

DATA SHEET

CHIP RESISTORS WITH AU-TERMINATIONS

AR series

5%, 1%

sizes 0402/0603/0805/1206



SCOPE

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

APPLICATIONS

- Power supply in small equipment
- Digital multi-meter
- Telecommunication
- Computer
- Automotive industry

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

YAGEO ORDERING CODE

CTC CODE

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%

(3) PACKAGING TYPE

R = Paper/PE taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Base on spec

(5) TAPING REEL

07 = 7 inch dia. Reel

(6) RESISTANCE VALUE

5R6, 56R, 560R, 56K, 10M.
 0R = Jumper

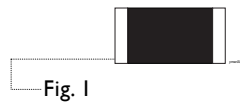
ORDERING EXAMPLE

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

For size 0603 Jumper supplied in 7-inch reel, the ordering code is AR0603JR-070R.

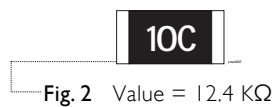
MARKING

AR0402



No marking

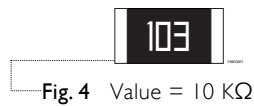
AR0603



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

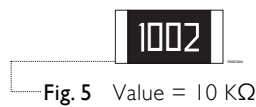


AR0603/0805/1206



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 marking codes, please see EIA-marking code rules in 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 paste. The composition of the paste 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 an overcoat and printed with the resistance value. Finally, the two external terminations (Gold) are added. See fig. 6.

DIMENSIONS

Table I For outlines see fig. 6

TYPE	L (mm)	W (mm)	H (mm)	l ₁ (mm)	l 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

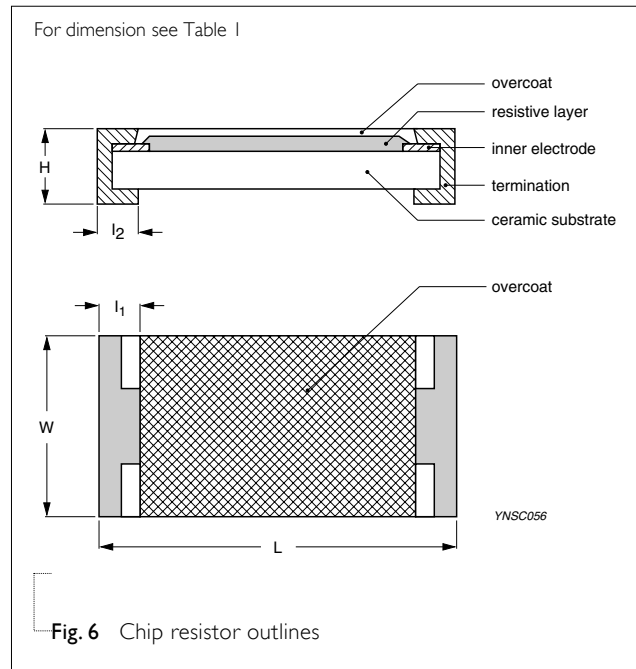


Fig. 6 Chip resistor outlines

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 Max. Current	
AR0402	1 Ω ≤ R < 10 MΩ,	-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			50 V	100 V	100 V		1.0 A	2.0 A
AR0805	Zero ohm Jumper < 0.05 Ω	+155 °C	150 V	300 V	300 V	1 Ω ≤ R ≤ 10 Ω: ±200 ppm/°C	2.0 A	5.0 A
AR1206			200 V	400 V	500 V		2.0 A	10.0 A

FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please see the special data sheet “Chip resistors mounting”.

ENVIRONMENTAL DATA

For material declaration information (IMDS-data) of the products, please see the separated info “Environmental data” conformed to EU RoHS.

PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	AR0402	AR0603	AR0805	AR1206
Paper/PE taping reel (R)	7" (178 mm)	10,000	5,000	5,000	5,000

NOTE

- For Paper/PE tape and reel specification/dimensions, please see the special data sheet “Packing” document.

