

# MLVA-R

## Multilayer varistor ESD suppressor



### Applications

- ESD port protection for mobile/smart phones
- Game console ESD port protection
- Set-top-boxes
- Tablets, notebooks, netbooks, laptops
- Media players
- Digital cameras
- Medical equipment
- Computers and peripherals ESD port protection
- Consumer electronics

### Product description

- Three compact footprint options 0201 (0603 metric), 0402 (1005 metric), and 0603 (1608 metric)
- Zinc oxide ceramic chip
- Provides Electro Static Discharge (ESD) protection with fast response time (<1 ns) allowing equipment to pass IEC 61000-4-2 Level 4 test
- 0402 and 0603 meet IEC 61000-4-4 and 61000-4-5
- Compact footprint utilizes less board space
- Low and stable leakage current reduces power consumption
- Low clamping voltage
- Wide operating voltage range: 5.5 Vdc to 26 Vdc
- Halogen free, lead free, RoHS compliant

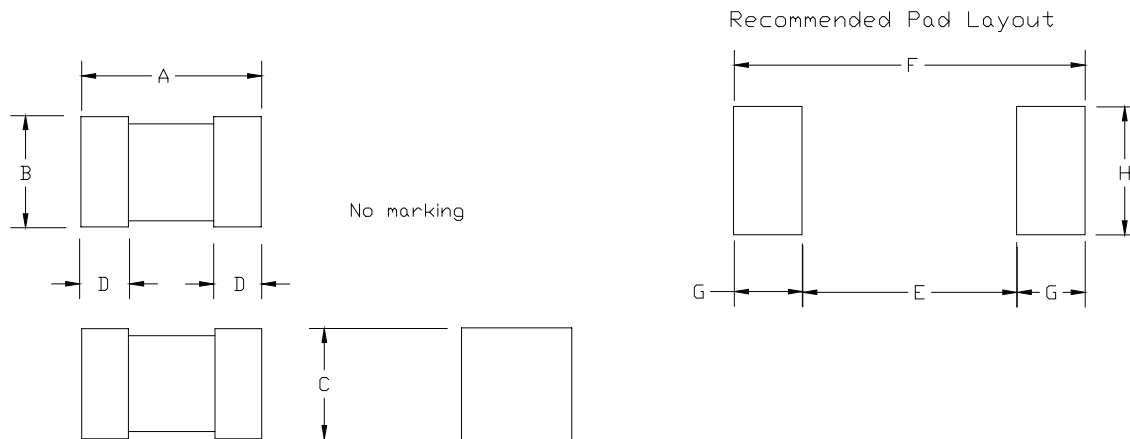
Product specifications

| Part number <sup>8</sup> | Package size       | Working voltage <sup>1,2</sup> |                    | Varistor voltage <sup>3</sup><br>(V) | Clamping voltage <sup>4</sup><br>(V) | Capacitance <sup>5</sup><br>(pF) typical | Peak current <sup>6</sup><br>(A) | Transient energy <sup>7</sup><br>(J) |
|--------------------------|--------------------|--------------------------------|--------------------|--------------------------------------|--------------------------------------|--|----------------------------------|--------------------------------------|
|                          |                    | (V <sub>rms</sub> )            | (V <sub>DC</sub> ) |                                      |                                      |  |                                  |                                      |
| MLVA02V05C033-R          | 0201 (0603 metric) | –                              | 5.5                | 8–14                                 | 30                                   | 33                                       | –                                | –                                    |
| MLVA02V05C047-R          | 0201 (0603 metric) | –                              | 5.5                | 8–14                                 | 26                                   | 47                                       | –                                | –                                    |
| MLVA02V05C064-R          | 0201 (0603 metric) | –                              | 5.5                | 8–14                                 | 26                                   | 64                                       | –                                | –                                    |
| MLVA04V05C270-R          | 0402 (1005 metric) | 4                              | 5.5                | 8–18                                 | 28                                   | 270                                      | 20                               | 0.05                                 |
| MLVA04V09C130-R          | 0402 (1005 metric) | 7                              | 9                  | 11.5–21.5                            | 41                                   | 130                                      | 20                               | 0.05                                 |
| MLVA04V18C085-R          | 0402 (1005 metric) | 14                             | 18                 | 23–33                                | 54                                   | 85                                       | 20                               | 0.05                                 |
| MLVA06V05C270-R          | 0603 (1608 metric) | 4                              | 5.5                | 8–18                                 | 31                                   | 270                                      | 30                               | 0.1                                  |
| MLVA06V09C210-R          | 0603 (1608 metric) | 7                              | 9                  | 11.5–21.5                            | 41                                   | 210                                      | 30                               | 0.1                                  |
| MLVA06V18C150-R          | 0603 (1608 metric) | 14                             | 18                 | 23–33                                | 54                                   | 150                                      | 30                               | 0.1                                  |
| MLVA06V26C100-R          | 0603 (1608 metric) | 20                             | 26                 | 32–42                                | 70                                   | 100                                      | 30                               | 0.1                                  |

