

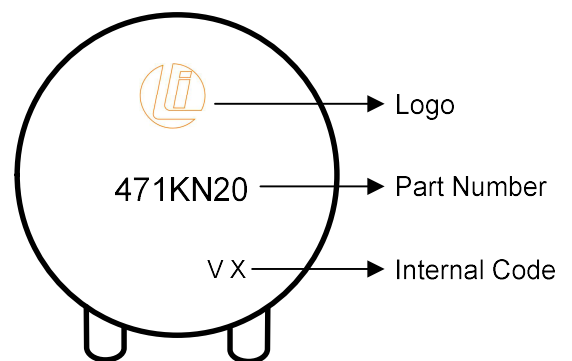
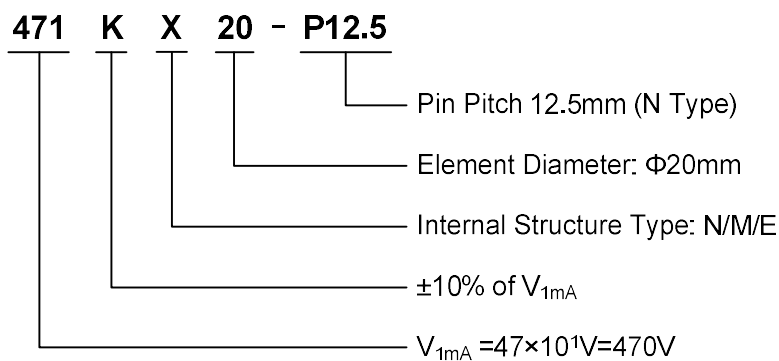
## Features

- TMOV is a thermal protection device with integrated fuse and varistor
- Wide operating voltage ( $V_{1mA}$ ) range from 18V to 1200V
- Fast responding to transient over-voltage
- Large absorbing transient energy capability
- Low clamping ratio and no follow-on current
- Meets MSL level1, per J-STD-020
- Operating temperature:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Storage Temperature:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

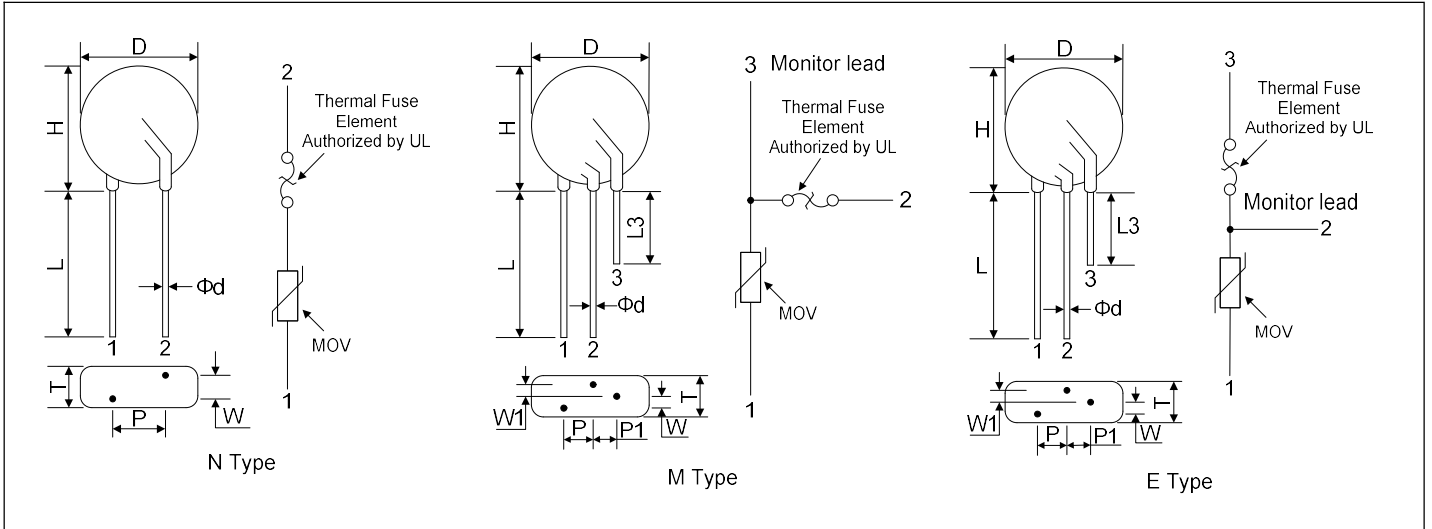
## Applications

- Transistor, diode, IC, SCR or SCR semiconductor protection
- Surge protection in consumer electronics
- Surge protection in industrial electronics
- Surge protection in electronic home appliances, gas and petroleum appliances
- Relay and electromagnetic valve surge absorption
- AC panel protection Modules