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: -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:

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

Where

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

P = Rated power (W)

R = Resistance value (Ω)

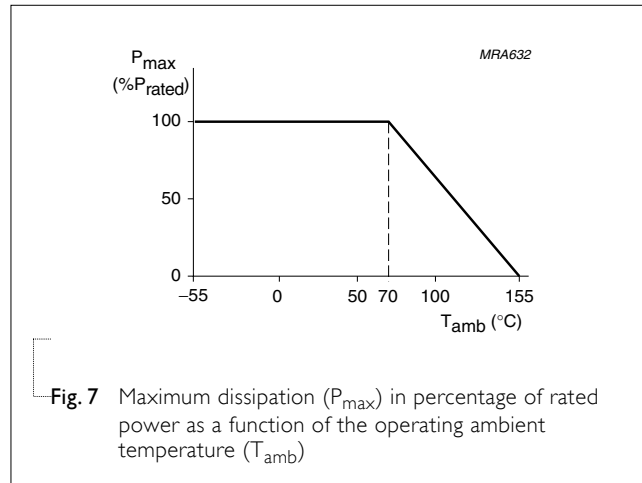


Fig. 7 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202F-method 304;	At +25/-55 °C and +25/+125 °C	Refer to table 2
	JIS C 5202-4.8	<p>Formula:</p> $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ <p>Where $t_1 = +25 \text{ °C}$ or specified room temperature $t_2 = -55 \text{ °C}$ or +125 °C test temperature $R_1 =$resistance at reference temperature in ohms $R_2 =$resistance at test temperature in ohms</p>	
Thermal Shock	MIL-STD-202F-method 107G; IEC 60115-1 4.19	At -65 (+0/-10) °C for 2 minutes and at +155 (+10/-0) °C for 2 minutes; 25 cycles	±(0.5%+0.05 Ω) for 1% tol. ±(1.0%+0.05 Ω) for 5% tol.
Low Temperature Operation	MIL-R-55342D-Para 4.7.4	At -65 (+0/-5) °C for 1 hour; RCWV applied for 45 (+5/-0) minutes	±(0.5%+0.05 Ω) for 1% tol. ±(1.0%+0.05 Ω) for 5% tol. No visible damage
Short Time Overload	MIL-R-55342D-Para 4.7.5; IEC 60115-1 4.13	2.5 × RCWV applied for 5 seconds at room temperature	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol. No visible damage
Insulation Resistance	MIL-STD-202F-method 302; IEC 60115-1 4.6.1.1	One DC voltage (V) applied for 1 minute Details see below table 5	≥10 GΩ
Dielectric Withstand Voltage	MIL-STD-202F-method 301; IEC 60115-1 4.6.1.1	One AC voltage (Vrms) applied for 1 minute Details see below table 5	No breakdown or flashover
Resistance to Soldering Heat	MIL-STD-202F-method 210C; IEC 60115-1 4.18	Unmounted chips; 260 ±5 °C for 10 ±1 seconds	±(0.5%+0.05 Ω) for 1% tol. ±(1.0%+0.05 Ω) for 5% tol. No visible damage
Life	MIL-STD-202F-method 108A; IEC 60115-1 4.25.1	At 70±2 °C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off	±(1%+0.05 Ω) for 1% tol. ±(3%+0.05 Ω) for 5% tol.

Table 4 Test condition, procedure and requirements (continued)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS	
Solderability	MIL-STD-202F-method 208A;	Solder bath at 245±3 °C	Well tinned (≥95% covered)	
	IEC 60115-1 4.17	Dipping time: 2±0.5 seconds	No visible damage	
Bending Strength	JIS C 5202.6.14;	Resistors mounted on a 90 mm glass epoxy resin PCB (FR4) Bending: 5 mm	±(1.0%+0.05 Ω) for 1% tol.	
	IEC 60115-1 4.15		±(1.0%+0.05 Ω) for 5% tol. No visible damage	
Resistance to Solvent	MIL-STD-202F-method 215; IEC 60115-1 4.29	Isopropylalcohol (C ₃ H ₇ OH) or dichloromethane (CH ₂ Cl ₂) followed by brushing	No smeared	
Noise	JIS C 5202 5.9; IEC 60115-1 4.12	Maximum voltage (V _{rms}) applied.	Resistors range	Value
			R < 100 Ω	10 dB
			100 Ω ≤ R < 1 KΩ	20 dB
			1 KΩ ≤ R < 10 KΩ	30 dB
			10 KΩ ≤ R < 100 KΩ	40 dB
			100 KΩ ≤ R < 1 MΩ	46 dB
			1 MΩ ≤ R ≤ 22 MΩ	48 dB
Humidity (steady state)	JIS C 5202 7.5; IEC 60115-8 4.24.8	1,000 hours; 40±2 °C; 93(+2/-3)% RH	±(0.5%+0.05 Ω) for 1% tol.	
		RCWV applied for 1.5 hours on and 0.5 hour off	±(2.0%+0.05 Ω) for 5% tol.	
Leaching	EIA/IS 4.13B; IEC 60115-8 4.18	Solder bath at 260±5 °C	No visible damage	
		Dipping time: 30±1 seconds		
Intermittent Overload	JIS C 5202 5.8	At room temperature; 2.5 × RCWV applied for 1 second on and 25 seconds off; total 10,000 cycles	±(1.0%+0.05 Ω) for 1% tol. ±(2.0%+0.05 Ω) for 5% tol.	
Resistance to Vibration	On request	On request		
Moisture Resistance Heat	MIL-STD-202F-method 106F; IEC 60115-1 4.24.2	42 cycles; total 1,000 hours	±(0.5%+0.05Ω) for 1% tol.	
		Shown as Fig. 8	±(2.0%+0.05Ω) for 5% tol.	
			No visible damage	

