

# MLVS 0603 Lead Free Series Specification

<b>Product Name</b>	<b>Multilayer Varistor</b>
<b>Series</b>	<b>MLVS Lead Free Series</b>
<b>Size</b>	<b>EIA 0603</b>



# MLVS 0603 Lead Free Series Engineering Specification

## 1. Scope

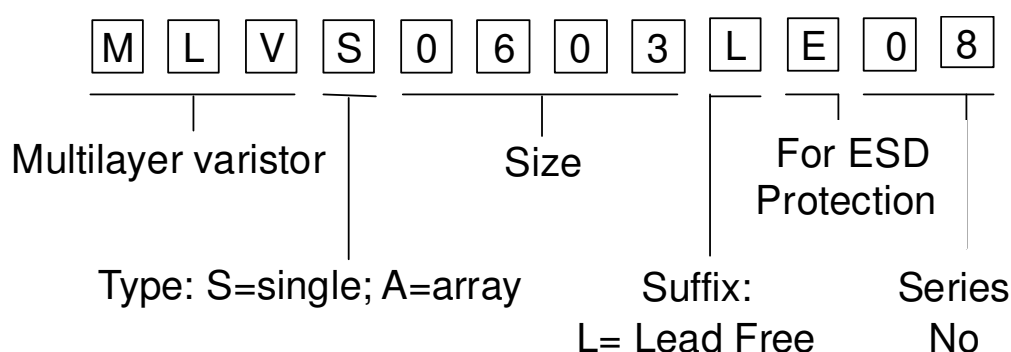
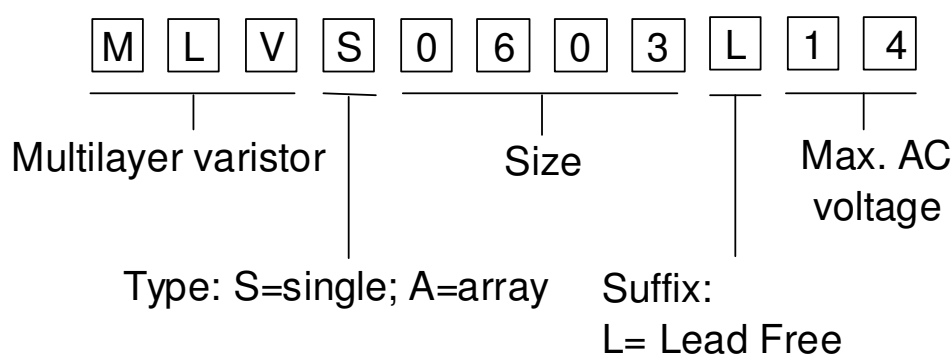
- (1) SMD type zinc oxide based ceramic chip
- (2) Lead free plating termination provided good solderability characteristic
- (3) Insulator over coat keeps excellent low and stable leakage current
- (4) Quick response time (<1ns)
- (5) Low clamping voltage
- (6) High transient current capability
- (7) Compact size for EIA 0603

