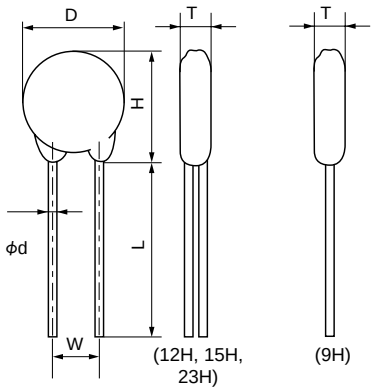
TNR® H SERIES AND HP SERIES

High Energy, Low Varistor Voltage Series

● H Series

Model Number	Maximum Applied Voltage			Maximum Energy (20mSec.)	Maximum Clamping Voltage		Varistor Voltage at 1mA DC
	Continuous		5 Minutes				
	ACrms(V)	DC(V)	DC(V)	(J)	(A)	(V)	(V)
TNR9H220K	12	16	24			43	22 (20～24)
TNR9H270K	15	19	29			53	27 (24～30)
TNR9H330K	18	24	36	5	2	65	33 (30～36)
TNR9H390K	22	28	42			77	39 (35～43)
TNR9H470K	26	34	50			93	47 (42～52)
TNR12H220K	12	16	24			43	22 (20～24)
TNR12H270K	15	19	29			53	27 (24～30)
TNR12H330K	18	24	36	10	5	65	33 (30～36)
TNR12H390K	22	28	42			77	39 (35～43)
TNR12H470K	26	34	50			93	47 (42～52)
TNR15H220K	12	16	24			43	22 (20～24)
TNR15H270K	15	19	29			53	27 (24～30)
TNR15H330K	18	24	36	20	10	65	33 (30～36)
TNR15H390K	22	28	42			77	39 (35～43)
TNR15H470K	26	34	50			93	47 (42～52)
TNR23H220K	12	16	24			43	22 (20～24)
TNR23H270K	15	19	29			53	27 (24～30)
TNR23H330K	18	24	36	40	25	65	33 (30～36)
TNR23H390K	22	28	42			77	39 (35～43)
TNR23H470K	26	34	50			93	47 (42～52)

Operating Temperature Range – 40 ~ +125°C Storage Temperature Range – 50 ~+150°C



Type	D Max.	H Max.	W ±1	L Min.	ϕd
9H	10.0	14.0	5.0	25.0	0.6
12H	14.0	17.0	7.5	25.0	0.8
15H	17.0	20.0	7.5	25.0	0.8
23H	24.0	28.0	10.0	25.0	0.8

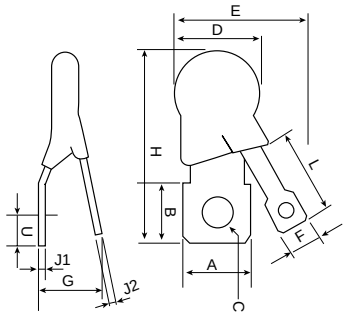
(mm)

	T Max.
220K~ 330K	6.0
390K~ 470K	8.0

● HP Series

Model Number	Maximum Applied Voltage			Maximum Energy (200ms)	Maximum Clamping Voltage		Varistor Voltage at 1mA DC
	Continuous		5 Minutes				
	ACrms(V)	DC(V)	DC(V)	(J)	(A)	(V)	(V)
TNR12HP220K	12	16	24			43	22 (20～24)
TNR12HP270K	15	19	29			53	27 (24～30)
TNR12HP330K	18	24	36	100	5	65	33 (30～36)
TNR12HP390K	22	28	42			77	39 (35～43)
TNR12HP470K	26	34	50			93	47 (42～52)
TNR15HP220K	12	16	24			43	22 (20～24)
TNR15HP270K	15	19	29			53	27 (24～30)
TNR15HP330K	18	24	36	200	10	65	33 (30～36)
TNR15HP390K	22	28	42			77	39 (35～43)
TNR15HP470K	26	34	50			93	47 (42～52)
TNR23HP220K	12	16	24			43	22 (20～24)
TNR23HP270K	15	19	29			53	27 (24～30)
TNR23HP330K	18	24	36	400	25	65	33 (30～36)
TNR23HP390K	22	28	42			77	39 (35～43)
TNR23HP470K	26	34	50			93	47 (42～52)

