

Metal Oxide Varistor : TVM-G Series

SMD Type For ESD Suppressor (Low Clamping Series)



■ Features

1. RoHS compliant
2. Low clamping voltage
3. EIA size 0402, 0603, 0805
4. Operating voltage: 5.5 ~ 30 Vdc
5. Bidirectional and symmetrical V/I characteristics
6. Multilayer ceramic construction technology
7. Rate for ESD protection
8. Variable capacitance
9. -40 ~ +125°C operating temperature range



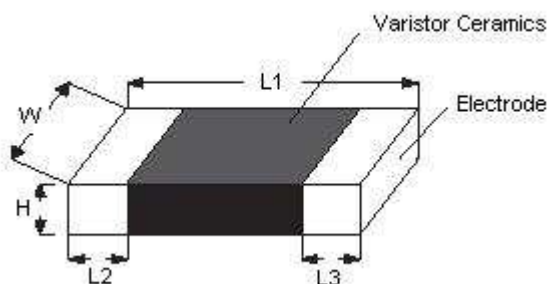
■ Recommended Applications

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

■ Part Number Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Product Type		Series			Max. Operating Voltage(V _{DC})			Typical Capacitance			Packaging		Optional Suffix		
TVM	Thinking Varistor TVM type	G	G series		5R5	5.5V		K500	50x10 ⁰ pF=50pF (@1KHZ)		R	Reel	001 ~ ZZZ		
					090	9x10 ⁰ =9V		M101	10x10 ¹ pF=100pF (@1MHZ)		B	Bulk			
		Size(EIA)													
		0	0402												
		1	0603												
		2	0805												

■ 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

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■ Electrical Characteristics

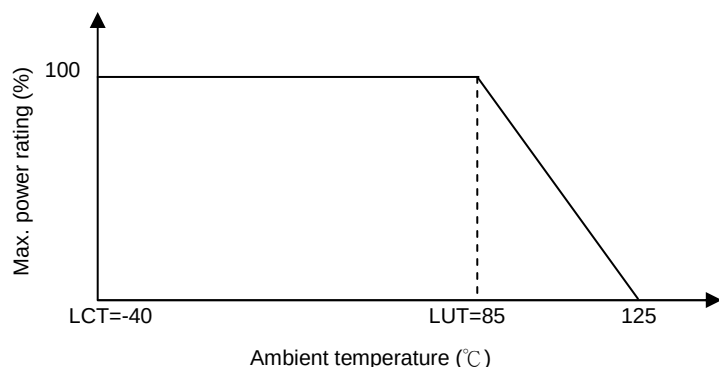
Part No..	Max. Operating Voltage	Varistor Voltage (@ 1mA DC)	Max. Clamping Voltage (8/20us)		Max. Surge Current (8/20us)	Max. Energy (10/1000us)	Typical Capacitance @1MHz
	V _{DC} (V)	V _{1mA} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	C (pF)
TVM0G5R5M100	5.5	8.8~13.2	35	1	1	0.01	10
TVM0G5R5M400	5.5	8.8~13.2	30	1	4	0.02	40
TVM0G5R5M900	5.5	8.8~13.2	30	1	10	0.05	90
TVM0G5R5M261	5.5	8.8~13.2	25	1	20	0.05	260
TVM0G5R5M411	5.5	8.8~13.2	25	1	20	0.05	410
TVM1G5R5M761	5.5	8.0~12.0	25	1	30	0.1	760
TVM2G5R5M991	5.5	8.0~12.0	25	1	40	0.1	990
TVM0G090M220	9	11~16	38	1	2	0.02	22
TVM0G090M400	9	11~16	35	1	4	0.02	40
TVM0G090M141	9	11~16	30	1	20	0.05	140
TVM0G090M201	9	11~16	30	1	20	0.05	200
TVM1G090M220	9	11~16	40	1	2	0.02	22
TVM1G090M491	9	11~16	29	1	30	0.1	490
TVM2G090M521	9	11~16	29	1	40	0.1	520
TVM0G140M400	14	15.9~21.5	42	1	4	0.02	40
TVM0G140M900	14	15.9~21.5	38	1	20	0.05	90
TVM0G140M151	14	15.9~21.5	38	1	20	0.05	150
TVM1G140M181	14	15.9~21.5	37	1	30	0.1	180
TVM2G140M321	14	15.9~20.3	34	1	40	0.1	320
TVM2G140M561	14	15.9~20.3	32	1	120	0.3	560
TVM0G180M030	18	46~75	135	1	1	0.01	3
TVM0G180M120	18	22~28	55	1	2	0.03	12
TVM0G180M300	18	22~28	52	1	4	0.05	30
TVM0G180M500	18	22~28	50	1	20	0.05	50
TVM1G180M030	18	46~75	135	1	1	0.01	3
TVM1G180M120	18	22~28	55	1	2	0.03	12
TVM1G180M121	18	22~28	50	1	30	0.1	120
TVM2G180M291	18	22~28	44	1	40	0.1	290
TVM2G180M521	18	22~28	44	1	120	0.3	520
TVM1G260M111	26	31~38	60	1	30	0.1	110
TVM2G260M141	26	29.5~38.5	60	1	40	0.1	140
TVM2G260M221	26	29.5~38.5	60	1	100	0.3	220
TVM1G300M900	30	37~46	74	1	30	0.1	90
TVM2G300M900	30	37~46	72	1	30	0.1	90

