



## **SIOV metal oxide varistors**

Leaded varistors, AdvanceD series

**Series/Type:** S05 ... E2, S07 ... E2, S10 ... E2, S14 ... E2, S20 ... E2

**Date:** December 2007

## Leaded varistors

### AdvancedD series

#### Construction

- Round varistor element, leaded
- Coating: epoxy resin, flame-retardant to UL 94 V-0
- Terminals: tinned copper wire

#### Features

- High-energy AdvancedD series E2
- High surge current ratings up to 10 kA
- High energy ratings up to 440 J
- Wide operating voltage range 130 ... 680 V<sub>RMS</sub>
- PSpice models

#### Approvals

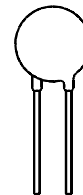
- UL
- CSA
- VDE
- CECC
- CQC S05/07 (K11 ... K460), S10/S14 (K11 ... K680), S20 (K11 ... K1100)
- IEC

#### Delivery mode

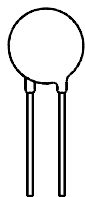
- Bulk (standard), taped versions on reel or in Ammo pack upon request.
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

#### General technical data

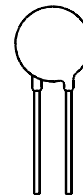
|                       |                |              |                   |
|-----------------------|----------------|--------------|-------------------|
| Climatic category     | to IEC 60068-1 | 40/85/56     |                   |
| Operating temperature | to CECC 42 000 | −40 ... + 85 | °C                |
| Storage temperature   |                | −40 ... +125 | °C                |
| Electric strength     | to CECC 42 000 | ≥2.5         | kV <sub>RMS</sub> |
| Insulation resistance | to CECC 42 000 | ≥10          | MΩ                |
| Response time         |                | <25          | ns                |


**Leaded varistors**
**Advanced series**
**Maximum ratings** ( $T_A = 85\text{ °C}$ )

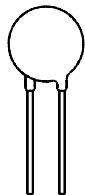
| Ordering code   | Type<br>(untaped)<br>SIOV- | $V_{RMS}$<br>V | $V_{DC}$<br>V | $i_{max}$<br>(8/20 $\mu$ s)<br>A | $W_{max}$<br>(2 ms)<br>J | $P_{max}$<br>W |
|-----------------|----------------------------|----------------|---------------|----------------------------------|--------------------------|----------------|
| B72205S2131K101 | S05K130E2                  | 130            | 170           | 800                              | 6.0                      | 0.10           |
| B72207S2131K101 | S07K130E2                  | 130            | 170           | 1750                             | 12.5                     | 0.25           |
| B72210S2131K101 | S10K130E2                  | 130            | 170           | 3500                             | 25.0                     | 0.40           |
| B72214S2131K101 | S14K130E2                  | 130            | 170           | 6000                             | 50.0                     | 0.60           |
| B72220S2131K101 | S20K130E2                  | 130            | 170           | 10000                            | 100.0                    | 1.00           |
| B72205S2141K101 | S05K140E2                  | 140            | 180           | 800                              | 6.5                      | 0.10           |
| B72207S2141K101 | S07K140E2                  | 140            | 180           | 1750                             | 13.5                     | 0.25           |
| B72210S2141K101 | S10K140E2                  | 140            | 180           | 3500                             | 27.5                     | 0.40           |
| B72214S2141K101 | S14K140E2                  | 140            | 180           | 6000                             | 55.0                     | 0.60           |
| B72220S2141K101 | S20K140E2                  | 140            | 180           | 10000                            | 110.0                    | 1.00           |
| B72205S2151K101 | S05K150E2                  | 150            | 200           | 800                              | 7.5                      | 0.10           |
| B72207S2151K101 | S07K150E2                  | 150            | 200           | 1750                             | 15.0                     | 0.25           |
| B72210S2151K101 | S10K150E2                  | 150            | 200           | 3500                             | 30.0                     | 0.40           |
| B72214S2151K101 | S14K150E2                  | 150            | 200           | 6000                             | 60.0                     | 0.60           |
| B72220S2151K101 | S20K150E2                  | 150            | 200           | 10000                            | 120.0                    | 1.00           |
| B72205S2171K101 | S05K175E2                  | 175            | 225           | 800                              | 8.0                      | 0.10           |
| B72207S2171K101 | S07K175E2                  | 175            | 225           | 1750                             | 17.0                     | 0.25           |
| B72210S2171K101 | S10K175E2                  | 175            | 225           | 3500                             | 35.0                     | 0.40           |
| B72214S2171K101 | S14K175E2                  | 175            | 225           | 6000                             | 70.0                     | 0.60           |
| B72220S2171K101 | S20K175E2                  | 175            | 225           | 10000                            | 135.0                    | 1.00           |
| B72205S2211K101 | S05K210E2                  | 210            | 270           | 800                              | 9.5                      | 0.10           |
| B72207S2211K101 | S07K210E2                  | 210            | 270           | 1750                             | 20.0                     | 0.25           |
| B72210S2211K101 | S10K210E2                  | 210            | 270           | 3500                             | 42.0                     | 0.40           |
| B72214S2211K101 | S14K210E2                  | 210            | 270           | 6000                             | 80.0                     | 0.60           |
| B72220S2211K101 | S20K210E2                  | 210            | 270           | 10000                            | 160.0                    | 1.00           |

**Leaded varistors****AdvancedD series****Characteristics** ( $T_A = 25\text{ °C}$ )

| Ordering code   | $V_V$<br>(1 mA)<br>V | $\Delta V_V$<br>(1 mA)<br>% | $V_{C, \max}$<br>( $i_C$ )<br>V | $i_C$<br>A | $C_{\text{typ}}$<br>(1 kHz)<br>pF |
|-----------------|----------------------|-----------------------------|---------------------------------|------------|-----------------------------------|
| B72205S2131K101 | 205                  | $\pm 10$                    | 340                             | 5.0        | 100                               |
| B72207S2131K101 | 205                  | $\pm 10$                    | 340                             | 10.0       | 200                               |
| B72210S2131K101 | 205                  | $\pm 10$                    | 340                             | 25.0       | 400                               |
| B72214S2131K101 | 205                  | $\pm 10$                    | 340                             | 50.0       | 650                               |
| B72220S2131K101 | 205                  | $\pm 10$                    | 340                             | 100.0      | 1340                              |
| B72205S2141K101 | 220                  | $\pm 10$                    | 360                             | 5.0        | 95                                |
| B72207S2141K101 | 220                  | $\pm 10$                    | 360                             | 10.0       | 180                               |
| B72210S2141K101 | 220                  | $\pm 10$                    | 360                             | 25.0       | 370                               |
| B72214S2141K101 | 220                  | $\pm 10$                    | 360                             | 50.0       | 610                               |
| B72220S2141K101 | 220                  | $\pm 10$                    | 360                             | 100.0      | 1240                              |
| B72205S2151K101 | 240                  | $\pm 10$                    | 395                             | 5.0        | 90                                |
| B72207S2151K101 | 240                  | $\pm 10$                    | 395                             | 10.0       | 170                               |
| B72210S2151K101 | 240                  | $\pm 10$                    | 395                             | 25.0       | 350                               |
| B72214S2151K101 | 240                  | $\pm 10$                    | 395                             | 50.0       | 570                               |
| B72220S2151K101 | 240                  | $\pm 10$                    | 395                             | 100.0      | 1160                              |
| B72205S2171K101 | 270                  | $\pm 10$                    | 455                             | 5.0        | 75                                |
| B72207S2171K101 | 270                  | $\pm 10$                    | 455                             | 10.0       | 150                               |
| B72210S2171K101 | 270                  | $\pm 10$                    | 455                             | 25.0       | 300                               |
| B72214S2171K101 | 270                  | $\pm 10$                    | 455                             | 50.0       | 490                               |
| B72220S2171K101 | 270                  | $\pm 10$                    | 455                             | 100.0      | 1000                              |
| B72205S2211K101 | 330                  | $\pm 10$                    | 545                             | 5.0        | 65                                |
| B72207S2211K101 | 330                  | $\pm 10$                    | 545                             | 10.0       | 125                               |
| B72210S2211K101 | 330                  | $\pm 10$                    | 545                             | 25.0       | 250                               |
| B72214S2211K101 | 330                  | $\pm 10$                    | 545                             | 50.0       | 410                               |
| B72220S2211K101 | 330                  | $\pm 10$                    | 545                             | 100.0      | 835                               |


**Leaded varistors**
**Advanced series**
**Maximum ratings** ( $T_A = 85\text{ °C}$ )

| Ordering code   | Type<br>(untaped)<br>SIOV- | $V_{RMS}$<br>V | $V_{DC}$<br>V | $i_{max}$<br>(8/20 $\mu s$ )<br>A | $W_{max}$<br>(2 ms)<br>J | $P_{max}$<br>W |
|-----------------|----------------------------|----------------|---------------|-----------------------------------|--------------------------|----------------|
| B72205S2231K101 | S05K230E2                  | 230            | 300           | 800                               | 11.0                     | 0.10           |
| B72207S2231K101 | S07K230E2                  | 230            | 300           | 1750                              | 23.0                     | 0.25           |
| B72210S2231K101 | S10K230E2                  | 230            | 300           | 3500                              | 45.0                     | 0.40           |
| B72214S2231K101 | S14K230E2                  | 230            | 300           | 6000                              | 90.0                     | 0.60           |
| B72220S2231K101 | S20K230E2                  | 230            | 300           | 10000                             | 180.0                    | 1.00           |
| B72205S2251K101 | S05K250E2                  | 250            | 320           | 800                               | 12.0                     | 0.10           |
| B72207S2251K101 | S07K250E2                  | 250            | 320           | 1750                              | 25.0                     | 0.25           |
| B72210S2251K101 | S10K250E2                  | 250            | 320           | 3500                              | 50.0                     | 0.40           |
| B72214S2251K101 | S14K250E2                  | 250            | 320           | 6000                              | 100.0                    | 0.60           |
| B72220S2251K101 | S20K250E2                  | 250            | 320           | 10000                             | 195.0                    | 1.00           |
| B72205S2271K101 | S05K275E2                  | 275            | 350           | 800                               | 13.5                     | 0.10           |
| B72207S2271K101 | S07K275E2                  | 275            | 350           | 1750                              | 27.5                     | 0.25           |
| B72210S2271K101 | S10K275E2                  | 275            | 350           | 3500                              | 55.0                     | 0.40           |
| B72214S2271K101 | S14K275E2                  | 275            | 350           | 6000                              | 110.0                    | 0.60           |
| B72220S2271K101 | S20K275E2                  | 275            | 350           | 10000                             | 215.0                    | 1.00           |
| B72205S2301K101 | S05K300E2                  | 300            | 385           | 800                               | 15.0                     | 0.10           |
| B72207S2301K101 | S07K300E2                  | 300            | 385           | 1750                              | 30.0                     | 0.25           |
| B72210S2301K101 | S10K300E2                  | 300            | 385           | 3500                              | 60.0                     | 0.40           |
| B72214S2301K101 | S14K300E2                  | 300            | 385           | 6000                              | 125.0                    | 0.60           |
| B72220S2301K101 | S20K300E2                  | 300            | 385           | 10000                             | 250.0                    | 1.00           |
| B72207S2321K101 | S07K320E2                  | 320            | 420           | 1750                              | 32.0                     | 0.25           |
| B72210S2321K101 | S10K320E2                  | 320            | 420           | 3500                              | 67.0                     | 0.40           |
| B72214S2321K101 | S14K320E2                  | 320            | 420           | 6000                              | 136.0                    | 0.60           |
| B72220S2321K101 | S20K320E2                  | 320            | 420           | 10000                             | 273.0                    | 1.00           |

