

## MOV Metal Oxide Varistors

Leaded varistors, TMOV High Surge, 25 series

**Series/Type:** VCRR25\*\*\*\*K\*\*\*\*

**Ordering code:** VCRR25\*\*\*\*K

**Date:** January 2020

**Version:** 1

## MOV metal oxide varistors

25\*\*\*\*k\*\*\*\*

## Leaded varistors, TMOV High Surge, 25 series

VCRR25\*\*\*\*K\*\*\*\*

### Construction

- Round varistor element, leaded
- Coating: epoxy resin, flame-retardant to UL 94 V-0
- Terminals: tinned wire

### Features

- High performance with smaller disk diameter
- Wide operating voltage range 50 ... 680V<sub>RMS</sub>
- High surge current ratings up to 20KA
- No derating up to 85°C ambient temperature
- Series connection of varistors and fuses to disconnect when about to fail, protecting the circuit
- Action temperature 136C, matched with 15A.136C temperature fuse

### Approvals

- ROHS
- REACH
- 

### Delivery mode

- Bulk (standard), taped versions on reel or in Ammo pack upon request
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

### General technical data

|                       |                |              |                   |
|-----------------------|----------------|--------------|-------------------|
| Climatic category     | to IEC 60068-1 | 40/85/56     |                   |
| Operating temperature | to IEC 61051   | -40 ... +130 | °C                |
| Storage temperature   |                | -40 ... +125 | °C                |
| Electric strength     | to IEC 61051   | ≥ 2.5        | kV <sub>RMS</sub> |
| Insulation resistance | to IEC 61051   | ≥ 100        | MΩ                |

**MOV metal oxide varistors**
**25\*\*\*\*k\*\*\*\***
**Leaded varistors, TMOV High Surge, 25 series**
**VCRR25\*\*\*\*K\*\*\*\***
**Electrical specifications and ordering codes**

Maximum ratings ( $T_A = 85\text{ }^{\circ}\text{C}$ )

| Ordering code   | Type     | $V_{RMS}$ | $V_{DC}$ | $i_{max}$<br>(8/20 $\mu\text{s}$ )<br>1 time<br>[kA]* | $I_n^{(1)}$<br>(8/20 $\mu\text{s}$ )<br>15 times<br>[kA]* | $W_{max}$<br>(10/1000 $\mu\text{s}$ )<br>[J] | $P_{max}$<br>[W] |
|-----------------|----------|-----------|----------|-------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------|------------------|
| VCRR25*820KJ101 | 25*820KJ | 50        | 65       | 20                                                    | 10                                                        | 110                                          | 1.0              |
| VCRR25*101KJ101 | 25*101KJ | 60        | 85       | 20                                                    | 10                                                        | 120                                          | 1.0              |
| VCRR25*121KJ101 | 25*121KJ | 75        | 100      | 20                                                    | 10                                                        | 130                                          | 1.0              |
| VCRR25*151KJ101 | 25*151KJ | 95        | 125      | 20                                                    | 10                                                        | 135                                          | 1.0              |
| VCRR25*181KJ101 | 25*181KJ | 115       | 150      | 20                                                    | 10                                                        | 140                                          | 1.0              |
| VCRR25*201KJ101 | 25*201KJ | 130       | 170      | 20                                                    | 10                                                        | 155                                          | 1.0              |
| VCRR25*221KJ101 | 25*221KJ | 140       | 180      | 20                                                    | 10                                                        | 170                                          | 1.0              |
| VCRR25*241KJ101 | 25*241KJ | 150       | 200      | 20                                                    | 10                                                        | 190                                          | 1.0              |
| VCRR25*271KJ101 | 25*271KJ | 175       | 225      | 20                                                    | 10                                                        | 210                                          | 1.0              |
| VCRR25*301KJ101 | 25*301KJ | 190       | 250      | 20                                                    | 10                                                        | 220                                          | 1.0              |
| VCRR25*331KJ101 | 25*331KJ | 210       | 270      | 20                                                    | 10                                                        | 230                                          | 1.0              |
| VCRR25*361KJ101 | 25*361KJ | 230       | 300      | 20                                                    | 10                                                        | 245                                          | 1.0              |
| VCRR25*391KJ101 | 25*391KJ | 250       | 320      | 20                                                    | 10                                                        | 300                                          | 1.0              |
| VCRR25*431KJ101 | 25*431KJ | 275       | 350      | 20                                                    | 10                                                        | 335                                          | 1.0              |
| VCRR25*471KJ101 | 25*471KJ | 300       | 385      | 20                                                    | 10                                                        | 385                                          | 1.0              |
| VCRR25*511KJ101 | 25*511KJ | 320       | 420      | 20                                                    | 10                                                        | 420                                          | 1.0              |
| VCRR25*561KJ101 | 25*561KJ | 350       | 460      | 20                                                    | 10                                                        | 420                                          | 1.0              |
| VCRR25*621KJ101 | 25*621KJ | 385       | 505      | 20                                                    | 10                                                        | 425                                          | 1.0              |
| VCRR25*681KJ101 | 25*681KJ | 420       | 560      | 20                                                    | 10                                                        | 430                                          | 1.0              |
| VCRR25*751KJ101 | 25*751KJ | 460       | 615      | 20                                                    | 10                                                        | 460                                          | 1.0              |
| VCRR25*821KJ101 | 25*821KJ | 510       | 670      | 20                                                    | 10                                                        | 485                                          | 1.0              |
| VCRR25*911KJ101 | 25*911KJ | 550       | 745      | 20                                                    | 10                                                        | 505                                          | 1.0              |
| VCRR25*951KJ101 | 25*951KJ | 575       | 765      | 20                                                    | 10                                                        | 620                                          | 1.0              |
| VCRR25*102KJ101 | 25*102KJ | 625       | 825      | 20                                                    | 10                                                        | 685                                          | 1.0              |
| VCRR25*112KJ101 | 25*112KJ | 680       | 895      | 20                                                    | 10                                                        | 785                                          | 1.0              |

<sup>1)</sup> **Note:** Nominal discharge current is the specification defined in UL1449 4<sup>th</sup> edition and tested with 8/20  $\mu\text{s}$  current waveform

