

Metal Oxide Varistor (MOV) Data Sheet

Features

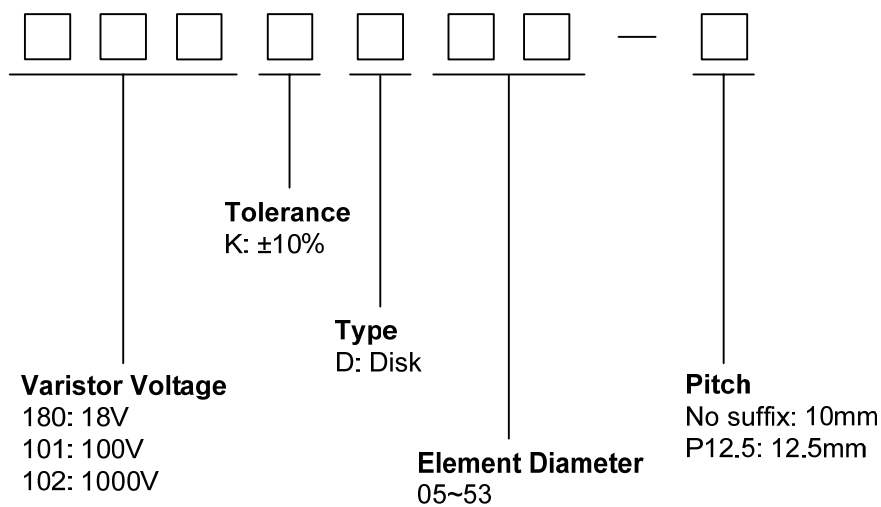
- Wide operating voltage (V_{1mA}) range from 18V to 1800V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Storage Temperature: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification: UL: E327997
CSA: 246579
VDE: 40027827



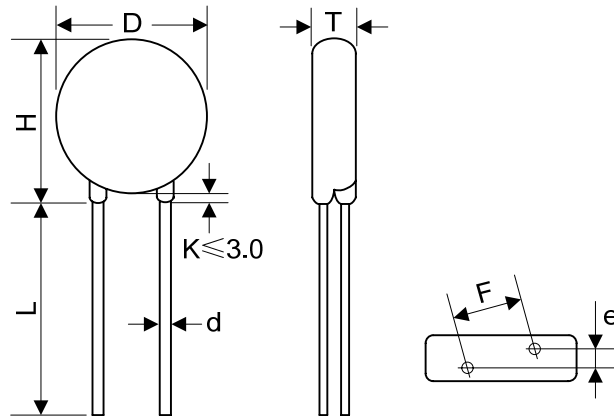
Applications

- 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 | 27.0~31.5 |
| L(min.) | 20.0 |
| D | 25.0~28.0 |
| F(± 1.0) | 10.0/12.5 |
| T | Table 2 |
| e(± 0.8) | Table 2 |
| d(± 0.1) | 1.0 |

| Table 2 | | | | | |
|----------|---------|-----|-------|----------|-----|
| Unit: mm | | | | | |
| Model | T | e | Model | T | e |
| 180K | 2.5~4.8 | 1.7 | 361K | 3.4~5.9 | 2.9 |
| 220K | 2.6~4.9 | 1.8 | 391K | 3.5~6.1 | 3.0 |
| 270K | 2.6~5.0 | 2.0 | 431K | 3.7~6.4 | 3.2 |
| 330K | 2.7~5.2 | 1.9 | 471K | 3.8~6.7 | 3.4 |
| 390K | 2.6~5.5 | 2.0 | 511K | 3.9~7.0 | 3.6 |
| 470K | 2.7~5.1 | 2.1 | 561K | 4.1~7.3 | 3.8 |
| 560K | 2.8~5.4 | 2.3 | 621K | 4.3~7.6 | 4.1 |
| 680K | 2.9~5.7 | 2.6 | 681K | 4.5~7.8 | 4.4 |
| 820K | 2.6~4.5 | 2.0 | 751K | 4.8~8.0 | 4.5 |
| 101K | 2.9~4.6 | 2.2 | 781K | 4.9~8.1 | 4.6 |
| 121K | 2.9~4.8 | 2.4 | 821K | 5.1~8.4 | 4.8 |
| 151K | 2.7~4.9 | 2.0 | 911K | 5.3~8.9 | 5.2 |
| 181K | 2.8~5.2 | 2.1 | 102K | 5.9~9.5 | 5.2 |
| 201K | 2.9~5.2 | 2.2 | 112K | 6.3~10.1 | 5.6 |
| 221K | 3.0~5.3 | 2.3 | 122K | 6.4~10.7 | 6.0 |
| 241K | 3.1~5.8 | 2.4 | 142K | 7.4~12.6 | 6.8 |
| 271K | 3.1~5.3 | 2.6 | 162K | 7.9~13.2 | 7.6 |
| 301K | 3.2~5.5 | 2.7 | 182K | 8.1~14.5 | 8.4 |
| 331K | 3.2~5.7 | 2.7 | | | |

