KAMAYA OHM

No.:	RMSW-K-HTS-0001 /3
Date:	2017. 12. 6

Data sheet

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

Style: RMSW06,10,16,20,32,35

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.

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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 RMSW06,10,16,20,32,35.

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)

RMSW	16	K	123	J	TP
1	2	3	4	5	6
Style					

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

K	±100×10^{-6}/ °C
−(Dash)	Standard

4 Rated resistance

123	E24 Series, 3 digit, Ex. 123--> 12kΩ,
1000	E96 Series, 4 digit, Ex. 1000-->100Ω 1022--> 10.2kΩ

5 Tolerance on rated resistance

D	±0.5%
F	±1%
J	±5%

6 Packaging form

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

3. Rating

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

Table−1

Style	Rated dissipation (W)	Temperature coefficient of resistance (10^{-6} / °C)		Rated resistance range (Ω)	Preferred number series for resistors	Tolerance on rated resistance
RMSW06	0.05	−(Dash) Standard	±200	10~10M	E24, 96	D(±0.5%),F(±1%)
			+350~−100	4.02~9.76		F(±1%)
			+600~−200	1~3.92		
			±200	10~10M	E24	J(±5%)
			+350~−100	4.3~9.1		
			+600~−200	1~3.9		
RMSW10	0.1	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~−200	1~9.76		F(±1%)
		K	±100	10~1M	E24	J(±5%)
		Standard	±200	1.1M~10M		
			+500~−200	1.0~9.1		
RMSW16	0.1	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~−200	1~9.76		F(±1%)
		K	±100	10~1M	E24	J(±5%)
		Standard	±200	1.1M~10M		
			+500~−200	1.0~9.1		
RMSW20	0.125	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~−200	1~9.76		F(±1%)
		K	±100	10~1M	E24	J(±5%)
		Standard	±200	1.1M~10M		
			+500~−200	1.0~9.1		
RMSW32	0.25	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~−200	1~9.76		F(±1%)
		K	±100	10~1M	E24	J(±5%)
		Standard	±200	1.1M~10M		
			+500~−200	1.0~9.1		
RMSW35	0.5	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~−200	1~9.76		F(±1%)
		K	±100	10~1M	E24	J(±5%)
		Standard	±200	1.1M~10M		
			+500~−200	1.0~9.1		

Style	Limiting element voltage (V)	Isolation voltage (V)	Category temperature range(°C)
RMSW06	25	50	−55~+155
RMSW10	50	100	
RMSW16			
RMSW20	150	500	
RMSW32	200		
RMSW35			

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

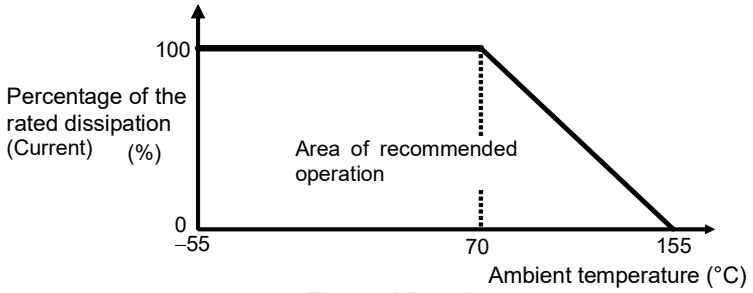
5% Limits for change of resistance:

–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–1 Derating curve

3.5 Rated voltage

d. c. or a. c. r. m. s. voltage calculated from the square root of the product of the rated resistance and the rated dissipation.

$$E = \sqrt{P \cdot R}$$

E : Rated voltage (V)

P : Rated dissipation (W)

R : Rated resistance (Ω)

Limiting element voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

At high value of resistance, the rated voltage may not be applicable.

4. Packaging form

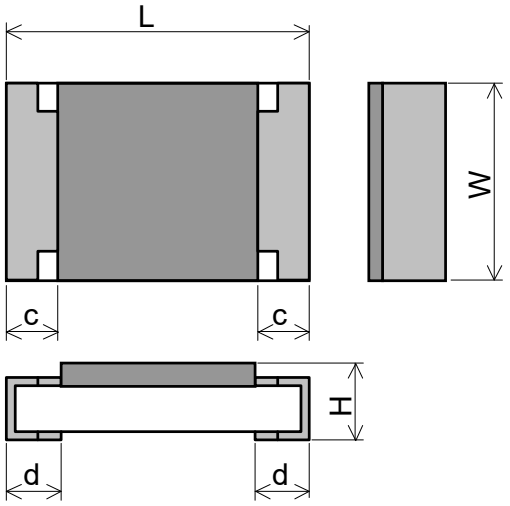
The standard packaging form shall be in accordance with Table–2.

