

# DATA SHEET

## AUTOMOTIVE GRADE SURGE CHIP RESISTORS

SR series

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

sizes 0201/0402/0603/0805/1206/1210/1218/2010/2512

RoHS compliant & Halogen free





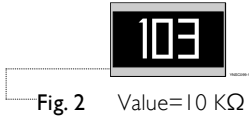
**MARKING**

**SR0201 / SR0402**



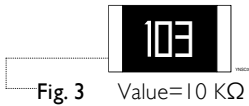
No Marking

**SR1218**



E-24 series: 3 digits  
First two digits for significant figure and 3rd digit for number of zeros

**SR0603 / SR0805 / SR1206 / SR1210 / SR2010 / SR2512**



E-24 series: 3 digits  
First two digits for significant figure and 3rd 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)			
	07	7W	7T	47
0201 1/20	1/10	-	1/5	-
0402 1/16	1/8	1/5	-	-
0603 1/10	1/5	1/4	1/3	-
0805 1/8	1/4	1/3	1/2	-
1206 1/4	1/2	3/4	1	-
1210 1/2	1	-	-	-
1218 1	1.5	-	-	-
2010 3/4	1.25	-	-	-
2512 1	2	-	-	-

**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**

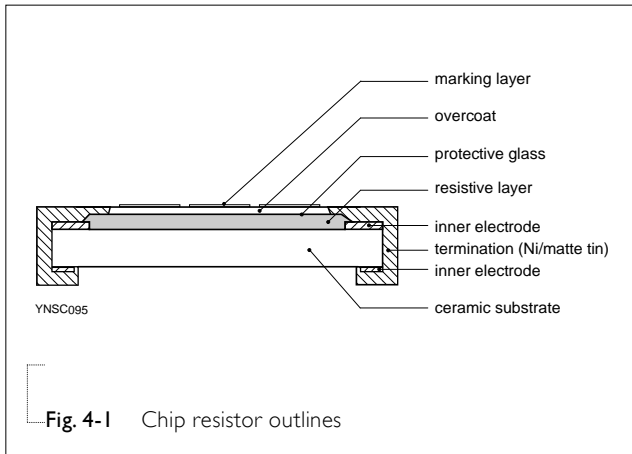


Fig. 4-1 Chip resistor outlines

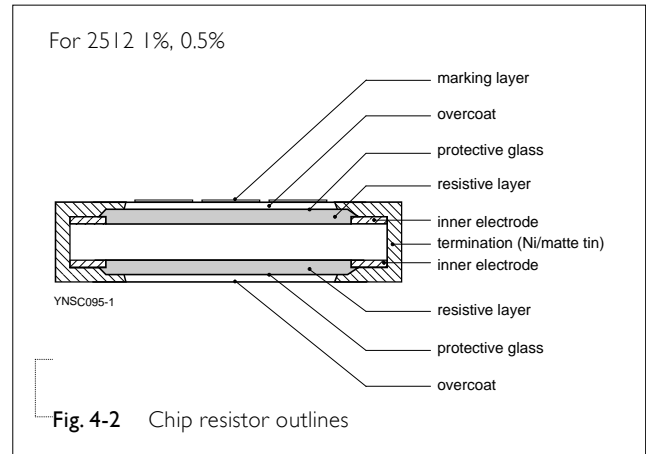


Fig. 4-2 Chip resistor outlines

**DIMENSIONS**

Table 2

TYPE	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)	l <sub>2</sub> (mm)
SR0201	0.60±0.03	0.30±0.03	0.23±0.03	0.12±0.05	0.15±0.05
SR0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
SR0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
SR0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
SR1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.45±0.20
SR1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
SR1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
SR2010	5.00±0.10	2.50±0.15	0.55±0.10	0.55±0.15	0.55±0.20
SR2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.60±0.20