- Working voltage V<sub>rms</sub>: Maximum AC operating voltage the device can maintain and not exceed 10 µA leakage current.
- Working voltage V<sub>DC</sub>: Maximum DC operating voltage the device can maintain and not exceed 10 µA leakage current
- Varistor voltage: Voltage across the device measured at 1 mA DC current
- Clamping voltage: Maximum peak voltage across the device with 8/20 µs waveform and 1 A pulse current
- Capacitance test parameters: Zero volt bias, 1.0 MHz, 1.0 Vrms

- Peak current: Maximum peak current which may be applied with 8/20 µs waveform without device failure.
- Transient energy: Maximum energy which may be dissipated with 10/1000 µs waveform without device failure.
- Part Number Definition: MLVAXXVXXCXXX  
MLVA xx= Product code and size  
Vxx= Working DC voltage  
Cxxx= Capacitance value  
-R suffix= RoHS compliant.

Dimensions—mm



| Part number     | A          | B          | C          | D          | E    | F    | G    | H    |
|-----------------|------------|------------|------------|------------|------|------|------|------|
| MLVA02V05C033-R | 0.60 ±0.05 | 0.30 ±0.05 | 0.30 ±0.05 | 0.20± 0.10 | 0.30 | 0.80 | 0.25 | 0.30 |
| MLVA02V05C047-R | 0.60 ±0.05 | 0.30 ±0.05 | 0.30 ±0.05 | 0.20± 0.10 | 0.30 | 0.80 | 0.25 | 0.30 |
| MLVA02V05C064-R | 0.60 ±0.05 | 0.30 ±0.05 | 0.30 ±0.05 | 0.20± 0.10 | 0.30 | 0.80 | 0.25 | 0.30 |
| MLVA04V05C270-R | 0.95 ±0.15 | 0.50 ±0.10 | 0.50 ±0.10 | 0.25± 0.15 | 0.51 | 1.73 | 0.61 | 0.51 |
| MLVA04V09C130-R | 0.95 ±0.15 | 0.50 ±0.10 | 0.50 ±0.10 | 0.25± 0.15 | 0.51 | 1.73 | 0.61 | 0.51 |
| MLVA04V18C085-R | 0.95 ±0.15 | 0.50 ±0.10 | 0.50 ±0.10 | 0.25± 0.15 | 0.51 | 1.73 | 0.61 | 0.51 |
| MLVA06V05C270-R | 1.60 ±0.15 | 0.80 ±0.10 | 0.80 ±0.10 | 0.30± 0.20 | 0.50 | 2.54 | 1.02 | 0.76 |
| MLVA06V09C210-R | 1.60 ±0.15 | 0.80 ±0.10 | 0.80 ±0.10 | 0.30± 0.20 | 0.50 | 2.54 | 1.02 | 0.76 |
| MLVA06V18C150-R | 1.60 ±0.15 | 0.80 ±0.10 | 0.80 ±0.10 | 0.30± 0.20 | 0.50 | 2.54 | 1.02 | 0.76 |
| MLVA06V26C100-R | 1.60 ±0.15 | 0.80 ±0.10 | 0.80 ±0.10 | 0.30± 0.20 | 0.50 | 2.54 | 1.02 | 0.76 |

**Environmental data**

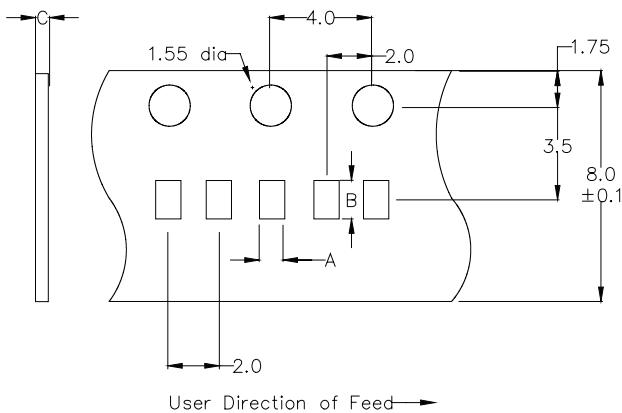
|  |
|--|
| Operating temperature: - 40 °C to +85 °C   |
| Storage temperature (component): +5 °C to +40 °C   |
| Full load voltage: +85 °C at working voltage for 1000 hours<br>Varistor voltage typical < 10% change                     |
| Thermal shock: 5 cycles, - 40 °C to +85 °C, 30 minute dwell time<br>Varistor voltage typical < 10% change                |
| Humidity bias: +40 °C, 90% relative humidity, at working voltage for 1000 hours<br>Varistor voltage typical < 10% change |
| Resistance to solder heat: 260 °C ± 5 °C for 10 seconds ± 1 second   |