## Part Number Code and Marking Code



**Dimensions (Unit: mm)**



Type \ Item	D	H	L	L3	d	P	P1	T	W	W1
<b>20N</b>	≤24.0	≤26.0	≥20.0	-	1.0±0.05	7.5±1.0 12.5±1.0	-	Refer to the following table	-	-
<b>20M / 20E</b>	≤24.0	≤26.0	≥20.0	≥10.0	1.0±0.05	7.5±1.0	5.0±1.0		1.5±1.0	

Model	T	W
180K~121K	≤9.0	≤3.0
151K~391K	≤9.8	≤3.8
431K~621K	≤11.5	≤5.5
681K~911K	≤13.8	≤7.8
102K~122K	≤16.0	≤10.0

## Electrical Characteristics

Model	Varistor Voltage	Maximum Allowable Voltage		Maximum Clamping Voltage		Surge Current	Maximum Energy (10/1000 $\mu$ s)	Maximum Leakage Current @83% of $V_{1mA}$	Rated Power	Typical Capacitance (Reference)
	$V_{1mA}$ (V)	$V_{AC}$ (V)	$V_{DC}$ (V)	$I_P$ (A)	$V_C$ (V)	I (A)	E (J)	$I_R$ ( $\mu$ A)	P (W)	@1KHz (pF)
180KN(M,E)20	18(15~21.6)	11	14	20	36	3000	13	50	0.2	28500
220KN(M,E)20	22(19.5~26)	14	18	20	43	3000	16	50	0.2	18500
270KN(M,E)20	27(24~31)	17	22	20	53	3000	19	50	0.2	13000
330KN(M,E)20	33(29.5~36.5)	20	26	20	65	3000	24	50	0.2	11500
390KN(M,E)20	39(35~43)	25	31	20	77	3000	28	50	0.2	8500
470KN(M,E)20	47(42~52)	30	38	20	93	5000	34	50	0.2	7400
560KN(M,E)20	56(50~62)	35	45	20	110	5000	41	50	0.2	6500
680KN(M,E)20	68(61~75)	40	56	20	135	5000	49	50	0.2	5800
820KN(M,E)20	82(74~90)	50	65	100	155	6500	56	35	1.0	4900
101KN(M,E)20	100(90~110)	60	85	100	165	6500	70	35	1.0	4000
121KN(M,E)20	120(108~132)	75	100	100	200	6500	85	35	1.0	3300
151KN(M,E)20	150(135~165)	95	125	100	250	10000	100	35	1.0	2700
181KN(M,E)20	180(162~198)	115	150	100	300	10000	110	35	1.0	2200
201KN(M,E)20	200(185~225)	130	170	100	340	10000	140	35	1.0	2000
221KN(M,E)20	220(198~242)	140	180	100	365	10000	155	35	1.0	1800
241KN(M,E)20	240(216~264)	150	200	100	395	10000	170	35	1.0	1650
271KN(M,E)20	270(243~297)	175	225	100	455	10000	190	35	1.0	1500
301KN(M,E)20	300(270~330)	190	250	100	500	10000	205	35	1.0	1300
331KN(M,E)20	330(297~363)	210	275	100	550	10000	215	35	1.0	1200
361KN(M,E)20	360(324~396)	230	300	100	595	10000	225	35	1.0	1100
391KN(M,E)20	390(351~429)	250	320	100	650	10000	240	35	1.0	1000
431KN(M,E)20	430(387~473)	275	350	100	710	10000	270	35	1.0	930
471KN(M,E)20	470(423~517)	300	385	100	775	10000	350	35	1.0	850
511KN(M,E)20	510(459~561)	320	415	100	845	10000	380	35	1.0	780
561KN(M,E)20	560(504~616)	350	460	100	925	10000	400	35	1.0	710
621KN(M,E)20	620(558~682)	385	505	100	1025	10000	425	35	1.0	650
681KN(M,E)20	680(612~748)	420	560	100	1120	10000	435	35	1.0	600
751KN(M,E)20	750(675~825)	460	615	100	1240	10000	455	35	1.0	530
781KN(M,E)20	780(702~858)	485	640	100	1290	10000	461	35	1.0	510
821KN(M,E)20	820(738~902)	510	670	100	1355	10000	475	35	1.0	500
911KN(M,E)20	910(819~1001)	550	745	100	1500	10000	500	35	1.0	440
102KN(M,E)20	1000(900~1100)	625	825	100	1650	10000	560	35	1.0	400
112KN(M,E)20	1100(990~1210)	680	895	100	1815	10000	610	35	1.0	360
122KN(M,E)20	1200(1080~1320)	750	990	100	1980	10000	650	35	1.0	320

