

Specification

Title: FIXED THIN FILM CHIP RESISTORS;
RECTANGULAR TYPE

Style: RNC06, 20, 32

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.



釜屋電機株式會社
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 fixed thin film chip resistors; rectangular type & precision, style of RNC06, 20, 32.

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-2133C-2010


2. Classification

Type designation shall be the following form.

(Example)

RNC	32	E	1002	B	B
1	2	3	4	5	6

Style					

1 Fixed thin film chip resistors; rectangular type  Style

2 Size

3 Temperature coefficient of resistance

E	±25×10 ⁶ /°C
C	±50×10 ⁶ /°C

4 Rated resistance Example; 1002 → 10kΩ

103	E24 Series, 3 digit,	Ex. 103--> 10kΩ,
1002	E96 Series, 4 digit,	Ex. 1002-->10kΩ 10R2--> 10.2kΩ

5 Tolerance on rated resistance

B	±0.1%
C	±0.25%
D	±0.5%
F	±1%

6 Packaging form

B	Bulk (loose package)
PA	Press pocket taping
TP	Paper taping

3. Rating

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

Table-1

Style	Rated dissipation (W)	Temperature coefficient of resistance ($10^{-5}/^{\circ}\text{C}$)	Rated resistance range(Ω)	Preferred number series for resistors	Tolerance on rated resistance	
RNC06	0.05	E: ± 25	100~12k	E24,96	B($\pm 0.1\%$)	
		C: ± 50				
		E: ± 25	27~12k		D($\pm 0.5\%$), F($\pm 1\%$)	
		C: ± 50	27~22k			
RNC20	0.1	E: ± 25	100~130k		E24,96	B($\pm 0.1\%$)
RNC32	0.125		10~130k			C($\pm 0.25\%$), D($\pm 0.5\%$)
			100~180k			B($\pm 0.1\%$)
10~180k	C($\pm 0.25\%$), D($\pm 0.5\%$)					

Style	Limiting element voltage (V)	Isolation Voltage (V)	Category temperature range($^{\circ}\text{C}$)
RNC06	15	50	-55~+155
RNC20	100	100	
RNC32	200		

3.2 Climatic category

55/125/56

Lower category temperature -55 $^{\circ}\text{C}$

Upper category temperature +155 $^{\circ}\text{C}$

Duration of the damp heat, steady state test 56days

3.3 Stability class

1%

Limits for change of resistance:

- for long - term tests $\pm(1.0\%+0.05\Omega)$

- for short - term tests $\pm(0.25\%+0.05\Omega)$

3.4 Derating

The derated values of dissipation at temperature in excess of 70 $^{\circ}\text{C}$ shall be as indicated by the following curve.

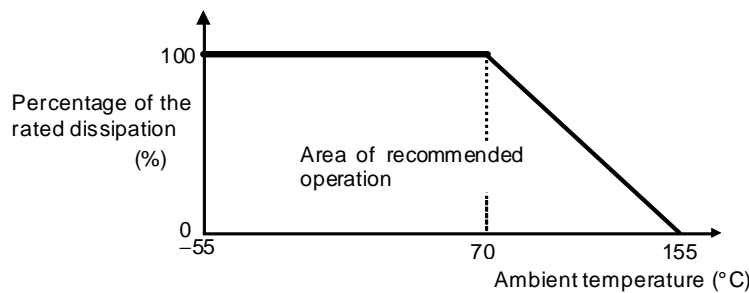


Figure-1 Derating curve

3.5 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)

Limiting element voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

At high value of resistance, the rated voltage may not be applicable.

4. Packaging form

The standard packaging form shall be in accordance with Table-2.

