

## **SIOV metal oxide varistors**

SMD varistors for automotive applications, CU  
types

**Series/Type:** B726\*  
Date: January 2018

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**SMD**
**EPCOS type designation system for SMD disk varistor automotive series**

<b>CU</b>	<b>4032</b>	<b>K</b>	<b>14</b>	<b>AUTO</b>	<b>G2</b>
<b>Construction:</b> CU $\triangleq$ Encapsulated chip					
<b>Case sizes:</b> 3225 $\triangleq$ 32 x 25 4032 $\triangleq$ 40 x 32					
<b>Varistor voltage tolerance:</b> K $\triangleq$ $\pm 10\%$					
<b>Maximum RMS operating voltage (<math>V_{RMS}</math>):</b> 14 $\triangleq$ 14 V 17 $\triangleq$ 17 V 30 $\triangleq$ 30 V					
<b>Automotive series</b>					
<b>Taping mode:</b> G2 $\triangleq$ Taped, 330-mm reel					



### SMD

#### 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

- 12 V and 24 V supply systems
- High energy absorption capability
- SMD plastic package
- No temperature derating up to 85 °C
- RoHS-compatible
- Suitable for lead-free soldering
- PSpice simulation modeling available for different pulses

#### Approvals

- UL approved

#### 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		$V_{RMS}$	14 ... 30	V
Maximum DC operating voltage		$V_{DC}$	16 ... 34	V
Maximum surge current	(8/20 $\mu$ s)	$i_{max}$	100 ... 250	A
Maximum load dump energy	(10 pulses)	$W_{LD}$	6 ... 12	J
Maximum jump start voltage	(5 min)	$V_{jump}$	25 ... 50	V
Maximum energy absorption	(2 ms)	$W_{max}$	400 ... 2000	mJ
Maximum clamping voltage	(8/20 $\mu$ s)	$V_{c,max}$	43 ... 93	V
Operating temperature			-40/+85	°C
Storage temperature			-40/+125	°C



SMD varistors (CU types)

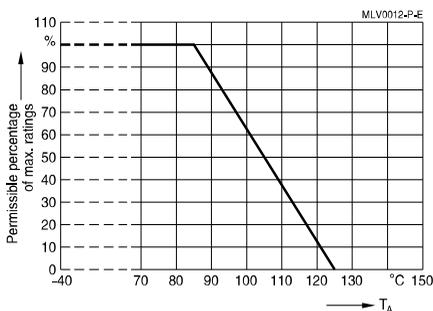
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### Temperature derating

Climatic category:  $-40/+85\text{ }^{\circ}\text{C}$



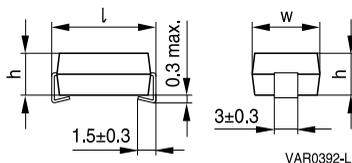
### Electrical specifications and ordering codes

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

Type	Ordering code	$V_{RMS}$ V	$V_{DC}$ V	$i_{max}$ (8/20 $\mu$ s) A	$W_{max}$ (2 ms) mJ	$W_{LD}$ (10 pulses) J	$P_{max}$ mW
CU3225K14AUTOG2	B72650M1140K072	14	16	100	400	6	10
CU4032K14AUTOG2	B72660M1140K072	14	16	250	900	12	20
CU3225K17AUTOG2	B72650M1170K072	17	20	100	500	6	10
CU4032K17AUTOG2	B72660M1170K072	17	20	250	1100	12	20
CU3225K30AUTOG2	B72650M1300K072	30	34	100	900	6	10
CU4032K30AUTOG2	B72660M1300K072	30	34	250	2000	12	20

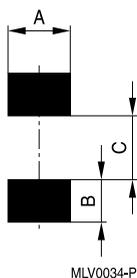
Characteristics ( $T_A = 25\text{ }^{\circ}\text{C}$ )