Operating Temperature Range – 40 ~ +150°C Storage Temperature Range – 50 ~ +150°C

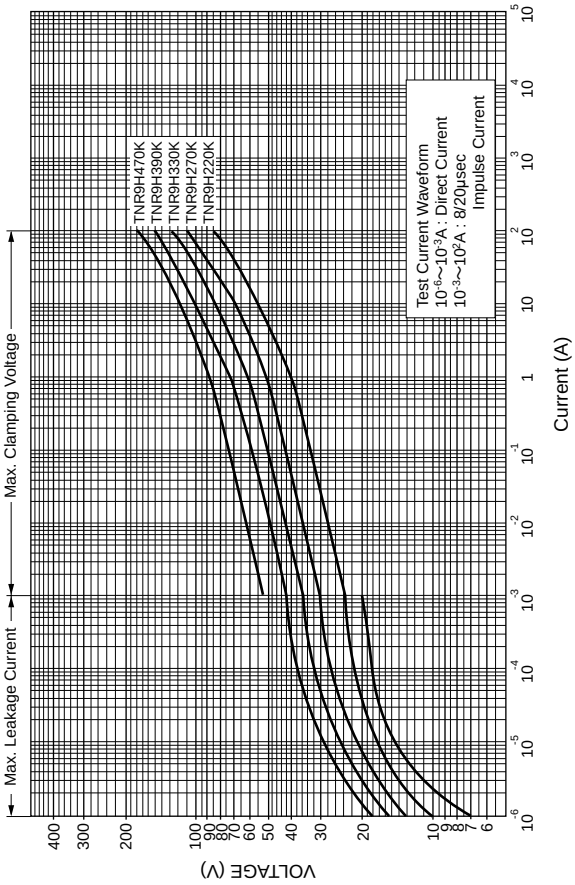


	12HP	15HP	23HP
A	10	12	14
B	10	12	14
ϕC	5.0	5.5	6.5
D	15 max.	18 max.	25 max.
E	23 max.	25 max.	30 max.
F	6.4	6.4	6.4
G	17 max.	20 max.	25 max.
H	32 max.	37 max.	45 max.
J1	0.8	0.8	0.8
J2	0.8	0.8	0.8
L	8 min.	9 min.	10 min.
U	5.0	6.0	7.0

