

# 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 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 × standard power  
 7T = 7 inch dia. Reel & 3 × standard power  
 47 = 7 inch dia. Reel & 4 × 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)

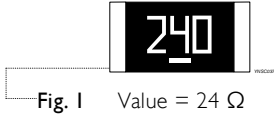
Resistance coding rule	Example
XRXX (1 to 9.76 Ω)	1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω
XXRX (10 to 97.6 Ω)	10R = 10 Ω 97R6 = 97.6 Ω
XXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (1 to 9.76 KΩ)	1K = 1,000 Ω 9K76 = 9760 Ω
XXXX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6 = 976,000 Ω
XXXXK (100 KΩ)	100K = 100,000 Ω

**ORDERING EXAMPLE**

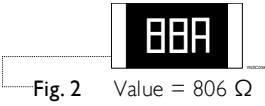
The ordering code for an AS0805 chip resistor, value 10 KΩ with ±5% tolerance, supplied in 7-inch tape reel is: AS0805JR-0710KL.

**MARKING**

**AS0603**

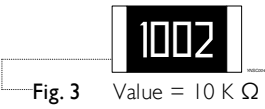


1%, 0.5%, E24 exception values 10/11/13/15/20/75 of E24 series



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

**AS0805 / 1206**



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**

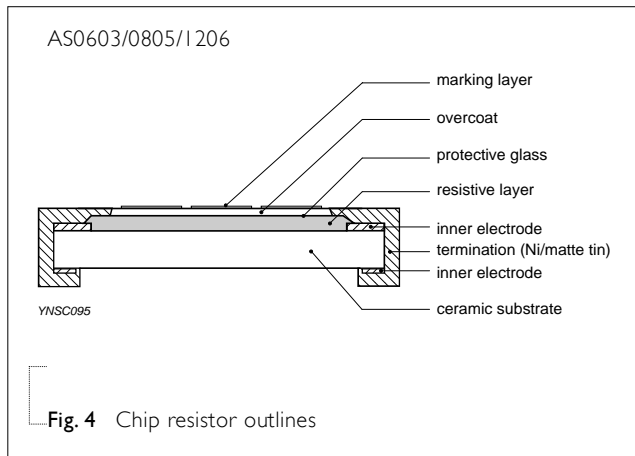
Table I

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.

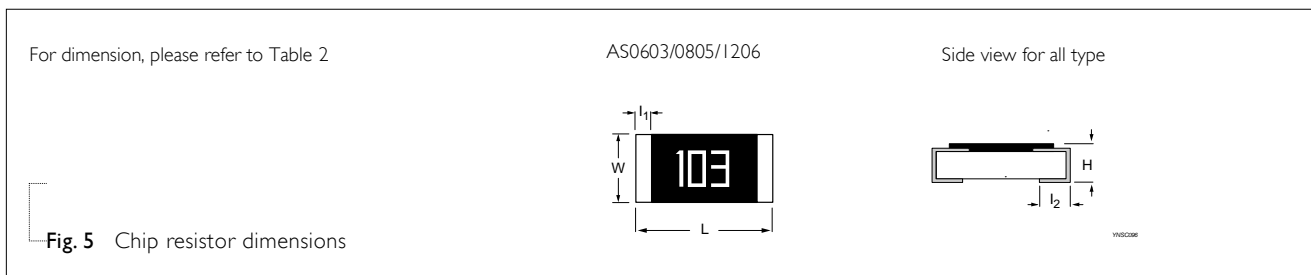
**OUTLINES**



**DIMENSIONS**

Table 2

TYPE	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)	l <sub>2</sub> (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



**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	150V	300V	300V	$\pm 200 \text{ ppm}^\circ\text{C}$
	1/3W	E24/E96 0.5%, 1%					$10\Omega < R \leq 1M\Omega$
	1/2W	$1\Omega \leq R \leq 1M\Omega$					$\pm 100 \text{ ppm}^\circ\text{C}$
1/4W							
AS1206	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:

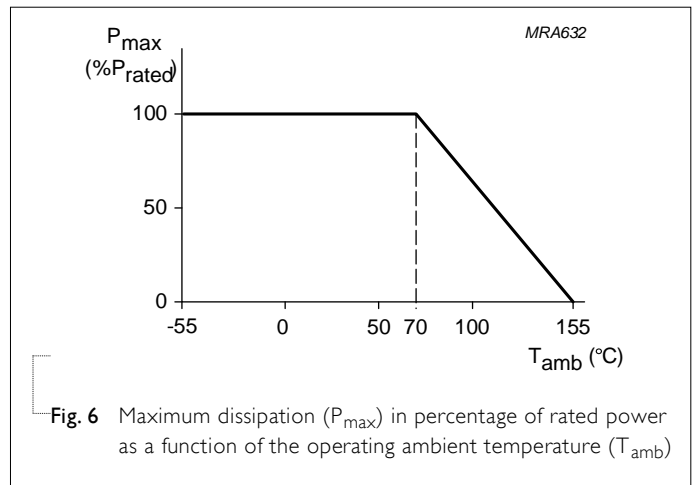
$$V = \sqrt{(P \times R)}$$

Where

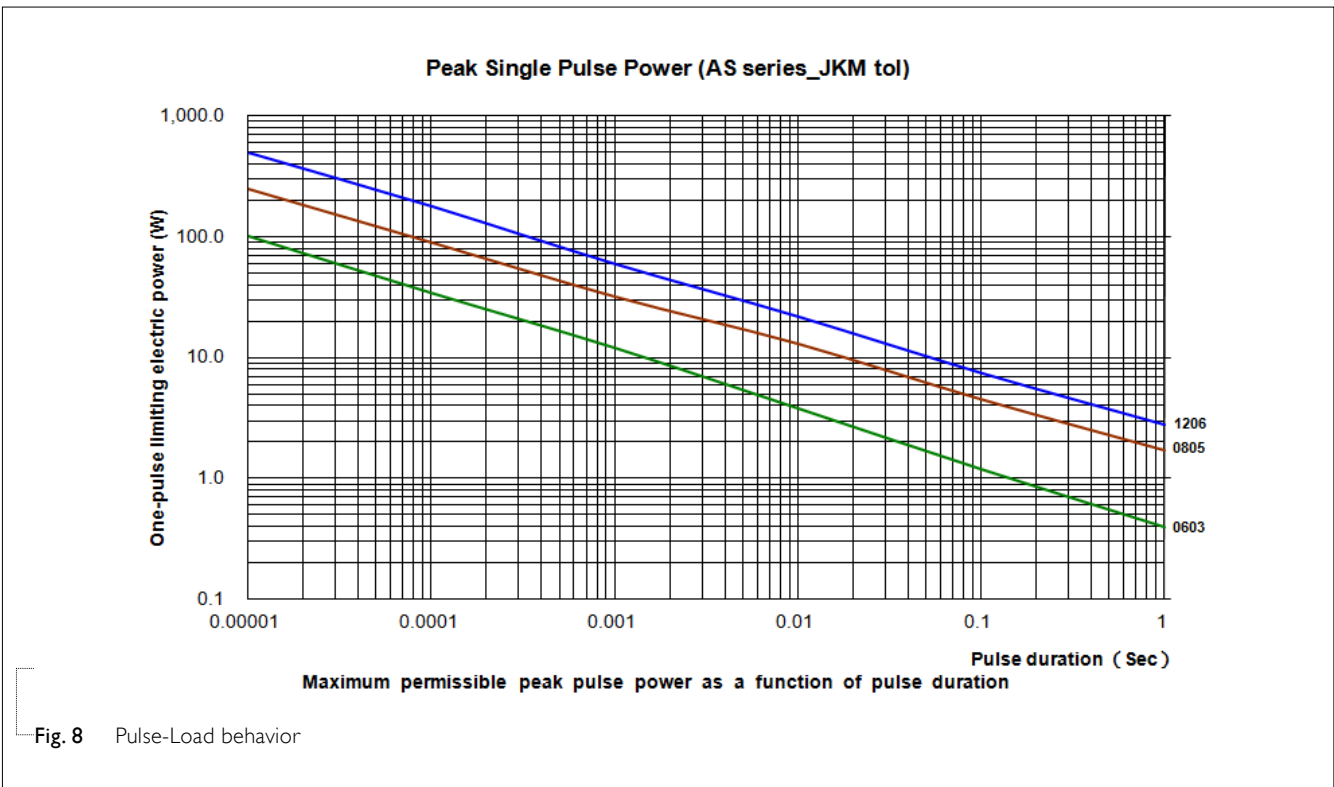
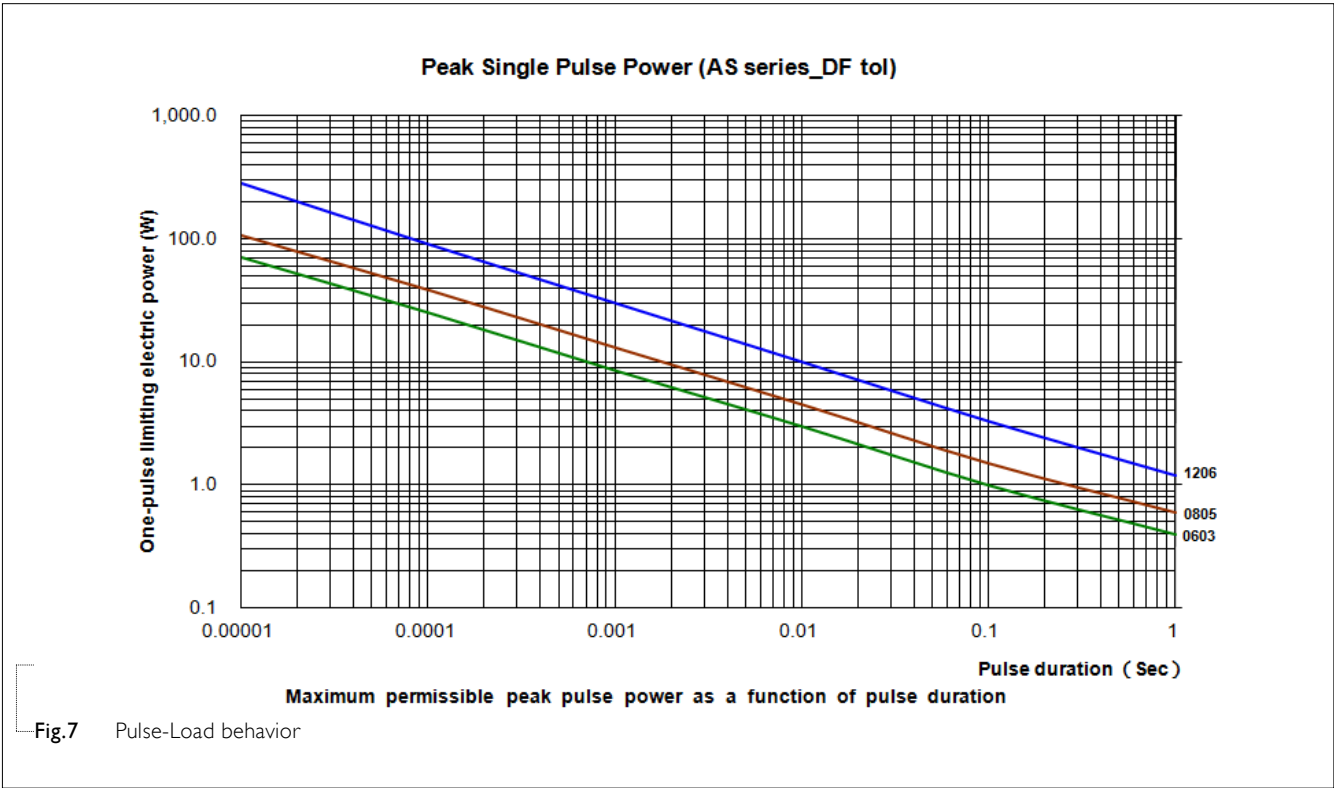
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value ( $\Omega$ )



**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	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 $25\text{ }^\circ\text{C}$ / $65\text{ }^\circ\text{C}$ 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 $24\pm 4$ 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, $260\pm 5\text{ }^\circ\text{C}$ , $10\pm 1$ 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	AEC-Q200 Test 16 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 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  <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 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

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