

DATA SHEET

THIN FILM CHIP RESISTORS

General purpose

RJ series

1%, TC50

sizes 0402/0603/0805/1206/
1210/2010/2512

RoHS compliant



SCOPE

This specification describes RJ0402 to RJ2512 general purpose chip resistors with lead-free terminations made by thin film process.

APPLICATIONS

- Converters
- Printer equipment
- Server board
- Telecom
- Consumer

FEATURES

- RoHS compliant
 - Products with lead free terminations meet RoHS requirements
 - Pb-glass contained in electrodes
 - Resistor element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production
- Halogen Free Epoxy

ORDERING INFORMATION - GLOBAL PART NUMBER & I2NC

Both part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

YAGEO BRAND ordering code

GLOBAL PART NUMBER (PREFERRED)

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

(1) SIZE

0402 / 0603 / 0805 / 1206 / 1210 / 2010 / 2512

(2) TOLERANCE

F = ±1%

(3) PACKAGING TYPE

R = Paper 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 13 = 13 inch dia. Reel

(6) RESISTANCE VALUE

There are 2~4 digits indicated the resistor value. Letter R/K/M is decimal point, no need to mention the last zero after R/K/M, e.g.1K2, not 1K20.

Detailed resistance rules show in table of "Resistance rule of global part number".

(7) OPTIONAL CODE

L = optional symbol (Note)

| Resistance code rule | Example |
|------------------------|--|
| XXXX (1 to 9.76 Ω) | 1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω |
| XXRX (10 to 97.6 Ω) | 10R = 10 Ω 97R6 = 97.6 Ω |
| XXXR (100 to 976 Ω) | 100R = 100 Ω |
| XKXX (1 to 9.76 KΩ) | 1K = 1,000 Ω 9K76 = 9760 Ω |
| XMXX (1 to 9.76 MΩ) | 1M = 1,000,000 Ω 9M76 = 9,760,000 Ω |

ORDERING EXAMPLE

The ordering code of a RJ0603 chip resistor, TC50 value 56 Ω with ±1% tolerance, supplied in 7-inch tape reel is:
RJ0603FRE0756R(L).

NOTE

1. All our RSMD products meet RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

PHYCOMP BRAND ordering codes

Both GLOBAL PART NUMBER (preferred) and I2NC (traditional) codes are acceptable to order Phycomp brand products.

GLOBAL PART NUMBER (PREFERRED)

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

I2NC CODE

2390 **XXX XXXXX L**
(1) (2) (3) (4)

| RJ SIZE | START IN ⁽¹⁾ | TOL. (%) | RESISTANCE RANGE | EMBOSSED TAPE ON REEL ⁽²⁾ | | PAPER TAPE ON REEL (units) ⁽²⁾ | | | |
|---------|-------------------------|----------|------------------|--------------------------------------|---|---|-----------|-----------|--------|
| | | | | 4,000 | | 5,000 | 10,000 | 20,000 | 50,000 |
| 0402 | 2390 | ±1% | 10 Ω to 121 kΩ | - | - | 407 8xxxx | 427 8xxxx | 447 8xxxx | - |
| 0603 | 2390 | ±1% | 5.1 Ω to 681 kΩ | - | - | 404 8xxxx | 424 8xxxx | 444 8xxxx | - |
| 0805 | 2390 | ±1% | 5.1 Ω to 1.5 MΩ | - | - | 401 8xxxx | 421 8xxxx | 441 8xxxx | - |
| 1206 | 2390 | ±1% | 5.1 Ω to 1.5 MΩ | - | - | 411 8xxxx | 431 8xxxx | 451 8xxxx | - |
| 1210 | 2390 | ±1% | 5.1 Ω to 1 MΩ | - | - | 412 0xxxx | 432 8xxxx | 412 8xxxx | - |
| 2010 | 2390 | ±1% | 10 Ω to 1 MΩ | 415 8xxxx | - | - | - | - | - |
| 2512 | 2390 | ±1% | 10 Ω to 1 MΩ | 418 8xxxx | - | - | - | - | - |

- (1) The resistors have a 12-digit ordering code starting with 2390.
- (2) The subsequent 4 digits indicate the resistor tolerance and packaging.
- (3) The remaining 4 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of I2NC".
- (4) "L" is optional symbol ^(Note)

| Resistance decade ⁽³⁾ | Last digit |
|----------------------------------|------------|
| 0.01 to 0.0976 Ω | 0 |
| 0.1 to 0.976 Ω | 7 |
| 1 to 9.76 Ω | 8 |
| 10 to 97.6 Ω | 9 |
| 100 to 976 Ω | 1 |
| 1 to 9.76 kΩ | 2 |
| 10 to 97.6 kΩ | 3 |
| 100 to 976 kΩ | 4 |
| 1 to 9.76 MΩ | 5 |
| 10 to 97.6 MΩ | 6 |

ORDERING EXAMPLE

The ordering code of a RJ0603 resistor, TC50 value 56 Ω, with ±1% tolerance, supplied in tape of 5,000 units per reel is: 239040485609(L) or RJ0603FRE0756R(L).

