



**THE DATASHEET OF
ROV07-221K-S**



ROV07, ROV07H

7mm Series Metal Oxide Varistors

www.tycopowercomponents.com

Document: SCD 25481
Status: Released
Rev. A June 30, 2003

GENERAL DESCRIPTION

The ROV07-XXX (**R**adial-leaded Metal **O**xide **V**aristor) products are 7mm 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.

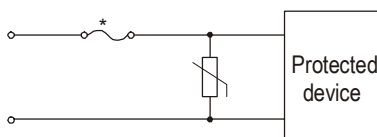
FEATURES

- Radial leaded
- Broad Varistor voltage and V_{rms} range
 - Varistor voltage : 18V - 820V
 - V_{rms} voltage : 11V - 510V
- 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.

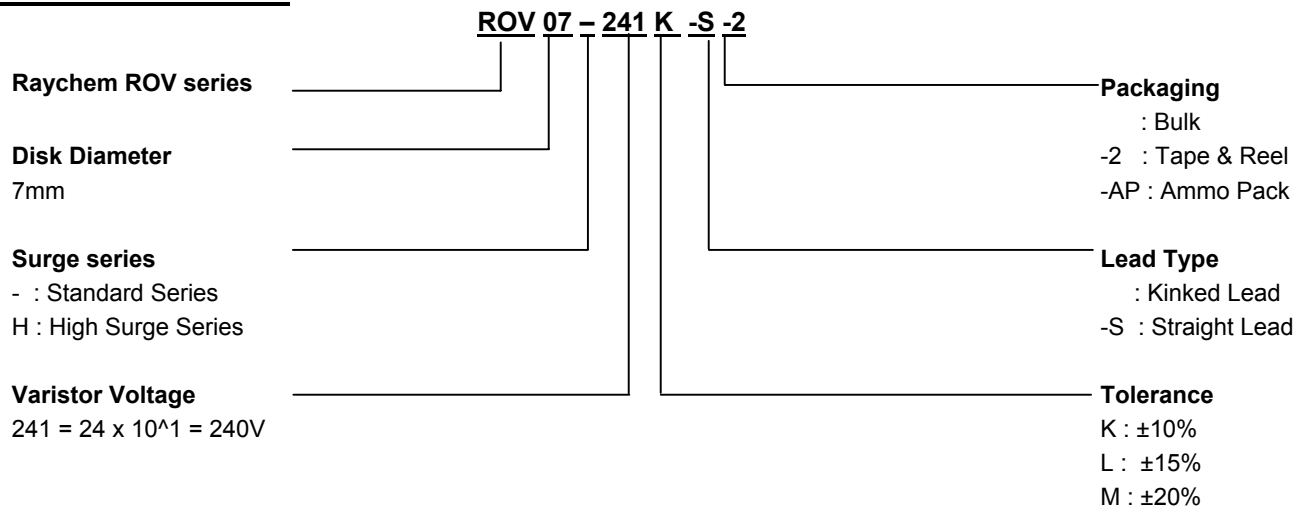
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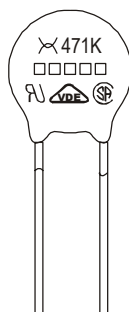
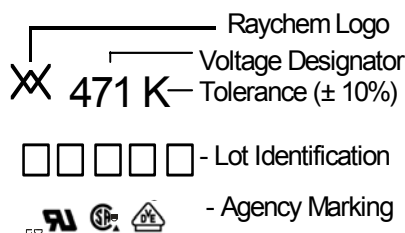
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PART NUMBERING



DEVICE MARKING



GENERAL CHARACTERISTICS

| | |
|---|----------------------------|
| Storage temperature: | -40°C ... +125°C |
| Maximum operating temperature: | -40°C ... +125°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/Pb 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 (2nd Edition) | CSA | VDE |
| ◆ | ● | ▲ | ■ |

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DEVICE RATINGS AND CHARACTERISTICS

