



ThermoFuse Varistor

Series/Type: NT14*
Ordering code: B72214***
Date: 2017-05-15
Version: a

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EPCOS AG is a TDK Group Company.

Construction

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

Features

- Wide operating voltage range 130 ... 680 VRMS
- Self-protected under abnormal overvoltage conditions
- High-energy AdvancedD series E2

Applications

- Inverters in solar power systems Household appliances
- Power supply units
- Inverters in solar power systems
- Lighting applications
- Communication and data systems
- Transient voltage surge suppressors (TVSS)
- Electronic metering

General technical data

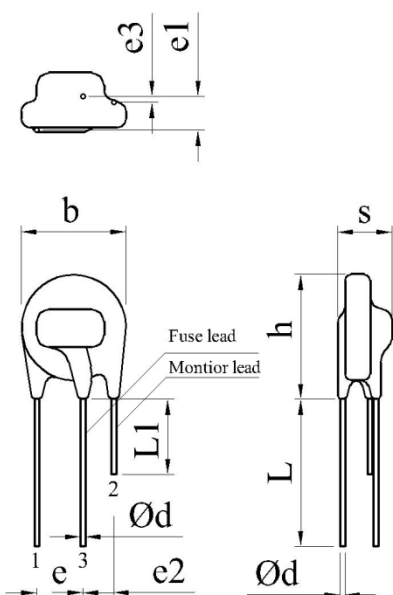
Climatic category	to IEC 60068-1	40/85/56	
Operating temperature		-40...+85	°C
Storage temperature		-40... +85	°C
Electric strength		≥2.5	kV _{RMS}
Insulation resistance		≥100	MΩ
Response time		< 25	ns

Nomenclature

- NT = Series designation
 14 = Rated disk diameter (mm)
 K = Tolerance of V_V at 1 mA: ±10%
 *** = Max. AC voltage
 E2 = Energy absorption characteristics, AdvanceD series
 S5 = Crimp design S5
 K4 = 2 pins version

