

# Data sheet

Title: FIXED CHIP RESISTOR NETWORKS; RECTANGULAR  
TYPE

Style: RAAW06 2D, RAAW06 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 shipment 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.



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**KAMAYA ELECTRIC CO., LTD.**

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## 1. Scope

1.1 This data sheet covers the detail requirements for fixed chip resistor networks; rectangular type, style of RAAW06 2D, RAAW06 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 | 06 | 4 | D | 103 | J | E | TH |
| 1    | 2  | 3 | 4 | 5   | 6 | 7 | 8  |

2. 

|      |    |   |   |    |   |    |
|------|----|---|---|----|---|----|
| RAAW | 06 | 4 | D | JP | E | TH |
| 1    | 2  | 3 | 4 | 5  | 7 | 8  |

Style

1 Fixed chip resistor networks; rectangular type

2 Size

3 Number of elements

4 Circuits

5 Rated resistance

|     |                                       |
|-----|---------------------------------------|
| 103 | E24 Series, 3 digit, Ex. 103--> 10kΩ, |
| JP  | Chip jumper                           |

6 Tolerance on rated resistance

|   |     |
|---|-----|
| F | ±1% |
| J | ±5% |

7 Terminal style

|   |             |                                   |
|---|-------------|-----------------------------------|
| E | Convex Type | Flat Type Low profile (Face down) |
| G |             | Flat Type Low profile (Face up)   |

8 Packaging form

|    |                      |
|----|----------------------|
| B  | Bulk (loose package) |
| TH | Paper taping         |

Style

## 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 <sup>-6</sup> / °C) | Rated resistance range(Ω) | Preferred number series for resistors | Tolerance on rated resistance |
|-----------|--------------------|-------------------------------|----------------------------------------------------------------|---------------------------|---------------------------------------|-------------------------------|
| RAAW06 2D | E, G               | 0.031                         | ±200                                                           | 100~100k                  | E24                                   | F(±1%)                        |
|           |                    |                               | ±350                                                           | 10~27                     |                                       | J(±5%)                        |
|           |                    |                               | ±200                                                           | 30~1M                     |                                       |                               |
| RAAW06 4D | E, G               |                               | ±200                                                           | 100~100k                  | E24                                   | F(±1%)                        |
|           |                    |                               | ±350                                                           | 10~27                     |                                       | J(±5%)                        |
|           |                    |                               | ±200                                                           | 30~1M                     |                                       |                               |

| Style     | Limiting element voltage(V) | Insulation voltage(V) | Number of elements | Circuit networks         | Category temperature range( $^\circ\text{C}$ ) |
|-----------|-----------------------------|-----------------------|--------------------|--------------------------|------------------------------------------------|
| RAAW06 2D | 12.5                        | 50                    | 2                  | D<br>(Independence type) | -55~+155                                       |
| RAAW06 4D |                             |                       | 4                  |                          |                                                |

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

Note. Resistance value of chip jumper: 50m $\Omega$  max.

## 3.2 Climatic category

55/155/56

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

5%

Limits for change of resistance:

-for long-term tests  $\pm(5\%+0.1\Omega)$  Chip jumper: 50 m $\Omega$  max.-for short-term tests  $\pm(1\%+0.05\Omega)$  Chip jumper: 50 m $\Omega$  max.

## 3.4 Derating

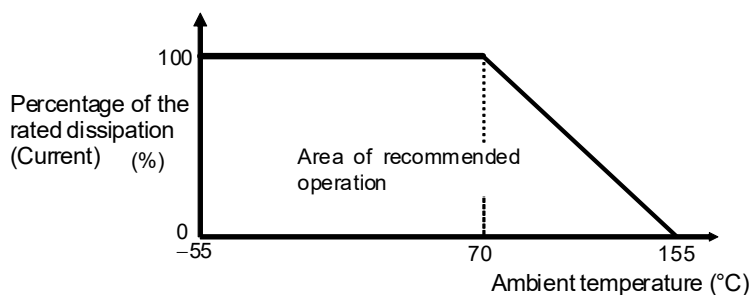
The derated values of dissipation (or current rating in case of chip jumper) at temperature in excess of 70  $^\circ\text{C}$  shall be as indicated by the following curve.

