# SIOV metal oxide varistors

## SMD varistors standard series, CU types

**Series/Type:** **B726***

Date: January 2018

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## EPCOS type designation system for SMD varistor standard series

| CU | 4032 | K | 275 | G2 |
|---|---|---|---|---|

**Construction:**
CU ≙ Encapsulated chip

**Case sizes:**
3225 ≙ 32 x 25
4032 ≙ 40 x 32

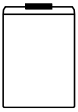
**Varistor voltage tolerance:**
K ≙ ±10%

**Maximum RMS operating voltage ($V_{RMS}$):**
275 ≙ 275 V

**Taping mode:**
G2 ≙ Taped, 330-mm reel

## SMD varistors (CU types) B726*

### Standard series



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**Construction**

- Cylindrical varistor element, encapsulated.
- Encapsulation: thermoplastic, flame-retardant to UL 94 V-0.
- Termination: tinned copper alloy, suitable for lead-free wave and reflow soldering, and compatible with tin/lead solder.

**Features**

- Electrical equivalents to leaded types SIOV-S05/S07
- Operating voltage up to 300 $V_{RMS}$
- SMD plastic package
- RoHS-compatible
- Suitable for lead-free soldering
- PSpice models available

**Approvals**

- UL
- IEC
- CSA approved (types with voltages higher than 30 $V_{RMS}$)

**Delivery mode**

- Blister tape, 330-mm reel
- Packing unit: 1000 pcs.

**V/I characteristics and derating curves**

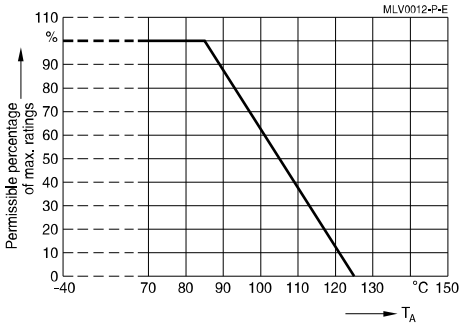
V/I and derating curves are attached to the data sheet. The curves are sorted by $V_{RMS}$ and then by case size, which is included in the type designation.

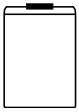
**General technical data**

| | | | | |
|---|---|---|---|---|
| Maximum RMS operating voltage | | $V_{RMS}$ | 11 ... 300 | V |
| Maximum DC operating voltage | | $V_{DC}$ | 14 ... 385 | V |
| Maximum surge current | (8/20 µs) 1 time | $i_{max}$ | 100 ... 1200 | A |
| Maximum energy absorption | (2 ms) | $W_{max}$ | 300 ... 23000 | mJ |
| Maximum clamping voltage | (8/20 µs) | $v_{c,max}$ | 36 ... 775 | V |
| Operating temperature | | | −40/+85 | °C |
| Storage temperature | | | −40/+125 | °C |

## Temperature derating

Climatic category: −40/+85 °C





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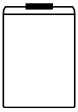
**Electrical specifications and ordering codes**

