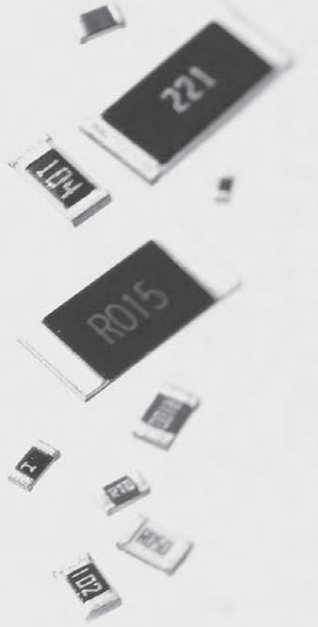
PSA PASSIVE SYSTEM ALLIANCE



KAMAYA

ELECTRONIC COMPONENTS CATALOG 2013

Products Guide

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_2O_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 Bipheuyl(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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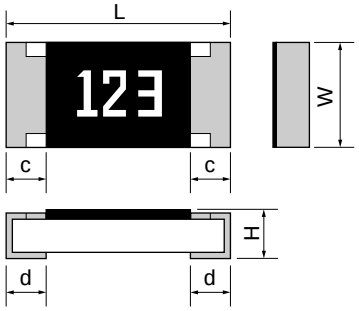
RMC

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	1.0±0.05	0.5 ±0.05	0.35±0.05	0.2 ±0.1	$0.25^{+0.05}_{-0.10}$	0.6mg
			WALSIN						
RMC1/16	1608	0603	KAMAYA	1.6±0.1	$0.8^{+0.15}_{-0.05}$	0.45±0.10	0.3 ±0.1	0.3 ±0.1	2mg
			WALSIN						
RMC1/10	2012	0805	KAMAYA	2.0±0.1	1.25±0.10	0.55±0.10	0.4 ±0.2	0.4 ±0.2	5mg
			WALSIN						
RMC1/8	3216	1206	KAMAYA	3.2±0.15	1.6 ±0.15	0.55±0.10	0.5 ±0.25	0.5 ±0.25	9mg
			WALSIN	3.1±0.1	1.6 ±0.1	0.6 ±0.15	0.45 ±0.20	0.5 ±0.2	
RMC1/4	3225	1210	KAMAYA	3.2±0.15	2.5 ±0.15	0.55±0.15	0.5 ±0.25	0.5 ±0.25	16mg
RMC1/2	5025	2010	KAMAYA	5.0±0.15	2.5 ±0.15	0.55±0.15	0.6 ±0.2	0.6 ±0.2	25mg
RMC1	6332	2512	KAMAYA	6.3±0.15	3.2 ±0.15	0.55±0.15	0.6 ±0.2	0.6 ±0.2	40mg

*Values for reference

●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code	Temperature Coefficient of Resistance 10^{-6}/°c	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
RMC1/32	0402 (01005)	0.03 (0.5A)	4.7~9.1 Ω 10~91 Ω 100~1M Ω	F, J	—	+600~−200	15	50	−55~+125
					—	±300			
					—	±200			
RMC1/20	0603 (0201)	0.05 (1.0A)	0.47~0.91 Ω 1~3.92 Ω 4.02~9.76 Ω 10~1M Ω 1.1M~10M Ω	J	—	+1000~+300	25		
				F, J	—	+600~−200			
					—	+350~−100			
				F, G, J	—	±200			
				F, J	—				
RMC1/16S	1005 (0402)	0.1 (1.0A)	1~9.76 Ω 10~1M Ω 1.02M~10M Ω	F, J	—	+500~−200	50	100	
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
RMC1/16	1608 (0603)	0.1 (2.0A)	0.47~0.91 Ω 1~9.76 Ω 10~10M Ω 11M~22M Ω	K	—	+1,000~+300			
				F, G, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				J	—	±200			
RMC1/10	2012 (0805)	0.125 (2.0A)	0.27~0.91 Ω 1~9.76 Ω 10~2.2M Ω 2.21M~10M Ω 11M~22M Ω	K	—	+1,000~+300	150	200	
				F, G, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
				J					
RMC1/8	3216 (1206)	0.25 (2.0A)	0.22~0.91 Ω 1~9.76 Ω 10~1M Ω 1.02M~10M Ω 11M~24M Ω	K	—	+1,000~+300			−55~+155
				F, G, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
				J					
RMC1/4	3225 (1210)	0.5 (2.0A)	0.2~0.91 Ω 1~9.76 Ω 10~1M Ω 1.02M~10M Ω 11M~22M Ω	K	—	+1,000~+300		500	
				F, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
				J					
RMC1/2	5025 (2010)	0.75 (2.0A)	0.33~0.91 Ω 1~9.76 Ω 10~1M Ω 1.1M~22M Ω	K	—	+1,000~+300			
				F, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				J	—	±200			
RMC1	6332 (2512)	1.0 (2.0A)	0.33~0.91 Ω 1~9.76 Ω 10~1M Ω 1.1M~22M Ω	K	—	+1,000~+300			
				F, J	—	+500~−200			
				G, J	—	±200			
				F	K	±100			
				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

Style

RMC	1/10	K	103	F	TP

Product Type

Rated Dissipation & Size

Code	Rated Dissipation	Metric	Inch
1/32	0.03W	0402	01005
1/20	0.05W	0603	0201
1/16S	0.1W	1005	0402
1/16		1608	0603
1/10	0.125W	2012	0805
1/8	0.25W	3216	1206
1/4	0.5W	3225	1210
1/2	0.75W	5025	2010
1	1.0W	6332	2512

Temperature Coefficient of Resistance

-	Standard	Resistor
K	±100×10^{-6}/°C	
None	———	Jumper

Rated Resistance

E24 Series e.g. : 2R2=2.2 ohm 103=10k ohm	3-Digit	Resistor
E96 Series e.g. : 10R2=10.2 ohm 1002=10k ohm	4-Digit	
JP		Jumper

Tolerance on Rated Resistance

F	± 1%	Resistor
G	± 2%	
J	± 5%	
K	±10%	
None	———	Jumper

*Packaging & Standard Qty. (Min.)

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

*Refer to Tape and Packaging information on pages 22 and 23.
*Please contact Kamaya sales department for 1mm pitch taping of RMC1/16s, 1/20.

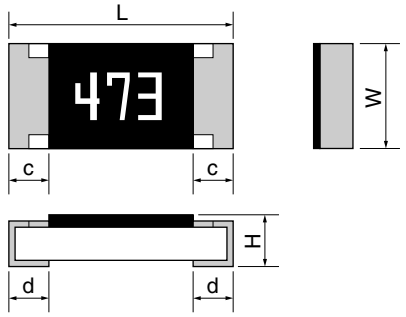
NEW RGC

Halogen Free | Antimony Free

●Features

Suitable for precision applications.
High stabilized characteristics and Performance equivalent to thin film chip resistors.
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.
Line up, 01005 sizes resistor.

●Dimensions



Rated resistance value marking is with 3-digit (E24) or 4-digit (E96) on the over coating.
RGC1/16 : only 3-digit marking is available.
RGC1/16S,1/20,1/32 : only No marking is available.

Unit : mm

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 10Ω 100Ω 1kΩ 1MΩ	Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code	Temperature Coefficient of Resistance 10^{-6}/°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 / 1k~1M	D(±0.5%)	K	±100	25		
					C	± 50			
RGC1/16S	1005 (0402)	0.063	10~97.6 / 100~1M / 1.02M~3.3M	D(±0.5%) F(±1%)	K	±100		100	−55~+155
					C	± 50			
					K	±100			
RGC1/16	1608 (0603)	0.1 *1(0.063)	3.3~9.76 / 10~97.6 / 100~1M / 1.02M~3.3M	F(±1%)	K	±100	50		−55~+125 *1(−55~+155)
				D(±0.5%) F(±1%)	C	± 50			
					K	±100			
RGC1/10	2012 (0805)	0.125 *1(0.1)	3.3~9.76 / 10~3.3M	F(±1%) D (±0.5%), F (±1%)	C	± 50	150		
RGC1/8	3216 (1206)	0.25 *1(0.125)	3.3~9.76 / 10~4.7M	F(±1%) 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 avaialable for "F"(1%) and "D"(0.5%)
Note2. Rated Voltage = $\sqrt{(\text{Rated Dissipation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note3. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.
Note4. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

●Part Number Description

Example

Style: RGC | 1/16 | C | 473 | D | TP

Product Type

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 (0.063W)	1608	0603
1/10	0.125W (0.1W)	2012	0805
1/8	0.25W (0.125W)	3216	1206

*If Category Temperature Range is "−55~+155", Rated Dissipation is applied to in ( ).

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^{-6}/°C
K	±100×10^{-6}/°C

Tolerance on Rated Resistance	
D	±0.5%
F	±1.0%

* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
PA	Press-Pocket	20,000pcs.	RGC1/32
	Paper Tape (2mm pitch)	15,000pcs.	RGC1/20
TH	Paper Tape (2 mm pitch)	10,000pcs.	RGC1/16S
TP	Paper Tape	5,000pcs.	RGC1/16 RGC1/10 RGC1/8
BA	Bulk Case	25,000pcs.	RGC1/16
		10,000pcs.	RGC1/10
		5,000pcs.	RGC1/8

*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.

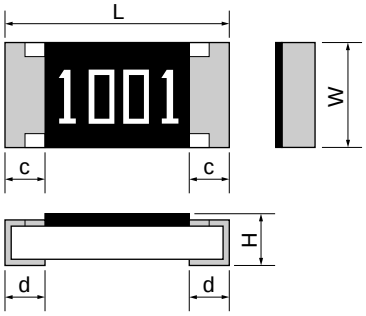
NEW RNC

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

Unit : mm

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	Temperature Coefficient of Resistance 10^{-6}/°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RNC06	0603 (0201)	0.03	100Ω~1kΩ	B (±0.1%)	E	±25	15	E96 E24	50	−55~+125
		0.05	47Ω~4.99kΩ	D (±0.5%)	E	±25				
			5.1kΩ~10kΩ		C	±50				
RNC20	2012 (0805)	0.1	100Ω~130kΩ	B (±0.1%)	E	±25	75		100	
			10Ω~130kΩ	C (±0.25%) D (±0.5%)						
RNC32	3216 (1206)	0.125	100Ω~180kΩ	B (±0.1%)			150			
			10Ω~180kΩ	C (±0.25%) D (±0.5%)						

Note1. Rated Voltage = $\sqrt{(\text{Rated Dissipation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.
Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

●Part Number Description

Example

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^{-6}/°C
C	±50×10^{-6}/°C

Rated Resistance: E24 Series e.g. : 103=10k ohm (3-Digit); E96 Series e.g. : 10R2=10.2 ohm, 1002=10k ohm (4-Digit)

Tolerance on Rated Resistance	
B	±0.1%
C	±0.25%
D	±0.5%

* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
PA	Press-Pocket Paper Tape (2mm pitch)	15,000pcs.	RNC06
TP	Paper Tape	5,000pcs.	RNC20 RNC32

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

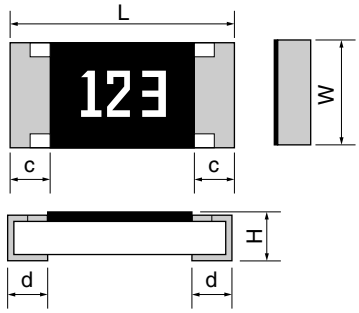
RVC

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 D(±0.5%)	F(±1%), G(±2%)	J(±5%), K(±10%)	Temperature Coefficient of Resistance Code	10⁻⁶/°C	Isolation Voltage V	Category Temperature Range °C
RVC16	1608 (0603)	0.1	200	–	470Ω ~ 10MΩ		K	±100	100	−55~+125
				–	47Ω ~ 464Ω		–	±200		
RVC20	2012 (0805)	0.25	400	–	100Ω~10MΩ	100Ω~51MΩ	K	±100	500	
				–	47Ω ~ 97.6Ω		–	±200		
RVC32	3216 (1206)	0.25	500	100kΩ~4.7MΩ	100Ω~10MΩ	100Ω~51MΩ	K	±100		
				–	47Ω ~ 97.6Ω		–	±200		
RVC50	5025 (2010)	0.5		–	470Ω~20MΩ	470Ω~51MΩ	K	±100		
				–	47Ω ~ 464Ω		–	±200		
RVC63	6332 (2512)	1.0	800	–	560Ω~20MΩ	560Ω~51MΩ	K	±100		
				–	100Ω ~ 549Ω		–	±200		
				–	47Ω ~ 97.6Ω		–	+500~−200		

Note1. E24 series is available , E96 series is available for tolerance "D" (0.5%) and "F" (1%)
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: RVC | 32 | K | 475 | F | TP

Product Type

Size		
Code	Metric	Inch
16	1608	0603
20	2012	0805
32	3216	1206
50	5025	2010
63	6332	2512

Rated Resistance

E24 Series e.g. : 475=4.7M ohm	3-Digit
E96 Series e.g. : 7154=7.15M ohm	4-Digit

Temperature Coefficient of Resistance

–	Standard
K	±100×10⁻⁶/°C

Tolerance on Rated Resistance

D	± 0.5%
F	± 1%
G	± 2%
J	± 5%
K	±10%

* Packaging & Standard Qty. (Min.)

