

# Multilayer Chip Varistors



## Features:

- Multilayer fabrication technology.
- -55°C to 125°C operating temperature range.
- Operating voltage range  $V_M(DC)$  at 5.5V to 85V.
- Able to withstand ESD test of IEC-61000-4-2.
- Bi-directional clamping characteristic.

## Applications:

Protection of cellular phones, PDA, High speed data line.....etc.

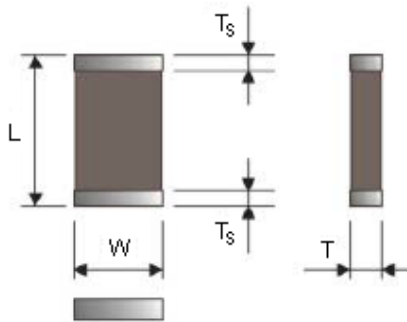
ESD protection for components sensitive to IEC 61000-4-2, provides circuit board transient voltage protection for transistors.

Protection of video and audio ports.

## Electrical Data

Item	General Specification
<b>Continuous Rating:</b> Steady state applied voltage: DC Voltage range ( $V_{M(DC)}$ ) AC Voltage range ( $V_{M(DC) RMS}$ )	5.5V to 85V 4V to 60V
<b>Transient Rating:</b> Non-Repetitive surge current (8/20 $\mu$ S) Non-Repetitive surge energy, 10/1000 $\mu$ S waveform, ( $W_{TM}$ ) Operating ambient temperature range ( $T_A$ ) Storage temperature range ( $T_{STG}$ ) Temperature coefficient ( $\alpha V$ ) of clamping voltage ( $V_C$ ) at specified test current	20A to 100A 0.05J to 1.0J -55°C to 125°C -55°C to 150°C <0.01%/°C

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## Dimensions

Size	MCV0402	MCV0603	MCV0805	MCV1206
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	0.50 ±0.10	0.80 ±0.15	0.80 ±0.20	0.80 ±0.10mm* 1.10 ±0.20mm**
T <sub>s</sub>	0.25 ±0.15	0.35 ±0.15	0.50 ±0.20	0.65 ±0.25

Dimensions : Millimetres

Terminal electrode : Ni / Sn electrode.

Note: \* means MCV1206 5.5V dc to 22V dc items

\*\* means MCV1206 26V dc to 85V dc items

## Device Rating and Specifications

Maximum Ratings					Specifications			Part Number
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 at 1KHz	
V <sub>M</sub> (DC)	V <sub>M</sub> (AC)	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N</sub> (DC) Minimum	V <sub>N</sub> (DC) Maximum	C	
(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)	
5.5	4	20	0.05	20 at 1A	8.0	11.0	295	MCV0402M050AGT
9	6	20	0.05	23 at 1A	10.2	13.8	190	MCV0402M090AGT
11	8	20	0.05	25 at 1A	12.75	17.25	160	MCV0402M110AGT
14	11	20	0.05	30 at 1A	15.3	20.7	135	MCV0402M140AGT
18	14	20	0.05	40 at 1A	21.6	26.4	93	MCV0402M180AGT
5.5	4	30	0.1	20 at 1A	8.0	11.0	800	MCV0603M050AGT
9	6	30	0.1	23 at 1A	10.2	13.8	680	MCV0603M090AGT
14	11	30	0.1	30 at 1A	15.3	20.7	350	MCV0603M140AGT
18	14	30	0.1	39 at 1A	21.6	26.4	270	MCV0603M180AGT
26	20	30	0.1	54 at 1A	29.7	36.3	200	MCV0603M260AGT

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## Device Rating and Specifications

