PTC thermistors

Limit temperature sensors,
SMD, EIA case size 0402, 0603 and 0805
with ±3 °C and ±5 °C tolerance

Series/Type:

Date: April 2008

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Limit temperature sensors

EIA size 0402, 0603 and 0805

Applications

- DC/DC converters
- Home appliances
- Dimmers
- Electronic ballasts
- Temperature management in automotive electronics
- Over temperature protection of power transistors and power ICs (e.g. in battery pack, notebook)
- SMPS

Features

- Thermistor chip with lead-free tinned terminations
- Small size
- Fast and reliable response
- Suitable for reflow soldering only
- RoHS-compatible
- Lead-free (total Pb content <0.1%), for T_{sense} ≤125 °C, except B59602A... and B59603A...
- UL approval to UL 1434 for B59601A... and B59604A... (file number E69802)

Options

- Other T_{sense} values on request

Delivery mode

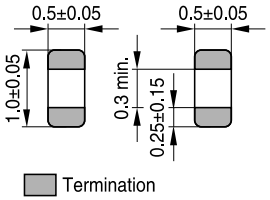
- Blister tape, 180-mm reel with 8-mm tape, taping to IEC 60286-3

General technical data

Max. operating voltage	(T_A= −40 °C ... T_{sense} +15 K)	V_{max}	32	VDC
Operating temperature range	($V \leq V_{max}$)	T_{op}	−40/ T_{sense} +15	°C

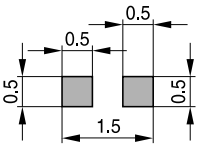
Dimensional drawings in mm

EIA case size 0402



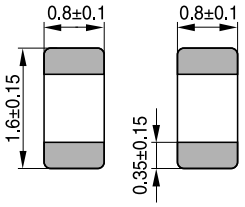
TPT0948-M-E

Solder pad



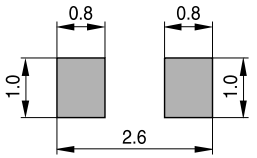
TPT0949-V

EIA case size 0603



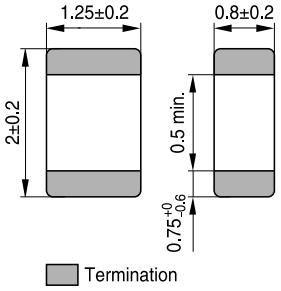
TPT0698-5-E

Solder pad



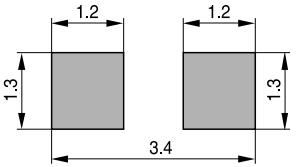
TPT0899-A

EIA case size 0805



TPT0650-F-E

Solder pad



TPT0870-7

Recommended maximum dimensions (mm)

Electrical specifications and ordering codes

T_{sense} °C	R_R Ω	ΔR_R %	R (T_{sense} +ΔT) kΩ	R (T_{sense} −ΔT) kΩ	R (T_{sense} +10 K) kΩ	R (T_{sense} +15 K) kΩ	Ordering code
Case size 0402, standard series, ΔT = ±5 °C							
105	470	±50	≤ 4.7	≥ 4.7			B59401A0105A062
115	470	±50	≤ 4.7	≥ 4.7			B59401A0115A062
Case size 0603, high ohmic series, ΔT = ±5 °C							
120	10000	±50	≤ 4700	≥ 4700			B59604A0085A062
130	10000	±50	≤ 4700	≥ 4700			B59604A0090A062
Case size 0603, standard series, ΔT = ±5 °C							
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
Case size 0603, tight resistance tolerance series, ΔT = ±5 °C							
70	110	±15	≤ 1.1	≥ 1.1			B59602A0055B062
55	470	±15	≤ 4.7	≥ 4.7			B59603A0055A062
85	470	±15	≤ 4.7	≥ 4.7			B59603A0085A062
105	470	±15	≤ 4.7	≥ 4.7			B59603A0105A062
Case size 0603, tight temperature tolerance series, ΔT = ±3 °C							
75	470	±50	≤ 4.7	≥ 4.7			B59601A0075B062
85	470	±50	≤ 4.7	≥ 4.7	≥ 15		B59601A0085B062
95	470	±50	≤ 4.7	≥ 4.7	≥ 40		B59601A0095B062
105	470	±50	≤ 4.7	≥ 4.7	≥ 40		B59601A0105B062
115	470	±50	≤ 4.7	≥ 4.7	≥ 40		B59601A0115B062
125	470	±50	≤ 4.7	≥ 4.7	≥ 40		B59601A0125B062
135	470	±50	≤ 4.7	≥ 4.7	≥ 40		B59601A0135B062
Case size 0805, standard series, ΔT = ±5 °C							
70	< 1000		≤ 5.7	≥ 5.7		≥ 40[1)]	B59701A0070A062
90	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0090A062
100	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0100A062
110	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0110A062
120	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0120A062
130	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0130A062
140	< 1000		≤ 5.5	≥ 13.3		≥ 40	B59701A0140A062

