

# Specification

Title: LINEAR POSITIVE T-C CHIP THERMISTORS;  
RECTANGULAR TYPE

Style: LTC1/10,1/8

RoHS COMPLIANCE ITEM  
Halogen and Antimony Free

Product specification contained in this specification  
are subject to change at any time without notice  
If you have any questions or a Purchasing Specification for any quality  
Agreement is necessary, please contact our sales staff.



**釜屋電機株式会社**  
**KAMAYA ELECTRIC CO., LTD.**

Hokkaido Research Center  
Approval by: T. Sannomiya  
Drawing by: M. Shibuya

Note: Stock conditions

Temperature: +5°C ~ +35°C

Relative humidity: 25% ~ 75%

The period of guarantee: Within 2 year from shipment by the company.  
Solderability shall be satisfied.

## 1. Scope

1.1 This specification covers the detail requirements for linear positive T-C chip thermistors; rectangular type, style of LTC1/10,1/8.

## 1.2 Applicable documents

JIS C 5201-1: 2011, JIS C 5201-8: 2014, JIS C 5201-8-1: 2014

IEC60115-1: 2008, IEC60115-8: 2009, IEC60115-8-1: 2014

EIAJ RC-2134C-2010

## 2. Classification

Type designation shall be the following form.

(Example)    

LTC	1/10	10	152	J	B
1	2	3	4	5	6

Style

1 Linear positive T-C chip thermistors; rectangular type  Style

2 Rated dissipation and/or dimension

3 Temperature coefficient of resistance

10	$\pm 1000 \times 10^{-6} / ^\circ\text{C}$
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4 Rated resistance

152	E24 Series, 3 digit, Ex. 152--> 1.5k $\Omega$
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5 Tolerance on rated resistance

J	$\pm 5\%$
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6 Packaging form

B	Bulk (loose package)
TP	Paper taping

## 3. Rating

3.1 The ratings shall be in accordance with Table-1.

Table-1

Style	Rated dissipation (W)	Isolation voltage (V)	Category temperature range (°C)
LTC1/10	0.1	100	-40~+125
LTC1/8	0.125		

## 3.2 Temperature coefficient of resistance and rated resistance .

3.2.1 The combination of temperature coefficient of resistance and rated resistance shall be in accordance with Table-2.

Table-2

Rated resistance			Temperature coefficient of resistance		
Resistance range		Tolerance	Symbol	Nominal value (10 <sup>-6</sup> /°C)	Tolerance
LTC1/10	LTC1/8				
100Ω~5.1kΩ	100Ω~10kΩ	J(±5%)	05	500	±100×10 <sup>-6</sup> /°C
100Ω~5.1kΩ	100Ω~10kΩ		08	800	±150×10 <sup>-6</sup> /°C
100Ω~5.1kΩ	100Ω~10kΩ		10	1000	±15%
100Ω~3.3kΩ	100Ω~4.7kΩ		15	1500	
100Ω~3.3kΩ	100Ω~4.7kΩ		20	2000	±10%
100Ω~1.6kΩ	100Ω~2.2kΩ		24	2400	
100Ω~3.3kΩ	100Ω~3.6kΩ		28	2800	
100Ω~3.3kΩ	100Ω~3.6kΩ		30	3000	
100Ω~3.3kΩ	100Ω~3.6kΩ		33	3300	
51Ω~910Ω	51Ω~1.2kΩ		36	3600	
51Ω~560Ω	51Ω~910Ω		39	3900	
33Ω~360Ω	33Ω~470Ω		42	4200	
33Ω~200Ω	33Ω~180Ω		45	4500	

## 3.2.2 The symbol of the temperature coefficient of resistance

The symbol of the temperature coefficient of resistance shall be in accordance with Table-2.

Example) 05.....500×10<sup>-6</sup>/°C10.....1,000×10<sup>-6</sup>/°C

## 3.2.3 Symbols for rated resistance

The symbol of the rated resistance shall be combined one English capital letter and one digit in accordance with Table-3 and Table-4.