**Maximum ratings ($T_A$ = 85 °C)**

| Type | Ordering code | $V_{RMS}$ V | $V_{DC}$ V | $i_{max}$ (8/20 µs) 1 time A | $I_n$ [1] (8/20 µs) 15 times A | $W_{max}$ (2 ms) mJ | $P_{max}$ mW |
|---|---|---|---|---|---|---|---|
| CU3225K11G2 | B72650M0110K072 | 11 | 14 | 100 | 50 | 300 | 10 |
| CU4032K11G2 | B72660M0110K072 | 11 | 14 | 250 | 100 | 800 | 20 |
| CU3225K14G2 | B72650M0140K072 | 14 | 18 | 100 | 50 | 400 | 10 |
| CU4032K14G2 | B72660M0140K072 | 14 | 18 | 250 | 100 | 900 | 20 |
| CU3225K17G2 | B72650M0170K072 | 17 | 22 | 100 | 50 | 500 | 10 |
| CU4032K17G2 | B72660M0170K072 | 17 | 22 | 250 | 100 | 1100 | 20 |
| CU3225K20G2 | B72650M0200K072 | 20 | 26 | 100 | 50 | 600 | 10 |
| CU4032K20G2 | B72660M0200K072 | 20 | 26 | 250 | 100 | 1300 | 20 |
| CU3225K25G2 | B72650M0250K072 | 25 | 31 | 100 | 50 | 700 | 10 |
| CU4032K25G2 | B72660M0250K072 | 25 | 31 | 250 | 100 | 1600 | 20 |
| CU3225K30G2 | B72650M0300K072 | 30 | 38 | 100 | 50 | 900 | 10 |
| CU4032K30G2 | B72660M0300K072 | 30 | 38 | 250 | 100 | 2000 | 20 |
| CU3225K35G2 | B72650M0350K072 | 35 | 45 | 100 | 50 | 1100 | 10 |
| CU4032K35G2 | B72660M0350K072 | 35 | 45 | 250 | 100 | 2500 | 20 |
| CU3225K40G2 | B72650M0400K072 | 40 | 56 | 100 | 50 | 1300 | 10 |
| CU4032K40G2 | B72660M0400K072 | 40 | 56 | 250 | 100 | 3000 | 20 |
| CU3225K50G2 | B72650M0500K072 | 50 | 65 | 400 | 150 | 1800 | 100 |
| CU4032K50G2 | B72660M0500K072 | 50 | 65 | 1200 | 500 | 4200 | 250 |
| CU3225K60G2 | B72650M0600K072 | 60 | 85 | 400 | 150 | 2200 | 100 |
| CU4032K60G2 | B72660M0600K072 | 60 | 85 | 1200 | 500 | 4800 | 250 |
| CU3225K75G2 | B72650M0750K072 | 75 | 100 | 400 | 150 | 2500 | 100 |
| CU4032K75G2 | B72660M0750K072 | 75 | 100 | 1200 | 500 | 5900 | 250 |
| CU3225K95G2 | B72650M0950K072 | 95 | 125 | 400 | 150 | 3400 | 100 |
| CU4032K95G2 | B72660M0950K072 | 95 | 125 | 1200 | 500 | 7600 | 250 |
| CU3225K115G2 | B72650M0111K072 | 115 | 150 | 400 | 150 | 3600 | 100 |
| CU4032K115G2 | B72660M0111K072 | 115 | 150 | 1200 | 500 | 8400 | 250 |
| CU3225K130G2 | B72650M0131K072 | 130 | 170 | 400 | 150 | 4200 | 100 |
| CU4032K130G2 | B72660M0131K072 | 130 | 170 | 1200 | 500 | 9500 | 250 |
| CU3225K140G2 | B72650M0141K072 | 140 | 180 | 400 | 150 | 4500 | 100 |
| CU4032K140G2 | B72660M0141K072 | 140 | 180 | 1200 | 500 | 10000 | 250 |
| CU3225K150G2 | B72650M0151K072 | 150 | 200 | 400 | 150 | 4900 | 100 |
| CU4032K150G2 | B72660M0151K072 | 150 | 200 | 1200 | 500 | 11000 | 250 |
| CU3225K175G2 | B72650M0171K072 | 175 | 225 | 400 | 150 | 5600 | 100 |
| CU4032K175G2 | B72660M0171K072 | 175 | 225 | 1200 | 500 | 13000 | 250 |

[1] **Note:** Nominal discharge current $I_n$ according to UL 1449, 4th edition.



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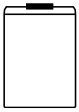
**Characteristics ($T_A$ = 25 °C)**

| Type | $V_V$ (1 mA) V | $\Delta V_V$ % | $v_{c,max}$ V | $I_c$ (8/20 µs) A | $C_{typ}$ (1 kHz, 1 V) pF |
|---|---|---|---|---|---|
| CU3225K11G2 | 18 | ±10 | 36 | 1.0 | 1750 |
| CU4032K11G2 | 18 | ±10 | 36 | 2.5 | 2750 |
| CU3225K14G2 | 22 | ±10 | 43 | 1.0 | 1450 |
| CU4032K14G2 | 22 | ±10 | 43 | 2.5 | 2300 |
| CU3225K17G2 | 27 | ±10 | 53 | 1.0 | 1200 |
| CU4032K17G2 | 27 | ±10 | 53 | 2.5 | 1900 |
| CU3225K20G2 | 33 | ±10 | 65 | 1.0 | 980 |
| CU4032K20G2 | 33 | ±10 | 65 | 2.5 | 1600 |
| CU3225K25G2 | 39 | ±10 | 77 | 1.0 | 850 |
| CU4032K25G2 | 39 | ±10 | 77 | 2.5 | 1400 |
| CU3225K30G2 | 47 | ±10 | 93 | 1.0 | 720 |
| CU4032K30G2 | 47 | ±10 | 93 | 2.5 | 1200 |
| CU3225K35G2 | 56 | ±10 | 110 | 1.0 | 620 |
| CU4032K35G2 | 56 | ±10 | 110 | 2.5 | 1050 |
| CU3225K40G2 | 68 | ±10 | 135 | 1.0 | 520 |
| CU4032K40G2 | 68 | ±10 | 135 | 2.5 | 900 |
| CU3225K50G2 | 82 | ±10 | 135 | 5.0 | 300 |
| CU4032K50G2 | 82 | ±10 | 135 | 10.0 | 530 |
| CU3225K60G2 | 100 | ±10 | 165 | 5.0 | 250 |
| CU4032K60G2 | 100 | ±10 | 165 | 10.0 | 480 |
| CU3225K75G2 | 120 | ±10 | 200 | 5.0 | 210 |
| CU4032K75G2 | 120 | ±10 | 200 | 10.0 | 430 |
| CU3225K95G2 | 150 | ±10 | 250 | 5.0 | 135 |
| CU4032K95G2 | 150 | ±10 | 250 | 10.0 | 260 |
| CU3225K115G2 | 180 | ±10 | 300 | 5.0 | 110 |
| CU4032K115G2 | 180 | ±10 | 300 | 10.0 | 220 |
| CU3225K130G2 | 205 | ±10 | 340 | 5.0 | 100 |
| CU4032K130G2 | 205 | ±10 | 340 | 10.0 | 200 |
| CU3225K140G2 | 220 | ±10 | 360 | 5.0 | 95 |
| CU4032K140G2 | 220 | ±10 | 360 | 10.0 | 180 |
| CU3225K150G2 | 240 | ±10 | 395 | 5.0 | 90 |
| CU4032K150G2 | 240 | ±10 | 395 | 10.0 | 170 |
| CU3225K175G2 | 270 | ±10 | 455 | 5.0 | 75 |
| CU4032K175G2 | 270 | ±10 | 455 | 10.0 | 150 |



