

## GENERAL DESCRIPTION

The ROV05-XXX (Radial-leaded Metal Oxide Varistor) products are 5mm radial leaded varistor devices suitable for protection of overvoltage transients.

ROV devices can provide protection for a wide variety of power systems against overvoltage faults such as lightning, power contact and power induction. Suitable for a broad range of applications including, but not limited to security, power supplies, surge strips, etc., the ROV device helps to protect valuable equipment from potential power surge damage by clamping high energy, short duration impulses. The ROV devices have high current handling and energy absorption capability and fast response times to help protect against transient faults.

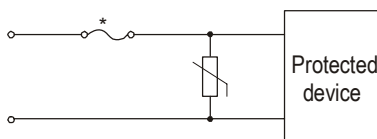
## FEATURES

- Radial leaded
- Broad Varistor voltage and  $V_{rms}$  range
  - Varistor voltage : 18V - 750V
  - $V_{rms}$  voltage : 11V - 460V
- Two surge capability series
  - Standard series, High surge series
- Various lead types
  - Straight, Kinked, Other
- Various packaging options
  - Bulk, Tape & Reel, Ammo Pack
- Helps designers meet the following standards
  - UL, CSA, VDE
- Fast response time
- High current and energy absorption capability

## APPLICATIONS

- Power supplies and power systems
- Line voltage
- Telecommunications systems
- Automotive systems
- Appliances

## TYPICAL APPLICATION SCHEMATIC



\*In some applications, a polymeric PTC device such as a Tyco Electronics PolySwitch device may be used instead of a fuse to provide a preferred solution.

## MATERIALS INFORMATION

RoHS Compliant

ELV Compliant

Directive 2002/95/EC  
Compliant

Directive 2000/53/EC  
Compliant

\*After May 1, 2005 all ROV devices will be produced as RoHS compliant devices.

## PART NUMBERING

**ROV 05 - 241 K -S -2**

**Manufacturer Series**

**Disk Diameter**  
 5mm

**Surge Series**

- : Standard Series  
 H : High Surge Series

**Varistor Voltage**

241 =  $24 \times 10^1 = 240V$

**Packaging**

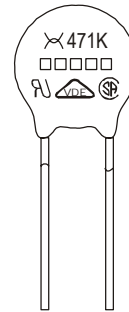
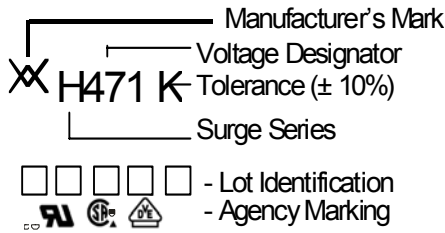
: Bulk  
 -2 : Tape & Reel  
 -AP : Ammo Pack

**Lead Type**

: Kinked Lead  
 -S : Straight Lead

**Tolerance**

K :  $\pm 10\%$   
 L :  $\pm 15\%$   
 M :  $\pm 20\%$



### **Lot Identification**

RoHS compliant devices: 4 characters  
 Non RoHS compliant devices: 5 characters with M at the end.

## GENERAL CHARACTERISTICS

|   |                         |
|---|-------------------------|
| Storage temperature:                          | -40°C ... +125°C        |
| Maximum operating temperature:                | -40°C ... + 85°C        |
| Maximum working surface temperature:          | +115°C                  |
| Temperature coefficient of voltage:           | 0 ... +0.05% / °C max.  |
| Insulation resistance of coating (@ 500 VDC): | Over 1000MΩ             |
| Maximum response time:                        | 25ns                    |
| Lead Material:                                | 22 AWG Sn Plated Copper |


## AGENCY RECOGNITION

Device Ratings and Characteristics Tables contain specific recognition information for each individual part. The table below details marking symbols for each agency recognition type.

|        |                         |     |     |
|--------|-------------------------|-----|-----|
| UL1414 | UL1449<br>(2nd Edition) | CSA | VDE |
| ◆      | ●                       | ▲   | ■   |

