

Data sheet

Title: FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE
ANTI-SULFURATION

Style: RMGW06,10,16,20,32,35,50,63

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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1. Scope

1.1 This data sheet covers the detail requirements for fixed thick film chip resistors; rectangular type & anti-sulfuration,, style of RMGW06,10,16,20,32,35,50,63.

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-2134C-2010

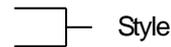
2. Classification

Type designation shall be the following form.

(Example)

| | | | | | | |
|----|-------|----|---|-----|---|----|
| 1) | RMGW | 16 | K | 123 | J | TP |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | Style | | | | | |
| 2) | RMGW | 16 | | JP | | TP |
| | 1 | 2 | | 4 | | 6 |
| | Style | | | | | |

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



| | |
|---------|---|
| K | $\pm 100 \times 10^{-6} / ^\circ\text{C}$ |
| -(Dash) | Standard |

4 Rated resistance

| | |
|------|--|
| 123 | E24 Series, 3 digit, Ex. 123--> 12k Ω , |
| 1000 | E96 Series, 4 digit, Ex. 1000-->100 Ω 1022--> 10.2k Ω |
| JP | Chip jumper |

5 Tolerance on rated resistance

| | |
|---|-------------|
| D | $\pm 0.5\%$ |
| F | $\pm 1\%$ |
| J | $\pm 5\%$ |

6 Packaging form

| | |
|----|----------------------|
| B | Bulk (loose package) |
| PA | Press pocket taping |
| TH | Paper taping |
| TP | |
| TE | Embossed taping |

3. Rating

The ratings shall be in accordance with Table-1.

3.1 Resistor

Table-1(1)

| Style | Rated dissipation (W) | Temperature coefficient of resistance (10 ⁶ /°C) | | Rated resistance range (Ω) | Preferred number series for resistors | Tolerance on rated resistance |
|--------|-----------------------|---|----------|----------------------------|---------------------------------------|-------------------------------|
| RMGW06 | 0.05 | Standard | +600—200 | 1~3.92 | E24, 96 | F(±1%), J(±5%) |
| | | | +350—100 | 4.02~9.76 | | |
| | | | ±200 | 10~1M | | |
| | | Standard | +600—200 | 1~3.92 | E24 | F(±1%), J(±5%) |
| | | | +350—100 | 4.02~9.76 | | |
| | | | ±200 | 10~1M | | |
| RMGW10 | 0.1 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | | Standard | ±200 | | |
| | | | | +500—200 | 1~9.76 | E24 |
| | | K | ±100 | 10~1M | | |
| | | | Standard | ±200 | 1.1M~10M | |
| | | | | +500—200 | 1.0~9.1 | |
| RMGW16 | 0.1 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | | Standard | ±200 | | |
| | | | | +500—200 | 1~9.76 | E24 |
| | | K | ±100 | 10~1M | | |
| | | | Standard | ±200 | 1.1M~10M | |
| | | | | +500—200 | 1.0~9.1 | |
| RMGW20 | 0.125 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | | Standard | ±200 | | |
| | | | | +500—200 | 1~9.76 | E24 |
| | | K | ±100 | 10~1M | | |
| | | | Standard | ±200 | 1.1M~10M | |
| | | | | +500—200 | 1.0~9.1 | |
| RMGW32 | 0.25 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | | Standard | ±200 | | |
| | | | | +500—200 | 1~9.76 | E24 |
| | | K | ±100 | 10~1M | | |
| | | | Standard | ±200 | 1.1M~10M | |
| | | | | +500—200 | 1.0~9.1 | |
| RMGW35 | 0.33 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | | Standard | ±200 | | |
| | | | | +500—200 | 1~9.76 | E24 |
| | | K | ±100 | 10~1M | | |
| | | | Standard | ±200 | 1.1M~10M | |
| | | | | +500—200 | 1.0~9.1 | |

Table-1(2)

| Style | Rated dissipation (W) | Temperature coefficient of resistance (10 ⁶ /°C) | | Rated resistance range (Ω) | Preferred number series for resistors | Tolerance on rated resistance |
|----------|-----------------------|---|---------|----------------------------|---------------------------------------|-------------------------------|
| | | K | ±100 | | | |
| RMGW50 | 0.75 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | Standard | ±200 | 1.02M~10M | | |
| | | | | +500~-200 | 1~9.76 | |
| | | K | ±100 | 10~1M | E24 | J(±5%) |
| Standard | ±200 | 1.1M~10M | | | | |
| | | +500~-200 | 1.0~9.1 | | | |
| RMGW63 | 1 | K | ±100 | 10~1M | E24, 96 | D(±1%), F(±1%) |
| | | Standard | ±200 | 1.02M~10M | | |
| | | | | +500~-200 | 1~9.76 | |
| | | K | ±100 | 10~1M | E24 | J(±5%) |
| Standard | ±200 | 1.1M~10M | | | | |
| | | +500~-200 | 1.0~9.1 | | | |

