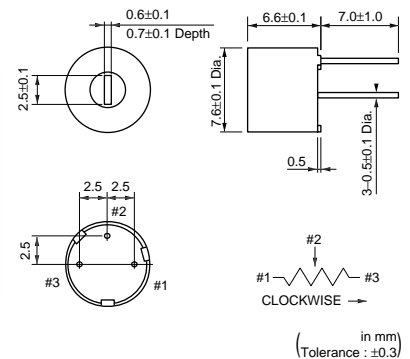
- |                          |                       |
|--------------------------|-----------------------|
| 1. Measuring instruments | 2. Facsimile machines |
| 3. CPUs                  | 4. PPCs               |
| 5. Printers              | 6. Sensors            |



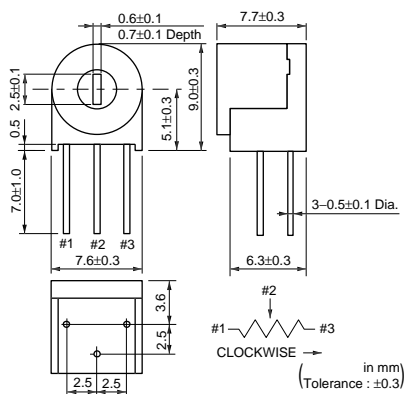
PV12H



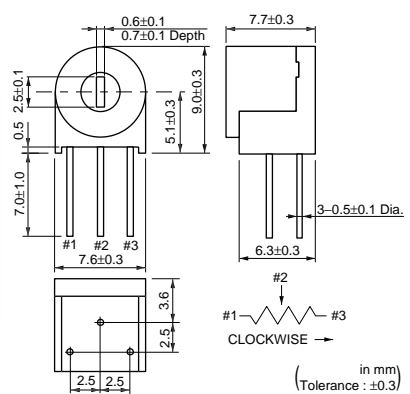
PV12P



PV12S



PV12T



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV12□100A01	0.5(70°C)	Flow/Soldering Iron	4	10ohm ±10%	±100
PV12□200A01	0.5(70°C)	Flow/Soldering Iron	4	20ohm ±10%	±100
PV12□500A01	0.5(70°C)	Flow/Soldering Iron	4	50ohm ±10%	±100
PV12□101A01	0.5(70°C)	Flow/Soldering Iron	4	100ohm ±10%	±100
PV12□201A01	0.5(70°C)	Flow/Soldering Iron	4	200ohm ±10%	±100
PV12□501A01	0.5(70°C)	Flow/Soldering Iron	4	500ohm ±10%	±100
PV12□102A01	0.5(70°C)	Flow/Soldering Iron	4	1k ohm ±10%	±100
PV12□202A01	0.5(70°C)	Flow/Soldering Iron	4	2k ohm ±10%	±100
PV12□502A01	0.5(70°C)	Flow/Soldering Iron	4	5k ohm ±10%	±100
PV12□103A01	0.5(70°C)	Flow/Soldering Iron	4	10k ohm ±10%	±100

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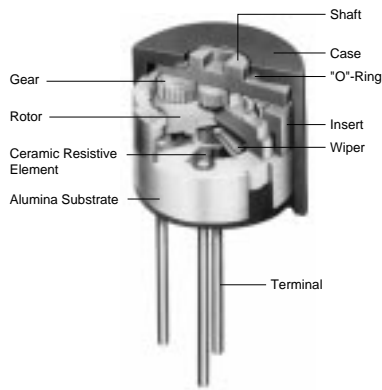
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV12□203A01	0.5(70°C)	Flow/Soldering Iron	4	20k ohm ±10%	±100
PV12□503A01	0.5(70°C)	Flow/Soldering Iron	4	50k ohm ±10%	±100
PV12□104A01	0.5(70°C)	Flow/Soldering Iron	4	100k ohm ±10%	±100
PV12□204A01	0.5(70°C)	Flow/Soldering Iron	4	200k ohm ±10%	±100
PV12□504A01	0.5(70°C)	Flow/Soldering Iron	4	500k ohm ±10%	±100
PV12□105A01	0.5(70°C)	Flow/Soldering Iron	4	1M ohm ±10%	±100
PV12□205A01	0.5(70°C)	Flow/Soldering Iron	4	2M ohm ±10%	±100

Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (H, P, T and S).

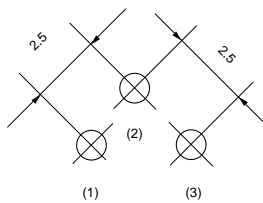
The order quantity should be an integral multiple of the "Minimum Quantity" .

## Construction



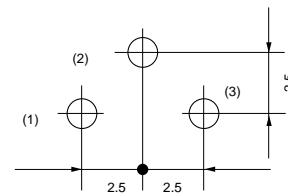
## Mounting Holes

PV12H



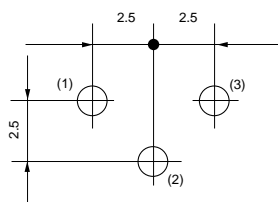
(Tolerance:±0.1 in mm)

PV12P/PV12S



(Tolerance:±0.1 in mm)

PV12T



(Tolerance:±0.1 in mm)

## ■ Characteristics

Temperature Cycle	$\Delta TR$	$\pm 2\%$
	$\Delta V.S.S.$	$\pm 1\%$
Humidity	$\Delta TR$	$\pm 2\%$
	IR	100Mohm min.
Vibration (20G)	$\Delta TR$	$\pm 1\%$
	$\Delta V.S.S.$	$\pm 1\%$
Shock (100G)	$\Delta TR$	$\pm 1\%$
	$\Delta V.S.S.$	$\pm 1\%$
Temperature Load Life	$\Delta TR$	$\pm 3\%$
	$\Delta V.S.S.$	$\pm 2\%$
Low Temperature Exposure	$\Delta TR$	$\pm 3\%$
	$\Delta V.S.S.$	$\pm 1.5\%$
High Temperature Exposure	$\Delta TR$	$\pm 3\%$
	$\Delta V.S.S.$	$\pm 1.5\%$
Rotational Life (200 cycles)	$\Delta TR$	$\pm 3\%$

$\Delta TR$  : Total Resistance Change  
 $\Delta V.S.S.$  : Voltage Setting Stability  
 IR : Insulation Resistance

## PV37 Series

### ■ Features

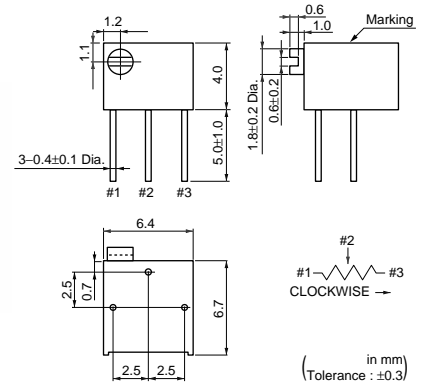
1. High resolution, 12-turns cermet.
2. Listed on the QPL for style RJ26 per MIL-R-22097.
3. Small size. (6.35x6.35x4.3mm)
4. Compatible with ultrasonic cleaning.
5. Clutch mechanism prevents excessive wiper rotation.

### ■ Applications

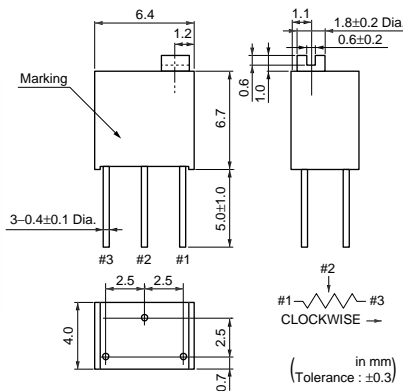
1. Measuring instruments
2. Facsimile machines
3. CPUs
4. PPCs
5. Printers
6. Sensors



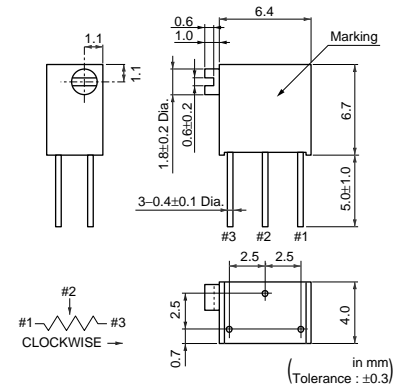
PV37P



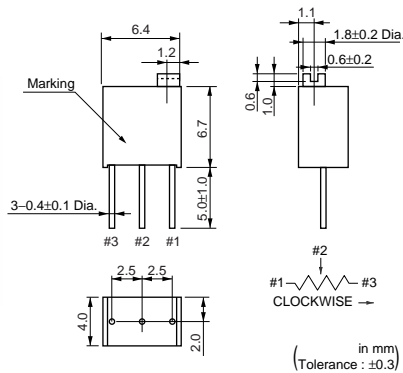
PV37W



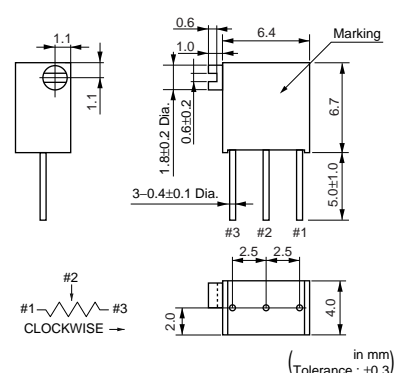
PV37X



PV37Y



PV37Z



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV37□100A01	0.25(85°C)	Flow/Soldering Iron	12	10ohm ±10%	±100
PV37□200A01	0.25(85°C)	Flow/Soldering Iron	12	20ohm ±10%	±100
PV37□500A01	0.25(85°C)	Flow/Soldering Iron	12	50ohm ±10%	±100
PV37□101A01	0.25(85°C)	Flow/Soldering Iron	12	100ohm ±10%	±100
PV37□201A01	0.25(85°C)	Flow/Soldering Iron	12	200ohm ±10%	±100
PV37□501A01	0.25(85°C)	Flow/Soldering Iron	12	500ohm ±10%	±100
PV37□102A01	0.25(85°C)	Flow/Soldering Iron	12	1k ohm ±10%	±100
PV37□202A01	0.25(85°C)	Flow/Soldering Iron	12	2k ohm ±10%	±100
PV37□502A01	0.25(85°C)	Flow/Soldering Iron	12	5k ohm ±10%	±100
PV37□103A01	0.25(85°C)	Flow/Soldering Iron	12	10k ohm ±10%	±100
PV37□203A01	0.25(85°C)	Flow/Soldering Iron	12	20k ohm ±10%	±100
PV37□253A01	0.25(85°C)	Flow/Soldering Iron	12	25k ohm ±10%	±100
PV37□503A01	0.25(85°C)	Flow/Soldering Iron	12	50k ohm ±10%	±100
PV37□104A01	0.25(85°C)	Flow/Soldering Iron	12	100k ohm ±10%	±100
PV37□204A01	0.25(85°C)	Flow/Soldering Iron	12	200k ohm ±10%	±100
PV37□254A01	0.25(85°C)	Flow/Soldering Iron	12	250k ohm ±10%	±100

