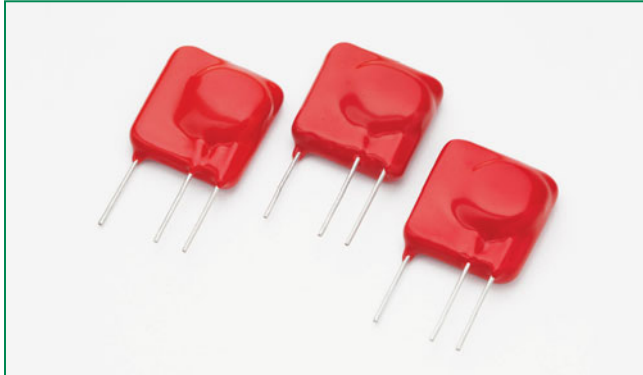


RoHS  **TMOV25S™ Varistor Series**

Product scheduled for release in summer 2011



Description


Metal Oxide Varistors (MOVs) are rated for specific AC line operating voltages, and exceeding these limits through the application of a sustained abnormal over-voltage condition could result in overheating and damage to the MOV.

The Littelfuse TMOV25S™ (Thermal MOV) Series was designed to address this condition in a single integrated package.

The TMOV25S™ Series incorporates a patented integrated thermally responsive element within the body of the device which will open-circuit the varistor in case of overheating due to the abnormal over-voltage events.

The TMOV25S™ Series is based on the Littelfuse UltraMOV™ 25S Series, which meets the surge suppressor component recognition requirements of UL1449 3rd edition for both cord connected and permanently connected SPD end products.*

Agency Approvals

| Agency | Agency File Number | Status |
|---|--------------------|----------|
|  | UL1449 3rd Edition | Pending* |

* UL1449 3rd Edition approval of TMOV25S series is currently pending related to the integrated thermal element of this series. See Notes section under Device Ratings and Specifications table on next page. Contact your Littelfuse product representative to discuss alternatives and for additional information.

Features

- RoHS Compliant and Lead-free
- Patented integrated thermal protection device - Patent #US6636403
- Standard Operating Voltage Range Compatible with Common AC Line Voltages (115VAC to 750VAC)
- Wave solderable
- High peak surge current rating up to 20kA at single 8/20µS impulse
- Standard lead form and spacing option
- Low leakage
- -55°C to +85°C operating temperature range

TMOV25S™ Series

Applications

- SPD Products
- AC Panel Protection Modules
- AC Line Power Supplies
- Surge Protected Strip Connectors
- AC Power Meters
- Inverters, AC/DC power supplies, etc.
- UPS (Uninterruptible Power Supply)

Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart.

| | TMOV25S™ Series | Units |
|--|-----------------|-------|
| Continuous: | | |
| AC Voltage Range ($V_{MACIRMS}$) | 115 to 750 | V |
| Transient: | | |
| Peak Pulse Current (I_{TM}) | | |
| For 8x20µs Current Wave, single pulse | 20,000 | A |
| Single-Pulse Energy Capability | | |
| For 2ms Current Wave | 170 to 670 | J |
| Operating Ambient Temperature Range (T_A) | -55 to +85 | °C |
| Storage Temperature Range (T_{STG}) | -55 to +125 | °C |
| Temperature Coefficient (αV) of Clamping Voltage (V_C) at Specified Test Current | <0.01 | %/°C |
| Hi-Pot Encapsulation (COATING Isolation Voltage Capability) | 2,500 | V |
| Thermal Protection Isolation Voltage Capability (when operated) | 600* | V |
| *See notes under Device Ratings & Specifications section for more information | | |
| COATING Insulation Resistance | 1,000 | MΩ |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Device Ratings & Specifications

