

# Specification

Title: FIXED THICK FILM CHIP RESISTORS;  
RECTANGULAR TYPE & PRECISION

Style: RGC1/32,1/20,1/16S,1/16,1/10,1/8

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

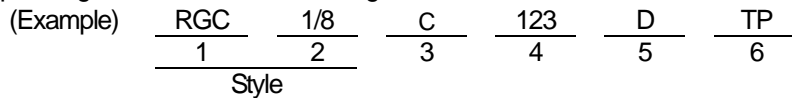
1.1 This specification covers the detail requirements for fixed thick film chip resistors; rectangular type & precision, style of RGC1/32,1/20,1/16S,1/16,1/10,1/8.

1.2 Applicable documents

- JIS C 5201-1: 1998, JIS C 5201-8: 1998, JIS C 5201-8-1: 1998
- IEC60115-1: 1999, IEC60115-8: 1989 Amendment 1: 1992, IEC60115-8-1: 1989
- EIAJ RC-2134B-2002

2. Classification

Type designation shall be the following form.



- 1 Fixed thick film chip resistors; rectangular type & precision  Style
- 2 Rated dissipation and / or dimension
- 3 Temperature coefficient of resistance
 

K	$\pm 100 \times 10^{-6} / ^\circ\text{C}$
C	$\pm 50 \times 10^{-6} / ^\circ\text{C}$
- 4 Rated resistance Example; 123  $\rightarrow$  12k $\Omega$
- 5 Tolerance on rated resistance
- 6 Packaging form

3. Rating

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

Table-1

Style	Rated dissipation (W)	Temperature coefficient of resistance ( $10^{-6} / ^\circ\text{C}$ )		Rated resistance range( $\Omega$ )	Preferred number series for resistors	Tolerance on rated resistance
RGC1/32	0.03	C	$\pm 50$	100~100k	E24,96	D( $\pm 0.5\%$ )
RGC1/20	0.05	C	$\pm 50$	1k~1M	E24,96	B( $\pm 0.1\%$ ), D( $\pm 0.5\%$ )
		K	$\pm 100$	100~976		
RGC1/16S	0.063	C	$\pm 50$	100~1M	E24,96	B( $\pm 0.1\%$ ), D( $\pm 0.5\%$ ), F( $\pm 1\%$ )
		K	$\pm 100$	1.02M~3.3M 10~97.6		
RGC1/16	0.1	C	$\pm 50$	100~1M	E24,96	B( $\pm 0.1\%$ ), D( $\pm 0.5\%$ ), F( $\pm 1\%$ )
		K	$\pm 100$	1.02M~3.3M 10~97.6		
				3.3~9.76		
RGC1/10	0.125	C	$\pm 50$	10~3.3M	E24,96	B( $\pm 0.1\%$ ), D( $\pm 0.5\%$ ), F( $\pm 1\%$ )
				3.3~9.76		
RGC1/8	0.25	C	$\pm 50$	10~4.7M	E24,96	B( $\pm 0.1\%$ ), D( $\pm 0.5\%$ ), F( $\pm 1\%$ )
				3.3~9.76		

Style	Limiting element voltage (V)	Isolation voltage (V)	Category temperature range( $^\circ\text{C}$ )
RGC1/32	15	50	-55~+125
RGC1/20	25		
RGC1/16S	50	100	-55~+155
RGC1/16			
RGC1/10	150		
RGC1/8	200		

3.2 Climatic category

3.2.1 RGC1/32

55/125/56	Lower category temperature	- 55 °C
	Upper category temperature	+125 °C
	Duration of the damp heat, steady state test	56days

3.2.2 RGC1/20,1/16S,1/16,1/10,1/8

55/155/56	Lower category temperature	- 55 °C
	Upper category temperature	+155 °C
	Duration of the damp heat, steady state test	56days

3.3 Stability class

5%

Limits for change of resistance:

- for long - term tests      ±(5%+0.1Ω)
- for short - term tests     ±(1%+0.05Ω)