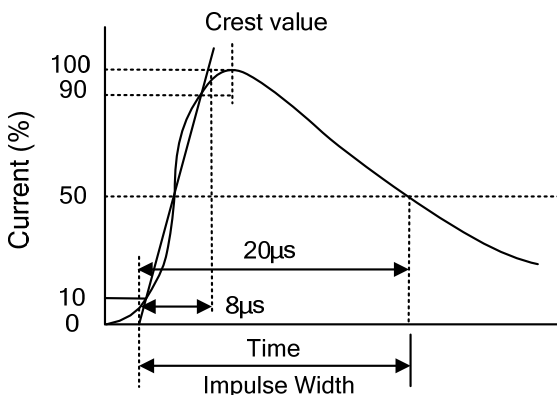
Electrical characteristics

| Part Number | Maximum Allowable Voltage | | Varistor Voltage | Maximum Clamping Voltage | | Withstanding Surge Current | Maximum Energy (10/1000μs) | Rated Power | Typical Capacitance (Reference) |
|-------------|---------------------------|---------------------|----------------------|--------------------------|--------------------|----------------------------|----------------------------|-------------|---------------------------------|
| | V _{AC} (V) | V _{DC} (V) | V _{1mA} (V) | I _P (A) | V _C (V) | I (A) | (J) | (W) | @1KHz (pf) |
| 180KD25 | 11 | 14 | 18(15~21.6) | 30 | 36 | 4500 | 20 | 0.25 | 45000 |
| 220KD25 | 14 | 18 | 22(19.5~26) | 30 | 43 | 4500 | 25 | 0.25 | 29000 |
| 270KD25 | 17 | 22 | 27(24~31) | 30 | 53 | 4500 | 30 | 0.25 | 26500 |
| 330KD25 | 20 | 26 | 33(29.5~36.5) | 30 | 65 | 4500 | 35 | 0.25 | 18000 |
| 390KD25 | 25 | 31 | 39(35~43) | 30 | 77 | 4500 | 40 | 0.25 | 13500 |
| 470KD25 | 30 | 38 | 47(42~52) | 30 | 93 | 4500 | 50 | 0.25 | 11500 |
| 560KD25 | 35 | 45 | 56(50~62) | 30 | 110 | 4500 | 60 | 0.25 | 10500 |
| 680KD25 | 40 | 56 | 68(61~75) | 30 | 135 | 4500 | 70 | 0.25 | 9050 |
| 820KD25 | 50 | 65 | 82(74~90) | 150 | 135 | 15000 | 80 | 1.2 | 7700 |
| 101KD25 | 60 | 85 | 100(90~110) | 150 | 165 | 15000 | 100 | 1.2 | 6300 |
| 121KD25 | 75 | 100 | 120(108~132) | 150 | 200 | 15000 | 120 | 1.2 | 5200 |
| 151KD25 | 95 | 125 | 150(135~165) | 150 | 250 | 15000 | 160 | 1.2 | 4300 |
| 181KD25 | 115 | 150 | 180(162~198) | 150 | 300 | 15000 | 175 | 1.2 | 3500 |
| 201KD25 | 130 | 170 | 200(180~220) | 150 | 340 | 15000 | 190 | 1.2 | 3200 |
| 221KD25 | 140 | 180 | 220(198~242) | 150 | 360 | 15000 | 200 | 1.2 | 2900 |
| 241KD25 | 150 | 200 | 240(216~264) | 150 | 395 | 15000 | 220 | 1.2 | 2650 |
| 271KD25 | 175 | 225 | 270(243~297) | 150 | 455 | 15000 | 255 | 1.2 | 2400 |
| 301KD25 | 190 | 250 | 300(270~330) | 150 | 500 | 15000 | 275 | 1.2 | 2100 |
| 331KD25 | 210 | 275 | 330(297~363) | 150 | 550 | 15000 | 300 | 1.2 | 1900 |
| 361KD25 | 230 | 300 | 360(324~396) | 150 | 595 | 15000 | 330 | 1.2 | 1750 |
| 391KD25 | 250 | 320 | 390(351~429) | 150 | 650 | 15000 | 360 | 1.2 | 1600 |
| 431KD25 | 275 | 350 | 430(387~473) | 150 | 710 | 15000 | 380 | 1.2 | 1500 |
| 471KD25 | 300 | 385 | 470(423~517) | 150 | 775 | 15000 | 400 | 1.2 | 1400 |
| 511KD25 | 320 | 415 | 510(459~561) | 150 | 845 | 15000 | 420 | 1.2 | 1250 |
| 561KD25 | 350 | 460 | 560(504~616) | 150 | 925 | 15000 | 440 | 1.2 | 1150 |
| 621KD25 | 385 | 505 | 620(558~682) | 150 | 1025 | 15000 | 450 | 1.2 | 1050 |
| 681KD25 | 420 | 560 | 680(612~748) | 150 | 1120 | 15000 | 460 | 1.2 | 950 |
| 751KD25 | 460 | 615 | 750(675~825) | 150 | 1240 | 15000 | 510 | 1.2 | 850 |
| 781KD25 | 485 | 640 | 780(702~858) | 150 | 1290 | 15000 | 530 | 1.2 | 850 |
| 821KD25 | 510 | 670 | 820(738~902) | 150 | 1355 | 15000 | 570 | 1.2 | 800 |
| 911KD25 | 550 | 745 | 910(819~1001) | 150 | 1500 | 15000 | 620 | 1.2 | 700 |
| 102KD25 | 625 | 825 | 1000(900~1100) | 150 | 1650 | 15000 | 685 | 1.2 | 650 |
| 112KD25 | 680 | 895 | 1100(990~1210) | 150 | 1815 | 15000 | 720 | 1.2 | 600 |
| 122KD25 | 750 | 990 | 1200(1080~1320) | 150 | 1980 | 15000 | 792 | 1.2 | 550 |
| 142KD25 | 880 | 1140 | 1400(1260~1540) | 150 | 2310 | 15000 | 850 | 1.2 | 500 |
| 162KD25 | 1000 | 1280 | 1600(1440~1760) | 150 | 2640 | 15000 | 970 | 1.2 | 450 |
| 182KD25 | 1100 | 1465 | 1800(1620~1980) | 150 | 2970 | 15000 | 1092 | 1.2 | 400 |

