

Metal Oxide Varistors (MOV) Data Sheet

Features

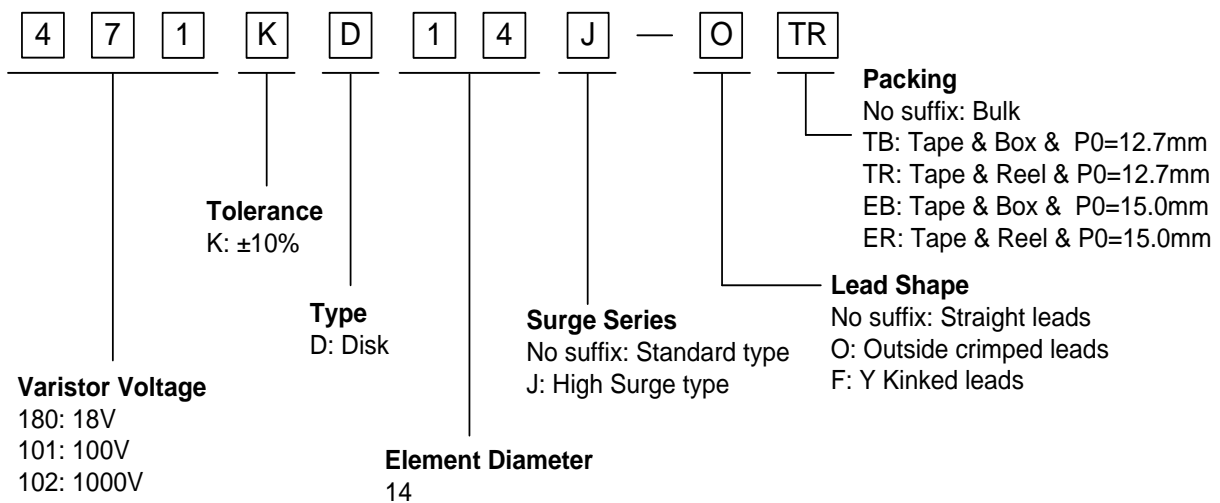
- Wide operating voltage (V_{1mA}) range from 18V to 1800V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature : $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
- Storage Temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Safety certification : UL 、 CSA 、 VDE



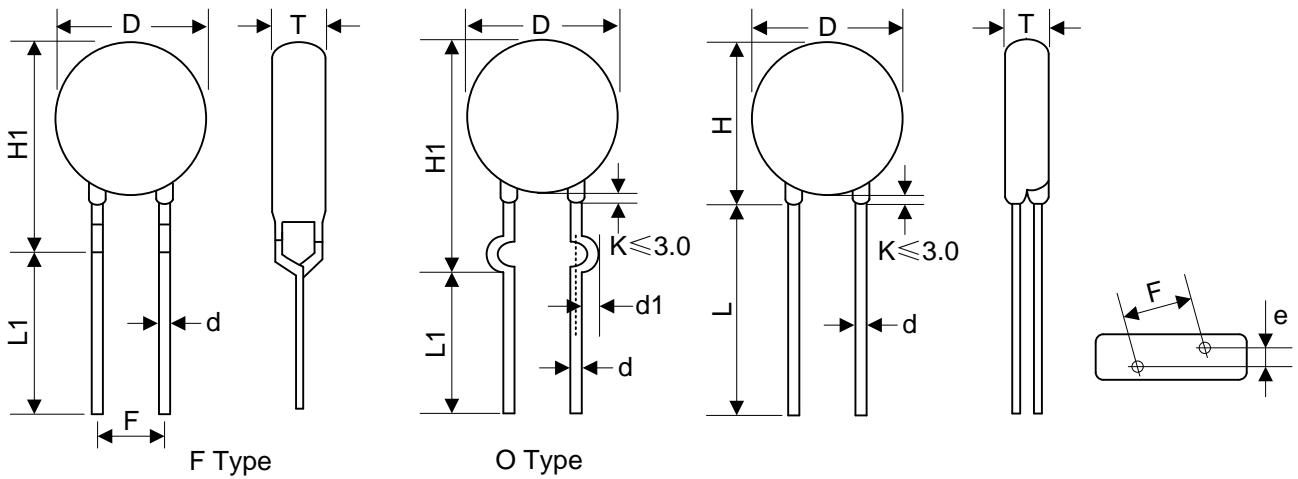
Applications

- 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



Notes: Varistor voltage $\geq 1200V$, structure diagram is F type.

| Table 1 | |
|-----------------|-----------|
| Unit: mm | |
| Symbol | Dimension |
| H | 14.5~20.0 |
| H1 | 17.0~21.0 |
| L(min.) | 20.0 |
| L1(min.) | 15.0 |
| D | 14.0~16.5 |
| 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 | 2.0~3.9 | 1.5 | 361K | 2.9~5.2 | 2.7 |
| 220K | 2.1~4.0 | 1.6 | 391K | 3.0~5.4 | 2.8 |
| 270K | 2.1~4.1 | 1.8 | 431K | 3.2~5.6 | 3.0 |
| 330K | 2.2~4.3 | 1.7 | 471K | 3.3~5.8 | 3.2 |
| 390K | 2.1~4.1 | 1.8 | 511K | 3.4~6.1 | 3.4 |
| 470K | 2.2~4.3 | 1.9 | 561K | 3.6~6.4 | 3.6 |
| 560K | 2.3~4.6 | 2.1 | 621K | 3.8~6.8 | 3.9 |
| 680K | 2.4~4.8 | 2.4 | 681K | 4.0~7.1 | 4.2 |
| 820K | 2.1~4.1 | 1.8 | 751K | 4.3~7.2 | 4.3 |
| 101K | 2.4~4.2 | 2.0 | 781K | 4.4~7.3 | 4.4 |
| 121K | 2.4~4.4 | 2.2 | 821K | 4.6~7.5 | 4.6 |
| 151K | 2.2~4.1 | 1.8 | 911K | 4.8~7.5 | 5.0 |
| 181K | 2.3~4.2 | 1.9 | 102K | 5.4~8.0 | 5.0 |
| 201K | 2.4~4.3 | 2.0 | 112K | 5.8~8.5 | 5.4 |
| 221K | 2.5~4.4 | 2.1 | 122K | 5.9~9.0 | 5.8 |
| 241K | 2.6~4.5 | 2.2 | 142K | 6.9~10.5 | 6.6 |
| 271K | 2.6~4.6 | 2.4 | 162K | 7.4~11.0 | 7.4 |
| 301K | 2.7~4.6 | 2.5 | 182K | 7.6~12.0 | 8.2 |
| 331K | 2.7~5.0 | 2.5 | | | |

