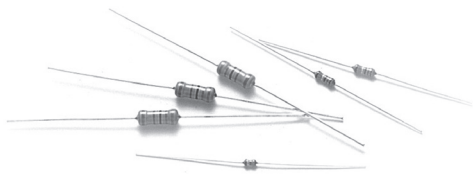


## Wirewound Resistors

# High Power Type

## Ultra Miniature Style [ PNP Series ]



### INTRODUCTION

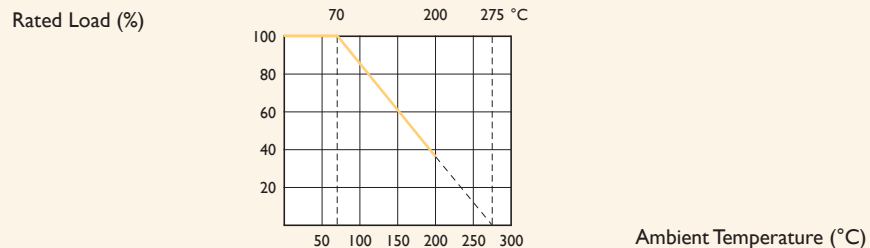
The resistor element is a resistive wire which is wound in a single layer on a ceramic rod, with tinned connecting wires of electrolytic copper welded to the end-caps. The ends of the resistive wire are connected to the caps by welding. The resistors are coated with layers of green color flame-proof lacquer. High power in small packages.

### FEATURES

|                                        |                                                                             |
|----------------------------------------|-----------------------------------------------------------------------------|
| Power Rating                           | 1W, 2W, 3W, 4W                                                              |
| Resistance Tolerance                   | $\pm 1\%$ , $\pm 5\%$                                                       |
| T.C.R.                                 | $\pm 100\text{ppm}/^{\circ}\text{C}$ , $\pm 300\text{ppm}/^{\circ}\text{C}$ |
| Flameproof Multi-layer Coating Meets   | UL-94V-0                                                                    |
| Flameproof Feature Meets Overload Test | UL-1412                                                                     |

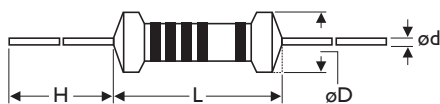
### DERATING CURVE

For resistors operated in ambient temperatures above  $70^{\circ}\text{C}$ , power rating must be derated in accordance with the curve below.



### DIMENSIONS

Unit: mm



5th color code: violet

| STYLE           | DIMENSION      |               |              |                 |
|-----------------|----------------|---------------|--------------|-----------------|
| Ultra Miniature | L              | øD            | H            | ød              |
| PNP100          | $6.3 \pm 0.5$  | $2.5 \pm 0.3$ | $28 \pm 2.0$ | $0.55 \pm 0.05$ |
| PNP200          | $9.0 \pm 0.5$  | $3.5 \pm 0.3$ | $26 \pm 2.0$ | $0.55 \pm 0.05$ |
| PNP300          | $11.5 \pm 1.0$ | $4.6 \pm 0.5$ | $35 \pm 2.0$ | $0.8 \pm 0.05$  |
| PNP400          | $15.5 \pm 1.0$ | $5.2 \pm 0.5$ | $33 \pm 2.0$ | $0.8 \pm 0.05$  |

Note:

## ELECTRICAL CHARACTERISTICS

| STYLE                          | PNP100                                                                  | PNP200                      | PNP300                       | PNP400                       |
|--------------------------------|-------------------------------------------------------------------------|-----------------------------|------------------------------|------------------------------|
| Power Rating at 70°C           | 1W                                                                      | 2W                          | 3W                           | 4W                           |
| Maximum working voltage        | $\sqrt{P \times R}$                                                     |                             |                              |                              |
| Voltage Proof on Insulation    | 300V                                                                    |                             |                              |                              |
| Resistance Range ( $\pm 1\%$ ) | 0.22 $\Omega$ - 130 $\Omega$                                            | 0.1 $\Omega$ - 820 $\Omega$ | 0.1 $\Omega$ - 2.2K $\Omega$ | 0.1 $\Omega$ - 2.8K $\Omega$ |
| Resistance Range ( $\pm 5\%$ ) | 0.1 $\Omega$ - 130 $\Omega$                                             | 0.1 $\Omega$ - 820 $\Omega$ | 0.1 $\Omega$ - 2.2K $\Omega$ | 0.1 $\Omega$ - 2.8K $\Omega$ |
| Operating Temp. Range          | -40°C to +200°C                                                         |                             |                              |                              |
| Temperature Coefficient        | $\pm 100\text{ppm}/^\circ\text{C}$ , $\pm 300\text{ppm}/^\circ\text{C}$ |                             |                              |                              |

Note: Special value is available on request

## ENVIRONMENTAL CHARACTERISTICS

| PERFORMANCE TEST              | TEST METHOD      |                                                                                                               | APPRAISE                                  |
|-------------------------------|------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Short Time Overload           | IEC 60115-1 4.13 | 10 times rated power for 5 Sec.                                                                               | $\pm 2.0\% + 0.05\Omega$                  |
| Voltage Proof on Insulation   | IEC 60115-1 4.7  | In V-Block for 60 sec., test voltage as above table                                                           | No Breakdown                              |
| Temperature Coefficient       | IEC 60115-1 4.8  | Between -40°C to +155°C                                                                                       | By type                                   |
| Insulation Resistance         | IEC 60115-1 4.6  | in V-block for 60 Sec.                                                                                        | >100M $\Omega$                            |
| Solderability                 | IEC 60115-1 4.17 | 245 $\pm 5^\circ\text{C}$ for 3 $\pm 0.5$ Sec.                                                                | 95% Min. coverage                         |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5 $\pm 0.5$ Min. with ultrasonic                                                                      | No deterioration of coatings and markings |
| Robustness of Terminations    | IEC 60115-1 4.16 | Direct load for 10 Sec. in the direction of the terminal leads                                                | $\geq 2.5\text{kg}$ (24.5N)               |
| Damp Heat Steady State        | IEC 60115-1 4.24 | 40 $\pm 2^\circ\text{C}$ , 90-95% RH for 56 days, loaded with 0.1 times RCWV                                  | $\pm 5.0\% + 0.05\Omega$                  |
| Endurance at 70°C             | IEC 60115-1 4.25 | 70 $\pm 2^\circ\text{C}$ at RCWV (or $U_{\text{max}}$ , Whichever less) for 1,000 Hr. (1.5Hr: on, 0.5Hr: Off) | $\pm 5.0\% + 0.05\Omega$                  |
| Temperature Cycling           | IEC 60115-1 4.19 | -55°C $\Rightarrow$ Room Temp. $\Rightarrow$ +155°C $\Rightarrow$ Room Temp. (5 cycles)                       | $\pm 1.0\% + 0.05\Omega$                  |
| Resistance to Soldering Heat  | IEC 60115-1 4.18 | 260 $\pm 3^\circ\text{C}$ for 10 $\pm 1$ Sec., immersed to a point 3 $\pm 0.5\text{mm}$ from the body         | $\pm 1.0\% + 0.05\Omega$                  |
| Accidental Overload Test      | IEC 60115-1 4.26 | 4 times RCWV for 1 Min.                                                                                       | No evidence of flaming or arcing          |

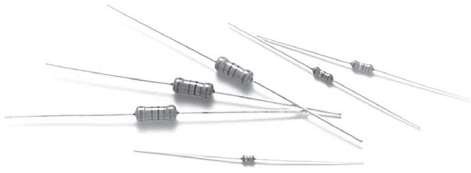
Note: RCWV(Rated Continuous Working Voltage) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$  or Max. working voltage listed above, whichever less.