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

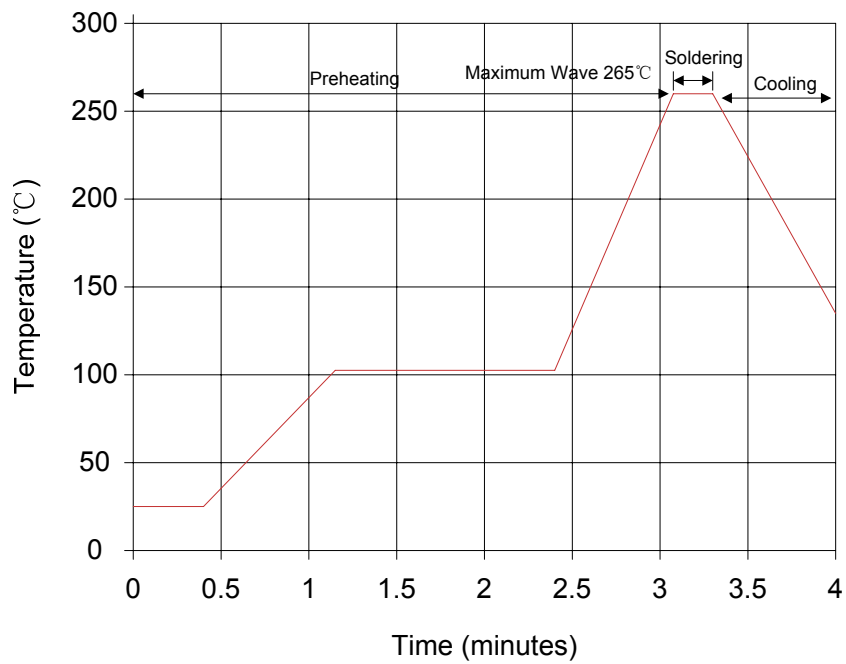
2. Leakage Current (@83% of V_{1mA}): IR≤50μA (180K~680K)
IR≤40μA (820K~182K)

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 | The maximum voltage between two terminals with the specification standard impulse current. Applied waveform: 8/20μs  | | | | | | |
| 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@85^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{60} \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 | 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. <table border="1" data-bbox="438 1881 1197 2004"> <tr> <td rowspan="2">25Φ series</td> <td>180K to 680K</td> <td>250A (8/20μs)</td> </tr> <tr> <td>820K to 182K</td> <td>450A (8/20μs)</td> </tr> </table> | 25Φ series | 180K to 680K | 250A (8/20μs) | 820K to 182K | 450A (8/20μs) | $\frac{\Delta V_b}{V_b} \leq \pm 10\%$ |
| 25Φ series | 180K to 680K | | 250A (8/20μs) | | | | |
| | 820K to 182K | 450A (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.) |

