

DATA SHEET

METAL OXIDE VARISTORS POWER SUPPLY

14K series

RoHS compliant & Halogen free



Product specification— October 06, 2020 V.1



Metal Oxide Varistor (MOV) Data Sheet

Features

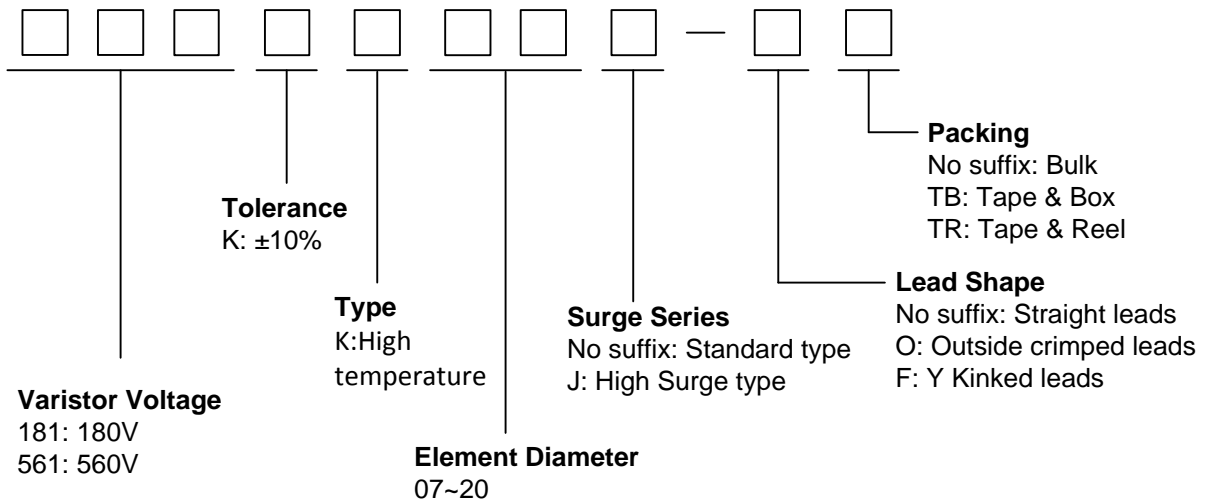
- Wide operating voltage (V1mA) range from 180V to 560V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature: -40°C ~ +125°C
- Storage Temperature: -40°C ~ +125°C
- Safety certification: UL: E327997