3.4 Derating

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

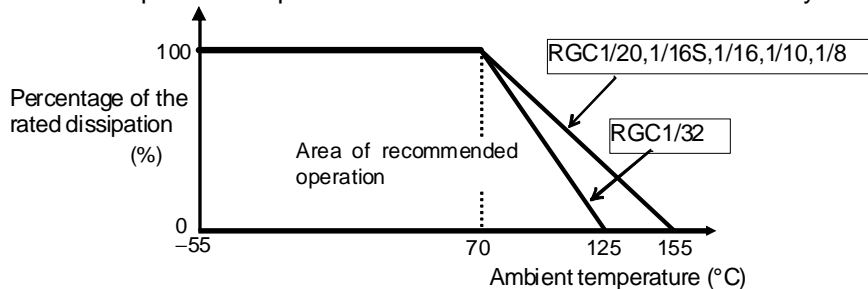


Figure-1 Derating curve

3.5 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.	RGC1/32,1/20,1/16S,1/16,1/10,1/8
PA	Press pocket taping (paper taping)	8mm width, 2mm pitches	20,000 pcs.	RGC1/32
			15,000 pcs.	RGC1/20
TH	Paper taping	8mm width, 2mm pitches	10,000 pcs.	RGC1/16S
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RGC1/16, 1/10, 1/8

5. Dimensions

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

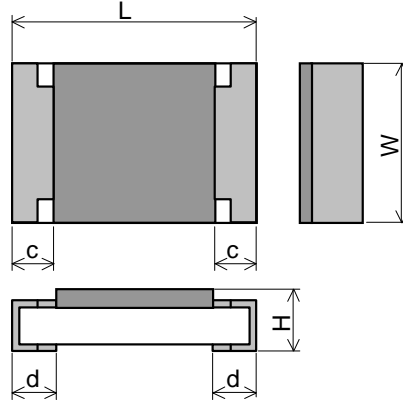


Figure-2

Table-3

Unit: mm

Style	L	W	H	c	d
RGC1/32	0.4±0.02	0.2±0.02	0.13±0.02	0.08±0.03	0.1±0.03
RGC1/20	0.6±0.03	0.3±0.03	0.23±0.03	0.1±0.05	0.15±0.05
RGC1/16S	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	0.25 <sup>+0.05</sup> <sub>-0.10</sub>
RGC1/16	1.6±0.1	0.8 <sup>+0.15</sup> <sub>-0.05</sub>	0.45±0.10	0.25±0.10	0.3±0.1
RGC1/10	2.0±0.1	1.25±0.10	0.6±0.1	0.4±0.2	0.4±0.2
RGC1/8	3.1±0.1	1.6±0.15	0.6±0.1	0.5±0.25	0.5±0.25

5.2 Net weight (Reference)

Style	Net weight(mg)
RGC1/32	0.035
RGC1/20	0.16
RGC1/16S	0.6
RGC1/16	2
RGC1/10	5
RGC1/8	9

6. Marking

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

The Rated resistance of RGC1/16 should not be marked in 4 digits.

The Rated resistance of RGC1/32,1/20,1/16S should not be marked.

(Example) “123” → 12×10<sup>3</sup> [Ω] → 12 [kΩ]

“3R3” → 3.3 [Ω]

“5623” → 562×10<sup>3</sup> [Ω] → 562 [kΩ]

“12R7” → 12.7 [Ω]



Table-4(2)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
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 resistance solvent	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 $\Delta R \leq \pm (1\%+0.05\Omega)$
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(RGC1/32: 2N, RGC1/20: 3N) Duration: 10 s ± 1 s Visual examination Sub-clause 4.19 RGC1/32 Lower category temperature: -55 °C Upper category temperature: +125 °C RGC1/20,1/16S,1/16,1/10,1/8 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 $\Delta R \leq \pm (1\%+0.05\Omega)$

Table-4(3)

