Housed Varistor

ThermoFuse Varistor

Series/Type:	**T20K460…1000**
Ordering code:	**B72220T0***K105
Date:	2013-01-25
Version:	b

Applications

- Overvoltage protection with integrated thermal fuse
- Suitable for use in industrial and household appliance applications

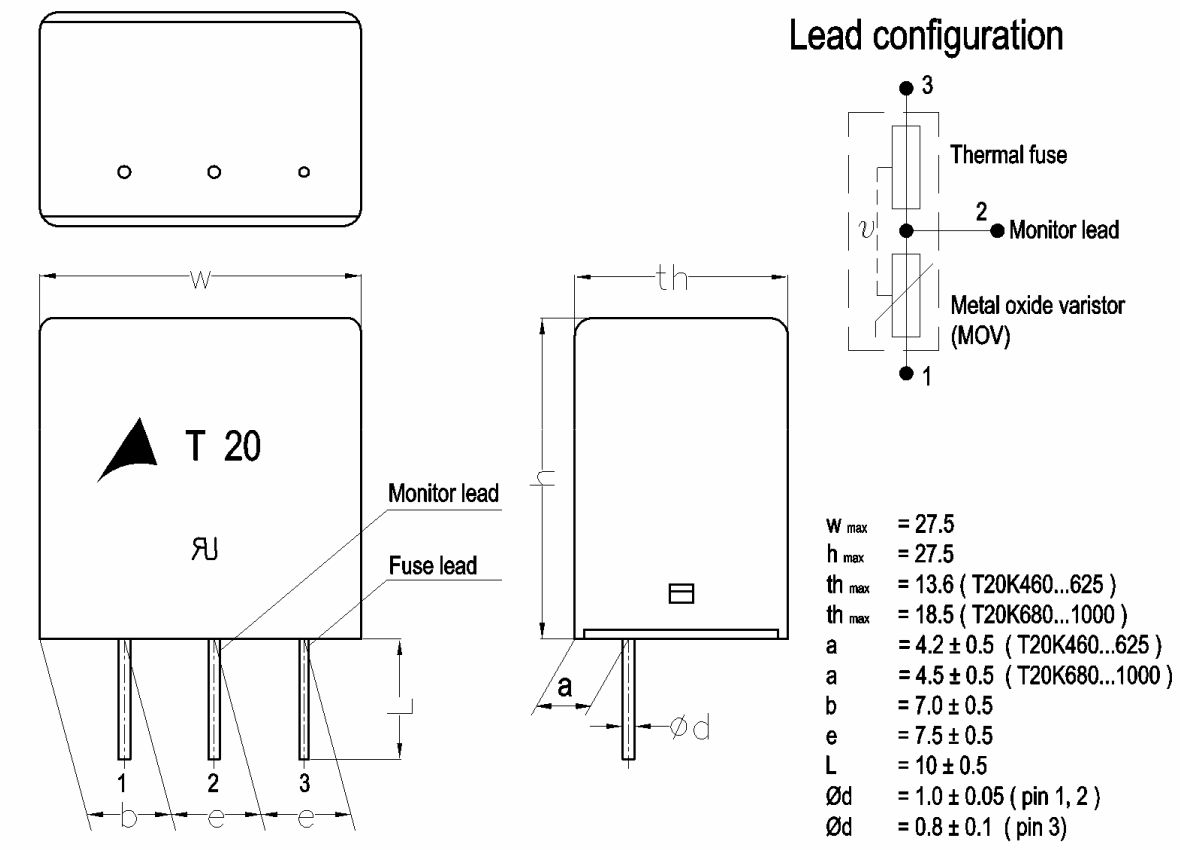
Features

- Three-leaded version for failure indication
- UL approval to UL1449 3rd edition (File number E321126)
- Approval pending to IEC61051 and VDE
- Meet thermal stability according to section 8.3.5.2 of IEC 61643-11
- Failure safe for abnormal over voltage (see “Reliability Data Electrical, Abnormal over voltage”)

Nomenclature

T	=	EPCOS ThermoFuse varistor
20	=	Rated disk diameter (mm)
K	=	Tolerance of V_V at 1 mA: ±10%
***	=	Max. AC voltage (see table on page 3)