## Electrical Ratings

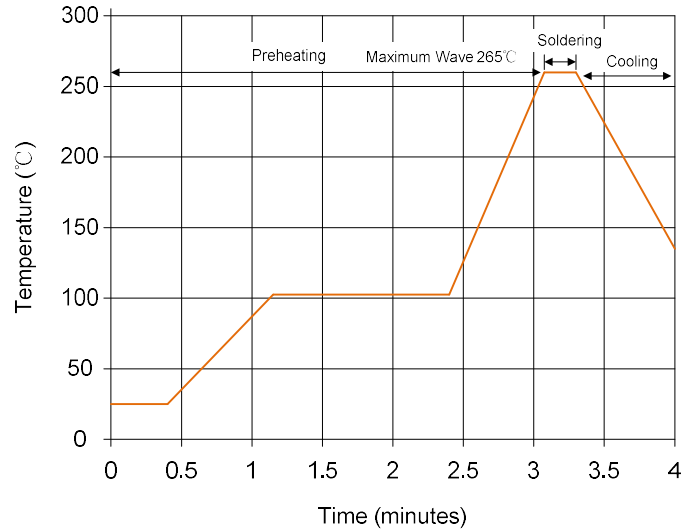
Items	Test Condition/Description	Requirement
Varistor Voltage	The voltage between two terminals with the specified measuring current 1mA.DC applied is called Vb.	To meet the Specified value
Maximum Allowable Voltage	The recommended maximum sine wave voltage (RMS) or the Maximum DC voltage can be applied continuously.	
Maximum Clamping Voltage	The maximum voltage between two terminals with the specification standard impulse current. Applied waveform: 8/20μs	
Surge Current	The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20μs) applied one time.	
Energy	The maximum energy within the varistor voltage change of ±10% when one impulse of 10/1000μs is applied.	
Leakage Current	The current through the varistor when 0.83V <sub>1mA</sub> is applied to both end.	
Rated Power	The maximum average power that can be applied within the specified ambient temperature.	
Varistor Voltage Temp. Coefficient	$\left  \frac{V_{1mA@85^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{60} \times 100\% (\%/^{\circ}C) \right $	≤0.05%/°C
	$\left  \frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\% (\%/^{\circ}C) \right $	

## Mechanical Characteristics and Reliability

Items	Test conditions / Methods		Specifications	
Tensile Strength of Terminals	Gradually applying the force specified and keeping the unit fixed for 10±1 sec.		No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
	Terminal diameter (mm)	Force (kg)		
	0.5<d≤0.8	1.0		
	0.8<d≤1.25	2.0		
Bending Strength of Terminals	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.		No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
	Terminal diameter (mm)	Force (kg)		
	0.5<d≤0.8	0.5		
	0.8<d≤1.25	1.0		
Vibration	Frequency range: 10~55 Hz Amplitude: 0.75mm or 98m/s <sup>2</sup> Direction: 3 mutually perpendicular directions, 2hrs each.		No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
	Solder Temp: 245±5°C Dipping Time: 2±0.5 sec			
Solder ability	Solder Temp: 245±5°C Dipping Time: 2±0.5 sec		At least 95% of terminal electrode is covered by new solder	
Resistance to Soldering Heat	Solder Temp: 260±5°C Dipping Time: ≤10sec		No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$	
High Temperature Storage	Ambient Temp: 85±2°C Duration: 1000hrs		$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
Low Temperature Storage	Ambient Temp: -40±2°C Duration: 1000hrs		$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
Humidity	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs		$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$	
Temperature Cycle	The conditions shown below shall be repeated 5 cycles			No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$
	Step	Temperature (°C)	Period (minutes)	
	1	-40±3	30±3	
	2	Room temperature	15±3	
	3	85±3	30±3	
High Temperature Load	Ambient Temp: 85±2°C      Duration: 1000hrs Load: Max. Allowable Voltage In AC eara.		$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$	
	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs      Load: Max. Allowable Voltage			
Damp Heat Load	Ambient Temp: 40±2°C, 90~95% R.H. Duration: 1000hrs      Load: Max. Allowable Voltage		No visible damage $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$	
Voltage Proof	Metal balls method, 2500Vac 1 min.		No visible damage	

## Soldering Recommendation

### Wave Lead Free Soldering Recommendation



Peak Temperature: 265°C

Dipping Time: 10 seconds (max.)

Soldering: 1 time

### Recommendation Reworking Conditions with Soldering Iron

Temperature of Soldering Iron-tip: 360°C (max.)

Soldering Time: 3 seconds (max.)

Distance from Varistor: 2mm (min.)

## Quantity

Packaging	Model	Quantity	
Bulk	180K~122K	100pcs/bag	2 bags/box

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