

# DATA SHEET

## LEAD FREE CHIP RESISTORS

RC\_P series  
 $\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 5\%$

Sizes 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

**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**

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)

**(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.

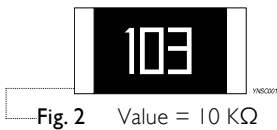
**MARKING**

RC0100 / RC0201 / RC0402



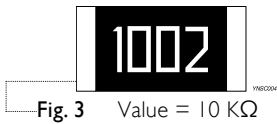
No Marking

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

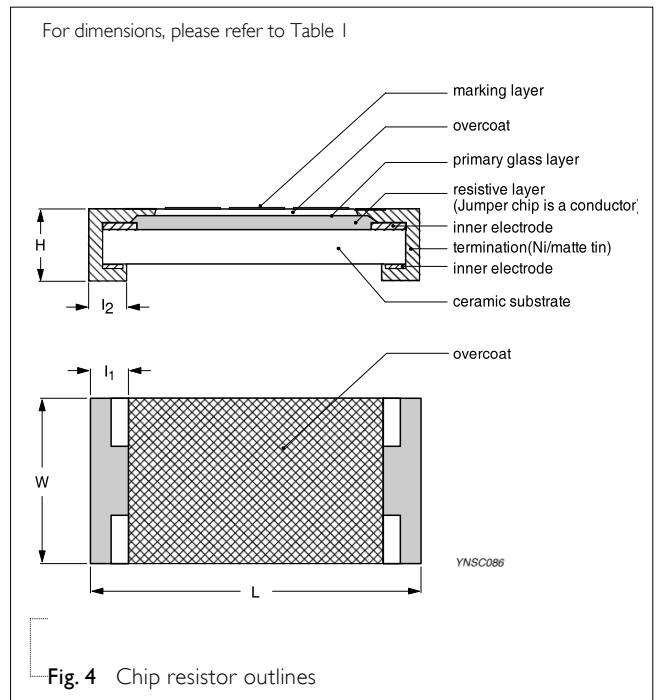
**Note**

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)
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	0.40±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	0.50±0.20
RC2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

**ELECTRICAL CHARACTERISTICS**

Table 2

TYPE	RESISTANCE RANGE	CHARACTERISTICS					Jumper Criteria
		Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance	
RC0100	1Ω ≤ R ≤ 22MΩ	-55 °C to +125 °C	15V	30V	30V	1Ω ≤ R ≤ 10Ω: -200~+600ppm/°C	Rated Current 0.5A Max. Current 1A
10Ω < R ≤ 100Ω: ±370ppm/°C							
RC0201	1Ω ≤ R ≤ 22MΩ	-55 °C to +125 °C	25V	50V	50V	1Ω ≤ R ≤ 10Ω: -100~+500ppm/°C	Rated Current 0.5A Max. Current 1A
10Ω < R ≤ 100Ω: ±300ppm/°C							
RC0402	5% (E24) 1Ω ≤ R ≤ 22MΩ	-55 °C to +125 °C	50 V	100 V	100 V	1Ω ≤ R ≤ 10Ω: ±350ppm/°C	Rated Current 1A Max. Current 2A
10Ω < R ≤ 100Ω: ±200ppm/°C							
RC0603	0201: Max. 10MΩ, 0100/1218: Max. 1MΩ	-55 °C to +125 °C	75V	150 V	150 V	1Ω ≤ R ≤ 10Ω: ±300ppm/°C	Rated Current 1A Max. Current 2A
10Ω < R ≤ 100Ω: ±200ppm/°C							
RC0805	1% (E24/E96) 1Ω ≤ R ≤ 10MΩ	-55 °C to +125 °C	150 V	300 V	300 V	1Ω ≤ R ≤ 10Ω: ±300ppm/°C	Rated Current 2A Max. Current 5A
100Ω < R ≤ 10MΩ: ±150ppm/°C							
RC1206	0.5% (E24/E96) 10Ω ≤ R ≤ 1MΩ	-55 °C to +155 °C	200 V	400 V	500 V	10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 2A Max. Current 10A
10MΩ < R ≤ 22MΩ: ±200ppm/°C							
RC1210	Jumper < 50mΩ	-55 °C to +155 °C	200 V	400 V	500 V	1Ω ≤ R ≤ 10Ω: ±300ppm/°C	Rated Current 2A Max. Current 10A
10Ω < R ≤ 100Ω: ±100ppm/°C							
RC1218	Jumper < 50mΩ	-55 °C to +155 °C	200V	500 V	500V	100Ω < R ≤ 10MΩ: ±100ppm/°C	Rated Current 6A Max. Current 10A
10MΩ < R ≤ 22MΩ: ±200ppm/°C							
RC2010	Jumper < 50mΩ	-55 °C to +155 °C	200 V	400 V	500 V	10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 2A Max. Current 10A
10MΩ < R ≤ 22MΩ: ±200ppm/°C							
RC2512	Jumper < 50mΩ	-55 °C to +155 °C	200 V	400 V	500 V	10MΩ < R ≤ 22MΩ: ±200ppm/°C	Rated Current 2A Max. Current 10A
10MΩ < R ≤ 22MΩ: ±200ppm/°C							

