

## Metal Oxide Varistors (MOV) Data Sheet

### Features

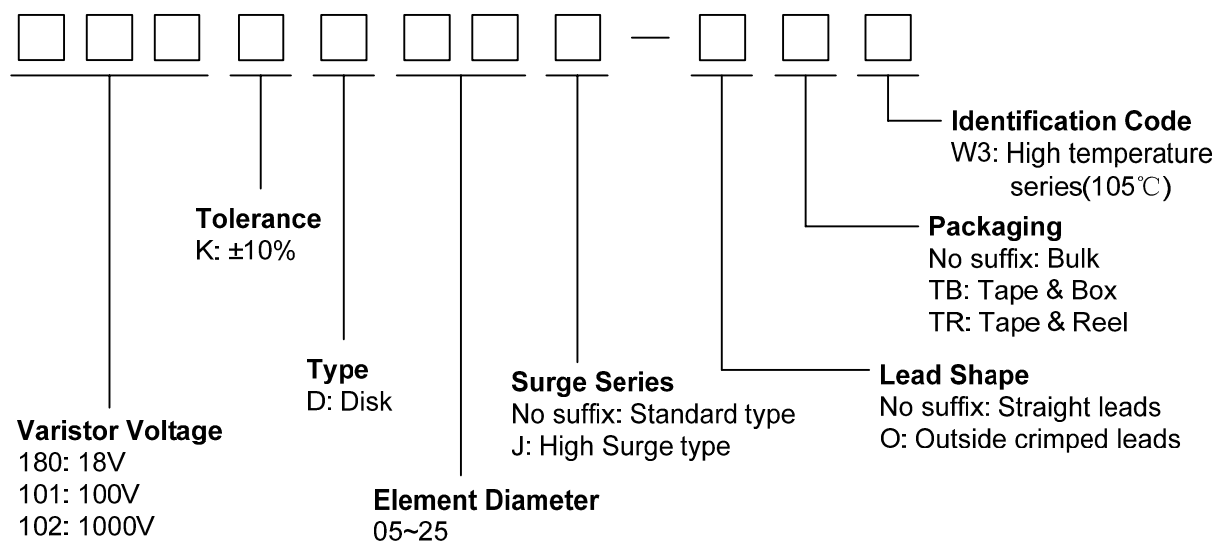
- Wide operating voltage ( $V_{1mA}$ ) range from 18V to 1100V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature:  $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
- Storage Temperature:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification: UL: E327997  
 CSA: 246579  
 VDE: 40027827



### 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

### Part Number Code



Dimensions

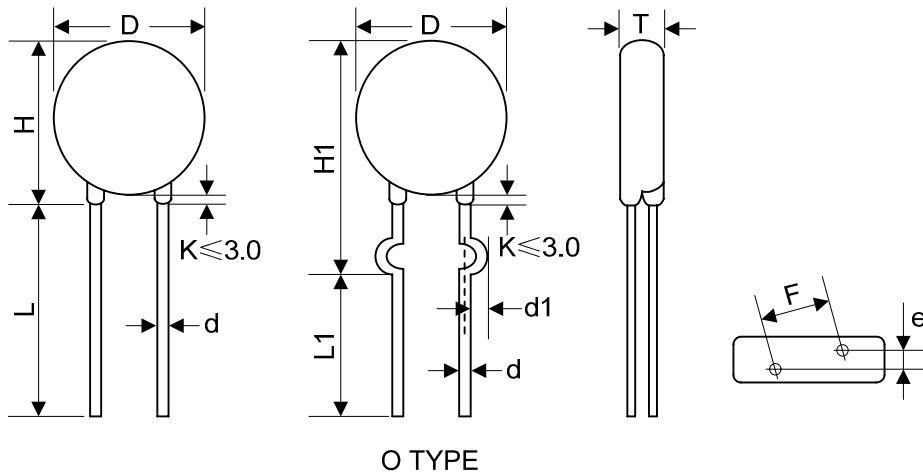


Table 1		Unit: mm	
Symbol	Dimension		
H	10.5~16.0	180K	
H1	13.0~17.5	220K	
L(min.)	20.0	270K	
L1(min.)	15.0	330K	
D	10.0~12.5	390K	
F(±0.8)	7.5	470K	
T	Table 2	560K	
e(±0.8)	Table 2	680K	
d(±0.05)	0.8	820K	
d1(±0.4)	1.4	101K	

121K  
151K  
181K  
201K  
221K  
241K  
271K

Table 2						Unit: mm	
Model	T	e	Model	T	e		
2.0~4.	6	1.5	301K	2.7~5.5	2.5		
2.1~4.	7	1.6	331K	2.7~5.8	2.5		
2.1~4.	8	1.8	361K	2.9~6.0	2.7		
2.2~5.	0	1.7	391K	3.0~6.2	2.8		
2.1~5.	3	1.8	431K	3.2~6.5	3.0		
2.2~5.	4	1.9	471K	3.3~6.7	3.2		
2.3~5.5		2.1	511K	3.4~6.8	3.4		
2.4~	5.6	2.4	561K	3.6~7.0	3.6		
2.1~	4.7	1.8	621K	3.8~7.3	3.9		
2.4~4.	9	2.0	681K	4.0~7.6	4.2		
2.4~5.1	2.2	751K	4.3~8.0	4.3			
2.2~5.4	1.8	781K	4.4~8.1	4.4			
2.3~4.8	1.9	821K	4.6~8.3	4.6			
2.4~5.0	2.0	911K	4.8~8.8	5.0			
2.5~5.1	2.1	102K	5.4~9.3	5.0			
2.6~5.2	2.2	112K	5.8~9.9	5.4			
2.6~5.4	2.4						