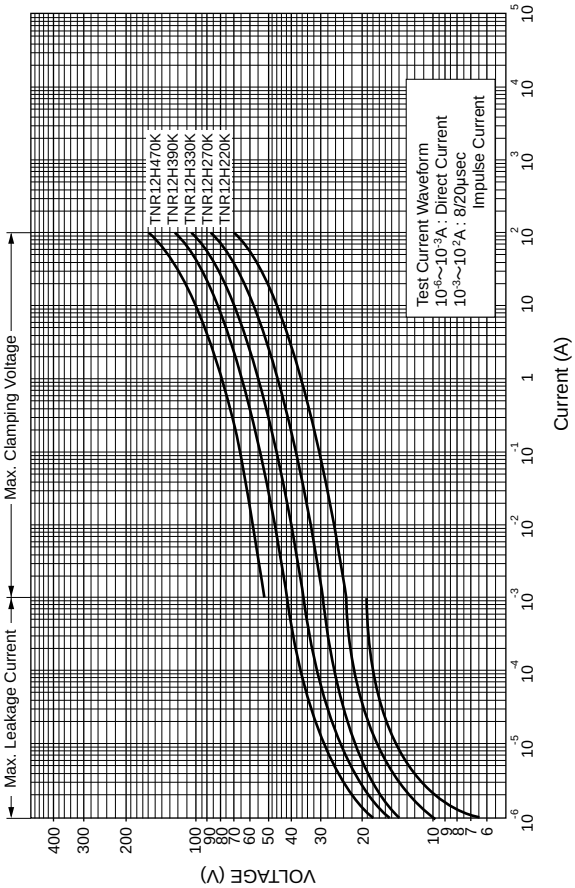
Unit : mm

CAT. No. E1006I

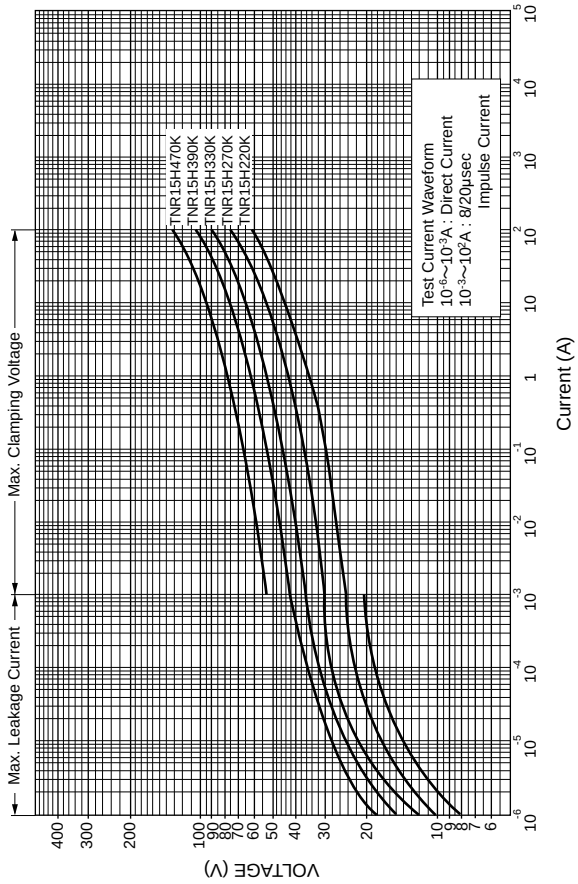
● V-I Curve (TNR9H220K~9H470K)



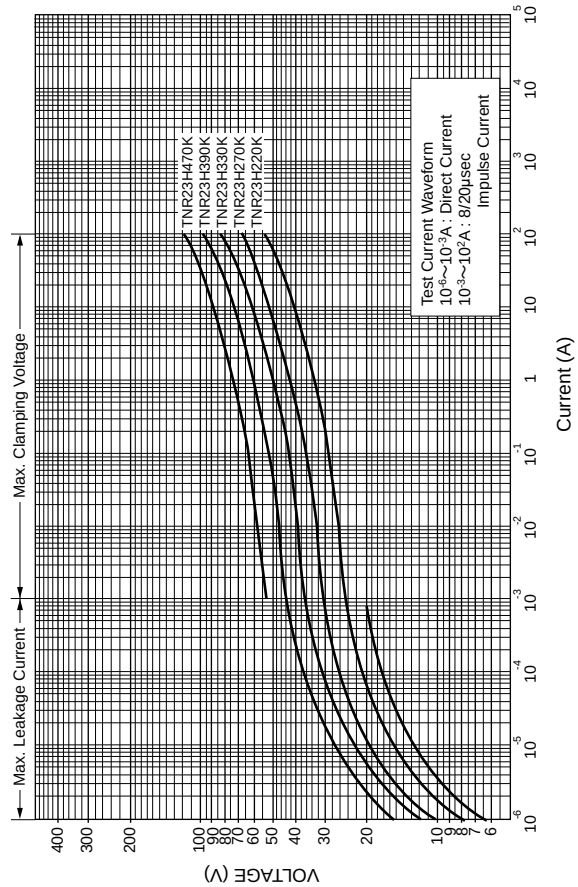
● 12H220K~470K



● 15H220K~470K



● 23H220K~470K



● General Specifications of TNR H Series

Operating temperature range : – 40℃ to +125℃ Storage temperature range : – 50℃ to +150℃

