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Last update: 2012.8.30 No.RVC-K-HTS-0001-8 (Uncontrolled copy)

# Specification

(Reference)

Title: FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE

AND HIGH VOLTAGE

Style: RVC16,20,32,50,63

# **RoHS COMPLIANCE ITEM**

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Issue Dept.: Research & Development Department Hokkaido Research Center

Title: FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE AND HIGH VOLTAGE

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#### 1. Scope

1.1 This specification covers the detail requirements for fixed thick film chip resistors; rectangular type, style of RVC16, 20, 32, 50, 63

#### 1.2 Applicable documents

JIS C 5201-1: 1998, JIS C 5201-8: 1998, JIS C 5201-8-1: 1998

IEC60115-1: 1999, IEC60115-8: 1989 Amendment 1: 1992, IEC60115-8-1: 1989

EIAJ RC-2134B-2002

#### 2. Classification

Type designation shall be the following form.

(Example)

RVC	32	_	475	F	TP
1	2	3	4	5	6
Stv	le				

1 Fixed thick film chip resistors; rectangular type and high voltage

— Style

2 Size

3 Temperature coefficient of resistance

K	±100×10 <sup>-6</sup> / °C
-(Dash)	Standard

- 4 Rated resistance Example;  $475 \rightarrow 4.7 M\Omega$
- 5 Tolerance on rated resistance
- 6 Packaging form

#### 3. Rating

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

Table-1(1)

				Table—I(I)														
Style	Rated		e coefficient of	Rated resistance	Preferred number	Tolerance on rated												
Otyle	dissipation (W)	resistano	e ( 10 <sup>-6</sup> / °C)	range(Ω)	series for resistors	resistance												
		K	±100	470~10M	E24, 96	F(±1%), G(±2%)												
RVC16	0.1	IX	±100	470~10W	E24	J(±5%), K(±10%)												
	0.1	Standard	±200	47~464	E24, 96	F(±1%), G(±2%)												
		Staridard	1200	47~404	E24	J(±5%), K(±10%)												
		К	±100	100~10M	E24, 96	F(±1%), G(±2%)												
RVC20	0.25	IX	±100	100~51M	E24	J(±5%), K(±10%)												
111020	0.23	Standard	±200	47~97.6	E24, 96	F(±1%), G(±2%)												
		Statitualu	±200	47~97.0	E24	J(±5%), K(±10%)												
	0.25	K 25	±100	100k~4.7M	E24, 96	D(±0.5%)												
				100~10M		F(±1%), G(±2%)												
RVC32				100~51M	E24	J(±5%), K(±10%)												
		Standard	Standard ±200	47~97.6	E24, 96	F(±1%), G(±2%)												
		Staridard			E24	J(±5%), K(±10%)												
		К	±100	470~20M	E24, 96	F(±1%), G(±2%)												
RVC50	0.5	r.	±100	470~51M	E24	J(±5%), K(±10%)												
11,000		Standard	±200	47~464	E24, 96	F(±1%), G(±2%)												
				±200 47~404	E24	J(±5%), K(±10%)												
		K	±100	560~20M	E24, 96	F(±1%), G(±2%)												
		IX	±100	560~51M	E24	J(±5%), K(±10%)												
RVC63	1.0		1200	100~549	E24, 96	F(±1%), G(±2%)												
11,0003	1.0	Standard	±200	100~548	E24	J(±5%), K(±10%)												
		StatitualU	· <b>5</b> 00 200	47.076	E24, 96	F(±1%), G(±2%)												
															+500~-200	47~97.6	E24	J(±5%), K(±10%)

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Table-1(2)

Style	Limiting element voltage(V)	Isolation voltage (V)	Category temperature range (°C)
RVC16	200	100	
RVC20	400		
RVC32	500	500	<i>–</i> 55∼+125
RVC50	500	500	
RVC63	800		

# 3.2 Climatic category

55/125/56 Lower category temperature - 55 °C
Upper category temperature +125 °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%+0.1Ω) -for short–term tests  $\pm$ (1%+0.05Ω)

# 3.4 Derating

The derated values of dissipation at temperature in excess of 70 °C shall be as indicated by the following curve.

