

# DATA SHEET

## METAL OXIDE VARISTORS POWER SUPPLY

07H Series

RoHS compliant & Halogen free



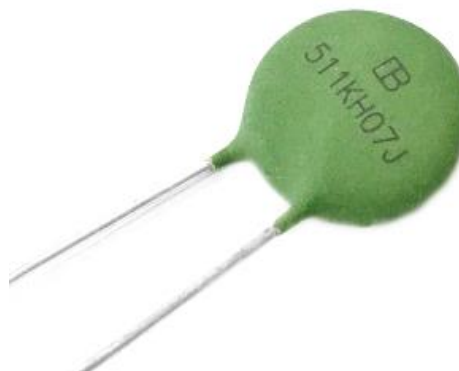
Product specification— April 11, 2022 V.2



## Metal Oxide Varistors (MOV) Data Sheet

### Features

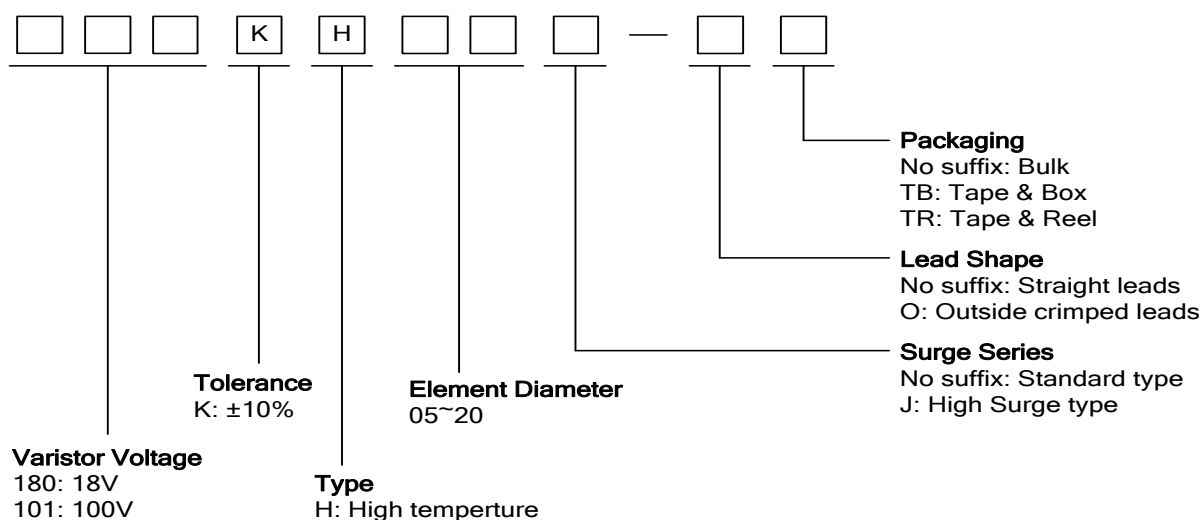
- Wide operating voltage ( $V_{1mA}$ ) range from 18V to 910V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level 1, per J-STD-020
- Operating Temperature:  $-40^{\circ}\text{C} \sim +140^{\circ}\text{C}$
- Storage Temperature:  $-40^{\circ}\text{C} \sim +140^{\circ}\text{C}$
- Safety certification: UL: E327997  
TUV: B0960480010  
CQC: 17001172542  
CSA: 246579



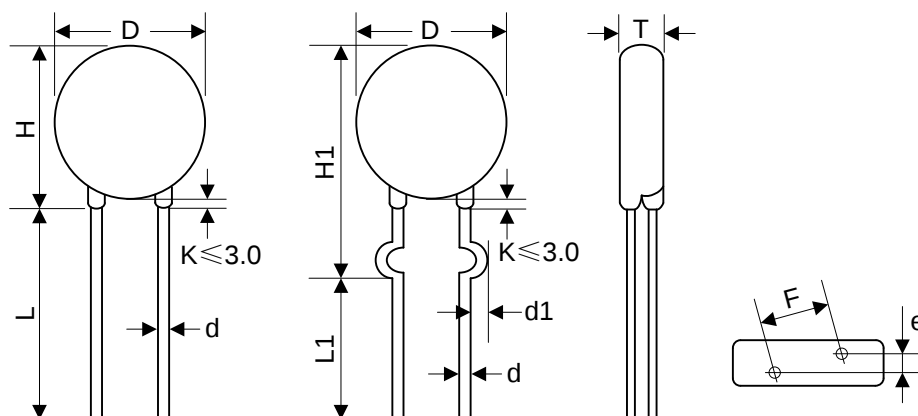
### Applications

- 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



O TYPE

Table 1

Unit: mm

| Symbol   | Dimension |
|----------|-----------|
| H        | 7.5~13.0  |
| H1       | 9.0~13.5  |
| L(min.)  | 20.0      |
| L1(min.) | 15.0      |
| D        | 7.0~10.0  |
| F(±0.8)  | 5.0       |
| T        | Table 2   |
| e(±0.8)  | Table 2   |
| d(±0.05) | 0.6       |
| d1(±0.4) | 1.2       |