Table-3

Code	A	B	C	D	E	F	G	H	J	K	L	M
Value	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0

Code	N	P	Q	R	S	T	U	V	W	X	Y	Z
Value	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1

Table-4

Code	0	1	2	3	4
Multiplier	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>

Example) A1.....1.0×10<sup>1</sup>=10ΩE3.....1.5×10<sup>3</sup>=1.5kΩ

## 3.3 Climatic category

40/125/56

Lower category temperature

-40 °C

Upper category temperature

+125 °C

Duration of the damp heat, steady state test

56days

## 3.4 Stability class

5%

Limits for change of resistance:

-for long - term tests ±(5%+0.1Ω)

-for short - term tests ±(1%+0.05Ω)

### 3.5 Derating

The derated values of dissipation at temperature in excess of 70 °C shall be as indicated by the following curve.

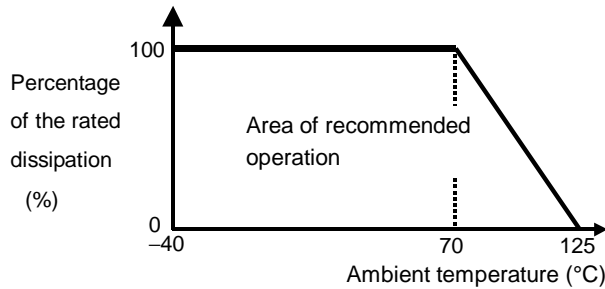


Figure-1 Derating curve

### 3.6 Rated voltage

d. c. or a. c. r. m. s. voltage calculated from the square root of the product of the rated resistance and the rated dissipation.

$$E = \sqrt{P \cdot R}$$

E : Rated voltage (V)

P : Rated dissipation (W)

R : Rated resistance (Ω)

### 4. Packaging form

The standard packaging form shall be in accordance with Table-5.

Table-5

Symbol	Packaging form		Standard packaging quantity / units
B	Bulk (loose package)		1,000 pcs.
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.

### 5. Dimensions

5.1 The resistor shall be of the design and physical dimensions in accordance with Figure-2 and Table-6.

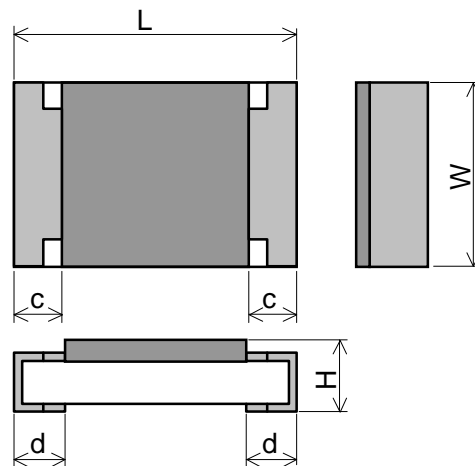


Figure-2

Table-6

Unit : mm

Style	L	W	H	c	d
LTC1/10	2.0 ± 0.15	1.25 <sup>+0.10</sup> / <sub>-0.05</sub>	0.6 ± 0.1	0.4 ± 0.2	0.3 <sup>+0.2</sup> / <sub>-0.1</sub>
LTC1/8	3.1 ± 0.1	1.55 ± 0.10	0.6 ± 0.1	0.45 ± 0.20	0.3 <sup>+0.2</sup> / <sub>-0.1</sub>

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## 5.2 Net weight (Reference)

Style	Net weight(mg)
LTC1/10	5
LTC1/8	9

## 6. Marking

The combination symbol of nominal resistance value and temperature coefficient of resistance shall be marked on over coat side as shown in following examples.

(Example) 10E3.....1,000×10<sup>-6</sup>/°C,1.5kΩ  
10K2.....3,900×10<sup>-6</sup>/°C,240Ω

## 7. Performance

7.1 The standard condition for tests shall be in accordance with Sub-clause 4. 2, JIS C 5201-1: 2011.

7.2 The performance shall be satisfied in Table-7.

Table-7(1)

No.	Test items	Condition of test (JIS C 5201 - 1)	Performance requirements
1	Visual examination	Sub-clause 4. 4. 1 Checked by visual examination.	As in 4. 4. 1 The marking shall be legible, as checked by visual examination.
2	Dimension Resistance	Sub-clause 4. 4. 2 Sub-clause 4. 5	As specified in Table-6 of this specification. As in 4. 5. 2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance.
3	Voltage proof	Sub-clause 4. 7 Method: 4. 6. 1. 4(See Figure-5) Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage. Duration: 60 s ± 5 s Insulation resistance Test voltage : Insulation voltage Duration: 1 min.	No breakdown or flash over  R ≥ 1 G Ω
4	Solderability	Sub-clause 4. 17 Without ageing Flux: The thermistors shall be immersed in a non - activated soldering flux for 2s. Bath temperature: 235 °C ± 5 °C Immersion time: 2 s ± 0.5 s	As in 4. 17. 4. 5 The terminations shall be covered with a smooth and bright solder coating.

