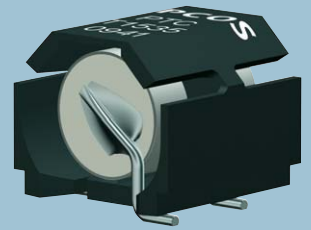
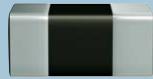
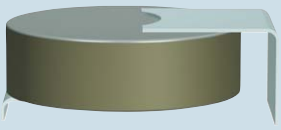


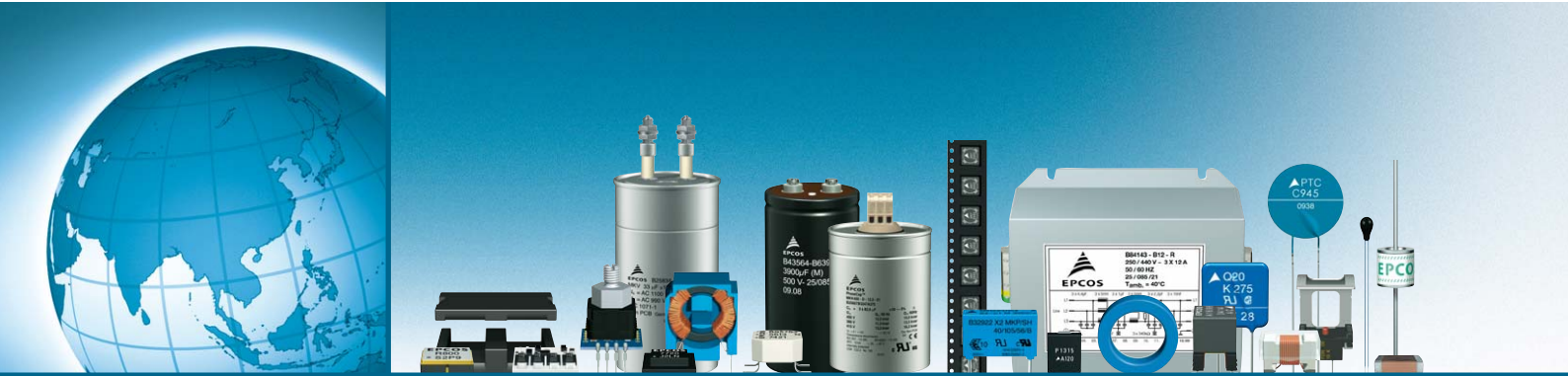


Product Profile 2010



## PTC Thermistors

## Welcome to the World of Electronic Components and Modules

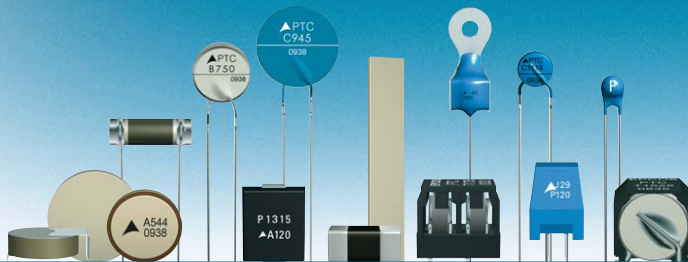


EPCOS is a leading manufacturer of electronic components, modules and systems. Our broad portfolio includes capacitors, inductors and ferrites, EMC filters, sensors and sensor systems, nonlinear resistors, and arresters, as well as SAW and BAW components and RF modules. As an innovative technology-driven company, EPCOS focuses technologically demanding growth markets in the areas of information and communications technology, automotive, industrial, and consumer electronics. We offer our customers both standard components as well as application-specific solutions.

EPCOS has design, manufacturing and marketing facilities in Europe, Asia and the Americas. We are continuously strengthening our global research and development network by expanding R&D activities at our production locations, primarily in Eastern Europe, China and India. With our global presence we are able to provide our customers with local development and manufacturing know-how and support in the early phases of their projects.

EPCOS is continually improving its processes and thus the quality of its products and services. The Group is ISO/TS 16949 certified and remains committed to constantly reviewing and systematically improving its quality management system.

# PTC Thermistors



## Contents

|   |    |
|---|----|
| <b>Important notes</b>  | 4  |
| <b>Preview</b>  | 5  |
| <b>Overcurrent protection</b>   | 6  |
| <b>Inrush current limiters</b>  | 10 |
| <b>Telecom</b>  | 11 |
| <b>Switching applications</b>   | 14 |
| <b>Motor starting</b>   | 15 |
| <b>Limit temperature sensors</b>  | 16 |
| <b>Heating elements</b>   | 20 |
| <b>Thermal management</b>   | 22 |
| <b>Level sensors</b>  | 23 |
| <b>Cautions and warnings</b>  | 24 |
| <b>Process control, production steps, quality assurance/Packing information</b> | 25 |
| <b>Symbols and terms</b>  | 26 |
| <b>Adresses</b>   | 27 |

# 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, 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 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.epcos.com/material](http://www.epcos.com/material)). Should you have any more detailed questions, please contact our sales offices.

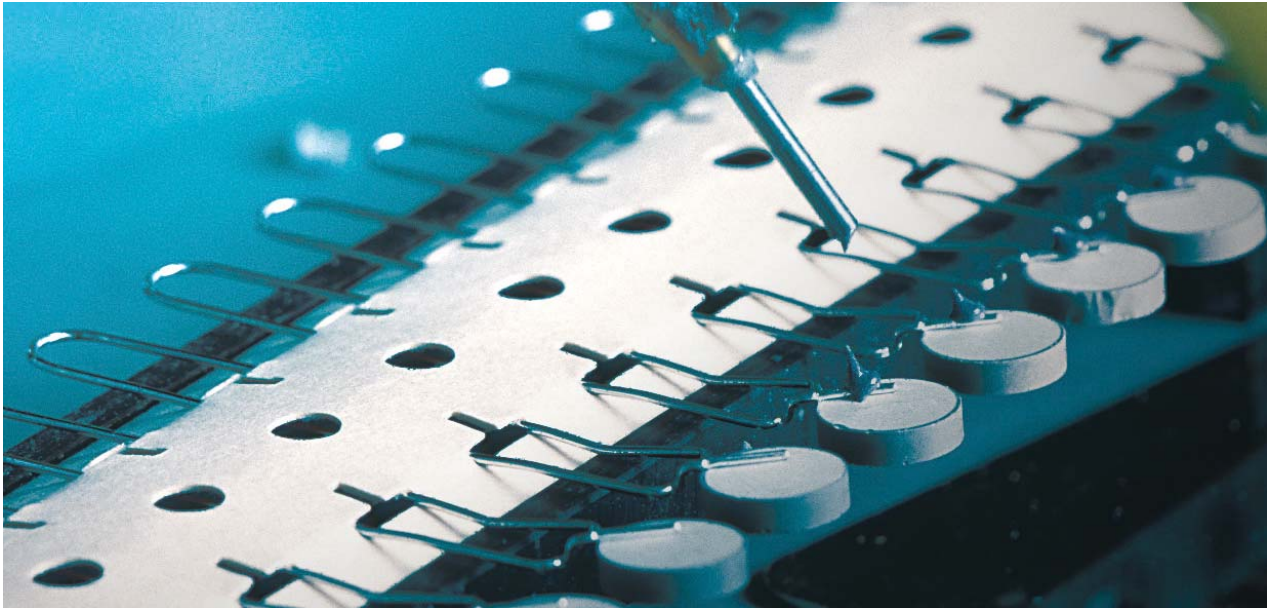
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication 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 the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, BAOKE, Alu-X, CeraDiode, CSMP, CSSP, CTVS, DSSP, MiniBlue, MiniCell, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SIMID, SineFormer, SIOV, SIP5D, SIP5K, 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](http://www.epcos.com/trademarks).

# Preview



This short form catalog presents the wide selection of PTC thermistors from EPCOS – with decades of experience in the development, manufacture and marketing of electronic components, the world market leader in PTC thermistors, and one of the world's biggest producers of electronic components, modules and systems.

PTC thermistors are ceramic components whose electrical resistance rapidly increases when a certain temperature is exceeded. This property makes them ideal for use in countless applications of modern electrical and electronic engineering, for example, as self-resetting fuses against current overload or for short circuit protection in motors. PTC thermistors are used in electronic lamp ballasts and switch-mode power supplies for delayed switching. Special motor-start PTC thermistors are also found in refrigerator compressors, for instance.

Thermal protection of motors and transformers is another example of the versatility of PTC thermistors. Their potential applications include measurement and control engineering and extend to entertainment, household and automotive electronics, as well as to IT systems and telecommunications. PTC thermistors are also suitable as self-regulating heater elements in hot plates and hot-glue guns, or for auxiliary heating and carburetor and fuel injection pre-heating in automobiles.

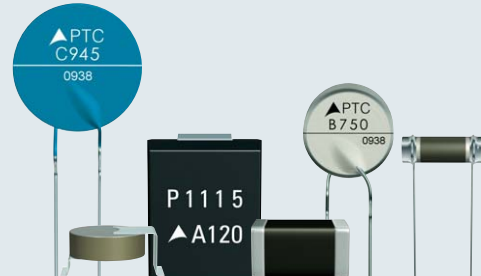
The various PTC thermistors types offered by EPCOS are equally diverse, providing a suitable solution for virtually every application. Backed by a wealth of expertise, the specialists at the center of competence in Deutschlandsberg are also able to produce PTC thermistors precisely to custom specifications.

Turn our creativity and competence into your success.

# Overcurrent Protection

## Applications

- Overload and short-circuit protection, e.g. for
  - motors
  - transformers
  - switch-mode power supplies
  - battery chargers
  - automotive electronics



