

# SMD Transient Voltage Suppressors

## ML/MH Series Part Number Identification

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### SMD Transient Voltage Suppressors

1206   ML   240   C

**Series Code**

Where: A = Operating voltage from  
8.0V<sub>RMS</sub> (11.0V<sub>DC</sub>) to 35.0V<sub>RMS</sub> (45.0V<sub>DC</sub>),  
High surge absorption, low clamping voltage.

C = Operating voltage from  
2.5V<sub>RMS</sub> (3.3V<sub>DC</sub>) to 95.0V<sub>RMS</sub> (127.0V<sub>DC</sub>),  
Wide range application.

**Varistor Voltage**

Where: 240 =  $24 \times 10^0 \text{ V} = 24 \text{ V}$   
241 =  $24 \times 10^1 \text{ V} = 240 \text{ V}$

**Application Code**

Where: ML = Multilayer SMD TVS

**Area of element**

<u>SIZE</u>	<u>LENGTH</u>	<u>WIDTH</u>
0402	1.0 ± 0.1mm	0.50 ± 0.10mm
0603	1.6 ± 0.15mm	0.80 ± 0.15mm
0805	2.0 ± 0.2mm	1.25 ± 0.15mm
1206	3.2 ± 0.2mm	1.60 ± 0.15mm
1210	3.2 ± 0.2mm	2.50 ± 0.20mm
1812	4.5 ± 0.2mm	3.20 ± 0.20mm
2220	5.7 ± 0.2mm	5.00 ± 0.20mm

# SMD Transient Voltage Suppressors

## *The Introduction of Multilayer Surface Varistor*

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**ML-Series** include two types of TVS, illustrate as below:

- ◎ **ML-A Series:** High energy and surge and specially specification, multilayer SMD formation Transient Voltage Suppressors (TVS).
- ◎ **ML-C Series:** Wide range applications, multilayer SMD formation Transient Voltage Suppressors (TVS).
- @ **CH series:** : High voltage suppressor, the working voltage could be up to 385Vdc

<b>Characteristics</b>	<b>ML Series</b>
Surge current ( 8/20 $\mu$ s ) up to	1200A
Energy absorption up to	12.0J
Average power dissipation up to	0.04W
Response time	<0.5ns
Storage temperature	(0402...0603) $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ (0805...2220) $-55^{\circ}\text{C} \sim +150^{\circ}\text{C}$
Operating temperature ( full load )	(0402...0603) $-55^{\circ}\text{C} \sim +85^{\circ}\text{C}$ (0805...2220) $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
Max. relative humidity (Without condensation)	<75% annual average, <95% on max. 30days per annu.

### GENERAL FEATURE:

- ◎ Chip size : from 0402 to 3220
- ◎ Working Voltage rating is from 2.5 to 300  $V_{\text{RMS}}$ ; 3.3 to 385 Vdc
- ◎ Leadless SMD formation surface mount design
- ◎ Surge current up to 1200A
- ◎ Bidirectional clamping, high energy rating up 12.0 Joules
- ◎ Low inductance, fast response
- ◎ Suitable for ESD Protection
- ◎ Excellent temperature coefficient
- ◎ Very low leakage current
- ◎ Good solderability
- ◎ Available in tape and reel for use with automatic pick & place equipment
- ◎ Compatible with most surface-mounting assembly equipment and mounting techniques

