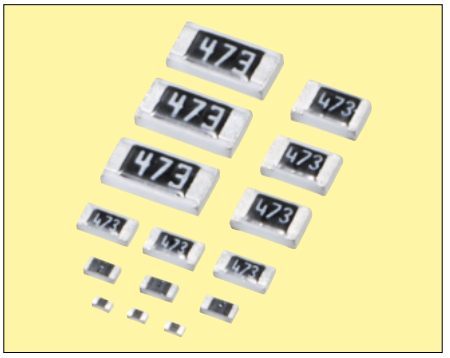
KYOCERA

Thick Film Chip Resistors (CR, CJ Series)



Features

- Low Noise
- Nickel Barrier Terminations

Application

- General Purpose

How to Order

CR ① 05 ② - 472 ③ J ④ - H ⑤

①Series
CR : Resistor
CJ : Jumper

②Size(EIA)

03	0201	**21**	0805
05	0402	**32**	1206
10	0603		

③Resistance Value(3 digits or 4 digits)
Ex. 562 : 56×10^2=5600Ω
4021 : 402×10^1=4020Ω
Chip Jumper : 000

④Tolerance

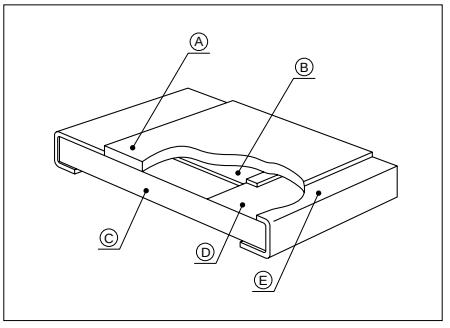
D	±0.5%	**J**	±5%
F	±1%	**Blank**	Jumper chips

⑤Packaging

T	Taping	Paper	ϕ178	4mm	5,000pcs
***H**	Taping	Paper	ϕ178	2mm	10,000pcs

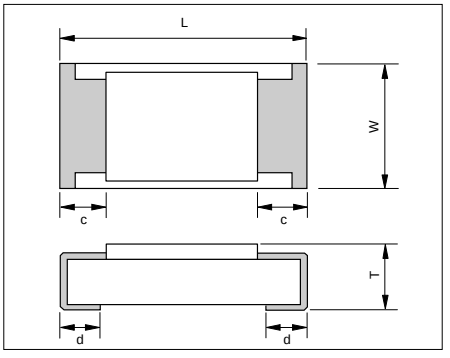
* Available for CR05 and CR03

Structure and material



Code	Structure	Material
Ⓐ	Coating	Glass or Epoxy
Ⓑ	Resistor	RuO_2 Resistor (The same material of Termination for chip jumper)
Ⓒ	Substrate	96% Alumina
Ⓓ	Termination	Silver
Ⓔ	Plating	(Ni, Sn or Sn-Pb) Pla.

Dimensions



(Unit : mm)

Type(EIA Size)	W	L	C	d	T
CR03, CJ03(0201)	0.30±0.03	0.60±0.03	0.15±0.10	0.15±0.05	0.23±0.03
CR05, CJ05(0402)	0.50±0.05	1.00±0.05	0.20±0.15	0.20±0.10	0.35±0.05
CR10, CJ10(0603)	$0.80^{+0.15}_{-0.10}$	1.60±0.10	0.25±0.20	$0.20^{+0.20}_{-0.15}$	0.50±0.10
CR21, CJ21(0805)	$1.25^{+0.15}_{-0.10}$	2.00±0.10	0.35±0.20	0.40±0.20	0.55±0.10
CR32, CJ32(1206)	$1.55^{+0.15}_{-0.10}$	3.10±0.10	0.45±0.20	0.45±0.20	$0.55^{+0.10}_{-0.05}$

