



SR series 1%, 0.5% sizes 0402/0603/0805/1206/1210/1218/2010/2512 RoHS compliant & Halogen free

Product specification – July 22, 2019 V.4







Chin Resistor Surface Mount SR SERIES

<u>SCOPE</u>

This specification describes SR0402 to SR2512 chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- Telecommunications
- Power supplies
- Car electronics

FEATURES

- AEC-Q200 qualified
- Superior to SR series in pulse withstanding voltage and surge withstanding voltage.
- MSL class: MSL I
- Halogen free epoxy
- RoHS compliant
 - Products with lead-free terminations meet RoHS requirements
 - Pb-glass contained in electrodes, resistor element and glass are exempted by RoHS
- 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

SR XXXX X X X XX XXXX L

(1) (2) (3) (4) (5) (6) (7)

(I) SIZE

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

(2) TOLERANCE

 $D = \pm 0.5\%$

 $F = \pm 1\%$

(3) PACKAGING TYPE R = Paper taping reel

K = Embossed 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 | | | |
|--|--|--|--|--|
| 13 = 13 inch dia. Reel | 7T = 7 inch dia. Reel & 3 x standard power | | | |
| 47 = 7 inch dia. Reel & 4 × standard power | | | | |

(6) RESISTANCE VALUE

$| \Omega \leq R \leq |M \Omega|$

There are $2\sim4$ 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. IK2, not IK20.

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 (Ι to 9.76 Ω) | R = Ω R5 = .5 Ω 9R76 = 9.76 Ω |
| XXRX (10 to 97.6 Ω) | IOR = 10 Ω 97R6 = 97.6 Ω |
| XXXR (100 to 976 Ω) | 100R = 100 Ω |
| XKXX (Ι to 9.76 K Ω) | IK = 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 SR0805 chip resistor, value 10 K Ω with ±5% tolerance, supplied in 7-inch tape reel is: SR0805JR-0710KL.

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| <u>YAGEO</u> | Phicomp | | | | | Product specification 3 |
|--------------|---|--|----|-------------|----------------------------|-------------------------|
| | Chip Resisto | r Surface Mount | SR | SERIES | 0402/0603/0805/1206/1210/ | 1218/2010/2512 9 |
| | | | | | | |
| MARKING | | | | | | |
| SR0402 | | | | | | |
| | | No Marking | | | | |
| Fig. I | parents, | | | | | |
| SR1218 | | | | | | |
| | 103 | E-24 series: 3 dig First two digits f | | nificant fi | gure and 3rd digit for num | ber of zeros |
| Fig. 2 ∨ | alue=10 KΩ | - | • | | | |
| SR0603 / SR | .0805 / SR I 206 / SR | 1210 / SR2010 / SR25 | 12 | | | |
| | | | | | | |
| | 103 //////////////////////////////////// | E-24 series: 3 dig First two digits f | | nificant fi | gure and 3rd digit for num | ber of zeros |

ΝΟΤΕ

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

Table I

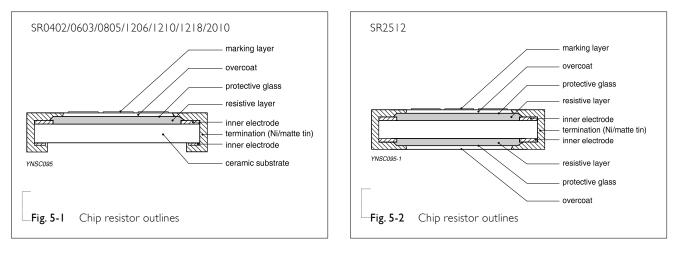
TAPING REEL & POWER

| | | F | OWER, W (P70) | | |
|------|------|------|---------------|-----|--|
| TYPE | | | 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 | I | |
| 1210 | 1/2 | I | - | - | |
| 1218 | I | 1.5 | - | - | |
| 2010 | 3/4 | 1.25 | - | - | |
| 2512 | I | 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.

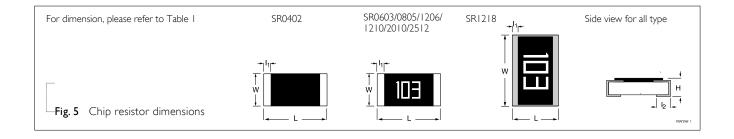
OUTLINES



DIMENSIONS

Table 2

| ТҮРЕ | L (mm) | W (mm) | H (mm) | l _ı (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 |





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Chip Resistor Surface Mount SR SERIES 0402/0603/0805/1206/1210/1218/2010/2512