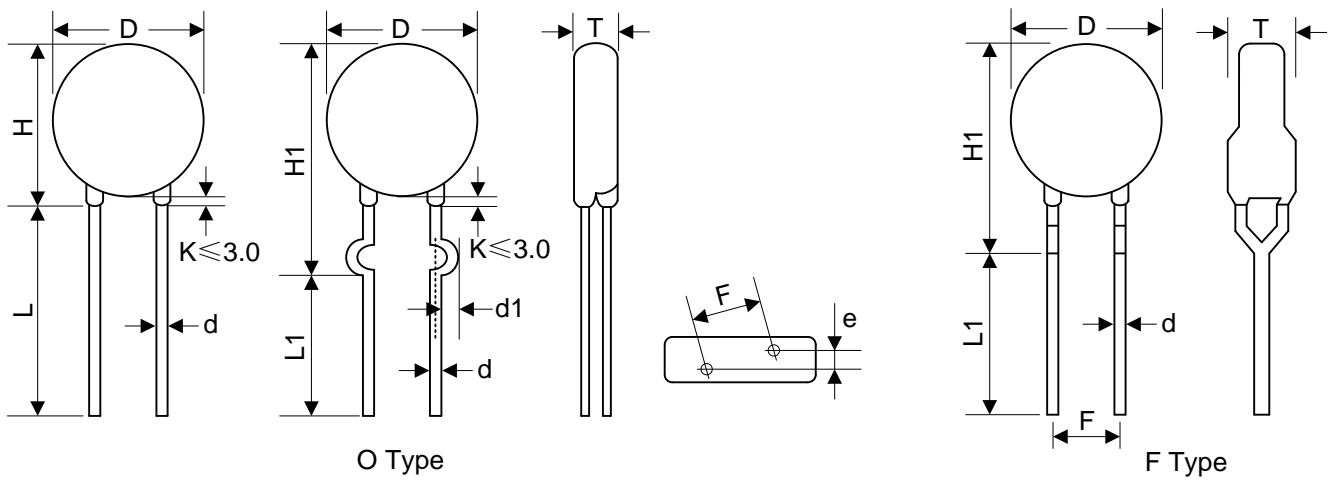
Applications

- 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



O Type

F Type

| 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 |

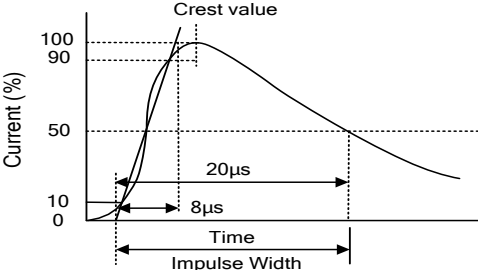
| Table 2 | | | | | |
|----------|---------|-----|-------|---------|-----|
| Unit: mm | | | | | |
| Model | T(max.) | e | Model | T(max.) | e |
| 181K | 4.2 | 1.9 | 471K | 5.8 | 3.2 |
| 201K | 4.3 | 2.0 | 511K | 6.1 | 3.4 |
| 221K | 4.4 | 2.1 | 561K | 6.4 | 3.6 |
| 241K | 4.5 | 2.2 | | | |
| 271K | 4.6 | 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 |

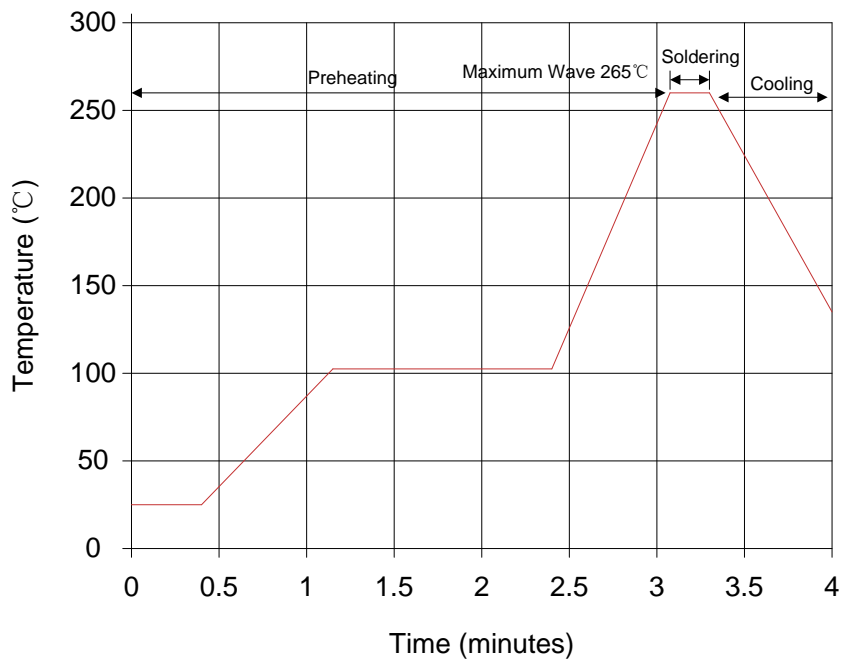
Notes: Leakage Current (@83% of V_{1mA}): I_R ≤ 25µA

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. 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 $ | ≤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="448 1809 1187 1865"> <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.) |

