

# Specification

Title: FIXED CHIP RESISTOR NETWORKS; RECTANGULAR TYPE

Style: RAC06 2D, RAC06 4D, RAC10 2D,  
RAC10 4D, RAC16 4D, RAC16 8D

RoHS COMPLIANCE ITEM  
Halogen and Antimony Free

Product specification contained in this specification  
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Agreement is necessary, please contact our sales staff.



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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 chip resistors networks; rectangular type, style of RAC06 2D, 06 4D, 10 2D, 10 4D, 16 4D, 16 8D.

### 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: 2003, IEC60115-9-1: 2004

EIAJ RC-2129-2000.

## 2. Classification

Type designation shall be the following form.

|              |       |    |   |   |     |   |    |    |
|--------------|-------|----|---|---|-----|---|----|----|
| (Example) 1. | RAC   | 16 | 4 | D | 103 | J | C  | TP |
|              | 1     | 2  | 3 | 4 | 5   | 6 | 7  | 8  |
|              | Style |    |   |   |     |   |    |    |
| 2.           | RAC   | 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  
5 Rated resistance
- } Style

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

### 6 Tolerance on rated resistance

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

### 7 Terminal style

|   |             |                       |
|---|-------------|-----------------------|
| C | Convex Type | With Corner           |
| D |             | Flat Type             |
| 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) | Rated network dissipation (W) | Temperature coefficient of resistance ( 10 <sup>-6</sup> / °C) | Rated resistance range(Ω) | Preferred number series for resistors | Tolerance on rated resistance |
|----------|--------------------|-------------------------------|-------------------------------|----------------------------------------------------------------|---------------------------|---------------------------------------|-------------------------------|
| RAC06 2D | D,E                | 0.031                         | 0.063                         | ±200                                                           | 100~100k                  | E24                                   | F(±1%)                        |
|          |                    |                               |                               | ±350                                                           | 10~27                     |                                       | J(±5%)                        |
|          |                    |                               |                               | ±200                                                           | 30~1M                     |                                       |                               |
| RAC06 4D | D,E                |                               | 0.125                         | ±200                                                           | 100~100k                  | E24                                   | F(±1%)                        |
|          |                    |                               |                               | ±350                                                           | 10~27                     |                                       | J(±5%)                        |
|          |                    |                               |                               | ±200                                                           | 30~1M                     |                                       |                               |
| RAC10 2D | C                  | 0.063                         | 0.125                         | ±400                                                           | 3~9.1                     | E24                                   | J(±5%)                        |
| RAC10 4D |                    |                               | 0.25                          | ±300                                                           | 10~1M                     |                                       |                               |
| RAC16 4D | C                  | 0.1                           | 0.25                          | ±100                                                           | 10~1M                     | E24                                   | F(±1%)                        |
|          |                    |                               |                               | ±200                                                           | 1~9.1                     |                                       | J(±5%)                        |
|          |                    |                               |                               | +300~+500                                                      | 1.1M~10M                  |                                       |                               |
| RAC16 8D | C                  | 0.063                         | 0.25                          | ±200                                                           | 10~1M                     | E24                                   | J(±5%)                        |

| Style    | Limiting element voltage(V) | Max over load voltage(V) | Number of element | Circuit networks         | Category temperature range( $^{\circ}\text{C}$ ) |
|----------|-----------------------------|--------------------------|-------------------|--------------------------|--------------------------------------------------|
| RAC06 2D | 12.5                        | 25                       | 2                 | D<br>(Independence type) | -55~+125                                         |
| RAC06 4D |                             |                          | 4                 |                          |                                                  |
| RAC10 2D | 25                          | 50                       | 2                 |                          |                                                  |
| RAC10 4D | 50                          | 100                      | 4                 |                          |                                                  |
| RAC16 4D | 50                          | 100                      | 4                 |                          |                                                  |
| RAC16 8D | 25                          | 100                      | 8                 |                          |                                                  |

