

# DATA SHEET

## METAL OXIDE VARISTORS POWER SUPPLY

07D series

RoHS compliant & Halogen free



Product specification— May 08, 2021 V.2



## Metal Oxide Varistors (MOV) Data Sheet

### Features

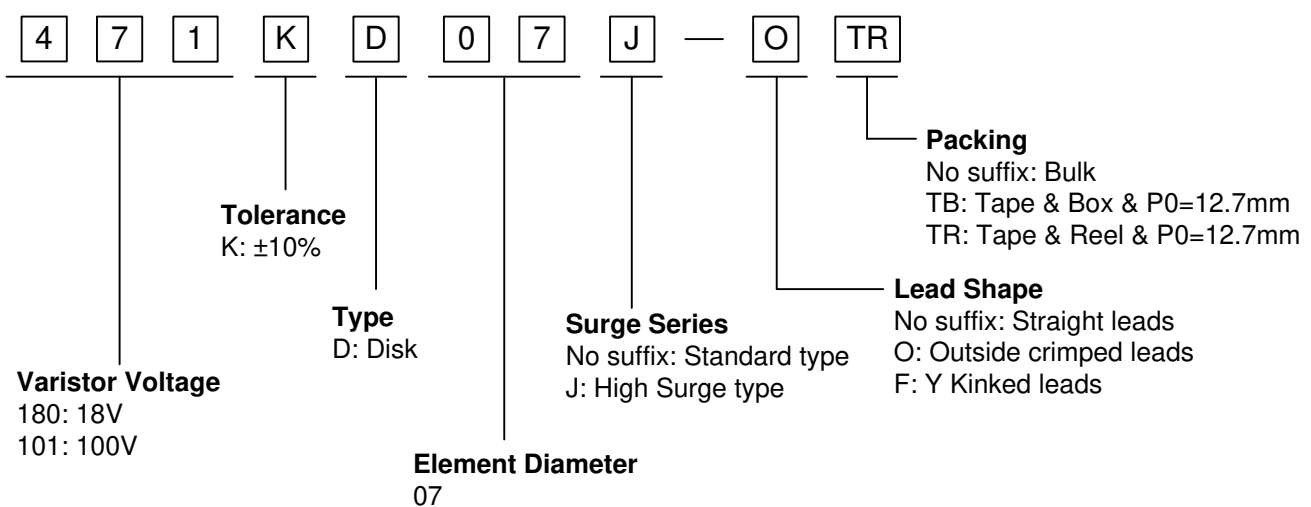
- Wide operating voltage ( $V_{1mA}$ ) range from 18V to 820V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature:  $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$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



