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[TE Connectivity Raychem Circuit Protection  
MLV0402-250K-C400](#)

For any questions, you can email us directly:

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308 Constitution Drive  
Menlo Park, CA 94025-1164  
Phone: 800-227-4856  
www.circuitprotection.com

## Multi Layer Varistor Overvoltage Protection Device

*Raychem Circuit Protection Products*

**PRODUCT: MLV0402**

DOCUMENT: SCD 26385  
PCN : RF0107, RF0545  
REV LETTER: D  
REV DATE: AUGUST 10, 2007  
PAGE NO.: 1 OF 5

### GENERAL DESCRIPTION

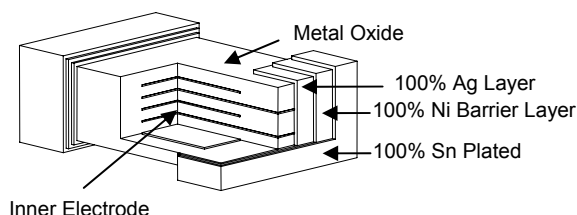
These Multi Layer Varistors are small, leadless, surface mount packages made of multiple layers of Zinc Oxide, with electrodes between them. They are used to help protect integrated circuits and other sensitive equipment. Their small size is ideal for high density printed circuit boards.

### BENEFITS

- Help to protect sensitive equipment against typical ESD, EMC and EOS (Electrical Over Stress) events and transients
- Cost efficient assembly and protection
- Resistance to standard wave solder fluxes, provides excellent solderability
- Space savings
- Longer battery life due to low leakage current

### FEATURES

- Bidirectional clamping
- Compatible with standard surface mount methods
- Low and stable leakage current
- Low clamping voltage
- Quick response time (<1ns)
- High transient current capability
- RoHS Compliant



### APPLICATIONS

ESD, EMC and EOS protection of:

- Computer I/O ports and interfaces (USB, IEEE 1394, etc...)
- Portable devices
- Automotive electronic circuits
- Telecom equipment
- Medical instruments

### SYMBOL



### MATERIALS INFORMATION

ROHS Compliant

Directive 2002/95/EC  
Compliant

ELV Compliant

Directive 2000/53/EC  
Compliant



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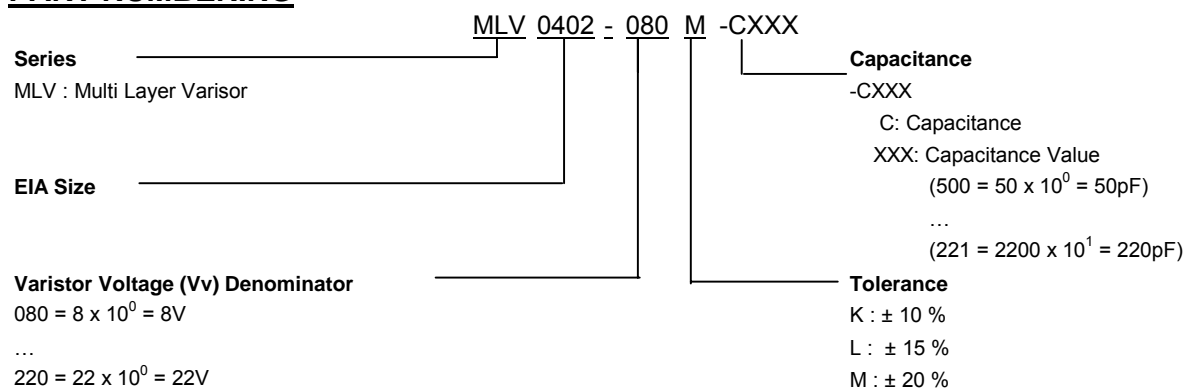
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### Ratings @ (25± 5°C)

