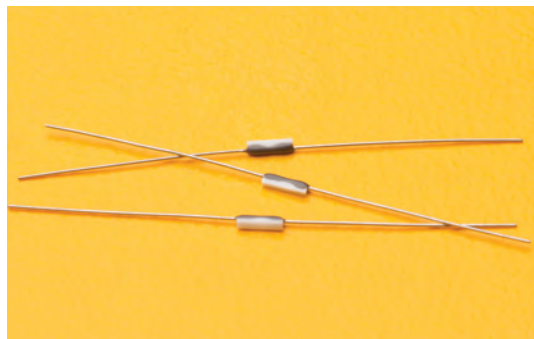
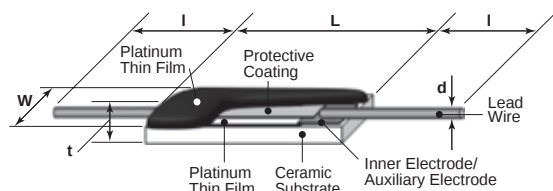




## features

- Small as quarter volume of conventional type. 3.2 second thermal time constant.
- Excellent heat-resistance
- Applies axial lead type suitable to use as heater element
- Products with lead-free terminations meet EU RoHS requirements
- AEC-Q200 Tested

## dimensions and construction



| Type       | Dimensions inches (mm)                                                            |                         |                          |                           |                       |
|------------|-----------------------------------------------------------------------------------|-------------------------|--------------------------|---------------------------|-----------------------|
|            | W                                                                                 | L                       | t                        | d (Nom.)                  | I                     |
| SDT310VASP | .016 <sup>+.006</sup> <sub>-.004</sub><br>(0.4 <sup>+.015</sup> <sub>-.01</sub> ) | .079±.004<br>(2.0±0.10) | .026 max.<br>(0.65 max.) | .006±.002<br>(ø0.15±0.05) | .394±.079<br>(10±2.0) |

## ordering information

|         |       |                           |              |                    |                      |                               |
|---------|-------|---------------------------|--------------|--------------------|----------------------|-------------------------------|
| SDT310V | AS    | P                         | K            | 20                 | F                    | 25                            |
| Type    | Style | Terminal Surface Material | Packaging    | Nominal Resistance | Resistance Tolerance | T.C.R. Tolerance              |
|         |       | P: Pt clad                | K: Chip Tray | 20: 20Ω            | F: ±1                | 25: ±25 x 10 <sup>-6</sup> /K |

## applications and ratings

| Part Designation | Nominal R. Value at 0°C | R. Value Tolerance (%) at 0°C | T.C.R. x 10 <sup>-6</sup> /K* | Thermal Time Constant**       | Maximum Current | Power Rating | Operating Temperature Range |
|------------------|-------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------|--------------|-----------------------------|
| SDT310VASP       | 20Ω                     | ±1%                           | 3850±25                       | 3.2 seconds in stationary air | 90mA Max.       | 0.5W         | -55°C to +600°C             |

\* T.C.R. measuring temperature: 0°C/+100°C.

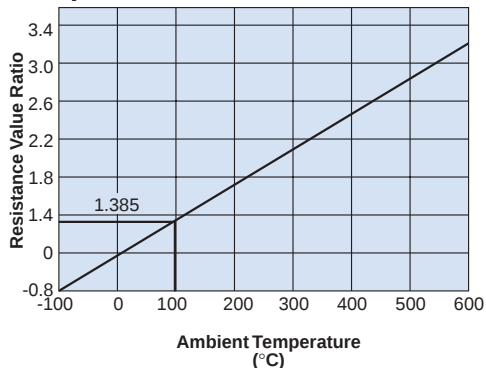
\*\* Thermal time constant is value measured in stationary air and is typical value, which are values of elements and vary with connecting or fixing methods.

\*\*\* Temperature of the device including a self-heating.

## small type platinum thin film thermal sensors (small heater element)

### environmental applications

#### Temperature Characteristics



Approximate Expression for Resistance-  
Temperature Characteristics

$$-55^{\circ}\text{C} \sim 0^{\circ}\text{C} : R_T = R_0 \{1 + C_1 T + C_2 T^2 + C_3 (T - 100) T^3\}$$

$$0^{\circ}\text{C} \sim +400^{\circ}\text{C} : R_T = R_0 (1 + C_1 T + C_2 T^2)$$

$R_T$  : Resistance value at  $T^{\circ}\text{C}$

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

$T$  : Ambient temperature( $^{\circ}\text{C}$ )