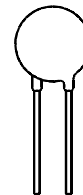


## Leaded varistors

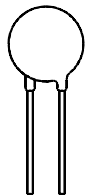
### AdvancedD series

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

| Ordering code   | $V_V$<br>(1 mA)<br>V | $\Delta V_V$<br>(1 mA)<br>% | $V_{C, \max}$<br>( $i_C$ )<br>V | $i_C$<br>A | $C_{typ}$<br>(1 kHz)<br>pF |
|-----------------|----------------------|-----------------------------|---------------------------------|------------|----------------------------|
| B72205S2231K101 | 360                  | $\pm 10$                    | 595                             | 5.0        | 60                         |
| B72207S2231K101 | 360                  | $\pm 10$                    | 595                             | 10.0       | 115                        |
| B72210S2231K101 | 360                  | $\pm 10$                    | 595                             | 25.0       | 230                        |
| B72214S2231K101 | 360                  | $\pm 10$                    | 595                             | 50.0       | 380                        |
| B72220S2231K101 | 360                  | $\pm 10$                    | 595                             | 100.0      | 760                        |
| B72205S2251K101 | 390                  | $\pm 10$                    | 650                             | 5.0        | 55                         |
| B72207S2251K101 | 390                  | $\pm 10$                    | 650                             | 10.0       | 105                        |
| B72210S2251K101 | 390                  | $\pm 10$                    | 650                             | 25.0       | 215                        |
| B72214S2251K101 | 390                  | $\pm 10$                    | 650                             | 50.0       | 350                        |
| B72220S2251K101 | 390                  | $\pm 10$                    | 650                             | 100.0      | 700                        |
| B72205S2271K101 | 430                  | $\pm 10$                    | 710                             | 5.0        | 50                         |
| B72207S2271K101 | 430                  | $\pm 10$                    | 710                             | 10.0       | 95                         |
| B72210S2271K101 | 430                  | $\pm 10$                    | 710                             | 25.0       | 195                        |
| B72214S2271K101 | 430                  | $\pm 10$                    | 710                             | 50.0       | 320                        |
| B72220S2271K101 | 430                  | $\pm 10$                    | 710                             | 100.0      | 630                        |
| B72205S2301K101 | 470                  | $\pm 10$                    | 775                             | 5.0        | 45                         |
| B72207S2301K101 | 470                  | $\pm 10$                    | 775                             | 10.0       | 90                         |
| B72210S2301K101 | 470                  | $\pm 10$                    | 775                             | 25.0       | 180                        |
| B72214S2301K101 | 470                  | $\pm 10$                    | 775                             | 50.0       | 300                        |
| B72220S2301K101 | 470                  | $\pm 10$                    | 775                             | 100.0      | 580                        |
| B72207S2321K101 | 510                  | $\pm 10$                    | 840                             | 10.0       | 85                         |
| B72210S2321K101 | 510                  | $\pm 10$                    | 840                             | 25.0       | 170                        |
| B72214S2321K101 | 510                  | $\pm 10$                    | 840                             | 50.0       | 280                        |
| B72220S2321K101 | 510                  | $\pm 10$                    | 840                             | 100.0      | 540                        |


**Leaded varistors**
**Advanced series**
**Maximum ratings** ( $T_A = 85\text{ °C}$ )

| Ordering code   | Type<br>(untaped)<br>SIOV- | $V_{RMS}$<br>V | $V_{DC}$<br>V | $i_{max}$<br>(8/20 $\mu s$ )<br>A | $W_{max}$<br>(2 ms)<br>J | $P_{max}$<br>W |
|-----------------|----------------------------|----------------|---------------|-----------------------------------|--------------------------|----------------|
| B72210S2381K101 | S10K385E2                  | 385            | 505           | 3500                              | 67.0                     | 0.40           |
| B72214S2381K101 | S14K385E2                  | 385            | 505           | 5000                              | 136.0                    | 0.60           |
| B72220S2381K101 | S20K385E2                  | 385            | 505           | 10000                             | 273.0                    | 1.00           |
| B72210S2421K101 | S10K420E2                  | 420            | 560           | 3500                              | 67.0                     | 0.40           |
| B72214S2421K101 | S14K420E2                  | 420            | 560           | 5000                              | 136.0                    | 0.60           |
| B72220S2421K101 | S20K420E2                  | 420            | 560           | 10000                             | 273.0                    | 1.00           |
| B72210S2461K101 | S10K460E2                  | 460            | 615           | 3500                              | 70.0                     | 0.40           |
| B72214S2461K101 | S14K460E2                  | 460            | 615           | 5000                              | 150.0                    | 0.60           |
| B72220S2461K101 | S20K460E2                  | 460            | 615           | 10000                             | 300.0                    | 1.00           |
| B72210S2511K101 | S10K510E2                  | 510            | 670           | 3500                              | 80.0                     | 0.40           |
| B72214S2511K101 | S14K510E2                  | 510            | 670           | 5000                              | 165.0                    | 0.60           |
| B72220S2511K101 | S20K510E2                  | 510            | 670           | 10000                             | 325.0                    | 1.00           |
| B72210S2551K101 | S10K550E2                  | 550            | 745           | 3500                              | 90.0                     | 0.40           |
| B72214S2551K101 | S14K550E2                  | 550            | 745           | 5000                              | 180.0                    | 0.60           |
| B72220S2551K101 | S20K550E2                  | 550            | 745           | 10000                             | 360.0                    | 1.00           |
| B72210S2621K101 | S10K625E2                  | 625            | 825           | 3500                              | 100.0                    | 0.40           |
| B72214S2621K101 | S14K625E2                  | 625            | 825           | 5000                              | 200.0                    | 0.60           |
| B72220S2621K101 | S20K625E2                  | 625            | 825           | 10000                             | 400.0                    | 1.00           |
| B72210S2681K101 | S10K680E2                  | 680            | 895           | 3500                              | 110.0                    | 0.40           |
| B72214S2681K101 | S14K680E2                  | 680            | 895           | 5000                              | 220.0                    | 0.60           |
| B72220S2681K101 | S20K680E2                  | 680            | 895           | 10000                             | 440.0                    | 1.00           |

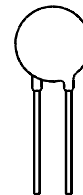


## Leaded varistors

### AdvancedD series

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

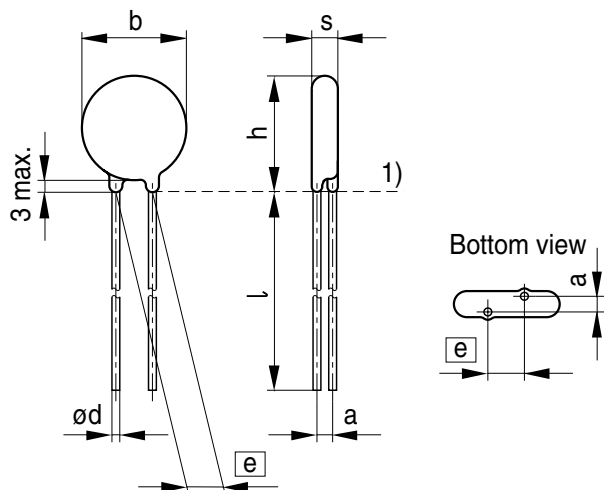
| Ordering code   | $V_V$<br>(1 mA)<br>V | $\Delta V_V$<br>(1 mA)<br>% | $V_{C, \max}$<br>( $i_C$ )<br>V | $i_C$<br>A | $C_{typ}$<br>(1 kHz)<br>pF |
|-----------------|----------------------|-----------------------------|---------------------------------|------------|----------------------------|
| B72210S2381K101 | 620                  | $\pm 10$                    | 1025                            | 25.0       | 150                        |
| B72214S2381K101 | 620                  | $\pm 10$                    | 1025                            | 50.0       | 240                        |
| B72220S2381K101 | 620                  | $\pm 10$                    | 1025                            | 100.0      | 450                        |
| B72210S2421K101 | 680                  | $\pm 10$                    | 1120                            | 25.0       | 135                        |
| B72214S2421K101 | 680                  | $\pm 10$                    | 1120                            | 50.0       | 220                        |
| B72220S2421K101 | 680                  | $\pm 10$                    | 1120                            | 100.0      | 420                        |
| B72210S2461K101 | 750                  | $\pm 10$                    | 1240                            | 25.0       | 120                        |
| B72214S2461K101 | 750                  | $\pm 10$                    | 1240                            | 50.0       | 200                        |
| B72220S2461K101 | 750                  | $\pm 10$                    | 1240                            | 100.0      | 380                        |
| B72210S2511K101 | 820                  | $\pm 10$                    | 1355                            | 25.0       | 110                        |
| B72214S2511K101 | 820                  | $\pm 10$                    | 1355                            | 50.0       | 180                        |
| B72220S2511K101 | 820                  | $\pm 10$                    | 1355                            | 100.0      | 340                        |
| B72210S2551K101 | 910                  | $\pm 10$                    | 1500                            | 25.0       | 105                        |
| B72214S2551K101 | 910                  | $\pm 10$                    | 1500                            | 50.0       | 170                        |
| B72220S2551K101 | 910                  | $\pm 10$                    | 1500                            | 100.0      | 320                        |
| B72210S2621K101 | 1000                 | $\pm 10$                    | 1650                            | 25.0       | 90                         |
| B72214S2621K101 | 1000                 | $\pm 10$                    | 1650                            | 50.0       | 150                        |
| B72220S2621K101 | 1000                 | $\pm 10$                    | 1650                            | 100.0      | 280                        |
| B72210S2681K101 | 1100                 | $\pm 10$                    | 1815                            | 25.0       | 85                         |
| B72214S2681K101 | 1100                 | $\pm 10$                    | 1815                            | 50.0       | 140                        |
| B72220S2681K101 | 1100                 | $\pm 10$                    | 1815                            | 100.0      | 250                        |



