

Metal Oxide Varistors (MOV) Data Sheet

Features

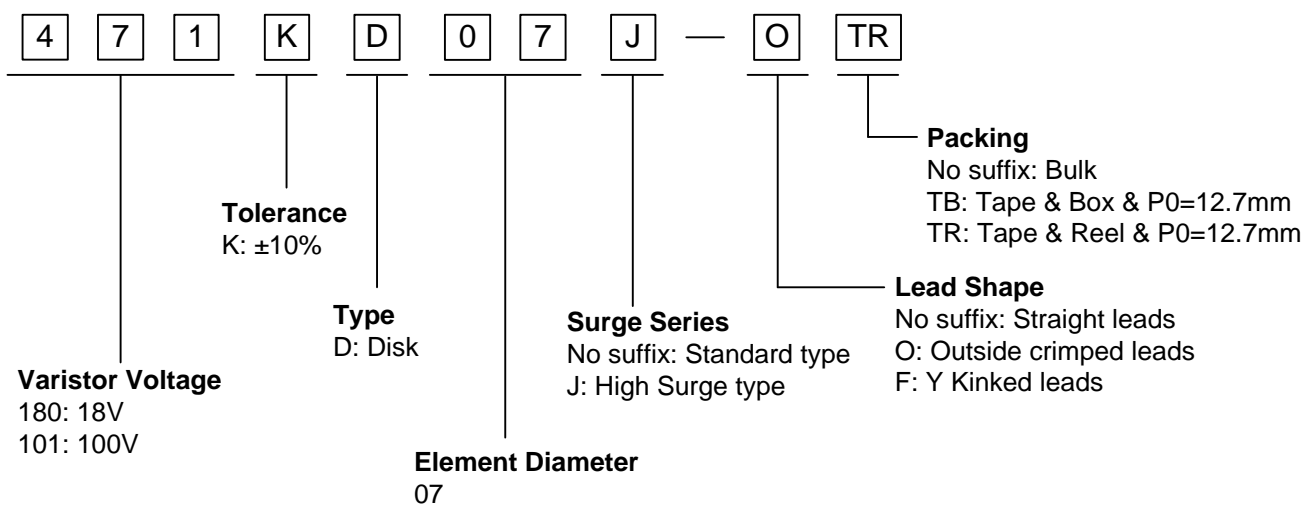
- Wide operating voltage (V_{1mA}) range from 18V to 820V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature : $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
- Storage Temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification : UL 、 CSA 、 VDE



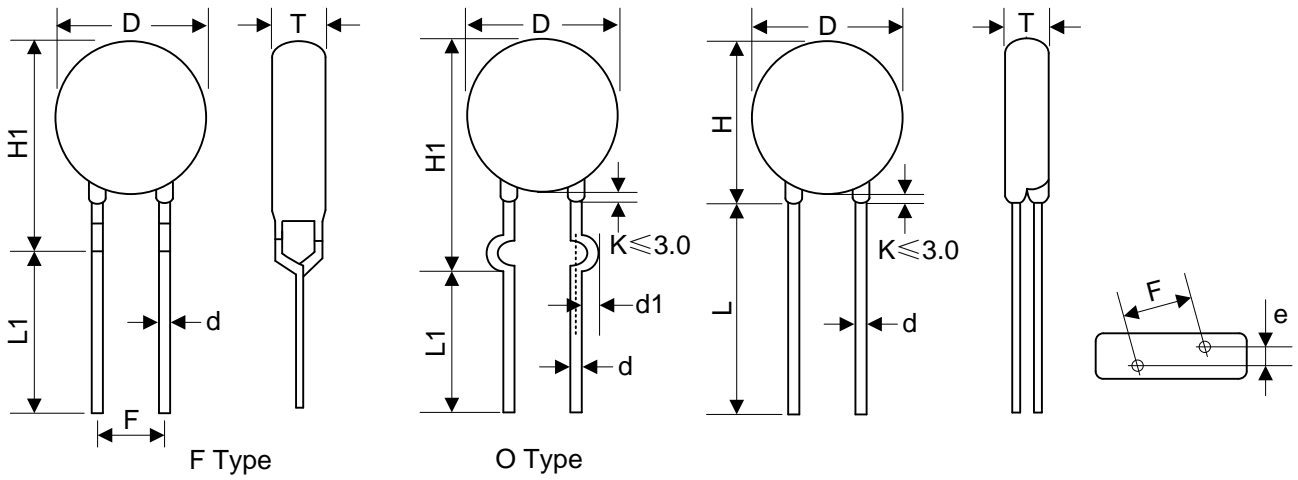
Applications

- 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 | 7.5~12.0 |
| H1 | 9.0~13.5 |
| L(min.) | 20.0 |
| L1(min.) | 15.0 |
| D | 7.0~9.0 |
| 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 | e | Model | T | e |
| 180K | 1.5~4.5 | 1.3 | 241K | 2.1~4.6 | 2.0 |
| 220K | 1.6~4.6 | 1.4 | 271K | 2.1~4.9 | 2.2 |
| 270K | 1.6~4.7 | 1.6 | 301K | 2.2~5.0 | 2.3 |
| 330K | 1.7~4.9 | 1.5 | 331K | 2.2~5.1 | 2.3 |
| 390K | 1.6~4.8 | 1.6 | 361K | 2.4~5.2 | 2.5 |
| 470K | 1.7~4.9 | 1.7 | 391K | 2.5~5.4 | 2.6 |
| 560K | 1.8~5.0 | 1.9 | 431K | 2.7~5.7 | 2.8 |
| 680K | 1.9~5.2 | 2.2 | 471K | 2.8~6.0 | 3.0 |
| 820K | 1.6~4.1 | 1.6 | 511K | 2.9~6.2 | 3.2 |
| 101K | 1.9~4.3 | 1.8 | 561K | 3.1~6.5 | 3.4 |
| 121K | 1.9~4.5 | 2.0 | 621K | 3.3~7.1 | 3.7 |
| 151K | 1.7~4.8 | 1.6 | 681K | 3.5~7.3 | 4.0 |
| 181K | 1.8~4.3 | 1.7 | 751K | 3.8~7.0 | 4.1 |
| 201K | 1.9~4.4 | 1.8 | 781K | 3.9~7.2 | 4.2 |
| 221K | 2.0~4.5 | 1.9 | 821K | 4.1~7.5 | 4.4 |

