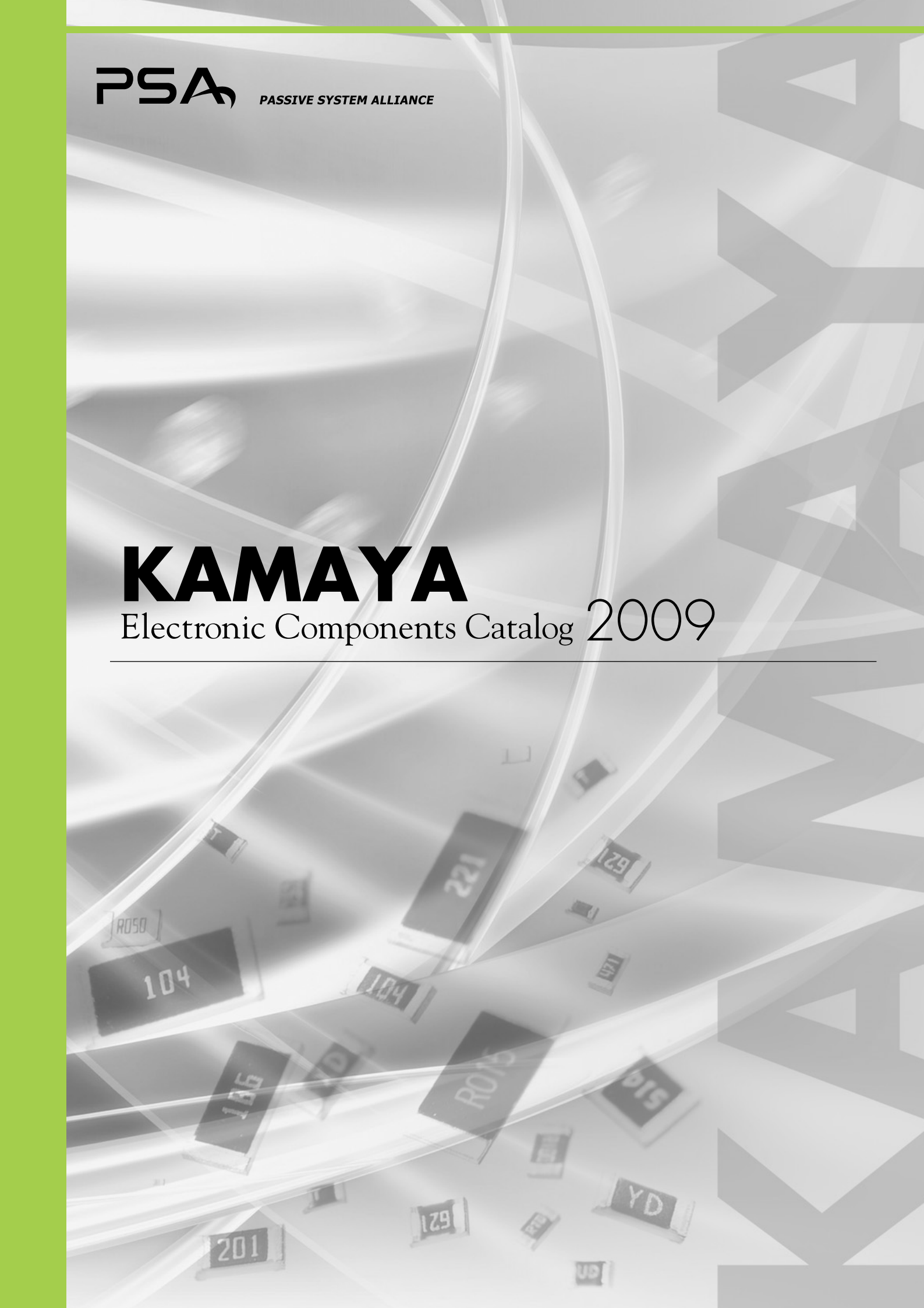
PSA PASSIVE SYSTEM ALLIANCE

KAMAYA

Electronic Components Catalog 2009



Operating Precautions

1. The use of the products mentioned in this catalog refers to consumer appliances that are available on the open market.
2. There are cases which high levels of reliability distinctive from consumer appliances 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 defects in medical equipment, space equipment, nuclear power-related equipment, vehicle-mounted equipment, aircraft and other equipments. 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.
3. As the use of resistors and surface-mounted parts used in all electrical components, especially resistors used in high-voltage circuits and in circuits prescribed for safety regulations, will be greatly affected by the circuit used, the method of mounting, the material, and environmental conditions, ensure that you consult with our sales department prior to deployment when examining the viability of use in characteristic circuits, mounting methods, material and under characteristic environmental conditions.
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 exist.
   (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 in environment which allow condensation to collect on the product.
5. Storage
   (1) Store these products in the following environment : Within 5~35°C, 25~75 % R.H.
   (2) Avoid storage in locations where corrosive gas is present (sea-breezes, Cl_2, H_2S, NH_3, SO_2, NO_2, etc.,) or in direct sunlight. Failure in observing this may result in a deterioration of performance and may adversely affect the soldering.
   (3) Terms of guarantee: 2 years except RC series and RC1/2U. Please refer storage terms at RC and RC products at 57 and 59.
6. Take care handling these products as they may be damaged and become defective if subject to impact, such as dropping.
7. Take special note of the following for surface-mounted components:
   (1) Separate the parts that do not require soldering with solder resist, and do not solder areas which do not require soldering.
   (2) Avoid mounting in areas which are subject to mechanical stress, such as close to printed circuit board grooves or areas which distort easily.
   (3) 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.
   (4) Use non-corrosive flux.
   (5) Avoid gripping chip resistors with pincers as this may result in the loss of the protective cover or resistance.
   (6) Do not allow soldering irons to come into direct contact with the electrodes when soldering with the use of an iron.
8. Ensure that the rated electricity is reduced sufficiently in consideration of temperature rises caused by adjacent heat generation components when using high-voltage circuits.

[RoHS Directive Compliance]

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.

All of KAMAYA branded products, chip resistors* and leaded resistors are in compliance with RoHS directive**

* In case of chip resistors, PbO is content in glass materials which is agreed by RoHS directive as exception.

("Environment Update, WEEE Handbook V")

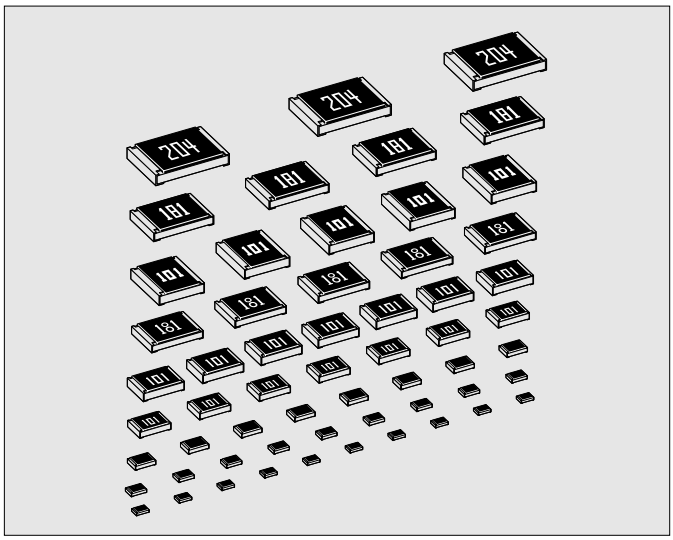
** RoHS Directive (The restriction of the certain hazardous substances in electrical and electronic equipment)

CONTENTS

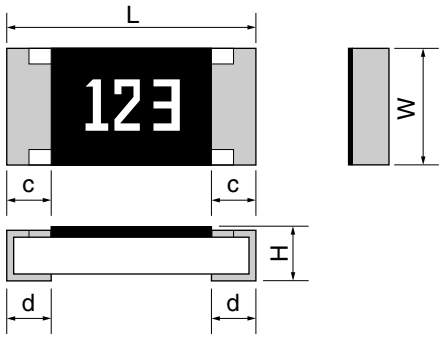
RMC

●Features

1. 01005 to 2512 inch size and Jumper chip available.
2. 0.1W is available for 0402 inch (RMC1/16S).
3. Precise dimension by Laser-scriber method (RMC1/20, RMC1/32).
4. Press Pocket Taping package (RMC1/20, RMC1/32).
5. Stability Class : 5%



●Dimensions



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	L	W	H	c	d	*Unit weight/pc.
RMC1/32	**0402**	**01005**	0.4±0.02	0.2 ±0.02	0.13±0.02	0.08 ±0.03	0.1 ±0.03	0.035mg
RMC1/20	**0603**	**0201**	0.6±0.03	0.3 ±0.03	0.23±0.03	0.1 ±0.05	0.15 ±0.05	0.16mg
RMC1/16S	**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
RMC1/16	**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
RMC1/10	**2012**	**0805**	2.0±0.1	1.25±0.10	0.55±0.10	0.4 ±0.2	0.4 ±0.2	5mg
RMC1/8	**3216**	**1206**	3.2±0.15	1.6 ±0.15	0.55±0.10	0.5 ±0.25	0.5 ±0.25	9mg
RMC1/4	**3225**	**1210**	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**	5.0±0.15	2.5 ±0.15	0.55±0.15	0.6 ±0.2	0.6 ±0.2	25mg
RMC1	**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

●Part Number Description

Example

Style

RMC	1/10	K	103	F	TP

Product Type

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

Tolerance on Rated Resistance		
F	± 1%	Resistor
G	± 2%	
J	± 5%	
K	±10%	
None	———	Jumper

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	0.33W	3225	1210
1/2	0.75W	5025	2010
1	1.0W	6332	2512

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

*Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All Styles
PA	Press-Pocket	20,000pcs.	RMC1/32
	Paper Tape (2 mm pitch)	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 48 and 49.

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

FIXED THICK FILM CHIP RESISTORS; RECTANGULAR TYPE RMC

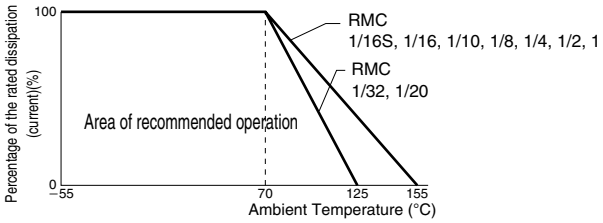
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range 1Ω 10Ω 100Ω 1MΩ 10MΩ	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 10～91 100～1M	F, J	—	＋600～－200	15	50	−55～+125
					—	±300			
					—	±200			
RMC1/20	0603 (0201)	0.05 (1.0A)	0.47～0.91 1～9.76 10～97.6 100～1M 1.1M～10M	J	—	＋1000～＋300	25		
				F, J	—	＋600～－200			
				F, G, J	—	±300			
					—	±200			
				J					
RMC1/16S	1005 (0402)	0.1 (1.0A)	1～9.76 10～1M 1.02M～10M	F, J	—	＋500～－200	50	100	−55～+155
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
RMC1/16	1608 (0603)		0.47～0.91 1～9.76 10～10M 11M～22M	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 1～9.76 10～2.2M 2.21M～10M 11M～22M	K	—	＋1,000～＋300	150	500	
				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 1～9.76 10～1M 1.02M～10M 11M～24M	K	—	＋1,000～＋300	200		
				F, G, J	—	＋500～－200			
				G, J	—	±200			
				F	K	±100			
				F, G, J	—	±200			
				J					
RMC1/4	3225 (1210)	0.33 (2.0A)	0.2～0.91 1～9.76 10～1M 1.02M～10M 11M～22M	K	—	＋1,000～＋300			
				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 1～9.76 10～1M 1.1M～22M	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 1～9.76 10～1M 1.1M～22M	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.

●Derating Curve

The derated values of dissipation for temperatures in excess of 70°C shall be indicated by the following Curve.
(For Jumpers the load current shall be derated according to the Derating Curve)



●Climatic Category

55/125/56 : RMC1/32, 1/20
55/155/56 : RMC1/16S, 1/16, 1/10, 1/8, 1/4, 1/2, 1

	RMC1/32, 1/20	RMC1/16S, 1/16, 1/10, 1/8, 1/4, 1/2, 1
Lower Category Temperature	−55°C	−55°C
Upper Category Temperature	+125°C	+155°C
Duration of the Damp heat, Steady-State Test	56 days	56 days

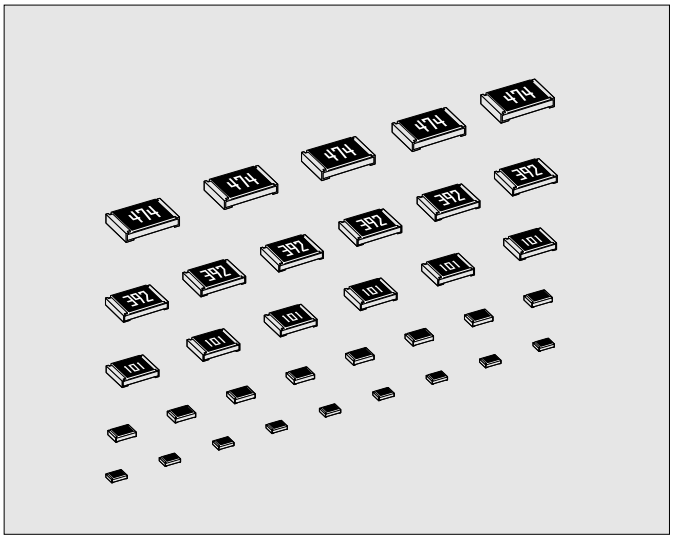
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods	
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7	RMC1/32,1/20 50Va.c.,60s RMC1/16S,1/16 100Va.c.,60s RMC1/10~1 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8	+20°C/−55°C/+20°C/+125°C/+20°C : RMC1/32, 1/20 +20°C/−55°C/+20°C/+155°C/+20°C : RMC1/16S~1
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13	The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17	235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18	After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19	5 cycles between −55°C and +125°C : RMC1/32, 1/20 5 cycles between −55°C and +155°C : RMC1/16S~1
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23	Dry/Damp heat (12+12h cycle), first cycle./ Cold/Damp heat (12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24	40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1	Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3	125°C, no-load, 1,000h. : RMC1/32, 1/20 155°C, no-load, 1,000h. : RMC1/16S~1
Adhesion	No visible damage	Clause 4.32	5N, 10s (RMC1/20 = 3N , RMC1/32 = 2N)
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33	RMC1/32~1/4 Amount of bend : 3 mm RMC1/2, 1 Amount of bend : 1 mm

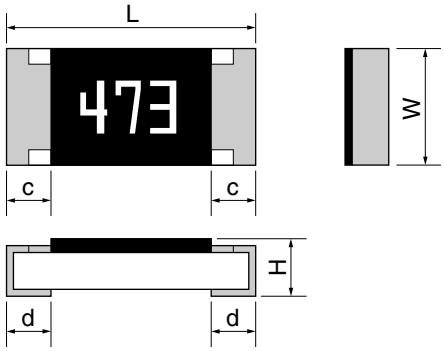
RGC

●Features

1. Suitable for precision applications.
2. High stabilized characteristics and Performance equivalent to thin-film chip resistors.
3. Precise Dimension by Laser-scriber method (RGC1/20).
4. Press Pocket Taping Package (RGC1/20).
5. Stability Class : 5%



●Dimensions



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

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
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 $^{+0.05}_{-0.1}$	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

●Part Number Description

Example

Style

RGC	1/16	C	473	D	TP

Product Type

Rated Dissipation & Size

Code	Rated Dissipation	Metric	Inch
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 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 48 and 49.
*Please contact Kamaya sales department for 1mm pitch taping of RGC1/16s, 1/20.

●Ratings

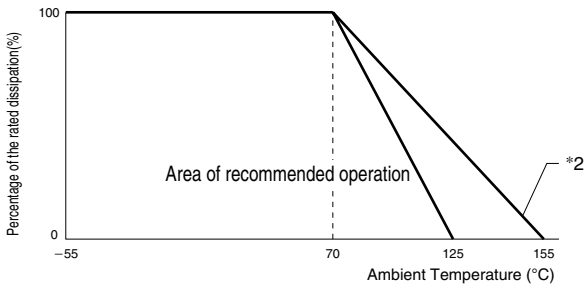
Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Resistance Range (10Ω 100Ω 1kΩ 1MΩ)	Tolerance on Rated Resistance	Temperature Coefficient of Resistance Code	Temperature Coefficient of Resistance 10^{-6}/°c	Limiting Element Voltage V	Isolation Voltage V	Category Temperature Range °C
RGC1/20	0603 (0201)	0.05	51～976	D(±0.5%)	K	±100	25	50	−55～+125
			1k～1M		C	± 50			
RGC1/16S	1005 (0402)	0.063	10～97.6	D(±0.5%) F(±1%)	K	±100	50	100	−55～+155
			100～1M		C	± 50			
			1.02M～3.3M		K	±100			
RGC1/16	1608 (0603)	0.1 *1(0.063)	3.3～9.76	F(±1%)	K	±100			−55～+125 *1(−55～+155)
			10～97.6	D(±0.5%) F(±1%)					
			100～1M		C	± 50			
			1.02M～3.3M		K	±100			
RGC1/10	2012 (0805)	0.125 *1(0.1)	3.3～9.76	F(±1%)	C	± 50	150	500	
			10～3.3M	D (±0.5%), F (±1%)					
RGC1/8	3216 (1206)	0.25 *1(0.125)	3.3～9.76	F(±1%)	C	± 50	200		
			10～4.7M	D (±0.5%), F (±1%)					

*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.

●Derating Curve

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



●Climatic Category

55/125/56 *2(55/155/56)

Lower Category Temperature −55°C *2(–55°C)
Upper Category Temperature +125°C *2(+155°C)
Duration of the Damp heat, Steady-State Test 56 days *2(56 days)

●Performance Characteristics JIS C 5201-1 : 1998

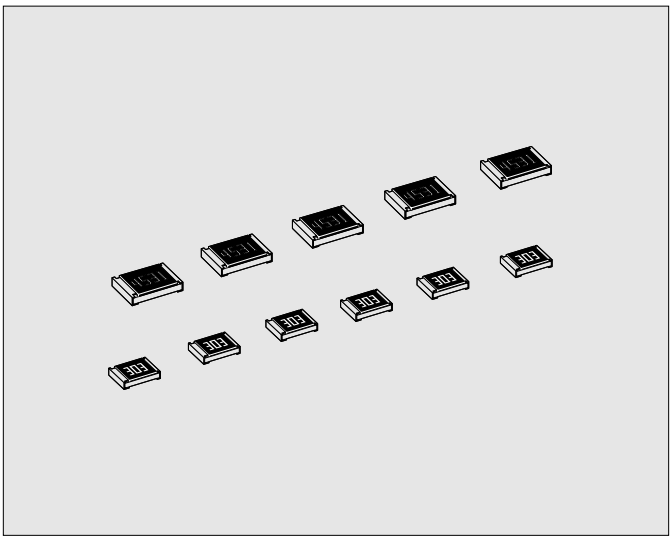
Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 RGC1/20 50Va.c.,60s RGC1/16S, 1/16, 1/10, 1/8 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/+125°C *2(+155°C) /+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C *2(+155°C).
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat (12+12h cycle), first cycle./ Cold/Damp heat (12+12h cycle), remaining cycle. /D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C *2(155°C), no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s (RGC1/20 : 3N)
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 Amount of bend : 3 mm

*2 ( ) on Derating Curue, Climatic Category, and Test Methods will be applied, when Upper Category Temperature is +155°C.

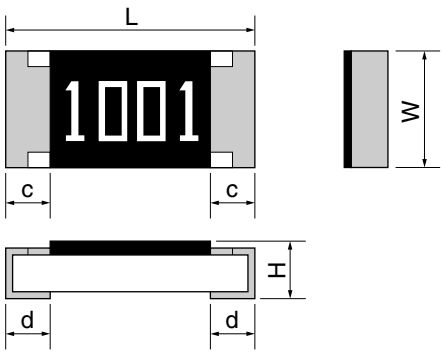
RNC

●Features

1. Suitable for high precision, higher stability and reliability applications compared to thick-film chip resistors.
2. Contribute to the reduction of fine adjustment, high accuracy and stability of circuit.
3. Stability Class : 1%



●Dimensions



Rated resistance value is maked with 3-digit (E24) or 4-digit (E96) on the over coating.

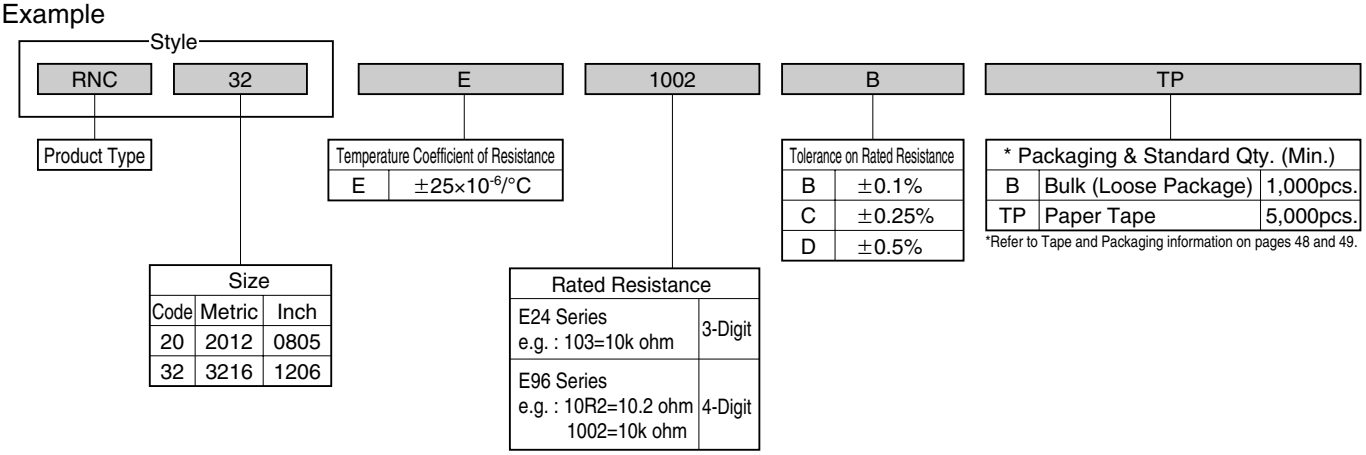
Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
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

●Part Number Description

Example



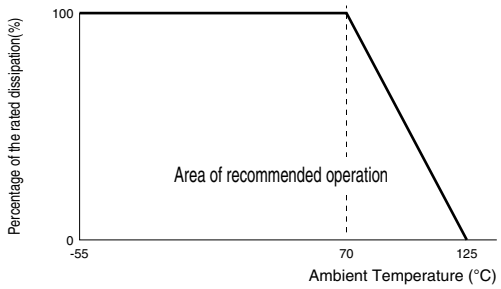
●Ratings

Style	Size Metric (Inch)	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
RNC20	2012 (0805)	0.1	100Ω～130kΩ	B (±0.1%)	±25	75	E96 E24	100	−55～+125
			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.

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

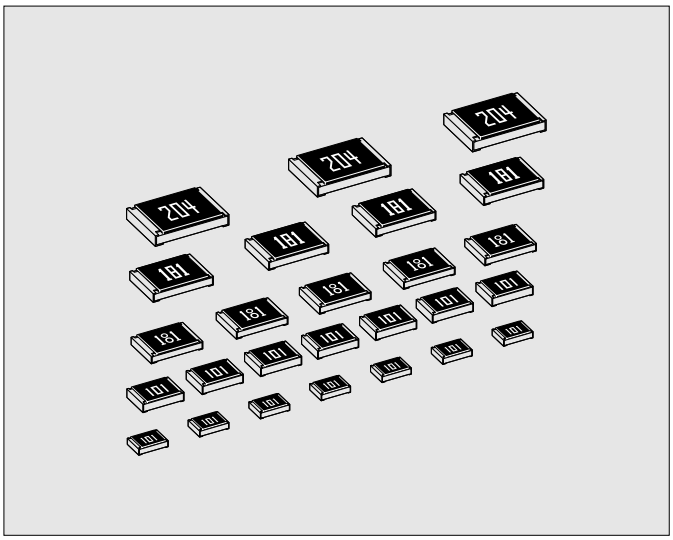
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/+125°C/+20°C
Overload	ΔR≤±(0.25%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(0.25%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(0.25%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(0.25%+0.05 ohm)	Clause 4.33 Amount of bend : 3 mm

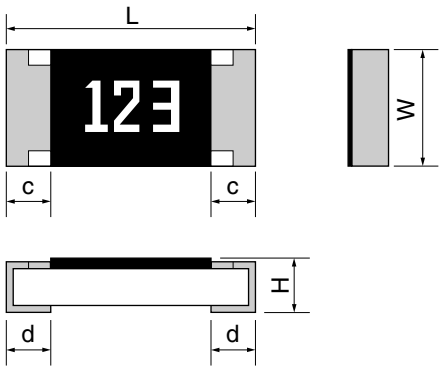
RVC

●Features

1. Higher Limiting Element Voltage compared with RMC (general use)
2. Stability Class : 5%



●Dimensions



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

●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

Temperature Coefficient of Resistance

–	Standard
K	±100×10^{-6}/°C

Rated Resistance

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

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 48 and 49.

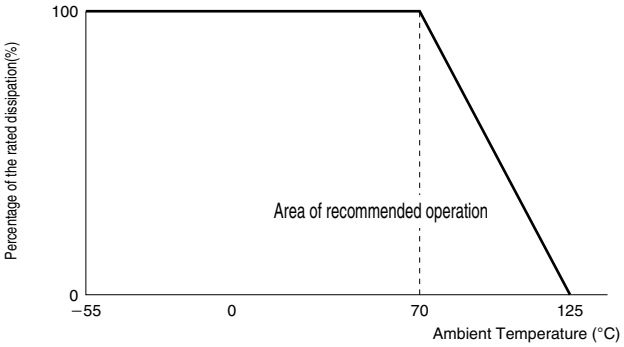
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Limiting Element Voltage V	Combinations of Rated Resistance Range and Tolerance on Rated Resistance			Temperature Coefficient of Resistance		Isolation Voltage V	Category Temperature Range °C
				D(±0.5%)	F(±1%) , G(±2%)	J(±5%) , K(±10%)	Code	10^{-6}/∞C		
RVC16	1608 (0603)	0.1	200	–	470Ω ~ 10MΩ		K	±100	100	−55~+125
				–	47Ω ~ 464Ω		–	±200		
RVC20	2012 (0805)	0.125	400	–	100Ω~10MΩ	100Ω~51MΩ	K	±100	500	
				–	47Ω ~ 97.6Ω		–	±200		
RVC32	3216 (1206)	0.25	500	100Ω~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 = $\sqrt{}$(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.