Dimensional drawing in mm



w_{max}	= 27.5
h_{max}	= 27.5
th_{max}	= 13.6 (T20K460...625)
th_{max}	= 18.5 (T20K680...1000)
a	= 4.2 ± 0.5 (T20K460...625)
a	= 4.5 ± 0.5 (T20K680...1000)
b	= 7.0 ± 0.5
e	= 7.5 ± 0.5
L	= 10 ± 0.5
Ød	= 1.0 ± 0.05 (pin 1, 2)
Ød	= 0.8 ± 0.1 (pin 3)

General technical data

Climatic category	to IEC 60068-1	40 / 85 / 56
Operating temperature		-40…+85 °C
Storage temperature		-40…+85 °C
Electric strength		≥2.5 kV_{RMS}
Insulation resistance		≥ 100 MΩ
Response time		< 25 ns

Electrical data

Maximum ratings (85 °C):

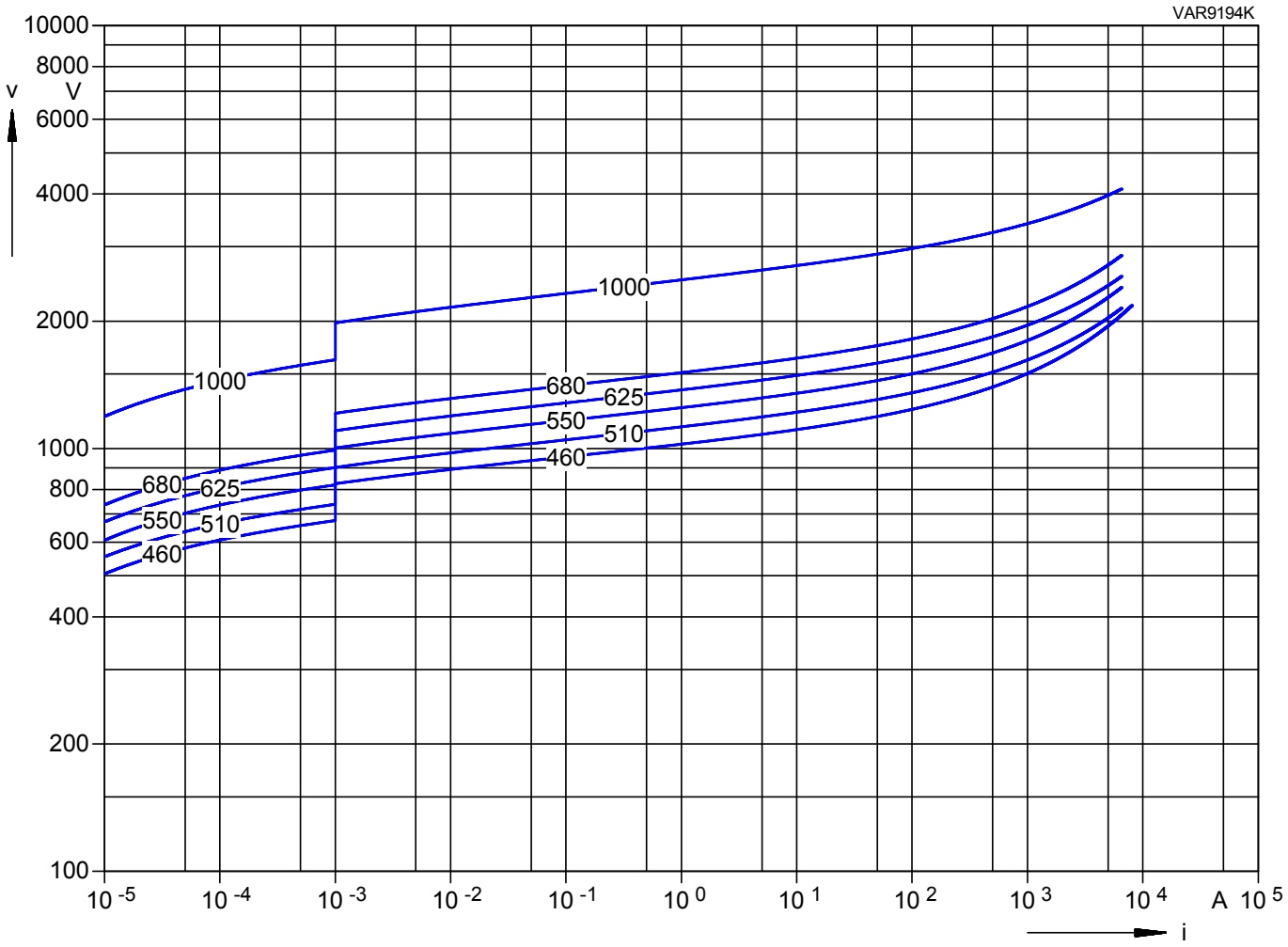
Ordering code	Type	Max. operating AC voltage V_{RMS} [V]	Max. operating DC voltage [V]	Surge current I_{max} (8/20 µs) 1 time [A]	Nominal discharge current In [1)] (8/20 µs) 15 times [A]	Energy absorption (2 ms) 1 time [J]	Max. average power dissipation P_{max} [W]
B72220T0461K105	T20K460	460	615	8000	3000	195	1.0
B72220T0511K105	T20K510	510	670	6500	3000	190	1.0
B72220T0551K105	T20K550	550	745	6500	3000	210	1.0
B72220T0621K105	T20K625	625	825	6500	3000	230	1.0
B72220T0681K105	T20K680	680	895	6500	3000	250	1.0
B72220T0102K105	T20K1000	1100	1465	6500	3000	410	1.0