Table-2

Symbol	Packaging form		Standard packaging quantity / units	Application
B	Bulk (loose package)		1,000 pcs.	RNC06, 20, 32
PA	Press pocket taping (paper taping)	8mm width, 2mm pitches	15,000 pcs.	RNC06
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RNC20, 32

5. Dimensions

5.1 The resistor shall be of the design and physical dimensions in accordance with Figure-2 and Table-3.

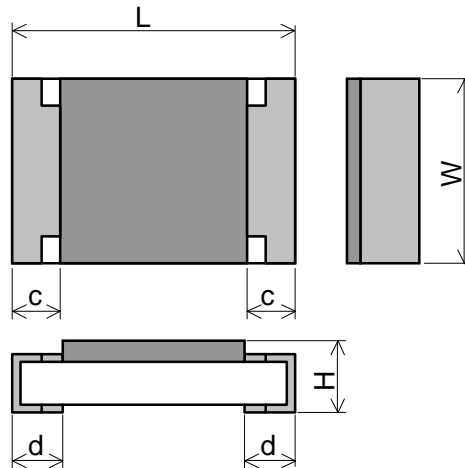


Figure-2

Table-3

Unit: mm

Style	L	W	H	c	d
RNC06	0.6±0.03	0.3±0.03	0.23±0.03	0.1±0.05	0.15±0.05
RNC20	2.0±0.15	1.25 ^{+0.10} _{-0.05}	0.6±0.1	0.4±0.2	0.3 ^{+0.2} _{-0.1}
RNC32	3.1±0.1	1.55 ^{+0.10} _{-0.05}	0.6±0.1	0.45±0.20	0.3 ^{+0.2} _{-0.1}

5.2 Net weight (Reference)

Style	Net weight(mg)
RNC06	0.16
RNC20	5
RNC32	9

6. Marking

The Rated resistance shall be marked in 3 digits (E24) or 4 digits (E96) and marked on over coat side.

- E24 series: 3 digits, E96 series: 4 digits

In case of the resistance value that E96 overlaps with E24, It is marked by either.

The Rated resistance of RNC06 should not be marked.

Marking example	Contents	Application
123	$12 \times 10^3 [\Omega] \rightarrow 12 [\text{k}\Omega]$	RNC20,32
12R7	12.7 [Ω]	E96, Less than 100 Ω of RNC20,32
5623	$562 \times 10^3 [\Omega] \rightarrow 562 [\text{k}\Omega]$	RNC20,32

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-4.

Table-4(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-3 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 \pm 5 s Insulation resistance Test voltage: Insulation voltage Duration: 1 min.	No breakdown or flash over R \geq 1 G Ω
4	Solderability	Sub-clause 4.17 Without ageing Flux: The resistors shall be immersed in a non-activated soldering flux for 2s. Bath temperature: 235 $^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Immersion time: 2 s \pm 0.5 s	As in 4.17.4.5 The terminations shall be covered with a smooth and bright solder coating.

Table-4(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 or twice the limiting element voltage, whichever is the less severe. 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 $\Delta R \leq \pm (0.25\%+0.05\Omega)$ 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	$\Delta R \leq \pm (0.25\%+0.05\Omega)$ 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. $\Delta R \leq \pm (0.25\%+0.05\Omega)$ No visible damage $\Delta R \leq \pm (0.25\%+0.05\Omega)$