Type	$V_V$ (1 mA) V	$\Delta V_V$ %	$V_{jump}$ (5 min) V	$V_{c,max}$ V	$I_c$ (8/20 $\mu$ s) A	$C_{typ}$ (1 kHz, 1 V) pF
CU3225K14AUTOG2	22	$\pm 10$	25	43	1	1400
CU4032K14AUTOG2	22	$\pm 10$	25	43	2.5	2300
CU3225K17AUTOG2	27	$\pm 10$	30	53	1	1200
CU4032K17AUTOG2	27	$\pm 10$	30	53	2.5	1900
CU3225K30AUTOG2	47	$\pm 10$	50	93	1	600
CU4032K30AUTOG2	47	$\pm 10$	50	93	2.5	1100


**SMD**
**Dimensional drawing**


Dimensions in mm

Chip size EIA in mm	$V_{RMS,max}$	l	w	h
3225	14, 17, 30	$8.0 \pm 0.3$	$6.3 \pm 0.3$	$3.2 \pm 0.3$
4032	14, 17, 30	$10.2 \pm 0.3$	$8.0 \pm 0.3$	$3.2 \pm 0.3$

**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

**Delivery mode**

EIA case size	Taping	Reel size mm	Packing unit pcs.	Type	Ordering code
3225	Blister	330	1000	CU3225K14AUTOG2	B72650M1140K072
3225	Blister	330	1000	CU3225K17AUTOG2	B72650M1170K072
3225	Blister	330	1000	CU3225K30AUTOG2	B72650M1300K072
4032	Blister	330	1000	CU4032K14AUTOG2	B72660M1140K072
4032	Blister	330	1000	CU4032K17AUTOG2	B72660M1170K072
4032	Blister	330	1000	CU4032K30AUTOG2	B72660M1300K072



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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	100 h at UCT 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. Thereafter, the change of $V_V$ shall be measured.	$ \Delta V/V$ (1 mA) $\leq 10\%$
Load dump	ISO 7637-2 Number of pulses: 10 Pulse interval: 60 s Pulse duration: 500 ms	$ \Delta V/V$ (1 mA) $\geq -15\%$ No visible damage
Jump start	$V_{DC, load} = V_{jump}$ ; 5 min duration 14 V (S...K14AUTO...); $V_{jump} = 25$ V 17 V (S...K17AUTO...); $V_{jump} = 30$ V 30 V (S...K30AUTO...); $V_{jump} = 45$ V	$ \Delta V/V$ (1 mA) $\geq -15\%$ No visible damage
Fast temperature cycling	IEC 60068-2-14, test Na, LCT/UCT, dwell time 15 min, 100 cycles	$ \Delta V/V$ (1 mA) $\leq 5\%$ No visible damage
Damp heat	IEC 60068-2-67, test Cy, 85 °C, 85% r. H., $V_{DC}$ , 1000 h	$ \Delta V/V$ (1 mA) $\leq 10\%$ No visible damage
Substrate bending test	IEC 60068-2-21, test Ue1 Deflection = 2 mm $t = 60$ s	$ \Delta V/V$ (1 mA) $\leq 10\%$ No visible damage
Shear test	IEC 60068-2-21, test Ue3 Force = 5 N $t = 10 \pm 1$ s	$ \Delta V/V$ (1 mA) $\leq 10\%$ No visible damage