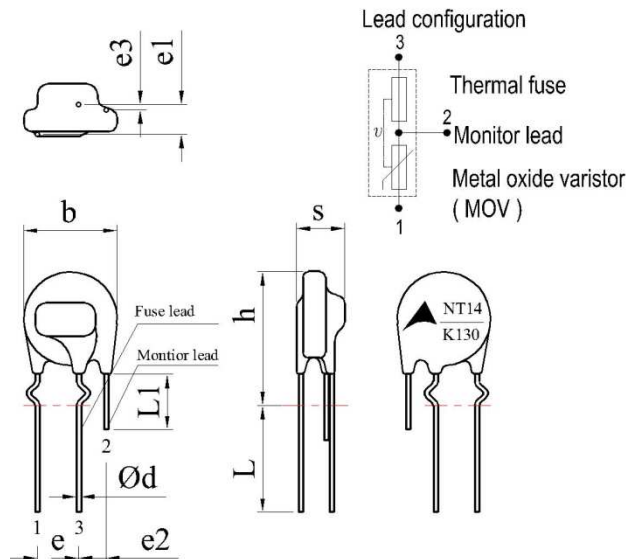
Dimensional drawing in mm

Straight leads



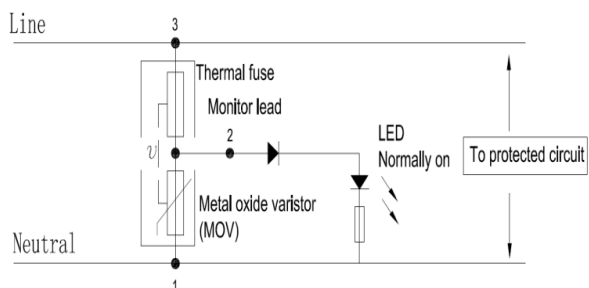
*K4

Crimp leads



*S5K4

Typical applications



Dimension

Ordering code	Type (untaped) -SIOV	b _{max} mm	h _{max} mm	s _{max} mm	e ±1 mm	e1 ±1 mm	e2 ±1 mm	e3 ±1 mm	L _{min} mm	L1 _{min} mm	φ d ±0.05 mm	
B72214W2131K101	NT14K130E2	17	22	9.0	7.5	2.6	5	1	25	6	0.8	
B72214R2131K101	NT14K130E2K4	17	22		7.5	2.6	/	/	25	/	0.8	
B72214W2141K101	NT14K140E2	17	22		7.5	2.7	5	1	25	6	0.8	
B72214R2141K101	NT14K140E2K4	17	22		7.5	2.7	/	/	25	/	0.8	
B72214W2151K101	NT14K150E2	17	22		7.5	2.8	5	1	25	6	0.8	
B72214R2151K101	NT14K150E2K4	17	22		7.5	2.8	/	/	25	/	0.8	
B72214W2171K101	NT14K175E2	17	22		7.5	2.8	5	1	25	6	0.8	
B72214R2171K101	NT14K175E2K4	17	22		7.5	2.8	/	/	25	/	0.8	
B72214W2211K101	NT14K210E2	17	22	9.5	7.5	2.9	5	1	25	6	0.8	
B72214R2211K101	NT14K210E2K4	17	22		7.5	2.9	/	/	25	/	0.8	
B72214W2251K101	NT14K250E2	17	22		7.5	3.1	5	1	25	6	0.8	
B72214R2251K101	NT14K250E2K4	17	22		7.5	3.1	/	/	25	/	0.8	
B72214W2271K101	NT14K275E2	17	22		7.5	3.2	5	1	25	6	0.8	
B72214R2271K101	NT14K275E2K4	17	22		7.5	3.2	/	/	25	/	0.8	
B72214W2301K101	NT14K300E2	17	22	11.0	7.5	3.3	5	1	25	6	0.8	
B72214R2301K101	NT14K300E2K4	17	22		7.5	3.3	/	/	25	/	0.8	
B72214W2321K101	NT14K320E2	17	22		7.5	3.5	5	1	25	6	0.8	
B72214R2321K101	NT14K320E2K4	17	22		7.5	3.5	/	/	25	/	0.8	
B72214W2351K101	NT14K350E2	17	22		7.5	3.7	5	1	25	6	0.8	
B72214R2351K101	NT14K350E2K4	17	22		7.5	3.7	/	/	25	/	0.8	
B72214W2381K101	NT14K385E2	17	22		7.5	4.0	5	1	25	6	0.8	
B72214R2381K101	NT14K385E2K4	17	22		7.5	4.0	/	/	25	/	0.8	
B72214W2421K101	NT14K420E2	17	22		7.5	4.2	5	1	25	6	0.8	
B72214R2421K101	NT14K420E2K4	17	22		7.5	4.2	/	/	25	/	0.8	
B72214W2461K101	NT14K460E2	17	22	12.0	7.5	4.4	5	1	25	6	0.8	
B72214R2461K101	NT14K460E2K4	17	22		7.5	4.4	/	/	25	/	0.8	
B72214W2511K101	NT14K510E2	17	22		7.5	4.5	5	1	25	6	0.8	
B72214R2511K101	NT14K510E2K4	17	22		7.5	4.5	/	/	25	/	0.8	
B72214W2551K101	NT14K550E2	17	22		7.5	4.7	5	1	25	6	0.8	
B72214R2551K101	NT14K550E2K4	17	22		7.5	4.7	/	/	25	/	0.8	
B72214W2621K101	NT14K625E2	17	22		13.0	7.5	5.0	5	1	25	6	0.8
B72214R2621K101	NT14K625E2K4	17	22			7.5	5.0	/	/	25	/	0.8
B72214W2681K101	NT14K680E2	17	22	7.5		5.5	5	1	25	6	0.8	
B72214R2681K101	NT14K680E2K4	17	22	7.5		5.5	/	/	25	/	0.8	