B	Bulk (Loose Package)	1,000pcs.	All Styles
TP	Paper Tape	5,000pcs.	RVC16 RVC20 RVC32
TE	Embossed Tape	4,000pcs.	RVC50 RVC63

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

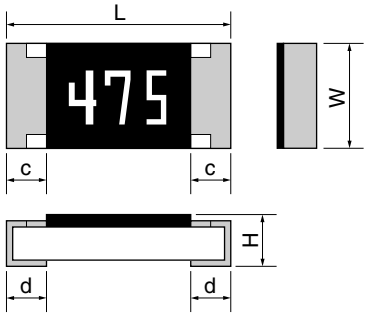
RZC

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 resistace 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 Charactoristics V	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10⁻⁶/°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 = √(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 values is equal to or higher than the critical resistance value.
Note3. Anti-Rush Voltage Charactoristics : 3,000V, 1sec "On", 9sec"off" ,100,000 times, Room temperature.

●Part Number Description

Example

Style: RZC | 50 | — | 475 | J | TE

Product Type

Size		
Code	Metric	Inch
50	5025	2010
63	6332	2512

Rated Resistance

e.g.:105=1.0M ohm
475=4.7M ohm
166=16M ohm

Tolerance on Rated Resistance

J	± 5%
K	±10%
M	±20%

Temperature Coefficient of Resistance

—	Standard

* Packaging & Standard Qty. (Min.)

B	Bulk (Loose Package)	1,000pcs.	All Styles
TE	Paper Tape	4,000pcs.	All Styles

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

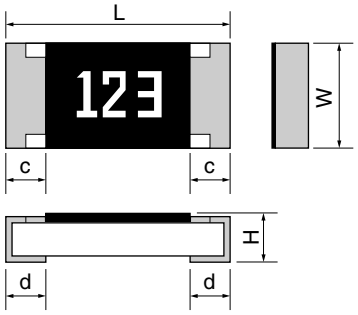
RPC

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

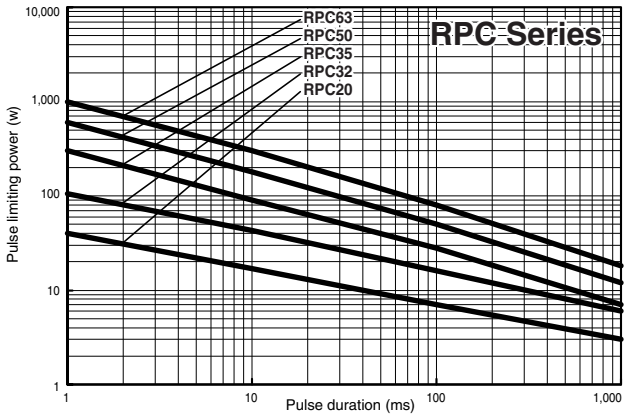
*Values for reference

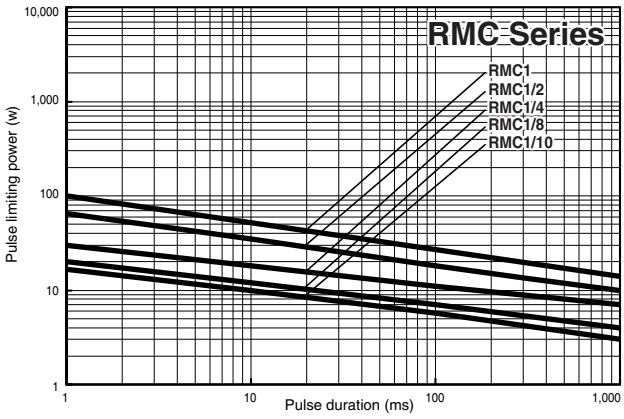
●Ratings

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

Product Type

Size

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

Rated Resistance

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

Tolerance on Rated Resistance

J	± 5%
K	±10%
M	±20%

*** 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.

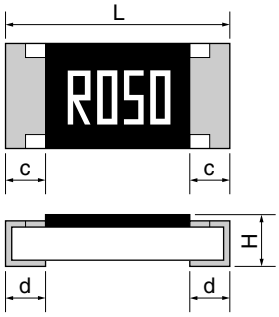
RLC

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.

Unit : mm

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		
					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	500	
					200mΩ~430mΩ	F, G, J	0~+200		
RLC32	3216 (1206)	0.5	0.18~3.16		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

Style					
RLC	32	K	R470	F	TP

Product Type

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

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

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

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.

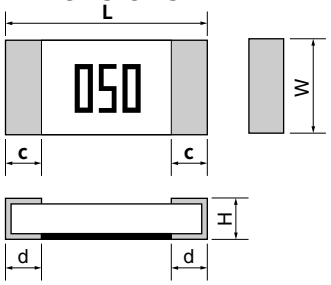
NEW RCC

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	$0.35^{+0.05}_{-0.10}$	$0.25^{+0.05}_{-0.10}$	$0.25^{+0.05}_{-0.10}$	0.6mg
RCC16	1608	0603	20mΩ ≤ R	1.6±0.1	0.8 $^{+0.15}_{-0.05}$	0.5 ±0.10	0.3 ±0.1	0.3 ±0.1	2mg
			R > 20mΩ					0.55 ±0.1	
RCC20	2012	0805	20mΩ ≤ R	2.0±0.15	1.25 ±0.10	0.6 ±0.10	0.4 ±0.2	0.4 ±0.2	5mg
			R > 20mΩ					0.6 ±0.2	
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

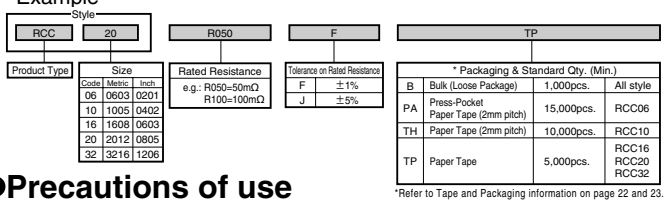
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combination of Rated Resistance Range and Temperature Coefficient of Resistance: Rated Resistance Range	Combination of Rated Resistance Range and Temperature Coefficient of Resistance: Temperature Coefficient of Resistance 10^{-6}/°C	Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °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			
				33mΩ ~ 50mΩ	0~+250			
				51mΩ ~100mΩ	±150			
RCC20	2012 (0805)	0.33	2.56~5.74	10mΩ ~ 27mΩ	0~+250		500	
				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



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

●Precautions of use

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

●Rated Resistance

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

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

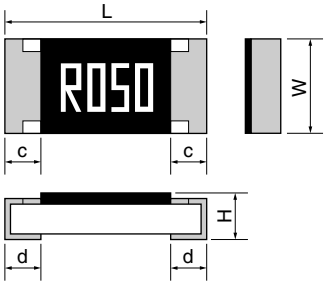
RLS

Halogen Free | Antimony Free

●Features

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

●Dimensions



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

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

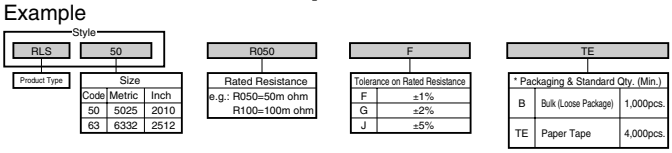
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance: Rated Resistance Range	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance: Temperature Coefficient of Resistance 10^{-6}/°C	Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C
RLS50	5025 (2010)	0.75	1.93~6.12	20mΩ~ 33mΩ	0~+350	F(±1%) G(±2%) J(±5%)	500	−55~+125
				36mΩ~ 47mΩ	0~+200			
RLS63	6332 (2512)	1.0	2.23~7.07	50mΩ~200mΩ	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



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

NEW

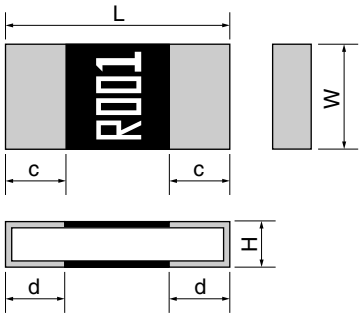
RLP,MLP

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 charactors on the overcoating.
The resistance value of RLP20 & RLP32 are marked with "2 numbers" & "_" on the overcoating.
Please contact KAMAYA for marking of RLP16.

Unit : mm

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				0.5 ±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	3.2 ±0.25	0.38±0.15	2.2 ±0.25	2.2 ±0.25	50mg
			5mΩ		3.1 ±0.25	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	F(±1%) J(±5%)	100	−55～+155
					N	±70			
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			

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

Product Type
RLP
MLP

Size		
Code	Metric	Inch
16	1608	0603
20	2012	0805
32	3216	1206
63	6332	2512

K

Temperature Coefficient of Resistance	
-	±150×10^{-6}/°C
K	±100×10^{-6}/°C
N	±70 ×10^{-6}/°C

R005

Rated Resistance
e.g.: R001=1mΩ
R010=10mΩ

F

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

TE

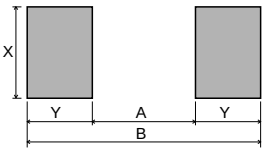
* Packaging & Standard Qty. (Min.)			
TP	Paper Tape	5,000pcs.	RLP16 RLP20 RLP32
TE	Embossed Tape	4,000pcs.	RLP63 MLP63

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

●Rated Resistance

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



Unit : mm

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				
MLP63			5mΩ				
			10mΩ				

*Values for reference

●Precautions of use

Resistance value will be changed by soldering condition.
Please design products in consideration of this change of resistance value.

RAC

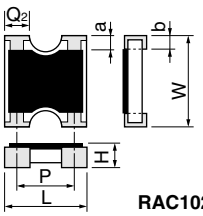
Halogen Free | Antimony Free

●Features

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

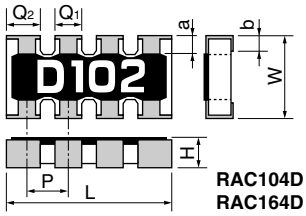
●Dimensions

Terminal Style: C



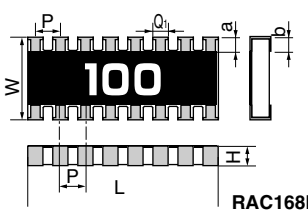
RAC102D

Terminal Style: C



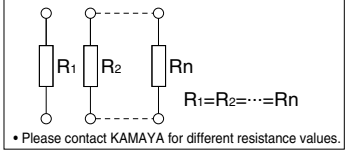
RAC104D
RAC164D

Terminal Style: C



RAC168D

Circuits



• Please contact KAMAYA for different resistance values.

