

ROV20, ROV20H, ROV20E

20mm Series Metal Oxide Varistors

www.tycopowercomponents.com

Document: SCD 25484
Status: Released
Rev. A June 30, 2003

GENERAL DESCRIPTION

The ROV20-XXX (**R**adial-leaded Metal **O**xide **V**aristor) products are 20mm 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.

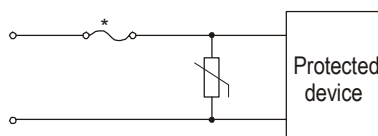
FEATURES

- Radial leaded
- Broad Varistor voltage and V_{rms} range
 - Varistor voltage : 18V - 1800V
 - V_{rms} voltage : 11V - 1000V
- Three surge capability series
 - Standard series, High surge series, Extra 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.

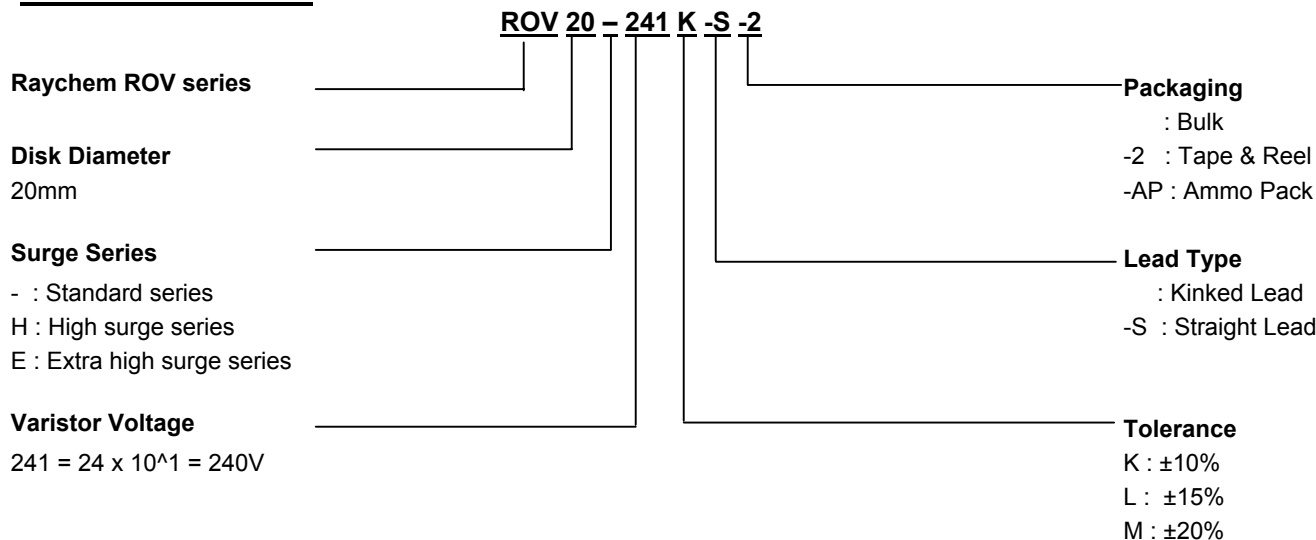
ROV20, ROV20H, ROV20E

20mm Series Metal Oxide Varistors

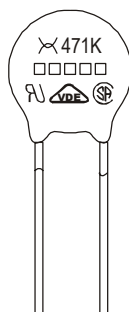
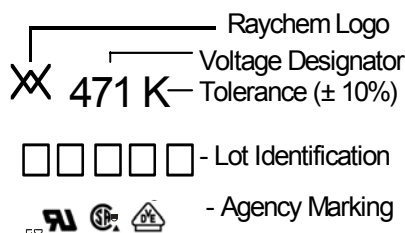
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PART NUMBERING



