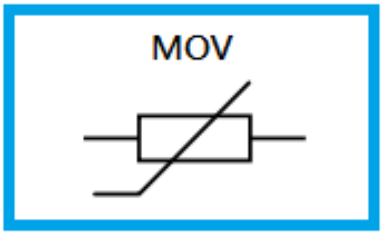
PVR20D Series MOV Devices

Features

- Wide operating voltages ranging from 10 V_{RMS} to 1000 V_{RMS} (14 V_{DC} to 1465 V_{DC}).
- Fast response time of less than 25 ns, instantly clamping the transient over voltage.
- High surge current handling capability.
- High energy absorption capability.
- Low clamping voltages, providing better surge protection.
- Low capacitance values, providing digital switching circuitry protection.
- High insulation resistance, preventing electric arcing to the adjacent devices or circuits.



Applications

- Transistor, diode, IC, thyristor or triac semiconductor protection.
- Surge protection in consumer electronics.
- Surge protection in industrial electronics.
- Surge protection in electronic home appliances, gas and petroleum appliances.
- Relay and electromagnetic valve surge absorption.

Agency Approval

- UL file no.: E475869
- VDE file no.: 40042411

General Characteristics Definition

- Operating temperature: -40 ~ 85°C
- Storage temperature: -40 ~ 125°C
- Working surface temperature: 115°C
- Insulation resistance: >100 MΩ
- Coating (Epoxy resin): Flame-Retardant to UL 94 V-0

Material

- Coating: Epoxy resin
- Lead wire: Tin plated copper
- Electrode: Silver solder
- Disk: Zinc oxide

Part Number Code

PVR 20 D □□□ □ □ - □ □

- Bulk or taping (B: Bulk; A: Ammo; R: Reel)
- Lead Form (S: Straight; C: Crimped)
- High surge & high energy (J: High surge; Blank: Standard)
- Tolerance of varistor voltage (K: ±10%; L: ±15%; M: ±20%)
- Varistor voltage
- Disc type device
- Chip Diameter (20: 20 mm)
- PolyTrans Varistor

PVR20D Series MOV Devices

Electrical Characteristics (Standard Product)

Part Number	Max Allowable Voltage		Varistor Voltage V_b @ 1 mA	Energy 10/1000 μs	Withstand Surge Current 8/20 μs	Rated Power	Max Leakage Current @ V_{DC}	Max Clamping Voltage		Typical Capacitance
	V_{RMS}	V_{DC}						V	I	
	(V)	(V)	(V)	(J)	(A)	(W)	(μA)	(V)	(A)	(pF)
PVR20D180L	10	14	18	6.1	2000	0.2	30	38	20.0	19000
PVR20D220K	14	18	22	7.4	2000	0.2	30	43	20.0	15000
PVR20D270K	17	22	27	9.1	2000	0.2	30	53	20.0	12000
PVR20D330K	20	26	33	11.2	2000	0.2	30	65	20.0	10000
PVR20D390K	25	31	39	13.2	2000	0.2	30	77	20.0	8500
PVR20D470K	30	38	47	16.8	2000	0.2	30	93	20.0	7400
PVR20D560K	35	45	56	19.6	2000	0.2	30	110	20.0	6500
PVR20D680K	40	56	68	23.8	2000	0.2	30	135	20.0	5800
PVR20D820K	50	65	82	37.8	6500	1.0	20	135	100.0	4900
PVR20D101K	60	85	100	42.0	6500	1.0	20	165	100.0	4000
PVR20D121K	75	100	120	56.0	6500	1.0	20	200	100.0	3300
PVR20D151K	95	125	150	70.0	6500	1.0	20	250	100.0	2700
PVR20D181K	115	150	180	84.0	6500	1.0	20	300	100.0	2200
PVR20D201K	130	170	200	98.0	6500	1.0	20	330	100.0	2000
PVR20D221K	140	180	220	105.0	6500	1.0	20	360	100.0	1800
PVR20D241K	150	200	240	112.0	6500	1.0	20	395	100.0	1650
PVR20D271K	175	225	270	126.0	6500	1.0	20	455	100.0	1500
PVR20D301K	190	250	300	133.0	6500	1.0	20	505	100.0	1300
PVR20D331K	210	275	330	140.0	6500	1.0	20	550	100.0	1200
PVR20D361K	230	300	360	168.0	6500	1.0	20	595	100.0	1100
PVR20D391K	250	320	390	182.0	6500	1.0	20	650	100.0	1000
PVR20D431K	275	350	430	196.0	6500	1.0	20	710	100.0	930
PVR20D471K	300	385	470	202.0	6500	1.0	20	775	100.0	850
PVR20D511K	320	415	510	207.0	6500	1.0	20	845	100.0	780
PVR20D561K	350	460	560	210.0	6500	1.0	20	920	100.0	715
PVR20D621K	385	505	620	224.0	6500	1.0	20	1025	100.0	650
PVR20D681K	420	560	680	224.0	6500	1.0	20	1120	100.0	600
PVR20D751K	460	615	750	230.0	6500	1.0	20	1240	100.0	530
PVR20D781K	485	640	780	240.0	6500	1.0	20	1290	100.0	510
PVR20D821K	510	670	820	250.0	6500	1.0	20	1355	100.0	500
PVR20D911K	550	745	910	260.0	6500	1.0	20	1500	100.0	440
PVR20D102K	625	825	1000	270.0	6500	1.0	20	1650	100.0	400
PVR20D112K	680	895	1100	280.0	6500	1.0	20	1815	100.0	360
PVR20D152K	900	1200	1500	420.0	6500	1.0	20	2475	100.0	260
PVR20D182K	1000	1465	1800	560.0	6500	1.0	20	2970	100.0	220

