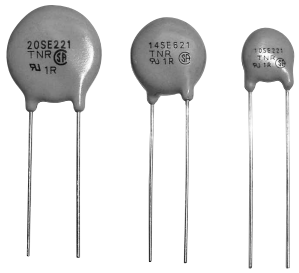
METAL OXIDE VARISTORS TNR®

SE Series



When the surge energy much higher than the rated maximum energy is applied to the varistors, it may blow up and catch fire.
Our newly developed TNR SE series is to prevent from being caught fire even very high surge energy is applied.
Thus electric appliance using our TNR SE series can be much safer.

◆FEATURES

- ●Newly developed non-flammable material (Harogen Free) is used for outer coating.
- ●The new outer coating will meet UL flammability test.
- ●At the over voltage test, the new material shall deter burning caused by the high temperature, arc and the large surge current when TNR shall blow up.
- ●General specifications are same as that of V series, large surge capability TNR.

◆APPLICATIONS

- ●Protection for semiconductors from over voltage.
- ●Protection for electronic instruments from lightning surge.
- ●Absorption of on-off surge from motors and relays.

Operating Temperature Range: -40 to +85℃
Storage Temperature Range: -50 to +125℃

◆PART NUMBERING SYSTEM

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
T	N	D			S	E				K	B						

Design Code
Lead Forming / Taping
Packing Style⑦
Varistor Volt. Tolerance⑥
Varistor Voltage⑤
Series④
Element Diameter③
Product Form②
Category①

①Category	
T	Metal Oxide Varistors TNR

②Product Form	
ND	DISK Type

③Element Diameter	
10	ϕ10mm
14	ϕ14mm
20	ϕ20mm

④Series	
SE	SE Series

⑤Varistor Voltage
The first two digits are significant figures and the third one denotes the number of following zeros.

⑥Varistor Volt. Tolerance	
K	±10%

⑦Packing Style	
B	Bulk
T	Taping

- ●UL recognized
  UL1449 : FIle E95427
  UL1414 : File E65426
- ●CSA recognized
  CSA CLASS 2221 01 : File LR 97864
- ●VDE recognized
  CECC 42000, CECC 42200, CECC 42201 : File 118623

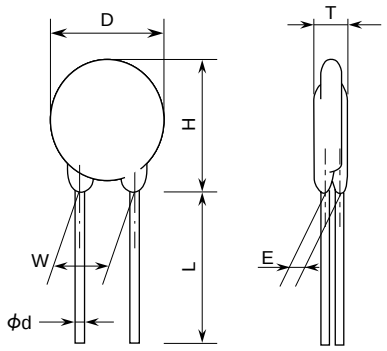
CAT. No. E1006M

SE Series

◆RATINGS AND CHARACTERISTICS

Part Number	Previous Part Number (Just for your reference)	Maximum Ratings					Max. Clamping Voltage		Capacitance Typical @1kHz	Varistor Voltage V1mA
		Max. Allowable Voltage		Max. Peak Current	Max. Energy	Rated Wattage				
		AC (Vrms)	DC (V)	8/20μs(A)	2ms(J)	(W)	(A)	(V)	(pF)	(V)
TND10SE221KB00AAA0	TNR10SE221K	140	180	3,500A/1 time	27.5	0.4	25	360	450	220 (198~242)
TND10SE241KB00AAA0	TNR10SE241K	150	200		30			395	400	240 (216~264)
TND10SE271KB00AAA0	TNR10SE271K	175	225		35			455	350	270 (247~303)
TND10SE431KB00AAA0	TNR10SE431K	275	350	2,500A/2 times	55			710	240	430 (387~473)
TND10SE471KB00AAA0	TNR10SE471K	300	385		60			775	220	470 (423~517)
TND10SE511KB00AAA0	TNR10SE511K	320	410		67			845	210	510 (459~561)
TND10SE621KB00AAA0	TNR10SE621K	385	505		67			1,025	180	620 (558~682)
TND14SE221KB00AAA0	TNR14SE221K	140	180	6,000A/1 time	55	0.6	50	360	850	220 (198~242)
TND14SE241KB00AAA0	TNR14SE241K	150	200		60			395	800	240 (216~264)
TND14SE271KB00AAA0	TNR14SE271K	175	225		70			455	700	270 (247~303)
TND14SE431KB00AAA0	TNR14SE431K	275	350	5,000A/2 times	110			710	460	430 (387~473)
TND14SE471KB00AAA0	TNR14SE471K	300	385		125			775	420	470 (423~517)
TND14SE511KB00AAA0	TNR14SE511K	320	410		136			845	390	510 (459~561)
TND14SE621KB00AAA0	TNR14SE621K	385	505	5,000A/1 time 4,500A/2 times	136			1,025	330	620 (558~682)
TND20SE221KB00AAA0	TNR20SE221K	140	180	10,000A/1 time	110	1.0	100	360	2,500	220 (198~242)
TND20SE241KB00AAA0	TNR20SE241K	150	200		120			395	2,300	240 (216~264)
TND20SE271KB00AAA0	TNR20SE271K	175	225		135			455	2,000	270 (247~303)
TND20SE431KB00AAA0	TNR20SE431K	275	350	7,000A/2 times	215			710	1,300	430 (387~473)
TND20SE471KB00AAA0	TNR20SE471K	300	385		250			775	1,200	470 (423~517)
TND20SE511KB00AAA0	TNR20SE511K	320	410		273			845	1,100	510 (459~561)
TND20SE621KB00AAA0	TNR20SE621K	385	505	7,500A/1 time 6,500A/2 times	273			1,025	900	620 (558~682)

