

SIOV metal oxide varistors

Block varistors, HighE series

Series/Type: B722*
Date: April 2011

HighE series
Construction

- Disk-shaped varistor element, potted in plastic housing
- Housing and potting flame-retardant to UL 94 V-0
- Screw terminals M4 (SIOV-B32 ... 40)
Screw terminals M5 (SIOV-B60 ... 80)

Features

- Heavy-duty varistors (surge current capability up to 100 kA)
- Wide operating voltage range 75 ... 1100 V_{RMS}
- SIOV-B40 also available without housing (LS40 series)
- PSpice models

Approvals

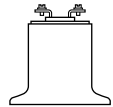
- UL
- CSA (≥ K130)

Delivery mode

- Cardboard box

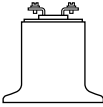
General technical data

| | | | |
|--------------------------------------|----------------|--------------|-------------------|
| Climatic category | to IEC 60068-1 | 40/85/56 | |
| Operating temperature | to CECC 42 000 | -40 ... + 85 | °C |
| Storage temperature | | -40 ... +110 | °C |
| Electric strength | to CECC 42 000 | ≥ 2.5 | kV _{RMS} |
| Insulation resistance | to CECC 42 000 | ≥ 10 | MΩ |
| Response time | | < 25 | ns |
| Maximum torque for B32 and B40 types | | 1.0 | Nm |
| Maximum torque for B60 and B80 types | | 2.5 | Nm |


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

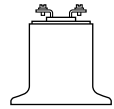
| Ordering code | Type | V_{RMS} | V_{DC} | i_{max} (8/20 μs) | W_{max} (2 ms) | P_{max} |
|--------------------------|---------|-----------|----------|------------------------------------|---------------------|-----------|
| | SIOV- | V | V | A | J | W |
| $V_{RMS} = 75\text{ V}$ | | | | | | |
| B72240B0750K001 | B40K75 | 75 | 100 | 25000 | 190 | 1.4 |
| $V_{RMS} = 130\text{ V}$ | | | | | | |
| B72232B0131K001 | B32K130 | 130 | 170 | 25000 | 210 | 1.2 |
| B72240B0131K001 | B40K130 | 130 | 170 | 40000 | 310 | 1.4 |
| B72260B0131K001 | B60K130 | 130 | 170 | 70000 | 490 | 1.6 |
| B72280B0131K001 | B80K130 | 130 | 170 | 100000 | 660 | 2.0 |
| $V_{RMS} = 150\text{ V}$ | | | | | | |
| B72232B0151K001 | B32K150 | 150 | 200 | 25000 | 240 | 1.2 |
| B72240B0151K001 | B40K150 | 150 | 200 | 40000 | 360 | 1.4 |
| B72260B0151K001 | B60K150 | 150 | 200 | 70000 | 570 | 1.6 |
| B72280B0151K001 | B80K150 | 150 | 200 | 100000 | 800 | 2.0 |
| $V_{RMS} = 230\text{ V}$ | | | | | | |
| B72232B0231K001 | B32K230 | 230 | 300 | 25000 | 300 | 1.2 |
| B72240B0231K001 | B40K230 | 230 | 300 | 40000 | 460 | 1.4 |
| B72260B0231K001 | B60K230 | 230 | 300 | 70000 | 730 | 1.6 |
| B72280B0231K001 | B80K230 | 230 | 300 | 100000 | 1200 | 2.0 |
| $V_{RMS} = 250\text{ V}$ | | | | | | |
| B72232B0251K001 | B32K250 | 250 | 320 | 25000 | 330 | 1.2 |
| B72240B0251K001 | B40K250 | 250 | 320 | 40000 | 490 | 1.4 |
| B72260B0251K001 | B60K250 | 250 | 320 | 70000 | 800 | 1.6 |
| B72280B0251K001 | B80K250 | 250 | 320 | 100000 | 1300 | 2.0 |
| $V_{RMS} = 275\text{ V}$ | | | | | | |
| B72232B0271K001 | B32K275 | 275 | 350 | 25000 | 360 | 1.2 |
| B72240B0271K001 | B40K275 | 275 | 350 | 40000 | 550 | 1.4 |
| B72260B0271K001 | B60K275 | 275 | 350 | 70000 | 860 | 1.6 |
| B72280B0271K001 | B80K275 | 275 | 350 | 100000 | 1400 | 2.0 |
| $V_{RMS} = 320\text{ V}$ | | | | | | |
| B72232B0321K001 | B32K320 | 320 | 420 | 25000 | 430 | 1.2 |
| B72240B0321K001 | B40K320 | 320 | 420 | 40000 | 640 | 1.4 |
| B72260B0321K001 | B60K320 | 320 | 420 | 70000 | 1000 | 1.6 |
| B72280B0321K001 | B80K320 | 320 | 420 | 100000 | 1600 | 2.0 |

Varistor elements without plastic housing (suitable for soldering) are available upon request.