STANDARD SERIES

| Part Number | Varistor Voltage V@1.0mA | | Maximum Allowable Voltage | | Maximum Clamping Voltage V@10A | Maximum Surge Current (8x20us) | | Rated Wattage | Energy (10x1000us) | Capacitance (Typical) | Certifications |
|-------------|-----------------------------|-----------|--|--------------------|-----------------------------------|-----------------------------------|-------------------|---------------|-----------------------|--------------------------|---|
| | (V _{DC}) | Tolerance | V _{rms} (V _{AC}) | (V _{DC}) | (V _{DC}) | 1 Time (A) | 2 Times (A) | (W) | (J) | @1kHz (pF) |  |
| ROV07-180M | 18 | ± 20% | 11 | 14 | 36 ¹⁾ | 250 | 125 | 0.02 | 1.2 | 2918 | ● |
| ROV07-220L | 22 | ± 15% | 14 | 18 | 43 ¹⁾ | | | | 1.4 | 2933 | ● |
| ROV07-270K | 27 | ± 10% | 17 | 22 | 53 ¹⁾ | | | | 1.7 | 2344 | ● |
| ROV07-330K | 33 | | 20 | 26 | 65 ¹⁾ | | | | 2.2 | 1840 | ● |
| ROV07-390K | 39 | | 25 | 31 | 77 ¹⁾ | | | | 2.4 | 1817 | ● |
| ROV07-470K | 47 | | 30 | 38 | 93 ¹⁾ | | | | 3.0 | 1595 | ● |
| ROV07-560K | 56 | | 35 | 45 | 110 ¹⁾ | | | | 3.5 | 1333 | ● |
| ROV07-680K | 68 | | 40 | 56 | 135 ¹⁾ | | | | 4.3 | 1119 | ● |
| ROV07-820K | 82 | | 50 | 65 | 135 | | | | 5.5 | 643 | ● ■ |
| ROV07-101K | 100 | | 60 | 85 | 165 | 7.0 | 535 | ● ■ | | | |
| ROV07-121K | 120 | | 75 | 100 | 200 | 8.0 | 457 | ● ■ | | | |
| ROV07-151K | 150 | | 95 | 125 | 250 | 11.0 | 371 | ● ■ | | | |
| ROV07-181K | 180 | 115 | 150 | 300 | 13.0 | 215 | ● ■ | | | | |
| ROV07-201K | 200 | 130 | 170 | 340 | 14.3 | 224 | ◆ ● ▲ ■ | | | | |
| ROV07-221K | 220 | 140 | 180 | 360 | 15.5 | 190 | ◆ ● ▲ ■ | | | | |
| ROV07-241K | 240 | 150 | 200 | 395 | 16.8 | 185 | ◆ ● ▲ ■ | | | | |
| ROV07-271K | 270 | 175 | 225 | 455 | 19.8 | 161 | ◆ ● ▲ ■ | | | | |
| ROV07-301K | 300 | 195 | 250 | 505 | 21.0 | 135 | ◆ ● ▲ ■ | | | | |
| ROV07-331K | 330 | 210 | 275 | 550 | 23.0 | 141 | ◆ ● ▲ ■ | | | | |
| ROV07-361K | 360 | 230 | 300 | 595 | 26.0 | 117 | ◆ ● ▲ ■ | | | | |
| ROV07-391K | 390 | 250 | 320 | 650 | 30.0 | 110 | ◆ ● ▲ ■ | | | | |
| ROV07-431K | 430 | 275 | 350 | 710 | 33.0 | 111 | ◆ ● ▲ ■ | | | | |
| ROV07-471K | 470 | 300 | 385 | 775 | 35.0 | 102 | ◆ ● ▲ ■ | | | | |
| ROV07-511K | 510 | 320 | 418 | 842 | 37.0 | 100 | ◆ ● ▲ | | | | |
| ROV07-561K | 560 | 350 | 460 | 920 | 39.0 | 87 | ◆ ● ▲ | | | | |
| ROV07-621K | 620 | 385 | 505 | 1025 | 41.0 | 80 | ◆ ● ▲ | | | | |
| ROV07-681K | 680 | 420 | 560 | 1120 | 43.0 | 82 | ◆ ● ▲ | | | | |
| ROV07-751K | 750 | 460 | 615 | 1240 | 45.0 | 74 | ◆ ● ▲ | | | | |
| ROV07-781K | 780 | 485 | 640 | 1290 | 46.0 | 70 | ◆ ● ▲ | | | | |
| ROV07-821K | 820 | 510 | 670 | 1355 | 47.0 | 70 | ◆ ● ▲ | | | | |

1). The clamping voltage for devices ROV07-180M to ROV07-680K is tested with 2.5A current.

