KAMAYA OHM

No.:	RMC-K-HTS-0006 /13
Date:	2022. 8. 19

Data sheet

Title: FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE

Style: RMC1/32,1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1

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.

釜屋電機株式會社
KAMAYA ELECTRIC CO., LTD.
Hokkaido Research Center
Approval by: T. Sannomiya
Drawing by: M. Shibuya

1. Scope

1.1 This data sheet covers the detail requirements for fixed thick film chip resistors; rectangular type, style of RMC1/32, 1/20, 1/16S, 1/16, 1/10, 1/8, 1/4, 1/2, 1.

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)

RMC	1/8	–	123	J	TP
1	2	3	4	5	6
Style					

2)

RMC	1/8		JP		TP
1	2		4		6
Style					

1 Fixed thick film chip resistors; rectangular type
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
JP	Chip jumper

5 Tolerance on rated resistance

D	±0.5%
F	±1%
G	±2%
J	±5%

6 Packaging form 1. Scope

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(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
RMC1/32	0.03	Standard	±200	100~1M	E24, 96	F(±1%)
			±300	10~91		
			+600~–200	4.7~9.1		
			±200	100~1M	E24	J(±5%)
			±300	10~91		
			+600~–200	1.0~9.1		
RMC1/20	0.05	Standard	±200	10~1M	E24, 96	D(±0.5%)
			±200	10~10M		F(±1%)
			+350~–100	4.02~9.76		
			+600~–200	1~3.92		
			±200	10~1M	E24	G(±2%)
			±200	10~10M		J(±5%)
			+350~–100	4.3~9.1		
			+600~–200	1~3.9		
RMC1/16S	0.1	K	±100	10~1M	E24, 96	D(±0.5%)
		Standard	±200	1.02M~3.3M		
		K	±100	10~1M		F(±1%)
		Standard	±200	1.02M~10M		
			+500~–200	1~9.76		
			±200	10~3.3M	E24	G(±2%)
			±200	10~10M		J(±5%)
			+500~–200	1~9.1		
RMC1/16	0.1	K	±100	10~3.3M	E24, 96	D(±0.5%)
			±100	10~10M		F(±1%)
		Standard	+500~–200	1~9.76		
			±200	10~10M	E24	G(±2%)
			+500~–200	1.0~9.1		
			±200	10~22M		J(±5%)
			+500~–200	1.0~9.1		
RMC1/10	0.125	K	±100	10~2.2M	E24,96	D(±0.5%)
		Standard	±200	2.21M~3.3M		
		K	±100	10~2.2M		F(±1%)
		Standard	±200	2.21M~10M		
			+500~–200	1.0~9.76		
			±200	10~10M	E24	G(±2%)
			+500~–200	1.0~9.1		
			±200	10~22M		J(±5%)
			+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
RMC1/8	0.25	K	±100	10~1M	E24,96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~–200	1.0~9.76		
			±200	10~10M	E24	G(±2%)
			+500~–200	1.0~9.1		
			±200	10~24M		J(±5%)
			+500~–200	1.0~9.1		
RMC1/4	0.5	K	±100	10~1M	E24,96	D(±0.5%)
		Standard	±200	1.02M~10M		F(±1%)
			+500~–200	1.0~9.76		
			±200	10~10M	E24	G(±2%)
				10~22M		J(±5%)
			+500~–200	1.0~9.1		
RMC1/2	0.75	K	±100	10~1M	E24, 96	F(±1%)
		Standard	+500~–200	1.0~9.76		
			±200	10~1M	E24	G(±2%)
				10~22M		J(±5%)
			+500~–200	1.0~9.1		
RMC1	1.0	K	±100	10~1M	E24, 96	F(±1%)
		Standard	+500~–200	1.0~9.76		
			±200	10~1M	E24	G(±2%)
				10~22M		J(±5%)
			+500~–200	1.0~9.1		

Style	Limiting element voltage (V)	Insulation voltage (V)	Category temperature range (°C)
RMC1/32	15	50	–55~+125
RMC1/20	25		–55~+155
RMC1/16S	50	100	
RMC1/16			
RMC1/10	150	500	
RMC1/8	200		
RMC1/4			
RMC1/2			
RMC1			

Note. Rated current of chip jumper: RMC1/32: 0.5(A), RMC1/20, 1/16S: 1(A),
RMC1/16, 1/10, 1/8, 1/4, 1/2,1: 2(A)

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

3.2 Climatic category

3.2.1 RMC1/32

55/125/56	Lower category temperature	– 55 °C
	Upper category temperature	+125 °C
	Duration of the damp heat, steady state test	56days

3.2.2 RMC1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1

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

2% Limits for change of resistance:

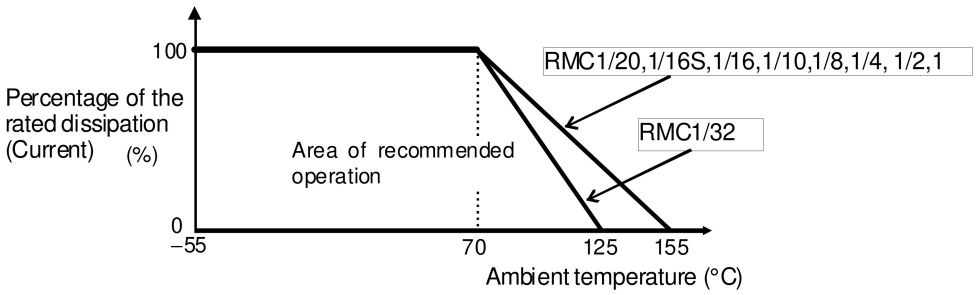
–for long–term tests ±(2%+0.1Ω) Chip jumper: 50 mΩ max.

*RMC1/32. 1/20: ±(3%+0.1Ω)

–for short–term tests ±(0.5%+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

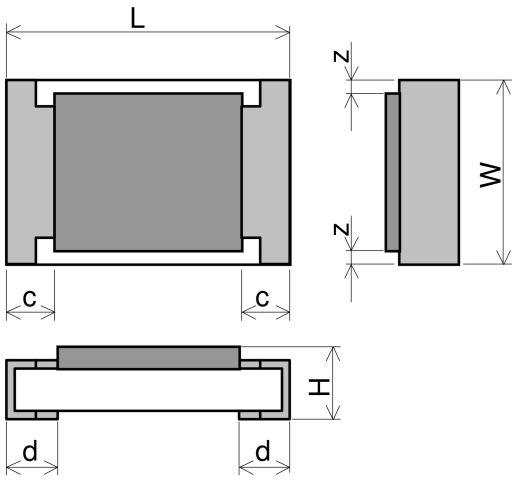
The standard packaging form shall be in accordance with Table–2.

Table–2

Symbol	Packaging form		Standard packaging quantity / units	Application
B	Bulk (loose package)		1,000 pcs.	RMC1/32,1/20,1/16S,1/16,1/10 ,1/8,1/4,1/2,1
PA	Press pocket taping (paper taping)	8mm width, 2mm pitches	20,000 pcs.	RMC1/32
			15,000 pcs.	RMC1/20
TH	Paper taping	8mm width, 2mm pitches	10,000 pcs.	RMC1/16S
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RMC1/16, 1/10, 1/8
TE	Embossed taping	8mm width, 4mm pitches	4,000 pcs.	RMC1/4
		12mm width, 4mm pitches		RMC1/2, 1

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	z
RMC1/32	0.4±0.02	0.2±0.02	0.13±0.02	0.08±0.03	0.1±0.03	---------
RMC1/20	0.6±0.03	0.3±0.03	0.23±0.03	0.1±0.05	0.15±0.05	
RMC1/16S	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	$0.25^{+0.05}_{-0.10}$	
RMC1/16	1.6±0.1	$0.8^{+0.15}_{-0.05}$	0.45±0.10	0.3±0.1	0.3±0.1	
RMC1/10	2.0±0.1	1.25±0.10	0.55±0.10	0.4±0.2	0.4±0.2	
RMC1/8	3.1±0.1	1.6±0.15	0.55±0.10	0.5±0.25	0.5±0.25	0.05~0.3
RMC1/4	3.1±0.15	2.5±0.15	0.55±0.15	0.5±0.25	0.5±0.25	0.05~0.3
RMC1/2	5.0±0.15	2.5±0.15	0.55±0.15	0.6±0.2	0.6±0.2	0.05~0.35
RMC1	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.2	0.6±0.2	0.05~0.35

5.2 Net weight (Reference)

Style	Net weight(mg)
RMC1/32	0.035
RMC1/20	0.16
RMC1/16S	0.6
RMC1/16	2
RMC1/10	5
RMC1/8	9
RMC1/4	16
RMC1/2	25
RMC1	40

6. Marking

The Rated resistance of RMC1/32, 1/20, 1/16S is not be marked.

6.1 RMC1/10,1/8,1/4,1/2,1

The nominal resistance shall be marked in 3 digits or 4 digits and marked on over coat side.

- Malaysia products: E24 series: 3 digits, E96 series: 4 digits
  In case of the resistance value that E96 overlaps with E24, It is marked by either.
- China products(RMC1/10,1/8): J(±5%): 3 digits, F(±1%): 4 digits

Marking example		Contents	Application
Malaysia	China		
123	123	12×10^3 [Ω] → 12 [kΩ]	RMC1/10,1/8,1/4,1/2,1
2R2	2R2	2. 2 [Ω]	Less than 10Ω of RMC1/8,1/4,1/2,1
2 . 2	2R2	2. 2 [Ω]	Less than 10Ω of RMC1/10
5623	5623	562×10^3 [Ω] → 562[kΩ]	RMC1/10,1/8,1/4,1/2,1
12R7	12R7	12.7 [Ω]	RMC1/10,1/81/4,1/2,1

6.2 RMC1/16

The nominal resistance shall be marked in 3 digits (E24 and/or E96) and marked on over coat side.
No marking in the E96 series of a Malaysia.
In case of the resistance value that E96 overlaps with E24, there is a case to mark in E96.

