

Varistor: TVG Series

Varistor and Gas Tube Integrated Over-Voltage Protector



■ Features

1. Hybrid design
2. Low leakage, low capacitance, and bidirectional protection
3. Body size: $\Phi 14\text{mm}$
4. High performance
(TVG14 is equivalent to TVR14-U Series: I_{max} : 10kA ; I_{n} : 5kA)
5. Agency recognition: TVG14 is approved by UL & TUV
6. RoHS compliant and Halogen-free
7. Operating temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
8. Storage temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$



■ Recommended Applications

1. Solar inverter, energy storage system, EV charging station
2. Premium power supply, uninterruptable power supply (UPS), power distribution system, battery-powered equipment
3. Industrial equipment, smart meter, smart motor drive and control
4. Smart home appliance, high-end consumer electronics
5. Telecommunication equipment, power line communication system

■ Part Number Code

T	V	G	1	4	4	3	1	K	Y	B	B				F		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Product Type			Body Size		Varistor Voltage (V_{1mA})		Appearance		Terminal quantity		Internal Control Code		Optional Suffix				
TVG			14 Φ14mm		431 43x10 ¹ V=430V 112 11x10 ² V=1100V		L Straight lead Y Y kink lead W Outer kink lead		B 2 terminals C 3 terminals		Special request code 001~ZZZ Miniaturization Request code X01~XZZ		M Silicone F Epoxy				
Tolerance of V_{1mA}			Packaging		A 0~+10%		B Bulk		C Cut lead (Special length control for cut lead).		H Taping & reel packing (hole pitch: 12.7mm)		I Taping & ammo box packing (hole pitch: 12.7mm)				
					B -10~0%		C Taping & reel packing (hole pitch: 15mm)		H Taping & reel packing (hole pitch: 12.7mm)		I Taping & ammo box packing (hole pitch: 12.7mm)		J Taping & reel packing (hole pitch: 15mm)				
					J ±5%		K Taping & reel packing (hole pitch: 15mm)		H Taping & reel packing (hole pitch: 12.7mm)		I Taping & ammo box packing (hole pitch: 12.7mm)		J Taping & reel packing (hole pitch: 15mm)				
					K ±10%				H Taping & reel packing (hole pitch: 12.7mm)		I Taping & ammo box packing (hole pitch: 12.7mm)		J Taping & reel packing (hole pitch: 15mm)				
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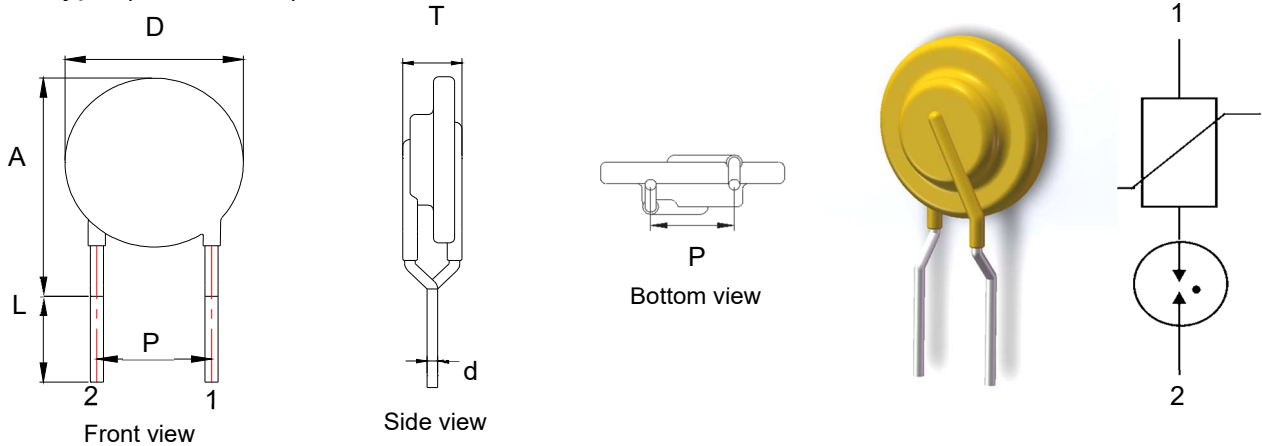
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■

Structure and Dimensions (Coating Structure)

- Y type (Y kink lead)



(Unit:mm)

Series	D	Amax	P	Φd	Lmin	Tmax
TVG14*KY*	16.5±2	23	7.5±1	1.0±0.05	6.0	Please Refer to Electrical Characteristics

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■ Electrical Characteristics 14mm Series (Coating structure)