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

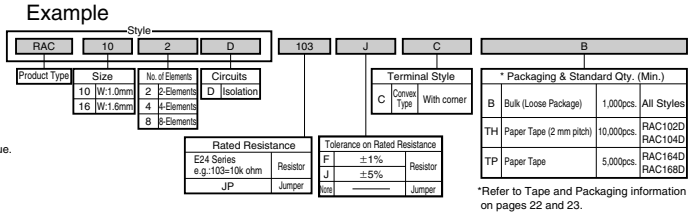
●Ratings

Style	Rated Dissipation at 70°C W/Element	Rated Dissipation at 70°C W/pc.	Rated Current of Jumper A	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10^{-6}/°C	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RAC102D	0.063	0.125	1.0	10Ω~1MΩ	J(±5%)	±200	25	E24	50	−55~+125
RAC104D		0.25								
RAC164D		0.25			F(±1%),J(±5%)		50		100	
RAC168D		0.25			J(±5%)		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.

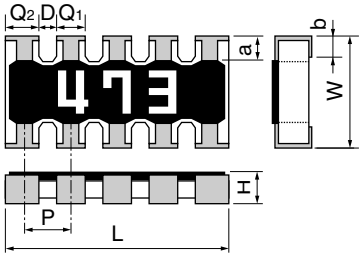
RAC168U

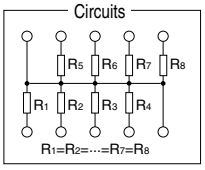
Halogen Free | Antimony Free

●Features

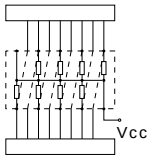
Highly suitable for the purposes of pull-up and pull-down.
Easy to handle because of no specified direction for mounting due to the symmetrical position of common terminals.
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

●Dimensions





●Application Examples



- Making the parallel 8-Elements resister 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

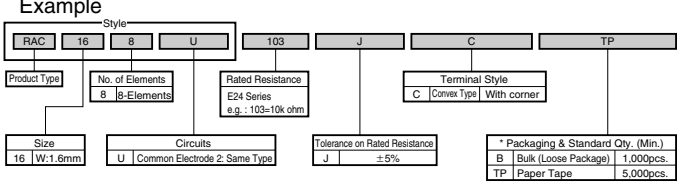
●Ratings

Style	Rated Dissipation at 70°C W	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10^{-6}/°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.

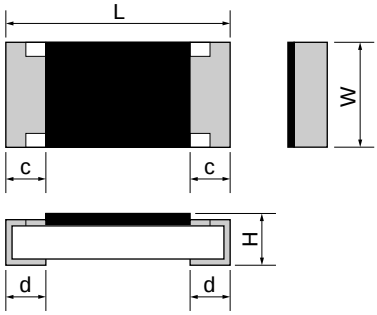
FCR

Halogen Free | Antimony Free

●Features

Trimmable 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: Rated Resistance Range	Temperature Coefficient of Resistance 10⁻⁶/°C	Tolerance on Rated Resistance	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
FCR1/16	1608 (0603)	0.063	10Ω~4.7MΩ	±200	L (±15%) −(0~−30%)	50	E24	100	−55~+125
FCR1/10	2012 (0805)	0.1				150		500	
FCR1/8	3216 (1206)	0.125	1Ω~9.1Ω	+500~−200		200			
FCR1/4	3225 (1210)	0.25	10Ω~4.7MΩ	±200					
FCR1/2	5025 (2010)	0.5							
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.: ±100×10⁻⁶/°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

Style: FCR | 1/4 | 471 | L | TE

Product Type

Rated Dissipation & Size			
Code	Rated Dissipation	Metric	Inch
1/16	0.063W	1608	0603
1/10	0.1W	2012	0805
1/8	0.125W	3216	1206
1/4	0.25W	3225	1210
1/2	0.5W	5025	2010
1	1.0W	6332	2512

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

Tolerance on Rated Resistance	
−	$^{0}_{-30}$ %
L	±15%

* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
TP	Paper Tape	5,000pcs.	FCR1/16 FCR1/10 FCR1/8
TE	Embossed Tape	4,000pcs.	FCR1/4 FCR1/2 FCR1

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

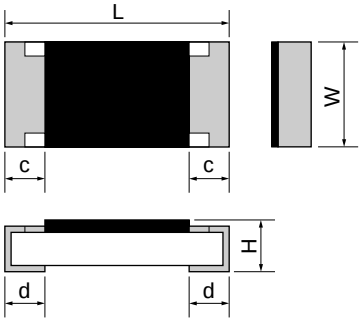
RHC

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 10⁻⁶/°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%)				
RHC20	2012 (0805)		100MΩ ~ 1GΩ	J (± 5%) K (±10%)	±2,000			−55~+125
			100MΩ ~ 10GΩ	M (±20%) N (±30%) H (±50%)				
			100GΩ ~ 150GΩ		±4,000			

●Part Number Description

例

Style: RHC | 20 | 75G0 | M | TP

Product Type

Size		
Code	Metric	Inch
16	1608	0603
20	2012	0805

Rated Resistance: e.g.: 100M=100M ohm, 1G00=1G ohm, 10G0=10G ohm, 100G=100G ohm

Tolerance on Rated Resistance	
J	± 5%
K	±10%
M	±20%
N	±30%
H	±50%

* Packaging & 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.

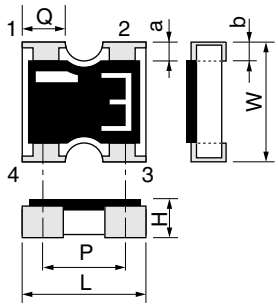
RAC101A

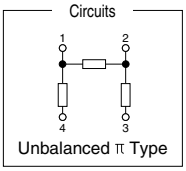
Halogen Free | Antimony Free

●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





Unit : mm

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

*Values for reference

Dot mark on Termination 1
Attenuation factor on Termination 2 to 3

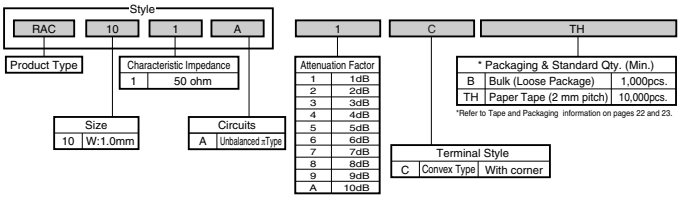
●Ratings

Style	Characteristic Impedance	Attenuation Factor symbol	Attenuation Factor dB	Tolerance on Attenuation Factor dB	Voltage Standing Wave Ratio	Frequency Range	Rated Input Power mW/package	Category Temperature Range ℃
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



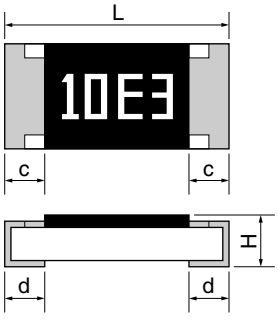
LTC

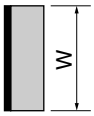
Halogen Free | Antimony Free | Pb Free

●Features

Linearity of resistance change in wide temperature range.
Suitable for temperature compensation, temperature sensing and controling, 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.

Unit : mm

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

*Values for reference

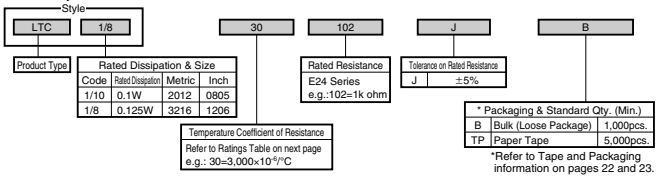
●Ratings

Temperature Coefficient of Resistance 10^{-6}/°C	Code	Resistance Temperature Coefficient Tolerance	Rated Resistance Range (Rated Dissipation at 70°C) LTC1/10 (0.1W)	Rated Resistance Range (Rated Dissipation at 70°C) LTC1/8 (0.125W)	Tolerance on Rated Resistance	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range ℃
500	05	±100×10^{-6}/°C	100 ohm– 5.1k ohm	100 ohm– 10k ohm	J(±5%)	E24	100	–40~+125
800	08	±150×10^{-6}/°C	100 ohm– 5.1k ohm	100 ohm– 10k ohm				
1,000	10	±15%	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	±10%	100 ohm– 3.3k ohm	100 ohm– 4.7k ohm				
2,400	24		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 Disspation)×(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



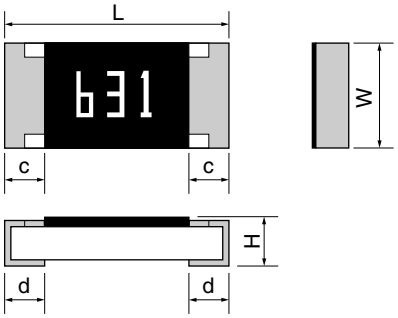
FCC,FHC

Halogen Free | Antimony Free | Pb Free

●Features

Fast-Atcting 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-pulce 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

Unit : mm

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

■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	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range
Metric	Inch		Code	A	m ohm max.				°C
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			
			132	1.25	90	M			
		FHC10	162	1.6	55	N	24Vd.c. 35A		
			202	2.0	40	S			
			252	2.5	36	T			
			322	3.15	26	U			
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			
			132	1.25	85	MD			
			162	1.6	70	ND			
			202	2.0	55	SD			
			252	2.5	45	TD	32Vd.c. 35A		
		FHC16	322	3.15	26	UD	24Vd.c. 35A		
			402	4.0	19	XD			
2012	0805	FCC20	401	0.4	330	401	50Vd.c. 50A		
			501	0.5	270	501			
			631	0.63	190	631			
			801	0.8	130	801			
			102	1.0	100	102			
			132	1.25	80	132			
			162	1.6	65	162			
			202	2.0	55	202			
			252	2.5	40	252			
		FHC20	322	3.15	26	UD	32Vd.c. 50A		
			402	4.0	19	XD			
			502	5.0	14	YD	24Vd.c. 50A		
3216	1206	FCC32	201	0.2	1,800	201	64Vd.c. 50A		
			251	0.25	1,000	251			
			321	0.315	750	321			
			401	0.4	350	401			
			501	0.5	295	501			
			631	0.63	200	631			
			801	0.8	140	801			
			102	1.0	110	102			
			132	1.25	85	132			
			152	1.5	78	152			
			162	1.6	75	162			
			202	2.0	65	202			
			252	2.5	45	252			
		FHC32	322	3.15	26	UD	32Vd.c. 50A		
			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	Mark	Interrupting Rating	Time/Current Characteristics	Working Temperature Range
Metric	Inch		Code	A	m ohm max.				°C
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			
		FHC10	202	2.0	55	S	24Vd.c. 35A		
			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			
		FHC16	252	2.5	40	TB	32Vd.c. 35A		
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		

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

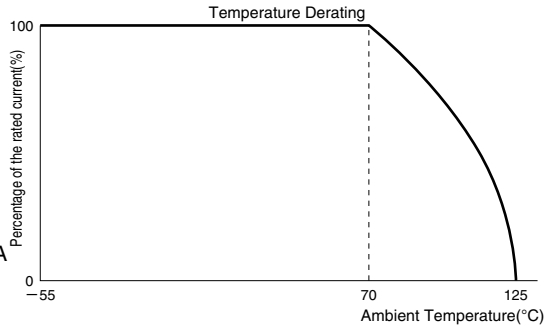
●Rating/Option Code : AA (Fast-Acting type)

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

●Recommended Derating for Rated Current

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

Ex.) If FCC16 102AB (Rated Current:1.0A) is used under ambient temperature 70°C,
Kamaya recommends, less than the current value derated as below,
Rated Current：1.0A× (Nominal Derating : 70%×Temperature Derating : 100%) =0.7A



●Part Number Description

Example

Style

FCC	20	202	AD	TP

Product Type
FCC
FHC

Size		
Code	Metric	Inch
10	1005	0402
16	1608	0603
20	2012	0805
32	3216	1206

Rated Current	
e.g. : 501=0.5A 132=1.25A 202=2.0A	3-Digit

Option Code	
Code	Clearing Time
AD	Within 5s under 250% of Rated Current
AB LB	Within 5s under 200% of Rated Current
AA	Within 120s under 200% of Rated Current

* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
PA	Press-Pocket Paper Tape (2mm pitch)	10,000pcs.	FCC10 FHC10
TP	Paper Tape	5,000pcs.	FCC16 FHC16 FCC20 FHC20 FCC32 FHC32
TH	Paper Tape (2mm pitch)	10,000pcs.	FCC10(LB)

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

NEW

FCCR10

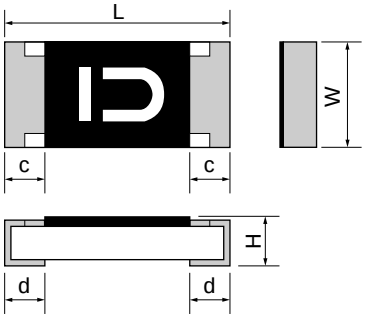
Halogen Free | Antimony Free | Pb Free

●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.