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

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

## 3.2 Derating

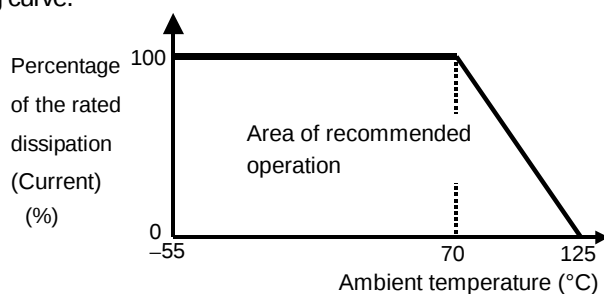
The derated values of dissipation (or current rating in case of chip jumper) at temperature in excess of 70  $^{\circ}\text{C}$  shall be as indicated by the following curve.

Figure-1 Derating curve

## 3.3 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.

[ So called RCWV (Rated continuous working Voltag) is determined by ]

## 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.                          | RAC06, 10,16               |
| TH     | Paper taping         | 8mm width, 2mm pitches | 10,000 pcs.                         | RAC06 2D, 4D, RAC10 2D, 4D |
| TP     | Paper taping         | 8mm width, 4mm pitches | 5,000 pcs.                          | RAC16 4D, 8D               |

## 5. Dimensions

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

### 5.1 Terminations style:E.

#### 5.1.1 RAC06 2D

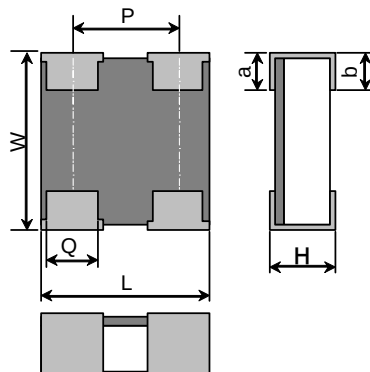


Figure-2

#### 5.1.2 RAC06 4D

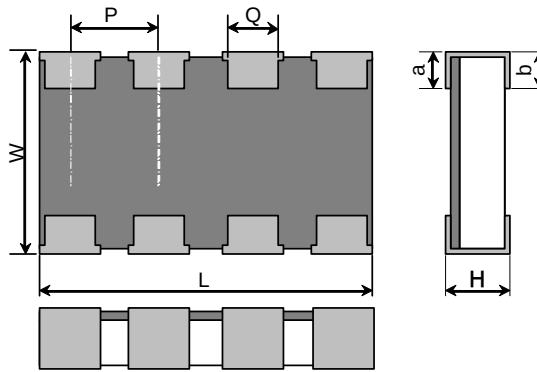


Figure-3

Table-3

Unit: mm

| Style    | Terminations style | L        | W        | H         | Q       | a       | b       | *P  |
|----------|--------------------|----------|----------|-----------|---------|---------|---------|-----|
| RAC06 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 |
| RAC06 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) |
|----------|--------------------|----------------|
| RAC06 2D | E                  | 0.38           |
| RAC06 4D | E                  | 0.65           |