Characteristics (25 °C):

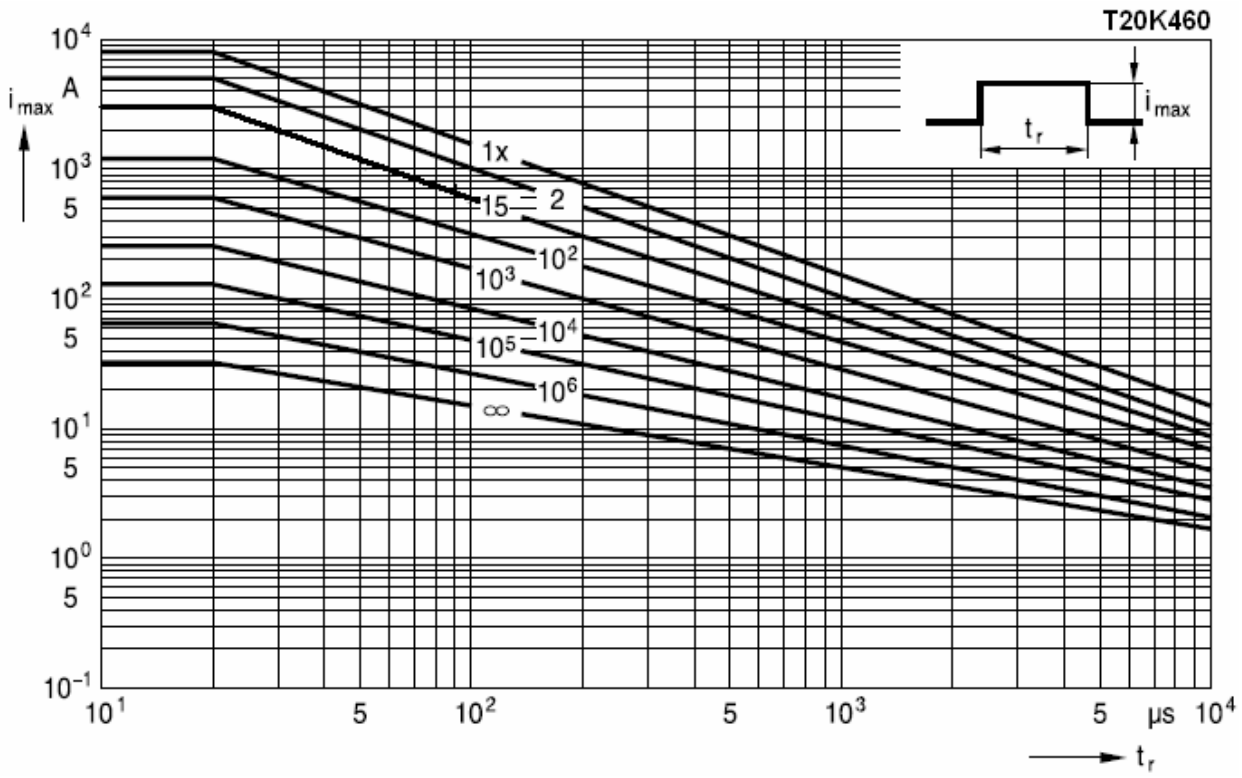
Ordering code	Type	Varistor voltage V_V at 1 mA [V]	Clamping voltage V_C at 100 A (8 / 20 µs) [V]	Typ. capacitance C_{typ} at 1 kHz [pF]
B72220T0461K105	T20K460	750 ±10%	1240	500
B72220T0511K105	T20K510	820 ±10%	1355	460
B72220T0551K105	T20K550	910 ±10%	1500	410
B72220T0621K105	T20K625	1000 ±10%	1650	380
B72220T0681K105	T20K680	1100 ±10%	1815	340
B72220T0102K105	T20K1000	1800 ±10%	2970	210