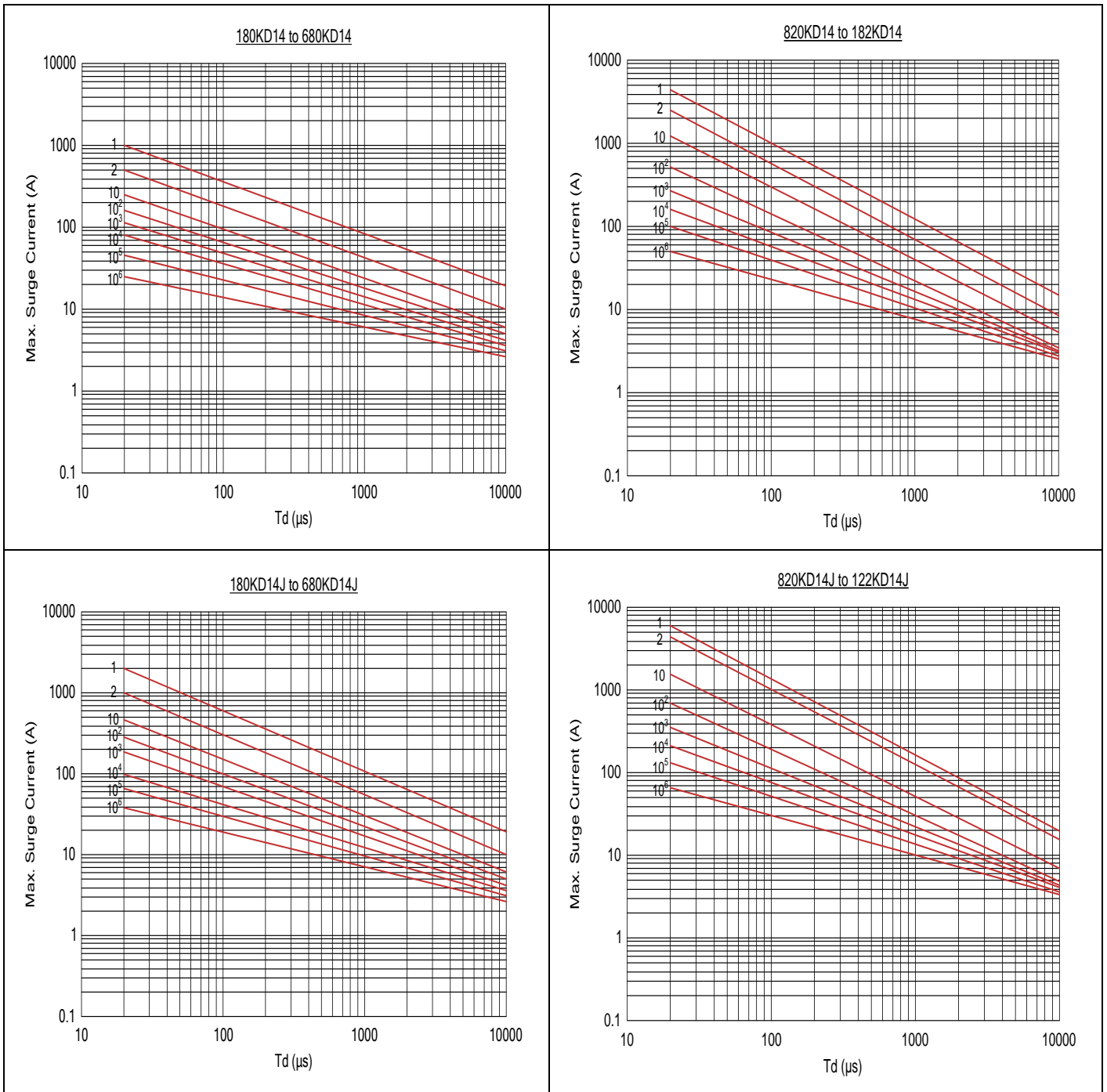
Electrical Characteristics

| 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) |
| 180KD14 | 180KD14J | 11 | 14 | 18(15~21.6) | 10 | 36 | 1000 | 2000 | 4.0 | 7.0 | 0.1 | 11100 |
| 220KD14 | 220KD14J | 14 | 18 | 22(19.5~26) | 10 | 43 | 1000 | 2000 | 5.0 | 8.0 | 0.1 | 9100 |
| 270KD14 | 270KD14J | 17 | 22 | 27(24~31) | 10 | 53 | 1000 | 2000 | 6.0 | 10.0 | 0.1 | 7400 |
| 330KD14 | 330KD14J | 20 | 26 | 33(29.5~36.5) | 10 | 65 | 1000 | 2000 | 7.5 | 12.0 | 0.1 | 6100 |
| 390KD14 | 390KD14J | 25 | 31 | 39(35~43) | 10 | 77 | 1000 | 2000 | 8.6 | 13.0 | 0.1 | 5100 |
| 470KD14 | 470KD14J | 30 | 38 | 47(42~52) | 10 | 93 | 1000 | 2000 | 10.0 | 17.0 | 0.1 | 4300 |
| 560KD14 | 560KD14J | 35 | 45 | 56(50~62) | 10 | 110 | 1000 | 2000 | 11.0 | 20.0 | 0.1 | 3600 |
| 680KD14 | 680KD14J | 40 | 56 | 68(61~75) | 10 | 135 | 1000 | 2000 | 14.0 | 24.0 | 0.1 | 2900 |
| 820KD14 | 820KD14J | 50 | 65 | 82(74~90) | 50 | 135 | 4500 | 6000 | 22.0 | 27.0 | 0.6 | 2400 |
| 101KD14 | 101KD14J | 60 | 85 | 100(90~110) | 50 | 165 | 4500 | 6000 | 28.0 | 33.0 | 0.6 | 2000 |
| 121KD14 | 121KD14J | 75 | 100 | 120(108~132) | 50 | 200 | 4500 | 6000 | 32.0 | 40.0 | 0.6 | 1700 |
| 151KD14 | 151KD14J | 95 | 125 | 150(135~165) | 50 | 250 | 4500 | 6000 | 40.0 | 53.0 | 0.6 | 1300 |
| 181KD14 | 181KD14J | 115 | 150 | 180(162~198) | 50 | 300 | 4500 | 6000 | 50.0 | 60.0 | 0.6 | 1100 |
| 201KD14 | 201KD14J | 130 | 170 | 200(180~220) | 50 | 340 | 4500 | 6000 | 57.0 | 70.0 | 0.6 | 1000 |
| 221KD14 | 221KD14J | 140 | 180 | 220(198~242) | 50 | 360 | 4500 | 6000 | 60.0 | 78.0 | 0.6 | 900 |
| 241KD14 | 241KD14J | 150 | 200 | 240(216~264) | 50 | 395 | 4500 | 6000 | 63.0 | 84.0 | 0.6 | 830 |
| 271KD14 | 271KD14J | 175 | 225 | 270(243~297) | 50 | 455 | 4500 | 6000 | 70.0 | 99.0 | 0.6 | 740 |
| 301KD14 | 301KD14J | 190 | 250 | 300(270~330) | 50 | 500 | 4500 | 6000 | 77.0 | 108 | 0.6 | 670 |
| 331KD14 | 331KD14J | 210 | 275 | 330(297~363) | 50 | 550 | 4500 | 6000 | 85.0 | 115 | 0.6 | 610 |
| 361KD14 | 361KD14J | 230 | 300 | 360(324~396) | 50 | 595 | 4500 | 6000 | 93.0 | 130 | 0.6 | 560 |
| 391KD14 | 391KD14J | 250 | 320 | 390(351~429) | 50 | 650 | 4500 | 6000 | 100 | 140 | 0.6 | 510 |
| 431KD14 | 431KD14J | 275 | 350 | 430(387~473) | 50 | 710 | 4500 | 6000 | 115 | 155 | 0.6 | 460 |
| 471KD14 | 471KD14J | 300 | 385 | 470(423~517) | 50 | 775 | 4500 | 6000 | 118 | 175 | 0.6 | 430 |
| 511KD14 | 511KD14J | 320 | 415 | 510(459~561) | 50 | 845 | 4500 | 6000 | 121 | 180 | 0.6 | 390 |
| 561KD14 | 561KD14J | 350 | 460 | 560(504~616) | 50 | 925 | 4500 | 6000 | 125 | 185 | 0.6 | 360 |
| 621KD14 | 621KD14J | 385 | 505 | 620(558~682) | 50 | 1025 | 4500 | 6000 | 128 | 190 | 0.6 | 320 |
| 681KD14 | 681KD14J | 420 | 560 | 680(612~748) | 50 | 1120 | 4500 | 6000 | 130 | 200 | 0.6 | 290 |
| 751KD14 | 751KD14J | 460 | 615 | 750(675~825) | 50 | 1240 | 4500 | 6000 | 143 | 210 | 0.6 | 270 |
| 781KD14 | 781KD14J | 485 | 640 | 780(702~858) | 50 | 1290 | 4500 | 6000 | 148 | 220 | 0.6 | 260 |
| 821KD14 | 821KD14J | 510 | 670 | 820(738~902) | 50 | 1355 | 4500 | 6000 | 157 | 235 | 0.6 | 240 |
| 911KD14 | 911KD14J | 550 | 745 | 910(819~1001) | 50 | 1500 | 4500 | 6000 | 175 | 255 | 0.6 | 220 |
| 102KD14 | 102KD14J | 625 | 825 | 1000(900~1100) | 50 | 1650 | 4500 | 6000 | 190 | 280 | 0.6 | 200 |
| 112KD14 | 112KD14J | 680 | 895 | 1100(990~1210) | 50 | 1815 | 4500 | 6000 | 213 | 310 | 0.6 | 180 |
| 122KD14 | 122KD14J | 750 | 990 | 1200(1080~1320) | 50 | 1980 | 4500 | 6000 | 232 | 324 | 0.6 | 160 |
| 142KD14 | / | 880 | 1140 | 1400(1260~1540) | 50 | 2310 | 4500 | / | 238 | / | 0.6 | 150 |