◆DIMENSIONS [mm]



Part Number	D Max.	H Max.	T Max.	L Min.	ϕd ±0.05	W ±1.0	E ±1.0
TND10SE221K	13.0	17.5	6.9	20	0.8	7.5	2.0
TND10SE241K							2.1
TND10SE271K							2.3
TND10SE431K			8.2				3.1
TND10SE471K							3.3
TND10SE511K							3.5
TND10SE621K	14.0	18.5	11.5				4.2
TND14SE221K	17.5	22.0	6.9	20	0.8	7.5	2.0
TND14SE241K							2.1
TND14SE271K							2.3
TND14SE431K			8.2				3.1
TND14SE471K							3.3
TND14SE511K							3.5
TND14SE621K	18.5	24.0	11.5				4.2
TND20SE221K	22.5	27.5	7.4	20	0.8	10.0	2.2
TND20SE241K							2.3
TND20SE271K							2.5
TND20SE431K			8.7				3.3
TND20SE471K							3.5
TND20SE511K							3.7
TND20SE621K	24.5	29.5	12.0				4.4

SE Series

◆V-I CURVE

V-I characteristics is same as that of V series.
Please see V-I Curve of V series.

CROSS REFERENCE TABLE

TNR SE SERIES	TNR V SERIES
TND10SE221K	TND10V-221K
TND10SE241K	TND10V-241K
TND10SE271K	TND10V-271K
TND10SE431K	TND10V-431K
TND10SE471K	TND10V-471K
TND10SE511K	TND10V-511K
TND10SE621K	TND10V-621K
TND14SE221K	TND14V-221K
TND14SE241K	TND14V-241K
TND14SE271K	TND14V-271K
TND14SE431K	TND14V-431K
TND14SE471K	TND14V-471K
TND14SE511K	TND14V-511K
TND14SE621K	TND14V-621K
TND20SE221K	TND20V-221K
TND20SE241K	TND20V-241K
TND20SE271K	TND20V-271K
TND20SE431K	TND20V-431K
TND20SE471K	TND20V-471K
TND20SE511K	TND20V-511K
TND20SE621K	TND20V-621K