Table 2

Unit: mm

| Model | T         | e   | Model | T         | e   |
|-------|-----------|-----|-------|-----------|-----|
| 180K  | 2.03~4.85 | 1.3 | 271K  | 2.57~5.71 | 2.2 |
| 220K  | 2.18~4.98 | 1.4 | 301K  | 2.66~5.88 | 2.3 |
| 270K  | 2.23~5.17 | 1.6 | 331K  | 2.76~6.06 | 2.3 |
| 330K  | 2.36~5.35 | 1.5 | 361K  | 2.86~6.24 | 2.5 |
| 390K  | 2.31~5.16 | 1.6 | 391K  | 2.95~6.42 | 2.6 |
| 470K  | 2.44~5.37 | 1.7 | 431K  | 3.08~6.66 | 2.8 |
| 560K  | 2.58~5.60 | 1.8 | 471K  | 3.21~6.89 | 3.0 |
| 680K  | 2.77~5.88 | 2.0 | 511K  | 3.34~7.13 | 3.2 |
| 820K  | 2.18~4.89 | 1.4 | 561K  | 3.50~7.43 | 3.4 |
| 101K  | 2.28~5.06 | 1.6 | 621K  | 3.69~7.79 | 3.7 |
| 121K  | 2.40~5.26 | 1.7 | 681K  | 3.89~8.14 | 4.0 |
| 151K  | 2.18~4.99 | 1.8 | 751K  | 4.11~8.56 | 4.1 |
| 181K  | 2.28~5.17 | 1.7 | 781K  | 4.21~8.74 | 4.2 |
| 201K  | 2.36~5.32 | 1.8 | 821K  | 4.34~8.98 | 4.4 |
| 221K  | 2.41~5.41 | 1.9 | 911K  | 4.63~9.51 | 4.6 |
| 241K  | 2.47~5.53 | 2.0 |       |           |     |