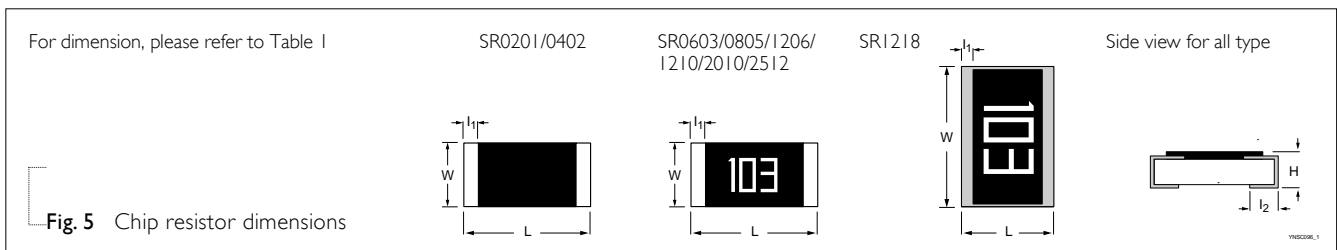


Fig. 5 Chip resistor dimensions

**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
SR0201	1/20W			25 V	50 V	50 V	$1\Omega \leq R < 10\Omega$ $-100 \sim +350 \text{ ppm}/^\circ\text{C}$ $10\Omega \leq R \leq 1M\Omega$ $\pm 200 \text{ ppm}/^\circ\text{C}$
	1/10W						
	1/5W						
SR0402	1/16W			75 V	100 V	100 V	
	1/8W						
	1/5W						
SR0603	1/10W			150V	300V	300V	
	1/5W						
	1/4W						
SR0805	1/3W	E24/E96 0.5%, 1% E24 5%, 10%, 20% $1\Omega \leq R \leq 1M\Omega$	-55 °C to +155 °C	500V	1000V	1000V	
	1/4W						
	1/2W						
	1/4 W						
SR1206	1/2W			200 V	400 V	500 V	$1\Omega \leq R < 10\Omega$ $\pm 200 \text{ ppm}/^\circ\text{C}$
	3/4W						
	1W						
SR1210	1/2W			200 V	400 V	500 V	
	1W						
SR1218	1W			200 V	400 V	500 V	
	1.5W						
SR2010	3/4W			200 V	400 V	500 V	
	1.25W						
SR2512	1 W			500 V	1000 V	1000 V	
	2W						

**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	SR0201/0402	SR0603/0805/1206	SR1210	SR1218/2010/2512
Paper taping reel (R)	7" (178 mm)	10,000	5,000	5,000	---
	13" (330 mm)	50,000	20,000	20,000	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	4,000

**NOTE**

I. 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:

- SR0201: 1/20W, 1/10W, 1/5W
- SR0402: 1/16W, 1/8W, 1/5W
- SR0603: 1/10W, 1/5W, 1/4W, 1/3W
- SR0805: 1/8W, 1/4W, 1/3W, 1/2W
- SR1206: 1/4W, 1/2W, 3/4W, 1W
- SR1210: 1/2W, 1W
- SR1218: 1W, 1.5W
- SR2010: 3/4W, 1.25W
- SR2512: 1W, 2W