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	–55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

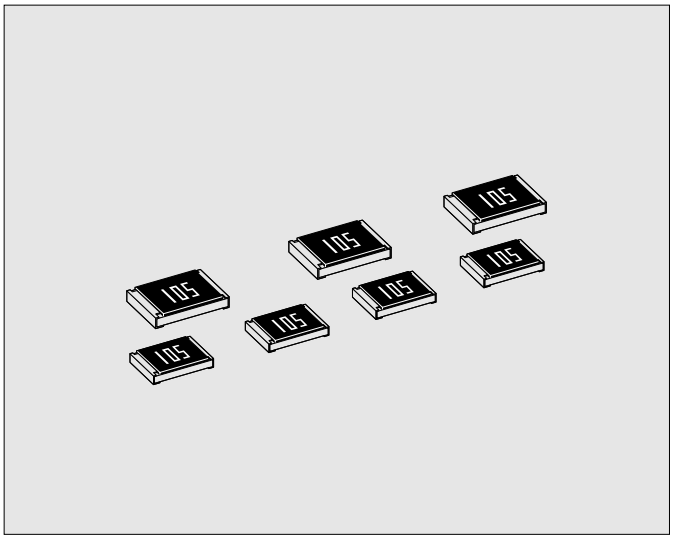
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 RVC16 100Va.c.,60s RVC20~RVC63 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature :+20°C/–55°C/+20°C/+125°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between –55°C and +125°C.
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle. /D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 RVC16~RVC32 Amount of bend : 3 mm RVC50, 63 Amount of bend : 1 mm

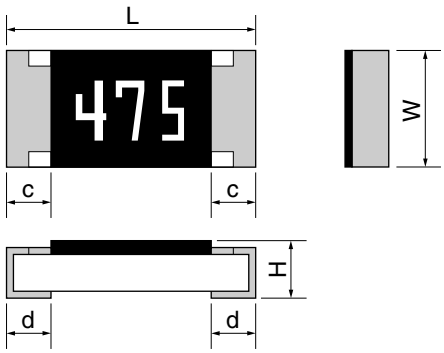
RZC

●Features

1. Endurance in the rushing into voltage of 3,000V.
   Note:3,000V, 1sec "On", 9sec"off" ,100,000 times, Room temperature.
2. Higher Limiting Element Voltage than RVC series.
3. Stability Class: 5%



●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

●Part Number Description

Example

Style

RZC	50	—	475	J	TE

Product Type

Size		
Code	Metric	Inch
50	5025	2010
63	6332	2512

Temperature Coefficient of Resistance

—	Standard

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%

* 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 48 and 49.

FIXED THICK FILM CHIP RESISTORS;RECTANGULAR TYPE & ULTRA HIGH VOLTAGE RZC

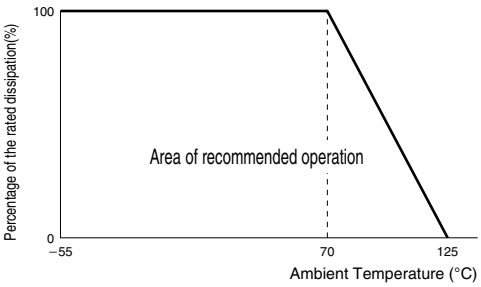
●Ratings

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		4.7MΩ～16MΩ					

Note1. Rated Voltage = $\sqrt{(\text{Rated Dissipation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Limiting Element Voltage can only be applied to resistors, when the resistance values is equal to or higher than the critical resistance value.
Note3. Anti-Rush Voltage Charactoristics : 3,000V, 1sec "On", 9sec"off" ,100,000 times, Room temperature.

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

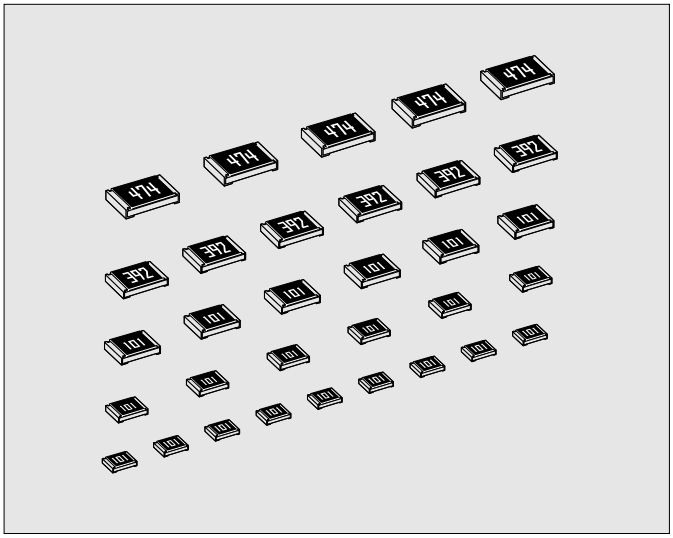
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/−55°C /+20°C/+125°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.13 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 Amount of bend : 1 mm

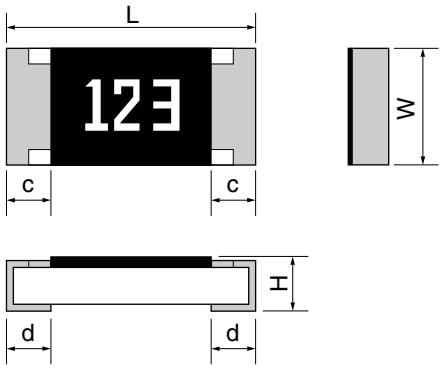
RPC

●Features

1. Higher Anti surge performance compared with RMC (general use)
2. Stability Class : 5%



●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

●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 48 and 49.

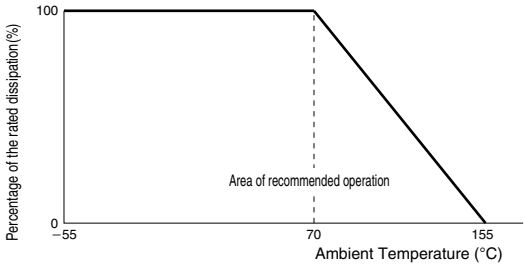
●Ratings

Style	Size Metric (Inch)	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
RPC20	2012 (0805)	0.125	0.27Ω ~ 22MΩ	J(± 5%) K(±10%) M(±20%)	±200	150	E24	500	−55~+155
RPC32	3216 (1206)	0.25				200			
RPC35	3225 (1210)	0.5							
RPC50	5025 (2010)	0.75							
RPC63	6332 (2512)	1.0							

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

●Derating Curve

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

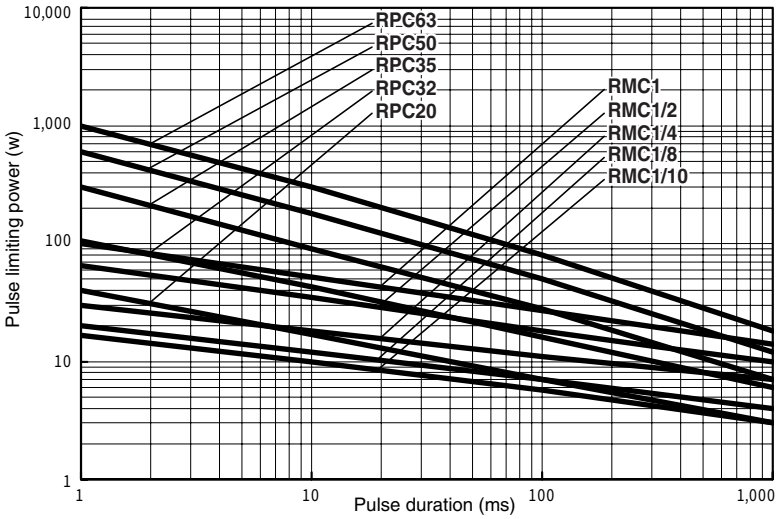


●Climatic Category

55/155/56

Lower Category Temperature	−55°C
Upper Category Temperature	+155°C
Duration of the Damp heat, Steady-Style Test	56 days

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



* pulse limiting power curve is different from resistance value.
* Please contact Kamaya sales department for the details.

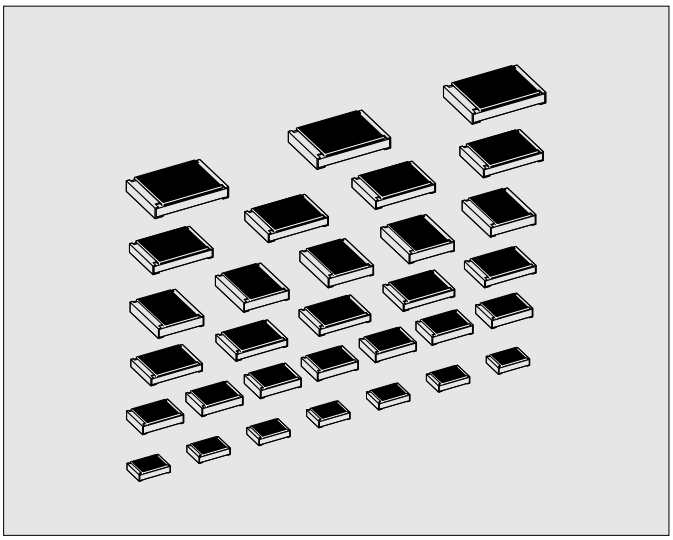
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 +20°C/−55°C/+20°C/+155°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 Cycle : −55°C/+155°C 5times
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 155°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 RPC20, 32, 35 Amount of bend : 3 mm RPC50, 63 Amount of bend : 1 mm

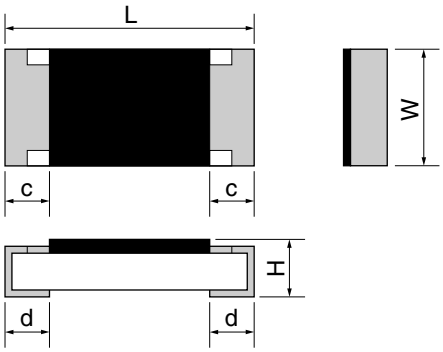
FCR

●Features

1. FCR is a trimmable device and replaceable with various resistors.
2. Resistance and coating film designed for YAG Laser Trimming.
3. Stability Class : 5%



●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

●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 48 and 49.

TRIMMABLE CHIP RESISTORS; RECTANGULAR TYPE FCR

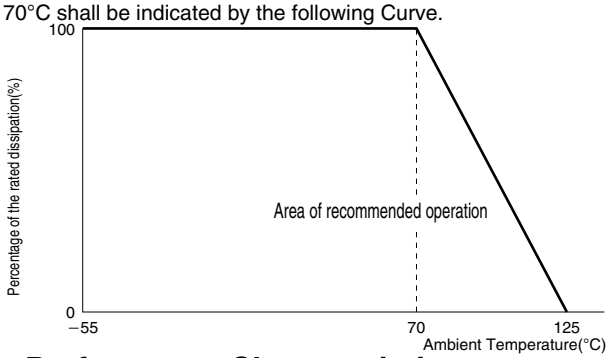
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Limiting Element Voltage V	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
			Rated Resistance Range	Temperature Coefficient of Resistance 10^{-6}/°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	1Ω～9.1Ω	+500～−200		150		500	
FCR1/8	3216 (1206)	0.125				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.

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Performance Characteristics JIS C 5201-1 : 1998

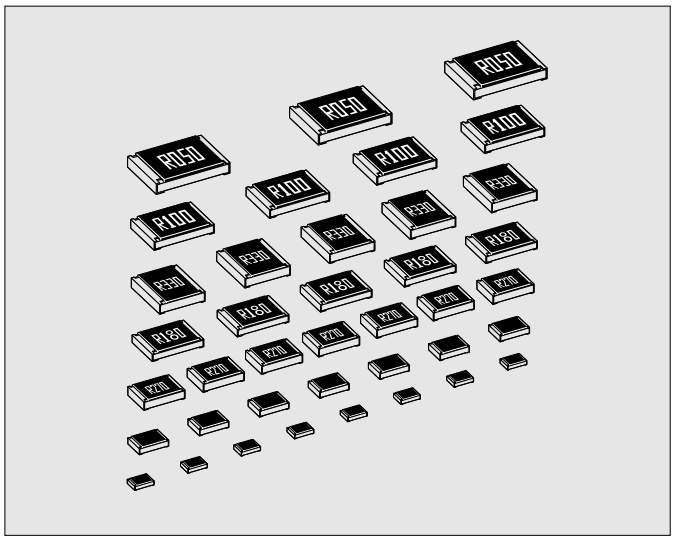
Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 FCR1/16 100Va.c.,60s FCR1/10~1 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/−55°C/ +20°C/+125°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting Element voltage, whichever is of the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle/ Cold/Damp heat(12+12h cycle), remaining Cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 FCR1/16~1/4 Amount of bend : 3 mm FCR1/2, 1 Amount of bend : 1 mm

Note5. The indicated characteristics value is without trimming.

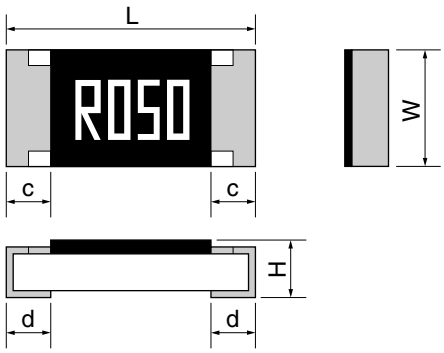
RLC

●Features

1. Most suitable for a detection of current in power source circuits, motor circuits, etc.
2. Raised Rated dissipation compared with RMC (except 2010,2512 size).
3. Stability Class : 5%



●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.

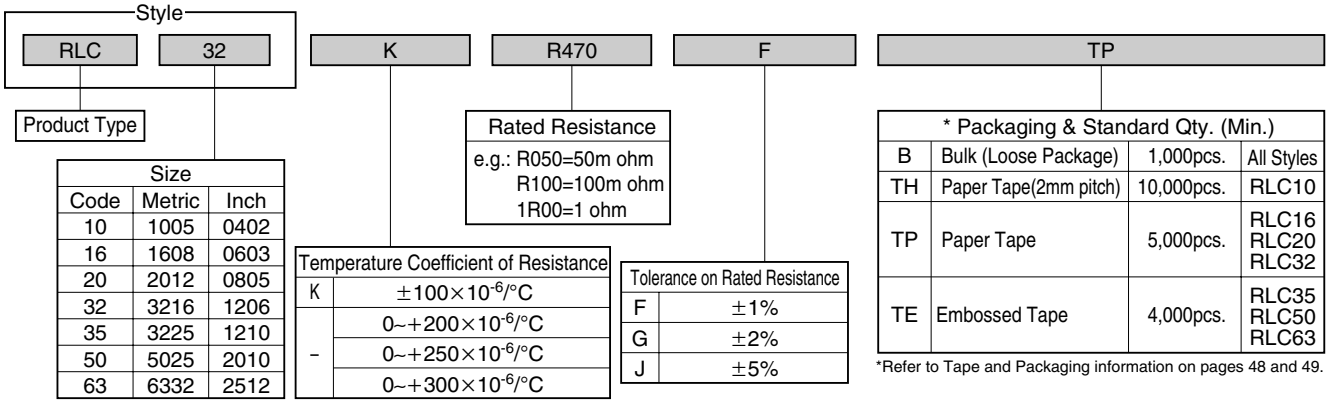
Unit : mm

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	$0.25^{+0.05}_{-0.10}$	1mg
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

●Part Number Description

Example



*Refer to Tape and Packaging information on pages 48 and 49.

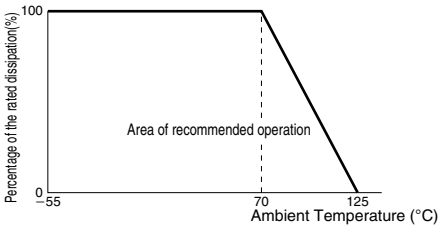
●Ratings

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	0.19 ~1.11	100mΩ~3.3Ω	100mΩ~220mΩ	J	0~ +300	100	−55~+125
					240mΩ~430mΩ	F, J			
					470mΩ~3.3Ω	F, G, J	0~ +200		
RLC16	1608 (0603)	0.25	0.27 ~1.58	100mΩ~3.3Ω	100mΩ~180mΩ	F, G, J	0~ +250		
					200mΩ~430mΩ	F, G, J	0~ +200		
					470mΩ~3.3Ω	F, G, J	±100		
RLC20	2012 (0805)	0.33	0.31 ~2.56	50mΩ~3.3Ω				500	
RLC32	3216 (1206)	0.5	0.38 ~3.16		50mΩ~180mΩ	F, G, J	0~ +250		
RLC35	3225 (1210)	0.66	0.44 ~3.63		200mΩ~430mΩ	F, G, J	0~ +200		
RLC50	5025 (2010)	0.75	0.47 ~3.87		470mΩ~3.3Ω	F, G, J	±100		
RLC63	6332 (2512)	1.0	0.55 ~4.47						

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

●Derating Curve

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

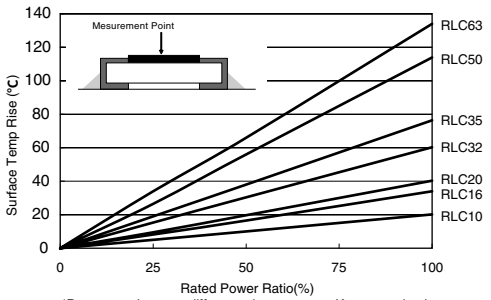


●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Surface Temperature Rise (Reference)



*Because values are different, please contact Kamaya salesdepartment for the details about deployment condition and terms of use.

●Rated Resistance

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
51mΩ	R051	90mΩ	R090	220mΩ	R220	470mΩ	R470	800mΩ	R800	1.8Ω	1R80
56mΩ	R056	91mΩ	R091	240mΩ	R240	500mΩ	R500	820mΩ	R820	2.0Ω	2R00
60mΩ	R060	100mΩ	R100	250mΩ	R250	510mΩ	R510	900mΩ	R900	2.2Ω	2R20
62mΩ	R062	110mΩ	R110	270mΩ	R270	560mΩ	R560	910mΩ	R910	2.4Ω	2R40
65mΩ	R065	120mΩ	R120	300mΩ	R300	600mΩ	R600	1.0Ω	1R00	2.7Ω	2R70
68mΩ	R068	130mΩ	R130	330mΩ	R330	620mΩ	R620	1.1Ω	1R10	3.0Ω	3R00
70mΩ	R070	150mΩ	R150	360mΩ	R360	650mΩ	R650	1.2Ω	1R20	3.3Ω	3R30
75mΩ	R075	160mΩ	R160	390mΩ	R390	680mΩ	R680	1.3Ω	1R30		
80mΩ	R080	180mΩ	R180	400mΩ	R400	700mΩ	R700	1.5Ω	1R50		

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

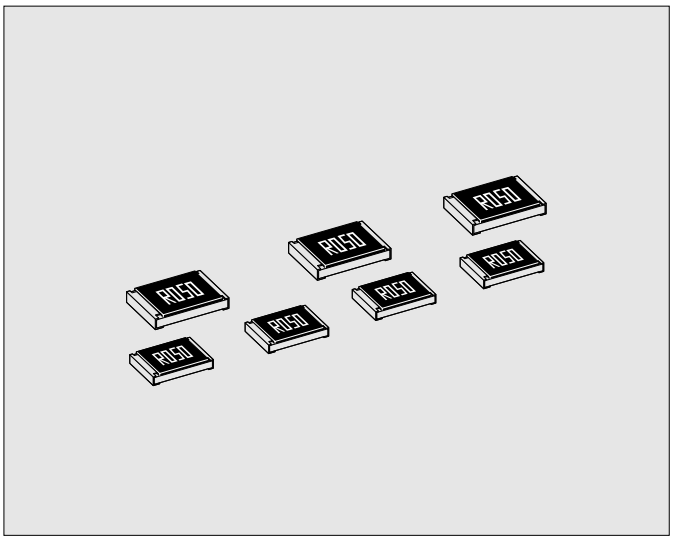
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods	
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7	RLC10,16 100Va.c.,60s RLC20~63 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8	Measuring temperature : +20°C/+125°C/+20°C
Overload	ΔR≤±1% No visible damage, legible marking	Clause 4.13	The applied voltage shall be 2.5 times of Rated Voltage, or equivalent current 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17	235°C, 2s
Resistance to soldering heat	ΔR≤±1%	Clause 4.18	After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±1% No visible damage	Clause 4.19	5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±5% No visible damage	Clause 4.23	Dry/Damp heat(12+12h cycle), first cycle/ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±5% No visible damage, legible marking	Clause 4.24	40°C, 95%R.H., 56 days, test a) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±5% No visible damage	Clause 4.25.1	Rated current, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±5% No visible damage	Clause 4.25.3	125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32	5N, 10s
Bend strength of the face plating	ΔR≤±1%	Clause 4.33	RLC10~35 Amount of bend : 3 mm RLC50, 63 Amount of bend : 1 mm

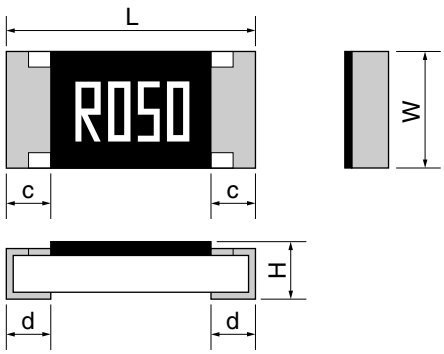
RLS

●Features

1. Suitable for current detection of high-precision circuits (power supply, motor, etc.)
2. Stability Class : 5%



●Dimensions



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

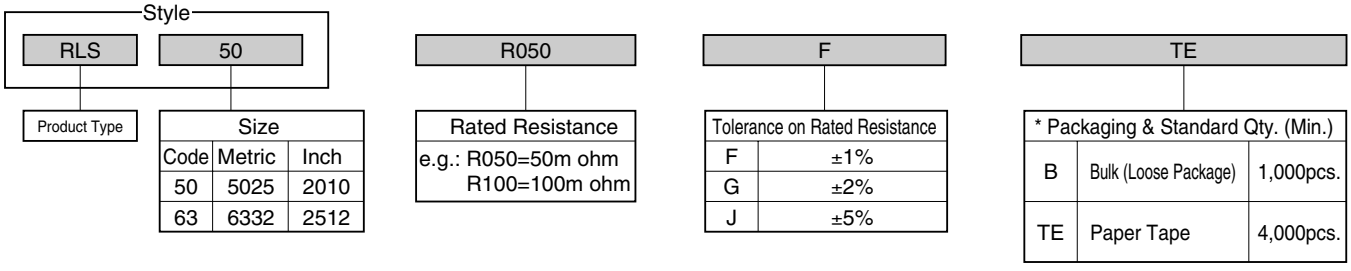
Unit : mm

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

●Part Number Description

Example



*Refer to Tape and Packaging information on pages 48 and 49.

●Ratings

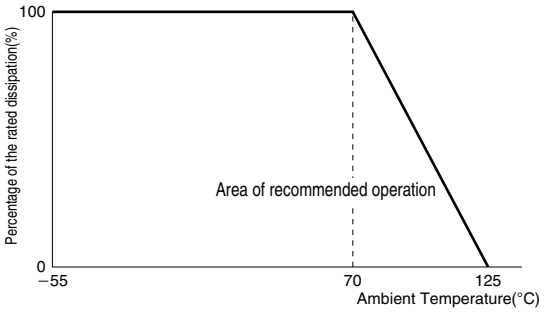
Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combinations of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C
				Rated Resistance Range	Temperature Coefficient of Resistance 10^{-6}/°C			
RLS50	5025 (2010)	0.75	1.93～6.12	20mΩ～ 33mΩ	0～ +350	F(±1%) G(±2%) J(±5%)	500	−55～+125
RLS63	6332 (2512)	1.0	2.23～7.07	36mΩ～ 47mΩ	0～ +200			
				50mΩ～200mΩ	0～ +100			

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

●Derating Curve

The derated values of dissipation for temperatures

in excess of 70°C shall be indicated by the following Curve.

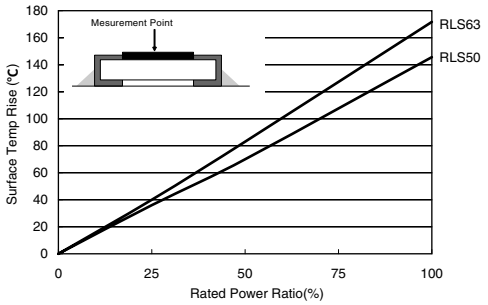


●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Surface Temperature Rise (Reference)



*Because values are different, please contact Kamaya salesdepartment for the details about deployment condition and terms of use.

●Rated Resistance

Resistance	Code
20mΩ	R020
22mΩ	R022
24mΩ	R024
25mΩ	R025
27mΩ	R027
30mΩ	R030

Resistance	Code
33mΩ	R033
36mΩ	R036
39mΩ	R039
40mΩ	R040
43mΩ	R043
47mΩ	R047

Resistance	Code
50mΩ	R050
51mΩ	R051
56mΩ	R056
60mΩ	R060
62mΩ	R062
65mΩ	R065

Resistance	Code
68mΩ	R068
70mΩ	R070
75mΩ	R075
80mΩ	R080
82mΩ	R082
90mΩ	R090

Resistance	Code
91mΩ	R091
100mΩ	R100
110mΩ	R110
120mΩ	R120
130mΩ	R130
150mΩ	R150

Resistance	Code
160mΩ	R160
180mΩ	R180
200mΩ	R200

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

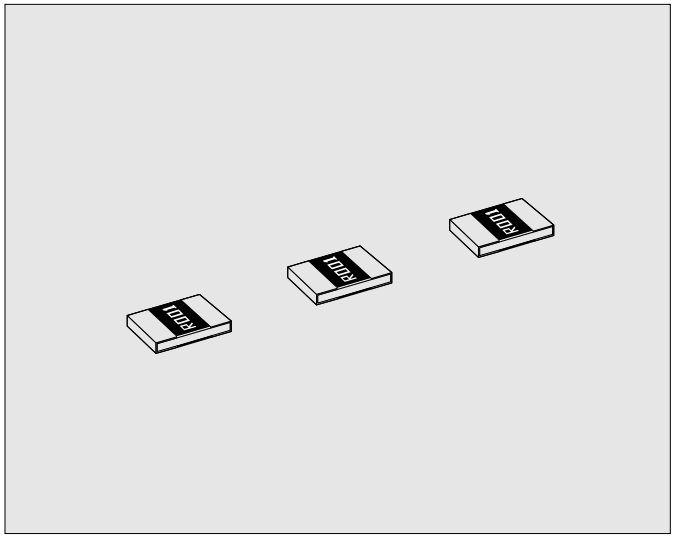
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/+125°C/+20°C
Overload	ΔR≤±1% No visible damage, legible marking	Clause 4.13 The rated voltage×2.5 times of Rated Voltage, or equivalent current 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±1%	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±1% No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±5% No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±5% No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±5% No visible damage	Clause 4.25.1 Rated Current, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±5% No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±1%	Clause 4.33 Amount of bend : 1 mm

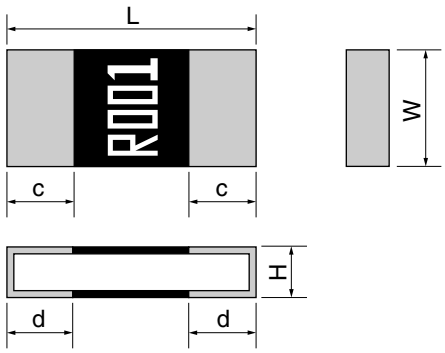
RLP,MLP

●Features

1. New Lineup, 1mΩ, 5mΩ, 10mΩ, 15mΩ.
2. Suitable for current sensing of Battery pack.
3. Stability Class: 5%



●Dimensions



Rated Resistnace marking is 4digit on over coating.

