

Platinum-Chip Temperature Sensors in SMD Design Type according to DIN EN 60751

- For temperatures from -50 to +150 °C (-70 to +250 °C)
- In accordance with DIN EN 60751, nominal values Pt100, Pt500, and Pt1000
- Tolerance classes F0.1, F0.15, F0.3 (standard), F0.6
- SMD design type 1206 (3216M) and 0805 (2012M)
- Gold-plated nickel wrap-around contact
- Solderability according to IEC / DIN EN 600068-2-58
- Belt packaging according to DIN IEC 60286-3
- High load capacity

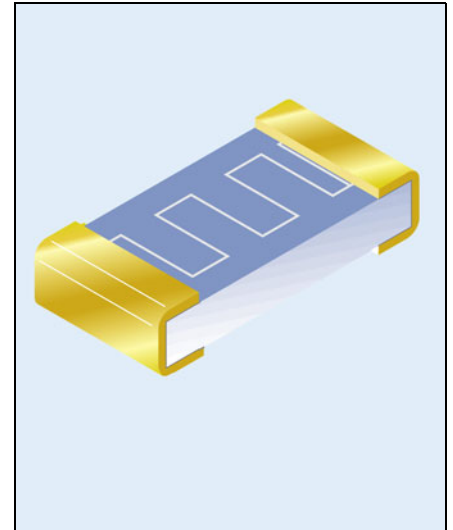
Introduction

Platinum-chip temperature sensors belong to the category of thin-film temperature sensors. During the manufacturing of these temperature sensors, a thin layer of platinum is deposited on a substrate of ultrapure aluminium oxide ceramic and structured in a meander-style pattern.

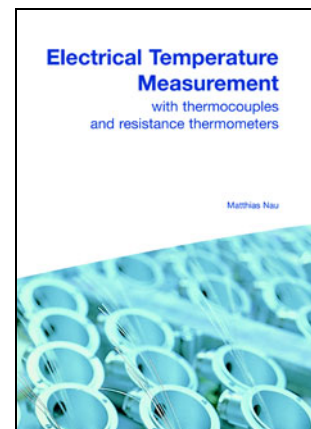
The temperature sensors are based on a temperature-dependent resistor, the curve and admissible tolerance of which are defined in the international standard DIN EN 60751. The thin-film technology applied enables us to manufacture extra small and robust design types.

The favorable, linear characteristic curve, the wide temperature measuring range, and high measuring accuracy, together with outstanding long-term stability, make these standardized temperature sensors the ideal choice.

Design type PCS



Technical literature



This brochure contains information on the basic theoretical principles of electrical temperature measurement, the practical design of temperature sensors, their standardization, electrical connection, tolerances, and design types. A detailed table section for voltage and resistor series according to DIN and EN makes this brochure a valuable guide.

August 2002
 Publication FAS 146
 Part no.: 00085081
 ISBN: 3-935742-07-X

JUMO platinum temperature sensors

Construction and application of platinum temperature sensors	Data sheet 906000
Platinum-ceramic temperature sensors	Data sheet 906022
Platinum-chip temperature sensors with connection wires	Data sheet 906121
Platinum-chip temperature sensors on an epoxy PCB	Data sheet 906122
Platinum-chip temperature sensors with terminal clamps	Data sheet 906123
Platinum-chip temperature sensors in SMD design type	Data sheet 906125

Platinum-Chip Temperature Sensors in SMD Design Type according to DIN EN 60751

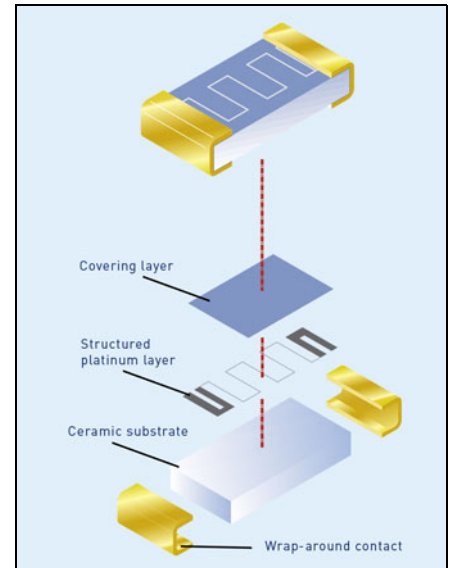
Brief description

The sensors are used for surface and ambient temperature measurements on circuit boards. For example, they are frequently used in temperature monitoring or compensation circuits, as well as an array of applications in temperature probes. Here, an assembled circuit board (data sheet 906122) is used as a measuring insert, which allows for easy installation. Application as a heated resistor for calorimetric measurements is also possible. In our standard range, the temperature sensors are available with nominal values of 100, 500, and 1000 Ω according to DIN EN 60751. Due to their small construction size, the SMD temperature sensors can be applied at a very high equipment density. Customers can choose between the two SMD design types (imperial / metric) 1206 / 3216M and 0805 / 2012M. The sensors are delivered in belt packaging in standard rolls. Thanks to the high-quality layered structure of the original packaging, they can also be stored for long periods without any issues.