## Leaded disks, coated

| Type  | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | Dimensions      |                 |                | Ordering code                 | Dimensional drawing<br>mm |
|---|------------------------------|---------------------------------------|-----------------|-----------------|----------------|-------------------------------|---------------------------|
|   |                              |                                       | $w_{max}$<br>mm | $h_{max}$<br>mm | $\phi d$<br>mm |                               |                           |
| <b><math>V_R = 12\text{ V DC/V AC}, V_{max} = 20\text{ V DC/V AC}</math></b>    |                              |                                       |                 |                 |                |                               | <p>TPT0647-V</p>          |
| C935  | 2100                         | 0.30                                  | 22.0            | 25.5            | 0.6            | B59935C0160A070               |                           |
| C945  | 1500                         | 0.45                                  | 17.5            | 21.0            | 0.6            | B59945C0160A070               |                           |
| C955  | 950                          | 0.80                                  | 13.5            | 17.0            | 0.6            | B59955C0160A070               |                           |
| C965  | 700                          | 1.20                                  | 11.0            | 14.5            | 0.6            | B59965C0160A070               |                           |
| C975  | 550                          | 1.80                                  | 9.0             | 12.5            | 0.6            | B59975C0160A070               |                           |
| C985  | 300                          | 4.60                                  | 6.5             | 10.0            | 0.6            | B59985C0160A070               |                           |
| C995  | 150                          | 13.00                                 | 4.0             | 7.5             | 0.5            | B59995C0160A070               |                           |
| <b><math>V_R = 12/24\text{ V DC/V AC}, V_{max} = 30\text{ V DC/V AC}</math></b> |                              |                                       |                 |                 |                |                               |                           |
|   |                              |                                       |                 |                 |                | <b>up to 15 V</b>             | <p>TPT0647-V</p>          |
| C935  | 1800                         | 0.30                                  | 22.0            | 25.5            | 0.6            | B59935C0120A070               |                           |
| C945  | 1300                         | 0.45                                  | 17.5            | 21.0            | 0.6            | B59945C0120A070               |                           |
| C955  | 850                          | 0.80                                  | 13.5            | 17.0            | 0.6            | B59955C0120A070               |                           |
| C965  | 600                          | 1.20                                  | 11.0            | 14.5            | 0.6            | B59965C0120A070               |                           |
| C975  | 450                          | 1.80                                  | 9.0             | 12.5            | 0.6            | B59975C0120A070               |                           |
| C985  | 250                          | 4.60                                  | 6.5             | 10.5            | 0.6            | B59985C0120A070               |                           |
| C995  | 120                          | 13.00                                 | 4.0             | 7.5             | 0.5            | B59995C0120A070               |                           |
| <b><math>V_R = 63\text{ V DC/V AC}, V_{max} = 80\text{ V DC/V AC}</math></b>    |                              |                                       |                 |                 |                |                               |                           |
| C910  | 1000                         | 1.20                                  | 22.0            | 25.5            | 0.8            | B59910C0130A070 <sup>1)</sup> |                           |
| C930  | 700                          | 1.65                                  | 22.0            | 25.5            | 0.6            | B59930C0120A070 <sup>1)</sup> |                           |
| C930  | 700                          | 2.20                                  | 17.5            | 21.0            | 0.8            | B59930C0130A070 <sup>1)</sup> |                           |
| C940  | 450                          | 2.30                                  | 17.5            | 21.0            | 0.6            | B59940C0120A070 <sup>1)</sup> |                           |
| C930  | 340                          | 1.65                                  | 22.0            | 25.5            | 0.6            | B59930C0080A070 <sup>2)</sup> |                           |
| C950  | 320                          | 3.70                                  | 13.5            | 17.0            | 0.6            | B59950C0120A070 <sup>1)</sup> |                           |
| C950  | 320                          | 4.90                                  | 11.0            | 14.5            | 0.6            | B59950C0130A070 <sup>1)</sup> |                           |
| C960  | 250                          | 5.60                                  | 11.0            | 14.5            | 0.6            | B59960C0120A070 <sup>1)</sup> |                           |
| C960  | 250                          | 8.00                                  | 9.0             | 12.5            | 0.6            | B59960C0130A070 <sup>1)</sup> |                           |
| C940  | 245                          | 2.30                                  | 17.5            | 21.0            | 0.6            | B59940C0080A070 <sup>2)</sup> |                           |
| C950  | 170                          | 3.70                                  | 13.5            | 17.0            | 0.6            | B59950C0080A070 <sup>2)</sup> |                           |
| C970  | 150                          | 9.40                                  | 9.0             | 12.5            | 0.6            | B59970C0120A070 <sup>1)</sup> |                           |
| C970  | 150                          | 20.00                                 | 6.5             | 10.0            | 0.6            | B59970C0130A070 <sup>1)</sup> |                           |
| C960  | 130                          | 5.60                                  | 11.0            | 14.5            | 0.6            | B59960C0080A070 <sup>2)</sup> |                           |
| C970  | 90                           | 9.40                                  | 9.0             | 12.5            | 0.6            | B59970C0080A070 <sup>2)</sup> |                           |
| C980  | 85                           | 25.00                                 | 6.5             | 10.0            | 0.6            | B59980C0120A070 <sup>1)</sup> |                           |
| C980  | 85                           | 62.00                                 | 4.0             | 7.5             | 0.6            | B59980C0130A070 <sup>1)</sup> |                           |
| C980  | 50                           | 25.00                                 | 6.5             | 10.0            | 0.6            | B59980C0080A070 <sup>2)</sup> |                           |
| C990  | 50                           | 55.00                                 | 4.0             | 7.5             | 0.5            | B59990C0120A070 <sup>1)</sup> |                           |
| C990  | 30                           | 55.00                                 | 4.0             | 7.5             | 0.5            | B59990C0080A070 <sup>2)</sup> |                           |


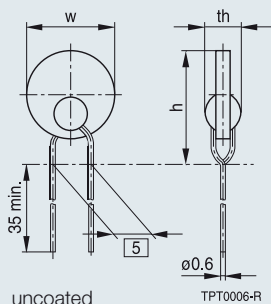


<sup>1)</sup> up to 65 V , <sup>2)</sup> up to 63 V , <sup>3)</sup> up to 220 V , <sup>4)</sup> up to 230 V , <sup>5)</sup> up to 165 V


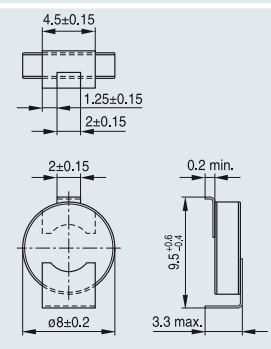
# Overcurrent Protection

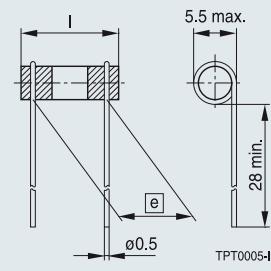
| Leaded disks, coated  |                              |                                       |                 |                 |                |                               |                               |
|---|------------------------------|---------------------------------------|-----------------|-----------------|----------------|-------------------------------|-------------------------------|
| Type  | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | Dimensions      |                 |                | Ordering code                 | Dimensional drawing<br><br>mm |
|   |                              |                                       | $w_{max}$<br>mm | $h_{max}$<br>mm | $\phi d$<br>mm |                               |                               |
| <b><math>V_R = 110\text{ V DC/V AC}</math>, <math>V_{max} = 160\text{ V DC/V AC}</math></b>                   |                              |                                       |                 |                 |                | <b>up to 125 V</b>            | <p>TPT0648-4</p>              |
| C830  | 525                          | 3.7                                   | 22.0            | 25.5            | 0.6            | B59830C0160A070               |                               |
| C840  | 400                          | 6.0                                   | 17.5            | 21.0            | 0.6            | B59840C0160A070               |                               |
| C850  | 250                          | 10.0                                  | 13.5            | 17.0            | 0.6            | B59850C0160A070               |                               |
| C860  | 180                          | 15.0                                  | 11.0            | 14.5            | 0.6            | B59860C0160A070               |                               |
| C870  | 125                          | 25.0                                  | 9.0             | 12.5            | 0.6            | B59870C0160A070               |                               |
| C880  | 70                           | 70.0                                  | 6.5             | 10.0            | 0.6            | B59880C0160A070               |                               |
| C890  | 35                           | 150.0                                 | 4.0             | 7.5             | 0.5            | B59890C0160A070               |                               |
| <b><math>V_R = 230\text{ V DC/V AC}</math>, <math>V_{max} = 265\text{ V DC/V AC}</math></b>                   |                              |                                       |                 |                 |                |                               |                               |
| C810  | 650                          | 3.5                                   | 22.0            | 25.5            | 0.8            | B59810C0130A070 <sup>3)</sup> |                               |
| C830  | 460                          | 3.7                                   | 22.0            | 25.5            | 0.6            | B59830C0120A070 <sup>4)</sup> |                               |
| C830  | 450                          | 5.0                                   | 17.5            | 21.0            | 0.8            | B59830C0130A070 <sup>3)</sup> |                               |
| C840  | 330                          | 6.0                                   | 17.5            | 21.0            | 0.6            | B59840C0120A070 <sup>4)</sup> |                               |
| C840  | 330                          | 9.0                                   | 13.5            | 17.0            | 0.6            | B59840C0130A070 <sup>3)</sup> |                               |
| C830  | 250                          | 3.7                                   | 22.0            | 25.5            | 0.6            | B59830C0080A070 <sup>5)</sup> |                               |
| C850  | 200                          | 10.0                                  | 13.5            | 17.0            | 0.6            | B59850C0120A070 <sup>4)</sup> |                               |
| C850  | 200                          | 13.0                                  | 11.0            | 14.5            | 0.6            | B59850C0130A070 <sup>3)</sup> |                               |
| C840  | 170                          | 6.0                                   | 17.5            | 21.0            | 0.6            | B59840C0080A070 <sup>5)</sup> |                               |
| C860  | 140                          | 15.0                                  | 11.0            | 14.5            | 0.6            | B59860C0120A070 <sup>4)</sup> |                               |
| C860  | 140                          | 25.0                                  | 9.0             | 12.5            | 0.6            | B59860C0130A070 <sup>3)</sup> |                               |
| C850  | 110                          | 10.0                                  | 13.5            | 17.0            | 0.6            | B59850C0080A070 <sup>5)</sup> |                               |
| C870  | 100                          | 25.0                                  | 9.0             | 12.5            | 0.6            | B59870C0120A070 <sup>4)</sup> |                               |
| C870  | 100                          | 50.0                                  | 6.5             | 10.0            | 0.6            | B59870C0130A070 <sup>3)</sup> |                               |
| C860  | 90                           | 15.0                                  | 11.0            | 14.5            | 0.6            | B59860C0080A070 <sup>5)</sup> |                               |
| C872  | 80                           | 35.0                                  | 9.0             | 12.5            | 0.6            | B59872C0120A070 <sup>4)</sup> |                               |
| C873  | 70                           | 45.0                                  | 9.0             | 12.5            | 0.6            | B59873C0120A070 <sup>4)</sup> |                               |
| C874  | 60                           | 55.0                                  | 9.0             | 12.5            | 0.6            | B59874C0120A070 <sup>4)</sup> |                               |
| C870  | 60                           | 25.0                                  | 9.0             | 12.5            | 0.6            | B59870C0080A070 <sup>5)</sup> |                               |
| C880  | 55                           | 70.0                                  | 6.5             | 10.0            | 0.6            | B59880C0120A070 <sup>4)</sup> |                               |
| C875  | 55                           | 65.0                                  | 9.0             | 12.5            | 0.6            | B59875C0120A070 <sup>4)</sup> |                               |
| C880  | 55                           | 160.0                                 | 4.0             | 7.5             | 0.6            | B59880C0130A070 <sup>3)</sup> |                               |
| C883  | 35                           | 120.0                                 | 6.5             | 10.0            | 0.6            | B59883C0120A070 <sup>3)</sup> |                               |
| C890  | 30                           | 150.0                                 | 4.0             | 7.5             | 0.5            | B59890C0120A070 <sup>3)</sup> |                               |
| C880  | 30                           | 70.0                                  | 6.5             | 10.0            | 0.6            | B59880C0080A070 <sup>5)</sup> |                               |
| C890  | 15                           | 150.0                                 | 4.0             | 7.5             | 0.5            | B59890C0080A070 <sup>5)</sup> |                               |
| <b><math>V_R = 230\text{ V DC/V AC}</math>, <math>V_{max} = 265\text{ V DC/V AC}</math>, lead-free series</b> |                              |                                       |                 |                 |                |                               |                               |
| C850  | 220                          | 10.0                                  | 13.5            | 17.0            | 0.6            | B59850C0120A570               |                               |
| C860  | 170                          | 15.0                                  | 11.0            | 14.5            | 0.6            | B59860C0120A570               |                               |
| C873  | 90                           | 45.0                                  | 9.0             | 12.5            | 0.6            | B59873C0120A570               |                               |
| C875  | 80                           | 65.0                                  | 9.0             | 12.5            | 0.6            | B59875C0120A570               |                               |
| C880  | 65                           | 70.0                                  | 6.5             | 10.0            | 0.6            | B59880C0120A570               |                               |
| C883  | 50                           | 120.0                                 | 6.5             | 10.0            | 0.6            | B59883C0120A570               |                               |
| <b><math>V_R = 380\text{ V DC/V AC}</math>, <math>V_{max} = 420\text{ V DC/V AC}</math></b>                   |                              |                                       |                 |                 |                | <b>up to 230 V</b>            |                               |
| C884  | 21                           | 600.0                                 | 6.5             | 10.0            | 0.6            | B59884C0120A070               |                               |
| <b><math>V_R = 500\text{ V DC/V AC}</math>, <math>V_{max} = 550\text{ V DC/V AC}</math></b>                   |                              |                                       |                 |                 |                | <b>up to 230 V</b>            |                               |
| C885  | 15                           | 1200.0                                | 6.5             | 10.0            | 0.6            | B59885C0120A070               |                               |
| C886  | 12                           | 1500.0                                | 6.5             | 10.0            | 0.6            | B59886C0120A070               |                               |

