

Metal Oxide Varistor (MOV) Data Sheet

Features

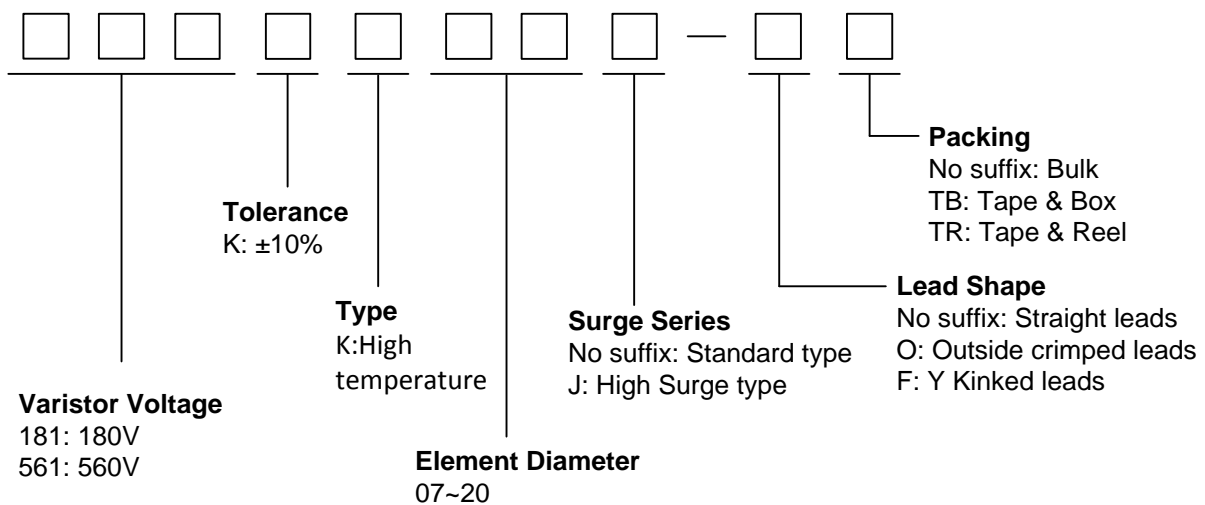
- Wide operating voltage (V1mA) range from 180V to 560V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature : -40°C ~ +125°C
- Storage Temperature : -40°C ~ +125°C
- 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