Block varistors
B722*
HighE series
Characteristics (T_A = 25 °C)

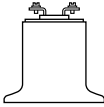
| Ordering code | V _v (1 mA) V | ΔV _v (1 mA) % | V _{C,max} (i _c) V | i _c A | C _{typ} (1 kHz) pF |
|--------------------------------|-------------------------------|--------------------------------|--|---------------------|-----------------------------------|
| V_{RMS} = 75 V | | | | | |
| B72240B0750K001 | 120 | ±10 | 220 | 300 | 11000 |
| V_{RMS} = 130 V | | | | | |
| B72232B0131K001 | 205 | ±10 | 340 | 200 | 4400 |
| B72240B0131K001 | 205 | ±10 | 340 | 300 | 5600 |
| B72260B0131K001 | 205 | ±10 | 340 | 500 | 15000 |
| B72280B0131K001 | 205 | ±10 | 340 | 800 | 28000 |
| V_{RMS} = 150 V | | | | | |
| B72232B0151K001 | 240 | ±10 | 395 | 200 | 3700 |
| B72240B0151K001 | 240 | ±10 | 395 | 300 | 4800 |
| B72260B0151K001 | 240 | ±10 | 395 | 500 | 12000 |
| B72280B0151K001 | 240 | ±10 | 395 | 800 | 23000 |
| V_{RMS} = 230 V | | | | | |
| B72232B0231K001 | 360 | ±10 | 595 | 200 | 2500 |
| B72240B0231K001 | 360 | ±10 | 595 | 300 | 3200 |
| B72260B0231K001 | 360 | ±10 | 595 | 500 | 7900 |
| B72280B0231K001 | 360 | ±10 | 595 | 800 | 16000 |
| V_{RMS} = 250 V | | | | | |
| B72232B0251K001 | 390 | ±10 | 650 | 200 | 2200 |
| B72240B0251K001 | 390 | ±10 | 650 | 300 | 2900 |
| B72260B0251K001 | 390 | ±10 | 650 | 500 | 7100 |
| B72280B0251K001 | 390 | ±10 | 650 | 800 | 14000 |
| V_{RMS} = 275 V | | | | | |
| B72232B0271K001 | 430 | ±10 | 710 | 200 | 2000 |
| B72240B0271K001 | 430 | ±10 | 710 | 300 | 2700 |
| B72260B0271K001 | 430 | ±10 | 710 | 500 | 6600 |
| B72280B0271K001 | 430 | ±10 | 710 | 800 | 13000 |
| V_{RMS} = 320 V | | | | | |
| B72232B0321K001 | 510 | ±10 | 840 | 200 | 1700 |
| B72240B0321K001 | 510 | ±10 | 840 | 300 | 2300 |
| B72260B0321K001 | 510 | ±10 | 840 | 500 | 5600 |
| B72280B0321K001 | 510 | ±10 | 840 | 800 | 11000 |

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

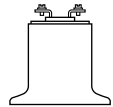
| Ordering code | Type | V_{RMS} | V_{DC} | i_{max} (8/20 μs) | W_{max} (2 ms) | P_{max} |
|--|---------|-----------|----------|------------------------------------|---------------------|-----------|
| | SIOV- | V | V | A | J | W |
| $V_{RMS} = 385\text{ V}$ | | | | | | |
| B72232B0381K001 | B32K385 | 385 | 505 | 25000 | 550 | 1.2 |
| B72240B0381K001 | B40K385 | 385 | 505 | 40000 | 800 | 1.4 |
| B72260B0381K001 | B60K385 | 385 | 505 | 70000 | 1200 | 1.6 |
| B72280B0381K001 | B80K385 | 385 | 505 | 100000 | 2000 | 2.0 |
| $V_{RMS} = 420\text{ V}$ | | | | | | |
| B72232B0421K001 | B32K420 | 420 | 560 | 25000 | 600 | 1.2 |
| B72240B0421K001 | B40K420 | 420 | 560 | 40000 | 910 | 1.4 |
| B72260B0421K001 | B60K420 | 420 | 560 | 70000 | 1500 | 1.6 |
| B72280B0421K001 | B80K420 | 420 | 560 | 100000 | 2200 | 2.0 |
| $V_{RMS} = 440\text{ V}$ | | | | | | |
| B72232B0441K001 | B32K440 | 440 | 585 | 25000 | 630 | 1.2 |
| B72240B0441K001 | B40K440 | 440 | 585 | 40000 | 950 | 1.4 |
| B72260B0441K001 | B60K440 | 440 | 585 | 70000 | 1580 | 1.6 |
| B72280B0441K001 | B80K440 | 440 | 585 | 100000 | 2350 | 2.0 |
| $V_{RMS} = 460\text{ V}$ | | | | | | |
| B72232B0461K001 | B32K460 | 460 | 615 | 25000 | 660 | 1.2 |
| B72240B0461K001 | B40K460 | 460 | 615 | 40000 | 1000 | 1.4 |
| B72260B0461K001 | B60K460 | 460 | 615 | 70000 | 1650 | 1.6 |
| B72280B0461K001 | B80K460 | 460 | 615 | 100000 | 2500 | 2.0 |
| $V_{RMS} = 550\text{ V}$ | | | | | | |
| B72232B0551K001 | B32K550 | 550 | 745 | 25000 | 620 | 1.2 |
| B72240B0551K001 | B40K550 | 550 | 745 | 40000 | 960 | 1.4 |
| B72260B0551K001 | B60K550 | 550 | 745 | 70000 | 1500 | 1.6 |
| B72280B0551K001 | B80K550 | 550 | 745 | 100000 | 3100 | 2.0 |
| $V_{RMS} = 680\text{ V}$ | | | | | | |
| B72232B0681K001 | B32K680 | 680 | 895 | 25000 | 760 | 1.2 |
| B72240B0681K001 | B40K680 | 680 | 895 | 40000 | 1100 | 1.4 |
| B72260B0681K001 | B60K680 | 680 | 895 | 70000 | 1800 | 1.6 |
| B72280B0681K001 | B80K680 | 680 | 895 | 100000 | 3600 | 2.0 |

