

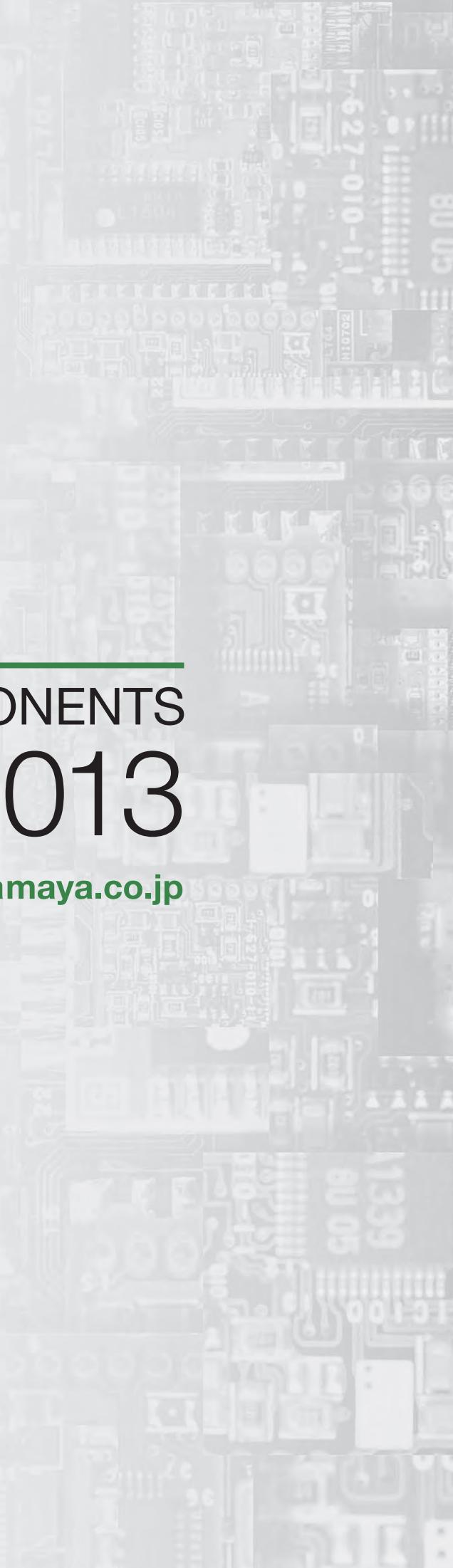
# KAMAYA

## ELECTRONIC COMPONENTS CATALOG

Products Guide

# 2013

<http://www.kamaya.co.jp>



# Chip product situation for environment

November, 2012

The reduction of the environmental hazardous materials(ex:Halogen, Antimony) of all chip product is promoted in KAMAYA now.

Products	RoHS	Pb free (Pb ≤ 1000ppm)	Halogen free (Cl or Br ≤ 900ppm & Cl+Br ≤ 1500ppm)	Antimony free (Sb <sub>2</sub> O <sub>3</sub> ≤ 900ppm)
<b>Chip Resistors</b>				
[General] RMC Series	○	×	○	○
[General] RGC Series	○	×	○	○
[General] RNC Series	○	○	○	○
[High Voltage] RVC Series	○	×	○	○
[High Voltage] RZC Series	○	×	○	○
[Surge] RPC Series	○	×	○	○
[Trimable] FCR Series	○	×	○	○
[Sensing] RLC Series	○	×	○	○
[Sensing] RLS Series	○	×	○	○
[Sensing] RLP · MLP Series	○	○	○	○
[Sensing] RCC Series	○	○	○	○
[Sensing] RHC Series	○	×	○	○
<b>Chip Network</b>				
[Chip Network] RAC Series	○	×	○	○
[Chip Network] RAC168U	○	×	○	○
<b>Chip Fuses</b>				
[Circuit Protection] FCC · FHC Series	○	○	○	○
[Circuit Protection] FCCR Series	○	○	○	○
[Circuit Protection] FMC16 Option code : AB	○	○	○	○
[Circuit Protection] FMC16 Option code : AH	○	○	○	○
[Circuit Protection] FMC10 Option code : AB	○	○	○	○
[Circuit Protection] SBF Series	○	○	○	○
<b>Chip Fusible Resistors</b>				
[Circuit Protection] FRC Series	○	×	○	○
<b>ESD Suppressors</b>				
[Circuit Protection] SPC Series	○	○	○	○
[Circuit Protection] HSPC Series	○	○	○	○
<b>Chip Attenuators</b>				
[High Frequency] RAC101A	○	×	○	○
<b>Chip Thermistors</b>				
[Temperature Compensation] LTC Series	○	○	○	○

<<NOTE>> The threshold in Pb free, Halogen free and Antimony free product shows the content in a homogeneous material.

"○"mean the items are matched the condition. "×"mean the items are not match the condition.

## RoHS Directive Compliance & REACH Action

### 1. RoHS Directive Compliance

(1) All Kamaya products are in compliance with RoHS directive\*1.

(2) The following 6 materials are prohibited by RoHS directive.

-Lead(Pb)      -Hexavalent Chromium  
-Cadmium(Cd)    -Polybrominated Bipheyl(PBB)  
-Mercury(Hg)     -Polybrominated Diphenyl Ether(PBDE)

(3) PbO is content in glass materials of Kamaya products.

However, this is exception stated by RoHS directive.

=>Directive 2011/65/EU OF THE EUROPEAN PARLIAMENT

AND OF THE COUNCIL of 8 June 2011 7(c)-I

Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound.

(4) About shipment product after January,2004 of our product(KAMAYA brand product),we ship it with an article (an electrode plating no lead article) for environment.

### 2. Kamaya REACH Action

Kamaya produce and develop our products in compliance with REACH\*2 which is effective since June 2007.

Please contact Kamaya Sales department about contained material of SVHC\*3 in Kamaya product, which need permission in REACH regulation.

\*1 RoHS Directive(The restriction of the certain hazardous substances in electrical and electronic equipment.)

\*2. REACH (The Regulation for Registration, Evaluation, Authorization, and Restriction of Chemicals)

\*3. SVHC (Substances of Very High Concern)

Substances in REACH regulation that especially affect the global environment and human body.

Please refer to ECHA (European Chemicals Agency) website for detail about SVHC in REACH regulation.

ECHA website :

([http://echa.europa.eu/chem\\_data/authorisation\\_process/candidate\\_list\\_table\\_en.asp](http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp))

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# Chip Resistors

General purpose

**KAMAYA OHM** <http://www.kamaya.co.jp>

## RMC

Halogen Free

Antimony Free

### ●Features

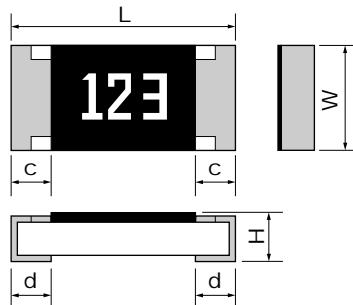
01005 to 2512 inch size and Jumper chip available.

Precise dimension by Laser-scriber method(RMC1/20,RMC1/32).

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Walsin Technology Corporation OEM products (1206 to 0402 inch) are also available.

### ●Dimensions



Please refer to Specification (Reference) at the Website for Marking.

Rated resistance value marking is 3-digit on the over coating except RMC1/16S & RMC1/20 & RMC1/32.  
4-digit marking is available for F & G tolerance except RMC1/16, RMC1/16S & RMC1/20 & RMC1/32 type.

Unit : mm

Style	Metric	Inch	Product	L	W	H	c	d	*Unit weight/pc.
RMC1/32	0402	01005	KAMAYA	0.4±0.02	0.2 ±0.02	0.13±0.02	0.08 ±0.03	0.1 ±0.03	0.035mg
RMC1/20	0603	0201	KAMAYA	0.6±0.03	0.3 ±0.03	0.23±0.03	0.1 ±0.05	0.15 ±0.05	0.16mg
RMC1/16S	1005	0402	KAMAYA WALSIN	1.0±0.05	0.5 ±0.05	0.35±0.05	0.2 ±0.1	0.25 ±0.10	0.6mg
RMC1/16	1608	0603	KAMAYA WALSIN	1.6±0.1	0.8 ±0.15	0.45±0.10	0.3 ±0.1	0.3 ±0.1	2mg
RMC1/10	2012	0805	KAMAYA WALSIN	2.0±0.1	1.25±0.10	0.55±0.10	0.4 ±0.2	0.4 ±0.2	5mg
RMC1/8	3216	1206	KAMAYA WALSIN	3.2±0.15	1.6 ±0.15	0.55±0.10	0.5 ±0.25	0.5 ±0.25	9mg
RMC1/4	3225	1210	KAMAYA	3.2±0.15	2.5 ±0.15	0.55±0.15	0.5 ±0.25	0.5 ±0.25	16mg
RMC1/2	5025	2010	KAMAYA	5.0±0.15	2.5 ±0.15	0.55±0.15	0.6 ±0.2	0.6 ±0.2	25mg
RMC1	6332	2512	KAMAYA	6.3±0.15	3.2 ±0.15	0.55±0.15	0.6 ±0.2	0.6 ±0.2	40mg

\*Values for reference

### ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range					Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
			1Ω	10Ω	100Ω	1MΩ	10MΩ					
RMC1/32	0402 (01005)	0.03 (0.5A)	4.7~9.1	10~91	100~1M			F, J	— +600~—200 — +300 — ±200	15		
RMC1/20	0603 (0201)	0.05 (1.0A)	0.47~0.91	1~3.92	4.02~9.76	10~1M	1.1M~10M	J F, J F, G, J	+1000~+300 +600~—200 +350~—100 — ±200	50 25		-55~+125
RMC1/16S	1005 (0402)	0.1 (1.0A)	1~9.76	10~1M	1.02M~10M			F, J G, J F F, G, J	+500~—200 ±200 ±100 — ±200			
RMC1/16	1608 (0603)	0.1 (2.0A)	0.47~0.91	1~9.76	10~10M	11M~22M		K F, G, J G, J F F, G, J	+1,000~+300 +500~—200 ±200 ±100 — ±200	50	100	
RMC1/10	2012 (0805)	0.125 (2.0A)	0.27~0.91	1~9.76	10~2.2M	2.21M~10M	11M~22M	J F, G, J G, J F F, G, J	— +1,000~+300 +500~—200 ±200 ±100 — ±200	150		
RMC1/8	3216 (1206)	0.25 (2.0A)	0.22~0.91	1~9.76	10~1M	1.02M~10M	11M~24M	K F, G, J G, J F F, G, J	— +1,000~+300 +500~—200 ±200 ±100 — ±200			-55~+155
RMC1/4	3225 (1210)	0.5 (2.0A)	0.2~0.91	1~9.76	10~1M	1.02M~10M	11M~22M	K F, G, J G, J F F, G, J	— +1,000~+300 +500~—200 ±200 ±100 — ±200	200	500	
RMC1/2	5025 (2010)	0.75 (2.0A)	0.33~0.91	1~9.76	10~1M	1.1M~22M		K F, G, J G, J F F, G, J	— +1,000~+300 +500~—200 ±200 ±100 — ±200			
RMC1	6332 (2512)	1.0 (2.0A)	0.33~0.91	1~9.76	10~1M	1.1M~22M		K F, G, J G, J F F, G, J	— +1,000~+300 +500~—200 ±200 ±100 — ±200			

Note1. E24 series is available , E96 series is available for tolerance "F"(1%)

Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

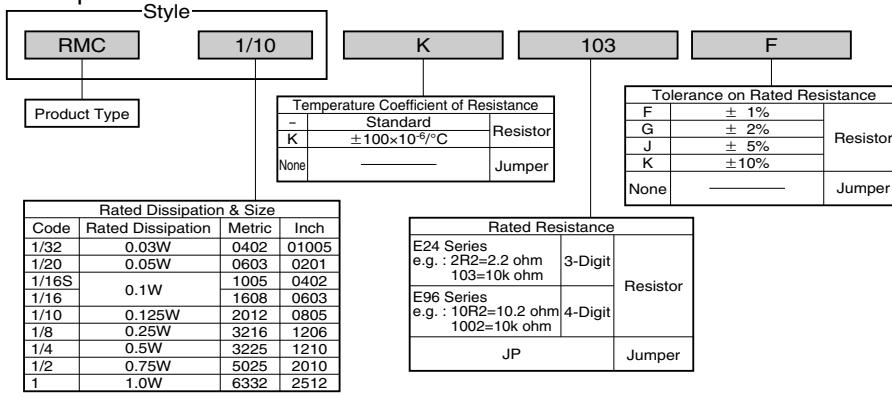
Note3. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note4. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

Note5. Jumper : Resistance value is less than 50m ohm.

### ●Part Number Description

Example



*Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
PA	Press-Pocket Paper Tape (2 mm pitch)	20,000pcs. 15,000pcs.	RMC1/32 RMC1/20
TH	Paper Tape (2 mm pitch)	10,000pcs.	RMC1/16 RMC1/16
TP	Paper Tape	5,000pcs.	RMC1/16 RMC1/10 RMC1/8
TE	Embossed Tape	4,000pcs.	RMC1/4 RMC1/2 RMC1
		25,000pcs.	RMC1/16
BA	Bulk Case	10,000pcs. 5,000pcs.	RMC1/10 RMC1/8

\*Refer to Tape and Packaging information on pages 22 and 23.

\*Please contact Kamaya sales department for 1mm pitch taping of RMC1/16s, 1/20.



**NEW**  
**RGC**

Halogen Free

Antimony Free

## ●Features

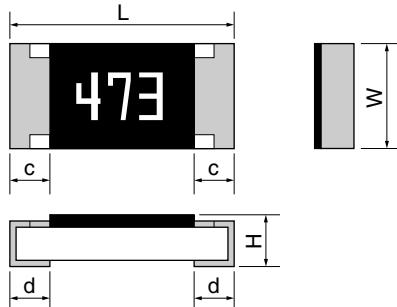
Suitable for precision applications.

High stabilized characteristics and Performance equivalent to thin film chip resistors.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Line up, 01005 sizes resistor.

## ●Dimensions



Rated resistance value marking is with 3-digit (E24) or 4-digit (E96) on the over coating.  
RGC1/16 : only 3-digit marking is available.

RGC1/16S, 1/20, 1/32 : only No marking is available.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
<b>NEW RGC1/32</b>	<b>0402</b>	<b>01005</b>	0.4±0.02	0.2 ±0.02	0.13 ±0.02	0.08 ±0.03	0.1 ±0.03	0.035mg
RGC1/20	0603	0201	0.6±0.03	0.3 ±0.03	0.23 ±0.03	0.1 ±0.05	0.15 ±0.05	0.16mg
RGC1/16S	1005	0402	1.0±0.05	0.5 ±0.05	0.35 ±0.05	0.2 ±0.1	0.25 ±0.05	0.6mg
RGC1/16	1608	0603	1.6±0.1	0.8 ±0.05	0.45 ±0.10	0.25 ±0.10	0.3 ±0.1	2mg
RGC1/10	2012	0805	2.0±0.1	1.25 ±0.10	0.6 ±0.1	0.4 ±0.2	0.4 ±0.2	5mg
RGC1/8	3216	1206	3.2±0.15	1.6 ±0.15	0.6 ±0.1	0.5 ±0.25	0.5 ±0.25	9mg

\*Values for reference

## ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range			Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code 10 <sup>6</sup> /°C	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
			10Ω	100Ω	1kΩ					
RGC1/32	0402 (01005)	0.03			100~100k	D(±0.5%)	C ± 50	15	50	-55~+125
RGC1/20	0603 (0201)	0.05		51~976	1k~1M	D(±0.5%)	K ±100	25		
RGC1/16S	1005 (0402)	0.063	10~97.6			D(±0.5%)	C ± 50	50		-55~+155
RGC1/16	1608 (0603)	0.1	33~97.6	10~97.6	100~1M	F(±1%)	K ±100	100		-55~+125
RGC1/10	2012 (0805)	0.125	33~97.6	10~3.3M		D(±0.5%)	C ± 50	150		-55~+155
RGC1/8	3216 (1206)	0.25	33~97.6		10~4.7M	F(±1%)	C ± 50	200		

\*1 If Category Temperature Range is "-55~+155°". Rated Dissipation is applied to in ( ).

Note1. E24, E96 are available for "F(±1%) and "D(±0.5%)

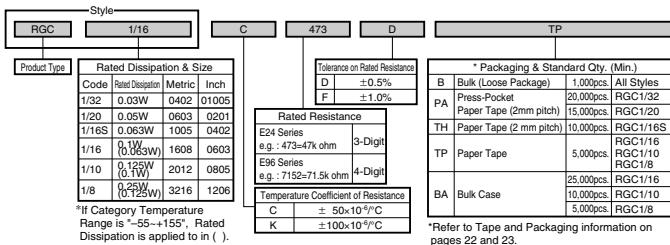
Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note3. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note4. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

## ●Part Number Description

Example



\*If Category Temperature Range is "-55~+155°. Rated Dissipation is applied to in ( ).

\*Refer to Tape and Packaging information on pages 22 and 23.

\*Please contact Kamaya sales department for 1mm pitch taping of RGC1/16s, 1/20.

**NEW**  
**RNC**

Halogen Free

Antimony Free

Pb Free

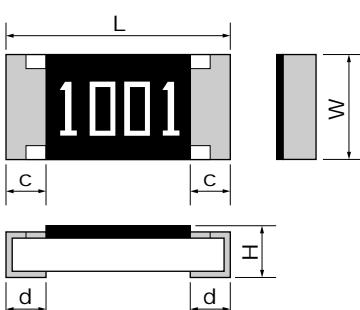
## ●Features

Suitable for high precision, higher stability and reliability applications.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

New line up minimum sizes resistor 0201inch.