Item	Test Conditions	Specifications
Standard Test Condition	Ambient temperature : 20 ± 5℃ Relative humidity : 65 ± 20% RH if there is any doubt about the results, measurement shall be made within the following limits. Ambient temperature : 20 ± 5℃ Relative humidity : 65 ± 20% RH	———
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 avoid heat effection.	Satisfy the specification.
Maximum Allowable Voltage	Maximum continuous sinusoidal RMS voltage or Maximum continuous DC voltage which may be applided.	Refer to RATINGS.
Maximum applicable voltage for a short period (5 minutes)	Maximum DC voltage to be applied for only 5 minutes.	Refer to RATINGS.
Maximum Clamping Voltage	The maximum voltage between the terminals, measured standard impluse current (8/20 μs).	Satisfy the specification.
Maximum Energy	Maximum energy within the ±10% varistor voltage change when 1 impulse 20 msec long is applied.	Satisfy the specification.
Temparature Coefficient	$\frac{\text{V1mA at 85℃} - \text{V1mA at 25℃}}{\text{V1mA at 25℃}} \times \frac{1}{60} \times 100\ (\%/℃)$	Within ±0.05%/℃

● Mechanical characteristics

Item	Test Conditions	Specifications
Terminal Pull Strength	After gradually applying the force keeping the unit fixed for 10 ± 1 second in axial direction, the damage of the terminals shall be visually examined. Lead diameter: ϕ0.6mm. ϕ0.8mm — Force: 10 N (1.0 kgf)	No remarkable damage
Terminal Bending Strength	The unit shall be secured with its terminal kept vertical and the weight specified below be applied in the axial direction. The terminal shall gradually be bend by 90° in one direction then 90° in the opposite direction, and again back to original position. The damage of the terminal shall be visually examined. Lead diameter: ϕ0.6mm. ϕ0.8mm — Force: 5 N (0.5 kgf)	No remarkable damage
Vibration	After repeatedly applying a single harmonic vibration (amplitude : 0.75mm) double amplitude : 1.5mm with 1 minute vibration frequency cycle (10Hz→500Hz→10Hz) to each three perpendicular directions for 2 hours. Total 6 hours. The devices shall be visually examined.	No remarkable damage
Solderability	Dipping the terminal to a Rosin depth for 5 ~ 10 seconds. After dipping the terminal to a depth of 1.5 ~ 2.0mm from the body in a soldering bath of 230 ± 5℃ for 5 ±0.5 seconds, the terminal shall be visually examined.	75% of the terminals should be covered with solder uniformly.
Resistance to Soldering Heat	The terminal shall be dipped into a soldering bath of 350 ± 10℃ to a depth of 1.5 ~ 2.0mm from the body and be held there for 5^{+1}_{0} seconds. or The terminal shall be dipped into a soldering bath of 260 ± 5℃ to a depth of 1.5 ~ 2.0mm from the body and be held there for 10±1 seconds.	ΔV1mA ≦ ±5% No outstanding damage

● Environmental characteristics

Item	Test Conditions	Specifications
High Temperature Storage (Dry heat)	The specimen shall be subjected 150±2℃ for 1000±12 hours without load.	ΔV1mA ≦±10%
Damp heat (Humidity)	The specimen shall be subjected to 60±2℃, 90 to 95%RH for 1000±12 hours without load.	ΔV1mA ≦±10%
Temperature Cycle	The temperature cycle shown below shall be repeated 50 cycles. –40℃±3℃, 30 minutes←→+150℃±2℃, 30 minutes	ΔV1mA ≦±10% No remarkable damage
High Temperature Operating	The specimen shall be subjected to 125±2℃ with the maximum allowable voltage for 1000 ±12 hours.	ΔV1mA ≦±20%
Damp heat Operating	The specimen shall be subjected to 60±2℃, 90 to 95%RH With the maximum allowable voltage for 1000 ±12 hours.	ΔV1mA ≦±10%

Varistor voltage change of forward direction shall be measured in the test of unipole surge life and DC load life.
Varistor voltage change is measured after stored at Standard Test Conditions for 1 to 2 hours.
Note : For 42V battery line, please contact our sales office.