KAMAYA OHM

No.:	RAAW–K–HTS–0001 /2
Date:	2017. 4. 21

Data sheet

Title: FIXED CHIP RESISTOR NETWORKS; RECTANGULAR TYPE

Style: RAAW06 2D, RAAW06 4D, RAAW10 2D, RAAW10 4D,RAAW16 4D

AEC-Q200 qualified

RoHS COMPLIANCE ITEM
Halogen and Antimony Free

Note: ・Stock conditions
Temperature: +5°C ~ +35°C
Relative humidity: 25% ~ 75%
The period of guarantee: Within 2 year from shipmen t by the company.
Solderability shall be satisfied.

・Product specification contained in this data sheet 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
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Hokkaido Research Center
Approval by: T. Sannomiya
Drawing by: M. Shibuya

1. Scope

1.1 This data sheet covers the detail requirements for fixed chip resistors networks; rectangular type, style of RAAW06 2D, RAAW06 4D, RAAW10 2D, RAAW10 4D, RAAW16 4D.

1.2 Applicable documents

JIS C 5201–1: 2011, JIS C 5201–9: 2006, JIS C 5201–9–1: 2006
IEC60115–1: 2008, IEC60115–9: 2004, IEC60115–9–1: 2004

2. Classification

Type designation shall be the following form.

(Example) 1.

RAAW	16	4	D	103	J	C	TP
1	2	3	4	5	6	7	8
	Style						

2.

RAAW	16	4	D	JP	C	TP
1	2	3	4	5	7	8
	Style					

1 Fixed chip resistors networks; rectangular type
2 Size
3 Number of element
4 Circuits
— Style

5 Rated resistance

103	E24 Series, 3 digit, Ex. 103--> 10kΩ,
1000	E96 Series, 4 digit, Ex. 1000-->100Ω 1022--> 10.2kΩ
JP	Chip jumper

6 Tolerance on rated resistance

F	±1%
J	±5%

7 Terminal style

C	Convex Type	With Corner
E		Flat Type Low profile

8 Packaging form

B	Bulk (loose package)
TH	Paper taping
TP	

3. Rating

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

Table–1

Style	Terminations style	Rated element dissipation (W)	Temperature coefficient of resistance (10^{-6} / °C)	Rated resistance range(Ω)	Preferred number series for resistors	Tolerance on rated resistance
RAAW06 2D	E	0.031	±200	100~100k	E24,96	F(±1%)
			±350	20~27	E24	J(±5%)
			±200	30~1M		
RAAW06 4D	E		±200	100~100k	E24,96	F(±1%)
			±350	20~27	E24	J(±5%)
			±200	30~1M		
RAAW10 2D	C	0.063	±200	10~1.0M	E24,96	F(±1%) J(±5%)
RAAW10 4D	C					
RAAW16 4D	C	0.1				

Style	Limiting element voltage(V)	Isolation voltage(V)	Number of element	Circuit networks	Category temperature range(°C)
RAAW06 2D	12.5	50	2	D (Independence type)	–55~+155
RAAW06 4D			4		
RAAW10 2D	25		2		
RAAW10 4D			4		
RAAW16 4D	50	100	4		

Note. Rated current of chip jumper: 1(A)

Note. Resistance value of chip jumper: 50mΩ max.

3.2 Climatic category

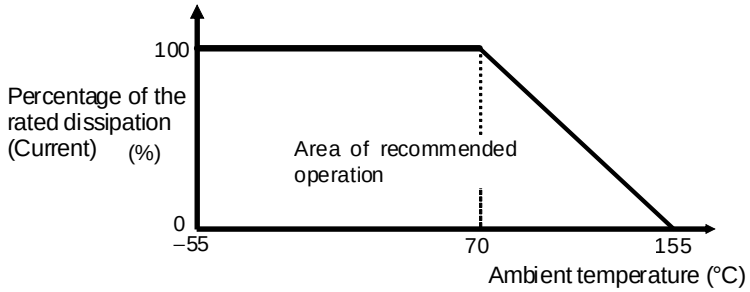
55/155/56	Lower category temperature	–55 °C
	Upper category temperature	+155 °C
	Duration of the damp heat, steady state test	56days

3.3 Stability class

5%	Limits for change of resistance:		
	–for long–term tests	±(5%+0.1Ω)	Chip jumper: 50 mΩ max.
	–for short–term tests	±(1%+0.05Ω)	Chip jumper: 50 mΩ max.