<sup>1)</sup> up to 65 V , <sup>2)</sup> up to 63 V , <sup>3)</sup> up to 220 V , <sup>4)</sup> up to 230 V , <sup>5)</sup> up to 165 V

# Overcurrent Protection

| Leaded disks, uncoated   |                              |                                       |                 |                 |                  |  |   |
|--|------------------------------|---------------------------------------|-----------------|-----------------|------------------|--|---|
| Type   | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | Dimensions      |                 |                  | Ordering code  | Dimensional drawing<br><br>mm   |
|  |                              |                                       | $w_{max}$<br>mm | $h_{max}$<br>mm | $th_{max}$<br>mm |  |   |
| <b><math>V_R = 380 \text{ V DC/V AC}, V_{max} = 420 \text{ V DC/V AC}</math></b>   |                              |                                       |                 |                 |                  |                     |  |
| B750   | 123                          | 25                                    | 12.5            | 16.5            | 7.0              | B59750B0120A070  |   |
| B751   | 87                           | 50                                    | 12.5            | 16.5            | 7.0              | B59751B0120A070  |   |
| B752   | 69                           | 80                                    | 12.5            | 16.5            | 7.0              | B59752B0120A070  |   |
| B770   | 64                           | 70                                    | 8.5             | 12.1            | 7.0              | B59770B0120A070  |   |
| B753   | 56                           | 120                                   | 12.5            | 16.5            | 7.0              | B59753B0120A070  |   |
| B754   | 50                           | 150                                   | 12.5            | 16.5            | 7.0              | B59754B0120A070  |   |
| B771   | 49                           | 120                                   | 8.5             | 12.1            | 7.0              | B59771B0120A070  |   |
| B772   | 43                           | 150                                   | 8.5             | 12.1            | 7.0              | B59772B0120A070  |   |
| <b><math>V_R = 500 \text{ V DC/V AC}, V_{max} = 550 \text{ V DC/V AC}</math></b>   |                              |                                       |                 |                 |                  | <b>up to 420 V</b>  | uncoated  |
| B755   | 28                           | 500                                   | 12.5            | 16.5            | 7.0              | B59755B0115A070  |   |
| B773   | 24                           | 500                                   | 8.5             | 12.1            | 7.0              | B59773B0120A070  |   |
| B774   | 16                           | 1100                                  | 8.5             | 12.1            | 7.0              | B59774B0115A070  |   |
| <b><math>V_R = 1000 \text{ V DC/V AC}, V_{max} = 1000 \text{ V DC/V AC}</math></b> |                              |                                       |                 |                 |                  | <b>up to 420 V</b>  | uncoated  |
| B758   | 8                            | 7500                                  | 12.5            | 16.5            | 7.0              | B59758B0110A070  |   |

| SMD disks, 265 V   |                              |                                       |  |   |
|--|------------------------------|---------------------------------------|--|---|
| Type   | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | Ordering code  | Dimensional drawing<br><br>mm   |
| <b><math>V_R = 230 \text{ V AC}, V_{max} = 265 \text{ V AC}</math></b> |                              |                                       | <b>up to 245 V</b>  |  |
| G1085  | 180                          | 10                                    | B59085G1120A161  |   |
| G1080  | 130                          | 25                                    | B59080G1120B262  |   |
| G1084  | 90                           | 50                                    | B59084G1120A161  |   |

| Cylinders  |                              |                                       |              |                 |                 |   |
|--|------------------------------|---------------------------------------|--------------|-----------------|-----------------|---|
| Type   | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | Dimensions   |                 | Ordering code   | Dimensional drawing<br><br>mm   |
|  |                              |                                       | $e$<br>mm    | $l_{max}$<br>mm |                 |   |
| <b><math>V_R = 500 \text{ V DC/V AC}, V_{max} = 550 \text{ V DC/V AC}</math></b> |                              |                                       |              |                 |                 |  |
| B404   | 4.0                          | 3500                                  | $12.5 \pm 1$ | 17.0            | B59404B0060A040 |   |
| B406   | 2.5                          | 5500                                  | $12.5 \pm 1$ | 17.0            | B59406B0060A040 |   |



# Overcurrent Protection

| SMD types   |                              |                                       |          |                 |   |  |
|---|------------------------------|---------------------------------------|----------|-----------------|---|--|
| Type  | Rated current<br>$I_R$<br>mA | Rated resistance<br>$R_R$<br>$\Omega$ | EIA size | Ordering code   | Dimensional drawing   |  |
| <b>SMD</b>  |                              |                                       |          |                 | mm  |  |
| <b><math>V_R = 24 \text{ V DC/V AC}, V_{\max} = 30 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| P1301   | 310                          | 3.1                                   | 4032     | B59301P1120A062 | <p>Termination<br/>TPT0528-4-E</p> <p>Contact surfaces tinned</p> |  |
| P1201   | 265                          | 4.6                                   | 3225     | B59201P1120A062 |   |  |
| P1301   | 205                          | 3.1                                   | 4032     | B59301P1080A062 |   |  |
| P1101   | 170                          | 13.0                                  | 3225     | B59101P1120A062 |   |  |
| P1201   | 165                          | 4.6                                   | 3225     | B59201P1080A062 |   |  |
| P1101   | 90                           | 13.0                                  | 3225     | B59101P1080A062 |   |  |
| <b><math>V_R = 63 \text{ V DC/V AC}, V_{\max} = 80 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| P1315   | 150                          | 16.0                                  | 4032     | B59315P1120A062 | <p>Termination<br/>TPT0698-5-E</p> <p>Contact surfaces tinned</p> |  |
| P1215   | 100                          | 25.0                                  | 3225     | B59215P1120A062 |   |  |
| P1315   | 80                           | 16.0                                  | 4032     | B59315P1080A062 |   |  |
| P1115   | 70                           | 55.0                                  | 3225     | B59115P1120A062 |   |  |
| P1215   | 65                           | 25.0                                  | 3225     | B59215P1080A062 |   |  |
| P1115   | 40                           | 55.0                                  | 3225     | B59115P1080A062 |   |  |
| <b><math>V_R = 42 \text{ V DC/V AC}, V_{\max} = 60 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| A622  | 22 <sup>1)</sup>             | 220.0                                 | 0603     | B59622A0090A062 | <p>Termination<br/>TPT0790-F-E</p> <p>Contact surfaces tinned</p> |  |
| <b><math>V_R = 63 \text{ V DC/V AC}, V_{\max} = 80 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| A623  | 15 <sup>1)</sup>             | 470.0                                 | 0603     | B59623A0090A062 |   |  |
| <b><math>V_R = 24 \text{ V DC/V AC}, V_{\max} = 30 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| A606  | 90 <sup>1)</sup>             | 27.0                                  | 1210     | B59606A0110A062 |   |  |
| A607  | 70 <sup>1)</sup>             | 55.0                                  | 1210     | B59607A0120A062 |   |  |
| <b><math>V_R = 63 \text{ V DC/V AC}, V_{\max} = 80 \text{ V DC/V AC}</math></b>   |                              |                                       |          |                 |   |  |
| A707  | 50 <sup>1)</sup>             | 125.0                                 | 1210     | B59707A0120A062 |   |  |
| <b><math>V_R = 230 \text{ V DC/V AC}, V_{\max} = 265 \text{ V DC/V AC}</math></b> |                              |                                       |          |                 |   |  |
| A807  | 15 <sup>1)</sup>             | 400.0                                 | 1210     | B59807A0120A062 |   |  |
| <b><math>V_R = 230 \text{ V DC/V AC}, V_{\max} = 400 \text{ V DC/V AC}</math></b> |                              |                                       |          |                 |   |  |
| A907  | 12 <sup>1)</sup>             | 1500.0                                | 1210     | B59907A0120A062 |   |  |

<sup>1)</sup> Measured on component soldered to standardized PCB.

| EIA case size | l mm      | w mm     | h mm     | a mm     |
|---------------|-----------|----------|----------|----------|
| 3225          | 8.0 ±0.5  | 6.3 ±0.5 | 3.2 ±0.5 | 1.7 ±0.3 |
| 4032          | 10.0 ±0.5 | 8.0 ±0.5 | 3.2 ±0.5 | 2.3 ±0.3 |
| 0603          | 1.6 ±0.15 | 0.8 ±0.1 | 0.8 ±0.1 | –        |
| 1210          | 3.2 ±0.2  | 2.5 ±0.2 | 1.6 ±0.2 | –        |

Case sizes 0603/1210 are suitable for reflow soldering only.  
Case sizes 3225/4032 are suitable for wave and reflow soldering.

# Inrush Current Limiters

## Applications

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



## Inrush current limiters in phenolic resin plastic case, leaded disks

| Type  | Maximum voltage<br>$V_{max}$<br>V AC | Maximum link voltage<br>$V_{link, max}$<br>V DC | Rated resistance<br>$R_R$<br>$\Omega$ | Rated tolerance<br>$\Delta R_R$<br>% | Ordering code   | Dimensional drawing<br>mm |
|---|--------------------------------------|---|---------------------------------------|--------------------------------------|-----------------|---------------------------|
| <b>In phenolic resin plastic case, operating cycles at <math>V_{max}</math> (charging of capacitor)<br/><math>N_c &gt; 100000</math> cycles</b> |                                      |   |                                       |                                      |                 |                           |
| J105  | 260                                  | 360   | 22                                    | $\pm 25$                             | B59105J0130A020 |                           |
| J107  | 440                                  | 620   | 56                                    | $\pm 25$                             | B59107J0130A020 |                           |
| J109  | 560                                  | 800   | 100                                   | $\pm 25$                             | B59109J0130A020 |                           |

| Type   | Max. voltage<br>$V_{max}$<br>V AC | Max. link voltage<br>$V_{link, max}$<br>V DC | Rated resist.<br>$R_R$<br>$\Omega$ | Rated toler.<br>$\Delta R_R$<br>% | Dimensions      |                 |                  | Ordering code   | Dimensional drawing<br>mm |
|--|-----------------------------------|--|------------------------------------|-----------------------------------|-----------------|-----------------|------------------|-----------------|---------------------------|
|  |                                   |  |                                    |                                   | $w_{max}$<br>mm | $h_{max}$<br>mm | $th_{max}$<br>mm |                 |                           |
| <b>Leaded disks, operating cycles at <math>V_{max}</math> (charging of capacitor)<br/><math>N_c &gt; 50000</math> cycles</b> |                                   |  |                                    |                                   |                 |                 |                  |                 |                           |
| B750   | 260                               | 360  | 25                                 | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59750B0120A070 |                           |
| B751   | 260                               | 360  | 50                                 | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59751B0120A070 |                           |
| B752   | 260                               | 360  | 80                                 | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59752B0120A070 |                           |
| B753   | 440                               | 620  | 120                                | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59753B0120A070 |                           |
| B754   | 440                               | 620  | 150                                | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59754B0120A070 |                           |
| B755   | 560                               | 800  | 500                                | $\pm 25$                          | 12.5            | 16.5            | 7.0              | B59755B0115A070 |                           |

## Applications

- Overcurrent protection for
  - line cards
  - MDF modules
  - modems
  - set-top boxes



