

# DATA SHEET

## THICK FILM LEAD FREE CHIP RESISTORS

### Precision grade

RE\_P series  
0.1%, 0.5%, 1%, TC 50 & 100  
sizes 0201/0402/0603/0805/1206  
RoHS compliant & Halogen Free



## SCOPE

This specification describes RE0201 to RE1206 ultra precision chip resistors made by thick film process.

## APPLICATIONS

- Total lead free without RoHS exemption
- Converters
- Printer equipment
- Server board
- Telecom
- Consumer

## FEATURES

- Halogen Free Epoxy
- RoHS compliant
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Non-forbidden material used in products/production
- Moisture sensitivity level: MSL 1

## ORDERING INFORMATION - GLOBAL PART NUMBER

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)

RE XXXX X X X XX XXXX P  
(1) (2) (3) (4) (5) (6) (7)

#### (1) SIZE

0201 / 0402 / 0603 / 0805 / 1206

#### (2) TOLERANCE

B =  $\pm 0.1\%$   
D =  $\pm 0.5\%$   
F =  $\pm 1\%$

#### (3) PACKAGING TYPE

R = Paper/PE taping reel

#### (4) TEMPERATURE COEFFICIENT OF RESISTANCE

E =  $\pm 50$  ppm/ $^{\circ}\text{C}$   
F =  $\pm 100$  ppm/ $^{\circ}\text{C}$

#### (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".

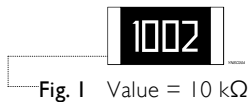
#### (7) DEFAULT CODE

Letter P is lead free (without RoHS exemption)

| Resistance rule of global part number |   |
|---------------------------------------|---|
| Resistance code rule                  | Example                                     |
| XXRX<br>(10 to 97.6 $\Omega$ )        | 10R = 10 $\Omega$<br>97R6 = 97.6 $\Omega$   |
| XXXR<br>(100 to 976 $\Omega$ )        | 100R = 100 $\Omega$                         |
| XKXX<br>(1 to 9.76 K $\Omega$ )       | 1K = 1,000 $\Omega$<br>9K76 = 9760 $\Omega$ |
| XMXX<br>(1 M $\Omega$ )               | 1M = 1,000,000 $\Omega$                     |

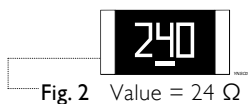
### ORDERING EXAMPLE

The ordering code of a RE0603 chip resistor, TC 50 value 56  $\Omega$  with  $\pm 0.5\%$  tolerance, supplied in 7-inch tape reel is: RE0603DRE0756RP.

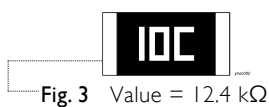
**MARKING****RE0805 / RE1206**

Either resistance in E-24 or E-96: 4 digits

First three digits for significant figure and 4th digit for number of zeros

**RE0603**

1%, 0.5%, 0.1% E24 exception values 10/11/13/15/20/75 of E24 series



1%, 0.5%, 0.1% E96 refer to EIA-96 marking method, including values 10/11/13/15/20/75 of E24 series