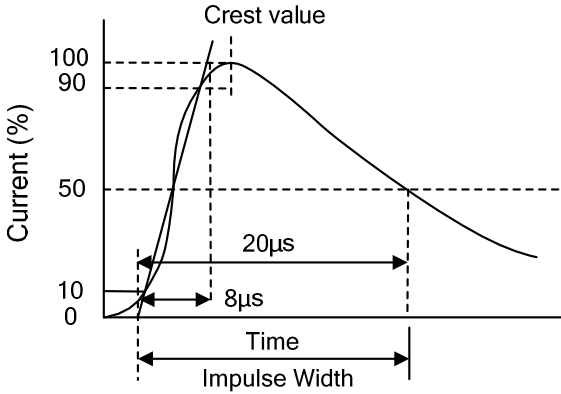
Electrical Characteristics

Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge Current		Maximum Energy (10/1000μs)		Rated Power	Typical Capacitance (Reference)
Standard	High Surge	V <sub>AC</sub> (V)	V <sub>DC</sub> (V)	V <sub>1mA</sub> (V)	I <sub>P</sub> (A)	V <sub>C</sub> (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
180KD10-W3	180KD10J-W3	11	14	15~21.6	5	36	500	1000	2.1	3.0	0.05	5600
220KD10-W3	220KD10J-W3	14	18	19.5~26	5	43	500	1000	2.5	5.0	0.05	4500
270KD10-W3	270KD10J-W3	17	22	24~31	5	53	500	1000	3.0	6.0	0.05	3700
330KD10-W3	330KD10J-W3	20	26	29.5~36.5	5	65	500	1000	4.0	7.0	0.05	3000
390KD10-W3	390KD10J-W3	25	31	35~43	5	77	500	1000	4.6	9.0	0.05	2400
470KD10-W3	470KD10J-W3	30	38	42~52	5	93	500	1000	5.5	11.0	0.05	2100
560KD10-W3	560KD10J-W3	35	45	50~62	5	110	500	1000	7.0	13.0	0.05	1800
680KD10-W3	680KD10J-W3	40	56	61~75	5	135	500	1000	8.2	15.0	0.05	1500
820KD10-W3	820KD10J-W3	50	65	74~90	25	135	2500	3500	12.0	17.0	0.4	1200
101KD10-W3	101KD10J-W3	60	85	90~110	25	165	2500	3500	15.0	18.0	0.4	1000
121KD10-W3	121KD10J-W3	75	100	108~132	25	200	2500	3500	18.0	21.0	0.4	830
151KD10-W3	151KD10J-W3	95	125	135~165	25	250	2500	3500	22.0	25.0	0.4	670
181KD10-W3	181KD10J-W3	115	150	162~198	25	300	2500	3500	27.0	30.0	0.4	560
201KD10-W3	201KD10J-W3	130	170	180~220	25	340	2500	3500	30.0	35.0	0.4	500
221KD10-W3	221KD10J-W3	140	180	198~242	25	360	2500	3500	32.0	39.0	0.4	450
241KD10-W3	241KD10J-W3	150	200	216~264	25	395	2500	3500	35.0	42.0	0.4	420
271KD10-W3	271KD10J-W3	175	225	243~297	25	455	2500	3500	37.0	49.0	0.4	370
301KD10-W3	301KD10J-W3	190	250	270~330	25	500	2500	3500	40.0	54.0	0.4	330
331KD10-W3	331KD10J-W3	210	275	297~363	25	550	2500	3500	43.0	58.0	0.4	300
361KD10-W3	361KD10J-W3	230	300	324~396	25	595	2500	3500	47.0	65.0	0.4	280
391KD10-W3	391KD10J-W3	250	320	351~429	25	650	2500	3500	60.0	70.0	0.4	260
431KD10-W3	431KD10J-W3	275	350	387~473	25	710	2500	3500	65.0	80.0	0.4	230
471KD10-W3	471KD10J-W3	300	385	423~517	25	775	2500	3500	67.0	85.0	0.4	210
511KD10-W3	511KD10J-W3	320	415	459~561	25	845	2500	3500	69.0	90.0	0.4	200
561KD10-W3	561KD10J-W3	350	460	504~616	25	925	2500	3500	70.0	92.0	0.4	180
621KD10-W3	621KD10J-W3	385	505	558~682	25	1025	2500	3500	72.0	95.0	0.4	160
681KD10-W3	681KD10J-W3	420	560	612~748	25	1120	2500	3500	75.0	98.0	0.4	150
751KD10-W3	751KD10J-W3	460	615	675~825	25	1240	2500	3500	77.0	100.0	0.4	130
781KD10-W3	781KD10J-W3	485	640	702~858	25	1290	2500	3500	80.0	105.0	0.4	125
821KD10-W3	821KD10J-W3	510	670	738~902	25	1355	2500	3500	85.0	110.0	0.4	120
911KD10-W3	911KD10J-W3	550	745	819~1001	25	1500	2500	3500	93.0	130.0	0.4	110
102KD10-W3	102KD10J-W3	625	825	900~1100	25	1650	2500	3500	102.0	140.0	0.4	100
112KD10-W3	112KD10J-W3	680	895	990~1210	25	1815	2500	3500	115.0	155.0	0.4	90

Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

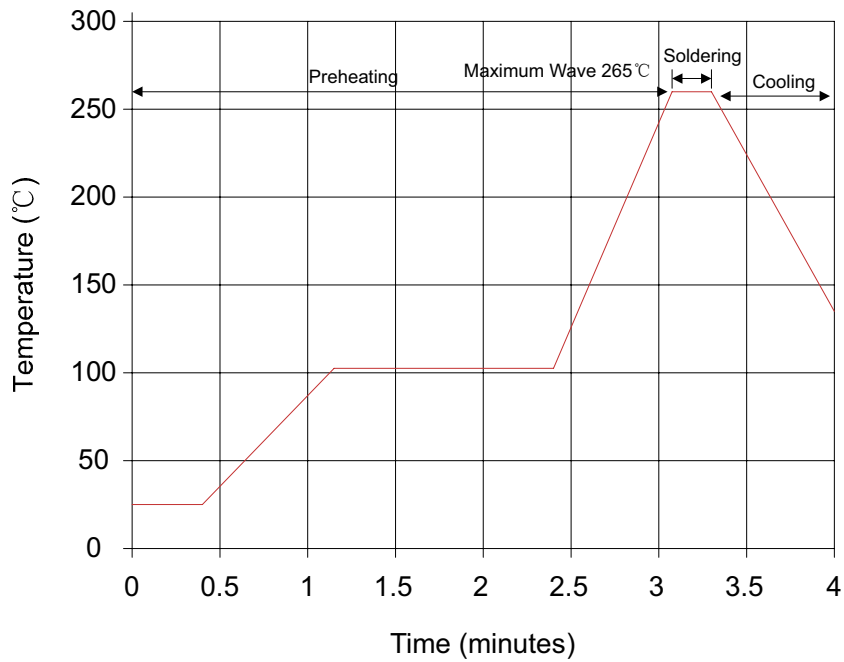
2. Leakage Current (@83% of V<sub>1mA</sub>): IR≤50μA (180K~680K)  
IR≤25μA (820K~112K)