### DEVICE RATINGS AND CHARACTERISTICS

#### STANDARD SERIES

| Part Number | Varistor Voltage<br>V@0.1mA |           | Maximum Allowable Voltage              |                    | Maximum Clamping Voltage<br>V@5A | Maximum Surge Current<br>(8x20us) |                   | Rated Wattage | Energy<br>(10x1000us) | Capacitance<br>(Typical) | Certifications  |     |     |     |
|-------------|-----------------------------|-----------|--|--------------------|----------------------------------|-----------------------------------|-------------------|---------------|-----------------------|--------------------------|---|-----|-----|-----|
|             | (V <sub>DC</sub> )          | Tolerance | V <sub>rms</sub><br>(V <sub>AC</sub> ) | (V <sub>DC</sub> ) | (V <sub>DC</sub> )               | 1<br>Time<br>(A)                  | 2<br>Times<br>(A) | (W)           | (J)                   | @1kHz<br>(pF)            |  |     |     |     |
| ROV05-180M  | 18                          | ± 20%     | 11                                     | 14                 | 40 <sup>1)</sup>                 | 100                               | 50                | 0.01          | 0.6                   | 1121                     | ● ■*  |     |     |     |
| ROV05-220L  | 22                          | ± 15%     | 14                                     | 18                 | 48 <sup>1)</sup>                 |                                   |                   |               | 0.7                   | 1233                     | ● ■*  |     |     |     |
| ROV05-270K  | 27                          | ± 10%     | 17                                     | 22                 | 60 <sup>1)</sup>                 |                                   |                   |               | 0.9                   | 1073                     | ● ■*  |     |     |     |
| ROV05-330K  | 33                          |           | 20                                     | 26                 | 73 <sup>1)</sup>                 |                                   |                   |               | 1.1                   | 834                      | ● ■*  |     |     |     |
| ROV05-390K  | 39                          |           | 25                                     | 31                 | 86 <sup>1)</sup>                 |                                   |                   |               | 1.2                   | 877                      | ● ■*  |     |     |     |
| ROV05-470K  | 47                          |           | 30                                     | 38                 | 104 <sup>1)</sup>                |                                   |                   |               | 1.5                   | 715                      | ● ■*  |     |     |     |
| ROV05-560K  | 56                          |           | 35                                     | 45                 | 123 <sup>1)</sup>                |                                   |                   |               | 1.8                   | 643                      | ● ■*  |     |     |     |
| ROV05-680K  | 68                          |           | 40                                     | 56                 | 150 <sup>1)</sup>                |                                   |                   |               | 2.1                   | 501                      | ● ■*  |     |     |     |
| ROV05-820K  | 82                          |           | 50                                     | 65                 | 145                              |                                   |                   |               | 400                   | 200                      | 0.1   | 2.8 | 269 | ● ■ |
| ROV05-101K  | 100                         |           | 60                                     | 85                 | 175                              |                                   |                   |               |                       |                          |   | 3.5 | 263 | ● ■ |
| ROV05-121K  | 120                         |           | 75                                     | 100                | 210                              | 4.0                               | 180               | ● ■           |                       |                          |   |     |     |     |
| ROV05-151K  | 150                         |           | 95                                     | 125                | 260                              | 5.5                               | 180               | ● ■           |                       |                          |   |     |     |     |
| ROV05-181K  | 180                         | 115       | 150                                    | 320                | 6.5                              | 95                                | ● ■               |               |                       |                          |   |     |     |     |
| ROV05-201K  | 200                         | 130       | 170                                    | 355                | 7.1                              | 85                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-221K  | 220                         | 140       | 180                                    | 380                | 7.8                              | 80                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-241K  | 240                         | 150       | 200                                    | 415                | 8.4                              | 74                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-271K  | 270                         | 175       | 225                                    | 475                | 9.9                              | 69                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-301K  | 300                         | 195       | 250                                    | 525                | 10.5                             | 65                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-331K  | 330                         | 210       | 275                                    | 575                | 11.5                             | 60                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-361K  | 360                         | 230       | 300                                    | 620                | 13.0                             | 69                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-391K  | 390                         | 250       | 320                                    | 675                | 15.0                             | 56                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-431K  | 430                         | 275       | 350                                    | 745                | 16.5                             | 47                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-471K  | 470                         | 300       | 385                                    | 810                | 17.5                             | 50                                | ◆ ● ▲ ■           |               |                       |                          |   |     |     |     |
| ROV05-511K  | 510                         | 320       | 418                                    | 880                | 18.5                             | 50                                | ◆ ● ▲ ■*          |               |                       |                          |   |     |     |     |
| ROV05-561K  | 560                         | 350       | 460                                    | 940                | 19.5                             | 50                                | ◆ ● ▲ ■*          |               |                       |                          |   |     |     |     |
| ROV05-621K  | 620                         | 385       | 505                                    | 1050               | 20.5                             | 50                                | ◆ ● ▲ ■*          |               |                       |                          |   |     |     |     |
| ROV05-681K  | 680                         | 420       | 560                                    | 1150               | 21.5                             | 43                                | ◆ ● ▲ ■*          |               |                       |                          |   |     |     |     |
| ROV05-751K  | 750                         | 460       | 615                                    | 1290               | 22.5                             | -----                             | ◆ ● ▲ ■*          |               |                       |                          |   |     |     |     |

\* Pending VDE recognition

1) The clamping voltage for devices ROV05-180M to ROV05-680K is tested with 1A current.

