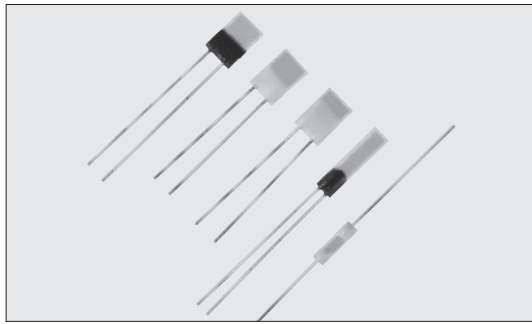


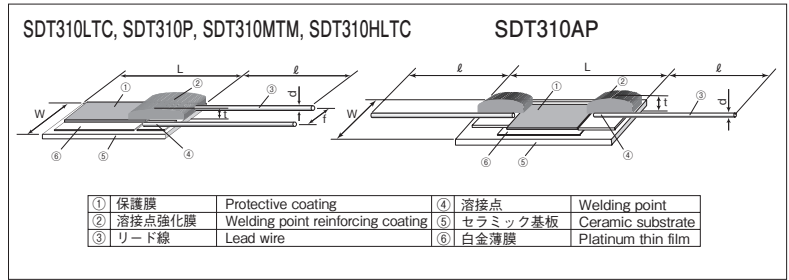
# THERMAL SENSORS



## SDT310 小形白金薄膜温度センサ Small Type Platinum Thin Film Thermal Sensors



### ■構造図 Construction



### ■特長 Features

- 抵抗温度特性 (T.C.R.) が JIS・IEC 規格に相当しております。
- 小形パッケージで抵抗値 1kΩ の実力。
- 小形パッケージの導入により、熱時定数を改良しました。
- 欧州 RoHS 対応品です。ガラスに含まれる鉛ガラスは欧州 RoHS の適用除外です。
- T.C.R. is equivalent to JIS・IEC standards.
- The small package with a real ability of 1kΩ resistance.
- Thermal time constant is improved with the small package.
- Products meet EU-RoHS requirements. EU-RoHS regulation is not intended for Pb-glass contained in glass.

### ■用途 Applications

- 熱電対温度調節器の冷接点補償、温度検出プローブ
- 風速計の熱線、温度補償
- 通信機器の送受信回路の温度補償、補正
- Cold Point compensation and temperature detection probe for thermocouple temperature controllers.
- Hot wires and temperature compensation of anemometers.
- Temperature compensation and revision for RF circuit of telecommunication equipment.

### ■外形寸法 Dimensions

| 形名<br>Type | 寸法 Dimensions (mm) |          |        |          |             | Weight (g)<br>(100pcs) |
|------------|--------------------|----------|--------|----------|-------------|------------------------|
|            | W                  | L        | t max. | f        | d (Nominal) |                        |
| SDT310LTC  | 2.0±0.25           | 3.0±0.25 | 1.2    | 1.1±0.25 | φ0.2±0.05   | 10 <sup>±5</sup>       |
| SDT310P    |                    |          |        |          |             | 8±2                    |
| SDT310MTM  |                    |          |        |          |             | 25.4                   |
| SDT310HLTC | 1.2±0.10           | 5.0±0.10 | 1.1    | 0.3±0.1  | φ0.2±0.05   | 10 <sup>±5</sup>       |
| SDT310AP   | 0.8±0.2            | 3.0±0.25 | 1.2    | —        |             | 8±2                    |

### ■品名構成 Type Designation

例 Example

| SDT310             | LT  | C   | 100   | A  | 3850   |  |
|--------------------|---|---|---|--|--|--|
| 品名<br>Product Code | 形状<br>Style                               | 温度範囲<br>Temperature Range                                 | 端子表面材質<br>Terminal Surface Material   | 公称抵抗値<br>Nominal Resistance                                | クラス又は抵抗値許容差<br>Class or Resistance Tol.                              | 抵抗温度係数<br>T.C.R.<br>(×10 <sup>-6</sup> /K) |
|                    | Nil: Standard<br>H: H style<br>A: A style | LT: -55°C~+155°C<br>Nil: -55°C~+400°C<br>MT: -55°C~+650°C | C: SnCu / SDT310LT<br>SDT310HLT<br>P: Pt clad<br>(SDT310-310A)<br>M: Ptr (SDT310MT) | 10: 10Ω<br>(SDT310AP)<br>100: 100Ω<br>500: 500Ω<br>1K: 1kΩ | A: ±(0.15+0.002 t )°C<br>B: ±(0.3+0.005 t )°C<br>C: ±(1.0+0.01 t )°C |  |

環境負荷物質含有について EU-RoHS 以外の物質に対するご要望がある場合にはお問合せください。  
Contact us when you have control request for environmental hazardous material other than the substance specified by EU-RoHS.

