

SIOV metal oxide varistors

Strap varistors, HighE, Advanced, LS41 series

Series/Type: B722*

Date: January 2018

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Construction

- Rectangular varistor element
- Coating: epoxy resin, flame-retardant to UL 94 V-0
- Bolt-holed strap terminals for screw fixing or soldering
- Bent or straight strap terminals

Features

- Dimensions equivalent to SIOV-LS40
- High surge current up to 50 kA
- Wide operating voltage range 130 ... 460 V_{RMS}
- Designed in accordance with the requirements of IEC 61643-1, class II, for low-voltage surge protection devices

Approvals

- UL
- CSA

Delivery mode

- Vacuum-packed styrofoam box

General technical data

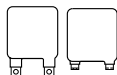
| | | | |
|-----------------------|----------------|--------------|-------------------|
| Climatic category | to IEC 60068-1 | 40/85/56 | |
| Operating temperature | to CECC 42000 | -25 ... + 85 | °C |
| Storage temperature | | -25 ... +110 | °C |
| Electric strength | to CECC 42 000 | ≥ 2.5 | kV _{RMS} |
| Insulation resistance | to CECC 42 000 | ≥ 10 | MΩ |


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

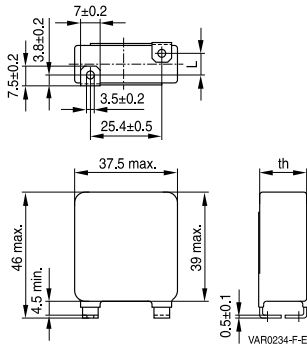
| Ordering code | Type | V_{RMS} | V_{DC} | $I_{max}^{(1)}$ (8/20 μs) 1 time | $I_n^{(2)}$ (8/20 μs) 15 times | W_{max} (2 ms) | P_{max} |
|---------------------------------|--------------|-----------|----------|--|--|---------------------|-----------|
| | SIOV- | V | V | A | A | J | W |
| Bent strap terminals | | | | | | | |
| B72241L0131K100 | LS41K130QP | 130 | 170 | 50000 | 20000 | 310 | 1.4 |
| B72241L0141K100 | LS41K140QP | 140 | 180 | 50000 | 20000 | 340 | 1.4 |
| B72241L0151K100 | LS41K150QP | 150 | 200 | 50000 | 20000 | 360 | 1.4 |
| B72241L0231K100 | LS41K230QP | 230 | 300 | 50000 | 20000 | 460 | 1.4 |
| B72241L0251K100 | LS41K250QP | 250 | 320 | 50000 | 20000 | 490 | 1.4 |
| B72241L0271K100 | LS41K275QP | 275 | 350 | 50000 | 20000 | 550 | 1.4 |
| B72241L0321K100 | LS41K320QP | 320 | 420 | 50000 | 20000 | 640 | 1.4 |
| B72241L0381K100 | LS41K385QP | 385 | 505 | 50000 | 20000 | 800 | 1.4 |
| B72241L0421K100 | LS41K420QP | 420 | 560 | 50000 | 20000 | 910 | 1.4 |
| B72241L0441K100 | LS41K440QP | 440 | 585 | 50000 | 20000 | 950 | 1.4 |
| B72241L0461K100 | LS41K460QP | 460 | 615 | 50000 | 20000 | 960 | 1.4 |
| Straight strap terminals | | | | | | | |
| B72241L0131K102 | LS41K130QPK2 | 130 | 170 | 50000 | 20000 | 310 | 1.4 |
| B72241L0141K102 | LS41K140QPK2 | 140 | 180 | 50000 | 20000 | 340 | 1.4 |
| B72241L0151K102 | LS41K150QPK2 | 150 | 200 | 50000 | 20000 | 360 | 1.4 |
| B72241L0231K102 | LS41K230QPK2 | 230 | 300 | 50000 | 20000 | 460 | 1.4 |
| B72241L0251K102 | LS41K250QPK2 | 250 | 320 | 50000 | 20000 | 490 | 1.4 |
| B72241L0271K102 | LS41K275QPK2 | 275 | 350 | 50000 | 20000 | 550 | 1.4 |
| B72241L0321K102 | LS41K320QPK2 | 320 | 420 | 50000 | 20000 | 640 | 1.4 |
| B72241L0381K102 | LS41K385QPK2 | 385 | 505 | 50000 | 20000 | 800 | 1.4 |
| B72241L0421K102 | LS41K420QPK2 | 420 | 560 | 50000 | 20000 | 910 | 1.4 |
| B72241L0441K102 | LS41K440QPK2 | 440 | 585 | 50000 | 20000 | 950 | 1.4 |
| B72241L0461K102 | LS41K460QPK2 | 460 | 615 | 50000 | 20000 | 960 | 1.4 |