# SMD Transient Voltage Suppressors

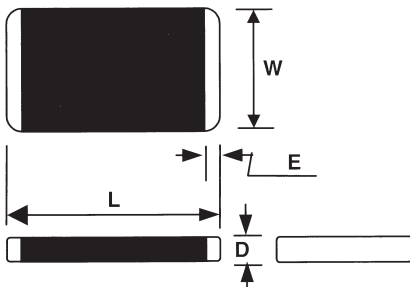
## High surge protection varistor A-series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20μs (A)		
1206ML150A	8.0	11.0	15(12.75~17.25)	200	1	25	0.4	1700
1206ML180A	11.0	14.0	18(15.3~20.7)	200	1	30	0.5	1500
1206ML220A	12.0	16.5	22(19.8~24.2)	200	1	36	0.5	1280
1206ML240A	14.0	18.0	24(21.6~27)	200	1	39	0.5	1160
1206ML270A	17.0	22.0	27(24.3~29.8)	200	1	44	0.6	1080
1206ML330A	20.0	26.0	33(29.7~36.3)	200	1	54	0.7	680
1206ML390A	25.0	30.0	39(35.1~42.9)	200	1	65	1.0	620
1206ML470A	30.0	38.0	47(42.3~51.7)	200	1	77	1.1	550
1206ML560A	35.0	45.0	56(50.4~61.6)	200	1	90	0.8	400
1210ML150A	8.0	11.0	15(12.75~17.25)	400	2.5	25	1.0	4050
1210ML180A	11.0	14.0	18(15.3~20.7)	400	2.5	30	1.2	3860
1210ML220A	12.0	16.5	22(19.8~24.2)	400	2.5	36	1.4	2600
1210ML240A	14.0	18.0	24(21.6~27)	400	2.5	39	1.4	2380
1210ML270A	17.0	22.0	27(24.3~29.8)	400	2.5	44	1.7	2100
1210ML330A	20.0	26.0	33(29.7~36.3)	400	2.5	54	1.9	1400
1210ML390A	25.0	30.0	39(35.1~42.9)	400	2.5	65	1.7	1180
1210ML470A	30.0	38.0	47(42.3~51.7)	400	2.5	77	2.0	1000
1210ML560A	35.0	45.0	56(50.4~61.6)	400	2.5	90	2.0	660
1812ML150A	8.0	11.0	15(12.75~17.25)	800	5	25	1.8	8450
1812ML180A	11.0	14.0	18(15.3~20.7)	800	5	30	1.9	7030
1812ML220A	12.0	16.5	22(19.8~24.2)	800	5	36	2.3	5080
1812ML240A	14.0	18.0	24(21.6~27)	800	5	38	2.3	4650
1812ML270A	17.0	22.0	27(24.3~29.8)	800	5	44	2.7	4150
1812ML330A	20.0	26.0	33(29.7~36.3)	800	5	54	3.0	3400
1812ML390A	25.0	30.0	39(35.1~42.9)	800	5	65	3.7	2950
1812ML470A	30.0	38.0	47(42.3~51.7)	800	5	77	4.2	2550
1812ML560A	35.0	45.0	56(50.4~61.6)	800	5	90	4.2	2400

# SMD Transient Voltage Suppressors

## High surge protection varistor A-series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20μs (A)		
2220ML150A	8	11	15(12.75~17.25)	1200	10	25	4.2	21200
2220ML180A	11	14	18(15.3~20.7)	1200	10	30	5.4	17700
2220ML220A	12	16.5	22(19.8~24.2)	1200	10	36	5.8	14500
2220ML240A	14	18	24(21.6~27)	1200	10	39	5.8	13600
2220ML270A	17	22	27(24.3~29.8)	1200	10	44	7.2	12000
2220ML330A	20	26	33(29.7~36.3)	1200	10	54	7.8	10500
2220ML390A	25	30	39(35.1~42.9)	1200	10	65	9.6	8900
2220ML470A	30	38	47(42.3~51.7)	1200	10	77	12.0	5700
2220ML560A	35	45	56(50.4~61.6)	1200	10	90	7.7	4800



Type	L mm	W Mm	D mm	E mm
1206 ML	3.2 ± 0.20	1.6 ± 0.15	1.5 max.	0.5 +0.2/-0.2
1210 ML	3.2 ± 0.20	2.5 ± 0.20	1.5 max.	0.5 +0.2/-0.2
1812 ML	4.5 ± 0.20	3.2 ± 0.20	2.0 max.	0.5 +0.3/-0.1
2220 ML	5.7 ± 0.20	5.0 ± 0.20	2.5 max.	0.5 +0.3/-0.1

### NOTES :

1. Tolerance of breakdown Voltage : 15~18V = ± 15%, 22~56V = ± 10%
2. Capacitance value just for reference
3. Typical leakage at 25°C < 50 μA, maximum leakage 200 μA.
4. If there is any change without notice, it depends on approval sheet.