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Table-7(2)

No	Test items	Condition of test (JIS C 5201 - 1)	Performance requirements
5	Mounting  Overload (in the mounted state)  Solvent resistance of the marking	Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-3 Sub-clause 4. 13 The applied voltage shall be 2.5 times the rated voltage. Duration: 2 s Visual examination Resistance Sub-clause 4. 30 Solvent : 2 - propanol Solvent temperature: 23 °C ± 5 °C Method 1 Rubbing material: cotton wool Without recovery	No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$ Legible marking
6	Mounting  Bound strength of the end face plating  Final measurements	Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-4 Sub-clause 4. 33 Bent value: 3 mm Resistance Sub-clause 4. 33. 6 Visual examination	$\Delta R \leq \pm (1\%+0.05\Omega)$  No visible damage
7	Resistance to soldering heat  Component solvent resistance	Sub-clause 4. 18 Solder temperature: 260 °C ± 5 °C Immersion time: 10 s ± 0. 5 s Visual examination  Resistance Sub-clause 4.29 Solvent: 2-propanol Solvent temperature: 23 °C ± 5 °C Method 2 Recovery: 48 h Visual examination Resistance	As in 4. 18. 3. 4 No sign of damage such as cracks. $\Delta R \leq \pm (1\%+0.05\Omega)$  No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$

Table-7(3)

No	Test items	Condition of test (JIS C 5201 - 1)	Performance requirements
8	<p>Mounting</p> <p>Adhesion</p> <p>Rapid change temperature</p>	<p>Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-3</p> <p>Sub-clause 4. 32 Force: 5 N Duration: 10 s ± 1 s Visual examination</p> <p>Sub-clause 4.19 Lower category temperature: -40 °C Upper category temperature: +85 °C Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles. Visual examination Resistance</p>	<p>No visible damage</p> <p>No visible damage <math>\Delta R \leq \pm(1\%+0.05\Omega)</math></p>
9	<p>Climatic sequence</p> <p>-Dry heat</p> <p>-Damp heat, cycle (12+12hour cycle) First cycle</p> <p>-Cold</p> <p>-Damp heat, cycle (12+12hour cycle) Remaining cycle</p> <p>-D.C. load</p>	<p>Sub-clause 4. 23 Sub-clause 4. 23. 2 Test temperature: +125 °C Duration: 16 h</p> <p>Sub-clause 4. 23. 3 Test method: 2 Test temperature: 55 °C [Severity(2)]</p> <p>Sub-clause 4. 23. 4 Test temperature -40 °C Duration: 2h</p> <p>Sub-clause 4. 23. 6 Test method: 2 Test temperature: 55 °C [Severity (2)] Number of cycles: 5 cycles</p> <p>Sub-clause 4. 23. 7 The applied voltage shall be the rated voltage Duration: 1 min. Visual examination Resistance</p>	<p>No visible damage <math>\Delta R \leq \pm (5\%+0.1\Omega)</math></p>
10	<p>Mounting</p> <p>Endurance at 70 °C</p>	<p>Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure - 3</p> <p>Sub-clause 4. 25. 1 Ambient temperature: 70 °C ± 2 °C Duration: 1000 h The voltage shall be applied in cycles of 1.5 h on and 0.5 h. The applied voltage shall be the rated voltage Examination at 48 h , 500 h and 1000 h: Visual examination Resistance</p>	<p>No visible damage <math>\Delta R \leq \pm (5\%+0.1\Omega)</math></p>

