Metal Oxide Varistor：TVM-A Series

SMD Type For ESD Suppressor

Note: TVM-A series is not recommended for new design.

Please choose TVM-G series for better clamping voltage performance.

For any other demand, please contact sales.

■ Features

1. RoHS compliance
2. EIA size 0402, 0603, 0805
3. Low leakage current
4. Working voltage: 3.3 ~ 45 Vdc
5. Bidirectional and symmetrical V/I characteristics
6. Multilayer ceramic construction technology
7. Rate for ESD protection
8. Variable capacitance
9. -40 ~ +125℃ operating temperature range

■ Recommended Applications

1. Cellular phones
2. I/O port for mother board
3. LCD Module
4. Data line (USB, RS232)
5. PDA

■ Part No. Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Product Type	
TVM	Thinking SMD Varistor TVM Type

Size	
0	0402
1	0603
2	0805

Type Series	
A	A Series

Varistor Voltage (V_{1mA})	
180	18x100V=18V
330	33x100V=33V
23R	23.5V

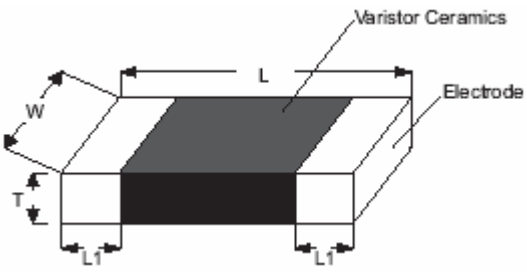
Tolerance of V_{1mA}	
K	±10%
L	±15%
M	±20%

Capacitance	
150	15 x 10^0=15pF
231	23 x 10^1=230pF

Packaging	
R	Taping
B	Bulk

Internal Control Code	
Z	ROHS Control

■ Dimensions



(Unit:mm)

Part No	Size	L	W	T	L1
TVM0	0402	1.00± 0.15	0.50± 0.10	0.60max	0.20±0.10
TVM1	0603	1.60±0.15	0.80±0.15	0.95max	0.25±0.15
TVM2	0805	2.00±0.20	1.25±0.20	1.20max	0.40±0.20