※can be designed during manufacturing according to the request, please contact our sales department if needed.

# SMD Transient Voltage Suppressors

## Surface Mount Multi layer 0402, 0603 C Series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20μs (A)		
0402ML050C	2.5	3.3	5(4.0~6.0)	20	1	10	0.05	390
0402ML080C	4	5.5	8(6.4~9.6)	20	1	16	0.05	295
0402ML120C	6	9	12(9.6~14.4)	20	1	20	0.05	190
0402ML150C	8	11	15(12.75~17.25)	20	1	25	0.05	160
0402ML180C	11	14	18(15.3~20.7)	20	1	30	0.05	135
0402ML220C	12	16.5	22(19.8~24.2)	20	1	36	0.05	105
0402ML240C	14	18	24(21.6~27)	20	1	40	0.05	93
0402ML270C	17	22	27(24.3~29.8)	20	1	45	0.05	75
0402ML330C	20	26	33(29.7~36.3)	20	1	54	0.05	54
0402ML390C	25	30	39(35.1~42.9)	20	1	65	0.05	45
0402ML470C	30	38	47(42.3~51.7)	20	1	77	0.05	27

0603ML050C	2.5	3.3	5(4.0~6.0)	30	1	10	0.1	1250
0603ML080C	4	5.5	8(6.4~9.6)	30	1	16	0.1	800
0603ML120C	6	9	12(9.6~14.4)	30	1	20	0.1	680
0603ML150C	8	11	15(12.75~17.25)	30	1	25	0.1	460
0603ML180C	11	14	18(15.3~20.7)	30	1	30	0.1	350
0603ML220C	12	16.5	22(19.8~24.2)	30	1	36	0.1	300
0603ML240C	14	18	24(21.6~27)	30	1	39	0.1	270
0603ML270C	17	22	27(24.3~29.8)	30	1	44	0.1	235
0603ML330C	20	26	33(29.7~36.3)	30	1	54	0.1	200
0603ML390C	25	30	39(35.1~42.9)	30	1	65	0.1	120
0603ML470C	30	38	47(42.3~51.7)	30	1	77	0.1	100
0603ML560C	35	45	56(50.4~61.6)	30	1	90	0.1	80

# SMD Transient Voltage Suppressors

## Surface Mount Multi layer 0805, 1206 C Series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
	AC (V <sub>RMS</sub> )	DC (V)			(A)	(V)		
0805ML050C	2.5	3.3	5(4.0~6.0)	40	1	10	0.1	2450
0805ML080C	4	5.5	8(6.4~9.6)	80	1	16	0.1	1600
0805ML120C	6	9	12(9.6~14.4)	80	1	20	0.1	1180
0805ML150C	8	11	15(12.75~17.25)	100	1	25	0.1	1050
0805ML180C	11	14	18(15.3~20.7)	100	1	30	0.1	750
0805ML220C	12	16.5	22(19.8~24.2)	100	1	36	0.2	680
0805ML240C	14	18	24(21.6~27)	100	1	39	0.2	550
0805ML270C	17	22	27(24.3~29.8)	100	1	44	0.2	400
0805ML330C	20	26	33(29.7~36.3)	100	1	54	0.3	350
0805ML390C	25	30	39(35.1~42.9)	100	1	65	0.3	310
0805ML470C	30	38	47(42.3~51.7)	100	1	77	0.3	280
0805ML560C	35	45	56(50.4~61.6)	80	1	90	0.3	195
0805ML680C	40	56	68(61.2~74.8)	80	1	110	0.3	145
0805ML820C	50	65	82(73.8~90.2)	60	1	135	0.3	85