No	Test items	Condition of test (JIS C 5201-1)	Performance requirements
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</p> <p>Sub-clause 4.23.2</p> <p>RGC1/32</p> <p>Test temperature: +125 °C</p> <p>RGC1/20,1/16S,1/16,1/10,1/8:</p> <p>Test temperature: +155 °C</p> <p>Duration: 16 h</p> <p>Sub-clause 4.23.3</p> <p>Test method: 2</p> <p>Test temperature: 55 °C</p> <p>[Severity(2)]</p> <p>Sub-clause 4.23.4</p> <p>Test temperature -55 °C</p> <p>Duration: 2h</p> <p>Sub-clause 4.23.6</p> <p>Test method: 2</p> <p>Test temperature: 55 °C</p> <p>[Severity (2)]</p> <p>Number of cycles: 5 cycles</p> <p>Sub-clause 4.23.7</p> <p>The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller.</p> <p>Duration: 1 min.</p> <p>Visual examination</p> <p>Resistance</p>	<p>No visible damage</p> <p><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</p> <p>Substrate material: Epoxide woven glass</p> <p>Test substrate: Figure-3</p> <p>Sub-clause 4.25.1</p> <p>Ambient temperature: 70 °C ± 2 °C</p> <p>Duration: 1000 h</p> <p>The voltage shall be applied in cycles of 1.5 h on and 0.5 h.</p> <p>The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller.</p> <p>Examination at 48 h, 500 h and 1000 h:</p> <p>Visual examination</p> <p>Resistance</p>	<p>No visible damage</p> <p><math>\Delta R \leq \pm (5\%+0.1\Omega)</math></p>