### ■参考規格 Reference Standards

IEC 60751-1995 JIS C 1604-1997

### ■定格 Ratings

| 形名<br>Type | 抵抗値<br>Resistance<br>Range at 0°C | 許容差クラス<br>Tolerance Class<br>許容差<br>Tolerance                        | 抵抗値許容差<br>Resistance<br>Tolerance | 抵抗温度係数*1<br>T.C.R.<br>(×10 <sup>-6</sup> /K) | 熱時定数*2<br>Thermal Time<br>constant | 熱放散定数*2<br>Thermal Dissipation<br>constant | 規定電流*3<br>Specified<br>Current                   | 使用温度範囲<br>Operating Temperature<br>Range |
|------------|-----------------------------------|--|-----------------------------------|--|------------------------------------|--|--|--|
| SDT310LTC  | 100Ω<br>500Ω, 1kΩ                 | A: ±(0.15+0.002 t )°C<br>B: ±(0.3+0.005 t )°C<br>C: ±(1.0+0.01 t )°C | ±0.059%<br>±0.12%<br>±0.39%       | 3850   | 7.0s<br>in stationary air          | 0.9mW/°C                                   | 10Ω, 100Ω<br>1mA max.<br>500Ω, 1kΩ<br>0.1mA max. | -55°C~+155°C                             |
| SDT310P    | 100Ω<br>500Ω, 1kΩ                 | A: ±(0.15+0.002 t )°C<br>B: ±(0.3+0.005 t )°C<br>C: ±(1.0+0.01 t )°C | ±0.059%<br>±0.12%<br>±0.39%       |  |                                    |  |  | -55°C~+400°C                             |
| SDT310MTM  | 100Ω                              | A: ±(0.15+0.002 t )°C<br>B: ±(0.3+0.005 t )°C<br>C: ±(1.0+0.01 t )°C | ±0.059%<br>±0.12%<br>±0.39%       |  |                                    |  |  | -55°C~+650°C                             |
| SDT310HLTC | 1kΩ                               | A: ±(0.15+0.002 t )°C<br>B: ±(0.3+0.005 t )°C<br>C: ±(1.0+0.01 t )°C | ±0.059%<br>±0.12%<br>±0.39%       |  | 2.8s<br>in stationary air          | 1.0mW/°C                                   |  | -55°C~+155°C                             |
| SDT310AP   | 10Ω                               | —  | ±10%                              |  | 6s in stationary air               | 1.0mW/°C                                   |  | -55°C~+400°C                             |
|            |                                   |  |                                   |  |                                    |  |  |  |

\*1 T.C.R.測定温度0°C/+100°C T.C.R. Measuring Temperature: 0°C/+100°C

\*2 熱時定数・熱放散定数は静止空气中で測定した値で、参考値となります。又、素子単体の値であり接続方法や固定方法で変わります。

\*3 素子に流す電流は自己発熱による温度上昇が無視できる範囲とします。測定電流は、100Ωでは、1mA、500Ω・1kΩでは、0.1mAを推奨いたします。SDT310APは、ホットフィルムとして使用可能です。自己発熱させて使用する場合は、規定電流は最大100mAとしてください。

\*2 Thermal time constant and dissipation constant are values measured in stationary air and are typical values, which are values of elements and vary with connecting or fixing methods.

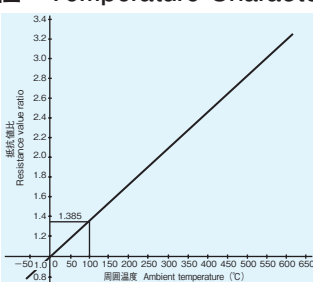
\*3 The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω or 1kΩ. SDT310AP can be used as hot-film sensor. Maximum specified current is 100mA when using under self-heating condition.