 1) I_{max} = Maximum discharge current to IEC 61643-11, class II

 2) I_n = Nominal discharge current to IEC 61643-11, class II


Strap varistors
B722*
HighE, AdvanceD, LS41 series
Characteristics (T_A = 25 °C)

| Ordering code | Type | V _v (1 mA) | ΔV _v (1 mA) | V _{c,max} (I _c) | i _c | C _{typ} (1 kHz) |
|---------------------------------|--------------|--------------------------|---------------------------|---|----------------|-----------------------------|
| | SIOV- | V | % | V | A | pF |
| Bent strap terminals | | | | | | |
| B72241L0131K100 | LS41K130QP | 205 | ±10 | 340 | 300 | 5600 |
| B72241L0141K100 | LS41K140QP | 220 | ±10 | 365 | 300 | 5200 |
| B72241L0151K100 | LS41K150QP | 240 | ±10 | 395 | 300 | 4800 |
| B72241L0231K100 | LS41K230QP | 360 | ±10 | 595 | 300 | 3200 |
| B72241L0251K100 | LS41K250QP | 390 | ±10 | 650 | 300 | 2900 |
| B72241L0271K100 | LS41K275QP | 430 | ±10 | 710 | 300 | 2700 |
| B72241L0321K100 | LS41K320QP | 510 | ±10 | 840 | 300 | 2300 |
| B72241L0381K100 | LS41K385QP | 620 | ±10 | 1025 | 300 | 1900 |
| B72241L0421K100 | LS41K420QP | 680 | ±10 | 1120 | 300 | 1800 |
| B72241L0441K100 | LS41K440QP | 715 | ±10 | 1180 | 300 | 1700 |
| B72241L0461K100 | LS41K460QP | 750 | ±10 | 1240 | 300 | 1600 |
| Straight strap terminals | | | | | | |
| B72241L0131K102 | LS41K130QPK2 | 205 | ±10 | 340 | 300 | 5600 |
| B72241L0141K102 | LS41K140QPK2 | 220 | ±10 | 365 | 300 | 5200 |
| B72241L0151K102 | LS41K150QPK2 | 240 | ±10 | 395 | 300 | 4800 |
| B72241L0231K102 | LS41K230QPK2 | 360 | ±10 | 595 | 300 | 3200 |
| B72241L0251K102 | LS41K250QPK2 | 390 | ±10 | 650 | 300 | 2900 |
| B72241L0271K102 | LS41K275QPK2 | 430 | ±10 | 710 | 300 | 2700 |
| B72241L0321K102 | LS41K320QPK2 | 510 | ±10 | 840 | 300 | 2300 |
| B72241L0381K102 | LS41K385QPK2 | 620 | ±10 | 1025 | 300 | 1900 |
| B72241L0421K102 | LS41K420QPK2 | 680 | ±10 | 1120 | 300 | 1800 |
| B72241L0441K102 | LS41K440QPK2 | 715 | ±10 | 1180 | 300 | 1700 |
| B72241L0461K102 | LS41K460QPK2 | 750 | ±10 | 1240 | 300 | 1600 |