3.4 Derating

The derated values of dissipation (or current rating in case of chip jumper) at temperature in excess of 70 °C shall be as indicated by the following curve.



Figure–1Derating 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

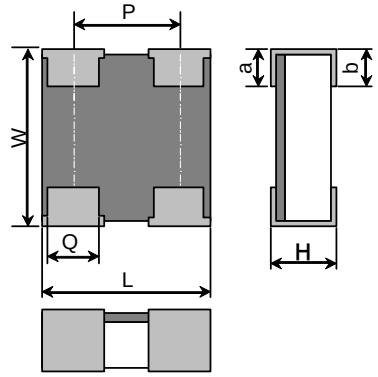
Symbol	Packaging form		Standard packaging quantity / units	Application
B	Bulk (loose package)		1,000 pcs.	RAAW06 2D, RAAW06 4D, RAAW10 2D, RAAW10 4D, RAAW16 4D
TH	Paper taping	8mm width, 2mm pitches	10,000 pcs.	RAAW06 2D, RAAW06 4D, RAAW10 2D, RAAW10 4D
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RAAW16 4D

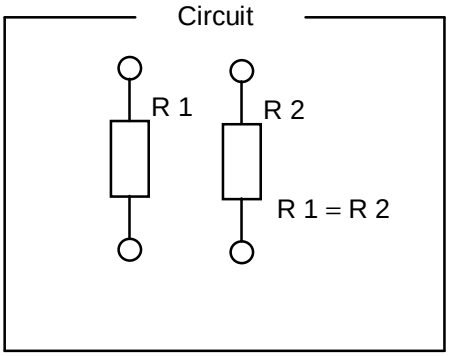
5. Dimensions

The resistor shall be of the design and physical dimensions in accordance with below.

