
SE10255018, The Platinum Resistance temperature sensor (PT-RTD) SMD

The history of revision change for the specification

| Date | Revision | Changes |
|------------|----------|---|
| 1997/10/24 | A0 | New Approval |
| 1998/05/08 | A1 | Add product name description and reliability conditions. Thermal response time change from 20 seconds to 6 seconds. Dissipating constant change from 8mW/°C to 3.5mW/°C. Operation temperature range change from -40°C~125°C to -55°C ~125°C. |
| 1998/07/23 | A2 | Add temperature & resistance value table. |
| 1999/04/11 | A3 | Change the number of drop test repetitions. Change the packaging quantity from 5000 pieces/reel to 1000 pieces/ reel. |
| 2012/01/13 | A4 | Change carrier tape dimensions and reel dimensions. |
| 2014/10/29 | A5 | Change the width of the A-side electrode from 0.3mm to 0.4mm. |
| 2017/11/28 | A6 | Resistance to soldering heat add solder bath method. |
| 2019/10/07 | A7 | Add Temperature – Resistance Diagram |
| 2020/12/02 | A8 | Change carrier tape dimensions. |
| | | |
| | | |

SE10255018, The Platinum Resistance temperature sensor (PT-RTD) SMD

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



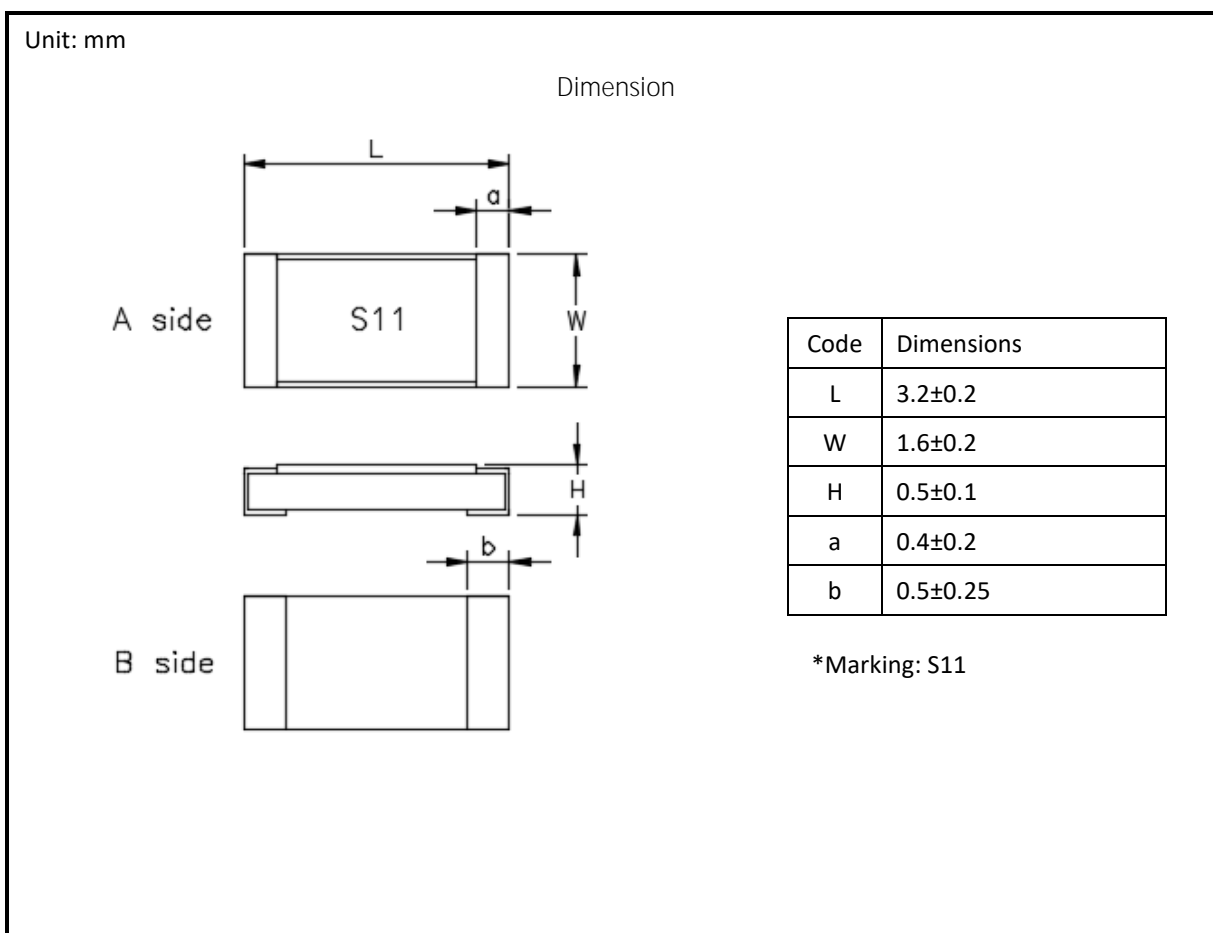
■ Applications:

