

Metal Oxide Varistors (MOV) Data Sheet

Features

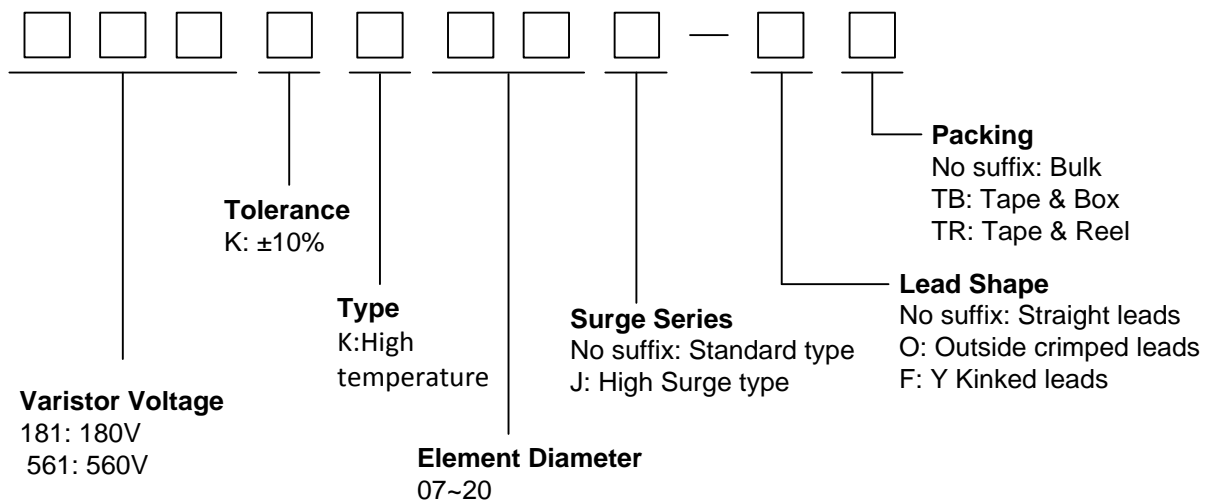
- Wide operating voltage (V_{1mA}) range from 180V to 560V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Storage Temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification: UL: E327997



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

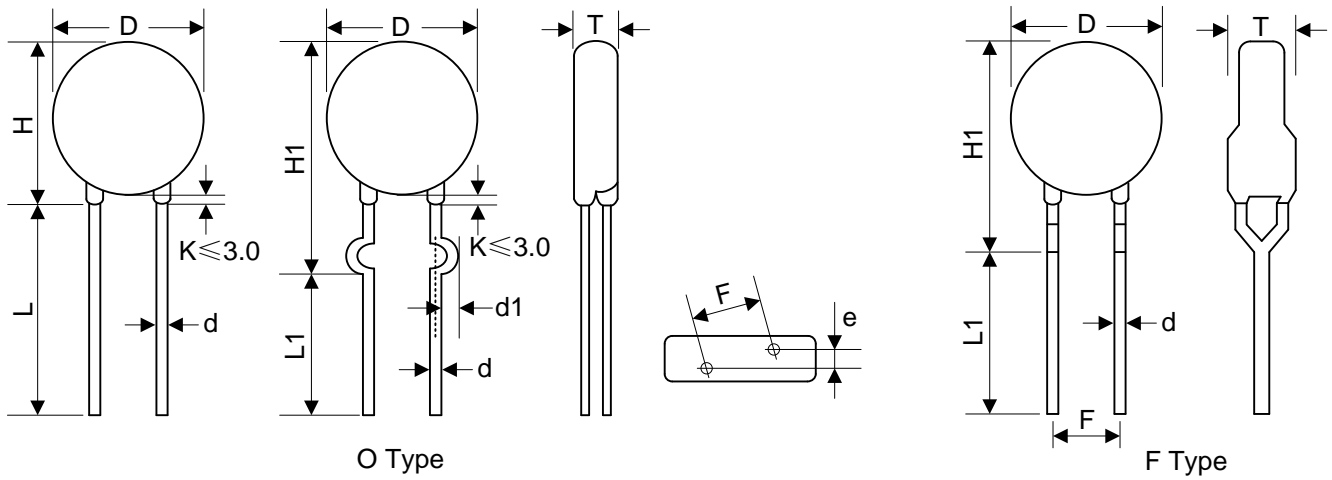


Table 1	
Unit: mm	
Symbol	Dimension
H(max.)	12.0
H1(max.)	13.5
L(min.)	20.0
L1(min.)	15.0
D(max.)	9.0
F(±0.8)	5.0
T	Table 2
e(±0.8)	Table 2
d(±0.05)	0.6
d1(±0.4)	1.2