Electrical Ratings

Items	Test Condition/Description	Requirement					
Varistor Voltage	The voltage between two terminals with the specified measuring current 1mA.DC applied is called Vb.						
Maximum Allowable Voltage	The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously.						
Maximum Clamping Voltage	<p>The maximum voltage between two terminals with the specification standard impulse current. Applied waveform: 8/20μs</p> 	To meet the Specified value					
Rated Wattage	The maximum average power that can be applied within the specified ambient temperature.						
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse of 10/1000μs or 2ms is applied.						
Withstanding Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20μs) applied one time.						
Varistor Voltage Temp. Coefficient	$\left  \frac{V_{1mA@105^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{80} \times 100\% (\%/^{\circ}C) \right $	≤0.05%/°C					
	$\left  \frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\% (\%/^{\circ}C) \right $						
Surge Life	<p>The change of Vb shall be measured after the impulse listed below which is applied 10,000 times continuously with the interval of ten seconds at room temperature.</p> <table border="1" data-bbox="440 1895 1203 2018"> <tr> <td data-bbox="440 1895 671 1955" rowspan="2">10Φ series</td> <td data-bbox="671 1895 935 1955">180K to 680K</td> <td data-bbox="935 1895 1203 1955">50A (8/20μs)</td> </tr> <tr> <td data-bbox="671 1955 935 2018">820K to 112K</td> <td data-bbox="935 1955 1203 2018">100A (8/20μs)</td> </tr> </table>	10Φ series	180K to 680K	50A (8/20μs)	820K to 112K	100A (8/20μs)	$\frac{\Delta V_b}{V_b} \leq 10\%$
10Φ series	180K to 680K		50A (8/20μs)				
	820K to 112K	100A (8/20μs)					

**Soldering Recommendation**

Wave Lead Free Soldering Recommendation



Item	Conditions
Peak Temperature	265°C
Dipping Time	10 seconds (max.)
Soldering	1 time

Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 seconds (max.)
Distance from Varistor	2mm (min.)

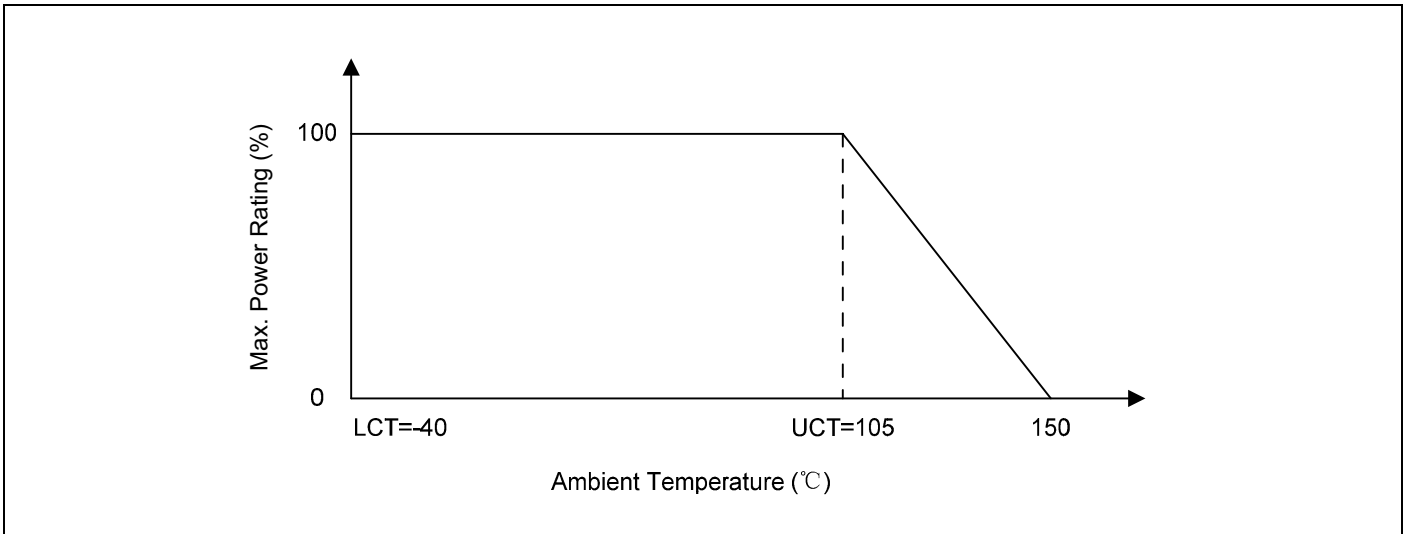
**Mechanical Characteristics**

Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5&lt;d≤0.8</td> <td>1.0</td> </tr> <tr> <td>0.8&lt;d≤1.25</td> <td>2.0</td> </tr> <tr> <td>1.25&lt;d</td> <td>4.0</td> </tr> </tbody> </table>	Terminal diameter (mm)	Force (kg)	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	1.25<d	4.0	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$
Terminal diameter (mm)	Force (kg)									
0.5<d≤0.8	1.0									
0.8<d≤1.25	2.0									
1.25<d	4.0									
Bending Strength of Terminals	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5&lt;d≤0.8</td> <td>0.5</td> </tr> <tr> <td>0.8&lt;d≤1.25</td> <td>1.0</td> </tr> <tr> <td>1.25&lt;d</td> <td>2.0</td> </tr> </tbody> </table>	Terminal diameter (mm)	Force (kg)	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	1.25<d	2.0	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$
Terminal diameter (mm)	Force (kg)									
0.5<d≤0.8	0.5									
0.8<d≤1.25	1.0									
1.25<d	2.0									
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s <sup>2</sup> Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$								
Solder ability	Solder Temp: 245±5°C Dipping Time: 2±0.5 sec	At least 95% of terminal electrode is covered by new solder								
Resistance to Soldering Heat	Solder Temp: 260±5°C Dipping Time: 10±1 sec	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$								

