

Chip Varistor for High Surge Current Suppression

1. Identification (Part Number)

MLV 1206 H 180 K R
 ① ② ③ ④ ⑤ ⑥

① Type		④ Maximum DC Operating Voltage	
MLV	Chip Varistor	180	18V
② External Dimension L×W		650	65V
1206	3.2×1.6	⑤ Tolerance of Varistor Voltage	
1210	3.2×2.5	K	±10%
1812	4.5×3.2	L	±15%
2220	5.7×5.0	⑥ Packaging	
③ Application Code		R	Reel
H	High Surge Current Suppression	B	Bulk

Features

SMD type, suitable for high density mounting Excellent clamping

ratio and strong capability of voltage surge suppression

Excellent solderability (Ni, Sn plating)

Applications

Used for security system, PLC, Automotive electronics, Industrial instrument, smart meters, Control and measurement equipment, etc.

2. Basic Parameters Definition

Varistor

A "varistor" is a resistive device with non-linear volt-ampere characteristics. It is mainly used to clamp the voltage when the circuit is under an overvoltage and absorb excess current to protect the sensitive device.

VDC DC working voltage

The maximum sustained DC voltage at which the varistor is used at highest operating temperature.

VAC AC working voltage

The maximum sustained sinusoidal AC operating voltage at which the varistor is used at the highest operating temperature.

IL Leakage current

The varistor is in a high-impedance state in non-conductive mode, to measure the leakage current at max. continuous working voltage.

VB Varistor Voltage

Threshold voltage that the varistor switches from the open circuit state to the working state. Normally measured at the current of 1mA DC.

VC Clamping voltage

The maximum voltage on a varistor under the condition of a specified pulse current and a 8/20us waveform condition or a ESD waveform.

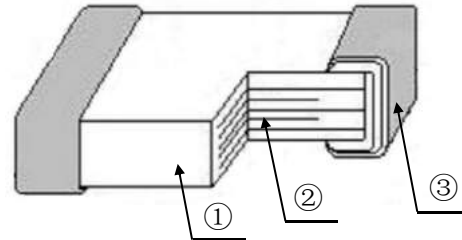
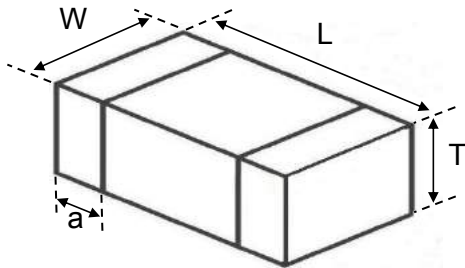
CP Capacitance

The capacitance value of the varistor that measured at 1MHz frequency and 0.5V voltage (AC).

IR Insulation Resistance

The resistance value of the varistor that measured at 3.6V voltage (DC).

3. Structure and Dimensions



Type	L (mm)	W (mm)	T (mm)	a (mm)
0402	1.00±0.10	0.50±0.10	0.50±0.10	0.25±0.15
0603	1.60±0.15	0.80±0.15	0.80±0.15	0.30±0.20
0805	2.00±0.20	1.25±0.20	0.85±0.20	0.50±0.30
1206	3.20±0.20	1.60±0.20	1.2 Max.	0.50±0.25
1210	3.20±0.25	2.50±0.25	1.5 Max.	0.50±0.25
1812	4.50±0.30	3.20±0.30	2.5 Max.	0.25~1.0
2220	5.70±0.40	5.00±0.40	2.5 Max.	0.25~1.0

Part	①	②	③
Component	ZnO Semiconductor Ceramics for Chip Varistor	Internal Electrode (Ag or Ag-Pd)	Terminal Electrode (Ag/Ni/Sn three layers)

