

**SA10201521, The Platinum Resistance temperature sensor (PT-RTD)**

The history of revision change for the specification

Date	Revision	Changes
2004/05/18	A0	New Approval
2019/09/26	A1	Add temperature - resistance diagram and packaging

## SA10201521, The Platinum Resistance temperature sensor (PT-RTD)

### Features / Applications :

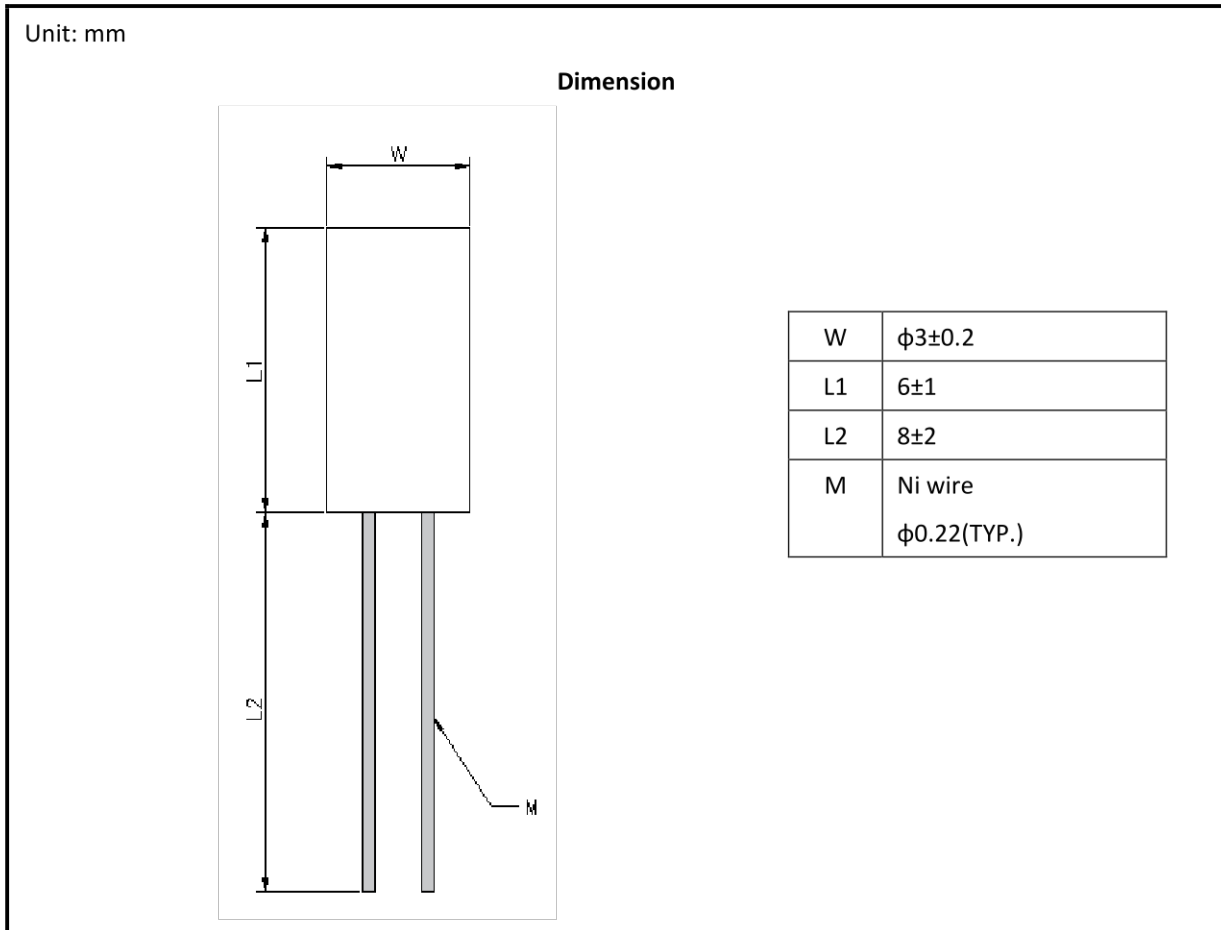
- Features:
  - Low drift
  - Long service life
  - Wide temperature range
  - Wide range of resistance values
  - Temperature linear control
  - High precision
  - Fast response time
  - RoHS compliant
  
- Applications:
  - Home Appliances: Oven, Air conditioner, Refrigerator, Calorimeter
  - Industrial Equipment: Temperature controller
  - Medical: Precision thermometer
  - Electronics: Over-Temperature protection



### Electrical Specifications :

Characteristics	Feature
Resistance value at 0°C	1000±1.2 ohm
Tolerance	Class B : ±0.12%
Temperature coefficient of resistance (TCR)	3850ppm/°C
Operation temperature range	-50°C~ +500°C
Maximum applied current	1 mA
Thermal response time (90%)	40 seconds max. (In air of 1 m/sec.)
Self-heating	2.5 mW/°C (In air of 1 m/sec.)