## ●Dimensions



Rated resistance value is made with 3-digit (E24) or 4-digit (E96) on the over coating.  
RNC06: only No marking is available.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
<b>NEW RNC06</b>	<b>0603</b>	<b>0201</b>	0.6±0.03	0.3 ±0.03	0.23 ±0.03	0.1 ±0.05	0.15 ±0.05	0.16mg
RNC20	2012	0805	2.0±0.15	1.25 ±0.05	0.6 ±0.1	0.4 ±0.2	0.3 ±0.1	5mg
RNC32	3216	1206	3.1±0.1	1.55 ±0.05	0.6 ±0.1	0.45±0.20	0.3 ±0.1	9mg

\*Values for reference

## ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range			Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code 10 <sup>6</sup> /°C	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
			100Ω	1kΩ	10MΩ					
RNC06	0603 (0201)	0.03	100Ω~1kΩ	B (±0.1%)	E ±25			15	50	-55~+125
		0.05	47Ω~4.99kΩ	D (±0.5%)	E ±25					
			5.1kΩ~10kΩ	C ±50						
RNC20	2012 (0805)	0.1	100Ω~130kΩ	B (±0.1%)				75	E96	-55~+125
			10Ω~130kΩ	C (±0.25%)	D (±0.5%)					
			100Ω~180kΩ	B (±0.1%)				150	E24	
			10Ω~180kΩ	C (±0.25%)	D (±0.5%)					

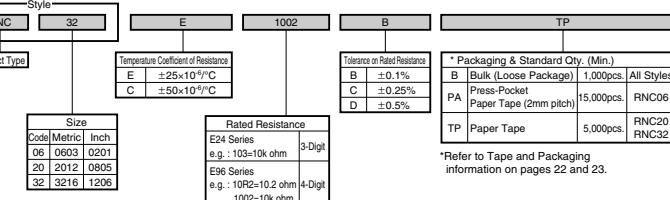
Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

## ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 22 and 23.



# Chip Resistors

## High Voltage

**KAMAYA OHM** <http://www.kamaya.co.jp>

## RVC

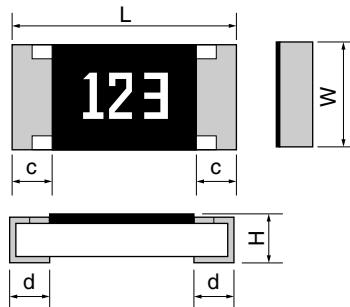
Halogen Free

Antimony Free

### ●Features

Higher Limiting Element Voltage compared with RMC series.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance is marked with 3-digit (E24) or 4-digit (E96) on the over coating.  
RVC16 : only 3-digit marking is available.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RVC16	1608	0603	1.6±0.1	0.8 <sup>+0.15</sup> <sub>-0.05</sub>	0.45±0.10	0.3±0.1	0.3±0.1	2mg
RVC20	2012	0805	2.0±0.1	1.25±0.10	0.55±0.10	0.4±0.2	0.4±0.2	5mg
RVC32	3216	1206	3.2±0.15	1.6±0.15	0.55±0.10	0.5±0.25	0.5±0.25	9mg
RVC50	5025	2010	5.0±0.15	2.5±0.15	0.55±0.15	0.6±0.2	0.6±0.2	25mg
RVC63	6332	2512	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.2	0.6±0.2	40mg

\*Values for reference

### ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Limiting Element Voltage V	Combinations of Rated Resistance Range and Tolerance on Rated Resistance			Temperature Coefficient of Resistance 10°C	Isolation Voltage V	Category Temperature Range °C
				D(±0.5%)	F(±1%)	G(±2%)			
RVC16	1608 (0603)	0.1	200	—	4700~10MΩ	—	K ±100	100	-55~+125
RVC20	2012 (0805)	0.25	400	—	100Ω~10MΩ	100Ω~51MΩ	K ±100	—	
RVC32	3216 (1206)	0.25	500	100kΩ~4.7MΩ	100Ω~10MΩ	100Ω~51MΩ	K ±100	—	
RVC50	5025 (2010)	0.5	—	—	47Ω~97.6Ω	—	±200	—	
RVC63	6332 (2512)	1.0	800	—	470Ω~20MΩ	470Ω~51MΩ	K ±100	—	
				—	560Ω~20MΩ	560Ω~51MΩ	K ±100	—	
				—	100Ω~549Ω	—	±200	—	
				—	47Ω~97.6Ω	—	±400~—200	—	

Note1. E24 series is available , E96 series is available for tolerance "D" (0.5%) and "F" (1%)

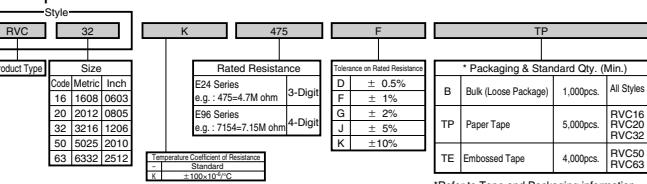
Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note3. Limiting Element Voltage can only be applied to resistors, when the resistance value is equal to or higher than the critical resistance value.

Note4. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 22 and 23.

## RZC

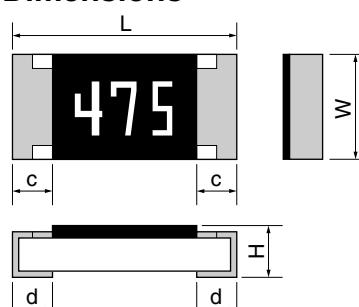
Halogen Free

Antimony Free

### ●Features

Suitable for the backlight inverter for large-screen LCD.  
Higher Limiting Element Voltage than RVC series.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance is marked with 3-digit(E24) on the over coating.

Style	Metric	Inch	L	W	H	c	d	*Unit/weight/pc.
RZC50	5025	2010	5.0±0.15	2.5±0.15	0.55±0.15	0.5±0.2	0.6±0.2	25mg
RZC63	6332	2512	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.2	0.6±0.2	40mg

\*Values for reference

### ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Limiting Element Voltage V	Anti-Bust Voltage Characteristics	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10°C	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RZC50	5025 (2010)	0.5	1500	300V	1.0MΩ~16MΩ	J(±5%) K(±10%) M(±20%)	±200	E24	500	-55~+125
RZC63	6332 (2512)	1.0	2000	—	—	—	—	—	—	—

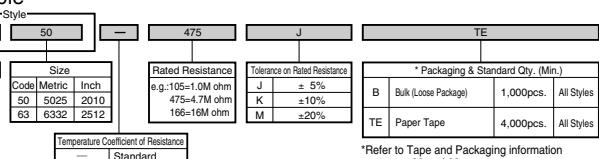
Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors, when the resistance value is equal to or higher than the critical resistance value.

Note3. Anti-Rush Voltage Characteristics : 3,000V, 1sec "On", 9sec "off", 100,000 times, Room temperature.

### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 22 and 23.



## RPC

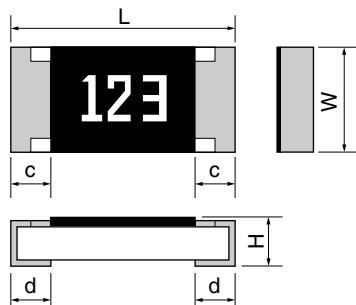
Halogen Free

Antimony Free

### ●Features

Higher Anti surge performance compared with RMC series.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance value is marked with 3-digit on the over coating.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RPC20	2012	0805	2.0±0.1	1.25±0.10	0.55±0.10	0.3±0.2	0.4±0.2	5mg
RPC32	3216	1206	3.2±0.15	1.6±0.15	0.55±0.10	0.3±0.2	0.5±0.25	9mg
RPC35	3225	1210	3.2±0.15	2.5±0.15	0.55±0.15	0.3±0.2	0.5±0.25	16mg
RPC50	5025	2010	5.0±0.15	2.5±0.15	0.55±0.15	0.3±0.15	0.6±0.2	25mg
RPC63	6332	2512	6.3±0.15	3.2±0.15	0.55±0.15	0.3±0.15	0.6±0.2	40mg

\*Values for reference

### ●Ratings

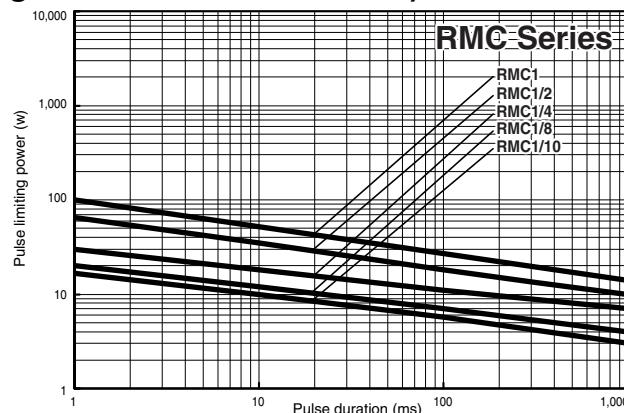
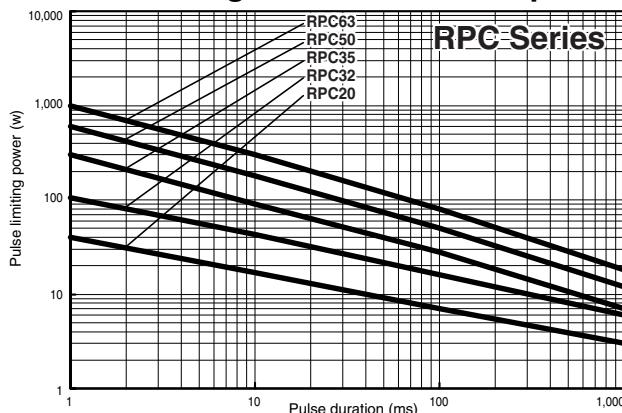
Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
			Rated Resistance Range	Temperature Coefficient of Resistance 10 <sup>6</sup> /°C					
RPC20	2012 (0805)	0.125				150			
RPC32	3216 (1206)	0.25	0.27Ω~0.91Ω	±200	J (± 5%)				
RPC35	3225 (1210)	0.5	1Ω~ 1MΩ	±100	K (±10%)				
RPC50	5025 (2010)	0.75	1.1M~22MΩ	±200	M (±20%)	200	E24	500	-55~+155
RPC63	6332 (2512)	1.0							

 Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors, when the resistance value is equal to or higher than the critical resistance value.

Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

### ●1Pulse Limiting Power Curve Comparison (e.g 100Ω value for reference)



\* pulse limiting power curve is different from resistance value.

\* Please contact Kamaya sales department for the details.

### ●Part Number Description

Example

Style		Size			Rated Resistance		Tolerance on Rated Resistance			* Packaging & Standard Qty. (Min.)			
Product Type	Code	Code	Metric	Inch	E24 Series	e.g. : 2R2=2.2 ohm	3-Digit	J	± 5%	K	±10%	M	±20%
RPC	20	32	50	63	103	103=10k ohm		J	± 5%	K	±10%	M	±20%
	2012	3216	5025	6332									
	0805	1206	2010	2512									

\*Refer to Tape and Packaging information on pages 22 and 23.



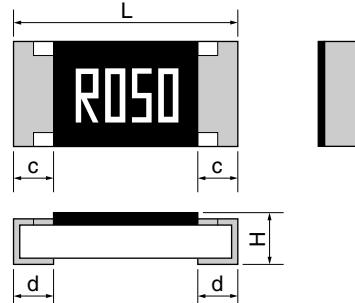
## RLC

Halogen Free

Antimony Free

**●Features** Most suitable for a detection of current in power source circuits, motor circuits, etc.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance is marked with 4-digit on the over coating. (RLC20-RLC63)  
RLC10 : only No marking is available.  
Please contact KAMAYA for marking of RLC16.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RLC10	1005	0402	1.0±0.05	0.5 ±0.05	0.35±0.05	0.2±0.1	0.25 <sup>+0.05</sup> <sub>-0.10</sub>	0.6mg
RLC16	1608	0603	1.6±0.1	0.8 <sup>+0.15</sup> <sub>-0.05</sub>	0.45±0.10	0.3±0.1	0.3 ±0.1	2mg
RLC20	2012	0805	2.0±0.15	1.25 ±0.10	0.6 ±0.1	0.4±0.2	0.4 ±0.2	5mg
RLC32	3216	1206	3.1±0.2	1.6 ±0.15	0.6 ±0.1	0.5±0.25	0.3 <sup>+0.2</sup> <sub>-0.1</sub>	9mg
RLC35	3225	1210	3.1±0.2	2.5 ±0.15	0.6 ±0.15	0.5±0.25	0.3 <sup>+0.2</sup> <sub>-0.1</sub>	16mg
RLC50	5025	2010	5.0±0.2	2.5 ±0.15	0.6 ±0.15	0.6±0.2	0.6 ±0.2	25mg
RLC63	6332	2512	6.3±0.2	3.2 ±0.15	0.6 ±0.15	0.6±0.2	0.6 ±0.2	40mg

\*Values for reference

### ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Rated Resistance Range	Combinations of Rated Resistance Range, Temperature Coefficient of Resistance and Tolerance on Rated Resistance			Isolation Voltage V	Category Temperature Range °C
					Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10 <sup>6</sup> /°C		
RLC10	1005 (0402)	0.125	0.11~1.11	100mΩ~10Ω	100mΩ~220mΩ	J	0~+300	100	-55~+125
					240mΩ~430mΩ	F, J	0~+200		
					470mΩ~3.3Ω	F, G, J	0~+200		
					3.6Ω~10Ω	F, J	±100		
RLC16	1608 (0603)	0.25	0.14~1.58	100mΩ~10Ω	100mΩ~180mΩ	F, G, J	0~+250	500	
					200mΩ~430mΩ	F, G, J	0~+200		
					470mΩ~3.3Ω	F, G, J	±100		
					3.6Ω~10Ω	F, J	±100		
RLC20	2012 (0805)	0.33	0.15~2.56	50mΩ~10Ω	50mΩ~180mΩ	F, G, J	0~+250		
RLC32	3216 (1206)	0.5	0.18~3.16		200mΩ~430mΩ	F, G, J	0~+200		
RLC35	3225 (1210)	0.66	0.44~3.63	50mΩ~3.3Ω	470mΩ~3.3Ω	F, G, J	±100		
RLC50	5025 (2010)	0.75	0.47~3.87		3.6Ω~10Ω	F, J	±100		
RLC63	6332 (2512)	1.0	0.55~4.47		50mΩ~180mΩ	F, G, J	0~+250		

Note1. Rated Current =  $\sqrt{(\text{Rated Dissipation})/(\text{Rated Resistance})}$  Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note3. Limiting Element Voltage\*1 is set up on RLC16, 20, 32, and rated current is not applied in the range of following rated of Resistance\*2.

\*1 RLC16=1.41V, RLC20=1.58V, RLC32=1.81V

\*2 RLC16 and RLC20 : 7.5Ω < R , RLC32 : 6.2Ω < R

The Rated Current in the above range of the Rated Resistance Value is calculated as below way.

Rated Current=Limiting Element Voltage/Rated Resistance

### ●Rated Resistance

Resistance	Code										
50mΩ	R050	82mΩ	R082	200mΩ	R200	430mΩ	R430	750mΩ	R750	1.6Ω	1R60
51mΩ	R051	90mΩ	R090	220mΩ	R220	470mΩ	R470	800mΩ	R800	4.3Ω	4R30
56mΩ	R056	91mΩ	R091	240mΩ	R240	500mΩ	R500	820mΩ	R820	4.7Ω	4R70
60mΩ	R060	100mΩ	R100	250mΩ	R250	510mΩ	R510	900mΩ	R900	5.1Ω	5R10
62mΩ	R062	110mΩ	R110	270mΩ	R270	560mΩ	R560	910mΩ	R910	5.6Ω	5R60
65mΩ	R065	120mΩ	R120	300mΩ	R300	600mΩ	R600	1.0Ω	1R00	6.2Ω	6R20
68mΩ	R068	130mΩ	R130	330mΩ	R330	620mΩ	R620	1.1Ω	1R10	6.8Ω	6R80
70mΩ	R070	150mΩ	R150	360mΩ	R360	650mΩ	R650	1.2Ω	1R20	7.5Ω	7R50
75mΩ	R075	160mΩ	R160	390mΩ	R390	680mΩ	R680	1.3Ω	1R30	8.2Ω	8R20
80mΩ	R080	180mΩ	R180	400mΩ	R400	700mΩ	R700	1.5Ω	1R50	9.1Ω	9R10
										10Ω	100

Note3. Other nominal resistances values are also available, please contact KAMAYA for further information.

### ●Part Number Description

Example

Style	RLC	32	K	R470	F	TP	* Packaging & Standard Qty. (Min.)			
Product Type	Rated Resistance e.g.: R050=50m ohm R100=100m ohm 1R00=1 ohm 100=10 ohm			B Bulk (Loose Package) 1,000pcs. All Styles			TH Paper Tape(2mm pitch) 10,000pcs. RLC10			
Size	Temperature Coefficient of Resistance K ±100×10 <sup>-6</sup> /°C			TP Paper Tape 5,000pcs. RLC16 RLC20 RLC32			TE Embossed Tape 4,000pcs. RLC35 RLC50 RLC63			
Code	Tolerance on Rated Resistance F ±1% G ±2% J ±5%			* Refer to Tape and Packaging information on pages 22 and 23.						
Metric										
Inch										
10	1005	0402								
16	1608	0603								
20	2012	0805								
32	3216	1206								
35	3225	1210								
50	5025	2010								
63	6332	2512								

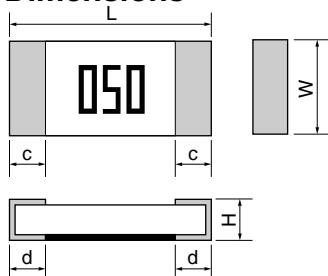

[Halogen Free](#)
[Antimony Free](#)
[Pb Free](#)

## ●Features

New lineup, 0201 & 1206 Size, Lower than 50mΩ.  
Suitable for current sensing of small mobile devices.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

## ●Dimensions



Resistance value is marking on surface.

Please refer to Specification (Reference) on kamaya website.  
Please contact Kamaya Sales Dept. for marking of RCC16.  
RCC10 & RCC06 is no marking.

Style	Metric	Inch	Rated Resistance	L	W	H	c	d	Unit weight/pc.
NEWRCC06	0603	0201	All Resistance	0.6±0.03	0.3 ±0.03	0.23 ±0.09	0.15 ±0.05	0.15 ±0.05	0.16mg
RCC10	1005	0402	All Resistance	1.0±0.05	0.5 ±0.05	0.35 ±0.05	0.25 ±0.05	0.25 ±0.10	0.6mg
RCC16	1608	0603	20mΩ ≤ R R > 20mΩ	1.6±0.1	0.8 ±0.15	0.5 ±0.10	0.3 ±0.1	0.3 ±0.1	2mg
RCC20	2012	0805	20mΩ ≤ R R > 20mΩ	2.0±0.15	1.25 ±0.10	0.6 ±0.10	0.4 ±0.2	0.4 ±0.2	5mg
NEWRCC32	3216	1206	All Resistance	3.1±0.2	1.6 ±0.15	0.6 ±0.10	0.5 ±0.25	0.5 ±0.25	9mg

Unit: mm

\*Values for reference

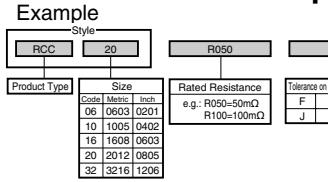
## ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combination of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C	
				Rated Resistance Range	Temperature Coefficient of Resistance 10³/°C				
RCC06	0603(0201)	0.1	1.0~2.23	20mΩ~100mΩ	0~+500	J (±5%)	50	-55~+125	
RCC10	1005 (0402)	0.125	1.11~2.23	25mΩ~50mΩ	0~+350	F (±1%) J (±5%)	100		
RCC16	1608 (0603)	0.25	1.58~5.00	51mΩ~100mΩ	±150				
RCC20	2012 (0805)	0.33	2.56~5.74	10mΩ~30mΩ	0~+350				
RCC32	3216 (1206)	0.5	2.23~5.00	33mΩ~50mΩ	0~+250	500			
				51mΩ~100mΩ	±150				
				10mΩ~27mΩ	0~+250				
				30mΩ~50mΩ	±150				
				20mΩ~33mΩ	0~+250				
				36mΩ~100mΩ	±100				

Note1. Rated Current =  $\sqrt{(\text{Rated Dissipation})/(\text{Rated Resistance})}$

Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

## ●Part Number Description



\*Refer to Tape and Packaging information on page 22 and 23.

## ●Precautions of use

1. Resistive element is on bottom surface.  
Please note for inspection of parts existence & nonexistence, inversion mounting by Inspection machine.
2. Resistance value will be changed by soldering condition.  
Please design products in consideration of this change of resistance value.

## ●Rated Resistance

Resistance	Code	Mark	Resistance	Code	Mark	Resistance	Code	Mark
10mΩ	R010	010	39mΩ	R039	039	68mΩ	R068	068
15mΩ	R015	015	40mΩ	R040	040	70mΩ	R070	070
20mΩ	R020	020	43mΩ	R043	043	75mΩ	R075	075
22mΩ	R022	022	47mΩ	R047	047	80mΩ	R080	080
24mΩ	R024	024	50mΩ	R050	050	82mΩ	R082	082
25mΩ	R025	025	51mΩ	R051	051	90mΩ	R090	■90
27mΩ	R027	027	56mΩ	R056	056	91mΩ	R091	091
30mΩ	R030	030	60mΩ	R060	060	100mΩ	R100	R10
33mΩ	R033	033	62mΩ	R062	062			
36mΩ	R036	036	65mΩ	R065	065			

Please contact Kamaya Sales Dept. for any other resistance values.