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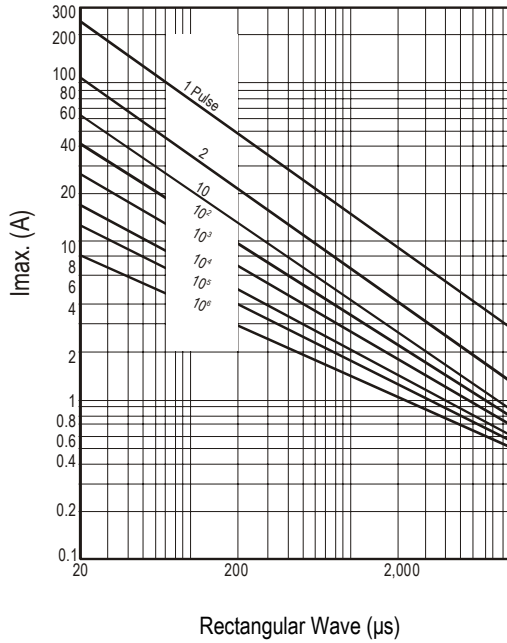
PULSE LIFETIME RATING CURVES

V-I CHARACTERISTIC CURVES

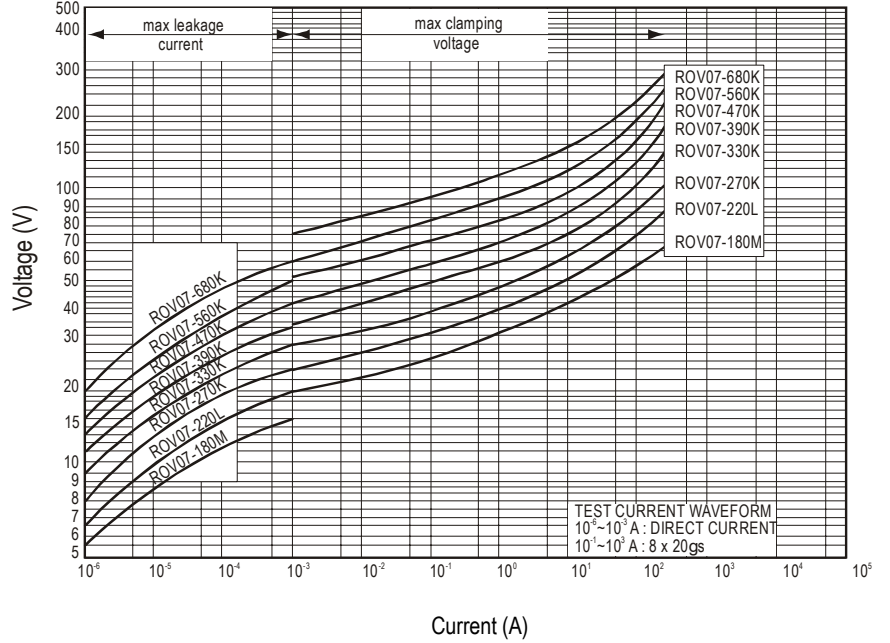
STANDARD SERIES

STANDARD SERIES

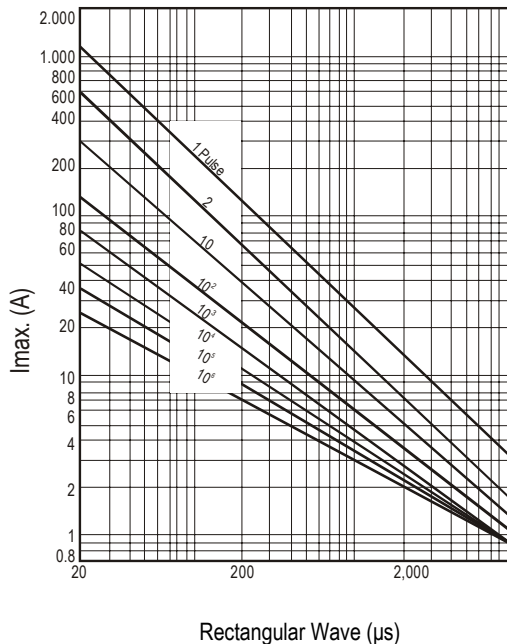
ROV07-180M – ROV07-680K



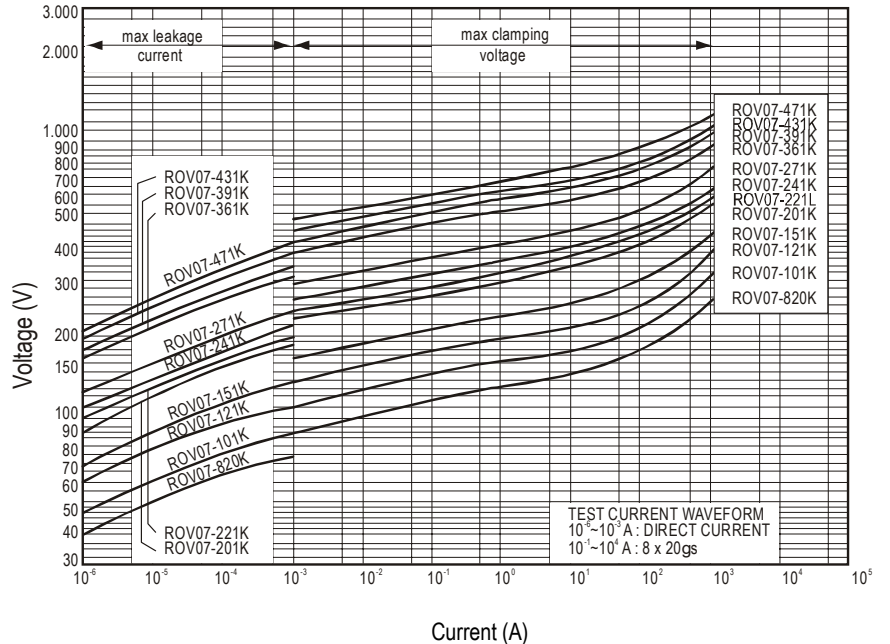
ROV07-180M – ROV07-680K



ROV07-820K – ROV07-821K



ROV07-820K – ROV07-821K



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DEVICE RATINGS AND CHARACTERISTICS

HIGH SURGE SERIES

| Part Number | Varistor Voltage V@1.0mA | | Maximum Allowable Voltage | | Maximum Clamping Voltage V@10A | Maximum Surge Current (8x20us) | | Rated Wattage | Energy (10x1000us) | Capacitance (Typical) | Certifications |
|-------------|-----------------------------|-----------|--|--------------------|-----------------------------------|-----------------------------------|-------------------|---------------|-----------------------|--------------------------|---|
| | (V _{DC}) | Tolerance | V _{rms} (V _{AC}) | (V _{DC}) | (V _{DC}) | 1 Time (A) | 2 Times (A) | (W) | (J) | @1kHz (pF) |  |
| ROV07H180M | 18 | ± 20% | 11 | 14 | 36 ¹⁾ | 500 | 250 | 0.02 | 1.5 | 2920 | ● |
| ROV07H220L | 22 | ± 15% | 14 | 18 | 43 ¹⁾ | | | | 1.7 | 2930 | ● |
| ROV07H270K | 27 | ± 10% | 17 | 22 | 53 ¹⁾ | | | | 2.1 | 2340 | ● |
| ROV07H330K | 33 | | 20 | 26 | 65 ¹⁾ | | | | 2.8 | 1840 | ● |
| ROV07H390K | 39 | | 25 | 31 | 77 ¹⁾ | | | | 3.0 | 1820 | ● |
| ROV07H470K | 47 | | 30 | 38 | 93 ¹⁾ | | | | 3.8 | 1600 | ● |
| ROV07H560K | 56 | | 35 | 45 | 110 ¹⁾ | | | | 4.4 | 1330 | ● |