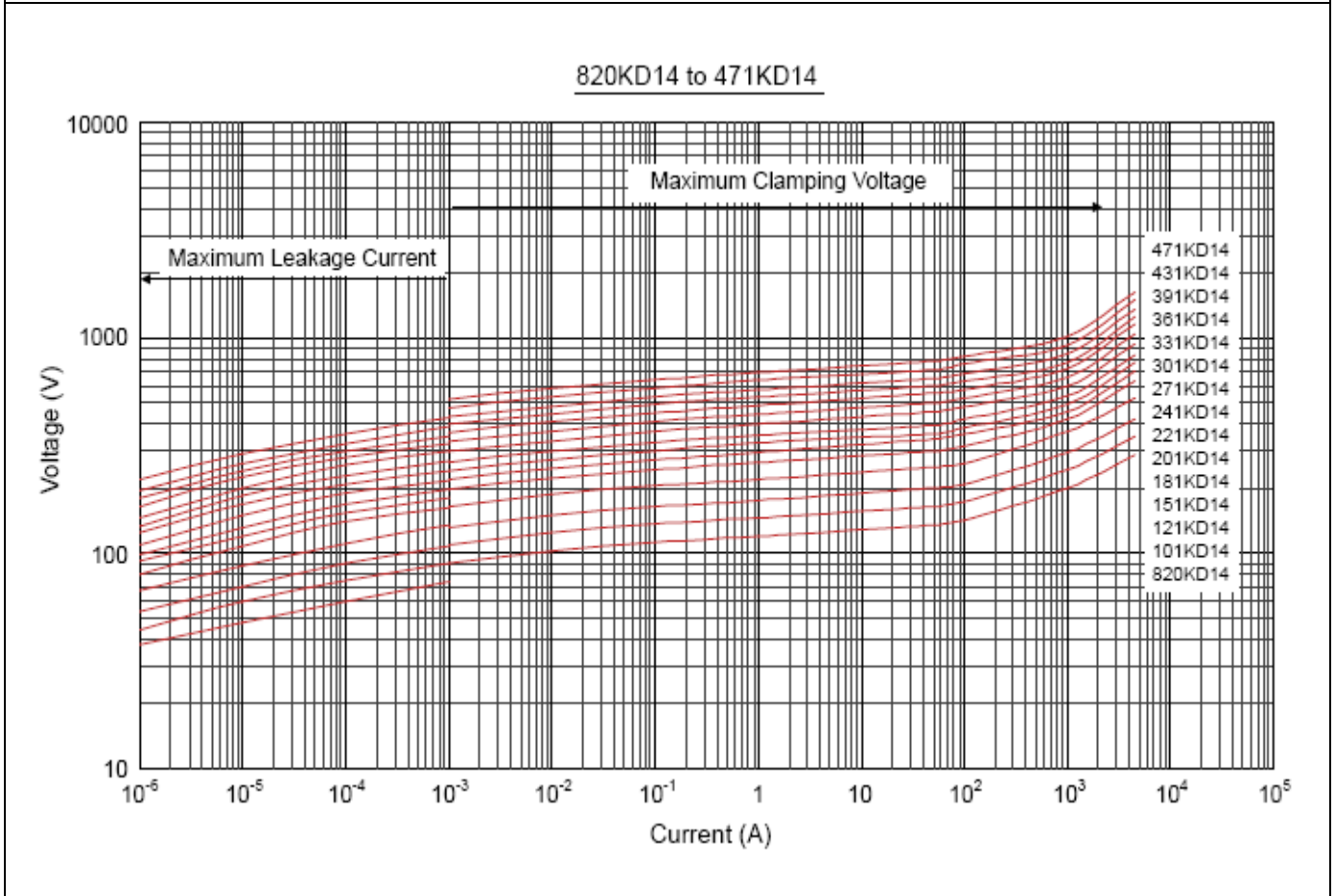
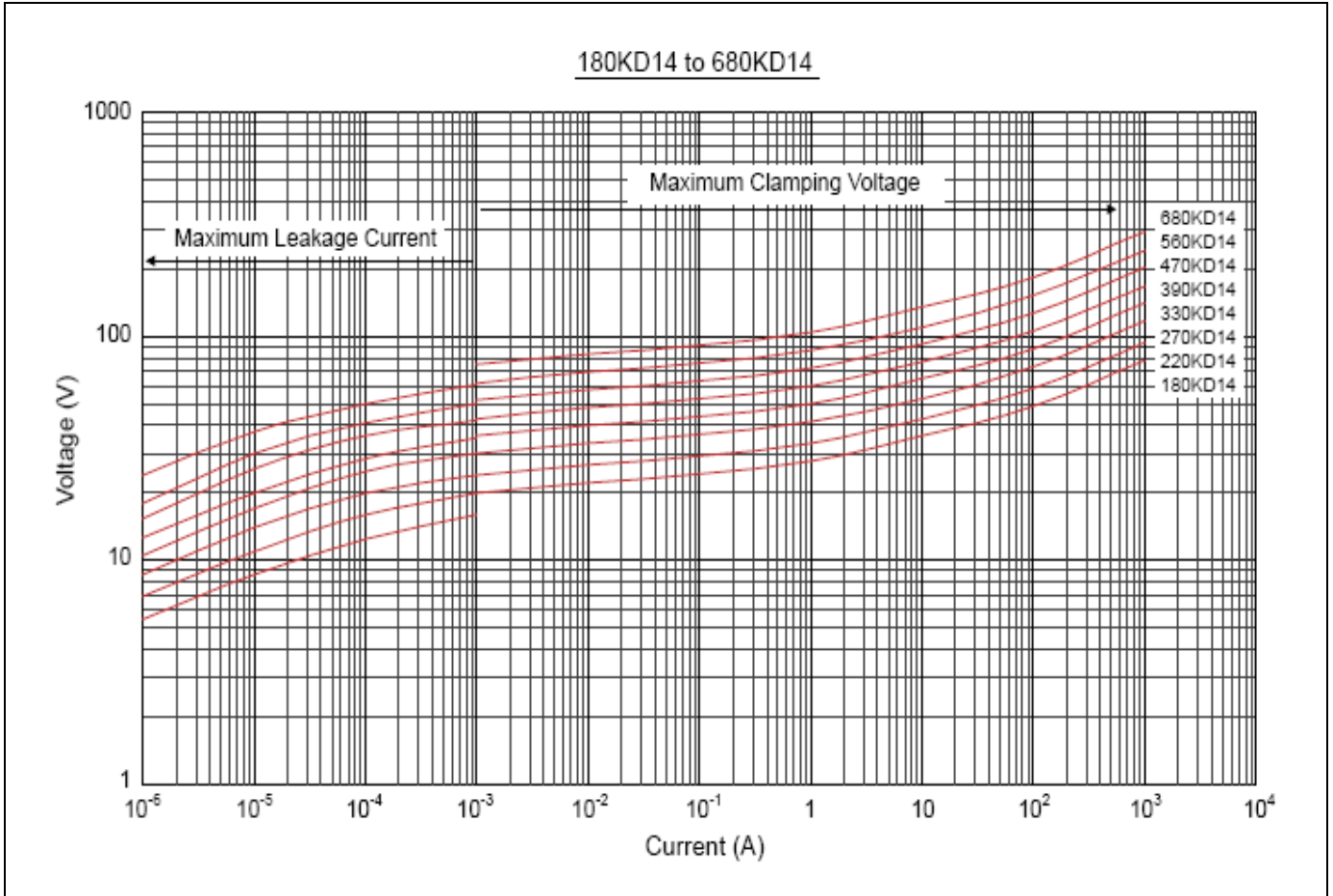
| Part Number | | Maximum Allowable Voltage | | Varistor Voltage | Maximum Clamping Voltage | | Withstanding Surge Current | | Maximum Energy (10/1000μs) | | Rated Power | Typical Capacitance (Reference) |
|-------------|------------|---------------------------|---------------------|----------------------|--------------------------|--------------------|----------------------------|------------------|----------------------------|----------------|-------------|---------------------------------|
| 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) |
| 162KD14 | / | 1000 | 1280 | 1600(1440~1760) | 50 | 2640 | 4500 | / | 243 | / | 0.6 | 140 |
| 182KD14 | / | 1100 | 1465 | 1800(1620~1980) | 50 | 2970 | 4500 | / | 250 | / | 0.6 | 130 |

- Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%;
 2. Varistor voltage $\geq 1200V$, structure diagram is F type;
 3. Leakage Current (@83% of V_{1mA}) : IR $\leq 50\mu A$ (180K~680K) ; IR $\leq 25\mu A$ (820K~182K).

