



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 ₂ O ₃ ≤ 900ppm)
Chip Resistors				
[General] RMC Series	○	×	○	○
[General] RGC Series	○	×	○	○
[General] RNC Series	○	○	○	○
[High Voltage] RVC Series	○	×	○	○
[High Voltage] RZC Series	○	×	○	○
[Surge] RPC Series	○	×	○	○
[Trimable] FCR Series	○	×	○	○
[Sencing] RLC Series	○	×	○	○
[Sencing] RLS Series	○	×	○	○
[Sencing] RLP · MLP Series	○	○	○	○
[Sencing] RCC Series	○	○	○	○
[Sencing] RHC Series	○	×	○	○
Chip Network				
[Chip Network] RAC Series	○	×	○	○
[Chip Network] RAC168U	○	×	○	○
Chip Fuses				
[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	○	○	○	○
Chip Fusible Resistors				
[Circuit Protection] FRC Series	○	×	○	○
ESD Suppressors				
[Circuit Protection] SPC Series	○	○	○	○
[Circuit Protection] HSPC Series	○	○	○	○
Chip Attenuators				
[High Frequency] RAC101A	○	×	○	○
Chip Thermistors				
[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

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Leaded Resistors

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RMC

Halogen Free

Antimony Free

●Features

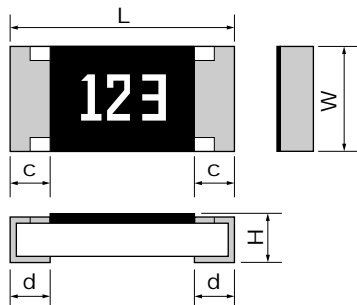
01005 to 2512 inch size and Jumper chip available.

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 ^{+0.05} _{-0.10}	0.6mg
RMC1/16	1608	0603	KAMAYA WALSIN	1.6±0.1	0.8 ^{+0.15} _{-0.05}	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		Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C	
			1Ω	10Ω	100Ω	1MΩ	10MΩ		Code	10 ⁻⁶ /°C				
RMC1/32	0402 (01005)	0.03 (0.5A)		4.7~9.1					F, J	—	+600~-200	15	50	-55~-+125
					10~91					—	±300			
						100~1M				—	±200			
RMC1/20	0603 (0201)	0.05 (1.0A)	0.47~0.91						J	—	+1000~-+300	25		
				1~392					F, J	—	+600~-200			
				4.02~9.76						—	+350~-100			
					10~1M			F, G, J	—	±200				
RMC1/16S	1005 (0402)	0.1 (1.0A)		1~9.76					F, J	—	+500~-200			
					10~1M			G, J	—	±200				
						1.02M~10M		F	K	±100				
							F, G, J	—	±200					
RMC1/16	1608 (0603)	0.1 (2.0A)	0.47~0.91	1~9.76					K	—	+1,000~-+300	50	100	
								F, G, J	—	+500~-200				
					10~10M			G, J	—	±200				
						11M~22M		F	K	±100				
RMC1/10	2012 (0805)	0.125 (2.0A)	0.27~0.91	1~9.76					J	—	±200	150		
									K	—	+1,000~-+300			
					10~2.2M			F, G, J	—	+500~-200				
								G, J	—	±200				
						2.21M~10M	11M~22M	F	K	±100				
RMC1/8	3216 (1206)	0.25 (2.0A)							F, G, J	—	±200			
			0.22~0.91	1~9.76					J	—	±200			
					10~1M			K	—	+1,000~-+300				
								F, G, J	—	+500~-200				
						1.02M~10M		G, J	—	±200				
RMC1/4	3225 (1210)	0.5 (2.0A)							F	K	±100	200	500	
								F, G, J	—	±200				
			0.2~0.91	1~9.76				J	—	±200				
					10~1M			K	—	+1,000~-+300				
								F, J	—	+500~-200				
RMC1/2	5025 (2010)	0.75 (2.0A)							G, J	—	±200			
									K	—	±200			
					10~1M			F	K	±100				
						1.1M~22M		F, G, J	—	±200				
								J	—	±200				
RMC1	6332 (2512)	1.0 (2.0A)	0.33~0.91	1~9.76					K	—	+1,000~-+300			
									F, J	—	+500~-200			
					10~1M			G, J	—	±200				
								F	K	±100				
						1.1M~22M		J	—	±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)

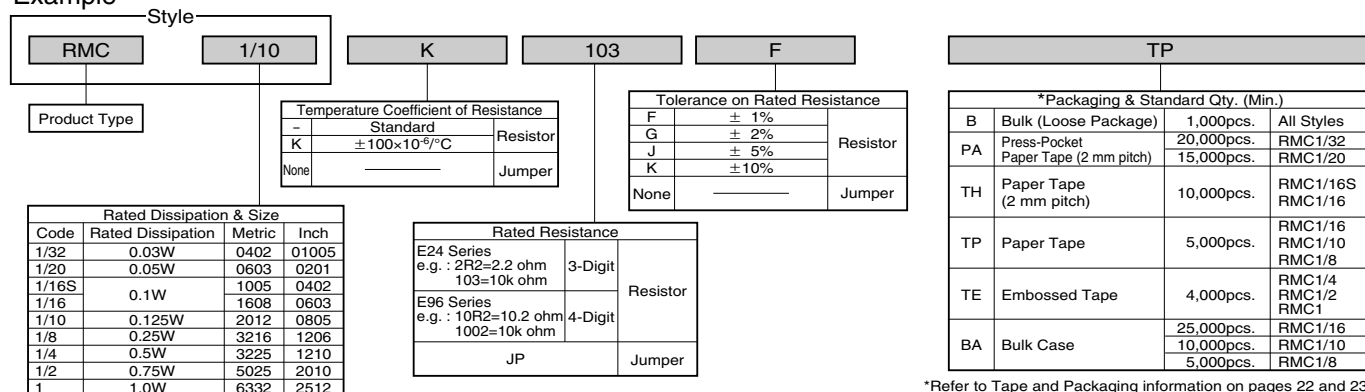
Note3. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

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



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

*Please contact Kamaya sales department for 1mm pitch taping of BMC1/16s. 1/20

NEW RGC

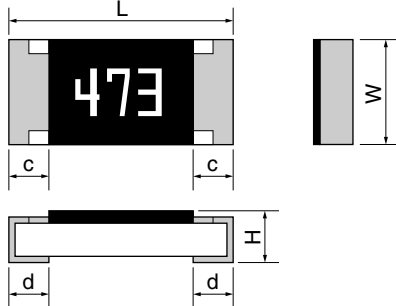
Halogen Free

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.
NEW RGC1/32	0402	01005	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} _{-0.10}	0.6mg
RGC1/16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-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 ⁻⁴ /°C	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
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	D(±0.5%)	K ± 100 C ± 50	25		
RGC1/16S	1005 (0402)	0.063	100~1M	D(±0.5%) F(±1%)	K ± 100 C ± 50	50		-55~+155
RGC1/16	1608 (0603)	0.1 ^{*(0.063)}	10~97.6 100~1M 1.02M~3.3M	D(±0.5%) F(±1%)	K ± 100 C ± 50	100		-55~+125 *(-55~+155)
RGC1/10	2012 (0805)	0.125 ^{*(0.1)}	10~97.6 100~1M 1.02M~3.3M	D(±0.5%) F(±1%)	K ± 100 C ± 50	150		
RGC1/8	3216 (1206)	0.25 ^{*(0.125)}	10~4.7M	D(±0.5%) 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 = √(Rated Dissipation)×(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

Style	1/16	C	473	D	TP
Product Type	RGC				
Rated Dissipation & Size	Code	Rated Dissipation	Metric	Inch	
	1/32	0.03W	0402	01005	
	1/20	0.05W	0603	0201	
	1/16S	0.063W	1005	0402	
	1/16	0.1W	1608	0603	
	1/10	0.125W	2012	0805	
	1/8	0.25W	3216	1206	
Tolerance on Rated Resistance	D	±0.5%	F	±1.0%	
Rated Resistance	E24 Series	e.g.: 473=47k ohm	3-Digit		
	E96 Series	e.g.: 7152=71.5k ohm	4-Digit		
Temperature Coefficient of Resistance	C	± 50×10 ⁻⁴ /°C	K	± 100×10 ⁻⁴ /°C	

*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

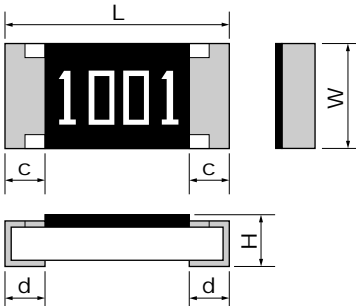
Antimony Free

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 marked 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.
NEW RNC06	0603	0201	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 ^{+0.10} _{-0.05}	0.6 ±0.1	0.4 ±0.2	0.3 ^{+0.2} _{-0.1}	5mg
RNC32	3216	1206	3.1±0.1	1.55 ^{+0.10} _{-0.05}	0.6 ±0.1	0.45±0.20	0.3 ^{+0.2} _{-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 ⁻⁴ /°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RNC06	0603 (0201)	0.03 0.05	100Ω~1kΩ 47Ω~4.9kΩ 5.1kΩ~10kΩ	B(±0.1%) D(±0.5%) C(±0.5%)	E ± 25 E ± 25 C ± 50	15		50	
RNC20	2012 (0805)	0.1	100Ω~130kΩ 10Ω~130kΩ	B(±0.1%) C(±0.25%) D(±0.5%)	E ± 25	75	E96 E24	100	-55~+125
RNC32	3216 (1206)	0.125	100Ω~180kΩ 10Ω~180kΩ	B(±0.1%) C(±0.25%) D(±0.5%)	E ± 25	150			

Note1. Rated Voltage = √(Rated Dissipation)×(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

Style	RNC	32	E	1002	B	TP
Product Type						
Size	Code	Metric	Inch			
	06	0603	0201			
	20	2012	0805			
	32	3216	1206			
Temperature Coefficient of Resistance	E	±25×10 ⁻⁴ /°C	C	±50×10 ⁻⁴ /°C		
Rated Resistance	E24 Series	e.g.: 103=10k ohm	3-Digit			
	E96 Series	e.g.: 10R2=10.2 ohm	4-Digit			
		1002=10k ohm				
Tolerance on Rated Resistance	B	±0.1%	D	±0.5%		
* Packaging & Standard Qty. (Min.)	B	Bulk (Loose Package)	1,000pcs	All Styles		
	PA	Press-Pocket	15,000pcs	RNC06		
	TP	Paper Tape (2mm pitch)	5,000pcs	RNC20 RNC32		

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

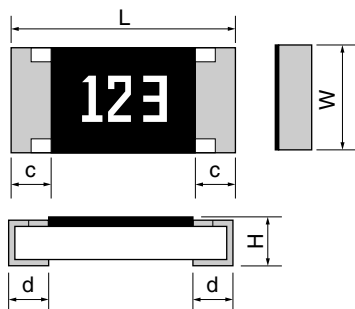
RVC

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.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RVC16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.05}	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 ⁴ /°C	Isolation Voltage V	Category Temperature Range °C
				D(±0.5%)	F(±1%)	G(±2%)	J(±5%)	K(±10%)	Code		
RVC16	1608 (0603)	0.1	200	—	—	—	470Ω ~ 10MΩ	—	K	±100	100
RVC20	2012 (0805)	0.25	400	—	—	—	47Ω ~ 464Ω	—	—	±200	—
RVC32	3216 (1206)	0.25	500	—	—	—	100Ω ~ 10MΩ	100Ω ~ 51MΩ	K	±100	—
RVC50	5025 (2010)	0.5	800	—	—	—	47Ω ~ 97.6Ω	—	—	±200	—
RVC63	6332 (2512)	1.0	800	—	—	—	470Ω ~ 20MΩ	470Ω ~ 51MΩ	K	±100	—
				—	—	—	47Ω ~ 464Ω	—	—	±200	—
				—	—	—	560Ω ~ 20MΩ	560Ω ~ 51MΩ	K	±100	—
				—	—	—	100Ω ~ 549Ω	—	—	±200	—
				—	—	—	47Ω ~ 97.6Ω	—	—	±200	—
				—	—	—	—	—	—	+500 ~ -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		Style		Product Type		Size		Rated Resistance		Tolerance on Rated Resistance		* Packaging & Standard Qty. (Min.)	
RVC	32	K	475	F	TP	Code	Metric	Inch	E24 Series e.g.: 475=4.7M ohm	D ± 0.5%	B Bulk (Loose Package)	1,000pcs.	All Styles
						16	1608	0603	E96 Series e.g.: 7154=7.15M ohm	F ± 1%	TP Paper Tape	5,000pcs.	RVC16 RVC20 RVC32
						20	2012	0805		G ± 2%	TE Embossed Tape	4,000pcs.	RVC50 RVC63
						32	3216	1206		J ± 5%			
						50	5025	2010		K ± 10%			
						63	6332	2512					

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

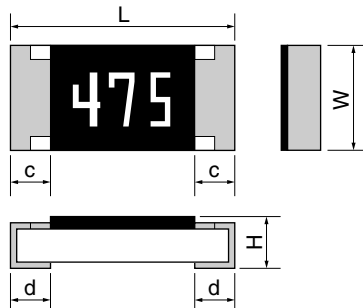
RZC

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.