SE Series

◆GENERAL SPECIFICATIONS

Operating Temperature Range: -40 to +85℃
Storage Temperature Range: -50 to +125℃

Item	Test Conditions	Specifications
Standard Test Condition	20±5℃, 65±20% RH unless specified. However, if it does not affect test result, the condition can be 20±15℃, 65±20% RH also.	
Varistor Voltage	The voltage between the two terminals measured at 1mA DC is called Varistor Voltage. The measurement shall be made as fast as possible to aviod heat effection.	Satisfy the specification
Maximum Allowable Voltage	Maximum continuous AC voltage (50 to 60Hz AC) and maximum DC voltage which can be applided.	Satisfy the specification
Maximum Peak Surge Current	Maximum surge current (8/20μsec. pulse wave to be applied once, or twice, 2 minute apart) for varistor voltage change within ±10% of the initial value.	Satisfy the specification
Energy Rating	Maximun energy (2msec. square wave to be applied once) for varistor voltage change within ±10% of the initial value.	Satisfy the specification
Rated Wattage	Maximum power (50 to 60Hz AC power to be applied for 1,000 hours at 85±2℃) for varistor voltage change within ±10% of the initial value.	Satisfy the specification
Maximum Clamping Voltage	Maximum voltage across varistor when 8/20μSec. rated current surge is applied.	Satisfy the specification
Capacitance	Varistor's capacitance at 1kHz, standard test condition.	For reference only.
Voltage Temparature Coefficient	$\frac{\text{V1mA at 85℃} - \text{V1mA at 25℃}}{\text{V1mA at 25℃}} \times \frac{1}{60} \times 100\ (\%/℃)$ V1mA : Actual Varistor Voltage	Within ±0.05%/℃
Insulation	Short circuit the two leads of varistor, and put the varistor body into lead balls (1.6mm diameter) leaving 2mm epoxy coating outside. Then, apply 2.5kVrms between the leads and the lead balls for 60±5 seconds.	The varistor shall withstand with no abnormality.

◆RELIABILITY CHARACTERISTICS

Item	Test Conditions	Specifications
Heat Cycle	Subject varistor to the following tempmrature cycles. -40℃ for 30 minutes→Normal room temperature for 10 minutes→85℃ for 30 minutes→Normal room temperature for 10 minutes. This completes one cycle. The cycle shall be repeated 50 times total. After the cycles, the varistor shall be stored at normal room temperature for one hour. Then check the varistor voltage and the appearance.	ΔV1mA ≦±5% No appearance abnormality.
High Temperature Exposure	Store varistor at 125℃ for 1,000 hours. After that, store the varistor at normal room temperature for one hour. Then check the varistor voltage.	ΔV1mA ≦±5%
Humidity Resistivity	Store at 40C, 90 to 95% RH for 1,000 hours. After that, store the varistor at normal room temperature for one hour. Then cheek the varistor voltage.	ΔV1mA ≦±5%
High Temperature Operation	Apply maximum applied voltage to varistor at 85℃ for 1,000 hours. After that, store the varistor at normal room temperature for one hour. Then check the varistor voltage.	ΔV1mA ≦±10%

SE Series

◆MECHANICAL CHARACTERISTICS

Item	Test Conditions	Specifications
Soldering Heat Resistivity	Store varistor at normal room temperature. Dip the varistor leads to solder, at 350±10℃ for 3^{+1}_{0} seconds, up to 2.0～2.5 mm from the varistor body. After that, store the varistor at normal room temperature for 30 miniutes, and measure the varistor voltage.	ΔV1mA ≦±5% Vc : Actual varistor voltage No mechanical damages
Solderability	Dip varistor leads to methanol solutin (JIS K 1501, about 25%) of rosin (JIS Z 5902) for 5 to 10 seconds. Then, dip the lead to solder (JIS Z 3282 H60A or H63A) at 225 to 240℃, up to 2.0～2.5mm from the varistor body for 5±0.5 seconds. Then, check the solderability.	At least, 95% of the surface dipped to solder shall be coverd by new solder.
Lead Pull Strength	Fix varistor body, and suspend specified weight toward direction of lead axis. Lead diameter: ϕ0.6mm, ϕ0.8mm — Force: 10 N	No abnormality such as disconnection. ΔV1mA ≦±5%
Lead Bend Strength	The varistor shall be secured with its terminal kept vertical and the force specified below shall be applied in the axial direction. The terminal shall gradually be bend by 90 in one direction then back to original position. The damage of the terminal shall be visually examined. Lead diameter: ϕ0.6mm, ϕ0.8mm — Force: 2.5 N	No remarkable damage as remarkable the inner ceramic element or terminal open.
Vibration Resistivity	Mount varistor body on vibrator, and conduct follwing vibration test. Peak-to-Peak amplitude : 1.5mm Vibration frequency range : 10Hz to 55Hz Sweeping time: Approximately one minute for 10Hz →55Hz →10Hz Direction and duration of vibration : Three directions of X, Y and Z. Two hours each. Six hours total.	No remarkable appearance abnormality. ΔV1mA ±5%
Flammability test	The varistor shall be subjected to 60 second applications of test flame. Burner : Bunsen gas burner 9000kcal / m^3 Diameter of flame nozzle : ϕ9.5 mm Position : The specimen shall be fixed horizontal. Point of application shall be approximately center of the specimen.	No catching fire, and no flaming drops.