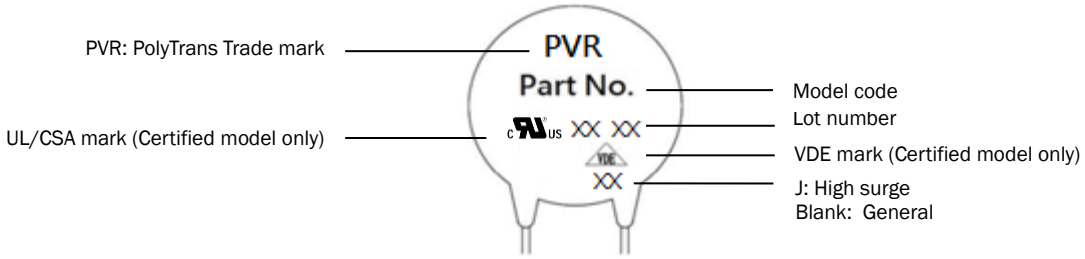
PVR20D Series MOV Devices

Electrical Characteristics (High Surge Product)

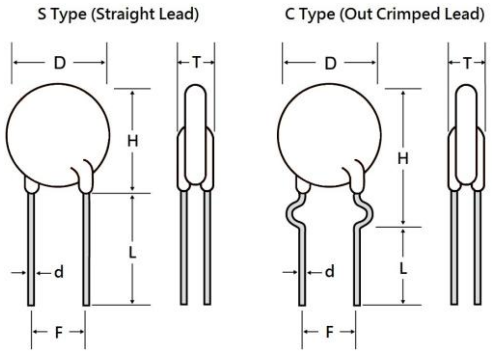
Part Number	Max Allowable Voltage		Varistor Voltage V_b @ 1 mA	Energy 10/1000 μs	Withstand Surge Current 8/20 μs	Rated Power	Max Leakage Current @ V_{DC}	Max Clamping Voltage		Typical Capacitance
	V_{RMS}	V_{DC}						V	I	
	(V)	(V)	(V)	(J)	(A)	(W)	(μA)	(V)	(A)	(pF)
PVR20D180LJ	10	14	18	13.0	3000	0.2	30	38	20.0	19000
PVR20D220KJ	14	18	22	16.0	3000	0.2	30	43	20.0	15000
PVR20D270KJ	17	22	27	19.0	3000	0.2	30	53	20.0	12000
PVR20D330KJ	20	26	33	24.0	3000	0.2	30	65	20.0	10000
PVR20D390KJ	25	31	39	28.0	3000	0.2	30	77	20.0	8500
PVR20D470KJ	30	38	47	34.0	3000	0.2	30	93	20.0	7400
PVR20D560KJ	35	45	56	41.0	3000	0.2	30	110	20.0	6500
PVR20D680KJ	40	56	68	49.0	3000	0.2	30	135	20.0	5800
PVR20D820KJ	50	65	82	56.0	10000	1.0	20	135	100.0	4900
PVR20D101KJ	60	85	100	70.0	10000	1.0	20	165	100.0	4000
PVR20D121KJ	75	100	120	85.0	10000	1.0	20	200	100.0	3300
PVR20D151KJ	95	125	150	106.0	10000	1.0	20	250	100.0	2700
PVR20D181KJ	115	150	180	130.0	10000	1.0	20	300	100.0	2200
PVR20D201KJ	130	170	200	140.0	10000	1.0	20	330	100.0	2000
PVR20D221KJ	140	180	220	155.0	10000	1.0	20	360	100.0	1800
PVR20D241KJ	150	200	240	168.0	10000	1.0	20	395	100.0	1650
PVR20D271KJ	175	225	270	190.0	10000	1.0	20	455	100.0	1500
PVR20D301KJ	190	250	300	210.0	10000	1.0	20	505	100.0	1300
PVR20D331KJ	210	275	330	228.0	10000	1.0	20	550	100.0	1200
PVR20D361KJ	230	300	360	255.0	10000	1.0	20	595	100.0	1100
PVR20D391KJ	250	320	390	275.0	10000	1.0	20	650	100.0	1000
PVR20D431KJ	275	350	430	305.0	10000	1.0	20	710	100.0	930
PVR20D471KJ	300	385	470	350.0	10000	1.0	20	775	100.0	850
PVR20D511KJ	320	415	510	360.0	10000	1.0	20	845	100.0	780
PVR20D561KJ	350	460	560	366.0	10000	1.0	20	920	100.0	715
PVR20D621KJ	385	505	620	372.0	10000	1.0	20	1025	100.0	650
PVR20D681KJ	420	560	680	382.0	10000	1.0	20	1120	100.0	600
PVR20D751KJ	460	615	750	410.0	10000	1.0	20	1240	100.0	530
PVR20D781KJ	485	640	780	421.0	10000	1.0	20	1290	100.0	510
PVR20D821KJ	510	670	820	460.0	10000	1.0	20	1355	100.0	500
PVR20D911KJ	550	745	910	510.0	10000	1.0	20	1500	100.0	440
PVR20D102KJ	625	825	1000	560.0	10000	1.0	20	1650	100.0	400
PVR20D112KJ	680	895	1100	620.0	10000	1.0	20	1815	100.0	360
PVR20D152KJ	900	1200	1500	780.0	10000	1.0	20	2475	100.0	260
PVR20D182KJ	1000	1465	1800	860.0	10000	1.0	20	2970	100.0	220

PVR20D Series MOV Devices

Marking Definitions



Physical Dimensions



Symbol		Dimension (mm)
D		23.0 max.
H	S type	25.0 max.
	C type	29.0 max.
L		15.0 min.
F		10.0±0.8
d		1.0±0.05

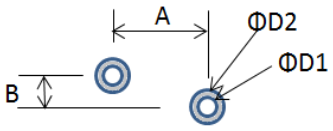
Part Number	T (Max) (mm)
PVR20D180L	4.0
PVR20D220K	4.0
PVR20D270K	4.0
PVR20D330K	4.2
PVR20D390K	4.5
PVR20D470K	4.5
PVR20D560K	4.1
PVR20D680K	4.1
PVR20D820K	4.1
PVR20D101K	4.3
PVR20D121K	4.5
PVR20D151K	4.8

Part Number	T (Max) (mm)
PVR20D181K	4.1
PVR20D201K	4.1
PVR20D221K	4.2
PVR20D241K	4.3
PVR20D271K	4.5
PVR20D301K	4.7
PVR20D331K	4.8
PVR20D361K	5.0
PVR20D391K	5.1
PVR20D431K	5.3
PVR20D471K	5.6
PVR20D511K	5.8

