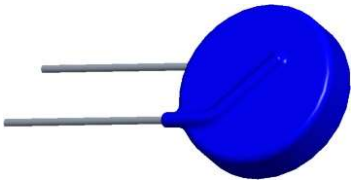
## Features

- 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
- Moisture sensitivity level：Level 1
- Operating Temperature：-40℃~+105℃
- Storage Temperature：-40℃~+125℃

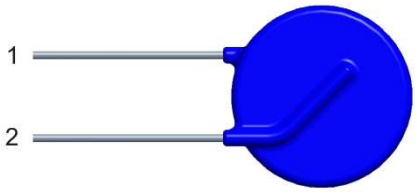
## Exterior



## Application information

- 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

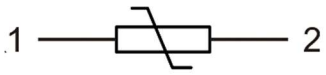
## Package (Top View)




## Agency Approvals

| Icon | Description |
|---|---|
| RoHS | Compliance with 2011/65/EU |
| HF | Compliance with IEC61249-2-21:2003 |
| Pb | Mean lead free |

## Schematic Symbol




## 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) | IP (A) | VC (V) | I (A) Standard | I (A) High Surge | (J) Standard | (J) High Surge | (W) | @1KHz (pf) |
| 10D180K | 10D180KH | 11 | 12 | 18(15~21.6) | 5 | 36 | 500 | 1000 | 2.1 | 3.0 | 0.05 | 5600 |
| 10D220K | 10D220KH | 14 | 18 | 22(19.5~26) | 5 | 43 | 500 | 1000 | 2.5 | 5.0 | 0.05 | 4500 |
| 10D270K | 10D270KH | 17 | 22 | 27(24~31) | 5 | 53 | 500 | 1000 | 3.0 | 6.0 | 0.05 | 3700 |
| 10D330K | 10D330KH | 20 | 26 | 33(29.5~36.5) | 5 | 65 | 500 | 1000 | 4.0 | 7.0 | 0.05 | 3000 |
| 10D390K | 10D390KH | 25 | 31 | 39(35~43) | 5 | 77 | 500 | 1000 | 4.6 | 9.0 | 0.05 | 2400 |
| 10D470K | 10D470KH | 30 | 38 | 47(42~52) | 5 | 93 | 500 | 1000 | 5.5 | 11.0 | 0.05 | 2100 |
| 10D560K | 10D560KH | 35 | 45 | 56(50~62) | 5 | 110 | 500 | 1000 | 7.0 | 13.0 | 0.05 | 1800 |
| 10D680K | 10D680KH | 40 | 56 | 68(61~75) | 5 | 135 | 500 | 1000 | 8.2 | 15.0 | 0.05 | 1500 |
| 10D820K | 10D820KH | 50 | 65 | 82(74~90) | 25 | 145 | 2500 | 3500 | 12.0 | 17.0 | 0.4 | 1200 |