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Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV37□504A01	0.25(85°C)	Flow/Soldering Iron	12	500k ohm ±10%	±100
PV37□105A01	0.25(85°C)	Flow/Soldering Iron	12	1M ohm ±10%	±100
PV37□205A01	0.25(85°C)	Flow/Soldering Iron	12	2M ohm ±10%	±100
PV37□100A31	0.25(85°C)	Flow/Soldering Iron	12	10ohm ±10%	±100
PV37□200A31	0.25(85°C)	Flow/Soldering Iron	12	20ohm ±10%	±100
PV37□500A31	0.25(85°C)	Flow/Soldering Iron	12	50ohm ±10%	±100
PV37□101A31	0.25(85°C)	Flow/Soldering Iron	12	100ohm ±10%	±100
PV37□201A31	0.25(85°C)	Flow/Soldering Iron	12	200ohm ±10%	±100
PV37□501A31	0.25(85°C)	Flow/Soldering Iron	12	500ohm ±10%	±100
PV37□102A31	0.25(85°C)	Flow/Soldering Iron	12	1k ohm ±10%	±100
PV37□202A31	0.25(85°C)	Flow/Soldering Iron	12	2k ohm ±10%	±100
PV37□502A31	0.25(85°C)	Flow/Soldering Iron	12	5k ohm ±10%	±100
PV37□103A31	0.25(85°C)	Flow/Soldering Iron	12	10k ohm ±10%	±100
PV37□203A31	0.25(85°C)	Flow/Soldering Iron	12	20k ohm ±10%	±100
PV37□253A31	0.25(85°C)	Flow/Soldering Iron	12	25k ohm ±10%	±100
PV37□503A31	0.25(85°C)	Flow/Soldering Iron	12	50k ohm ±10%	±100
PV37□104A31	0.25(85°C)	Flow/Soldering Iron	12	100k ohm ±10%	±100
PV37□204A31	0.25(85°C)	Flow/Soldering Iron	12	200k ohm ±10%	±100
PV37□254A31	0.25(85°C)	Flow/Soldering Iron	12	250k ohm ±10%	±100
PV37□504A31	0.25(85°C)	Flow/Soldering Iron	12	500k ohm ±10%	±100
PV37□105A31	0.25(85°C)	Flow/Soldering Iron	12	1M ohm ±10%	±100
PV37□205A31	0.25(85°C)	Flow/Soldering Iron	12	2M ohm ±10%	±100

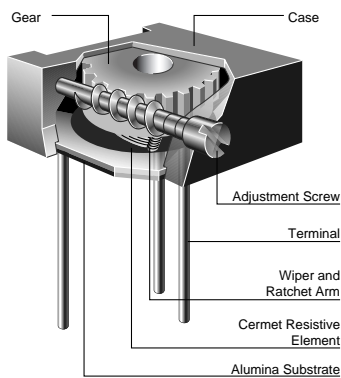
Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (P, X, Y, W and Z).

The order quantity should be an integral multiple of the "Minimum Quantity".

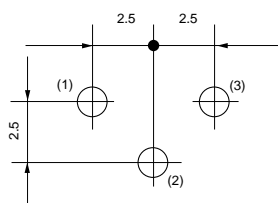
The last three digits express the individual specification codes. A01 for standard type and A31 for radial tapping type (PV36W/PV36X series only).

## ■ Construction



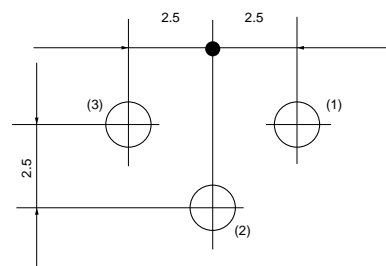
## ■ Mounting Holes

PV37P



(Tolerance:±0.1 in mm)

PV37W/PV37X



(Tolerance:±0.1 in mm)

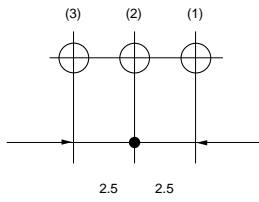
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## ■ Mounting Holes

PV37Y/PV37Z



( Tolerance:±0.1  
in mm )

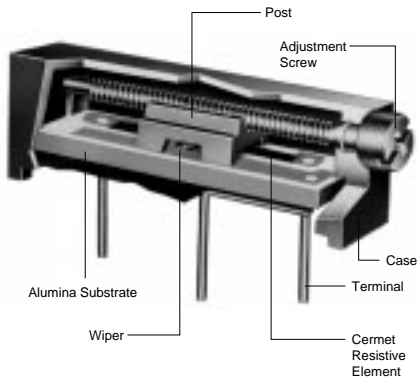
## ■ Characteristics

Temperature Cycle	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock (100G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Low Temperature Exposure	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Rotational Life (200 cycles)	$\Delta$ TR	±2%

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

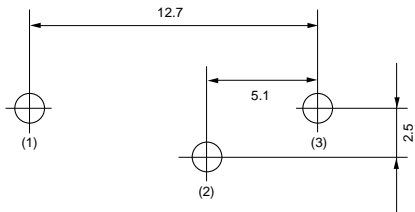


## ■ Construction



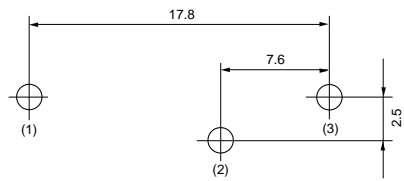
## ■ Mounting Holes

PV23P



(Tolerance: ±0.1 in mm)

PV23Y



(Tolerance: ±0.1 in mm)

## ■ Characteristics

Temperature Cycle	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock (50G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±3%
	$\Delta$ V.S.S.	±1%
Low Temperature Exposure	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Rotational Life (200 cycles)	$\Delta$ TR	±3%

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

## PV22 Series

### ■ Features

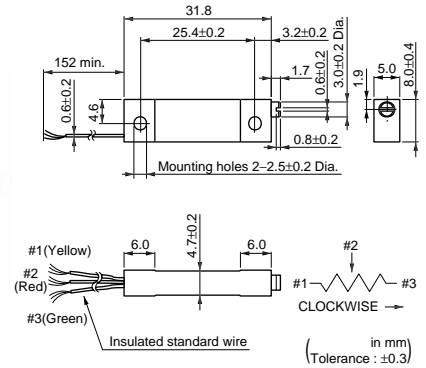
1. Recommended for applications requiring side adjustment.
2. High power rating (1W at 70deg. C), 22-turns.
3. Compatible with ultrasonic cleaning.
4. Clutch mechanism prevents excessive wiper rotation.

### ■ Applications

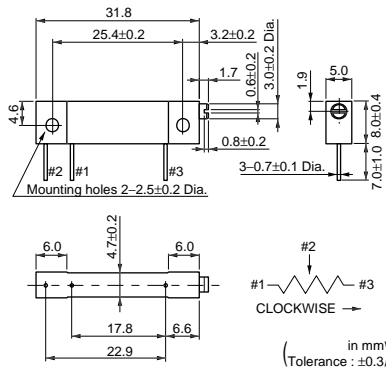
1. Measuring instruments
2. Facsimile machines
3. CPUs
4. PPCs
5. Printers
6. Sensors



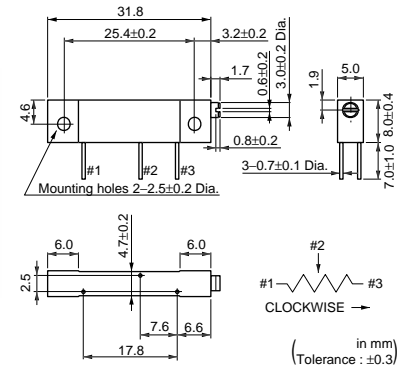
PV22L



PV22S



PV22Y



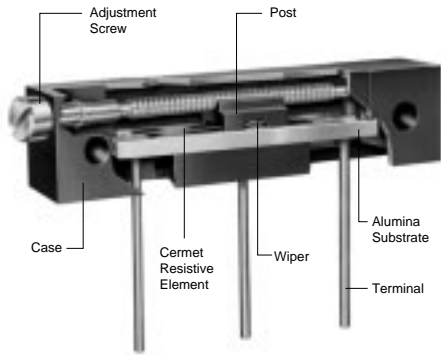
Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV22□100A01	1.0(70°C)	Flow/Soldering Iron	22	10ohm ±10%	±100
PV22□200A01	1.0(70°C)	Flow/Soldering Iron	22	20ohm ±10%	±100
PV22□500A01	1.0(70°C)	Flow/Soldering Iron	22	50ohm ±10%	±100
PV22□101A01	1.0(70°C)	Flow/Soldering Iron	22	100ohm ±10%	±100
PV22□201A01	1.0(70°C)	Flow/Soldering Iron	22	200ohm ±10%	±100
PV22□501A01	1.0(70°C)	Flow/Soldering Iron	22	500ohm ±10%	±100
PV22□102A01	1.0(70°C)	Flow/Soldering Iron	22	1k ohm ±10%	±100
PV22□202A01	1.0(70°C)	Flow/Soldering Iron	22	2k ohm ±10%	±100
PV22□502A01	1.0(70°C)	Flow/Soldering Iron	22	5k ohm ±10%	±100
PV22□103A01	1.0(70°C)	Flow/Soldering Iron	22	10k ohm ±10%	±100
PV22□203A01	1.0(70°C)	Flow/Soldering Iron	22	20k ohm ±10%	±100
PV22□503A01	1.0(70°C)	Flow/Soldering Iron	22	50k ohm ±10%	±100
PV22□104A01	1.0(70°C)	Flow/Soldering Iron	22	100k ohm ±10%	±100
PV22□204A01	1.0(70°C)	Flow/Soldering Iron	22	200k ohm ±10%	±100
PV22□504A01	1.0(70°C)	Flow/Soldering Iron	22	500k ohm ±10%	±100
PV22□105A01	1.0(70°C)	Flow/Soldering Iron	22	1M ohm ±10%	±100
PV22□205A01	1.0(70°C)	Flow/Soldering Iron	22	2M ohm ±10%	±100

Operating Temperature Range: -55 to 150 °C

The blank column is filled with the code of adjustment direction and lead type (L, S and Y).

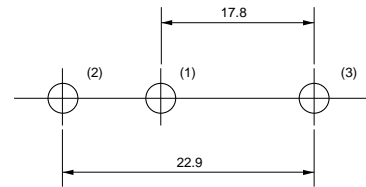
The order quantity should be an integral multiple of the "Minimum Quantity" .

