

DATA SHEET

THIN FILM CHIP RESISTORS

General purpose

RJ series (Pb Free)

1%, TC50

sizes 0201/0402/0603/0805/

1206/1210/2010/2512



SCOPE

This specification describes RJ0201 to RJ2512 general purpose chip resistors with lead-free terminations made by thin film process.

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

YAGEO ORDERING CODE

CTC CODE

RJ XXXX F X X XX XXXX L
 (1) (2) (3) (4) (5) (6) (7)

(1) SIZE

- 0201
- 0402
- 0603
- 0805
- 1206
- 1210
- 2010
- 2512

(2) TOLERANCE

F = ±1%

(3) PACKAGING TYPE

- R = Paper/PE taping reel
- K = Embossed taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

E = 50 ppm/°C

(5) TAPING REEL

- 07 = 7 inch dia. Reel
- 10 = 10 inch dia. Reel (not preferred)
- 13 = 13 inch dia. Reel

(6) RESISTANCE VALUE

5R6, 56R, 560R, 5K6, 56K, 1M.

(7) RESISTOR TERMINATIONS

L = Lead free terminations (matte tin) ^(a)

ORDERING EXAMPLE

The ordering code of a RJ0603 chip resistor, TC50 value 56 Ω with ±1% tolerance, supplied in 7-inch tape reel is: RJ0603FRE0756RL.

NOTE

- a. The “L” at the end of the code is only for ordering. On the reel label, the standard CTC will be mentioned an additional stamp “LFP”= lead free production.
- b. Products with lead in terminations fulfil the same requirements as mentioned in this datasheet.
- c. Products with lead in terminations will be phased out in the coming months (before July 1st, 2006)

MARKING

RJ0805 / RJ1206 / RJ1210 / RJ2010 / RJ2512



Fig. 1 Value = 10 kΩ

Either resistance in E-24 or E-96: 4 digits
First three digits for significant figure and 4th digit for number of zeros

RJ0603



Fig. 2 Value = 12 kΩ

E-24 series: 3 digits
First two digits for significant figure and 3rd digit for number of zeros



Fig. 3 Value = 12.4 kΩ

E-96 series: 3 digits for 0603±1% EIA-96 marking method

RJ0201 / RJ0402



Fig. 4

No marking

For marking codes, please see EIA-marking code rules in data sheet “Chip resistors marking”.

CONSTRUCTION

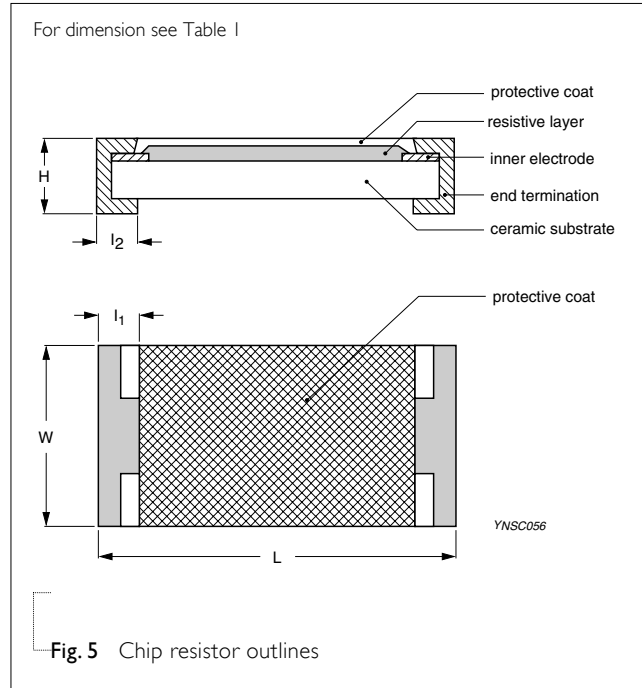
The resistors are constructed out of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive layer. The resistive layer is adjusted to give the approximate required resistance and laser cutting of this resistive layer that achieves tolerance trims the value. The resistive layer is covered with a protective coat and printed with the resistance value. Finally, the two external terminations (matte tin) are added. See fig. 5.

DIMENSION

Table I For outlines see fig. 5

TYPE	L (mm)	W (mm)	H (mm)	l ₁ (mm)	l ₂ (mm)
RJ0201	0.6 ±0.10	0.30 ±0.05	0.25 ±0.05	0.15 ±0.10	0.15 ±0.10
RJ0402	1.00 ±0.10	0.50 ±0.05	0.30 ±0.05	0.20 ±0.10	0.25 ±0.10
RJ0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
RJ0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
RJ1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.40 ±0.20
RJ1210	3.10 ±0.10	2.60 ±0.15	0.55 ±0.10	0.50 ±0.20	0.50 ±0.20
RJ2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20
RJ2512	6.35 ±0.10	3.20 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±0.20

