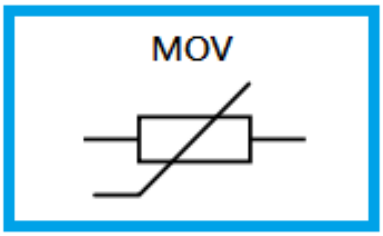
PVR10D Series MOV Devices

Features

- Wide operating voltages ranging from 10 V_{RMS} to 680 V_{RMS} (14 V_{DC} to 895 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 ~ 125°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 10 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 (10: 10 mm)
- PolyTrans Varistor

PVR10D 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)
PVR10D180L	10	14	18	2.8	500	0.05	30	38	5.0	5600
PVR10D220K	14	18	22	4.5	500	0.05	30	43	5.0	4500
PVR10D270K	17	22	27	6.0	500	0.05	30	53	5.0	3700
PVR10D330K	20	26	33	7.4	500	0.05	30	65	5.0	3000
PVR10D390K	25	31	39	9.1	500	0.05	30	77	5.0	2600
PVR10D470K	30	38	47	10.8	500	0.05	30	93	5.0	2100
PVR10D560K	35	45	56	12.9	500	0.05	30	110	5.0	1800
PVR10D680K	40	56	68	15.4	500	0.05	30	135	5.0	1500
PVR10D820K	50	65	82	16.8	2500	0.40	20	135	25.0	1200
PVR10D101K	60	85	100	18.2	2500	0.40	20	165	25.0	1000
PVR10D121K	75	100	120	21.0	2500	0.40	20	200	25.0	830
PVR10D151K	95	125	150	25.2	2500	0.40	20	250	25.0	670
PVR10D181K	115	150	180	30.8	2500	0.40	20	300	25.0	560
PVR10D201K	130	170	200	42.0	2500	0.40	20	330	25.0	500
PVR10D221K	140	180	220	46.2	2500	0.40	20	360	25.0	450
PVR10D241K	150	200	240	50.4	2500	0.40	20	395	25.0	420
PVR10D271K	175	225	270	57.4	2500	0.40	20	455	25.0	370
PVR10D301K	190	250	300	63.0	2500	0.40	20	505	25.0	330
PVR10D331K	210	275	330	68.6	2500	0.40	20	550	25.0	300
PVR10D361K	230	300	360	74.2	2500	0.40	20	595	25.0	280
PVR10D391K	250	320	390	81.2	2500	0.40	20	650	25.0	260
PVR10D431K	275	350	430	88.2	2500	0.40	20	710	25.0	230
PVR10D471K	300	385	470	96.0	2500	0.40	20	775	25.0	210
PVR10D511K	320	415	510	98.0	2500	0.40	20	845	25.0	200
PVR10D561K	350	460	560	100.0	2500	0.40	20	920	25.0	180
PVR10D621K	385	505	620	102.0	2500	0.40	20	1025	25.0	160
PVR10D681K	420	560	680	104.0	2500	0.40	20	1120	25.0	150
PVR10D751K	460	615	750	110.0	2500	0.40	20	1240	25.0	140
PVR10D781K	485	640	780	118.0	2500	0.40	20	1290	25.0	130
PVR10D821K	510	670	820	122.0	2500	0.40	20	1355	25.0	120
PVR10D911K	550	745	910	128.0	2500	0.40	20	1500	25.0	110
PVR10D102K	625	825	1000	131.0	2500	0.40	20	1650	25.0	100
PVR10D112K	680	895	1100	133.0	2500	0.40	20	1815	25.0	90

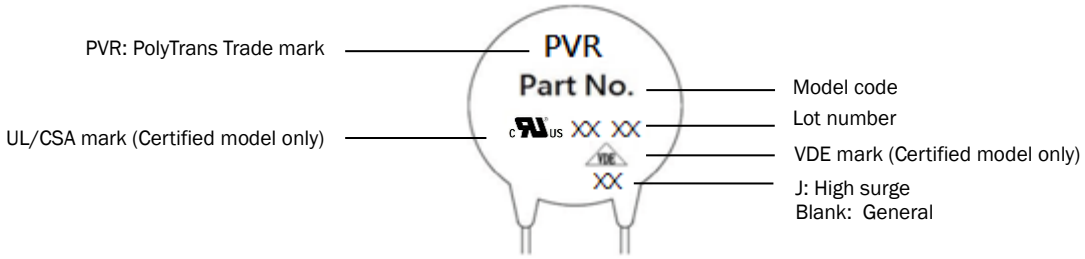
PVR10D Series MOV Devices

Electrical Characteristics (High Surge Product)