4. Electrical Characteristics

I . MLV0402H~MLV0805H

Part No.	Max. Working Voltage		Varistor Voltage @1mA DC		Max. Clamping Voltage (8/20 μ s 1A)	Peak Current (8/20 μ s)	Energy (10/1000 μ s)	Typical Capacitance @1MHz
	VDC(V)	VAC(V)	VB(V)	Δ VB	Vc(V)	Ip(A)	WT (J)	Cp(pF)
MLV0402H5R5LR	5.5	4	12	$\pm 15\%$	24	20	0.05	150
MLV0402H080LR	8	6	13	$\pm 15\%$	26	20	0.05	130
MLV0402H120LR	12	9	18	$\pm 15\%$	32	20	0.05	80
MLV0402H180KR	18	14	25	$\pm 10\%$	43	20	0.05	60
MLV0402H240KR	24	17	33	$\pm 10\%$	58	20	0.05	50
MLV0603H5R5LR	5.5	4	12	$\pm 15\%$	24	30	0.1	250
MLV0603H080LR	8	6	13	$\pm 15\%$	26	30	0.1	230
MLV0603H120LR	12	9	18	$\pm 15\%$	32	30	0.1	140
MLV0603H180KR	18	14	25	$\pm 10\%$	43	30	0.1	110
MLV0603H220KR	22	17	30	$\pm 10\%$	50	30	0.1	90
MLV0603H260KR	26	20	35	$\pm 10\%$	60	30	0.1	80
MLV0603H300KR	30	25	40	$\pm 10\%$	68	30	0.1	70
MLV0603H380KR	38	30	49	$\pm 10\%$	83	30	0.1	60
MLV0805H5R5LR	5.5	4	12	$\pm 15\%$	24	100	0.3	600
MLV0805H080LR	8	6	13	$\pm 15\%$	26	100	0.3	560
MLV0805H120LR	12	9	18	$\pm 15\%$	32	100	0.3	360
MLV0805H180KR	18	14	25	$\pm 10\%$	43	100	0.3	280
MLV0805H220KR	22	17	30	$\pm 10\%$	50	100	0.3	240
MLV0805H260KR	26	20	35	$\pm 10\%$	60	100	0.3	210
MLV0805H300KR	30	25	40	$\pm 10\%$	68	100	0.3	190
MLV0805H330KR	33	26	43	$\pm 10\%$	73	100	0.3	180
MLV0805H380KR	38	30	49	$\pm 10\%$	83	100	0.3	150
MLV0805H450KR	45	35	58	$\pm 10\%$	99	100	0.3	130

II. MLV1206H

Part No.	Max. Working Voltage		Varistor Voltage @1mA DC		Max. Clamping Voltage (8/20 μ s 1A)	Peak Current (8/20 μ s)	Energy (10/1000 μ s)	Typical Capacitance @1MHz
	VDC(V)	VAC(V)	VB(V)	Δ VB				
MLV1206H090LR	9	7	13	$\pm 15\%$	26	1	200	0.5
MLV1206H120LR	12	9	18	$\pm 15\%$	32	1	200	0.5
MLV1206H140KR	14	11	20	$\pm 10\%$	35	1	200	0.5
MLV1206H180KR	18	14	25	$\pm 10\%$	43	1	200	0.5
MLV1206H220KR	22	17	30	$\pm 10\%$	50	1	200	0.5
MLV1206H260KR	26	20	35	$\pm 10\%$	60	1	200	0.6
MLV1206H300KR	30	25	40	$\pm 10\%$	68	1	200	0.6
MLV1206H330KR	33	26	43	$\pm 10\%$	73	1	200	0.6
MLV1206H380KR	38	30	49	$\pm 10\%$	83	1	200	0.6
MLV1206H420KR	42	33	54	$\pm 10\%$	92	1	200	0.6
MLV1206H450KR	45	35	58	$\pm 10\%$	99	1	200	0.6
MLV1206H480KR	48	37	62	$\pm 10\%$	105	1	200	0.6
MLV1206H560KR	56	40	70	$\pm 10\%$	119	1	200	0.6
MLV1206H600KR	60	45	76	$\pm 10\%$	129	1	200	0.6
MLV1206H650KR	65	50	82	$\pm 10\%$	139	1	200	0.6
MLV1206H750KR	75	55	92	$\pm 10\%$	156	1	200	0.6
MLV1206H850KR	85	60	102	$\pm 10\%$	175	1	200	0.6

