

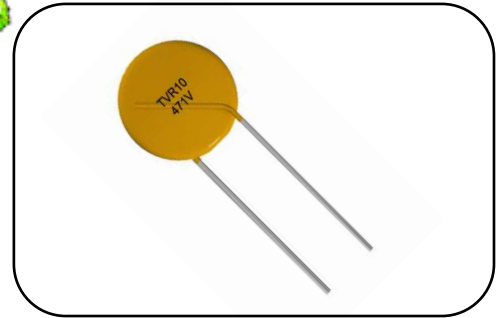
Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ Features

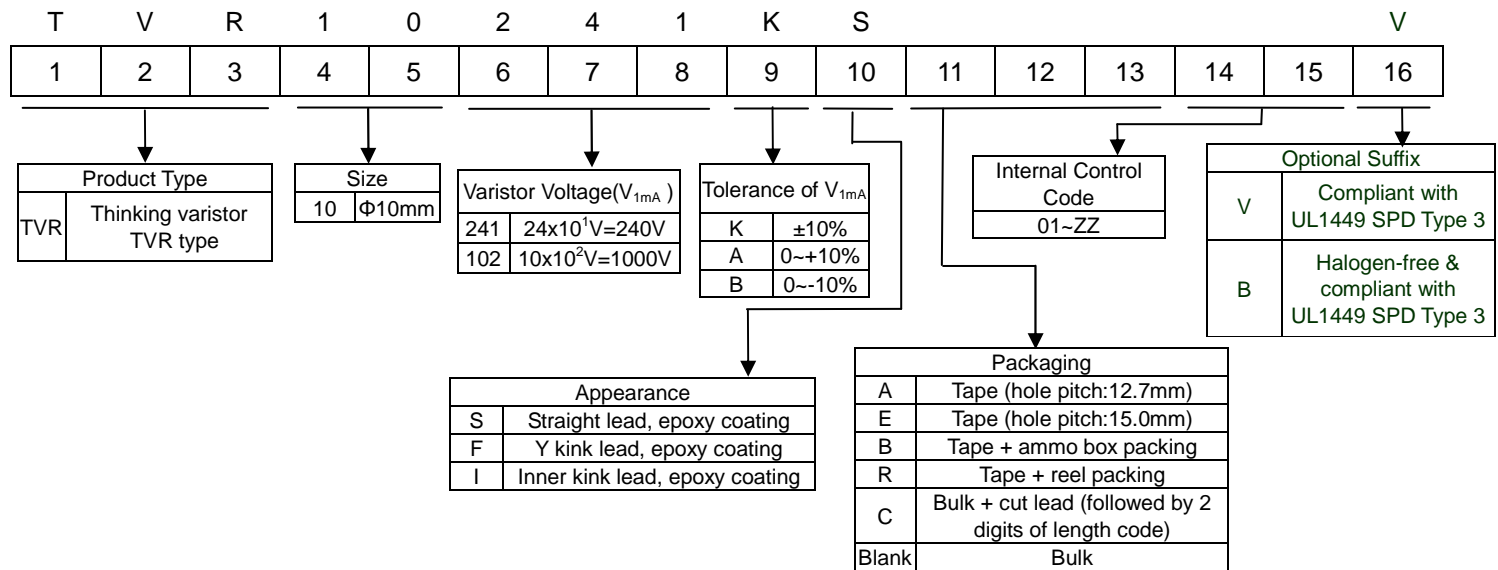
1. Body size $\Phi 10\text{mm}$ only
2. UL 1449 3rd Type 3 compliant
3. Meet requirement of IEC 60950-1 for 6KV/3KA combination wave test.
4. Wide operating voltage range : 130Vac ~ 680Vac
5. Operating temperature range : $-40 \sim +85^{\circ}\text{C}$
6. Agency recognition: UL 1449 3rd (File no:E314979)
VDE: Pending
7. RoHS compliant & Halogen-free series available.



■ Recommended Applications

1. Power supply
2. Home appliance
3. Industrial equipment
4. Telecommunication or telephone system

■ Part Number Code



Note: Optional suffix will be the 11th digit if packaging and internal control codes are not coded.

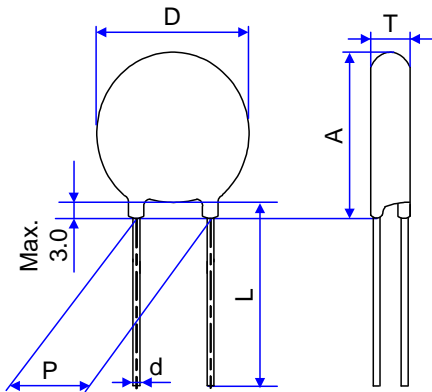
Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ Structure and Dimensions

