

Metal Oxide Varistor : TVM-B Series



SMD Type for Surge Suppressor

■ Features

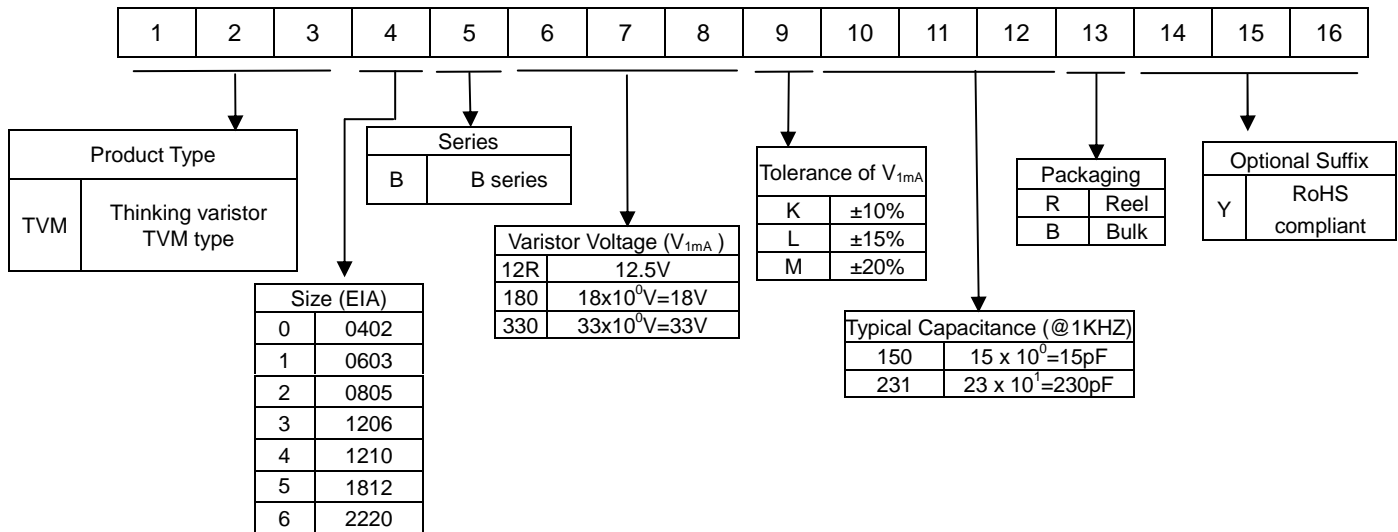
1. RoHS compliant
2. High surge suppress capability
3. EIA size 0402 ~ 2220
4. Operating voltage: 5.5 ~ 85 Vdc
5. Bidirectional and symmetrical V/I characteristics
6. Multilayer ceramic construction technology
7. Variable capacitance
8. -40 ~ +125°C operating temperature range



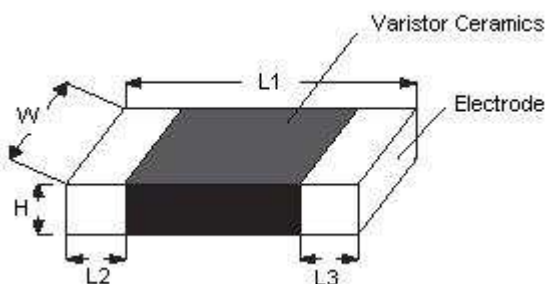
■ Recommended Applications

1. Power system
2. Mother board / notebook
3. Scanner
4. Handheld devices
5. Digital video
6. Set-top box

■ Part Number Code



■ Structure and Dimensions



(Unit:mm)

Part No.	Size (EIA)	L1	W	H max.	L2 and L3
TVM0	0402	1.00±0.15	0.50±0.10	0.60	0.20±0.10
TVM1	0603	1.60±0.15	0.80±0.15	0.95	0.35±0.15
TVM2	0805	2.00±0.20	1.25±0.20	1.20	0.40±0.20
TVM3	1206	3.20 ±0.30	1.60±0.20	1.50	0.50±0.20
TVM4	1210	3.20 ±0.30	2.50±0.25	1.50	0.50±0.20
TVM5	1812	4.50 ±0.40	3.20±0.30	1.50	0.60±0.30
TVM6	2220	5.70 ±0.40	5.00±0.30	2.00	0.60±0.30

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■ Electrical Characteristics