| 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) | IP (A) | VC (V) | I (A) Standard | I (A) High Surge | (J) Standard | (J) High Surge | (W) | @1KHz (pf) |
| 10D101K | 10D101KH | 60 | 85 | 100(90~110) | 25 | 165 | 2500 | 3500 | 15.0 | 18.0 | 0.4 | 1000 |
| 10D121K | 10D121KH | 75 | 100 | 120(108~132) | 25 | 200 | 2500 | 3500 | 18.0 | 21.0 | 0.4 | 830 |
| 10D151K | 10D151KH | 95 | 125 | 150(135~165) | 25 | 250 | 2500 | 3500 | 22.0 | 25.0 | 0.4 | 670 |
| 10D181K | 10D181KH | 115 | 150 | 180(162~198) | 25 | 300 | 2500 | 3500 | 27.0 | 30.0 | 0.4 | 560 |
| 10D201K | 10D201KH | 130 | 170 | 200(180~220) | 25 | 340 | 2500 | 3500 | 30.0 | 35.0 | 0.4 | 500 |
| 10D221K | 10D221KH | 140 | 180 | 220(198~242) | 25 | 360 | 2500 | 3500 | 32.0 | 39.0 | 0.4 | 450 |
| 10D241K | 10D241KH | 150 | 200 | 240(216~264) | 25 | 395 | 2500 | 3500 | 35.0 | 42.0 | 0.4 | 420 |
| 10D271K | 10D271KH | 175 | 225 | 270(243~297) | 25 | 455 | 2500 | 3500 | 37.0 | 42.0 | 0.4 | 370 |
| 10D301K | 10D301KH | 190 | 250 | 300(270~330) | 25 | 500 | 2500 | 3500 | 40.0 | 54.0 | 0.4 | 330 |
| 10D331K | 10D331KH | 210 | 275 | 330(297~363) | 25 | 550 | 2500 | 3500 | 43.0 | 58.0 | 0.4 | 300 |
| 10D361K | 10D361KH | 230 | 300 | 360(324~396) | 25 | 595 | 2500 | 3500 | 47.0 | 65.0 | 0.4 | 280 |
| 10D391K | 10D391KH | 250 | 320 | 390(351~429) | 25 | 650 | 2500 | 3500 | 60.0 | 70.0 | 0.4 | 260 |
| 10D431K | 10D431KH | 275 | 350 | 430(387~473) | 25 | 710 | 2500 | 3500 | 65.0 | 80.0 | 0.4 | 230 |
| 10D471K | 10D471KH | 300 | 385 | 470(423~517) | 25 | 775 | 2500 | 3500 | 67.0 | 85.0 | 0.4 | 210 |
| 10D511K | 10D511KH | 320 | 415 | 510(459~561) | 25 | 845 | 2500 | 3500 | 69.0 | 90.0 | 0.4 | 200 |
| 10D561K | 10D561KH | 350 | 460 | 560(504~616) | 25 | 925 | 2500 | 3500 | 70.0 | 92.0 | 0.4 | 180 |
| 10D621K | 10D621KH | 385 | 505 | 620(558~682) | 25 | 1025 | 2500 | 3500 | 72.0 | 95.0 | 0.4 | 160 |
| 10D681K | 10D681KH | 420 | 560 | 680(612~748) | 25 | 1120 | 2500 | 3500 | 75.0 | 98.0 | 0.4 | 150 |
| 10D751K | 10D751KH | 460 | 615 | 750(675~825) | 25 | 1240 | 2500 | 3500 | 77.0 | 100.0 | 0.4 | 130 |
| 10D781K | 10D781KH | 485 | 640 | 780(702~858) | 25 | 1290 | 2500 | 3500 | 80.0 | 105.0 | 0.4 | 125 |
| 10D821K | 10D821KH | 510 | 670 | 820(738~902) | 25 | 1355 | 2500 | 3500 | 85.0 | 110.0 | 0.4 | 120 |
| 10D911K | 10D911KH | 550 | 745 | 910(819~1001) | 25 | 1500 | 2500 | 3500 | 93.0 | 130.0 | 0.4 | 110 |
| 10D102K | 10D102KH | 625 | 825 | 1000(900~1100) | 25 | 1650 | 2500 | 3500 | 102.0 | 140.0 | 0.4 | 100 |
| 10D112K | 10D112KH | 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 V1mA)：IR≤50μA (180K~680K) ; IR≤25μA (820K~112K).

