Innovative Service Around the Globe YAGEO

DATA SHEET

ANTI SURGE AND ANTI SULFURATION AUTOMOTIVE GRADE CHIP RESISTORS

AS series

0.5%, 1%, 5%, 10%, 20%

sizes 0603/0805/1206

RoHS compliant & Halogen free

YAGEO

Product specification – April 8, 2021 V.1

SCOPE

This specification describes AS0603 to AS1206 chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- Telecommunications
- Power supplies
- Car electronics

FEATURES

- AEC-Q200 qualified
- Superior to AS series in pulse withstanding voltage and surge withstanding voltage.
- MSL class: MSL 1
- Halogen free epoxy
- RoHS compliant
- Reduce environmentally hazardous waste
- High component and equipment reliability

ORDERING INFORMATION - GLOBAL PART NUMBER

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

GLOBAL PART NUMBER

AS	XXXX	X	X	X	XX	XXXX	L
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

(1) SIZE

0603 / 0805 / 1206

(2) TOLERANCE

D = ±0.5%
F = ±1%
J = ± 5%
K = ±10%
M = ±20%

(3) PACKAGING TYPE

R = Paper taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Based on spec.

(5) TAPING REEL & POWER

07 = 7 inch dia. Reel
7W = 7 inch dia. Reel & 2 x standard power
7T = 7 inch dia. Reel & 3 x standard power
47 = 7 inch dia. Reel & 4 x standard power

(6) RESISTANCE VALUE

1 Ω ≤ R ≤ 1M Ω

There are 2~4 digits indicated the resistance 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 coding rules of resistance are shown in the table of "Resistance rule of global part number".

(7) DEFAULT CODE

Letter L is the system default code for ordering only. (Note)

Resistance rule of global part number

Resistance coding 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
XXKX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6= 976,000 Ω
XXXK (100 KΩ)	100K = 100,000 Ω

ORDERING EXAMPLE

The ordering code for an AS0805 chip resistor, value 10 KΩ with ±5% tolerance, supplied in 7-inch tape reel is: AS0805JR-0710KL.

MARKING

AS0603

Fig. 1 Value = 24 Ω

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

Fig. 2 Value = 806 Ω

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

AS0805 / 1206

Fig. 3 Value = 10 K Ω

Both E-24 and E-96 series: 4 digits, ±0.5% & ±1%
First three digits for significant figure and 4th digit for number of zeros

NOTE
For further marking information, please refer to data sheet "Chip resistors marking".

TAPING REEL & POWER

Table 1

TYPE	POWER, W (P70)			
	CODING			
	07	7W	7T	47
0603	1/10	1/5	1/4	-
0805	1/8	1/4	1/3	1/2
1206	1/4	1/2	3/4	-

CONSTRUCTION

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive glaze. The resistive glaze is covered by a lead-free glass. The composition of the glaze is adjusted to give the approximately required resistance value. The whole element is covered by a protective overcoat. The top of overcoat is marked with the resistance value. Finally, the two external terminations (Ni/matte tin) are added, as shown in Fig.4.

OUTLINES

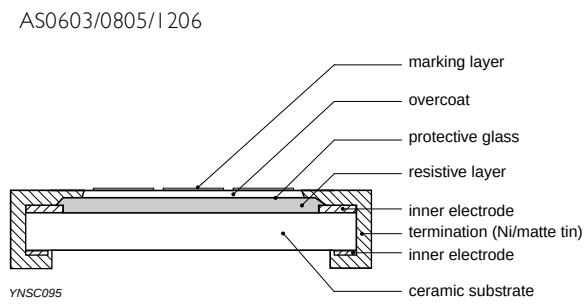

Fig. 4 Chip resistor outlines

DIMENSIONS

Table 2

TYPE	L (mm)	W (mm)	H (mm)	I_1 (mm)	I_2 (mm)
AS0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
AS0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
AS1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20