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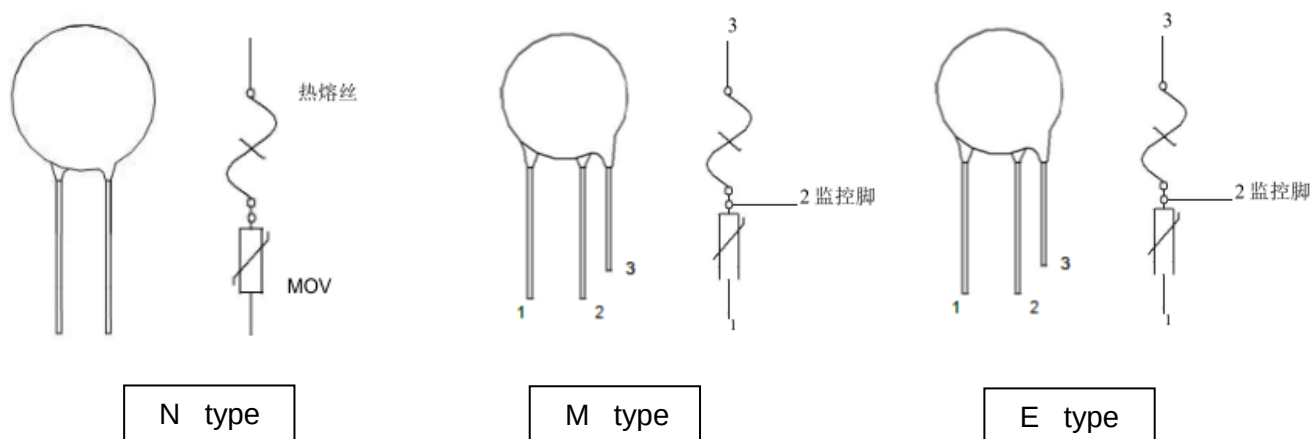
VCRR25\*\*\*\*K\*\*\*\*

### Characteristics (T<sub>A</sub>=25 °C):

| Ordering code   | Type     | V <sub>V</sub><br>(1 mA)<br>[V] | ΔV <sub>V</sub><br>(1 mA)<br>[%] | Max clamping<br>voltage |                       | C <sub>typ</sub><br>(1 kHz)<br>[pF] |
|-----------------|----------|---------------------------------|----------------------------------|-------------------------|-----------------------|-------------------------------------|
|                 |          |                                 |                                  | V <sub>c</sub><br>[V]   | I <sub>c</sub><br>[A] |                                     |
| VCRR25*820KJ101 | 25*820KJ | 82                              | ±10                              | 135                     | 150                   | 2400                                |
| VCRR25*101KJ101 | 25*101KJ | 100                             | ±10                              | 165                     | 150                   | 2000                                |
| VCRR25*121KJ101 | 25*121KJ | 120                             | ±10                              | 200                     | 150                   | 1700                                |
| VCRR25*151KJ101 | 25*151KJ | 150                             | ±10                              | 250                     | 150                   | 1300                                |
| VCRR25*181KJ101 | 25*181KJ | 180                             | ±10                              | 300                     | 150                   | 1100                                |
| VCRR25*201KJ101 | 25*201KJ | 200                             | ±10                              | 340                     | 150                   | 1000                                |
| VCRR25*221KJ101 | 25*221KJ | 220                             | ±10                              | 360                     | 150                   | 900                                 |
| VCRR25*241KJ101 | 25*241KJ | 240                             | ±10                              | 395                     | 150                   | 830                                 |
| VCRR25*271KJ101 | 25*271KJ | 270                             | ±10                              | 455                     | 150                   | 740                                 |
| VCRR25*301KJ101 | 25*301KJ | 300                             | ±10                              | 500                     | 150                   | 670                                 |
| VCRR25*331KJ101 | 25*331KJ | 330                             | ±10                              | 550                     | 150                   | 610                                 |
| VCRR25*361KJ101 | 25*361KJ | 360                             | ±10                              | 595                     | 150                   | 560                                 |
| VCRR25*391KJ101 | 25*391KJ | 390                             | ±10                              | 650                     | 150                   | 510                                 |
| VCRR25*431KJ101 | 25*431KJ | 430                             | ±10                              | 710                     | 150                   | 460                                 |
| VCRR25*471KJ101 | 25*471KJ | 470                             | ±10                              | 775                     | 150                   | 430                                 |
| VCRR25*511KJ101 | 25*511KJ | 510                             | ±10                              | 840                     | 150                   | 390                                 |
| VCRR25*561KJ101 | 25*561KJ | 560                             | ±10                              | 910                     | 150                   | 360                                 |
| VCRR25*621KJ101 | 25*621KJ | 620                             | ±10                              | 1025                    | 150                   | 320                                 |
| VCRR25*681KJ101 | 25*681KJ | 680                             | ±10                              | 1120                    | 150                   | 290                                 |
| VCRR25*751KJ101 | 25*751KJ | 750                             | ±10                              | 1240                    | 150                   | 270                                 |
| VCRR25*821KJ101 | 25*821KJ | 820                             | ±10                              | 1355                    | 150                   | 260                                 |
| VCRR25*911KJ101 | 25*911KJ | 910                             | ±10                              | 1500                    | 150                   | 230                                 |
| VCRR25*951KJ101 | 25*951KJ | 950                             | ±10                              | 1570                    | 150                   | 220                                 |
| VCRR25*102KJ101 | 25*102KJ | 1000                            | ±10                              | 1650                    | 150                   | 180                                 |
| VCRR25*112KJ101 | 25*112KJ | 1100                            | ±10                              | 1815                    | 150                   | 130                                 |

2) \*Please refer to the suffix code

### Schematic Diagram:



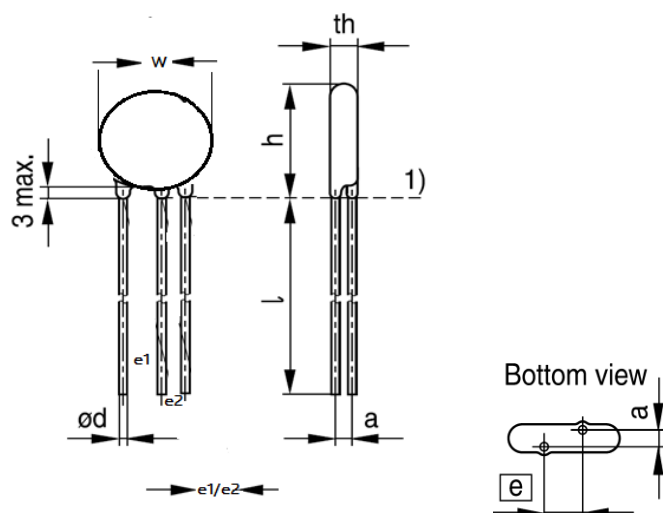
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### Dimensional drawings



### Weight

| Nominal diameter<br>mm | V <sub>RMS</sub><br>V | Weight<br>g |
|------------------------|-----------------------|-------------|
| 25                     | 50...680              | 5.5...75    |

Different voltage levels result in differences in weight.