## 5.2 Terminations style:D.

### 5.2.1 RAC06 2D

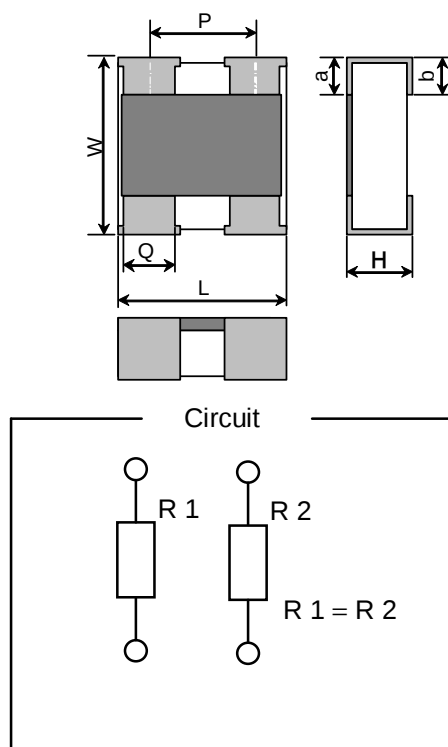


Figure-4

### 5.2.2 RAC06 4D

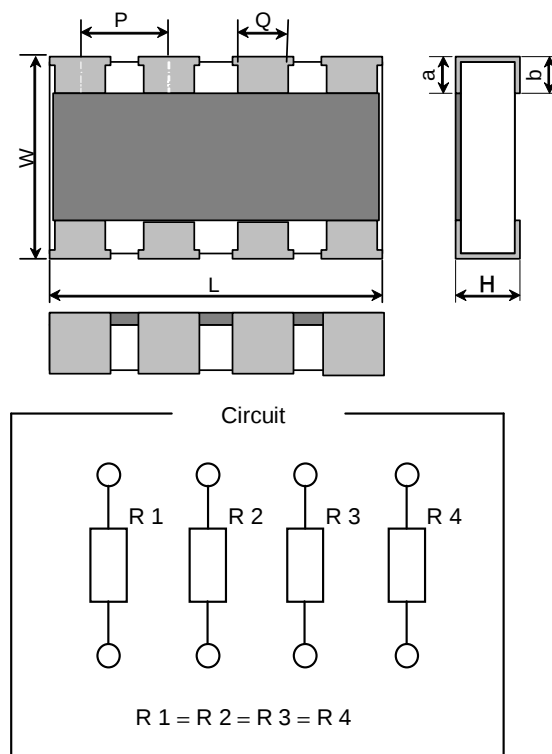


Figure-5

Table-4

Unit: mm

| Style    | Terminations style | L       | W       | H         | Q         | a         | b         | *P  |
|----------|--------------------|---------|---------|-----------|-----------|-----------|-----------|-----|
| RAC06 2D | D                  | 0.8±0.1 | 0.6±0.1 | 0.35±0.10 | 0.3±0.1   | 0.15±0.10 | 0.15±0.10 | 0.5 |
| RAC06 4D | D                  | 1.4±0.1 | 0.6±0.1 | 0.35±0.10 | 0.25±0.10 | 0.15±0.10 | 0.20±0.10 | 0.4 |

\*Reference

### 5.2.3 Net weight (Reference)

| Style    | Terminations style | Net weight(mg) |
|----------|--------------------|----------------|
| RAC06 2D | D                  | 0.56           |
| RAC06 4D | D                  | 0.98           |

## 5.3 RAC10 2D

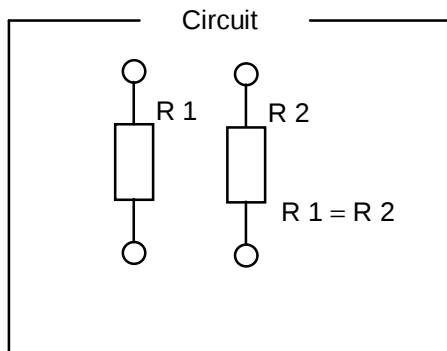
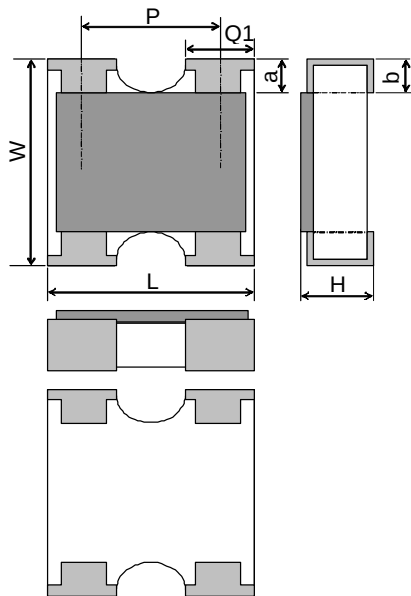


