



## **PTC thermistors**

Motor protection, triple sensors

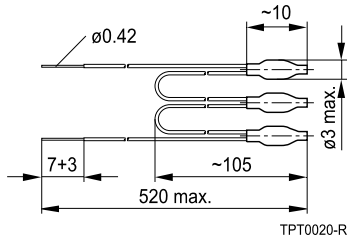
**Series/Type:** B59300  
**Date:** March 2006

**Applications**

- Thermal protection of winding in electric motors
- Limit temperature monitoring

**Features**

- Thermistor pellets with insulating encapsulation in series connection (triple sensor)
- Low-resistance type, steep R/T curve
- Silver-plated and PTFE-insulated AWG 26 litz wires
- Characteristics for nominal threshold temperatures  $T_{NTT} = 90$  up to  $160$  °C conform with DIN 44082
- Color coding of litz wires to DIN 44082, connecting wires in yellow
- UL approval to UL 1434 (file number E69802)
- RoHS-compatible

**Dimensional drawing**


Dimensions in mm

**Delivery mode**

- Bulk

**General technical data**

|                             |   |                       |                      |          |
|-----------------------------|---|-----------------------|----------------------|----------|
| Max. operating voltage      | $(T_A = 0 \dots 40 \text{ °C})$                       | $V_{\max}$            | 30                   | VDC      |
| Max. measuring voltage      | $(T_A = -25 \text{ °C} \dots T_{NTT} + 23 \text{ K})$ | $V_{\text{meas,max}}$ | 7.5                  | VDC      |
| Rated resistance            | $(V_{PTC} \leq 2.5 \text{ V})$                        | $R_R$                 | $\leq 300$           | $\Omega$ |
| Insulating test voltage     |   | $V_{\text{ins}}$      | 2.5                  | kVAC     |
| Thermal threshold time      |   | $t_a$                 | $< 3$                | s        |
| Operating temperature range | $(V \leq V_{\text{meas,max}})$                        | $T_{\text{op}}$       | $-25 / T_{NTT} + 23$ | °C       |
| Operating temperature range | $(V = V_{\max})$                                      | $T_{\text{ep}}$       | $0 / +40$            | °C       |

**Electrical specifications and ordering codes**

| $T_{NTT}$                | R<br>$(T_{NTT} - \Delta T)$<br>$(V_{PTC} \leq 2.5 \text{ V})$ | R<br>$(T_{NTT} + \Delta T)$<br>$(V_{PTC} \leq 2.5 \text{ V})$ | R<br>$(T_{NTT} + 15 \text{ K})$<br>$(V_{PTC} \leq 7.5 \text{ V})$ | R<br>$(T_{NTT} + 23 \text{ K})$<br>$(V_{PTC} \leq 2.5 \text{ V})$ | Ordering code   |
|--------------------------|---|---|---|---|-----------------|
| °C                       | $\Omega$  | $\Omega$  | $\Omega$  | $\Omega$  |                 |
| $\Delta T = 5 \text{ K}$ |   |   |   |   |                 |
| 60                       | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 \text{ k}$   | B59300M1060A070 |
| 70                       | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 \text{ k}$   | B59300M1070A070 |
| 80                       | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 \text{ k}$   | B59300M1080A070 |
| 90                       | $< 1650$  | $> 3990$  | $> 12 \text{ k}$  | -   | B59300M1090A070 |