Marking example		Contents	Application
Malaysia	China		
123	123	12×10^3 [Ω] → 12 [kΩ]	E24
2R2	2R2	2. 2 [Ω]	E24
No marking	02C	102×10^2 [Ω] → 10.2 [kΩ]	E96
No marking	51X	332×10^{-1} [Ω] → 33.2 [Ω]	E96

	marking	Sub-clause 4.3.6 Solvent: 2–propanol Solvent temperature: 23 °C ± 5 °C Method 1 Rubbing material: cotton wool Without recovery	

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 Test substrate: Figure–4	
	Bound strength of the end face plating	Sub–clause 4.33 Bent value: 3 mm (3225 size max.) 1 mm (5025 size min.)	
		Resistance	$\Delta R \leq \pm (0.5\%+0.05\Omega)$ Chip jumper: 50mΩ max.
	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	$\Delta R \leq \pm (0.5\%+0.05\Omega)$ Chip jumper: 50mΩ max.
	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	$\Delta R \leq \pm (0.5\%+0.05\Omega)$ Chip jumper: 50mΩ max.
8	Mounting	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3	
	Adhesion	Sub–clause 4.32 Force: 5 N (RMC1/32: 2N, RMC1/20: 3N) Duration: 10 s ± 1 s	
		Visual examination	No visible damage
	Rapid change temperature	Sub–clause 4.19 RMC1/32 Lower category temperature: –55 °C Upper category temperature: +125 °C RMC1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1 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	$\Delta R \leq \pm(0.5\%+0.05\Omega)$ Chip jumper: 50mΩ max.

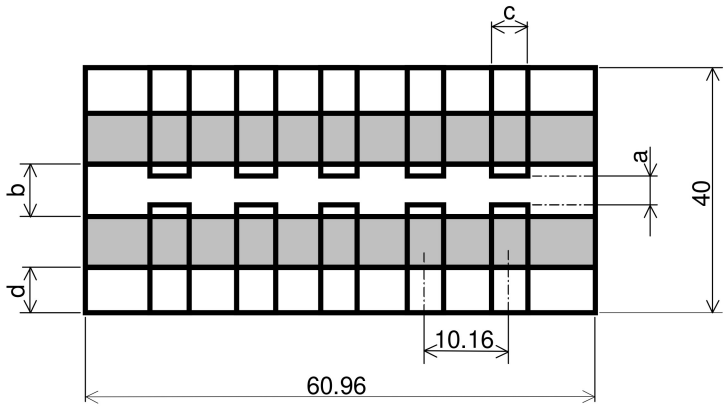
Table–4(3)

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
9	Climatic sequence –Dry heat	Sub–clause 4.23 Sub–clause 4.23.2 RMC1/32 Test temperature: +125 °C RMC1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1: Test temperature: +155 °C Duration: 16 h	
	–Damp heat, cycle (12+12hour cycle) First cycle	Sub–clause 4.23.3 Test method: 2 Test temperature: 55 °C [Severity(2)]	
	–Cold	Sub–clause 4.23.4 Test temperature –55 °C Duration: 2h	
	–Damp heat, cycle (12+12hour cycle) Remaining cycle	Sub–clause 4.23.6 Test method: 2 Test temperature: 55 °C [Severity (2)] Number of cycles: 5 cycles	
	–D.C. load	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 RMC1/32,1/20: $\Delta R \leq \pm (3\%+0.1\Omega)$ Others: $\Delta R \leq \pm (2\%+0.1\Omega)$ Chip jumper: 50mΩ max.
10	Mounting	Sub–clause 4.31 Substrate material: Epoxide woven glass (RMC1may use Alumina substrate.) Test substrate: Figure–3	
	Endurance at 70 °C	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 RMC1/32,1/20: $\Delta R \leq \pm (3\%+0.1\Omega)$ Others: $\Delta R \leq \pm (2\%+0.1\Omega)$ Chip jumper: 50mΩ max.