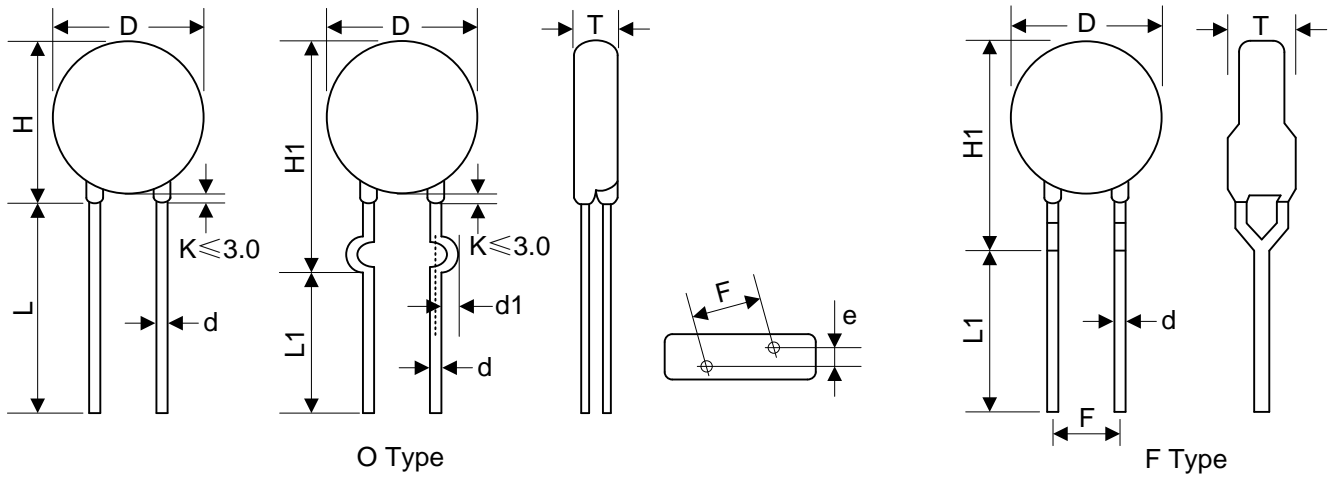


Table 1	
Unit: mm	
Symbol	Dimension
H(max.)	20.0
H1(max.)	21.0
L(min.)	20.0
L1(min.)	15.0
D(max.)	16.5
F(±0.8)	7.5
T(max.)	Table 2
e(±0.8)	Table 2
d(±0.05)	0.8
d1(±0.4)	1.4

Table 2					
Unit: mm					
Model	T(max.)	e	Model	T(max.)	e
181K	4.2	1.9	471K	5.8	3.2
201K	4.3	2.0	511K	6.1	3.4
221K	4.4	2.1	561K	6.4	3.6
241K	4.5	2.2			
271K	4.6	2.4			
301K	4.6	2.5			
331K	5.0	2.5			
361K	5.2	2.7			
391K	5.4	2.8			
431K	5.6	3.0			

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 _{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)
181KK14	181KK14J	115	150	180(162~198)	50	300	4500	6000	50.0	60.0	0.6	1100
201KK14	201KK14J	130	170	200(180~220)	50	340	4500	6000	57.0	70.0	0.6	1000
221KK14	221KK14J	140	180	220(198~242)	50	360	4500	6000	60.0	78.0	0.6	900
241KK14	241KK14J	150	200	240(216~264)	50	395	4500	6000	63.0	84.0	0.6	830
271KK14	271KK14J	175	225	270(243~297)	50	455	4500	6000	70.0	99.0	0.6	740
301KK14	301KK14J	190	250	300(270~330)	50	500	4500	6000	77.0	108	0.6	670
331KK14	331KK14J	210	275	330(297~363)	50	550	4500	6000	85.0	115	0.6	610
361KK14	361KK14J	230	300	360(324~396)	50	595	4500	6000	93.0	130	0.6	560
391KK14	391KK14J	250	320	390(351~429)	50	650	4500	6000	100	140	0.6	510
431KK14	431KK14J	275	350	430(387~473)	50	710	4500	6000	115	155	0.6	460
471KK14	471KK14J	300	385	470(423~517)	50	775	4500	6000	118	175	0.6	430
511KK14	511KK14J	320	415	510(459~561)	50	845	4500	6000	121	180	0.6	390
561KK14	561KK14J	350	460	560(504~616)	50	925	4500	6000	125	185	0.6	360

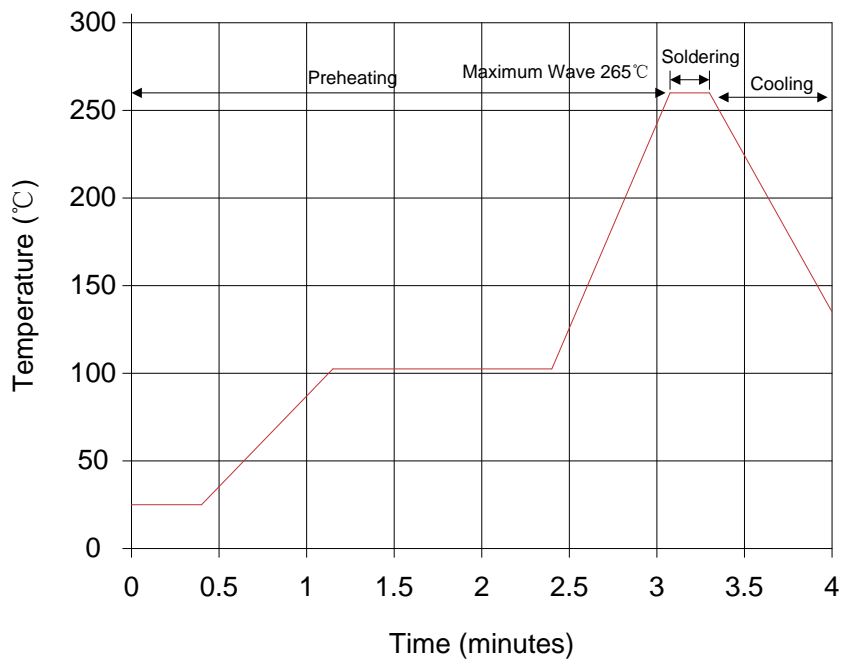
Notes: Leakage Current (@83% of V_{1mA}) : IR≤25µA