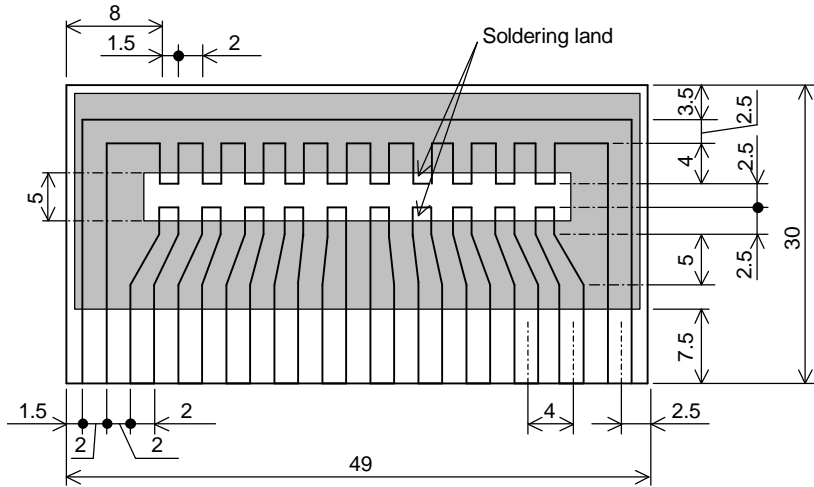
Table-4(3)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
8	Mounting Adhesion Rapid change temperature	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3 Sub-clause 4.32 Force: 5 N (RNC06: 3N) Duration: 10 s ± 1 s Visual examination Sub-clause 4.19 Lower category temperature: -55 °C Upper category temperature: +155 °C Duration of exposure at each temperature: 30 min. Number of cycles: 5 cycles. Visual examination Resistance	No visible damage No visible damage $\Delta R \leq \pm(0.25\%+0.05\Omega)$
9	Climatic sequence -Dry heat -Damp heat, cycle (12+12hour cycle) First cycle -Cold -Damp heat, cycle (12+12hour cycle) Remaining cycle -D.C. load	Sub-clause 4.23 Sub-clause 4.23.2 Test temperature: + 155 °C Duration: 16 h Sub-clause 4.23.3 Test method: 2 Test temperature: 55 °C [Severity(2)] Sub-clause 4.23.4 Test temperature -55 °C Duration: 2h Sub-clause 4.23.6 Test method: 2 Test temperature: 55 °C [Severity (2)] Number of cycles: 5 cycles Sub-clause 4.23.7 The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller. Duration: 1 min. Visual examination Resistance	No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$
10	Mounting Endurance at 70 °C	Sub-clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure-3 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 or the limiting element voltage whichever is the smaller. Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$

Table-4(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 / +125°C	As in Table-1
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 ₃ ² % a) 1st group: without voltage applied. b) 2nd group: The d.c.voltage shall be applied continuously. The voltage shall be accordance with Sub-clause 4.24.2.1 b). without polarizing voltage [4.24.2.1, c)] Visual examination Resistance	No visible damage Legible marking $\Delta R \leq \pm (1\%+0.05\Omega)$
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: 155 °C ± 2 °C Duration: 1000 h Examination at 48 h, 500 h and 1000 h: Visual examination Resistance	As in Table-3 No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$

