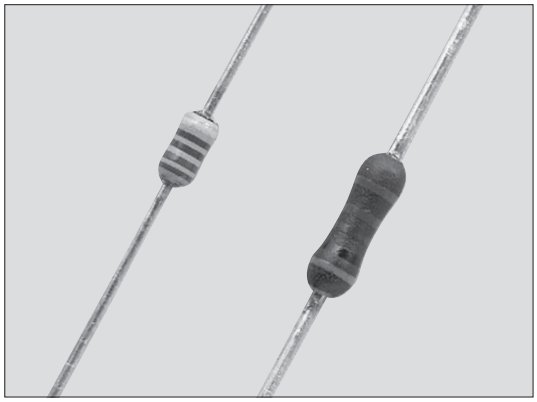
# THERMAL SENSORS

EU RoHS

## LP 薄膜电阻温度传感器
**Thin Film Resistance Thermal Sensors**

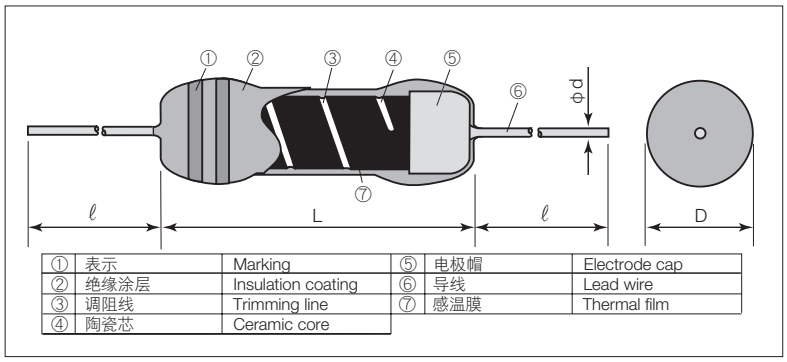


外观颜色：象牙色（LP1/16）、茶色（LP1/8）
Coating color: Ivory (LP1/16), Brown (LP1/8)
表示：彩色码　Marking: Color code

### ■ 特点　Features
- 是薄膜温度传感器，阻值允许偏差±1%标准对应。对应高T.C.R. ＋5000×10⁻⁶/K。
- 适用于各种工业设备的温度控制。
- 符合欧盟RoHS。
- LP series is thin-film thermal sensors and accomodates resistance tolerance ±1% and high T.C.R. ＋5000×10⁻⁶/K with the standard products.
- Suitable for control of temperatures for various industrialequipment.
- Products meet EU-RoHS requirements.

### ■ 用途　Applications
- 电子秤用负荷传感器的温度补偿。
- 防止汽车电动机、打印机头的过热。
- 家电、计量测量设备、通信设备的温度补偿。
- 防止各种印刷电路板的过热。
- Temperature compensation for Load Cells in a Electronic Weighing Instruments.
- Overheat prevention for Printer Heads.
- Temperature compensation for Home Electrical Appliances, Measuring Instruments and Communications Equipment.
- Overheat prevention for various PCBs.

### ■ 结构图　Construction




| | | | | | |
|---|---|---|---|---|---|
| ① | 表示 | Marking | ⑤ | 电极帽 | Electrode cap |
| ② | 绝缘涂层 | Insulation coating | ⑥ | 导线 | Lead wire |
| ③ | 调阻线 | Trimming line | ⑦ | 感温膜 | Thermal film |
| ④ | 陶瓷芯 | Ceramic core | | | |

### ■ 外形尺寸　Dimensions

| 型号 Type | 尺寸 Dimensions （mm） | | | | Weight (g) (1000pcs) |
|---|---|---|---|---|---|
| | L | D±0.2 | d (Nominal)±0.05 | ℓ±3 | |
| LP 1/16 | $3.5^{+0.2}_{-0.4}$ | 1.7 | 0.5 | 30 | 150 |
| LP 1/8 | 6.35±0.8 | 2.3 | 0.65 | 38 | 250 |

### ■ 品名构成　Type Designation

实例　Example

| LP | 1/8 | C | T26 | A | 103 | J | 362 |
|---|---|---|---|---|---|---|---|
| 品种 Product Code | 额定功率 Power Rating | 端子表面材质 Termination Surface Material | 二次加工 Taping | 包装 Packaging | 公称电阻值 Nominal Resistance | 阻值允许偏差 Resistance Tolerance | 电阻温度系数符号 Symbol of T.C.R. |
| | 1/16: 0.063W<br>1/8 : 0.125W | C:SnCu | 空栏：散装 Nil:Bulk<br>T26:26mm Taping<br>T52:52mm Taping | 空栏：散装 Nil:Bulk<br>A:AMMO包装 A:AMMO | 3digits | F:±1%<br>G:±2%<br>J:±5% | 3digits<br>151:150<br>362:3600 |

欲知关于此产品含有的环境负荷物质详情（除EU-RoHS以外），请与我们联系。
编带细节请参考卷末附录C。
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.

