

PTC thermistors as point level sensors

Stainless steel case, water level sensing

 Series/Type:
 B59050D1100B040

 Date:
 January 2016

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Applications

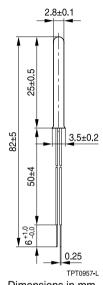
Liquid level detection in water tanks and home appliances

Features

- Hermetically sealed stainless steel case
- Solderability complies with IEC 60068-2-20
- RoHS-compatible

Delivery mode

Bulk



Dimensions in mm

General technical data

Max. operating voltage		V _{max}	18	V DC
Rated resistance		R _R	40 80	Ω
Operating temperature range	(V = 0 V)	T _{op}	-55/+100	°C
Operating temperature range	(V = 18 V)	T _{op}	+10/+65	°C
Number of cycles	$(R_s = 50 \Omega, V = 18 V)$	N	5000	
Residual current in water		I _{r,oil}	see diagram	mA
Residual current in air		I _{r,air}	see diagram	mA
Settling time		t _E	60	s
Surface temperature	(V = 18 V)	T _{surf}	< 80	°C

Ordering code

Ordering code	B59050D1100B040
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Dimensional drawing



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Test set-up

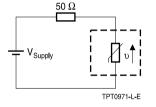
- Unclipped leads, held at the ends by clamps
- Sensor in vertical position
- Distance of clamping point to body: min. 15 mm
- Pellet points downwards
- Settling time after application of voltage:
 60 s



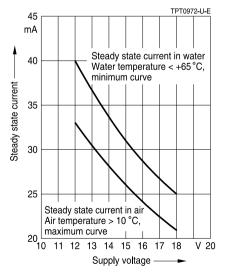
Clamp

TPT0515-L-E

Circuit diagram



Limits of operating range





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Reliability data

Test	Standard	Test conditions	$ \Delta R_{25}/R_{25} $
Electrical endurance,		$V = 19 V; R_s = 100 \Omega$	< 25%
cycling		$T_{air} = 25 \ ^{\circ}C, \ T_{oil} = 50 \ ^{\circ}C$	
		Number of cycles: 5000	
Electrical endurance,	IEC 60738-1	Storage at V_{max} and $T_{op,max}$ (@ V_{max})	< 25%
constant		Test duration: 1000 h	
Damp heat	IEC 60738-1	Temperature of air: 40 °C	< 25%
		Relative humidity of air: 93%	
		Duration: 56 days	
		Test according to IEC 60068-2-78	
Rapid change	IEC 60738-1	$T_1 = T_{op,min} (0 V), T_2 = T_{op,max} (0 V)$	< 25%
of temperature		Number of cycles: 5	
		Test duration: 30 min	
		Test according to IEC 60068-2-14, test Na	
Vibration	IEC 60738-1	Frequency range: 10 to 55 Hz	< 5%
		Displacement amplitude: 0.75 mm	
		Test duration: 3×2 h	
		Test according to IEC 60068-2-6, test Fc	



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Cautions and warnings

General

- EPCOS thermistors 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.
- 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 prior to processing.
- 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 1210 and smaller: 12 months

Handling

- PTCs must not be dropped. Chip-offs must not be caused during handling of PTCs.
- The ceramic and metallization of the components must not be touched with bare hands. Gloves are recommended.
- Avoid contamination of thermistor surface during handling.

Soldering (where applicable)

- 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.



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Mounting

- Electrode must not be scratched before/during/after 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 and pressure of the clamping contacts pressing against the PTC must be 10 N and 50 kPa, respectively. In case the assembly is exposed to mechanical shock and/ or vibration this force should be higher in order to avoid movement of the PTC during operation.
- 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 temperatures 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 an appropriate fail-safe function to prevent secondary product damage caused by abnormal function (e.g. use VDR for limitation of overvoltage condition).

This listing does not claim to be complete, but merely reflects the experience of EPCOS AG.

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



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Symbols and terms

Symbol	Term
A	Area
С	Capacitance
C _{th}	Heat capacity
f	Frequency
I	Current
I _{max}	Maximum current
I _R	Rated current
I _{res}	Residual current
I _{PTC}	PTC current
l _r	Residual currrent
I _{r,oil}	Residual currrent in oil (for level sensors)
$I_{r,air}$	Residual currrent in air (for level sensors)
I _{RMS}	Root-mean-square value of current
I _s	Switching current
I _{Smax}	Maximum switching current
LCT	Lower category temperature
Ν	Number (integer)
N _c	Operating cycles at V_{max} , charging of capacitor
N _f	Switching cycles at V _{max} , failure mode
Р	Power
P ₂₅	Maximum power at 25 °C
P_{el}	Electrical power
P_{diss}	Dissipation power
R _G	Generator internal resistance
R _{min}	Minimum resistance
R _R	Rated resistance @ rated temperature T _R
ΔR_R	Tolerance of R _B
R _P	Parallel resistance
R _{PTC}	PTC resistance
R _{ref}	Reference resistance
Rs	Series resistance
R ₂₅	Resistance at 25 °C
R _{25,match}	Resistance matching per reel/ packing unit at 25 °C
ΔR_{25}	Tolerance of R ₂₅

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TTemperaturetTimeT_AAmbient temperaturetaThermal threshold timeT_CFerroelectric Curie temperatureteSettling time (for level sensors)T_RRated temperature @ 25 °C or otherwise specified in the data sheetT_{sense}Sensing temperatureT_opOperating temperatureT_opOperating temperatureT_opOperating temperatureT_opOperating temperatureT_refReference temperatureT_ntimTemperature at minimum resistancetsSwitching timeT_surfSurface temperatureUCTUpper category temperatureV or VelVoltage (with subscript only for distinction from volume)V _{ermax} Maximum voltage applied at fault conditions in protection modeV _{mmax} Maximum voltageV _{max} Maximum operating voltageV _{max} Maximum operating voltageV _{max} Maximum measuring voltageV _{meas.max} Maximum measuring voltageV _{max} Maximum factor α Temperature coefficient Δ Tolerance, change δ_m Dissipation factor τ_m Temperature coefficient λ Failure rate e Lead spacing (in mm)		
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$\begin{array}{llllllllllllllllllllllllllllllllllll$	$V_{\text{meas,max}}$	Maximum measuring voltage
	V _R	Rated voltage
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$δ_{th}$ Dissipation factor $τ_{th}$ Thermal cooling time constant $λ$ Failure rate	α	Temperature coefficient
$ \begin{aligned} & \tau_{th} & Thermal cooling time constant \\ \lambda & Failure rate \end{aligned} $	Δ	Tolerance, change
λ Failure rate	δ_{th}	Dissipation factor
	$ au_{th}$	Thermal cooling time constant
e Lead spacing (in mm)	λ	Failure rate
	e	Lead spacing (in mm)



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 lifesaving 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.
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7. The trade names EPCOS, Alu-X, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PQSine, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, TFAP, ThermoFuse, WindCap are trademarks registered or pending in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.