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.

1) R (T_{sense} +25 °C)

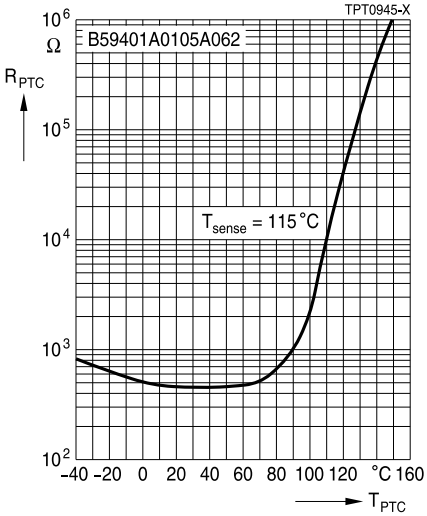
Reliability data

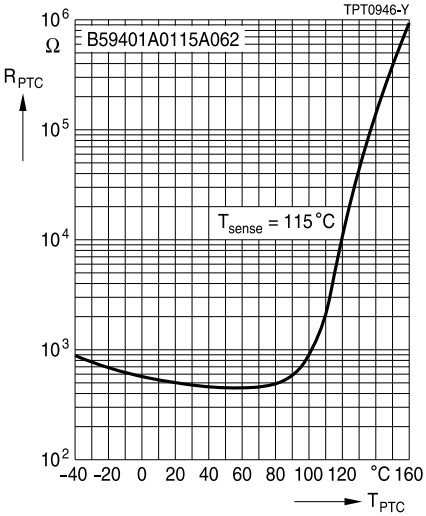
Test	Standard	Test conditions	$\lvert\Delta R_{25}/R_{25}\rvert$
Electrical endurance, const. at 85 °C	IEC 60738-1	Storage at V_{max} T = 85 °C t : 1000 h	< 25%
Damp heat	IEC 60068-2-3	Storage at 40 °C Relative humidity: 93% Duration: 56 days	< 10%
Rapid change of temperature in air	IEC 60068-2-14, Test Na	−25 °C, 125 °C Number of cycles: 5 t : 30 min	< 10%
Vibration	IEC 60068-2-6, Test Fc	f = 10-55-10 Hz h = 0.75 mm (respectively 10 g) t = 3 · 2 h	< 5%
Bump	IEC 60068-2-27	Pulse shape: half-sine a = 50 g Pulse duration: 1 ms; 6 · 3 pulses	< 5%
Climatic sequence	IEC 60068-2-30	Dry heat: T = 125 °C, t : 16 h Damp heat first cycle Cold: T = −25 °C, t : 2 h Damp heat 5 cycles	< 10%
Adhesive strength on PCB		Shearing of the component soldered on PCB by a force of 5 N in normal to components longitudinal axis	No visible damage