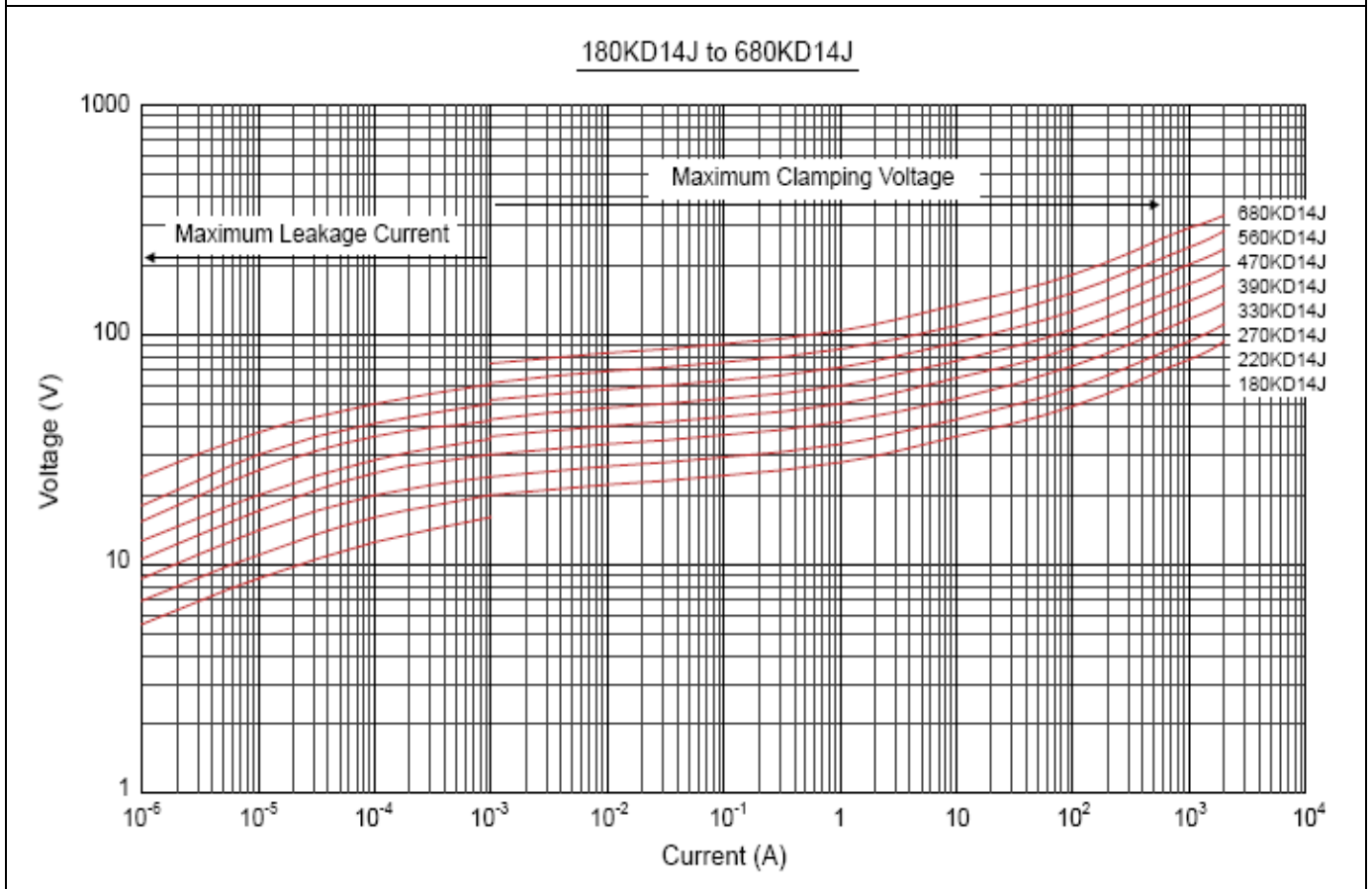
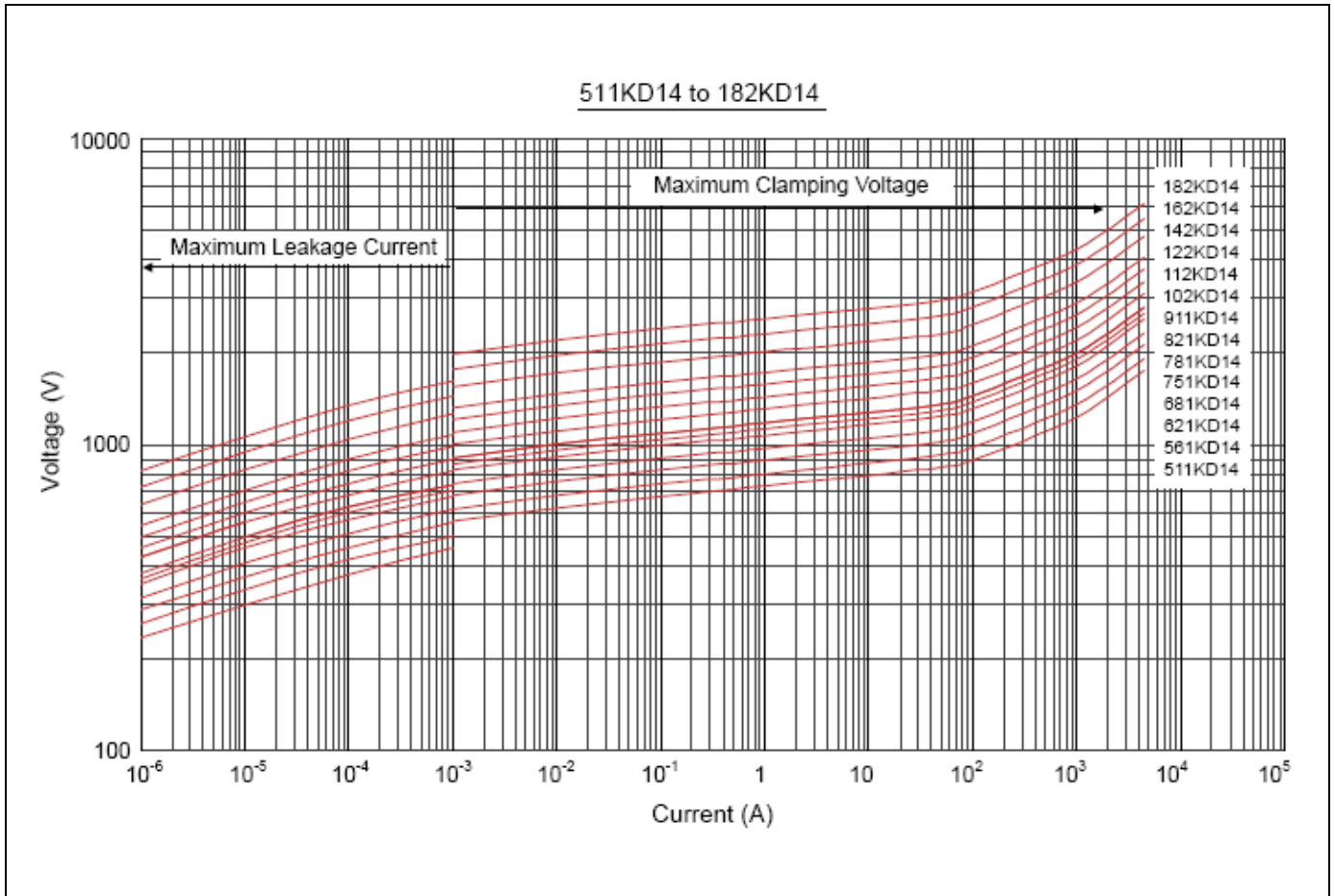
Maximum Surge Current Derating Curve



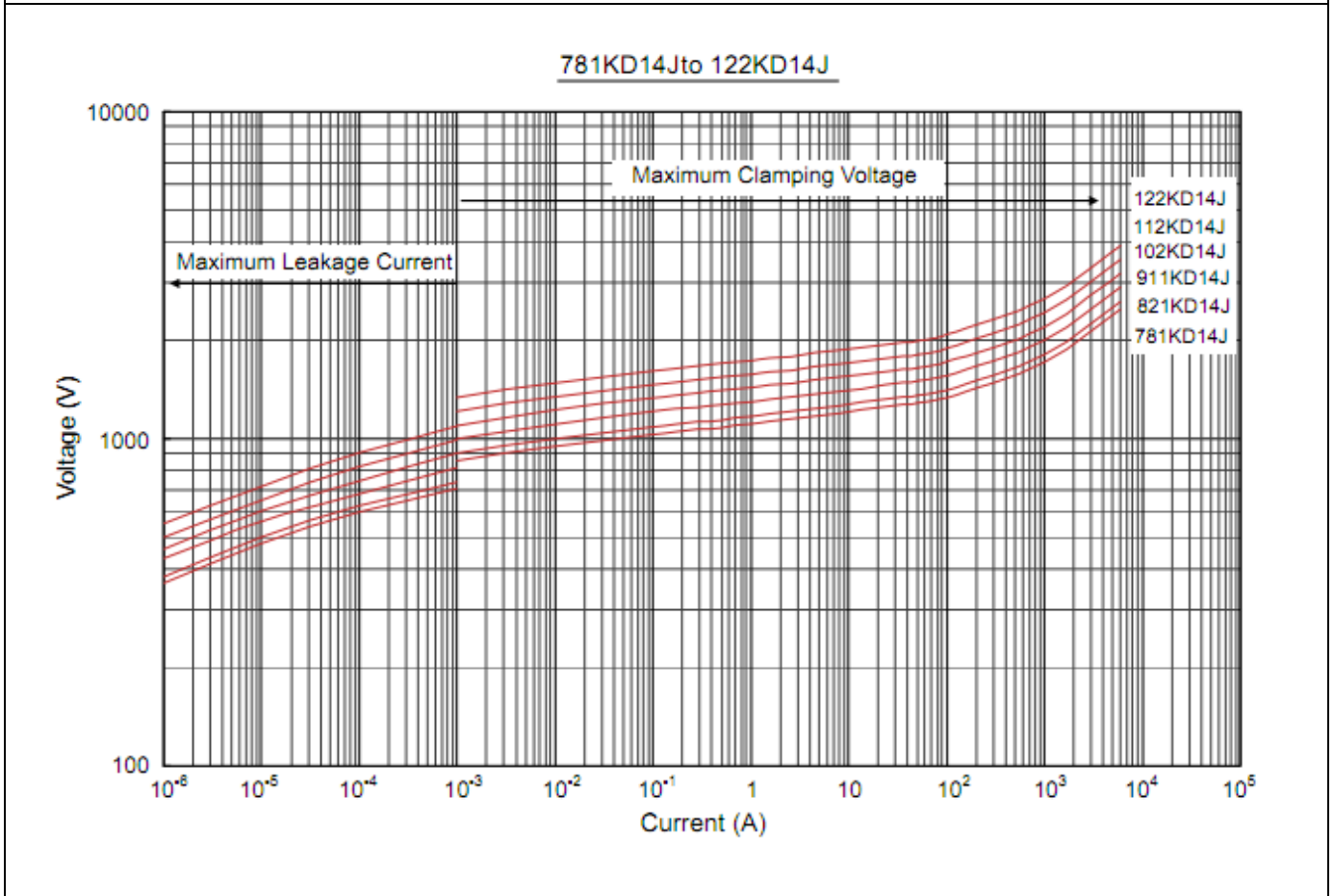
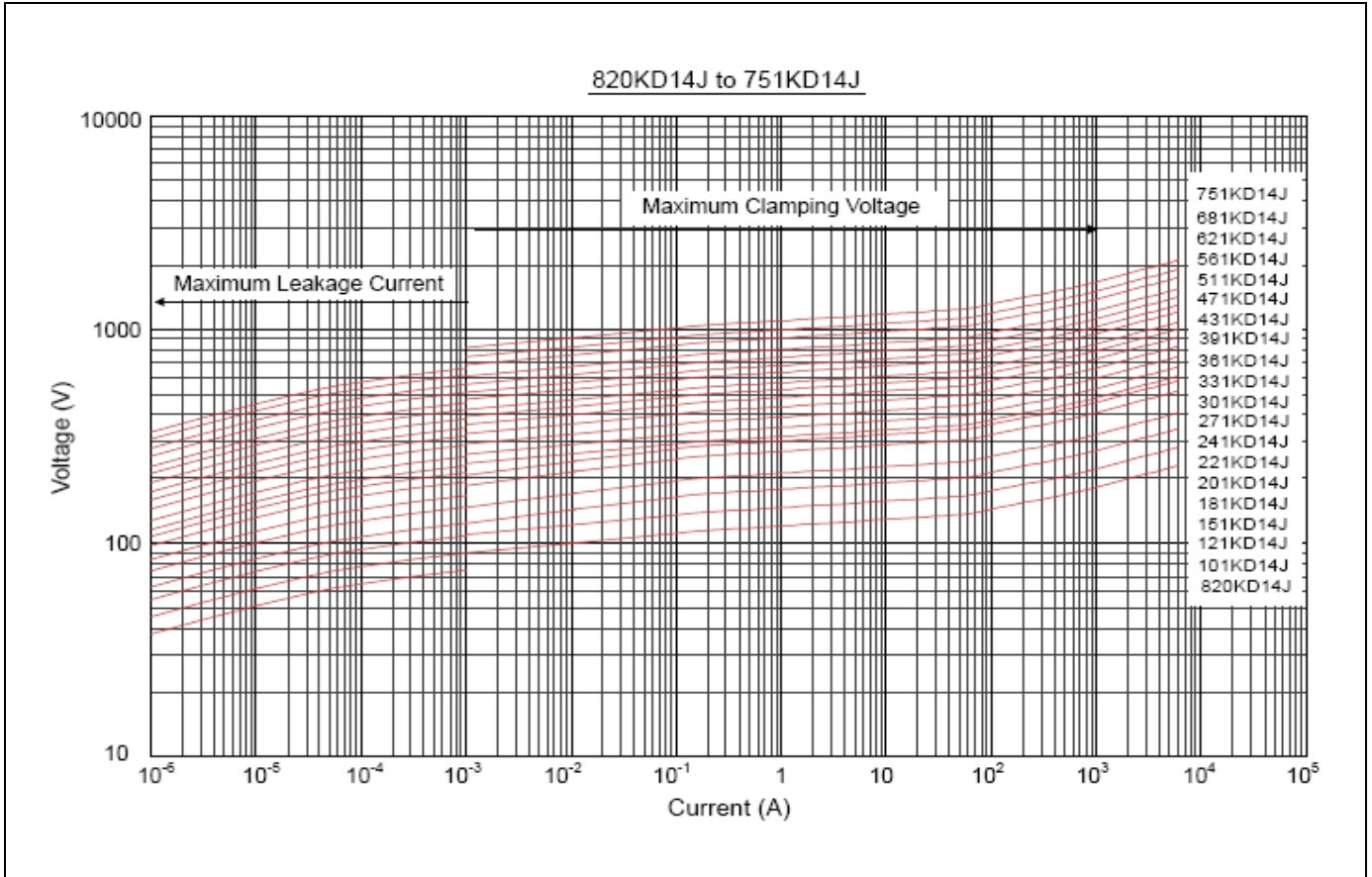
Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve



Maximum Leakage Current and Maximum Clamping Voltage Curve

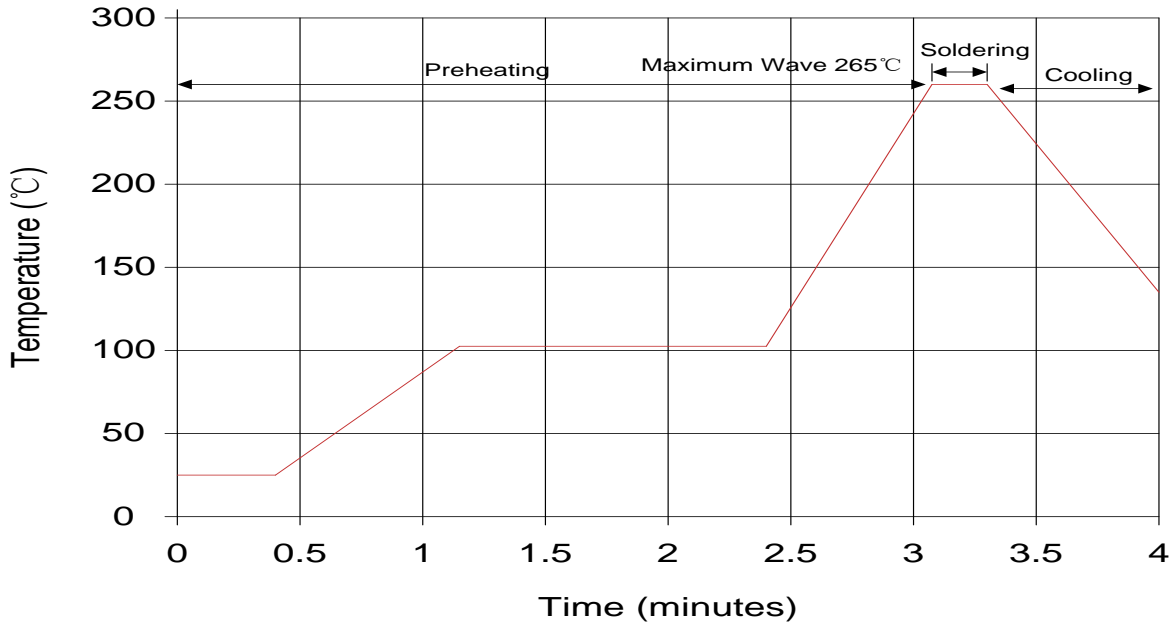


Reliability

| 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" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5 < d ≤ 0.8</td> <td>1.0</td> </tr> <tr> <td>0.8 < d ≤ 1.25</td> <td>2.0</td> </tr> <tr> <td>1.25 < d</td> <td>4.0</td> </tr> </tbody> </table> | Terminal diameter (mm) | Force (kg) | 0.5 < d ≤ 0.8 | 1.0 | 0.8 < d ≤ 1.25 | 2.0 | 1.25 < d | 4.0 | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% | | | | | | | |
| Terminal diameter (mm) | Force (kg) | | | | | | | | | | | | | | | | | |
| 0.5 < d ≤ 0.8 | 1.0 | | | | | | | | | | | | | | | | | |
| 0.8 < d ≤ 1.25 | 2.0 | | | | | | | | | | | | | | | | | |
| 1.25 < d | 4.0 | | | | | | | | | | | | | | | | | |
| Bending Strength of Terminals | 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" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (kg)</th> </tr> </thead> <tbody> <tr> <td>0.5 < d ≤ 0.8</td> <td>0.5</td> </tr> <tr> <td>0.8 < d ≤ 1.25</td> <td>1.0</td> </tr> <tr> <td>1.25 < d</td> <td>2.0</td> </tr> </tbody> </table> | Terminal diameter (mm) | Force (kg) | 0.5 < d ≤ 0.8 | 0.5 | 0.8 < d ≤ 1.25 | 1.0 | 1.25 < d | 2.0 | No visible damage ΔV _{1mA} /V _{1mA} ≤ 5% | | | | | | | |
| Terminal diameter (mm) | Force (kg) | | | | | | | | | | | | | | | | | |
| 0.5 < d ≤ 0.8 | 0.5 | | | | | | | | | | | | | | | | | |
| 0.8 < d ≤ 1.25 | 1.0 | | | | | | | | | | | | | | | | | |
| 1.25 < d | 2.0 | | | | | | | | | | | | | | | | | |
| Vibration | 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" 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 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 | | | | | | | | | | | | | | | | |
| 8/20μS 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

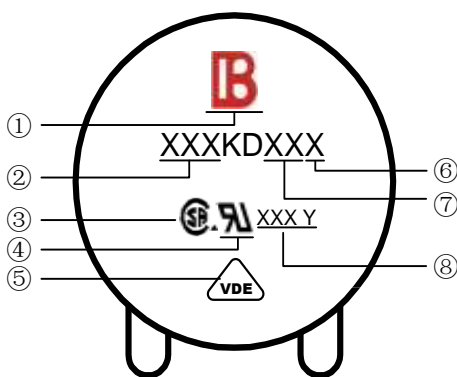


| Item | Conditions |
|------------------|-------------------|
| Peak Temperature | 265°C |
| Dipping Time | 10 seconds (max.) |
| Soldering | 1 time |

