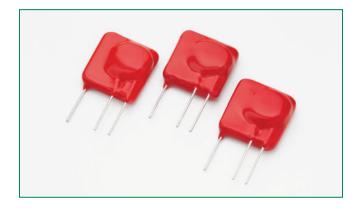


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Product scheduled for release in summer 2011





#### **Agency Approvals**

Agency	Agency File Number	Status			
<b>7U</b> °	UL1449 3rd Edition	Pending*			

<sup>\*</sup> 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 Specificaions table on next page. Contact your Littlefuse product representative to discuss alternatives and for additional information.

## **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.\*

#### **Features**

- RoHS Compliant and Lead-free
- Patented integrated thermal protection device Patent #US6636403
- 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

#### **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)

# Varistor Products Radial Lead Varistors > TMOV25S™ Series



## **Absolute Maximum Ratings**

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

	TMOV25S <sup>™</sup> Series	Units		
Continous:				
AC Voltage Range (V <sub>MIACIRMS</sub> )	115 to 750	V		
Transient:				
Peak Pulse Current (I <sub>TM</sub> )				
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 <sub>A</sub> )	-55 to +85	°C		
Storage Temperature Range (T <sub>STG</sub> )	-55 to +125	°C		
Temperature Coefficient (αV) of Clamping Voltage (V <sub>C</sub> ) at Specified Test Current	<0.01	%/°C		
Hi-Pot Encapsulation (COATING Isolation Voltage Capability)	2,500	V		
Thermal Protection Isolation Voltage Capability (when operated) *See notes under Device Ratings & Specifications section for more information	600*	V		
COATING Insulation Resistance	1,000	ΜΩ		

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**

	Maxim	85°C)	Specifications (25 °C)							
		Continuous	Trans	Transient				UL 1449*		
		AC Volts	Energy 2ms	Peak Current 8/20µs	Varistor Voltage at 1mA Test Current		Clamping Voltage at 100A Current 8/20µs	(3 <sup>RD</sup> Edition Approval Pending)	Nominal Discharge Current	Typical Capacitance
Part Number	Branding	V <sub>m(AC)RMS</sub> /MCOV	W <sub>TM</sub>	I <sub>™</sub> 1 x Pulse	V <sub>N(DC)</sub> Min	V <sub>N(DC)</sub> Max	V <sub>c</sub>	VPR	I <sub>N</sub>	С
		(V)	(J)	(A)	()	/)	(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

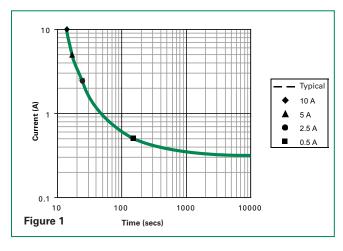
<sup>\*</sup> UL1449 3rd Edition approval of TMOV25S series is currently pending due to matters related to testing of the the integrated thermal element of this series. Contact your Littelfuse product representative to discuss alternatives and for additional information.

Devices with ratings >420V have not been evaluated.