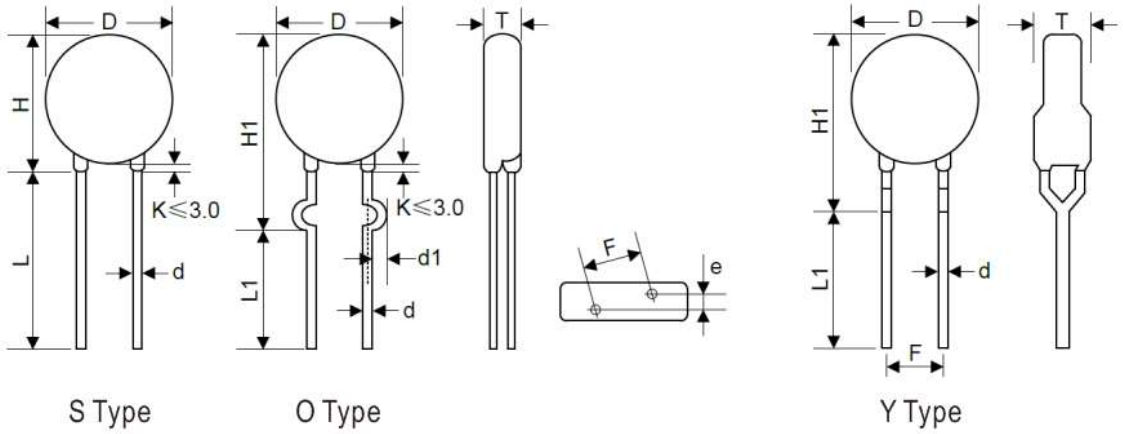
3. The foot shape can be customized according to customer needs.

## Part Numbering System

| B | M | O | V | 1 | 0 | D | 4 | 7 | 1 | K | S | C | H | 0 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

| Bencent MOV | Element Diameter | | Type | Varistor Voltage | | Tolerance | | Lead Shape | | Packing | | Internal control code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 07 | Φ7mm | D: Disk | 180 | 18V | K | ±10% | S | Straight leads | C | Bulk | 001~ZZZ |
| | 10 | Φ10mm | | 101 | 100V | M | ±20% | Y | Y Kinked leads | T | Tape & Box | No suffix: Standard type |
| | 14 | Φ14mm | | 102 | 1000V | | | O | Outside crimped leads | R | Tape & Reel | |
| | 20 | Φ20mm | | | | | | | | | | |

## Dimensions




S Type O Type Y Type

Notes:The foot shape can be customized according to customer needs.

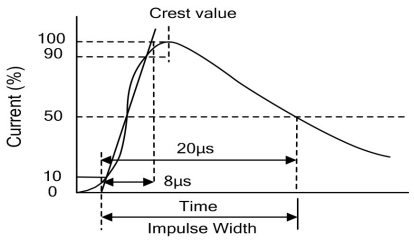
Unit: mm

| Table 1 | |
|---|---|
| Symbol | Dimension |
| H | 10.5~16.5 |
| H1 | 13.5~18.5 |
| L(min) | 20 |
| L1(min) | 15 |
| D(max) | 14 |
| F | 7.5±0.8 |
| T | Table 2 |
| e(±0. 8) | Table 2 |
| d(±0. 05) | 0.8 |
| d1(±0. 4) | 1. 4 |

