SIOV metal oxide varistors

SMD varistors for automotive applications, CU types

Series/Type: **B726***

Date: January 2018

EPCOS AG is a TDK Group Company.

Automotive series

SMD

EPCOS type designation system for SMD disk varistor automotive series

CU	4032	K	14	AUTO	G2

Construction:
CU ≙ Encapsulated chip

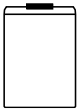
Case sizes:
3225 ≙ 32 x 25
4032 ≙ 40 x 32

Varistor voltage tolerance:
K ≙ ±10%

Maximum RMS operating voltage (V_{RMS}):
14 ≙ 14 V
17 ≙ 17 V
30 ≙ 30 V

Automotive series

Taping mode:
G2 ≙ Taped, 330-mm reel



SMD varistors (CU types) **B726***

Automotive series

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.

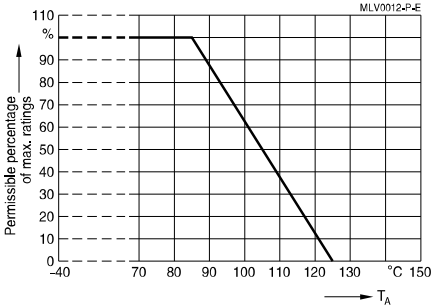
General technical data

Maximum RMS operating voltage		V_{RMS}	14 ... 30	V
Maximum DC operating voltage		V_{DC}	16 ... 34	V
Maximum surge current	(8/20 µs)	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 µs)	$v_{c,max}$	43 ... 93	V
Operating temperature			−40/+85	°C
Storage temperature			−40/+125	°C

SMD

Temperature derating

Climatic category: −40/+85 °C



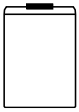
Electrical specifications and ordering codes

Maximum ratings (T_A = 85 °C)

Type	Ordering code	V_{RMS} V	V_{DC} V	i_{max} (8/20 µs) 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

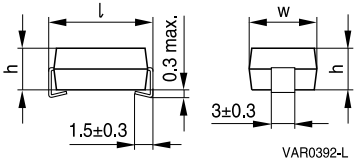
Characteristics (T_A = 25 °C)