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.</p> <p>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" style="margin-left: auto; margin-right: auto;"> <tr> <td>14Φ series</td> <td>181K to 821K</td> <td>150A (8/20µs)</td> </tr> </table>	14Φ series	181K to 821K	150A (8/20µs)	$\frac{\Delta V_b}{V_b} \leq \pm 10\%$
14Φ series	181K to 821K	150A (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.)

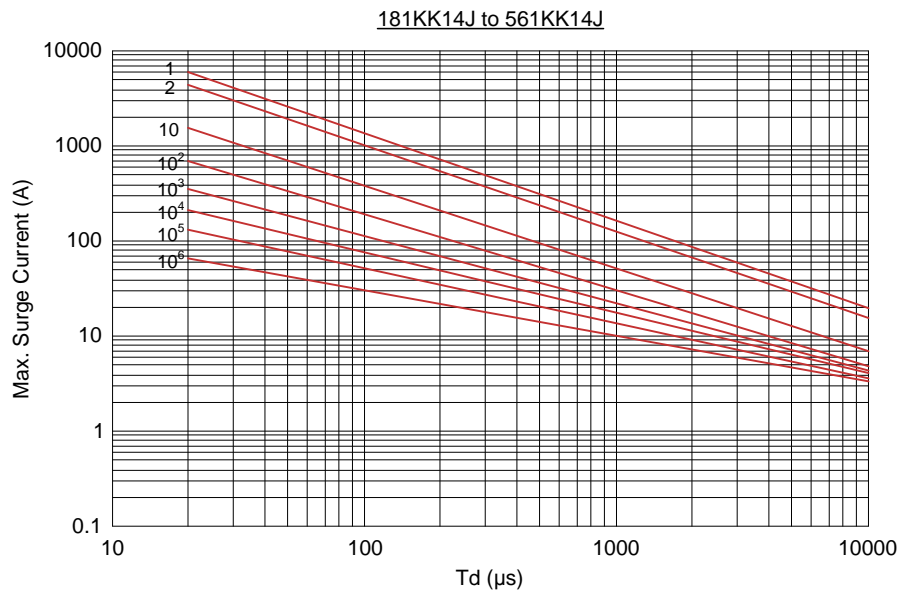
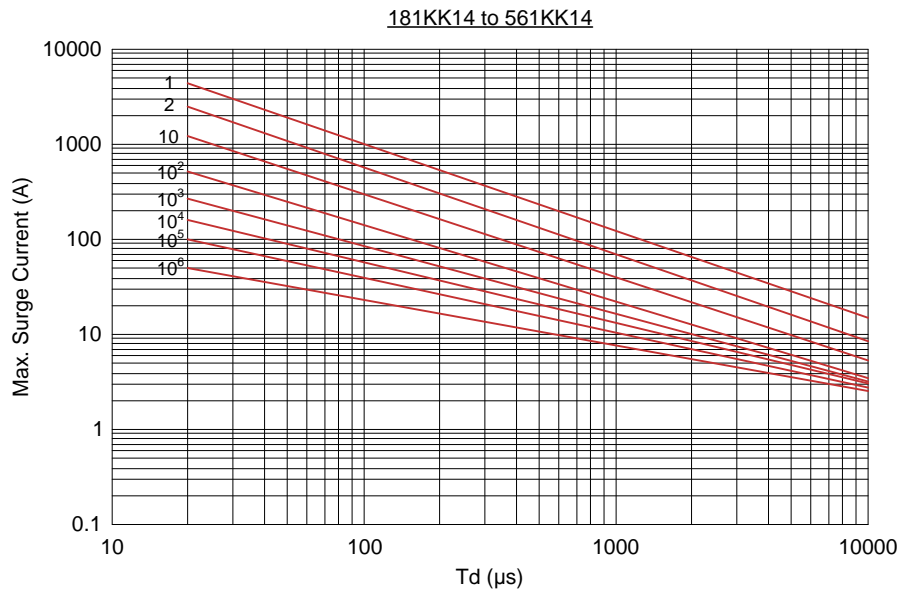
Mechanical Characteristics