| Part Number | | Maximum Rating (85°C) | | | Specifications (25 °C) | | | | | |
|--------------|--------------------|-----------------------|---------------------------------------|---------------------|--------------------------------------|-------|---|---|---------------------------|---------------------|
| | | Continuous | | Transient | Varistor Voltage at 1mA Test Current | | Clamping Voltage at 100A Current 8/20µs | UL 1449* (3rd Edition Approval Pending) | Nominal Discharge Current | Typical Capacitance |
| | | AC Volts | Energy 2ms | Peak Current 8/20µs | | | | | | |
| Branding | $V_{MACIRMS}/MCOV$ | W_{TM} | $I_{TM} \times 1 \times \text{Pulse}$ | $V_{N(DC) Min}$ | $V_{N(DC) Max}$ | V_C | VPR | I_N | C | |
| | (V) | (J) | (A) | (V) | | (V) | (V) | (A) | (pF) | |
| TMOV25SP115M | P25T115M | 115 | 170 | 20000 | 162 | 198 | 295 | 400* | 5800 | 3200 |
| TMOV25SP130M | P25T130M | 130 | 190 | 20000 | 184 | 226 | 335 | 500* | 5800 | 2800 |
| TMOV25SP140M | P25T140M | 140 | 210 | 20000 | 200 | 240 | 355 | 500* | 5800 | 2500 |
| TMOV25SP150M | P25T150M | 150 | 220 | 20000 | 216 | 264 | 390 | 500* | 5800 | 2300 |
| TMOV25SP175M | P25T175M | 175 | 250 | 20000 | 243 | 297 | 450 | 600* | 5800 | 1900 |
| TMOV25SP230M | P25T230M | 230 | 300 | 20000 | 324 | 396 | 585 | 700* | 5800 | 1500 |
| TMOV25SP250M | P25T250M | 250 | 330 | 20000 | 351 | 429 | 640 | 800* | 5800 | 1400 |
| TMOV25SP275M | P25T275M | 275 | 350 | 20000 | 387 | 473 | 700 | 900* | 5800 | 1250 |
| TMOV25SP300M | P25T300M | 300 | 370 | 20000 | 423 | 517 | 765 | 1000* | 5800 | 1150 |
| TMOV25SP320M | P25T320M | 320 | 390 | 20000 | 459 | 561 | 825 | 1000* | 5800 | 1080 |
| TMOV25SP385M | P25T385M | 385 | 430 | 20000 | 558 | 682 | 1010 | 1200* | 5800 | 900 |
| TMOV25SP420M | P25T420M | 420 | 460 | 20000 | 612 | 748 | 1100 | 1500* | 5800 | 820 |
| TMOV25SP440M | P25T440M | 440 | 470 | 20000 | 643 | 787 | 1160 | n/a* | 5800 | 790 |
| TMOV25SP460M | P25T460M | 460 | 490 | 20000 | 675 | 825 | 1220 | n/a* | 5800 | 750 |
| TMOV25SP510M | P25T510M | 510 | 520 | 20000 | 738 | 902 | 1335 | n/a* | 5800 | 680 |
| TMOV25SP550M | P25T550M | 550 | 550 | 20000 | 819 | 1001 | 1475 | n/a* | 5800 | 630 |
| TMOV25SP625M | P25T625M | 625 | 600 | 20000 | 900 | 1100 | 1625 | n/a* | 5800 | 550 |
| TMOV25SP750M | P25T750M | 750 | 670 | 20000 | 1080 | 1320 | 1950 | n/a* | 5800 | 460 |

* UL1449 3rd Edition approval of TMOV25S series is currently pending due to matters related to testing of the the integrated thermal element of this series. Contact your Littelfuse product representative to discuss alternatives and for additional information. Devices with ratings >420V have not been evaluated.

Thermal Characteristics

Typical time to open circuit under UL 1449 Abnormal Overvoltage Limited Current Test:

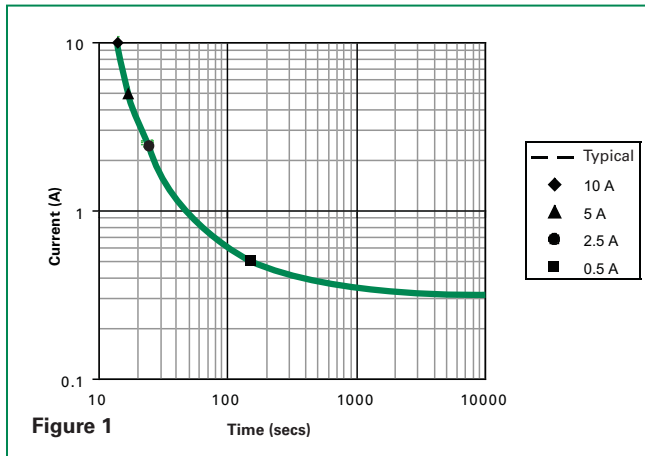


Figure 1

Current, Energy, Power Derating Curve

For applications exceeding 85°C ambient temperature, the peak surge current and energy ratings must be reduced as shown below.