Part Number	T (Max) (mm)
PVR20D561K	6.2
PVR20D621K	6.4
PVR20D681K	6.4
PVR20D751K	6.5
PVR20D781K	6.8
PVR20D821K	7.2
PVR20D911K	7.6
PVR20D102K	7.8
PVR20D112K	8.5
PVR20D152K	11.0
PVR20D182K	12.5

PVR20D Series MOV Devices

Recommended Pad Layout



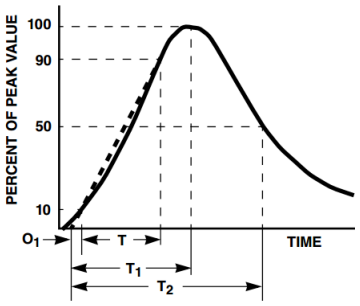
Symbol	Dimension (mm)
A	10.0 typ.
ΦD1	1.6 typ.
ΦD2	3.2 typ.

Part Number	B (Typ) (mm)
PVR20D180L	1.7
PVR20D220K	1.8
PVR20D270K	2.0
PVR20D330K	2.2
PVR20D390K	2.4
PVR20D470K	2.5
PVR20D560K	2.7
PVR20D680K	1.9
PVR20D820K	2.0
PVR20D101K	2.0
PVR20D121K	2.1
PVR20D151K	2.2

Part Number	B (Typ) (mm)
PVR20D181K	2.0
PVR20D201K	2.0
PVR20D221K	2.1
PVR20D241K	2.2
PVR20D271K	2.2
PVR20D301K	2.2
PVR20D331K	2.3
PVR20D361K	2.5
PVR20D391K	2.6
PVR20D431K	2.8
PVR20D471K	2.9
PVR20D511K	3.1

Part Number	B (Typ) (mm)
PVR20D561K	3.3
PVR20D621K	3.6
PVR20D681K	3.8
PVR20D751K	4.1
PVR20D781K	4.2
PVR20D821K	4.4
PVR20D911K	4.7
PVR20D102K	5.0
PVR20D112K	5.4
PVR20D152K	6.4
PVR20D182K	6.7

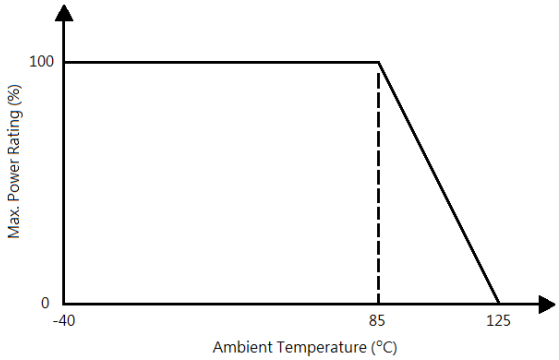
Peak Pulse Current Test Waveform



O_1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T1 = Rise Time = 1.25 x T
T2 = Decay Time

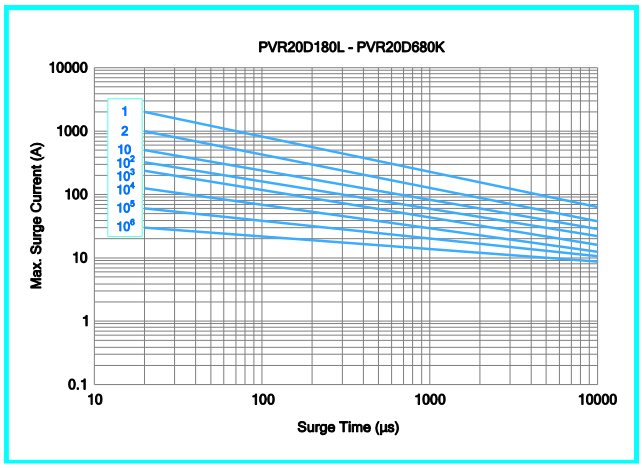
Example – For an 8/20 μs current waveform
8 μs = T1 = Rise Time
20 μs = T2 = Decay Time

