



## **SIOV metal oxide varistors**

Housed (ThermoFuse) varistors, AdvanceD series

**Series/Type:**            **ETFV14**  
**Date:**                     December 2007

## Housed varistors

### ThermoFuse varistors, ETFV14 series

#### Construction

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

#### Features

- Wide operating voltage range 130 ... 420 V<sub>RMS</sub>
- Self-protected under abnormal overvoltage conditions
- High-energy Advanced series E2

#### Approvals

- UL

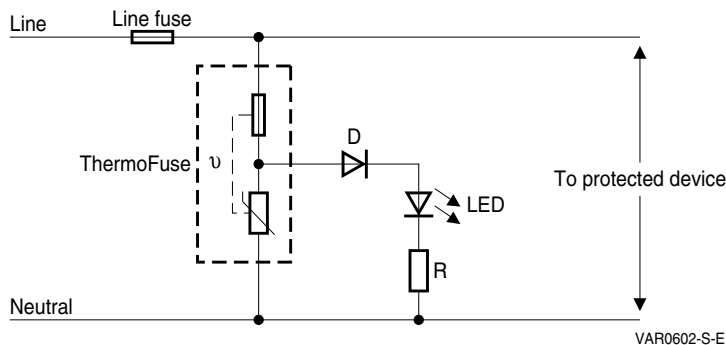
#### Applications

- Air conditioner, refrigerator, TV, etc.
- Power meter, inverter, telecom equipment, etc.
- Transient voltage surge suppressors (TVSS)

#### Delivery mode

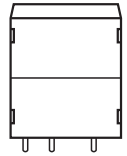
- Bulk (standard)

#### Typical applications



#### General technical data

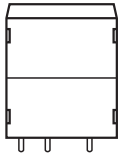
Climatic category	to IEC 60068-1	40/85/56	
Operating temperature	to CECC 42 000	-40 ... + 85	°C
Storage temperature		-40 ... +125	°C
Electric strength	to CECC 42 000	≥2.5	kV <sub>RMS</sub>
Response time		<25	ns


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

Ordering code	Type (untaped) SIOV-	$V_{RMS}$ V	$V_{DC}$ V	$i_{max}$ (8/20 $\mu$ s) A	$W_{max}$ (2 ms) J	$P_{max}$ W
B72214T2131K101	ETFV14K130E2	130	170	6000	50	0.6
B72214T2141K101	ETFV14K140E2	140	180	6000	55	0.6
B72214T2151K101	ETFV14K150E2	150	200	6000	60	0.6
B72214T2171K101	ETFV14K175E2	175	225	6000	70	0.6
B72214T2211K101	ETFV14K210E2	210	270	6000	80	0.6
B72214T2231K101	ETFV14K230E2	230	300	6000	90	0.6
B72214T2251K101	ETFV14K250E2	250	320	6000	100	0.6
B72214T2271K101	ETFV14K275E2	275	350	6000	110	0.6
B72214T2301K101	ETFV14K300E2	300	385	6000	125	0.6
B72214T2321K101	ETFV14K320E2	320	420	6000	136	0.6
B72214T2351K101	ETFV14K350E2	350	460	6000	136	0.6
B72214T2381K101	ETFV14K385E2	385	505	6000	136	0.6
B72214T2421K101	ETFV14K420E2	420	560	6000	136	0.6

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

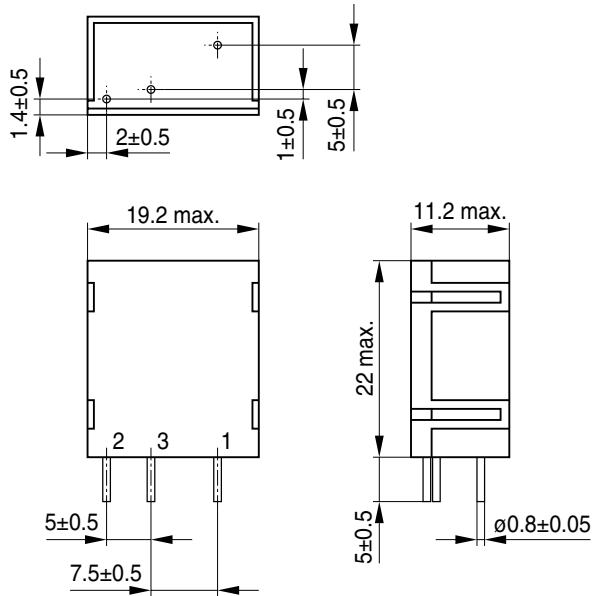
Ordering code	Type (untaped) SIOV-	$V_V$ (1 mA) V	$\Delta V_V$ (1 mA) %	$V_{c, max}$ ( $i_c$ ) V	$i_c$ A	$C_{typ}$ (1 kHz) pF
B72214T2131K101	ETFV14K130E2	205	$\pm 10$	340	50	650
B72214T2141K101	ETFV14K140E2	220	$\pm 10$	360	50	610
B72214T2151K101	ETFV14K150E2	240	$\pm 10$	395	50	570
B72214T2171K101	ETFV14K175E2	270	$\pm 10$	455	50	490
B72214T2211K101	ETFV14K210E2	330	$\pm 10$	545	50	410
B72214T2231K101	ETFV14K230E2	360	$\pm 10$	595	50	380
B72214T2251K101	ETFV14K250E2	390	$\pm 10$	650	50	350
B72214T2271K101	ETFV14K275E2	430	$\pm 10$	710	50	320
B72214T2301K101	ETFV14K300E2	470	$\pm 10$	775	50	300
B72214T2321K101	ETFV14K320E2	510	$\pm 10$	840	50	280
B72214T2351K101	ETFV14K350E2	560	$\pm 10$	910	50	260
B72214T2381K101	ETFV14K385E2	620	$\pm 10$	1025	50	240
B72214T2421K101	ETFV14K420E2	680	$\pm 10$	1120	50	220