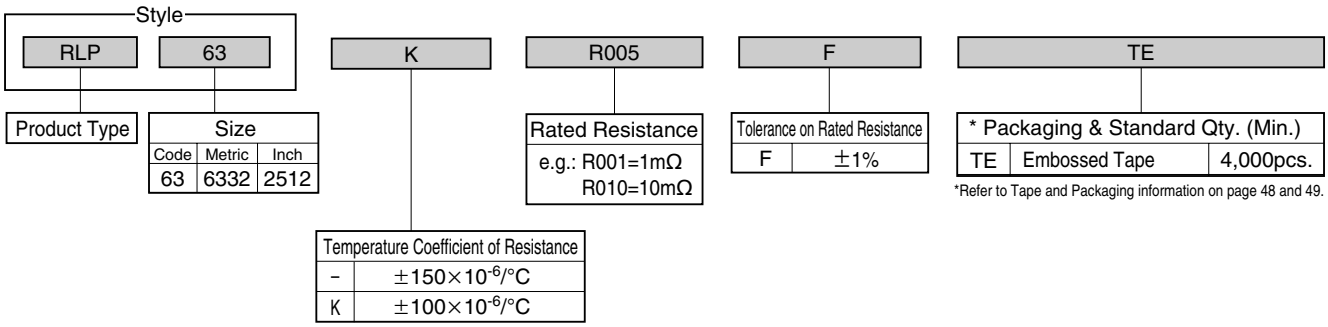
Unit : mm

Style	Metric	Inch	Rated Resistace	L	W	H	c	d	*Unit weight/pc.
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			0.23±0.15	0.95±0.25	0.95±0.25	26mg
MLP63			5mΩ			0.51±0.15	1.1 ±0.25	1.1 ±0.25	64mg

*Values for reference

●Part Number Description

Example



*Refer to Tape and Packaging information on page 48 and 49.

NEW METAL-PLATE CHIP RESISTORS; LOW OHM RLP

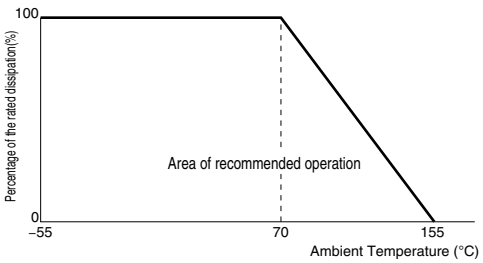
●Ratings

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
RLP63	6332 (2512)	2.0	44.7	1mΩ	±150	F(±1%)	100	−55～+155
		1.0	8.16,10,14.1	5mΩ,10mΩ,15mΩ	±100			
MLP63		2.0	20	5mΩ				

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

●Derating Curve

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

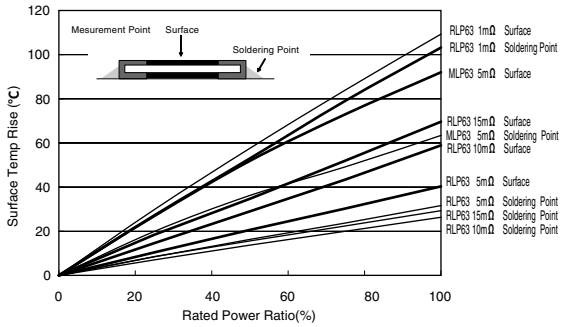


●Climatic Category

55/155/56

Lower Category Temperature	−55°C
Upper Category Temperature	+155°C
Duration of the Damp heat, Steady-State Test	56 days

●Surface Temperature Rise (Reference)

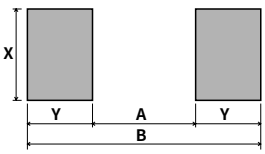


*Because values are different, please contact Kamaya salesdepartment for the details about deployment condition and terms of use.

●Rated Resistance

Style	Resistance	Code
RLP63	1mΩ	R001
RLP63 • MLP63	5mΩ	R005
RLP63	10mΩ	R010
	15mΩ	R015

●Recommended land Pattern



Unit : mm

Style	Metric	Lnch	Rated Resistance	A	B	X	Y
RLP63	6332	2512	1mΩ	2.0	7.6	3.5	2.8
			5mΩ	2.4	7.6	3.5	2.6
			10mΩ	4.0	7.6	3.5	1.8
			15mΩ				
MLP63			5mΩ				

*Values for reference

●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/+155°C/+20°C
Overload	ΔR≤±1% No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of Rated Voltage, or equivalent current 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±1%	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±1% No visible damage	Clause 4.19 5 cycles between −55°C and +155°C.
Climatic sequence	ΔR≤±5% No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle/ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±5% No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±5% No visible damage	Clause 4.25.1 Rated current, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±5% No visible damage	Clause 4.25.3 155°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±1%	Clause 4.33 Amount of bend : 1 mm

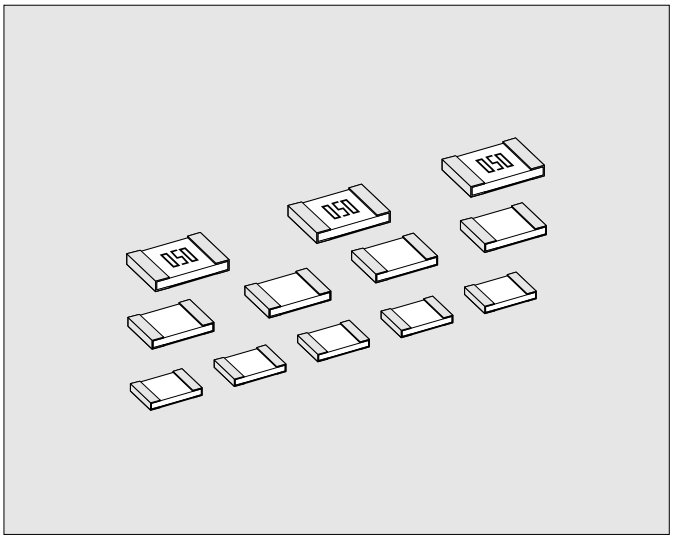
●Precautions of use

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

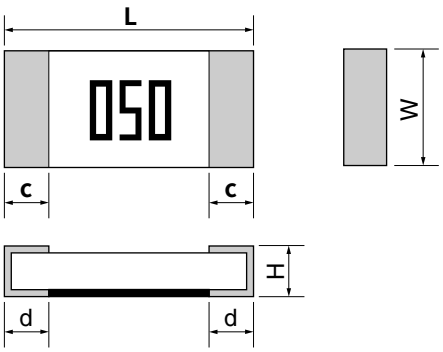
RCC

●Features

1. New lineup, 0402, 0603, 0805size, Lower than 50mΩ
2. Suitable for current sensing of small mobile devices
3. Higher rated dissipation compared to RMC series (General use)
4. Stability Class: 5%



●Dimensions



Resistance value is marking on surface.
Please refer to Rated Resistance table on page 23.
Please contact Kamaya Sales Dept. for marking of RCC16.
RCC10 is no marking.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
RCC10	**1005**	**0402**	1.0±0.05	0.5 ±0.05	0.35 $^{+0.05}_{-0.10}$	0.25 $^{+0.05}_{-0.10}$	0.25 $^{+0.05}_{-0.10}$	1mg
RCC16	**1608**	**0603**	1.6±0.1	0.8 $^{+0.15}_{-0.05}$	0.5 ±0.1	0.3 ±0.1	0.3 ±0.1	2mg
RCC20	**2012**	**0805**	2.0±0.15	1.25 ±0.10	0.6 ±0.1	0.4 ±0.2	0.4 ±0.2	5mg

*Values for reference

●Part Number Description

Example

Style: RCC | 20

Product Type

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

R050

Rated Resistance
e.g.: R050=50mΩ R100=100mΩ

F

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

TP

* Packaging & Standard Qty. (Min.)			
B	Bulk (Loose Package)	1,000pcs.	All style
TH	Paper Tape (2mm pitch)	10,000pcs.	RCC10
TP	Paper Tape	5,000pcs.	RCC16 RCC20

*Refer to Tape and Packaging information on page 48 and 49.

NEW FIXED THICK FILM CHIP RESISTORS;RECTANGULAR TYPE & LOW OHM RCC

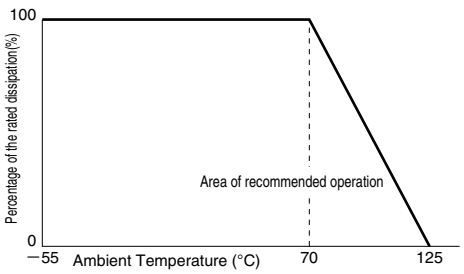
●Ratings

Style	Size Metric (Inch)	Rated Dissipation at 70°C W	Rated Current Range A	Combination of Rated Resistance Range and Temperature Coefficient of Resistance		Tolerance on Rated Resistance	Isolation Voltage V	Category Temperature Range °C
				Rated Resistance Range	Temperature Coefficient of Resistance 10^{-6}/°C			
RCC10	1005 (0402)	0.125	1.11 ～1.94	33mΩ ～ 50mΩ	0～+350	F (±1%) J (±5%)	100	−55～+125
				51mΩ ～100mΩ	±150			
RCC16	1608 (0603)	0.25	1.58 ～2.75	33mΩ ～ 50mΩ	0～+250			
				51mΩ ～100mΩ	±150			
RCC20	2012 (0805)	0.33	2.56 ～4.06	20mΩ ～ 27mΩ	0～+250		500	
				30mΩ ～ 50mΩ	±150			

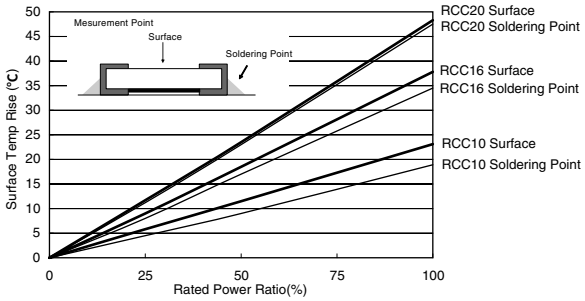
Note1. Rated Current = $\sqrt{\text{(Rated Dissipation)/(Rated Resistance)}}$
Note2. Rated Voltage = $\sqrt{\text{(Rated Dissipation)}\times\text{(Rated Resistance)}}$. (d.c. or a.c. r.m.s. Voltage)

●Derating Curve

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



●Surface Temperature Rise (Reference)



*Because values are different, please contact Kamaya salesdepartment for the details about deployment condition and terms of use.

●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Rated Resistance

Resistance	Code	Mark
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

Resistance	Code	Mark
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

Resistance	Code	Mark
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.

●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 RCC10,16 100Va.c.,60s RCC20 500Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/+125°C/+20°C
Overload	ΔR≤±1% No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of Rated Voltage, or equivalent current 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±1%	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±1% No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±5% No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle/ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±5% No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±5% No visible damage	Clause 4.25.1 Rated current, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±5% No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±1%	Clause 4.33 Amount of bend : 3 mm

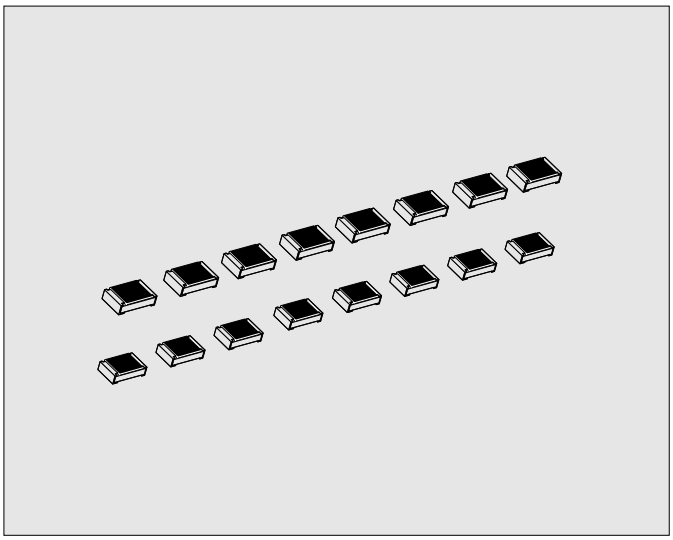
●Precautions of use

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.

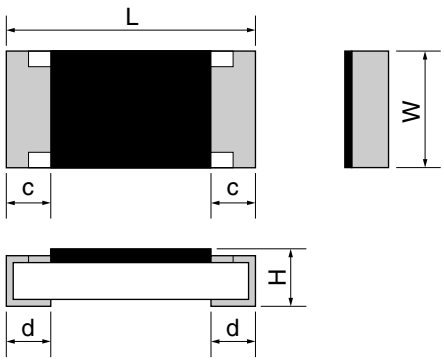
RHC

●Features

1. Max. resistance value : 150G ohm.
2. Suitable for compact instrumentation, infrared rays, sensors, etc.



●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

●Part Number Description

Example

Style

RHC	20	75G0	M	TP
Product Type	Size	Rated Resistance	Tolerance on Rated Resistance	* Packaging & Standard Qty. (Min.)

Code	Metric	Inch
16	1608	0603
20	2012	0805

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

J	± 5%
K	±10%
M	±20%
N	±30%
H	±50%

B	Bulk (Loose Package)	1,000pcs.
TP	Paper Tape	5,000pcs.

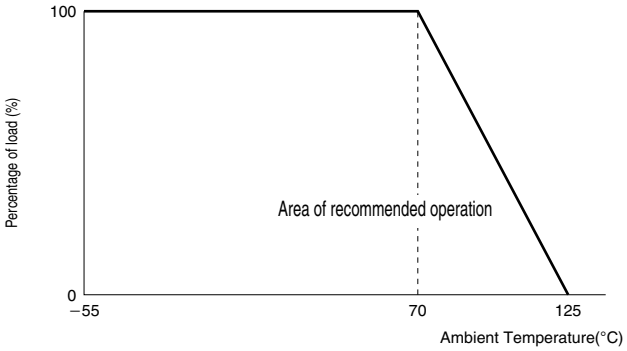
*Refer to Tape and Packaging information on pages 48 and 49.

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

●Derating Curve

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



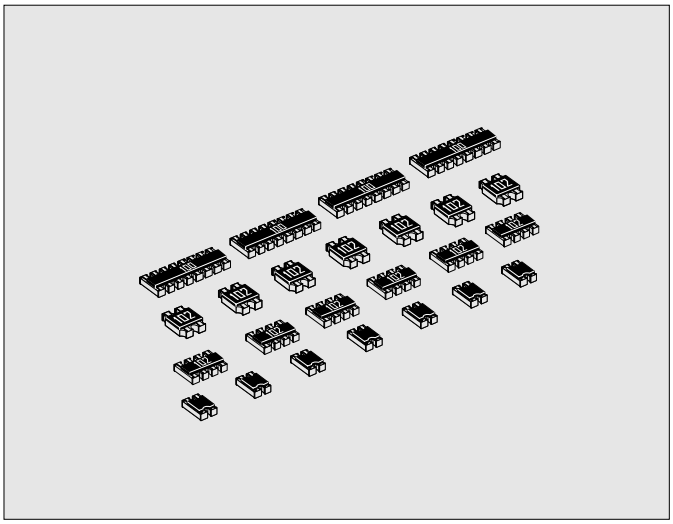
●Performance Characteristics

Description	Requirements		Test Method JIS C5202-1990
Resistance	RHC16	RHC20	5.1 clause Measuring voltage: 15V
	Within specified tolerance		
Temperature characteristic of resistance	See Rating Table		5.2 clause Measuring temperature: 5°C/35°C
Voltage coefficient	100M ohm≤R<100G ohm : within ±1%/V 100G ohm≤R≤150G ohm : within ±2%/V	100M ohm≤R≤10G ohm : within 0~−2%/V 100G ohm≤R≤150G ohm : within ±10%/V	5.3 clause Measuring voltage: 5V/15V
Insulation resistance	At least 10T ohm		5.6 clause 100Vd.c., 60s
Solderability	At least 95% of the terminal surface must be covered by new solder		6.11 clause Dip into 235°C solder bath for 2s.
Resistance to soldering heat	100M ohm≤R≤10G ohm : within ±1% 10G ohm<R≤150G ohm : within ±2% No major visible damage	100M ohm≤R≤10G ohm : within ±1% 100G ohm≤R≤150G ohm : within ±5%	6.10 clause Dip into 260°C solder bath for 10s.
Rapid change of temperature	100M ohm≤R≤10G ohm : within ±1% 10G ohm<R≤150G ohm : within ±2% No major visible damage	100M ohm≤R≤10G ohm : within ±1% 100G ohm≤R≤150G ohm : within ±5%	7.4 clause Cycle between −55°C and +125°C for 5 cycles.
Moisture resistance property (steady state)	100M ohm≤R≤10G ohm : within ±2% 10G ohm<R≤150G ohm : within ±5% No major visible damage	100M ohm≤R≤10G ohm : within ±2% 100G ohm≤R≤150G ohm : within ±5%	7.5 clause 40°C, 90~95%R.H., 1,000h.
Endurance at 70°C (rated load)	100M ohm≤R≤10G ohm : within ±3% 10G ohm<R≤150G ohm : within ±5% No major visible damage	100M ohm≤R≤10G ohm : within ±3% 100G ohm≤R≤150G ohm : within ±20%	7.10 clause Rated voltage, 1.5 h "ON", 0.5h "OFF", 70°C, 1,000h.
Capacity	1.0pF or less		Measuring voltage: 1V, Measuring frequency: 10k, 100k, 1MHz.

RAC

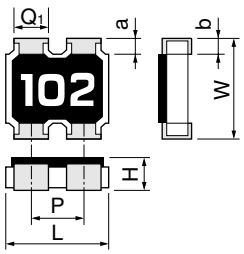
●Features

1. High-density SMD packaging contributes higher productivity and reduces assembly costs.
2. Stability Class : 5%



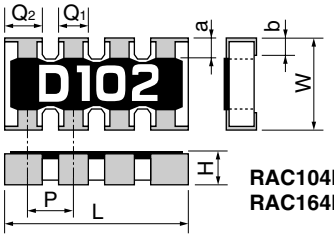
●Dimensions and Circuits

Terminal Style: A



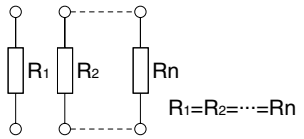
RAC162D

Terminal Style: C



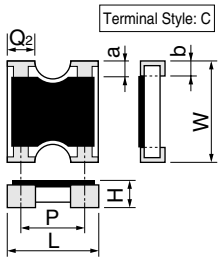
RAC104D
RAC164D

Circuits



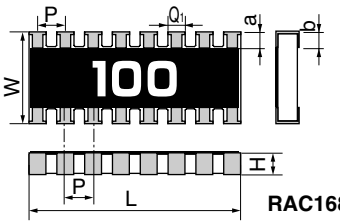
• Please contact KAMAYA for different resistance values.

Terminal Style: C



RAC102D

Terminal Style: C



RAC168D NEW

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

Unit : mm

Style	Terminal Style	L	W	H	Q_1	*Q_2	a	b	*P	*Unit weight/pc.
RAC102D	**C**	1.0±0.05	1.0±0.05	0.35±0.05	–	0.33	0.15±0.10	$0.25^{+0.05}_{-0.10}$	0.65	1.1mg
RAC104D	**C**	2.0±0.1	1.0±0.1	0.35±0.05	0.35±0.1	0.45	0.15±0.10	0.25±0.10	0.5	2.1mg
RAC162D	**A**	1.6±0.1	1.6±0.1	0.5 ±0.1	0.5 ±0.1	–	0.25±0.10	$0.25^{+0.15}_{-0.10}$	0.8	3.5mg
RAC164D	**C**	3.2±0.1	1.6±0.1	0.5 ±0.1	0.4 ±0.15	0.6	0.3 ±0.2	0.25±0.15	0.8	7mg
RAC168D	**C**	3.8±0.1	1.6±0.1	0.45±0.1	0.3 ±0.1	0.3	0.3 ±0.1	0.3 ±0.1	0.5	8.3mg

*Values for reference

●Part Number Description

Example

Style

RAC	16	2	D	103	J	A	B

Product Type

Size

10	W:1.0mm
16	W:1.6mm

No. of Elements

2	2-Elements
4	4-Elements
8	8-Elements

Circuits

D	Isolation

Rated Resistance

E24 Series e.g.:103=10k ohm	Resistor
JP	Jumper

Tolerance on Rated Resistance

F	±1%	Resistor
J	±5%	
None	————	Jumper

Terminal Style

A	Convex Type	Without corner
C		With corner

*** Packaging & Standard Qty. (Min.)**

B	Bulk (Loose Package)	1,000pcs.	All Styles
TH	Paper Tape (2 mm pitch)	10,000pcs.	RAC102D RAC104D
TP	Paper Tape	5,000pcs.	RAC162D RAC164D RAC168D

*Refer to Tape and Packaging information on pages 48 and 49.

FIXED CHIP RESISTOR NETWORKS; RECTANGULAR TYPE RAC

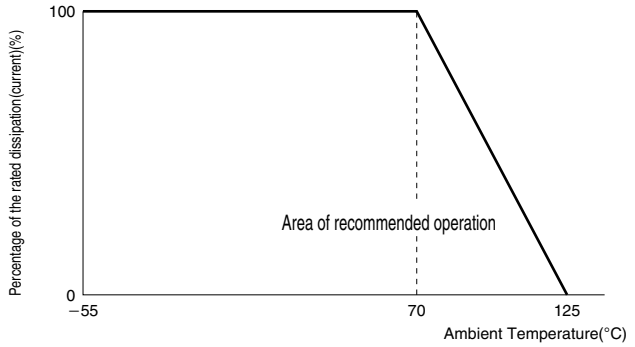
●Ratings

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								
RAC162D		0.125					50		100	
RAC164D		0.25			F(±1%)J(±5%)					
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.

●Derating Curve

The derated values of dissipation for temperatures in excess of 70°C shall be indicated by the following Curve.
(For Jumpers the load current shall be derated according to the Derating Curve)



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

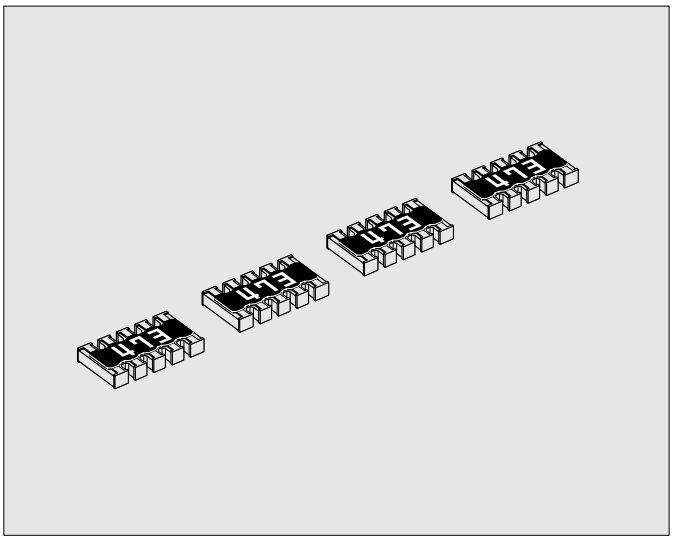
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 RAC102D, 104D 50Va.c.,60s RAC162D, 104D, 168D 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/−55°C/+20°C/+125°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the Immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) and b) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 Amount of bend : 3 mm

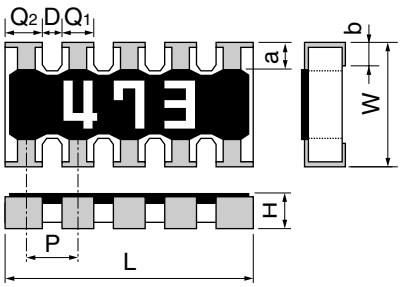
RAC168U

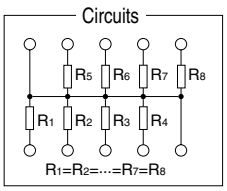
●Features

1. Highly suitable for the purposes of pull-up and pull-down.
2. Easy to handle because of no specified direction for mounting due to the symmetrical position of common terminals.
3. Stability Class : 5%



●Dimensions and Circuits





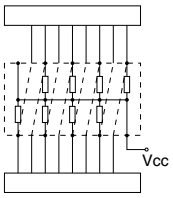
Rated resistance is marked with 3-digit on the over coating.

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

●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.

●Part Number Description

Example

Style

RAC	16	8	U	103	J	C	TP

Product Type

No. of Elements

8	8-Elements

Rated Resistance

E24 Series
e.g. : 103=10k ohm

Terminal Style

C	Convex Type	With corner

Size

16	W:1.6mm

Circuits

U	Common Electrode 2: Same Type

Tolerance on Rated Resistance

J	±5%

*** Packaging & Standard Qty. (Min.)**

B	Bulk (Loose Package)	1,000pcs.
TP	Paper Tape	5,000pcs.

*Refer to Tape and Packaging information on pages 48 and 49.

