

**Key Features**

**High Power with Small Size for Space Saving**

**Excellent Long Term Stability**

**Complete Flameproof Construction**

**Controlled Temperature Capability**

**Solvent Resistant Coat and Code**

**Special Lead Formations Possible**

**Type ROX Series**



The resistive element comprises a metal oxide film deposited on a ceramic former. The element is protected by a flameproof coating which will withstand overload conditions without flame or mechanical damage. They are recommended for use in applications such as line protection etc

**Characteristics – Electrical**

| Type        | Rated Power @ 70°C | Max. Working Voltage | Max. Overload Voltage | Dielectric Withstand Voltage | Resistance Range Ω | Operating Temp. Range |
|-------------|--------------------|----------------------|-----------------------|------------------------------|--------------------|-----------------------|
| Normal Size | ROX025             | 0.25W                | 250V                  | 400V                         | 250V               | 0.3 ~ 50K             |
|             | ROX05              | 0.5W                 | 250V                  | 400V                         | 250V               | 0.3 ~ 330K            |
|             | ROX1               | 1W                   | 350V                  | 600V                         | 350V               | 0.1 ~ 470K            |
|             | ROX2               | 2W                   | 350V                  | 600V                         | 350V               | 0.1 ~ 560K            |
|             | ROX3               | 3W                   | 500V                  | 800V                         | 500V               | 5.0 ~ 100K            |
|             | ROX5               | 5W                   | 750V                  | 1000V                        | 750V               | 5.0 ~ 150K            |
|             | ROX7               | 7W                   | 750V                  | 1000V                        | 750V               | 20 ~ 150K             |
|             | ROX8               | 8W                   | 750V                  | 1000V                        | 750V               | 30 ~ 200K             |
|             | ROX9               | 9W                   | 750V                  | 1000V                        | 750V               | 50 ~ 200K             |
| Small Size  | ROX05S             | 0.5W                 | 250V                  | 400V                         | 250V               | 0.3 ~ 50K             |
|             | ROX1S              | 1W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1MΩ             |
|             | ROX2S              | 2W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1MΩ             |
|             | ROX3S              | 3W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1MΩ             |
|             | ROX4S              | 4W                   | 500V                  | 800V                         | 500V               | 5.0 ~ 100K            |
|             | ROX5SS             | 5W                   | 500V                  | 800V                         | 500V               | 5.0 ~ 100K            |
|             | ROX5S              | 5W                   | 500V                  | 800V                         | 500V               | 5.0 ~ 150K            |

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

Rated Voltage = RCWV or Max. Working Voltage, whichever is smaller

### Environmental Characteristics

| Characteristics                 | Specification   | Test Methods<br>( JIS C 5201-1 )  |           |
|---------------------------------|---|---|-----------|
| DC. Resistance                  | Must be within the specified tolerance  | 5.1 The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance  |           |
| Temperature Coefficient         | Range $\Omega$  | 5.2 Natural resistance change per temp. degree centigrade.<br><br>$\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/}^\circ\text{C)}$ R <sub>1</sub> : Resistance value at room temperature (t <sub>1</sub> )<br>R <sub>2</sub> : Resistance value at room temp. plus 100 °C (t <sub>2</sub> )  |           |
|                                 | 0.1 $\Omega$ ~ 12 $\Omega$  |   | $\pm 200$ |
|                                 | 12.1 $\Omega$ ~ 100K  |   | $\pm 350$ |
|                                 | 101K ~ 1M   |   | -700      |
|                                 | 1.1M ~ 10M  |   | -1500     |
| Short time overload             | Resistance change rate is<br>Normal Size : $\pm (1\% + 0.05\Omega)$ Max.<br>Small Size : $\pm (2\% + 0.05\Omega)$ Max.<br>with no evidence of mechanical damage | 5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV or the max. overload voltage respectively specified in the above list, whichever less for 5 seconds  |           |
| Dielectric Withstanding Voltage | No evidence of flashover mechanical damage, arcing or insulation break down   | 5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the electrical characteristics table for<br>60 + 10/ -0 seconds  |           |
| Terminal Strength               | No Evidence of mechanical damage  | 6.1 <b>Direct load:</b><br>Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads<br><br><b>Twist test:</b><br>Terminal leads shall be bent through 90° at point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations. |           |
| Resistance to soldering heat    | Resistance change rate is:<br>$\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage   | 6.4 Permanent resistance change when leads immersed to 3.2 mm to 4.8 mm from the body in 350°C $\pm$ 10 °C solder for 3 $\pm$ 0.5 seconds   |           |
| Solderability                   | 95 % coverage Min.  | 6.5 The area covered with a new , smooth, clean , shiny and continuous surface free from concentrated pinholes.<br>Test temp. of solder: 245°C $\pm$ 3°C<br>Dwell time in solder : 2 ~ 3 seconds  |           |