## Leaded disks

| Type   | Rated resistance<br>$R_R$<br>$\Omega$ | $R_{25, match}$<br>(per packing unit)<br>$ R_2 - R_1 _{max}$<br>$\Omega$ | Rated current<br>$I_R @ 25^\circ C$<br>mA | Dimensions      |                 |                  | Ordering code   | Dimensional drawing<br>mm |
|--|---------------------------------------|--|---|-----------------|-----------------|------------------|-----------------|---------------------------|
|  |                                       |  |   | $w_{max}$<br>mm | $h_{max}$<br>mm | $th_{max}$<br>mm |                 |                           |
| <b><math>V_{max} = 245 \text{ V AC}</math>, kinked leads, uncoated</b>   |                                       |  |   |                 |                 |                  |                 |                           |
| B1048  | 6                                     | 0.80   | 140                                       | 8.0             | 12.0            | 5.0              | B59048B1080B151 |                           |
| B1076  | 10                                    | 1.00   | 140                                       | 6.6             | 8.0             | 4.0              | B59076B1120B151 |                           |
| B1042  | 10                                    | 1.00   | 150                                       | 8.2             | 12.1            | 4.0              | B59042B1120B151 |                           |
| B1012  | 12                                    | not matched  | 90  | 6.0             | 10.0            | 4.0              | B59012B1080B070 |                           |
| B1603  | 25                                    | 0.60   | 100                                       | 10.2            | 12.6            | 5.0              | B59603B1120B157 |                           |
| S1024  | 35                                    | 2.00   | 70  | 8.2             | 12.1            | 4.5              | B59024S1120A151 |                           |
| B1184  | 50                                    | 1.00   | 60  | 8.2             | 12.1            | 4.0              | B59184B1120A151 |                           |
| <b><math>V_{max} = 245 \text{ V AC}</math>, straight leads, uncoated</b> |                                       |  |   |                 |                 |                  |                 |                           |
| B1010  | 9                                     | not matched  | 150                                       | 10.1            | 10.1            | 4.2              | B59010B1120A070 |                           |
| B1076  | 10                                    | 1.00   | 140                                       | 6.6             | 7.5             | 4.0              | B59076B1120B153 |                           |
| B1084  | 20                                    | 0.50   | 100                                       | 6.6             | 7.5             | 4.0              | B59084B1120A151 |                           |
| B1069  | 25                                    | 1.00   | 60  | 5.2             | 5.2             | 3.5              | B59069B1080B151 |                           |
| B1069  | 25                                    | not matched  | 60  | 5.2             | 5.2             | 3.5              | B59069B1080B051 |                           |
| B1069  | 25                                    | not matched  | 85  | 5.2             | 5.2             | 3.5              | B59069B1120A051 |                           |
| <b><math>V_{max} = 245 \text{ V AC}</math>, kinked leads, coated</b>     |                                       |  |   |                 |                 |                  |                 |                           |
| C1098  | 6                                     | not matched  | 185                                       | 13.0            | 17.0            | 5.0              | B59098C1100B051 |                           |
| C1154  | 50                                    | 1.00   | 65  | 6.0             | 10.0            | 4.5              | B59154C1130A151 |                           |
| C1184  | 50                                    | 1.00   | 65  | 9.0             | 12.5            | 4.5              | B59184C1120B153 |                           |
| <b><math>V_{max} = 245 \text{ V AC}</math>, kinked leads, uncoated</b>   |                                       |  |   |                 |                 |                  |                 |                           |
| B1070  | 10                                    | 1.00   | 135                                       | 10.2            | 14.0            | 4.5              | B59070B1105B151 |                           |
| S1022  | 10                                    | not matched  | 160                                       | 10.5            | 14.5            | 4.2              | B59022S1120A051 |                           |
| S1071  | 17.5                                  | 2.00   | 150                                       | 8.2             | 8.2             | 4.0              | B59071S1120B151 |                           |
| B1045  | 25                                    | 1.00   | 90  | 6.6             | 9.5             | 4.0              | B59045B1120B151 |                           |
| S1023  | 25                                    | not matched  | 95  | 8.2             | 10.5            | 4.0              | B59023S1120A070 |                           |
| B1008  | 25                                    | 1.00   | 100                                       | 8.2             | 10.5            | 4.0              | B59008B1130A051 |                           |
|  |                                       |  |   |                 |                 |                  |                 |                           |

| Telecom pair protector (TPP)           |                   |                                     |                          |                 |                     |
|--|-------------------|-------------------------------------|--------------------------|-----------------|---------------------|
| Type                                   | Rated resistance  | $R_{25, match}$<br>(in one housing) | Rated current            | Ordering code   | Dimensional drawing |
| <u>SMD</u>                             | $R_R$<br>$\Omega$ | $ R_2 - R_1 _{max}$<br>$\Omega$     | $I_R @ 25^\circ C$<br>mA |                 | mm                  |
| <b><math>V_{max} = 245 V AC</math></b> |                   |                                     |                          |                 |                     |
| T1535                                  | 35.0              | 1.0                                 | 110.0                    | B59535T1120A262 | <p>TPT0988-G</p>    |
| T1550                                  | 50.0              | 1.0                                 | 90.0                     | B59550T1120A262 |                     |
| T1510                                  | 10.0              | 1.0                                 | 180.0                    | B59510T1120A062 | <p>TPT0983-N</p>    |
| T1525                                  | 25.0              | 1.0                                 | 130.0                    | B59525T1120A062 |                     |
| T1635                                  | 35.0              | 1.0                                 | 110.0                    | B59635T1120A062 | <p>TPT0911-D</p>    |
| T1650                                  | 50.0              | 1.0                                 | 90.0                     | B59650T1120A062 |                     |
| T1725                                  | 25.0              | 1.0                                 | 130.0                    | B59725T1120A062 | <p>TPT0911-J</p>    |
| T1735                                  | 35.0              | 1.0                                 | 110.0                    | B59735T1120A062 |                     |
| T1750                                  | 50.0              | 1.0                                 | 90.0                     | B59750T1120A062 |                     |
| T1805                                  | 4.75              | 0.5                                 | 160.0                    | B59805T1080A062 | <p>TPT0962-M</p>    |
| T1810                                  | 10.0              | 1.0                                 | 180.0                    | B59810T1120A062 |                     |
| T1825                                  | 25.0              | 1.0                                 | 130.0                    | B59825T1120A062 |                     |
| T1835                                  | 35.0              | 1.0                                 | 110.0                    | B59835T1120A062 |                     |
| T1850                                  | 50.0              | 1.0                                 | 90.0                     | B59850T1120A062 |                     |
| T1875                                  | 75.0              | 2.0                                 | 70.0                     | B59875T1120A062 |                     |
|  |                   |                                     |                          |                 |                     |

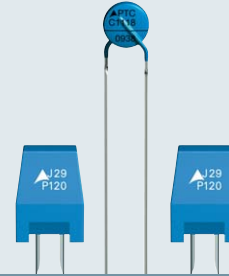
| Telecom pair protector (TPP), for GR1089 Central Office |                   |                                     |                          |                 |                     |
|---|-------------------|-------------------------------------|--------------------------|-----------------|---------------------|
| Type  | Rated resistance  | $R_{25, match}$<br>(in one housing) | Rated current            | Ordering code   | Dimensional drawing |
| <u>SMD</u>  | $R_R$<br>$\Omega$ | $ R_2 - R_1 _{max}$<br>$\Omega$     | $I_R @ 25^\circ C$<br>mA |                 | mm                  |
| <b><math>V_{max} = 245 V AC</math></b>                  |                   |                                     |                          |                 |                     |
| T1970   | 70.0              | 2.0                                 | 70.0                     | B59970T1100A062 |                     |

| Single SMDs                                     |                   |                                       |                          |                 |                     |
|---|-------------------|---------------------------------------|--------------------------|-----------------|---------------------|
| Type  | Rated resistance  | $R_{25, match}$<br>(per packing unit) | Rated current            | Ordering code   | Dimensional drawing |
| <u>SMD</u>                                      | $R_R$<br>$\Omega$ | $ R_2 - R_1 _{max}$<br>$\Omega$       | $I_R @ 25^\circ C$<br>mA |                 | mm                  |
| <b><math>V_{max} = 245 V AC, Gamma I</math></b> |                   |                                       |                          |                 |                     |
|   |                   |                                       |                          | up to 245 V     |                     |
| G1081   | 9                 | 0.5                                   | 180                      | B59081G1120A161 |                     |
| G1085   | 10                | 1.0                                   | 180                      | B59085G1120A161 |                     |
| G1083   | 16                | 0.5                                   | 150                      | B59083G1120A161 |                     |
| G1080   | 25                | 1.0                                   | 130                      | B59080G1120B262 |                     |
| G1086   | 29                | 1.0                                   | 125                      | B59086G1120B262 |                     |
| G1084   | 50                | 1.0                                   | 90                       | B59084G1120A161 |                     |
| <b><math>V_{max} = 245 V AC, Gamma L</math></b> |                   |                                       |                          |                 |                     |
|   |                   |                                       |                          | up to 245 V     |                     |
| G1040   | 25                | 1.0                                   | 120                      | B59040G1120B161 |                     |

# Switching Applications

## Applications

- Disks:  
E.g. for lighting applications/  
electronic lamp ballasts
- Encased types:  
For delayed switching, primarily in  
switch-mode power supplies



## Leaded disks

| Type   | $I_{Smax}$<br>( $V=V_{max}$ )<br>mA | $t_s$ @<br>$I_{Smax}$<br>s | Rated<br>resistance<br>$R_R$<br>$\Omega$ | Reference<br>temperature<br>$T_{ref}$<br>$^{\circ}C$ | Dimensions      |                 |                | Ordering code   | Dimensional drawing<br>mm |
|--|-------------------------------------|----------------------------|--|--|-----------------|-----------------|----------------|-----------------|---------------------------|
|  |                                     |                            |  |  | $w_{max}$<br>mm | $h_{max}$<br>mm | $\phi d$<br>mm |                 |                           |
| <b>For energy-saving lamps <math>V_{max}^{1)} = 310 V_{RMS}</math> (C1119) or <math>550 V_{RMS}</math> (S1082)</b> |                                     |                            |  |  |                 |                 |                |                 |                           |
| C1119  | 200                                 | 0.6                        | 150                                      | 80   | 4.0             | 7.5             | 0.5            | B59119C1080A070 |                           |
| C1119  | 200                                 | 1.2                        | 150                                      | 120  | 4.0             | 7.5             | 0.5            | B59119C1120A070 |                           |
| S1082  | 100                                 | 1.1                        | 1500                                     | 80   | 6.5             | 10.1            | 0.6            | B59082S1080B054 |                           |
| <b>For electronic ballasts <math>V_{max}^{1)} = 310 V_{RMS}</math></b>   |                                     |                            |  |  |                 |                 |                |                 |                           |
| C1118  | 400                                 | 0.9                        | 70                                       | 80   | 6.5             | 10.0            | 0.6            | B59118C1080A070 |                           |
| C1118  | 400                                 | 1.75                       | 70                                       | 120  | 6.5             | 10.0            | 0.6            | B59118C1120A070 |                           |
| S1076  | 600                                 | 0.7                        | 110                                      | 120  | 7.5             | 14.5            | 0.6            | B59076S1120B054 |                           |