8. Test substrate

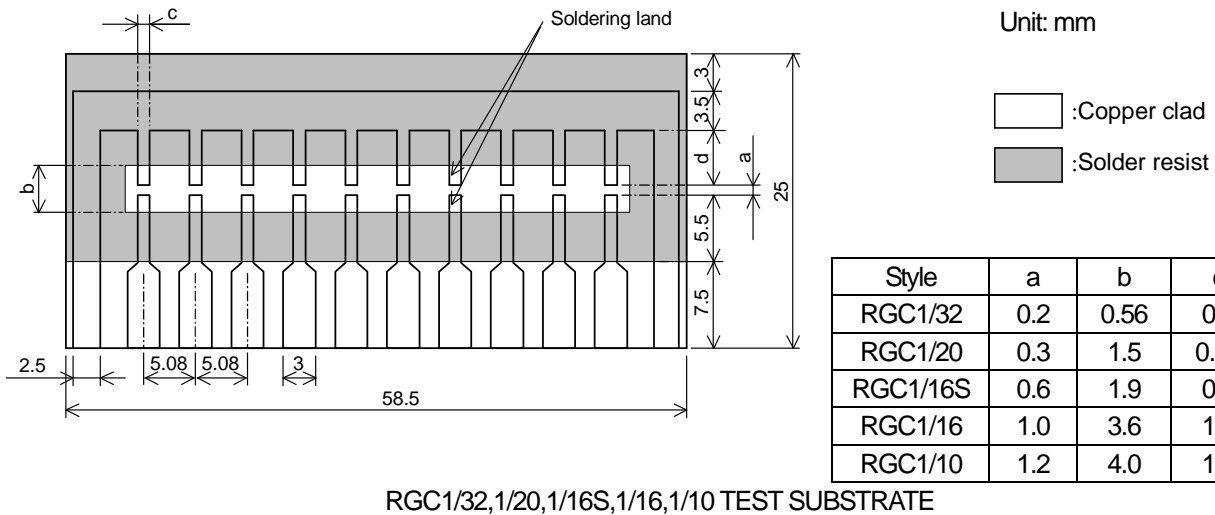
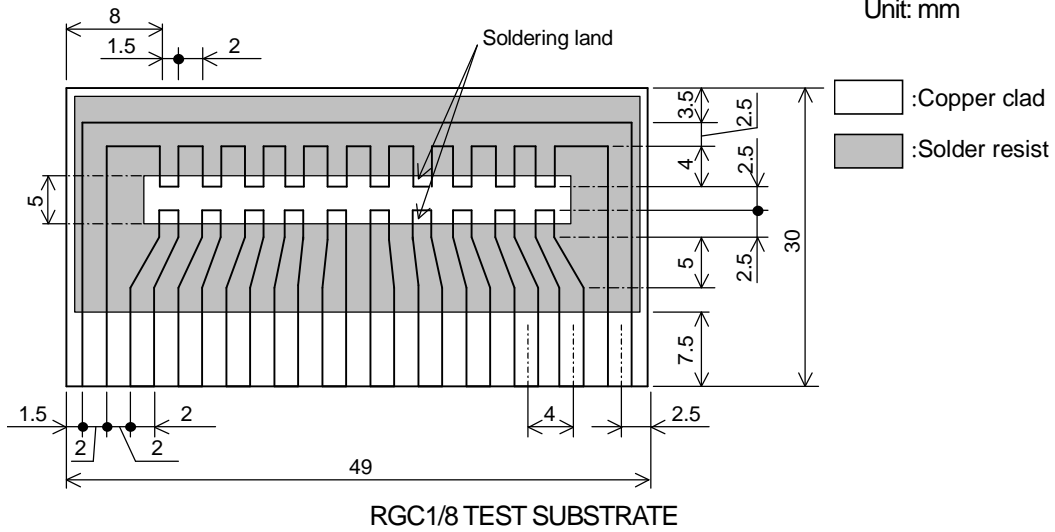
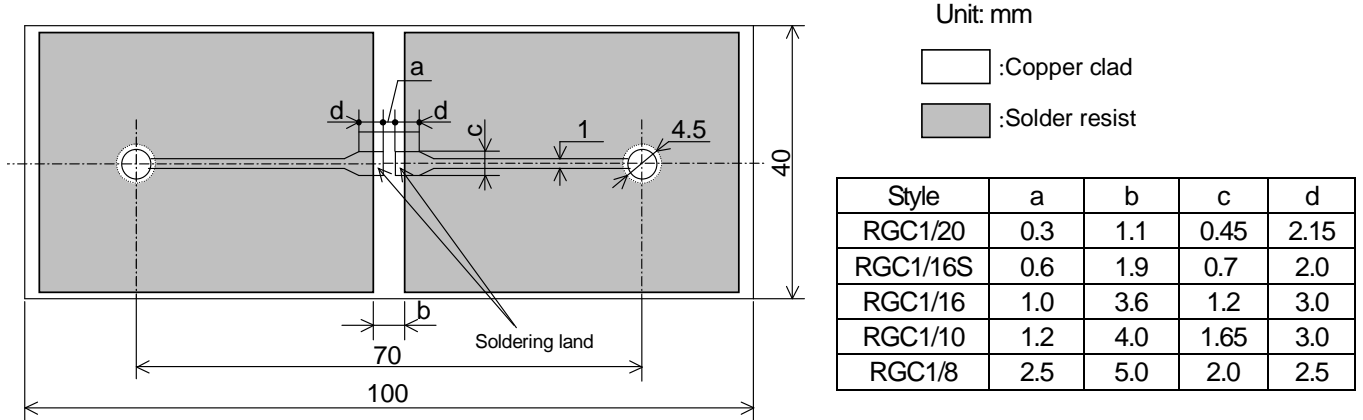
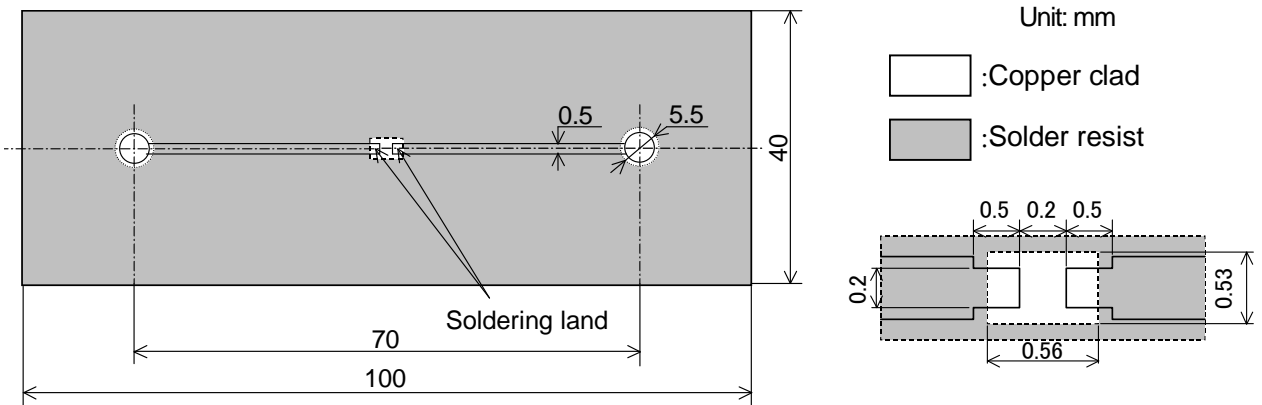


Figure-3

- 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.



