

## TMOV®25S Varistor Series



### 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 TMOV®25S Varistor Series was designed to address this condition in a single integrated package.

The TMOV®25S Varistor 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 TMOV®25S Varistor Series meets the surge suppressor component recognition requirements of UL1449 3rd edition for both cord connected and permanently connected SPD end products.

### Agency Approvals

| Agency | Agency Approval   | Agency File Number |
|--------|---|--------------------|
|        | UL1449  | E320116            |
|        | IEC-CECC Spec:<br>QC42201-C001,<br>QC42201-A001,<br>IEC 60950-1 (Annex Q) | E1274/F            |
|        | IEC 61051-1,<br>IEC 61051-2,<br>IEC 60950-1 (Annex Q)                     | 40021525           |

### Features

- RoHS Compliant and Lead-free
- Wave solderable
- Standard Operating Voltage Range Compatible with Common AC Line Voltages (115VAC to 750VAC)
- High peak surge current rating up to 20kA at single 8/20µS impulse
- Standard lead form and spacing option
- -55°C to +85°C operating temperature range

### Additional Information



**Datasheet**



**Resources**



**Samples**

### Applications

- SPD Products
- AC Panel Protection Modules
- AC/DC power supplies
- UPS (Uninterruptible Power Supply)

### Absolute Maximum Ratings

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

|  | TMOV®25S Varistor Series | Units |
|--|--------------------------|-------|
| <b>Continuous:</b>   |                          |       |
| AC Voltage Range ( $V_{MIACIRMS}$ )  | 115 to 750               | V     |
| <b>Transient:</b>  |                          |       |
| <b>Peak Pulse Current (<math>I_{TM}</math>)</b>  |                          |       |
| For 8x20µs Current Wave, single pulse  | 20,000                   | A     |
| <b>Single-Pulse Energy Capability</b>  |                          |       |
| For 2ms Current Wave   | 170 to 670               | J     |
| Operating Ambient Temperature Range ( $T_A$ )  | -55 to +85               | °C    |
| Storage Temperature Range ( $T_{STG}$ )  | -55 to +125              | °C    |
| Temperature Coefficient ( $\alpha V$ ) 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     |
| *See notes under Device Ratings & Specifications section for more information                  |                          |       |
| COATING 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

