

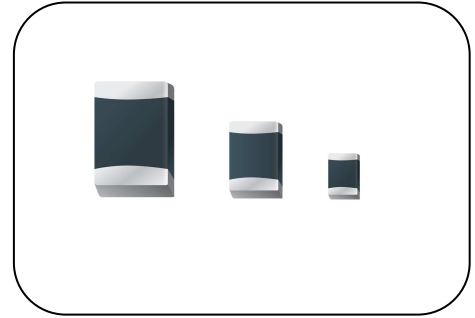
# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



### ■ Features

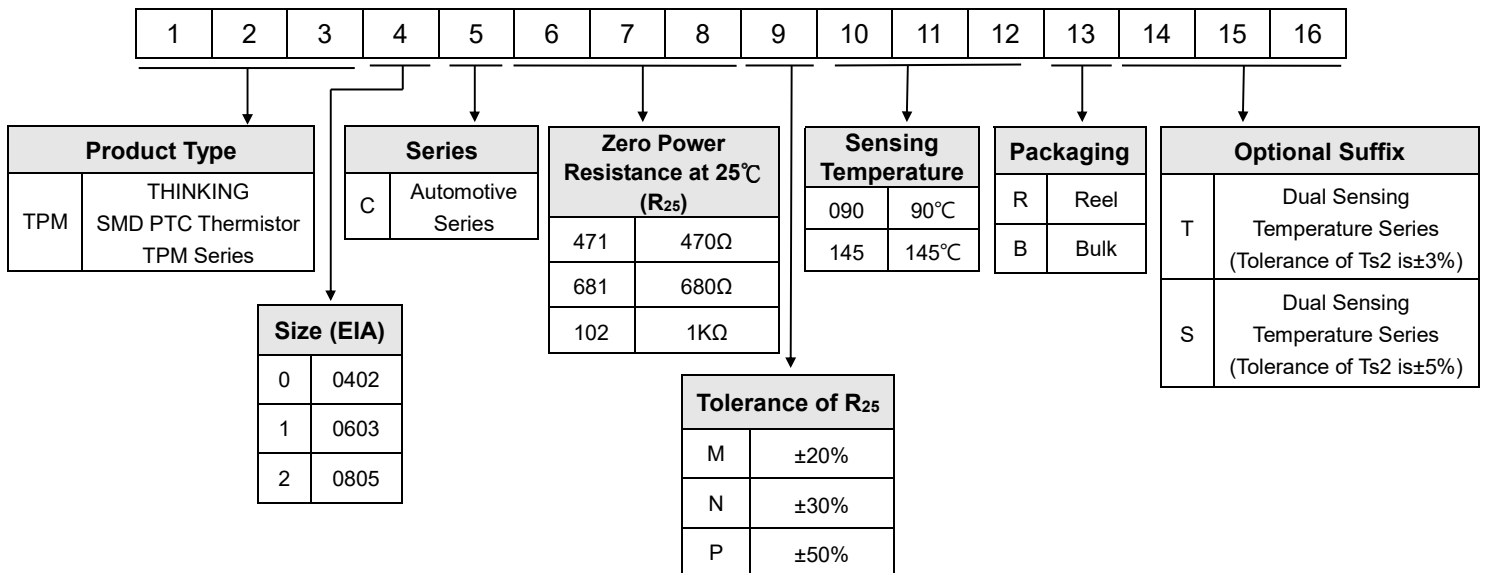
1. Qualification based on AEC-Q200 Rev-D
2. RoHS & Halogen-free compliant
3. EIA size: 0402, 0603, 0805
4. Fast and reliable response



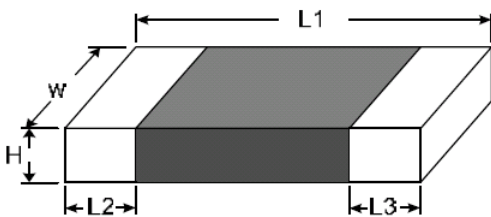
### ■ Recommended Applications

1. Automotive electronics

### ■ 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	0.50±0.10	0.20±0.10
TPM1	0603	1.60±0.15	0.80±0.15	0.80±0.15	0.40±0.20
TPM2	0805	2.00±0.20	1.25±0.20	1.00 max.	0.45±0.25