Items	Test conditions / Methods	Specifications								
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <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	No visible damage ΔV _{1mA} /V _{1mA} ≤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"> <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	No visible damage ΔV _{1mA} /V _{1mA} ≤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 ² Direction: 3 mutually perpendicular directions, 2hrs each.	No visible damage ΔV _{1mA} /V _{1mA} ≤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 ΔV _{1mA} /V _{1mA} ≤10%								

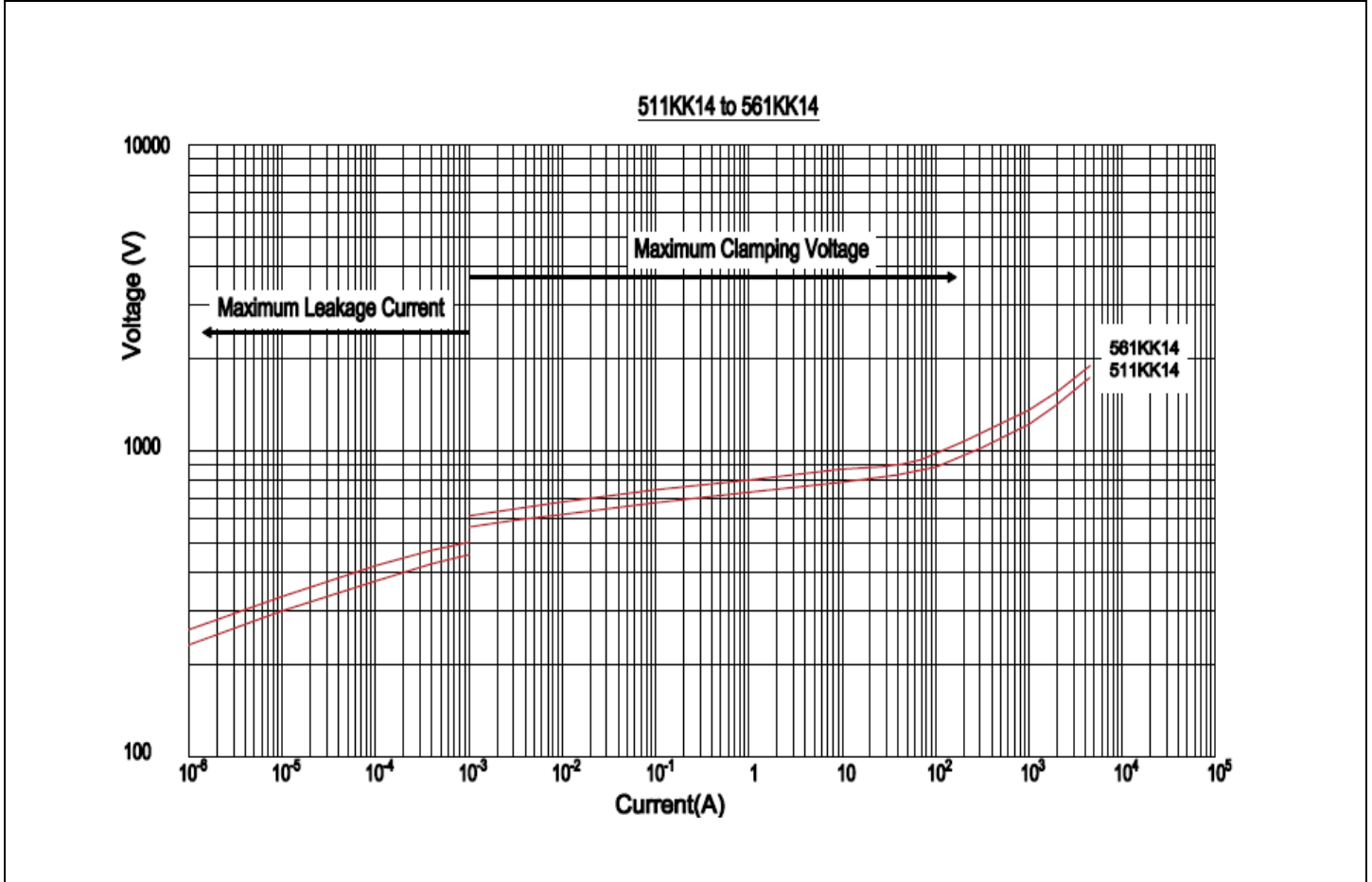
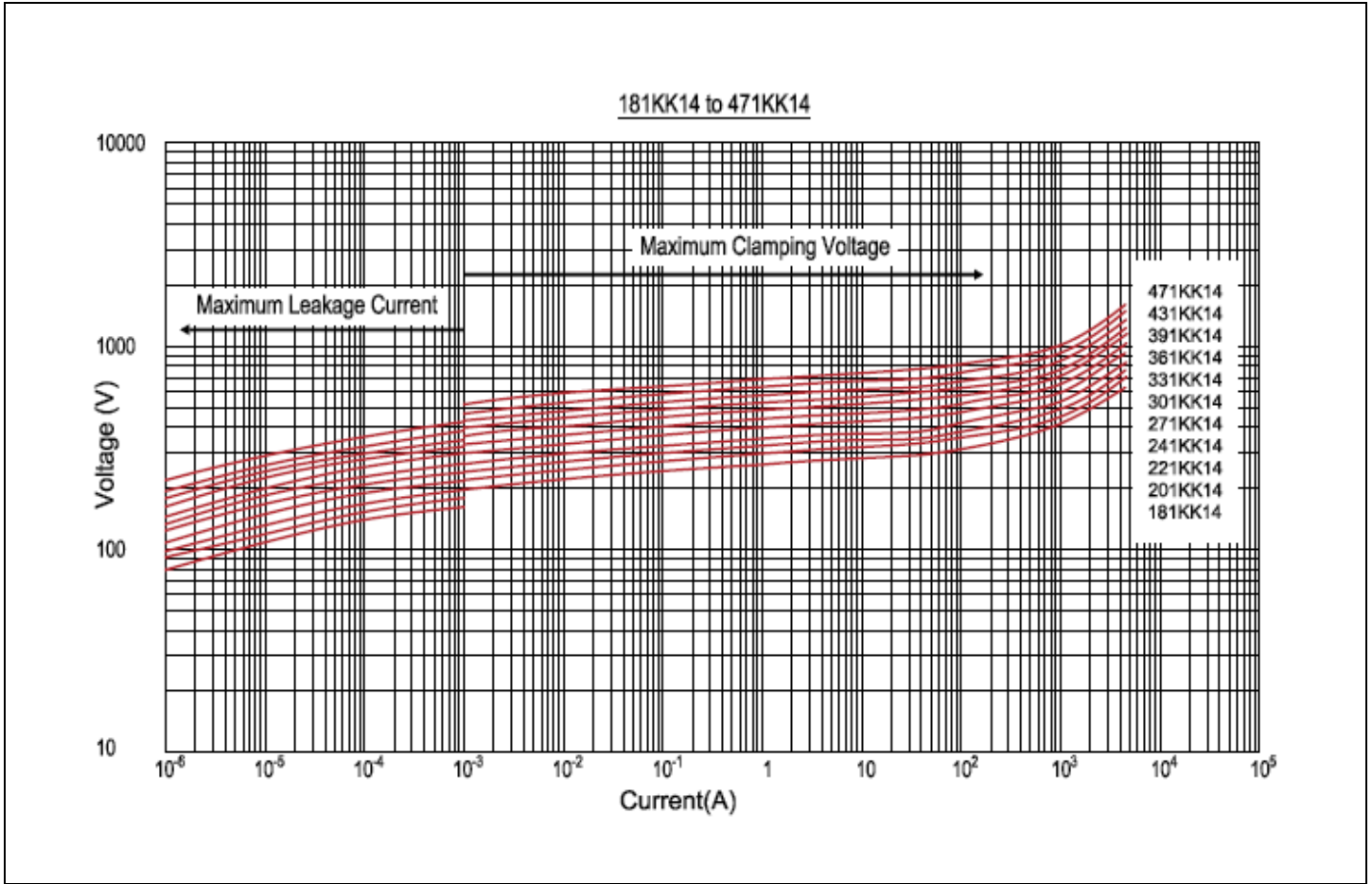
Reliability