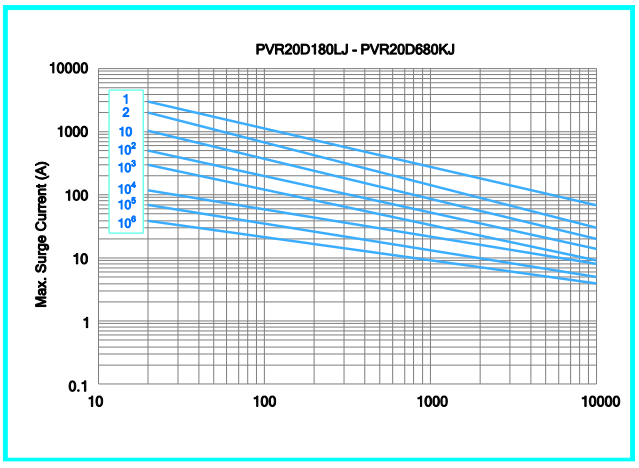
Power Derating Curve

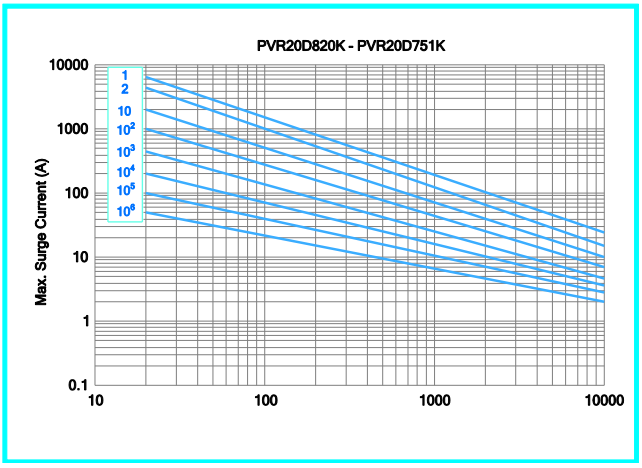


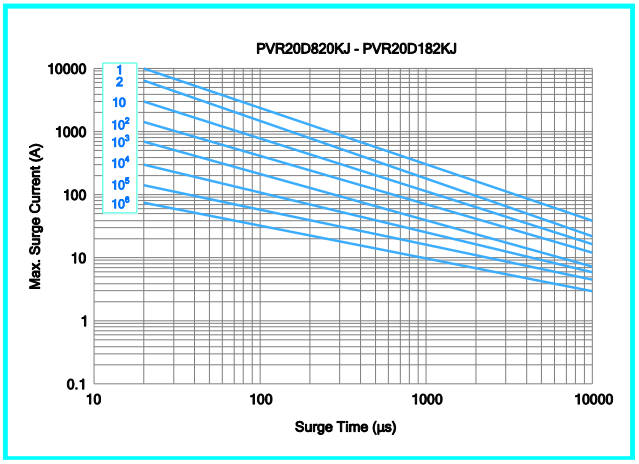
PVR20D Series MOV Devices

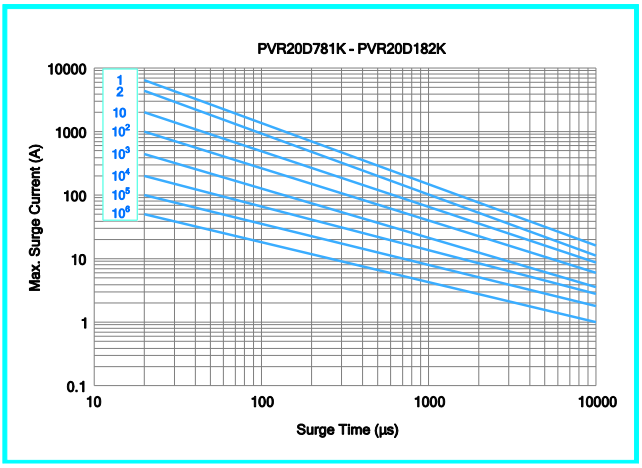
Pulse Rating Curves





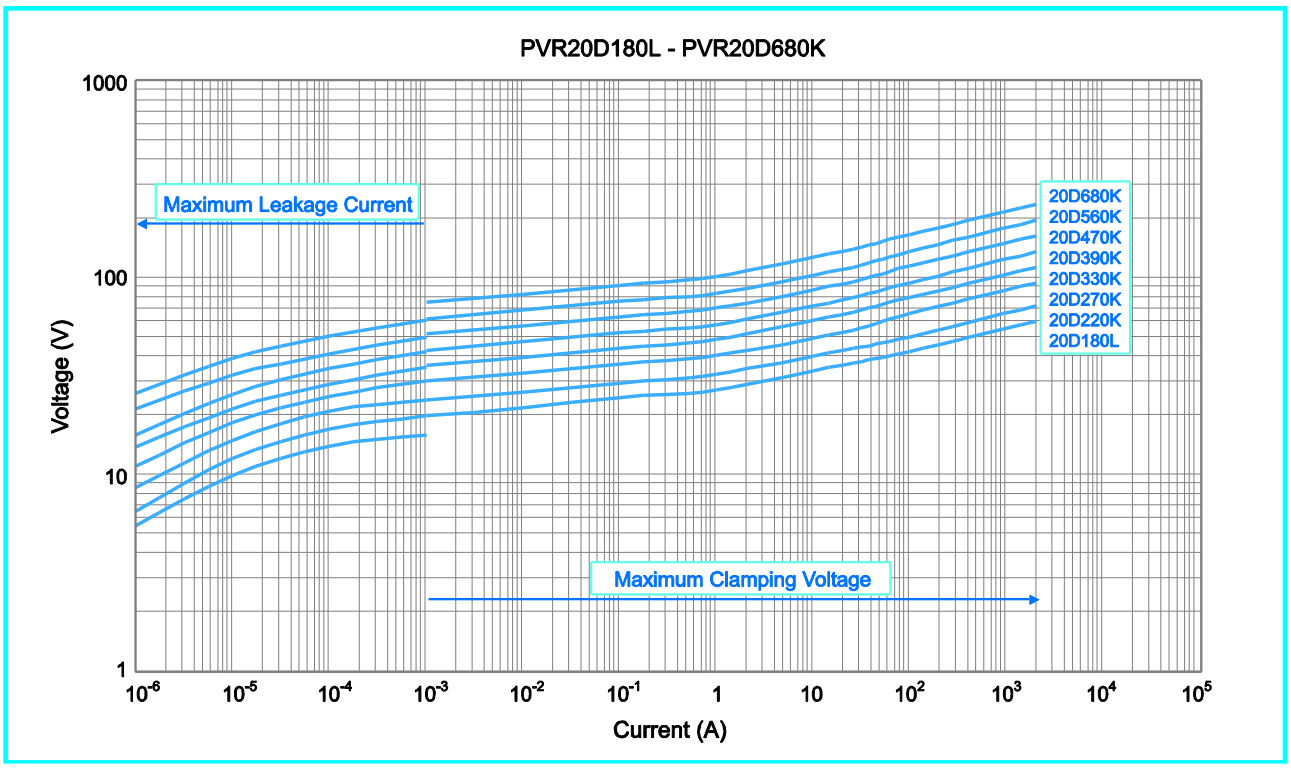