## ■ Construction



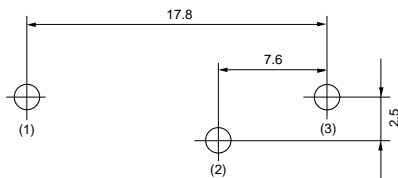
## ■ Mounting Holes

PV22S



(Tolerance:±0.1  
in mm)

PV22Y



(Tolerance:±0.1  
in mm)

## ■ Characteristics

Temperature Cycle	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock (50G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±3%
	$\Delta$ V.S.S.	±1%
Low Temperature Exposure	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Rotational Life (200 cycles)	$\Delta$ TR	±2%

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance

## PV36 Series

### ■ Features

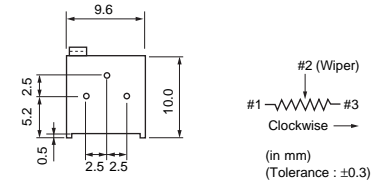
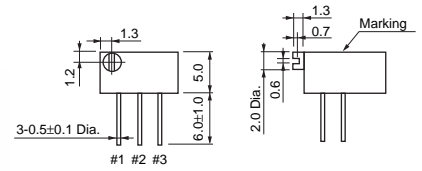
1. 25-turns, cermet, square, 9.5mm package.
2. 5 terminal styles, top and side adjustment.
3. Compatible with ultrasonic cleaning.
4. Clutch mechanism presents excessive wiper rotation.

### ■ Applications

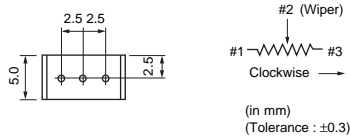
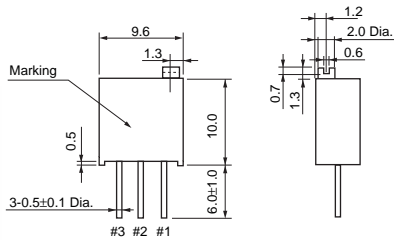
1. Measuring instruments
2. Facsimile machines
3. CPUs
4. PPCs
5. Printers
6. Sensors



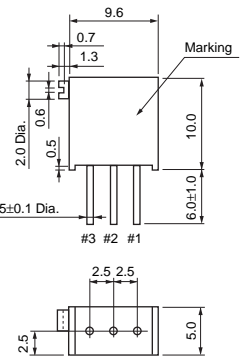
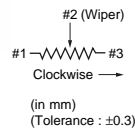
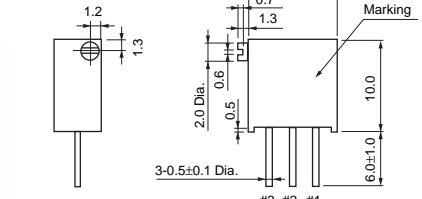
PV36P



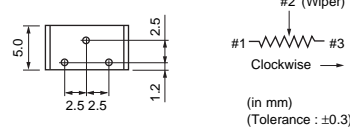
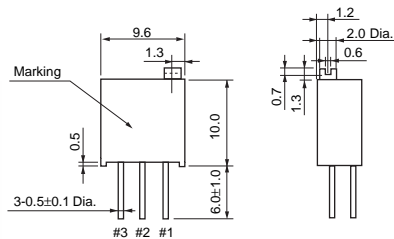
PV36W



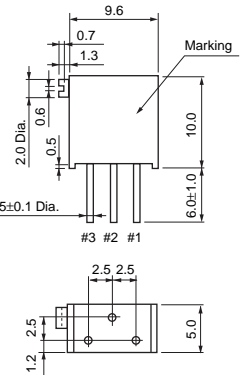
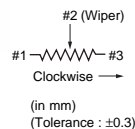
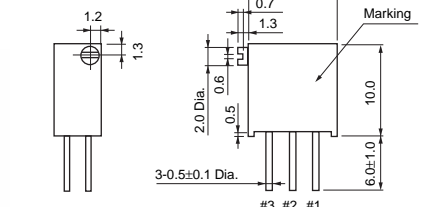
PV36X



PV36Y



PV36Z



Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV36□100A01	0.5(70°C)	Flow/Soldering Iron	25	10ohm ±10%	±100
PV36□200A01	0.5(70°C)	Flow/Soldering Iron	25	20ohm ±10%	±100
PV36□500A01	0.5(70°C)	Flow/Soldering Iron	25	50ohm ±10%	±100
PV36□101A01	0.5(70°C)	Flow/Soldering Iron	25	100ohm ±10%	±100
PV36□201A01	0.5(70°C)	Flow/Soldering Iron	25	200ohm ±10%	±100
PV36□501A01	0.5(70°C)	Flow/Soldering Iron	25	500ohm ±10%	±100
PV36□102A01	0.5(70°C)	Flow/Soldering Iron	25	1k ohm ±10%	±100
PV36□202A01	0.5(70°C)	Flow/Soldering Iron	25	2k ohm ±10%	±100
PV36□502A01	0.5(70°C)	Flow/Soldering Iron	25	5k ohm ±10%	±100
PV36□103A01	0.5(70°C)	Flow/Soldering Iron	25	10k ohm ±10%	±100
PV36□203A01	0.5(70°C)	Flow/Soldering Iron	25	20k ohm ±10%	±100
PV36□253A01	0.5(70°C)	Flow/Soldering Iron	25	25k ohm ±10%	±100
PV36□503A01	0.5(70°C)	Flow/Soldering Iron	25	50k ohm ±10%	±100
PV36□104A01	0.5(70°C)	Flow/Soldering Iron	25	100k ohm ±10%	±100
PV36□204A01	0.5(70°C)	Flow/Soldering Iron	25	200k ohm ±10%	±100
PV36□254A01	0.5(70°C)	Flow/Soldering Iron	25	250k ohm ±10%	±100

Continued on the following page. ↗

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Part Number	Power Rating (W)	Soldering Method	Number of Turns (Effective Rotation Angle)	Total Resistance Value	TCR (ppm/°C)
PV36□504A01	0.5(70°C)	Flow/Soldering Iron	25	500k ohm ±10%	±100
PV36□105A01	0.5(70°C)	Flow/Soldering Iron	25	1M ohm ±10%	±100
PV36□205A01	0.5(70°C)	Flow/Soldering Iron	25	2M ohm ±10%	±100
PV36□100A31	0.5(70°C)	Flow/Soldering Iron	25	10ohm ±10%	±100
PV36□200A31	0.5(70°C)	Flow/Soldering Iron	25	20ohm ±10%	±100
PV36□500A31	0.5(70°C)	Flow/Soldering Iron	25	50ohm ±10%	±100
PV36□101A31	0.5(70°C)	Flow/Soldering Iron	25	100ohm ±10%	±100
PV36□201A31	0.5(70°C)	Flow/Soldering Iron	25	200ohm ±10%	±100
PV36□501A31	0.5(70°C)	Flow/Soldering Iron	25	500ohm ±10%	±100
PV36□102A31	0.5(70°C)	Flow/Soldering Iron	25	1k ohm ±10%	±100
PV36□202A31	0.5(70°C)	Flow/Soldering Iron	25	2k ohm ±10%	±100
PV36□502A31	0.5(70°C)	Flow/Soldering Iron	25	5k ohm ±10%	±100
PV36□103A31	0.5(70°C)	Flow/Soldering Iron	25	10k ohm ±10%	±100
PV36□203A31	0.5(70°C)	Flow/Soldering Iron	25	20k ohm ±10%	±100
PV36□253A31	0.5(70°C)	Flow/Soldering Iron	25	25k ohm ±10%	±100
PV36□503A31	0.5(70°C)	Flow/Soldering Iron	25	50k ohm ±10%	±100
PV36□104A31	0.5(70°C)	Flow/Soldering Iron	25	100k ohm ±10%	±100
PV36□204A31	0.5(70°C)	Flow/Soldering Iron	25	200k ohm ±10%	±100
PV36□254A31	0.5(70°C)	Flow/Soldering Iron	25	250k ohm ±10%	±100
PV36□504A31	0.5(70°C)	Flow/Soldering Iron	25	500k ohm ±10%	±100
PV36□105A31	0.5(70°C)	Flow/Soldering Iron	25	1M ohm ±10%	±100
PV36□205A31	0.5(70°C)	Flow/Soldering Iron	25	2M ohm ±10%	±100

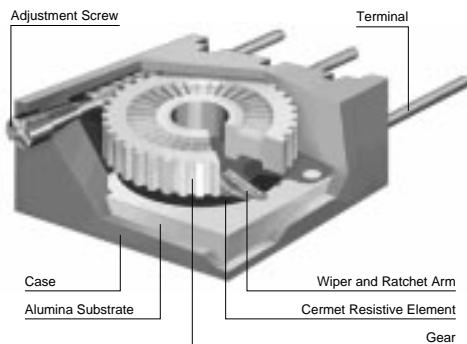
Operating Temperature Range: -55 to 125 °C

The blank column is filled with the code of adjustment direction and lead type (P, X, Y, W and Z).

The order quantity should be an integral multiple of the "Minimum Quantity" .

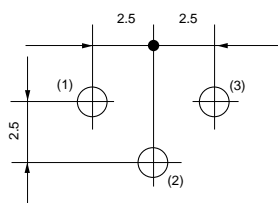
The last three digits express the individual specification codes. A01 for standard type and A31 for radial tapping type (PV37Y/PV37Z series only).

## ■ Construction



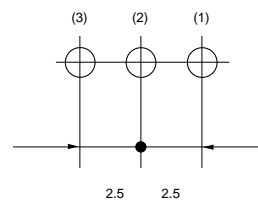
## ■ Mounting Holes

PV36P



(Tolerance:±0.1 in mm)

PV36W

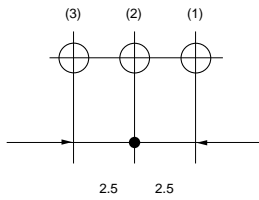


(Tolerance:±0.1 in mm)

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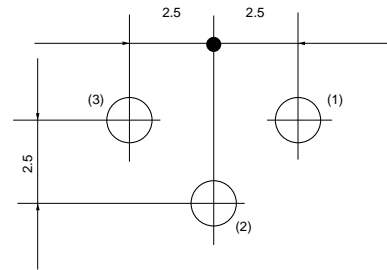
## ■ Mounting Holes

PV36X



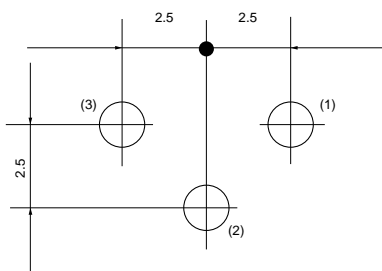
(Tolerance:±0.1  
in mm)

PV36Y



(Tolerance:±0.1  
in mm)

PV36Z



(Tolerance:±0.1  
in mm)

## ■ Characteristics

Temperature Cycle	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
Humidity	$\Delta$ TR	±2%
	IR	100Mohm min.
Vibration (20G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Shock (100G)	$\Delta$ TR	±1%
	$\Delta$ V.S.S.	±1%
Temperature Load Life	$\Delta$ TR	±3%
	$\Delta$ V.S.S.	±1%
Low Temperature Exposure	$\Delta$ TR	±2%
	$\Delta$ V.S.S.	±1%
High Temperature Exposure	$\Delta$ TR	±3%
	$\Delta$ V.S.S.	±1%
Rotational Life (200 cycles)	$\Delta$ TR	±3%

$\Delta$ TR : Total Resistance Change  
 $\Delta$ V.S.S. : Voltage Setting Stability  
 IR : Insulation Resistance



## PV12/PV37/PV23/PV22/PV36 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. The trimmer potentiometer should not be used under the following environmental conditions:  
If you use the trimmer potentiometer in an environment other these listed below, please consult with Murata factory representative prior to

using.

