

PTC Thermistor : TPM-S Series

SMD PTC Thermistor for Temperature Sensing



■ Features

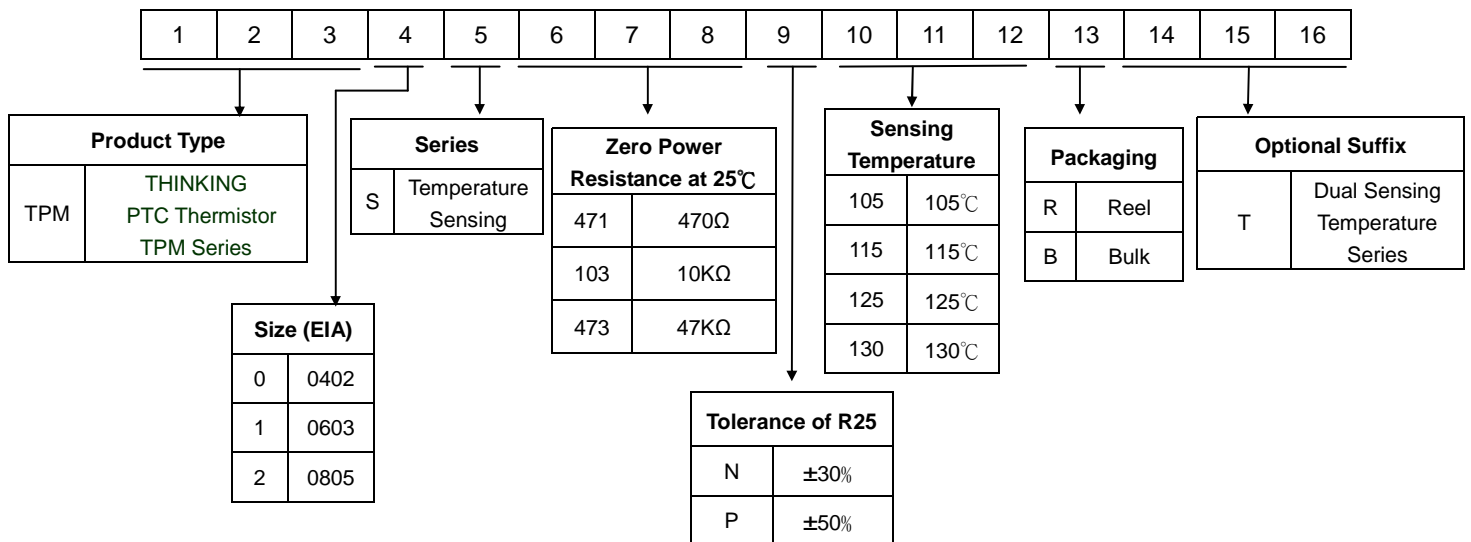
1. RoHS & Halogen-free compliant
2. Thermistor chip with lead-free tinned terminals
3. EIA size 0402,0603,0805
4. Fast and reliable response
5. Suitable for reflow soldering
6. Agency Recognition:
UL & cUL : File No. E138827
TUV : File No. R50133294



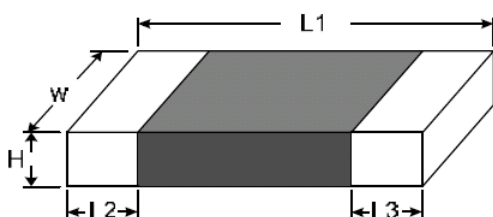
■ Recommended Applications

1. DC/DC converter
2. AC adapter
3. Inverter
4. Overheat protection for transistor and ICs
5. LED

■ Part Number Code



■ Structure and Dimensions



(Unit: mm)

| Part No. | Size (EIA) | L1 | W | H max. | L2 and L3 |
|----------|------------|-----------|-----------|--------|-----------|
| TPM0 | 0402 | 1.00±0.15 | 0.50±0.10 | 0.60 | 0.20±0.10 |
| TPM1 | 0603 | 1.60±0.15 | 0.80±0.15 | 0.95 | 0.40±0.20 |
| TPM2 | 0805 | 2.00±0.20 | 1.25±0.20 | 1.00 | 0.45±0.25 |

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Electrical Characteristics

Dual Sensing Temperature Series

| Part No. | Size (EIA) | Zero Power Resistance at 25°C (Ω) | Sensing Temperature 1 at 4.7 KΩ (°C) | Sensing Temperature 2 at 47 KΩ (°C) | Max. Voltage (V) | Operating Temperature Range(°C) |
|----------------|------------|-----------------------------------|--------------------------------------|-------------------------------------|------------------|---------------------------------|
| | | R25 | Ts1 | Ts2 | V _{dc} | T _L ~T _U |
| TPM0S541P115RT | 0402 | 540 | 115±5 | 135±7 | 32 | -25~+150 |
| TPM1S471P065RT | 0603 | 470 | 65±5 | 80±7 | 32 | -25~+90 |

| Part No. | Size (EIA) | Zero Power Resistance at 25°C (Ω) | Sensing Temperature 1 at 10 KΩ (°C) | Sensing Temperature 2 at 100 KΩ (°C) | Max. Voltage (V) | Operating Temperature Range(°C) |
|----------------|------------|-----------------------------------|-------------------------------------|--------------------------------------|------------------|---------------------------------|
| | | R25 | Ts1 | Ts2 | V _{dc} | T _L ~T _U |
| TPM0S102P115RT | 0402 | 1000 | 115±5 | 130±3 | 32 | -40~+140 |
| TPM0S102P125RT | | | 125±5 | 140±3 | | -40~+150 |