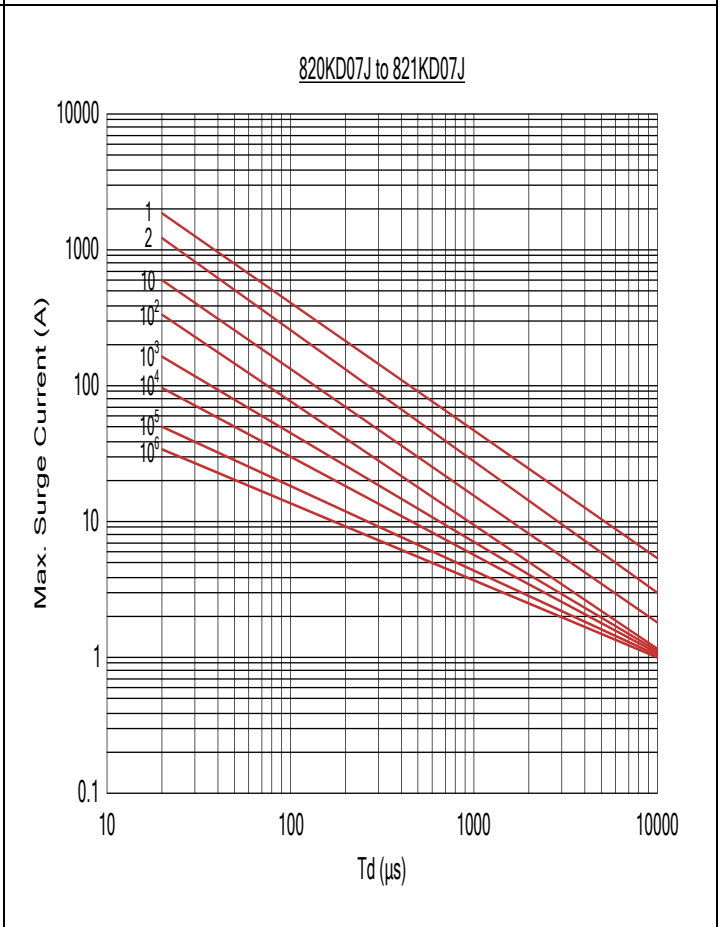
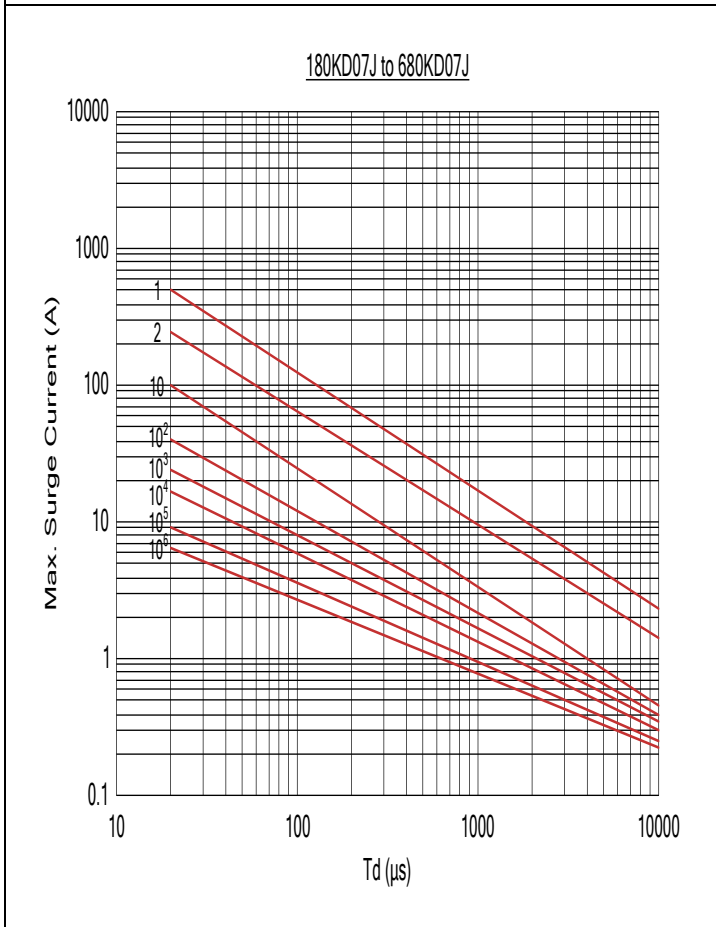
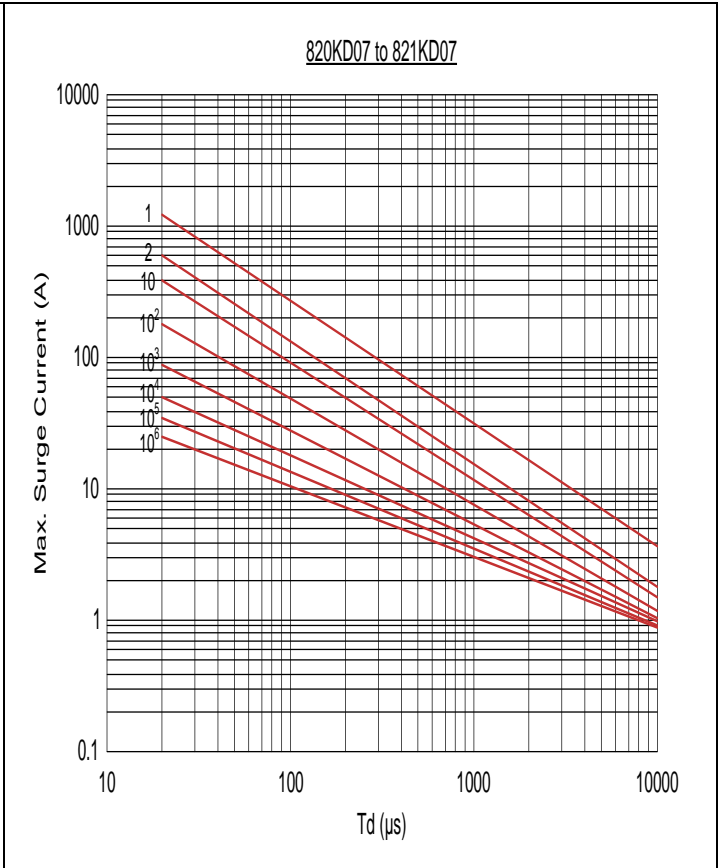
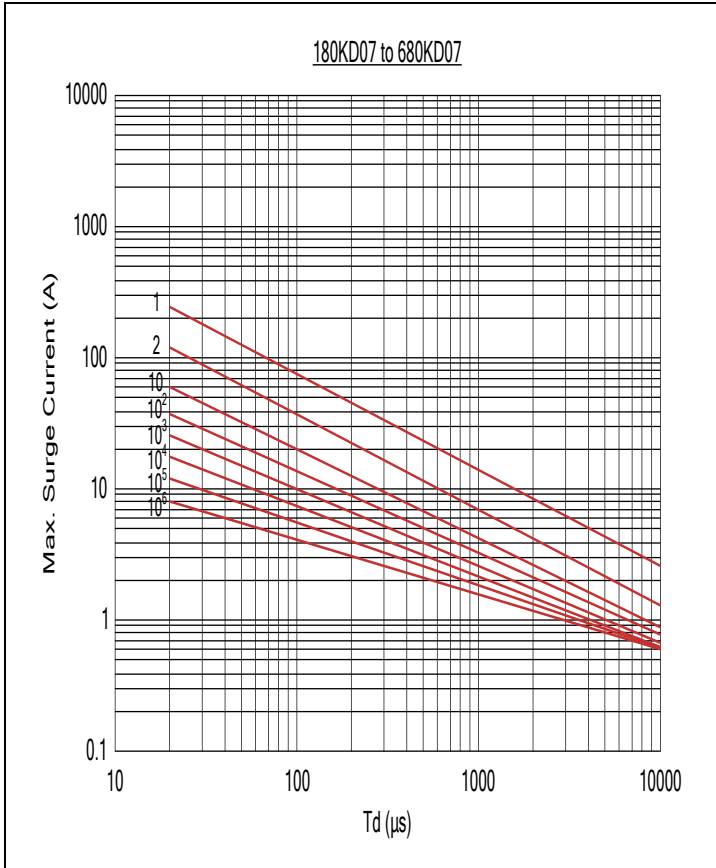
Electrical Characteristics

