



**THE DATASHEET OF  
390KD10J**



# DATA SHEET

## METAL OXIDE VARISTORS POWER SUPPLY

10D 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 1100V
- 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        | 10.5~16.0 |
| H1       | 13.0~17.5 |
| L(min.)  | 20.0      |
| L1(min.) | 15.0      |
| D        | 10.0~12.5 |
| F(±0.8)  | 7.5       |
| T        | Table 2   |
| e(±0.8)  | Table 2   |
| d(±0.05) | 0.8       |
| d1(±0.4) | 1.4       |

| Table 2  |         |     |       |         |     |
|----------|---------|-----|-------|---------|-----|
| Unit: mm |         |     |       |         |     |
| Model    | T       | e   | Model | T       | e   |
| 180K     | 2.0~4.6 | 1.5 | 301K  | 2.7~5.5 | 2.5 |
| 220K     | 2.1~4.7 | 1.6 | 331K  | 2.7~5.8 | 2.5 |
| 270K     | 2.1~4.8 | 1.8 | 361K  | 2.9~6.0 | 2.7 |
| 330K     | 2.2~5.0 | 1.7 | 391K  | 3.0~6.2 | 2.8 |
| 390K     | 2.1~5.3 | 1.8 | 431K  | 3.2~6.5 | 3.0 |
| 470K     | 2.2~5.4 | 1.9 | 471K  | 3.3~6.7 | 3.2 |
| 560K     | 2.3~5.5 | 2.1 | 511K  | 3.4~6.8 | 3.4 |
| 680K     | 2.4~5.6 | 2.4 | 561K  | 3.6~7.0 | 3.6 |
| 820K     | 2.1~4.7 | 1.8 | 621K  | 3.8~7.3 | 3.9 |
| 101K     | 2.4~4.9 | 2.0 | 681K  | 4.0~7.6 | 4.2 |
| 121K     | 2.4~5.1 | 2.2 | 751K  | 4.3~8.0 | 4.3 |
| 151K     | 2.2~5.4 | 1.8 | 781K  | 4.4~8.1 | 4.4 |
| 181K     | 2.3~4.8 | 1.9 | 821K  | 4.6~8.3 | 4.6 |
| 201K     | 2.4~5.0 | 2.0 | 911K  | 4.8~8.8 | 5.0 |
| 221K     | 2.5~5.1 | 2.1 | 102K  | 5.4~9.3 | 5.0 |
| 241K     | 2.6~5.2 | 2.2 | 112K  | 5.8~9.9 | 5.4 |
| 271K     | 2.6~5.4 | 2.4 |       |         |     |