Single Sensing Temperature Series

| Part No. | Size (EIA) | Sensing Temperature (°C) | Resistance (Ω) | | | Max. Voltage (V) | Operating Temperature Range(°C) | Safety Approvals | |
|---------------|------------|--------------------------|----------------|----------|----------|------------------|---------------------------------|------------------|-------|
| | | Ts | 25°C | Ts - 5°C | Ts + 5°C | V _{dc} | T _L ~T _U | UL/cUL | TUV |
| TPM0S471P105R | 0402 | 105±5 | 470 | ≤4.7K | ≥4.7K | 32 | -25~+120 | √ | √ |
| TPM0S471P115R | | 115±5 | | | | | -25~+130 | √ | √ |
| TPM0S471P125R | | 125±5 | | | | | -25~+140 | √ | √ |
| TPM0S103P130R | | 130±5 | 10K | ≤4.7M | ≥4.7M | | -25~+145 | | |
| TPM1S101N130R | 0603 | 130±7 | 100 | ≤1K | ≥1K | 24 | -25~+145 | | |
| TPM1S221N105R | | 105±7 | 220 | ≤2.2K | ≥2.2K | | -25~+120 | | |
| TPM1S471P065R | | 65±5 | 470 | ≤4.7K | ≥4.7K | 32 | -25~+80 | √ | √ |
| TPM1S471P075R | | 75±5 | | | | | -25~+90 | √ | √ |
| TPM1S471P085R | | 85±5 | | | | | -25~+100 | √ | √ |
| TPM1S471P095R | | 95±5 | | | | | -25~+110 | √ | √ |
| TPM1S471P105R | | 105±5 | | | | | -25~+120 | √ | √ |
| TPM1S471P115R | | 115±5 | | | | | -25~+130 | √ | √ |
| TPM1S471P125R | | 125±5 | | | | | -25~+140 | √ | √ |
| TPM1S471P135R | | 135±5 | | | | | -25~+150 | √ | √ |
| TPM1S472P105R | | 105±5 | 4.7K | ≤47K | ≥47K | | -25~+120 | | |
| TPM1S103P110R | | 110±5 | 10K | ≤4.7M | ≥4.7M | | -25~+125 | √ | √ |
| TPM1S103P120R | | 120±5 | | | | | -25~+135 | √ | √ |
| TPM1S103P130R | | 130±5 | | | | | -25~+145 | √ | √ |
| TPM1S473P130R | | 130±5 | | | | | 47K | ≤4.7M | ≥4.7M |

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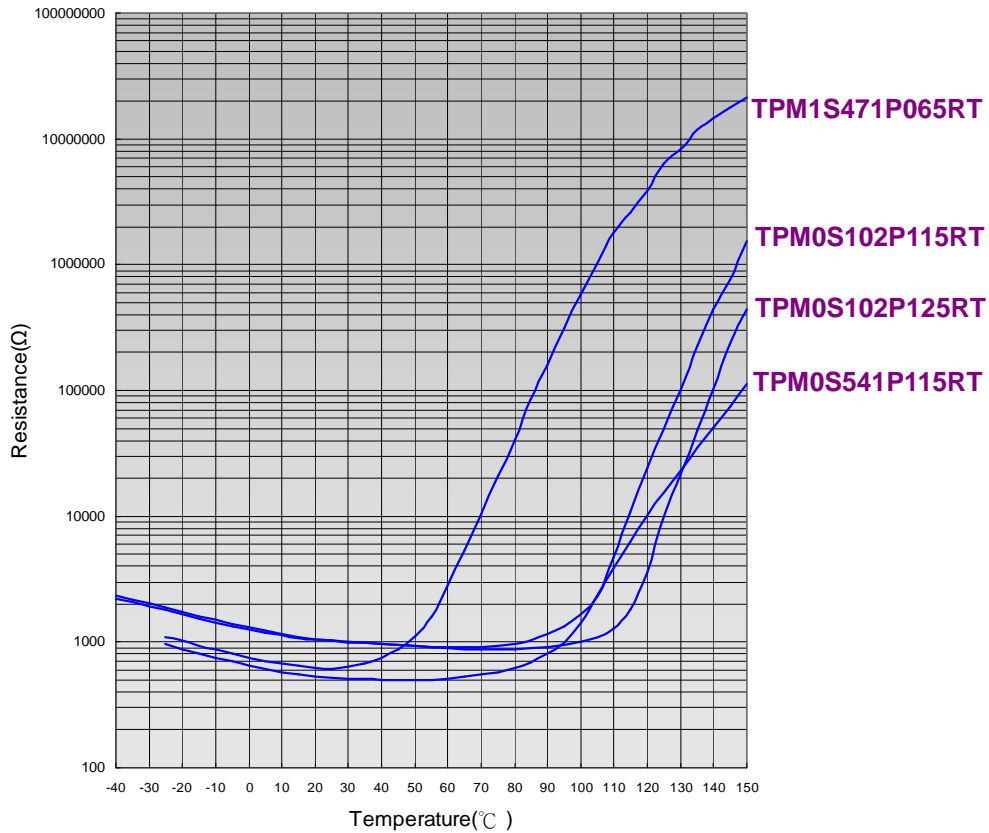
| Part No. | Size (EIA) | Sensing Temperature (°C) | Resistance (Ω) | | | Max. Voltage (V) | Operating Temperature Range(°C) | Safety Approvals | | | | |
|---------------|------------|--------------------------|----------------|----------|----------|------------------|---------------------------------|------------------|-------|----------|--|--|
| | | Ts | 25°C | Ts - 5°C | Ts + 5°C | V _{dc} | T _L ~T _U | UL/cUL | TUV | | | |
| TPM2S101N110R | 0805 | 110±7 | 100 | ≤1K | ≥1K | 24 | -25~+125 | | | | | |
| TPM2S101N115R | | 115±7 | | | | | -25~+130 | | | | | |
| TPM2S101N130R | | 130±7 | | | | | -25~+145 | | | | | |
| TPM2S471P065R | | 65±5 | 470 | ≤4.7K | ≥4.7K | 32 | -25~+80 | √ | √ | | | |
| TPM2S471P075R | | 75±5 | | | | | -25~+90 | √ | √ | | | |
| TPM2S471P085R | | 85±5 | | | | | -25~+100 | √ | √ | | | |
| TPM2S471P095R | | 95±5 | | | | | -25~+110 | √ | √ | | | |
| TPM2S471P105R | | 105±5 | | | | | -25~+120 | √ | √ | | | |
| TPM2S471P115R | | 115±5 | | | | | -25~+130 | √ | √ | | | |
| TPM2S471P125R | | 125±5 | | | | | -25~+140 | √ | √ | | | |
| TPM2S471P135R | | 135±5 | | | | | -25~+150 | √ | √ | | | |
| TPM2S103P130R | | 130±5 | | | | | 10K | ≤4.7M | ≥4.7M | -25~+145 | | |