Unit : mm

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-Rush Voltage Characteristics	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10 ⁴ /°C	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RZC50	5025 (2010)	0.5	1500	3000	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 values 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		Style		Product Type		Size		Rated Resistance		Tolerance on Rated Resistance		* Packaging & Standard Qty. (Min.)	
RZC	50	—	475	J	TE	Code	Metric	Inch	e.g.: 105=1.0M ohm	J ± 5%	B Bulk (Loose Package)	1,000pcs.	All Styles
						50	5025	2010	475=4.7M ohm	K ± 10%	TP Paper Tape	4,000pcs.	All Styles
						63	6332	2512	166=16M ohm	M ± 20%			

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

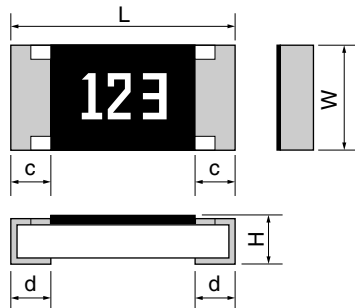
RPC

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.

Unit : mm

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

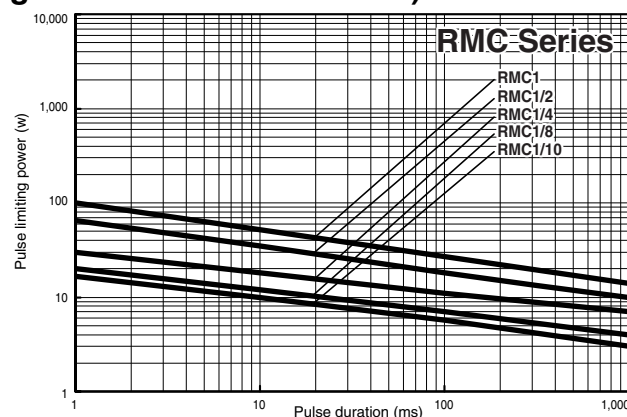
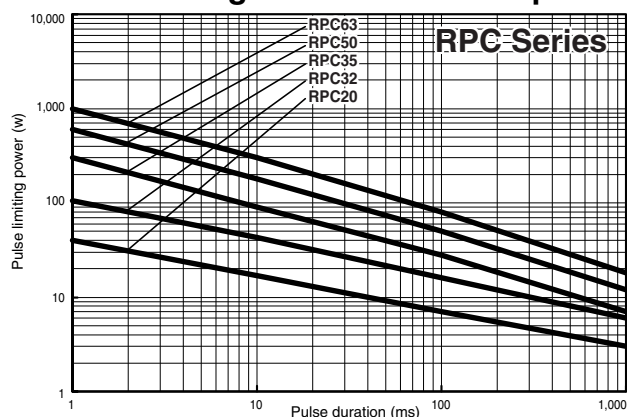
Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
			Rated Resistance Range	Temperature Coefficient of Resistance 10 ⁻³ /°C					
RPC20	2012 (0805)	0.125	<div>0.27Ω~0.91Ω</div> <div>1Ω~ 1MΩ</div> <div>1.1M~22MΩ</div>	<div>±200</div> <div>±100</div> <div>±200</div>	<div>J (± 5%)</div> <div>K (±10%)</div> <div>M (±20%)</div>	150	E24	500	−55~+155
RPC32	3216 (1206)	0.25							
RPC35	3225 (1210)	0.5							
RPC50	5025 (2010)	0.75							
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	
RPC	50

Product Type

Size		
Code	Metric	Inch
20	2012	0805
32	3216	1206
35	3225	1210
50	5025	2010
63	6332	2512

103

Rated Resistance

E24 Series e.g. : 2R2=2.2 ohm 103=10k ohm	3-Digit
---	---------

J

Tolerance on Rated Resistance

J	± 5%
K	±10%
M	±20%

TE

* Packaging & Standard Qty. (Min.)

B	Bulk (Loose Package)	1,000pcs.	All Styles
TP	Paper Tape	5,000pcs.	RPC20 RPC32
TE	Embossed Tape	4,000pcs.	RPC35 RPC50 RPC63

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

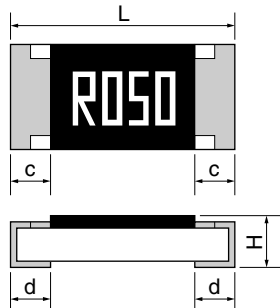
RLC

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 ^{+0.05} _{-0.10}	0.6mg
RLC16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.05}	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 ^{+0.2} _{-0.1}	9mg
RLC35	3225	1210	3.1±0.2	2.5 ±0.15	0.6 ±0.15	0.5±0.25	0.3 ^{+0.2} _{-0.1}	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 ⁻⁶ /°C			
RLC10	1005 (0402)	0.125	0.11~1.11	100mΩ~10Ω	100mΩ~220mΩ	J	0~+300	100	-55~+125	
					240mΩ~430mΩ	F, J				
					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				
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			
				470mΩ~3.3Ω	F, G, J	±100				
				3.6Ω~10Ω	F, J					
RLC35	3225 (1210)	0.66	0.44~3.63	50mΩ~3.3Ω	50mΩ~180mΩ	F, G, J	0~+250			
RLC50	5025 (2010)	0.75	0.47~3.87		200mΩ~430mΩ	F, G, J	0~+200			
RLC63	6332 (2512)	1.0	0.55~4.47		470mΩ~3.3Ω	F, G, J	±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)
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

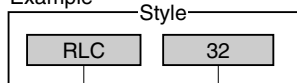
● Rated Resistance

Resistance	Code	Resistance	Code	Resistance	Code	Resistance	Code	Resistance	Code	Resistance	Code	Resistance	Code
50mΩ	R050	82mΩ	R082	200mΩ	R200	430mΩ	R430	750mΩ	R750	1.6Ω	1R60	4.3Ω	4R30
51mΩ	R051	90mΩ	R090	220mΩ	R220	470mΩ	R470	800mΩ	R800	1.8Ω	1R80	4.7Ω	4R70
56mΩ	R056	91mΩ	R091	240mΩ	R240	500mΩ	R500	820mΩ	R820	2.0Ω	2R00	5.1Ω	5R10
60mΩ	R060	100mΩ	R100	250mΩ	R250	510mΩ	R510	900mΩ	R900	2.2Ω	2R20	5.6Ω	5R60
62mΩ	R062	110mΩ	R110	270mΩ	R270	560mΩ	R560	910mΩ	R910	2.4Ω	2R40	6.2Ω	6R20
65mΩ	R065	120mΩ	R120	300mΩ	R300	600mΩ	R600	1.0Ω	1R00	2.7Ω	2R70	6.8Ω	6R80
68mΩ	R068	130mΩ	R130	330mΩ	R330	620mΩ	R620	1.1Ω	1R10	3.0Ω	3R00	7.5Ω	7R50
70mΩ	R070	150mΩ	R150	360mΩ	R360	650mΩ	R650	1.2Ω	1R20	3.3Ω	3R30	8.2Ω	8R20
75mΩ	R075	160mΩ	R160	390mΩ	R390	680mΩ	R680	1.3Ω	1R30	3.6Ω	3R60	9.1Ω	9R10
80mΩ	R080	180mΩ	R180	400mΩ	R400	700mΩ	R700	1.5Ω	1R50	3.9Ω	3R90	10Ω	100

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

● Part Number Description

Example

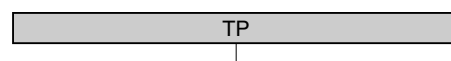


Size		
Code	Metric	Inch
10	1005	0402
16	1608	0603
20	2012	0805
32	3216	1206
35	3225	1210
50	5025	2010
63	6332	2512

Temperature Coefficient of Resistance	
K	±100×10 ⁻⁶ /°C
	0~+200×10 ⁻⁶ /°C
-	0~+250×10 ⁻⁶ /°C
	0~+300×10 ⁻⁶ /°C

Rated Resistance
e.g.: R050=50m ohm
R100=100m ohm
1R00=1 ohm
100=10 ohm

Tolerance on Rated Resistance	
F	±1%
G	±2%
J	±5%



* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
TH	Paper Tape(2mm pitch)	10,000pcs.	RLC10
TP	Paper Tape	5,000pcs.	RLC16 RLC20 RLC32
TE	Embossed Tape	4,000pcs.	RLC35 RLC50 RLC63

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

NEW RCC

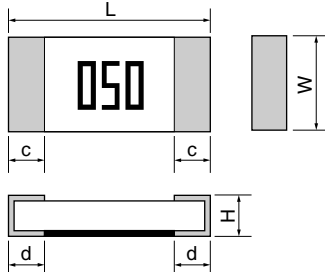
Halogen Free

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.

Unit : mm

Style	Metric	Inch	Rated Resistance	L	W	H	c	d	*Unit weight/pc.
NEW RCC06	0603	0201	All Resistance	0.6±0.03	0.3 ±0.03	0.23 ^{+0.03} / _{-0.10}	0.15 ^{+0.05} / _{-0.10}	0.15 ±0.05	0.16mg
RCC10	1005	0402	All Resistance	1.0±0.05	0.5 ±0.05	0.35 ^{+0.05} / _{-0.10}	0.25 ^{+0.05} / _{-0.10}	0.25 ±0.05	0.6mg
RCC16	1608	0603	20mΩ ≤ R R > 20mΩ	1.6±0.1	0.8 ^{+0.15} / _{-0.05}	0.5 ±0.10	0.3 ±0.1	0.3 ±0.1 0.55 ±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 0.6 ±0.2	5mg
NEW RCC32	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

*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 10 ⁻³ /°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	
				51mΩ ~100mΩ	±150			
RCC16	1608 (0603)	0.25	1.58~5.00	10mΩ ~ 30mΩ	0~+350		500	
				33mΩ ~ 50mΩ	0~+250			
				51mΩ ~100mΩ	±150			
RCC20	2012 (0805)	0.33	2.56~5.74	10mΩ ~ 27mΩ	0~+250			
				30mΩ ~ 50mΩ	±150			
RCC32	3216 (1206)	0.5	2.23~5.00	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

Example

Style	Size	Rated Resistance	Tolerance on Rated Resistance	TP
RCC	20	R050	F ±1%	
Product Type	Code	Size	Rated Resistance	
	06	0603 (0201)	e.g.: R050=50mΩ	
	10	1005 (0402)	R100=100mΩ	
	16	1608 (0603)		
	20	2012 (0805)		
	32	3216 (1206)		

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

●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	090
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.

●Precautions of use

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

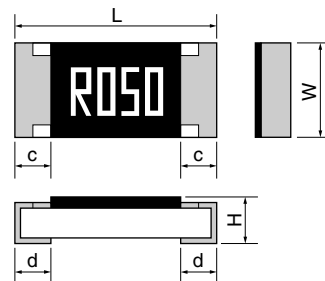
RLS

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.

