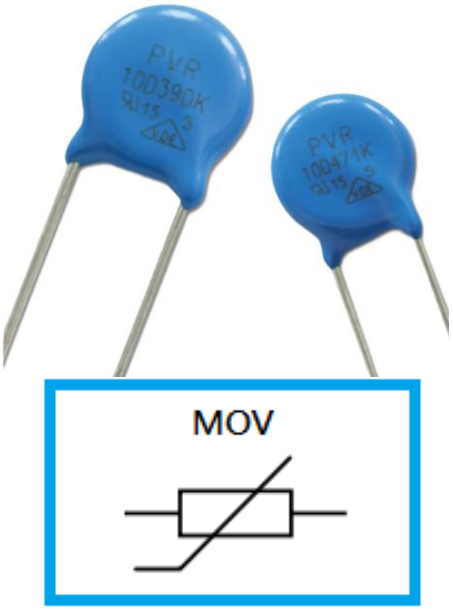
PVR05D Series MOV Devices

Features

- Wide operating voltages ranging from 10 V_{RMS} to 460 V_{RMS} (14 V_{DC} to 615 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 05 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 (05: 05 mm)
- PolyTrans Varistor

PVR05D 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)
PVR05D180L	10	14	18	0.4	100	0.01	30	38	1.0	1400
PVR05D220K	14	18	22	0.6	100	0.01	30	43	1.0	1150
PVR05D270K	17	22	27	0.7	100	0.01	30	53	1.0	930
PVR05D330K	20	26	33	0.8	100	0.01	30	65	1.0	760
PVR05D390K	25	31	39	1.1	100	0.01	30	77	1.0	640
PVR05D470K	30	38	47	1.4	100	0.01	30	93	1.0	530
PVR05D560K	35	45	56	1.5	100	0.01	30	110	1.0	450
PVR05D680K	40	56	68	1.8	100	0.01	30	135	1.0	370
PVR05D820K	50	65	82	2.6	400	0.10	20	135	10.0	300
PVR05D101K	60	85	100	2.8	400	0.10	20	165	10.0	250
PVR05D121K	75	100	120	4.2	400	0.10	20	200	10.0	210
PVR05D151K	95	125	150	4.2	400	0.10	20	250	10.0	165
PVR05D181K	115	150	180	5.6	400	0.10	20	300	10.0	140
PVR05D201K	130	170	200	7.7	400	0.10	20	330	10.0	125
PVR05D221K	140	180	220	8.8	400	0.10	20	360	10.0	110
PVR05D241K	150	200	240	9.8	400	0.10	20	395	10.0	100
PVR05D271K	175	225	270	10.5	400	0.10	20	455	10.0	95
PVR05D301K	190	250	300	11.8	400	0.10	20	505	10.0	85
PVR05D331K	210	275	330	14.0	400	0.10	20	550	10.0	75
PVR05D361K	230	300	360	14.0	400	0.10	20	595	10.0	70
PVR05D391K	250	320	390	15.4	400	0.10	20	650	10.0	65
PVR05D431K	275	350	430	16.8	400	0.10	20	710	10.0	60
PVR05D471K	300	385	470	18.2	400	0.10	20	775	10.0	55
PVR05D511K	320	415	510	19.6	400	0.10	20	845	10.0	50
PVR05D561K	350	460	560	19.6	400	0.10	20	920	10.0	45
PVR05D621K	385	505	620	21.0	400	0.10	20	1025	10.0	40
PVR05D681K	420	560	680	21.0	400	0.10	20	1120	10.0	35

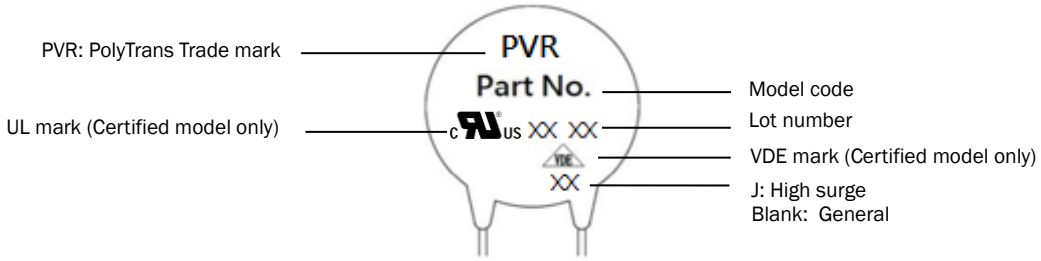
PVR05D Series MOV Devices

Electrical Characteristics (High Surge Product)

