

## DESCRIPTION

Walsin Multi-Layer chip Varistor (MLV) is a family of Transient Voltage Surge Suppression (TVS) products. Nowadays, it is a trend that electronic designs improve to be smaller and more sensitive to external interference, such as abnormal surge & Electronic Static Discharge (ESD). Walsin MLV is designed to protect components from destruction by transient over voltage and ESD. The wide operating voltage and surge energy ranges of Walsin MLV make it suitable for many applications in Input & Output protection, power supply protection, Keyboard protection, LCD protection, Sensor protection...etc. The Walsin MLV, manufactured by Multilayer fabrication technology, for which Walsin Technology is well known, provides excellent voltage clamping ability and is in surface mount device (SMD) package.

It is compatible with modern reflow and wave soldering procedures. We would give you a solution to transient over voltage and ESD protection in electronic products.

## FEATURES

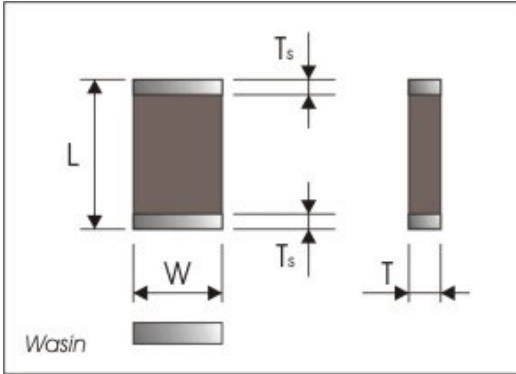
1. Multilayer Fabrication Technology
2. **Plated & Lead-free Termination**
3. Small size
4. -55°C to 125°C Operating Temperature Range
5. Wide Operating Voltage Range (DC) from 5.5V to 56V
6. Able to withstand high surge current
7. Bi-directional Clamping characteristic

## APPLICATIONS

1. Cellular phones, data transmission lines, LANs, modems, PC, SCART sockets,...etc.
2. ESD Protection for Components Sensitive to IEC1000-4-2, MIL-STD-883C Method 3015.7, and Other Industry Specifications
3. Provides Circuit Board Transient Voltage Protection for ICs and Transistors
4. Replace Larger Surface Mount TVS Zeners Diodes.

## ELECTRICAL DATA

| Item                                                                                                                                                                                                                                                                                                                                        | General Specification                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Continuous Rating :</b><br>Steady State Applied Voltage :<br>DC voltage Range ( $V_{MDC}$ )<br>AC voltage Range ( $V_{MDC\ RMS}$ )                                                                                                                                                                                                       | <br><br>5.5V to 85V<br>4V to 67V                                                      |
| <b>Transient Rating :</b><br>Non-Repetitive Surge Current( 8/20 $\mu$ s)<br>Non-Repetitive Surge Energy, 10/1000 $\mu$ s Waveform, ( $W_{TM}$ )<br>Operating Ambient Temperature Range( $T_A$ )<br>Storage Temperature Range ( $T_{STG}$ )<br>Temperature Coefficient( $\alpha V$ ) of clamping Voltage ( $V_C$ ) at Specified Test Current | <br><br>20A to 500A<br>0.1J to 2.5J<br>-55°C to 125°C<br>-55°C to 150°C<br><0.01 %/°C |



## DIMENSIONS

| CASE SIZE | VZ0402    | VZ0603    | VZ0805    | VZ1206    |
|-----------|-----------|-----------|-----------|-----------|
| L         | 1.00±0.10 | 1.60±0.15 | 2.00±0.20 | 3.20±0.20 |
| W         | 0.50±0.10 | 0.80±0.15 | 1.25±0.20 | 1.60±0.20 |
| T (max.)  | 0.60      | 0.90      | 1.10      | 1.20      |
| Ts        | 0.25±0.15 | 0.35±0.15 | 0.50±0.25 | 0.60±0.20 |