Figure-6

## 5.4 RAC10 4D

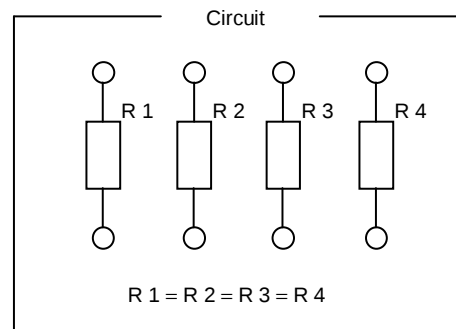
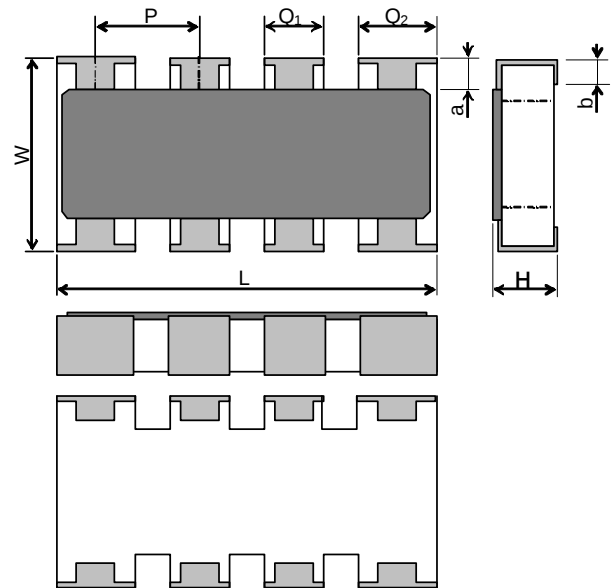


Figure-7

Table-5

Unit: mm

| Style    | Terminations style | L       | W       | H         | Q or Q <sub>1</sub> | *Q <sub>2</sub> |
|----------|--------------------|---------|---------|-----------|---------------------|-----------------|
| RAC10 2D | C                  | 1.0±0.1 | 1.0±0.1 | 0.35±0.10 | 0.34±0.10           | ----            |
| RAC10 4D | C                  | 2.0±0.1 | 1.0±0.1 | 0.45±0.10 | 0.3±0.05            | 0.4±0.1         |

| Style    | a        | b         | *P   |
|----------|----------|-----------|------|
| RAC10 2D | 0.2±0.15 | 0.25±0.17 | 0.65 |
| RAC10 4D | 0.2±0.1  | 0.25±0.10 | 0.5  |

\*Reference

## 5.5 Net weight (Reference)

| Style    | Terminations style | Net weight(mg) |
|----------|--------------------|----------------|
| RAC10 2D | C                  | 1.1            |
| RAC10 4D | C                  | 2.1            |