### Dimensions

| Ordering code <sup>2)</sup> | [e1/e2] ±1<br>mm | W <sub>max</sub><br>mm | h <sub>max</sub><br>mm | th <sub>max</sub><br>mm | a <sub>typ</sub><br>mm | l <sub>min</sub><br>mm | Ød±0.05<br>mm |
|-----------------------------|------------------|------------------------|------------------------|-------------------------|------------------------|------------------------|---------------|
| VCRR25*820KJ101             | 7.5/5            | 27                     | 30                     | 7                       | 4.3                    | 25.0                   | 1.0           |
| VCRR25*101KJ101             | 7.5/5            | 27                     | 30                     | 7                       | 4.3                    | 25.0                   | 1.0           |
| VCRR25*121KJ101             | 7.5/5            | 27                     | 30                     | 7                       | 4.3                    | 25.0                   | 1.0           |
| VCRR25*151KJ101             | 7.5/5            | 27                     | 30                     | 7                       | 4.3                    | 25.0                   | 1.0           |
| VCRR25*181KJ101             | 7.5/5            | 27                     | 30                     | 7                       | 4.5                    | 25.0                   | 1.0           |
| VCRR25*201KJ101             | 7.5/5            | 27                     | 30                     | 8                       | 4.5                    | 25.0                   | 1.0           |
| VCRR25*221KJ101             | 7.5/5            | 27                     | 30                     | 8                       | 4.5                    | 25.0                   | 1.0           |
| VCRR25*241KJ101             | 7.5/5            | 27                     | 30                     | 8                       | 4.5                    | 25.0                   | 1.0           |
| VCRR25*271KJ101             | 7.5/5            | 27                     | 30                     | 8.5                     | 4.5                    | 25.0                   | 1.0           |
| VCRR25*301KJ101             | 7.5/5            | 27                     | 30                     | 8.7                     | 4.5                    | 25.0                   | 1.0           |
| VCRR25*331KJ101             | 7.5/5            | 27                     | 30                     | 8.8                     | 4.5                    | 25.0                   | 1.0           |
| VCRR25*361KJ101             | 7.5/5            | 27                     | 30                     | 9                       | 4.6                    | 25.0                   | 1.0           |
| VCRR25*391KJ101             | 7.5/5            | 27                     | 30                     | 9.5                     | 4.8                    | 25.0                   | 1.0           |
| VCRR25*431KJ101             | 7.5/5            | 27                     | 30                     | 9.4                     | 5.0                    | 25.0                   | 1.0           |
| VCRR25*471KJ101             | 7.5/5            | 27                     | 30                     | 9.6                     | 5.1                    | 25.0                   | 1.0           |
| VCRR25*511KJ101             | 7.5/5            | 27                     | 30                     | 9.8                     | 5.3                    | 25.0                   | 1.0           |
| VCRR25*561KJ101             | 7.5/5            | 27                     | 30                     | 10.1                    | 5.3                    | 25.0                   | 1.0           |
| VCRR25*621KJ101             | 7.5/5            | 27                     | 30                     | 10.2                    | 5.8                    | 25.0                   | 1.0           |
| VCRR25*681KJ101             | 7.5/5            | 27                     | 30                     | 10.3                    | 5.4                    | 25.0                   | 1.0           |
| VCRR25*751KJ101             | 7.5/5            | 27                     | 30                     | 10.7                    | 6.1                    | 25.0                   | 1.0           |
| VCRR25*821KJ101             | 7.5/5            | 27                     | 30                     | 11.1                    | 6.4                    | 25.0                   | 1.0           |
| VCRR25*911KJ101             | 7.5/5            | 27                     | 30                     | 11.5                    | 6.7                    | 25.0                   | 1.0           |
| VCRR25*951KJ101             | 7.5/5            | 27                     | 30                     | 11.9                    | 6.9                    | 25.0                   | 1.0           |
| VCRR25*102KJ101             | 7.5/5            | 27                     | 30                     | 11.9                    | 7.1                    | 25.0                   | 1.0           |
| VCRR25*112KJ101             | 7.5/5            | 27                     | 30                     | 12.0                    | 7.4                    | 25.0                   | 1.0           |

2) \*Please refer to the suffix code.

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**Reliability data**

| Test                                    | Test methods/conditions                                                                                                                                                                                                                                                                                                                                                       | Requirement                                                                                              |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Varistor voltage                        | The voltage between two terminals with the specified measuring current applied is called $V_V$ (1 mA <sub>DC</sub> @ 0.2 ... 2 s).                                                                                                                                                                                                                                            | To meet the specified value                                                                              |
| Clamping voltage                        | The maximum voltage between two terminals with the specified standard impulse current (8/20 $\mu$ s) applied.                                                                                                                                                                                                                                                                 | To meet the specified value                                                                              |
| Endurance at upper category temperature | 1000 h at UCT<br>After having continuously applied the maximum allowable AC voltage at UCT $\pm 2$ °C for 1000 h, the specimen shall be stored at room temperature and normal humidity for 1 to 2 h.<br>Thereafter, the change of $V_V$ shall be measured.                                                                                                                    | $ \Delta V/V (1 \text{ mA})  \leq 10\%$                                                                  |
| Surge current derating, 8/20 $\mu$ s    | 10 surge currents (8/20 $\mu$ s), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 $\mu$ s                                                                                                                                                                                                                                            | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>(measured in direction of surge current)<br>No visible damage |
| Surge current derating, 2 ms            | 10 surge currents (2 ms), unipolar, interval 120 s, amplitude corresponding to derating curve for 10 impulses at 2 ms                                                                                                                                                                                                                                                         | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>(measured in direction of surge current)<br>No visible damage |
| Electric strength                       | IEC 61051-1, test 4.9.2<br>Metal balls method, 2500 VRMS, 60 s<br>The varistor is placed in a container holding $1.6 \pm 0.2$ mm diameter metal balls such that only the terminations of the varistor are protruding.<br>The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls. | No breakdown                                                                                             |