Part No.	Varistor Voltage (@ 1mA DC)		Max. Operating Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Max. Energy (10/1000μs)	Rate Power	Typical Capacitance @1KHz
	V _{1mA} (V)	ΔV _{1mA} (±%)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (pF)
TVM0B080M231	8	20	4	5.5	19	1	10	0.05	0.003	230
TVM1B080M951	8	20	4	5.5	19	1	30	0.1	0.003	950
TVM2B080M152	8	20	4	5.5	19	1	60	0.1	0.005	1500
TVM3B080M482	8	20	4	5.5	17	1	150	0.3	0.008	4800
TVM4B080M822	8	20	4	5.5	17	2.5	250	0.4	0.01	8200
TVM5B080M183	8	20	4	5.5	17	5	500	0.8	0.015	18000
TVM6B080M293	8	20	4	5.5	17	10	1000	1.4	0.02	29000
TVM0B110M161	11	20	6	8	27	1	10	0.05	0.003	160
TVM1B110M601	11	20	6	8	27	1	30	0.1	0.003	600
TVM2B110M142	11	20	6	8	27	1	60	0.2	0.005	1400
TVM3B110M392	11	20	6	8	25	1	200	0.4	0.008	3900
TVM4B110M752	11	20	6	8	25	2.5	300	0.7	0.01	7500
TVM5B110M153	11	20	6	8	25	5	500	1	0.015	15000
TVM6B110M253	11	20	6	8	25	10	1200	3.6	0.02	25000
TVM0B12RM141	12.5	20	7	9	30	1	10	0.05	0.003	140
TVM1B12RM571	12.5	20	7	9	30	1	30	0.1	0.003	570
TVM2B12RM112	12.5	20	7	9	29	1	60	0.2	0.005	1100
TVM0B150L121	15	15	8	11	33	1	10	0.05	0.003	120
TVM1B150L521	15	15	8	11	33	1	30	0.1	0.003	520
TVM2B150L951	15	15	8	11	33	1	60	0.2	0.005	950
TVM3B150L252	15	15	8	11	30	1	200	0.5	0.008	2500
TVM4B150L482	15	15	8	11	30	2.5	400	1	0.01	4800
TVM5B150L103	15	15	8	11	30	5	800	1.8	0.015	10000
TVM6B150L183	15	15	8	11	30	10	1200	4.2	0.02	18000
TVM0B180K800	18	10	11	14	35	1	10	0.05	0.003	80
TVM1B180K421	18	10	11	14	35	1	30	0.2	0.003	420
TVM2B180K671	18	10	11	14	35	1	60	0.2	0.005	670
TVM3B180K152	18	10	11	14	33	1	200	0.5	0.008	1500
TVM4B180K292	18	10	11	14	33	2.5	400	1.2	0.01	2900
TVM5B180K552	18	10	11	14	33	5	800	1.9	0.015	5500
TVM6B180K123	18	10	11	14	33	10	1200	5.4	0.02	12000
TVM0B220K600	22	10	14	18	44	1	10	0.05	0.003	60
TVM1B220K301	22	10	14	18	40	1	30	0.2	0.003	300
TVM2B220K431	22	10	14	18	40	1	60	0.3	0.005	430
TVM3B220K122	22	10	14	18	42	1	200	0.5	0.008	1200
TVM4B220K242	22	10	14	18	38	2.5	400	1.5	0.01	2400
TVM5B220K502	22	10	14	18	38	5	800	2.3	0.015	5000
TVM6B220K103	22	10	14	18	38	10	1200	5.8	0.02	10000

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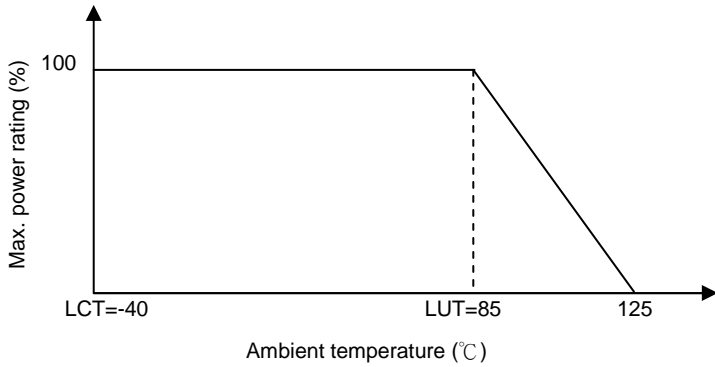
Part No.	Varistor Voltage (@ 1mA DC)		Max. Operating Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Rate Power	Typical Capacitance @1KHz
	V _{1mA} (V)	Δ V _{1mA} (\pm %)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (pF)
TVM0B270K500	27	10	17	22	55	1	10	0.05	0.003	50
TVM1B270K181	27	10	17	22	46	1	30	0.2	0.003	180
TVM2B270K331	27	10	17	22	46	1	60	0.3	0.005	330
TVM3B270K102	27	10	17	22	48	1	200	0.6	0.008	1000
TVM4B270K202	27	10	17	22	44	2.5	400	1.7	0.01	2000
TVM5B270K402	27	10	17	22	44	5	800	2.7	0.015	4000
TVM6B270K772	27	10	17	22	44	10	1200	7.2	0.02	7700
TVM0B330K400	33	10	20	26	63	1	10	0.05	0.003	40
TVM1B330K151	33	10	20	26	56	1	30	0.3	0.003	150
TVM2B330K301	33	10	20	26	56	1	60	0.3	0.005	300
TVM3B330K801	33	10	20	26	54	1	200	0.7	0.008	800
TVM4B330K132	33	10	20	26	54	2.5	400	1.9	0.01	1300
TVM5B330K322	33	10	20	26	54	5	800	3	0.015	3200
TVM6B330K582	33	10	20	26	54	10	1200	7.8	0.02	5800
TVM1B390K101	39	10	25	31	67	1	30	0.3	0.003	100
TVM2B390K181	39	10	25	31	67	1	60	0.3	0.005	180
TVM3B390K651	39	10	25	31	65	1	200	1	0.008	650
TVM4B390K102	39	10	25	31	65	2.5	300	1.7	0.01	1000
TVM5B390K252	39	10	25	31	65	5	800	3.7	0.015	2500
TVM6B390K412	39	10	25	31	65	10	1200	9.6	0.02	4100
TVM2B470K151	47	10	30	38	77	1	60	0.3	0.005	150
TVM3B470K381	47	10	30	38	77	1	200	1.1	0.008	380
TVM4B470K901	47	10	30	38	77	2.5	300	2	0.01	900
TVM5B470K202	47	10	30	38	77	5	800	4.2	0.015	2000
TVM6B470K302	47	10	30	38	77	10	1200	12	0.02	3000
TVM3B560K301	56	10	35	45	90	1	100	0.4	0.008	300
TVM4B560K601	56	10	35	45	90	2.5	250	2	0.01	600
TVM5B560K122	56	10	35	45	90	5	500	4	0.015	1200
TVM6B560K202	56	10	35	45	90	10	1000	7.7	0.02	2000
TVM3B680K251	68	10	40	56	110	1	100	0.5	0.008	250
TVM4B680K451	68	10	40	56	110	2.5	250	2.3	0.01	450
TVM5B680K102	68	10	40	56	110	5	500	4.8	0.015	1000
TVM6B680K152	68	10	40	56	110	10	1000	9	0.02	1500
TVM3B820K181	82	10	50	65	135	1	100	0.6	0.008	180
TVM4B820K301	82	10	50	65	135	2.5	200	1.6	0.01	300
TVM5B820K601	82	10	50	65	135	5	400	4.5	0.015	600
TVM6B820K102	82	10	50	65	135	10	800	5.6	0.02	1000
TVM3B101K151	100	10	60	85	146	1	100	0.7	0.008	150
TVM4B101K161	100	10	60	85	165	2.5	200	2	0.01	160
TVM5B101K301	100	10	60	85	165	5	400	5.8	0.015	300
TVM6B101K601	100	10	60	85	165	10	800	6.8	0.02	600

