Multilayer Chip NTC Thermistors

Type: **ERTJ**

The Multilayer Chip NTC Thermistors are especially designed for surface mountings featuring the miniature sizes of "0402" and "0603" type (EIA) with highly reliable multilayer and monolithic structure.

■ Features

- Highly reliable multilayer / monolithic structure
- Superior heat resistance to reflow soldering and excellent solderability thanks to the unique external electrodes of three metallic layers
- Wide ranges of operating temperature (–40 to 125 °C)
- Low Capacitance (less 3pF)

■ Recommended Applications

- Cellular Phone
  - Temperature compensation for Crystal Oscillator
  - Temperature compensation for Semiconductor
- Personal Computer
  - Temperature detection for CPU and memory device
  - Temperature compensation for Ink-viscosity (Inkjet Printer)
- Battery Pack
  - Temperature detection for battery cell
- Liquid Crystal Display
  - Temperature compensation for contrast
  - Temperature compensation for Back light

■ Explanation of Part Numbers

1	2	3	4	5	6	7	8	9	10	11	12
E	R	T									

Product Code

ERT	NTC Thermistors

Shape Size Type (EIA)

J0	"0402" Type
J1	"0603" Type

Packaging Styles

Code	Styles
E	"0402"Type Paper Taping (Pitch: 2 mm)
V	"0603"Type Paper Taping (Pitch: 4 mm)

Center of "B" Value (K)

A	2701 – 2800K
B	2801 – 2900K
C	2901 – 3000K In every step of 100 (K) as following. (Note: Expect letters of "I" and "O")
W	4701 – 4800K
X	4801 – 4900K
Y	4901 – 5000K
Z	Others

Resistance R_{25} (Ω)

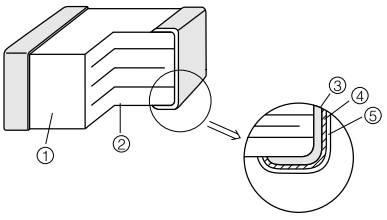
The first two disits are significant figures of resistance and the third one denotes number of zeros following them.

Resistance Tolerance

F	±1%	Narrow Tolerance Type
G	±2%	
H	±3%	Standard Type
J	±5%	
K	±10%	

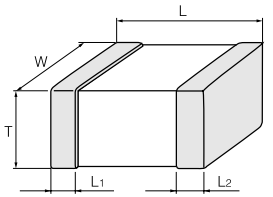
Special Specification

■ Construction



No	Name
①	Ceramic Semiconductor
②	Inner electrode
③	Substrate electrode
④	Intermediate electrode
⑤	External electrode

■ Dimensions in mm (not to scale)



Size Code (EIA)	L	W	T	L_1, L_2
"J0" Type (0402)	1.00±0.10	0.50±0.05	0.50±0.05	0.20±0.10
"J1" Type (0603)	1.60±0.15	0.80±0.10	0.80±0.10	0.30±0.20

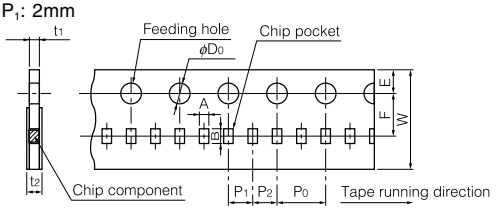
■ Packaging Specifications

● Standard Packing Quantity

Size Code \ Thickness \ Style		Paper taping
J0 (0402)	0.5 mm	Pitch 2 mm: 10000 pcs./reel
J1 (0603)	0.8 mm	Pitch 4 mm: 4000 pcs./reel

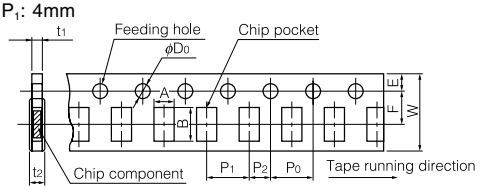
● Paper Taping

P_1: 2mm



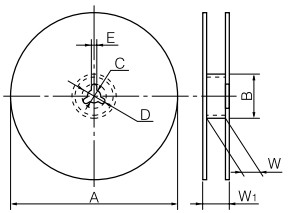
Symbol / Size Code		A	B	W	F	E	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	J0 (0402)	0.65 ±0.05	1.15 ±0.05	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	0.7 max.	1.0 max.