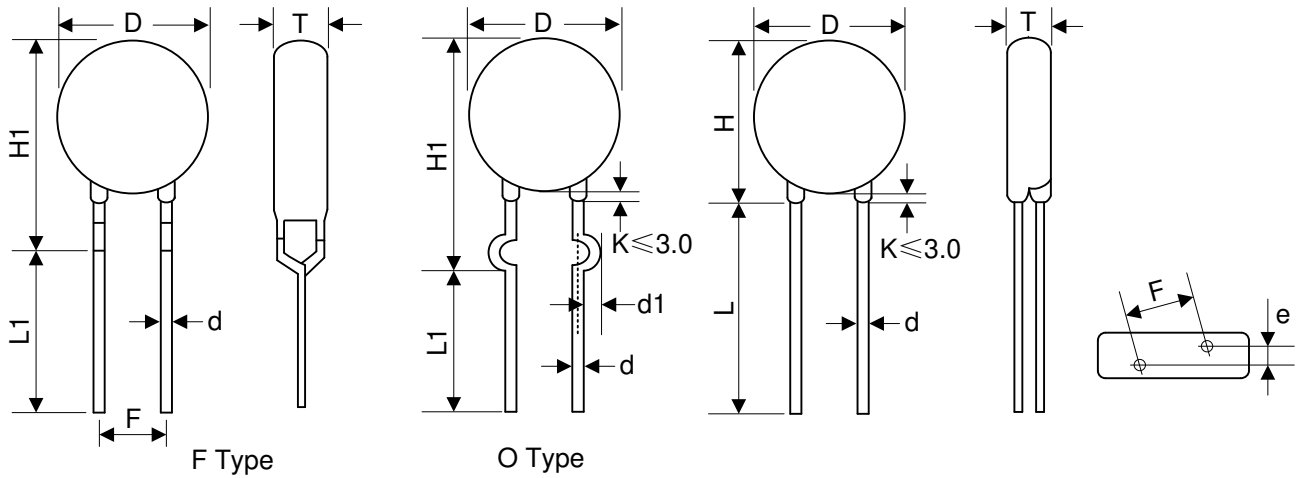
### Applications

- 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 |

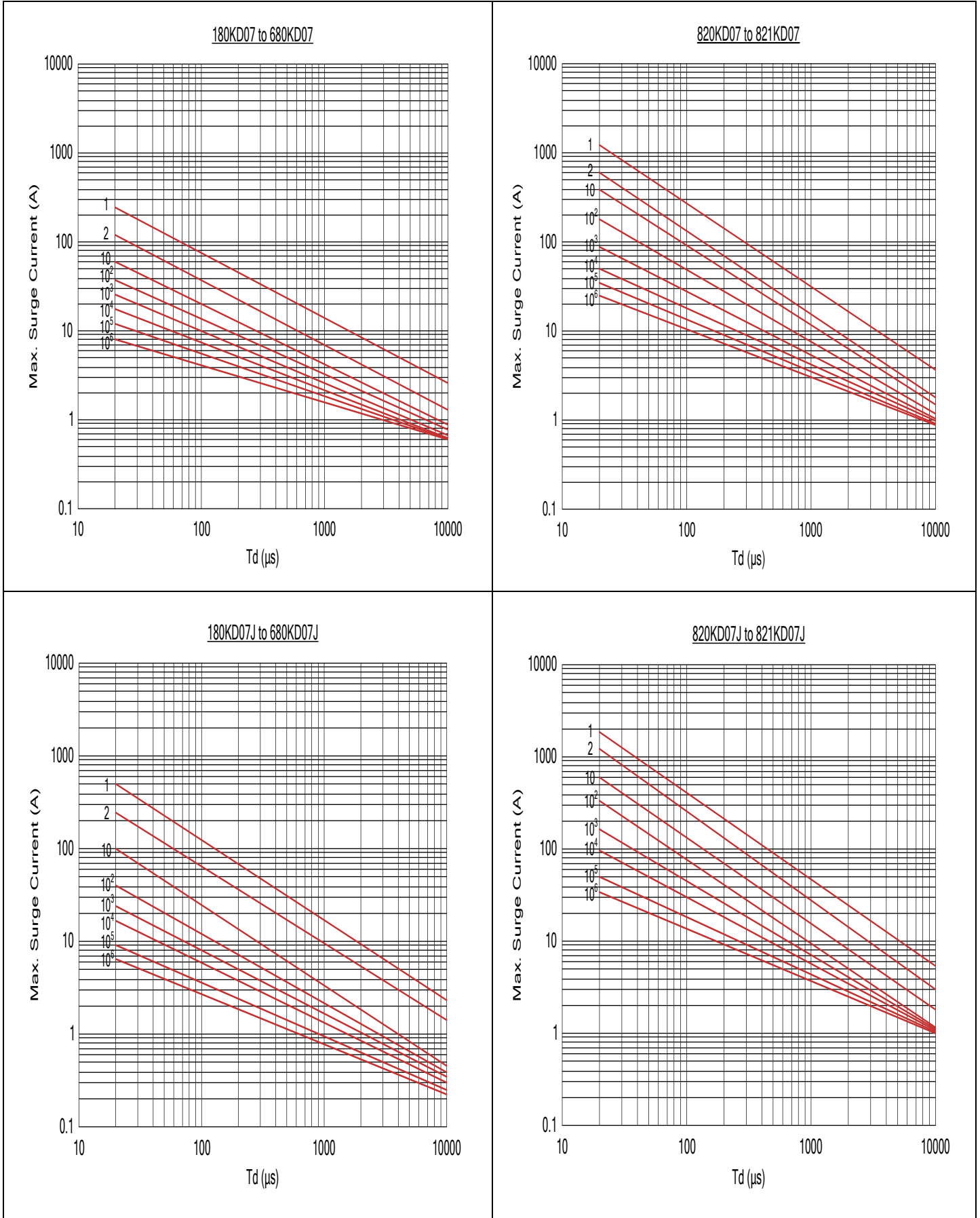
## Electrical Characteristics

| Part Number |            | Maximum Allowable Voltage |                     | Varistor Voltage     | Maximum Clamping Voltage |                    | Withstanding Surge Current |                  | Maximum Energy (10/1000 $\mu$ s) |                | Rated Power | Typical Capacitance (Reference) |
|-------------|------------|---------------------------|---------------------|----------------------|--------------------------|--------------------|----------------------------|------------------|----------------------------------|----------------|-------------|---------------------------------|
| Standard    | High Surge | V <sub>AC</sub> (V)       | V <sub>DC</sub> (V) | V <sub>1mA</sub> (V) | I <sub>P</sub> (A)       | V <sub>C</sub> (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                              |

