# THE DATASHEET OF

# 102KD10

Innovative Service Around the Globe YAGEO

# 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

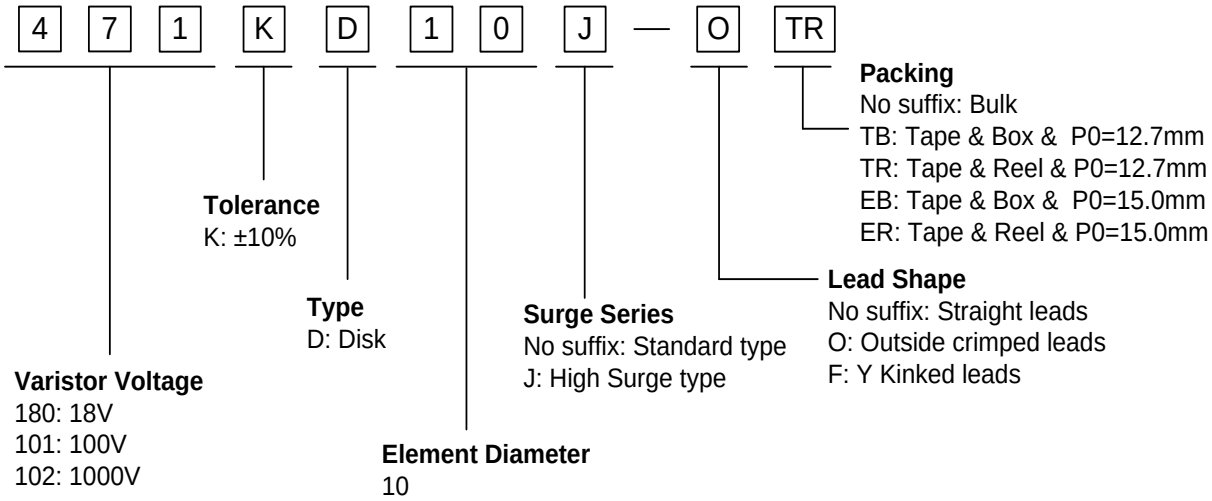
## Features

- 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℃ ~ +105℃
- Storage Temperature：-40℃ ~ +125℃
- 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

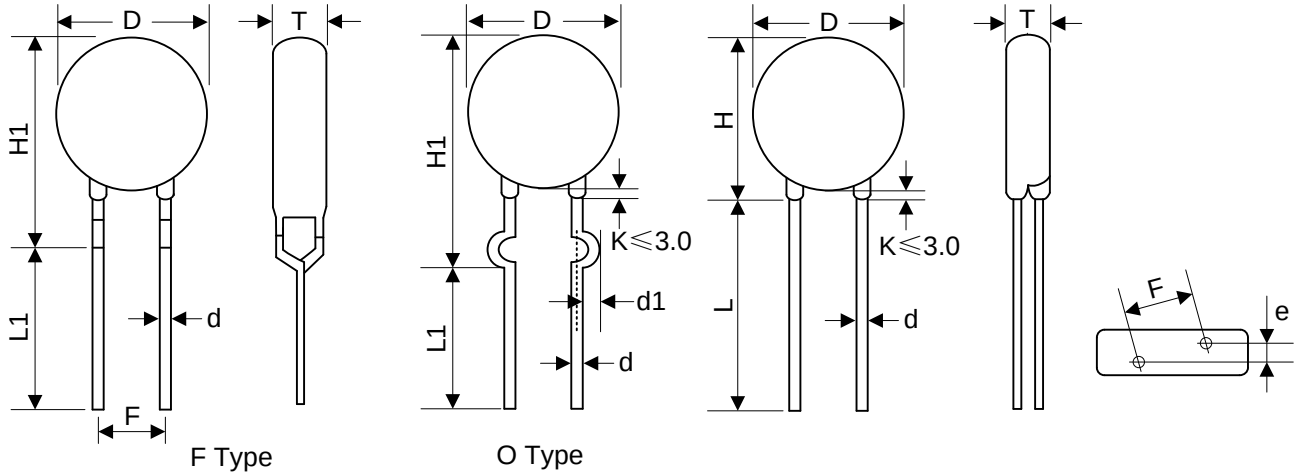



Table 1

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

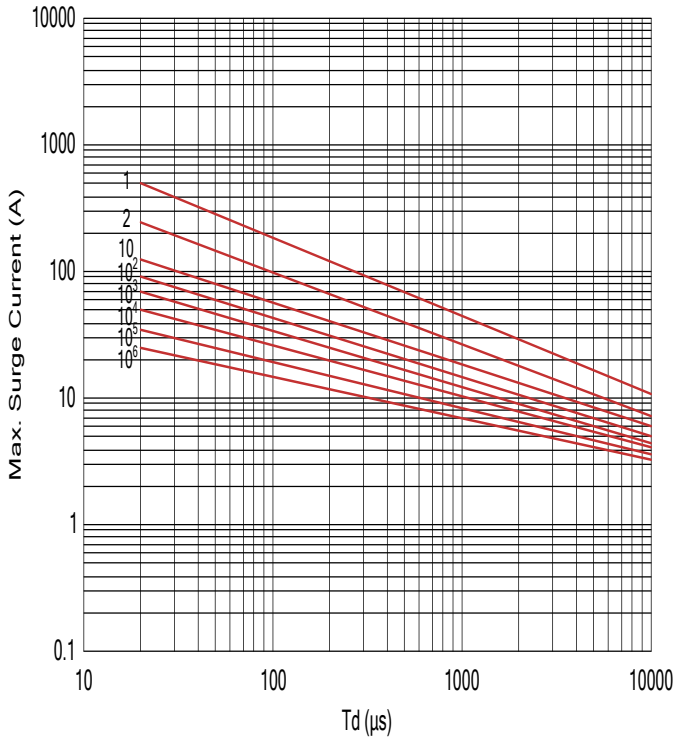
| Part Number | | Maximum Allowable Voltage | | Varistor Voltage | Maximum Clamping Voltage | | Withstanding Surge Current | | Maximum Energy (10/1000μs) | | Rated Power | Typical Capacitance (Reference) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard | High Surge | $V_{AC}$(V) | $V_{DC}$(V) | $V_{1mA}$(V) | $I_P$(A) | $V_C$(V) | I (A) Standard | I (A) High Surge | (J) Standard | (J) High Surge | (W) | @1KHz (pf) |
| 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%.

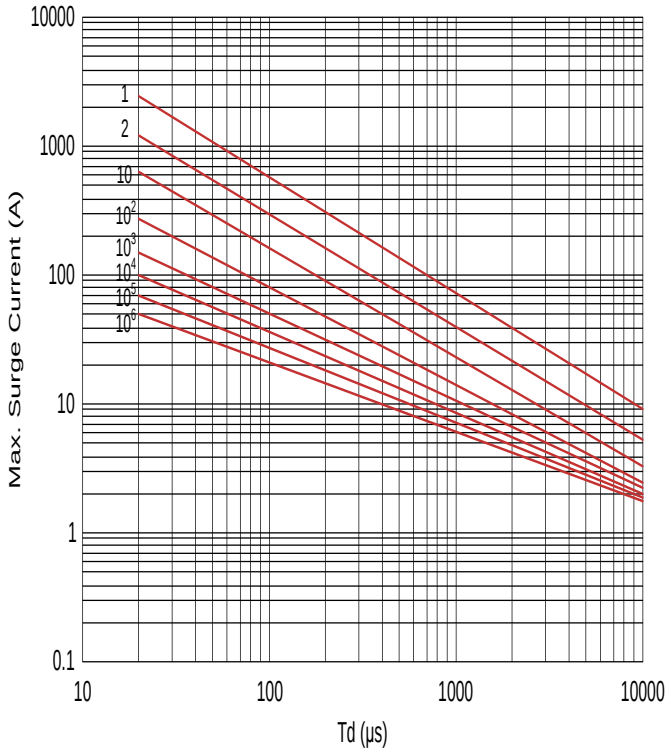
2. Leakage Current (@83% of $V_{1mA}$)：IR≤50μA (180K~680K)　IR≤25μA (820K~112K)