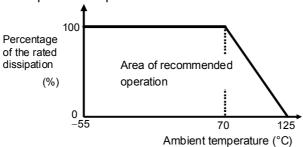


Figure-1 Derating curve

# 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.

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
В	Bulk (loose package	)	1,000 pcs.	RVC16, 20, 32, 50, 63
TP	Paper taping	8mm width, 4mm pitches	5,000 pcs.	RVC16, 20, 32
TE	Embossed taping	12mm width, 4mm pitches	4,000 pcs.	RVC50, 63

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#### 5. Dimensions

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

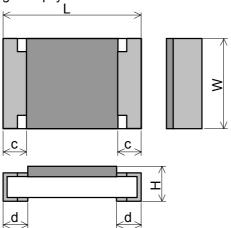


Figure-2

	Iable-3				Unit : mm
Style	L	W	Н	С	d
RVC16	1.6 ± 0.1	$0.8^{+0.15}_{-0.05}$	0.45 ± 0.10	$0.3 \pm 0.1$	$0.3 \pm 0.1$
RVC20	$2.0 \pm 0.1$	1.25 ± 0.10	0.55 ± 0.10	$0.4 \pm 0.2$	$0.4 \pm 0.2$
RVC32	3.2 ± 0.15	1.6 ± 0.15	0.55 ± 0.10	$0.5 \pm 0.25$	$0.5 \pm 0.25$
RVC50	5.0 ± 0.15	2.5 ± 0.15	0.55 ± 0.15	$0.6 \pm 0.2$	0.6 ± 0.2
RVC63	6.3 ± 0.15	$3.2 \pm 0.15$	0.00 ± 0.10	0.0 ± 0.2	0.0 ± 0.2

# 5.2 Net weight (Reference)

Style	Net weight(mg)
RVC16	2
RVC20	5
RVC32	9
RVC50	25
RVC63	40

#### 6. Marking

The Rated resistance shall be marked in 3 digits (E24) or 4 digits (E96) and marked on over coat side.

The Rated resistance of RVC16 should not be marked in 4 digits.

(Example) "123" 
$$\rightarrow$$
 12 ×10  $^{3}$  [ $\Omega$ ]  $\rightarrow$  12 [k $\Omega$ ] "5623"  $\rightarrow$  562 ×10  $^{3}$  [ $\Omega$ ]  $\rightarrow$  562 [k $\Omega$ ] "51R1"  $\rightarrow$  51.1 [ $\Omega$ ]

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#### 7. Performance

7.1 The standard condition for tests shall be in accordance with Sub-clause 4.2, JIS C 5201–1: 1998.

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	As in 4.4.1
		Checked by visual examination.	The marking shall be legible, as
		,,	checked by visual examination.
2	Dimension	Sub-clause 4.4.2	As specified in Table-3 of this
			specification.
	Resistance	Sub-clause 4.5	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	No breakdown or flash over
3	Voltage proof	Method: 4.6.1.4(See Figure–5)	NO DIEARGOWITOI IIASITOVEI
		Test voltage: Alternating voltage with a peak	
		value of 1.42 times the insulation	
		voltage.	
		Duration: 60 s ± 5 s	
		Insulation resistance	R≥1GΩ
		Test voltage: Insulation voltage	
		Duration: 1 min.	
4	Solderability	Sub-clause 4.17	As in 4.17.4.5
		Without ageing	The terminations shall be covered
		Flux: The resistors shall be immersed in a	with a smooth and bright solder
		non-activated soldering flux for 2s.	coating.
		Bath temperature: $235 ^{\circ}\text{C} \pm 5 ^{\circ}\text{C}$ Immersion time: $2  \text{s} \pm 0.5  \text{s}$	
5	Mounting	Sub-clause 4.31	
5	IVIOUTILITY	Substrate material: Epoxide woven glass	
		Test substrate: Figure–3	
		Sub-clause 4.13	
	Overload	The applied voltage shall be 2.5 times the rated	
	(in the mounted state)	voltage or twice the limiting element voltage,	
	,	whichever is the less severe.	
		Duration: 2 s	
		Visual examination	No visible damage
	Ochocat mariet	Resistance	$\Delta R \leq \pm (1\% + 0.05\Omega)$
	Solvent resistance of the	Sub-clause 4.30	Legible marking
	marking	Solvent: 2-propanol	
		Solvent temperature: 23 °C ± 5 °C	
		Method 1	
		Rubbing material: cotton wool	
		Without recovery	