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 ( $\Omega$ )

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 |
|--------|----------------------|------------------------|-------------------------------------|
| B      | Bulk (loose package) |                        | 1,000 pcs.                          |
| TH     | Paper taping         | 8mm width, 2mm pitches | 10,000 pcs.                         |

## 5. Dimensions

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

### 5.1 Terminations style:E.[Flat Type Low profile (Face down)]

#### 5.1.1 RAAW06 2D

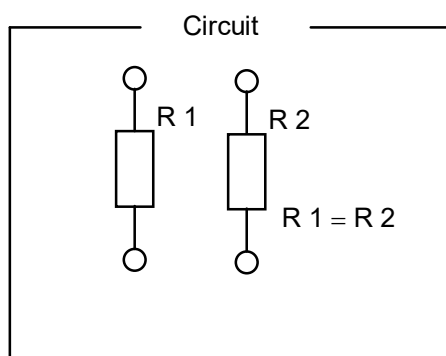
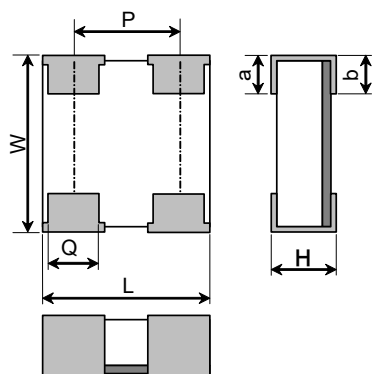


Figure-2

#### 5.1.2 RAAW06 4D

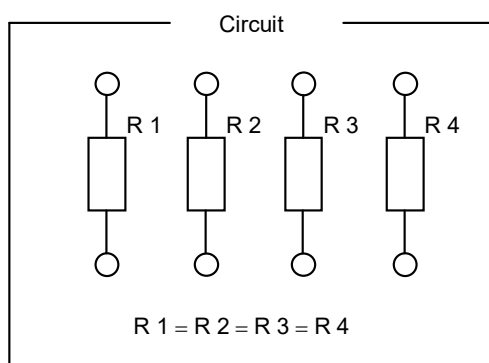
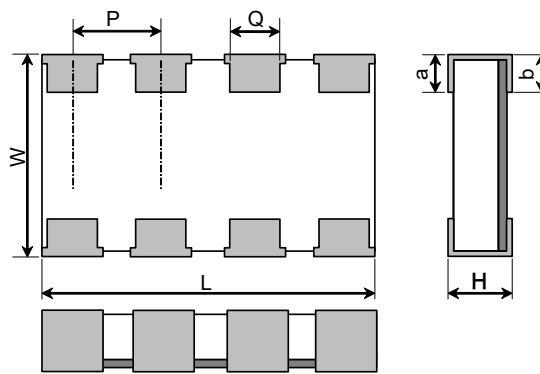


Figure-3

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 Terminations style:G[ Flat Type Low profile (Face up)]

### 5.2.1 RAAW06 2D

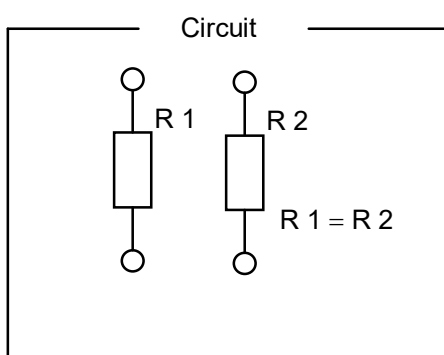
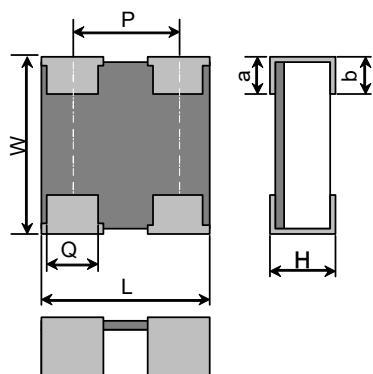