| 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 _{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) |
| 180KD07 | 180KD07J | 11 | 14 | 18(15~21.6) | 2.5 | 36 | 250 | 500 | 0.9 | 2.0 | 0.02 | 2800 |
| 220KD07 | 220KD07J | 14 | 18 | 22(19.5~26) | 2.5 | 43 | 250 | 500 | 1.1 | 2.4 | 0.02 | 2300 |
| 270KD07 | 270KD07J | 17 | 22 | 27(24~31) | 2.5 | 53 | 250 | 500 | 1.4 | 3.0 | 0.02 | 1800 |
| 330KD07 | 330KD07J | 20 | 26 | 33(29.5~36.5) | 2.5 | 65 | 250 | 500 | 1.7 | 3.5 | 0.02 | 1500 |
| 390KD07 | 390KD07J | 25 | 31 | 39(35~43) | 2.5 | 77 | 250 | 500 | 2.1 | 4.0 | 0.02 | 1300 |
| 470KD07 | 470KD07J | 30 | 38 | 47(42~52) | 2.5 | 93 | 250 | 500 | 2.5 | 5.0 | 0.02 | 1100 |
| 560KD07 | 560KD07J | 35 | 45 | 56(50~62) | 2.5 | 110 | 250 | 500 | 3.1 | 6.0 | 0.02 | 890 |
| 680KD07 | 680KD07J | 40 | 56 | 68(61~75) | 2.5 | 135 | 250 | 500 | 3.6 | 7.0 | 0.02 | 740 |
| 820KD07 | 820KD07J | 50 | 65 | 82(74~90) | 10 | 135 | 1200 | 1750 | 5 | 10.0 | 0.25 | 600 |
| 101KD07 | 101KD07J | 60 | 85 | 100(90~110) | 10 | 165 | 1200 | 1750 | 6.5 | 12.0 | 0.25 | 500 |
| 121KD07 | 121KD07J | 75 | 100 | 120(108~132) | 10 | 200 | 1200 | 1750 | 7.8 | 13.0 | 0.25 | 420 |
| 151KD07 | 151KD07J | 95 | 125 | 150(135~165) | 10 | 250 | 1200 | 1750 | 9.7 | 15.0 | 0.25 | 330 |
| 181KD07 | 181KD07J | 115 | 150 | 180(162~198) | 10 | 300 | 1200 | 1750 | 11.7 | 16.0 | 0.25 | 280 |
| 201KD07 | 201KD07J | 130 | 170 | 200(180~220) | 10 | 340 | 1200 | 1750 | 13.0 | 17.0 | 0.25 | 250 |
| 221KD07 | 221KD07J | 140 | 180 | 220(198~242) | 10 | 360 | 1200 | 1750 | 14.0 | 19.0 | 0.25 | 230 |
| 241KD07 | 241KD07J | 150 | 200 | 240(216~264) | 10 | 395 | 1200 | 1750 | 15.0 | 21.0 | 0.25 | 210 |
| 271KD07 | 271KD07J | 175 | 225 | 270(243~297) | 10 | 455 | 1200 | 1750 | 18.0 | 24.0 | 0.25 | 185 |
| 301KD07 | 301KD07J | 190 | 250 | 300(270~330) | 10 | 500 | 1200 | 1750 | 20.0 | 26.0 | 0.25 | 165 |
| 331KD07 | 331KD07J | 210 | 275 | 330(297~363) | 10 | 550 | 1200 | 1750 | 23.0 | 28.0 | 0.25 | 150 |
| 361KD07 | 361KD07J | 230 | 300 | 360(324~396) | 10 | 595 | 1200 | 1750 | 24.0 | 32.0 | 0.25 | 140 |
| 391KD07 | 391KD07J | 250 | 320 | 390(351~429) | 10 | 650 | 1200 | 1750 | 26.0 | 35.0 | 0.25 | 130 |
| 431KD07 | 431KD07J | 275 | 350 | 430(387~473) | 10 | 710 | 1200 | 1750 | 28.0 | 40.0 | 0.25 | 115 |
| 471KD07 | 471KD07J | 300 | 385 | 470(423~517) | 10 | 775 | 1200 | 1750 | 29.0 | 42.0 | 0.25 | 105 |
| 511KD07 | 511KD07J | 320 | 415 | 510(459~561) | 10 | 845 | 1200 | 1750 | 31.0 | 45.0 | 0.25 | 100 |
| 561KD07 | 561KD07J | 350 | 460 | 560(504~616) | 10 | 925 | 1200 | 1750 | 35.0 | 49.0 | 0.25 | 90 |
| 621KD07 | 621KD07J | 385 | 505 | 620(558~682) | 10 | 1025 | 1200 | 1750 | 38.0 | 55.0 | 0.25 | 80 |
| 681KD07 | 681KD07J | 420 | 560 | 680(612~748) | 10 | 1120 | 1200 | 1750 | 42.0 | 60.0 | 0.25 | 75 |
| 751KD07 | 751KD07J | 460 | 615 | 750(675~825) | 10 | 1240 | 1200 | 1750 | 45.0 | 64.0 | 0.25 | 70 |
| 781KD07 | 781KD07J | 485 | 640 | 780(702~858) | 10 | 1290 | 1200 | 1750 | 48.0 | 69.0 | 0.25 | 65 |
| 821KD07 | 821KD07J | 510 | 670 | 820(738~902) | 10 | 1355 | 1200 | 1750 | 52.0 | 73.0 | 0.25 | 60 |