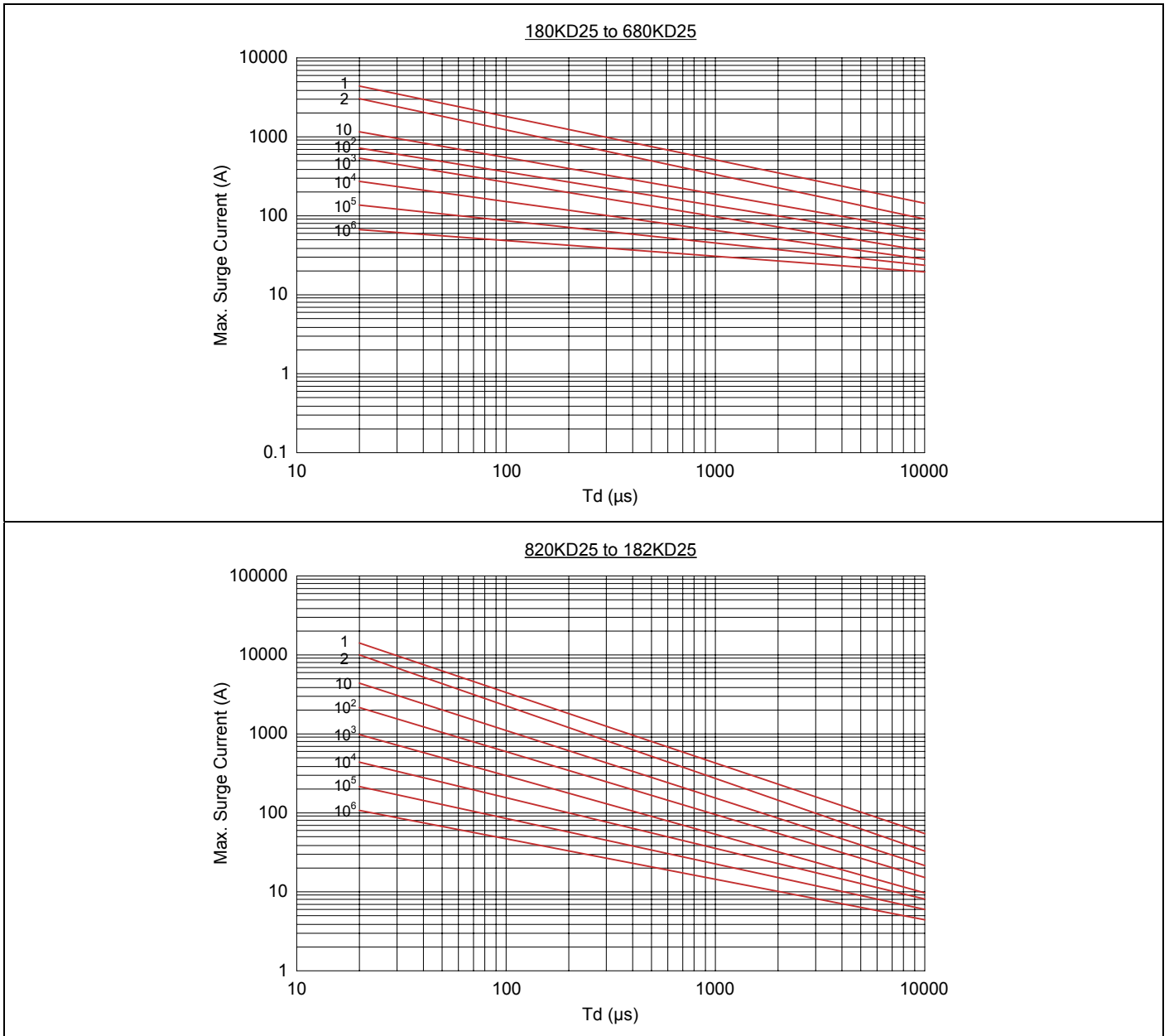
Mechanical Characteristics

| 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<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" 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<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% | | | | | | | | |