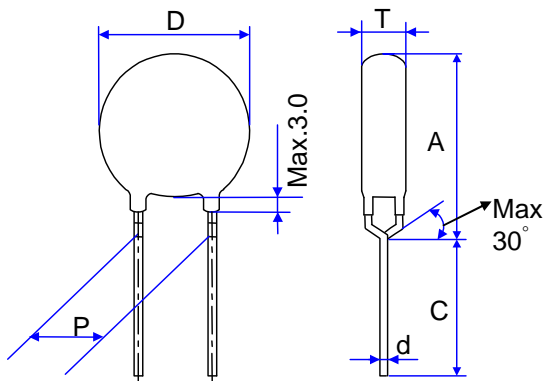
● S Type (Straight lead)



(Unit :mm)

Disc Size	D max.	L min.	d	P.	A max.	T max.
10-V	12.5	26.5	0.8±0.02	7.5±1	15.5	Please refer to the Electrical Characteristics Table

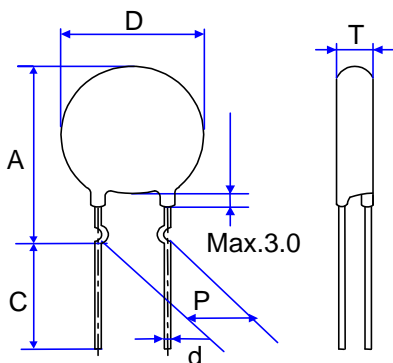
● F Type (Y kink lead)



(Unit :mm)

Disc Size	D max.	C min.	d	P.	A max.	T max.
10-V	12.5	25	0.8±0.02	7.5±1	21	Please refer to the Electrical Characteristics Table

● I Type (Inner kink lead)



(Unit :mm)

Disc Size	D max.	C min.	d	P.	A max.	T max.
10-V	12.5	25	0.8±0.02	7.5±1	20	Please refer to the Electrical Characteristics Table

Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ Electrical Characteristics

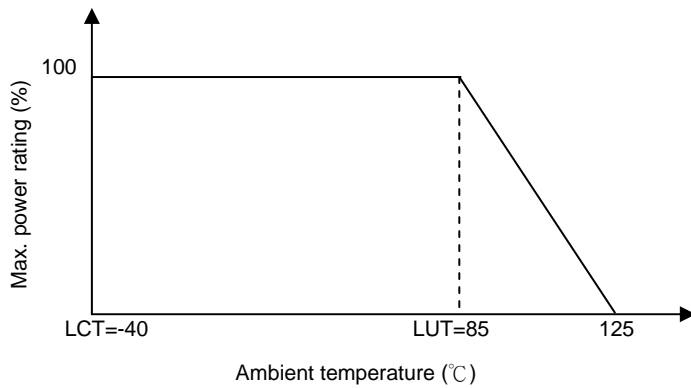
Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)		Max. Energy (10/1000 μ s)	Rated Power	Cap. @1KHz	Thickness		Safety Approvals
	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	1time	2times	W _{max} (J)	P (W)	C (pF)	Min.	Max.	UL1449 3rd
						I _{max} (A)					(mm)		
TVR10201-V	200	130	170	340	25	3500	2500	35	0.4	570	2.9	4.4	√
TVR10221-V	220	140	180	360	25	3500	2500	39	0.4	520	3.0	4.5	√
TVR10241-V	240	150	200	395	25	3500	2500	42	0.4	480	3.1	4.6	√
TVR10271-V	270	175	225	455	25	3500	2500	49	0.4	425	3.3	5.0	√
TVR10301-V	300	195	250	500	25	3500	2500	53	0.4	380	3.5	5.3	√
TVR10331-V	330	215	275	550	25	3500	2500	58	0.4	350	3.8	5.7	√
TVR10361-V	360	230	300	595	25	3500	2500	65	0.4	320	4.0	6.0	√
TVR10391-V	390	250	320	650	25	3500	2500	70	0.4	295	4.2	6.2	√
TVR10431-V	430	275	350	710	25	3500	2500	80	0.4	260	4.3	6.5	√
TVR10471-V	470	300	385	775	25	3500	2500	85	0.4	240	4.4	6.6	√
TVR10511-V	510	320	410	845	25	3500	2500	92	0.4	220	4.6	6.8	√
TVR10561-V	560	350	450	930	25	3500	2500	92	0.4	200	4.7	7.1	√
TVR10621-V	620	395	510	1020	25	3500	2500	95	0.4	180	4.8	7.2	√
TVR10681-V	680	420	560	1120	25	3500	2500	98	0.4	175	4.9	7.4	√
TVR10751-V	750	465	615	1235	25	3500	2500	100	0.4	160	5.1	7.6	√
TVR10821-V	820	510	670	1355	25	3500	2500	110	0.4	150	5.2	7.8	√
TVR10911-V	910	550	745	1500	25	3500	2500	130	0.4	130	5.3	8.0	√
TVR10102-V	1000	625	825	1650	25	3500	2500	140	0.4	120	5.3	8.3	√
TVR10112-V	1100	680	895	1815	25	3500	2500	155	0.4	110	5.7	8.6	√