Part No.	Max. Continuous Voltage		Varistor Voltage (±10%)	GDT Voltage (±20%)	Nominal Discharge Current (8/20μs)	Max Discharge Current (8/20μs)	Max. Clamping Voltage@ I _c (8/20μs)		Combination wave 1.2/50-8/20μs 10kV/5kA	Max. Energy (10/1000μs)	Max. Capacitance (1MHz)	Dimension
	AC (rms)	DC	V _{1mA}	V _{100V/S}	I _n / 15 times	I _{max} / 1 time	V _c	I _c	Time	W _{max}	C	T _{max}
	(V)	(V)	(V)	(V)	(A)	(A)	(V)	(A)	--	(J)	(pF)	(mm)
TVG14201	150	200	200	600	5000	10000	340	100	40	140	4	8.7
TVG14221	175	225	220	600	5000	10000	360	100	40	154	4	8.9
TVG14241	195	250	240	600	5000	10000	395	100	40	168	4	8.9
TVG14271	215	275	270	600	5000	10000	455	100	40	190	4	9.1
TVG14301	230	300	300	600	5000	10000	500	100	40	210	4	9.2
TVG14331	250	320	330	600	5000	10000	550	100	40	228	4	9.4
TVG14361	275	350	360	600	5000	10000	595	100	40	255	4	9.5
TVG14391	300	385	390	600	5000	10000	650	100	40	275	4	9.6
TVG14431	320	420	430	600	5000	10000	710	100	40	303	4	9.9
TVG14471	350	450	470	1000	5000	10000	775	100	40	350	4	10.1
TVG14511	395	510	510	1000	5000	10000	845	100	40	382	4	10.3
TVG14561	420	560	560	1000	5000	10000	930	100	40	382	4	10.5
TVG14621	465	615	620	1000	5000	10000	1020	100	40	382	4	10.9
TVG14681	510	670	680	1000	5000	10000	1120	100	40	382	4	11.2
TVG14751	550	745	750	1000	5000	10000	1235	100	40	420	4	11.0

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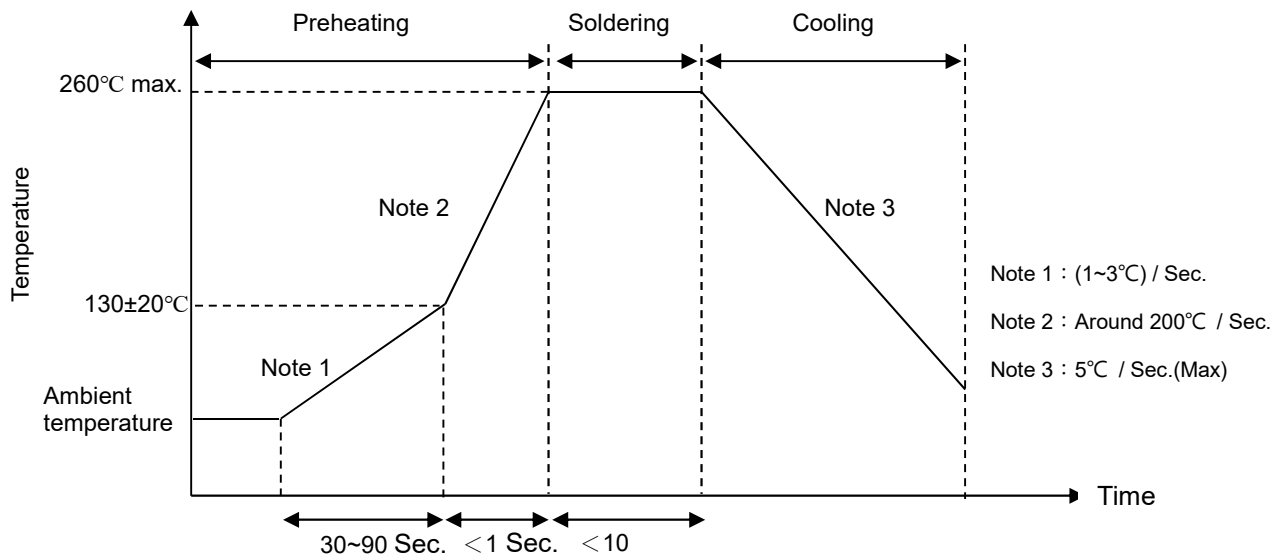


■ Safety Approvals

Certified Model No.	Agency	
		
	UL1449 & cUL	EN IEC 61051-1 IEC 61051-2-2 IEC 61051-2 EN IEC 61051-2
	E314979	J50626170
TVG14201	-	√
TVG14221	-	√
TVG14241	√	√
TVG14271	√	√
TVG14301	√	√
TVG14331	√	√
TVG14361	√	√
TVG14391	√	√
TVG14431	√	√
TVG14471	√	√
TVG14511	√	√
TVG14561	√	√
TVG14621	√	√
TVG14681	√	√
TVG14751	√	√

■ Recommended Soldering Conditions

● Wave Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

Item	Condition
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 Sec. (max.)
Distance from Varistor	2 mm (min.)