P_1: 4mm



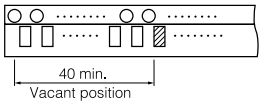
Symbol / Size Code		A	B	W	F	E	P_1	P_2	P_0	ϕD_0	t_1	t_2
Dim. (mm)	J1 (0603)	1.10 ±0.10	1.90 ±0.10	8.0 ±0.2	3.50 ±0.05	1.75 ±0.10	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	1.5 +0.1 0	1.1 max.	1.4 max.

● Reel for Taping

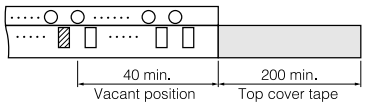


Symbol	A	B	C	D	E	W	W_1
Dim. (mm)	$\phi 180^{\ 0}_{-3}$	$\phi 60.0_{\pm 0.5}$	$13.0_{\pm 0.5}$	$21.0_{\pm 0.8}$	$2.0_{\pm 0.5}$	$9.0_{\pm 0.3}$	$11.4_{\pm 1.0}$

● Leader Part and Taped End



Leader part



Unit : mm

■ Ratings and Characteristics

● Narrow Tolerance Type (Resistance Tolerance: ±2 %, ±1 %)

Size Code	Part No.	Zero-Power Resistance (at 25 °C)	B Value		Heat ** Dissipation Constant	Operating Temperature Range	Resistance to Soldering Heat
			$B_{25/50}$	$B_{25/85}$			
"10" Type (1005)	ERTJ0EG103 □ *	10 kΩ	(3375 K)	3435 K±1%	≒ 2 (mW/°C)	−40 °C to 125 °C	270±5 °C 3±0.5 sec.
	ERTJ0ES104 □ *	100 kΩ	(4330 K)	4390 K±1%			
"11" Type (1608)	ERTJ1VG103 □ *	10 kW	(3375 K)	3435 K±1%	≒ 3 (mW/°C)		
	ERTJ1VS104 □ *	100 kΩ	(4330 K)	4390 K±1%			

■ Ratings and Characteristics

● Standard Type (Resistance Tolerance: ±10 %, ± 5%, ±3 %)

Size Code (EIA)	Part No.	Zero-Power Resistance (at 25 °C)	B Value		Heat Dissipation Constant	Operating Temperature Range	Resistance to Soldering Heat
			$B_{25/50}$	$B_{25/85}$			
"J0" (0402)	ERTJ0EA220 □ *	22 Ω	2750 K±3 %	(2700 K)	Approximately 2 mw/°C	–40 °C to 125 °C	Soldering temp. 270±5 °C Dipping Time: 3.0±0.5 sec.
	ERTJ0EA330 □ *	33 Ω					
	ERTJ0EA400 □ *	40 Ω					
	ERTJ0EA470 □ *	47 Ω	2800 K±3 %	(2750 K)			
	ERTJ0EA680 □ *	68 Ω					
	ERTJ0EA101 □ *	100 Ω					
	ERTJ0EA151 □ *	150 Ω					
	ERTJ0ET102 □ *	1 kΩ	4500 K±2 %	(4450 K)			
	ERTJ0ET152 □ *	1.5 kΩ					
	ERTJ0ET202 □ *	2.0 kΩ					
	ERTJ0ET222 □ *	2.2 kΩ					
	ERTJ0ET302 □ *	3.0 kΩ					
	ERTJ0ET332 □ *	3.3 kΩ					
	ERTJ0ET472 □ *	4.7 kΩ					
	ERTJ0ER332 □ *	3.3 kΩ	4250 K±2 %	(4300 K)			
	ERTJ0ER472 □ *	4.7 kΩ					
	ERTJ0ER682 □ *	6.8 kΩ					
	ERTJ0ER103 □ *	10 kΩ					
	ERTJ0ER153 □ *	15 kΩ					
	ERTJ0ER223 □ *	22 kΩ					
	ERTJ0ER333 □ *	33 kΩ					
	ERTJ0EP473 □ *	47 kΩ	4050 K±2 %	(4100 K)			
	ERTJ0EV473 □ *	47 kΩ	4700 K±2 %	(4750 K)			
	ERTJ0EV683 □ *	68 kΩ					
	ERTJ0EV104 □ *	100 kΩ					
	ERTJ0EV154 □ *	150 kΩ					
"J1" (0603)	ERTJ1VA220 □ *	22 Ω	2750 K±3 %	(2700 K)	Approximately 3 mw/°C		
	ERTJ1VA330 □ *	33 Ω					
	ERTJ1VA400 □ *	40 Ω	2800 K±3 %	(2750 K)			
	ERTJ1VA470 □ *	47 Ω					
	ERTJ1VA680 □ *	68 Ω					
	ERTJ1VA101 □ *	100 Ω					
	ERTJ1VT102 □ *	1 kΩ	4500 K±2 %	(4450 K)			
	ERTJ1VT152 □ *	1.5 kΩ					
	ERTJ1VT202 □ *	2.0 kΩ					
	ERTJ1VT222 □ *	2.2 kΩ					
	ERTJ1VT302 □ *	3.0 kΩ					
	ERTJ1VT332 □ *	3.3 kΩ					
	ERTJ1VT472 □ *	4.7 kΩ					
	ERTJ1VR332 □ *	3.3 kΩ	4250 K±2 %	(4300 K)			
	ERTJ1VR472 □ *	4.7 kΩ					
	ERTJ1VR682 □ *	6.8 kΩ					
	ERTJ1VR103 □ *	10 kΩ					
	ERTJ1VR153 □ *	15 kΩ					
	ERTJ1VR223 □ *	22 kΩ					
	ERTJ1VR333 □ *	33 kΩ					
	ERTJ1VR473 □ *	47 kΩ					
	ERTJ1VR683 □ *	68 kΩ					
	ERTJ1VP473 □ *	47 kΩ	4050 K±2 %	(4100 K)			
	ERTJ1VV473 □ *	47 kΩ	4700 K±2 %	(4750 K)			
	ERTJ1VV683 □ *	68 kΩ					
	ERTJ1VV104 □ *	100 kΩ					
	ERTJ1VV154 □ *	150 kΩ					