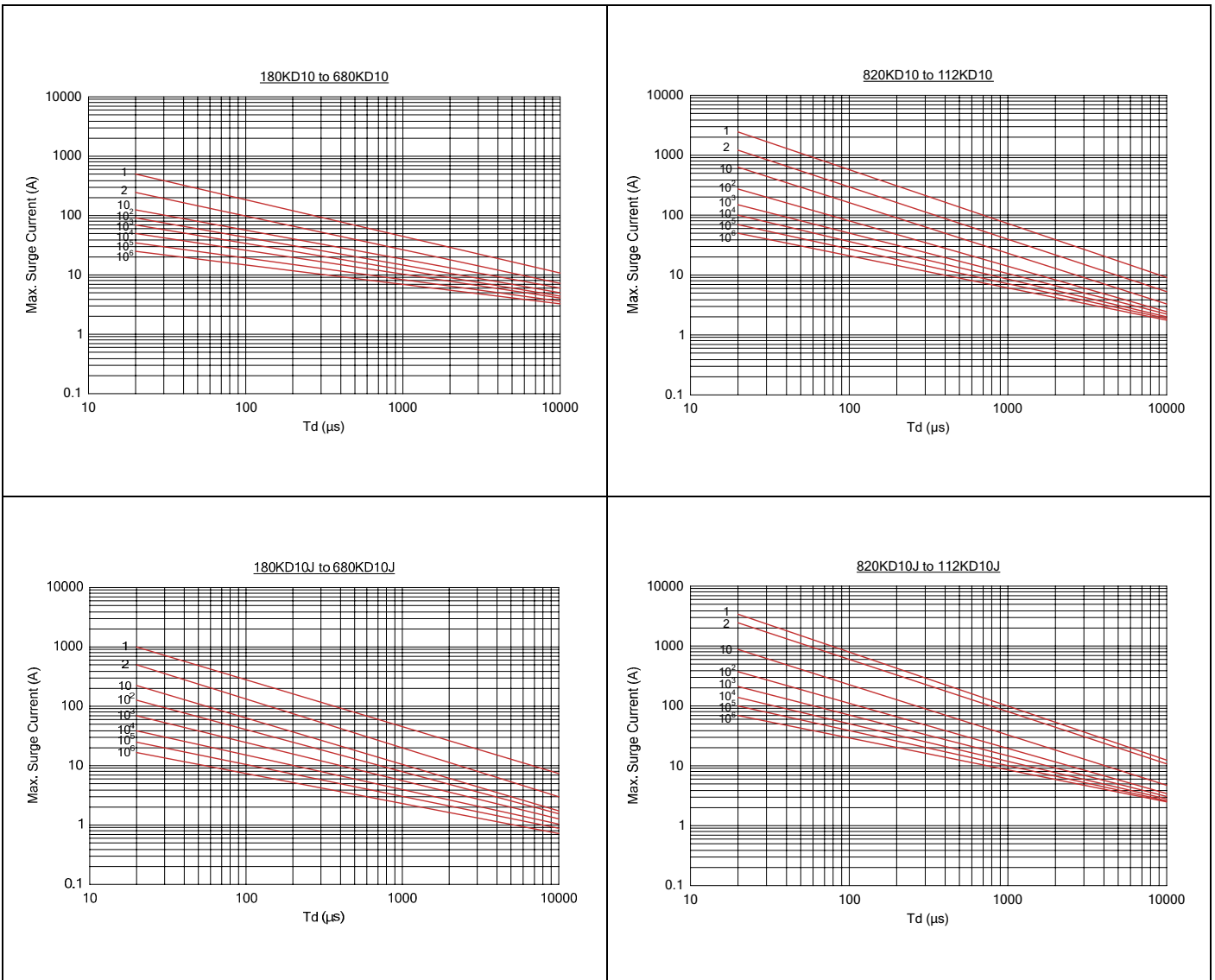
**Reliability**

Items	Test conditions / Methods	Specifications															
High Temperature Storage	Ambient Temp: 125±2°C Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$															
Low Temperature Storage	Ambient Temp: -40±2°C Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$															
Humidity	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$															
Temperature Cycle	The conditions shown below shall be repeated 5 cycles <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>15±3</td> </tr> <tr> <td>3</td> <td>125±3</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>15±3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40±3	30±3	2	Room temperature	15±3	3	125±3	30±3	4	Room temperature	15±3	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$
Step	Temperature (°C)	Period (minutes)															
1	-40±3	30±3															
2	Room temperature	15±3															
3	125±3	30±3															
4	Room temperature	15±3															
High Temperature Load	Ambient Temp: 105±2°C    Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$															
Damp Heat Load	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs    Load: Max. Allowable Voltage	No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$															
Voltage Proof	Metal balls method, 2500Vac 1 min.	No visible damage															