### ■使用上の注意 Precautions for Use

- SDT310P、SDT310MTM、SDT310APは、耐熱性リードを採用しているためはんだ付けが困難です。リード線の接続には溶接をご使用ください。
- 使用電流が、規定電流の場合は、自己発熱による温度上昇を計算して、誤差確認してください。
- SDT310シリーズをモールド加工したり、金属保護管内に樹脂を充填して使用する場合、使用する樹脂によっては、稀に僅少の抵抗値変化を伴う場合があります。
- It is difficult to solder SDT310P, SDT310MTM and SDT310AP because of using heat-resistant leads. Make use of welding to connect the leads wire.
- When an operating current is specified current, calculate a rise in temperature by self-heating to confirm an error.
- If SDT310 series is used by being molded or placed in a metal protection tube filled with resin, the resistance value may occasionally vary slightly depending on the resin used.

**性能 Performance**

| 試験項目<br>Test Items                                 | 規格値 Performance Requirements<br>ΔR± (%+0.05Ω) |                              | 試験方法<br>Test Methods  |
|--|---|------------------------------|---|
|  | 保証値 Limit                                     | 代表値 Typical                  |   |
| 抵抗値<br>Resistance                                  | 規定の許容差内<br>Within specified tolerance         | —                            | 0°C   |
| 抵抗温度係数<br>T.C.R.                                   | 規定値内<br>Within specified T.C.R.               | —                            | 0°C/+100°C  |
| 絶縁抵抗<br>Insulation resistance                      | 100MΩ以上<br>100MΩ or more                      | —                            | d.c.100V  |
| 耐電圧<br>Dielectric withstanding voltage             | 0.12  | 0.010                        | a.c.100V 60s~70s  |
| はんだ耐熱性 (SDT310LTC)<br>Resistance to soldering heat | 0.5   | 0.014                        | 350°C, 3.5s   |
| 温度急変<br>Rapid change of temperature                | 0.12  | -0.026                       | -55°C (30min)/+25°C (2~3min)/+155°C (30min)/+25°C (2~3min) 10 cycles (SDT310LTC・SDT310HLTC)<br>-55°C (30min)/+25°C (2~3min)/+400°C (30min)/+25°C (2~3min) 10 cycles (SDT310P・SDT310A)<br>+25°C (30min)/+650°C (30min) 10 cycles (SDT310MTM) |
| 耐湿負荷<br>Moisture resistance                        | 0.5   | -0.004                       | 60°C±2°C, 90%~95%RH, 1000h, 1mA<br>1.5時間ON/0.5時間OFFの周期 1.5h ON/0.5h OFF cycle   |
| 常温負荷<br>Normal temperature load life               | 0.5   | -0.017                       | 20°C±10°C, 1000h<br>1mA連続通電 1mA Continuous turning on electricity   |
| 高温負荷<br>High temperature load life                 | 0.5   | -0.022                       | 155°C±2°C(SDT310LTC・SDT310HLTC), 400°C±8°C(SDT310P・SDT310AP), 1000h, 650°C±13°C(SDT310MTM), 250h<br>1mA連続通電 1mA Continuous turning on electricity   |
| 高温放置<br>High temperature exposure                  | 0.12<br>0.5 (SDT310MTM)                       | -0.027<br>-0.060 (SDT310MTM) | +155°C(SDT310LTC・SDT310HLTC), +400°C(SDT310P・SDT310AP), +650°C(SDT310MTM), 250h   |
| 低温放置<br>Low temperature exposure                   | 0.12  | -0.036                       | -55°C, 250h   |

**抵抗温度特性 Temperature Characteristics**


抵抗温度特性近似式

Approximate Expression for Resistance-Temperature Characteristics

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

$$0^{\circ}\text{C} \sim +650^{\circ}\text{C} : R_T = R_0 (1 + C_1 T + C_2 T^2)$$

 $R_T$ : T°Cでの抵抗値

 $R_T$ : Resistance value at T°C

 $R_0$ : 0°Cでの抵抗値

 $R_0$ : Resistance value at 0°C

 $T$ : 周囲温度 (°C)

 $T$ : Ambient temperature (°C)

 $C_1, C_2, C_3$ : 定数

$$\text{Constants } C_1, C_2, C_3 : C_1 = 3.9083 \times 10^{-3} \text{ } ^{\circ}\text{C}^{-1}$$