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 V _{DC}): | Over 1000MΩ |
| Maximum response time: | 25ns |
| Lead Material: | 22AWG 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@100A | 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) |  |
| ROV20-180M | 18 | ± 20% | 11 | 14 | 36 ¹⁾ | 2000 | 1000 | 0.20 | 7.0 | 27100 | ● ■ |
| ROV20-220M | 22 | | 14 | 18 | 43 ¹⁾ | | | | 8.0 | 21200 | ● ■ |
| ROV20-270M | 27 | | 17 | 22 | 53 ¹⁾ | | | | 10.0 | 20000 | ● ■ |
| ROV20-330M | 33 | | 20 | 26 | 65 ¹⁾ | | | | 12.0 | 17200 | ● ■ |
| ROV20-390L | 39 | ± 15% | 25 | 31 | 77 ¹⁾ | 2000 | 1000 | 0.20 | 14.0 | 15003 | ● ■ |
| ROV20-470L | 47 | | 30 | 38 | 93 ¹⁾ | | | | 17.0 | 12080 | ● ■ |
| ROV20-560L | 56 | | 35 | 45 | 110 ¹⁾ | | | | 20.0 | 11600 | ● ■ |
| ROV20-680L | 68 | | 40 | 56 | 135 ¹⁾ | | | | 24.0 | 9600 | ● ■ |
| ROV20-820K | 82 | ± 10% | 50 | 65 | 135 | 6500 | 4000 | 1.00 | 44.0 | 5200 | ● ■ |
| ROV20-101K | 100 | | 60 | 85 | 165 | | | | 56.0 | 4000 | ● ■ |
| ROV20-121K | 120 | | 75 | 100 | 200 | | | | 64.0 | 3800 | ● ■ |
| ROV20-151K | 150 | | 95 | 125 | 250 | | | | 88.0 | 3000 | ● ■ |
| ROV20-181K | 180 | | 115 | 150 | 300 | | | | 104.0 | 2400 | ● ■ |
| ROV20-201K | 200 | | 130 | 170 | 340 | | | | 114.0 | 1829 | ◆ ● ▲ ■ |
| ROV20-221K | 220 | | 140 | 180 | 360 | | | | 124.0 | 1600 | ◆ ● ▲ ■ |
| ROV20-241K | 240 | | 150 | 200 | 395 | | | | 134.0 | 1422 | ◆ ● ▲ ■ |
| ROV20-271K | 270 | | 175 | 225 | 455 | | | | 158.0 | 1261 | ◆ ● ▲ ■ |
| ROV20-301K | 300 | | 195 | 250 | 505 | | | | 168.0 | 1100 | ◆ ● ▲ ■ |
| ROV20-331K | 330 | | 210 | 275 | 550 | | | | 184.0 | 1106 | ◆ ● ▲ ■ |
| ROV20-361K | 360 | | 230 | 300 | 595 | | | | 208.0 | 987 | ◆ ● ▲ ■ |
| ROV20-391K | 390 | | 250 | 320 | 650 | | | | 240.0 | 975 | ◆ ● ▲ ■ |
| ROV20-431K | 430 | | 275 | 350 | 710 | | | | 264.0 | 858 | ◆ ● ▲ ■ |
| ROV20-471K | 470 | | 300 | 385 | 775 | | | | 280.0 | 761 | ◆ ● ▲ ■ |
| ROV20-511K | 510 | | 320 | 418 | 842 | | | | 296.0 | 792 | ◆ ● ▲ ■ |
| ROV20-561K | 560 | 350 | 460 | 920 | 312.0 | 679 | ◆ ● ▲ ■ | | | | |
| ROV20-621K | 620 | 385 | 505 | 1025 | 328.0 | 605 | ◆ ● ▲ ■ | | | | |
| ROV20-681K | 680 | 420 | 560 | 1120 | 344.0 | 553 | ◆ ● ▲ ■ | | | | |
| ROV20-751K | 750 | 460 | 615 | 1240 | 360.0 | 554 | ◆ ● ▲ ■ | | | | |
| ROV20-781K | 780 | 485 | 640 | 1290 | 368.0 | 481 | ◆ ● ▲ ■ | | | | |
| ROV20-821K | 820 | 510 | 670 | 1355 | 376.0 | 519 | ◆ ● ▲ ■ | | | | |
| ROV20-911K | 910 | 550 | 745 | 1500 | 408.0 | 444 | ◆ ● ▲ ■ | | | | |
| ROV20-102K | 1000 | 625 | 825 | 1650 | 448.0 | 400 | ◆ ● ▲ ■ | | | | |
| ROV20-112K | 1100 | 680 | 895 | 1815 | 496.0 | 360 | ◆ ● ▲ ■ | | | | |
| ROV20-182K | 1800 | 1000 | 1465 | 2970 | 695.0 | 260 | | | | | |

1) The clamping voltage for devices ROV20-180M to ROV20-680L is tested with 20A current.