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| Test                        | Test methods/conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Requirement                                                                   |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Climatic sequence           | <p>The specimen shall be subjected to:</p> <p>a) dry heat at UCT, 16 h, IEC 60068-2-2, test Ba</p> <p>b) damp heat, 1<sup>st</sup> cycle:<br/>55 °C, 93% r. H., 24 h, IEC 60068-2-30, test Db</p> <p>c) cold, LCT, 2 h, IEC 60068-2-1, test Aa</p> <p>d) damp heat, additional 5 cycles:<br/>55 °C/25 °C, 93% r. H., 24 h/cycle, IEC 60068-2-30, test Db.</p> <p>Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h.</p> <p>Thereafter, the change of <math>V_V</math> shall be measured. Thereafter, insulation resistance <math>R_{ins}</math> shall be measured at <math>V = 500</math> V.</p> | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>$R_{ins} \geq 100 \text{ M}\Omega$ |
| Rapid change of temperature | IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br>No visible damage                   |
| Damp heat, steady state     | IEC 60068-2-78, test Ca<br>The specimen shall be subjected to $40 \pm 2$ °C, 90 to 95% r. H. for 56 days without load / with 10% of the maximum continuous DC operating voltage VDC. Then stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of $V_V$ shall be measured.<br>Thereafter, insulation resistance $R_{ins}$ shall be measured at $V = 500$ V (insulated varistors only).                                                                                                                                                                                                                 | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>$R_{ins} \geq 100 \text{ M}\Omega$ |

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| Test                         | Test methods/conditions                                                                                                                                                                                                                                                                                                                                                           | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solderability                | IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: 245 °C, 3 s:<br>After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 245 °C for 3 s, the terminals shall be visually examined.                                                                                                               | The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area. |
| Resistance to soldering heat | IEC 60068-2-20, test Tb, method 1A, 260 °C, 10 s:<br>Each lead shall be dipped into a solder bath having a temperature of 260 ±5 °C to a point 2.0 to 2.5 mm from the body of the specimen, be held there for 10 ±1 s and then be stored at room temperature and normal humidity for 1 to 2 h.<br>The change of VV shall be measured and the specimen shall be visually examined. | $ \Delta V/V (1 \text{ mA})  \leq 5\%$ No visible damage                                                                                                                                                                                                                                                                                                                                                                    |
| Tensile strength             | IEC 60068-2-21, test Ua1<br>After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage.<br><br>Force for wire diameter:<br>0.6 mm = 10 N<br>0.8 mm = 10 N<br>1.0 mm = 20 N                                                                                                                    | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br>No break of solder joint, no wire break                                                                                                                                                                                                                                                                                                                                           |

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| Test        | Test methods/conditions                                                                                                                                                                                                                                                                                                                              | Requirement                           |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Vibration   | IEC 60068-2-6, test Fc, method B4<br>Frequency range: 10 ... 55 Hz<br>Amplitude: 0.75 mm or 98 m/s <sup>2</sup><br>Duration: 6 h (3 · 2 h)<br>Pulse: sine wave<br>After repeatedly applying a single harmonic vibration according to the table above.<br>The change of V <sub>V</sub> shall be measured and the specimen shall be visually examined. | ΔV/V (1 mA)  ≤5%<br>No visible damage |
| Bump        | IEC 60068-2-29, test Eb<br>Pulse duration: 6 ms<br>Max. acceleration: 400 m/s <sup>2</sup><br>Number of bumps: 4000<br>Pulse: half sine                                                                                                                                                                                                              | ΔV/V (1 mA)  ≤5%<br>No visible damage |
| Fire hazard | IEC 60695-11-5 (needle flame test)<br>Severity: vertical 10 s                                                                                                                                                                                                                                                                                        | 5 s max.                              |