**RE0201/0402**

No marking

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

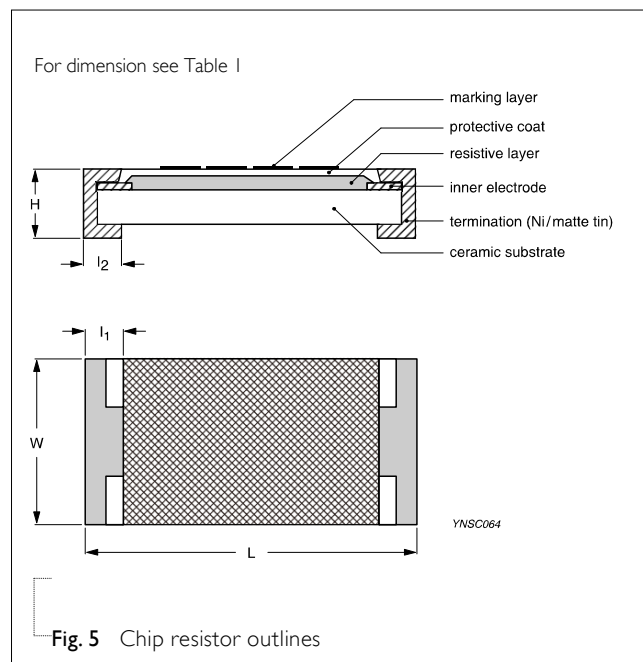
**CONSTRUCTION**

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)     | I <sub>1</sub> (mm) | I <sub>2</sub> (mm) |
|--------|------------|------------|------------|---------------------|---------------------|
| RE0201 | 0.60 ±0.03 | 0.30 ±0.03 | 0.23 ±0.03 | 0.10 ±0.05          | 0.15 ±0.05          |
| RE0402 | 1.00 ±0.05 | 0.50 ±0.05 | 0.32 ±0.05 | 0.20 ±0.10          | 0.25 ±0.10          |
| RE0603 | 1.60 ±0.10 | 0.80 ±0.10 | 0.45 ±0.10 | 0.25 ±0.15          | 0.25 ±0.15          |
| RE0805 | 2.00 ±0.10 | 1.25 ±0.10 | 0.50 ±0.10 | 0.35 ±0.20          | 0.35 ±0.20          |
| RE1206 | 3.10 ±0.10 | 1.60 ±0.10 | 0.55 ±0.10 | 0.45 ±0.20          | 0.45 ±0.20          |

**OUTLINES**

## ELECTRICAL CHARACTERISTICS

Table 2

| TYPE   | RESISTANCE RANGE<br>(E24/E96) | OPERATING TEMPERATURE RANGE | POWER RATING | MAXIMUM WORKING VOLTAGE | DIELECTRIC WITHSTAND VOLTAGE | MAXIMUM OVERLOAD VOLTAGE | TEMPERATURE COEFFICIENT OF RESISTANCE |
|--------|-------------------------------|-----------------------------|--------------|-------------------------|------------------------------|--------------------------|---------------------------------------|
| RE0201 | 100 $\Omega$ to 2 M $\Omega$  | -55 °C to +155 °C           | 1/20W        | 25 V                    | 50 V                         | 50 V                     | $\pm 50$ ppm/°C<br>$\pm 100$ ppm/°C   |
| RE0402 | 10 $\Omega$ to 10 M $\Omega$  | -55 °C to +155 °C           | 1/16 W       | 50 V                    | 100 V                        | 100 V                    | $\pm 50$ ppm/°C<br>$\pm 100$ ppm/°C   |
| RE0603 | 10 $\Omega$ to 10 M $\Omega$  | -55 °C to +155 °C           | 1/10 W       | 75 V                    | 150 V                        | 150 V                    | $\pm 50$ ppm/°C<br>$\pm 100$ ppm/°C   |
| RE0805 | 10 $\Omega$ to 10 M $\Omega$  | -55 °C to +155 °C           | 1/8 W        | 150 V                   | 300 V                        | 300 V                    | $\pm 50$ ppm/°C<br>$\pm 100$ ppm/°C   |
| RE1206 | 10 $\Omega$ to 10 M $\Omega$  | -55 °C to +155 °C           | 1/4 W        | 200 V                   | 500 V                        | 400 V                    | $\pm 50$ ppm/°C<br>$\pm 100$ ppm/°C   |

### NOTE

The maximum working voltage that may be continuously applied to the resistor element, see “IEC publication 60115-8”

## 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 | RE0201 | RE0402 | RE0603 | RE0805 | RE1206 |
|--------------------------|----------------|--------|--------|--------|--------|--------|
| Paper/PE taping reel (R) | 7" (178 mm)    | 10,000 | 10,000 | 5,000  | 5,000  | 5,000  |
|                          | 10" (254 mm)   | 20,000 | 20,000 | 10,000 | 10,000 | 10,000 |
|                          | 13" (330 mm)   | 50,000 | 50,000 | 20,000 | 20,000 | 20,000 |

### NOTE

1. For Paper/PE tape and reel specification/dimensions, please see the special data sheet “Chip resistors packing”

## FUNCTIONAL DESCRIPTION

### POWER RATING

Each type rated power at 70°C:

RE0201=1/20W, RE0402=1/16W, RE0603=1/10W,

RE0805=1/8 W, RE1206=1/4W

### RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

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

or max. working voltage whichever is less

Where

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

P=Rated power (W)

R=Resistance value ( $\Omega$ )