Table–4(4)

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
11	Mounting Variation of resistance with temperature	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.8 RMC1/32: –55 °C / +20 °C +20 °C / +125°C RMC1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1: –55 °C / +20 °C +20 °C / +155°C	As in Table–1
12	Mounting Damp heat, steady state	Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 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 RMC1/32,1/20: $\Delta R \leq \pm$ (3%+0.1Ω) Others: $\Delta R \leq \pm$ (2%+0.1Ω) Chip jumper: 50mΩ max.
13	Dimensions (detail) Mounting Endurance at upper category temperature	Sub–clause 4.4.3 Sub–clause 4.31 Substrate material: Epoxide woven glass Test substrate: Figure–3 Sub–clause 4.25.3 RMC1/32: Ambient temperature:125 °C ± 2 °C RMC1/20,1/16S,1/16,1/10,1/8,1/4,1/2,1: 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 RMC1/32,1/20: $\Delta R \leq \pm$ (3%+0.1Ω) Others: $\Delta R \leq \pm$ (2%+0.1Ω) Chip jumper: 50mΩ max.

8. Test substrate



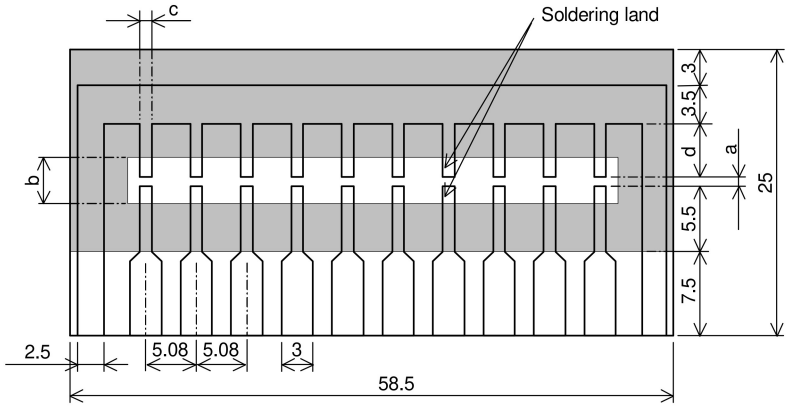
Unit: mm

:Copper clad

:Solder resist

Style	a	b	c	d
RMC1/2	4.0	7.5	2.0	7.5
RMC 1	5.0	9.0	4.5	7.5

RMC1/2, 1 TEST SUBSTRATE



Unit: mm

:Copper clad

:Solder resist

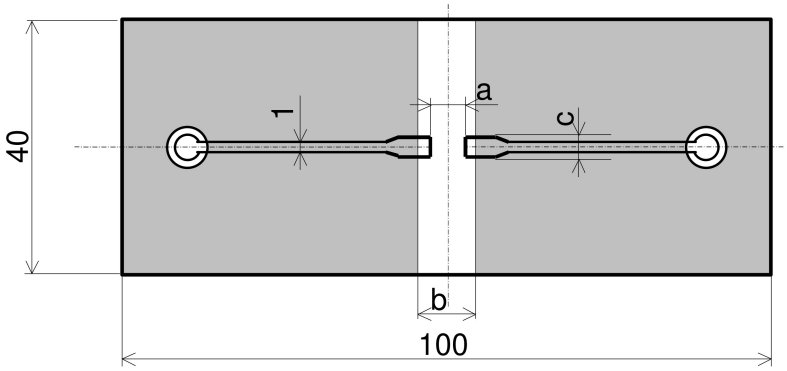
Style	a	b	c	d
RMC1/32	0.2	0.56	0.2	5.3
RMC1/20	0.3	1.5	0.45	5.2
RMC1/16S	0.6	1.9	0.7	4.9
RMC1/16	1.0	3.6	1.0	4.5
RMC1/10	1.2	4.0	1.5	4.3
RMC1/8	2.1	3.9	1.7	3.4
RMC1/4	2.2	5.0	2.9	3.3

RMC1/20, 1/16S, 1/16, 1/10, 1/8, 1/4 TEST SUBSTRATE

Figure–3

Remark 1). Material: Epoxide woven glass
Thickness: 1.6mm Thickness of copper clad: 0.035mm

2). In the case of connection by connector, the connecting terminals are gold plated.
However, the plating is not necessary when the connection is made by soldering.



