PTC Thermistor

Inrush current limiter

Series/Type:	**C 750-A 140-A 51**
Ordering code:	**B59750C0140A051**
Date:	2019-06-18
Version:	a

Applications

- Inrush current limiter (charging resistor) for smoothing and DC link capacitors
- To replace high-power fixed resistors for capacitor charging

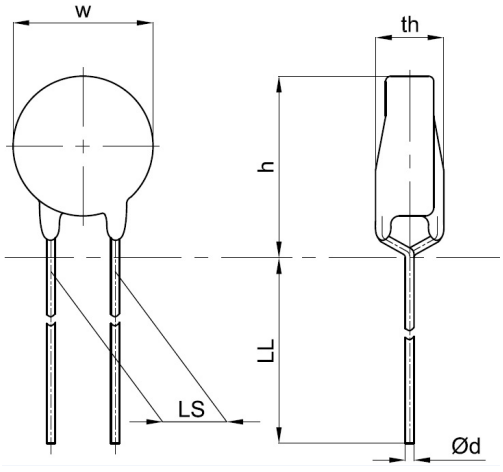
Features

- Self-protecting in case of malfunction of short-circuit relay or internal short circuit of capacitor
- Inrush current limiters are not damaged when directly connected to Vmax even without additional current limitation
- Marking: Type, Manufacturer's logo, reference temperature in °C and date code YYWW
- RoHS-compatible

Delivery mode

- Cardboard tape reeled

Dimensions and drawing



w_{max}	13.0	mm
th_{max}	5.0	mm
h_{max}	18.0	mm
d	0.6 ± 0.05	mm
LS	5.0 +0.6/-0.1	mm
LL	acc. to taping	

General Technical Data

Maximum operating voltage	V_{max}	280	V_{AC}
Max. DC Link voltage (single phase bridge rectifier)	$V_{link, max}$	400	V_{DC}
Rated resistance	R_{25}	25	Ω
Resistance tolerance	ΔR_{25}	± 25	%
Reference temperature (typ.)	Tref	140	°C
Thermal capacity (typ.)	C_{th}	0.72	J/K
Thermal time constant (typ.)	τ_{th}	100	s
Operating cycles at V_{max}(charging of capacitor)	N_c	> 100k	cycles
Switching cycles at V_{max} (failure mode)	N_f	> 100	cycles
Operating temperature range (V = 0)	T_{op}	- 40 / +125	°C
Operating temperature range (V = V_{max})	T_{op}	- 20 / +85	°C

Specification for T_{amb} = 25°C

Calculation of the number of required PTC elements

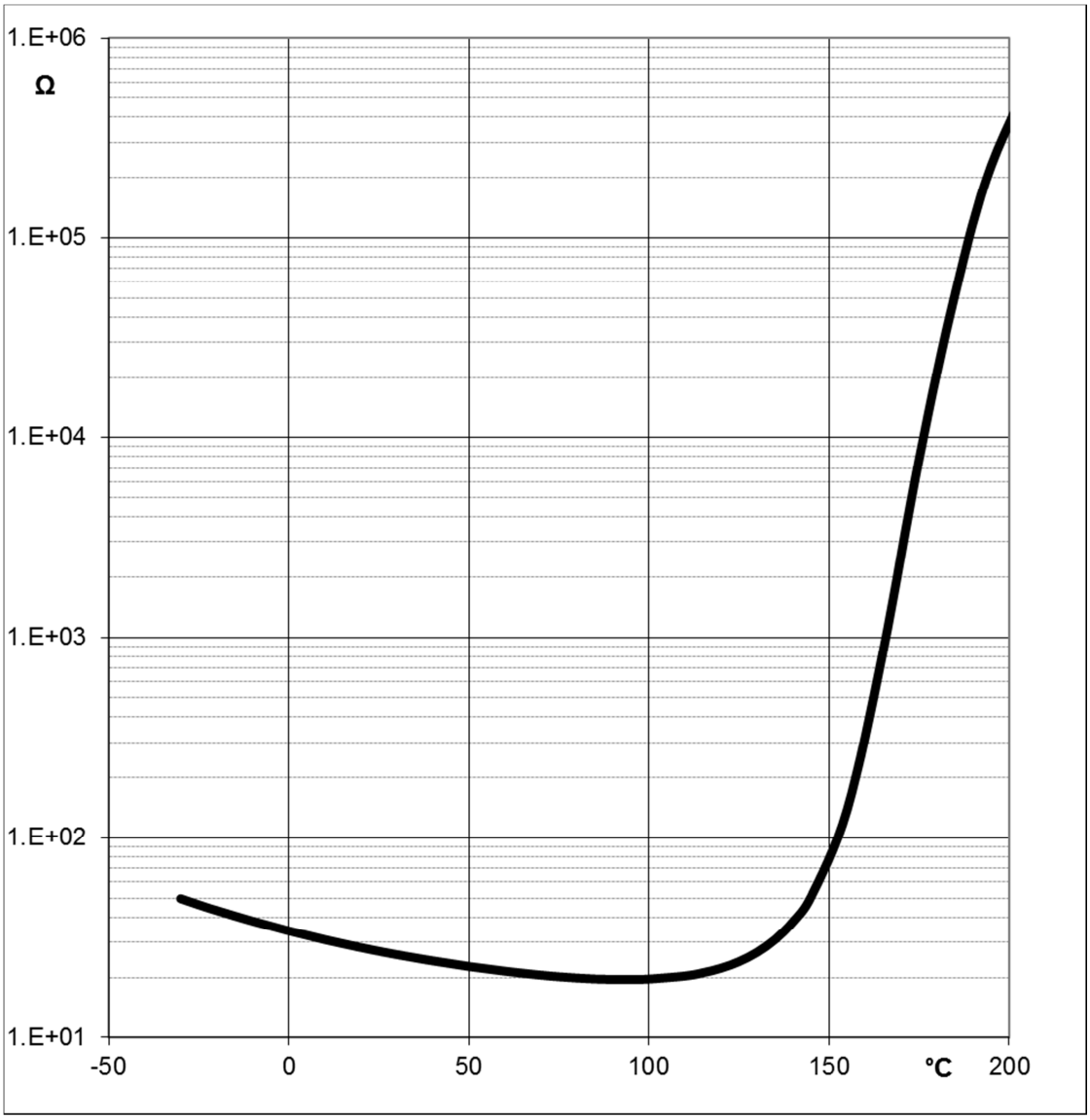
Number of required PTC elements (connected in parallel) as function of capacitance and charging voltage of smoothing or DC link capacitor:

$$N \geq \frac{K \cdot C \cdot V^2}{2 \cdot C_{th} \cdot (T_{ref} - T_{A,max})}$$

K	K factor K = 1 for DC source K = 0.96 for 3-phase bridge rectifier K = 0.76 for single phase bridge rectifier
N	Number of required PTC thermistors connected in parallel
C	Capacitance of smoothing or DC link capacitor in F
V	Charging voltage of capacitor in V
C_{th}	Heat capacity in J/K
T_{ref}	Reference temperature of PTC in °C
$T_{A,max}$	Expected maximum ambient temperature in °C

In case of large N values the resulting resistance of the parallel PTC network might be too low for effective limitation of the charging current. In this case a combination of series and parallel connected PTC thermistors can be used.

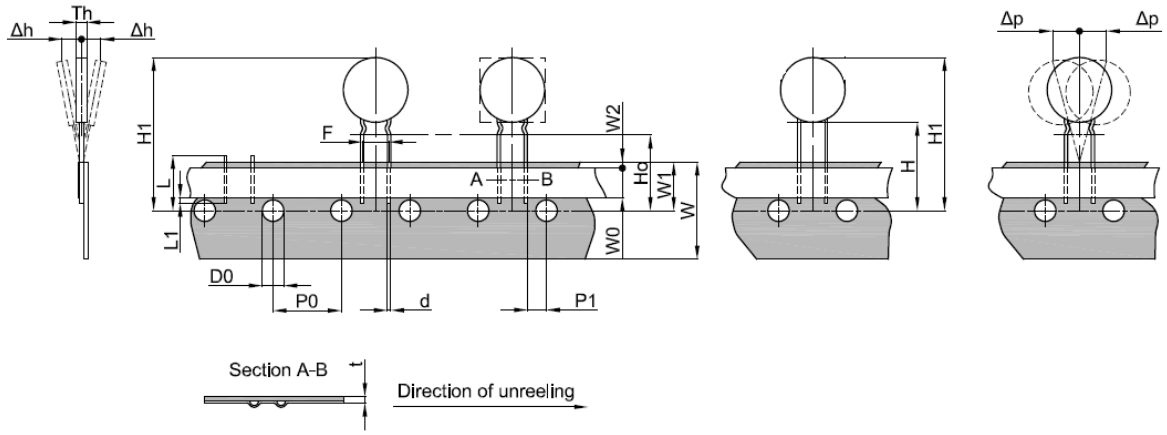
R-T Curve



Reliability data

Test	Standard	Test conditions	$I\Delta R_{25}/R_{25}I$
Electrical endurance, cycling		Room temperature, V_{max} applied energy < Cth x (Tref - T_{amb}) Number of cycles: 100,000	<25%
Electrical endurance, constant	IEC 60738-1	Storage at V_{max} /$T_{op,max}$ (V_{max}) Test duration: 1000h	<25%
Damp heat	IEC 60738-1	Temperature of air: 40°C Relative humidity of air: 93% Duration: 56 days Test according to IEC 60068-2-78	<10%
Rapid change of temperature	IEC 60738-1	$T_1 = T_{op,min}$ (0 V), $T_2 = T_{op,max}$ (0 V) Number of cycles: 5 Test duration: 30min Test according to IEC 60068-2-14, Test Na	<10%
Vibration	IEC 60738-1	Frequency range: 10 to 55 Hz Displacement amplitude: 0.75mm Test duration: 3x2 h Test according to IEC 60068-2-6, Test Fc	<5%
Climatic sequence	IEC 60738-1	Dry heat: $T = T_{op,max}$ (0 V) Test duration: 16 h Damp heat first cycle Cold $T = T_{op,min}$ (0 V) Test duration: 2h Damp heat 5 cycle Tests performed according to IEC 60068-2-30	<10%