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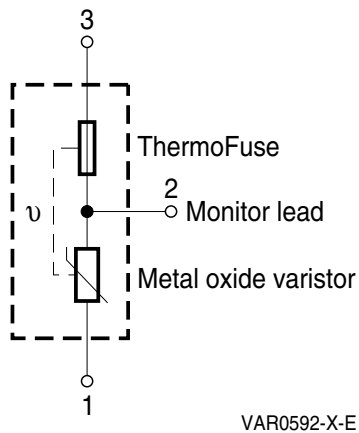
#### Dimensional drawing

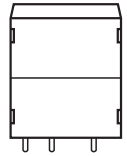


#### Weight

Nominal diameter mm	$V_{RMS}$ V	Weight g
14	130 ... 420	4.3 ... 5.3

#### Lead configuration



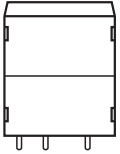


**Housed varistors**

**ThermoFuse varistors, ETFV14 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 μs) applied.	To meet the specified value.
Surge current derating, 8/20 μs	CECC 42 000, test C 2.1 100 surge currents (8/20 μs), unipolar, interval 30 s, amplitude corresponding to derating curve for 100 impulses at 20 μs	$ \Delta V/V (1 \text{ mA})  \leq 10\%$ (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	CECC 42 000, test C 2.1 100 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\%$ (measured in direction of surge current) No visible damage
Abnormal overvoltage test	UL1449, limited current abnormal overvoltage test. Apply a high AC voltage to ThermoFuse varistor, the amplitude of overvoltage and current limit will be adopted from UL1449 general instruction in section 37. The specimen will be tested on a softwood surface covered with a double layer of white tissue paper. The specimen is to be loosely draped with a double layer of cheesecloth. The cheesecloth shall cover openings where flame, molten or other particles may be expelled as a result of the test. The test result will be visually inspected.	Any of these phenomena shall not be observed, or this specimen will be judged as failed part. <ul style="list-style-type: none"> <li>1. Emission of flame, molten metal, glowing or flaming particles through any openings (pre-existed or created as a result of the test) in the product.</li> <li>2. Charring, glowing, or flaming of the supporting surface, tissue paper, or cheesecloth.</li> <li>3. Ignition of the enclosure.</li> <li>4. Creation of any openings in the enclosure that result in accessibility of live parts, when judged in accordance with accessibility of live parts, UL1449 section 13.</li> </ul>