RGC BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE

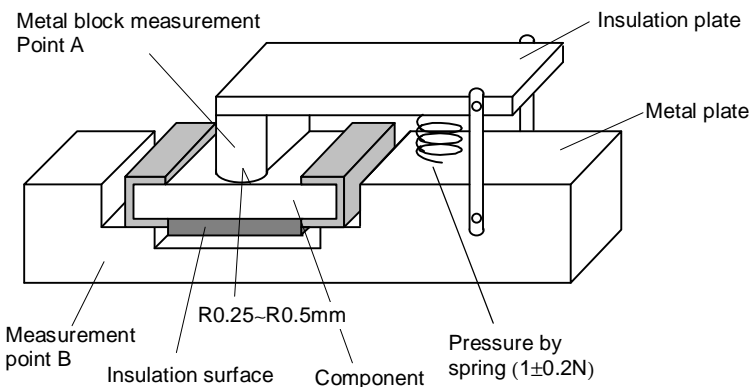


RGC1/32 BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE

Figure-4

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

•RGC1/16S,1/16,1/10,1/8



•RGC1/32,1/20

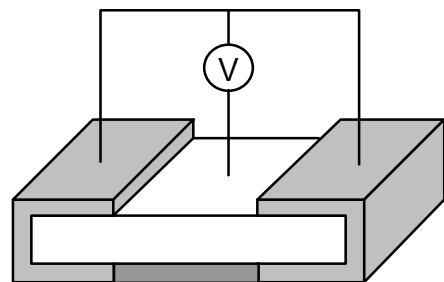


Figure-5

9. Taping

9.1 Applicable documents JIS C 0806-3: 1999, EIAJ ET-7103: 2004, EIAJ ET-7200B: 2003

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.

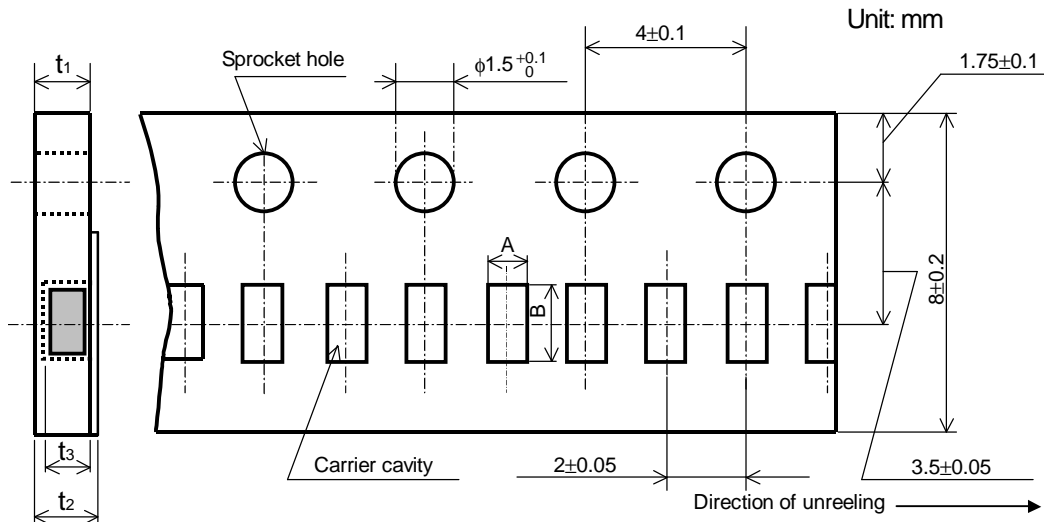


Figure-6

Table-5

Unit: mm

Style	A	B	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>
RGC1/32	0.24±0.03	0.45±0.03	0.31±0.03	0.36±0.02	0.15±0.02
RGC1/20	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, 2mm pitches)