## SMD PTC Thermistor for Temperature Sensing

### ■ Electrical Characteristics

#### 0402 Series

Part No.	Size (EIA)	Zero Power Resistance at 25°C	Sensing Temperature at 4.7KΩ	Max. Voltage	Operating Temperature Range
		R25	Ts	Vmax	T <sub>L</sub> ~T <sub>U</sub>
		(Ω)	(°C)	(V <sub>DC</sub> )	(°C)
TPM0C471□125*	0402	470	125±5	32	-40 ~ +140

#### 0603 Series

Part No.	Size (EIA)	Zero Power Resistance at 25°C	Sensing Temperature at 4.7KΩ	Max. Voltage	Operating Temperature Range
		R25	Ts	Vmax	T <sub>L</sub> ~T <sub>U</sub>
		(Ω)	(°C)	(V <sub>DC</sub> )	(°C)
TPM1C471□085*	0603	470	85±5	32	-40 ~ +100
TPM1C471□095*			95±5		-40 ~ +110
TPM1C471□105*			105±5		-40 ~ +120
TPM1C471□115*			115±5		-40 ~ +130
TPM1C471□135*			135±5		-40 ~ +150

#### 0805 Series

Part No.	Size (EIA)	Zero Power Resistance at 25°C	Sensing Temperature at 4.7KΩ	Max. Voltage	Operating Temperature Range
		R25	Ts	Vmax	T <sub>L</sub> ~T <sub>U</sub>
		(Ω)	(°C)	(V <sub>DC</sub> )	(°C)
TPM2C471□095*	0805	470	95±5	32	-40 ~ +110
TPM2C471□105*			105±5		-40 ~ +120
TPM2C471□125*			125±5		-40 ~ +140

Note1: □ is tolerance of R25

Note2: \* is packaging

## SMD PTC Thermistor for Temperature Sensing

### ■ Electrical Characteristics

#### 0805 Series

Part No.	Size (EIA)	Sensing Temperature	Resistance				Max. Voltage	Operating Temperature Range
		T <sub>s</sub>	R <sub>25</sub>	T <sub>s</sub> - 5°C	T <sub>s</sub> + 5°C	T <sub>s</sub> + 15°C	V <sub>max</sub>	T <sub>L</sub> ~T <sub>U</sub>
		(°C)	(Ω)	(KΩ)	(KΩ)	(KΩ)	(V <sub>DC</sub> )	(°C)
TPM2C681□080*	0805	80	680	≤ 5.5	≥ 13.3	≥ 40	32	-40 ~ +125
TPM2C681□090*		90						-40 ~ +125
TPM2C681□100*		100						-40 ~ +125
TPM2C681□110*		110						-40 ~ +135

#### Dual Sensing Temperature 0402 Series

Part No.	Size (EIA)	Zero Power Resistance at 25°C	Sensing Temperature 1 at 10KΩ	Sensing Temperature 2 at 100KΩ	Max. Voltage	Operating Temperature Range
		R <sub>25</sub>	T <sub>s1</sub>	T <sub>s2</sub>	V <sub>max</sub>	T <sub>L</sub> ~T <sub>U</sub>
		(KΩ)	(°C)	(°C)	(V <sub>DC</sub> )	(°C)
TPM0C102□105*S	0402	1	105±5	120±5	32	-40 ~ +130
TPM0C102□115*S			115±5	130±5		-40 ~ +140