Maximum Ratings					Specifications			Part Number
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 at 1KHz	
V <sub>M</sub> (DC)	V <sub>M</sub> (AC)	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N</sub> (DC) Minimum	V <sub>N</sub> (DC) Maximum	C	
(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)	
30	25	30	0.1	65 at 1A	35.1	42.9	120	MCV0603M300AGT
38	30	30	0.1	77 at 1A	42.3	51.7	100	MCV0603M380AGT
5.5	4	80	0.1	20 at 1A	8.0	11.0	1600	MCV0805M050AGT
9	6	80	0.1	23 at 1A	10.2	13.8	1180	MCV0805M090AGT
18	14	100	0.2	39 at 1A	21.6	26.4	550	MCV0805M180AGT
22	17	100	0.2	44 at 1A	24.3	29.7	400	MCV0805M220AGT
26	20	100	0.3	54 at 1A	29.7	36.3	350	MCV0805M260AGT
30	25	100	0.3	65 at 1A	35.1	42.9	310	MCV0805M300AGT
38	30	100	0.3	77 at 1A	42.3	51.7	280	MCV0805M380AGT
45	35	80	0.3	90 at 1A	50.4	61.6	195	MCV0805M450AGT
5.5	4	100	0.2	20 at 1A	8.0	11.0	3200	MCV1206M050AGT
14	11	100	0.3	30 at 1A	15.3	20.7	1150	MCV1206M140AGT
18	14	100	0.3	38 at 1A	21.6	26.4	900	MCV1206M180AGT
22	17	100	0.4	44 at 1A	24.3	29.7	840	MCV1206M220AGT
26	20	100	0.5	54 at 1A	29.7	36.3	490	MCV1206M260AGT
30	25	100	0.6	65 at 1A	35.1	42.9	440	MCV1206M300AGT
38	30	100	0.7	77 at 1A	42.3	51.7	400	MCV1206M380AGT
45	35	100	0.8	90 at 1A	50.4	61.6	310	MCV1206M450AGT
56	40	100	1.0	110 at 1A	61.2	74.8	280	MCV1206M560AGT
65	50	100	0.5	135 at 1A	73.8	90.2	240	MCV1206M650AGT
85	60	100	0.6	165 at 1A	90.0	110	160	MCV1206M850AGT

## Standard Testing Condition

### Unless otherwise specified

Temperature : 15 to 35°C.  
 Humidity : 25%RH to 85%RH.  
 Atmospheric pressure : 86kPa to 106kPa.


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## Specifications

Electrical Reliability																				
Test Item	Test Condition / Test Method	Specification																		
High temperature storage	+125 ±3°C for 1000 hours Measurement to be made after keeping at room temperature for 24 ±2 hours	ΔV at 1mA <10%																		
Low temperature storage	-40 ±3°C for 1000 hours Measurement to be made after keeping at room temperature for 24 ±2 hours	ΔV at 1mA <10%																		
Humidity storage	40 ±2°C, 90 to 95%RH for 500 hours Measurement to be made after keeping at room temperature for 24 ±2 hours	ΔV at 1mA <10%																		
Temperature cycles	<table border="1"> <thead> <tr> <th colspan="3">Times: 5 cycles</th> </tr> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (Minimum)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55 ±3</td> <td>30 ±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>2 to 3</td> </tr> <tr> <td>3</td> <td>+125 ±3°C</td> <td>30 ±2</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>2 to 3</td> </tr> </tbody> </table> <p>Measurement to be made after keeping at room temperature for 24 ±2 hours</p>	Times: 5 cycles			Step	Temperature (°C)	Time (Minimum)	1	-55 ±3	30 ±3	2	Room temperature	2 to 3	3	+125 ±3°C	30 ±2	4	Room temperature	2 to 3	ΔV at 1mA <10%
Times: 5 cycles																				
Step	Temperature (°C)	Time (Minimum)																		
1	-55 ±3	30 ±3																		
2	Room temperature	2 to 3																		
3	+125 ±3°C	30 ±2																		
4	Room temperature	2 to 3																		
Mechanical Reliability																				
Solderability	Solder temperature : 230 ±5°C Immersion time : 2 ±0.5 seconds Immersion and emersion rates : 25mm/s	Minimum 90% electrode shall be covered with solder																		
Resistance to soldering heat	Pre-heating: 120 to 150°C, 60 seconds Solder temperature: 260 ±5°C Immersion time: 10 ±1 seconds Measurement to be made after keeping at room temperature for 24 ±2 hours	ΔV at 1mA <10% 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 0805/1206 Series: 10N (1Kg) for 10 seconds 0402/0603 Series: 5N (0.5Kg) for 10 seconds  <b>Chip varistor</b> 	No visible damage																		
Vibration	Solder Chip on PCB. Frequency: 10Hz to 55Hz to 10Hz (1min) Oscillation amplitude: 1.5mm Times: 2 hours in each of three perpendicular direction	No visible damage																		
Bending Test	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5 seconds	No visible damage ΔV at 1mA <10%																		

