

SIOV metal oxide varistors

SMD varistors standard series, CU types

Series/Type: **B726***

Date: January 2018

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SMD
EPCOS type designation system for SMD varistor standard series

| | | | | |
|--|------|---|-----|----|
| CU | 4032 | K | 275 | G2 |
| Construction: CU \triangleq Encapsulated chip | | | | |
| Case sizes: 3225 \triangleq 32 x 25 4032 \triangleq 40 x 32 | | | | |
| Varistor voltage tolerance: K \triangleq $\pm 10\%$ | | | | |
| Maximum RMS operating voltage (V_{RMS}): 275 \triangleq 275 V | | | | |
| Taping mode: G2 \triangleq Taped, 330-mm reel | | | | |

SMD varistors (CU types)

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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 |



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Temperature derating

Climatic category: -40/+85 °C




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Electrical specifications and ordering codes
Maximum ratings ($T_A = 85\text{ }^\circ\text{C}$)

| Type | Ordering code | V_{RMS} | V_{DC} | i_{max} (8/20 μ s) | $I_n^{(1)}$ (8/20 μ s) | W_{max} (2 ms) | P_{max} |
|--------------|-----------------|-----------|----------|-----------------------------|-------------------------------|---------------------|-----------|
| | | V | V | 1 time A | 15 times A | mJ | 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 | ΔV _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 ($T_A = 85\text{ °C}$)

| Type | Ordering code | V_{RMS} | V_{DC} | i_{max} (8/20 μ s) 1 time | $I_n^{(1)}$ (8/20 μ s) 15 times | W_{max} (2 ms) | P_{max} |
|--------------|-----------------|-----------|----------|---------------------------------------|---|---------------------|-----------|
| | | V | V | A | A | mJ | 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 ($T_A = 25\text{ °C}$)

| Type | V_V (1 mA) V | ΔV_V % | $V_{c,max}$ V | I_c (8/20 μ s) 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 |



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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 |



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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 μ s) applied. | To meet the specified value |
| Endurance at upper category temperature | 1000 h at UCT 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. Thereafter, the change of V_V shall be measured. | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ |
| Surge current derating, 8/20 μ s | 10 surge currents (8/20 μ s), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 μ s | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ (measured in direction of surge current) 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\%$ (measured in direction of surge current) No visible damage |


SMD

| 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, 1st cycle: 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: 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 V_V shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at $V = 500$ V.</p> | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 100 \text{ M}\Omega$ |
| 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\%$ No visible damage |
| Damp heat, steady state | IEC 60068-2-78, test Ca 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. Thereafter, the change of V_V shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at $V = 500$ V (insulated varistors only). | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 100 \text{ M}\Omega$ |
| Solderability | IEC 60068-2-58, test Td1, method 1 - solder bath, Sn96, 5Ag3Cu0.5 $T = 245 \pm 3$ °C $t = 2$ 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 $T = 260 \pm 5$ °C $d = 10 \pm 1$ s | $ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage |


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| Test | Test methods/conditions | Requirement |
|---------------------------|---|--|
| Robustness of termination | Substrate bending test IEC 60068-2-21, test Ue1 Deflection = 2 mm t = 60 s | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ No visible damage |
| | Shear test IEC 60068-2-21, test Ue3 Force = 5 N t = 10 ± 1 s | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ No visible damage |
| Vibration | IEC 60068-2-6, test Fc, method B4 Frequency range: 10 ... 55 Hz Amplitude: 0.75 mm or 98 m/s ² Duration: 6 h (3 · 2 h) Pulse: sine wave After repeatedly applying a single harmonic vibration according to the table above. The change of V_V shall be measured and the specimen shall be visually examined. | $ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage |
| Bump | IEC 60068-2-27, test Ea Pulse duration: 6 ms Max. acceleration: 400 m/s ² Number: 6 x 5000 shocks Pulse shape: half sine | $ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage |
| Fire hazard | IEC 60695-11-5 (needle flame test) 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 ...