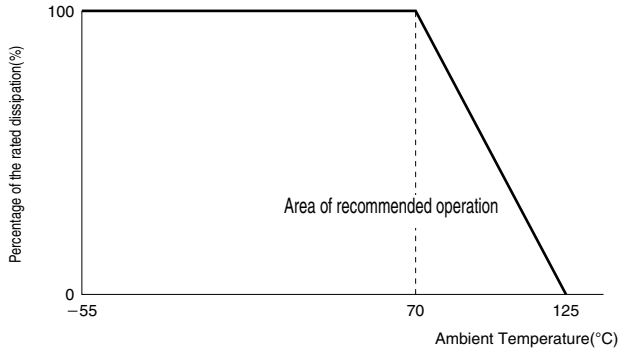
●Ratings

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.

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Clause 4.8 Measuring temperature : +20°C/−55°C/ +20°C/+125°C/+20°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 ohm)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 ohm) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) of Clause 4.24.2.1
Endurance at 70°C	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 ohm) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 ohm)	Clause 4.33 Amount of bend : 3 mm

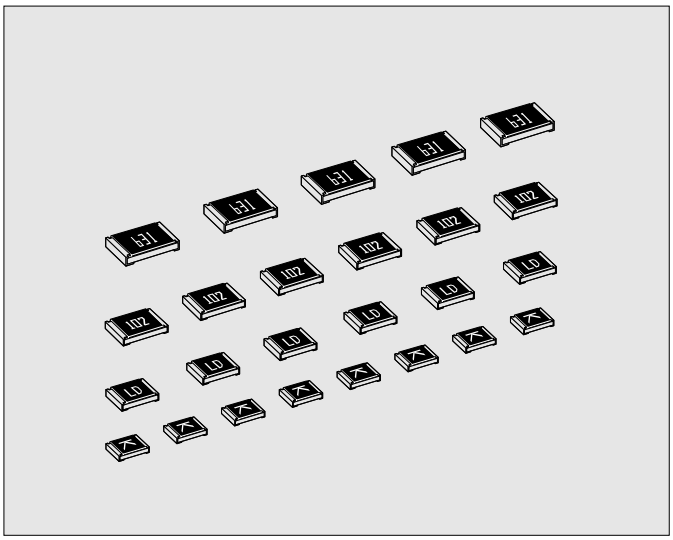
FCC,FHC

●Features

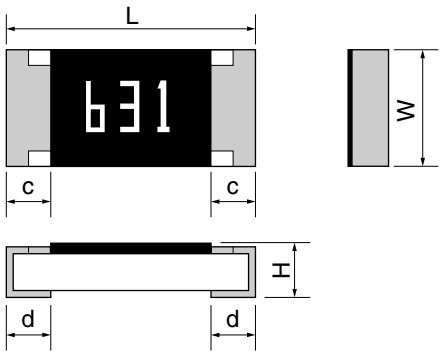
1. Fast-Acting Type
2. Suitable for over-current protection of the circuit of miniture portable equipment.
3. 4 sizes available : from 0402 to 1206.
4. No smoke, no flame, at the fusing conditions.
5. Certified UL and c-UL.
   •File No.: E176847

c UL us

6. Major applications
   •PC related equipment and peripherals (PC, Hard Drive, Printer etc.).
   •Small portable devices (Mobile phone, PDA Battery Charger etc.).
   •Digital Camera (Digital still camera).
   •Game equipment.



●Dimensions



Current value is marked on the over coating.
Please refer to Ratings Table on next page.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FCC10 / FHC10	1005	0402	1.0±0.05	0.5 ±0.05	0.4 ±0.1	0.2±0.10	0.25±0.10	0.8mg
FCC16 / FHC16	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
FCC20 / FHC20	2012	0805	2.0±0.1	1.25±0.10	0.6 ±0.1	0.4±0.2	0.4 ±0.2	6mg
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

*Values for reference

●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	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

*Refer to Tape and Packaging information on pages 48 and 49.

CHIP FUSES; RECTANGULAR TYPE FCC FHC

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

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Category Temperature Range °C
Metric	Inch		Code	A					
1005	0402	FCC10	151	0.15	2,700	O	32Vd.c. 35A	Rated Current×250% Opening Time 5s max.	−55～+125
			201	0.2	1,000	Z	30Vd.c. 35A		
			251	0.25	750	C			
			321	0.315	620	D			
			401	0.4	340	E			
			501	0.5	290	F			
			631	0.63	210	I			
			801	0.8	150	K			
			102	1.0	120	L			
			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. 35A		
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			

●Performance Characteristics

Description	Requirements	Test Methods
Carrying capacity	No fusing	Carrying Current : Rated current × 110%, 70°C, 1h.
Temperature rise on the surface	75°C max.	Ambient temperature : 10°C~30°C Carrying Current : Rated current
Bend strength of the face plating	No visible damage	**IEC 60127-4** Clause 8.3 1mm/s, amount of bend : 3 mm
Solderability	At least 95% of the terminal surface must be covered by new solder	**IEC 60127-4** Clause 8.5 Be immersed into solder at 235°C for 2s.
Resistance to soldering heat	No visible damage. Meet electrical requirement	**IEC 60127-4** Clause 8.7 Be immersed into solder at 260°C for 10s.
Endurance (rated load)	The voltage drop shall not have increased by more than 10% of the value measured before the test	**IEC 60127-4** Clause 9.4 At normal condition. Rated current ×1.05, 1h"ON", a quarter"OFF",100 cycles. Rated current ×1.25, 1h.

Note. Please contact KAMAYA for special applications.

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

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Time/Current Characteristics	Category Temperature Range °C
Metric	Inch		Code	A					
1005	0402	FCC10	201	0.2	2,400	Z	30Vd.c. 35A	Rated Current×200% Opening Time 5s max.	−55～+125
			251	0.25	1 ,000	C			
			321	0.315	750	D			
			401	0.4	620	E			
			501	0.5	340	F			
			631	0.63	290	I			
			751	0.75	220	A			
			801	0.8	210	K			
			102	1.0	150	L			
			132	1.25	120	M			
			152	1.5	100	H			
			162	1.6	90	N			
		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		

●Option Code : AA (Fast-Acting type)

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

●Recommended Derating for Rated Current

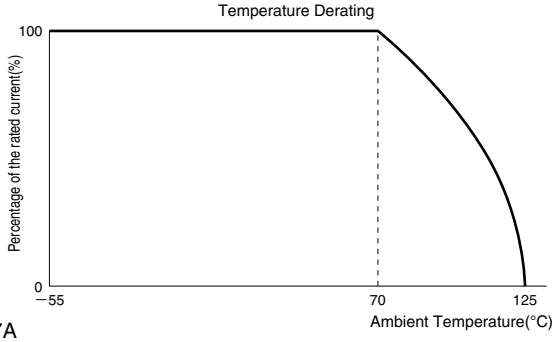
- Nominal Derating

  Option Code AD:Nominal Derating ≤ 80% of Rated Current

  Option Code AB:Nominal Derating ≤ 70% of Rated Current

- Temperature Derating

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



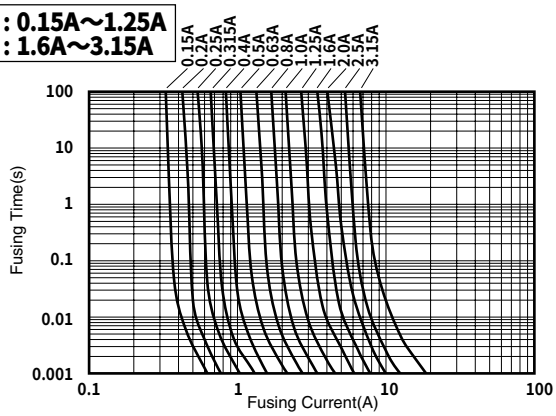
Ex.) If FCC16 102AB (Rated Current:1.0A) is used under ambient temperature 70°C, Kamaya recommends, less than the current value derated as below,

Rated Current：1.0A× (Nominal Derating : 70%×Temperature Derating : 100%) =0.7A

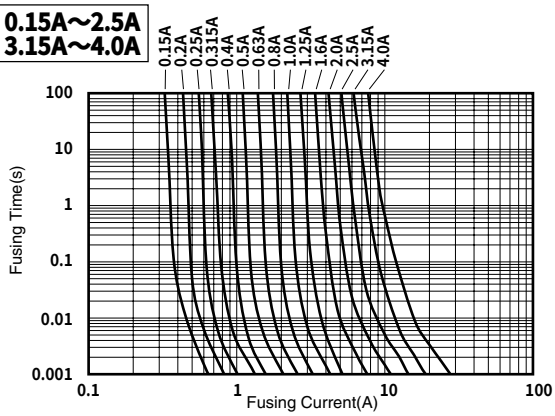
NOTE » Please contact Kamaya Sale Dept, if you need to confirm Inrush current endurance, Anti-pulse performance etc.
We can provide Application Guide for FCC, FHC selection.

●Time / Current Characteristics

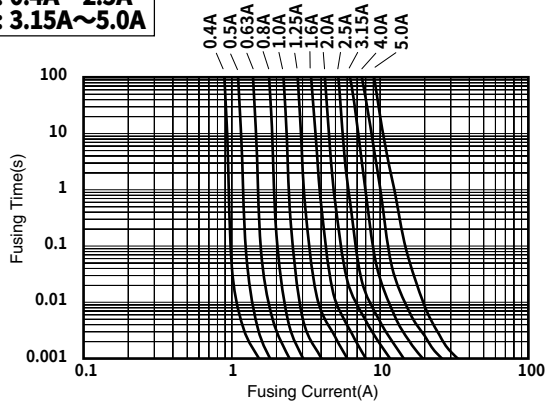
FCC10 AD : 0.15A～1.25A
FHC10 AD : 1.6A～3.15A



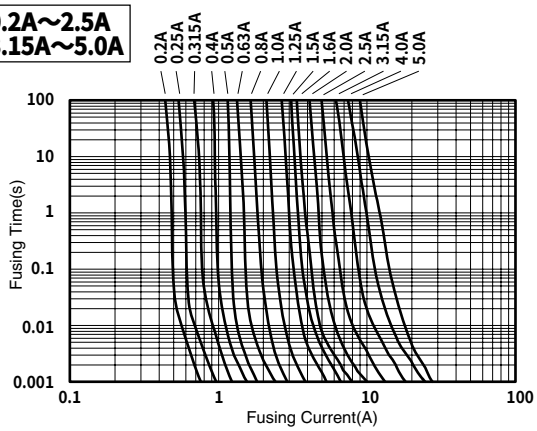
FCC16 AD : 0.15A～2.5A
FHC16 AD : 3.15A～4.0A



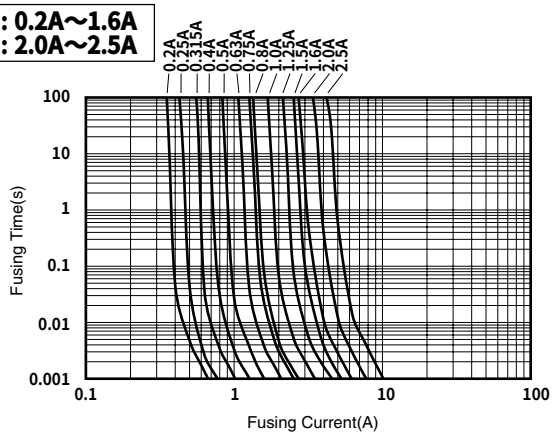
FCC20 AD : 0.4A～2.5A
FHC20 AD : 3.15A～5.0A



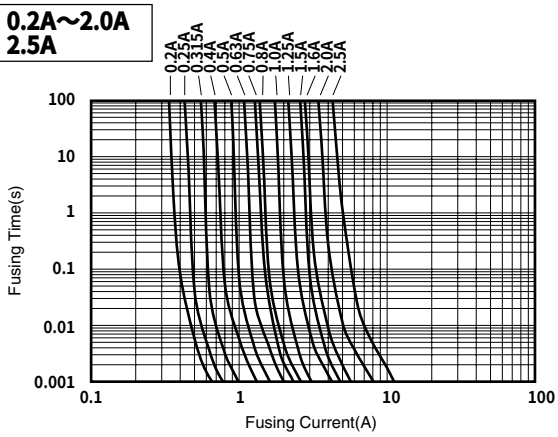
FCC32 AD : 0.2A～2.5A
FHC32 AD : 3.15A～5.0A



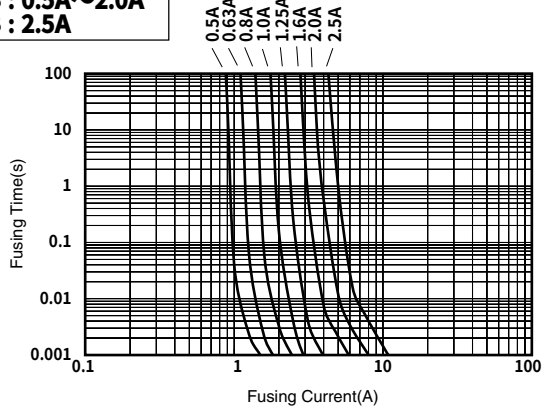
FCC10 AB : 0.2A～1.6A
FHC10 AB : 2.0A～2.5A



FCC16 AB : 0.2A～2.0A
FHC16 AB : 2.5A



FCC20 AB : 0.5A～2.0A
FHC20 AB : 2.5A



NEW

CHIP FUSES; RECTANGULAR TYPE **KAMAYA OHM**

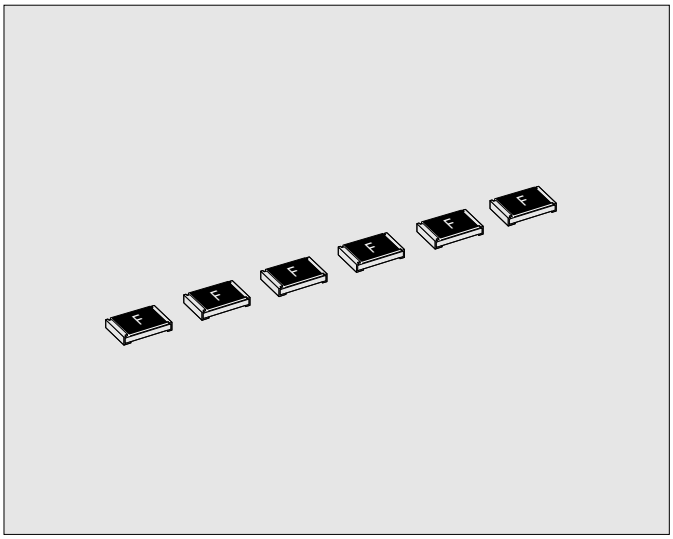
FMC/Low Ohm & Fast Acting

●Features

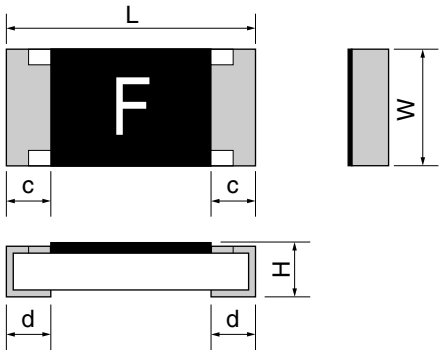
1. Suitable for over-current protection of the circuit of miniature portable equipment.
2. Low internal resistance compared with FCC/FHC16 AB series for low power consumption and voltage dropping.
3. Certified UL, c-UL.
   ·File No. : E176847

c UL us

4.Major application
- •PC related equipment and peripherals (PC, Hard Drive, Printer etc.).
- •Small portable devices (Mobile phone, PDA Battery Charger etc.).
- •Digital Camera (Digital still camera).
- •Game equipment.
- •LCD monitors, LCD modules.
- •Battery pack.



●Dimension



Current value is marked on the cover coating.
Please refer to Ratings table on next page.

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

●Part Number Description

Example

Style: FMC | 16 | 252 | AB | TP

Product Type
FMC

Size		
Code	Metric	Inch
16	1608	0603

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

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

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

*Refer to Tape and Packaging information on pages 48 and 49.

NEW CHIP FUSES; RECTANGULAR TYPE FMC

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

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics	Category Temperature Range °C
Metric	Inch		Code	A					
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			

●Performance Characteristics

Description	Requirements	Test Methods
Temperature rise on the surface	75°C max.	Ambient temperature : 10°C~30°C Carrying Current : Rated current
Bend strength of the face plating	No visible damage	**IEC 60127-4** Clause 8.3 1mm/s, amount of bend : 3 mm
Solderability	At least 95% of the terminal surface must be covered by new solder	**IEC 60127-4** Clause 8.5 Be immersed into solder at 235°C for 2s.
Resistance to soldering heat	No visible damage. Meet electrical requirement	**IEC 60127-4** Clause 8.7 Be immersed into solder at 260°C for 10s.

Note. Please contact KAMAYA for special applications.

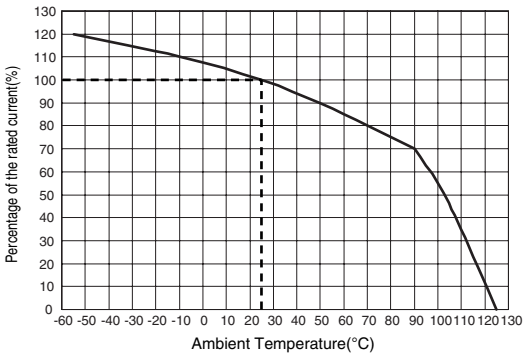
●Recommended Derating for Rated Current

- Nominal Derating

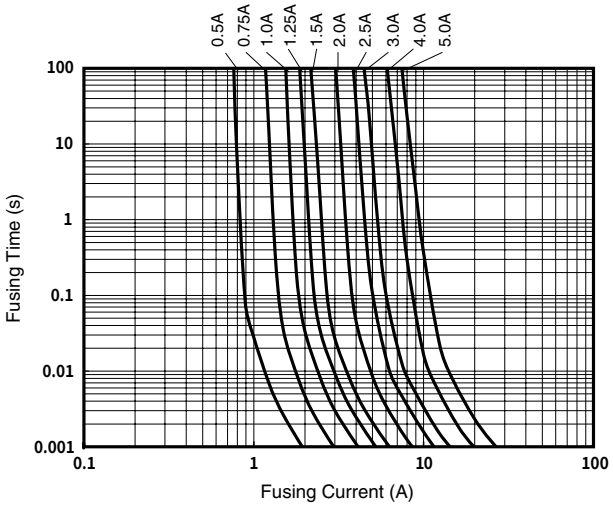
  Nominal Derating ≤ 75% of Rated Current
- Temperature Derating

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

Ex.) If FSC16 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

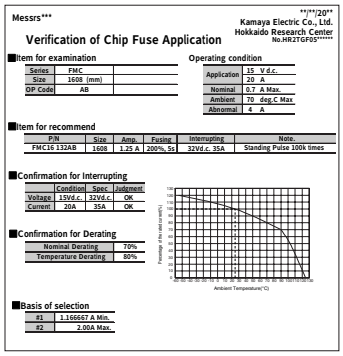


●Time / Current Characteristics



●Help Support of Fuse Selection

Please contact kamaya sales Dept, if you need to confirm In-rush Current endurance, Anti-pulse performance etc. We can provide Application Guide for FMC16 selection.


Messrs***

Verification of Chip Fuse Application

Kamaya Electric Co., Ltd.
Hokkaido Research Center

■Item for examination

Series	FMC
Size	1608 (mm)
OP Code	AB

Operating condition

Application	15 V d.c.
	20 A
Nominal	0.7 A Max.
Ambient	70 deg.C Max
Abnormal	4 A

■Item for recommend

P/N	Size	Amp.	Fusing	Interrupting	Note
FMC16 132AB	1608	1.25 A	200%, 5s	32Vd.c. 35A	Standing Pulse 100k times

■Confirmation for Interrupting

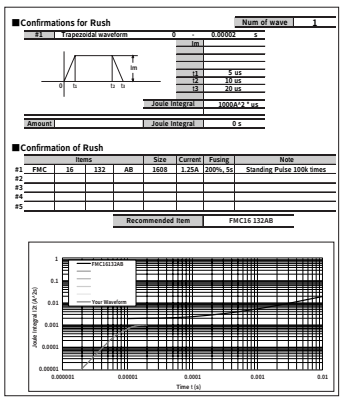
	Condition	Spec.	Judgment
Voltage	15Vd.c.	32Vd.c.	OK
Current	20A	35A	OK

■Confirmation for Derating

Nominal Derating	70%
Temperature Derating	80%

■Basis of selection

#1	1.166667 A Min.
#2	2.00A Max.


■Confirmations for Rush

#1	Trapezoidal waveform	0	0.00002	s
		Im		
		t1	5 us	
		t2	10 us	
		t3	20 us	
	Joule Integral		1000A^2 * us	
Amount		Joule Integral	0 s	

■Confirmation of Rush

	Items		Size	Current	Fusing	Note
#1	FMC	16	132	AB	1608	1.25A	200%, 5s	Standing Pulse 100k times
#2								
#3								
#4								
#5								

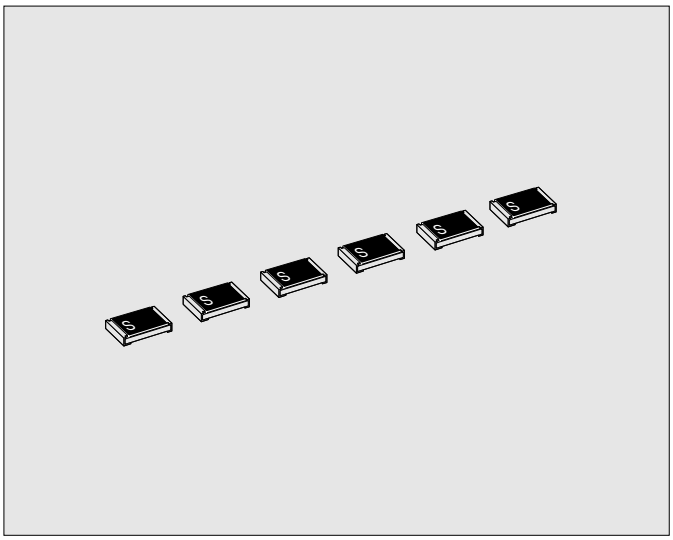
Recommended Item	FMC16 132AB

FSC/In-rush Withstand

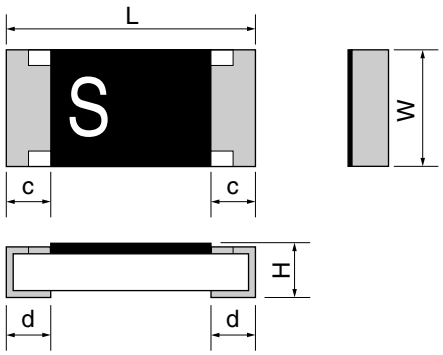
●Features

1. 0603inch size is available and suitable for circuit protection of portable devices and terminals.
2. High anti pulse performance.
3. Certified UL, c-UL.
   ·File No. : E176847

4.Major application
- •PC related equipment and peripherals (PC, Hard Drive, Printer etc.).
- •Small portable devices (Mobile phone, PDA Battery Charger etc.).
- •Digital Camera (Digital still camera).
- •Game equipment.
- •LCD monitors, LCD modules.
- •Battery pack.



●Dimension



Current value is marked on the cover coating.
Please refer to Ratings table on next page.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FSC16	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

●Part Number Description

Example

Style: FSC 16

Product Type
FSC

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	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 48 and 49.

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

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics	Category Temperature Range °C
Metric	Inch		Code	A					
1608	0603	FSC16	501	0.5	400	F	32Vd.c. 35A	Rated Current / Opening time ×100% / 4h Min. ×200% / 5s Max. ×300% / 0.2s Max.	−55～+125
			631	0.63	300	I			
			751	0.75	210	A			
			801	0.8	180	K			
			102	1.0	115	L			
			132	1.25	90	M			
			152	1.5	70	H			
			162	1.6	60	N			
			202	2.0	50	S			
			252	2.5	37	T			
			302	3.0	28	R			
			322	3.15	26	U			
			402	4.0	18	X			
			502	5.0	14	Y			

●Performance Characteristics

Description	Requirements	Test Methods
Temperature rise on the surface	75°C max.	Ambient temperature : 10°C~30°C Carrying Current : Rated current
Bend strength of the face plating	No visible damage	**IEC 60127-4** Clause 8.3 1mm/s, amount of bend : 3 mm
Solderability	At least 95% of the terminal surface must be covered by new solder	**IEC 60127-4** Clause 8.5 Be immersed into solder at 235°C for 2s.
Resistance to soldering heat	No visible damage. Meet electrical requirement	**IEC 60127-4** Clause 8.7 Be immersed into solder at 260°C for 10s.

Note. Please contact KAMAYA for special applications.

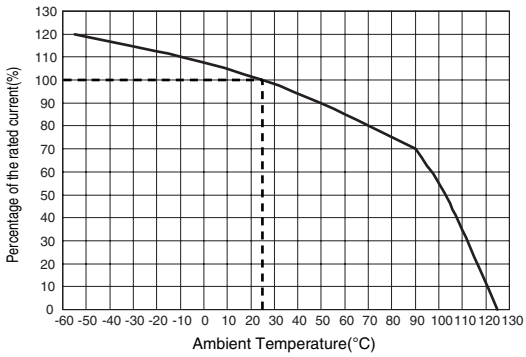
●Recommended Derating for Rated Current

- Nominal Derating

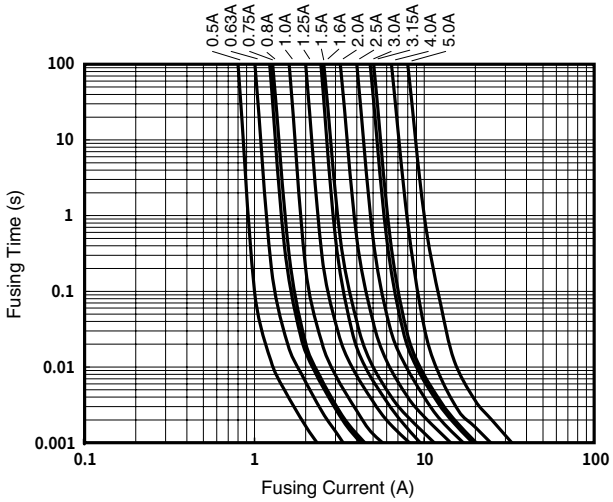
  Nominal Derating ≤ 75% of Rated Current
- Temperature Derating

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

Ex.) If FSC16 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

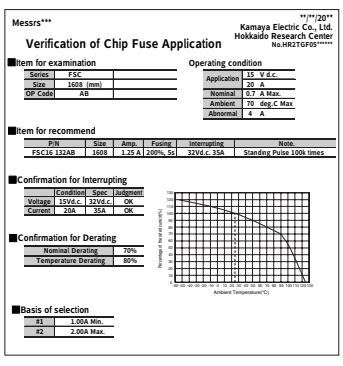


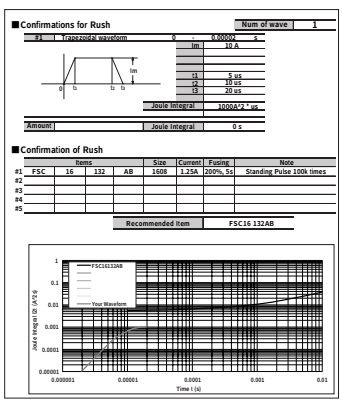
●Time / Current Characteristics



●Help Support of Fuse Selection

Please contact kamaya sales Dept, if you need to confirm In-rush Current endurance, Anti-pulse performance etc. We can provide Application Guide for FSC16 selection.