**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 <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)                     |
| 180KD10     | 180KD10J   | 11                        | 14                  | 18(15~21.6)          | 5                        | 36                 | 500                        | 1000             | 2.1                        | 3.0            | 0.05        | 5600                            |
| 220KD10     | 220KD10J   | 14                        | 18                  | 22(19.5~26)          | 5                        | 43                 | 500                        | 1000             | 2.5                        | 5.0            | 0.05        | 4500                            |
| 270KD10     | 270KD10J   | 17                        | 22                  | 27(25~31)            | 5                        | 53                 | 500                        | 1000             | 3.0                        | 6.0            | 0.05        | 3700                            |
| 330KD10     | 330KD10J   | 20                        | 26                  | 33(29.5~36.5)        | 5                        | 65                 | 500                        | 1000             | 4.0                        | 7.0            | 0.05        | 3000                            |
| 390KD10     | 390KD10J   | 25                        | 31                  | 39(35~43)            | 5                        | 77                 | 500                        | 1000             | 4.6                        | 9.0            | 0.05        | 2400                            |
| 470KD10     | 470KD10J   | 30                        | 38                  | 47(42~52)            | 5                        | 93                 | 500                        | 1000             | 5.5                        | 11.0           | 0.05        | 2100                            |
| 560KD10     | 560KD10J   | 35                        | 45                  | 56(50~62)            | 5                        | 110                | 500                        | 1000             | 7.0                        | 13.0           | 0.05        | 1800                            |
| 680KD10     | 680KD10J   | 40                        | 56                  | 68(61~75)            | 5                        | 135                | 500                        | 1000             | 8.2                        | 15.0           | 0.05        | 1500                            |
| 820KD10     | 820KD10J   | 50                        | 65                  | 82(74~90)            | 25                       | 135                | 2500                       | 3500             | 12.0                       | 17.0           | 0.4         | 1200                            |
| 101KD10     | 101KD10J   | 60                        | 85                  | 100(90~110)          | 25                       | 165                | 2500                       | 3500             | 15.0                       | 18.0           | 0.4         | 1000                            |
| 121KD10     | 121KD10J   | 75                        | 100                 | 120(108~132)         | 25                       | 200                | 2500                       | 3500             | 18.0                       | 21.0           | 0.4         | 830                             |
| 151KD10     | 151KD10J   | 95                        | 125                 | 150(135~165)         | 25                       | 250                | 2500                       | 3500             | 22.0                       | 25.0           | 0.4         | 670                             |
| 181KD10     | 181KD10J   | 115                       | 150                 | 180(162~198)         | 25                       | 300                | 2500                       | 3500             | 27.0                       | 30.0           | 0.4         | 560                             |
| 201KD10     | 201KD10J   | 130                       | 170                 | 200(180~220)         | 25                       | 340                | 2500                       | 3500             | 30.0                       | 35.0           | 0.4         | 500                             |
| 221KD10     | 221KD10J   | 140                       | 180                 | 220(198~242)         | 25                       | 360                | 2500                       | 3500             | 32.0                       | 39.0           | 0.4         | 450                             |
| 241KD10     | 241KD10J   | 150                       | 200                 | 240(216~264)         | 25                       | 395                | 2500                       | 3500             | 35.0                       | 42.0           | 0.4         | 420                             |
| 271KD10     | 271KD10J   | 175                       | 225                 | 270(243~297)         | 25                       | 455                | 2500                       | 3500             | 37.0                       | 49.0           | 0.4         | 370                             |
| 301KD10     | 301KD10J   | 190                       | 250                 | 300(270~330)         | 25                       | 500                | 2500                       | 3500             | 40.0                       | 54.0           | 0.4         | 330                             |
| 331KD10     | 331KD10J   | 210                       | 275                 | 330(297~363)         | 25                       | 550                | 2500                       | 3500             | 43.0                       | 58.0           | 0.4         | 300                             |
| 361KD10     | 361KD10J   | 230                       | 300                 | 360(324~396)         | 25                       | 595                | 2500                       | 3500             | 47.0                       | 65.0           | 0.4         | 280                             |
| 391KD10     | 391KD10J   | 250                       | 320                 | 390(351~429)         | 25                       | 650                | 2500                       | 3500             | 60.0                       | 70.0           | 0.4         | 260                             |
| 431KD10     | 431KD10J   | 275                       | 350                 | 430(387~473)         | 25                       | 710                | 2500                       | 3500             | 65.0                       | 80.0           | 0.4         | 230                             |
| 471KD10     | 471KD10J   | 300                       | 385                 | 470(423~517)         | 25                       | 775                | 2500                       | 3500             | 67.0                       | 85.0           | 0.4         | 210                             |
| 511KD10     | 511KD10J   | 320                       | 415                 | 510(459~561)         | 25                       | 845                | 2500                       | 3500             | 69.0                       | 90.0           | 0.4         | 200                             |
| 561KD10     | 561KD10J   | 350                       | 460                 | 560(504~616)         | 25                       | 925                | 2500                       | 3500             | 70.0                       | 92.0           | 0.4         | 180                             |
| 621KD10     | 621KD10J   | 385                       | 505                 | 620(558~682)         | 25                       | 1025               | 2500                       | 3500             | 72.0                       | 95.0           | 0.4         | 160                             |
| 681KD10     | 681KD10J   | 420                       | 560                 | 680(612~748)         | 25                       | 1120               | 2500                       | 3500             | 75.0                       | 98.0           | 0.4         | 150                             |
| 751KD10     | 751KD10J   | 460                       | 615                 | 750(675~825)         | 25                       | 1240               | 2500                       | 3500             | 77.0                       | 100.0          | 0.4         | 130                             |
| 781KD10     | 781KD10J   | 485                       | 640                 | 780(702~858)         | 25                       | 1290               | 2500                       | 3500             | 80.0                       | 105.0          | 0.4         | 125                             |
| 821KD10     | 821KD10J   | 510                       | 670                 | 820(738~902)         | 25                       | 1355               | 2500                       | 3500             | 85.0                       | 110.0          | 0.4         | 120                             |
| 911KD10     | 911KD10J   | 550                       | 745                 | 910(819~1001)        | 25                       | 1500               | 2500                       | 3500             | 93.0                       | 130.0          | 0.4         | 110                             |
| 102KD10     | 102KD10J   | 625                       | 825                 | 1000(900~1100)       | 25                       | 1650               | 2500                       | 3500             | 102.0                      | 140.0          | 0.4         | 100                             |
| 112KD10     | 112KD10J   | 680                       | 895                 | 1100(990~1210)       | 25                       | 1815               | 2500                       | 3500             | 115.0                      | 155.0          | 0.4         | 90                              |

