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**SPECIFICATION FOR APPROVAL**

CUSTOMER	Codico
CERTIFIED	
MODEL/TYPE	
PART NO.	TPM1C471P105RT01 (RoHS+HF)
APPLICATION	
CUSTOMER P/N	
ISSUE DATE	Mar. 11, 2016
REV. NO.	
REV. DATE	

FOR CUSTOMER APPROVAL	CHECKED BY
	<i>Shu Ling Fu</i>
	APPROVED BY
	<i>Chun Chu Tu</i>





**REVISED RECORD SHEET**

REV. NO	REV. DATE	REVISED CONTENT



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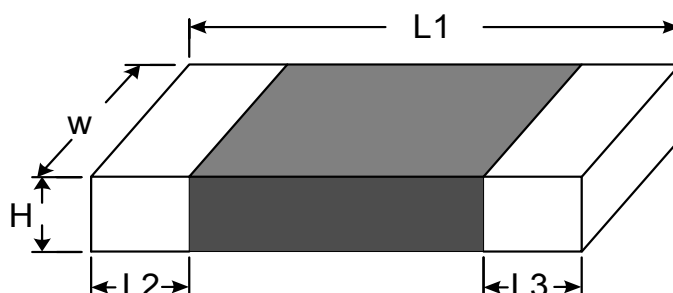
Part Number Code

Example :

**TPM** **1** **C** **471** **P** **105** **R** **T01**  
(1) (2) (3) (4) (5) (6) (7) (8)

No.	Item	Digit	Specification
(1)	Product Type	TPM	Thinking CPTC thermistor TPM type
(2)	Size (EIA)	1	0603
(3)	Type Series	C	Sensing Automotive Series
(4)	Zero Power Resistance at 25°C	471	$47 \times 10^1 = 470\Omega$
(5)	Tolerance of $R_{25}$	P	$\pm 50\%$
(6)	Sensing Temperature	105	$T_s = 105^\circ\text{C}$
(7)	Packaging	R	Reel
(8)	Optional Suffix	T01	13" ; 16kpcs/Reel Dual Sensing Temperature Product

### Structure and Dimensions



( unit : mm )

L1	W	H max.	L2 and L3
1.60±0.15	0.80±0.15	0.95	0.40±0.20

### Electrical Characteristics

Part No.	Zero Power Resistance at 25°C	Sensing Temp.1 @ 4.7KΩ	Sensing Temp.2 @ 47KΩ	Max. Voltage	Operating Temperature Range
	R <sub>25</sub> (Ω)	Ts1 (°C)	Ts2 (°C)	V <sub>max.</sub> (V <sub>DC</sub> )	(°C)
TPM1C471P105RT01	470±50%	105±5	120±7	32	-40~+130

## Reliability

Tests of SMD PTC thermistors are based on AEC-Q200 Rev-C.

### 1、Preconditioning Reflow Requirements Before Reliability Stress Testing

Required Reliability Stress Tests after Preconditioning	Temperature Cycling	Operational Life	Thermal Shock	Terminal Strength	Board Flex
Number of reflow passes required onto test boards	2	2	2	2	2

### 2、Table of Test Methods

Item	Standard	Test conditions / Methods	Specifications																																										
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	Test temp.: Tmax. +3/-0°C Duration: 1000 h Unpowered Measurement at 24±2 hours after test conclusion.	No visible damage   $\Delta R_{25}/R_{25}$   ≤ 20 %																																										
Temperature Cycling	JESD22 Method JA-104	Lower test temp. : -40 +0/-3°C Upper test temp. : 125 +3/-0°C Soak Time at Lower or Upper Temp. : 1 min Cycle time : 2 Cycles/hr Number of cycles : 1000 Measurement at 24±2 hours after test conclusion.	No visible damage   $\Delta R_{25}/R_{25}$   ≤ 20 %																																										
Moisture Resistance	MIL-STD-202 Method 106	Duration of 1 cycle: 24 h Number of cycles: 10 · Unpowered Measurement at 24±2 hours after test conclusion.  <table border="1" data-bbox="507 1585 1091 1948"> <thead> <tr> <th rowspan="2">Step</th> <th colspan="2">Temp.</th> <th rowspan="2">humidity (%)</th> <th rowspan="2">Period (hr)</th> </tr> <tr> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>2</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>3</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>4</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>5</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>6</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>7</td> <td>25</td> <td>25</td> <td>80~100</td> <td>8</td> </tr> </tbody> </table>	Step	Temp.		humidity (%)	Period (hr)	Start	Finish	1	25	65	90~100	2.5	2	65	65	90~100	3	3	65	25	80~100	2.5	4	25	65	90~100	2.5	5	65	65	90~100	3	6	65	25	80~100	2.5	7	25	25	80~100	8	No visible damage   $\Delta R_{25}/R_{25}$   ≤ 20 %
Step	Temp.			humidity (%)	Period (hr)																																								
	Start	Finish																																											
1	25	65	90~100	2.5																																									
2	65	65	90~100	3																																									
3	65	25	80~100	2.5																																									
4	25	65	90~100	2.5																																									
5	65	65	90~100	3																																									
6	65	25	80~100	2.5																																									
7	25	25	80~100	8																																									