ELECTRICAL CHARACTERISTICS

Table 3

| | | | | CHA | RACTERISTI | CS | |
|---------|-------|-----------------------------------|--------------------------------|----------------------------|-----------------------------|---------------------------------------|---|
| TYPE | POWER | RESISTANCE RANGE | Operating Temperature Range | Max. Working Voltage | Max. Overload Voltage | Dielectric Withstanding Voltage | Temperature Coefficient of Resistance |
| | 1/16W | | | | | | |
| SR0402 | 1/8W | | | 50 V | 100 V | 100 V | |
| | 1/5W | | _ | | | | |
| | 1/10W | | | | | | |
| SR0603 | 1/5W | | | 75V | 150V | 150V | |
| | 1/4W | | - | | | | |
| | 1/8 W | | | 150V | 300V | 300V | |
| SR0805 | 1/4W | | | | | | |
| 5110005 | 1/3W | | | | | | |
| | 1/2W | | _ | | | | 10Ω < R≤ IMΩ ±100 ppm/°C |
| | 1/4 W | E24/E96 0.5%, 1% | –55 ℃ to +155 ℃ | | | | |
| SR1206 | 1/2W | $ \Omega \leq R \leq M \Omega $ | | 200 V | 400 V | 500 V | $ \Omega \leq R \leq 0\Omega $ |
| 51(1200 | 3/4W | | | | | | $\pm 200 \text{ ppm/°C}$ |
| | IW | | _ | | | | ±200 ppm/ C |
| SR1210 | 1/2W | | | 200.14 | 400.14 | F00.)/ | |
| 381210 | IW | | _ | 200 V | 400 V | 500 V | |
| SR1218 | IW | | | 200 V | 400 V | 500 V | |
| 381210 | 1.5W | | _ | 200 V | 400 V | 500 V | |
| SR2010 | 3/4W | | | 200 V | 400 V | 500 V | |
| 312010 | 1.25W | | | 200 V | 400 V | 500 V | |
| SR2512 | I W | | | 200 V | 400 V | 500 V | |
| SK2512 | 2W | | | 200 V | 400 V | 500 V | |

FOOTPRINT AND SOLDERING PROFILES

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

PACKING STYLE AND PACKAGING QUANTITY

| lable 4 Packing style a | nd 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 |
| | | | | | |

Table 4 Packing style and packaging quantity

ΝΟΤΕ

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



Chip Resistor Surface Mount SR SERIES

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

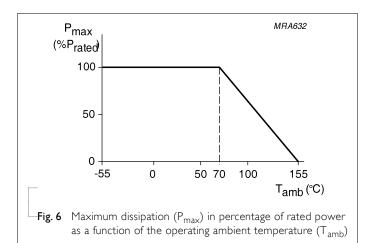
Where

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

P = Rated power (W)

 $R = Resistance value (\Omega)$

ynsc151 10000 Pulse Limiting Electric power (W) 00 00 00 00 00 00 - SR2512 - SR1218 - SR2010 · · SR1210 -SR1206 SR0805 — SR0603 1 SR0402 0.1 0.01 0.1 1 10 100 1000 Pulse duration (ms) -Fig. 7 Pulse-Load behavior



PULSE LOAD BEHAVIOR



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TESTS AND REQUIREMENTS

Table 5 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS | |
|-------------------------------|-------------------------|--|-------------------|--|
| Temperature Coefficient of | MIL-STD-202 Method 304 | At +25/–55 °C and +25/+125 °C Refer to table 2 | | |
| Resistance (T.C.R.) | | 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 | | |
| Short Time Overload | IEC60115-14.13 | 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature | ±(2.0%+0.05 Ω) | |
| High Temperature Exposure | IEC 60068-2-2 | 1,000 hours at T _A = 155 °C \pm 5 °C, unpowered | ±(2.0%+0.05 Ω) | |
| Humidity | IEC 60115-1 4.24.2 | Steady state for 1,000 hours at 40 °C / 95% R.H. | ±(3.0%+0.05 Ω) | |
| | | RCWV applied for 1.5 hours on and 0.5 hour off | | |
| Life | IEC 60115-1 4.25.1 | 1,000 hours at 70±2 °C, RCWV applied for 1.5 | ±(2.0%+0.05 Ω) | |
| | MIL-STD-202 Method 108 | hours on, 0.5 hour off, still-air required | · · · · · | |
| Resistance to | IEC 60115-1 4.18 | Condition B, no pre-heat of samples | ±(1.0%+0.05 Ω) | |
| Soldering Heat | MIL-STD- 202 Method 210 | Lead-free solder, 260 \pm 5 °C, 10 \pm 1 seconds immersion time | No visible damage | |
| | | Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | | |
| Temperature Cycling | JESD22-A104C | -55/+125 °C for 1 cycle per hour, with 1,000 cycles. | ±(1.0%+0.05 Ω) | |

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| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---------------|------------------|---|----------------------------|
| Solderability | | | |
| - Wetting | J-STD-002 | Electrical Test not required Magnification 50X | Well tinned (≥95% covered) |
| | | SMD conditions: | No visible damage |
| | | Immerse the specimen into the solder pot at 245±3°C for 2±0.5 seconds. | |
| Board Flex | IEC 60115-1 4.33 | Chips mounted on a 90mm glass epoxy resin | ±(1.0%+0.05 Ω) |
| | | PCB (FR4) Bending for 0402: 5mm 0603 & 0805: 3mm 1206 and above: 2mm | |
| | | Holding time: minimum 60 seconds | |

Chip Resistor Surface Mount SR SERIES

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

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REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|-------------------------|---------------------|---|
| Version 4 | Jul. 22, 2019 | - | - Update power rating |
| | | | - Extend resistance range of 0402 ~ 2512 to 1Mohm |
| Version 3 | Version 3 Sep. 27, 2018 | - | - Tighten TCR of all sizes for for 10 Ω $<$ R \leq 1M Ω from \pm 200 ppm/°C to \pm 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 I | Nov. 11, 2016 | - | - Update 7T power for 1206 |
| Version 0 | Dec. 01, 2015 | - | - New product datasheet |

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