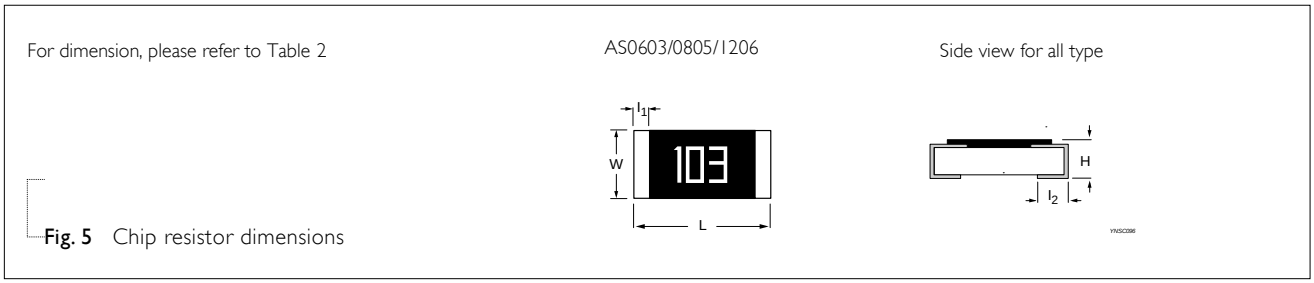

Fig. 5 Chip resistor dimensions

ELECTRICAL CHARACTERISTICS

Table 3

TYPE	POWER	RESISTANCE RANGE	CHARACTERISTICS				
			Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
AS0603	1/10W	E24 5%, 10%, 20% 1Ω ≤ R ≤ 1MΩ E24/E96 0.5%, 1% 1Ω ≤ R ≤ 1MΩ	–55 °C to +155 °C	75V	150V	150V	1Ω≤ R ≤ 10Ω ± 200 ppm°C 10Ω< R ≤ 1MΩ ± 100 ppm°C
	1/5W						
	1/4W						
AS0805	1/8W			150V	300V	300V	
	1/4W						
	1/3W						
	1/2W						
AS1206	1/4W			200 V	400 V	500V	
	1/2W						
	3/4W						

FOOTPRINT AND SOLDERING PROFILES

Recommended footprint and soldering profiles, please refer to data sheet "Chip resistors mounting".

PACKING STYLE AND PACKAGING QUANTITY

Table 4 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	AS0603/0805/1206
Paper taping reel (R)	7" (178 mm)	5,000

NOTE

1. For paper/embossed tape and reel specification/dimensions, please refer to data sheet "Chip resistors packing".

FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: –55 °C to +155 °C

POWER RATING

Each type rated power at 70 °C:
AS0603: 1/10W, 1/5W, 1/4W
AS0805: 1/8W, 1/4W, 1/3W, 1/2W
AS1206: 1/4W, 1/2W, 3/4W

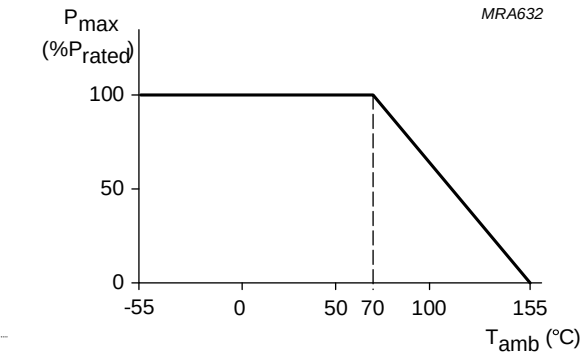

Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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)