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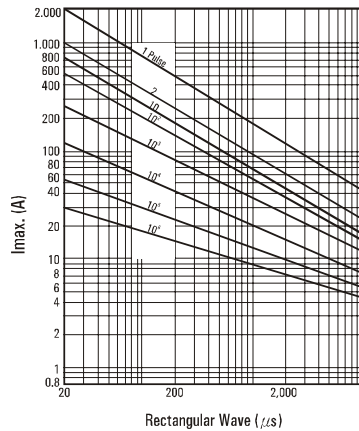
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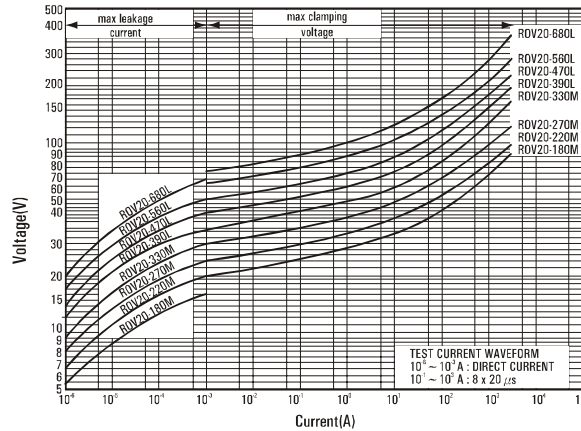
PULSE LIFETIME RATING CURVES
STANDARD SERIES