**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)

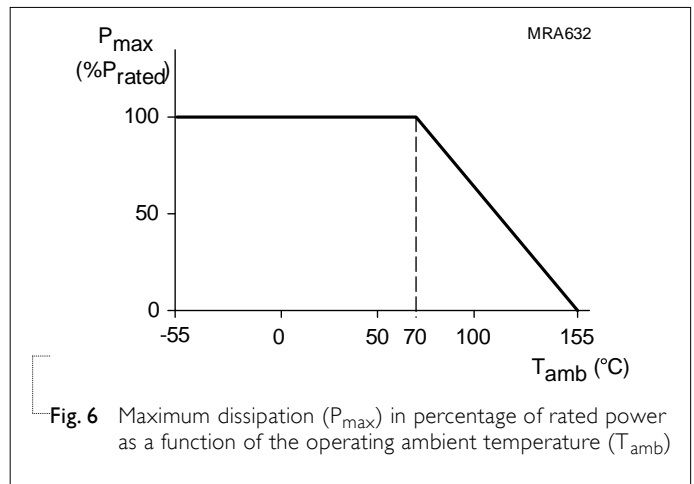
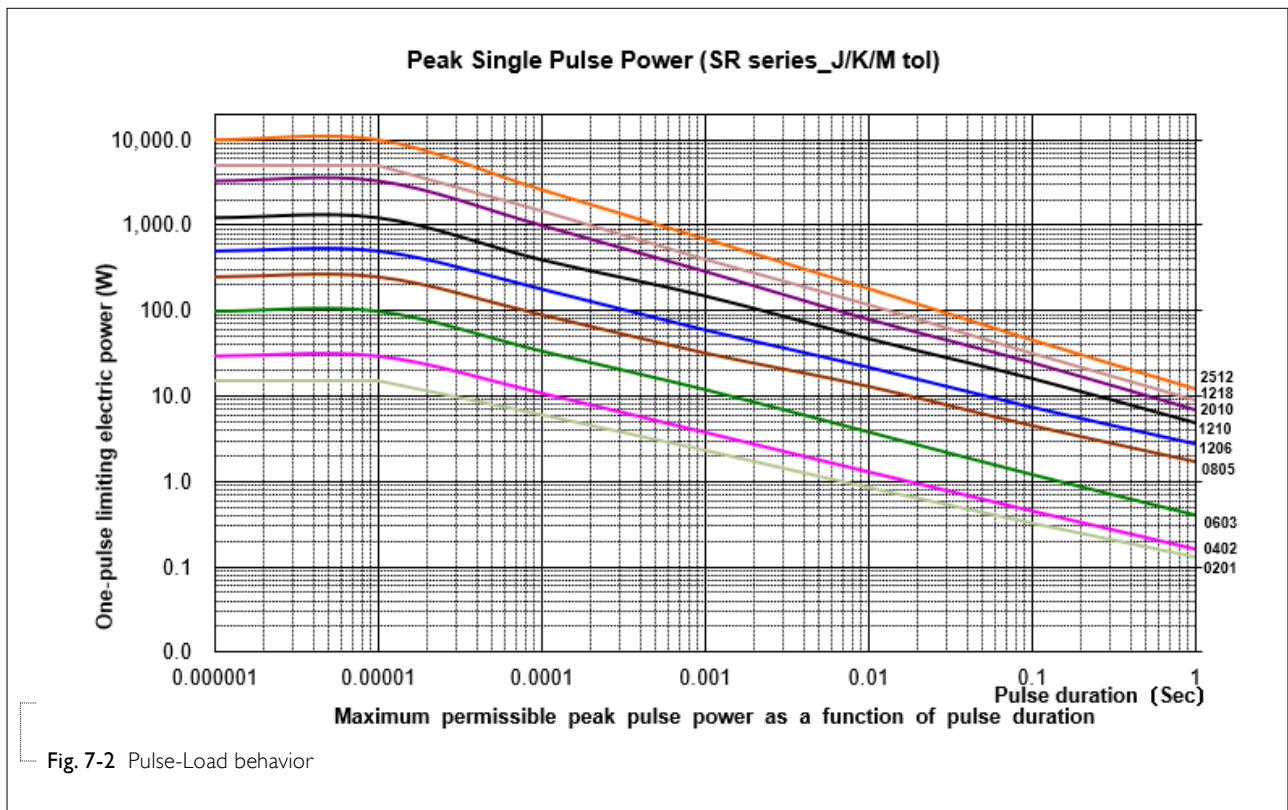
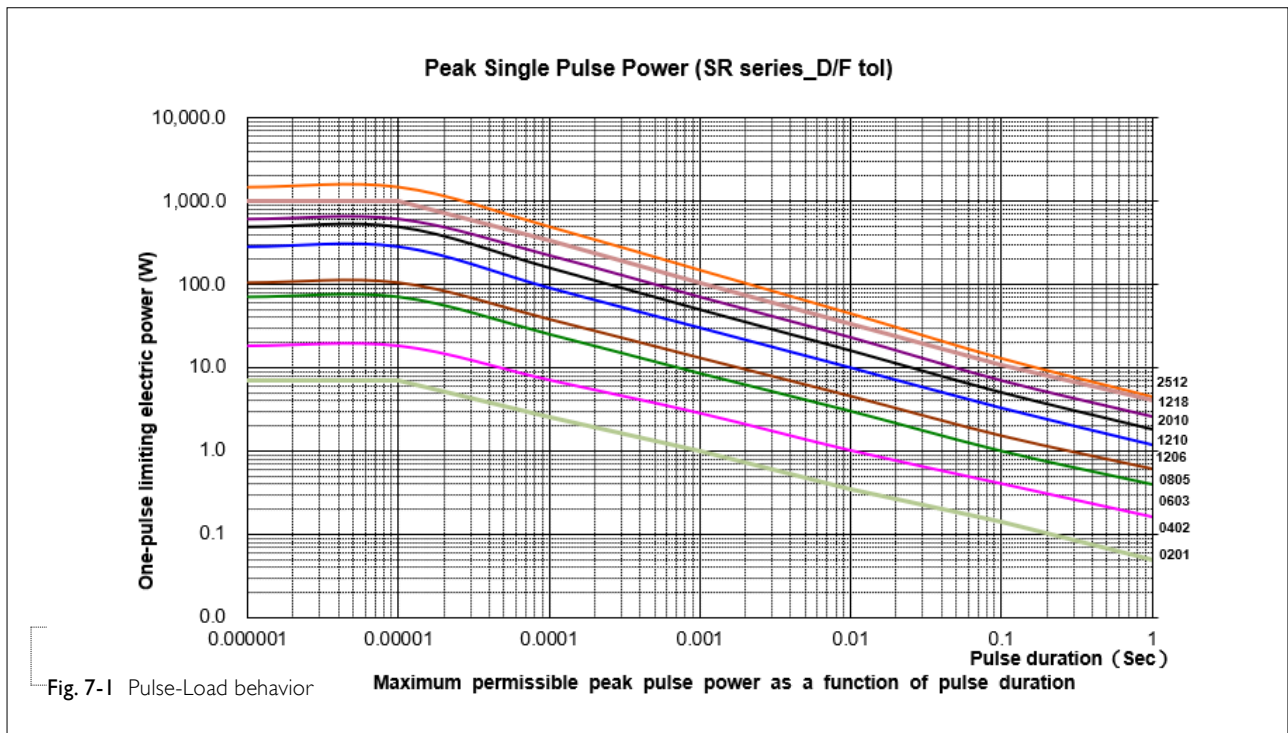