Table 5 Criteria of rated continued working voltage and overload voltage

TYPE	AR0402	AR0603	AR0805	AR1206
Voltage (DC/unit: V); (AC/ unit: V _{rms})	100	100	300	500

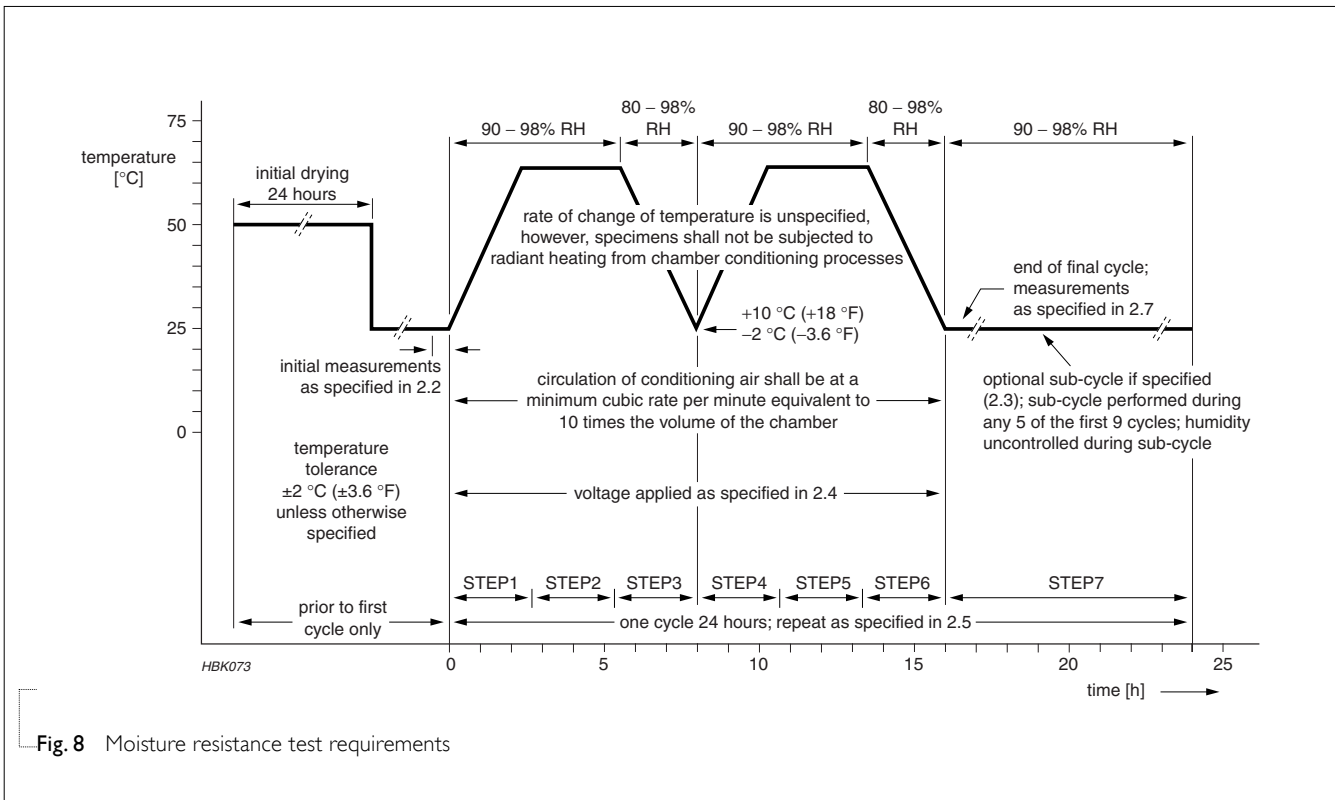


Fig. 8 Moisture resistance test requirements

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
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Version 0	Sep 26, 2005	-	- First issue of this specification
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