1) Note: nominal discharge current is the specification defined in UL1449 3rd and tested with 8/20µs current waveform.

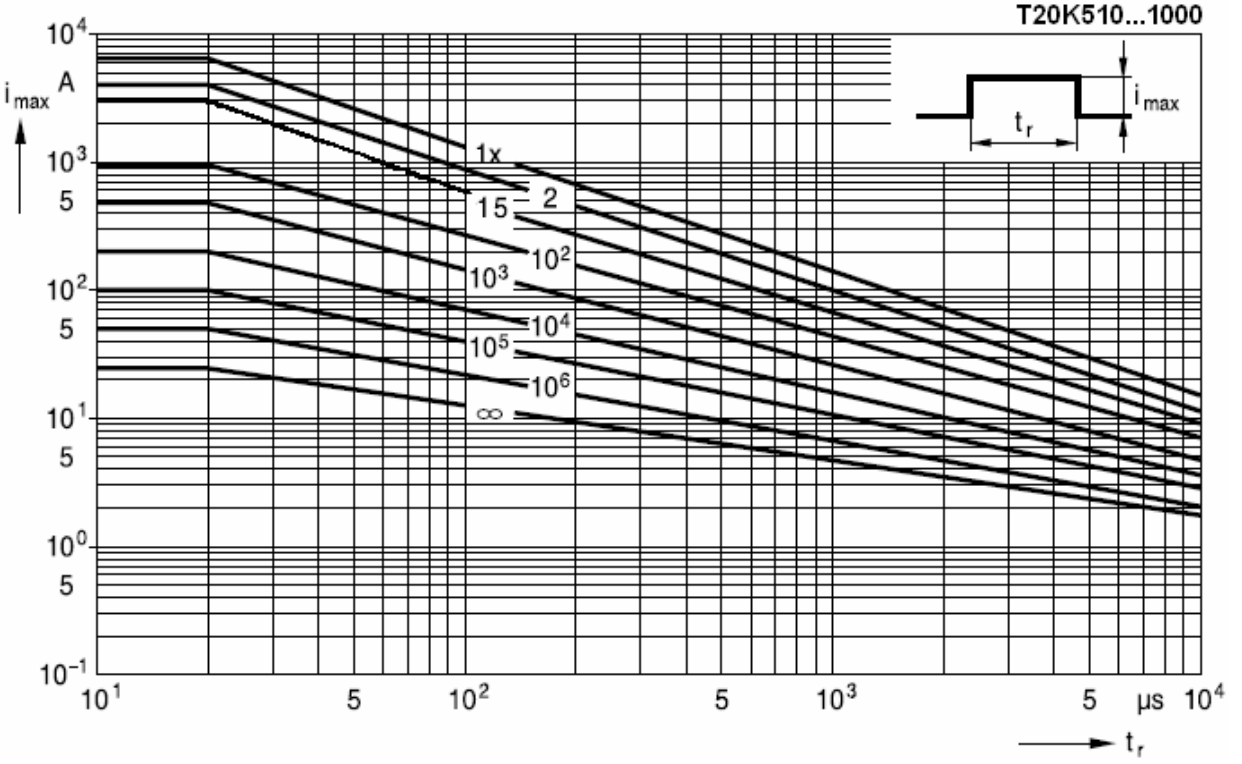
v/i characteristic



Derating curves (suitable for T20K460)

