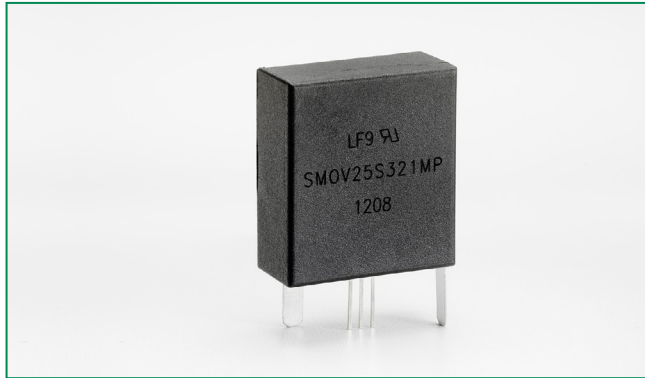


## SMOV25S<sup>®</sup> Varistor Series



### Agency Approvals

| Agency | Agency Approval | Agency File Number |
|--------|-----------------|--------------------|
|        | UL1449          | E320116            |

### Additional Information



Datasheet



Resources



Samples

### Description

The Littelfuse SMOV<sup>®</sup>25S thermally protected varistor is a self-protected device. It consists of a 25mm square varistor with an integral thermal disconnect designed to open in the event of overheating due to abnormal overvoltage as outlined in UL1449. The SMOV<sup>®</sup> helps facilitate SPD module compliance to UL1449 and offers quick thermal response due to the close proximity of the integrated thermal element to the MOV body. This configuration also offers lower inductance than most discreet solutions resulting in improved clamping performance to fast over voltage transients.

The device has a separate micro-switch, which can be used to indicate that the MOV has been disconnected from the circuit. This separate switch makes the monitoring circuitry completely isolated from the main power which ensures indicator circuit safety and simplifies the customers circuit design.

### Features

- Maximum single surge capability 20 kA, 8/20 waveshape.
- Nominal Discharge Current Value: 10kA.
- Intermediate current rating: 50A/150A.
- -45°C to +75°C operating temperature.
- Recognized to UL 1449.
- Lead-Free and RoHS compliant.
- Integrated micro-switch for indication circuitry/design.

### Applications

- SPD applications
- AC/DC distribution
- IT/Data center
- Power supplier
- Telecommunication