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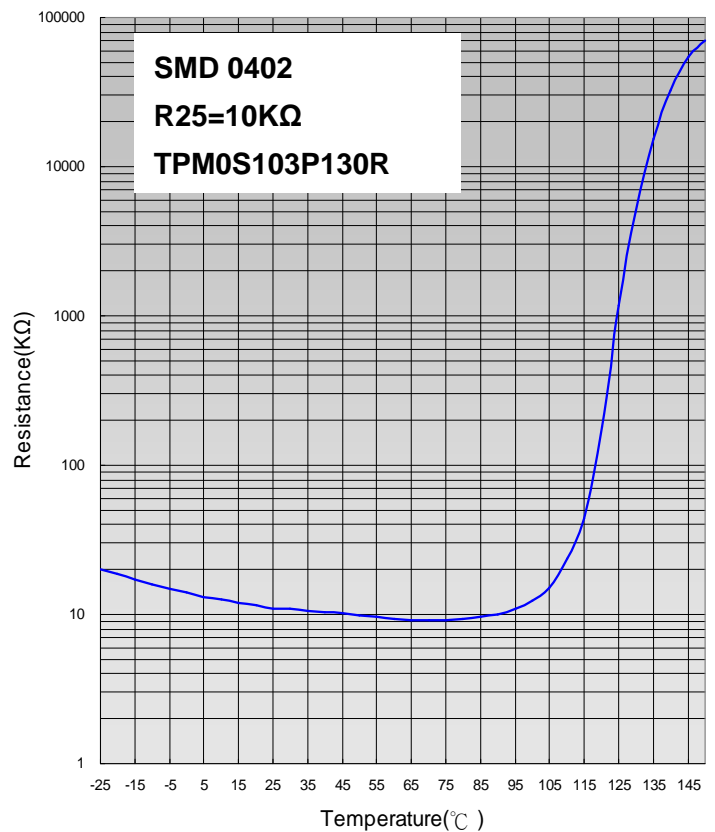
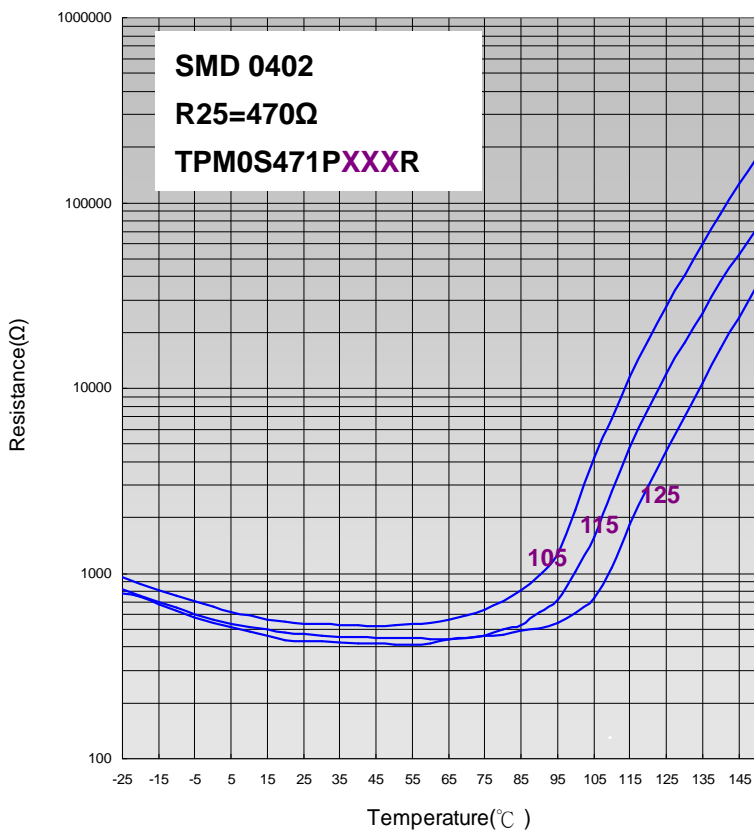


■ Resistance-Temperature Characteristics (Typical) Dual Sensing Temperature Series