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■ Characteristics

Part No.	Varistor Voltage		Max. Allowable Voltage		Max. Clamping Voltage (8/20 μs)		Max. Surge Current (8/20 μs)	Max. Energy (10/1000 μs)	Rate Power	Reference Capacitance @1KHz
	V_{1mA} (V)	$\triangle V_{1mA}$ (±%)	$V_{AC(rms)}$ (V)	V_{DC} (V)	V_p (V)	I_p (A)	I_{max} (A)	W_{max} (J)	P (W)	C (PF)
TVM0A080M350	8	20	2.5	3.3	40	1	2.5	0.05	0.003	35
TVM0A080M171	8	20	2.5	3.3	32	1	10	0.05	0.003	170
TVM0A080M231	8	20	2.5	3.3	32	1	10	0.05	0.003	230
TVM0A080M351	8	20	2.5	3.3	31	1	10	0.05	0.003	350
TVM1A080M220	8	20	2.5	3.3	42	1	1	0.01	0.003	22
TVM1A080M141	8	20	2.5	3.3	28	1	10	0.05	0.003	140
TVM1A080M351	8	20	2.5	3.3	31	1	10	0.05	0.003	350
TVM1A080M651	8	20	2.5	3.3	29	1	10	0.05	0.003	650
TVM2A080M122	8	20	2.5	3.3	23	1	10	0.05	0.005	1200
TVM1A090M600	9	20	3.5	4.5	48	1	5	0.05	0.003	60
TVM1A090M151	9	20	3.5	4.5	30	1	10	0.05	0.003	150
TVM0A110M160	11	20	4	5.5	50	1	1	0.01	0.003	16
TVM0A110M101	11	20	4	5.5	50	1	10	0.05	0.003	100
TVM0A110M221	11	20	4	5.5	36	1	10	0.05	0.003	220
TVM1A110M100	11	20	4	5.5	51	1	1	0.01	0.003	10
TVM1A110M101	11	20	4	5.5	50	1	10	0.05	0.003	100
TVM1A110M141	11	20	4	5.5	37	1	10	0.05	0.003	140
TVM2A110M101	11	20	4	5.5	50	1	10	0.05	0.005	100
TVM2A110M102	11	20	4	5.5	29	1	10	0.05	0.005	1000
TVM0A12RM150	12.5	20	4.5	6.5	54	1	1	0.01	0.003	15
TVM0A12RM121	12.5	20	4.5	6.5	42	1	10	0.05	0.003	120
TVM0A12RM171	12.5	20	4.5	6.5	41	1	10	0.05	0.003	170
TVM0A150L170	15	15	7	8	64	1	1	0.01	0.003	17
TVM0A150L151	15	15	7	8	45	1	10	0.05	0.003	150
TVM1A150L180	15	15	7	8	47	1	1	0.01	0.003	18
TVM1A150L151	15	15	7	8	38	1	10	0.05	0.003	150
TVM2A150L551	15	15	7	8	35	1	10	0.05	0.005	550
TVM2A150L951	15	15	7	8	32	1	10	0.05	0.005	950
TVM0A180K220	18	10	8	11	58	1	1	0.01	0.003	22
TVM0A180K800	18	10	8	11	50	1	5	0.05	0.003	80
TVM0A180K121	18	10	8	11	48	1	10	0.05	0.003	120
TVM1A180K151	18	10	8	11	41	1	10	0.05	0.003	150
TVM2A180K800	18	10	8	11	42	1	5	0.05	0.005	80
TVM2A180K541	18	10	8	11	41	1	10	0.05	0.005	540
TVM2A180K671	18	10	8	11	37	1	10	0.05	0.005	670
TVM0A220K120	22	10	11	14	70	1	1	0.01	0.003	12
TVM0A220K500	22	10	11	14	70	1	10	0.05	0.003	50
TVM1A220K100	22	10	11	14	78	1	1	0.01	0.003	10
TVM1A220K500	22	10	11	14	70	1	10	0.05	0.003	50
TVM1A220K141	22	10	11	14	48	1	10	0.05	0.003	140
TVM1A220K301	22	10	11	14	42	1	10	0.05	0.003	300
TVM2A220K600	22	10	11	14	52	1	5	0.05	0.005	60
TVM2A220K541	22	10	11	14	50	1	10	0.05	0.005	540

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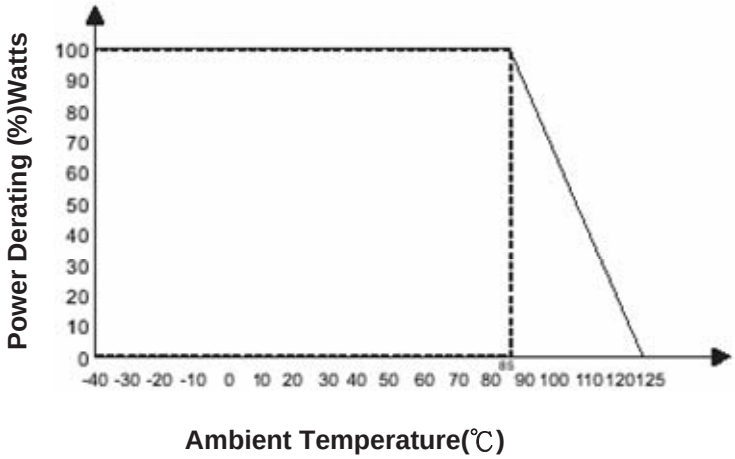
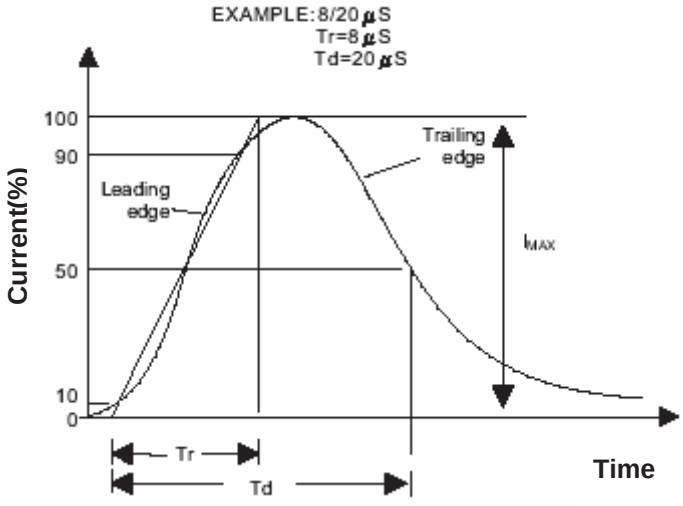
	V_{1mA} (V)	$\triangle V_{1mA}$ (±%)	$V_{AC(rms)}$ (V)	V_{DC} (V)	V_p (V)	I_p (A)	I_{max} (A)	W_{max} (J)	P (W)	C (PF)
TVM0A270K120	27	10	14	18	73	1	1	0.01	0.003	12
TVM0A270K400	27	10	14	18	75	1	10	0.05	0.003	40
TVM1A270K070	27	10	14	18	85	1	1	0.01	0.003	7
TVM1A270K400	27	10	14	18	75	1	10	0.05	0.003	40
TVM2A270K500	27	10	14	18	58	1	5	0.05	0.005	50
TVM1A330K050	33	10	17	22	93	1	1	0.01	0.003	5
TVM1A330K350	33	10	17	22	67	1	2.5	0.05	0.003	35
TVM1A330K151	33	10	17	22	70	1	10	0.05	0.003	150
TVM1A390K101	39	10	20	26	80	1	10	0.05	0.003	100
TVM2A470K121	47	10	25	31	83	1	10	0.05	0.005	120
TVM1A560K060	56	10	30	38	132	1	1	0.01	0.003	6
TVM2A560K111	56	10	30	38	107	1	10	0.05	0.005	110
TVM2A680K101	68	10	35	45	117	1	10	0.05	0.005	100