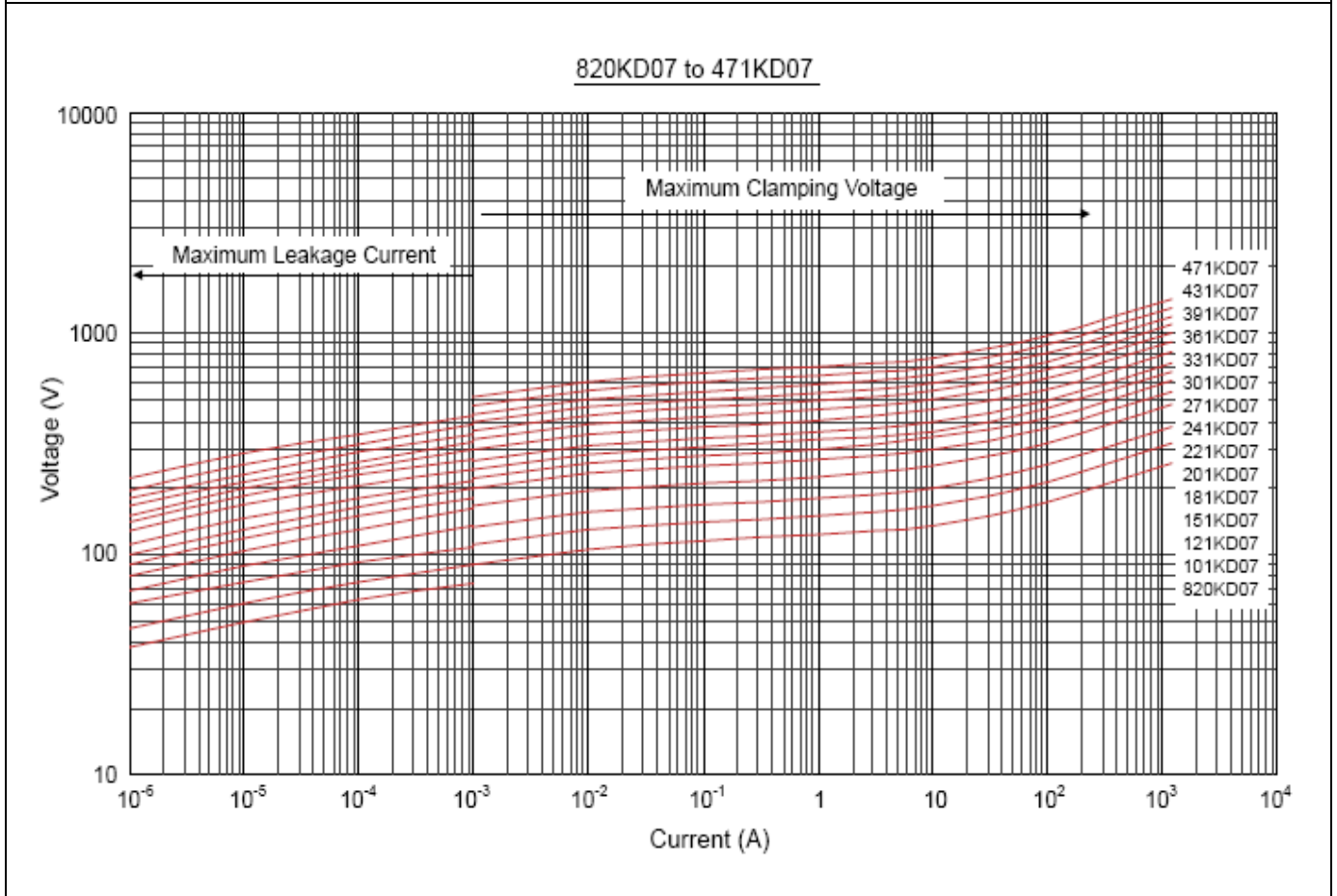
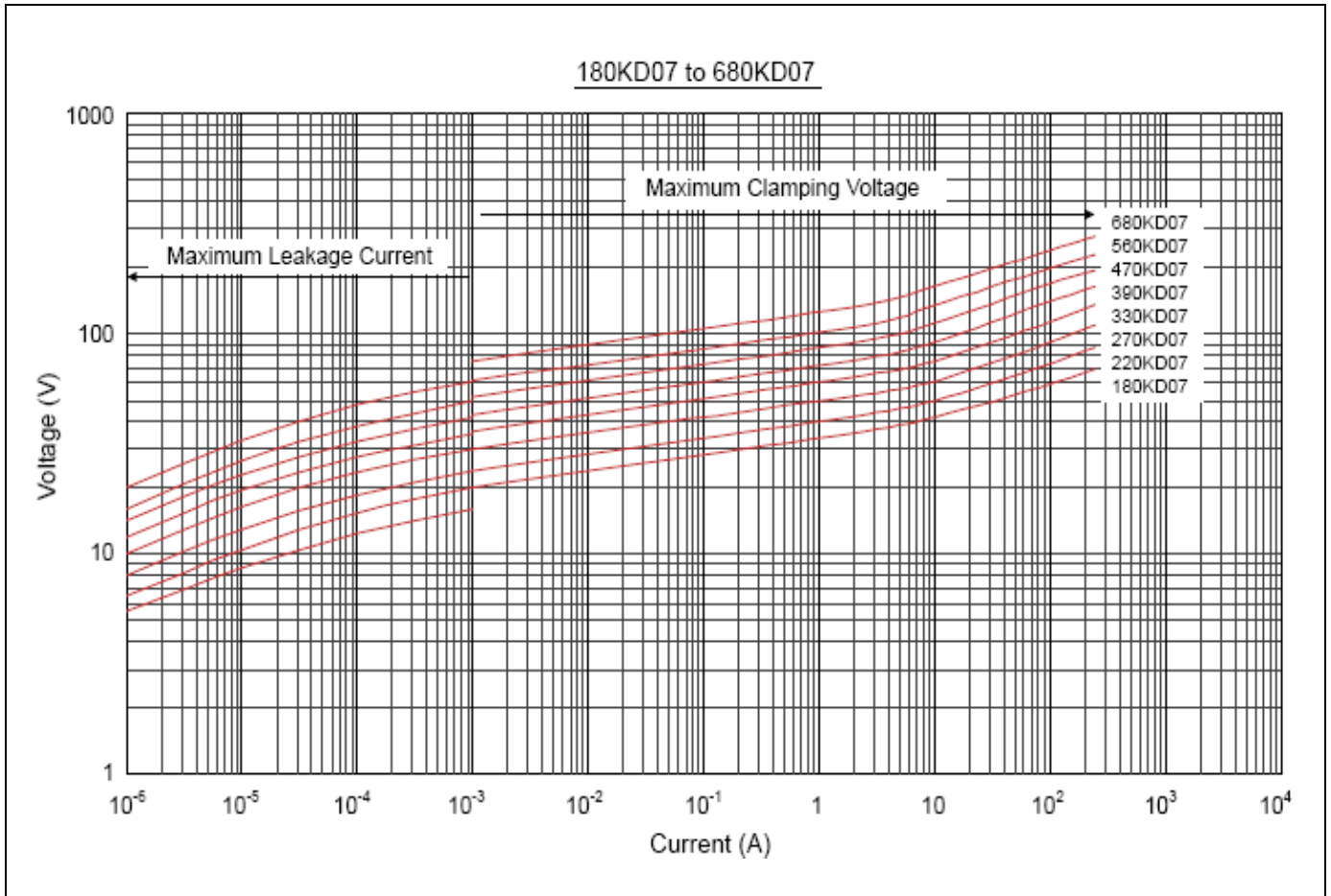
Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