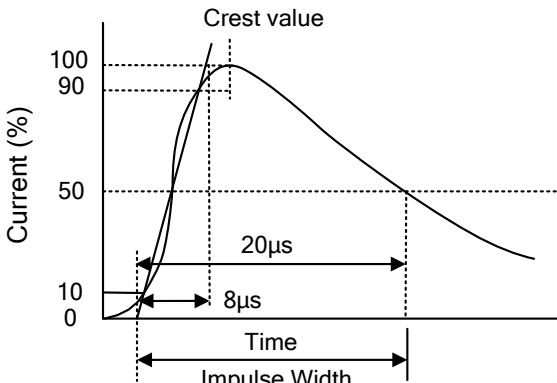
## Electrical Characteristics

| 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)                      |
| 180KH07     | 180KH07J   | 11                        | 14                  | 18(15~21.6)          | 2.5                      | 36                 | 250                        | 500              | 0.9                        | 2.0            | 0.02        | 2800                            |
| 220KH07     | 220KH07J   | 14                        | 18                  | 22(19.5~26)          | 2.5                      | 43                 | 250                        | 500              | 1.1                        | 2.4            | 0.02        | 2300                            |
| 270KH07     | 270KH07J   | 17                        | 22                  | 27(24~31)            | 2.5                      | 53                 | 250                        | 500              | 1.4                        | 3.0            | 0.02        | 1800                            |
| 330KH07     | 330KH07J   | 20                        | 26                  | 33(29.5~36.5)        | 2.5                      | 65                 | 250                        | 500              | 1.7                        | 3.5            | 0.02        | 1500                            |
| 390KH07     | 390KH07J   | 25                        | 31                  | 39(35~43)            | 2.5                      | 77                 | 250                        | 500              | 2.1                        | 4.0            | 0.02        | 1300                            |
| 470KH07     | 470KH07J   | 30                        | 38                  | 47(42~52)            | 2.5                      | 93                 | 250                        | 500              | 2.5                        | 5.0            | 0.02        | 1100                            |
| 560KH07     | 560KH07J   | 35                        | 45                  | 56(50~62)            | 2.5                      | 110                | 250                        | 500              | 3.1                        | 6.0            | 0.02        | 890                             |
| 680KH07     | 680KH07J   | 40                        | 56                  | 68(61~75)            | 2.5                      | 135                | 250                        | 500              | 3.6                        | 7.0            | 0.02        | 740                             |
| 820KH07     | 820KH07J   | 50                        | 65                  | 82(74~90)            | 10                       | 135                | 1200                       | 1750             | 5.0                        | 10.0           | 0.25        | 600                             |
| 101KH07     | 101KH07J   | 60                        | 85                  | 100(90~110)          | 10                       | 165                | 1200                       | 1750             | 6.5                        | 12.0           | 0.25        | 500                             |
| 121KH07     | 121KH07J   | 75                        | 100                 | 120(108~132)         | 10                       | 200                | 1200                       | 1750             | 7.8                        | 13.0           | 0.25        | 420                             |
| 151KH07     | 151KH07J   | 95                        | 125                 | 150(135~165)         | 10                       | 250                | 1200                       | 1750             | 9.7                        | 15.0           | 0.25        | 330                             |
| 181KH07     | 181KH07J   | 115                       | 150                 | 180(162~198)         | 10                       | 300                | 1200                       | 1750             | 11.7                       | 16.0           | 0.25        | 280                             |
| 201KH07     | 201KH07J   | 130                       | 170                 | 200(180~220)         | 10                       | 340                | 1200                       | 1750             | 13.0                       | 17.0           | 0.25        | 250                             |
| 221KH07     | 221KH07J   | 140                       | 180                 | 220(198~242)         | 10                       | 360                | 1200                       | 1750             | 14.0                       | 19.0           | 0.25        | 230                             |
| 241KH07     | 241KH07J   | 150                       | 200                 | 240(216~264)         | 10                       | 395                | 1200                       | 1750             | 15.0                       | 21.0           | 0.25        | 210                             |