■ **Operating Temperature vs. Power Derating Curve**

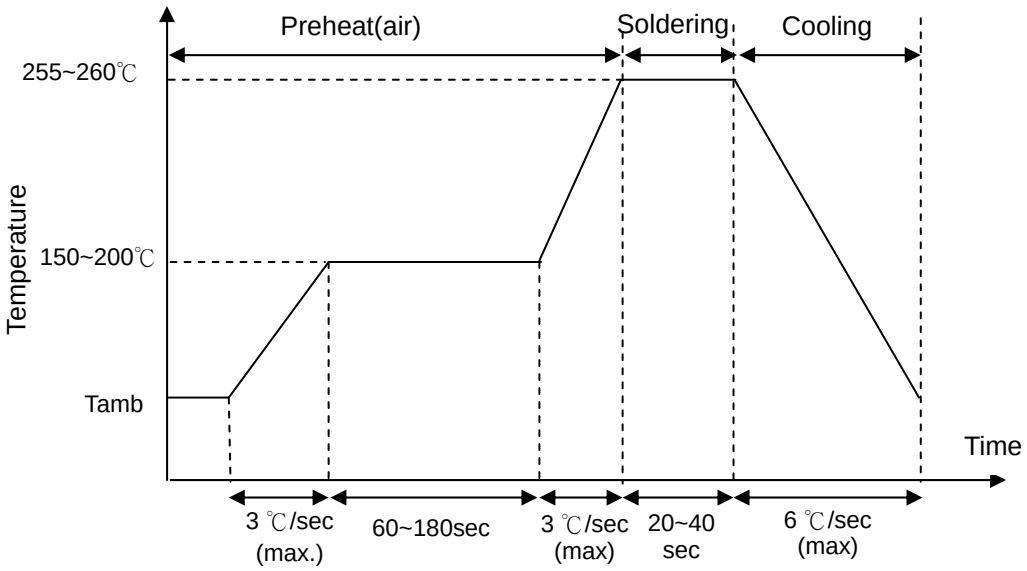


■ **Surge Current Standard Waveform**

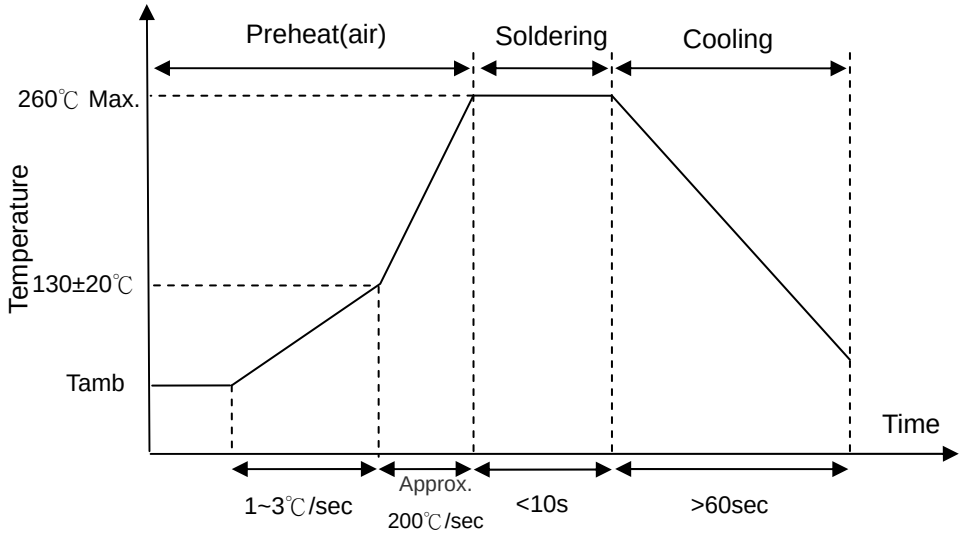


■ Soldering Recommendation

● IR-Reflow Soldering Profile



● Wave Flow Soldering Profile



● Reworking Conditions With Soldering Iron

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

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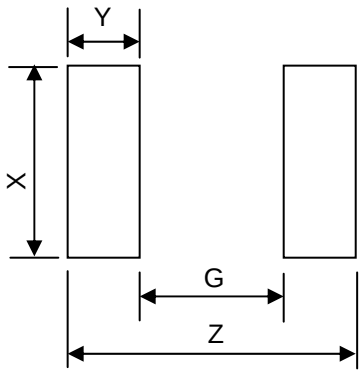
■ Recommended Pad dimensions



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

Followed standard ：IPC-SM-782A

■ Storage condition of products

- Storage Conditions :

  1. Storage Temperature: -10℃~+40℃
  2. Relative humidity: ≦75%RH
  3. Varistor must be kept away from sunlight and stored in a non-corrosive atmosphere.

- Period of Storage : 1 year

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■ Reliability test

<table>
<tr><th>Item</th><th>Standard</th><th>Test conditions / Methods</th><th>Specifications</th></tr>
<tr><td>Bending Strength</td><td>IEC 1051-14.10.3</td><td>Warp:2mm ; Speed<0.5mm/sec.
Duration :10sec on PCB.
  </td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>Soldering Strength</td><td>Specification Standard</td><td>Speed<0.5mm/sec. on PCB
 
w</td><td>W≧0.5Kgf
the terminal electrode shall be break off nor the chip element</td></tr>
<tr><td>Damp Heat Load</td><td>IEC 1051-14.18</td><td>40±2℃ 90~95% RH
500±24HRS at V_{DC}</td><td>| △V/V_{1mA} | ≦ 10 %
No visible damage</td></tr>
<tr><td>High Temp. Storage</td><td>IEC 1051-14.17.3</td><td>125±5 ℃ x 1000±24HRS</td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>Thermal Shock</td><td>IEC 1051-14.13</td><td>The thermal shock conditions shown below shall be repeated 5 cycles on PCB