V-I CHARACTERISTIC CURVES
STANDARD SERIES

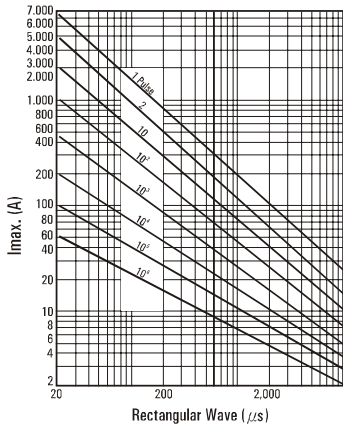
ROV20-180M – ROV20-680K



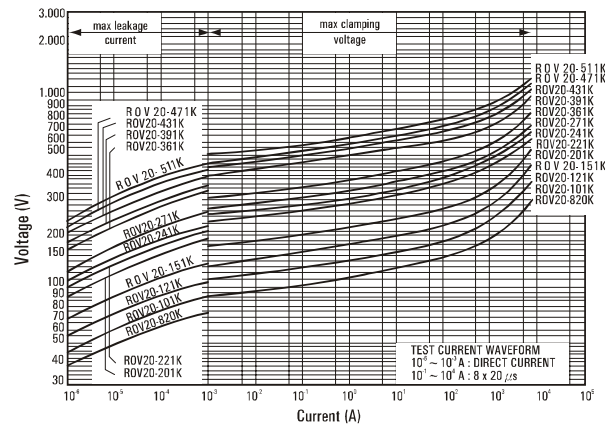
ROV20-180M – ROV20-680K



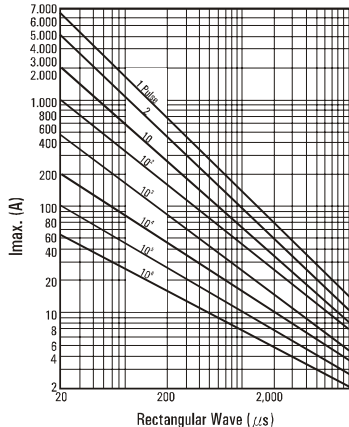
ROV20-820K – ROV20-511K



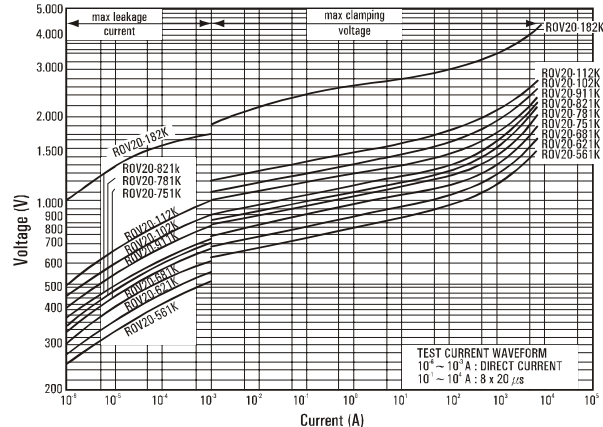
ROV20-820K – ROV20-511K



ROV20-561K – ROV20-182K



ROV20-561K – ROV20-182K



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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@100A | 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) | | | | |
| ROV20H180M | 18 | ± 20% | 11 | 14 | 36 ¹⁾ | 3000 | 2000 | 0.20 | 13.0 | 27100 | ● ■ | | | |
| ROV20H220M | 22 | | 14 | 18 | 43 ¹⁾ | | | | 16.0 | 21200 | ● ■ | | | |
| ROV20H270M | 27 | | 17 | 22 | 53 ¹⁾ | | | | 19.0 | 20000 | ● ■ | | | |
| ROV20H330M | 33 | | 20 | 26 | 65 ¹⁾ | | | | 24.0 | 17200 | ● ■ | | | |
| ROV20H390L | 39 | ± 15% | 25 | 31 | 77 ¹⁾ | | | | 28.0 | 15000 | ● ■ | | | |
| ROV20H470L | 47 | | 30 | 38 | 93 ¹⁾ | | | | 34.0 | 12100 | ● ■ | | | |
| ROV20H560L | 56 | | 35 | 45 | 110 ¹⁾ | | | | 41.0 | 11600 | ● ■ | | | |
| ROV20H680L | 68 | | 40 | 56 | 135 ¹⁾ | | | | 49.0 | 9600 | ● ■ | | | |
| ROV20H820K | 82 | ± 10% | 50 | 65 | 135 | | | | 10000 | 6500 | 1.00 | 56.0 | 5200 | ● ■ |
| ROV20H101K | 100 | | 60 | 85 | 165 | | | | | | | 72.0 | 4000 | ● ■ |
| ROV20H121K | 120 | | 75 | 100 | 200 | | | | | | | 88.0 | 3800 | ● ■ |
| ROV20H151K | 150 | | 95 | 125 | 250 | | | | | | | 106.0 | 3000 | ● ■ |
| ROV20H181K | 180 | | 115 | 150 | 300 | | | | | | | 130.0 | 2400 | ● ■ |
| ROV20H201K | 200 | | 130 | 170 | 340 | | | | | | | 140.0 | 1830 | ◆ ● ▲ ■ |