## Housed varistors

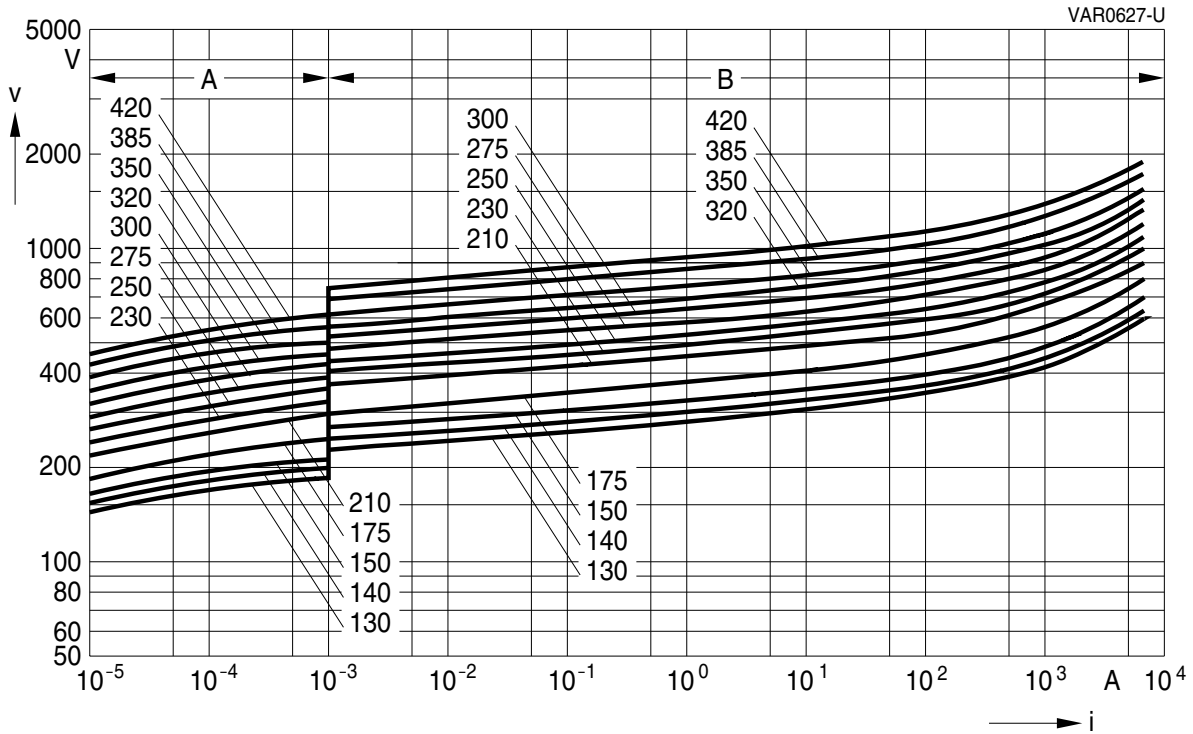
### ThermoFuse varistors, ETFV14 series

#### v/i characteristics

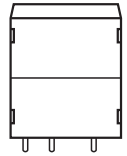
$v = f(i)$  – for explanation of the characteristics refer to “General technical information”, 1.6.3

A = Leakage current  
B = Protection level

{ for worst-case varistor tolerances



SIOV-ETFV14 ... E2



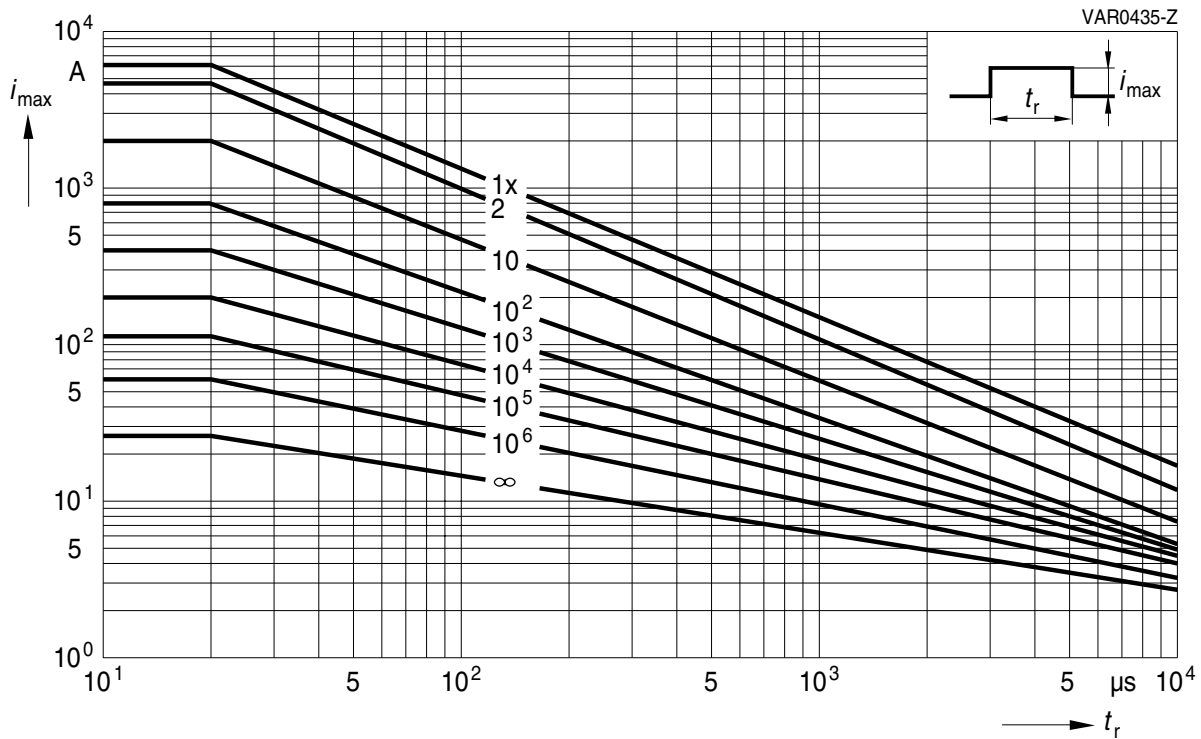
**Housed varistors**

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**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-ETFV14 ... E2**

## Housed varistors

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## 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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