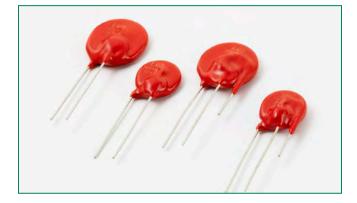
TMOV[®] and iTMOV[®] Varistor Series





ittelfuse

Expertise Applied | Answers Delivered

Agency Approvals								
	Agency Approval	Agency File Number						
9Ľ	UL1414	E56529						
71 °	UL1449	E320116						
E	QC 42201-C001, QC42201-A001, IEC 60950-1 (Annex Q)	E1274/F						
	IEC 61051-1, IEC 61051-2, IEC 60950-1 (Annex Q)	40021525						

Description

The Littelfuse TMOV[®] and iTMOV[®] thermally protected varistors represent a new development in integrated circuit protection. Both versions are comprised of radial leaded MOVs (Metal Oxide Varistors) with an integrated thermally activated element designed to open in the event of overheating due to the abnormal overvoltage, limited current, conditions outlined in UL1449. The TMOV[®] and iTMOV[®] varistor's integrated thermal element, in conjunction with appropriate enclosure design, helps facilitate SPD module compliance to UL1449 for both cord connected and permanently connected applications.

The TMOV[®] and iTMOV[®] varistors offer quick thermal response due to the close proximity of the integrated thermal element to the MOV body. The integrated configuration also offers lower inductance than most discrete solutions resulting in improved clamping performance to fast overvoltage transients.

The iTMOV[®] varistor differs from the TMOV[®] varistor by the inclusion of a third lead for the purpose of indicating that the MOV has been disconnected from the circuit. This lead facilitates connection to monitoring circuitry.

Additionally TMOV[®] and iTMOV[®] varistors are wave solderable, thus simplifying end product assembly by reducing the the expense and rework associated with hand soldering operations.

Features

- RoHS compliant and Lead–free available
- Patented integrated thermal protection device
 Patent #US6636403
- Designed to facilitate compliance to UL1449 3nd Edition for SPD product
- High peak surge current rating up to 10kA
- Standard lead form and spacing option

Wave solderable

- Low leakage
- -55°C to +85°C operating temp range
- Three-lead version available for indication purposes
- Applications
 - SPD Products
 - AC Panel Protection Modules
 - AC Line Power Supplies
 - Surge Protected
 Strip Connectors
- Strip Connectors
- AC Power Meters
- Relocatable AC
 Power Taps

- GFCI (Ground Fault Current Interupter)
- UPS (Uninterruptable Power Supply)
- White Goods
- Plug-in SPD
- Inverters
- AC/DC Power Supplies

Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart		
Continuous	TMOV [®] and iTMOV [®] Series	Units
Steady State Applied Voltage:		
AC Voltage Range (V _{MIACIBMS})	115 to 750	V
Transient:		
Peak Pulse Current (I _{TM}) - For $8x20\mu$ s Current Wave, single pulse	6,000 to 10,000	A
Single-Pulse Energy Capability - For 2ms Current Wave	35 to 480	J
Operating Ambient Temperature Range (T_)	-55 to +85	°C
Storage Temperature Range (T _{sto})	-55 to +125	°C
Temperature Coefficient (aV) 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
COATING Insulation Resistance	1,000	MΩ
Indicator Lead Rating (Lead-3 - iTMOV® varistor only):		
Continuous RMS current	100	mA
Surge Current, 8/20 <i>µ</i> s	10,000	A

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.

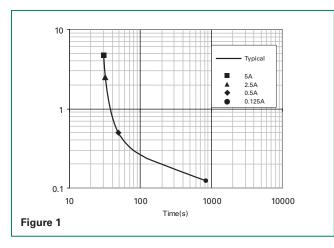
TMOV and iTMOV[®] Ratings & Specifications

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NIGVZUNE750E 21750E 1190VZUNE750191 21750191 20 750 970 480 10000 6500 1080 1320 1980 100 175															
	TMOV20RP750E	P2T750E	TMOV20RP750M	P2T750M	20	750	970	480	10000	6500	1080	1320	1980	100	

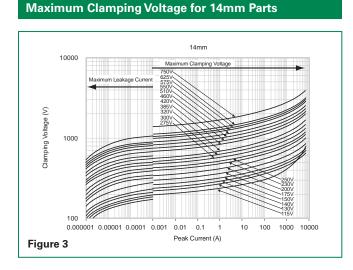
NOTE: For 14mm devices with a voltage rating greater than 420V, please contact factory regarding availability.



