Innovative Service Around the Globe YAGEO

# DATA SHEET

## CHIP RESISTORS WITH NI/AU TERMINATIONS

AR series

5%, 1%

**sizes 0402/0603/0805/1206**

**RoHS compliant**

YAGEO

Product specification – December 23. 2008 V.7

## SCOPE

This specification describes AR0402 to AR1206 chip resistors with Ni/Au-terminations made by thick film process.

## APPLICATIONS

- Power supply in small equipment
- Digital multi-meter
- Telecommunication
- Computer
- Industry

## 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
- Moisture sensitivity level: MSL 1

## ORDERING INFORMATION - GLOBAL PART NUMBER & 12NC

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)**

**AR XXXX X X X XX XXXX**
(1) (2) (3) (4) (5) (6)

### (1) SIZE

0402
0603
0805
1206

### (2) TOLERANCE

F = ±1%
J = ±5% (for Jumper ordering, use code of J)

### (3) PACKAGING TYPE

R = Paper taping reel

### (4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Base on spec

### (5) TAPING REEL

07 = 7 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 rule of global part number

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

### ORDERING EXAMPLE

The ordering code of a AR0603 chip resistor with gold terminations, value 56 X with ±1% tolerance, supplied in 7-inch tape reel is: AR0603FR-0756R(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

## MARKING

### AR0402

Fig. 1

No marking

### AR0603

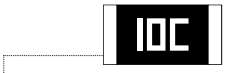


Fig. 2 Value = 12.4 KΩ

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

For 0603 ±1% E-24 series, one short bar under marking letter


Fig. 3 E-24 1% Value = 56 KΩ

### AR0603/0805/1206


Fig. 4 Value = 10 KΩ

E-24 series: 3 digits

First two digits for significant figure and 3rd digit for number of zeros

### AR0805/1206

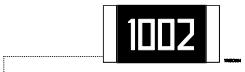


Fig. 5 Value = 10 KΩ

Both E-24 and E-96 series: 4 digits

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

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 environment 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 (Gold) are added. See fig. 6.

## DIMENSIONS

Table 1 For outlines see fig. 6

| TYPE | L (mm) | W (mm) | H (mm) | $I_1$ (mm) | $I_2$ (mm) |
|---|---|---|---|---|---|
| AR0402 | 1.00 ±0.05 | 0.50 ±0.05 | 0.35 ±0.05 | 0.20 ±0.10 | 0.25 ±0.10 |
| AR0603 | 1.60 ±0.10 | 0.80 ±0.10 | 0.45 ±0.10 | 0.25 ±0.15 | 0.25 ±0.15 |
| AR0805 | 2.00 ±0.10 | 1.25 ±0.10 | 0.50 ±0.10 | 0.35 ±0.20 | 0.35 ±0.20 |
| AR1206 | 3.10 ±0.10 | 1.60 ±0.10 | 0.55 ±0.10 | 0.45 ±0.20 | 0.40 ±0.20 |

## OUTLINES

For dimension see Table 1

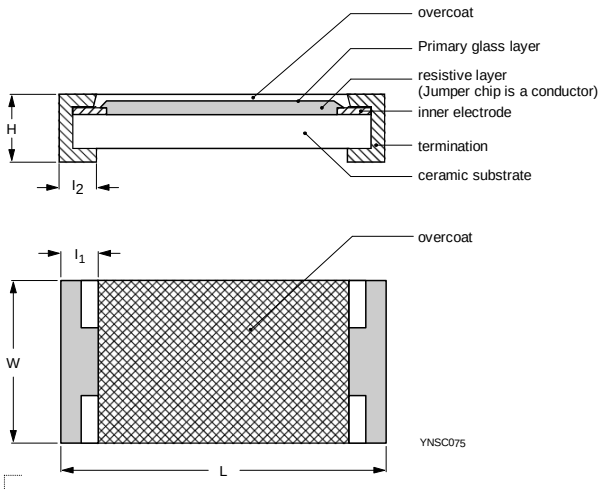


Fig. 6 Chip resistor outlines

## 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: Rated Current | Jumper Criteria: Max. Current |
| AR0402 | 1 Ω ≤ R ≤ 10 MΩ<br>Zero ohm Jumper < 0.05 Ω | –55 °C to +155 °C | 50 V | 100 V | 100 V | 10 Ω< R ≤10 MΩ: ±100 ppm/°C<br>1 Ω≤ R ≤10 Ω: ±200 ppm/°C | 1.0 A | 2.0 A |
| AR0603 | | | 50 V | 100 V | 100 V | | 1.0 A | 2.0 A |
| AR0805 | | | 150 V | 300 V | 300 V | | 2.0 A | 5.0 A |
| AR1206 | | | 200 V | 500 V | 500 V | | 2.0 A | 10.0A |

## 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 | AR0402 | AR0603 | AR0805 | AR1206 |
|---|---|---|---|---|---|
| Paper taping reel (R) | 7" (178 mm) | 10,000 | 5,000 | 5,000 | 5,000 |

**NOTE**

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

## FUNCTIONAL DESCRIPTION

### OPERATING TEMPERATURE RANGE

AR0402 to AR1206: –55 °C to +155 °C

### POWER RATING

Each type rated power at 70°C:

AR0402=1/16 W; AR0603=1/10 W;
AR0805=1/8 W; AR1206=1/4 W.

