

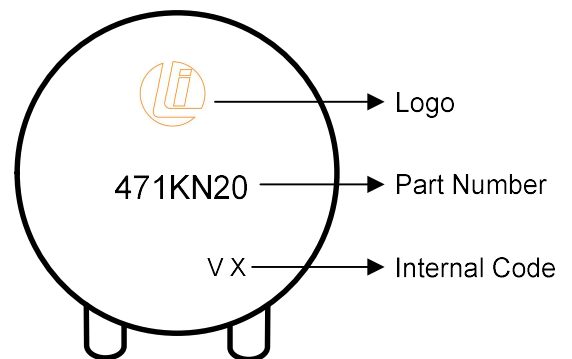
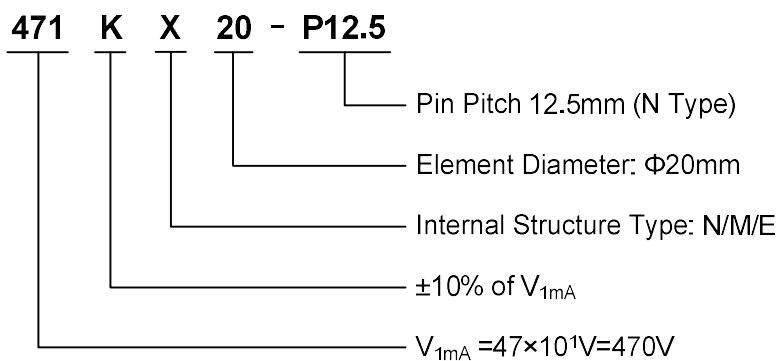
## Features

- 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:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

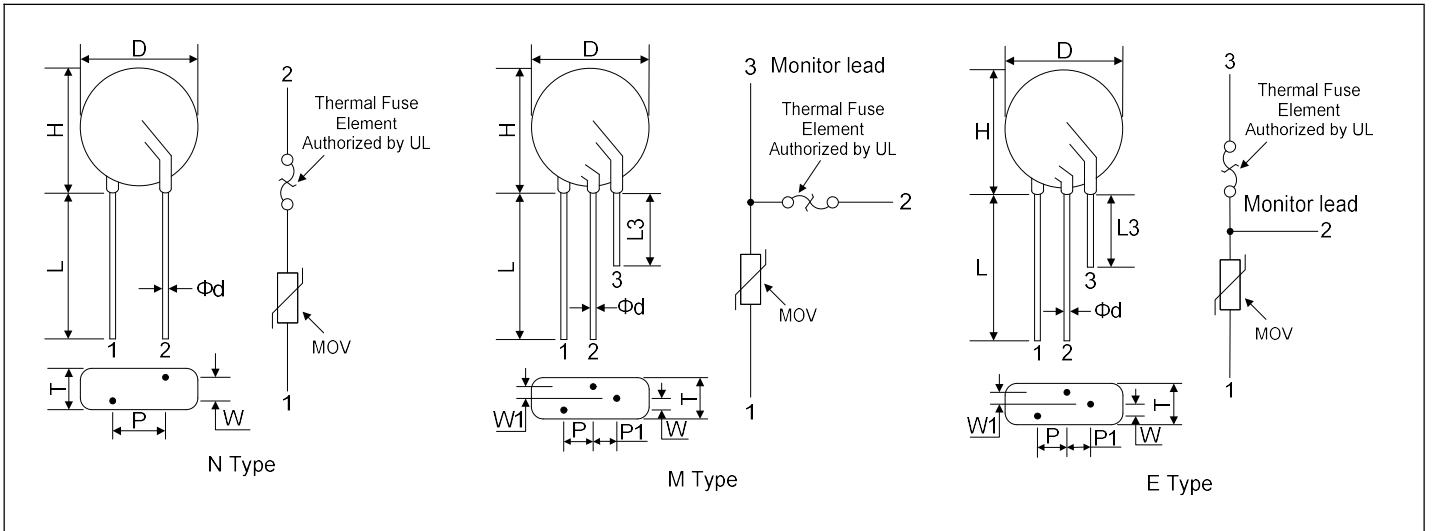
## Applications

- 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<br>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

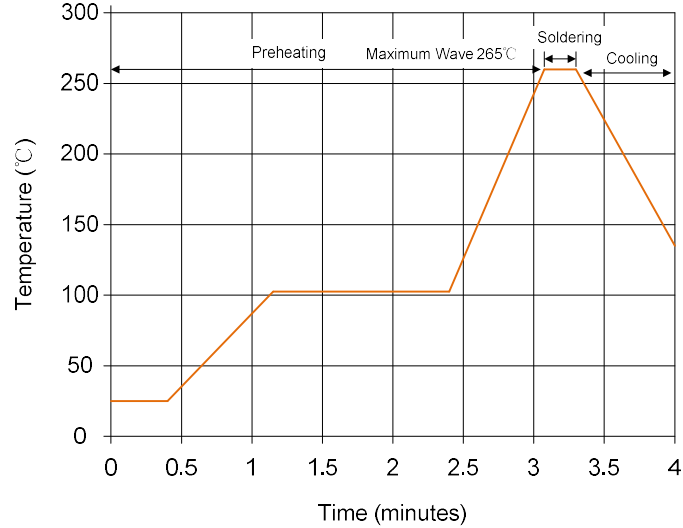
| Items                              | Test Condition/Description  | Requirement                 |
|------------------------------------|---|-----------------------------|
| Varistor Voltage                   | The voltage between two terminals with the specified measuring current 1mA.DC applied is called 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.<br>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<br>$ \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<br>$ \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<br>Amplitude: 0.75mm or 98m/s <sup>2</sup><br>Direction: 3 mutually perpendicular directions, 2hrs each.  |                  | No visible damage<br>$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$    |  |
|                               | Solder Temp: 245±5°C<br>Dipping Time: 2±0.5 sec   |                  |   |  |
| Solder ability                | Solder Temp: 245±5°C<br>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<br>Dipping Time: ≤10sec  |                  | No visible damage<br>$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$   |  |
| High Temperature Storage      | Ambient Temp: 85±2°C<br>Duration: 1000hrs   |                  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                         |  |
| Low Temperature Storage       | Ambient Temp: -40±2°C<br>Duration: 1000hrs  |                  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                         |  |
| Humidity                      | Ambient Temp: 40±2°C, 90~95% R.H.<br>Duration: 1000hrs  |                  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$                         |  |
| Temperature Cycle             | The conditions shown below shall be repeated 5 cycles   |                  |   | No visible damage<br>$ \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<br>Load: Max. Allowable Voltage In AC eara.   |                  | $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$                        |  |
|                               | Ambient Temp: 40±2°C, 90~95% R.H.<br>Duration: 1000hrs      Load: Max. Allowable Voltage  |                  |   |  |
| Damp Heat Load                | Ambient Temp: 40±2°C, 90~95% R.H.<br>Duration: 1000hrs      Load: Max. Allowable Voltage  |                  | No visible damage<br>$ \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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