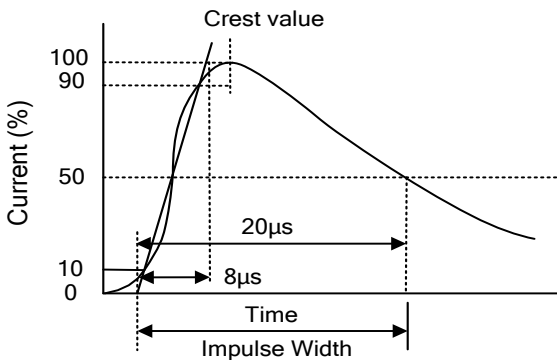
Table 2					
Unit: mm					
Model	T(max.)	e	Model	T(max.)	e
181K	4.3	1.7	471K	6.0	3.0
201K	4.4	1.8	511K	6.2	3.2
221K	4.5	1.9	561K	6.5	3.4
241K	4.6	2.0			
271K	4.9	2.2			
301K	5.0	2.3			
331K	5.1	2.3			
361K	5.2	2.5			
391K	5.4	2.6			
431K	5.7	2.8			

Electrical Characteristics

Part Number		Maximum Allowable Voltage		Varistor Voltage	Maximum Clamping Voltage		Withstanding Surge Current		Maximum Energy (10/1000 μ s)		Rated Power	Typical Capacitance (Reference)
Standard	High Surge	V _{AC} (V)	V _{DC} (V)	V _{1mA} (V)	I _P (A)	V _C (V)	I (A) Standard	I (A) High Surge	(J) Standard	(J) High Surge	(W)	@1KHz (pf)
181KK07	181KK07J	115	150	180(162~198)	10	300	1200	1750	11.7	16.0	0.25	280
201KK07	201KK07J	130	170	200(180~220)	10	340	1200	1750	13.0	17.0	0.25	250
221KK07	221KK07J	140	180	220(198~242)	10	360	1200	1750	14.0	19.0	0.25	230
241KK07	241KK07J	150	200	240(216~264)	10	395	1200	1750	15.0	21.0	0.25	210
271KK07	271KK07J	175	225	270(243~297)	10	455	1200	1750	18.0	24.0	0.25	185
301KK07	301KK07J	190	250	300(270~330)	10	500	1200	1750	20.0	26.0	0.25	165
331KK07	331KK07J	210	275	330(297~363)	10	550	1200	1750	23.0	28.0	0.25	150
361KK07	361KK07J	230	300	360(324~396)	10	595	1200	1750	24.0	32.0	0.25	140
391KK07	391KK07J	250	320	390(351~429)	10	650	1200	1750	26.0	35.0	0.25	130
431KK07	431KK07J	275	350	430(387~473)	10	710	1200	1750	28.0	40.0	0.25	115
471KK07	471KK07J	300	385	470(423~517)	10	775	1200	1750	29.0	42.0	0.25	105
511KK07	511KK07J	320	415	510(459~561)	10	845	1200	1750	31.0	45.0	0.25	100
561KK07	561KK07J	350	460	560(504~616)	10	925	1200	1750	35.0	49.0	0.25	90

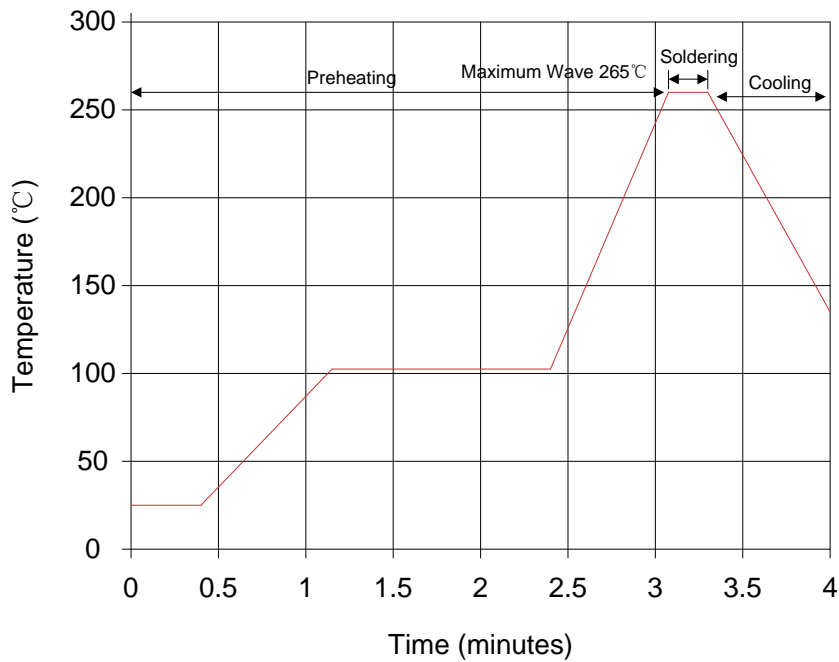
Notes: 1. Leakage Current (@83% of V_{1mA}) : IR \leq 25 μ A