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## Electrical specifications and ordering codes

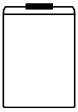
**Maximum ratings ($T_A$ = 85 °C)**

| Type | Ordering code | $V_{RMS}$ V | $V_{DC}$ V | $i_{max}$ (8/20 µs) 1 time A | $I_n$ [1] (8/20 µs) 15 times A | $W_{max}$ (2 ms) mJ | $P_{max}$ mW |
|---|---|---|---|---|---|---|---|
| CU3225K230G2 | B72650M0231K072 | 230 | 300 | 400 | 150 | 7200 | 100 |
| CU4032K230G2 | B72660M0231K072 | 230 | 300 | 1200 | 500 | 17000 | 250 |
| CU3225K250G2 | B72650M0251K072 | 250 | 320 | 400 | 150 | 8200 | 100 |
| CU4032K250G2 | B72660M0251K072 | 250 | 320 | 1200 | 500 | 19000 | 250 |
| CU3225K275G2 | B72650M0271K072 | 275 | 350 | 400 | 150 | 8600 | 100 |
| CU4032K275G2 | B72660M0271K072 | 275 | 350 | 1200 | 500 | 21000 | 250 |
| CU3225K300G2 | B72650M0301K072 | 300 | 385 | 400 | 150 | 9600 | 100 |
| CU4032K300G2 | B72660M0301K072 | 300 | 385 | 1200 | 500 | 23000 | 250 |

[1] **Note:** Nominal discharge current $I_n$ according to UL 1449, 4th edition.

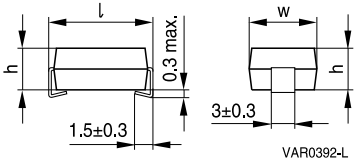
**Characteristics ($T_A$ = 25 °C)**

| Type | $V_V$ (1 mA) V | $\Delta V_V$ % | $v_{c,max}$ V | $I_c$ (8/20 µs) A | $C_{typ}$ (1 kHz, 1 V) pF |
|---|---|---|---|---|---|
| CU3225K230G2 | 360 | ±10 | 595 | 5.0 | 60 |
| CU4032K230G2 | 360 | ±10 | 595 | 10.0 | 115 |
| CU3225K250G2 | 390 | ±10 | 650 | 5.0 | 55 |
| CU4032K250G2 | 390 | ±10 | 650 | 10.0 | 105 |
| CU3225K275G2 | 430 | ±10 | 710 | 5.0 | 50 |
| CU4032K275G2 | 430 | ±10 | 710 | 10.0 | 95 |
| CU3225K300G2 | 470 | ±10 | 775 | 5.0 | 45 |
| CU4032K300G2 | 470 | ±10 | 775 | 10.0 | 90 |





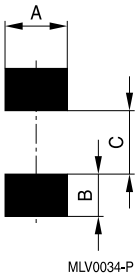
## Dimensional drawing




Dimensions in mm

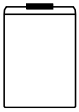
| Chip size EIA in mm | $V_{RMS,max}$ | l | w | h |
|---|---|---|---|---|
| 3225 | 11 ... 175 | 8.0 ±0.3 | 6.3 ±0.3 | 3.2 ±0.3 |
| 3225 | 230 ... 300 | 8.0 ±0.3 | 6.3 ±0.3 | 4.5 ±0.3 |
| 4032 | 11 ... 175 | 10.2 ±0.3 | 8.0 ±0.3 | 3.2 ±0.3 |
| 4032 | 230 ... 300 | 10.2 ±0.3 | 8.0 ±0.3 | 4.5 ±0.3 |

## Recommended solder pad layout




Dimensions in mm

| Chip size EIA in mm | A | B | C |
|---|---|---|---|
| 3225 | 3.50 | 2.80 | 4.50 |
| 4032 | 3.50 | 2.80 | 6.50 |



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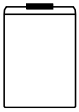
**Delivery mode**