<sup>1)</sup>  $t \leq 200$  ms

## Encased types

| Type   | $I_{Smax}$<br>( $V=V_{max}$ )<br>mA | $t_s$ @<br>$I_{Smax}$<br>s | Rated<br>current<br>$I_R$<br>mA | Rated<br>resistance<br>$R_R$<br>$\Omega$ | Reference<br>temperature<br>$T_{ref}$<br>$^{\circ}C$ | Ordering code        | Dimensional drawing<br>mm |
|--|-------------------------------------|----------------------------|---------------------------------|--|--|----------------------|---------------------------|
| <b><math>V_{max} = 160 V AC, 100.000</math> switching cycles</b> |                                     |                            |                                 |  |  | <b>Case material</b> |                           |
| J282   | 700                                 | $\leq 0.5$                 | 48                              | 80                                       | 120  | B59339A1800P020      |                           |
| <b><math>V_{max} = 265 V AC, 100.000</math> switching cycles</b> |                                     |                            |                                 |  |  | <b>Case material</b> |                           |
| J284   | 420                                 | $\leq 0.5$                 | 30                              | 200                                      | 120  | B59339A1201P020      |                           |
| J285   | 330                                 | $\leq 0.5$                 | 24                              | 320                                      | 120  | B59339A1321P020      |                           |
| J286   | 270                                 | $\leq 0.5$                 | 20                              | 500                                      | 120  | B59339A1501P020      |                           |
| J289   | 150                                 | $\leq 0.5$                 | 10                              | 2000                                     | 120  | B59339A1202P020      |                           |
| J290   | 120                                 | $\leq 0.5$                 | 8                               | 3200                                     | 115  | B59339A1322P020      |                           |
| J29  | 100                                 | $\leq 0.5$                 | 14                              | 5000                                     | 190  | B59346A1502P020      |                           |
| J29  | 100                                 | $\leq 2.0$                 | 7                               | 5000                                     | 115  | B59339A1502P020      |                           |

# Motor Starting

## Applications

- Motor start in compressors and airconditioning systems (refrigerators)
- Time delay in turning off the auxiliary winding

## Options

- Metallized disks in EPCOS motor start housing on request



## Metallized disks

| Type                                  | Operat. current<br>$I_{max}$<br>A | Volt.<br>$V_{max}$<br>V | $R_R \pm \Delta R_R$<br>( $V_{PTC} \leq 2.5$ V)<br>$\Omega$ | Refer. temp.<br>$T_{ref}$<br>$^{\circ}C$ | Dimensions          |                | Ordering code                 | Dimensional drawing<br>mm |
|---------------------------------------|-----------------------------------|-------------------------|---|--|---------------------|----------------|-------------------------------|---------------------------|
|                                       |                                   |                         |   |  | w<br>mm             | th<br>mm       |                               |                           |
| <b><math>V_R = 230 V_{RMS}</math></b> |                                   |                         |   |  |                     |                |                               |                           |
| A314                                  | 9.0                               | 400                     | 38.0 $\pm$ 30%  | 120                                      | 20.0 $\pm$ 0.2/-0.8 | 5.0 $\pm$ 0.25 | B59314A0120B010 <sup>1)</sup> |                           |
| <b><math>V_R = 120 V_{RMS}</math></b> |                                   |                         |   |  |                     |                |                               |                           |
| A536                                  | 10.0                              | 200                     | 10.0 $\pm$ 20%  | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59536A0135A020 <sup>1)</sup> |                           |
| A506                                  | 12.0                              | 180                     | 4.7 $\pm$ 20%   | 120                                      | 17.5 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59506A0120A020 <sup>1)</sup> |                           |
| A546                                  | 12.0                              | 180                     | 4.7 $\pm$ 20%   | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59546A0135A020 <sup>1)</sup> |                           |
| A548                                  | 12.0                              | 200                     | 6.8 $\pm$ 20%   | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59548A0135A020 <sup>1)</sup> |                           |
| <b><math>V_R = 230 V_{RMS}</math></b> |                                   |                         |   |  |                     |                |                               |                           |
| A501                                  | 6.0                               | 355                     | 33.0 $\pm$ 20%  | 135                                      | 19.5 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59501A0135A020 <sup>1)</sup> |                           |
| A550                                  | 6.0                               | 355                     | 33.0 $\pm$ 20%  | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59550A0135A020 <sup>1)</sup> |                           |
| A524                                  | 7.0                               | 300                     | 22.0 $\pm$ 20%  | 135                                      | 19.5 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59524A0135A020               |                           |
| A549                                  | 7.0                               | 300                     | 22.0 $\pm$ 20%  | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59549A0135A020 <sup>1)</sup> |                           |
| A556                                  | 8.0                               | 300                     | 15.0 $\pm$ 20%  | 135                                      | 16.0 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59556A0135A020 <sup>1)</sup> |                           |
| A544                                  | 8.0                               | 320                     | 20.0 $\pm$ 20%  | 120                                      | 17.5 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59544A0120A020 <sup>1)</sup> |                           |
| A192                                  | 8.0                               | 325                     | 25.0 $\pm$ 15/-20%  | 120                                      | 19.5 $\pm$ 0.5      | 2.5 $\pm$ 0.2  | B59192A0120A020 <sup>1)</sup> |                           |
| A196                                  | 8.0                               | 350                     | 15.0 $\pm$ 30%  | 120                                      | 19.5 $\pm$ 0.5      | 3.2 $\pm$ 0.2  | B59196A0120A020 <sup>1)</sup> |                           |
| A197                                  | 9.0                               | 350                     | 33.0 $\pm$ 30%  | 120                                      | 19.5 $\pm$ 0.5      | 3.2 $\pm$ 0.2  | B59197A0120B020 <sup>1)</sup> |                           |

<sup>1)</sup> VDE approval

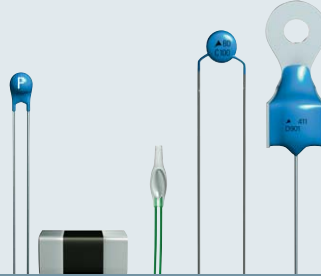
Note: PTC thermistors without encapsulation such as motor start disks must be kept absolutely clean during processing. Otherwise the operating functions of the device may be impaired.

# Limit Temperature Sensors

## Applications

Sensors for limit temperature monitoring

- In lighting applications
- In home appliances (dish washers, washing machines, ironing machines, electric cookers etc.)
- In automotive electronics
- In data and communications engineering (DC/DC converters)
- In motor windings



## Coated disks

| Type   | Sensing temperature<br>$T_{\text{sense}} \pm \Delta T$<br>°C | Rated resistance<br>$R_R$<br>Ω | Resistance<br>$R(T_{\text{sense}} - \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | $R(T_{\text{sense}} + \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | Ordering code   | Dimensional drawing<br>mm |
|--|--|--------------------------------|--|--|-----------------|---------------------------|
| <b><math>V_{\text{max}} = 30 \text{ V DC}</math></b> |  |                                |  |  |                 |                           |
| C8   | 60 ±5  | ≤250                           | ≤570   | ≥ 570  | B59008C0060A040 | <p>TPT0013-9</p>          |
|  | 70 ±5  | ≤250                           | ≤570   | ≥ 570  | B59008C0070A040 |                           |
|  | 80 ±5  | ≤250                           | ≤570   | ≥ 570  | B59008C0080A040 |                           |
|  | 90 ±5  | ≤250                           | ≤550   | ≥1330  | B59008C0090A040 |                           |
|  | 100 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0100A040 |                           |
|  | 110 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0110A040 |                           |
|  | 120 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0120A040 |                           |
|  | 130 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0130A040 |                           |
|  | 140 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0140A040 |                           |
|  | 150 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0150A040 |                           |
|  | 160 ±5   | ≤250                           | ≤550   | ≥1330  | B59008C0160A040 |                           |
|  | <b><math>V_{\text{max}} = 30 \text{ V DC}</math></b>         |                                |  |  |                 |                           |
| C100   | 10 ±5  | >5000                          | ≤2300  | ≥2300  | B59100C0010A070 | <p>TPT0646-M</p>          |
|  | 50 ±5  | < 150                          | ≤ 400  | ≥ 400  | B59100C0050A070 |                           |
|  | 60 ±5  | ≤ 100                          | ≤ 570  | ≥ 570  | B59100C0060A070 |                           |
|  | 70 ±5  | ≤ 100                          | ≤ 570  | ≥ 570  | B59100C0070A070 |                           |
|  | 80 ±5  | ≤ 100                          | ≤ 570  | ≥ 570  | B59100C0080A070 |                           |
|  | 90 ±5  | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0090A070 |                           |
|  | 100 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0100A070 |                           |
|  | 110 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0110A070 |                           |
|  | 120 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0120A070 |                           |
|  | 130 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0130A070 |                           |
|  | 140 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0140A070 |                           |
|  | 150 ±5   | ≤ 100                          | ≤ 550  | ≥1330  | B59100C0150A070 |                           |



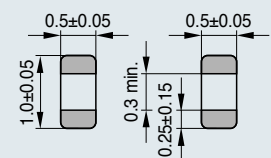
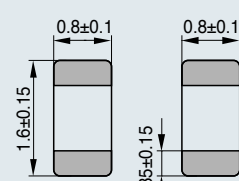
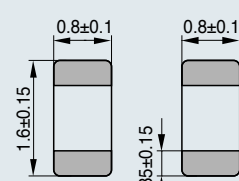
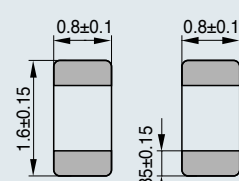
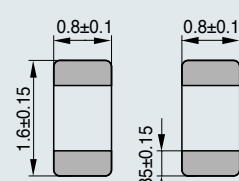
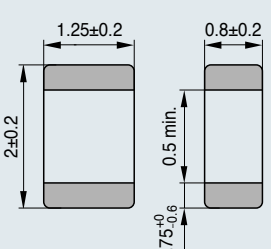
# Limit Temperature Sensors

| Motor protection sensors   |  |  |  |                 |   |
|--|--|--|--|-----------------|---|
| Type   | Sensing temperature<br>$T_{\text{sense}} \pm \Delta T$<br>°C | Resistance<br>$R(T_{\text{sense}} - \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | $R(T_{\text{sense}} + \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | Ordering code   | Dimensional drawing                             |
| <b><math>V_{\text{max}} = 30 \text{ V DC}, R_{\text{R}} \leq 100 \Omega</math></b> |  |  |  |                 | <p>mm</p> <p>Single sensor</p> <p>TPT0018-F</p> |
| M1100  | 60 ±5  | ≤ 570  | ≥ 570  | B59100M1060A070 |   |
|  | 70 ±5  | ≤ 570  | ≥ 570  | B59100M1070A070 |   |
|  | 80 ±5  | ≤ 570  | ≥ 570  | B59100M1080A070 |   |
|  | 90 ±5  | ≤ 550  | ≥1330  | B59100M1090A070 |   |
|  | 100 ±5   | ≤ 550  | ≥1330  | B59100M1100A070 |   |
|  | 110 ±5   | ≤ 550  | ≥1330  | B59100M1110A070 |   |
|  | 120 ±5   | ≤ 550  | ≥1330  | B59100M1120A070 |   |
|  | 130 ±5   | ≤ 550  | ≥1330  | B59100M1130A070 |   |
|  | 140 ±5   | ≤ 550  | ≥1330  | B59100M1140A070 |   |
|  | 145 ±5   | ≤ 550  | ≥1330  | B59100M1145A070 |   |
|  | 150 ±5   | ≤ 550  | ≥1330  | B59100M1150A070 |   |
|  | 155 ±5   | ≤ 550  | ≥1330  | B59100M1155A070 |   |
|  | 160 ±5   | ≤ 550  | ≥1330  | B59100M1160A070 |   |
|  | 170 ±7   | ≤ 570  | ≥ 570  | B59100M1170A070 |   |
|  | 180 ±7   | ≤ 570  | ≥ 570  | B59100M1180A070 |   |
| <b><math>V_{\text{max}} = 30 \text{ V DC}, R_{\text{R}} \leq 300 \Omega</math></b> |  |  |  |                 | <p>mm</p> <p>Triple sensor</p> <p>TPT0020-R</p> |
| M1300  | 100 ±5   | ≤1650  | ≥3990  | B59300M1100A070 |   |
|  | 110 ±5   | ≤1650  | ≥3990  | B59300M1110A070 |   |
|  | 120 ±5   | ≤1650  | ≥3990  | B59300M1120A070 |   |
|  | 130 ±5   | ≤1650  | ≥3990  | B59300M1130A070 |   |
|  | 140 ±5   | ≤1650  | ≥3990  | B59300M1140A070 |   |
|  | 150 ±5   | ≤1650  | ≥3990  | B59300M1150A070 |   |
|  | 155 ±5   | ≤1650  | ≥3990  | B59300M1155A070 |   |
|  | 160 ±5   | ≤1650  | ≥3990  | B59300M1160A070 |   |
|  | 170 ±7   | ≤1710  | ≥1710  | B59300M1170A070 |   |
|  | 180 ±7   | ≤1710  | ≥1710  | B59300M1180A070 |   |