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≤50µA (180K~680K) IR≤25µA (820K~112K)

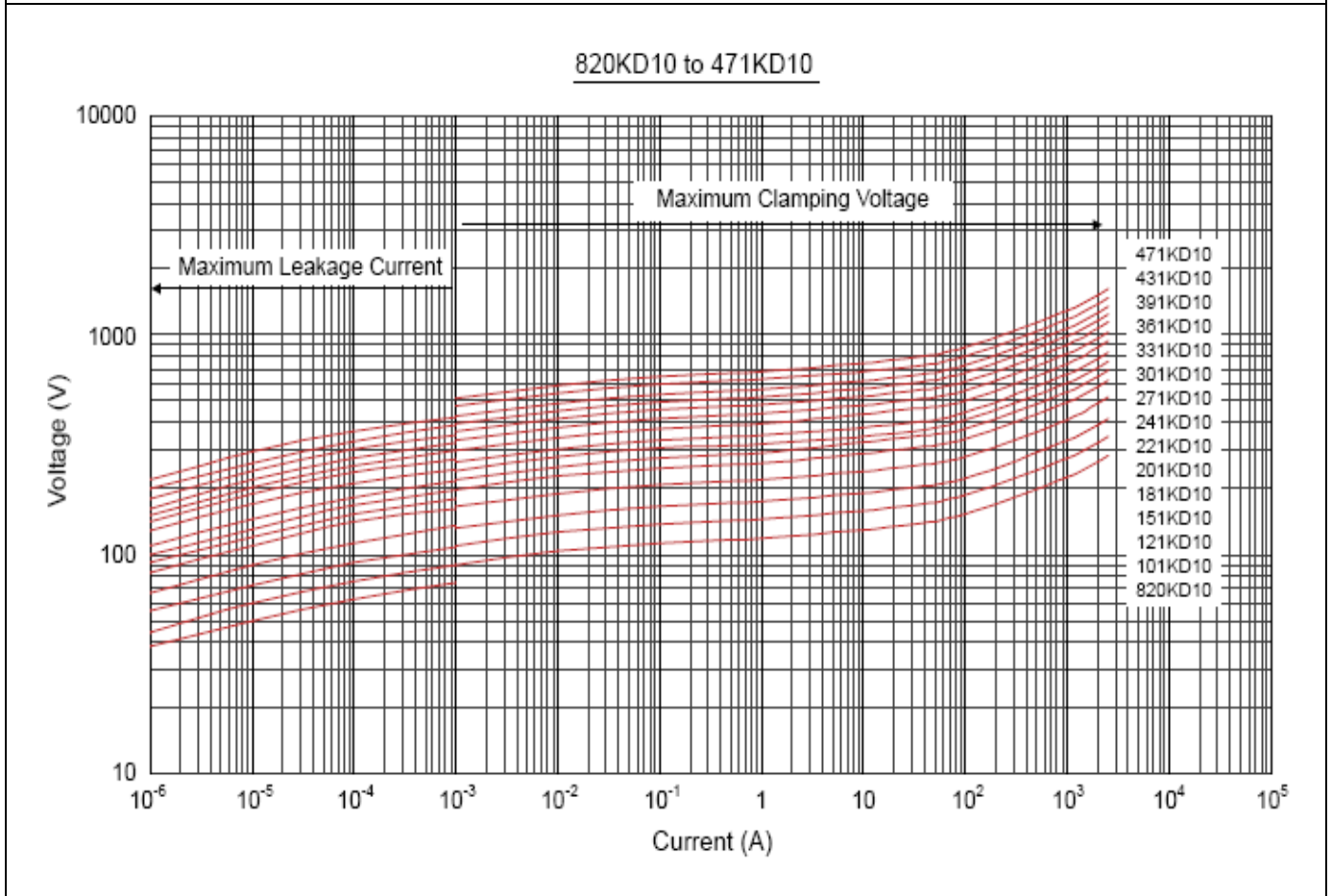
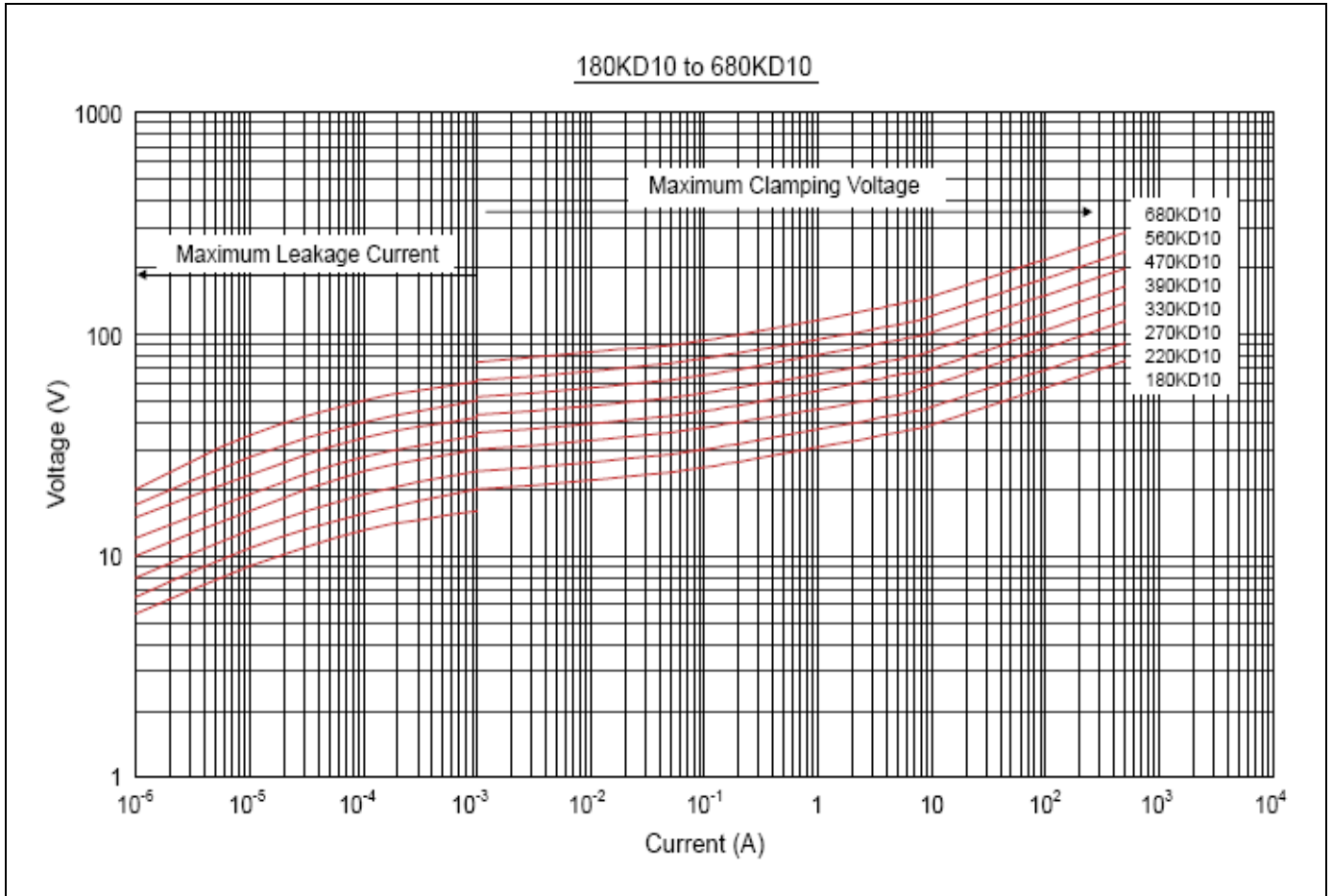
**Maximum Surge Current Derating Curve**