## Leaded varistors

### AdvancedD series

## Dimensional drawing



1) Seating plane to IEC 60717

## Weight

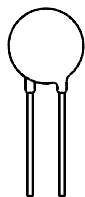
| Nominal diameter<br>mm | V <sub>RMS</sub><br>V | Weight<br>g |
|------------------------|-----------------------|-------------|
| 5                      | 130 ... 300           | 0.4 ... 0.5 |
| 7                      | 130 ... 320           | 0.6 ... 0.8 |
| 10                     | 130 ... 680           | 1.2 ... 2.8 |
| 14                     | 130 ... 680           | 1.8 ... 4.8 |
| 20                     | 130 ... 680           | 3.3 ... 9.6 |

The weight of varistors in between these voltage classes can be interpolated.

VAR0408-C

## Dimensions

| Ordering code   | $\overline{e} \pm 1$<br>mm | $a \pm 1$<br>mm | $b_{\max}$<br>mm | $s_{\max}$<br>mm | $h_{\max}$<br>mm | $l_{\min}$<br>mm | $d \pm 0.05$<br>mm |
|-----------------|----------------------------|-----------------|------------------|------------------|------------------|------------------|--------------------|
| B72205S2131K101 | 5.0                        | 1.6             | 7.0              | 3.9              | 8.5              | 25.0             | 0.6                |
| B72207S2131K101 | 5.0                        | 1.6             | 9.0              | 3.9              | 11.0             | 25.0             | 0.6                |
| B72210S2131K101 | 7.5                        | 1.8             | 12.0             | 4.5              | 14.5             | 25.0             | 0.8                |
| B72214S2131K101 | 7.5                        | 1.9             | 15.5             | 4.6              | 18.5             | 25.0             | 0.8                |
| B72220S2131K101 | 10.0                       | 2.0             | 21.5             | 5.0              | 25.5             | 25.0             | 1.0                |
| B72205S2141K101 | 5.0                        | 1.7             | 7.0              | 4.0              | 8.5              | 25.0             | 0.6                |
| B72207S2141K101 | 5.0                        | 1.7             | 9.0              | 4.0              | 11.0             | 25.0             | 0.6                |
| B72210S2141K101 | 7.5                        | 1.9             | 12.0             | 4.6              | 14.5             | 25.0             | 0.8                |
| B72214S2141K101 | 7.5                        | 2.0             | 15.5             | 4.7              | 18.5             | 25.0             | 0.8                |
| B72220S2141K101 | 10.0                       | 2.1             | 21.5             | 5.1              | 25.5             | 25.0             | 1.0                |
| B72205S2151K101 | 5.0                        | 1.8             | 7.0              | 4.1              | 8.5              | 25.0             | 0.6                |
| B72207S2151K101 | 5.0                        | 1.8             | 9.0              | 4.1              | 11.0             | 25.0             | 0.6                |
| B72210S2151K101 | 7.5                        | 2.0             | 12.0             | 4.7              | 14.5             | 25.0             | 0.8                |
| B72214S2151K101 | 7.5                        | 2.1             | 15.5             | 4.8              | 18.5             | 25.0             | 0.8                |
| B72220S2151K101 | 10.0                       | 2.2             | 21.5             | 5.2              | 25.5             | 25.0             | 1.0                |
| B72205S2171K101 | 5.0                        | 2.0             | 7.0              | 4.3              | 8.5              | 25.0             | 0.6                |
| B72207S2171K101 | 5.0                        | 2.0             | 9.0              | 4.3              | 11.0             | 25.0             | 0.6                |
| B72210S2171K101 | 7.5                        | 2.2             | 12.0             | 4.9              | 14.5             | 25.0             | 0.8                |
| B72214S2171K101 | 7.5                        | 2.2             | 15.5             | 4.9              | 18.5             | 25.0             | 0.8                |
| B72220S2171K101 | 10.0                       | 2.3             | 21.5             | 5.3              | 25.5             | 25.0             | 1.0                |

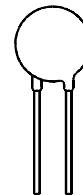


## Leaded varistors

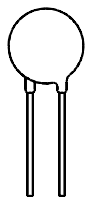
### AdvancedD series

#### Dimensions

| Ordering code   | $e \pm 1$<br>mm | $a \pm 1$<br>mm | $b_{\max}$<br>mm | $s_{\max}$<br>mm | $h_{\max}$<br>mm | $l_{\min}$<br>mm | $d \pm 0.05$<br>mm |
|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|--------------------|
| B72205S2211K101 | 5.0             | 1.7             | 7.0              | 4.2              | 8.5              | 25.0             | 0.6                |
| B72207S2211K101 | 5.0             | 1.7             | 9.0              | 4.2              | 11.0             | 25.0             | 0.6                |
| B72210S2211K101 | 7.5             | 1.9             | 12.0             | 5.0              | 14.5             | 25.0             | 0.8                |
| B72214S2211K101 | 7.5             | 1.9             | 15.5             | 5.0              | 18.5             | 25.0             | 0.8                |
| B72220S2211K101 | 10.0            | 2.2             | 21.5             | 5.4              | 25.5             | 25.0             | 1.0                |
| B72205S2231K101 | 5.0             | 1.8             | 7.0              | 4.4              | 8.5              | 25.0             | 0.6                |
| B72207S2231K101 | 5.0             | 1.8             | 9.0              | 4.4              | 11.0             | 25.0             | 0.6                |
| B72210S2231K101 | 7.5             | 2.0             | 12.0             | 5.0              | 14.5             | 25.0             | 0.8                |
| B72214S2231K101 | 7.5             | 2.0             | 15.5             | 5.1              | 18.5             | 25.0             | 0.8                |
| B72220S2231K101 | 10.0            | 2.3             | 21.5             | 5.5              | 25.5             | 25.0             | 1.0                |
| B72205S2251K101 | 5.0             | 1.9             | 7.0              | 4.5              | 8.5              | 25.0             | 0.6                |
| B72207S2251K101 | 5.0             | 1.9             | 9.0              | 4.5              | 11.0             | 25.0             | 0.6                |
| B72210S2251K101 | 7.5             | 2.1             | 12.0             | 5.2              | 14.5             | 25.0             | 0.8                |
| B72214S2251K101 | 7.5             | 2.1             | 15.5             | 5.2              | 18.5             | 25.0             | 0.8                |
| B72220S2251K101 | 10.0            | 2.4             | 21.5             | 5.7              | 25.5             | 25.0             | 1.0                |
| B72205S2271K101 | 5.0             | 2.0             | 7.0              | 4.6              | 8.5              | 25.0             | 0.6                |
| B72207S2271K101 | 5.0             | 2.0             | 9.0              | 4.6              | 11.0             | 25.0             | 0.6                |
| B72210S2271K101 | 7.5             | 2.2             | 12.0             | 5.4              | 14.5             | 25.0             | 0.8                |
| B72214S2271K101 | 7.5             | 2.2             | 15.5             | 5.4              | 18.5             | 25.0             | 0.8                |
| B72220S2271K101 | 10.0            | 2.6             | 21.5             | 5.8              | 25.5             | 25.0             | 1.0                |
| B72205S2301K101 | 5.0             | 2.1             | 7.0              | 4.7              | 8.5              | 25.0             | 0.6                |
| B72207S2301K101 | 5.0             | 2.1             | 9.0              | 4.7              | 11.0             | 25.0             | 0.6                |
| B72210S2301K101 | 7.5             | 2.3             | 12.0             | 5.6              | 14.5             | 25.0             | 0.8                |
| B72214S2301K101 | 7.5             | 2.3             | 15.5             | 5.6              | 18.5             | 25.0             | 0.8                |
| B72220S2301K101 | 10.0            | 2.8             | 21.5             | 6.1              | 25.5             | 25.0             | 1.0                |
| B72207S2321K101 | 5.0             | 2.3             | 9.0              | 4.6              | 11.0             | 25.0             | 0.6                |
| B72210S2321K101 | 7.5             | 2.4             | 12.0             | 5.8              | 15.0             | 25.0             | 0.8                |
| B72214S2321K101 | 7.5             | 2.4             | 15.5             | 5.8              | 19.0             | 25.0             | 0.8                |
| B72220S2321K101 | 10.0            | 2.9             | 21.5             | 6.2              | 25.5             | 25.0             | 1.0                |
| B72210S2381K101 | 7.5             | 3.3             | 12.0             | 7.1              | 15.0             | 25.0             | 0.8                |
| B72214S2381K101 | 7.5             | 3.4             | 15.5             | 7.1              | 19.0             | 25.0             | 0.8                |
| B72220S2381K101 | 10.0            | 3.9             | 21.5             | 7.6              | 26.0             | 25.0             | 1.0                |
| B72210S2421K101 | 7.5             | 3.5             | 12.0             | 7.4              | 15.0             | 25.0             | 0.8                |
| B72214S2421K101 | 7.5             | 3.6             | 15.5             | 7.5              | 19.0             | 25.0             | 0.8                |
| B72220S2421K101 | 10.0            | 4.2             | 21.5             | 7.9              | 26.0             | 25.0             | 1.0                |