**PULSE LIFETIME RATING CURVES**

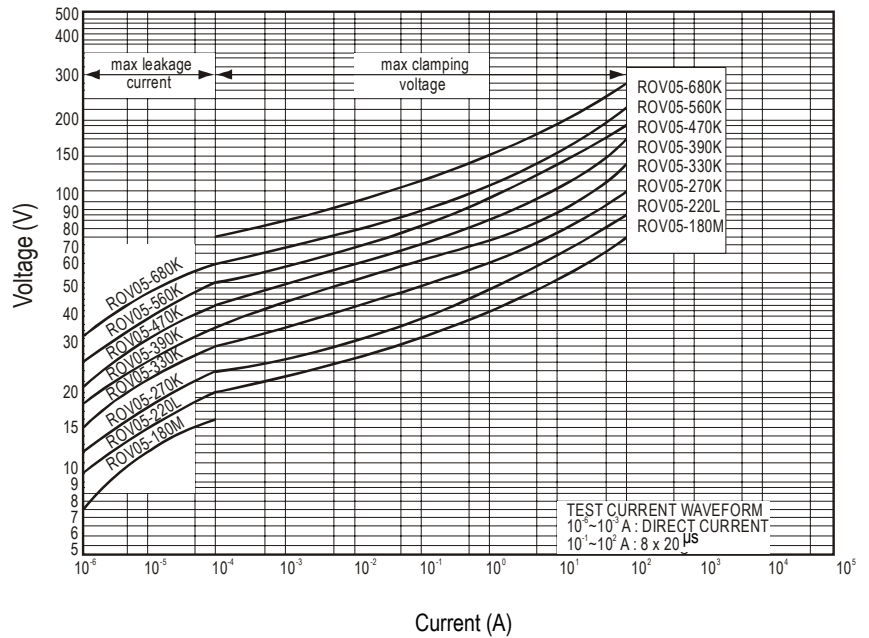
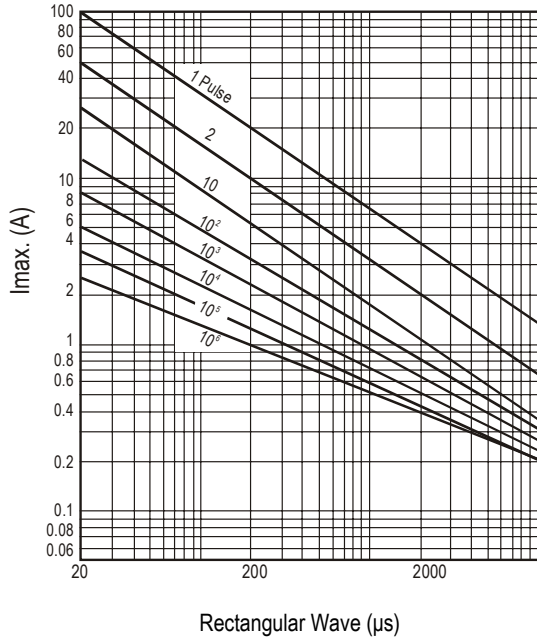
**V-I CHARACTERISTIC CURVES**

**STANDARD SERIES**

**STANDARD SERIES**

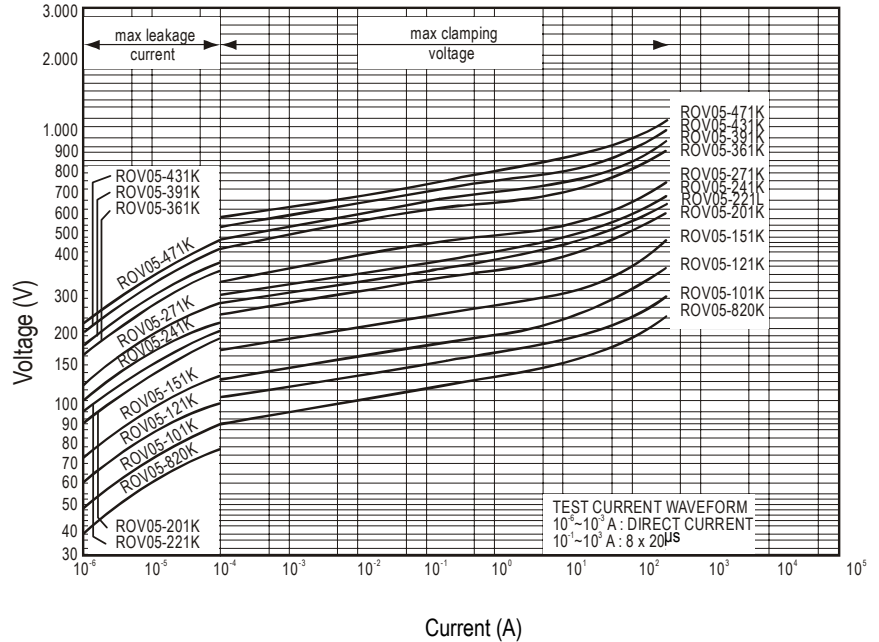
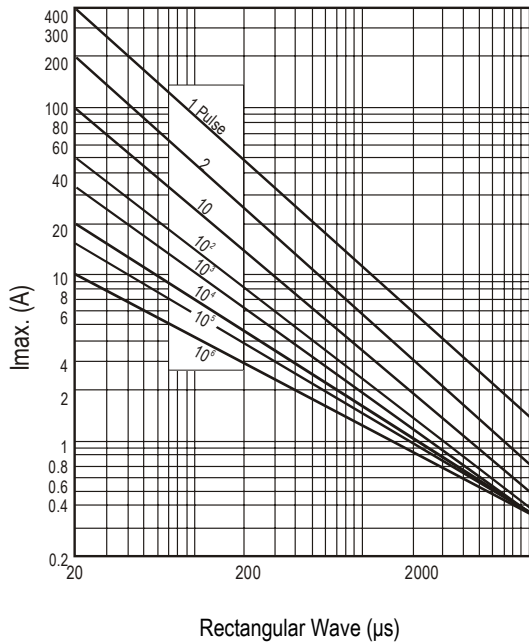
**ROV05-180M – ROV05-680K**