● Single Sensing Temperature Series

● 0402 Series

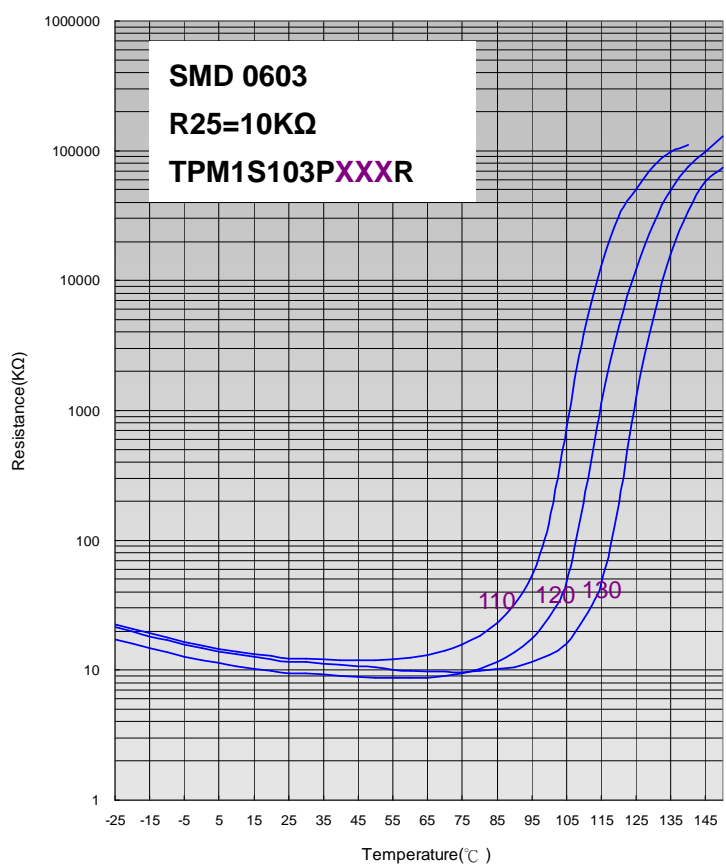
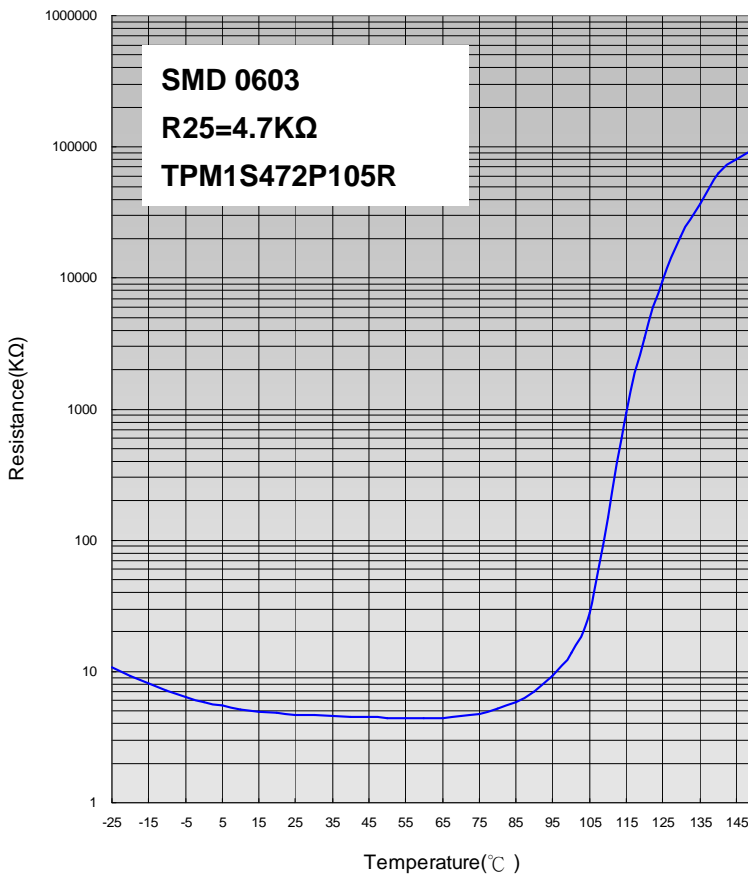
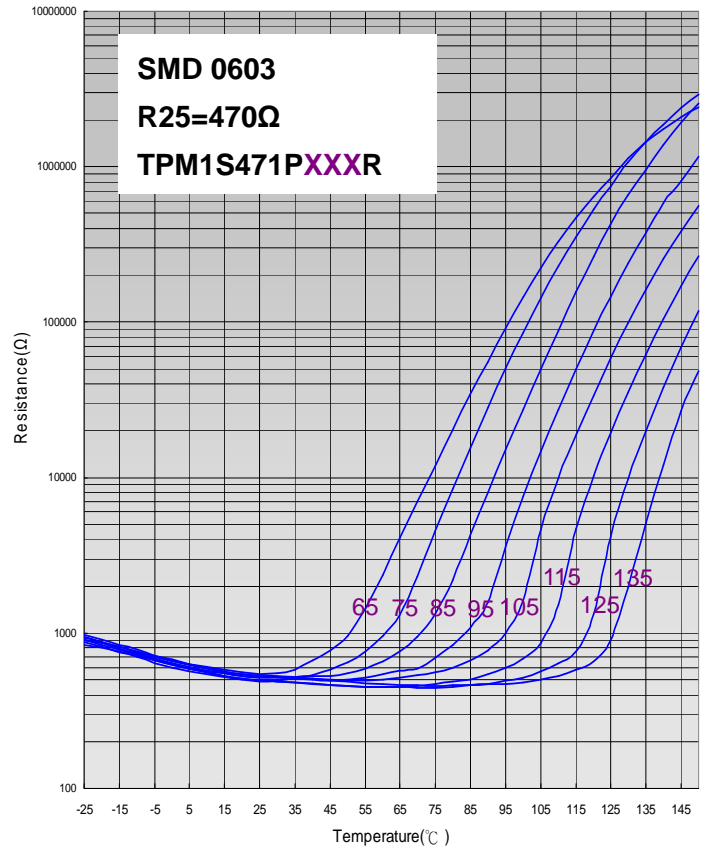
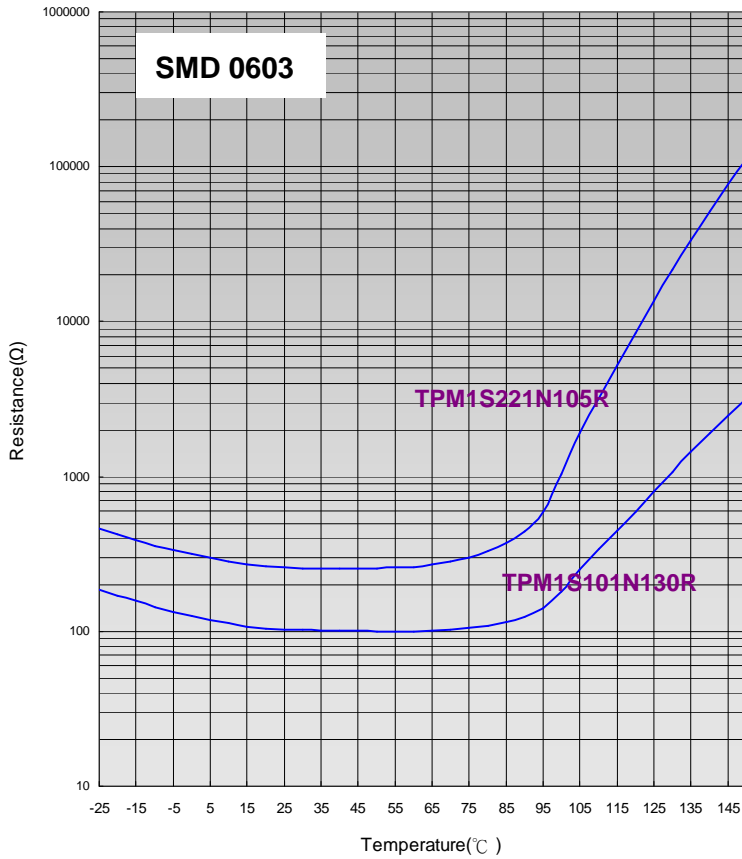