NOTE

- 1. All our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
- 2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

Example:

| | | |
|--------|---|-------------|
| 0.02 Ω | = | 0200 or 200 |
| 0.3 Ω | = | 3007 or 307 |
| 1 Ω | = | 1008 or 108 |
| 33 kΩ | = | 3303 or 333 |
| 10 MΩ | = | 1006 or 106 |

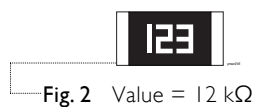
MARKING

RJ0805 / RJ1206 / RJ1210 / RJ2010 / RJ2512



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

RJ0603



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



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

RJ0402



No marking

For further marking information, please see special data sheet “Chip resistors marking”.

CONSTRUCTION

A metal film layer is deposited on a high-grade ceramic body (aluminium oxide). It is given the approximate resistance required and the value is trimmed to within tolerance by laser cutting of this resistive layer.

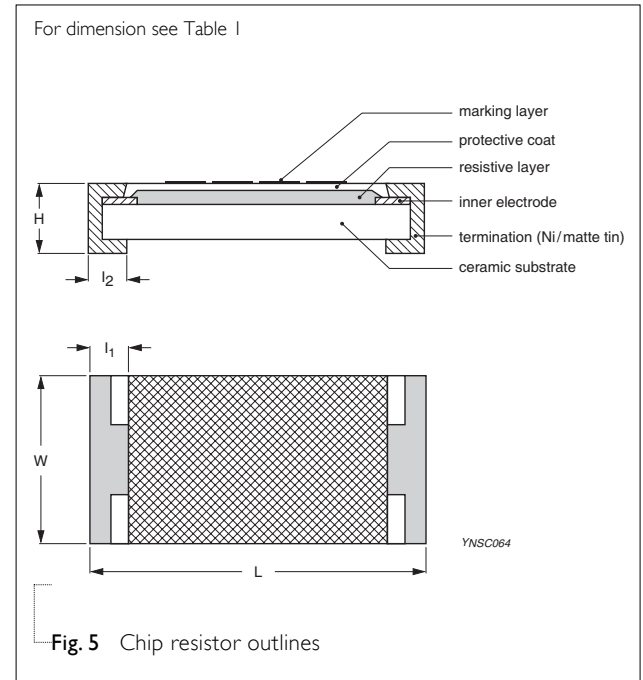
Internal metal electrodes are formed into several layers at each end as a contact. To guarantee optimum solderability, the outer layer consists of matte tin.

The resistive layer is covered with a protective coat and printed with the resistance value. See fig. 5.

Table 1 For outlines see fig. 5

| TYPE | L (mm) | W (mm) | H (mm) | I ₁ (mm) | I ₂ (mm) |
|--------|------------|------------|------------|---------------------|---------------------|
| 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 | POWER RATING | MAXIMUM WORKING VOLTAGE | DIELECTRIC WITHSTAND VOLTAGE | MAXIMUM OVERLOAD VOLTAGE | TEMPERATURE COEFFICIENT OF RESISTANCE |
|--------|------------------|-----------------------------|--------------|-------------------------|------------------------------|--------------------------|---------------------------------------|
| RJ0402 | 10 Ω to 121 KΩ | -55 °C to +125 °C | 1/16 W | 25 V | 100 V | 100 V | ±50 ppm/°C |
| RJ0603 | 5.1 Ω to 681 KΩ | -55 °C to +125 °C | 1/16 W | 50 V | 100 V | 100 V | ±50 ppm/°C |
| RJ0805 | 5.1 Ω to 1.5 MΩ | -55 °C to +125 °C | 1/10 W | 100 V | 250 V | 200 V | ±50 ppm/°C |
| RJ1206 | 5.1 Ω to 1.5 MΩ | -55 °C to +125 °C | 1/8 W | 150 V | 250 V | 250 V | ±50 ppm/°C |
| RJ1210 | 5.1 Ω to 1 MΩ | -55 °C to +125 °C | 1/4 W | 150 V | 400 V | 300 V | ±50 ppm/°C |
| RJ2010 | 10 Ω to 1 MΩ | -55 °C to +125 °C | 1/2 W | 150 V | 400 V | 300 V | ±50 ppm/°C |
| RJ2512 | 10 Ω to 1 MΩ | -55 °C to +125 °C | 3/4 W | 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”.