| Symbol            | Varistor Voltage | Maximum Working Voltage |                 | Clamping Voltage | Typical Resistance         | Peak Current     | Transient Energy | Typical Capacitance <sup>1</sup> |        |
|-------------------|------------------|-------------------------|-----------------|------------------|----------------------------|------------------|------------------|----------------------------------|--------|
|                   | V <sub>v</sub>   | V <sub>RMS</sub>        | V <sub>DC</sub> | V <sub>C</sub>   | IR                         | I <sub>max</sub> | W <sub>max</sub> | Cp                               |        |
| Units             | V                | V                       | V (Max)         | V                | X10 <sup>0</sup> Ohm (Min) | A (Min)          | J (Max)          | pF                               |        |
| Test Conditions   | @ 1mA DC         | <10µA                   | < 10µA          | @ 1A 8/20µs      | @ 5 V <sub>DC</sub>        | 8/20µs           | 10/1000µs        | @ 1KHz                           | @ 1MHz |
| MLV0402-080M-C221 | 8 ± 20%          | 4                       | 5.5             | 20               | 10                         | 20               | 0.05             | 230                              | 220    |
| MLV0402-250K-C400 | 25 ± 10%         | 14                      | 18              | 50               | 10                         | 20               | 0.05             | 45                               | 40     |

Note 1: Cp – Device capacitance measured with zero volt bias and 1 Vrms signal

### PART NUMBERING



### GENERAL CHARACTERISTICS

Operating Temperature: -40 to +85°C

Storage Temperature: -40 to +85°C

### ENVIRONMENTAL CHARACTERISTICS

| Characteristics        | Specifications    | Test Conditions   |
|------------------------|-------------------|---|
| Bias Humidity          | Δ Vv / Vv ≤ ± 10% | 90%RH, 40°C, maximum working Voltage V <sub>DC</sub> , 1000 hours |
| Thermal Shock          | Δ Vv / Vv ≤ ± 10% | -40°C to 85°C, 30 min. cycle, 5 cycles                            |
| Full Load Voltage      | Δ Vv / Vv ≤ ± 10% | Maximum working Voltage V <sub>DC</sub> , 85°C, 1000 hours        |
| Solderability          | 95% Coverage      | 230°C, 3s   |
| Solder Heat Resistance | 90% Coverage      | 260°C, 10s  |



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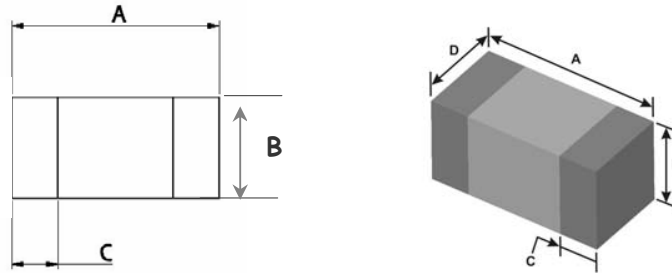
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**DIMENSIONS**



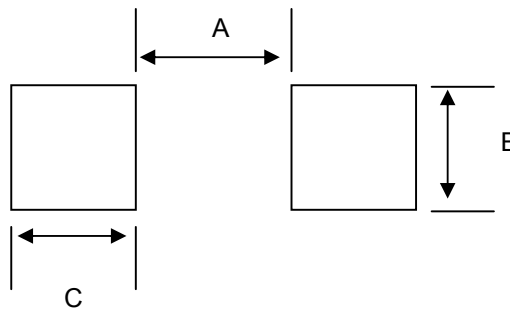
Drawing Not To Scale

|      | length A |         | Height B |         | Terminal Width C |         | Width D |         |
|------|----------|---------|----------|---------|------------------|---------|---------|---------|
|      | MIN      | MAX     | MIN      | MAX     | MIN              | MAX     | MIN     | MAX     |
| mm:  | 0.85     | 1.15    | 0.4      | 0.6     | 0.1              | 0.4     | 0.4     | 0.6     |
| in*: | (0.033)  | (0.045) | (0.016)  | (0.024) | (0.004)          | (0.016) | (0.016) | (0.024) |

\* Rounded off approximation

**RECOMMENDED PAD LAYOUT**

Print solder with a thickness of 150 to 200µm



|      | A       | B       | C       |
|------|---------|---------|---------|
| mm:  | 0.35    | 0.75    | 0.85    |
| in*: | (0.014) | (0.030) | (0.033) |