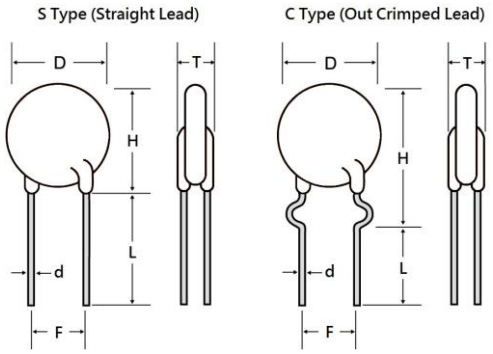
Part Number	Max Allowable Voltage		Varistor Voltage V_b @ 1 mA	Energy 10/1000 μs	Withstand Surge Current 8/20 μs	Rated Power	Max Leakage Current @ V_{DC}	Max Clamping Voltage		Typical Capacitance
	V_{RMS}	V_{DC}						V	I	
	(V)	(V)	(V)	(J)	(A)	(W)	(μA)	(V)	(A)	(pF)
PVR10D180LJ	10	14	18	3.0	1000	0.05	30	38	5.0	5600
PVR10D220KJ	14	18	22	5.0	1000	0.05	30	43	5.0	4500
PVR10D270KJ	17	22	27	6.5	1000	0.05	30	53	5.0	3700
PVR10D330KJ	20	26	33	8.0	1000	0.05	30	65	5.0	3000
PVR10D390KJ	25	31	39	9.5	1000	0.05	30	77	5.0	2600
PVR10D470KJ	30	38	47	11.0	1000	0.05	30	93	5.0	2100
PVR10D560KJ	35	45	56	13.0	1000	0.05	30	110	5.0	1800
PVR10D680KJ	40	56	68	16.0	1000	0.05	30	135	5.0	1500
PVR10D820KJ	50	65	82	17.0	3500	0.40	20	135	25.0	1200
PVR10D101KJ	60	85	100	18.5	3500	0.40	20	165	25.0	1000
PVR10D121KJ	75	100	120	21.5	3500	0.40	20	200	25.0	830
PVR10D151KJ	95	125	150	26.0	3500	0.40	20	250	25.0	670
PVR10D181KJ	115	150	180	38.0	3500	0.40	20	300	25.0	560
PVR10D201KJ	130	170	200	42.5	3500	0.40	20	330	25.0	500
PVR10D221KJ	140	180	220	46.5	3500	0.40	20	360	25.0	450
PVR10D241KJ	150	200	240	51.0	3500	0.40	20	395	25.0	420
PVR10D271KJ	175	225	270	58.0	3500	0.40	20	455	25.0	370
PVR10D301KJ	190	250	300	63.5	3500	0.40	20	505	25.0	330
PVR10D331KJ	210	275	330	69.0	3500	0.40	20	550	25.0	300
PVR10D361KJ	230	300	360	75.0	3500	0.40	20	595	25.0	280
PVR10D391KJ	250	320	390	82.0	3500	0.40	20	650	25.0	260
PVR10D431KJ	275	350	430	89.0	3500	0.40	20	710	25.0	230
PVR10D471KJ	300	385	470	100.0	3500	0.40	20	775	25.0	210
PVR10D511KJ	320	415	510	102.0	3500	0.40	20	845	25.0	200
PVR10D561KJ	350	460	560	104.0	3500	0.40	20	920	25.0	180
PVR10D621KJ	385	505	620	106.0	3500	0.40	20	1025	25.0	160
PVR10D681KJ	420	560	680	108.0	3500	0.40	20	1120	25.0	150
PVR10D751KJ	460	615	750	118.0	3500	0.40	20	1240	25.0	140
PVR10D781KJ	485	640	780	120.0	3500	0.40	20	1290	25.0	130
PVR10D821KJ	510	670	820	125.0	3500	0.40	20	1355	25.0	120
PVR10D911KJ	550	745	910	134.0	3500	0.40	20	1500	25.0	110
PVR10D102KJ	625	825	1000	140.0	3500	0.40	20	1650	25.0	100
PVR10D112KJ	680	895	1100	155.0	3500	0.40	20	1815	25.0	90

PVR10D Series MOV Devices

Marking Definitions



Physical Dimensions



Symbol		Dimension
		(mm)
D		12.5 max.
H	S type	17.0 max.
	C type	20.0 max.
L		15.0 min.
F		7.5±0.8
d		0.8±0.05

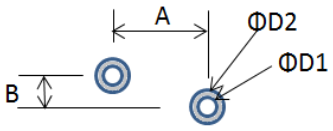
Part Number	T (Max)
	(mm)
PVR10D180L	4.6
PVR10D220K	4.7
PVR10D270K	4.8
PVR10D330K	5.0
PVR10D390K	4.9
PVR10D470K	5.0
PVR10D560K	5.1
PVR10D680K	5.3
PVR10D820K	4.5
PVR10D101K	4.5
PVR10D121K	4.5

Part Number	T (Max)
	(mm)
PVR10D151K	4.5
PVR10D181K	4.5
PVR10D201K	4.5
PVR10D221K	4.7
PVR10D241K	4.8
PVR10D271K	5.0
PVR10D301K	5.1
PVR10D331K	5.3
PVR10D361K	5.5
PVR10D391K	5.7
PVR10D431K	5.9

Part Number	T (Max)
	(mm)
PVR10D471K	6.1
PVR10D511K	6.4
PVR10D561K	6.7
PVR10D621K	7.1
PVR10D681K	7.1
PVR10D751K	7.5
PVR10D781K	7.9
PVR10D821K	7.9
PVR10D911K	8.1
PVR10D102K	8.6
PVR10D112K	9.2

PVR10D Series MOV Devices

Recommended Pad Layout



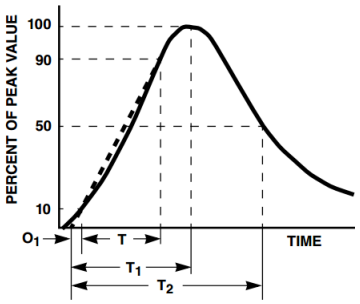
Symbol	Dimension (mm)
A	7.5 typ.
ΦD1	1.3 typ.
ΦD2	2.8 typ.

