

## 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             |
| Small Size  | ROX9               | 9W                   | 750V                  | 1000V                        | 750V               | 50 ~ 200K             |
|             | ROX05S             | 0.5W                 | 250V                  | 400V                         | 250V               | 0.3 ~ 50K             |
|             | ROX1S              | 1W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1M0             |
|             | ROX2S              | 2W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1M0             |
|             | ROX3S              | 3W                   | 350V                  | 600V                         | 350V               | 0.3 ~ 1M0             |
|             | 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         |                                                                                                                                             |              | 5.2 Natural resistance change per temp. degree centigrade.<br><br>$\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6 \text{ (PPM/}^\circ\text{C)}$<br>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> )                                                                                                  |
|                                 | Range Ω                                                                                                                                     | TCR (PPM/°C) |                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 | 0.1Ω ~ 12Ω                                                                                                                                  | ±200         |                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 | 12.1Ω ~ 100K                                                                                                                                | ±350         |                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 | 101K ~ 1M                                                                                                                                   | -700         |                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 | 1.1M ~ 10M                                                                                                                                  | -1500        |                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                 |                                                                                                                                             |              |                                                                                                                                                                                                                                                                                                                                                                                                        |
| Short time overload             | Resistance change rate is<br>Normal Size : ± (1% + 0.05Ω) Max.<br>Small Size : ± (2% + 0.05Ω) 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><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>± (1% + 0.05Ω) 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 ± 10 °C solder for 3 ± 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 ± 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>± (2% + 0.05Ω) Max. with no evidence of mechanical damage                                                      | 7.4 Resistance change after continuous 5 cycles for duty shown below:                                                                                                                                |      |      |        |
|                       |                                                                                                                                              | Step                                                                                                                                                                                                 | Step | Step |        |
|                       |                                                                                                                                              | 1                                                                                                                                                                                                    | 1    | 1    |        |
|                       |                                                                                                                                              | 2                                                                                                                                                                                                    | 2    | 2    |        |
|                       |                                                                                                                                              | 3                                                                                                                                                                                                    | 3    | 3    |        |
|                       |                                                                                                                                              | 4                                                                                                                                                                                                    | 4    | 4    |        |
| Load life in humidity |                                                                                                                                              | 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 ± 2 °C and 90 to 95 % relative humidity |      |      |        |
|                       | Resistance Value                                                                                                                             |                                                                                                                                                                                                      |      |      | ΔR/R   |
|                       | Less than 100KΩ                                                                                                                              |                                                                                                                                                                                                      |      |      | ± 5 %  |
|                       | 100KΩ or more                                                                                                                                |                                                                                                                                                                                                      |      |      | ± 10 % |
|                       |                                                                                                                                              |                                                                                                                                                                                                      |      |      |        |
| Load life             |                                                                                                                                              | 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 ± 2°C ambient                                                       |      |      |        |
|                       | Resistance Value                                                                                                                             |                                                                                                                                                                                                      |      |      | ΔR/R   |
|                       | Less than 100KΩ                                                                                                                              |                                                                                                                                                                                                      |      |      | ± 5 %  |
|                       | 100KΩ or more                                                                                                                                |                                                                                                                                                                                                      |      |      | ± 10 % |
|                       |                                                                                                                                              |                                                                                                                                                                                                      |      |      |        |
| Pulse overload        | Resistance change rate is:<br>Normal Size : ± (2% + 0.05Ω) Max.<br>Small Size : ± (5% + 0.05Ω) 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  $70^\circ\text{C}$  the load shall de-rate as shown in the graph below:



## Construction:



| No. | Name            | Material                                                                                                                  |                                        |
|-----|-----------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1   | Basic Body      | Rod Type Ceramics                                                                                                         |                                        |
| 2   | Resistance Film | $0.1\Omega \leq R \leq 12\Omega$ : CNP film                                                                               | For All Wattage                        |
|     |                 | $12.1\Omega \leq R \leq 100K\Omega$ : Metal oxide film                                                                    | For 1/2W-S, 1/4W                       |
|     |                 | $R > 100K\Omega$ : Carbon film                                                                                            |                                        |
|     |                 | $12.1\Omega \leq R \leq 120K\Omega$ : Metal oxide film                                                                    | For 1/2W, 1W-S                         |
|     |                 | $R > 120K\Omega$ : Carbon film                                                                                            |                                        |
|     |                 | $12.1\Omega \leq R \leq 150K\Omega$ : Metal oxide film                                                                    | For 1W, 2W-S, 2W, 3W-S, 3W, 4W-S, 5W-S |
|     |                 | $R > 150K\Omega$ : Carbon film                                                                                            |                                        |
|     |                 | $12.1\Omega \leq R \leq 180K\Omega$ : Metal oxide film                                                                    | (For 5W, 5W-S)                         |
|     |                 | $R > 180K\Omega$ : Carbon film                                                                                            | (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 $\pm 0.05$ | H $\pm 3$ |
| 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

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

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