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



SMD

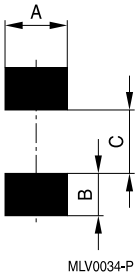
Dimensional drawing



Dimensions in mm

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

Recommended solder pad layout

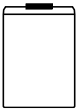


Dimensions in mm

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



SMD

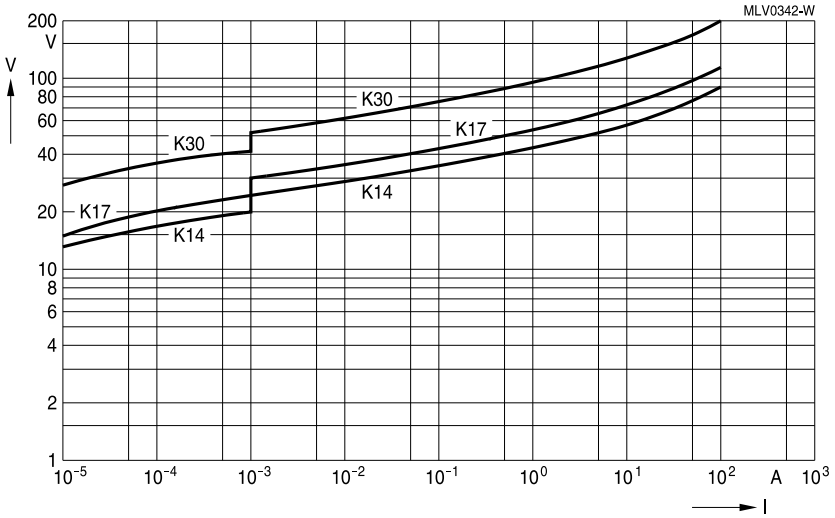
Reliability data

Test	Test methods/conditions	Requirement
Varistor voltage	The voltage between two terminals with the specified measuring current applied is called V_V (1 mA_{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	100 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 chance of V_V shall be measured.	$\lvert\Delta V/V$ (1 mA)$\rvert \leq$10%
Load dump	ISO 7637-2 Number of pulses: 10 Pulse interval: 60 s Pulse duratin: 500 ms	$\lvert\Delta V/V$ (1 mA)$\rvert \geq$-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	$\lvert\Delta V/V$ (1 mA)$\rvert \geq$-15% No visible damage
Fast temperature cycling	IEC 60068-2-14, test Na, LCT/UCT, dwell time 15 min, 100 cycles	$\lvert\Delta V/V$ (1 mA)$\rvert \leq$5% No visible damage
Damp heat	IEC 60068-2-67, test Cy, 85 °C, 85% r. H., V_{DC}, 1000 h	$\lvert\Delta V/V$ (1 mA)$\rvert \leq$10% No visible damage
Substrate bending test	IEC 60068-2-21, test Ue1 Deflection = 2 mm t = 60 s	$\lvert\Delta V/V$ (1 mA)$\rvert \leq$10% No visible damage
Shear test	IEC 60068-2-21, test Ue3 Force = 5 N t = 10 ±1 s	$\lvert\Delta V/V$ (1 mA)$\rvert \leq$10% No visible damage

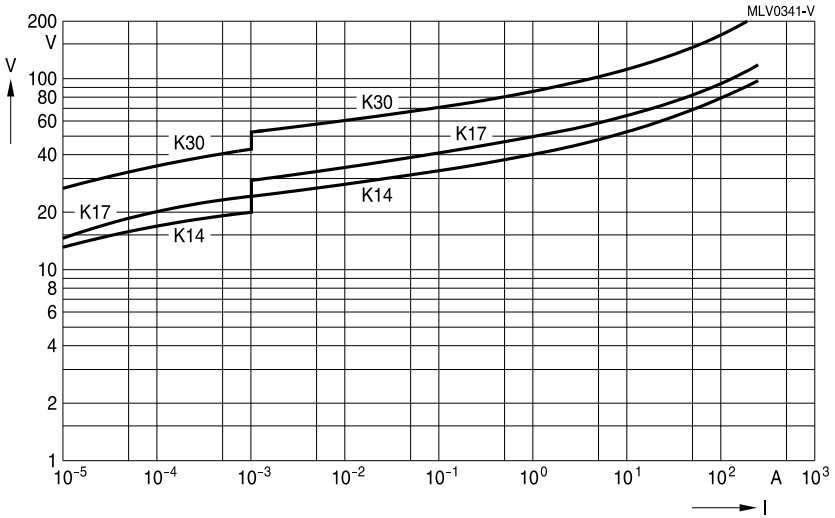
Note:
UCT = Upper category temperature
LCT = Lower category temperature