## Applications

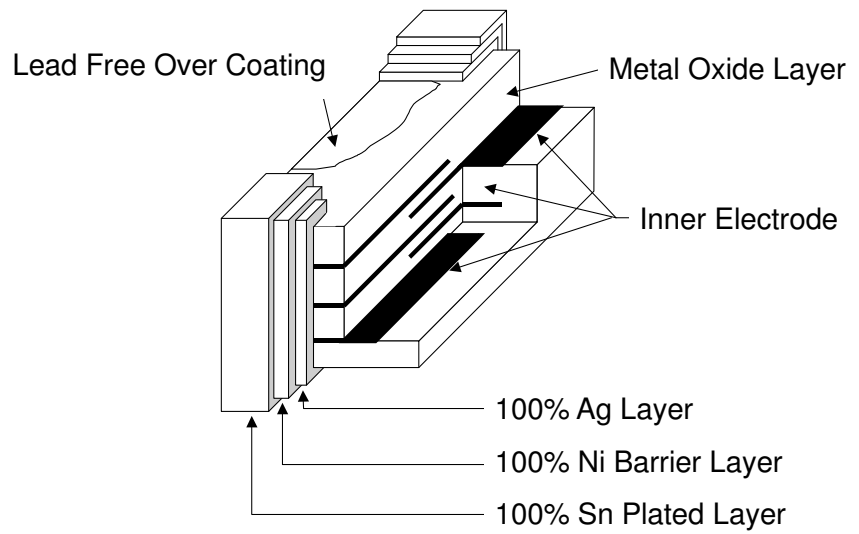
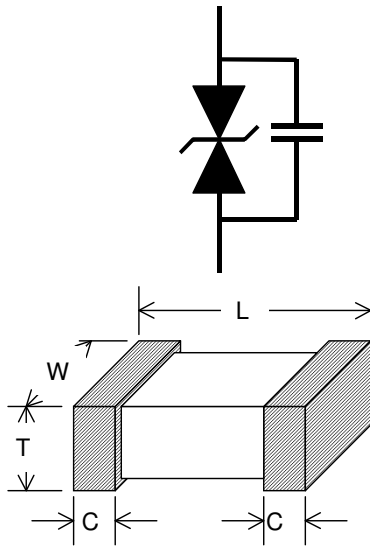
**Applications** for Mother Board and Notebook, Cellular Phone, PDA, handheld device, DSC, DV, Scanner, and Set-Top Box etc.

**Suitable** for Push-Button, Power Line and Low Frequency single line over voltage protect.

## 2. Explanation of Part Number



### 3. Construction & Dimension



Unit: mm	0603
L	1.60±0.15
W	0.80±0.1
T	0.80±0.1
c	0.30±0.20

## 4. Part ratings and characteristics:

### 4.1. Rating(25±5℃)

	Working voltage		Varistor voltage	Clamping Voltage	Capacitance	Peak current	Transient energy
Symbol	$V_{RMS}$	$V_{DC}$	$V_V$	$V_c$	$C_p$	$i_{max}$	$W_{max}$
Units	Volts	Volts (Max.)	Volts	Volts (Max.)	pF (Typical)	Amps (Max.)	Joules (Max.)
Test Condition		$< 10 \mu A$	1mA DC	1A 8/20 $\mu s$	1MHz	8/20 $\mu s$	10/1000 $\mu s$
MLVS 0603 L04	4	5.5	8 ~ 18	24	270	30	0.1
MLVS 0603 L04M	4	5.5	6.4 ~ 9.6	19	300	30	0.1
MLVS 0603 L06	7	9	11.5 ~ 21.5	41	210	30	0.1
MLVS 0603 L11	11	14	16.5 ~ 26.5	45	220	30	0.1
MLVS 0603 L14	14	18	23 ~ 33	54	150	30	0.1
MLVS 0603 L14J	14	18	22 ~ 28	45	150	30	0.1
MLVS 0603 L20	20	26	32 ~ 42	70	100	30	0.1
MLVS 0603 L21	21	29	38 ~ 48	70	80	30	0.1
MLVS 0603 LE06	-	12	25 ~ 40	60 (Typical)	40	-	-
MLVS 0603 LE08	-	12	25 ~ 40	110	40	-	-
MLVS 0603 LE10	-	12	45 ~ 65	150	3.5	-	-
MLVS 0603 LE12	-	26	45 ~ 65	145	4	-	-

$V_{RMS}$  – Maximum AC operating voltage the varistor can maintain and not exceed 10 $\mu$ A leakage current

$V_{DC}$  – Maximum DC operating voltage the varistor can maintain and not exceed 10 $\mu$ A leakage current

$V_V$  – Voltage across the device measured at 1mA DC current.  
Equivalent to  $V_b$ , “Breakdown Voltage”.

$C_p$  – Device capacitance measured with zero volt bias 1Vrms at 1MHz.