\* Terminal electrode : Ni/Sn electrode

## DEVICE RATING AND SPECIFICATIONS

| PART NUMBER    | MAXIMUM RATINGS(125°C)             |                    |                                                |                                                  |                                                        | SPECIFICATIONS(25°C)                |                         |                           |
|----------------|------------------------------------|--------------------|------------------------------------------------|--------------------------------------------------|--------------------------------------------------------|-------------------------------------|-------------------------|---------------------------|
|                | Maximum continuous working voltage |                    | Maximum non- repetitive surge current (8/20μs) | Maximum non- repetitive surge energy (10/1000μs) | Maximum Clamping Voltage At Specified Current (8/20μs) | Nominal Voltage at 1mA (DC) Current |                         | Typical Capacitance @1MHz |
|                | V <sub>M(DC)</sub>                 | V <sub>M(AC)</sub> | I <sub>TM</sub>                                | W <sub>TM</sub>                                  | V <sub>C</sub>                                         | V <sub>N(DC)</sub> min.             | V <sub>N(DC)</sub> max. | C                         |
|                | (V)                                | (V)                | (A)                                            | (J)                                              | (V)                                                    | (V)                                 | (V)                     | (pF)                      |
| VZ0402M050APT  | 5.5                                | 4.0                | 20                                             | 0.05                                             | 15.5 at 1A                                             | 7.1                                 | 9.5                     | 150                       |
| VZ0402M090APT  | 9.0                                | 6.5                | 20                                             | 0.05                                             | 23 at 1A                                               | 11                                  | 15                      | 90                        |
| VZ0402M140APT  | 14                                 | 10                 | 20                                             | 0.05                                             | 30 at 1A                                               | 16                                  | 20.3                    | 70                        |
| VZ0402M180APT  | 18                                 | 14                 | 20                                             | 0.05                                             | 40 at 1A                                               | 22                                  | 28.0                    | 50                        |
| VZ0603M050APT  | 5.5                                | 4.0                | 30                                             | 0.1                                              | 15.5 at 2A                                             | 7.1                                 | 9.5                     | 750                       |
| VZ0603M090APT  | 9.0                                | 6.5                | 30                                             | 0.1                                              | 23 at 2A                                               | 11                                  | 15                      | 520                       |
| VZ0603M140APT  | 14                                 | 10                 | 30                                             | 0.1                                              | 30 at 2A                                               | 16                                  | 20.3                    | 400                       |
| VZ0603M180APT  | 18                                 | 14                 | 30                                             | 0.1                                              | 40 at 2A                                               | 22                                  | 28                      | 200                       |
| VZ0603M260APT  | 26                                 | 20                 | 30                                             | 0.1                                              | 58 at 2A                                               | 31                                  | 38                      | 140                       |
| VZ0603M300APT  | 30                                 | 25                 | 30                                             | 0.1                                              | 65 at 2A                                               | 37                                  | 46                      | 110                       |
| VZ0805M050APT* | 5.5                                | 4.0                | 120                                            | 0.3                                              | 15.5 at 5A                                             | 7.1                                 | 9.5                     | 2200                      |
| VZ0805M140APT* | 14                                 | 10                 | 120                                            | 0.3                                              | 30 at 5A                                               | 16                                  | 20.3                    | 600                       |
| VZ0805M180APT* | 18                                 | 14                 | 120                                            | 0.3                                              | 40 at 5A                                               | 22                                  | 28                      | 480                       |
| VZ0805M260APT* | 26                                 | 20                 | 120                                            | 0.3                                              | 58 at 5A                                               | 29.5                                | 38                      | 170                       |
| VZ0805M300APT* | 30                                 | 25                 | 40                                             | 0.1                                              | 65 at 2A                                               | 37                                  | 46                      | 80                        |
| VZ1206M050APT  | 5.5                                | 4.0                | 200                                            | 0.6 *                                            | 15.5 at 10A                                            | 7.1                                 | 9.5                     | 2400                      |
| VZ1206M140APT  | 14                                 | 10                 | 200                                            | 0.6 *                                            | 30 at 10A                                              | 16                                  | 20.3                    | 900                       |
| VZ1206M180APT  | 18                                 | 14                 | 200                                            | 0.6 *                                            | 40 at 10A                                              | 22                                  | 28                      | 600                       |
| VZ1206M220APT  | 22                                 | 17                 | 200                                            | 0.6 *                                            | 44 at 10A                                              | 24.3                                | 29.7                    | 580                       |
| VZ1206M260APT  | 26                                 | 20                 | 200                                            | 0.6 *                                            | 58 at 10A                                              | 29.5                                | 38                      | 420                       |
| VZ1206M300APT  | 30                                 | 25                 | 200                                            | 0.6 *                                            | 65 at 10A                                              | 37                                  | 46                      | 390                       |
| VZ1206M480APT  | 48                                 | 40                 | 200                                            | 0.6 *                                            | 100 at 10A                                             | 55                                  | 67                      | 300                       |
| VZ1206M560APT  | 56                                 | 40                 | 200                                            | 0.6 *                                            | 110 at 10A                                             | 60                                  | 74                      | 250                       |

\*: please contact sales for sample availability.

Notes: 1. Maximum surge energy of VZ1206 is measured by 2mS pulse.