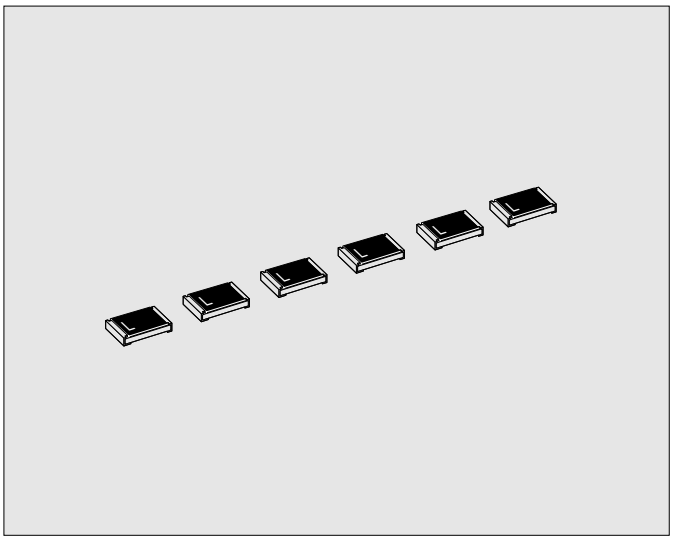


FLC/Low-ratio Fusing

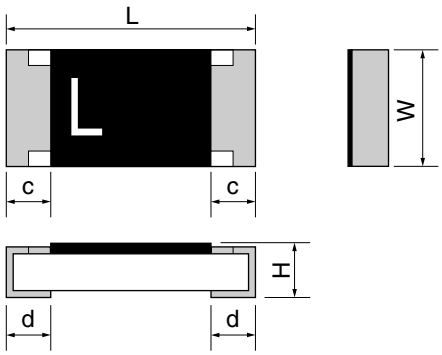
●Features

1. Low-ratio fusing.
   ·Rated Current ×140% fusing (120s Typical.)
2. Certified UL, and c-UL.
   ·File No. : E176847

3.Major application
- •PC related equipment and peripherals (PC, Hard Drive, Printer etc.).
- •Small portable devices (Mobile phone, PDA Battery Charger etc.).
- •Digital Camera (Digital still camera).
- •Game equipment.
- •LCD monitors, LCD modules.
- •Battery pack.



●Dimension



Current value is marked on the cover coating.
Please refer to Ratings table on next page.

Unit : mm

Style	Metric	Inch	L	W	H	c	d	*Unit weight/pc.
FLC16	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

●Part Number Description

Example

Style: FLC | 16 | 102 | AF | TP

Product Type
FLC

Size		
Code	Metric	Inch
16	1608	0603

Rated Current	
e.g. :102=1.0A 132=1.25A 202=2.0A	3digit

Option Code	
Code	Clearing Time
AF	Rated Current×160% 5s max.

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

*Refer to Tape and Packaging information on pages 48 and 49.

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

Size		Style	Rated Current		Internal Resistance m ohm max.	Mark	Interrupting Rating	Electrical Characteristics		Category Temperature Range °C
Metric	Inch		Code	A						
1608	0603	FLC16	102	1.0	120	L	32Vd.c. 35A	Rated Current	Opening time	−55～+125
			132	1.25	100	M		×100%	4h Min.	
			162	1.6	75	N		×160%	5s Max.	
			202	2.0	55	S				

●Performance Characteristics

Description	Requirements	Test Methods
Temperature rise on the surface	75°C max.	Ambient temperature : 10°C~30°C Carrying Current : Rated current
Bend strength of the face plating	No visible damage	**IEC 60127-4** Clause 8.3 1mm/s, amount of bend : 3 mm
Solderability	At least 95% of the terminal surface must be covered by new solder	**IEC 60127-4** Clause 8.5 Be immersed into solder at 235°C for 2s.
Resistance to soldering heat	No visible damage. Meet electrical requirement	**IEC 60127-4** Clause 8.7 Be immersed into solder at 260°C for 10s.

Note. Please contact KAMAYA for special applications.

●Recommended Derating for Rated Current

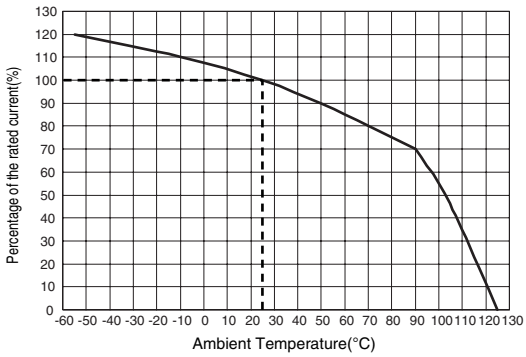
- Nominal Derating

  Nominal Derating ≦ 70% of Rated Current
- Temperature Derating

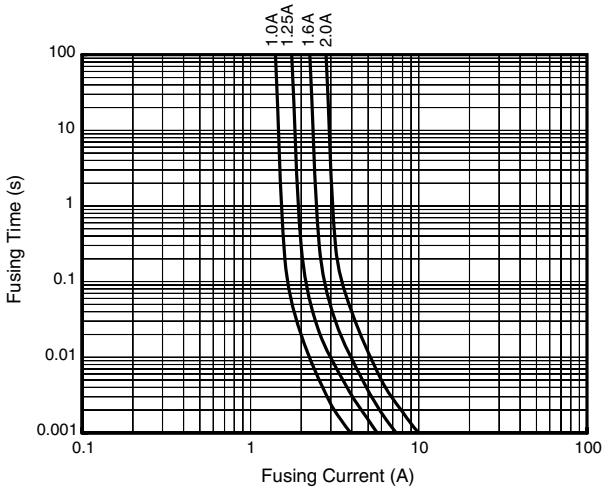
  Please refer to the following graph regarding the current derating value for ambient temperature.

Ex.) If FLC16 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 : 80%) = 0.56A

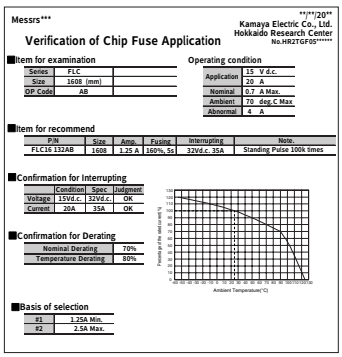


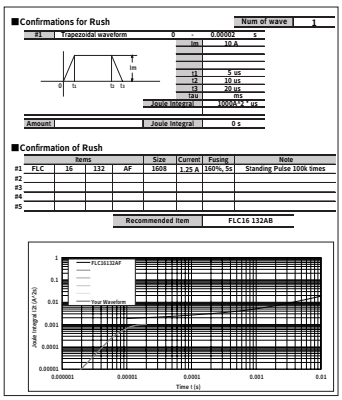
●Time / Current Characteristics



●Help Support of Fuse Selection

Please contact kamaya sales Dept, if you need to confirm In-rush Current endurance, Anti-pulse performance etc. We can provide Application Guide for FLC16 selection.

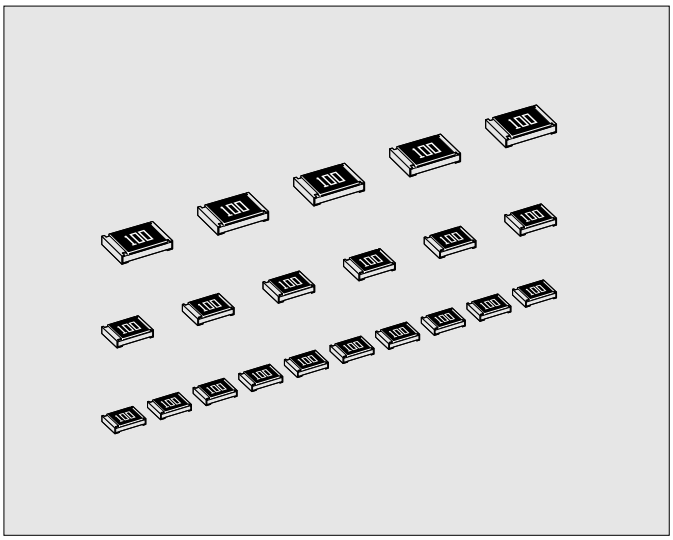




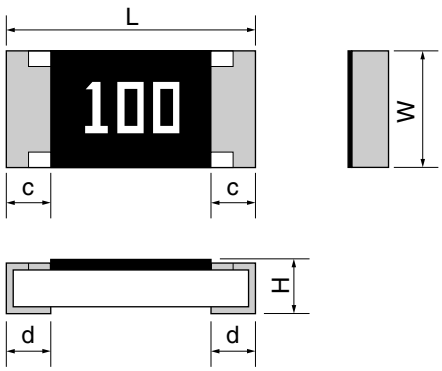
FRC

●Features

1. No flame, No smoke in overload conditions.
2. Suitable for Battery circuit and Power supply circuit.



●Dimension



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

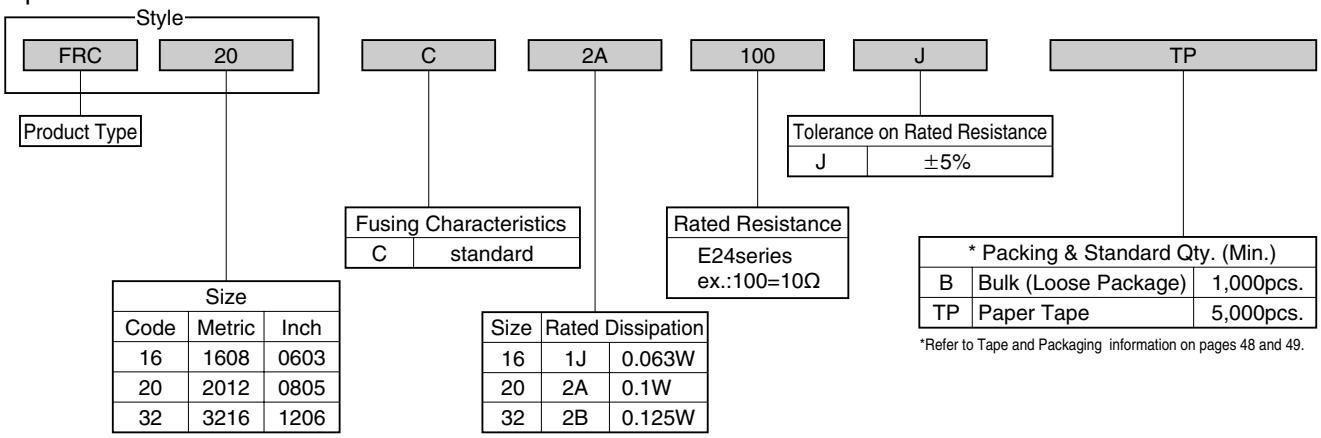
Unit : mm

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

●Part Number Description

Example



*Refer to Tape and Packaging information on pages 48 and 49.

CHIP FUSIBLE RESISTORS; RECTANGULAR TYPE FRC

●Ratings

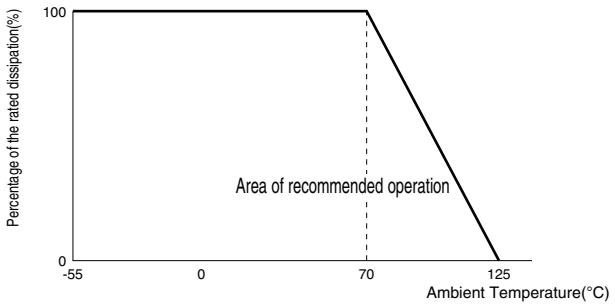
Style	Size Metric (Inch)	Rated Dissipation W	Rated Resistance Range	Tolerance on Rated Resistance	Temperature Coefficient of Resistance 10^{-6}/°C	Preferred Number Series for Resistors	Fusing Characteristic		Maximum open-circuit voltage	Category Temperature Range °C
							Applied Power	Fusing Time		
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					2.5W			

Note1. Rated Voltage = $\sqrt{(\text{Rated Dissipation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Contact us for further information on other style, resistance and pre-arcing time-current characteristic than those mentioned above.
Note3. Contact us for information when inrush and surge voltage are supposed to be applied.
Note4. Maximum open circuit voltage is the value of voltage applicable to both ends of resistors,when a 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.

●Derating Curve

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



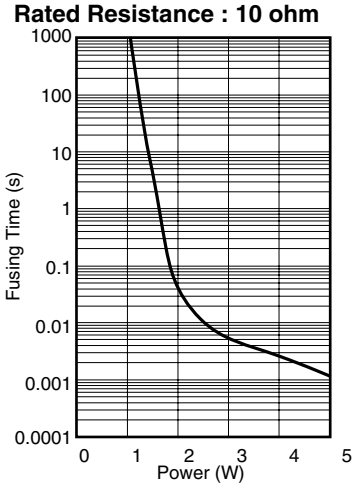
●Performance Characteristics

Description	Requirements	Test Method JIS C5202-1990	
Resistance	Within specified tolerance	5.1 clause	
Temperature characteristic of resistance	See Ratings Table	5.2 clause	Room temp. and 100°C above.
Overload	ΔR≤±5% No major visible damage	5.5 clause	Rated voltage ×2.5, 5s
Resistance to soldering heat	ΔR≤±3%	6.4 clause	Dip into 260°C Solder bath for 10s.
Rapid change of temperature	ΔR≤±5% No major visible damage	7.4 clause	5 cycle between −55°C and +125°C.
Endurance in humidity	ΔR≤±5% No major visible damage	7.9 clause	Rated voltage, 1.5h "ON", 0.5h "OFF", 40°C, 95%R.H., 1,000h.
Endurance at 70°C	ΔR≤±5% No major visible damage	7.10 clause	Rated voltage, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.

●Example of Typical Fusing Characteristics

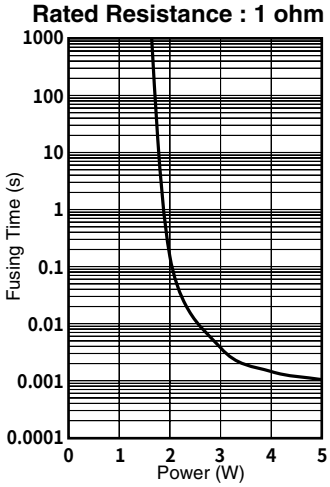
FRC16

Rated Resistance : 10 ohm



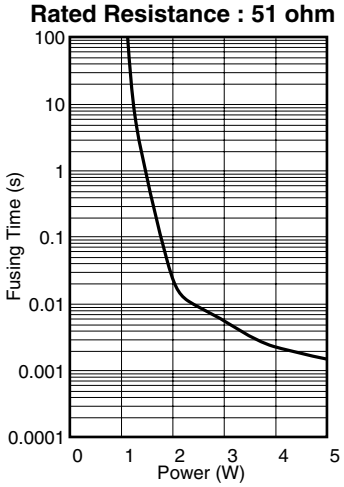
FRC20

Rated Resistance : 1 ohm



FRC32

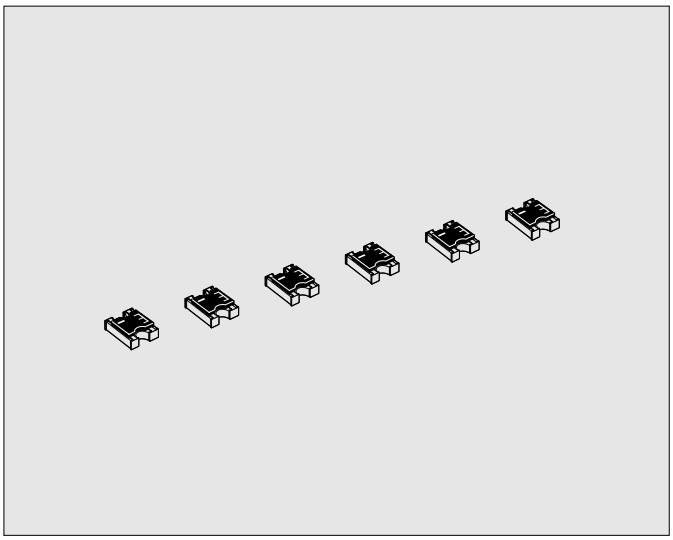
Rated Resistance : 51 ohm



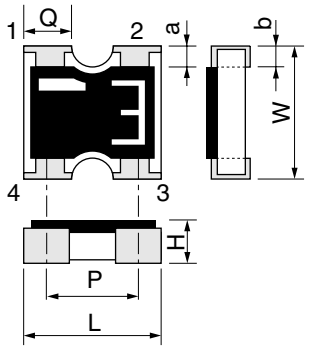
RAC101A

●Features

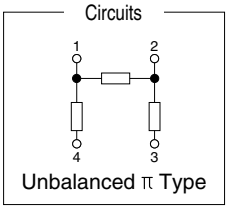
1. Suitable for use at DC and up to UHF band frequencies.
2. 75 ohm is available upon request.
3. Replaceable three discrete resistors with one chip on attenuation circuits.



●Dimensions and Circuits



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



Unit : mm

Style	Terminal Style	L	W	H	Q	a	b	*P	*Unit weight/pc.
RAC101A	**C**	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

*Values for reference

●Part Number Description

Example

Style

RAC	10	1	A	1	C	TH

Product Type

Characteristic Impedance

1	50 ohm

Size

10	W:1.0mm

Circuits

A	Unbalanced πType

Attenuation Factor

0	0dB
X	0.5dB
1	1dB
Y	1.5dB
2	2dB
3	3dB
4	4dB
5	5dB
6	6dB
7	7dB
8	8dB
9	9dB
A	10dB
B	11dB
C	12dB
D	13dB
E	14dB
F	15dB
G	16dB
H	17dB
J	18dB
K	19dB
L	20dB

Terminal Style

C	Convex Type	With corner

*** Packaging & Standard Qty. (Min.)**

B	Bulk (Loose Package)	1,000pcs.
TH	Paper Tape (2 mm pitch)	10,000pcs.

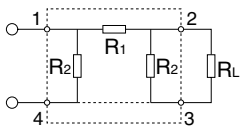
*Refer to Tape and Packaging information on pages 48 and 49.

●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 °C
RAC101A	—	0	0	—	—	DC ≤f ≤3GHz	100	–40~+125
	50 ohm	X	0.5	±0.1	1.1max.			
		1	1	±0.3	1.2max.			
		Y	1.5					
		2	2					
		3	3					
		4	4					
		5	5					
		6	6	±0.4				
		7	7					
		8	8					
		9	9					
		A	10					
		B	11	±0.8				
		C	12					
		D	13					
		E	14	±1.0				
		F	15	±1.5				
		G	16					
		H	17	±2.0				
		J	18					
		K	19					
		L	20	±2.5				

Note. The following information is available.
1. Test methods for Attenuation Factor and VSWR characteristics.

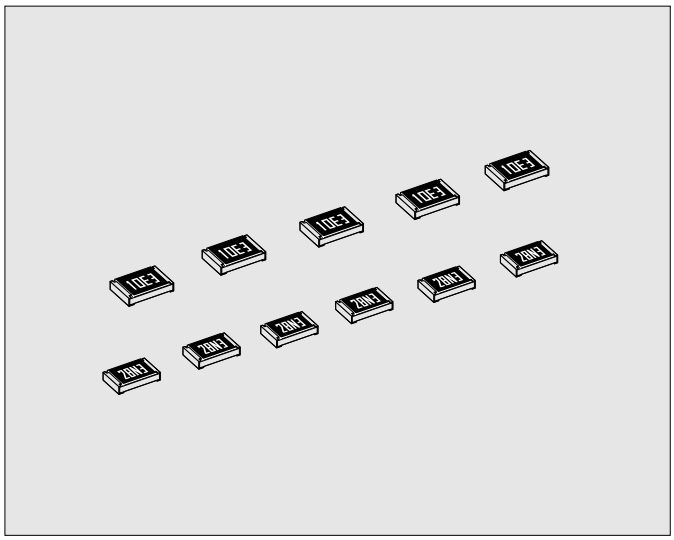
●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements 0.5~2dB	3dB~5dB	6dB~20dB	Test Methods
Characteristic impedance	50 ohm			Measuring Circuits  RL=50 ohm
Insulation resistance	At least 100M ohm			50Vd.c., 60s
Solderability	In accordance with Clause 4.17.4.5			Clause 4.17 Dip into 235°C Solder bath for 2s.
Resistance to soldering heat	Within ±0.1dB No major visible damage.	Within ±0.2dB	Within ±0.3dB	Clause 4.18 Dip into 260°C Solder bath for 5s.
Rapid change of temperature	Within ±0.1dB No major visible damage.	Within ±0.2dB	Within ±0.3dB	Clause 4.19 5 cycles between –55°C and +125°C.
Endurance at 85˚C	Within ±0.1dB	Within ±0.2dB	Within ±0.3dB	Clause 4.25.1 Rated input power, 1.5h"ON", 0.5h"OFF", 85°C, 1,000h.
Bend strength of the face plating	Within ±0.1dB	Within ±0.2dB	Within ±0.3dB	Clause 4.33 Amount of bend : 3 mm

LTC

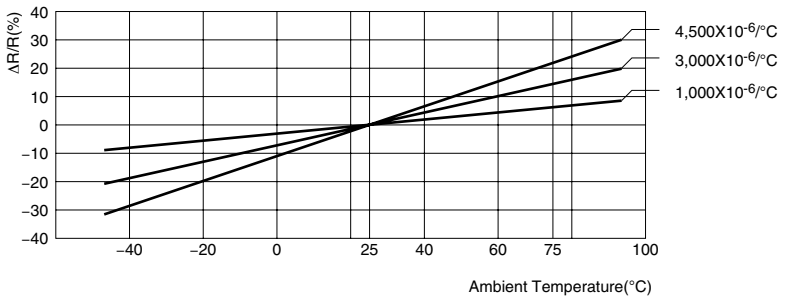
●Features

1. Linearity of resistance change in wide temperature range.
2. Suitable for temperature compensation, temperature sensing and controling, and circuit protection applications.
3. Stability Class : 5%

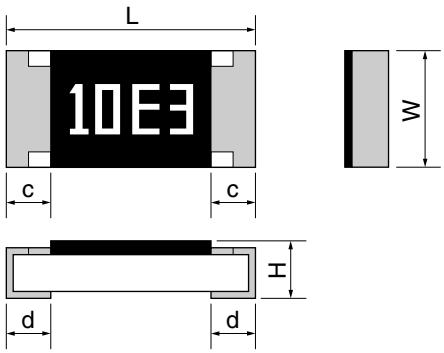


●Termal Characteristics

Temperature Characteristics and Linearity



●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

●Part Number Description

Example

Style: LTC | 1/8 — 30 — 102 — J — B

Product Type

Rated Dissipation & Size

Code	Rated Dissipation	Metric	Inch
1/10	0.1W	2012	0805
1/8	0.125W	3216	1206

Temperature Coefficient of Resistance

Refer to Ratings Table on next page
e.g.: 30=3,000×10^{-6}/°C

Rated Resistance

E24 Series
e.g.:102=1k ohm

Tolerance on Rated Resistance

J	±5%

*** Packaging & Standard Qty. (Min.)**

B	Bulk (Loose Package)	1,000pcs.
TP	Paper Tape	5,000pcs.

*Refer to Tape and Packaging information on pages 48 and 49.

LINEAR POSITIVE T-C CHIP THERMISTORS; RECTANGULAR TYPE LTC

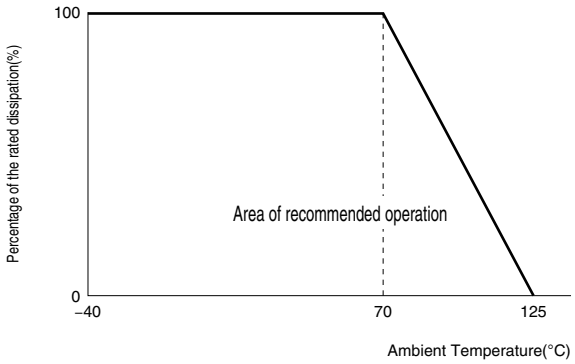
●Ratings

Temperature Coefficient of Resistance 10^{-6}/°C	Code	Resistance Temperature Coefficient Tolerance	Rated Resistance Range (Rated Dissipation at 70°C) LTC1/10 (0.1W)	LTC1/8 (0.125W)	Tolerance on Rated Resistance	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
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 = $\sqrt{(\text{Rated Disspation})\times(\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Listed above will be made by order. Please contact KAMAYA for further information.

●Derating Curve

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



●Climatic Category

40/125/56

Lower Category Temperature	−40°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

●Performance Characteristics JIS C 5201-1 : 1998

Description	Requirements	Test Methods
Voltage proof	No breakdown or flashover R≥1G ohm	Clause 4.7 100Va.c.,60s
Variation of resistance with temperature	See Ratings Table	Measuring temperature : +25°C/+75°C
Overload	ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times severe, 2s.
Solderability	In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat	ΔR≤±(1%+0.05 omh)	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 260°C for 5s.
Rapid change of temperature	ΔR≤±(1%+0.05 omh) No visible damage	Clause 4.19 5 cycles between −40°C and +85°C.
Climatic sequence	ΔR≤±(5%+0.1 omh) No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state	ΔR≤±(5%+0.1 omh) No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) of Clause 4. 24. 2. 1
Endurance at 70°C	ΔR≤±(5%+0.1 omh) No visible damage	Clause 4.25.1 Rated voltage, 1.5h"ON", 0.5h"OFF", 70°C, 1,000h.
Endurance at the upper category temperature	ΔR≤±(5%+0.1 omh) No visible damage	Clause 4.25.3 125°C, no-load, 1,000h.
Adhesion	No visible damage	Clause 4.32 5N, 10s
Bend strength of the face plating	ΔR≤±(1%+0.05 omh)	Clause 4.33 Amount of bend : 3 mm

RECOMMENDED LAND PATTERN (SMD TYPE)

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

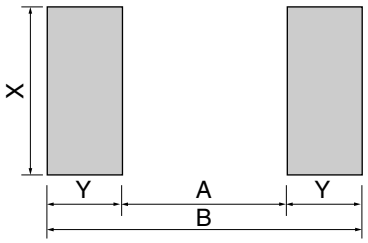
This is reference information only.