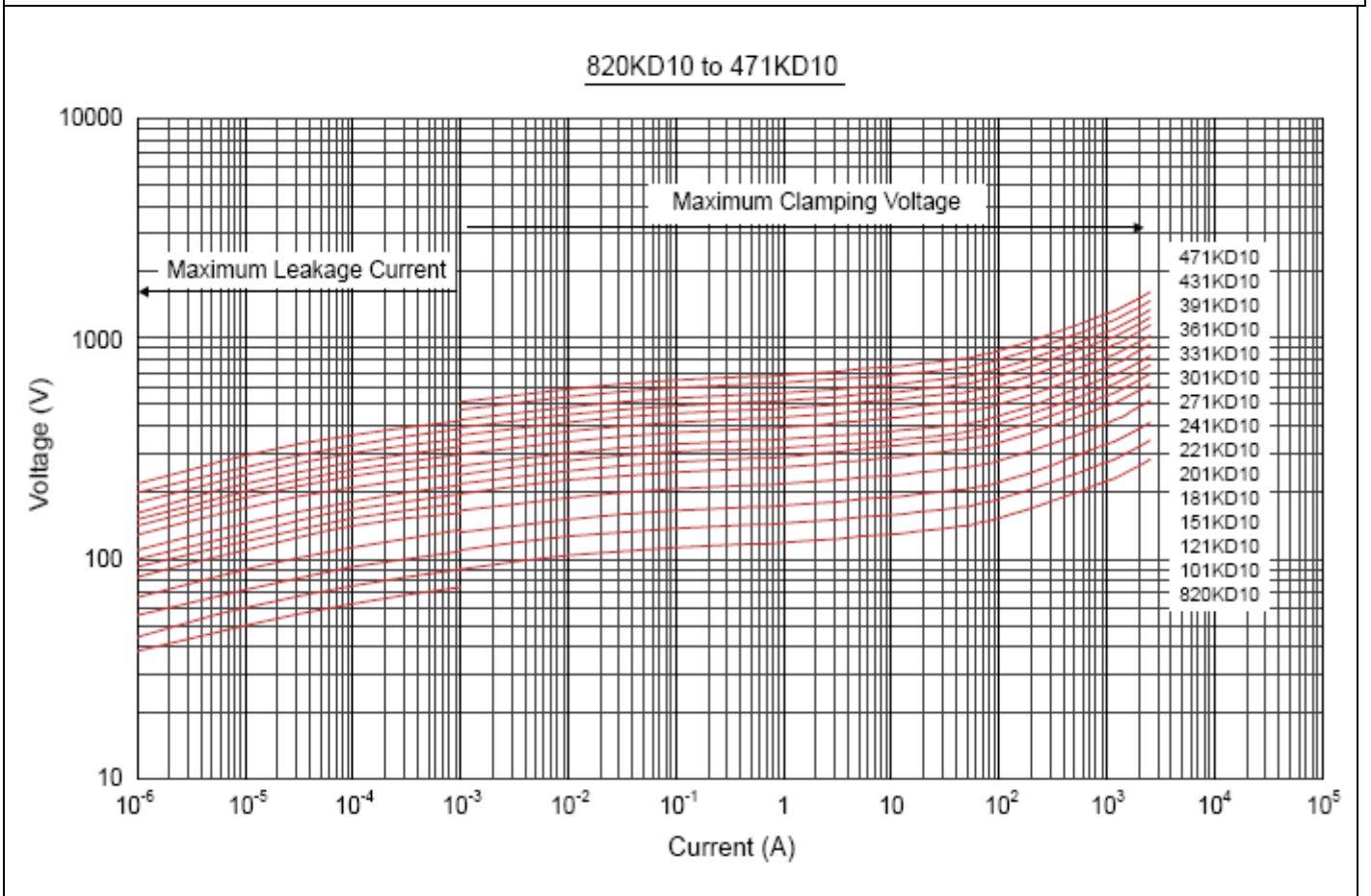
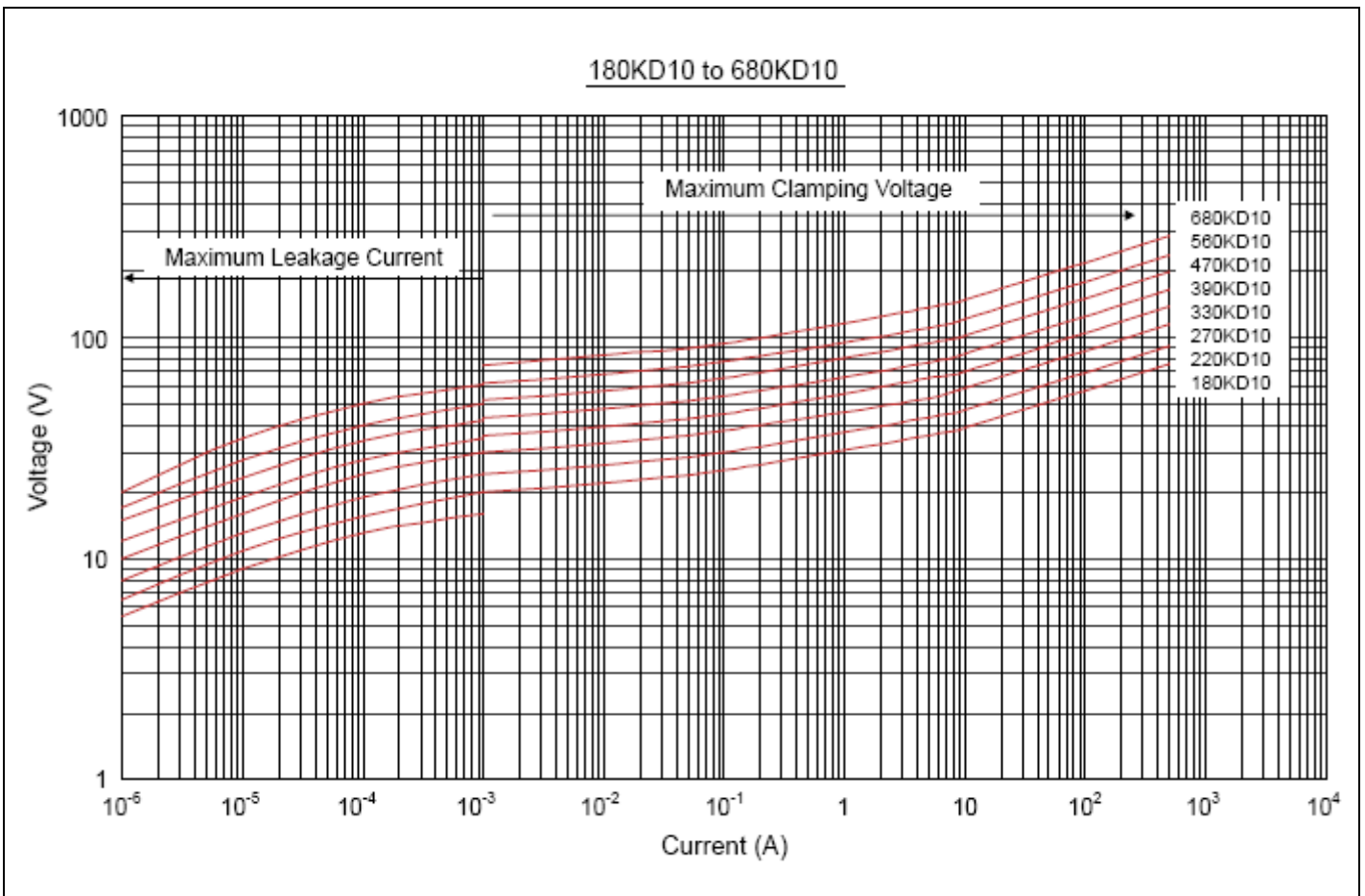
Power Derating Curve