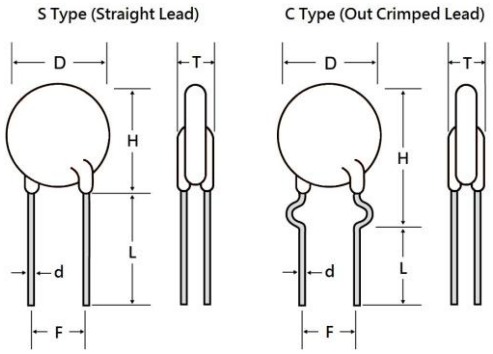
Part Number	Max Allowable Voltage		Varistor Voltage V_b @ 1 mA	Energy 10/1000 μs	Withstand Surge Current 8/20 μs	Rated Power	Max Leakage Current @ V_{DC}	Max Clamping Voltage		Typical Capacitance
	V_{RMS}	V_{DC}						V	I	
	(V)	(V)	(V)	(J)	(A)	(W)	(μA)	(V)	(A)	(pF)
PVR05D180LJ	10	14	18	0.6	250	0.01	30	38	1.0	1400
PVR05D220KJ	14	18	22	0.7	250	0.01	30	43	1.0	1150
PVR05D270KJ	17	22	27	0.9	250	0.01	30	53	1.0	930
PVR05D330KJ	20	26	33	1.1	250	0.01	30	65	1.0	760
PVR05D390KJ	25	31	39	1.2	250	0.01	30	77	1.0	640
PVR05D470KJ	30	38	47	1.5	250	0.01	30	93	1.0	530
PVR05D560KJ	35	45	56	1.8	250	0.01	30	110	1.0	450
PVR05D680KJ	40	56	68	2.2	250	0.01	30	135	1.0	370
PVR05D820KJ	50	65	82	3.8	800	0.10	20	135	10.0	300
PVR05D101KJ	60	85	100	4.0	800	0.10	20	165	10.0	250
PVR05D121KJ	75	100	120	5.0	800	0.10	20	200	10.0	210
PVR05D151KJ	95	125	150	7.0	800	0.10	20	250	10.0	165
PVR05D181KJ	115	150	180	8.0	800	0.10	20	300	10.0	140
PVR05D201KJ	130	170	200	8.7	800	0.10	20	330	10.0	125
PVR05D221KJ	140	180	220	9.0	800	0.10	20	360	10.0	110
PVR05D241KJ	150	200	240	11.0	800	0.10	20	395	10.0	100
PVR05D271KJ	175	225	270	13.0	800	0.10	20	455	10.0	95
PVR05D301KJ	190	250	300	14.0	800	0.10	20	505	10.0	85
PVR05D331KJ	210	275	330	14.5	800	0.10	20	550	10.0	75
PVR05D361KJ	230	300	360	16.0	800	0.10	20	595	10.0	70
PVR05D391KJ	250	320	390	17.0	800	0.10	20	650	10.0	65
PVR05D431KJ	275	350	430	20.0	800	0.10	20	710	10.0	60
PVR05D471KJ	300	385	470	20.8	800	0.10	20	775	10.0	55
PVR05D511KJ	320	415	510	21.0	800	0.10	20	845	10.0	50
PVR05D561KJ	350	460	560	23.0	800	0.10	20	920	10.0	45
PVR05D621KJ	385	505	620	25.0	800	0.10	20	1025	10.0	40
PVR05D681KJ	420	560	680	29.0	800	0.10	20	1120	10.0	35

PVR05D Series MOV Devices

Marking Definitions



Physical Dimensions



Symbol		Dimension
		(mm)
D		7.0 max.
H	S type	10.0 max.
	C type	12.0 max.
L		15.0 min.
F		5.0±0.8
d		0.6±0.05

