

DATA SHEET

AUTOMOTIVE GRADE SURGE CHIP RESISTORS

SR series

1%, 0.5%

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

RoHS compliant & Halogen free



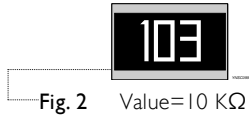
MARKING

SR0402



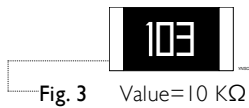
No Marking

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”.

Table I

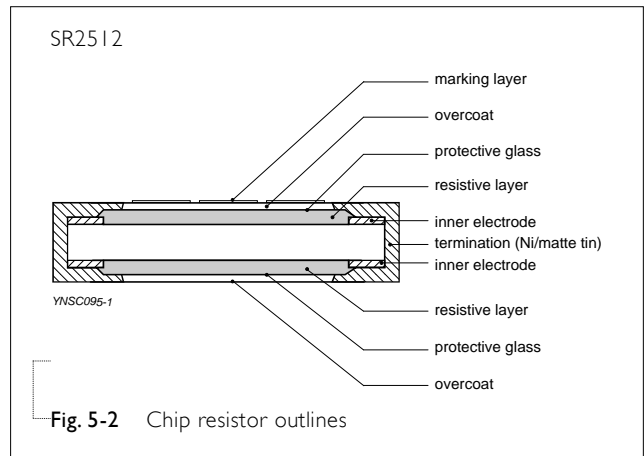
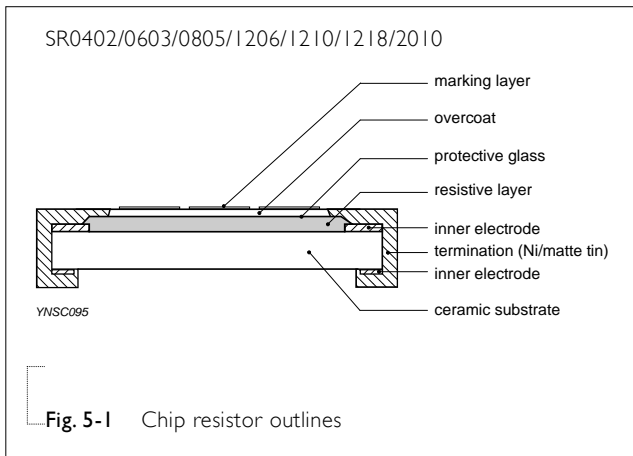
TAPING REEL & POWER

| TYPE | POWER, W (P70) | | | |
|------|----------------|------|-----|-----|
| | CODING | | | |
| | 07 | 7W | 7T | 47 |
| 0402 | 1/16 | 1/8 | 1/5 | - |
| 0603 | 1/10 | 1/5 | 1/4 | - |
| 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.5.

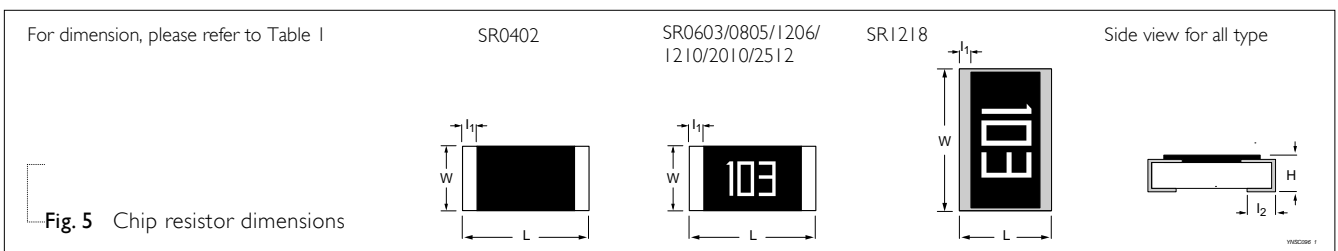
OUTLINES



DIMENSIONS

Table 2

| TYPE | L (mm) | W (mm) | H (mm) | l ₁ (mm) | l ₂ (mm) |
|--------|-----------|-----------|-----------|---------------------|---------------------|
| 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 | 0.40±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 | 0.50±0.20 |
| SR2512 | 6.35±0.10 | 3.10±0.15 | 0.55±0.10 | 0.60±0.20 | 0.50±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 |
| SR0402 | 1/16W | | | 50 V | 100 V | 100 V | |
| | 1/8W | | | | | | |
| | 1/5W | | | | | | |
| SR0603 | 1/10W | | | 75V | 150V | 150V | |
| | 1/5W | | | | | | |
| | 1/4W | | | | | | |
| SR0805 | 1/8 W | | | 150V | 300V | 300V | |
| | 1/4W | | | | | | |
| | 1/3W | | | | | | |
| SR1206 | 1/2W | E24/E96 0.5%, 1% 1 Ω ≤ R ≤ 1M Ω | -55 °C to +155 °C | 200 V | 400 V | 500 V | 10Ω < R ≤ 1MΩ ±100 ppm/°C |
| | 1/4 W | | | | | | |
| | 3/4W | | | | | | |
| | 1W | | | | | | 1Ω ≤ R ≤ 10Ω ±200 ppm/°C |
| 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 | | | 200 V | 400 V | 500 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 | SR0402 | 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

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:

- SR0402: 1/16W, 1/8W, 1/5W
- SR0603: 1/10W, 1/5W, 1/4W
- 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:

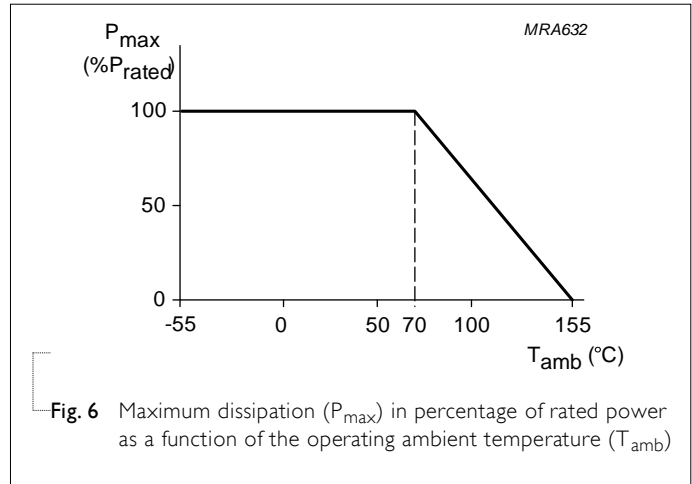
$$V = \sqrt{P \times R}$$

Where

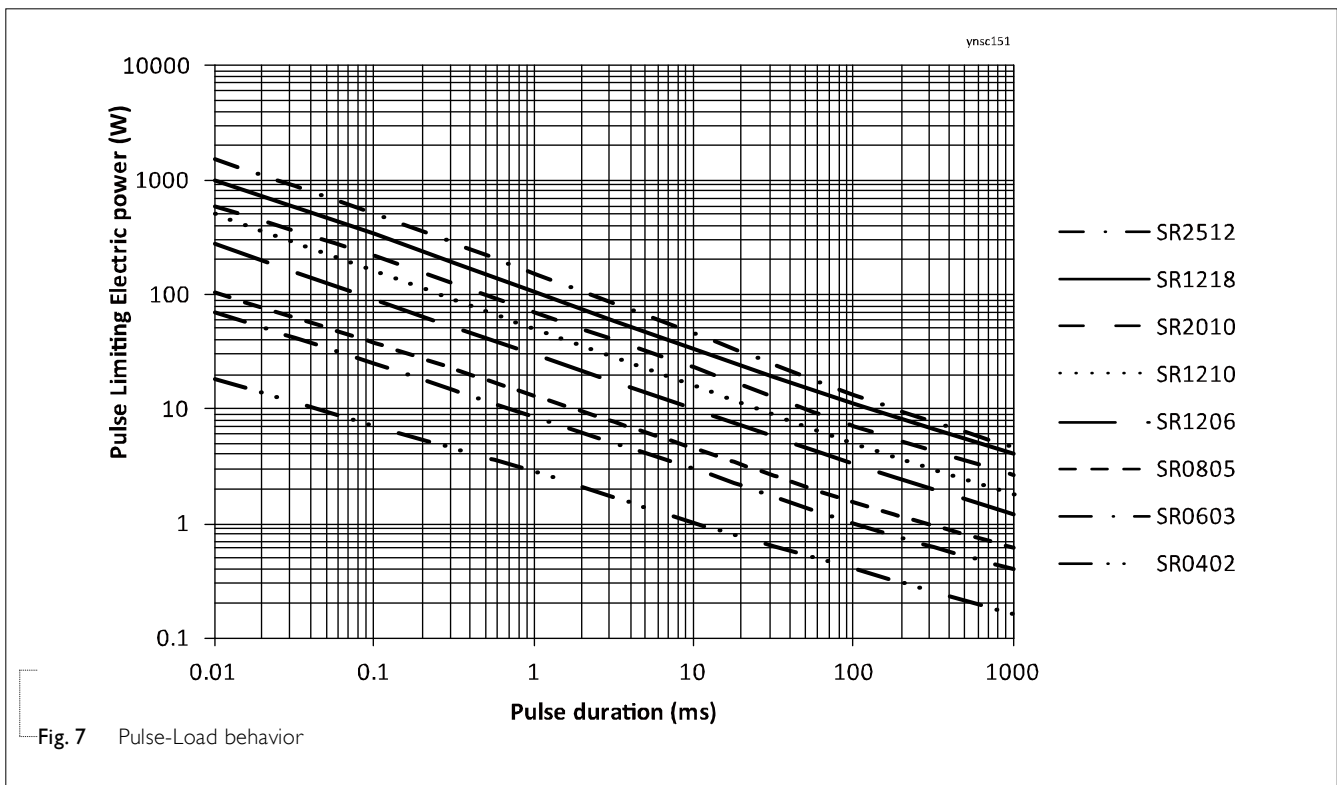
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value (Ω)



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 | $\pm(2.0\%+0.05\Omega)$ |
| 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 | $\pm(0.5\%+0.05\Omega)$ |
| 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. | $\pm(1.0\%+0.05\Omega)$ |
| 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 | $\pm(2.0\%+0.05\Omega)$ |
| 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 | $\pm(1\%+0.05\Omega)$ 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 | $\pm(0.5\%+0.05\Omega)$ |
| 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 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: $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ 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 2 |
| 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 | ±(2.0%+0.05Ω) |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|---------------|---------------------|--|
| Version 5 | Aug. 09, 2021 | - | - Upgrade to Automotive Grade |
| Version 4 | Jul. 22, 2019 | - | - Update power rating |
| Version 3 | Sep. 27, 2018 | - | - Extend resistance range of 0402 ~ 2512 to 1Mohm - Tighten TCR of all sizes for for $10\Omega < R \leq 1M\Omega$ from ± 200 ppm/°C to ± 100 ppm/°C - Add SR1210, SR1218, SR2010 7W (double power) |
| Version 2 | Oct. 02, 2017 | - | - Add SR0402 7T (triple power), SR0805 47 (quadruple power), SR2512 7W (double power) |
| Version 1 | Nov. 11, 2016 | - | - Update 7T power for 1206 |
| Version 0 | Dec. 01, 2015 | - | - New product datasheet |

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"The reimbursement is limited to the value of the products."