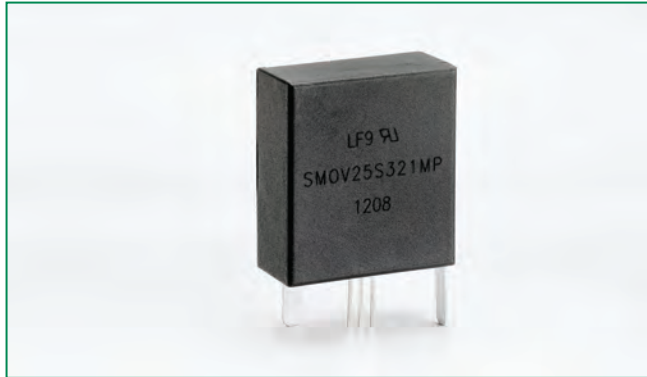


RoHS  **SMOV25S Varistor Series**



**Agency Approvals**

| Agency  | Agency File Number |
|---|--------------------|
|  | E320116            |

**Description**

The Littelfuse SMOV 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 3rd edition. The SMOV 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 3rd edition.
- Lead-Free and RoHS compliant.
- Integrated micro-switch for indication circuitry/design.

**Applications**

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

SMOV25S Series

### Absolute Maximum Ratings

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

|  | SMOV25S Series | Units |
|--|----------------|-------|
| <b>Continuous:</b>   |                |       |
| <b>Steady State Applied Voltage:</b>                             |                |       |
| DC Voltage Range (VM(DC))  | 150 to 970     | V     |
| AC Voltage Range (VM(AC)RMS)                                     | 115 to 750     | V     |
| <b>Transient:</b>  |                |       |
| Non-Repetitive Surge Current, 8/20µs Waveform (ITM)              | 20,000         | A     |
| Non-Repetitive Energy Capability, 2ms Waveform (WTM)             | 170 to 670     | J     |
| Operating Ambient Temperature Range (TA)                         | -45 to +75     | °C    |
| Storage Temperature Range (TSTG)                                 | -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) |                                      |               |                                 |      |                              |
|              | VM(AC)                | VM(DC)   | WTM        | ITM<br>1 x Pulse          | In                             | VN(DC)<br>Min                        | VN(DC)<br>Max | Vc                              | IPK  | C                            |
| (V)          | (V)                   | (J)      | (A)        | (A)                       | (V)                            | (V)                                  | (V)           | (A)                             | (pF) |                              |
| SMOV25S111MP | 115                   | 150      | 170        | 20000                     | 10000                          | 162                                  | 198           | 295                             | 100  | 3200                         |
| SMOV25S131MP | 130                   | 170      | 190        | 20000                     | 10000                          | 184                                  | 226           | 335                             | 100  | 2800                         |
| SMOV25S151MP | 150                   | 200      | 220        | 20000                     | 10000                          | 216                                  | 264           | 390                             | 100  | 2300                         |
| SMOV25S181MP | 175                   | 225      | 250        | 20000                     | 10000                          | 243                                  | 297           | 450                             | 100  | 1900                         |
| SMOV25S251MP | 250                   | 320      | 330        | 20000                     | 10000                          | 351                                  | 429           | 640                             | 100  | 1400                         |
| SMOV25S271MP | 275                   | 350      | 350        | 20000                     | 10000                          | 387                                  | 473           | 700                             | 100  | 1250                         |
| SMOV25S301MP | 300                   | 385      | 370        | 20000                     | 10000                          | 423                                  | 517           | 765                             | 100  | 1150                         |
| SMOV25S321MP | 320                   | 420      | 390        | 20000                     | 10000                          | 459                                  | 561           | 825                             | 100  | 1080                         |
| SMOV25S421MP | 420                   | 560      | 460        | 20000                     | 10000                          | 612                                  | 748           | 1100                            | 100  | 820                          |
| SMOV25S461MP | 460                   | 615      | 490        | 20000                     | 10000                          | 675                                  | 825           | 1220                            | 100  | 750                          |
| SMOV25S511MP | 510                   | 670      | 520        | 20000                     | 10000                          | 738                                  | 902           | 1335                            | 100  | 680                          |
| SMOV25S551MP | 550                   | 745      | 550        | 20000                     | 10000                          | 819                                  | 1001          | 1475                            | 100  | 630                          |
| SMOV25S751MP | 750                   | 970      | 670        | 20000                     | 10000                          | 1080                                 | 1320          | 1950                            | 100  | 460                          |