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Period (minutes)</th></tr>
<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>
</table></td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>High Temp. Load</td><td>IEC 1051-14.20</td><td>85±2 ℃ 1000±24HRS at V_{DC}</td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>Low Temp. Load</td><td>Specification Standard</td><td>-40±5 ℃ 1000±24HRS at V_{DC}</td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>Max. Energy</td><td>Specification Standard</td><td>10/1000 μS Waveform, Wmax, 1 surge current</td><td>| △V/V_{1mA} | ≦ 10 %
No visible damage</td></tr>
<tr><td>Vibration</td><td>IEC 1051-14.16</td><td>Frequency range : 10~55Hz
Amplitude : 0.75mm or 98m/S^2
Duration : 6HRS(3x2HRS)</td><td>| △V/V_{1mA} | ≦ 5 %
No visible damage</td></tr>
<tr><td>Varistor Voltage Temp. Coefficient</td><td>Specification Standard</td><td>measure V_{1mA} at -40℃、25℃、125℃</td><td>|Tc| ≦0.05%/℃</td></tr>
<tr><td>Climatic Sequence</td><td>IEC 1051-14.17</td><td>a. 125℃ x 16HRS
b. 1st cycle : 55℃ 93%RH x 24HRS
c. -40℃ x 2HRS
d. 5 cycles : 55℃ 93%RH x 24HRS/Cycle</td><td>| △V/V_{1mA} | ≦ 10 %
No visible damage</td></tr>
<tr><td>Solderability</td><td>IEC 60068-2-20</td><td>235±5℃ 2±0.5 sec</td><td>At least 95% of terminal electrode is covered by new solder</td></tr>
<tr><td>Resistance to soldering heat</td><td>IEC 60068-2-20</td><td>260±5℃ 10±1 sec</td><td>| △V/V_{1mA} | ≦ 5 %</td></tr>
<tr><td>Electrostatic Discharge (ESD)</td><td>IEC 61000-4-2</td><td>Contact Discharge Test Voltage：8KV
Air Discharge Test Voltage：15KV
Number of Test Pulse：20 times
Polarity：Positive/Negative
Discharge Network：150pF,330Ω
Operating Temperature：15~35℃
Operating Humidity：25~75%</td><td>| △V/V_{1mA} | ≦ 10 %
No visible damage</td></tr>
</table>