| 271KH07     | 271KH07J   | 175                       | 225                 | 270(243~297)         | 10                       | 455                | 1200                       | 1750             | 18.0                       | 24.0           | 0.25        | 185                             |
| 301KH07     | 301KH07J   | 190                       | 250                 | 300(270~330)         | 10                       | 500                | 1200                       | 1750             | 20.0                       | 26.0           | 0.25        | 165                             |
| 331KH07     | 331KH07J   | 210                       | 275                 | 330(297~363)         | 10                       | 550                | 1200                       | 1750             | 23.0                       | 28.0           | 0.25        | 150                             |
| 361KH07     | 361KH07J   | 230                       | 300                 | 360(324~396)         | 10                       | 595                | 1200                       | 1750             | 24.0                       | 32.0           | 0.25        | 140                             |
| 391KH07     | 391KH07J   | 250                       | 320                 | 390(351~429)         | 10                       | 650                | 1200                       | 1750             | 26.0                       | 35.0           | 0.25        | 130                             |
| 431KH07     | 431KH07J   | 275                       | 350                 | 430(387~473)         | 10                       | 710                | 1200                       | 1750             | 28.0                       | 40.0           | 0.25        | 115                             |
| 471KH07     | 471KH07J   | 300                       | 385                 | 470(423~517)         | 10                       | 775                | 1200                       | 1750             | 29.0                       | 42.0           | 0.25        | 105                             |
| 511KH07     | 511KH07J   | 320                       | 415                 | 510(459~561)         | 10                       | 845                | 1200                       | 1750             | 31.0                       | 45.0           | 0.25        | 100                             |
| 561KH07     | 561KH07J   | 350                       | 460                 | 560(504~616)         | 10                       | 925                | 1200                       | 1750             | 35.0                       | 49.0           | 0.25        | 90                              |
| 621KH07     | 621KH07J   | 385                       | 505                 | 620(558~682)         | 10                       | 1025               | 1200                       | 1750             | 38.0                       | 55.0           | 0.25        | 80                              |
| 681KH07     | 681KH07J   | 420                       | 560                 | 680(612~748)         | 10                       | 1120               | 1200                       | 1750             | 42.0                       | 60.0           | 0.25        | 75                              |
| 751KH07     | 751KH07J   | 460                       | 615                 | 750(675~825)         | 10                       | 1240               | 1200                       | 1750             | 45.0                       | 64.0           | 0.25        | 70                              |
| 781KH07     | 781KH07J   | 485                       | 640                 | 780(702~858)         | 10                       | 1290               | 1200                       | 1750             | 48.0                       | 69.0           | 0.25        | 65                              |
| 821KH07     | 821KH07J   | 510                       | 670                 | 820(738~902)         | 10                       | 1355               | 1200                       | 1750             | 52.0                       | 73.0           | 0.25        | 60                              |
| 911KH07     | 911KH07J   | 550                       | 745                 | 910(819~1001)        | 10                       | 1500               | 1200                       | 1750             | 57.0                       | 78.0           | 0.25        | 55                              |

Notes: 1. The tolerance of varistor voltage between 18V and 27V is more than 10%.

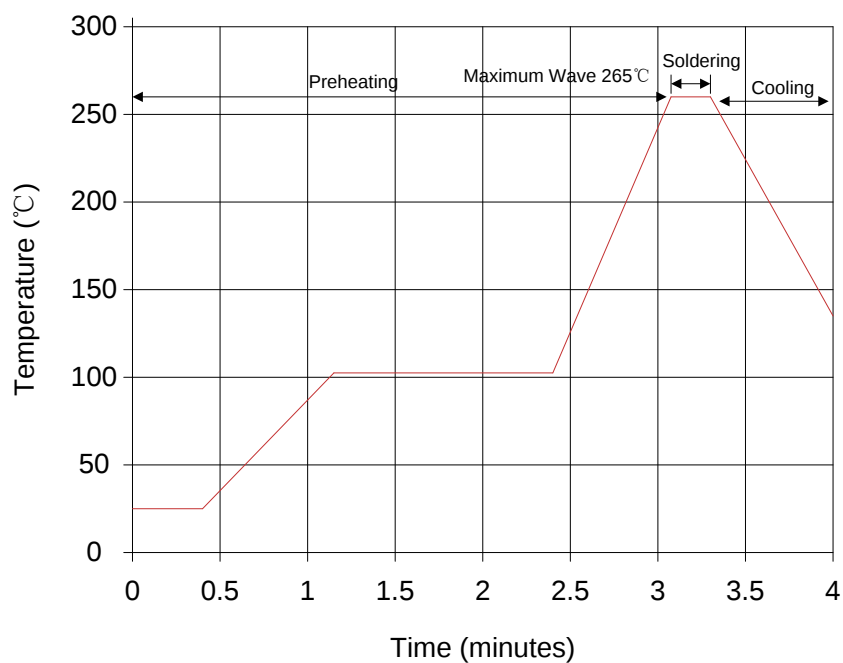
2. Leakage Current (@83% of V<sub>1mA</sub>): IR≤40μA (180K~680K) IR≤20μA (820K~911K)