Specifications

Series	Rated Power	Max. Working Voltage	Resistance Tolerance	Resistance Value Range	Working Temperature
CR03(0201)	0.05(1/20)W	15V	J: ±5%	10Ω to 1MΩ	–55 to +125°C
CR05(0402)	0.0625(1/16)W	50V	F: ±1% J: ±5%	10Ω to 1MΩ 1.0Ω to 10MΩ	
CR10(0603)	0.10(1/10)W	50V	D: ±0.5% F: ±1% J: ±5%	10Ω to 1MΩ 10Ω to 1MΩ 1.0Ω to 10MΩ	
CR21(0805)	0.125(1/8)W	100V	D: ±0.5% F: ±1% J: ±5%	10Ω to 1MΩ 10Ω to 1MΩ 1.0Ω to 10MΩ	
CR32(1206)	0.25(1/4)W	200V	D: ±0.5% F: ±1% J: ±5%	10Ω to 1MΩ 10Ω to 1MΩ 1.0Ω to 10MΩ	

Specifications

• CJ series

Part Number	Rated Current	Resistivity	Working Temperature
CJ03 (0201 Type)	0.5A(70°C)	50mΩmax	–55 to +125°C
CJ05, CJ10, CJ21 (0402, 0603, 0805 Type)	1A(70°C)		
CJ32 (1206 Type)	2A(70°C)		

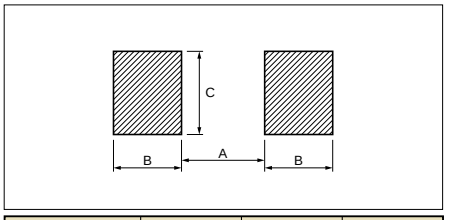
How to Calculate Rated Voltage

$E=\sqrt{P \cdot R}$

E : Rated Voltage (V)
P : Rated Power (W)
R : Standard Resistance Value (Ω)

Rated voltage should be lower than max working voltage.

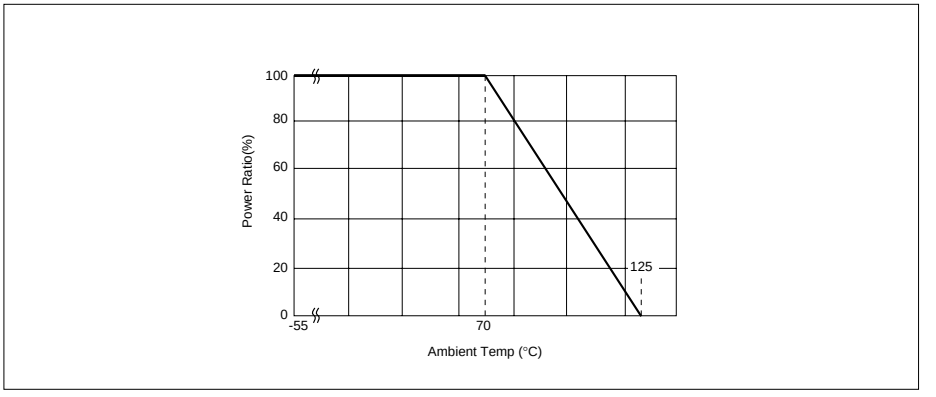
Recommended Land Pattern (Unit : mm)



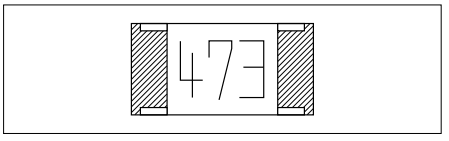
EIA Size	A	B	C
0201	0.25	0.225	0.3
0402	0.5	0.4	0.5
0603	0.8	0.7	0.8
0805	1.0	0.8	1.2
1206	2.0	0.8	1.5

Derating Curve

Rated power should be reduced as below when temperature become higher.
Under high temperature, power derated as follows:



Marking



Resistance value (3 digits code)
(Ex.)47×10^3=47000(Ω)
=47(KΩ)