### ■ 额定值　Ratings

| 型　号 Type | 额定功率 Power Rating | 热时间常数※ Thermal Time Constant | 热消散系数※ Thermal Dissipation Constant | 额定环境温度 Rated Ambient Temperature | 使用温度范围 Operating Temp. Range | 编带和包装数/卷 Taping & Q'ty/Reel (pcs) | |
|---|---|---|---|---|---|---|---|
| | | | | | | T26A | T52A |
| LP1/16C | 0.063W | 8s | 2.5mW/℃ | ＋70℃ | －55℃～＋150℃ | 4,000 | 4,000 |
| LP1/8C | 0.125W | 14s | 4.5mW/℃ | | | 2,000 | 2,000 |

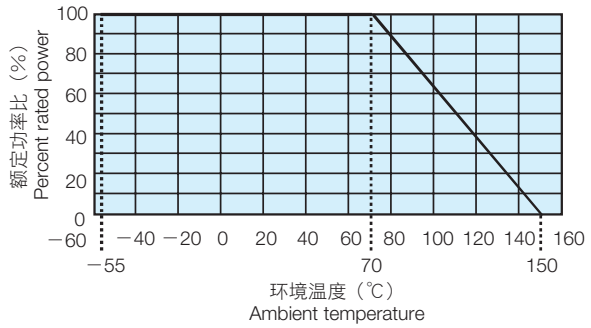
※　热时间常数•热消散系数是在静止空气中测定的值，为参考值。又是元件单体的值，因连接方法和固定方法而变化。
※　Thermal time constant and dissipation constant are reference values, which are values of elements and vary with connecting or fixing methods.

### ■ 电阻温度系数和电阻值范围　T.C.R. and Resistance Range

| 电阻温度系数 T.C.R. (×10⁻⁶/K) | 电阻温度系数允许偏差 T.C.R. Tolerance | 电阻值范围（Ω） Resistance Range（E24 & 2.5, 5.0×10ⁿ） | | | | | |
|---|---|---|---|---|---|---|---|
| | | LP1/16 | | | LP1/8 | | |
| | | F:±1% | G:±2% | J:±5% | F:±1% | G:±2% | J:±5% |
| 150 • 250 • 350 | ±50×10⁻⁶/K | – | 150～10k | 150～10k | – | 150～51k | 150～51k |
| 450 | | | 150～30k | 150～30k | | 150～100k | 150～100k |
| 550 • 650 • 750 • 850 | ±10% | | | | | | |
| 950 • 1000 • 1200 | | | | | | | |
| 1400 • 1600 • 1800 | | | | | | | |
| 2000 • 2200 • 2400 | | | | | | | |
| 2500 | ±5% | 100～30k | 10～30k | 1～30k | 100～100k | 10～100k | 1～100k |
| 3000 | | 100～10k | 10～10k | 1～10k | | | |
| 3300 | | | | | | | |
| 3600 | | | | | 100～51k | 10～51k | 1～51k |
| 4000 • 4500 • 5000 | | | | | 100～20k | 10～20k | 1～20k |

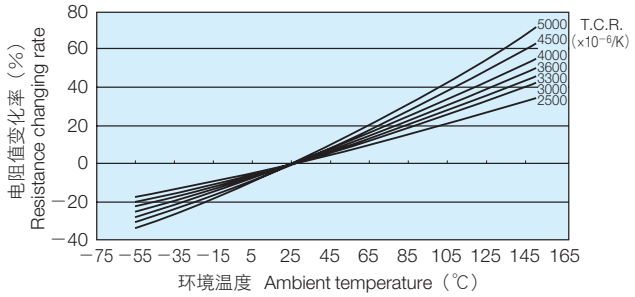
电阻温度系数测定温度+25℃/+65℃。还有，电阻温度系数通过抽样检查来保证。
T.C.R. Measuring Temperature: ＋25℃/＋65℃. T.C.R. is guaranted by random inspections.

## ■ 负荷减轻特性曲线　Derating Curve




在环境温度70℃以上使用时，应按照上图负荷减轻特性曲线，减小额定功率。
For resistors operated at an ambient temperature of 70ºC or above, a power rating shall be derated in accordance with the above derating curve.