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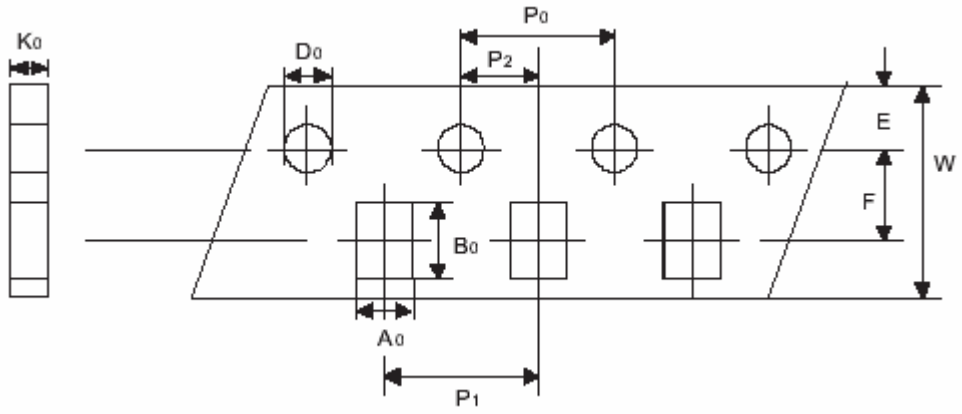
■ Packaging

● Taping Specification

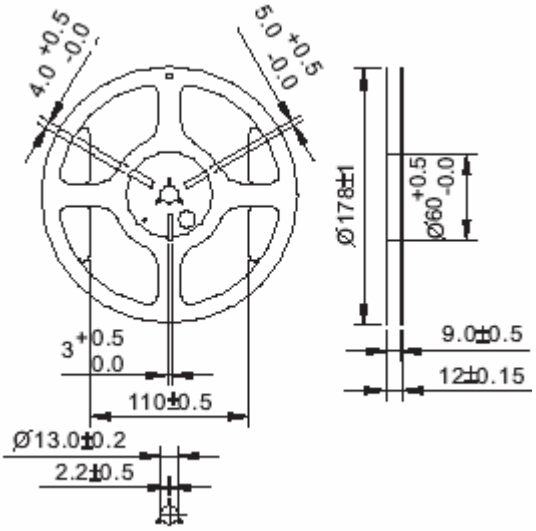


(Unit: mm)

Type \ Index	A_0 ±0.05	B_0 ±0.12	W ±0.2	E ±0.1	F ±0.05	P_1 ±0.1	P_2 ±0.05	P_0 ±0.1	D_0 ±0.1	K_0 ±0.1
0402	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60

Type \ Index	A_0 ±0.2	B_0 ±0.2	W ±0.2	E ±0.1	F ±0.05	P_1 ±0.1	P_2 ±0.05	P_0 ±0.1	D_0 ±0.1	K_0 ±0.1
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	0.95

● Quantity



(Unit: mm)

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