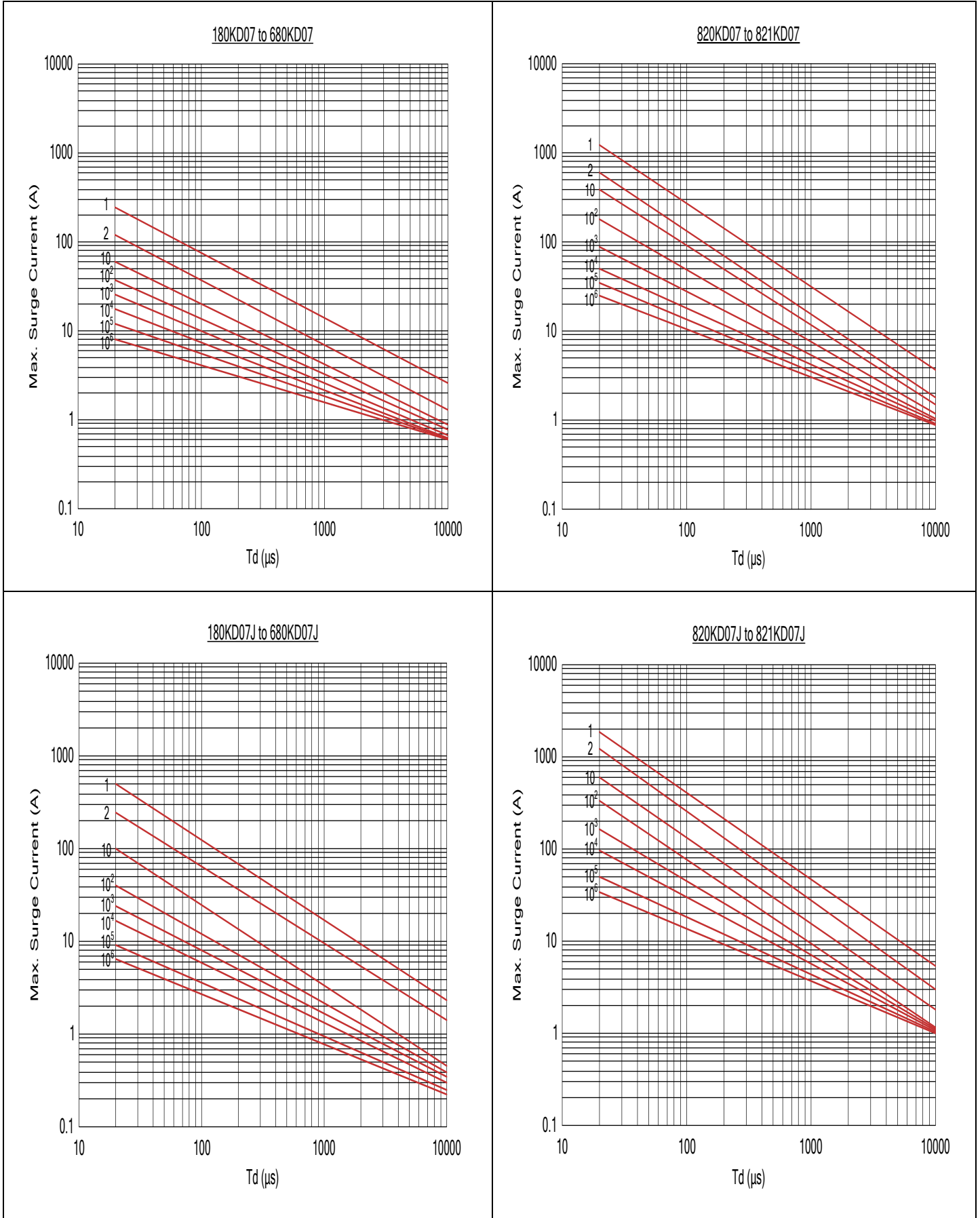
Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