1206ML050C	2.5	3.3	5(4.0~6.0)	60	1	10	0.1	3850
1206ML080C	4	5.5	8(6.4~9.6)	100	1	16	0.2	3200
1206ML120C	6	9	12(9.6~14.4)	100	1	20	0.2	2200
1206ML150C	8	11	15(12.75~17.25)	100	1	25	0.2	1300
1206ML180C	11	14	18(15.3~20.7)	100	1	30	0.3	1150
1206ML220C	12	16.5	22(19.8~24.2)	100	1	36	0.3	1000
1206ML240C	14	18	24(21.6~27)	100	1	38	0.3	900
1206ML270C	17	22	27(24.3~29.8)	100	1	44	0.4	840
1206ML330C	20	26	33(29.7~36.3)	100	1	54	0.5	490
1206ML390C	25	30	39(35.1~42.9)	100	1	65	0.6	440
1206ML470C	30	38	47(42.3~51.7)	100	1	77	0.7	400
1206ML560C	35	45	56(50.4~61.6)	100	1	90	0.8	310
1206ML680C	40	56	68(61.2~74.8)	100	1	110	1.0	280
1206ML820C	50	65	82(73.8~90.2)	100	1	135	0.5	240
1206ML101C	60	85	100(90~110)	100	1	165	0.6	160
1206ML111C	70	90	110(99~121)	100	1	180	0.6	120

# SMD Transient Voltage Suppressors

## Surface Mount Multi layer 1210, 1812 C Series

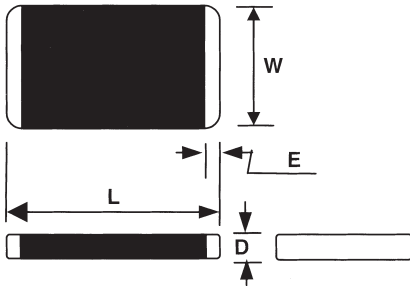
Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance ※
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20μs (A)		
1210ML080C	4	5.5	8(6.4~9.6)	250	2.5	16	0.4	6200
1210ML120C	6	9	12(9.6~14.4)	250	2.5	20	0.5	4400
1210ML150C	8	11	15(12.75~17.25)	250	2.5	25	0.6	3520
1210ML180C	11	14	18(15.3~20.7)	250	2.5	30	0.7	3260
1210ML220C	12	16.5	22(19.8~24.2)	250	2.5	36	0.8	2100
1210ML240C	14	18	24(21.6~27)	250	2.5	38	0.8	1950
1210ML270C	17	22	27(24.3~29.8)	250	2.5	44	1.0	1720
1210ML330C	20	26	33(29.7~36.3)	250	2.5	54	1.2	1090
1210ML390C	25	30	39(35.1~42.9)	250	2.5	65	1.4	920
1210ML470C	30	38	47(42.3~51.7)	250	2.5	77	1.6	780
1210ML560C	35	45	56(50.4~61.6)	250	2.5	90	2.0	470
1210ML680C	40	56	68(61.2~74.8)	250	2.5	110	2.3	390
1210ML820C	50	65	82(73.8~90.2)	250	2.5	135	1.2	320
1210ML101C	60	85	100(90~110)	200	2.5	165	1.4	220
1210ML111C	70	90	110(99~121)	200	2.5	180	1.4	200

1812ML120C	6	9	12(9.6~14.4)	500	5	20	0.9	9150
1812ML150C	8	11	15(12.75~17.25)	500	5	25	1.2	7320
1812ML180C	11	14	18(15.3~20.7)	500	5	30	1.4	6100
1812ML220C	12	16.5	22(19.8~24.2)	500	5	36	1.6	4300
1812ML240C	14	18	24(21.6~27)	500	5	38	1.7	3930
1812ML270C	17	22	27(24.3~29.8)	500	5	44	2.0	3500
1812ML330C	20	26	33(29.7~36.3)	500	5	54	2.5	2900
1812ML390C	25	30	39(35.1~42.9)	500	5	65	2.9	2500
1812ML470C	30	38	47(42.3~51.7)	500	5	77	3.5	2200
1812ML560C	35	45	56(50.4~61.6)	500	5	90	4.2	1950
1812ML680C	40	56	68(61.2~74.8)	500	5	110	4.8	1650
1812ML820C	50	65	82(73.8~90.2)	400	5	135	4.5	1060
1812ML101C	60	85	100(90~110)	400	5	165	5.8	870
1812ML111C	70	90	110(99~121)	400	5	180	5.8	790
1812ML151C	95	127	150(135~165)	300	5	248	5.8	420