*Resistance Tolerance

**Mounted on a glass epoxy board (1.6t)

$$B25/50=\frac{\ell n\ (R_{25}/R_{50})}{1/298.15-1/323.15}$$

$$B25/85=\frac{\ell n\ (R_{25}/R_{85})}{1/298.15-1/358.15}$$

R_{25}=Resistance at 25.0±0.1 °C

R_{50}=Resistance at 50.0±0.1 °C

R_{85}=Resistance at 85.0±0.1 °C

● Resistance ratios to R25 at each temperature

T(°C)	ERTJ▫ ▫A (2750 K) typical	ERTJ▫ ▫A (2800 K) typical	ERTJ▫ ▫T (4500 K) typical	ERTJ▫ ▫R (4250 K) typical	ERTJ▫ ▫P (4050 K) typical	ERTJ▫ ▫V (4700 K) typical	ERTJ▫ ▫G *(3435 K) typical	ERTJ▫ ▫S *(4390 K) typical
–40	12.965	13.583	62.936	42.791	36.401	59.797	20.238	45.549
–35	10.177	10.615	42.679	30.248	26.052	41.298	15.292	32.019
–30	8.060	8.372	29.347	21.628	18.865	28.758	11.669	22.774
–25	6.438	6.660	20.445	15.635	13.813	20.267	8.988	16.379
–20	5.184	5.341	14.421	11.420	10.219	14.428	6.984	11.904
–15	4.205	4.317	10.291	8.424	7.636	10.368	5.472	8.738
–10	3.436	3.514	7.425	6.271	5.759	7.519	4.322	6.475
–5	2.826	2.880	5.414	4.710	4.382	5.500	3.439	4.841
0	2.340	2.376	3.987	3.567	3.362	4.056	2.755	3.650
5	1.949	1.973	2.964	2.723	2.600	3.015	2.221	2.773
10	1.634	1.649	2.226	2.096	2.026	2.260	1.803	2.124
15	1.379	1.387	1.689	1.626	1.591	1.709	1.473	1.640
20	1.171	1.174	1.294	1.271	1.257	1.302	1.210	1.276
25	1	1	1	1	1	1	1	1
30	0.8585	0.8562	0.7795	0.7923	0.8006	0.7733	0.8309	0.7889
35	0.7409	0.7369	0.6127	0.6318	0.6450	0.6022	0.6941	0.6265
40	0.6425	0.6373	0.4852	0.5069	0.5229	0.4720	0.5826	0.5006
45	0.5598	0.5539	0.3872	0.4090	0.4264	0.3723	0.4914	0.4024
50	0.4899	0.4838	0.3111	0.3319	0.3496	0.2954	0.4164	0.3253
55	0.4286	0.4220	0.2517	0.2710	0.2882	0.2358	0.3543	0.2645
60	0.3774	0.3708	0.2049	0.2224	0.2388	0.1894	0.3027	0.2162
65	0.3345	0.3279	0.1679	0.1834	0.1989	0.1530	0.2596	0.1776
70	0.2982	0.2918	0.1385	0.1520	0.1664	0.1242	0.2233	0.1467
75	0.2674	0.2611	0.1148	0.1266	0.1398	0.1014	0.1928	0.1217
80	0.2411	0.2350	0.09570	0.1059	0.1180	0.08322	0.1670	0.1014
85	0.2185	0.2125	0.08021	0.08894	0.1000	0.06862	0.1451	0.08486
90	0.1980	0.1923	0.06766	0.07507	0.08511	0.05684	0.1260	0.07137
95	0.1801	0.1746	0.05735	0.06361	0.07271	0.04731	0.1097	0.06027
100	0.1645	0.1592	0.04884	0.05412	0.06235	0.03956	0.09570	0.05111
105	0.1507	0.1456	0.04177	0.04622	0.05366	0.03322	0.08370	0.04350
110	0.1386	0.1337	0.03588	0.03962	0.04634	0.02801	0.07338	0.03717
115	0.1279	0.1232	0.03094	0.03408	0.04015	0.02371	0.06448	0.03187
120	0.1183	0.1138	0.02679	0.02941	0.03490	0.02015	0.05678	0.02743