Part Number	B (Typ) (mm)
PVR10D180L	1.5
PVR10D220K	1.6
PVR10D270K	1.8
PVR10D330K	2.0
PVR10D390K	2.2
PVR10D470K	2.3
PVR10D560K	2.4
PVR10D680K	1.7
PVR10D820K	1.8
PVR10D101K	1.8
PVR10D121K	1.9

Part Number	B (Typ) (mm)
PVR10D151K	2.0
PVR10D181K	1.8
PVR10D201K	1.8
PVR10D221K	1.9
PVR10D241K	2.0
PVR10D271K	2.0
PVR10D301K	2.0
PVR10D331K	2.1
PVR10D361K	2.3
PVR10D391K	2.4
PVR10D431K	2.6

Part Number	B (Typ) (mm)
PVR10D471K	2.7
PVR10D511K	2.9
PVR10D561K	3.1
PVR10D621K	3.4
PVR10D681K	3.6
PVR10D751K	3.9
PVR10D781K	4.0
PVR10D821K	4.2
PVR10D911K	4.5
PVR10D102K	4.8
PVR10D112K	5.2

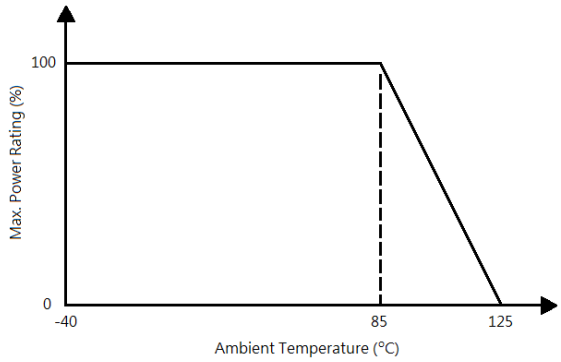
Peak Pulse Current Test Waveform



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

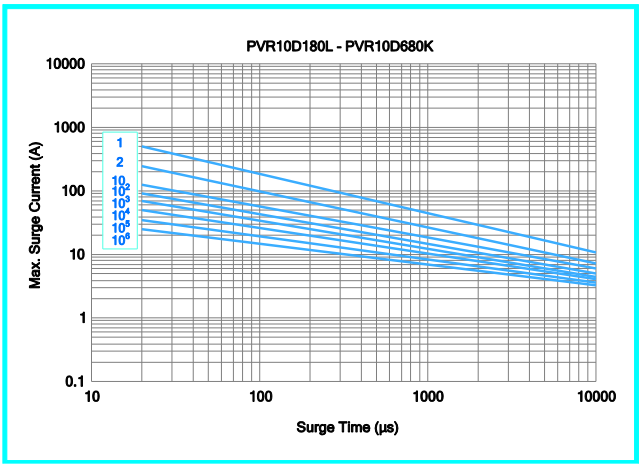
Example – For an 8/20 μs current waveform
8 μs = T1 = Rise Time
20 μs = T2 = Decay Time

