

# DATA SHEET

## LEAD FREE CHIP RESISTORS

RC\_P series

$\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 5\%$

Sizes 0075/0100/0201/0402/0603/0805/  
1206/1210/1218/2010/2512



**YAGEO**

Product specification – September 21, 2022 V.5



### SCOPE

This specification describes RC series chip resistors with made by thick film process.

### APPLICATIONS

- All general purpose application

### FEATURES

- Total lead free without RoHS exemption
- Halogen Free Epoxy
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space

### ORDERING INFORMATION - GLOBAL PART NUMBER

Global part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

#### GLOBAL PART NUMBER

**RC    XXXX   X   X   X   XX   XXXX   P**  
           (1)    (2) (3) (4) (5)        (6)    (7)

#### (1) SIZE

0075/0100/0201/0402/0603/0805/1206/1210/1218/2010/2512

#### (2) TOLERANCE

D =  $\pm 0.5\%$

F =  $\pm 1.0\%$

J =  $\pm 5.0\%$  ( for jumper ordering, use code of J)

#### (3) PACKAGING TYPE

R = Paper taping reel

K = Embossed taping reel

S = ESD safe reel (0100 only)

#### (4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec.

#### (5) TAPING REEL

07= 7 inch dia. Reel

13= 13 inch dia. Reel

7N = 7 inch dia. Reel, ESD safe reel (0100 only)

7W = 7 inch dia. Reel & 2 x standard power

#### (6) RESISTANCE VALUE

There are 2~4 digits indicated the resistance value.

Letter R/K/M is decimal point.

Example:

97R6 =  $97.6\Omega$

9K76 =  $9760\Omega$

1M =  $1,000,000\Omega$

#### (7) DEFAULT CODE

Letter P is lead free (without RoHS exemption)

### ORDERING EXAMPLE

The ordering code for a RC0402 0.0625W chip resistor value 100K $\Omega$  with  $\pm 5\%$  tolerance, supplied in 7-inch tape reel of 10,000 units per reel is: RC0402JR-07100KP.

**MARKING**

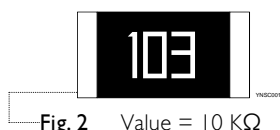
RC0075 / RC0100 / RC0201 / RC0402



No Marking

Fig. 1

RC0603

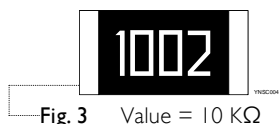


E24 series: 3 digits, 5%

First two digits for significant figure and 3rd digit for number of zeros

Fig. 2 Value = 10 K $\Omega$ 

RC0805 / RC1206 / RC1210 / RC1218 / RC2010 / RC2512



E24/E96 series: 4 digits, 1%, 0.5%

First three digits for significant figure and 4th digit for number of zeros

Fig. 3 Value = 10 K $\Omega$ **Note**

For further marking information, please see special data sheet "Chip resistors marking".

**CONSTRUCTION**

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environmental influences. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the two external terminations (matte tin on Nibarrier) are added, as shown in Fig.4.

**Outlines**

For dimensions, please refer to Table I

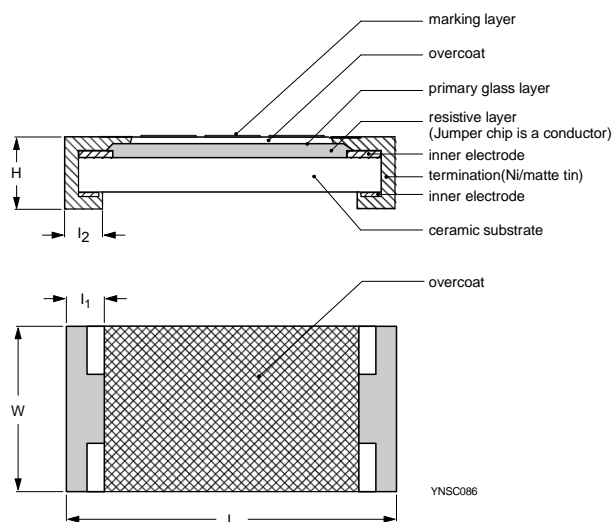


Fig. 4 Chip resistor outlines

## DIMENSION

Table 1

TYPE	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)	l <sub>2</sub> (mm)
RC0075	0.30±0.01	0.15±0.01	0.13±0.01	0.08±0.03	0.08±0.03
RC0100	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03
RC0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
RC0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
RC0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
RC0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
RC1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.45±0.20
RC1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
RC1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
RC2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.55±0.20
RC2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.60±0.20