#### Note:

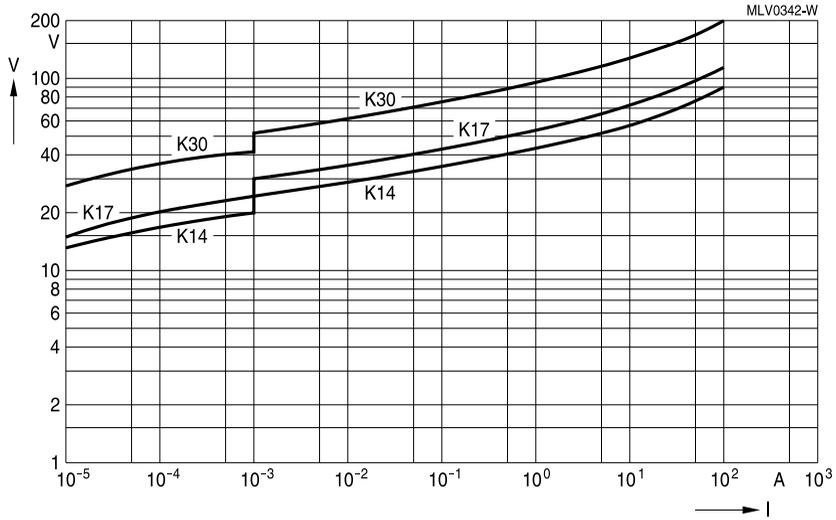
UCT = Upper category temperature

LCT = Lower category temperature

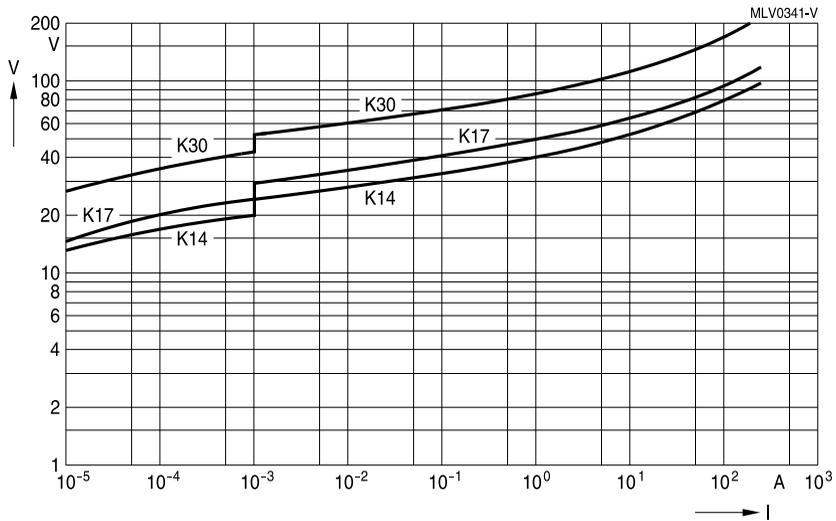


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**V/I characteristics**



**CU3225 ... AUTOG2**



**CU4032 ... AUTOG2**

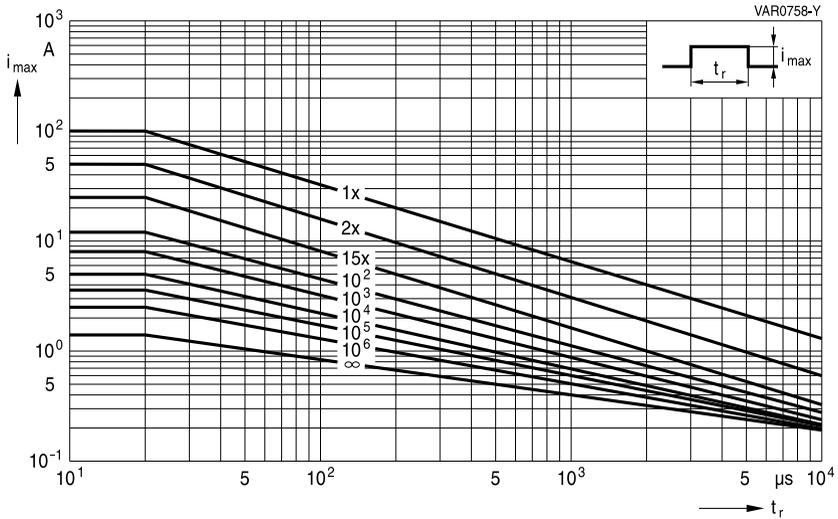


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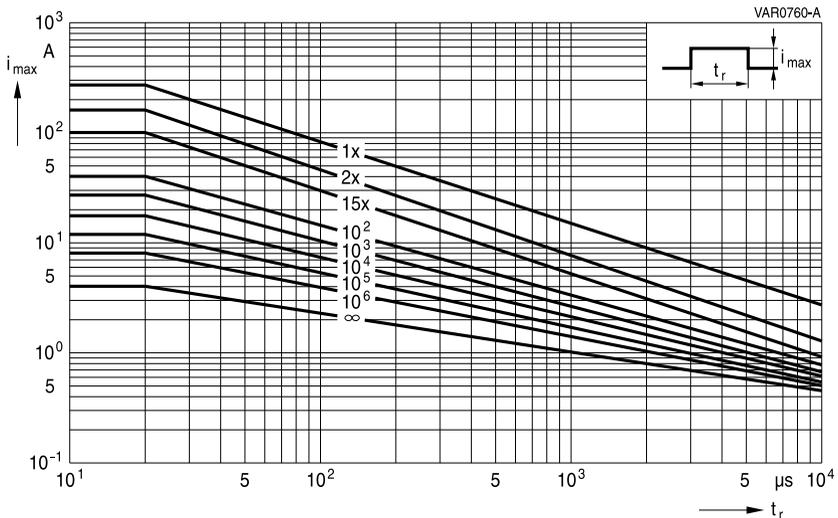
**Derating curves**

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

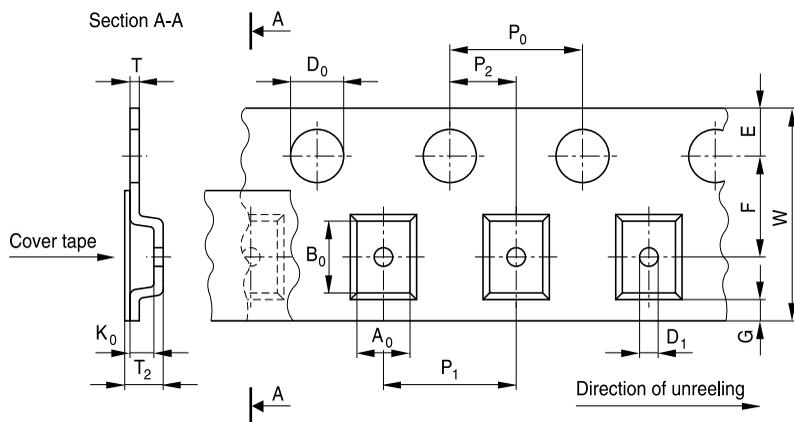
For explanation of the derating curves refer to "General technical information", chapter 2.7.2



**CU3225K14AUTOG2 ... K30AUTOG2**



**CU4032K14AUTOG2 ... K30AUTOG2**


**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	$\pm 0.20$
Compartment length	$B_0$	8.70	10.6	$\pm 0.20$
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		$\pm 0.05$
Pitch of the component compartments	$P_1$	12.00		$\pm 0.10$