Insulation resistance (test voltage)  $V_{\text{ins}} = 2.5 \text{ kV}$   
 Operating temperature ( $V \leq 7.5 \text{ V DC}$ )  $-25/T_{\text{sense}} + 23 \text{ }^\circ\text{C}$

| Probe assemblies                                     |  |  |  |  |                 |                            |
|--|--|--|--|--|-----------------|----------------------------|
| Type   | Sensing temperature<br>$T_{\text{sense}} \pm \Delta T$<br>°C | Rated resistance $R_{\text{R}}$<br>( $V_{\text{meas}} \leq 1.5 \text{ V}$ )<br>Ω | Resistance<br>$R(T_{\text{sense}} - \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | $R(T_{\text{sense}} + \Delta T)$<br>( $V_{\text{PTC}} \leq 2.5 \text{ V}$ )<br>Ω | Ordering code   | Dimensional drawing        |
| <b><math>V_{\text{max}} = 30 \text{ V DC}</math></b> |  |  |  |  |                 | <p>mm</p> <p>TPT0016-Y</p> |
| D901   | 60 ±5  | ≤100   | ≤570   | ≥ 570  | B59901D0060A040 |                            |
|  | 70 ±5  | ≤100   | ≤570   | ≥ 570  | B59901D0070A040 |                            |
|  | 80 ±5  | ≤100   | ≤570   | ≥ 570  | B59901D0080A040 |                            |
|  | 90 ±5  | ≤100   | ≤550   | ≥1330  | B59901D0090A040 |                            |
|  | 100 ±5   | ≤100   | ≤550   | ≥1330  | B59901D0100A040 |                            |
|  | 110 ±5   | ≤100   | ≤550   | ≥1330  | B59901D0110A040 |                            |
|  | 120 ±5   | ≤100   | ≤550   | ≥1330  | B59901D0120A040 |                            |
|  | 130 ±5   | ≤100   | ≤550   | ≥1330  | B59901D0130A040 |                            |

# Limit Temperature Sensors

| SMD types, standard series   |                                   |                                |   |   |        |                 | Dimensional drawing   |  |
|--|-----------------------------------|--------------------------------|---|---|--------|-----------------|---|--|
| Type   | Temp.<br>$T_{\text{sense}}$<br>°C | Rated resistance<br>$R_R$<br>Ω | Resistance tolerance<br>$\Delta R_R$<br>% | Resistance<br>$(T_{\text{sense}} - \Delta T)$   $(T_{\text{sense}} + \Delta T)$<br>kΩ |        | Ordering code   |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0402, ΔT = ±5 °C</b>                                     |                                   |                                |   |   |        |                 | <b>EIA case size 0402</b><br><br>TPT0948-M-E   |  |
| A401   | 75                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0075A062 |   |  |
|  | 85                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0085A062 |   |  |
|  | 95                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0095A062 |   |  |
|  | 105                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0105A062 |   |  |
|  | 115                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0115A062 |   |  |
|  | 125                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0125A062 |   |  |
|  | 135                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59401A0135A062 |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0603, high-ohmic series, ΔT = ±5 °C</b>                  |                                   |                                |   |   |        |                 | <b>EIA case size 0603</b><br><br>TPT0698-5-E  |  |
| A604   | 120                               | 10000                          | ±50                                       | ≤ 4700  | ≥ 4700 | B59604A0085A062 |   |  |
|  | 130                               | 10000                          | ±50                                       | ≤ 4700  | ≥ 4700 | B59604A0090A062 |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0603, ΔT = ±5 °C</b>                                     |                                   |                                |   |   |        |                 | <b>EIA case size 0603</b><br><br>TPT0698-5-E  |  |
| A601   | 75                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0075A062 |   |  |
|  | 85                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0085A062 |   |  |
|  | 95                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0095A062 |   |  |
|  | 105                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0105A062 |   |  |
|  | 115                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0115A062 |   |  |
|  | 125                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0125A062 |   |  |
|  | 135                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0135A062 |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0603, tight resistance tolerance series, ΔT = ±5 °C</b>  |                                   |                                |   |   |        |                 |   | <b>EIA case size 0603</b><br><br>TPT0698-5-E |
| A602   | 70                                | 110                            | ±15                                       | ≤ 1.1   | ≥ 1.1  | B59602A0055B062 |   |  |
| A603   | 55                                | 470                            | ±15                                       | ≤ 4.7   | ≥ 4.7  | B59603A0055A062 |   |  |
|  | 85                                | 470                            | ±15                                       | ≤ 4.7   | ≥ 4.7  | B59603A0085A062 |   |  |
|  | 105                               | 470                            | ±15                                       | ≤ 4.7   | ≥ 4.7  | B59603A0105A062 |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0603, tight temperature tolerance series, ΔT = ±3 °C</b> |                                   |                                |   |   |        |                 | <b>EIA case size 0603</b><br><br>TPT0698-5-E  |  |
| A601   | 75                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0075B062 |   |  |
|  | 85                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0085B062 |   |  |
|  | 95                                | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0095B062 |   |  |
|  | 105                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0105B062 |   |  |
|  | 115                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0115B062 |   |  |
|  | 125                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0125B062 |   |  |
|  | 135                               | 470                            | ±50                                       | ≤ 4.7   | ≥ 4.7  | B59601A0135B062 |   |  |
| <b>V<sub>max</sub> = 32 V DC, case size 0805, ΔT = ±5 °C</b>                                     |                                   |                                |   |   |        |                 | <b>EIA case size 0805</b><br><br>TPT0650-F-E |  |
| A701   | 70                                | < 1000                         |   | ≤ 5.7   | ≥ 5.7  | B59701A0070A062 |   |  |
|  | 90                                | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0090A062 |   |  |
|  | 100                               | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0100A062 |   |  |
|  | 110                               | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0110A062 |   |  |
|  | 120                               | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0120A062 |   |  |
|  | 130                               | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0130A062 |   |  |
|  | 140                               | < 1000                         |   | ≤ 5.5   | ≥ 13.3 | B59701A0140A062 |   |  |

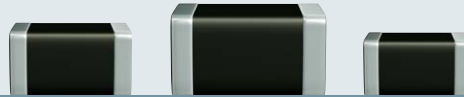
Suitable for reflow soldering only.

Note: In order to limit self heating effects the electrical power during measurement should be below 2 mW for case size 0402, below 4 mW for case size 0603 and below 6 mW for case size 0805.

# Limit Temperature Sensors

## Features

- Wave solderable up to 280 °C
- Qualification, based on AEC-Q 200, Rev. C
- Elevated reliability performance
- Second sensor point at 47 kΩ for case sizes 0402 and 0603



## SMD types, superior series

| Type  | Temp.<br>$T_{sense}$<br>°C | Rated resistance<br>$R_R$<br>Ω | Resistance tolerance<br>$\Delta R_R$<br>% | Resistance                   |                              | Ordering code   | Dimensional drawing<br>mm                    |
|---|----------------------------|--------------------------------|---|------------------------------|------------------------------|-----------------|--|
|   |                            |                                |   | $(T_{sense}-\Delta T)$<br>kΩ | $(T_{sense}+\Delta T)$<br>kΩ |                 |  |
| <b><math>V_{max} = 32</math> V DC, case size 0402, <math>\Delta T = \pm 5</math> °C</b> |                            |                                |   |                              |                              |                 | <b>EIA case size 0402</b><br><br>TPT0948-M-E |
| A421  | 75                         | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0075A062 |  |
|   | 85                         | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0085A062 |  |
|   | 95                         | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0095A062 |  |
|   | 105                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0105A062 |  |
|   | 115                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0115A062 |  |
|   | 125                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0125A062 |  |
|   | 135                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59421A0135A062 |  |
| <b><math>V_{max} = 32</math> V DC, case size 0603, <math>\Delta T = \pm 5</math> °C</b> |                            |                                |   |                              |                              |                 | <b>EIA case size 0603</b><br><br>TPT0698-5-E |
| A641  | 85                         | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0085A062 |  |
|   | 95                         | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0095A062 |  |
|   | 105                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0105A062 |  |
|   | 115                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0115A062 |  |
|   | 125                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0125A062 |  |
|   | 135                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0135A062 |  |
|   | 145                        | 470                            | ±50                                       | ≤ 4.7                        | ≥ 4.7                        | B59641A0145A062 |  |
| <b><math>V_{max} = 32</math> V DC, case size 0805, <math>\Delta T = \pm 5</math> °C</b> |                            |                                |   |                              |                              |                 | <b>EIA case size 0805</b><br><br>TPT0650-F-E |
| A721  | 70                         | 680                            | ±50                                       | ≤ 5.7                        | ≥ 5.7                        | B59721A0070A062 |  |
|   | 80                         | 680                            | ±50                                       | ≤ 5.7                        | ≥ 5.7                        | B59721A0080A062 |  |
|   | 90                         | 680                            | ±50                                       | ≤ 5.5                        | ≥ 13.3                       | B59721A0090A062 |  |
|   | 100                        | 680                            | ±50                                       | ≤ 5.5                        | ≥ 13.3                       | B59721A0100A062 |  |
|   | 110                        | 680                            | ±50                                       | ≤ 5.5                        | ≥ 13.3                       | B59721A0110A062 |  |
|   | 120                        | 680                            | ±50                                       | ≤ 5.5                        | ≥ 13.3                       | B59721A0120A062 |  |
|   | 130                        | 680                            | ±50                                       | ≤ 5.5                        | ≥ 13.3                       | B59721A0130A062 |  |

<sup>1)</sup> UL approval expected March 2010.

Suitable for reflow and wave soldering.

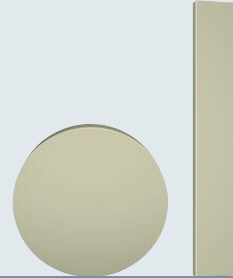
Note: In order to limit self heating effects the electrical power during measurement should be below 2 mW for case size 0402, below 4 mW for case size 0603 and below 6 mW for case size 0805.