Unit : mm

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	Ω	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

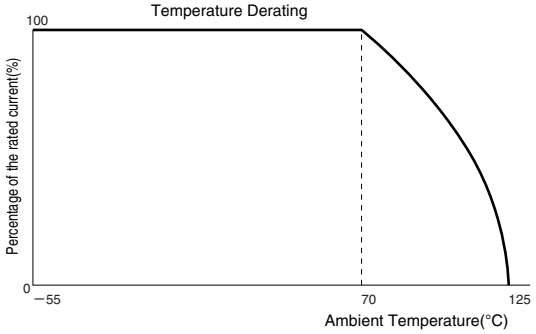
- Nominal Derating

  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

Style: FCCR | 10

Product Type
FCCR

Size		
Code	Metric	Inch
10	1005	0402

151

Rated Current	
e.g. :151=0.15A 321=0.315A 501=0.5A	3digit

AB

Option Code	
Code	Clearing Time
AB	Within 5s under 200% of Rated Current

PA

* Packing & Standard Qty. (Min.)		
B	Bulk (Loose Package)	1,000pcs.
PA	Press-Pocket Paper Tape(2mm pitch)	10,000pcs.

*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

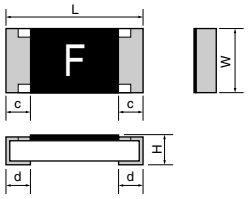
Halogen Free | Antimony Free | Pb Free

●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 perfomance.
Please contact Kamaya Sales Dept, if you need to confirm Inrush current endurance, Anti-pulce performance etc.
We can provide Application Guide for FMC16 selection.
Please refer to Specification (Reference) at the Website to confirm the specification for more detail.

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

●Dimensions



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

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/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	Mark	Interrupting Rating	Electrical Characteristics	Working Temperature Range
Metric	Inch		Code	A	m ohm max.				°C
1608	0603	FMC16	501	0.5	260	F	32Vd.c. 35A	Rated Current / Opening time ×100% 4h Min. ×200% 5s Max. ×300% 0.2s Max.	−55~+125
			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	Mark	Interrupting Rating	Electrical Characteristics	Working Temperature Range
Metric	Inch		Code	A	m ohm max.				°C
1608	0603	FMC16	501	0.5	400	HF	32Vd.c. 35A	Rated Current / Opening time ×100% 4h Min. ×200% 5s Max. ×300% 0.2s Max.	−55~+125
			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

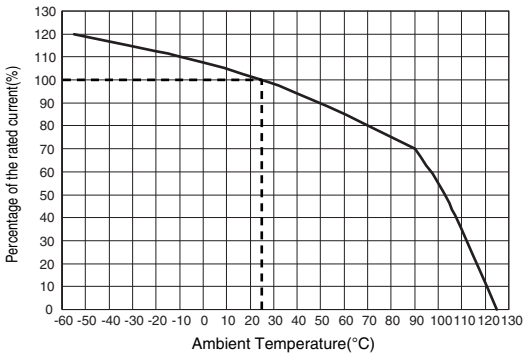
  Nominal Derating ≤ 75% of Rated Current

- 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

Style: FMC | 16

Product Type
FMC

Size		
Code	Metric	Inch
16	1608	0603

252

Rated Current	
e.g. :102=1.0A 132=1.25A 252=2.5A	3digit

AB

Option Code	
Code	Clearing Time
AB AH	Rated Current×200% 5s 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.

NEW

FMC10 Option Code : AB / Low Ohm & Fast Acting

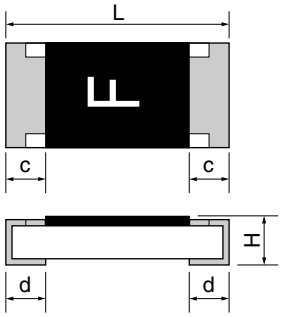
Halogen Free | Antimony Free | Pb Free

●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.

Unit : mm

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

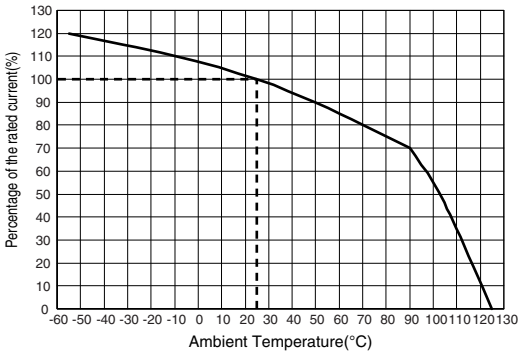
●Ratings/Option Code : AB (Fast-Acting type)

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

●Recommended Derating for Rated Current

- Nominal Derating
  Nominal Derating m 75% of Rated Current
- Temperature Derating
  Please refer to the following graph regarding the current derating value for ambient temperature.

Ex.) If FMC10 102AB (Rated Current 1.0A) is used under ambient temperature 70∞C,
Kamaya recommends, less than the current value derated as below,
Rated Current : 1.0Au (Nominal Derating : 75%uTemperature Derating : 80%) = 0.6A



●Part Number Description

Example

Style

FMC	10	501	AB	TH

Product Type	Size	
FMC	10	1005

Rated Current	
e.g. :501=0.5A 132=1.25A 302=3.0A	3digit

Option Code	
Code	Clearing Time
AB	Rated Current×200% 5s max.

* Packing & Standard Qty. (Min.)		
B	Bulk (Loose Package)	1,000pcs.
TH	Paper Tape	10,000pcs.

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

SBF32 Slow Blow

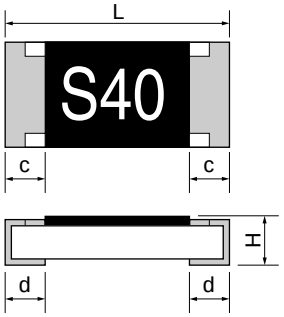
Halogen Free | Antimony Free | Pb Free

●Features

"Slow Blow "ensure high anti pulse performance.
Please contact Kamaya Sales Dept, if you need to confirm Inrush current endurance, Anti-pulce 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.

Unit : mm

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

*Values for reference

●Opton 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.	Opening time 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		×300%	0.02s	3.0s	
			502	5.0	12	S50					
			602	6.0	10	S60		×800%	0.0015s	0.05s	
			702	7.0	7	S70					
			802	8.0	6	S80					

●Recommended Derating for Rated Current

- Nominal Derating

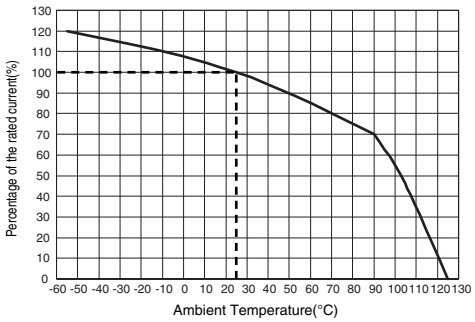
  Nominal Derating ≤ 75% of Rated Current

- 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

Style: SBF | 32 | 402 | AS | TP

Product Type
SBF

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

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

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

Size		
Code	Metric	Inch
32	3216	1206

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

Support of Chip Fuse Selection

We would like to support the customer to find the appropriate Kamaya chip fuse it 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***

//20**
Kamaya Electric Co., Ltd.
Hokkaido Research Center
No.HR2TGF05******

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

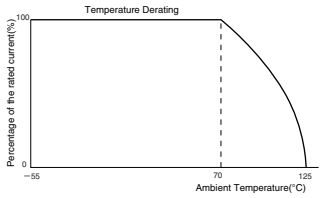
P/N	Size	Amp.	Fusing	Interrupting	Note.
FCCR10501AB	1005	0.5 A	200%, 5s	24 Vd.c. 35A	Standing Pulse 100k times

■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%



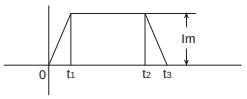
■Basis of selection

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

■Confirmations for Rush

Num of wave: 1

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

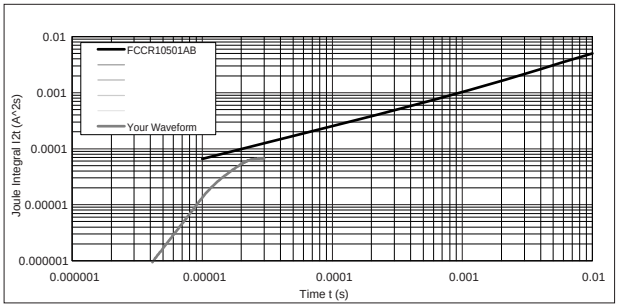


Amount		Joule Integral	

■Confirmation of Rush

	Items				Size	Current	Fusing	Note
#1	FCCR	10	501	AB	1005	0.5A	200%, 5s	Standing Pulse 100k times
#2								
#3								
#4								
#5								

Recommended Item	FCCR10501AB



We can provide Application Guide for Fuses selection.

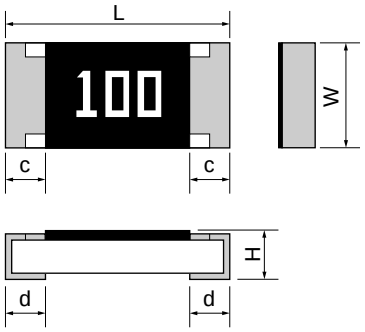
FRC

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

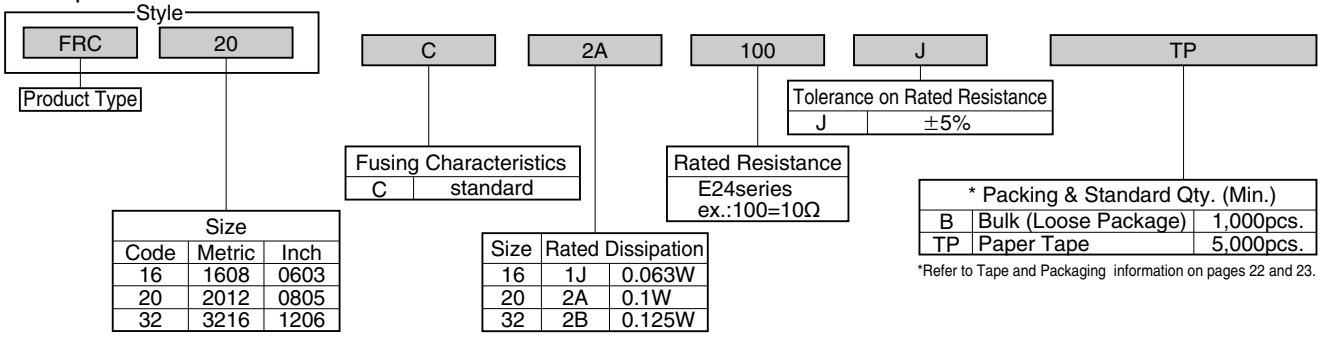
●Ratings

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				2.5W			
			56Ω~100Ω		±500					

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 resister 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.

