

SIOV metal oxide varistors

Leaded varistors, Automotive 42 V series

Series/Type:B722*Date:January 2018

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Automotive series for 42 V

Construction

- Round varistor element, leaded
- Coating: phenolic resin
- Terminals: tinned wire

Features

- Automotive series for 42 V supply systems
- This series complies with the electrical requirements for the new 42 V board net as specified in draft standard ISO/TC22 WD42V-1E
- Stable protection level, minimum leakage current
- High resistance to cyclic temperature stress: 1000 cycles
- High operating temperature up to 125 °C
- All types are AEC-Q200 qualified

Delivery mode

- Bulk (standard), taped versions on reel or in Ammo pack upon request.
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

General technical data

Climatic category	to IEC 60068-1	40/125/56	
Operating temperature		-40 +125	°C
Storage temperature		-40 +150	°C

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Electrical specifications and ordering codes

Maximum ratings (T_A = 125 °C)

Ordering code	Туре	V _{RMS, op, max} 1)	V _{op, max} ²⁾	V max, dyn ³⁾	W _{max}	P _{max}
-	(untaped)				(2 ms)	
	SIOV-	V _{DC}	V _{DC}	V _{DC}	J	W
42-V supply systems						
B72207S1390K201	S07V42AUTOS2D1	48	50	58	3.0	0.02
B72210S1390K501	S10V42AUTOS5D1	48	50	58	6.4	0.05
B72214S1390K501	S14V42AUTOS5D1	48	50	58	13.0	0.10
B72220S1390K501	S20V42AUTOS5D1	48	50	58	37.0	0.20

1) Root-mean-square value of max. DC operating voltage incl. ripple

2) Peak value of max. DC operating voltage incl. ripple

3) Max. dynamic overvoltage as per ISO/TC22 WD24V-1E, $t_{\rm S} \leq 400~{\rm ms}$

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

Ordering code	Type (untaped) SIOV-	V _v (1 mA) V	ΔV _v (1 mA) %	V _{c,max} (i _c) V	i _c A	C _{typ} (1 kHz) nF
42-V supply systems						
B72207S1390K201	S07V42AUTOS2D1	68	±10	135	2.5	0.90
B72210S1390K501	S10V42AUTOS5D1	68	±10	135	5.0	2.10
B72214S1390K501	S14V42AUTOS5D1	68	±10	135	10.0	3.55
B72220S1390K501	S20V42AUTOS5D1	68	±10	135	20.0	6.75



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Dimensional drawings





1) Seating plane to IEC 60717 VAR0553-D-E

S07V42AUTOS2D1

1) Seating plane to IEC 60717

S10, S14, S20V42AUTOS5D1

Dimensions

Ordering code	[e] ±1	a (typical)	W _{max}	th _{max}	h _{max}	I _{min}	d ±0.05
-	mm	mm	mm	mm	mm	mm	mm
B72207S1390K201	5.0	1.7	9.0	4.1	12.5	25.0	0.6
B72210S1390K501	7.5	2.0	12.0	4.8	16.0	25.0	0.8
B72214S1390K501	7.5	2.1	16.0	4.9	20.0	25.0	0.8
B72220S1390K501	10.0	2.3	22.0	5.5	27.0	25.0	1.0

Weight

Nominal diameter	V _{RMS, op, max}	Weight
mm	V	g
7	48	0.5
10	48	1.0
14	48	2.5
20	48	5.0



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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 _{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
Max. DC operating voltage	MIL STD 202F, method 108A, UCT, $V_{\mbox{\tiny DC}},$ 1000 h	l∆V/V (1 mA)l ≤10% No visible damage
Fast temperature cycling	IEC 60068-2-14, test Na, LCT/UCT, dwell time 15 min, 100 cycles for SIOVAUTO types and dwell time 15 min, 1000 cycles for SIOVAUTOD1 types	l∆V/V (1 mA)l ≤5% No visible damage
Damp heat	IEC 60068-2-67, test Cy, 85 °C, 85% r. H., V _{DC} , 1000 h	l∆V/V (1 mA)l ≤10% No visible damage

Note:

UCT = Upper category temperature

LCT = Lower category temperature



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v/i characteristics

v = f(i) for explanation of the characteristics refer to "General technical information", 1.6.3 A = Leakage current, B = Protection level } for worst-case varistor tolerances



SIOV-S10(-S14)(-S20)V42AUTOS5D1

Please read Cautions and warnings and Important notes at the end of this document.

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Derating curves

Maximum surge current $i_{max} = f(t_r, pulse train)$

For explanation of the derating curves refer to "General technical information", section 1.8.1

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SIOV-S07V42AUTOS2D1



SIOV-S10V42AUTOS5D1



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Derating curves

Maximum surge current $i_{max} = f(t_r, pulse train)$

For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-S14V42AUTOS5D1



SIOV-S20V42AUTOS5D1



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Taping, packaging and lead configuration

1 EPCOS ordering code system

For leaded varistors







2 Taping and packaging of leaded varistors

Tape packaging for lead spacing $\boxed{e} = 5$ fully conforms to IEC 60286-2, while for lead spacings $\boxed{e} = 7.5$ and 10 the taping mode is based on this standard.

