

Metal Oxide Varistor Data Sheet

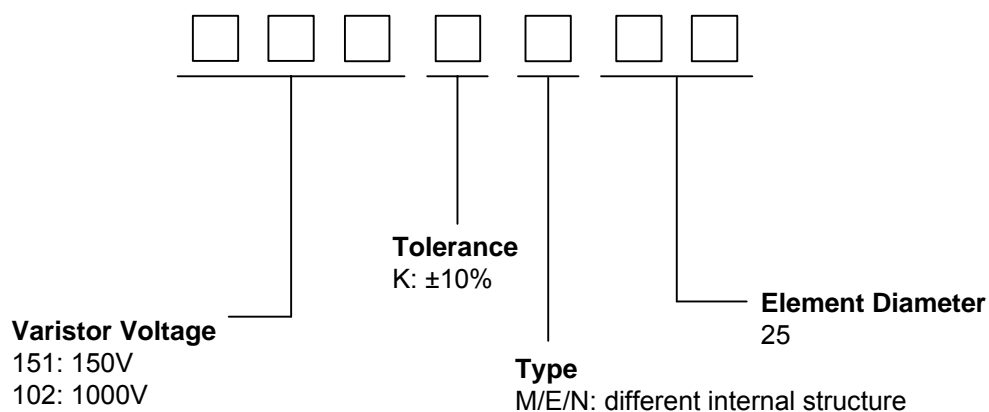
Features

- TMOV integrated thermal protection device
- High peak surge current rating up to 15KA
- Designed to facilitate compliance to UL1449 for TVSS products
- Wide operating voltage (V_{1mA}) range from 150V to 1200V
- Rated current: 20A
- Rated Functioning Temperature: 136(°C)
- Fast responding to transient over-voltage and limited current
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Three-lead version available for indication purposes
- Meets MSL level 1, per J-STD-020
- Operating Temperature: -40°C ~ +85°C
- Storage Temperature: -40°C ~ +85°C
- Safety certification: UL: E327997