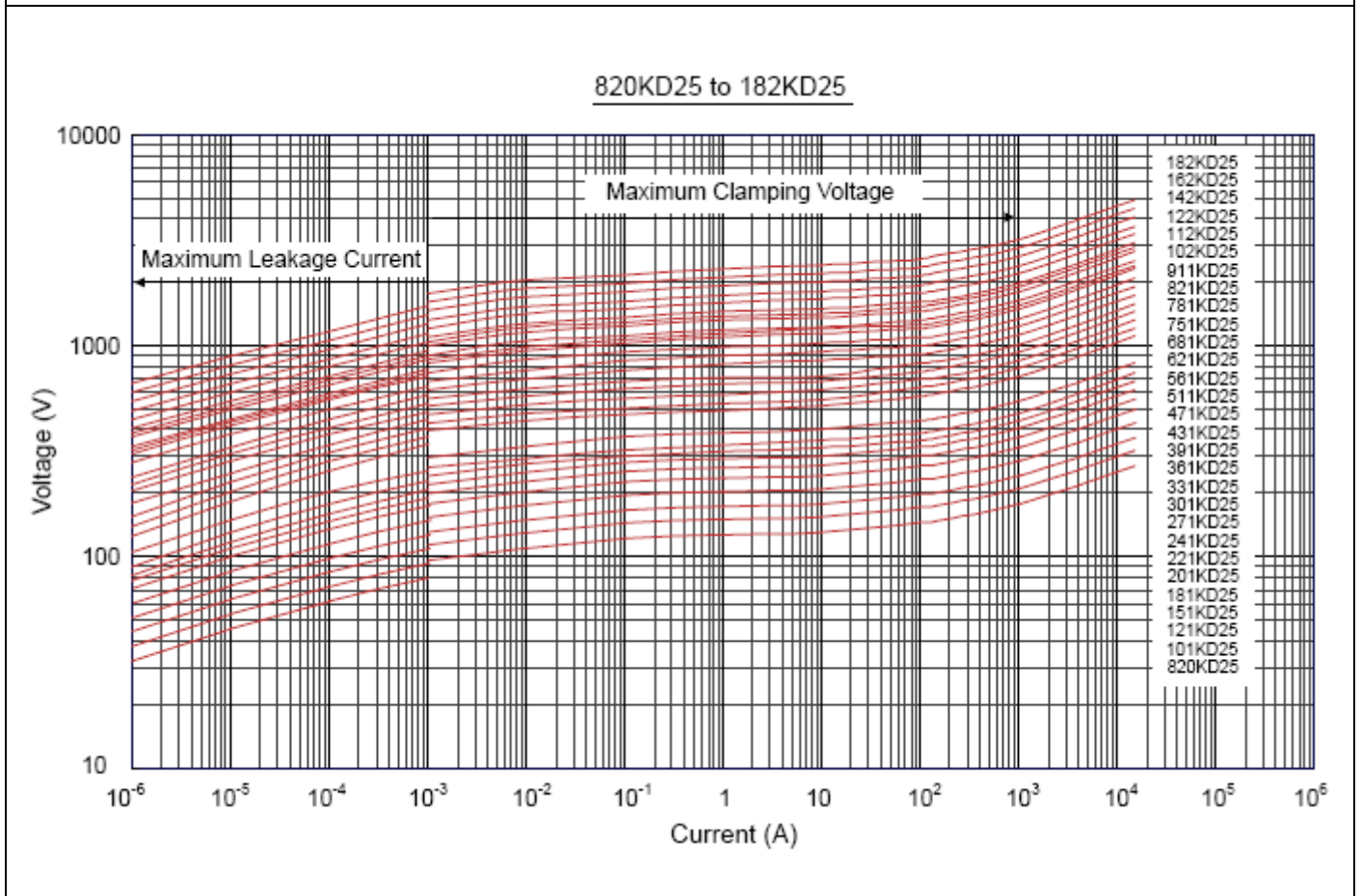