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

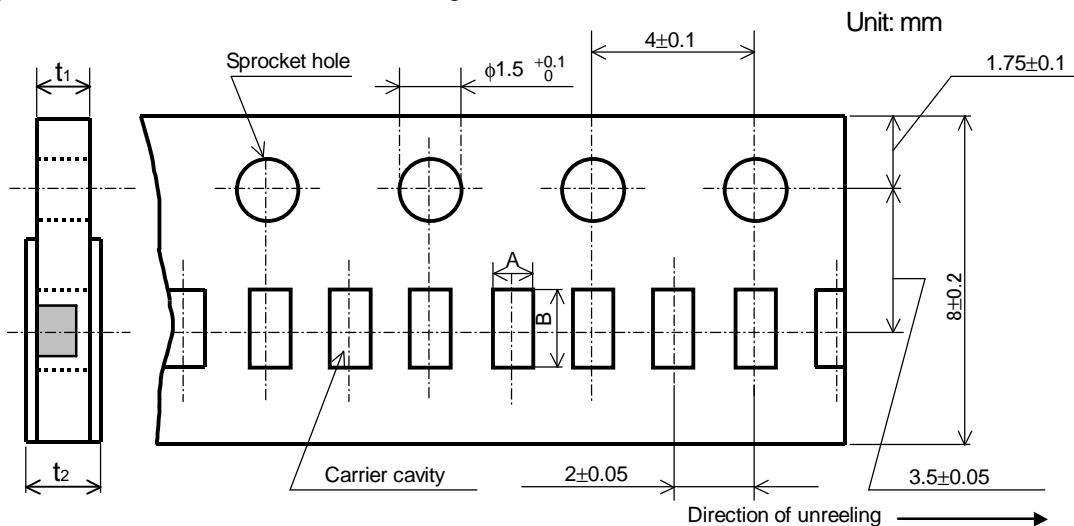


Figure-7

Table-6

Unit: mm

Style	A	B	t <sub>1</sub>	t <sub>2</sub>
RGC1/16S	0.65 <sup>+0.05</sup> <sub>-0.10</sub>	1.15 <sup>+0.05</sup> <sub>-0.10</sub>	0.4 ± 0.05	0.5max.

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

Taping dimensions shall be in accordance with Figure-8 and Table-7.

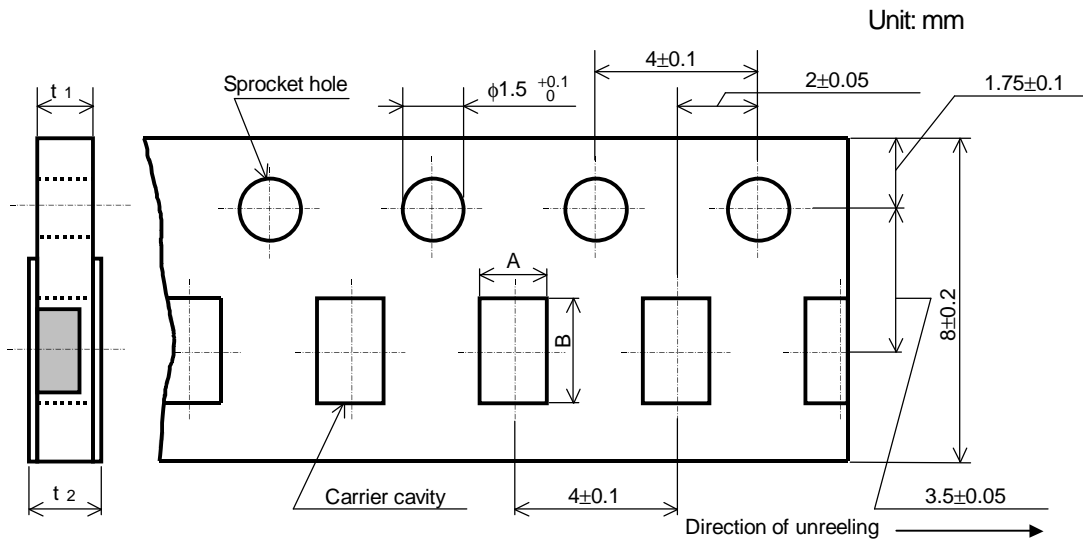


Figure-8

Table-7

Unit: mm

Style	A	B	t <sub>1</sub>	t <sub>2</sub>
RGC1/16	1.15 ± 0.15	1.9 ± 0.2	0.6 ± 0.1	0.8max.
RGC1/10	1.65 ± 0.15	2.5 ± 0.2	0.8 ± 0.1	1.0max.
RGC1/8	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 ±0.2mm.
- 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  
RGC1/32,1/20: Figure-9, RGC1/16S, 1/16, 1/10, 1/8: Figure-10.
- 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.