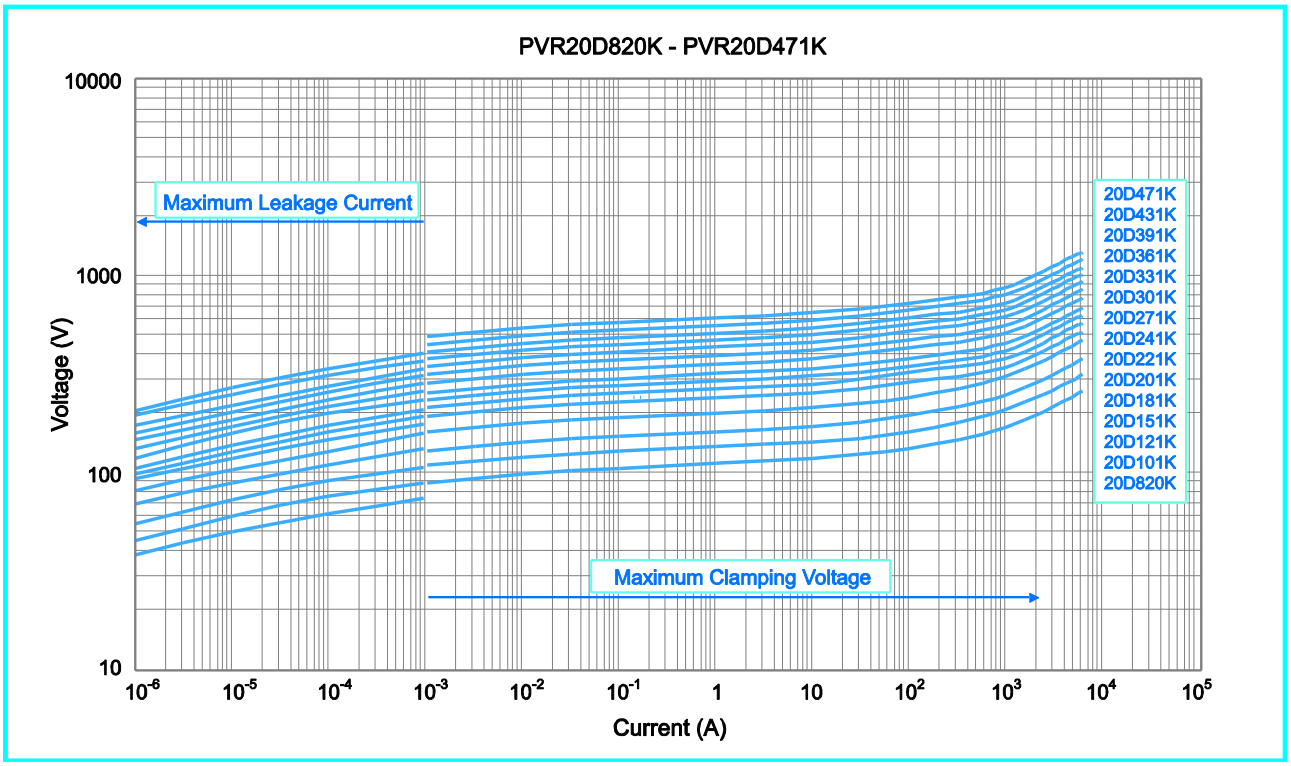




PVR20D Series MOV Devices

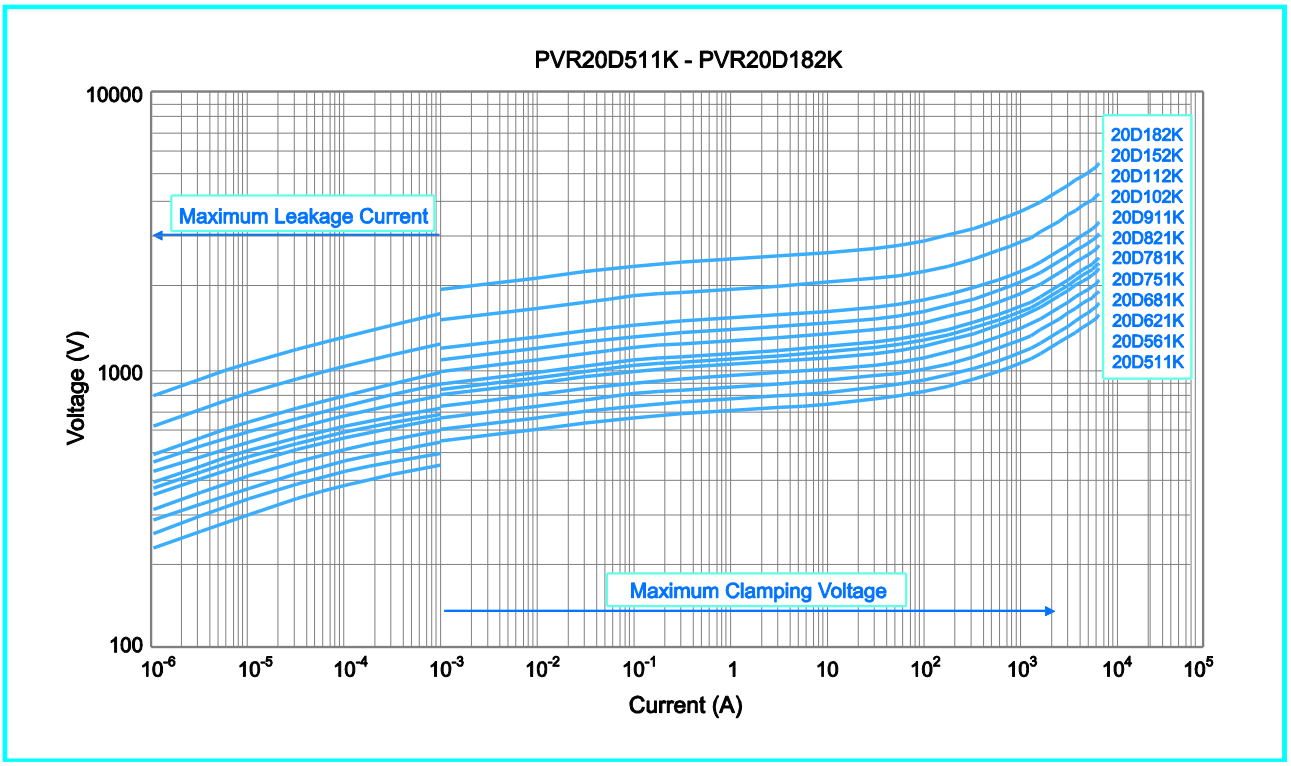
V-I Characteristics Curves

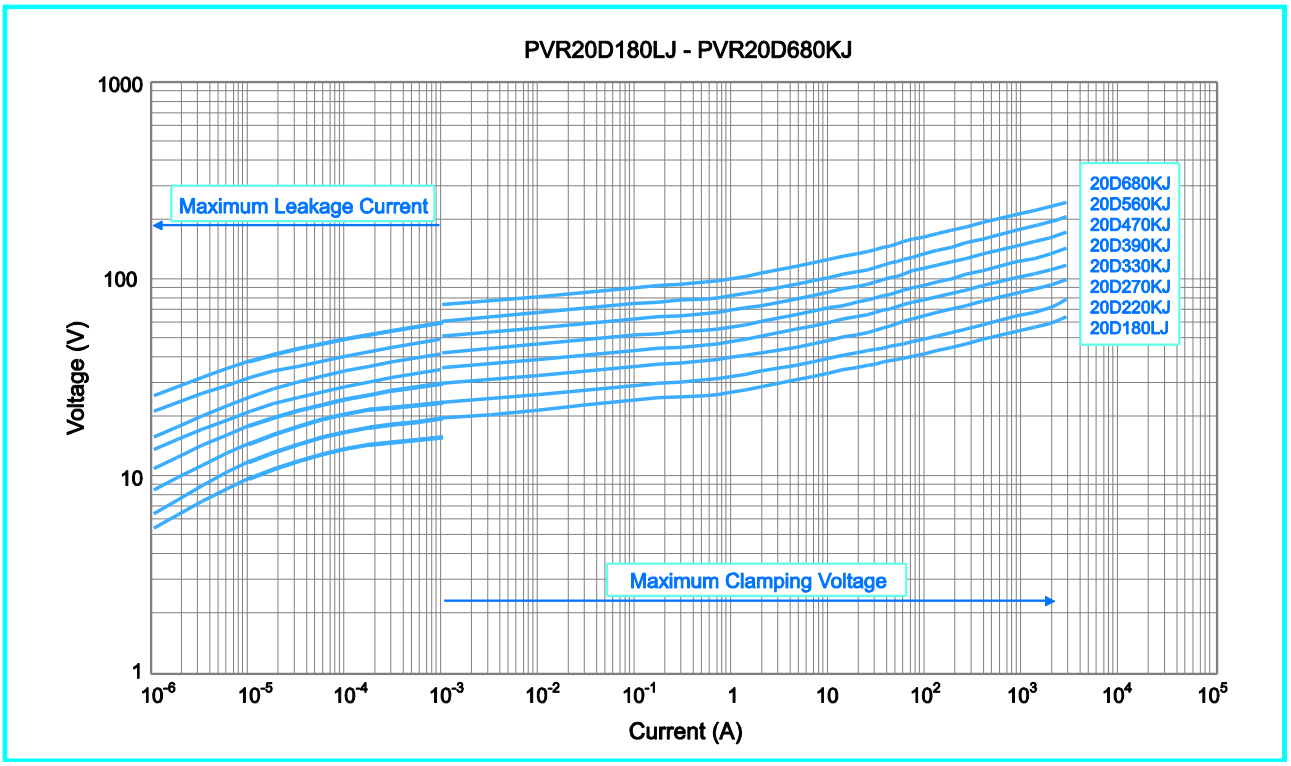




PVR20D Series MOV Devices

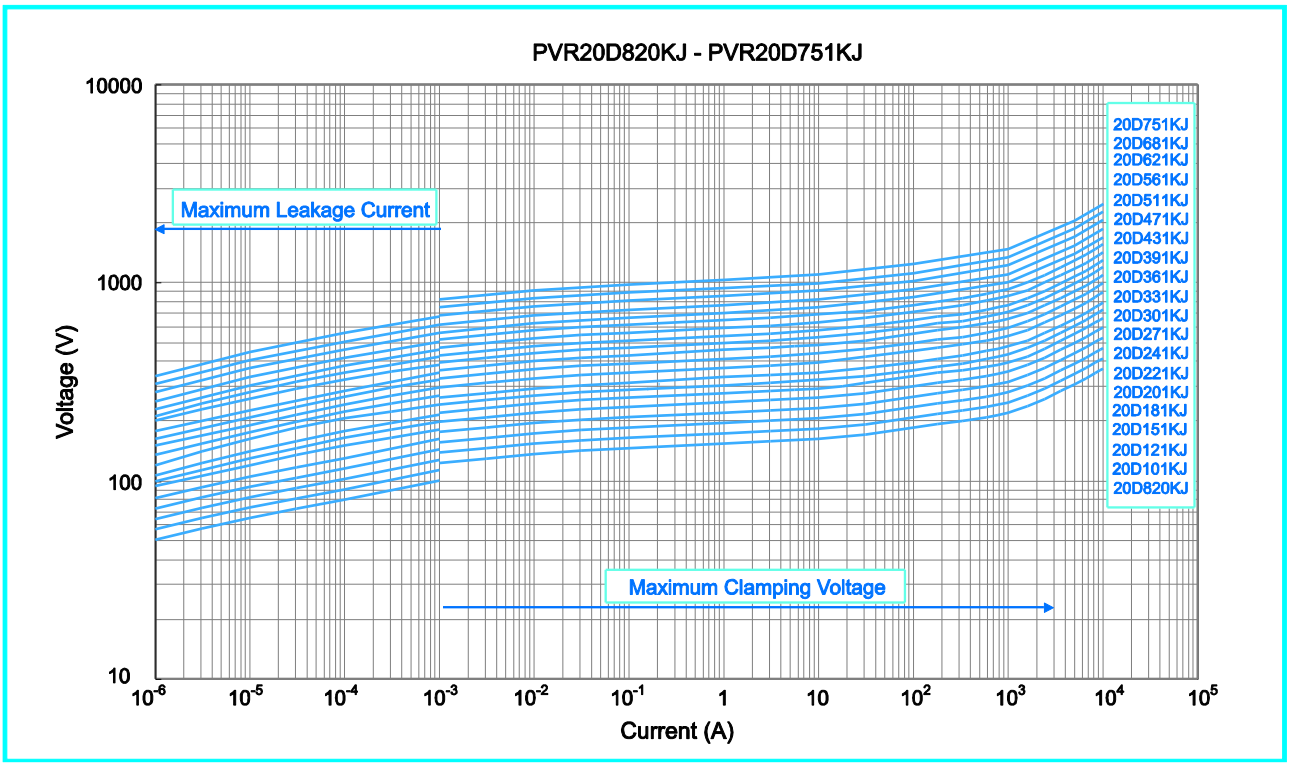
