

# 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.

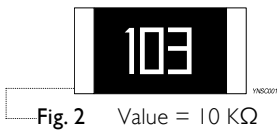
**MARKING**

**RC0201 / RC0402**



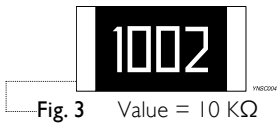
No Marking

**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

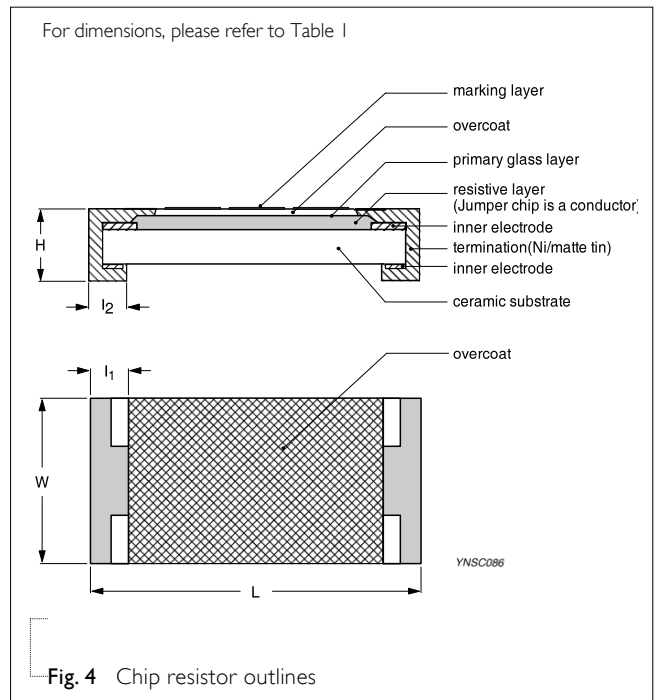
**Note**

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 10Ω<R≤100Ω: ±300ppm/°C 100Ω<R≤10MΩ: ±200ppm/°C	Rated Current 0.5A Max. Current 1A
RC0402			50 V	100 V	100 V	1Ω≤R≤10Ω: ±350ppm/°C 10Ω<R≤100Ω: ±200ppm/°C 100Ω<R≤10MΩ: ±150ppm/°C 10MΩ<R≤22MΩ: ±200ppm/°C	Rated Current 1A Max. Current 2A
RC0603			75V	150 V	150 V	1Ω≤R≤10Ω: ±300ppm/°C 10Ω<R≤100Ω: ±200ppm/°C 100Ω<R≤10MΩ: ±150ppm/°C 10MΩ<R≤22MΩ: ±200ppm/°C	Rated Current 1A Max. Current 2A
RC0805	5% (E24) 1Ω≤R≤22MΩ (0201: Max. 10MΩ, 1218: Max. 1MΩ)		150 V	300 V	300 V	1Ω≤R≤10Ω: ±300ppm/°C 10Ω<R≤100Ω: ±150ppm/°C 100Ω<R≤10MΩ: ±100ppm/°C 10MΩ<R≤22MΩ: ±200ppm/°C	Rated Current 2A Max. Current 5A
RC1206	1% (E24/E96) 1Ω≤R≤10MΩ (1218: Max. 1MΩ)	-55 °C to +155 °C	200 V	400 V	500 V		Rated Current 2A Max. Current 10A
RC1210	0.5% (E24/E96) 10Ω≤R≤1MΩ						Rated Current 2A Max. Current 10A
RC1218	Jumper<50mΩ					1Ω≤R≤10Ω: ±300ppm/°C 10Ω<R≤100Ω: ±100ppm/°C 100Ω<R≤10MΩ: ±100ppm/°C 10MΩ<R≤22MΩ: ±200ppm/°C	Rated Current 6A Max. Current 10A
RC2010			200V	500 V	500V		Rated Current 2A Max. Current 10A
RC2512							Rated Current 2A 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:

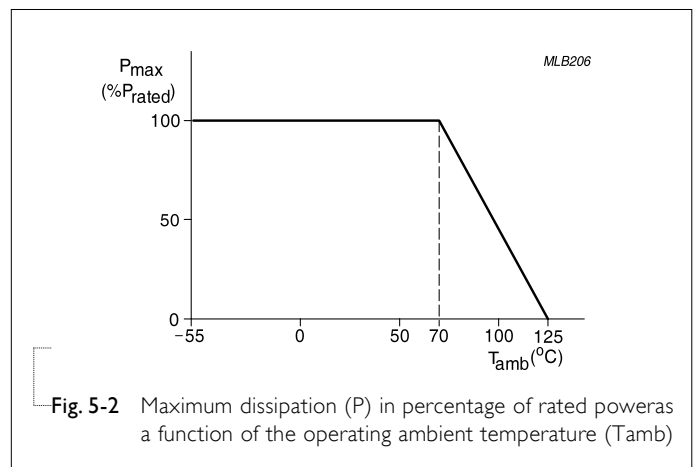
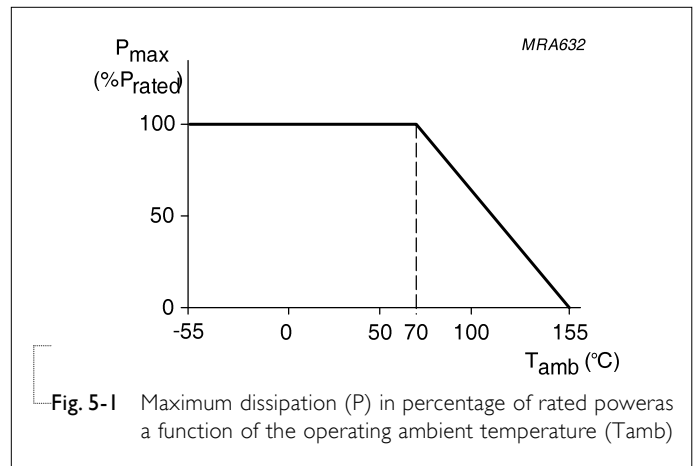
$$V = \sqrt{(P \times R)}$$

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  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-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 ±(3%+0.05Ω) for J tol <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 ±(2%+0.05Ω) for J tol <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 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 4.24.2	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 ±(2%+0.05Ω) for J tol <100mR for jumper
Thermal Shock	MIL-STD-202 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 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	J-STD-002 test B	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	J-STD-002 test D	Leadfree solder ,260°C, 30 seconds immersion time	No visible damage
-Resistance to Soldering Heat	MIL-STD-202 Method 210F IEC 60115-1 4.18	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
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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