

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



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 AF 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 = $\pm 0.5\%$

F = $\pm 1\%$

J = $\pm 5\%$

K = $\pm 10\%$

M = $\pm 20\%$

(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

$1\ \Omega \leq R \leq 1\text{M}\ \Omega$

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
XXXX (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
XXXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (1 to 9.76 K Ω)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 K Ω)	10K = 10,000 Ω 97K6 = 976,000 Ω
XXXXK (100 K Ω)	100K = 100,000 Ω

ORDERING EXAMPLE

The ordering code for an AS0805 chip resistor, value 10 K Ω with $\pm 5\%$ 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 / 1206Fig. 3 Value = 10 K Ω Both E-24 and E-96 series: 4 digits, $\pm 0.5\%$ & $\pm 1\%$

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

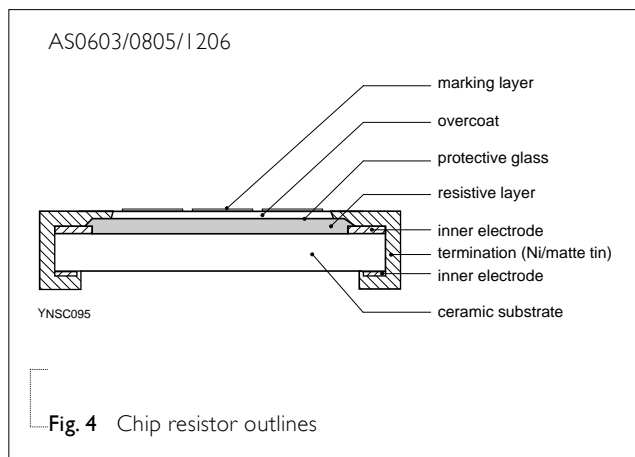
Table I

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.

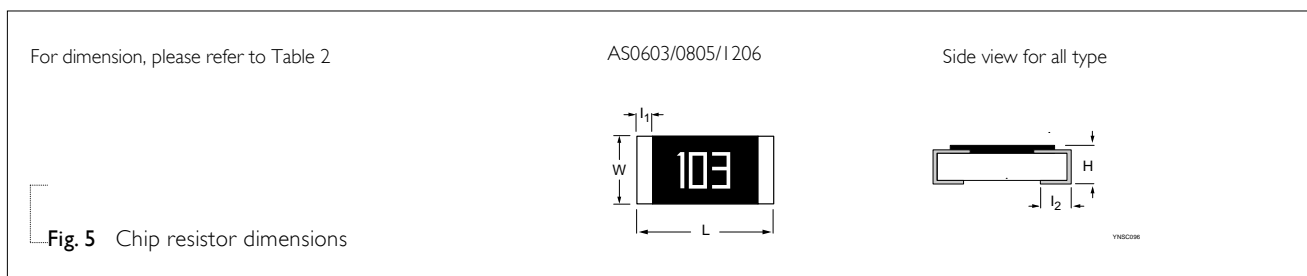
OUTLINES



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	0.45±0.20



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						
	1/5W			75V	150V	150V	
	1/4W						
AS0805	1/8W	E24 5%, 10%, 20%					$1\Omega \leq R \leq 10\Omega$
	1/4W	$1\Omega \leq R \leq 1M\Omega$	-55 °C to +155 °C				$\pm 200 \text{ ppm}^\circ\text{C}$
	1/3W	E24/E96 0.5%, 1%		150V	300V	300V	$10\Omega < R \leq 1M\Omega$
	1/2W	$1\Omega \leq R \leq 1M\Omega$					$\pm 100 \text{ ppm}^\circ\text{C}$
AS1206	1/4W						
	1/2W			200 V	400 V	500V	
	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