2. L suffix is a low capacitance and energy version.



## STANDARD TESTING CONDITION

1. Unless otherwise specified
  - Temperature : 15~35°C
  - Humidity : 25%RH~85%RH
  - Atmospheric pressure : 86kPa~106kPa
2. In case of doubt
  - Temperature : 20±2°C
  - Humidity : 60%RH~70%RH
  - Atmospheric pressure : 86kPa~106kPa

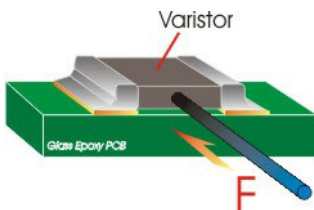
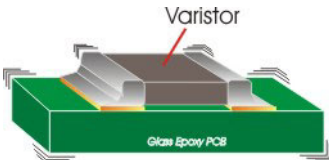
## SPECIFICATION

1. Electrical reliability

| Test item                  | Test condition / Test method                                                                                                                                                                                                                                                                                                                          | Specification |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|------------|---|---------|----|---|------------|----|---|----------|----|---|------------|----|------------|
| High temperature storage   | 125±3°C for 1000 hrs.                                                                                                                                                                                                                                                                                                                                 | ΔV1mA < 5%    |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| Low temperature storage    | -40±3°C for 1000 hrs.                                                                                                                                                                                                                                                                                                                                 | ΔV1mA < 5%    |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| Humidity storage           | 40±2°C, 90~95%RH for 1000 hrs.                                                                                                                                                                                                                                                                                                                        | ΔV1mA < 5%    |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| Temperature cycle          | Times : 5 cycles<br><table border="1"> <thead> <tr> <th>Step</th><th>Temp.(°C)</th><th>Temp(min.)</th></tr> </thead> <tbody> <tr> <td>1</td><td>-40±3°C</td><td>30</td></tr> <tr> <td>2</td><td>room temp.</td><td>15</td></tr> <tr> <td>3</td><td>+125±3°C</td><td>30</td></tr> <tr> <td>4</td><td>room temp.</td><td>15</td></tr> </tbody> </table> | Step          | Temp.(°C) | Temp(min.) | 1 | -40±3°C | 30 | 2 | room temp. | 15 | 3 | +125±3°C | 30 | 4 | room temp. | 15 | ΔV1mA < 5% |
| Step                       | Temp.(°C)                                                                                                                                                                                                                                                                                                                                             | Temp(min.)    |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| 1                          | -40±3°C                                                                                                                                                                                                                                                                                                                                               | 30            |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| 2                          | room temp.                                                                                                                                                                                                                                                                                                                                            | 15            |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| 3                          | +125±3°C                                                                                                                                                                                                                                                                                                                                              | 30            |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| 4                          | room temp.                                                                                                                                                                                                                                                                                                                                            | 15            |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| High temperature load test | 125°C with Max. Operating Voltage for 1000 hrs                                                                                                                                                                                                                                                                                                        | ΔV1mA < 10%   |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |
| Damp heat load             | 40±2°C, 90~95%RH with Max. operating voltage for 1000 hrs.                                                                                                                                                                                                                                                                                            | ΔV1mA < 10%   |           |            |   |         |    |   |            |    |   |          |    |   |            |    |            |

- Test chips shall be soldered on the glass epoxy PCB.
- After each test has been done , the tested chips shall be left in room ambient for 1~2 hours then measure the breakdown voltage.

## 2. Mechanical reliability

| Test item                        | Test condition / Test method                                                                                                                                                                                                               | Specification                                                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Solderability                    | Flux : Ethanol solution of rosin,25wt%<br>Pre-heating : 150°C, 60sec<br>Solder : Sn:60%, Pb:40%<br>Solder temp. : 230±5°C<br>Immersion time : 3±1 sec<br>Immersion and emersion rates : 25mm/s                                             | Min. 90% electrode shall be covered with solder.                                                                                   |
| Resistance to soldering heat     | Flux : Ethanol solution of rosin,25wt%<br>Pre-heating : 150°C, 60sec<br>Solder : Sn:60%, Pb:40%<br>Solder Temp. : 260±5°C<br>Immersion time : 5±1 sec<br>Immersion and emersion rates : 25mm/s                                             | $\Delta V_{1mA} < 5\%$<br>Disappearance of electrode due to immersion into solder shall not exceed 25% of edges of each electrode. |
| Adhesive strength of termination | Solder chip on PCB and applied 10N(1Kgf) for 10 secs<br>                                                                                                 | No visible damage                                                                                                                  |
| Vibration                        | Soldered chip on PCB.<br>Frequency : 10Hz~55Hz~10Hz (1min)<br>Oscillation amplitude : 1.5mm<br>Time: 2hrs. in each of three perpendicular direction<br> | No visible damage                                                                                                                  |
| Drop                             | Drop 10 times on a concrete floor from a height of 91 cm.                                                                                                                                                                                  | No visible damage                                                                                                                  |

- After each test has been done , the tested chips shall be left in room ambient for 1~2 hours then measure the breakdown voltage.