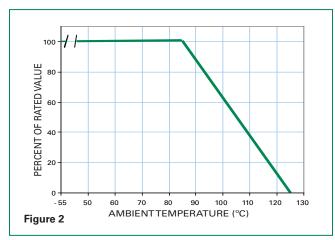
## **Thermal Characteristics**

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

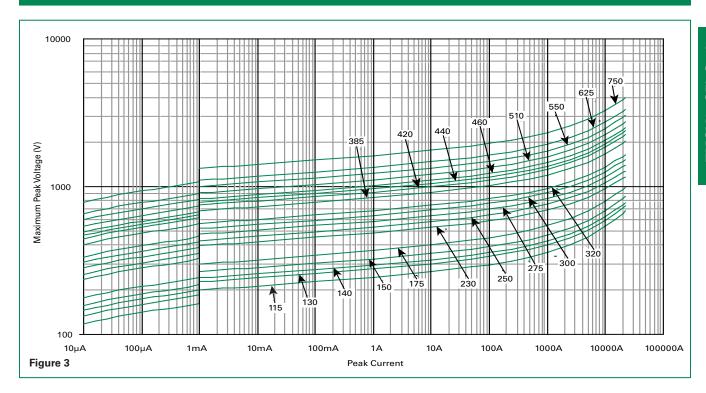


## **Current, Energy, Power Derating Curve**

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

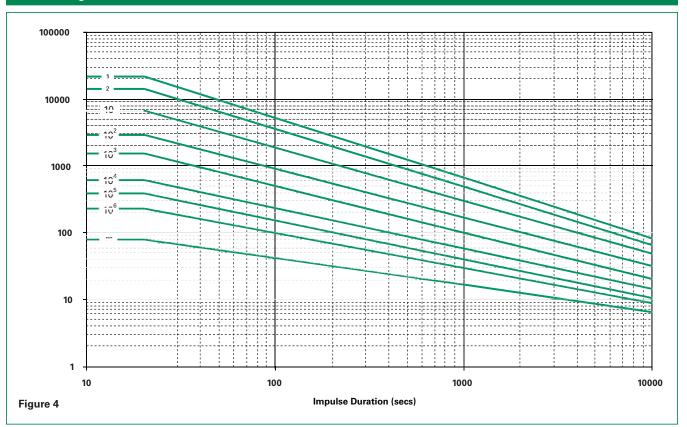


## **Transient V-I Characteristic Curves**





#### **Pulse Rating Curve**

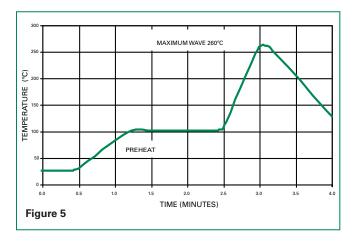


#### **Wave Solder Profile**

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**





## **Physical Specifications**

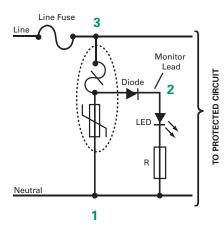
Lead Material	Tin-coated Copper wire				
Soldering Characteristics	Solderability per MIL-STD-202, Method 208E				
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V-0 requirements				
Device Labeling	Marked with LF, voltage, UL logos, and date code				

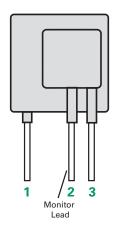
## **Environmental Specifications**

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**

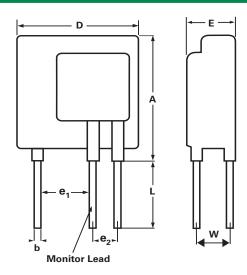
The application example left shows how the indicator lead on the TMOV® can be used to indicate that thermal element has been opened. This signifies that the circuit is no longer protected from transients by the MOV.







## **Dimensions**



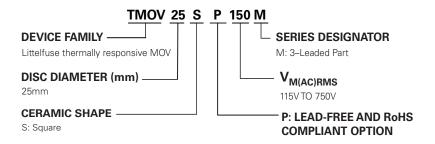
# **Product Dimensions (mm)**

Part Number	W <sub>MIN</sub>	W <sub>MAX</sub>	Е	A <sub>MAX</sub>	B <sub>MIN</sub>	B <sub>MAX</sub>	D <sub>MAX</sub>	e <sub>1</sub>	$e_{_2}$	L
TMOV25SP115M	1.5	2.7	11.7			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		0.95		20			
TMOV25SP300M	2.4	3.9	12.9	34.5						
TMOV25SP320M	2.6	4.1	13.1	34.5			28			
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  $\rm V_{\rm RMS}$  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<sub>™</sub>)

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 (IN)

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<sub>PR</sub>)

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<sub>N(DC)</sub>)

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.