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B722*
HighE series
Characteristics (T_A = 25 °C)

| Ordering code | V _v (1 mA) V | ΔV _v (1 mA) % | V _{C,max} (i _C) V | i _C A | C _{typ} (1 kHz) pF |
|--------------------------------|-------------------------------|--------------------------------|--|---------------------|-----------------------------------|
| V_{RMS} = 385 V | | | | | |
| B72232B0381K001 | 620 | ±10 | 1025 | 200 | 1400 |
| B72240B0381K001 | 620 | ±10 | 1025 | 300 | 1900 |
| B72260B0381K001 | 620 | ±10 | 1025 | 500 | 4600 |
| B72280B0381K001 | 620 | ±10 | 1025 | 800 | 9000 |
| V_{RMS} = 420 V | | | | | |
| B72232B0421K001 | 680 | ±10 | 1120 | 200 | 1300 |
| B72240B0421K001 | 680 | ±10 | 1120 | 300 | 1800 |
| B72260B0421K001 | 680 | ±10 | 1120 | 500 | 4300 |
| B72280B0421K001 | 680 | ±10 | 1120 | 800 | 8500 |
| V_{RMS} = 440 V | | | | | |
| B72232B0441K001 | 715 | ±10 | 1180 | 200 | 1250 |
| B72240B0441K001 | 715 | ±10 | 1180 | 300 | 1700 |
| B72260B0441K001 | 715 | ±10 | 1180 | 500 | 4100 |
| B72280B0441K001 | 715 | ±10 | 1180 | 800 | 8100 |
| V_{RMS} = 460 V | | | | | |
| B72232B0461K001 | 750 | ±10 | 1240 | 200 | 1200 |
| B72240B0461K001 | 750 | ±10 | 1240 | 300 | 1600 |
| B72260B0461K001 | 750 | ±10 | 1240 | 500 | 3900 |
| B72280B0461K001 | 750 | ±10 | 1240 | 800 | 7700 |
| V_{RMS} = 550 V | | | | | |
| B72232B0551K001 | 910 | ±10 | 1500 | 200 | 1000 |
| B72240B0551K001 | 910 | ±10 | 1500 | 300 | 1400 |
| B72260B0551K001 | 910 | ±10 | 1500 | 500 | 3300 |
| B72280B0551K001 | 910 | ±10 | 1500 | 800 | 6500 |
| V_{RMS} = 680 V | | | | | |
| B72232B0681K001 | 1100 | ±10 | 1815 | 200 | 830 |
| B72240B0681K001 | 1100 | ±10 | 1815 | 300 | 1100 |
| B72260B0681K001 | 1100 | ±10 | 1815 | 500 | 2600 |
| B72280B0681K001 | 1100 | ±10 | 1815 | 800 | 5200 |

Varistor elements without plastic housing (suitable for soldering) are available upon request.


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

| Ordering code | Type | V_{RMS} | V_{DC} | i_{max} (8/20 μ s) | W_{max} (2 ms) | P_{max} |
|---|------------------------|-----------|----------|-----------------------------|---------------------|-----------|
| | SIOV- | V | V | A | J | W |
| $V_{RMS} = 750\text{ V}$ | | | | | | |
| B72232B0751K001 | B32K750 | 750 | 970 | 25000 | 800 | 1.2 |
| B72240B0751K001 | B40K750 | 750 | 970 | 40000 | 1200 | 1.4 |
| B72260B0751K001 | B60K750 | 750 | 970 | 70000 | 2000 | 1.6 |
| B72280B0751K001 | B80K750 | 750 | 970 | 100000 | 4000 | 2.0 |
| $V_{RMS} = 1100\text{ V}$ | | | | | | |
| B72260B0102K001 | B60K1000 ¹⁾ | 1100 | 1465 | 70000 | 3000 | 1.6 |
| B72280B0112K001 | B80K1100 | 1100 | 1465 | 100000 | 6000 | 2.0 |

Varistor elements without plastic housing (suitable for soldering) are available upon request.

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

| Ordering code | V_v (1 mA) | ΔV_v (1 mA) | $V_{c,max}$ (i_c) | i_c | C_{typ} (1 kHz) |
|---|-----------------|------------------------|--------------------------|-------|----------------------|
| | V | % | V | A | pF |
| $V_{RMS} = 750\text{ V}$ | | | | | |
| B72232B0751K001 | 1200 | ± 10 | 2000 | 200 | 800 |
| B72240B0751K001 | 1200 | ± 10 | 2000 | 300 | 1000 |
| B72260B0751K001 | 1200 | ± 10 | 2000 | 500 | 2400 |
| B72280B0751K001 | 1200 | ± 10 | 2000 | 800 | 4800 |
| $V_{RMS} = 1100\text{ V}$ | | | | | |
| B72260B0102K001 | 1800 | ± 10 | 2970 | 500 | 1600 |
| B72280B0112K001 | 1800 | ± 10 | 2970 | 800 | 3200 |

Varistor elements without plastic housing (suitable for soldering) are available upon request.