## SOLDERING CONDITION

Typical examples of soldering processes that provide reliable joints without any damage are given in Fig 3.

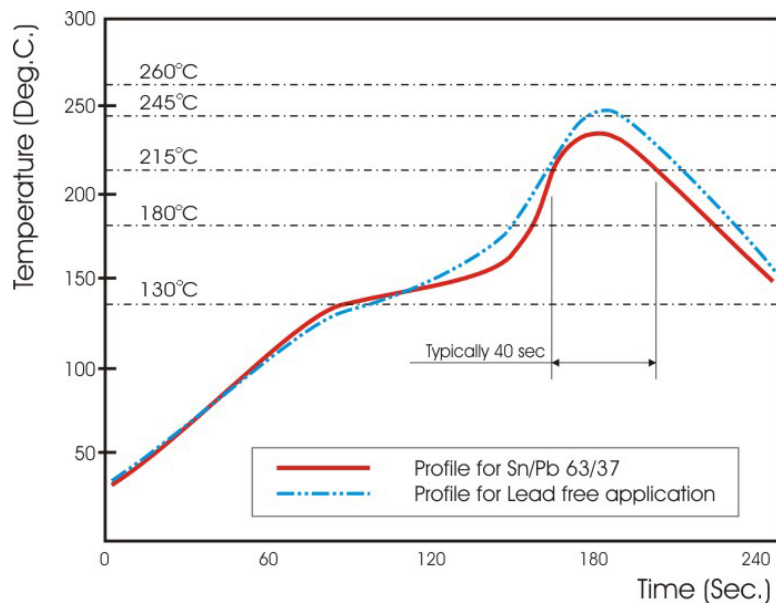


Fig 3. Infrared soldering profile

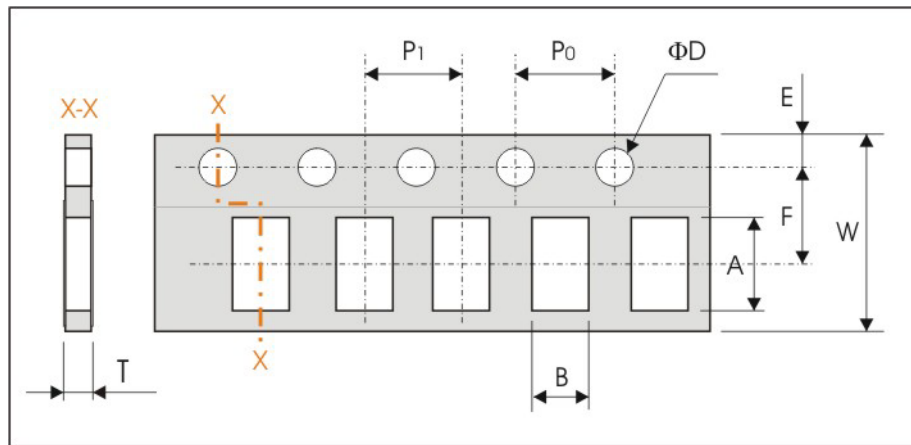
## ORDERING CODE

| VZ                            | 0603                                                                 | M                          | 180                                                                                                                      | A                   | P                                               | T                      | -                  |
|-------------------------------|----------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------|------------------------|--------------------|
| Type code                     | Chip Size                                                            | Style                      | Rated Voltage<br>(Vdc)                                                                                                   | Capacitance<br>Code | Type                                            | Packing<br>Code        | Special<br>Request |
| V : Sincera* Chip<br>Varistor | Code is L X W<br>(in inches)                                         | M: Multilayer<br>R: Array* | 050 : 5.5<br>090 : 9.0<br>120 : 12.0<br>140 : 14.0<br>180 : 18.0<br>260 : 26.0<br>300 : 30.0<br>480 : 48.0<br>560 : 56.0 | A : Standard        | P : Electro<br>plating by<br>Ni/Sn (Pb<br>Free) | T : Reeled<br>B : Bulk |                    |
| Z : Zinc Oxide                | 0402=.04"×.02"<br>0603=.06"×.03"<br>0805=.08"×.05"<br>1206=.12"×.06" |                            |                                                                                                                          |                     |                                                 |                        |                    |