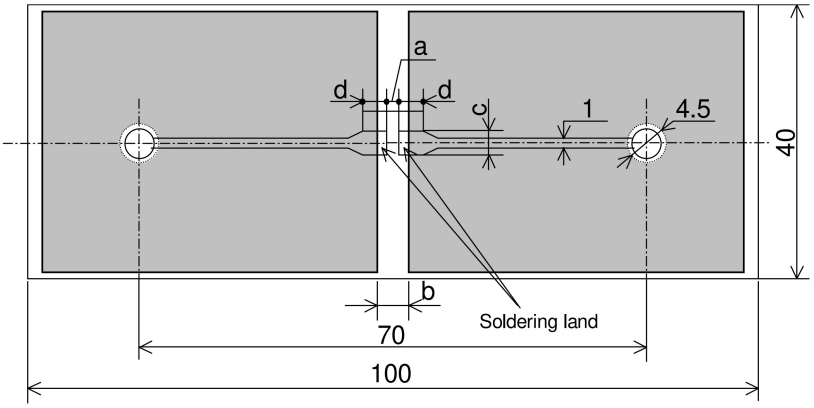
Unit: mm

:Copper clad

:Solder resist

Style	a	b	c
RMC1/2	4.0	7.5	3.0
RMC 1	5.0	9.0	4.0

RMC1/2, 1 BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE



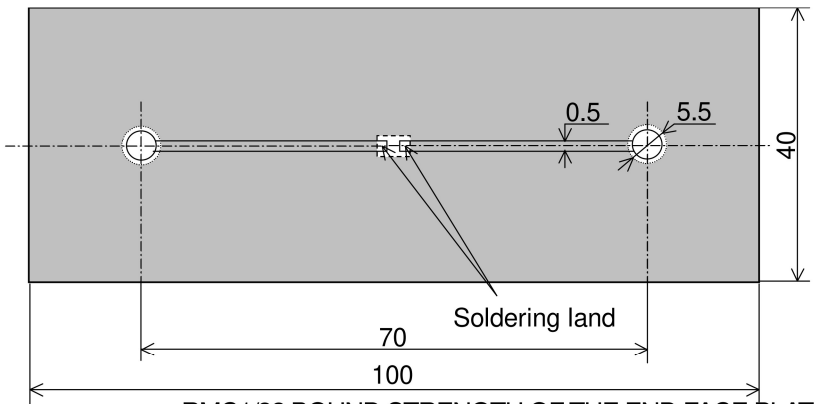
Unit: mm

:Copper clad

:Solder resist

Style	a	b	c	d
RMC1/20	0.3	1.1	0.45	2.15
RMC1/16S	0.6	1.9	0.7	2.0
RMC1/16	1.0	3.6	1.20	3.0
RMC1/10	1.2	4.0	1.65	3.0
RMC1/8	2.5	5.0	2.0	2.5
RMC1/4	2.2	5.0	2.9	2.5

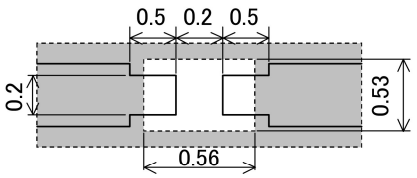
RMC1/20,1/16S,1/16,1/10,1/8,1/4 BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE



Unit: mm

:Copper clad

:Solder resist

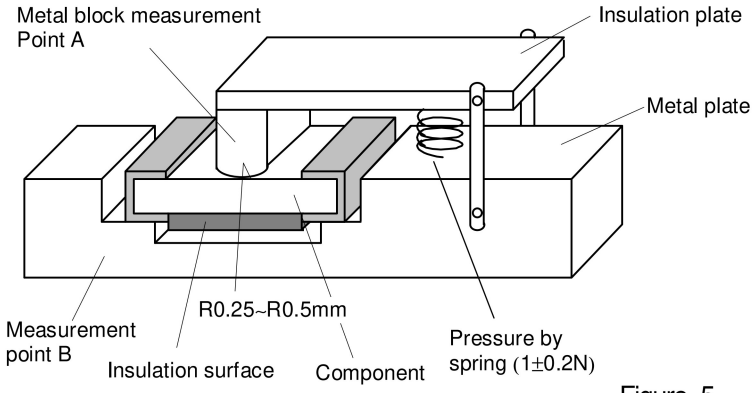


RMC1/32 BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE

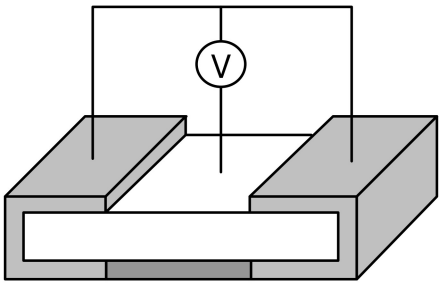
Remark 1). Material: Epoxide woven glass
Thickness: 1.6mm Thickness of copper clad: 0.035mm