**Note:**

UCT = Upper category temperature

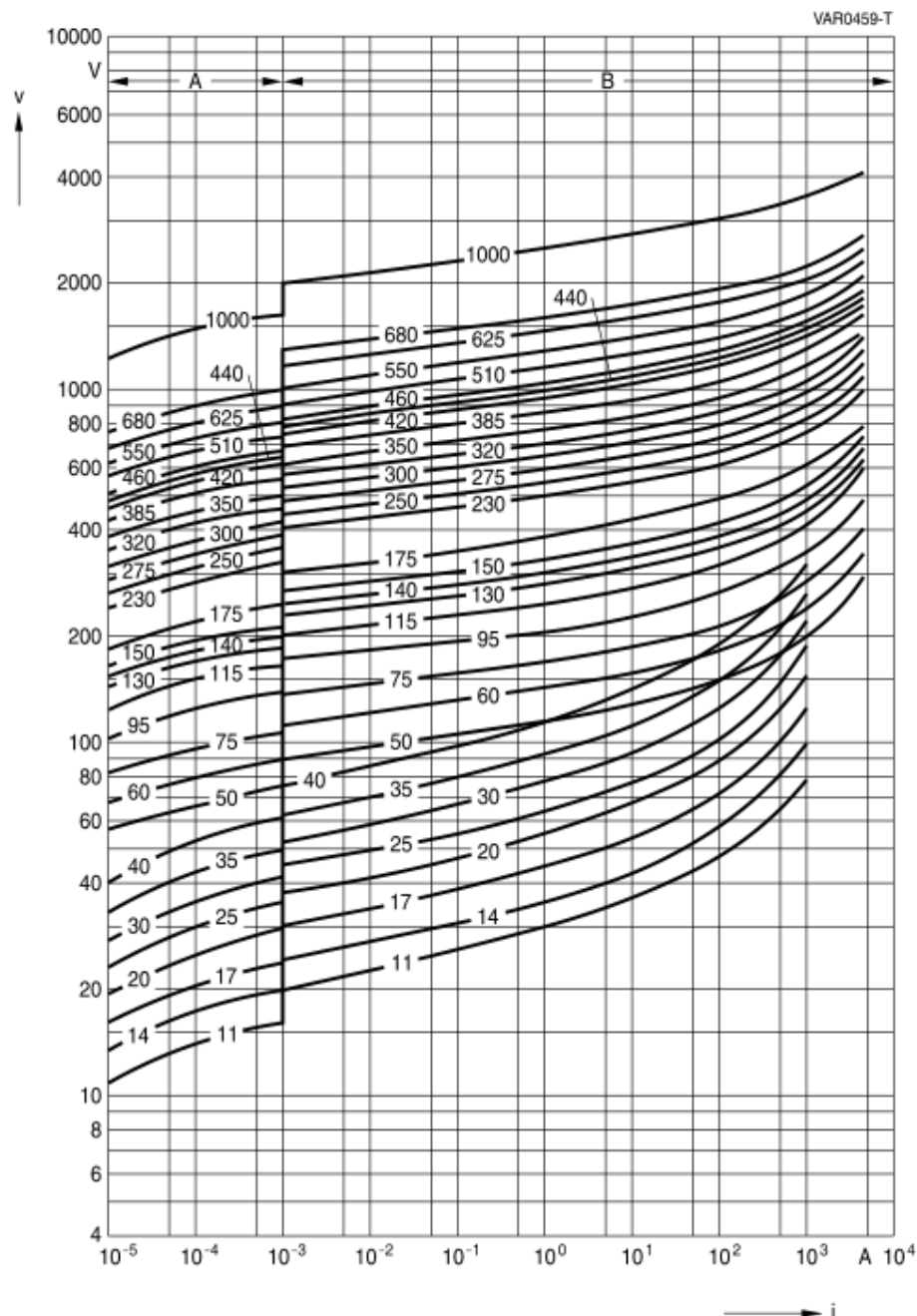
LCT = Lower category temperature

R<sub>ins</sub> = Insulation resistance

## v/i characteristics

$v = f(i)$  - for explanation of the characteristics refer to "General technical information".

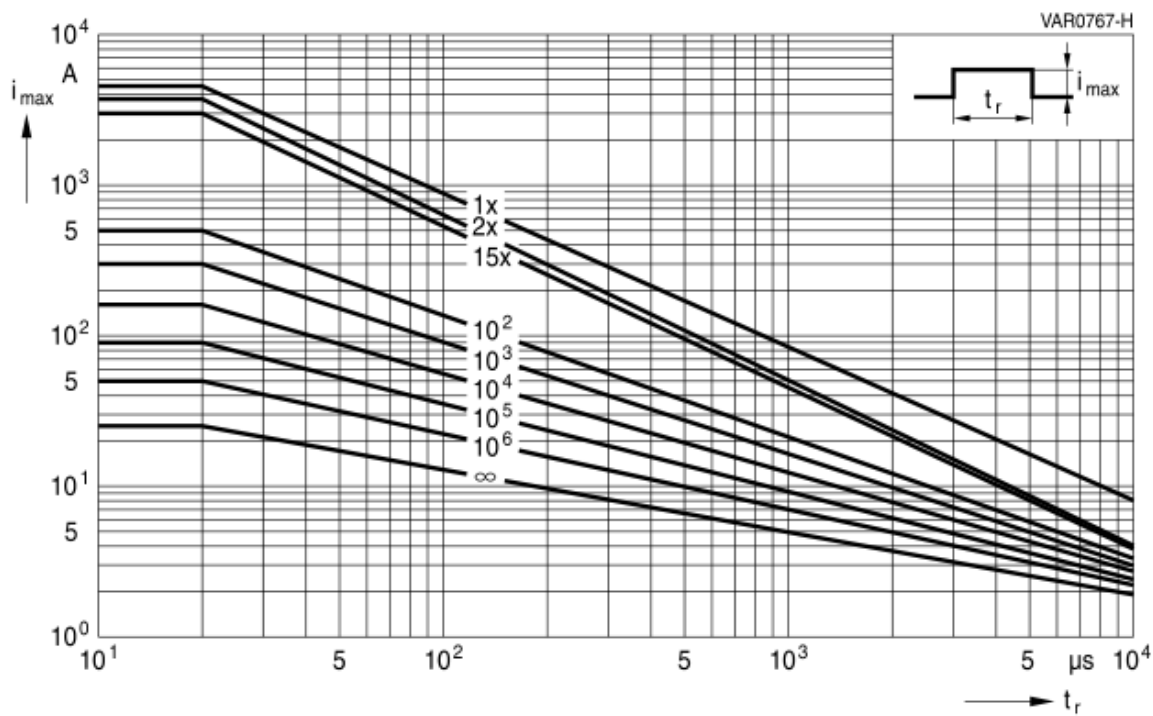
A = Leakage current, B = Protection level } for worst-case varistor tolerances



## Derating curves

Maximum surge current  $i_{\max} = f(t_r, \text{pulse train})$

For explanation of the derating curves refer to "General technical information",



## Taping, packaging and lead configuration

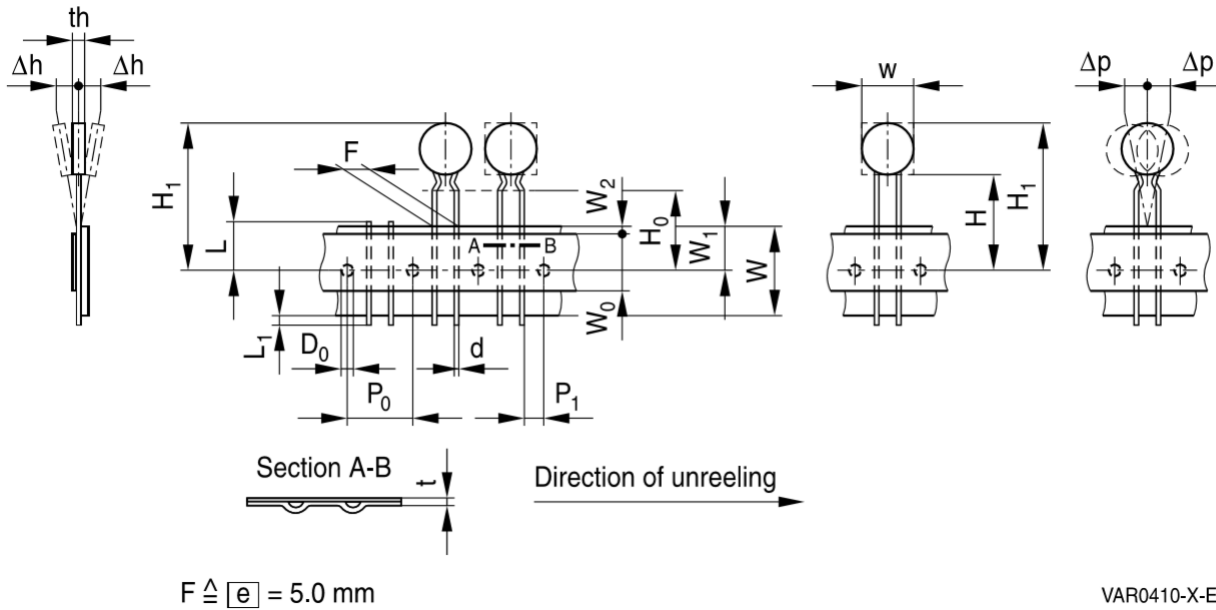
### 1 JORDUN Electronics ordering code system for leaded varistors