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● 0603 Series

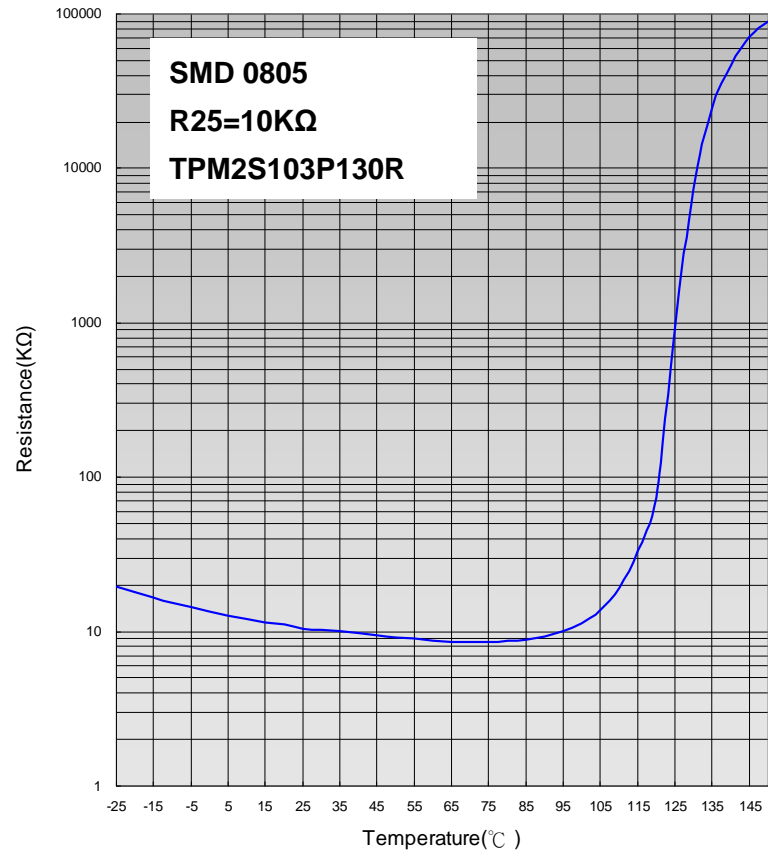
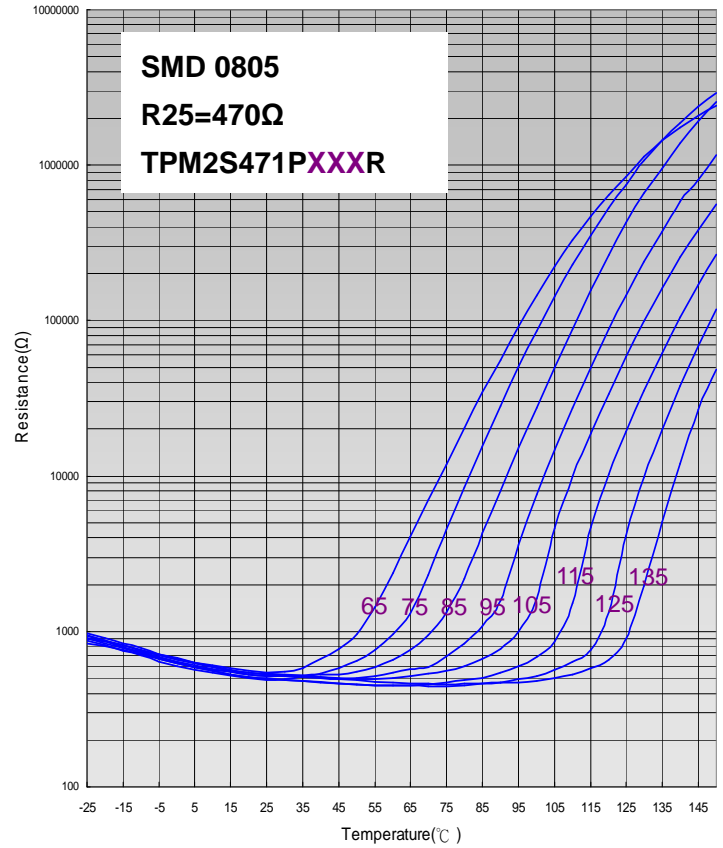
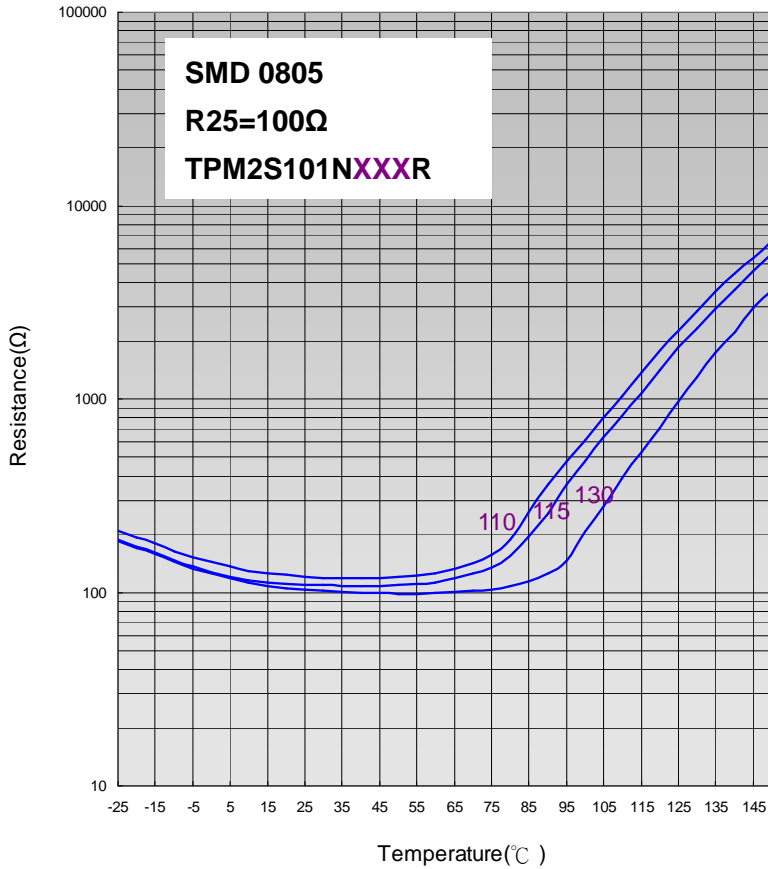