4R7 : 4.7Ω(The decimal point is shown by "R".)
100 : 10Ω
102 : 1kΩ
105 : 1MΩ

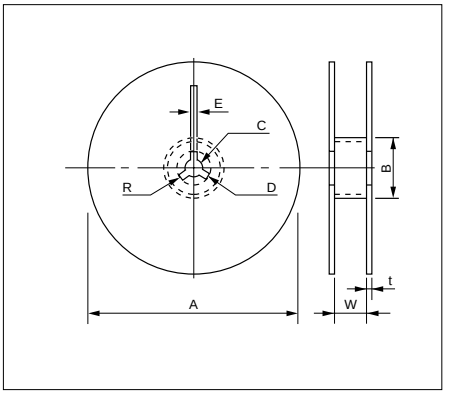
Standard Resistance Value

E24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2
	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1
	5.6	6.2	6.8	7.5	8.2	9.1			

Tape & Reel

• Reel

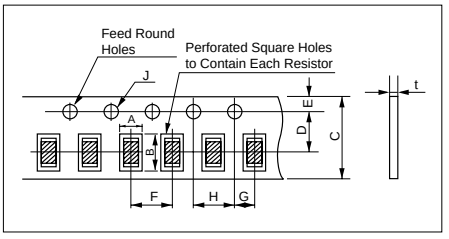
(Unit : mm)



Code	A	B	C	D	E	W	t	R
Dimension	ϕ178±0.2	ϕ50min	ϕ13.0±0.5	ϕ21.0±0.8	2.0±0.5	10.0±1.5	2.5max	1.0

• Carrier Tape

(Unit : mm)



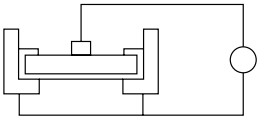
TYPE \ Dimension Code	A	B	C	D	E	F	G	H	J	t
0201	0.40±0.05	0.70±0.05	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.05	4.0±0.1	ϕ1.5 $^{+0.1}_{-0}$	0.45max
0402	0.65±0.1	1.15±0.1								0.6max
0603	1.1±0.2	1.9±0.2				4.0±0.1				1.1max
0805	1.65±0.2	2.4±0.2								
1206	2.0±0.2	3.6±0.2								

• Taping Quantity per reel

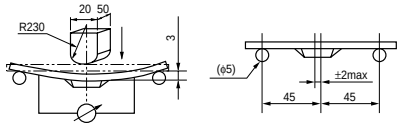
(Unit : pcs)

TYPE	Paper(ϕ178 reel)
0201	10000(2mm pitch)
0402	10000(2mm pitch)
0603	5000(4mm pitch)
0805	5000(4mm pitch)
1206	5000(4mm pitch)