Table–2

Symbol	Packaging form		Standard packaging quantity / units	Application
B	Bulk (loose package)		1,000 pcs.	RMSW06,10,16,20,32,35
PA	Press pocket taping (paper taping)	8mm width, 2mm pitches	15,000 pcs.	RMSW06
TH	Paper taping	8mm width, 2mm pitches	10,000 pcs.	RMSW10
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RMSW16,20,32
TE	Embossed taping	8mm width, 4mm pitches	4,000 pcs.	RMSW35

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
RMSW06	0.6±0.03	0.3±0.03	0.23±0.03	0.15±0.10	0.15±0.05
RMSW10	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	$0.25^{+0.05}_{-0.10}$
RMSW16	1.6±0.1	$0.8^{+0.15}_{-0.05}$	0.45±0.10	0.3±0.1	0.3±0.1
RMSW20	2.0±0.1	1.25±0.10	0.55±0.10	0.4±0.2	0.4±0.2
RMSW32	3.1±0.1	1.6±0.15	0.55±0.10	0.5±0.25	0.5±0.25
RMSW35	3.1±0.15	2.5±0.15	0.55±0.15	0.5±0.25	0.5±0.25

5.2 Net weight (Reference)

Style	Net weight(mg)
RMSW06	0.16
RMSW10	0.6
RMSW16	2
RMSW20	5
RMSW32	9
RMSW35	16

6. Marking

The Rated resistance of ,RMSW06,10 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 RMSW16 should not be marked in 4 digits(E96).

Marking example	Contents	Application
123	12×10^{3} [Ω] → 12 [kΩ]	E24(RMSW16,20,32,35)
2R2	2. 2 [Ω]	E24(RMSW16,20,32,35)
5623	562×10^{3} [Ω] → 562 [kΩ]	E96(RMSW20,32,35)
12R7	12.7 [Ω]	E96(RMSW20,32,35)

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.
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 $R \geq 1\ G\Omega$
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 $\Delta R \leq \pm (1\%+0.05\Omega)$ Legible marking

Table−4(2)

No	Test items	Condition of test (JIS C 5201−1)	Performance requirements
6	Mounting	Sub−clause 4.31 Substrate material: Epoxide woven glass	
	Bound strength of the end face plating	Sub−clause 4.33 Bent value: 3 mm	
		Resistance	ΔR ≤ ± (1%+0.05Ω)
	Final measurements	Sub−clause 4.33.6 Visual examination	No visible damage
7	Resistance to soldering heat	Sub−clause 4.18 Solder temperature: 260 °C ± 5 °C Immersion time: 10 s ± 0.5 s	
		Visual examination	As in 4.18.3.4 No sign of damage such as cracks.
		Resistance	ΔR ≤ ± (1%+0.05Ω)
	Component solvent resistance	Sub−clause 4.29 Solvent: 2−propanol Solvent temperature: 23 °C ± 5 °C Method 2 Recovery: 48 h	
		Visual examination	No visible damage
		Resistance	ΔR ≤ ± (1%+0.05Ω)
8	Mounting	Sub−clause 4.31 Substrate material: Epoxide woven glass	
	Adhesion	Sub−clause 4.32 Force: 5 N (RMSW06: 3N) Duration: 10 s ± 1 s	
		Visual examination	No visible damage
	Rapid change temperature	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	No visible damage
		Resistance	ΔR ≤ ±(1%+0.05Ω)

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 ΔR ≤ ± (5%+0.1Ω)
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 ΔR ≤ ± (5%+0.1Ω)
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

Table−4(4)

No	Test items	Condition of test (JIS C 5201−1)	Performance requirements
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 $\Delta R \leq \pm (5\%+0.1\Omega)$
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 Table−3 No visible damage $\Delta R \leq \pm (5\%+0.1\Omega)$
14	Humid Sulfur vapor test (FOS)	ASTM B809 Reagent: Sulfur (Saturated vapor) Test temp.: 105°C Relative humidity: 95%RH Test period: 500h Resistance	 $\Delta R \leq \pm (1\%+0.05\Omega)$