Figure-4

### 5.2.2 RAAW06 4D

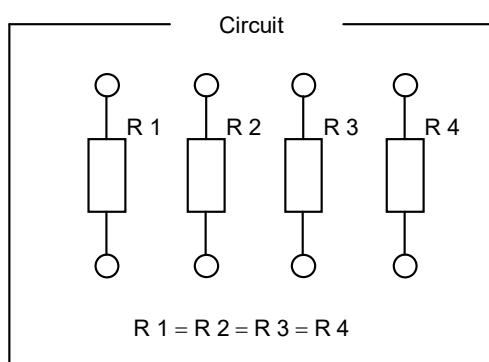
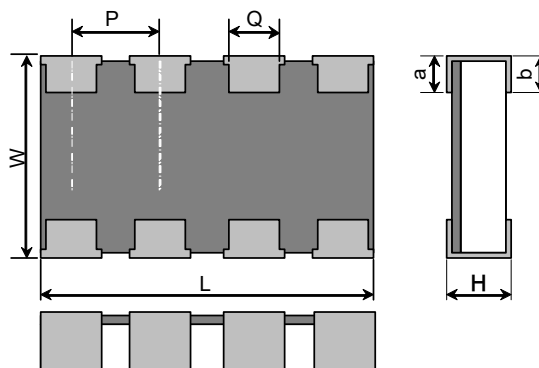


Figure-5

Table-4

Unit: mm

| Style     | Terminations style | L        | W        | H         | *Q      | a       | b       | *P  |
|-----------|--------------------|----------|----------|-----------|---------|---------|---------|-----|
| RAAW06 2D | G                  | 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 | G                  | 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

### 5.2.3 Net weight (Reference)

| Style     | Terminations style | Net weight(mg) |
|-----------|--------------------|----------------|
| RAAW06 2D | G                  | 0.38           |
| RAAW06 4D | G                  | 0.65           |

## 6. Marking

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

## 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-5.

Table-5(1)

| No. | Test items                                                                                              | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                                                                                                                                                                       | Performance requirements                                                                                                                                                                                       |
|-----|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Visual examination                                                                                      | Sub-clause 4. 4. 1<br>Checked by visual examination.                                                                                                                                                                                                                                                                                                                                                                   | As in 4. 4. 1<br>The marking shall be legible, as checked by visual examination.                                                                                                                               |
| 2   | Dimension<br><br>Resistance                                                                             | Sub-clause 4. 4. 2<br><br>Sub-clause 4. 5                                                                                                                                                                                                                                                                                                                                                                              | As specified in sub clause5 of this specification.<br>As in 4. 5. 2<br>The resistance value shall correspond with the rated resistance taking into account the specified tolerance.<br>Chip jumper: 50 mΩ max. |
| 3   | Voltage proof                                                                                           | Sub-clause 4. 7<br>Method: 4. 6. 1. 4<br>Test voltage: Alternating voltage with a peak value of 1.42 times the insulation voltage.<br>Duration: 60 s ± 5 s<br>Insulation resistance<br>Test voltage: Insulation voltage<br>Duration: 1 min.                                                                                                                                                                            | No breakdown or flash over<br><br><br><br><br>R ≥ 1 G Ω                                                                                                                                                        |
| 4   | Solderability                                                                                           | Sub-clause 4. 17<br>Without ageing<br>Flux: The resistors shall be immersed in a non-activated soldering flux for 2s.<br>Bath temperature: 235 °C ± 5 °C<br>Immersion time: 2 s ± 0.5 s                                                                                                                                                                                                                                | As in 4. 17. 4. 5<br>The terminations shall be covered with a smooth and bright solder coating.                                                                                                                |
| 5   | Mounting<br><br>Overload<br>(in the mounted state)<br><br><br><br><br>Solvent resistance of the marking | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 13<br>The applied voltage shall be 2.5 times the rated voltage or twice the limiting element voltage, whichever is the less severe.<br>Duration: 2 s<br>Visual examination<br>Resistance<br><br>Sub-clause 4. 30<br>Solvent: 2-propanol<br>Solvent temperature: 23°C±5°C<br>Method 1<br>Rubbing material: cotton wool<br>Without recovery | No visible damage<br>Δ R ≤ ± (1%+0.05Ω)<br>Chip jumper: 50 mΩ max.<br>Legible marking                                                                                                                          |