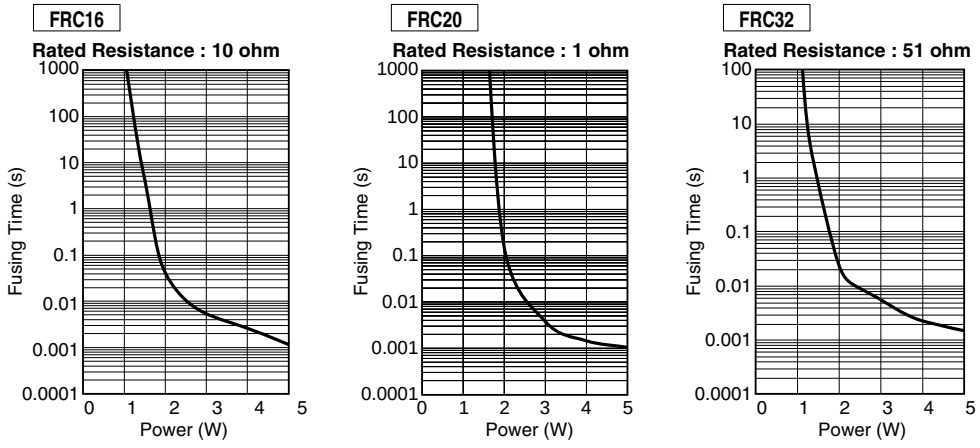
●Part Number Description

Example



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

●Example of Typical Fusing Characteristics



SPC10

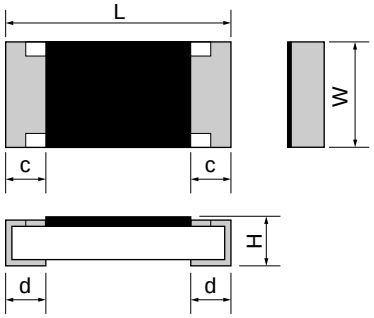
Halogen Free | Antimony Free | Pb Free

●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

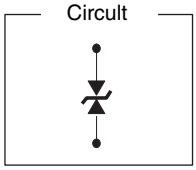


Unit : mm

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

*Values for reference

Circuit



●Ratings

Part Number	Size Metric (Inch)	Capacitance Note.1 pF	ESD Characteristics				Note.4 Rated votage V	Note.5 Leakage current μA	Note.6 Category Temperature Range °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℃, 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

Style: SPC | 10 | 501 | A | 01 | TH

Product Type	
SPC	

Size		
Code	Metric	Inch
10	1005	0402

Peak Voltage	
Code	Peak Voltage
501	500V

Rated Voltage	
Code	Rated Voltage
A	30V max.

Option Code	
Code	Option Code
01	Capacitance 0.1pF max.

* Packing & Standard Qty. (Min.)		
B	Bulk (Loose Package)	1,000pcs.
TH	Paper Tape (2mm pitch)	10,000pcs.

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

NEW

HSPC16

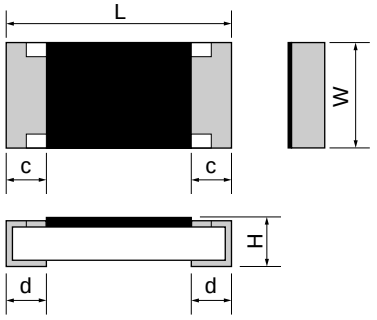
Halogen Free | Antimony Free | Pb Free

●Features

High ESD protection performance(15kV) for automotive (Tight ESD spec requirement)
IEC61000-4-2 Air Discharge: ±15kV

［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

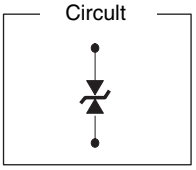


Unit : mm

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

*Values for reference

Circult



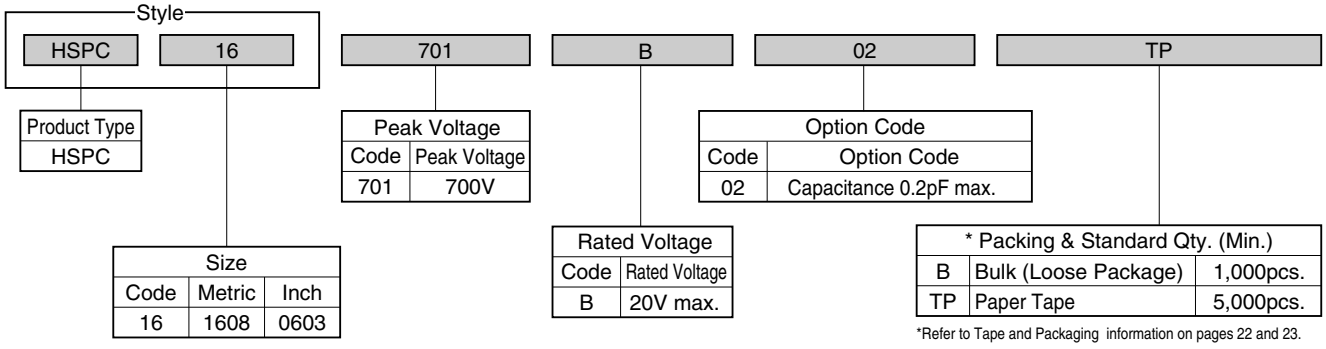
●Ratings

Style	Size Metric (Inch)	Capacitance Note.1 pF	ESD Characteristics				Note.4 Rated votage V	Note.5 Leakage current μA	Note.6 Category 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℃, 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

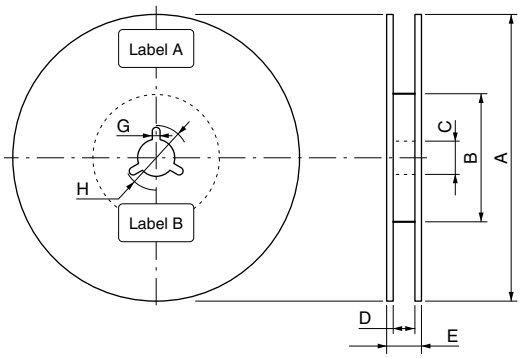
Example



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

Packaging for Surface Mount Devices

●Reel Dimensions



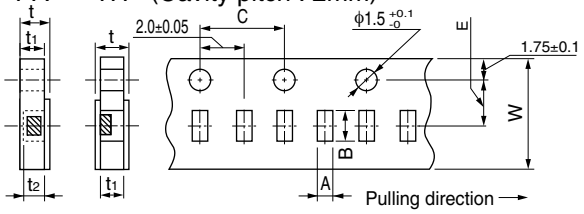
Unit : mm

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

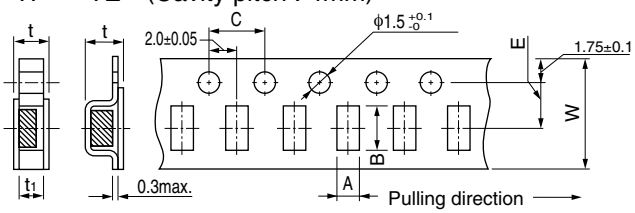
*Dimension A : Please contact KAMAYA for plastic reels of ϕ250mm and ϕ330mm.

●Tape Dimensions (Unit : mm)

PA TH (Cavity pitch : 2mm)



TP TE (Cavity pitch : 4mm)

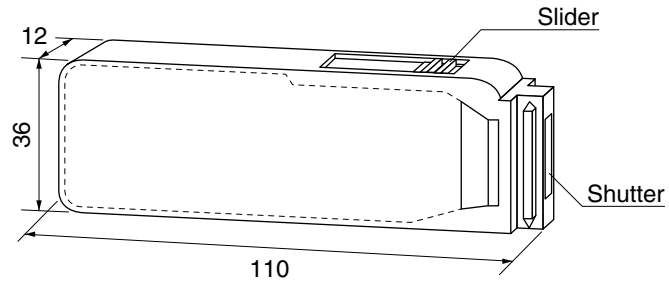


*Please contact Kamaya sales department for 1mm pitch cavity taping.

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				0.6±0.05	0.5±0.05	0.7 max.
		RMC1/16S, RGC1/16S, RLC10, RCC10, FCC10(LB), FMC10, SPC10	TH	0.65 +0.05 -0.10	1.15 +0.05 -0.10	4.0±0.1			0.4±0.05	–	0.5 max.
		RMC1/16		1.15±0.15	1.9±0.2				0.6±0.1	–	0.8 max.
1608	0603	RMC1/16, RGC1/16, FCR1/16, RVC16 RLC16, RHC16, RCC16, RLP16 FCC16, FHC16, FMC16, FRC16, HSPC16	TP	1.15±0.15	1.9±0.2				0.6±0.1	–	0.8 max.
2012	0805	RMC1/10, RGC1/10, FCR1/10, RNC20 RVC20, RPC20, RLC20, RHC20, LTC1/10 FCC20, FHC20, FRC20, RCC20		1.65±0.15	2.5±0.2				0.8±0.1	–	1.0 max.
		RLP20							0.6±0.1		
3216	1206	RMC1/8, RGC1/8, FCR1/8, RNC32, RVC32 RPC32, RLC32, LTC1/8, FCC32, FHC32 SBF32, FRC32, RCC32		2.0±0.15	3.6±0.2				0.8±0.1	–	
		RLP32							0.6±0.1		
3225	1210	RMC1/4, FCR1/4, RPC35, RLC35	TE	2.85±0.20	3.5±0.2		8.0±0.3		–	–	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	5.5±0.05	–	–	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									0.5 max.
		RAC104D		1.2±0.1	2.2±0.1				0.4±0.1	–	
		RAC164D, RAC168U	TP	1.9±0.15	3.6±0.2				0.6±0.1	–	0.8 max.
		RAC168D		1.9±0.15	4.1±0.15		8.0±0.3			–	

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 (m^3)	
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				8.3		
		RMC1/16, RGC1/16, FCR1/16 RVC16, RLC16, RHC16, RCC16, RLP16 FCC16, FHC16, FMC16, FRC16, HSPC16	TP	5,000		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			40	8.0		
6332	2512	RMC1, FCR1, RVC63, RPC63, RZC63 RLC63, RLS63				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 .

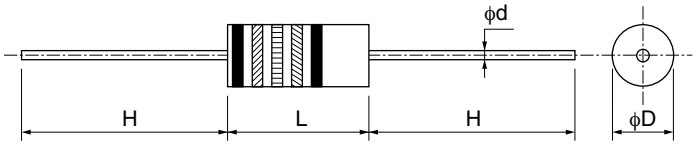
RC1/2U

●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 Perferred 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.