Constants  $C_1, C_2, C_3$ :

$$C_1 = 3.9083 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$$

$$C_2 = -5.775 \times 10^{-7} \text{ }^{\circ}\text{C}^{-2}$$

$$C_3 = -4.183 \times 10^{-12} \text{ }^{\circ}\text{C}^{-4}$$

#### Pt100 Resistance - Temperature Characteristic 20 at $0^{\circ}\text{C}$

| Temperature<br>( $^{\circ}\text{C}$ ) | 0     | -1    | -2    | -3    | -4    | -5    | -6    | -7    | -8    | -9    |
|---------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| -50                                   | 16.06 | 15.98 | 15.90 | 15.82 | 15.74 | 15.66 | -     | -     | -     | -     |
| -40                                   | 16.85 | 16.77 | 16.70 | 16.62 | 16.54 | 16.46 | 16.38 | 16.30 | 16.22 | 16.14 |
| -30                                   | 17.64 | 17.57 | 17.49 | 17.41 | 17.33 | 17.25 | 17.17 | 17.09 | 17.01 | 16.93 |
| -20                                   | 18.43 | 18.35 | 18.27 | 18.20 | 18.12 | 18.04 | 17.96 | 17.88 | 17.80 | 17.72 |
| -10                                   | 19.22 | 19.14 | 19.06 | 18.98 | 18.90 | 18.82 | 18.75 | 18.67 | 18.59 | 18.51 |
| 0                                     | 20.00 | 19.92 | 19.84 | 19.77 | 19.69 | 19.61 | 19.53 | 19.45 | 19.37 | 19.30 |
| 0                                     | 0     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |
| 0                                     | 20.00 | 20.08 | 20.16 | 20.23 | 20.31 | 20.39 | 20.47 | 20.55 | 20.62 | 20.70 |
| 10                                    | 20.78 | 20.86 | 20.94 | 21.01 | 21.09 | 21.17 | 21.25 | 21.33 | 21.40 | 21.48 |
| 20                                    | 21.56 | 21.64 | 21.71 | 21.79 | 21.87 | 21.95 | 22.02 | 22.10 | 22.18 | 22.26 |
| 30                                    | 22.33 | 22.41 | 22.49 | 22.57 | 22.64 | 22.72 | 22.80 | 22.88 | 22.95 | 23.03 |
| 40                                    | 23.11 | 23.19 | 23.26 | 23.34 | 23.42 | 23.49 | 23.57 | 23.65 | 23.73 | 23.80 |
| 50                                    | 23.88 | 23.96 | 24.03 | 24.11 | 24.19 | 24.26 | 24.34 | 24.42 | 24.49 | 24.57 |
| 60                                    | 24.65 | 24.73 | 24.80 | 24.88 | 24.96 | 25.03 | 25.11 | 25.19 | 25.26 | 25.34 |
| 70                                    | 25.42 | 25.49 | 25.57 | 25.64 | 25.72 | 25.80 | 25.87 | 25.95 | 26.03 | 26.10 |
| 80                                    | 26.18 | 26.26 | 26.33 | 26.41 | 26.48 | 26.56 | 26.64 | 26.71 | 26.79 | 26.87 |
| 90                                    | 26.94 | 27.02 | 27.09 | 27.17 | 27.25 | 27.32 | 27.40 | 27.47 | 27.55 | 27.63 |
| 100                                   | 27.70 | 27.78 | 27.85 | 27.93 | 28.00 | 28.08 | 28.16 | 28.23 | 28.31 | 28.38 |
| 110                                   | 28.46 | 28.53 | 28.61 | 28.69 | 28.76 | 28.84 | 28.91 | 28.99 | 29.06 | 29.14 |
| 120                                   | 29.21 | 29.29 | 29.36 | 29.44 | 29.51 | 29.59 | 29.67 | 29.74 | 29.82 | 29.89 |
| 130                                   | 29.97 | 30.04 | 30.12 | 30.19 | 30.27 | 30.34 | 30.42 | 30.49 | 30.57 | 30.64 |
| 140                                   | 30.72 | 30.79 | 30.87 | 30.94 | 31.02 | 31.09 | 31.17 | 31.24 | 31.32 | 31.39 |
| 150                                   | 31.47 | 31.54 | 31.61 | 31.69 | 31.76 | 31.84 | 31.91 | 31.99 | 32.06 | 32.14 |
| 160                                   | 32.21 | 32.29 | 32.36 | 32.43 | 32.51 | 32.58 | 32.66 | 32.73 | 32.81 | 32.88 |