Recommendation Reworking Conditions with Soldering Iron

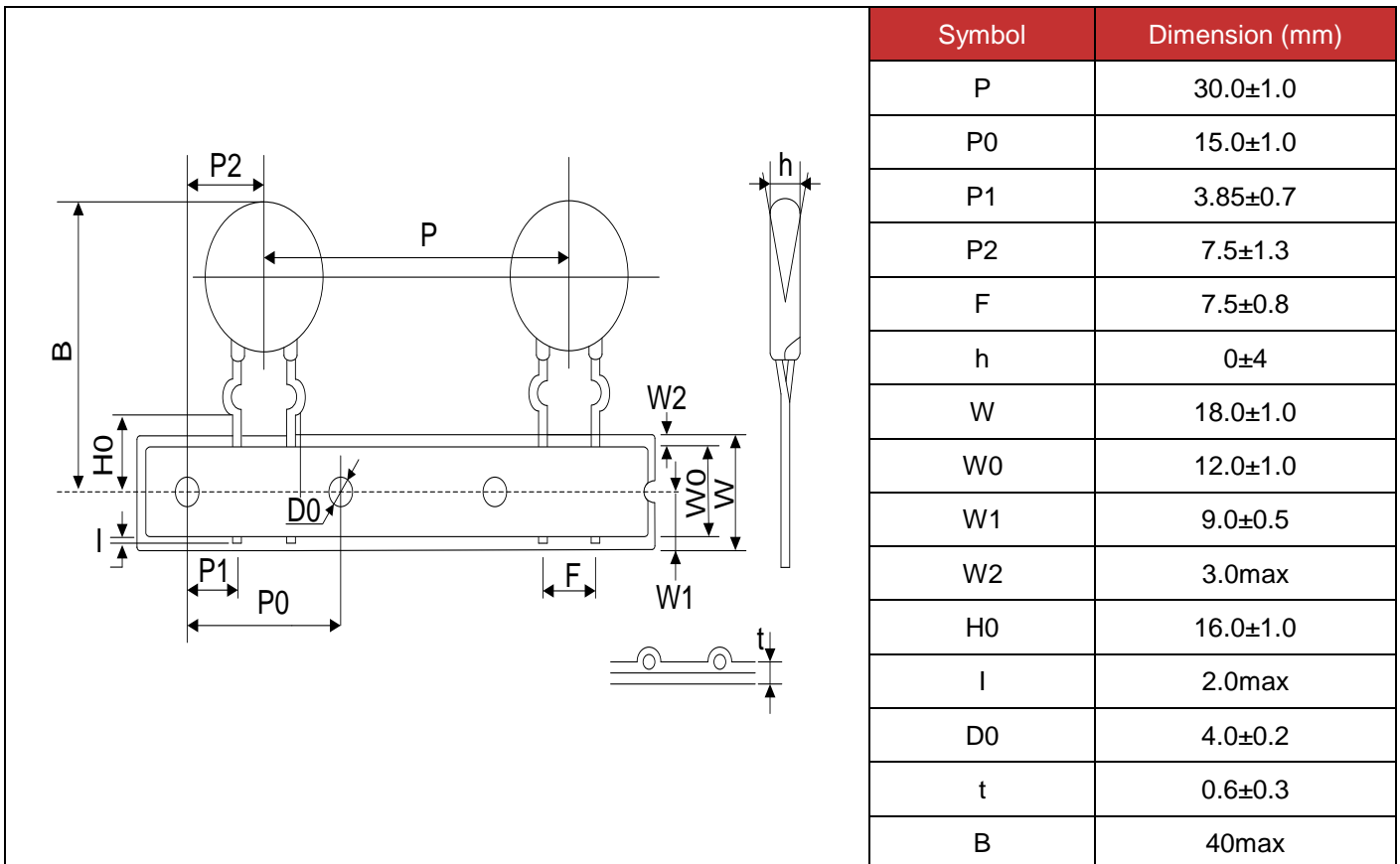
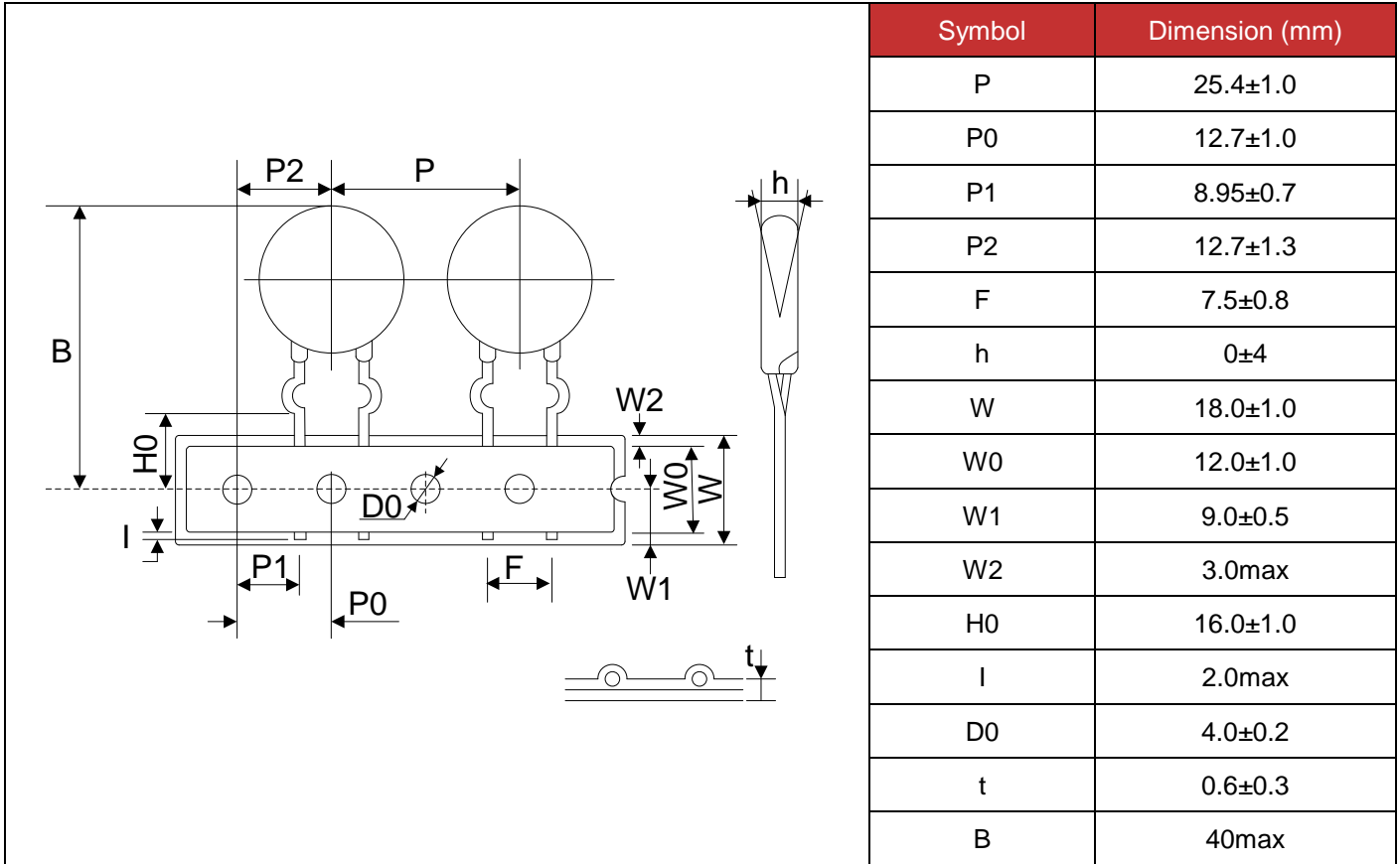
| Item | Conditions |
|-----------------------------------|------------------|
| Temperature of Soldering Iron-tip | 360°C (max.) |
| Soldering Time | 3 seconds (max.) |
| Distance from Varistor | 2mm (min.) |