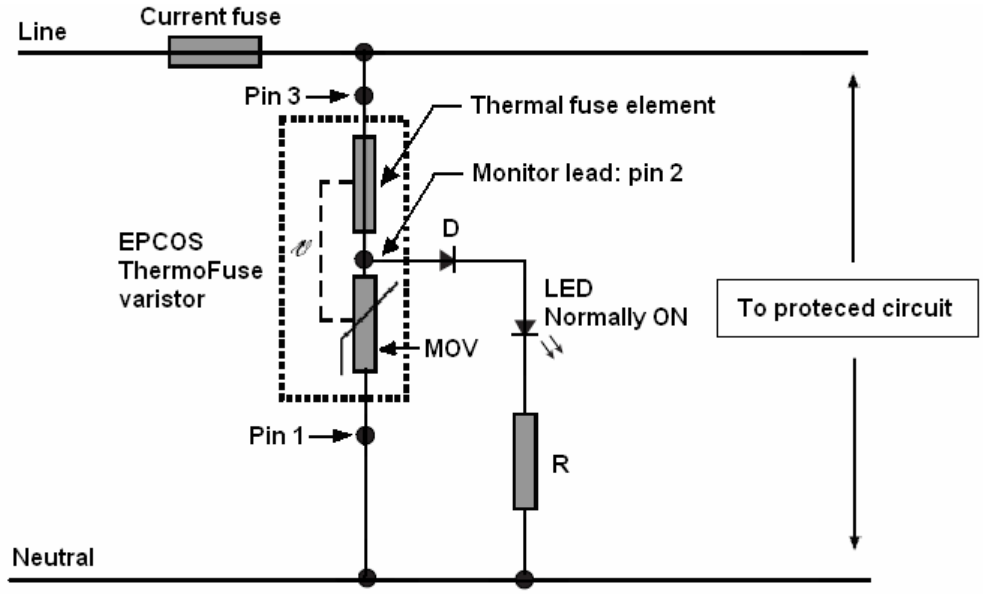


Derating curves (suitable for T20K510…1000)



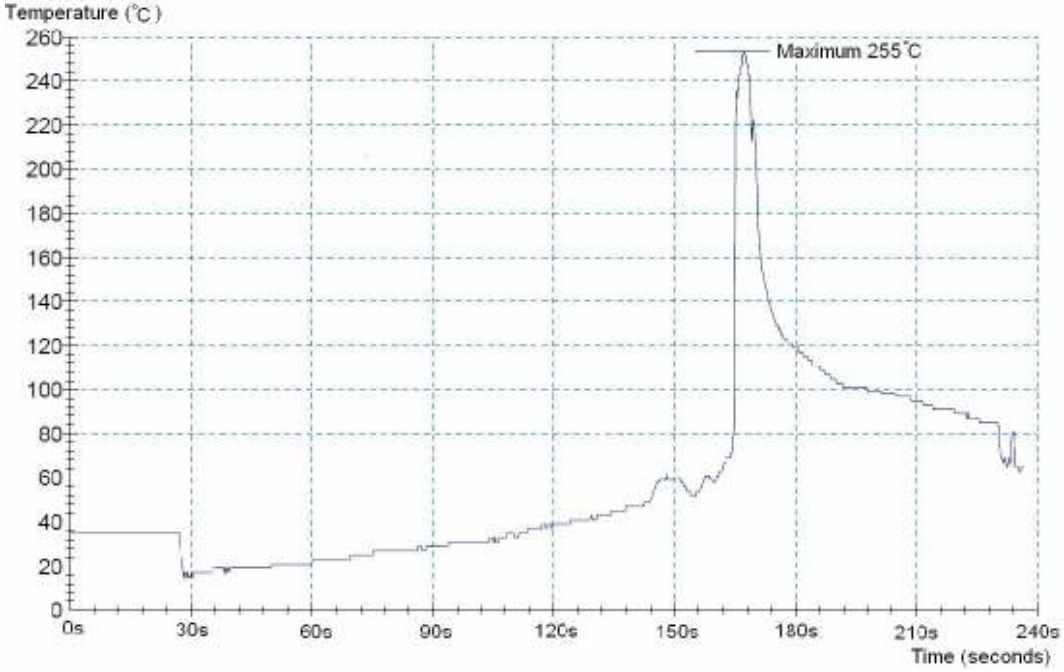
Typical application

The typical application below shows how the monitor lead on the device can be used to indicate that the thermal fuse has been opened. This denotes that the circuit will be no longer protected from surge currents by the MOV after the thermal fuse forms open circuit.