PULSE LOAD BEHAVIOR

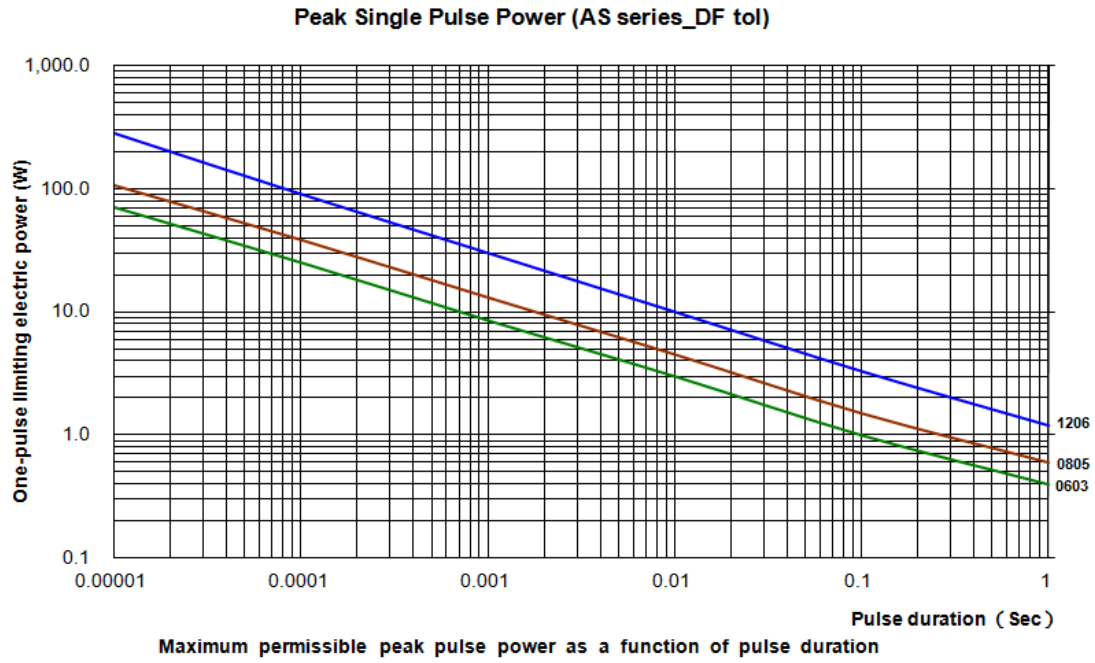

Fig.7 Pulse-Load behavior

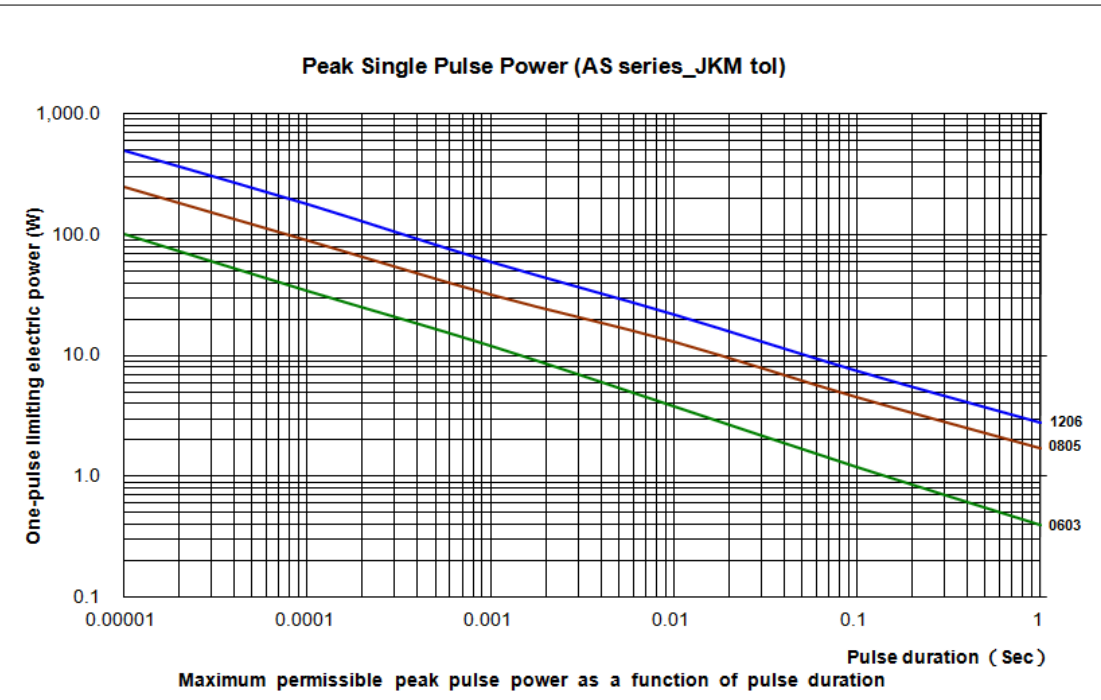

Fig. 8 Pulse-Load behavior

TESTS AND REQUIREMENTS

Table 5 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
High Temperature Exposure	AEC-Q200 Test 3 MIL-STD-202 Method 108	1,000 hours at T_A = 155 °C, unpowered	±(1.0%+0.05Ω) for D/F tol ±(2.0%+0.05Ω) for J tol
Moisture Resistance	AEC-Q200 Test 6 MIL-STD-202 Method 106	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	±(0.5%+0.05Ω) for D/F tol ±(2.0%+0.05Ω) for J tol
Biased Humidity	AEC-Q200 Test 7 MIL-STD-202 Method 103	1,000 hours; 85 °C / 85% RH 10% of operating power Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for J tol
Operational Life	AEC-Q200 Test 8 MIL-STD-202 Method 108	1,000 hours at 125 °C, derated voltage applied for 1.5 hours on, 0.5 hour off, still-air required	±(1.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for J tol
Resistance to Soldering Heat	AEC-Q200 Test 15 MIL-STD-202 Method 210	Condition B, no pre-heat of samples Lead-free solder, 260±5 °C, 10±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	±(0.5%+0.05Ω) for D/F tol ±(1.0%+0.05Ω) for J tol No visible damage
Thermal Shock	AEC-Q200 Test 16 MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(0.5%+0.05Ω) for D/F tol ±(1.0%+0.05Ω) for J tol
ESD	AEC-Q200 Test 17 AEC-Q200-002	Human Body Model, $1_{pos.}$ + $1_{neg.}$ discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV	±(3.0%+0.05Ω)

