SIOV Metal Oxide Varistors

ThermoFuse Varistors, NT series

Series/Type:	**NT14 series**
Ordering code:	**B72214W/R***
Date:	2026-01-28
Version:	f

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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 to 680 V RMS
- Self-protected under abnormal overvoltage conditions
- High-energy AdvanceD series E2
- UL approval to UL1449, 4th edition, type 4CA (file number E321126)
- IEC 61051-2-2 certification
- VDE certification (certificate number 40031102）

Applications

- Home appliances
- Power supplies
- Inverters
- Photovoltaic inverters
- Drives
- Lighting applications
- Communication and data systems
- Smart meters

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

The upper category temperature has been revised to comply with VDE and IEC standards. UL certification for this parameter is currently under review and has not yet been updated.

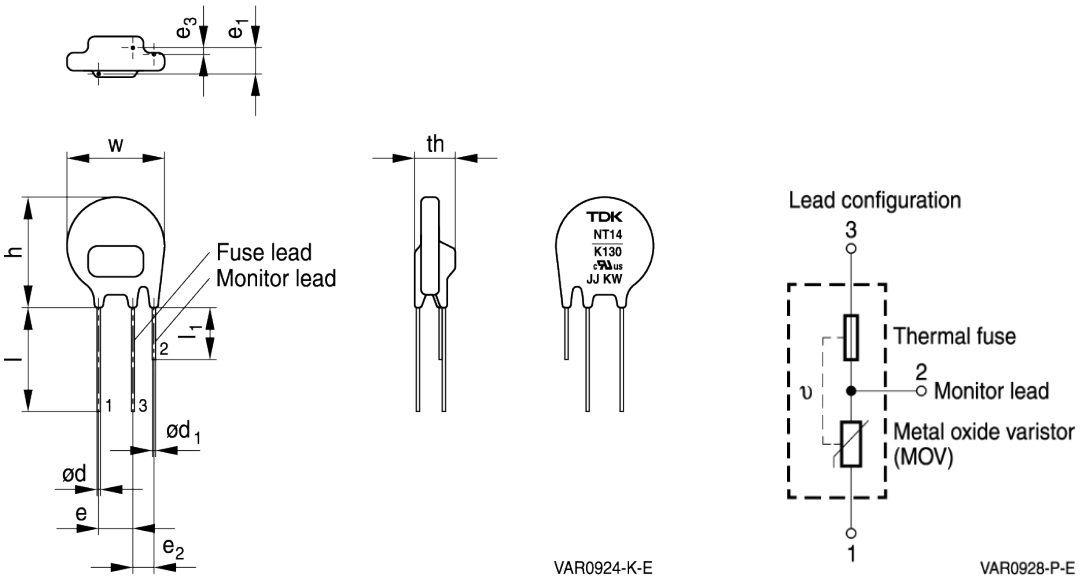
Nomenclature

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 = S5 kinked style
K4 = 2 leads version