Electrical Characteristics

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="2">Standard</th><th colspan="2">Test Conditions</th></tr>
<tr><th>Resistor</th><th>Jumper</th><th>Resistor</th><th>Jumper</th></tr>
<tr><td colspan="2">DC Resistance</td><td>Within Initial Tolerance</td><td>50mΩmax</td><td colspan="2">Power Contdition A
(20°C, 65%RH)</td></tr>
<tr><td colspan="2">Temperature Characteristics</td><td><table><tr><th>Resistance(Ω)</th><th>TCR(ppm/°C)</th></tr><tr><td>*D, F
10≤R≤1M</td><td>–100 to +100</td></tr><tr><td>J, CR05:F
R <10
10≤ R ≤1M
1M< R</td><td>
–100 to +600
–250 to +250
–500 to +300</td></tr></table>*Except CR05</td><td></td><td>Test Temperature: 25,125(°C)
$\Delta R/R=R_2-R_1/R_1\times1/T_2-T_1\times10^6$
ΔR/R: Temp. Coefficient (ppm/°C)
T_1: 25(°C)
T_2: 125(°C)
R_1: T_1 Resistance at (Ω)
R_2: T_2 Resistance at (Ω)</td><td></td></tr>
<tr><td rowspan="2">Short-time Overload</td><td>ΔR/R</td><td>±(2.0%+0.10Ω)max
of the intial value</td><td>50mΩmax</td><td rowspan="2">(1) Apply 2.0×rated voltage for 5sec. (2.5×rated voltage for Arrays)
(2) Wait 30minutes
(3) Measure resistance
CR03: 30Vmax
CR05: 50Vmax
CR10: 100Vmax
CR21: 200Vmax
CR32: 400Vmax
CRA3A, CRB3A, CRC3A : 100V max</td><td rowspan="2">(1) 2A for 5sec. (CJ03: 1A)
(2) Wait 30minutes
(3) Measure resistance</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage
intermittent overload</td></tr>
<tr><td rowspan="2">Intermittent Overload</td><td>ΔR/R</td><td>±(5%+0.1Ω)max
of the intial value</td><td>50mΩmax</td><td rowspan="2">(1) Perform 10000voltage cycles as follows:
ON(2.0×rated voltage, 2.5×for Arrays) 1sec.
OFF 25sec.
(2) Stabilization time 30min without loading
(3) Measure resistance
CR03: 30Vmax
CR05: 50Vmax
CR10: 100Vmax
CR21: 200Vmax
CR32: 400Vmax
CRA3A, CRB3A, CRC3A : 100V max</td><td rowspan="2">(1) Perform 10000 current cycles as follows:
ON(2A) 1sec.
OFF 25sec.
(2) Wait 30minutes
(3) Measure resistance
CJ03: 1A max</td></tr>
<tr><td>Visual</td><td colspan="2">No evidence of mechanical damage</td></tr>
<tr><td colspan="2">Dielectric Withstanding Voltage</td><td colspan="2">No evidence of mechanical damage</td><td colspan="2" rowspan="2">Apply 500VAC for 1min (CR10 300VAC)
(CR05, CRA3A, CRB3A, CRC3A 300VAC/1sec.
CR03 50VAC/1min.)
 
Apply 500V DC.
(CR05, CRA3A, CRB3A, CRC3A 100V DC
CR03 50VDC)</td></tr>
<tr><td colspan="2">Insulation Resistance</td><td colspan="2">■CR03, CJ03 : 10^8Ωmin
■CR05, CJ05 : 10^8Ωmin
■CR10, CJ10 : 10^9Ωmin
■CR21, CJ21 : 10^{10}Ωmin
■CR32, CJ32 : 10^{12}Ωmin
■CRA3A, CRB3A, CRC3A : 10^9Ωmin</td></tr>
</table>

Mechanical Characteristics

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Terminal Strength	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	Apply the load as show: Measure resistance during load application Unit: mm Bending in 10seconds  PC board: Glass epoxy t=1.6	
	Visual	No evidence of mechanical damage after loading			
Soldering Heat Resistance	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	Immerse into molten solder at 260±5°C for 10±1sec. Stabillize component at room temperature for 1hr. Measure resistance.	
	Visual	No evidence of leaching			
Solderability		Coverage ≥95% each termination end		Immerse in Rogin Flux for 2±0.5 sec. and in SN62 solder at 235±5°C for 2±0.5 sec.	
Anti-Vibration Test	ΔR/R	±(1%+0.1Ω)max of the intial value	50mΩmax	2 hrs. each in X, Y and Z axis. (TTL 6hrs.)10 to 55 Hz sweep in 1min.at 1.5mm amplitude.	
	Visual	No evidence of mechanical damage			
Solvent Resistance	ΔR/R	±(0.5%+0.05Ω)max of the intial value	50mΩmax	Immerse in static state butyl acetate at 20°C to 25°C for 30±5sec. Stabillize component at room temperature for 30min then measure Value.	
	Visual	No evidence of mechanical damage			