$V_c$  – Maximum peak voltage across the varistor measured at 8/20us waveform and 1A pulse current

$i_{max}$  – Maximum peak current which may be applied with 8/20us waveform without device failure

$W_{max}$  – Maximum energy that may be dissipated with the 10/1000us waveform without device failure

## 5. General electrical specifications

### 5.1. General technical data

Operating temperature	-40 ... +85°C
Storage temperature (on board)	-40... +85°C
Response time	<1 ns
Solderability	245±5°C, 5+0/ -0.5sec
Solder leach resistance	260±5°C, 10 ±1sec

### 5.2. Environmental Specifications

Characteristics	Specifications	Test condition
Bias humidity	$\Delta V_V / V_V \leq \pm 10\%$	90%RH, 40°C, Working voltage, 1000 hours
Thermal shock	$\Delta V_V / V_V \leq \pm 10\%$	-40°C to 85°C, 30 min. Cycle, 5 cycles
Full load voltage	$\Delta V_V / V_V \leq \pm 10\%$	Working voltage, 85°C, 1000 hours

### 5.3. Storage Condition with package

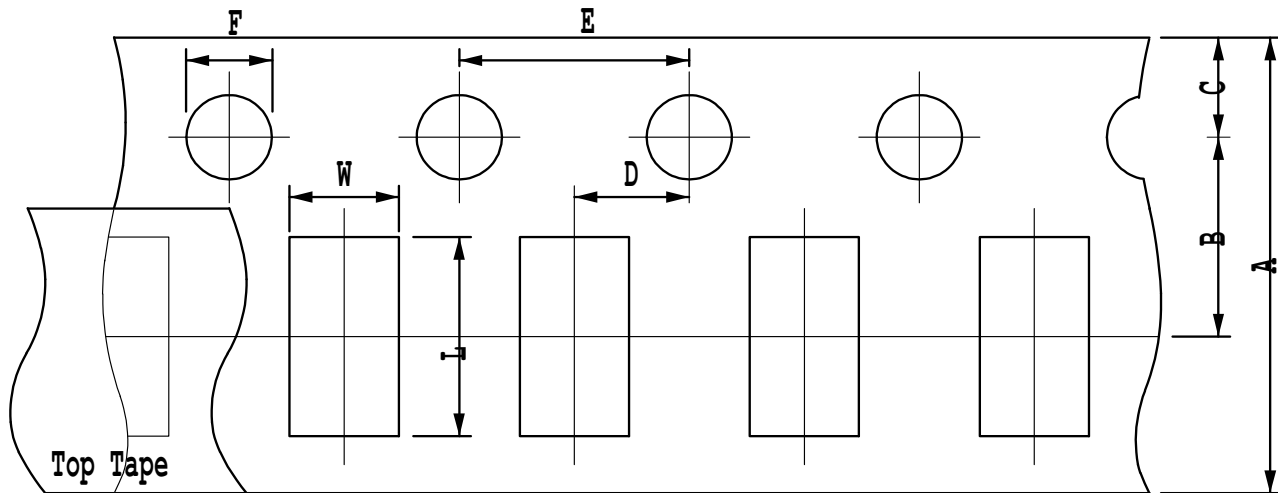
Storage Time: 12 months max

Storage Temperature : 5 to 40°C

Relative Humidity: to 65 %

## 6. Taping Package and Label Marking

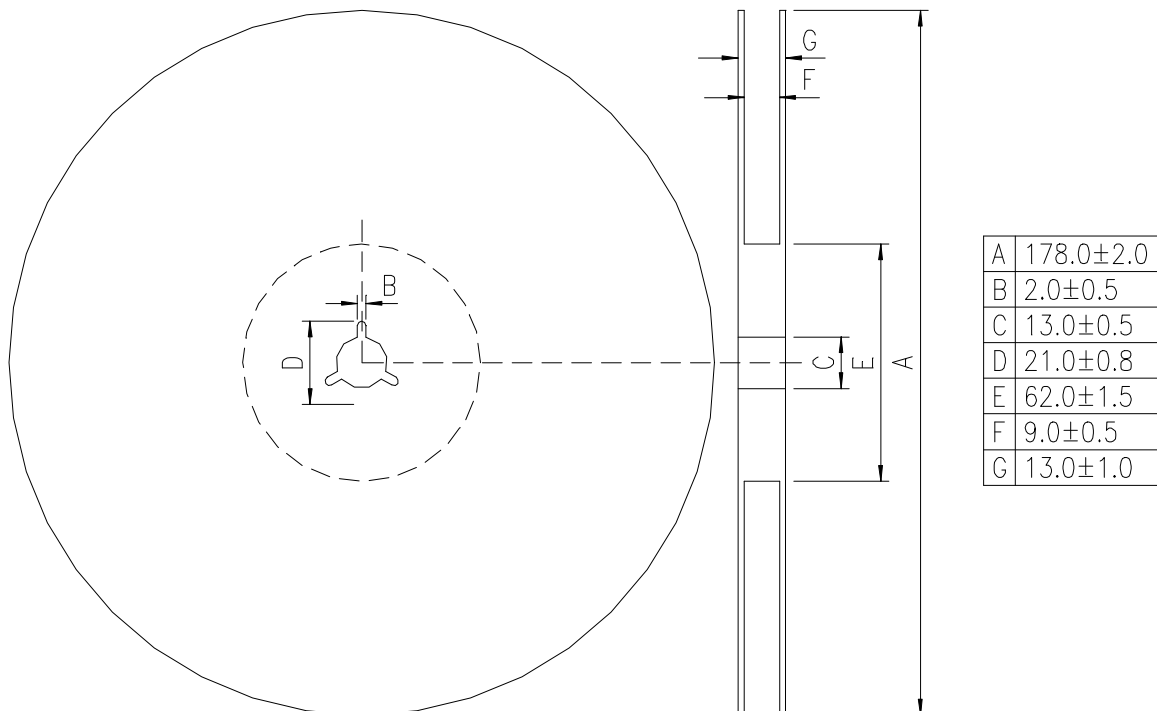
### 6.1. Carrier tape dimensions



UNIT: mm

