

PTC thermistors as limit temperature sensors

Leaded disks, coated, miniaturized

Series/Type: B59008 Date: November 2009

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Applications

Limit temperature monitoring

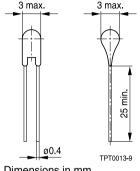
Features

- Tinned leads
- Marked with coded sensing temperature
- Characteristics for sensing temperatures
- $T_{sense} = 90$ to 160 °C conform with DIN 44081
- Extremely fast response due to small dimensions
- UL approval to UL 1434 (file number E69802)
- RoHS-compatible

Delivery mode

Bulk (standard)

Dimensional drawing



Dimensions in mm

General technical data

Max. operating voltage	(T _A = 0 40 °C)	V _{max}	30	V DC
Max. measuring voltage	$(T_A = -25 \ ^{\circ}C \ \ T_{sense} +23 \ K)$	$V_{\text{meas,max}}$	7.5	V DC
Rated resistance	$(V_{PTC} \le 2.5 \text{ V})$	R _R	≤ 250	Ω
Thermal threshold time		t _a	< 3	s
Operating temperature range	$(V \le V_{meas,max})$	T _{op}	$-40/T_{sense}$ +23	°C
Operating temperature range	$(V = V_{max})$	T _{op}	0/+40	°C

Electrical specifications and ordering codes

T_{sense}	R	R	R	R	Stamp	Ordering code
	$(T_{sense} - \Delta T)$	$(T_{sense} + \Delta T)$	(T _{sense} + 15 K)	(T _{sense} + 23 K)	code	
	$(V_{PTC} \le 2.5 \text{ V})$	$(V_{PTC} \le 2.5 \text{ V})$	$(V_{PTC} \le 7.5 \text{ V})$	$(V_{PTC} \le 2.5 \text{ V})$		
°C	Ω	Ω	Ω	Ω		
$\Delta T = \pm$	5 K					
60	≤ 570	≥ 570	-	\geq 4 k	f	B59008C0060A040
70	≤ 570	≥ 570	-	\geq 4 k	g	B59008C0070A040
80	≤ 570	≥ 570	-	\geq 4 k	h	B59008C0080A040
90	≤ 550	≥ 1330	\geq 4 k	-	i	B59008C0090A040
100	≤ 550	≥ 1330	\geq 4 k	-	j	B59008C0100A040
110	≤ 550	≥ 1330	\geq 4 k	-	k	B59008C0110A040
120	≤ 550	≥ 1330	\geq 4 k	-	I	B59008C0120A040
130	≤ 550	≥ 1330	\geq 4 k	-	m	B59008C0130A040
140	≤ 550	≥ 1330	\geq 4 k	-	n	B59008C0140A040
150	≤ 550	≥ 1330	\geq 4 k	-	р	B59008C0150A040
160	≤ 550	≥ 1330	$\ge 4 \text{ k}$	-	S	B59008C0160A040

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Reliability data

Test	Standard	Test conditions	$ \Delta R_{25}/R_{25} $
Electrical endurance,	IEC 60738-1	Storage at V _{max} /T _{op,max} (V _{max})	< 25%
constant		Test duration: 1000 h	
Damp heat	IEC 60738-1	Temperature of air: 40 °C	< 10%
		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	

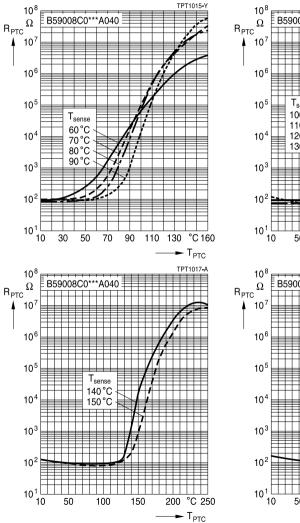


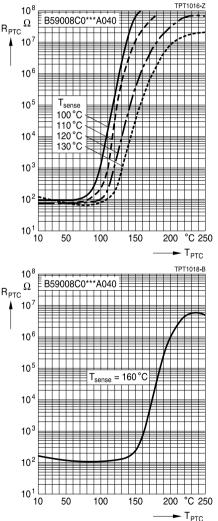
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Characteristics (typical)

PTC resistance $R_{\mbox{\tiny PTC}}$ versus PTC temperature $T_{\mbox{\tiny PTC}}$

(measured at low signal voltage)







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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 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 (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 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 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).



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Symbols and terms

А	Area
C _{th}	Heat capacity
f	Frequency
I	Current
I _{max}	Maximum current
I _R	Rated current
I _{PTC}	PTC current
l _r	Residual currrent
I _{r,oil}	Residual currrent in oil (for level sensors)
l _{r,air}	Residual currrent in air (for level sensors)
I _{RMS}	Root-mean-square value of current
ls	Switching current
I _{Smax}	Maximum switching current
LCT	Lower category temperature
N	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 _{min}	Minimum resistance
R _R	Rated resistance
ΔR_R	Tolerance of R _R
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 $^\circ \text{C}$
ΔR_{25}	Tolerance of R ₂₅
Т	Temperature
t	Time
T _A	Ambient temperature
t _a	Thermal threshold time
Tc	Ferroelectric Curie temperature



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t _E	Settling time (for level sensors)
T _R	Rated temperature
T_{sense}	Sensing temperature
T _{op}	Operating temperature
T _{PTC}	PTC temperature
t _R	Response time
T _{ref}	Reference temperature
T _{Rmin}	Temperature at minimum resistance
ts	Switching time
T _{surf}	Surface temperature
UCT	Upper category temperature
V or V_{el}	Voltage (with subscript only for distinction from volume)
V _{RMS}	Root-mean-square value of voltage
V _{BD}	Breakdown voltage
V _{ins}	Insulation test voltage
$V_{\text{link,max}}$	Maximum link voltage
V _{max}	Maximum operating voltage
V _{max,dyn}	Maximum dynamic (short-time) operating voltage
V _{meas}	Measuring voltage
$V_{\text{meas,max}}$	Maximum measuring voltage
V _R	Rated voltage
V_{PTC}	Voltage drop across a PTC thermistor
α	Temperature coefficient
Δ	Tolerance, change
δ_{th}	Dissipation factor
$ au_{th}$	Thermal cooling time constant
λ	Failure rate
е	Lead spacing (in mm)

Abbreviations / Notes

SMD Surface-mount devices

* To be replaced by a number in ordering codes, type designations etc.

+ To be replaced by a letter

All dimensions are given in mm.

The commas used in numerical values denote decimal points.

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