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

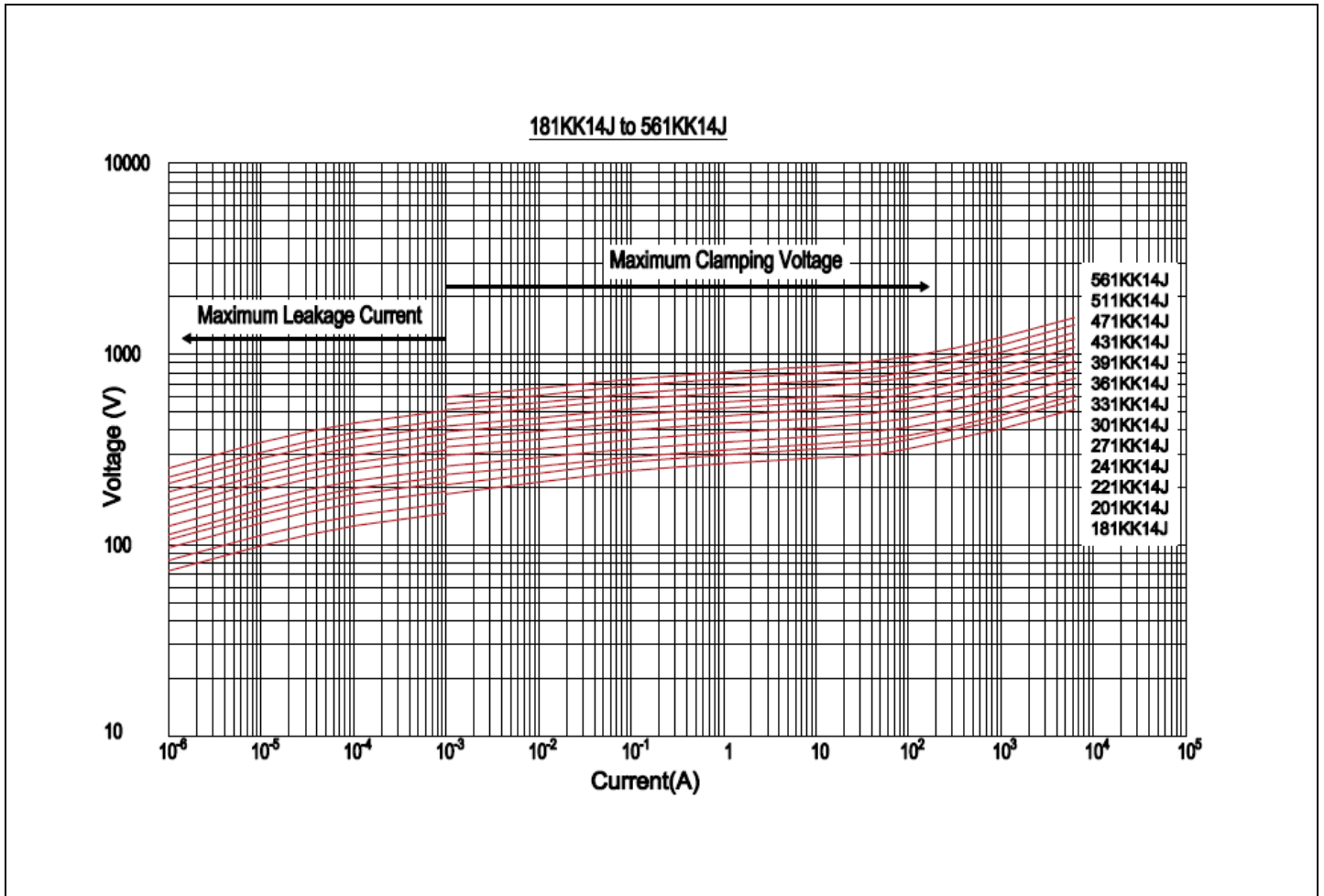
Maximum Surge Current Derating Curve



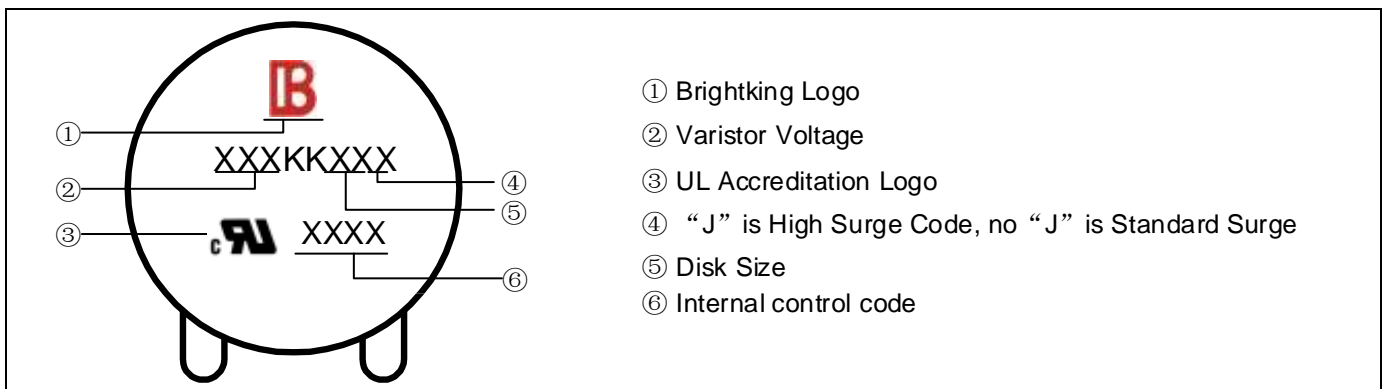
