

## Metal Oxide Varistor (MOV) Data Sheet

### Features

- Wide operating voltage ( $V_{1mA}$ ) range from 18V to 750V
- 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
- Safety certification:
  - UL: E327997
  - CSA: 246579
  - VDE: 40027827

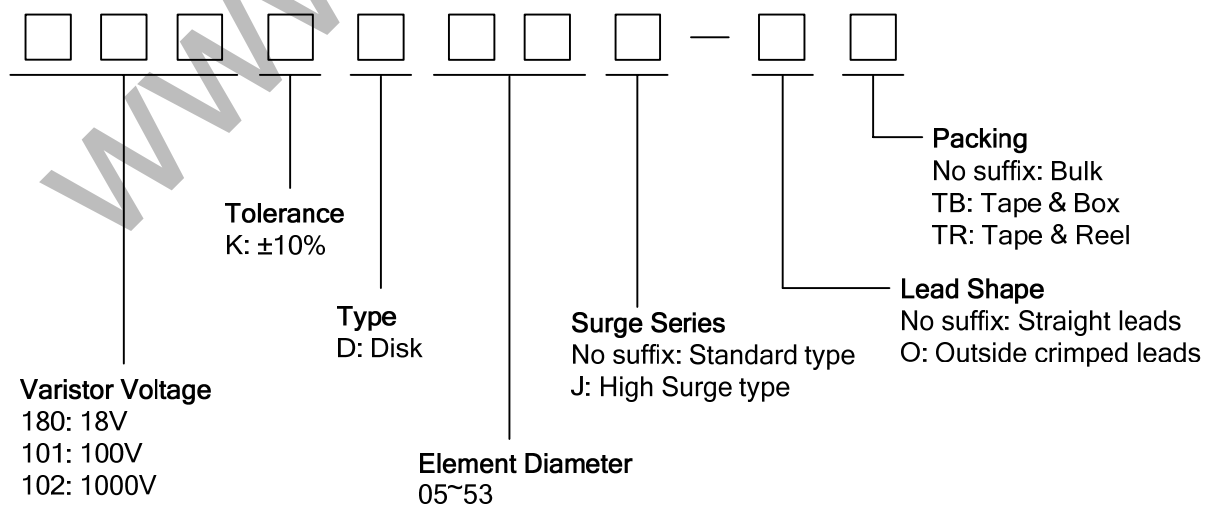
### Applications

- 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

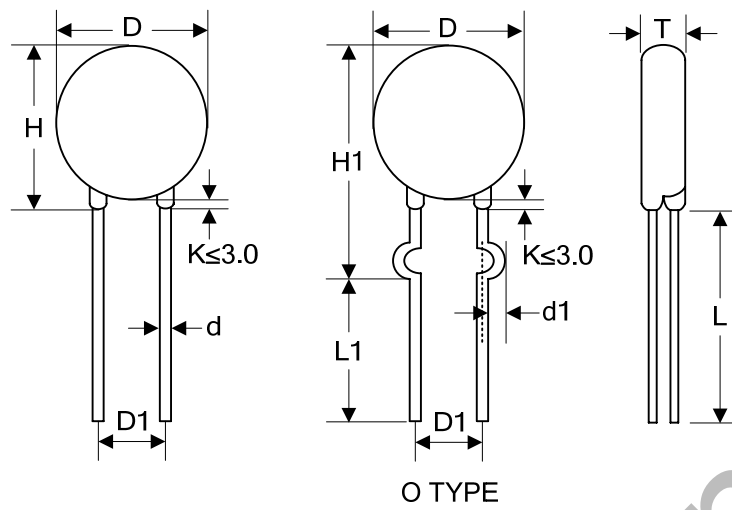
### General Characteristics Definition

- Operating Temperature:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Storage Temperature:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$

### Part Number Code



**Dimensions**



| TABLE 1  |           |
|----------|-----------|
| Unit: mm |           |
| Symbol   | Dimension |
| H(max.)  | 10.5      |
| H1(max.) | 13.0      |
| L(min.)  | 20.0      |
| L1(min.) | 15.0      |
| D(max.)  | 7.5       |
| D1(±0.8) | 5.0       |
| T(max.)  | TABLE 2   |
| d(±0.05) | 0.6       |
| d1(±0.4) | 1.2       |

