

# DATA SHEET

## LEAD FREE CHIP RESISTORS

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

Sizes 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**

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

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

- = Based on spec.

**(5) TAPING REEL**

07= 7 inch dia. Reel  
 13=13 inch dia. Reel

**(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.

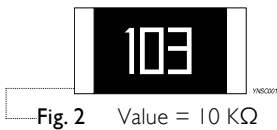
**MARKING**

**RC0201 / RC0402**



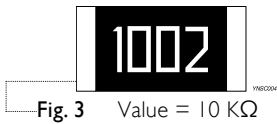
No Marking

**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

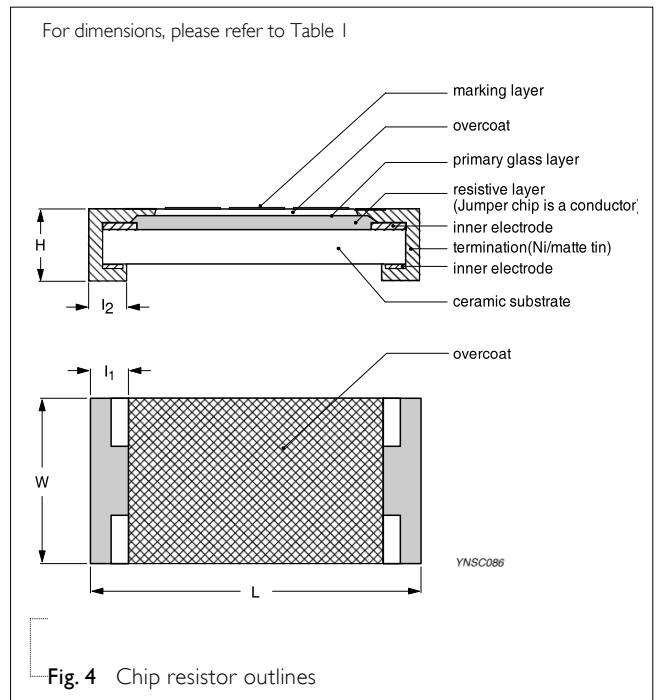
**Note**

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

**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 | RC0201 | RC0402 | RC0603 | RC0805 | RC1206 | RC1210 | RC1218 | RC2010 | RC2512 |
|-----------------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Paper taping reel (R) | 7" (178 mm)    | 10,000 | 10,000 | 5,000  | 5,000  | 5,000  | 5,000  | ---    | ---    | ---    |
|                       | 13" (330 mm)   | 50000  | 50000  | 20000  | 20000  | 20000  | 20000  | ---    | ---    | ---    |
| 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)

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

**POWER RATING**

Each type rated power at 70 °C:

- 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:

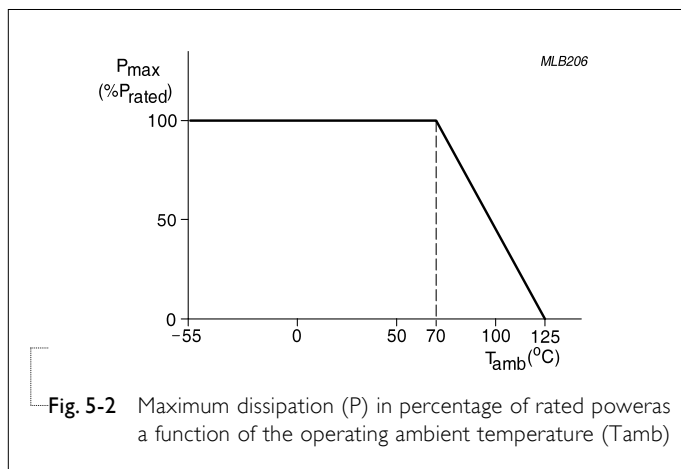
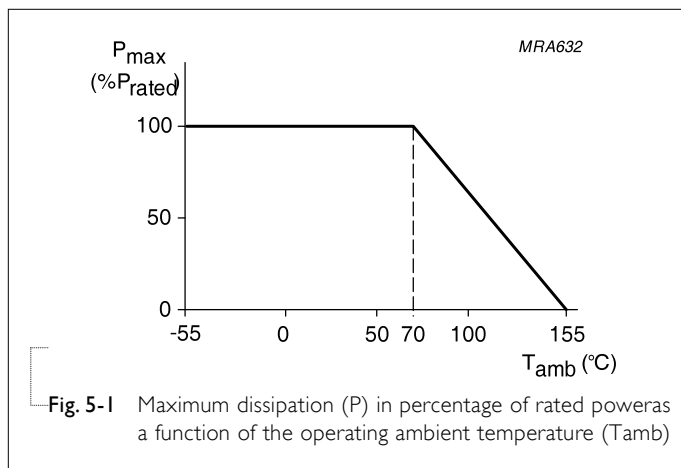
$$V = \sqrt{(P \times R)}$$