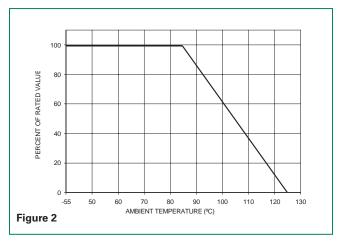
Thermal Characteristics



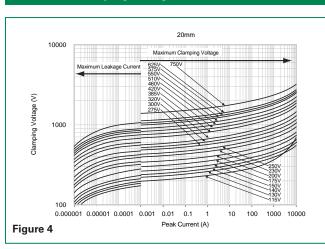
Note : The TMOV[®] and iTMOV[®] varistors are intended, in conjunction with appropriate enclosure design, to help facilitate SPD module compliance to UL 1449, 3rd Edition Section 39.4 (abnormal overvoltage limited current requirements). Under these extreme abnormal overvoltage conditions, some units will exhibit substantial heating, arcing and venting prior to opening. Modules should be designed to contain this possibility. Application testing is strongly recommended.



Current, Energy, Power Derating Curve



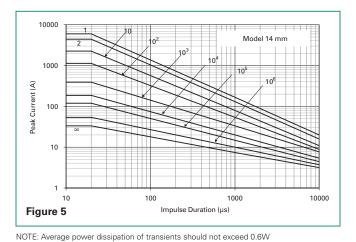
For applications exceeding 85°C ambient temperature, the peak surge current and energy ratings must be reduced as shown above.



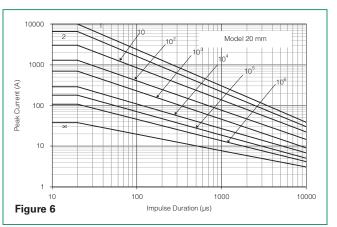
Maximum Clamping Voltage for 20mm Parts



Repetitive Surge Capability for 14mm Parts



Repetitive Surge Capability for 20mm Parts

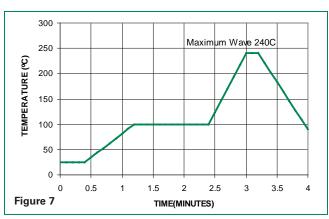


NOTE: Average power dissipation of transients should not exceed 1.0W

Wave Solder Profile

Because the TMOV[®] and iTMOV[®] 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.

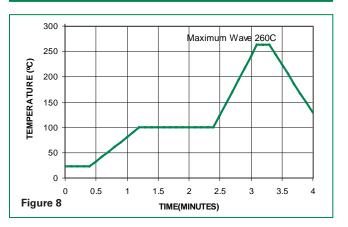




Physical Specifications

Lead Material	Non Lead-free parts: Solder coated Copper wire, or Tin-coated Copper wire Lead-free parts: 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/CSA logos, and date code	

Lead-free Profile

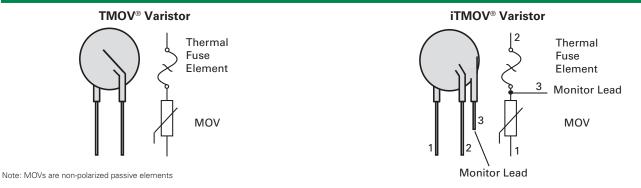


Environmental Specifications

Operating/Storage Temperature	-40°C to +85°C
Passive Aging	+85°C, 1000 hours +/-10% typical voltage change
Humidity Aging	+85°C, 85% RH , 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



Lead Configurations

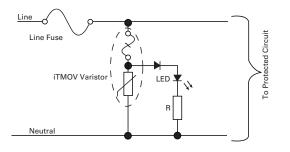


iTMOV[®] Varistor Application Examples

The application examples below show how the indicator lead on the iTMOV[®] can be used to indicate that the thermal element has been opened. This signifies that the circuit is no longer protected from transients by the MOV.

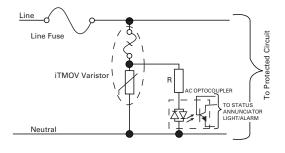
Application Example 1

In this case, the LED is normally on, and is off when the thermal element opens.



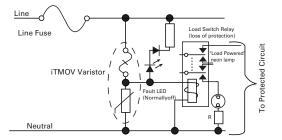
Application Example 2

This circuit utilizes an optocoupler to provide galvanic isolations between the iTMOV® varistor and the indicating or alarm circuitry.



Application Example 3

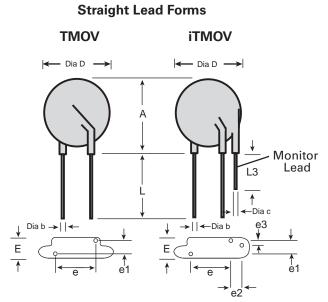
This circuit illustrates the use of the monitoring lead of the iTMOV® varistor to ensure that equipment is only operated when overvoltage protection present. In normal operation the load switch relay solenoid is powered via the indicator lead of the iTMOV® varistor. In the event of the thermal element being activated, the relay will de-activate, cutting power to the protected circuit and the fault LED will illuminate.