**Sensors**
**Motor protection, triple sensors**
**M1300**

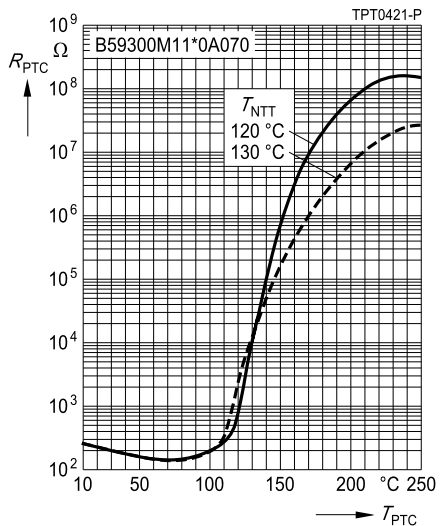
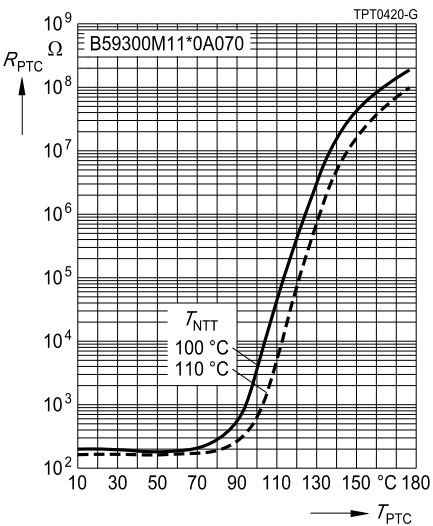
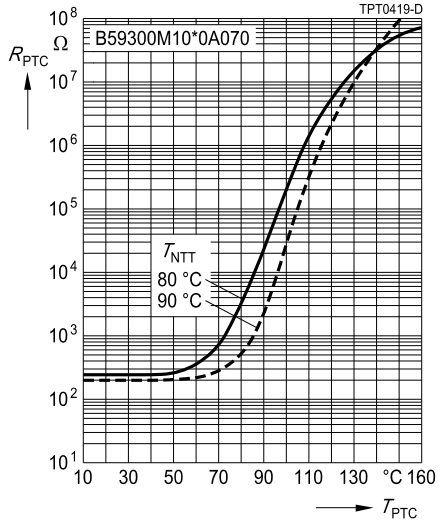
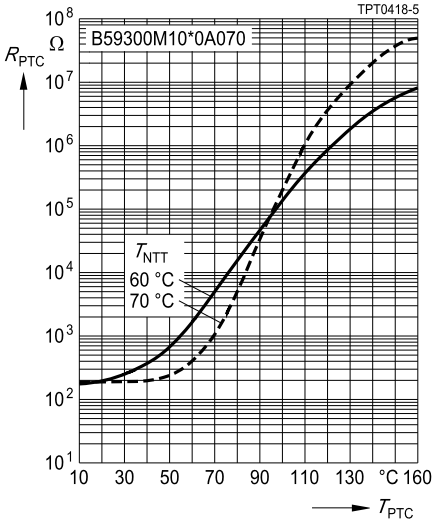
| $T_{NNT}$<br>°C                    | R<br>( $T_{NNT} - \Delta T$ )<br>( $V_{PTC} \leq 2.5 V$ )<br>$\Omega$ | R<br>( $T_{NNT} + \Delta T$ )<br>( $V_{PTC} \leq 2.5 V$ )<br>$\Omega$ | R<br>( $T_{NNT} + 15 K$ )<br>( $V_{PTC} \leq 7.5 V$ )<br>$\Omega$ | R<br>( $T_{NNT} + 23 K$ )<br>( $V_{PTC} \leq 2.5 V$ )<br>$\Omega$ | Ordering code   |
|------------------------------------|---|---|---|---|-----------------|
| 100                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1100A070 |
| 110                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1110A070 |
| 120                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1120A070 |
| 130                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1130A070 |
| 140                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1140A070 |
| 145                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1145A070 |
| 150                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1150A070 |
| 155                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1155A070 |
| 160                                | $\leq 1650$   | $\geq 3990$   | $\geq 12 k$   | -   | B59300M1160A070 |
| <b><math>\Delta T = 7 K</math></b> |   |   |   |   |                 |
| 170                                | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 k$   | B59300M1170A070 |
| 180                                | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 k$   | B59300M1180A070 |
| 190                                | $\leq 1710$   | $\geq 1710$   | -   | $\geq 30 k$   | B59300M1190A070 |

**Color coding of litz wires (to DIN 44081)**

| $T_{NNT}$<br>°C | Color       |
|-----------------|-------------|
| 60              | white/grey  |
| 70              | white/brown |
| 80              | white/white |
| 90              | green/green |
| 100             | red/red     |
| 110             | brown/brown |
| 120             | grey/grey   |
| 130             | blue/blue   |
| 140             | white/blue  |
| 145             | white/black |
| 150             | black/black |
| 155             | blue/black  |
| 160             | blue/red    |
| 170             | white/green |
| 180             | white/red   |
| 190             | black/grey  |

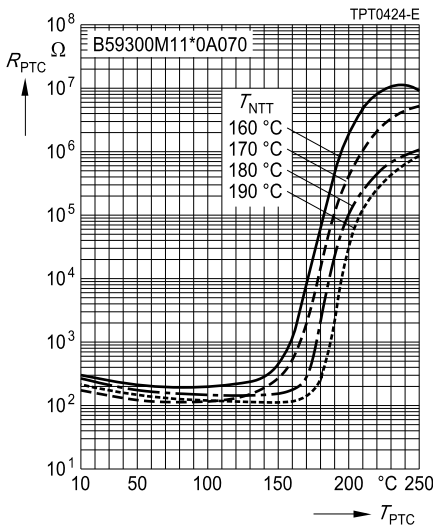
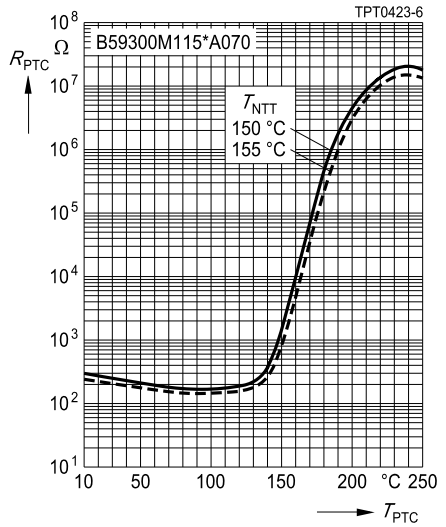
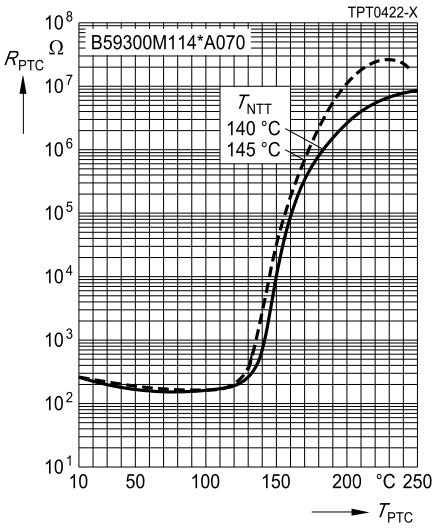
**Characteristics (typical)**

PTC resistance  $R_{PTC}$  versus PTC temperature  $T_{PTC}$   
(measured at low signal voltage)



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PTC resistance  $R_{PTC}$  versus PTC temperature  $T_{PTC}$   
(measured at low signal voltage)



## 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  $-25\text{ °C} \dots +45\text{ °C}$ , relative humidity  $\leq 75\%$  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 6 months after delivery.

### 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.

### 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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