\* Rounded off approximation



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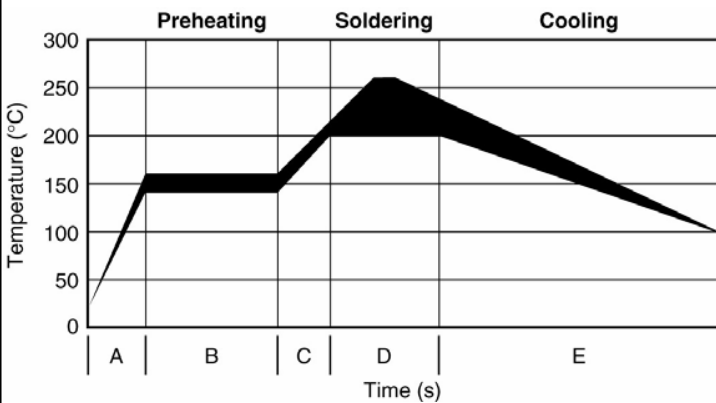
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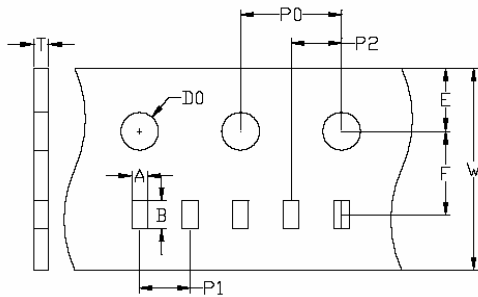
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**SOLDER REFLOW RECOMMENDATIONS**



|   |                       |  |   |
|---|-----------------------|--|---|
| A | Temperature ramp up 1 | From ambient to Preheating temperature       | 30s to 60s                                      |
| B | Preheating            | 140°C - 160°C                                | 60s to 120s                                     |
| C | Temperature ramp up 2 | From Preheating to Main heating temperature  | 20s to 40s                                      |
| D | Main heating          | at 200°C<br>at 220°C<br>at 240°C<br>at 260°C | 60s ~ 70s<br>50s ~ 60s<br>30s ~ 40s<br>5s ~ 10s |
| E | Cooling               | From main heating temperature to 100°C       | max 4°C/s                                       |

**PACKAGING**

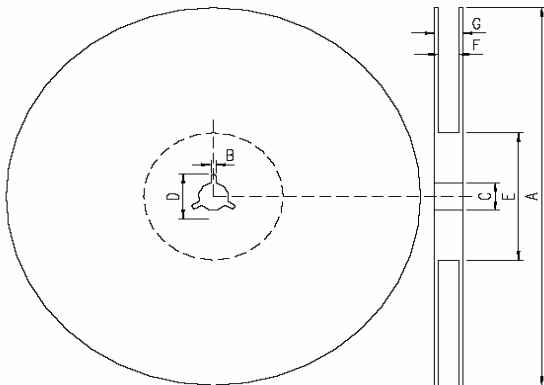


|       | A       | B       | W       | E       | F       | P0      | P1      | P2      | D0      | T       |         |         |         |         |         |         |         |         |         |         |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| mm    | 0.59    | 0.65    | 1.09    | 1.15    | 7.7     | 8.3     | 1.7     | 1.8     | 3.45    | 3.55    | 3.9     | 4.1     | 1.95    | 2.05    | 1.95    | 2.05    | 1.4     | 1.6     | 0.55    | 0.65    |
| inch* | (0.023) | (0.025) | (0.042) | (0.045) | (0.303) | (0.326) | (0.066) | (0.070) | (0.135) | (0.139) | (0.153) | (0.161) | (0.076) | (0.080) | (0.076) | (0.080) | (0.055) | (0.062) | (0.021) | (0.025) |

\*Rounded off approximation

**Leader & Trailer:** The leader is 180mm in length & consists of empty cavities with sealed cover tape.

The trailer is 350mm in length & consists of empty cavities with sealed cover tape.



|   |           |
|---|-----------|
| A | 178.0±2.0 |
| B | 2.0±0.5   |
| C | 13.0±0.5  |
| D | 21.0±0.8  |
| E | 62.0±1.5  |
| F | 9.0±0.5   |
| G | 13.0±1.0  |



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### RECOMMENDED STORAGE CONDITIONS

Storage time: 12 months max  
Storage temperature: 5 to 40°C  
Storage Relative humidity: 65% max

### POST REFLOW, CLEANING CONDITIONS

A 5% saponifier combined with water during wash.

For an Ultrasonic process water temperature should be at 50°C and board should be submerged for a minimum of one minute in the solution, then rinse and dry.

For in-line washing, the temperature of the water sprayed should be at 110°C, rise and drying is done in-line.

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