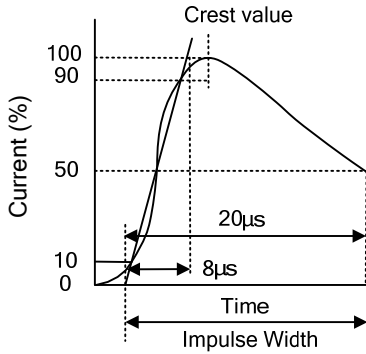
| TABLE 2  |         |       |         |
|----------|---------|-------|---------|
| Unit: mm |         |       |         |
| Model    | T(max.) | Model | T(max.) |
| 180K     | 4.50    | 221K  | 4.50    |
| 220K     | 4.60    | 241K  | 4.60    |
| 270K     | 4.70    | 271K  | 4.90    |
| 330K     | 4.90    | 301K  | 5.00    |
| 390K     | 4.80    | 331K  | 5.10    |
| 470K     | 4.90    | 361K  | 5.20    |
| 560K     | 5.00    | 391K  | 5.40    |
| 680K     | 5.20    | 431K  | 5.70    |
| 820K     | 4.10    | 471K  | 6.00    |
| 101K     | 4.30    | 511K  | 6.20    |
| 121K     | 4.50    | 561K  | 6.50    |
| 151K     | 4.80    | 621K  | 6.50    |
| 181K     | 4.30    | 681K  | 6.87    |
| 201K     | 4.40    | 751K  | 6.90    |

**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)                      |
| 180KD05     | 180KD05J   | 11                        | 14                  | 18(15~21.6)          | 1                        | 40                 | 100                        | 250              | 0.4                        | 0.6            | 0.01        | 1400                            |
| 220KD05     | 220KD05J   | 14                        | 18                  | 22(19.5~26)          | 1                        | 48                 | 100                        | 250              | 0.5                        | 0.7            | 0.01        | 1150                            |
| 270KD05     | 270KD05J   | 17                        | 22                  | 27(24~31)            | 1                        | 60                 | 100                        | 250              | 0.6                        | 0.9            | 0.01        | 930                             |
| 330KD05     | 330KD05J   | 20                        | 26                  | 33(29.5~36.5)        | 1                        | 73                 | 100                        | 250              | 0.8                        | 1.1            | 0.01        | 760                             |
| 390KD05     | 390KD05J   | 25                        | 31                  | 39(35~43)            | 1                        | 80                 | 100                        | 250              | 0.9                        | 1.2            | 0.01        | 640                             |
| 470KD05     | 470KD05J   | 30                        | 38                  | 47(42~52)            | 1                        | 104                | 100                        | 250              | 1.1                        | 1.5            | 0.01        | 530                             |
| 560KD05     | 560KD05J   | 35                        | 45                  | 56(50~62)            | 1                        | 123                | 100                        | 250              | 1.3                        | 1.8            | 0.01        | 450                             |
| 680KD05     | 680KD05J   | 40                        | 56                  | 68(61~75)            | 1                        | 145                | 100                        | 250              | 1.6                        | 2.2            | 0.01        | 370                             |
| 820KD05     | 820KD05J   | 50                        | 65                  | 82(74~90)            | 5                        | 150                | 400                        | 800              | 2.5                        | 4.0            | 0.1         | 300                             |
| 101KD05     | 101KD05J   | 60                        | 85                  | 100(90~110)          | 5                        | 177                | 400                        | 800              | 3.0                        | 4.1            | 0.1         | 250                             |
| 121KD05     | 121KD05J   | 75                        | 100                 | 120(108~132)         | 5                        | 210                | 400                        | 800              | 4.0                        | 4.9            | 0.1         | 210                             |
| 151KD05     | 151KD05J   | 95                        | 125                 | 150(135~165)         | 5                        | 260                | 400                        | 800              | 4.1                        | 6.5            | 0.1         | 165                             |
| 181KD05     | 181KD05J   | 115                       | 150                 | 180(162~198)         | 5                        | 320                | 400                        | 800              | 4.9                        | 7.5            | 0.1         | 140                             |
| 201KD05     | 201KD05J   | 130                       | 170                 | 200(180~220)         | 5                        | 355                | 400                        | 800              | 6.5                        | 8.5            | 0.1         | 125                             |
| 221KD05     | 221KD05J   | 140                       | 180                 | 220(198~242)         | 5                        | 380                | 400                        | 800              | 7.5                        | 9.0            | 0.1         | 110                             |
| 241KD05     | 241KD05J   | 150                       | 200                 | 240(216~264)         | 5                        | 415                | 400                        | 800              | 8.0                        | 10.5           | 0.1         | 100                             |
| 271KD05     | 271KD05J   | 175                       | 225                 | 270(243~297)         | 5                        | 475                | 400                        | 800              | 8.5                        | 11.0           | 0.1         | 95                              |
| 301KD05     | 301KD05J   | 190                       | 250                 | 300(270~330)         | 5                        | 520                | 400                        | 800              | 9.0                        | 12.0           | 0.1         | 85                              |
| 331KD05     | 331KD05J   | 210                       | 275                 | 330(297~363)         | 5                        | 570                | 400                        | 800              | 9.5                        | 13.0           | 0.1         | 75                              |
| 361KD05     | 361KD05J   | 230                       | 300                 | 360(324~396)         | 5                        | 620                | 400                        | 800              | 10.0                       | 16.0           | 0.1         | 70                              |
| 391KD05     | 391KD05J   | 250                       | 320                 | 390(351~429)         | 5                        | 675                | 400                        | 800              | 12.0                       | 17.0           | 0.1         | 65                              |
| 431KD05     | 431KD05J   | 275                       | 350                 | 430(387~473)         | 5                        | 745                | 400                        | 800              | 13.0                       | 20.0           | 0.1         | 60                              |
| 471KD05     | 471KD05J   | 300                       | 385                 | 470(423~517)         | 5                        | 810                | 400                        | 800              | 15.0                       | 21.0           | 0.1         | 55                              |
| 511KD05     | 511KD05J   | 320                       | 415                 | 510(459~561)         | 5                        | 845                | 400                        | 800              | 16.0                       | 22.5           | 0.1         | 50                              |
| 561KD05     | 561KD05J   | 350                       | 460                 | 560(504~616)         | 5                        | 920                | 400                        | 800              | 16.0                       | 24.0           | 0.1         | 45                              |
| 621KD05     | 621KD05J   | 385                       | 505                 | 620(558~682)         | 5                        | 1025               | 400                        | 800              | 21.0                       | 25.0           | 0.1         | 40                              |
| 681KD05     | 681KD05J   | 420                       | 560                 | 680(612~748)         | 5                        | 1120               | 400                        | 800              | 21.0                       | 29.0           | 0.1         | 35                              |
| 751KD05     | 751KD05J   | 460                       | 615                 | 750(675~825)         | 5                        | 1240               | 400                        | 800              | 22.4                       | 32.0           | 0.1         | 30                              |