\*Array: Please contact sales for availability

## PACKAGING

### Paper Tape specifications (unit :mm) and Packing quantity

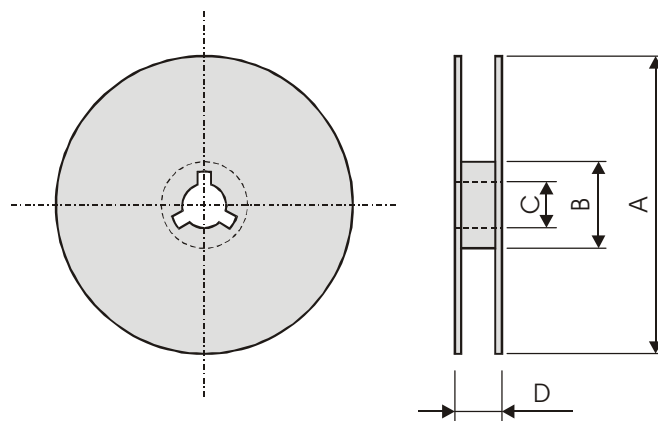


| Series | A               | B               | E               | F               | ΦD              |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| VZ0402 | $1.12 \pm 0.10$ | $0.62 \pm 0.10$ | $1.75 \pm 0.05$ | $3.50 \pm 0.05$ | $1.55 \pm 0.05$ |
| VZ0603 | $1.85 \pm 0.10$ | $1.10 \pm 0.10$ | $1.75 \pm 0.05$ | $3.50 \pm 0.05$ | $1.55 \pm 0.05$ |
| VZ0805 | $2.40 \pm 0.20$ | $1.60 \pm 0.20$ | $1.75 \pm 0.05$ | $3.50 \pm 0.05$ | $1.55 \pm 0.05$ |
| VZ1206 | $3.60 \pm 0.20$ | $2.00 \pm 0.20$ | $1.75 \pm 0.05$ | $3.50 \pm 0.05$ | $1.55 \pm 0.05$ |

| Series | P0              | P1              | T               | W               | Quantity/Reel |
|--------|-----------------|-----------------|-----------------|-----------------|---------------|
| VZ0402 | $4.00 \pm 0.10$ | $2.00 \pm 0.10$ | $0.60 \pm 0.15$ | $8.00 \pm 0.20$ | 10Kpcs        |
| VZ0603 | $4.00 \pm 0.10$ | $4.00 \pm 0.10$ | $<1.00$         | $8.00 \pm 0.20$ | 4Kpcs         |
| VZ0805 | $4.00 \pm 0.10$ | $4.00 \pm 0.10$ | $<1.00$         | $8.00 \pm 0.20$ | 4Kpcs         |
| VZ1206 | $4.00 \pm 0.10$ | $2.00 \pm 0.10$ | $<1.00$         | $8.00 \pm 0.20$ | 4Kpcs         |

- Tape Material : Plastic tape for the chip varistors which thickness  $>0.9\text{mm}$ , Paper tape for the chip varistors thickness  $<0.9\text{mm}$ .

### Reel dimensions



| Symbol    | A                    | B                   | C              | D              |
|-----------|----------------------|---------------------|----------------|----------------|
| Dimension | $\Phi 178.0 \pm 2.0$ | $\Phi 60.0 \pm 1.0$ | $13.0 \pm 0.2$ | $10.0 \pm 1.5$ |

## CAUTION OF HANDLING

### Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- (1) Aircraft equipment
- (2) Aerospace equipment
- (3) Undersea equipment
- (4) Medical equipment
- (5) Disaster prevention / crime prevention equipment
- (6) Traffic signal equipment
- (7) Transportation equipment (vehicles, trains, ships, etc.)
- (8) Applications of similar complexity and /or reliability requirements to the applications listed in the above.

### Storage condition

- (1) Products should be used in 6 months from the day of WALSIN outgoing inspection, which can be confirmed.
- (2) Storage environment condition.
  - Products should be storage in the warehouse on the following conditions.
  - Temperature : -10 to +40°C
  - Humidity : 30 to 70% relative humidity
  - Don't keep products in corrosive gases such as sulfur. Chlorine gas or acid or it may cause oxidization of electrode, resulting in poor solderability.
  - Products should be storage on the palette for the prevention of the influence from humidity, dust and so on.
  - Products should be storage in the warehouse without heat shock, vibration, direct sunlight and so on.
  - Products should be storage under the airtight packaged condition.