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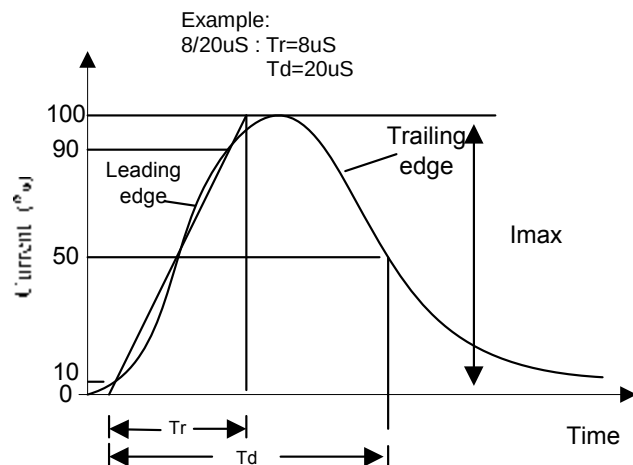
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■ Power Derating Curve

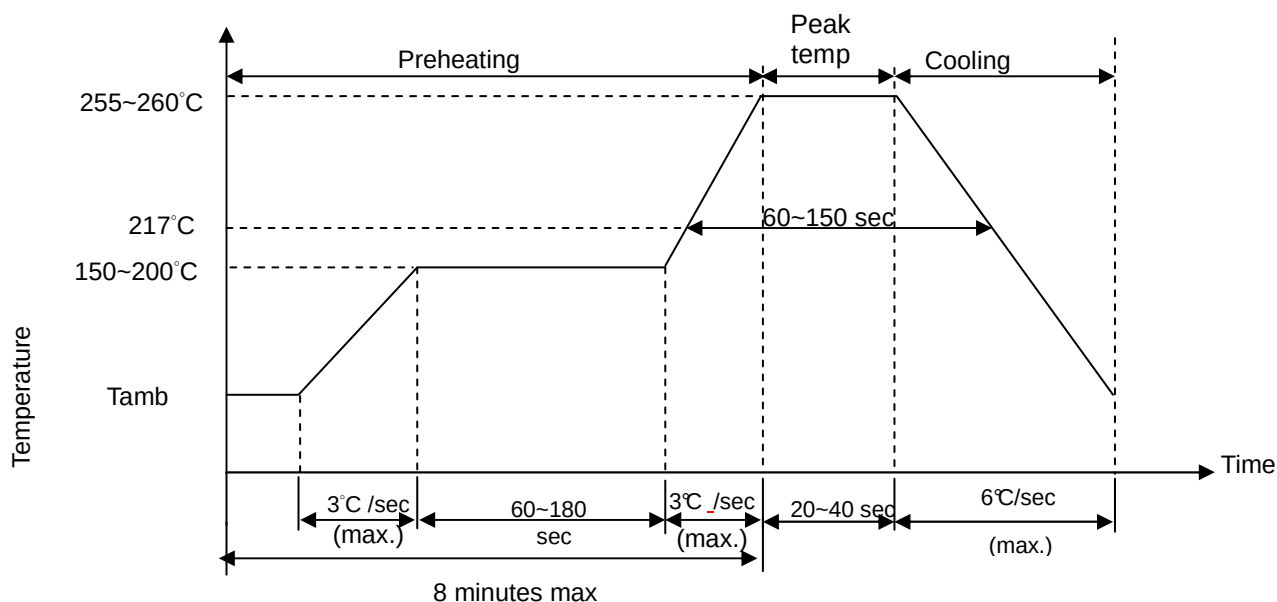


■ Surge Current Standard Waveform

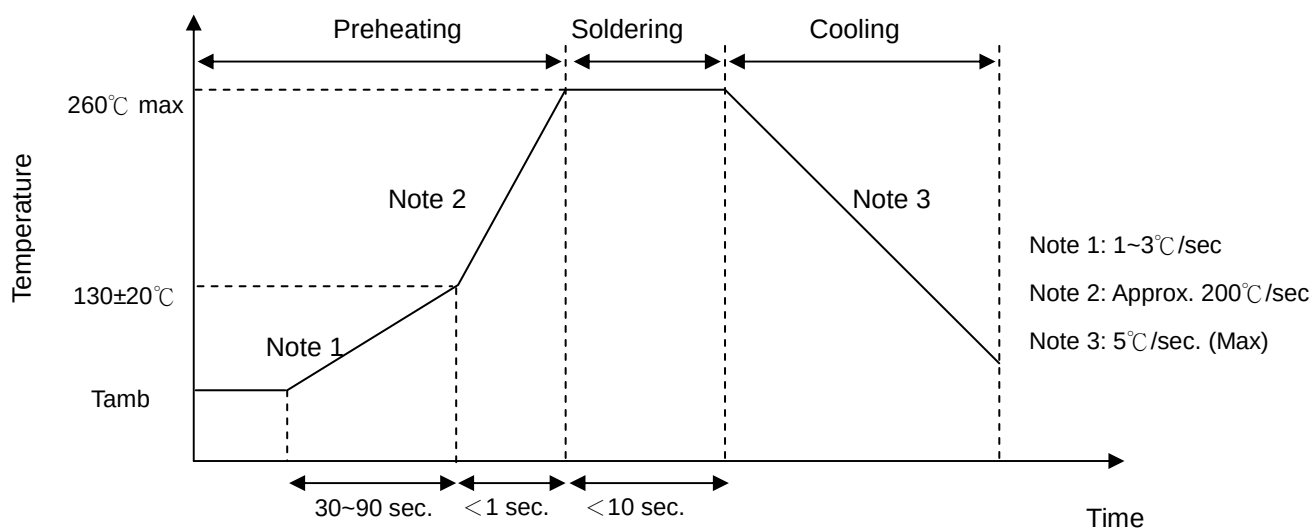


■ Soldering Recommendation

● IR-reflow Soldering Profile



● Wave Flow Soldering Profile



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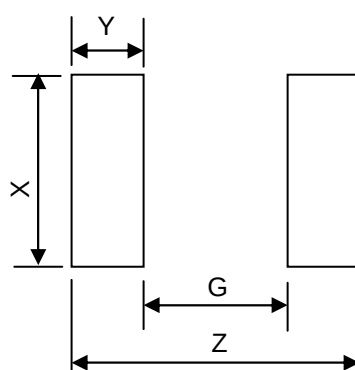
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- Reworking Conditions with Soldering Iron

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

■ 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

Followed Standard:IPC-SM-782A

■ Storage Conditions of Products

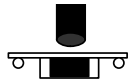
- Storage Conditions :
 1. Storage Temperature: -10°C ~+40°C
 2. Relative Humidity: $\leq 75\%RH$
 3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage : 1 year