**Leaded varistors**
**Advanced series**
**Dimensions**

| Ordering code   | $e \pm 1$<br>mm | $a \pm 1$<br>mm | $b_{\max}$<br>mm | $s_{\max}$<br>mm | $h_{\max}$<br>mm | $l_{\min}$<br>mm | $d \pm 0.05$<br>mm |
|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|--------------------|
| B72210S2461K101 | 7.5             | 3.7             | 12.0             | 7.7              | 15.0             | 25.0             | 0.8                |
| B72214S2461K101 | 7.5             | 3.8             | 15.5             | 7.8              | 19.0             | 25.0             | 0.8                |
| B72220S2461K101 | 10.0            | 4.5             | 21.5             | 8.2              | 26.0             | 25.0             | 1.0                |
| B72210S2511K101 | 7.5             | 4.0             | 12.0             | 8.0              | 15.0             | 25.0             | 0.8                |
| B72214S2511K101 | 7.5             | 4.0             | 15.5             | 8.1              | 19.0             | 25.0             | 0.8                |
| B72220S2511K101 | 10.0            | 4.6             | 21.5             | 8.6              | 26.0             | 25.0             | 1.0                |
| B72210S2551K101 | 7.5             | 4.3             | 12.0             | 8.4              | 15.0             | 25.0             | 0.8                |
| B72214S2551K101 | 7.5             | 4.7             | 15.5             | 8.5              | 19.0             | 25.0             | 0.8                |
| B72220S2551K101 | 10.0            | 4.8             | 21.5             | 9.0              | 26.0             | 25.0             | 1.0                |
| B72210S2621K101 | 7.5             | 5.0             | 12.0             | 8.8              | 15.0             | 25.0             | 0.8                |
| B72214S2621K101 | 7.5             | 5.1             | 15.5             | 8.9              | 19.0             | 25.0             | 0.8                |
| B72220S2621K101 | 10.0            | 5.4             | 21.5             | 9.4              | 26.0             | 25.0             | 1.0                |
| B72210S2681K101 | 7.5             | 5.4             | 12.0             | 9.2              | 15.0             | 25.0             | 0.8                |
| B72214S2681K101 | 7.5             | 5.5             | 15.5             | 9.3              | 19.0             | 25.0             | 0.8                |
| B72220S2681K101 | 10.0            | 5.8             | 21.5             | 9.8              | 26.0             | 25.0             | 1.0                |

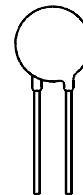


## Leaded varistors

### AdvancedD 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 <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.                                                                             |
| Max. AC operating voltage               | CECC 42 000, test 4.20<br>1000 h at UCT<br><br>After having continuously applied the maximum allowable 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.<br>Thereafter, the change of $V_V$ shall be measured.                                                                                                            | $ \Delta V/V (1 \text{ mA})  \leq 10\%$                                                                  |
| Surge current derating,<br>8/20 $\mu$ s | CECC 42 000, test C 2.1<br><br>100 surge currents (8/20 $\mu$ s), unipolar, interval 30 s, amplitude corresponding to derating curve for 100 impulses at 20 $\mu$ s                                                                                                                                                                                                                              | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>(measured in direction of surge current)<br>No visible damage |
| Surge current derating,<br>2 ms         | CECC 42 000, test C 2.1<br><br>100 surge currents (2 ms), unipolar, interval 120 s, amplitude corresponding to derating curve for 100 impulses at 2 ms                                                                                                                                                                                                                                           | $ \Delta V/V (1 \text{ mA})  \leq 10\%$<br>(measured in direction of surge current)<br>No visible damage |
| Electric strength                       | CECC 42 000, test 4.7<br><br>Metal balls method, 2500 V <sub>RMS</sub> , 60 s<br><br>The varistor is placed in a container holding $1.6 \pm 0.2$ mm diameter metal balls such that only the terminations of the varistor are protruding.<br>The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls. | No breakdown                                                                                             |

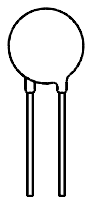


## Leaded varistors

### Advanced series

#### Reliability data

| Test                     | Test methods/conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Climatic sequence        | <p>CECC 42 000, test 4.16</p> <p>The specimen shall be subjected to:</p> <ul style="list-style-type: none"> <li>a) dry heat at UCT, 16 h</li> <li>b) damp heat, 1st cycle:<br/>55 °C, 93% r. H., 24 h</li> <li>c) cold, LCT, 2 h</li> <li>d) damp heat, additional 5 cycles:<br/>55 °C/25 °C, 93% r. H., 24 h/cycle.</li> </ul> <p>Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h.</p> <p>Thereafter, the change of <math>V_V</math> shall be measured. Thereafter, insulation resistance <math>R_{ins}</math> shall be measured according to CECC 42 000, test 4.8 at <math>V = 500 \text{ V}</math>.</p> | <p><math> \Delta V/V (1 \text{ mA})  \leq 10\%</math></p> <p><math>R_{ins} \geq 1 \text{ M}\Omega</math></p>                                                                                                                                                                                                                                                                                                                       |
| Fast temperature cycling | IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><math> \Delta V/V (1 \text{ mA})  \leq 5\%</math></p> <p>No visible damage</p>                                                                                                                                                                                                                                                                                                                                                  |
| Damp heat, steady state  | <p>The specimen shall be subjected to <math>40 \pm 2 \text{ °C}</math>, 90 to 95% r. H. for 56 days without load / with 10% of the maximum continuous DC operating voltage <math>V_{DC}</math>. Then stored at room temperature and normal humidity for 1 to 2 h.</p> <p>Thereafter, the change of <math>V_V</math> shall be measured. Thereafter, insulation resistance <math>R_{ins}</math> shall be measured according to CECC 42 000, test 4.8 at <math>V = 500 \text{ V}</math>.</p>                                                                                                                                                          | <p><math> \Delta V/V (1 \text{ mA})  \leq 10\%</math></p> <p><math>R_{ins} \geq 1 \text{ M}\Omega</math></p>                                                                                                                                                                                                                                                                                                                       |
| Solderability            | <p>IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: 245 °C, 3 s:</p> <p>After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 245 °C for 3 s, the terminals shall be visually examined.</p>                                                                                                                                                                                                                                                                                                                                                                     | <p>The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.</p> |



## Leaded varistors

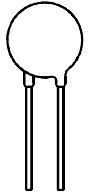
### AdvancedD series

#### Reliability data

| Test                         | Test methods/conditions                                                                                                                                                                                                                                                                                                                                                                         | Requirement                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Resistance to soldering heat | IEC 60068-2-20, test Tb, method 1A, 260 °C, 10 s:<br><br>Each lead shall be dipped into a solder bath having a temperature of $260 \pm 5$ °C to a point 2.0 to 2.5 mm from the body of the specimen, be held there for $10 \pm 1$ s and then be stored at room temperature and normal humidity for 1 to 2 h. The change of $V_V$ shall be measured and the specimen shall be visually examined. | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br><br>No visible damage                       |
| Tensile strength             | IEC 60068-2-21, test Ua1<br><br>After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage.<br><br>Force for wire diameter:<br>0.6 mm = 10 N<br>0.8 mm = 10 N<br>1.0 mm = 20 N                                                                                                                              | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br><br>No break of solder joint, no wire break |
| Vibration                    | IEC 60068-2, test Fc<br><br>Frequency range: 10 ... 55 Hz<br>Amplitude: 0.75 mm or 98 m/s <sup>2</sup><br>Duration: 6 h (3 · 2 h)<br>Pulse: sine wave<br>After repeatedly applying a single harmonic vibration according to the table above.<br>The change of $V_V$ shall be measured and the specimen shall be visually examined.                                                              | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br><br>No visible damage                       |
| Bump                         | IEC 60068-2-29, test Eb<br><br>Pulse duration: 6 ms<br>Max. acceleration: 400 m/s <sup>2</sup><br>Number of bumps: 4000<br>Pulse: half sine                                                                                                                                                                                                                                                     | $ \Delta V/V (1 \text{ mA})  \leq 5\%$<br><br>No visible damage                       |
| Flammability                 | IEC 60695-2-2 (needle flame test)<br><br>Severity: vertical 10 s                                                                                                                                                                                                                                                                                                                                | 5 s max.                                                                              |

#### Note:

UCT = Upper category temperature / LCT = Lower category temperature /  $R_{ins}$  = Insulation resistance to CECC 42 000, test 4.8