SMD

Characteristics (typical) for type A401

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

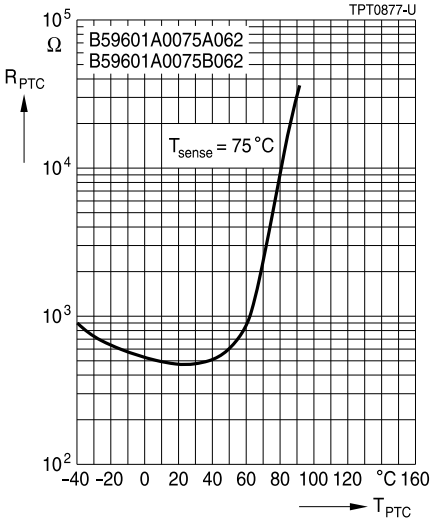


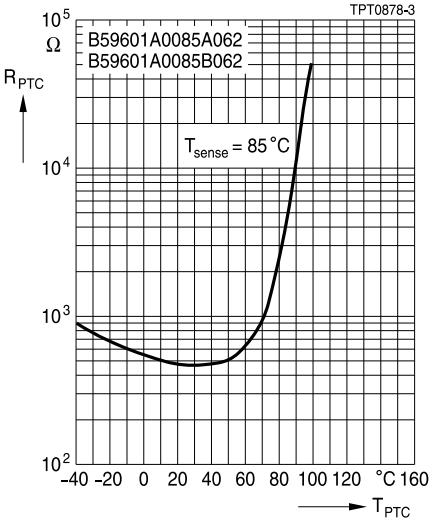


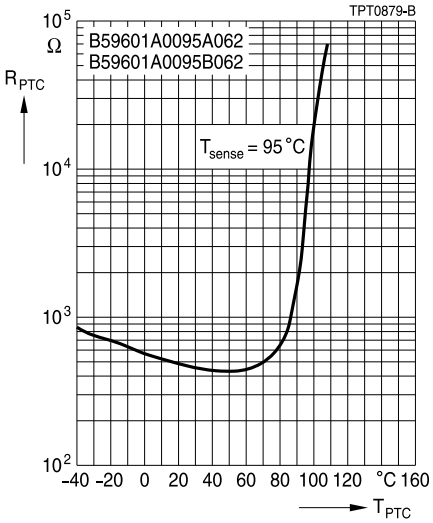
SMD

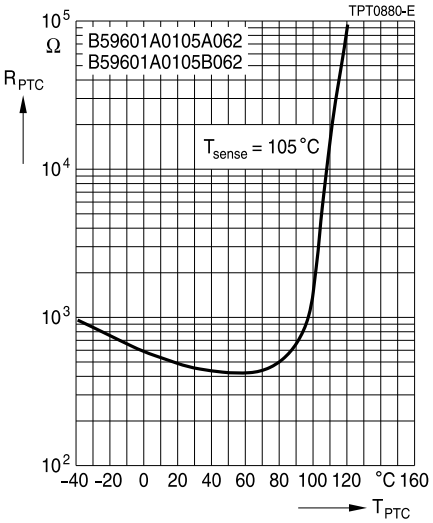
Characteristics (typical) for type A601

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