- Home Appliances: 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±4.8 ohm |
| Temperature deviation | Class D : ±0.48% |
| Temperature coefficient of resistance (TCR) | 3750ppm/°C |
| Operation temperature range | -55°C~ +125°C |
| Maximum applied current | 1 mA |
| Thermal response time (90%) | 6 seconds max. (In air of 1 m/sec.) |
| Dissipating constant | 3.5mW/°C (In air of 1 m/sec.) |

Outline Drawing :



Type Designation :

SE 102 5 5 XXX
 (1) (2) (3) (4) (5)

Where

- (1) Series No: SE= Applicable temperature range 125°C
- (2) Ice point resistance : 102=10X10²=1000 ohm
- (3) TCR/Class: 5 = 3750/D
- (4) Package type : 5 = surface mount
- (5) Serial No

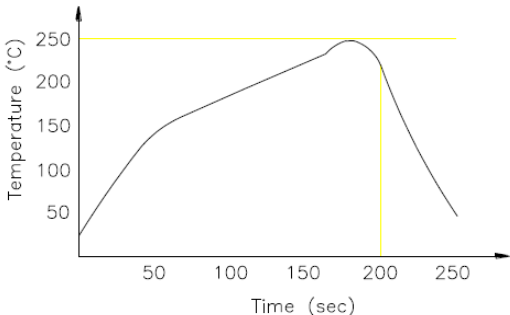
Characteristics :

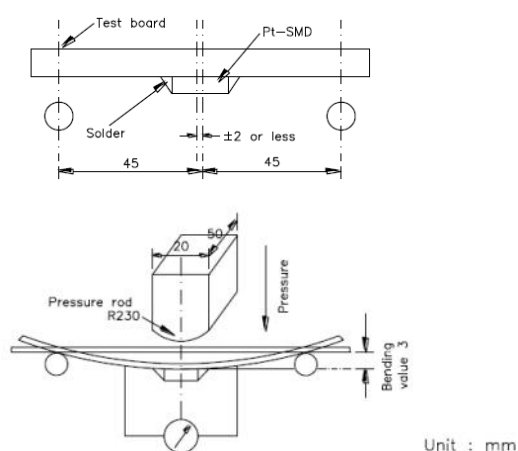
Electrical

| Item | Specification and Requirement | Test Method |
|-------------------------|--|---|
| Insulation resistance | >1000 Megohms | Test voltage: 100 VDC for 1 minute at room temperature. |
| Voltage proof | $\Delta R(0 \text{ degree}) \leq 0.48\%$ Without damage by flashover, fire or breakdown, etc. | Test voltage: 100 VAC r.m.s for 1 minute. |
| Intermittently overload | $\Delta R(0 \text{ degree}) \leq 0.48\%$ | Input current 2.5 time the applied current for 1 sec. with pauses of 25 sec. for 1000 cycles. |
| ESD | $\Delta R(0 \text{ degree}) \leq 0.48\%$ | Human body, 2KV. |

