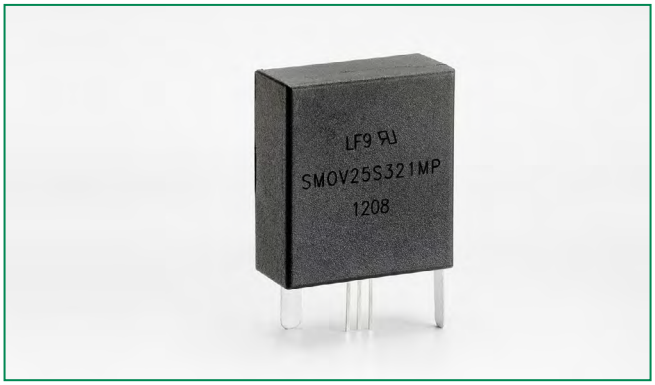
SMOV25S Varistor Series



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

Absolute Maximum Ratings

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

	SMOV25S Series	Units
Continous:		
Steady State Applied Voltage:		
DC Voltage Range (VM(DC))	150 to 970	V
AC Voltage Range ($V_{M(AC)RMS}$)	115 to 750	V
Transient:		
Non-Repetitive Surge Current, 8/20µs Waveform (I_{TM})	20,000	A
Non-Repetitive Energy Capability, 2ms Waveform (W_{TM})	170 to 670	J
Operating Ambient Temperature Range (T_A)	-45 to +75	°C
Storage Temperature Range (T_{STG})	-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.

Revised: 05/23/14

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} 1 x Pulse	In	$V_{N(DC)}$ Min	$V_{N(DC)}$ Max	Vc	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.

Revised: 05/23/14

Thermal Characteristics

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

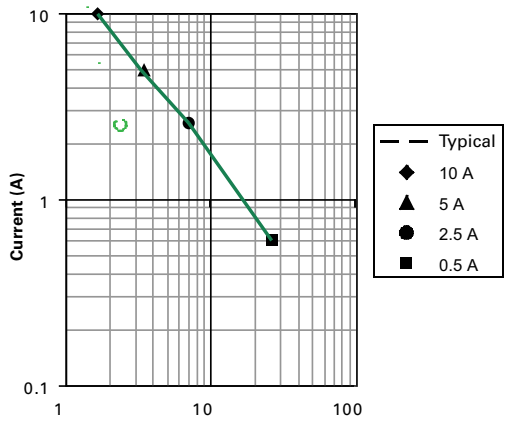


Figure 1

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.