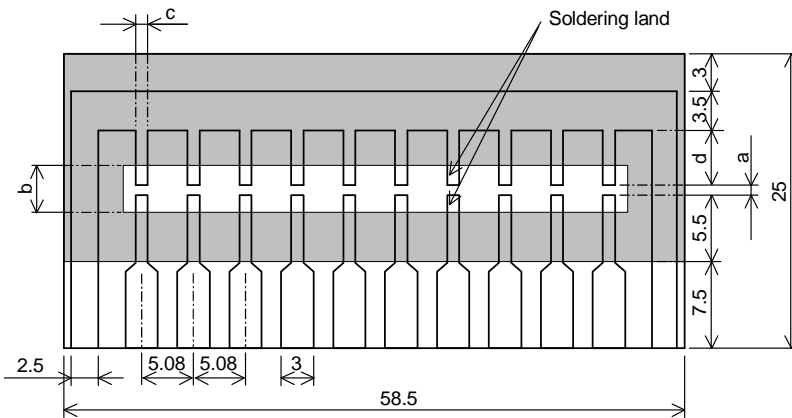
8. Test substrate



Unit: mm

□ :Copper clad
■ :Solder resist

RNC32 TEST SUBSTRATE



Unit: mm

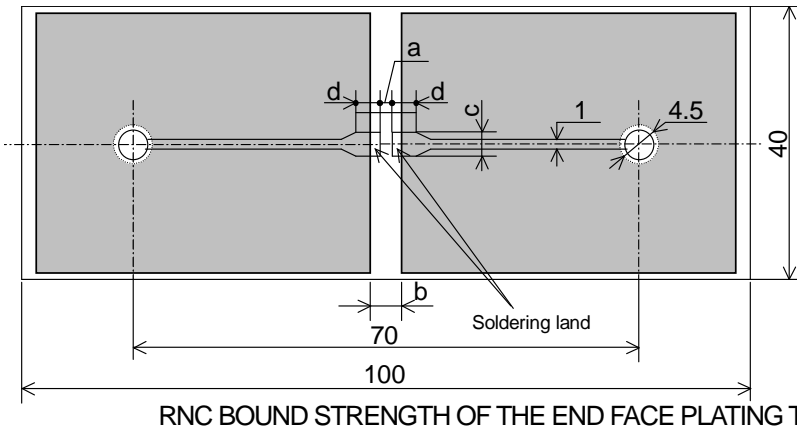
□ :Copper clad
■ :Solder resist

Style	a	b	c	d
RNC06	0.3	1.5	0.45	5.2
RNC20	1.2	4.0	1.5	4.3

RNC06, 20 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
RNC06	0.3	1.1	0.45	2.15
RNC20	1.2	4.0	1.65	3.0
RNC32	2.5	5.0	2.0	2.5

Figure-4

Remark 1). Material: Epoxide woven glass
Thickness: 1.6mm Thickness of copper clad: 0.035mm

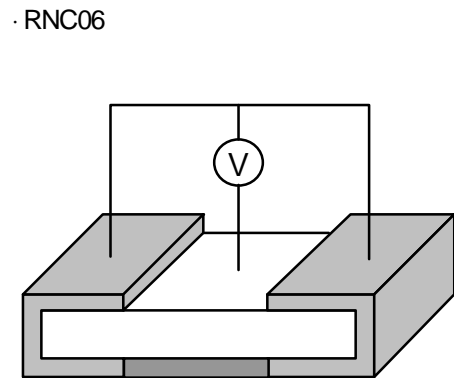
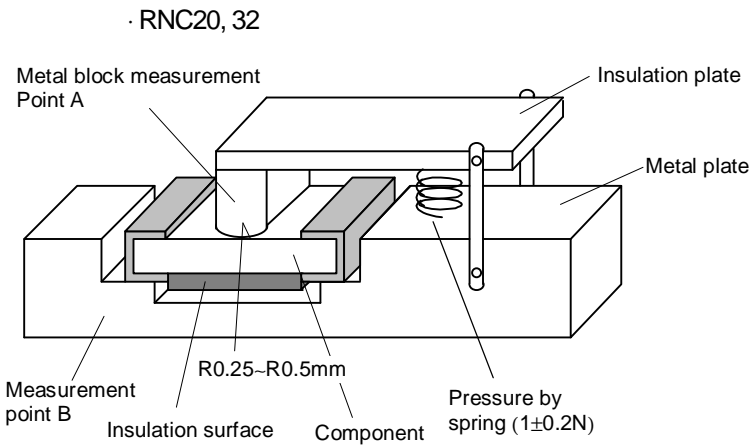


Figure-5

9. Taping

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

9.2 Taping dimensions

9.2.1 Press pocket taping (Paper taping, 8mm width, 2mm pitches)

Taping dimensions shall be in accordance with Figure-6 and Table-5.