Table-1(3)

| Style | Limiting element voltage (V) | Isolation voltage (V) | Category temperature range(°C) |
|--------|------------------------------|-----------------------|--------------------------------|
| RMGW06 | 25 | 50 | -55~+155 |
| RMGW10 | 50 | 100 | |
| RMGW16 | | | |
| RMGW20 | 150 | 500 | |
| RMGW32 | 200 | | |
| RMGW35 | | | |
| RMGW50 | | | |
| RMGW63 | | | |

3.2 Chip Jumper

Table-1(4)

| Style | Chip jumper symbol | Resistance value of chip jumper | Rated current of chip jumper (A) |
|--------|--------------------|---------------------------------|----------------------------------|
| RMGW06 | JP | 50mΩmax. | 1 |
| RMGW10 | | | 1 |
| RMGW16 | | | 1 |
| RMGW20 | | | 2 |
| RMGW32 | | | 2 |
| RMGW35 | | | 2 |
| RMGW50 | | | 2 |
| RMGW63 | | | 2 |

3.3 Climatic category

55/155/56

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

3.4 Stability class

5%

Limits for change of resistance:
 -for long-term tests ±(2%+0.1Ω) Chip jumper: 50 mΩ max.
 -for short-term tests ±(0.5%+0.05Ω) Chip jumper: 50 mΩ max.

3.5 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.

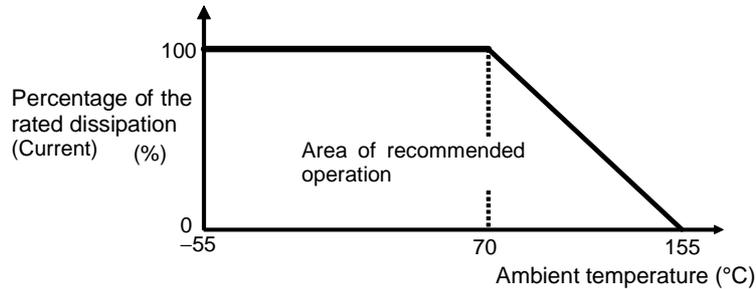


Figure-1 Derating curve

3.6 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. | RMGW16,20,32,35,50,63 |
| PA | Press pocket taping (paper taping) | 8mm width, 2mm pitches | 15,000 pcs. | RMGW06 |
| TH | Paper taping | 8mm width, 2mm pitches | 10,000 pcs. | RMGW10 |
| TP | Paper taping | 8mm width, 4mm pitches | 5,000 pcs. | RMGW16,20,32 |
| TE | Embossed taping | 8mm width, 4mm pitches | 4,000 pcs. | RMGW35 |
| | | 12mm width, 4mm pitches | | RMGW50,63 |