| 2 Leaded Device -<br>Without Indicator Lead |          | 3 Leaded Device -<br>With Indicator Lead Option |          | Model<br>Size Disc<br>Diameter<br>(mm) | Maximum Rating (85°C)             |                               |                               |   | Specifications (25 °C)                        |                  |  |                                    |
|---|----------|---|----------|--|-----------------------------------|-------------------------------|-------------------------------|---|---|------------------|--|------------------------------------|
|   |          |   |          |  | Continuous                        |                               | Transient                     |   | Varistor<br>Voltage at<br>1mA Test<br>Current |                  | Clamping<br>Voltage at<br>100A Current<br>8/20µs | Typical<br>Capacitance<br>(f=1MHz) |
| Part<br>Number                              | Branding | Part<br>Number                                  | Branding |  | AC<br>Volts<br><br>$V_{MIACIRMS}$ | DC<br>Volts<br><br>$V_{MIDC}$ | Energy<br>2ms<br><br>$W_{TM}$ | Peak<br>Current<br>8/20µs<br><br>$I_{TM} \times 1$<br>Pulse | $V_{NDC}$<br>Min                              | $V_{NDC}$<br>Max | $V_C$  | C                                  |
|   |          |   |          |  | (V)                               | (V)                           | (J)                           | (A)   | (V)   | (V)              | (V)  | (pF)                               |
| TMOV25SP115E                                | P25T115E | TMOV25SP115M                                    | P25T115M | 25                                     | 115                               | 150                           | 170                           | 20000   | 162   | 198              | 295  | 3200                               |
| TMOV25SP130E                                | P25T130E | TMOV25SP130M                                    | P25T130M | 25                                     | 130                               | 170                           | 190                           | 20000   | 184.5   | 225.5            | 335  | 2800                               |
| TMOV25SP140E                                | P25T140E | TMOV25SP140M                                    | P25T140M | 25                                     | 140                               | 180                           | 210                           | 20000   | 198   | 242              | 355  | 2500                               |
| TMOV25SP150E                                | P25T150E | TMOV25SP150M                                    | P25T150M | 25                                     | 150                               | 200                           | 220                           | 20000   | 216   | 264              | 390  | 2300                               |
| TMOV25SP175E                                | P25T175E | TMOV25SP175M                                    | P25T175M | 25                                     | 175                               | 225                           | 250                           | 20000   | 243   | 297              | 450  | 1900                               |
| TMOV25SP200E                                | P25T200E | TMOV25SP200M                                    | P25T200M | 25                                     | 200                               | 265                           | 270                           | 20000   | 283   | 345              | 530  | 1700                               |
| TMOV25SP230E                                | P25T230E | TMOV25SP230M                                    | P25T230M | 25                                     | 230                               | 300                           | 300                           | 20000   | 324   | 396              | 585  | 1500                               |
| TMOV25SP250E                                | P25T250E | TMOV25SP250M                                    | P25T250M | 25                                     | 250                               | 320                           | 330                           | 20000   | 351   | 429              | 640  | 1400                               |
| TMOV25SP275E                                | P25T275E | TMOV25SP275M                                    | P25T275M | 25                                     | 275                               | 350                           | 350                           | 20000   | 387   | 473              | 700  | 1250                               |
| TMOV25SP300E                                | P25T300E | TMOV25SP300M                                    | P25T300M | 25                                     | 300                               | 385                           | 370                           | 20000   | 423   | 517              | 765  | 1150                               |
| TMOV25SP320E                                | P25T320E | TMOV25SP320M                                    | P25T320M | 25                                     | 320                               | 420                           | 390                           | 20000   | 459   | 561              | 825  | 1080                               |
| TMOV25SP385E                                | P25T385E | TMOV25SP385M                                    | P25T385M | 25                                     | 385                               | 505                           | 430                           | 20000   | 558   | 682              | 1010   | 900                                |
| TMOV25SP420E                                | P25T420E | TMOV25SP420M                                    | P25T420M | 25                                     | 420                               | 560                           | 460                           | 20000   | 612   | 748              | 1100   | 820                                |
| TMOV25SP440E                                | P25T440E | TMOV25SP440M                                    | P25T440M | 25                                     | 440                               | 585                           | 470                           | 20000   | 643.5   | 786.5            | 1160   | 790                                |
| TMOV25SP460E                                | P25T460E | TMOV25SP460M                                    | P25T460M | 25                                     | 460                               | 615                           | 490                           | 20000   | 675   | 825              | 1220   | 750                                |
| TMOV25SP510E                                | P25T510E | TMOV25SP510M                                    | P25T510M | 25                                     | 510                               | 670                           | 520                           | 20000   | 738   | 902              | 1335   | 680                                |
| TMOV25SP550E                                | P25T550E | TMOV25SP550M                                    | P25T550M | 25                                     | 550                               | 745                           | 550                           | 20000   | 819   | 1001             | 1475   | 630                                |
| TMOV25SP625E                                | P25T625E | TMOV25SP625M                                    | P25T625M | 25                                     | 625                               | 825                           | 600                           | 20000   | 900   | 1100             | 1625   | 550                                |
| TMOV25SP750E                                | P25T750E | TMOV25SP750M                                    | P25T750M | 25                                     | 750                               | 970                           | 670                           | 20000   | 1080  | 1320             | 1950   | 460                                |

Notes:  
Average power dissipation of transients should not exceed 1.5 watts.