V-I Characteristics Curves

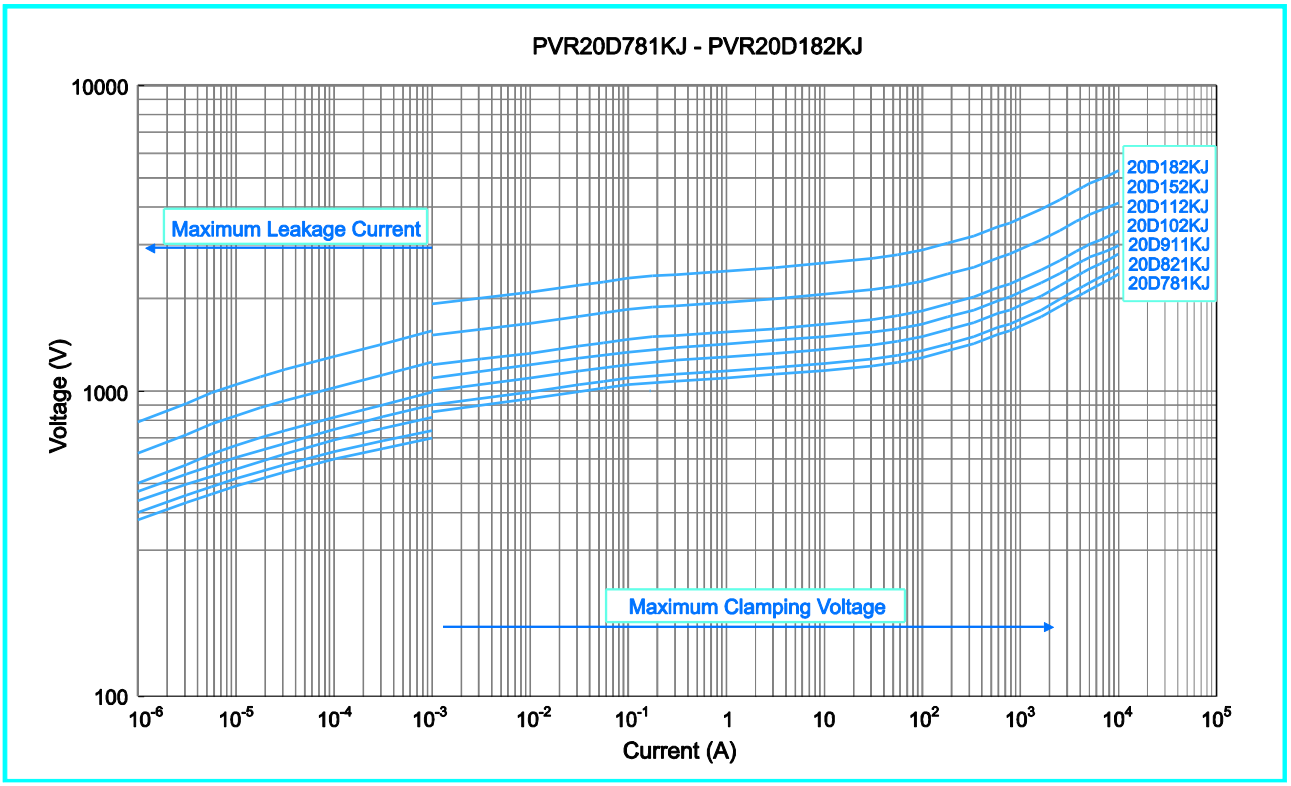




PVR20D Series MOV Devices

V-I Characteristics Curves

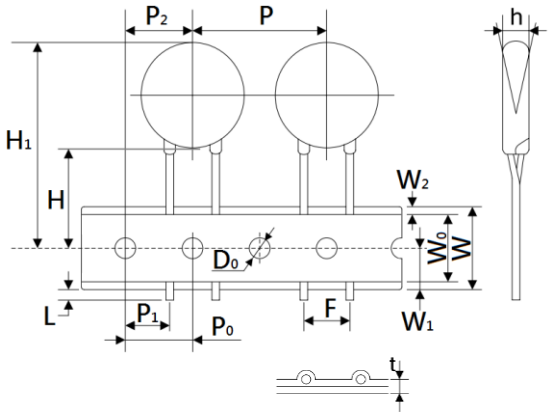




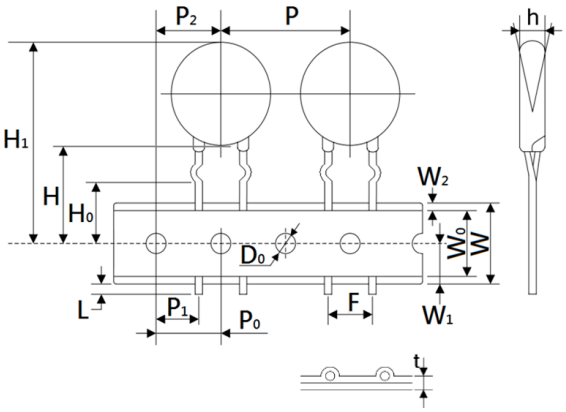
PVR20D Series MOV Devices

Taping Dimensions

S Type

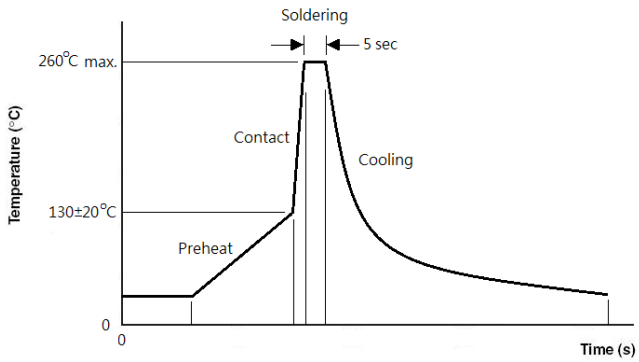


C Type



Symbol	Dimension (mm)	Symbol	Dimension (mm)
P	25.4±1.0	W_2	3.0 max.
P_0	12.7±1.0	H	20.0±2.0
P_1	8.95±0.7	H_0	16.0±1.0
P_2	12.7±1.3	H_1	46.5 max.
F	7.5±0.8	h	0±0.2
W	18.0±1.0	L	1.0 max.
W_0	12.5 max.	D_0	4.0±0.2
W_1	9.0±0.5	t	0.6±0.3