|                                                                                                                                                                   |    |       |     |   |   |   |   |   |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------|-----|---|---|---|---|---|---|
| VCRR                                                                                                                                                              | 25 | N/M/E | 471 | K | J | 1 | 0 | 1 | 1 |
| logo                                                                                                                                                              |    |       |     |   |   |   |   |   |   |
| Disc Diameter                                                                                                                                                     |    |       |     |   |   |   |   |   |   |
| Design structure:<br>N: 2 Pin M: Fuse is pin 2<br>E: Fuse is pin 3                                                                                                |    |       |     |   |   |   |   |   |   |
| Varistor Voltage:<br>471:470V 561:560V<br>470:47V 102:1000V                                                                                                       |    |       |     |   |   |   |   |   |   |
| Tolerance of Varistor Voltage:<br>K=±10% J=±5%<br>S=Special tolerance                                                                                             |    |       |     |   |   |   |   |   |   |
| Design:<br>J=High Joule N=High Energy T=Automotive<br>Remark: eg:printing 14N561KJ or<br>25E561KJ or 25M561KJ.25N561KJ                                            |    |       |     |   |   |   |   |   |   |
| Lead Configuration:<br>1=Straight Leads 2=Inner Pin<br>3=Forward and Backward Pin 4=Outer K Pin<br>Please refer to "Standard leads and non-standard crimp styles" |    |       |     |   |   |   |   |   |   |
| Packaging:<br>0=Bulk 1=Taping Style for further information<br>please refer to chapter "Taping, packaging and lead configuration"                                 |    |       |     |   |   |   |   |   |   |
| Bulk Pin Length:<br>1=3.5±0.5mm 2=3.0±0.5mm<br>3=4.0±0.5mm 4=25±0.5mm<br>5=5.0±0.5mm                                                                              |    |       |     |   |   |   |   |   |   |
| Internal Coding:<br>ABCDEF                                                                                                                                        |    |       |     |   |   |   |   |   |   |

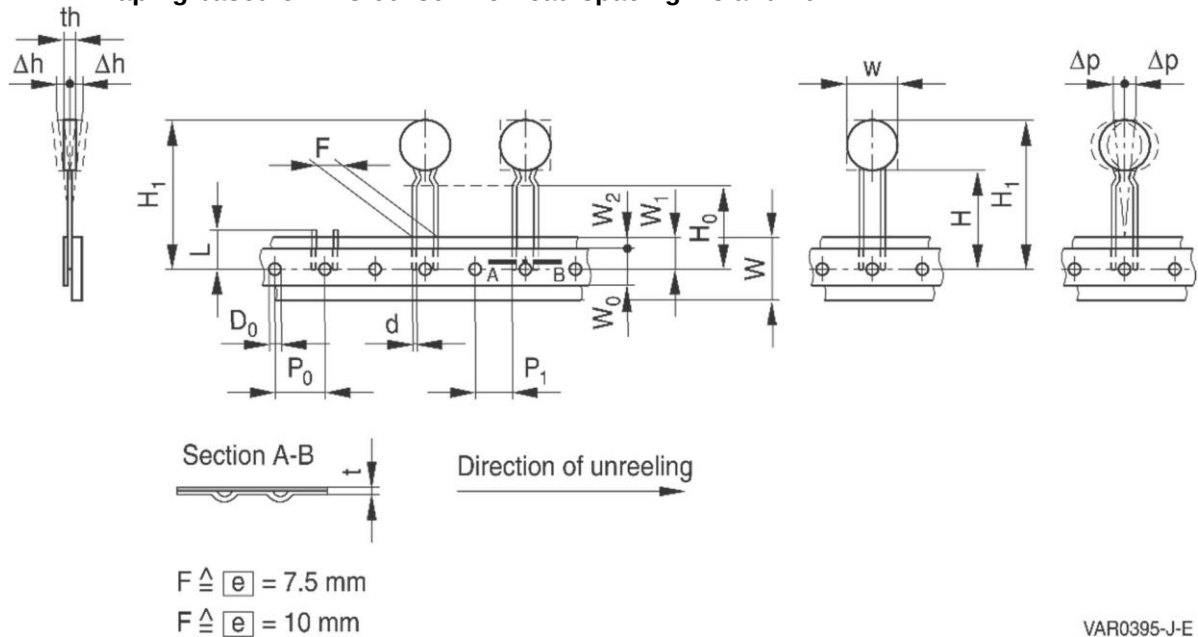
## 2 Taping and packaging of leaded varistors

Tape packaging for lead spacing  $\boxed{e} = 5$  fully conforms to IEC 60286-2, while for lead spacings  $\boxed{e} = 7.5$  and 10 the taping mode is based on this standard.

### 2.1 Taping in accordance with IEC 60286-2 for lead spacing 5.0 mm



### 2.2 Taping based on IEC 60286-2 for lead spacing 7.5 and 10 mm



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**VCRR25\*\*\*\*K\*\*\*\***
**2.3 Tape dimensions (in mm)**