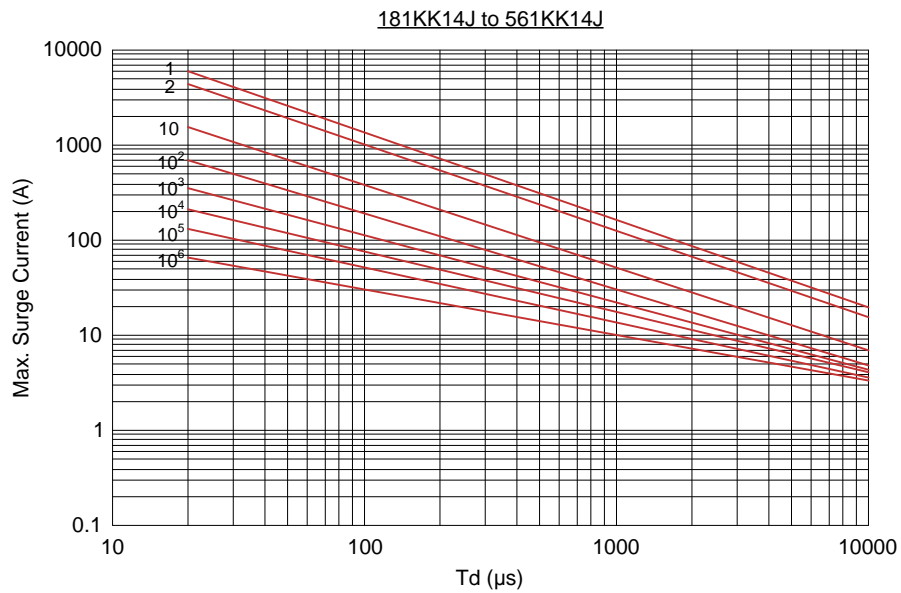
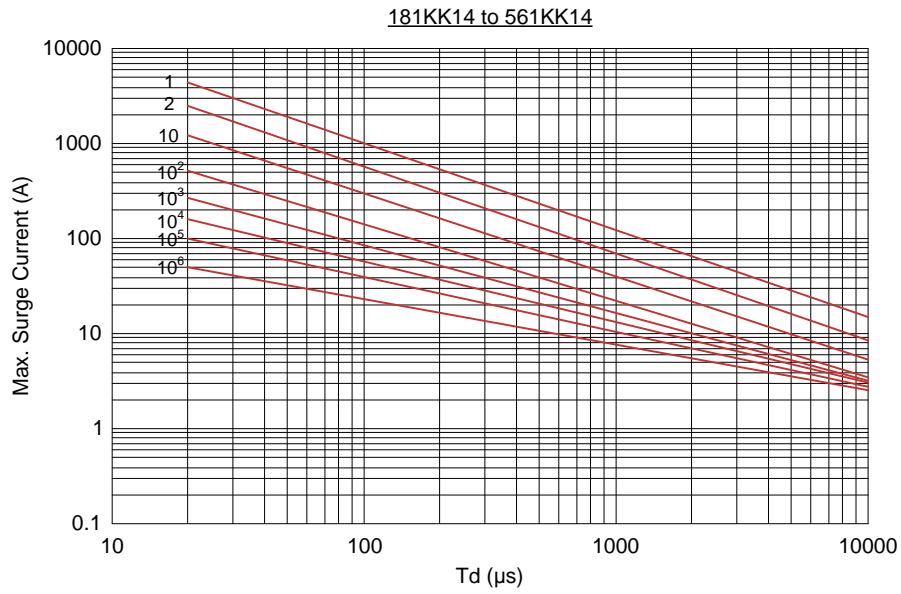
Mechanical Characteristics