5.1 Terminations style:E.

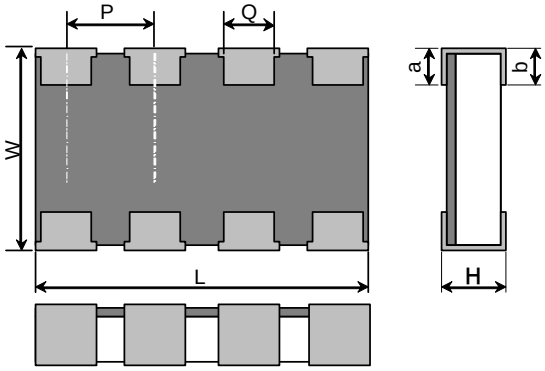
5.1.1 RAAW06 2D

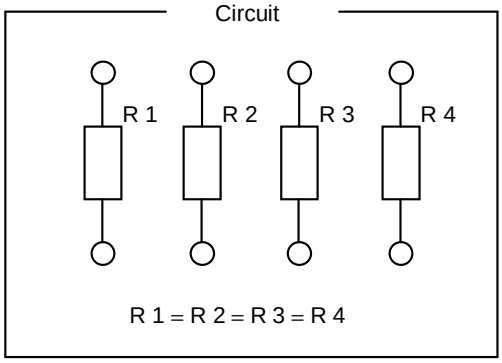




Figure–2

5.1.2 RAAW06 4D





Figure–3

Table–3 Unit: mm

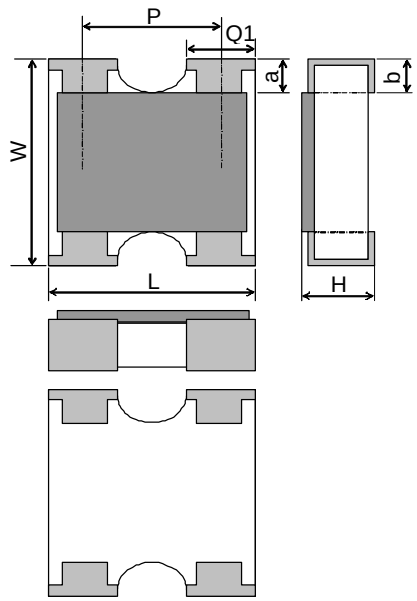
Style	Terminations style	L	W	H	Q	a	b	∗P
RAAW06 2D	E	0.8±0.05	0.6±0.05	0.23±0.10	0.2±0.1	0.2±0.1	0.2±0.1	0.5
RAAW06 4D	E	1.4±0.05	0.6±0.05	0.23±0.10	0.2±0.1	0.2±0.1	0.2±0.1	0.4

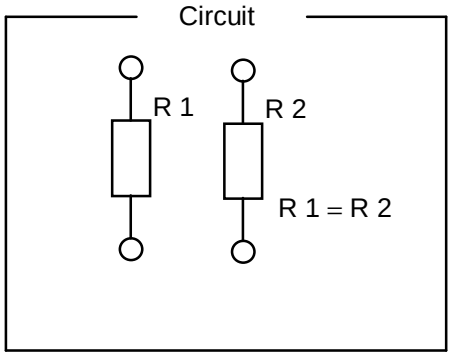
∗Reference

5.1.3 Net weight (Reference)

Style	Terminations style	Net weight(mg)
RAAW06 2D	E	0.38
RAAW06 4D	E	0.65

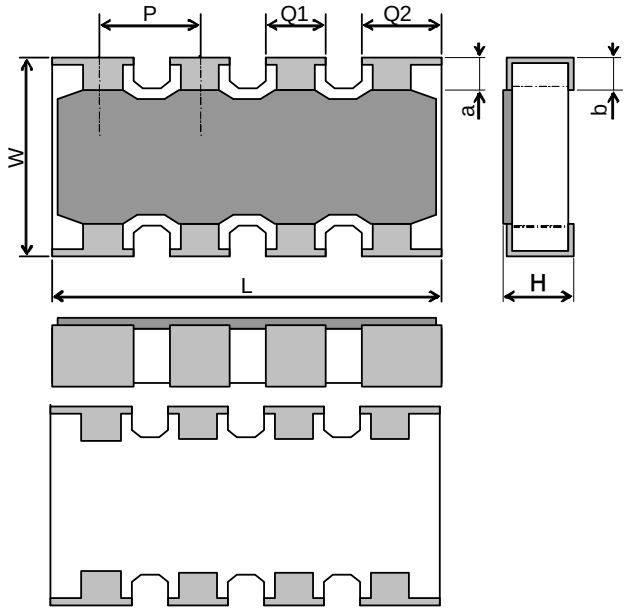
5.2 RAAW10 2D

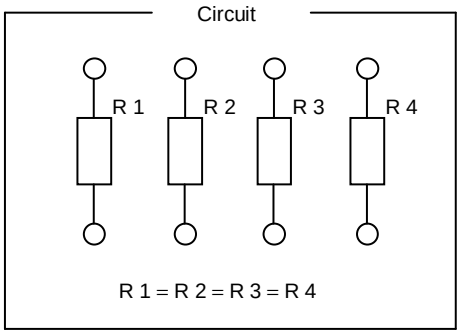




Figure–4

5.3 RAAW10 4D





Figure–5

Table–4 Unit: mm

Style	Terminations style	L	W	H	Q_1	*Q_2
RAAW10 2D	C	1.0±0.10	1.0±0.10	0.35±0.10	0.34±0.10	-----
RAAW10 4D	C	2.0±0.1	1.0±0.1	0.4±0.1	0.35±0.10	0.45± 0.10