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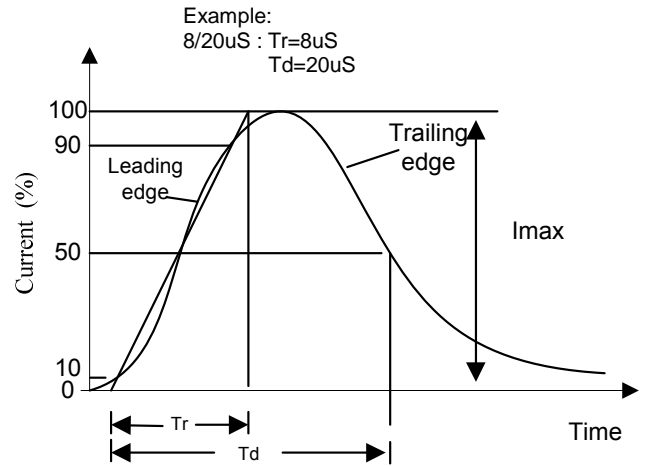


SMD Type for Surge Suppressor

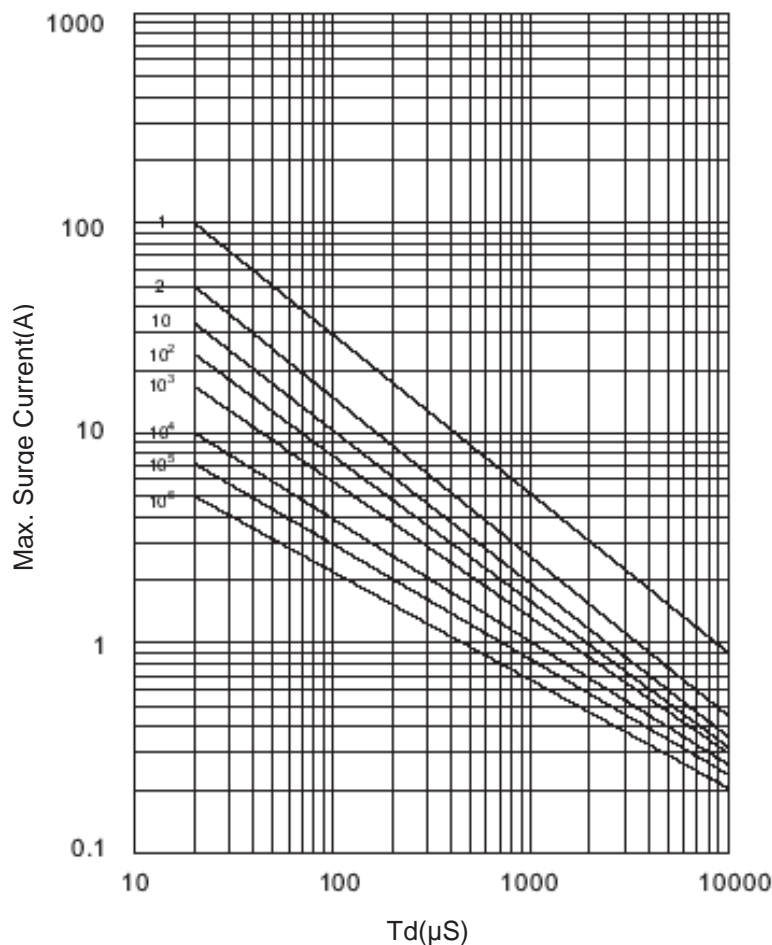
■ Power Derating Curve



■ Surge Current Standard Waveform



■ Max. Surge Current Derating Curves (Reference)