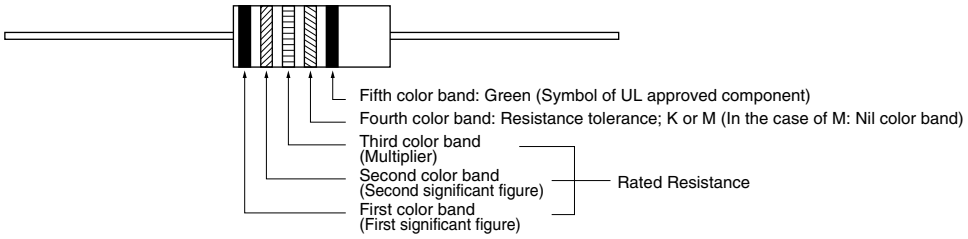
●Part Number Description

Example

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

*Refer to Tape and Packaging information on pages 25.

●Color Coding

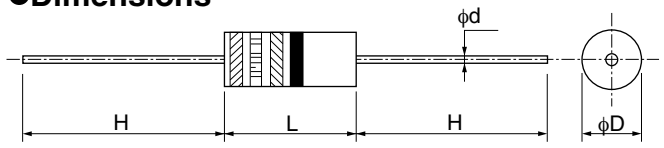


RC

●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 %/K at −55 °C	at +125 °C	Rated Resistance Range	Tolerance on Rated Resistance and Perferred 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	1 ohm - 1k ohm	J (± 5%) : E24 K (± 10%) : E12 M(± 20%) : E6	100	−55-+125
				+10 -0	0 - −6	1.1k ohm - 10k ohm			
RC1/2	0.5	350	1 ohm-22M ohm	+13 -0	0 - −7.5	11k ohm - 100k ohm		500	
				+15 -0	0 - −10	110k ohm - 1M ohm			
				+20 -0	0 - −15	1.1M 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 (Product Type) | 1/4 (Rated Dissipation: 1/4 0.25W; 1/2 0.5W)
102 — Rated Resistance: E24, 12, 6 Series; e.g. : 2R2=2.2 ohm, 102=1k ohm
J — Tolerance on Rated Resistance: J ±5%; K ±10%; M ±20%
B — *Packaging: B Bulk (Straight); H Horizontal Forming; TB 52 mm Width Tape (Ammo Box); TD 52 mm Width Tape (Reel)

*Refer to Tape and Packaging information on pages 25.

●Storage

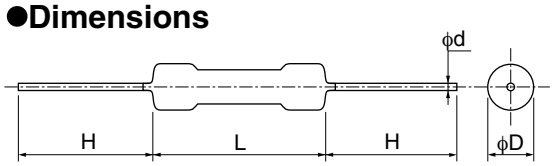
Temperature 20±15°C, Humidity 60%R.H. Max, Recommendation Storing Term 6 months after shipped from factory.

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.

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

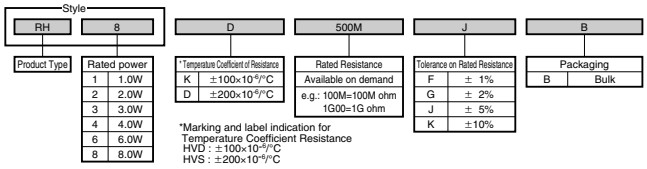
●Ratings

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

Note1. Rated Voltage=$\sqrt{(\text{Rated Dissipation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.
Note3. Critical Resistance Value is the resistance value at which the rated voltage is equal to the limiting element voltage.

●Part Number Description

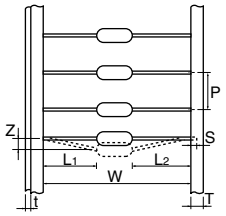
Example



*Marking and label indication for Temperature Coefficient Resistance
HVD : ±100×10⁻⁶/°C
HVS : ±200×10⁻⁶/°C

Packaging for Leaded Resistors

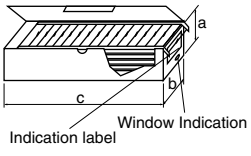
●Tape



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.

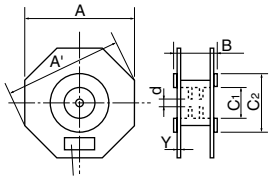
●Ammo Box



Unit : mm

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

●Tape & Reel (Code : TD)



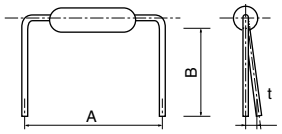
Label indication

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.

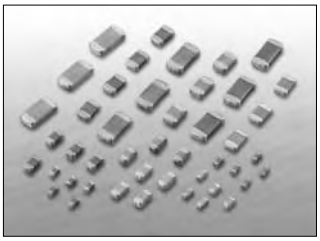
Style	Tape & Reel					Ammo Box					Bulk Packaging				
	Q'ty / Reel (pcs.)	Reel Size (mm)	Outer Carton			Width of Taping (mm)	Q'ty / Box (pcs.)	Outer Carton			M.P.Q. Q'ty / Plastic Bag pcs.	Q'ty / Inner Carton (pcs.)	Outer Carton		
			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (m³)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (m³)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (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

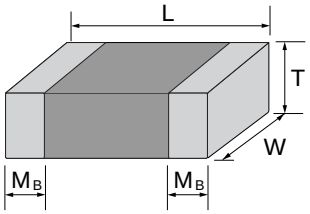
Please see Catalog of Walsin Technology Corporation. (Website: http://www.passivecomponent.com/) for detail information.

●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			M_B	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
							0.4 ±0.2	OP
				1.25±0.1	D	#	0.5 ±0.2	General Purpose, High Capacitance, High Voltage
							0.4 ±0.2	OP
			1.25±0.2	0.95max.	T	#	0.5 ±0.2	TT
		2.0 ±0.2		1.25±0.2	I	#	0.5 ±0.2	High Capacitance
1632	0612	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B		0.13max.	Low Inductance
3216	1206	3.2 ±0.15	1.6 ±0.15	0.8 ±0.1	B		0.6 ±0.2	General Purpose, High Voltage
							0.5 ±0.2	OP
				0.95max.	T	#	0.6 ±0.2	TT
				0.95±0.1	C		0.6 ±0.2	General Purpose, High Capacitance, High Voltage
							0.5 ±0.2	OP
				1.15±0.15	J	#	0.6 ±0.2	General Purpose
		3.2 ±0.2	1.6 ±0.2				0.6 ±0.2	High Capacitance
				1.25max.			0.6 ±0.2	TT
		3.2 ±0.15	1.6 ±0.15	1.25±0.1	D	#	0.6 ±0.2	General Purpose, High Capacitance, High Voltage
							0.5 ±0.2	OP
			1.6 ±0.2	1.6 ±0.2	G	#	0.6 ±0.2	General Purpose, High Capacitance, High Voltage
							0.5 ±0.2	OP
		3.2+0.3/−0.1	1.6+0.3/−0.1	1.6+0.3/−0.1	P	#	0.6 ±0.2	General Purpose, High Capacitance
3225	1210	3.2 ±0.3	2.5 ±0.2	0.95max.	T	#	0.75±0.25	TT
				0.95±0.1	C	#	0.75±0.25	General Purpose, High Voltage
							0.5 ±0.25	OP
				1.25±0.1	D	#	0.75±0.25	General Purpose, High Voltage
							0.5 ±0.25	OP
		3.2 ±0.4	2.5 ±0.3	1.6 ±0.2	G	#	0.75±0.25	General Purpose, High Voltage
							0.5 ±0.25	OP
				2.5 ±0.3	M	#	0.75±0.25	High Voltage
4520	1808	4.5 ±0.4	2.03±0.25	1.25±0.1	D	#	0.5 ±0.25	S2, S3
							0.75±0.25	High Voltage
				2.0 ±0.2	K	#	0.5 ±0.25	S2, S3
							0.75±0.25	High Voltage
4532	1812	4.5 ±0.4	3.2 ±0.3	1.25±0.1	D	#	0.75±0.25	General Purpose, S2, S3
							0.6 ±0.25	OP
				2.0 ±0.2	K	#	0.75±0.25	General Purpose, S2, S3
							0.6 ±0.25	OP

: Reflow soldering process only.

●Characteristic

Application	Series	Dielectric	Size			Rated Voltage	Capacitance
General Purpose	General Purpose	NPO, X7R, Y5V	0402(1005) 0603(1608)	0805(2012) 1206(3216)	1210(3225) 1812(4532)	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

0805	B	104	K	500	C	T

Size Inch (Metric)
0201= (0603)
0402= (1005)
0603= (1608)
0805= (2012)
1206= (3216)
1210= (3225)
1808= (4520)
1812= (4532)

Dielectric
N=NPO
B=X7R
X=X5R
F=Y5V

Capacitance
R47=0.47pF
0R5=0.5pF
1R0=1pF
100=10pF
101=100pF
102=1000pF
103=0.01uF
104=0.1uF
105=1uF
106=10uF
107=100uF

Tolerance
A =±0.05pF
B =±0.1pF
C =±0.25pF
D =±0.5pF
F =±1%
G =±2%
J =±5%
K =±10%
M =±20%
Z =−20to+80%

Rated Voltage
6R3=6.3 Vdc
100=10 Vdc
160=16 Vdc
250=25 Vdc
500=50 Vdc
101=100 Vdc
201=200 Vdc
251=250 Vdc
501=500 Vdc
631=630 Vdc
102=1000 Vdc
152=1500 Vdc
202=2000 Vdc
302=3000 Vdc

Electrode
L = Ag/Ni/Sn
C= Cu/Ni/Sn

Package
B= Bulk
C= Bulk case
T= 7Inch width Reale

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

Style

OP	21

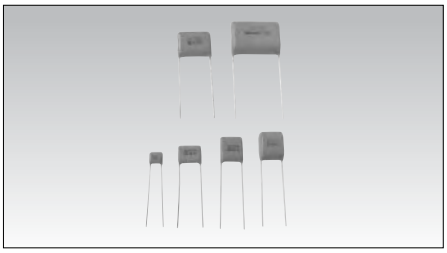
Product Type
TT=
OP=
HH=
MW=
S2=
S3=

Size
15=0402
18=0603
21=0805
31=1206
32=1210
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 (℃)
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	• Low Noise • Needle flame test proof	450VDC	0.47～2.2	-40～+85 (+110)
			FPS				-40～+85 (+105)
	Large capacitance		MDL	• Miniature and Large capacitance • For high frequency and high ripple	35VDC 63VDC	4.7～22 10～22	-40～ +85 (+105)
	High voltage		MDD	• High voltage series • For AC and DC	1250VDC (500VAC)	0.0022～0.1	-40～ +85 (+105)
High frequency circuit use			FPD4	• Standard	250VDC 450VDC 630VDC	0.01～10 0.01～3.3 0.01～2.2	-40～ +105
			FPD5	• Small in size	450VDC	0.47～2.2	-40～ +105
Across- the- line use			CFD-N	• For noise immunity test • Standard	125VAC 250VAC	0.033～4.7 0.01～2.2	-40～ +85 (+105)
Surge absorber C-R units			CR	• C-R Unit	125VAC 250VAC	0.1μF +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 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, Cl_2, H_2S, NH_3, SO_2, NO_2, 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℃
Humidity : 25 to 75%
Terms of guarantee: 2 years

3. Pattern Design

To solder parts on the printed circuit board properly, it is necessary to take a careful attention in design stage.
It is necessary to consider the land pattern position by mounting equipment, method of soldering (flow or reflow), and material of print circuit board. Moreover, it is necessary to consider the position of adhesive and the array of parts at the flow soldering. Refer to Page 30 for recommended land pattern of Kamaya product

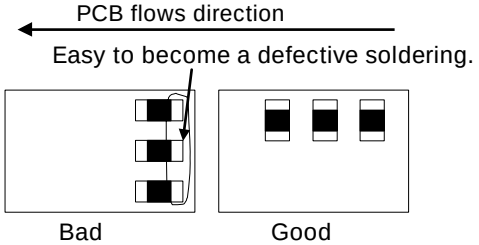
3.1 Strength of parts might decrease under the condition that the width or the shape of land pattern is too large, or the bend of the substrate occurs when gap of soldering position is generated or there are a lot of solder quantities.