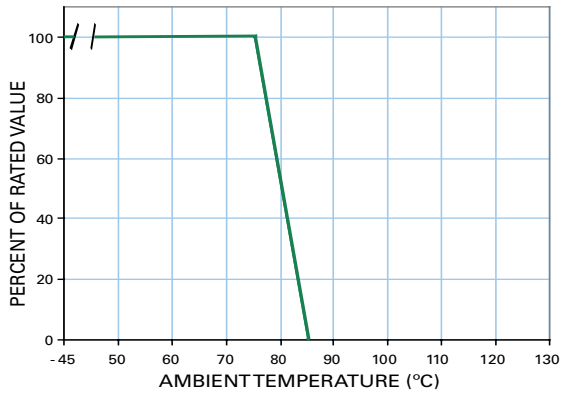


Figure 2

Transient V–I Characteristic Curves

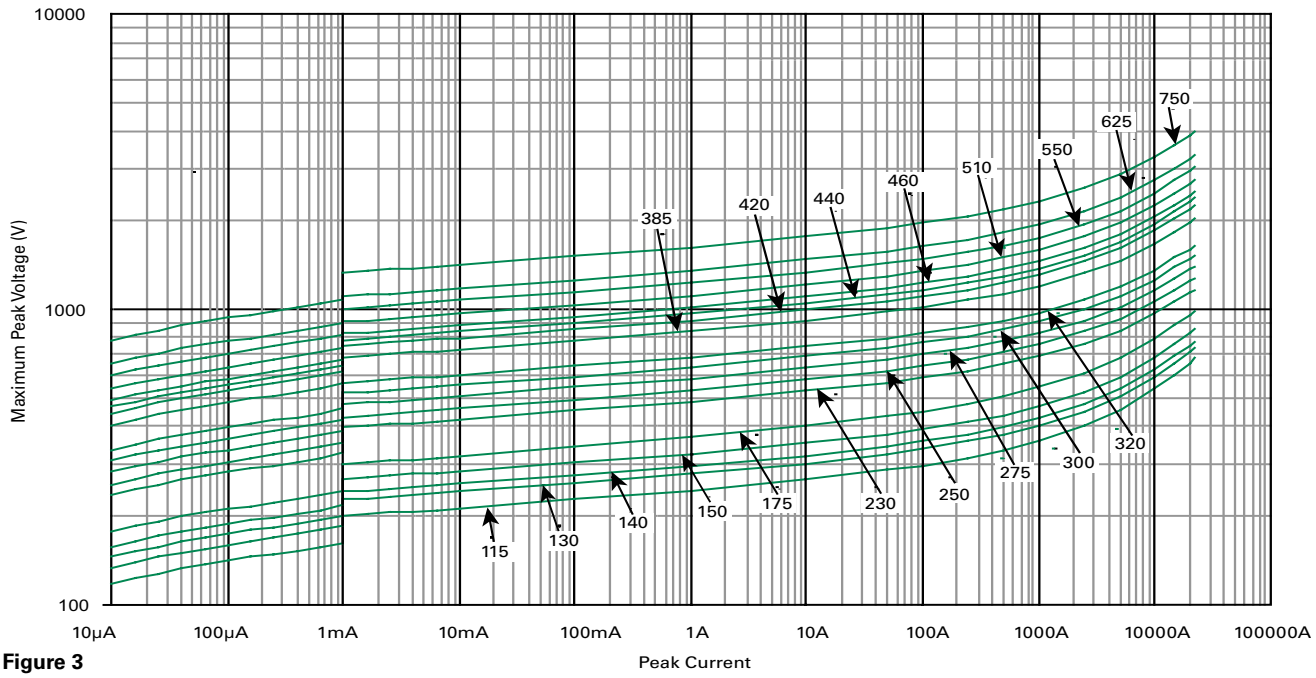


Figure 3

Revised: 05/23/14

SMOV25S Pulse Rating Curve

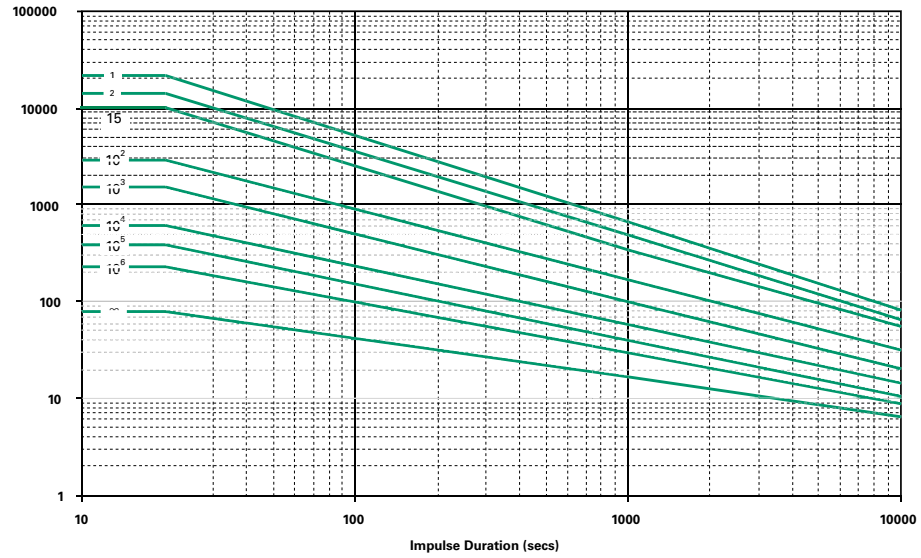


Figure 4

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

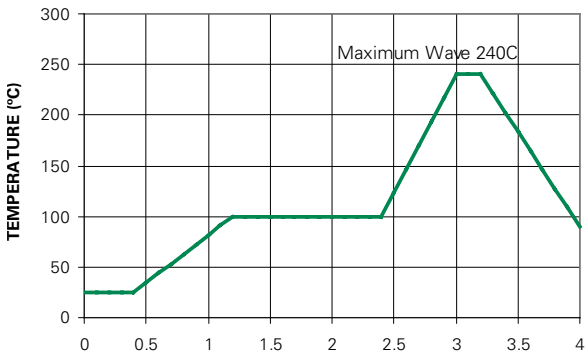


Figure 5

Lead–free Profile

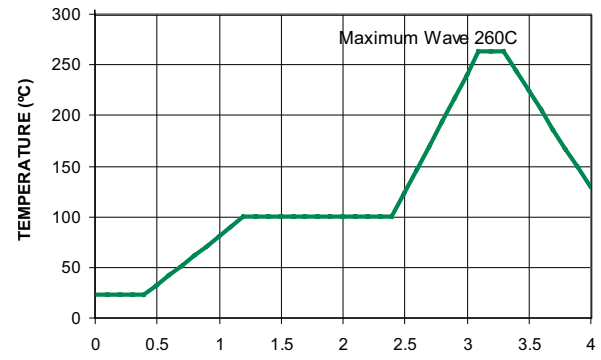


Figure 6

Physical Specifications

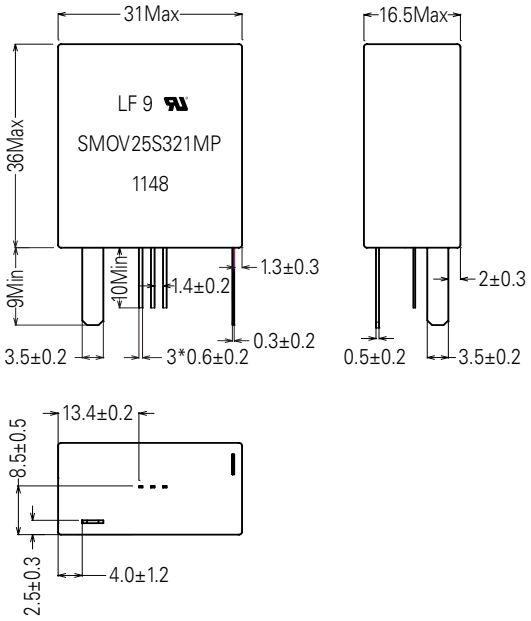
Lead Material	Tin–plated
Soldering Characteristics	Solderability per MIL-STD-202, Method 208E
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V-0 requirements
Device Labeling	Marked with LF, voltage, UL logos, and date code

Environmental Specifications

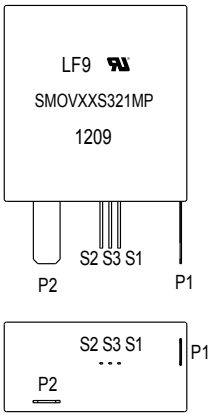
Operating/Storage Temp.	-45°C to +75°C / -45°C to +85°C
Passive Aging	+75°C, 1000 hours -/+10% typical voltage change
Humidity Aging	+75°C, 85%R.H., 1000 hours -/+10% typical voltage change