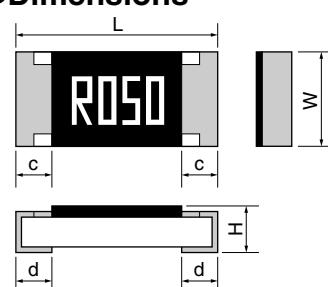
# RLS

[Halogen Free](#)
[Antimony Free](#)

## ●Features

Suitable for current detection of high-precision circuits.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

## ●Dimensions



Rated resistance value is marked with 4-digit on the over coating.

Style	Metric	Inch	L	W	H	c	d	Unit weight/pc.
RLS50	5025	2010	5.0±0.2	2.5±0.15	0.6±0.15	0.6±0.2	0.6±0.2	25mg
RLS63	6332	2512	6.3±0.2	3.2±0.15	0.6±0.15	0.6±0.2	0.6±0.2	40mg

\*Values for reference

## ●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C
				Rated Resistance Range	Temperature Coefficient of Resistance 10³/°C			
RLS50	5025 (2010)	0.75	1.93~6.12	20mΩ~33mΩ	0~+350	F(±1%)	500	-55~+125
RLS63	6332 (2512)	1.0	2.23~7.07	36mΩ~47mΩ	0~+200	G(±2%)		
				50mΩ~200mΩ	0~+150	J(±5%)		

Note1. Rated Current =  $\sqrt{(\text{Rated Dissipation})/(\text{Rated Resistance})}$

Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

## ●Part Number Description

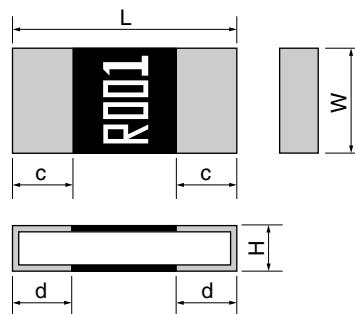
Style	Code	Inch	Size	Code	Inch	Rated Resistance	Tolerance on Rated Resistance	*Packaging & Standard Qty. (Min.)
RLS	50	20	R050	5025	2010	0.75~6.12	F(±1%)	1,000pcs.
	63	25	R100	6332	2512	1.0~7.07	G(±2%)	4,000pcs.

\*Refer to Tape and Packaging information on pages 22and 23.

**●Features** New lineup, 1mΩ to 5mΩ, 10mΩ, 15mΩ.  
Suitable for current sensing of battery pack.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

**●Dimensions**



Resistance value of RLP series are marked like below.  
The resistance value of RLP63 & MLP63 are marked with 4 characters on the overcoating.  
The resistance value of RLP20 & RLP32 are marked with "2 numbers" & "\_" on the overcoating.  
Please contact KAMAYA for marking of RLP16.

Style	Metric	Inch	Rated Resistance	L	W	H	c	d	*Unit weight/pc.
RLP16	1608	0603	10mΩ	1.6±0.1	0.8±0.1	0.3±0.1	0.2±0.1	0.3±0.1	2mg
NEW RLP20	2012	0805	10mΩ	2.0±0.15	1.25±0.15	0.22±0.10	0.3±0.1	0.47±0.20	3mg
NEW RLP32	3216	1206	1mΩ		0.32±0.15		1.1±0.25	1.1±0.25	12mg
			2mΩ				0.5±0.25	0.5±0.25	11mg
			5mΩ		0.35±0.10	1.0±0.25	1.0±0.25	1.0±0.25	11mg
			10mΩ		0.28±0.10		0.5±0.25	0.5±0.25	9mg
			15mΩ		0.22±0.10		0.5±0.25	0.5±0.25	6mg
RLP63			1mΩ	3.2±0.25	0.38±0.15	2.2±0.25	2.2±0.25	50mg	
			5mΩ		0.34±0.15	1.95±0.25	1.95±0.25	43mg	
			10mΩ		0.23±0.15	1.75±0.25	1.75±0.25	30mg	
			15mΩ		0.95±0.25	0.95±0.25	0.95±0.25	26mg	
			5mΩ		0.51±0.15	1.1±0.25	1.1±0.25	64mg	
			10mΩ		0.35±0.15	0.5±0.25	0.5±0.25	41mg	

Unit : mm

\*Values for reference

**●Ratings**

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combination of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C
				Rated Resistance Range	Temperature Coefficient of Resistance			
					Code			
RLP16	1608 (0603)	0.33	5.7	10mΩ	K ±100			
RLP20	2012 (0805)	0.5	7.0	10mΩ	N ±70			
RLP32	3216 (1206)	1	31.6	1mΩ	K ±100	F(±1%) J(±5%)	100	-55~+155
			22.3, 14.1, 10, 8.1	2mΩ, 5mΩ, 10mΩ, 15mΩ	N ±70			
RLP63	6332 (2512)	2	44.7	1mΩ	- ±150			
		1	14.1, 10, 8.1	5mΩ, 10mΩ, 15mΩ	N ±70			
		2	20.0, 14.1	5mΩ, 10mΩ	K ±100			
					N ±70			
MLP63								

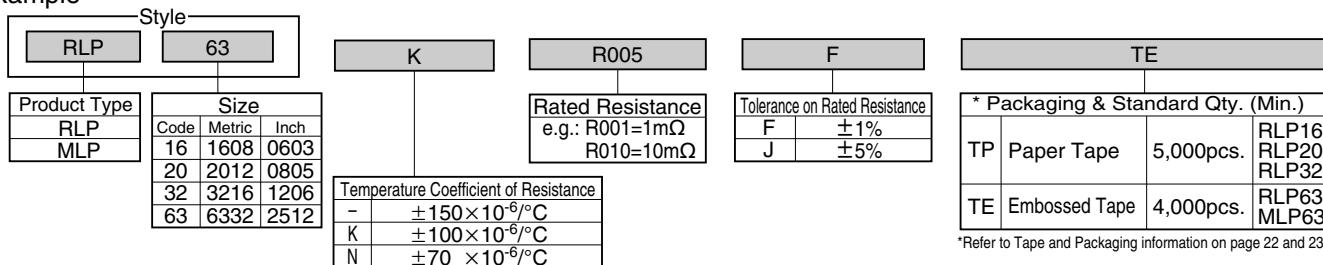
Note1. Rated Current =  $\sqrt{(\text{Rated Dissipation})/(\text{Rated Resistance})}$

Note2. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note3. Please contact Kamaya Sales Dept. for any other resistance values.

**●Part Number Description**

Example



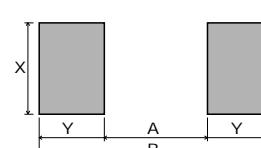
* Packaging & Standard Qty. (Min.)			
TP	Paper Tape	5,000pcs.	RLP16 RLP20 RLP32
TE	Embossed Tape	4,000pcs.	RLP63 MLP63

\*Refer to Tape and Packaging information on page 22 and 23.

**●Rated Resistance**

**●Recommended land Pattern**

Style	Resistance	Marking
RLP16	10mΩ	No Marking
RLP20	10mΩ	10
RLP32	1mΩ	01
	2mΩ	02
	5mΩ	05
	10mΩ	10
	15mΩ	15
RLP63	1mΩ	R001
	5mΩ	R005
	10mΩ	R010
	15mΩ	R015
MLP63	5mΩ	R005
	10mΩ	R010



Style	Metric	Inch	Rated Resistance	A	B	X	Y
RLP16	1608	0603	10mΩ	1.0	2.2	0.8	0.6
RLP20	2012	0805	10mΩ	0.8	2.7	1.35	0.95
RLP32	3216	1206	1mΩ	1.0			1.45
			2mΩ	2.1			0.9
			5mΩ	1.4	3.9	1.7	1.25
			10mΩ				0.9
			15mΩ	2.1			
RLP63	6332	2512	1mΩ	2.0			2.8
			5mΩ	2.4			2.6
			10mΩ		7.6	3.5	
			15mΩ				1.8
			5mΩ				
			10mΩ				

\*Values for reference

**●Precautions of use**

Resistance value will be changed by soldering condition.

Please design products in consideration of this change of resistance value.

## RAC

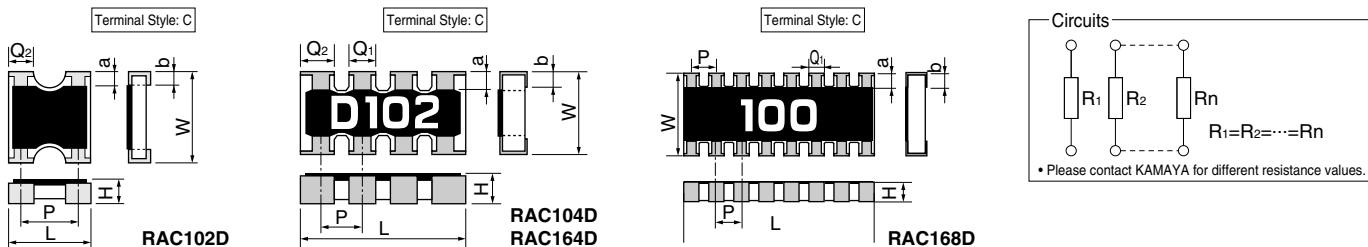
Halogen Free

Antimony Free

### ●Features

High-density SMD packaging contributes higher productivity and reduces assembly costs.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.  
Walsin Technology Corporation OEM products are also available.

### ●Dimensions



Note. Please contact KAMAYA for the detail of marking on the over coating.

Style	Terminal Style	Product	L	W	H	Q1	*Q2	a	b	*P	*Unit weight/pc.
RAC102D	C	KAMAYA	1.0±0.05	1.0±0.05	0.35±0.05	-	0.33±0.10	0.15±0.10	0.25 <sup>+0.05</sup> <sub>-0.10</sub>	0.65	1.1mg
		WALSIN	1.0±0.1	1.0±0.1	0.35±0.10		0.34±0.05	0.2±0.15	0.25±0.17		
RAC104D	C	KAMAYA	2.0±0.1	1.0±0.1	0.35±0.05	0.35±0.1	0.45±0.10	0.15±0.10	0.25±0.10	0.5	2.1mg
		WALSIN	2.0±0.1	1.0±0.1	0.45±0.10	0.3 ±0.05	0.4 ±0.1	0.2 ±0.1	0.25±0.10		
RAC164D	C	KAMAYA	3.2±0.1	1.6±0.1	0.5 ±0.1	0.4 ±0.15	0.6 ±0.15	0.3 ±0.2	0.25±0.15	0.8	7mg
		WALSIN	3.2±0.1	1.6±0.1	0.5 ±0.1	0.4 ±0.1	0.6 ±0.1	0.3 ±0.1	0.3 ±0.2		
RAC168D	C	WALSIN	3.8±0.1	1.6±0.1	0.45±0.1	0.3 ±0.1	—	0.3 ±0.1	0.3 ±0.1	0.5	8.3mg

\*Values for reference

### ●Ratings

Style	Rated Dissipation at 70°C W/Element W/pc.	Rated Current of Jumper A	Rated Resistance Range	Tolerance on Rated Resistance 10°C	Temperature Coefficient of Resistance 10°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RAC102D	0.125			J(±5%)		25		50	
RAC104D	0.063	0.25	1.0 10Ω~1MΩ	±200	F(±1%)J(±5%)	50	E24	100	-55~+125
RAC164D	0.25			J(±5%)		25			
RAC168D	0.25					16	16		

Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

### ●Part Number Description

#### Example

RAC	10	2	D	103	J	C	B
Product Type	Size	No. of Elements	Circuits				* Packaging & Standard Qty. (Min.)
	10 W:1.0mm	2 E:Elements	D Isolation				B Bulk (Loose Package) 1,000pcs. All Styles
	16 W:1.6mm	4 E:Elements					TH Paper Tape (2 mm pitch) 10,000pcs. RAC102D RAC104D
		8 E:Elements					TP Paper Tape 5,000pcs. RAC164D RAC168D

\*Refer to Tape and Packaging information on pages 22 and 23.

## RAC168U

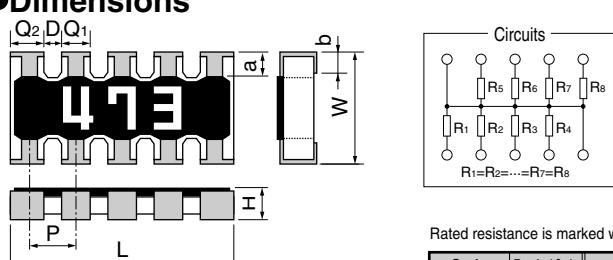
Halogen Free

Antimony Free

### ●Features

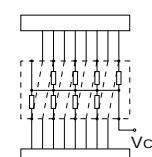
Highly suitable for the purposes of pull-up and pull-down.  
Easy to handle because of no specified direction for mounting due to the symmetrical position of common terminals.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance is marked with 3-digit on the over coating.

### ●Application Examples



- Making the parallel 8-Elements resistor for pull-up / pull-down into one chip.
- Ideal for high density SMT applications as direct mounting on the bus line is possible.

### ●Ratings

Style	Rated Dissipation at 70°C W	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RAC168U	0.063	10Ω~18Ω 20Ω~1MΩ	J(±5%)	±250	25	E24	100	-55~+125

Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

### ●Part Number Description

#### Example

RAC	16	8	U	103	J	C	TP
Product Type	Size	No. of Elements	Circuits				* Packaging & Standard Qty. (Min.)
	16 W:1.6mm	8 8-Elements	Rated Resistance e.g.: 103=10k ohm				B Bulk (Loose Package) 1,000pcs.
			Tolerance on Rated Resistance J ±5%				TH Paper Tape (2 mm pitch) 10,000pcs. RAC102D RAC104D
							TP Paper Tape 5,000pcs. RAC164D RAC168D

\*Refer to Tape and Packaging information on pages 22 and 23.



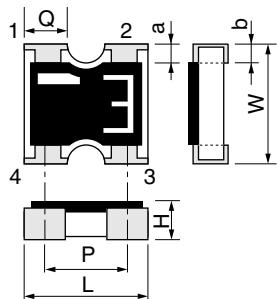
## RAC101A

[Halogen Free](#)
[Antimony Free](#)

### ●Features

Suitable for use at DC and up to UHF band frequencies.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Style	Terminal Style	L	W	H	Q	a	b	P	*Unit weight/p.c.
RAC101A	C	1.0±0.1	1.0 <sup>+0.10</sup> <sub>0</sub>	0.35±0.1	0.33±0.10	0.15±0.10	0.25±0.10	0.65±0.10	1.1mg

Unit : mm

\*Values for reference

Dot mark on Termination 1

Attenuation factor on Termination 2 to 3

### ●Ratings

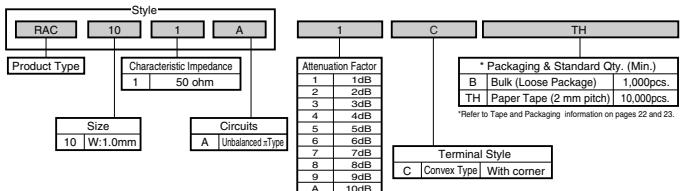
Style	Characteristic Impedance symbol	Attenuation Factor dB	Tolerance on Attenuation Factor dB		Voltage Standing Wave Ratio	Frequency Range	Rated Input Power mW/package	Category Temperature Range °C
			1	2				
RAC101A	50 ohm	1	1	2	±0.3	DC sf s3GHz	100	-40~+125
			2	2				
			3	3				
			4	4				
			5	5				
		2	6	6	±0.4	1.2max.		
			7	7				
			8	8				
			9	9				
			A	10				

Note. The following information is available.

1. Test methods for Attenuation Factor and VSWR characteristics.

### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 22 and 23.

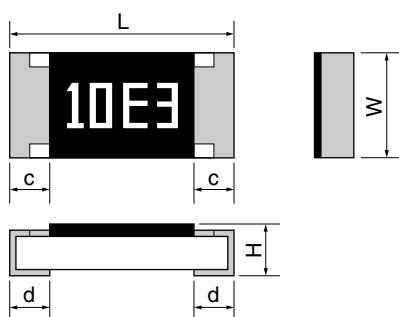
## LTC

[Halogen Free](#)
[Antimony Free](#)
[Pb Free](#)

### ●Features

Linearity of resistance change in wide temperature range.  
Suitable for temperature compensation, temperature sensing and controlling, and circuit protection applications.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Rated resistance and T.C.R. value are marked with 4-digit on the over coating.  
e.g. 10E3... 10 : 1,000×10<sup>-6</sup>/°C  
E3 : 1.5k ohm

Please contact KAMAYA Sales department for further information.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/p.c.
LTC1/10	2012	0805	2.0±0.15	1.29 <sup>+0.10</sup> <sub>-0.05</sub>	0.6±0.1	0.4 ±0.2	0.3 <sup>+0.2</sup> <sub>-0.1</sub>	5mg
LTC1/8	3216	1206	3.1±0.1	1.55±0.10	0.6±0.1	0.45±0.20	0.3 <sup>+0.2</sup> <sub>-0.1</sub>	9mg

\*Values for reference

### ●Ratings

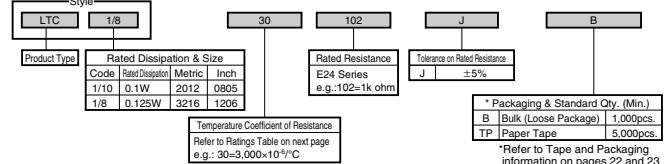
Temperature Coefficient of Resistance 10 <sup>-6</sup> /°C	Resistance Temperature Coefficient Tolerance	Rated Resistance Range (Rated Dissipation at 70°C)		Tolerance on Rated Resistance	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
		LTC1/10 (0.1W)	LTC1/8 (0.125W)				
500	±100×10 <sup>-6</sup> /°C	100 ohm~5.1k ohm	100 ohm~10k ohm	J(±5%)	E24	100	-40~+125
		100 ohm~5.1k ohm	100 ohm~10k ohm				
		100 ohm~5.1k ohm	100 ohm~10k ohm				
		100 ohm~3.3k ohm	100 ohm~4.7k ohm				
		100 ohm~3.3k ohm	100 ohm~4.7k ohm				
		100 ohm~1.6k ohm	100 ohm~2.2k ohm				
		100 ohm~3.3k ohm	100 ohm~3.6k ohm				
		100 ohm~3.3k ohm	100 ohm~3.6k ohm				
		51 ohm~910 ohm	51 ohm~1.2k ohm				
		51 ohm~560 ohm	51 ohm~910 ohm				
3,000	±10%	33 ohm~390 ohm	33 ohm~470 ohm				
		33 ohm~200 ohm	33 ohm~180 ohm				
		33 ohm~200 ohm	33 ohm~180 ohm				
		33 ohm~200 ohm	33 ohm~180 ohm				
		33 ohm~200 ohm	33 ohm~180 ohm				

Note1. Rated Voltage =  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Listed above will be made by order. Please contact KAMAYA for further information.

### ●Part Number Description

Example



\* Packaging & Standard Qty. (Min.)  
B Bulk (Loose Package) 1,000pcs.

\* Refer to Tape and Packaging information on pages 22 and 23.



# FCC, FHC

Halogen Free

Antimony Free

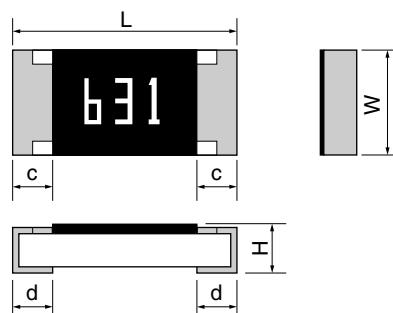
Pb Free

## ●Features

Fast-Acting Type. Suitable for over-current protection of the circuit of miniature portable equipment.  
Please contact Kamaya Sales Dept, if you need to confirm Inrush current endurance, Anti-pulse performance etc.  
We can provide Application Guide for FCC, FHC selection.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail. Certified UL, c-UL. File No. : E176847



## ●Dimensions



Current value is marked on the cover coating.  
Please refer to Ratings table as below.