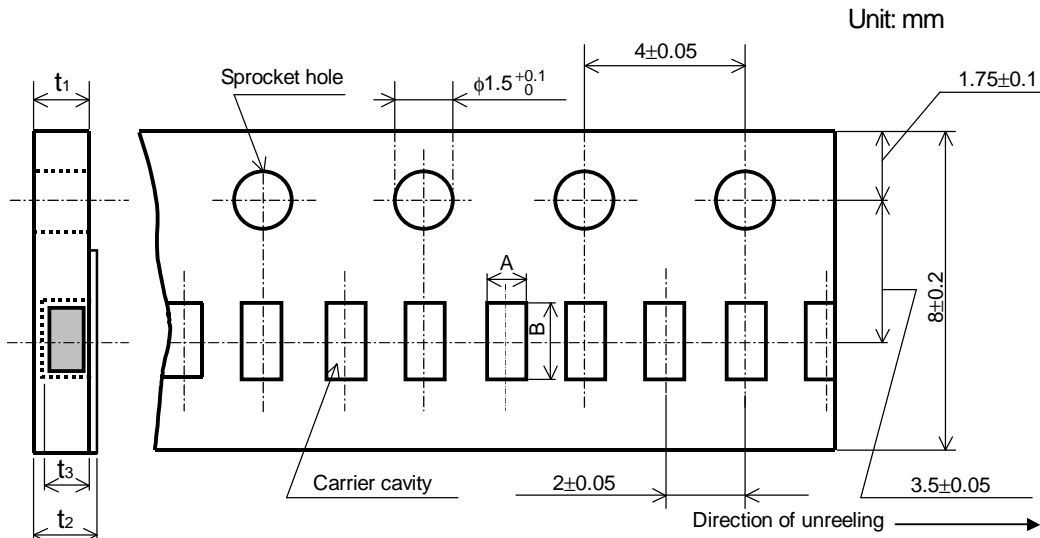


Figure-6

Table-5

Style	A	B	t_1	t_2	t_3
RNC06	0.37 ± 0.05	0.67 ± 0.05	0.42 ± 0.03	0.45 ± 0.05	0.27 ± 0.02

9.2.2 Paper taping (8mm width, 4mm pitches)

Taping dimensions shall be in accordance with Figure-7 and Table-6.

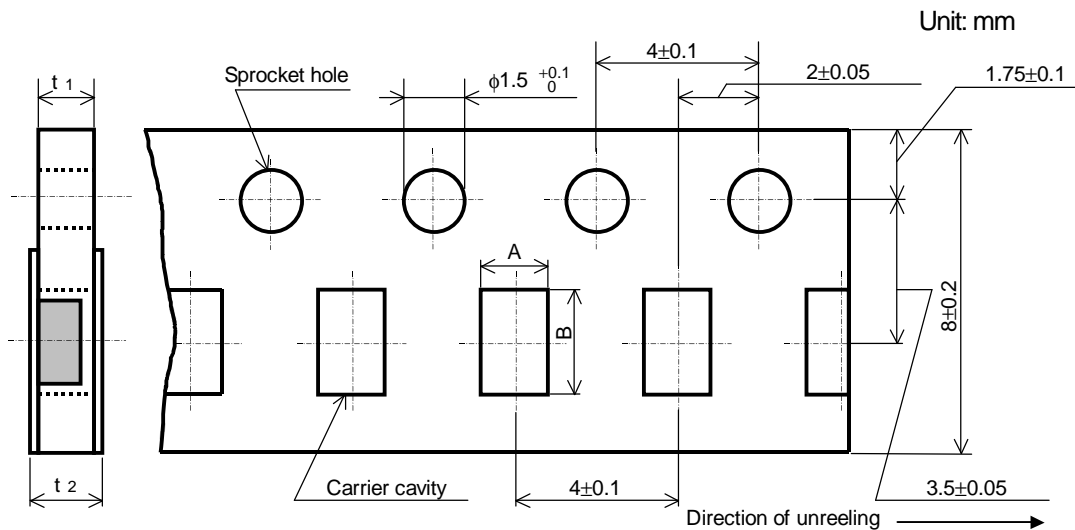


Figure-7

Table-6

Style	A	B	t_1	t_2
RNC20	1.65 ± 0.15	2.5 ± 0.2	0.8 ± 0.1	1.0max.
RNC32	2.00 ± 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 within 0.1N to 0.5N on the test method as shown in the following RNC06: Figure-8, RNC20, 32: Figure-9.
- 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 resistors shall be faced to upward at the over coating side in the carrier cavity.