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Dimensional drawings in mm

Straight style: 3 leads

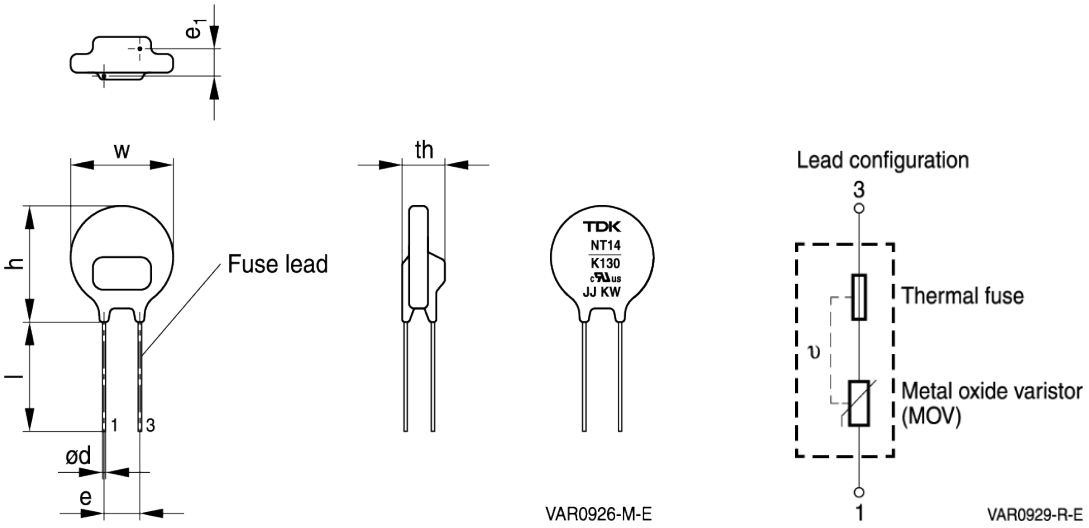


Ordering code[1)]	Type (untaped) -SIOV	w_{max} mm	h_{max} mm	th_{max} mm	e ±1 mm	e1 ±1 mm	e2 ±1 mm	e3 ±1 mm	L_{min} mm	$L1_{min}$ mm	∅d ±0.05 mm
B72214W2131K101*	NT14K130E2	17	22		7.5	2.6	5	1	25	6	0.8
B72214W2141K101*	NT14K140E2	17	22		7.5	2.7	5	1	25	6	0.8
B72214W2151K101*	NT14K150E2	17	22		7.5	2.8	5	1	25	6	0.8
B72214W2171K101*	NT14K175E2	17	22	9	7.5	2.8	5	1	25	6	0.8
B72214W2211K101*	NT14K210E2	17	22		7.5	2.9	5	1	25	6	0.8
B72214W2251K101*	NT14K250E2	17	22		7.5	3.1	5	1	25	6	0.8
B72214W2271K101*	NT14K275E2	17	22	9.5	7.5	3.2	5	1	25	6	0.8
B72214W2301K101*	NT14K300E2	17	22		7.5	3.3	5	1	25	6	0.8
B72214W2321K101*	NT14K320E2	17	22		7.5	3.5	5	1	25	6	0.8
B72214W2351K101*	NT14K350E2	17	22		7.5	3.7	5	1	25	6	0.8
B72214W2381K101*	NT14K385E2	17	22		7.5	4	5	1	25	6	0.8
B72214W2421K101*	NT14K420E2	17	22		7.5	4.2	5	1	25	6	0.8
B72214W2461K101*	NT14K460E2	17	22	11	7.5	4.4	5	1	25	6	0.8
B72214W2511K101*	NT14K510E2	17	22		7.5	4.5	5	1	25	6	0.8
B72214W2551K101*	NT14K550E2	17	22	12	7.5	4.7	5	1	25	6	0.8
B72214W2621K101*	NT14K625E2	17	22		7.5	5	5	1	25	6	0.8
B72214W2681K101*	NT14K680E2	17	22	13	7.5	5.5	5	1	25	6	0.8