Unit : mm

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 10 ⁻³ /°C			
RLS50	5025 (2010)	0.75	1.93~6.12	20mΩ ~ 33mΩ	0~+350	F (±1%) G (±2%) J (±5%)	500	-55~+125
RLS63	6332 (2512)	1.0	2.23~7.07	36mΩ ~ 47mΩ 50mΩ ~ 200mΩ	0~+200 0~+150			

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

Example

Style	Size	Rated Resistance	Tolerance on Rated Resistance	TP
RLS	50	R050	F ±1%	
Product Type	Code	Size	Rated Resistance	
	50	5025 (2010)	e.g.: R050=50mΩ	
	63	6332 (2512)	R100=100mΩ	

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

NEW RLP,MLP

Halogen Free

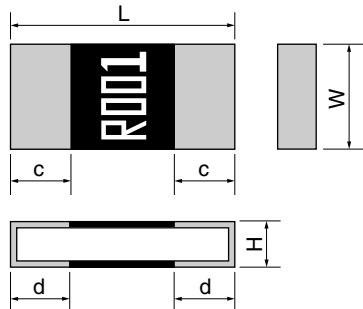
Antimony Free

Pb Free

●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	3.2±0.15	1.6 ±0.15	0.32±0.15	1.1 ±0.25	1.1 ±0.25	12mg
			2mΩ			0.35±0.10	0.5 ±0.25	0.5 ±0.25	11mg
			5mΩ			0.35±0.10	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			6mg
RLP63	6332	2512	1mΩ	6.3±0.25	3.1 ±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	26mg
NEW MLP63			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

*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 10 ⁻⁶ /°C			
RLP16	1608 (0603)	0.33	5.7	10mΩ	K ±100 N ±70	F(±1%) J(±5%)	100	-55~+155
RLP20	2012 (0805)	0.5	7.0	10mΩ	K ±100 N ±70			
RLP32	3216 (1206)	1	31.6	1mΩ	- ±150 K ±100			
			22.3, 14.1, 10, 8.1	2mΩ, 5mΩ, 10mΩ, 15mΩ	K ±100 N ±70			
RLP63	6332 (2512)	2	44.7	1mΩ	- ±150 N ±70			
		1	14.1, 10, 8.1	5mΩ, 10mΩ, 15mΩ	K ±100 N ±70			
MLP63		2	20.0, 14.1	5mΩ, 10mΩ	K ±100 N ±70			
					K ±100 N ±70			

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

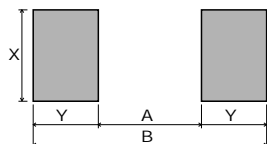
Style	RLP	63	K	R005	F	TE
Product Type	RLP	MLP				
Size	Code	Metric	Inch	Rated Resistance	Tolerance on Rated Resistance	* Packaging & Standard Qty. (Min.)
	16	1608	0603	e.g.: R001=1mΩ	F ±1%	TP Paper Tape 5,000pcs.
	20	2012	0805	R010=10mΩ	J ±5%	TE Embossed Tape 4,000pcs.
	32	3216	1206			
	63	6332	2512			
Temperature Coefficient of Resistance						
-						
K						
N						

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

●Rated Resistance

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

●Recommended land Pattern



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	3.9	1.7	1.45
			2mΩ	2.1			0.9
			5mΩ	1.4			1.25
			10mΩ	2.1			0.9
			15mΩ				
RLP63	6332	2512	1mΩ	2.0	7.6	3.5	2.8
			5mΩ	2.4			2.6
			10mΩ	4.0			1.8
15mΩ							
5mΩ							
10mΩ							
MLP63							

*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.

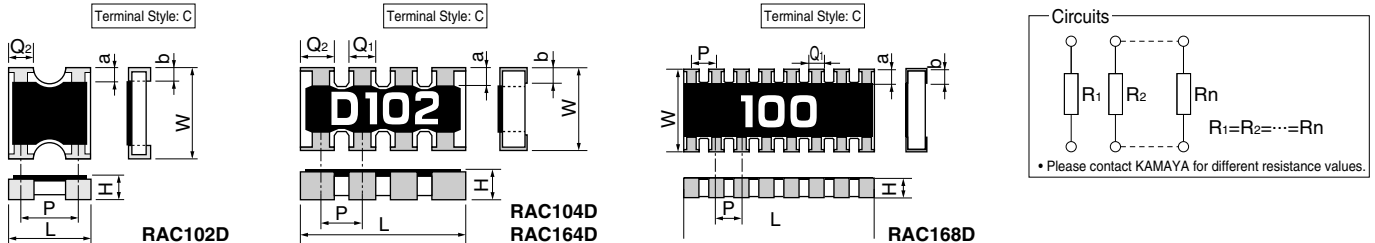
RAC

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.

Unit : mm

Style	Terminal Style	Product	L	W	H	Q ₁	*Q ₂	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 ^{+0.05} _{-0.10}	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	Rated Current of Jumper A	Rated Resistance Range	Tolerance on Rated Resistance J(±5%) F(±1%)(±5%) J(±5%)	Temperature Coefficient of Resistance 10 ⁻⁴ /°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RAC102D	0.125	1.0	10Ω~1MΩ	J(±5%) F(±1%)(±5%) J(±5%)	±200	25	E24	50	-55~+125
RAC104D	0.25					50		100	
RAC168D	0.25					25			

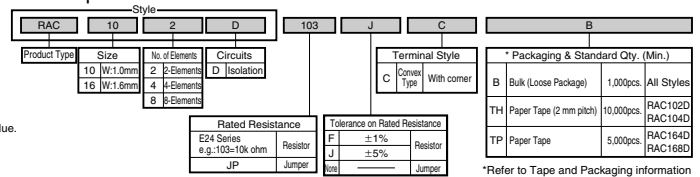
Note1. Rated Voltage = $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)

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.

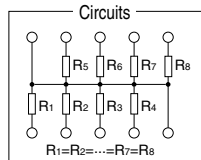
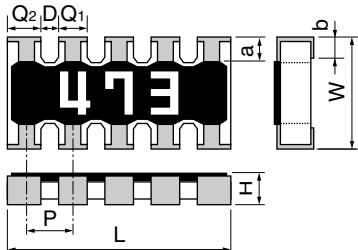
RAC168U

Halogen Free

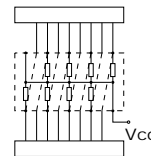
Antimony Free

- **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



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.

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

Unit : mm

Style	Terminal Style	L	W	H	D	Q ₁	*Q ₂	a	b	*P	*Unit weight/pc.
RAC168U	C	3.2±0.2	1.6±0.1	0.5±0.1	0.32±0.10	0.32±0.10	0.53	0.3±0.2	0.3±0.15	0.64	7.6mg

*Values for reference

Ratings

Style	Rated Dissipation at 70°C W	Rated Resistance Range	Tolerance on Rated Resistance J(±5%)	Temperature Coefficient of Resistance 10 ⁻⁴ /°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RAC168U	0.063	10Ω~18Ω	J(±5%)	±250	25	E24	100	-55~+125
		20Ω~1MΩ		±200				

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

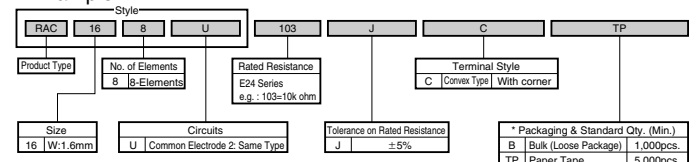
Note2. Limiting Element Voltage can only be applied to resistors

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.

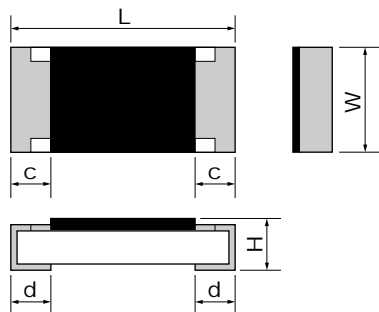
FCR

Halogen Free

Antimony Free

- **Features** Trimable device and replaceable with various resistors.
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

●Dimensions



Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FCR1/16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.10}	0.45±0.10	0.3±0.1	0.3±0.1	2mg
FCR1/10	2012	0805	2.0±0.1	1.25±0.10	0.55±0.10	0.4±0.2	0.4±0.2	5mg
FCR1/8	3216	1206	3.2±0.15	1.6 ±0.15	0.55±0.10	0.5±0.25	0.5±0.25	9mg
FCR1/4	3225	1210	3.2±0.15	2.5 ±0.15	0.55±0.15	0.5±0.25	0.5±0.25	16mg
FCR1/2	5025	2010	5.0±0.15	2.5 ±0.15	0.55±0.15	0.6±0.2	0.6±0.2	25mg
FCR1	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	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 ⁻⁴ /°C					
FCR1/16	1608 (0603)	0.063	10Ω~4.7MΩ	±200		50		100	
FCR1/10	2012 (0805)	0.1				150			
FCR1/8	3216 (1206)	0.125							
FCR1/4	3225 (1210)	0.25	10Ω~9.1Ω	+500~-200	L (±15%) - (0~-30%)	200	E24	500	-55~+125
FCR1/2	5025 (2010)	0.5	10Ω~4.7MΩ	±200					
FCR1	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.
 Note4. T.C.R.: ±100×10⁻⁴/°C (10 ohm~1M ohm) is available on your request.
 Note5. The indicated values of Ratings are in the case without trimming.

●Part Number Description

Example

FCR	1/4	471	L	TE
Product Type	Style	Rated Dissipation & Size	Tolerance on Rated Resistance	* Packaging & Standard Qty. (Min.)
		Code Rated Dissipation Metric Inch		
		1/16 0.063W 1608 0603	±5%	B Bulk (Loose Package) 1,000pcs. All Styles
		1/8 0.1W 2012 0805		TP Paper Tape 5,000pcs. FCR1/16 FCR1/10 FCR1/8
		1/4 0.25W 3216 1206		TE Embossed Tape 4,000pcs. FCR1/4 FCR1/2 FCR1
		1/2 0.5W 5025 2010		
		1 1.0W 6332 2512		

Rated Resistance
E24 Series
e.g.: 471=470 ohm

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

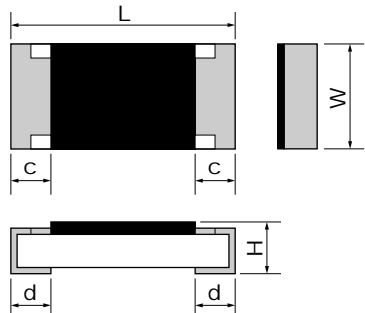
RHC

Halogen Free

Antimony Free

- **Features** Suitable for compact instrumentation, infrared rays, sensors, etc.
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

●Dimensions



Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RHC16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.05}	0.45±0.10	0.3±0.1	0.3±0.1	2mg
RHC20	2012	0805	2.0±0.1	1.25±0.10	0.55±0.10	0.4±0.2	0.4±0.2	5mg

*Values for reference

●Ratings

Style	Size Metric (Inch)	Rated Voltage V	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10 ⁻⁴ /°C	Preferred Number Series for resistors	Isolation Voltage V	Category Temperature Range °C
RHC16	1608 (0603)	15	100MΩ ~ 270MΩ	J (±5%)	0~-2,000	E12	100	-55~+155
			100MΩ ~ 4GΩ	K (±10%)				
			100MΩ ~ 150GΩ	M (±20%) N (±30%) H (±50%)				
			100MΩ ~ 1GΩ	J (±5%)				
RHC20	2012 (0805)	15	100MΩ ~ 10GΩ	M (±20%) N (±30%) H (±50%)	±2,000	E12	100	-55~+125
			100GΩ ~ 150GΩ		±4,000			

●Part Number Description

例

RHC	20	75G0	M	TP
Product Type	Style	Rated Resistance	Tolerance on Rated Resistance	* Packaging & Standard Qty. (Min.)
		Code Metric Inch		
		16 1608 0603	±5%	B Bulk (Loose Package) 1,000pcs.
		20 2012 0805	±10%	TP Paper Tape 5,000pcs.
			±20%	
			±30%	
			±50%	

Rated Resistance
e.g.: 100M=100M ohm
1GΩ=1G ohm
100G=100G ohm
100G=100G ohm

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

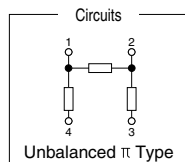
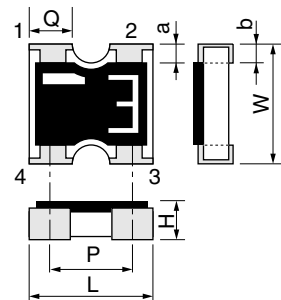
RAC101A

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/pc.
RAC101A	C	1.0±0.1	1.0 ^{+0.10} ₀	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

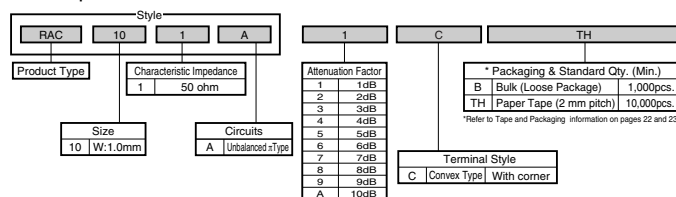
●Ratings

Style	Characteristic Impedance	Attenuation Factor		Tolerance on Attenuation Factor	Voltage Standing Wave Ratio	Frequency Range	Rated Input Power	Category Temperature
		symbol	dB	dB			mW/package	°C
RAC101A	50 ohm	1	1	±0.3	1.2max.	DC ≤ f ≤3GHz	100	−40~+125
		2	2					
		3	3					
		4	4					
		5	5					
		6	6	±0.4				
		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



LTC

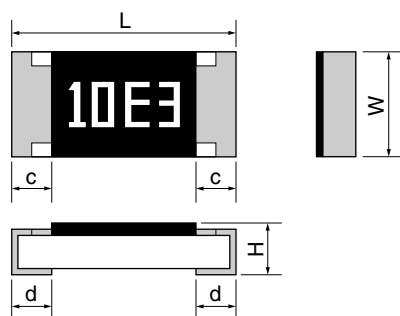
Halogen Free

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 : 1,000×10⁻⁶/°C
E3 : 1.5k ohm

Please contact KAMAYA Sales department for further information.

