

# ROV20, ROV20H, ROV20E

## 20mm Series Metal Oxide Varistors

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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.

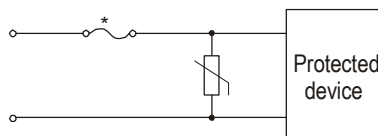
### FEATURES

- 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.

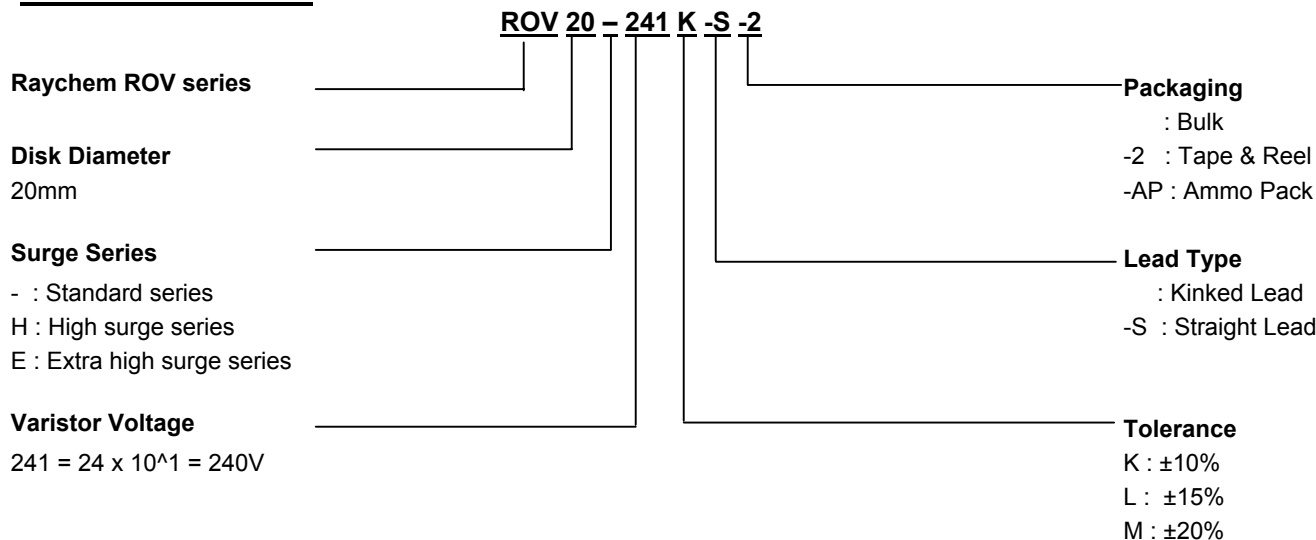
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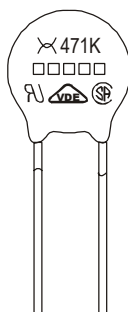
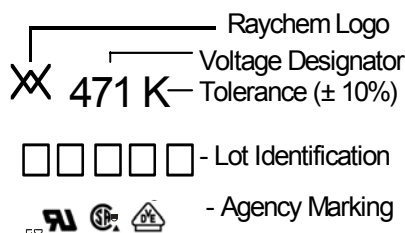
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### PART NUMBERING