**ROV05-180M – ROV05-680K**




**ROV05-820K – ROV05-471K**

**ROV05-820K – ROV05-471K**



### DEVICE RATINGS AND CHARACTERISTICS

#### HIGH SURGE SERIES

| Part Number | Varistor Voltage<br>V@0.1mA |           | Maximum Allowable Voltage              |                    | Maximum Clamping Voltage<br>V@5A | Maximum Surge Current<br>(8x20us) |                   | Rated Wattage<br>(W) | Energy<br>(10x1000us)<br>(J) | Capacitance<br>(Typical)<br>@1kHz<br>(pF) | Certifications<br> |     |     |      |
|-------------|-----------------------------|-----------|--|--------------------|----------------------------------|-----------------------------------|-------------------|----------------------|------------------------------|---|---|-----|-----|------|
|             | (V <sub>DC</sub> )          | Tolerance | V <sub>rms</sub><br>(V <sub>AC</sub> ) | (V <sub>DC</sub> ) | (V <sub>DC</sub> )               | 1<br>Time<br>(A)                  | 2<br>Times<br>(A) |                      |                              |   |   |     |     |      |
| ROV05H180M  | 18                          | ± 20%     | 11                                     | 14                 | 40 <sup>1)</sup>                 | 250                               | 125               | 0.01                 | 0.7                          | 1120                                      | ● ■*  |     |     |      |
| ROV05H220L  | 22                          | ± 15%     | 14                                     | 18                 | 48 <sup>1)</sup>                 |                                   |                   |                      | 0.8                          | 1230                                      | ● ■*  |     |     |      |
| ROV05H270K  | 27                          | ± 10%     | 17                                     | 22                 | 60 <sup>1)</sup>                 |                                   |                   |                      | 1.1                          | 1070                                      | ● ■*  |     |     |      |
| ROV05H330K  | 33                          |           | 20                                     | 26                 | 73 <sup>1)</sup>                 |                                   |                   |                      | 1.3                          | 830                                       | ● ■*  |     |     |      |
| ROV05H390K  | 39                          |           | 25                                     | 31                 | 86 <sup>1)</sup>                 |                                   |                   |                      | 1.5                          | 880                                       | ● ■*  |     |     |      |
| ROV05H470K  | 47                          |           | 30                                     | 38                 | 104 <sup>1)</sup>                |                                   |                   |                      | 1.8                          | 720                                       | ● ■*  |     |     |      |
| ROV05H560K  | 56                          |           | 35                                     | 45                 | 123 <sup>1)</sup>                |                                   |                   |                      | 2.2                          | 640                                       | ● ■*  |     |     |      |
| ROV05H680K  | 68                          |           | 40                                     | 56                 | 150 <sup>1)</sup>                |                                   |                   |                      | 2.6                          | 500                                       | ● ■*  |     |     |      |
| ROV05H820K  | 82                          |           | 50                                     | 65                 | 145                              |                                   |                   |                      | 800                          | 600                                       | 0.10  | 3.5 | 270 | ● ■* |
| ROV05H101K  | 100                         |           | 60                                     | 85                 | 175                              |                                   |                   |                      |                              |   |   | 4.5 | 260 | ● ■* |
| ROV05H121K  | 120                         |           | 75                                     | 100                | 210                              | 5.5                               | 180               | ● ■*                 |                              |   |   |     |     |      |
| ROV05H151K  | 150                         |           | 95                                     | 125                | 260                              | 6.5                               | 180               | ● ■*                 |                              |   |   |     |     |      |
| ROV05H181K  | 180                         | 115       | 150                                    | 320                | 8.0                              | 95                                | ● ■*              |                      |                              |   |   |     |     |      |
| ROV05H201K  | 200                         | 130       | 170                                    | 355                | 8.5                              | 85                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H221K  | 220                         | 140       | 180                                    | 380                | 9.0                              | 80                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H241K  | 240                         | 150       | 200                                    | 415                | 10.5                             | 75                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H271K  | 270                         | 175       | 225                                    | 475                | 11.0                             | 70                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H301K  | 300                         | 195       | 250                                    | 525                | 12.0                             | 65                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H331K  | 330                         | 210       | 275                                    | 575                | 13.0                             | 60                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H361K  | 360                         | 230       | 300                                    | 620                | 16.0                             | 70                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H391K  | 390                         | 250       | 320                                    | 675                | 17.0                             | 55                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H431K  | 430                         | 275       | 350                                    | 745                | 20.0                             | 45                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H471K  | 470                         | 300       | 385                                    | 810                | 21.0                             | 50                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H511K  | 510                         | 320       | 418                                    | 880                | 22.0                             | 50                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H561K  | 560                         | 350       | 460                                    | 940                | 25.0                             | 50                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H621K  | 620                         | 385       | 505                                    | 1050               | 27.0                             | 50                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H681K  | 680                         | 420       | 560                                    | 1150               | 28.0                             | 40                                | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |
| ROV05H751K  | 750                         | 460       | 615                                    | 1290               | 29.0                             | -----                             | ◆ ● ▲ ■*          |                      |                              |   |   |     |     |      |

