

# 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



**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
- MSL class: MSL I

**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 = ±0.5%  
 F = ±1.0%  
 J = ±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 = 97.6Ω  
 9K76 = 9760Ω  
 1M = 1,000,000Ω

**(7) DEFAULT CODE**

Letter P is lead free (without RoHS exemption)

**ORDERING EXAMPLE**

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

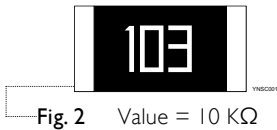
**MARKING**

RC0075 / RC0100 / RC0201 / RC0402



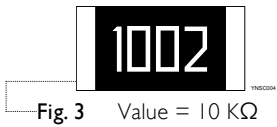
No Marking

RC0603



E24 series: 3 digits, 5%  
First two digits for significant figure and 3rd digit for number of zeros

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

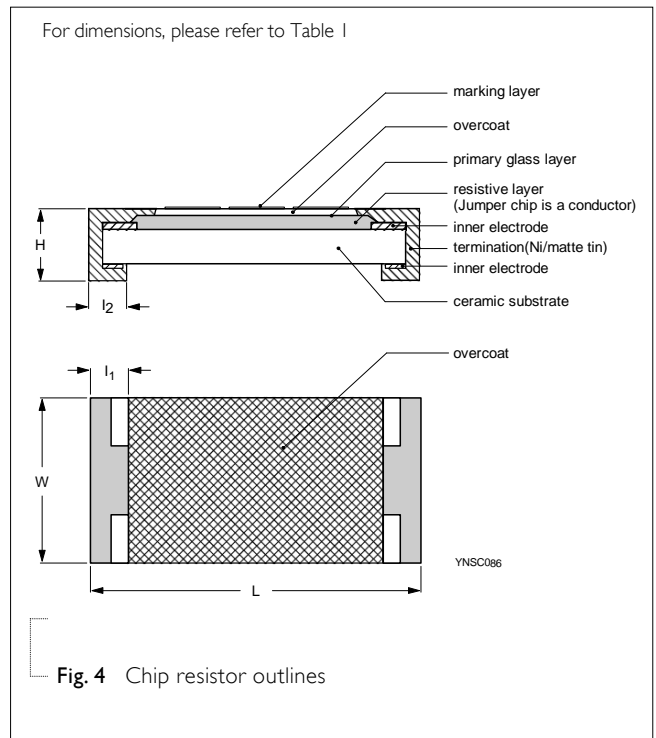
**Note**

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**



## 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<100Ω:-200~+600ppm°C	Rated Current 0.5A	
						10Ω≤R≤1MΩ			
						E24/E96 ±1%			
						100Ω≤R≤1MΩ: ±200ppm°C			
						10Ω≤R≤1MΩ	Max. Current 1.0A		
						Jumper< 50mΩ			
RC0100	1/32W	-55°C to +125°C	15V	30V	30V	E24 ±5%		1Ω≤R<10Ω:-200~+600ppm°C	Rated Current 0.5A
						1Ω≤R≤10MΩ			
						E24/E96 ±1%			
						10Ω≤R<100Ω: ±300ppm°C			
						100Ω≤R≤10MΩ: ±200ppm°C	Max. Current 1.0A		
						1Ω≤R≤10MΩ			
						Jumper< 50mΩ			
RC0201	1/20W	-55°C to +125°C	25V	50V	50V	E24 ±5%		1Ω≤R≤10Ω:-100~+350ppm°C	Rated Current 0.5A
						1Ω≤R≤10MΩ			
						E24/E96 ±1%			
						10Ω<R≤10MΩ: ±200ppm°C			
						10Ω≤R≤10MΩ: ±200ppm°C	Max. Current 1.0A		
						10Ω≤R≤1MΩ			
						Jumper< 50mΩ			

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%	1Ω ≤ R ≤ 10Ω: ±200ppm°C 10Ω < R ≤ 10MΩ: ±100ppm°C 10MΩ < R ≤ 22MΩ: ±200ppm°C	Rated Current 2.0A Max. Current 10.0A
						1Ω ≤ R ≤ 22MΩ E24/E96 ±1%		
RC1218	1W	-55°C to +155°C	200V	500V	500V	E24 ±5%	1Ω ≤ R ≤ 10Ω: ±200ppm°C 10Ω < R ≤ 1MΩ: ±100ppm°C	Rated Current 6.0A Max. Current 10.0A
						1Ω ≤ R ≤ 1MΩ E24/E96 ±1%		
RC2010	3/4W	-55°C to +155°C	200V	500V	500V	E24 ±5%	1Ω ≤ R ≤ 10Ω: ±200ppm°C 10Ω < R ≤ 10MΩ: ±100ppm°C 10MΩ < R ≤ 22MΩ: ±200ppm°C	Rated Current 2.0A Max. Current 10.0A
						1Ω ≤ R ≤ 22MΩ E24/E96 ±1%		
RC2512	1W	-55°C to +155°C	200V	500V	500V	E24 ±5%	1Ω ≤ R ≤ 10Ω: ±200ppm°C 10Ω < R ≤ 10MΩ: ±100ppm°C 10MΩ < R ≤ 22MΩ: ±200ppm°C	Rated Current 2.0A Max. Current 10.0A
						1Ω ≤ R ≤ 22MΩ E24/E96 ±1%		