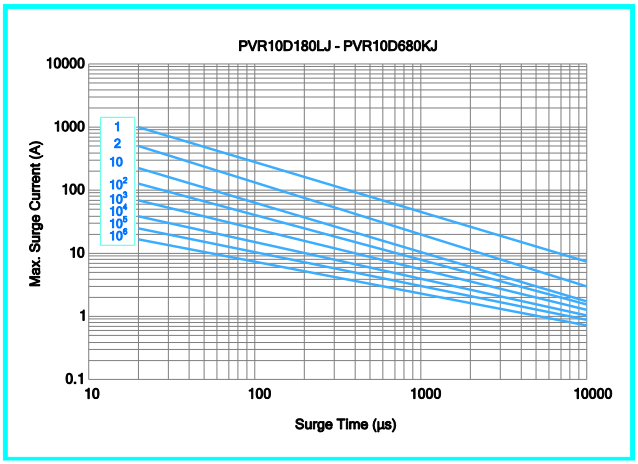
Power Derating Curve

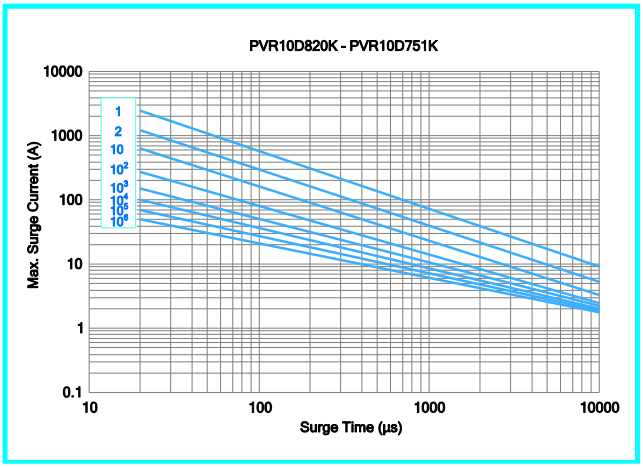


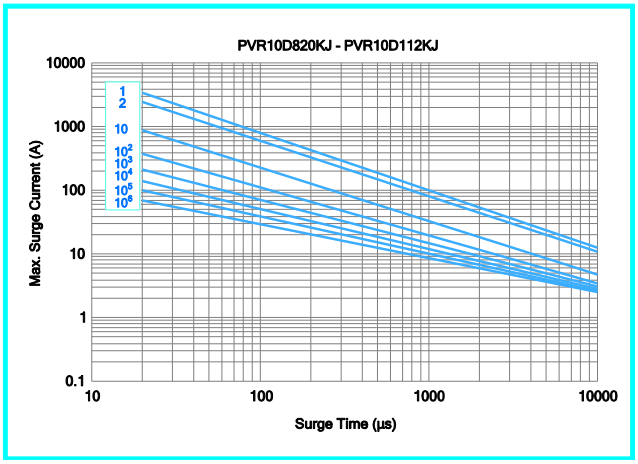
PVR10D Series MOV Devices

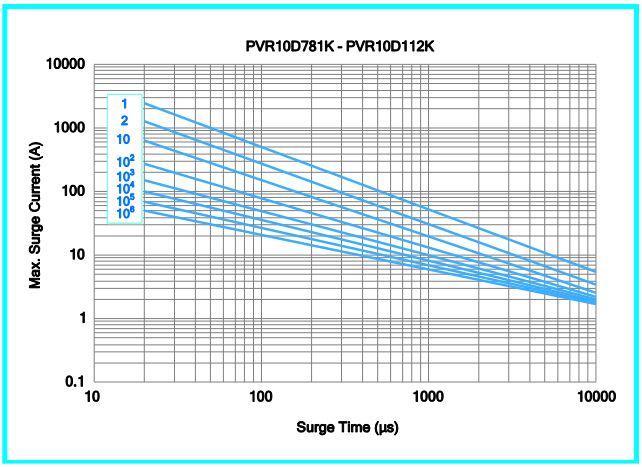
Pulse Rating Curves





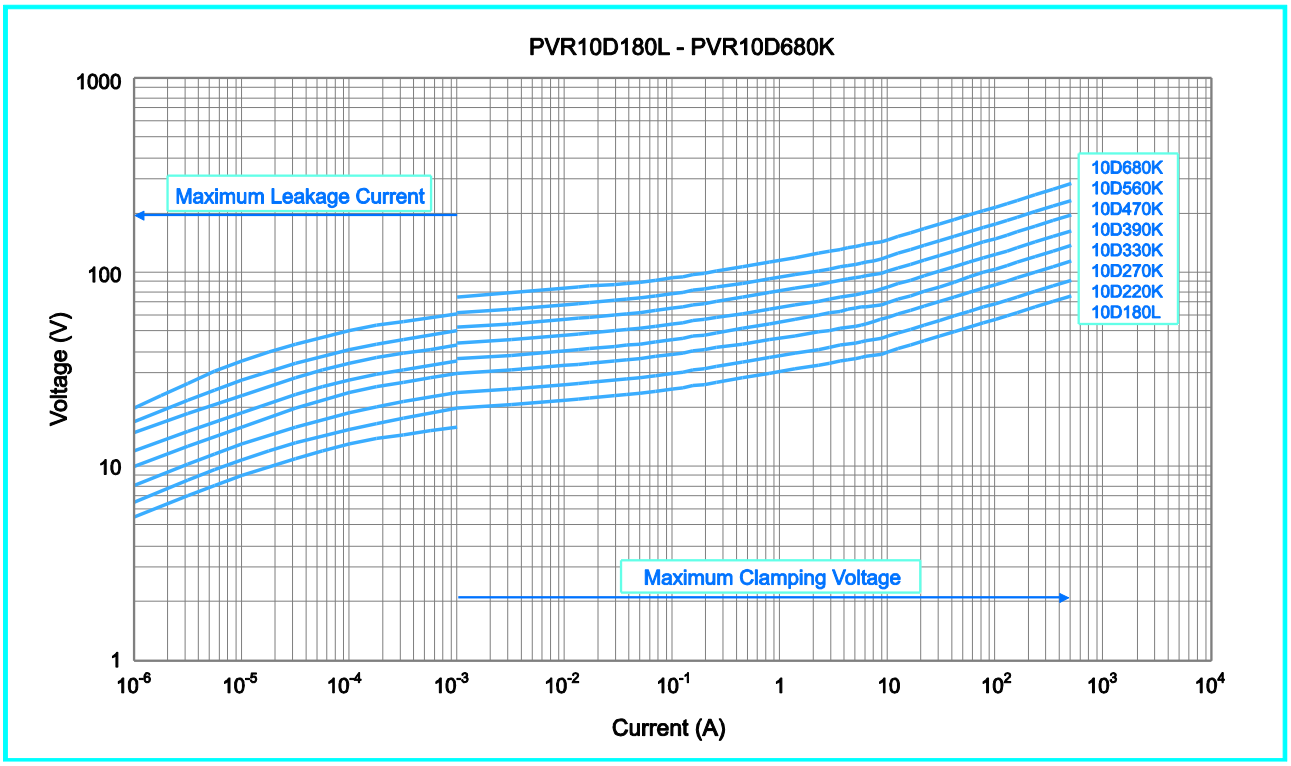


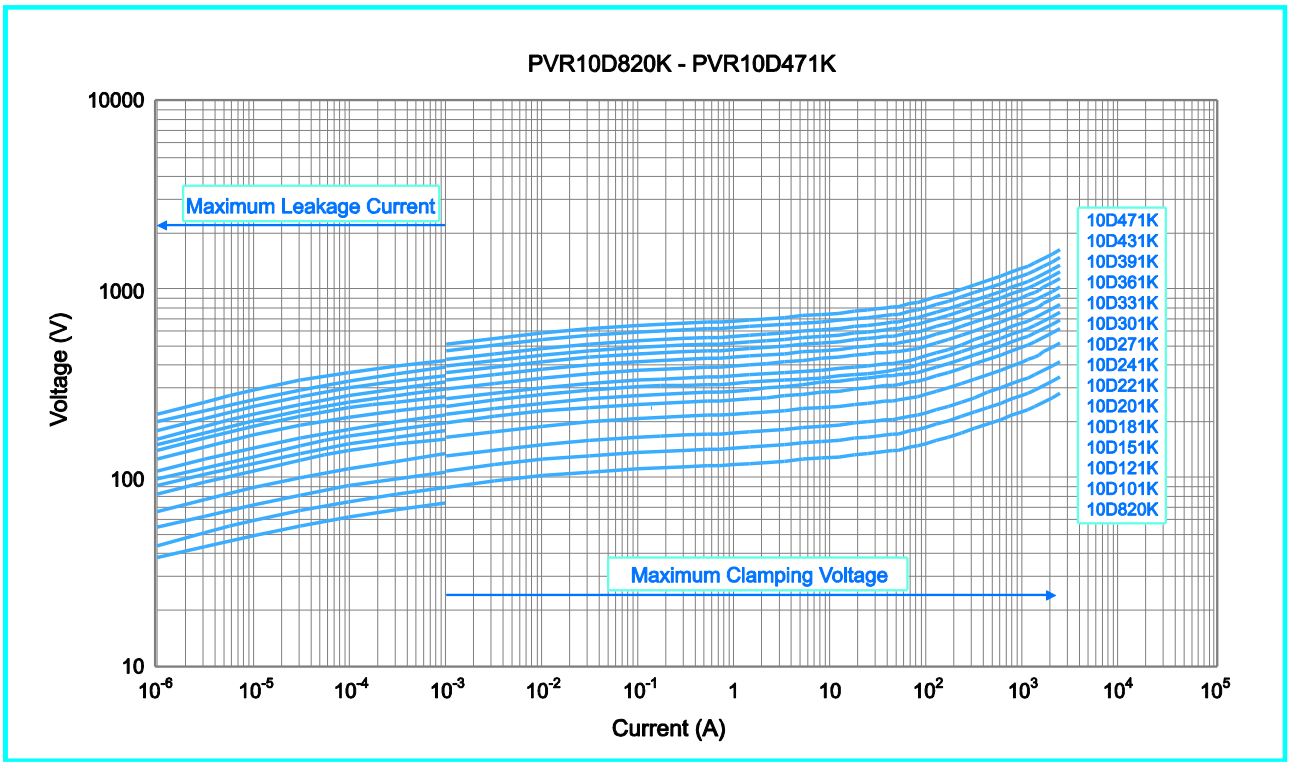




PVR10D Series MOV Devices

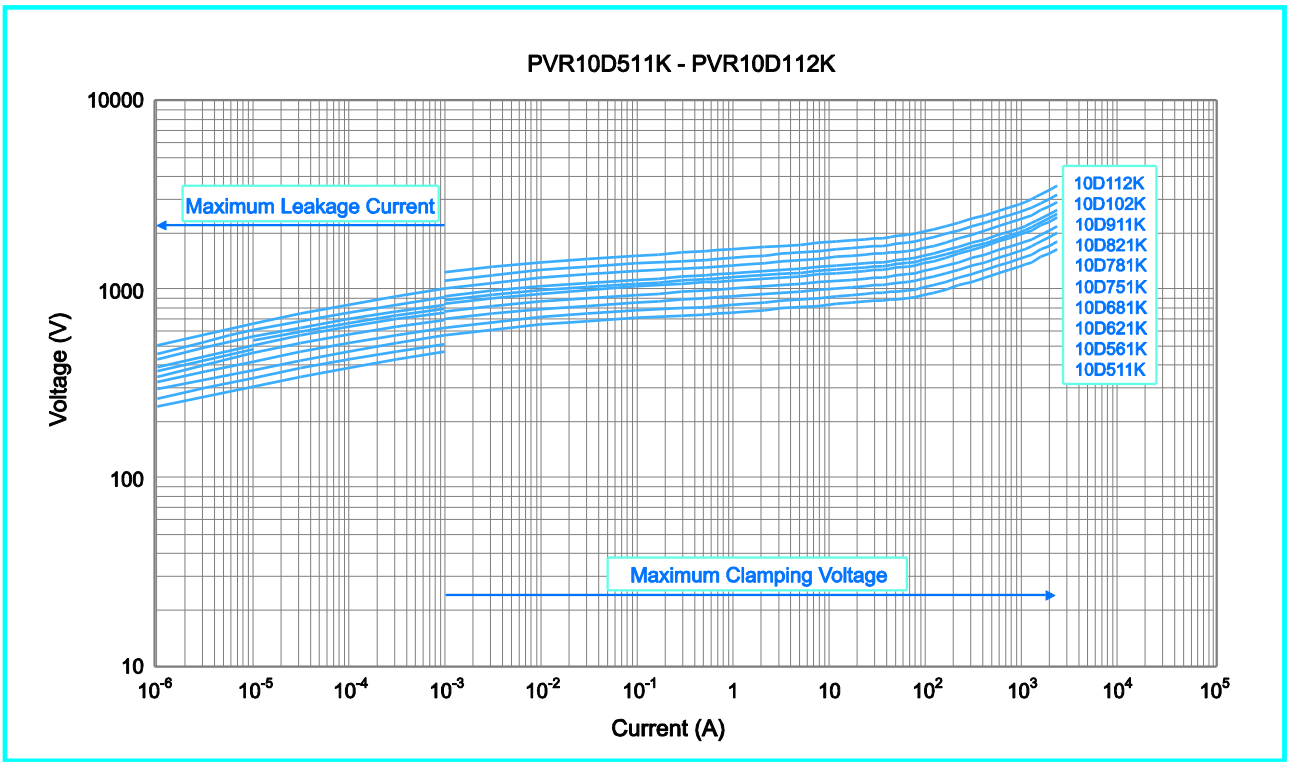
V-I Characteristics Curves

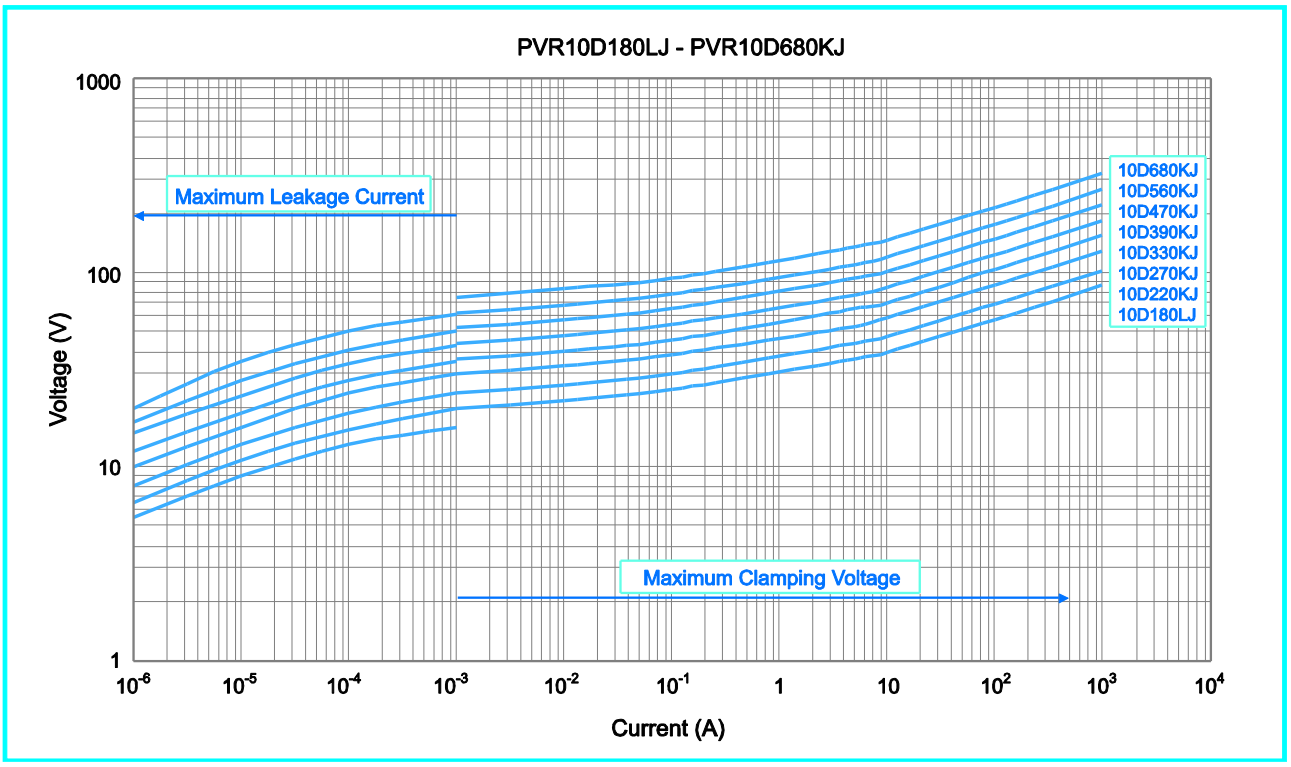