Fig. 6 Maximum dissipation (P<sub>max</sub>) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

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 <sub>A</sub> = 155 °C, unpowered	±(2.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for others
Moisture Resistance	MIL-STD-202 Method 106	Each temperature / humidity cycle is defined at 8 hours, 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 others
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 others
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	±(2.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for others
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	±(1.0%+0.05Ω) No visible damage
Thermal Shock	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 others
ESD	AEC-Q200 Test 17 AEC-Q200-002	Human Body Model, I <sub>pos.</sub> + I <sub>neg.</sub> discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV	±(3.0%+0.05Ω)
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



TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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 <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 2
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	±(2.0%+0.05Ω)

**REVISION HISTORY**

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 11	Aug. 31, 2023	-	- Upgrade the working voltage of 2512 to 500V - Merge F/D tol - Add size 0201
Version 10	Aug. 02, 2022	-	- Upgrade the working voltage of 0402 to 75V - Upgrade the working voltage of 0603 to 150V - Upgrade the working voltage of 0805 to 500V - I2 dimension updated, for size 1206, size 2010, size 2512
Version 9	Aug. 04, 2021	-	- Upgrade to Automotive Grade
Version 8	Jul. 22, 2019	-	- Update power rating
Version 7	Sep. 27, 2018	-	- Extend resistance range of 0402 ~ 2512 to 1Mohm, - Tighten TCR of all sizes for $10\Omega < R \leq 1M\Omega$ from $\pm 200$ ppm/°C to $\pm 100$ ppm/°C - Add SR1210, SR1218, SR2010 7W (double power)
Version 6	Oct. 02, 2017	-	- Add SR0402 7T (triple power), SR0805 47 (quadruple power), SR2512 7W (double power)
Version 5	Nov. 11, 2016	-	- Update 7T power for 1206
Version 4	Sep. 01, 2015	-	- Update SR0603 Dielectric Withstanding Voltage to 150V - Update 7T power for 0603/0805 & 7W for 1210
Version 3	Jul. 31, 2015	-	- Comply with AEC-Q200 standard
Version 2	Jan. 06, 2014	-	- Add SR0402/0603/1210 - Update electrical characteristic
Version 1	Mar 18, 2011	-	- Change to dual brand datasheet that describes SR0805 to SR2512 with RoHS compliant - Define global part number
Version 0	Oct 19, 2004	-	-

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