●Application

All KAMAYA Surface Mount Devices

●Recommended land pattern (Reference)

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

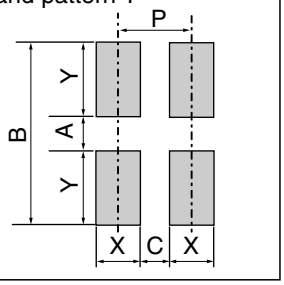


Size		Flow soldering				Reflow soldering			
Metric	Inch	A	B	X	Y	A	B	X	Y
0402	01005	Not applied				0.18	0.58	0.2	0.2
0603	0201					0.3	0.9	0.3	0.3
1005	0402					0.5	1.3	0.5	0.4
1608	0603	1.0	2.6	0.8	0.8	1.0	2.0	0.8	0.5
2012	0805	1.3	3.1	1.25	0.9	1.3	2.7	1.25	0.7
3216	1206	2.2	4.3	1.6	1.05	2.2	3.9	1.6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

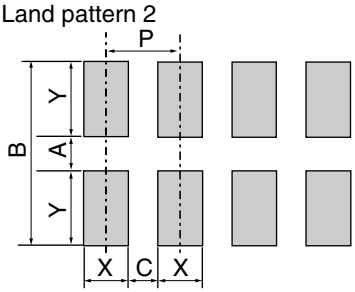
※For RLP63, please refer to the page 21.

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

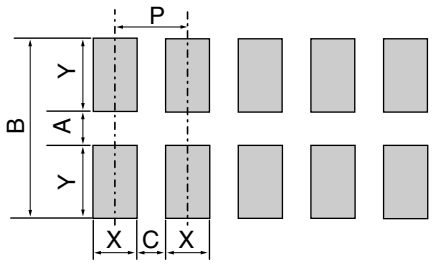
Land pattern 1



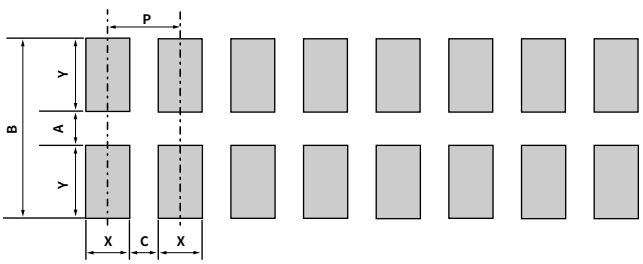
Land pattern 2



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
1	RAC16 2D	A	0.8	1.0	2.6	0.35	0.45	0.8	1.0	2.0	0.35	0.45	0.5
2	RAC16 4D	C											
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.

RECOMMENDED SOLDERING CONDITION (SMD TYPE)

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

This is reference information only.

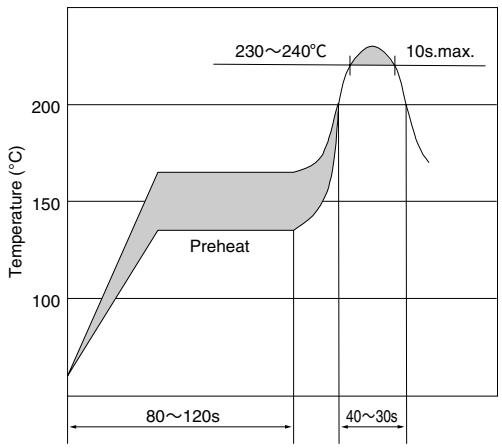
●Application

All KAMAYA Surface Mount Devices

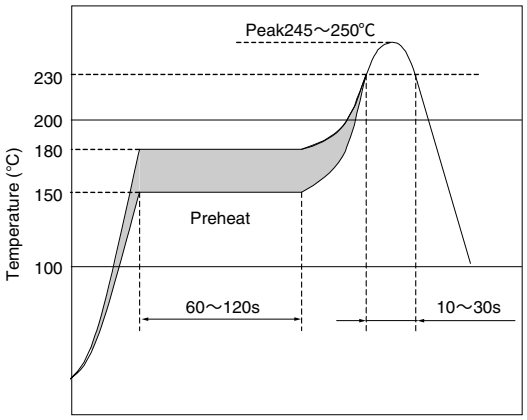
●Recommended soldering condition (Reference)

1. Reflow soldering

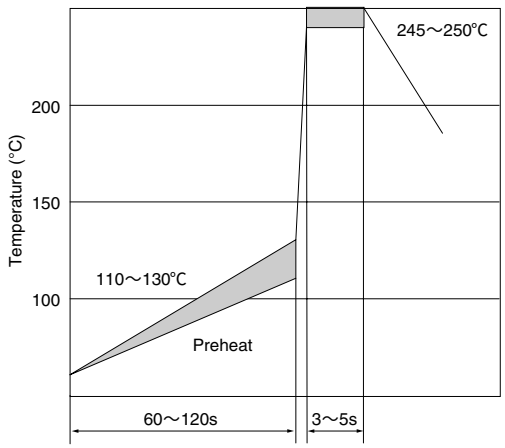
1.1 Recommended condition of Sn-Pb solder.
Reflow times: 2 times



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.

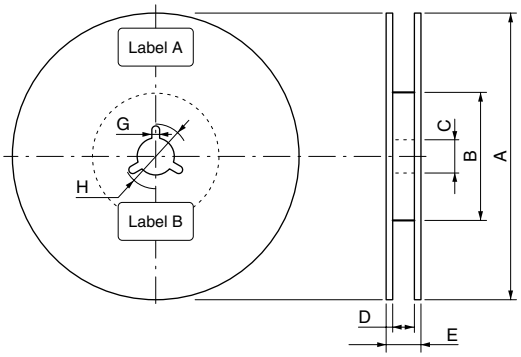
●Others

(1) Please contact Kamaya Sales department for further information.

(2) Please carry out an enough mounting evaluation when use this profile.

Packaging for Surface Mount Devices

●Reel Dimensions



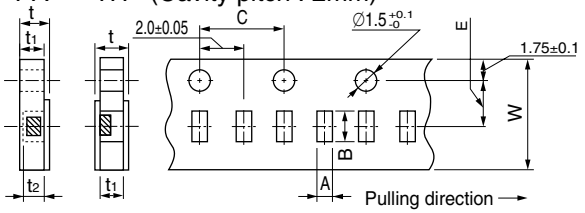
Unit : mm

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

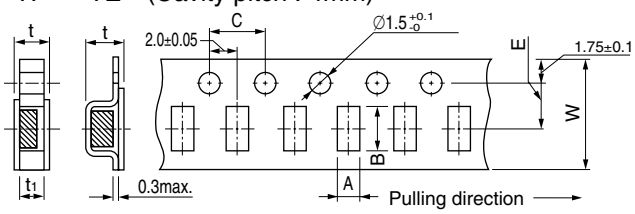
*Dimension A : Please contact KAMAYA for paper reels of ∅250mm and plastic reels of ∅330mm.

●Tape Dimensions (Unit : mm)

PA TH (Cavity pitch : 2mm)



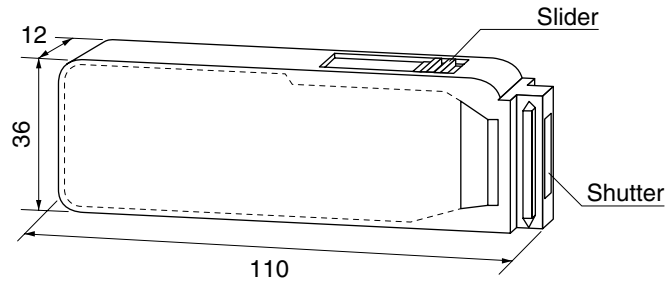
TP TE (Cavity pitch : 4mm)



*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	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		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		0.65±0.10	1.15±0.10				0.6±0.05	0.55±0.05	0.7 max.
		RMC1/16S, RGC1/16S, RLC10, RCC10	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 FCC16, FHC16, FSC16, FLC16, FMC16, FRC16	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	TP	1.65±0.15	2.5±0.2				0.8±0.1	–	1.0 max.
3216	1206	RMC1/8, RGC1/8, FCR1/8 RNC32, RVC32, RPC32 RLC32 LTC1/8 FCC32, FHC32, FRC32	TP	2.0±0.15	3.6±0.2					–	
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		RAC102D 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 $^{+0.05}_{-0.10}$	–	0.5 max.
		RAC104D		1.2±0.1	2.2±0.1				0.4±0.1	–	
		RAC162D	TP	1.8±0.1	1.8±0.1				0.6±0.1	–	0.8 max.
		RAC164D RAC168U		1.9±0.1	3.6±0.2						
		RAC168D		1.9±0.15	4.1±0.15		8.0±0.3			–	

●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)

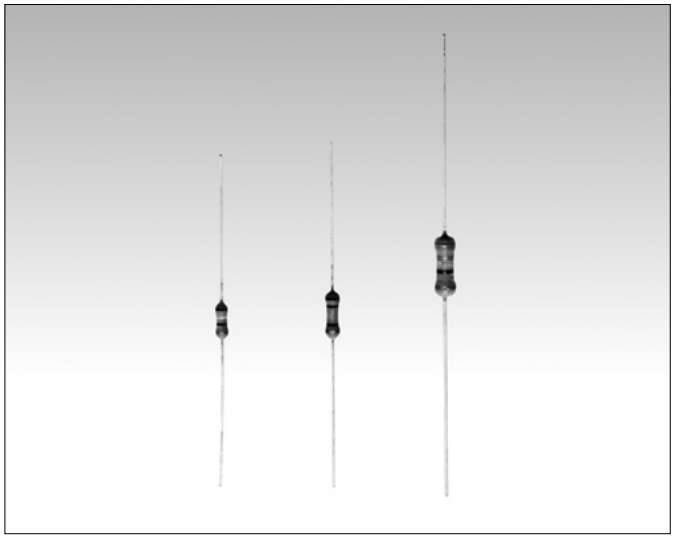
Metric	Inch	Style	Tape & Reel					Bulk
			Code	M. P. Q. (pcs./reel)	Outer Carton			Q' ty (pcs.)
					Reel Q' ty (pcs.)	Gross Weight (kg)	Measurement (m^3)	
0402	01005	RMC1/32	PA	20,000	50	8.5	0.027	1,000 ※1
0603	0201	RMC1/20, RGC1/20		15,000		8.0		
1005	0402	FCC10, FHC10		10,000		7.8		
		RMC1/16S, RGC1/16S, RLC10, RCC10	TH			6.5		
1608	0603	RMC1/16				8.3		
		RMC1/16, RGC1/16, FCR1/16 RVC16 RLC16, RHC16, RCC16 FCC16, FHC16, FSC16, FLC16, FMC16, FRC16	TP	5,000		7.8		
2012	0805	RMC1/10, RGC1/10, FCR1/10 RNC20, RVC20, RPC20 RLC20, RHC20 LTC1/10 FCC20, FHC20, FRC20, RCC20				8.6		
3216	1206	RMC1/8, RGC1/8, FCR1/8 RNC32, RVC32, RPC32 RLC32 LTC1/8 FCC32, FHC32, FRC32				9.6		
3225	1210	RMC1/4, FCR1/4 RPC35, RLC35	TE	4,000	50	8.2	0.02	
5025	2010	RMC1/2, FCR1/2 RVC50, RPC50, RZC50 RLC50, RLS50			40	6.4	0.027	
6332	2512	RMC1, FCR1 RVC63, RPC63, RZC63 RLC63, RLS63, RLP63, MLP63				8.3		
Chip Networks Chip Attenuators		RAC102D RAC101A	TH	10,000	50	6.6		
		RAC104D	TP			8.3		
		RAC162D		5,000		8.1		
		RAC164D RAC168U				8.5		
		RAC168D		5,000		8.6		5,000

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

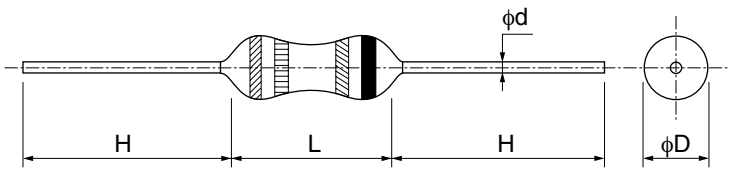
FRN

●Features

1. Resistor fuses in overload conditions.
2. Suitable for use with paper-phenol PBC due to small size and light weight.
3. Pre-formed products available by request.
4. Metal-film resistor element gives stable characteristics under normal conditions.
5. Fusing immediately under abnormal overload.



●Dimensions



Unit : mm

Style	L	D	H	d	*Unit weight/pc.
FRN1/4	6.5±0.5	2.3±0.5	30±3	0.6±0.05	218mg
FRN1/2	8.5±1.0	3.0±0.5	30±3	0.6±0.05	292mg
FRN1	11.0±1.0	4.0±1.0	35±3	0.7±0.05	655mg

*There is a broad space between the second and the third color bands.

*Values for reference

●Part Number Description

Example

Style

FRN	1/2	A	101	J	B

Product Type

FRN

Rated Dissipation

1/4	0.25W
1/2	0.5W
1	1.0W

Rated Resistance

E24 Series
e.g.: 2R2=2.2 ohm
101=100 ohm

Fusible Characteristic

A	Characteristic A

Tolerance on Rated Resistance

J	±5%

***Packaging**

B	Bulk (Straight)	All Styles
HA	Horizontal Forming (Kinked)	
HB	Horizontal Forming (Free-Standing)	
TB	52 mm Width Tape (Ammo Box)	FRN1/4 FRN1/2
TD	52 mm Width Tape (Reel)	

*Refer to Tape and Packaging information on pages 64 and 65.

FIXED FUSIBLE RESISTORS FRN

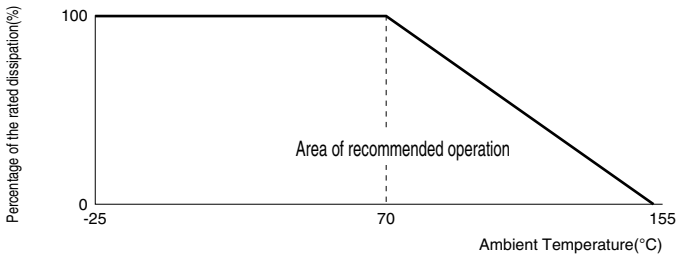
●Ratings

Style	Rated Dissipation at 70°C W	Temperature Coefficient of Resistance 10^{-6}/°C	Rated Resistance Range	Tolerance on Rated Resistance	Perferred Number Series for Resistors	Category Temperature Range °C
FRN 1/4	0.25	±300	1.0 ohm~1k ohm	J (±5%)	E24	–25~+155
FRN 1/2	0.5					
FRN 1	1.0					

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

●Derating Curve

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



●Performance Characteristics

Description	Requirements	Test Method JIS C5202-1990	
Resistance	Within specified tolerance	Clause 5.1	
Temperature characteristic of resistance	See Ratings Table	Clause 5.2	Room temperature and 100°C above.
Overload	Within ±(1.5%+0.05 ohm) No major visible damage	Clause 5.5	Condition A Rated Voltage × 2.5, 5s
Voltage proof	No flashover, scorching or insulation breakdown	Clause 5.7	FRN1/4 :300Va.c., 60s FRN1/2,1 :350Va.c., 60s
Bond strength of the face plating — Pulling	Lead is not cut, Terminal is not loose	Clause 6.1.2 (1)	FRN1/4,1/2 :10N for 5~10s FRN1 :25N for 5~10s
Bond strength of the face plating — Bending		Clause 6.1.2 (4)	5N, 2 times
Vibration	Within ±(1%+0.05 ohm) No mechanical damage	Clause 6.3	Type A 10~55Hz, 3 directions, 2h each
Resistance to soldering heat	Within ±(1%+0.05 ohm) No major visible damage	Clause 6.4	350°C, 2~2.5mm from the body 3.5s.
Solderability	At least 95% of the dipping surface must be covered by new solder	Clause 6.5	235°C, 5s
Rapid change of temperature	Within ±(1%+0.05 ohm) No major visible damage Markings legible	Clause 7.4	–25°C/+85°C for 5 cycles.
Humidity (Normal Condition)	Within ±(5%+0.1 ohm) No major visible damage Markings legible	Clause 7.5	40°C 90~95%R.H. 500h.
Endurance in humidity	Within ±(5%+0.1 ohm) No major visible damage Markings legible	Clause 7.9	Rated voltage, 1.5h "ON", 0.5h "OFF", 40°C, 95%R.H., 1,000h.
Endurance at 70°C	Within ±(5%+0.1 ohm) No major visible damage Markings legible	Clause 7.10	Rated Voltage, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Fusing characteristic	This must melt and cut within the time indicated below without burning or arcing characteristic A 24s at 15 times rated dissipation. But with FRN1/4 R<4.7 ohm. 30s at 15 times rated dissipation.	Using the resistor without turning on electricity as the testing sample at room temperature with no wind, apply a voltage equivalent to the rated dissipation ratio (keep the voltage fixed while testing), and measure the times until the circuit current decreases drastically.	

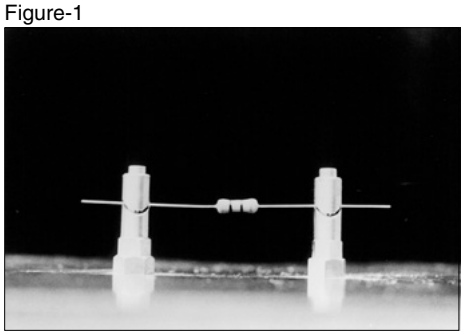
Note2. Fusing characteristic of constant current circuit is available on your request.
Note3. Other fusing characteristic products are also available. Contact KAMAYA for further details.

●Observation for smoke during fusing out

To illustrate fusing characteristics and flame resistance of KAMAYA OHM FRN type resistors. These pictures were taken of a 10 ohm FRN1/2 subjected to an overload of 15 times rated power at room temperature.

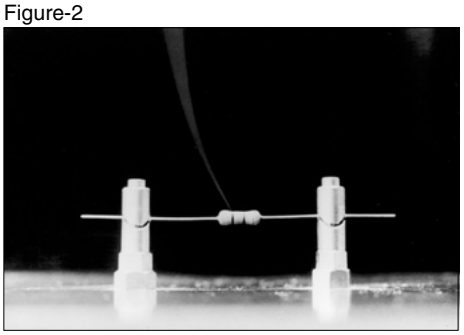
The pictures taken at various time intervals graphically record the ability of the FRN1/2 to withstand severe overload without smoke.

Figure-1



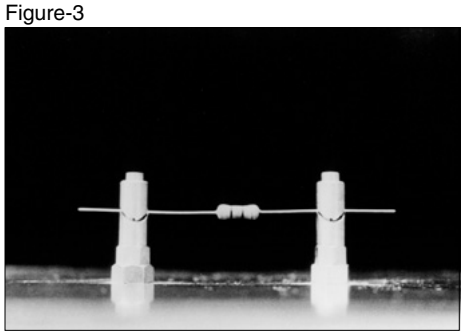
Before the voltage charge

Figure-2



3 seconds after the voltage charge

Figure-3

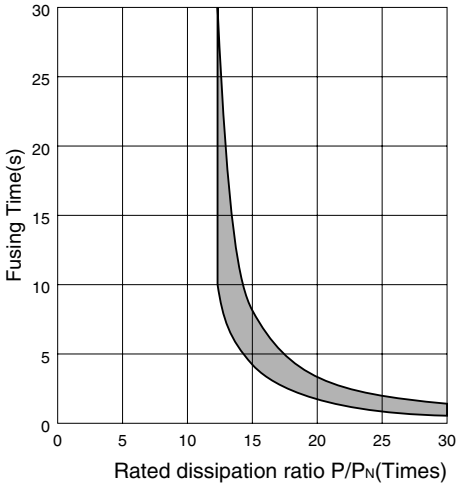


Immediately after fusing

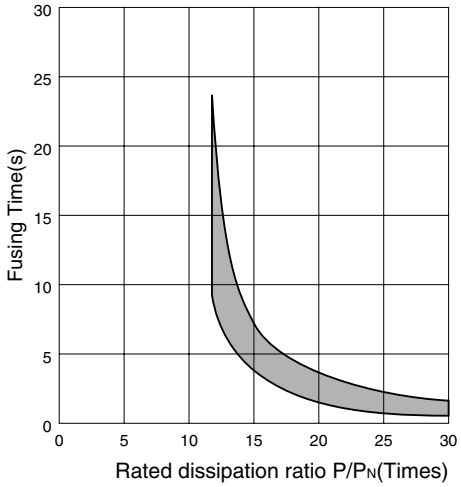
●Example of Typical Fusing Characteristics

FRN 1/4

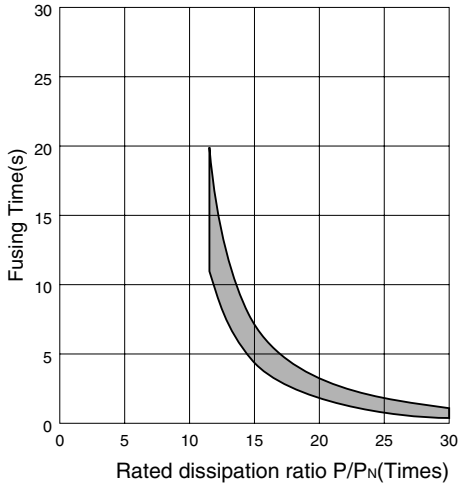
Rated Resistance:4.7 ohm



Rated Resistance:47 ohm

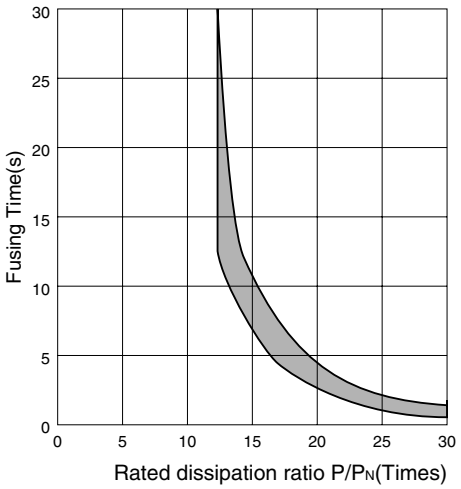


Rated Resistance:100 ohm

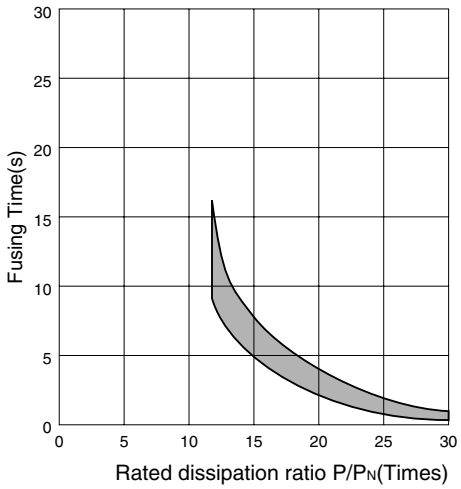


FRN 1/2

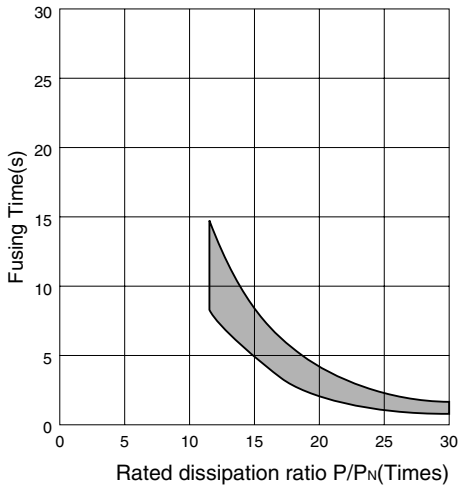
Rated Resistance:4.7 ohm



Rated Resistance:47 ohm

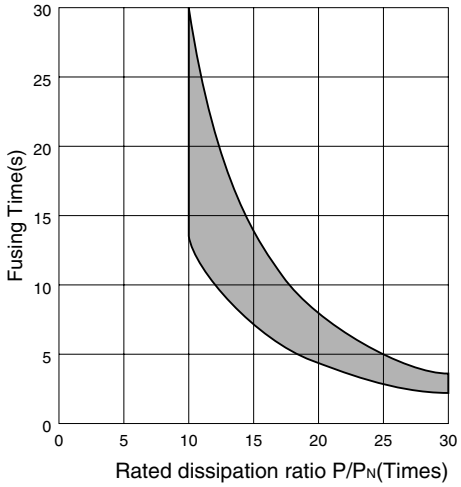


Rated Resistance:100 ohm

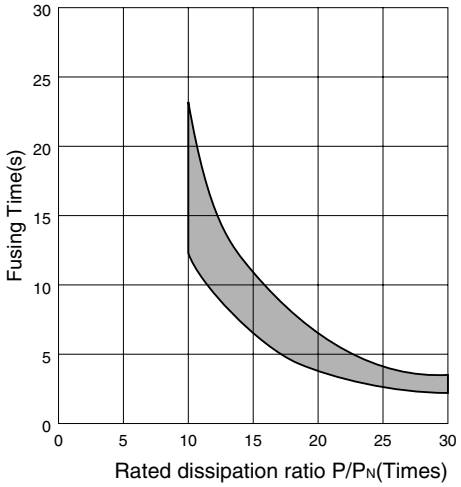


FRN 1

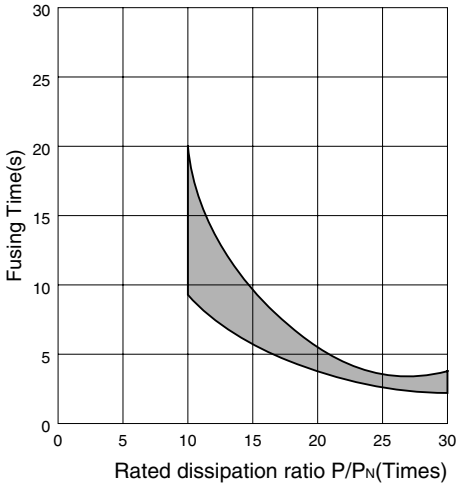
Rated Resistance:4.7 ohm



Rated Resistance:47 ohm



Rated Resistance:100 ohm

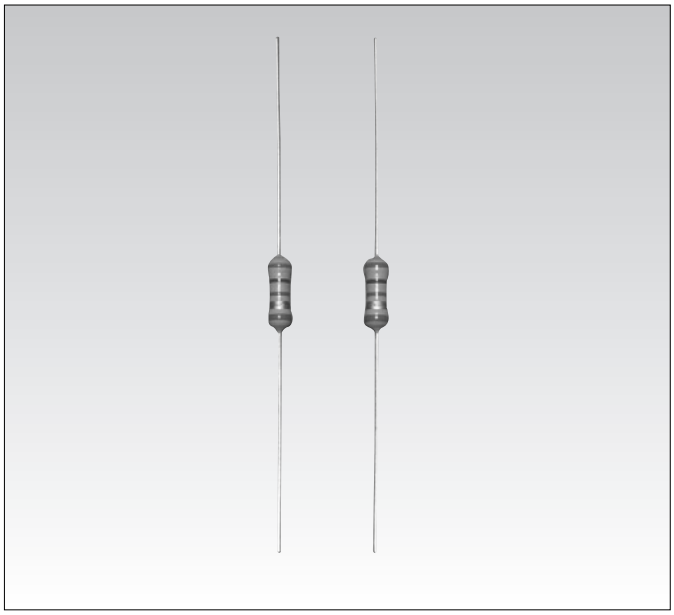


RNV

●Features

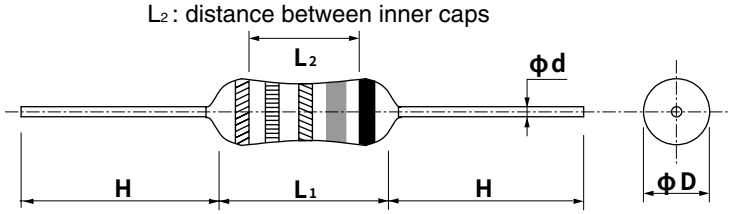
1. High maximum working voltage, excellent for surge applications.
2. IEC Publ. 65 applies to RNV1.
3. Approved to UL, c-UL, BSI and VDE standards.
   - •UL, c-UL, File No. E151897
     510k ohm~910k ohm : 125V max.
     960k ohm~11M ohm : 250V max.
   - •BSI No.7778
     BS EN 60065:1994 (BS 415:1994) : Sub-clauses 9.3.5,14.1 (a) and (b)
   - •VDE No.VDE-Reg.-Nr.10149
     DIN EN VDE (EN 60065:1994-04,14.1a)

4. Stability Class : 5%



●Dimensions

L_2 : distance between inner caps



Unit : mm

Style	L_1	L_2	D	H	d	*Unit Weight/pc.
RNV 1	$12.0^{+1.0}_{-1.5}$	6.0min.	4.0±1.0	37±2	0.7±0.1	703mg

*Value for Reference

●Part Number Description

Example

Style: RNV | 1

Product Type	Rated Dissipation	
	1	1.0 W

225 — Rated Resistance: E24, 12 Series e.g. : 225=2.2M ohm

J — Tolerance on Rated Resistance: J = ±5%

B — *Packaging

B	Bulk (Straight)
H	Horizontal Forming
HB	Horizontal Forming (Free-Standing)
TB	52 mm Width Tape (Ammo Box)
TD	52 mm Width Tape (Reel)

*Refer to Tape and Packaging information on pages 64 and 65.
Some code numbers may be added after packing codes.