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
LTC1/10	2012	0805	2.0±0.15	1.25 ^{+0.10} _{-0.05}	0.6±0.1	0.4 ±0.2	0.3 ^{+0.2} _{-0.1}	5mg
LTC1/8	3216	1206	3.1±0.1	1.55±0.10	0.6±0.1	0.45±0.20	0.3 ^{+0.2} _{-0.1}	9mg

Unit : mm

*Values for reference

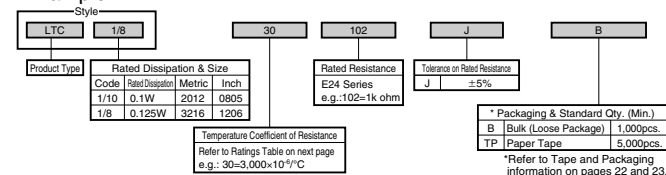
●Ratings

Temperature Coefficient of Resistance 10 ⁻⁵ /°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
	Code		LTC1/10 (0.1W)	LTC1/8 (0.125W)				
500	05	±100×10 ⁻⁵ /°C	100 ohm-5.1k ohm	100 ohm-10k ohm	J(±5%)	E24	100	-40→125
800	08	±150×10 ⁻⁵ /°C	100 ohm-5.1k ohm	100 ohm-10k ohm				
1,000	10	±15%/°C	100 ohm-5.1k ohm	100 ohm-10k ohm				
1,500	15		100 ohm-3.3k ohm	100 ohm-4.7k ohm				
2,000	20		100 ohm-3.3k ohm	100 ohm-4.7k ohm				
2,400	24	±10%	100 ohm-1.6k ohm	100 ohm-2.2k ohm				
2,800	28		100 ohm-3.3k ohm	100 ohm-3.6k ohm				
3,000	30		100 ohm-3.3k ohm	100 ohm-3.6k ohm				
3,300	33	100 ohm-3.3k ohm	100 ohm-3.6k ohm					
3,600	36	51 ohm-910 ohm	51 ohm-1.2k ohm					
3,900	39	51 ohm-560 ohm	51 ohm-910 ohm					
4,200	42	33 ohm-360 ohm	33 ohm-470 ohm					
4,500	45	33 ohm-200 ohm	33 ohm-180 ohm					

Note1. Rated Voltage = √(Rated Dissipation)×(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



FCC,FHC

Halogen Free

Antimony Free

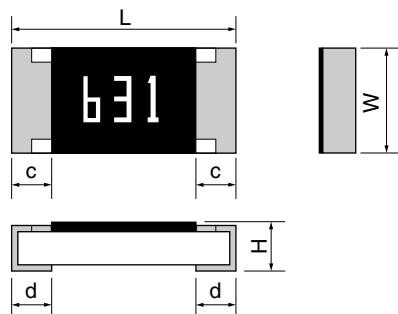
Pb Free

●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 ^{+0.15} _{-0.05}	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 ±0.1	0.5±0.25	0.5 ±0.25	10mg
FHC32					0.65±0.10			11mg

Unit : mm

■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	30Vd.c. 35A					
			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	24Vd.c. 35A					
			132	1.25	90	M						
			162	1.6	55	N						
			202	2.0	40	S						
			252	2.5	36	T						
		322	3.15	26	U							
		FHC10	402	4.0	19	X				32Vd.c. 50A		
			502	5.0	14	Y						
502	5.0		14	YD								
1608	0603		FCC16	151	0.15	4,000	OD			50Vd.c. 35A		
				201	0.2	1,800	ZD			36Vd.c. 35A		
				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					
				801	0.8	130	KD					
				102	1.0	110	LD			32Vd.c. 35A		
				132	1.25	85	MD					
		162		1.6	70	ND						
		202		2.0	55	SD						
		252		2.5	45	TD						
		FHC16	322	3.15	26	UD	24Vd.c. 35A					
			402	4.0	19	XD	50Vd.c. 50A					
			501	0.5	270	501						
2012	0805	FCC20	631	0.63	190	631				32Vd.c. 50A		
			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						
			FHC20	322	3.15	26	UD			24Vd.c. 50A		
				402	4.0	19	XD			32Vd.c. 50A		
				502	5.0	14	YD					
			3216	1206	FCC32	201	0.2				1,800	201
						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	32Vd.c. 50A					
132	1.25	85				132						
152	1.5	78				152						
162	1.6	75				162						
202	2.0	65				202						
252	2.5	45				252						
FHC32	322	3.15			26	UD						
	402	4.0			19	XD						
	502	5.0			14	YD						

FCC, FHC

●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 ℃
Metric	Inch		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			
			152	1.5	100	H			
			162	1.6	90	N			
			202	2.0	55	S			
			252	2.5	40	T			
1608	0603	FCC16	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			
			631	0.63	280	IB			
			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			
2012	0805	FCC20	501	0.5	330	FB	50Vd.c. 50A		
			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			
		FHC20	252	2.5	40	TB	32Vd.c. 50A		

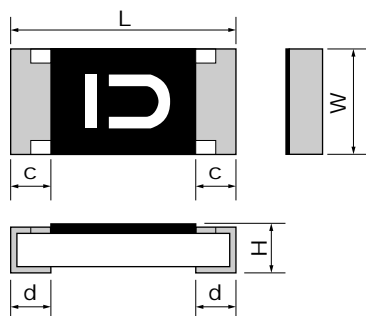
●Features

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

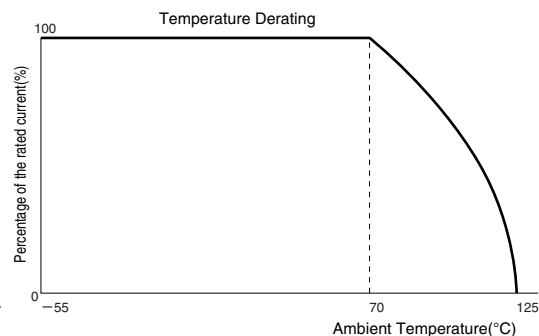
Nominal Derating ≤ 75% of Rated Current

• Temperature Derating

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

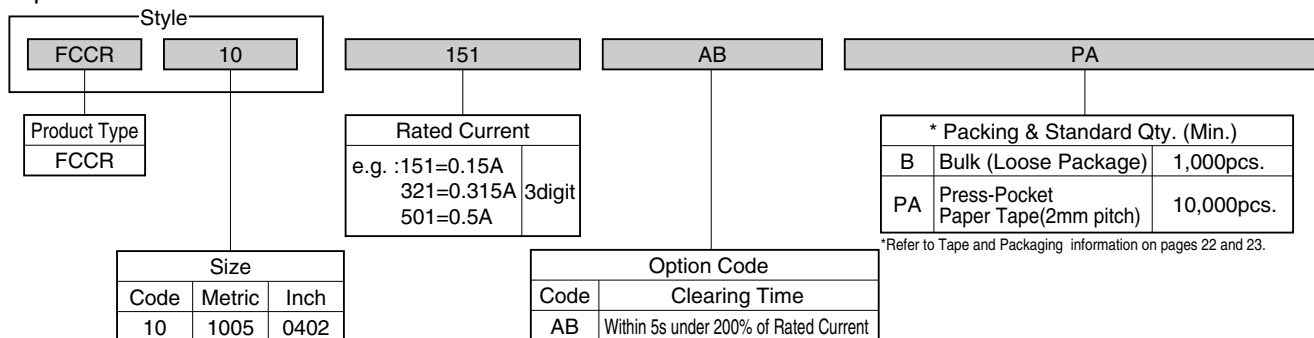
Ex.) If FCCR10 501AB (Rated Current:0.5A) is used under ambient temperature 70°C,
Kamaya recommends, less than the current value derated as below,

Rated Current : 0.5A × (Nominal Derating : 75% × Temperature Derating : 100%) = 0.375A



●Part Number Description

Example



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

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

Halogen Free

Antimony Free

Pb Free

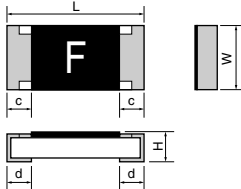
●Features

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.

Style	Metric	Inch	L	W	H	c	d	Unit weight/pc.
FMC16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.05}	0.45±0.10	0.3±0.15	0.3±0.1	2mg

*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 ℃							
Metric	Inch		Code	A													
1608	0603	FMC16	501	0.5	260	F	32Vd.c. 35A	<table><tr><td>Rated Current</td><td>Opening time</td></tr><tr><td>×100%</td><td>4h Min.</td></tr><tr><td>×200%</td><td>5s Max.</td></tr><tr><td>×300%</td><td>0.2s Max.</td></tr></table>	Rated Current	Opening time	×100%	4h Min.	×200%	5s Max.	×300%	0.2s Max.	-55~+125
			Rated Current	Opening time													
			×100%	4h Min.													
			×200%	5s Max.													
			×300%	0.2s Max.													
			751	0.75	140	A											
			102	1.0	110	L											
			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)

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics		Working Temperature Range °C								
Metric	Inch		Code	A														
1608	0603	FMC16	501	0.5	400	HF	32Vd.c. 35A	<table><tr><td>Rated Current</td><td>Opening time</td></tr><tr><td>×100%</td><td>4h Min.</td></tr><tr><td>×200%</td><td>5s Max.</td></tr><tr><td>×300%</td><td>0.2s Max.</td></tr></table>		Rated Current	Opening time	×100%	4h Min.	×200%	5s Max.	×300%	0.2s Max.	−55~+125
			Rated Current	Opening time														
			×100%	4h Min.														
			×200%	5s Max.														
			×300%	0.2s Max.														
			631	0.63	300	HI												
			751	0.75	210	HA												
			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 ≤ 75% of Rated Current

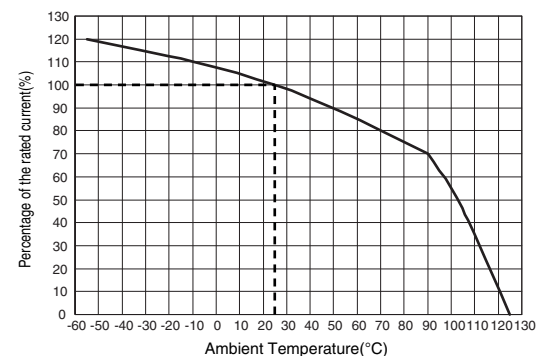
• Temperature Derating

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,

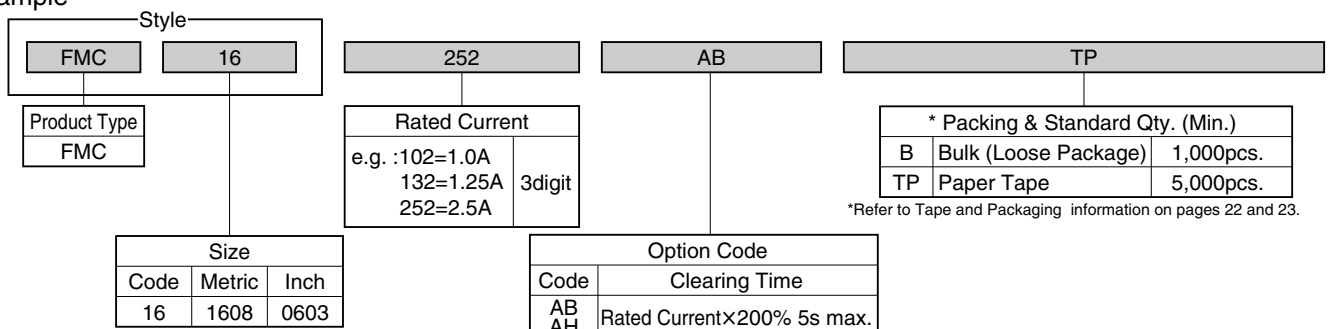
Kamaya recommends, less than the current value derated as below,

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



●Part Number Description

Example



NEW

FMC10 Option Code : AB / Low Ohm & Fast Acting

Halogen Free

Antimony Free

Pb Free

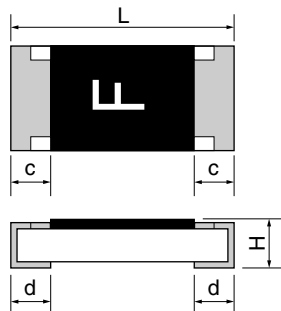
●Features

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	24Vd.c. 35A	×100%	4h Min.	-55~+125
			751	0.75	140	A				
			102	1.0	95	L				
			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		×200%	5s Max.	
								×300%	0.2s Max.	