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

3.3 The resistor is a generation of heat source.
The pattern design that opens enough distance is necessary from other generation of heat parts.
Especially, please do enough derating of the rated dissipation for a high voltage circuit after considering the temperature rises of the adjoining generation of heat parts.

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

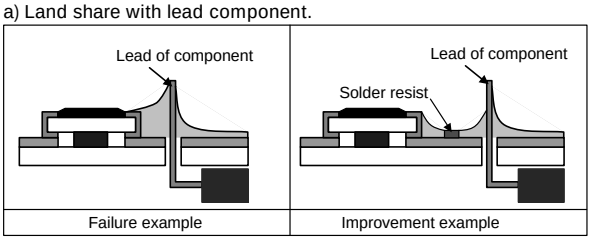
Figure-1



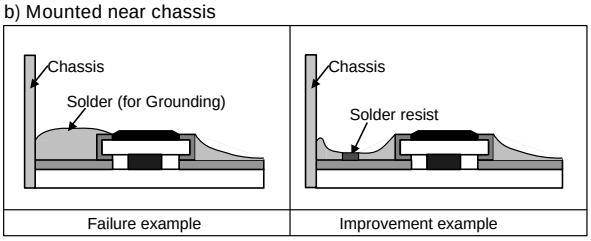
3.5 Examples of division of land pattern (Cross-sectional view)
a. Land share with lead component.
b. Mounted near Chassis.
c. Side by side array.

Figure-2

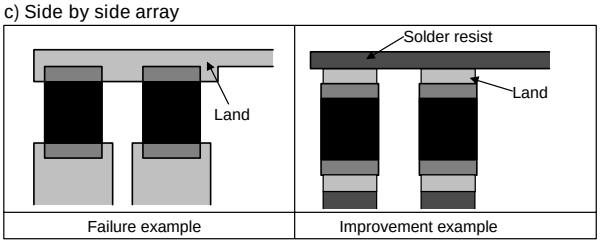
a) Land share with lead component.



b) Mounted near chassis

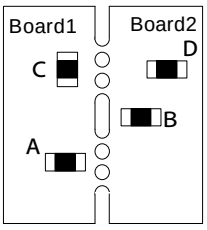


c) Side by side array



3.6 Avoid the component placement to the following places.
1) Near cutting line of print circuit board.
2) 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.

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.

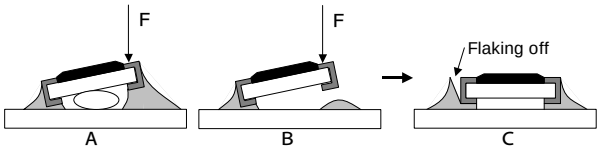
7.2 Select flux without the causticity.

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 safely regulations, will be greatly affected by the circuit used, the method of mounting, the material, and environmental conditions, ensure that you consult with our sales department prior to deployment when examining the viability of use in characteristic circuits, mounting methods, material and under characteristic environmental conditions,

9.4 Thoroughly verify performance and reliability when using under the following characteristic environmental conditions :
(1) Use within a liquid environment (Water, oil, liquid chemical, organic solution, etc.)
(2) Use in direct sunshine. Outdoors in heavy dew, in dusty environments, or where corrosive gas is present (Sea breezes, Cl_2, H_2S, NH_3, SO_2, NO_2, 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.

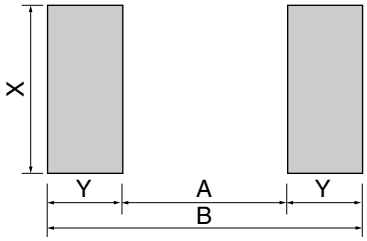
This is reference information only.

●Application

All KAMAYA Surface Mount Devices

●Recommended land pattern (Reference)

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

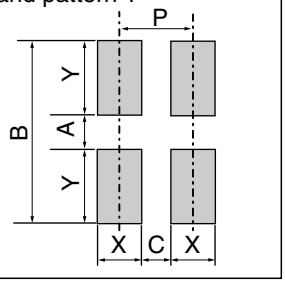


Size		Flow soldering				Reflow soldering			
Metric	Inch	A	B	X	Y	A	B	X	Y
0402	01005	Not applied				0.18	0.58	0.2	0.2
0603	0201					0.3	0.9	0.3	0.3
1005	0402					0.5	1.3	0.5	0.4
1608	0603	1.0	2.6	0.8	0.8	1.0	2.0	0.8	0.5
2012	0805	1.3	3.1	1.25	0.9	1.3	2.7	1.25	0.7
3216	1206	2.2	4.3	1.6	1.05	2.2	3.9	1.6	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

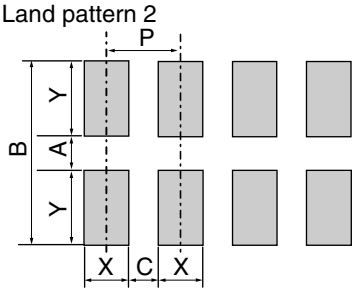
※For RLP, MLP please refer to the page 8.

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

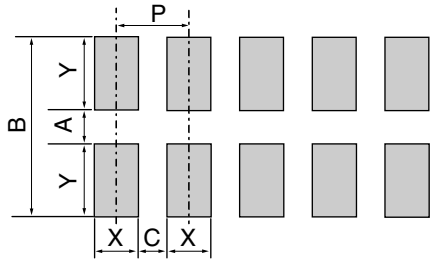
Land pattern 1



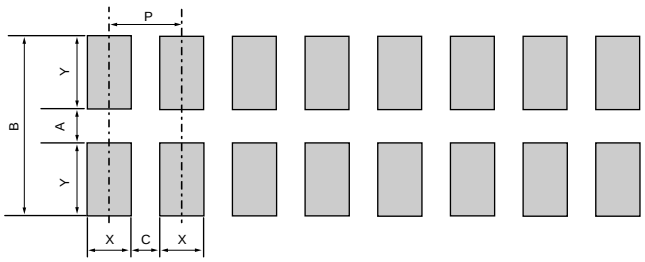
Land pattern 2



Land pattern 3



Land pattern 4



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												
2	RAC10 4D		0.5						0.5	1.3	0.15	0.35	0.4
2	RAC16 4D	C	0.8	1.0	2.6	0.35	0.45	0.8	1.0	2.0	0.35	0.45	0.5
3	RAC16 8U	C	0.64	Not applied					1.0	2.0	0.32	0.32	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.

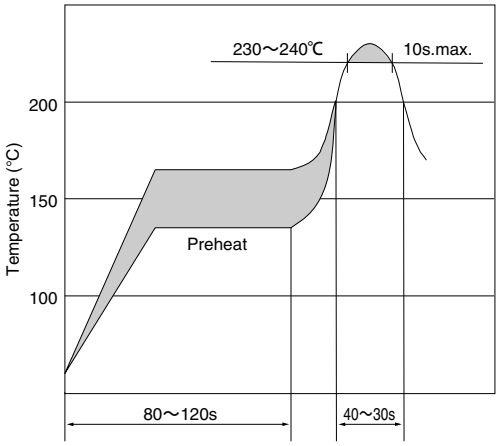
●Application

All KAMAYA Surface Mount Devices

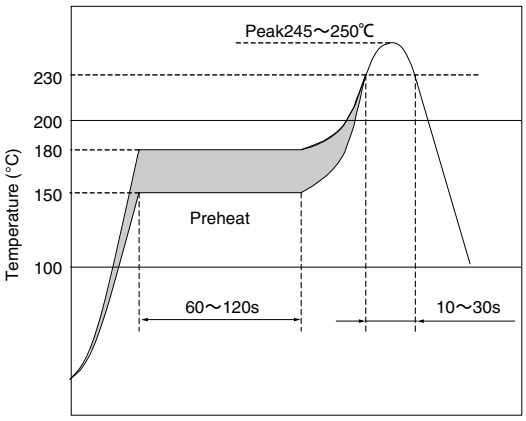
●Recommended soldering condition (Reference)

1. Reflow soldering

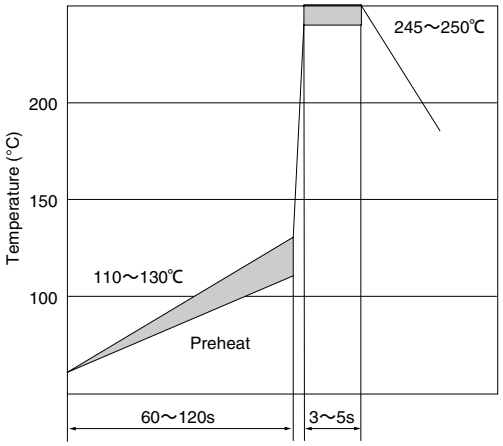
1.1 Recommended condition of Sn-Pb solder.
Reflow times: 2 times



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℃ 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

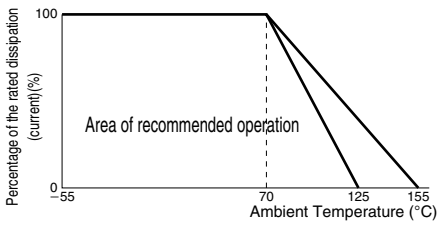
The r.m.s voltage is impressed for 1 minute the one that the electrode (terminal) was lumped together and between the insulation exterior or substrates, and the insulation exterior indicates the maximum value of the voltage that breakdown or flashover.

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℃ shall be indicated by the following Curve.



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

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

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

R :Measured resistance at T℃
R_0 :Measured resistance at T℃
T :Measured test temperature (℃)
T_0 :Measured base temperature (℃)

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.

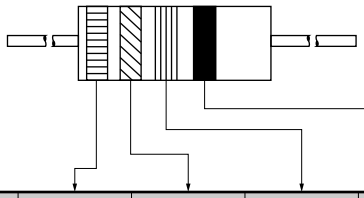
Internal Resistance Value
An internal resistance values shown in this document include values in any materials of fuse,
fuse element, outer terminations etc. Please refer to "section 10" for further information.
Additionally, resistance values are different depending on Temperature and Steady-state Current.

Maximum Open Circuit Voltage
Maximum open circuit voltage is the value of voltage applicable to both ends of resistors, when a resister 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

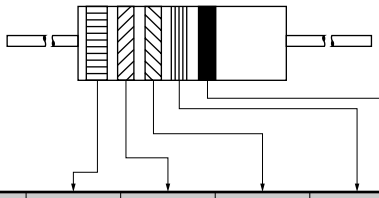
• Three - color band or four - color band system



Color	1st color band	2nd color band	3rd color band	4th color band
	1st figure	2nd figure	Multiplier	Resistance tolerance
Black	0	0	10^0	–
Brown	1	1	10^1	F(±1%)
Red	2	2	10^2	G(±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(±5%)
Silver	–	–	10^{-2}	K(±10%)
Not colored	–	–	–	M(±20%)

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

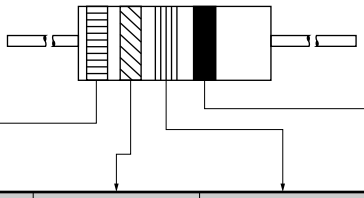
• Five - color band system



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

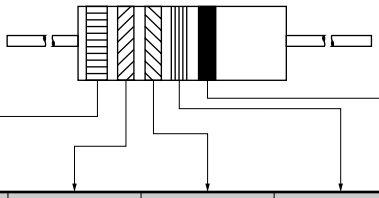
*RC1/2U : Please refer to page 24.