## ■ 电阻温度特性实例
## Examples of Temperature Characteristics of Resistance




## ■ 电阻温度特性近似式
## Approximate Expression for Resistance-Temperature Characteristics

（是代表值，不是保证值。　Values are not guaranteed but typical.）

$R_T=R_{25}(C_0+C_1T+C_2T^2)$

$R_T$：T℃时的电阻值　$R_T$: Resistance value at T℃
$R_{25}$：25℃时的电阻值　$R_{25}$: Resistance value at 25℃
T：环境温度（℃）　T: Ambient temperature（℃）
$C_0$、$C_1$、$C_2$：常数　$C_0$, $C_1$, $C_2$: Constants

| T.C.R. ($\times10^{-6}$/K) | $C_0$ | $C_1$ | $C_2$ |
|---|---|---|---|
| 3000 | 0.931258 | 0.00265213 | $3.90112\times10^{-6}$ |
| 3300 | 0.924355 | 0.00292569 | $4.00516\times10^{-6}$ |
| 3600 | 0.915818 | 0.00323524 | $4.34173\times10^{-6}$ |
| 4000 | 0.907039 | 0.00361006 | $4.33457\times10^{-6}$ |
| 4500 | 0.897412 | 0.00395222 | $6.05201\times10^{-6}$ |
| 5000 | 0.886014 | 0.00437224 | $7.48048\times10^{-6}$ |

## ■ 性能　Performance

| 试验项目 Test Items | 标准值　Performance Requirements ΔR±（%+0.05 Ω） | | 试验方法 Test Methods |
|---|---|---|---|
| | 保证值　Limit | 代表值　Typical | |
| 电阻值 Resistance | 在规定的阻值允许偏差内 Within specified tolerance | – | 25℃ |
| 电阻温度系数 T.C.R. | 在规定值以内 Within specified T.C.R. | – | +25℃/+65℃ |
| 过载（短时间） Overload（Short time） | 0.5 | 0.2 | 额定电压的2.5倍施加5秒钟。 Rated voltage×2.5 for 5s. |
| 耐焊接热 Resistance to soldering heat | 0.5 | 0.2 | 350℃±10℃、1s |
| 温度突变 Rapid change of temperature | 0.5 | 0.2 | −55℃（30min.）/+25℃（10min.）/+150℃（30min.）/+25℃（10min.）5 cycles |
| 耐湿负荷 Moisture resistance | 2 | 0.3 | 40℃±2℃, 90%～95%RH, 1000h 1.5小时ON、0.5小时OFF的周期　1.5h ON/0.5h OFF cycle |
| 在70℃时的耐久性 Endurance at 70℃ | 2 | 0.5 | 70℃±3℃, 1000h 1.5小时ON、0.5小时OFF的周期　1.5h ON/0.5h OFF cycle |

## ■ 使用注意事项　Precautions for Use

- 由于自身发热，电阻值会发生变动，因此应考虑自身发热后使用。使用额定功率时，会引起10℃以上的温度误差。
- 在+3000×$10^{-6}$/K～+5000×$10^{-6}$/K中，由于也有用特殊的感温膜的领域，因此，在平常高温领域使用时，请另行商谈。
- 助焊剂等在本产品和安装的印刷电路板上附着离子性杂质时，其耐湿性•耐腐蚀性将受到影响。助焊剂内有时含有氯•酸等离子性物质，为除去这些离子性物质应进行清洗。特别是使用无铅助焊剂时，由于湿润性提高了，有时会含有大量离子性物质，所以在使用RMA系的焊锡或助焊剂时，应充分进行清洗。并且，保管环境和安装条件、环境等，附着了汗•盐等离子性物质时，其耐湿性•耐腐蚀性也将受到影响。对于这种污染，为了除去这些离子性物质，应当进行清洗。
- 产品受到人的汗和唾液等中所含钠、氯等离子性物质污染时，已证实会引发电蚀，因此，在保管•装载或使用时应防止污染。并且，确认有污染时，应当用纯水清洗干燥，注意不使离子性物质残留。
- The resistance of the part changes by its self heat-generation, so use it in consideration of this. The sensor operated at rated power causes a temperature error of 10℃ or more.
- Some areas of +3000×$10^{-6}$/K to +5000×$10^{-6}$/K use a special temperature sensing film (patented). Consult with us if the sensor will be always operated in a high temperature region.
- 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 ($Na^+$), chlorine ($Cl^-$) etc. included in perspiration and saliva, it leads to electric erosion. 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.