Mechanical

| Item | Specification and Requirement | Test Method |
|--------------------|---|--|
| Solderability | $\Delta R(0 \text{ degree}) \leq 0.48\%$ Without distinct damage in appearance. | A new uniform coating of solder shall cover minimum of 95% of the surface being immersed. Temperature of solder: $245 \pm 5^\circ\text{C}$ Immersion duration: $2 \pm 0.5 \text{ sec}$ |
| Solvent resistance | Marking shall be legible. Without mechanical damage and distinct damage in appearance. | Immersion cleansing. At room temperature for 90 sec in isopropyl Alcohol. |
| Drop test | $\Delta R(0 \text{ degree}) \leq 0.48\%$ | The Pt-SMD can resist to a 75 cm drop on a 6mm thick steel sheet with no damage on it's characteristics, repeat three times. |

| Item | Specification and Requirement | Test Method |
|------------------------------|---|---|
| Resistance to soldering heat | $\Delta R(0 \text{ degree}) \leq 0.48\%$ Without distinct deformation in appearance. | <p>Shall be satisfied in the following methods.</p> <p>(1) Solder bath method Dipped into solder at $270 \pm 5^\circ\text{C}$ for 10 ± 1 seconds.</p> <p>(2) Reflow soldering method Peak temperature: $240 \pm 5^\circ\text{C}$ for 3 to 5 sec. Temperature : $220 \pm 5^\circ\text{C}$ for 40 sec.</p> <p>The Pt-SMD shall be stored at standard atmospheric conditions for 1 hours, after which the measurements shall be made.</p>  <p>The graph shows a temperature profile for reflow soldering. The y-axis is Temperature (°C) ranging from 50 to 250. The x-axis is Time (sec) ranging from 0 to 250. The curve starts at approximately 25°C at 0 seconds, rises to a peak of about 240°C at 180 seconds, and then falls back to about 50°C at 250 seconds. A horizontal yellow line is drawn at 240°C, and a vertical yellow line is drawn at 200 seconds, intersecting the peak of the curve.</p> |
| Vibration test | The Pt-SMD can resist to a vibration test with no damage on it's characteristic. Valuation of resistance should be within 0.48%. | Entire of frequency range: 10 Hz to 55 Hz to 10 Hz for 1 minute. Vibration amplitude : 1.5 mm For a period of 2 hours in each of 3 mutual perpendicular directions. |
| Shock test | The Pt-SMD can resist to a shock test with no damage on it's characteristic. Valuation of resistance should be within 0.48%. | Peak acceleration: 50G Duration of the pulse: 11 ms Each 3 times in each direction of 3 mutually perpendicular axis. |

| Item | Specification and Requirement | Test Method |
|-------------------|---|--|
| Substrate bending | <p>Electrical characteristics shall be satisfied.</p> <p>If there are electrodes on both surfaces, it shall satisfy 1000 ± 4.8 ohm on whichever surface it may be fixated on.</p> <p>Valuation of resistance should be within 0.48%.</p> | <p>Bent width: 3mm 30 sec.</p>  <p>Unit : mm</p> |

Endurance

| Item | Specification and Requirement | Test Method |
|------------------------------|---|---|
| Rapid change of temperature | <p>$\Delta R(0 \text{ degree}) : \leq 0.48\%$</p> <p>Without distinct damage in appearance.</p> | <p>Perform 5 cycles as follows:</p> <ol style="list-style-type: none"> (1) $-55 \pm 5^\circ\text{C}$ cycles for 30 min. (2) Standard atmospheric conditions 2 to 3 min. (3) $125 \pm 5^\circ\text{C}$ for 30 min. (4) Standard atmospheric conditions 2 to 3 min. |
| Dump heat with load | <p>$\Delta R(0 \text{ degree}) : \leq 0.48\%$</p> <p>Without distinct damage in appearance.</p> <p>The marking shall be legible.</p> | <p>$60 \pm 5^\circ\text{C}$ with relative humidity of 90% to 95%.</p> <p>Input current 1mA for 1.5 hours on 30 minutes off, 1000+48/-0 hours.</p> |
| Endurance 70°C | <p>$\Delta R(0 \text{ degree}) : \leq 0.48\%$</p> <p>Without distinct damage in appearance.</p> <p>The marking shall be legible.</p> | <p>Input current 1mA for 1.5 hours on 30 minutes off, 1000+48/-0 hours at $70 \pm 5^\circ\text{C}$</p> |
| Low temperature test | <p>$\Delta R(0 \text{ degree}) : \leq 0.48\%$</p> <p>Without distinct damage in appearance.</p> | <p>Keep the PT sensor in -55°C for 1000 hours.</p> |
| High temperature test | <p>$\Delta R(0 \text{ degree}) : \leq 0.48\%$</p> <p>Without distinct damage in appearance.</p> | <p>Keep the PT sensor in 125°C for 1000 hours.</p> |