Taping



Dimensions and tolerances (taping in accordance with IEC 60286-2):

Designation	Symbol	Nominal size [mm]	Tolerance [mm]	Remarks
Pitch of holes	P_0	12.7	±0.3	±1 mm/20 sprocket holes
Spacing hole center	P_1	3.85	±0.7	
Spacing of the lead	F	5.0	+0.6/-0.1	
Diameter of the lead	d	0.6	±0.05	
Slope of component	Δh	0	±2.0	Measured at top of component body
Slope of component	Δp	0	±1.3	
Carrier type width	W	18.0	+1.0/-0.5	
Hot adhesive tape width	W_0	5.0	min.	peel-off force ≥ 5 N
Position of holes	W_1	9.0	+0.75/-0.5	
Position of adhesive tape	W_2	3.0	max.	
Spacing hole center / bottom edge of component	H	18	+2/-0	non-kinked lead version only
Spacing hole center / kink level	H_0	16.0	±0.5	kinked lead version only
Spacing hole center / upper edge of component	H_1	35	max.	
Hole diameter	D_0	4.0	±0.2	
Tape thickness	t	0.9	max.	without wires
Length of remaining wire after removal of component	L	11.0	max.	
Length of wire below adhesive tap	L_1	4.0	Max.	

Cautions and warnings

General

- EPCOS thermistors are designed for specific applications and should not be used purposes not identified in our specifications, application notes and data books unless otherwise agreed with EPCOS during the design-in-phase.
- Ensure suitability of thermistor through reliability testing during the design-in phase. The thermistors should be evaluated taking into consideration worst-case conditions.

Storage

- Store thermistors only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging: storage temperature -25°C… +45°C, relative humidity ≤75% annual mean, maximum 95%, dew precipitation is inadmissible.
- Avoid contamination of thermistors surface during storage, handling and processing.
- Avoid storage of thermistor in harmful environment with effect on function on long-term operation (examples given under operation precautions).
- Use thermistor within the following period after delivery:
  - Through-hole devices (housed and leaded PTCs): 24 months
  - Motor protection sensors, glass-encapsulated sensors and probe assemblies: 24 months
  - Telecom pair and quattro protectors (TPP, TQP): 24 months
  - Leadless PTC thermistors for pressure contacting: 12 months
  - Leadless PTC thermistors for soldering: 6 months
  - SMDs in EIA sizes 3225 and 4032, and for PTCs with metal tags: 24 months
  - SMDs in EIA sizes 0402, 0603, 0805 and 1210: 12 months

Handling

- PTCs must not be dropped. Chip-offs must not be caused during handling of PTCs.
- Components must not be touched with bare hands. Gloves are recommended.
- Avoid contamination of thermistor surface during handling.

Soldering

- Use rosin-type flux or non-activated flux.
- Insufficient preheating may cause ceramic cracks.
- Rapid cooling by dipping in solvent is not recommended.
- Complete removal of flux is recommended.
- Standard PTC heaters are not suitable for soldering.

Mounting

- Electrode must not be scratched before/during/after in the mounting process.
- Contacts and housing used for assembly with thermistor have to be clean before mounting. Especially grease or oil must be removed.
- When PTC thermistors are encapsulated with sealing material, the precautions given in chapter “Mounting instructions”, “Sealing and potting” must be observed.
- When the thermistor is mounted, there must not be any foreign body between the electrode of the thermistor and the clamping contact.
- The minimum force of the clamping contacts pressing against the PTC must be 10 N.

- During operation, the thermistor's surface temperature can be very high. Ensure that adjacent components are placed at a sufficient distance from the thermistor to allow for proper cooling at the thermistors.
- Ensure that adjacent materials are designed for operation at temperature comparable to the surface temperature of thermistor. Be sure that surrounding parts and materials can withstand this temperature.
- Avoid contamination of thermistor surface during processing.

Operation

- Use thermistors only within the specified temperature operating range.
- Use thermistors only within the specified voltage and current ranges.
- Environmental conditions must not harm the thermistors. Use thermistors 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.
- Be sure to provide and appropriate fail-safe function to prevent secondary product damage caused by abnormal function (e.g. use VDR for limitation of over voltage condition).

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Important notes

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