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■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Tensile Strength of Lead Terminals	IEC61051-1 (IEC60068-2)	Gradually apply the specified force and keep the unit fixed for 10±1 sec. <table><tr><td>Terminal diameter (mm)</td><td>Force (Kg)</td></tr><tr><td>0.5<d≤0.8</td><td>1.0</td></tr><tr><td>0.8<d≤1.25</td><td>2.0</td></tr></table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	$\Delta V/V \leq \pm 5\%$ No visible damage									
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	1.0																	
0.8<d≤1.25	2.0																	
Bending Strength of Terminals	IEC61051-1 (IEC60068-2)	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table><tr><td>Terminal diameter (mm)</td><td>Force (Kg)</td></tr><tr><td>0.5<d≤0.8</td><td>0.5</td></tr><tr><td>0.8<d≤1.25</td><td>1.0</td></tr></table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	$\Delta V/V \leq \pm 5\%$ No visible damage									
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	0.5																	
0.8<d≤1.25	1.0																	
Voltage Proof	IEC61051-1	Metal balls method, 2500 V _{ac} , 1min	No breakdown															
High Temp. Load	IEC61051-1	+125°C, 1000±24hrs at V _{DC} or V _{rms} (Max. Operatng Voltage)	$\Delta V/V_c \leq \pm 10\%$ No visible damage															
High Temperature Storage	IEC60068-2	125±2°C x 1000± 24 hrs	$\Delta V/V_c \leq \pm 5\%$ No visible damage															
Damp Heat, Steady State	IEC61051-1 (IEC60068-2)	Testing divided into two groups: a. and b. groups. a. 40±2°C, 90 ~ 95 % RH, 1344 hrs b. 40±2°C, 90 ~ 95 % RH, at 10%V _{dc} , 1344 hrs	$\Delta V/V_c \leq \pm 5\%$ No visible damage															
Vibration	IEC61051-1 (IEC60068-2)	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S ² Direction: 3 mutually perpendicular directions, 2hrs each.	$\Delta V/V_c \leq \pm 5\%$ No visible damage															
10/1000µs Surge Life	IEC61051-1 (IEC60060-2)	Single current pulse with 2ms rectangular wave shape or 10/1000µs wave shape	$\Delta V/V_c \leq \pm 10\%$ No visible damage															
Solderability	IEC61051-1	245±3°C, 3±0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC61051-1	260°C ± 5°C, 10 ± 1 sec	$\Delta V/V_c \leq \pm 5\%$ No visible damage															
Rapid Change of Temperature	IEC61051-1 (IEC60068-2)	The conditions shown below shall be repeated 5 cycles <table><tr><td>Step</td><td>Temperature (°C)</td><td>Period (minutes)</td></tr><tr><td>1</td><td>-40±3°C</td><td>30±3 min</td></tr><tr><td>2</td><td>Room temperature</td><td>≤ 3</td></tr><tr><td>3</td><td>125±2°C</td><td>30±3 min</td></tr><tr><td>4</td><td>Room temperature</td><td>≤ 3</td></tr></table>	Step	Temperature (°C)	Period (minutes)	1	-40±3°C	30±3 min	2	Room temperature	≤ 3	3	125±2°C	30±3 min	4	Room temperature	≤ 3	$\Delta V/V_c \leq \pm 5\%$ No visible damage
Step	Temperature (°C)	Period (minutes)																
1	-40±3°C	30±3 min																
2	Room temperature	≤ 3																
3	125±2°C	30±3 min																
4	Room temperature	≤ 3																