Thermal Shock	+75°C to -40°C 5 times -/+10% typical voltage change
Solvent Resistance	MIL-STD-202, Method 215F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

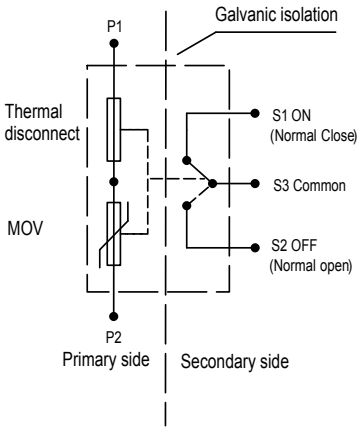
Revised: 05/23/14

Product Dimensions

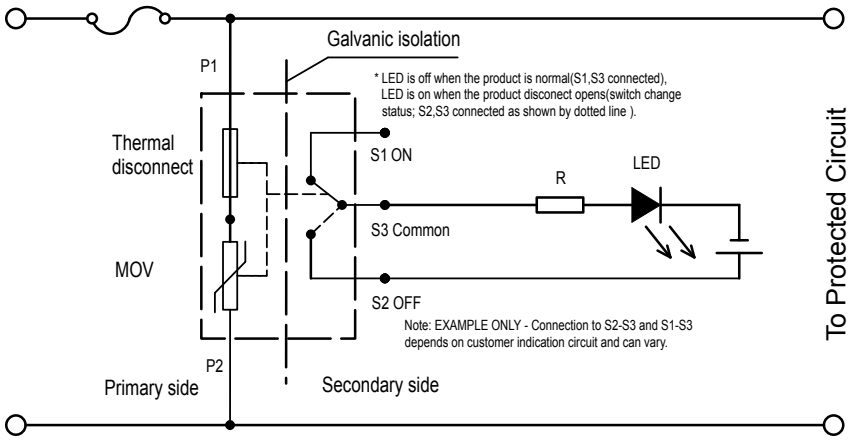


Lead Configuration





Application Example



Switch Specification

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

Revised: 05/23/14

Part Numbering System

SMOV 25 S 321 N P Xxxxx

DEVICE FAMILY
Littelfuse Thermally Self Protected MOV

DISC SIZE (mm)
25mm

CERAMIC SHAPE
S: Square

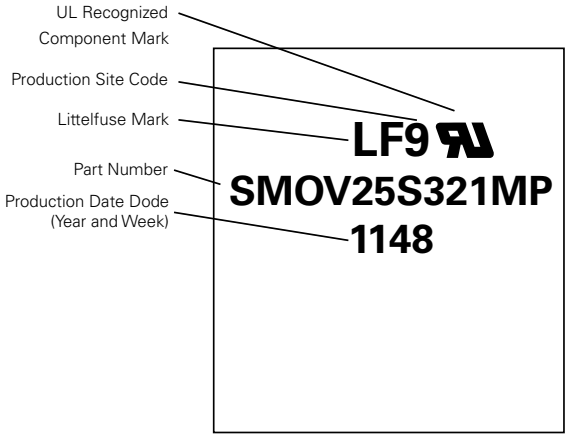
$V_{M(AC)RMS}$
115V to 750V

M:With Isolated Monitored Switch
N: Non Isolated Monitored Switch Design

P: Lead-Free and RoHS compliant

Option Codes

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 8/20µs 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 8/20µs 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.

Revised: 05/23/14