### Absolute Maximum Ratings

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

|   | SMOV25S Varistor Series | Units |
|---|-------------------------|-------|
| <b>Continuous:</b>  |                         |       |
| <b>Steady State Applied Voltage:</b>                              |                         |       |
| DC Voltage Range (VM(DC))   | 150 to 970              | V     |
| AC Voltage Range (V <sub>M(AC)RMS</sub> )                         | 115 to 750              | V     |
| <b>Transient:</b>   |                         |       |
| Non-Repetitive Surge Current, 8/20µs Waveform (I <sub>TM</sub> )  | 20,000                  | A     |
| Non-Repetitive Energy Capability, 2ms Waveform (W <sub>TM</sub> ) | 170 to 670              | J     |
| Operating Ambient Temperature Range (T <sub>A</sub> )             | -45 to +75              | °C    |
| Storage Temperature Range (T <sub>STG</sub> )                     | -45 to +85              | °C    |
| Hi-Pot Encapsulation (Isolation Voltage Capability)               | 2500                    | V     |
| Isolation Voltage Capability (when the thermal disconnect opens)  | 1500                    | V     |
| Housing 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 (75°C) |             |            |                           |                                | Specifications (25 °C)               |                    |                                 |          |                              |
|--------------|-----------------------|-------------|------------|---------------------------|--------------------------------|--------------------------------------|--------------------|---------------------------------|----------|------------------------------|
|              | Continuous            |             | Transient  |                           |                                | Varistor Voltage at 1mA Test Current |                    | Maximum Clamping Voltage 8/20µs |          | Typical Capacitance f = 1MHz |
|              | AC Volts              | DC Volts    | Energy 2ms | Peak Surge Current 8/20µs | Nominal Discharge Current (In) |                                      |                    |                                 |          |                              |
|              | $V_{M(AC)}$           | $V_{M(DC)}$ | $W_{TM}$   | $I_{TM}$<br>1 x Pulse     | $I_n$                          | $V_{N(DC)}$<br>Min                   | $V_{N(DC)}$<br>Max | $V_c$                           | $I_{PK}$ | C                            |
|              | (V)                   | (V)         | (J)        | (A)                       | (A)                            |                                      | (V)                | (V)                             | (A)      | (pF)                         |
| SMOV25S111MP | 115                   | 150         | 170        | 20000                     | 10000                          | 162                                  | 198                | 295                             | 100      | 3200                         |
| SMOV25S111NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S131MP | 130                   | 170         | 190        | 20000                     | 10000                          | 184.5                                | 225.5              | 335                             | 100      | 2800                         |
| SMOV25S131NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S151MP | 150                   | 200         | 220        | 20000                     | 10000                          | 216                                  | 264                | 390                             | 100      | 2300                         |
| SMOV25S151NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S181MP | 175                   | 225         | 250        | 20000                     | 10000                          | 243                                  | 297                | 450                             | 100      | 1900                         |
| SMOV25S181NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S251MP | 250                   | 320         | 330        | 20000                     | 10000                          | 351                                  | 429                | 640                             | 100      | 1400                         |
| SMOV25S251NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S271MP | 275                   | 350         | 350        | 20000                     | 10000                          | 387                                  | 473                | 700                             | 100      | 1250                         |
| SMOV25S271NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S301MP | 300                   | 385         | 370        | 20000                     | 10000                          | 423                                  | 517                | 765                             | 100      | 1150                         |
| SMOV25S301NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S321MP | 320                   | 420         | 390        | 20000                     | 10000                          | 459                                  | 561                | 825                             | 100      | 1080                         |
| SMOV25S321NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S421MP | 420                   | 560         | 460        | 20000                     | 10000                          | 612                                  | 748                | 1100                            | 100      | 820                          |
| SMOV25S421NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S461MP | 460                   | 615         | 490        | 20000                     | 10000                          | 675                                  | 825                | 1220                            | 100      | 750                          |
| SMOV25S461NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S511MP | 510                   | 670         | 520        | 20000                     | 10000                          | 738                                  | 902                | 1335                            | 100      | 680                          |
| SMOV25S511NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S551MP | 550                   | 745         | 550        | 20000                     | 10000                          | 819                                  | 1001               | 1475                            | 100      | 630                          |
| SMOV25S551NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S621MP | 620                   | 800         | 600        | 20000                     | 10000                          | 900                                  | 1100               | 1625                            | 100      | 550                          |
| SMOV25S621NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |
| SMOV25S751MP | 750                   | 970         | 670        | 20000                     | 10000                          | 1080                                 | 1320               | 1950                            | 100      | 460                          |
| SMOV25S751NP |                       |             |            |                           |                                |                                      |                    |                                 |          |                              |

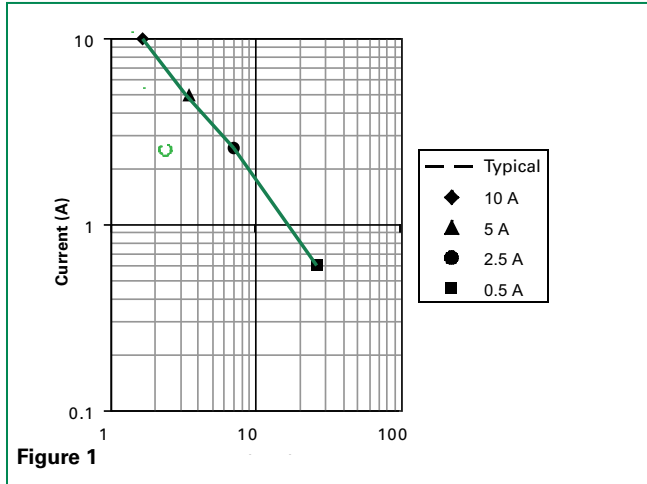
Average power dissipation of transients should not exceed 1.5 watts

Same ratings and specifications apply to Non Isolated Monitored Switch alternative design. Replace "M" with "N" in the part number. e.g.: SMOV25S111NP.

Refer to Part Number System at the end of this document.