FIXED HIGH VOLTAGE RESISTORS RNV

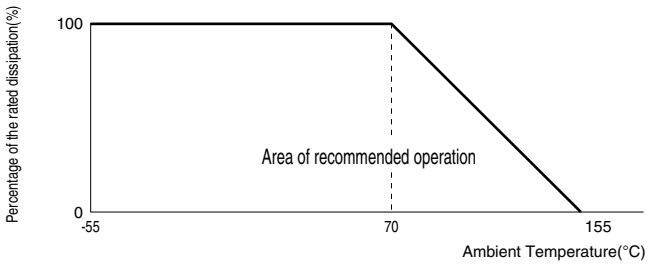
●Ratings

Style	Rated Dissipation at 70°C W	Limiting Element Voltage V	Temperature Coefficient of Resistance 10^{-6}/°C	Rated Resistance Range	Tolerance on Rated Resistance	Preferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
RNV 1	1.0	2,000	±350	470k ohm ~ 4.7M ohm	J (±5%)	E12	500	-55~+155
			–600~+500	5.6M ohm ~ 12M ohm				

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.

●Derating Curve

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



●Climatic Category

55/155/56

Lower Category Temperature	–55°C
Upper Category Temperature	+155°C
Duration of the Damp heat, Steady-State Test	56 days

●Performance Characteristics JIS C 5201-1 : 1998

Description		Requirements	Test Methods
Voltage proof		No breakdown or flashover	Clause 4.7 V–block method 500Va.c.,60s
Variation of resistance with temperature		See Ratings Table	Clause 4.8 Measuring temperature : +20°C/–55°C/ +20°C/+155°C/+20°C
Overload		ΔR≤±(0.5%+0.05 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or 4,000V whichever is the less severe, 5s.
Overloadability		Within ±20%	Conditioned at 40°C, 95%R.H., for 21 days. : Charged 10kV to capacitor (1,000pF) for 1 second and discharge for 4 seconds, total of 50 cycles.
Robustness of terminations	Tensile	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.16.2 10N for 5~10s
	Bending	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.16.3 5N twice
	Torsion	ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.16.4 180°C, 2 rotation
Solderability		In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 2s
Resistance to soldering heat		ΔR≤±(1%+0.05 ohm) No visible damage, legible marking	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out in Solder bath at 350°C for 3.5s.
Rapid change of temperature		ΔR≤±(1%+0.05 ohm) No visible damage	Clause 4.19 5 cycles between –55°C and +155°C.
Climatic sequence		ΔR≤±(5%+0.1 ohm) Insulation resistance : R≥100M ohm No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state		ΔR≤±(5%+0.1 ohm) Insulation resistance : R≥100M ohm No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a),b) and c) of Clause 4.24.2.1
Endurance at 70°C		ΔR≤±(5%+0.1 ohm) No visible damage Insulation resistance : R≥1G ohm	Clause 4.25.1 Rated voltage, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature		ΔR≤±(5%+0.1 ohm) No visible damage Insulation resistance : R≥1G ohm	Clause 4.25.3 155°C, no-load, 1,000h.

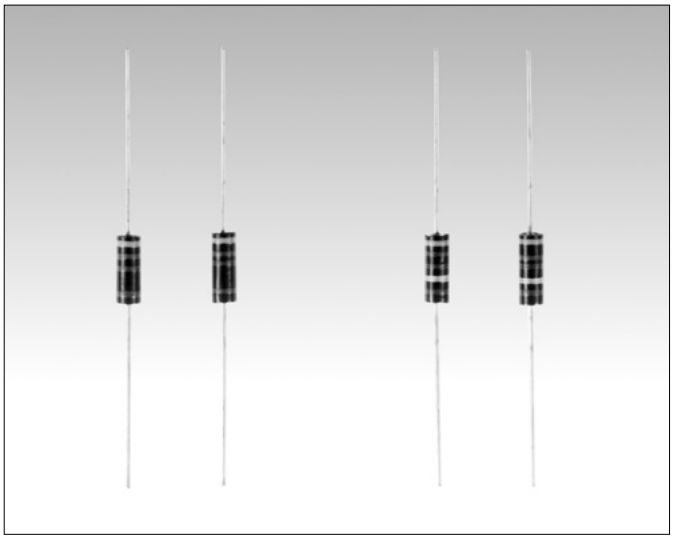
RC1/2U

●Features

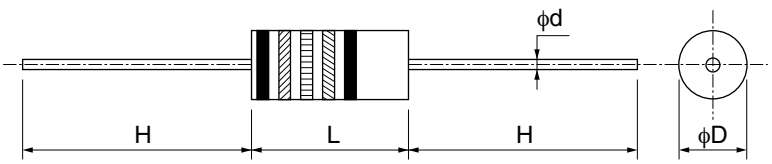
1. UL recognized component (UL1676) (File No.E151897)

c UL us

2. Reduce UL or CSA approval and maintenance cost.
3. Color band 5 is green signify UL 1676 approval and distinguishes from standard resistors.
4. Stability Class : 10%



●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

●Part Number Description

Example

Style		685	M	B
RC	1/2U			
Product Type	Rated Dissipation	Rated Resistance	Tolerance on Rated Resistance	*Packaging

Rated Dissipation	
1/2U	0.5W

Rated Resistance
E12, 6 Series
e.g. : 685=6.8M ohm
106=10M ohm

Tolerance on Rated Resistance	
K	±10%
M	±20%

*Packaging	
B	Bulk (straight)
H	Horizontal Forming
TB	52 mm Width Tape (Ammo Box)
TD	52 mm Width Tape (Reel)

*Refer to Tape and Packaging information on pages 64 and 65.

※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.

FIXED CONDUCTIVE PATH RESISTORS RC1/2U

●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

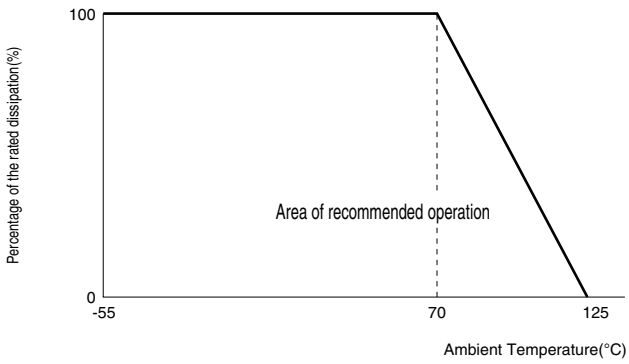
Note1. Required characteristic performance is based on JIS C 6406 and UL 1676.
Note2. The name of this, product is granted as Conductive Path, but UL1676 and the requirements as Discharge Path shown in CSA22, 2 No,1-94 are satisfied, but the products performance does not cover all the requirements as Conductive Path.

●Storage

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

●Derating Curve

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

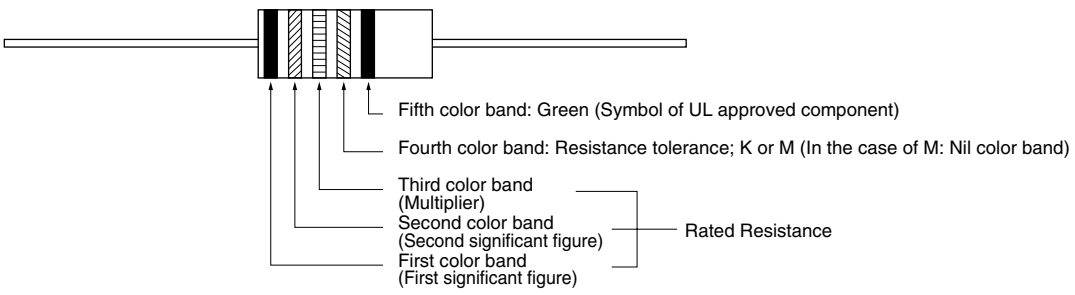


●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

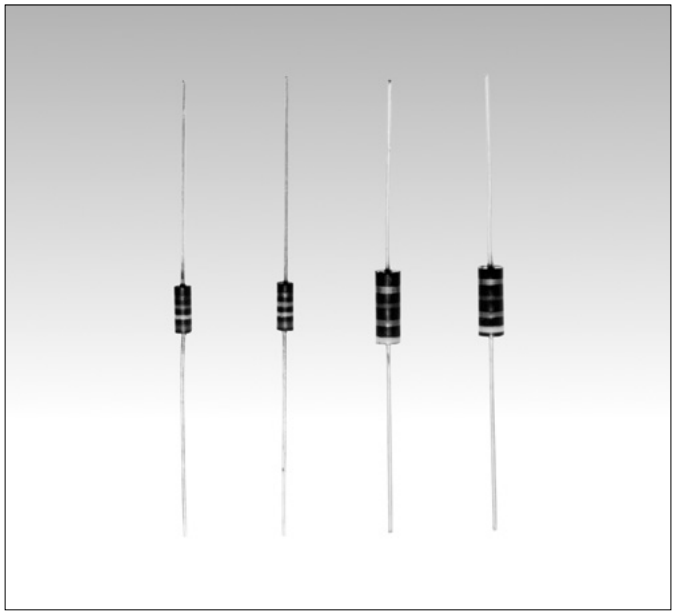
●Color Coding



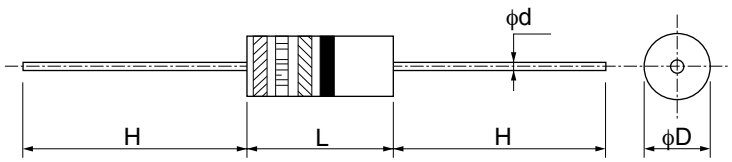
RC

●Features

1. Improved pulse endurance characteristics compared to carbon-film devices.
2. Wide resistance range is available, 1 ohm ~ 22M ohm.
3. Stability Class : 10%



●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

●Part Number Description

Example

Style

RC	1/4	102	J	B

Product Type

Rated Dissipation

1/4	0.25W
1/2	0.5W

Rated Resistance

E24, 12, 6 Series
e.g. : 2R2=2.2 ohm
102=1k ohm

Tolerance on Rated Resistance

J	±5%
K	±10%
M	±20%

***Packaging**

B	Bulk (Straight)
H	Horizontal Forming
TB	52 mm Width Tape (Ammo Box)
TD	52 mm Width Tape (Reel)

*Refer to Tape and Packaging information on pages 64 and 65.

●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			Tolerance on Rated Resistance and Perferred Number Series for Resistors	Isolation Voltage V	Category Temperature Range °C
				Temperature Coefficient of Resistance %		Rated Resistance Range			
				at −55 °C	at +125 °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			

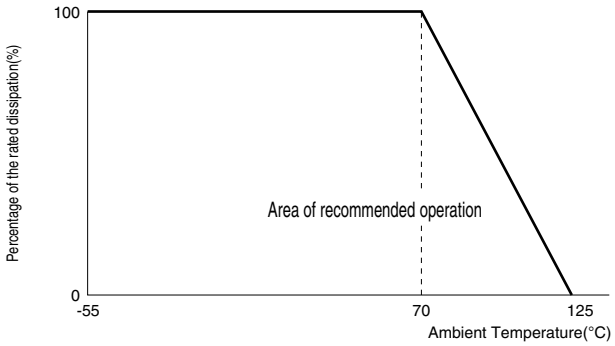
Note1. Rated Voltage = $\sqrt{(\text{Rated Dissipation}) \times (\text{Rated Resistance})}$. (d.c. or a.c. r.m.s. Voltage)
Note2. Limiting Element Voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.
Note3. Critical Resistance Value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

●Storage

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

●Derating Curve

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



●Climatic Category

55/125/56

Lower Category Temperature	−55°C
Upper Category Temperature	+125°C
Duration of the Damp heat, Steady-State Test	56 days

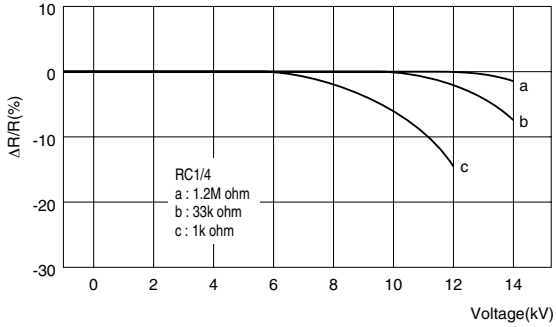
●Performance Characteristics JIS C 5201-1 : 1998

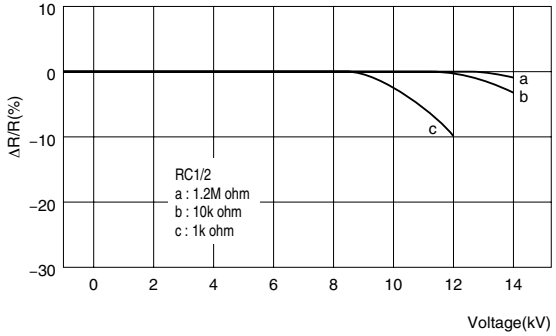
Description		Requirements	Test Methods
Voltage proof		No breakdown or flashover	Clause 4.7 V-block method RC1/4 100Va.c.,60s RC1/2 500Va.c.,60s
Variation of resistance with temperature		See Ratings Table	Clause 4.8 Measuring temperature : +20°C/−55°C/ +20°C/+125°C/+20°C
Overload		ΔR≤±(2%+0.1 ohm) No visible damage, legible marking	Clause 4.13 The applied voltage shall be 2.5 times of the rated voltage or twice of the limiting element voltage, whichever is the less Severe, 5s.
Robustness of terminations	Tensile	ΔR≤±(2%+0.1 ohm) No visible damage	Clause 4.16.2 10N for 5~10s
	Bending	ΔR≤±(2%+0.1 ohm) No visible damage	Clause 4.16.3 5N twice
	Torsion	ΔR≤±(2%+0.1 ohm) No visible damage	Clause 4.16.4 180°C, 2 rotation
Solderability		In accordance with Clause 4.17.4.5	Clause 4.17 235°C, 5s
Resistance to soldering heat		ΔR≤±(3%+0.1 ohm) No visible damage, legible marking	Clause 4.18 After immersion into the flux, the immersion into solder shall be carried out 4mm from the body at 350°C for 3.5s.
Rapid change of temperature		ΔR≤±(2%+0.1 ohm) No visible damage	Clause 4.19 5 cycles between −55°C and +125°C.
Climatic sequence		ΔR≤±(10%+0.5 ohm) Insulation resistance : R≥100M ohm No visible damage	Clause 4.23 Dry/Damp heat(12+12h cycle), first cycle./ Cold/Damp heat(12+12h cycle), remaining cycle./ D.C.Load.
Damp test, steady state		ΔR≤±(10%+0.5 ohm) Insulation resistance : R≥100M ohm No visible damage, legible marking	Clause 4.24 40°C, 95%R.H., 56 days, test a) , b) and c) of Clause 4.24.2.1
Endurance at 70°C		ΔR≤±(10%+0.5 ohm) No visible damage Insulation resistance : R≥1G ohm	Clause 4.25.1 Rated voltage, 1.5h "ON", 0.5h "OFF", 70°C, 1,000h.
Endurance at the upper category temperature		ΔR≤±(10%+0.5 ohm) No visible damage Insulation resistance : R≥1G ohm	Clause 4.25.3 125°C, no-load, 1,000h.

●Typical Characteristics

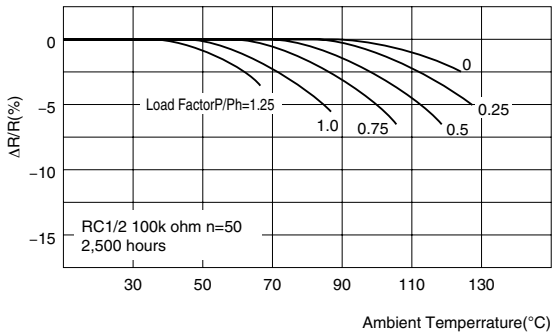
•Surge Resistance Characteristics

Charging and discharging a 2,000 pF capacitor for 100 cycles.

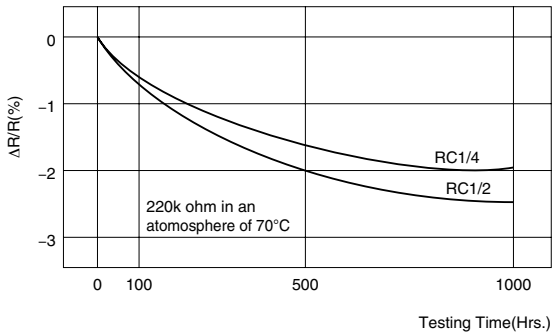




•Relationship between Load Ratio and Category Temperature

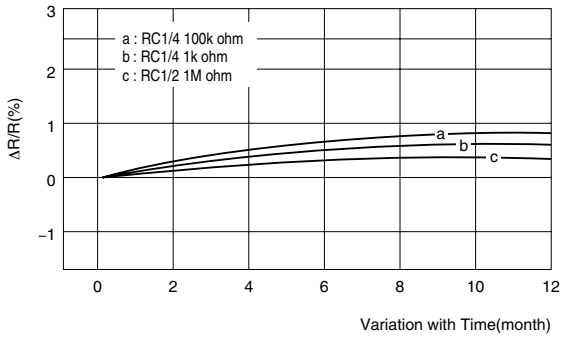


•Endurance at 70°C

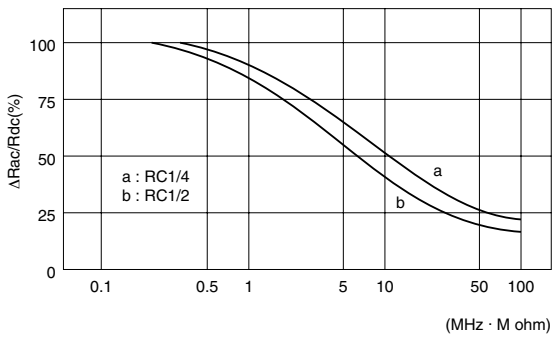


•Variation with Time

Condition : 5~35°C , 45~85% R.H.



•Frequency Characteristics



"Typical characteristics indicate the mean values of ΔR/R etc."

●Reliability Test

Endurance in humidity

Samples : RC1/4J,100 ohm,1k ohm,10k ohm,100k ohm×150 each. Total 2,400.

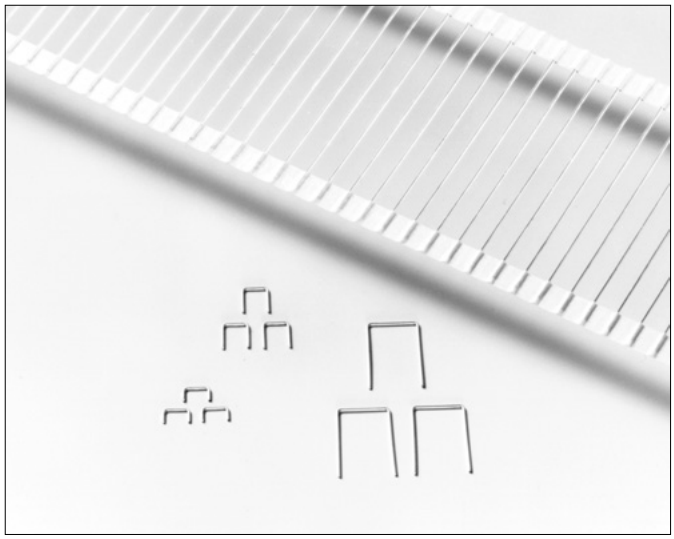
Conditions : Direct current voltage equivalent to the following load ratings in cycles on "ON" for 1.5h and "OFF" for 0.5h for a total of 5,000h in an atmosphere of 40°C, 90 to 95%R.H.

Criterion (%)		Load Ratio P/Pn (%)	Total Testing Time T(Hrs.)	Number of Failures r(pcs.)	Failure Ratio		Average Lifetime (60% reliability level) (Hrs.)
					$\hat{\lambda}$	λCL(60%)	
ΔR/R	±5	0	$2.984X10^{6}$	6	0.201	0.244	4.098×10^{5}
		20	$2.990X10^{6}$	4	0.134	0.176	5.682×10^{5}
		60	$2.997X10^{6}$	2	0.067	0.104	9.615×10^{5}
		100	$2.992X10^{6}$	3	0.100	0.139	7.194×10^{5}
		Total	$1.196X10^{7}$	15	0.125	0.138	7.209×10^{5}
	±10	Total	$1.20X10^{7}$	0	0.0055	0.007	1.299×10^{7}

JW

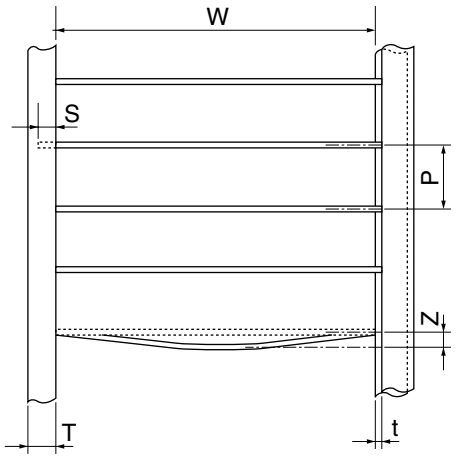
●Features

1. 26 mm and 52 mm available for automatic insertion.
2. Pre-formed product available on request.

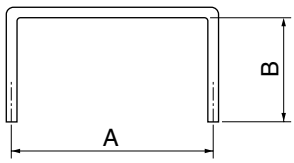


●Dimensions

1. Tape



2. Forming



Example

A dimension × B dimension
5.0 × 2.5
5.0 × 5.5
10.0 × 15.0
12.5 × 2.5

*Please contact KAMAYA for other dimensions.

Unit : mm

Style	W	T	t	P	Z	S
52 mm Width Tape	52±1	6.0±0.5	0.5max.	5.0±0.3	1.0max.	3.2min.
26 mm Width Tape	26±0.2					

●Ratings

Maximum Rated Currency(A)	Category Temperature Range(°C)
10	−55~+155

Style

JW	1	3	H16A
Product Type	Dia	Material	

Dia	
1	ϕ0.6mm

Material	
3	Sn Plated copper

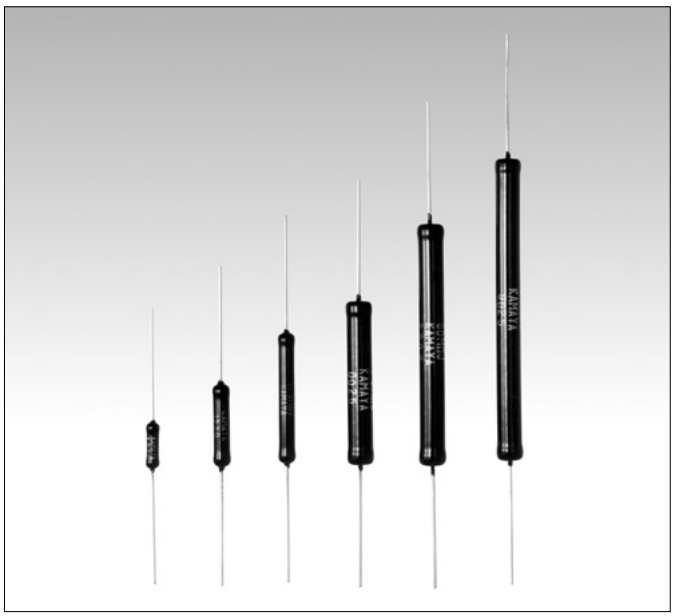
*Packaging	
H16A	Forming 5.0×2.5
H13A	Forming 5.0×5.5
H14D	Forming 10.0×15.0
H16E	Forming 12.5×2.5
TA	26 mm Width Tape (Ammo Box)
TB	52 mm Width Tape (Ammo Box)

*Some code numbers may be added after packing codes.