### 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 V <sub>DC</sub> ):	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 <sub>DC</sub> )	Tolerance	V <sub>rms</sub> (V <sub>AC</sub> )	(V <sub>DC</sub> )	(V <sub>DC</sub> )	1 Time (A)	2 Times (A)	(W)	(J)	@1kHz (pF)							
ROV20-180M	18	± 20%	11	14	36 <sup>1)</sup>	2000	1000	0.20	7.0	27100	● ■						
ROV20-220M	22		14	18	43 <sup>1)</sup>				8.0	21200	● ■						
ROV20-270M	27		17	22	53 <sup>1)</sup>				10.0	20000	● ■						
ROV20-330M	33		20	26	65 <sup>1)</sup>				12.0	17200	● ■						
ROV20-390L	39	± 15%	25	31	77 <sup>1)</sup>				6500	4000	1.00	14.0	15003	● ■			
ROV20-470L	47		30	38	93 <sup>1)</sup>							17.0	12080	● ■			
ROV20-560L	56		35	45	110 <sup>1)</sup>							20.0	11600	● ■			
ROV20-680L	68		40	56	135 <sup>1)</sup>							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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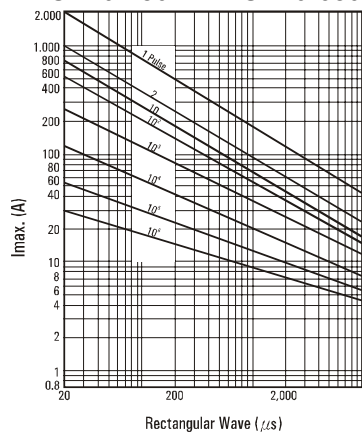
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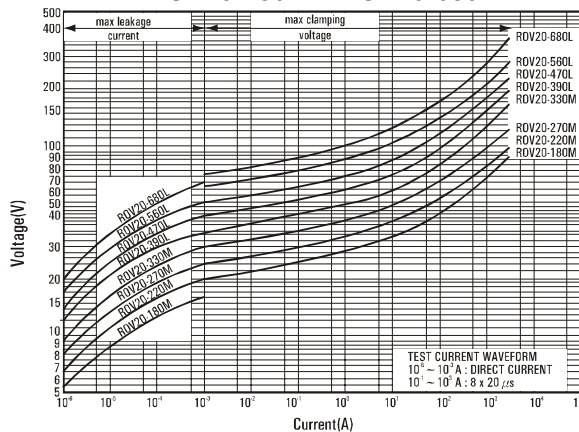
**PULSE LIFETIME RATING CURVES**  
**STANDARD SERIES**