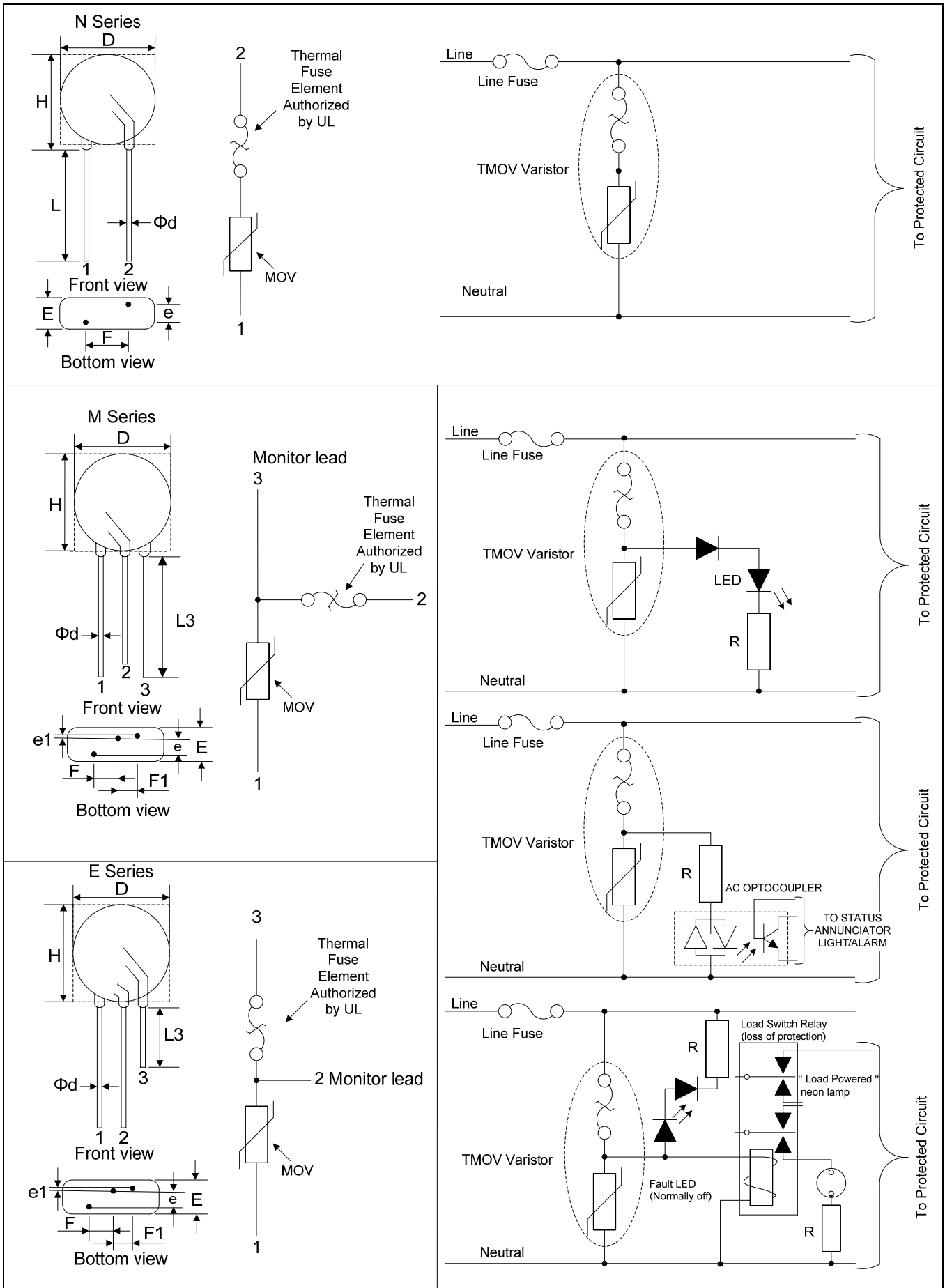
Applications

- AC power line or AC/DC supplies
- 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
- AC panel protection Modules

Part number code



Lead configurations and application examples



Dimensions

| Symbol | | BK'S M / E / N Varistor | | |
|-----------|-----------|-------------------------|------------|------------|
| | | 25M | 25E | 25N |
| | | Unit: mm | | |
| D (max.) | | 29.0 | 29.0 | 29.0 |
| H (max.) | | 32.0 | 32.0 | 32.0 |
| F (±1.0) | | 7.5 | 12.5 / 7.5 | 12.5 / 7.5 |
| F1 (±1.0) | | 5.0 | 6.5 / 5.0 | - |
| e Max. | 151K~391K | 3.8 | 3.8 | 3.8 |
| | 431K~621K | 5.5 | 5.5 | 5.5 |
| | 681K~911K | 7.8 | 7.8 | 7.8 |
| | 102K~122K | 10.0 | 10.0 | 10.0 |
| e1 | 151K~391K | 2.3±1.0 | 2.3±1.0 | -- |
| | 431K~621K | | | |
| | 681K~911K | | | |
| | 102K~122K | | | |
| E Max. | 151K~391K | 11.8 | 11.8 | 11.8 |
| | 431K~621K | 13.5 | 13.5 | 13.5 |
| | 681K~911K | 15.8 | 15.8 | 15.8 |
| | 102K~122K | 18.0 | 18.0 | 18.0 |
| L (min.) | | 20.0 | 20.0 | 20.0 |
| L3 (min.) | | 10.0 | 10.0 | - |
| Φd | | 1.0 | | |