Electrical Ratings

Items	Test Condition/Description	Requirement			
Varistor Voltage	The voltage between the 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 the 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@125^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{100} \times 100\% (/^{\circ}C) \right $ $\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 $		≤0.05%/°C		
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="454 1892 1189 1960"> <tr> <td>7Φ series</td> <td>181K to 821K</td> <td>50A (8/20μs)</td> </tr> </table>	7Φ series	181K to 821K	50A (8/20μs)	$\frac{\Delta V_b}{V_b} \leq \pm 10\%$
7Φ series	181K to 821K	50A (8/20μs)			

Soldering Recommendation

Lead-free Wave 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.)

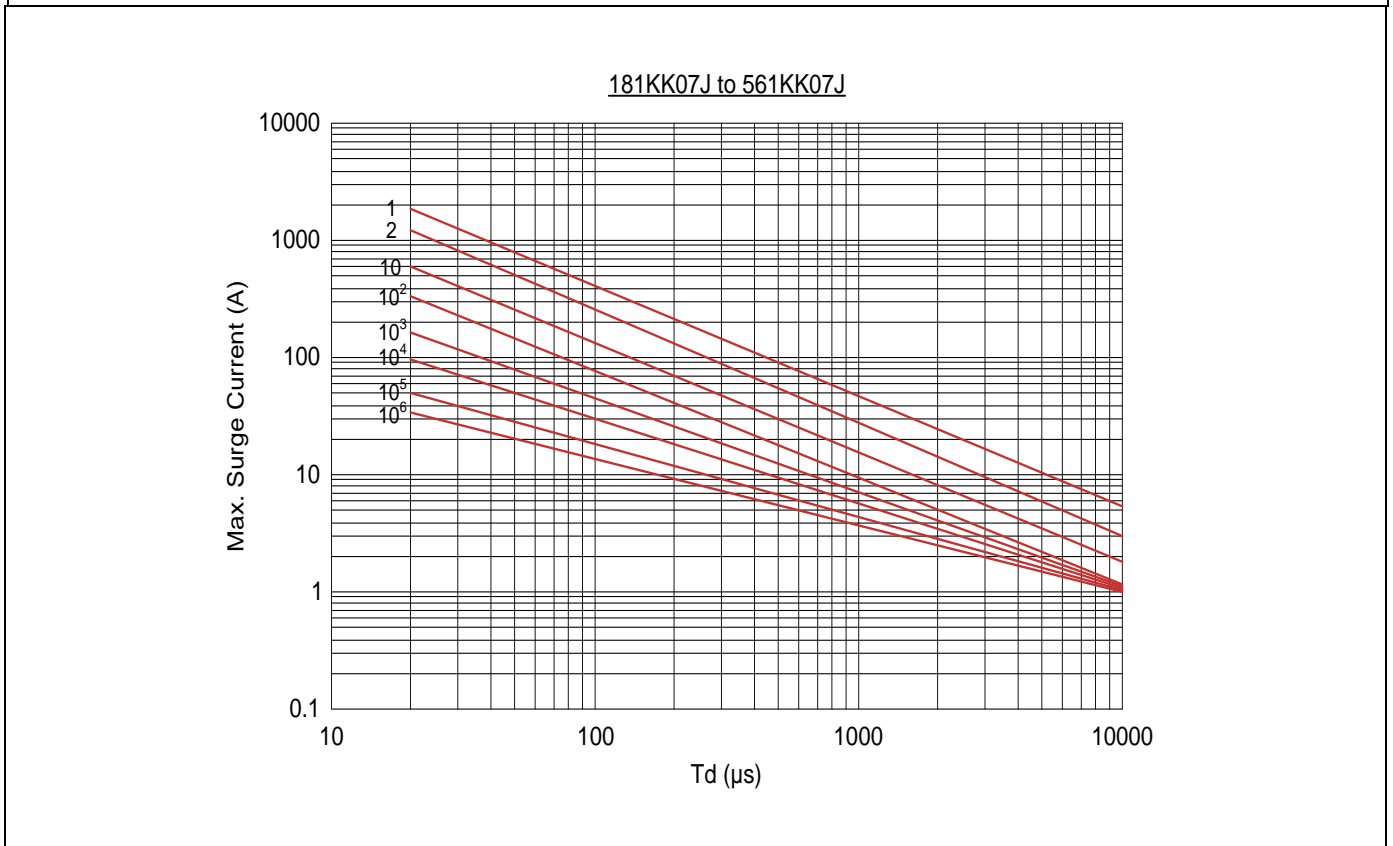
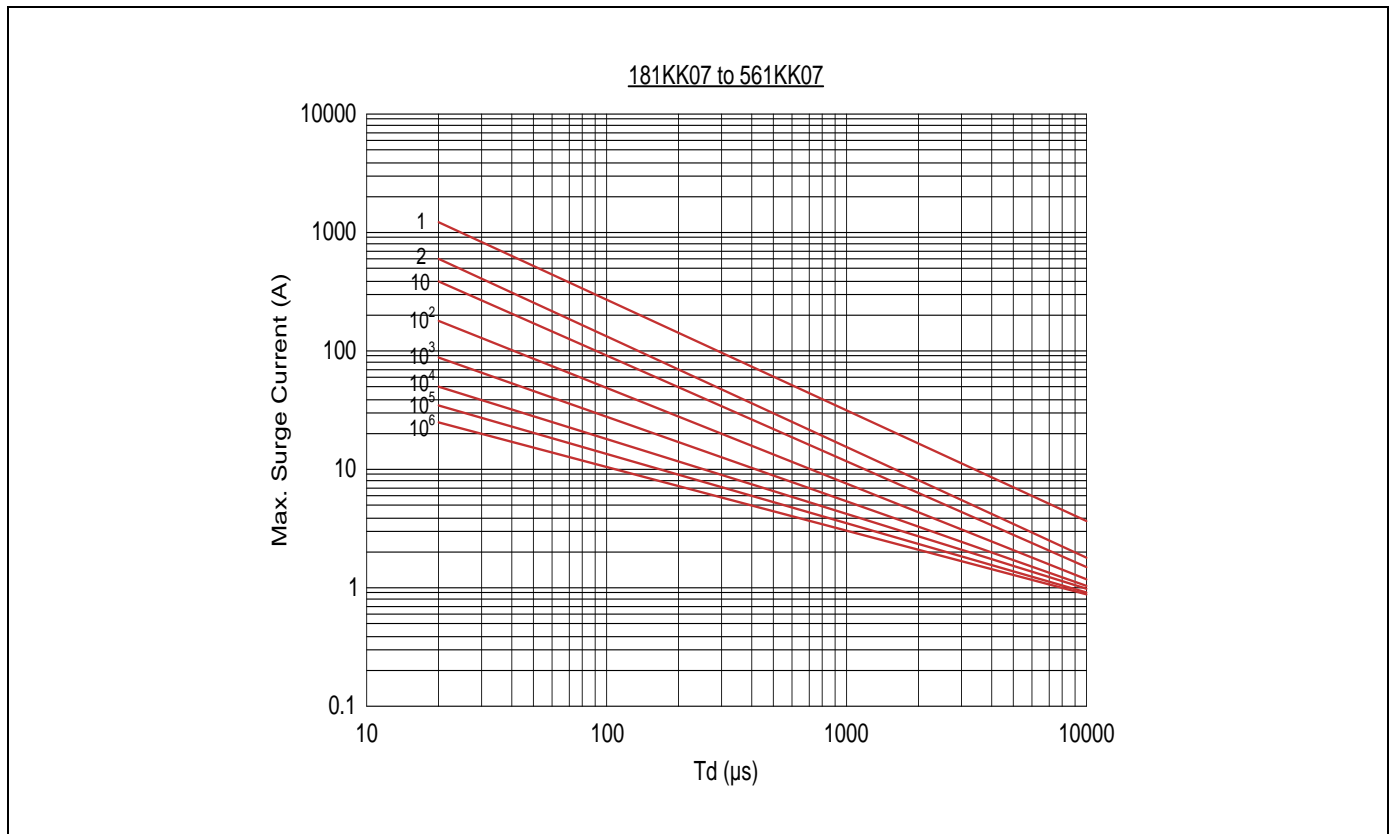
Mechanical Characteristics

Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	<p>Gradually applying the force specified and keeping the unit fixed for 10±1 sec.</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5 < d ≤ 0.8</td> <td>1.0</td> </tr> <tr> <td>0.8 < d ≤ 1.25</td> <td>2.0</td> </tr> <tr> <td>1.25 < 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	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 5%</p>
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	<p>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.</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5 < d ≤ 0.8</td> <td>0.5</td> </tr> <tr> <td>0.8 < d ≤ 1.25</td> <td>1.0</td> </tr> <tr> <td>1.25 < 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	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 5%</p>
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	<p>Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s² Direction: 3 mutually perpendicular directions, 2hrs each.</p>	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 5%</p>								
Solder ability	<p>Solder Temp: 245±5°C Dipping Time: 2±0.5 sec</p>	<p>At least 95% of terminal electrode is covered by new solder</p>								
Resistance to Soldering Heat	<p>Solder Temp: 260±5°C Dipping Time: 10±1 sec</p>	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 10%</p>								

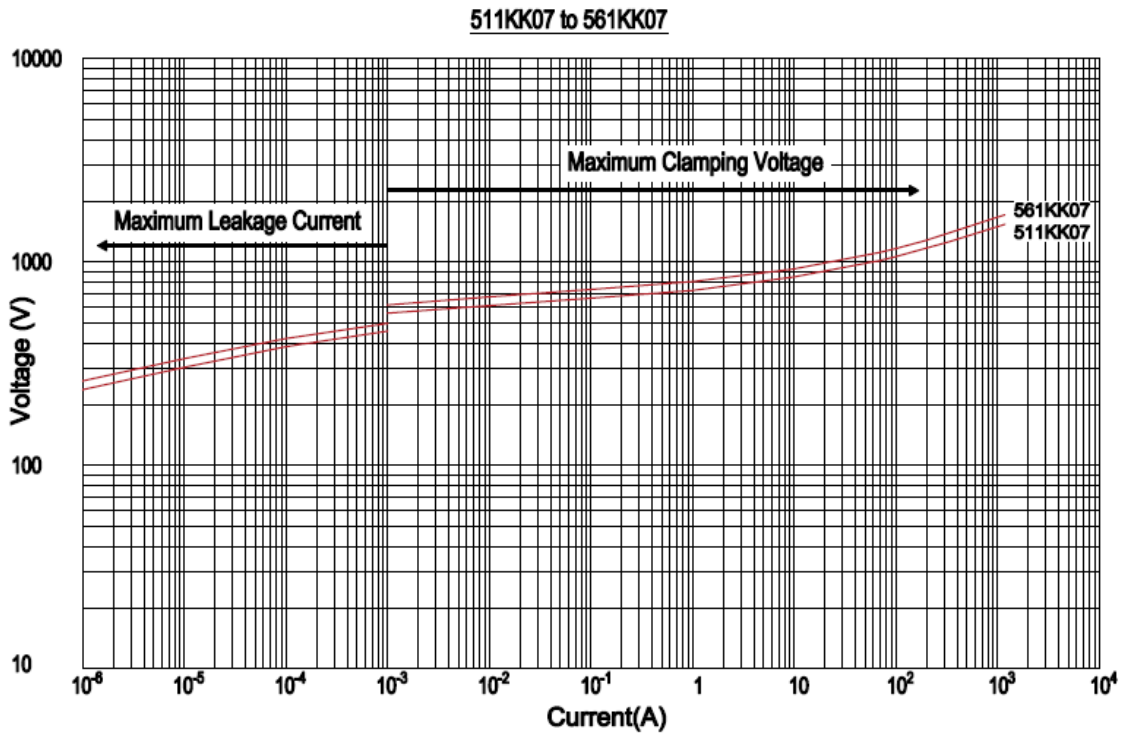
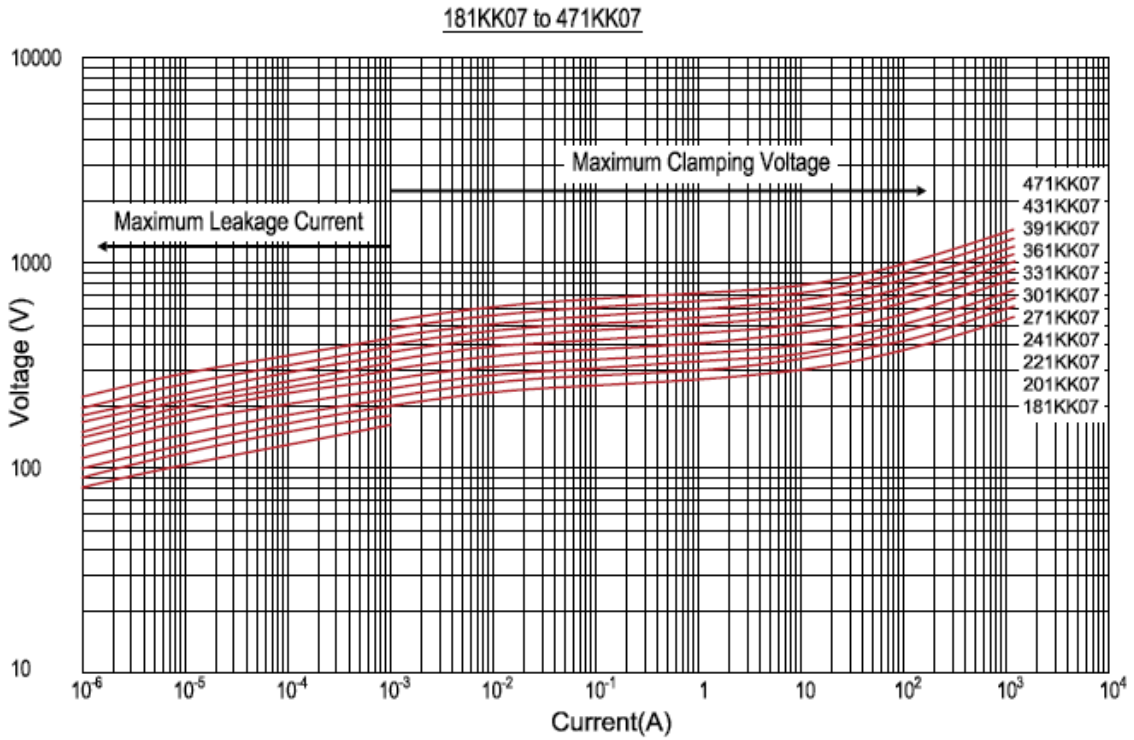
Reliability