## Maximum Surge Current Derating Curve

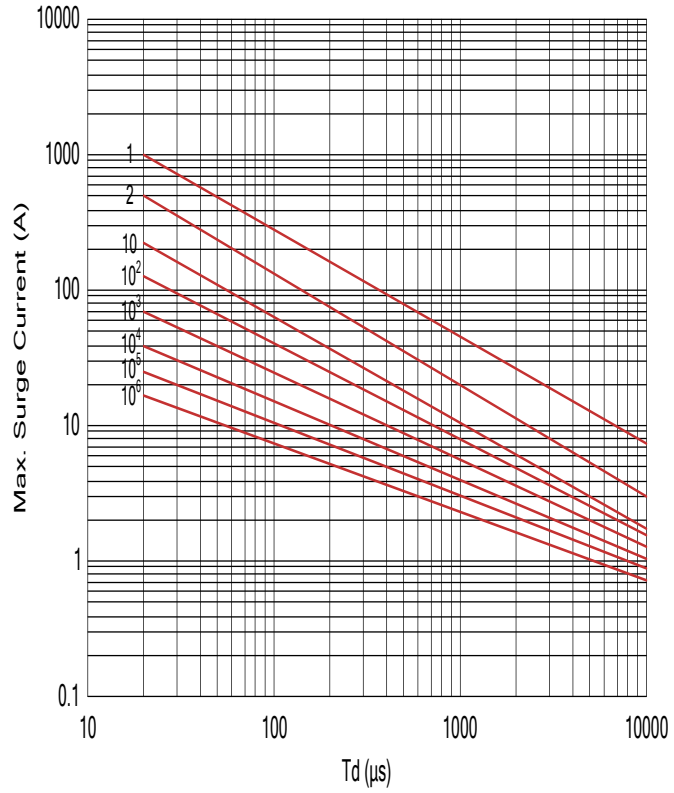
180KD10 to 680KD10



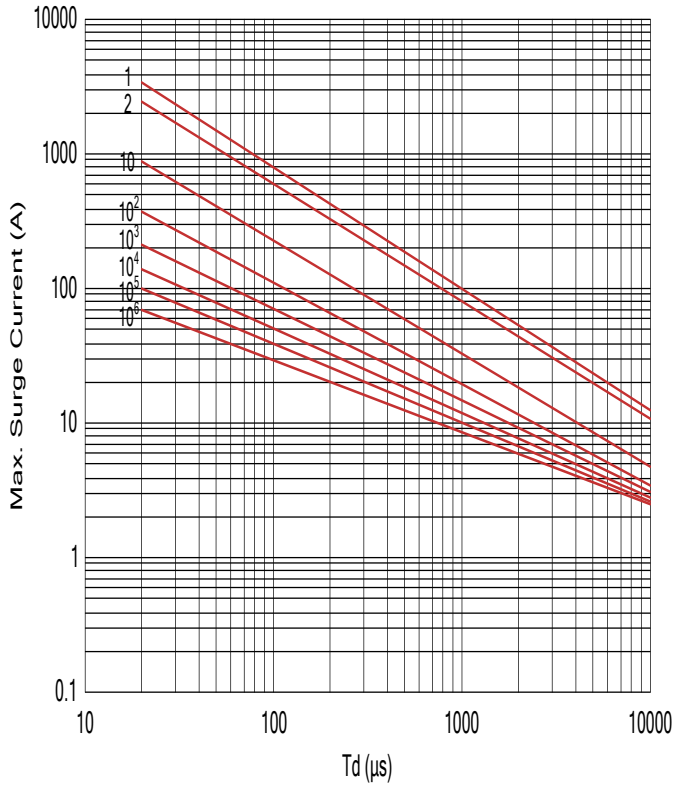

820KD10 to 112KD10



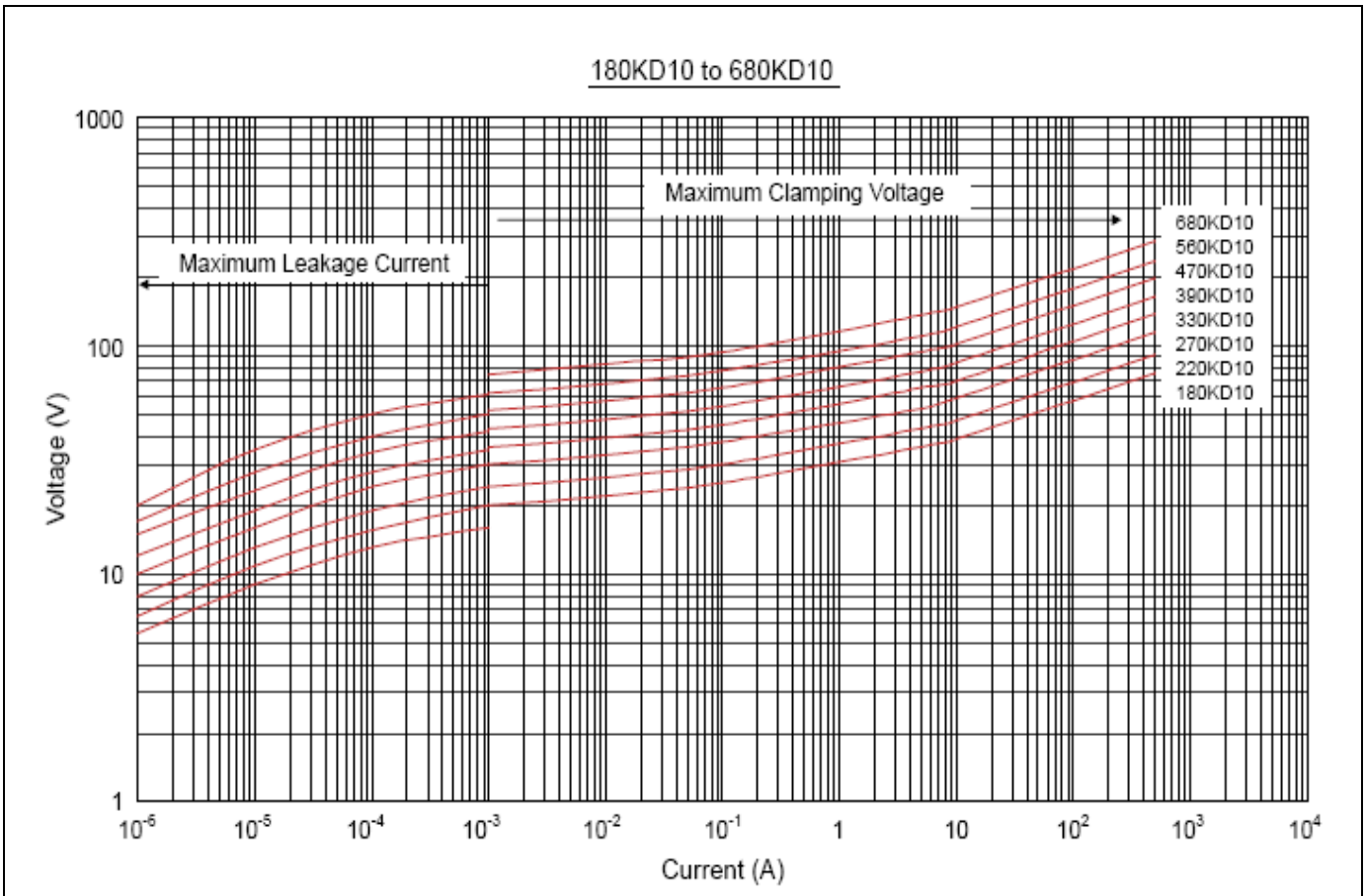

180KD10J to 680KD10J