1) Operating voltage differs from type designation



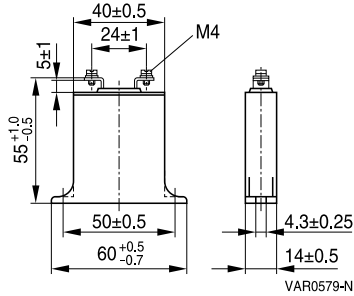
Block varistors

B722*

HighE series

Dimensional drawings

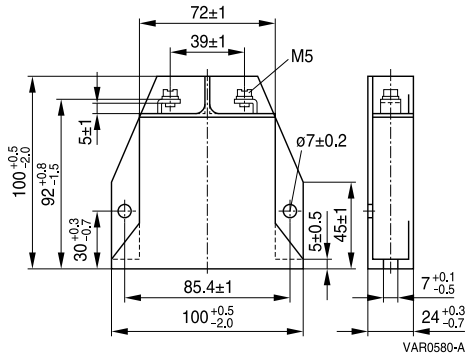
SI0V-B32/-B40



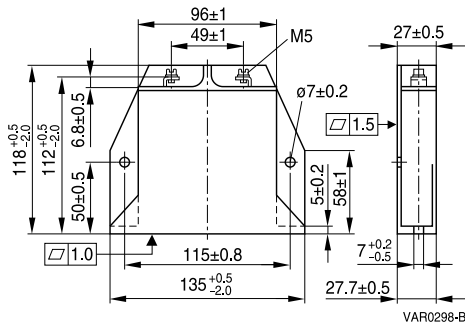
Weight

| Nominal diameter mm | V _{RMS} V | Weight g |
|------------------------|-----------------------|-------------|
| 32 | 130 ... 750 | 45 |
| 40 | 75 ... 750 | 50 |
| 60 | 130 ... 1100 | 250 |
| 80 | 130 ... 1100 | 650 |

SI0V-B60



SI0V-B80



Dimensions in mm


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 h) \leq I_{leak} (t = 0 h) $ \Delta V/V$ (1 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 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 120 min, 5 cycles | $ \Delta V/V$ (1 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 mA) \leq 10% |

Note:

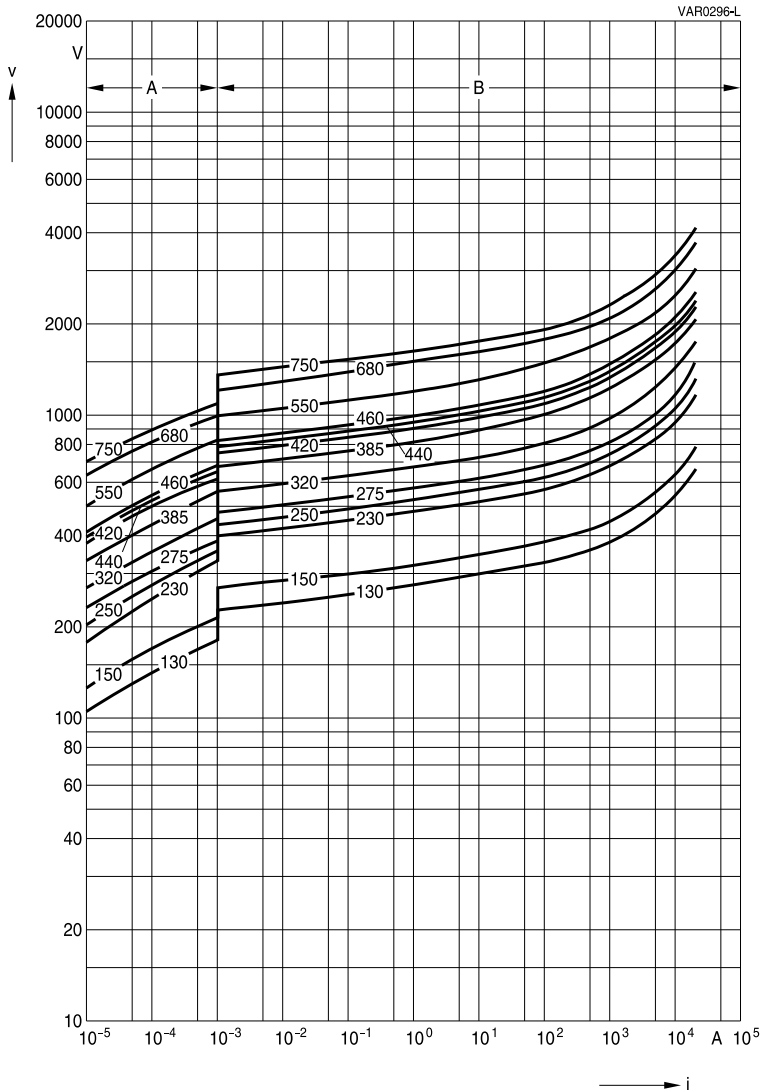
UCT = Upper category temperature

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

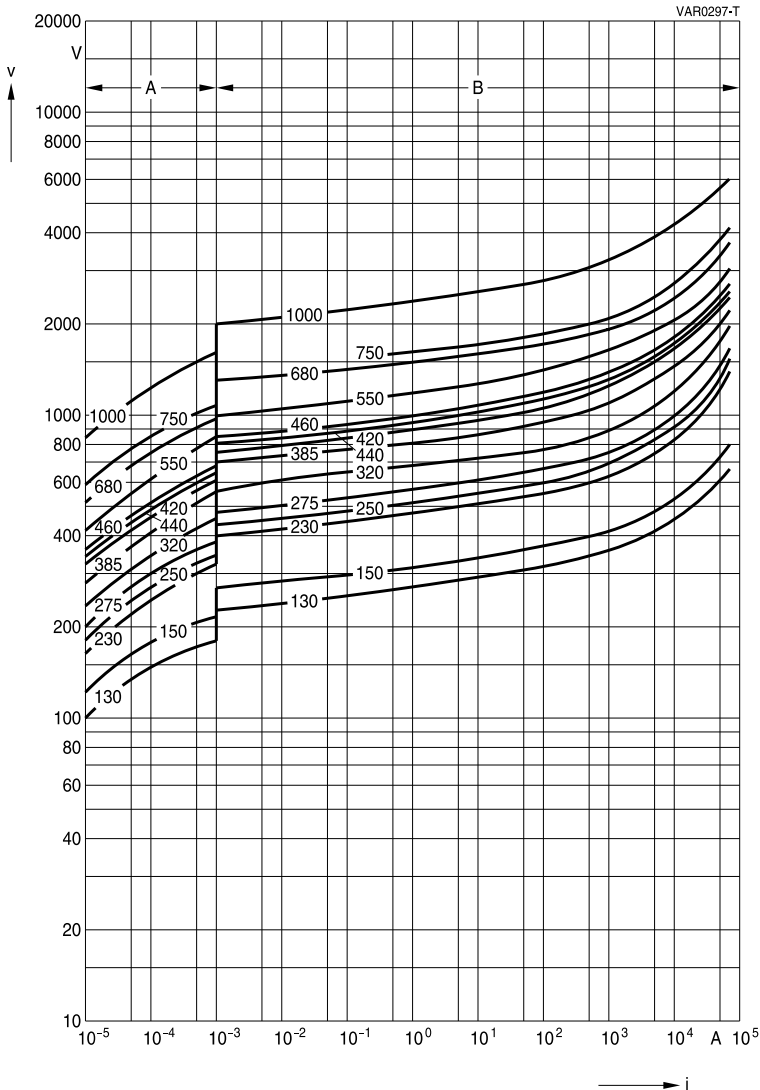


SIOV-B32K130 ... K750



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

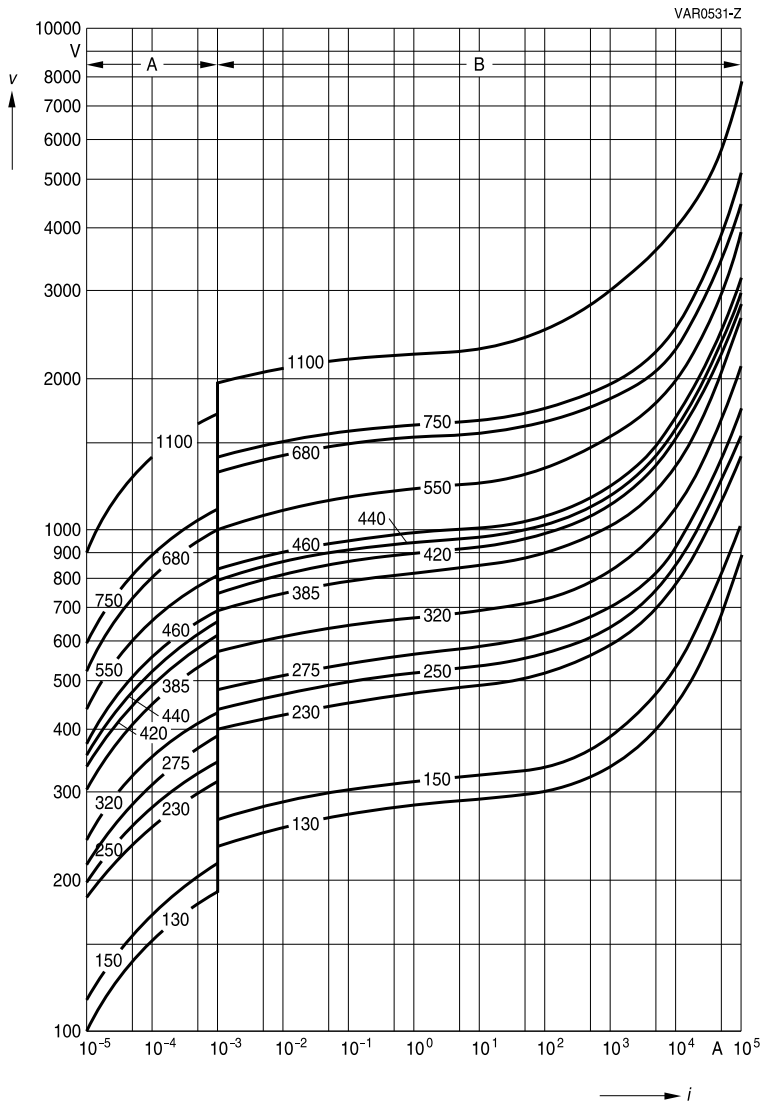