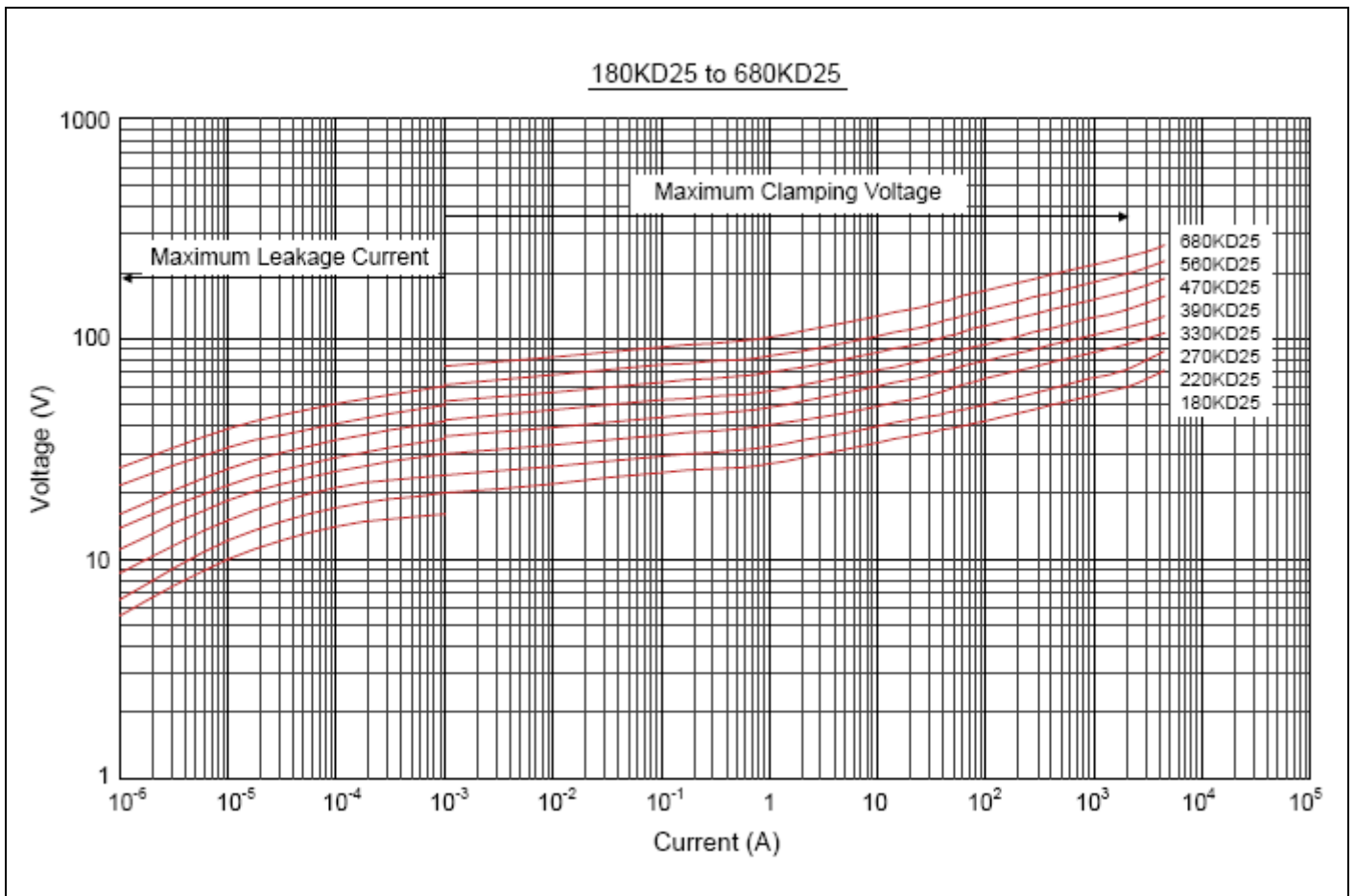
Reliability