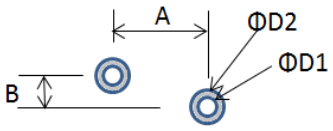
Part Number	T (Max)
	(mm)
PVR05D180L	3.8
PVR05D220K	3.8
PVR05D270K	3.9
PVR05D330K	3.9
PVR05D390K	4.1
PVR05D470K	4.1
PVR05D560K	4.5
PVR05D680K	4.5
PVR05D820K	4.1
PVR05D101K	4.3
PVR05D121K	4.5

Part Number	T (Max)
	(mm)
PVR05D151K	4.8
PVR05D181K	4.1
PVR05D201K	4.1
PVR05D221K	4.2
PVR05D241K	4.3
PVR05D271K	4.5
PVR05D301K	4.7
PVR05D331K	4.8
PVR05D361K	5.0
PVR05D391K	5.1
PVR05D431K	5.3

Part Number	T (Max)
	(mm)
PVR05D471K	5.6
PVR05D511K	5.8
PVR05D561K	6.2
PVR05D621K	6.4
PVR05D681K	6.4
PVR05D751K	6.5

PVR05D Series MOV Devices

Recommended Pad Layout



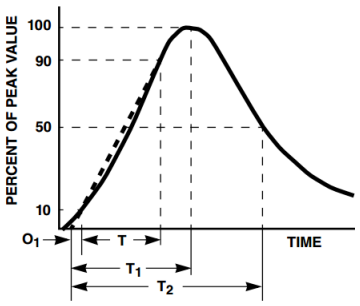
Symbol	Dimension (mm)
A	5.0 typ.
ΦD1	1.0 typ.
ΦD2	2.5 typ.

Part Number	B (Typ) (mm)
PVR05D180L	1.3
PVR05D220K	1.4
PVR05D270K	1.6
PVR05D330K	1.8
PVR05D390K	2.0
PVR05D470K	2.1
PVR05D560K	2.2
PVR05D680K	1.5
PVR05D820K	1.6
PVR05D101K	1.6
PVR05D121K	1.7

Part Number	B (Typ) (mm)
PVR05D151K	1.8
PVR05D181K	1.6
PVR05D201K	1.6
PVR05D221K	1.7
PVR05D241K	1.8
PVR05D271K	1.8
PVR05D301K	1.8
PVR05D331K	1.9
PVR05D361K	2.1
PVR05D391K	2.2
PVR05D431K	2.4

Part Number	B (Typ) (mm)
PVR05D471K	2.5
PVR05D511K	2.7
PVR05D561K	2.9
PVR05D621K	3.2
PVR05D681K	3.4
PVR05D751K	3.7

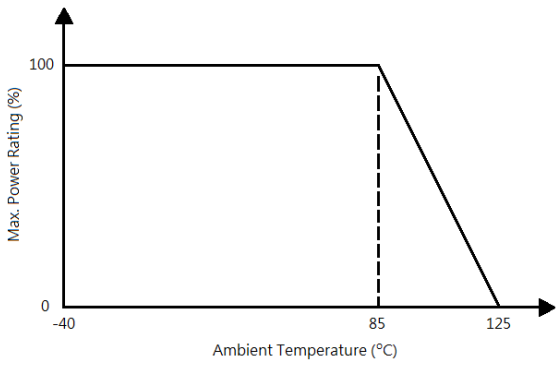
Peak Pulse Current Test Waveform



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

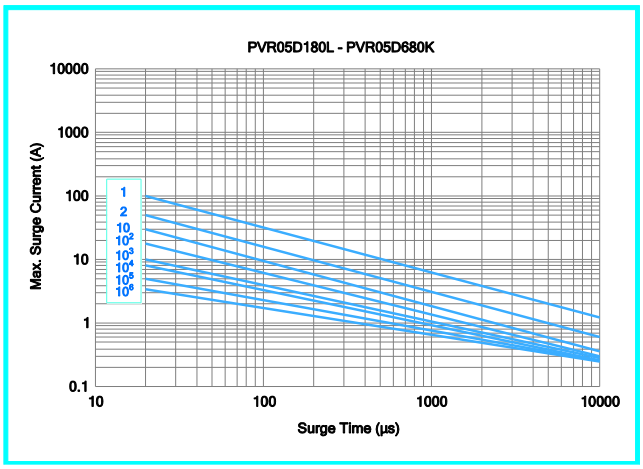
Example – For an 8/20 μs current waveform
8 μs = T1 = Rise Time
20 μs = T2 = Decay Time