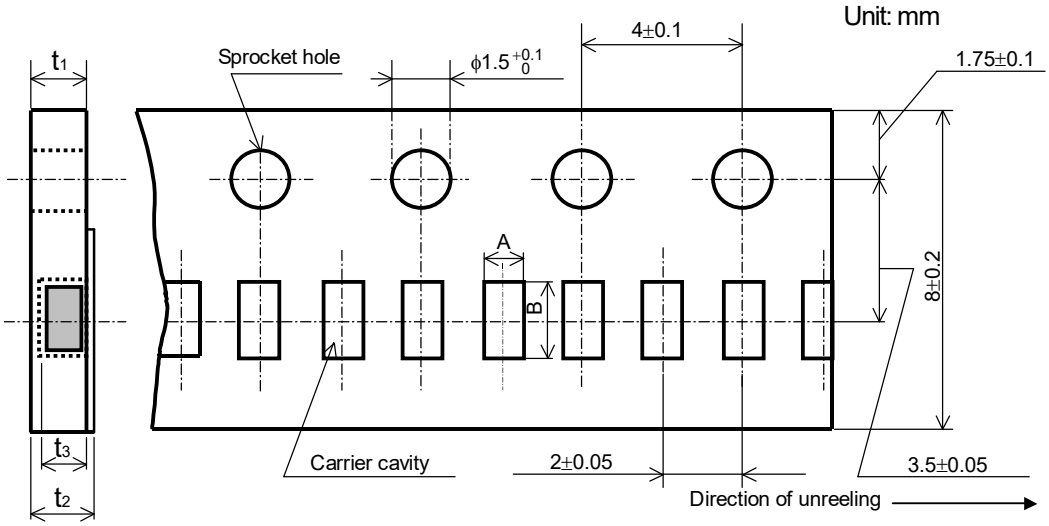
8. Taping

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

8.2 Taping dimensions

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

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



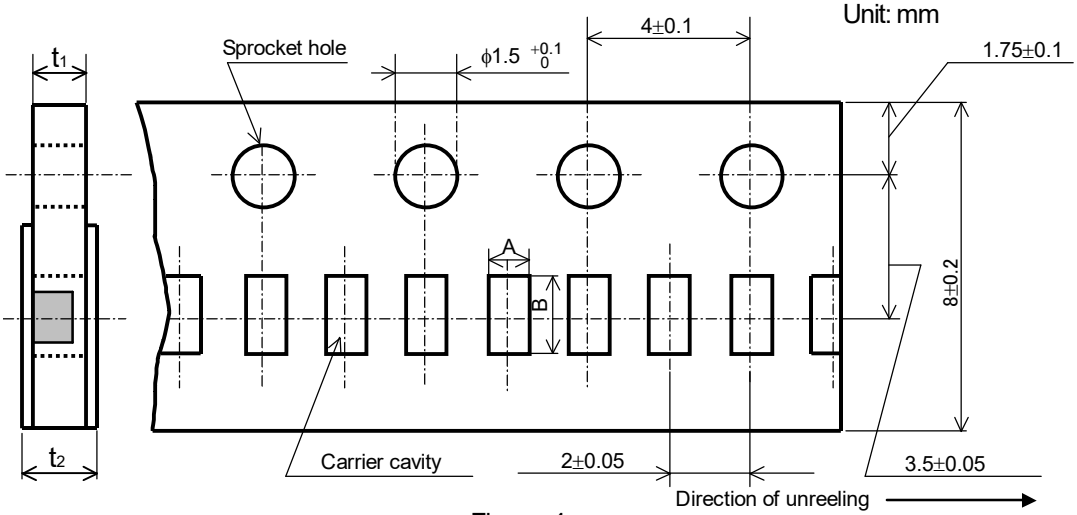
Figure−3

Table−5 Unit: mm

Style	A	B	t_1	t_2	t_3
RMSW06	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