5.6 RAC16 4D

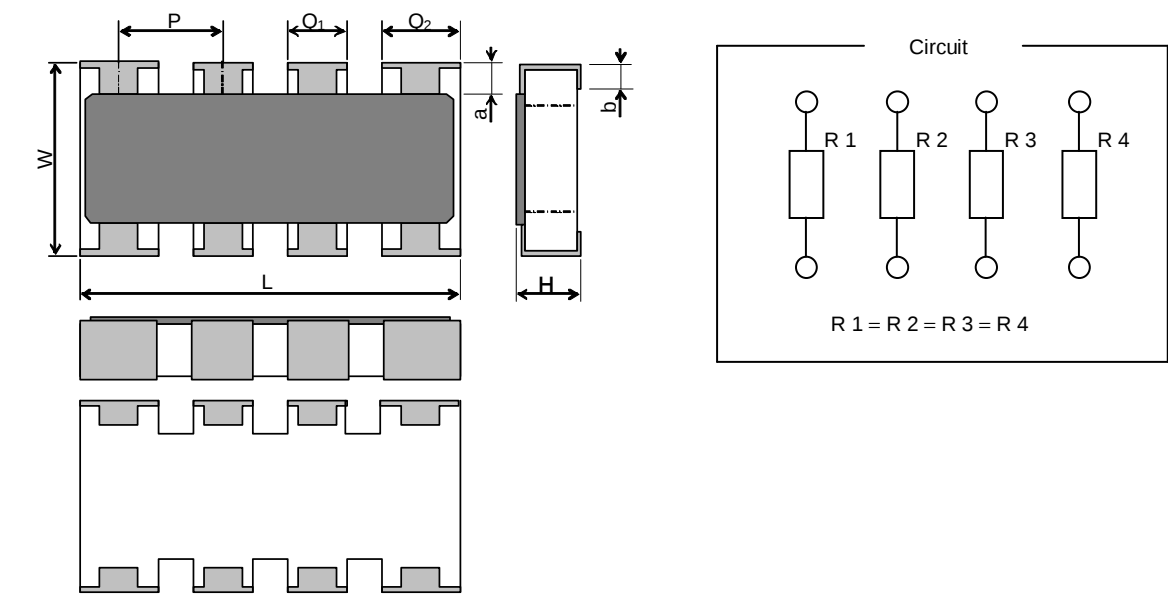


Figure-8

Table-6

Unit: mm

| Style    | Terminations style | L       | W       | H       | Q <sub>1</sub> | a       |
|----------|--------------------|---------|---------|---------|----------------|---------|
| RAC16 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 <sub>2</sub> | *P  | *Reference |
|----------|---------|-----------------|-----|------------|
| RAC16 4D | 0.3±0.2 | 0.6±0.1         | 0.8 |            |

5.7 Net weight (Reference)

| Style    | Terminations style | Net weight(mg) |
|----------|--------------------|----------------|
| RAC16 4D | C                  | 7              |

## 5.8 RAC16 8D

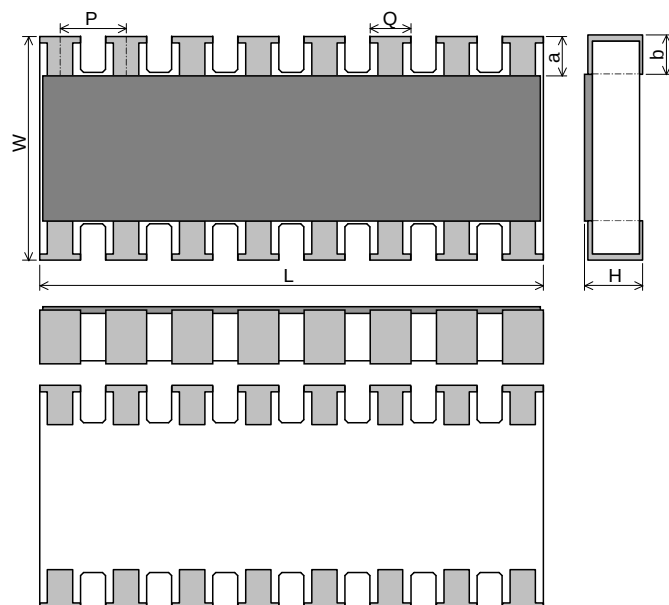


Figure-9

Table-7

Unit: mm

| Style    | Terminations style | L       | W       | H         | Q       | a       |
|----------|--------------------|---------|---------|-----------|---------|---------|
| RAC16 8D | C                  | 3.8±0.1 | 1.6±0.1 | 0.45±0.10 | 0.3±0.1 | 0.3±0.1 |

\*Reference

| Style    | b       | *P  |
|----------|---------|-----|
| RAC16 8D | 0.3±0.1 | 0.5 |

## 5.9 Net weight (Reference)

| Style    | Terminations style | Net weight(mg) |
|----------|--------------------|----------------|
| RAC16 8D | C                  | 8.3            |

## 6. Marking

The Rated resistance of RAC06 2D, 4D, RAC10 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.