Electrical characteristics

| Part Number | Maximum Allowable Voltage | | Varistor Voltage $V_{1mA}(V)$ | Maximum Clamping Voltage | | Maximum Peak Current (8/20 μ s) | | Maximum Energy (Joule) | | Rated Power (W) | Typical Capacitance (Reference) @1KHz (pf) |
|--------------|---------------------------|-------------|----------------------------------|--------------------------|----------|-------------------------------------|---------|------------------------|-----|-----------------|---|
| | $V_{AC}(V)$ | $V_{DC}(V)$ | | $I_P(A)$ | $V_C(V)$ | 1 time | 2 times | 10/100 0 μ s | 2ms | | |
| | | | (A) | | | | | | | | |
| 151KM(E,N)25 | 95 | 125 | 150(135~165) | 150 | 250 | 15000 | 12000 | 160 | 105 | 1.20 | 4300 |
| 181KM(E,N)25 | 115 | 150 | 180(162~198) | 150 | 300 | 15000 | 12000 | 175 | 120 | 1.20 | 3500 |
| 201KM(E,N)25 | 130 | 170 | 200(185~225) | 150 | 340 | 15000 | 12000 | 210 | 150 | 1.20 | 3200 |
| 221KM(E,N)25 | 140 | 180 | 220(198~242) | 150 | 365 | 15000 | 12000 | 230 | 165 | 1.20 | 2900 |
| 241KM(E,N)25 | 150 | 200 | 240(216~264) | 150 | 395 | 15000 | 12000 | 255 | 180 | 1.20 | 2650 |
| 271KM(E,N)25 | 175 | 225 | 270(243~297) | 150 | 455 | 15000 | 12000 | 285 | 205 | 1.20 | 2400 |
| 301KM(E,N)25 | 190 | 250 | 300(270~330) | 150 | 500 | 15000 | 12000 | 310 | 220 | 1.20 | 2100 |
| 331KM(E,N)25 | 210 | 275 | 330(297~363) | 150 | 550 | 15000 | 12000 | 325 | 231 | 1.20 | 1900 |
| 361KM(E,N)25 | 230 | 300 | 360(324~396) | 150 | 595 | 15000 | 12000 | 340 | 240 | 1.20 | 1750 |
| 391KM(E,N)25 | 250 | 320 | 390(351~429) | 150 | 650 | 15000 | 12000 | 360 | 250 | 1.20 | 1600 |
| 431KM(E,N)25 | 275 | 350 | 430(387~473) | 150 | 710 | 15000 | 12000 | 440 | 310 | 1.20 | 1500 |
| 471KM(E,N)25 | 300 | 385 | 470(423~517) | 150 | 775 | 15000 | 12000 | 490 | 345 | 1.20 | 1400 |
| 511KM(E,N)25 | 320 | 415 | 510(459~561) | 150 | 845 | 15000 | 12000 | 530 | 370 | 1.20 | 1250 |
| 561KM(E,N)25 | 350 | 460 | 560(504~616) | 150 | 920 | 15000 | 12000 | 560 | 390 | 1.20 | 1150 |
| 621KM(E,N)25 | 385 | 505 | 620(558~682) | 150 | 1025 | 15000 | 12000 | 590 | 410 | 1.20 | 1050 |
| 681KM(E,N)25 | 420 | 560 | 680(612~748) | 150 | 1120 | 15000 | 12000 | 620 | 430 | 1.20 | 950 |
| 751KM(E,N)25 | 460 | 615 | 750(675~825) | 150 | 1240 | 15000 | 12000 | 630 | 440 | 1.20 | 850 |
| 781KM(E,N)25 | 485 | 640 | 780(702~858) | 150 | 1290 | 15000 | 12000 | 675 | 470 | 1.20 | 800 |
| 821KM(E,N)25 | 510 | 670 | 820(738~902) | 150 | 1355 | 15000 | 12000 | 690 | 480 | 1.20 | 750 |
| 911KM(E,N)25 | 550 | 745 | 910(819~1001) | 150 | 1500 | 15000 | 12000 | 715 | 500 | 1.20 | 700 |
| 102KM(E,N)25 | 625 | 825 | 1000(900~1100) | 150 | 1650 | 15000 | 12000 | 750 | 505 | 1.20 | 650 |
| 112KM(E,N)25 | 680 | 895 | 1100(990~1210) | 150 | 1815 | 15000 | 12000 | 780 | 550 | 1.20 | 600 |
| 122KM(E,N)25 | 750 | 990 | 1200(1080~1320) | 150 | 1980 | 15000 | 12000 | 840 | 590 | 1.20 | 550 |