Table-5(2)

| No | Test items                                                                       | Condition of test (JIS C 5201 - 1)                                                                                                                                                                                                                                                                                                                                      | Performance requirements                                                                                                                                                                                                              |
|----|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6  | Mounting<br><br>Bound strength of the end face plating<br><br>Final measurements | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 33<br>Bent value: 3 mm<br>Resistance<br><br>Sub-clause 4. 33. 6<br>Visual examination                                                                                                                                                                                                      | $\Delta R \leq \pm (1\%+0.05\Omega)$<br>Chip jumper: 50 m $\Omega$ max.<br>No visible damage                                                                                                                                          |
| 7  | Resistance to soldering heat<br><br><br><br>Component resistance solvent         | Sub-clause 4. 18<br>Solder temperature: 260°C $\pm$ 5°C<br>Immersion time: 10s $\pm$ 0.5s<br>Visual examination<br><br>Resistance<br><br>Sub-clause 4.29<br>Solvent: 2-propanol<br>Solvent temperature: 23°C $\pm$ 5°C<br>Method 2<br>Recovery: 48 h<br>Visual examination<br>Resistance                                                                                | As in 4. 18. 3. 4<br>No sign of damage such as cracks.<br>$\Delta R \leq \pm (1\%+0.05\Omega)$<br>Chip jumper: 50 m $\Omega$ max.<br><br>No visible damage<br>$\Delta R \leq \pm (1\%+0.05\Omega)$<br>Chip jumper: 50 m $\Omega$ max. |
| 8  | Mounting<br><br>Adhesion<br><br>Rapid change temperature                         | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 32<br>Force: 3 N<br>Duration: 10s $\pm$ 1s<br>Visual examination<br>Sub-clause 4.19<br>Lower category temperature : -55 °C<br>Upper category temperature : +155 °C<br>Duration of exposure at each temperature: 30 min.<br>Number of cycles: 5 cycles.<br>Visual examination<br>Resistance | No visible damage<br><br><br><br><br><br><br>No visible damage<br>$\Delta R \leq \pm (1\%+0.05\Omega)$<br>Chip jumper: 50 m $\Omega$ max.                                                                                             |

Table-5(3)

| No | Test items                                                                                                                                                                                 | Condition of test (JIS C 5201 - 1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Performance requirements                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 9  | Climatic sequence<br>–Dry heat<br><br>–Damp heat, cycle<br>(12+12hour cycle)<br>First cycle<br><br>–Cold<br><br>–Damp heat, cycle<br>(12+12hourcycle)<br>Remaining cycle<br><br>–D.C. load | Sub-clause 4. 23<br>Sub-clause 4. 23. 2<br>Test temperature: +155 °C<br>Duration: 16 h<br><br>Sub-clause 4. 23. 3<br>Test method : 2<br>Test temperature: 55 °C<br>[Severity(2)]<br>Sub-clause 4. 23. 4<br>Test temperature–55 °C<br>Duration: 2h<br><br>Sub-clause 4. 23. 6<br>Test method: 2<br>Test temperature: 55 °C<br>[Severity (2)]<br>Number of cycles: 5 cycles<br>Sub-clause 4. 23. 7<br>The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller.<br>Duration: 1 min.<br>Visual examination<br>Resistance | No visible damage<br>$\Delta R \leq \pm (5\%+0.1\Omega)$<br>Chip jumper: 50 m $\Omega$ max. |
| 10 | Mounting<br><br>Endurance at 70 °C                                                                                                                                                         | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 25. 1<br>Ambient temperature: 70°C±2°C<br>Duration: 1000 h<br>The voltage shall be applied in cycles of 1. 5 h on and 0. 5 h off.<br>The applied voltage shall be the rated voltage or the limiting element voltage whichever is the smaller.<br>Examination at 48 h , 500 h and 1000 h:<br>Visual examination<br>Resistance                                                                                                                                                            | No visible damage<br>$\Delta R \leq \pm (5\%+0.1\Omega)$<br>Chip jumper: 50 m $\Omega$ max. |