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# 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	Sub-clause 4.33	
	face plating	Bent value: 3 mm (3216 size max.)	
		1 mm (5025 size min.)	AD < 1 (40/ 10.050)
	Final measurements	Resistance	$\Delta R \le \pm (1\% + 0.05\Omega)$ No visible damage
	i illai measurements	Sub-clause 4.33.6	NO VISIBLE dalliage
<u> </u>	Desistance to caldering be at	Visual examination	
7	Resistance to soldering heat	Sub-clause 4.18	
		Solder temperature: 260 °C ± 5 °C	
		Immersion time: 10 s ± 0.5 s	As in 4.18.3.4
		Visual examination	
		Decistores	No sign of damage such as cracks.
	Component solvent	Resistance Sub-clause 4.29	$\Delta R \le \pm (1\% + 0.05\Omega)$
	resistance		
	1 CSIStal ICC	Solvent: 2–propanol	
		Solvent temperature: 23 °C ± 5 °C Method 2	
		Recovery: 48 h	
		Visual examination	No visible damage
		Resistance	$\Delta R \le \pm (1\% + 0.05\Omega)$
8	Mounting	Sub-clause 4.31	,
	3	Substrate material: Epoxide woven glass	
		Test substrate: Figure-3	
	Adhesion	Sub-clause 4.32	
		Force: 5 N	
		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: +125 °C	
		Duration of exposure at each temperature: 30	
		min.	
		Number of cycles: 5 cycles.	No visible damage
		Visual examination	No visible damage $\Delta R \le \pm (1\% + 0.05\Omega)$
1		Resistance	$\triangle \Gamma \ge \pm (1.70 \pm 0.0052)$

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# Table-4(3)

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
9	Climatic sequence	Sub-clause 4.23	
	-Dry heat	Sub-clause 4.23.2	
	-	Test temperature: +125 °C	
		Duration: 16 h	
	–Damp heat, cycle	Sub-clause 4.23.3	
	(12+12hour cycle)	Test method: 2	
	First cycle	Test temperature: 55 °C	
	-	[Severity(2)]	
	-Cold	Sub-clause 4.23.4	
		Test temperature –55 °C	
		Duration: 2h	
	–Damp heat, cycle	Sub-clause 4.23.6	
	(12+12hour cycle)	Test method: 2	
	Remaining cycle	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.	No visible demage
		Visual examination	No visible damage
		Resistance	$\Delta R \le \pm (5\% + 0.1\Omega)$
10	Mounting	Sub-clause 4.31	
		Substrate material: Epoxide woven glass	
		(RVC63 may 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.	
		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:	No visible demand
		Visual examination	No visible damage
		Resistance	$\Delta R \le \pm (5\% + 0.1\Omega)$

FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE AND HIGH VOLTAGE

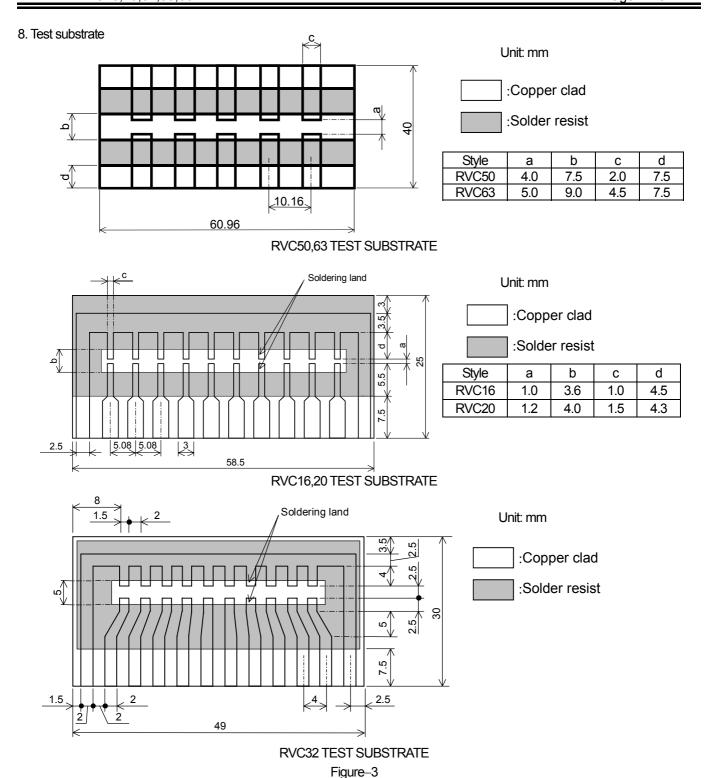
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# Table-4(4)

No	Test items	Condition of test (JIS C 5201–1)	Performance requirements
11	Mounting	Sub-clause 4.31 Substrate material: Epoxide woven glass	
	Variation of resistance with temperature	Test substrate: Figure–3 Sub–clause 4.8 –55 °C / +20 °C +20 °C / +125°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 ΔR ≤ ± (5%+0.1Ω)
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 Ambient temperature:125 °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 $\Delta R \le \pm (5\% + 0.1\Omega)$

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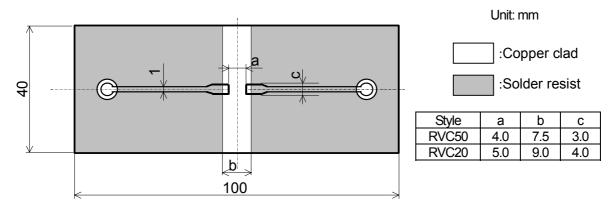
Remark 1). Material: Epoxide woven glass

Thickness: 1.6mm Thickness of copper clad: 0.035mm

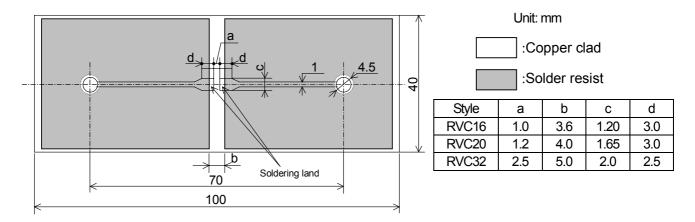
2). In the case of connection by connector, the connecting terminals are gold plated. However, the plating is not necessary when the connection is made by soldering.

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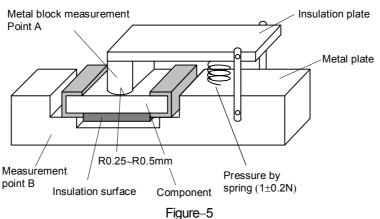
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RVC50,63 TERMINAL STRENGTH TEST SUBSTRATE



Remark 1). Material: Epoxide woven glass
Thickness: 1.6mm Thickness of copper clad: 0.035mm
RVC16,20,32 BOUND STRENGTH OF THE END FACE PLATING TEST SUBSTRATE
Figure-4