### ■ Ratings/Option Code : AD, AB, AA

Style	Metric	Inch	L	W	H	c	d	Unit weight/pc.
FCC10	1005	0402	1.0±0.05	0.5 ±0.05	0.4 ±0.05	0.2±0.1	0.25±0.10	0.8mg
FHC10								
FCC16	1608	0603	1.6±0.1	0.8 <sup>+0.15</sup> <sub>-0.05</sub>	0.45±0.10	0.3±0.15	0.3 ±0.1	2mg
FHC16								
FCC20	2012	0805	2.0±0.1	1.25±0.10	0.6 ±0.1	0.4±0.2	0.4 ±0.2	6mg
FHC20								
FCC32	3216	1206	3.2±0.2	1.6 ±0.15	0.6 <sup>+0.1</sup> <sub>-0.10</sub>	0.5±0.25	0.5 ±0.25	10mg
FHC32					0.65±0.10			11mg

### ■ Ratings/Option Code : LB

Style	Metric	Inch	L	W	H	c	d	Unit weight/pc.
FCC10	1005	0402	1.0±0.05	0.5 ±0.05	0.35 Max.	0.2±0.1	0.25±0.10	0.6mg

\*Values for reference

## ● Ratings/Option Code : AD (Fast-Acting type)

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range °C		
Metric	Inch		Code	A							
1005	0402	FCC10	151	0.15	2,700	O	32Vd.c. 35A	Rated Current×250% Opening Time 5s max.	-55~+125		
			201	0.2	1,000	Z					
			251	0.25	750	C					
			321	0.315	620	D					
			401	0.4	340	E					
			501	0.5	290	F					
			631	0.63	210	I					
			801	0.8	150	K					
			102	1.0	120	L					
			132	1.25	90	M					
		FHC10	162	1.6	55	N	24Vd.c. 35A				
			202	2.0	40	S					
			252	2.5	36	T					
			322	3.15	26	U					
			402	4.0	19	XD					
		FCC16	151	0.15	4,000	OD	50Vd.c. 35A				
			201	0.2	1,800	ZD					
			251	0.25	1,000	CD					
			321	0.315	750	DD					
			401	0.4	330	ED					
			501	0.5	280	FD					
			631	0.63	200	ID	36Vd.c. 35A				
			801	0.8	130	KD					
			102	1.0	110	LD					
			132	1.25	85	MD					
			162	1.6	70	ND					
			202	2.0	55	SD	32Vd.c. 35A				
			252	2.5	45	TD					
			322	3.15	26	UD					
		FHC16	402	4.0	19	XD	24Vd.c. 35A				
			401	0.4	330	401	50Vd.c. 50A				
			501	0.5	270	501					
		FCC20	631	0.63	190	631					
			801	0.8	130	801					
			102	1.0	100	102					
			132	1.25	80	132					
			162	1.6	65	162					
			202	2.0	55	202					
			252	2.5	40	252					
			322	3.15	26	UD	32Vd.c. 50A				
			402	4.0	19	XD					
			502	5.0	14	YD					
		FCC32	201	0.2	1,800	201	64Vd.c. 50A				
			251	0.25	1,000	251					
			321	0.315	750	321					
			401	0.4	350	401					
			501	0.5	295	501					
			631	0.63	200	631					
			801	0.8	140	801					
			102	1.0	110	102					
			132	1.25	85	132					
			152	1.5	78	152					
			162	1.6	75	162					
			202	2.0	65	202	32Vd.c. 50A				
			252	2.5	45	252					
			322	3.15	26	UD					
		FHC32	402	4.0	19	XD	24Vd.c. 50A				
			502	5.0	14	YD					

● Ratings/Option Code : AB (Fast-Acting type)

Metric	Inch	Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range °C		
			Code	A							
1005	0402	FCC10	201	0.2	2,400	Z	30Vd.c. 35A	Rated Current×200% Opening Time 5s max.	-55~+125		
			251	0.25	1,000	C					
			321	0.315	750	D					
			401	0.4	620	E					
			501	0.5	340	F					
			631	0.63	290	I					
			751	0.75	220	A					
			801	0.8	210	K					
			102	1.0	150	L					
			132	1.25	120	M	24Vd.c. 35A				
1608	0603	FCC16	152	1.5	100	H					
			162	1.6	90	N					
			202	2.0	55	S					
			252	2.5	40	T					
			201	0.2	3,200	ZB	36Vd.c. 35A				
			251	0.25	1,800	CB					
			321	0.315	1,000	DB					
			401	0.4	750	EB					
			501	0.5	330	FB					
2012	0805	FCC20	631	0.63	280	IB	32Vd.c. 35A				
			751	0.75	210	AB					
			801	0.8	200	KB					
			102	1.0	130	LB					
			132	1.25	110	MB					
			152	1.5	95	HB					
			162	1.6	85	NB					
			202	2.0	70	SB					
			252	2.5	40	TB					
			501	0.5	330	FB	50Vd.c. 50A				
2012	0805	FCC20	631	0.63	270	IB					
			801	0.8	190	KB					
			102	1.0	130	LB					
			132	1.25	100	MB					
			162	1.6	80	NB					
			202	2.0	65	SB					
			252	2.5	40	TB					

Metric	Inch	Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range °C
			Code	A					
1005	0402	FCC10	321	0315	750	3	30Vd.c. 35A	Rated Current×200% Opening Time 5s max.	-55~+125

● Rating/Option Code : AA (Fast-Acting type)

Metric	Inch	Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range °C
			Code	A					
2012	0805	FCC20	501	0.5	270	501	50Vd.c. 50A	Rated Current×200% Opening Time 120s max.	-55~+125
			631	0.63	190	631			
			801	0.8	130	801			
			102	1.0	100	102			
			132	1.25	80	132			
			162	1.6	65	162			
			202	2.0	55	202			
			252	2.5	40	252			

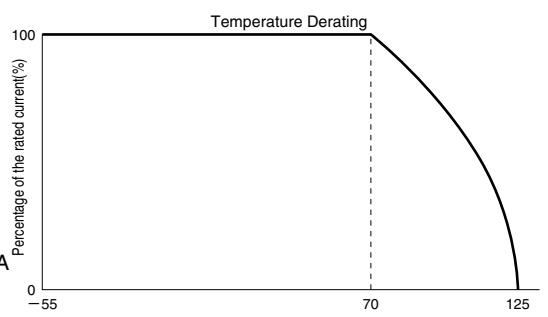
● Recommended Derating for Rated Current

- Nominal Derating  
Option Code AD: Nominal Derating  $\leq$  80% of Rated Current
- Option Code AB, LB: Nominal Derating  $\leq$  70% of Rated Current
- Temperature Derating  
Please refer to the following graph regarding the current derating value for ambient temperature.

Ex.) If FCC16 102AB (Rated Current: 1.0A) is used under ambient temperature 70°C,

Kamaya recommends, less than the current value derated as below,

Rated Current :  $1.0A \times (Nominal\ Derating : 70\% \times Temperature\ Derating : 100\%) = 0.7A$



● Part Number Description

Example

Style	Product Type	Size	Rated Current	Option Code	* Packaging & Standard Qty. (Min.)
FCC	FCC	1005	0.5	AD	Bulk (Loose Package) 1,000pcs. All Styles
FHC	FHC	1608	0.63	AD	Press-Pocket Paper Tape (2mm pitch) 10,000pcs. FCC16 FHC16
		2012	0.8	AB	FCC20 Paper Tape 5,000pcs. FCC32 FHC32
		3216	1.0	LB	FCC32 FHC32 Paper Tape (2mm pitch) 10,000pcs. FCC10(LB)
				AA	

\*Refer to Tape and Packaging information on pages 22 and 23.

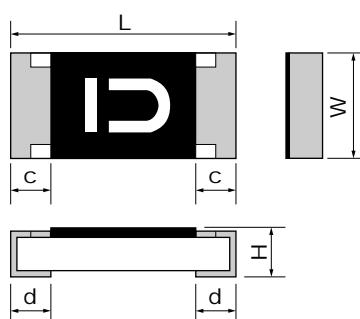
### ●Features

Suitable for over-current protection of the circuit of miniature portable equipment.  
Low internal resistance compared with FCC10AB series for low power consumption and voltage dropping.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Certified UL, c-UL. File No. : E176847



### ●Dimensions



Current value is marked on the cover coating.  
Please refer to Ratings table as below.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FCCR10	1005	0402	1.0±0.05	0.5±0.05	0.4±0.05	0.2±0.1	0.25±0.10	0.8mg

\*Values for reference

### ●Ratings/Option Code : AB (Fast-Acting type)

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time / Current Characteristics	Working Temperature Range °C
Metric	Inch		Code	A					
1005	0402	FCCR10	151	0.15	1850	□	24Vd.c. 35A	Rated Current × 200% Opening time 5s Max.	-55~+125
			201	0.2	1250	Z			
			251	0.25	880	C			
			321	0.315	600	D			
			401	0.4	400	E			
			501	0.5	300	F			

### ●Recommended Derating for Rated Current

#### • Nominal Derating

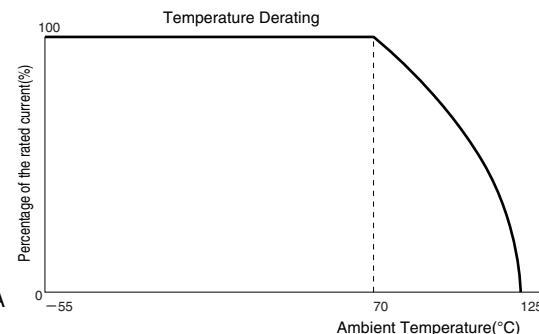
Nominal Derating  $\leq$  75% of Rated Current

#### • Temperature Derating

Please refer to the following graph regarding the current derating value for ambient temperature.

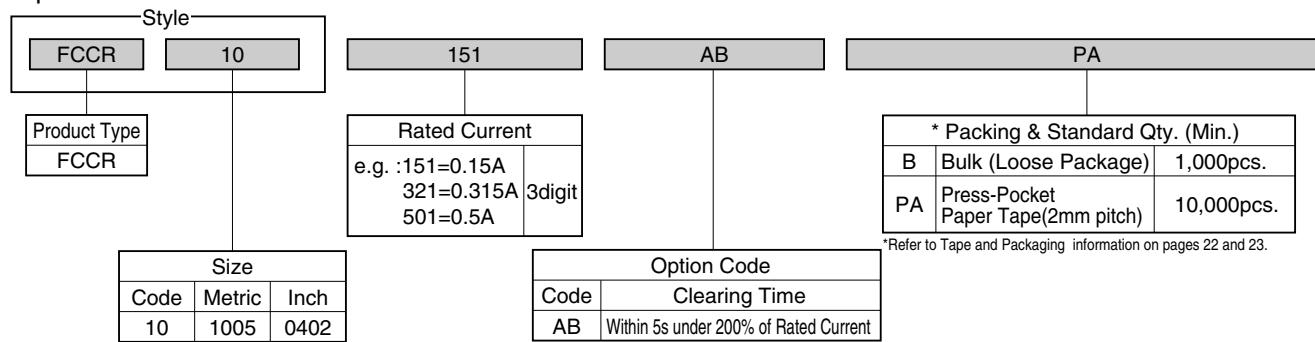
Ex.) If FCCR10 501AB (Rated Current:0.5A) is used under ambient temperature 70°C,  
Kamaya recommends, less than the current value derated as below,

$$\text{Rated Current} : 0.5A \times (\text{Nominal Derating} : 75\% \times \text{Temperature Derating} : 100\%) = 0.375A$$



### ●Part Number Description

#### Example





**FMC16** Option Code : AB / Low Ohm & Fast Acting  
Option Code : AH / In-rush Withstand

Halogen Free

Antimony Free

Pb Free

**●Features** Option code : AB / Low internal resistance compared with FCC/FHC16 AB series for low power consumption and voltage dropping.

Option code : AH / High anti pulse performance.

Please contact Kamaya Sales Dept, if you need to confirm Inrush current endurance, Anti-pulse performance etc.

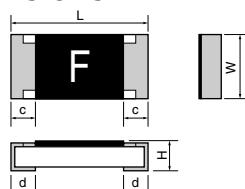
We can provide Application Guide for FMC16 selection.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Certified UL, c-UL. File No. : E176847



**●Dimensions**



Current value is marked on the cover coating.  
Please refer to Ratings table as below.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/p.c.
FMC16	1608	0603	1.6±0.1	0.8 <sup>+0.15</sup> <sub>-0.05</sub>	0.45±0.10	0.3±0.15	0.3±0.1	2mg

\*Values for reference

**●Ratings/Option Code : AB (Fast-Acting type)**

Metric	Size Inch	Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics		Working Temperature Range °C
			Code	A				Rated Current	Opening time	
1608	0603	FMC16	501	0.5	260	F	32Vd.c. 35A	×100%	4h Min.	-55~+125
			751	0.75	140	A			5s Max.	
			102	1.0	110	L			0.2s Max.	
			132	1.25	80	M				
			152	1.5	65	H				
			202	2.0	45	S				
			252	2.5	32	T				
			302	3.0	26	R				
			402	4.0	18	X				
			502	5.0	14	Y				

**●Ratings/Option Code : AH (Fast-Acting type)**

Metric	Size Inch	Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics		Working Temperature Range °C
			Code	A				Rated Current	Opening time	
1608	0603	FMC16	501	0.5	400	HF	32Vd.c. 35A	×100%	4h Min.	-55~+125
			631	0.63	300	HI			5s Max.	
			751	0.75	210	HA			0.2s Max.	
			801	0.8	180	HK				
			102	1.0	115	HL				
			132	1.25	90	HM				
			152	1.5	70	HH				
			162	1.6	60	HN				
			202	2.0	50	HS				
			252	2.5	37	HT				
			302	3.0	28	HR				
			322	3.15	26	HU				
			402	4.0	18	HX				
			502	5.0	14	HY				

**●Recommended Derating for Rated Current**

• Nominal Derating

Nominal Derating  $\leq$  75% of Rated Current

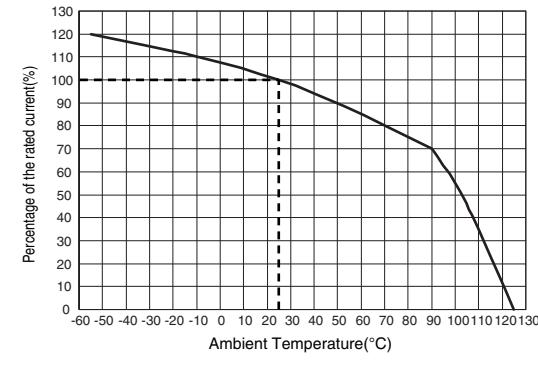
• Temperature Derating

Please refer to the following graph regarding the current derating value for ambient temperature.

Ex.) If FMC16 102AB (Rated Current 1.0A) is used under ambient temperature 70°C,

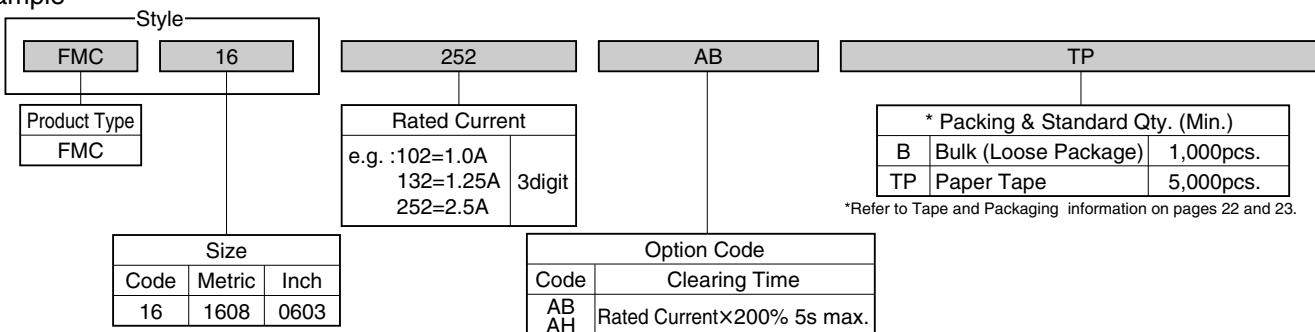
Kamaya recommends, less than the current value derated as below,

Rated Current :  $1.0A \times (Nominal\ Derating : 75\% \times Temperature\ Derating : 80\%) = 0.6A$



**●Part Number Description**

Example



**NEW**

## FMC10 Option Code : AB / Low Ohm & Fast Acting

Halogen Free

Antimony Free

Pb Free

### ●Features

Features Suitable for over-current protection of the circuit of miniature portable equipment.

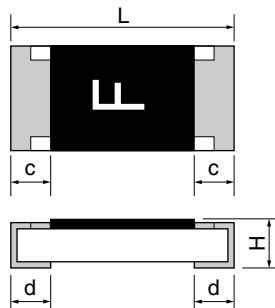
Low internal resistance compared with FCC/FHC 10AB Series.

Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Certified UL, c-UL. File No. : E176847



### ●Dimensions



Current value is marked on the cover coating.  
Please refer to Ratings table as below.

Style	Metric	Inch	L	W	H	c	d	Unit weight/pc.
FMC10	1005	0402	1.0±0.05	0.5±0.05	0.38±0.05	0.2±0.1	0.25±0.10	0.6mg

\*Values for reference

### ●Ratings/Option Code : AB (Fast-Acting type)

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics		Working Temperature Range °C
Metric	Inch		Code	A				Rated Current	Opening time	
1005	0402	FMC10	501	0.5	240	F	24Vdc. 35A	×100%	4h Min.	-55~+125
			751	0.75	140	A		×200%	5s Max.	
			102	1.0	95	L		×300%	0.2s Max.	
			132	1.25	73	M				
			152	1.5	60	H				
			202	2.0	41	S				
			252	2.5	32	T				
			302	3.0	25	R				

### ●Recommended Derating for Rated Current

#### • Nominal Derating

Nominal Derating m 75% of Rated Current

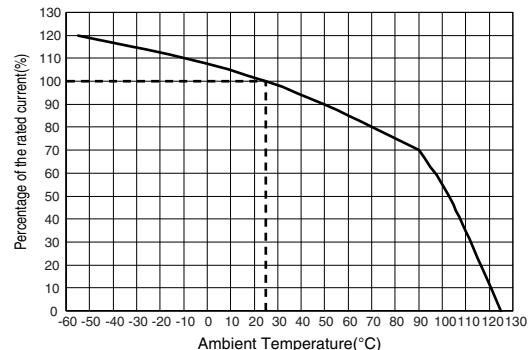
#### • Temperature Derating

Please refer to the following graph regarding the current derating value for ambient temperature.

Ex.) If FMC10 102AB (Rated Current 1.0A) is used under ambient temperature 70°C,

Kamaya recommends, less than the current value derated as below,

Rated Current : 1.0Au (Nominal Derating : 75% Temperature Derating : 80%) = 0.6A



### ●Part Number Description

Example

Style		501		AB		TH		* Packing & Standard Qty. (Min.)							
Product Type	Size	Rated Current						B	Bulk (Loose Package)						
FMC	10 1005	e.g. :501=0.5A 132=1.25A 302=3.0A		3digit				TH	Paper Tape						
* Refer to Tape and Packaging information on pages 22 and 23.															
Option Code															
Code      Clearing Time															
AB      Rated Current×200% 5s max.															



## SBF32 Slow Blow

Halogen Free

Antimony Free

Pb Free

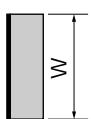
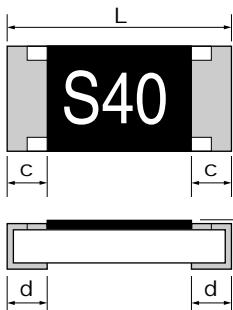
### ●Features

“Slow Blow” ensure high anti pulse performance.  
Please contact Kamaya Sales Dept, if you need to confirm Inrush current endurance, Anti-pulse performance etc.  
We can provide Application Guide for SBF32 selection.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

Certified UL, c-UL. File No. : E176847



### ●Dimensions



Current value is marked on the cover coating.  
Please refer to Ratings table as below.