●Recommended Derating for Rated Current

• Nominal Derating

Nominal Derating m 75% of Rated Current

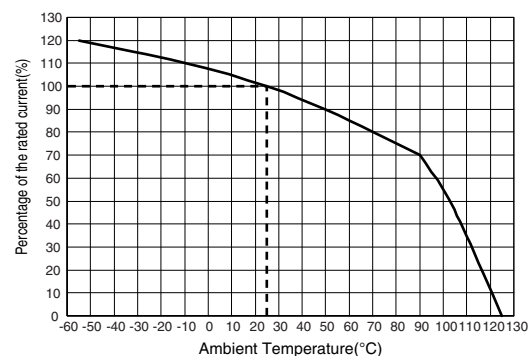
• Temperature Derating

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,

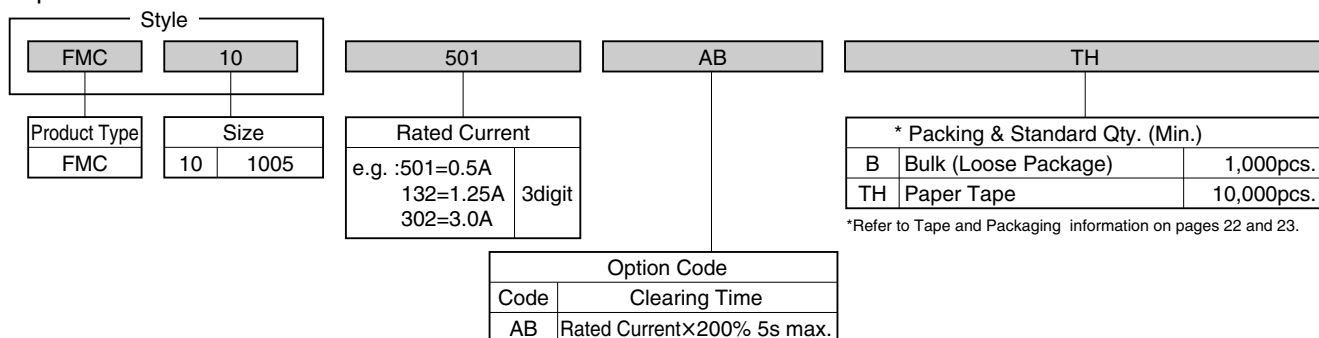
Kamaya recommends, less than the current value derated as below,

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



●Part Number Description

Example



SBF32 Slow Blow

Halogen Free

Antimony Free

Pb Free

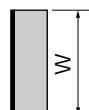
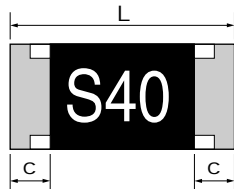
●Features

"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/pc.
SBF32	3216	1206	3.2±0.2	1.6±0.15	0.65±0.10	0.5±0.25	0.5±0.25	10mg

Unit : mm

*Values for reference

●Option Code:AS(Slow Blow type)

Size		Style	Rated Current		Internal Resistance m ohm typ.	Mark	Interrupting Rating	Electrical Characteristics			Working Temperature Range °C
Metric	Inch		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					
			152	1.5	68	S15					
			202	2.0	40	S20					
			252	2.5	30	S25	32Vd.c. 50A	×200%	1s	120s	
			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	×300%	0.02s	3.0s					
							×800%	0.0015s	0.05s		

●Recommended Derating for Rated Current

• Nominal Derating

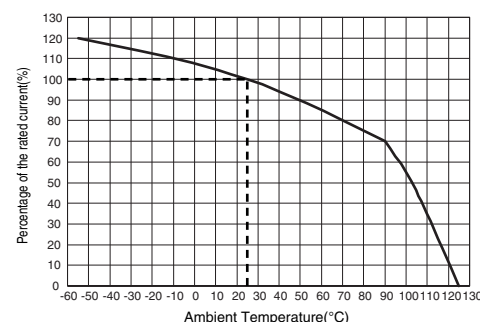
Nominal Derating ≤ 75% of Rated Current

• Temperature Derating

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

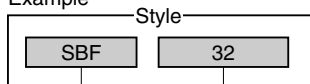
Ex.) If SBF32 102AS (Rated Current 1.0A) is used under ambient temperature 70°C,
Kamaya recommends, less than the current value derated as below.

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



●Part Number Description

Example



Product Type
SBF

402

Rated Current	
e.g. :252=2.5A	3digit
402=4.0A	
802=8.0A	

AS

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

TP

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

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

■ Item for examination

Series	FCCR
Size	1005 (mm)
OP Code	AB

Operating condition

Application	15 V d.c.
	20 A
Nominal	0.2 A Max.
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.

***/*/*20**

Kamaya Electric Co., Ltd.
Hokkaido Research Center
No.HR2TGF05*****

■ Confirmations for Rush

#1	Trapezoidal waveform	0	0.00002 s
		I_m	3 A
		t_1	5 us
		t_2	10 us
		t_3	20 us
		Joule Integral	$90A^2 \cdot us$
Amount		Joule Integral	

■ Confirmation of Rush

#1	FCCR	10	501	AB	1005	0.5A	200%, 5s	Standing Pulse 100k times
#2								
#3								
#4								
#5								
Recommended Item							FCCR10501AB	

Temperature Derating

Joule Integral [2t (A²·s)]

We can provide Application Guide for Fuses selection.

FRC

Halogen Free

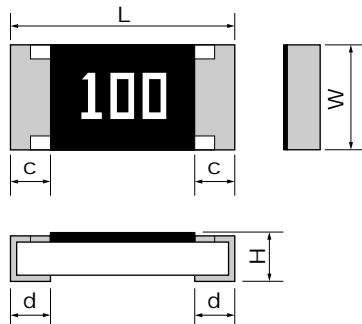
Antimony Free

●Features

Suitable for battery circuit and power supply circuit.

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

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FRC16	1608	0603	1.6±0.1	0.8 ^{+0.15} _{-0.05}	0.45±0.10	0.3±0.1	0.3±0.1	2.2mg
FRC20	2012	0805	2.0±0.1	1.25±0.10	0.6 ±0.1	0.4±0.2	0.4±0.2	6mg
FRC32	3216	1206	3.2±0.2	1.6 ±0.15	0.6 ±0.1	0.5±0.25	0.5±0.25	10mg

*Values for reference

●Ratings

Style	Size Metric (Inch)	Rated Dissipation W	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10 ⁻⁶ /°C	Preferred Number Series for Resistors	Fusing Characteristic		Maximum open-circuit voltage	Category Temperature Range °C
							Applied Power	Fusing Time		
FRC16	1608 (0603)	0.063	3.9Ω~51Ω	J(±5%)	±1,000	E24	1.89W	30s max.	50V	-55~+125
FRC20	2012 (0805)	0.1	1Ω~51Ω				2.0W			
FRC32	3216 (1206)	0.125	1Ω~51Ω 56Ω~100Ω				2.5W			

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

Note2. Contact us for further information on other style, resistance and pre-arcing time-current characteristic than those mentioned above.

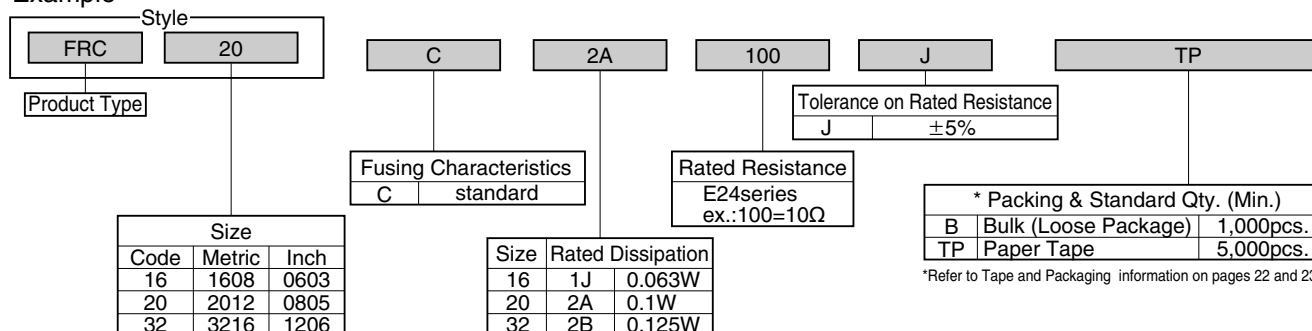
Note3. Contact us for information when inrush and surge voltage are supposed to be applied.

Note4. Maximum open circuit voltage is the value of voltage applicable to both ends of resistors, when a resistor is open condition in a circuit.

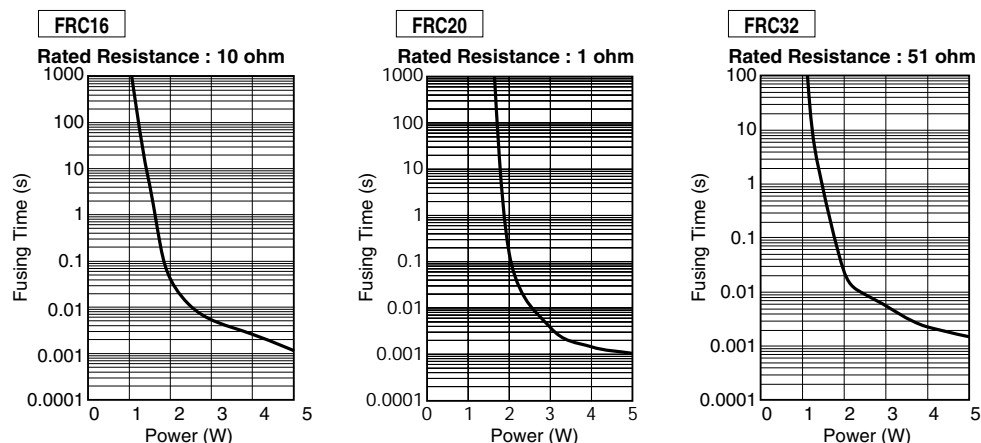
This voltage shall be corresponding to 1,000 times the rated dissipation or maximum open circuit which is the less severe.

●Part Number Description

Example



●Example of Typical Fusing Characteristics



SPC10

Halogen Free

Antimony Free

Pb Free

●Features

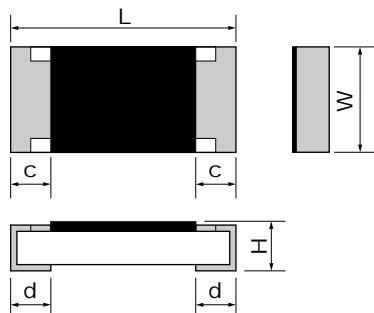
Low capacitance 0402inch: 0.1pF Max.
Suitable for ESD protection of High Speed data lines.
High ESD Withstand, IEC61000-4-2 Lv4 8kV Contact Discharge

[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.

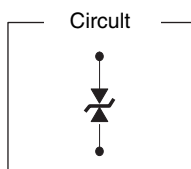
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

●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

Unit : mm
*Values for reference



●Ratings

Part Number	Size Metric (Inch)	Capacitance ^{Note.1} pF	ESD Characteristics				Rated voltage ^{Note.4} V	Leakage current ^{Note.5} μA	Category Temperature Range ^{Note.6} °C
			Peak Voltage ^{Note.2} Code	V	Clamp Voltage ^{Note.3} V	ESD pulse withstand Pulses			
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.