Metal Oxide Varistor : TVR-V Series

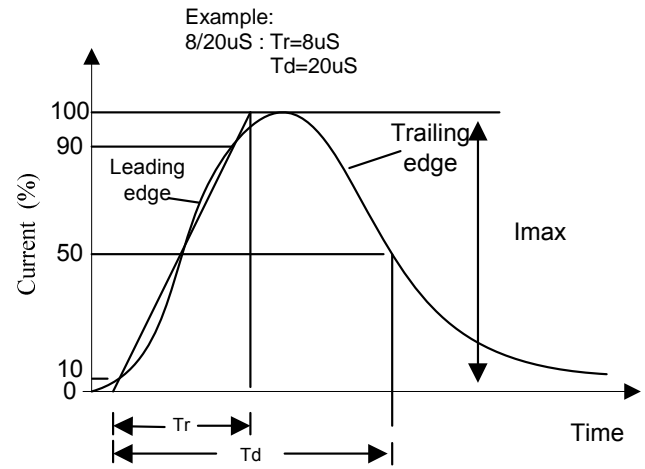


Most compact series compliant with UL1449 3rd SPD Type 3

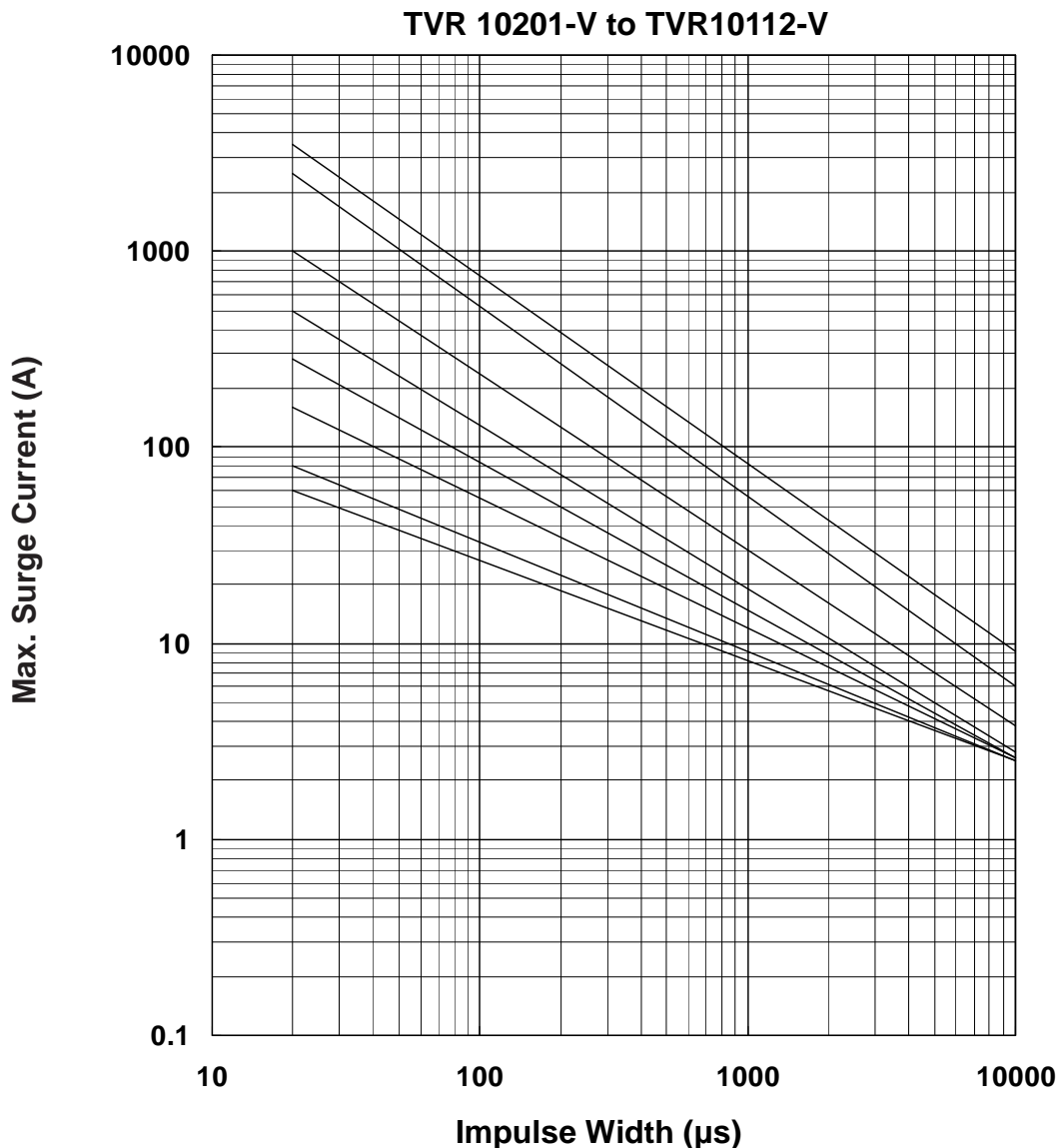
Power Derating Curve



Surge Current Standard Waveform