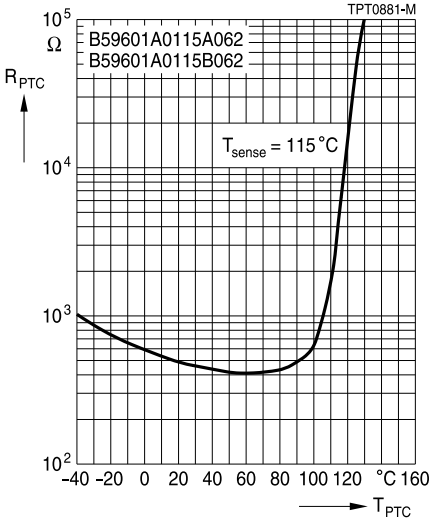


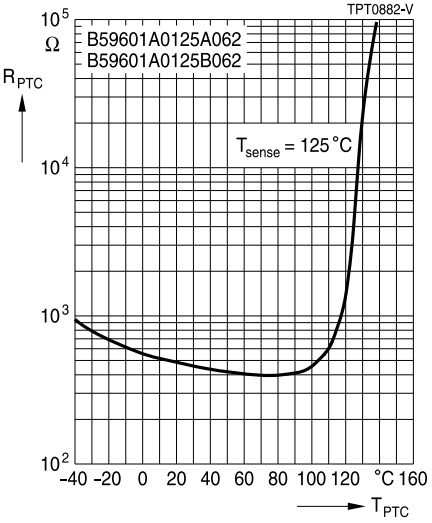


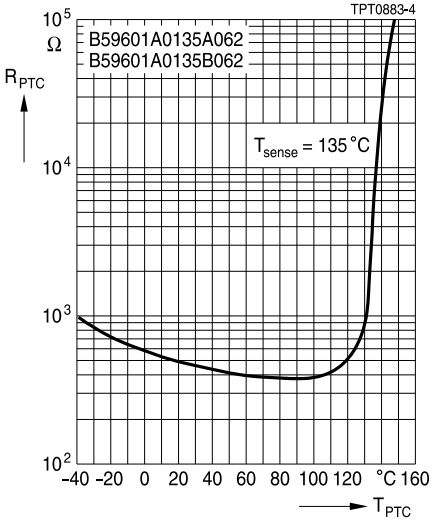
SMD

Characteristics (typical) for type A601

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

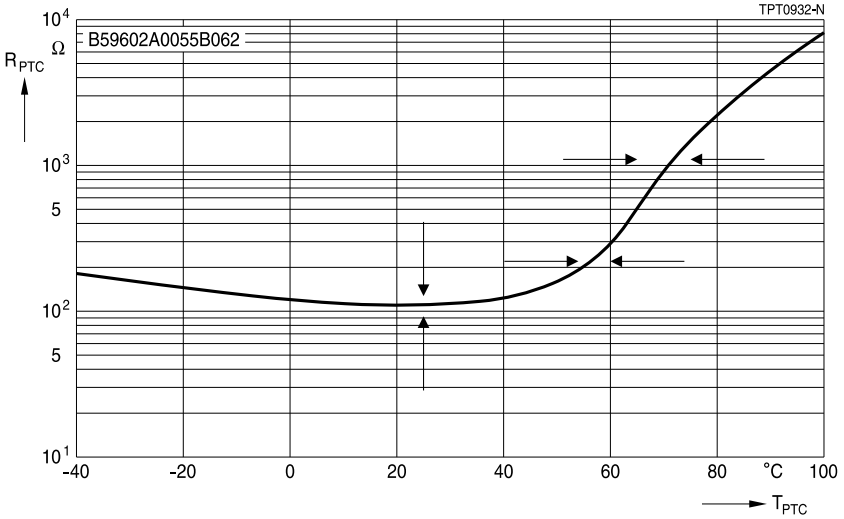


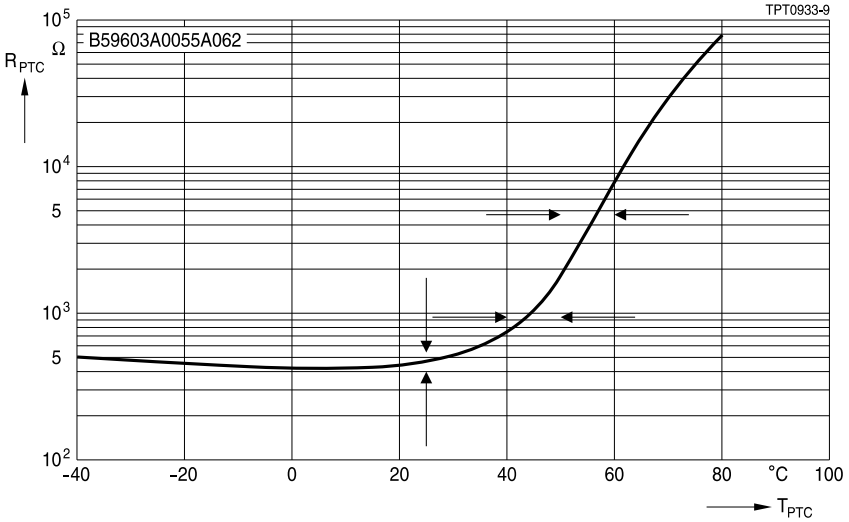




Characteristics (typical) for type A602 and A603