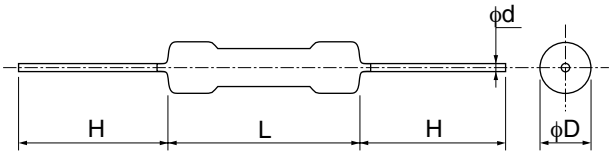
RH

●Features

1. This product has a low temperature coefficient of resistance and features a choice of 100×10^{-6}/°C (K type) and 200×10^{-6}/°C (D type).
2. Extremely stable characteristics.
3. A wide range of high resistance values available.
4. Various resistance tolerance available.
5. 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 the like.



●Dimensions



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

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

Note. Please contact KAMAYA for the details of marking.

●Part Number Description

Example

Style: RH | 8

Product Type

Rated power	
1	1.0W
2	2.0W
3	3.0W
4	4.0W
6	6.0W
8	8.0W

D

* Temperature Coefficient of Resistance	
K	±100×10^{-6}/°C
D	±200×10^{-6}/°C

500M

Rated Resistance
Available on demand
e.g.: 100M=100M ohm 1G00=1G ohm

J

Tolerance on Rated Resistance	
F	± 1%
G	± 2%
J	± 5%
K	±10%

B

Packaging	
B	Bulk

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

FIXED HIGH VOLTAGE RESISTORS; PRECISION RH

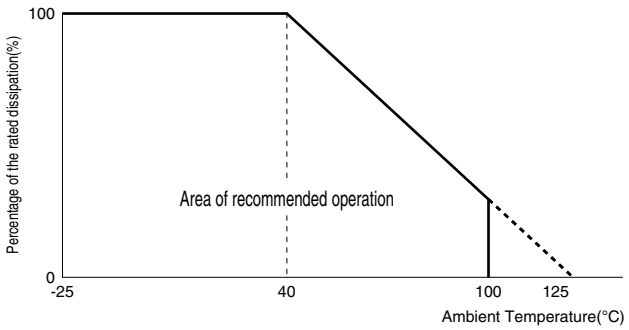
●Ratings

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

●Derating Curve

The derated values of dissipation for temperatures in excess of 40°C shall be indicated by the following Curve.



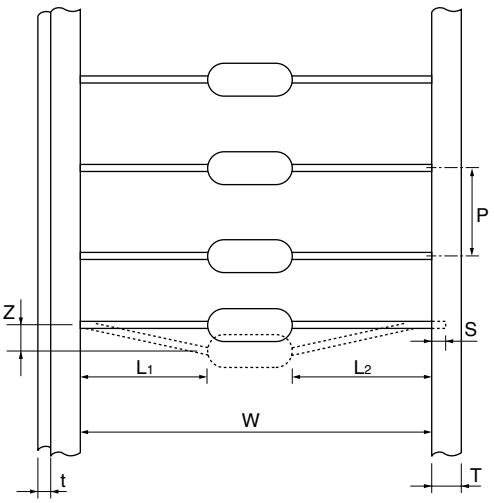
●Performance Characteristics

Description	Requirements	Test Method JIS C5202-1990	
Resistance	Within specified tolerance	clause 5.1	
Temperature characteristic of resistance	See Ratings Table	clause 5.2	Room temperature and 80°C above.
Overload	Within ±1% No major visible damage	clause 5.5	Condition A Rated voltage × 2.5, 5s
Insulation resistance	At least 1,000M ohm	clause 5.6	Condition A 500Vd.c., 60s
Pulse endurance	Within ±1% No major visible damage	Apply (1.2×50)μs pulse wave 10,000 times 10s each. See ratings table for pulse Voltage.	
Bond Strength of the face plating — Pulling	Lead is not cut Terminal is not loose	clause 6-1-2(1)	25N, 10s
Bond Strength of the face plating — Bending		clause 6-1-2(4)	90°C, opposite directions 5 times.
Solderability	At least 3/4 of the dipping surface must be covered by new solder	clause 6.5	260°C, 5s
Rapid change of temperature	Within ±1% No major visible damage, legible marking	clause 7.4	–25°C/+85°C for 5 cycles.
Humidity (Normal Condition)	Within ±5% No major visible damage	clause 7.5	40°C, 95%R.H., 1,000h.
Endurance at 70°C	Within ±5% No major visible damage	clause 7.10	Rated voltage, 1.5h "ON", 0.5h "OFF", 40°C, 1,000h.

*We have equivalent products for the use in insulating oil. Please contact us for further information.

Packaging for Leaded Resistors

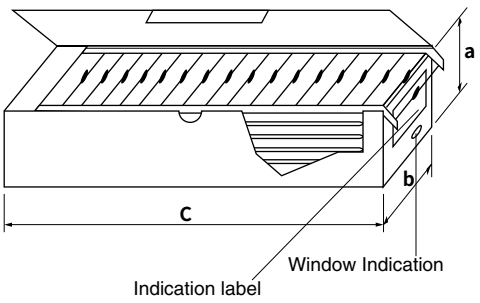
●Tape



Unit : mm

Style	W	L_1-L_2	T	t	P	Z	S
RNV1	52^{+2}_{-1}	1.0max.	6.0±0.5	0.5max.	5.0±0.3	1.0max.	3.2min.
FRN1/4 FRN1/2					5.08±0.38		
RC1/4 RC1/2 RC1/2U	$52.4^{+1.6}_{-1.4}$						

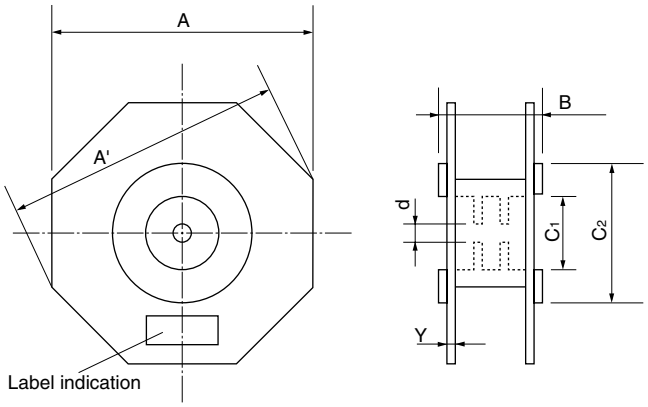
●Ammo Box



Unit : mm

Style	Code	a	b	c
RNV1	TB 52mm Width Tape	85±5	75±5	275±5
FRN1/4		60±5		
FRN1/2		75±5		252±5
RC1/4		60±5		275±5
RC1/2 RC1/2U		65±5		455±5

●Tape & Reel (Code : TD)

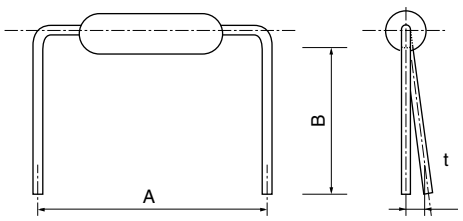


Unit : mm

Style	Code	A	*A'	B	C_1	C_2	d	*Y
RNV1 RC1/4, 1/2, 1/2U FRN1/2,1/4	TD	260±5	280	75±5	60.4±1	78±1	14.5±0.5	3

*Value for reference

●Horizontal Forming (Code : H)

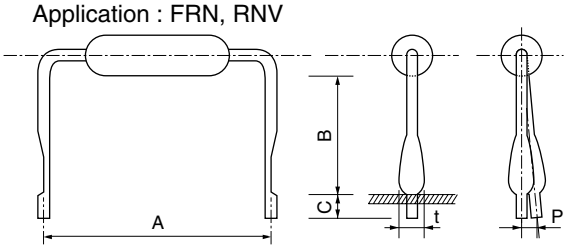


Unit : mm

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.
RNV1	H77	15.0±1.0		1.5max.
	H78	25.0±1.0		

●Horizontal Forming (Free-Standing) (Code : HB)

Application : FRN, RNV

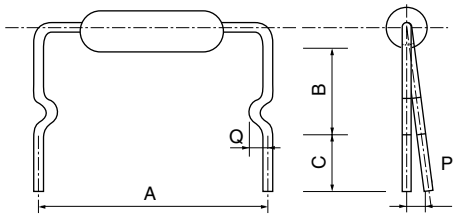


Unit : mm

Style	Code	A	B	C	t	P
FRN 1/4	HB	10.0±1.0	$8.0\ ^{+1.5}_{0}$	5.0±1.5	1.2±0.2	1.5max.
FRN 1/2		12.5±1.0				
RNV1 FRN1		15.0±1.0	$8.0\ ^{+1.5}_{0}$	5.0±1.5	1.4±0.2	1.5max.

Note. Recommended PCB hole : FRN1/4,1/2 : ϕ0.75–ϕ0.85
FRN1, RNV1 : ϕ0.9–ϕ1.05

●Horizontal Forming (Kinked) (Code : HA)



Unit : mm

Style	Code	A	B	C	Q	P
FRN1/4 FRN1/2	HA	12.5±1.0	$8.0\ ^{+1.5}_{0}$	5.0±0.5	$1.0\ ^{+1}_{0}$	1.5max.
FRN1		15.0±1.0				

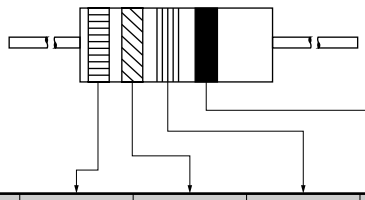
Style	Tape & Reel					Ammo Box					Bulk Packaging				
	Q'ty / Reel (pcs.)	Reel Size (mm)	Outer Carton			Width of Taping (mm)	Q'ty / Box (pcs.)	Outer Carton			M.P.Q. (Q'ty / Plastic Bag pcs.)	Q'ty / Inner Carton (pcs.)	Outer Carton		
			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (m^3)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (m^3)			Q'ty / Carton (pcs.)	Gross Weight (kg)	Measure-ment (m^3)
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
FRN1	—	—	—	—	—	—	—	—	—	—	250 (50×5)	3,000	12,000	10	0.03
FRN1/2	3,000	260	24,000	10	0.04	52	2,000	24,000	10	0.02	500 (100×5)	7,000	28,000	10	0.03
FRN1/4	5,000	260	40,000	12	0.04	52	2,000	40,000	13	0.03	500 (100×5)	8,000	32,000	9	0.03
RNV1	1,500	260	12,000	12	0.04	52	1,000	12,000	11	0.02	250 (50×5)	4,000	12,000	10	0.03
JW	—					52	10,000	60,000	15	0.02	1000 (200×5)	※			
						26	5,000	150,000	17	0.03					

※Please contact Kamaya Sales Dept.

Product Marking

●Color coding

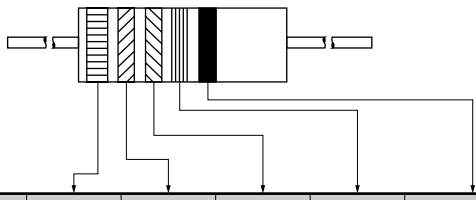
• Three - color band or four - color band system



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%).

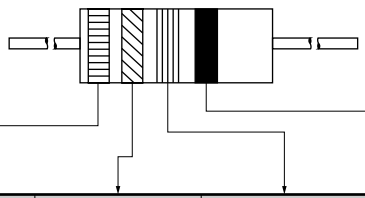
• Five - color band system



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}	–

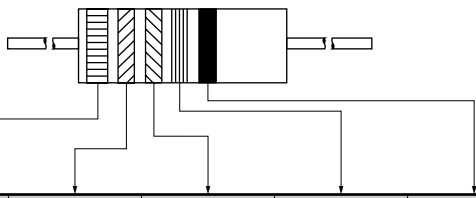
*RC1/2U : Please refer to page 56.

• 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

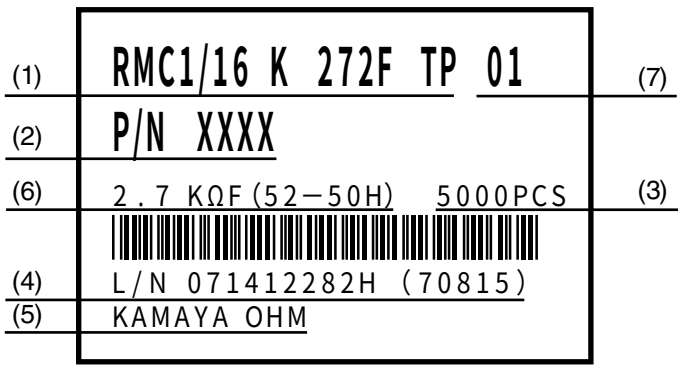
*The letters M and G are used as multipliers for 10^6 and 10^9 respectively of the resistance value expressed in ohms.

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.

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

●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
	12	12			117
				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
		24			240
				243	243
					246
			249	249	249
					252
				255	255
					258
			261	261	261
					264
				267	267
		27			271
		27	274	274	274
					277
				280	280
					284
			287	287	287
					291
				294	294
		30			298
			301	301	301
					305
				309	309
					312
			316	316	316
					320
				324	324
33	33	33			328
			332	332	332
					336
				340	340
					344
			348	348	348
					352
				357	357
		36			361
			365	365	365
					370
				374	374
					379
			383	383	383
		39			388
				392	392
					397
			402	402	402
					407
				412	412
					417
			422	422	422
		43			427
				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
		51			505
			511	511	511
					517
				523	523
					530
			536	536	536
					542
				549	549
	56	56			556
			562	562	562
					569
				576	576
					583
			590	590	590
					597
				604	604
					612
			619	619	619
		62			626
				634	634
					642
			649	649	649
					657
				665	665
68	68	68			673
			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
	82	82			816
			825	825	825
					835
				845	845
					856
			866	866	866
					876
				887	887
					898
			909	909	909
		91			920
				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	$\sqrt{PR}$	$\frac{P}{I}$	$\frac{E}{R}$	$\sqrt{\frac{P}{R}}$	$\frac{P}{E}$	$\frac{E}{I}$	$\frac{E^2}{P}$	$\frac{P}{I^2}$

Glossary

"JIS C5201-1" established in 1998 was made on the basis of "IEC 60115-1:1982".
Technical terms and Electronics-Test Methods in the catalogue are based on "IEC 60115-1:1990".
Please refer to the cross reference down below for making a comparison between "JIS C5201:1994/JIS C5202:1990" and "IEC 60115-1:1990".

JIS C5201 : 1994 JIS C5202 : 1990	IEC 60115-1 : 1990 (JIS C5201-1 : 1998)
Nominal resistance value	Rated resistance
Critical resistance value	Critical resistance
Working temperature range	Category temperature range
	Climatic category
Highest ambient temperature	Upper category temperature
Lowest ambient temperature	Lower category temperature
	Duration of the damp heat, steady-state test
Rated power	Rated dissipation
Derating curve	Derating curve
Ratio to rated dispassion	Percentage of the rated dissipation
Rated voltage	Rated voltage
Maximum working voltage	Limiting element voltage
Maximum overload voltage	(Not applicable)
Stability class	Stability class
Resistance change after long term test	Limits for change in resistance-Long-term test
Resistance change after short term test	Limits for change in resistance-Short-term test
Tolerance on resistance value	Tolerance on rated resistance
Nominal resistance range	Rated resistance range
Standard values of nominal resistance	Preferred number series for resistors
	Isolation voltage
Resistance	Resistance
Temperature characteristic of resistance	Variation of resistance with temperature
	Temperature characteristic of resistance
Temperature coefficient of resistance	Temperature coefficient of resistance
Voltage coefficient	Voltage coefficient of resistance
Temperature rise	Temperature rise
Short-time overload	Overload
Insulation resistance	Insulation resistance
Dielectric withstand voltage (voltage proof)	Voltage proof
Intermittent overload	(Not applicable)
Robustness of terminations Tensile strength of termination	Robustness of terminations-Tensile
Robustness of terminations Torsional strength of lead/wire termination	Robustness of terminations-Torsion
Robustness of terminations Bending strength of lead/wire termination	Robustness of terminations-Bending
Resistance to base material bending	Bond strength of the face plating
Adhesiveness	Adhesion
Robustness of resistor body	Robustness of the resistors bory
Resistance to vibration	Vibration
Resistance to soldering heat	Resistance to soldering heat
Solderability	Solderability
Shock	Shock
Resistance to solvent Resistance to solvent of body	Component solvent resistance
Resistance to sovent Resistance to solvent of marking	Solvent resistance of marking
Resistance to dry heat	Dry heat
Change of temperature	Rapid change of temperature
Resistance to damp heat (steady state)	Damp test, steady state
Endurance (under damp and load)	(Not applicable)
Endurance (rated road)	Endurance at 70°C
Stability	Endurance at the upper category temperature
Flame resistance-Flame resistance test	(Not applicable)
Flame resistance-Over-load burning resistance test	(Not applicable)
Climatic sequence	Climatic sequence
Resistance to dry heat	Dry heat
Resistance to damp heat (cyclic) (first cycle)	Damp heat, cycle, test Db, first cycle
Resistance to cold	Cold
Low air pressure	Low air pressure
Resistance to damp heat (cyclic) (remaining cycle)	Damp heat, cycle, test Db, remaining cycle
D.C.Load	D.C. Load
	Endurance at room temperature

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.
Characteristics of this catalog are typical examples of the representative characteristics.
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.

Category 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.

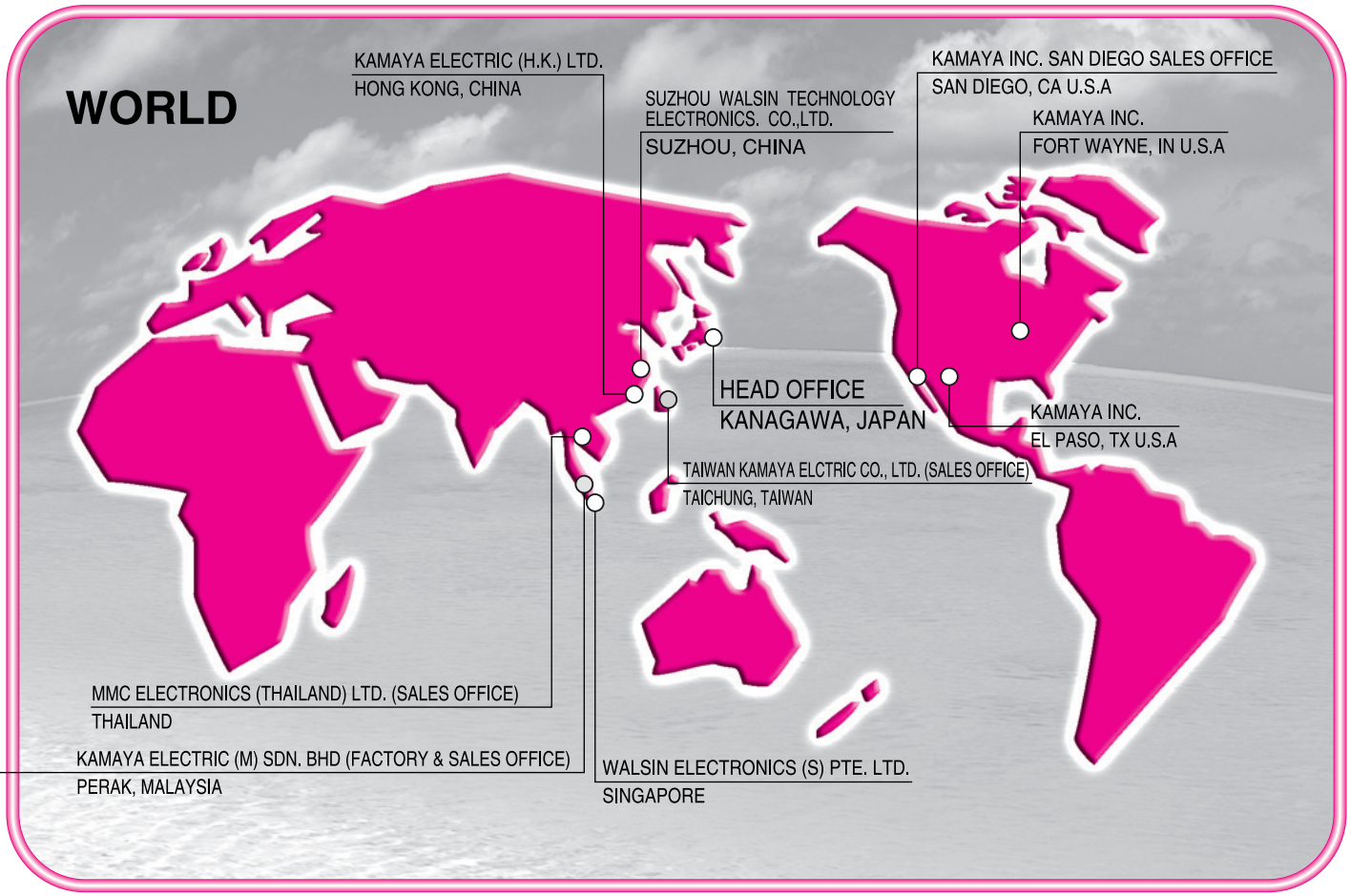
In-rush Current(Rush current)
Current that rapidly flows on circuit when power supply is turned on.
In many cases In-rush Current is bigger than Steady-state Current.
Chip fuses are confirmed to withstand In-rush Current.

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.

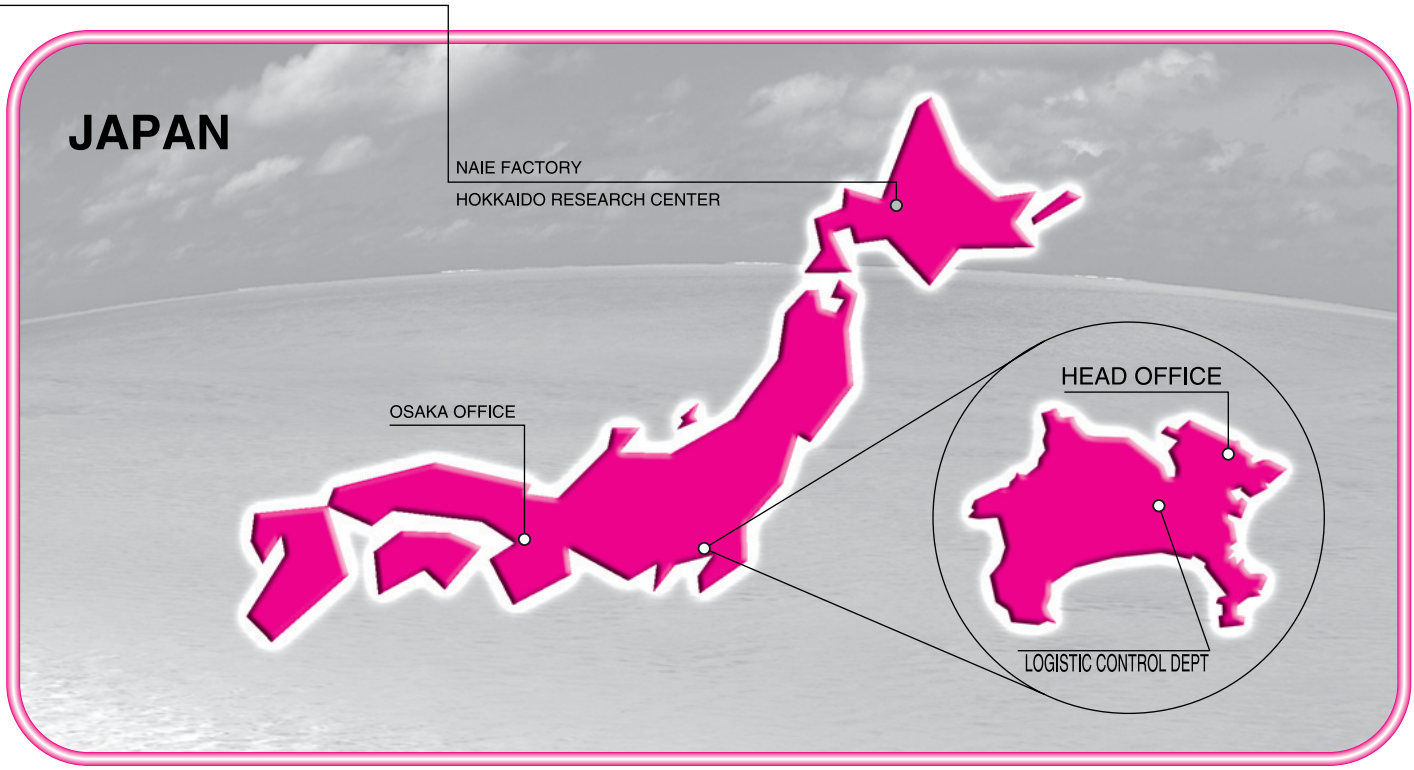
Maximum Open Circuit Voltage
Maximum open circuit voltage is the value of voltage applicable to both ends of resistors, when a resister is open condition in a circuit.
This voltage shall be corresponding to 1,000 times the rated dissipation or maximum open circuit which is the less severe.

MEMO

•Kamaya Global Network



Application Facilities		Standard	Certification Organization	Certification No.	Certificate Date	Note
JAPAN	NAIE Factory	ISO9001	Bureau Veritas Japan Co., Ltd	187346	Jul.28,1995	
		ISO14001	Reliability Center for Electronic Components of Japan	EMS 02 028	May.9,2002	
MALAYSIA	KAMAYA ELECTRIC(M)SDN, BHD.	ISO14001	SIRIM QAS Sdn, Bhd.	K00810001	Jul.11,2003	
		ISO/TS16949	NQA Global Assurance	IATF 0054622	Jul.26,2007	
		ISO9001		22815	Jul.25,2007	



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Important

Product specifications contained in this catalogue are subject tochange at any time without notice. Please confirm specifications with your order.

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