Max. Surge Current Derating Curves



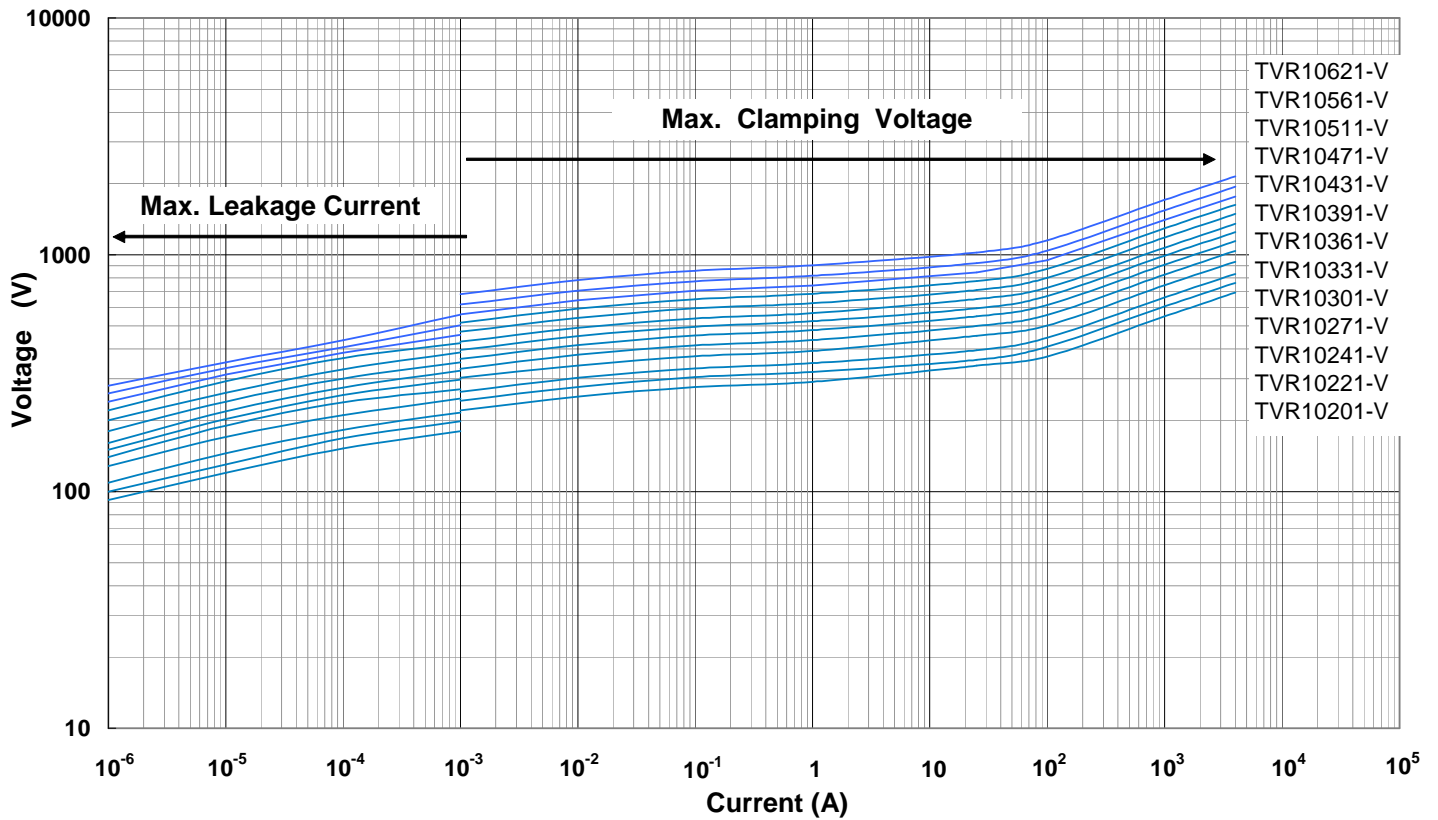
Metal Oxide Varistor : TVR-V Series



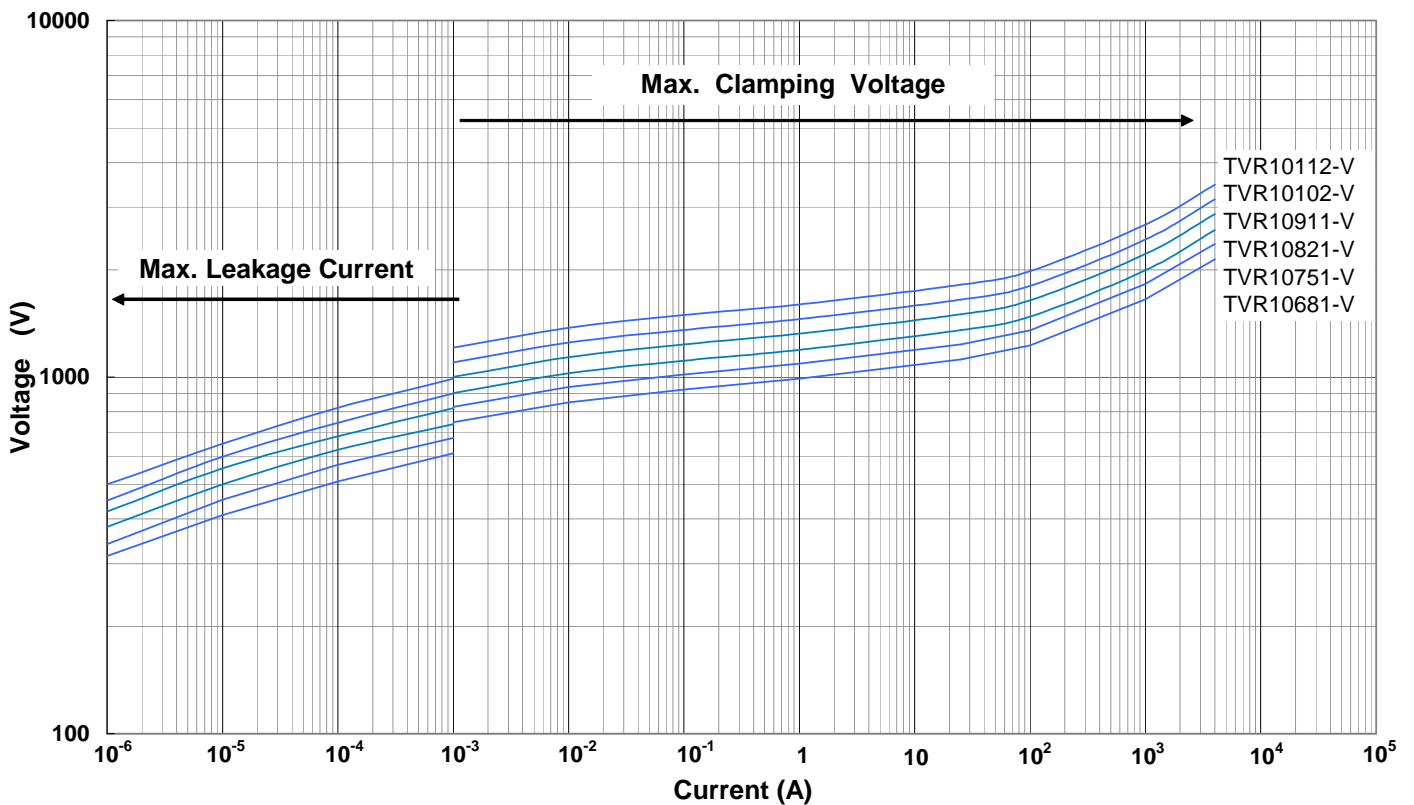
Most compact series compliant with UL1449 3rd SPD Type 3

● Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR 10201-V to TVR10621-V)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 10681-V to TVR10112-V)



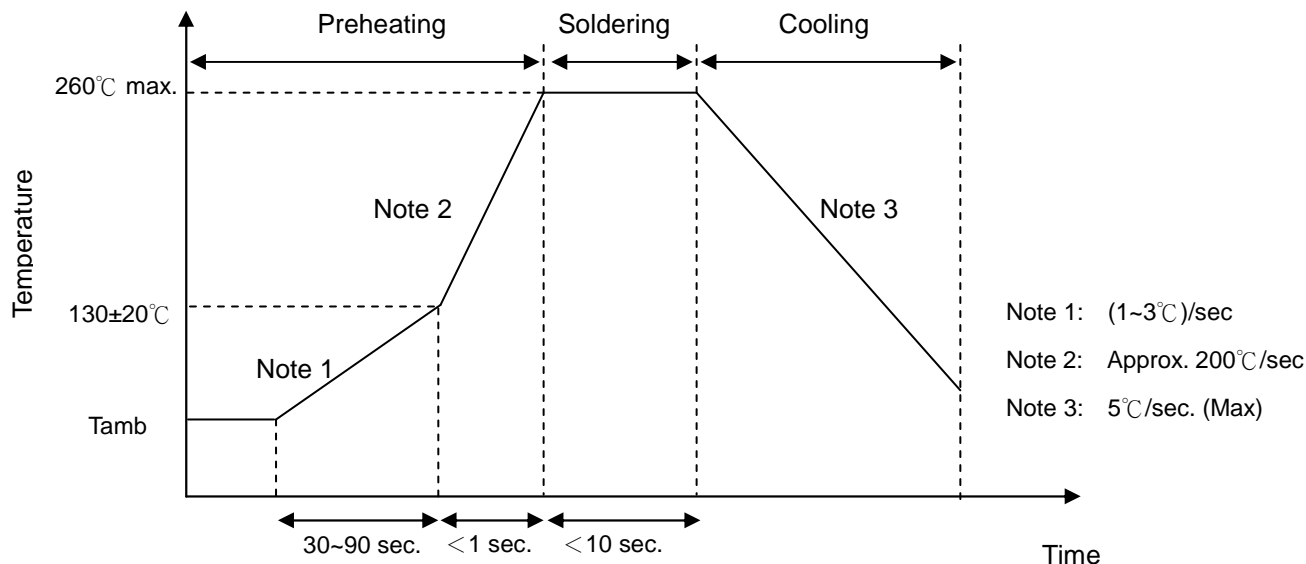
Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ Soldering Recommendation