- (1) Corrosive gaseous atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Rating)

1. When using with partial load (rheostat), minimize the power depend on the resistance value.
2. The maximum input voltage to a trimmer potentiometer should not exceed  $(P \cdot R)^{1/2}$  or the maximum operating voltage, whichever is smaller.
3. The maximum input current to a trimmer potentiometer should not exceed  $(P/R)^{1/2}$  or the allowable wiper current, whichever is smaller.

### ■ Notice (Soldering and Mounting)

#### 1. Soldering

##### (1) Standard soldering condition

###### (a) Flow soldering :

- >Pre-heating temp. 80-100deg. C
- >Soldering temp. 260deg. C max.
- >Soldering time 3sec. max.

###### (b) Soldering iron :

- >Temperature of tip 300deg. C max.
- >Soldering time 3sec. max.
- >Wattage of iron 40W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e. g., excessive time and/or excessive temperature, the trimmer potentiometer may deviate from the specified characteristics.

- (2) To minimize mechanical stress when adjusting, the trimmer potentiometer shall be mounted onto PCB without gap.
- (3) The soldering iron should not come in contact with the case of the trimmer potentiometer. If such contact does occur, the trimmer potentiometer may be damaged.

#### 2. Mounting

- (1) Use PCB hole to meet the pin of the trimmer potentiometer. If the trimmer potentiometer instools into insufficient PCB hole, the

trimmer potentiometer may be damaged by mechanical stress.

- (2) Do not apply excessive force (preferable 9.8N (Ref.; 1kgf) max.), when the trimmer potentiometer is mounted to the PCB.

#### 3. Cleaning

- (1) Isopropyl-alcohol and Ethyl-alcohol are applicable solvent for cleaning. If you use any other types of solvents, please consult with Murata factory representative prior to using.
- (2) The total cleaning time by cold dipping, vapor and ultrasonic washing (conditions as below) method shall be less than 3 minutes.
- (3) For ultra-sonic cleaning, the available condition is as follows.
  - >Power : 600W (67liter) max.
  - >Frequency : 28kHz
  - >Temperature : Ambient temperature

Due to the ultra-sonic cleaning equipment peculiar self resonance point and the cleaning compatibility usually depends on the jig construction and/or the cleaning condition such as the depth of immersion, please check the cleaning equipment to determine the suitable conditions.

If the trimmer potentiometer is cleaned by other conditions, the trimmer potentiometer may be damaged.

## PV12/PV37/PV23/PV22/PV36 Series Notice

### ■ Notice (Handling)

1. Use suitable screwdrivers that fit comfortably in driver slot. We recommend the below screwdrivers.  
\* Recommended screwdriver for manual adjustment  
VESSEL MFG. : NO. 9000-1.8x30  
(Murata P/N : KMDR110)  
We can supply above screwdrivers.  
If you place order, please nominate Murata P/N.
2. Don't apply more than 9.8N (Ref.; 1kgf) of twist and stress after mounted onto PCB to prevent contact intermittence. If excessive force is

applied, the trimmer potentiometer may not function.

3. When adjusting with an adjustment tool, the applied force to the adjustment screw should not exceed 4.9N (Ref.; 500gf). If excessive force is applied, the trimmer potentiometer may not function due to damage.
4. When using a lock paint to fix slot position, please use adhesive resin without chlorine or sulfur (Three-bond "1401series").

### ■ Notice (Other)

1. Please make sure that your product has been evaluated and confirmed against your specifications when our product is mounted to your product.
2. Murata cannot guarantee trimmer potentiometer integrity when used under conditions other than those specified in this document.

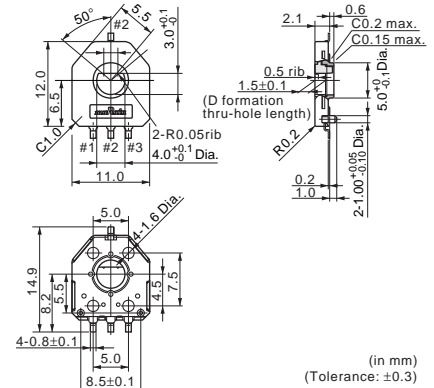
# Trimmer Potentiometers



## Angle Sensing Potentiometer SMD Dust-proof Type 12mm Size PVS1 Series

### ■ Features

1. Dust-proof construction protects the internal from dust, which maintains stable characteristics.
2. Compliant to high peak temperature reflow soldering.
3. Excellent resistance materials and high reliability wiper achieves 1M cycles.
4. D formatin thru-hole rotor enables to select any kind of gear shape.
5. Leaded terminal type is available.
6. Ultra-thin size. (2.1mm height)
7. Au plated terminals without Lead.

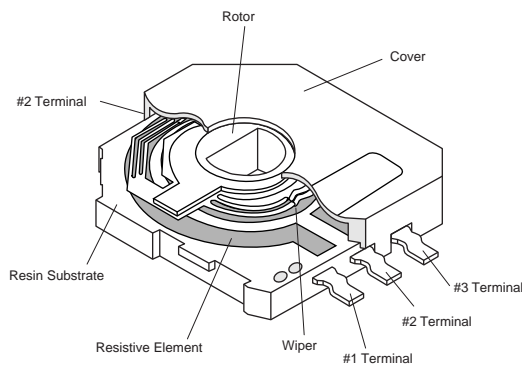


### ■ Applications

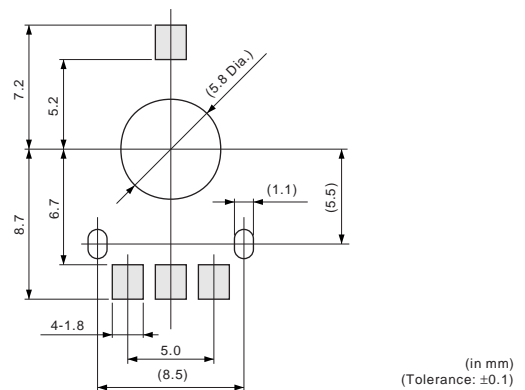
1. Animal robot
2. Switch for automotive
3. Motor drive unit
4. Radio control equipment
5. Electric motor-driven bicycle

Part Number	Total Resistance Value (k ohm)	Linearity (%)	Effective Rotational Angle	TCR	Rotational Life
PVS1A103A01	10 ±30%	±2	333.3° (Ref.)	±500ppm/°C	1M cycles

### ■ Construction



### ■ Standard Land Pattern



Continued on the following page.

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**■ Characteristics**

Temperature Cycle (Thermal Shock)	ΔTR	±20%
	Linearity	±3%
Humidity	ΔTR	±20%
	Linearity	±3%
Vibration	ΔTR	±10%
	Linearity	±3%
Shock (20G)	ΔTR	±10%
	Linearity	±3%
Humidity Load Life	ΔTR	±20%
	Linearity	±3%
High Temperature Exposure	ΔTR	+5/-30%
	Linearity	±3%
Low Temperature Exposure	ΔTR	±20%
	Linearity	±3%
Rotational Life (1M cycles)	ΔTR	±20%
	Linearity	±3%

ΔTR: Total Resistance Change

## PVS1 Series Notice

### ■ Notice (Operating and Storage Conditions)

1. Store that the temperature is -10 to +40deg. C and the relative humidity is 30-85%RH.
2. Do not store in or near corrosive gases.
3. Use within six months after delivery.
4. Open the package just before using.
5. Do not store under direct sunlight.
6. Do not use the rotary position sensor under the following environmental conditions. If you use the rotary position sensor in an environment other than these listed below, please consult with Murata factory representative prior to using.

- (1) Corrosive gasses atmosphere.  
(Ex. Chlorine gas, Hydrogen sulfide gas, Ammonia gas, Sulfuric acid gas, Nitric oxide gas, etc.)
- (2) In liquid.  
(Ex. Water, Oil, Medical liquid, Organic solvent, etc.)
- (3) Dusty/dirty atmosphere.
- (4) Direct sunlight.
- (5) Static voltage nor electric/magnetic fields.
- (6) Direct sea breeze.
- (7) Other variations of the above.

### ■ Notice (Soldering and Mounting)

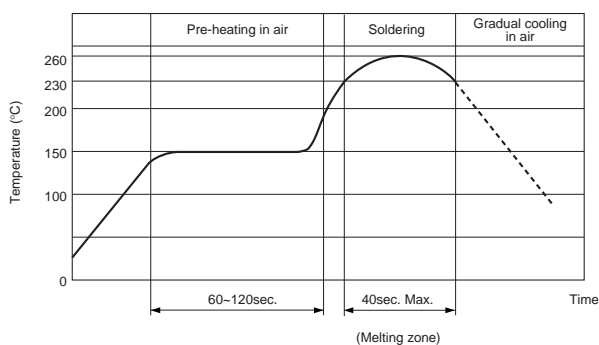
#### 1. Soldering

- (1) PVS1 series can be soldered by reflow soldering method and soldering iron. Do not use flow soldering method (dipping).
- (2) The dimension of land pattern should be used Murata's standard land pattern at reflow soldering. Excessive land area may cause displacement due to effect of the surface tension of the solder. Insufficient land area may cause insufficient soldering strength on PCB.
- (3) Standard soldering condition
  - (a) Reflow soldering : Refer to the standard temperature profile.
  - (b) Soldering iron:
    - >Temperature of tip 360deg. C max.
    - >Soldering time 3sec. max./1 terminal
    - >Diameter 3mm max.
    - >Wattage of iron 30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e.g., excessive time and/or excessive temperature, the rotary position sensor may deviate from the specified characteristics.

- (4) The amount of solder is critical. Insufficient amounts of solder can lead to insufficient soldering strength on PCB. Excessive amounts of solder may cause the bridging between the terminals.
  - (5) The soldering iron should not come in contact with the cover of the rotary position sensor. If such contact does occur, the rotary position sensor may be damaged.
- #### 2. Cleaning
- Can not be cleaned because of open construction.

### ■ Reflow Soldering Standard Profile



## PVS1 Series Notice

### ■ Notice (Handling)

1. Do not warp and/or bend PCB to prevent rotary position sensor from breakage.
2. In case that load to the product except rotor and/or excessive force except rotational action to the rotor are applied to the product, the change of the electrical characteristics, increase in torque and mechanical damage may occur. Therefore, please pay attention to the fixing method and holding method of the shaft to avoid the foregoing.