**V-I CHARACTERISTIC CURVES**  
**STANDARD SERIES**

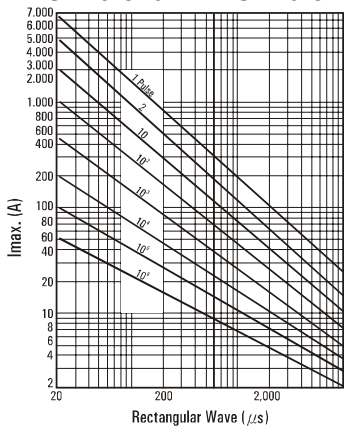
**ROV20-180M – ROV20-680K**



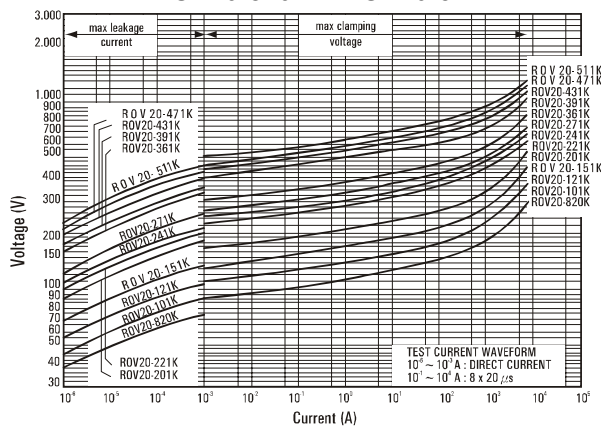
**ROV20-180M – ROV20-680K**



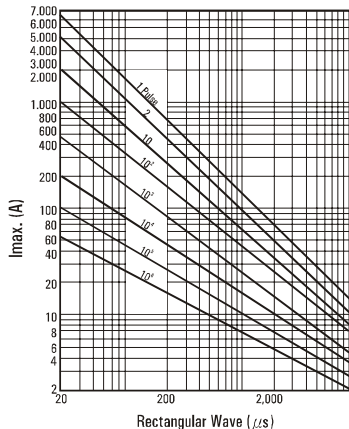
**ROV20-820K – ROV20-511K**



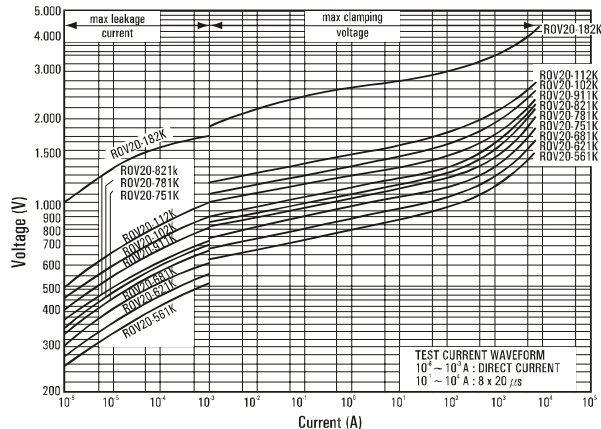
**ROV20-820K – ROV20-511K**



**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 <sub>DC</sub> )	Tolerance	V <sub>rms</sub> (V <sub>AC</sub> )	(V <sub>DC</sub> )	(V <sub>DC</sub> )	1 Time (A)	2 Times (A)	(W)	(J)	@1kHz (pF)				
ROV20H180M	18	± 20%	11	14	36 <sup>1)</sup>	3000	2000	0.20	13.0	27100	● ■			
ROV20H220M	22		14	18	43 <sup>1)</sup>				16.0	21200	● ■			
ROV20H270M	27		17	22	53 <sup>1)</sup>				19.0	20000	● ■			
ROV20H330M	33		20	26	65 <sup>1)</sup>				24.0	17200	● ■			
ROV20H390L	39	± 15%	25	31	77 <sup>1)</sup>				28.0	15000	● ■			
ROV20H470L	47		30	38	93 <sup>1)</sup>				34.0	12100	● ■			
ROV20H560L	56		35	45	110 <sup>1)</sup>				41.0	11600	● ■			
ROV20H680L	68		40	56	135 <sup>1)</sup>				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.

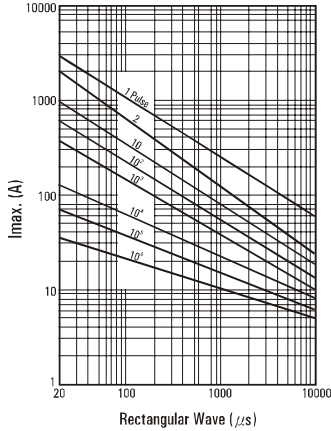
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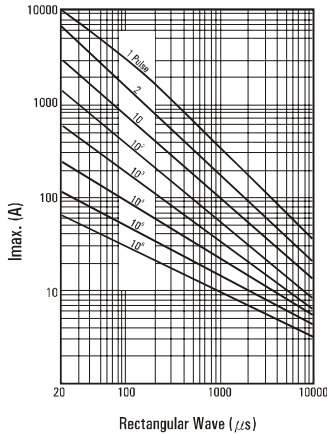
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**PULSE LIFETIME RATING CURVES**  
**HIGH SURGE SERIES**