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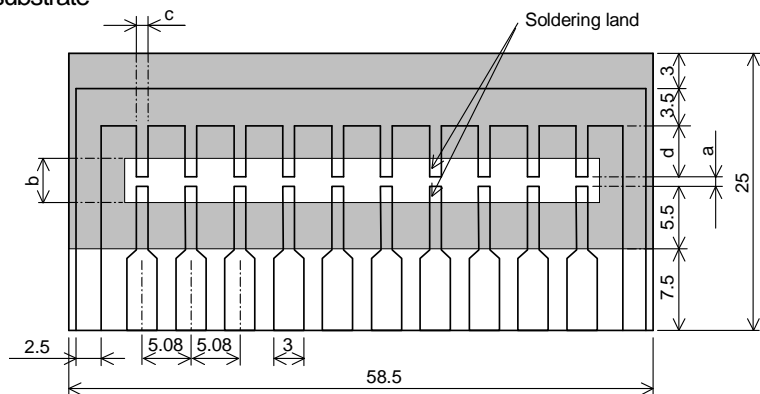
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Table-7(4)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
11	Mounting  Variation of resistance with temperature	Sub - clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4. 8 +20 °C / + 75°C	As in Table-2
12	Mounting  Damp heat, steady state	Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4. 24 Ambient temperature: 40 °C ± 2 °C Relative humidity : 93 $\pm$ <sub>3</sub> % Without voltage applied. Without polarizing voltage [4. 24. 2. 1, c)] Visual examination  Resistance	No visible damage Legible marking $\Delta R \leq \pm (5\%+0.1\Omega)$
13	Dimensions (detail)  Mounting  Endurance at upper category temperature	Sub-clause 4. 4. 3  Sub-clause 4. 31 Substrate material: Epoxide woven glass Test substrate: Figure-3  Sub-clause 4. 25. 3 Ambient temperature: 125 °C ± 2 °C Duration: 1000 h Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	As in Table-6       No visible damage $\Delta R \leq \pm (5\%+0.1\Omega)$



## 8. Test substrate

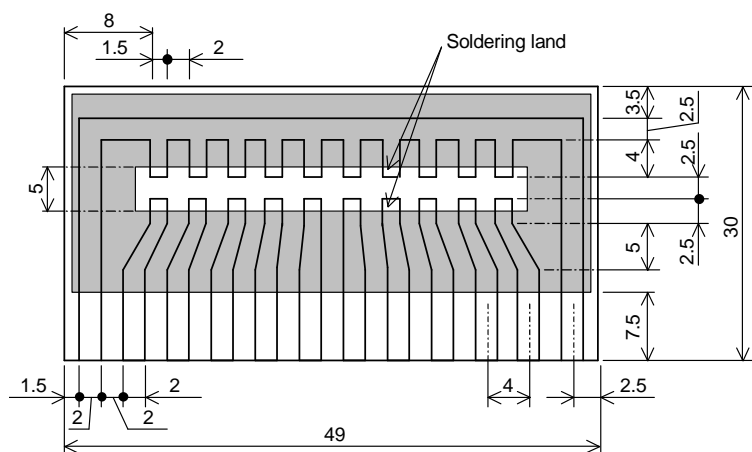


Unit: mm

□ :Copper clad  
■ :Solder resist

Style	a	b	c	d
LTC1/10	1.2	4.0	1.5	4.3

LTC1/10 TEST SUBSTRATE

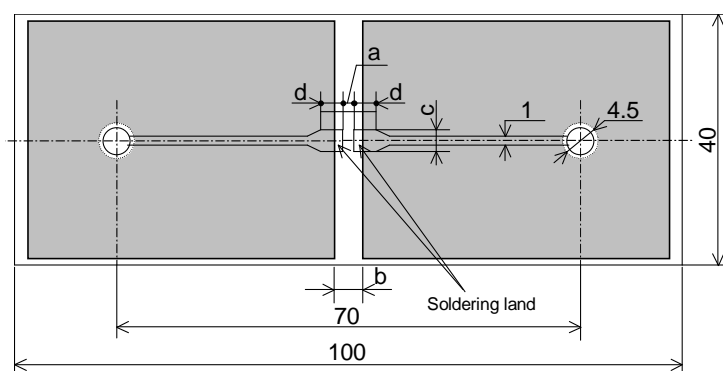


□ :Copper clad  
■ :Solder resist

LTC1/8 TEST SUBSTRATE

Figure-3

- Remark 1). Material: Epoxide woven glass  
Thickness: 1.6mm Thickness of copper clad: 0.035mm
- 2). In the case of connection by connector, the connecting terminals are gold plated.  
However, the plating is not necessary when the connection is made by soldering.