Note: The standard max. surge current derating curves are available upon request

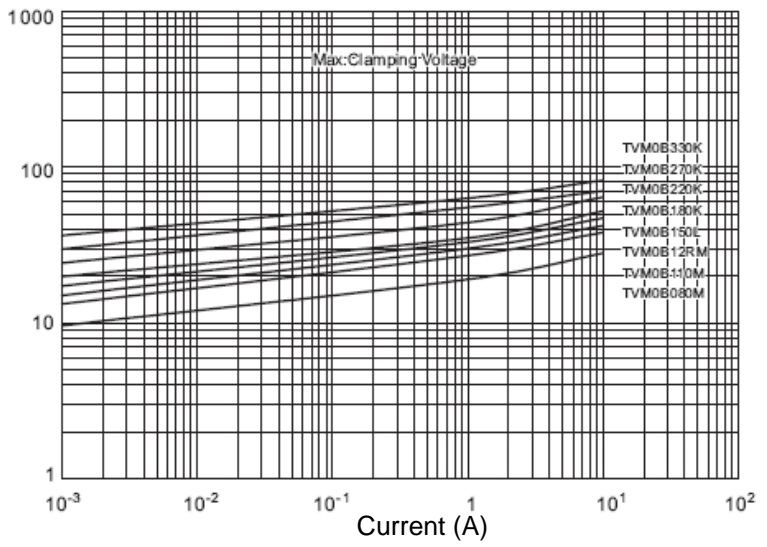
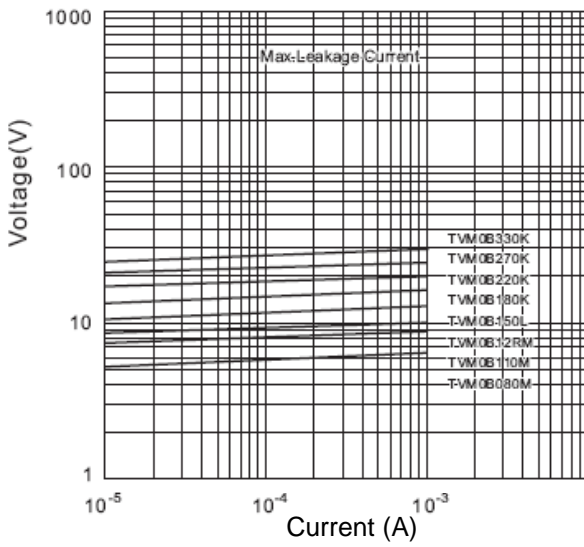
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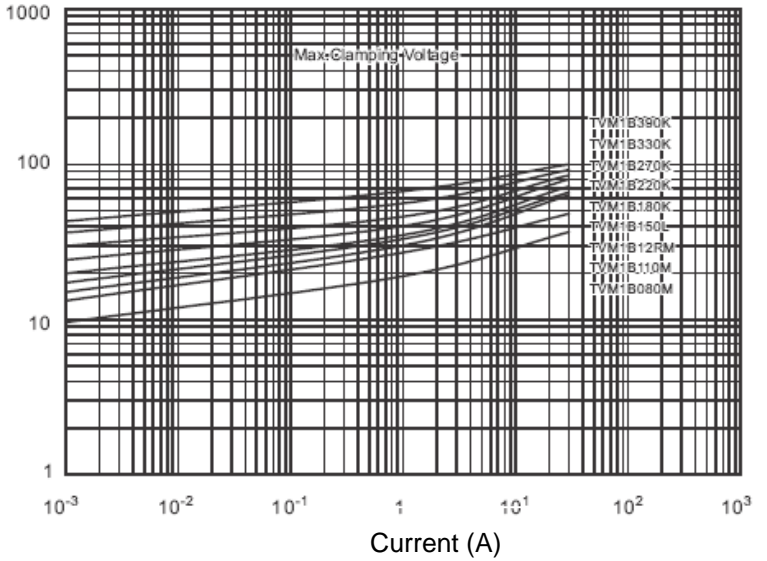
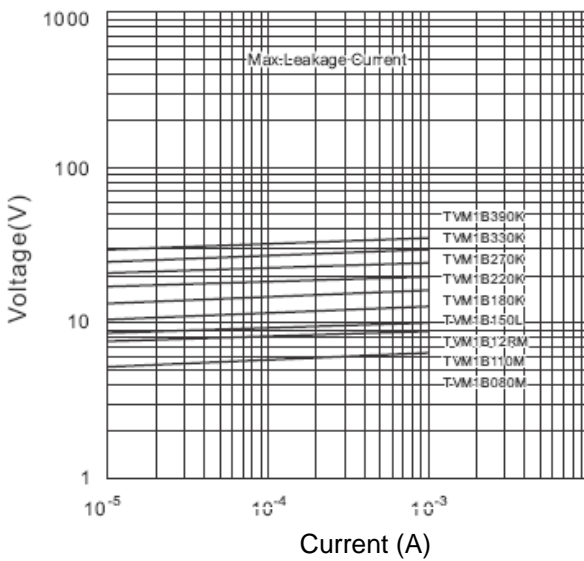


Max. Leakage Current and Max. Clamping Voltage Curves

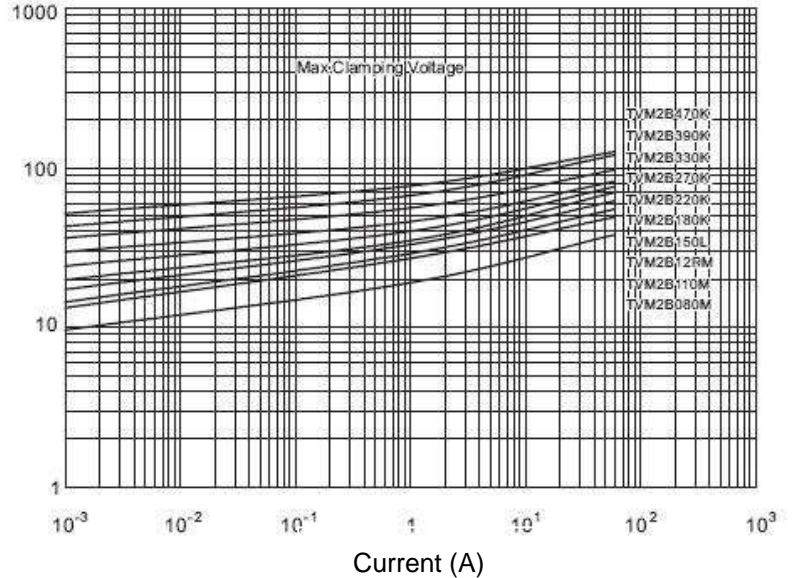
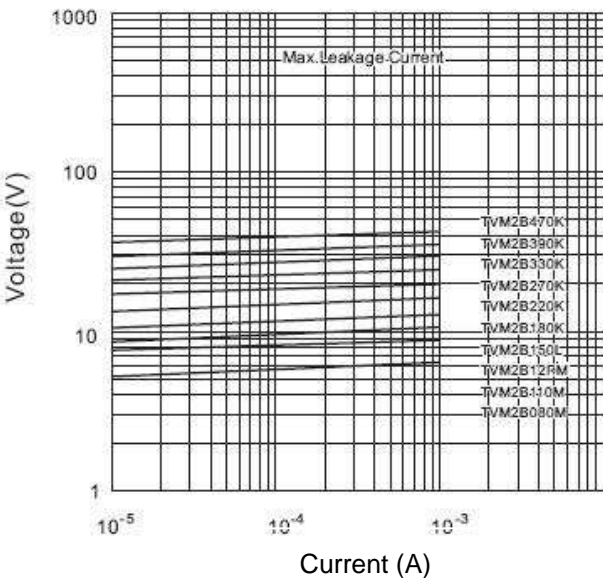
TVM0B080M~TVM0B330K