# Heating Elements

## Applications

Application in all sorts of heating systems

- In household appliances (hot plates, water heaters, hot-adhesive pistols, hair curlers etc.)
- In automotive electronics (preheating of diesel filter and injection system, additional heating of passenger compartment)
- In medical appliances (vaporizers, inhalators)



## Metalized round disks

| Type  | Reference temperature<br>$T_{ref}$<br>°C | Rated resistance<br>( $V_{meas} \leq 1.5 V$ )<br>$R_R$<br>$\Omega$ | Ordering code                 | Dimensional drawing<br>mm   |
|---|--|--|-------------------------------|---|
| <b><math>V_{max} = 30 V DC, \Delta R_R = \pm 30\%</math><sup>1)</sup></b> |  |  |                               |   |
| A60   | 0  | $\geq 320$   | B59060A0000A010               | <p>12±0.2      1±0.2</p> <p>Termination      TPT0457-Q-E</p> <p>Contact surface: silver</p> |
|   | 40                                       | 9  | B59060A0040A010               |   |
|   | 60                                       | 9  | B59060A0060A010               |   |
|   | 80                                       | 9  | B59060A0080A010               |   |
|   | 120                                      | 9  | B59060A0120A010               |   |
|   | 160                                      | 9  | B59060A0160A010               |   |
|   | 180                                      | 9  | B59060A0180A010               |   |
|   | 220                                      | 9  | B59060A0220A010               |   |
| <b><math>V_{max} = 265 V AC, \Delta R_R = \pm 35\%</math></b>             |  |  |                               |   |
| A53   | 110                                      | 4200   | B59053A0110A010 <sup>2)</sup> | <p>8±0.2      3±0.2</p> <p>Termination      TPT0309-Z-E</p> <p>Contact surface: silver</p>  |
|   | 130                                      | 4200   | B59053A0130A010               |   |
|   | 150                                      | 4200   | B59053A0150A010               |   |
|   | 180                                      | 4200   | B59053A0180A010               |   |
|   | 220                                      | 6000   | B59053A0220A010 <sup>2)</sup> |   |

<sup>1)</sup> Tolerance not valid for B59060A0000A010

<sup>2)</sup> UL approved

Components are suitable for pressure contacting.

Note: PTC thermistors without encapsulation must be kept absolutely clean during processing since contamination may lead to malfunction.

# Heating Elements

| Metalized rectangular disks                                |  |  |                               |                               |
|--|--|--|-------------------------------|-------------------------------|
| Type   | Reference temperature<br>$T_{ref}$<br>°C | Rated resistance<br>( $V_{meas} \leq 1.5 V$ )<br>$R_R$<br>$\Omega$ | Ordering code                 | Dimensional drawing<br><br>mm |
| <b><math>V_{max} = 12 V, \Delta R_R = \pm 50\%</math></b>  |  |  |                               |                               |
| R41  | 80                                       | 3.2  | B59041R0080A010               |                               |
|  | 120                                      | 3.2  | B59041R0120A010               |                               |
|  | 160                                      | 3.2  | B59041R0160A010               |                               |
|  | 180                                      | 3.2  | B59041R0180A010               |                               |
|  | 220                                      | 6.4  | B59041R0220A010               |                               |
| <b><math>V_{max} = 230 V, \Delta R_R = \pm 50\%</math></b> |  |  |                               |                               |
| R102   | 50                                       | 700  | B59102R0050A010 <sup>1)</sup> |                               |
|  | 70                                       | 700  | B59102R0070A010 <sup>1)</sup> |                               |
|  | 90                                       | 700  | B59102R0090A010 <sup>1)</sup> |                               |
|  | 110                                      | 700  | B59102R0110A010 <sup>1)</sup> |                               |
|  | 130                                      | 700  | B59102R0130A010 <sup>1)</sup> |                               |
|  | 150                                      | 700  | B59102R0150A010 <sup>1)</sup> |                               |
|  | 180                                      | 700  | B59102R0180A010 <sup>1)</sup> |                               |
|  | 220                                      | 1000   | B59102R0220A010 <sup>2)</sup> |                               |
|  | 240                                      | 1000   | B59102R0240A010               |                               |
|  | 270                                      | 1300   | B59102R0270A010 <sup>2)</sup> |                               |

<sup>1)</sup> UL approval with  $V_{max}$  230 V

<sup>2)</sup> UL approval with  $V_{max}$  140 V

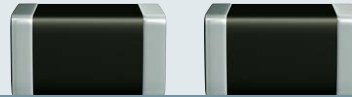
Components are suitable for pressure contacting.

Note: PTC thermistors without encapsulation must be kept absolutely clean during processing since contamination may lead to malfunction.

# Thermal Management

## Applications

- LED driver circuits
- Thermal management
- Temperature compensation



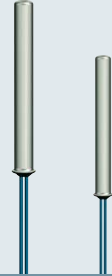
## Thermal management in LED driver circuits

| Type   | Temperature                              | Rated resistance<br>$R_R$<br>$\Omega$ | Resistance   |  | Temperature                             |  | Ordering code   | Dimensional drawing<br><br>mm         |
|--|--|---------------------------------------|--|--|---|--|-----------------|---------------------------------------|
|  | $T_{\text{sense}}$<br>$^{\circ}\text{C}$ |                                       | $(T_{\text{sense}} - 5^{\circ}\text{C})$<br>k $\Omega$ | $(T_{\text{sense}} + 5^{\circ}\text{C})$<br>k $\Omega$ | $(@ 2 \cdot R_R)$<br>$^{\circ}\text{C}$ | (typ.)<br>$(@ R_{\text{min}})$<br>$^{\circ}\text{C}$ |                 |                                       |
| <b><math>V_{\text{max}} = 32 \text{ V DC}</math>, <math>\Delta R_R = \pm 15\%</math>, EIA size case 0603</b> |  |                                       |  |  |   |  |                 |                                       |
| A603   | 55                                       | 470                                   | < 4.7  | > 4.7  | $45 \pm 5$                              | 5  | B59603A0055A062 | <p>Termination</p> <p>TPT0698-5-E</p> |
| A602   | 70                                       | 110                                   | < 1.1  | > 1.1  | $57 \pm 3$                              | 15   | B59602A0055B062 |                                       |
| A603   | 85                                       | 470                                   | < 4.7  | > 4.7  | $75 \pm 5$                              | 40   | B59603A0085A062 |                                       |
| A603   | 105                                      | 470                                   | < 4.7  | > 4.7  | $95 \pm 5$                              | 55   | B59603A0105A062 |                                       |

# Level Sensors

## Applications

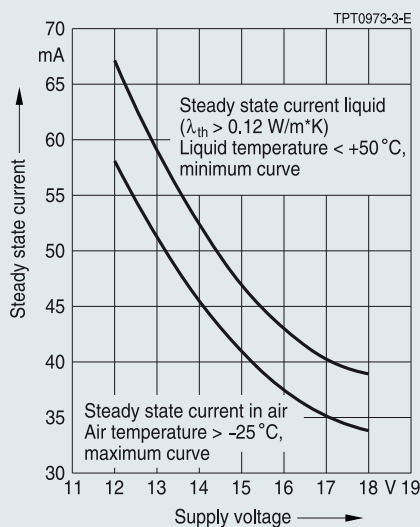
- Liquid level detection in tanks (oil, gas, water, etc.) and home appliances



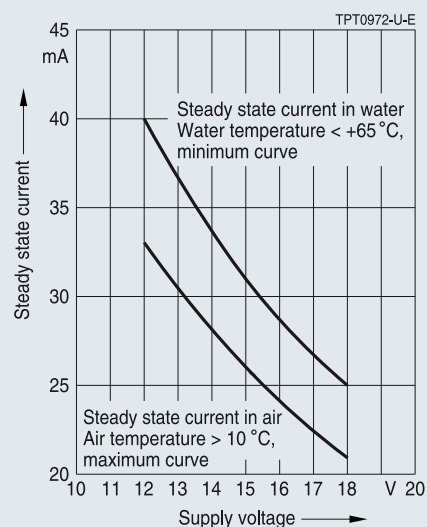
## Point level sensors

| Type   | Max. operat. voltage<br>$V_{max}$<br>V DC | Rated resistance<br>$R_R$<br>$\Omega$ | Setting time<br>$t_E$<br>s | Surface temperature (V = 18 V)<br>$T_{surf}$<br>$^{\circ}C$ | Ordering code   | Dimensional drawing<br>mm                   |
|--|---|---------------------------------------|----------------------------|---|-----------------|---|
| <b>Stainless steel case, oil level sensing</b>   |   |                                       |                            |   |                 |   |
| D1050  | 18  | 40 ... 80                             | 60                         | < 90  | B59050D1120B040 | <p style="text-align: right;">TPT0957-L</p> |
| <b>Stainless steel case, water level sensing</b> |   |                                       |                            |   |                 |   |
| D1050  | 18  | 40 ... 80                             | 60                         | < 80  | B59050D1100B040 |   |

### Limits of operating range for oil level sensing



### Limits of operating range for water level sensing



# 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 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.

## Mounting

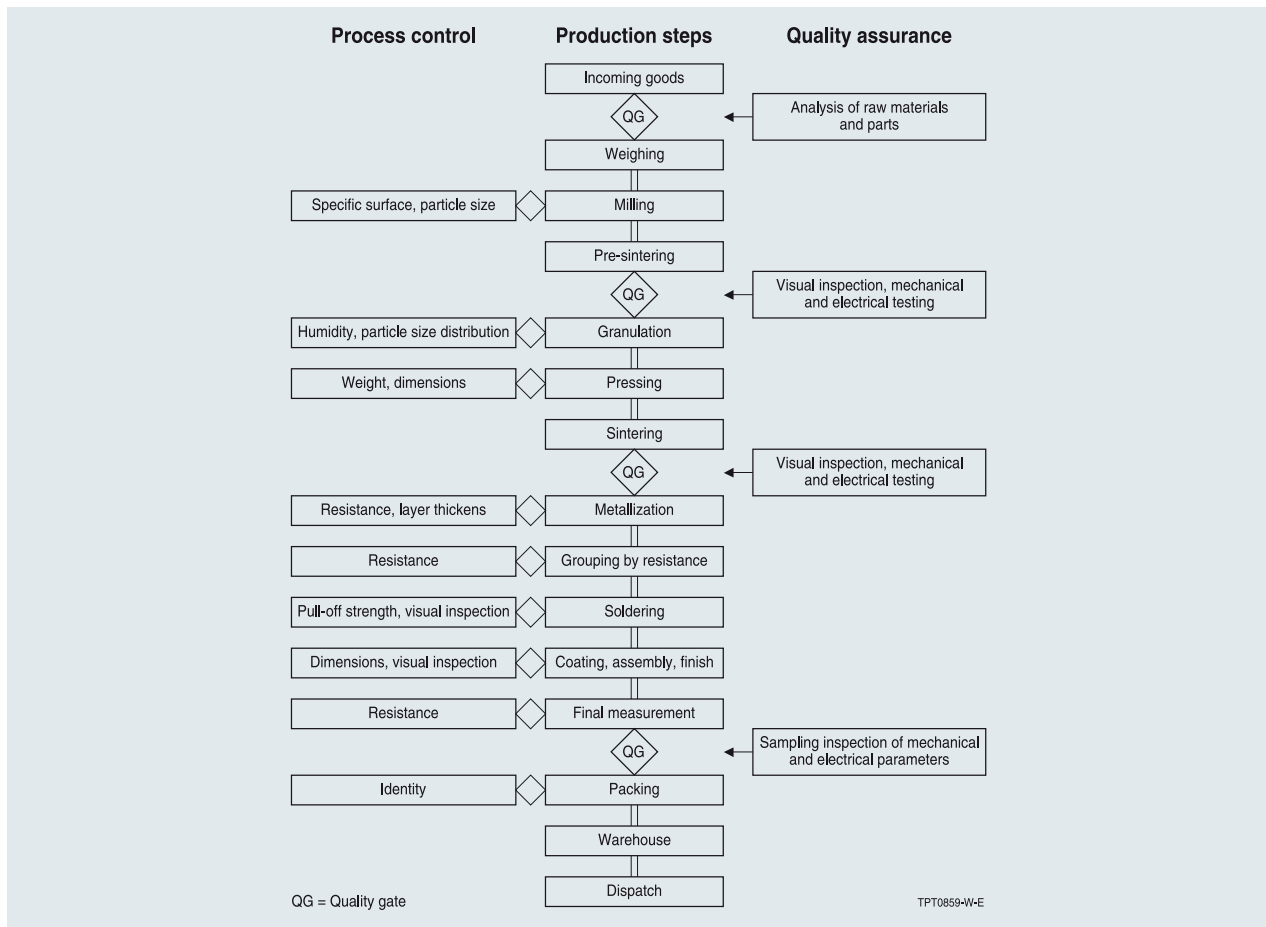
- Electrode must not be scratched before/during/after the mounting process.
- Contacts and housing used for assembly with thermistor have to be clean before mounting. Especially grease or oil must be removed.
- When PTC thermistors are encapsulated with sealing material, the precautions given in chapter "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).