# SMD Transient Voltage Suppressors

## Surface Mount Multi Layer 2220 C Series

Model Number	Working Voltage (MAX)		Breakdown Voltage	Peak Current (MAX)	Clamping Voltage (MAX)		Energy Absorption (MAX)	Typical Capacitance
	AC (V <sub>RMS</sub> )	DC (V)			1mA (V)	8/20μs (A)		
2220ML120C	6	9	12(9.6~14.4)	1000	10	20	1.9	36500
2220ML150C	8	11	15(12.75~17.25)	1000	10	25	2.3	18400
2220ML180C	11	14	18(15.3~20.7)	1000	10	30	2.7	15300
2220ML220C	12	16.5	22(19.8~24.2)	1000	10	36	2.9	12500
2220ML240C	14	18	24(21.6~27)	1000	10	38	3.1	11800
2220ML270C	17	22	27(24.3~29.8)	1000	10	44	3.8	10400
2220ML330C	20	26	33(29.7~36.3)	1000	10	54	4.3	8900
2220ML390C	25	30	39(35.1~42.9)	1000	10	65	5.5	7500
2220ML470C	30	38	47(42.3~51.7)	1000	10	77	6.3	4600
2220ML560C	35	45	56(50.4~61.6)	1000	10	90	7.7	4000
2220ML680C	40	56	68(61.2~74.8)	1000	10	110	8.8	3500
2220ML820C	50	65	82(73.8~90.2)	800	10	135	5.6	2850
2220ML101C	60	85	100(90~110)	800	10	165	6.8	1800
2220ML111C	70	90	110(99~121)	800	10	180	6.8	1500



Type	L mm	W mm	D mm	E mm
0402	1.0 ± 0.10	0.5 ± 0.10	0.6 max	0.25+0.1/-0.1
0603	1.6 ± 0.15	0.8 ± 0.10	0.9 max	0.3+0.1/-0.1
0805	2.0 ± 0.20	1.25 ± 0.15	1.2 max	0.3+0.1/-0.1
1206	3.2 ± 0.20	1.6 ± 0.15	1.5 max.	0.5 +0.2/-0.2
1210	3.2 ± 0.20	2.5 ± 0.20	1.5 max.	0.5 +0.2/-0.2
1812	4.5 ± 0.20	3.2 ± 0.20	2.0 max.	0.5 +0.3/-0.1
2220	5.7 ± 0.20	5.0 ± 0.20	2.5 max.	0.5 +0.3/-0.1

### NOTES :

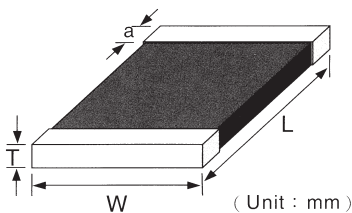
1. Tolerance of breakdown Voltage : 5~8V = ± 20 % , 12~15V = ± 15 % , 18~110V = ± 10 %
2. Capacitance value just for reference
3. Typical leakage at 25°C < 50 μA, maximum leakage 200 μA.
4. If there is any change without notice , it depends on approval sheet.

※ can be designed during manufacturing according to the request, please contact our sales department if needed.