Ordering code	Type (untaped) -SIOV	b _{max} mm	h _{max} mm	S _{max} mm	e ±1 mm	e1 ±1 mm	e2 ±1 mm	e3 ±1 mm	L _{min} mm	L1 _{min} mm	φ d ±0.05 mm
B72214W2131K501	NT14K130E2S5	17	23	9.0	7.5	2.6	5	1	25	6	0.8
B72214R2131K501	NT14K130E2S5K4	17	23		7.5	2.6	/	/	25	/	0.8
B72214W2141K501	NT14K140E2S5	17	23		7.5	2.7	5	1	25	6	0.8
B72214R2141K501	NT14K140E2S4K4	17	23		7.5	2.7	/	/	25	/	0.8
B72214W2151K501	NT14K150E2S5	17	23		7.5	2.8	5	1	25	6	0.8
B72214R2151K501	NT14K150E2S5K4	17	23		7.5	2.8	/	/	25	/	0.8
B72214W2171K501	NT14K175E2S5	17	23		7.5	2.8	5	1	25	6	0.8
B72214R2171K501	NT14K175E2S5K4	17	23		7.5	2.8	/	/	25	/	0.8
B72214W2211K501	NT14K210E2S5	17	23	9.5	7.5	2.9	5	1	25	6	0.8
B72214R2211K501	NT14K210E2S5K4	17	23		7.5	2.9	/	/	25	/	0.8
B72214W2251K501	NT14K250E2S5	17	23		7.5	3.1	5	1	25	6	0.8
B72214R2251K501	NT14K250E2S5K4	17	23		7.5	3.1	/	/	25	/	0.8
B72214W2271K501	NT14K275E2S5	17	23		7.5	3.2	5	1	25	6	0.8
B72214R2271K501	NT14K275E2S5K4	17	23		7.5	3.2	/	/	25	/	0.8
B72214W2301K501	NT14K300E2S5	17	23	11.0	7.5	3.3	5	1	25	6	0.8
B72214R2301K501	NT14K300E2S5K4	17	23		7.5	3.3	/	/	25	/	0.8
B72214W2321K501	NT14K320E2S5	17	23		7.5	3.5	5	1	25	6	0.8
B72214R2321K501	NT14K320E2S5K4	17	23		7.5	3.5	/	/	25	/	0.8
B72214W2351K501	NT14K350E2S5	17	23		7.5	3.7	5	1	25	6	0.8
B72214R2351K501	NT14K350E2S5K4	17	23		7.5	3.7	/	/	25	/	0.8
B72214W2381K501	NT14K385E2S5	17	23		7.5	4.0	5	1	25	6	0.8
B72214R2381K501	NT14K385E2S5K4	17	23		7.5	4.0	/	/	25	/	0.8
B72214W2421K501	NT14K420E2S5	17	23		7.5	4.2	5	1	25	6	0.8
B72214R2421K501	NT14K420E2S5K4	17	23		7.5	4.2	/	/	25	/	0.8
B72214W2461K501	NT14K460E2S5	17	23		7.5	4.4	5	1	25	6	0.8
B72214R2461K501	NT14K460E2S5K4	17	23		7.5	4.4	/	/	25	/	0.8
B72214W2511K501	NT14K510E2S5	17	23	12.0	7.5	4.5	5	1	25	6	0.8
B72214R2511K501	NT14K510E2S5K4	17	23		7.5	4.5	/	/	25	/	0.8
B72214W2551K501	NT14K550E2S5	17	23		7.5	4.7	5	1	25	6	0.8
B72214R2551K501	NT14K550E2S5K4	17	23		7.5	4.7	/	/	25	/	0.8
B72214W2621K501	NT14K625E2S5	17	23	13.0	7.5	5.0	5	1	25	6	0.8
B72214R2621K501	NT14K625E2S5K4	17	23		7.5	5.0	/	/	25	/	0.8
B72214W2681K501	NT14K680E2S5	17	23		7.5	5.5	5	1	25	6	0.8
B72214R2681K501	NT14K680E2S5K4	17	23		7.5	5.5	/	/	25	/	0.8

Electrical data
Maximum ratings (85 °C):