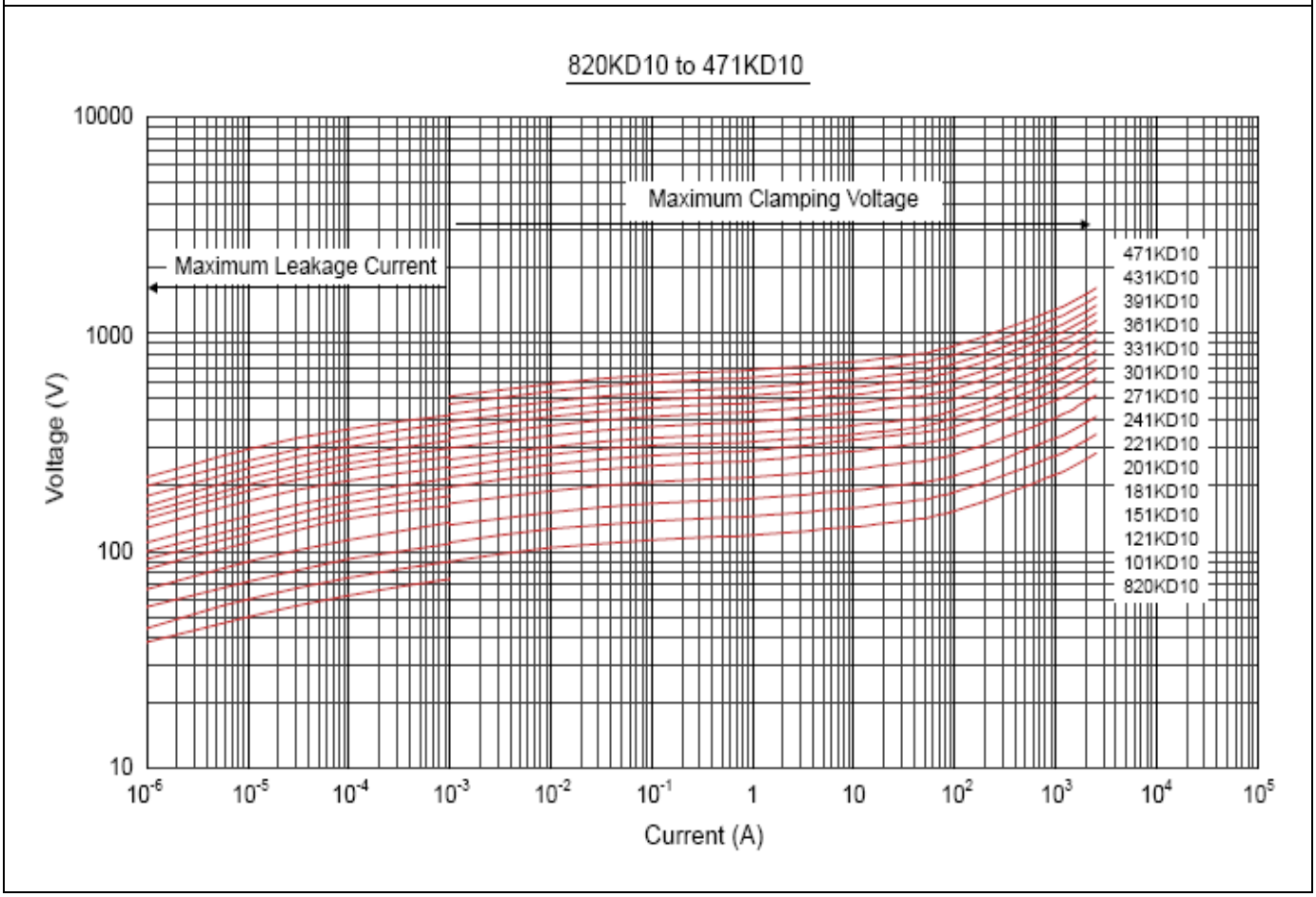



820KD10J to 112KD10J



## Maximum Leakage Current and Maximum Clamping Voltage Curve



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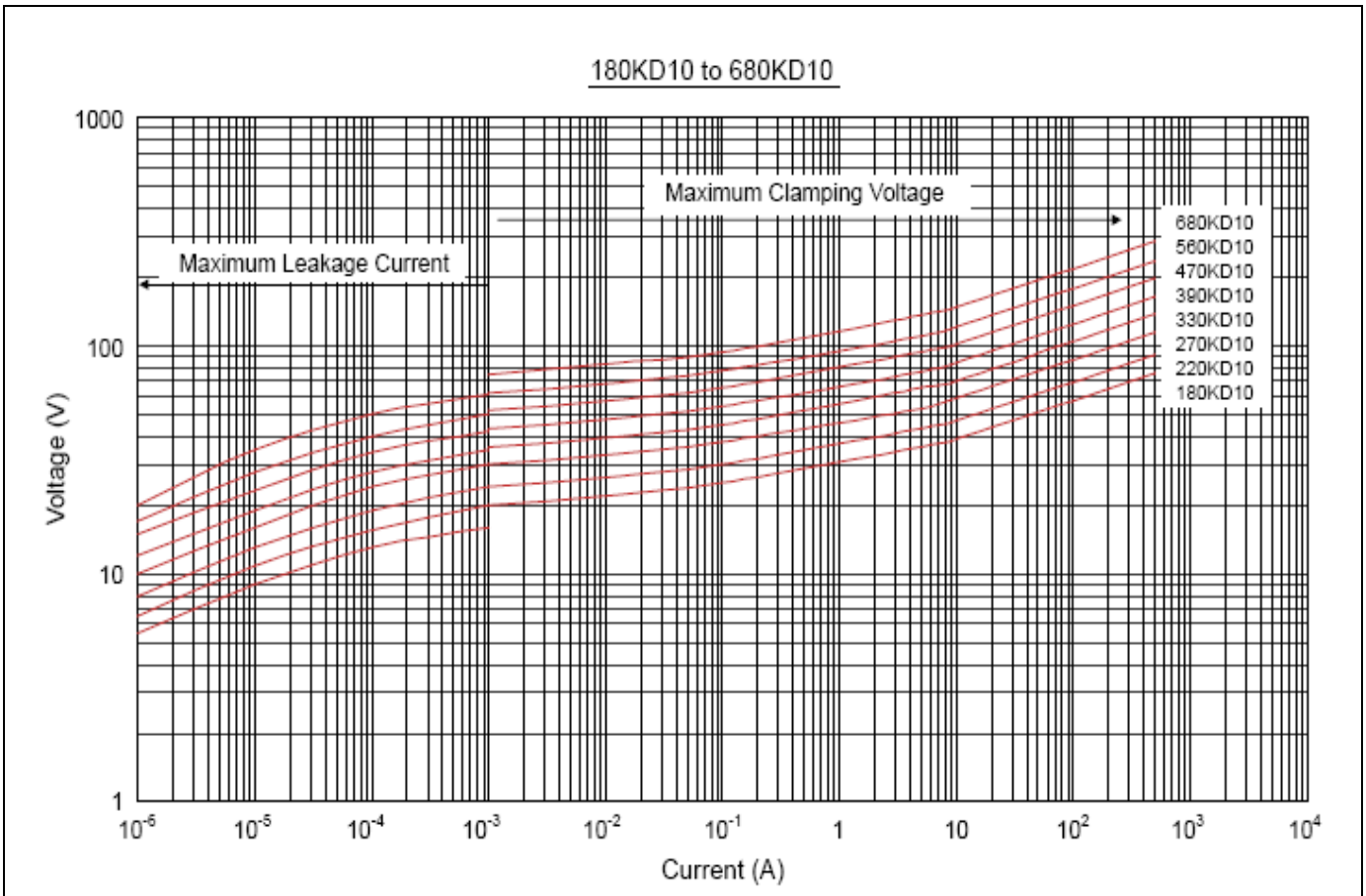