| 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% | | | | | | | | |

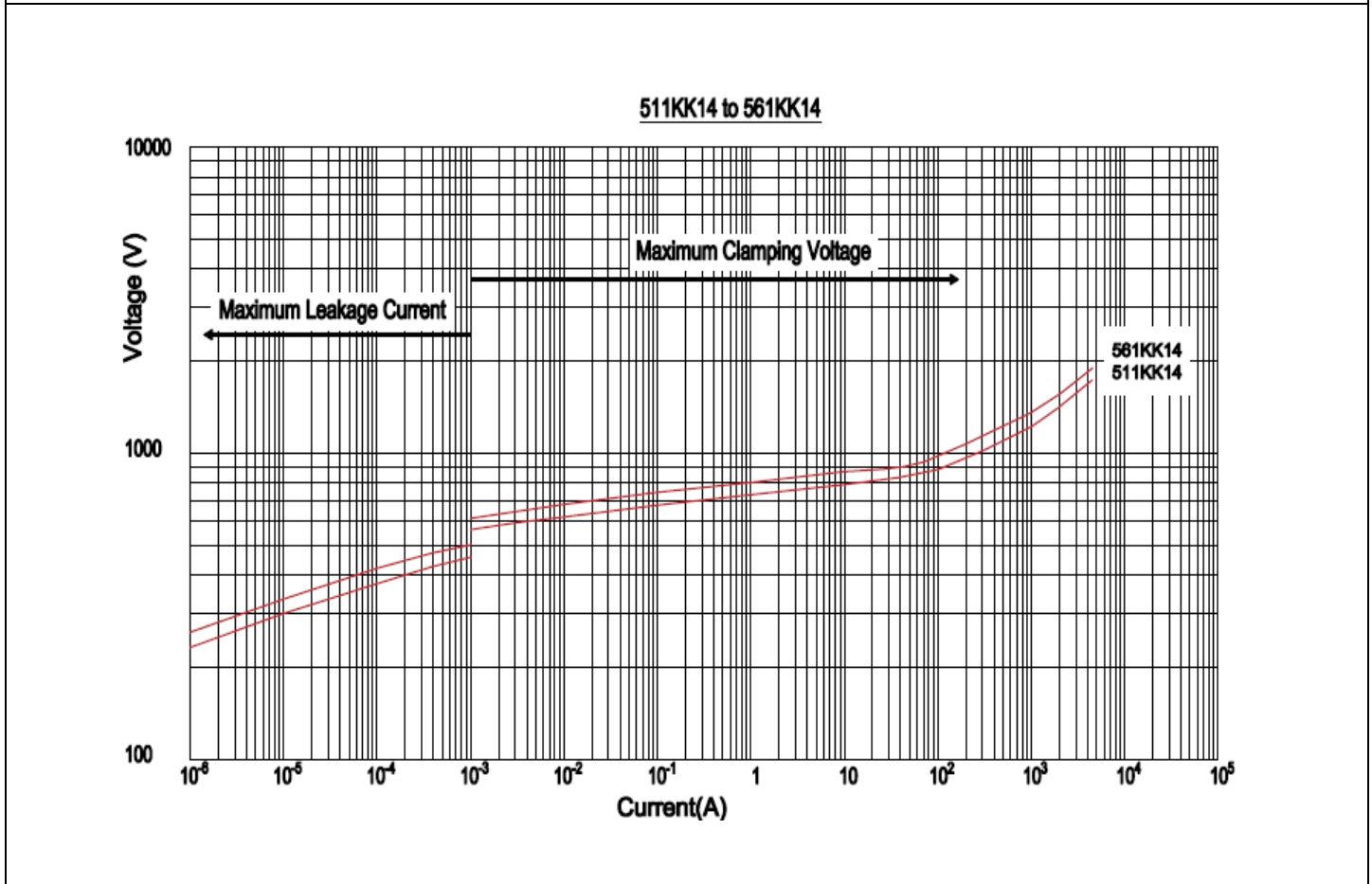
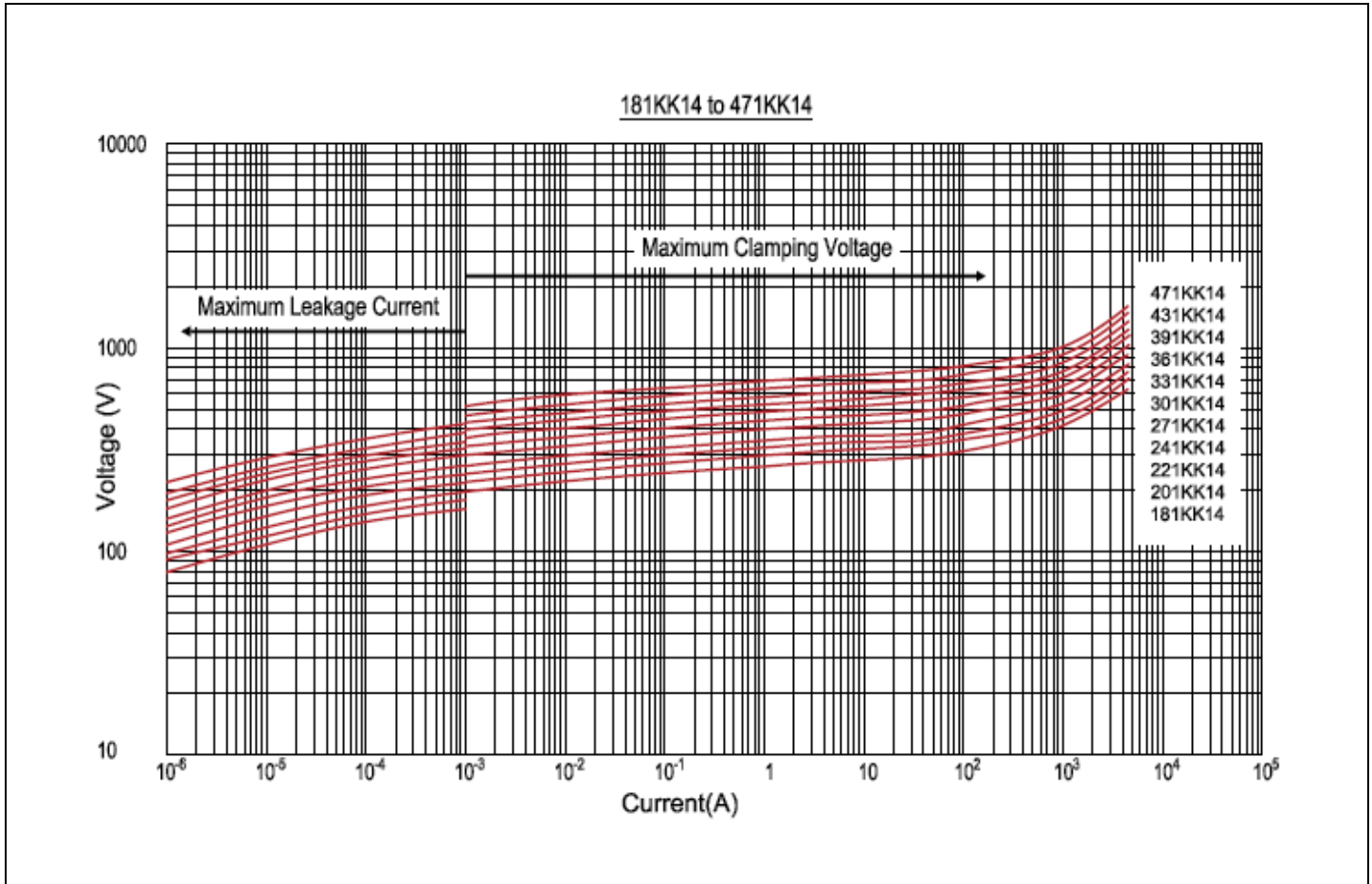
Reliability