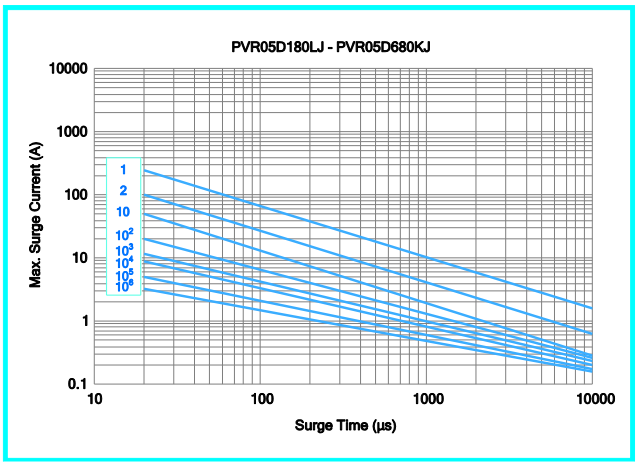
Power Derating Curve

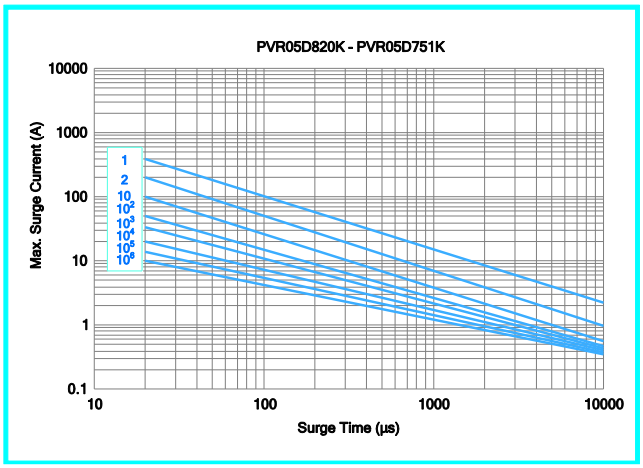


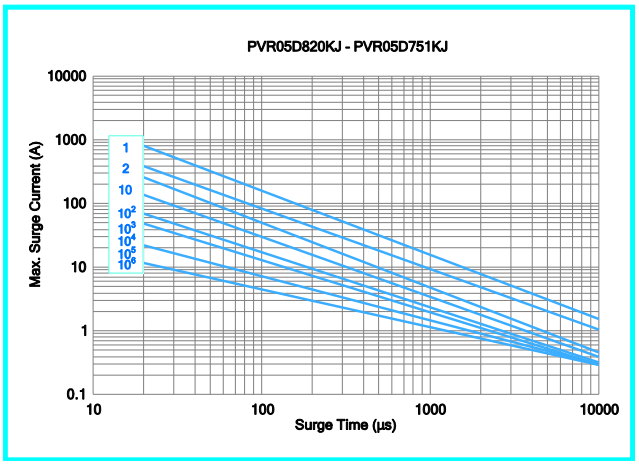
PVR05D Series MOV Devices

Pulse Rating Curves



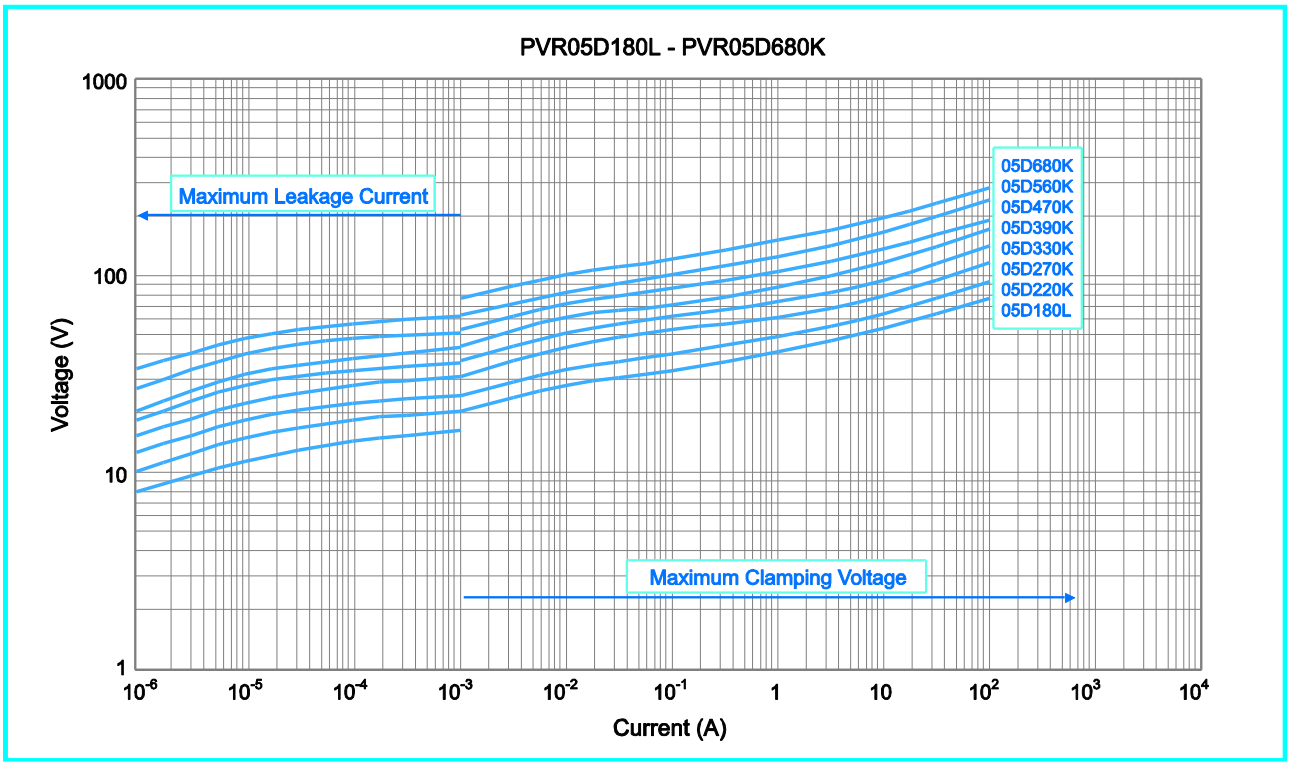


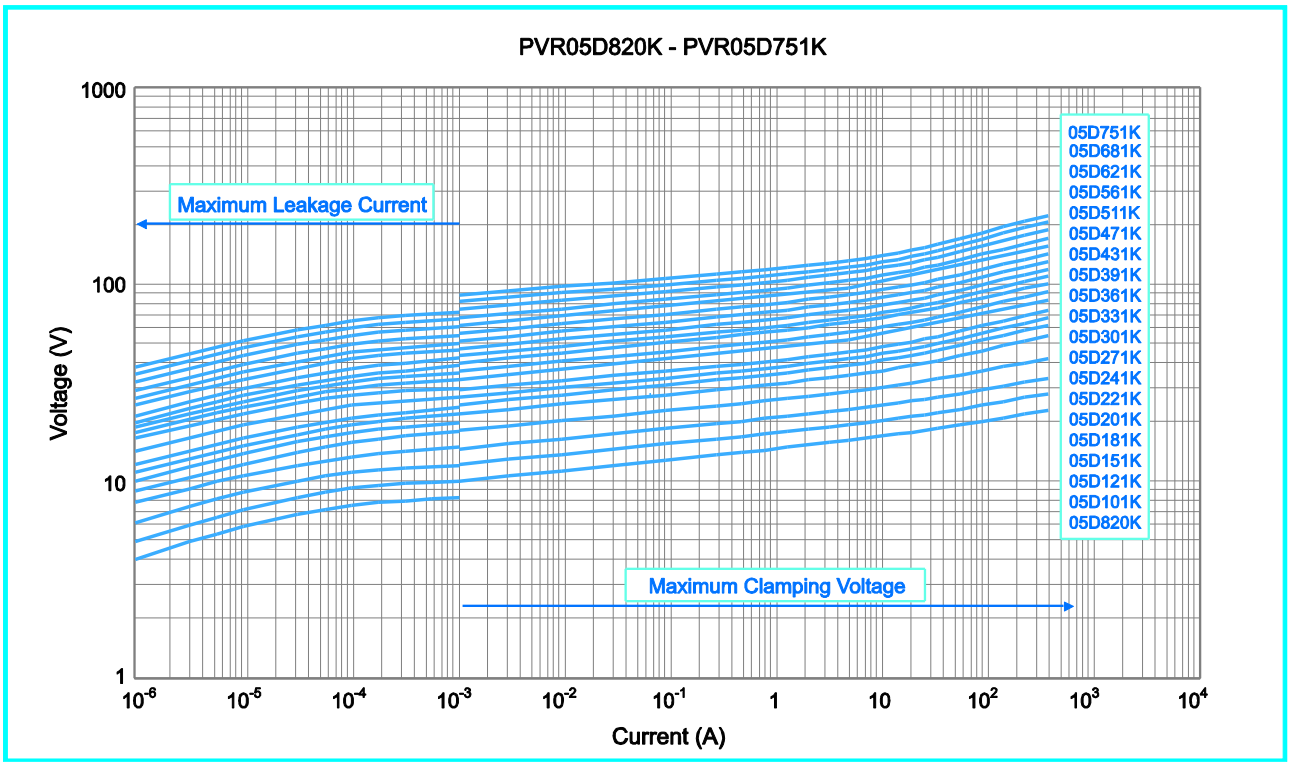




PVR05D Series MOV Devices

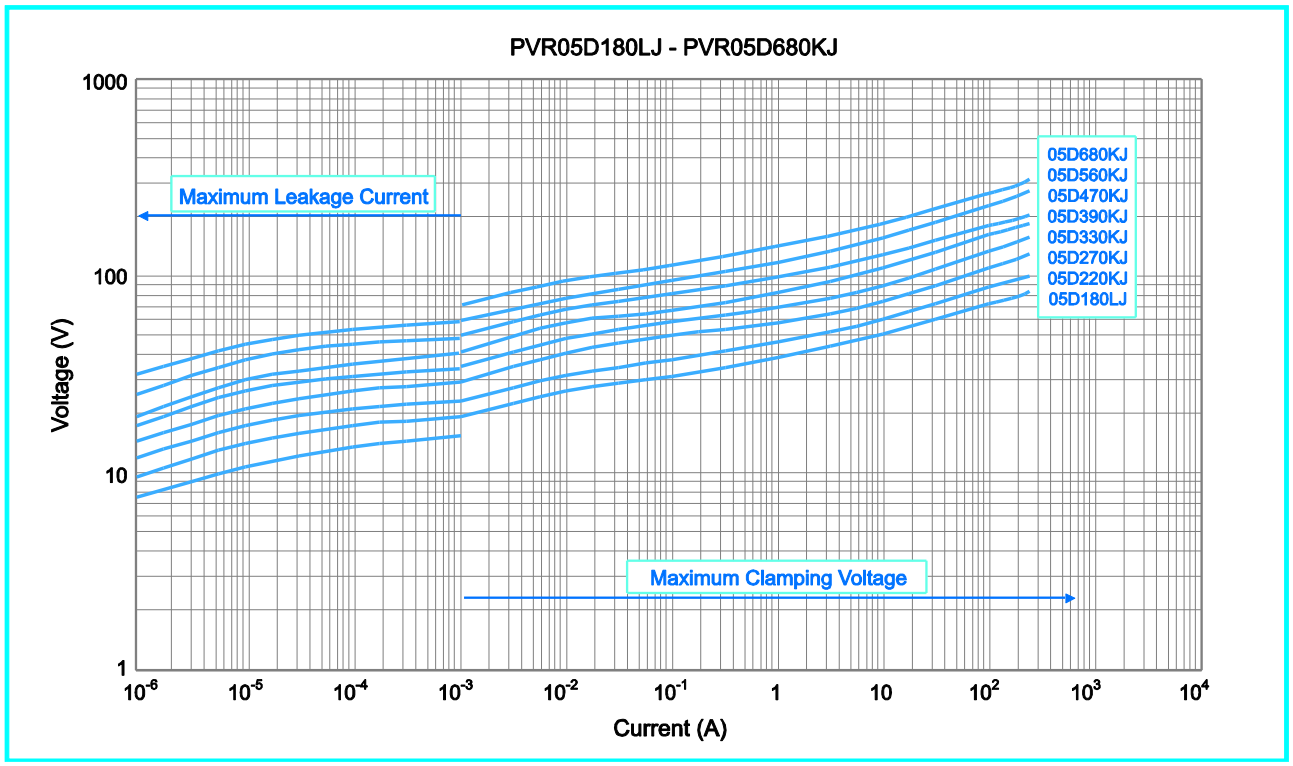