Type (untaped) -SIOV	V _{RMS} V	V _{DC} V	i _{max} (8/20 μs) A	In 1) (8/20 μs) 15 times A	W _{max} (2 ms) J	P _{max} W
NT14K130E2*	130	170	6000	3000	50	0.6
NT14K140E2*	140	180	6000	3000	55	0.6
NT14K150E2*	150	200	6000	3000	60	0.6
NT14K175E2*	175	225	6000	3000	70	0.6
NT14K210E2*	210	270	6000	3000	80	0.6
NT14K250E2*	250	320	6000	3000	100	0.6
NT14K275E2*	275	350	6000	3000	110	0.6
NT14K300E2*	300	385	6000	3000	125	0.6
NT14K320E2*	320	420	6000	3000	136	0.6
NT14K350E2*	350	460	6000	3000	110	0.6
NT14K385E2*	385	505	6000	3000	136	0.6
NT14K420E2*	420	560	6000	3000	136	0.6
NT14K460E2*	460	615	6000	3000	150	0.6
NT14K510E2*	510	670	6000	3000	165	0.6
NT14K550E2*	550	745	6000	3000	180	0.6
NT14K625E2*	625	825	6000	3000	200	0.6
NT14K680E2*	680	895	6000	3000	220	0.6

*May be suffix S5,K4

 1) Note: nominal discharge current is the specification defined in UL1449 4th and tested with 8/20μs current waveform.

Characteristics (25 °C):

Type	V_V (1 mA) V	ΔV_V (1 mA) %	$V_{c,max}$ i_c V	i_c A	C_{typ} 1 kHz pF
NT14K130E2*	205	10	340	50	880
NT14K140E2*	220	10	360	50	820
NT14K150E2*	240	10	395	50	750
NT14K175E2*	270	10	455	50	670
NT14K210E2*	330	10	545	50	580
NT14K250E2*	390	10	650	50	490
NT14K275E2*	430	10	710	50	440
NT14K300E2*	470	10	775	50	400
NT14K320E2*	510	10	840	50	370
NT14K350E2*	560	10	910	50	350
NT14K385E2*	620	10	1025	50	315
NT14K420E2*	680	10	1120	50	290
NT14K460E2*	750	10	1240	50	260
NT14K510E2*	820	10	1355	50	240
NT14K550E2*	910	10	1500	50	215
NT14K625E2*	1000	10	1650	50	200
NT14K680E2*	1100	10	1815	50	180

Reliability Data Electrical

Test	Test methods	Requirement
Varistor voltage	The voltage between two terminals with the specified measuring current applied is called V_V (1 mA _{DC} @ 0.2 ... 2 s).	To meet the specified value.
Clamping voltage	The maximum voltage between two terminals with the specified standard impulse current (8/20 μs) illustrated below applied. <div style="text-align: center;"> <p> Ts Rise Time μs Tr Decay time to half value μs 0i Nominal start Im Peak value </p> </div>	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	$ V/V(1\text{ mA}) \leq 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	$ V/V(1\text{ mA}) \leq 10\%$ (measured in direction of surge current) No visible damage