Maximum Leakage Current and Maximum Clamping Voltage Curve



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



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



Maximum Leakage Current and Maximum Clamping Voltage Curve

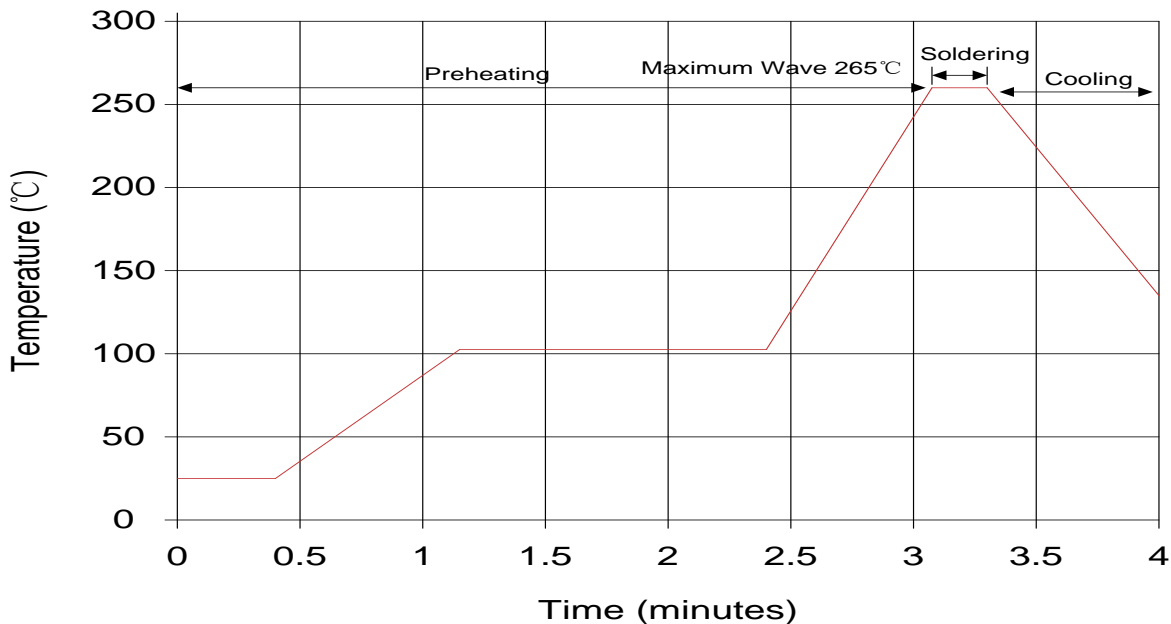


**Reliability**

| 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><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            |