| Marking example | Contents                                                  |
|-----------------|-----------------------------------------------------------|
| 123             | $12 \times 10^3 [\Omega] \rightarrow 12 [\text{k}\Omega]$ |

## 6.2 For the Jumper Chip

| Marking example | Contents |
|-----------------|----------|
| 000             | JP       |

## 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-8.

Table-8(1)

| No. | Test items                               | Condition of test (JIS C 5201-1)                                                                                                                                                                                                                                                                                                         | Performance requirements                                                                                                                              |                                                     |            |
|-----|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------|
| 1   | Resistance                               | Sub-clause 4.5                                                                                                                                                                                                                                                                                                                           | As in 4.5.2<br>The resistance value shall correspond with the rated resistance taking into account the specified tolerance.<br>Chip jumper: 50mΩ max. |                                                     |            |
| 2   | Temperature characteristic of resistance | 4.8<br>Natural resistance change per change in degree centigrade.<br>$TCR(10^{-6}/\Omega)=\frac{R2-R1}{R1(t2-t1)} \times 10^6$<br>t1 : 20°C $\begin{smallmatrix} +5 \\ -1 \end{smallmatrix}$ °C, t2: 125°C $\begin{smallmatrix} +5 \\ -1 \end{smallmatrix}$ °C<br>R1 : Resistance at t1 temperature<br>R2 : Resistance at t2 temperature | See Table-1.                                                                                                                                          |                                                     |            |
| 3   | Short time overload                      | 4.13<br>Test voltage: 2.5 times RCWV<br>Test period: 5s.<br>Test potential should not exceed max. overload voltage as shown in Table-1.                                                                                                                                                                                                  | Resistor:<br>ΔR/R: Within ±(2%+0.1Ω)<br>Chip jumper: 50mΩ max.<br>No visible damage                                                                   |                                                     |            |
| 4   | Resistance to soldering heat             | 4.18<br>Test by a piece.<br>Temp. of solder bath : 260±5°C<br>Immersion time: 10±1s<br>After immersion into solder leaving the room temp. for 1h or more, and then measure the resistance.                                                                                                                                               | Resistor: ΔR/R: Within ±(1%+0.05Ω)<br>Chip jumper: 50mΩ max.<br>No evidence of appearance damage.                                                     |                                                     |            |
| 5   | Solderability                            | 4.17<br>Test by a piece.<br>Flax: Rosin-Methanol<br>Temp. of solder bath: 235±5°C<br>Immersion time: 2±0.5s                                                                                                                                                                                                                              | 95% coverage min., good tinning and no visible damage.                                                                                                |                                                     |            |
| 6   | Temperature cycling                      | 4.19<br>Test cycle: 5 cycles for duty cycle as specified below.                                                                                                                                                                                                                                                                          | Resistor: ΔR/R: Within ±(1%+0.05Ω)<br>Chip jumper: 50mΩ max.<br>No visible damage                                                                     |                                                     |            |
|     |                                          | Step                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                       | Temperature(°C)                                     | Time(min.) |
|     |                                          | 1                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       | -55±3                                               | 30         |
|     |                                          | 2                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       | 20 $\begin{smallmatrix} +5 \\ -1 \end{smallmatrix}$ | 2~3        |
|     |                                          | 3                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       | +125±2                                              | 30         |
|     |                                          | 4                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       | 20 $\begin{smallmatrix} +5 \\ -1 \end{smallmatrix}$ | 2~3        |