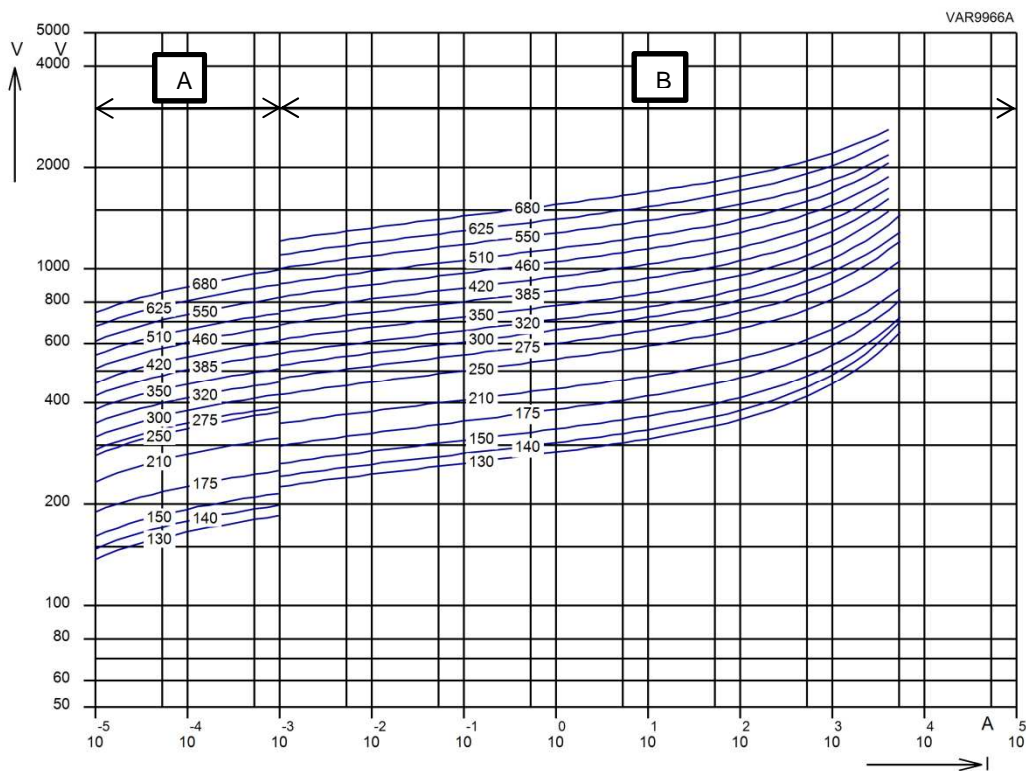
Test	Test Methods/Description	Requirement																																																			
Abnormal over voltage	<p>This device is designed to form open circuit in the event of overheating due to the limited current abnormal over voltage conditions as outlined in section 44.4 of UL1449 4th edition.</p> <p>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 (Isc). The variable resistor is to be adjusted such that Isc equals 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 equilibrium³⁾.</p> <p>The test result will be visually inspected.</p> <p>Detailed test voltages applied onto the devices are as in the following table:</p> <table border="1" data-bbox="384 927 1129 1680"> <thead> <tr> <th data-bbox="384 927 683 1014">Type</th> <th data-bbox="683 927 906 1014">Device rating (V ac)</th> <th data-bbox="906 927 1129 1014">Test voltage (V ac)</th> </tr> </thead> <tbody> <tr><td data-bbox="384 1014 683 1055">NT14K130E2*</td><td data-bbox="683 1014 906 1055">130</td><td data-bbox="906 1014 1129 1055">240</td></tr> <tr><td data-bbox="384 1055 683 1095">NT14K150E2*</td><td data-bbox="683 1055 906 1095">150</td><td data-bbox="906 1055 1129 1095">240</td></tr> <tr><td data-bbox="384 1095 683 1135">NT14K175E2*</td><td data-bbox="683 1095 906 1135">175</td><td data-bbox="906 1095 1129 1135">240</td></tr> <tr><td data-bbox="384 1135 683 1176">NT14K210E2*</td><td data-bbox="683 1135 906 1176">210</td><td data-bbox="906 1135 1129 1176">240</td></tr> <tr><td data-bbox="384 1176 683 1216">NT14K250E2*</td><td data-bbox="683 1176 906 1216">250</td><td data-bbox="906 1176 1129 1216">480</td></tr> <tr><td data-bbox="384 1216 683 1256">NT14K275E2*</td><td data-bbox="683 1216 906 1256">275</td><td data-bbox="906 1216 1129 1256">480</td></tr> <tr><td data-bbox="384 1256 683 1296">NT14K300E2*</td><td data-bbox="683 1256 906 1296">300</td><td data-bbox="906 1256 1129 1296">480</td></tr> <tr><td data-bbox="384 1296 683 1337">NT14K320E2*</td><td data-bbox="683 1296 906 1337">320</td><td data-bbox="906 1296 1129 1337">480</td></tr> <tr><td data-bbox="384 1337 683 1377">NT14K350E2*</td><td data-bbox="683 1337 906 1377">350</td><td data-bbox="906 1337 1129 1377">600</td></tr> <tr><td data-bbox="384 1377 683 1417">NT14K385E2*</td><td data-bbox="683 1377 906 1417">385</td><td data-bbox="906 1377 1129 1417">600</td></tr> <tr><td data-bbox="384 1417 683 1458">NT14K420E2*</td><td data-bbox="683 1417 906 1458">420</td><td data-bbox="906 1417 1129 1458">690</td></tr> <tr><td data-bbox="384 1458 683 1498">NT14K460E2*</td><td data-bbox="683 1458 906 1498">460</td><td data-bbox="906 1458 1129 1498">690</td></tr> <tr><td data-bbox="384 1498 683 1538">NT14K510E2*</td><td data-bbox="683 1498 906 1538">510</td><td data-bbox="906 1498 1129 1538">1000</td></tr> <tr><td data-bbox="384 1538 683 1579">NT14K550E2*</td><td data-bbox="683 1538 906 1579">550</td><td data-bbox="906 1538 1129 1579">1000</td></tr> <tr><td data-bbox="384 1579 683 1619">NT14K625E2*</td><td data-bbox="683 1579 906 1619">625</td><td data-bbox="906 1579 1129 1619">1000</td></tr> <tr><td data-bbox="384 1619 683 1659">NT14K680E2*</td><td data-bbox="683 1619 906 1659">680</td><td data-bbox="906 1619 1129 1659">1000</td></tr> </tbody> </table>	Type	Device rating (V ac)	Test voltage (V ac)	NT14K130E2*	130	240	NT14K150E2*	150	240	NT14K175E2*	175	240	NT14K210E2*	210	240	NT14K250E2*	250	480	NT14K275E2*	275	480	NT14K300E2*	300	480	NT14K320E2*	320	480	NT14K350E2*	350	600	NT14K385E2*	385	600	NT14K420E2*	420	690	NT14K460E2*	460	690	NT14K510E2*	510	1000	NT14K550E2*	550	1000	NT14K625E2*	625	1000	NT14K680E2*	680	1000	<p>Any of below phenomena shall not be observed, otherwise this device will be judged as failed part:</p> <ol style="list-style-type: none"> 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.
Type	Device rating (V ac)	Test voltage (V ac)																																																			
NT14K130E2*	130	240																																																			
NT14K150E2*	150	240																																																			
NT14K175E2*	175	240																																																			
NT14K210E2*	210	240																																																			
NT14K250E2*	250	480																																																			
NT14K275E2*	275	480																																																			
NT14K300E2*	300	480																																																			
NT14K320E2*	320	480																																																			
NT14K350E2*	350	600																																																			
NT14K385E2*	385	600																																																			
NT14K420E2*	420	690																																																			
NT14K460E2*	460	690																																																			
NT14K510E2*	510	1000																																																			
NT14K550E2*	550	1000																																																			
NT14K625E2*	625	1000																																																			
NT14K680E2*	680	1000																																																			