| ROV20H221K | 220 | | 140 | 180 | 360 | | | | | | | 155.0 | 1600 | ◆ ● ▲ ■ |
| ROV20H241K | 240 | | 150 | 200 | 395 | | | | | | | 168.0 | 1420 | ◆ ● ▲ ■ |
| ROV20H271K | 270 | | 175 | 225 | 455 | 190.0 | 1260 | ◆ ● ▲ ■ | | | | | | |
| ROV20H301K | 300 | | 195 | 250 | 505 | 210.0 | 1100 | ◆ ● ▲ ■ | | | | | | |
| ROV20H331K | 330 | | 210 | 275 | 550 | 228.0 | 1110 | ◆ ● ▲ ■ | | | | | | |
| ROV20H361K | 360 | | 230 | 300 | 595 | 255.0 | 990 | ◆ ● ▲ ■ | | | | | | |
| ROV20H391K | 390 | | 250 | 320 | 650 | 275.0 | 980 | ◆ ● ▲ ■ | | | | | | |
| ROV20H431K | 430 | | 275 | 350 | 710 | 303.0 | 860 | ◆ ● ▲ ■ | | | | | | |
| ROV20H471K | 470 | | 300 | 385 | 775 | 350.0 | 760 | ◆ ● ▲ ■ | | | | | | |
| ROV20H511K | 510 | | 320 | 418 | 842 | 382.0 | 790 | ◆ ● ▲ ■ | | | | | | |
| ROV20H561K | 560 | 350 | 460 | 920 | 410.0 | 680 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H621K | 620 | 385 | 505 | 1025 | 420.0 | 600 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H681K | 680 | 420 | 560 | 1120 | 430.0 | 550 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H751K | 750 | 460 | 615 | 1240 | 440.0 | 550 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H781K | 780 | 485 | 640 | 1290 | 450.0 | 480 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H821K | 820 | 510 | 670 | 1355 | 460.0 | 520 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H911K | 910 | 550 | 745 | 1500 | 510.0 | 440 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H102K | 1000 | 625 | 825 | 1650 | 566.0 | 400 | ◆ ● ▲ ■ | | | | | | | |
| ROV20H112K | 1100 | 680 | 895 | 1815 | 620.0 | 360 | ◆ ● ▲ ■ | | | | | | | |