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- 0805 Series



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■ Typical Application Circuit

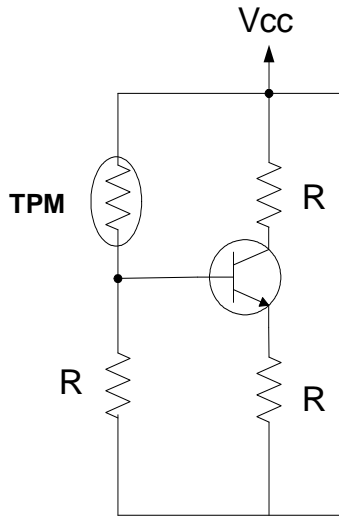


Fig 1. Overheat Protection

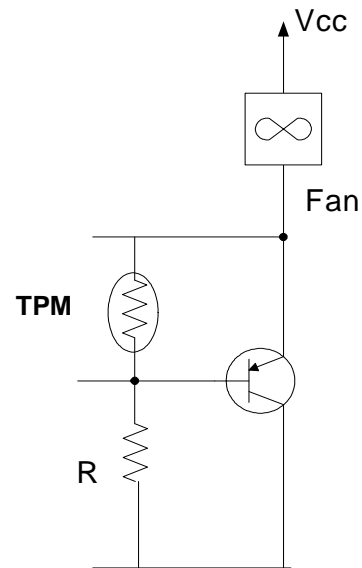


Fig 2. Temp. Sensing and Control

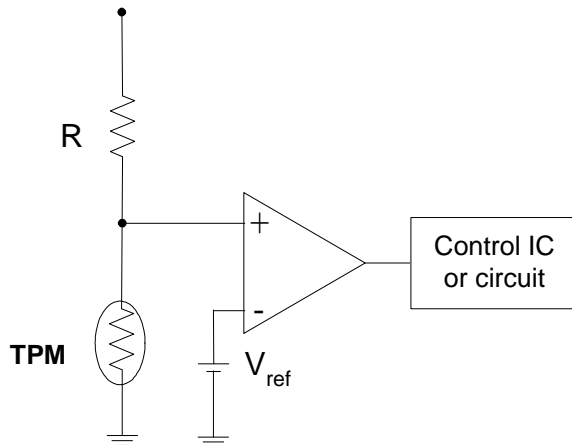


Fig 3. Comparator Circuit

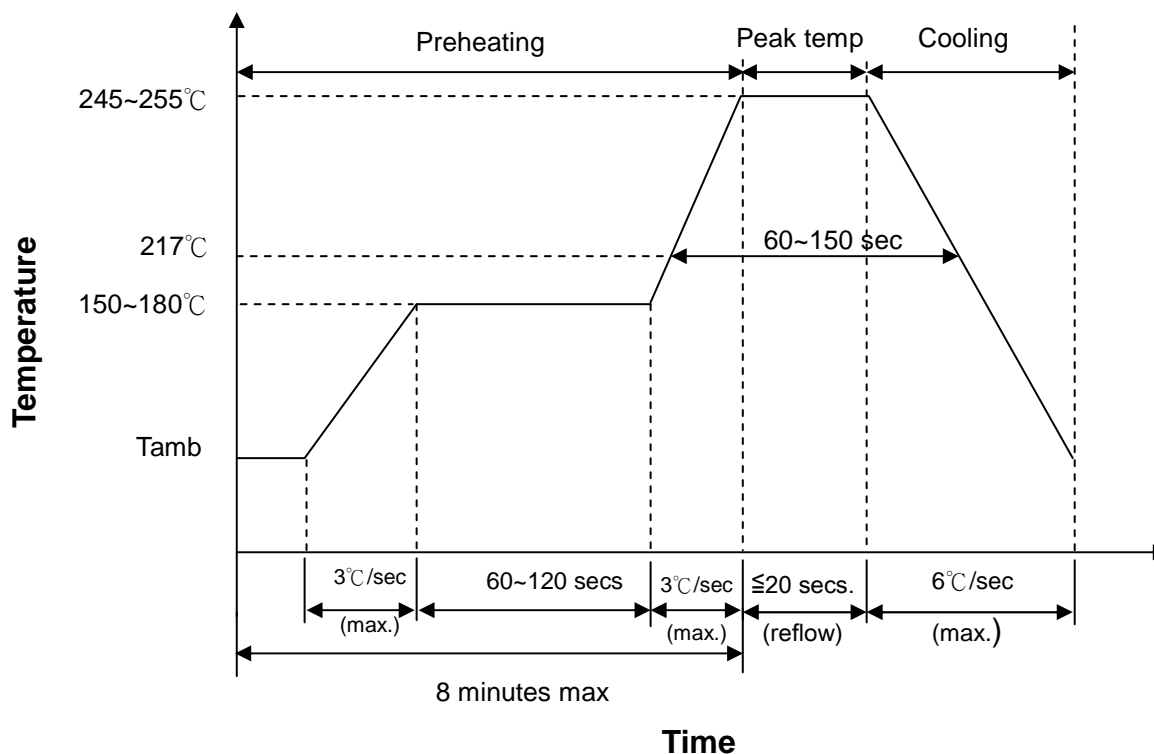
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■ Soldering Recommendation

● IR-Reflow Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

| Item | Conditions |
|-----------------------------------|--------------|
| Temperature of Soldering Iron-tip | 360°C (max.) |
| Soldering Time | 3 sec (max.) |
| Diameter of Soldering Iron-tip | Φ3mm (max.) |

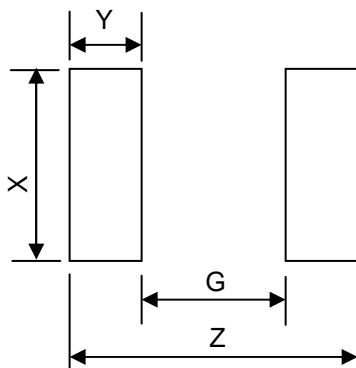
Caution: Please do not touch the component surface with soldering iron directly to avoid its damage.

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■ Recommended Pad Dimensions



| Size | Z (mm) | G (mm) | X (mm) | Y (mm) |
|------|--------|--------|--------|--------|
| 0402 | 1.7 | 0.5 | 0.6 | 0.6 |
| 0603 | 3.0 | 1.0 | 1.0 | 1.0 |
| 0805 | 3.4 | 1.0 | 1.4 | 1.2 |

■ Reliability

| Item | Standard | Test Conditions / Methods | Specifications | | | | | | | | | | | | | | | |
|-----------------------------|------------------------------|--|---|------------------|------------------|---|-------------|------------|---|------------------|-----------|---|-------------|------------|---|------------------|-----------|---|