Unit: mm

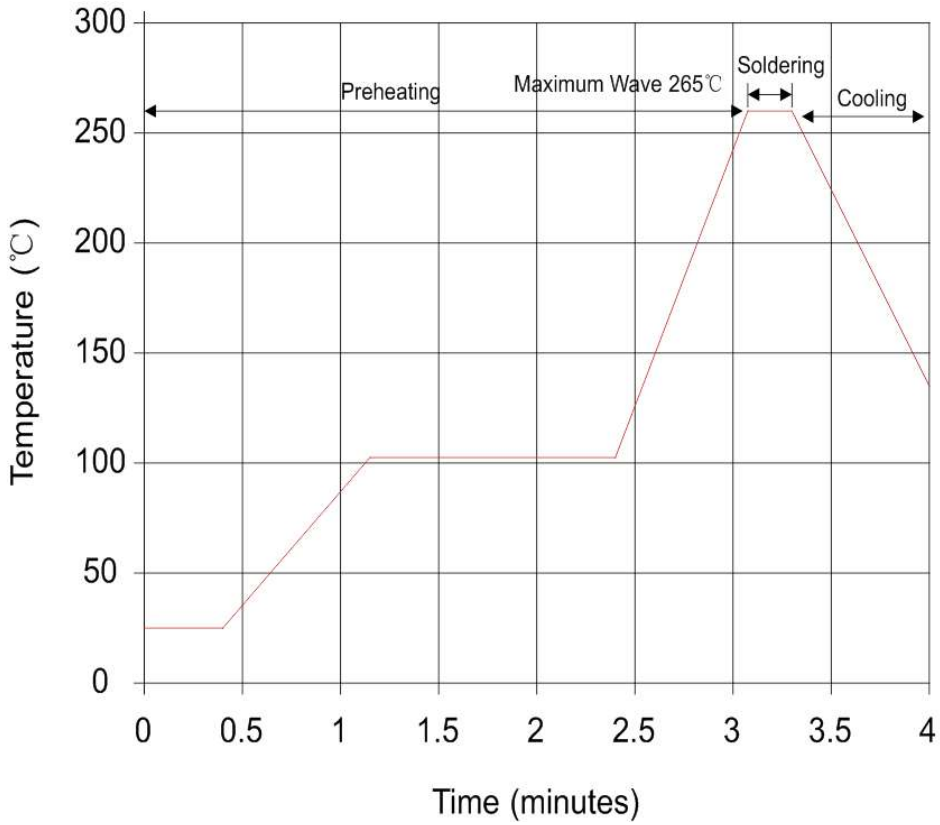
| Table 2 | | | | | |
|---|---|---|---|---|---|
| Model | T | e | Model | T | e |
| 180K | 2.44~5.27 | 1.5 | 301K | 3.06~6.28 | 2.5 |
| 220K | 2.54~5.41 | 1.6 | 331K | 3.16~6.46 | 2.5 |
| 270K | 2.65~5.61 | 1.8 | 361K | 3.26~6.64 | 2.7 |
| 330K | 2.77~5.79 | 1.7 | 391K | 3.35~6.82 | 2.8 |
| 390K | 2.73~5.58 | 1.8 | 431K | 3.48~7.06 | 3.0 |
| 470K | 2.85~5.80 | 1.9 | 471K | 3.61~7.29 | 3.2 |
| 560K | 2.99~6.04 | 2.0 | 511K | 3.74~7.53 | 3.4 |
| 680K | 3.19~6.32 | 2.2 | 561K | 3.90~7.83 | 3.6 |
| 820K | 2.58~5.30 | 1.8 | 621K | 4.09~8.29 | 3.9 |
| 101K | 2.69~5.47 | 2.0 | 681K | 4.29~8.54 | 4.2 |
| 121K | 2.81~5.67 | 2.2 | 751K | 4.51~8.63 | 4.3 |
| 151K | 2.58~5.39 | 1.8 | 781K | 4.61~8.69 | 4.4 |
| 181K | 2.68~5.57 | 1.9 | 821K | 4.74~8.90 | 4.6 |
| 201K | 2.76~5.72 | 2.0 | 911K | 5.03~8.95 | 5.0 |
| 221K | 2.81~5.81 | 2.1 | 102K | 5.31~9.39 | 5.1 |
| 241K | 2.87~5.93 | 2.2 | 112K | 5.64~9.88 | 5.4 |
| 271K | 2.97~6.11 | 2.4 | | | |