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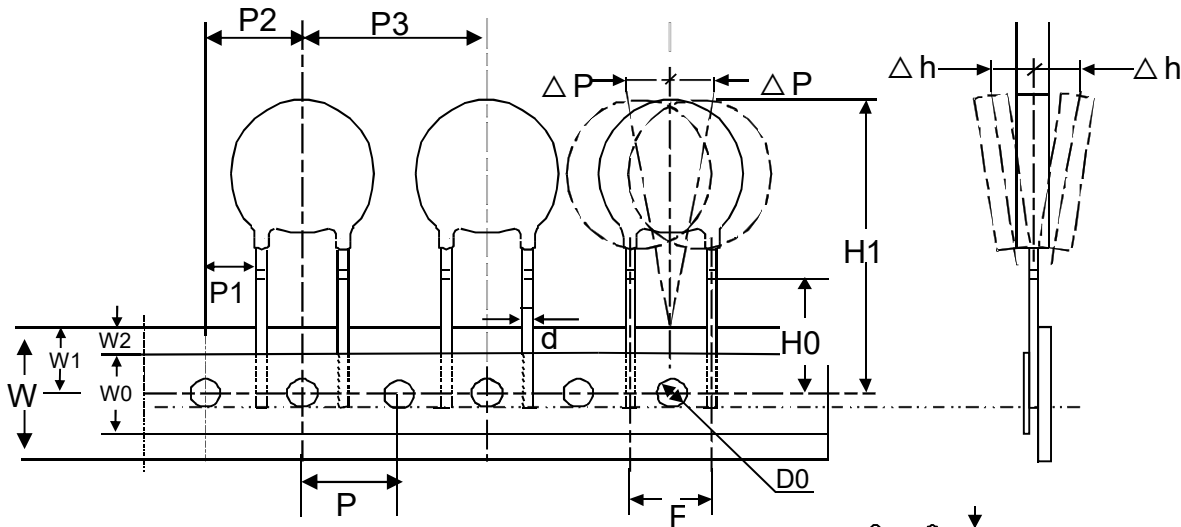
Flammability Test	IEC61051-1	Perform needle flame test: 1) The flame is positioned on: the vertical of the resistor. 2) Flame duration: 10s.	Permissible duration: 5 sec Max.
8/20 μ S Nominal Discharge Test	UL1449	8/20 μ s waveform, 1n, 15 times (Surges should be applied in 3 groups of 5 surges, interval 1min between surges, after each group of 5 surges, the sample shall rest for 30 min.)	$\Delta V/V_c \leq \pm 10\%$ No visible damage
Combination pulse	IEC61051-1	10kV/5kA coupled with the maximum Vac, interval 60S, ± 5 times, 40 times in total (at 0, 90, 180, and 270 degree)	No visible damage

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- Packaging
 - Taping Specification



(Unit: mm)

Taping Code	Body Size	P0	F	P1	P2	P3	H0	H1	W0	W1	W2	W	ΔP	Δh	D0	d	t
		±0.3	±1	±1	±1.3	±1	± 0.5	Max	±1.5	+0.75 /-0.5	Max	±1	Max	Max	±0.2	±0.05	± 0.2
TVG14	AR	12.7	7.5	8.45	12.7	25.4	16	40	12	9	3	18	1.0	2.0	4	1.0	0.6

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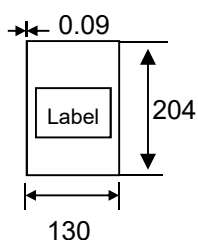


■ Quantity

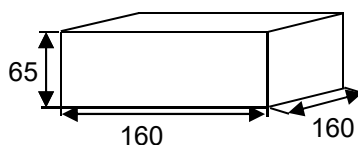
● Bulk Packing

Series	QTY (pcs/bag)	QTY (bag /box)	QTY (pcs /carton)
TVG14	50	30	1,500

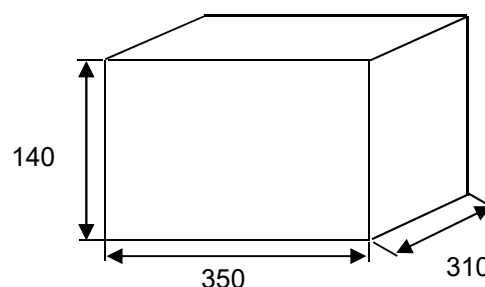
Inner bag



Inner box



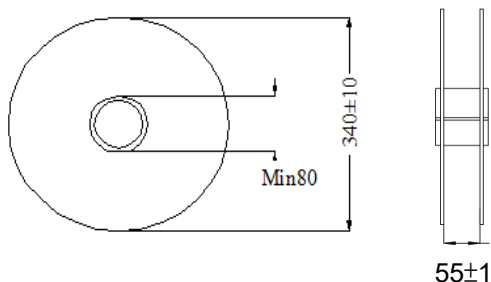
Carton



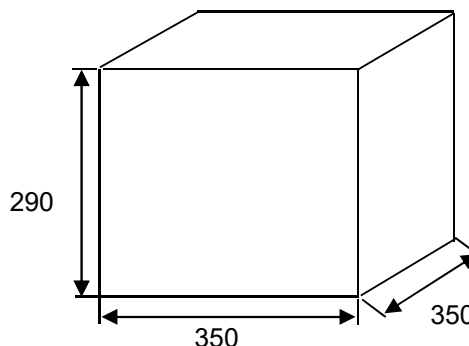
● Reel Packing

Series	QTY (pcs/reel)	QTY (reel/carton)	QTY(pcs/carton)
TVG14	300	4	1,200

Inner box



Carton



■ Warehouse 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