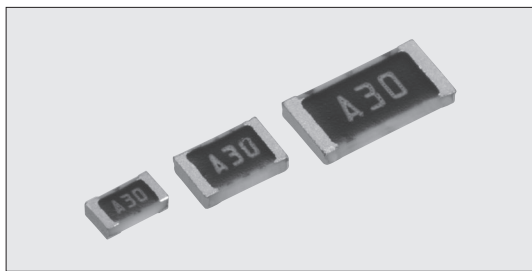


# THERMAL SENSORS

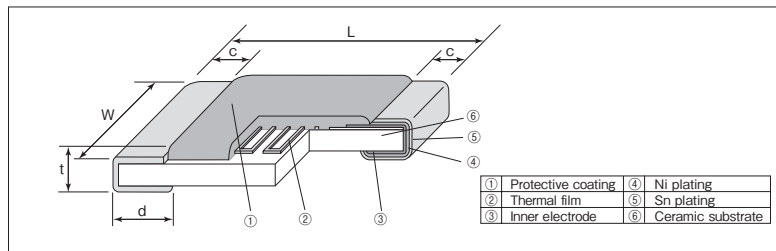


## LP73 Thin Film Resistance Thermal Chip Sensors



Coating color : Black

### Construction



### Features

- LP73s are thin-film thermal sensors of SMD type.
- LP73s accommodate resistance tolerance  $\pm 1\%$ , a wide range of TCR  $+3000 \times 10^{-6}/K \sim +5000 \times 10^{-6}/K$  with the standard products.
- Suitable for control of temperatures in various industrial equipment.
- Suitable for both flow and reflow soldering.
- Products with lead free termination meet EU-RoHS requirements.

### Applications

- Temperature compensation on overheat prevention for Cameras and Small DC Motors.
- Temperature compensation for various kinds of Sensor Drive Circuits.
- Temperature compensation for Telecommunication and Measuring Devices.
- Temperature compensation for Hybrid ICs.

### Dimensions

| Type<br>(Inch Size Code) | Dimensions (mm) |             |               |               |                | Weight (g)<br>(1000pcs) |
|--------------------------|-----------------|-------------|---------------|---------------|----------------|-------------------------|
|                          | L $\pm 0.2$     | W $\pm 0.2$ | c             | d             | t              |                         |
| 1J<br>(0603)             | 1.6             | 0.8         | 0.3 $\pm 0.2$ | 0.3 $\pm 0.2$ | 0.5 $\pm 0.1$  | 1.91                    |
| 2A<br>(0805)             | 2.0             | 1.25        | 0.4 $\pm 0.2$ | 0.4 $\pm 0.2$ | 0.5 $\pm 0.15$ | 4.09                    |
| 2B<br>(1206)             | 3.2             | 1.6         | 0.5 $\pm 0.3$ | 0.5 $\pm 0.3$ |                | 7.61                    |

### Type Designation

Example

| LP73         | 2B   | T                         | TE  | 103                | J   | 3600                          |
|--------------|--|---------------------------|---|--------------------|---|-------------------------------|
| Product Code | Size   | Terminal Surface Material | Taping                                      | Nominal Resistance | Resistance Tolerance                            | T.C.R. ( $\times 10^{-6}/K$ ) |
|              | 1J:1.6 $\times$ 0.8mm<br>2A:2.0 $\times$ 1.25mm<br>2B:3.2 $\times$ 1.6mm | T : Sn                    | TE:4mm pitch<br>plastic embossed<br>BK:Bulk | 3 digits           | F : $\pm 1\%$<br>G : $\pm 2\%$<br>J : $\pm 5\%$ |                               |

The terminal surface material lead free is standard.

Contact us when you have control request for environmental hazardous material other than the substance specified by EU-RoHS.

For further information on taping, please refer to APPENDIX C on the back pages.