● Wave Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

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

Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Tensile Strength of Terminals	IEC60068-2-21	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table style="width:100%; border:none;"> <tr> <td style="text-align:center; border-bottom:1px solid black;">Terminal diameter (mm)</td> <td style="text-align:center; border-bottom:1px solid black;">Force (Kg)</td> </tr> <tr> <td style="text-align:center;">0.5<d≤0.8</td> <td style="text-align:center;">1.0</td> </tr> <tr> <td style="text-align:center;">0.8<d≤1.25</td> <td style="text-align:center;">2.0</td> </tr> <tr> <td style="text-align:center;">1.25<d</td> <td style="text-align:center;">4.0</td> </tr> </table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	1.25<d	4.0	No visible damage ΔV/V _{1mA} ≤5%							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	1.0																	
0.8<d≤1.25	2.0																	
1.25<d	4.0																	
Bending Strength of Terminals	IEC 60068-2-21	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 style="width:100%; border:none;"> <tr> <td style="text-align:center; border-bottom:1px solid black;">Terminal diameter (mm)</td> <td style="text-align:center; border-bottom:1px solid black;">Force (Kg)</td> </tr> <tr> <td style="text-align:center;">0.5<d≤0.8</td> <td style="text-align:center;">0.5</td> </tr> <tr> <td style="text-align:center;">0.8<d≤1.25</td> <td style="text-align:center;">1.0</td> </tr> <tr> <td style="text-align:center;">1.25<d</td> <td style="text-align:center;">2.0</td> </tr> </table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	1.25<d	2.0	No visible damage ΔV/V _{1mA} ≤5%							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	0.5																	
0.8<d≤1.25	1.0																	
1.25<d	2.0																	
Vibration	IEC 1051-1	Frequency range: 10 ~ 55 Hz Amplitude: 0.75mm or 98 m/s ² Direction:3 mutually perpendicular directions ,2hrs each.	ΔV/V _{1mA} ≤5% No visible damage															
Solderability	IEC 60068-2-20	245 ± 3 °C , 3 ± 0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	260 ± 3 °C , 10 ± 1 sec	ΔV/V _{1mA} ≤ 5 % No visible damage															
High Temperature Storage	IEC 60068-2-2	125±5°C x 1000± 24 hrs	ΔV/V _{1mA} ≤ 5 % No visible damage															
Damp Heat, Steady State	IEC 60068-2-3	a. 40±2°C, 90 ~ 95 % RH, 1344HRS b. 40±2°C, 90 ~ 95 % RH, at 10%Vdc, 1344 hrs	No visible damage ΔV/V _{1mA} ≤ 5 % Insulation Resistance ≥ 100MΩ															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td style="text-align:center;">1</td> <td style="text-align:center;">-40±3</td> <td style="text-align:center;">30±3</td> </tr> <tr> <td style="text-align:center;">2</td> <td style="text-align:center;">Room temperature</td> <td style="text-align:center;">5±3</td> </tr> <tr> <td style="text-align:center;">3</td> <td style="text-align:center;">85±2</td> <td style="text-align:center;">30±3</td> </tr> <tr> <td style="text-align:center;">4</td> <td style="text-align:center;">Room temperature</td> <td style="text-align:center;">5±3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40±3	30±3	2	Room temperature	5±3	3	85±2	30±3	4	Room temperature	5±3	ΔV/V _{1mA} ≤ 5 % No visible damage
Step	Temperature (°C)	Period (minutes)																
1	-40±3	30±3																
2	Room temperature	5±3																
3	85±2	30±3																
4	Room temperature	5±3																
Endurance at Upper Category Temperature	IEC61051-4.20	85 ± 2 °C , 1000 ± 24 hrs, at VDC or Vrms(Max. Operating Voltage)	ΔV/V _{1mA} ≤ 10 % No visible damage															
Low Temperature Storage (Optional)	CECC42000	-40±5°C , 1000±24 hrs	ΔV/V _{1mA} ≤ 5% No visible damage															
8/20μs Surge Life	CECC42000	10,000 pulses(8/20μs) , unipolar, interval 10 secs, amplitude corr. to max. Surge current derating curves for 20μs	ΔV _{1mA} /V _{1mA} ≤ 10 % No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA} \text{ at } 85^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{60} \times 100 (\% / ^{\circ}\text{C})$ $\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$	-0.05 ≤ TC ≤ 0.05(%/°C)															