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

| PACKING STYLE | REEL DIMENSION | RJ0402 | RJ0603 | RJ0805 | RJ1206 | RJ1210 | RJ2010 | RJ2512 |
|--------------------------|----------------|--------|--------|--------|--------|--------|--------|--------|
| Paper taping reel (R) | 7" (178 mm) | 10,000 | 5,000 | 5,000 | 5,000 | 5,000 | --- | --- |
| | 10" (254 mm) | 20,000 | 10,000 | 10,000 | 10,000 | 10,000 | --- | --- |
| | 13" (330 mm) | 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/Embossed tape and reel specification/dimensions, please see the special data sheet “Packing” document.

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: -55°C to +125°C

POWER RATING

Each type rated power at 70°C:
 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)

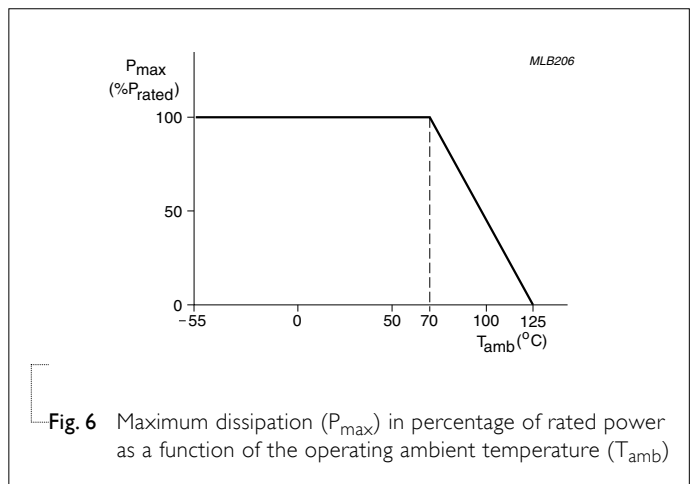


Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS
Table 4 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|--|--|----------------|
| Life/ Operational Life/ Endurance | MIL-STD-202F-method 108A IEC 60115- 4.25.1 JIS C 5202-7.10 | 1,000 hours at 70°C ±5°C applied RCWV 1.5h on, 0.5h off, still air required | ±(1%+0.05 Ω) |
| High Temperature Exposure/ Endurance at upper category temperature | MIL-STD-202F-method 108A IEC 60115- 4.25.3 JIS C 5202-7.11 | 1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 1.25±3 °C | ±(0.5%+0.05 Ω) |
| Moisture Resistance | MIL-STD-202F-method 106F IEC 60115- 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 Measurement at 24±2 hours after test conclusion | ±(0.5%+0.05 Ω) |
| Thermal Shock | MIL-STD-202 Method 107 | -55/+125 °C Note: Number of cycles required is 300. Devices unmounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air | ±(0.5%+0.05 Ω) |
| Short time overload | MIL-R-55342D-para 4.7.5 IEC60155-1 4.6.1.1 | 2.5 times RCWV or maximum overload voltage whichever is less for 5 sec at room temperature | ±(1%+0.05 Ω) |
| Board Flex/ Bending | IEC60115-1 4.33 IEC60068-2-21 Ue1 | Device mounted on PC board as described, only 1 board bending required Bending: sizes ≤ 1206 : 3mm sizes > 1206 : 2mm Bending time: 60±5 seconds Ohmic value checked during bending | ±(1%+0.05 Ω) |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|-----------------------------------|----------------------------------|--|---|
| Solderability - Wetting | J-STD-002 | Electrical Test not required. Magnification 50X. SMD conditions: 1 st step: method B, aging 4 hours at 155°C dry heat 2 nd step: leadfree solder bath at 245±3°C Dipping time: 3±0.5 seconds | Well tinned (≥95% covered) No visible damage |
| - Leaching | EIA/IS 4.13B IEC 60115-8 4.18 | Leadfree solder, 260 °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, 270 °C, 10 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | ±(0.5%+0.05 Ω) |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|--------------|---------------------|---|
| Version 2 | Jul 11, 2008 | - | <ul style="list-style-type: none"> - Change to dual brand datasheet that describe RJ0402 to RJ2512 with RoHS compliant - Modify ordering information - global part number & I2NC - Modify electrical characteristic - Tests and requirements update |
| Version 1 | May 30, 2005 | - | <ul style="list-style-type: none"> - New datasheet for thin film general purpose chip resistors sizes of 0201/0402/0603/0805/1206/1210/2010/2512 1%, TC50 with lead-free terminations |