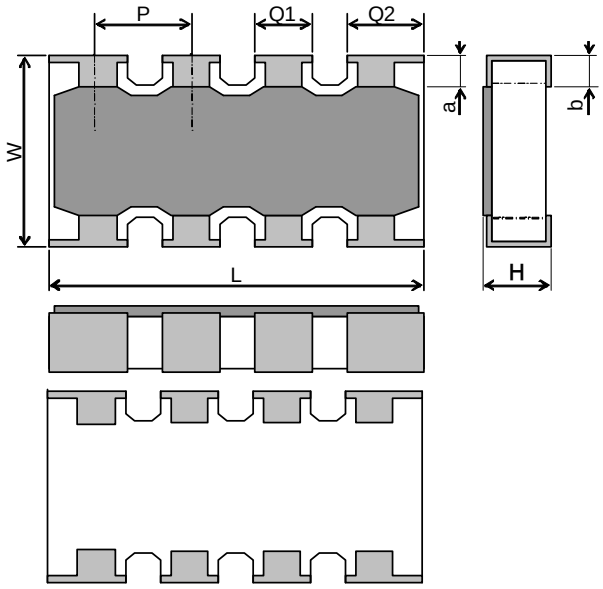
Style	a	b	*P
RAAW10 2D	0.2±0.15	0.25±0.10	0.65
RAAW10 4D	0.2±0.15	0.25±0.10	0.5

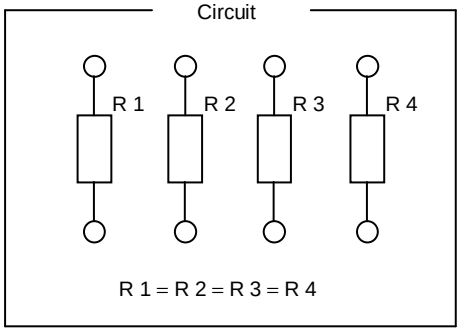
*Reference

5.4 Net weight (Reference)

Style	Terminations style	Net weight(mg)
RAAW10 2D	C	1.1
RAAW10 4D	C	2.1

5.5 RAAW16 4D





Figure–6

Table–5 Unit: mm

Style	Terminations style	L	W	H	Q_1	a
RAAW16 4D	C	3.2±0.1	1.6±0.1	0.5±0.1	0.4±0.1	0.3±0.1

Style	b	∗Q_2	∗P
RAAW16 4D	0.3±0.2	0.6±0.1	0.8

∗Reference

5.6 Net weight (Reference)

Style	Terminations style	Net weight(mg)
RAAW16 4D	C	7

6. Marking

The Rated resistance of RAAW06 2D, 4D, RAAW10 2D should not be marked.

6.1 For the resistors

The rated resistance shall be marked in 3 digits (E24) and marked on over coat side.

No marking in the E96 series.

Marking example	Contents	Application
1R2	1.2 [Ω]	RAAW104D RAAW164D
123	12×10^3 [Ω] → 12 [kΩ]	RAAW104D RAAW164D

6.2 Marking example of Jumper Chip

Marking example	Contents	Application
000	JP	RAAW104D RAAW164D

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–6.

Table–6(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 sub clause5 of this specification. As in 4. 5. 2 The resistance value shall correspond with the rated resistance taking into account the specified tolerance. Chip jumper: 50 mΩ max.
3	Voltage proof	Sub–clause 4. 7 Method: 4. 6. 1. 4 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 resistors 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.
5	Mounting Overload (in the mounted state) Solvent resistance of the marking	Sub–clause 4. 31 Substrate material: Epoxide woven glass 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 Δ R ≤ ± (1%+0.05Ω) Chip jumper: 50 mΩ max. Legible marking

Table–6(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 Sub–clause 4. 33 Bent value: 3 mm Resistance Sub–clause 4. 33. 6 Visual examination	 $\Delta R \leq \pm (1\%+0.05\Omega)$ Chip jumper: 50 mΩ max. No visible damage
7	Resistance to soldering heat Component solvent resistance	Sub–clause 4. 18 Solder temperature: 260°C±5°C Immersion time: 10s±0.5s 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. $\Delta R \leq \pm (1\%+0.05\Omega)$ Chip jumper: 50 mΩ max. No visible damage $\Delta R \leq \pm (1\%+0.05\Omega)$ Chip jumper: 50 mΩ max.
8	Mounting Adhesion Rapid change temperature	Sub–clause 4. 31 Substrate material: Epoxide woven glass Sub–clause 4. 32 Force: 5 N (RAAW06: 3N) Duration: 10s±1s 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 $\Delta R \leq \pm (1\%+0.05\Omega)$ Chip jumper: 50 mΩ max.