2. Leakage Current (@83% of V<sub>1mA</sub>): IR $\leq$ 50 $\mu$ A (180K~680K) IR $\leq$ 25 $\mu$ A (820K~821K)

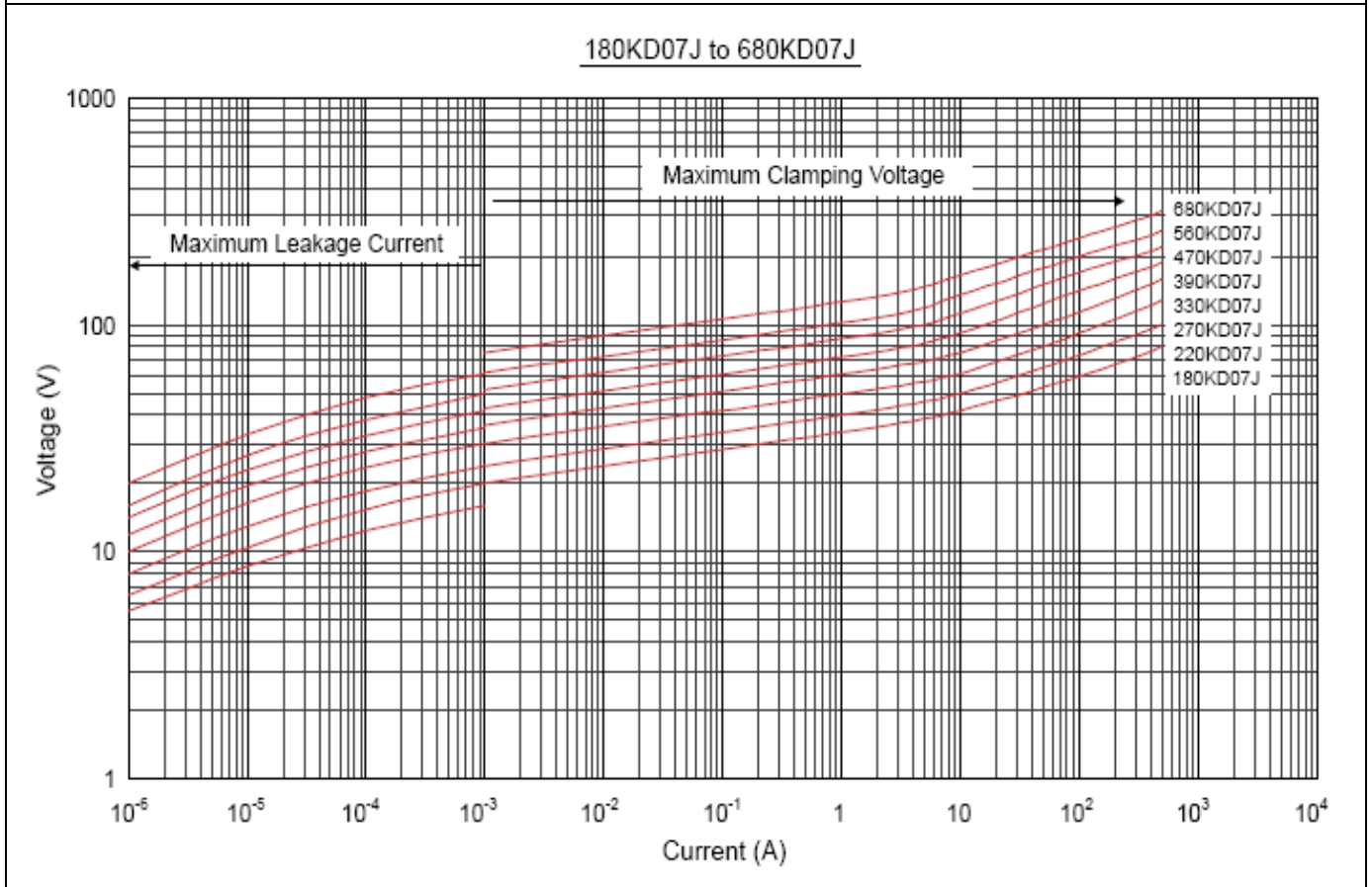
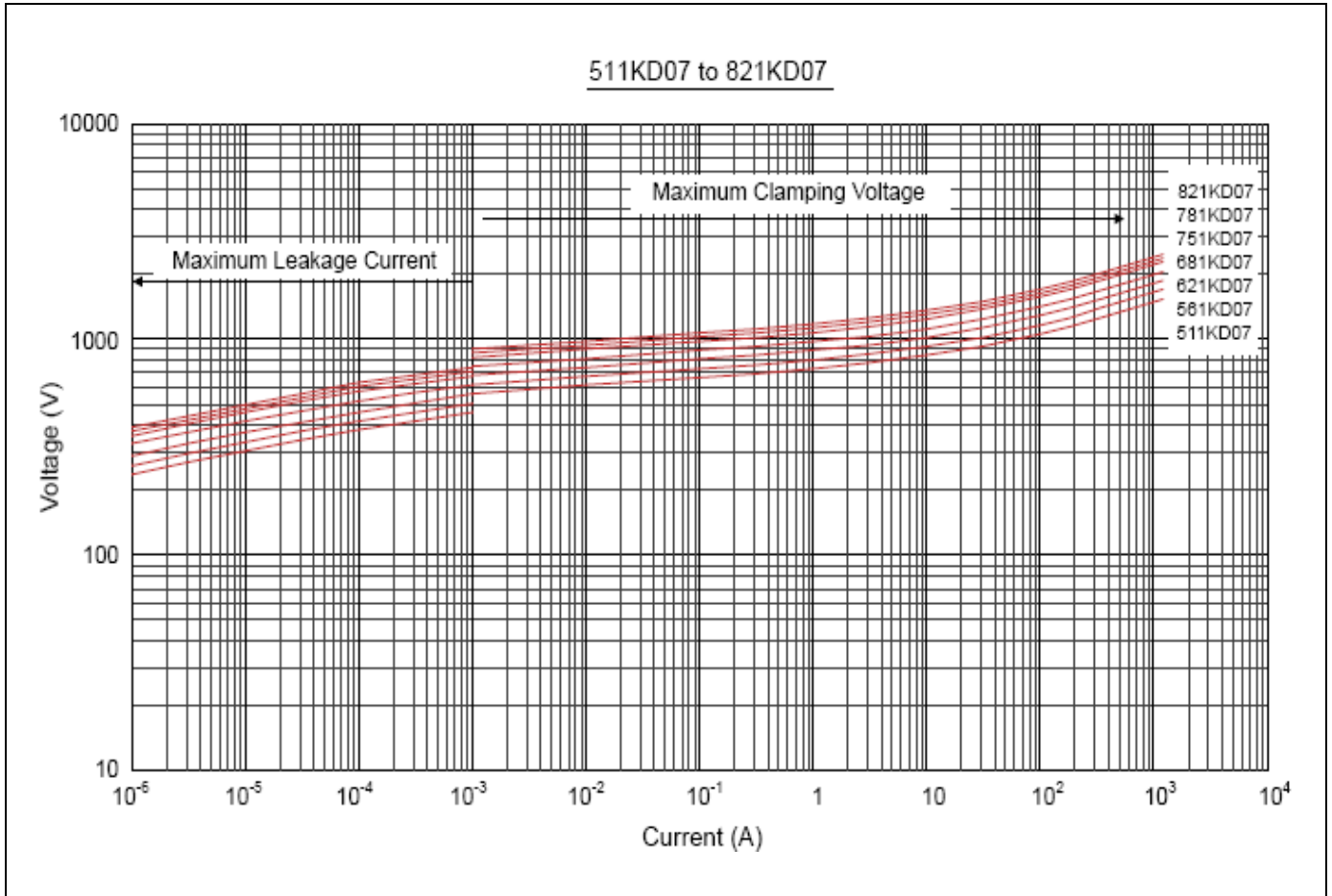
**Maximum Surge Current Derating Curve**