PVR10D Series MOV Devices

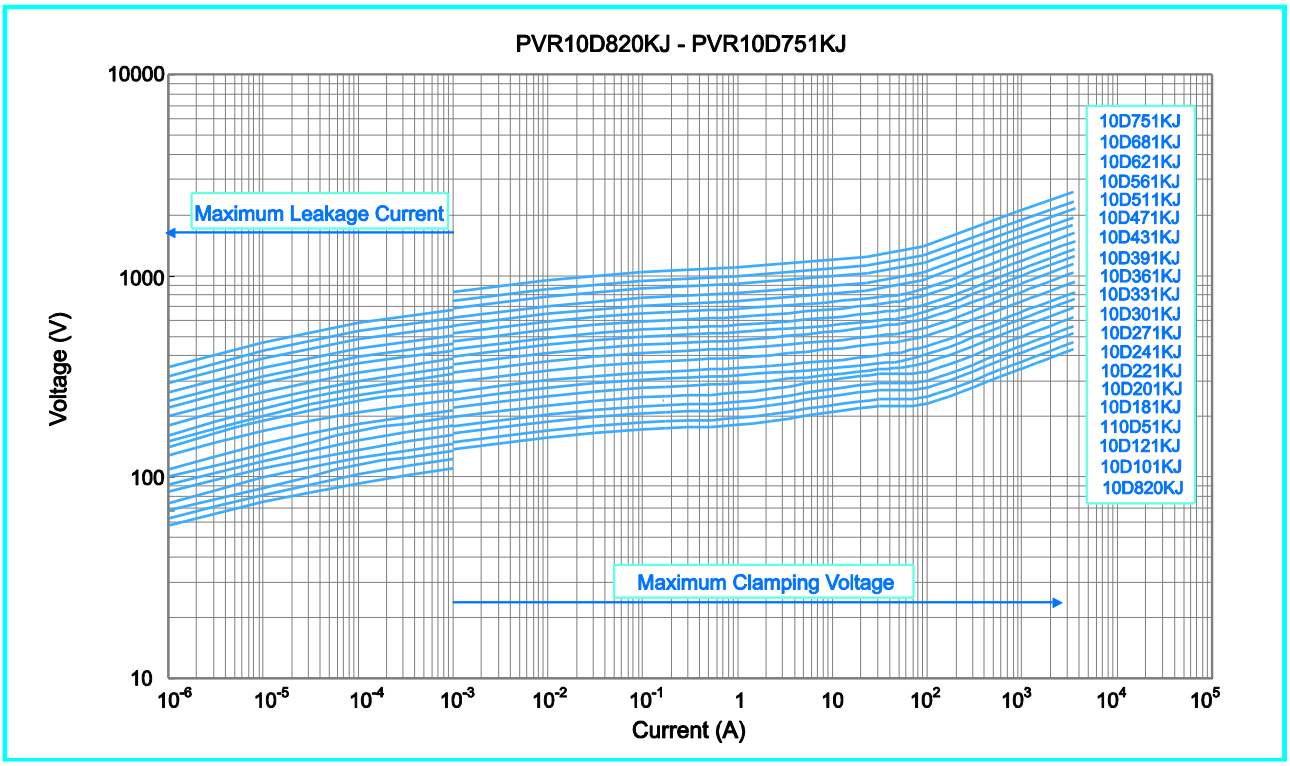
V-I Characteristics Curves

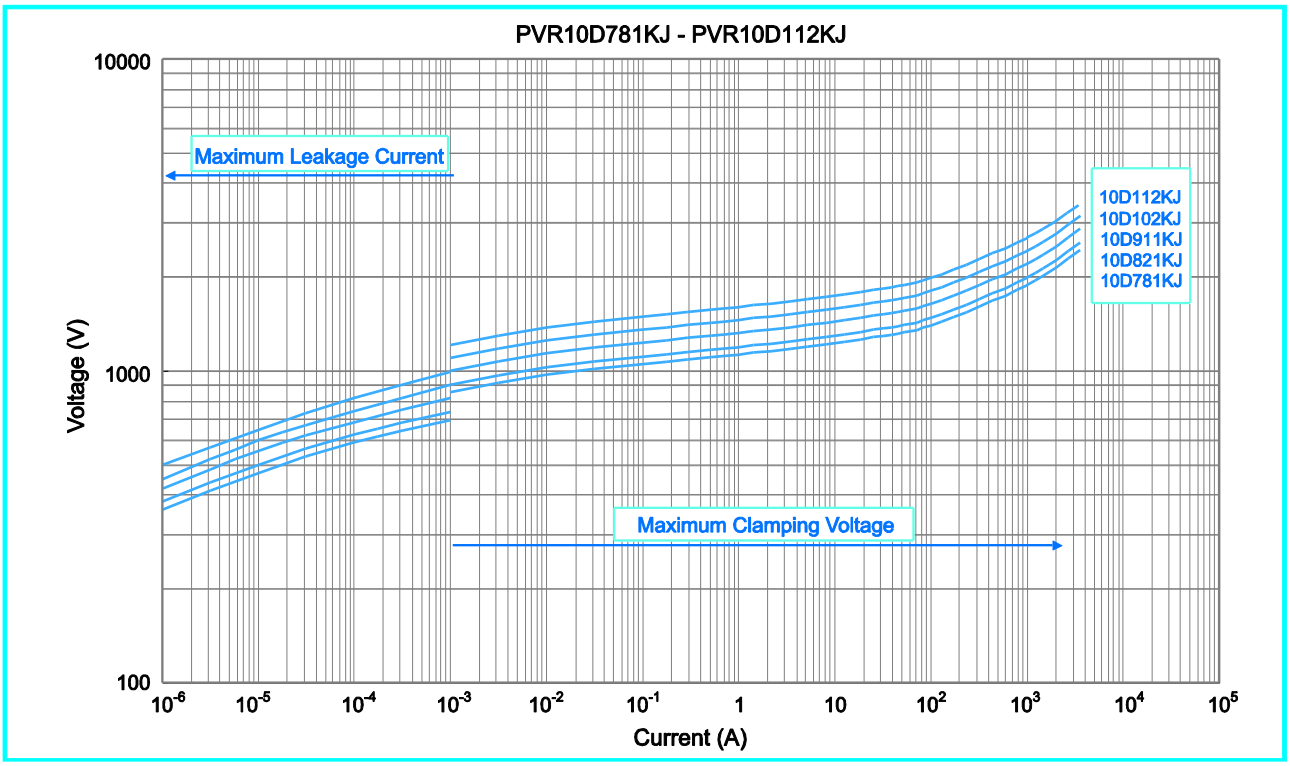




PVR10D Series MOV Devices

V-I Characteristics Curves

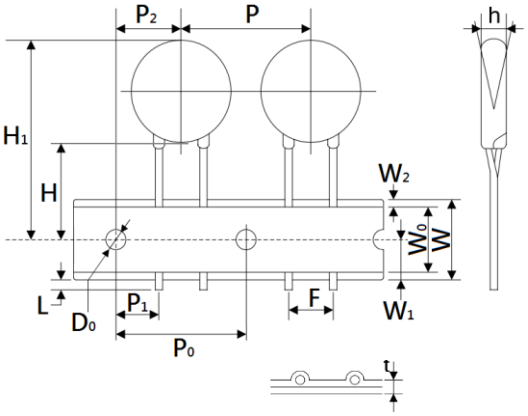




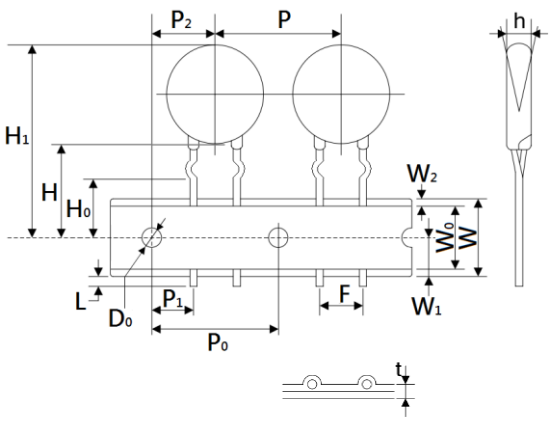
PVR10D Series MOV Devices

Taping Dimensions

S Type

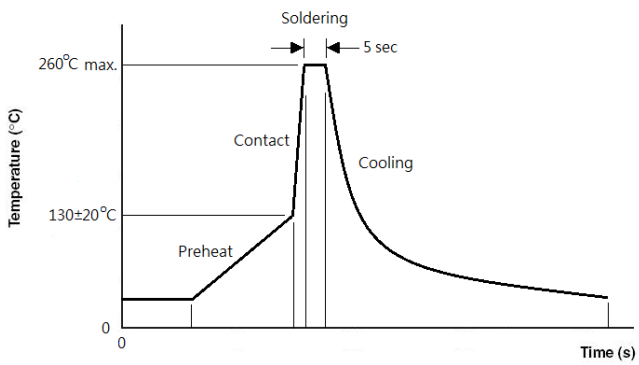


C Type



Symbol	Dimension (mm)	Symbol	Dimension (mm)
P	12.7±1.0	W_2	3.0 max.
P_0	12.7±1.0	H	20.0±2.0