2.1 Taping in accordance with IEC 60286-2 for lead spacing 5.0 mm



2.2 Taping based on IEC 60286-2 for lead spacing 7.5 and 10 mm





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2.3 Tape dimensions (in mm)

Sym-	<i>e</i> = 5.0	Tolerance	<i>e</i> = 7.5	Tolerance	<i>e</i> = 10.0	Tolerance	Remarks
bol							
w		max.		max.		max.	see tables in
							each series
th		max.		max.		max.	under
							"Dimensions"
d	0.6	±0.05	0.8	±0.05	1.0	±0.05	
P ₀	12.7	±0.3	12.7 ¹⁾	±0.3	12.7	±0.3	±1 mm/20
							sprocket holes
P ₁	3.85	±0.7	8.95	±0.8	7.7	±0.8	
F	5.0	+0.6/-0.1	7.5	±0.8	10.0	±0.8	
Δh	0	±2.0	depends of	ns	depends on	S	measured at
Δр	0	±1.3	0	±2.0	0	±2.0	top of compo-
							nent body
W	18.0	±0.5	18.0	±0.5	18.0	±0.5	
W _o	5.5	min.	11.0	min.	11.0	min.	Peel-off
							force ≥ 5 N
W ₁	9.0	±0.5	9.0	+0.75/-0.5	9.0	+0.75/-0.5	
W ₂	3.0	max.	3.0	max.	3.0	max.	
Н	18.0	+2.0/-0	18.0	+2.0/-0	18.0	+2.0/-0	2)
H₀	16.0	±0.5	16.0	±0.5	16.0	±0.5	3)
	(18.0)		(18.0)				
H ₁	32.2	max.	45.0	max.	45.0	max.	
D ₀	4.0	±0.2	4.0	±0.2	4.0	±0.2	
t	0.9	max.	0.9	max.	0.9	max.	without lead
L	11.0	max.	11.0	max.	11.0	max.	
L ₁	0.5	max.					

1) Taping with $P_0 = 15.0$ mm upon request

2) Applies only to uncrimped types

Applies only to crimped types (H₀ = 18 upon request)





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2.4 Taping mode

Example: B72210S0271K151

Digit 14

Digit 14	Taping	Reel type	Seating plane height H_0	Seating plane height H	Pitch distance
	mode		for crimped types	for uncrimped types	P ₀
			mm	mm	mm
0	-	Bulk	-	-	-
1	G	I	16	18	12.7
2	G2	I	18	-	12.7
3	G3	П	16	18	12.7
4	G4	П	18	-	12.7
5	G5	Ш	16	18	12.7
6	GA	Ammo pack	16	18	12.7
7	G2A	Ammo pack	18	-	12.7
Internal	coding fo	r special tapin	g		
	G6	III	18	-	12.7
	G10	П	16	18	15.0
	G11	П	18	-	15.0
	G10A	Ammo pack	16	18	15.0
	G11A	Ammo pack	18	_	15.0

2.5 Reel dimension





Dimensions (in mm)

Reel type	d	f	n	W
I	360 max.	31 ±1	approx. 45	54 max.
II	360 max.	31 ±1	approx. 55	64 max.
III	500 max.	23 ±1	approx. 59	72 max.

If reel type III is not compatible with insertion equipment because of its large diameter, nominal disk diameter 10 mm and 14 mm can be supplied on reel II upon request (taping mode G3).

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2.6 Ammo pack dimensions



3 Lead configuration

Straight leads are standard for disk varistors. Other lead configurations as crimp style or customer-specific lead wire length according to 3.1, 3.2, 3.3 and 3.4 are optional. Crimped leads (non-standard) are differently crimped for technical reasons; the individual crimp styles are denoted by consecutive numbers (S, S2 through S5) as shown in the dimensional drawings below.

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The crimp styles of the individual types can be seen from the type designation in the ordering tables.

3.1 Crimp style mode

Example: B72210S0271K 5 01

Digit 13

Digit 13 of ordering code	Crimp style	Figure
1	Standard, straight leads	1
2	S2	2
3	S3	3
5	S5	4
Available upon request		
Internal coding	-	5





3.2 Standard leads and non-standard crimp styles

The basic dimensions in figure 1 to 5 are valid for types with either round or square (EnergetiQ series) component head.

Standard, straight leads



1) Seating plane to IEC 717 VAR0586-W-E



Non-standard,

1) Seating plane to IEC 60717 VAR0411-F-E

Non-standard, crimp style S3



1) Seating plane to IEC 60717 VAR0396-R-E



Figure 1

Figure 2

Non-standard, crimp style S5



1) Seating plane to IEC 60717 VAR0726-M-E

Figure 4



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Trimmed leads (non-standard) 3.3

Varistors with cut leads available upon request.

Lead length tolerances:	
Straight leads	+/-0.8 mm
Crimped leads	+/-0.5 mm
Minimum lead length	3.0 mm



 Seating plane to IEC 60717
For round component head
For EnergetiQ series, square component head VAR0642-U-E

Figure 5



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Cautions and warnings

General

- 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.
- 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.
- 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.
- Temperatures of all preheat stages and the solder bath must be strictly controlled especially for T series (T14 and T20).



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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.
- 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
С	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
l _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 $i_{\rm c}$
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
$V_{\text{RMS, op, max}}$	Root-mean-square value of max. DC operating voltage incl. ripple current
V _{surge}	Super imposed surge voltage
Vv	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.



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