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 Abnormal Overvoltage Limited Current Test:

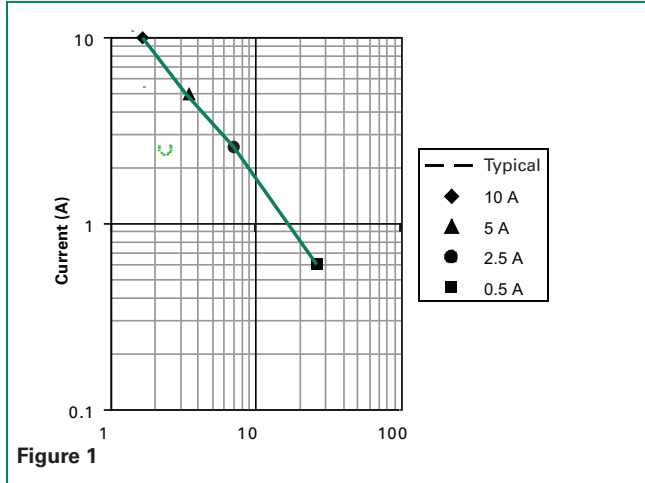


Figure 1

**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.

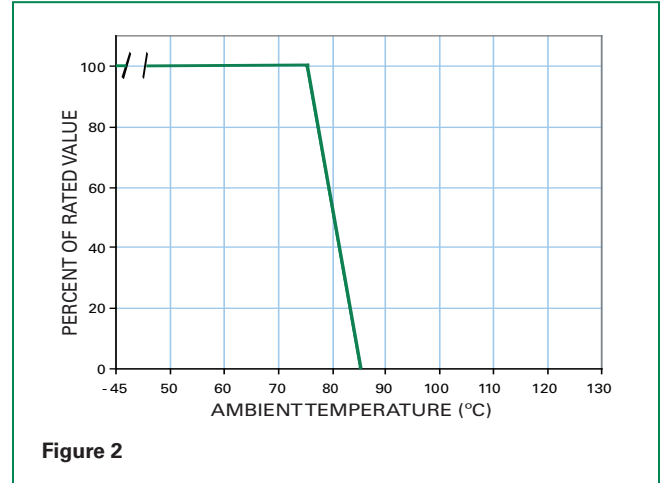


Figure 2

**Transient V-I Characteristic Curves**

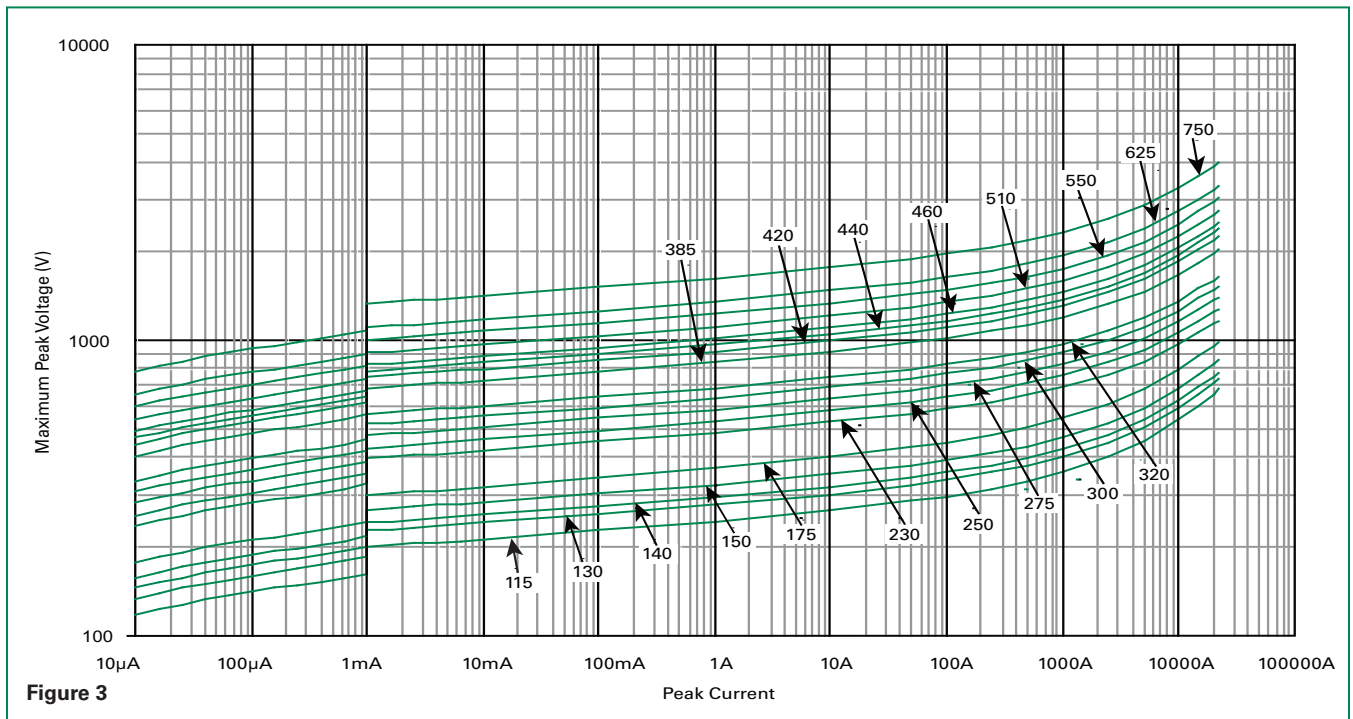


Figure 3