| ROV07H680K | 68 | | 40 | 56 | 135 ¹⁾ | | | | 5.4 | 1120 | ● |
| ROV07H820K | 82 | | 50 | 65 | 135 | | | | 7.0 | 640 | ● |
| ROV07H101K | 100 | | 60 | 85 | 165 | | | | 9.0 | 540 | ● |
| ROV07H121K | 120 | | 75 | 100 | 200 | 11.0 | 460 | ● | | | |
| ROV07H151K | 150 | | 95 | 125 | 250 | 13.0 | 370 | ● | | | |
| ROV07H181K | 180 | 115 | 150 | 300 | 16.0 | 220 | ● | | | | |
| ROV07H201K | 200 | 130 | 170 | 340 | 17.5 | 220 | ◆ ● ▲ | | | | |
| ROV07H221K | 220 | 140 | 180 | 360 | 19.0 | 190 | ◆ ● ▲ | | | | |
| ROV07H241K | 240 | 150 | 200 | 395 | 21.0 | 190 | ◆ ● ▲ | | | | |
| ROV07H271K | 270 | 175 | 225 | 455 | 24.0 | 160 | ◆ ● ▲ | | | | |
| ROV07H301K | 300 | 195 | 250 | 505 | 26.0 | 140 | ◆ ● ▲ | | | | |
| ROV07H331K | 330 | 210 | 275 | 550 | 1750 | 1250 | 0.25 | 28.0 | 140 | ◆ ● ▲ | |
| ROV07H361K | 360 | 230 | 300 | 595 | | | | 32.0 | 120 | ◆ ● ▲ | |
| ROV07H391K | 390 | 250 | 320 | 650 | | | | 35.0 | 110 | ◆ ● ▲ | |
| ROV07H431K | 430 | 275 | 350 | 710 | | | | 40.0 | 110 | ◆ ● ▲ | |
| ROV07H471K | 470 | 300 | 385 | 775 | | | | 42.0 | 100 | ◆ ● ▲ | |
| ROV07H511K | 510 | 320 | 418 | 842 | | | | 45.0 | 100 | ◆ ● ▲ | |
| ROV07H561K | 560 | 350 | 460 | 920 | | | | 51.0 | 85 | ◆ ● ▲ | |
| ROV07H621K | 620 | 385 | 505 | 1025 | | | | 54.0 | 80 | ◆ ● ▲ | |
| ROV07H681K | 680 | 420 | 560 | 1120 | | | | 56.0 | 80 | ◆ ● ▲ | |
| ROV07H751K | 750 | 460 | 615 | 1240 | | | | 58.0 | 75 | ◆ ● ▲ | |
| ROV07H781K | 780 | 485 | 640 | 1290 | 59.0 | 70 | ◆ ● ▲ | | | | |
| ROV07H821K | 820 | 510 | 670 | 1355 | 60.0 | 70 | ◆ ● ▲ | | | | |