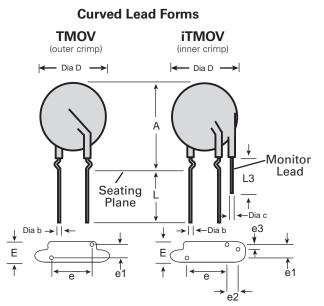


Please note: Indicator circuits are provided as a guideline only. Verification of actual indicator circuitry is the responsibility of the end user. Component values selected must be appropriate for the specific AC line voltage service and application.



Device Dimensions





		TMOV [®] Varistor			iTMOV [®] Varistor				
Dimension	V _{RMS} Voltage	14mn	n Size	20mn	n Size	14mn	14mm Size		n Size
	Model	Min. mm (in)	Max. mm (in)	Min. mm (in)	Max. mm (in)	Min. mm (in)	Max. mm (in)	Min. mm (in)	Max. mm (in)
A Straight Lead	ALL	17.0 (0.669)	22.0 (0.866)	23.0 (0.906)	28.0 (1.10)	17.0 (0.669)	22.0 (0.866)	23.0 (0.906)	28.0 (1.10)
A Crimped Lead	ALL		22.5 (0.886)		31.0 (1.221)	-	22.5 (0.886)	-	31.0 (1.221)
Dia D	ALL	13.5 (0.531)	17.0 (0.669)	19.0 (0.748)	23.0 (0.906)	13.5 (0.531)	17.0 (0.669)	19.0 (0.748)	23.0 (0.906)
е	ALL	6.5 (0.256)	8.5 (0.335)	6.5 (0.256)	8.5 (0.335)	6.5 (0.256)	8.5 (0.335)	6.5 (0.256)	8.5 (0.335)
	115-175	1.5 (0.059)	4.0 (0.157)	1.5 (0.059)	4.0 (0.157)	1.5 (0.059)	4.0 (0.157)	1.5 (0.059)	4.0 (0.157)
e1	200-275	2.0 (0.079)	4.5 (0.177)	2.0 (0.079)	4.5 (0.177)	2.0 (0.079)	4.5 (0.177)	2.0 (0.079)	4.5 (0.177)
Bulk Pack	300-420	3.0 (0.118)	5.5 (0.217)	3.0 (0.118)	5.5 (0.217)	3.0 (0.118)	5.5 (0.217)	3.0 (0.118)	5.5 (0.217)
	460-750	n/a	n/a	0	2.0 (0.079)	n/a	n/a	0	2.0 (0.079)
e1 Tape & Reel and	115-420	0	2.0 (0.079)	0	2.0 (0.079)	0	2.0 (0.079)	0	2.0 (0.079)
In-Line Lead	460-550*	n/a	n/a	0	2.0 (0.079)	n/a	n/a	0	2.0 (0.079)
e2	ALL	n/a	n/a	n/a	n/a	4.0 (0.138)	6.0 (0.236)	4.0 (0.157)	6.0 (0.236)
e3	ALL	n/a	n/a	n/a	n/a	0	2.0 (0.079)	0	2.0 (0.079)
	115-175		9.0 (0.335)		9.0 (0.335)		9.0 (0.335)		9.0 (0.335)
	200-275		9.5 (0.374)		9.5 (0.374)		9.5 (0.374)		9.5 (0.374)
E	300-460		11.0 (0.433)		11.0 (0.433)		11.0 (0.433)		11.0 (0.433)
	510-575		n/a		12.0 (0.472)		n/a		12.0 (0.472)
	625-750		n/a		13.0 (0.512)		n/a		13.0 (0.512)
L	ALL	25.4 (1.00)		25.4 (1.00)		25.4 (1.00)		25.4 (1.00)	
L3	ALL	n/a	n/a	n/a	n/a	6.0 (0.236)		6.0 (0.236)	
Dia b	115-420	0.76 (0.030)	0.86 (0.034)	0.76 (0.030)	0.86 (0.034)	0.76 (0.030)	0.86 (0.034)	0.76 (0.030)	0.86 (0.034)
	460-750	n/a	n/a	0.95 (0.037)	1.05 (0.041)	n/a	n/a	0.95 (0.037)	1.05 (0.041)
Dia c Outside Lead Only	ALL	n/a	n/a	n/a	n/a	0.76 (0.030)	0.86 (0.034)	0.76 (0.030)	0.86 (0.034)

NOTES:

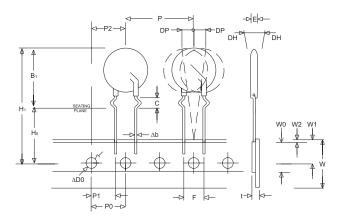
For 14mm ratings above 420 $\rm V_{RMS}$ contact factory for specifications. * Items above 550 $\rm V_{RMS}$ are not available packaged as tape and reel (bulk pack only)

TMOV[®] and *i*TMOV[®] Varistor Series

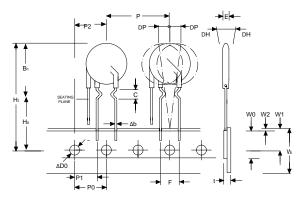


Tape and Reel Specification

TMOV® VARISTOR WITH OUTER CRIMP



iTMOV® VARISTOR WITH INNER CRIMP



- Reel capacity varies with voltage.
- Leads are crimped and in-line. This excludes the monitor lead on iTMOV $^{\otimes}$ devices which are not crimped and not in-line.
- To order tape and reel option please add suffix 'L2T7' to end of standard part number.
- Tape and reel option is available for rated voltages up to 420V. Contact factory regarding availability of higher voltages.

Contact Littelfuse for additional details.

	DESCRIPTION	MODEL SIZE				
	DESCRIPTION	14mm	20mm			
B ₁	Component Top to Seating Plane	22.5 Max	31 Max			
Р	Pitch of Component	25.4 +/- 1.0	25.4 +/- 1.0			
Po	Feed Hole Pitch	12.7 +/- 0.2	12.7 +/- 0.2			
P ₁	Feed Hole Center to Pitch	8.95 +/- 0.7	8.95 +/- 0.7			
P ₂	Hole Center to Component Center	12.7 +/- 0.7	12.7 +/- 0.7			
F	Lead to Lead Distance	7.5 +/- 0.8	7.5 +/- 0.8			
Δh	Component Alignment	2.0 Max	2.0 Max			
W	Tape Width	18.0 +1.0/-0.5	18.0 +1.0/-0.5			
W _o	Hold Down Tape Width	12.0 +/- 0.3	12.0 +/- 0.3			
W ₁	Hole Position	9.0 +0.75/-0.50	9.0 +0.75/-0.50			
W ₂	Hold Down Tape Position	0.5 Max	0.5 Max			
H ₁	Component Height	40.0 Max	46.5 Max			
D	Feed Hole Diameter	4.0 +/- 0.2	4.0 +/- 0.2			
t	Total Tape Thickness	0.7 +/- 0.2	0.7 +/- 0.2			
L	Length of Clipped Lead	11.0 Max	11.0 Max			
Δр	Component Alignment	3 Max. 1.00mm	3 Max			
С	Crimp Length	2.6 typ	2.6 typ			
H。	Seating Plane Height	16.0 +/- 0.5	16.0 +/- 0.5			

Dimensions in mm



Part Numbering System

(See ratings & specifications tables and notes below) TMOV 20 R P 150 E	(See below)
DEVICE FAMILY	NON-STANDARD LEAD FORM, PACKAGING and LEAD SPACING OPTIONS ¹ :
DISC DIAMETER (mm) 14 or 20mm	L2B7: Lead Form: Crimped and In-Line ² Leads Packaging: Bulk Pack
CERAMIC SHAPE	Lead Spacing ³ : 7.5mm
LEAD-FREE/RoHS COMPLIANT INDICATOR	L2T7: Lead Form: Crimped and In-Line ² Leads Packaging: Tape and Reel ⁴
Vm/ac/RMs 115V to 750V	Lead Spacing ³ : 7.5mm Other non-standard options may be available -
SERIES DESIGNATOR E: TMOV (2-Leaded, without indicator lead)	please contact Littelfuse.

NOTES:

1 Use Base Part Code only to receive standard product:

- Lead Form: Straight Leads. Devices greater than 420Vrms are provided In-Line². Packaging: Bulk Pack Lead Spacing: 7.5mm +/-1.0mm
- 2 "In-Line" refers to straight row of leads at the tip where product is to contact the circuit board. Refer to "e1" in Device Dimensions section.

3 Lead Spacing refers to span between leads as "e" dimension in Device Dimensions section.

4 Due to device bulk, tape and reel packaging option is available only for devices up to 420Vrms

Pack Quantities

	Pack Quantities							
Rated	Bulk	Pack	Tape and Reel					
Voltage	Mode	el Size	Model Size					
	14mm	20mm	14mm	20mm				
115-250	600	400	500	400				
275-550	500	300	400	300				
575-750	400	200	n/a	n/a				

NOTE: Tape and Reel available up to 420V only - please contact factory regarding availability of higher voltage parts.