125	0.1098	0.1055	0.02328	0.02547	0.03043	0.01719	0.05011	0.02368

* B25/85

Multilayer Chip NTC Thermistors

Handling Precautions

⚠Safety Precautions

The Multilayer Chip NTC Thermistors (hereafter referred to as **"The Thermistors"**) may fail through burnout, flaming or glowing in the worst case, when subjected to severe conditions of electrical, environmental and/or mechanical stresses.
The following " ⚠Safety Precautions " and "Application Notes" should be studied carefully by you. If you have a question about the Handling Precautions, please contact our engineering section or factory.

1. ⚠Operating Conditions and Circuit Design

1.1 Fail-Safe Design for Equipment

In applications using Thermistors, equipment should be protected against deterioration and failure of the Thermistors.

1.2 Operating Power

The Thermistors, should not be operated beyond the specified Maximum Permissible power, otherwise, burnout and damage due to thermal run away may result. (if operated in ambient temperatures above 25 °C, power rating should be derated in accordance with the derating curve.)
In applications using the Thermistor for temperature detection, the accuracy of the detection may be greatly influenced by the self heat generation and heat dissipation of the Thermistor, even if the Thermistor is operated under the specified Maximum Permissible Power.
Take into account the Heat Dissipation Constant and the specified Maximum Permissible Power before use.
The safety and reliability should be checked in your circuit.

1.3 Restriction on Environmental Conditions

The Thermistors should not be operated and/or stored under the following environmental conditions:

a) Exposed directly to water or salt water.
b) Exposed directly to sunlight.
c) Conditions of dew formation.
d) Conditions of corrosive atmospheres such as hydrogen sulfide, sulfurous acid, chlorine, or ammonia etc.
e) Severe conditions of extreme vibration or shock.

2. ⚠Design of Printed Circuit Board

2.1 Selection of Printed Circuit Boards

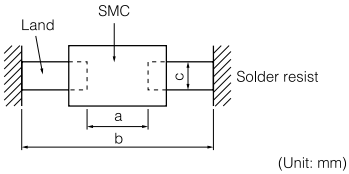
When the Thermistors are mounted and soldered on an "Aluminum Substrate", the substrate influences the Thermistors' reliability against "Temperature Cycles" and "Heat shock" because of the difference of the thermal expansion coefficients between them. It should be carefully confirmed that the actual board used does not deteriorate the characteristics of the Thermistors.