| EIA case size | Taping | Reel size mm | Packing unit pcs. | Type | Ordering code |
|---|---|---|---|---|---|
| 3225 | Blister | 330 | 1000 | CU3225K115G2 | B72650M0111K072 |
| 3225 | Blister | 330 | 1000 | CU3225K11G2 | B72650M0110K072 |
| 3225 | Blister | 330 | 1000 | CU3225K130G2 | B72650M0131K072 |
| 3225 | Blister | 330 | 1000 | CU3225K140G2 | B72650M0141K072 |
| 3225 | Blister | 330 | 1000 | CU3225K14G2 | B72650M0140K072 |
| 3225 | Blister | 330 | 1000 | CU3225K150G2 | B72650M0151K072 |
| 3225 | Blister | 330 | 1000 | CU3225K175G2 | B72650M0171K072 |
| 3225 | Blister | 330 | 1000 | CU3225K20G2 | B72650M0200K072 |
| 3225 | Blister | 330 | 1000 | CU3225K230G2 | B72650M0231K072 |
| 3225 | Blister | 330 | 1000 | CU3225K250G2 | B72650M0251K072 |
| 3225 | Blister | 330 | 1000 | CU3225K25G2 | B72650M0250K072 |
| 3225 | Blister | 330 | 1000 | CU3225K275G2 | B72650M0271K072 |
| 3225 | Blister | 330 | 1000 | CU3225K300G2 | B72650M0301K072 |
| 3225 | Blister | 330 | 1000 | CU3225K30G2 | B72650M0300K072 |
| 3225 | Blister | 330 | 1000 | CU3225K35G2 | B72650M0350K072 |
| 3225 | Blister | 330 | 1000 | CU3225K40G2 | B72650M0400K072 |
| 3225 | Blister | 330 | 1000 | CU3225K50G2 | B72650M0500K072 |
| 3225 | Blister | 330 | 1000 | CU3225K60G2 | B72650M0600K072 |
| 3225 | Blister | 330 | 1000 | CU3225K75G2 | B72650M0750K072 |
| 3225 | Blister | 330 | 1000 | CU3225K95G2 | B72650M0950K072 |
| 3225 | Blister | 330 | 1000 | CU4032K11G2 | B72660M0110K072 |
| 4032 | Blister | 330 | 1000 | CU3225K17G2 | B72650M0170K072 |
| 4032 | Blister | 330 | 1000 | CU4032K115G2 | B72660M0111K072 |
| 4032 | Blister | 330 | 1000 | CU4032K130G2 | B72660M0131K072 |
| 4032 | Blister | 330 | 1000 | CU4032K140G2 | B72660M0141K072 |
| 4032 | Blister | 330 | 1000 | CU4032K14G2 | B72660M0140K072 |
| 4032 | Blister | 330 | 1000 | CU4032K150G2 | B72660M0151K072 |
| 4032 | Blister | 330 | 1000 | CU4032K175G2 | B72660M0171K072 |
| 4032 | Blister | 330 | 1000 | CU4032K17G2 | B72660M0170K072 |
| 4032 | Blister | 330 | 1000 | CU4032K20G2 | B72660M0200K072 |
| 4032 | Blister | 330 | 1000 | CU4032K230G2 | B72660M0231K072 |
| 4032 | Blister | 330 | 1000 | CU4032K250G2 | B72660M0251K072 |
| 4032 | Blister | 330 | 1000 | CU4032K25G2 | B72660M0250K072 |
| 4032 | Blister | 330 | 1000 | CU4032K275G2 | B72660M0271K072 |
| 4032 | Blister | 330 | 1000 | CU4032K300G2 | B72660M0301K072 |
| 4032 | Blister | 330 | 1000 | CU4032K30G2 | B72660M0300K072 |
| 4032 | Blister | 330 | 1000 | CU4032K35G2 | B72660M0350K072 |
| 4032 | Blister | 330 | 1000 | CU4032K40G2 | B72660M0400K072 |
| 4032 | Blister | 330 | 1000 | CU4032K50G2 | B72660M0500K072 |
| 4032 | Blister | 330 | 1000 | CU4032K60G2 | B72660M0600K072 |
| 4032 | Blister | 330 | 1000 | CU4032K75G2 | B72660M0750K072 |
| 4032 | Blister | 330 | 1000 | CU4032K95G2 | B72660M0950K072 |

**Reliability data**

**Note: For CU varistors mounted on PCB by reflow soldering.**

| Test | Test methods/conditions | Requirement |
|---|---|---|
| Varistor voltage | The voltage between two terminals with the specified measuring current applied is called $V_V$ (1 $mA_{DC}$ @ 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 µs) 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 ±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. | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$ |
| Surge current derating, 8/20 µs | 10 surge currents (8/20 µs), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 µs | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$ (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 | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$<br>(measured in direction of surge current)<br>No visible damage |



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| Test | Test methods/conditions | Requirement |
|---|---|---|
| Climatic sequence | The specimen shall be subjected to:<br>a) dry heat at UCT, 16 h, IEC 60068-2-2, test Ba<br>b) damp heat, 1st cycle:<br>55 °C, 93% r. H., 24 h, IEC 60068-2-30, test Db<br>c) cold, LCT, 2 h, IEC 60068-2-1, test Aa<br>d) damp heat, additional 5 cycles:<br>55 °C/25 °C, 93% r. H., 24 h/cycle, IEC 60068-2-30, test Db.<br>Then 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. Thereafter, insulation resistance $R_{ins}$ shall be measured at V = 500 V. | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$<br>$R_{ins} \geq 100$ MΩ |
| Rapid change of temperature | IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 5\%$<br>No visible damage |
| Damp heat, steady state | IEC 60068-2-78, test Ca<br>The specimen shall be subjected to 40 ±2 °C, 90 to 95% r. H. for 56 days without load / with 10% of the maximum continuous DC operating voltage $V_{DC}$. Then stored at room temperature and normal humidity for 1 to 2 h.<br>Thereafter, the change of $V_V$ shall be measured. Thereafter, insulation resistance $R_{ins}$ shall be measured at V = 500 V (insulated varistors only). | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$<br>$R_{ins} \geq 100$ MΩ |
| Solderability | IEC 60068-2-58, test Td1, method 1 - solder bath, Sn96, 5Ag3Cu0.5<br>T = 245 ±3 °C<br>t = 2 s | The terminations shall be uniformly tinned for soldering test. |
| Resistance to soldering heat | IEC 60068-2-58, test Td2, method 1 - solder bath, Sn96, 5Ag3Cu0.5<br>T = 260 ±5 °C<br>d = 10 ±1 s | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 5\%$<br>No visible damage |