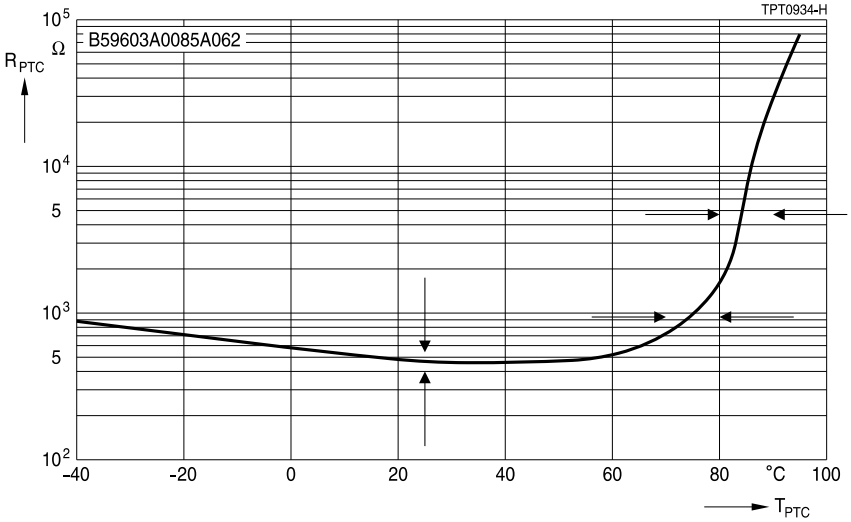
PTC resistance R_{PTC} versus PTC temperature T_{PTC}
(measured at low signal voltage)

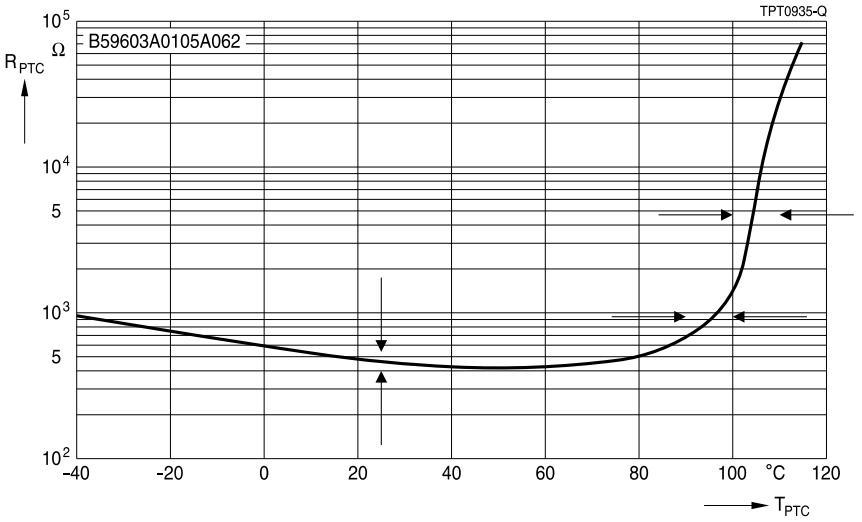




Characteristics (typical) for type A603

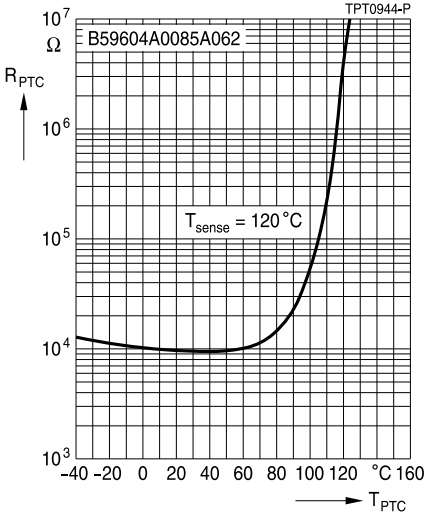
PTC resistance R_{PTC} versus PTC temperature T_{PTC}
(measured at low signal voltage)