Maximum Leakage Current and Maximum Clamping Voltage Curve



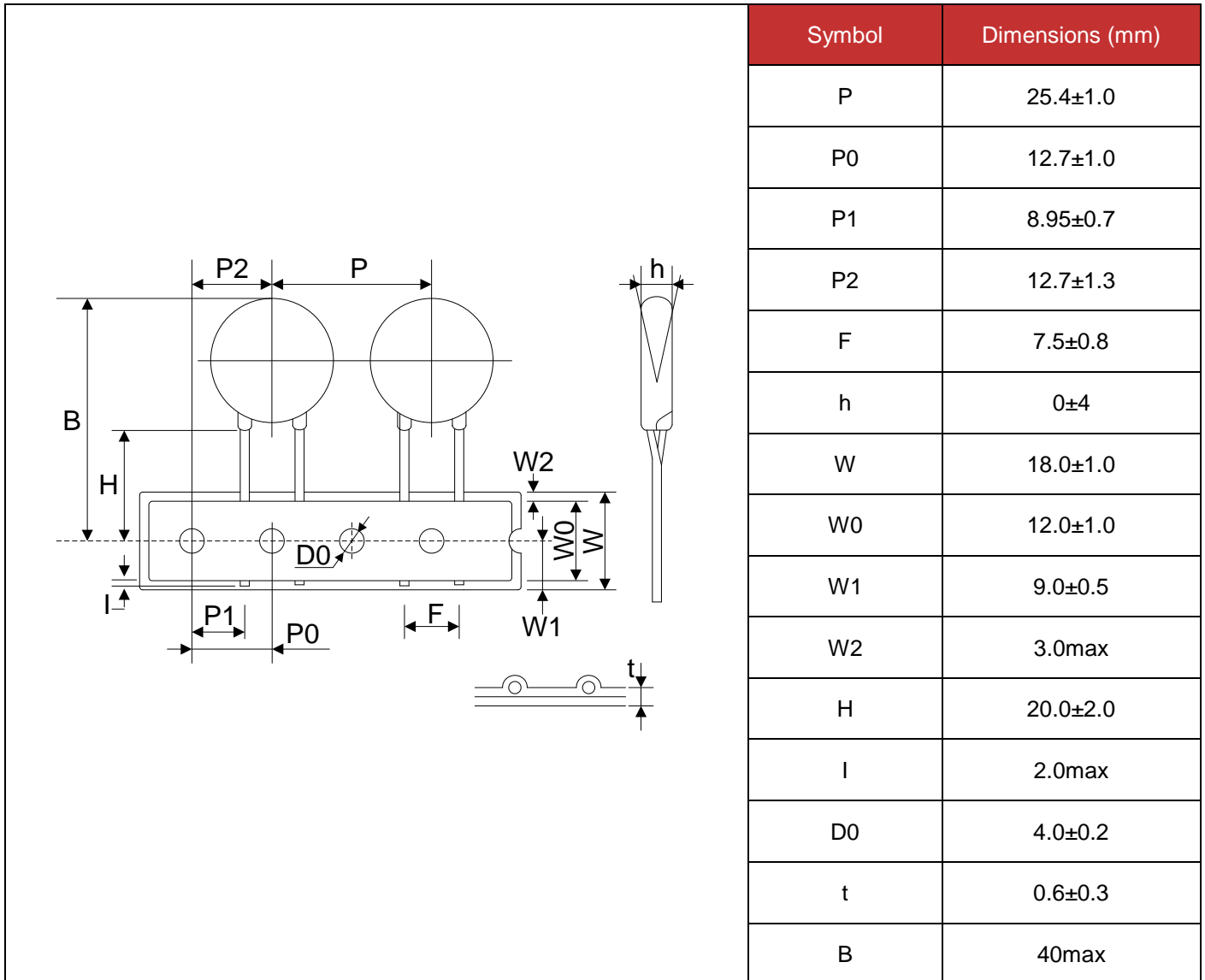
Maximum Leakage Current and Maximum Clamping Voltage Curve