2. Leakage Current (@83% of V_{1mA}) : IR≤50μA (180K~680K) ; IR≤25μA (820K~821K)

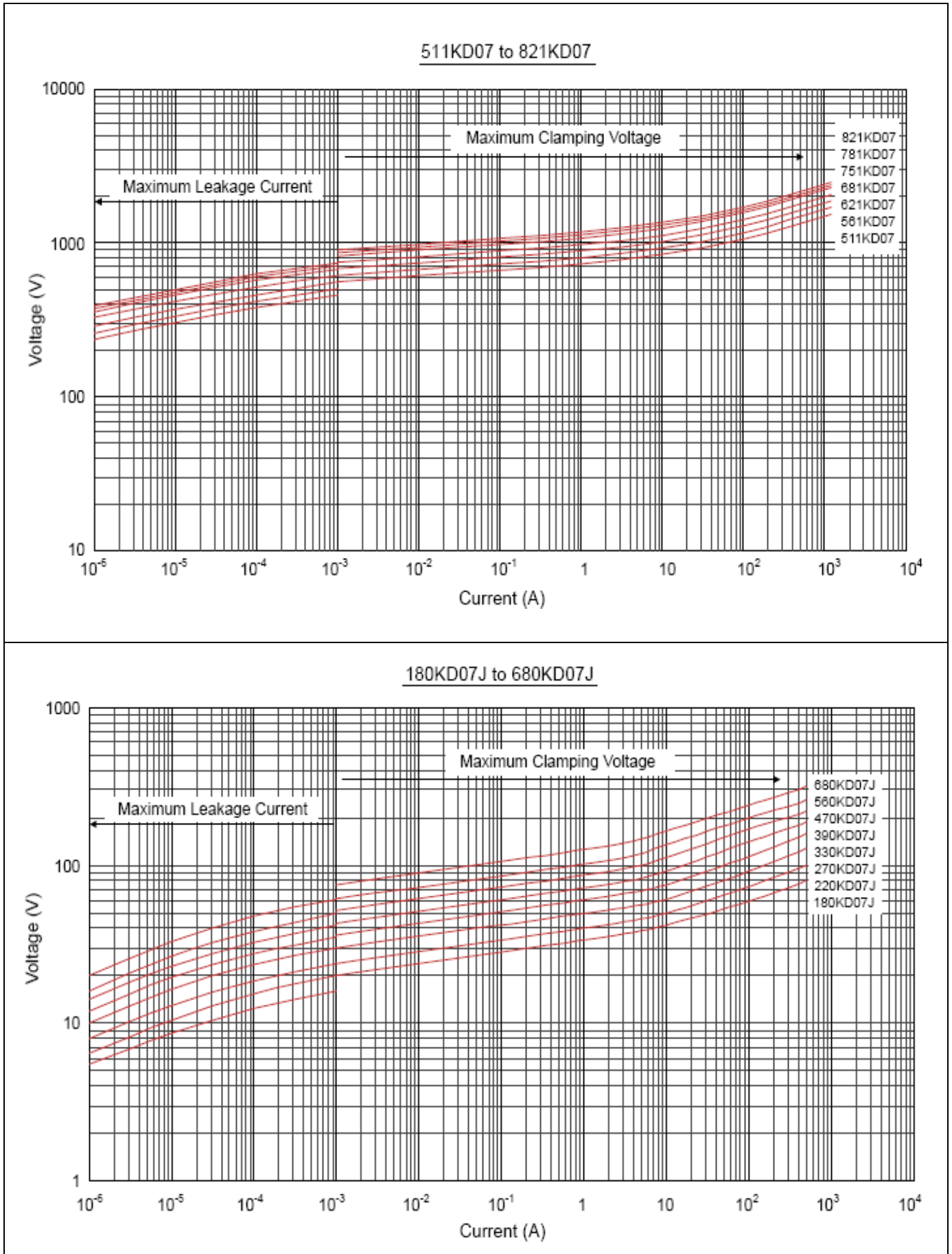
Maximum Surge Current Derating Curve



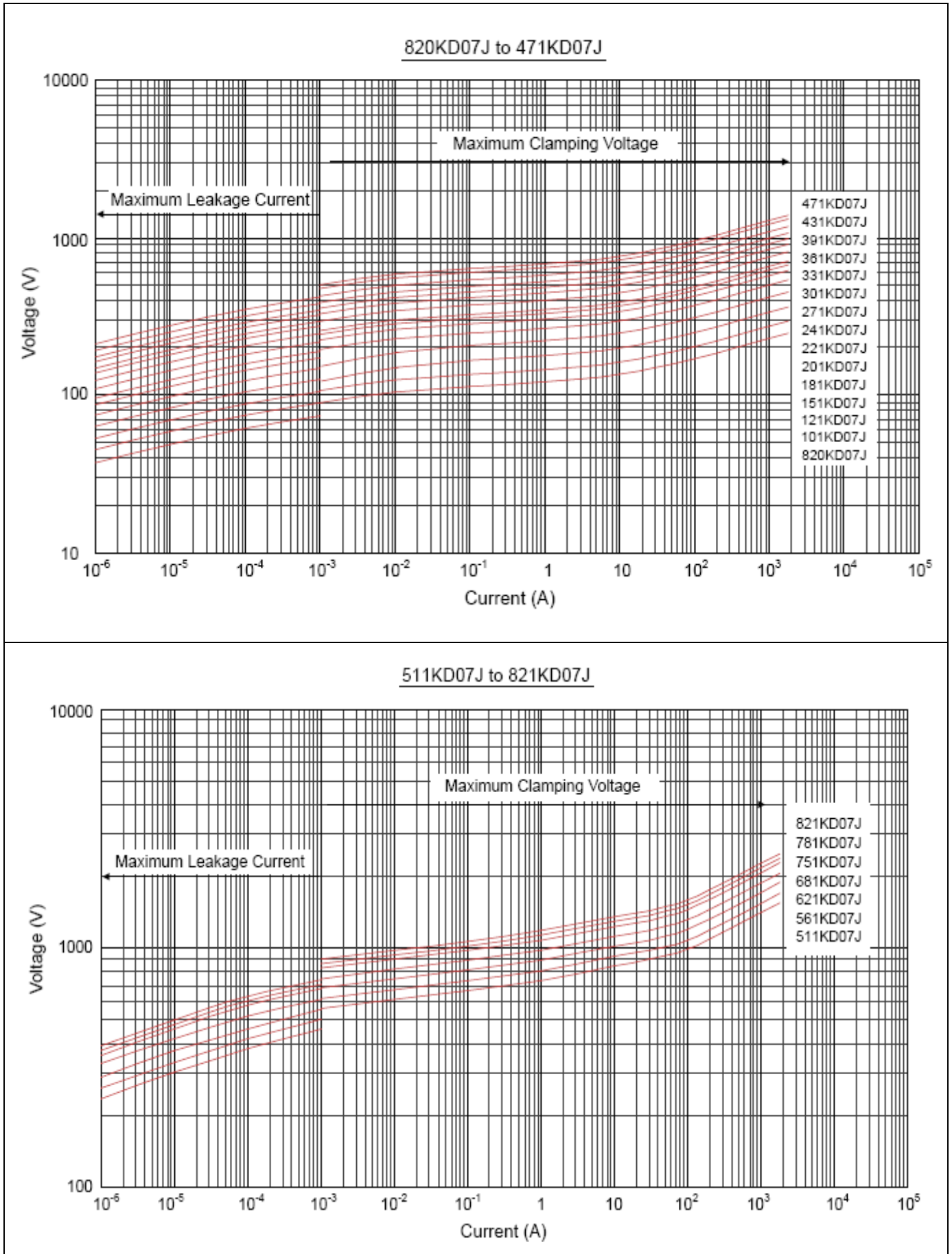
Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve

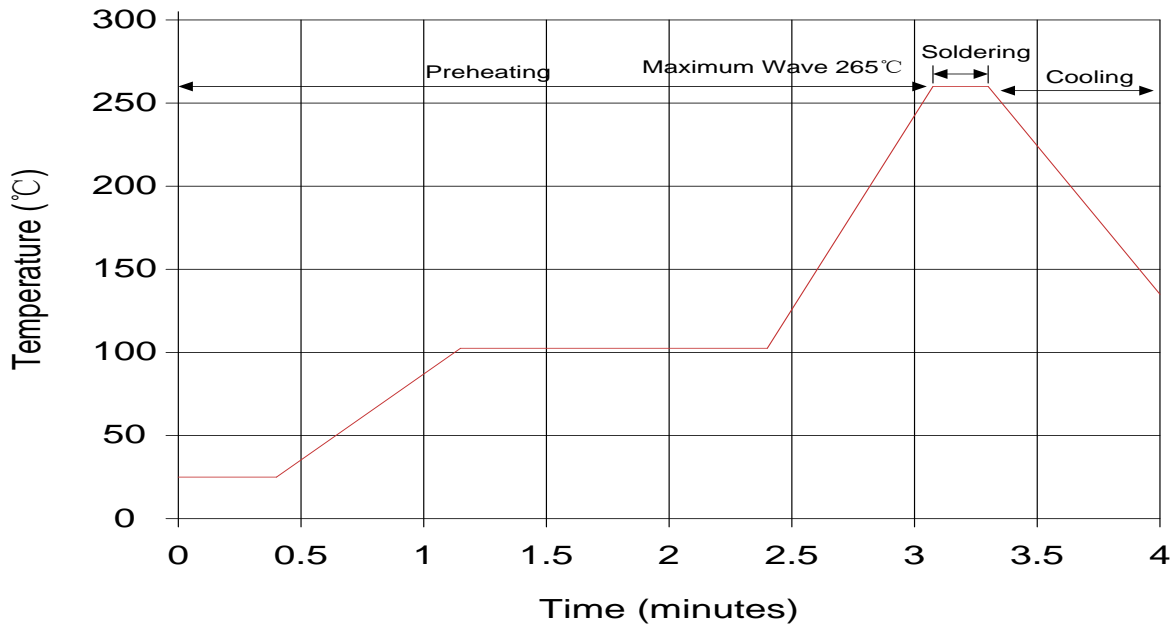


Reliability

| Items | Standard | Test conditions / Methods | Specifications | | | | | | | | | | | | | | | |
|-------------------------------|------------------------|---|--|------------------|------------------|-----|----------------|------|----------|------------------|--|---|-------|------|---|------------------|-----|--|
| Tensile Strength of Terminals | IEC60068-2-21 | 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 | IEC60068-2-21 | 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 | IEC60068-2-6 | 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% | | | | | | | | | | | | | | | |
| Solderability | IEC60068-2-20 | 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 | IEC60068-2-20 | Solder Temp: 260±5 °C Dipping Time: 10±1 sec | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% | | | | | | | | | | | | | | | |
| High Temperature Storage | IEC60068-2-2 | Ambient Temp: 125±2 °C Duration: 1000±24hrs | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% | | | | | | | | | | | | | | | |
| Low Temperature Storage | IEC60068-2-1 | Ambient Temp: -40±2 °C Duration: 1000±24hrs | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% | | | | | | | | | | | | | | | |
| Damp Heat, Steady State | IEC60068-2-78 | The test is divided into two groups . a. 40±2 °C , 90~95% RH for 1344±24hrs b. 40±2 °C , 90~95% RH, at 10%VDC , 1344±24 hrs | No visible damage ΔV _{1mA} /V _{1mA} ≤ 10% Insulation Resistance ≥ 100MΩ | | | | | | | | | | | | | | | |
| High Temperature Load | MIL-STD-202 Method 108 | Ambient Temp: 105±2 °C Duration: 1000±24hrs Load: Max. Allowable Voltage In AC. | ΔV _{1mA} /V _{1mA} ≤ 10% | | | | | | | | | | | | | | | |
| Temperature Cycle | IEC60068-2-14 | 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>5±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>5±3</td> </tr> </tbody> </table> | Step | Temperature (°C) | Period (minutes) | 1 | -40±3 | 30±3 | 2 | Room temperature | 5±3 | 3 | 125±3 | 30±3 | 4 | Room temperature | 5±3 | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% |
| Step | Temperature (°C) | Period (minutes) | | | | | | | | | | | | | | | | |
| 1 | -40±3 | 30±3 | | | | | | | | | | | | | | | | |
| 2 | Room temperature | 5±3 | | | | | | | | | | | | | | | | |
| 3 | 125±3 | 30±3 | | | | | | | | | | | | | | | | |
| 4 | Room temperature | 5±3 | | | | | | | | | | | | | | | | |
| 8/20uS Surge Life | IEC61051-1 | 8/20μS waveform, 10 surge currents, unipolar, interval 30secs, amplitude corresponding to max. surge current derating curves for 20μS. | No visible damage ΔV _b (1mA) ≤ ±10% | | | | | | | | | | | | | | | |
| 10/1000μS Surge Life | IEC61051-1 | 10/1000μS waveform, 10 surge currents, unipolar, interval 2mins, amplitude corresponding to max. surge current derating curves for 1000μS. | No visible damage ΔV _{1mA} /V _{1mA} ≤ 10% | | | | | | | | | | | | | | | |
| Voltage Proof | IEC61051-1 | Metal balls method, 2500Vac 1 min. | No visible damage | | | | | | | | | | | | | | | |