SMOV25S Series

### SMOV25S Pulse Rating Curve

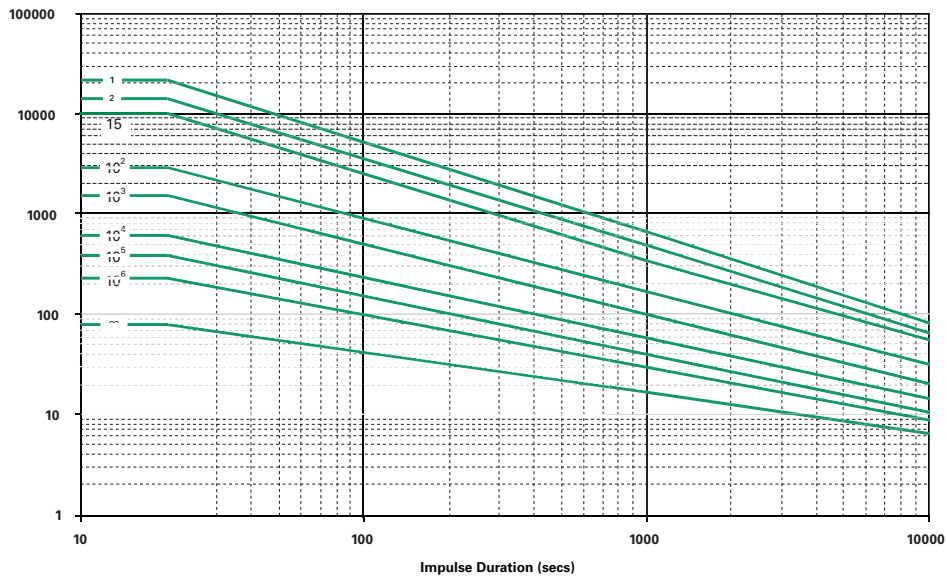


Figure 4

### Wave Solder Profile

Because the SMOV25S Series 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

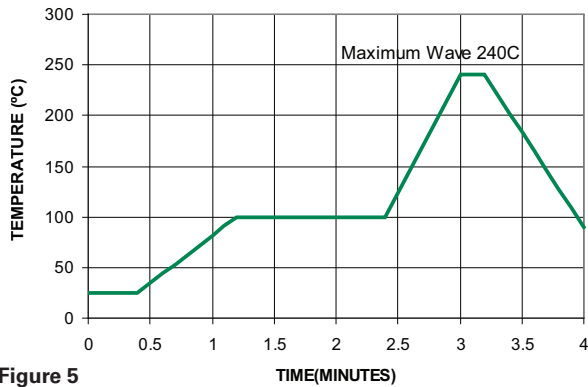


Figure 5

### Lead-free Profile

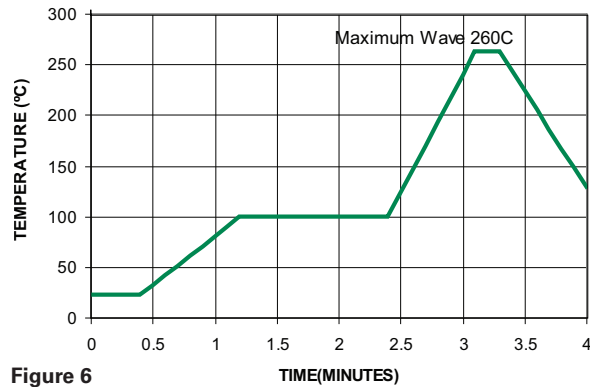


Figure 6

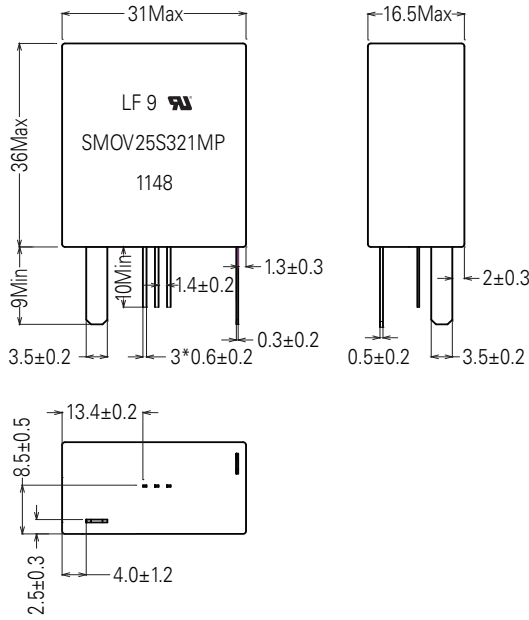
### Physical Specifications

|                                  |   |
|----------------------------------|---|
| <b>Lead Material</b>             | Tin-coated Copper wire  |
| <b>Soldering Characteristics</b> | Solderability per MIL-STD-202, Method 208E                      |
| <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                |