Style	Metric	Inch	L	W	H	C	d	*Unit weight/p.c.
SBF32	3216	1206	3.2±0.2	1.6±0.15	0.65±0.10	0.5±0.25	0.5±0.25	10mg

\*Values for reference

### ●Option Code:AS(Slow Blow type)

Metric	Inch	Style	Rated Current		Internal Resistance m ohm typ.	Mark	Interrupting Rating	Electrical Characteristics			Working Temperature Range °C
			Code	A				Rated Current	Opening time Min.	Max.	
3216	1206	SBF32	102	1.0	130	S10	63Vd.c. 50A	×100%	4h	—	-55~+125
			132	1.25	94	S13			1s	120s	
			152	1.5	68	S15			0.02s	3.0s	
			202	2.0	40	S20			0.0015s	0.05s	
			252	2.5	30	S25					
			302	3.0	24	S30					
			402	4.0	15	S40					
			502	5.0	12	S50					
			602	6.0	10	S60					
			702	7.0	7	S70					
			802	8.0	6	S80					

### ●Recommended Derating for Rated Current

#### • Nominal Derating

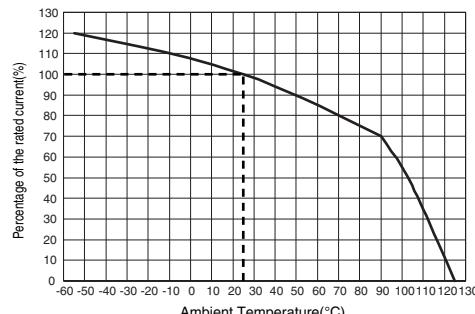
Nominal Derating  $\leq$  75% of Rated Current

#### • Temperature Derating

Please refer to the following graph regarding the current derating value for ambient temperature.

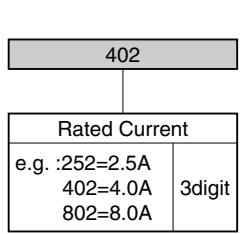
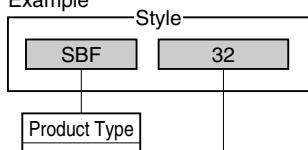
Ex.) If SBF32 102AS (Rated Current 1.0A) is used under ambient temperature 70°C,  
Kamaya recommends, less than the current value derated as below.

Rated Current :  $1.0A \times (Nominal\ Derating : 75\% \times Temperature\ Derating : 80\%) = 0.6A$



### ●Part Number Description

Example



Packing & Standard Qty. (Min.)		
B	Bulk (Loose Package)	1,000pcs.
TP	Paper Tape	5,000pcs.

\*Refer to Tape and Packaging information on pages 22 and 23.

Size		
Code	Metric	Inch
32	3216	1206

Option Code		
Code	Clearing Time	
AS	Rated Current×200% : 1s min~120s. max.	

# Support of Chip Fuse Selection

We would like to support the customer to find the appropriate Kamaya chip fuse if the following conditions of usage are provided.  
Please contact kamaya Sales Dept for details.

- The item you would like to check.
- Circuit Voltage:Max voltage value of circuit mounting fuses.
- Steady-State Current:Current value flown fuses on normal condition.
- Ambient Temperature:Temperature around fuses.
- Wave form (In-rush Current) : It rapidly flows on circuit when power supply is turned on.

Messrs\*\*\*      **Verification of Chip Fuse Application**      \*\*\*/20\*\*

**Item for examination**

Series	FCCR
Size	1005 (mm)
OP Code	AB

**Operating condition**

Application	15 V d.c.
Nominal	20 A
Ambient	70 deg.C Max
Abnormal	1 A

**Item for recommend**

P/N	Size	Amp.	Fusing	Interrupting	Note
FCCR10501AB	1005	0.5 A	200%, 5s	24 Vd.c. 35A	Standing Pulse 100k times

**Confirmation for Interrupting**

Condition	Spec	Judgment
Voltage	15Vd.c.	24Vd.c. OK
Current	20A	35A OK

**Confirmation for Derating**

Nominal Derating	75%
Temperature Derating	100%

**Basis of selection**

#1	0.2666667 A Min.
#2	0.5 A Max.

**Confirmations for Rush**

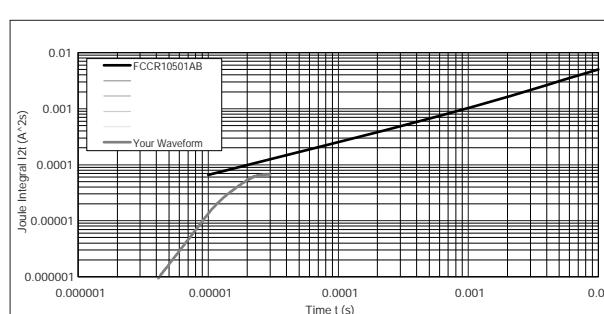
Num of wave	1
#1	Trapezoidal waveform
0	- 0.00002 s
Im	3 A
t1	5 us
t2	10 us
t3	20 us
Joule Integral	90A^2 * us
Amount	Joule Integral

**Confirmation of Rush**

Items	Size	Current	Fusing	Note
#1 FCCR	10 501	AB	1005	0.5A 200%, 5s
#2				
#3				
#4				
#5				

Recommended Item: FCCR10501AB

**Graph of Joule Integral vs Time**



We can provide Application Guide for Fuses selection.



## SPC10

Halogen Free

Antimony Free

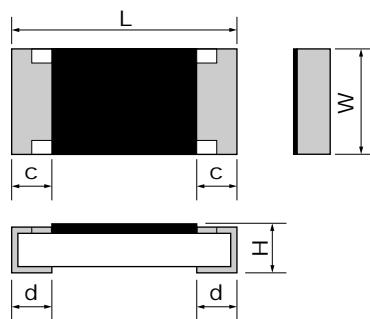
Pb Free

### ●Features

- Low capacitance 0402inch: 0.1pF Max.
- Suitable for ESD protection of High Speed data lines.
- High ESD Withstand, IEC61000-4-2 Lv4 8kV Contact Discharge
- [Major application]
  - PC, PC related equipment and peripherals
  - Mobile Phone, PDA, Small portable devices
  - Digital Video Camera, Digital Still Camera
  - LCD TV, PDP TV, STB
  - Game equipment etc.

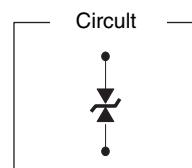
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
SPC10	1005	0402	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	0.25±0.10	0.6mg

\*Values for reference



### ●Ratings

Part Number	Size Metric (Inch)	Capacitance <sup>Note.1</sup> pF	ESD Characteristics			Note.4 Rated voltage V	Note.5 Leakage current μA	Note.6 Category Temperature Range °C
			Peak Voltage <sup>Note.2</sup> Code	Peak Voltage <sup>Note.2</sup> V	Clamp Voltage <sup>Note.3</sup> V			
SPC10	1005 (0402)	0.1 Max.	501	500 Max.	100 Max.	100 Min.	30 Max.	1 Max. -55~+125

Note1. Capacitance : Measured at 25°C, 1MHz, 1V rms.

Note2. Peak voltage : Measured at IEC61000-4-2 8kV Contact Discharge.

Note3. Clamp voltage : Measured at IEC61000-4-2 8kV Contact Discharge, at 30ns.

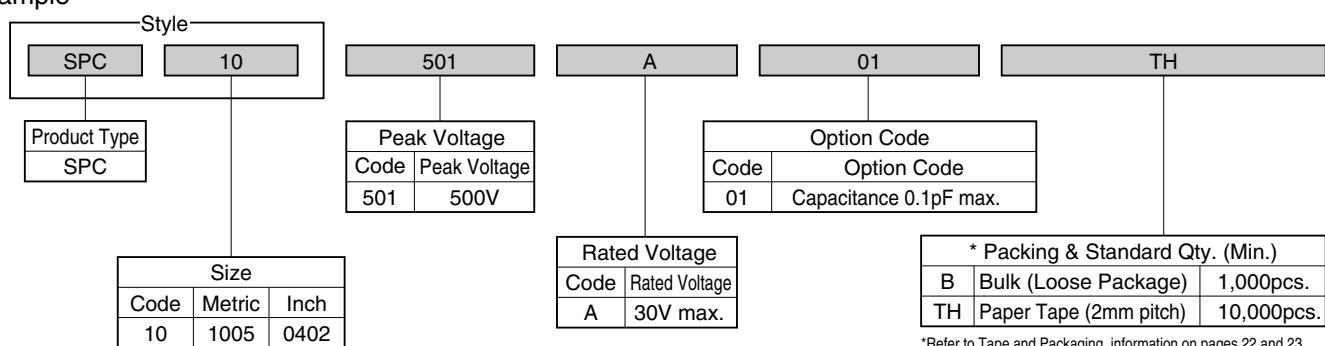
Note4. Rated Voltage : The value of voltage that is applicable to each terminal of ESD suppressor without operation of suppressor.

Note5. Leakage Current : The value of current that ESD suppressor is impressed at rated voltage.

Note6. Category Temperature Range : Working Temperature Range of ESD suppressor.

### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 22 and 23.



NEW

## HSPC16

Halogen Free

Antimony Free

Pb Free

**●Features** High ESD protection performance(15kV) for automotive (Tight ESD spec requirement)  
IEC61000-4-2 Air Discharge:  $\pm 15\text{kV}$

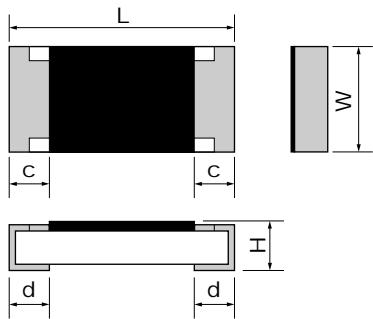
[Major application]

Car audio, Car Navigation System etc.

Video Camera, DSC, Desk top-PC, Note PC etc.

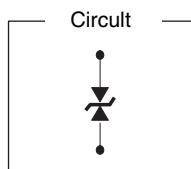
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
HSPC16	1608	0603	1.6 $\pm 0.1$	0.8 $^{+0.15}_{-0.05}$	0.5 $\pm 0.10$	0.3 $\pm 0.1$	0.3 $\pm 0.1$	2mg

\*Values for reference



### ●Ratings

Style	Size Metric (Inch)	Capacitance <sup>Note.1</sup> pF	ESD Characteristics			Note.4 Rated voltage V	Note.5 Leakage current $\mu\text{A}$	Note.6 Category Temperature Range $^{\circ}\text{C}$	
			Peak Voltage <sup>Note.2</sup> Code	V	Clamp Voltage <sup>Note.3</sup> V	ESD pulse withstand Pulses			
HSPC16	1608 (0603)	0.2 Max.	701	700 Max.	100 Max.	100 Min.	20 Max.	1 Max.	-55~+125

Note1. Capacitance : Measured at 25°C, 1MHz, 1V rms.

Note2. Peak voltage : Measured at IEC61000-4-2 15kV Air Discharge.

Note3. Clamp voltage : Measured at IEC61000-4-2 15kV Air Discharge, at 30ns.

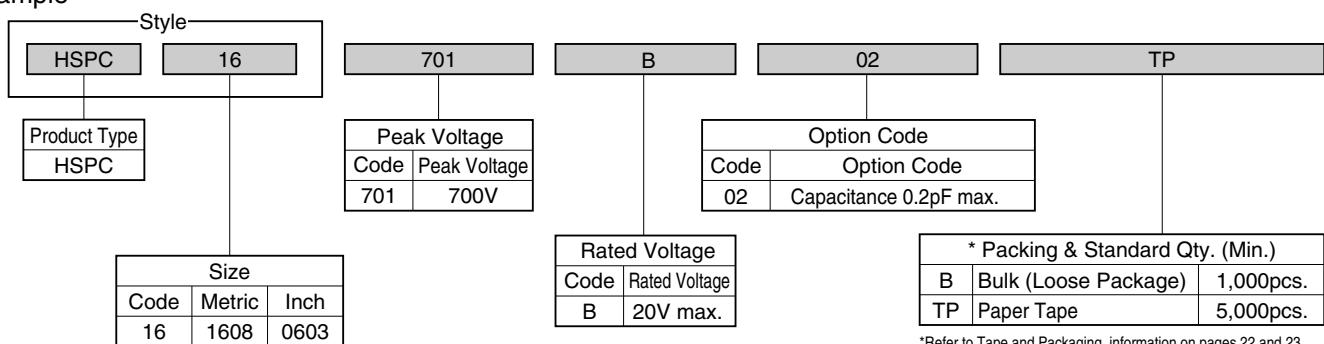
Note4. Rated Voltage : The value of voltage that is applicable to each terminal of ESD suppressor without operation of suppressor.

Note5. Leakage Current : The value of current that ESD suppressor is impressed at rated voltage.

Note6. Category Temperature Range : Working Temperature Range of ESD suppressor.

### ●Part Number Description

Example



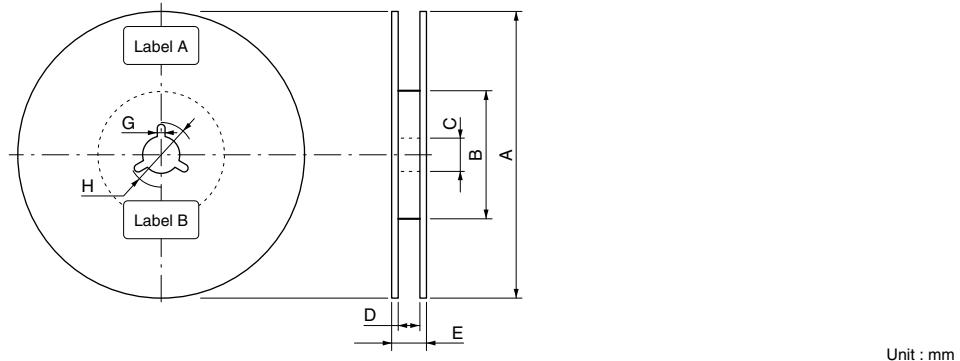
\*Refer to Tape and Packaging information on pages 22 and 23.

# Packaging for SMD

KAMAYA OHM <http://www.kamaya.co.jp>

## Packaging for Surface Mount Devices

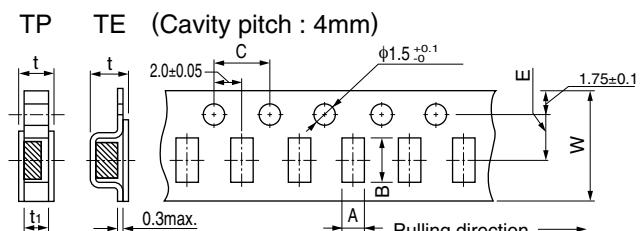
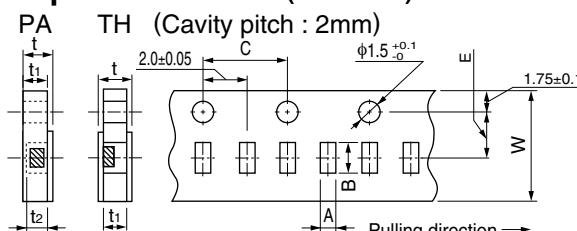
### ● Reel Dimensions



	Code		A	B	C	D	E	G	H			
Plastic Reel (EIAJ ET-7200B)	PA, TH, TP, TE (8 mm width)	Shoot molding	$\phi 180^{+0}_{-1.5}$	$\phi 60^{+1}_{-0}$	$\phi 13 \pm 0.2$	$9^{+1.0}_{-0}$	$11.4 \pm 1.0$	$2 \pm 0.5$	$\phi 21 \pm 0.8$			
	Vacuum molding						$13.0 \pm 1.0$					
	TE(12 mm width)						$13^{+1.0}_{-0}$	$17.0 \pm 1.0$				

\*Dimension A : Please contact KAMAYA for plastic reels of  $\phi 250$ mm and  $\phi 330$ mm.

### ● Tape Dimensions (Unit : mm)



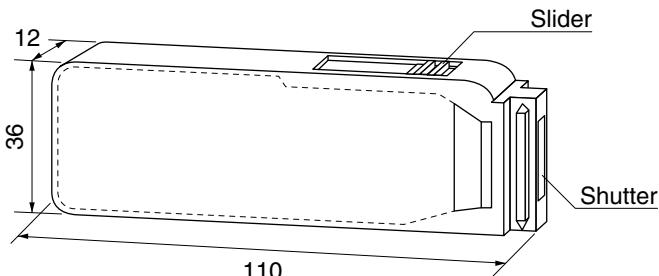
\*Please contact Kamaya sales department for 1mm pitch cavity taping.