**Thermal Characteristics**

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



**Transient V-I Characteristic Curves**



**Pulse Rating Curve**

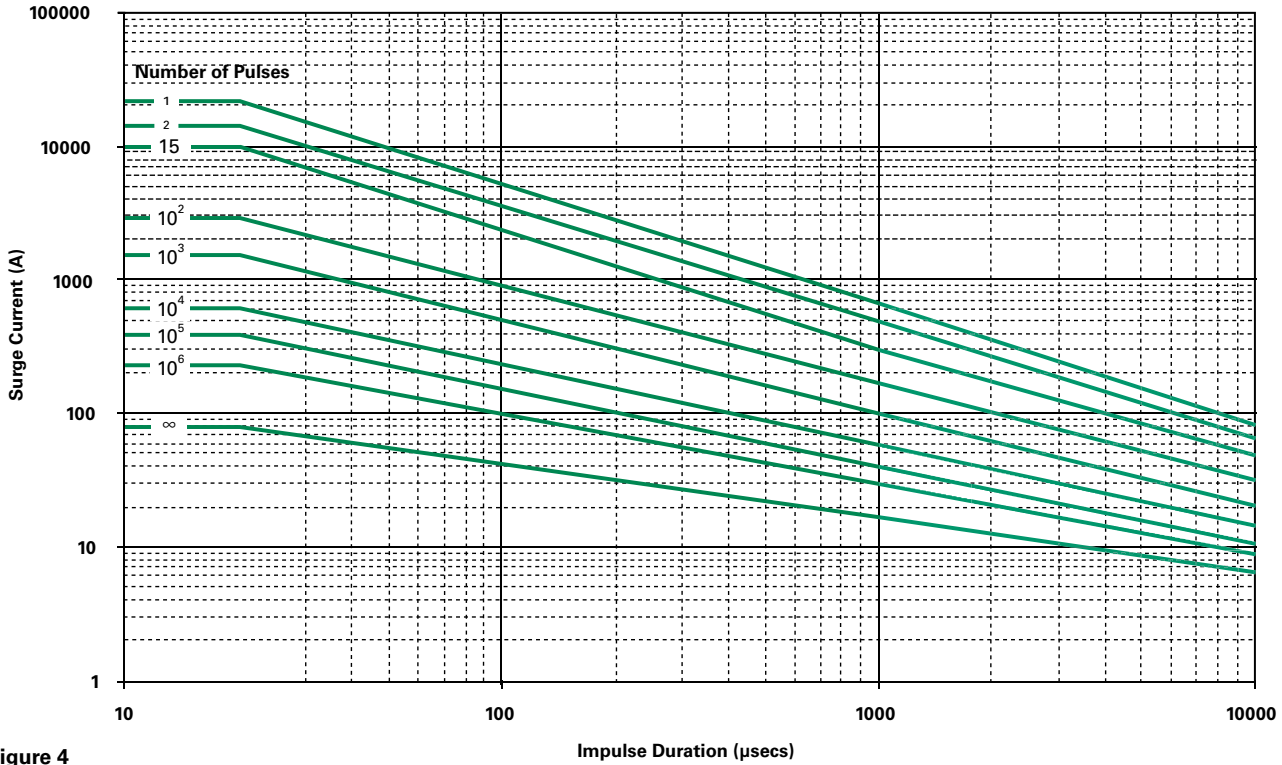


Figure 4

**Wave Solder Profile**

Because the TMOV<sup>®</sup>25S Varistor 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<sup>®</sup> Varistor 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

**Soldering Profile**

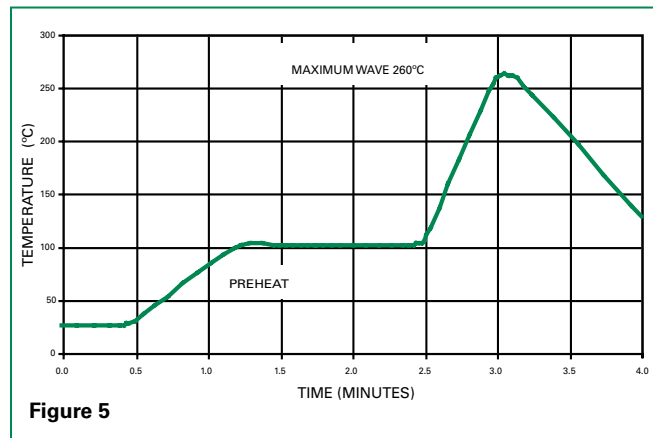


Figure 5

### Physical Specifications

|                                  |   |
|----------------------------------|---|
| <b>Lead Material</b>             | Tin-coated Copper wire  |
| <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 Temperature</b> | -55°C to +85°C   |
| <b>Humidity Aging</b>                | +85°C, 85% R.H., 1000 hours<br>-/+10% typical voltage change |
| <b>Thermal Shock</b>                 | +85°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   |