SMD

V/I characteristics



CU3225 ... AUTOG2

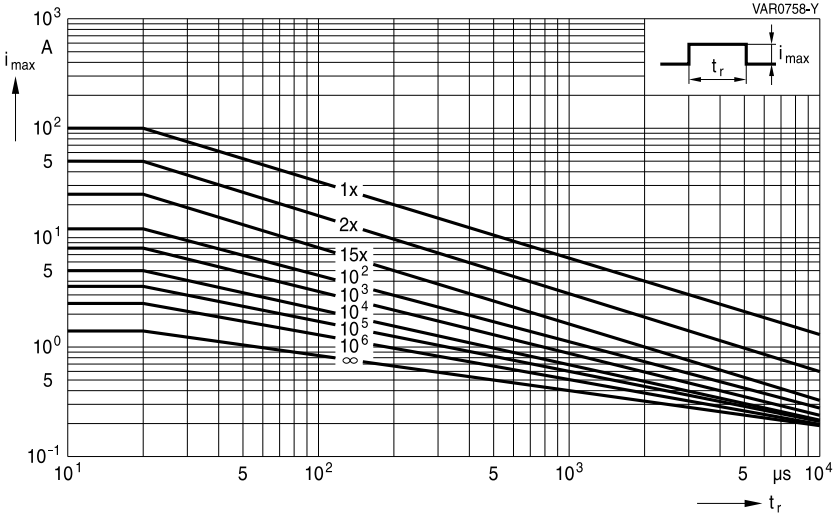


CU4032 ... AUTOG2

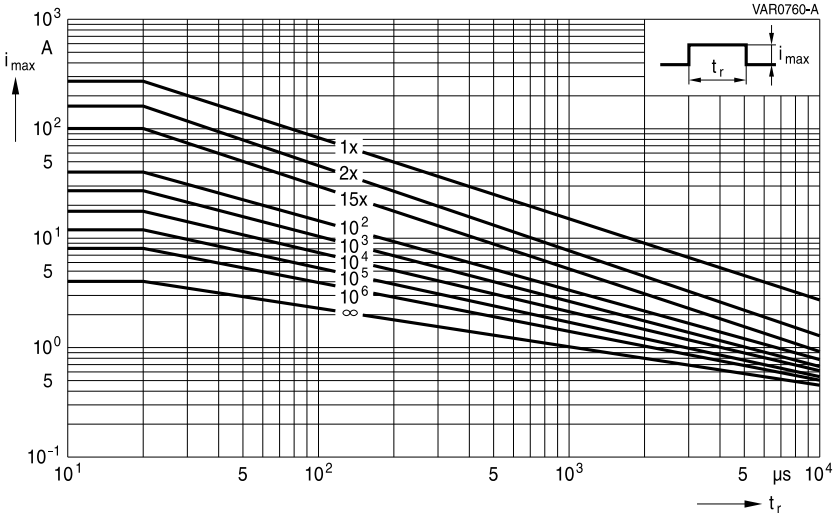
SMD

Derating curves

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



CU3225K14AUTOG2 ... K30AUTOG2

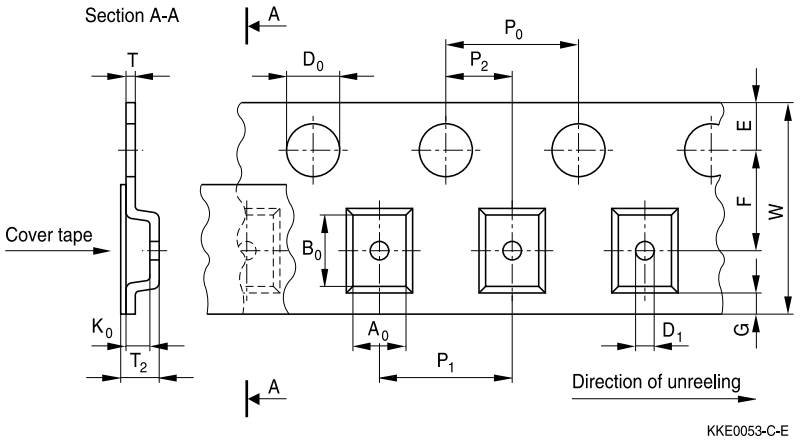


CU4032K14AUTOG2 ... K30AUTOG2

SMD

Taping and packing for CU varistors

Blister tape (taping to IEC 60286-3)



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		±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.

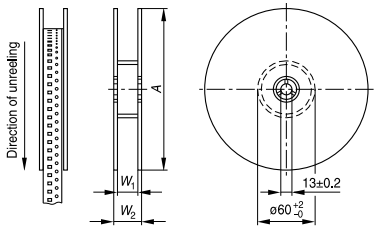
1) ≤0.2 mm over 10 sprocket holes

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

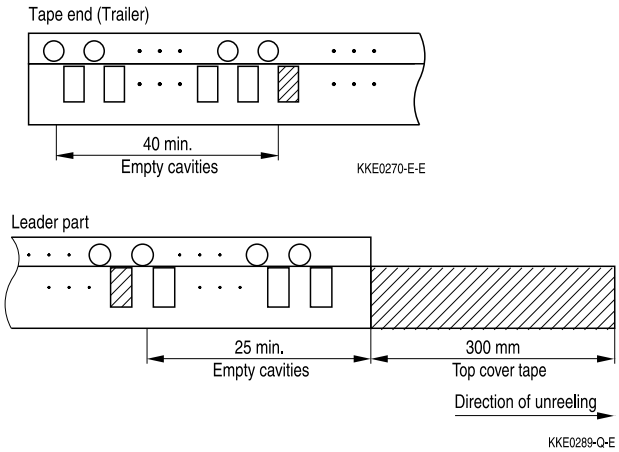


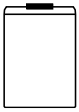
Dimensions in mm

		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





SMD

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

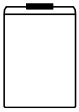
1. Potting, sealing or adhesive compounds can produce chemical reactions in the SIOV ceramic that will degrade the component's electrical characteristics.
2. Overloading SIOVs may result in ruptured packages and expulsion of hot materials. For this reason SIOVs should be physically shielded from adjacent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



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, EPCOS is 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 an EPCOS 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 lifesaving 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.epcos.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 the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.

7. 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.epcos.com/trademarks.