2.2 Design of Land Pattern

(1) Recommended Dimensions of Lands: As shown in Table 1 and Fig.1.

Notes: ∗ Too large land requires excess amount of solder.
∗∗ The Dimensions shall be symetrical

Fig.1 Recommended Land Dimensions



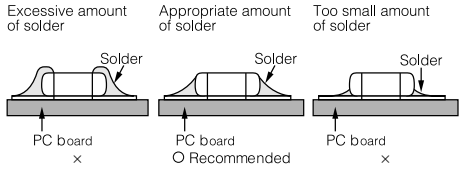
(Unit: mm)

Table 1 Recommended Land Dimensions in mm

Size Code (EIA)	Components Dimensions			Land Dimensions for Flow Soldering			Land Dimensions for Reflow Soldering		
	L	W	T	a	b	c	a	b	c
J1 (0603)	1.6	0.8	0.8	0.8–1.0	2.0–2.6	0.6–0.8	0.8–1.0	2.0–2.6	0.8–1.0
J0 (0402)	1.0	0.5	0.5	—	—	—	0.5–0.6	1.5–1.7	0.5–0.6

(2) Recommended amount of solder
Recommended amount of solder: As shown in Fig.2
Excess amount of solder gives large mechanical stresses to the Thermistors/components.

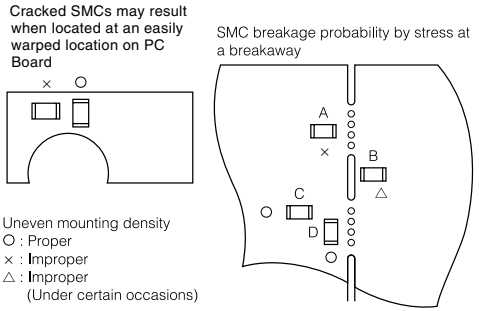
Fig.2 Recommended Amount of Solder



2.3 Component Layout

When placing/mounting the Thermistors/components near an area which is apt to bend or a grid groove on the PC board, it is advisable to have both electrodes subjected to uniform stresses, or to position the components' electrodes at right angles to the grid groove or bending line.

Fig.3 Component Layout



Probability at which the chip Thermistors are broken by the stress on PC board break: A>C>B≒D

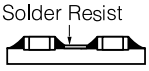
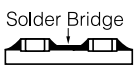
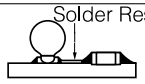
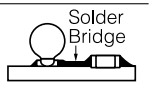
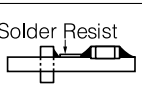
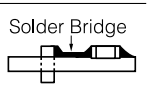
2.4 Mounting Density and Spaces

Placement with too narrow space between components may cause "Solder Bridges" during soldering. The minimum space between components should be 0.5 mm taking into consideration the positioning tolerances of the mounting machines and the dimensional tolerances of the components and PC Boards.

2.5 Application of Solder Resist

Application of Solder Resist is effective to prevent solder bridges and to control amounts of solder on PC boards. (As shown in Table 2)

Table 2 Application Examples of Solder Resist

	Recommended Application Examples	Examples of Solder Bridges
Narrow Spacing between Chip Components		
Radial Components are directly connected to Chip Components		
Common lands (chassis,etc.)are close to Chip Components.		

3. Assembly Precautions

3.1 Adhesives for Mounting

(1) Selection of adhesives

- The viscosity of an adhesive for mountings should be such that the adhesive does not flow off on the land during it's curing.
- If the adhesive is too low in its viscosity, mounted components may be out of alignment after or during soldering.
- The adhesives should not be corrosive or chemically active to the mounted components and the PC boards.
- The amount of adhesive should be such that the adhesive does not flow off or get out of alignment.

(2) Curing Conditions

- Adhesives for mountings can be cured by ultraviolet or infrared radiation. In order to prevent the terminal electrodes of the Thermistors from oxidizing, the curing should be done at conditions of 160 °C max., for 2 minutes max.