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| Test | Test methods/conditions | Requirement |
|---|---|---|
| Robustness of termination | Substrate bending test<br>IEC 60068-2-21, test Ue1<br>Deflection = 2 mm<br>t = 60 s | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$<br>No visible damage |
| | Shear test<br>IEC 60068-2-21, test Ue3<br>Force = 5 N<br>t = 10 ±1 s | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 10\%$<br>No visible damage |
| Vibration | IEC 60068-2-6, test Fc, method B4<br>Frequency range: 10 … 55 Hz<br>Amplitude: 0.75 mm or 98 m/s$^2$<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 $V_v$ shall be measured and the specimen shall be visually examined. | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 5\%$<br>No visible damage |
| Bump | IEC 60068-2-27, test Ea<br>Pulse duration: 6 ms<br>Max. acceleration: 400 m/s$^2$<br>Number: 6 x 5000 shocks<br>Pulse shape: half sine | $\lvert\Delta V/V$ (1 mA)$\rvert \leq 5\%$<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

$R_{ins}$ = Insulation resistance

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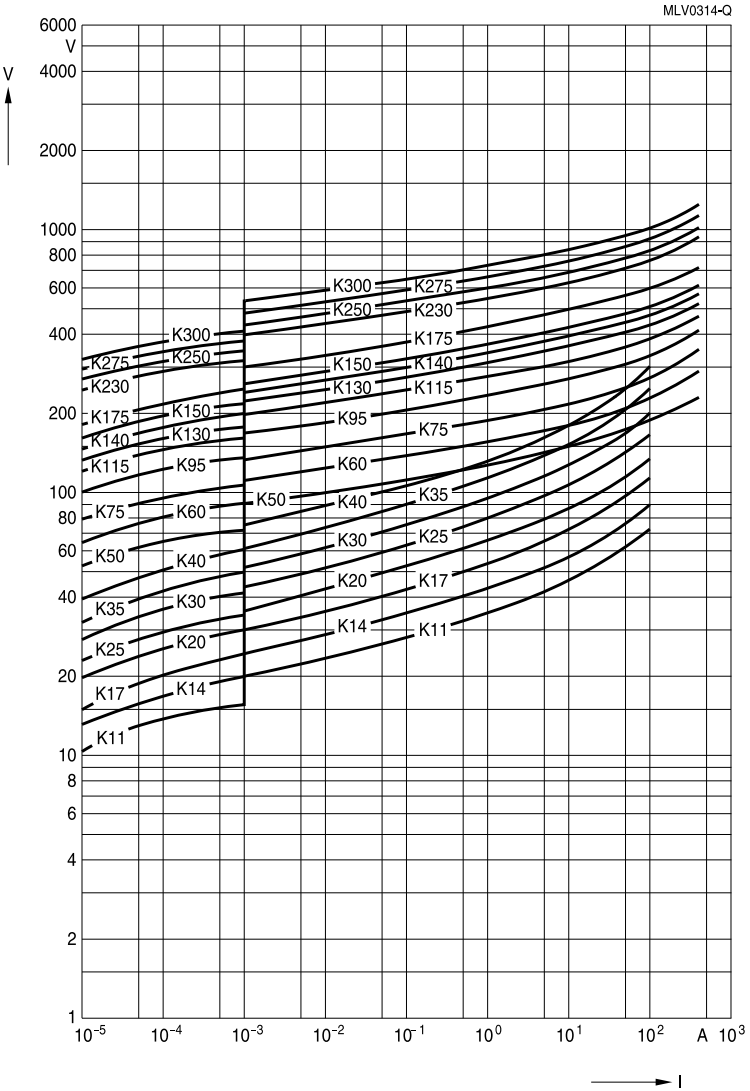
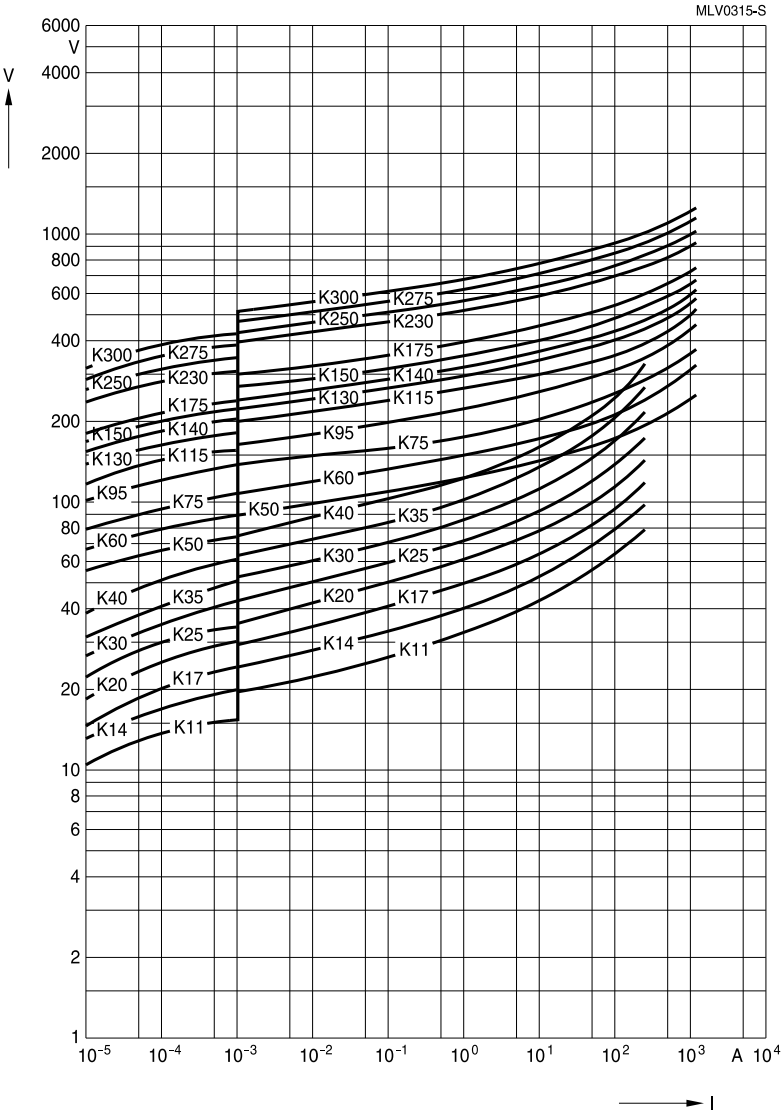
## V/I characteristics