1) *For example, suffix -V87: CCS wire for leads

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Straight style, 2 leads

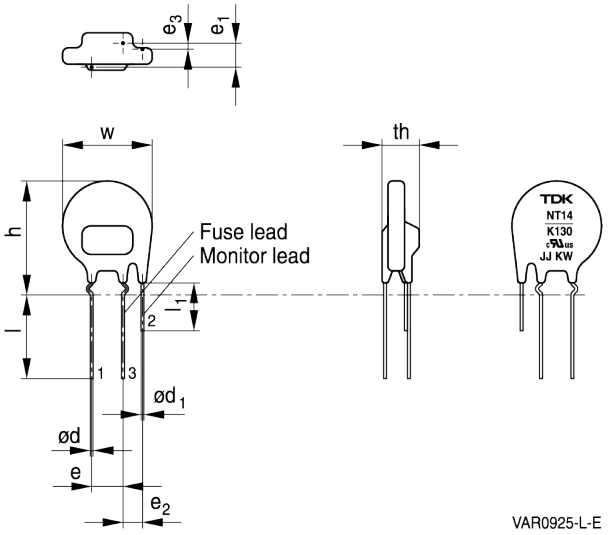


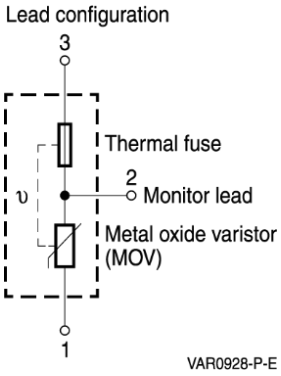
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B72214R2131K101*	NT14K130E2K4	17	22		7.5	2.6	/	/	25	/	0.8
B72214R2141K101*	NT14K140E2K4	17	22		7.5	2.7	/	/	25	/	0.8
B72214R2151K101*	NT14K150E2K4	17	22		7.5	2.8	/	/	25	/	0.8
B72214R2171K101*	NT14K175E2K4	17	22	9	7.5	2.8	/	/	25	/	0.8
B72214R2211K101*	NT14K210E2K4	17	22		7.5	2.9	/	/	25	/	0.8
B72214R2251K101*	NT14K250E2K4	17	22		7.5	3.1	/	/	25	/	0.8
B72214R2271K101*	NT14K275E2K4	17	22	9.5	7.5	3.2	/	/	25	/	0.8
B72214R2301K101*	NT14K300E2K4	17	22		7.5	3.3	/	/	25	/	0.8
B72214R2321K101*	NT14K320E2K4	17	22		7.5	3.5	/	/	25	/	0.8
B72214R2351K101*	NT14K350E2K4	17	22		7.5	3.7	/	/	25	/	0.8
B72214R2381K101*	NT14K385E2K4	17	22		7.5	4	/	/	25	/	0.8
B72214R2421K101*	NT14K420E2K4	17	22		7.5	4.2	/	/	25	/	0.8
B72214R2461K101*	NT14K460E2K4	17	22	11	7.5	4.4	/	/	25	/	0.8
B72214R2511K101*	NT14K510E2K4	17	22		7.5	4.5	/	/	25	/	0.8
B72214R2551K101*	NT14K550E2K4	17	22	12	7.5	4.7	/	/	25	/	0.8
B72214R2621K101*	NT14K625E2K4	17	22		7.5	5	/	/	25	/	0.8
B72214R2681K101*	NT14K680E2K4	17	22	13	7.5	5.5	/	/	25	/	0.8