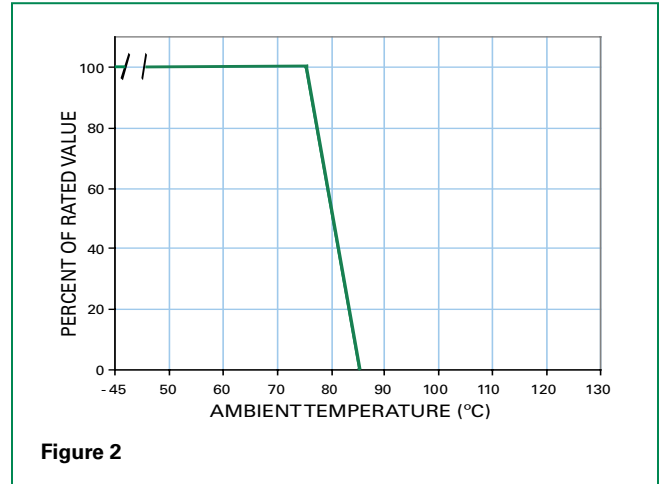
**Thermal Characteristics**

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

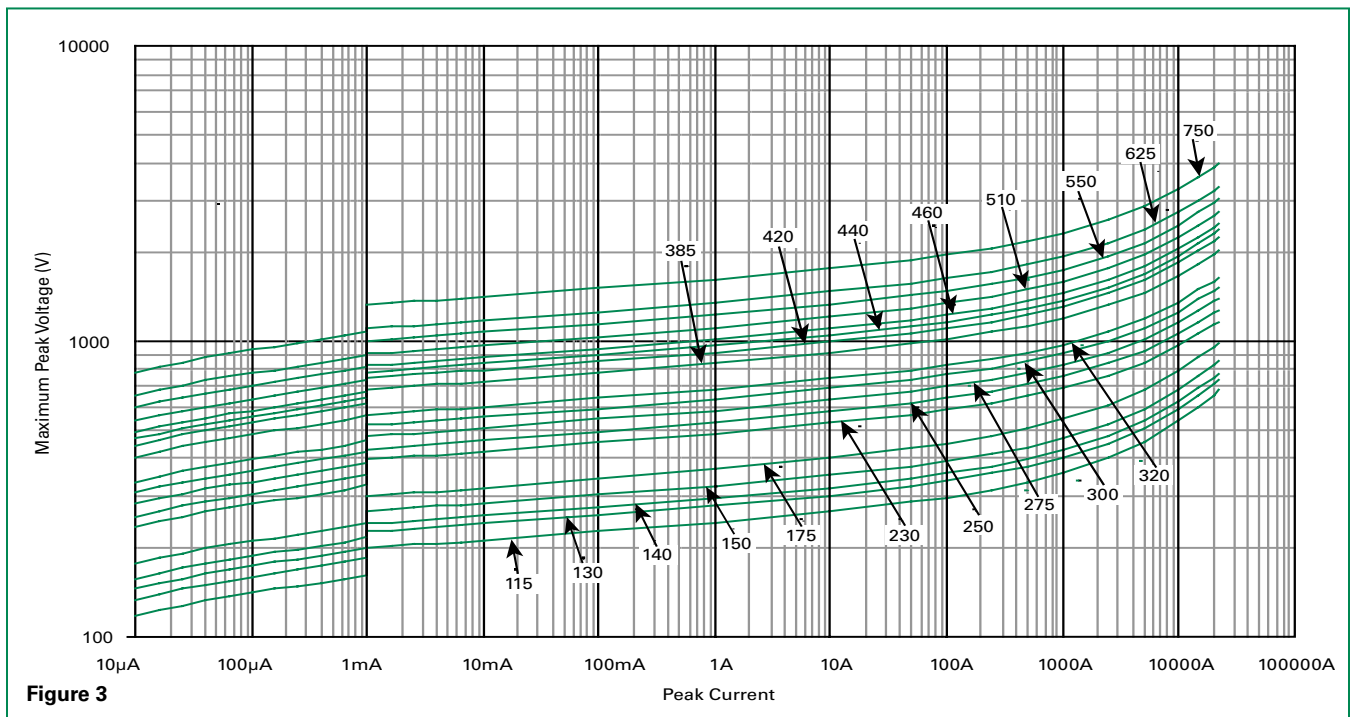


**Peak Current & Energy Derating Curve**

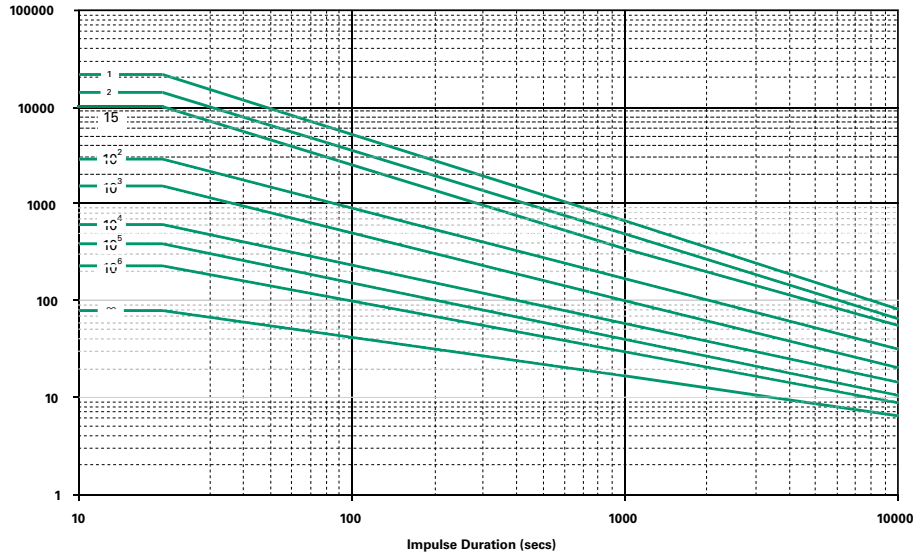
For applications exceeding 75°C ambient temperature, the peak surge current and energy ratings must be reduced as shown below.