#### Dual Sensing Temperature 0603 Series

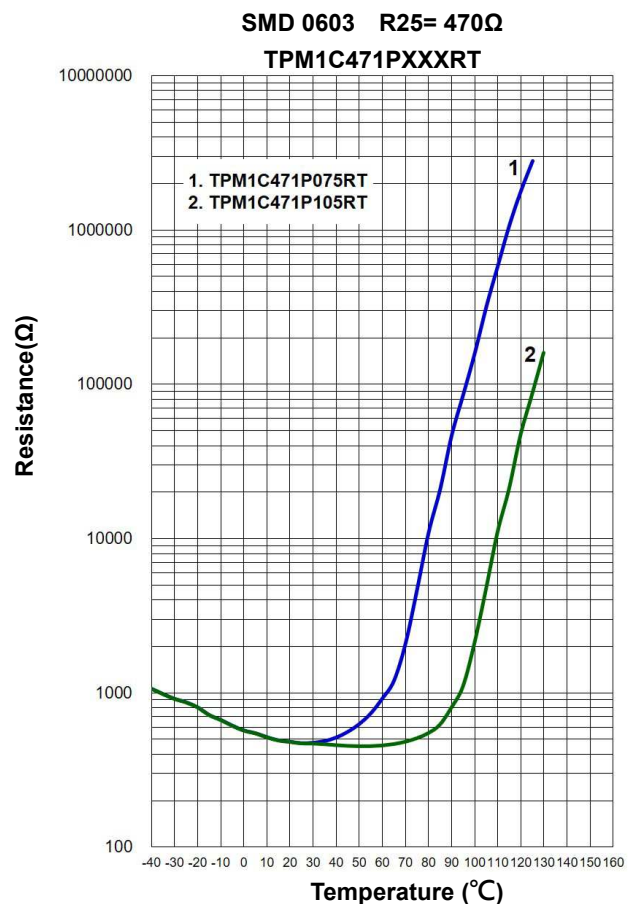
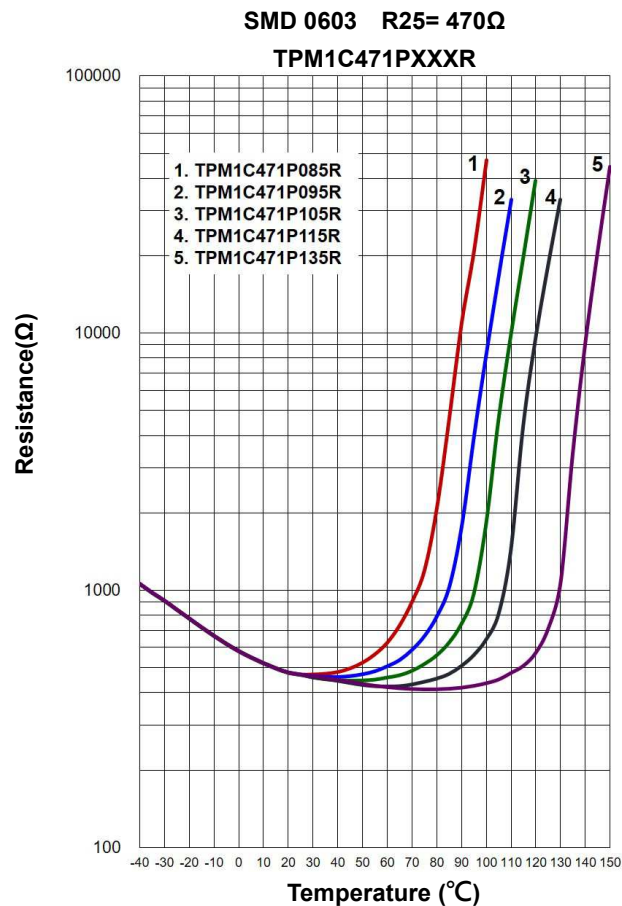
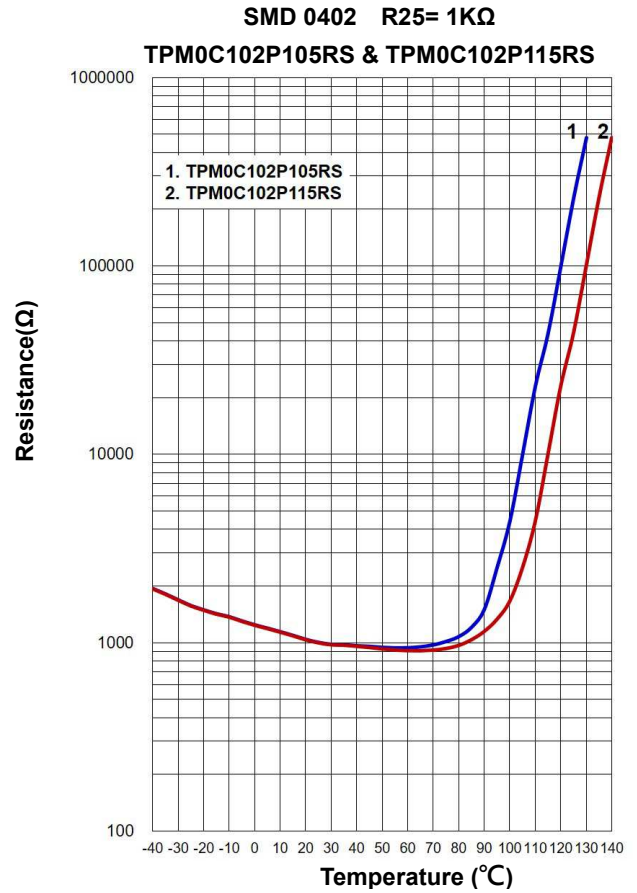
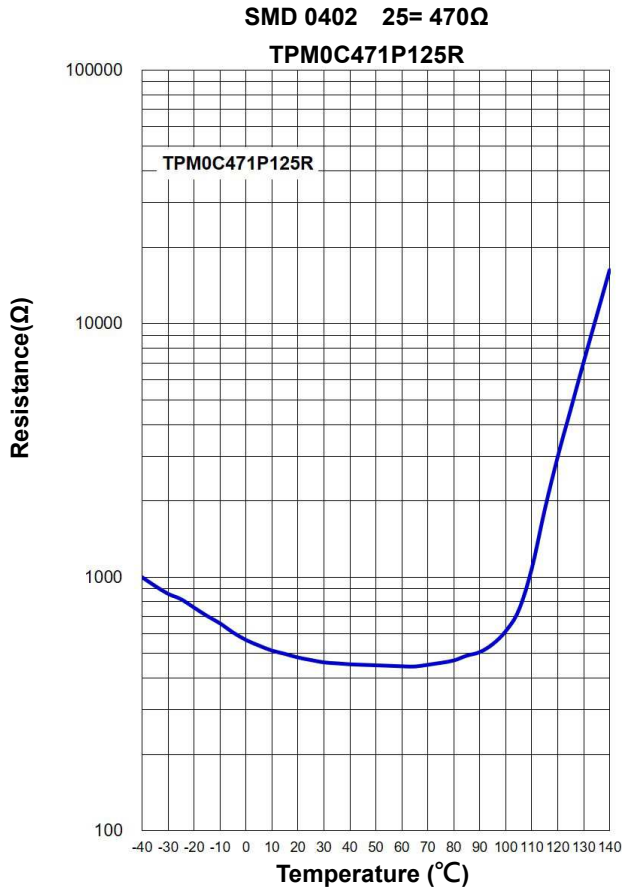
Part No.	Size (EIA)	Zero Power Resistance at 25°C	Sensing Temperature 1 at 4.7 KΩ	Sensing Temperature 2 at 47 KΩ	Max. Voltage	Operating Temperature Range
		R <sub>25</sub>	T <sub>s1</sub>	T <sub>s2</sub>	V <sub>max</sub>	T <sub>L</sub> ~T <sub>U</sub>
		(Ω)	(°C)	(°C)	(V <sub>DC</sub> )	(°C)
TPM1C471□075*T	0603	470	75±5	90±7	32	-40 ~ +125
TPM1C471□105*T			105±5	120±7		-40 ~ +130

# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



### Resistance-Temperature Characteristics (Typical)



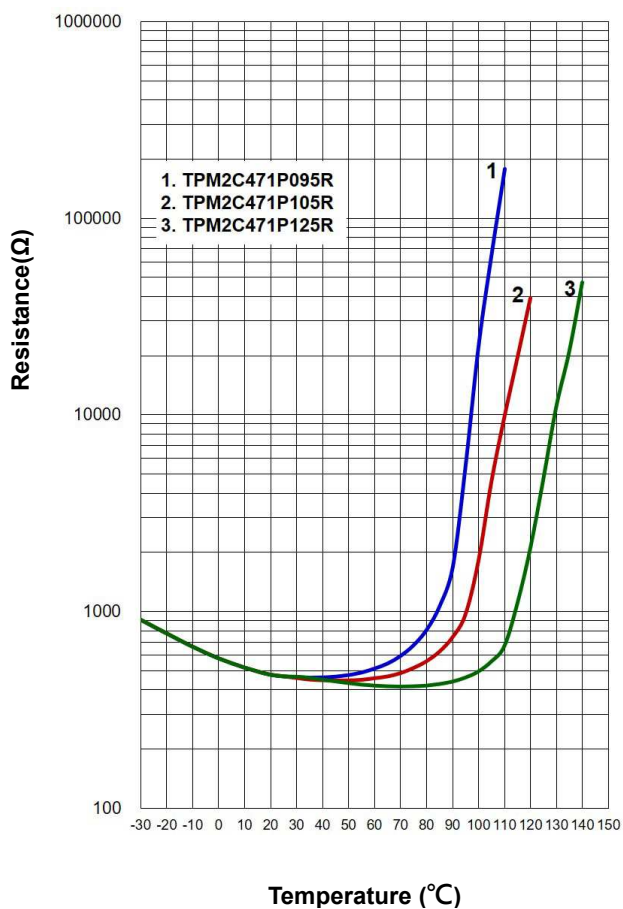
### Resistance-Temperature Characteristics (Typical)

# Ceramic PTC Thermistor for Automotive: TPM-C Series

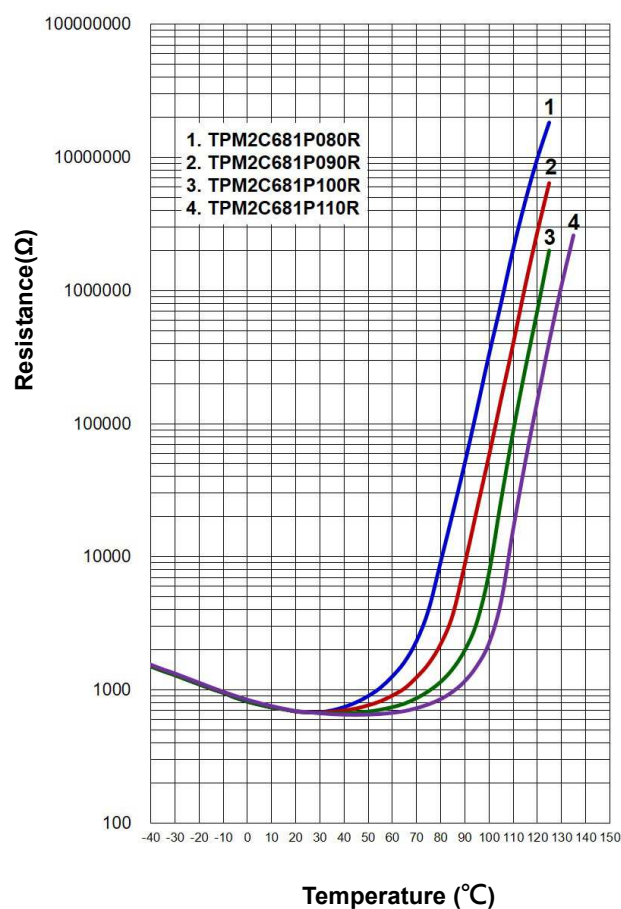
## SMD PTC Thermistor for Temperature Sensing