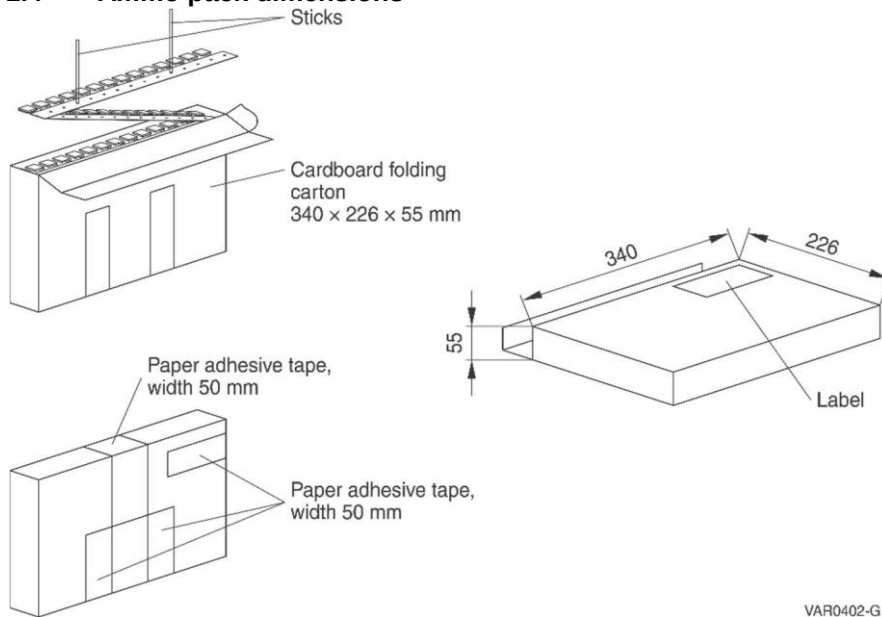
| Symbol         | $e = 5.0$ | Tolerance                  | $e = 7.5$          | Tolerance                  | $e = 10.0$   | Tolerance                  | Remarks                                                   |
|----------------|-----------|----------------------------|--------------------|----------------------------|--------------|----------------------------|-----------------------------------------------------------|
| w<br>th<br>d   | 0.6       | max.<br>max.<br>$\pm 0.05$ | 0.8                | max.<br>max.<br>$\pm 0.05$ | 1.0          | max.<br>max.<br>$\pm 0.05$ | see tables in<br>each series<br>under<br>"Dimensions<br>" |
| P <sub>0</sub> | 12.7      | $\pm 0.3$                  | 12.7 <sup>1)</sup> | $\pm 0.3$                  | 12.7         | $\pm 0.3$                  | $\pm 1$ mm/20<br>sprocket holes                           |
| P <sub>1</sub> | 3.85      | $\pm 0.7$                  | 8.95               | $\pm 0.8$                  | 7.7          | $\pm 0.8$                  |                                                           |
| F              | 5.0       | $\pm 10$                   | 7.5                | $\pm 0.8$                  | 10.0         | $\pm 0.8$                  | measured at<br>top of compo-<br>nent body                 |
| $\Delta h$     | 0         | $\pm 2.0$                  | depends on s       |                            | depends on s |                            |                                                           |
| $\Delta p$     | 0         | $\pm 1.3$                  | 0                  | $\pm 2.0$                  | 0            | $\pm 2.0$                  |                                                           |
| W              | 18.0      | $\pm 0.5$                  | 18.0               | $\pm 0.5$                  | 18.0         | $\pm 0.5$                  | Peel-off<br>force $\geq 5$ N                              |
| W <sub>0</sub> | 5.5       | min.                       | 11.0               | min.                       | 11.0         | min.                       |                                                           |
| W <sub>1</sub> | 9.0       | $\pm 0.5$                  | 9.0                | $+0.75/-0.5$               | 9.0          | $+0.75/-0.5$               |                                                           |
| W <sub>2</sub> | 3.0       | max.                       | 3.0                | max.                       | 3.0          | max.                       |                                                           |
| H              | 18.0      | $+2.0/-0$<br>$\pm 0.5$     | 18.0               | $+2.0/-0$<br>$\pm 0.5$     | 18.0         | $+2.0/-0$<br>$\pm 0.5$     | 2)<br>3)                                                  |
| H <sub>0</sub> | 16.0      |                            | 16.0               |                            | 16.0         |                            |                                                           |
|                | (18.0)    |                            | (18.0)             |                            |              |                            |                                                           |
| H <sub>1</sub> | 32.2      | max.                       | 45.0               | max.                       | 45.0         | max.                       |                                                           |
| D <sub>0</sub> | 4.0       | $\pm 0.2$                  | 4.0                | $\pm 0.2$                  | 4.0          | $\pm 0.2$                  | without lead                                              |
| t              | 0.9       | max.                       | 0.9                | max.                       | 0.9          | max.                       |                                                           |
| L              | 11.0      | max.                       | 11.0               | max.                       | 11.0         | max.                       |                                                           |
| L <sub>1</sub> | 0.5       | max.                       |                    |                            |              |                            |                                                           |

1) Taping with P<sub>0</sub> = 15.0 mm upon request

2) Applies only to uncrimped types

3) Applies only to crimped types (H<sub>0</sub> = 18 upon request)

### 2.4 Ammo pack dimensions



### 2.5 Quantities Per Packaging

| Part No | Voltage | Bulk |        | Ammo Packing(Taping) |        |
|---------|---------|------|--------|----------------------|--------|
|         |         | Bag  | Carton | Box                  | Carton |
| 7D      | 181-821 | 1000 | 20000  | 1000                 | 10000  |
| 10D     | 180-182 | 1000 | 10000  | 1000                 | 10000  |
| 14D     | 180-182 | 500  | 8000   | 800                  | 8000   |
| 20D     | 180-182 | 250  | 5000   | ----                 | ----   |
| 25D     | 180-182 | 200  | 3000   | ----                 | ----   |

## 3 Lead configuration

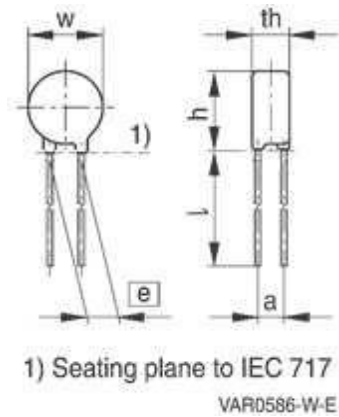
Straight leads are standard for disk varistors. Other lead configurations as crimp style or customerspecific lead wire length according to 3.1, 3.2, 3.3 and 3.4 are optional. Crimped leads (non-standard) are differently crimped for technical reasons; the individual crimp styles are denot-ed by consecutive numbers (S, S2 through S5) as shown in the dimensional drawings below.

The crimp styles of the individual types can be seen from the type designation in the ordering tables.