Note:

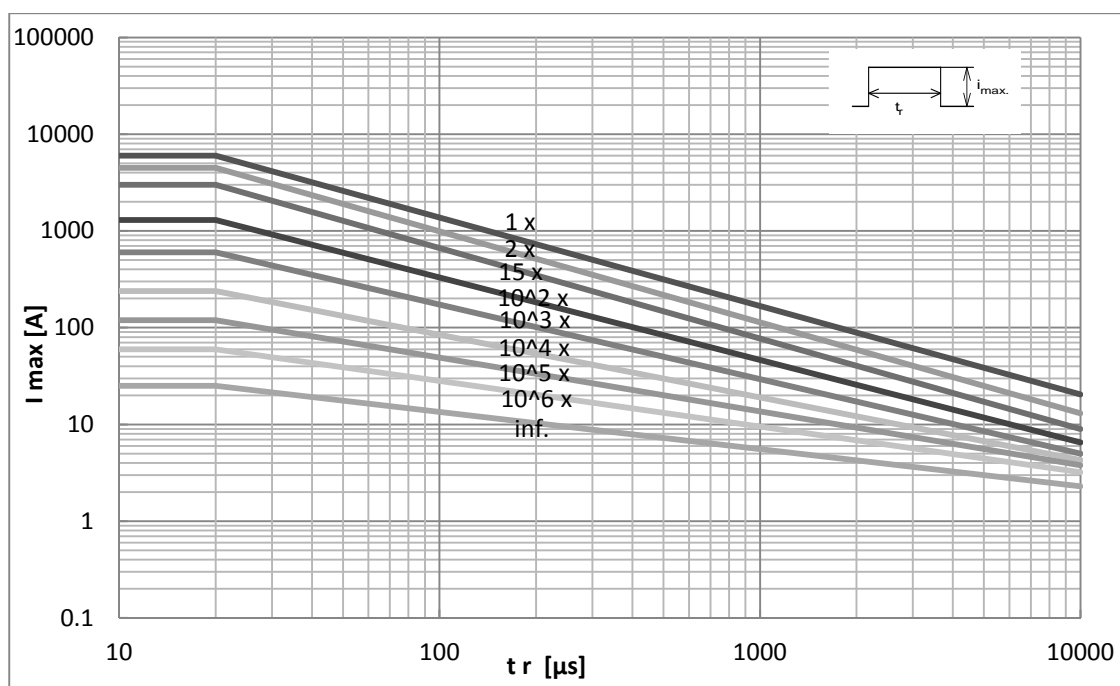
3) Thermal fuse may not form open circuit under low current [e.g. 0.125A] due to less heat generated by MOV, however the device will reach thermal equilibrium within 30 minutes under a low temperature which will not be able to cause any damage to the device.