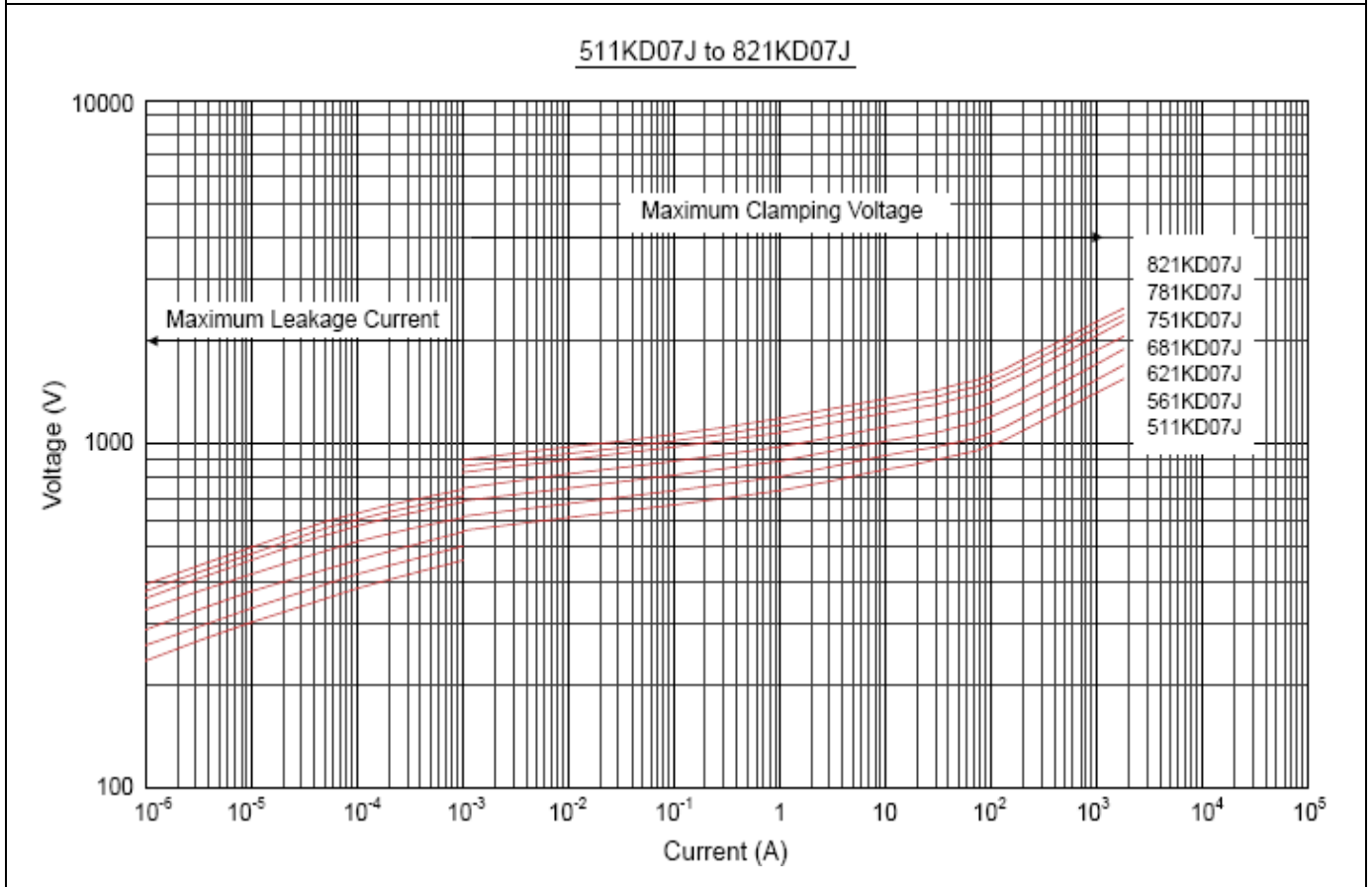
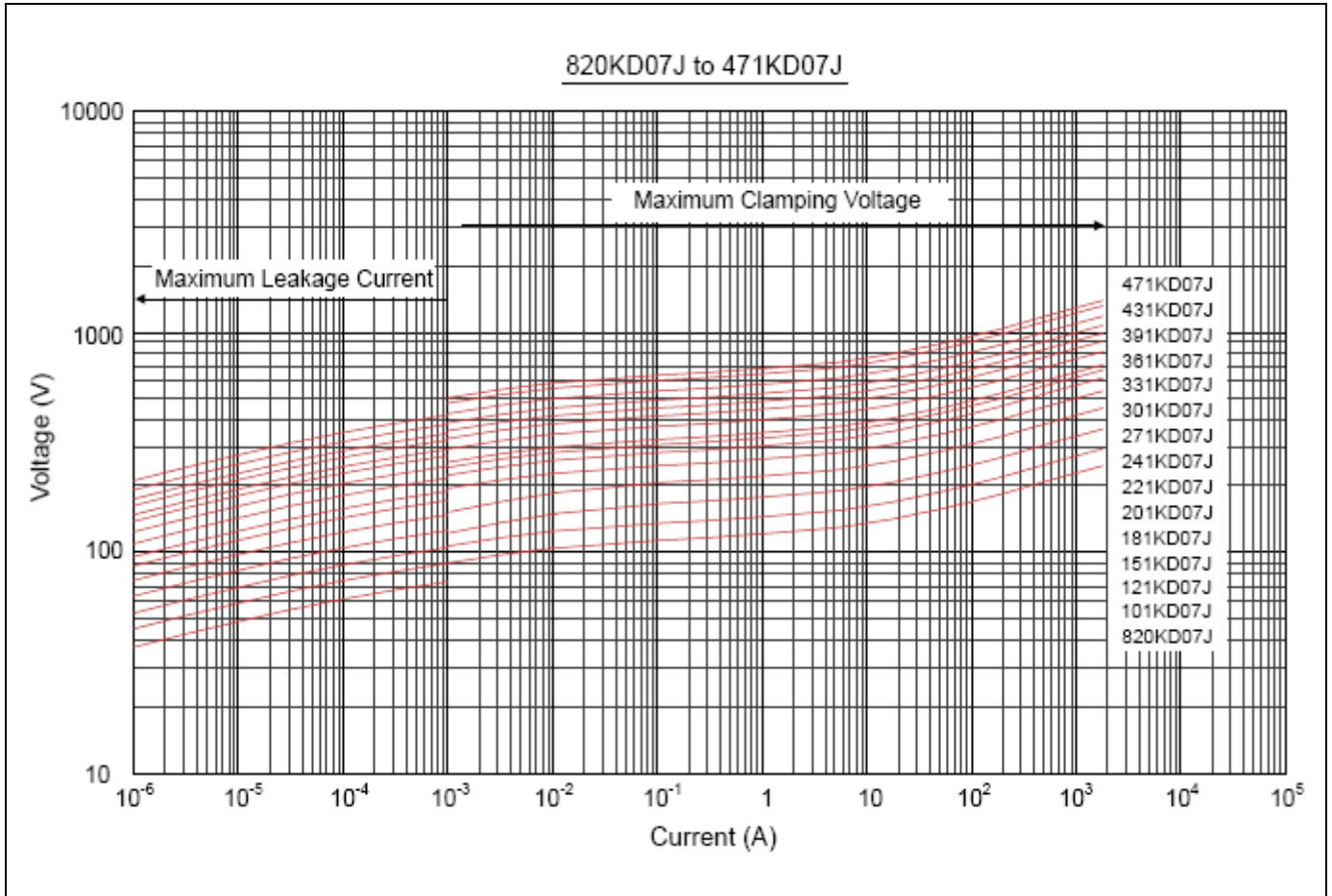
**Maximum Leakage Current and Maximum Clamping Voltage Curve**