**CU3225 ...**

## V/I characteristics




**CU4032 ...**

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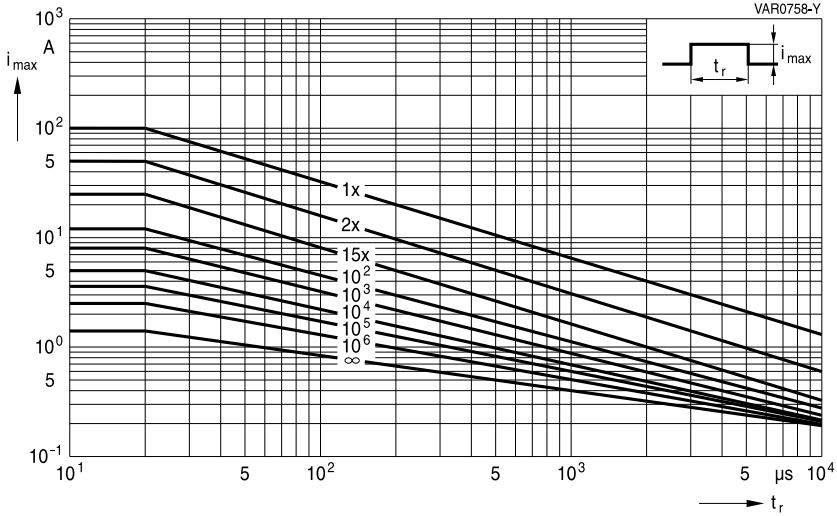
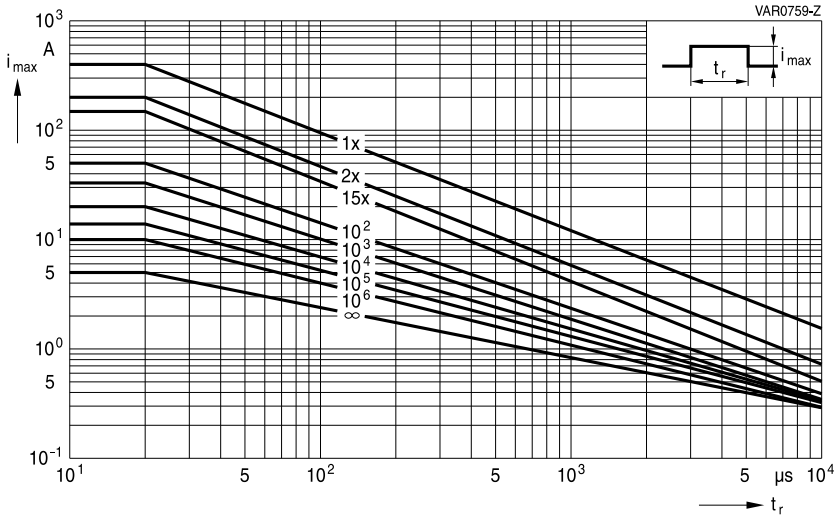
**Derating curves for CU3225...**

Maximum surge current $I_{surge,max}$ = f ($t_r$, pulse train)
For explanation of the derating curves refer to "General technical information", chapter 2.7.2