Figure–4

· RMC1/16S,1/16,1/10,1/8,1/4,1/2,1



· RMC1/32, 1/20



Figure–5

9. Taping

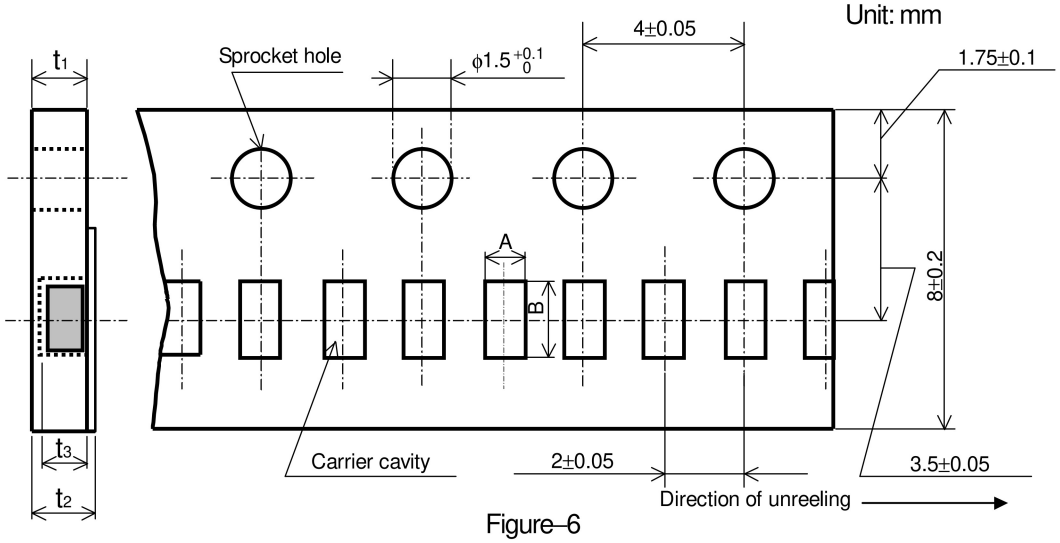
9.1 Applicable documents JIS C 0806–3: 2014, EIAJ ET–7200C: 2010

9.2 Taping dimensions

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

Taping dimensions shall be in accordance with Figure–6 and Table–5.

Unit: mm



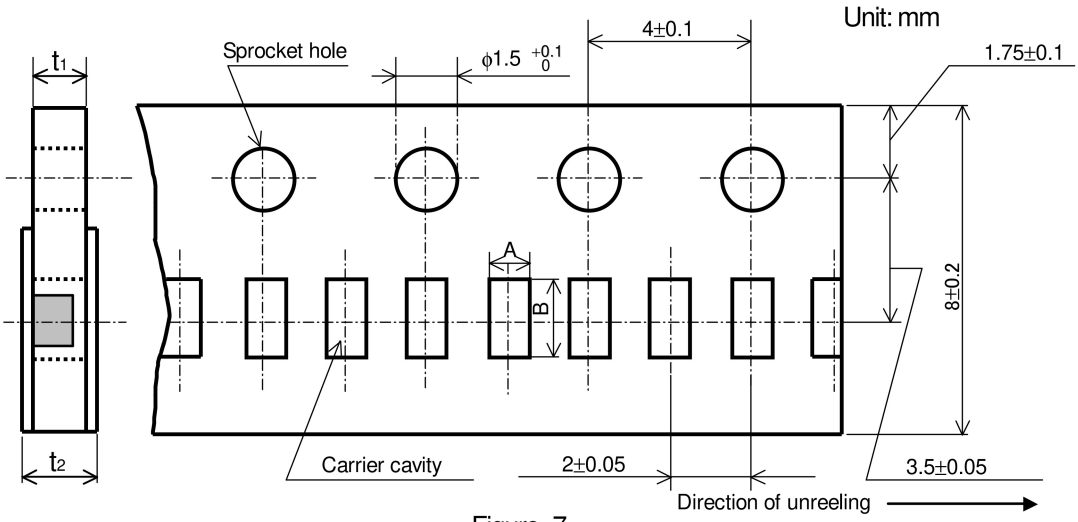
Figure–6

Table–5 Unit: mm

Style	A	B	t_1	t_2	t_3
RMC1/32	0.24±0.03	0.45±0.03	0.31±0.03	0.36±0.03	0.15±0.02
RMC1/20	0.37±0.05	0.67±0.05	0.42±0.03	0.45±0.05	0.27±0.02

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

Taping dimensions shall be in accordance with Figure–7 and Table–6.