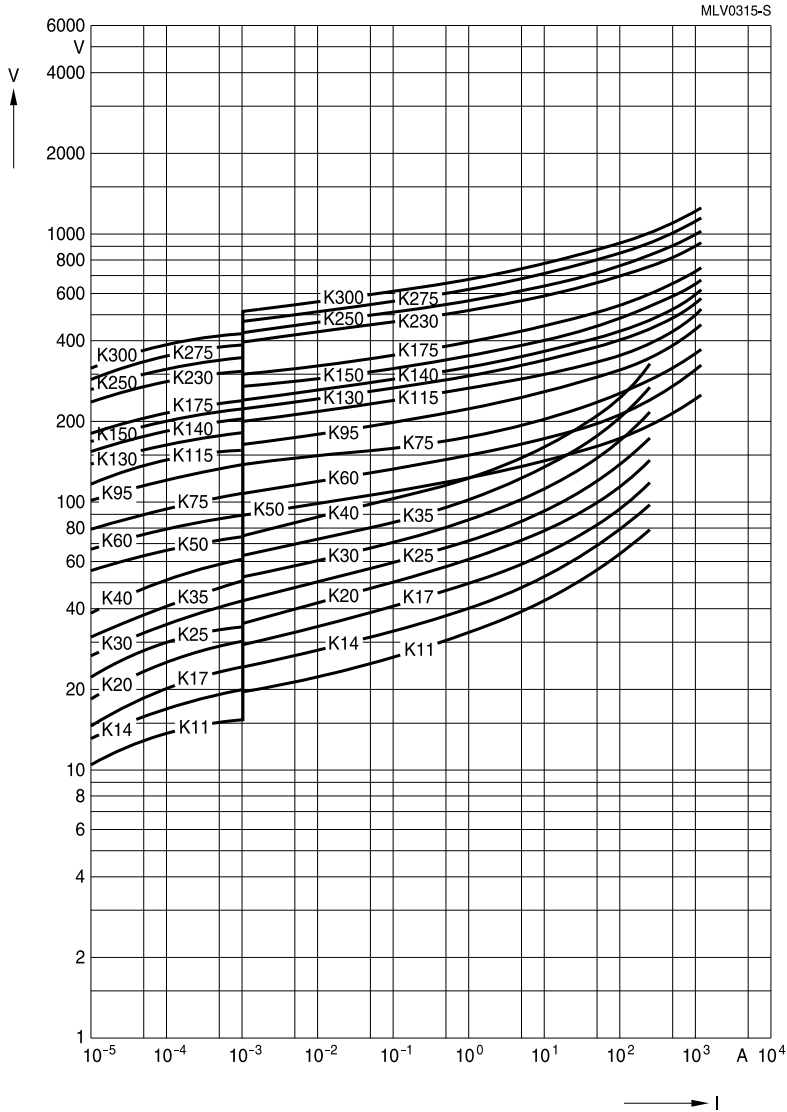
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V/I characteristics



CU4032 ...



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Derating curves for CU3225...

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

For explanation of the derating curves refer to "General technical information", chapter 2.7.2



CU3225K11G2 ... K40G2



CU3225K50G2 ... K300G2



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Derating curves for CU4032...

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

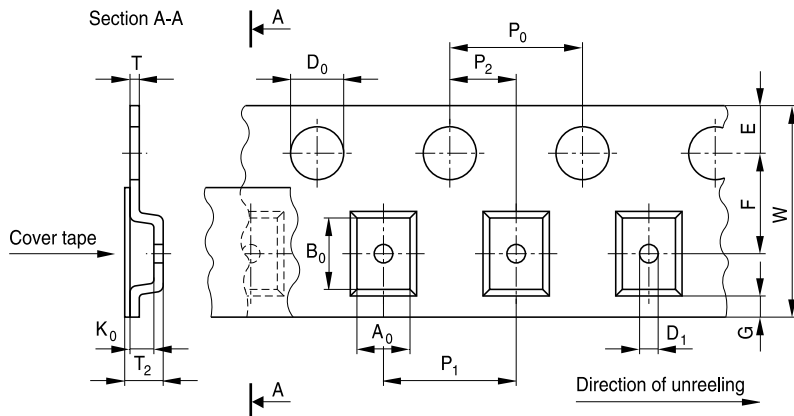
For explanation of the derating curves refer to "General technical information", chapter 2.7.2



CU4032K11G2 ... K40G2



CU4032K50G2 ... K300G2


SMD
Taping and packing for CU varistors
Blister tape (taping to IEC 60286-3)


KKE0053-C-E

Dimensions in mm

| | Symbol | Case size | | Tolerance |
|--|--------|-----------|------|-----------------|
| | | 3225 | 4032 | |
| 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 | | $\pm 0.10^{1)}$ |
| 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 |
| Distance 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



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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

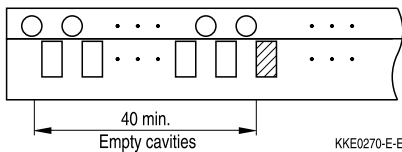


| | | Dimension | Tolerance |
|----------------------|----------------|-----------|-----------|
| Reel diameter | A | 330 | +0/-2.0 |
| Reel width (inside) | W ₁ | 16.4 | +1.5/-0 |
| Reel width (outside) | W ₂ | 22.4 | max. |

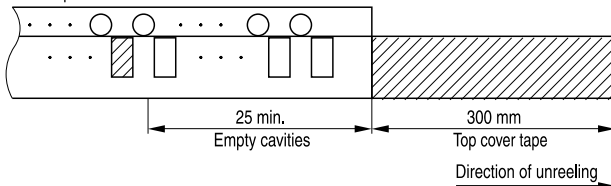
Packing unit: 1000 pcs./ reel

Leader, trailer

Tape end (Trailer)



Leader part



KKE0289-Q-E



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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


SMD
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 |
| ΔV_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.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to our General Terms and Conditions of Supply**.
7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard**. The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements ("CSR") TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System**. For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

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.

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