Items	Test conditions / Methods	Specifications															
High Temperature Storage	<p>Ambient Temp: 125±2°C Duration: 1000hrs</p>	<p> ΔV_{1mA}/V_{1mA} ≤ 5%</p>															
Low Temperature Storage	<p>Ambient Temp: -40±2°C Duration: 1000hrs</p>	<p> ΔV_{1mA}/V_{1mA} ≤ 5%</p>															
Humidity	<p>Ambient Temp: 40±2°C, 90~95%R.H. Duration: 1000hrs</p>	<p> ΔV_{1mA}/V_{1mA} ≤ 5%</p>															
Temperature Cycle	<p>The conditions shown below shall be repeated 5 cycles</p> <table border="1"> <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	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 5%</p>
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	<p>Ambient Temp: 125±2°C Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.</p>	<p> ΔV_{1mA}/V_{1mA} ≤ 10%</p>															
Damp HeatLoad	<p>Ambient Temp: 40±2°C, 90~95%R.H. Duration: 1000hrs Load: Max. Allowable Voltage.</p>	<p>No visible damage ΔV_{1mA}/V_{1mA} ≤ 10%</p>															
Voltage Proof	<p>Metal balls method, 2500Vac 1 min.</p>	<p>No visible damage</p>															

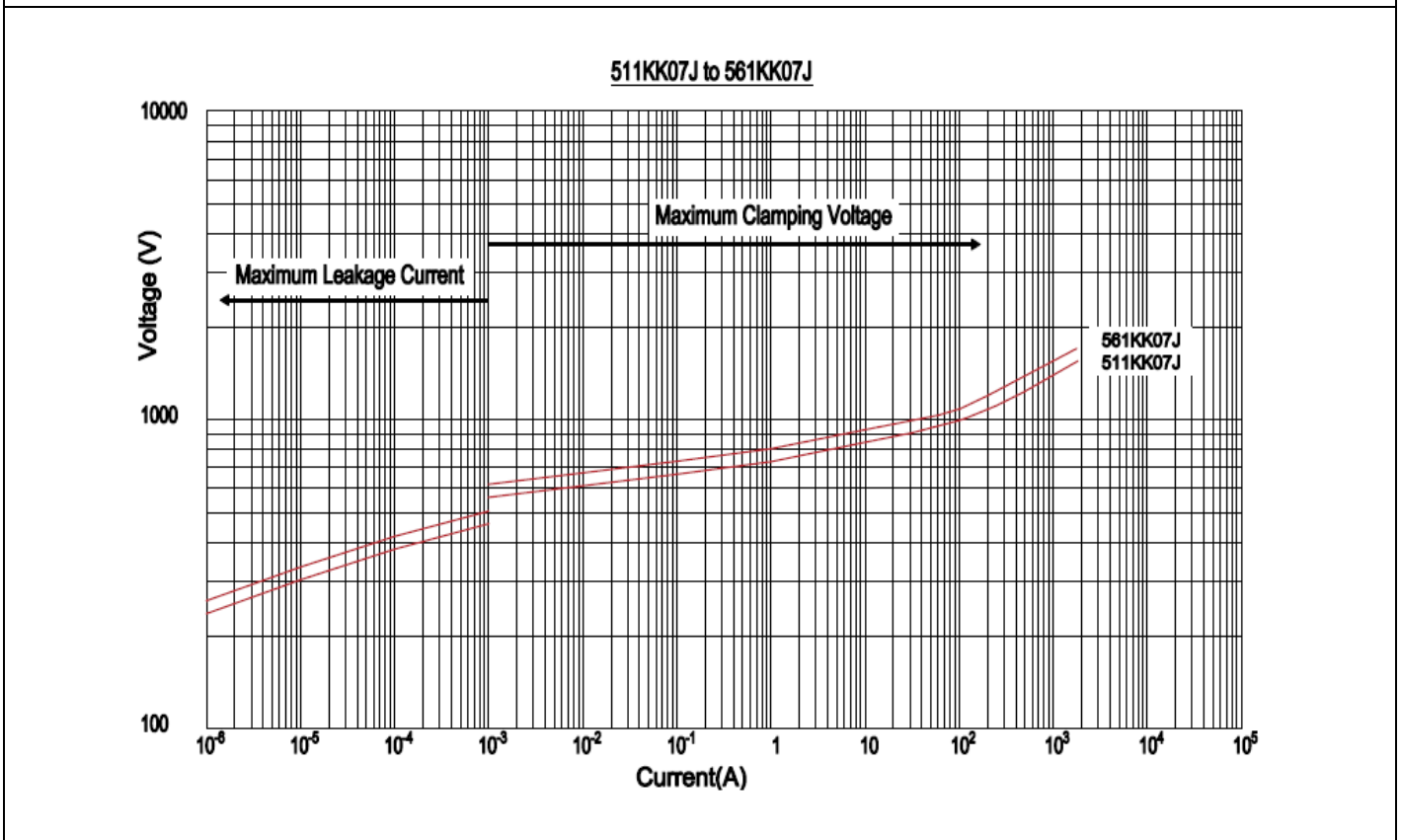
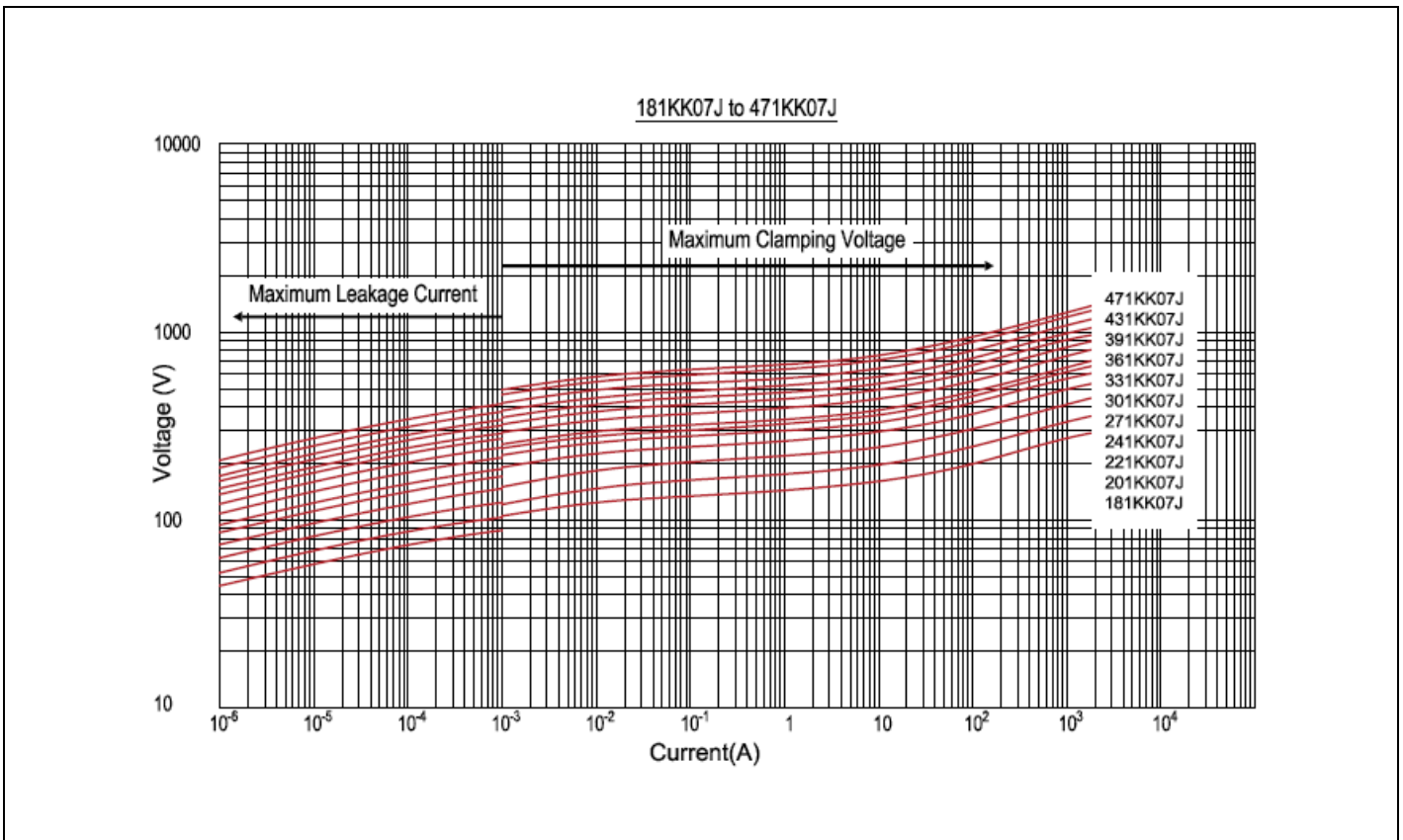
Maximum Surge Current Derating Curve