# SMD Transient Voltage Suppressors

## The Introductions of CH-Series

MODEL NUMBER	MAXIMUM RATING(TA=125°C)				CHARACTERISTICS(TA=25°C)				
Model Number	MAX. WORKING VOLTAGE		SURGE CURRENT	ENERGY ABSORPTION (10/100μs)	MAX. CLAMPING VOLTAGE		VATISTOR VOLTAGE	TYPICAL CAPACITANCE	Thickness T± 1
Unit Condition	AC(V <sub>RIVS</sub> )	DC(V)	8/20 μs(A)	(J)	(A)	(V)	(V)	PF(MHz)	(mm)
08CH180K	11	14	250	0.8	5	40	18(16~20)	3300	1.5
08CH220K	14	18	250	1.0	5	46	22(20~24)	1750	1.5
08CH270K	17	22	250	1.0	5	56	27(24~30)	1500	1.5
08CH330K	20	26	250	1.2	5	67	33(30~36)	1200	1.5
08CH390K	25	31	250	1.5	5	76	39(35~43)	820	1.5
08CH470K	30	38	250	1.8	5	90	47(42~52)	660	1.5
08CH560K	35	45	250	2.3	5	106	56(50~62)	530	2.0
08CH680K	40	56	250	3.0	5	124	68(62~74)	360	2.0
08CH820K	50	65	500	4.0	10	135	82(74~90)	250	1.5
08CH101K	65	85	500	5.0	10	165	100(90~110)	225	1.5
08CH121K	75	102	500	6.0	10	198	120(108~132)	200	1.5
08CH151K	95	127	500	8.0	10	248	150(135~165)	150	1.5
08CH181K	115	153	500	10.0	10	292	180(162~198)	110	1.5
08CH201K	130	175	500	11.0	10	340	200(180~220)	100	1.5
08CH221K	140	180	500	12.0	10	356	220(198~242)	94	1.5
08CH241K	150	200	500	13.0	10	390	240(216~264)	86	1.5
08CH271K	175	225	500	14.0	10	450	270(243~297)	76	1.5
08CH301K	190	250	500	15.0	10	495	300(270~330)	64	1.5
08CH331K	210	275	500	16.0	10	545	330(297~363)	52	1.5
08CH361K	230	300	500	20.0	10	593	360(324~396)	45	2.0
08CH391K	250	330	500	21.0	10	647	390(351~429)	42	2.0
08CH431K	275	369	500	23.0	10	705	430(387~473)	39	2.5
08CH471K	300	385	500	25.0	10	775	470(423~517)	35	2.5



Type	Length L	Width W	Electrode A
08CH (mm)	8.0± 0.30	5.0± 0.30	0.8+0.5/-0.1
3220 (inches)	0.315± 0.118	0.196 ± 0.118	0.0315+0.196/-0.039

# SMD Transient Voltage Suppressors

## SMD Transient Voltage Suppressors ESD Series

### Part Number Identification

**0402 - 050    E    220    N    P**

**Size :** Unit mm

Model	0402 Series	0603 Series
Length(L)	1.0 ±0.15	1.60 ±0.15
Width(W)	0.50 ±0.15	0.80 ±0.15
Thickness(T)	0.6 Max	0.9 Max
Termination(a)	0.25 ±0.1	0.3 ±0.1

**MAX Working Voltage :**

Mark	Voltage
050	5V
120	12V
240	24V

**Package :**

Mark	Type
P	Taping
C	normal

**Cap. Tolerance :**

Mark	Range
N	+/-30%
P	+80%-20%

Exception under 5PF

**Cap. Value :**  
 Where 220=22× 10<sup>0</sup>= 22(PF)  
 Where 2R5=2.5× 10<sup>0</sup>= 2.5(PF)

**Series :**  
ESD Protect Solution

(Unit : mm)

### ESD Series

Mark	101	820	560	330	220	100	050	2R5
<b>Capacitance</b>	100PF	82PF	56PF	33PF	22PF	10PF	4~8PF	2~4PF
<b>Working Voltage (Max)</b>	5V	⊙	⊙	⊙	⊙	⊙	⊙	-
	12V	⊙	⊙	⊙	⊙	⊙	⊙	-
	24V	-	-	-	-	⊙	⊙	⊙