Table–6(3)

No	Test items	Condition of test (JIS C 5201 - 1)	Performance requirements
9	Climatic sequence –Dry heat –Damp heat, cycle (12+12hour cycle) First cycle –Cold –Damp heat, cycle (12+12hourcycle) 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 $\Delta R \leq \pm (5\%+0.1\Omega)$ Chip jumper: 50 mΩ max.
10	Mounting Endurance at 70 °C	Sub–clause 4. 31 Substrate material: Epoxide woven glass 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 off. 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 $\Delta R \leq \pm (5\%+0.1\Omega)$ Chip jumper: 50 mΩ max.

Table–6(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 Sub–clause 4. 8 –55 °C / +20 °C +20 °C / +155°C	 As in Table–1
12	Mounting Damp heat, steady state	Sub–clause 4. 31 Substrate material: Epoxide woven glass Sub–clause 4. 24 Ambient temperature: 40°C±2°C Relative humidity : 93 $^{+2}_{-3}$ % 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 $\Delta R \leq \pm (5\%+0.1\Omega)$ Chip jumper: 50 mΩ max.
13	Dimensions (detail) Mounting Endurance at upper category temperature	Sub–clause 4. 4. 3 Sub–clause 4. 31 Substrate material: Epoxide woven glass 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 Sub–clause 5 of this specification No visible damage $\Delta R \leq \pm (5\%+0.1\Omega)$ Chip jumper: 50 mΩ max.

7. Taping

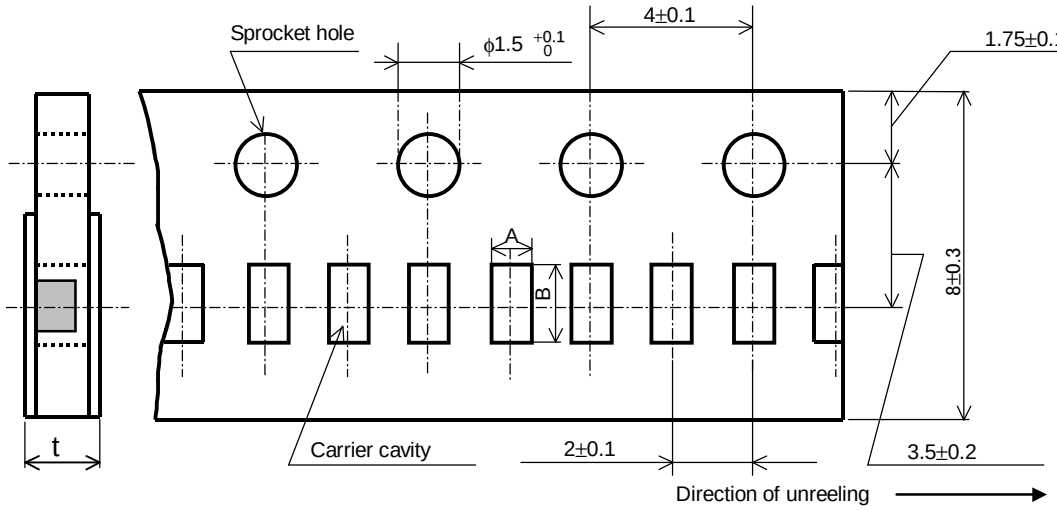
7.1 Applicable documents JIS C 0806–3: 2014, EIAJ ET–7200C: 2010