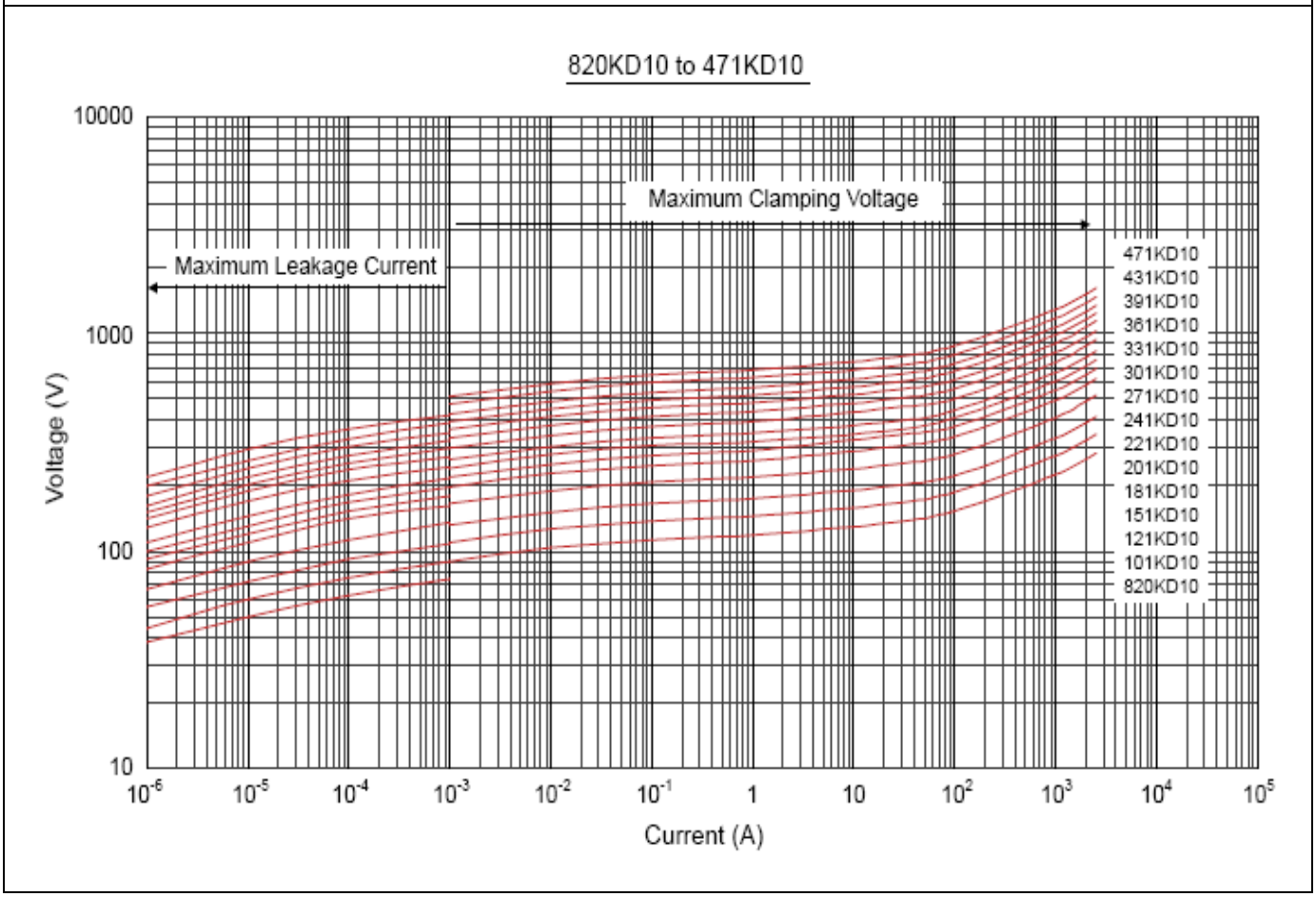

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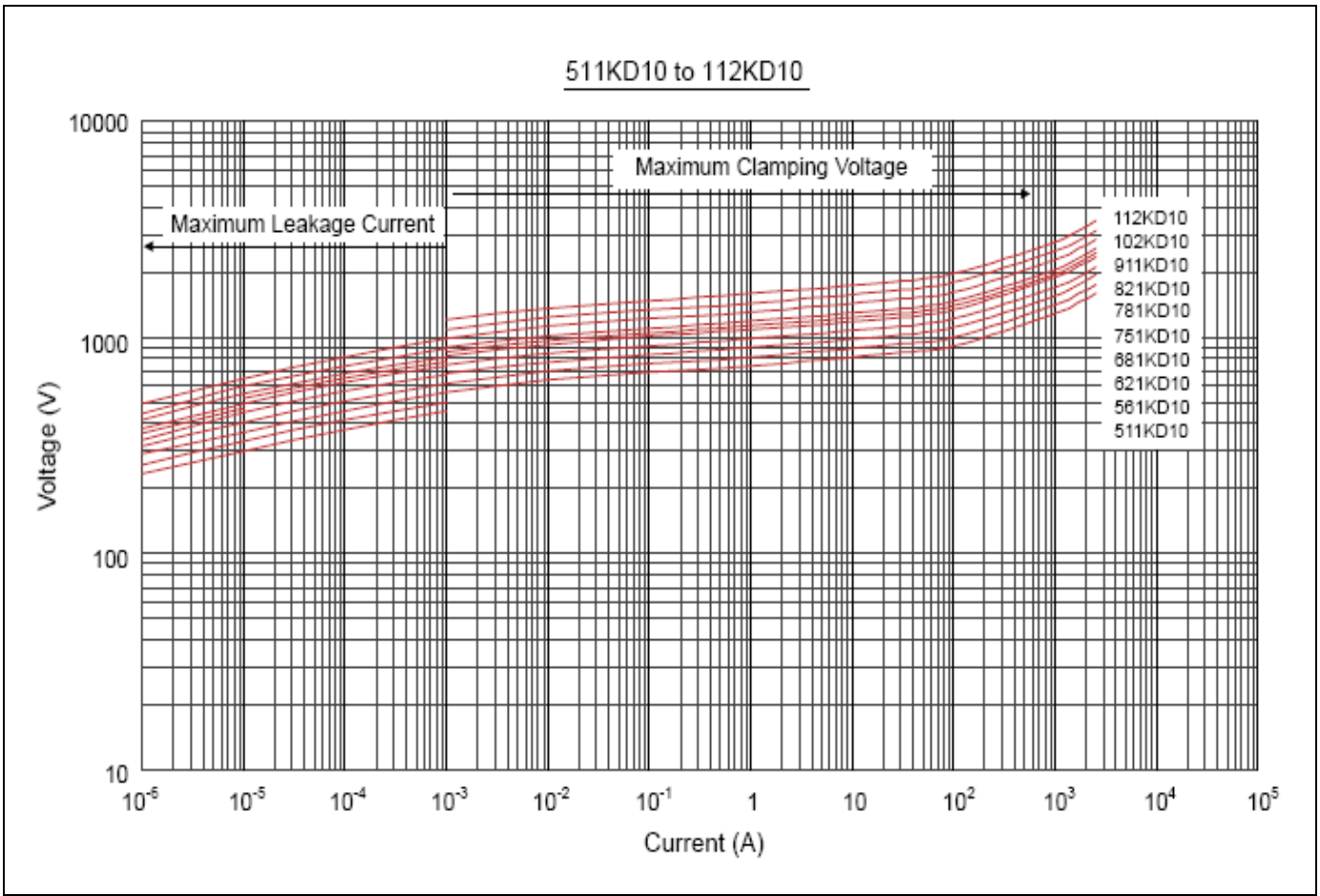