OUTLINES



ELECTRICAL CHARACTERISTICS

Table 2

TYPE	RESISTANCE RANGE	OPERATING TEMPERATURE RANGE	DERATED TO 0 LOAD AT	MAXIMUM WORKING VOLTAGE	DIELECTRIC WITHSTAND VOLTAGE	MAXIMUM OVERTOAD VOLTAGE	TEMPERATURE COEFFICIENT OF RESISTANCE
RJ0201	10 Ω to 22 KΩ	-55 °C to +125 °C	+125 °C	15 V	50 V	50 V	±50 ppm/°C
RJ0402	1 Ω to 121 KΩ	-55 °C to +125 °C	+125 °C	25 V	100 V	100 V	±50 ppm/°C
RJ0603	1 Ω to 681 KΩ	-55 °C to +125 °C	+125 °C	50 V	100 V	100 V	±50 ppm/°C
RJ0805	1 Ω to 1.5 MΩ	-55 °C to +125 °C	+125 °C	100 V	250 V	200 V	±50 ppm/°C
RJ1206	1 Ω to 1.5 MΩ	-55 °C to +125 °C	+125 °C	150 V	250 V	250 V	±50 ppm/°C
RJ1210	1 Ω to 1 MΩ	-55 °C to +125 °C	+125 °C	150 V	400 V	300 V	±50 ppm/°C
RJ2010	1 Ω to 1 MΩ	-55 °C to +125 °C	+125 °C	150 V	400 V	300 V	±50 ppm/°C
RJ2512	1 Ω to 1 MΩ	-55 °C to +125 °C	+125 °C	150 V	400 V	300 V	±50 ppm/°C

FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please see the special data sheet “Chip resistors mounting”.

ENVIRONMENTAL DATA

For material declaration information (IMDS-data) of the products, please see the separated info “Environmental data” conformed to EU RoHS.

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	RJ0201	RJ0402	RJ0603	RJ0805	RJ1206	RJ1210	RJ2010	RJ2512
Paper/PE taping reel (R)	7" (178 mm)	10,000	10,000	5,000	5,000	5,000	5,000	---	---
	10" (254 mm) ⁽²⁾	20,000	20,000	10,000	10,000	10,000	10,000	---	---
	13" (330 mm)	50,000	50,000	20,000	20,000	20,000	20,000	---	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	---	---	---	4,000	4,000

NOTE

1. For Paper/PE/Embossed tape and reel specification/dimensions, please see the special data sheet “Packing” document.
2. 10" reel is not preferred taping reel.

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: -55°C to +125°C

POWER RATING

Each type rated power at 70°C:
 RJ0201=1/20 W, RJ0402=1/16 W, RJ0603=1/16 W,
 RJ0805=1/10 W, RJ1206=1/8 W, RJ1210=1/4 W,
 RJ2010=1/2 W, RJ2512=3/4 W.

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)

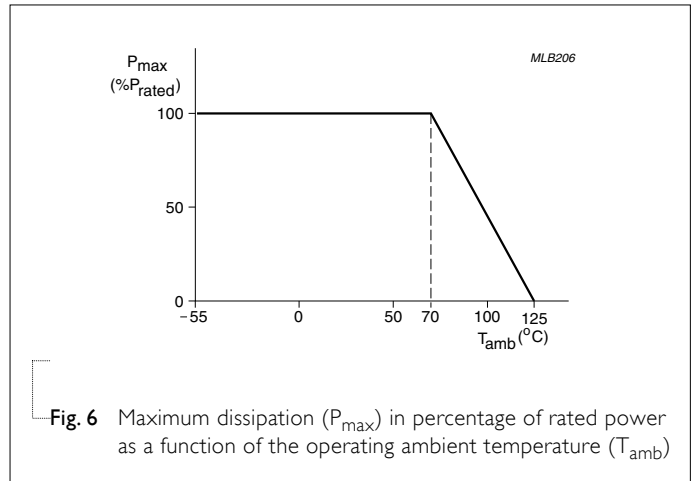


Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202F-method 304;	At +25/-55 °C and +25/+125 °C	±50 ppm/°C
	JIS C 5202-4.8	<p>Formula:</p> $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ <p>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</p>	
Thermal Shock	MIL-STD-202F-method 107G; IEC 60115-1 4.19	At -65 (+0/-10) °C for 2 minutes and at +125 (+10/-0) °C for 2 minutes; 25 cycles	±(0.5%+0.05 Ω)
Low Temperature Operation	MIL-R-55342D-Para 4.7.4	At -65 (+0/-5) °C for 1 hour; RCWV applied for 45 (+5/-0) minutes	±(0.5%+0.05 Ω) No visible damage
Short Time Overload	MIL-R-55342D-Para 4.7.5; IEC 60115-1 4.13	2.5 × RCWV applied for 5 seconds at room temperature	±(1.0%+0.05 Ω) No visible damage
Insulation Resistance	MIL-STD-202F-method 302; IEC 60115-1 4.6.1.1	RCOV for 1 minute Details see below table 5	≥10 GΩ
Dielectric Withstand Voltage	MIL-STD-202F-method 301; IEC 60115-1 4.6.1.1	Maximum voltage (V_{rms}) applied for 1 minute Details see below table 5	No breakdown or flashover
Resistance to Soldering Heat	MIL-STD-202F-method 210C; IEC 60115-1 4.18	Unmounted chips; 260 ±5 °C for 10 ±1 seconds	±(0.5%+0.05 Ω) No visible damage
Life	MIL-STD-202F-method 108A; IEC 60115-1 4.25.1	At 70±2 °C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off	±(1%+0.05 Ω)