Title: FIXED CHIP RESISTOR NETWORKS; RECTANGULAR TYPE  
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Table-8(2)

| No. | Test items                      | Condition of test (JIS C 5201-1)                                                                                                                                                  | Performance requirements                                                            |
|-----|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 7   | Load life                       | 4.25<br>Test temp.: 70±2°C<br>Test voltage: Cycle of 1h 30min. "ON" and 30min. "OFF" at dc rated voltage.<br>Test period: 1,000 <sup>+48</sup> / <sub>0</sub> h                   | Resistor:<br>ΔR/R: Within ±(3%+0.1Ω)<br>Chip jumper: 50mΩ max.<br>No visible damage |
| 8   | Load life in humidity           | 4.24<br>Test condition: 40±2°C & 90~95% R.H.<br>Test voltage: Cycle of 1h 30min. "ON" and 30min. "OFF" at dc rated voltage.<br>Test period: 1,000 <sup>+48</sup> / <sub>0</sub> h | Resistor:<br>ΔR/R: Within ±(3%+0.1Ω)<br>Chip jumper: 50mΩ max.<br>No visible damage |
| 9   | Adhesion                        | 4.32<br>Pressurizing force: 5N ( RAC06: 3N)<br>Test time: 10±1sec.                                                                                                                | No remarkable damage or removal of the terminations                                 |
| 10  | Insulation resistance           | 4.6<br>Test voltage: Max. overload voltage (DC)<br>Test period: 1min.                                                                                                             | R≥1GΩ                                                                               |
| 11  | Dielectric withstanding voltage | 4.7<br>Test voltage: Max. overload voltage (AC)<br>Test period: 1min.                                                                                                             | No flashover, fire and breakdown.                                                   |

## 8. Taping

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

### 8.2 Taping dimensions

8.2.1 RAC06 2D, RAC06 4D, RAC10 2D, RAC10 4D (Paper taping, 8mm width, 2mm pitches)

Taping dimensions shall be in accordance with Figure-10 and Table-9.

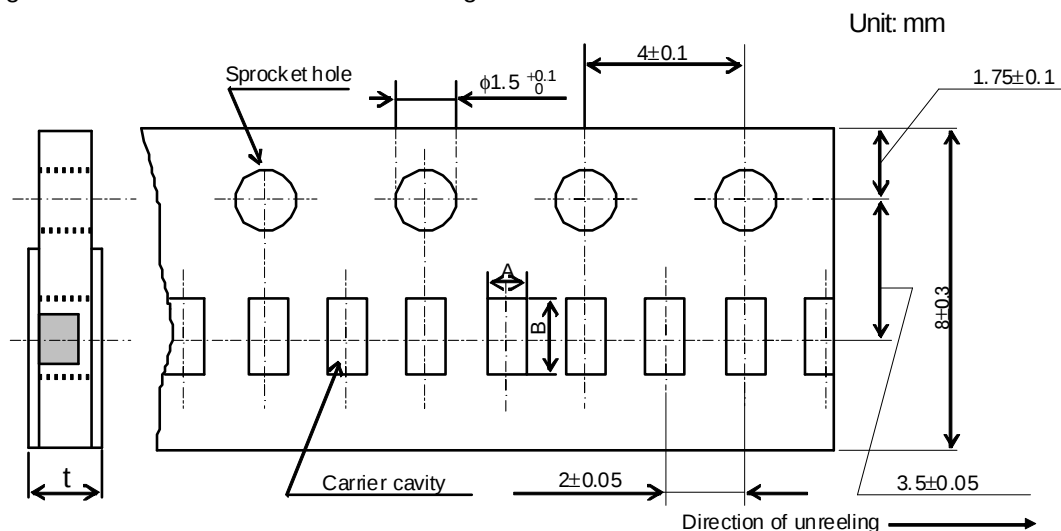


Figure-10

Table-9

Unit: mm

| Style    | A        | B        | t       |
|----------|----------|----------|---------|
| RAC06 2D | 0.7±0.1  | 0.9±0.1  | 0.5±0.1 |
| RAC06 4D |          | 1.5±0.1  |         |
| RAC10 2D | 1.15±0.1 | 1.15±0.1 | 0.5max. |
| RAC10 4D | 1.2±0.2  | 2.2±0.2  | 0.6max. |

8.2.2 RAC16 4D, RAC16 8D (Paper taping, 8mm width, 4mm pitches)

Taping dimensions shall be in accordance with Figure-11 and Table-10.