| 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" 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 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: 105±2°C Duration: 1000hrs Load: Max. Allowable Voltage In AC eara. | ΔV _{1mA} /V _{1mA} ≤10% | | | | | | | | | | | | | | | |
| Damp Heat Load | 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 | | | | | | | | | | | | | | | |

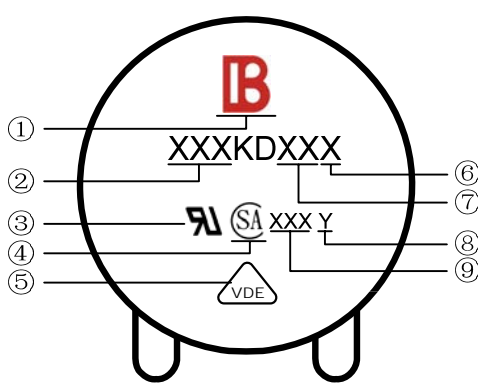
Maximum Surge Current Derating Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve

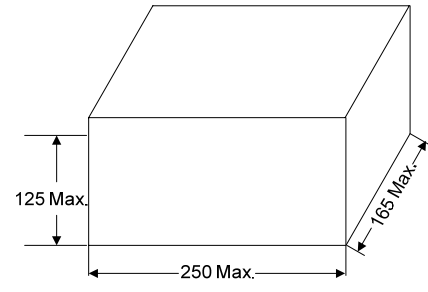



Marking code



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

Quantity

| Packaging Dimensions (Unit: mm) | Quantity |
|---|--|
| Exposure in bulk  | 100pcs/bag 4bags/box (180K~621K) |
| | 50pcs/bag 4bags/box (681K~182K) |
| Cut the feet in bulk  | 100pcs/bag 4bags/box (180K~621K) |
| | 50pcs/bag 4bags/box (681K~182K) |

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