Innovative Service Around the Globe YAGEO

DATA SHEET

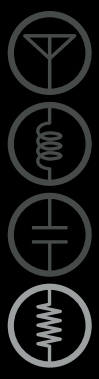
CHIP RESISTORS WITH NI/AU TERMINATIONS

AR series

5%, 1%

sizes 0402/0603/0805/1206

RoHS compliant



YAGEO Phicomp

Product specification – Dec 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
- Automotive 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

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 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 Ω 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 / 12NC can be added (both are on customer request)

PHYCOMP BRAND ordering codes

Both GLOBAL PART NUMBER (preferred) and 12NC (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.

12NC CODE

2322 XXX XXXXX
(1) (2) (3)

SIZE	TYPE	START IN (1)	TOL. (%)	RESISTANCE RANGE	PAPER/PE TAPE ON REEL (units) (2) 5,000	10,000
0402	RC31	2322	±5%	1 to 10 MΩ	-	705 12xxx
	RC32	2322	±1%	1 to 10 MΩ	-	706 2xxxx
	Jumper	2322	-	0 Ω	-	705 19001
0603	RC21	2322	±5%	1 to 10 MΩ	702 11xxx	-
	RC22H	2322	±1%	1 to 10 MΩ	704 1xxxx	-
	Jumper	2322	-	0 Ω	702 19001	-
0805	RC11	2322	±5%	1 to 10 MΩ	730 11xxx	-
	RC12	2322	±1%	1 to 10 MΩ	734 1xxxx	-
	Jumper	2322	-	0 Ω	730 19001	-
1206	RC01	2322	±5%	1 to 10 MΩ	711 11xxx	-
	RC02H	2322	±1%	1 to 10 MΩ	729 1xxxx	-
	Jumper	2322	-	0 Ω	711 19001	-

Last digit of 12NC

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

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

(1) The resistors have a 12-digit ordering code starting with 2322.

(2) The subsequent 4 or 5 digits indicate the resistor tolerance and packaging.

(3) The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of 12NC".

(4) "L" is optional symbol (Note).

ORDERING EXAMPLE

The ordering code of a RC22H resistor with gold terminations, value 56 Ω with ±1% tolerance, supplied in tape of 5,000 units per reel is:
232270415609 (L) or AR0603FR-0756R(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 / 12NC can be added (both are on customer request)

MARKING

AR0402

Fig. 1

No marking

AR0603

Fig. 2 Value = 12.4 KΩ

Fig. 3 E-24 1% Value = 56 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

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

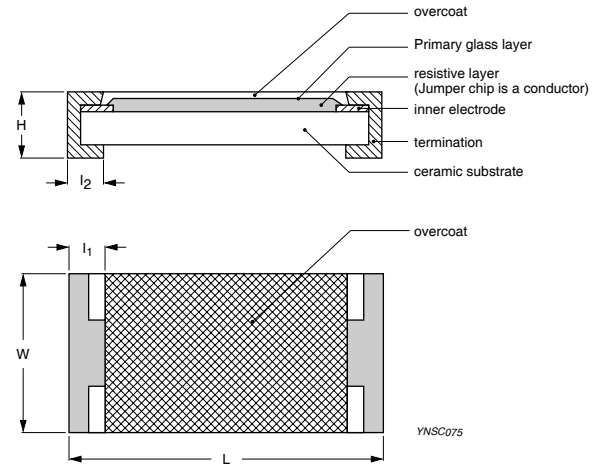


Fig. 6 Chip resistor outlines

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 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 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)

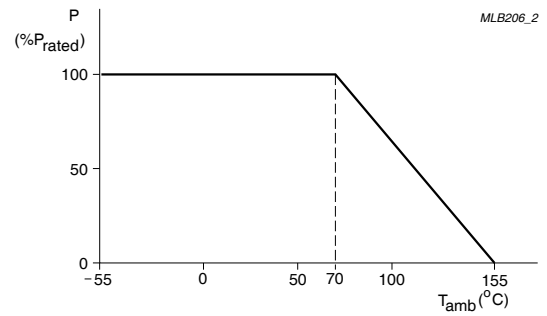


Fig. 7 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Operational Life/ Endurance	MIL-STD-202G-method 108A IEC 60115-1 4.25.1 JIS C 5202-7.10	1,000 hours at 70±5 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	±(2%+0.05 Ω) <100 mΩ for Jumper
High Temperature Exposure/ Endurance at upper category temperature	MIL-STD-202G-method 108A IEC 60115-1 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: 150±3 °C	±(1%+0.05 Ω) <50 mΩ for Jumper
Moisture Resistance	MIL-STD-202G-method 106F IEC 60115-1 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	±(2%+0.05 Ω) <100 mΩ for Jumper
Thermal Shock	MIL-STD-202G-method 107G	AR0402/0603: -55/+155 °C AR0805/1206: -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) for 10 KΩ to 10 MΩ ±(1%+0.05 Ω) for others <50 mΩ for Jumper
Short time overload	MIL-R-55342D-para 4.7.5 IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 sec at room temperature	±(2%+0.05 Ω) <50 mΩ for Jumper No visible damage
Board Flex/ Bending	IEC60115-1 4.33	Device mounted on PCB test board as described, only 1 board bending required 3 mm bending Bending time: 60±5 seconds Ohmic value checked during bending	±(1%+0.05 Ω) <50 mΩ for Jumper No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability - Wetting	IPC/JEDECJ-STD-002B test B IEC 60068-2-58	Electrical Test not required Magnification 50X SMD conditions: 1st step: method B, aging 4 hours at 155 °C dry heat 2nd step: leadfree solder bath at 245±3 °C Dipping time: 3±0.5 seconds	Well tinned (≥95% covered) No visible damage
- Leaching	IPC/JEDECJ-STD-002B test D IEC 60068-2-58	Leadfree solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to Soldering Heat	MIL-STD-202G-method 210F IEC 60068-2-58	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	±(1%+0.05 Ω) <50 mΩ 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 0603and 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