| 170                                   | 32.95 | 33.03 | 33.10 | 33.18 | 33.25 | 33.33 | 33.40 | 33.47 | 33.55 | 33.62 |
| 180                                   | 33.70 | 33.77 | 33.84 | 33.92 | 33.99 | 34.07 | 34.14 | 34.21 | 34.29 | 34.36 |
| 190                                   | 34.43 | 34.51 | 34.58 | 34.66 | 34.73 | 34.80 | 34.88 | 34.95 | 35.02 | 35.10 |
| 200                                   | 35.17 | 35.24 | 35.32 | 35.39 | 35.47 | 35.54 | 35.61 | 35.69 | 35.76 | 35.83 |
| 210                                   | 35.91 | 35.98 | 36.05 | 36.13 | 36.20 | 36.27 | 36.34 | 36.42 | 36.49 | 36.56 |
| 220                                   | 36.64 | 36.71 | 36.78 | 36.86 | 36.93 | 37.00 | 37.08 | 37.15 | 37.22 | 37.29 |
| 230                                   | 37.37 | 37.44 | 37.51 | 37.59 | 37.66 | 37.73 | 37.80 | 37.88 | 37.95 | 38.02 |
| 240                                   | 38.19 | 38.17 | 38.24 | 38.31 | 38.38 | 38.46 | 38.53 | 38.60 | 38.67 | 38.75 |
| 250                                   | 38.82 | 38.89 | 38.96 | 39.04 | 39.11 | 39.18 | 39.25 | 39.33 | 39.40 | 39.47 |
| 260                                   | 39.54 | 39.61 | 39.69 | 39.76 | 39.83 | 39.90 | 39.97 | 40.05 | 40.12 | 40.19 |
| 270                                   | 40.26 | 40.33 | 40.41 | 40.48 | 40.55 | 40.62 | 40.69 | 40.77 | 40.84 | 40.91 |
| 280                                   | 40.98 | 41.05 | 41.12 | 41.20 | 41.27 | 41.34 | 41.41 | 41.48 | 41.55 | 41.63 |
| 290                                   | 41.70 | 41.77 | 41.84 | 41.91 | 41.98 | 42.05 | 42.13 | 42.20 | 42.27 | 42.34 |
| 300                                   | 42.41 | 42.48 | 42.55 | 42.62 | 42.70 | 42.77 | 42.84 | 42.91 | 42.98 | 43.05 |
| 310                                   | 43.12 | 43.19 | 43.26 | 43.33 | 43.41 | 43.48 | 43.55 | 43.62 | 43.69 | 43.76 |
| 320                                   | 43.83 | 43.90 | 43.97 | 44.04 | 44.11 | 44.18 | 44.25 | 44.33 | 44.40 | 44.47 |
| 330                                   | 44.54 | 44.61 | 44.68 | 44.75 | 44.82 | 44.89 | 44.96 | 45.03 | 45.10 | 45.17 |
| 340                                   | 45.24 | 45.31 | 45.38 | 45.45 | 45.52 | 45.59 | 45.66 | 45.73 | 45.80 | 45.87 |
| 350                                   | 45.94 | 46.01 | 46.08 | 46.15 | 46.22 | 46.29 | 46.36 | 46.43 | 46.50 | 46.57 |
| 360                                   | 46.64 | 46.71 | 46.78 | 46.85 | 46.92 | 46.99 | 47.06 | 47.13 | 47.20 | 47.27 |
| 370                                   | 47.34 | 47.41 | 47.48 | 47.55 | 47.62 | 47.69 | 47.76 | 47.83 | 47.90 | 47.97 |
| 380                                   | 48.04 | 48.10 | 48.17 | 48.24 | 48.31 | 48.38 | 48.45 | 48.52 | 48.59 | 48.66 |
| 390                                   | 48.73 | 48.80 | 48.87 | 48.94 | 49.00 | 49.07 | 49.14 | 49.21 | 49.28 | 49.35 |
| 400                                   | 49.42 | 49.49 | 49.56 | 49.63 | 49.69 | 49.76 | 49.83 | 49.90 | 49.97 | 50.04 |
| 410                                   | 50.11 | 50.18 | 50.24 | 50.31 | 50.38 | 50.45 | 50.52 | 50.59 | 50.66 | 50.72 |
| 420                                   | 50.79 | 50.86 | 50.93 | 51.00 | 51.07 | 51.13 | 51.20 | 51.27 | 51.34 | 51.41 |
| 430                                   | 51.48 | 51.54 | 51.61 | 51.68 | 51.75 | 51.82 | 51.88 | 51.95 | 52.02 | 52.09 |
| 440                                   | 52.16 | 52.22 | 52.29 | 52.36 | 52.43 | 52.50 | 52.56 | 52.63 | 52.70 | 52.77 |