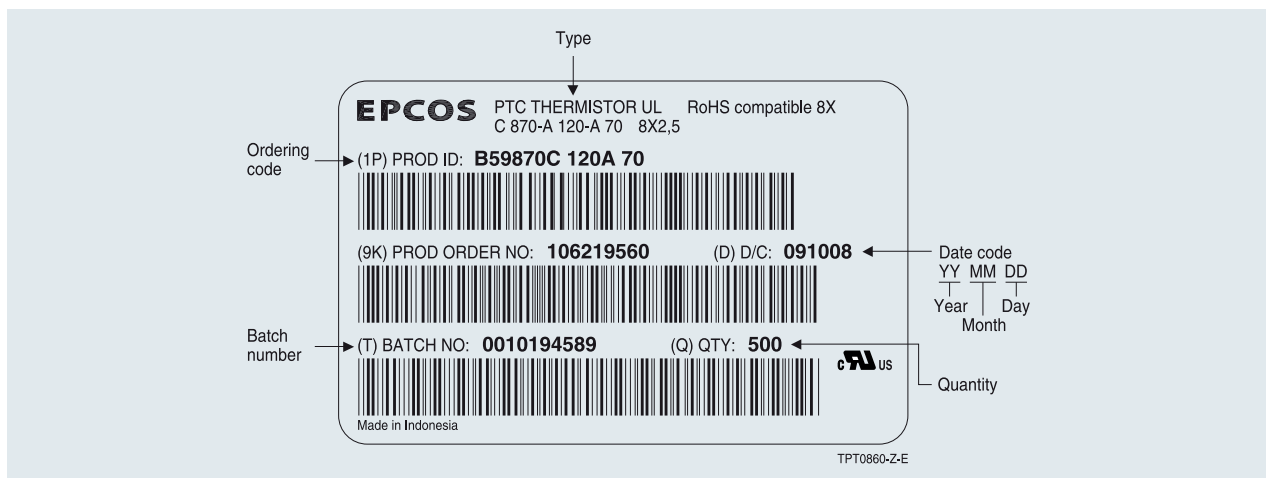


# Process Control, Production Steps, Quality Assurance



General

## Packing Information



### Barcode identification

Radial-lead thermistors:  
Tape packaging in accordance with IEC 60286-2

SMD thermistors:  
Tape packaging in accordance with IEC 60286-3

# Symbols and Terms

| Symbol  | Term  |
|---|---|
| $I_{in, coil}$  | Inrush current through degaussing coil                            |
| $I_{max}$   | Operating current   |
| $I_R$   | Rated current ( $T = T_R$ )                                       |
| $I_{PTC}$   | PTC current   |
| $I_r, coil$   | Residual current through degaussing coil                          |
| $R_R$   | Rated resistance ( $T = T_R$ )                                    |
| $R_{25}$  | Rated resistance ( $T = 25\text{ °C}$ )                           |
| $R_{25, match}$   | Resistance matching per reel/packing unit at $25\text{ °C}$       |
| $R_{PTC}$   | PTC resistance (at specified temperature)                         |
| $T$   | Operating temperature   |
| $T_R$   | Rated temperature (if not otherwise stated $T_R = 25\text{ °C}$ ) |
| $T_{sense}$   | Nominal threshold temperature                                     |
| $T_{ref}$   | Reference temperature   |
| $V_{max}$   | Maximum operating voltage   |
| $V_{Smax}$  | Maximum switching voltage   |
| $V_{meas}$  | Measuring voltage   |
| $\Delta$  | Tolerance   |
| $e$   | Lead spacing (in mm)  |
| <b>Abbreviations/General notes</b>  |   |
| <b>SMD</b>  | Surface-mount devices   |
|  | UL approval   |
|   | All dimensions are given in mm.                                   |

# Get in Contact

## Europe

### Austria, Bulgaria, Greece, Macedonia

EPCOS OHG  
Vienna/Austria  
T +43 51 70 72 56 30  
F +43 51 70 75 56 45  
sales.csee@epcos.com

### Czech Republic

EPCOS s.r.o.  
Prague  
T +420 2 33 03 22 81  
F +420 2 33 03 22 89  
sales.czech@epcos.com

### Finland

EPCOS Nordic OY  
Espoo  
T +358 10 5 11 32 00  
F +358 10 5 11 22 85  
sales.nordic@epcos.com

### France, Belgium, Luxembourg, Malta, Netherlands

EPCOS SAS  
Saint-Denis/France  
T +33 1 49 46 67 89  
F +33 1 49 46 67 67  
sales.france@epcos.com

### Germany, Liechtenstein, Switzerland

EPCOS AG  
Customer Service  
Munich/Germany  
T (D) 0180 500 33 48  
(0,14 Euro/min.)  
(CH) 08 48 37 26 71  
F +49 89 63 62 80 10  
sales.germany@epcos.com

### Hungary

EPCOS Elektronikai  
Alkatrész Kft.  
Budapest  
T +36 1 436 07 20  
F +36 1 436 07 21  
sales.hungary@epcos.com

### Italy

Infineon Technologies Italia s.r.l.  
Settore EPCOS  
Milan  
T +39 02 25 20 44 265  
F +39 02 25 20 44 380  
sales.italy@epcos.com

### Poland, Latvia, Lithuania

EPCOS Polska Sp. z o.o  
Warsaw/Poland  
T +48 22 24 60 409  
F +48 22 24 60 400  
sales.poland@epcos.com

### Portugal

EPCOS 2 Portugal LDA  
Évora  
T +351 91 75 67 927  
F +351 21 49 33 476  
sales.portugal@epcos.com

## Romania

EPCOS Sales Representative  
Timisoara  
T +40 72 31 14 111  
sales.romania@epcos.com

## Russia, Belarus, Kazakhstan, Moldavia, Ukraine

OOO EPCOS  
Moscow/Russia  
T +7 495 737 24 17 / 18  
F +7 495 737 23 46  
sales.cis@epcos.com

## Slovakia

EPCOS Sales Representative  
Dolný Kubín  
T +42 1 43 5 82 36 73  
F +42 1 43 5 82 37 33  
sales.slovakia@epcos.com

## Slovenia, Serbia, Croatia, Bosnia & Herzegovina, Montenegro

EPCOS Sales Representative  
Škofljica/Slovenia  
T +386 599 56 35 3  
F +386 599 56 35 4  
sales.slovenia@epcos.com

## Spain

EPCOS Electronic Components  
S.A.  
Getafe  
T +34 91 514 71 61  
F +34 91 514 70 14  
sales.iberia@epcos.com

## Sweden, Estonia, Iceland, Denmark, Norway

EPCOS Nordic AB  
Kista/Sweden  
T +46 8 4 77 27 00  
F +46 8 4 77 27 01  
sales.nordic@epcos.com

## Turkey

EPCOS AG  
Liaison Office  
Istanbul  
T +90 216 5 69 81 01  
F +90 216 4 64 07 56  
sales.turkey@epcos.com

## United Kingdom, Ireland

EPCOS UK Ltd.  
Bracknell/UK  
T +44 13 44 38 15 10  
F +44 13 44 38 15 12  
sales.uk@epcos.com

## Asia

### Afghanistan, Iran, Iraq, Jordan, Lebanon, Syria

EPCOS AG  
Liaison Office  
Istanbul/Turkey  
T +90 216 5 69 81 01  
F +90 216 4 64 07 56  
sales.turkey@epcos.com

## China

EPCOS (Shanghai) Ltd.  
Shanghai  
T +86 21 33 02 46 20  
F +86 21 63 91 68 89  
sales.cn@epcos.com

## Hong Kong

EPCOS Limited  
Hong Kong  
T +85 2 31 01 56 00  
F +85 2 31 01 56 46  
sales.cn@epcos.com

## India, Bahrain, Bangladesh, Kuwait, Nepal, Oman, Pakistan, Qatar, Saudi Arabia, Sri Lanka, United Arab Emirates

EPCOS India Private Ltd.  
Bangalore/India  
T +91 80 40 39 06 15  
F +91 80 40 39 06 03  
sales.in@epcos.com

## Israel

Nisko Projects Electronics &  
Communications (1999) Ltd.  
Tel Aviv  
T +972 37 65 73 00  
F +972 37 65 73 33  
sales.israel@epcos.com

## Japan

EPCOS KK  
Yokohama  
T +81 45 4 78 72 00  
F +81 45 4 78 72 25  
sales.jp@epcos.com

## Korea

EPCOS Korea LLC  
Seoul  
T +82 2 21 56 68 18  
F +82 2 21 56 68 98  
sales.kr@epcos.com

## Malaysia

EPCOS SDN. BHD.  
Kuala Lumpur  
T +60 3 79 60 81 80  
F +60 3 79 60 81 82  
sales.asean@epcos.com

## Philippines

Siemens Inc.  
Manila  
T +63 2 8 78 94 44  
F +63 2 8 78 94 40  
sales.asean@epcos.com

## Singapore, Indonesia, Thailand, Vietnam

EPCOS PTE LTD  
Singapore  
T +65 68 41 20 11  
F +65 67 44 69 92  
sales.asean@epcos.com

## Taiwan

EPCOS Taiwan Co. Ltd.  
Taipei  
T +886 2 26 55 76 76  
F +886 2 55 59 02 88  
sales.tw@epcos.com

## Americas

### USA, Canada, Mexico

EPCOS, Inc.  
Iselin, NJ/USA  
T +1 732 9 06 43 00  
F +1 732 9 06 43 95  
sales.usa@epcos.com

### South America

EPCOS do Brasil Ltda.  
São Paulo/Brazil  
T +55 11 36 12 50 30  
F +55 11 36 12 50 30  
sales.br@epcos.com

## Australia

### Australia, New Zealand

Electronic Component  
Solutions Pty Ltd  
Melbourne/Australia  
T +61 3 85 61 19 99  
F +61 3 95 74 70 55  
sales.au@epcos.com

## Africa

### Republic of South Africa

Electrocomp (PTY) Ltd.  
Sandton  
T +27 11 458 90 00 32  
F +27 11 458 90 34  
sales.southernafrica@epcos.com

## Egypt

Siemens Ltd.  
EPCOS Division  
Cairo  
T +202 3 333 36 69  
F +202 3 333 36 07  
sales.egypt@epcos.com

## Morocco, Tunisia

EPCOS SAS  
Saint-Denis/France  
T +33 1 49 46 67 89  
F +33 1 49 46 67 67  
sales.france@epcos.com

10/09

The addresses of our worldwide distributors and regional sales offices are available at [www.epcos.com/sales](http://www.epcos.com/sales)

© EPCOS AG 2009, Corporate Center, P.O.Box 80 17 09, 81617 Munich, Germany, T +49 89 636 09, F +49 89 636 226 89  
Reproduction, publication and dissemination of this publication and the information contained therein without EPCOS' prior express consent is prohibited.