**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:

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

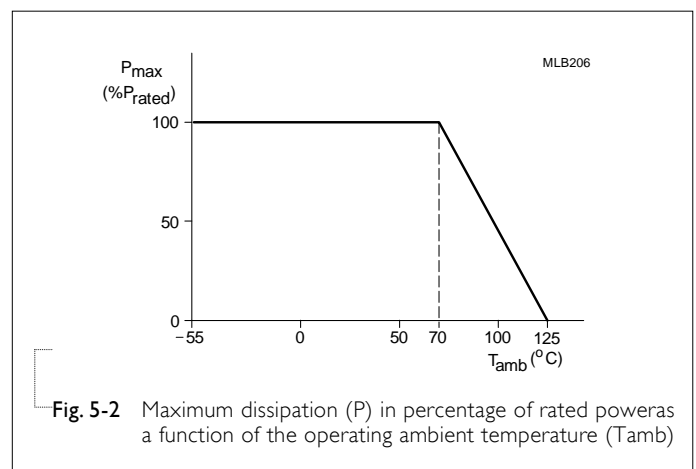
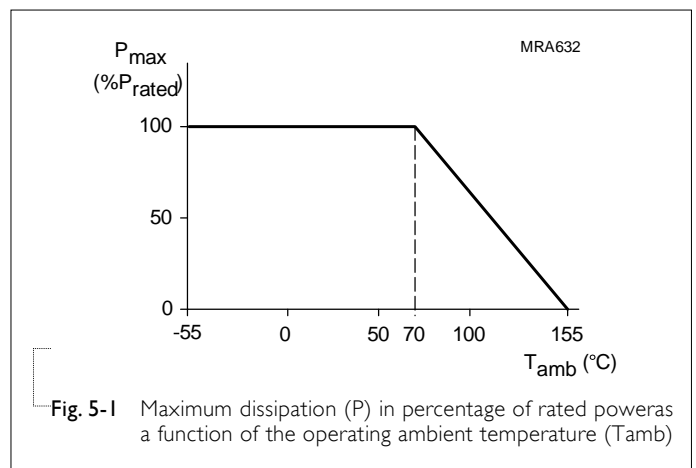
or max. working voltage whichever is less

Where

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

P = Rated power (W)

R = Resistance value (Ω)



**TESTS AND REQUIREMENTS**

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202 Method 304	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 <sub>1</sub> =+25 °C or specified room temperature t <sub>2</sub> =-55 °C or +125 °C test temperature R <sub>1</sub> =resistance at reference temperature in ohms R <sub>2</sub> =resistance at test temperature in ohms	Refer to table 2
Life/ Endurance	MIL-STD-202G Method 108 IEC 60115-1 7.1	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 108	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-202 Method 106	Each temperature / humidity cycle is defined at 8 hours, 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 10.4	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) 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 107	-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 8.1	2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature	0075/01005: $\pm(2\% + 50m\Omega)$ < 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 9.8	Device mounted or as described only 1 board bending required bending time: 60 $\pm$ 5 seconds 0075/0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm	$\pm(1\% + 50m\Omega)$ < 50m $\Omega$ for jumper No visible damage
Solderability - Wetting	J-STD-002 test B1	Electrical Test not required Magnification 50X SMD conditions: 1 <sup>st</sup> step: aging 4 hours at 155 $^{\circ}$ C dry heat 2 <sup>nd</sup> step: method B1, leadfree solder bath at 245 $\pm$ 3 $^{\circ}$ C Dipping time: 3 $\pm$ 0.5 seconds	Well tinned (>95% covered) No visible damage
-Leaching	J-STD-002 test D	Leadfree solder ,260 $^{\circ}$ C, 30 seconds immersion time	No visible damage
-Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B, no pre-heat of samples Leadfree solder, 260 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C, 10 $\pm$ 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	0075: $\pm(3\% + 50m\Omega)$ <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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