III. MLV1210H

Part No.	Max. Working Voltage		Varistor Voltage @1mA DC		Max. Clamping Voltage (8/20 μ s 1A)	Peak Current (8/20 μ s)	Energy (10/1000 μ s)	Typical Capacitance @1MHz
	VDC(V)	VAC(V)	VB(V)	Δ VB	Vc(V)	Ip(A)	WT (J)	Cp(pF)
MLV1210H090LR	9	7	13	$\pm 15\%$	26	2.5	400	1.5
MLV1210H120LR	12	9	18	$\pm 15\%$	32	2.5	400	1.5
MLV1210H140KR	14	11	20	$\pm 10\%$	35	2.5	400	1.5
MLV1210H180KR	18	14	25	$\pm 10\%$	43	2.5	400	1.5
MLV1210H220KR	22	17	30	$\pm 10\%$	50	2.5	400	1.5
MLV1210H260KR	26	20	35	$\pm 10\%$	60	2.5	400	1.5
MLV1210H300KR	30	25	40	$\pm 10\%$	68	2.5	400	1.5
MLV1210H330KR	33	26	43	$\pm 10\%$	73	2.5	400	1.5
MLV1210H380KR	38	30	49	$\pm 10\%$	83	2.5	400	1.5
MLV1210H420KR	42	33	54	$\pm 10\%$	92	2.5	400	1.5
MLV1210H450KR	45	35	58	$\pm 10\%$	99	2.5	400	1.5
MLV1210H480KR	48	37	62	$\pm 10\%$	105	2.5	400	1.5
MLV1210H560KR	56	40	70	$\pm 10\%$	119	2.5	400	1.5
MLV1210H600KR	60	45	76	$\pm 10\%$	129	2.5	400	1.5
MLV1210H650KR	65	50	82	$\pm 10\%$	139	2.5	400	1.5
MLV1210H750KR	75	55	92	$\pm 10\%$	156	2.5	400	1.5
MLV1210H850KR	85	60	102	$\pm 10\%$	175	2.5	400	1.5

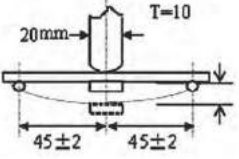
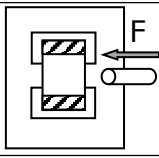
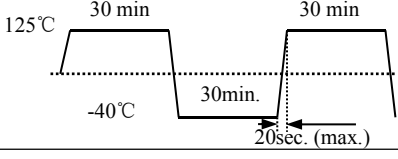
IV. MLV1812H