**Packaging information – mm**

(Drawing not to scale)

Supplied in tape and reel packaging

15 000 parts per 7.0" diameter reel: MLVA02V05C033-R, MLVA02V05C047-R, MLVA02V05C064-R  
10 000 parts per 7.0" diameter reel: MLVA04V05C270-R, MLVA04V09C130-R, MLVA04V18C085-R

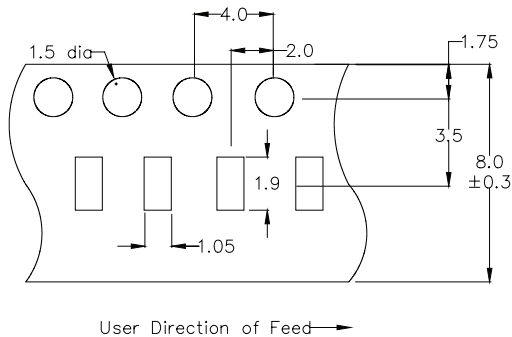


| Part number     | A    | B    | C    |
|-----------------|------|------|------|
| MLVA02V05C033-R | 0.37 | 0.69 | 0.42 |
| MLVA02V05C047-R | 0.37 | 0.69 | 0.42 |
| MLVA02V05C064-R | 0.37 | 0.69 | 0.42 |
| MLVA04V05C270-R | 0.58 | 1.20 | 0.60 |
| MLVA04V09C130-R | 0.58 | 1.20 | 0.60 |
| MLVA04V18C085-R | 0.58 | 1.20 | 0.60 |

Supplied in tape and reel packaging

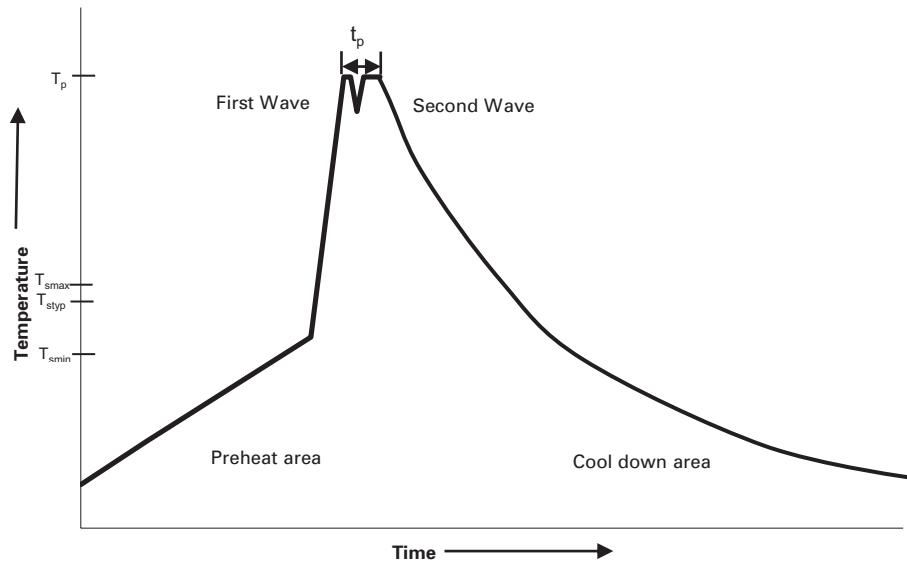
4 000 parts per 7.0" diameter reel

MLVA06V05C270-R, MLVA06V09C210-R, MLVA06V18C150-R, MLVA06V26C100-R



### Wave solder profile

Reflow soldering not recommended



### Reference EN 61760-1:2006

| Profile Feature                     | Standard SnPb Solder                          | Lead (Pb) Free Solder                     |
|-------------------------------------|---|---|
| Preheat                             | • Temperature min. ( $T_{smin}$ )             | 100°C                                     |
|                                     | • Temperature typ. ( $T_{styp}$ )             | 120°C                                     |
|                                     | • Temperature max. ( $T_{smax}$ )             | 130°C                                     |
|                                     | • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ ) | 70 seconds                                |
| $\Delta$ preheat to max Temperature | 150°C max.                                    | 150°C max.                                |
| Peak temperature ( $T_p$ )*         | 235°C – 260°C                                 | 250°C – 260°C                             |
| Time at peak temperature ( $t_p$ )  | 10 seconds max<br>5 seconds max each wave     | 10 seconds max<br>5 seconds max each wave |
| Ramp-down rate                      | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max     | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max |
| Time 25°C to 25°C                   | 4 minutes                                     | 4 minutes                                 |

### Manual solder

350°C, 4-5 seconds (by soldering iron), generally manual hand soldering is not recommended.