**Transient V-I Characteristic Curves**



**Pulse Rating Curve**



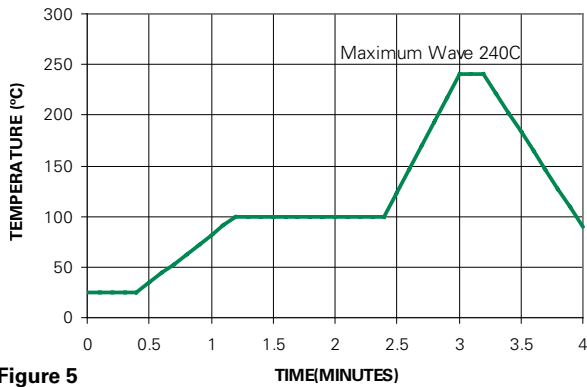
**Figure 4**

**Wave Solder Profile**

Because the SMOV®25S Varistors contain a thermal protection device, care must be taken when soldering the devices into place. Two soldering methods are possible. Firstly, hand soldering: It is

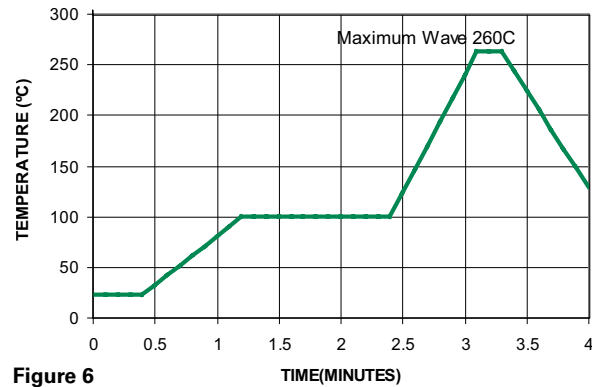
recommended to heat-sink the leads of the device. Secondly, wave-soldering: It is critically important that all preheat stage and the solder bath temperatures are rigidly controlled.