Table-5(4)

| No | Test items                                                                         | Condition of test (JIS C 5201 - 1)                                                                                                                                                                                                                                                                                                                                                                                                  | Performance requirements                                                                                                                            |
|----|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Mounting<br><br>Variation of resistance with temperature                           | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 8<br>-55 °C / +20 °C<br>+20 °C / +155°C                                                                                                                                                                                                                                                                                                                | As in Table-1                                                                                                                                       |
| 12 | Mounting<br><br>Damp heat, steady state                                            | Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 24<br>Ambient temperature: 40°C±2°C<br>Relative humidity : 93 $\pm$ <sub>3</sub> %<br>a) 1st group: without voltage applied.<br>b) 2nd group: The d. c. voltage shall be applied continuously.<br>The voltage shall be accordance with Sub-clause 4. 24. 2 .1 b). without polarizing voltage [4. 24. 2. 1, c)]<br>Visual examination<br><br>Resistance | No visible damage<br>Legible marking<br>$\Delta R \leq \pm (5\%+0.1\Omega)$<br>Chip jumper: 50 mΩ max.                                              |
| 13 | Dimensions (detail)<br><br>Mounting<br><br>Endurance at upper category temperature | Sub-clause 4. 4. 3<br><br>Sub-clause 4. 31<br>Substrate material: Epoxide woven glass<br>Sub-clause 4. 25. 3<br>Ambient temperature:155°C±2°C<br>Duration: 1000 h<br>Examination at 48 h, 500 h and 1000 h:<br>Visual examination<br>Resistance                                                                                                                                                                                     | As in Sub-clause 5 of this specification<br><br><br><br><br><br>No visible damage<br>$\Delta R \leq \pm (5\%+0.1\Omega)$<br>Chip jumper: 50 mΩ max. |
| 14 | Humid Sulfur vapor test (FOS)                                                      | ASTM B809<br>Reagent: Sulfur (Saturated vapor)<br>Test temp.: 60°C<br>Relative humidity: 95%RH<br>Test period: 1000 h<br>Resistance                                                                                                                                                                                                                                                                                                 | $\Delta R \leq \pm (1\%+0.05\Omega)$<br>Chip jumper: 50 mΩ max.                                                                                     |

## 8. Taping

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

### 8.2 Taping dimensions

#### 8.2.1 Paper taping (8mm width, 2mm pitches)

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

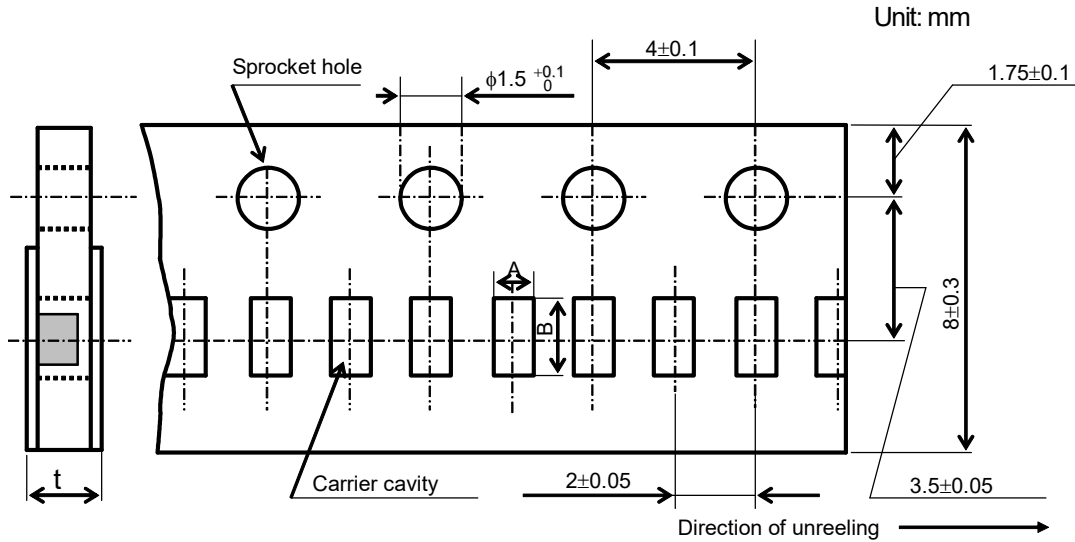


Figure-6

Table-6

Unit: mm

| Style     | A             | B             | t        |
|-----------|---------------|---------------|----------|
| RAAW06 2D | $0.7 \pm 0.1$ | $0.9 \pm 0.1$ | 0.6 max. |
| RAAW06 4D | $0.7 \pm 0.1$ | $1.5 \pm 0.1$ |          |