1) The clamping voltage for devices ROV20H180M to ROV20H680L is tested with 20A current.

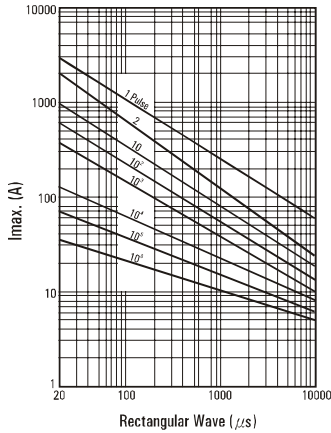
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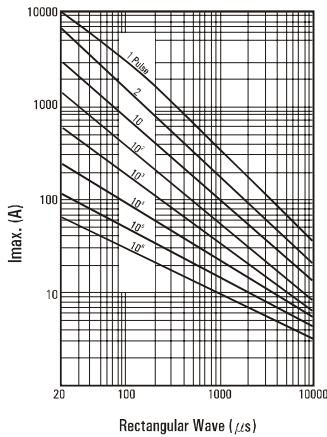
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PULSE LIFETIME RATING CURVES
HIGH SURGE SERIES

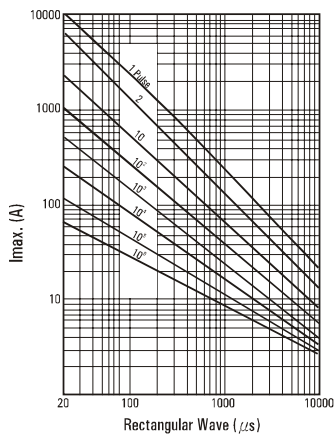
ROV20H180M – ROV20H680K



ROV20H820K – ROV20H511K

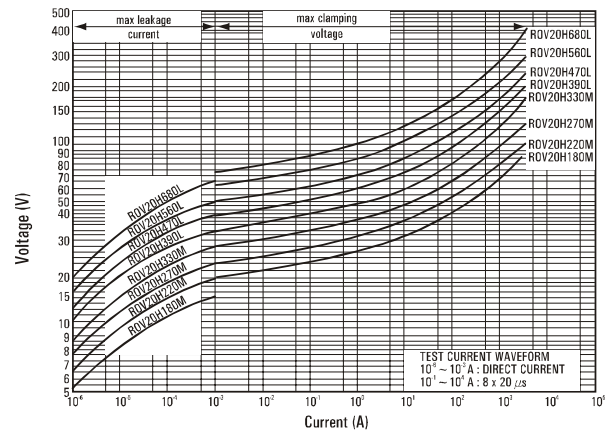


ROV20H561K – ROV20H182K

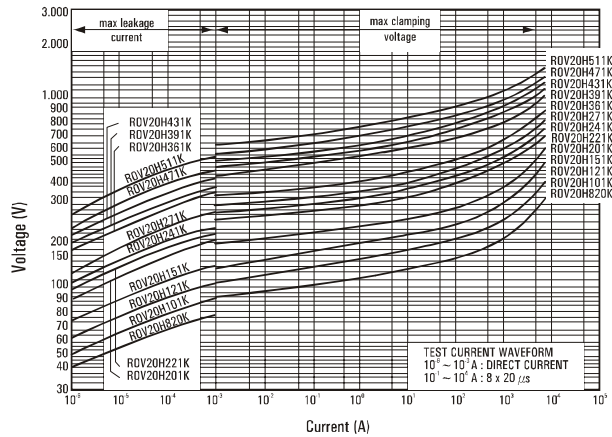


V-I CHARACTERISTIC CURVES
HIGH SURGE SERIES

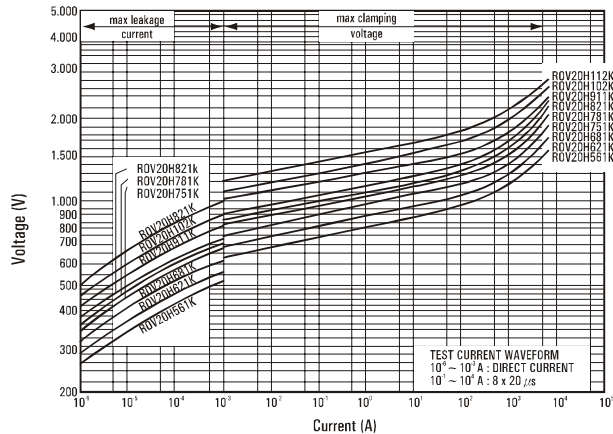
ROV20H180M – ROV20H680K



ROV20H820K – ROV20H511K



ROV20H561K – ROV20H182K




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DEVICE RATINGS AND CHARACTERISTICS

EXTRA HIGH SURGE SERIES

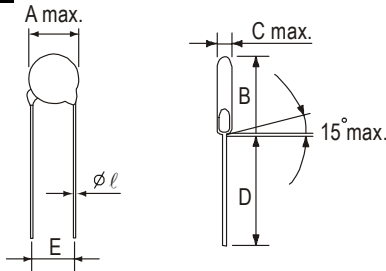
| Part Number | Varistor Voltage V@1.0mA | | Maximum Allowable Voltage | | Maximum Clamping Voltage V@100A | Maximum Surge Current (8x20us) | | Rated Wattage | Energy (10x1000us) | Capacitance (Typical) | Certifications |
|-------------|-----------------------------|-----------|--|--------------------|------------------------------------|-----------------------------------|-------------------|---------------|-----------------------|--------------------------|---|
| | (V _{DC}) | Tolerance | V _{rms} (V _{AC}) | (V _{DC}) | (V _{DC}) | 1 Time (A) | 2 Times (A) | (W) | (J) | @1kHz (pF) |  |
| ROV20E201K | 200 | ± 10% | 130 | 170 | 340 | 12500 | 10000 | 1.00 | 168.0 | 1830 | • ▲ |
| ROV20E221K | 220 | | 140 | 180 | 360 | | | | 186.0 | 1600 | • ▲ |
| ROV20E241K | 240 | | 150 | 200 | 395 | | | | 202.0 | 1420 | • ▲ |
| ROV20E271K | 270 | | 175 | 225 | 455 | | | | 227.0 | ----- | |
| ROV20E301K | 300 | | 195 | 250 | 505 | | | | 252.0 | ----- | |
| ROV20E331K | 330 | | 210 | 275 | 550 | | | | 277.0 | ----- | |
| ROV20E361K | 360 | | 230 | 300 | 595 | | | | 302.0 | ----- | |

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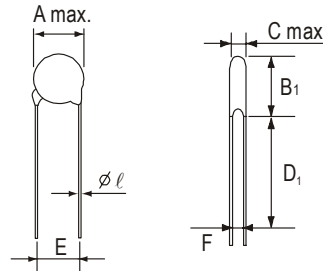
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DIMENSIONS