7.2 Taping dimensions

7.2.1 Paper taping (8mm width, 2mm pitches)

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

Unit: mm



Figure–7

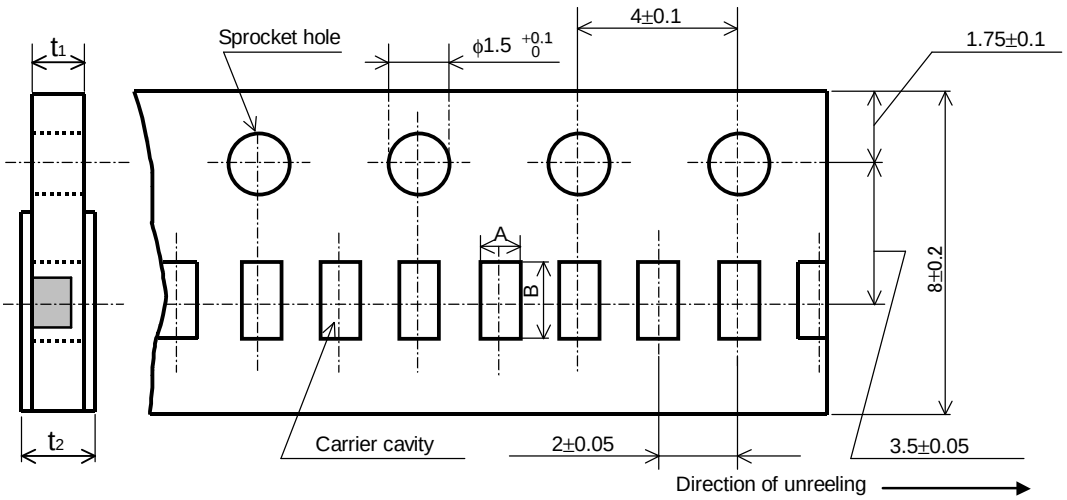
Table–7 Unit: mm

Style	A	B	t
RAAW06 2D	0.7±0.1	0.9±0.1	0.6 max.
RAAW06 4D	0.7±0.1	1.5±0.1	

7.2.1 RAAW10 2D, RAAW10 4D (Paper taping, 8mm width, 2mm pitches)

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

Unit: mm



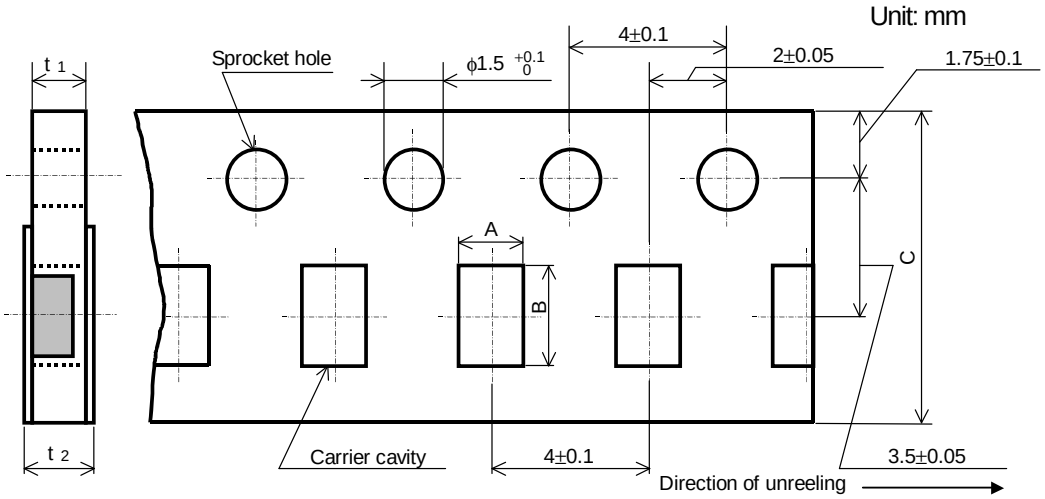
Figure–8

Table–8 Unit: mm

Style	A	B	t_1	t_2
RAAW10 2D	1.15 +0.05 −0.10	1.15 +0.05 −0.10	0.4 +0.05 −0.10	0.5max.
RAAW10 4D	1.2±0.1	2.2±0.1	0.4±0.1	

7.2.2 RAAW16 4D (Paper taping, 8mm width, 4mm pitches)

Taping dimensions shall be in accordance with Figure–9 and Table–9.