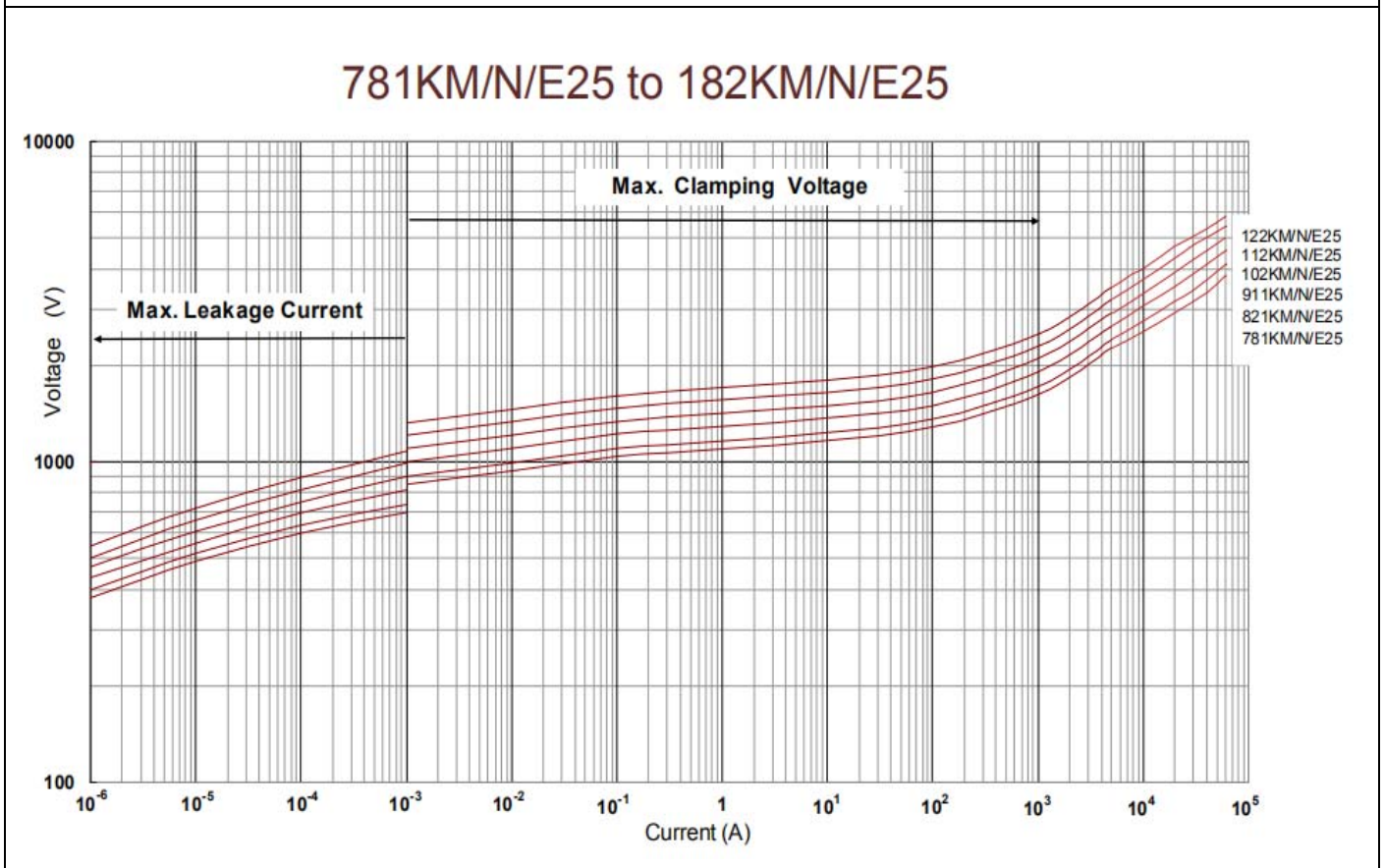
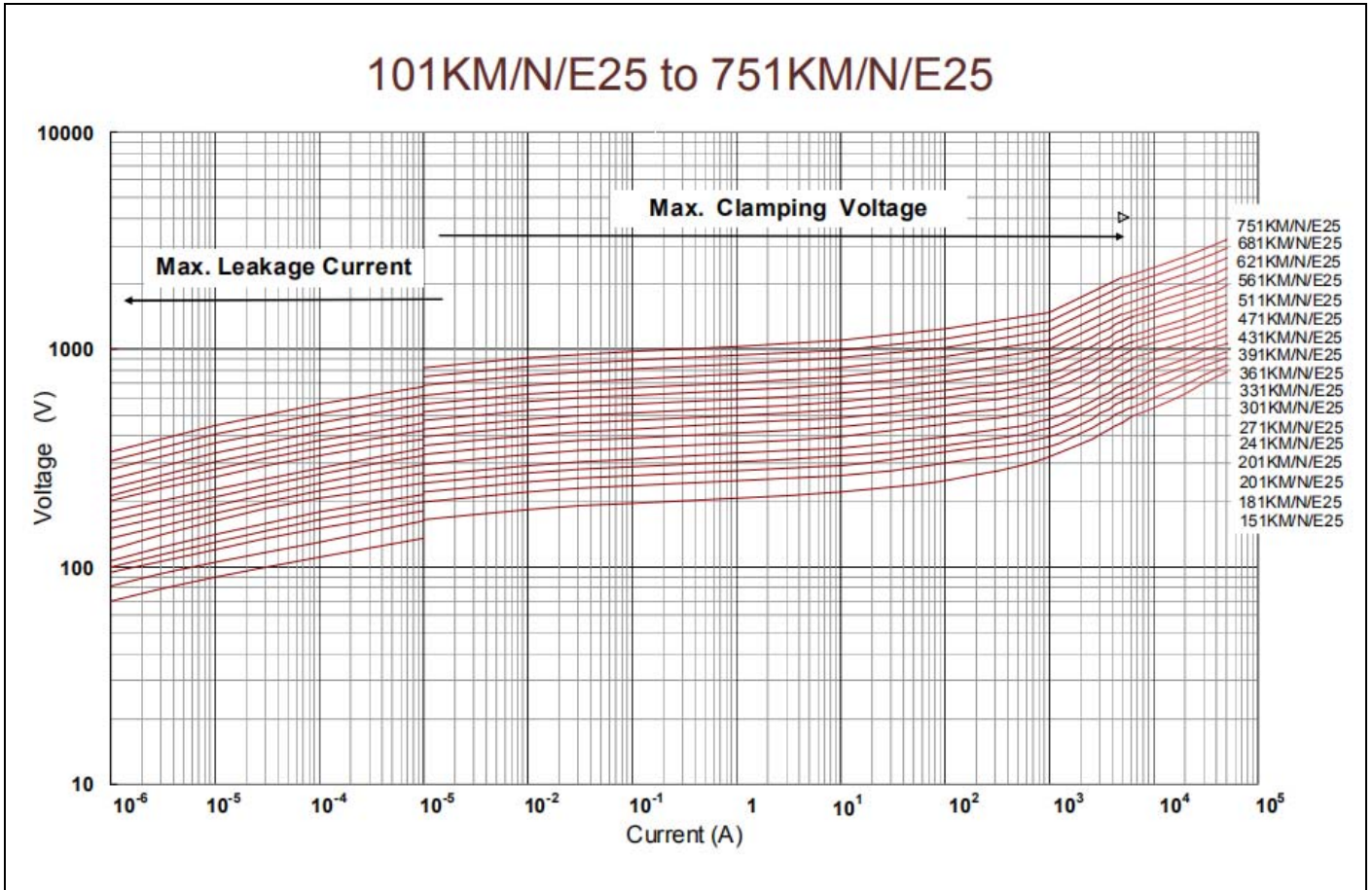
Mechanical Characteristics