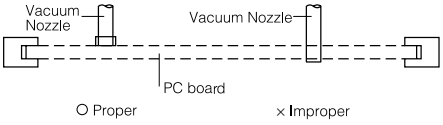
3.2 Chip Mounting Consideration

In mounting the Thermistors/components on a printed circuit board, any bending and expanding force against them should be kept to a minimum to prevent them from becoming damaged or cracked. Following precautions and recommendations should be observed carefully in the process;

(1) Maximum stroke of the vacuum nozzle should be adjusted so that the pushing force to the printed circuit board shall be limited to a static load of 1 to 3 N (100 to 300 gf). (See Fig.4)

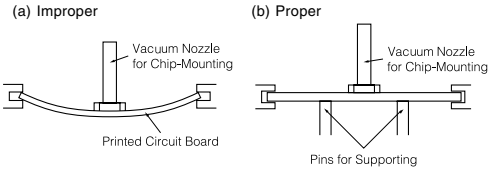
(2) Maximum stroke of the nozzle should be adjusted so that the maximum bending of printed circuit board does not exceed 0.5 mm. (See Fig.4)

Fig.4



(3) The printed circuit board should be supported by means of adequate supporting pins as shown in Fig.5-(b).

Fig.5



3.3 ⚠ Soldering Flux and Solder

(1) Soldering Flux:

- The content of halogen in the soldering flux should be 0.2 wt% or less.
- Rosin-based and non-activated soldering flux is recommended.

(2) Water soluble type Soldering Flux:

In the case of water soluble type soldering flux being applied, the flux residue on the surface of P.C. boards may influence the reliability of the components and cause deterioration and failure.

(3) Solder:

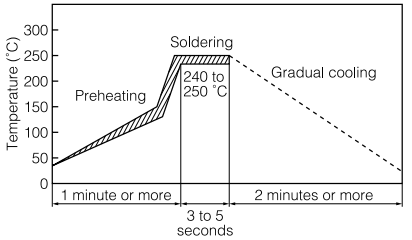
An eutectic solder (Sn63: Pb37) is recommended.

3.4 ⚠ Soldering

3.4.1 Flow Soldering

In flow soldering process, abnormal and large thermal and mechanical stresses, caused by "Temperature Gradient" between the mounted Thermistors and melted solder in a soldering bath, may be applied directly to the Thermistors, resulting in failure and damage to the Thermistors. So it is essential that the soldering process should be controlled according to the following recommended conditions and precautions. (See Fig.6)

Fig.6 Recommended Soldering Temperature-Time Profile (Flow soldering)



(1) Application of Flux:

The soldering flux (3.3) should be applied to the mounted Thermistors thinly and uniformly by forming method.

(2) Preheating:

The mounted Thermistors/Components should be preheated sufficiently so that the "Temperature Gradient" between the Thermistors/components and the melted solder shall be 150 °C or below.

(3) Immersion in Soldering Bath:

The Thermistors should be immersed into a soldering bath of 240 to 250 °C for 3 to 5 seconds.

(4) Cooling:

The Thermistors should be cooled gradually to room ambient temperature with the cooling temperature rates of 8 °C/s max. from 250 °C to 170 °C, and 4 °C/s max. from 170 °C to 130 °C.

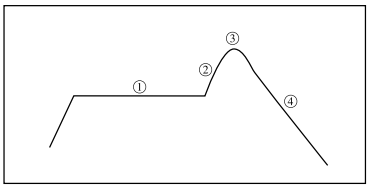
(5) Flux Cleaning:

When the Thermistors are immersed in cleaning solvent, it should be confirmed that the surface temperatures of devices do not exceed 100 °C. (See 3.5)

3. 4 . 2 Reflow Soldering

The temperature conditions of Reflow soldering consists of temperature curves for preheating the part, temperature increase of the part, main heating of the part and cooling of the part. If rapid heat is added to thermistors, distortion occurs due to the large internal temperature difference of the thermistor and it will cause thermal cracks. Please pay careful attention to the temperature difference. Preheating parts is necessary to avoid tombstoning (chip standing). Please pay careful attention to temperature control.

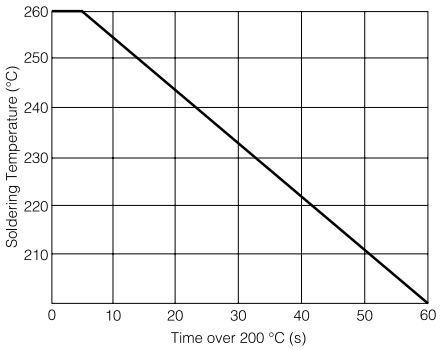
Fig.7 Recommended Profile for Flow Soldering (Ex.)