## Electrical Ratings

| Items | Test Condition/Description | Requirement |
|---|---|---|
| Varistor Voltage | The voltage between the two terminals with the specified measuring current 1mA.DC applied is called $V_{1mA}$. | To meet the Specified value |
| Maximum Allowable Voltage | The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously. | |
| Maximum Clamping Voltage | The maximum voltage between the two terminals with the specification standard impulse current.<br>Applied waveform: 8/20μs<br>  | |
| Rated Wattage | The maximum average power that can be applied within the specified ambient temperature. | |
| Energy | The maximum energy within the varistor voltage change of ±10%when one impulse of 10/1000μs or 2ms is applied. | |
| Withstanding Surge Current | The maximum current within the varistor voltage change of ±10% withthe standard impulse current (8/20μs) applied one time. | |
| Varistor Voltage Temp. Coefficient | $\left\lvert \frac{V_{1mA@105℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{80} \times 100\%(\%/℃) \right\rvert$ | ≤0.05%/℃ |
| | $\left\lvert \frac{V_{1mA@-40℃}-V_{1mA@25℃}}{V_{1mA@25℃}} \times \frac{1}{65} \times 100\%(\%/℃) \right\rvert$ | |
| Surge Life | The change of Vb shall be measured after the impulse listed below which is applied 10,000 times continuously with the interval of ten seconds at room temperature.<br>10Φ series: 180K to 680K — 50A (8/20μs); 820K to 112K — 100A (8/20μs) | $\frac{\Delta Vb}{Vb} \leq \pm 10\%$ |

## 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℃ |
| Soldering Time | 3 seconds (max) |
| Distance from Varistor | 2mm (min) |

## Mechanical Characteristics

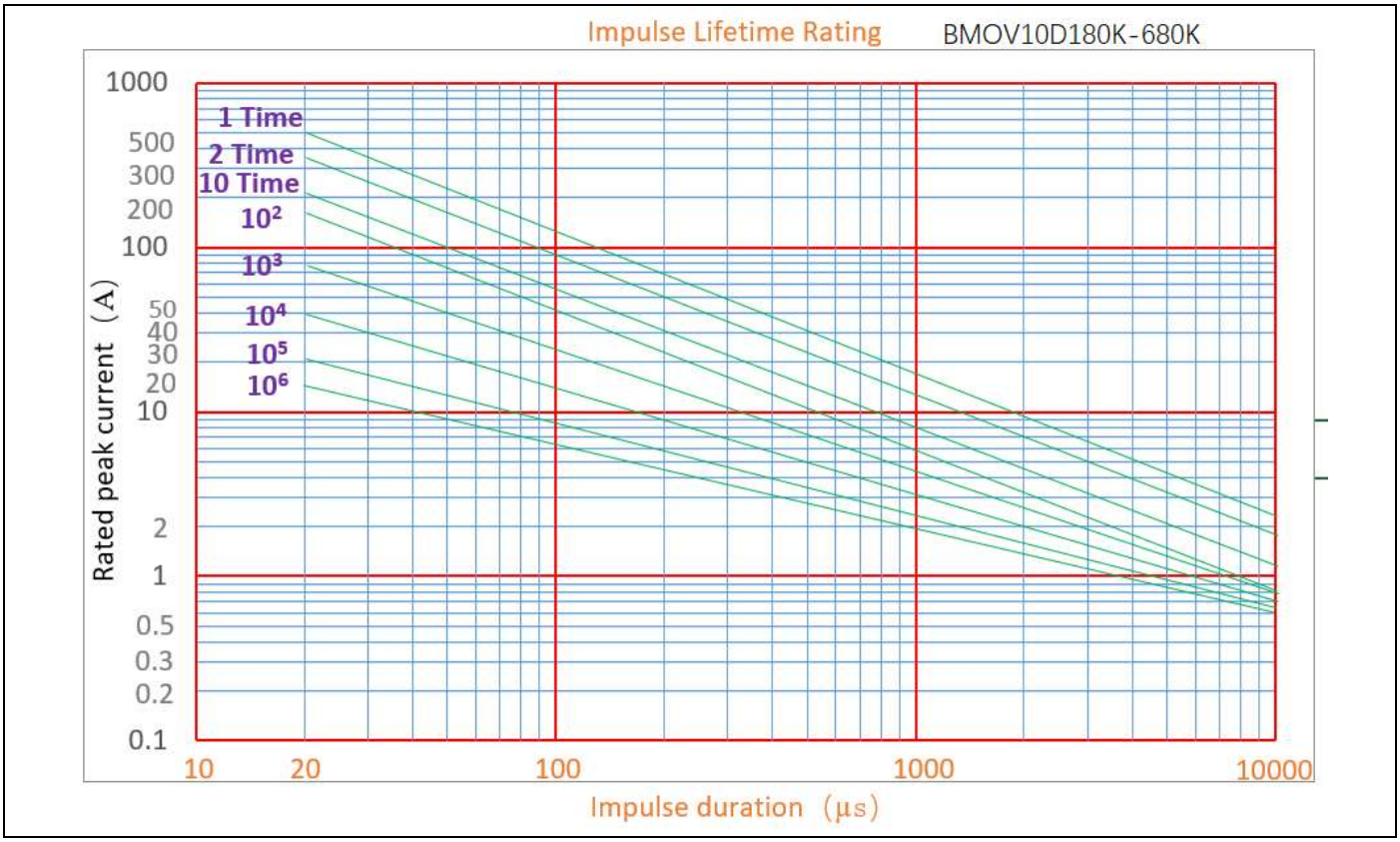
| Items | Test conditions / Methods | Specifications |
|---|---|---|
| Tensile Strength of Terminals | Gradually applying the force specified and keeping the unit fixed for 10±1 sec<br>Terminal diameter (mm) / Force (kg)<br>0.5＜d≤0.8 / 1.0<br>0.8＜d≤1.25 / 2.0<br>1.25＜d / 4.0 | No visible damage<br>\|△V1mA/V1mA \|≤5% |
| Bending Strength of Terminals | 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>\|△V1mA/V1mA \|≤5% |
| Vibration | 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>\|△V1mA/V1mA \|≤5% |
| Solder ability | Solder Temp: 245±5˚C<br>Dipping Time: 2±0.5 sec | Atleast 95% of terminal electrode is covered by new solder |
| Resistance to Soldering Heat | Solder Temp: 260±5˚C<br>Dipping Time: 10±1 sec | No visible damage<br>\|△V1mA/V1mA \|≤10% |