Lead Free Wave Soldering Recommendations

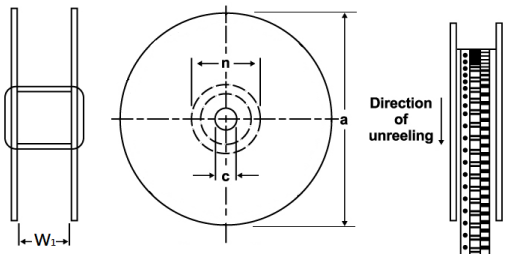


Preheat - Temperature Min (T_{s_min}) - Temperature Max (T_{s_max}) - Time (T_{s_min} to T_{s_max}) - Average Ramp-Up Rate	 110°C 150°C 30-90 seconds 1~3°C/second
Peak Temperature	260°C
Max Time at Peak Temperature	5 seconds
Ramp-Down Rate	5 °C /second max.

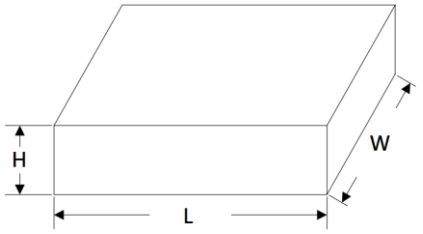
Note: If the wave soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

PVR20D Series MOV Devices

Reel and Ammo Packing Dimensions/Quantity



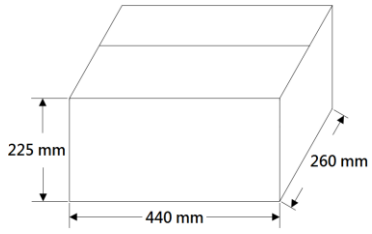
Symbol	Dimension (mm)
W_1	55±1
a	340±10
c	31±1



Symbol	Dimension (mm)
W	348±5
L	275±5
H	60±5

Part Number	Reel pack		Ammo pack	
	Box	Carton	Box	Carton
180L – 471K	500	5000	500	5000
511K – 821K	500	2000	300	3000

Bulk Packing Quantity



Part Number	Bulk pack			
	Type	Bag	Small Carton	Carton
180L – 182K	Long leg	250	1500	3000
	Short leg	250	1500	4000

PVR20D Series MOV Devices

Reliability Test

Mechanical Ratings		
Test Parameter	**Test Condition / Description**	**Performance Requirements**
Terminal Pull Strength	After gradually applying the load specified bellow and keeping the unit fixed for ten seconds, the terminal shall be visually examined for any damage. Diameter / Loading 0.6 mm / 1.0 kg 0.8 mm / 1.0 kg 1.0 mm / 2.0 kg	No visible damage
Terminal Bending Strength	The unit shall be secured with its terminal kept vertical and the weight specified below be applied in axial direction. The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position. The damage of the terminal shall be visually examined. Diameter / Loading 0.6 mm / 0.5 kg 0.8 mm / 0.5 kg 1.0 mm / 1.0 kg	No visible damage
Vibration	The specimen shall be vibrated by its lead wires with a total amplitude of 1.5 mm and a varying frequency of 10~55~10Hz (each minutes) for a period of 2 hours respectively in each X, Y and Z directions.	No Visible damage $\Delta V_b/V_b \leqq 5\%$
Solderability	After dipping the terminal the depth of approximately 3 mm from the specimen in a soldering bath of 260℃ for 10±1 (D5: 5±1) seconds. Thereafter the terminal shall be visually examined.	Terminations shall be uniformly covered by solder
Resistance to solder heat	After preheating the specimen, the specimen shall be completely immersed into a soldering bath having a temperature of 260±5℃ for 10±1 (D5: 5±1) seconds or iron of 400±5℃ for 3±0.5 seconds. Thereafter the change of V_b and mechanical damage shall be examined.	No Visible damage $\Delta V_b/V_b \leqq 5\%$
Environmental Ratings		
Test Parameter	**Test Condition / Description**	**Performance Requirements**
Dry Heat Loading	The specimen shall be applied continuously the maximum allowable voltage at the specified conditions for specified period and then stored at room temperature and normal humidity over 2 hours. Thereafter, the change of V_b and mechanical damage shall be examined. Ambient temp: 125±2°C / Period: 1000±24hours	$\Delta V_b/V_b \leqq 10\%$
High Temp Storage	In a dry oven without load. Ambient temp: 125±2°C / Period: 1000±24hours	$\Delta V_b/V_b \leqq 5\%$
Damp Heat Loading	The specimen shall be applied continuously the maximum allowable voltage at the specified conditions for specified period and then stored at room temperature and normal humidity over 2 hours. Thereafter, the change of V_b and mechanical damage shall be examined. Ambient temp: 40±2°C, 90~95%RH / Period: 1000±24hours	$\Delta V_b/V_b \leqq 10\%$
Temperature Cycle	Condition the specimen to each temperature from step 1 to step 4 in this order for the period shown in the table of specifications. The change of V_b and mechanical damage shall be examined after 2 hours. Step 1 / -40±3°C / 30min. Step 2 / Room temp / 15min. Step 3 / 85±2°C / 30min. Step 4 / Room temp / 15min.	No Visible damage $\Delta V_b/V_b \leqq 10\%$
Surge Lifetime Rating	The change of Vb shall be measured after the impulse listed below is applied 10,000 times continuously with the interval of ten seconds at room temperature.	No Visible damage $\Delta V_b/V_b \leqq 10\%$
Voltage Proof	Voltage: 2500 Vac / Leakage current≦0.5 mA / Time: 60 seconds	No Breakdown