(1) Preheating 1: 140 to 160 °C for 60 to 90 s
(2) Preheating 2: 150 to 200 °C for 2 to 5 s
(3) Soldering: As shown in Fig.8
(4) Cooling: 230 to 100 °C for 1 to 4 s

After soldering, the mounted Thermistors/components should be gradually cooled to room ambient temperature for preventing mechanical damage such as cracking.

Fig.8 Recommended Soldering Maximum Temperature



(5) Flux Cleaning:

When the Thermistors are immersed into cleaning solvent, it should be confirmed that the surface temperatures of devices do not exceed 100 °C.

(6) There is no problem with repeat flow soldering under the conditions described in the diagram [Recommended Profile for Flow Soldering(Example)] below. Care should, however, be taken to prevent board warping or bending.

3.4.3 Hand Soldering

In hand soldering of the Thermistors, a large temperature gradient between the preheated Thermistors and the tip of soldering iron may cause electrical failures and mechanical damage such as cracking or breaking. The soldering should be carefully controlled and carried out so that the temperature gradient is kept to a minimum with the following recommended conditions for hand soldering.

[Recommended Soldering Conditions]

(1) Solder:
ϕ1 mm Thread eutectic solder (Sn63: Pb37) with soldering flux* in the core.
* Rosin-based, and non-activated flux is recommended.

(2) Preheating:
The Thermistors should be preheated so that "Temperature Gradient" between the devices and the tip of soldering iron is 150 °C or below.

(3) Soldering Iron:
Rated Power of 20 W max. with 3 mm soldering tip in diameter.

(4) Temperature of soldering iron tip: 300 °C max.
(The required amount of solder should be melted in advance on the soldering tip.)

(5) Cooling:
After soldering. The Thermistors should be cooled gradually at room ambient temperature.

3.5 ⚠ Post Soldering Cleaning

(1) Residues of corrosive soldering fluxes on the PC board after cleaning may greatly influence the electrical characteristics and the reliability (such as humidity resistance) of the Thermistors which have been mounted on the board. It should be confirmed that the characteristics and the reliability of the devices are not affected by the applied cleaning conditions.

(2) Solubility of alternative cleaning solvent such as alcohol etc, is inferior to that of freon cleaning solvent in the flux cleaning.
So in a case of alternative cleaning solvents applied, fresh cleaning solvent always should be used, and sufficient rinsing and drying should be carried out.

(3) When ultrasonic cleaning is used on the mounted Thermistors on PC boards, the following conditions are recommended for preventing failure or damage to the devices due to the large vibration energy and the resonance caused by the ultrasonic waves :
Frequency : 29 kHz max.
Radiated Power : 20 W/liter max.
Period : 5 minutes max.

3.6 Process Inspection

When the mounted printed circuits are inspected with measuring terminal pins, abnormal and excess mechanical stresses should not be applied to the PC board and mounted components, to prevent failure or damage to the devices.

(1) The mounted PC boards should be supported by adequate supporting pins to prevent bending.

(2) It should be confirmed that the measuring pins have the right tip in shape, are equal in height and are set in the right positions.

3.7 Protective Coating

When the surface of a printed board on which the Thermistors have been mounted is coated with resin to protect against moisture and dust, it should be confirmed that the protective coat does not influence reliability of the Thermistors in the actual equipment.

(1) Coating materials, that are corrosive and chemically active, should not be applied to the Thermistors and other components.

(2) Coating materials with a large expansivity should not be applied to the Thermistors in order to prevent failure or damage (such as cracking) to the devices in the curing process.

3.8 ⚠ Dividing/Breaking of PC Boards

(1) Abnormal and excessive mechanical stresses, such as bending or expanding force, on the components on the printed circuit board, should be kept to a minimum in the dividing/breaking.

(2) Dividing/Breaking of the PC boards should be done carefully at moderate speed by using a jig or apparatus to prevent the Thermistors on the boards from mechanical damages.

3.9 Long Term Storage

The Thermistors should not be stored under severe conditions of high temperatures and high humidities. Store them indoors under 40 °C max. and 75 % RH max.. Use them within 6 months and check the solderability before use.