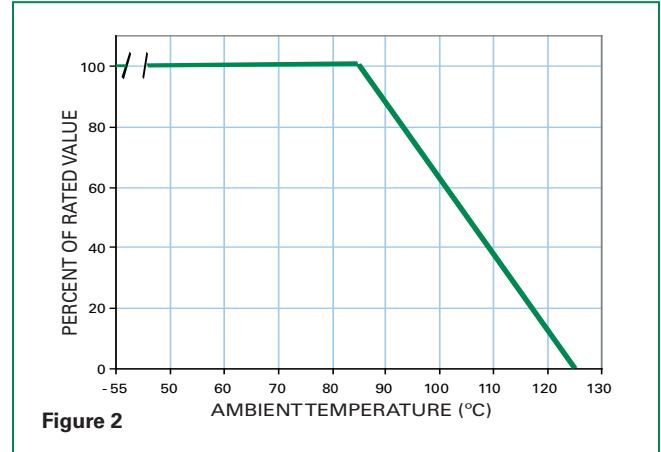


Figure 2

Transient V-I Characteristic Curves

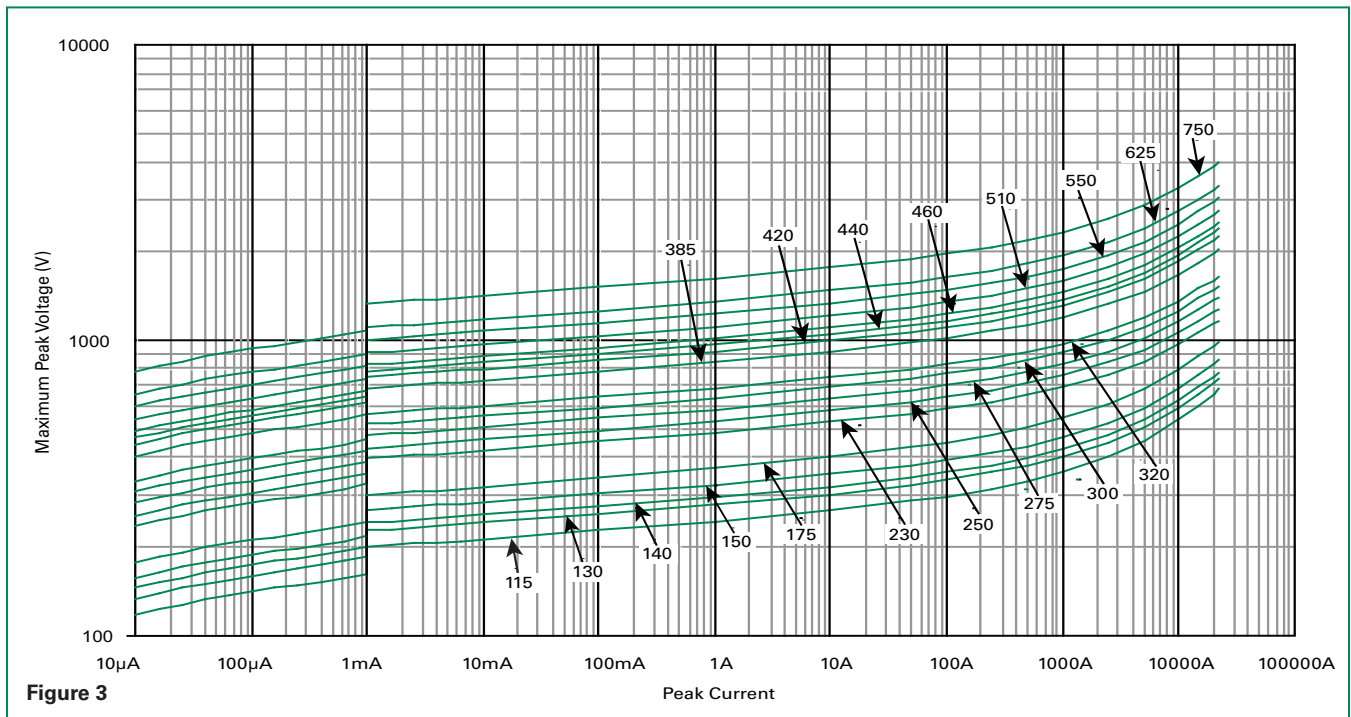


Figure 3

TMOV25S™ Series

Pulse Rating Curve

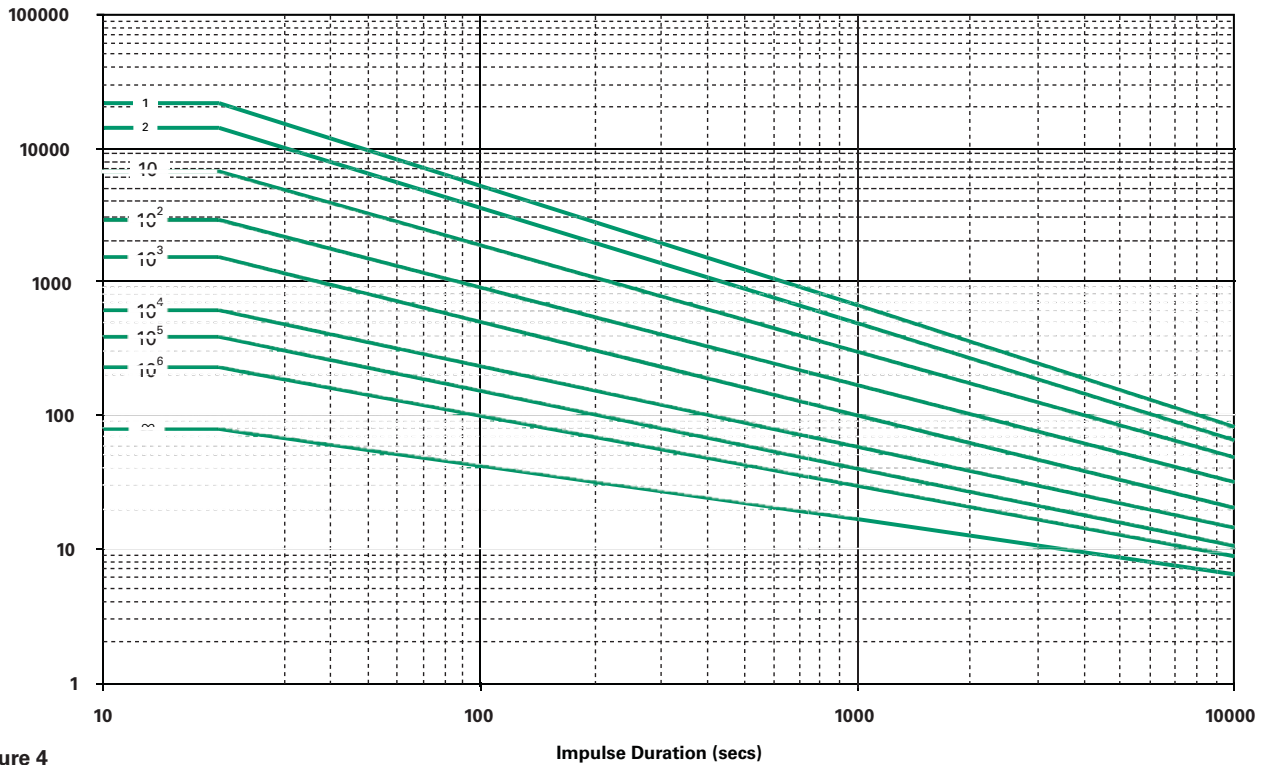


Figure 4

Wave Solder Profile

Because the TMOV25S™ Series contains a thermally responsive device, care must be taken when soldering the device into place. Two soldering methods are possible. Firstly, hand soldering: We recommend the use of pliers to heat-sink the leads of the device. Secondly, wave-soldering: This is a strenuous process requiring pre-heat stages to reduce the stresses on devices.

It is critically important that all preheat stage and the solder bath temperatures are rigidly controlled. The recommended solder for the TMOV® Series is a 62/36/2 (Sn/Pb/Ag), 60/40 (Sn/Pb) or 63/37 (Sn/Pb). Littelfuse also recommends an RMA solder flux. SAC solders (SnAgCu) are recommended for Lead-free applications.