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■ Reliability

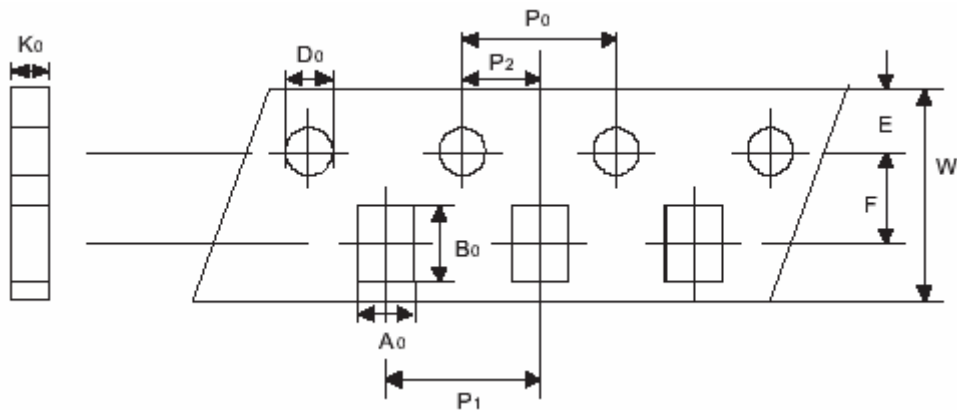
Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 1051-1	Warp:2mm ; Speed<0.5mm/sec Duration : 10 sec on PCB.. 	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Adhesion	Specification standard	Speed < 0.5mm/sec. on PCB 	$W \geq 0.5\text{Kgf}$ the terminal electrode shall be break off not the chip element															
Damp Heat Load, Steady State	IEC 1051-1	40±2℃ 90~95% RH 500±24hrs at V _{DC}	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage															
High Temp. Storage	IEC 1051-1	125±5 ℃ 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><thead><tr><th>Step</th><th>Temperature (℃)</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 (℃)	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 (℃)	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±2 ℃ 1000±24 hrs at V _{DC}	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Low Temp. Load	Specification standard	-40±5 ℃ 1000±24 hrs at V _{DC}	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Max. Energy	Specification standard	10/1000 μS Waveform, Wmax, 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/S2 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℃ 、25℃ 、125℃	$ T_c \leq 0.05\%/^{\circ}\text{C}$															
Climatic Sequence	IEC 1051-1	a. 125℃ x 16 hrs b. 1st cycle : 55℃ 93%RH x 24 hrs c. -40℃ x 2 hrs d. 5 cycles : 55℃ 93%RH x 24 hrs/cycle	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Solderability	IEC 60068-2-20	235±5℃ 2±0.5 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	260±5℃ 10±1 sec	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Electrostatic Discharge (ESD)	IEC 61000-4-2	Contact discharge test voltage : 8KV Polarity : Positive/Negative Number of test pulse : 10/10 times Discharge network : 150pF,330Ω Operating temperature : 15~35℃ Operating humidity : 25~75 RH	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage															

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- Packaging
 - Taping Specification

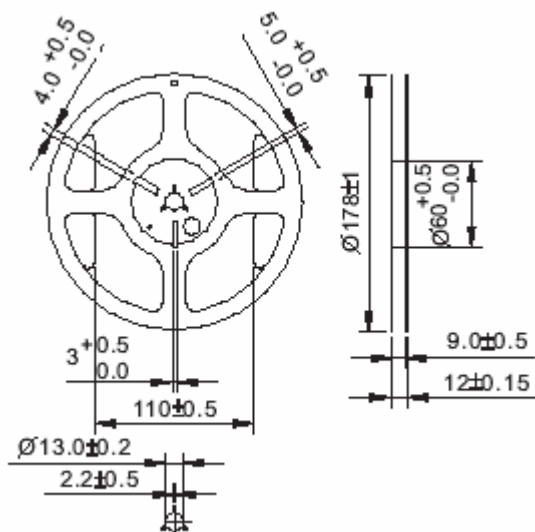


(Unit: mm)

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

- Quantity



(Unit: mm)

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