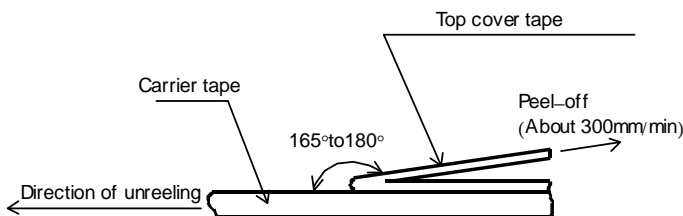


Figure-9

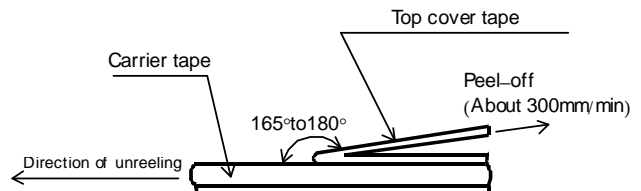


Figure-10

9.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-11 and Table-8.  
Plastic reel (Based on EIAJ ET-7200B)

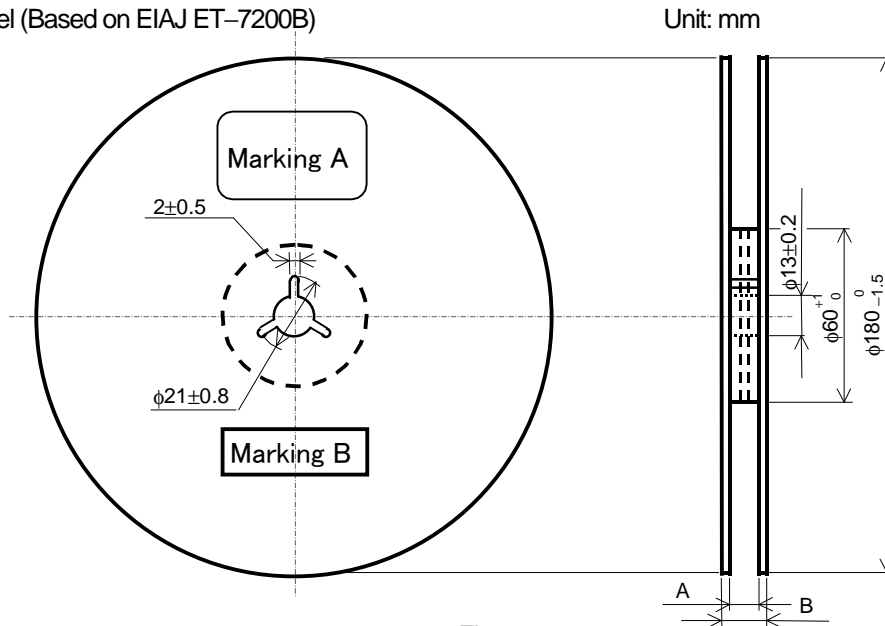


Figure-11  
Table-8

Style	A	B	Note
RGC1/32,1/20,1/16S,1/16,1/10,1/8	9 <sup>+1.0</sup> / <sub>0</sub>	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)

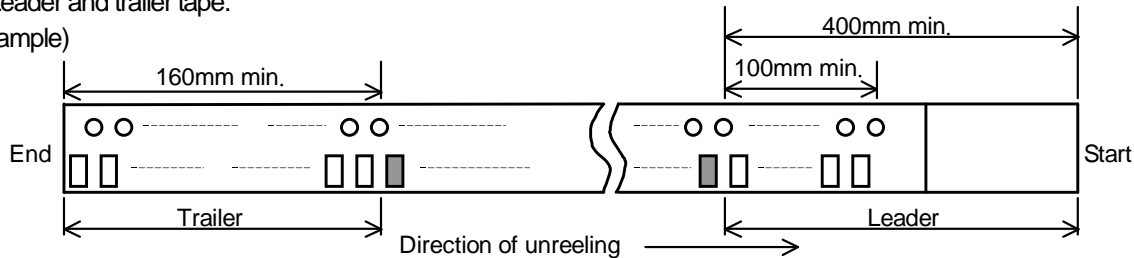


Figure-12

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)