5. Dimensions

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

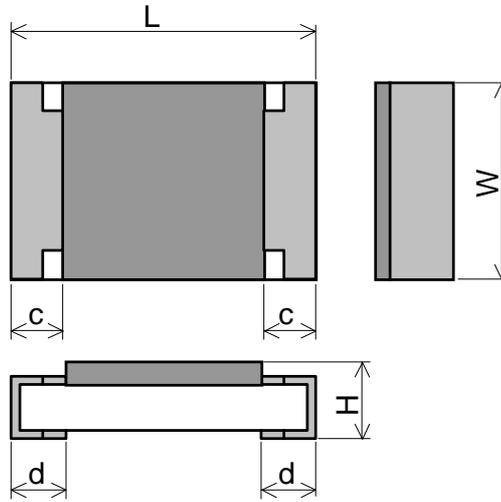


Figure-2

Table-3

Unit : mm

| Style | L | W | H | c | d |
|--------|----------|---------------------------------------|-----------|-----------|--|
| RMGW06 | 0.6±0.03 | 0.3±0.03 | 0.23±0.03 | 0.15±0.10 | 0.15±0.05 |
| RMGW10 | 1.0±0.05 | 0.5±0.05 | 0.35±0.05 | 0.2±0.1 | 0.25 ^{+0.05} _{-0.10} |
| RMGW16 | 1.6±0.1 | 0.8 ^{+0.15} _{-0.05} | 0.45±0.10 | 0.3±0.1 | 0.3±0.1 |
| RMGW20 | 2.0±0.1 | 1.25±0.10 | 0.55±0.10 | 0.4±0.2 | 0.4±0.2 |
| RMGW32 | 3.1±0.1 | 1.6±0.15 | 0.55±0.10 | 0.5±0.25 | 0.5±0.25 |
| RMGW35 | 3.1±0.15 | 2.5±0.15 | 0.55±0.15 | 0.5±0.25 | 0.5±0.25 |
| RMGW50 | 5.0±0.15 | 2.5±0.15 | 0.55±0.15 | 0.6±0.2 | 0.6±0.2 |
| RMGW63 | 6.3±0.15 | 3.2±0.15 | 0.55±0.15 | 0.6±0.2 | 0.6±0.2 |

5.2 Net weight (Reference)

| Style | Net weight(mg) |
|--------|----------------|
| RMGW06 | 0.16 |
| RMGW10 | 0.6 |
| RMGW16 | 2 |
| RMGW20 | 5 |
| RMGW32 | 9 |
| RMGW35 | 16 |
| RMGW50 | 25 |
| RMGW63 | 40 |

6. Marking

The Rated resistance of ,RMGW06, 10 should not be marked.

6.1 Resistor

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 RMGW16 should not be marked in 4 digits(E96).

| Marking example | Contents | Application |
|-----------------|--|----------------------------|
| 123 | $12 \times 10^{-3} [\Omega] \rightarrow 12 [\text{k}\Omega]$ | E24(RMGW16,20,32,35,50,63) |
| 2R2 | $2.2 [\Omega]$ | E24(RMGW16,20,32,35,50,63) |
| 5623 | $562 \times 10^3 [\Omega] \rightarrow 562 [\text{k}\Omega]$ | E96(RMGW20,32,35,50,63) |
| 12R7 | $12.7 [\Omega]$ | E96(RMGW20,32,35,50,63) |

6.2 Marking example of Jumper Chip

| Marking example | Contents | Application |
|-----------------|----------|--------------|
| ○ | JP | RMGW16,20,32 |
| 000 | JP | RMGW35,50,63 |

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. Chip jumper: 50mΩ 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 ΔR ≤ ± (1%+0.05Ω) Chip jumper: 50mΩ max. Legible marking |

Table-4(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+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 $\Delta R \leq \pm (2\%+0.1\Omega)$ Chip jumper: 50m Ω max. |
| 10 | Mounting Endurance at 70 °C | Sub-clause 4.31 Substrate material: Epoxide woven glass (RMGW63 may use Alumina substrate.) Sub-clause 4.25.1 Ambient temperature: 70 °C \pm 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 $\Delta R \leq \pm (2\%+0.1\Omega)$ Chip jumper: 50m Ω max. |
| 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 |

8. Taping

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

8.2 Taping dimensions

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

Taping dimensions shall be in accordance with Figure-3 and Table-5.