SMD 0805 R25= 470Ω  
TPM2C471PXXXR



SMD 0805 R25= 680Ω  
TPM2C681PXXXR



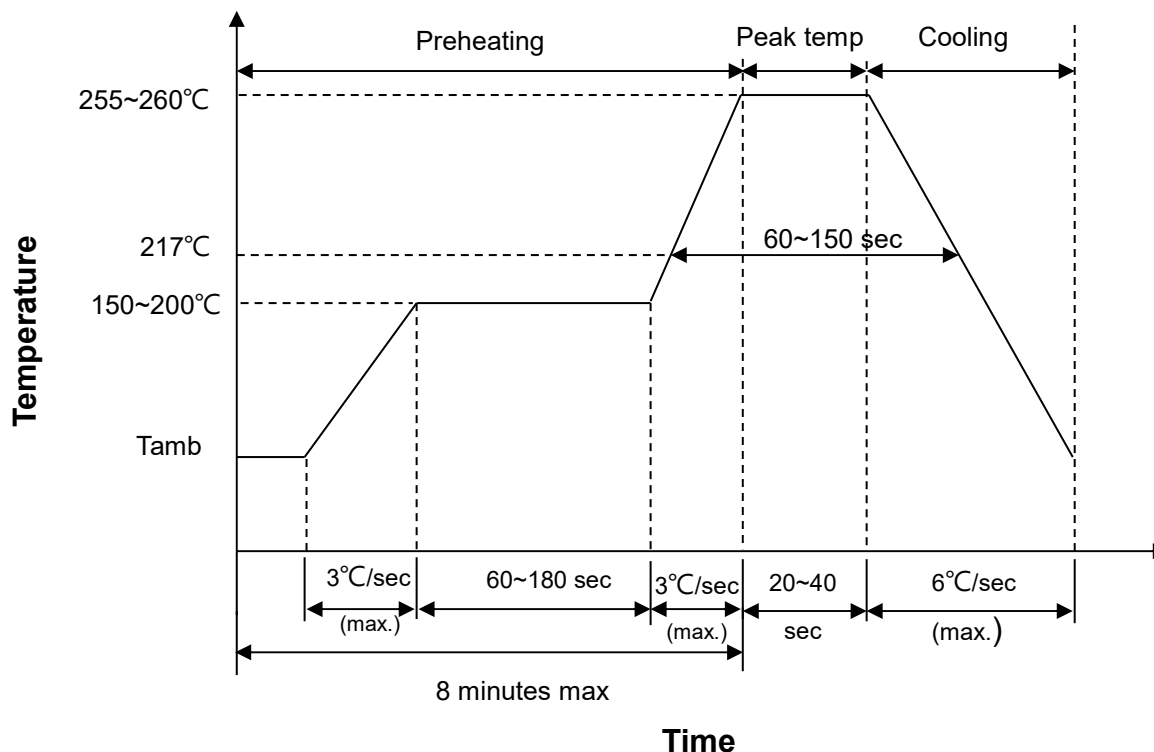
### ■ Soldering Recommendation

# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



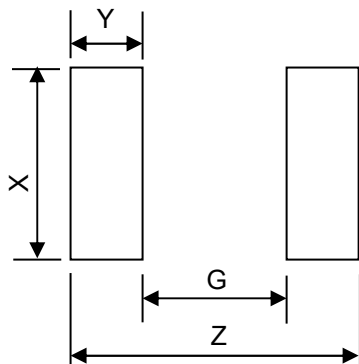
### ● IR-Reflow Soldering Profile



### ● 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.)
<b>Caution:</b> Please do not touch the component surface with soldering iron directly to prevent component damage.	

### ■ Recommended Soldering Pad Dimensions



Size (EIA)	Z (mm)	G (mm)	X (mm)	Y (mm)
0402	1.4	0.4	0.5	0.5
0603	2.8	0.8	1.0	1.0
0805	3.4	1.0	1.4	1.2

# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



### ■ Reliability (based on AEC-Q200 Rev-D)

Item	Standard	Test Conditions / Methods	Specifications
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	Test temperature: T <sub>max</sub> . +3/-0°C Duration: 1000 hrs unpowered Measurement at 24±2 hours after test conclusion.	No visible damage   Δ R <sub>25</sub> /R <sub>25</sub>   ≤ 20%
Temperature Cycling	JESD22 Method JA-104	Lower test temperature: -40 +0/-3°C Upper test temperature: 125 +3/-0°C Dwell time at Lower or Upper Temperature: 30 min Maximum transition time: 1 min. Number of cycles: 1000 Measurement at 24±4 hours after test conclusion.	No visible damage   Δ R <sub>25</sub> /R <sub>25</sub>   ≤ 20%
Biased Humidity	MIL-STD-202 Method 103	Test temperature: 85°C Rel. humidity of air: 85% +5/-0% Duration: 1000 h Bias at Max. Voltage V <sub>max</sub> (V <sub>DC</sub> ) Measurement at 24±4 hours after test conclusion.	No visible damage   Δ R <sub>25</sub> /R <sub>25</sub>   ≤ 20%
Operational Life	MIL-STD-202 Method 108	Test temperature: T <sub>max</sub> . +3/-0°C Duration: 1000 h Bias at Max. Voltage V <sub>max</sub> (V <sub>DC</sub> ) Measurement at 24±4 hours after test conclusion.	No visible damage   Δ R <sub>25</sub> /R <sub>25</sub>   ≤ 20%
External Visual	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship.	No visible damage
Physical Dimension	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification.	Within the specified values

# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



Item	Standard	Test Conditions / Methods	Specifications
Resistance to Solvents	MIL-STD-202 Method 215	Per MIL-STD-202 Method 215 Solvent: 1:1 part (by volume) of isopropyl alcohol 3 part (by volume) of mineral spirits.	No visible damage
Mechanical Shock	MIL-STD-202 Method 213	Test Condition F Peak value:1500g's Half sine Waveform Normal duration (D): 0.5ms In 3 directions perpendicularly intersecting each other (total 18 times).	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 20\%$
Vibration	MIL-STD-202 Method 204	Acceleration: 5 g's Sweep time: 20 min Frequency range: 10 to 2000 Hz 3×12 cycles	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 20\%$
Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Temperature: 260±5°C, Time:10±1s Immersion and emersion rate: 25±6 mm/s Number of heat cycles: 1	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 20\%$
ESD	AEC-Q200 -002	Discharge capacitance: 150 pF Test from 6KV DC to 25KV AD 1 pulse in each polarity (DC=Direct Contact Discharge, AD=Air Discharge)	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 20\%$
Solderability	IEC 60068-2-58 J-STD-002	a) 4 hrs @ 155°C dry heat Dip @245±5°C 3±0.3sec b) Steam aging 8h±15min @93±3°C Dip @260±5°C 7±0.5sec	95% of termination wetted
Electrical Characterization	Specifications	R(25°C) Ts1±5°C Ts2±7°C	Within the specified values
Board Flex	AEC-Q200 -005	Bend the board: 2mm (Min.) Duration: 60 (+5) Sec	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 10\%$
Terminal Strength	AEC-Q200 -006	Apply force: 0201=0.15kg (1.5 N) 0402=0.5kg (5 N) 0603=1.0kg (10 N) ≥ 0805=1.8kg (17.7 N) Duration: 60 (+1) Sec	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 20\%$

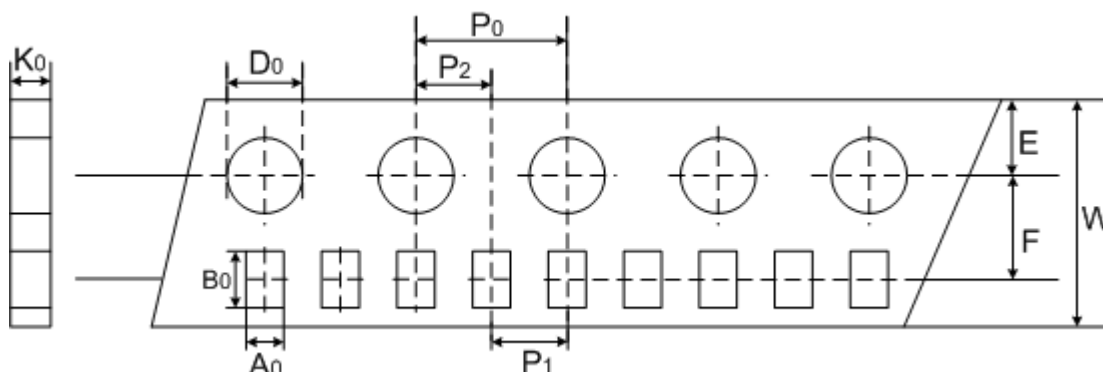
# Ceramic PTC Thermistor for Automotive: TPM-C Series