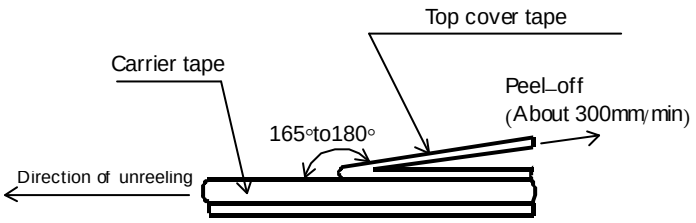


Figure–9

Table–9 Unit: mm

Style	A	B	C	t_1	t_2
RAAW16 4D	1.9±0.15	3.6±0.2	8.0±0.2	0.6±0.1	0.8max.

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 with in 0.1N to 0.5N on the test method as shown in the following 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.

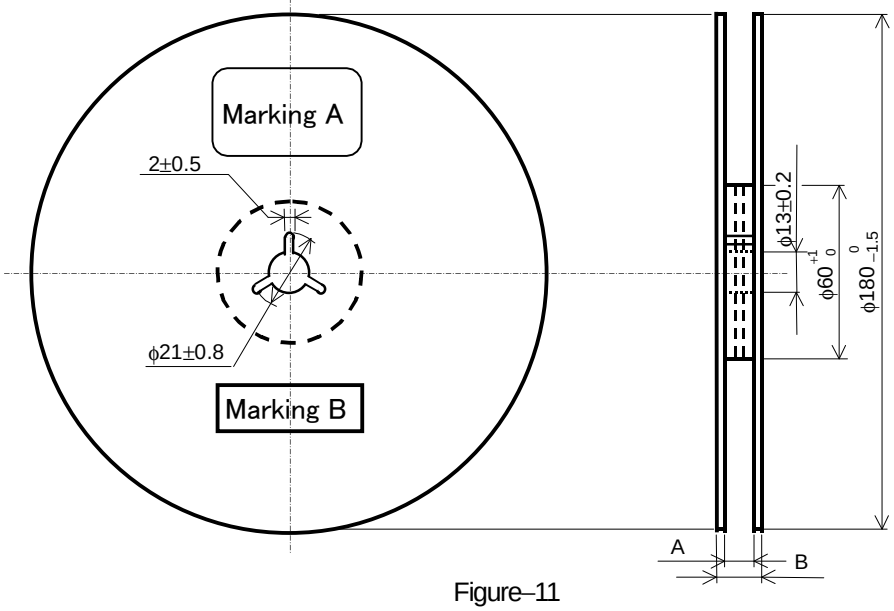


Figure–10

7.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure–11 and Table–10.

Plastic reel (Based on EIAJ ET–7200C) Unit: mm



Figure–11

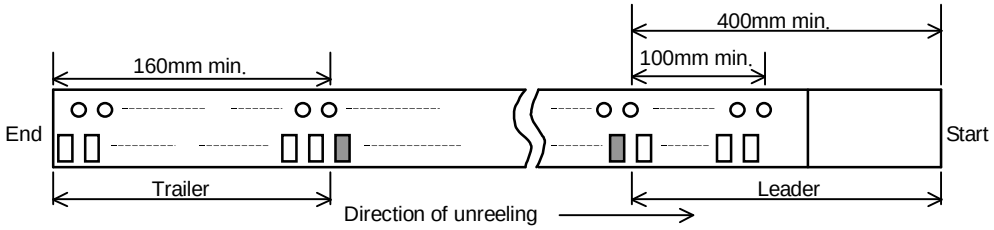
Table–10 Unit: mm

Style	A	B	Note
RAAW06,10,16	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.

7.4 Leader and trailer tape.

(Example)



Figure–12

8. Marking on package

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

8.1 Marking A

(1) Classification (Style, Rated resistance, Tolerance on rated resistance, Terminal style, Packaging form)

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

8.2 Marking B (KAMAYA Control label)