## Outline Drawing :



## Type Designation :

SA    102    0    1    XXX  
 (1)    (2)    (3) (4)    (5)

Where

- (1) Series No: SA= Applicable temperature range 500°C
- (2) Resistance Value: 102=10X10<sup>2</sup>=1000 ohm
- (3) TCR/Class: 0 = 3850/B
- (4) Package type : 1 = Ceramic tube
- (5) Serial No

## Characteristics :

### Electrical

Item	Specification and Requirement	Test Method
Insulation resistance	>100 Megohms	Apply 500 VDC between the lead wire and ceramic tube for 1 minute at room temperature.
ESD	$\Delta R(0 \text{ degree}) \leq 0.12\%$	Human body, 2KV.

### Endurance

Item	Specification and Requirement	Test Method
Low temperature test	$\Delta R(0 \text{ degree}) \leq 0.12\%$ Without distinct damage in appearance.	Keep the PT sensor in $-50^{\circ}\text{C}$ for 1000 hours.
High temperature test	$\Delta R(0 \text{ degree}) \leq 0.12\%$ Without distinct damage in appearance.	Keep the PT sensor in $500^{\circ}\text{C}$ for 1000 hours.
Humidity test	$\Delta R(0 \text{ degree}) \leq 0.12\%$ Without distinct damage in appearance.	Keep the PT sensor in $60^{\circ}\text{C}$ and 90%~95% R.H. for 1000 hours.
Thermal shock	$\Delta R(0 \text{ degree}) \leq 0.12\%$ Without distinct damage in appearance.	Keep the PT sensor in $0^{\circ}\text{C}$ ice water for at least 15 seconds then within 10 seconds directly put into $100^{\circ}\text{C}$ hot water for at least 15 seconds. The above process should be proceeded for at least 10 cycles.

## Temperature and resistance relationship:

- The temperature and resistance relationships used in this standard are as follows:

When  $T < 0^{\circ}\text{C}$  :

$$R_t = R_0 [ 1 + aT + bT^2 + cT^3 ( T - 100 ) ]$$

When  $T \geq 0^{\circ}\text{C}$  :

$$R_t = R_0 (1 + aT + bT^2)$$

Where

$R_t$ : resistance at a certain temperature  $T$

$R_0$ : resistance at  $0^{\circ}\text{C}$

$a, b, c$  : coefficient (refer to the following table)

Coefficient for  $\text{TCR}=3850 \text{ PPM}/^{\circ}\text{C}$  (IEC 751 Standard)

Temperature	a	b	c
$T < 0^{\circ}\text{C}$	3.90830E-03	-5.77500E-07	-4.18300E-12
$T \geq 0^{\circ}\text{C}$	3.90830E-03	-5.77500E-07	0