| 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 eera. | 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 | | | | | | | | | | | | | | | |

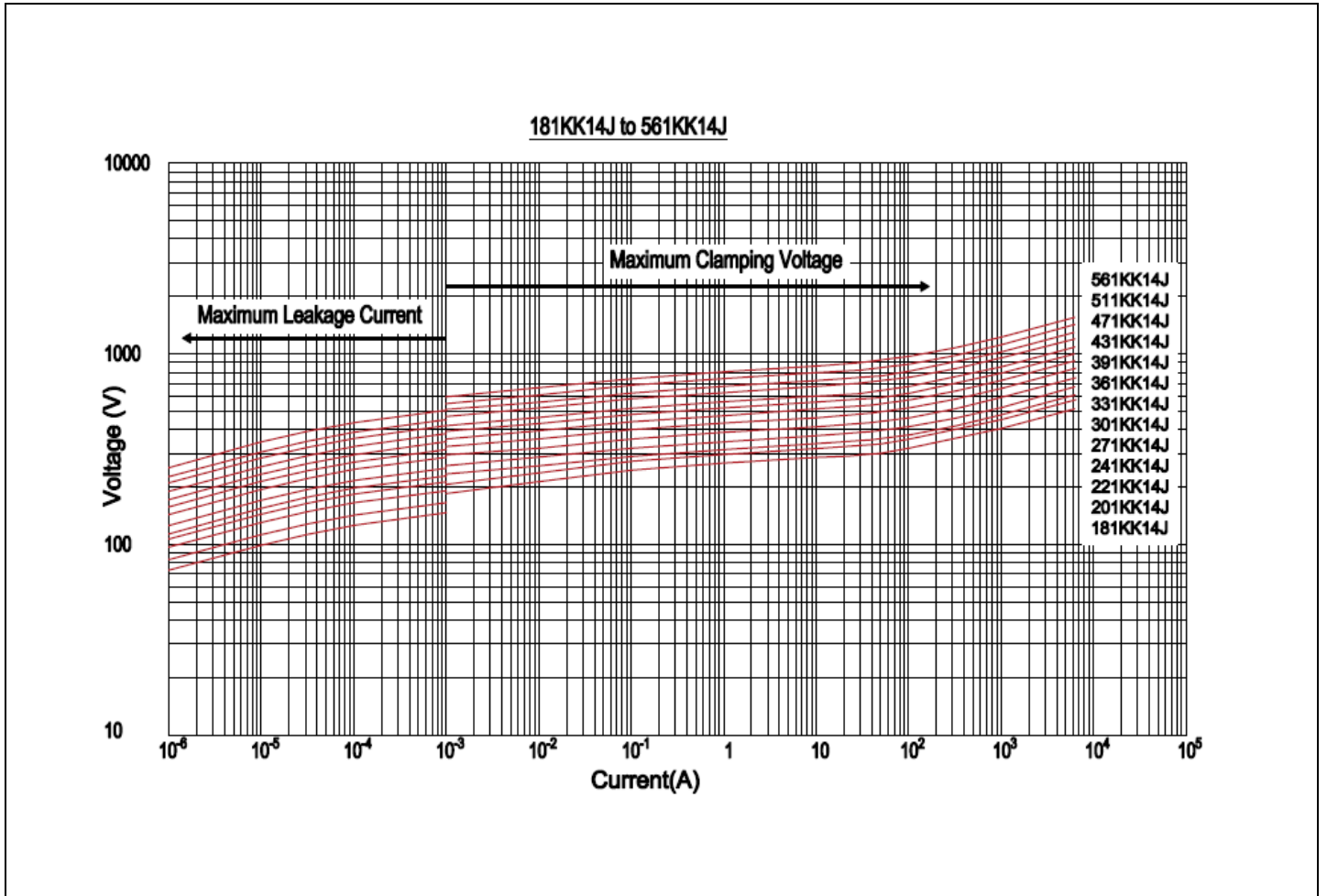
Maximum Surge Current Derating Curve