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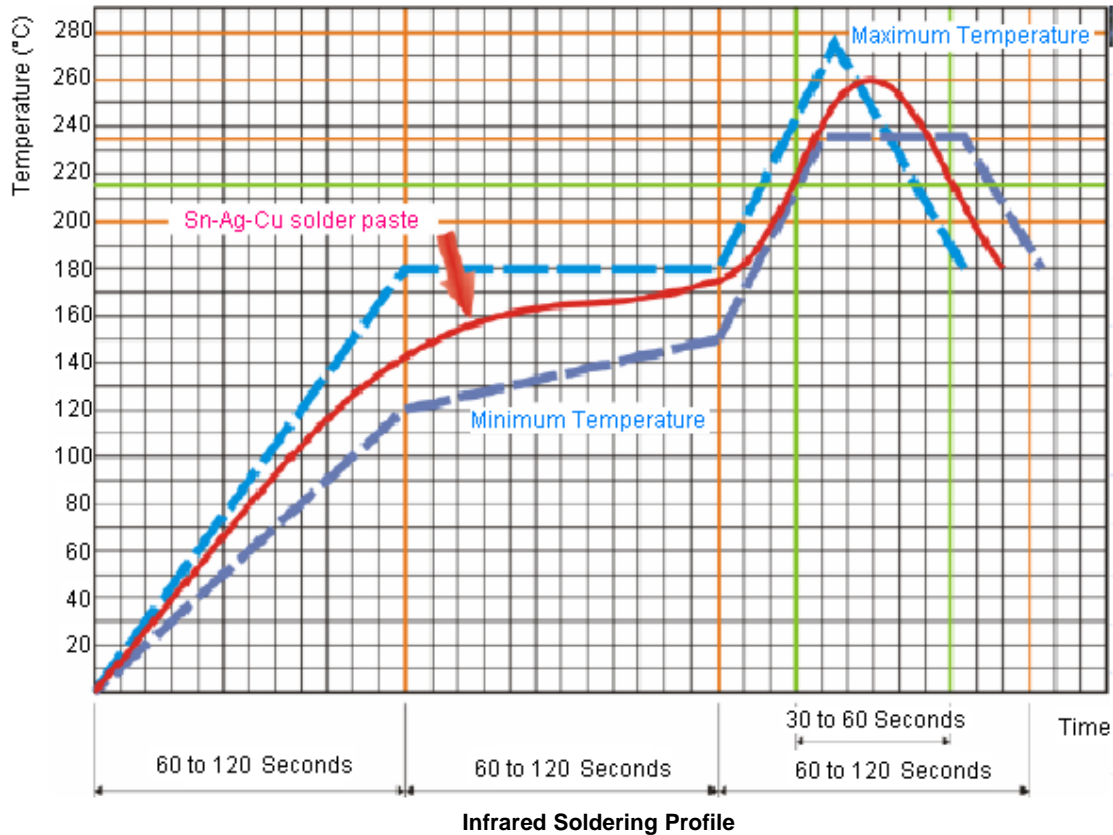


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## Soldering Condition

Typical examples of soldering processes that provide reliable joints without any damage are given in figure below:



## Ordering Code

<b>MCV</b>	<b>0402</b>	<b>M</b>	<b>050</b>	<b>A</b>	<b>G</b>	<b>T</b>
<b>Type Code</b> MCV: Varistor	<b>Chip Size</b> Code is L x W (in inches)  0402 = 04 x 02 0603 = 06 x 03 0805 = 08 x 05 1206 = 12 x 06	<b>Style</b> M: Multilayer A: Array	<b>Rated Voltage</b> 050 = 5.5V 070 = 7V 090 = 9V 140 = 14V 180 = 18V	<b>Capacitance Tolerance</b> A: Standard	<b>Termination</b> G: Green Material	<b>Packing</b> T: Reeled B: Bulk

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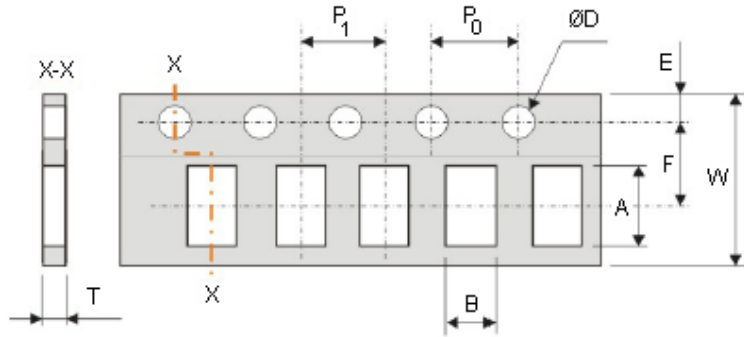


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## Packaging

Paper Tape Specifications (Unit: mm) and Packaging Quantity



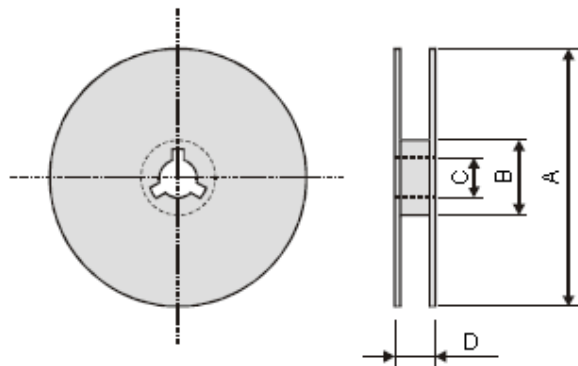
A	B	E	F	ØD	Part Number
1.12 ±0.03	0.62 ±0.03	1.75 ±0.05	3.50 ±0.05	1.55 ±0.05	MCV0402
1.80 ±0.05	0.95 ±0.05	1.75 ±0.05	3.50 ±0.05	1.55 ±0.05	MCV0603
2.25 ±0.05	1.45 ±0.05	1.75 ±0.05	3.50 ±0.05	1.55 ±0.05	MCV0805
3.50 ±0.05	1.88 ±0.05	1.75 ±0.05	3.50 ±0.05	1.55 ±0.05	MCV1206

P <sub>0</sub>	P <sub>1</sub>	T	W	Quantity/Reel	Part Number
4.00 ±0.10	2.00 ±0.10	0.60 ±0.03	8.00 ±0.20	10K Pieces	MCV0402
4.00 ±0.10	2.00 ±0.10	0.87 ±0.05	8.00 ±0.20	4K Pieces	MCV0603
4.00 ±0.10	2.00 ±0.10	1.24 ±0.05	8.00 ±0.20	4K Pieces	MCV1206

• Tape Material: Paper tape.

Dimensions : Millimetres

## Reel Dimensions



Symbol	A	B	C	D
Dimension	Ø178.0 ±2.0	Ø60.0 ±1.0	13.0 ±0.2	10.0 ±1.5

Dimensions : Millimetres

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## 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) Traffic signal equipment.
- (6) 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 final date of manufacture 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 son 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.

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