If it get any change , without notice

### Recommend Application

Item	Device Description	Data Rate & Frequency	Rise time	General Location	Capacitance
1	USB 2.0 Data Port	480 M bps	0.5~0.6 nS	I/O port, Data, Signal	<4PF
2	USB1.1 Data Port	12 M bps	4~20 nS	I/O port, Data, Signal	5~56PF
3	Keyboard or Wireless device	1.5 M bps	75~300 nS	I/O port, Data, Signal	5~56PF
4	RS232 、IrDA1.0	115.2 K Hz	1uS~8 uS	I/O port, Data, Signal	10~100PF
5	Audio (Microphone/Speaker)	20~20K Hz	0.05mS~50 mS	I/O port, Data, Signal	10~100PF

# SMD Transient Voltage Suppressors

## *DISC Varistor series*

Model Number	Element Size (mm)					Working Voltage (MAX)		Breakdown Voltage
	05D	07D	10D	14D	20D	AC	DC	1mA(V)
180K	◎	◎	◎	◎	◎	11	14	18 (16~20)
220K	◎	◎	◎	◎	◎	14	18	22 (20~24)
270K	◎	◎	◎	◎	◎	17	22	27 (24~30)
330K	◎	◎	◎	◎	◎	20	26	33 (30~36)
390K	◎	◎	◎	◎	◎	25	31	39 (35~43)
470K	◎	◎	◎	◎	◎	30	38	47 (42~52)
560K	◎	◎	◎	◎	◎	35	45	56 (50~62)
680K	◎	◎	◎	◎	◎	40	56	68 (61~75)
820K	◎	◎	◎	◎	◎	50	65	82 (74~90)
101K	◎	◎	◎	◎	◎	60	85	100 (90~110)
121K	◎	◎	◎	◎	◎	75	100	120 (108~132)
151K	◎	◎	◎	◎	◎	95	125	150 (135~165)
181K	◎	◎	◎	◎	◎	115	150	180 (162~198)
201K	◎	◎	◎	◎	◎	130	170	200 (185~225)
221K	◎	◎	◎	◎	◎	140	180	220 (198~242)
241K	◎	◎	◎	◎	◎	150	200	240 (216~264)
271K	◎	◎	◎	◎	◎	175	225	270 (247~303)
301K	◎	◎	◎	◎	◎	195	250	300 (270~330)
331K	◎	◎	◎	◎	◎	210	270	330 (297~363)
361K	◎	◎	◎	◎	◎	230	300	360 (324~396)
391K	◎	◎	◎	◎	◎	250	320	390 (351~429)
431K	◎	◎	◎	◎	◎	275	350	430 (387~473)
471K	◎	◎	◎	◎	◎	300	385	470 (423~517)
511K	◎	◎	◎	◎	◎	320	418	510 (459~561)
561K	◎	◎	◎	◎	◎	350	460	560 (504~616)
621K		◎	◎	◎	◎	385	505	620 (558~682)
681K		◎	◎	◎	◎	420	560	680 (612~748)
751K			◎	◎	◎	460	615	750 (685~825)
781K			◎	◎	◎	485	640	780 (702~858)
821K			◎	◎	◎	510	670	820 (738~902)
911K			◎	◎	◎	550	745	910 (819~1001)
102K			◎	◎	◎	625	825	1000 (900~1100)
112K			◎	◎	◎	680	895	1100 (990~1210)
182K				◎	◎	1000	1465	1800 (1620~1980)