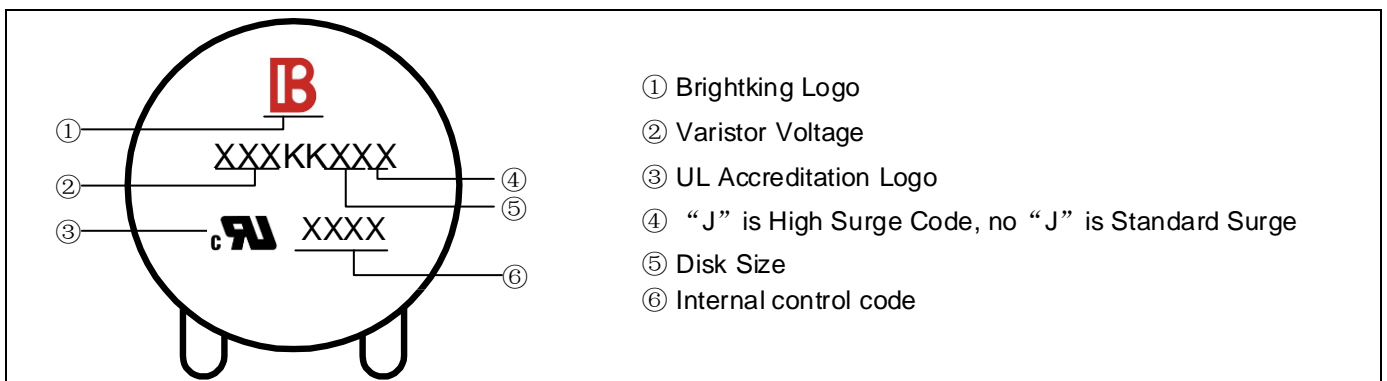
Maximum Leakage Current and Maximum Clamping Voltage Curve



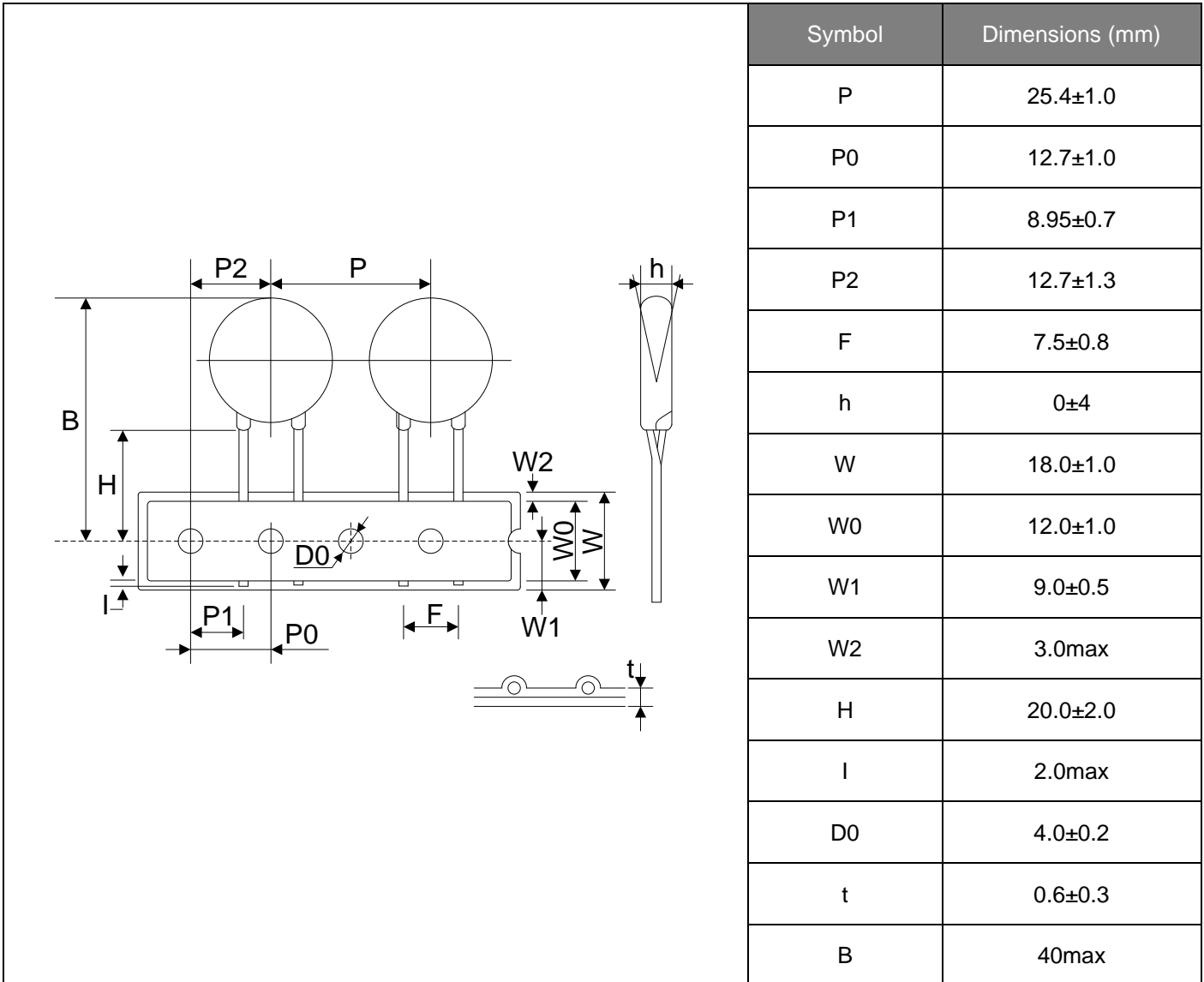
Maximum Leakage Current and Maximum Clamping Voltage Curve