## 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 <sub>b</sub> .                                                                                                                                                                                                                                                                    | 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           | <p>The maximum voltage between the two terminals with the specification standard impulse current.<br/>Applied waveform: 8/20μs</p>                                                                                                                                                                   |                             |              |              |              |              |                                        |
| 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 | $\left  \frac{V_{1mA@140^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{115} \times 100\%(\%/^{\circ}C) \right $                                                                                                                                                                                                                                                 | ≤0.05%/°C                   |              |              |              |              |                                        |
|                                    | $\left  \frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\%(\%/^{\circ}C) \right $                                                                                                                                                                                                                                                  |                             |              |              |              |              |                                        |
| Surge Life                         | <p>The change of V<sub>b</sub> 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="438 1803 1204 1926"> <tr> <td rowspan="2">7Φ series</td><td>180K to 680K</td><td>25A (8/20μs)</td></tr> <tr> <td>820K to 911K</td><td>50A (8/20μs)</td></tr> </table> | 7Φ series                   | 180K to 680K | 25A (8/20μs) | 820K to 911K | 50A (8/20μs) | $\frac{\Delta V_b}{V_b} \leq \pm 10\%$ |
| 7Φ series                          | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                            |                             | 25A (8/20μs) |              |              |              |                                        |
|                                    | 820K to 911K                                                                                                                                                                                                                                                                                                                                                                            | 50A (8/20μs)                |              |              |              |              |                                        |

## 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.)       |

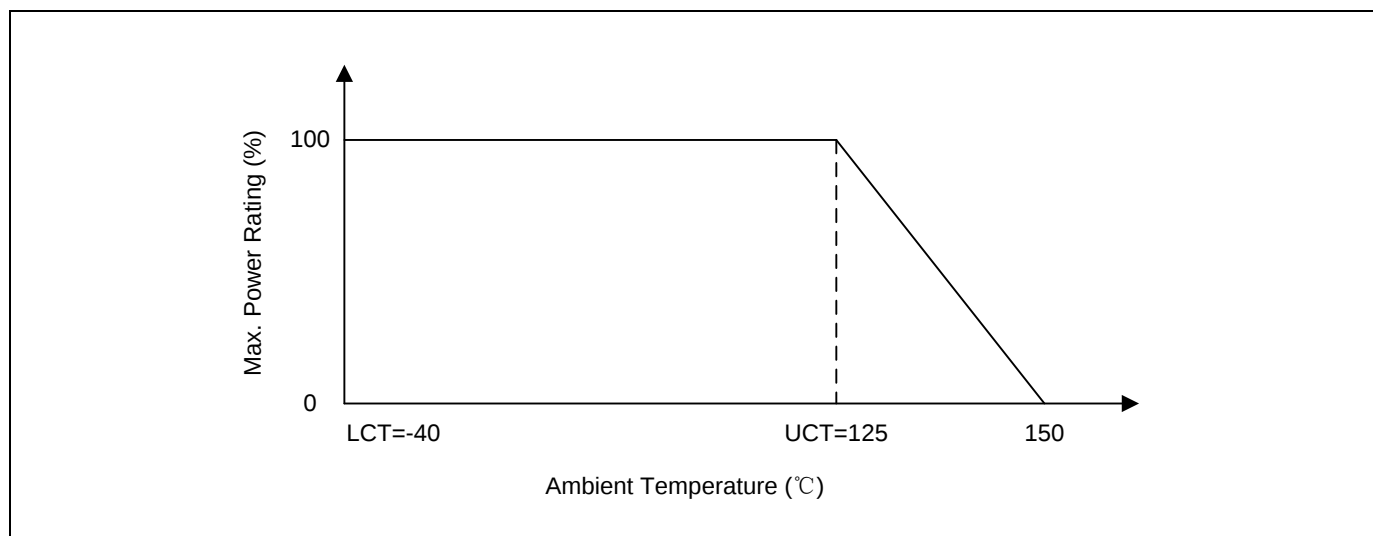
## Mechanical Characteristics

| Items                         | Test conditions / Methods                                                                                                                                                                                                                                                                                                                                                                         | Specifications                                                  |            |           |     |            |     |        |     |                                                                |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------|-----------|-----|------------|-----|--------|-----|----------------------------------------------------------------|
| Tensile Strength of Terminals | <div>Gradually applying the force specified and keeping the unit fixed for 10±1 sec.</div> <table><tr><th>Terminal diameter (mm)</th><th>Force (kg)</th></tr><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></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 | <div>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.</div> <table><tr><th>Terminal diameter (mm)</th><th>Force (kg)</th></tr><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></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                     | 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%  |            |           |     |            |     |        |     |                                                                |
| Solder ability                | 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  | Solder Temp: 260±5℃<br>Dipping Time: 10±1 sec                                                                                                                                                                                                                                                                                                                                                     | No visible damage<br> ΔV <sub>1mA</sub> /V <sub>1mA</sub>  ≤10% |            |           |     |            |     |        |     |                                                                |