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

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

**抵抗-温度特性 (JIS C1604-1997) 抜粋 Pt100 Resistance-Temperature Characteristic (JIS C1604-1997)**  
 100Ω at 0°C

| 温度 (°C)<br>Temperature | 0      | -1     | -2     | -3     | -4     | -5     | -6     | -7     | -8     | -9     |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -50                    | 80.31  | 79.91  | 79.51  | 79.11  | 78.72  | 78.32  | —      | —      | —      | —      |
| -40                    | 84.27  | 83.87  | 83.48  | 83.08  | 82.69  | 82.29  | 81.89  | 81.50  | 81.10  | 80.70  |
| -30                    | 88.22  | 87.83  | 87.43  | 87.04  | 86.64  | 86.25  | 85.85  | 85.46  | 85.06  | 84.67  |
| -20                    | 92.16  | 91.77  | 91.37  | 90.98  | 90.59  | 90.19  | 89.80  | 89.40  | 89.01  | 88.62  |
| -10                    | 96.09  | 95.69  | 95.30  | 94.91  | 94.52  | 94.12  | 93.73  | 93.34  | 92.95  | 92.55  |
| 0                      | 100.00 | 99.61  | 99.22  | 98.83  | 98.44  | 98.04  | 97.65  | 97.26  | 96.87  | 96.48  |
| 0                      | 100.00 | 100.39 | 100.78 | 101.17 | 101.56 | 101.95 | 102.34 | 102.73 | 103.12 | 103.51 |
| 10                     | 103.90 | 104.29 | 104.68 | 105.07 | 105.46 | 105.85 | 106.24 | 106.63 | 107.02 | 107.41 |
| 20                     | 107.79 | 108.18 | 108.57 | 108.96 | 109.35 | 109.73 | 110.12 | 110.51 | 110.90 | 111.29 |
| 30                     | 111.67 | 112.06 | 112.45 | 112.83 | 113.22 | 113.61 | 114.00 | 114.38 | 114.77 | 115.15 |
| 40                     | 115.54 | 115.93 | 116.31 | 116.70 | 117.08 | 117.47 | 117.86 | 118.24 | 118.63 | 119.01 |
| 50                     | 119.40 | 119.78 | 120.17 | 120.55 | 120.94 | 121.32 | 121.71 | 122.09 | 122.47 | 122.86 |
| 60                     | 123.24 | 123.63 | 124.01 | 124.39 | 124.78 | 125.16 | 125.54 | 125.93 | 126.31 | 126.69 |
| 70                     | 127.08 | 127.46 | 127.84 | 128.22 | 128.61 | 128.99 | 129.37 | 129.75 | 130.13 | 130.52 |
| 80                     | 130.90 | 131.28 | 131.66 | 132.04 | 132.42 | 132.80 | 133.18 | 133.57 | 133.95 | 134.33 |
| 90                     | 134.71 | 135.09 | 135.47 | 135.85 | 136.23 | 136.61 | 136.99 | 137.37 | 137.75 | 138.13 |
| 100                    | 138.51 | 138.88 | 139.26 | 139.64 | 140.02 | 140.40 | 140.78 | 141.16 | 141.54 | 141.91 |
| 110                    | 142.29 | 142.67 | 143.05 | 143.43 | 143.80 | 144.18 | 144.56 | 144.94 | 145.31 | 145.69 |
| 120                    | 146.07 | 146.44 | 146.82 | 147.20 | 147.57 | 147.95 | 148.33 | 148.70 | 149.08 | 149.46 |
| 130                    | 149.83 | 150.21 | 150.58 | 150.96 | 151.33 | 151.71 | 152.08 | 152.46 | 152.83 | 153.21 |
| 140                    | 153.58 | 153.96 | 154.33 | 154.71 | 155.08 | 155.46 | 155.83 | 156.20 | 156.58 | 156.95 |
| 150                    | 157.33 | 157.70 | 158.07 | 158.45 | 158.82 | 159.19 | 159.56 | 159.94 | 160.31 | 160.68 |
| 160                    | 161.05 | 161.43 | 161.80 | 162.17 | 162.54 | 162.91 | 163.29 | 163.66 | 164.03 | 164.40 |