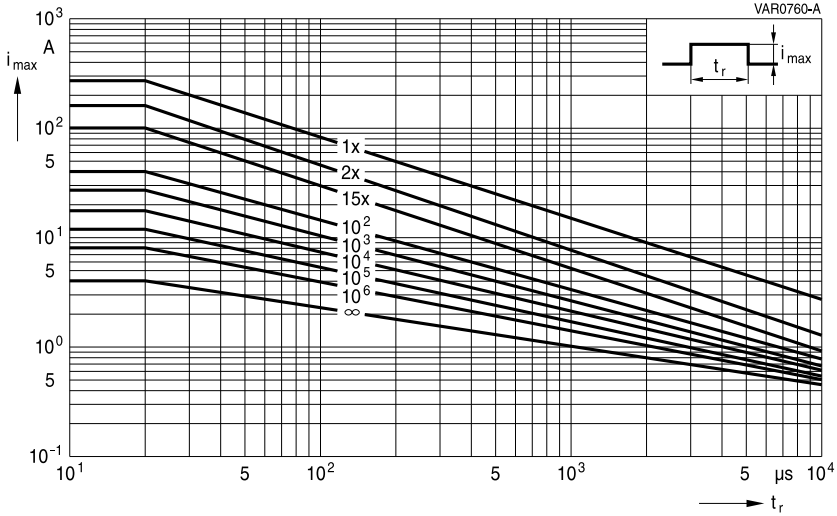

**CU3225K11G2 ... K40G2**



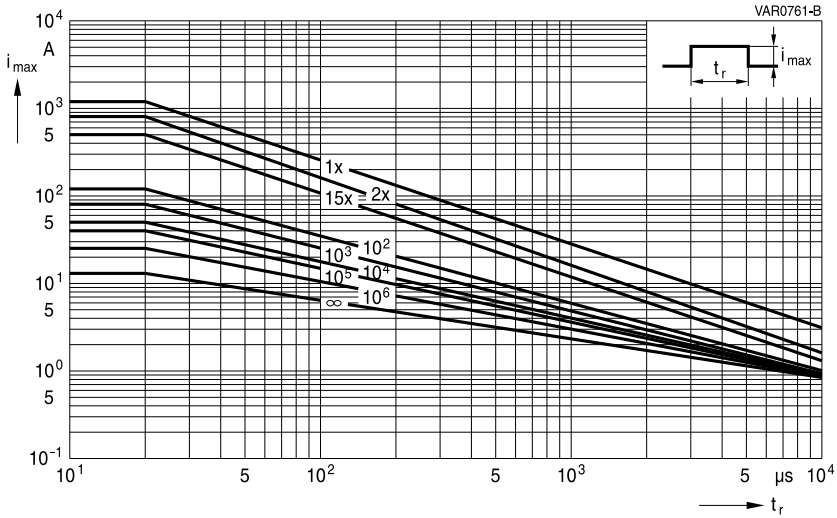

**CU3225K50G2 ... K300G2**

**Derating curves for CU4032...**

Maximum surge current $I_{surge,max}$ = f ($t_r$, pulse train)
For explanation of the derating curves refer to "General technical information", chapter 2.7.2




**CU4032K11G2 ... K40G2**




**CU4032K50G2 ... K300G2**

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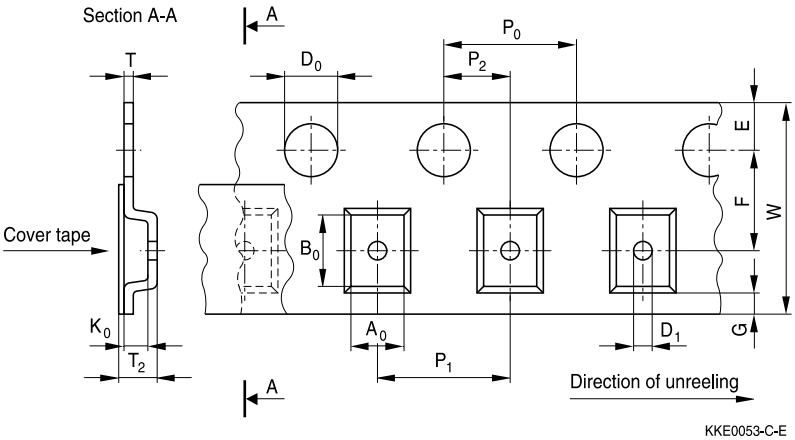
## Taping and packing for CU varistors

**Blister tape** (taping to IEC 60286-3)




**Dimensions in mm**

| | Symbol | Case size 3225 | Case size 4032 | Tolerance |
|---|---|---|---|---|
| Compartment width | $A_0$ | 7.0 | 8.6 | ±0.20 |
| Compartment length | $B_0$ | 8.70 | 10.6 | ±0.20 |
| Thickness cover tape | $K_0$ | 5.00 | | max. |
| Overall thickness | $T_2$ | 5.50 | | max. |
| Thickness tape | T | 0.30 | | max. |
| Sprocket hole diameter | $D_0$ | 1.50 | | +0.10/−0 |
| Sprocket hole diameter | $D_1$ | 1.50 | | min. |
| Sprocket hole pitch | $P_0$ | 4.00 | | ±0.10[1)] |
| Distance center hole to center compartment | $P_2$ | 2.00 | | ±0.05 |
| Pitch of the component compartments | $P_1$ | 12.00 | | ±0.10 |
| Tape width | W | 16.00 | | ±0.30 |
| Distance edge to center of hole | E | 1.75 | | ±0.10 |
| Distnace center hole to center compartment | F | 7.50 | | ±0.05 |
| Distance compartment to edge | G | 0.75 | | min. |