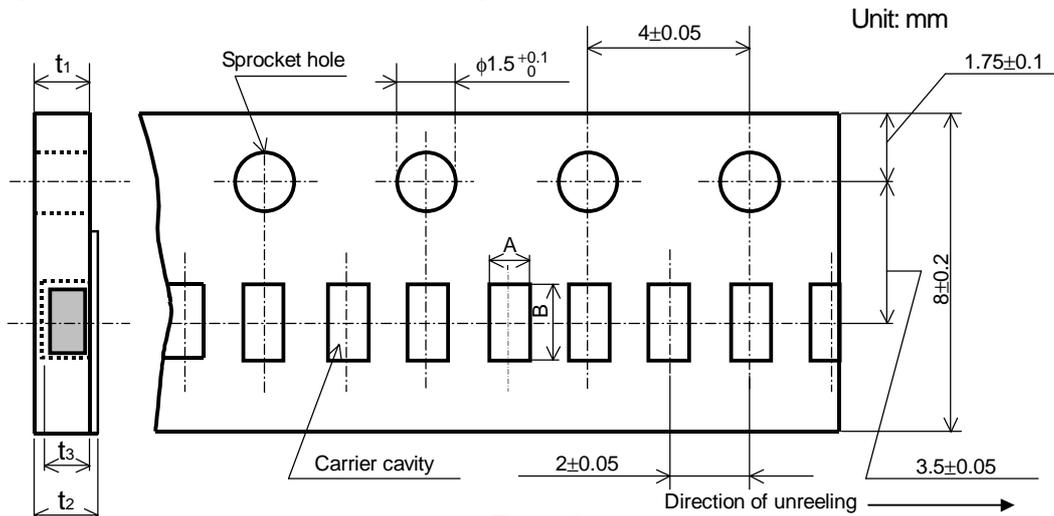


Figure-3

Table-5

| Style | A | B | t ₁ | t ₂ | t ₃ |
|--------|-----------|-----------|----------------|----------------|----------------|
| RMGW06 | 0.37±0.05 | 0.67±0.05 | 0.42±0.03 | 0.45±0.05 | 0.27±0.02 |

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

Taping dimensions shall be in accordance with Figure-4 and Table-6.

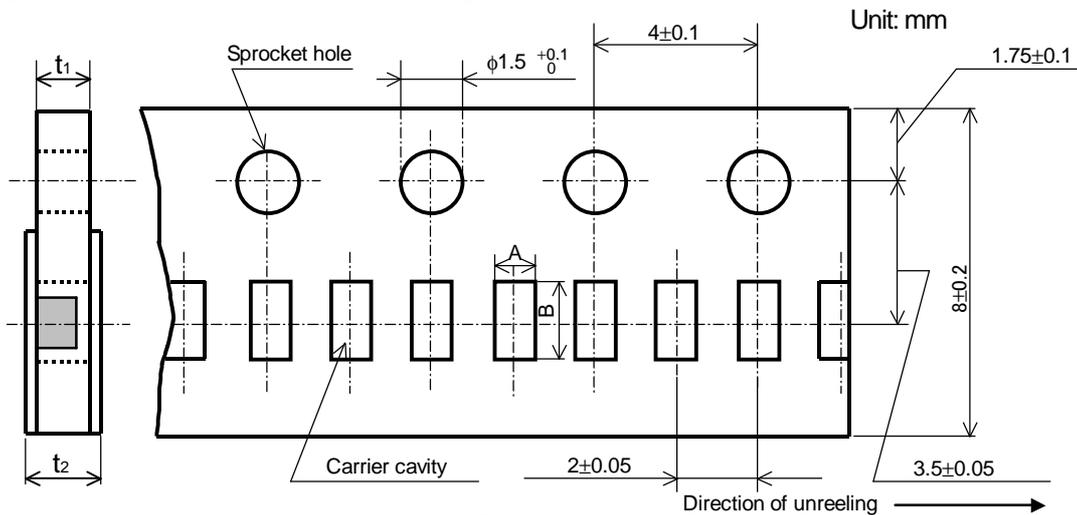


Figure-4

Table-6

| Style | A | B | t ₁ | t ₂ |
|--------|--|--|----------------|----------------|
| RMGW10 | 0.65 ^{+0.05} _{-0.10} | 1.15 ^{+0.05} _{-0.10} | 0.4 ± 0.05 | 0.5max. |

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

Taping dimensions shall be in accordance with Figure-5 and Table-7.