Metric	Inch	Style	Code	A	B	C	W	E	t <sub>1</sub>	t <sub>2</sub>	t
0402	01005	RMC1/32, RGC1/32	PA	$0.24 \pm 0.03$	$0.45 \pm 0.03$	$4.0 \pm 0.05$	$8.0 \pm 0.2$	$3.5 \pm 0.05$	$0.31 \pm 0.03$	$0.15 \pm 0.02$	$0.36 \pm 0.03$
0603	0201	RMC1/20, RGC1/20, RCC06, RNC06		$0.37 \pm 0.05$	$0.67 \pm 0.05$	$4.0 \pm 0.05$			$0.42 \pm 0.03$	$0.27 \pm 0.02$	$0.45 \pm 0.05$
		FCC10, FHC10, FCCR10		$0.65 \pm 0.10$	$1.15 \pm 0.10$				$0.6 \pm 0.05$	$0.5 \pm 0.05$	$0.7 \text{ max.}$
1005	0402	RMC1/16S, RGC1/16S, RLC10, RCC10, FCC10(LB), FMC10, SPC10	TH	$0.65^{+0.05}_{-0.10}$	$1.15^{+0.05}_{-0.10}$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$0.8 \pm 0.1$	$0.4 \pm 0.05$	—	$0.5 \text{ max.}$
		RMC1/16		$1.15 \pm 0.15$	$1.9 \pm 0.2$				$0.6 \pm 0.1$	—	$0.8 \text{ max.}$
1608	0603	RMC1/16, RGC1/16, FCR1/16, RVC16, RLC16, RHC16, RCC16, RLP16, FCC16, FHC16, FMC16, FRC16, HSPC16	TP	$1.15 \pm 0.15$	$1.9 \pm 0.2$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$0.8 \pm 0.1$	$0.6 \pm 0.1$	—	$0.8 \text{ max.}$
		RMC1/10, RGC1/10, FCR1/10, RNC20, RVC20, RPC20, RLC20, RHC20, LTC1/10, FCC20, FHC20, FRC20, RCC20		$1.65 \pm 0.15$	$2.5 \pm 0.2$				$0.6 \pm 0.1$	—	$1.0 \text{ max.}$
		RLP20		$2.0 \pm 0.15$	$3.6 \pm 0.2$				$0.8 \pm 0.1$	—	
2012	0805	RMC1/10, RGC1/10, FCR1/10, RNC20, RVC20, RPC20, RLC20, RHC20, LTC1/10, FCC20, FHC20, FRC20, RCC20	TH	$2.85 \pm 0.20$	$3.5 \pm 0.2$	$8.0 \pm 0.3$	$8.0 \pm 0.3$	$5.5 \pm 0.05$	$0.6 \pm 0.1$	—	$1.0 \pm 0.2$
		RLP20		$3.1 \pm 0.2$	$5.5 \pm 0.2$				$0.8 \pm 0.1$	—	$1.1 \pm 0.15$
3216	1206	RMC1/8, RGC1/8, FCR1/8, RNC32, RVC32, RPC32, RLC32, LTC1/8, FCC32, FHC32, SBF32, FRC32, RCC32	TE	$3.6 \pm 0.2$	$6.9 \pm 0.2$	$12 \pm 0.3$	$12 \pm 0.3$	$5.5 \pm 0.05$	$0.6 \pm 0.1$	—	$0.8 \text{ max.}$
		RLP32		$1.15^{+0.05}_{-0.10}$	$1.15^{+0.05}_{-0.10}$				$0.4^{+0.05}_{-0.10}$	—	$0.55 \text{ max.}$
3225	1210	RMC1/4, FCR1/4, RPC35, RLC35	TH	$1.2 \pm 0.1$	$2.2 \pm 0.1$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$3.5 \pm 0.05$	$0.4 \pm 0.1$	—	$0.5 \text{ max.}$
5025	2010	RMC1/2, FCR1/2, RVC50, RPC50, RZC50, RLC50, RLS50		$1.9 \pm 0.15$	$3.6 \pm 0.2$				$0.6 \pm 0.1$	—	$0.8 \text{ max.}$
6332	2512	RMC1, FCR1, RVC63, RPC63, RZC63, RLC63, RLS63, RLP63, MLP63		$1.9 \pm 0.15$	$4.1 \pm 0.15$				$0.8 \pm 0.1$	—	
Chip Networks Chip Attenuators		RAC101A	TP	$1.9 \pm 0.15$	$3.6 \pm 0.2$	$8.0 \pm 0.3$	$8.0 \pm 0.3$	$5.5 \pm 0.05$	$0.4 \pm 0.1$	—	$0.55 \text{ max.}$
		RAC102D		$1.9 \pm 0.15$	$4.1 \pm 0.15$				$0.6 \pm 0.1$	—	$0.5 \text{ max.}$
		RAC104D	TH	$1.2 \pm 0.1$	$2.2 \pm 0.1$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$3.5 \pm 0.05$	$0.4 \pm 0.1$	—	$0.8 \text{ max.}$
		RAC164D, RAC168U		$1.9 \pm 0.15$	$3.6 \pm 0.2$				$0.6 \pm 0.1$	—	
		RAC168D		$1.9 \pm 0.15$	$4.1 \pm 0.15$				$0.8 \pm 0.1$	—	



## PACKAGING FOR SURFACE MOUNT DEVICES

### ● Bulk Case (Code : BA) (Unit : mm)



### ● Standard Packaging Quantities

Size		Bulk case (pcs./case)
Metric	Inch	
1608	0603	25,000
2012	0805	10,000
3216	1206	5,000

### ● Standard Packaging Quantities (Minimum Units)

Metric	Inch	Style	Tape & Reel				Bulk Q' ty (pcs.)	
			Code	M. P. Q. (pcs./reel)	Outer Carton			
Metric	Inch	Style			Reel Q' ty (pcs.)	Gross Weight (kg)	Measurement (m³)	
		PA	20,000	50	8.8	0.027		
			15,000		7.8			
			TH		6.0			
		TP	10,000		8.3			
					7.2			
					8.4			
					8.8			
					10.0			
		TE	4,000		7.7			
					8.0			
					10.4			
					12.0			
Chip Networks Chip Attenuators		RAC102D, RAC101A	TH	10,000	50	6.0	1,000*	
		RAC104D				6.3		
		RAC164D, RAC168U	TP	5,000		7.7		
		RAC168D				8.6		

※Please contact Kamaya Sales department about bulk package of RLP16, RLP20, RLP32, RLP63, MLP63.

# Leaded Resistors

Pulse

KAMAYA OHM <http://www.kamaya.co.jp>

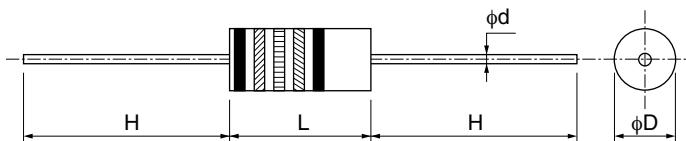
## RC1/2U

**●Features** UL recognized component(UL1676) (File No.E151897). Reduce UL or CSA approval and maintenance cost. Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

UL recognized component (UL1676) (File No.E151897)



### ●Dimensions



Style	L	D	H	d	*Unit weight/pc.
RC1/2U	9.5 <sup>+0.8</sup> <sub>-0.7</sub>	3.6±0.2	28±3	0.7 <sup>+0.07</sup> <sub>-0.05</sub>	422mg

\*Value for reference

### ●Ratings

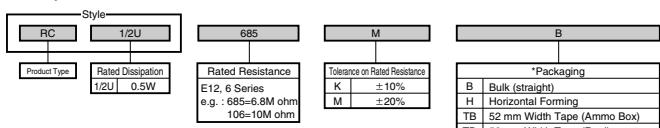
Style	Rated Dissipation at 70°C W	Rated Voltage V	Rated Resistance Range	Tolerance on Rated Resistance and Preferred Number Series for Resistors	Specified Line Voltage	Isolation Voltage V	Category Temperature Range °C
RC1/2U	0.5	350	1M ohm~10M ohm	K(±10%) E12	250V.a.c. max. or 125V.a.c. max.	500	-55~+125

Note1. Required characteristic performance is based on JIS C 6406 and UL 1676.

Note2. The name of this product is granted as Conductive Path, but UL1676 and the requirements as Discharge Path shown in CSA22, 2 No.1-94 are satisfied, but the products performance does not cover all the requirements as Conductive Path.

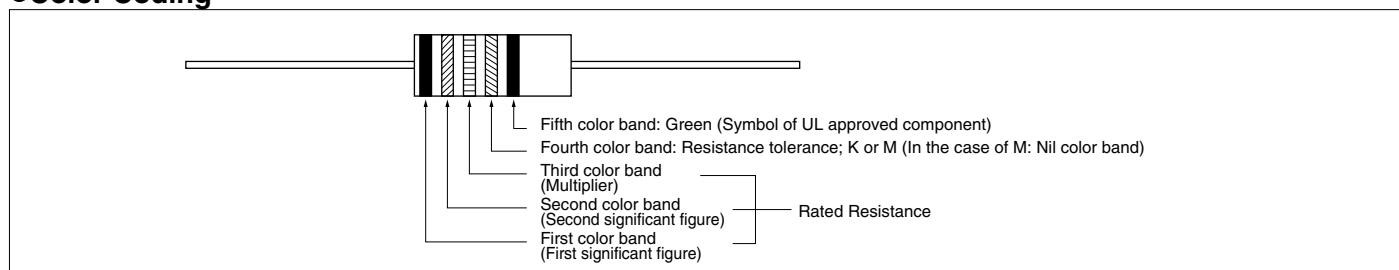
### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 25.

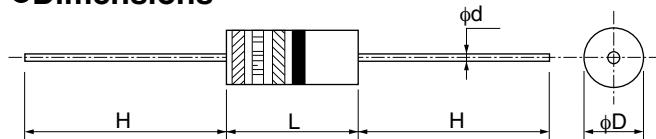
### ●Color Coding



## RC

**●Features** Improved pulse endurance characteristics compared to carbon-film devices. Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



Style	L	D	H	d	*Unit weight/pc.
RC1/4	6.3±0.7	2.4±0.1	30±3	0.6±0.05	222mg
RC1/2	9.5 <sup>+0.8</sup> <sub>-0.7</sub>	3.6±0.2	28±3	0.7 <sup>+0.07</sup> <sub>-0.05</sub>	422mg

\*Values for reference

### ●Ratings

Style	Rated Dissipation at 70°C W	Limiting Element Voltage V	Rated Resistance Range	Combination of Rated Resistance Range and Temperature Coefficient of Resistors	Rated Resistance Range	Tolerance on Rated Resistance and Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RC1/4	0.25	250	1 ohm~5.6M ohm	+6.5~+0.5   +1~+6   1 ohm~ 1k ohm -10~ -0   0~ -6   1k ohm~ 10k ohm +19~ -0   0~ -7.5   1k ohm~ 100k ohm +15~ -0   0~ -10   10k ohm~ 1M ohm +20~ -0   0~ -15   1M ohm~ 22M ohm	J (± 5%) E24 K (±10%) E12 M (±20%) E6	100	-55~+125	
RC1/2	0.5	350	1 ohm~22M ohm	+20~ -0   0~ -15   1.1M ohm~ 22M ohm	500			

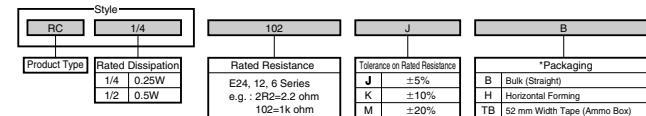
Note1. Rated Voltage =  $\sqrt{(Rated Dissipation) \times (Rated Resistance)}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

### ●Part Number Description

Example



\*Refer to Tape and Packaging information on pages 25.

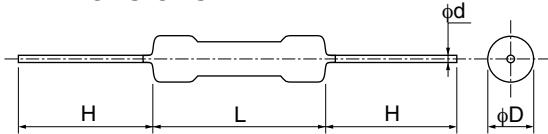
**●Storage** Temperature 20±15°C, Humidity 60%R.H. Max, Recommendation Storing Term 6 months after shipped from factory.



## RH

**●Features** Most suitable resistor for high-tension circuits in which high precision is required for example, the physical and chemical measurement equipment, X-ray apparatus, electron microscope, and etc.  
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

### ●Dimensions



\*Dimension "L" should be measured between both side of D/2.

Note. Please contact KAMAYA for the details of marking.

### ●Ratings

Style	Rated Dissipation W	Limiting Element Voltage kV	Maximum Overload Voltage kV	Pulse Voltage kV	Combination of Temperature Coefficient of Resistance and rated Resistance Range		Tolerance on Rated Resistance
					Rated Resistance Range M ohm	Temperature Coefficient of Resistance 10°C	
RH 1	1.0	1.5	4	4	1sRx500	±100	F (± 1%)
RH 2	2.0	5	12.5	7.5	500-Rx5,000	±200	G (± 2%)
RH 3	3.0	10	25	15			J (± 5%)
RH 4	4.0	15	30	20			K (± 10%)
RH 6	6.0	20	40	30			
RH 8	8.0	30	60	40			

Note1. Rated Voltage=  $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$ . (d.c. or a.c. r.m.s. Voltage)

Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

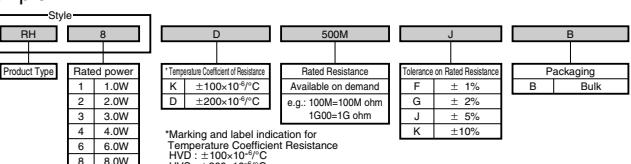
Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

Style	L	D	H	d	Unit Weight/pc.
RH 1	14.5±1.0	4.0±1.0	38±3	0.8	950mg
RH 2	26.5±1.0	5.0±1.0	38±3	1.0	1,950mg
RH 3	39.0±2.0	5.0±1.0	38±3	1.0	2,410mg
RH 4	52.0±2.0	9.0±1.0	38±3	1.0	6,880mg
RH 6	77.0±2.0	9.0±1.0	38±3	1.0	9,290mg
RH 8	97.0±2.0	9.0±1.0	38±3	1.0	11.46g

\*Values for reference

### ●Part Number Description

Example



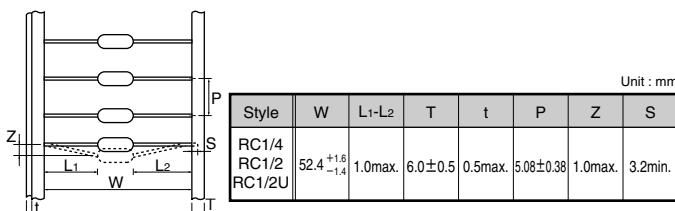
\*Marking and label indication for Temperature Coefficient Resistance

HVD: ±100×10⁻⁶/°C

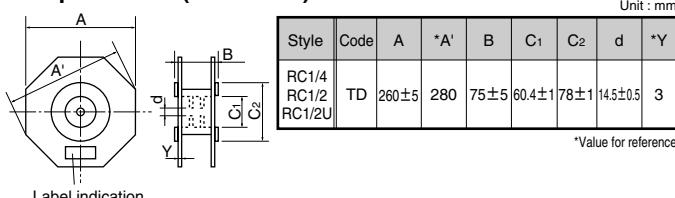
HVS: ±200×10⁻⁶/°C

## Packaging for Leaded Resistors

### ●Tape

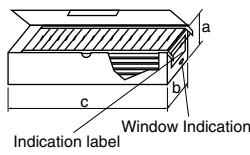


### ●Tape & Reel (Code : TD)



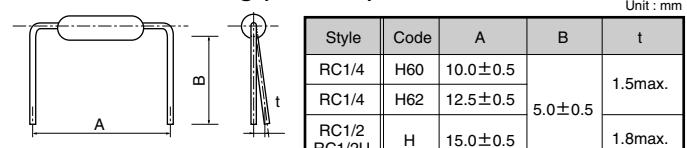
Label indication

### ●Ammo Box



Style	Code	a	b	c
RC1/4	TB	60±5		275±5
RC1/2	52mm Width Tape	65±5	75±5	455±5
RC1/2U				

### ●Horizontal Forming (Code : H)



Style	Tape & Reel				Ammo Box				Bulk Packaging			
	Q'ty / Reel (pcs.)	Reel Size (mm)	Outer Carton		Width of Taping (mm)	Q'ty / Box (pcs.)	Outer Carton		M.P.Q. (Q'ty / Plastic Bag pcs.)	Q'ty / Inner Carton (pcs.)	Outer Carton	
			Q'ty / Carton (pcs.)	Gross Weight (kg)			Q'ty / Carton (pcs.)	Gross Weight (kg)			Q'ty / Carton (pcs.)	Gross Weight (kg)
RC1/2U	3,000	260	24,000	13	0.04	52	2,000	30,000	16	0.05	500 (100×5)	5,000
RC1/2	3,000	260	24,000	13	0.04	52	2,000	30,000	16	0.05	500 (100×5)	5,000
RC1/4	5,000	260	40,000	12	0.04	52	2,000	30,000	10	0.03	1000 (200×5)	10,000

# Capacitors

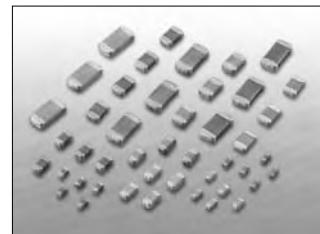
KAMAYA OHM <http://www.kamaya.co.jp>

## Multilayer Ceramic Capacitor

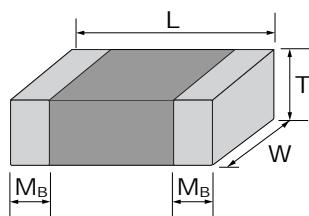
Please see Catalog of Walsin Technology Corporation. (Website: <http://www.passivecomponent.com/>) for detail information.

### ●Features

1. General purpose, Board of PC etc.
2. Full support by Japanese Quality Assurance team.



### ●Dimensions



Metric	Inch	L	W	T/Symbol	M <sub>B</sub>	Series
<b>1005</b>	<b>0402</b>	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	N	0.25±0.05/-0.1
<b>1608</b>	<b>0603</b>	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07	S	0.4 ±0.15
		1.6+0.15/-0.1	0.8+0.15/-0.1	0.8+0.15/-0.1	X	0.4 ±0.15
				0.6 ±0.1	A	0.5 ±0.2
				0.8 ±0.1	B	0.5 ±0.2
				1.25±0.1	D	0.4 ±0.2
				1.25±0.1	#	0.5 ±0.2
				1.25±0.2	T	0.5 ±0.2
				1.25±0.2	I	0.5 ±0.2
<b>2012</b>	<b>0805</b>	2.0 ±0.15	1.25±0.1	0.8 ±0.1	B	0.13max.
				0.8 ±0.1	B	0.6 ±0.2
				0.95max.	T	0.5 ±0.2
				0.95±0.1	C	0.6 ±0.2
				1.15±0.15	J	0.6 ±0.2
				1.25max.	D	0.6 ±0.2
				1.6 ±0.15	#	0.5 ±0.2
				1.6 ±0.15	T	0.5 ±0.2
				1.6 ±0.2	G	0.6 ±0.2
				3.2+0.3/-0.1	P	0.5 ±0.2
<b>1632</b>	<b>0612</b>	3.2 ±0.15	1.6 ±0.15	1.6+0.3/-0.1	#	0.5 ±0.2
				0.8 ±0.1	T	0.5 ±0.2
				0.95max.	I	0.5 ±0.2
				0.95±0.1	G	0.6 ±0.2
				1.15±0.15	J	0.6 ±0.2
				1.25max.	D	0.6 ±0.2
				3.2 ±0.15	#	0.5 ±0.2
				3.2 ±0.2	T	0.5 ±0.2
				1.6 ±0.15	G	0.6 ±0.2
<b>3216</b>	<b>1206</b>	3.2 ±0.15	1.6 ±0.15	1.6+0.3/-0.1	P	0.5 ±0.2
				0.8 ±0.1	#	0.5 ±0.2
				0.95max.	T	0.5 ±0.2
				0.95±0.1	I	0.5 ±0.2
				1.15±0.15	G	0.6 ±0.2
				1.25max.	J	0.6 ±0.2
				3.2 ±0.2	D	0.6 ±0.2
				1.6 ±0.15	#	0.5 ±0.2
				1.6 ±0.2	T	0.5 ±0.2
				1.6 ±0.2	G	0.6 ±0.2
				3.2+0.3/-0.1	P	0.5 ±0.2
<b>3225</b>	<b>1210</b>	3.2 ±0.3	2.5 ±0.2	0.95max.	#	0.5 ±0.25
				0.95±0.1	T	0.5 ±0.25
				1.25±0.1	I	0.5 ±0.25
				3.2 ±0.4	G	0.75±0.25
				2.5 ±0.3	J	0.75±0.25
				2.5 ±0.3	D	0.75±0.25
<b>4520</b>	<b>1808</b>	4.5 ±0.4	2.03±0.25	1.25±0.1	#	0.5 ±0.25
				2.0 ±0.2	T	0.5 ±0.25
				2.0 ±0.2	G	0.75±0.25
				4.5 ±0.4	P	0.5 ±0.25
<b>4532</b>	<b>1812</b>	4.5 ±0.4	3.2 ±0.3	1.25±0.1	#	0.6 ±0.25
				2.0 ±0.2	T	0.6 ±0.25
				2.0 ±0.2	G	0.75±0.25
				4.5 ±0.4	P	0.6 ±0.25

Unit: mm

# : Reflow soldering process only.

### ●Characteristic

Application	Series	Dielectric	Size	Rated Voltage	Capacitance
General Purpose	General Purpose	NPO, X7R, Y5V	0402(1005) 0603(1608)	0805(2012) 1206(3216)	1210(3225) 1812(4532)
	High Capacitance	X7R, X5R, Y5V	0402(1005) 0603(1608)	0805(2012) 1206(3216)	1210(3225) 1812(4532)
Safety and Power supply control	Middle & High Voltage	NPO, X7R, Y5V	0805(2012) 1206(3216)	1210(3225) 1812(4532)	200V, 250V, 500V, 630V 1kV, 1.5kV, 2kV, 3kV

### ●Part Number Description

Example General purpose  
High Capacitance  
Ultra-small  
Middle & High Voltage  
Low Inductance