### Ratings

| Type    | Power Rating (W) | Thermal Time <sup>※1</sup> Constant (s) | Thermal Dissipation <sup>※1</sup> Constant (mW/ $^{\circ}C$ ) | Rated Ambient Temperature ( $^{\circ}C$ ) | Operating Temperature Range ( $^{\circ}C$ ) | Taping & Q'ty/Reel (pcs) |
|---------|------------------|---|---|---|---|--------------------------|
|         |                  |   |   |   |   | TE                       |
| LP73 1J | 0.016            | 2                                       | 1.2   | +70                                       | -55 $\sim$ +125                             | 5,000                    |
| LP73 2A | 0.031            | 4                                       | 1.8   |   |   |                          |
| LP73 2B | 0.063            | 6.5                                     | 2.4   |   |   |                          |

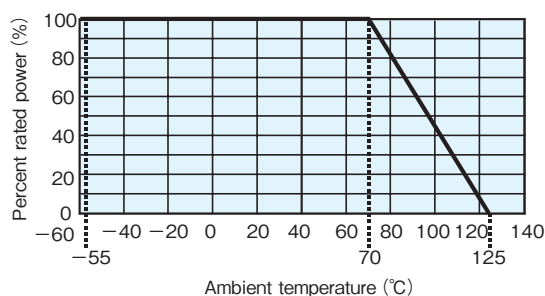
※1 Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

### T.C.R. and Resistance Range

| T.C.R. (×10 <sup>-6</sup> /K) <sup>#2</sup> | T.C.R. Tolerance (%) | Resistance Range (E24 & 5.0×10 <sup>n</sup> ) (Ω) |        |         | Resistance Tolerance (%) |
|---|----------------------|---|--------|---------|--------------------------|
|   |                      | 1J  | 2A     | 2B      |                          |
| 3000  | ±5                   | 100~1k  | 100~2k | 100~10k | F: ±1, G: ±2, J: ±5      |
| 3300  |                      | 100~300   |        |         | G: ±2, J: ±5             |
| 3600  |                      | 330~1k  |        |         | F: ±1, G: ±2, J: ±5      |
| 4000  |                      | 100~1k  |        |         |                          |
| 4500  |                      |   |        |         |                          |
| 5000  |                      |   |        |         |                          |

※2 T.C.R. Measuring Temperature : +25 $^{\circ}C$ /+65 $^{\circ}C$

## Derating Curve



For sensors operated at an ambient temperature of 70°C or higher, the power shall be derated in accordance with the above derating curve.

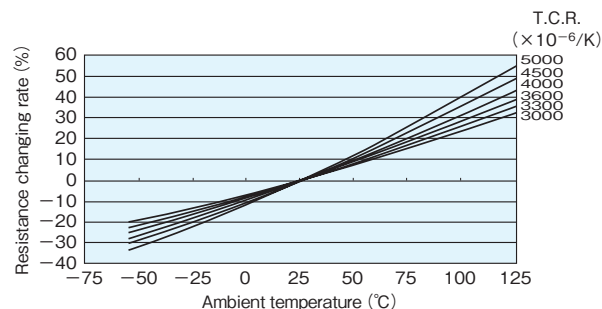
## Approximate Expression for Resistance-Temperature Characteristics

(Values are not guaranteed but typical.)

$$R_T = R_{25} (C_0 + C_1 T + C_2 T^2)$$

$R_T$  : Resistance value at  $T^\circ\text{C}$   
 $R_{25}$  : Resistance value at  $25^\circ\text{C}$   
 $T$  : Ambient temperature ( $^\circ\text{C}$ )  
 $C_0, C_1, C_2$  : Constants

## Example of Temperature Characteristics of Resistance



| T.C.R. | C <sub>0</sub> | C <sub>1</sub> | C <sub>2</sub>             |
|--------|----------------|----------------|----------------------------|
| 3000   | 0.931258       | 0.00265213     | 3.90112 × 10 <sup>-6</sup> |
| 3300   | 0.924355       | 0.00292569     | 4.00516 × 10 <sup>-6</sup> |
| 3600   | 0.916356       | 0.00323714     | 4.34428 × 10 <sup>-6</sup> |
| 4000   | 0.907039       | 0.00361006     | 4.33457 × 10 <sup>-6</sup> |
| 4500   | 0.897412       | 0.00395222     | 6.05201 × 10 <sup>-6</sup> |
| 5000   | 0.886014       | 0.00437224     | 7.48809 × 10 <sup>-6</sup> |