TVM1B080M~TVM1B390K



TVM2B080M~TVM2B470K

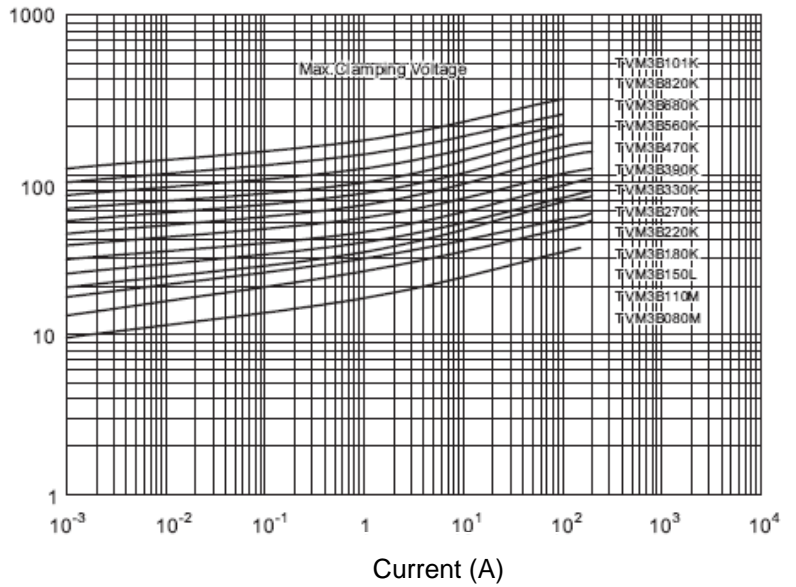
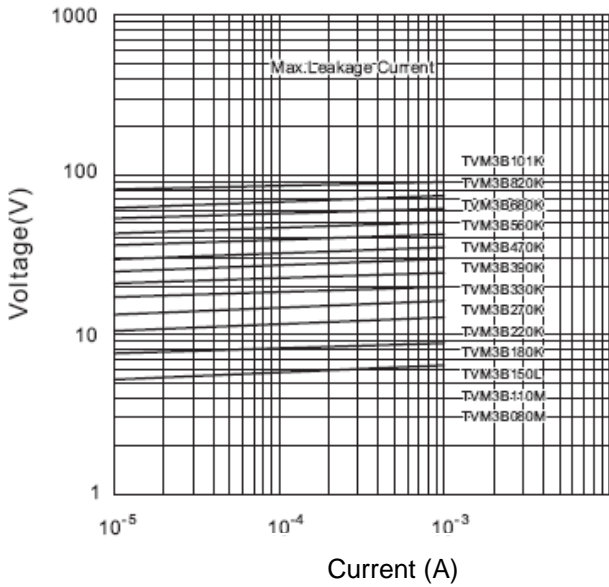