## ELECTRICAL CHARACTERISTICS

Table 2

TYPE	POWER	CHARACTERISTICS						
		Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	RESISTANCE RANGE	Temperature Coefficient of Resistance	Jumper Criteria
RC0075	1/50W	-55°C to +125°C	10V	25V	25V	E24 ±5% 10Ω ≤ R ≤ 1MΩ E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	10Ω ≤ R < 100Ω: -200~+600ppm/°C 100Ω ≤ R ≤ 1MΩ: ±200ppm/°C	Rated Current 0.5A Max. Current 1.0A
RC0100	1/32W	-55°C to +125°C	15V	30V	30V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ Jumper < 50mΩ	1Ω ≤ R < 10Ω: -200~+600ppm/°C 10Ω ≤ R < 100Ω: ±300ppm/°C 100Ω ≤ R ≤ 10MΩ: ±200ppm/°C	Rated Current 0.5A Max. Current 1.0A
RC0201	1/20W	-55°C to +125°C	25V	50V	50V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω: -100~+350ppm/°C 10Ω < R ≤ 10MΩ: ±200ppm/°C	Rated Current 0.5A Max. Current 1.0A

TYPE	POWER	CHARACTERISTICS						
		Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	RESISTANCE RANGE	Temperature Coefficient of Resistance	Jumper Criteria
RC0402	1/16W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C 10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 1.0A Max. Current 2.0A
	1/8W	-55°C to +155°C	50V	100V	100V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C	—
RC0603	1/10W	-55°C to +155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C 10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 1.0A Max. Current 2.0A
	1/5W	-55°C to +155°C	75V	150V	150V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C	—
RC0805	1/8W	-55°C to +155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C 10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 2.0A Max. Current 5.0A
	1/4W	-55°C to +155°C	150V	300V	300V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C	—
RC1206	1/4W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 22MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ E24/E96 ±0.5% 10Ω ≤ R ≤ 1MΩ Jumper < 50mΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C 10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 2.0A Max. Current 10.0A
	1/2W	-55°C to +155°C	200V	400V	500V	E24 ±5% 1Ω ≤ R ≤ 10MΩ E24/E96 ±1% 1Ω ≤ R ≤ 10MΩ	1Ω ≤ R ≤ 10Ω: ±200ppm/°C 10Ω < R ≤ 10MΩ: ±100ppm/°C	—

TYPE	POWER	CHARACTERISTICS						
		Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	RESISTANCE RANGE	Temperature Coefficient of Resistance	Jumper Criteria
RC1210	1/2W	-55°C to +155°C	200V	500V	500V	E24 ±5% $1\Omega \leq R \leq 22M\Omega$	$1\Omega \leq R \leq 10\Omega$ : ±200ppm/°C $10\Omega < R \leq 10M\Omega$ : ±100ppm/°C $10M\Omega < R \leq 22M\Omega$ : ±200ppm/°C	Rated Current 2.0A Max. Current 10.0A
						E24/E96 ±1% $1\Omega \leq R \leq 10M\Omega$ E24/E96 ±0.5% $10\Omega \leq R \leq 1M\Omega$ Jumper < 50mΩ		
RC1218	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% $1\Omega \leq R \leq 1M\Omega$	$1\Omega \leq R \leq 10\Omega$ : ±200ppm/°C $10\Omega < R \leq 1M\Omega$ : ±100ppm/°C	Rated Current 6.0A Max. Current 10.0A
						E24/E96 ±1% $1\Omega \leq R \leq 1M\Omega$ E24/E96 ±0.5% $10\Omega \leq R \leq 1M\Omega$ Jumper < 50mΩ		
RC2010	3/4W	-55°C to +155°C	200V	500V	500V	E24 ±5% $1\Omega \leq R \leq 22M\Omega$	$1\Omega \leq R \leq 10\Omega$ : ±200ppm/°C $10\Omega < R \leq 10M\Omega$ : ±100ppm/°C $10M\Omega < R \leq 22M\Omega$ : ±200ppm/°C	Rated Current 2.0A Max. Current 10.0A
						E24/E96 ±1% $1\Omega \leq R \leq 10M\Omega$ E24/E96 ±0.5% $10\Omega \leq R \leq 1M\Omega$ Jumper < 50mΩ		
RC2512	1W	-55°C to +155°C	200V	500V	500V	E24 ±5% $1\Omega \leq R \leq 22M\Omega$	$1\Omega \leq R \leq 10\Omega$ : ±200ppm/°C $10\Omega < R \leq 10M\Omega$ : ±100ppm/°C $10M\Omega < R \leq 22M\Omega$ : ±200ppm/°C	Rated Current 2.0A Max. Current 10.0A
						E24/E96 ±1% $1\Omega \leq R \leq 10M\Omega$ E24/E96 ±0.5% $10\Omega \leq R \leq 1M\Omega$ Jumper < 50mΩ		

## FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please refer to data sheet “Chip resistors mounting”

## PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	RC0075	RC0100	RC0201	RC0402	RC0603	RC0805	RC1206	RC1210	RC1218	RC2010	RC2512
Paper taping reel (R)	7" (178 mm)	---	20,000	10,000	10,000	5,000	5,000	5,000	5,000	---	---	---
	13" (330 mm)	---	80,000	50,000	50,000	20,000	20,000	20,000	20,000	---	---	---
ESD safe reel (S)	7" (178 mm)	20,000	40,000	---	---	---	---	---	---	---	---	---
Embossed taping reel	7" (178 mm)	---	---	---	---	---	---	---	---	4,000	4,000	4,000

### NOTE

For tape and reel specification/dimensions, please refer to data sheet “Chip resistors packing”.

## FUNCTIONAL DESCRIPTION

### OPERATING TEMPERATURE RANGE

RC0402 to RC2512 Range: -55°C to +155°C (Fig. 5-1)

RC0075 to RC0201 Range: -55°C to +125°C (Fig. 5-2)

### POWER RATING

Each type rated power at 70 °C:

RC0075=1/50W

RC0100=1/32W

RC0201=1/20 W

RC0402=1/16 W, 1/8W

RC0603=1/10W, 1/5W

RC0805=1/8W, 1/4W

RC1206=1/4W, 1/2W

RC1210=1/2W

RC1218=1W

RC2010=3/4W

RC2512=1W

### RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{P \times R}$$

Where

V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value ( $\Omega$ )