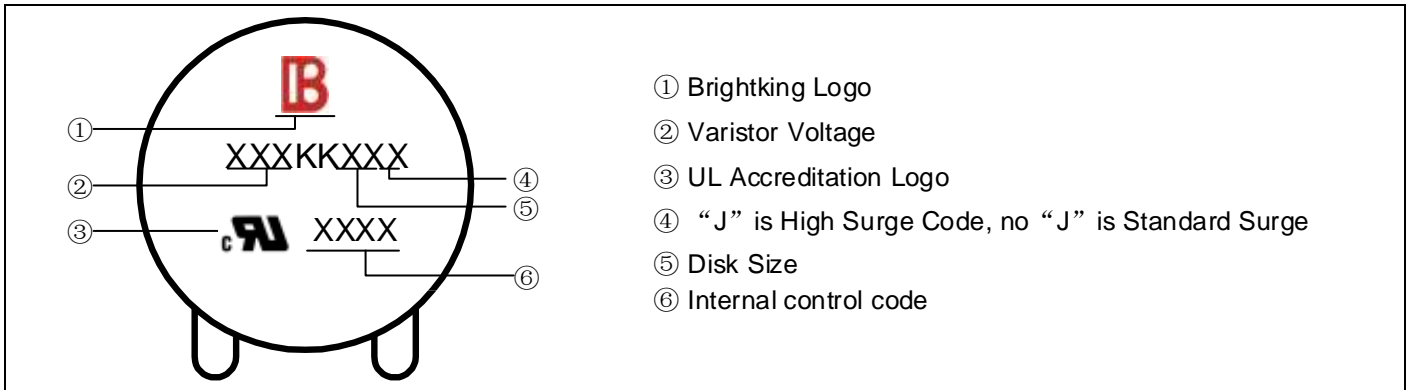
Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve



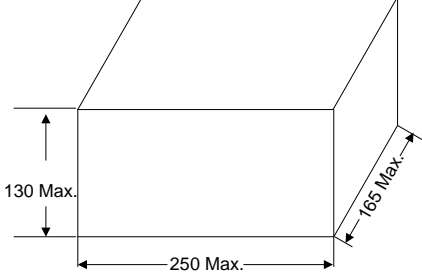
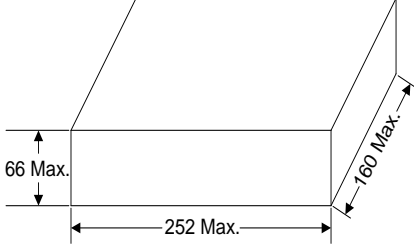
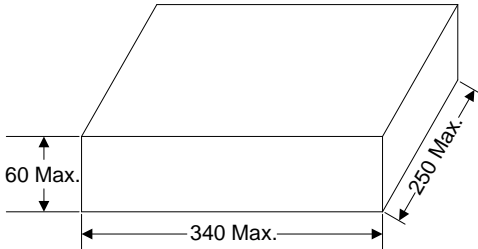
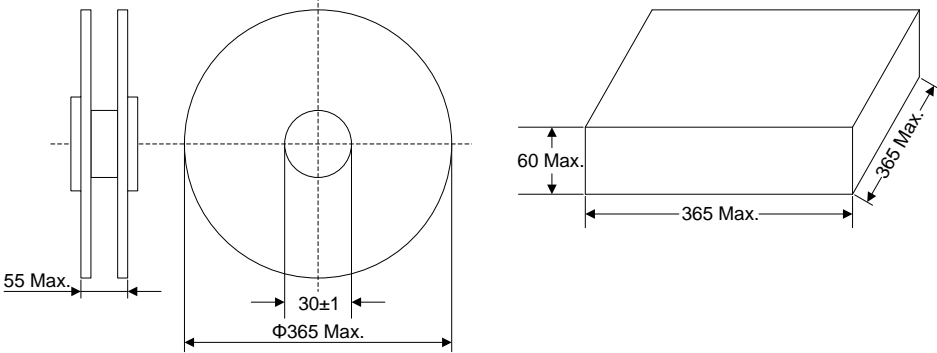
Marking Code



Taping Dimensions

Symbol	Dimensions (mm)
P	12.7±1.0
P0	12.7±0.3
P1	3.85±0.7
P2	6.35±1.3
F	5.0±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	2.0max
D0	4.0±0.2
t	0.6±0.3
B	32max

Quantity

Packaging Dimensions (Unit: mm)	Quantity
<p>In bulk for Terminals Untrimmed Products</p> 	<p>1000pcs/bag 4bags/box</p>
<p>In bulk for Terminals Trimmed Products</p> 	<p>1000pcs/bag 4bags/box</p>
<p>Tape & Box</p> 	<p>1500pcs/box (181K~391K)</p>
	<p>1000pcs/box (431K~561K)</p>
<p>Tape & Reel</p> 	<p>2000pcs/reel (181K~331K)</p>
	<p>1500pcs/reel (361K~561K)</p>