SIOV-B60K130 ... K1000



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



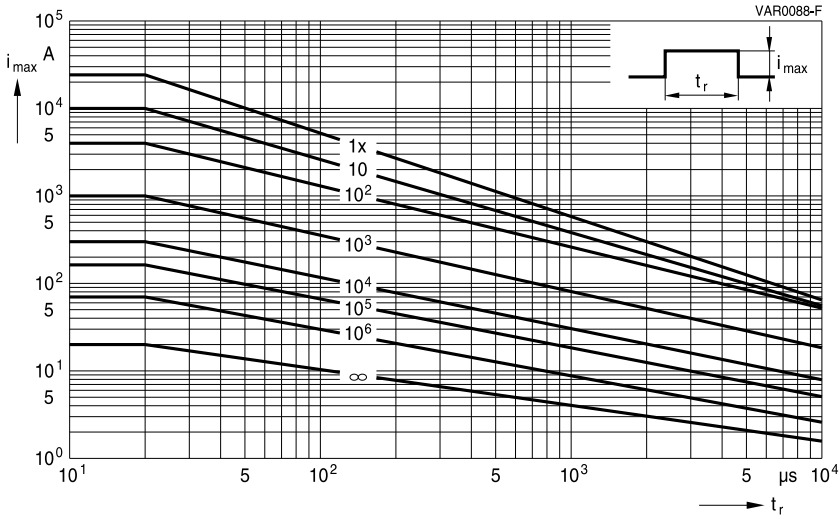
SIOV-B80K130 ... K1100



Derating curves

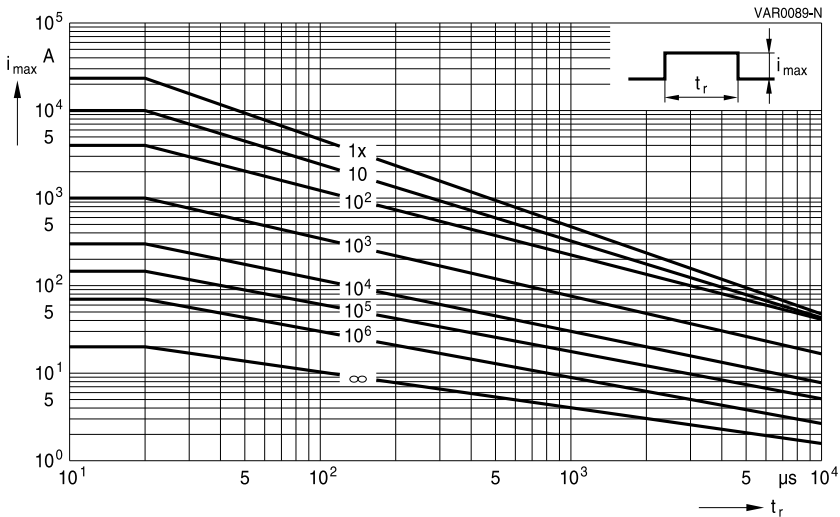
Maximum surge current $i_{max} = f(t_r, \text{pulse train})$