Environmental Characteristics

Item		Standard		Test Conditions	
		Resistor	Jumper	Resistor	Jumper
Temperature Cycle	ΔR/R	±(1%+0.05Ω)max of the intial value	50mΩmax	1) Run 5cycles as follows: –55±3°C for 30min. 125±3°C for 30min. Room temp for 10-15min. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Low Temperature Storage	ΔR/R	±(2%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in –55°C chamber without loading for 1000^{+48}_{-0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
High Temperature Storage	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in 125°C chamber without loading for 1000^{+48}_{-0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Moisture Resistance	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Dwell in temp: 65°C RH90 to 95%RH chamber without loading for 1000^{+48}_{-0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Life Test	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Temp: 70±3°C Voltage: (rated voltage) on 90 min off 30min. Duration: 1000^{+48}_{-0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			
Loading Life in Moisture	ΔR/R	±(3%+0.1Ω)max of the intial value	50mΩmax	1) Temp: 40±2°C RH: 90-95% Voltage Cycle: on 90 min(rated voltage) off 30min. Duration: 1000^{+48}_{-0} hrs. 2) Stabilize component at room temperature for 1hr. then measure value.	
	Visual	No evidence of mechanical damage			

Circuit design

1) Once application and assembly environments have been checked, the resistors may be used in conformance with the catalog and the specifications.

2) Please consult the manufacturer in advance when the resistors is used in devices such as: devices which deal with human life, I.e. medical devices; devices which are highy public orientated; and devices which demand a high standerd of liability.

3) Please use the resistors in conformance with the operating temperature provided in both the catalog and the specifications.

4) Please keep voltage under the rated voltage which is applied to the resistor.

5) Do not use the resistor in an environment where it might easily exceed the respective provisions concerning shock and vibration specified in the catalog and specifications.

6) Please do not use the resistor in the following environments.
①State that water, oil, and solvent hang in resistor
②State where poisonous gas (sulfur and chlorine, etc.) exists
③State that direct sunshine, radiation, and ultraviolet, etc. are irradiated

7) There is a thing that resistance changes according to the stuff of the resin when the coating with the resin is given.
Please use resin coating after confirming the characteristic.

8) There is a thing that resistance changes according to flux and cleaner.
Please use flux and cleaner after confirming the characteristic.

9) Please consult about a lead free products.

Storage

1) Keep storage place temperature +5 to +35˚C, humidity 45 to 75% RH.

2) Please keep parts out of poisonous gas such as sulfur or chlorine in the air, and out of salty moisture. Or they may cause rust of terminal, and poor solderability. and, please consider the above-mentioned item after mounting your company.

4) Soldering iron

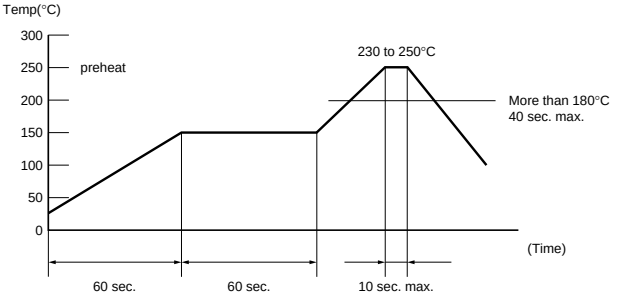
Temperature	soldering iron 300±5°C *
Time	3 sec. max. *

*Do not place the soldering iron on the chip. Soldering iron is 30W max.

Soldering method

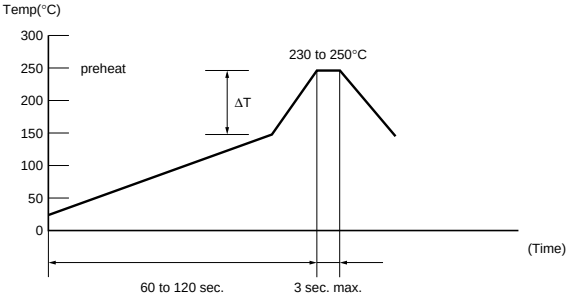
1) Recommendable temperature profile

reflow



2) Recommendable temperature profile

wave



(Caution) Cooling after soldering should be as slow as possible.
Ensure that the chip Resistor is preheated adequately.
Ensure that the temperature difference(ΔT) does not exceed 130˚C.

3) pb-free recommendable temperature profile

reflow