Style		B		K		500		C		T	
0805				104							
Size (Inch / Metric)	Dielectric	Capacitance	Tolerance	Rated Voltage	Electrode	Package					
0201 = (0603)	N=NPO	R47=0.47pF	A = ±0.05pF	6R3=6.3 Vdc	L = Ag/Ni/Sn	B = Bulk					
0402 = (1005)	B=X7R	0R5=0.5pF	B = ±0.1pF	100=10 Vdc	C = Cu/Ni/Sn	C= Bulk case					
0603 = (1608)	X=X5R	1R0=1pF	C = ±0.25pF	160=16 Vdc		T= 7inch width Reale					
0805 = (2012)	F=Y5V	100=10pF	D = ±0.5pF	250=25 Vdc							
1206 = (3216)		101=100pF	F = ±1%	500=50 Vdc							
1210 = (3225)		102=1000pF	G = ±2%	101=100 Vdc							
1808 = (4520)		103=0.01uF	J = ±5%	201=200 Vdc							
1812 = (4532)		104=0.1uF	K = ±10%	251=250 Vdc							
		105=1uF	M = ±20%	501=500 Vdc							
		106=10uF	Z = -20to+80%	631=630 Vdc							
		107=100uF		102=1000 Vdc							
				152=1500 Vdc							
				202=2000 Vdc							
				302=3000 Vdc							

Example Low profile  
Open-mode Design  
High Q Low ESR  
Microwave  
Safety certified

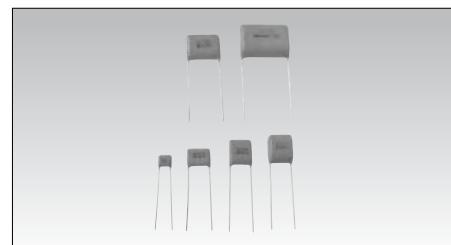
Style		21	
OP			
21			
Product Type	Size		
TT=	15=0402		
OP=	18=0603		
HH=	21=0805		
MW=	31=1206		
S2=	32=1210		
S3=	42=1808		
	43=1812		



# Film Capacitors

## ●Dipped metallized film capacitors

### ●CR Units



#### Film Capacitors Summary

Summary		Style	Series Code	Features	Rated Voltage	Capacitance ( $\mu$ F)	Temp. Range (°C)
General use	Standard		FPB <b>NEW</b>	• Small in size	250VDC 450VDC 630VDC	0.47~10 0.22~4.7 0.068~2.2	-40~ +85 (+105)
			MDX	• Standard	250VDC 450VDC 630VDC	0.01~10 0.01~4.7 0.01~2.2	-40~ +85 (+105)
			MDS	• Standard	100VDC 250VDC 400VDC 630VDC	0.56~10 0.18~10 0.039~4.7 0.01~2.2	-40~ +85 (+105)
			MDD	• Lead pitch 5,7.5mm	50VDC 63VDC 100VDC 250VDC	0.1~2.2 0.1~1.0 0.047~0.47 0.01~0.15	-40~ +85 (+105)
	PFC circuit in power		FPA	• Small in size • High temperature proof • Halogen-free	450VDC 550VDC	0.47~2.2	-40~ +85 (+110)
			FPS3	• Low Noise	450VDC	0.47~2.2	-40~+85 (+110)
			FPS	• Needle flame test proof			-40~+85 (+105)
	Large capacitance		MDL	• Miniature and Large capacitance • For high frequency and high ripple	35VDC 63VDC	4.7~22 10~22	-40~ +85 (+105)
	High voltage		MDD	• High voltage series • For AC and DC	1250VDC (500VAC)	0.0022~0.1	-40~ +85 (+105)
High frequency circuit use			FPD4	• Standard	250VDC 450VDC 630VDC	0.01~10 0.01~3.3 0.01~2.2	-40~ +105
			FPD5	• Small in size	450VDC	0.47~2.2	-40~ +105
Across- the- line use			CFD-N	• For noise immunity test • Standard	125VAC 250VAC	0.033~4.7 0.01~2.2	-40~ +85 (+105)
Surge absorber C-R units			CR	• C-R Unit	125VAC 250VAC	0.1 $\mu$ F +120 $\Omega$ 0.033 $\mu$ F +120 $\Omega$	-40~ +85
			CRKH	• C-R Unit • UL,VDE Safety Standard	250VAC (275VAC)	0.01~0.1 $\mu$ F 47, 100, 120 $\Omega$	-40~ +100

#### ■Compliance with RoHS requirement

Our film capacitors (all products in the above list) comply with RoHS requirement.

#### About Nitsuko product, Please contact as follows.

**Nitsuko** Nitsuko Electronics Corporation <http://www.nitsuko-ele.co.jp/>

Development · Sales Department

2031-1, Ogawara, Suzaka-shi, Nagano-ken, Postcode 382-0071

TEL (+81) 26-246-6351 FAX (+81) 26-245-6239 E-Mail: [ec@nitsuko-ele.co.jp](mailto:ec@nitsuko-ele.co.jp)

# Information

KAMAYA OHM <http://www.kamaya.co.jp>

## SMD Product handling manual

### 1. Scope

This product handling manual is applied to parts for the surface mounting that KAMAYA ELECTRIC CO., LTD. produce.

### 2. Storage

Consider the following four points for keeping the environment, the storage method, and the storage period to maintain the qualities of parts below.

2.1 Avoid storing in locations where corrosive gas is present (Sea breezes, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, etc.) or in dusty and moist circumstances. Otherwise, it may result in deterioration of performance and adversely affect the soldering.

2.2 Avoid keeping goods in high temperature and direct sunlight. Otherwise, it may cause deformation of packing materials, and adherence of parts on packing materials.

2.3 Please enforce First-In & First-Out for the use of parts in consideration of the change in the environmental condition.

2.4 Store these products in the following environment.

Temperature: 5 to 35°C

Humidity : 25 to 75%

Terms of guarantee: 2 years

### 3. Pattern Design

To solder parts on the printed circuit board properly, it is necessary to take a careful attention in design stage.

It is necessary to consider the land pattern position by mounting equipment, method of soldering (flow or reflow), and material of print circuit board. Moreover, it is necessary to consider the position of adhesive and the array of parts at the flow soldering. Refer to Page 30 for recommended land pattern of Kamaya product

3.1 Strength of parts might decrease under the condition that the width or the shape of land pattern is too large, or the bend of the substrate occurs when gap of soldering position is generated or there are a lot of solder quantities.

3.2 Interval of parts should not narrow too much for the short-circuit prevention.

In general, it is safer to open more than 0.5mm from the positioning accuracy of mounting.

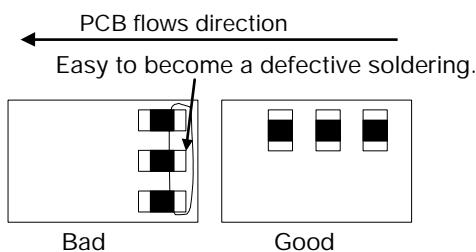
3.3 The resistor is a generation of heat source.

The pattern design that opens enough distance is necessary from other generation of heat parts.

Especially, please do enough derating of the rated dissipation for a high voltage circuit after considering the temperature rises of the adjoining generation of heat parts.

3.4 When the flow soldering is executed, soldering differs depending on the direction where the printed circuit board is thrown.

Figure-1

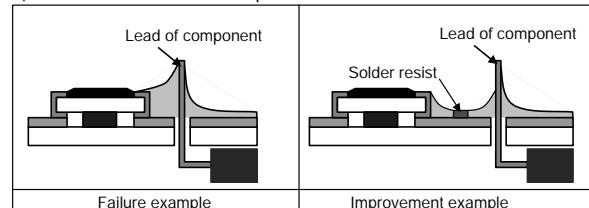


### 3.5 Examples of division of land pattern (Cross-sectional view)

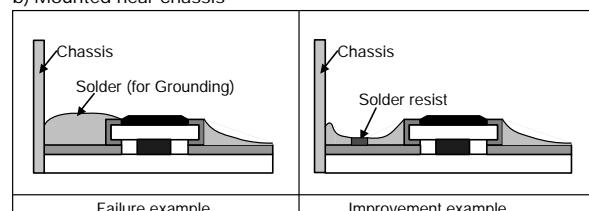
- Land share with lead component.
- Mounted near Chassis.
- Side by side array.

Figure-2

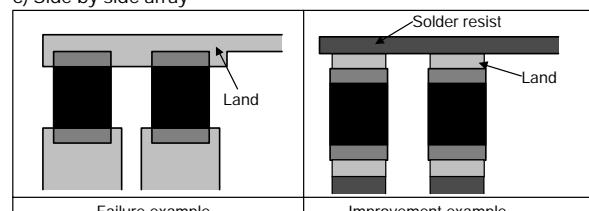
a) Land share with lead component.



b) Mounted near chassis



c) Side by side array



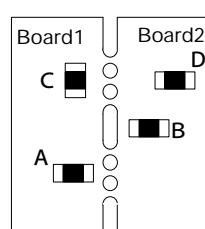
### 3.6 Avoid the component placement to the following places.

- Near cutting line of print circuit board.
- Place where print circuit board is distorted and mechanical stress is received easily.

Figure-3

Layout of resistors near the cutting line of print circuit board.

Improper A → B → C&D → Proper



### 4. Print Circuit Board

Please consider following respects.

#### 4.1 Thermal diffusivity (thermal conductivity)

Thermal diffusivity through the print circuit board is necessary for generation of heat from parts.

Especially, use the print circuit board with high thermal conductivity when the calorific value is large.

#### 4.2 Resistance to soldering heat

Select a heatproof, good substrate to soldering parts. Because it often solders two or more times.



## SMD PRODUCT HANDLING MANUAL

### 4.3 Pull peel strength of land pattern

Consider that the print circuit board corresponding to the land pattern size and sticking strength with the copper foil.

### 4.4 Bend strength

The stress in the electrodes and parts body, when the PCB bends by weight and external stress of parts, causes the joining electrode flaking off and the crack. Consider the bend ability of print circuit board.

### 5. Adhesive

When an adhesive is applied, the spread should be set corresponding to each part so that there are no overflow into the land or no dropout of the parts.

### 5.1 Strength of adhesive must be strong not to fall and move parts in the mounting process.

### 5.2 Stiffen at the low temperature as much as possible. Do not heat parts as the cure temperature.

### 5.3 Keep without stringy, slumping adhesion, and dewetting that solder can not adhere to parts.

### 5.4 After soldering, there must be no causticity.

### 6. Mounting

Please consider following to install parts in the printed circuit board.

- 1) Gap of installing position
- 2) Product floating from land pattern
- 3) Mechanical stress to overcoat of parts.

### 6.1 Do not touch with bare-handed in the electrode and wash it well with an organic solvent when the foreign body such as oils and fats adheres.

### 6.2 Mounting trouble of static electricity may occur when you touch or rub the part, packaging materials and the cover tape of the taping especially. When you deal with parts on the worktable, please execute the static electricity prevention measures (like the electrification prevention mat).

### 7. Soldering

#### 7.1 The lead free is recommended in the solder paste.

Select appropriate solder paste after executing the evaluations of soldering and strength of bond, etc.

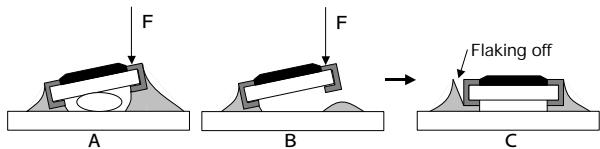
#### 7.2 Select flux without the causticity.

#### 7.3 The conditions of temperature and time should be well considered in the soldering process so that any warp or twist in the printed circuit board may not grow. Moreover, the electrode might flake off when the substrate is bent after it solders or the high impact is given parts or around it.

#### 7.4 In VPS Reflow, preheat well so that the difference of temperature may not big too much between parts and inside of furnace. A big difference of temperature cause drop out of parts.

#### 7.5 Do not rub the electrodes of resistor with soldering iron. The electrode may flake off when the iron is pressed on the electrode. Do not raise the temperature of the soldering iron more than necessary when the side electrode of parts is formed with the Ag resin.

Figure-4



### 7.6 The overcoat and the main body may be chipped off when you hold the parts strongly with tweezers.

Do not use parts detached from the print circuit board once again.

### 7.7 Please refer to page 31 for our recommended soldering conditions.

### 8. Cleaning

The remaining of the flux on print circuit board with part mounted may cause a bad effect on humidity resistance and corrosion resistance. Please use a rosin flux with low chlorine-containing, or alcoholic and hydrocarbon solvent.

### 9. Other Notes

#### 9.1 The use of the products mentioned in this catalog refers to consumer applications that are available on the open market.

#### 9.2 There are cases which high levels of reliability distinctive from consumer applications sold on the open market are necessary for electrical components which are used in equipment that could effect human life or create huge social loss owing to defect in medical equipment, space equipment, nuclear power-related equipment, vehicle mounted equipment, aircraft and other equipment. When you examine the use in the above-mentioned equipment or for uses not mentioned within this catalog, ensure that you consult with our sales department prior to deployment.

#### 9.3 As the use of resistors and surface-mounted parts used in all electrical components, especially resistors used in high-voltage circuits and in circuits prescribed for safety regulations, will be greatly affected by the circuit used, the method of mounting, the material, and environmental conditions, ensure that you consult with our sales department prior to deployment when examining the viability of use in characteristic circuits, mounting methods, material and under characteristic environmental conditions,

#### 9.4 Thoroughly verify performance and reliability when using under the following characteristic environmental conditions :

- (1) Use within a liquid environment (Water, oil, liquid chemical, organic solution, etc.)
- (2) Use in direct sunshine. Outdoors in heavy dew, in dusty environments, or where corrosive gas is present (Sea breezes, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, etc.)
- (3) Use in environments with strong electrostatic or magnetic waves exists.
- (4) Use nearby flammable substances.
- (5) Use with the resistors coated in resin, etc.
- (6) Use of water or water solution for flux cleaning after unwashed soldering or soldering.
- (7) Use under environment of condensation

#### 9.5 Ensure that the condition of the mounting is evaluated and verified on circuit boards when subjected to overloads in the form of pulses or surges, etc.

#### 9.6 Take care handling these products as they may be damaged and become defective if subject to impact, such as dropping.

# Information

KAMAYA OHM <http://www.kamaya.co.jp>

## SMD Product handling manual (RECOMMENDED LAND PATTERN)

Note: This land pattern is not supported by the mounting evaluation.

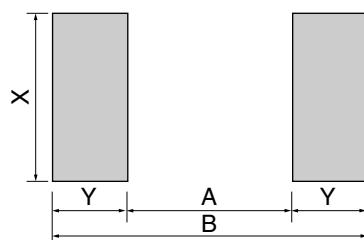
This is reference information only.

### ●Application

All KAMAYA Surface Mount Devices

### ●Recommended land pattern (Reference)

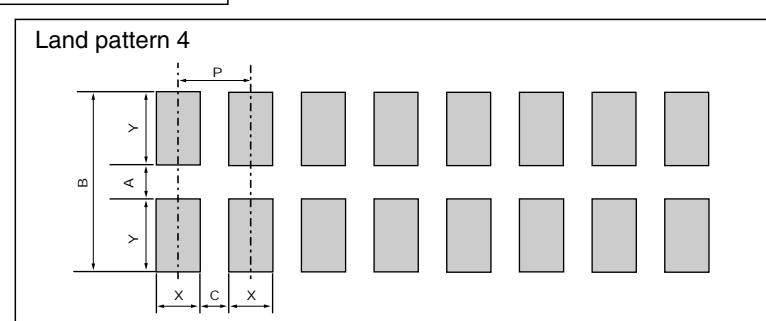
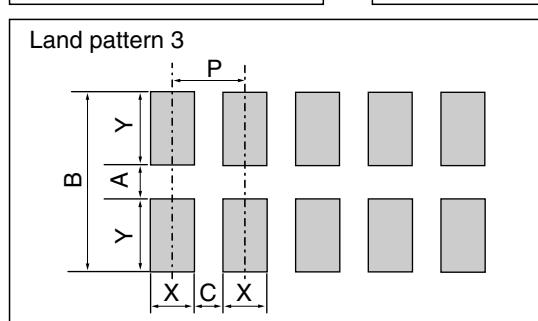
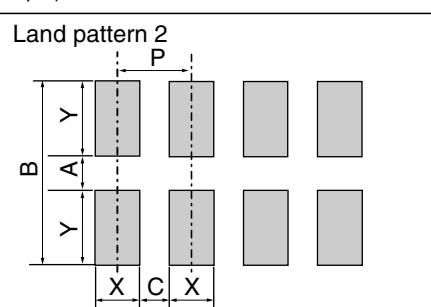
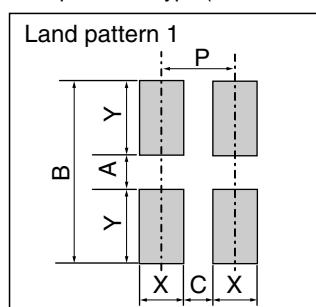
1. Square chip type (No. of terminals: 2)



Metric	Inch	Size				Flow soldering				Reflow soldering			
		A	B	X	Y	A	B	X	Y	A	B	X	Y
0402	01005	Not applied				0.18	0.58	0.2	0.2				
0603	0201					0.3	0.9	0.3	0.3				
1005	0402					0.5	1.3	0.5	0.4				
1608	0603	1.0	2.6	0.8	0.8	1.0	2.0	0.8	0.5				
2012	0805	1.3	3.1	1.25	0.9	1.3	2.7	1.25	0.7				
3216	1206	2.2	4.3	1.6	1.05	2.2	3.9	1.6	0.85				
3225	1210	2.2	4.3	2.5	1.05	2.2	3.9	2.5	0.85				
5025	2010	3.9	6.3	2.5	1.2	3.9	5.9	2.5	1.0				
6332	2512	5.2	7.6	3.2	1.2	5.2	7.2	3.2	1.0				

※For RLP, MLP please refer to the page 8.

2. Chip network type (No. of terminal: Multiple)



Land pattern	Style	Terminals style	P	Flow soldering					Reflow soldering				
				A	B	C	X	Y	A	B	C	X	Y
1	RAC10 2D	C	0.65	Not applied					0.5	1.3	0.34	0.33	0.4
	RAC10 1A								0.5	1.3	0.15	0.35	0.4
2	RAC10 4D	C	0.5	1.0	2.6	0.35	0.45	0.8	1.0	2.0	0.35	0.45	0.5
2	RAC16 4D		0.8						1.0	2.0	0.32	0.32	0.5
3	RAC16 8U	C	0.64	Not applied					1.0	2.0	0.2	0.3	0.5
4	RAC16 8D		0.5						1.0	2.0	0.3	0.3	0.5

### ●Others

(1) Please contact Kamaya Sales Dept. for other products and further details.

(2) Please carry out an enough mounting evaluation when use these patterns.



# SMD Product handling manual (RECOMMENDED SOLDERING CONDITION)

Note: This soldering condition is not supported by the mounting evaluation.

**This is reference information only.**

## ●Application

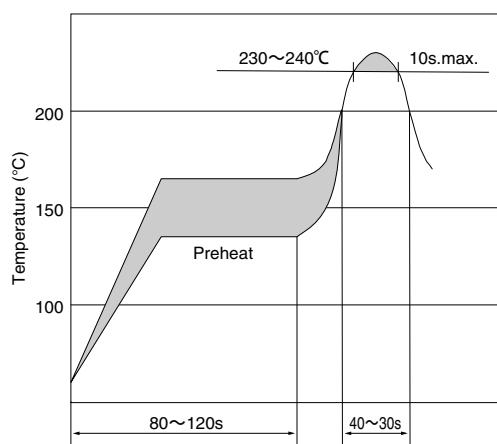
All KAMAYA Surface Mount Devices

## ●Recommended soldering condition (Reference)

### 1. Reflow soldering

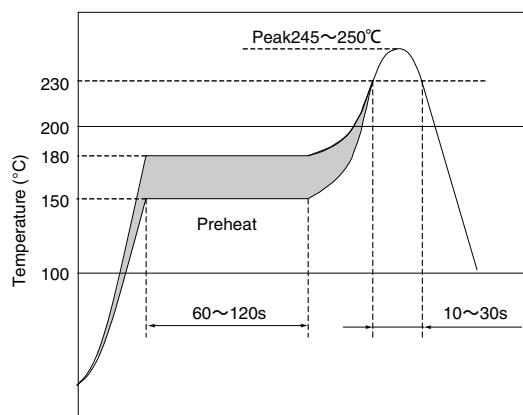
#### 1.1 Recommended condition of Sn-Pb solder.