Maximum Leakage Current and Maximum Clamping Voltage Curve



**Maximum Leakage Current and Maximum Clamping Voltage Curve**



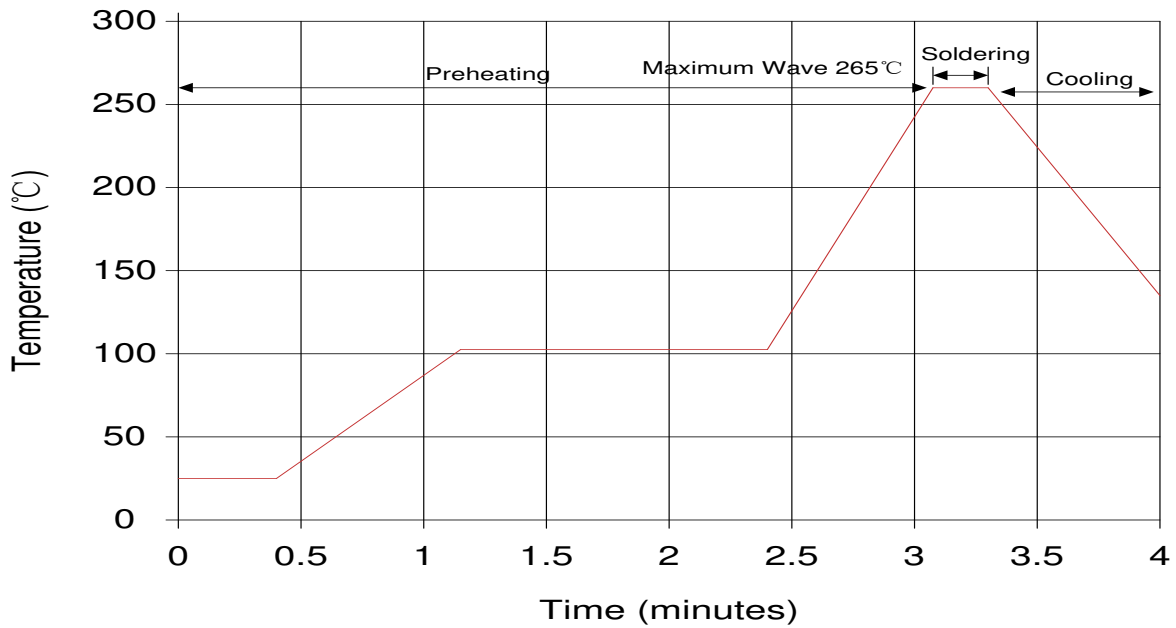


**Reliability**

| 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.<br><br><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 &lt; d ≤ 0.8</td> <td>1.0</td> </tr> <tr> <td>0.8 &lt; d ≤ 1.25</td> <td>2.0</td> </tr> <tr> <td>1.25 &lt; 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<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 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.<br><br><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 &lt; d ≤ 0.8</td> <td>0.5</td> </tr> <tr> <td>0.8 &lt; d ≤ 1.25</td> <td>1.0</td> </tr> <tr> <td>1.25 &lt; 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<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 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<br>Amplitude: 0.75mm or 98m/s <sup>2</sup><br>Direction: 3 mutually perpendicular directions, 2hrs each.   | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 5%                                   |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| Solderability                 | IEC60068-2-20          | Solder Temp: 245±5°C<br>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<br>Dipping Time: 10±1 sec   | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 5%                                   |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| High Temperature Storage      | IEC60068-2-2           | Ambient Temp: 125±2°C<br>Duration: 1000±24hrs  | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 5%                                   |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| Low Temperature Storage       | IEC60068-2-1           | Ambient Temp: -40±2°C<br>Duration: 1000±24hrs  | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 5%                                   |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| Damp Heat, Steady State       | IEC60068-2-78          | The test is divided into two groups .<br>a. 40±2°C , 90~95% RH for 1344±24hrs<br>b. 40±2°C , 90~95% RH, at 10%VDC , 1344±24 hrs  | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 10%<br>Insulation Resistance ≥ 100MΩ |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| High Temperature Load         | MIL-STD-202 Method 108 | Ambient Temp: 105±2°C    Duration: 1000±24hrs<br>Load: Max. Allowable Voltage In AC.   | ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 10%  |                  |                  |     |                |      |          |                  |  |   |       |      |   |                  |     |  |
| Temperature Cycle             | IEC60068-2-14          | The conditions shown below shall be repeated 5 cycles<br><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>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<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 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<br>ΔV <sub>b(1mA)</sub> ≤ ±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<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>   ≤ 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            |