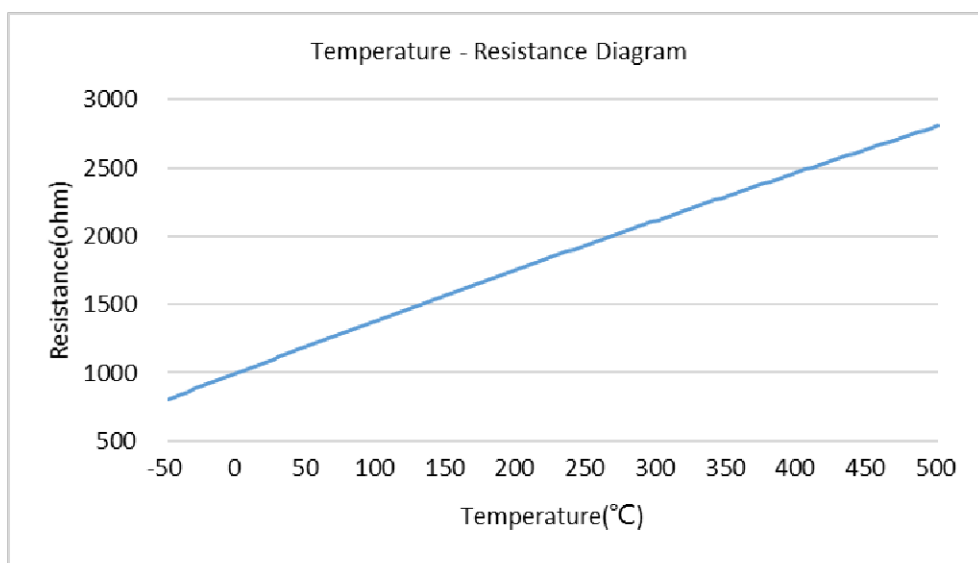
- Temperature deviation

$$\pm(a+b |t|)^{\circ}\text{C}$$

$$a = 0.3$$

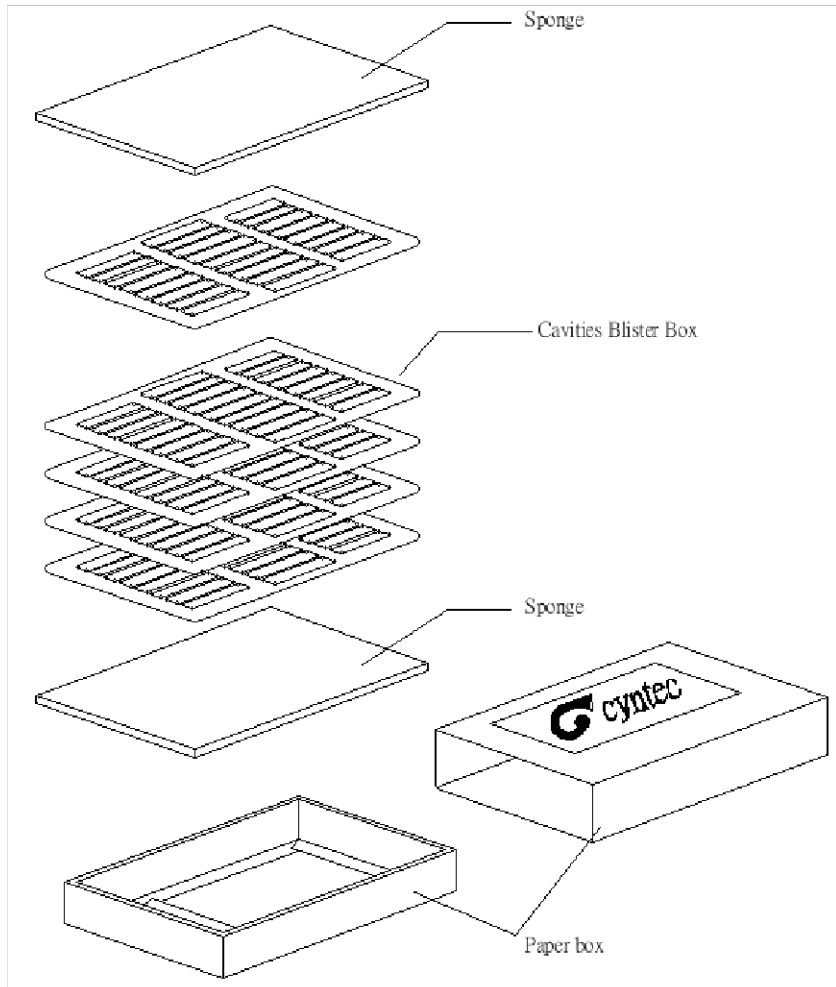
$$b = 0.005$$

- Temperature – Resistance Diagram



## Packaging :

Box dimension	Quantity per box
97x62x22mm	100pcs



## Order Information :

Part Number	Dimension (mm)		Nominal Resistance at 0°C	Operating Temperature Range
	Sensor Body	Wire Length		
SA10201521	3 x 6	8	1000±1.2Ω	-50°C~ +500°C

