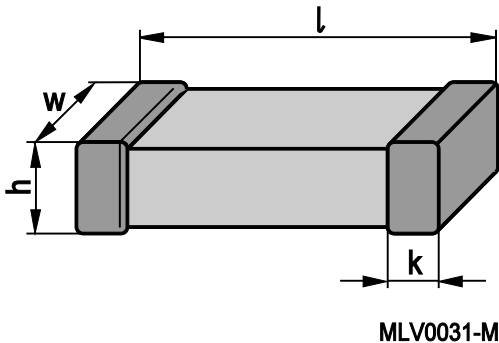


| | |
|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Specification available from:</i> Österreichischer Verband für Elektrotechnik (ÖVE) A-1010 Wien, Eschenbachgasse 9</p> | <p>IEC 61051-2-2 AT0006 Issue 2 / 2022-08</p> |
| <p><i>Electronic components of assessed quality in accordance with:</i> IEC 61051-1: 2018-10 IEC 61051-2: 2021-11</p> | <p>IEC 61051-2: 2021-11</p> |
|  <p>MLV0031-M</p> | <p>ZINC OXIDE SURGE SUPPRESSION VARISTORS</p> <p>Multilayer Varistors High Surge CT Series (C)hip with <u>three-layer-termination</u> (Ag/Ni/Sn))</p> <p>Multilayer Varistors High Surge CN Series (C)hip not molded, with two-layer-termination(Ag/Pt))</p> <p>Non insulated</p> <p>Assessment level: E</p> |

NOTES

- 1 - The undimensioned details do not affect the performance of the device.
- 2 - The terminations are suitable for soldering.
- 3 - The terminations are suitable for printing wired applications.
- 4 - The terminations are rigid.

Information on the availability of components qualified to this detail specification is given in the Qualified Products List.

SECTION ONE – GENERAL DATA

1 General data

1.1 Recommended Method(s) of mounting

If not specified otherwise, the SMD Varistors shall be reflow-soldered on FR4 test boards (recommend reflow curve profile according to IEC60068-2-58, test Td2, Tpeak = 235°C - 260°C).

1.2 Dimensions, ratings and characteristics

1.2.1 Dimensions (All dimensions are in millimeters)

- Body length: l see table below
- Body width: w see table below
- Body thickness: h see table below
- Thickness of terminations: k see table below

| Chip size | Vrms, max (V) | l (mm) | w (mm) | h (mm) | k(mm) |
|-----------|---------------|-----------|-----------|---------|---------------|
| CN2220 | 60 | 5.5-6.0 | 4.9±0.30 | 3.0 max | 0.4...1.0 |
| CT1210 | 60 | 3.2 ±0.30 | 2.5 ±0.25 | 2.6 max | 0.25 ... 0.75 |

1.2.2 Ratings and characteristics

Climatic category: 40/125/56
LCT/UCT (Lower/Upper category temperature) ¹⁾ -40°C/125°C

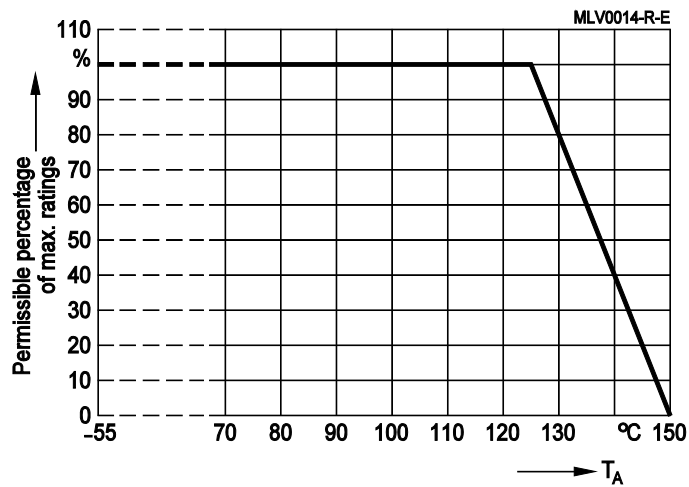
Maximum continuous a.c. voltage: see table below
Maximum continuous d.c. voltage: see table below
Supply voltage: see table below
Voltage at specified current (1 mA)/Maximum Current at Vdc,max:
- at 25°C see table below
- if applicable, at upper category temperature: -
- if applicable, at ... °C -
Maximum peak current:
- for 10 pulses 8/20 µs at 2 per min: see table below
- for 10 pulses 10/1000 µs at 1 every two min: see table below
Class current: see table below
Voltage at class current (protection level), Vclamp,max: see table below
Capacitance: see table below
Maximum temperature coefficient of the voltage at specified current Not specified