## Reliability

### 2、Table of Test Methods

Item	Standard	Test conditions / Methods	Specifications
Biased Humidity	MIL-STD-202 Method 103	Test temp.: 85°C Rel. humidity of air: 85% Duration: 1000 h Bias at Max. Voltage $V_{max}$ ( $V_{DC}$ ) Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta R_{25}/R_{25}  \leq 20\%$
Operational Life	MIL-STD-202 Method 108	Test temp.: $T_{max.} +3/-0^{\circ}C$ Duration: 1000 h Bias at Max. Voltage $V_{max}$ ( $V_{DC}$ ) Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta R_{25}/R_{25}  \leq 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
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-202-213	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 : 25mm/s ±6 mm/s Number of heat cycles : 1	No visible damage $ \Delta R_{25}/R_{25}  \leq 20\%$
Thermal Shock	MIL-STD-202 Method 107	Lower test temp. : -40 +0/-3°C Upper test temp. : 125 +3/-0°C Maximum transfer time : 20 seconds. Dwell time : 15 minutes. Air-Air. Number of cycles : 300	No visible damage $ \Delta R_{25}/R_{25}  \leq 20\%$

Reliability

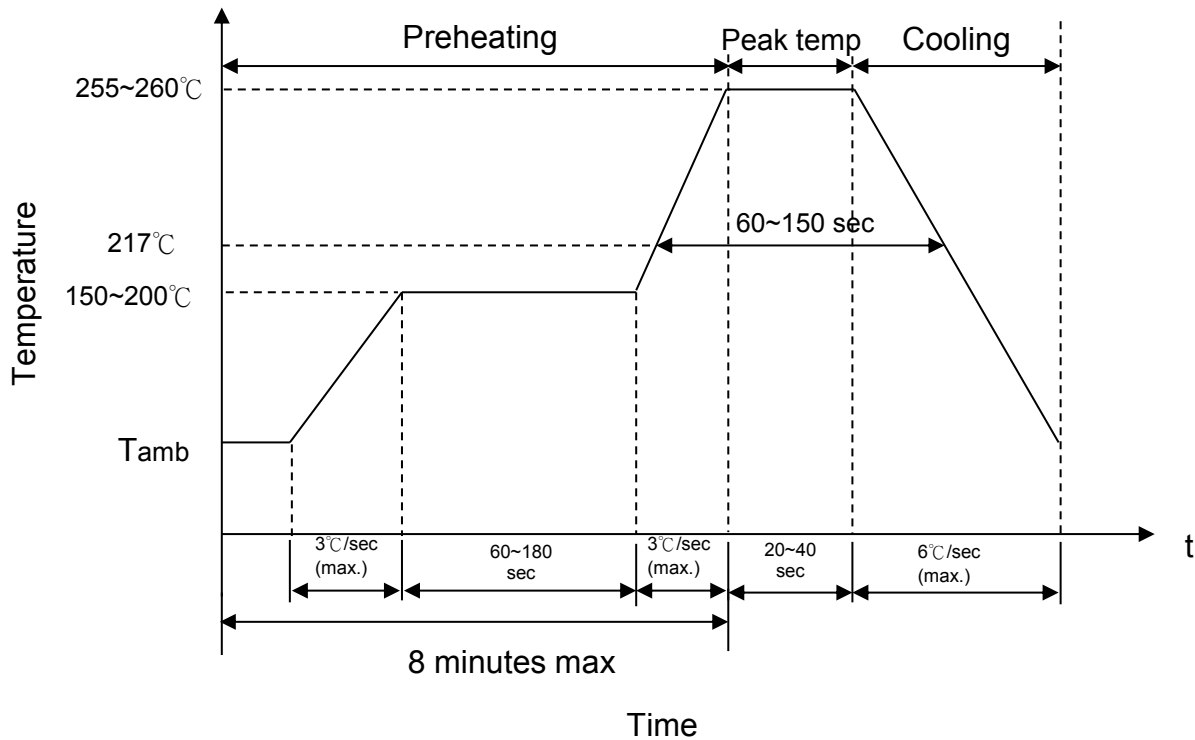
## 2、Table of Test Methods

Item	Standard	Test conditions / Methods	Specifications
ESD	AEC-Q200 -002	Discharge capacitance : 150 pF Charging voltage: 6 kV Contact discharge 1 pulse in each polarity	No visible damage $ \Delta R_{25}/R_{25}  \leq 20\%$
Solderability	IEC 60068-2- 58 J-STD-002	a) 4 h @ 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	Ta1:25±2°C Ta2:[Tsx+□°C]±0.1°C Ta3:[Tsx-□°C]±0.1°C	Within the specified values
Board Flex	AEC-Q200 -005 (JIS-C-6429)	Bend the board : 2mm (Min.) Duration : 60 (+5) Sec	No visible damage $ \Delta R_{25}/R_{25}  \leq 10\%$
Terminal Strength	AEC-Q200 -006 (JIS-C-6429)	Apply force : 0.5kg (5 N)	No visible damage $ \Delta R_{25}/R_{25}  \leq 20\%$