| Items | Test conditions / Methods | Specifications | | | | | | | | |
|-------------------------------|---|--|------------|-----------|-----|------------|-----|--------|-----|---|
| Tensile Strength of Terminals | Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table border="1"> <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 | 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"> <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 | 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% | | | | | | | | |
| Solder ability | 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 | Solder Temp: 260±5°C Dipping Time: ≤10 sec | No visible damage ΔV _{1mA} /V _{1mA} ≤10% | | | | | | | | |

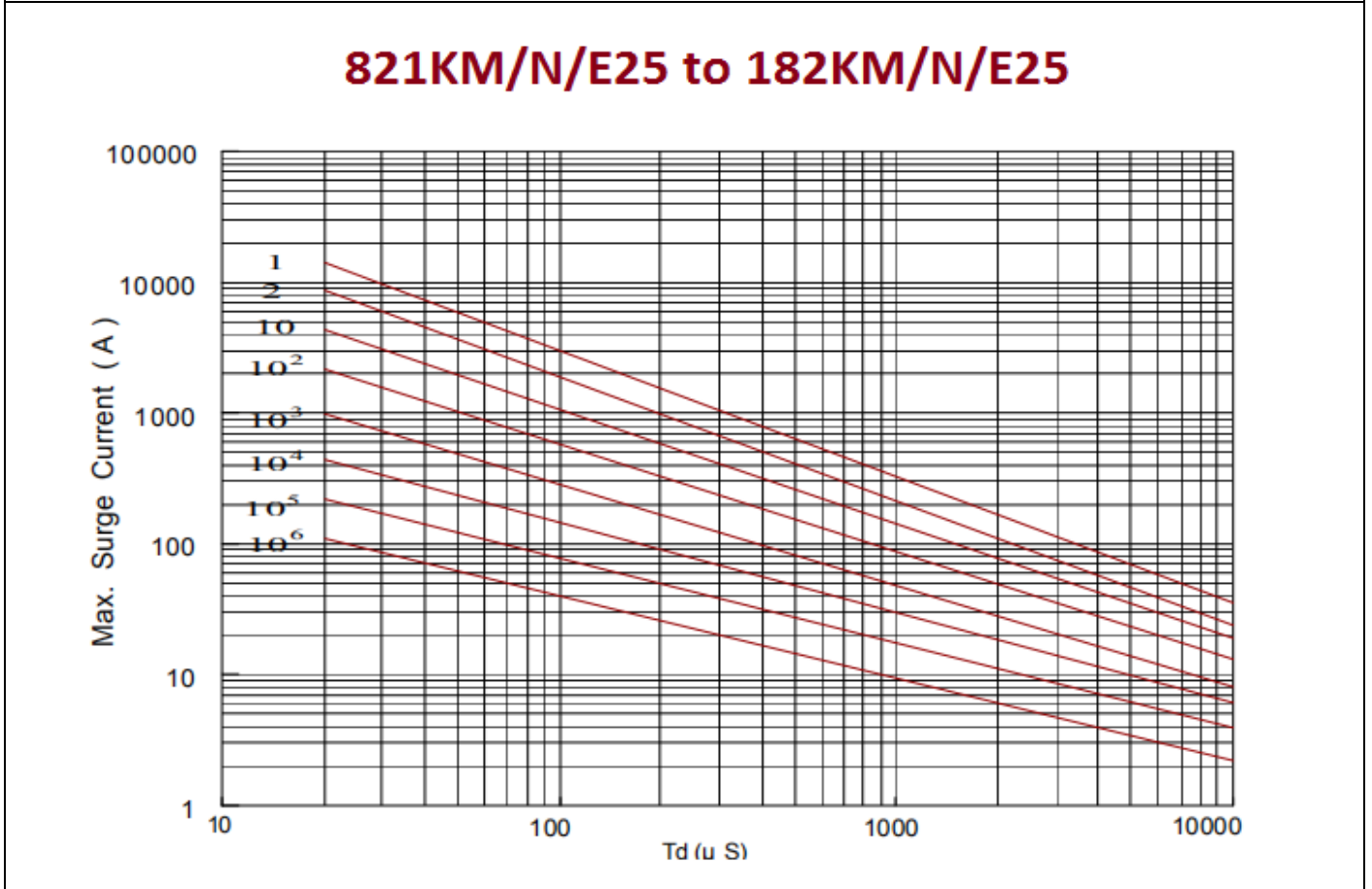
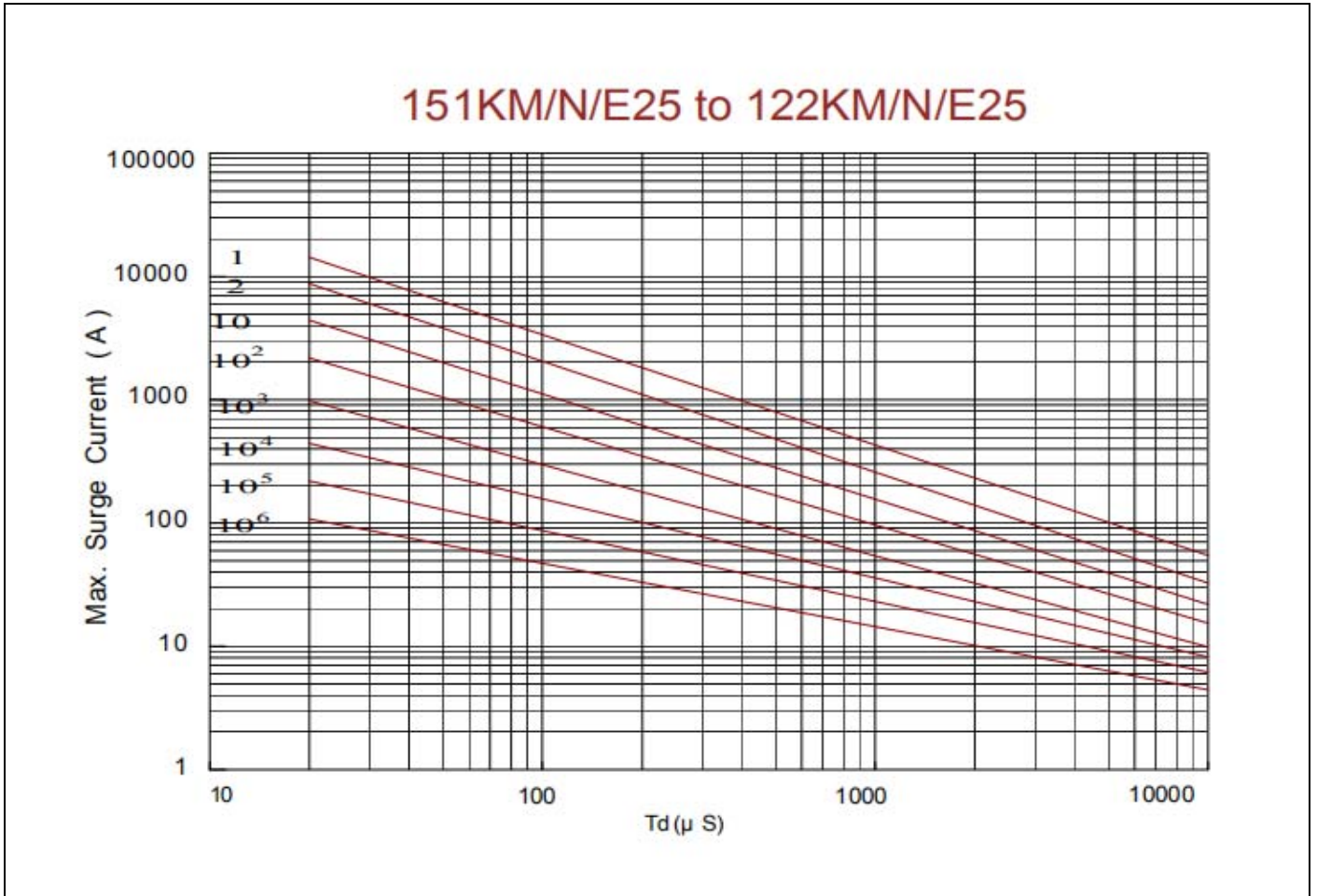
Reliability