A	B	C	D	E	F	L	W
8.00± 0.30	3.50± 0.05	1.75± 0.10	2.00± 0.05	4.00± 0.10	1.50± 0.10	1.90± 0.15	1.05± 0.15

### 6.2. Taping reel dimensions



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

### **6.3. Taping specifications**

There shall be the portion having no product in both the head and the end of taping, and there shall be the cover tape in the head of taping.

### **6.4. Label Marking**

The label specified as follows shall be put on the side of reel.

(1) Part No.

(2) Quantity

(3) Lot No.

\* Part No. And Quantity shall be marked on outer packaging.

### **6.5. Quantity of products in the taping package**

(1) Standard quantity: 4000pcs/Reel for MLVS 0603 Lead Free series

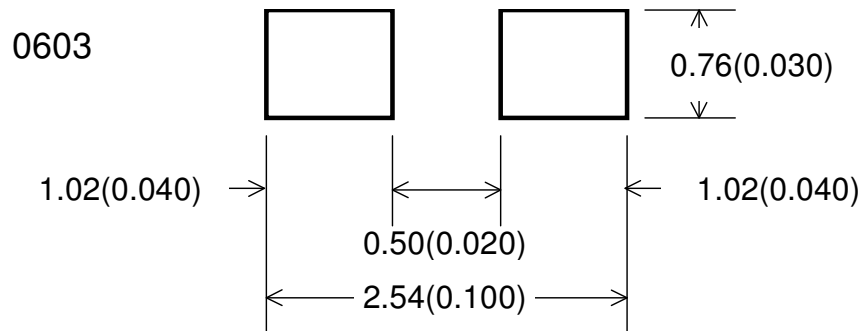
(2) Shipping quantity is a multiple of standard quantity.

## 7. Precautions for Handling

### 7.1. Solder cream in reflow soldering

Refer to the recommendable land pattern as printing mask pattern for solder cream.

- (1) Print solder in a thickness of 150 to 200  $\mu\text{m}$ .
- (2) Dimensions: millimeters (inches)



### 7.2. Precaution for handling of substrate

Do not exceed to bend the board after soldering this product extremely.