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#### 9. Taping

- 9.1 Applicable documents JIS C 0806-3: 1999, EIAJ ET-7200B: 2003
- 9.2 Taping dimensions
- 9.2.1 Paper taping (8mm width, 4mm pitches)

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

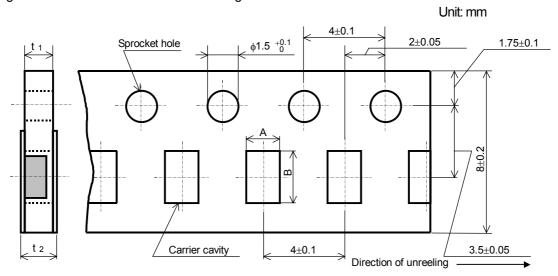
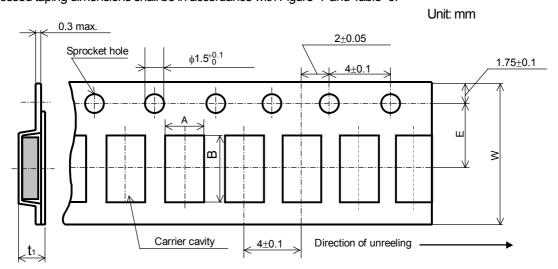


Figure-6

		Unit: mm		
Style	Α	В	<b>t</b> 1	<b>t</b> 2
RVC16	1.15±0.15	1.9±0.2	0.6±0.1	0.8max.
RVC20	1.65±0.15	2.5±0.2	0.8±0.1	1.0max.
RVC32	2.00±0.15	3.6±0.2	0.0±0.1	1.011ax.

### 9.2.2 Embossed taping dimensions shall be in accordance with Figure-7 and Table-6.



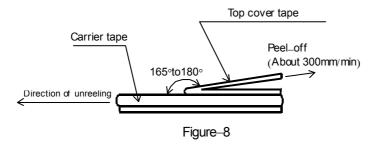
Figure\_7

lable-6					Unit: mm
Style	Α	В	W	E	t 1
RVC50	3.1±0.2	5.5±0.2	12.0±0.3	5.5±0.05	1.1±0.15
RVC63	3.6±0.2	6.9±0.2	12.0±0.3	5.5±0.05	1.1±0.15

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- 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 RVC16,20,32: Figure–8, RVC50,63: Figure–9.
- 6). When the tape is bent with the minimum radius for RVC16,20,32: 25 mm, or RVC50,63: 30 mm, the tape shall not be damaged and the components shall maintain their position and orientation in the tape.
- 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.



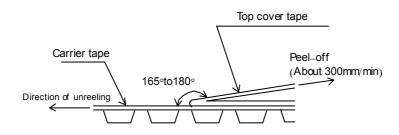


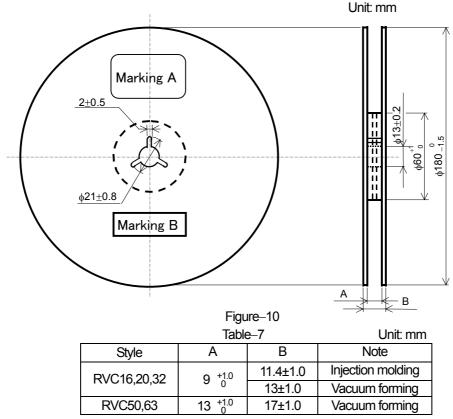
Figure-9

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#### 9.3 Reel dimension

Reel dimensions shall be in accordance with the following Figure–10 and Table–7. Plastic reel (Based on EIAJ ET–7200B)



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.

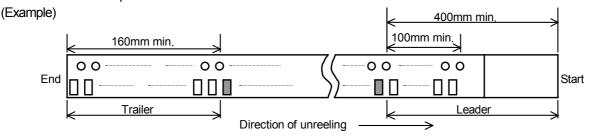


Figure-11

# 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)