Tape width	$W$	16.00		$\pm 0.30$
Distance edge to center of hole	$E$	1.75		$\pm 0.10$
Distance center hole to center compartment	$F$	7.50		$\pm 0.05$
Distance compartment to edge	$G$	0.75		min.

 1)  $\leq 0.2$  mm over 10 sprocket holes



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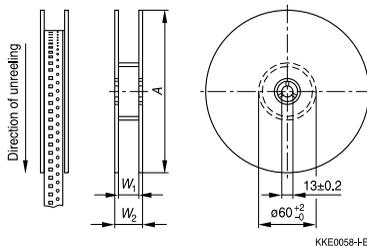
**Additional taping information**

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**

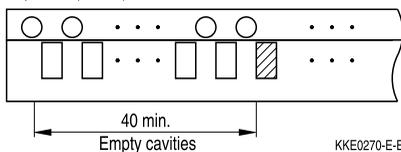


		Dimension	Tolerance
Reel diameter	A	330	+0/-2.0
Reel width (inside)	W <sub>1</sub>	16.4	+1.5/-0
Reel width (outside)	W <sub>2</sub>	22.4	max.

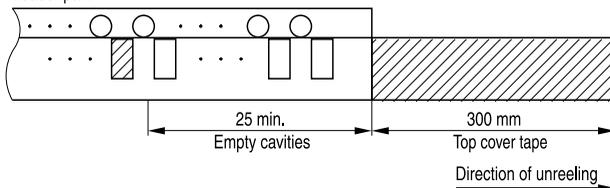
**Packing unit: 1000 pcs./ reel**

**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.

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**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
$\Delta V_V$	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.

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