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability - Wetting	AEC-Q200 Test 18 J-STD-002	Electrical Test not required Magnification 50X SMD conditions: (a) Method B, aging 4 hours at 155 °C dry heat, dipping at 235±3 °C for 5±0.5 seconds. (b) Method B, steam aging 8 hours, dipping at 215±3 °C for 5±0.5 seconds. (c) Method D, steam aging 8 hours, dipping at 260±3 °C for 30±0.5 seconds.	Well tinned (≥95% covered) No visible damage
Board Flex	AEC-Q200 Test 21 AEC-Q200-005	Chips mounted on a 90mm glass epoxy resin PCB (FR4) Bending for 0201/0402: 5 mm 0603/0805: 3 mm 1206 and above: 2 mm Holding time: minimum 60 seconds	±(1.0%+0.05Ω)
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202 Method 304	At +25/–55 °C and +25/+125 °C **Formula:** $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (ppm/°C) Where t_1=+25 °C or specified room temperature t_2=–55 °C or +125 °C test temperature R_1=resistance at reference temperature in ohms R_2=resistance at test temperature in ohms	Refer to table 3
Short Time Overload	IEC60115-1 4.13	2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature	±(1.0%+0.05Ω) for D/F tol ±(2.0%+0.05Ω) for J tol
FOS	ASTM-B-809-95* * Modified	Sulfur 750 hours, 105 °C, unpowered	± (4.0%+0.05Ω)

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 0	Nov. 30, 2020	-	- New product datasheet
Version 1	Apr. 08, 2021	-	- Upgrade to Automotive Grade