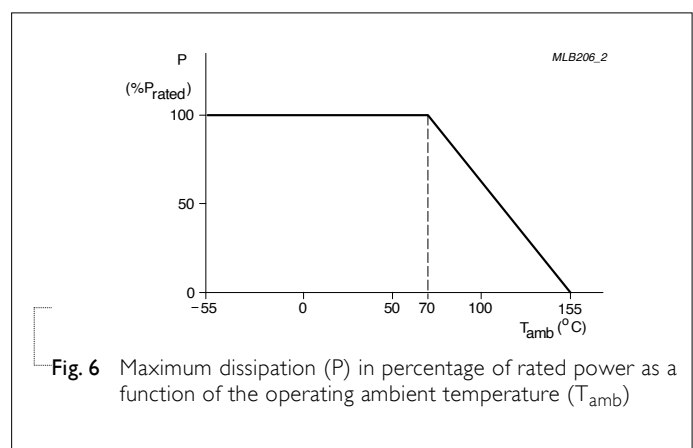


Fig. 6 Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

**TESTS AND REQUIREMENTS****Table 4** Test condition, procedure and requirements

| TEST                      | TEST METHOD                                | PROCEDURE  | REQUIREMENTS                      |
|---------------------------|--|--|-----------------------------------|
| Life/Endurance            | IEC 60115-1 7.1<br>MIL-STD-202 Method 108A | At 70±2 °C for 1,000 hours, RCWV applied for 1.5 hours on, 0.5 hour off, still air required  | ±(3%+0.05 Ω)                      |
| High Temperature Exposure | IEC 60068-2-2<br>MIL-STD-202 Method 108A   | 1,000 hours at 155±5 °C, unpowered   | ±(3%+0.05 Ω)                      |
| Moisture Resistance       | MIL-STD-202 Method 106G                    | Each temperature / humidity cycle is defined at 8 hours, 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<br><br>Measurement at 24±2 hours after test conclusion | ±(3%+0.05 Ω)                      |
| Thermal Shock             | MIL-STD-202 Method 107G                    | -55/+125 °C<br>Number of cycles required is 300.<br><br>Devices mounted<br><br>Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air  | ±(1%+0.05 Ω)                      |
| Short Time Overload       | IEC60115-1 8.1                             | 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature   | ±(1%+0.05 Ω)<br>No visible damage |
| Board Flex/Bending        | IEC 60115-1 9.8                            | Chips mounted on a 100mm x 40mm glass epoxy resin PCB (FR4)<br><br>Bending: see table 5 for each size<br><br>Bending time: 60±5 seconds  | ±(1%+0.05 Ω)<br>No visible damage |

| TEST                           | TEST METHOD      | PROCEDURE   | REQUIREMENTS                                    |
|--------------------------------|------------------|---|---|
| Humidity                       | IEC 60115-1 10.4 | Steady state for 1000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off  | $\pm(3\%+0.05 \Omega)$                          |
| Solderability<br>- Wetting     | J-STD-002 test B | Electrical Test not required<br>Magnification 50X<br>SMD conditions:<br>1 <sup>st</sup> step: method B, aging 4 hours at 155°C dry heat<br>2 <sup>nd</sup> step: leadfree solder bath at 245±3°C<br>Dipping time: 3±0.5 seconds | Well tinned (≥95% covered)<br>No visible damage |
| - Leaching                     | J-STD-002 test D | Leadfree solder, 260 °C, 30 seconds immersion time  | No visible damage                               |
| - Resistance to Soldering Heat | IEC 60115-1 4.18 | Condition B, no pre-heat of samples.<br>Leadfree solder, 260 °C, 10 seconds immersion time<br>Procedure 2 for SMD: devices fluxed and cleaned with isopropanol  | $\pm(1\%+0.05 \Omega)$<br>No visible damage     |

Table 5 Bending for sizes 0201 to 1206

| TYPE               | RE0201 | RE0402 | RE0603 | RE0805 | RE1206 |
|--------------------|--------|--------|--------|--------|--------|
| Specification (mm) | 5      | 5      | 3      | 3      | 2      |

REVISION HISTORY

| REVISION  | DATE          | CHANGE NOTIFICATION | DESCRIPTION                            |
|-----------|---------------|---------------------|--|
| Version 3 | Jun. 06, 2023 | -                   | - Range of 0402~1206 upgrade to 10Mohm |
| Version 2 | Oct. 29, 2021 | -                   | - Add TCR $\pm 100$ ppm/°C             |
| Version 1 | Oct. 15, 2021 | -                   | - Range of 0201 upgrade to 2Mohm       |
| Version 0 | Mar. 13, 2021 | -                   | - First issue of this specification    |

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