## Soldering Recommendation

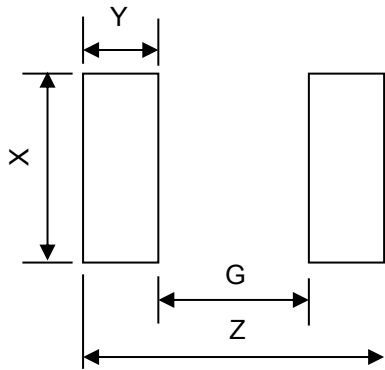
### ■ IR-Reflow Soldering Profile



### ■ 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	φ 3mm (max.)
Caution: Not to touch the component surface with soldering iron directly	

Recommended Soldering Pad Dimensions



Size (EIA)	0603
Z	3.0 mm
G	1.0 mm
X	1.0 mm
Y	1.0 mm

RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS directive 2011/65/EU.

Warehouse Storage Conditions of Products

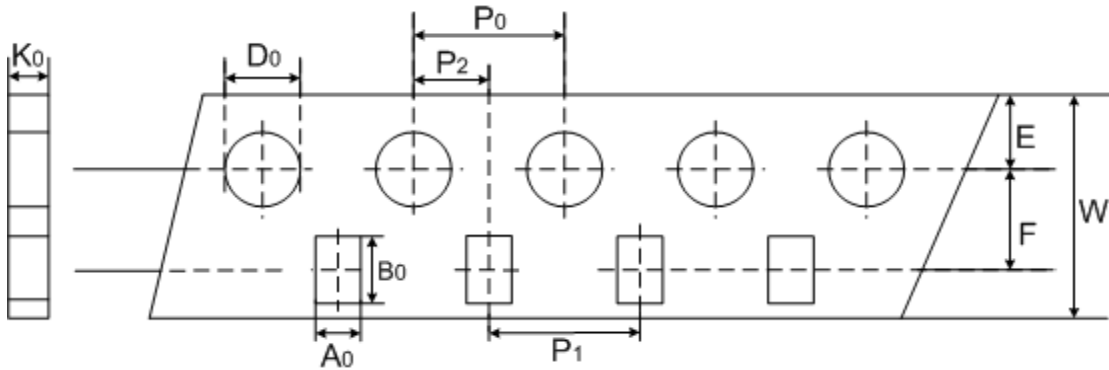
(I) Storage Conditions :

- 1.Storage Temperature : -10°C~+40°C
- 2.Relative Humidity :  $\leq 75\%RH$
- 3.Keep away from corrosive atmosphere and sunlight.

(II) Period of Storage : 1 year

Packaging

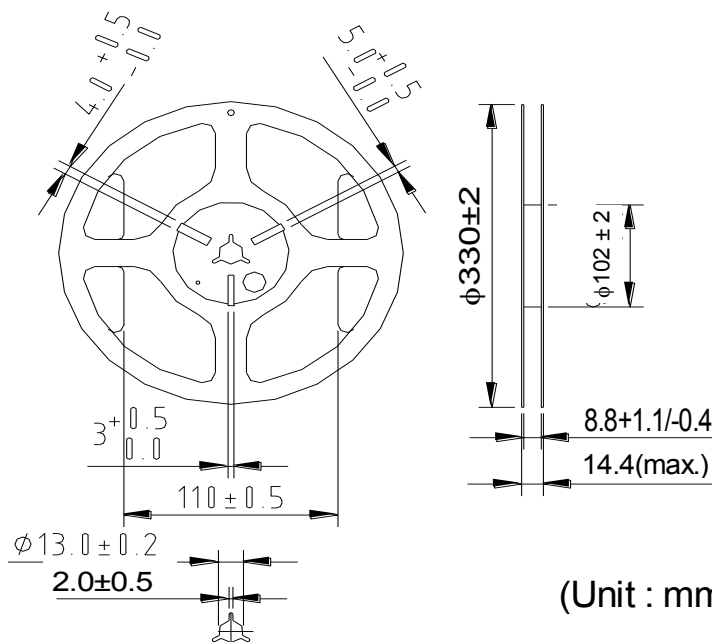
■ Taping specification ( 0603 series)



(Unit : mm)

Index	$A_0$	$B_0$	$W$	$E$	$F$	$P_1$	$P_2$	$P_0$	$D_0$	$K_0$
Size	$\pm 0.2$	$\pm 0.2$	$\pm 0.2$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95

■ Quantity ( 16,000 pcs / reel )



(Unit : mm)

### Certificates

- (1) TS 16949 certificate
- (2) ISO 9001 certificate
- (3) QC 080000 certificate

### Test Report

- (1) RoHS test report
- (2) Halogen-free test report

R-T Characteristic Curve

TPM1C471P105RT01