KINKED LEAD TYPE
Dimension Table

| | |
|-----------------|------|
| A max. | 23.0 |
| $\ell \pm 0.05$ | 1.0 |
| $E \pm 1.0$ | 10.0 |
| B max. | 28.0 |
| 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 | 5.2 | 0.9 | 26.5 |
| 220L | 5.3 | 1.0 | 26.5 |
| 270K | 5.4 | 1.1 | 26.5 |
| 330K | 5.4 | 1.2 | 26.5 |
| 390K | 5.4 | 1.4 | 26.5 |
| 470K | 5.6 | 1.4 | 26.5 |
| 560K | 5.6 | 1.6 | 26.5 |
| 680K | 6.1 | 1.9 | 26.5 |
| 820K | 4.9 | 1.2 | 26.5 |
| 101K | 5.1 | 1.2 | 26.5 |
| 121K | 5.3 | 1.3 | 26.5 |
| 151K | 5.6 | 1.6 | 26.5 |
| 181K | 5.2 | 1.4 | 26.5 |
| 201K | 5.3 | 1.4 | 26.5 |
| 221K | 5.4 | 1.5 | 26.5 |
| 241K | 5.5 | 1.7 | 26.5 |
| 271K | 5.7 | 1.9 | 26.5 |
| 301K | 5.9 | 2.1 | 26.5 |
| 331K | 6.0 | 2.1 | 26.5 |
| 361K | 6.2 | 2.3 | 26.5 |
| 391K | 6.4 | 2.4 | 26.5 |
| 431K | 7.2 | 2.7 | 26.5 |
| 471K | 7.5 | 2.9 | 27.0 |
| 511K | 7.7 | 3.3 | 27.0 |
| 561K | 8.0 | 3.6 | 27.0 |
| 621K | 8.3 | 4.1 | 27.0 |
| 681K | 8.7 | 4.4 | 27.0 |
| 751K | 9.1 | 4.5 | 27.0 |
| 781K | 9.3 | 4.8 | 27.0 |
| 821K | 9.5 | 4.8 | 27.0 |
| 911K | 10.1 | 5.7 | 27.0 |
| 102K | 10.7 | 5.8 | 27.0 |
| 112K | 11.2 | 6.3 | 27.0 |
| 182K | 13.5 | 10.4 | 29.0 |

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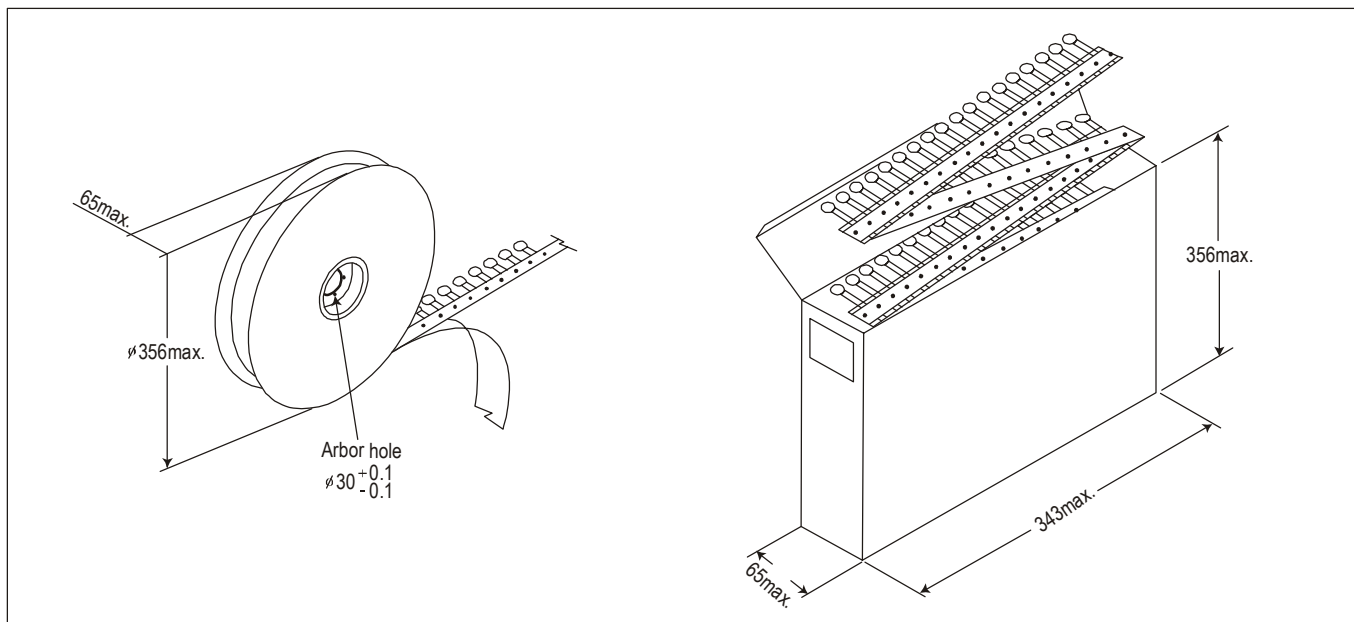
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PACKAGING