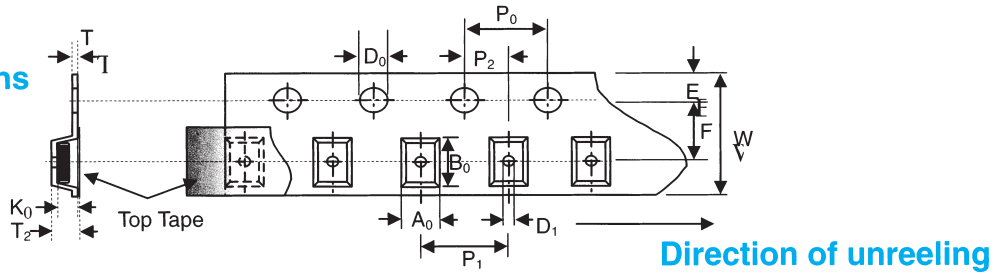
NOTES : 180 K =  $18 \times 10^0$  V = 18V, 181 K =  $18 \times 10^1$  V = 180V, 182 K =  $18 \times 10^2$  V = 1800V

K : Tolerance 10%

# SMD Transient Voltage Suppressors

## Packaging

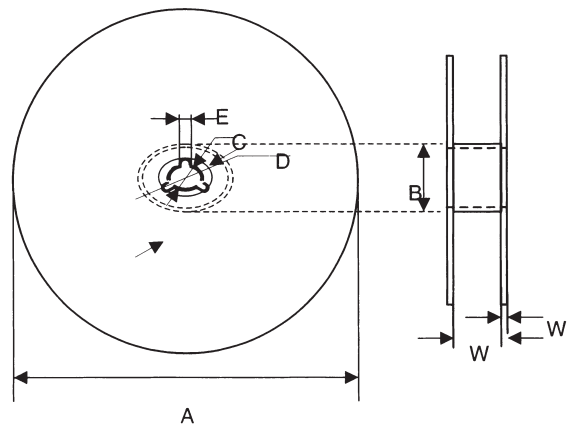
### Tape Dimensions



Symbol	$A_0$ $\pm 0.10$	$B_0$ $\pm 0.10$	$K_0$ $\pm 0.10$	$T$ $\pm 0.05$	$T_2$ $\pm 0.05$	$D_0$ $+0.10$ $-0.00$	$D_1$ $\pm 0.05$	$P_1$ $\pm 0.10$	$P_2$ $\pm 0.05$	$P_0$ $\pm 0.05$	$W$ $\pm 0.20$	$E$ $\pm 0.10$	$F$ $\pm 0.05$
<b>0402</b>	1.08	1.88	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
<b>0603</b>	1.08	1.88	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
<b>0805</b>	1.42	2.30	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
<b>1206</b>	1.88	3.50	1.27	0.2	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
<b>1210</b>	2.18	3.46	1.45	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
<b>1812</b>	3.66	4.95	1.74	0.25	0.10	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50
<b>2220</b>	5.10	5.97	2.80	0.25	0.10	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50

Unit: mm

### Reel Dimensions



Symbol	A	B	C	D	E	W	$W_1$
<b>0402</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.0 $\pm$ 0.2	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	9.0 $\pm$ 0.50	1.5 $\pm$ 0.15
<b>0603</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.0 $\pm$ 0.2	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	9.0 $\pm$ 0.50	1.5 $\pm$ 0.15
<b>0805</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.0 $\pm$ 0.2	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	9.0 $\pm$ 0.50	1.5 $\pm$ 0.15
<b>1206</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.0 $\pm$ 0.2	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	9.0 $\pm$ 0.50	1.5 $\pm$ 0.15
<b>1210</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.0 $\pm$ 0.2	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	9.0 $\pm$ 0.50	1.5 $\pm$ 0.15
<b>1812</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.5 $\pm$ 0.1	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	13.6 $\pm$ 0.2	1.5 $\pm$ 0.15
<b>2220</b>	178.0 $\pm$ 1.0	60.0 $\pm$ 0.5	13.5 $\pm$ 0.1	21.0 $\pm$ 0.2	2.0 $\pm$ 0.5	13.6 $\pm$ 0.2	1.5 $\pm$ 0.15

Pieces packaged per reel Unit mm

Type	0402	0603	0805	1206	1210	1812	2220
<b>Pcs/reel</b>	10000	4000	3000	3000	2000	1000	1000
<b>Pcs/kg</b>	850000	168000	66000	31500	18500	7600	4200