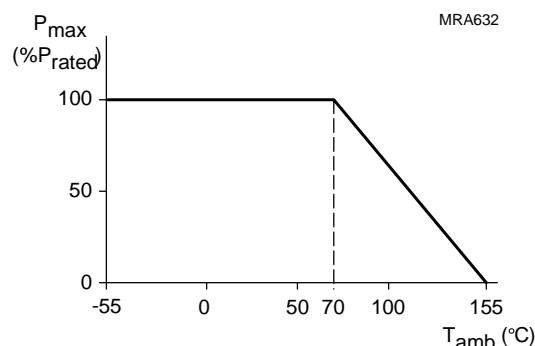


Fig. 5-1 Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

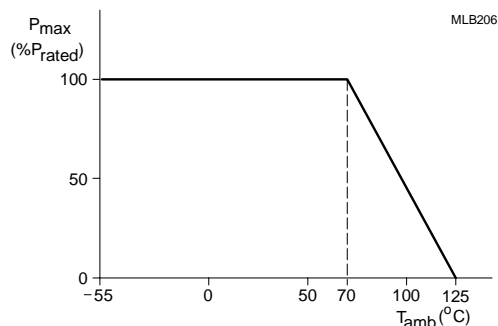


Fig. 5-2 Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

## TESTS AND REQUIREMENTS

Table 8 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	IEC 60115-1 4.8	At +25/-55 °C and +25/+125 °C  Formula: $T.C.R. = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ Where $t_1 = +25 \text{ °C}$ or specified room temperature $t_2 = -55 \text{ °C}$ or +125 °C test temperature $R_1$ = resistance at reference temperature in ohms $R_2$ = resistance at test temperature in ohms	Refer to table 2
Life/ Endurance	MIL-STD-202G Method 108A IEC 60115-1 4.25.1	At 70±5°C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off, still air required	0075: ±(5%+100mΩ) <100mΩ for jumper 0100: ±(3%+0.05Ω) Others: ±(1%+0.05Ω) for D/F tol ±(3%+0.05Ω) for J tol <100mR for jumper
High Temperature Exposure	MIL-STD-202G Method 108A IEC 60115-1 4.25.3	1,000 hours at maximum operating temperature depending on specification, unpowered.	0075: ±(5%+100mΩ) <100mΩ for jumper 0100: ±(1%+0.05Ω) Others: ±(1%+0.05Ω) for D/F tol ±(2%+0.05Ω) for J tol <50mR for jumper
Moisture Resistance	MIL-STD-202G Method 106F IEC 60115-1 4.24.2	Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered Parts mounted on test-boards, without condensation on parts	0075: ±(2%+100mΩ) <100mΩ for jumper 0100: ±(2%+0.05Ω) Others: ±(0.5%+0.05Ω) for D/F tol ±(2%+0.05Ω) for J tol <100mR for jumper
Humidity	IEC 60115-1 4.37	Steady state for 1000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off	0075: ±(5%+100mΩ) no visible damage 0100: ±(3%+0.05Ω) Others: ±(1%+0.05Ω) for D/F tol ±(2%+0.05Ω) for J tol <100mR for jumper
Thermal Shock	MIL-STD-202G Method 107G	-55/+125°C Note Number of cycles required is 300 Devices mounted Maximum transfer time is 20 seconds Dwell time is 15 minutes. Air - Air	0075/01005: ±(1%+50mΩ) < 50mΩ for jumper Others: ±(0.5%+0.05Ω) for D/F tol ±(1%+0.05Ω) for J tol <50mR for jumper

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Short Time Overload	IEC 60115-1 4.13	2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature	0075/01005: $\pm(2\% + 50\text{m}\Omega)$ < 50m $\Omega$ for jumper Others: $\pm(1\% + 0.05\Omega)$ for D/F tol $\pm(2\% + 0.05\Omega)$ for J tol <50mR for jumper
Board Flex/ Bending	IEC 60115-1 4.33	Device mounted or as described only 1 board bending required bending time: 60 $\pm$ 5 seconds 0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm	0075/01005: $\pm(1\% + 50\text{m}\Omega)$ < 50m $\Omega$ for jumper No visible damage
Solderability - Wetting	IPC/JEDECJ-STD-002B test B IEC 60068-2-58	Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155 °C dry heat 2nd step: leadfree solder bath at 245 $\pm$ 3 °C Dipping time: 3 $\pm$ 0.5 seconds	Well tinned (>95% covered) No visible damage
-Leaching	IPC/JEDECJ-STD-002B test D IEC 60068-2-58	Leadfree solder ,260°C, 30 seconds immersion time	No visible damage
-Resistance to Soldering Heat	MIL-STD-202F Method 210F IEC 60068-2-58	Condition B, no pre-heat of samples Leadfree solder, 260 °C $\pm$ 5°C, 10 $\pm$ 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	0075: $\pm(3\% + 50\text{m}\Omega)$ <50m $\Omega$ for jumper 0100: $\pm(1\% + 0.05\Omega)$ Others: $\pm(0.5\% + 0.05\Omega)$ for D/F tol $\pm(1\% + 0.05\Omega)$ for J tol <50mR for jumper No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 5	Sep. 21, 2022	-	- Add size 0075
Version 4	May. 10, 2022	-	- Extend the range of size 01005 to 10Mohm
Version 3	Oct. 12, 2021	-	- Upgrade Temperature Coefficient of Resistance
Version 2	Mar. 25, 2021	-	- Add size 01005 and Double Power for size 0402~1206
Version 1	Sep. 05, 2018	-	- Remove size 01005 of this specification
Version 0	Aug. 22, 2014	-	- First issue of this specification

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Any product change will be announced by PCN.”