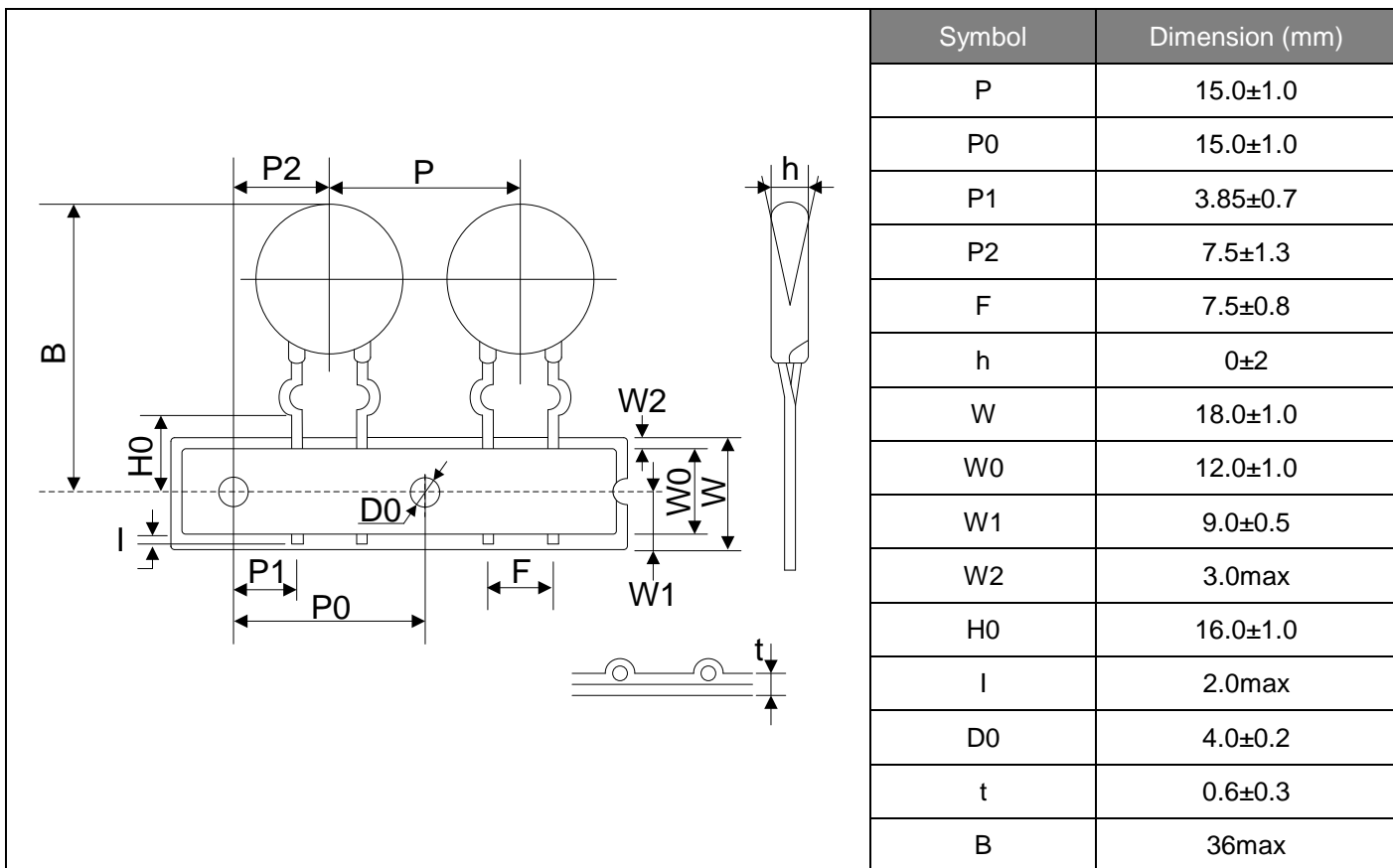
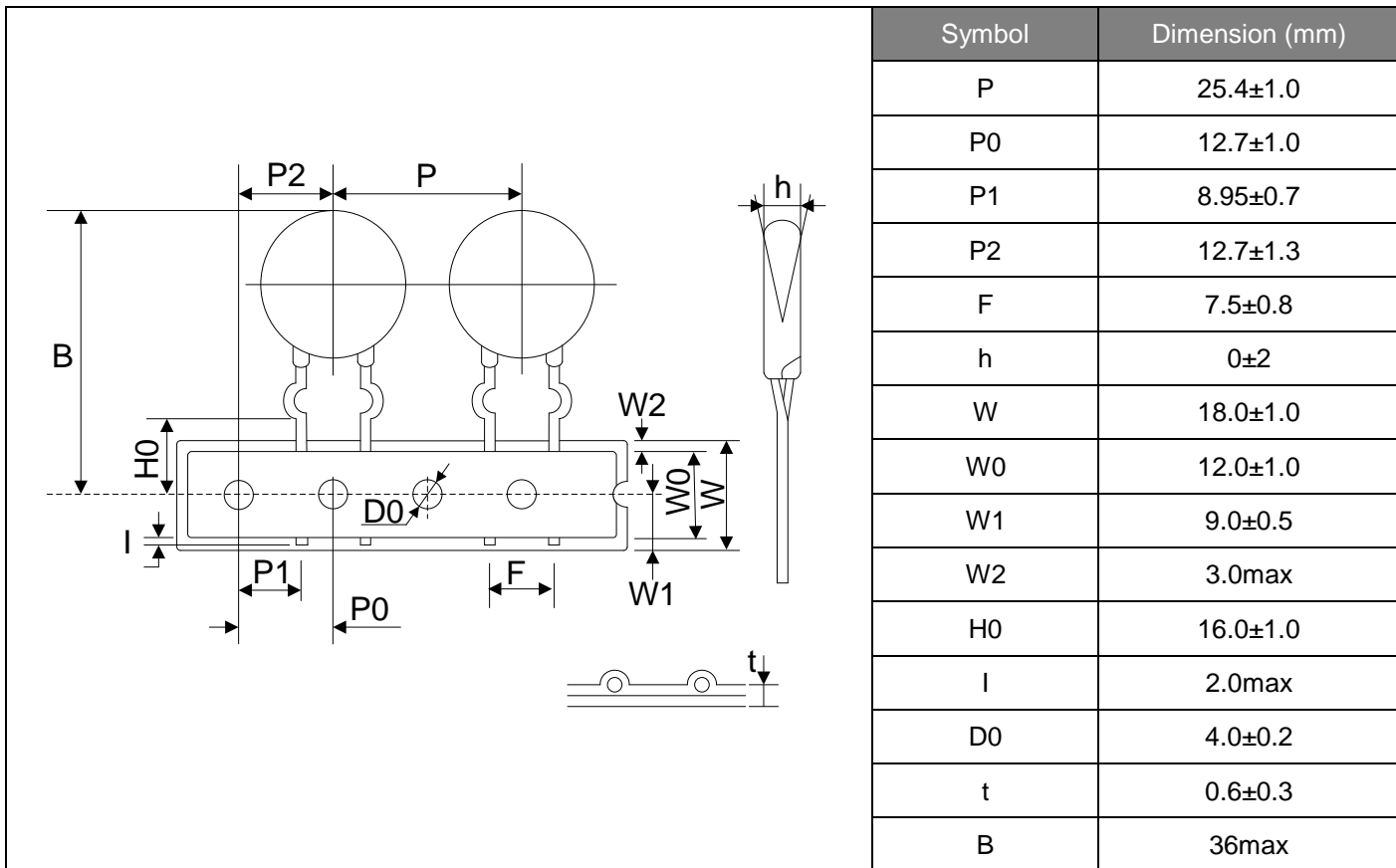
Recommendation Reworking Conditions with Soldering Iron