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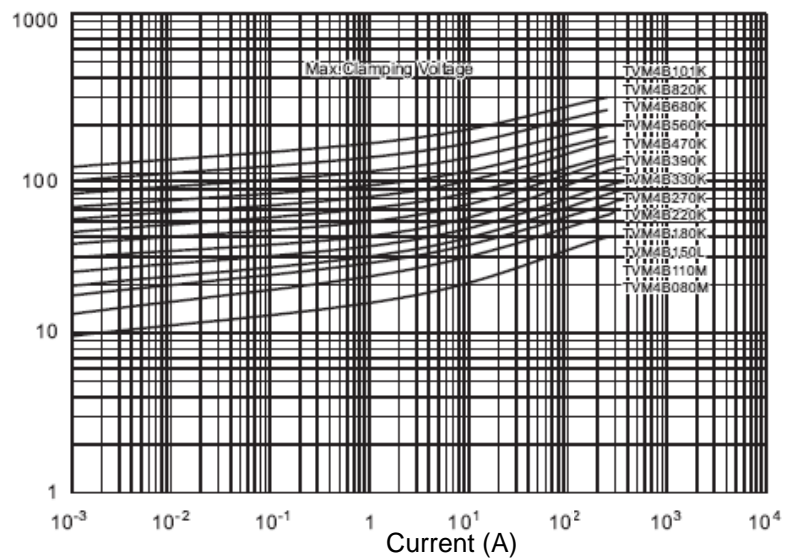
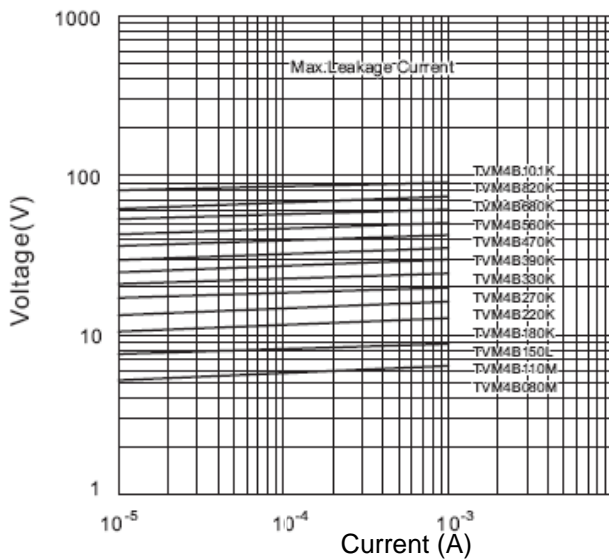
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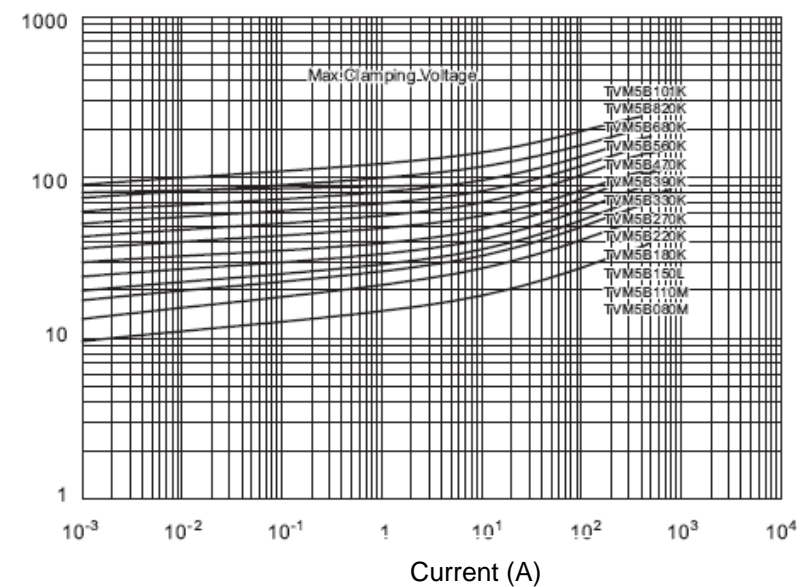
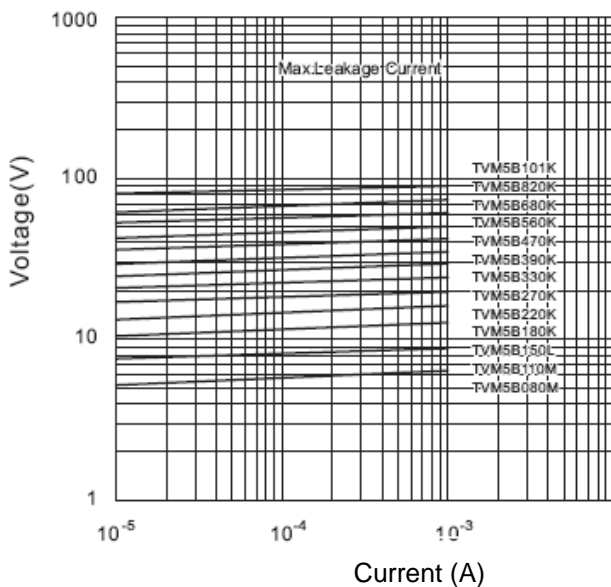
TVM3B080M~TVM3B101K



TVM4B080M~TVM4B101K



TVM5B080M~TVM5B101K

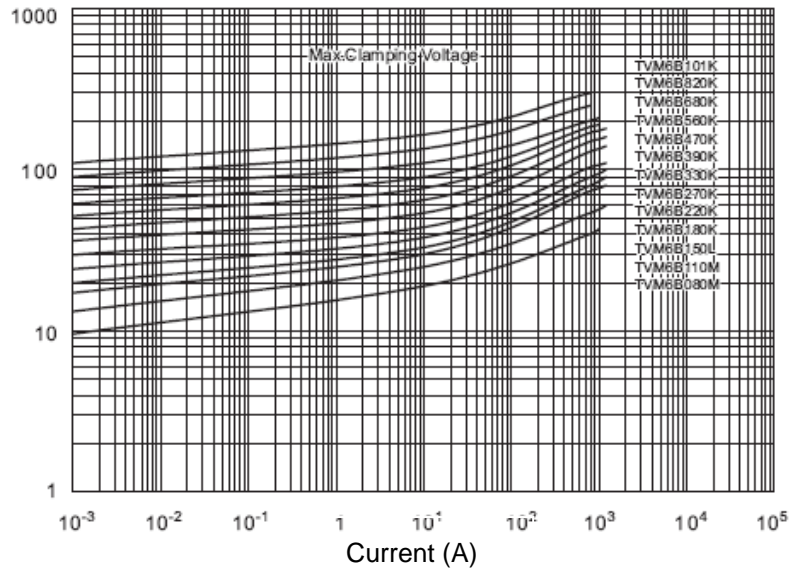
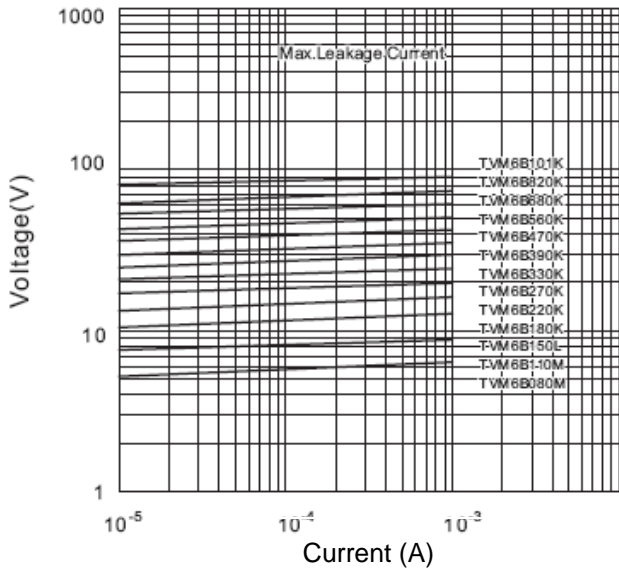