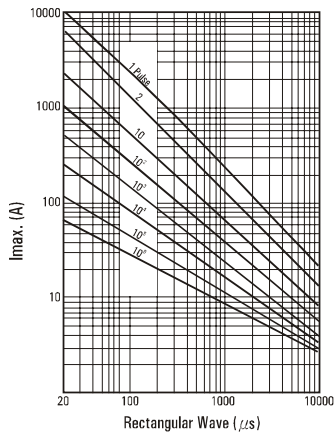
**ROV20H180M – ROV20H680K**



**ROV20H820K – ROV20H511K**

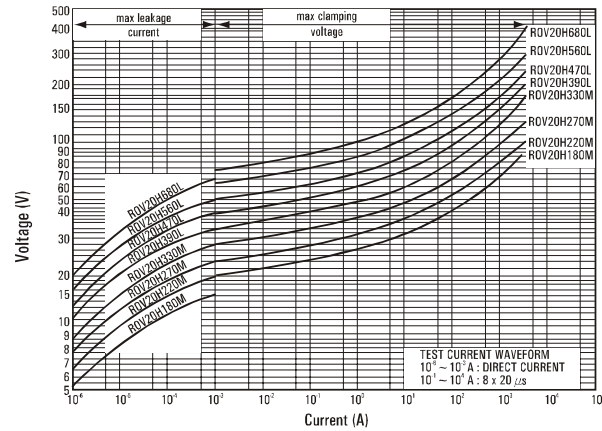


**ROV20H561K – ROV20H182K**

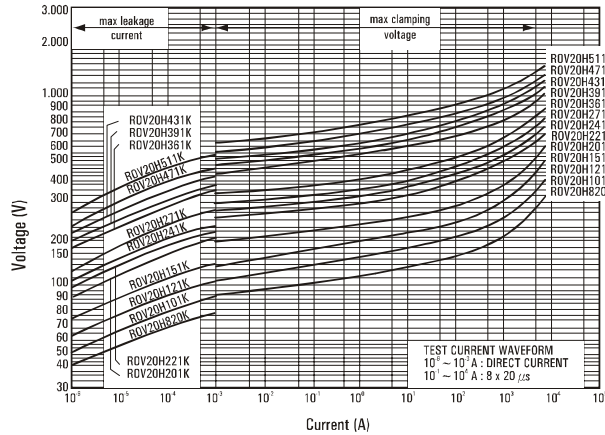


**V-I CHARACTERISTIC CURVES**  
**HIGH SURGE SERIES**

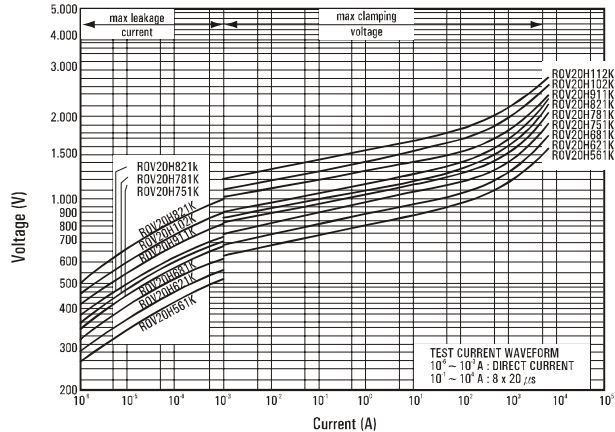
**ROV20H180M – ROV20H680K**



**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 <sub>DC</sub> )	Tolerance	V <sub>rms</sub> (V <sub>AC</sub> )	(V <sub>DC</sub> )	(V <sub>DC</sub> )	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	-----	

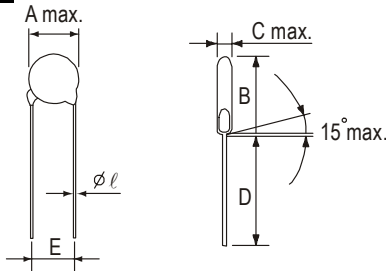


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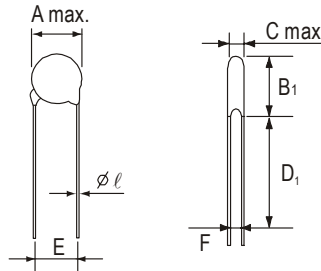
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**DIMENSIONS**



**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 B<sub>1</sub> max.

Type No.	C max.	F $\pm 0.8$	B <sub>1</sub> 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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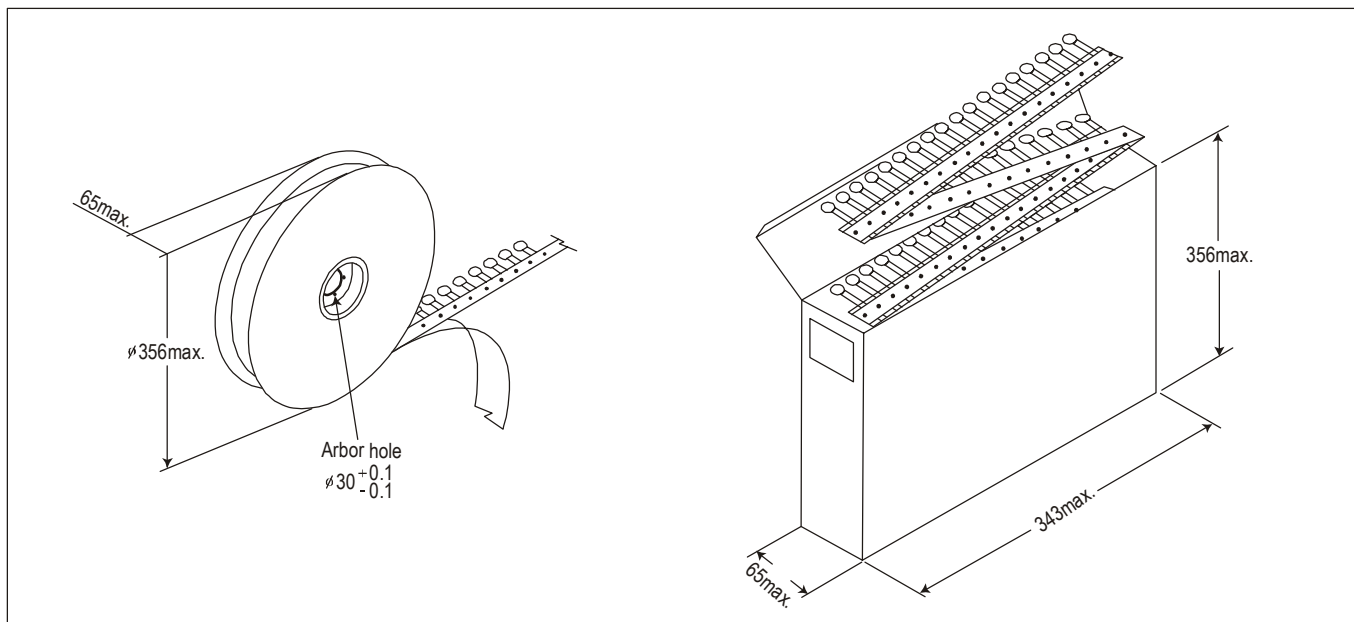
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### PACKAGING