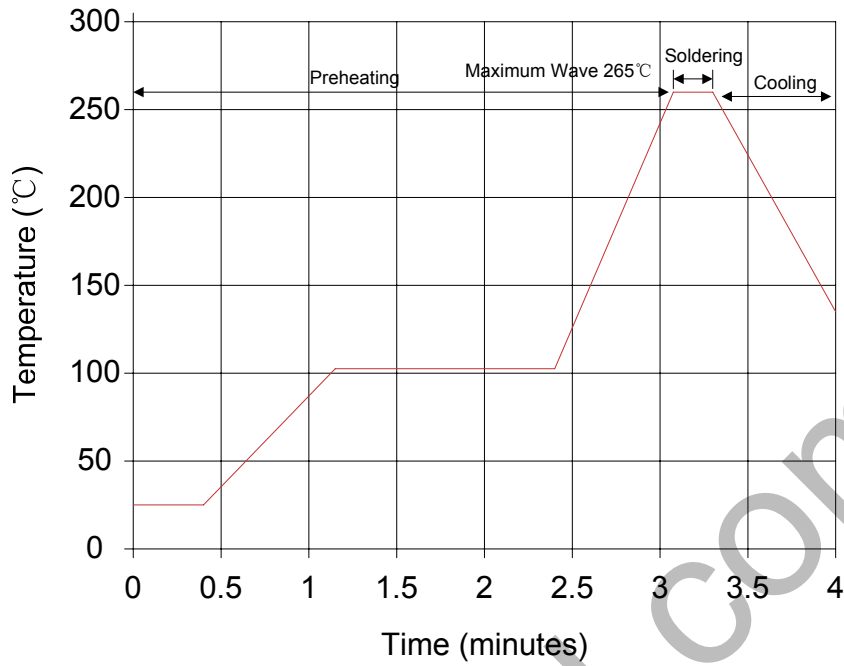
Notes: The tolerance of varistor voltage between 18V and 27V is more than 10%.