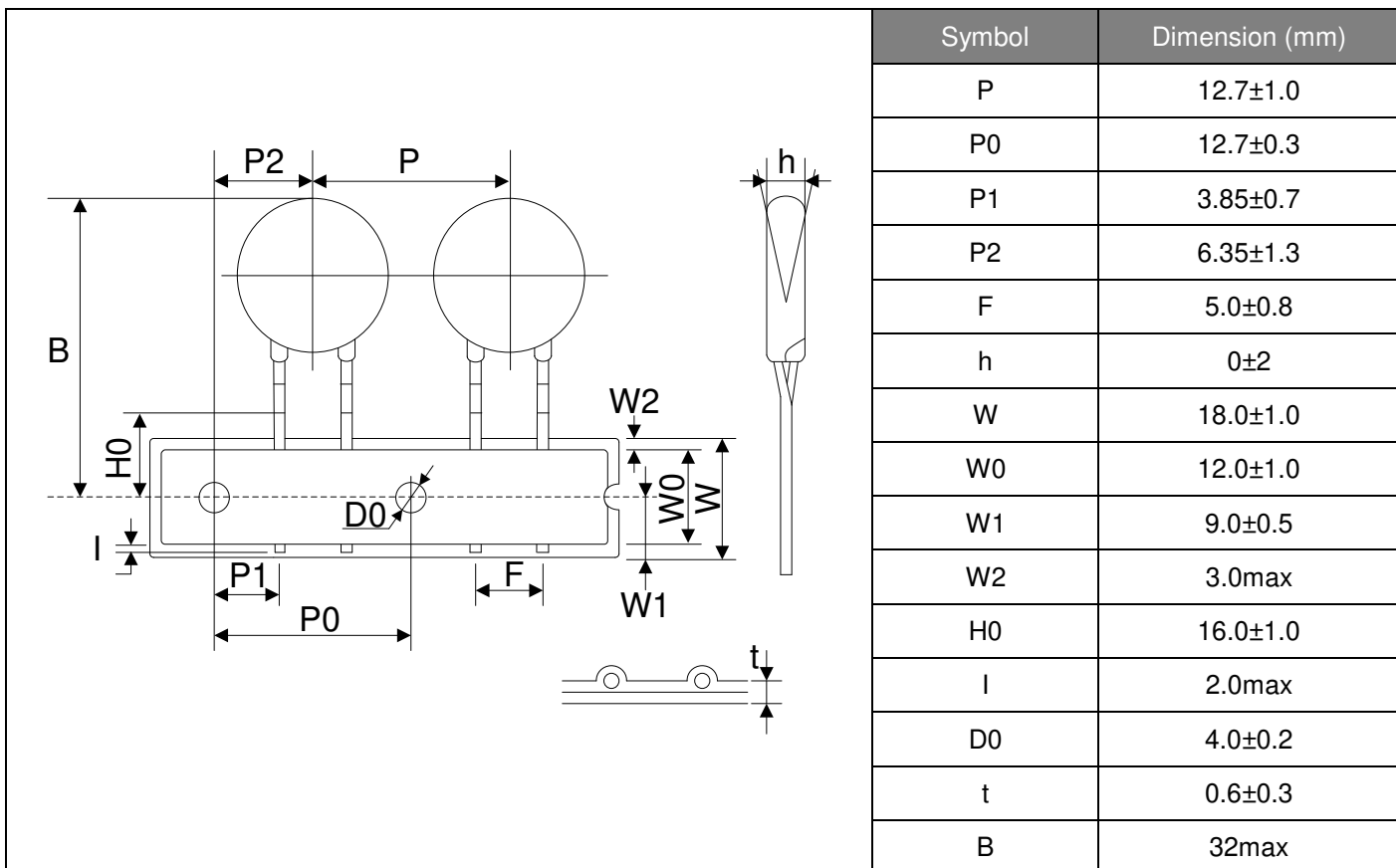
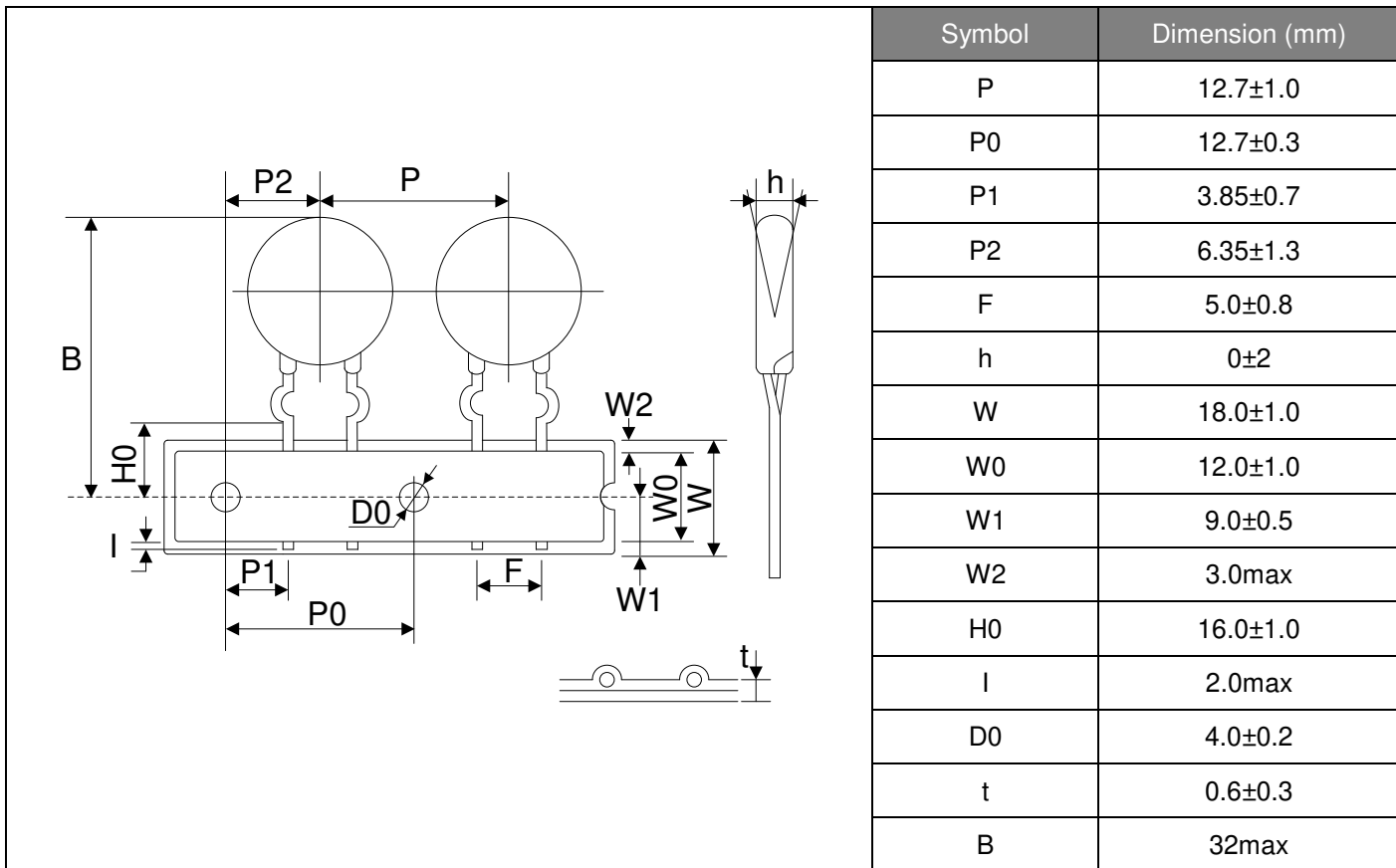
Recommendation Reworking Conditions with Soldering Iron