Maximum Surge Current Derating Curve

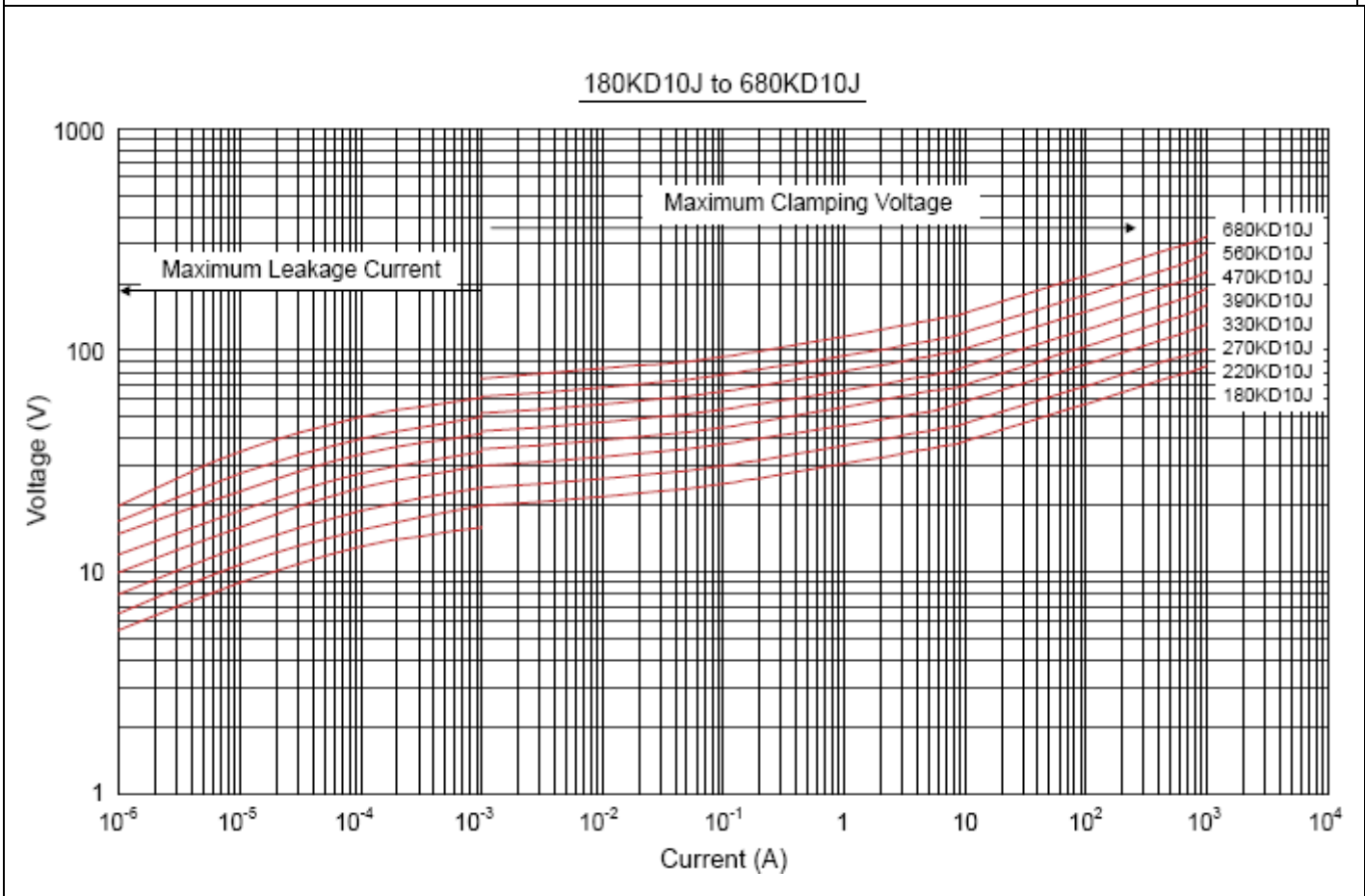
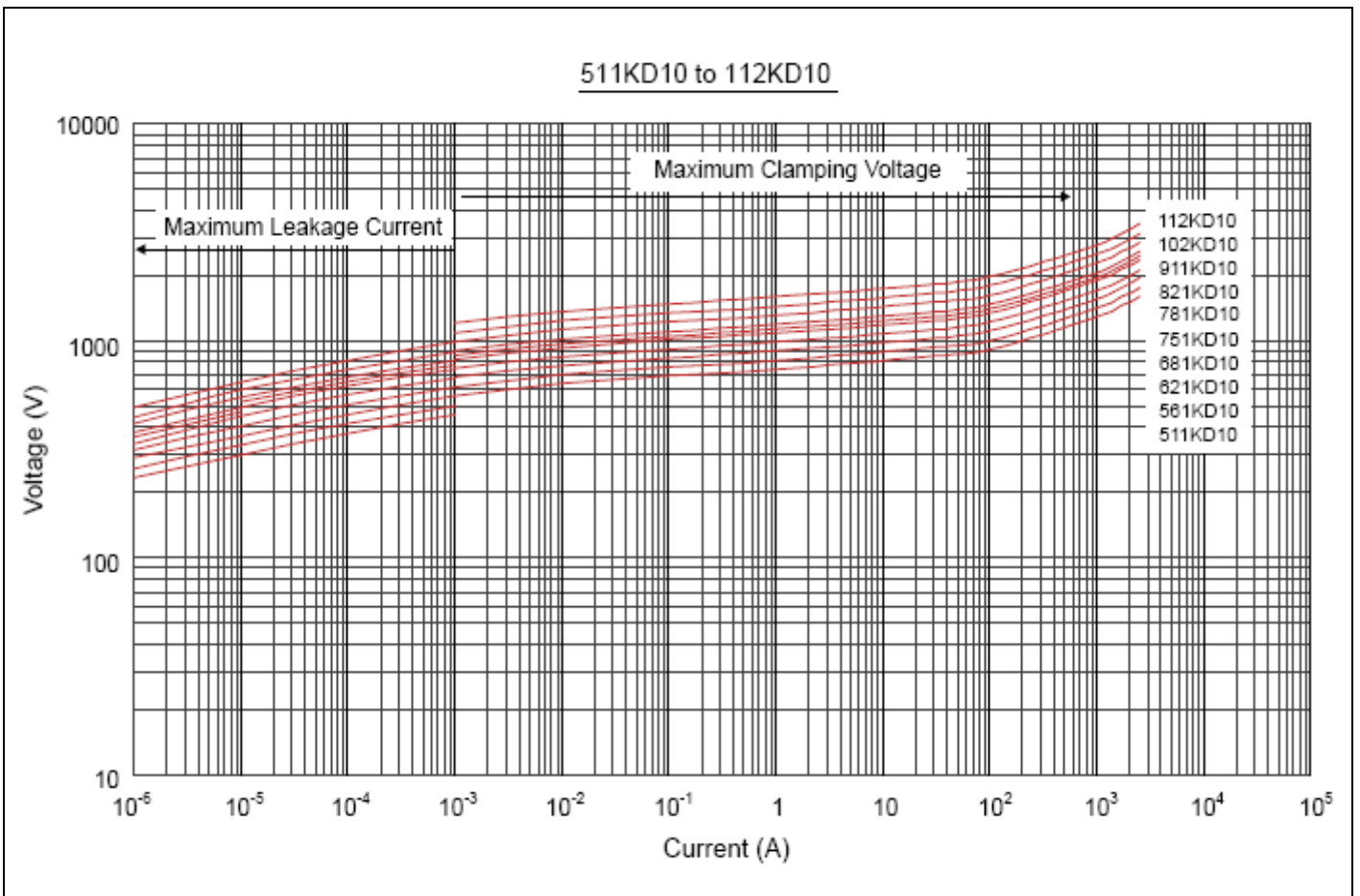