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

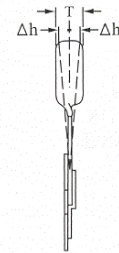
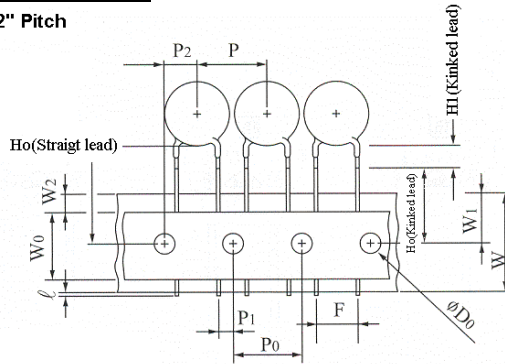
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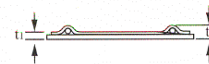
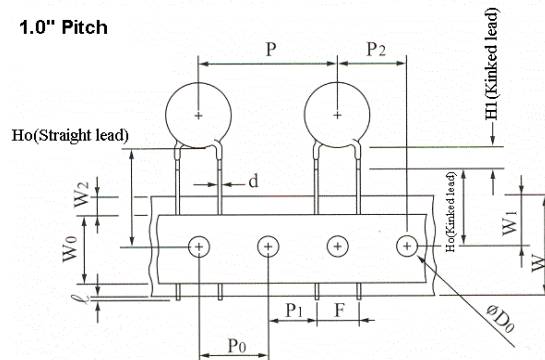
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**TAPE AND REEL DIMENSIONS**

1/2" Pitch



1.0" Pitch



Symbols	Item	Value
l	Cut out length	1.1mm max.
H <sub>1</sub> (Kinked type)	Height of kink	3.5mm max.
H <sub>0</sub> (Kinked type)	Height to seating plane	16.0 ± 0.5mm
H <sub>0</sub> (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 <sup>+1.0</sup> <sub>-0.5</sub> mm
W <sub>0</sub>	Hold down tape width	12.0mm
W <sub>1</sub>	Sprocket hole position	9.0 <sup>+0.75</sup> <sub>-0.5</sub> mm
W <sub>2</sub>	Adhesive tape position	3.0mm max.
F	Component lead spacing	10.0 <sup>+0.8</sup> <sub>-0.2</sub> mm
P	Pitch of component	25.4 ± 1.0mm
P <sub>0</sub>	Sprocket hole pitch	12.7 ± 0.3mm
P <sub>1</sub>	Lead length from hole center to lead	7.7 ± 0.7mm, 8.95 ± 0.7mm
P <sub>2</sub>	Length from hole center to disk center	12.7 ± 1.3mm
D <sub>0</sub>	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 <sub>1</sub>	Total thickness tape	0.7 ± 0.05mm
t <sub>2</sub>	Total thickness	1.8mm max.



## ROV20, ROV20H, ROV20E 20mm Series Metal Oxide Varistors

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