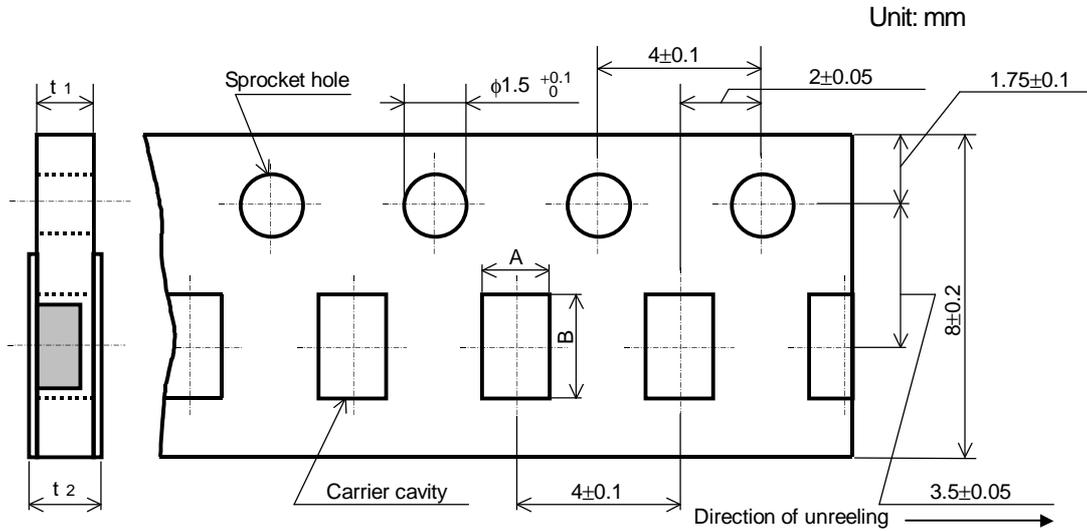


Figure-5

Table-7

Unit: mm

| Style | A | B | t_1 | t_2 |
|--------|-----------------|---------------|---------------|---------|
| RMGW16 | 1.15 ± 0.15 | 1.9 ± 0.2 | 0.6 ± 0.1 | 0.8max. |
| RMGW20 | 1.65 ± 0.15 | 2.5 ± 0.2 | 0.8 ± 0.1 | 1.0max. |
| RMGW32 | 2.00 ± 0.15 | 3.6 ± 0.2 | 0.8 ± 0.1 | 1.0max. |

8.2.3 Embossed taping dimensions shall be in accordance with Figure-6 and Table-8.

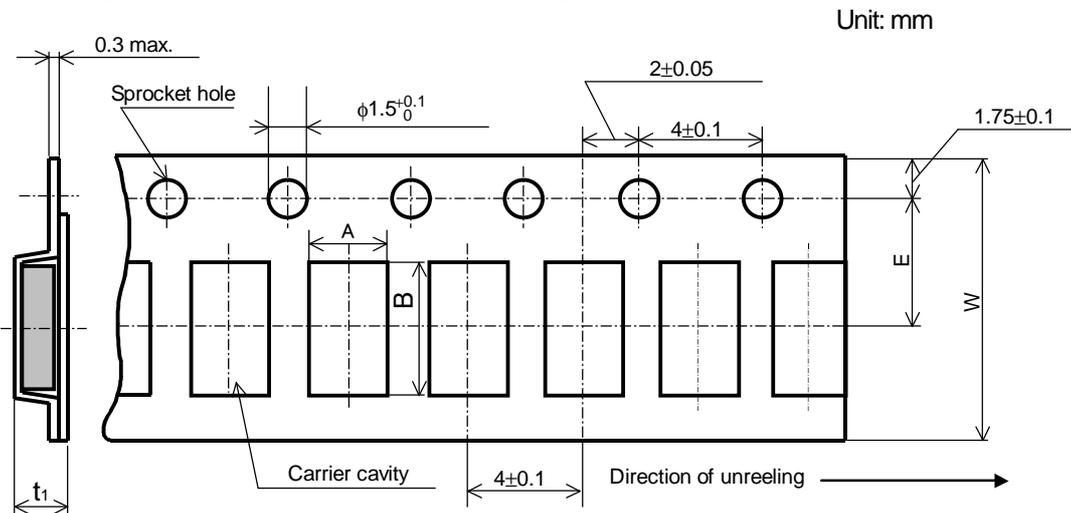


Figure-6

Table-8

Unit: mm

| Style | A | B | W | E | t_1 |
|--------|-----------------|---------------|----------------|----------------|----------------|
| RMGW35 | 2.85 ± 0.20 | 3.5 ± 0.2 | 8.0 ± 0.3 | 3.5 ± 0.05 | 1.0 ± 0.2 |
| RMGW50 | 3.1 ± 0.2 | 5.5 ± 0.2 | 12.0 ± 0.3 | 5.5 ± 0.05 | 1.1 ± 0.15 |
| RMGW63 | 3.6 ± 0.2 | 6.9 ± 0.2 | 12.0 ± 0.3 | 5.5 ± 0.05 | 1.1 ± 0.15 |

- 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
RMGW06: Figure-7. RMGW10,16,20,32: Figure-8 and RMGW35,50,63 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.