| 170                    | 164.77 | 165.14 | 165.51 | 165.89 | 166.26 | 166.63 | 167.00 | 167.37 | 167.74 | 168.11 |
| 180                    | 168.48 | 168.85 | 169.22 | 169.59 | 169.96 | 170.33 | 170.70 | 171.07 | 171.43 | 171.80 |
| 190                    | 172.17 | 172.54 | 172.91 | 173.28 | 173.65 | 174.02 | 174.39 | 174.75 | 175.12 | 175.49 |
| 200                    | 175.86 | 176.22 | 176.59 | 176.96 | 177.33 | 177.69 | 178.06 | 178.43 | 178.79 | 179.16 |
| 210                    | 179.53 | 179.89 | 180.26 | 180.63 | 180.99 | 181.36 | 181.72 | 182.09 | 182.46 | 182.82 |
| 220                    | 183.19 | 183.55 | 183.92 | 184.28 | 184.65 | 185.01 | 185.38 | 185.74 | 186.11 | 186.47 |
| 230                    | 186.84 | 187.20 | 187.56 | 187.93 | 188.29 | 188.66 | 189.02 | 189.39 | 189.75 | 190.11 |
| 240                    | 190.47 | 190.84 | 191.20 | 191.56 | 191.92 | 192.29 | 192.65 | 193.01 | 193.37 | 193.74 |
| 250                    | 194.10 | 194.46 | 194.82 | 195.18 | 195.55 | 195.91 | 196.27 | 196.63 | 196.99 | 197.35 |
| 260                    | 197.71 | 198.07 | 198.43 | 198.79 | 199.15 | 199.51 | 199.87 | 200.23 | 200.59 | 200.95 |
| 270                    | 201.31 | 201.67 | 202.03 | 202.39 | 202.75 | 203.11 | 203.47 | 203.83 | 204.19 | 204.55 |
| 280                    | 204.90 | 205.26 | 205.62 | 205.98 | 206.34 | 206.70 | 207.06 | 207.41 | 207.77 | 208.13 |
| 290                    | 208.48 | 208.84 | 209.20 | 209.56 | 209.91 | 210.27 | 210.63 | 210.98 | 211.34 | 211.70 |
| 300                    | 212.05 | 212.41 | 212.76 | 213.12 | 213.48 | 213.83 | 214.19 | 214.54 | 214.90 | 215.25 |
| 310                    | 215.61 | 215.96 | 216.32 | 216.67 | 217.03 | 217.38 | 217.74 | 218.09 | 218.44 | 218.80 |
| 320                    | 219.15 | 219.51 | 219.86 | 220.21 | 220.57 | 220.92 | 221.27 | 221.63 | 221.98 | 222.33 |
| 330                    | 222.68 | 223.04 | 223.39 | 223.74 | 224.09 | 224.45 | 224.80 | 225.15 | 225.50 | 225.85 |
| 340                    | 226.21 | 226.56 | 226.91 | 227.26 | 227.61 | 227.96 | 228.31 | 228.66 | 229.01 | 229.37 |
| 350                    | 229.72 | 230.07 | 230.42 | 230.77 | 231.12 | 231.47 | 231.82 | 232.17 | 232.52 | 232.87 |
| 360                    | 233.21 | 233.56 | 233.91 | 234.26 | 234.61 | 234.96 | 235.31 | 235.66 | 236.01 | 236.36 |
| 370                    | 236.70 | 237.05 | 237.40 | 237.74 | 238.09 | 238.44 | 238.79 | 239.13 | 239.48 | 239.83 |
| 380                    | 240.18 | 240.52 | 240.87 | 241.22 | 241.56 | 241.91 | 242.26 | 242.60 | 242.95 | 243.29 |
| 390                    | 243.64 | 243.98 | 244.33 | 244.68 | 245.02 | 245.37 | 245.71 | 246.06 | 246.40 | 246.75 |
| 400                    | 247.09 | 247.44 | 247.78 | 248.13 | 248.47 | 248.81 | 249.16 | 249.50 | 249.85 | 250.19 |
| 410                    | 250.53 | 250.88 | 251.22 | 251.56 | 251.91 | 252.25 | 252.59 | 252.93 | 253.28 | 253.62 |
| 420                    | 253.96 | 254.30 | 254.65 | 254.99 | 255.33 | 255.67 | 256.01 | 256.35 | 256.70 | 257.04 |