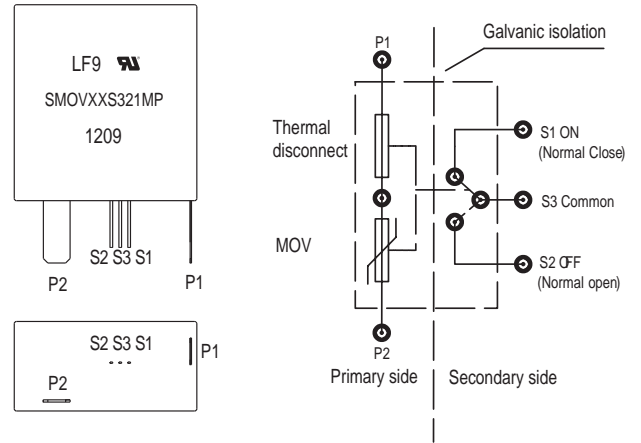
### Environmental Specifications

|                                |   |
|--------------------------------|---|
| <b>Operating/Storage Temp.</b> | -45°C to +75°C / -45°C to +85°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 215F                                    |
| <b>Moisture Sensitivity</b>    | Level 1, J-STD-020C   |

**Product Dimensions**

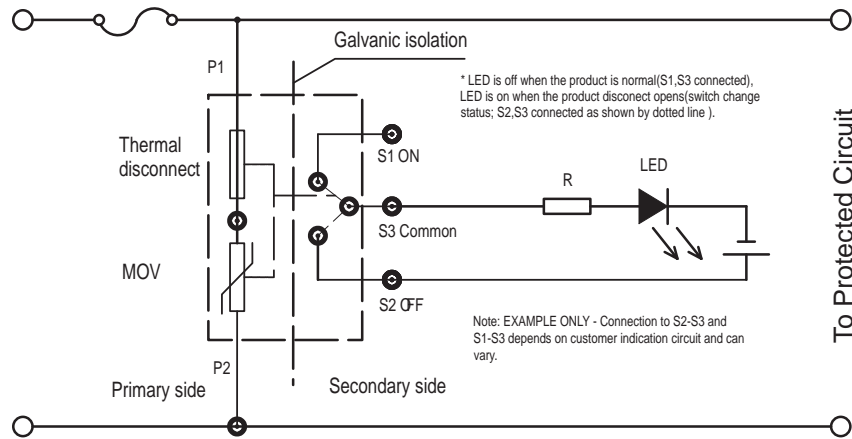


**Lead Configuration**



**SMOV25S Series**

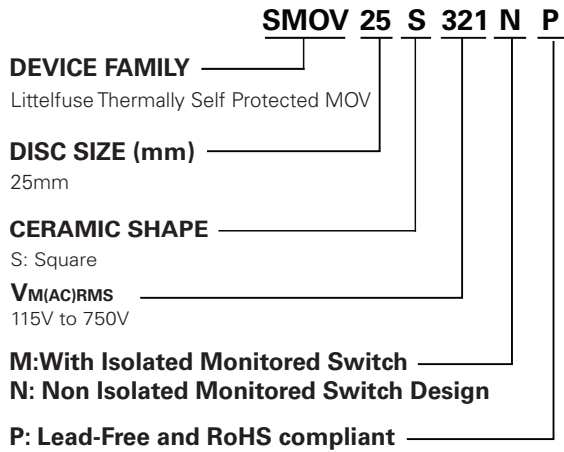
**Application Example**



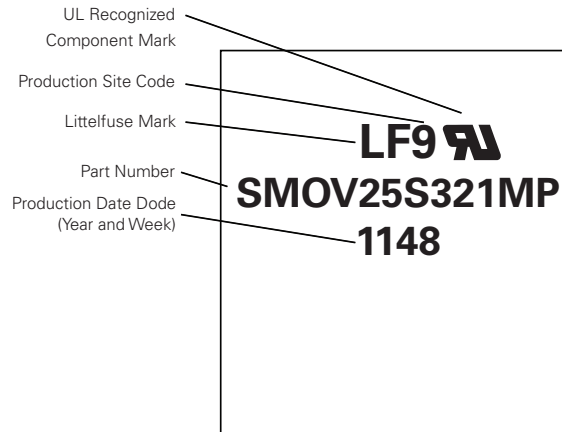
**Switch Specification**

| 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



### 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 $\mu$ 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 $\mu$ 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.

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