Dimensional drawings
Bent strap terminals

SIOV-LS41K ... QP

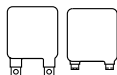
Weight: 20 ... 40 g

Straight strap terminals

SIOV-LS41K ... QPK2

Weight: 20 ... 40 g

| Ordering code | th _{max} mm | L ±1.0 mm |
|---------------------------------|-------------------------|--------------|
| Bent strap terminals | | |
| B72241L0131K100 | 8.1 | -3.5 |
| B72241L0141K100 | 8.2 | -3.3 |
| B72241L0151K100 | 8.3 | -3.2 |
| B72241L0231K100 | 9.0 | -2.0 |
| B72241L0251K100 | 9.2 | -1.8 |
| B72241L0271K100 | 9.4 | -1.6 |
| B72241L0321K100 | 9.9 | -1.1 |
| B72241L0381K100 | 10.6 | -0.4 |
| B72241L0421K100 | 10.9 | 0.0 |
| B72241L0441K100 | 11.1 | 0.2 |
| B72241L0461K100 | 11.4 | 0.4 |
| Straight strap terminals | | |
| B72241L0131K102 | 8.1 | 4.4 |
| B72241L0141K102 | 8.2 | 4.5 |
| B72241L0151K102 | 8.3 | 4.6 |
| B72241L0231K102 | 9.0 | 5.4 |
| B72241L0251K102 | 9.2 | 5.6 |
| B72241L0271K102 | 9.4 | 5.8 |
| B72241L0321K102 | 9.9 | 6.3 |
| B72241L0381K102 | 10.6 | 6.9 |
| B72241L0421K102 | 10.9 | 7.3 |
| B72241L0441K102 | 11.1 | 7.6 |
| B72241L0461K102 | 11.4 | 7.8 |


Strap varistors
B722*
HighE, AdvanceD, LS41 series
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 μ s) applied. | To meet the specified value |
| Max. DC operating voltage | The maximum allowable DC operating voltage V_{DC} at UCT +5/-0 °C is applied for 1000 \pm 48 h. The leakage current $I_{leak}(t)$ during test is recorded. Then 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. | $I_{leak}(t = 1000 \text{ h}) \leq I_{leak}(t = 0 \text{ h})$ $ \Delta V/V (1 \text{ mA}) \leq 10\%$ |
| Surge current derating, 8/20 μ s | 10 surge currents (8/20 μ s), unipolar, interval \geq 60 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 |
| Fast temperature cycling | IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ No visible damage |
| Damp heat, steady state | IEC 60068-2-78 The specimen shall be subjected to 40 \pm 2 °C, 90 to 95% r. H. for 56 \pm 2 days 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. | $ \Delta V/V (1 \text{ mA}) \leq 10\%$ |

Note:

UCT = Upper category temperature

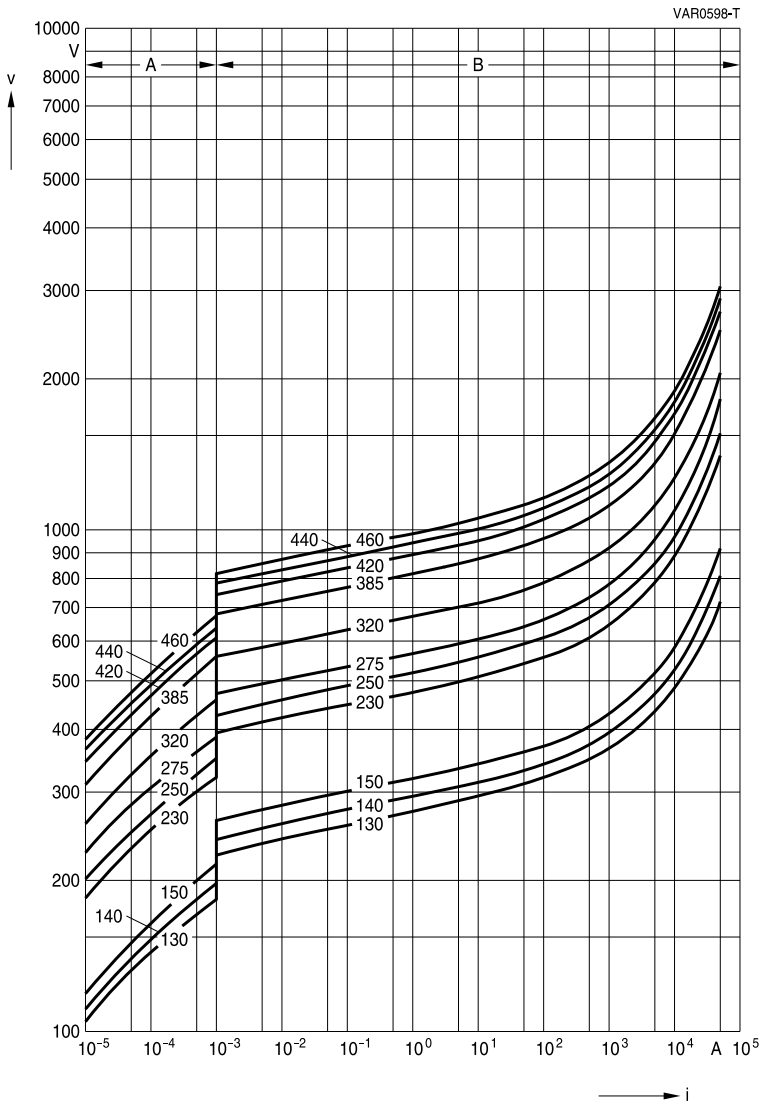
LCT = Lower category temperature



v/i characteristics

$v = f(i)$ for explanation of the characteristics refer to "General technical information", chapter 1.6.3

A = Leakage current, B = Protection level } for worst-case varistor tolerances



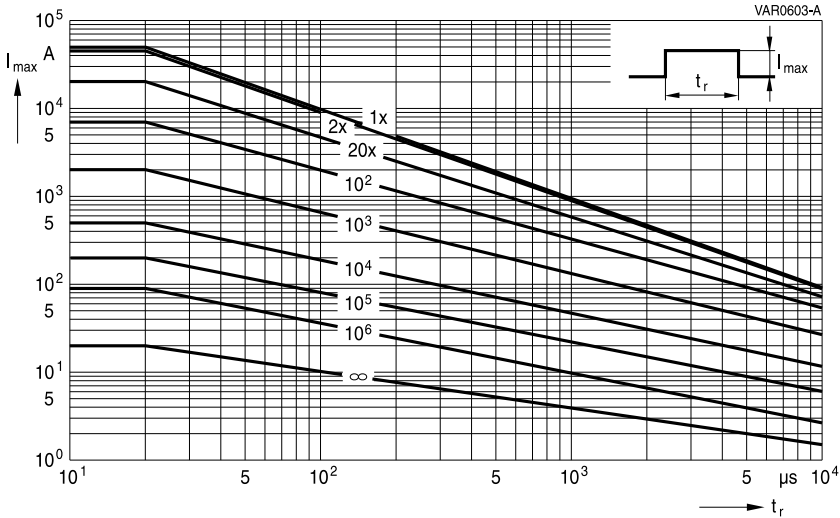
SIOV-LS41K130QP(K2) ... K460QP(K2)



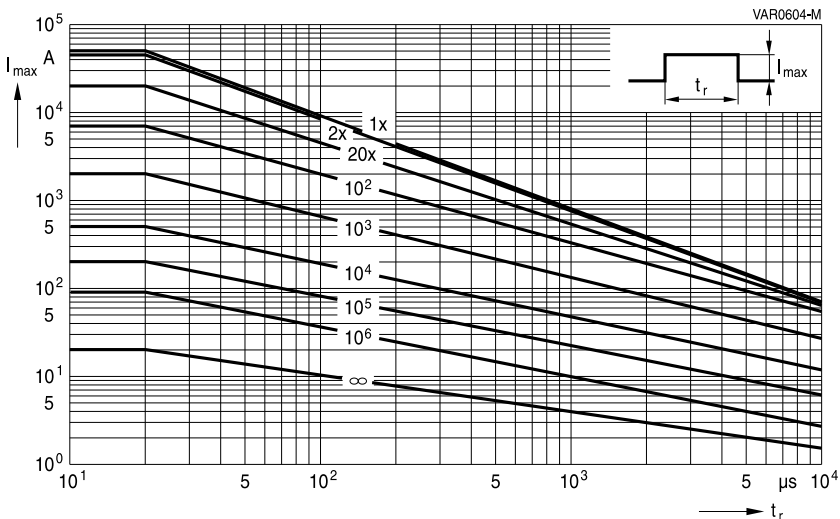
Derating curves

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

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



SIOV-LS41K130QP(K2) ... K150QP(K2)



SIOV-LS41K230QP(K2) ... K460QP(K2)



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: $-25\text{ }^{\circ}\text{C} \dots +45\text{ }^{\circ}\text{C}$,
 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:

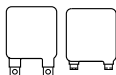
| | |
|---------------------------|------------|
| SIOV-S, -Q, -LS, -B, -SNF | 24 months |
| ETFV/ T series, -CU | 12 months. |

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.

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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 |
| 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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3. **The warnings, cautions and product-specific notes must be observed.**
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Release 2018-10

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А