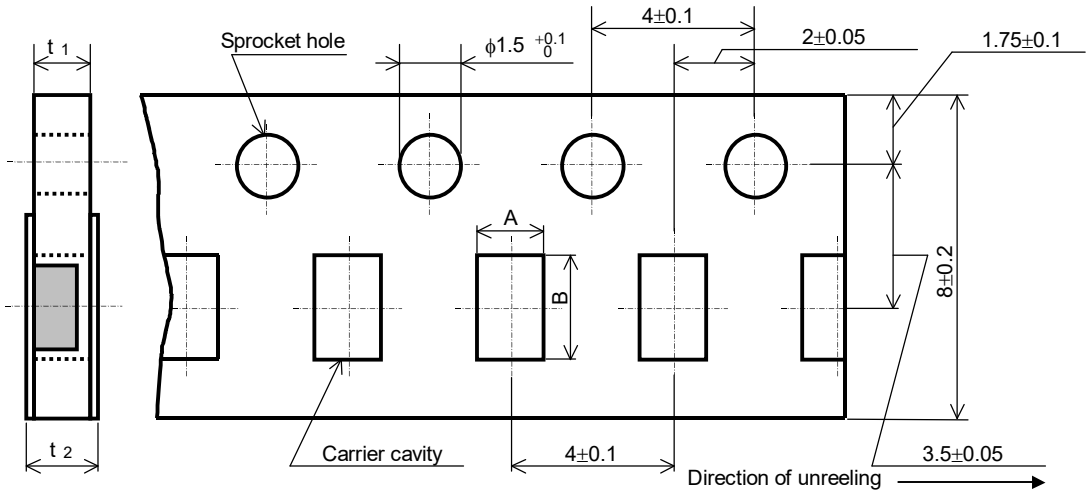
Table−6 Unit: mm

Style	A	B	t_1	t_2
RMSW10	$0.65^{+0.05}_{-0.10}$	$1.15^{+0.05}_{-0.10}$	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.

Unit: mm



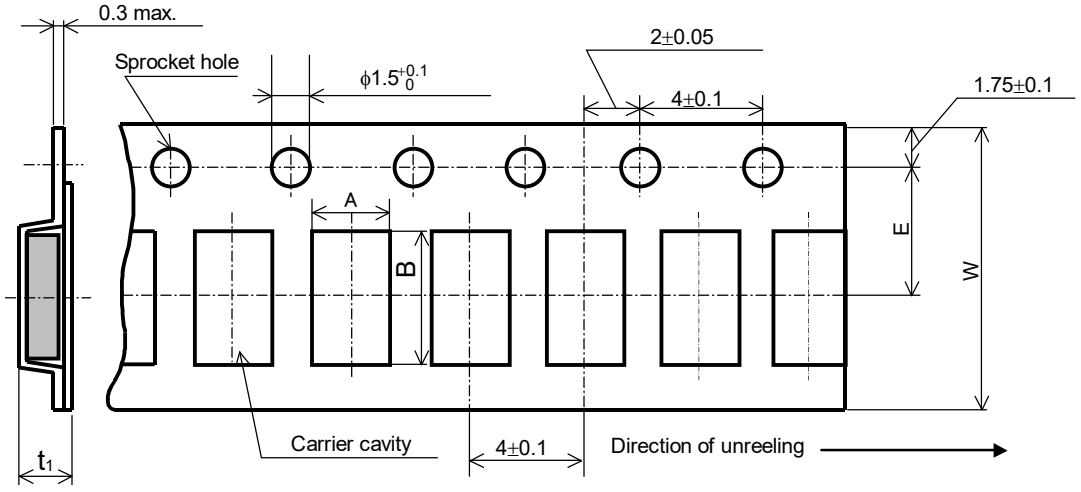
Figure−5

Table−7 Unit: mm

Style	A	B	t_1	t_2
RMSW16	1.15±0.15	1.9±0.2	0.6±0.1	0.8max.
RMSW20	1.65±0.15	2.5±0.2	0.8±0.1	1.0max.
RMSW32	2.00±0.15	3.6±0.2	0.8±0.1	1.0max.

