



## **SIOV metal oxide varistors**

Housed (Fail-safe) varistors

**Series/Type:**            **SFS14**

**Date:**                    December 2007

**Housed varistors**
**Fail-safe varistor, SFS14 series**
**Construction**

- Plastic housing protected varistor
- Terminals: tinned copper wire
- Housing: heat-resistant and flame-retardant to UL 94 V-0

**Features**

- No flame or rupture under specified test conditions  
(see "Reliability data", "Overvoltage test")
- No harm to other components nearby on printed circuit board (PCB)

**Approvals**

- UL
- CSA

**Applications**

- Consumer electronics
- Power supply

**Delivery mode**

- Bulk (standard)

**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                |



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**Maximum ratings** ( $T_A = 85\text{ °C}$ )

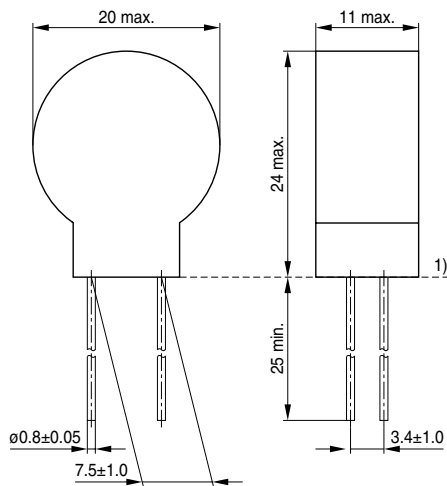
| Ordering code   | Type (untaped)<br>SIOV- | $V_{RMS}$<br>V | $V_{DC}$<br>V | $i_{max}$<br>(8/20 $\mu$ s)<br>A | $W_{max}$<br>(2 ms)<br>J | $P_{max}$<br>W |
|-----------------|-------------------------|----------------|---------------|----------------------------------|--------------------------|----------------|
| B72214F2381K101 | SFS14K385E2             | 385            | 505           | 5000                             | 136                      | 0.6            |

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

| Ordering code   | Type (untaped)<br>SIOV- | $V_V$<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 |
|-----------------|-------------------------|----------------------|-----------------------------|--------------------------------|------------|----------------------------|
| B72214F2381K101 | SFS14K385E2             | 620                  | $\pm 10$                    | 1025                           | 50         | 240                        |

Other types are available on request.

**Dimensional drawing**



1) Seating plane in accordance with IEC 60717

VAR0593-F-E

**Weight**

| Nominal diameter<br>mm | $V_{RMS}$<br>V | Weight<br>g |
|------------------------|----------------|-------------|
| 14                     | 385            | 5.5         |



## Housed varistors

### Fail-safe varistor, SFS14 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.   |
| Surge current derating, 8/20 $\mu$ s | CECC 42 000, test C 2.1<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, 2 ms         | CECC 42 000, test C 2.1<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 |
| Overvoltage test                     | The varistor should be subjected to $V_{RMS}$ test ( $V_{RMS} = 0.85 V_V$ (1 mA)) until it failed, in series with 5 A fuse and 5 $\Omega$ resistor (based on S14 series). | No flame, no rupture   |