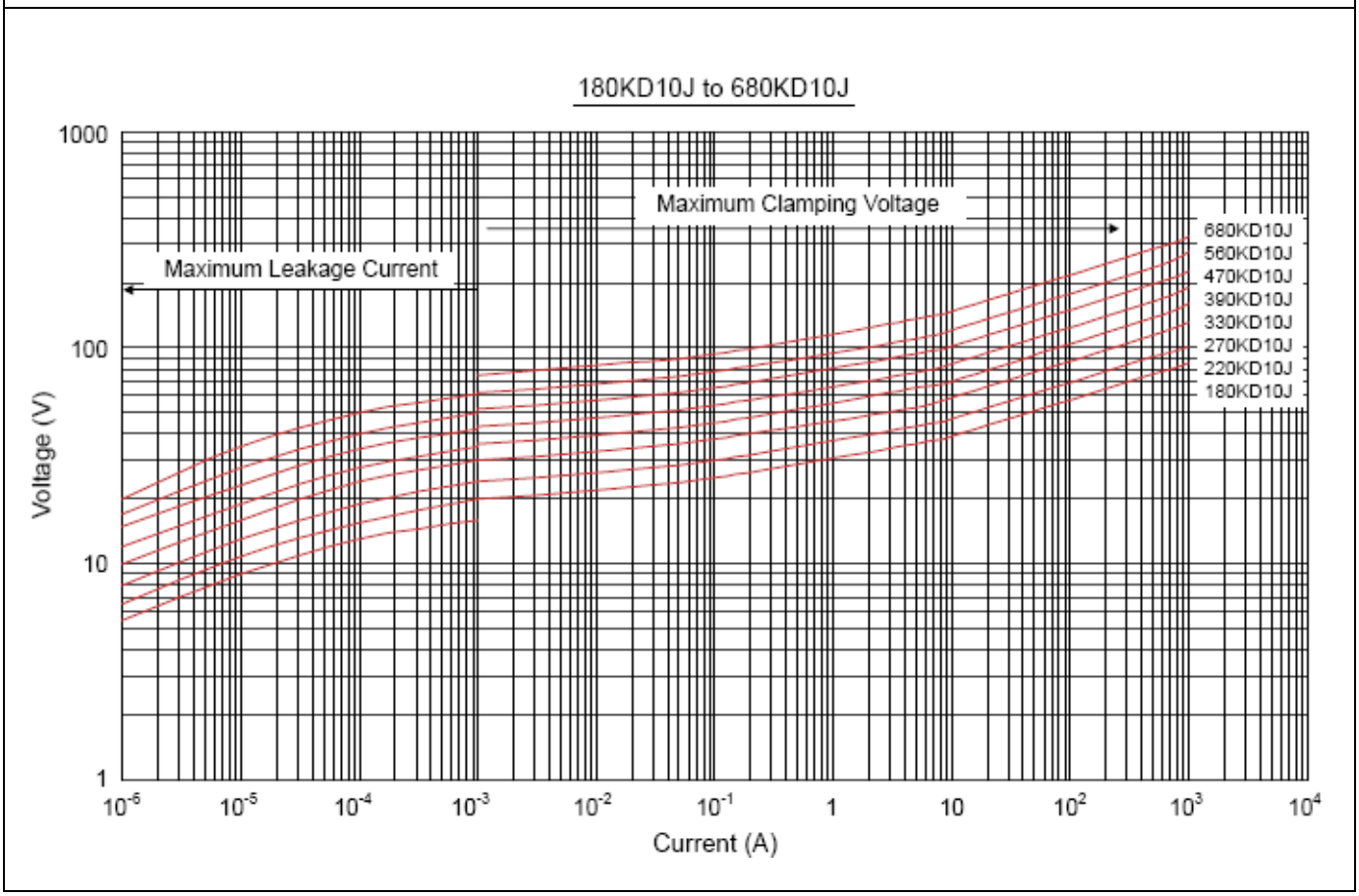
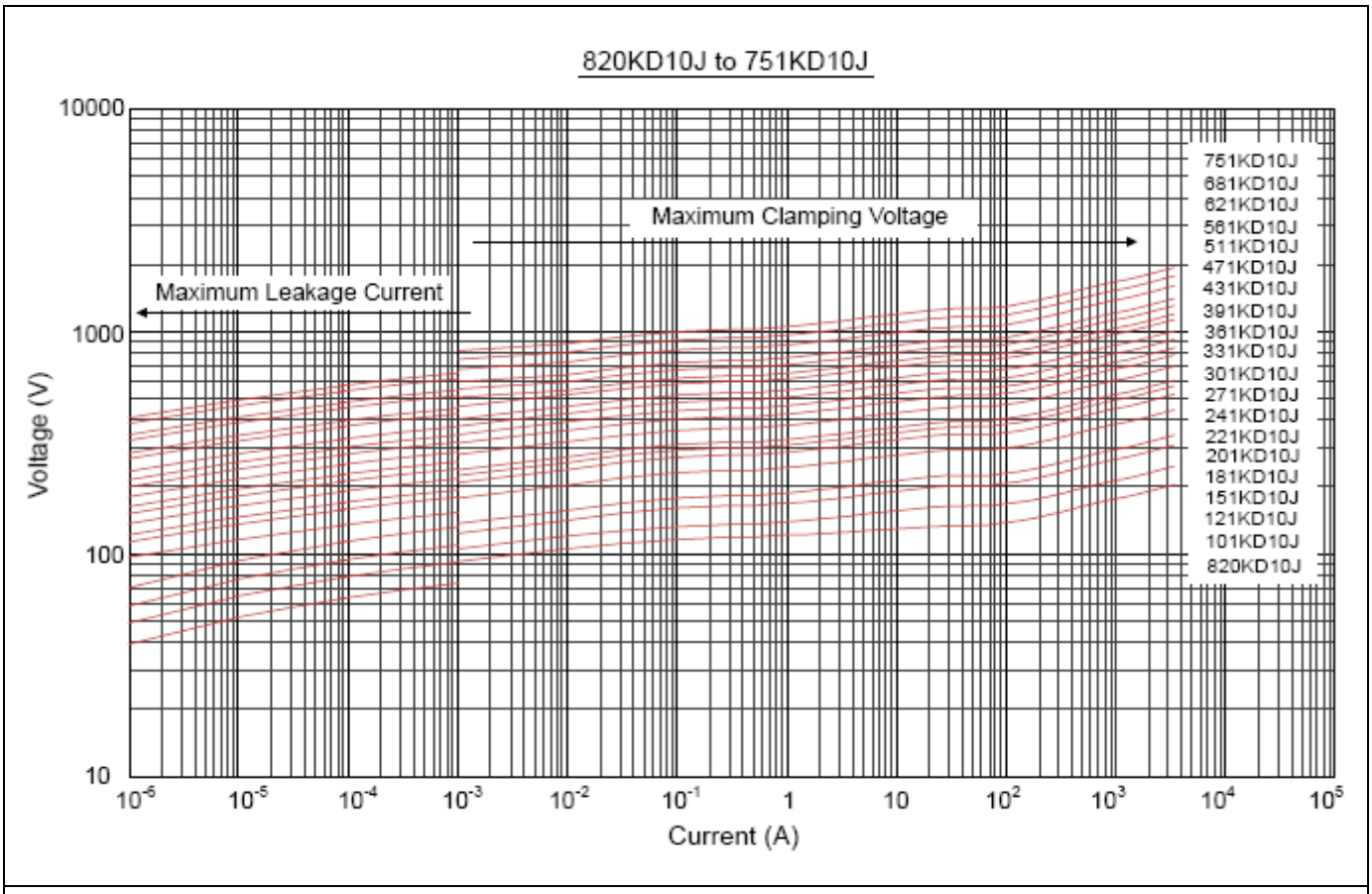
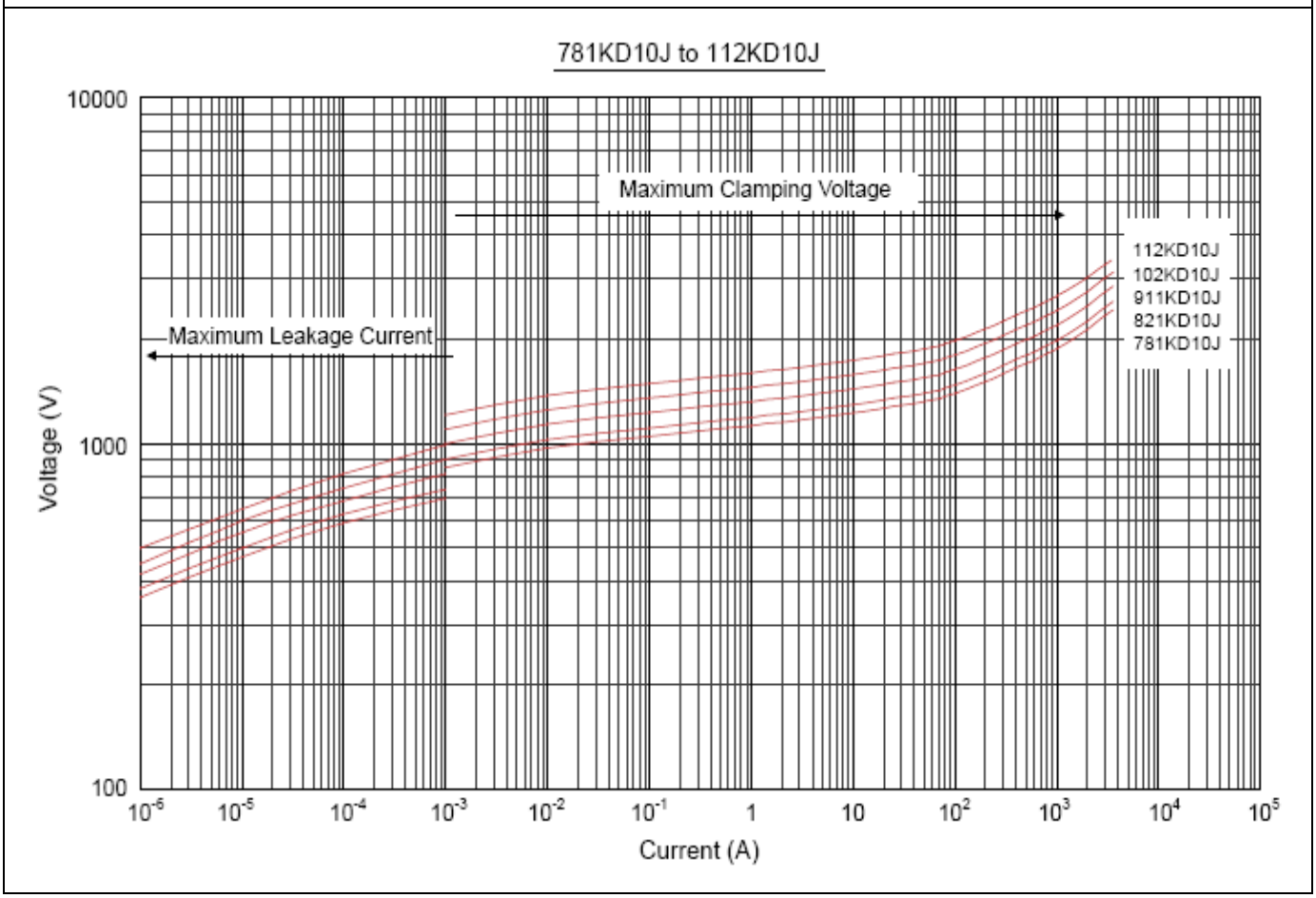