## Reliability

| Items | Test conditions / Methods | Specifications |
|---|---|---|
| High Temperature Storage | Ambient Temp: 125±2˚C<br>Duration: 1000hrs | \|△V1mA/V1mA \|≤5% |
| Low Temperature Storage | Ambient Temp: -40±2˚C<br>Duration: 1000hrs | \|△V1mA/V1mA \|≤5% |
| Humidity | Ambient Temp: 40±2˚C, 90~95% R.H.<br>Duration: 1000hrs | \|△V1mA/V1mA \|≤5% |
| Temperature Cycle | The conditions shown below shall be repeated 5 cycles<br>Step / Temperature (˚C) / Period (minutes)<br>1 / -40±3 / 30±3<br>2 / Room temperature / 15±3<br>3 / 125±3 / 30±3<br>4 / Room temperature / 15±3 | No visible damage<br>\|△V1mA/V1mA \|≤5% |

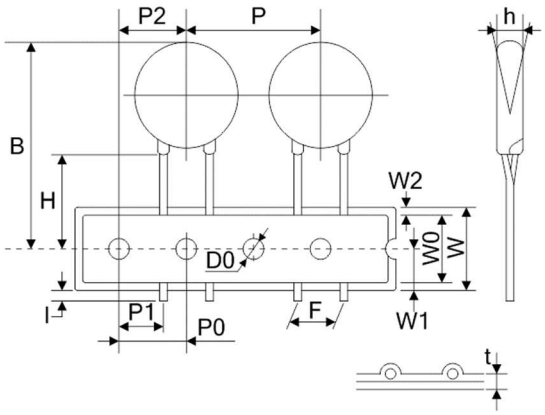
| Items | Test conditions / Methods | Specifications |
|---|---|---|
| High Temperature Load | Ambient Temp: 105±2˚C Duration: 1000hrs<br>Load: Max. Allowable Voltage In AC eara. | \|△V1mA/V1mA \|≤10% |
| Damp Heat Load | Ambient Temp: 40±2˚C, 90~95% R.H.<br>Duration: 1000hrs Load: Max. Allowable Voltage | No visible damage<br>\|△V1mA/V1mA \|≤10% |
| Voltage Proof | Metal balls method,<br>1000Vac 1 min.(180K~331K), 1500Vac 1 min.(361K~112K) | No visible damage |