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°C

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

Coefficient for $\text{TCR}=3750 \text{ PPM}/^{\circ}\text{C}$

| Temperature | a | b | c |
|----------------------------|-------------|--------------|--------------|
| $T < 0^{\circ}\text{C}$ | 3.90830E-03 | -6.01875E-07 | -6.14500E-12 |
| $T \geq 0^{\circ}\text{C}$ | 3.90830E-03 | -6.01875E-07 | 0 |

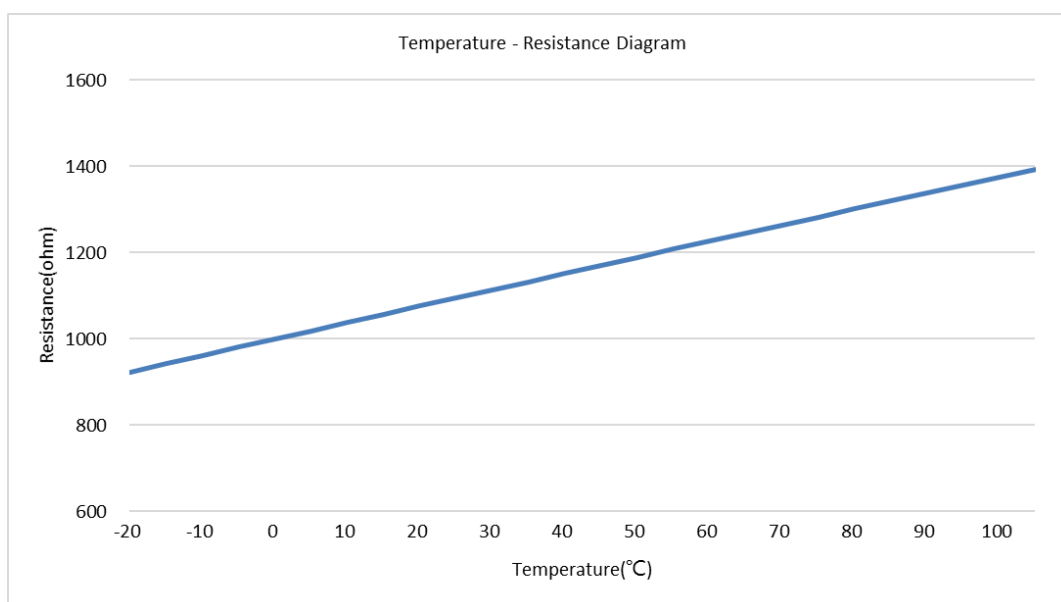
- Temperature deviation

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

$$a = 1.28$$

$$b = 0.014$$

- Temperature – Resistance Diagram



- Dimensions

[illegible]

Technical drawing of a circular mechanical part, showing a top view and a side view.

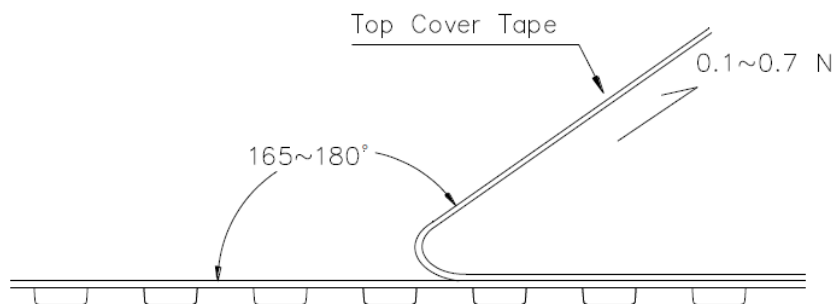
Top View Dimensions:

- Central feature diameter: 2.2 ± 0.5

Side View Dimensions:

- Total height: 178 ± 2
- Central section height: 60 ± 1
- Base section height: 56 ± 2
- Base section diameter: 1.3 ± 0.2
- Width: 9 ± 0.5
- Depth: 12 ± 0.5

■ Peel force of top cover tape



■ Numbers of taping

1000 pieces/reel

■ Marking

The following items shall be marked on the reel.