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of  $105^{\circ}\text{C}$ , read the value in the column where  $100^{\circ}\text{C}$  in the vertical axis and  $5^{\circ}\text{C}$  in the horizontal axis cross. The value will be  $28.08\Omega$ .

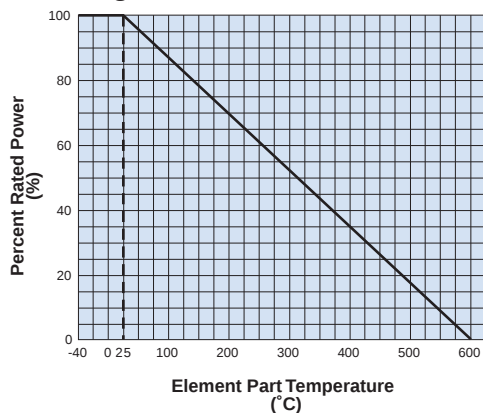
## environmental applications (continued)

### Pt100 Resistance - Temperature Characteristic 20 at 0°C

| Temperature (°C) | 0     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 450              | 52.84 | 52.90 | 52.97 | 53.04 | 53.11 | 53.17 | 53.24 | 53.31 | 53.38 | 53.44 |
| 460              | 53.51 | 53.58 | 53.65 | 53.71 | 53.78 | 53.85 | 53.92 | 53.98 | 54.05 | 54.12 |
| 470              | 54.19 | 54.25 | 54.32 | 54.39 | 54.46 | 54.52 | 54.59 | 54.66 | 54.72 | 54.79 |
| 480              | 54.86 | 54.93 | 54.99 | 55.06 | 55.13 | 55.19 | 55.26 | 55.33 | 55.39 | 55.46 |
| 490              | 55.53 | 55.60 | 55.66 | 55.73 | 55.80 | 55.86 | 55.93 | 56.00 | 56.06 | 56.13 |
| 500              | 56.20 | 56.26 | 56.33 | 56.40 | 56.46 | 56.53 | 56.59 | 56.66 | 56.73 | 56.79 |
| 510              | 56.86 | 56.93 | 56.99 | 57.06 | 57.13 | 57.19 | 57.26 | 57.32 | 57.39 | 57.46 |
| 520              | 57.52 | 57.59 | 57.66 | 57.72 | 57.79 | 57.85 | 57.92 | 57.99 | 58.05 | 58.12 |
| 530              | 58.18 | 58.25 | 58.32 | 58.38 | 58.45 | 58.51 | 58.58 | 58.64 | 58.71 | 58.78 |
| 540              | 58.84 | 58.91 | 58.97 | 59.04 | 59.10 | 59.17 | 59.24 | 59.30 | 59.37 | 59.43 |
| 550              | 59.50 | 59.56 | 59.63 | 59.69 | 59.76 | 59.82 | 59.89 | 59.96 | 60.02 | 60.09 |
| 560              | 60.15 | 60.22 | 60.28 | 60.35 | 60.41 | 60.48 | 60.54 | 60.61 | 60.67 | 60.74 |
| 570              | 60.80 | 60.87 | 60.93 | 61.00 | 61.06 | 61.13 | 61.19 | 61.26 | 61.32 | 61.39 |
| 580              | 61.45 | 61.52 | 61.58 | 61.65 | 61.71 | 61.77 | 61.84 | 61.90 | 61.97 | 62.03 |
| 590              | 62.10 | 62.16 | 62.23 | 62.29 | 62.36 | 62.42 | 62.48 | 62.55 | 62.61 | 62.68 |
| 600              | 62.74 | -     | -     | -     | -     | -     | -     | -     | -     | -     |

Note: Desired temperature values are obtained by adding temperatures in the vertical and horizontal axes. When calculating a resistance value of 105°C, read the value in the column where 100°C in the vertical axis and 5°C in the horizontal axis cross. The value will be 28.08Ω.

## Derating Curve



For sensors operated at an element part temperature of 25°C or above, a power rating shall be derated in accordance with the above derating curve.

## Performance Characteristics

| Parameter                    | Requirement $\Delta R$ (%+0.05Ω) | Test Method                                                                |
|------------------------------|----------------------------------|----------------------------------------------------------------------------|
| Resistance                   | Within specified tolerance       | 0°C                                                                        |
| T.C.R.                       | Within specified T.C.R.          | 0°C/ +100°C                                                                |
| Rapid Change of Temperature  | ±0.5%                            | -55°C (30 minutes)/ +200°C (30 minutes) 1000 cycles                        |
| Moisture Resistance          | ±0.5%                            | 85°C ± 2°C, 85% RH, 1000 hours, 10mA, 1.5 hr ON, 0.5 hr OFF cycle          |
| Normal Temperature Load Life | ±0.5%                            | 25°C ± 10°C, 1000 hours, 90mA, 1.5 hr ON, 0.5 hr OFF cycle                 |
| High Temperature Load Life   | ±0.5%                            | 125°C, 1000 hours, 85mA continuous turning on electricity                  |
| Mechanical Shock             | ±0.5%                            | 100g's maximum, 6Dms (standard), 12.3ft/s                                  |
| Vibration                    | ±0.5%                            | Test from 10-2000hz 20g's for 20 minutes, 12 cycles each of 3 orientations |
| Component Strength           | 600g and more                    | Pull test                                                                  |