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S5 kinked style, 3 leads



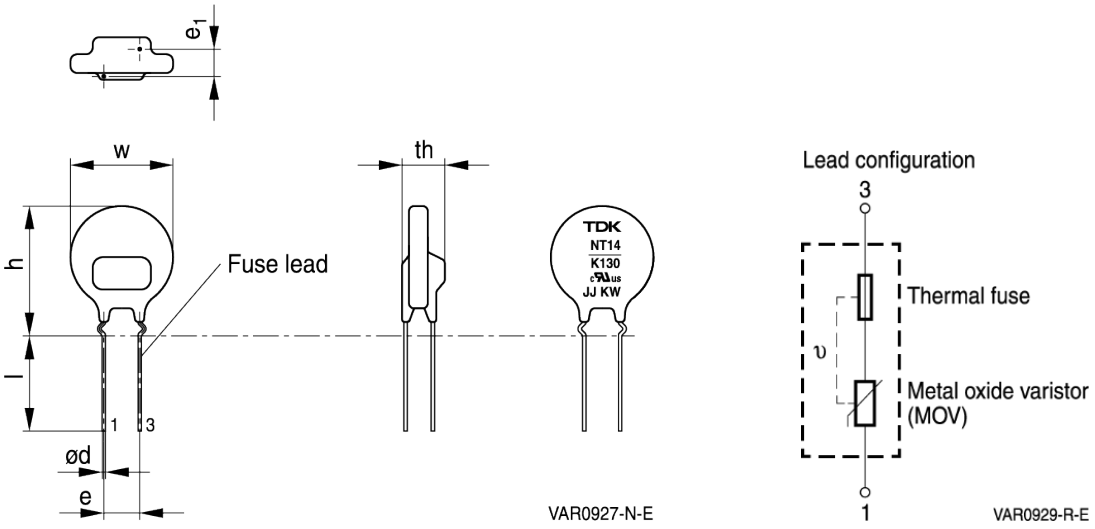


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B72214W2131K501*	NT14K130E2S5	17	23		7.5	2.6	5	1	25	6	0.8
B72214W2141K501*	NT14K140E2S5	17	23		7.5	2.7	5	1	25	6	0.8
B72214W2151K501*	NT14K150E2S5	17	23		7.5	2.8	5	1	25	6	0.8
B72214W2171K501*	NT14K175E2S5	17	23	9	7.5	2.8	5	1	25	6	0.8
B72214W2211K501*	NT14K210E2S5	17	23		7.5	2.9	5	1	25	6	0.8
B72214W2251K501*	NT14K250E2S5	17	23		7.5	3.1	5	1	25	6	0.8
B72214W2271K501*	NT14K275E2S5	17	23	9.5	7.5	3.2	5	1	25	6	0.8
B72214W2301K501*	NT14K300E2S5	17	23		7.5	3.3	5	1	25	6	0.8
B72214W2321K501*	NT14K320E2S5	17	23		7.5	3.5	5	1	25	6	0.8
B72214W2351K501*	NT14K350E2S5	17	23		7.5	3.7	5	1	25	6	0.8
B72214W2381K501*	NT14K385E2S5	17	23		7.5	4	5	1	25	6	0.8
B72214W2421K501*	NT14K420E2S5	17	23		7.5	4.2	5	1	25	6	0.8
B72214W2461K501*	NT14K460E2S5	17	23	11	7.5	4.4	5	1	25	6	0.8
B72214W2511K501*	NT14K510E2S5	17	23		7.5	4.5	5	1	25	6	0.8
B72214W2551K501*	NT14K550E2S5	17	23	12	7.5	4.7	5	1	25	6	0.8
B72214W2621K501*	NT14K625E2S5	17	23		7.5	5	5	1	25	6	0.8
B72214W2681K501*	NT14K680E2S5	17	23	13	7.5	5.5	5	1	25	6	0.8

1) *For example, suffix -V87: CCS wire for leads

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S5 kinked style, 2 leads

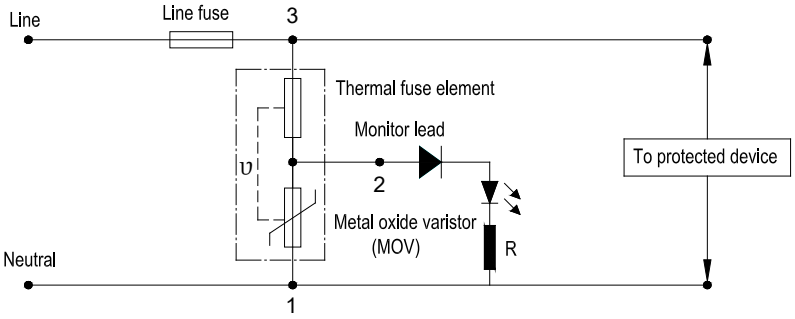


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B72214R2141K501*	NT14K140E2S5K4	17	23		7.5	2.7	/	/	25	/	0.8
B72214R2151K501*	NT14K150E2S5K4	17	23		7.5	2.8	/	/	25	/	0.8
B72214R2171K501*	NT14K175E2S5K4	17	23	9	7.5	2.8	/	/	25	/	0.8
B72214R2211K501*	NT14K210E2S5K4	17	23		7.5	2.9	/	/	25	/	0.8
B72214R2251K501*	NT14K250E2S5K4	17	23		7.5	3.1	/	/	25	/	0.8
B72214R2271K501*	NT14K275E2S5K4	17	23	9.5	7.5	3.2	/	/	25	/	0.8
B72214R2301K501*	NT14K300E2S5K4	17	23		7.5	3.3	/	/	25	/	0.8
B72214R2321K501*	NT14K320E2S5K4	17	23		7.5	3.5	/	/	25	/	0.8
B72214R2351K501*	NT14K350E2S5K4	17	23		7.5	3.7	/	/	25	/	0.8
B72214R2381K501*	NT14K385E2S5K4	17	23		7.5	4	/	/	25	/	0.8
B72214R2421K501*	NT14K420E2S5K4	17	23		7.5	4.2	/	/	25	/	0.8
B72214R2461K501*	NT14K460E2S5K4	17	23	11	7.5	4.4	/	/	25	/	0.8
B72214R2511K501*	NT14K510E2S5K4	17	23		7.5	4.5	/	/	25	/	0.8
B72214R2551K501*	NT14K550E2S5K4	17	23	12	7.5	4.7	/	/	25	/	0.8
B72214R2621K501*	NT14K625E2S5K4	17	23		7.5	5	/	/	25	/	0.8
B72214R2681K501*	NT14K680E2S5K4	17	23	13	7.5	5.5	/	/	25	/	0.8

[1)] *For example, suffix -V87: CCS wire for leads

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Typical applications



Electrical specifications

Maximum ratings (+85 °C):

Type （untaped） -SIOV	V_{RMS} V	V_{DC} V	i_{max} (8/20 µs) A	In [2] (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	136	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

*For example: suffix S5, K4

[2] Note:

Nominal discharge current is the specification defined in UL1449, 4th edition and tested with 8/20 µs current waveform.