| Style (1) /Material number | Maximum continuous voltage | | Varistor Voltage at 1 mA @Tamb | Ileak max @Vdc,max | Vclamp,max Voltage at class current (8/20µs) | | Max. peak current 8/20µs, 1 time | Max. peak current 8/20µs, 10 time | Max. peak current 10/1000µs 1 time | Rated Energy 10/1000µs | Max. C @1kHz, 1 V |
|---------------------------------------|----------------------------|----------|--------------------------------|--------------------|----------------------------------------------|---------------|----------------------------------|-----------------------------------|------------------------------------|------------------------|-------------------|
| | r.m.s. (V) | d.c. (V) | | | Class current (A) | Max. volt (V) | | | | | |
| CN2220K60E3GK2_U/ B72542U2600K62V9 | 60 | 85 | 90-110 | 70 | 100 | 170 | 4500 | 3000 | 85 | 9 | 8000 |
| CT1210K60E2G/ B72530T6600K 62V 9 | 60 | 85 | 90-110 | 70 | 100 | 180 | 1200 | 1000 | 40 | 4 | 2000 |

(1) For explanation of style reference number, see clause 1.5.

1.2.3 Derating curve

Maximum continuous a.c. or d.c. voltage with temperature.



1.3 Related documents

Generic specification:

IEC Publication 61051-1: Varistors for Use in Electronic Equipment.

Part 1: Generic Specification.

Sectional specification:

IEC Publication 61051-2: Varistors for Use in Electronic Equipment.

Part 2: Sectional Specification for Surge Suppression Varistors.

1.4 Marking

None.

1.5 Ordering information

Orders for varistors covered by this specification shall contain, in clear or in coded form, the following minimum information

Example CN 2220 60 E 2 G* K2 U

| | |
|------------------|-------------------------------------------------------------|
| <u>CN/CT</u> | Series code. |
| <u>2220/1210</u> | Chip size |
| <u>K</u> | Varistor voltage tolerance at 1 mA: K: $\pm 10\%$ |
| <u>60</u> | Max. continuous r.m.s. voltage |
| <u>E2/E3</u> | Increased energy handling capability/low clamping voltage |
| <u>G</u> | Taping, packing options (not effecting IEC specifications). |
| <u>K2</u> | Termination material (CN types only) |
| <u>U</u> | Customer specific version |

1.6 Terminations

CT (Single chip with nickel barrier termination (AgNiSn)) and CN (Single chip with silver-platin termination (AgPt))
The terminations are suitable for soldering.

1.7 Certified records or released lots

Not required.

1.8 Additional information (not for inspection purposes)

The voltage indicated on the component is the maximum allowable steady state sinusoidal voltage at 50 - 60 Hz. When use is made of a supply voltage, the maximum continuous a.c. r.m.s. voltage = 1.1 x supply voltage. Should the varistor be subjected to voltage above the indicated voltage, it may fail by package rupture or expulsion material, causing a major problem in the equipment.

Coating information: Not applicable.

1.9 Additional or increased severities or requirements to those specified in the generic and/or sectional specification

None.

SECTION TWO – INSPECTION REQUIREMENTS

2 Inspection requirements

2.1 Procedures

2.1.1 For Qualification Approval the procedure shall be in accordance with the Sectional Specification, IEC Publication 61051-2, Sub-clause 3.2.

2.1.2 For Quality Conformance Inspection the test schedule (Table II) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by Sub-clause 3.3.1 of the Sectional Specification.

TABLE II

| | | | |
|-------|----|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Notes | 1. | - | Sub-clause numbers of tests and performance requirements refer to the Generic Specification, IEC Publication 61051-1. |
| | 2. | - | Inspection Levels and AQL's are selected from IEC Publication 61193-2 Sampling Plans and Procedures for Inspection by Attributes. |
| | 3. | - | In this table: p = periodicity (in months) n = sample size c = acceptance criterion (permitted number of defectives) D = destructive ND = non-destructive IL = inspection level AQL = acceptable quality limit } IEC 61193-2 |
| | 4. | | There are two grades of severity for shock test are considered to be alternative. The detail specification shall indicate which test is to be performed. |
| | 5. | - | Where d.c. has been applied to the varistor, the reference voltage shall be measured in the same direction. |
| | 6. | | The manufacturer shall only be required to perform one of these tests |