\* Pending VDE Recognition

1). The clamping voltage for devices ROV05H180M to ROV05H680K is tested with 1A current.

**PULSE LIFETIME RATING CURVES**

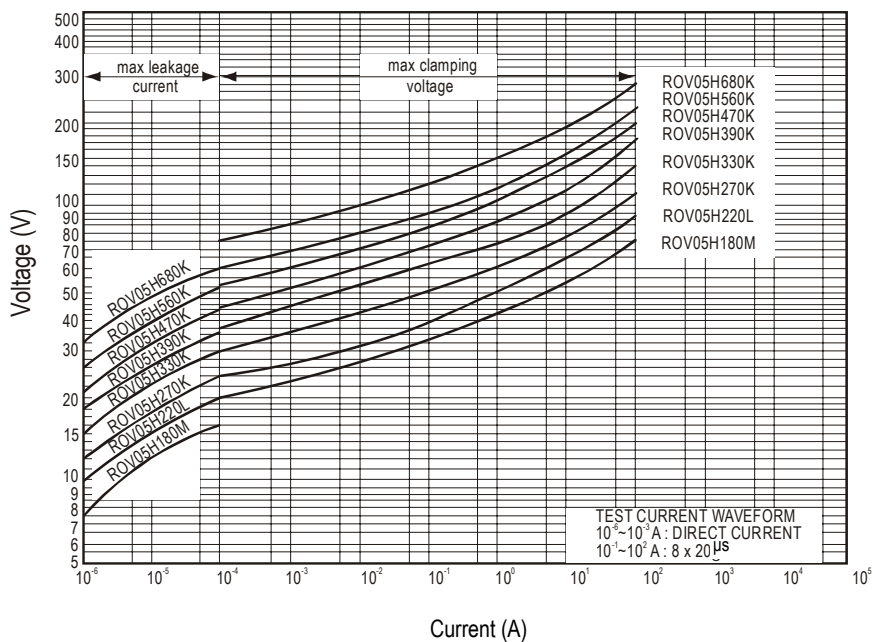
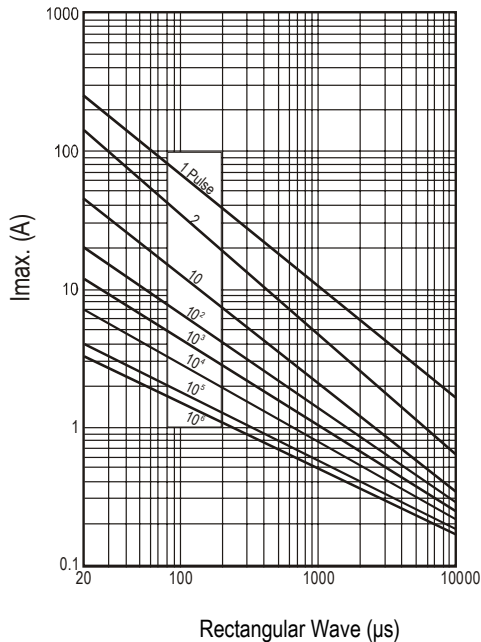
**V-I CHARACTERISTIC CURVES**