1). The clamping voltage for devices ROV07H180M to ROV07H680K is tested with 2.5A current.

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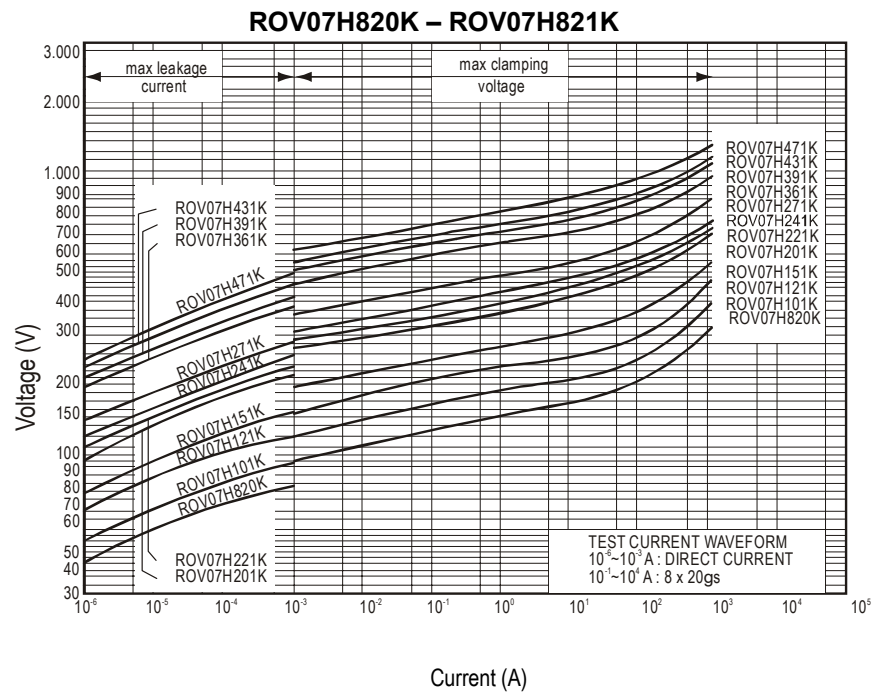
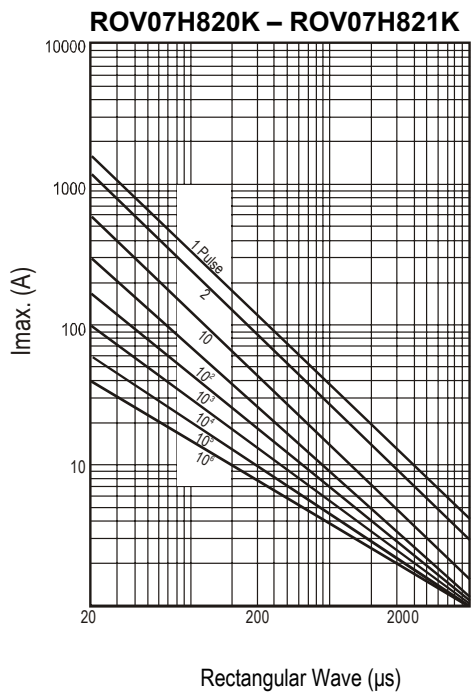
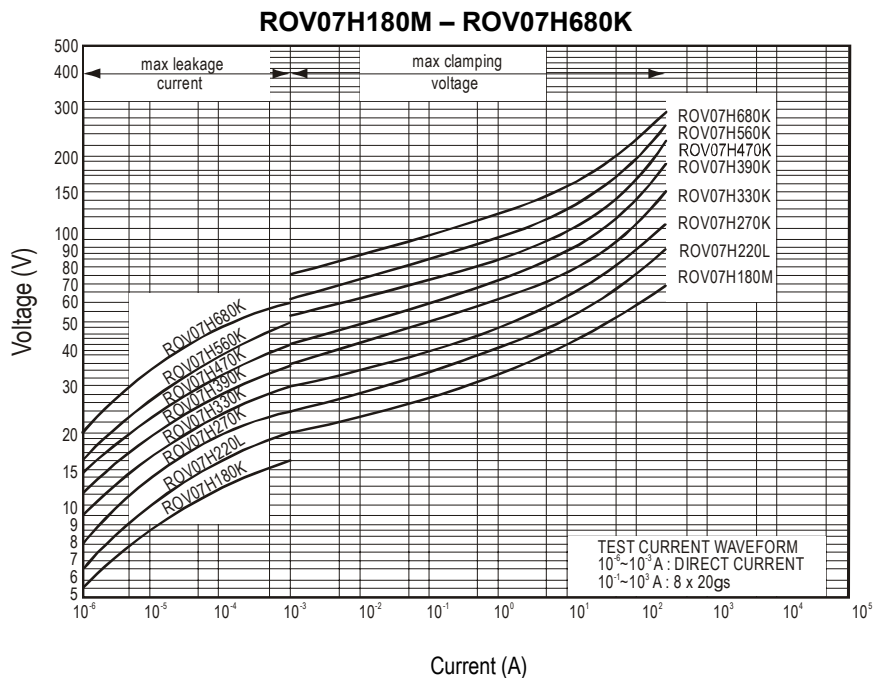
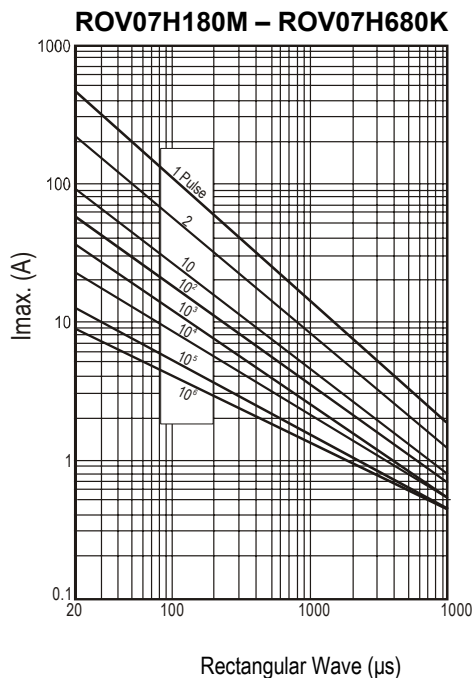
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PULSE LIFETIME RATING CURVES

V-I CHARACTERISTIC CURVES

HIGH SURGE SERIES

HIGH SURGE SERIES

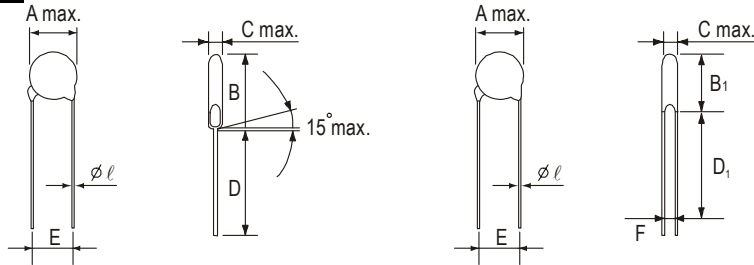


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DIMENSIONS



KINKED LEAD TYPE
Dimension Table

| | |
|--------------|------|
| A max. | 9.0 |
| $l \pm 0.05$ | 0.6 |
| $E \pm 1.0$ | 5.0 |
| B max. | 13.0 |
| D_1 min. | 25.0 |
| D min. | 24.0 |