Unit: mm

□ :Copper clad  
■ :Solder resist

Style	a	b	c	d
LTC1/10	1.2	4.0	1.65	3.0
LTC1/8	2.5	5.0	2.0	2.5

- Remark 1). Material: Epoxide woven glass  
Thickness: 1.6mm Thickness of copper clad: 0.035mm
- Figure-4 LTC BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE

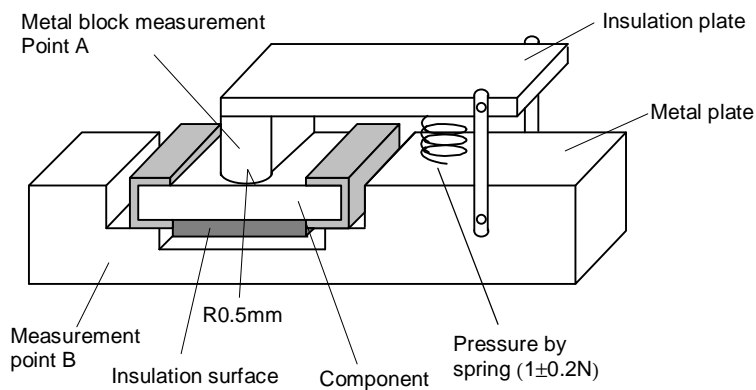


Figure-5

## 9. Taping

9.1 Applicable documents JIS C 0806-3: 2014, EIAJ ET-7200C: 2010

### 9.2 Taping dimensions

Taping dimensions shall be in accordance with Figure-6 and Table-8.

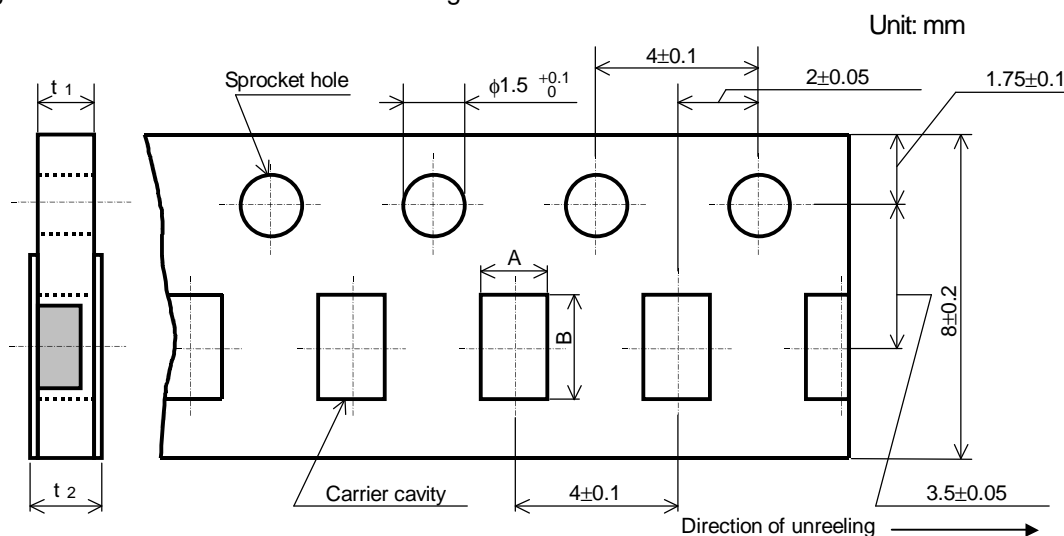


Figure-6

Table-8

Unit: mm

Style	A	B	t <sub>1</sub>	t <sub>2</sub>
LTC1/10	1.65 ± 0.15	2.5 ± 0.2	0.8 ± 0.1	1.0max.
LTC1/8	2.0 ± 0.15	3.6 ± 0.2		

- 1). The cover tapes shall not cover the sprocket holes.
- 2). Tapes in adjacent layers shall not stick together in the packing.
- 3). Components shall not stick to the carrier tape or to the cover tape.
- 4). Pitch tolerance over any 10 pitches  $\pm 0.2\text{mm}$ .
- 5). The peel strength of the top cover tape shall be with in 0.1N to 0.5N on the test method as shown in the following Figure-7.
- 6). When the tape is bent with the minimum radius for 25 mm, the tape shall not be damaged and the components shall maintain their position and orientation in the tape.
- 7). In no case shall there be two or more consecutive components missing.  
The maximum number of missing components shall be one or 0. 1%, whichever is greater..
- 8). The thermistors shall be faced to upward at the over coating side in the carrier cavity.