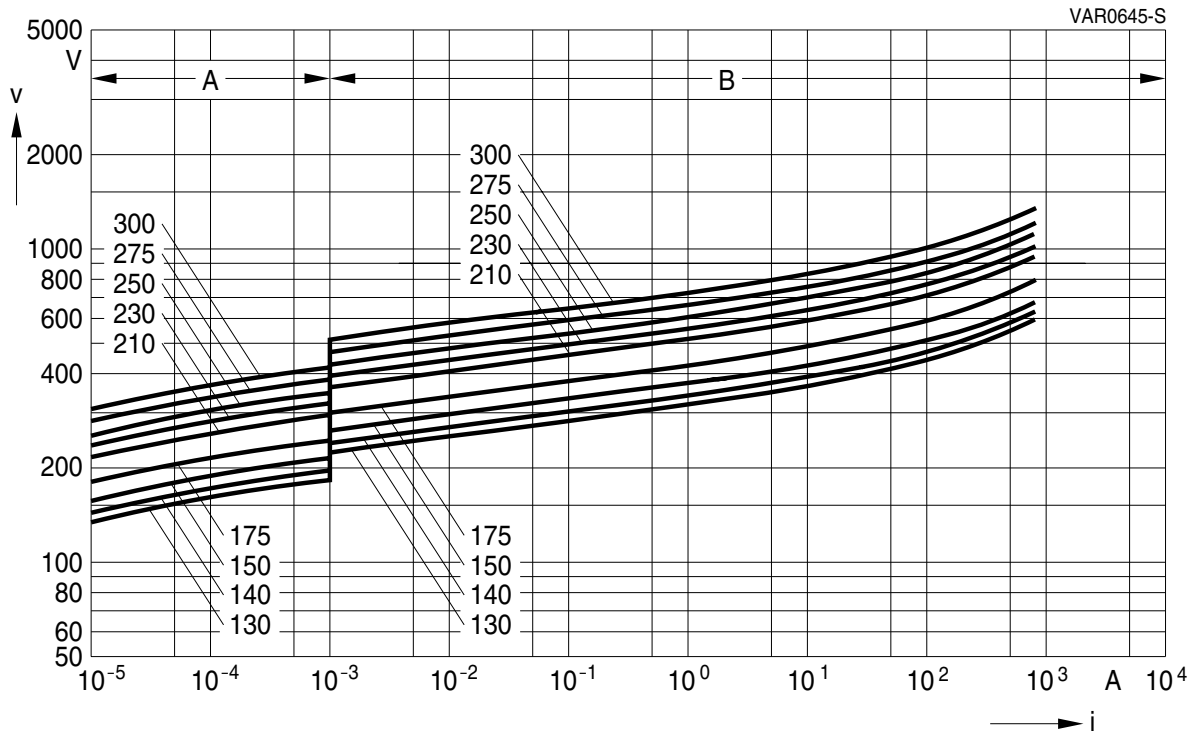
## Leaded varistors

### AdvancedD series

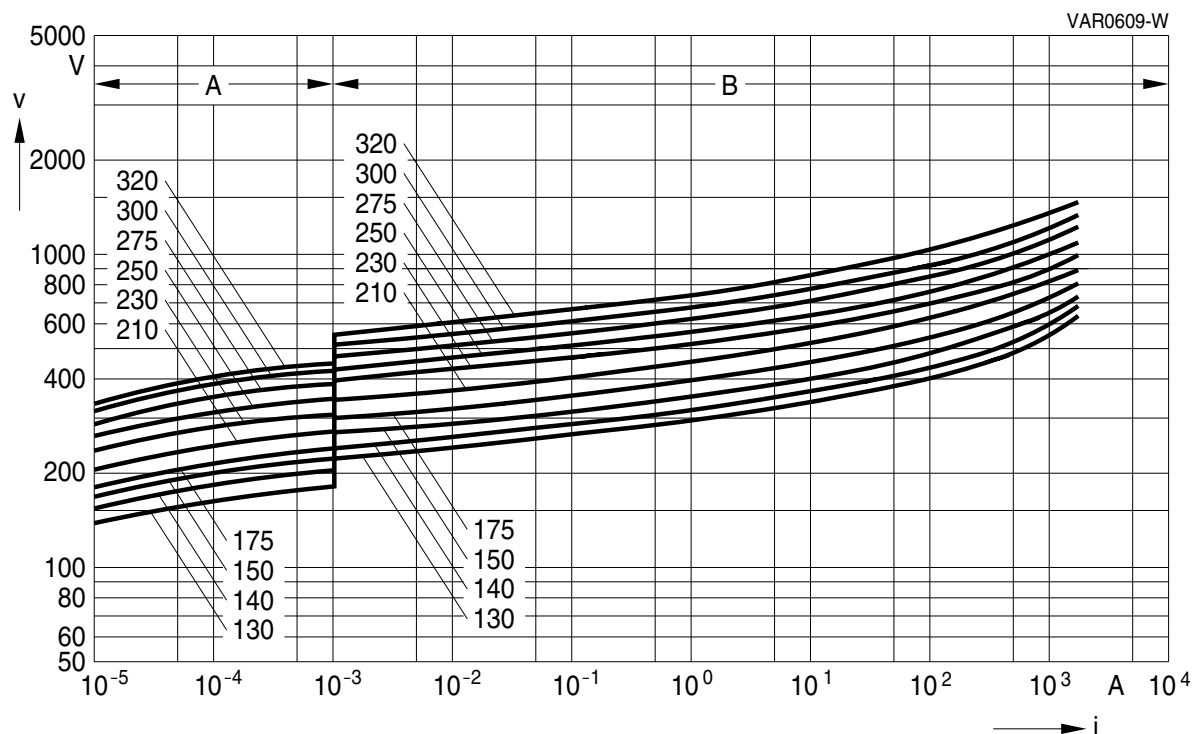
#### v/i characteristics

$v = f(i)$  – for explanation of the characteristics refer to “General technical information”, 1.6.3

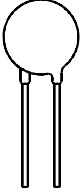
A = Leakage current { for worst-case  
B = Protection level { varistor tolerances



#### SIOV-S05 ... E2



#### SIOV-S07 ... E2



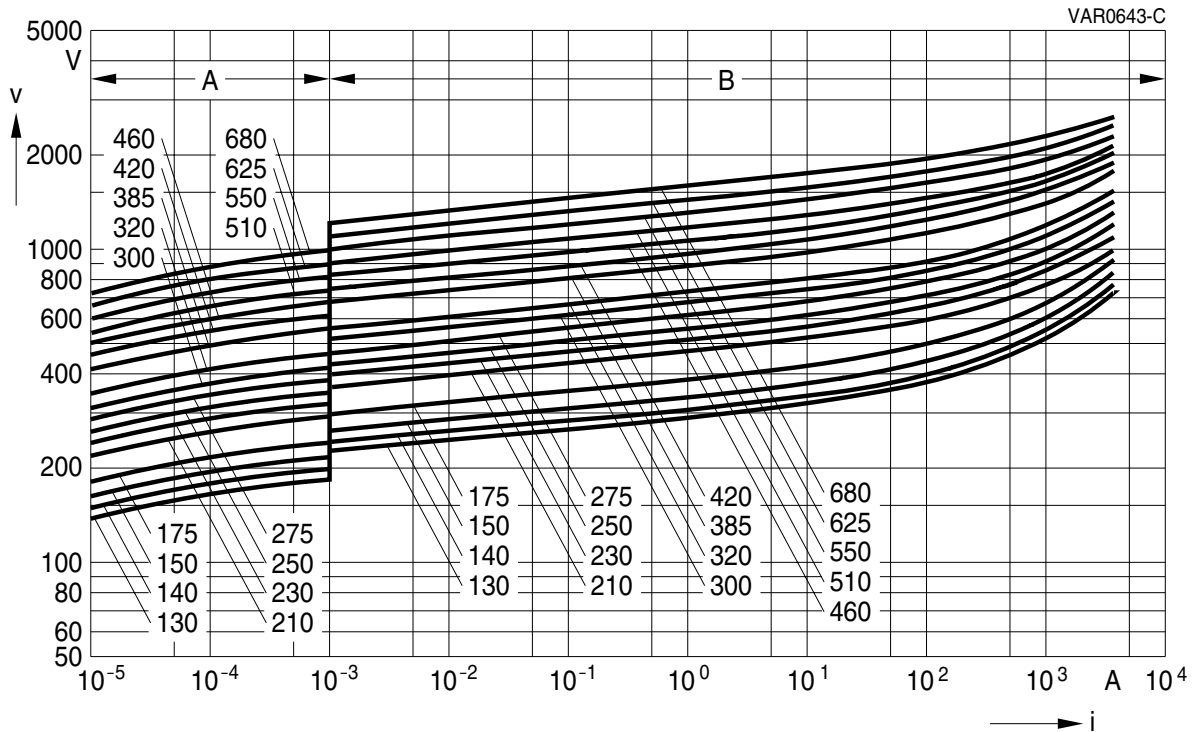
## Leaded varistors

### AdvancedD series

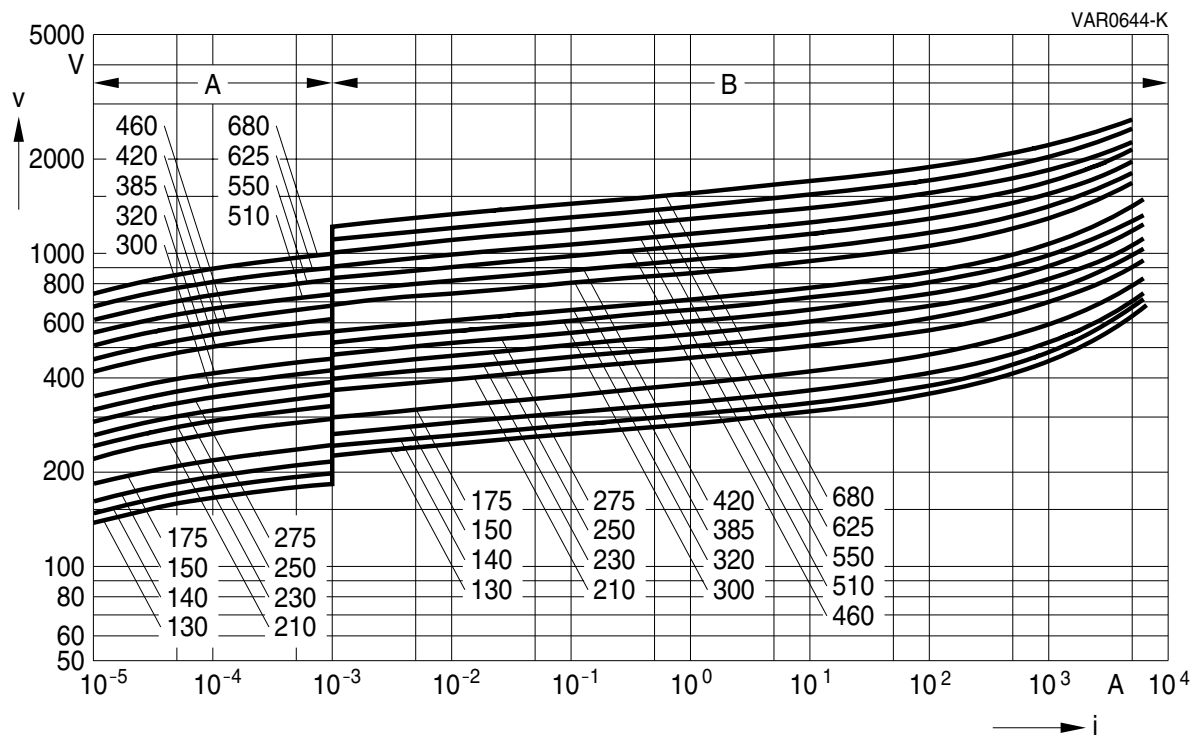
#### v/i characteristics

$v = f(i)$  – for explanation of the characteristics refer to “General technical information”, 1.6.3