Soldering Recommendation

Lead-free Wave Soldering Recommendation

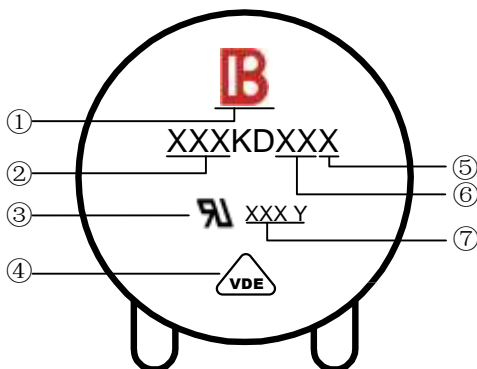


| Item | Conditions |
|------------------|-------------------|
| Peak Temperature | 265°C |
| Dipping Time | 10 seconds (max.) |
| Soldering | 1 time |

Recommendation Reworking Conditions with Soldering Iron

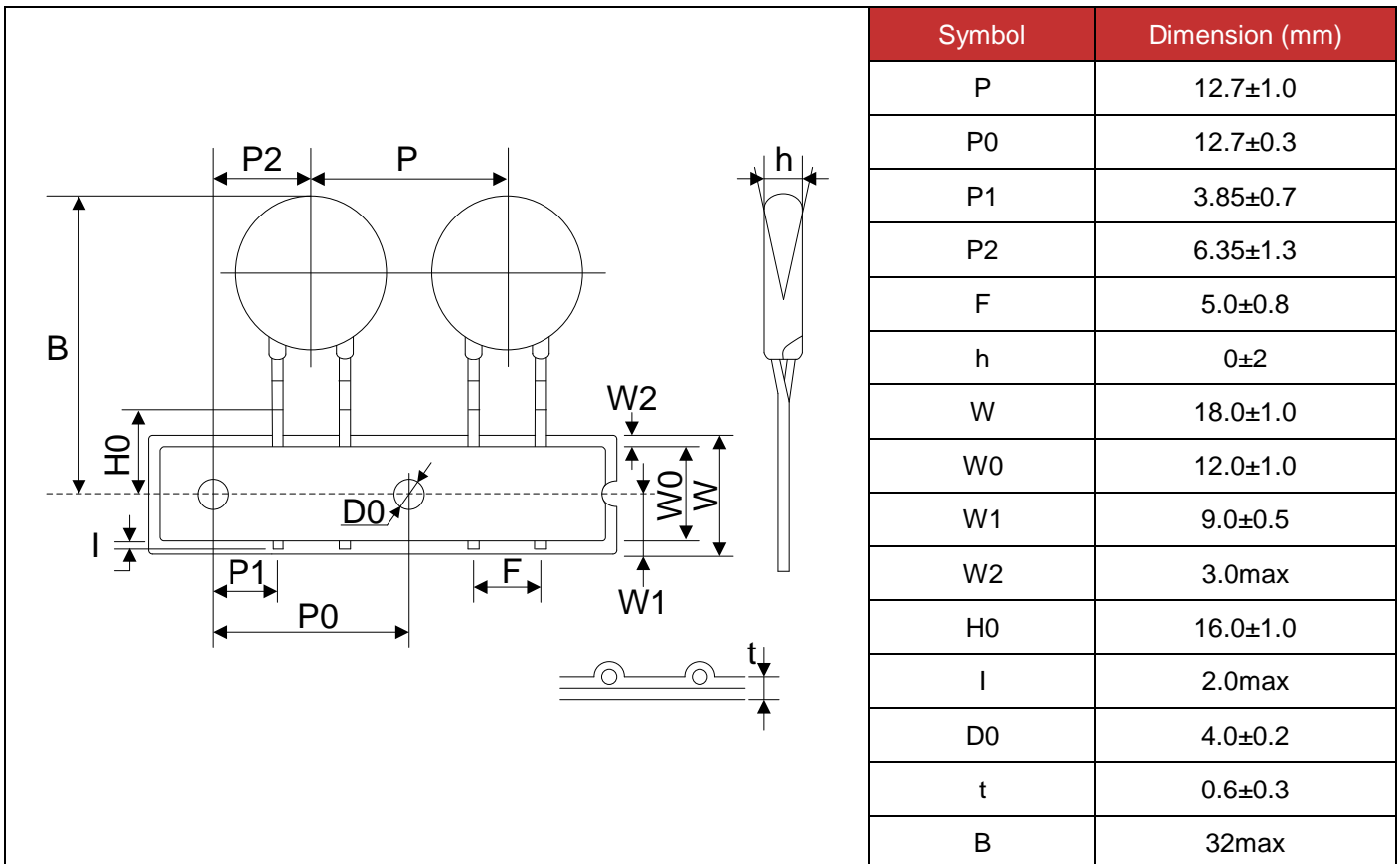
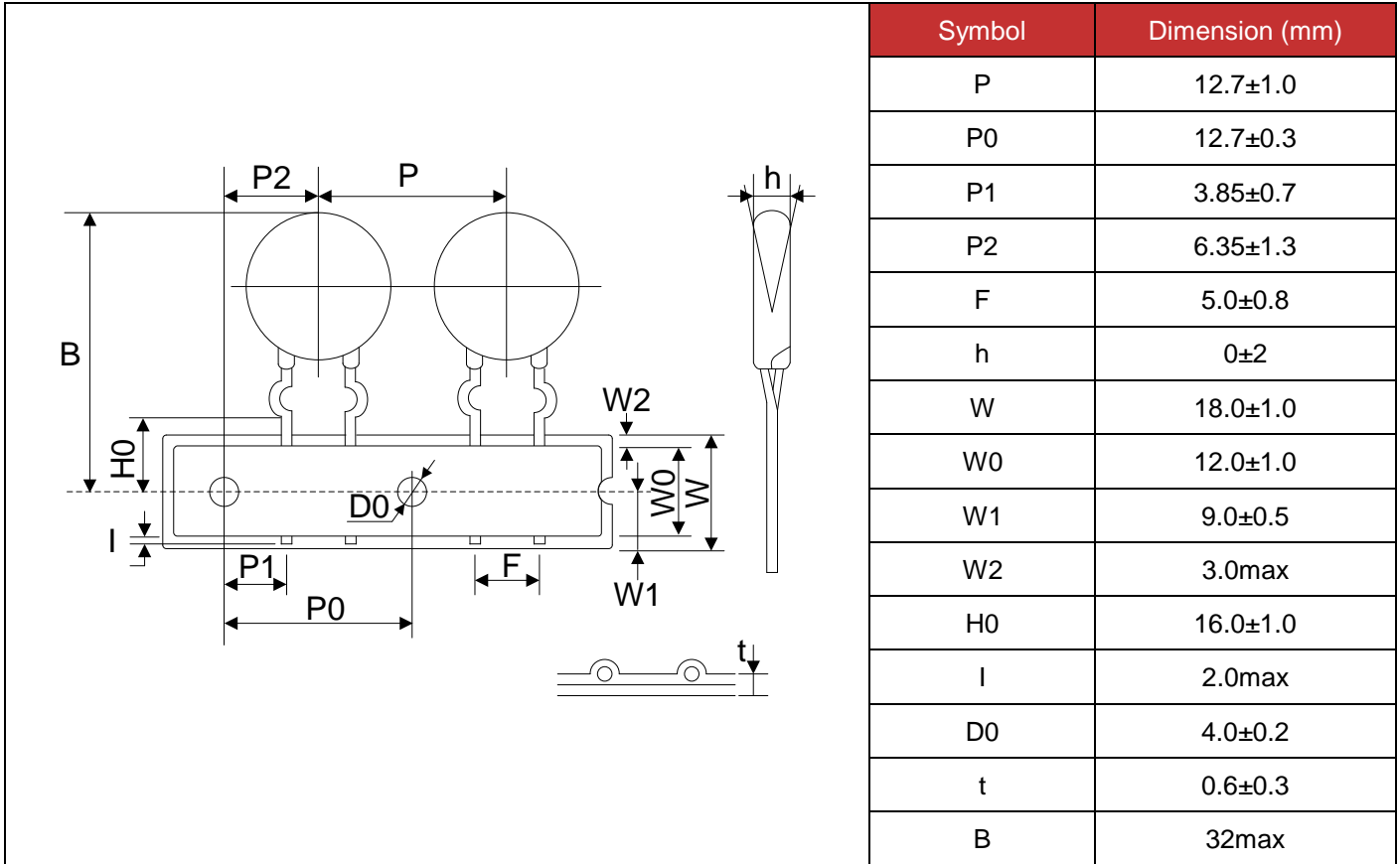
| Item | Conditions |
|-----------------------------------|------------------|
| Temperature of Soldering Iron-tip | 360°C (max.) |
| Soldering Time | 3 seconds (max.) |
| Distance from Varistor | 2mm (min.) |