## Resistance tolerance and Temperature Deviation table of PT 1000 Class B:

Temperature (°C)	Resistance (Ω)	Temperature deviation (±°C)	Resistance tolerance (±Ω)	Temperature (°C)	Resistance (Ω)	Temperature deviation (±°C)	Resistance tolerance (±Ω)
-50	803.06	0.55	2.18	130	1498.32	0.95	3.57
-45	822.90	0.53	2.08	135	1517.10	0.98	3.66
-40	842.71	0.50	1.98	140	1535.84	1.00	3.75
-35	862.48	0.48	1.88	145	1554.56	1.03	3.83
-30	882.22	0.45	1.78	150	1573.25	1.05	3.92
-25	901.92	0.43	1.67	155	1591.91	1.08	4.01
-20	921.60	0.40	1.57	160	1610.54	1.10	4.10
-15	941.24	0.38	1.47	165	1629.15	1.13	4.18
-10	960.86	0.35	1.37	170	1647.72	1.15	4.27
-5	980.44	0.33	1.27	175	1666.27	1.18	4.35
0	1000.00	0.30	1.20	180	1684.78	1.20	4.44
5	1019.53	0.33	1.27	185	1703.27	1.23	4.53
10	1039.03	0.35	1.36	190	1721.73	1.25	4.61
15	1058.49	0.38	1.46	195	1740.16	1.28	4.70
20	1077.94	0.40	1.55	200	1758.56	1.30	4.78
25	1097.35	0.43	1.65	205	1776.93	1.33	4.86
30	1116.73	0.45	1.74	210	1795.28	1.35	4.95
35	1136.08	0.48	1.84	215	1813.59	1.38	5.03
40	1155.41	0.50	1.93	220	1831.88	1.40	5.12
45	1174.70	0.53	2.02	225	1850.13	1.43	5.20
50	1193.97	0.55	2.12	230	1868.36	1.45	5.28
55	1213.21	0.58	2.21	235	1886.56	1.48	5.36
60	1232.42	0.60	2.30	240	1904.73	1.50	5.45
65	1251.60	0.63	2.40	245	1922.87	1.53	5.53
70	1270.75	0.65	2.49	250	1940.98	1.55	5.61
75	1289.87	0.68	2.58	255	1959.06	1.58	5.69
80	1308.97	0.70	2.67	260	1977.12	1.60	5.77
85	1328.03	0.73	2.76	265	1995.14	1.63	5.85
90	1347.07	0.75	2.85	270	2013.14	1.65	5.93
95	1366.08	0.78	2.94	275	2031.11	1.68	6.01
100	1385.06	0.80	3.03	280	2049.05	1.70	6.09
105	1404.00	0.83	3.12	285	2066.96	1.73	6.17
110	1422.93	0.85	3.21	290	2084.84	1.75	6.25
115	1441.82	0.88	3.30	295	2102.69	1.78	6.33
120	1460.68	0.90	3.39	300	2120.52	1.80	6.41
125	1479.51	0.93	3.48	305	2138.31	1.83	6.49

Temperature (°C)	Resistance (Ω)	Temperature deviation (±°C)	Resistance tolerance (±Ω)
310	2156.08	1.85	6.57
315	2173.81	1.88	6.65
320	2191.52	1.90	6.72
325	2209.20	1.93	6.80
330	2226.85	1.95	6.88
335	2244.47	1.98	6.95
340	2262.06	2.00	7.03
345	2279.63	2.03	7.11
350	2297.16	2.05	7.18
355	2314.67	2.08	7.26
360	2332.14	2.10	7.33
365	2349.59	2.13	7.41
370	2367.01	2.15	7.48
375	2384.40	2.18	7.56
380	2401.76	2.20	7.63
385	2419.10	2.23	7.71
390	2436.40	2.25	7.78
395	2453.67	2.28	7.85
400	2470.92	2.30	7.93
405	2488.14	2.33	8.00
410	2505.33	2.35	8.07
415	2522.48	2.38	8.14
420	2539.62	2.40	8.22
425	2556.72	2.43	8.29
430	2573.79	2.45	8.36
435	2590.83	2.48	8.43
440	2607.85	2.50	8.50
445	2624.83	2.53	8.57
450	2641.79	2.55	8.64
455	2658.72	2.58	8.71
460	2675.62	2.60	8.78
465	2692.49	2.63	8.85
470	2709.33	2.65	8.92
475	2726.14	2.68	8.99
480	2742.93	2.70	9.06
485	2759.68	2.73	9.12
490	2776.41	2.75	9.19
495	2793.11	2.78	9.26
500	2809.78	2.80	9.33