STRAIGHT LEAD TYPE (-S)
Table of C max., F, and B₁ max.

| Type No. | C max. | F±0.8 | B ₁ max. |
|----------|--------|-------|---------------------|
| 180M | 4.5 | 0.8 | 12.0 |
| 220L | 4.5 | 0.9 | 12.0 |
| 270K | 4.7 | 0.9 | 12.0 |
| 330K | 4.7 | 1.0 | 12.0 |
| 390K | 4.7 | 1.2 | 12.0 |
| 470K | 5.0 | 1.2 | 12.0 |
| 560K | 5.0 | 1.4 | 12.0 |
| 680K | 5.5 | 1.7 | 12.0 |
| 820K | 3.8 | 0.8 | 12.0 |
| 101K | 3.9 | 0.8 | 12.0 |
| 121K | 4.1 | 0.9 | 12.0 |
| 151K | 4.5 | 1.2 | 12.0 |
| 181K | 4.1 | 1.0 | 12.0 |
| 201K | 4.2 | 1.0 | 12.0 |
| 221K | 4.3 | 1.1 | 12.0 |
| 241K | 4.4 | 1.3 | 12.0 |
| 271K | 4.6 | 1.4 | 12.0 |
| 301K | 4.8 | 1.5 | 12.0 |
| 331K | 4.9 | 1.5 | 12.0 |
| 361K | 5.1 | 1.9 | 12.0 |
| 391K | 5.3 | 2.0 | 12.5 |
| 431K | 6.1 | 2.3 | 12.5 |
| 471K | 6.4 | 2.3 | 12.5 |
| 511K | 6.6 | 2.5 | 13.0 |
| 561K | 6.9 | 2.8 | 13.0 |
| 621K | 7.2 | 3.1 | 13.0 |
| 681K | 7.5 | 3.4 | 13.0 |
| 751K | 7.9 | 3.7 | 13.0 |
| 781K | 8.1 | 3.9 | 13.0 |
| 821K | 8.3 | 4.1 | 13.0 |

ROV07, ROV07H

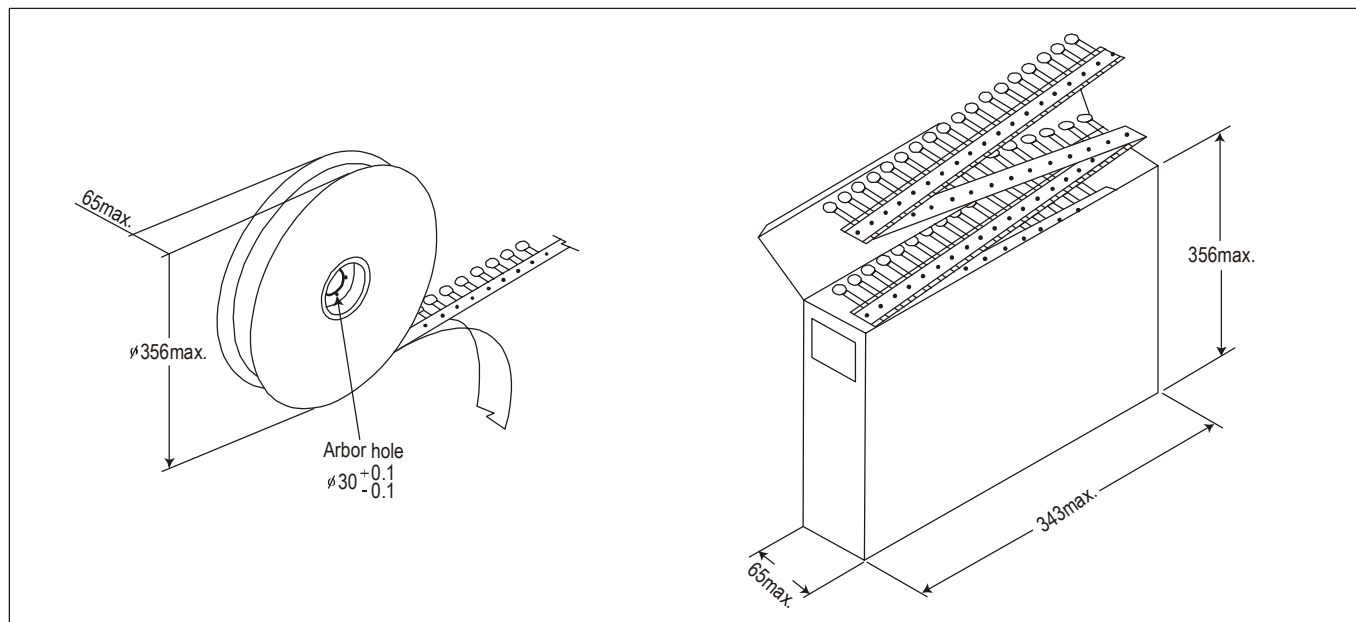
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PACKAGING