**HIGH SURGE SERIES**

**HIGH SURGE SERIES**

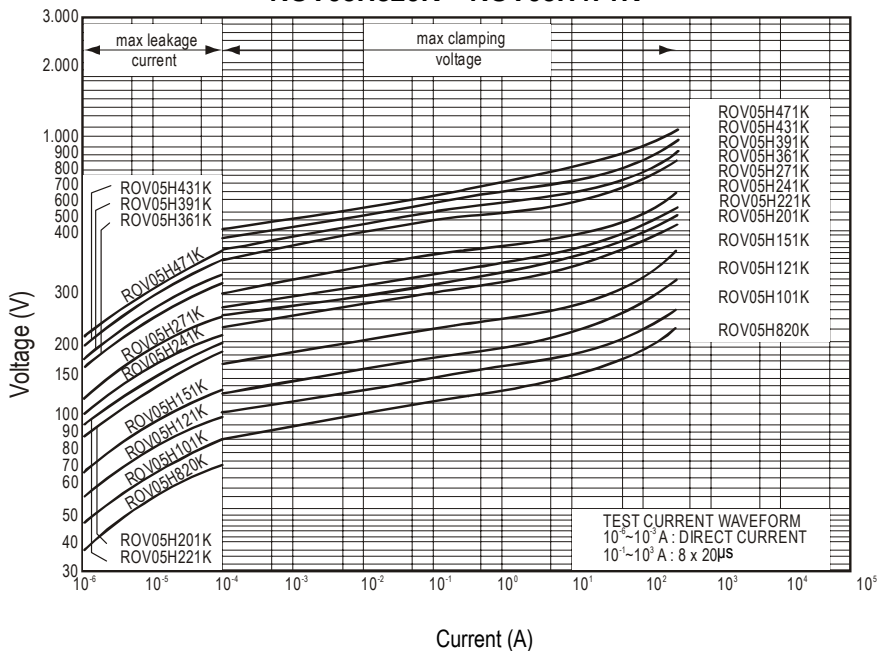
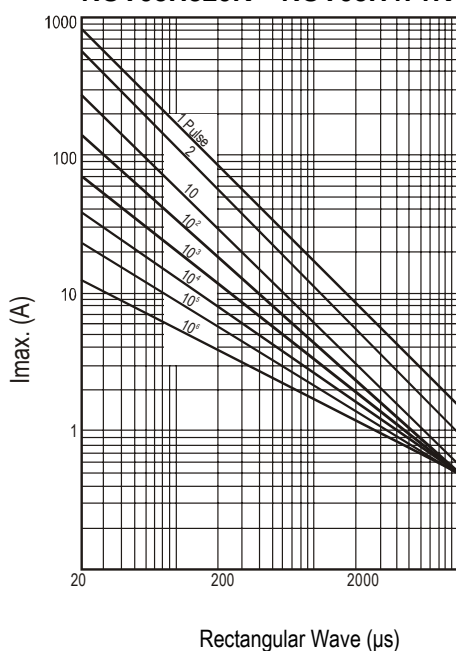
**ROV05H180M – ROV05H680K**

**ROV05H180M – ROV05H680K**

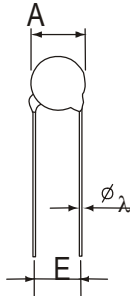


**ROV05H820K – ROV05H471K**

**ROV05H820K – ROV05H471K**

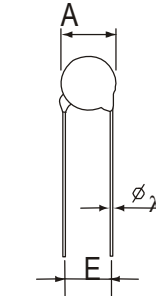
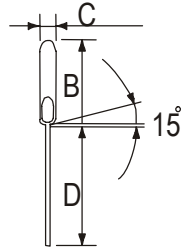


## DIMENSIONS



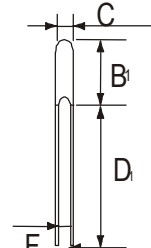
**KINKED LEAD TYPE**  
Dimension Table

|                    |      |
|--------------------|------|
| A max.             | 7.5  |
| $\lambda \pm 0.05$ | 0.6  |
| $E \pm 1.0$        | 5.0  |
| B max.             | 11.0 |
| $D_1$ min.         | 25.0 |
| D min.             | 24.0 |