As well as all forms of reflow soldering, the gold-plated nickel wrap-around contact can also be used with alternative forms of connection technology, such as wave soldering, conductive adhesion, and wired bonds. The high-quality plating on the contacts also ensures a high level of reliability during operation of the temperature sensor. In order to achieve extra-high resistance to temperature changes, it is important to select a suitable circuit board material with a modified expansion coefficient. In applications with high temperature cycling loads, we recommend using the smaller design type 1302 (0805 or 2012M).

Two baked-in glass cover layers reliably protect the platinum layer from external influences. Platinum-chip temperature sensors are designed for use in temperature ranges from -50 to +150 °C. If suitable connection techniques are used, the temperature sensors can even be used in a range from -70 to +250 °C. Adherence to tolerance limits then has to be checked according to the application. The connection technology and housing selected by the customer determine the thermal resistance.

Design type PCS



Item overview

Temperature sensor			Material / quantity		Part no. for tolerance class		
Type	Design type	R_0/Ω	Solder connection / material	Packaging unit in belt on reel	F0.1 (class AA)	F0.15 (class A)	F0.3 (class B)
PCS 1.1302.1M	0805	1×100	Gold-plated nickel	5,000	00647797	00659407	00585849
PCS 1.1302.5M	0805	1×500	Gold-plated nickel	5,000	Upon request	Upon request	00649601
PCS 1.1302.5M	0805	1×500	Gold-plated nickel	20,000	Upon request	00628428	00585853
PCS 1.1302.10M	0805	1×1000	Gold-plated nickel	5,000	00647795	00647798	00649602
PCS 1.1302.10M	0805	1×1000	Gold-plated nickel	20,000	Upon request	Upon request	00585854
PCS 1.1503.1M	1206	1×100	Gold-plated nickel	5,000	00647835 ^a	Upon request ^a	00585846 ^a
PCS 1.1503.5M	1206	1×500	Gold-plated nickel	5,000	Upon request ^a	Upon request ^a	00649603 ^a
PCS 1.1503.5M	1206	1×500	Gold-plated nickel	20,000	Upon request ^a	Upon request ^a	00585847 ^a
PCS 1.1503.10M	1206	1×1000	Gold-plated nickel	5,000	Upon request ^a	00647834 ^a	00649605 ^a
PCS 1.1503.10M	1206	1×1000	Gold-plated nickel	20,000	Upon request ^a	Upon request ^a	00585848 ^a

^a Available from 4th quarter of 2016

Order example:

PCS 1.1302.10M (part no. 00649602) corresponds to temperature sensor Pt1000 and SMD design type 0805.

The tolerance class is indicated in the part no.

Standard packaging according to IEC 60286-3:

- Packaging unit of 5,000 pieces in an 8-mm belt on a 7" plastic reel with roll feed line
- Packaging unit of 20,000 pieces in an 8-mm belt on a 330-mm plastic reel with roll feed line
- Small quantity without roll feed line

Standard variant: tolerance class F0.3, packaging unit of 5,000 pieces in a belt on a plastic reel
Special variants, smaller quantities, or other packaging units are available upon request.

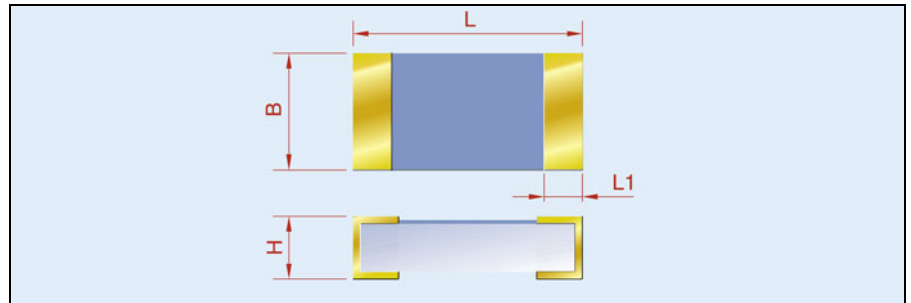
Dimensions

The dimensions are based on the standard DIN EN 140401-801: 2008-05; all dimensions are in mm.

Type	SMD design type Imperial / metric	L	B	H	L1
PCS 1.1302.xM	0805 / 2012M	2.0	1.25	0.4	0.4
PCS 1.1503.xM	1206 / 3216M	3.0	1.5	0.4	0.4
Dimension tolerances	All	$\Delta L = +0.2/-0.1$	$\Delta B = +0.2/-0.1$	$\Delta H = \pm 0.1$	$\Delta L1 = +0.1/-0.2$