Metal Oxide Varistor : TVR-V Series

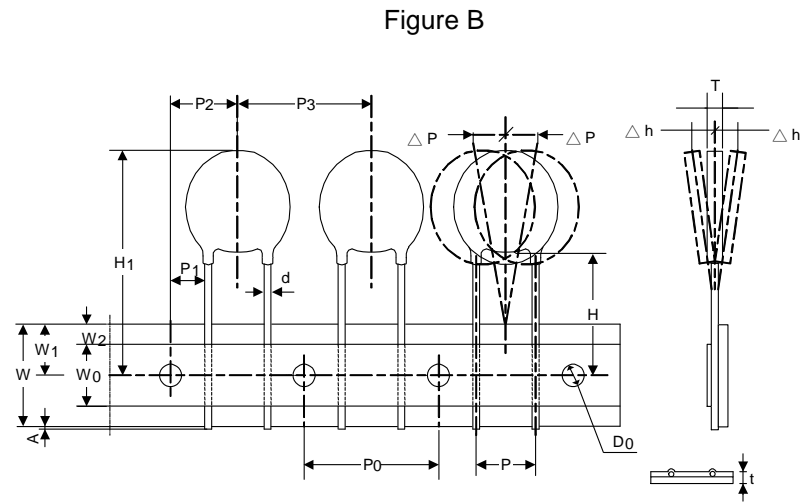
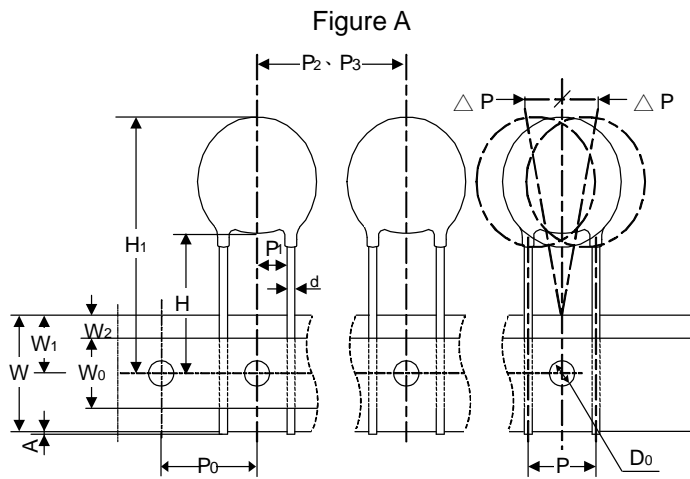


Most compact series compliant with UL1449 3rd SPD Type 3

Item	Standard	Test conditions / Methods	Specifications
10/1000 μ S Surge Life	CECC42000	10/1000 μ s waveform, 10 surge currents, unipolar, interval 2mins, amplitude corr. to max. surge current derating curves for 1000 μ S	$ \Delta V1mA/V1mA \leq 10\%$ No visible damage
Surge Endurance	Combination Waveform	6KV/3KA, 15times	No visible damage
Voltage Proof	IEC61051-4.8	Metal balls method, 2500 Vac 1 min	No visible damage

■ Packaging

- Taping Specification
S Type (Straight lead)



(Unit: mm)

Taping Code	Disc Size	P ₀	P	P ₁	P ₂	P ₃	H	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	A	D ₀	t	Figure
A (P ₀ =12.7)	10	12.7	7.5	3.35	12.7	12.7	18	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	10	15	7.5	3.35	7.5	15	18	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B

Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

I Type (Inner kink lead)

Figure A

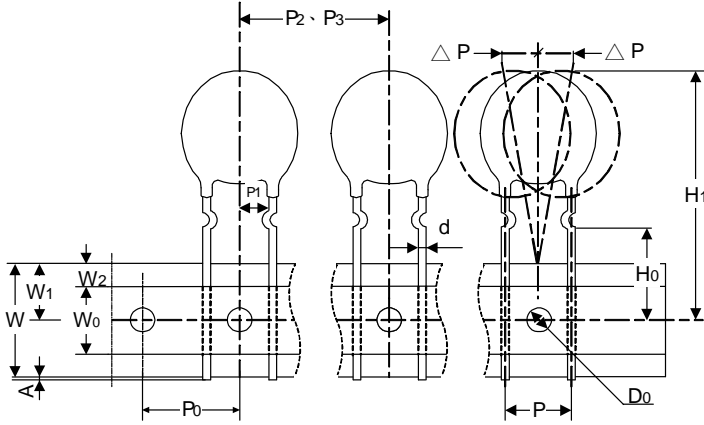
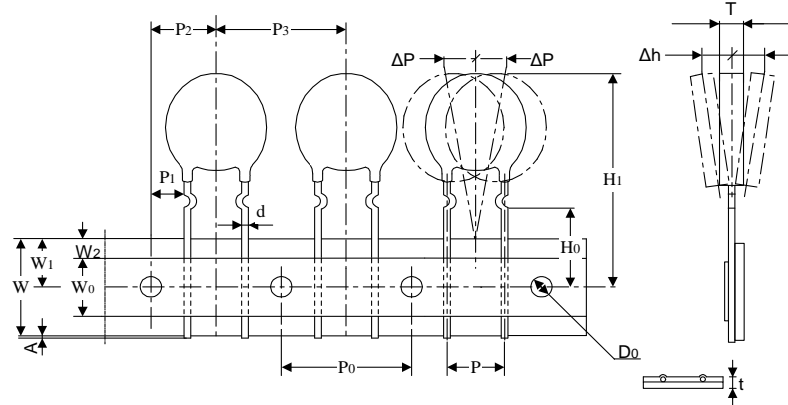


Figure B



(Unit: mm)