| Bending Strength | IEC-60068-2-21 | Warp 2mm Speed < 0.5mm/sec. Duration: 10 sec on PCB. | No visible damage $ \Delta R_{25}/R_{25} \leq 10\%$ | | | | | | | | | | | | | | | |
| Damp Heat, Steady State | IEC 60068-2-3 | $40 \pm 2\text{ }^\circ\text{C}$, 90 ~ 95% RH, 1000± 24 HRS | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ ^{*1}) | | | | | | | | | | | | | | | |
| High Temp. Storage | IEC 60738-1 IEC 60068-2-2 | $T_u. \pm 5\text{ }^\circ\text{C}$, 1000 ± 24 HRS | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ ^{*1}) | | | | | | | | | | | | | | | |
| Rapid Change of Temperature | IEC 60068-2-14 | The conditions shown below shall be repeated 5 cycles on PCB <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-25 ± 5</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> <tr> <td>3</td> <td>150 ± 5</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>5 ± 3</td> </tr> </tbody> </table> | Step | Temperature (°C) | Period (minutes) | 1 | -25 ± 5 | 30 ± 3 | 2 | Room temperature | 5 ± 3 | 3 | 150 ± 5 | 30 ± 3 | 4 | Room temperature | 5 ± 3 | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ ^{*1}) |
| Step | Temperature (°C) | Period (minutes) | | | | | | | | | | | | | | | | |
| 1 | -25 ± 5 | 30 ± 3 | | | | | | | | | | | | | | | | |
| 2 | Room temperature | 5 ± 3 | | | | | | | | | | | | | | | | |
| 3 | 150 ± 5 | 30 ± 3 | | | | | | | | | | | | | | | | |
| 4 | Room temperature | 5 ± 3 | | | | | | | | | | | | | | | | |
| High Temp. Load | IEC 60738-1 | $85 \pm 5\text{ }^\circ\text{C}$ Vmax., 1000 ± 24 HRS | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ ^{*1}) | | | | | | | | | | | | | | | |