## Maximum Leakage Current and Maximum Clamping Voltage Curve



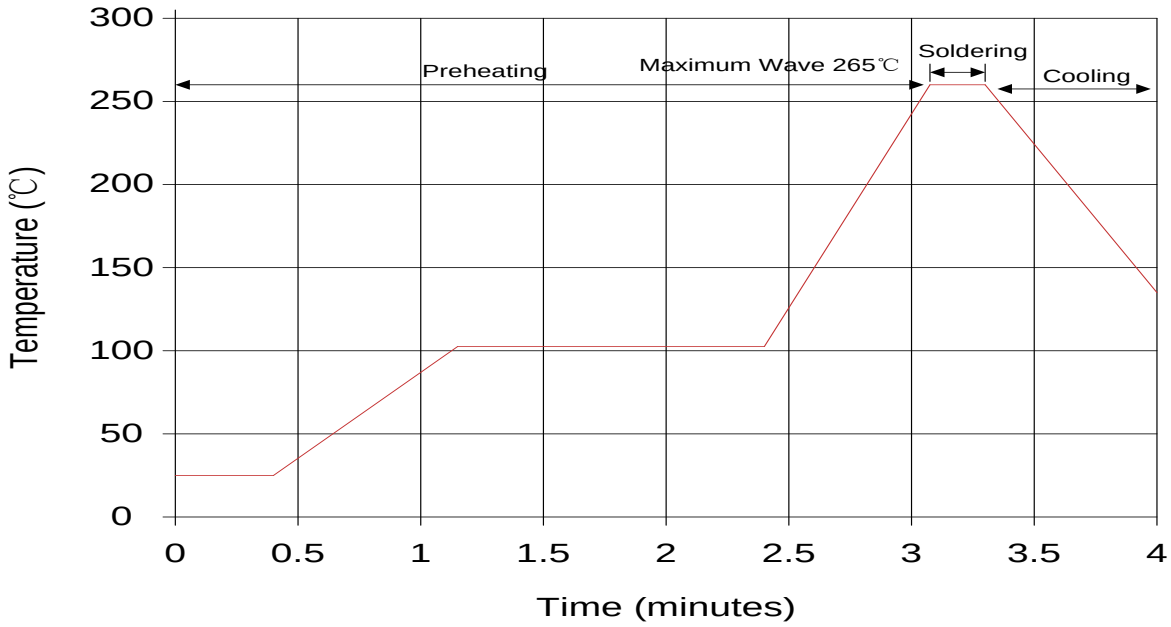



## Reliability

| 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>Terminal diameter (mm) / Force (kg)<br>0.5＜d≤0.8 / 1.0<br>0.8＜d≤1.25 / 2.0<br>1.25＜d / 4.0 | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| 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>Terminal diameter (mm) / Force (kg)<br>0.5＜d≤0.8 / 0.5<br>0.8＜d≤1.25 / 1.0<br>1.25＜d / 2.0 | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| Vibration | IEC60068-2-6 | Frequency range: 10~55 Hz<br>Amplitude: 0.75mm or 98m/s$^2$<br>Direction: 3 mutually perpendicular directions, 2hrs each. | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| Solderability | IEC60068-2-20 | Solder Temp: 245±5℃<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℃<br>Dipping Time: 10±1 sec | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| High Temperature Storage | IEC60068-2-2 | Ambient Temp: 125±2℃<br>Duration: 1000±24hrs | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| Low Temperature Storage | IEC60068-2-1 | Ambient Temp: -40±2℃<br>Duration: 1000±24hrs | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| Damp Heat, Steady State | IEC60068-2-78 | The test is divided into two groups .<br>a. 40±2℃ , 90~95% RH for 1344±24hrs<br>b. 40±2℃ , 90~95% RH,at 10%VDC ,1344±24 hrs | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 10\%$<br>Insulation Resistance≧100MΩ |
| High Temperature Load | MIL-STD-202 Method 108 | Ambient Temp: 105±2℃ Duration: 1000±24hrs<br>Load: Max. Allowable Voltage In AC. | $\|\Delta V_{1mA}/V_{1mA}\| \leq 10\%$ |
| Temperature Cycle | IEC60068-2-14 | The conditions shown below shall be repeated 5 cycles<br>Step / Temperature (℃) / Period (minutes)<br>1 / -40±3 / 30±3<br>2 / Room temperature / 5±3<br>3 / 125±3 / 30±3<br>4 / Room temperature / 5±3 | No visible damage<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 5\%$ |
| 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>△Vb(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<br>$\|\Delta V_{1mA}/V_{1mA}\| \leq 10\%$ |
| Voltage Proof | IEC61051-1 | Metal balls method, 2500Vac 1 min. | No visible damage |

## Soldering Recommendation

Lead-free Wave Soldering Recommendation

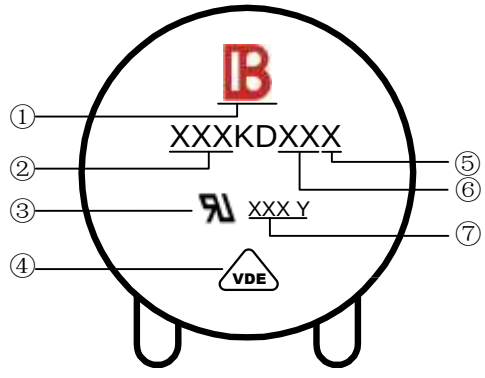



| Item | Conditions |
|---|---|
| Peak Temperature | 265℃ |
| Dipping Time | 10 seconds (max.) |
| Soldering | 1 time |

Recommendation Reworking Conditions with Soldering Iron

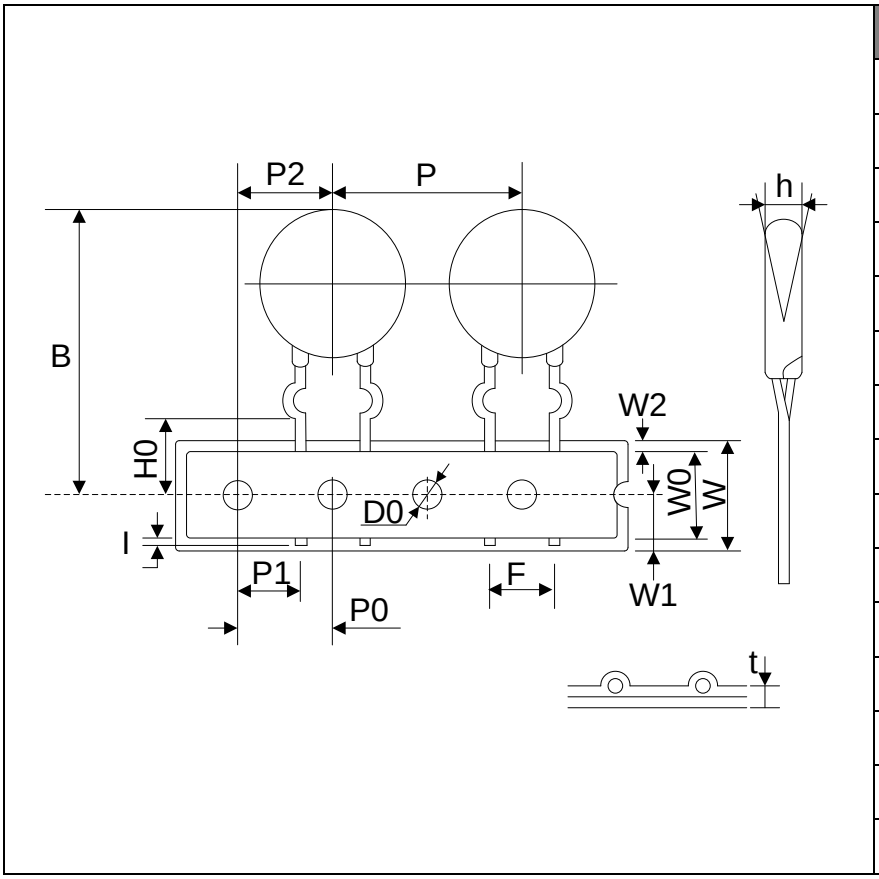
| Item | Conditions |
|---|---|
| Temperature of Soldering Iron-tip | 360℃ (max.) |
| Soldering Time | 3 seconds (max.) |
| Distance from Varistor | 2mm (min.) |