**Electrical Ratings**

| Items                              | Test Condition/Description  | Requirement                 |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|------------------------------------|---|-----------------------------|--------------|--------------|--------------|--------------|-----------|--------------|--------------|--------------|--------------|------------|--------------|--------------|--------------|---------------|------------|--------------|--------------|--------------|---------------|------------|--------------|---------------|--------------|---------------|--|
| Varistor Voltage                   | The voltage between two terminals with the specified measuring current 1mA.DC applied is called Vb.   |                             |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| Maximum Allowable Voltage          | The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously.  |                             |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| Maximum Clamping Voltage           | <p>The maximum voltage between two terminals with the specification standard impulse current.<br/>Applied waveform: 8/20μs</p>   | To meet the Specified value |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| 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% with the standard impulse current (8/20μs) applied one time.   |                             |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| Varistor Voltage Temp. Coefficient | $\frac{V_b \text{ at } 20^{\circ}\text{C} - V_b \text{ at } 70^{\circ}\text{C}}{V_b \text{ at } 20^{\circ}\text{C}} \times \frac{1}{50} \times 100(\%/^{\circ}\text{C})$  | 0.05%/°C max                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| Surge Life                         | <p>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.</p> <table border="1" data-bbox="443 1460 1203 1928"> <tbody> <tr> <td rowspan="2">5Φ series</td> <td>180K to 680K</td> <td>10A (8/20μs)</td> </tr> <tr> <td>820K to 751K</td> <td>20A (8/20μs)</td> </tr> <tr> <td rowspan="2">7Φ series</td> <td>180K to 680K</td> <td>25A (8/20μs)</td> </tr> <tr> <td>820K to 821K</td> <td>50A (8/20μs)</td> </tr> <tr> <td rowspan="2">10Φ series</td> <td>180K to 680K</td> <td>50A (8/20μs)</td> </tr> <tr> <td>820K to 112K</td> <td>100A (8/20μs)</td> </tr> <tr> <td rowspan="2">14Φ series</td> <td>180K to 680K</td> <td>75A (8/20μs)</td> </tr> <tr> <td>820K to 182K</td> <td>150A (8/20μs)</td> </tr> <tr> <td rowspan="2">20Φ series</td> <td>180K to 680K</td> <td>100A (8/20μs)</td> </tr> <tr> <td>820K to 182K</td> <td>200A (8/20μs)</td> </tr> </tbody> </table> | 5Φ series                   | 180K to 680K | 10A (8/20μs) | 820K to 751K | 20A (8/20μs) | 7Φ series | 180K to 680K | 25A (8/20μs) | 820K to 821K | 50A (8/20μs) | 10Φ series | 180K to 680K | 50A (8/20μs) | 820K to 112K | 100A (8/20μs) | 14Φ series | 180K to 680K | 75A (8/20μs) | 820K to 182K | 150A (8/20μs) | 20Φ series | 180K to 680K | 100A (8/20μs) | 820K to 182K | 200A (8/20μs) | $\frac{\Delta V_b}{V_b} \leq \pm 10\%$ |
| 5Φ series                          | 180K to 680K  |                             | 10A (8/20μs) |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|                                    | 820K to 751K  | 20A (8/20μs)                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| 7Φ series                          | 180K to 680K  | 25A (8/20μs)                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|                                    | 820K to 821K  | 50A (8/20μs)                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| 10Φ series                         | 180K to 680K  | 50A (8/20μs)                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|                                    | 820K to 112K  | 100A (8/20μs)               |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| 14Φ series                         | 180K to 680K  | 75A (8/20μs)                |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|                                    | 820K to 182K  | 150A (8/20μs)               |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
| 20Φ series                         | 180K to 680K  | 100A (8/20μs)               |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |
|                                    | 820K to 182K  | 200A (8/20μs)               |              |              |              |              |           |              |              |              |              |            |              |              |              |               |            |              |              |              |               |            |              |               |              |               |  |

**Soldering Recommendation**

Wave Lead Free Soldering Recommendation

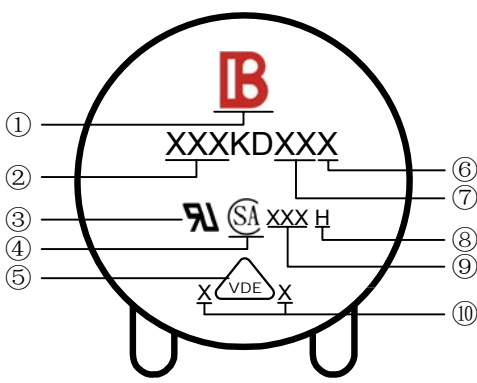


| Item             | Conditions |
|------------------|------------|
| Peak Temperature | 265°C      |
| Dipping Time     | 10 seconds |
| Soldering        | 1 time     |