• Example



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

• 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}	±1%
768 ×0.1 (ohm) ±1%				
76.8 ohm F				

●Rated resistance symbols

The symbols to indicate rated resistance are depicted in 3 characters (for the E6, E12, and E24 series) or 4 characters (for the E48, E96 and E192 series) as indicated below.
In the case of 3 characters, the first and second character represent the effective numeral, and the third character is the multiplier following the effective numeral.
In the case of 4 characters, the first, second and third character represent the effective numeral, and the fourth character is the multiplier following the effective numeral.
When a decimal point exists, the decimal point is represented by an R for all effective numerals.

• 3-Digit (example)

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

• 4-Digit (example)

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

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

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

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

Standard Resistance Values and Symbols

●Code Tolerances

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

●Temperature Characteristics Symbol Table

Code	Temperature coefficient of resistance
E	$\pm 25\times10^{-6}$/°C
C	$\pm 50\times10^{-6}$/°C
K	$\pm 100\times10^{-6}$/°C
D	$\pm 200\times10^{-6}$/°C
A	$\pm 500\times10^{-6}$/°C
M	$\pm 1{,}000\times10^{-6}$/°C
N	$\pm 70\times10^{-6}$/°C

●Significant Figure of Resistance Value

E6	E12	E24	E48	E96	E192
10	10	10	100	100	100 101
				102	102 104
			105	105	105 106
				107	107 109
		11	110	110	110 111
				113	113 114
			115	115	115 117
	12	12		118	118 120
			121	121	121 123
				124	124 126
			127	127	127 129
		13		130	130 132
			133	133	133 135
				137	137 138
			140	140	140 142
				143	143 145
			147	147	147 149
15	15	15		150	150 152
			154	154	154 156
		16		158	158 160
			162	162	162 164
				165	165 167
			169	169	169 172
				174	174 176
	18	18	178	178	178 180
				182	182 184
			187	187	187 189
				191	191 193
			196	196	196 198
		20		200	200 203
			205	205	205 208
				210	210 213

E6	E12	E24	E48	E96	E192
22	22	22	215	215	215 218
				221	221 223
			226	226	226 229
				232	232 234
			237	237	237 240
		24		243	243 246
			249	249	249 252
				255	255 258
			261	261	261 264
				267	267 271
		27	27	274	274 277
				280	280 284
			287	287	287 291
				294	294 298
		30	301	301	301 305
				309	309 312
			316	316	316 320
				324	324 328
33	33	33	332	332	332 336
				340	340 344
			348	348	348 352
				357	357 361
		36	365	365	365 370
				374	374 379
			383	383	383 388
		39		392	392 397
			402	402	402 407
				412	412 417
			422	422	422 427
		43		432	432 437
			442	442	442 448
				453	453 459

E6	E12	E24	E48	E96	E192
47	47	47	464	464	464 470
				475	475 481
			487	487	487 493
				499	499 505
		51	511	511	511 517
				523	523 530
			536	536	536 542
				549	549 556
	56	56	562	562	562 569
				576	576 583
			590	590	590 597
				604	604 612
			619	619	619 626
		62		634	634 642
			649	649	649 657
				665	665 673
68	68	68	681	681	681 690
				698	698 706
			715	715	715 723
				732	732 741
		75	750	750	750 759
				768	768 777
			787	787	787 796
				806	806 816
		82	825	825	825 835
				845	845 856
			866	866	866 876
				887	887 898
			909	909	909 920
		91		931	931 942
			953	953	953 965
				976	976 988

*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

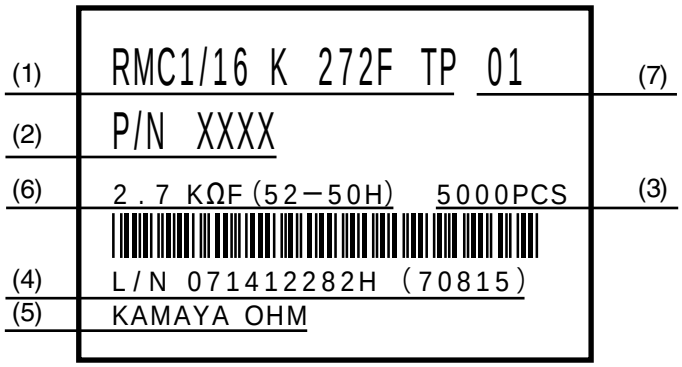
Direct Current	Power(P)			Voltage(E)			Current(I)			Resistance(R)		
Calculating Formula	EI	I^2R	$\frac{E^2}{R}$	IR	$\sqrt{PR}$	$\frac{P}{I}$	$\frac{E}{R}$	$\sqrt{\frac{P}{R}}$	$\frac{P}{E}$	$\frac{E}{I}$	$\frac{E^2}{P}$	$\frac{P}{I^2}$

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)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)

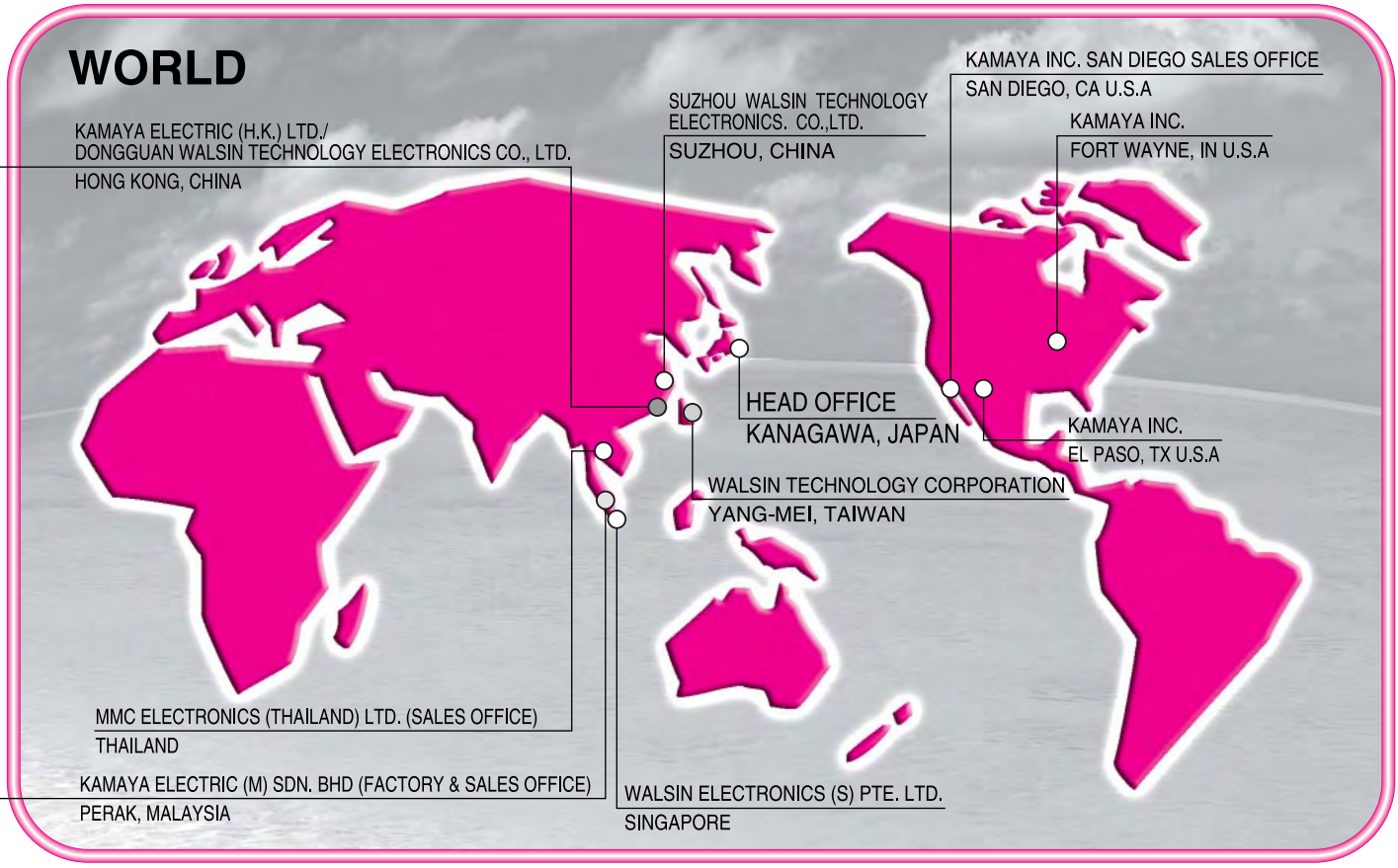
(5)Manufacturer

(6)Internal code 1

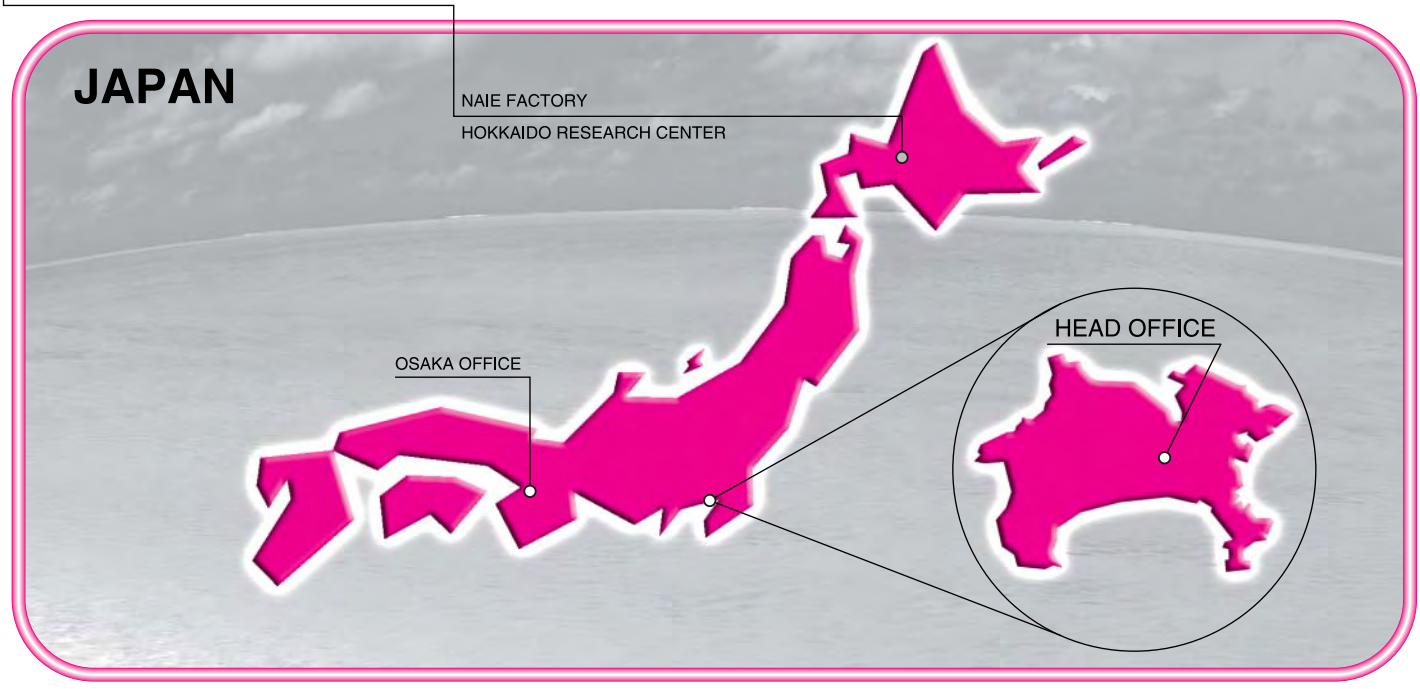
(7)Internal code 2

*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



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



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