**Non Lead-free Profile**



**Figure 5**

**Lead-free Profile**



**Figure 6**

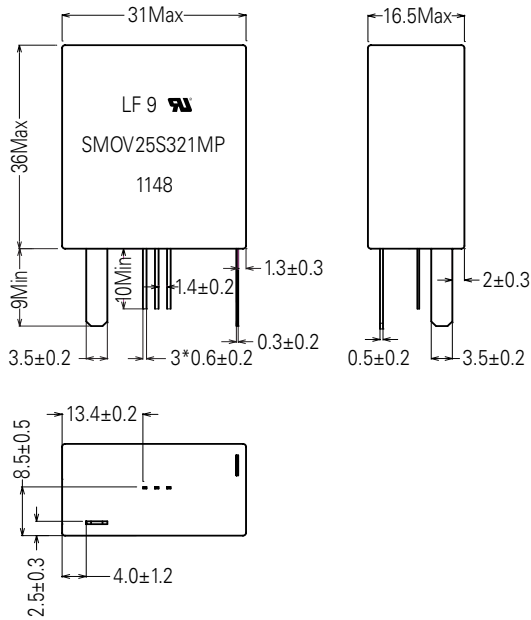
**Physical Specifications**

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

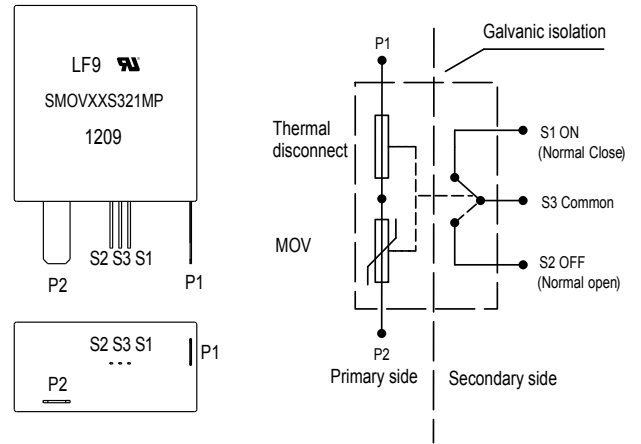
**Environmental Specifications**

|                                |   |
|--------------------------------|---|
| <b>Operating/Storage Temp.</b> | -45°C to +75°C  |
| <b>Passive Aging</b>           | +75°C, 1000 hours<br>-/+10% typical voltage change          |
| <b>Humidity Aging</b>          | +75°C, 85%R.H., 1000 hours<br>-/+10% typical voltage change |
| <b>Thermal Shock</b>           | +75°C to -40°C 5 times<br>-/+10% typical voltage change     |
| <b>Solvent Resistance</b>      | MIL-STD-202, Method 215                                     |
| <b>Moisture Sensitivity</b>    | Level 1, J-STD-020  |

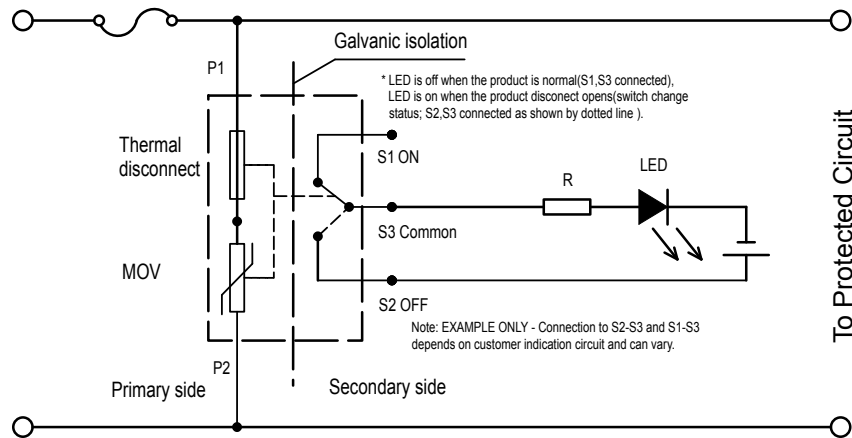
**Product Dimensions**



**Lead Configuration**



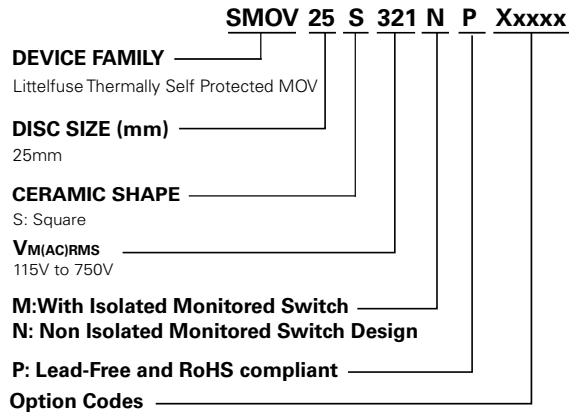
**Application Example**



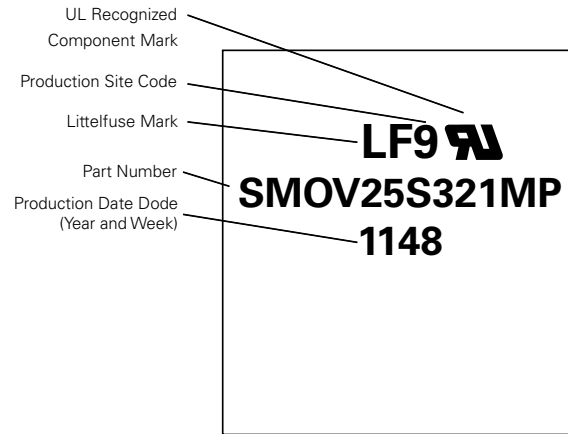
**Switch Specification**

| SMOV Switch | Voltage DC | Current (Amps) | Contact Resistance Max. | Insulation Resistance Min. | Dielectric Strength<br>0.5mA/Minute |
|-------------|------------|----------------|-------------------------|----------------------------|-------------------------------------|
| Switch      | 12V        | 0.1A           | 70mΩ                    | 100MΩ                      | 500VAC                              |

**Part Numbering System**



**Part Marking System**



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