**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	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)	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)

RC0100 to RC0201 Range: -55°C to +125°C (Fig. 5-2)

**POWER RATING**

Each type rated power at 70 °C:

- RC0100=1/32W
- RC0201=1/20 W
- RC0402=1/16 W
- RC0603=1/10W
- RC0805=1/8W
- RC1206=1/4W
- 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:

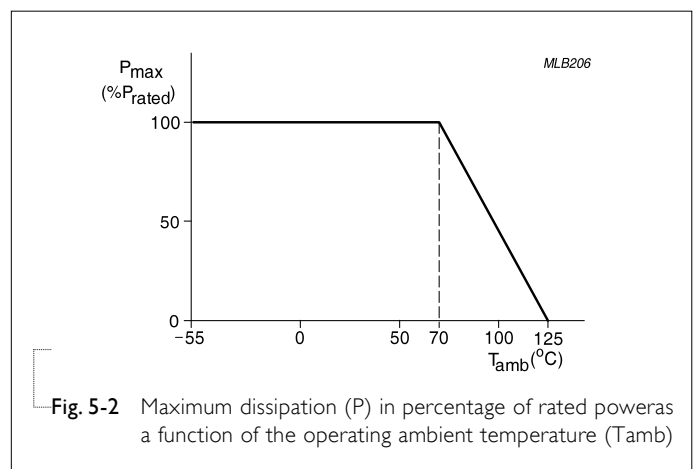
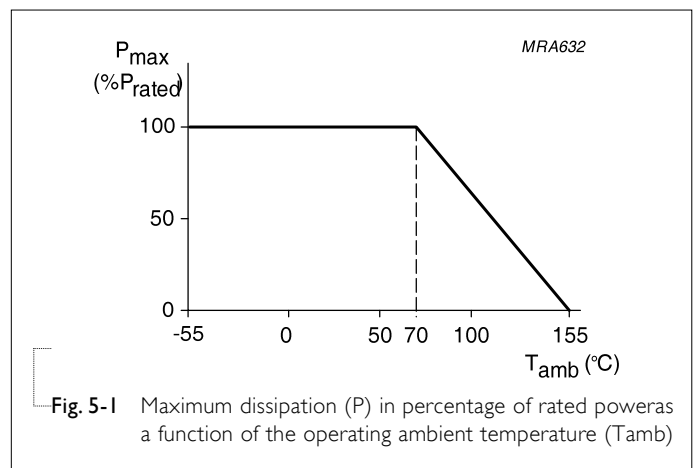
$$V = \sqrt{(P \times R)}$$

Where

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

P = Rated power (W)

R = Resistance value (Ω)



**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 <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 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	±(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.	±(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	±(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	±(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	±(0.5%+0.05Ω) for D/F tol ±(1%+0.05Ω) for J tol <50mR for jumper
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	±(1%+0.05Ω) for D/F tol ±(2%+0.05Ω) for J tol <50mR for jumper No visible damage
Board Flex/ Bending	IEC 60115-1 4.33	Device mounted or as described only 1 board bending required bending time: 60±5 seconds 0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm	±(1%+0.05Ω) for D/F/J Tol <50mR for jumper No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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±3 °C Dipping time: 3±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 ±5°C, 10 ±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	±(0,5%+0,05Ω ) for D/F tol ±(1%+0,05Ω ) for J tol <50mR for jumper No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
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Version 0	Aug. 22, 2014	-	- First issue of this specification
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