The upper category temperature is +85 °C in UL certification.

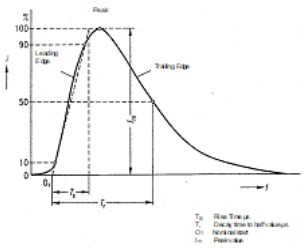
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Characteristics (+25 °C):

Type	V_V (1 mA) V	$\triangle V_V$ (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

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Reliability data

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 … 2s).	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	|△V/V (1 mA)| ≤ 10% (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	10 surge currents (2 ms), unipolar, interval 120 s, amplitude corresponding to derating curve for 10 impulses at 2 ms	|△V/V (1 mA)| ≤ 10% (measured in direction of surge current) No visible damage

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Reliability data

Characteristics	Test methods/Description	Specifications
Tensile strength	IEC 60068-2-21, test Ua1	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 5\%$
	After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage. Force for wire diameters: 0.6 mm = 10 N 0.8 mm = 10 N 1.0 mm = 20 N	No break of solder joint, no wire break
Vibration	IEC 60068-2-6, test Fc, method B4 Frequency range: 10 ... 55 Hz Amplitude: 0.75 mm or 98 m/s² Duration: 6 h (3 x 2 h) Pulse: sine wave After repeatedly applying a single harmonic vibration according to the table above, the change of Vv shall be measured and the part shall be visually examined.	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 5\%$ No visible damage
Solderability	IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: +245 °C, 3 s: 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.	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.

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Reliability data

Characteristics	Test methods/Description	Specifications
Resistance to soldering heat	IEC 60068-2-20, test Tb, method 1A, +260 °C, 10 s: Each lead shall be dipped into a solder bath having a temperature of 260 ±5 °C to a point 2.0 to 2.5 mm from the body of the unit, be held there for 10 ±1 s and then be stored at room temperature and normal humidity for 1 to 2 hours. The change of Vv shall be measured and the part shall be visually examined.	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 5\%$ No visible damage
Bump	IEC 60068-2-29, test Eb Pulse duration: 6 ms Max. acceleration: 400 m/s^2 Number of bumps: 6 × 4000 Pulse: half sine	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 5\%$ No visible damage
Fire hazard	IEC 60695-11-5 (needle flame test) Severity: vertical 10 s	5 s max.
Electric strength	IEC 61051-1, test 4.9.2 Metal balls method, 2500 V RMS, 60 s The varistor is placed in a container holding 1.6 ±0.2 mm diameter metal balls such that only the terminations of the varistor are protruding. The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls.	No breakdown

Reliability data

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Characteristics	Test methods/Description	Specifications
Endurance at upper category temperature	IEC61051-2-2, 1000 h at UCT After having continuously applied the maximum allowable AC voltage at UCT ±2 °C for 1000 h, the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured.	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 10\%$
Damp heat, steady state	IEC 60068-2-78, test Ca The specimen shall be subjected to +40 ±2 °C, 90 to 95 % RH for 56 days without load / with 10% of the maximum continuous DC operating voltage V DC. Then stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at V = 500 V (insulated varistors only).	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 10\%$ $R_{ins} \geq 100\ M\Omega$
Climatic sequence	The specimen shall be subjected to: a) IEC 60068-2-2, test Ba, dry heat at UCT, 16 h b) IEC 60068-2-30, test Db, damp heat, 1st cycle: +55 °C, 93% RH, 24 h c) IEC 60068-2-1, test Aa, cold, LCT, 2 h d) IEC 60068-2-30, test Db, damp heat, additional 5 cycles: +55 °C/+25 °C, 93% RH, 24 h/cycle. Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of Vv shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at V = 500 V.	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 10\%$ $R_{ins} \geq 100\ M\Omega$
Rapid change of temperature	IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles	$\lvert\triangle V/V\ (1\ mA)\rvert \leq 5\%$ No visible damage

Note:

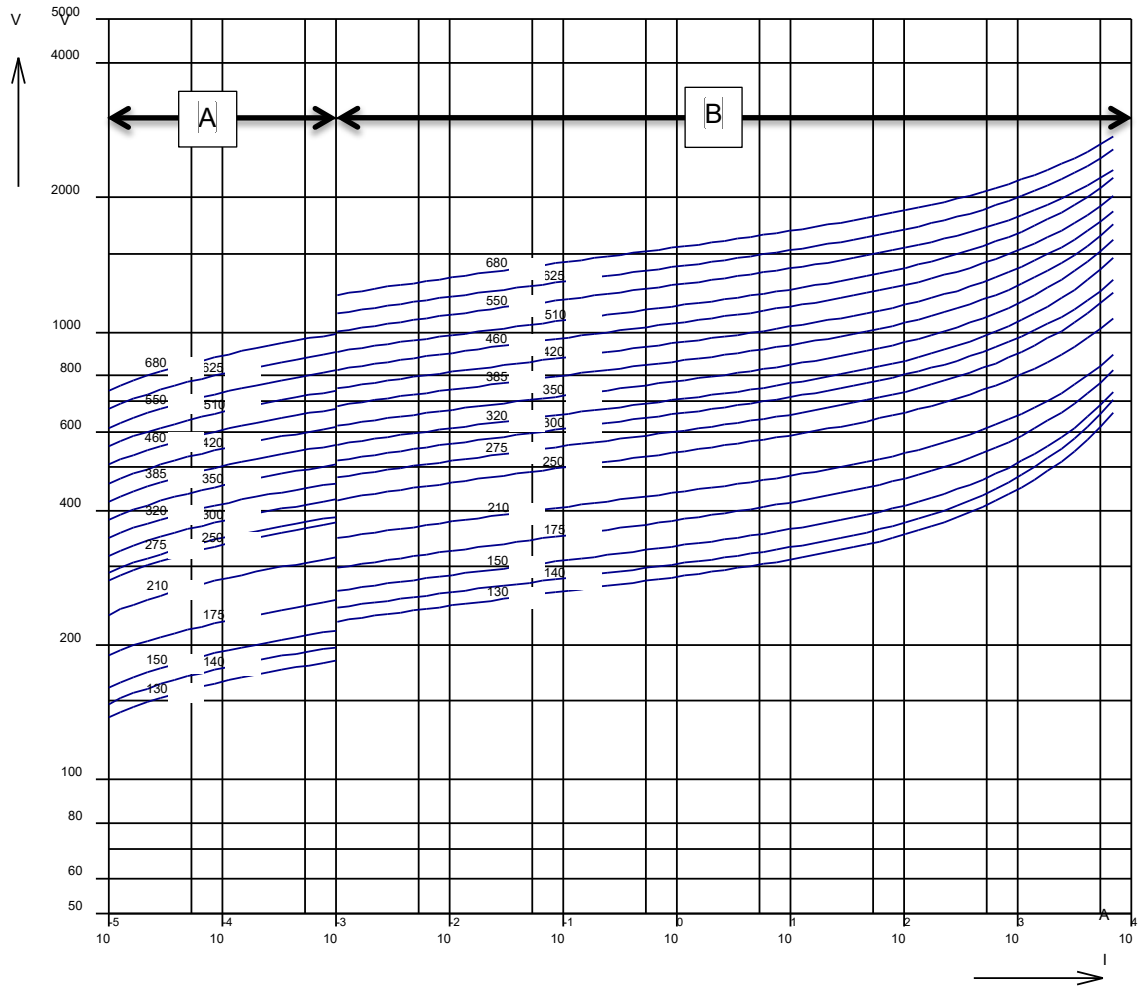
UCT = Upper category temperature
LCT = Lower category temperature
R_{ins} = Insulation resistance
All electrical tests should be performed between terminal pin1 and pin3.