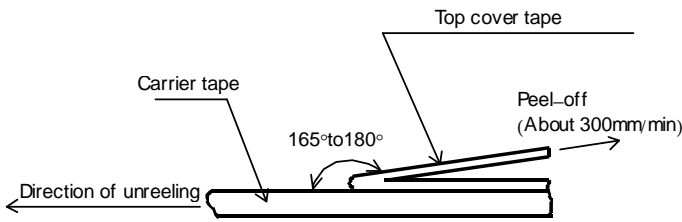


Figure-8

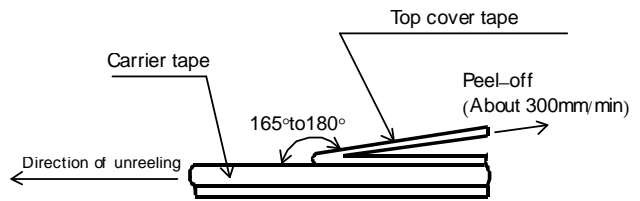


Figure-9

9.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-10 and Table-7.
Plastic reel (Based on EIAJ ET-7200C) Unit: mm

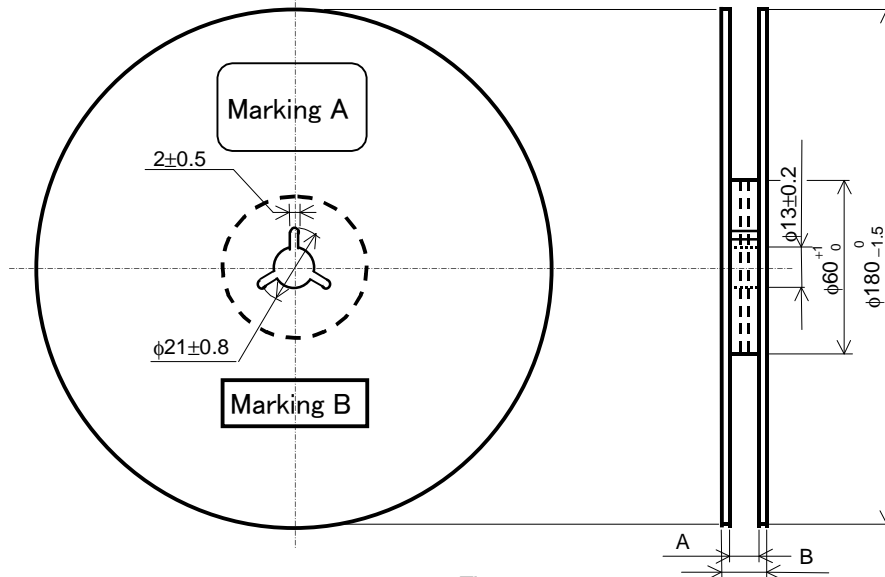


Figure-10

Table-7

Unit: mm

Style	A	B	Note
RNC06, 20, 32	9 ^{+1.0} / ₀	11.4±1.0	Injection molding
		13±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.

(Example)

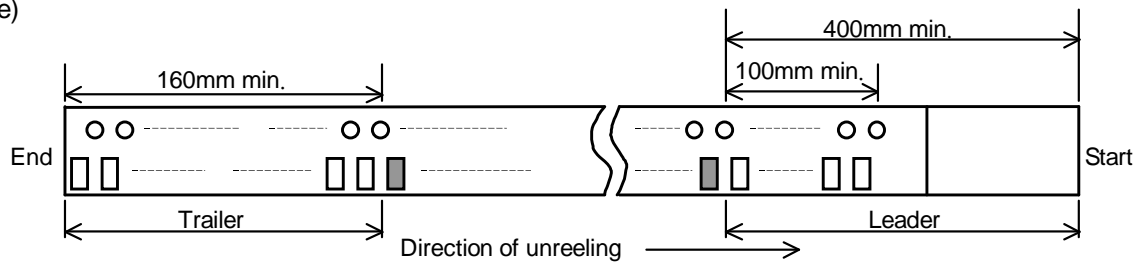


Figure-11

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)