## Marking Code

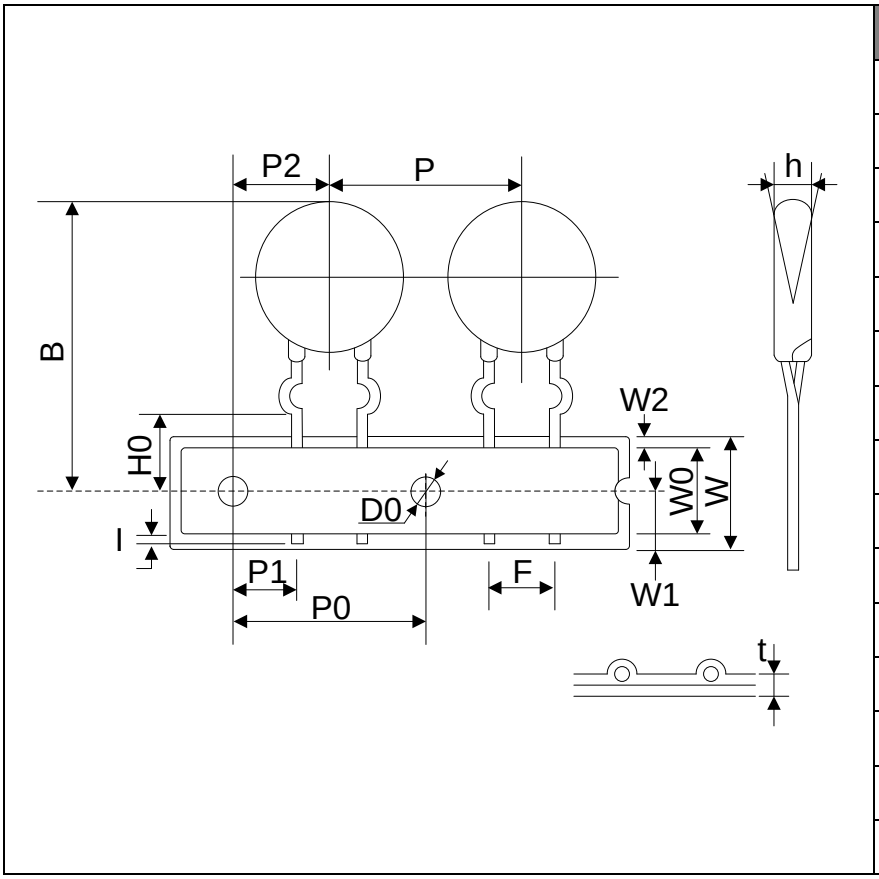



① Brightking Logo
② Varistor Voltage
③ UL Accreditation Logo
④ VDE Accreditation Logo
⑤ "J" is High Surge Code, no "J" is Standard Surge
⑥ Disk Size
⑦ Internal control code

## Taping Dimensions

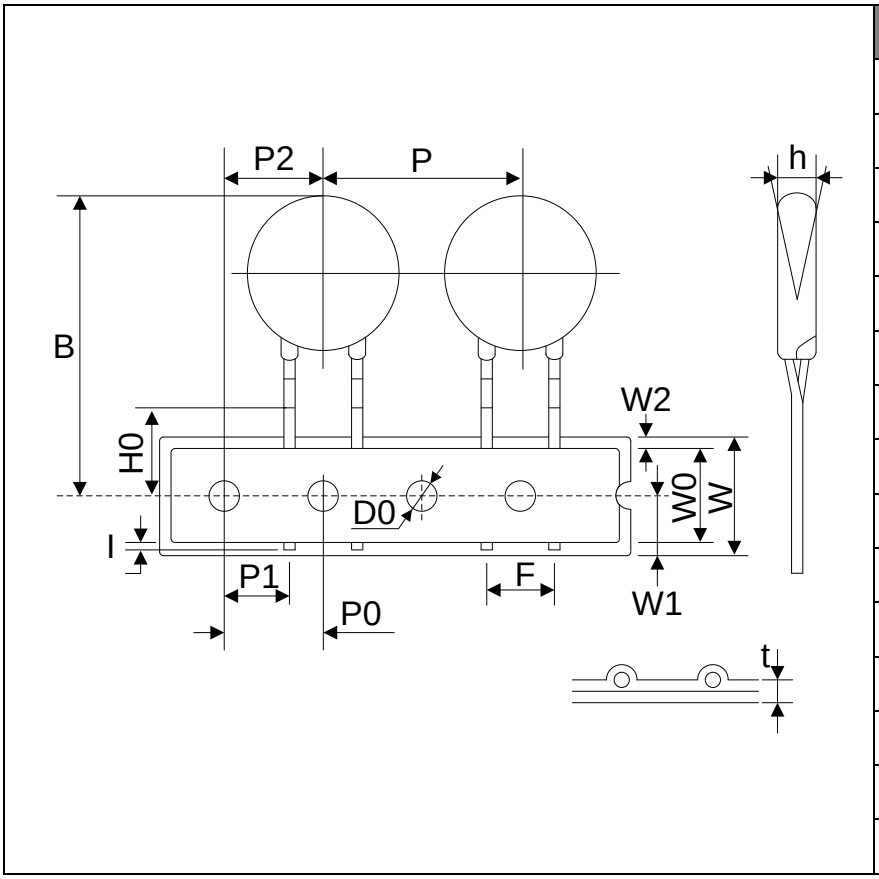



| Symbol | Dimension (mm) |
|---|---|
| P | 25.4±1.0 |
| P0 | 12.7±1.0 |
| P1 | 8.95±0.7 |
| P2 | 12.7±1.3 |
| F | 7.5±0.8 |
| h | 0±2 |
| W | 18.0±1.0 |
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H0 | 16.0±1.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |




| Symbol | Dimension (mm) |
|---|---|
| P | 15.0±1.0 |
| P0 | 15.0±1.0 |
| P1 | 3.85±0.7 |
| P2 | 7.5±1.3 |
| F | 7.5±0.8 |
| h | 0±2 |
| W | 18.0±1.0 |
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H0 | 16.0±1.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |

## Taping Dimensions

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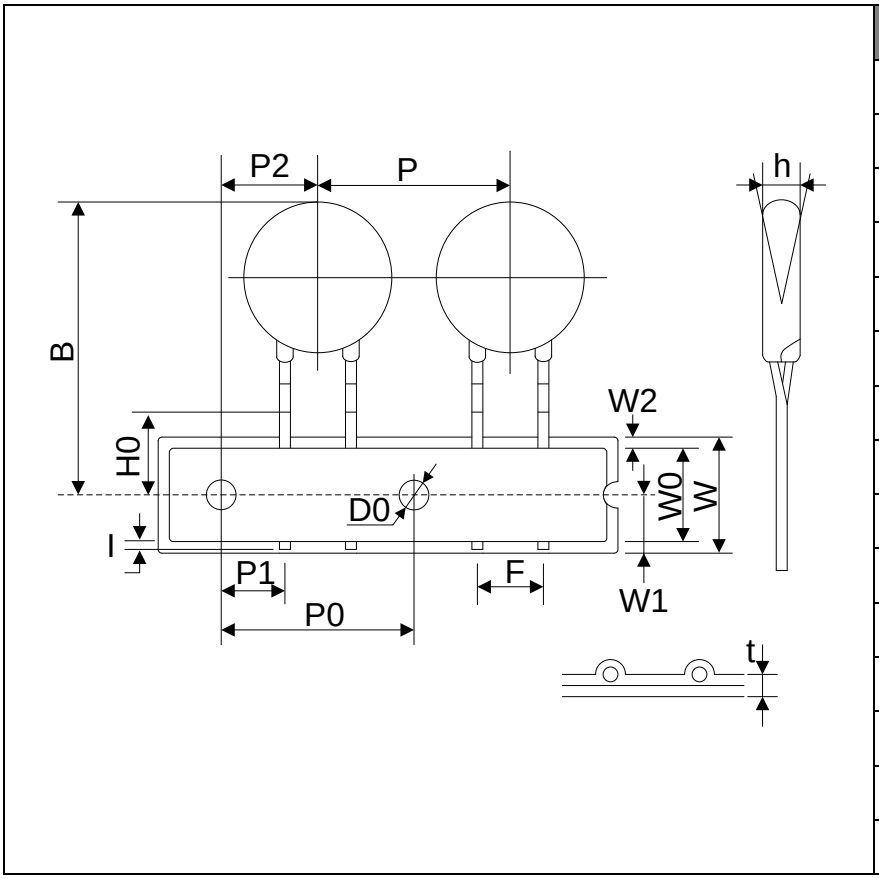
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H0 | 16.0±1.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |




| Symbol | Dimension (mm) |
|---|---|
| P | 15.0±1.0 |
| P0 | 15.0±1.0 |
| P1 | 3.85±0.7 |
| P2 | 7.5±1.3 |
| F | 7.5±0.8 |
| h | 0±2 |
| W | 18.0±1.0 |
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H0 | 16.0±1.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |

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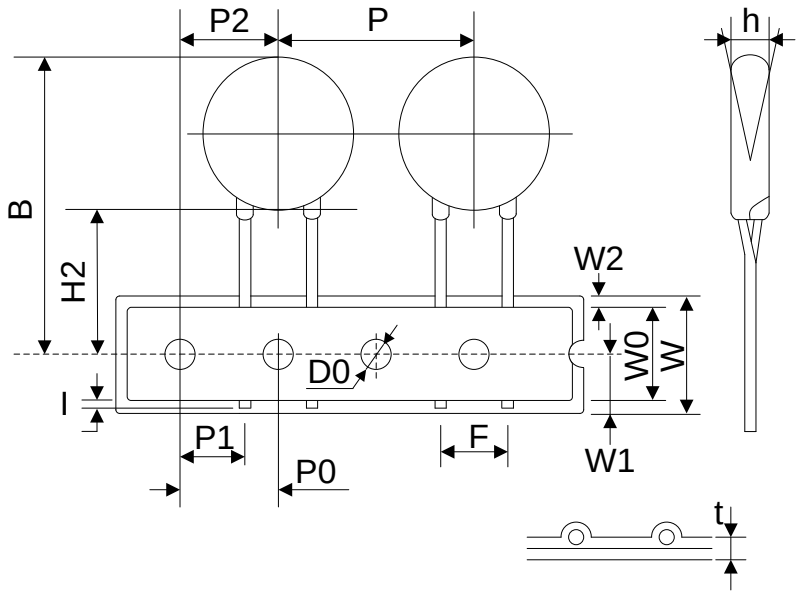


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|---|---|
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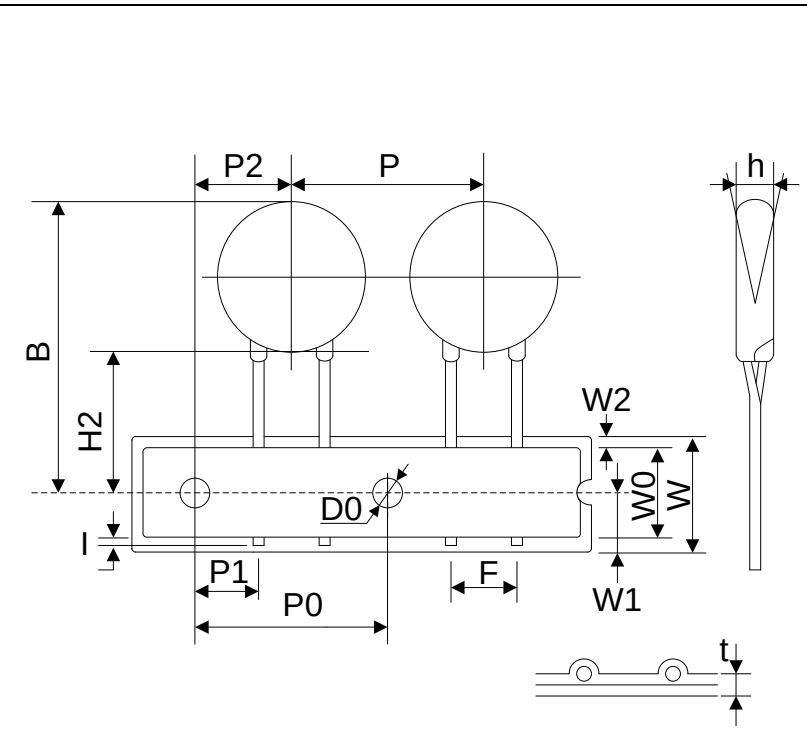
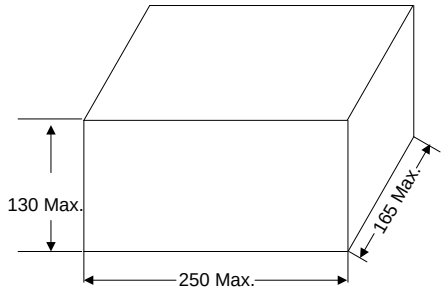
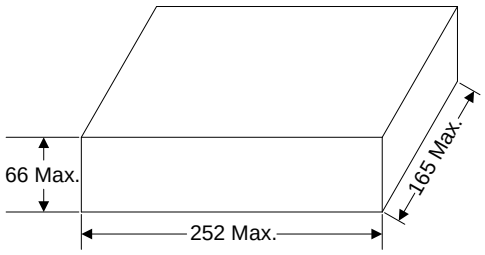
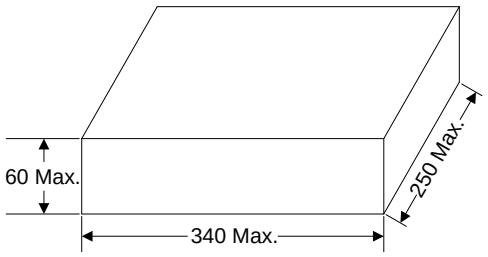
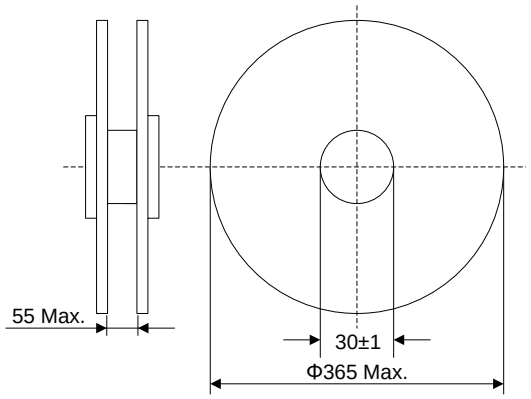
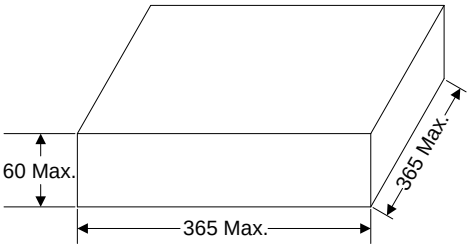
| P1 | 8.95±0.7 |
| P2 | 12.7±1.3 |
| F | 7.5±0.8 |
| h | 0±2 |
| W | 18.0±1.0 |
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H2 | 20.0±2.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |

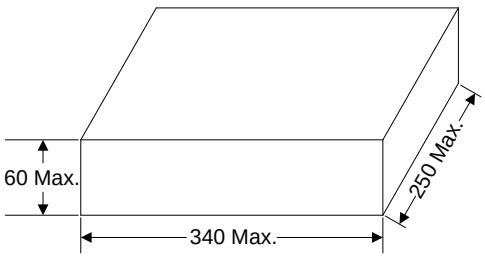
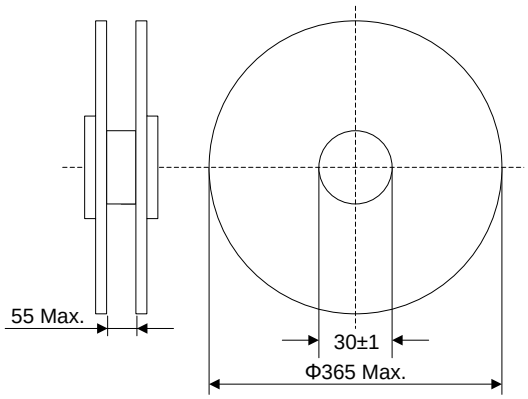
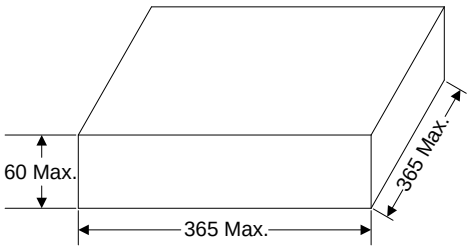



| Symbol | Dimension (mm) |
|---|---|
| P | 15.0±1.0 |
| P0 | 15.0±1.0 |
| P1 | 3.85±0.7 |
| P2 | 7.5±1.3 |
| F | 7.5±0.8 |
| h | 0±2 |
| W | 18.0±1.0 |
| W0 | 12.0±1.0 |
| W1 | 9.0±0.5 |
| W2 | 3.0max |
| H2 | 20.0±2.0 |
| I | 2.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |

**Quantity**

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

**Quantity**

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