| 430                    | 257.38 | 257.72 | 258.06 | 258.40 | 258.74 | 259.08 | 259.42 | 259.76 | 260.10 | 260.44 |
| 440                    | 260.78 | 261.12 | 261.46 | 261.80 | 262.14 | 262.48 | 262.82 | 263.16 | 263.50 | 263.84 |
| 450                    | 264.18 | 264.52 | 264.86 | 265.20 | 265.53 | 265.87 | 266.21 | 266.55 | 266.89 | 267.22 |
| 460                    | 267.56 | 267.90 | 268.24 | 268.57 | 268.91 | 269.25 | 269.59 | 269.92 | 270.26 | 270.60 |
| 470                    | 270.93 | 271.27 | 271.61 | 271.94 | 272.28 | 272.61 | 272.95 | 273.29 | 273.62 | 273.96 |
| 480                    | 274.23 | 274.56 | 274.90 | 275.23 | 275.56 | 275.89 | 276.23 | 276.56 | 276.89 | 277.23 |
| 490                    | 277.64 | 277.98 | 278.31 | 278.64 | 278.98 | 279.31 | 279.64 | 279.98 | 280.31 | 280.64 |
| 500                    | 280.98 | 281.31 | 281.64 | 281.98 | 282.31 | 282.64 | 282.97 | 283.31 | 283.64 | 283.97 |
| 510                    | 284.30 | 284.63 | 284.97 | 285.30 | 285.63 | 285.96 | 286.29 | 286.62 | 286.95 | 287.29 |
| 520                    | 287.62 | 287.95 | 288.28 | 288.61 | 288.94 | 289.27 | 289.60 | 289.93 | 290.26 | 290.59 |
| 530                    | 290.92 | 291.25 | 291.58 | 291.91 | 292.24 | 292.57 | 292.90 | 293.23 | 293.56 | 293.89 |
| 540                    | 294.21 | 294.54 | 294.86 | 295.19 | 295.52 | 295.85 | 296.18 | 296.51 | 296.84 | 297.17 |
| 550                    | 297.49 | 297.81 | 298.14 | 298.47 | 298.80 | 299.12 | 299.45 | 299.78 | 300.10 | 300.43 |
| 560                    | 300.75 | 301.08 | 301.41 | 301.73 | 302.06 | 302.38 | 302.71 | 303.03 | 303.36 | 303.69 |
| 570                    | 304.01 | 304.34 | 304.66 | 304.98 | 305.31 | 305.63 | 305.96 | 306.28 | 306.61 | 306.93 |
| 580                    | 307.25 | 307.58 | 307.90 | 308.23 | 308.55 | 308.87 | 309.20 | 309.52 | 309.84 | 310.16 |
| 590                    | 310.49 | 310.81 | 311.13 | 311.45 | 311.78 | 312.10 | 312.42 | 312.74 | 313.06 | 313.39 |
| 600                    | 313.71 | 314.03 | 314.35 | 314.67 | 314.99 | 315.31 | 315.63 | 315.95 | 316.27 | 316.60 |
| 610                    | 316.92 | 317.24 | 317.56 | 317.88 | 318.20 | 318.52 | 318.84 | 319.16 | 319.48 | 319.80 |
| 620                    | 320.12 | 320.44 | 320.76 | 321.07 | 321.39 | 321.71 | 322.03 | 322.35 | 322.67 | 322.98 |
| 630                    | 323.30 | 323.62 | 323.94 | 324.26 | 324.57 | 324.89 | 325.21 | 325.53 | 325.84 | 326.16 |
| 640                    | 326.48 | 326.79 | 327.11 | 327.43 | 327.74 | 328.06 | 328.38 | 328.69 | 329.01 | 329.32 |
| 650                    | 329.64 | —      | —      | —      | —      | —      | —      | —      | —      | —      |

注意

横軸の温度+縦軸の温度が求める温度です。105°Cの抵抗値を求める場合は縦軸の100°Cと横軸の5°Cの交わる欄の数字を読んでください。

140.40Ωとなります。  
0°C 500Ωの場合は本表の抵抗値を5倍した値になります。また0°C、1kΩの場合は、10倍した値になります。

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 140.40Ω.

The value for 500Ω at 0°C will be the value obtained by multiplying the resistance value in this table by 5. Similarly, the value for 1KΩ at 0°C will be the value obtained by multiplying the resistance value by 10.