**Housed varistors**

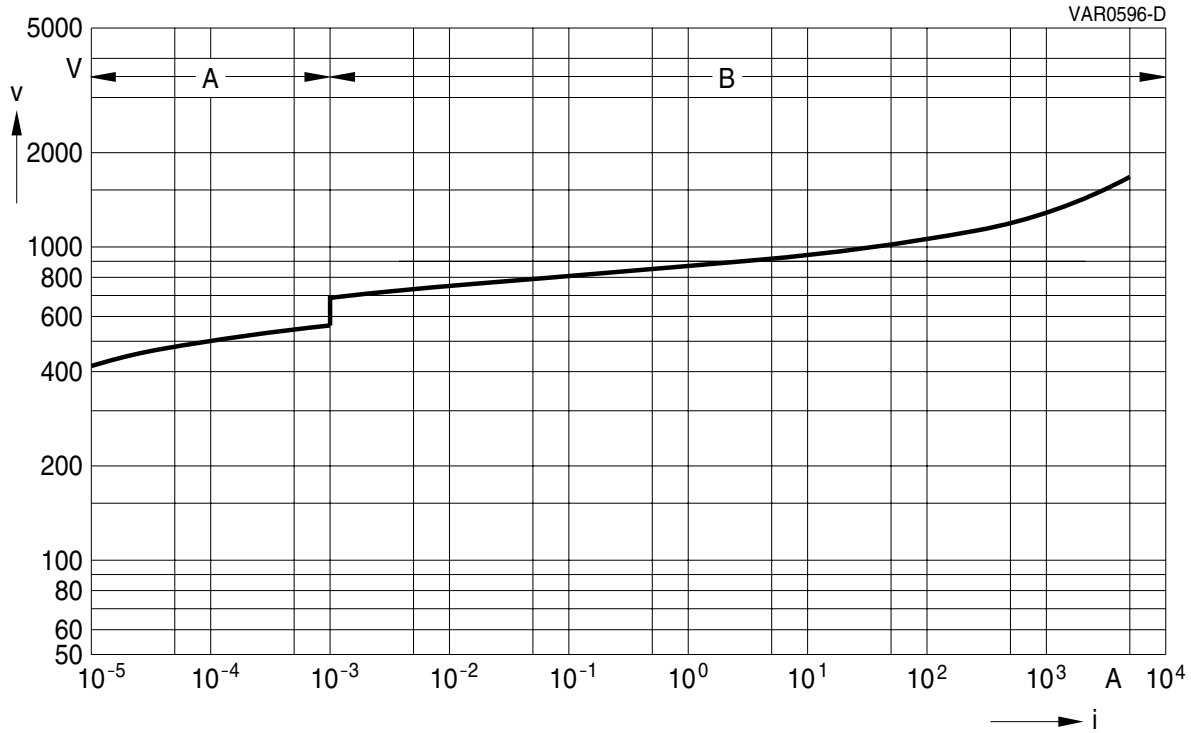
**Fail-safe varistor, SFS14 series**

**v/i characteristics**

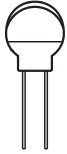
$v = f(i)$  – for explanation of the characteristics refer to “General technical information”, 1.6.3

A = Leakage current  
 B = Protection level

{ for worst-case  
 } varistor tolerances



**SIOV-SFS14K385E2**



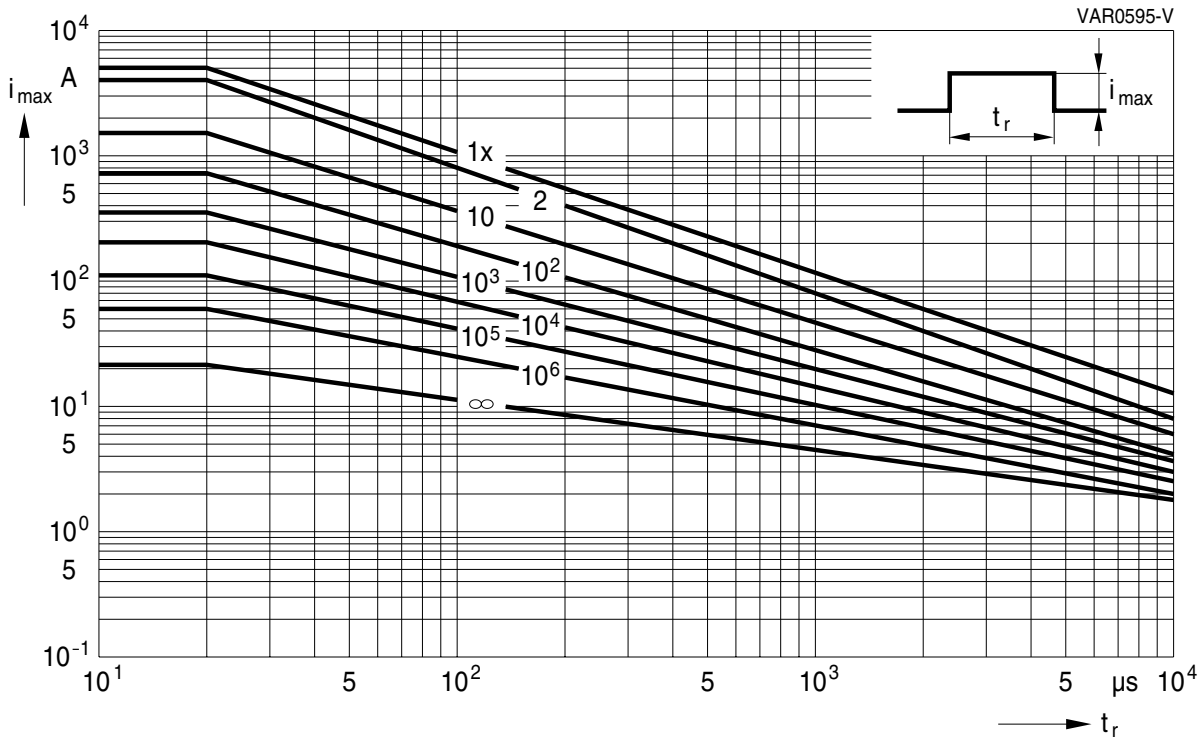
**Housed varistors**

**Fail-safe varistor, SFS14 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-SFS14K385E2**

## 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.

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#### Mounting

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

#### Operation

1. Use SIOVs only within the specified temperature operating range.
2. Use SIOVs only within the specified voltage and current ranges.
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.



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