x = Nominal value \div 100 Ω

Dimensional drawing



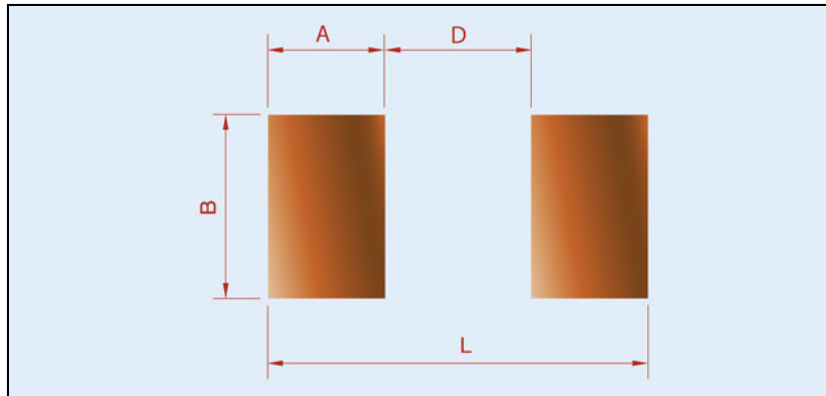
Technical data

Standard	DIN EN 60751:2009-05		
Temperature coefficient	$\alpha = 3.850 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$ (between 0 and 100 °C)		
Temperature range	Nominal temperature -50 to +150 °C, expanded temperature range -70 to +250 °C		
Tolerance	Temperature validity ranges Class F0.3: -50 to +250 °C Class F0.15: -30 to +150 °C Class F0.1: 0 to 150 °C		
Measuring current	Pt100: recommended 1.0 mA, max. 7.0 mA Pt500: recommended 0.7 mA, max. 3.0 mA Pt1000: recommended 0.1 mA, max. 1.0 mA		
Self-heating	$\Delta t = I^2 \times R \times E$ (see data sheet 906000 for definitions)		
Self-heating coefficient E in K/mW	Type	In water (0 °C, $v \geq 0.2$ m/s), fitted as RTD temperature probe	
	PCS 1.1302.xM	0.15	
	PCS 1.1503.xM	0.09	
Response times in s	Type	In water ($v = 0.4$ m/s)	In air ($v = 1$ m/s)
		$t_{0.5}$	$t_{0.9}$
	PCS 1.1302.xM	0.1	0.3
	PCS 1.1503.xM	0.1	0.3
Stability at maximum temperature	1000 h at 160 °C in air: measuring value drift $\Delta T_0 < 100$ mK		
Long-term stability	Max. drift ≤ 0.05 % / year (see data sheet 906000 for definitions)		
Vibration resistance	According to DIN EN 60751, paragraph 4.4.2.		
Processing	Reflow soldering, lead-free and leaded, see "Processing notes" The user must adapt the soldering profile. Only circuit boards with suitable coefficients of thermal expansion are admissible.		
Solder connections	Gold-plated nickel wrap-around contact, thickness of nickel layer ≥ 1 μm , gold ≥ 40 nm, solderability according to IEC / DIN EN 60068-2-58: Class 3 soldering process "Higher temperatures", solder Sn96.5Ag3.0Cu0.5, solder profile according to 60068-2-58 / figure 2b / table 3 / table 1 Resistance to dissolution according to IEC / DIN EN 60068-2-58: Class 3 soldering process "Higher temperatures", solder Sn96.5Ag3.0Cu0.5, solder profile according to 60068-2-58 / figure 2b / table 4		
Operating conditions	Platinum-chip temperature sensors must not be used unprotected in humid ambient conditions or corrosive atmospheres. The user may have to carry out some checks before operation. Please also refer to the installation instructions B 906121.4 "Information for the application of platinum-chip temperature sensors."		
Storage	In the original unopened packaging, JUMO temperature sensors of PCS design type can be stored for at least 5 years under normal ambient conditions. Storage in an aggressive atmosphere or in corrosive or reductive media or under high air humidity is not permitted.		
RoHS compliant	According to "Directive 2011/65/EU": free of lead, mercury, cadmium, hexavalent chromium, PBB, and PBDE		
REACH compliant	Yes		
Shearing strength of soldered connection	Tested as JUMO PCSE module (data sheet 906122): According to IEC 62137-1-2:2007; temperature cycling a) Rapid change of temperature; test Na, defined in IEC 60068-2-14 b) Lower temperature (TA) -40 °C, upper temperature (TB) +125 °C c) Dwell time at TA and TB, 10 minutes each d) Number of temperature cycles: 1000 In accordance with AEC - Q200-006A (F = 17.7 N)		
ESD	Typically ≥ 2 kV, HBM (direct contact), soldered onto circuit board as a module according to data sheet 906122, in accordance with AEC - Q200-002		

Processing notes

All forms of reflow soldering are preferred. The temperature sensors could be damaged when soldering with a soldering iron. The manufacturer has tested unleaded SAC solder as well as leaded standard solder (up to 95 % Pb). The soldering temperature can be raised slightly in comparison to tin-plated components.

Recommended pad dimensions on the circuit board



Type	SMD design type (imperial)	SMD design type (metric)	A	B	D	L
PCS 1.1302.xM	0805	2012	0.80	1.25	1.0	2.6
PCS 1.1503.xM	1206	3216	0.80	1.50	2.0	3.6

All measurements in mm.

x = Nominal value ÷ 100 Ω

Recommended soldering profile for lead-free solder, type SAC 305/405