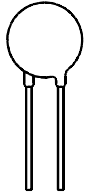
A = Leakage current { for worst-case  
B = Protection level { varistor tolerances



#### SIOV-S10 ... E2



#### SIOV-S14 ... E2



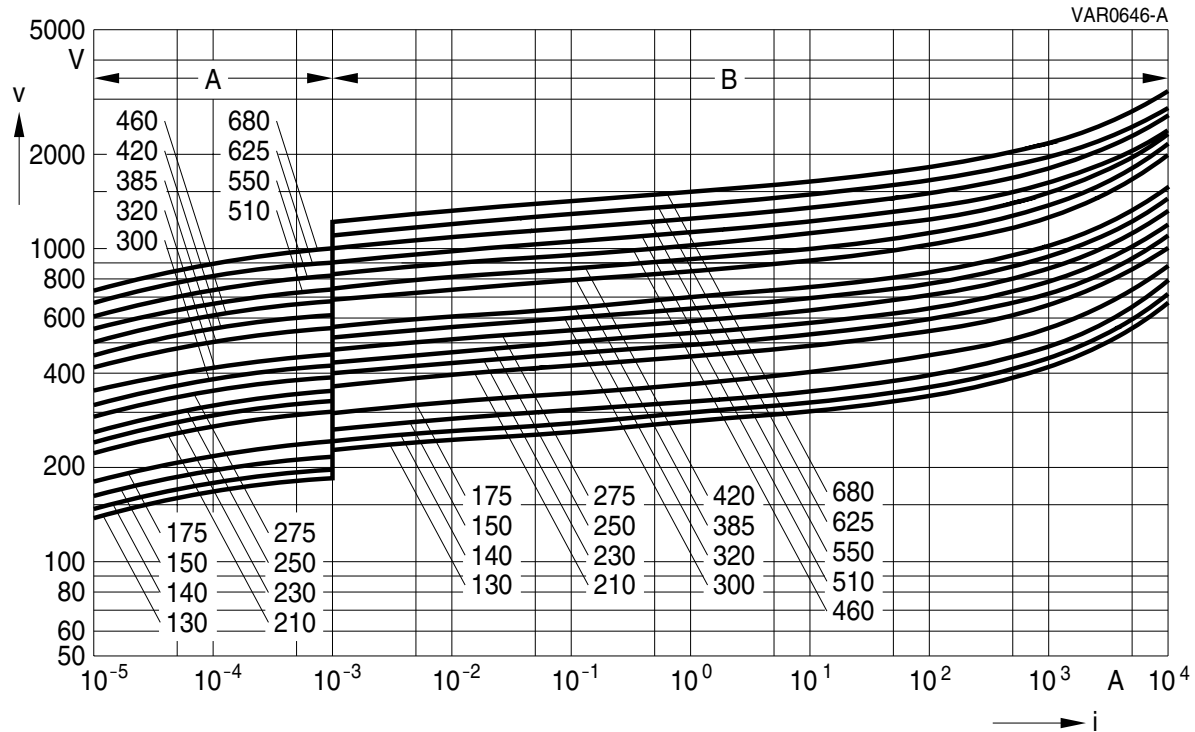
## Leaded varistors

### AdvancedD series

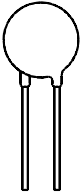
#### v/i characteristics

$v = f(i)$  – for explanation of the characteristics refer to “General technical information”, 1.6.3

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



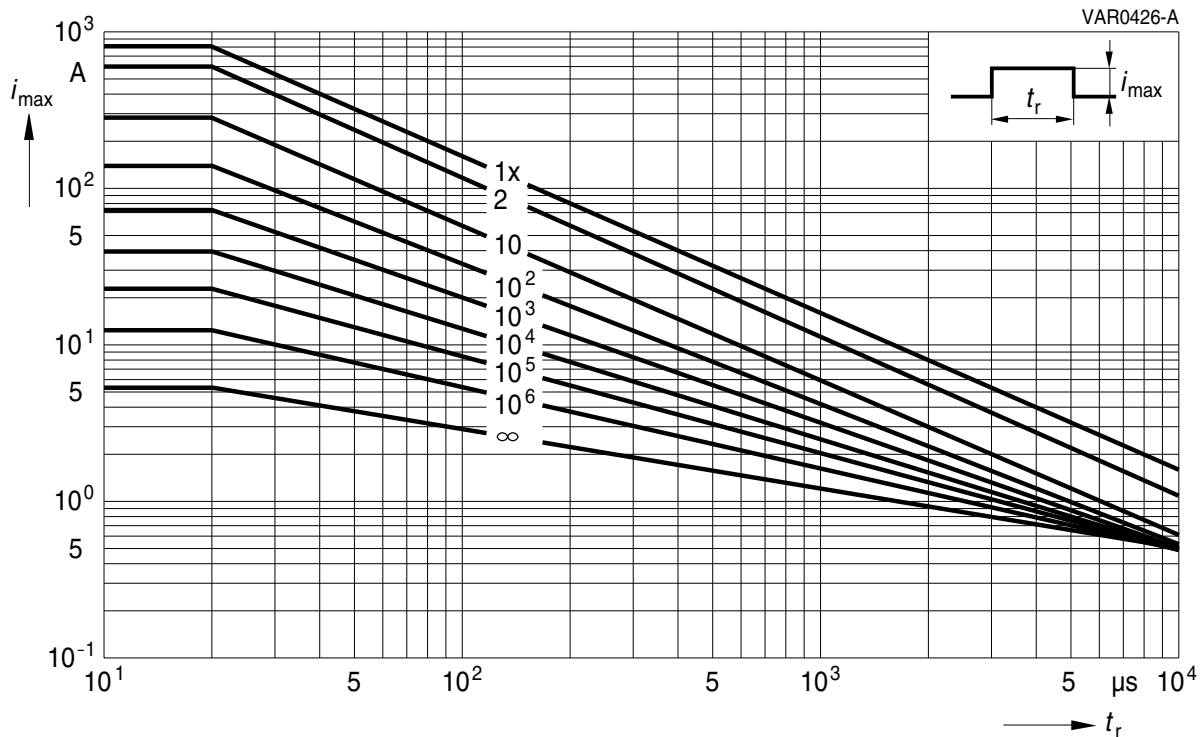
SIOV-S20 ... E2



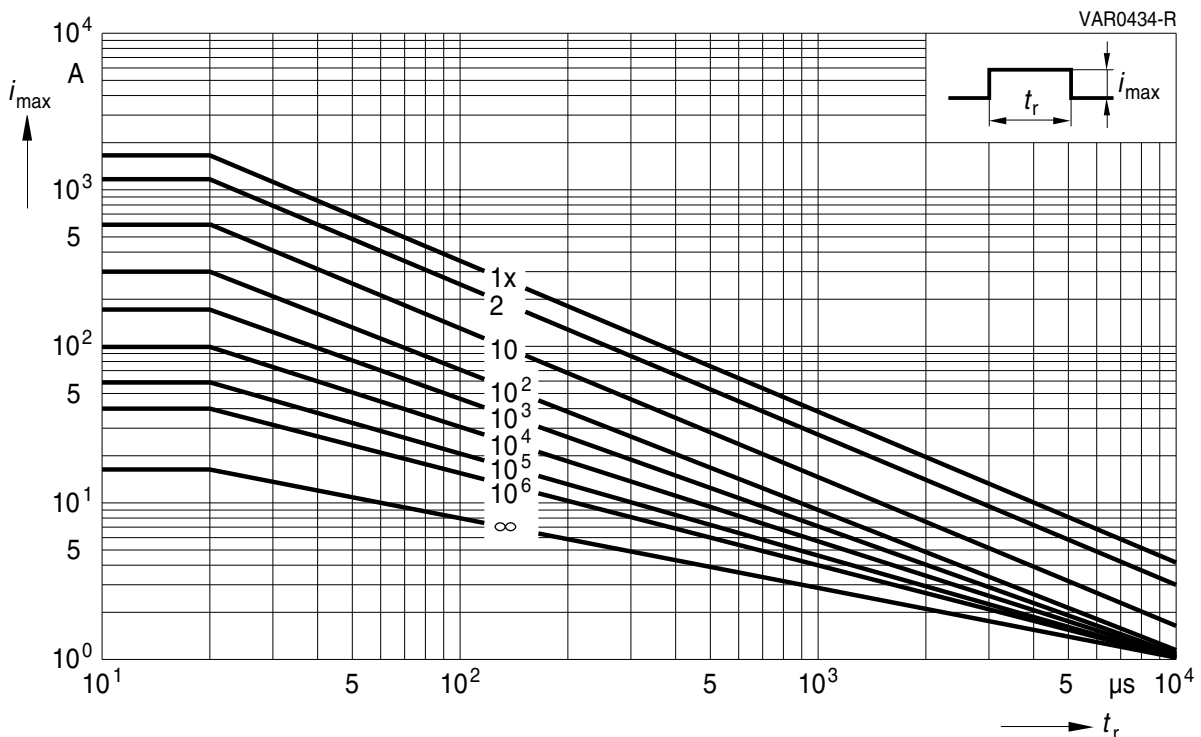
## Derating curves

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

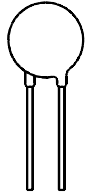
For explanation of the derating curves refer to "General technical information", section 1.8.1