Marking Code



- ① Brightking Logo
- ② Varistor Voltage
- ③ UL Accreditation Logo
- ④ VDE Accreditation Logo
- ⑤ “J” is High Surge Code, no “J” is Standard Surge
- ⑥ Disk Size
- ⑦ Internal control code

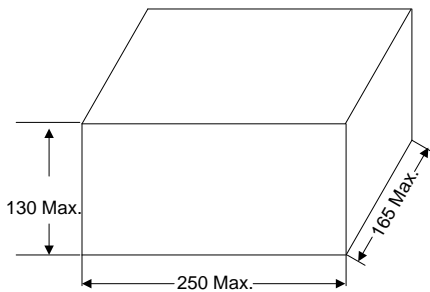
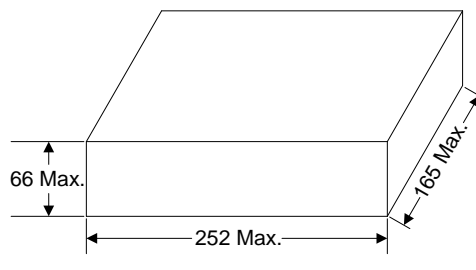
Taping Dimensions



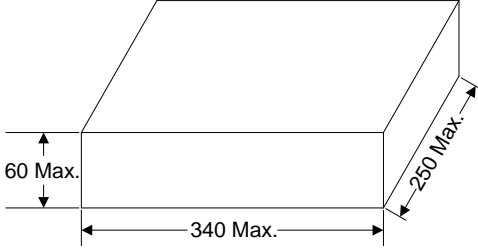
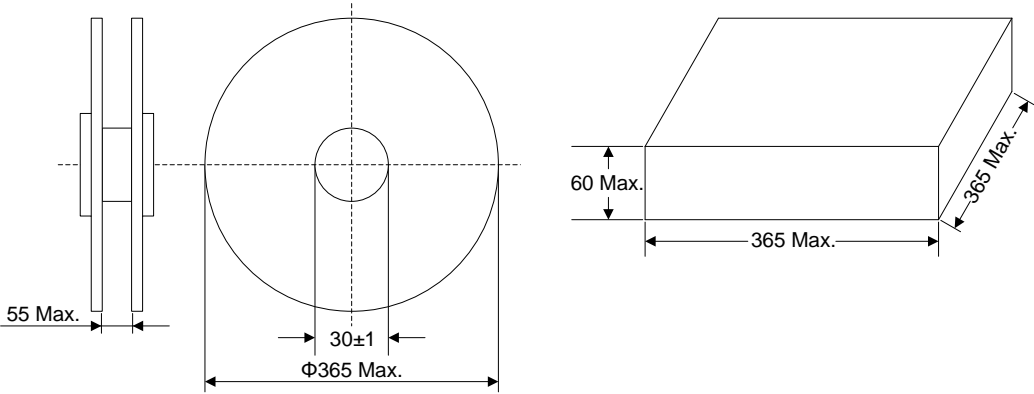
Taping Dimensions

| Symbol | Dimension (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 |
| H2 | 20.0±2.0 |
| l | 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 (180K~821K)</p> |
| <p>In bulk for Terminals Trimmed Products</p>  | <p>1000pcs/bag 4bags/box (180K~821K)</p> |

Quantity

| Packaging Dimensions (Unit: mm) | Quantity |
|--|-----------------------------|
| <p>Tape & Box & P0=12.7mm</p>  | 1500pcs/box (180K~391K) |
| | 1000pcs/box (431K~681K) |
| | 750pcs/box (751K~821K) |
| <p>Tape & Reel & P0=12.7mm</p>  | 2000pcs/reel (180K~331K) |
| | 1500pcs/reel (361K~821K) |

Storage Condition of Products

(I) Storage Conditions :

- 1.Storage Temperature : -10°C ~ +40°C
- 2.Relative Humidity : ≦80%RH
- 3.Keep away from corrosive atmosphere and sunlight.

(II) Period of Storage : 1 year

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[NTE1V275](#) [NTE2V015](#) [NTE2V035](#) [NTE2V115](#)