## Performance

| Test Items                   | Performance Requirements $\Delta R \pm (\% + 0.05 \Omega)$ |         | Test Methods   |
|------------------------------|--|---------|--|
|                              | Limit  | Typical |  |
| Resistance                   | Within specified tolerance                                 | —       | 25°C   |
| T.C.R.                       | Within specified T.C.R.                                    | —       | +25°C / +65°C  |
| Overload                     | 0.5  | 0.3     | Rated voltage × 2.5 for 5s.  |
| Resistance to soldering heat | 0.5  | 0.3     | 260°C ± 5°C, 10s ± 0.5s  |
| Rapid change of temperature  | 0.5  | 0.3     | -55°C (30min.) / +25°C (2~3min.) / +125°C (30min.) / +25°C (2~3min.)<br>5 cycles |
| Moisture resistance          | 2  | 1.5     | 40°C ± 2°C, 90%~95%RH, 1000h<br>1.5h ON / 0.5h OFF cycle                         |
| Endurance at 70°C            | 2  | 1.5     | 70°C ± 2°C, 1000h<br>1.5h ON / 0.5h OFF cycle                                    |

Confirming resistance drift is recommended since this product has a tendency to have bigger resistance change than general flat chip over 70°C.  
Please pay attention not to be applied ESD, it may cause of resistance change.

## Actual Value (Out of guarantee)

| Test Items                | Reference | Test Methods             |
|---------------------------|-----------|--------------------------|
| High temperature exposure | 8%        | +125°C, 1000h            |
| ESD                       | 500V      | Human model, 100pF 1.5kΩ |

## Precautions for Use

- The resistance varies by its self heat-generation. Reasonable care must be exercised in using it by taking its self-heating into consideration. Sensors operated at rated power will cause temperature errors in excess of 10°C.
- The properly and electrostatically measured taping materials are used for the components, but attention should be paid to the fact that there is some danger the parts absorb on the top tapes to cause a failure in the mounting and the parts are destructed by static electricity to change the resistance in the conditions of an excessive dryness or after the parts are given vibration for a long time as they are packaged on the tapes. Similarly, care should be given not to apply the excessive static electricity when mounting on the boards.
- Ionic impurities such as flux etc. that are attached to these products or those mounted onto a PCB, negatively affect their moisture resistance, corrosion resistance, etc. The flux may contain ionic substances like chlorine, acid, etc. Please wash them to get rid of these ionic substances especially when using lead-free solder that may contain much of the said substances for improving a wetting characteristic. Using RMA solder or RMA flux, or well-washing is needed. Also, attaching ionic substances such as perspiration, salt etc. by storage environments or mounting conditions/environments negatively affects their moisture resistance, corrosion resistance etc. Please wash them to remove the ionic substances when they are polluted.
- When the components are polluted by ionic impurities like sodium ( $\text{Na}^+$ ), chlorine ( $\text{Cl}^-$ ) etc. included in perspiration and saliva, it leads to electrolytic corrosion. Avoid the pollution when storage, mounting and using. Consider not to remain ionic substances on the components. Wash by pure water etc. and dry them when you find pollution.  
It is recommended to avoid using adhesive or masking tapes. Because the upper coating can stick off by peeling masking tapes which covers our product to flow-solder larger parts or by knocking and rubbing with adhesive tapes and by brushing to remove the solder balls.
- Please pay attention that the top of an iron does not direct touch to the components. There is a risk that may cause a change in resistance. Take care that another risk may happen that the protecting coat is carbonized in an instant when touched directly by the top of the iron, also climatic-proof for electrolytic corrosion or insulation of protecting coat may be dropped down. Be sure not to give high temperature on the top of the iron as it will degrade the protecting coat.
- Avoid storing components under direct sun rays, high temperature/humidity. Direct sun rays will cause quality change of taping and difficulty of keeping appropriate peeling strength. 5~35°C/35~75%RH, there is no deterioration of solderability for 12 months, but take special care for storing, because condensation, dust, and toxic gas like hydrogen sulfide, sulfurous acid gas, hydrogen chloride, etc. may drop solderability.