### Environmental Characteristics (continued)

| Characteristics       | Specification  | Test Methods<br>( JIS C 5201-1 )   |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|-----------------------|--|--|--------------|-------------------------|-----------|-----------------------|------------|--|---|---|---|---|---|---|---|---|---|
| Resistance to Solvent | No deterioration of protective coatings and marking  | 6.9 Specimens shall be immersed in a bath of trichroethane completely for 3 minutes with ultrasonic  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| Temperature cycling   | Resistance change rate is:<br>$\pm (2\% + 0.05\Omega)$ Max. with no evidence of mechanical damage  | 7.4 Resistance change after continuous 5 cycles for duty shown below:  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  | <table border="1"> <thead> <tr> <th>Step</th> <th>Step</th> <th>Step</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>3</td> <td>3</td> </tr> <tr> <td>4</td> <td>4</td> <td>4</td> </tr> </tbody> </table> | Step         | Step                    | Step      | 1                     | 1          | 1  | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 |
|                       |  | Step   | Step         | Step                    |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  | 1  | 1            | 1                       |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  | 2  | 2            | 2                       |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| 3                     | 3  | 3  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| 4                     | 4  | 4  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| Load life in humidity | <table border="1"> <thead> <tr> <th>Resistance Value</th> <th><math>\Delta R/R</math></th> </tr> </thead> <tbody> <tr> <td>Less than 100K<math>\Omega</math></td> <td><math>\pm 5\%</math></td> </tr> <tr> <td>100K<math>\Omega</math> or more</td> <td><math>\pm 10\%</math></td> </tr> </tbody> </table> | Resistance Value   | $\Delta R/R$ | Less than 100K $\Omega$ | $\pm 5\%$ | 100K $\Omega$ or more | $\pm 10\%$ | 7.9 Resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") in a humidity test chamber controlled at 40 °C $\pm$ 2 °C and 90 to 95 % relative humidity |   |   |   |   |   |   |   |   |   |
|                       | Resistance Value   | $\Delta R/R$   |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       | Less than 100K $\Omega$  | $\pm 5\%$  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| 100K $\Omega$ or more | $\pm 10\%$   |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| Load life             | <table border="1"> <thead> <tr> <th>Resistance Value</th> <th><math>\Delta R/R</math></th> </tr> </thead> <tbody> <tr> <td>Less than 100K<math>\Omega</math></td> <td><math>\pm 5\%</math></td> </tr> <tr> <td>100K<math>\Omega</math> or more</td> <td><math>\pm 10\%</math></td> </tr> </tbody> </table> | Resistance Value   | $\Delta R/R$ | Less than 100K $\Omega$ | $\pm 5\%$ | 100K $\Omega$ or more | $\pm 10\%$ | 7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70°C $\pm$ 2°C ambient   |   |   |   |   |   |   |   |   |   |
|                       | Resistance Value   | $\Delta R/R$   |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       | Less than 100K $\Omega$  | $\pm 5\%$  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| 100K $\Omega$ or more | $\pm 10\%$   |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
|                       |  |  |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |
| Pulse overload        | Resistance change rate is:<br>Normal Size : $\pm (2\% + 0.05\Omega)$ Max.<br>Small Size : $\pm (5\% + 0.05\Omega)$ Max.<br>with no evidence of mechanical damage   | 5.8 Resistance change after 10,000 cycles (1 second "on", 25 seconds "off") at 4 times RCWV or the max. pulse overload voltage   |              |                         |           |                       |            |  |   |   |   |   |   |   |   |   |   |

### Derating:

In ambient temperatures greater than 70°C the load shall de-rate as shown in the graph below:



**Construction:**



| No. | Name            | Material  |           |                                      |
|-----|-----------------|---|-----------|--------------------------------------|
| 1   | Basic Body      | Rod Type Ceramics   |           |                                      |
| 2   | Resistance Film | 0.1Ω ≤ R ≤ 12Ω : CNP film<br>For All Wattage  |           |                                      |
|     |                 | 12.1Ω ≤ R ≤ 100KΩ : Metal oxide film<br>R > 100KΩ : Carbon film<br>For 1/2W-S, 1/4W                                     |           |                                      |
|     |                 | 12.1Ω ≤ R ≤ 120KΩ : Metal oxide film<br>R > 120KΩ : Carbon film<br>For 1/2W, 1W-S                                       |           |                                      |
|     |                 | 12.1Ω ≤ R ≤ 150KΩ : Metal oxide film<br>R > 150KΩ : Carbon film<br>For 1W, 2W-S, 2W, 3W-S, 3W, 4W-S, 5W-SS              |           |                                      |
|     |                 | 12.1Ω ≤ R ≤ 180KΩ : Metal oxide film<br>R > 180KΩ : Carbon film<br>(For 5W, 5W-S)                                       |           |                                      |
|     |                 | 12.1Ω ≤ R ≤ 200KΩ : Metal oxide film<br>(For 7W, 8W, 9W)  |           |                                      |
|     |                 | 3   | End Cap   | Steel (Tin plated iron surface)      |
|     |                 | 4   | Lead Wire | Annealed copper wire coated with tin |
| 5   | Joint           | By welding  |           |                                      |
| 6   | Coating         | Normal size --Insulated & Non-Flame Paint (Color : Gray)<br>Small size --Insulated & Non-Flame Paint (Color : Sea-Blue) |           |                                      |
| 7   | Color Code      | Non-Flame epoxy resin   |           |                                      |

**Dimensions:**



| Type        | Dimensions (MM) |          |         |      |    |
|-------------|-----------------|----------|---------|------|----|
|             | D (max.)        | L (max.) | d ±0.05 | H ±3 |    |
| Normal Size | ROX025          | 2.5      | 7.5     | 0.54 | 28 |
|             | ROX05           | 3.5      | 10      | 0.70 | 28 |
|             | ROX1            | 5        | 12      | 0.70 | 25 |
|             | ROX2            | 5.5      | 16      | 0.70 | 28 |
|             | ROX3            | 6.5      | 17.5    | 0.75 | 28 |
|             | ROX5            | 8.5      | 26      | 0.75 | 38 |
|             | ROX7            | 8.5      | 32      | 0.75 | 38 |
|             | ROX8            | 8.5      | 41      | 0.75 | 38 |
|             | ROX9            | 8.5      | 54      | 0.75 | 38 |
| Small Size  | ROX05S          | 2.5      | 7.5     | 0.54 | 28 |
|             | ROX1S           | 3.5      | 10      | 0.70 | 28 |
|             | ROX2S           | 5        | 12      | 0.70 | 25 |
|             | ROX3S           | 5.5      | 16      | 0.70 | 28 |
|             | ROX4S           | 6.5      | 17.5    | 0.75 | 28 |
|             | ROX5SS          | 6.5      | 17.5    | 0.75 | 28 |
|             | ROX5S           | 8        | 25      | 0.75 | 38 |

### Painting method:

Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within  $\frac{1}{2}$  of the resistor body diameter.



### Marking:

For 1/4W, 1/2W, 1W, 2W, 3W, 4W, 5W and all of small size Resistors shall be marked with color coding. colors shall be in accordance with JIS C 0802



For 7W, 8W, 9W marking shall be in text format:



Code description and regulation

1. Wattage rating.
2. Nominal resistance value.
3. Resistance Tolerance.

G:  $\pm 2\%$

J:  $\pm 5\%$

K:  $\pm 10\%$

### Packing Specification:

Taping:



|             | Type   | Style | O±1 | P      | L1-L2 | T   | Z     | R | t   | S       |
|-------------|--------|-------|-----|--------|-------|-----|-------|---|-----|---------|
| Normal Size | ROX025 | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX05  | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX1   | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX2   | PT-64 | 64  | 10±0.5 | 1 Max | 6±1 | 1 Max | 0 | 5±1 | 0.5 max |
|             | ROX3   | PT-64 | 64  | 10±0.5 | 1 Max | 6±1 | 1 Max | 0 | 5±1 | 0.5 max |
| Small Size  | ROX05S | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX1S  | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX2S  | PT-52 | 52  | 5±0.3  | 1 Max | 6±1 | 1 Max | 0 | 4±1 | 0.5 max |
|             | ROX3S  | PT-64 | 64  | 10±0.5 | 1 Max | 6±1 | 1 Max | 0 | 5±1 | 0.5 max |
|             | ROX4S  | PT-64 | 64  | 10±0.5 | 1 Max | 6±1 | 1 Max | 0 | 5±1 | 0.5 max |
|             | ROX5SS | PT-64 | 64  | 10±0.5 | 1 Max | 6±1 | 1 Max | 0 | 5±1 | 0.5 max |

Tape in box packing (Ammopack):



| Type   | C ± 5 | A ± 5 | B ± 5 | Pack Quantity |
|--------|-------|-------|-------|---------------|
| ROX025 | 250   | 75    | 96    | 5000          |
| ROX05  | 260   | 85    | 70    | 1000          |
| ROX1   | 262   | 86    | 80    | 1000          |
| ROX2   | 262   | 92    | 108   | 1000          |
| ROX3   | 256   | 92    | 80    | 500           |
| ROX05S | 250   | 75    | 96    | 5000          |
| ROX1S  | 260   | 85    | 70    | 1000          |
| ROX2S  | 262   | 86    | 80    | 1000          |
| ROX3S  | 262   | 92    | 108   | 1000          |
| ROX4S  | 256   | 92    | 80    | 500           |
| ROX5SS | 256   | 92    | 80    | 500           |

NB Certain products can be supplied reeled on request.

Plastic cases in box:



| Type  | C ±5 | A ±5 | B ±5 | Quantity     |      |
|-------|------|------|------|--------------|------|
|       |      |      |      | Plastic Case | Box  |
| ROX5S | 36   | 20   | 8    | 100          | 1000 |
| ROX5  | 36   | 20   | 8    | 100          | 1000 |

Bulk packaging (plastic bag in inner box):



Inner Box of Plastic bag.



Carton Box

| Type | Qty/Bag (Pcs) | Qty/Box (Pcs) | Qty/Carton Pcs | Box size LxWxH (±5) | Carton size LxWxH (±5) | Gross wt ±2 Kgs |
|------|---------------|---------------|----------------|---------------------|------------------------|-----------------|
| ROX7 | 8             | 32            | 1600           | 150 x 75 x 33       | 432 x 308 x 215        | 9.5             |
| ROX8 | 8             | 32            | 1600           | 150 x 75 x 33       | 432 x 308 x 215        | 11.5            |
| ROX9 | 10            | 300           | 1800           | 200 x 171 x 113     | 520 x 215 x 250        | 15              |

**How To Order**

| Common Part                                       | ROX                | 1S                | J                | 100K   | Special Request                            |
|---|--------------------|-------------------|------------------|--|--|
|   | Power Rating       |                   | Tolerance        | Resistance Value   |  |
| ROX – Flame proof power metal oxide film resistor | <b>Normal size</b> | <b>Small size</b> | G – 2%<br>J – 5% | R33 -0.33Ω<br>1R0 - 1Ω<br>10R - 10Ω<br>100R - 100Ω<br>1K0 – 1KΩ<br>(1000Ω)<br>100K – 100KΩ<br>(100,000Ω) | BL * – Pre-formed Leads<br><br>TR - Reeled |
|   | 025 - 1/4W         | 05S – 1/2W        |                  |  |  |
|   | 05 – 1/2W          | 1S – 1W           |                  |  |  |
|   | 1 – 1W             | 2S – 2W           |                  |  |  |
|   | 2 – 2W             | 3S – 3W           |                  |  |  |
|   | 3 – 3W             | 4S – 4W           |                  |  |  |
|   | 5 – 5W             | 5SS – 5W          |                  |  |  |
|   | 7 – 7W             | 5S – 5W           |                  |  |  |
|   | 8 – 8W             |                   |                  |  |  |
|   | 9 – 9W             |                   |                  |  |  |

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