V-I Characteristics Curves

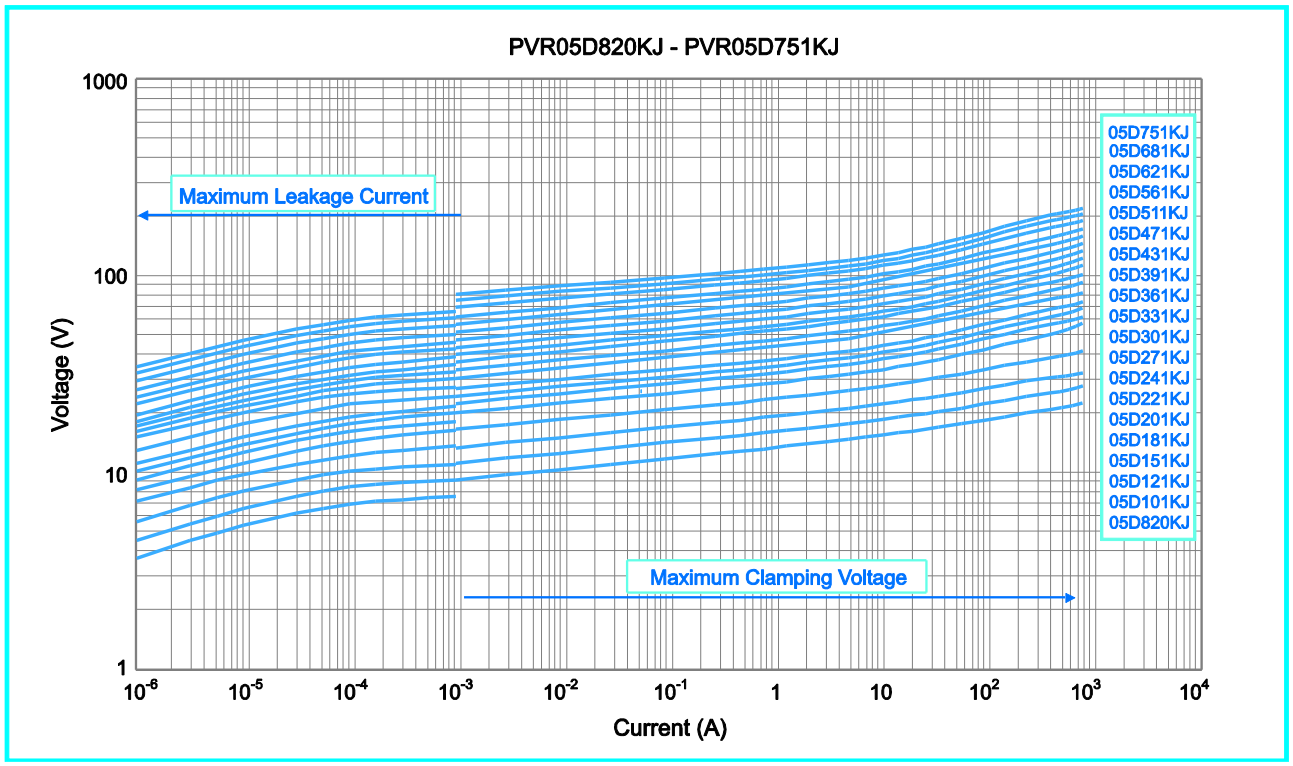




PVR05D Series MOV Devices

V-I Characteristics Curves

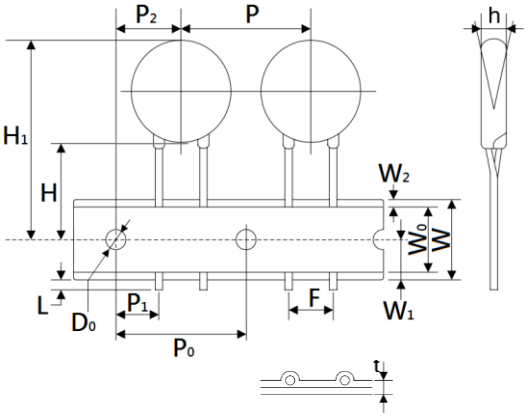




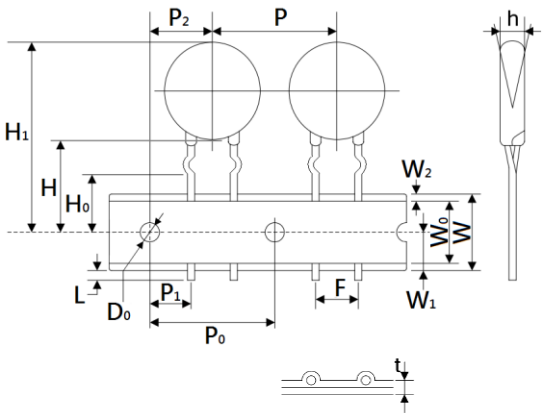
PVR05D Series MOV Devices

Taping Dimensions

S Type

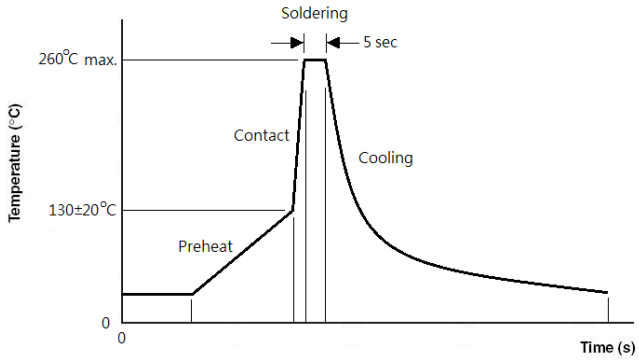


C Type



Symbol	Dimension (mm)	Symbol	Dimension (mm)
P	12.7±1.0	W_2	3.0 max.