Marking Code

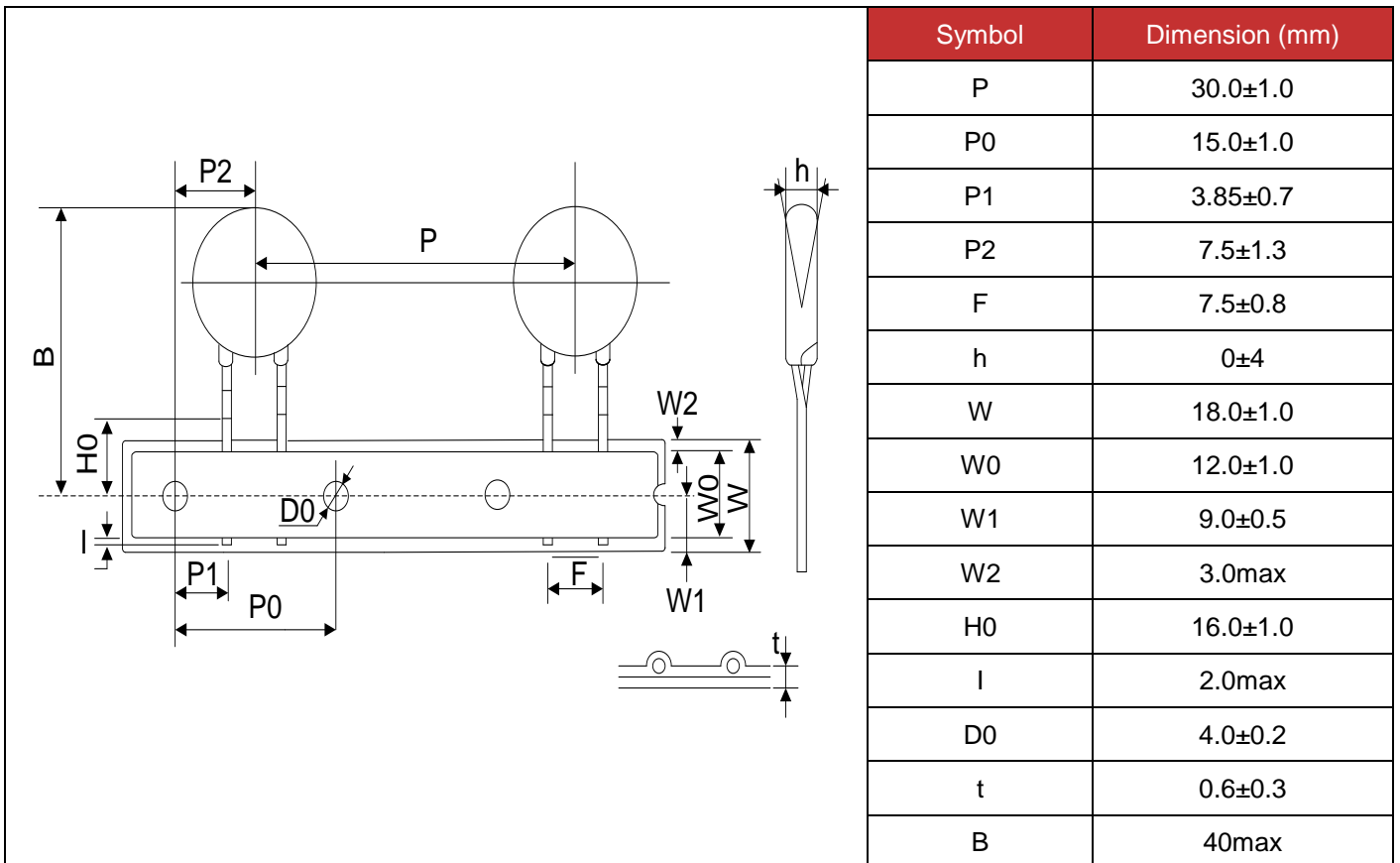
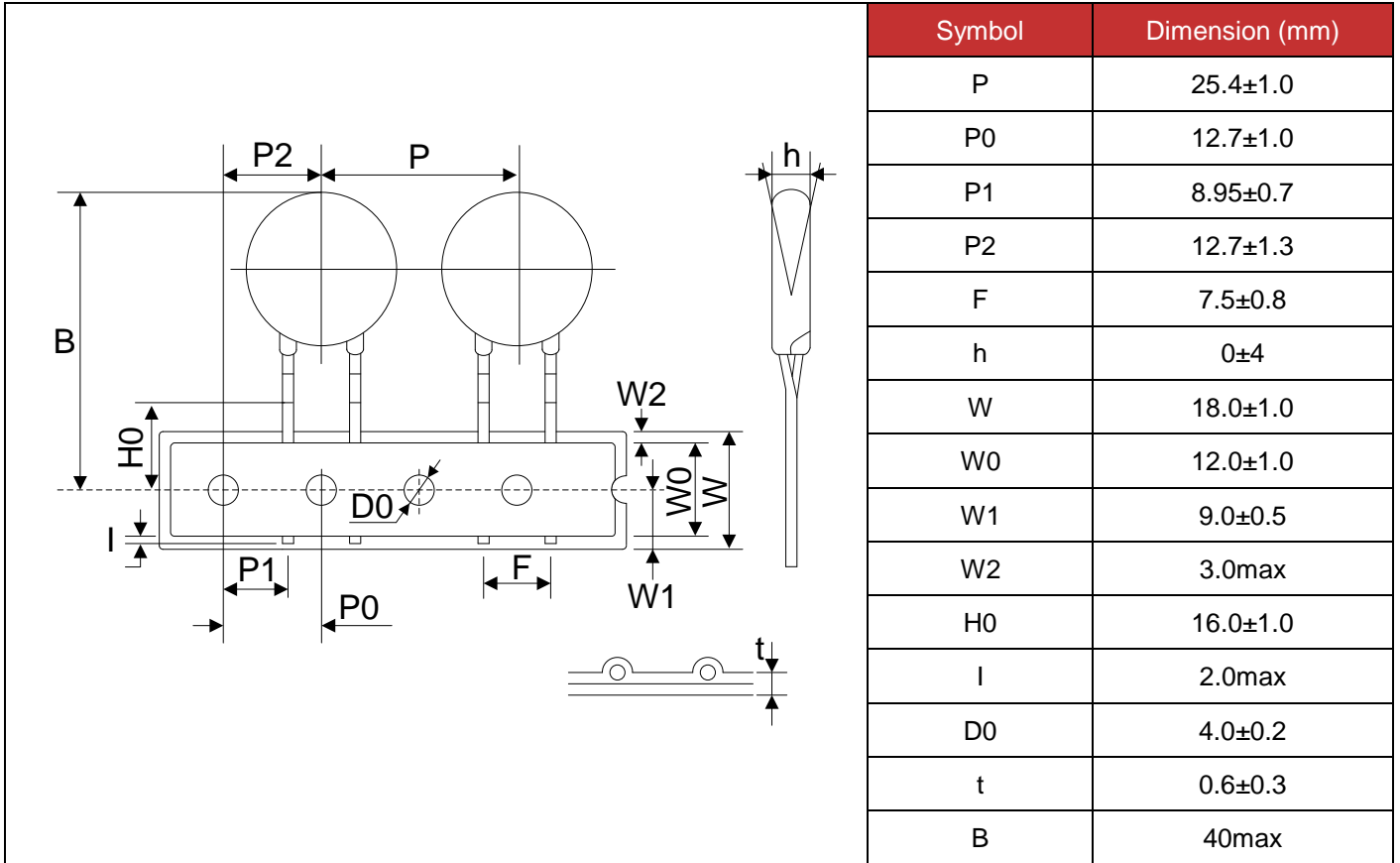


- ① Brightking Logo
- ② Varistor Voltage
- ③ CSA Accreditation Logo
- ④ UL Accreditation Logo
- ⑤ VDE Accreditation Logo
- ⑥ “J” is High Surge Code, no “J” is Standard Surge
- ⑦ Disk Size
- ⑧ Internal control code

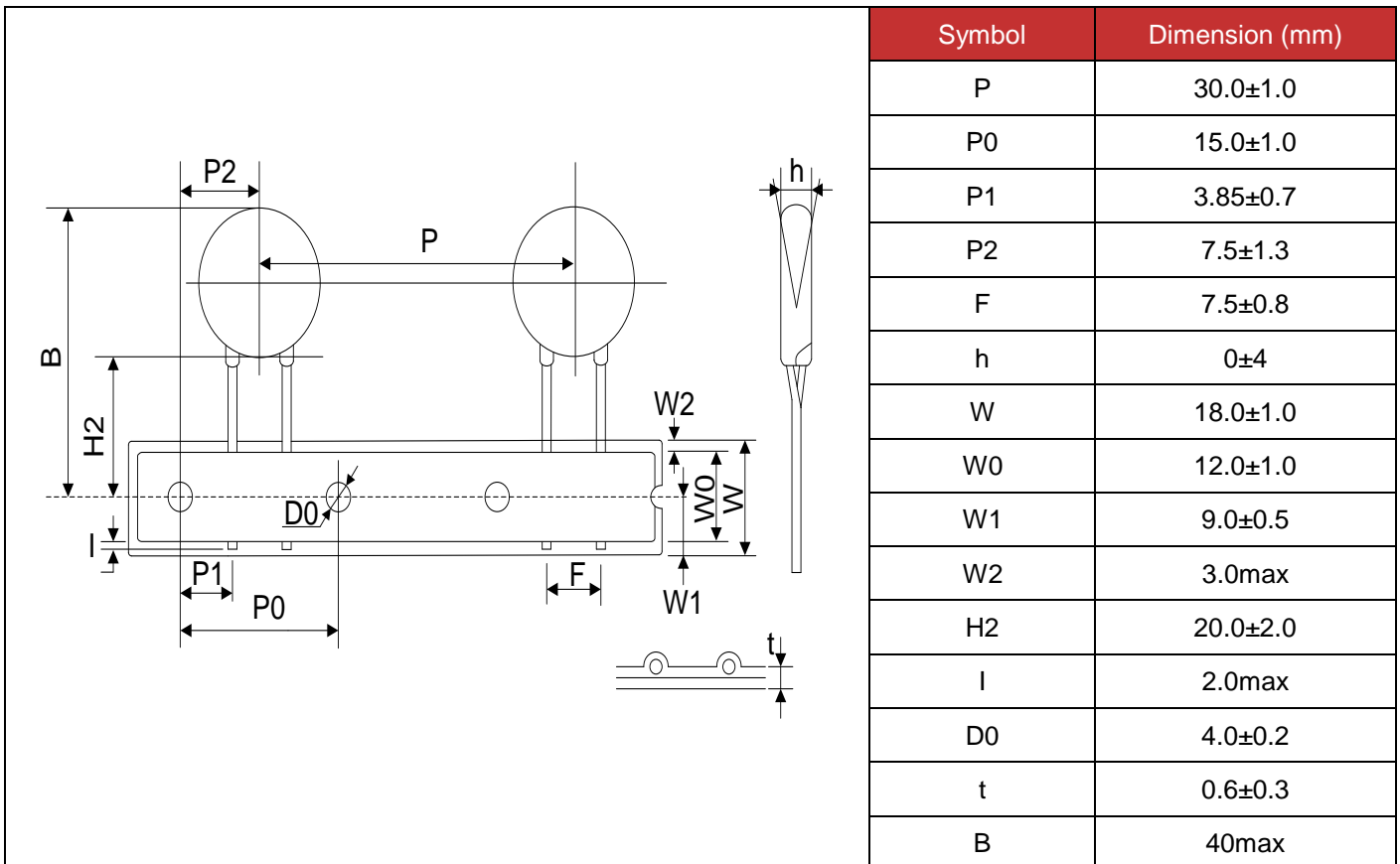
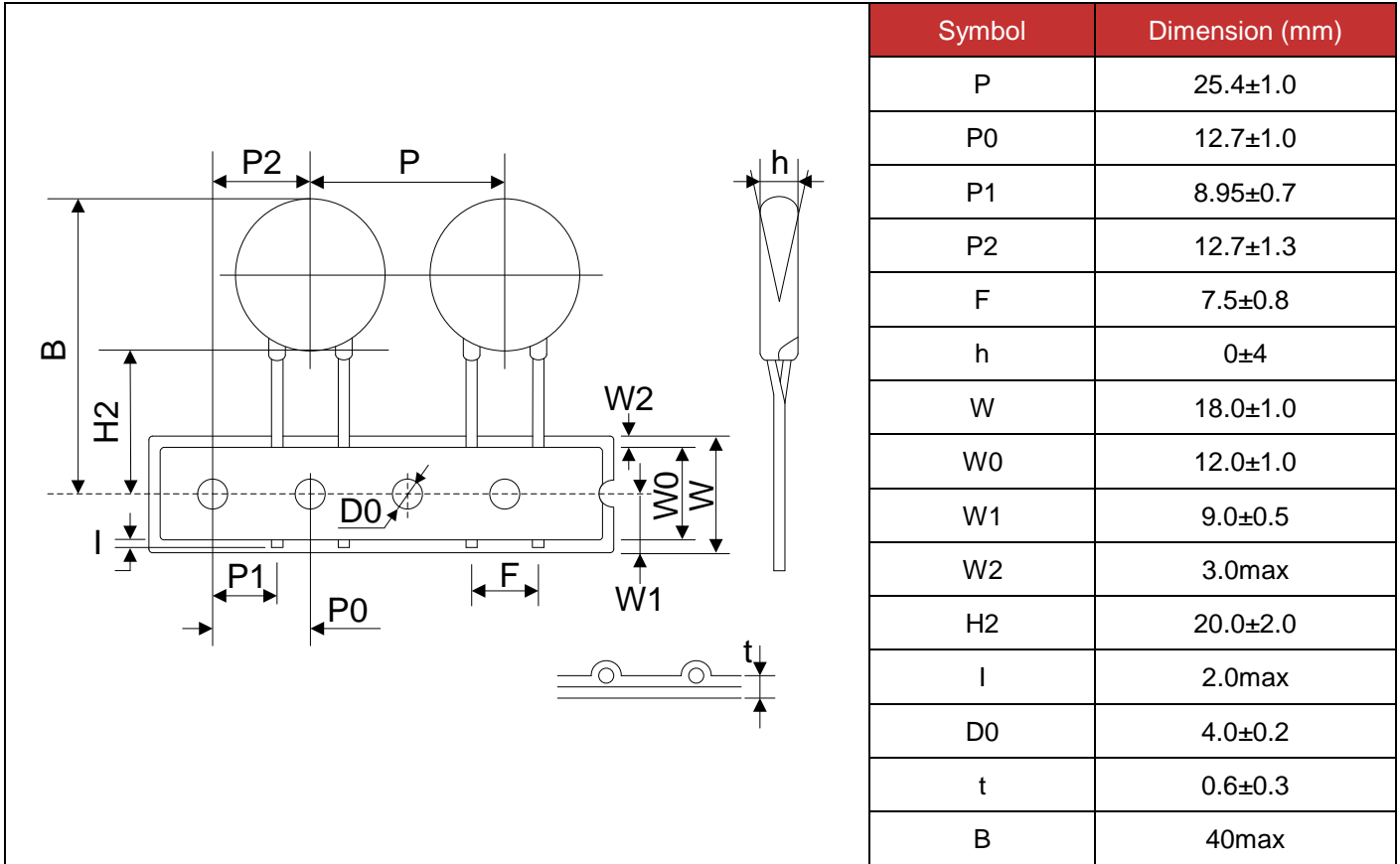
Taping Dimensions