in mm



| Packaging | Bulk (box) | Reel | Ammo |
|------------------|-----------------|-------------------|-----------------|
| Box size (mm) | 290 x 155 x 110 | 350 x 350 x 74 | 350 x 260 x 65 |
| Carton size (mm) | 310 x 328 x 250 | 370 x 370 x 468 | 365 x 535 x 275 |
| One carton with | 4 Boxes | 6 Boxes (6 reels) | 8 Boxes |

| Part Number | Bulk (box) | Reel | Ammo |
|---|------------|------|------|
| ROV20-180M to ROV20-470K ROV20H180M to ROV20H470K | 750 | 500 | 500 |
| ROV20-560K to ROV20-680K, ROV20H560K to ROV20H680K | 750 | 500 | 500 |
| ROV20-820K to ROV20-331K, ROV20H820K to ROV20H331K | 750 | 500 | 500 |
| ROV20-361K to ROV20-391K, ROV20H361K to ROV20H391K | 750 | 500 | 500 |
| ROV20-431K to ROV20-471K, ROV20H431K to ROV20H471K | 750 | 500 | 500 |
| ROV20-511K to ROV20-751K, ROV20H511K to ROV20H751K | 450 | 500 | 500 |
| ROV20-781K to ROV20-182K, ROV20H781K to ROV20H112K | 450 | 500 | 500 |

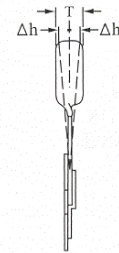
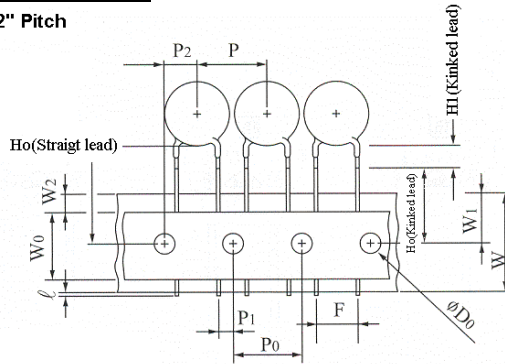
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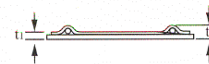
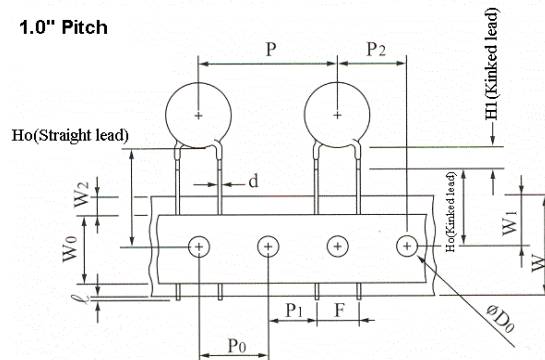
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TAPE AND REEL DIMENSIONS

1/2" Pitch



1.0" Pitch



| Symbols | Item | Value |
|--------------------------------|--|---|
| l | Cut out length | 1.1mm max. |
| H ₁ (Kinked type) | Height of kink | 3.5mm max. |
| H ₀ (Kinked type) | Height to seating plane | 16.0 ± 0.5mm |
| H ₀ (Straight type) | 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 | 12.0mm |
| W ₁ | Sprocket hole position | 9.0 ^{+0.75} _{-0.5} mm |
| W ₂ | Adhesive tape position | 3.0mm max. |
| F | Component lead spacing | 10.0 ^{+0.8} _{-0.2} mm |
| P | Pitch of component | 25.4 ± 1.0mm |
| P ₀ | Sprocket hole pitch | 12.7 ± 0.3mm |
| P ₁ | Lead length from hole center to lead | 7.7 ± 0.7mm, 8.95 ± 0.7mm |
| P ₂ | Length from hole center to disk center | 12.7 ± 1.3mm |
| D ₀ | Sprocket hole diameter | 4.0 ± 0.2mm |
| d | Lead wire diameter | 0.8 ± 0.05mm, 1.0 ± 0.05mm |
| T | Disk thickness | See C. max table |
| t ₁ | Total thickness tape | 0.7 ± 0.05mm |
| t ₂ | Total thickness | 1.8mm max. |



ROV20, ROV20H, ROV20E 20mm Series Metal Oxide Varistors

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