Soldering Profile

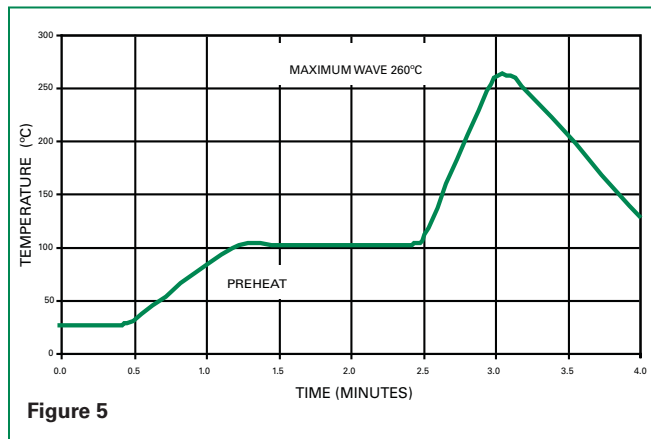


Figure 5

Physical Specifications

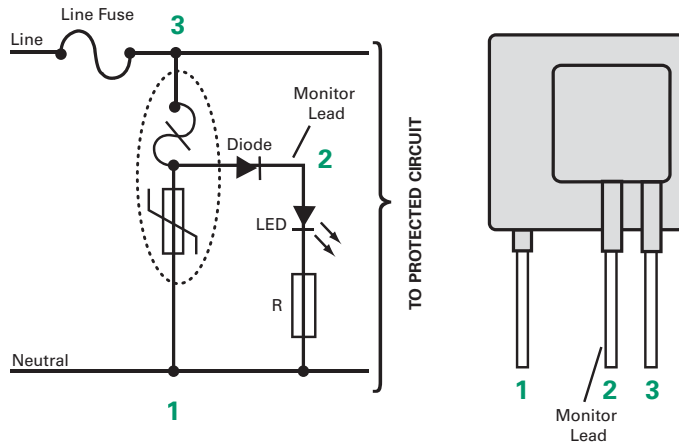
| | |
|----------------------------------|---|
| Lead Material | Tin-coated Copper wire |
| Soldering Characteristics | Solderability per MIL-STD-202, Method 208E |
| Insulating Material | Cured, flame retardant epoxy polymer meets UL94V-0 requirements |
| Device Labeling | Marked with LF, voltage, UL logos, and date code |

Environmental Specifications

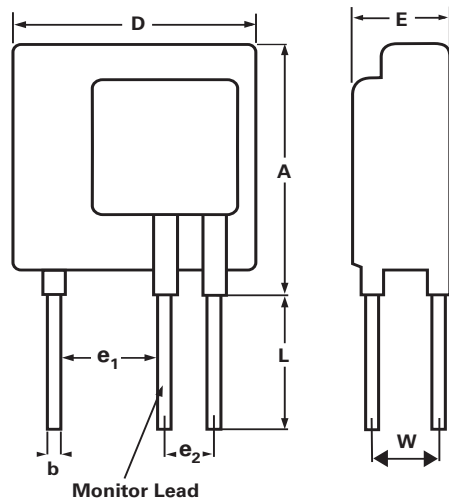
| | |
|--------------------------------------|---|
| Operating/Storage Temperature | -40°C to +85°C |
| Passive Aging | +85°C, 1000 hours -/+10% typical voltage change |
| Humidity Aging | +85°C, 85%R.H., 1000 hours -/+10% typical voltage change |
| Thermal Shock | +85°C to -40°C 5 times -/+10% typical voltage change |
| Solvent Resistance | MIL-STD-202, Method 215F |
| Moisture Sensitivity | Level 1, J-STD-020C |

Application Example

The application example left shows how the indicator lead on the TMOV® can be used to indicate that thermal element has been opened. This signifies that the circuit is no longer protected from transients by the MOV.