### SIOV-S05K130 ... K300E2



### SIOV-S07K130 ... K320E2



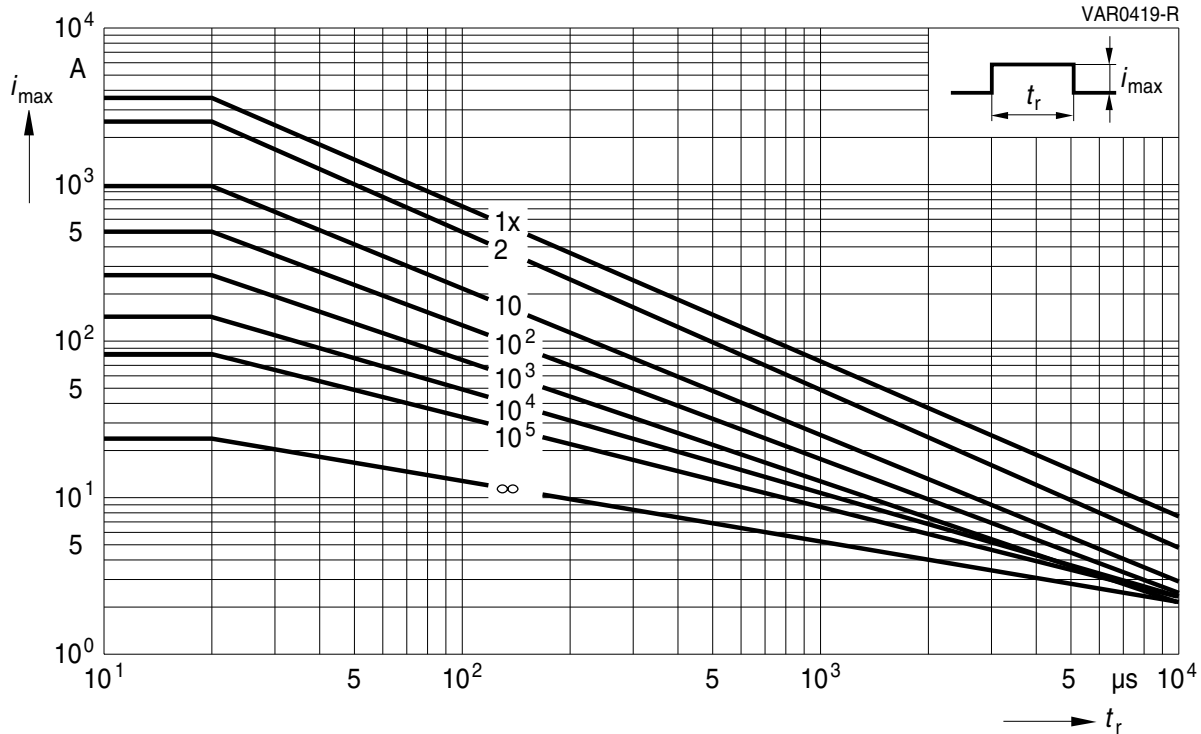
## Leaded varistors

### AdvancedD series

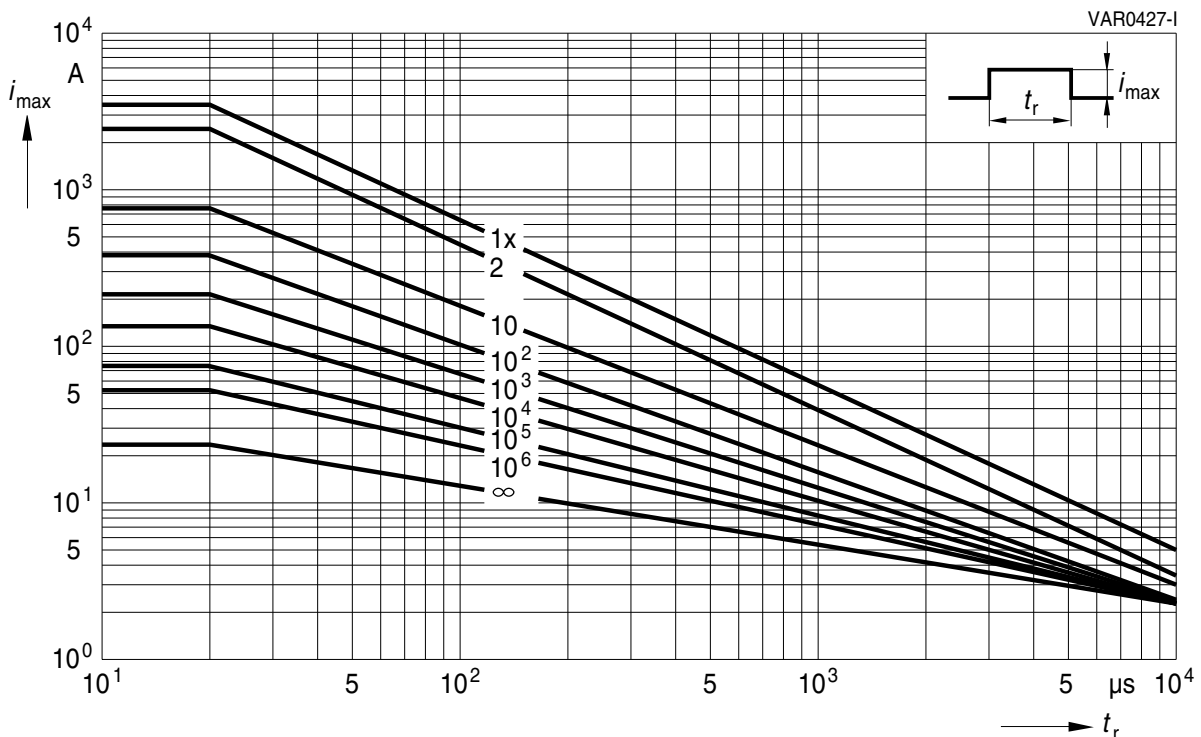
#### Derating curves

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

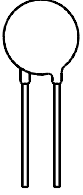
For explanation of the derating curves refer to “General technical information”, section 1.8.1