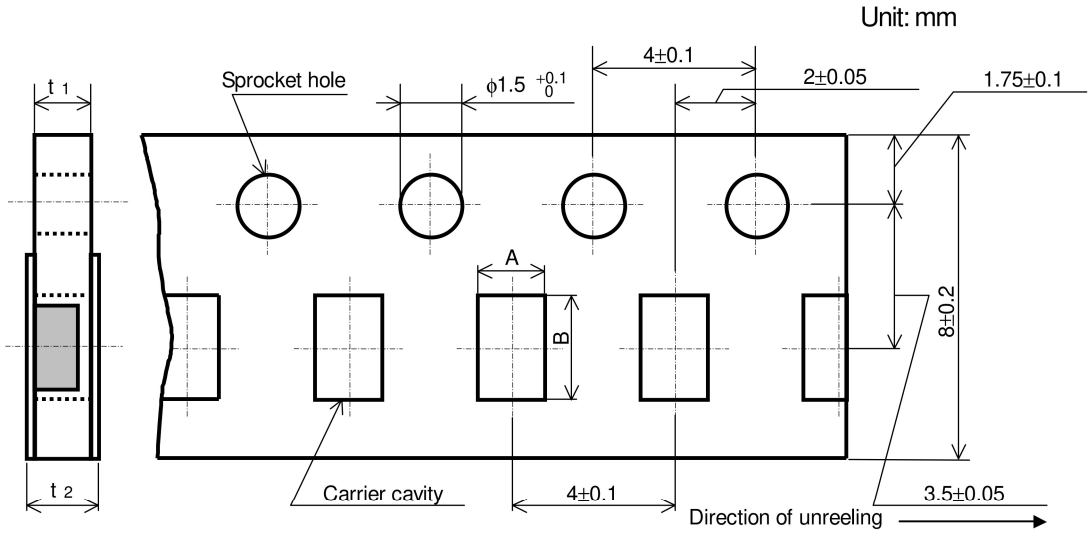
Figure–7

Table–6 Unit: mm

Style	A	B	t_1	t_2
RMC1/16S	$0.65^{+0.05}_{-0.10}$	$1.15^{+0.05}_{-0.10}$	0.4 ± 0.05	0.5max.

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

Taping dimensions shall be in accordance with Figure–8 and Table–7.



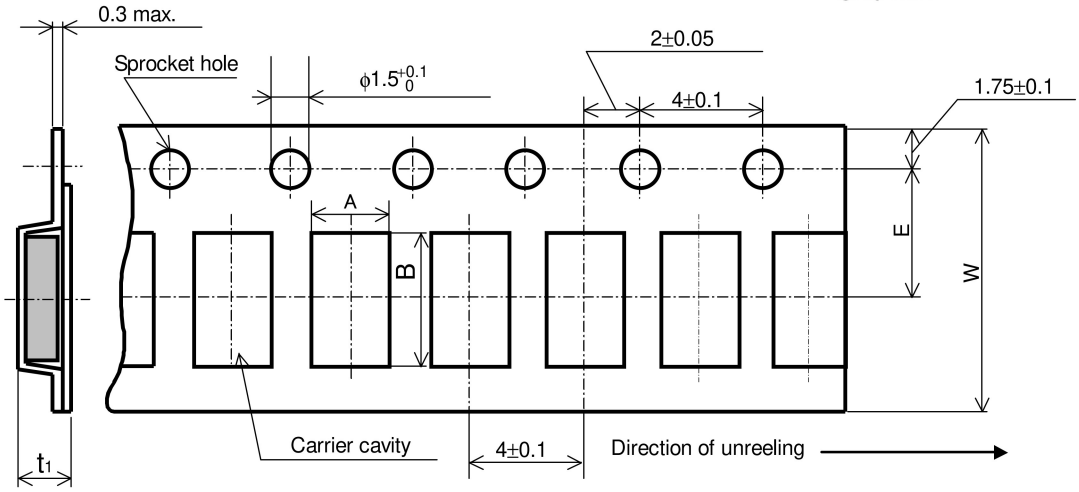
Figure–8

Table–7 Unit: mm

Style	A	B	t_1	t_2
RMC1/16	1.15±0.15	1.9±0.2	0.6±0.1	0.8max.
RMC1/10	1.65±0.15	2.5±0.2	0.8±0.1	1.0max.
RMC1/8	2.00±0.15	3.6±0.2		

9.2.4 Embossed taping dimensions shall be in accordance with Figure–9 and Table–8.

Unit: mm

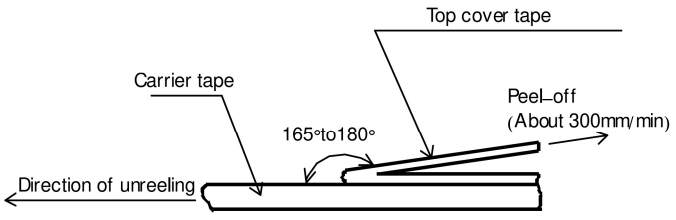


Figure–9

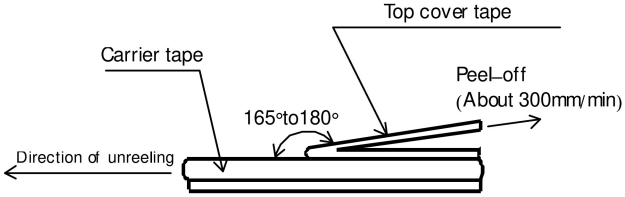
Table–8 Unit: mm

Style	A	B	W	E	t_1
RMC1/4	2.85±0.20	3.5±0.2	8.0±0.3	3.5±0.05	1.0±0.2
RMC1/2	3.1±0.2	5.5±0.2	12.0±0.3	5.5±0.05	1.1±0.15
RMC 1	3.6±0.2	6.9±0.2			