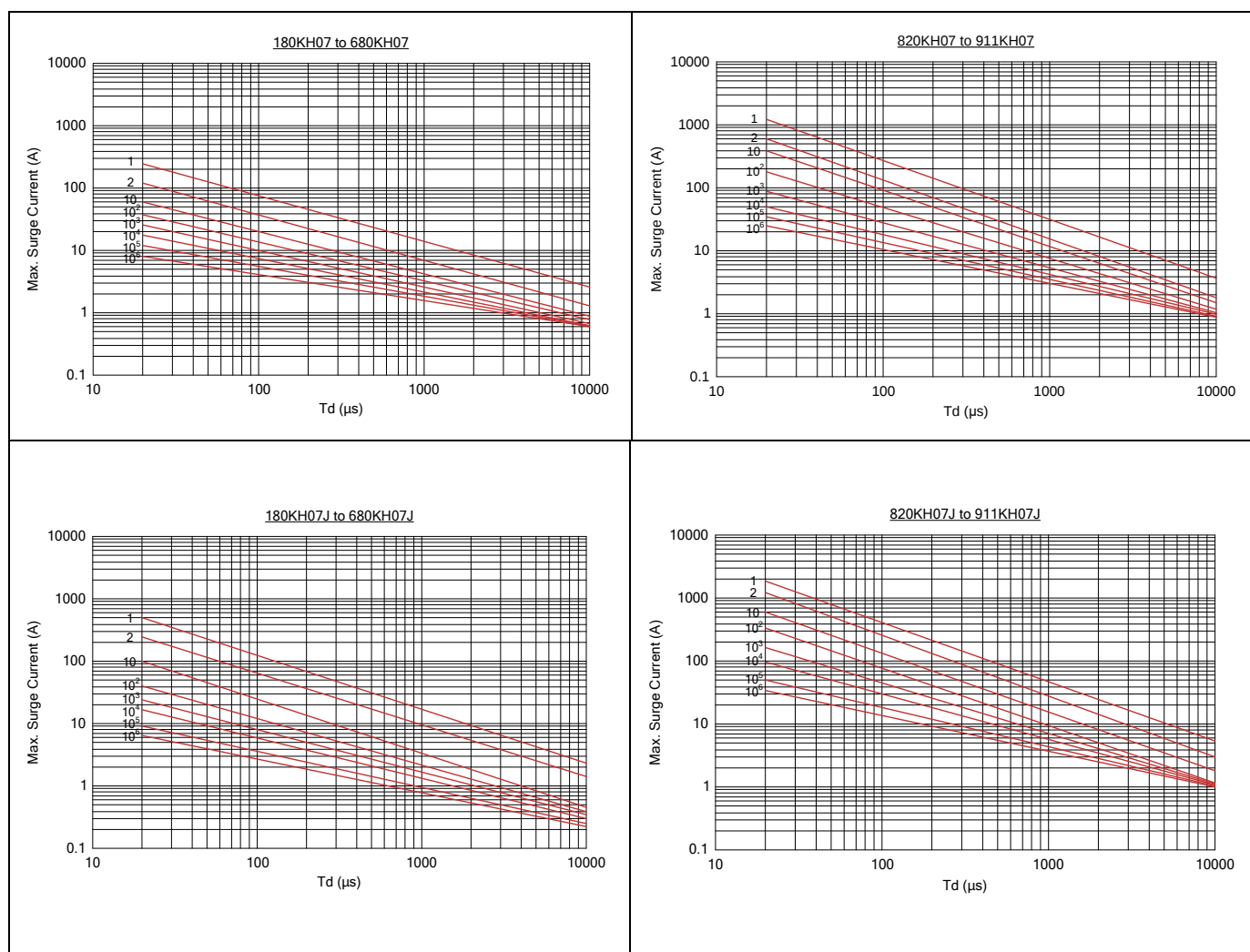
## Reliability

| Items                    | Test conditions / Methods                                                                                                                                                                                                                                                                                                                                                 | Specifications                                            |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|------------------|---|-------|------|---|------------------|------|---|-------|------|---|------------------|------|----------------------------------------------------------|
| High Temperature Storage | Ambient Temp: 125±2°C<br>Duration: 1000hrs                                                                                                                                                                                                                                                                                                                                | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                       |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| Low Temperature Storage  | Ambient Temp: -40±2°C<br>Duration: 1000hrs                                                                                                                                                                                                                                                                                                                                | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                       |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| Humidity                 | Ambient Temp: 40±2°C, 90~95% R.H.<br>Duration: 1000hrs                                                                                                                                                                                                                                                                                                                    | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                       |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| Temperature Cycle        | The conditions shown below shall be repeated 5 cycles<br><table> <tr> <th>Step</th><th>Temperature (°C)</th><th>Period (minutes)</th></tr> <tr> <td>1</td><td>-40±3</td><td>30±3</td></tr> <tr> <td>2</td><td>Room temperature</td><td>15±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>15±3</td></tr> </table> | Step                                                      | Temperature (°C) | Period (minutes) | 1 | -40±3 | 30±3 | 2 | Room temperature | 15±3 | 3 | 125±3 | 30±3 | 4 | Room temperature | 15±3 | No visible damage<br>$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ |
| Step                     | Temperature (°C)                                                                                                                                                                                                                                                                                                                                                          | Period (minutes)                                          |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| 1                        | -40±3                                                                                                                                                                                                                                                                                                                                                                     | 30±3                                                      |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| 2                        | Room temperature                                                                                                                                                                                                                                                                                                                                                          | 15±3                                                      |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| 3                        | 125±3                                                                                                                                                                                                                                                                                                                                                                     | 30±3                                                      |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| 4                        | Room temperature                                                                                                                                                                                                                                                                                                                                                          | 15±3                                                      |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| High Temperature Load    | Ambient Temp: 125±2°C      Duration: 1000hrs<br>Load: Max. Allowable Voltage In AC eara.                                                                                                                                                                                                                                                                                  | $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$                      |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| Damp Heat Load           | Ambient Temp: 40±2°C, 90~95% R.H.<br>Duration: 1000hrs      Load: Max. Allowable Voltage                                                                                                                                                                                                                                                                                  | No visible damage<br>$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |
| Voltage Proof            | Metal balls method,<br>1000Vac 1 min.(180K~331K), 1500Vac 1 min.(361K~911K)                                                                                                                                                                                                                                                                                               | No visible damage                                         |                  |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |                                                          |