| 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**



**Taping Dimensions**



**Quantity**

| Packaging Dimensions (Unit: mm)   | Quantity                               |
|---|--|
| <p>In bulk for Terminals Untrimmed Products</p>  | 500pcs/bag<br>4bags/box<br>(180K~621K) |
|   | 400pcs/bag<br>4bags/box<br>(681K~112K) |
|   | 300pcs/bag<br>4bags/box<br>(122K~182K) |
| <p>In bulk for Terminals Trimmed Products</p>    | 500pcs/bag<br>4bags/box<br>(180K~621K) |
|   | 400pcs/bag<br>4bags/box<br>(681K~112K) |
|   | 300pcs/bag<br>4bags/box<br>(122K~182K) |
| Packaging Dimensions (Unit: mm)   | Quantity                               |
| <p>Tape &amp; Box &amp; P0=12.7mm</p>          | 750pcs/box<br>(180K~241K)              |
|   | 600pcs/box<br>(271K~391K)              |
|   | 500pcs/box<br>(431K~621K)              |
|   | 300pcs/box<br>(681K~112K)              |
| <p>Tape &amp; Reel &amp; P0=12.7mm</p>        | 1000pcs/reel<br>(180K~391K)            |
|   | 750pcs/reel<br>(431K~621K)             |
|   | 500pcs/reel<br>(681K~112K)             |

**Quantity**

| Packaging Dimensions (Unit: mm)  | Quantity                    |
|--|-----------------------------|
| <p>Tape &amp; Box &amp; P0=15.0mm</p>     | 1000pcs/box<br>(180K~391K)  |
|  | 750pcs/box<br>(431K~621K)   |
|  | 600pcs/box<br>(681K~751K)   |
|  | 500pcs/box<br>(781K~112K)   |
| <p>Tape &amp; Reel &amp; P0=15.0mm</p>  | 1000pcs/reel<br>(180K~391K) |
|  | 750pcs/reel<br>(431K~751K)  |
|  | 500pcs/reel<br>(781K~112K)  |

**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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