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



SIOV-B32K130 ... K150

SIOV-B40K75



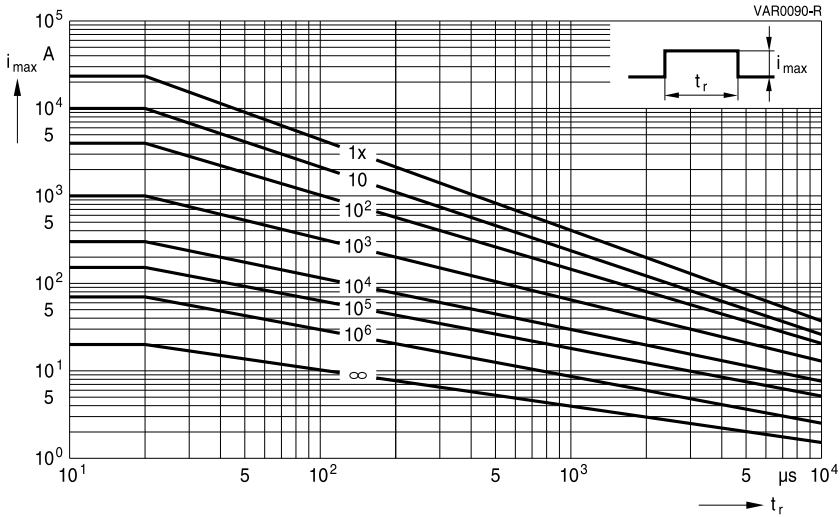
SIOV-B32K230 ... K460



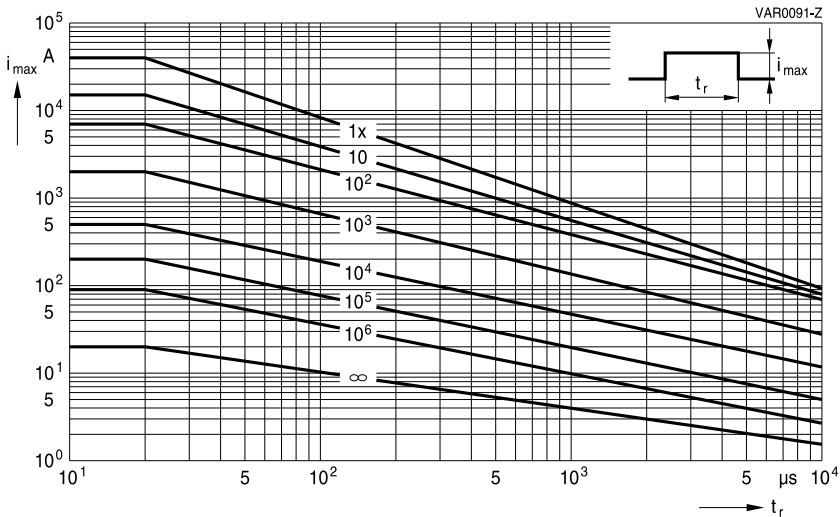
Derating curves

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-B32K550 ... K750



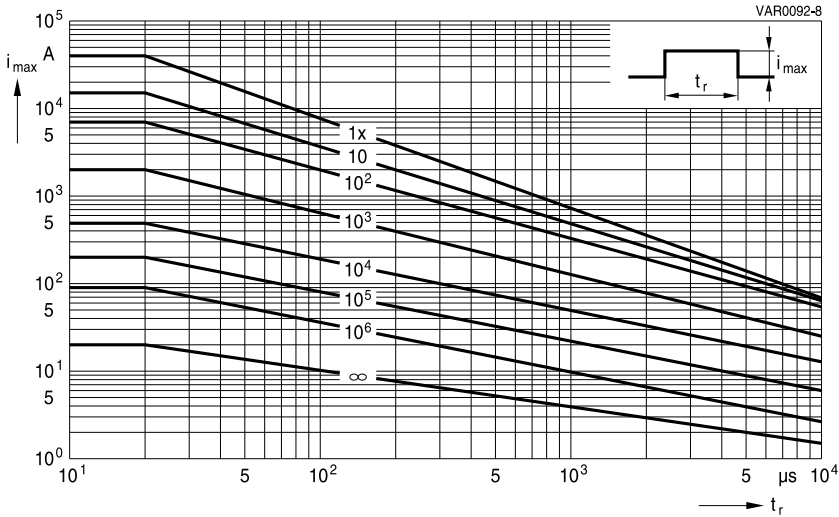
SIOV-B40K130 ... K150



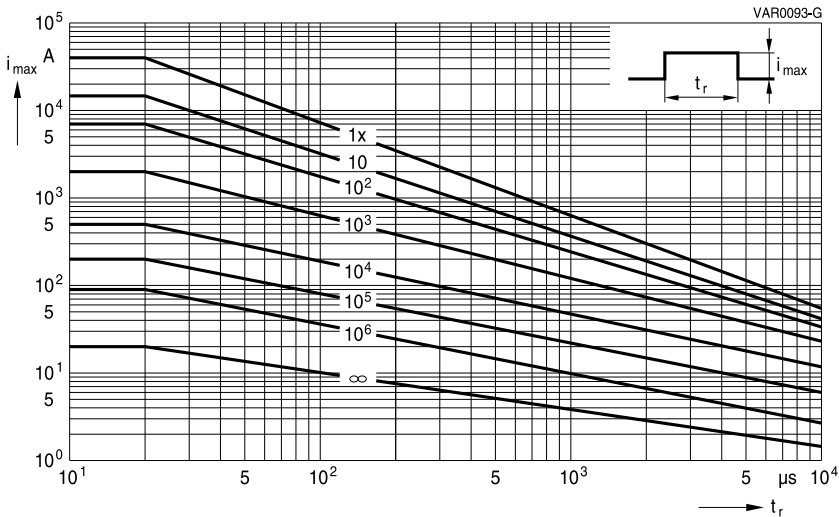
Derating curves

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-B40K230 ... K460



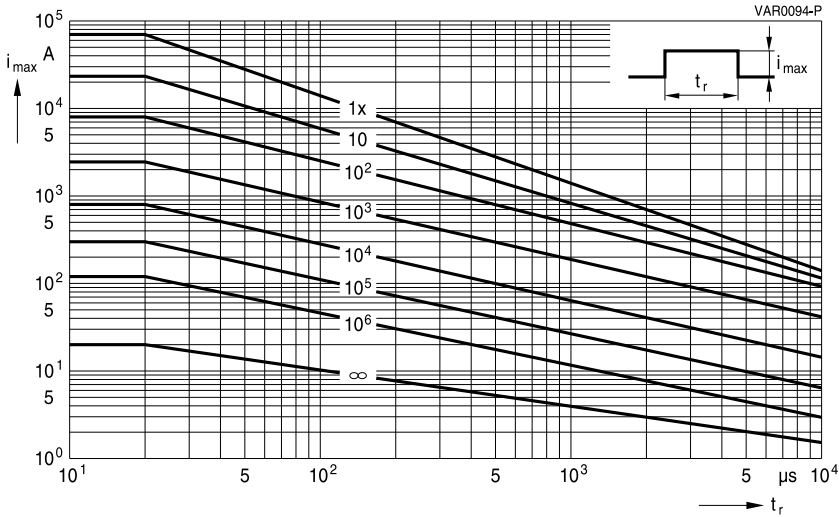
SIOV-B40K550 ... K750



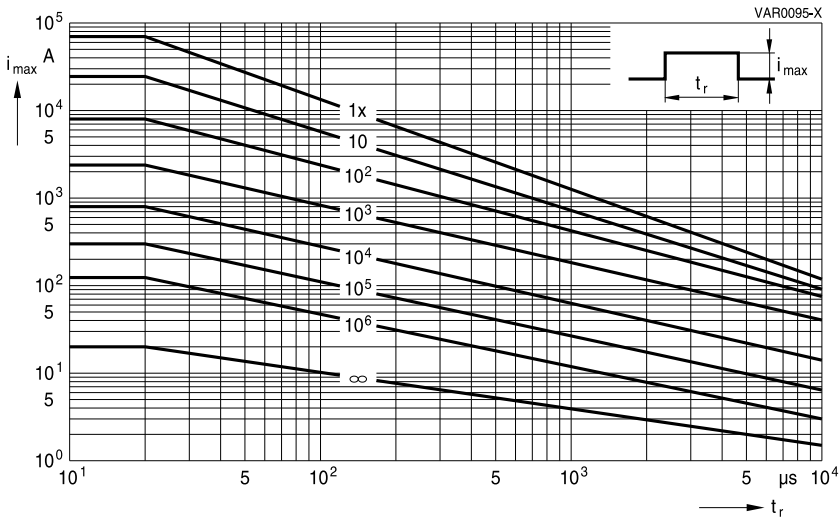
Derating curves

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