### ■ Notice (Other)

1. Please make sure the connecting impedance is not to be less than 1M ohm. The rotary position sensor is designed to connect the output terminal and A/D port of the microprocessor directly. Therefore, connecting impedance presuppose certain M ohm and the contact resistance is set high.
  - (1) Data install should be done plural times and applied the mean value.
  - (2) Data considered as error should be invalid.
  - (3) Data should be re-installed if quare occurs.
2. To minimize the processing error and noise influence which occur in rare cases, when data is installed through the product, please note the following items and program your software.
  3. Before using rotary position sensor, please test after assembly in your particular mass production system.
  4. MURATA cannot guarantee rotary position sensor integrity when used under conditions other than those specified in this document.

## SMD Open Type and PVM4A\_A01 Series Specifications and Test Methods

The tests and measurements shall be conducted under the condition of 15 to 35°C of temperature, 25 to 75% of relative humidity and 86 to 106 kpa of atmospheric pressure unless otherwise specified. In case when entertained a doubt in judgment obtained from results measured in accordance with the above mentioned conditions, the tests and measurements shall be conducted under the condition of 25±2°C of temperature and, 45 to 55% of relative humidity and 86 to 106 kpa of atmospheric pressure.

No.	Item	Test Methods																														
1	Total Resistance	<p>Measure total resistance between the resistance element and terminals (terminals #1 and #3) with the contact arm positioned against a stop. The positioning of the contact arm and terminal shall be the same for subsequent total resistance measurements on the same device.</p> <p>Use the test voltage specified in Table-1 for total resistance measurements. This voltage shall be used whenever a subsequent total resistance measurement is made.</p> <table border="1"> <thead> <tr> <th>Total resistance, Nominal (ohm)</th> <th>Maximum Test Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>10≤R≤100</td> <td>1.0</td> </tr> <tr> <td>100&lt;R≤1k</td> <td>3.0</td> </tr> <tr> <td>1k&lt;R≤10k</td> <td>10.0</td> </tr> <tr> <td>10k&lt;R≤100k</td> <td>30.0</td> </tr> <tr> <td>100k&lt;R</td> <td>100.0</td> </tr> </tbody> </table> <p>Table-1 Total resistance test voltage</p>	Total resistance, Nominal (ohm)	Maximum Test Voltage (V)	10≤R≤100	1.0	100<R≤1k	3.0	1k<R≤10k	10.0	10k<R≤100k	30.0	100k<R	100.0																		
Total resistance, Nominal (ohm)	Maximum Test Voltage (V)																															
10≤R≤100	1.0																															
100<R≤1k	3.0																															
1k<R≤10k	10.0																															
10k<R≤100k	30.0																															
100k<R	100.0																															
2	Residual Resistance	<p>Position the contact arm at the extreme counterclockwise limit of mechanical travel and measure the resistance between the contact arm and the corresponding end terminal. Then, position the contact arm at the extreme clockwise limit of mechanical travel and measure the resistance between the contact arm and the corresponding end terminal. During this test, take suitable precautions to ensure that the rated current of the resistance element is not exceeded.</p>																														
3	Contact Resistance	<p>Contact resistance variation shall be measured with the measuring circuit shown in below, or its equivalent. The operating wiper shall be rotated in both directions through 90% of the actual effective-electrical travel for a total of 6 cycles.</p> <p>The rate of rotation of the operating wiper shall be such that the wiper completes 1 countin determining whether or not a contact resistance variation is observed at least twice in the same location. The test current shall follow the value given in Table-2 unless otherwise limited by the power rating.</p> <table border="1"> <thead> <tr> <th>Standard total resistance R (ohm)</th> <th>Test Current</th> </tr> </thead> <tbody> <tr> <td>100≤R&lt;10k</td> <td>10mA Max.</td> </tr> <tr> <td>10k≤R&lt;100k</td> <td>1mA Max.</td> </tr> <tr> <td>100≤R</td> <td>100μA Max.</td> </tr> </tbody> </table> <p>Table-2 Test current for CRV</p> <p>Rx : Trimmer Potentiometer Oscilloscope bandwidth :100Hz to 50kHz</p> <p>Figure-1 CRV measuring circuit</p>	Standard total resistance R (ohm)	Test Current	100≤R<10k	10mA Max.	10k≤R<100k	1mA Max.	100≤R	100μA Max.																						
Standard total resistance R (ohm)	Test Current																															
100≤R<10k	10mA Max.																															
10k≤R<100k	1mA Max.																															
100≤R	100μA Max.																															
4	Humidity Exposure	<p>The wiper contact point shall be pre-setted at about 50% position of effective rotational angle. After that, the potentiometer shall be placed in a chamber at 40±2°C and 90 - 95% without loading for 500±12 hours. The resistance value shall be measured after keeping the potentiometer in a room for 5±1/6 hours.</p>																														
5	High Temperature Exposure	<p>The wiper contact point shall be pre-setted at about 50% position of effective rotational angle. After that, the potentiometer shall be placed in a chamber at 70±2°C without loading for 500±12 hours. The resistance value shall be measured after keeping the potentiometer in a room for 1.5±1/6 hours.</p>																														
6	Humidity Load Life	<p>The wiper contact point shall be pre-setted at about 50% position of effective rotational angle. After that, the potentiometer shall be placed in a chamber at 40±2°C and 90 - 95% with loading the 1/2 rated voltage between #1 and #2 terminals, intermittently 1.5 hours ON and 0.5 hours OFF for 1000±12hours. The resistance value shall be measured after keeping the potentiometer in a room for 5±1/6 hours.</p>																														
7	Load Life	<p>The wiper contact point shall be pre-setted at about 50% position of effective rotational angle. After that, the potentiometer shall be placed in a chamber at 70±2°C (50±2°C for PVZ) with loading the 1/2 rated voltage between #1 and #2 terminals, intermittently 1.5 hours ON and 0.5 hours OFF for 1000±12 hours. The resistance value shall be measured after keeping the potentiometer in a room for 1.5±1/6 hours.</p>																														
8	Temperature Cycle	<p>The wiper contact point shall be pre-setted at about 50% position of effective rotational angle. After that, the potentiometer shall be subjected to Table-3, Table-4 temperature for 5 cycles. The resistance value shall be measured after keeping the potentiometer in a room for 1.5±10 minutes.</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temp. (°C)</td> <td>-25±3</td> <td>+25±2</td> <td>+85±3</td> <td>+25±2</td> </tr> <tr> <td>Time (min.)</td> <td>30±3</td> <td>10Max.</td> <td>30±3</td> <td>10Max.</td> </tr> </tbody> </table> <p>Table-3 PVZ</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temp. (°C)</td> <td>-55±3</td> <td>+25±2</td> <td>+125±3</td> <td>+25±2</td> </tr> <tr> <td>Time (min.)</td> <td>30±3</td> <td>10Max.</td> <td>30±3</td> <td>10Max.</td> </tr> </tbody> </table> <p>Table-4 PVA3/PVS3/PVM4A□□□A01</p>	Sequence	1	2	3	4	Temp. (°C)	-25±3	+25±2	+85±3	+25±2	Time (min.)	30±3	10Max.	30±3	10Max.	Sequence	1	2	3	4	Temp. (°C)	-55±3	+25±2	+125±3	+25±2	Time (min.)	30±3	10Max.	30±3	10Max.
Sequence	1	2	3	4																												
Temp. (°C)	-25±3	+25±2	+85±3	+25±2																												
Time (min.)	30±3	10Max.	30±3	10Max.																												
Sequence	1	2	3	4																												
Temp. (°C)	-55±3	+25±2	+125±3	+25±2																												
Time (min.)	30±3	10Max.	30±3	10Max.																												

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## SMD Open Type and PVM4A\_A01 Series Specifications and Test Methods

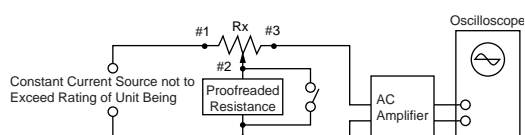
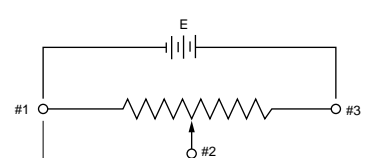
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No.	Item	Test Methods																				
9	Temperature Coefficient of Resistance	<p>The trimmer potentiometer shall be subjected to the following each temperature (see Table-5, Table-6) for 30 to 45 minutes. The resistance value shall be measured in the chamber.</p> $TCR = \frac{R_2 - R_1}{R_1 (T_2 - T_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ <p>                     T<sub>1</sub> : Reference temperature in degrees celsius                      T<sub>2</sub> : Test temperature in degrees celsius                      R<sub>1</sub> : Resistance at reference temperature in ohm                      R<sub>2</sub> : Resistance at test temperature in ohm                 </p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">Sequence</td> <td style="border: 1px solid black; padding: 2px;">1*</td> <td style="border: 1px solid black; padding: 2px;">2</td> <td style="border: 1px solid black; padding: 2px;">3*</td> <td style="border: 1px solid black; padding: 2px;">4</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">Temp. (°C)</td> <td style="border: 1px solid black; padding: 2px;">+25±2</td> <td style="border: 1px solid black; padding: 2px;">-25±3</td> <td style="border: 1px solid black; padding: 2px;">+25±2</td> <td style="border: 1px solid black; padding: 2px;">+85±3</td> </tr> </table> <p>Note)*: Norm Temp.</p> <p style="text-align: center;">Table-5 PVZ</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">Sequence</td> <td style="border: 1px solid black; padding: 2px;">1</td> <td style="border: 1px solid black; padding: 2px;">2</td> <td style="border: 1px solid black; padding: 2px;">3*</td> <td style="border: 1px solid black; padding: 2px;">4</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">Temp. (°C)</td> <td style="border: 1px solid black; padding: 2px;">+25±2</td> <td style="border: 1px solid black; padding: 2px;">-55±3</td> <td style="border: 1px solid black; padding: 2px;">+25±2</td> <td style="border: 1px solid black; padding: 2px;">+125±3</td> </tr> </table> <p style="text-align: center;">Table-6 PVA3/PVS3/PVM4A□□□A01</p>	Sequence	1*	2	3*	4	Temp. (°C)	+25±2	-25±3	+25±2	+85±3	Sequence	1	2	3*	4	Temp. (°C)	+25±2	-55±3	+25±2	+125±3
Sequence	1*	2	3*	4																		
Temp. (°C)	+25±2	-25±3	+25±2	+85±3																		
Sequence	1	2	3*	4																		
Temp. (°C)	+25±2	-55±3	+25±2	+125±3																		
10	Rotational Life	<p>The wiper shall be rotated over 90% of the effective rotational angle without loading at a speed of 10 cycles per minute, for 10 cycles continuously. The resistance value shall be measured after keeping the potentiometer in a room for 10±5 minutes.</p>																				



## SMD Sealed Type/Lead Sealed Type Specifications and Test Methods

The following describes trimmer potentiometer testing conducted by Murata Manufacturing Co., Ltd. in accordance with MIL-R-22097 (Military specification for variable resistors, non-wirewound) and MIL-STD-202 (Test methods for electronic and electrical component parts).