| 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**



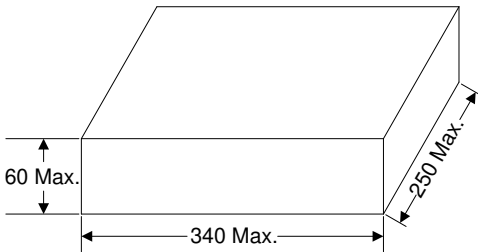
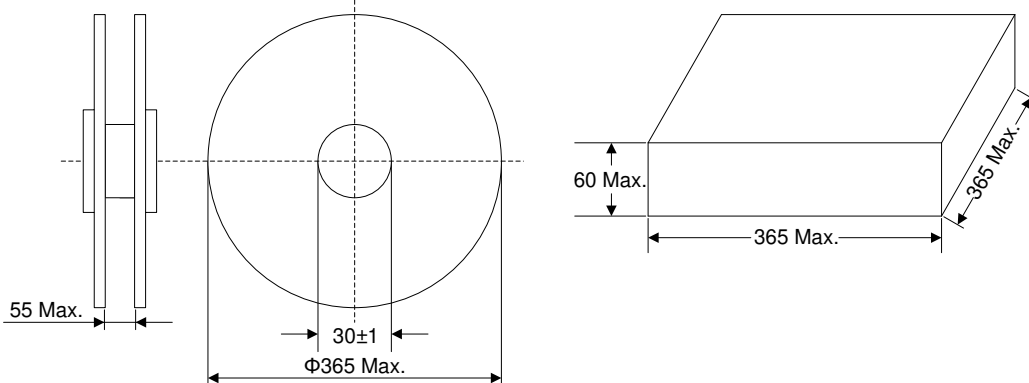
**Taping Dimensions**

|   | 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<br/>4bags/box<br/>(180K~821K)</p> |
| <p>In bulk for Terminals Trimmed Products</p>   | <p>1000pcs/bag<br/>4bags/box<br/>(180K~821K)</p> |

**Quantity**

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

**Storage Condition of Products**

(I) Storage Conditions :

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

(II) Period of Storage : 1 year

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