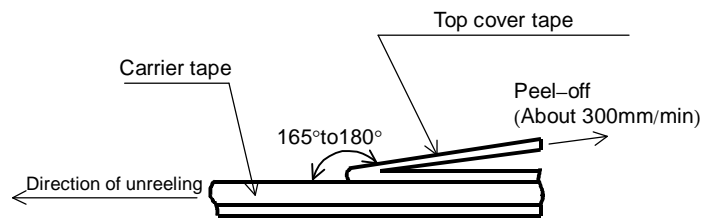


Figure-7

### 9.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-8 and Table-9.

Plastic reel (Based on EIAJ ET-7200C)

Unit: mm

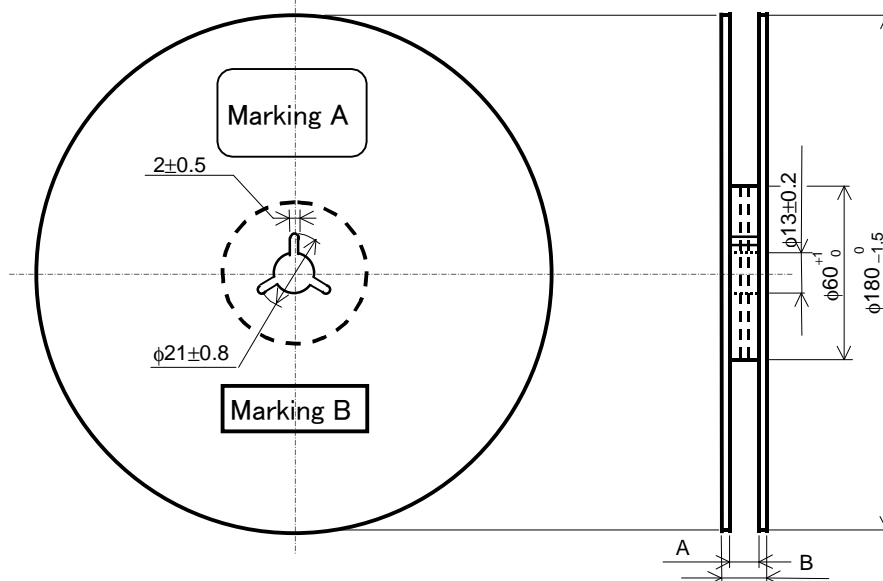


Figure-8

Table-9

Unit: mm

Style	A	B	Note
LTC1/10,1/8	9 $^{+1.0}_0$	11.4 $\pm$ 1.0	Injection molding
		13 $\pm$ 1.0	Vacuum forming

Note: Marking label shall be marked on a place of Marking A or two place of marking A and B.

## 9.4 Leader and trailer tape.

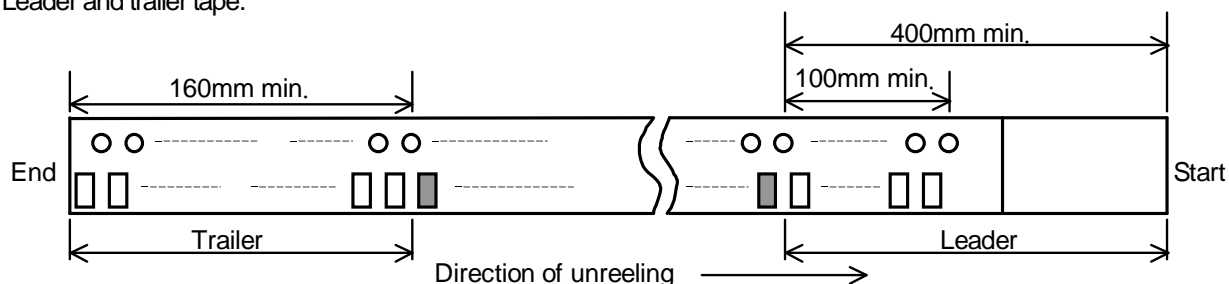


Figure-9

## 10. Marking on package

The label of a minimum package shall be legibly marked with follows.

### 10.1 Marking A

#### (1) Classification

(Style, Temperature coefficient of resistance, Rated resistance, Tolerance on rated resistance, Packaging form)

#### (2) Quantity (3) Lot number (4) Manufacturer's name or trade mark (5) Others

### 10.2 Marking B(KAMAYA Control label)