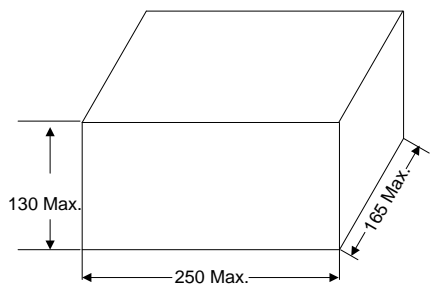
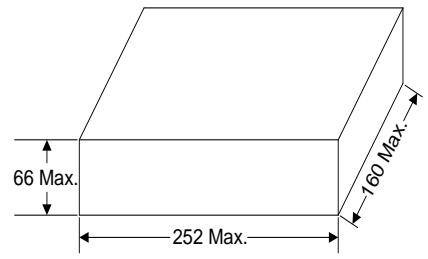
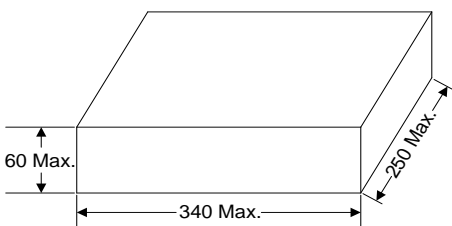
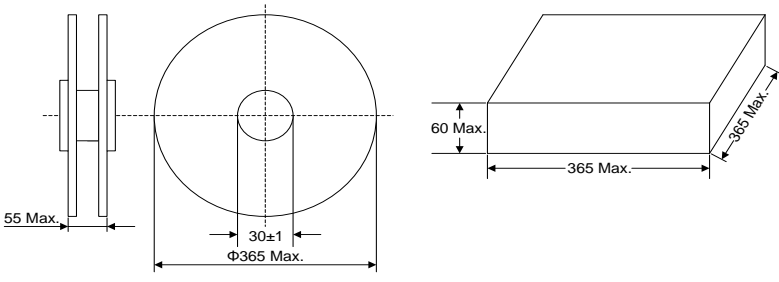
Marking Code



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>300pcs/bag 4bags/box (361K~561K)</p> |
| <p>In bulk for Terminals Trimmed Products</p>  | <p>400pcs/bag 4bags/box (181K~331K)</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> |