- 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 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 resistors shall be faced to upward at the over coating side in the carrier cavity.

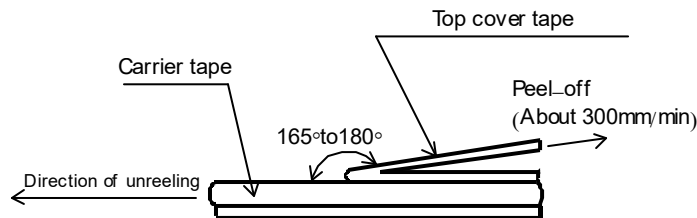


Figure-7

## 8.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-8 and Table-7.

Plastic reel (Based on EIAJ ET-7200C)

Unit: mm

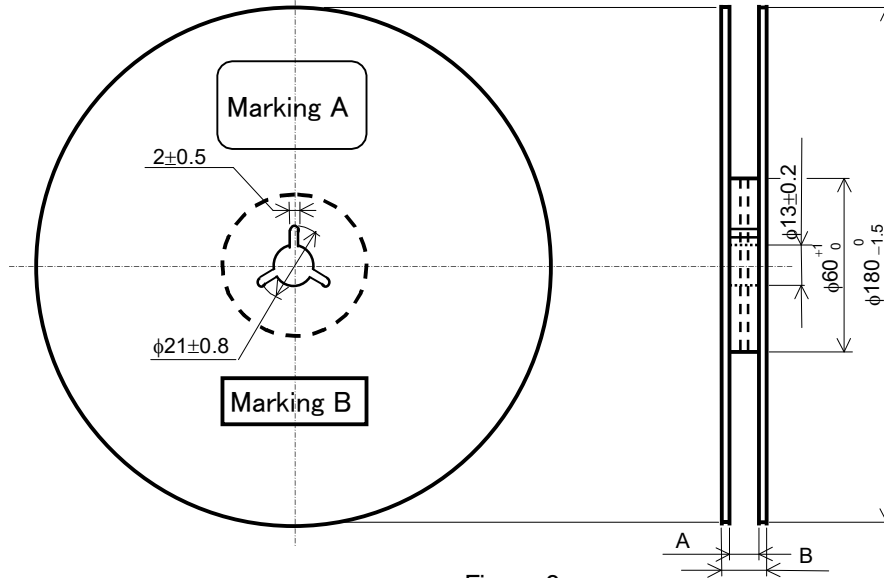


Figure-8

Table-7

Unit: mm

| Style  | A                              | B        | Note              |
|--------|--------------------------------|----------|-------------------|
| RAAW06 | 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.

## 8.4 Leader and trailer tape.

(Example)

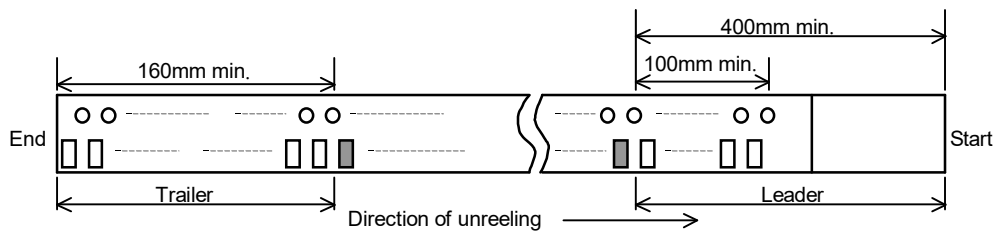


Figure-9

## 9. Marking on package

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

### 9.1 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

### 9.2 Marking B (KAMAYA Control label)