| Items | Test conditions / Methods | Specifications | | | | | | | | | | | | | | | |
|--------------------------|--|--|------------------|------------------|---|-------|------|---|------------------|------|---|------|------|---|------------------|------|---|
| High Temperature Storage | Ambient Temp: 85±2°C Duration: 1000hrs | ΔV _{1mA} /V _{1mA} ≤5% | | | | | | | | | | | | | | | |
| Low Temperature Storage | Ambient Temp: -40±2°C Duration: 1000hrs | ΔV _{1mA} /V _{1mA} ≤5% | | | | | | | | | | | | | | | |
| Humidity | Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs | ΔV _{1mA} /V _{1mA} ≤5% | | | | | | | | | | | | | | | |
| Temperature Cycle | The conditions shown below shall be repeated 5 cycles <table border="1"> <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>15±3</td> </tr> <tr> <td>3</td> <td>85±3</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>15±3</td> </tr> </tbody> </table> | Step | Temperature (°C) | Period (minutes) | 1 | -40±3 | 30±3 | 2 | Room temperature | 15±3 | 3 | 85±3 | 30±3 | 4 | Room temperature | 15±3 | No visible damage ΔV _{1mA} /V _{1mA} ≤5% |
| Step | Temperature (°C) | Period (minutes) | | | | | | | | | | | | | | | |
| 1 | -40±3 | 30±3 | | | | | | | | | | | | | | | |
| 2 | Room temperature | 15±3 | | | | | | | | | | | | | | | |
| 3 | 85±3 | 30±3 | | | | | | | | | | | | | | | |
| 4 | Room temperature | 15±3 | | | | | | | | | | | | | | | |
| High Temperature Load | Ambient Temp: 85±2°C Duration: 1000hrs Load: Max. Allowable Voltage In AC eara. | ΔV _{1mA} /V _{1mA} ≤10% | | | | | | | | | | | | | | | |
| Damp Heat Load | Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs Load: Max. Allowable Voltage | No visible damage ΔV _{1mA} /V _{1mA} ≤10% | | | | | | | | | | | | | | | |
| Voltage Proof | Metal balls method, 2500Vac 1 min. | No visible damage | | | | | | | | | | | | | | | |