RATED VOLTAGE

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

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

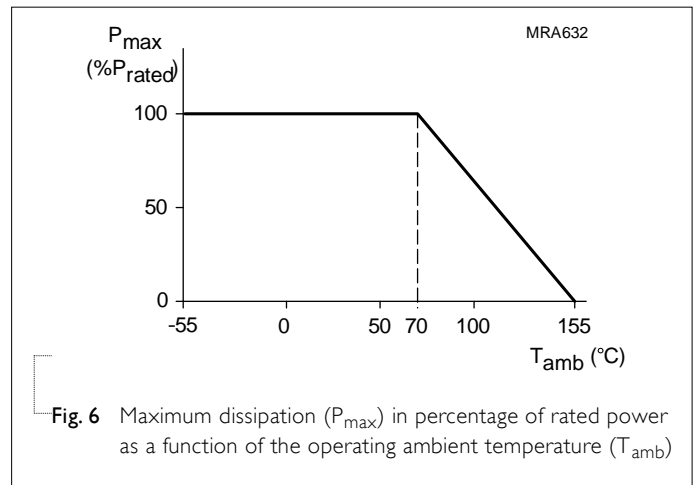
or max. working voltage whichever is less

Where

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

P = Rated power (W)

R = Resistance value (Ω)



PULSE LOAD BEHAVIOR

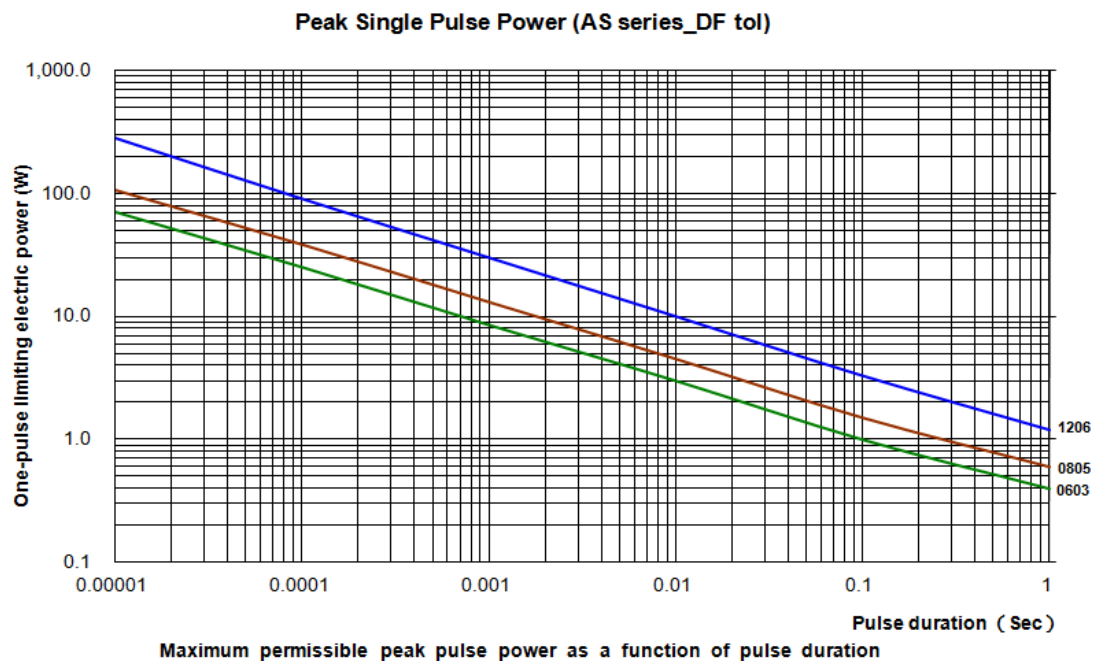


Fig.7

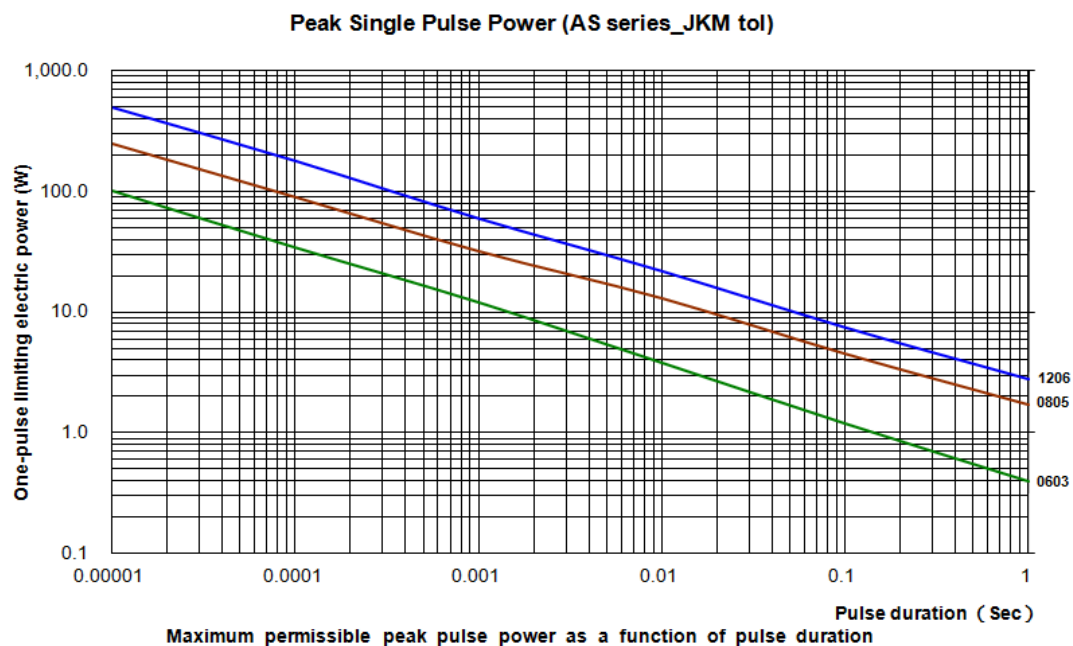


Fig. 8 Pulse-Load behavior

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 $T_A = 155\text{ }^{\circ}\text{C}$, unpowered	$\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(2.0\%+0.05\Omega)$ for J tol
Moisture Resistance	MIL-STD-202 Method 106	Each temperature / humidity cycle is defined at 8 hours, 3 cycles / 24 hours for 10d. with $25\text{ }^{\circ}\text{C}$ / $65\text{ }^{\circ}\text{C}$ 95% R.H, without steps 7a & 7b, unpowered	$\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(2.0\%+0.05\Omega)$ for J tol
Biased Humidity	AEC-Q200 Test 7 MIL-STD-202 Method 103	1,000 hours; $85\text{ }^{\circ}\text{C}$ / 85% RH 10% of operating power Measurement at 24 ± 4 hours after test conclusion.	$\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(3.0\%+0.05\Omega)$ for J tol
Operational Life	AEC-Q200 Test 8 MIL-STD-202 Method 108	1,000 hours at $125\text{ }^{\circ}\text{C}$, derated voltage applied for 1.5 hours on, 0.5 hour off, still-air required	$\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(3.0\%+0.05\Omega)$ 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, $260\pm 5\text{ }^{\circ}\text{C}$, 10 ± 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	$\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(1.0\%+0.05\Omega)$ for J tol No visible damage
Thermal Shock	MIL-STD-202 Method 107	$-55/+125\text{ }^{\circ}\text{C}$ Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	$\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(1.0\%+0.05\Omega)$ for J tol
ESD	AEC-Q200 Test 17 AEC-Q200-002	Human Body Model, $I_{\text{pos.}} + I_{\text{neg.}}$ discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV	$\pm(3.0\%+0.05\Omega)$

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability - Wetting	AEC-Q200 Test I8 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 100mm x 40mm 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: $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ 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 8.1	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 2	Aug. 03, 2022	-	- I2 dimension updated, for size I 206.
Version 1	Apr. 08, 2021	-	- Upgrade to Automotive Grade
Version 0	Nov. 30, 2020	-	- New product datasheet

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