Revision: 2020

## Wirewound Resistors

# High Power Type

## Normal Style [ PNP V Series ]



### INTRODUCTION

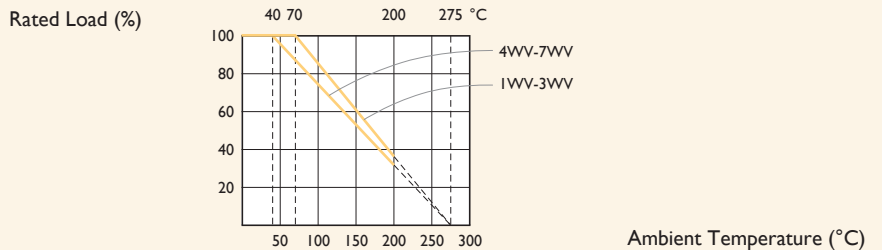
The resistor element is a resistive wire which is wound in a single layer on a ceramic rod, with tinned connecting wires of electrolytic copper welded to the end-caps. The ends of the resistive wire are connected to the caps by welding. The resistors are coated with layers of green color flame-proof lacquer. High power in small package. The 5th color band is violet to represent PNPV series.

### FEATURES

|                                        |                                                                             |
|----------------------------------------|-----------------------------------------------------------------------------|
| Power Rating                           | 1W, 3W, 4W, 5W, 7W                                                          |
| Resistance Tolerance                   | $\pm 1\%$ , $\pm 5\%$                                                       |
| T.C.R.                                 | $\pm 100\text{ppm}/^{\circ}\text{C}$ , $\pm 300\text{ppm}/^{\circ}\text{C}$ |
| Flameproof Multi-layer Coating Meets   | UL-94V-0                                                                    |
| Flameproof Feature Meets Overload Test | UL-1412                                                                     |

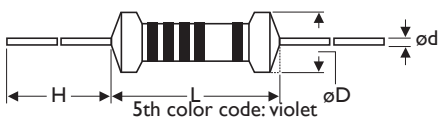
### DERATING CURVE

For resistors operated in ambient temperatures above  $40^{\circ}\text{C}$ , power rating must be derated in accordance with the curve below.



### DIMENSIONS

Unit: mm



| STYLE  | DIMENSION      |               |              |                |
|--------|----------------|---------------|--------------|----------------|
| Normal | L              | $\phi D$      | H            | $\phi d$       |
| PNP1WV | $10 \pm 1.0$   | $4.3 \pm 0.5$ | $26 \pm 2.0$ | $0.8 \pm 0.05$ |
| PNP3WV | $13 \pm 1.0$   | $5.5 \pm 0.5$ | $34 \pm 2.0$ | $0.8 \pm 0.05$ |
| PNP4WV | $17.5 \pm 1.0$ | $6.2 \pm 0.5$ | $32 \pm 2.0$ | $0.8 \pm 0.05$ |
| PNP5WV | $17 \pm 1.0$   | $7.5 \pm 0.5$ | $32 \pm 2.0$ | $0.8 \pm 0.05$ |
| PNP7WV | $25 \pm 1.0$   | $7.5 \pm 0.5$ | $38 \pm 2.0$ | $0.8 \pm 0.05$ |

Note:

## ELECTRICAL CHARACTERISTICS

| STYLE                          | PNP1WV                                                                  | PNP3WV                         | PNP4WV                         | PNP5WV                         | PNP7WV                      |
|--------------------------------|-------------------------------------------------------------------------|--------------------------------|--------------------------------|--------------------------------|-----------------------------|
| Power Rating at 40°C           |                                                                         |                                | 4W                             | 5W                             | 7W                          |
| Power Rating at 70°C           | 1W                                                                      | 3W                             |                                |                                |                             |
| Maximum working voltage        | $\sqrt{P \times R}$                                                     |                                |                                |                                |                             |
| Voltage Proof on Insulation    | 300V                                                                    |                                |                                |                                |                             |
| Resistance Range ( $\pm 1\%$ ) | 0.1 $\Omega$ - 1K $\Omega$                                              | 0.1 $\Omega$ - 2.8K $\Omega$   | 0.1 $\Omega$ - 4.3K $\Omega$   | 0.1 $\Omega$ - 8.2K $\Omega$   | 0.1 $\Omega$ - 10K $\Omega$ |
| Resistance Range ( $\pm 5\%$ ) | 0.047 $\Omega$ - 1K $\Omega$                                            | 0.047 $\Omega$ - 2.8K $\Omega$ | 0.047 $\Omega$ - 4.3K $\Omega$ | 0.047 $\Omega$ - 8.2K $\Omega$ | 0.1 $\Omega$ - 10K $\Omega$ |
| Operating Temp. Range          | -40°C to +200°C                                                         |                                |                                |                                |                             |
| Temperature Coefficient        | $\pm 100\text{ppm}/^\circ\text{C}$ , $\pm 300\text{ppm}/^\circ\text{C}$ |                                |                                |                                |                             |

Note: Special value is available on request

## ENVIRONMENTAL CHARACTERISTICS

| PERFORMANCE TEST              | TEST METHOD      |                                                                                                       | APPRAISE                                  |
|-------------------------------|------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Short Time Overload           | IEC 60115-1 4.13 | 10 times rated power for 5 Sec.                                                                       | $\pm 2.0\% + 0.05\Omega$                  |
| Voltage Proof on Insulation   | IEC 60115-1 4.7  | In V-Block for 60 sec., test voltage as above table                                                   | No Breakdown                              |
| Temperature Coefficient       | IEC 60115-1 4.8  | Between -40°C to +155°C                                                                               | By type                                   |
| Insulation Resistance         | IEC 60115-1 4.6  | in V-block for 60 Sec.                                                                                | >100M $\Omega$                            |
| Solderability                 | IEC 60115-1 4.17 | 245 $\pm 5^\circ\text{C}$ for 3 $\pm 0.5$ Sec.                                                        | 95% Min. coverage                         |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5 $\pm 0.5$ Min. with ultrasonic                                                              | No deterioration of coatings and markings |
| Robustness of Terminations    | IEC 60115-1 4.16 | Direct load for 10 Sec. in the direction of the terminal leads                                        | $\geq 2.5\text{kg}$ (24.5N)               |
| Damp Heat Steady State        | IEC 60115-1 4.24 | 40 $\pm 2^\circ\text{C}$ , 90-95% RH for 56 days, loaded with 0.1 times RCWV                          | $\pm 5.0\% + 0.05\Omega$                  |
| Endurance at 70°C             | IEC 60115-1 4.25 | 70 $\pm 2^\circ\text{C}$ at RCWV (or Umax., Whichever less) for 1,000 Hr. (1.5Hr: on, 0.5Hr: Off)     | $\pm 5.0\% + 0.05\Omega$                  |
| Temperature Cycling           | IEC 60115-1 4.19 | -55°C $\Rightarrow$ Room Temp. $\Rightarrow$ +155°C $\Rightarrow$ Room Temp. (5 cycles)               | $\pm 1.0\% + 0.05\Omega$                  |
| Resistance to Soldering Heat  | IEC 60115-1 4.18 | 260 $\pm 3^\circ\text{C}$ for 10 $\pm 1$ Sec., immersed to a point 3 $\pm 0.5\text{mm}$ from the body | $\pm 1.0\% + 0.05\Omega$                  |
| Accidental Overload Test      | IEC 60115-1 4.26 | 4 times RCWV for 1 Min.                                                                               | No evidence of flaming or arcing          |

Note: RCWV(Rated Continuous Working Voltage) =  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$  or Max. working voltage listed above, whichever less.

Revision: 2020