No.	Item	Test Methods																				
1	Total Resistance	<p>Measure total resistance between the resistance element and terminals (#1 and #3) with the contact arm positioned against a stop. The positioning of the contact arm and terminal shall be the same for subsequent total resistance measurements on the same device. Use the test voltage specified in Table-1 for total resistance measurements. This voltage shall be used for all subsequent total resistance measurements.</p> <table border="1"> <thead> <tr> <th>Total resistance, Nominal (ohm)</th> <th>Maximum Test Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>10≤R≤100</td> <td>1.0</td> </tr> <tr> <td>100&lt;R≤1k</td> <td>3.0</td> </tr> <tr> <td>1k&lt;R≤10k</td> <td>10.0</td> </tr> <tr> <td>10k&lt;R≤100k</td> <td>30.0</td> </tr> <tr> <td>100k&lt;R</td> <td>100.0</td> </tr> </tbody> </table> <p>Table-1 Total resistance test voltage</p>	Total resistance, Nominal (ohm)	Maximum Test Voltage (V)	10≤R≤100	1.0	100<R≤1k	3.0	1k<R≤10k	10.0	10k<R≤100k	30.0	100k<R	100.0								
Total resistance, Nominal (ohm)	Maximum Test Voltage (V)																					
10≤R≤100	1.0																					
100<R≤1k	3.0																					
1k<R≤10k	10.0																					
10k<R≤100k	30.0																					
100k<R	100.0																					
2	Residual Resistance	<p>Position the contact arm at the extreme counterclockwise limit of mechanical travel and measure the resistance between the contact arm and the corresponding end terminal. Then, position the contact arm at the extreme clockwise limit of mechanical travel and measure the resistance between the contact arm and the corresponding end terminal. During this test, take suitable precautions to ensure that the rated current of the resistance element is not exceeded.</p>																				
3	Contact Resistance Variation	<p>Contact resistance variation shall be measured with the measuring circuit shown in Figure-1, or its equivalent. The adjustment rotor (screw) shall be rotated in both directions through 90% of the actual effective-electrical rotational angle (number of turns) for a total of 6 cycles. Only the last 3 cycles shall count in determining whether or not a contact resistance variation is observed at least twice in the same location, exclusive of the roll-on or roll-off points where the contact arm moves from the termination, on or off, the resistance element. The rate of rotation of the adjustment rotor (screw) shall be such that the adjustment rotor (screw) completes 1 cycle for 5 seconds minimum to 2 minutes maximum. The test current used shall follow the value given in Table-2 unless otherwise limited by power rating.</p> <table border="1"> <thead> <tr> <th>Standard total resistance R (ohm)</th> <th>Test current</th> </tr> </thead> <tbody> <tr> <td>R≤100</td> <td>20mA</td> </tr> <tr> <td>100&lt;R&lt;500</td> <td>10mA</td> </tr> <tr> <td>500≤R&lt;1k</td> <td>4mA</td> </tr> <tr> <td>1k≤R&lt;2k</td> <td>2mA</td> </tr> <tr> <td>2k≤R&lt;50k</td> <td>1mA</td> </tr> <tr> <td>50k≤R&lt;200k</td> <td>200μA</td> </tr> <tr> <td>200k≤R&lt;1M</td> <td>100μA</td> </tr> <tr> <td>1M≤R&lt;2M</td> <td>50μA</td> </tr> <tr> <td>2M≤R</td> <td>30μA</td> </tr> </tbody> </table> <p>Table-2 Test current for CRV</p>  <p>Figure-1 CRV measuring circuit</p>	Standard total resistance R (ohm)	Test current	R≤100	20mA	100<R<500	10mA	500≤R<1k	4mA	1k≤R<2k	2mA	2k≤R<50k	1mA	50k≤R<200k	200μA	200k≤R<1M	100μA	1M≤R<2M	50μA	2M≤R	30μA
Standard total resistance R (ohm)	Test current																					
R≤100	20mA																					
100<R<500	10mA																					
500≤R<1k	4mA																					
1k≤R<2k	2mA																					
2k≤R<50k	1mA																					
50k≤R<200k	200μA																					
200k≤R<1M	100μA																					
1M≤R<2M	50μA																					
2M≤R	30μA																					
4	Temperature Coefficient of Resistance	<p>The trimmer potentiometer shall be subjected to the following each temperature (see Table-3) for 30-45 minutes. Temperature coefficient of resistance shall be applied to the following formula.</p> $TCR = \frac{R_2 - R_1}{R_1 (T_2 - T_1)} \times 10^6 \text{ (ppm/°C)}$ <p>T<sub>1</sub> : Reference temperature in degrees celsius  T<sub>2</sub> : Test temperature in degrees celsius  R<sub>1</sub> : Resistance at reference temperature ohm  R<sub>2</sub> : Resistance at test temperature in ohm</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>1*</th> <th>2</th> <th>3</th> <th>4*</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>Temperature(°C)</td> <td>+25</td> <td>-15</td> <td>Min. operating temperature</td> <td>+25</td> <td>+65</td> <td>Max. operating temperature</td> </tr> </tbody> </table> <p>Note) * : Reference temperature</p> <p>Table-3 Test temperatures</p>	Sequence	1*	2	3	4*	5	6	Temperature(°C)	+25	-15	Min. operating temperature	+25	+65	Max. operating temperature						
Sequence	1*	2	3	4*	5	6																
Temperature(°C)	+25	-15	Min. operating temperature	+25	+65	Max. operating temperature																
5	Voltage Setting Stability	<p>The wiper shall be set at approximately 40% of the actual effective-electrical rotational angle (number of turns). An adequate DC test potential shall be applied between the terminal #1 and the terminal #3. The voltage between the terminal #1 and the terminal #3, and the voltage between the terminal #1 and the terminal #2, shall be measured and applied to the following formula.</p> $\text{Voltage setting stability} = \left( \frac{e'}{E} - \frac{e}{E} \right) \times 100 \text{ (\%)}$ <p>e : Before test  (The voltage between the terminal #1 and the terminal #2)  e' : After test  (The voltage between the terminal #1 and the terminal #2)  E : The voltage between the terminal #1 and the terminal #3</p>  <p>Figure-2</p>																				

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## SMD Sealed Type/Lead Sealed Type Specifications and Test Methods

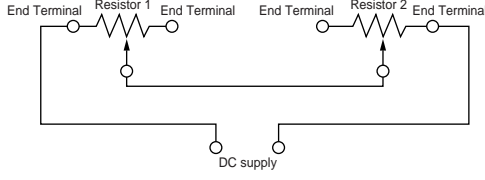
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No.	Item	Test Methods																									
6	Temperature Cycle	<p>The trimmer potentiometer shall be subjected to Table-4 temperature for 5 cycles. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 1–2 hours.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="width: 15%;">Sequence</th> <th style="width: 15%;">1</th> <th style="width: 15%;">2</th> <th style="width: 15%;">3</th> <th style="width: 15%;">4</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="vertical-align: middle;">Temp. (°C)</td> <td>PV□□ series</td> <td>-55±3</td> <td>+25±2</td> <td>+125±3</td> <td rowspan="3" style="vertical-align: middle;">+25±2</td> </tr> <tr> <td>PV22 series</td> <td></td> <td></td> <td>+150±3</td> </tr> <tr> <td>PVF2 series</td> <td>-25±3</td> <td></td> <td>+60±3</td> </tr> <tr> <td colspan="2" style="text-align: center;">Time (min.)</td> <td style="text-align: center;">30</td> <td style="text-align: center;">5 max.</td> <td style="text-align: center;">30</td> <td style="text-align: center;">5 max.</td> </tr> </tbody> </table> <p style="text-align: center;">Table-4 One cycle of temperature cycle.</p>	Sequence	1	2	3	4	Temp. (°C)	PV□□ series	-55±3	+25±2	+125±3	+25±2	PV22 series			+150±3	PVF2 series	-25±3		+60±3	Time (min.)		30	5 max.	30	5 max.
Sequence	1	2	3	4																							
Temp. (°C)	PV□□ series	-55±3	+25±2	+125±3	+25±2																						
	PV22 series			+150±3																							
	PVF2 series	-25±3		+60±3																							
Time (min.)		30	5 max.	30	5 max.																						
7	Humidity	<p>1) PVC6, PV12, PV32, PV34 PVM4A□□□B01series The trimmer potentiometer shall be placed in a chamber at a temperature of 40±2°C and a humidity of 90–95% without loading for 250±8 hours. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 5±1/6 hours.</p> <p>2) PVF2series The trimmer potentiometer shall be placed in a chamber at 60±2°C and 90–95% without loading for 1000±12 hours. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 5±1/6 hours</p> <p>2) PVG3, PVG5, PV01, PV22, PV23, PV36, PV37series The trimmer potentiometer shall be subjected Figure-3 the programmed humidity environment for 10 cycle. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 5±1/2 hours.</p> <div style="text-align: right; font-size: small; margin-bottom: 5px;">MIL-STD-202 METHOD 106</div> <p style="text-align: center;">Figure-3</p>																									
8	Vibration	<p>1) PV□□ series The trimmer potentiometer shall be vibrated throughout the frequency range at the 20G level. A complete frequency range, 10Hz to 2000Hz and back, shall be made within 15 minutes for a total of 4 sweeps in each of the three axis direction for a total of 12 sweeps.</p> <p>2) PVF2 series The trimmer potentiometer shall be subjected to vibration at 0.3 inch amplitude. The frequency shall be varied uniformly between the approximate limits of 10 Hz and 55Hz. This motion shall be applied for period of 2 hours in each of 3 mutually perpendicular direction (total of 6 hours).</p>																									
9	Shock	<p>1) PV□□ series The trimmer potentiometer shall be shocked at the 100G (50G for PV22 and PV23series) level and shall be subjected to 4 shocks in each of the three axis direction for a total of 12 shocks.</p> <p>2) PVM4A□□□B01series The trimmer potentiometer shall be shocked at the 100G level and shall be subjected to 3 shocks in each of the six axis direction for a total of 18 shocks.</p>																									
10	Temperature Road Life	Full rated continuous working voltage not exceeding the maximum rated voltage shall be applied intermittently between the terminal #1 and the terminal #3 of the trimmer potentiometer, 1.5 hours on and 0.5 hours off, for a total of 1000±12 hours, at a temperature of 70±2°C (85±2°C for PV01 and PV37series, 50±2°C for PVF2series). The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 1 to 2 hours.																									
11	High Temperature Exposure (Except for PVF2)	The trimmer potentiometer shall be placed in a chamber at a temperature of 125±3°C (150±3°C for PV12series) 250±8 hours without loading. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for 1 to 2 hours.																									
12	Low Temperature Exposure (Except for PVF2 and PVM4A□□□B01)	The trimmer potentiometer shall be placed in a chamber at a temperature of -55±3°C for 1 hours without loading. Full rated continuous working voltage not exceeding the maximum rated voltage shall be applied for 45 minutes. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of 25±5°C for approximately 24 hours.																									

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## SMD Sealed Type/Lead Sealed Type Specifications and Test Methods

Continued from the preceding page.