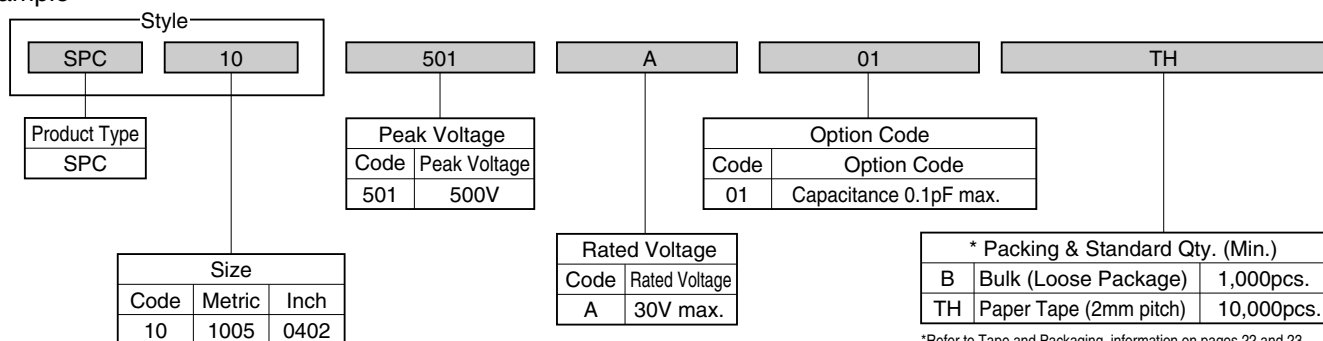
Note4. Rated Voltage : The value of voltage that is applicable to each terminal of ESD suppressor without operation of suppressor.

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

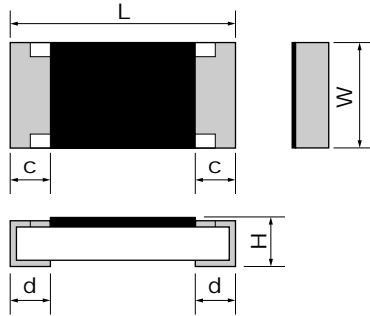
Halogen Free

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.

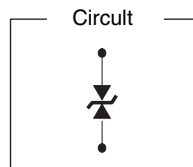
●Dimensions



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

Unit : mm

*Values for reference



●Ratings

Style	Size Metric (Inch)	Capacitance ^{Note.1} pF	ESD Characteristics				Rated ^{Note.4} voltage V	Leakage ^{Note.5} current μA	Category ^{Note.6} Temperature Range °C
			Peak Voltage ^{Note.2} Code	V	Clamp Voltage ^{Note.3} 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.

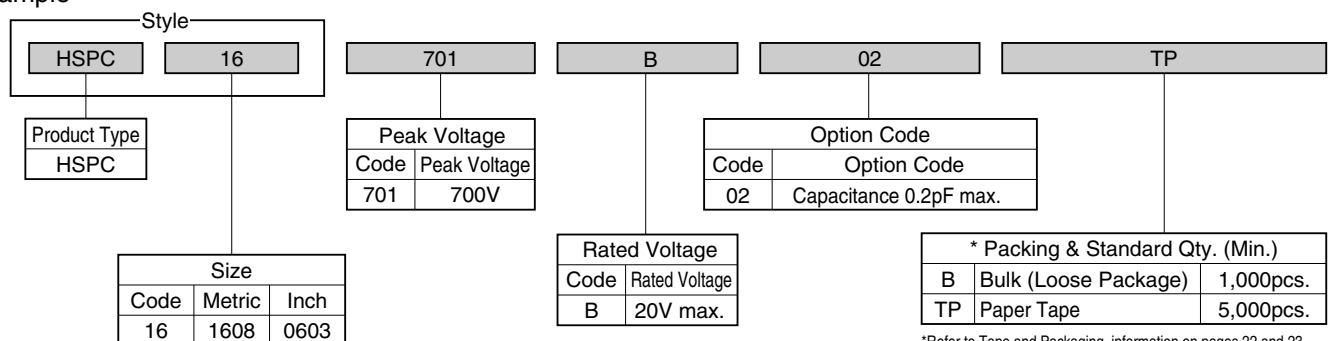
Note4. Rated Voltage : The value of voltage that is applicable to each terminal of ESD suppressor without operation of suppressor.

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

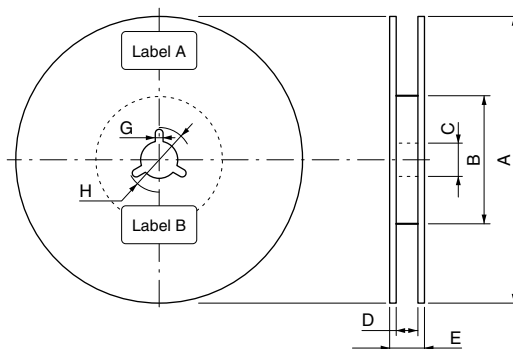
Example



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

Packaging for Surface Mount Devices

●Reel Dimensions

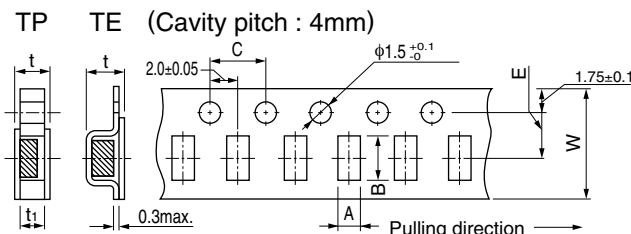
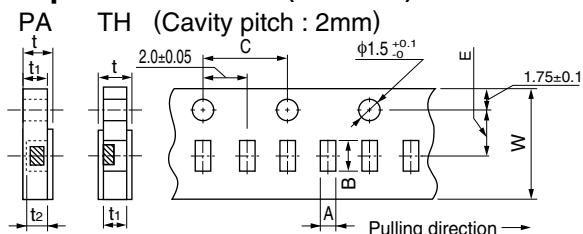


Unit : mm

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

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

●Tape Dimensions (Unit : mm)

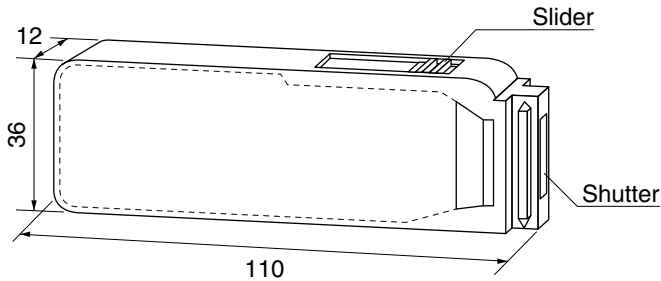


*Please contact Kamaya sales department for 1mm pitch cavity taping.

Metric	Inch	Style	Code	A	B	C	W	E	t ₁	t ₂	t	
0402	01005	RMC1/32, RGC1/32	PA	0.24±0.03	0.45±0.03	4.0±0.05	8.0±0.2	3.5±0.05	0.31±0.03	0.15±0.02	0.36±0.03	
0603	0201	RMC1/20, RGC1/20, RCC06, RNC06		0.37±0.05	0.67±0.05	4.0±0.05			0.42±0.03	0.27±0.02	0.45±0.05	
1005	0402	FCC10, FHC10, FCCR10		0.65±0.10	1.15±0.10	4.0±0.1			0.6±0.05	0.5±0.05	0.7 max.	
		RMC1/16S, RGC1/16S, RLC10, RCC10, FCC10(LB), FMC10, SPC10	0.65 ^{+0.05} _{-0.10}	1.15 ^{+0.05} _{-0.10}	0.4±0.05							—
1608	0603	RMC1/16	1.15±0.15	1.9±0.2	4.0±0.1	0.6±0.1			—	0.8 max.		
		RMC1/16, RGC1/16, FCR1/16, RVC16 RLC16, RHC16, RCC16, RLP16 FCC16, FHC16, FMC16, FRC16, HSPC16	1.15±0.15	1.9±0.2							0.6±0.1	—
2012	0805	RMC1/10, RGC1/10, FCR1/10, RNC20 RVC20, RPC20, RLC20, RHC20, LTC1/10 FCC20, FHC20, FRC20, RCC20	TP	1.65±0.15	2.5±0.2	4.0±0.1			0.8±0.1	—	1.0 max.	
		RLP20		0.6±0.1	0.8±0.1							—
3216	1206	RMC1/8, RGC1/8, FCR1/8, RNC32, RVC32 RPC32, RLC32, LTC1/8, FCC32, FHC32 SBF32, FRC32, RCC32	TP	2.0±0.15	3.6±0.2	4.0±0.1			0.6±0.1	—	1.0 max.	
		RLP32		0.6±0.1	0.8±0.1				—	1.0 max.		
3225	1210	RMC1/4, FCR1/4, RPC35, RLC35	TE	2.85±0.20	3.5±0.2	4.0±0.1	8.0±0.3	5.5±0.05	—	—	1.0±0.2	
5025	2010	RMC1/2, FCR1/2, RVC50, RPC50, RZC50 RLC50, RLS50		3.1±0.2	5.5±0.2		12±0.3		—	—	1.1±0.15	
6332	2512	RMC1, FCR1, RVC63, RPC63, RZC63 RLC63, RLS63, RLP63, MLP63		3.6±0.2	6.9±0.2				—	—		
Chip Networks Chip Attenuators		RAC101A	TH	1.15 ^{+0.05} _{-0.10}	1.15 ^{+0.05} _{-0.10}	4.0±0.1	8.0±0.2	3.5±0.05	0.4 ^{+0.05} _{-0.10}	—	0.55 max.	
		RAC102D		1.2±0.1	2.2±0.1				0.4±0.1	—	0.5 max.	
		RAC104D							TP	1.9±0.15	3.6±0.2	8.0±0.3
		RAC164D, RAC168U	1.9±0.15	4.1±0.15	0.6±0.1					—		
		RAC168D	1.9±0.15	4.1±0.15	0.6±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	
			Code	M. P. Q. (pcs./reel)	Outer Carton			Q' ty (pcs.)	
					Reel Q' ty (pcs.)	Gross Weight (kg)	Measurement (m³)		
0402	01005	RMC1/32, RGC1/32	PA	20,000	50	8.8	0.027	1,000**	
0603	0201	RMC1/20, RGC1/20, RCC06, RNC06		15,000		7.8			
1005	0402	FCC10, FHC10, FCCR10		10,000		6.0			
		RMC1/16S, RGC1/16S, RLC10 RCC10, FMC10, SPC10	TH						
1608	0603	RMC1/16	TP	5,000		8.3			
		RMC1/16, RGC1/16, FCR1/16 RVC16, RLC16, RHC16, RCC16, RLP16 FCC16, FHC16, FMC16, FRC16, HSPC16				7.2			
2012	0805	RMC1/10, RGC1/10, FCR1/10, RLP20 RNC20, RVC20, RPC20, RLC20, RHC20 LTC1/10, FCC20, FHC20, FRC20, RCC20				8.4			
3216	1206	RMC1/8, RGC1/8, FCR1/8 RNC32, RVC32, RPC32, RLC32, LTC1/8, FRC32, RCC32				8.8			
		RLP32, FCC32, FHC32, SBF32			10.0				
3225	1210	RMC1/4, FCR1/4, RPC35, RLC35	TE	4,000	7.7				
5025	2010	RMC1/2, FCR1/2, RVC50, RPC50 RZC50, RLC50, RLS50			8.0				
6332	2512	RMC1, FCR1, RVC63, RPC63, RZC63 RLC63, RLS63			40	10.4			
		RLP63, MLP63				12.0			
Chip Networks Chip Attenuators		RAC102D, RAC101A	TH	10,000	50	6.0			
		RAC104D				6.3			
		RAC164D, RAC168U	TP	5,000		7.7			
		RAC168D				8.6			
							5,000		

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



Leaded Resistors

Pulse

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

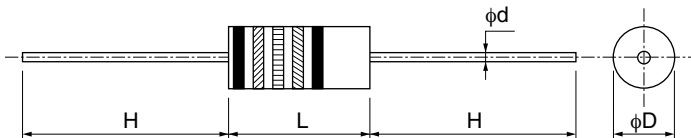
RC1/2U

- **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



Unit : mm

Style	L	D	H	d	*Unit weight/pc.
RC1/2U	9.5 ^{+0.8} _{-0.7}	3.6±0.2	28±3	0.7 ^{+0.07} _{-0.05}	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 M(±20%) E6	250Va.c. max. or 125Va.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.