Table 4 Test condition, procedure and requirements (continued)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability	MIL-STD-202F-method 208A; IEC 60115-1 4.17	Solder bath at 245±3 °C Dipping time: 2±0.5 seconds	Well tinned (≥95% covered) No visible damage
Bending Strength	JIS C 5202.6.14; IEC 60115-1 4.15	Resistors mounted on a 90 mm glass epoxy resin PCB (FR4) Bending: see table 6 for each size	±(1.0%+0.05 Ω) No visible damage
Resistance to Solvent	MIL-STD-202F-method 215; IEC 60115-1 4.29	Isopropylalcohol (C ₃ H ₇ OH) or dichloromethane (CH ₂ Cl ₂) followed by brushing	No smeared
Noise	JIS C 5202 5.9; IEC 60115-1 4.12	Maximum voltage (V _{rms}) applied.	< 10 dB
Humidity (steady state)	JIS C 5202 7.5; IEC 60115-8 4.24.8	1,000 hours; 40±2 °C; 93(+2/-3)% RH RCWV applied for 1.5 hours on and 0.5 hour off	±(0.5%+0.05 Ω)
Leaching	EIA/IS 4.13B; IEC 60115-8 4.18	Solder bath at 260±5 °C Dipping time: 30±1 seconds	No visible damage
Intermittent Overload	JIS C 5202 5.8	At room temperature; 2.5 × RCWV applied for 1 second on and 25 seconds off; total 10,000 cycles	±(1.0%+0.05 Ω)
Resistance to Vibration	On request	On request	
Moisture Resistance Heat	MIL-STD-202F-method 106F; IEC 60115-1 4.24.2	42 cycles; total 1,000 hours Shown as figure 7	±(0.5%+0.05Ω) No visible damage

Table 5 Criteria of rated continued working voltage and overload voltage

TYPE	RJ0201	RJ0402	RJ0603	RJ0805	RJ1206	RJ1210	RJ2010	RJ2512
Voltage (DC/unit: V); (AC/ unit: V _{rms})	50	100	100	300	500	500	500	500

Table 6 Bending for sizes 0201 to 2512

TYPE	RJ0201	RJ0402	RJ0603	RJ0805	RJ1206	RJ1210	RJ2010	RJ2512
Specification (mm)	2	2	3	3	2	2	2	2

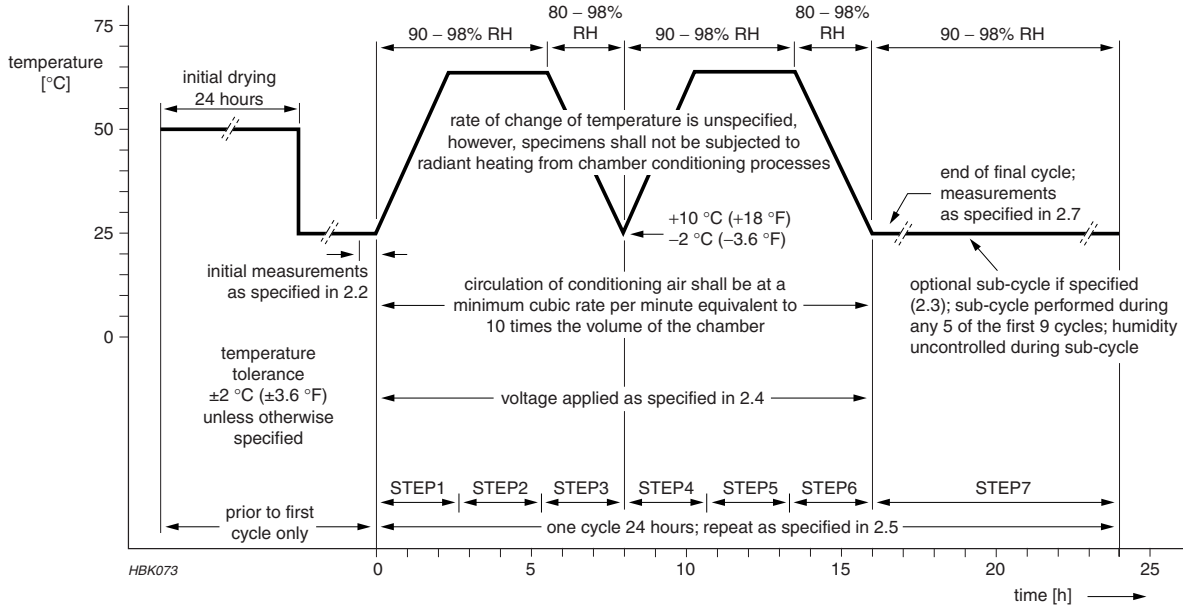


Fig. 7 Moisture resistance test requirements

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Nov 11, 2003		- First issue of this specification
Version 1	May 30, 2005	-	- Test method and procedure updated - PE tape added (paper tape will be replaced by PE tape)