P_0	12.7±0.3	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	29.0 max.
F	5.0±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

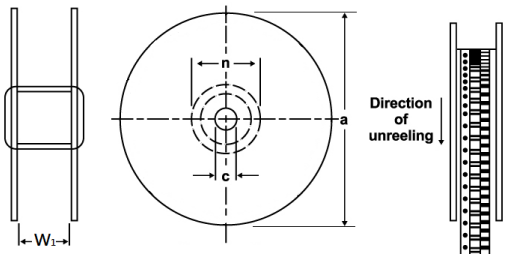


Preheat - Temperature Min (T_{s_min}) - Temperature Max (T_{s_max}) - Time (T_{s_min} to T_{s_max}) - Average Ramp-Up Rate	 110°C 150°C 30-90 seconds 1~3°C/second
Peak Temperature	260°C
Max Time at Peak Temperature	5 seconds
Ramp-Down Rate	5 °C /second max.

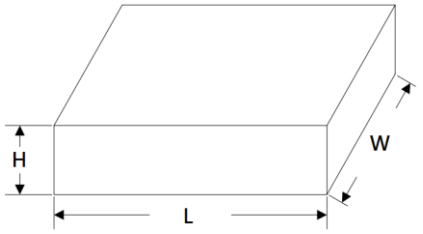
Note: If the wave soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

PVR05D Series MOV Devices

Reel and Ammo Packing Dimensions/Quantity



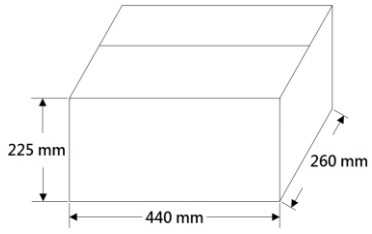
Symbol	Dimension (mm)
W_1	46±1
a	340±10
c	31±1



Symbol	Dimension (mm)
W	348±5
L	185±5
H	60±5

Part Number	Reel pack		Ammo pack	
	Box	Carton	Box	Carton
180L – 241K	2000	20000	N/A	N/A
271K – 751K	1500	15000	N/A	N/A

Bulk Packing Quantity



Part Number	Bulk pack			
	Type	Bag	Small Carton	Carton
180L – 751K	Long leg	1000	10000	20000
	Short leg	1000	15000	30000

PVR05D 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