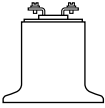
For explanation of the derating curves refer to "General technical information", section 1.8.1



SIOV-B60K130 ... K150



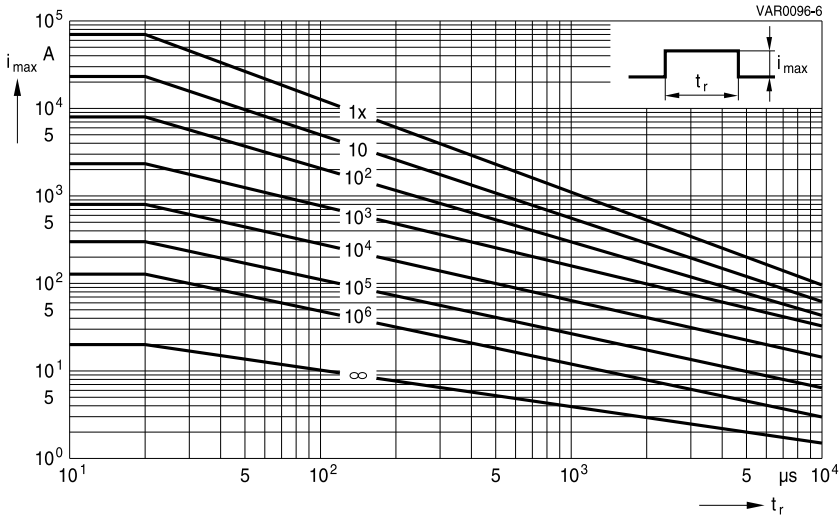
SIOV-B60K230 ... K460



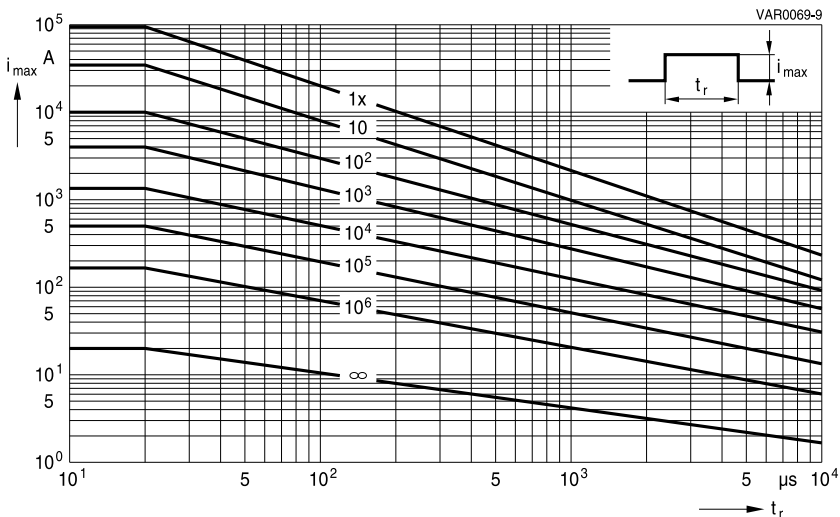
Derating curves

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-B60K550 ... K1000



SIOV-B80K130 ... K1100



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.


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 to IEC 61643-1 |
| I_{nom} | Nominal discharge current to IEC 61643-1 |
| 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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