v/i characteristic

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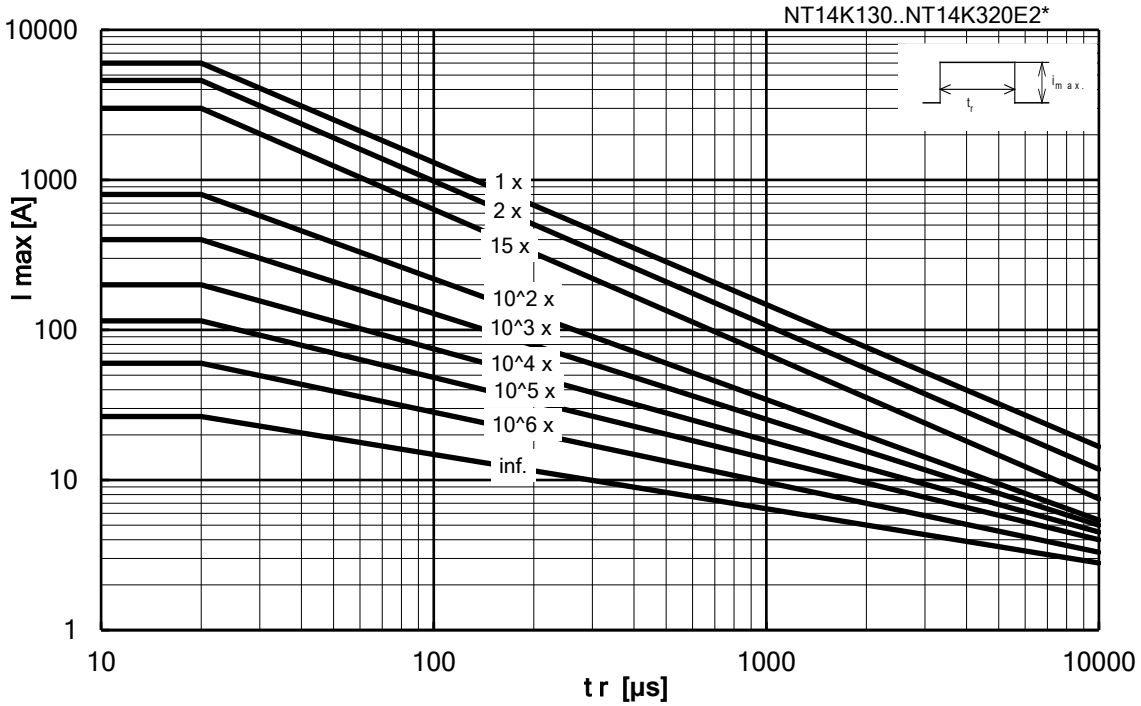
A = Leakage current, B = Protection level } for worst-case varistor tolerances.

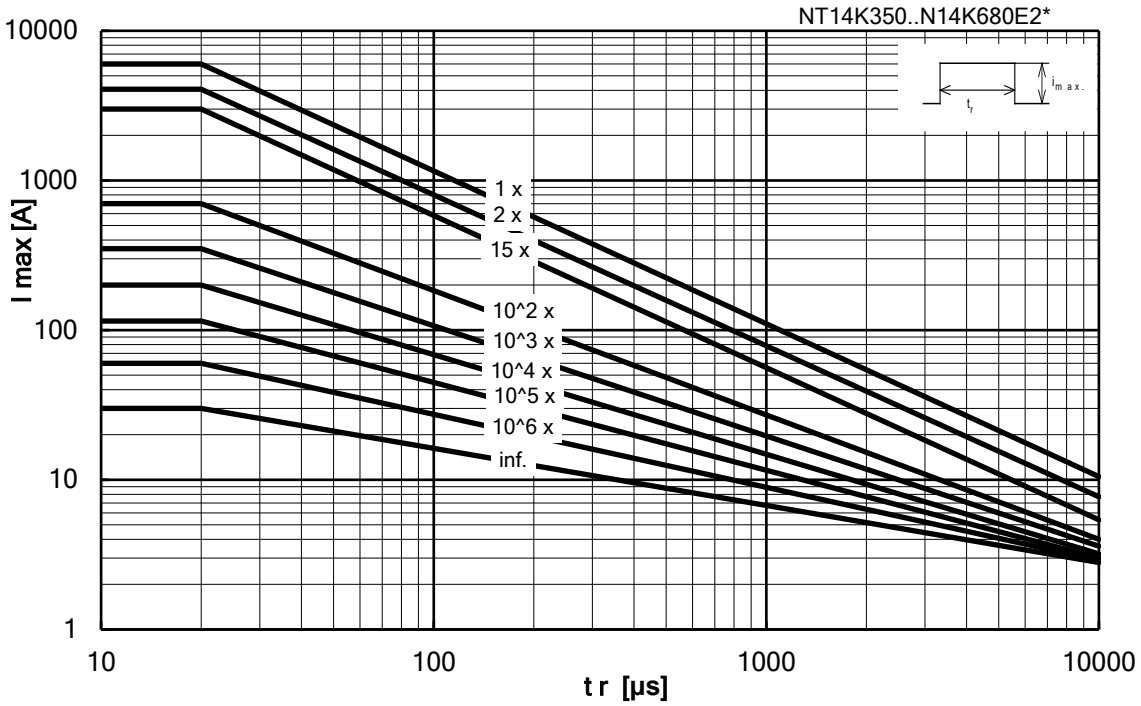
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Derating curves