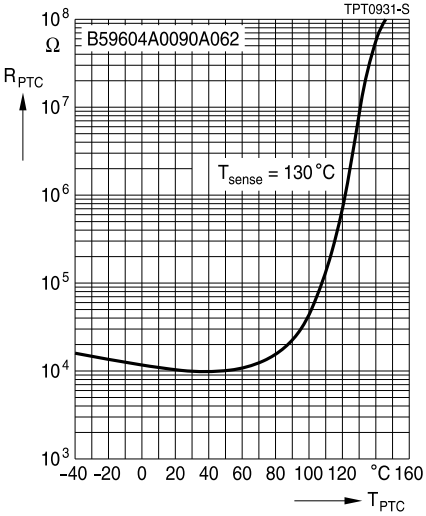




Characteristics (typical) for type A604

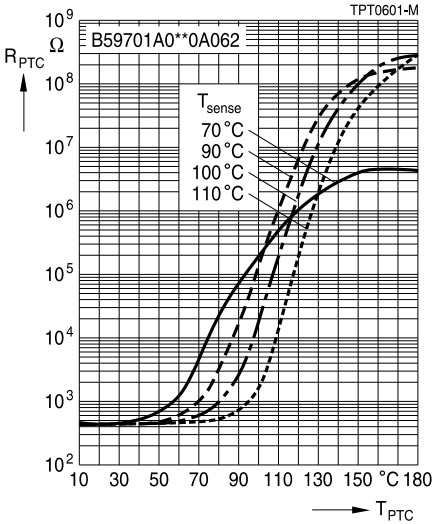
PTC resistance R_{PTC} versus PTC temperature T_{PTC}
(measured at low signal voltage)

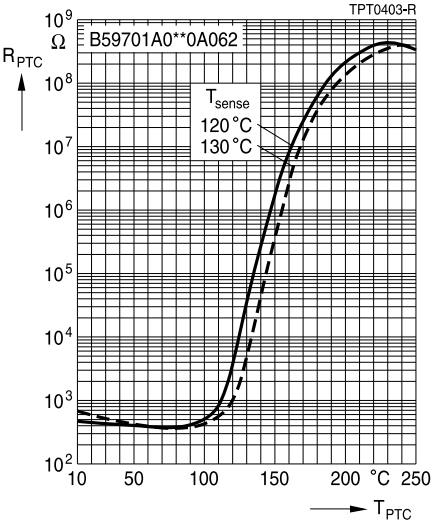


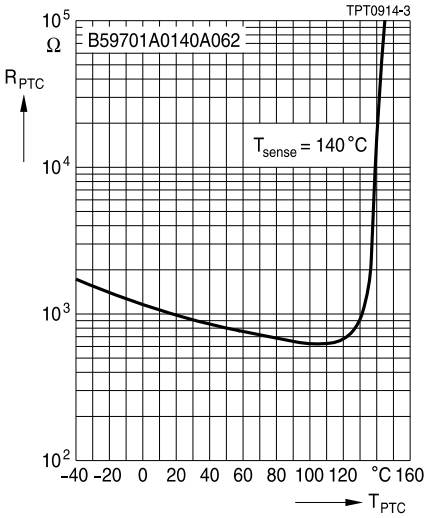


Characteristics (typical) for type A701

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







Cautions and warnings

General

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

Storage

- Store thermistors only in original packaging. Do not open the package before storage.
- Storage conditions in original packaging: storage temperature −25 °C ... +45 °C, relative humidity ≤75% annual mean, maximum 95%, dew precipitation is inadmissible.
- Avoid contamination of thermistors surface during storage, handling and processing.
- Avoid storage of thermistor in harmful environment with effect on function on long-term operation (examples given under operation precautions).
- Use thermistor within 6 months after delivery.

Handling

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

Soldering (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).

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 lifesaving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
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