Reflow times: 2 times

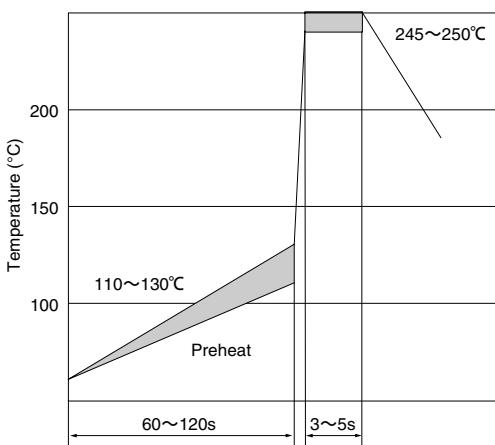


#### 1.2 Recommended condition of Sn solder

Reflow times: 2 times



### 2. Flow soldering (Recommended condition of Sn solder and Sn-Pb solder)



### 3. Soldering Iron (Recommended condition of Sn solder and Sn-Pb solder)

- (1) Temperature of soldering iron tip: 300°C, Duration: 10 s max.
- (2) Temperature of soldering iron tip: 350°C, Duration: 3 s max.

## ●Others

- (1) Please contact Kamaya Sales department for further information.
- (2) Please carry out an enough mounting evaluation when use this profile.

## Term Explanation

### ● Resistors

#### Rated Dissipation

The maximum value of the electric power that can continuously be impressed to the resistor at the ambient temperature provided for within the category temperature range is indicated.

The derated values of dissipation for temperatures in excess of 70°C shall be indicated by the derating Curve.

Please note that the chip resistor networks provide for the rated dissipation of each element and each package when you use it.

#### Rated Voltage

The maximum value of the D.C or r.m.s. voltage that can continuously be impressed to the resistor at the ambient temperature provided for within the range of the category temperature range is indicated.

Rated Voltage = (Rated Dissipation) (Rated Resistance). (d.c. or a.c. r.m.s. Voltage)

However, Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

#### Critical Resistance Value

Critical resistance value is the resistance value at which the rated voltage is equal to the limiting element voltage.

Below critical resistance value, please use the rated voltage as the limiting element voltage.

#### Limiting Element Voltage

The maximum value of the d.c. or r.m.s. voltage that can continuously be impressed to the resistor and the resistive element is indicated. Limiting Element Voltage that provides for the kind and each shape is different.

#### Isolation Voltage

The maximum value of the d.c. voltage that can be impressed for 1 minute the one that the electrode (terminal) was lumped together and between the insulation exterior or substrates is indicated.

When the voltage that exceeds the isolation voltage is impressed for the electrode and the insulation exterior (substrate), the insulation exterior might be destroyed by generation of heat and the direct current electrolysis action by the leakage current.

#### Voltage proof

The r.m.s voltage is impressed for 1 minute the one that the electrode (terminal) was lumped together and between the insulation exterior or substrates, and the insulation exterior indicates the maximum value of the voltage that breakdown or flashover.

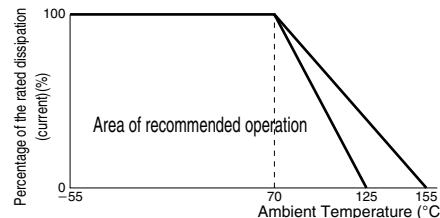
#### Category Temperature Range

The ambient temperature of the resistor that can continuously be used adding a regulated rated load (electric power) is shown.

It is not a temperature of air outside of an electronic equipment, and it is necessary to compare it with the ambient temperature in the electronic equipment in which the resistor is built in.

#### Derating Curve

The derated values of dissipation for temperatures in excess of 70°C shall be indicated by the following Curve.



#### Variation of resistance with temperature (Temperature Coefficient of Resistance: TCR)

The change of resistance 1°C rate of the resistor within the range of the category temperature (category temperature range) is shown.

$$\text{Temperature Coefficient of Resistance: TCR} (\times 10^{-6}/^\circ\text{C}) = \frac{R - R_0}{R_0} \times \frac{1}{T - T_0} \times 10^{-6}$$

R : Measured resistance at T°C

R<sub>0</sub> : Measured resistance at T<sub>0</sub>°C

T : Measured test temperature (°C)

T<sub>0</sub> : Measured base temperature (°C)

Especially, because the resistance temperature coefficient tends the large dependence of the measurement resistance on the measuring method, RLC/RLS/RCC/RLP&MLP needs noting.



# Term Explanation

## ● Chip Fuses & Fusible Resistors

### Joule Heat

It is the heat generated by the current.

The fuse melts inside by joule heat, and interrupts the current.

### Fusible Characteristics

Relation between current (I) and fusion time (t) that flows to fuse.

It shows for the fusible Resistors by the relation between an impressed electric power (W) and the fusion time (W-t characteristic).

### Rated Voltage

It shows maximum voltage value fuse can work properly.

It is the maximum voltage value in which the circuit can be safely interrupted after the fuse workings.

On selecting a fuse, it is necessary to confirm that the maximum rated voltage is less than rated voltage.

### Interrupting Rating

It shows Maximum voltage(Rated voltage) and Maximum current for an interrupting circuit safely.

Maximum voltage and Maximum current should be applied below interrupting rating.

### Working Temperature Range

It is temperature range fuse can works with specified condition,

Ambient temperature is to be within category temperature range.

### Rated Current

A value of current which the fuse can be complied with, according to the test conditions.

It is different from the maximum current that applied to fuses, considering a long life span, the deratings are required.

### Steady - State Current

It is current value at time that regularly flows to circuit regularly.

### Deratings

#### 1) Nominal Derating

It is derating value for rated current.

The reduction rate is depended on the type of fuse.

#### 2) Temperature Derating

It is ambient temperature derating value for rated current.

The reduction rate is depended on the types of fuse and ambient temperature.

### In-rush Current(Rush current)

Current that rapidly flows on circuit when power supply is turned on.

In many cases In-rush Current is bigger than Steady-state Current.

Chip fuses are confirmed to withstand In-rush Current.

### Internal Resistance Value

An internal resistance values shown in this document include values in any materials of fuse, fuse element, outer terminations etc. Please refer to "section 10" for further information.

Additionally, resistance values are different depending on Temperature and Steady-state Current.

### Maximum Open Circuit Voltage

Maximum open circuit voltage is the value of voltage applicable to both ends of resistors, when a resistor is open condition in a circuit. This voltage shall be corresponding to 1,000 times the rated dissipation or maximum open circuit which is the less severe.

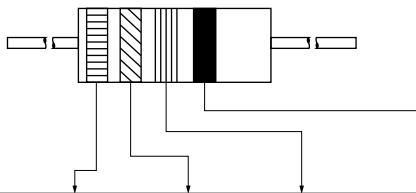
# Information

KAMAYA OHM <http://www.kamaya.co.jp>

## Product Marking

### ●Color coding

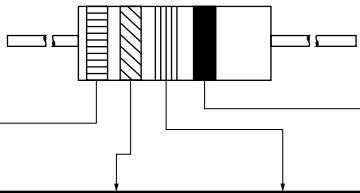
#### • Three - color band or four - color band system



Color	1st color band	2nd color band	3rd color band	4th color band
	1st figure	2nd figure	Multiplier	Resistance tolerance
Black	0	0	$10^0$	—
Brown	1	1	$10^1$	F( $\pm 1\%$ )
Red	2	2	$10^2$	G( $\pm 2\%$ )
Orange	3	3	$10^3$	—
Yellow	4	4	$10^4$	—
Green	5	5	$10^5$	—
Blue	6	6	$10^6$	—
Purple	7	7	$10^7$	—
Gray	8	8	$10^8$	—
White	9	9	$10^9$	—
Gold	—	—	$10^{-1}$	J( $\pm 5\%$ )
Silver	—	—	$10^{-2}$	K( $\pm 10\%$ )
Not colored	—	—	—	M( $\pm 20\%$ )

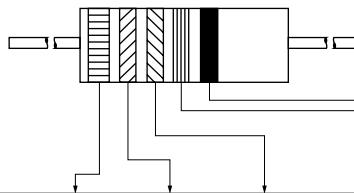
\*For three-color band system the 4th color band is eliminated  
(Resistance tolerance is  $\pm 20\%$ ).

#### • Example



1st color band	2nd color band	3rd color band	4th color band
Brown	Red	Yellow	Gold
1	2	$10^4$	$\pm 5\%$
12 $\times 10,000$ (ohm) $\pm 5\%$			120k ohm J

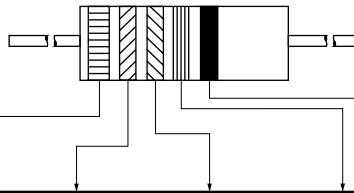
#### • Five - color band system



Color	1st color band	2nd color band	3rd color band	4th color band	5th color band
	1st figure	2nd figure	3rd figure	Multiplier	Resistance tolerance
Black	0	0	0	$10^0$	—
Brown	1	1	1	$10^1$	F( $\pm 1\%$ )
Red	2	2	2	$10^2$	G( $\pm 2\%$ )
Orange	3	3	3	$10^3$	—
Yellow	4	4	4	$10^4$	—
Green	5	5	5	$10^5$	D( $\pm 0.5\%$ )
Blue	6	6	6	$10^6$	C( $\pm 0.25\%$ )
Purple	7	7	7	$10^7$	B( $\pm 0.1\%$ )
Gray	8	8	8	$10^8$	—
White	9	9	9	$10^9$	—
Gold	—	—	—	$10^{-1}$	—
Silver	—	—	—	$10^{-2}$	—

\*RC1/2U : Please refer to page 24.

#### • Example



1st color band	2nd color band	3rd color band	4th color band	5th color band
Purple	Blue	Gray	Gold	Brown
7	6	8	$10^{-1}$	$\pm 1\%$
768 $\times 0.1$ (ohm) $\pm 1\%$			76.8 ohm F	

### ●Rated resistance symbols

The symbols to indicate rated resistance are depicted in 3 characters (for the E6, E12, and E24 series) or 4 characters (for the E48, E96 and E192 series) as indicated below.

In the case of 3 characters, the first and second character represent the effective numeral, and the third character is the multiplier following the effective numeral.

In the case of 4 characters, the first, second and third character represent the effective numeral, and the fourth character is the multiplier following the effective numeral. When a decimal point exists, the decimal point is represented by an R for all effective numerals.

#### • 3-Digit (example)

Rated resistance symbols	Resistance value
R15	0.15 ohm
1R5	1.5 ohm
150	15 ohm
151	150 ohm
152	1.5k ohm
153	15k ohm
154	150k ohm
155	1.5M ohm
156	15M ohm
157	150M ohm

#### • 4-Digit (example)

Rated resistance symbols	Resistance value
R154	0.154 ohm
1R54	1.54 ohm
15R4	15.4 ohm
1540	154 ohm
1541	1.54k ohm
1542	15.4k ohm
1543	154k ohm
1544	1.54M ohm
1545	15.4M ohm
1546	154M ohm

#### • Resistance values of 100M ohm and greater(example)

Rated resistance symbols	Resistance value
100M	100M ohm
1G00	1G ohm
10G0	10G ohm
100G	100G ohm

\*The letters M and G are used as multipliers for  $10^6$  and  $10^9$  respectively of the resistance value expressed in ohms.



# Standard Resistance Values and Symbols

## ●Code Tolerances

Code	Tolerance on rated resistance
H	±50%
N	±30%
M	±20%
K	±10%
J	±5%
G	±2%
F	±1%
D	±0.5%
C	±0.25%
B	±0.1%

## ●Temperature Characteristics Symbol Table

Code	Temperature coefficient of resistance
E	$\pm 25 \times 10^{-6} / ^\circ C$
C	$\pm 50 \times 10^{-6} / ^\circ C$
K	$\pm 100 \times 10^{-6} / ^\circ C$
D	$\pm 200 \times 10^{-6} / ^\circ C$
A	$\pm 500 \times 10^{-6} / ^\circ C$
M	$\pm 1,000 \times 10^{-6} / ^\circ C$
N	$\pm 70 \times 10^{-6} / ^\circ C$

## ●Significant Figure of Resistance Value

E6	E12	E24	E48	E96	E192	E6	E12	E24	E48	E96	E192	E6	E12	E24	E48	E96	E192
10	10	10	100	100	100	22	22	22	215	215	215	47	47	47	464	464	464
				101	101				218	218	218				470	470	470
				102	102				221	221	221				475	475	475
				104	104				223	223	223				481	481	481
				105	105				226	226	226				487	487	487
				105	105				232	232	232				493	493	493
				106	106				234	234	234				499	499	499
				107	107				237	237	237				505	505	505
				109	109				240	240	240				511	511	511
				110	110				243	243	243				517	517	517
				111	111				246	246	246				523	523	523
				113	113				249	249	249				530	530	530
				114	114				252	252	252				536	536	536
				115	115				255	255	255				542	542	542
				117	117				258	258	258				549	549	549
				118	118				261	261	261				556	556	556
				120	120				264	264	264				562	562	562
				121	121				267	267	267				576	576	576
				123	123				271	271	271				583	583	583
				124	124				274	274	274				590	590	590
				126	126				277	277	277				604	604	604
				127	127				280	280	280				612	612	612
				129	129				284	284	284				619	619	619
				130	130				287	287	287				626	626	626
				132	132				291	291	291				634	634	634
				133	133				294	294	294				642	642	642
				135	135				298	298	298				649	649	649
				137	137				301	301	301				657	657	657
				138	138				305	305	305				665	665	665
				140	140				309	309	309				673	673	673
				142	142				312	312	312				681	681	681
				143	143				316	316	316				690	690	690
				145	145				324	324	324				698	698	698
				147	147				328	328	328				706	706	706
				149	149				332	332	332				715	715	715
				150	150				336	336	336				723	723	723
				152	152				340	340	340				732	732	732
				154	154				344	344	344				741	741	741
				156	156				352	352	352				750	750	750
				158	158				357	357	357				768	768	768
				160	160				361	361	361				777	777	777
				162	162				365	365	365				787	787	787
				164	164				370	370	370				796	796	796
				165	165				374	374	374				806	806	806
				167	167				379	379	379				816	816	816
				169	169				383	383	383				825	825	825
				172	172				392	392	392				845	845	845
				174	174				397	397	397				856	856	856
				176	176				402	402	402				866	866	866
				178	178				407	407	407				876	876	876
				180	180				412	412	412				887	887	887
				182	182				417	417	417				898	898	898
				184	184				422	422	422				909	909	909
				187	187				427	427	427				920	920	920
				189	189				432	432	432				931	931	931
				191	191				437	437	437				942	942	942
				193	193				442	442	442				953	953	953
				196	196				448	448	448				965	965	965
				198	198				453	453	453				976	976	976
				200	200				459	459	459				988	988	988
				203	203												
				205	205												
				208	208												
				210	210												
				213	213												

\*Please refer to each page for standard values of each parts.

## Numerical Symbols and Multipliers

Code	T(tera)	G(giga)	M(mega)	k(kilo)	m(milli)	$\mu$ (micron)	n(nano)	p(pico)
Multiplier	$10^{12}$	$10^9$	$10^6$	$10^3$	$10^{-3}$	$10^{-6}$	$10^{-9}$	$10^{-12}$

## Formula of Ohm's Law

Direct Current	Power(P)			Voltage(E)			Current(I)			Resistance(R)		
Calculating Formula	EI	$I^2R$	$\frac{E^2}{R}$	IR	$\sqrt{PR}$	$\frac{P}{I}$	$\frac{E}{R}$	$\sqrt{\frac{P}{R}}$	$\frac{P}{E}$	$\frac{E}{I}$	$\frac{E^2}{P}$	$\frac{P}{I^2}$

## Kamaya Shipping Label

Kamaya products are put a shipping label on reel or other packaging.  
Refer to the sample of the shipping label as follows.

### ●Example for chip resistors

RMC1/16K 272F TP 1608size, Fixed Thick Film Chip Resistor, 2.7k ohm F(±1%)

(1)	RMC1/16 K 272F TP 01	(7)
(2)	P/N XXXX	
(6)	2 . 7 KΩF (52-50H) 5000PCS	(3)
(4)		
(5)	L/N 071412282H (70815)	
	KAMAYA OHM	

(1)Product type(Style, Temperature coefficient of resistance, Rated resistance, Tolerance, Packaging)

(2)Parts number from customer (P/N)

(3)Quantity

(4)Shipping Lot Number (L/N)

(5)Manufacturer

(6)Internal code 1

(7)Internal code 2

\*There are cases in which (2) and (7) are not shown on Kamaya shipping label.

\*Please contact Kamaya sales department, if you need to confirm this label specification.

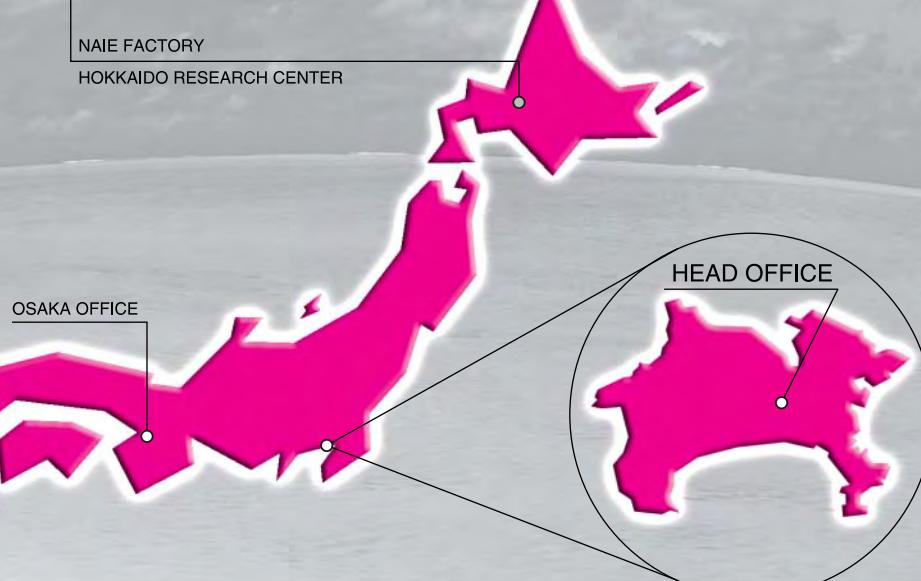
# •Kamaya Global Network

## WORLD



Application Facilities		Standard	Certification Organization	Certification No.	Certificate Date
● JAPAN	NAIE Factory	ISO9001	Bureau Veritas JapanCo.,Ltd	2785613	Jul.28,1995
		ISO/TS16949		IATF 136837	Mar.22,2012
		ISO14001		2989282	May.9,2002
● MALAYSIA	KAMAYA ELECTRIC(M)SDN. BHD.	ISO9001	NQA Global Assurance	22815	Aug.10,2007
		ISO/TS16949		IATF 0106025	Jul.26,2007
		ISO14001		E3242	Jul.11,2007
● China (WALSIN Product)	DONGGUAN WALSIN TECHNOLOGY ELECTRONICS CO., LTD.	ISO9001	UL DQS Inc	20003508 QM08	May.21,1996
		ISO/TS16949		IATF 0117277	Mar.25,2005
		ISO14001	CTI International Certification	04112E20082R3L	Aug.13,2003
		OHSAS 18001		04111S18001R1L	Aug.14,2008

## JAPAN





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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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