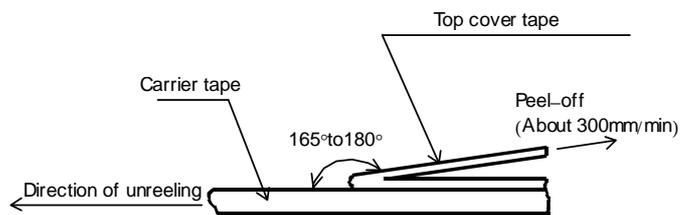


Figure-7

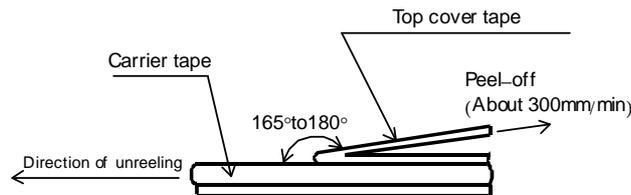


Figure-8

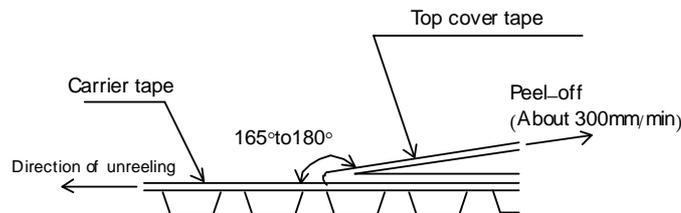


Figure-9

8.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure-10 and Table-9.

Plastic reel (Based on EIAJ ET-7200C)

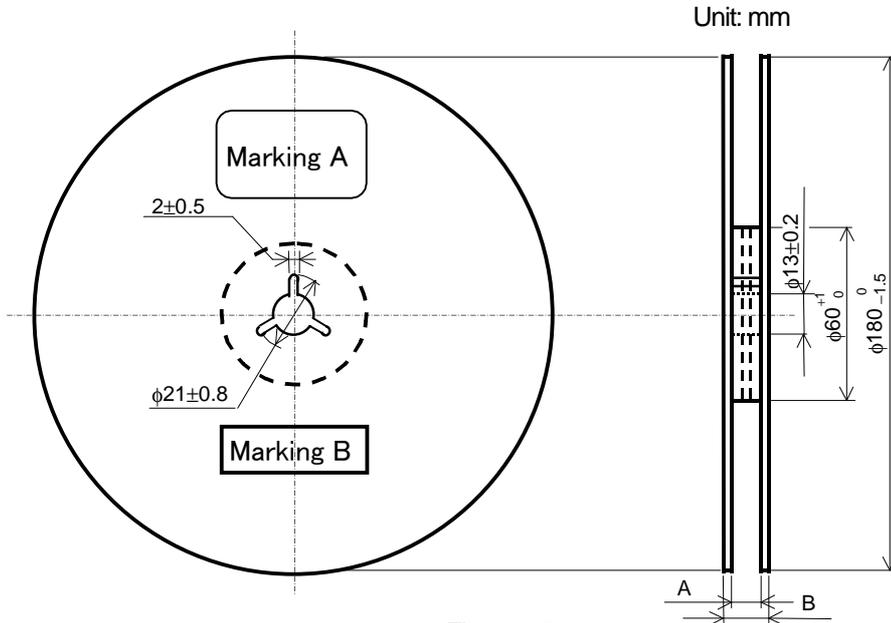


Figure-10

Table-9

Unit: mm

| Style | A | B | Note |
|-----------------------|----------------|----------|-------------------|
| RMGW06,10,16,20,32,35 | 9 $^{+1.0}_0$ | 11.4±1.0 | Injection molding |
| | | 13±1.0 | Vacuum forming |
| RMGW50,63 | 13 $^{+1.0}_0$ | 17±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)

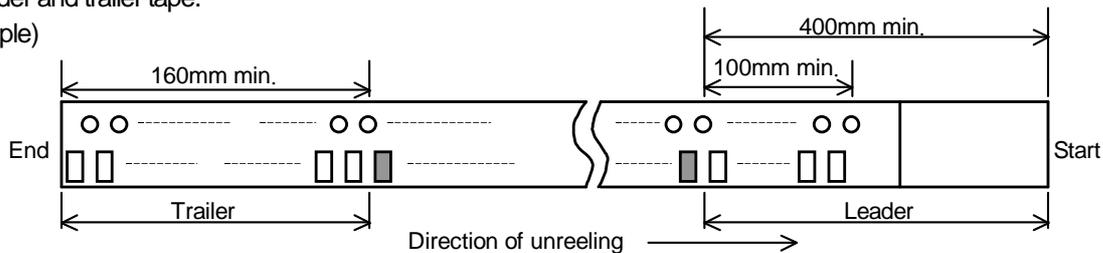


Figure-11

9. Marking on package

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

9.1 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

9.2 Marking B (KAMAYA Control label)