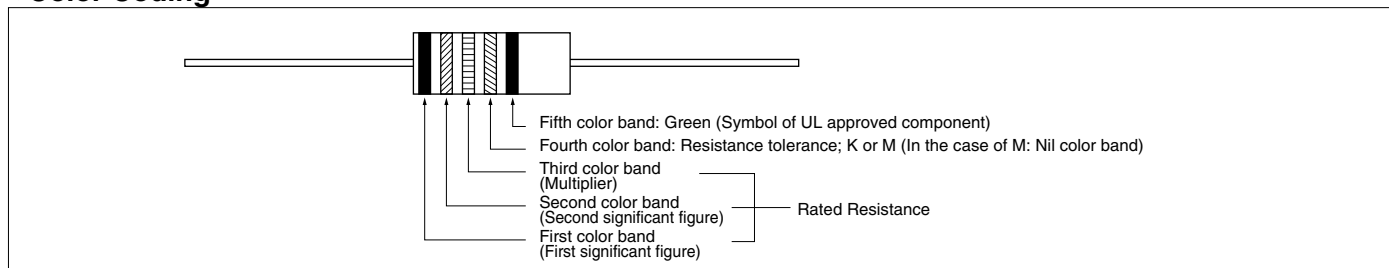
●Part Number Description

Example

Style	RC	1/2U	685	M	B
Product Type	RC	1/2U	Rated Dissipation 0.5W	Tolerance on Rated Resistance K ±10% M ±20%	*Packaging B Bulk (straight) H Horizontal Forming TB 52 mm Width Tape (Ammo Box) TD 52 mm Width Tape (Reel)
Rated Resistance			E12, 6 Series e.g. : 685=6.8M ohm 106=10M ohm		

*Refer to Tape and Packaging information on pages 25.

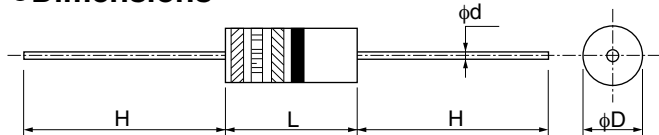
●Color Coding



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



Unit : mm

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 ^{+0.8} _{-0.7}	3.6±0.2	28±3	0.7 ^{+0.07} _{-0.05}	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 Resistance Temperature Coefficient of Resistance % at -55 °C at +125 °C	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 +1 -5 +10 -0 0 -7.5 +13 -0 +15 -0 +20 -0	1 ohm ~ 1k ohm 1.1k ohm ~ 10k ohm 11k ohm ~ 100k ohm 110k ohm ~ 1M ohm 1.1M ohm ~ 22M ohm	J (± 5%) E24 K (± 10%) E12 M (± 20%) E6	100 500	-55~+125
RC1/2	0.5	350	1 ohm~22M ohm					

Note1. Rated Voltage =√ (Rated Dissipation)×(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

Style	RC	1/4	102	J	B
Product Type	RC	1/4	Rated Dissipation 0.25W 1/2 0.5W	Tolerance on Rated Resistance J ±5% K ±10% M ±20%	*Packaging B Bulk (Straight) H Horizontal Forming TB 52 mm Width Tape (Ammo Box) TD 52 mm Width Tape (Reel)
Rated Resistance			E24, 12, 6 Series e.g. : 2R2=2.2 ohm 102=1k ohm		

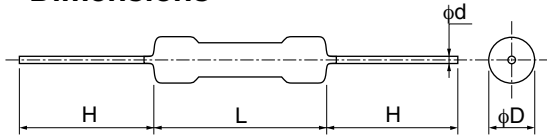
*Refer to Tape and Packaging information on pages 25.

- **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	Rated Resistance Range M ohm	Temperature Coefficient of Resistance 10°C	Tolerance on Rated Resistance
RH 1	1.0	1.5	4	4	1sRs500 500<Rs5,000	±100 ±200	F (± 1%)
RH 2	2.0	5	12.5	7.5			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.

Unit : mm

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

Style	D	500M	J	B
RH	8			
Product Type	Rated power	Temperature Coefficient of Resistance	Rated Resistance	Tolerance on Rated Resistance
1	1.0W	K ±100×10 ⁻⁴ /°C	Available on demand	F ± 1%
2	2.0W	D ±200×10 ⁻⁴ /°C	e.g.: 100M=100M ohm	G ± 2%
3	3.0W		1G00=1G ohm	J ± 5%
4	4.0W			K ±10%
6	6.0W			
8	8.0W			
		Marking and label indication for Temperature Coefficient Resistance		
		HVS : ±100×10 ⁻⁴ /°C		
		HVS : ±200×10 ⁻⁴ /°C		

Packaging for Leaded Resistors

●Tape

Unit : mm

Style	W	L1-L2	T	t	P	Z	S
RC1/4 RC1/2 RC1/2U	52.4 ^{+1.6} _{-1.4}	1.0max.	6.0±0.5	0.5max.	5.08±0.38	1.0max.	3.2min.

●Ammo Box

Unit : mm

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

●Tape & Reel (Code : TD)

Unit : mm

Style	Code	A	*A'	B	C1	C2	d	*Y
RC1/4 RC1/2 RC1/2U	TD	260±5	280	75±5	60.4±1	78±1	14.5±0.5	3

*Value for reference

●Horizontal Forming (Code : H)

Unit : mm

Style	Code	A	B	t
RC1/4	H60	10.0±0.5	5.0±0.5	1.5max.
RC1/4	H62	12.5±0.5		
RC1/2 RC1/2U	H	15.0±0.5		1.8max.

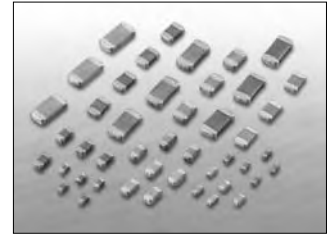
Style	Tape & Reel					Ammo Box					Bulk Packaging				
	Q'ty / Reel (pcs.)	Reel Size (mm)	Outer Carton			Width of Taping (mm)	Q'ty / Box (pcs.)	Outer Carton			M.P.Q. (100×5) Q'ty / Plastic Bag (pcs.)	Q'ty / Inner Carton (pcs.)	Outer Carton		
			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measurement (m³)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measurement (m³)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measurement (m³)
RC1/2U	3,000	260	24,000	13	0.04	52	2,000	30,000	16	0.05	500 (100×5)	5,000	30,000	13	0.04
RC1/2	3,000	260	24,000	13	0.04	52	2,000	30,000	16	0.05	500 (100×5)	5,000	30,000	13	0.04
RC1/4	5,000	260	40,000	12	0.04	52	2,000	30,000	10	0.03	1000 (200×5)	10,000	50,000	13	0.04

Multilayer Ceramic Capacitor

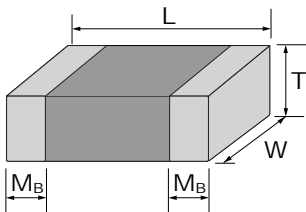
Please see Catalog of Walsin Technology Corporation. (Website: <http://www.passivecomponent.com/>) for detail information.

●Features

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



●Dimensions



Unit: mm

Metric	Inch	L	W	T/Symbol	MB	Series
1005	0402	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05 N	0.25±0.05/-0.1	General Purpose, High Capacitance, MW, HH
1608	0603	1.6 ±0.1	0.8 ±0.1	0.8 ±0.07 S	0.4 ±0.15	General Purpose, High Capacitance, MW, HH
		1.6+0.15/-0.1	0.8+0.15/-0.1	0.8+0.15/-0.1 X	0.4 ±0.15	General Purpose, High Capacitance
2012	0805	2.0 ±0.15	1.25±0.1	0.6 ±0.1 A	0.5 ±0.2	General Purpose, High Voltage
				0.8 ±0.1 B	0.5 ±0.2	General Purpose, High Capacitance, High Voltage
				1.25±0.1 D #	0.5 ±0.2	General Purpose, High Capacitance, High Voltage
		2.0 ±0.2	1.25±0.2	0.95max. T #	0.4 ±0.2	OP
				1.25±0.2 I #	0.5 ±0.2	High Capacitance
				0.8 ±0.1 B	0.13max.	Low Inductance
1632	0612	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1 B	0.6 ±0.2	General Purpose, High Voltage
3216	1206	3.2 ±0.15	1.6 ±0.15	0.95max. T #	0.6 ±0.2	TT
				0.95±0.1 C	0.6 ±0.2	General Purpose, High Capacitance, High Voltage
				1.15±0.15 J #	0.5 ±0.2	OP
		3.2 ±0.2	1.6 ±0.2	1.25max. T #	0.6 ±0.2	General Purpose
				1.25±0.1 D #	0.6 ±0.2	High Capacitance
		3.2 ±0.15	1.6 ±0.15	1.6 ±0.2 G #	0.6 ±0.2	General Purpose, High Capacitance, High Voltage
				1.6 ±0.2 G #	0.5 ±0.2	OP
				1.6 ±0.2 G #	0.5 ±0.2	General Purpose, High Capacitance, High Voltage
		3.2+0.3/-0.1	1.6+0.3/-0.1	2.5 ±0.3 M #	0.75±0.25	High Voltage
				1.25±0.1 D #	0.5 ±0.25	S2, S3
3225	1210	3.2 ±0.3	2.5 ±0.2	0.95max. T #	0.75±0.25	General Purpose, High Voltage
				0.95±0.1 C #	0.5 ±0.25	OP
		3.2 ±0.4	2.5 ±0.3	1.25±0.1 D #	0.75±0.25	General Purpose, High Voltage
				1.6 ±0.2 G #	0.5 ±0.25	OP
4520	1808	4.5 ±0.4	2.03±0.25	2.5 ±0.3 M #	0.75±0.25	High Voltage
				1.25±0.1 D #	0.5 ±0.25	S2, S3
				2.0 ±0.2 K #	0.75±0.25	High Voltage
4532	1812	4.5 ±0.4	3.2 ±0.3	0.75±0.25	General Purpose, S2, S3	
				1.25±0.1 D #	0.6 ±0.25	OP
				2.0 ±0.2 K #	0.75±0.25	General Purpose, S2, S3
					0.6 ±0.25	OP

●Characteristic

: Reflow soldering process only.

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)	16V, 25V, 50V, 100V	0.5pF~1uF
	High Capacitance	X7R, X5R, Y5V	0402(1005) 0603(1608)	0805(2012) 1206(3216)	1210(3225) 1812(4532)	6.3V, 10V, 16V, 25V, 50V	1uF~100uF
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	0.5pF~0.22uF

●Part Number Description

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

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

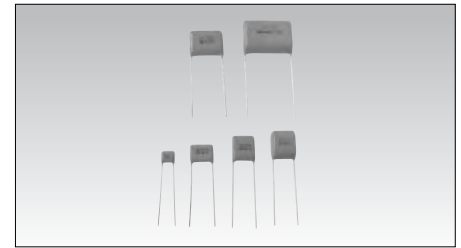
Example Low profile
Open-mode Design
High Q Low ESR
Microwave
Safety certified

Style	
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 (μF)	Temp. Range (°C)
General use	Standard		FPB NEW	• 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 FPS	• Low Noise • Needle flame test proof	450VDC	0.47~2.2	-40~+85 (+110) -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
			FPD5	• Small in size	450VDC	0.47~2.2	-40~ +85 (+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	0.1μF +120Ω 0.033μF +120Ω	-40~ +85
			CRKH	• C-R Unit • UL,VDE Safety Standard	250VAC (275VAC)	0.01~0.1μF 47, 100, 120Ω	-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

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, Cl₂, H₂S, NH₃, SO₂, NO₂, 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.

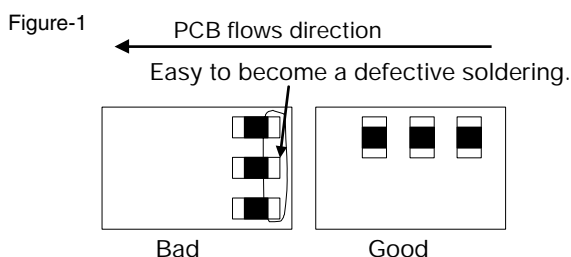
3.2 Interval of parts should not narrow too much for the short-circuit prevention.
In general, it is safer to open more than 0.5mm from the positioning accuracy of mounting.

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.