## SMD PTC Thermistor for Temperature Sensing



### ■ Packaging

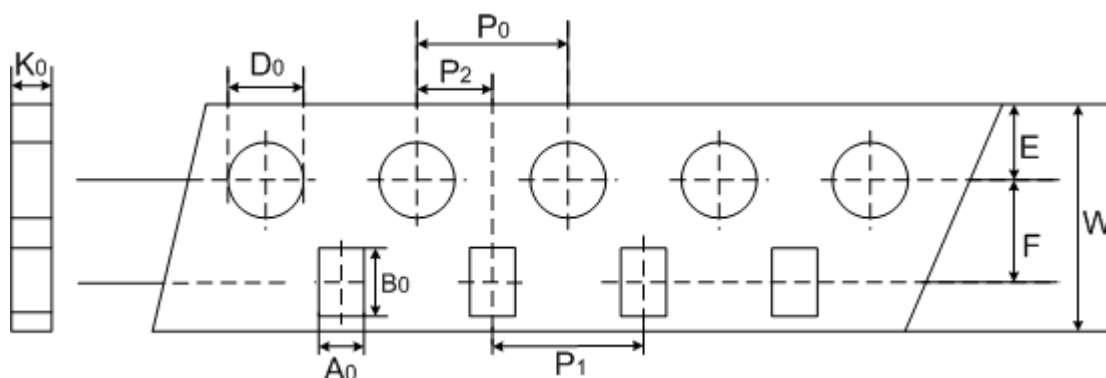
#### ● Taping Specification (0402 Series)



(Unit: mm)

Index Size	A <sub>0</sub>	B <sub>0</sub>	W	E	F	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	K <sub>0</sub>
0402	±0.05	±0.12	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60

#### ● Taping Specification (0603 & 0805 Series)



(Unit: mm)

Index Size	A <sub>0</sub>	B <sub>0</sub>	W	E	F	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	K <sub>0</sub>
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
	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

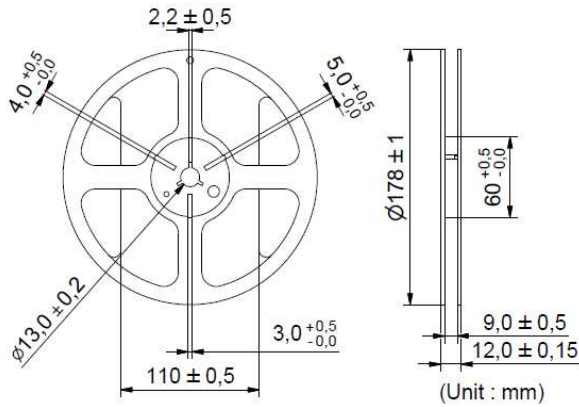
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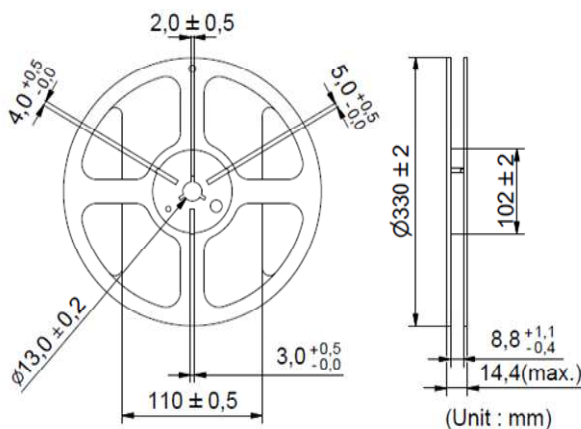
### Quantity

- 7" Reel



Size (EIA)	Quantity (pcs / reel)
0402	10,000
0603	4,000
0805	3,500

- 13" Reel



Size (EIA)	Quantity (pcs / reel)
0402	50,000
0603	16,000
0805	14,000

### Warehouse Storage Conditions of Products

- Storage Conditions:
  1. Storage Temperature:  $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
  2. Relative Humidity:  $\leq 75\%RH$
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage: 1 year