No.	Item	Test Methods
13	Low Temperature Operation (Only for PVF2 and PVM4A□□□B01)	The trimmer potentiometer shall be placed in a chamber at a temperature of $-25\pm 3^{\circ}\text{C}$ ( $-55\pm 3^{\circ}\text{C}$ for PVM4A□□□B01series) 48±4 hours without loading. The trimmer potentiometer shall be removed from the chamber, and maintained at a temperature of $25\pm 5^{\circ}\text{C}$ for 5±1/6 hours
14	Rotational Life	<p>1) PV□□ series Full rated continuous working voltage not exceeding the maximum rated voltage shall be applied with the circuit shown in the figure. The adjustment rotor (screw) shall be continuously cycled through not less than 90% of effective-electrical rotational angle (number of turns), at the rate of 1 cycle for 5 seconds minimum to 2.5 a minutes maximum for total of 200 cycles.</p>  <p style="text-align: center;">Figure-4</p> <p>2) PVG3, PVG5series The adjustment rotor (screw) shall be continuously cycled though not less than 90% of effective- electrical rotational angle (number of turns), at the rate of 1 cycle for 5 seconds minimum to 2.5 minutes maximum for a total of 50 (100 for PVG5) cycles, without loading.</p> <p>3) PVF2, PVM4A□□□B01series The wiper shall be rotated over 90% of the effective rotational angle without loading at a speed of 10 cycles per minute, for 100 cycles continuously.</p>

## Angle Sensing Potentiometer Specifications and Test Methods

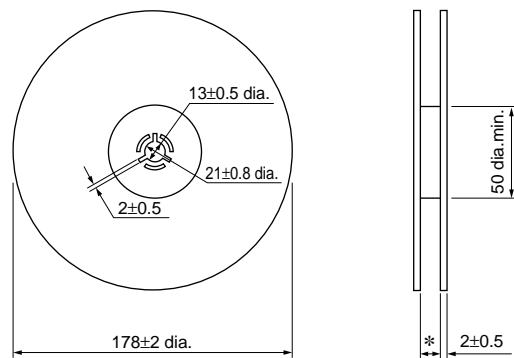
No.	Item	Test Methods															
1	Linearity	<p>Independent linearity shall vary no more than <math>\pm 2\%</math> within <math>\pm 160^\circ</math> to 50% voltage ratio. Taper : linear, 100%/333.3° Measured with the circuit as below (Figure-1).</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Output voltage ratio (%) <math>\left( \frac{V(1-2)}{V(1-3)} \times 100 \right)</math></p> <p>Rotational angle (°)</p> </div> <div style="text-align: center;"> <p>DC5V (#3)    GND (#1) Output (#2) Connection Impedance : 1M ohm min.</p> </div> </div> <p style="text-align: right;">Figure-1</p>															
2	Temperature Coefficient of Resistance	<p>The rotary position sensor shall be subjected to the following each temperature (see Table-1) for 30-45 minutes. Temperature coefficient of resistance shall be applied to the following formula.</p> $TCR = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ <p> <math>t_1</math> : Reference temperature in degrees celsius  <math>t_2</math> : Test temperature in degrees celsius  <math>R_1</math> : Resistance at reference temperature in ohm  <math>R_2</math> : Resistance at test temperature in ohm         </p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Sequence</th> <th style="width: 15%;">*1</th> <th style="width: 15%;">2</th> <th style="width: 15%;">*3</th> <th style="width: 15%;">4</th> </tr> </thead> <tbody> <tr> <td>Temperature (°C)</td> <td>+25</td> <td>-40</td> <td>+25</td> <td>+85</td> </tr> </tbody> </table> <p>Note) * : Reference temperature</p> <p style="text-align: center;">Table-1 Test temperatures</p>	Sequence	*1	2	*3	4	Temperature (°C)	+25	-40	+25	+85					
Sequence	*1	2	*3	4													
Temperature (°C)	+25	-40	+25	+85													
3	Temperature Cycle (Thermal Shock)	<p>The rotary position sensor shall be subjected to Table-2 temperature for 5 cycles. Then, the rotary position sensor shall be kept in the dry box for 24 +8/-0 hrs.</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Sequence</th> <th style="width: 15%;">1</th> <th style="width: 15%;">2</th> <th style="width: 15%;">3</th> <th style="width: 15%;">4</th> </tr> </thead> <tbody> <tr> <td>Temperature (°C)</td> <td>-40±3</td> <td>+25±2</td> <td>+85±3</td> <td>+25±2</td> </tr> <tr> <td>Time (min.)</td> <td>30</td> <td>5 max.</td> <td>30</td> <td>5 max.</td> </tr> </tbody> </table> <p style="text-align: center;">Table-2 One cycle of temperature cycle</p>	Sequence	1	2	3	4	Temperature (°C)	-40±3	+25±2	+85±3	+25±2	Time (min.)	30	5 max.	30	5 max.
Sequence	1	2	3	4													
Temperature (°C)	-40±3	+25±2	+85±3	+25±2													
Time (min.)	30	5 max.	30	5 max.													
4	Humidity	<p>The rotary position sensor shall be stored in a chamber at temperature of <math>+60 \pm 2^\circ\text{C}</math> and relative Humidity of 90-95% for 250±8 hrs. After removing from the chamber, the rotary position sensor shall be kept in the dry box for 24 +8/-0 hours.</p>															
5	Vibration	<p>The rotary position sensor shall be tested under the condition of the amplitude of 1.5mm, the frequency range from 10 to 55Hz (shall be traversed in approximately one minute) and 2 hours in each of 3 mutually perpendicular directions. (Total 6 hours) Then, the rotary position sensor shall be kept in the dry box for 1-2 hrs.</p>															
6	Shock	<p>The rotary position sensor shall be tested under the condition of the peak acceleration 20G max. in half-sine wave and 5 shocks in each of 3 mutually perpendicular directions. (Total 15 shocks) Then, the rotary position sensor shall be kept in the dry box for 1-2 hrs.</p>															
7	Humidity Load Life	<p>Full rated continuous working voltage not exceeded 5Vdc shall be applied intermittently between the terminal #1 and the terminal #3 of the rotary position sensor, 1.5 hours on and 0.5 hours off, for 96±4 hours in total in a chamber at the temperature of <math>+40 \pm 2^\circ\text{C}</math> and the relative humidity of 90-95%. After removing from the chamber, the rotary position sensor shall be kept in the dry box for 24 +8/-0 hours.</p>															
8	High Temp. Exposure	<p>The rotary position sensor shall be stored in a chamber at the temperature of <math>+85 \pm 3^\circ\text{C}</math> without loading for 250±8 hours. After removing from the chamber, the rotary position sensor shall be kept in the dry box for 24 +8/-0 hours.</p>															
9	Low Temp. Exposure	<p>The rotary position sensor shall be stored in a chamber at the temperature of <math>-40 \pm 3^\circ\text{C}</math> without loading for 168±4 hours. After removing from the chamber, the rotary position sensor shall be kept in the dry box for 24 +8/-0 hours.</p>															
10	Rotational Life	<p>The adjustment rotor shall be continuously rotated within <math>\pm 160^\circ</math> of effective electrical rotational angle, at the rate of one cycle for 6 seconds for 1 Million cycles under the condition of <math>+25 \pm 2^\circ\text{C}</math> of temperature without loading.</p>															

## Packaging

### ■ Minimum Quantity

Part Number	Minimum Quantity (pcs.)				
	ø180mm reel	ø330mm reel	Ammo Pack	Magazine	Bulk
PVZ2A	3000	12000	—	—	1000
PVZ2K	3000	—	—	—	1000
PVZ3A	2000	8000	—	—	1000
PVZ3K/R	1500	—	—	—	1000
PVZ3T	—	—	—	—	2000
PVS3	2500	8000	—	—	500
PVA3	2000	8000	—	—	500
PVG3A/G	1000	—	—	—	500
PVG3K	500	—	—	—	—
PVM4	500	3000	—	—	500
PVF2A	500	—	—	—	100
PVG5A	250	—	—	—	50
PVG5H	500	—	—	—	50
PV01W	—	—	—	70	—
PV01P/X	—	—	—	60	—
PVC6A/D/G/H/E	—	—	—	50	50
PVC6M/Q	—	—	1000	50	50
PV34	—	—	—	—	100
PV32	—	—	—	—	100
PV23/12	—	—	—	—	50
PV22	—	—	—	—	30
PV36W	—	—	1000	50	50
PV36Y	—	—	—	50	50
PV36X	—	—	1000	40	50
PV36Z/P	—	—	—	40	50
PV37Y/Z	—	—	1000	—	50
PV37W/X/P	—	—	—	—	50
PVS1	—	1000	—	—	50

### ■ Dimensions of Reel



\* 10±1.5 ( 8mm Width) — PVZ2A, PVZ3A, PVS3, PVA3, PVF2  
 14±1.5 (12mm Width) — PVG5H, PVG3, PVZ2K, PVZ3K, PVZ3R, PVM4  
 18±1.5 (16mm Width) — PVG5A

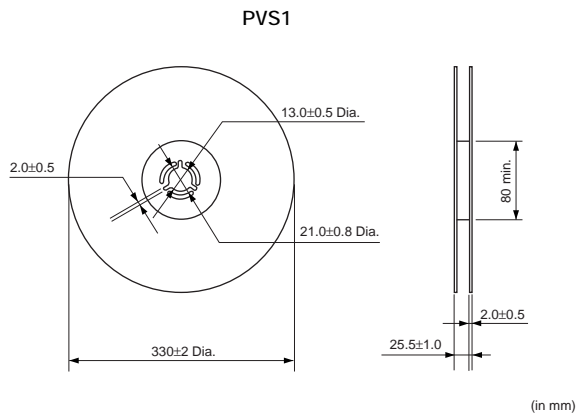
(in mm)

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## Packaging

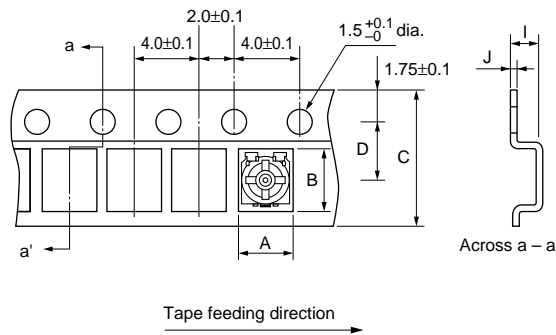
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### ■ Dimensions of Reel



### ■ Dimensions of Plastic Tape

#### PVZ2 / PVZ3 / PVA3 / PVS3 / PVF2



Part Number	A	B	C	D	I	J	
<b>PVZ2A</b>	$2.4 \pm 0.1$	$3.1 \pm 0.1$	$8.0 \pm 0.2$	$3.5 \pm 0.1$	$1.1 \pm 0.1$	$0.2 \pm 0.1$	
<b>PVZ2K</b>		$5.7 \pm 0.1$	$12.0 \pm 0.1$	$5.5 \pm 0.1$		$0.3 \pm 0.1$	
<b>PVZ3A/PVA3</b>	$3.3 \pm 0.2$	$3.8 \pm 0.2$	$8.0 \pm 0.2$	$3.5 \pm 0.1$	$1.95 \pm 0.1$	$0.2 \pm 0.1$	
<b>PVZ3K</b>		$5.8 \pm 0.2$	$12.0 \pm 0.2$	$5.5 \pm 0.1$		$2.3 \pm 0.1$	$0.3 \pm 0.1$
<b>PVZ3R</b>		$6.5 \pm 0.2$				$2.1 \pm 0.1$	
<b>PVS3</b>	$2.3 \pm 0.2$	$4.1 \pm 0.2$	$8.0 \pm 0.2$	$3.5 \pm 0.1$	$1.6 \pm 0.1$	$0.2 \pm 0.1$	
<b>PVF2</b>		$2.3 \pm 0.2$				$2.3 \pm 0.2$	$2.3 \pm 0.1$

• The side containing terminals #1 and #3 faces the plastic tape pilot holes.