Maximum Leakage Current and Maximum Clamping Voltage Curve

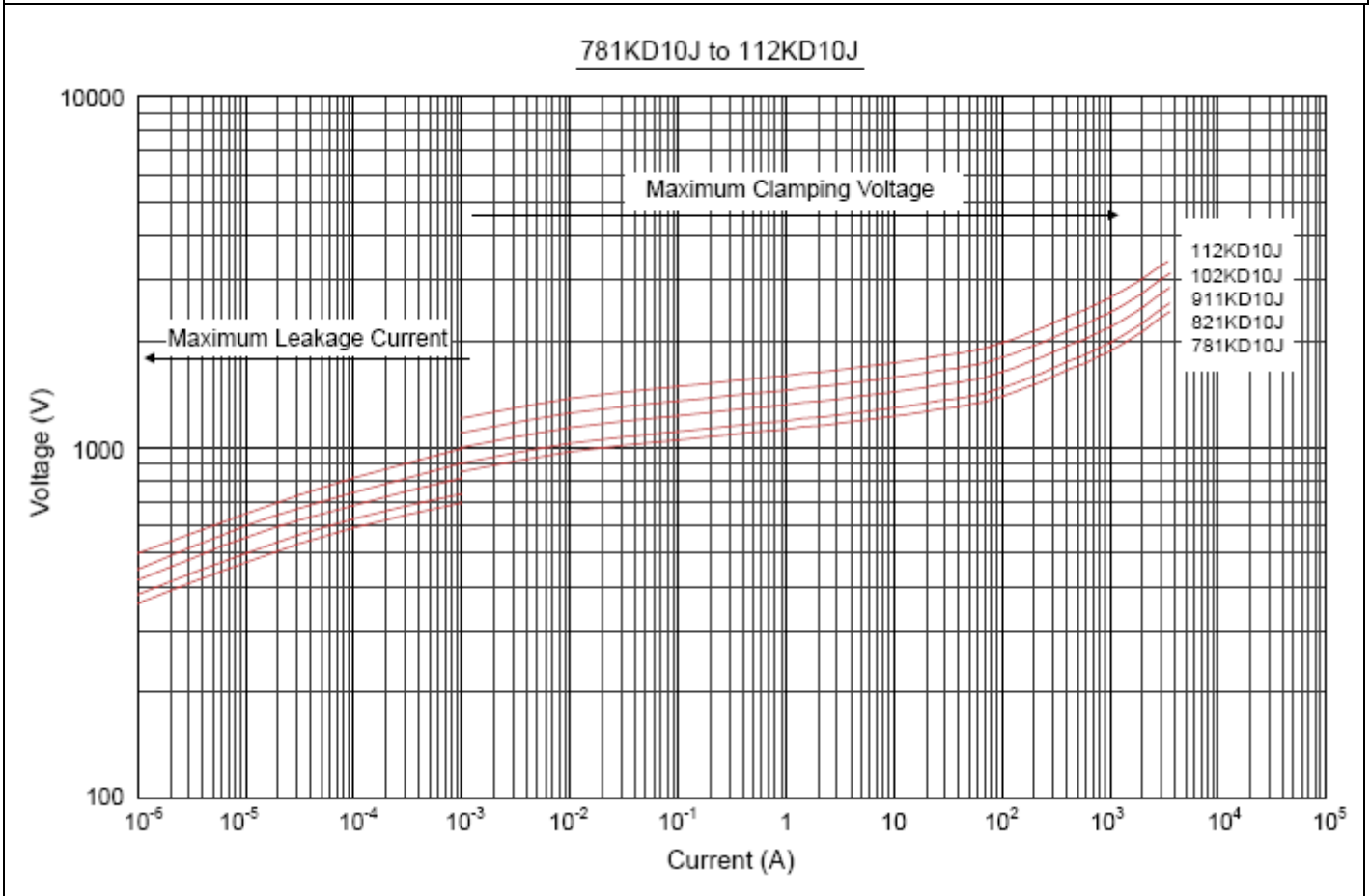
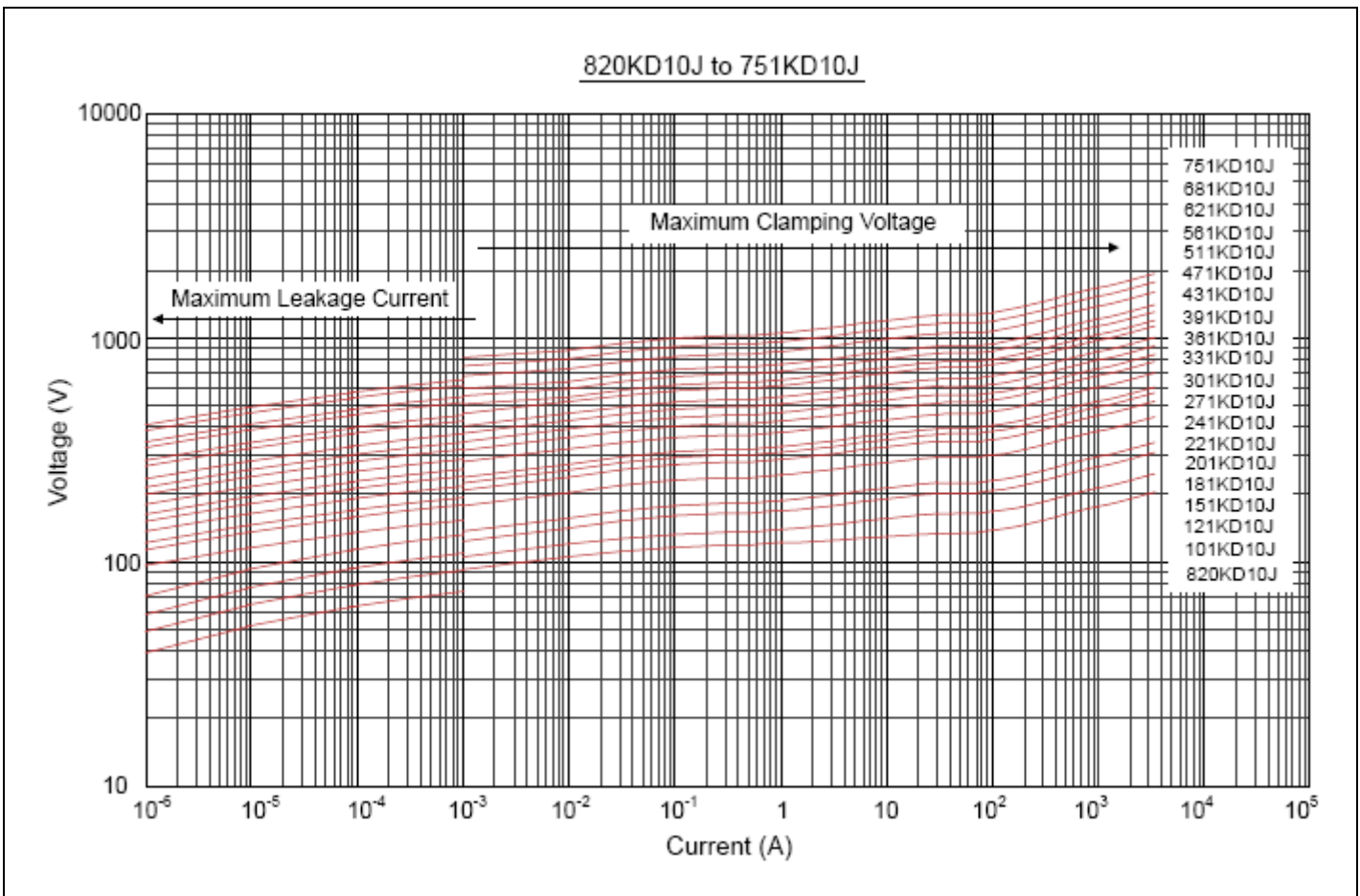