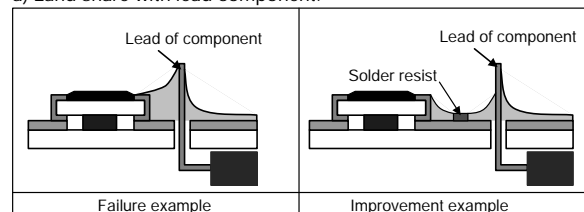


3.5 Examples of division of land pattern (Cross-sectional view)

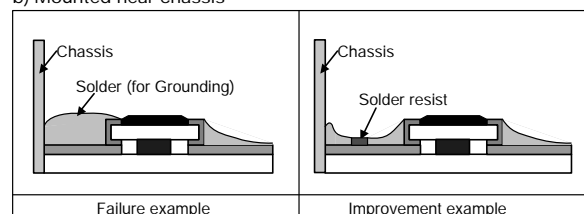
- Land share with lead component.
- Mounted near Chassis.
- Side by side array.

Figure-2

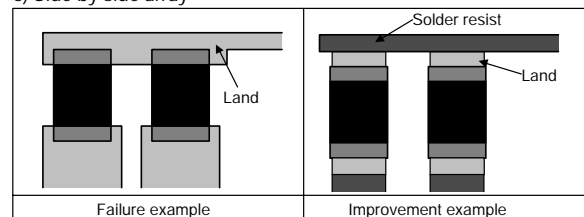
a) Land share with lead component.



b) Mounted near chassis



c) Side by side array



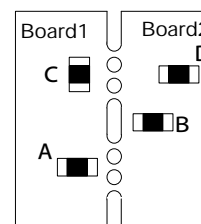
3.6 Avoid the component placement to the following places.

- 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.

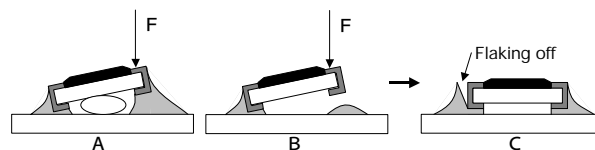
7.2 Select flux without the causticity.

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, Cl₂, H₂S, NH₃, SO₂, NO₂, 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 cares handling these products as they may be damaged and become defective if subject to impact, such as dropping.

SMD Product handling manual (RECOMMENDED LAND PATTERN)

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

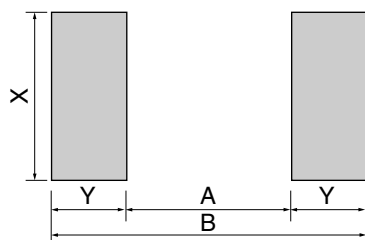
This is reference information only.

●Application

All KAMAYA Surface Mount Devices

●Recommended land pattern (Reference)

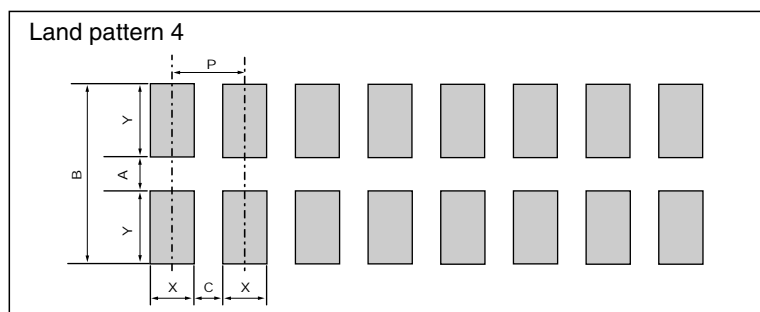
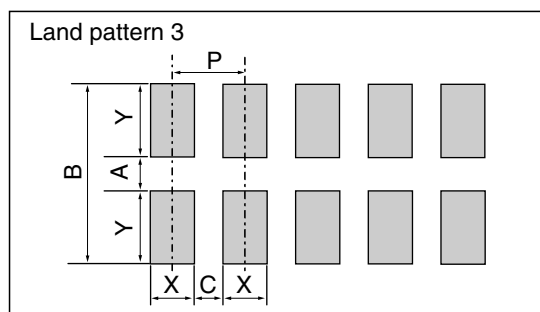
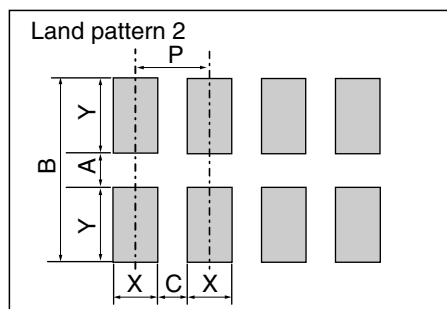
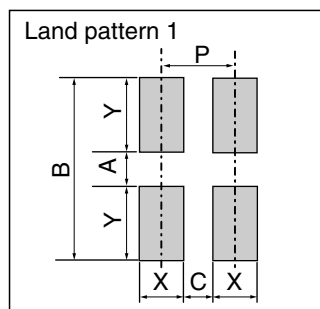
1. Square chip type (No. of terminals: 2)



Size		Flow soldering				Reflow soldering			
Metric	Inch	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	C	0.8	Not applied					1.0	2.0	0.32	0.32	0.5
3	RAC16 8U	C	0.64						1.0	2.0	0.2	0.3	0.5
4	RAC16 8D	C	0.5						1.0	2.0	0.2	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

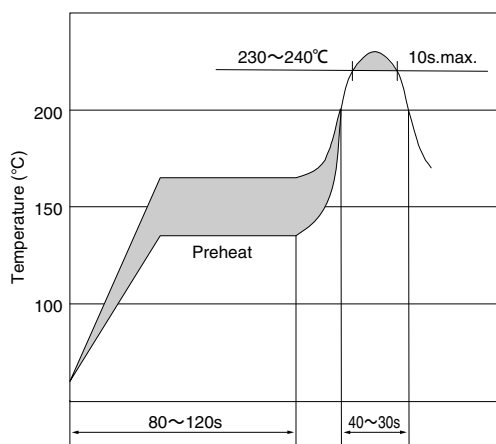
All KAMAYA Surface Mount Devices

●Recommended soldering condition (Reference)

1. Reflow soldering

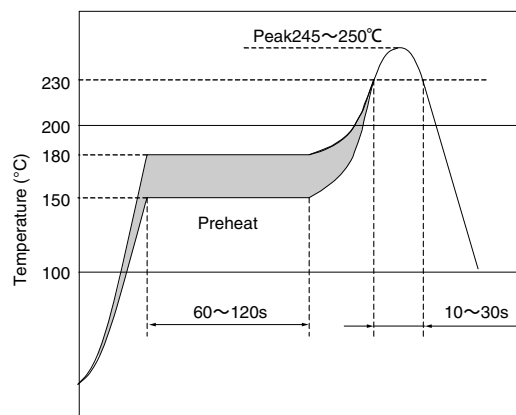
1.1 Recommended condition of Sn-Pb solder.

Reflow times: 2 times

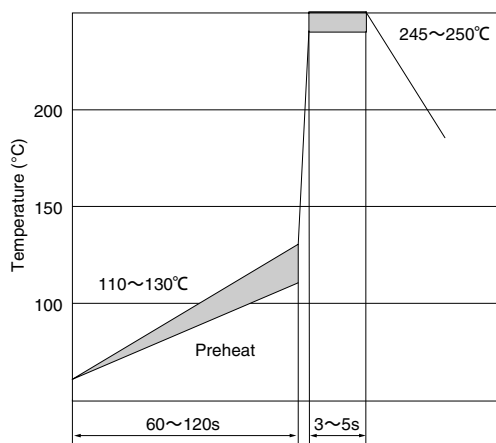


1.2 Recommended condition of Sn solder

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.

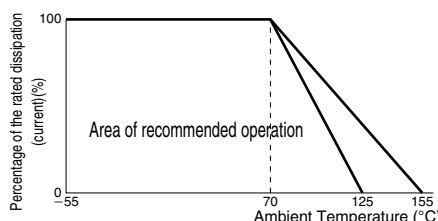
Category Temperature Range

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

R₀ : Measured resistance at T°C

T : Measured test temperature (°C)

T₀ : 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

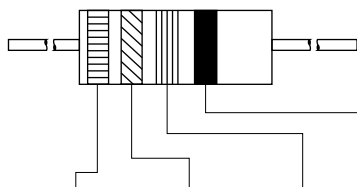
Maximum open circuit voltage is the value of voltage applicable to both ends of resistors, when a resistor is open condition in a circuit.

This voltage shall be corresponding to 1,000 times the rated dissipation or maximum open circuit which is the less severe.

Product Marking

●Color coding

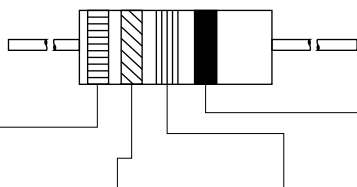
• Three - color band or four - color band system



Color	1st color band 1st figure	2nd color band 2nd figure	3rd color band Multiplier	4th color band 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($\pm 20\%$)

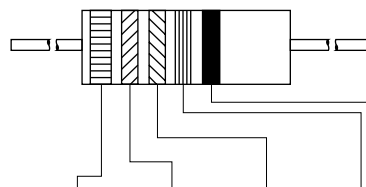
*For three-color band system the 4th color band is eliminated
(Resistance tolerance is $\pm 20\%$).

• Example



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

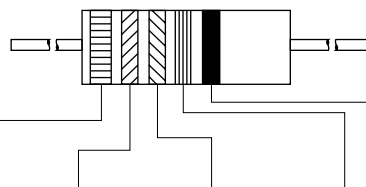
• Five - color band system



Color	1st color band 1st figure	2nd color band 2nd figure	3rd color band 3rd figure	4th color band Multiplier	5th color band 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}	$\pm 1\%$
$768 \times 0.1 \text{ (ohm)} \pm 1\%$				
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	$\pm 50\%$
N	$\pm 30\%$
M	$\pm 20\%$
K	$\pm 10\%$
J	$\pm 5\%$
G	$\pm 2\%$
F	$\pm 1\%$
D	$\pm 0.5\%$
C	$\pm 0.25\%$
B	$\pm 0.1\%$

●Temperature Characteristics Symbol Table

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

●Significant Figure of Resistance Value

E6	E12	E24	E48	E96	E192
10	10	10	100	100	100
				102	101
					102
				105	104
					105
					106
					107
					109
			11	110	110
					111
					113
					114
			12	115	115
				118	117
					118
				121	120
					121
					123
					124
			126		
		127	127		
			127		
			129		
	13	130	130		
			130		
		133	133		
			135		
			137		
			138		
		140	140		
			142		
			143		
			145		
		147	147		
			147		
			149		
15	15	15	150	150	150
				152	151
					152
				154	154
					154
				156	
				158	158
				158	160
			16	162	162
					162
				165	164
					165
					167
				169	169
					172
				174	174
					176
			18	178	178
					178
		182	180		
			182		
		187	184		
			187		
			189		
			191		
		191	191		
			193		
		196	196		
			196		
			200		
		200	200		
			203		
	20	205	205		
			205		
			208		
			210		
			213		

E6	E12	E24	E48	E96	E192
22	22	22	215	215	215
				221	221
			226	226	226
				232	232
			237	237	237
				243	243
			249	249	249
				255	255
		27	261	261	261
				267	267
			274	274	274
				280	280
			287	287	287
				294	294
			301	301	301
				309	309
33	33	33	316	316	316
				324	324
			332	332	332
				340	340
			348	348	348
				357	357
			365	365	365
				374	374
		39	383	383	383
				392	392
			402	402	402
				412	412
			422	422	422
				432	432
			442	442	442
				453	453

E6	E12	E24	E48	E96	E192
47	47	47	464	464	464
				475	470
				487	487
				499	481
		51		511	493
					505
					517
				523	517
		56		536	523
					530
				549	536
				562	542
		62		576	549
				590	556
					562
				619	569
68	68	68		604	576
				619	583
				634	590
				649	597
		75		665	604
					612
				681	619
				698	626
		82		715	634
					642
				732	649
				750	657
		91		768	665
				787	673
					681
				806	690
68	68	68		698	698
				706	706
				715	715
				732	723
		75		750	732
					741
				768	750
				787	759
		82		806	768
					777
				825	787
				845	806
		91		866	816
					825
				887	835
				909	845
68	68	68		856	856
				866	866
				887	876
				909	887
		75		931	898
					909
				953	920
					931
		82		976	942
					953
				988	965
					976
		91			988

*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)	μ(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)	L/N 071412282H (70815)	
(5)	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

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	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 (WAL SIN Product)	DONGGUAN WAL SIN 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	EICS	04111S18001R1L	Aug.14,2008

JAPAN

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