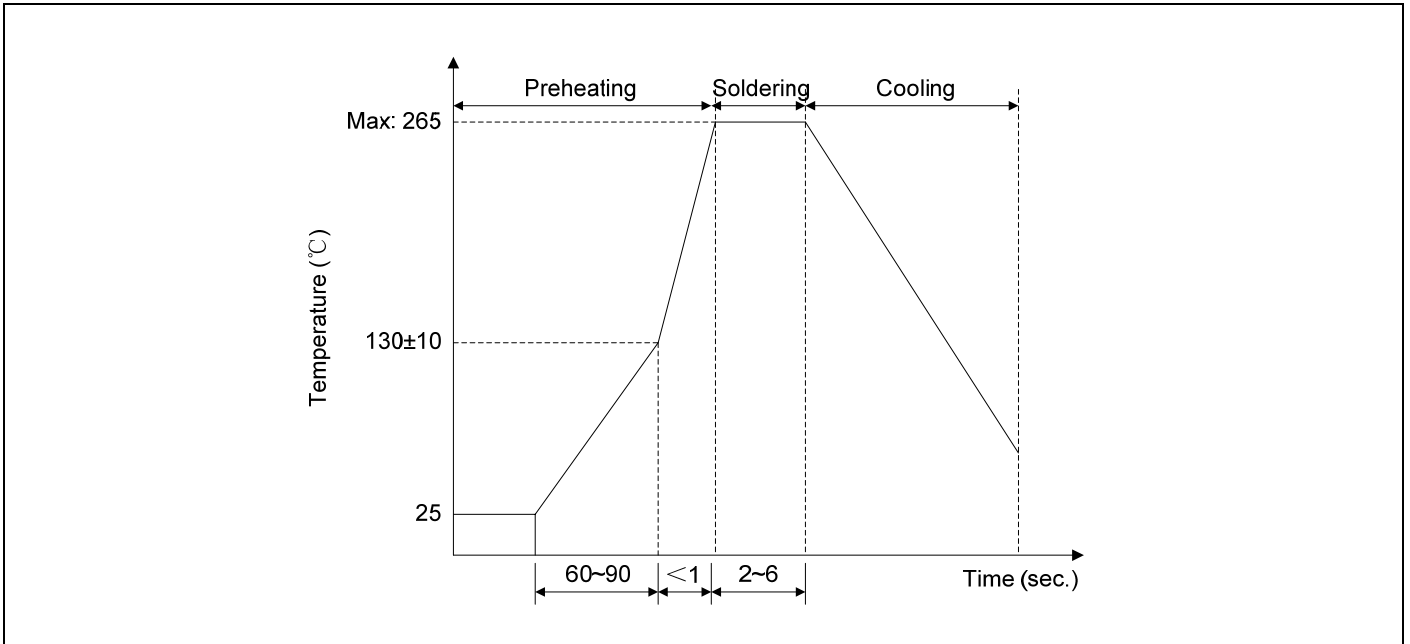
Maximum Leakage Current and Maximum Clamping Voltage Curve



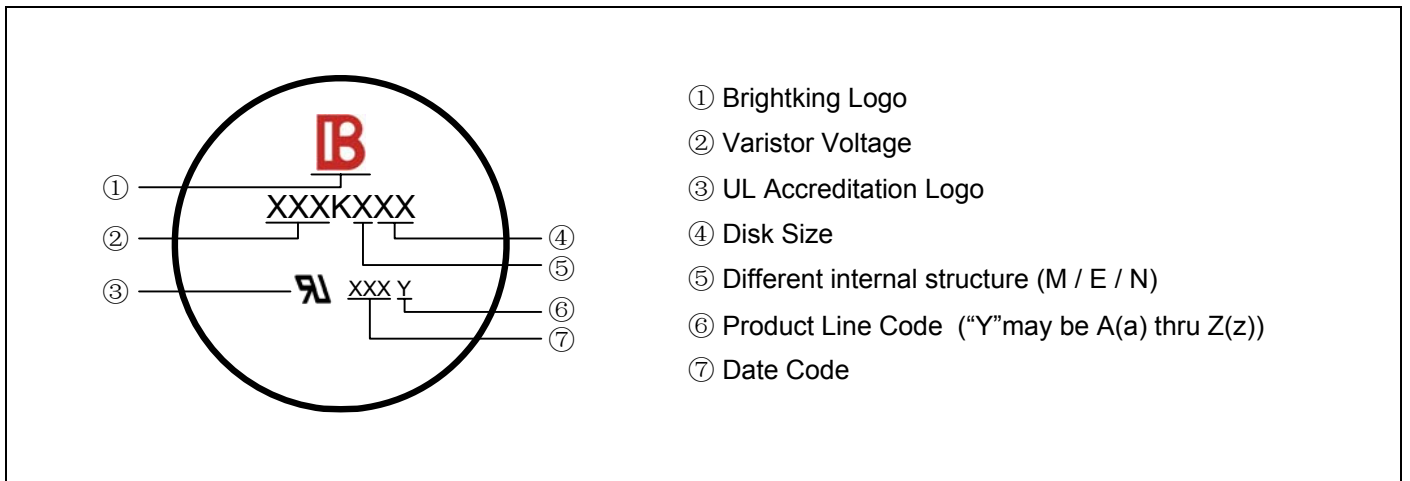
Maximum Surge Current Derating Curve



Soldering Recommendation



Marking code



Quantity

| Packaging Dimensions (Unit: mm) | Quantity |
|---------------------------------|--------------------------------|
| <p>Bulk</p> | <p>50pcs/bag 2bags/box</p> |