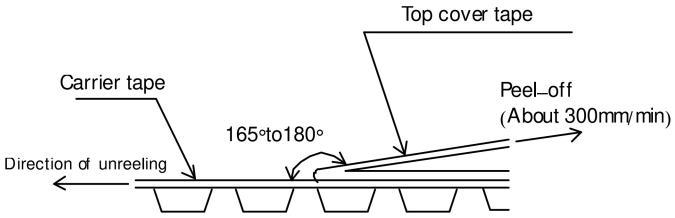
1). The cover tapes shall not cover the sprocket holes.
2). Tapes in adjacent layers shall not stick together in the packing.
3). Components shall not stick to the carrier tape or to the cover tape.
4). Pitch tolerance over any 10 pitches ±0.2mm.
5). The peel strength of the top cover tape shall be with in 0.1N to 0.5N on the test method as shown in the following RMC1/32,1/20: Figure–10, RMC1/16S, 1/16, 1/10, 1/8: Figure–11, RMC1/4, 1/2, 1: Figure–12.
6). When the tape is bent with the minimum radius for RMC1/32, 1/20, 1/16S, 1/16, 1/10,1/8, 1/4: 25 mm, or RMC1/2, 1: 30 mm, the tape shall not be damaged and the components shall maintain their position and orientation in the tape.
7). In no case shall there be two or more consecutive components missing.
The maximum number of missing components shall be one or 0.1%, whichever is greater.
8). The resistors shall be faced to upward at the over coating side in the carrier cavity.



Figure–10



Figure–11



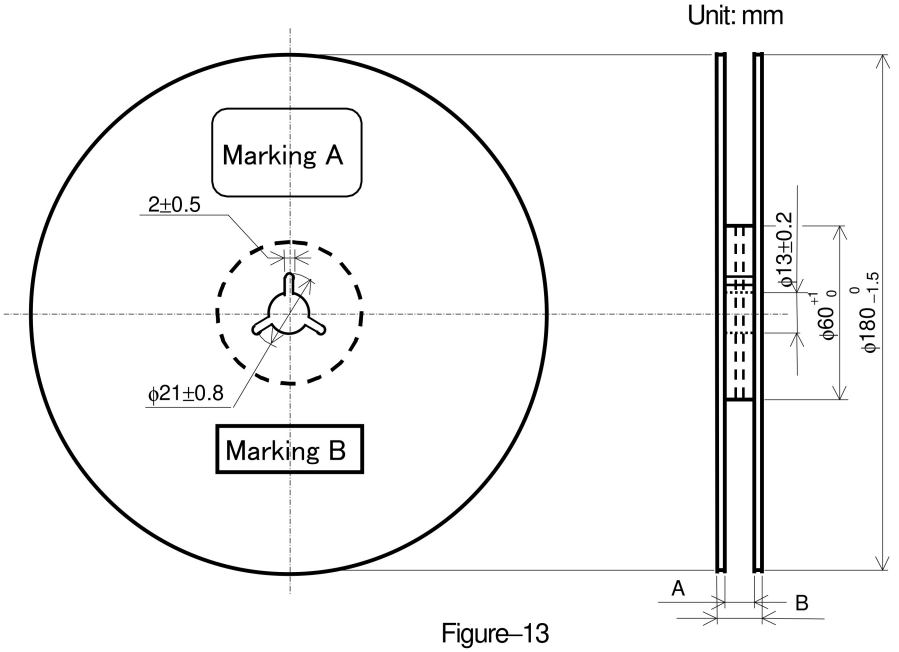
Figure–12

9.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure–13 and Table–9.

Plastic reel (Based on EIAJ ET–7200C)

Unit: mm



Figure–13

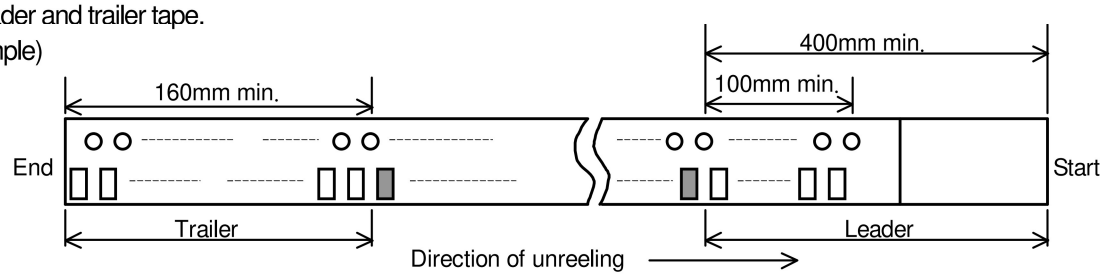
Table–9 Unit: mm

Style	A	B	Note
RMC1/32, 1/20, 1/16S, 1/16, 1/10, 1/8, 1/4	9 $^{+1.0}_{0}$	11.4±1.0	Injection molding
		13±1.0	Vacuum forming
RMC1/2, 1	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.

9.4 Leader and trailer tape.

(Example)



Figure–14

10. Marking on package

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

10.1 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

10.2 Marking B (KAMAYA Control label)