#### SIOV-S10K130 ... K320E2



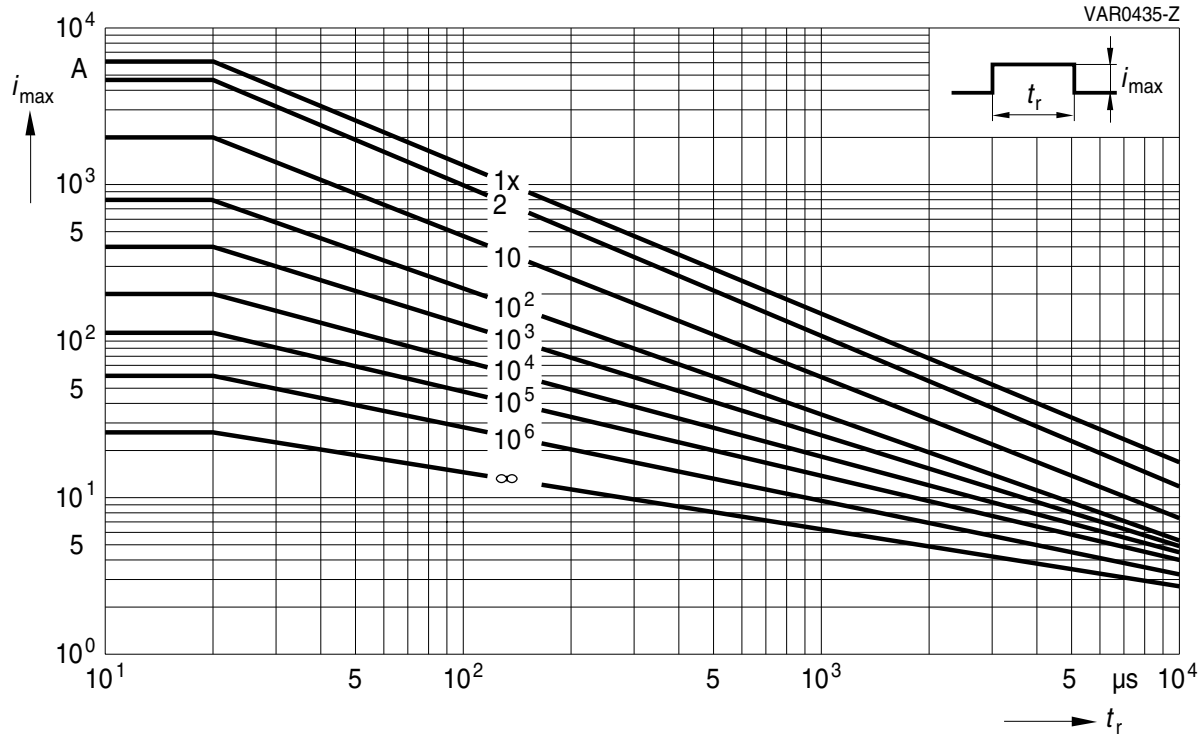
#### SIOV-S10K385 ... K680E2



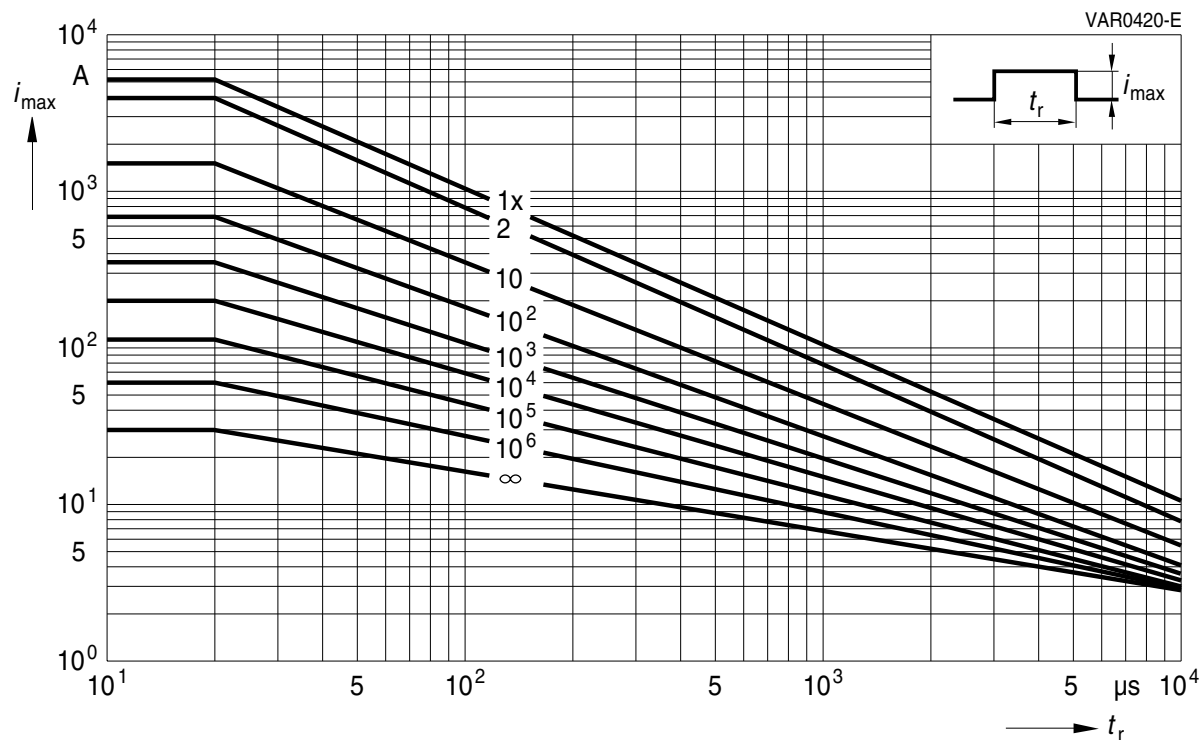
## Derating curves

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

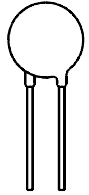
For explanation of the derating curves refer to "General technical information", section 1.8.1



### SIOV-S14K130 ... K320E2



### SIOV-S14K385 ... K680E2



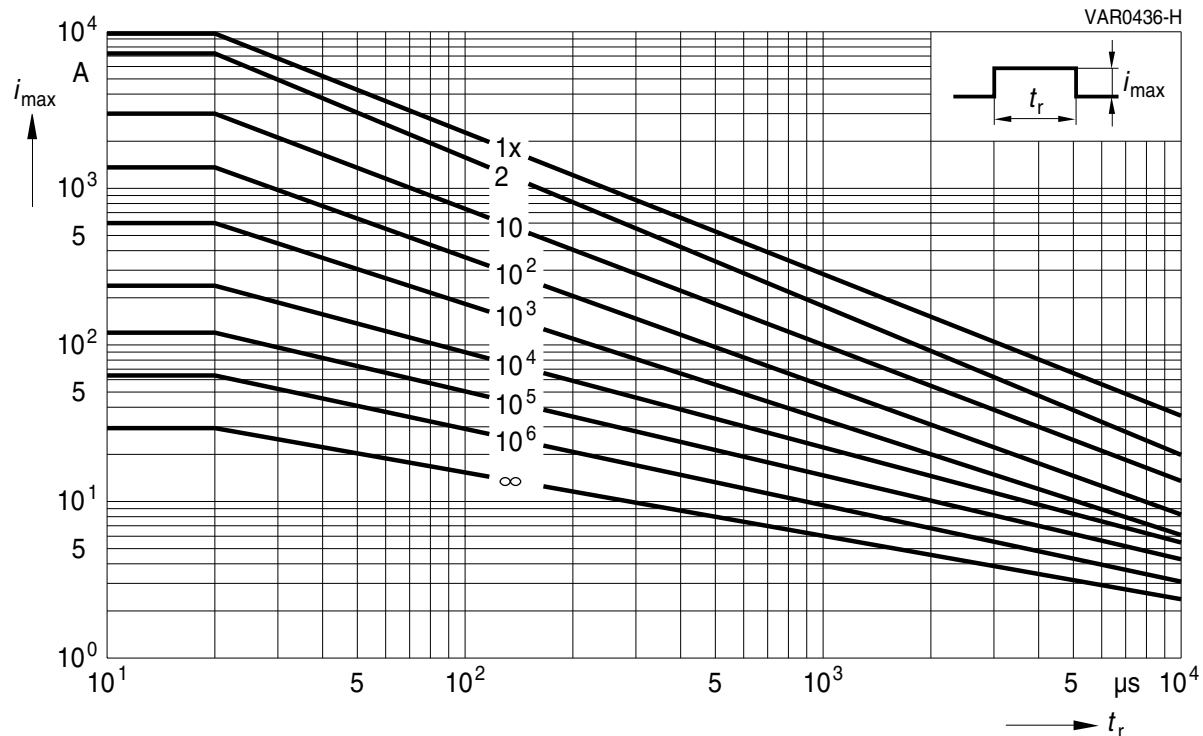
## Leaded varistors

### AdvancedD series

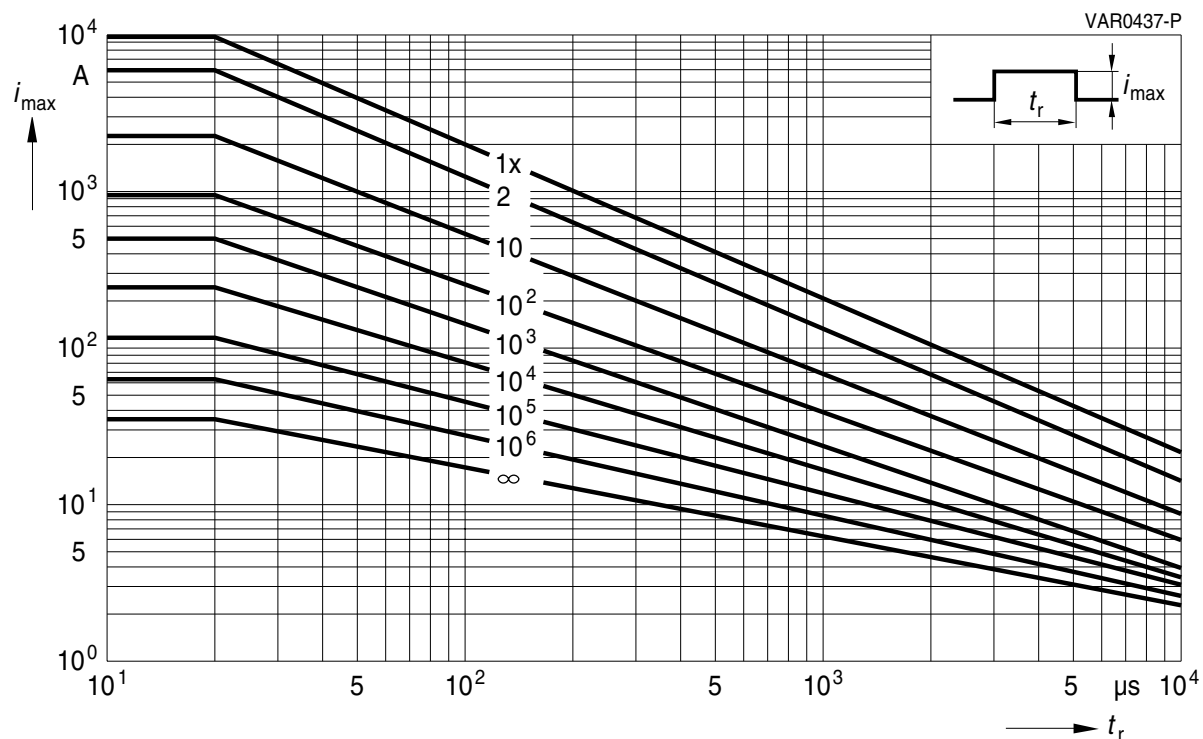
#### Derating curves

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-S20K130 ... K320E2



#### SIOV-S20K385 ... K680E2

## Leaded varistors

### AdvancedD series

## Cautions and warnings

### General

1. EPCOS metal oxide varistors (SIOVs) 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 before storage.
2. Storage conditions in original packaging:  
Storage temperature:  $-25\text{ °C} \dots +45\text{ °C}$   
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 surface 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 within the time specified:  
SIOV-S, -Q, -LS      24 months  
ETFV and SFS types   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.

## Leaded varistors

### AdvancedD series

#### 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 the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions. Avoid contact with any liquids and solvents.

## 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 passive 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 a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving 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 a passive 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](http://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, BAOKE, Alu-X, CeraDiode, CSSP, DSSP, MiniBlue, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseMod, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SIMID, SineFormer, SIOV, SIP5D, SIP5K, 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](http://www.epcos.com/trademarks).



## О компании

ООО "ТрейдЭлектроникс" - это оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов. Реализуемая нашей компанией продукция насчитывает более полумиллиона наименований.

Благодаря этому наша компания предлагает к поставке практически не ограниченный ассортимент компонентов как оптовыми, мелкооптовыми партиями, так и в розницу.

Наличие собственной эффективной системы логистики обеспечивает надежную поставку продукции по конкурентным ценам в точно указанные сроки.

Срок поставки со стоков в **Европе и Америке – от 3 до 14 дней.**

Срок поставки из **Азии – от 10 дней.**

Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

Предоставляем спец цены на элементы для создания инженерных сэмплов.

**Упорный труд, качественный результат дают нам право быть уверенными в себе и надежными для наших клиентов.**

### Наша компания это:

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование

Наша организация особенно сильна в поставках модулей, микросхем, пассивных компонентов, ксайленсах (XC), EPF, EPM и силовой электроники.

Большой выбор предлагаемой продукции, различные виды оплаты и доставки, позволят Вам сэкономить время и получить максимум выгоды от сотрудничества с нами!

## Перечень производителей, продукцию которых мы поставляем на российский рынок





Trade Electronics.ru

гарантия бесперебойности производства и  
качества выпускаемой продукции

С удовольствием будем прорабатывать для Вас поставки всех необходимых компонентов по текущим запросам для скорейшего выявления групп элементов, по которым сотрудничество именно с нашей компанией будет для Вас максимально выгодным!

С уважением,

Менеджер отдела продаж ООО

«Трейд Электроникс»

Шишлаков Евгений

8 (495)668-30-28 доб 169

manager28@tradeelectronics.ru

<http://www.tradeelectronics.ru/>