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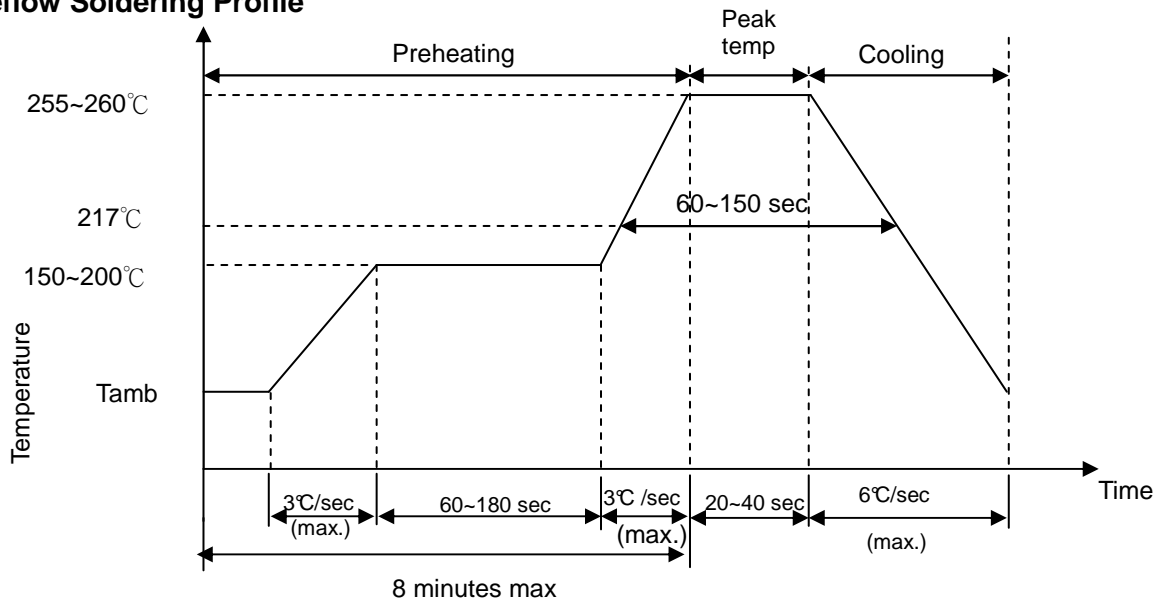


TVM6B080M~TVM6B101K



■ Soldering Recommendation

● IR-reflow Soldering Profile



● Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	Φ 3mm (max.)

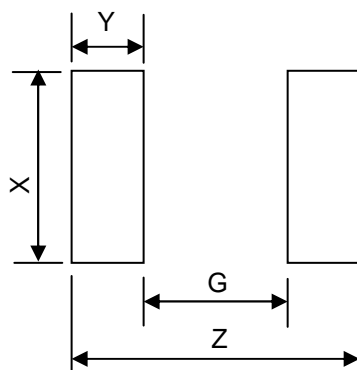
Caution: Do not touch the component surface with soldering iron directly to prevent it from damage.

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■ Recommended Soldering Pad Dimensions



Size	Z (mm)	G (mm)	X (mm)	Y (mm)
0402	2.1~2.2	0.4~0.5	0.6~0.7	0.9~1.0
0603	2.7~2.8	0.6~0.7	0.9~1.0	1.0~1.1
0805	3.1~3.2	0.6~0.7	1.4~1.5	1.2~1.3
1206	4.3~4.4	1.2~1.3	1.7~1.8	1.5~1.6
1210	4.3~4.4	1.2~1.3	2.6~2.7	1.5~1.6
1812	5.7~5.8	2.0~2.1	3.3~3.4	1.8~1.9
2220	6.9~7.0	2.6~2.7	5.1~5.2	2.1~2.2

Followed Standard: IPC-SM-782A

■ Storage Conditions of Products

● Storage Conditions :

1. Storage Temperature: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
2. Relative Humidity: $\leq 75\% \text{RH}$
3. Keep away from corrosive atmosphere and sunlight.

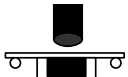
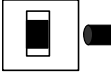
● Period of Storage : 1 year

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■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 1051-1	Warp:2mm ; Speed<0.5mm/sec Duration : 10 sec on PCB.. 	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															
Adhesion	Specification Standard	Speed < 0.5mm/sec. on PCB 	$W \geq 0.5\text{Kgf}$ the terminal electrode shall be break off not the chip element															
Damp Heat Load, Steady State	IEC 1051-1	$40 \pm 2^\circ\text{C}$ 90~95% RH 500±24 hrs at V_{DC}	$ \Delta V_{1mA} / V_{1mA} \leq 10\%$ No visible damage															
High Temp. Storage	IEC 1051-1	$125 \pm 5^\circ\text{C}$ x 1000±24 hrs	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															
Rapid Change of Temperature	IEC 1051-1	The conditions shown below shall be repeated 5 cycles on PCB <table border="1" data-bbox="504 958 1193 1218"> <thead> <tr> <th>Step</th> <th>Temperature ($^\circ\text{C}$)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 ± 5</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> <tr> <td>3</td> <td>125 ± 5</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> </tbody> </table>	Step	Temperature ($^\circ\text{C}$)	Period (minutes)	1	-40 ± 5	30 ± 3	2	Room temperature	5 ± 3	3	125 ± 5	30 ± 3	4	Room temperature	5 ± 3	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage
Step	Temperature ($^\circ\text{C}$)	Period (minutes)																
1	-40 ± 5	30 ± 3																
2	Room temperature	5 ± 3																
3	125 ± 5	30 ± 3																
4	Room temperature	5 ± 3																
High Temp. Load	IEC 1051-1	$85 \pm 2^\circ\text{C}$ 1000±24 hrs at V_{DC}	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															
Low Temp. Load	Specification Standard	$-40 \pm 5^\circ\text{C}$ 1000±24 hrs at V_{DC}	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															
Max. Energy	Specification Standard	10/1000 μS Waveform, W_{max} , 1 surge current	$ \Delta V_{1mA} / V_{1mA} \leq 10\%$ No visible damage															
Vibration	IEC 1051-1	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S ² Direction:3 mutually perpendicular directions,2hrs each	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	measure V_{1mA} at -40°C 、 25°C 、 125°C	$ T_c \leq 0.05\%/^\circ\text{C}$															
Climatic Sequence	IEC 1051-1	a. 125°C x 16 hrs b. 1st cycle : 55°C 93%RH x 24 hrs c. -40°C x 2 hrs d. 5 cycles : 55°C 93%RH x 24 hrs/cycle	$ \Delta V_{1mA} / V_{1mA} \leq 10\%$ No visible damage															
Solderability	IEC 60068-2-20	$235 \pm 5^\circ\text{C}$ 2±0.5 sec.	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	$260 \pm 5^\circ\text{C}$ 10±1 sec.	$ \Delta V_{1mA} / V_{1mA} \leq 5\%$ No visible damage															