**STRAIGHT LEAD TYPE (-S)**  
Table of C max., F, and  $B_1$  max.

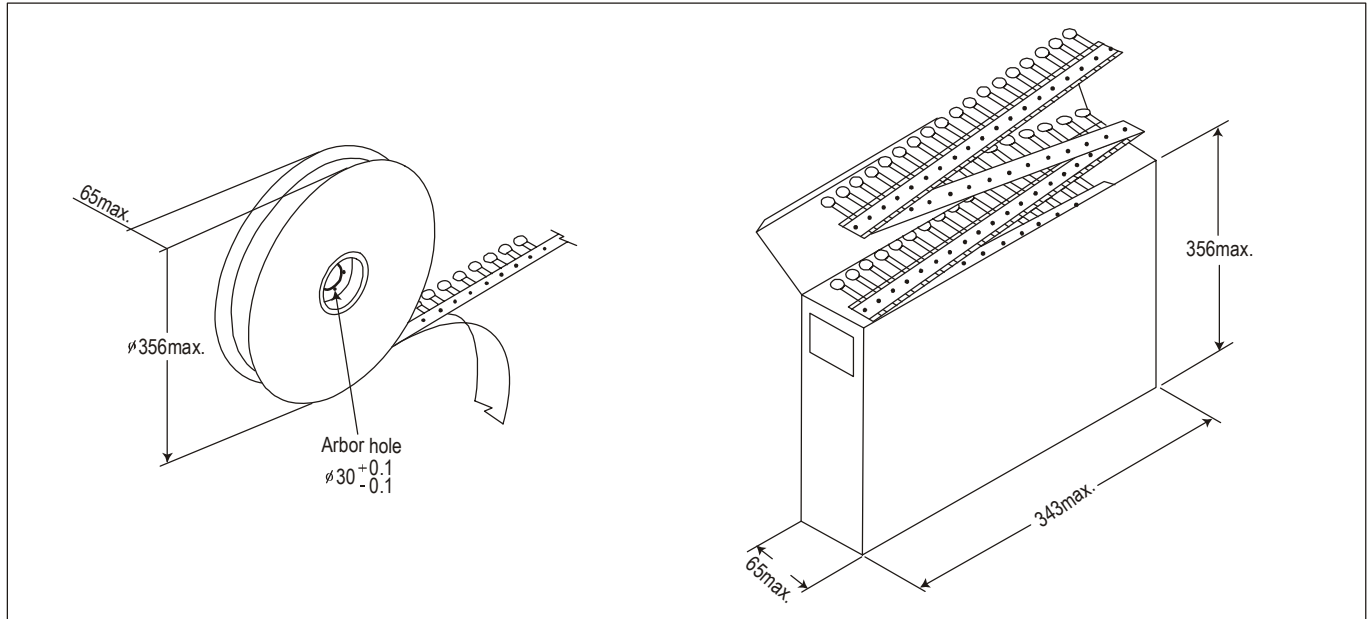
| Type No. | C max. | $F \pm 0.8$ | $B_1$ max. |
|----------|--------|-------------|------------|
| 180M     | 4.5    | 0.8         | 10.5       |
| 220L     | 4.5    | 0.9         | 10.5       |
| 270K     | 4.7    | 0.9         | 10.5       |
| 330K     | 4.7    | 1.0         | 10.5       |
| 390K     | 4.7    | 1.2         | 10.5       |
| 470K     | 5.0    | 1.2         | 10.5       |
| 560K     | 5.0    | 1.4         | 10.5       |
| 680K     | 5.5    | 1.7         | 10.5       |
| 820K     | 3.8    | 0.8         | 10.5       |
| 101K     | 3.9    | 0.8         | 10.5       |
| 121K     | 4.1    | 0.9         | 10.5       |
| 151K     | 4.5    | 1.2         | 10.5       |
| 181K     | 4.1    | 1.0         | 10.5       |
| 201K     | 4.2    | 1.0         | 10.5       |
| 221K     | 4.3    | 1.1         | 10.5       |
| 241K     | 4.4    | 1.1         | 10.5       |
| 271K     | 4.6    | 1.3         | 10.5       |
| 301K     | 4.8    | 1.3         | 10.5       |
| 331K     | 4.9    | 1.3         | 10.5       |
| 361K     | 5.1    | 1.8         | 10.5       |
| 391K     | 5.3    | 2.0         | 11.0       |
| 431K     | 6.1    | 2.1         | 11.0       |
| 471K     | 6.4    | 2.2         | 11.0       |
| 511K     | 6.6    | 2.5         | 11.5       |
| 561K     | 6.9    | 2.8         | 11.5       |
| 621K     | 7.2    | 3.1         | 11.5       |
| 681K     | 7.5    | 3.4         | 11.5       |
| 751K     | 7.9    | 3.7         | 11.5       |





## PACKAGING

in mm



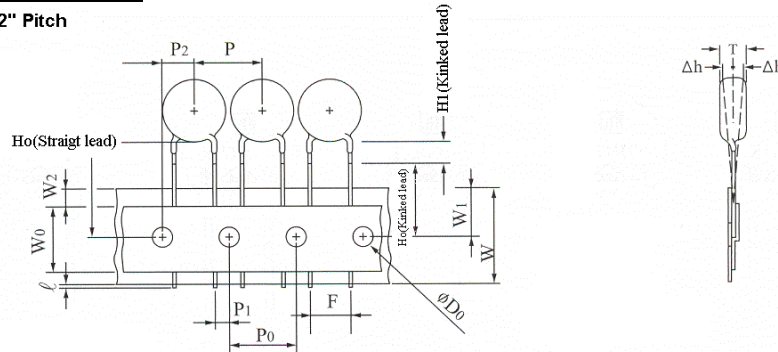
| Packaging        | Bulk (box)      | Reel               | Ammo            |
|------------------|-----------------|--------------------|-----------------|
| Box size (mm)    | 290 x 155 x 110 | 350 x 350 x 108    | 330 x 240 x 46  |
| Carton size (mm) | 310 x 328 x 250 | 371 x 371 x 590    | 350 x 500 x 270 |
| One carton with  | 4 Boxes         | 5 Boxes (10 reels) | 10 Boxes        |