### Application Example

The application example left shows how the indicator lead on the TMOV® Varistor 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

**2 Leaded Device**  
 Without Indicator Lead  
 (E part number suffix)



**3 Leaded Device**  
 With Indicator Lead Option  
 (M part number suffix)



### Product Dimensions (mm)

| Part Number  | Part Number  | W <sub>MIN</sub> | W <sub>MAX</sub> | W2      | E <sub>MAX</sub> | A <sub>MAX</sub> | b <sub>MIN</sub> | b <sub>MAX</sub> | D <sub>MAX</sub> | e         | e1        | L         |
|--------------|--------------|------------------|------------------|---------|------------------|------------------|------------------|------------------|------------------|-----------|-----------|-----------|
| TMOV25SP115E | TMOV25SP115M | 1.5              | 2.7              | 3.6+/-1 | 11.7             | 34.5             | 0.95             | 1.05             | 28               | 19.2 +/-1 | 12.7 +/-1 | 12.7 Min. |
| TMOV25SP130E | TMOV25SP130M | 1.6              | 2.9              | 3.7+/-1 | 11.9             |                  |                  |                  |                  |           |           |           |
| TMOV25SP140E | TMOV25SP140M | 1.7              | 3.0              | 3.8+/-1 | 12.0             |                  |                  |                  |                  |           |           |           |
| TMOV25SP150E | TMOV25SP150M | 1.8              | 3.1              | 3.9+/-1 | 12.1             |                  |                  |                  |                  |           |           |           |
| TMOV25SP175E | TMOV25SP175M | 1.9              | 3.3              | 4.1+/-1 | 12.3             |                  |                  |                  |                  |           |           |           |
| TMOV25SP200E | TMOV25SP200M | 1.9              | 3.3              | 4.1+/-1 | 12.3             |                  |                  |                  |                  |           |           |           |
| TMOV25SP230E | TMOV25SP230M | 2.0              | 3.4              | 4.2+/-1 | 12.4             |                  |                  |                  |                  |           |           |           |
| TMOV25SP250E | TMOV25SP250M | 2.1              | 3.5              | 4.3+/-1 | 12.5             |                  |                  |                  |                  |           |           |           |
| TMOV25SP275E | TMOV25SP275M | 2.3              | 3.7              | 4.5+/-1 | 12.7             |                  |                  |                  |                  |           |           |           |
| TMOV25SP300E | TMOV25SP300M | 2.4              | 3.9              | 4.6+/-1 | 12.9             |                  |                  |                  |                  |           |           |           |
| TMOV25SP320E | TMOV25SP320M | 2.6              | 4.1              | 4.8+/-1 | 13.1             |                  |                  |                  |                  |           |           |           |
| TMOV25SP385E | TMOV25SP385M | 3.0              | 4.7              | 5.3+/-1 | 13.7             |                  |                  |                  |                  |           |           |           |
| TMOV25SP420E | TMOV25SP420M | 3.3              | 5.0              | 5.6+/-1 | 14.0             |                  |                  |                  |                  |           |           |           |
| TMOV25SP440E | TMOV25SP440M | 3.4              | 5.2              | 5.8+/-1 | 14.2             |                  |                  |                  |                  |           |           |           |
| TMOV25SP460E | TMOV25SP460M | 3.6              | 5.4              | 6+/-1   | 14.4             |                  |                  |                  |                  |           |           |           |
| TMOV25SP510E | TMOV25SP510M | 3.9              | 5.7              | 6.3+/-1 | 14.7             |                  |                  |                  |                  |           |           |           |
| TMOV25SP550E | TMOV25SP550M | 4.2              | 6.2              | 6.7+/-1 | 15.2             |                  |                  |                  |                  |           |           |           |
| TMOV25SP625E | TMOV25SP625M | 4.6              | 6.6              | 7.1+/-1 | 15.6             |                  |                  |                  |                  |           |           |           |
| TMOV25SP750E | TMOV25SP750M | 5.4              | 7.7              | 8.0+/-1 | 16.7             |                  |                  |                  |                  |           |           |           |

**Part Numbering System**



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ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А