### RATED VOLTAGE

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

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

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 (Ω)

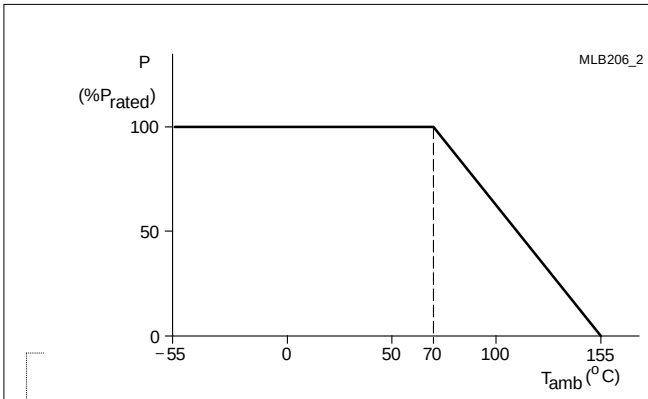


Fig. 7 Maximum dissipation ($P_{max}$) in percentage of rated power as a function of the operating ambient temperature ($T_{amb}$)

## TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| Temperature Coefficient of Resistance (T.C.R.) | MIL-STD-202 Method 304 | At +25/–55°C and +25/+125°C<br>Formula:<br>$T.C.R=\frac{R_2-R_1}{R_1(t_2-t_1)}\times 10^6$ (ppm/°C)<br>Where<br>$t_1$=+25 °C or specified room temperature<br>$t_2$=–55 °C or +125 °C test temperature<br>$R_1$=resistance at reference temperature in ohms<br>$R_2$=resistance at test temperature in ohms | Refer to table 2 |
| Life/ Endurance | MIL-STD-202 Method 108<br>IEC 60115-1 7.1 | At 70±2°C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off, still air required | 0075: ±(5%+100mΩ)<br><100mΩ for jumper<br>01005: ±(3% +50mΩ)<br><100mΩ for jumper<br>Others:<br>±(1%+50mΩ) for B/D/F tol<br>±(3%+50mΩ) for J tol<br><100mR for jumper |
| High Temperature Exposure | MIL-STD-202 Method 108 | 1,000 hours at maximum operating temperature depending on specification, unpowered. | 0075: ±(5%+100mΩ)<br><100mΩ for jumper<br>01005: ±(1% +50mΩ)<br>< 50mΩ for jumper<br>Others:<br>±(1%+50mΩ) for B/D/F tol<br>±(2%+50mΩ) for J tol<br><50mR for jumper |
| Moisture Resistance | MIL-STD-202 Method 106 | 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>Parts mounted on test-boards, without condensation on parts | 0075: ±(2%+100mΩ)<br><100mΩ for jumper<br>01005: ±(2% +50mΩ)<br>< 100mΩ for jumper<br>Others:<br>±(0.5%+50mΩ) for B/ D/F tol<br>±(2%+50mΩ) for J tol<br><100mR for jumper |
| 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 | 0075: ±(5%+100mΩ)<br>no visible damage<br>01005: ±(3% +50mΩ)<br>< 100mΩ for jumper<br>Others:<br>±(1%+50mΩ) for B/D/F tol<br>±(2%+50mΩ) for J tol<br><100mR for jumper |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| Thermal Shock | MIL-STD-202 Method 107 | -55/+125°C<br>Note Number of cycles required is 300. Devices mounted<br>Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air - Air | 0075/01005: ±(1% +50mΩ)<br>< 50mΩ for jumper<br>Others:<br>±(0.5%+50mΩ) for B/D/F tol<br>±(1%+50mΩ) for J tol<br>< 50mR for jumper |
| Short Time Overload | IEC 60115-1 8.1 | 2.5 times RCWV or maximum overload voltage which is less for 5 seconds at room temperature | 0075/01005: ±(2% +50mΩ)<br>< 50mΩ for jumper<br>Others:<br>±(1%+50mΩ) for B/D/F tol<br>±(2%+50mΩ) for J tol<br><50mR for jumper<br>No visible damage |
| Board Flex/ Bending | IEC 60115-1 9.8 | Device mounted or as described only 1 board bending required<br>bending time: 60±5 seconds<br>0075/0100/0201/0402:5mm;<br>0603/0805:3mm;<br>1206 and above:2mm | 0075/01005: ±(1% +50mΩ)<br>< 50mΩ for jumper<br>Others:<br>±(1%+50mΩ) for B/D/F/J tol<br><50mR for jumper<br>No visible damage |
| Solderability - Wetting | J-STD-002 test B1 | Electrical Test not required Magnification 50X SMD conditions:<br>1st step: aging 4 hours at 155°C dry heat<br>2nd step: method B1, 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 | MIL-STD-202 Method 210 | Condition B, no pre-heat of samples<br>Leadfree solder, 260°C±5°C, 10 ±1 seconds immersion time<br>Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | 0075: ±(3%+50mΩ)<br><50mΩ for jumper<br>01005: ±(1% +50mΩ)<br>< 50mΩ for jumper<br>Others:<br>±(0.5% +50mΩ) for B/D/F tol.<br>±(1% +50mΩ) for J tol.<br><50mR for jumper<br>No visible damage |

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version 7 | Dec. 23, 2008 | - | - Change to dual brand datasheet that describes AR0402 to AR1206 with RoHS compliant<br>- Description of "Halogen Free Epoxy" added<br>- Define global part number |
| Version 6 | Sep. 26, 2005 | - | - Sizes of 0402/0805 1% and 5% extended<br>- Replace the 0603and 1206 parts of pdf files: RC01_02H_21_22H_51_5.<br>- Test method and procedure updated<br>- PE tape added (paper tape will be replaced by PE tape) |
| Version 5 | Jul. 07, 2003 | - | - Updated company logo<br>- Table 1: RC01, RC02H, RC22H ordering code revised<br>- Marking code revised |
| Version 4 | Oct. 14, 2001 | - | - Table 3: 'length' and 'width' changed; Table 4: 'bending' changed |
| Version 3 | Apr. 27, 2001 | - | - Converted to Phycomp brand |

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