Part No.	Max. Working Voltage		Varistor Voltage @1mA DC		Max. Clamping Voltage (8/20 μ s 1A)	Peak Current (8/20 μ s)	Energy (10/1000 μ s)	Typical Capacitance @1MHz
	VDC(V)	VAC(V)	VB(V)	Δ VB	Vc(V)	Ip(A)	WT (J)	Cp(pF)
MLV1812H090LR	9	7	13	$\pm 15\%$	26	5.0	800	2.5
MLV1812H120LR	12	9	18	$\pm 15\%$	32	5.0	800	2.5
MLV1812H140KR	14	11	20	$\pm 10\%$	35	5.0	800	2.5
MLV1812H180KR	18	14	25	$\pm 10\%$	43	5.0	800	3.0
MLV1812H220KR	22	17	30	$\pm 10\%$	50	5.0	800	3.0
MLV1812H260KR	26	20	35	$\pm 10\%$	60	5.0	800	3.0
MLV1812H300KR	30	25	40	$\pm 10\%$	68	5.0	800	3.5
MLV1812H330KR	33	26	43	$\pm 10\%$	73	5.0	800	3.5
MLV1812H380KR	38	30	49	$\pm 10\%$	83	5.0	800	3.5
MLV1812H420KR	42	33	54	$\pm 10\%$	92	5.0	800	3.5
MLV1812H450KR	45	35	58	$\pm 10\%$	99	5.0	800	3.5
MLV1812H480KR	48	37	62	$\pm 10\%$	105	5.0	800	3.5
MLV1812H560KR	56	40	70	$\pm 10\%$	119	5.0	800	3.5
MLV1812H600KR	60	45	76	$\pm 10\%$	129	5.0	800	3.5
MLV1812H650KR	65	50	82	$\pm 10\%$	139	5.0	800	3.5
MLV1812H750KR	75	55	92	$\pm 10\%$	156	5.0	800	3.5
MLV1812H850KR	85	60	102	$\pm 10\%$	175	5.0	800	3.5

V. MLV2220H

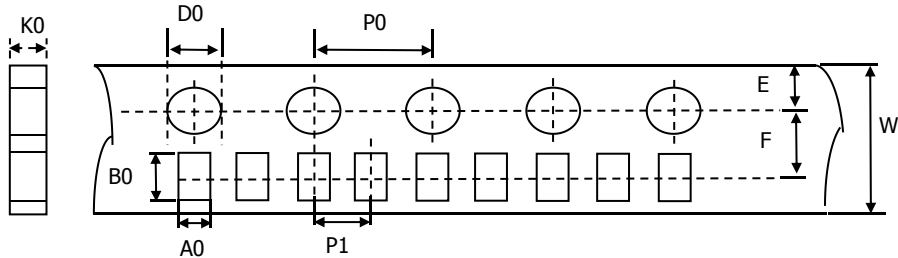
Part No.	Max. Working Voltage		Varistor Voltage @1mA DC		Max. Clamping Voltage (8/20 μ s 1A)	Peak Current (8/20 μ s)	Energy (10/1000 μ s)	Typical Capacitance @1MHz
	VDC(V)	VAC(V)	VB(V)	Δ VB	Vc(V)	Ip(A)	WT (J)	Cp(pF)
MLV2220H180KR	18	14	25	$\pm 10\%$	43	5.0	1200	5.0
MLV2220H220KR	22	17	30	$\pm 10\%$	50	5.0	1200	5.0
MLV2220H260KR	26	20	35	$\pm 10\%$	60	5.0	1200	5.0
MLV2220H300KR	30	25	40	$\pm 10\%$	68	5.0	1200	5.0
MLV2220H330KR	33	26	43	$\pm 10\%$	73	5.0	1200	5.0
MLV2220H380KR	38	30	49	$\pm 10\%$	83	5.0	1200	5.0
MLV2220H420KR	42	33	54	$\pm 10\%$	92	5.0	1200	5.0
MLV2220H450KR	45	35	58	$\pm 10\%$	99	5.0	1200	5.0
MLV2220H480KR	48	37	62	$\pm 10\%$	105	5.0	1200	5.0
MLV2220H560KR	56	40	70	$\pm 10\%$	119	5.0	1200	5.0
MLV2220H600KR	60	45	76	$\pm 10\%$	129	5.0	1200	5.0
MLV2220H650KR	65	50	82	$\pm 10\%$	139	5.0	1200	5.0
MLV2220H750KR	75	55	92	$\pm 10\%$	156	5.0	1200	5.0
MLV2220H850KR	85	60	102	$\pm 10\%$	175	5.0	1200	5.0