- (1) Type designation
- (2) Quantity
- (3) Taping number
- (4) Manufacturer's name

Order Information :

| Part Number | Dimension (mm) | Nominal Resistance at 0°C | Operating Temperature Range |
|-------------|----------------|---------------------------|-----------------------------|
| | Sensor Body | | |
| SE10255018 | 1.6 x 3.2 | 1000±4.8Ω | -55°C~ +125°C |

Resistance tolerance and Temperature Deviation table of PT 1000 Class D:

| Temperature (°C) | Resistance (Ω) | Temperature deviation (±°C) | Resistance tolerance (±Ω) | Temperature (°C) | Resistance (Ω) | Temperature deviation (±°C) | Resistance tolerance (±Ω) |
|---------------------|-------------------|-----------------------------------|---------------------------------|---------------------|-------------------|-----------------------------------|---------------------------------|
| -55 | 788.46 | 2.05 | 7.97 | 125 | 1466.87 | 3.03 | 11.09 |
| -50 | 807.87 | 1.98 | 7.68 | | | | |
| -45 | 827.24 | 1.91 | 7.39 | | | | |
| -40 | 846.57 | 1.84 | 7.11 | | | | |
| -35 | 865.87 | 1.77 | 6.82 | | | | |
| -30 | 885.13 | 1.70 | 6.54 | | | | |
| -25 | 904.36 | 1.63 | 6.26 | | | | |
| -20 | 923.55 | 1.56 | 5.98 | | | | |
| -15 | 942.71 | 1.49 | 5.70 | | | | |
| -10 | 961.84 | 1.42 | 5.43 | | | | |
| -5 | 980.93 | 1.35 | 5.15 | | | | |
| 0 | 1000.00 | 1.28 | 4.80 | | | | |
| 5 | 1019.04 | 1.35 | 5.14 | | | | |
| 10 | 1038.04 | 1.42 | 5.39 | | | | |
| 15 | 1057.02 | 1.49 | 5.65 | | | | |
| 20 | 1075.96 | 1.56 | 5.91 | | | | |
| 25 | 1094.88 | 1.63 | 6.16 | | | | |
| 30 | 1113.76 | 1.70 | 6.42 | | | | |
| 35 | 1132.62 | 1.77 | 6.67 | | | | |
| 40 | 1151.44 | 1.84 | 6.92 | | | | |
| 45 | 1170.24 | 1.91 | 7.17 | | | | |
| 50 | 1189.00 | 1.98 | 7.43 | | | | |
| 55 | 1207.74 | 2.05 | 7.68 | | | | |
| 60 | 1226.44 | 2.12 | 7.92 | | | | |
| 65 | 1245.12 | 2.19 | 8.17 | | | | |
| 70 | 1263.76 | 2.26 | 8.42 | | | | |
| 75 | 1282.38 | 2.33 | 8.67 | | | | |
| 80 | 1300.96 | 2.40 | 8.91 | | | | |
| 85 | 1319.52 | 2.47 | 9.16 | | | | |
| 90 | 1338.04 | 2.54 | 9.40 | | | | |
| 95 | 1356.54 | 2.61 | 9.65 | | | | |
| 100 | 1375.00 | 2.68 | 9.89 | | | | |
| 105 | 1393.43 | 2.75 | 10.13 | | | | |
| 110 | 1411.84 | 2.82 | 10.37 | | | | |
| 115 | 1430.21 | 2.89 | 10.61 | | | | |
| 120 | 1448.56 | 2.96 | 10.85 | | | | |