| Part Number   | Bulk (box) | Reel | Ammo |
|---|------------|------|------|
| ROV05-180M to ROV05-470K,<br>ROV05H180M to ROV05H470K | 5000       | 1500 | 1500 |
| ROV05-560K to ROV05-680K,<br>ROV05H560K to ROV05H680K | 5000       | 1500 | 1000 |
| ROV05-820K to ROV05-331K,<br>ROV05H820K to ROV05H331K | 5000       | 1500 | 1500 |
| ROV05-361K to ROV05-391K,<br>ROV05H361K to ROV05H391K | 5000       | 1500 | 1000 |
| ROV05-431K to ROV05-471K,<br>ROV05H431K to ROV05H471K | 5000       | 1500 | 1000 |
| ROV05-511K to ROV05-751K,<br>ROV05H511K to ROV05H751K | 4000       | 1000 | 1000 |

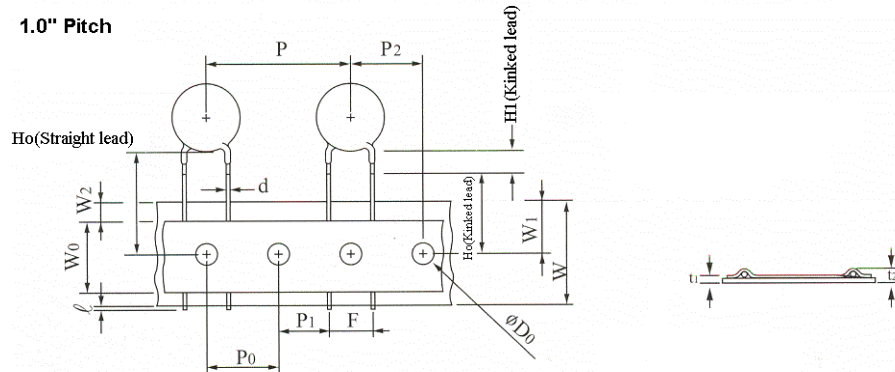


### TAPE AND REEL DIMENSIONS

1/2" Pitch



1.0" Pitch



| Symbols               | Item                                   | Value                                   |
|-----------------------|--|---|
| $\lambda$             | Cut out length                         | 1.1mm max.                              |
| $H_1$ (Kinked lead)   | Height of kink                         | 3.5mm max.                              |
| $H_o$ (Kinked lead)   | Height to seating plane                | 16.0 ± 0.5mm                            |
| $H_o$ (Straight lead) | Height of component from hole center   | 16.0-21.0mm                             |
| $\Delta h$            | Front to back deviation                | 0.0 ± 2.0mm                             |
| $W$                   | Carrier tape width                     | 18.0 <sup>+1.0</sup> <sub>-0.5</sub> mm |
| $W_0$                 | Hold down tape width                   | 10.0mm                                  |
| $W_1$                 | Sprocket hole position                 | 9.0 <sup>+0.75</sup> <sub>-0.5</sub> mm |
| $W_2$                 | Adhesive tape position                 | 3.0mm max.                              |
| $F$                   | Component lead spacing                 | 5.0 <sup>+0.8</sup> <sub>-0.2</sub> mm  |
| $P$                   | Pitch of component                     | 12.7 ± 1.0mm                            |
| $P_0$                 | Sprocket hole pitch                    | 12.7 ± 0.3mm                            |
| $P_1$                 | Lead length from hole center to lead   | 3.85 ± 0.7mm                            |
| $P_2$                 | Length from hole center to disk center | 6.35 ± 1.3mm                            |
| $D_0$                 | Sprocket hole diameter                 | 4.0 ± 0.2mm                             |
| $d$                   | Lead wire diameter                     | 0.6 ± 0.05mm                            |
| $T$                   | Disk thickness                         | See C. max table                        |
| $t_1$                 | Total thickness tape                   | 0.7 ± 0.05mm                            |
| $t_2$                 | Total thickness                        | 1.6mm max.                              |

# Metal Oxide Varistors

## Overvoltage Protection Device

*Raychem Circuit Protection Products*

**PRODUCT: ROV05, R0V05H**  
**5mm Series**

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