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.) | MIL-STD-202 Method 304                     | At +25/-55 °C and +25/+125 °C<br><br><b>Formula:</b><br><br>$T.C.R. = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ Where<br>t <sub>1</sub> =+25 °C or specified room temperature<br>t <sub>2</sub> =-55 °C or +125 °C test temperature<br>R <sub>1</sub> =resistance at reference temperature in ohms<br>R <sub>2</sub> =resistance at test temperature in ohms | Refer to table 2  |
| Life/ Endurance                                | MIL-STD-202 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<br>±(3%+0.05Ω) for J tol<br><100mR for jumper                     |
| High Temperature Exposure                      | MIL-STD-202 Method 108A IEC 60068-2-2      | 1,000 hours at maximum operating temperature depending on specification, unpowered.   | ±(1%+0.05Ω) for D/F tol<br>±(2%+0.05Ω) for J tol<br><50mR for jumper                      |
| Moisture Resistance                            | MIL-STD-202 Method 106G IEC                | 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<br><br>Parts mounted on test-boards, without condensation on parts  | ±(0.5%+0.05Ω) for D/F tol<br>±(2%+0.05Ω) for J tol<br><100mR for jumper                   |
| Humidity                                       | IEC 60115-1 4.24.2                         | 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<br>±(2%+0.05Ω) for J tol<br><100mR for jumper                     |
| Thermal Shock                                  | MIL-STD-202 Method 107G                    | -55/+125°C<br><br>Note Number of cycles required is 300 Devices mounted<br><br>Maximum transfer time is 20 seconds Dwell time is 15 minutes. Air - Air  | ±(0.5%+0.05Ω) for D/F tol<br>±(1%+0.05Ω) for J tol<br><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<br>±(2%+0.05Ω) for J tol<br><50mR for jumper<br>No visible damage |
| Board Flex/ Bending                            | IEC 60115-1 4.33                           | Device mounted or as described only 1 board bending required<br><br>bending time: 60±5 seconds<br>0201/0402:5mm;<br>0603/0805:3mm;<br>1206 and above:2mm  | ±(1%+0.05Ω) for D/F/J Tol<br><50mR for jumper<br>No visible damage                        |

| TEST                             | TEST METHOD                                 | PROCEDURE   | REQUIREMENTS  |
|----------------------------------|---|---|---|
| Solderability<br>- Wetting       | J-STD-002 test B                            | Electrical Test not required Magnification 50X<br>SMD conditions:<br>1st step: method B, aging 4 hours at 155 °C<br>dry heat<br>2nd step: leadfree solder bath at 245±3 °C<br>Dipping time: 3±0,5 seconds | Well tinned<br>(>95% covered)<br>No visible damage  |
| -Leaching                        | J-STD-002 test D                            | Leadfree solder ,260°C, 30 seconds immersion<br>time  | No visible damage   |
| -Resistance to<br>Soldering Heat | MIL-STD-202 Method 210F<br>IEC 60115-1 4.18 | Condition B, no pre-heat of samples<br>Leadfree solder, 260 °C ±5°C, 10 ±1 seconds<br>immersion time<br>Procedure 2 for SMD: devices fluxed and<br>cleaned with isopropanol                               | ±(0,5%+0,05Ω ) for D/F tol<br>±(1%+0,05Ω ) for J tol<br><50mR for jumper<br>No visible damage |

REVISION HISTORY

| REVISION  | DATE          | CHANGE NOTIFICATION | DESCRIPTION                              |
|-----------|---------------|---------------------|--|
| Version 1 | Sep.05, 2018  | -                   | - Remove size 0100 of this specification |
| Version 0 | Aug. 22, 2014 | -                   | - First issue of this specification      |

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