

# DATA SHEET

## CHIP RESISTORS WITH NI/AU TERMINATIONS

AR series

5%, 1%

sizes 0402/0603/0805/1206

RoHS compliant



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 & 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)**

**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 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 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

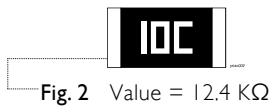
**MARKING**

**AR0402**



No marking

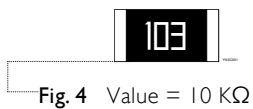
**AR0603**



E-96 series: 3 digits for 0603 ±1% EIA-96 marking method  
For 0603 ±1% E-24 series, one short bar under marking letter

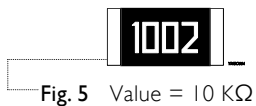


**AR0603/0805/1206**



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

**AR0805/1206**



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**

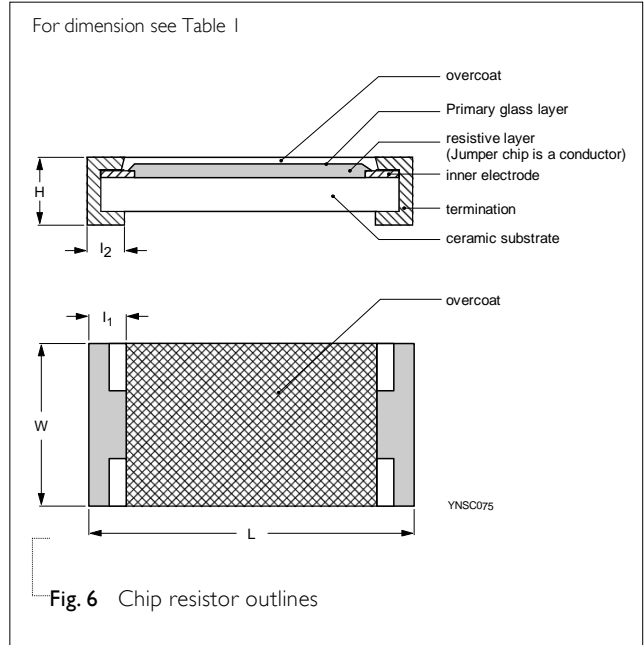
The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environment 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)	l <sub>1</sub> (mm)	l <sub>2</sub> (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**



**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	Max. Current
AR0402		-55 °C to +155 °C	50 V	100 V	100 V	10 Ω < R ≤ 10 MΩ: ±100 ppm/°C	1.0 A	2.0 A
AR0603	1 Ω ≤ R ≤ 10 MΩ		50 V	100 V	100 V		1.0 A	2.0 A
AR0805	Zero ohm Jumper < 0.05 Ω		150 V	300 V	300 V	1 Ω ≤ R ≤ 10 Ω: ±200 ppm/°C	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**

I. 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:

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

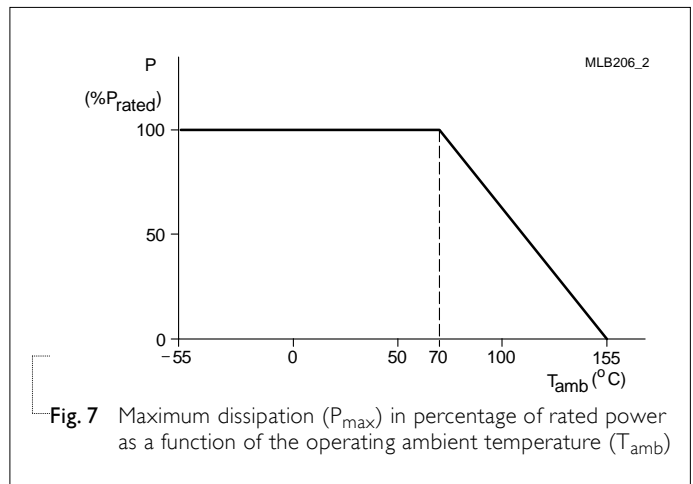
or max. working voltage whichever is less

Where

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

P = Rated power (W)

R = Resistance value ( $\Omega$ )



**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  <b>Formula:</b> $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ 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 108 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) <100mΩ for jumper 01005: ±(3%+50mΩ) <100mΩ for jumper Others: ±(1%+50mΩ) for B/D/F tol ±(3%+50mΩ) for J tol <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) <100mΩ for jumper 01005: ±(1%+50mΩ) <50mΩ for jumper Others: ±(1%+50mΩ) for B/D/F tol ±(2%+50mΩ) for J tol <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 Parts mounted on test-boards, without condensation on parts	0075: ±(2%+100mΩ) <100mΩ for jumper 01005: ±(2%+50mΩ) <100mΩ for jumper Others: ±(0.5%+50mΩ) for B/ D/F tol ±(2%+50mΩ) for J tol <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) no visible damage 01005: ±(3%+50mΩ) <100mΩ for jumper Others: ±(1%+50mΩ) for B/D/F tol ±(2%+50mΩ) for J tol <100mR for jumper

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Thermal Shock	MIL-STD-202 Method 107	-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	0075/01005: $\pm(1\% + 50m\Omega)$ < 50m $\Omega$ for jumper Others: $\pm(0.5\% + 50m\Omega)$ for B/D/F tol $\pm(1\% + 50m\Omega)$ for J tol < 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: $\pm(2\% + 50m\Omega)$ < 50m $\Omega$ for jumper Others: $\pm(1\% + 50m\Omega)$ for B/D/F tol $\pm(2\% + 50m\Omega)$ for J tol <50mR for jumper No visible damage
Board Flex/Bending	IEC 60115-1 9.8	Device mounted or as described only   board bending required bending time: 60 $\pm$ 5 seconds 0075/0100/0201/0402:5mm; 0603/0805:3mm; 1206 and above:2mm	0075/01005: $\pm(1\% + 50m\Omega)$ < 50m $\Omega$ for jumper Others: $\pm(1\% + 50m\Omega)$ for B/D/F/J tol <50mR for jumper No visible damage
Solderability - Wetting	J-STD-002 test B1	Electrical Test not required Magnification 50X SMD conditions: 1 <sup>st</sup> step: aging 4 hours at 155°C dry heat 2 <sup>nd</sup> step: method B1, leadfree solder bath at 245 $\pm$ 3°C Dipping time: 3 $\pm$ 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 210	Condition B, no pre-heat of samples Leadfree solder, 260°C $\pm$ 5°C, 10 $\pm$ 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	0075: $\pm(3\% + 50m\Omega)$ <50m $\Omega$ for jumper 01005: $\pm(1\% + 50m\Omega)$ < 50m $\Omega$ for jumper Others: $\pm(0.5\% + 50m\Omega)$ for B/D/F tol. $\pm(1\% + 50m\Omega)$ for J tol. <50mR for jumper 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 - Description of "Halogen Free Epoxy" added - Define global part number
Version 6	Sep. 26, 2005	-	- Sizes of 0402/0805 1% and 5% extended - Replace the 0603 and 1206 parts of pdf files: RC01_02H_21_22H_51_5. - Test method and procedure updated - PE tape added (paper tape will be replaced by PE tape)
Version 5	Jul. 07, 2003	-	- Updated company logo - Table 1: RC01, RC02H, RC22H ordering code revised - 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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