P_1	3.85±0.7	H_0	16.0±1.0
P_2	6.35±1.3	H_1	36.0 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

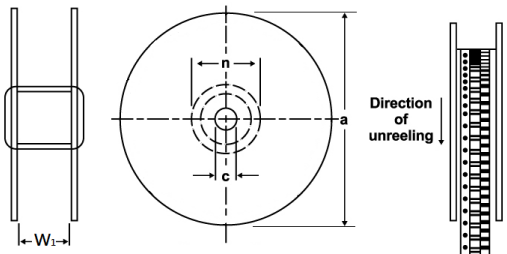


Preheat - Temperature Min (T_{s_min}) - Temperature Max (T_{s_max}) - Time (T_{s_min} to T_{s_max}) - Average Ramp-Up Rate	 110°C 150°C 30-90 seconds 1~3°C/second
Peak Temperature	260°C
Max Time at Peak Temperature	5 seconds
Ramp-Down Rate	5 °C /second max.

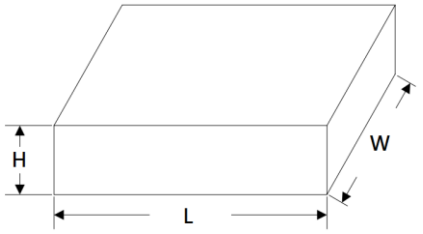
Note: If the wave soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

PVR10D Series MOV Devices

Reel and Ammo Packing Dimensions/Quantity



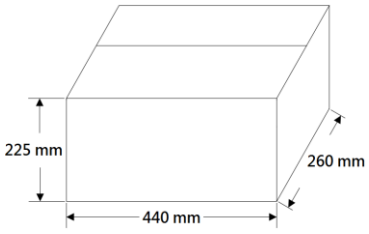
Symbol	Dimension (mm)
W_1	55±1
a	340±10
c	31±1



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

Part Number	Reel pack		Ammo pack	
	Box	Carton	Box	Carton
180L – 681K	1000	4000	1000	10000
751K – 112K	800	3200	800	8000

Bulk Packing Quantity



Part Number	Bulk pack			
	Type	Bag	Small Carton	Carton
180L – 112K	Long leg	500	5000	10000
	Short leg	500	7500	15000

PVR10D 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℃ / Period: 1000±24hours	$\Delta V_b/V_b \leqq 10\%$
High Temp Storage	In a dry oven without load. Ambient temp: 125±2℃ / 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℃, 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℃ / 30min. Step 2 / Room temp / 15min. Step 3 / 85±2℃ / 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