Dimensions

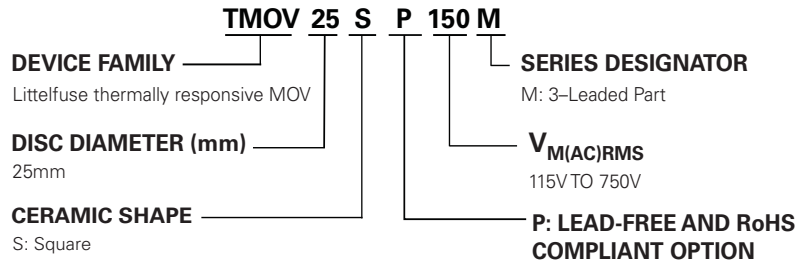


Product Dimensions (mm)

| Part Number | W _{MIN} | W _{MAX} | E | A _{MAX} | B _{MIN} | B _{MAX} | D _{MAX} | e ₁ | e ₂ | L |
|--------------|------------------|------------------|------|------------------|------------------|------------------|------------------|----------------|----------------|-----------|
| TMOV25SP115M | 1.5 | 2.7 | 11.7 | 34.5 | 0.95 | 1.05 | 28 | 12.7+/-1 | 6.5+/-1 | 12.7 Min. |
| TMOV25SP130M | 1.6 | 2.9 | 11.9 | | | | | | | |
| TMOV25SP140M | 1.7 | 3.0 | 12.0 | | | | | | | |
| TMOV25SP150M | 1.8 | 3.1 | 12.1 | | | | | | | |
| TMOV25SP175M | 1.9 | 3.3 | 12.3 | | | | | | | |
| TMOV25SP230M | 2.0 | 3.4 | 12.4 | | | | | | | |
| TMOV25SP250M | 2.1 | 3.5 | 12.5 | | | | | | | |
| TMOV25SP275M | 2.3 | 3.7 | 12.7 | | | | | | | |
| TMOV25SP300M | 2.4 | 3.9 | 12.9 | | | | | | | |
| TMOV25SP320M | 2.6 | 4.1 | 13.1 | | | | | | | |
| TMOV25SP385M | 3.0 | 4.7 | 13.7 | | | | | | | |
| TMOV25SP420M | 3.3 | 5.0 | 14.0 | | | | | | | |
| TMOV25SP440M | 3.4 | 5.2 | 14.2 | | | | | | | |
| TMOV25SP460M | 3.6 | 5.4 | 14.4 | | | | | | | |
| TMOV25SP510M | 3.9 | 5.7 | 14.7 | | | | | | | |
| TMOV25SP550M | 4.2 | 6.2 | 15.2 | | | | | | | |
| TMOV25SP625M | 4.6 | 6.6 | 15.6 | | | | | | | |
| TMOV25SP750M | 5.4 | 7.7 | 16.7 | | | | | | | |

For 14mm ratings above 420 V_{RMS} contact factory for specifications.

Part Numbering System



Term Definitions

Rated AC Voltage ($V_{M(AC)RMS}$) – MCOV

This is the maximum continuous sinusoidal RMS voltage that may be applied. This voltage may be applied at any temperature up to the maximum operating temperature of the device.

Maximum Non-Repetitive Surge Current (I_{TM})

This is the maximum peak current which may be applied for a single 8/20 μ s impulse, with rated line voltage also applied, without causing device failure. The pulse can be applied to the device in either polarity with the same confidence factor.

Nominal Discharge Current (I_N)

Peak value of the current, selected by the manufacturer, through the SPD having a current waveshape of 8/20 μ s where the SPD remains functional after 15 surges.

Voltage Protection Rating (V_{PR})

A rating selected from a list of preferred values as given in UL 1449 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from UL 1449 to the measured limiting voltage determined during the transient-voltage surge suppression test using the combination wave generator at a setting of 6kV, 3kA.

UL 1449

An Underwriters Laboratory standard covering the safety requirements for Surge Protective Devices intended for permanently connected, cord-connected and direct plug-in applications.

Limited Current Abnormal Over-voltage Test

An AC over-voltage condition applied to a Surge Protective Device according to UL 1449, Section 39.4. The short circuit current is limited by series connected resistors to 10A, 5A, 2.5A, 0.5A and 0.125A. The condition is maintained for 7 hours or until the device under test is disconnected from the AC supply or the current or temperature reaches equilibrium.

Maximum Non-Repetitive Surge Energy (W_{TM})

This is the maximum rated transient energy which may be dissipated for a single current pulse at a specified impulse duration, with the rated RMS voltage applied, without causing device failure.

Nominal Voltage ($V_{N(DC)}$)

This is the voltage at which the device changes from the off (standby state) to the on (clamping state) and enters its conduction mode of operation. The voltage value is usually characterised at the 1mA point and has a specified minimum and maximum voltage range.