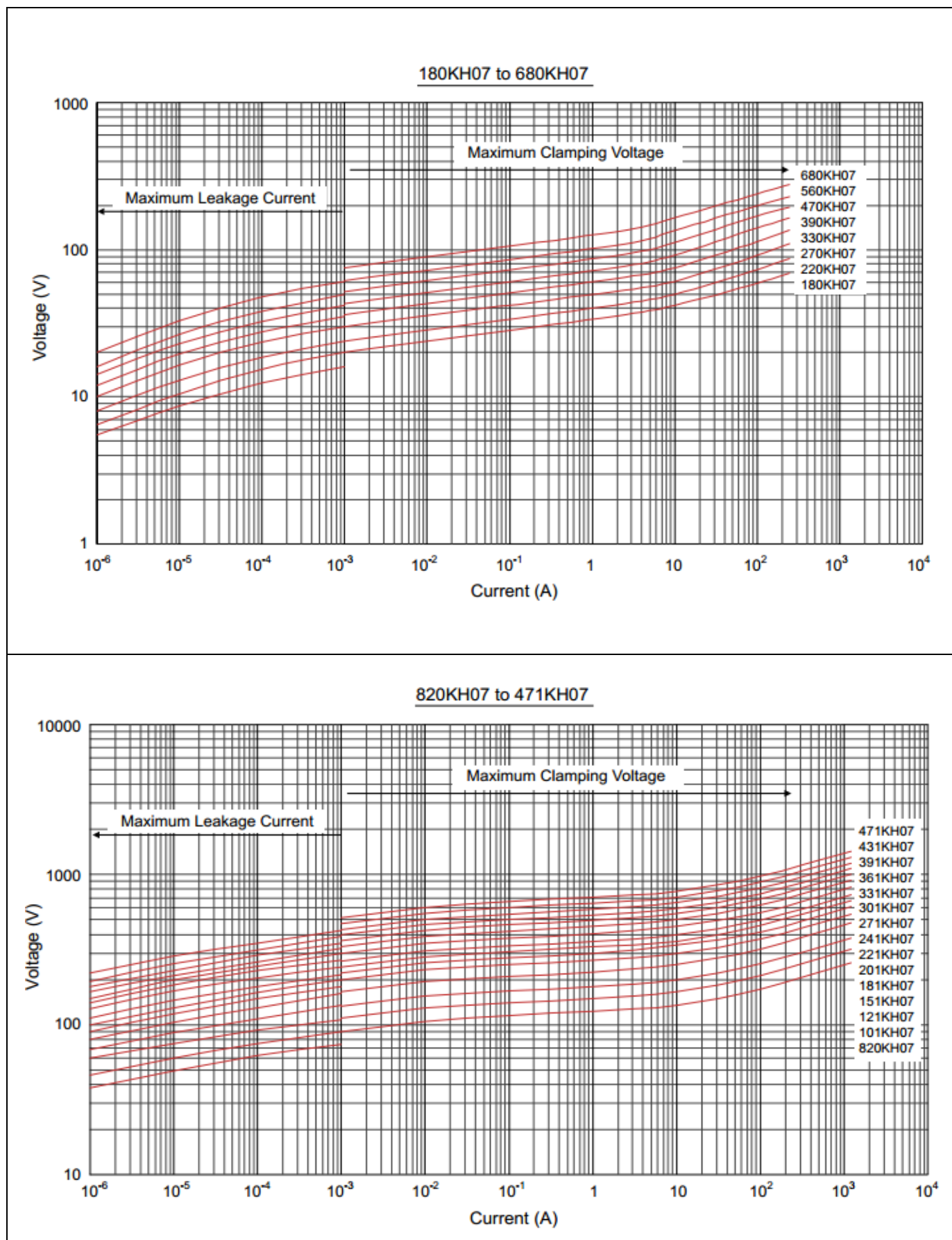
## Power Derating Curve



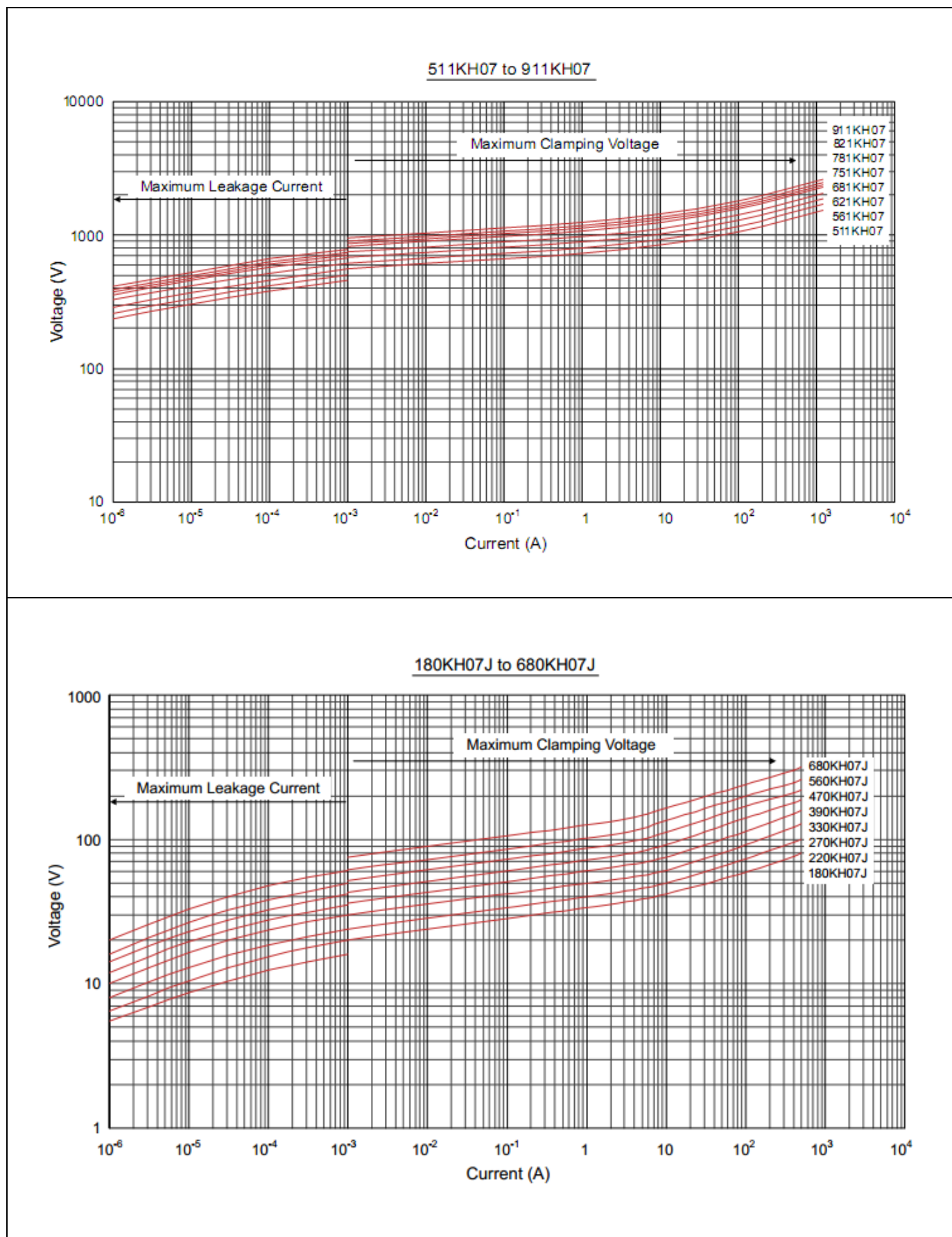
## Maximum Surge Current Derating Curve



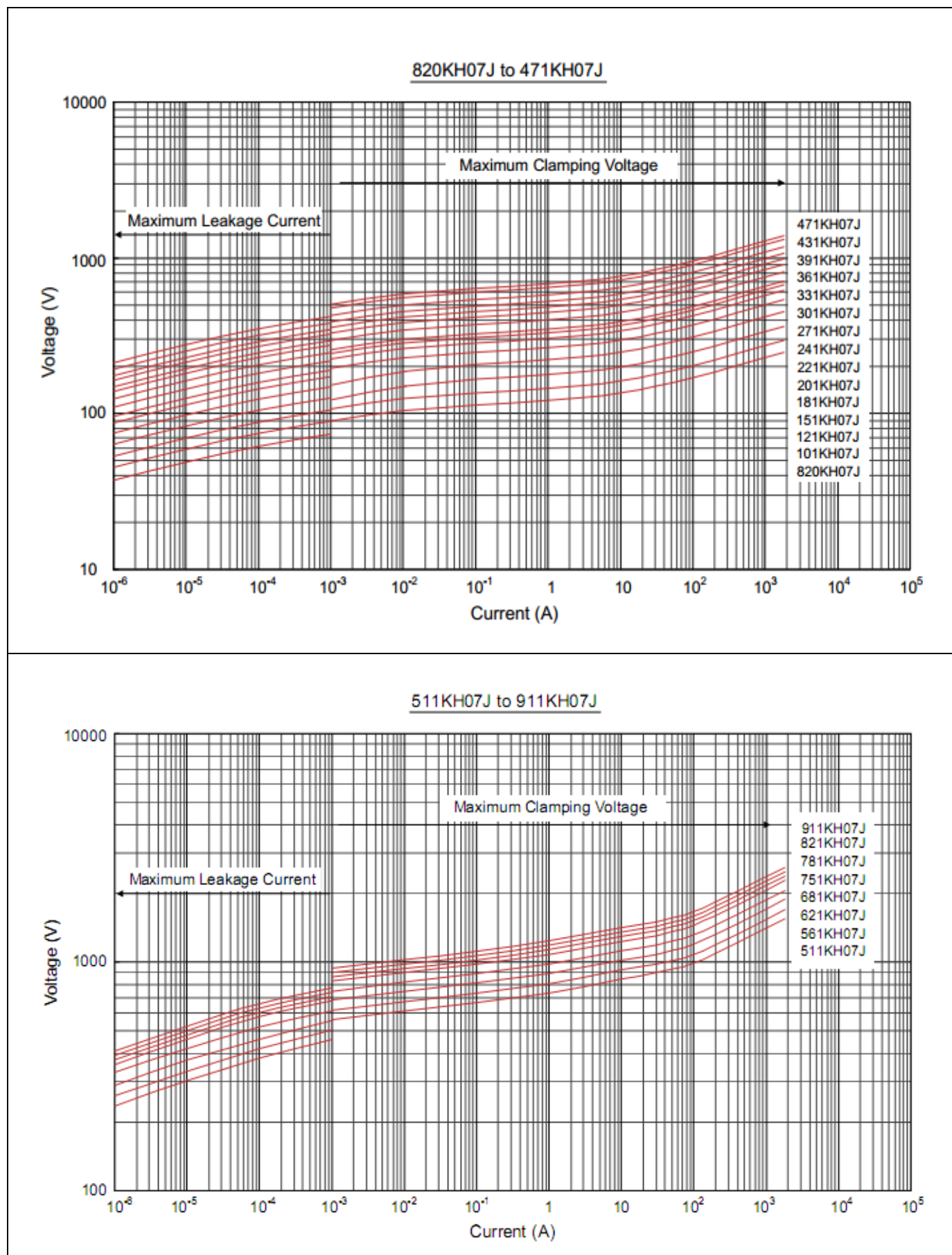
## Maximum Leakage Current and Maximum Clamping Voltage Curve



## Maximum Leakage Current and Maximum Clamping Voltage Curve



## Maximum Leakage Current and Maximum Clamping Voltage Curve



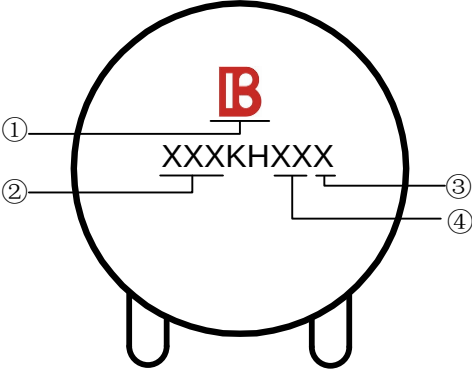
Marking Code

①

②

③

④



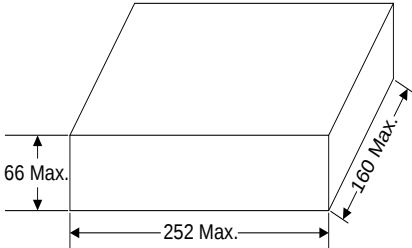
① Brightking Logo

② Varistor Voltage

③ “J” is High Surge Code, no “J” is Standard Surge

④ Varistor Size

Quantity

| Packaging Dimensions (Unit: mm)                                                                                | Quantity                                |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <div>Bulk</div> <div></div> | 1000pcs/bag<br>2bags/box<br>(180K~391K) |
|                                                                                                                | 800pcs/bag<br>2bags/box<br>(431K~621K)  |
|                                                                                                                | 600pcs/bag<br>2bags/box<br>(681K~911K)  |

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