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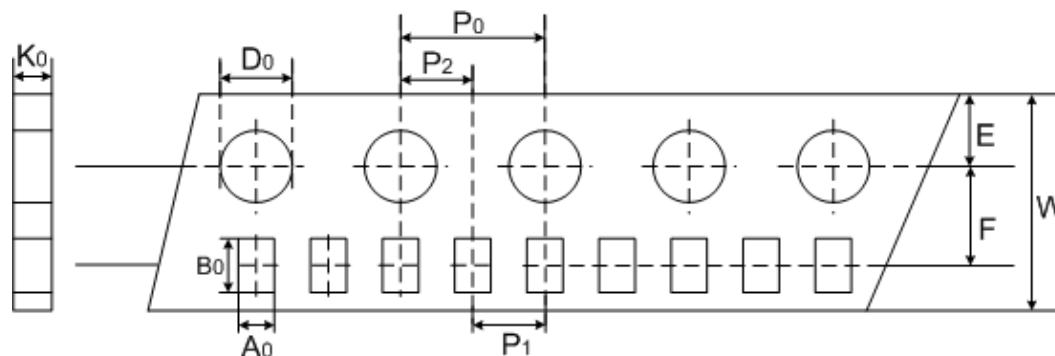


| Item | Standard | Test Conditions / Methods | Specifications |
|------------------------------|------------------------|--|---|
| Climatic Sequence | IEC 60738-1 | a. Tu. x 16 HRS b. 1st cycle : 40 °C 95 %RH x 24 HRS c. -25 °C x 2 HRS d. 5 cycles : 40°C 95% RH x 24 HRS / Cycle | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ *1) |
| Solderability | IEC 60068-2-58 | 245 ± 5 °C , 3 ± 0.3 sec | At least 95% of terminal electrode is covered by new solder |
| Resistance to Soldering Heat | IEC 60068-2-58 | 260 ± 5 °C , 10 ± 1 sec | No visible damage $ \Delta R_{25}/R_{25} \leq 20\%$ ($ \Delta R_{25}/R_{25} \leq 30\%$ *1) |
| Low Temp. Storage | Specification Standard | TL ± 3 °C , 1000 ± 24 HRS | No visible damage $ \Delta R_{25}/R_{25} \leq 30\%$ |

*1 : Apply for TPM1S472P105R, TPM1S103P110R, TPM1S103P120R, TPM1S103P130R, TPM1S473P130R, TPM2S103P130R only.

■ Package

● Taping Specification

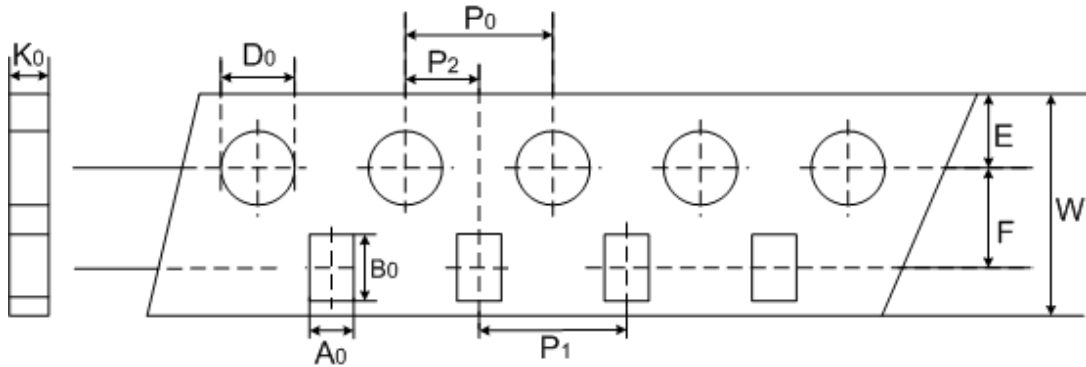


(Unit: mm)

| Index Type | A ₀ | B ₀ | W | E | F | P ₁ | P ₂ | P ₀ | D ₀ | K ₀ |
|---------------|----------------|----------------|------|------|-------|----------------|----------------|----------------|----------------|----------------|
| | ±0.05 | ±0.12 | ±0.2 | ±0.1 | ±0.05 | ±0.1 | ±0.05 | ±0.1 | ±0.1 | ±0.1 |
| 0402 | 0.62 | 1.12 | 8 | 1.75 | 3.5 | 2 | 2 | 4 | 1.55 | 0.60 |

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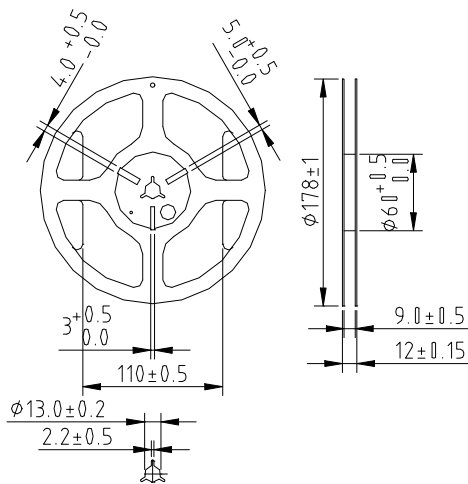
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(Unit: mm)

| Index Type | A ₀ | B ₀ | W | E | F | P ₁ | P ₂ | P ₀ | D ₀ | K ₀ |
|---------------|----------------|----------------|------|------|-------|----------------|----------------|----------------|----------------|----------------|
| 0603 | ±0.2 | ±0.2 | ±0.2 | ±0.1 | ±0.05 | ±0.1 | ±0.05 | ±0.1 | ±0.1 | ±0.1 |
| 0805 | 1.1 | 1.9 | 8 | 1.75 | 3.5 | 4 | 2 | 4 | 1.55 | 0.95 |
| 0805 | 1.5 | 2.3 | 8 | 1.75 | 3.5 | 4 | 2 | 4 | 1.55 | 1.00 |

● Quantity



| Type | Quantity(pcs/reel) |
|------|--------------------|
| 0402 | 10,000 |
| 0603 | 4,000 |
| 0805 | 3,500 |

■ Warehouse Storage Conditions of Products

- Storage Conditions :
 1. Storage Temperature: -10°C ~ +40°C
 2. Relative Humidity: ≤ 75%RH
 3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage : 1 year