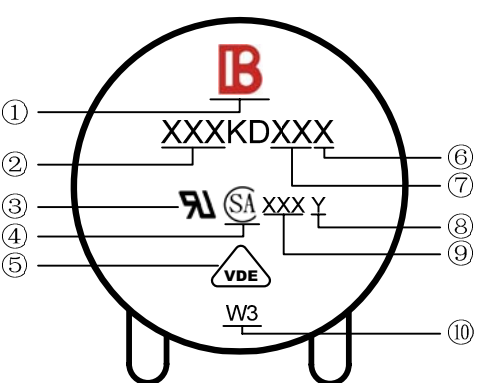
Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve

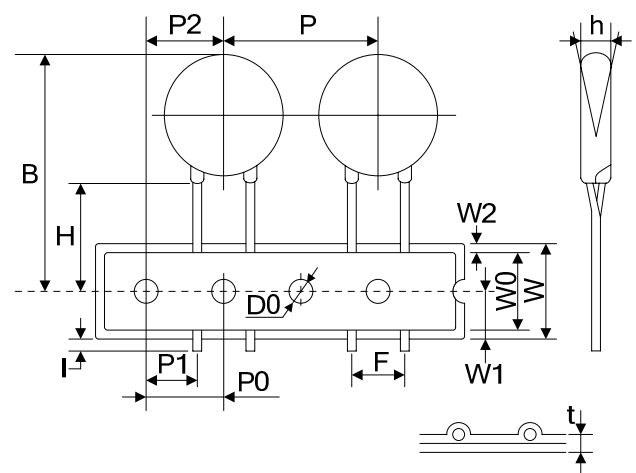


Marking Code



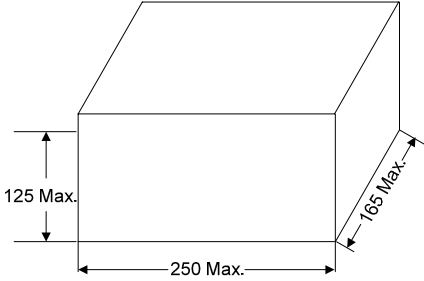
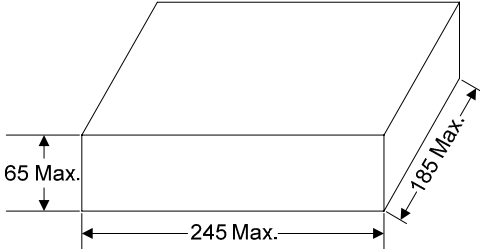
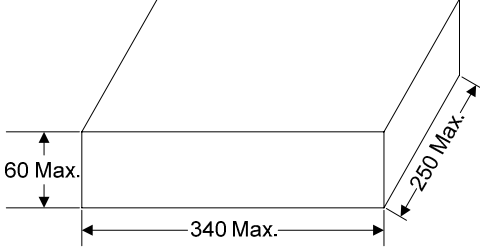
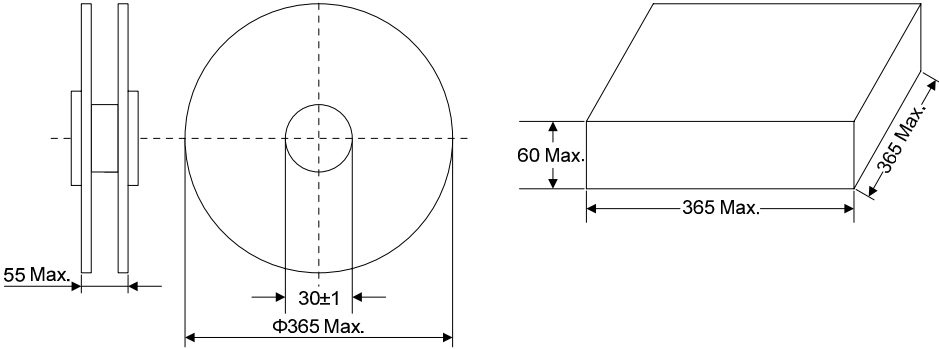
① Brightking Logo  
 ② Varistor Voltage  
 ③ UL Accreditation Logo  
 ④ CSA Accreditation Logo  
 ⑤ VDE Accreditation Logo  
 ⑥ “J” is High Surge Code, no “J” is Standard Surge  
 ⑦ Disk Size  
 ⑧ Product Line Code (“Y” may be A(a) thru Z(z))  
 ⑨ Date Code  
 ⑩ High Temperature Code (105°C)

Taping Dimensions



Symbol	Dimension (mm)
P	25.4±1.0
P0	12.7±1.0
P1	8.95±0.7
P2	12.7±1.3
F	7.5±0.8
h	0±2
W	18.0±1.0
W0	12.0±1.0
W1	9.0±0.5
W2	3.0max
H	20.0±2.0
I	1.0max
D0	4.0±0.2
t	0.6±0.3
B	36max

**Quantity**

Packaging Dimensions (Unit: mm)	Quantity
<p>Exposure in bulk</p> 	<p>500pcs/bag 4bags/box (180K~621K)</p>
<p>Cut the feet in bulk</p> 	<p>500pcs/bag 4bags/box (180K~621K)</p> <p>400pcs/bag 4bags/box (681K~112K)</p>
<p>Tape &amp; Box</p> 	<p>750pcs/box (180K~391K)</p> <p>500pcs/box (431K~621K)</p> <p>300pcs/box (681K~751K)</p>
<p>Tape &amp; Reel</p> 	<p>1000pcs/reel (180K~391K)</p> <p>750pcs/reel (431K~621K)</p> <p>500pcs/reel (681K~751K)</p>