Solder reflow profile

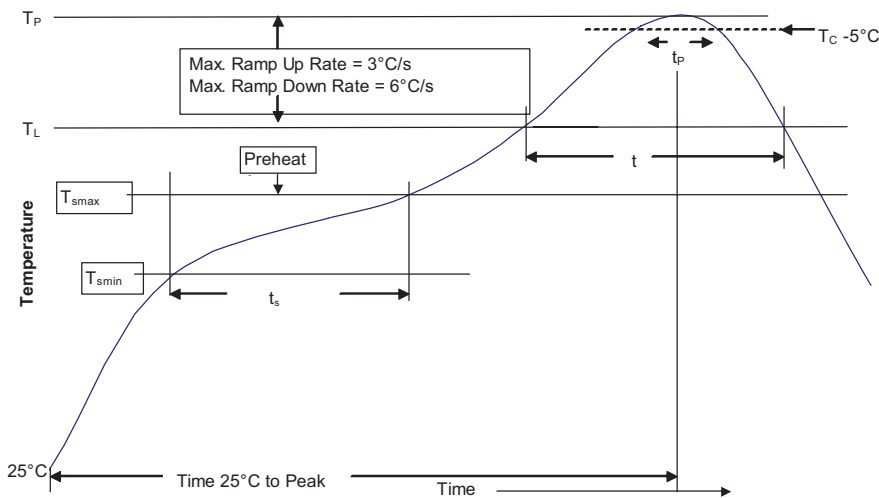


Table 1 - Standard SnPb Solder (T<sub>C</sub>)

| Package Thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5mm)           | 235°C                       | 220°C                       |
| ≥2.5mm            | 220°C                       | 220°C                       |

Table 2 - Lead (Pb) Free Solder (T<sub>C</sub>)

| Package Thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> 350 - 2000 | Volume mm <sup>3</sup> >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6mm            | 260°C                       | 260°C                             | 260°C                        |
| 1.6 - 2.5mm       | 260°C                       | 250°C                             | 245°C                        |
| >2.5mm            | 250°C                       | 245°C                             | 245°C                        |

Reference JDEC J-STD-020D

| Profile Feature  | Standard SnPb Solder | Lead (Pb) Free Solder |
|--|----------------------|-----------------------|
| Preheat and Soak   |                      |                       |
| • Temperature min. (T <sub>smin</sub> )  | 100°C                | 150°C                 |
| • Temperature max. (T <sub>smax</sub> )  | 150°C                | 200°C                 |
| • Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )                                 | 60-120 Seconds       | 60-120 Seconds        |
| Average ramp up rate T <sub>smax</sub> to T <sub>p</sub>   | 3°C/ Second Max.     | 3°C/ Second Max.      |
| Liquidous temperature (T <sub>L</sub> )  | 183°C                | 217°C                 |
| Time at liquidous (t <sub>L</sub> )  | 60-150 Seconds       | 60-150 Seconds        |
| Peak package body temperature (T <sub>p</sub> )*   | Table 1              | Table 2               |
| Time (t <sub>p</sub> )** within 5 °C of the specified classification temperature (T <sub>C</sub> ) | 20 Seconds**         | 30 Seconds**          |
| Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> )                                      | 6°C/ Second Max.     | 6°C/ Second Max.      |
| Time 25°C to Peak Temperature  | 6 Minutes Max.       | 8 Minutes Max.        |

\* Tolerance for peak profile temperature (T<sub>p</sub>) is defined as a supplier minimum and a user maximum.  
\*\* Tolerance for time at peak profile temperature (t<sub>p</sub>) is defined as a supplier minimum and a user maximum.

Life Support Policy: Eaton does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

Eaton reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Eaton also reserves the right to change or update, without notice, any technical information contained in this bulletin.

**Eaton**  
Electronics Division  
1000 Eaton Boulevard  
Cleveland, OH 44122  
United States  
www.eaton.com/elx

© 2016 Eaton  
All Rights Reserved  
Printed in USA  
Publication No. 10493 BU-MC16005  
February 2016

Eaton is a registered trademark.  
All other trademarks are property of their respective owners.