(in mm)

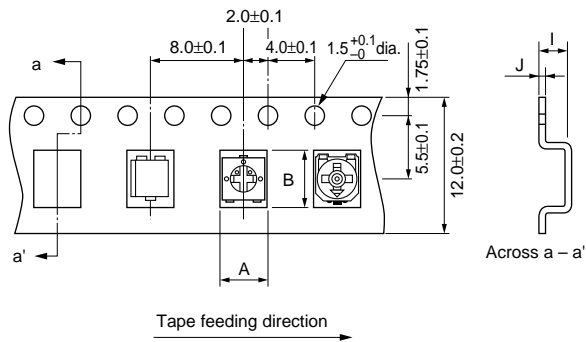
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## Packaging

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### ■ Dimensions of Plastic Tape

#### PVG3A / PVG3G / PVM4 / PVG5H

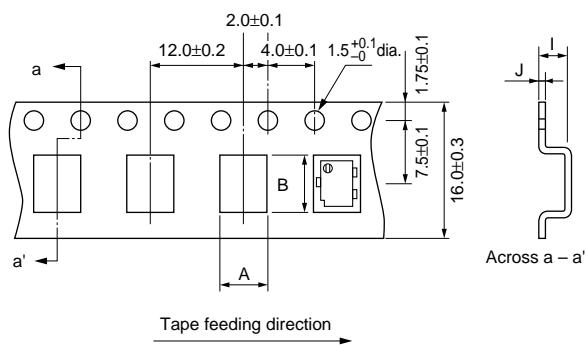


Part Number	A	B	I	J
<b>PVG3A</b>	4.0±0.1	4.0±0.1	2.1±0.1	0.3±0.1
<b>PVG3G</b>		4.9±0.1		
<b>PVM4</b>	4.5±0.2	5.5±0.2	2.15±0.1	0.3±0.1
<b>PVG5H</b>	5.4±0.2	5.8±0.2	4.0±0.1	0.4±0.1

• The side containing terminals #1 and #3 faces the plastic tape pilot holes.  
(except PVG3)

(in mm)

#### PVG5A



Part Number	A	B	I	J
<b>PVG5A</b>	4.3±0.2	5.4±0.2	5.4±0.1	0.4±0.1

(in mm)

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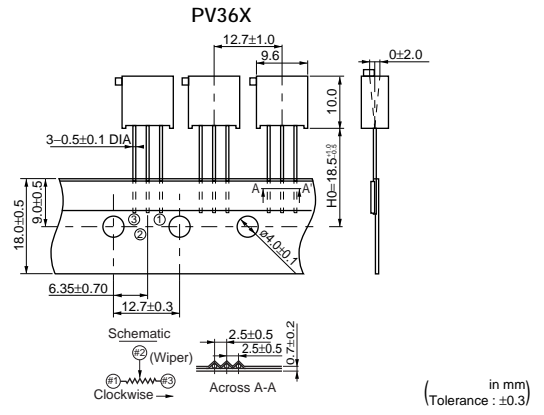
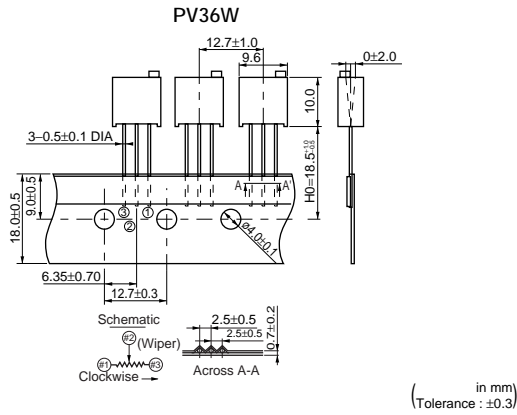




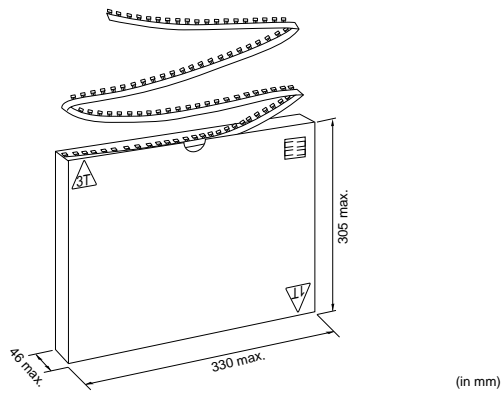
## Packaging

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### ■ Dimensions of Radial Taping

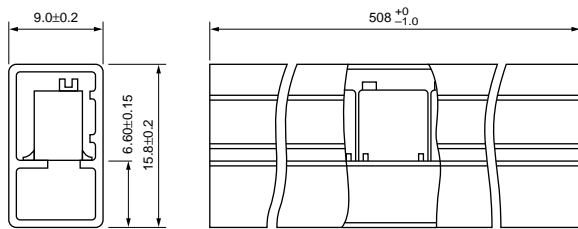


### ■ Dimensions of Ammo Pack

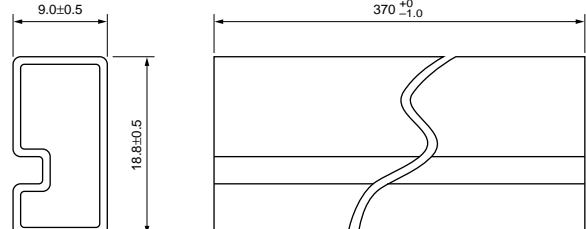


### ■ Dimensions of Magazine Packaging

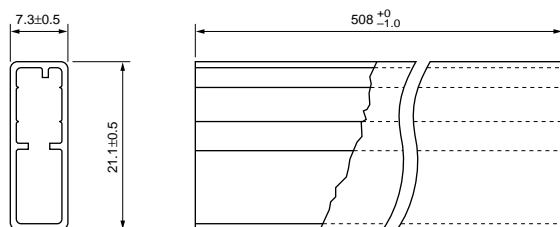
PV01



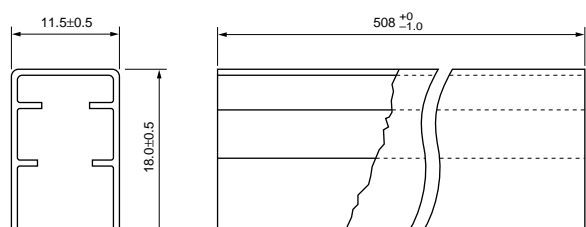
PVC6



PV36W/Y/X/Z



PV36P



(in mm)

## Recommendable adjustment tools/Qualified Standards

### ■ Recommendable adjustment tools

Trimmer Potentiometer Series	Manufactures	Model Number	MURATA Model Number	Blade
<b>PVZ2</b>	MURATA MFG.	KMDR090	KMDR090	- Minus (Raund edge)
<b>PVZ3</b>	VESSEL MFG.	No.9000+1.7×30	KMDR080	+ Cross
	TORAY INDUSTRIES. INC.	SA-2225	KMDR070	- Minus (Raund edge)
<b>PVA3</b>	VESSEL MFG.	No.9000+1.7×30	KMDR080	+ Cross
	TORAY INDUSTRIES. INC.	SA-2225	KMDR070	- Minus (Raund edge)
<b>PVS3</b>	TORAY INDUSTRIES. INC.	SA-2225	KMDR070	- Minus (Raund edge)
<b>PVG3</b>	TORAY INDUSTRIES. INC.	SA-2225	KMDR070	- Minus (Raund edge)
<b>PVM4</b>	VESSEL MFG.	No.9000-2.6×30	KMDR120	- Minus
<b>PVF2</b>	MURATA MFG.	KMDR140	KMDR140	- Minus
<b>PVG5</b>	VESSEL MFG.	No.9000-1.3×30	KMDR130	- Minus
	FUTABA TOOL MFG.	DA-54		- Minus
<b>PVC6</b>	VESSEL MFG.	No.9000+0×30	KMDR150	+ Cross
	TORAY INDUSTRIES. INC.	SA-2225	KMDR070	- Minus (Raund edge)
others	VESSEL MFG.	No.9000-1.8×30	KMDR110	- Minus
	FUTABA TOOL MFG.	DA-40	KMDR180	- Minus (both ends)
		DA-55		- Minus

### ■ For Automatic Adjustment

Trimmer Potentiometer Series	Manufactures	Model Number	MURATA Model Number	Blade
<b>PVZ3</b> <b>PVA3</b> <b>PVS3</b> <b>PVG3</b>	TORAY INDUSTRIES. INC.	JB-2225	KMBT070	- Minus (Raund edge)
<b>PVC6</b>	VESSEL MFG.	No.CA-10	KMBT090	+ Cross
	TORAY INDUSTRIES. INC.	JB-2225	KMBT070	- Minus (Raund edge)

### ■ Qualified Standards

The products listed here has been produced by the QS9000 and ISO9002 certified factory

MURATA FACTORY	Qualified Date	Standard	Qualified Number
Sabae Murata Mfg.Co.,Ltd.	August.14.1997	UNDERWRITERS LABORATORIES INC.	A5704

\* No ODCs (Ozone Depleting Chemicals) are used on Murata's all trimmer potentiometers

**⚠Note:**

1. Export Control

〈For customers outside Japan〉

Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.

〈For customers in Japan〉

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or product engineers before using our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than specified in this catalog.

- |                             |   |
|-----------------------------|---|
| ① Aircraft equipment        | ② Aerospace equipment   |
| ③ Undersea equipment        | ④ Power plant equipment   |
| ⑤ Medical equipment         | ⑥ Transportation equipment (vehicles, trains, ships, etc.)  |
| ⑦ Traffic signal equipment  | ⑧ Disaster prevention / crime prevention equipment  |
| ⑨ Data-processing equipment | ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above |

3. Product specifications in this catalog are as of July 2002. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. Please read rating and ⚠CAUTION (for storage and operating, rating, soldering and mounting, handling) in this catalog to prevent smoking and/or burning, etc.

5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specification or transact the approval sheet for product specification before ordering.

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