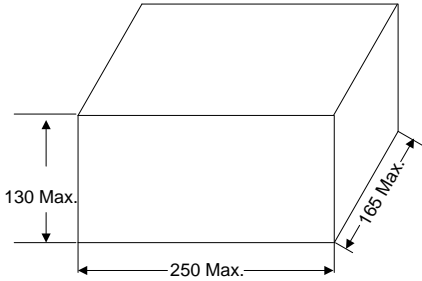

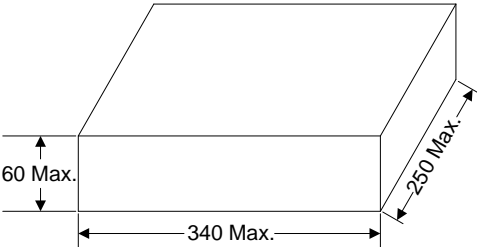
Taping Dimensions



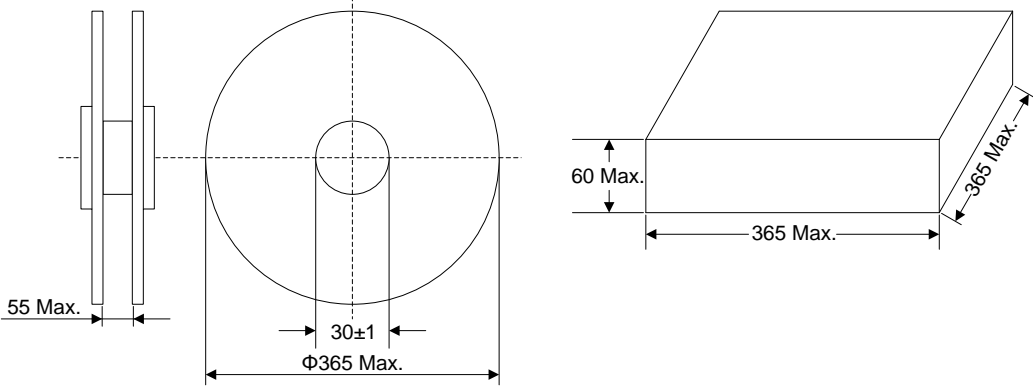
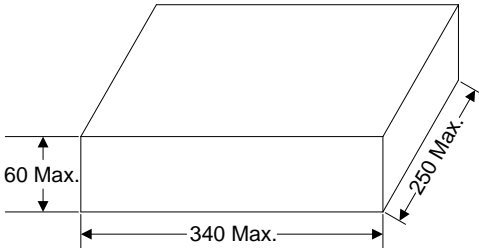
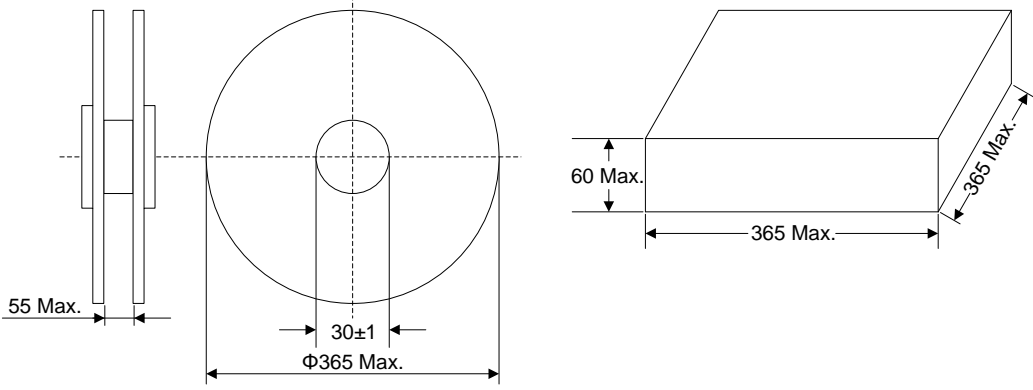
Taping Dimensions



Quantity

| Packaging Dimensions (Unit: mm) | Quantity |
|---|--|
| <p>In bulk for Terminals Untrimmed Products</p>  | 400pcs/bag 4bags/box (180K~331K) |
| | 300pcs/bag 4bags/box (361K~621K) |
| | 250pcs/bag 4bags/box (681K~112K) |
| | 150pcs/bag 4bags/box (122K~182K) |
| <p>In bulk for Terminals Trimmed Products</p>  | 400pcs/bag 4bags/box (180K~331K) |
| | 300pcs/bag 4bags/box (361K~621K) |
| | 250pcs/bag 4bags/box (681K~112K) |
| | 150pcs/bag 4bags/box (122K~182K) |
| Packaging Dimensions (Unit: mm) | Quantity |
| <p>Tape & Box & P0=12.7mm</p>  | 750pcs/ box (180K~241K) |
| | 600pcs/ box (271K~331K) |
| | 500pcs/ box (361K~621K) |
| | 400pcs/ box (681K~751K) |
| | 350pcs/ box (781K~112K) |

Quantity

| Packaging Dimensions (Unit: mm) | Quantity |
|--|--|
| <p>Tape & Reel & P0=12.7mm</p>  | <p>1000pcs/reel (180K~331K)</p> <p>750pcs/reel (361K~621K)</p> <p>500pcs/reel (681K~751K)</p> <p>400pcs/reel (781K~112K)</p> |
| <p>Packaging Dimensions (Unit: mm)</p> <p>Tape & Box & P0=15.0mm</p>  | <p>500pcs/ box (180K~331K)</p> <p>400pcs/ box (361K~751K)</p> <p>300pcs/ box (781K~112K)</p> |
| <p>Tape & Reel & P0=15.0mm</p>  | <p>750pcs/reel (180K~331K)</p> <p>600pcs/reel (361K~751K)</p> <p>500pcs/reel (781K~112K)</p> |

Storage Condition of Products

(I) Storage Conditions :

- 1.Storage Temperature : $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- 2.Relative Humidity : $\cong 80\%RH$
- 3.Keep away from corrosive atmosphere and sunlight.

(II) Period of Storage : 1 year

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