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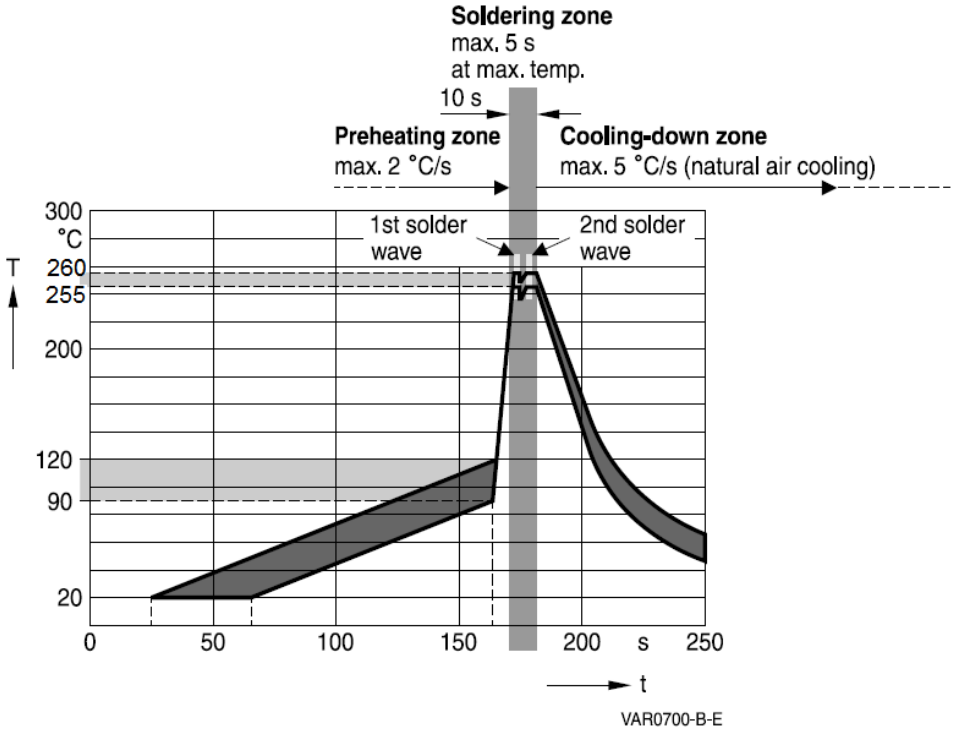
Soldering instructions only for NT series

Manual soldering

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

Wave soldering

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



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

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Cautions and warnings

General

1. TDK Electronics' metal oxide varistors 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 TDK Electronics 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

After shipment from TDK Electronics the SIOV type series should be soldered within the following time periods:

SIOV-S, -Q, L(S), -SNF, -ICL, -B, -E	24 months
SIOV-ETFV, -T, -SMD, -MT, -EM, -NT, -G, -GNF	12 months
SIOV-D	6 months
SIOV-D(Cu)	3 months

The parts are to be left in the original packaging to prevent oxidized terminals which can cause soldering problems.

Storage temperature:	-25 to +45 °C
Max. relative humidity (without condensation):	< 75% annual average,
	< 95% on max. 30 days per annum.

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.
5. Temperature of all preheat stages and the solder bath must be strictly controlled especially for the T series (T14 and T20).

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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 the SIOVs. Use SIOVs only in normal atmospheric conditions. Avoid use in deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions. Contact with any liquids and solvents should be prevented.

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company 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.tdk-electronics.tdk.com/orderingcodes.

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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 we are 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 a 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.tdk-electronics.tdk.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 our General Terms and Conditions of Supply.**
7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard.** The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.

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8. The trade names EPCOS, CarXield, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, FilterCap, FormFit, InsuGate, LeaXield, MediPlas, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PiezoBrush, PlasmaBrush, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SurfIND, ThermoFuse, WindCap, XieldCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.tdk-electronics.tdk.com/trademarks.

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