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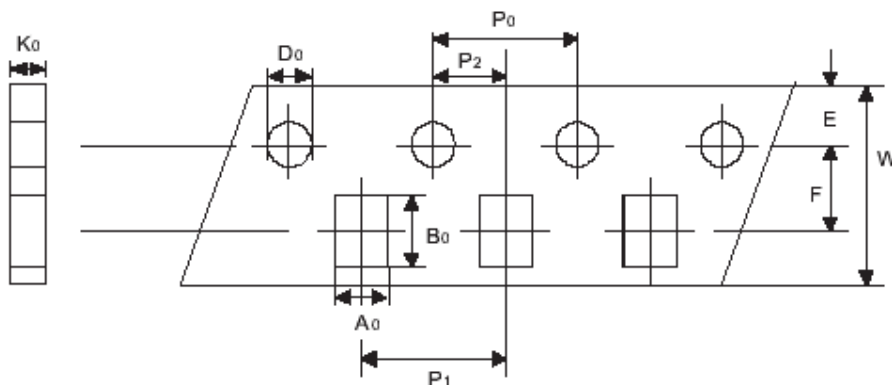


SMD Type for Surge Suppressor

■ Packaging

● Taping Specification

0402 ~ 0805 type

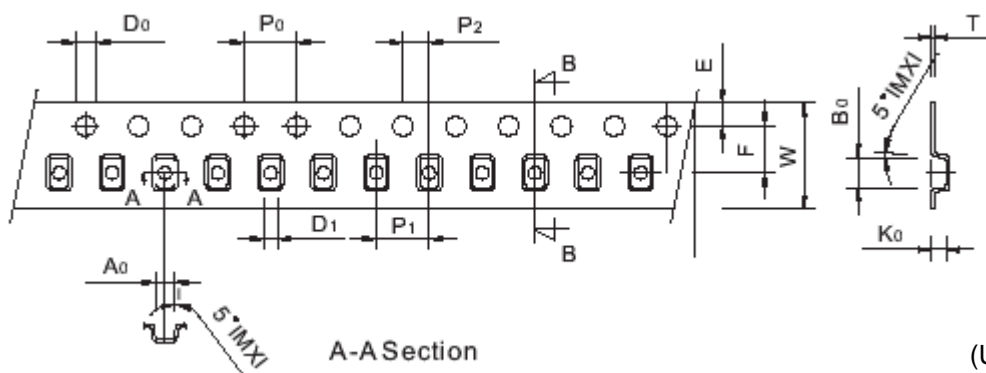


(Unit: mm)

Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
0402	±0.05	±0.12	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1

Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
0603	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	0.95

1206~ 2220 type



(Unit: mm)

Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	D ₁	T
1206	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1
1210	1.85	3.45	8	1.75	3.5	4	2	4	1.55	1	0.25

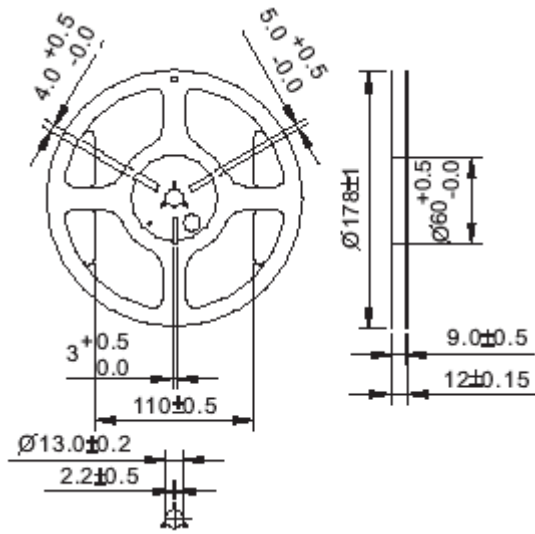
Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	D ₁	T
1812	±0.2	±0.2	±0.3	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1
2220	3.65	4.96	12	1.75	5.5	8	2	4	1.55	1.5	0.25

Metal Oxide Varistor : TVM-B Series



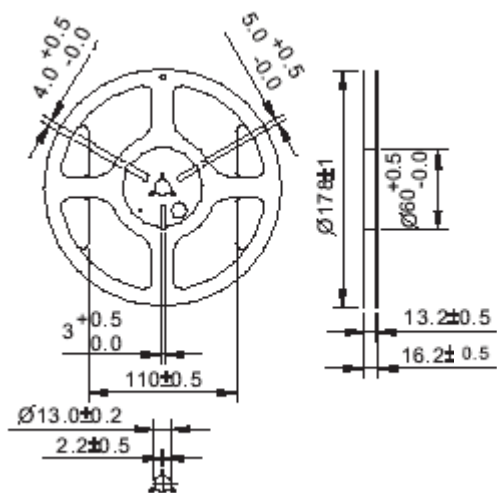
SMD Type for Surge Suppressor

- Quantity



(Unit: mm)

Type	Quantity (pcs/reel)
0402	10000
0603	4000
0805	3500
1206	2500
1210	2500



(Unit: mm)

Type	Quantity (pcs/reel)
1812	1000
2220	1000