| Sub-clause number and Test (see Note 1) | D or ND | Conditions of test (see Note 1) | Sample size and criterion of acceptability (See Note 2) | | | | Performance requirements (see Note 1) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------|------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | IL | AQL | IL or n | AQL or C | |
| <u>GROUP A INSPECTION</u> (lot-by-lot) | | | | | | | |
| <u>Sub-group A1</u> <u>6.4.1</u> Visual examination <u>6.4.2</u> Marking | ND | Not applicable | II | 1,0% | 100% | 0 | 100% testing in production line (AOI) As in <u>6.4.1</u> n.a |
| <u>Sub-group A2</u> <u>6.6</u> Varistor Voltage | ND | Voltage at specified current | II | 0,65 % | 100% | 0 | 100% testing in production line As specified in 1.2.2 |
| <u>Sub-group A3</u> <u>6.4.3</u> Dimensions (gauging) | ND | Note: Gauging not applicable. Measuring dimensions: l, w, h | S-4 | 1,0% | 100% | 0 | 100% testing in production line (AOI) As specified in <u>1.2.1</u> |
| <u>GROUP B INSPECTION</u> (lot-by-lot) | | | | | | | |
| <u>Sub-group B1</u> <u>6.17</u> Robustness of terminations <u>6.19</u> Solderability <u>6.27</u> Solvent resistance of the marking | D | Substrate bending test IEC 60068-2-21, Test Ue1 d = 2 mm, t = 60 s Visual examination Voltage at specified current Shear test IEC 60068-2-21, Test Ue3 Force F = 5 N, t = 10 ± 1 s. Visual examination Voltage at specified current IEC 60068-2-58, test Td1 Method: Reflow soldering, Sn96,5Ag3Cu,5, T = 235 ± 3 °C, t = 10 ± 5s Visual examination Not applicable | S-3 | 2,5% | 20 20 | 0 0 | Bending test: 10 samples Shear test: 10 samples No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ The terminations shall be uniformly tinned. |
| <u>Sub-group B2</u> <u>6.11</u> Clamping Voltage <u>6.9</u> Voltage proof | | Voltage at class current: Vclamp,max See 1.2.2 Not applicable. | S-2 | 1,0% | 20 | 0 | As specified in the detail specification |

| Sub-clause number and Test (see Note 1) | D or ND | Conditions of test (see Note 1) | Sample size & criterion of acceptability (see Note 3) | | | Performance requirements (see Note 1) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | p | n | c | |
| <u>GROUP C INSPECTION</u> (periodic) <u>Sub-group C1</u> 6.13 Maximum peak current | D | <u>Pulse current</u> 10 pulses 8/20 µs at 2 per min in one direction (current according 1.2.2 and 1.2.3) Visual examination Voltage at specified current | 6 | 13 | 1 | No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ |
| <u>Sub-group C2</u> 6.15 Rated Energy | D | Single current pulse with 2 ms rectangular wave shape or 10 µs /1000 µs wave shape (energy according Detail Specification table 1) Visual examination Voltage at specified current | 12 | 13 | 1 | No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ |
| <u>Sub-group C3A</u> Part of sample of Sub-group C3 6.8 Capacitance 6.18 Resistance to soldering heat 6.28 Component solvent resistance of the marking 6.20 Rapid change of temperature | | f = 1 kHz Signal level ≤ 1V Zero bias IEC 60068-2-58, test Td2, Method1: Solder bath, Sn96,5Ag3Cu,5 T = 260±5°C, d = 10±1s Visual examination Voltage at specified current Not applicable. IEC 60068-2-14, Test Na N = 5 cycles, d = 30 min θ _A = -40 ± 3°C θ _B = 125 ± 2°C Visual examination Voltage at specified current | 12 | 7 | | As specified in 1.2.2 of this specification No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 5\%$ No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ |

| Sub-clause number and Test (see Note 1) | D or ND | Conditions of test (see Note 1) | Sample size & criterion of acceptability (see Note 3) | | | Performance requirements (see Note 1) |
|----------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---|---|-----------------------------------------------------------------------|
| | | | p | n | c | |
| <u>Sub-group C3B</u> Other part of sample of Sub-group C3 6.21 Shock (or repetitive shock, see Note 4) | | IEC 60068-2-27, Ea Pulse shape: half sine. A = 400 m/s ² , d = 6 ms N = 6 x 5000 shocks. Visual examination Voltage at specified current | 12 | 6 | | No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 5\%$ |
| 6.22 Vibration | | IEC 60068-2-6, Test Fc, Method B4 Frequency range: 10 Hz to 55 Hz a = 0,75 mm or 98 m/s ² (whichever is the less) d = 3x2 h Visual examination Voltage at specified current | | | | No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 5\%$ |

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| Sub-clause number and Test (see Note 1) | D or ND | Conditions of test (see Note 1) | Sample size & criterion of acceptability (see Note 3) | | | Performance requirements (see Note 1) |
|-------------------------------------------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---|---|------------------------------------------------------------------------|
| | | | p | n | c | |
| <u>GROUP D INSPECTION</u> <u>Sub-group D1</u> 6.24 Damp heat, steady state | D | IEC 60068-2-78, Test Ca T = 40 ± 2°C, RH = 93(+2/-3)%, 56d. <u>4 specimens:</u> No voltage applied <u>Other 4 specimens:</u> Applied voltage: 10% of the max. d.c. voltage Visual examination Voltage at specified current | 24 | 8 | 1 | No visible damage $\left \frac{\Delta U_V}{U_V} \right \leq 10\%$ |
| <u>Sub-group D2</u> 6.4.4 Dimensions (detail) 6.6 Voltage (if applicable) | ND | Measuring dimensions: l, w, h, k U _v at specified current I _{leak,max} @ V _{dc,max} At following temperatures: 25°C | | | | As specified in 1.2.1 As specified in 1.2.2 |
| <u>Sub-group D3</u> 6.25 Fire hazard (Needle flame test) | D | Not specified for MLV. | 24 | 5 | 0 | |