(Reference examples)

- Mounting place must be as far as possible from the position, which is close to the break line of board, or on the line of large holes of board.
- Do not bend extremely the board, in mounting another components.  
If necessary, use back-up pin (support pin) to prevent from bending extremely.
- Do not break the board by hand. We recommend using the machine or the jig to break it.

### 7.3. Precaution for soldering

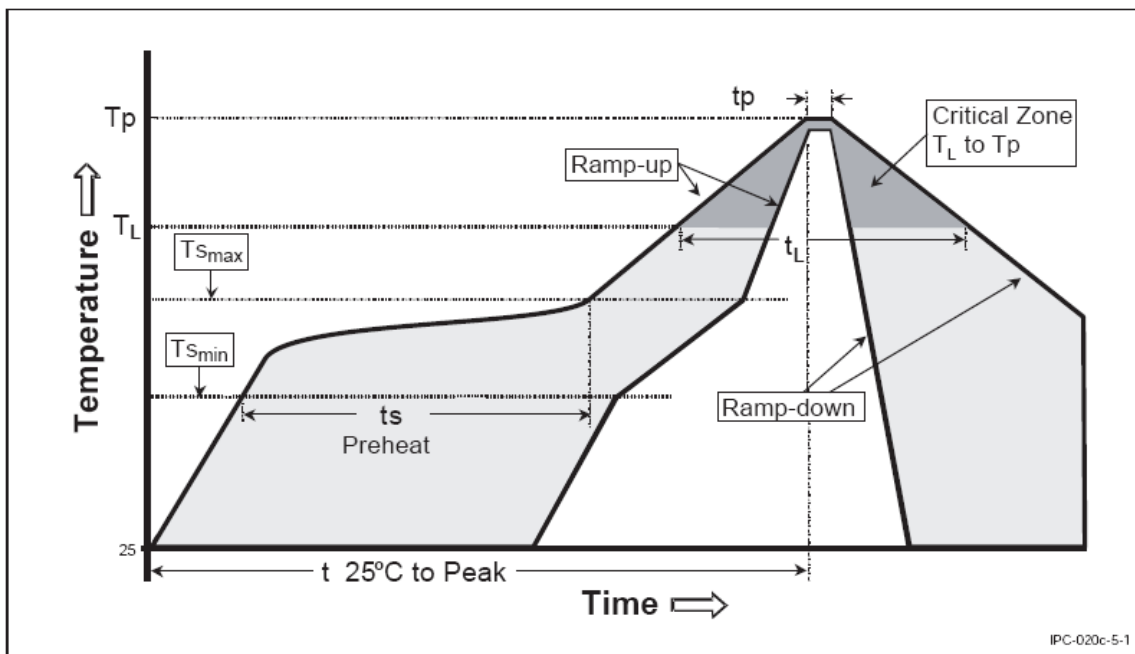
Note that rapid heating, rapid cooling or local heating will easily damage this product.

Do not give heat shock over 100°C in the process of soldering. We recommend taking preheating and gradual cooling.



#### 7.4. Recommendable reflow soldering

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T <sub>smax</sub> to T <sub>p</sub> )	3° C/second max.
<b>Preheat</b> – Temperature Min (T <sub>smin</sub> ) – Temperature Max (T <sub>smax</sub> ) – Time (t <sub>smin</sub> to t <sub>smax</sub> )	150 °C 200 °C 60-180 seconds
Time maintained above: – Temperature (T <sub>L</sub> ) – Time (t <sub>L</sub> )	217 °C 60-150 seconds
Peak/Classification Temperature (T <sub>p</sub> )	260 °C
Time within 5 °C of actual Peak Temperature (t <sub>p</sub> )	20-40 seconds
Ramp-Down Rate	6 °C/second max.
Time 25 °C to Peak Temperature	8 minutes max.



\*According to J-STD-020C

### **7.5. Soldering gun procedure**

Note the follows, in case of using solder gun for replacement.

- (1) The tip temperature must be less than 350°C for the period within 3 seconds by using soldering gun less than 30 W.
- (2) The soldering gun tip shall not touch this product directly.

### **7.6. Soldering volume**

Note that excess of soldering volume will easily get crack the body of this product.