### 3.1 Standard leads and non-standard crimp styles

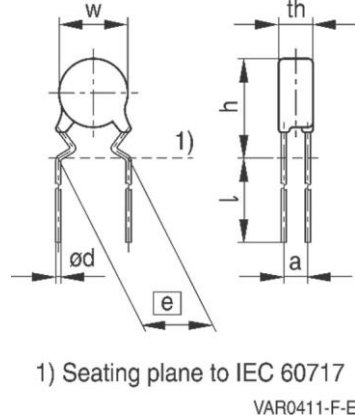
The basic dimensions in figure 1 to 5 are valid for types with either round or square (EnergetiQ series) component head

**Standard,  
straight leads**



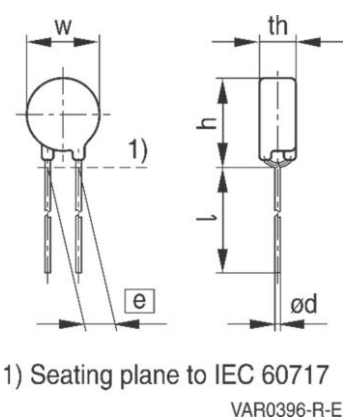
**Figure 1**

**Non-standard,  
crimp style S2**



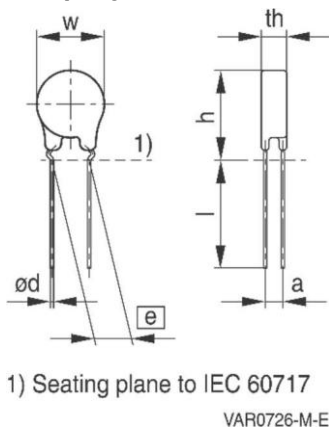
**Figure 2**

**Non-standard,  
crimp style S3**



**Figure 3**

**Non-standard,  
crimp style S5**



**Figure**

### 3.2 Trimmed leads (non-standard)

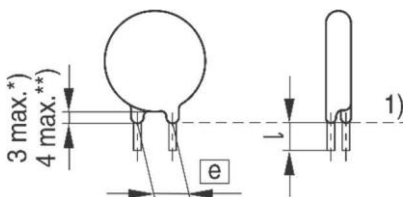
Varistors with cut leads available upon request.

Lead length tolerances:

Straight leads  $\pm 0.8$  mm

Crimped leads  $\pm 0.5$  mm

Minimum lead length 3.0 mm



1) Seating plane to IEC 60717

\*) For round component head

\*\*) For EnergetiQ series, square component head

VAR0642-U-E

## **Cautions and warnings**

### **General**

1. JORDUN Electronics metal oxide varistors (MOV) are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data books unless otherwise agreed with JORDUN Electronics during the design-in-phase.
2. Ensure suitability of MOV through reliability testing during the design-in phase. The MOV should be evaluated taking into consideration worst-case conditions.
3. For applications of MOV in line-to ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

### **Storage**

1. Store MOV only in original packaging. Do not open the package prior to processing.
2. Recommended storage conditions in original packaging:  

|                      |                                                         |
|----------------------|---------------------------------------------------------|
| Storage temperature: | -25 °C ... +45 °C                                       |
| Relative humidity:   | <75% annual average,<br><95% on maximum 30 days a year. |
| Dew precipitation:   | Is to be avoided.                                       |
3. Avoid contamination of an MOV's during storage, handling and processing.
4. Avoid storage of MOVs in harmful environments that can affect the function during long-term operation (examples given under operation precautions).
5. The MOV type series should be soldered after shipment from JORDUN ELECTRONIC within the time specified.  

|           |           |
|-----------|-----------|
| MOV-J,N,T | 24 months |
|-----------|-----------|

### **Handling**

1. MOVs must not be dropped.
2. Components must not be touched with bare hands. Gloves are recommended.
3. Avoid contamination of the surface of MOV electrodes during handling, be careful of the sharp edge of MOV electrodes.

### **Soldering (where applicable)**

1. Use rosin-type flux or non-activated flux.
2. Insufficient preheating may cause ceramic cracks.

3. Rapid cooling by dipping in solvent is not recommended.
4. Complete removal of flux is recommended.
5. Temperatures of all preheat stages and the solder bath must be strictly controlled especially for T series

### **Mounting**

1. Potting, sealing or adhesive compounds can produce chemical reactions in the MOV ceramic that will degrade the component's electrical characteristics.
2. Overloading MOVs may result in ruptured packages and expulsion of hot materials. For this reason the MOVs should be physically shielded from adjacent components.

### **Operation**

1. Use MOVs only within the specified temperature operating range
2. Use MOVs only within the specified voltage and current ranges.
3. Environmental conditions must not harm the MOVs. Use MOVs only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions, Avoid contact with any liquids and solvents.

## Symbols and terms

| Symbol                                                                              | Term                                                                     |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| C                                                                                   | Capacitance                                                              |
| $C_{typ}$                                                                           | Typical capacitance                                                      |
| i                                                                                   | Current                                                                  |
| $i_c$                                                                               | Current at which $V_{c, max}$ is measured                                |
| $I_{leak}$                                                                          | Leakage current                                                          |
| $i_{max}$                                                                           | Maximum surge current (also termed peak current)                         |
| $I_{max}$                                                                           | Maximum discharge current                                                |
| $I_n$                                                                               | Nominal discharge current to UL 1449                                     |
| LCT                                                                                 | Lower category temperature                                               |
| $L_{typ}$                                                                           | Typical inductance                                                       |
| $P_{max}$                                                                           | Maximum average power dissipation                                        |
| $R_{ins}$                                                                           | Insulation resistance                                                    |
| $R_{min}$                                                                           | Minimum resistance                                                       |
| $T_A$                                                                               | Ambient temperature                                                      |
| $t_r$                                                                               | Duration of equivalent rectangular wave                                  |
| UCT                                                                                 | Upper category temperature                                               |
| v                                                                                   | Voltage                                                                  |
| $V_{clamp}$                                                                         | Clamping voltage                                                         |
| $V_{c, max}$                                                                        | Maximum clamping voltage at specified current $i_c$ DC operating voltage |
| $V_{DC}$                                                                            | Maximum jump start voltage                                               |
| $V_{jump}$                                                                          | Maximum voltage                                                          |
| $V_{max}$                                                                           | Operating voltage                                                        |
| $V_{op}$                                                                            | AC operating voltage, root-mean-square value                             |
| $V_{RMS}$                                                                           | Root-mean-square value of max. DC operating voltage incl. ripple current |
| $V_{RMS, op, max}$                                                                  | Super imposed surge voltage                                              |
| $V_{surge}$                                                                         | Varistor voltage                                                         |
| $V_V$                                                                               | Tolerance of varistor voltage                                            |
| $\Delta V_V$                                                                        |                                                                          |
| $W_{LD}$                                                                            | Maximum load dump                                                        |
| $W_{max}$                                                                           | Maximum energy absorption                                                |
|  | Lead spacing                                                             |

All dimensions are given in mm.

The commas used in numerical values denote decimal points.

Release:Version January,2020