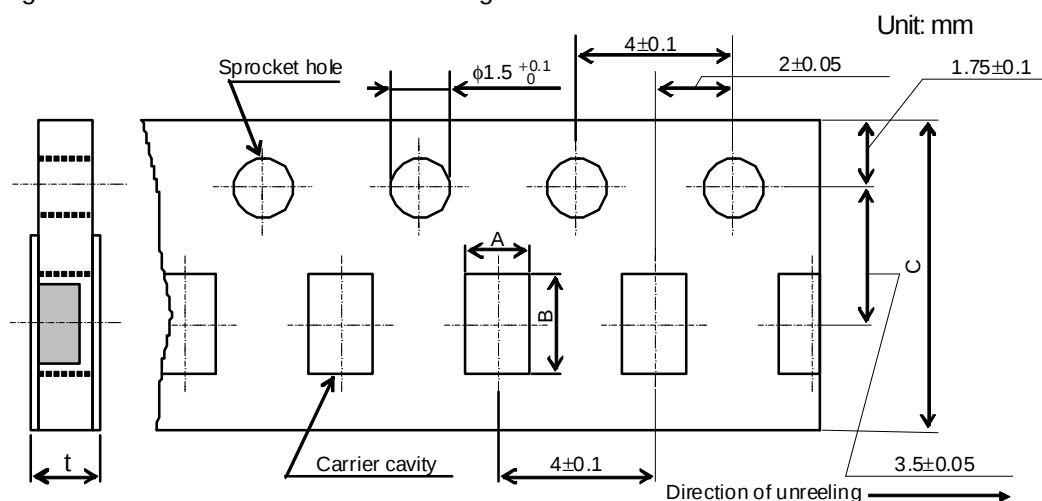


Figure-11

Table-10

Unit: mm

| Style    | A        | B        | C       | t        |
|----------|----------|----------|---------|----------|
| RAC16 4D | 2.0±0.2  | 3.6±0.2  | 8.0±0.3 | 1.0max.  |
| RAC16 8D | 1.9±0.15 | 4.1±0.15 |         | 0.85max. |

## 8.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-12 and Table-11.

Unit: mm

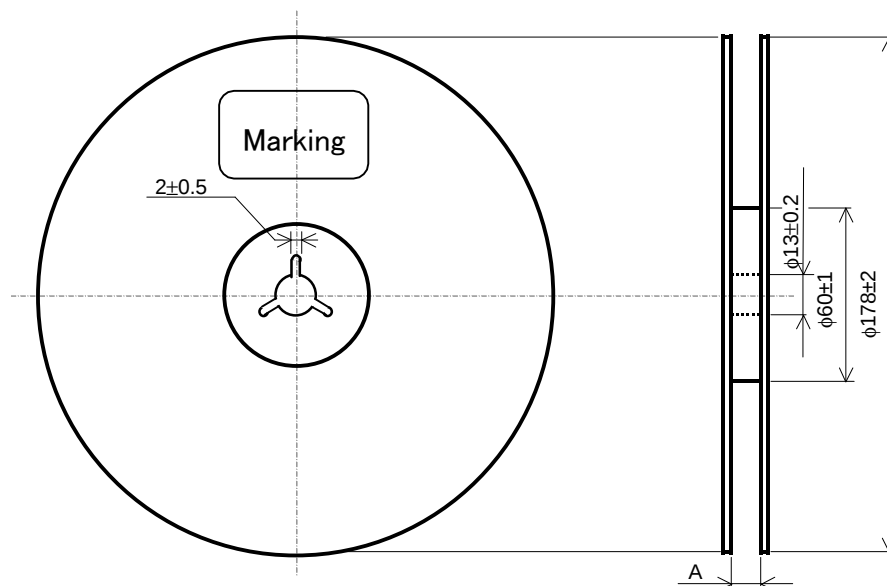


Figure-12

Table-11

Unit: mm

| Style       | A     |
|-------------|-------|
| RAC06,10,16 | 9±0.5 |

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

## 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)