Taping Code	Disc	P ₀	P	P ₁	P ₂	P ₃	H ₀	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	A	D ₀	t	Figure
	Size	±0.3	±1	±1	±1.3	±1	±0.5	Max.	±0.02	±1	+0.75/ -0.5	Max.	±1	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ =12.7)	10	12.7	7.5	3.35	12.7	12.7	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	10	15	7.5	3.35	7.5	15	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B

F Type (Y kink lead)

Figure A

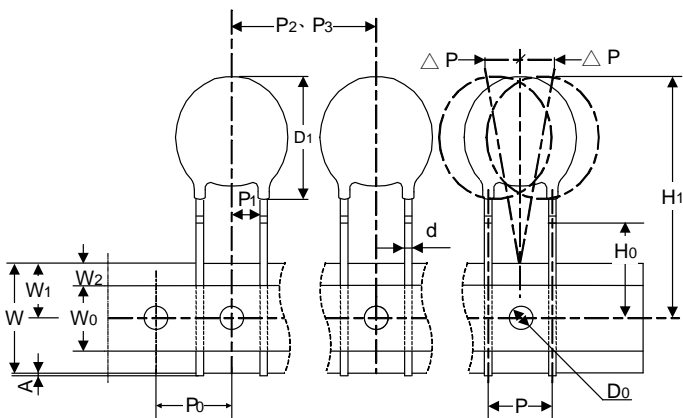
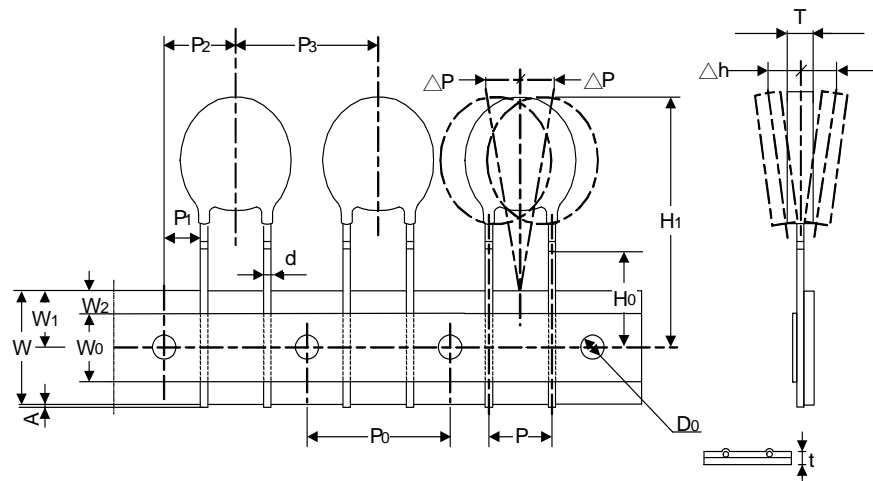


Figure B



Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

(Unit: mm)

Taping Code	Disc Size	P ₀	P	P ₁	P ₂	P ₃	H	H ₁	d	W ₀	W ₁	W ₂	W	△P	△h	A	D ₀	t	Figure
	±0.3	±1	±1	±1.3	±1	±0.5	Max.	±0.02	±1	+0.75/ -0.5	Max.	±1	Max.	Max.	Max.	±0.2	±0.2		
A (P ₀ =12.7)	10	12.7	7.5	3.35	12.7	12.7	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	10	15	7.5	3.35	7.5	15	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B

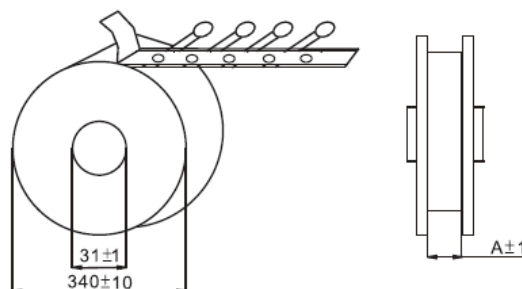
Quantity

Bulk Packing

Disc Size/mm	Quantity pcs/ bag
φ 10-V	200

Reel Packing

Disc Size/mm	Quantity pcs/reel
φ 10(201~911)-V	1000
φ 10(102~112)-V	750

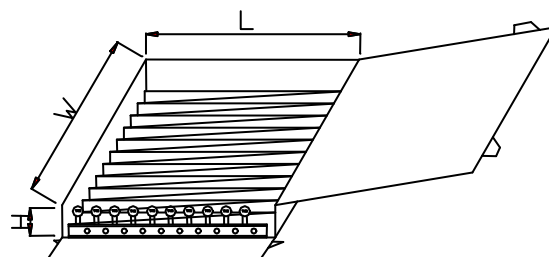


(Unit:mm)

A	46	55
Disc Size	φ 05 ~ φ 14	φ 20

Ammo Packing

Disc Size/mm	Quantity pcs/ box
φ 10(201~361)-V	750
φ 10(391~621)-V	500
φ 10(681~112)-V	400



Disc Size	W±5	L±5	H±5
φ07~φ14	348	275	50
	348	185	50
φ20	348	275	60
	348	185	60

Metal Oxide Varistor : TVR-V Series



Most compact series compliant with UL1449 3rd SPD Type 3

■ 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.