8.2.4 Embossed taping dimensions shall be in accordance with Figure−6 and Table−8.

Unit: mm

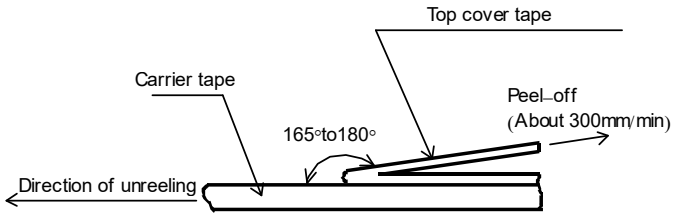


Figure−6

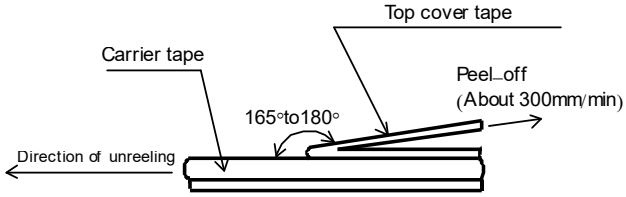
Table−8 Unit: mm

Style	A	B	W	E	t_1
RMSW35	2.85±0.20	3.5±0.2	8.0±0.3	3.5±0.05	1.0±0.2

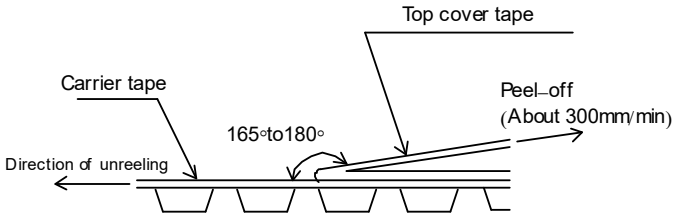
1). The cover tapes shall not cover the sprocket holes.
2). Tapes in adjacent layers shall not stick together in the packing.
3). Components shall not stick to the carrier tape or to the cover tape.
4). Pitch tolerance over any 10 pitches ±0.2mm.
5). The peel strength of the top cover tape shall be with in 0.1N to 0.5N on the test method as shown in the following RMSW06: Figure−7, RMSW10,16,20,32: Figure−8 and RMSW35 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



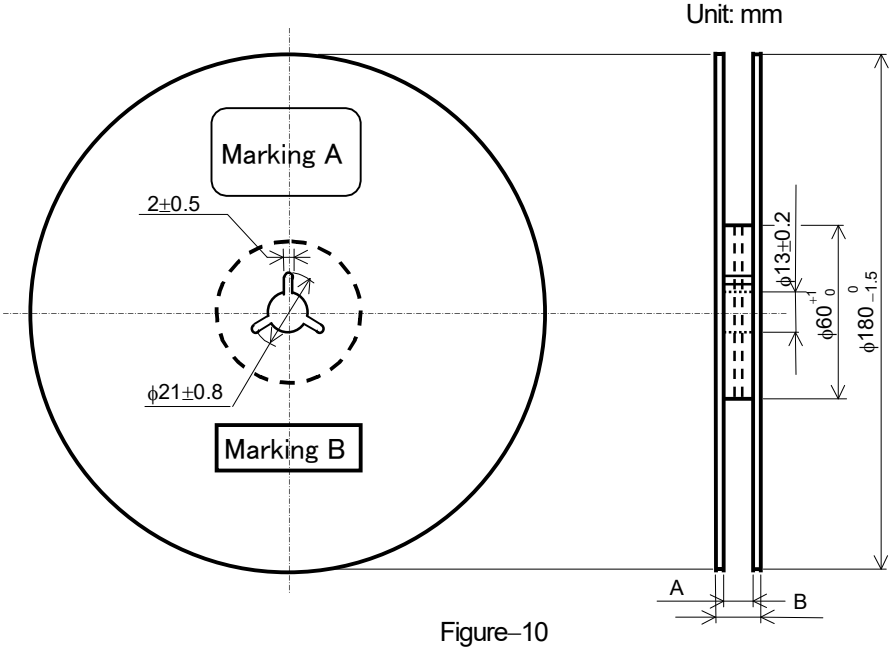
Figure−9

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)

Unit: mm



Figure−10

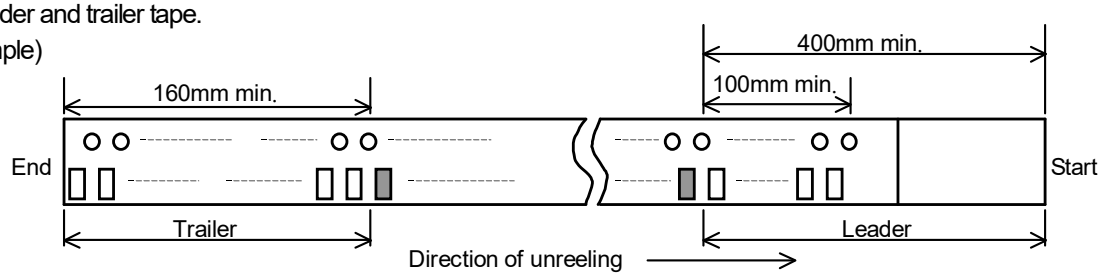
Table−9 Unit: mm

Style	A	B	Note
RMSW06,10,16,20,32,35	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.

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)