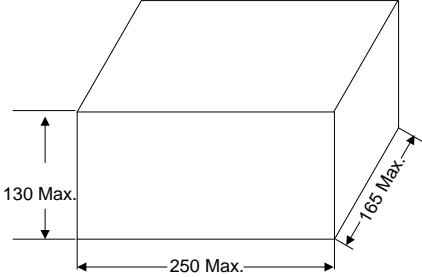
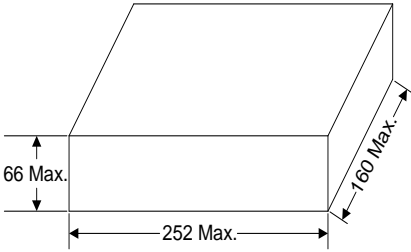
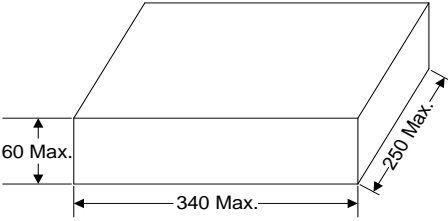
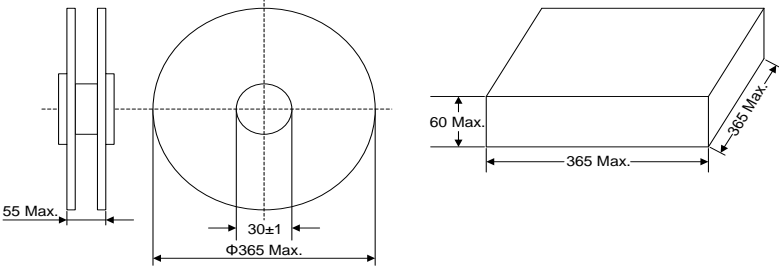
Marking Code



Taping Dimensions



Quantity

Packaging Dimensions (Unit: mm)	Quantity
<p>In bulk for Terminals Untrimmed Products</p> 	<p>400pcs/bag 4bags/box (181K~331K)</p>
<p>In bulk for Terminals Trimmed Products</p> 	<p>300pcs/bag 4bags/box (361K~561K)</p>
<p>Tape & Box</p> 	<p>750pcs/box (181K~241K)</p> <p>600pcs/box (271K~331K)</p> <p>500pcs/box (361K~561K)</p>
<p>Tape & Reel</p> 	<p>1000pcs/reel (181K~331K)</p> <p>750pcs/reel (361K~561K)</p>