5. Reliability Test

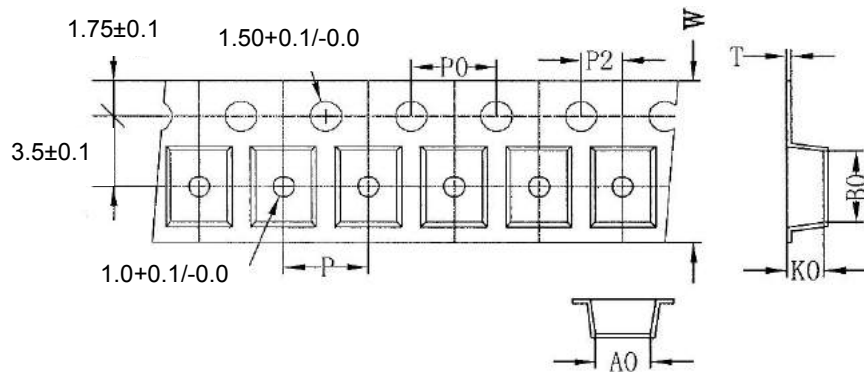
No	Items	Test conditions / Methods	Requirements
1	Bending Resistance	Warp: 2mm Speed<0.5mm/s Duration: 10s 	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 5\%$.
2	Terminal Strength	Speed<0.5mm/s Apply force: 10N Duration: 10±1s 	No removal or split of the termination
3	Solderability	Solder temperature: 240±5℃; Dipping Duration: 3±0.3s;	① No visible mechanical damage. ② Wetting shall exceed 90% coverage.
4	Resistance to Soldering Heat	Solder temperature: 260±5℃; Dipping Duration: 5±1s;	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
5	Thermal Shock	High and low temperatures Transform for 100 Cycles. 	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
6	Damp Heat	Temperature: 60±2℃ Humidity: 90% ~ 95% RH.Duration: 1000+24 h.	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
7	High Temp. Storage	Temperature: 125±2℃ Duration: 1000±24 h.	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
8	High Temp. Load	Temperature: 85±2℃ Loading Voltage: V _{DC} .Duration: 1000±24 h.	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
9	Damp Heat Load	Temperature: 40±2℃ Humidity: 90% ~ 95% RH.Loading Voltage: V _{DC} .Duration: 500±12 h.	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
10	Maximum Surge Current	Pulse waveform: 8/20 us Number of hit: each 1 time of +/- polarity Applied current: maximum surge current (I _p)	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.
11	Maximum Surge Energy	Pulse waveform: 10/1000 us Number of hit: each 1 time of +/- polarity Applied current: maximum surge energy(W _{max})	① No visible mechanical damage. ② $ \Delta V_{1mA} / V_{1mA} \leq 10\%$.

6. Packaging

1. Carrier tape dimensions. (Unit: mm)

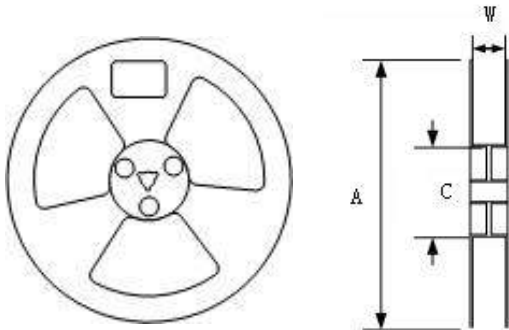


Type	A0	B0	W	E	F	P1	P0	D0	K0
0402	0.65±0.2	1.15±0.2	8.0±0.3	1.75±0.1	3.5±0.1	2.0±0.1	4.0±0.1	1.55±0.1	0.8 Max.
0603	1.05±0.2	1.85±0.2	8.0±0.3	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	1.55±0.1	1.1 Max.
0805	1.5±0.2	2.3±0.2	8.0±0.3	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	1.55±0.1	1.1 Max.