## Maximum Surge Current Derating Curve



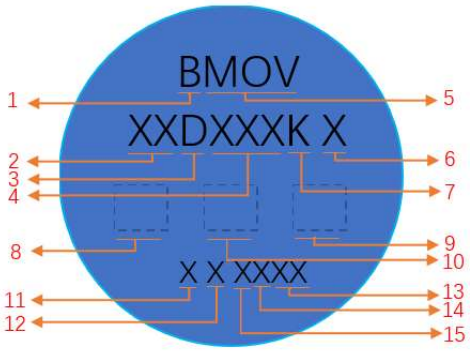


## Taping Dimensions




| 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 |
| H | 20.0±2.0 |
| I | 1.0max |
| D0 | 4.0±0.2 |
| t | 0.6±0.3 |
| B | 36max |

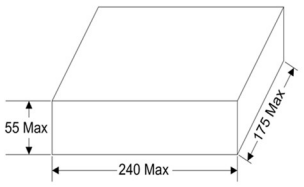
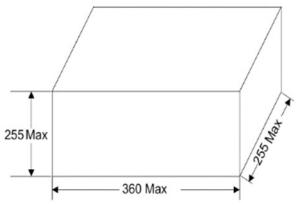
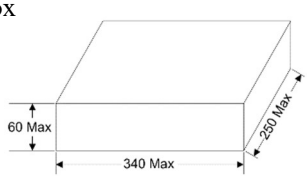
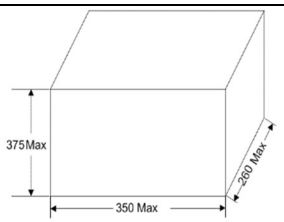
## Marking Code

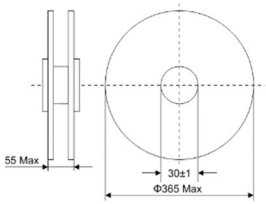
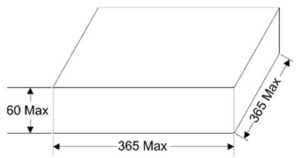
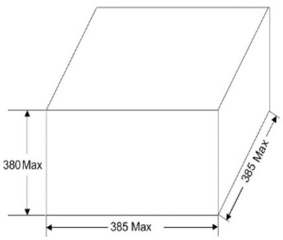



1 B:Bencent
2 XX:Disk size（mm）：07、10、14、20、25…
3 D:Round；S:Square；R:Superposition;N/M/E:TMOV
4 XXX:Varistor voltage specifications
5 MOV:Metal Oxide Varistor
6 X:High Surge Code，no"X" is standard Surge
7 K:The varistor voltage range,±10%;L: ±15%;M: ±20%
8 UL Mark；9 CSA Mark;10 TUV Mark
11X:Disk product line Code ； 12X:Finished line code
13XX:Date Code，1、2、3…29、30、31
14X:Month Code，A 、B 、C…J、K 、L
15X:Year Code，A 、B 、C…X、Y、Z

## Quantity

Packaging Dimensions (Unit: mm)

| Inner box size | Outer box size | Quantity |
|---|---|---|
| Bulk   |   | 500pcs/bag<br>2bags/box<br>(180K~621K) |
| | | 400pcs/bag<br>2bags/box<br>(681K~112K) |
| Tape & Box   |   | 100pcs/box<br>(180K~331K) |
| | | 750pcs/box<br>(361K~621K) |
| | | 500pcs/box<br>(681K~112K) |

| Reel size | Inner box size | Outer box size | Quantity |
|---|---|---|---|
| Tape & Reel   |   |   | 750pcs/reel<br>(180K~331K) |
| | | | 500pcs/reel<br>(361K~621K) |
| | | | 300pcs/reel<br>(681K~112K) |