in mm



| Packaging | Bulk (box) | Reel | Ammo |
|------------------|-----------------|--------------------|-----------------|
| Box size (mm) | 290 x 155 x 110 | 350 x 350 x 108 | 330 x 240 x 45 |
| Carton size (mm) | 310 x 328 x 250 | 371 x 371 x 590 | 354 x 515 x 258 |
| One carton with | 4 Boxes | 5 Boxes (10 reels) | 10 Boxes |

| Part Number | Bulk (box) | Reel | Ammo |
|--|------------|------|------|
| ROV07-180M to ROV07-470K ROV07H180M to ROV07H470K | 5000 | 1500 | 1500 |
| ROV07-560K to ROV07-680K ROV07H560K to ROV07H680K | 5000 | 1500 | 1000 |
| ROV07-820K to ROV07-331K ROV07H820K to ROV07H331K | 5000 | 1500 | 1500 |
| ROV07-361K to ROV07-391K ROV07H361K to ROV07H391K | 5000 | 1500 | 1000 |
| ROV07-431K to ROV07-471K ROV07H431K to ROV07H471K | 5000 | 1000 | 1000 |
| ROV07-511K to ROV07-751K ROV07H511K to ROV07H751K | 4000 | 1000 | 1000 |
| ROV07-781K to ROV07-821K ROV07H781K to ROV07H821K | 4000 | 1000 | 1000 |

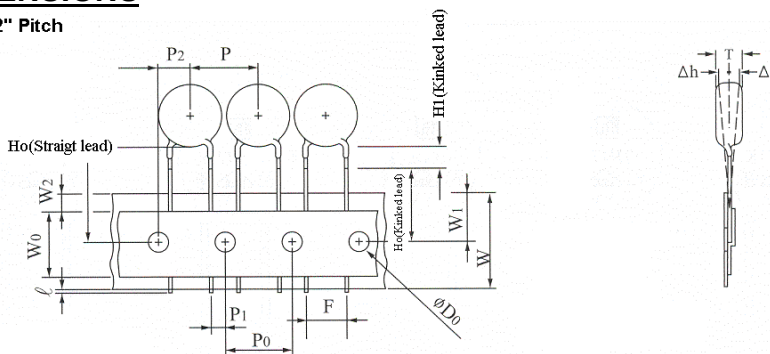
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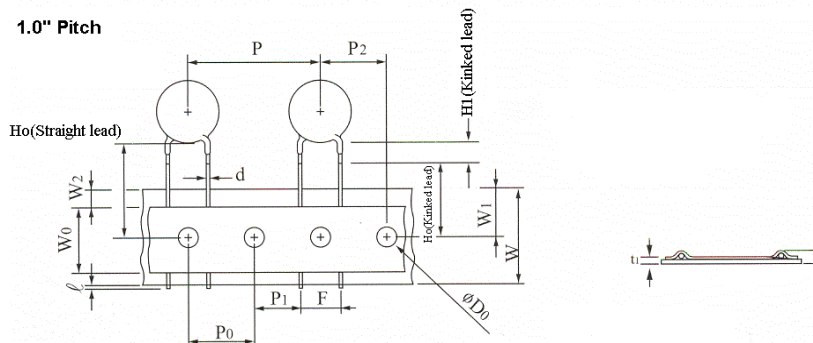
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TAPE AND REEL DIMENSIONS

1/2" Pitch



1.0" Pitch



| Symbols | Item | Value |
|-----------------------|--|---|
| ℓ | 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 |
| Δh | Front to back deviation | 0.0 ± 2.0mm |
| W | Carrier tape width | 18.0 ^{+1.0} _{-0.5} mm |
| W_0 | Hold down tape width | 10.0mm |
| W_1 | Sprocket hole position | 9.0 ^{+0.75} _{-0.5} mm |
| W_2 | Adhesive tape position | 3.0mm max. |
| F | Component lead spacing | 5.0 ^{+0.8} _{-0.2} 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. |



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-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management