Type	A0 (±0.2)	B0 (±0.2)	K0Max.	T Max.	W (±0.3)	P0 (±0.2)	P (±0.2)	P2 (±0.2)
1206	1.9	3.5	2.0	0.30	8.0	4.0	4.0	2.0
1210	2.8	3.5	2.0	0.30	8.0	4.0	4.0	2.0
1812	3.5	4.8	2.8	0.30	12.0	4.0	8.0	2.0
2220	5.1	6.0	3.0	0.30	12.0	4.0	8.0	2.0

2. Taping Dimensions



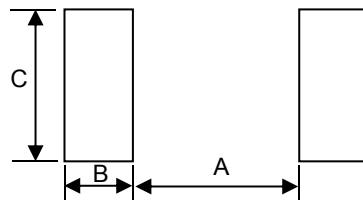
Type	Spec.	Dimensions(mm)		
		A	W	C
0402	7"	178±2	8.4+2.0/-0.0	58±2
0603	7"	178±2	8.4+2.0/-0.0	58±2
0805	7"	178±2	8.4+2.0/-0.0	58±2
1206	7"	178±2	8.4+2.0/-0.0	58±2
1210	7"	178±2	8.4+2.0/-0.0	58±2
1812	7"	178±2	12.4+2.0/-0.0	58±2
2220	7"	178±2	12.4+2.0/-0.0	58±2

3. Packaging quantity

Type	Tape	Quantity (pcs/reel)
0402	Paper Tape	10K
0603		4K
0805		4K
1206	Embossed Tape	3K
1210		3K
1812		1K
2220		1K

7. Soldering Recommendation

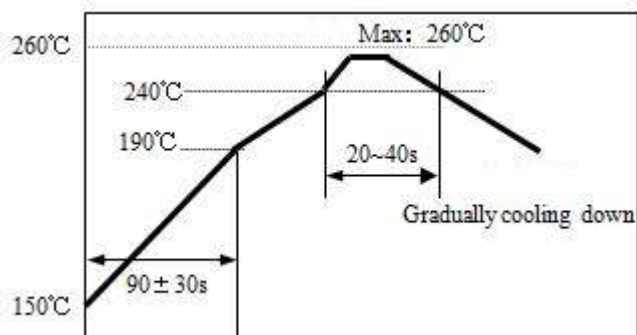
1. Recommended Land pattern



Type	A (mm)	B (mm)	C (mm)
0402	0.45~0.55	0.40~0.50	0.45~0.55
0603	0.60~0.80	0.60~0.80	0.60~0.80
0805	0.80~1.20	0.80~1.20	0.90~1.60
1206	1.8~2.5	1.2~1.8	1.2~2.0
1210	1.8~2.5	1.3~2.0	2.2~3.0
1812	2.5~3.3	1.5~2.2	2.8~3.6
2220	3.8~4.6	1.5~2.2	4.8~5.5

2. Recommended Soldering Profile

- Pb Free Solder Paste:
Sn/Ag/Cu (96.5/3.0/0.5).
- Max time at max temp: 10sec.
- Allowed Reflow time: 2x Max.



8. Notes & Warnings

Storage

1. Storage temperature in original packaging: -10~+40°C.
2. Relative Humidity: $\leq 70\%RH$.
3. Keep away from corrosive atmosphere and sunlight.
4. Period of Storage: 12 Months.
5. Shall not be operated and stored under the following environmental condition:
 - (1) Corrosive or deoxidized atmospheres
(such as chlorine, sulfured hydrogen, ammonia, sulfuric acid, nitric oxide and so on)
 - (2) Volatile or inflammable atmospheres
 - (3) Dusty condition
 - (4) Excessive high or low pressure condition
 - (5) Humid site
 - (6) Places with brine, oil, chemical liquid or organic solvent
 - (7) Intense vibration
 - (8) Places with analogously deleterious

Usage

1. The ceramic body of the MLV series varistors is fragile, no excessive pressure or impact shall be exerted on it.
2. The MLV series varistors shall not be operated beyond the specified “Operating ambient temperature” range.