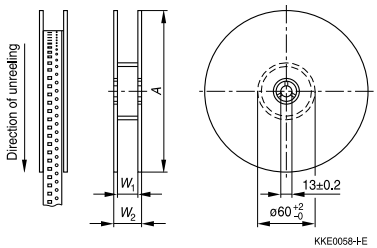
1) ≤0.2 mm over 10 sprocket holes

## Additional taping information

| | |
|---|---|
| Reel material | Polystyrol (PS) |
| Tape material | Polystyrol (PS) or Polycarbonat (PC), PVC or PET |
| Tape break force | min. 10 N |
| Top cover tape strength | min. 10 N |
| Tape peel angle | Angle between top cover tape and the direction of feed during peel off: 165° to 180° |
| Cavity play | Each part rests in the cavity so that the angle between the part and cavity center line is no more than 20° |

## Reel packing

Packing material: Plastic

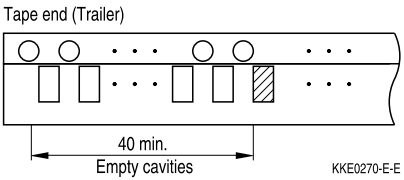


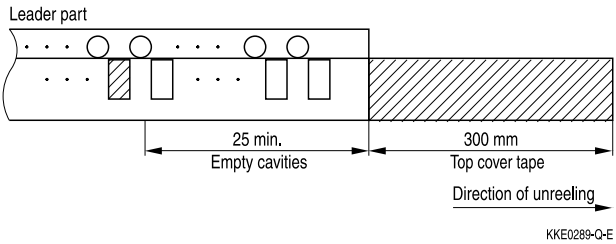

**Dimensions in mm**

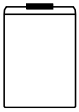
| | | Dimension | Tolerance |
|---|---|---|---|
| Reel diameter | A | 330 | +0/−2.0 |
| Reel width (inside) | $W_1$ | 16.4 | +1.5/−0 |
| Reel width (outside) | $W_2$ | 22.4 | max. |

**Packing unit: 1000 pcs./ reel**

**Leader, trailer**





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## Cautions and warnings

### General

1. EPCOS metal oxide varistors 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 EPCOS during the design-in-phase.
2. Ensure suitability of SIOVs through reliability testing during the design-in phase. SIOVs should be evaluated taking into consideration worst-case conditions.
3. For applications of SIOVs in line-to-ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

### Storage

1. Store SIOVs 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,
   <95% on maximum 30 days a year.
   Dew precipitation: is to be avoided.
3. Avoid contamination of an SIOV's during storage, handling and processing.
4. Avoid storage of SIOVs in harmful environments that can affect the function during long-term operation (examples given under operation precautions).
5. The SIOV type series should be soldered after shipment from EPCOS within the time specified:

| | |
|---|---|
| SIOV-S, -Q, -LS, -B, -SNF | 24 months |
| ETFV/ T series, -CU | 12 months. |

### Handling

1. SIOVs must not be dropped.
2. Components must not be touched with bare hands. Gloves are recommended.
3. Avoid contamination of the surface of SIOV electrodes during handling, be careful of the sharp edge of SIOV 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 (T14 and T20).

## Mounting

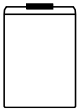
1. Potting, sealing or adhesive compounds can produce chemical reactions in the SIOV ceramic that will degrade the component's electrical characteristics.
2. Overloading SIOVs may result in ruptured packages and expulsion of hot materials. For this reason SIOVs should be physically shielded from adjacent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

## Operation

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

## Display of ordering codes for EPCOS products

The ordering code for one and the same EPCOS product can be represented differently in data sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products**. Detailed information can be found on the Internet under www.epcos.com/orderingcodes



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## 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 $i_c$ |
| $V_{DC}$ | DC operating voltage |
| $V_{jump}$ | Maximum jump start voltage |
| $v_{max}$ | Maximum voltage |
| $V_{op}$ | Operating voltage |
| $V_{RMS}$ | AC operating voltage, root-mean-square value |
| $V_{RMS,\ op,\ max}$ | Root-mean-square value of max. DC operating voltage incl. ripple current |
| $V_{surge}$ | Super imposed surge voltage |
| $V_V$ | Varistor voltage |
| $\Delta V_V$ | Tolerance of varistor voltage |
| $W_{LD}$ | Maximum load dump |
| $W_{max}$ | Maximum energy absorption |
| *e* | Lead spacing |

All dimensions are given in mm.
The commas used in numerical values denote decimal points.

## Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application.** As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.
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## Important notes

8. The trade names EPCOS, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

Release 2018-10

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