Recommendation Reworking Conditions with Soldering Iron

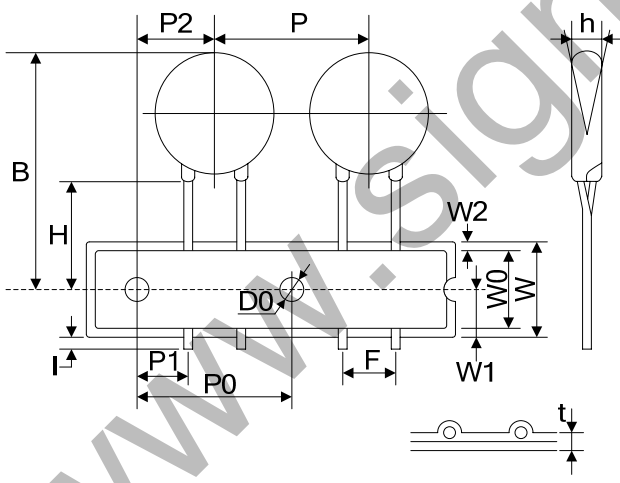
| Item                              | Conditions       |
|-----------------------------------|------------------|
| Temperature of Soldering Iron-tip | 360°C (max.)     |
| Soldering Time                    | 3 seconds (max.) |
| Distance from Varistor            | 2mm (min.)       |

**Marking Code**




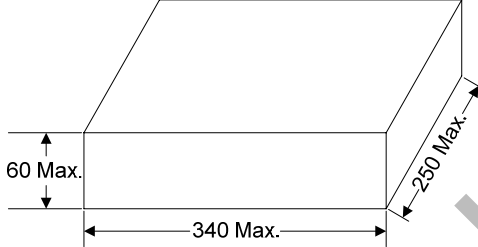
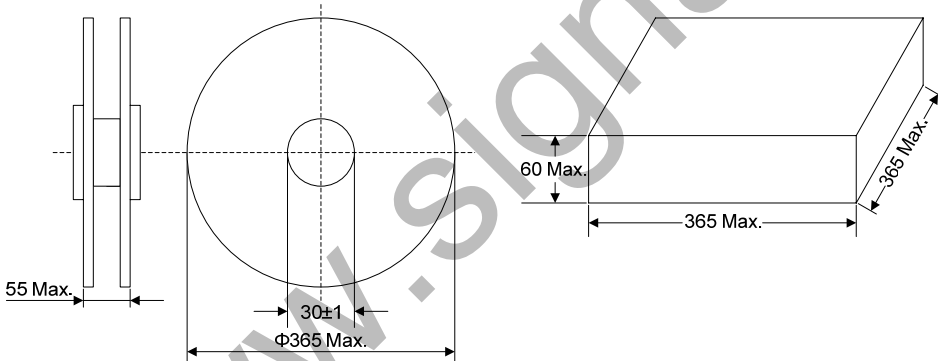
① Brightking Logo  
 ② Varistor Voltage  
 ③ UL Accreditation Logo  
 ④ CSA Accreditation Logo  
 ⑤ VDE Accreditation Logo  
 ⑥ “J” is High Surge Code, no “J” is Standard Surge  
 ⑦ Disk Size  
 ⑧ “H” is Halogen Free Code, no “H” is Halogen  
 ⑨ Date Code  
 ⑩ Product Line Code

**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         |
| H      | 20.0±2.0       |
| I      | 1.0max         |
| D0     | 4.0±0.2        |
| t      | 0.6±0.3        |
| B      | 32max          |

Quantity

| Packaging Dimensions (Unit: mm)   | Quantity                            |
|---|-------------------------------------|
| <p>Bulk</p>                | <p>1000pcs/bag<br/>2bags/box</p>    |
| <p>Tape &amp; Box</p>      | <p>1500pcs/box<br/>(180K~391K)</p>  |
| <p>Tape &amp; Reel</p>  | <p>2000pcs/reel<br/>(180K~391K)</p> |
|   | <p>1500pcs/reel<br/>(431K~751K)</p> |