v/i characteristic

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



Derating curves



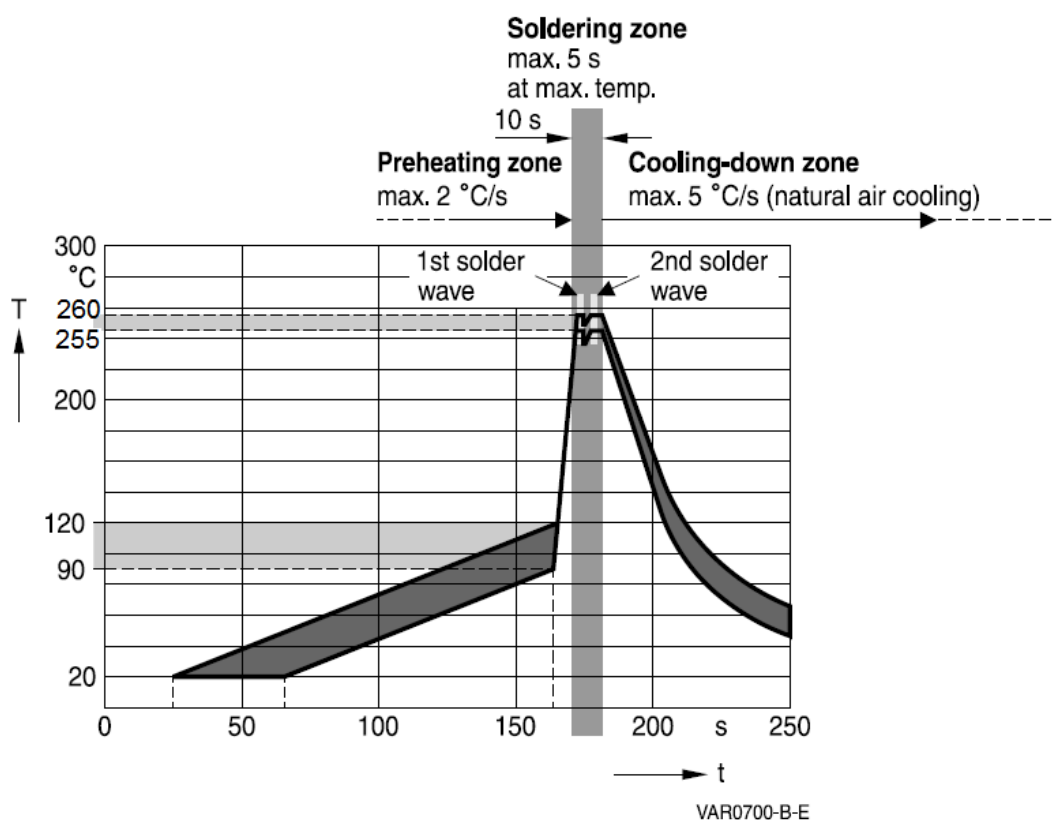
1 Soldering instructions only for NT series

1.1 Manual soldering

Maximum soldering temperature 350 ° C for 3 s. It is recommended to heat sink the lead wires of the ThermoFuse varistors (NT series).

1.2 Wave soldering

Recommended temperature profile for wave soldering only for ThermoFuse varistors (NT series).



Important note: Temperatures of all preheat stages and the solder bath must be strictly controlled.

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 NT 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.

Display of ordering codes for EPCOS products

The ordering code for one and the same EPCOS product can be represented differently in data sheets, data books, other publications, on the EPCOS website, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.** Detailed information can be found on the Internet under www.epcos.com/orderingcodes

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 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 an 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 an 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). 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.

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