KAMAYA OHM

Title: FIXED THIN FILM CHIP RESISTORS; RECTANGULAR TYPE
RNC06, 20, 32

製品仕様書類 制定、改訂 履歴書

製品仕様書番号		RNC-K-HTS-0001		版数	第 10 版	頁	1/2										
版数	制定・改訂日	頁	制定・改訂の内容														
1	1997.5.30	全	前製品仕様書 RNC-K-RD2-0001を廃止し、本製品仕様書を新規制定する。														
2	1998.8.8	1	1.2 関連規格 JIS C 5222-1989→JIS C 5222-1995に変更														
			2.形名 <table style="display: inline-table; border-collapse: collapse; vertical-align: middle;"> <tr> <td style="border: none; padding: 0 5px;">RNC</td> <td style="border: none; padding: 0 5px;">32</td> <td style="border: none; padding: 0 5px;">→</td> <td style="border: none; padding: 0 5px;">RNC</td> <td style="border: none; padding: 0 5px;">32</td> </tr> <tr> <td style="border: none; padding: 0 5px;">種類</td> <td style="border: none; padding: 0 5px;">定格電力</td> <td style="border: none; padding: 0 5px;"></td> <td style="border: none; padding: 0 5px;">種類</td> <td style="border: none; padding: 0 5px;">サイズ</td> </tr> </table> <div style="text-align: right; margin-right: 20px;">形状 に変更</div>					RNC	32	→	RNC	32	種類	定格電力		種類	サイズ
		RNC	32	→	RNC	32											
		種類	定格電力		種類	サイズ											
		1,2	2.形名、3.定格 抵抗温度特性 → 抵抗温度係数 に誤記訂正														
		2	4.包装形態 包装状態 → 包装形態に誤記訂正														
		3	5.2 製品重量(参考値)を追加														
		4	7.3 3短時間過負荷 規格値「著しい外観の異常がないこと」を追加														
		5	7.4 6耐基板曲げ性 規格値「機械的損傷のないこと」を追加 試験条件:(3)保持時間:10±1秒間を追加 7はんだ耐熱性 規格値「はんだクワレのないこと」→ 「著しい外観の異常がないこと」に変更														
		6	7.5 9温度サイクル、10耐久性(耐湿負荷)、11耐久性(定格負荷) 規格値「著しい外観の異常がないこと」を追加														
		9	9.1 関連規格 JIS C 0806-1990→JIS C 0806-1995に変更														
11	10.包装に関する表示 「定格電力」を削除																
全	寸法等数値の表現方法統一																
3	2000.9.4	全	新JIS規格の制定に伴い全ページ改訂														
4	2002.9.29	5	7 性能 No.7 はんだ耐熱性 浸せき時間:5s±0.5s →10s±0.5sに変更。														
		9	9.1 関連規格 EIAJ ET-7200:1997 → EIAJ ET-7200Aに変更。														
		10	9.3 テーピング用リール ・EIAJ ET-7200 → EIAJ ET-7200Aに変更。 ・ $9^{+0.3}_0$ → $9^{+1.0}_0$ (mm) 以上変更。														
5	2007.10.1	1	1.2 関連規格 EIAJ RC-2133A-1998→EIAJ RC-2133B-2002														
		7	No.11 温度による抵抗値変化 試験条件-55°C/+20°Cを削除														
		9	9.1 関連規格 EIAJ ET-7200A:1999→EIAJ ET-7200B:2003に変更。														
		10	9.3 テーピング用リール EIAJ ET-7200A→EIAJ ET-7200Bに変更 13±1.0mm 幅真空成形リール追加														
		11	10 包装に関する表示 2) 表示 B より形状を削除														
6	2008.10.1	1,2	抵抗温度係数 C:±50 x 10 ⁻⁶ /°Cを削除														
		11	10 包装に関する表示 2) 表示 B を社内管理ラベルとした。														
7	2012.10.5	全	全面見直し														
8	2015.6.26	1	3 定格 RNC06 定格抵抗値範囲 Tol: B 100~1k(Ω)→100~10kΩ Tol: D 47~4.99k(Ω)→27~4.99(Ω)														
所長	マネージャー	担当															
三宮	清野	戸田															