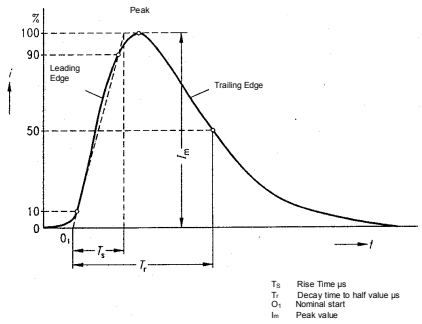


Typical wave soldering curve

Care must be taken when soldering the device into place because it contains a thermal fuse element. Two soldering methods are possible: (1) Manual soldering under max. 350℃ / 3s: it is recommended to heat-sink the leads of the device. (2) Wave soldering: it is very important that the temperatures of all preheat stages and the solder bath should be strictly controlled.



Reliability Data Electrical

Characteristics	Test methods / Description	Specifications
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 µs) illustrated below applied. 	To meet the specified value.
Surge current derating, 8/20 µs	10 surge currents (8/20 µs), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 µs	|ΔV/V (1 mA)| ≤10% (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	10 surge currents (2ms), unipolar, interval 120s, amplitude corresponding to derating curve for 10 impulses at 2 ms	|ΔV/V (1 mA)|≤10% (measured in direction of surge current) No visible damage

<table>
<tr><th>Characteristics</th><th>Test Methods/Description</th><th>Specifications</th></tr>
<tr><td>Abnormal over voltage</td><td>This device is designed to form open circuit in the event of overheating due to the limited current abnormal over voltage conditions as outlined in section 39.4 of UL1449 3rd edition.

The device (pin 1 & 3) is to be connected to a power supply having an open circuit voltage equal to the test voltage specified below. The power supply is to incorporate a series variable resistor that can be adjusted to obtain the short-circuit current (I_{sc}). The variable resistor is to be adjusted such that I_{sc} equals 10A, 5A, 2.5A, 0.5A or 0.125A respectively (measured without the device in the circuit). The device will be energized for 7 hours, or until the device becomes disconnected from the power supply, or until current to, or temperature within the device attains equilibrium [2].

The test result will be visually inspected.

Detailed test voltages applied onto the devices are as below:

<table>
<tr><th rowspan="2">Type
T20K460</th><th>Device rating</th><th>Test voltage</th></tr>
<tr><th>(V ac)</th><th>(V ac)</th></tr>
<tr><td>T20K460</td><td>460</td><td>690</td></tr>
</table>

<table>
<tr><th rowspan="2">Type
T20K510…1000</th><th>Device rating</th><th>Test voltage [3]</th></tr>
<tr><th>(V dc)</th><th>(V dc)</th></tr>
<tr><td>T20K510</td><td>670</td><td>780</td></tr>
<tr><td>T20K550</td><td>745</td><td>860</td></tr>
<tr><td>T20K625</td><td>825</td><td>950</td></tr>
<tr><td>T20K680</td><td>895</td><td>1040</td></tr>
<tr><td>T20K1000</td><td>1465</td><td>1700</td></tr>
</table>
</td><td>Any of below phenomena shall not be observed, otherwise this device will be judged as failed part:
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 device.
2. Charring, glowing, or flaming of the supporting surface, or cheesecloth draped on the device.
3. Ignition of the enclosure.
4. Creation of any openings in the enclosure that result in accessibility of live parts.</td></tr>
</table>

Note:

2) Thermal fuse may not form open circuit under low current [e.g. 0.125A] due to less heat generated by MOV, however the device will reach thermal equilibrium within 30 minutes under a low temperature which will not be able to cause any damage to the device.

3) For ”T20K510…T20K680” the UL1449 3rd approval were according to Photovoltaic Systems applications only. The “test voltage” for T20K510…1000 in above table is the max. dc long-duration test overvoltage for the device. Overstress above the listed “test voltage” may cause permanent damage to the device.

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. The 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 °C … +45 °C
Relative humidity:	<75% annual average, <95% on maximum 30 days a year.
Dew precipitation:	Is to be avoided.

3. Avoid contamination of SIOVs surface during storage, handling and processing.

4. Avoid storage of SIOVs in harmful environments which 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 month
T, ETFV and SFS types	12 month.

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.

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 the 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 the 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.
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