

# DATA SHEET

## SURGE CHIP RESISTORS

AUTOMOTIVE GRADE

SR series

20%, 10%, 5%

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

RoHS compliant & Halogen free



SCOPE

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)

**(1) SIZE**

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

**(2) TOLERANCE**

J = ±5%  
 K = ±10%  
 M = ±20%

**(3) PACKAGING TYPE**

R = Paper taping reel                                          K = Embossed taping reel

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

– = Based on spec.

**(5) TAPING REEL**

07 = 7 inch dia. Reel                                          7W = 7 inch dia. Reel & 2 × standard power  
 13 = 13 inch dia. Reel                                          7T = 7 inch dia. Reel & 3 × standard power

**(6) RESISTANCE VALUE**

$1 \Omega \leq R \leq 100 \text{ K}\Omega$   
 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)

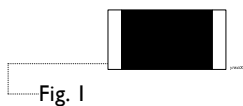
Resistance coding rule	Example
XRXX (1 to 9.76 $\Omega$ )	1R = 1 $\Omega$ 1R5 = 1.5 $\Omega$ 9R76 = 9.76 $\Omega$
XXRX (10 to 97.6 $\Omega$ )	10R = 10 $\Omega$ 97R6 = 97.6 $\Omega$
XXXR (100 to 976 $\Omega$ )	100R = 100 $\Omega$
XKXX (1 to 9.76 K $\Omega$ )	1K = 1,000 $\Omega$ 9K76 = 9760 $\Omega$
XXKX (10 to 97.6 K $\Omega$ )	10K = 10,000 $\Omega$ 97K6 = 976,000 $\Omega$
XXXK (100 K $\Omega$ )	100K = 100,000 $\Omega$

**ORDERING EXAMPLE**

The ordering code for an SR0805 chip resistor, value 10 K $\Omega$  with ±5% tolerance, supplied in 7-inch tape reel is: SR0805JR-0710KL.

**MARKING**

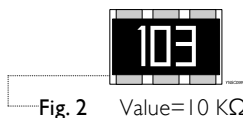
**SR0402**



No Marking

Fig. 1

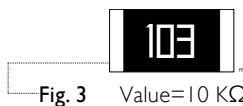
**SR1218**



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

Fig. 2 Value=10 KΩ

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



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

Fig. 3 Value=10 KΩ

**NOTE**

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

**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**

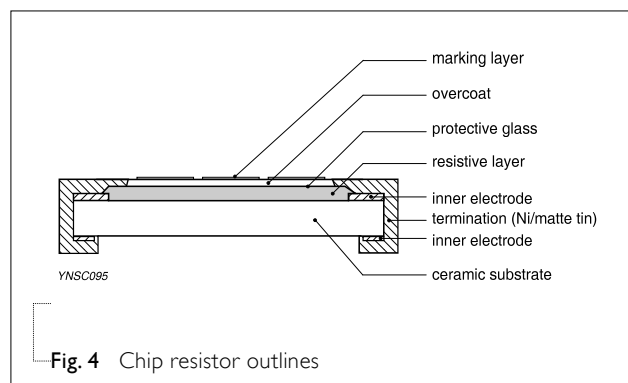
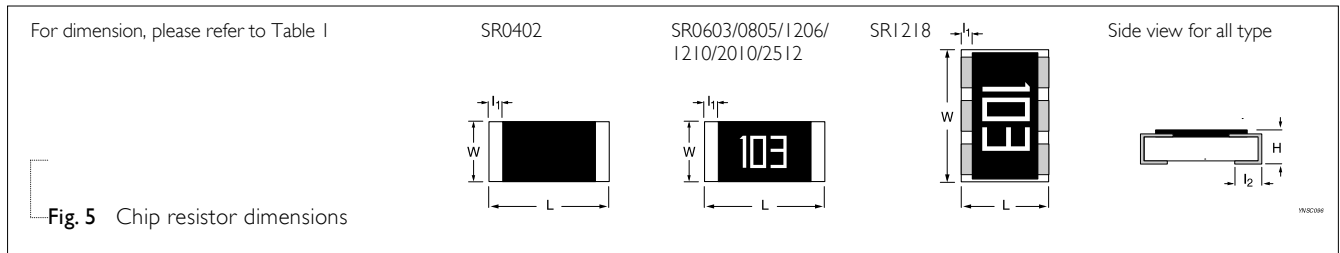


Fig. 4 Chip resistor outlines

**DIMENSIONS**

Table I

TYPE	L (mm)	W (mm)	H (mm)	l <sub>1</sub> (mm)	l <sub>2</sub> (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	0.50±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 2**

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	
	1/8						
SR0603	1/10W						
	1/5W			75V	150V	150V	
	1/4W						
SR0805	1/8 W						
	1/4W	E24 5%, 10%, 20% 1 Ω ≤ R ≤ 100 KΩ	-55 °C to +155 °C	150V	300V	300V	±200 ppm/°C
	1/3W						
1/4 W							
SR1206	1/2W			200 V	400 V	500 V	
	3/4W						
SR1210	1/2W			200 V	400 V	500 V	
SR1218	1 W			200 V	400 V	500 V	
SR2010	3/4 W			200 V	400 V	500 V	
SR2512	1 W			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**

**Table 3** 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**

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:

SR0402: 07 = 1/16W; 7W = 1/8W

SR0603: 07 = 1/10W; 7W = 1/5W; 7T=1/4W

SR0805: 07 = 1/8W; 7W = 1/4W; 7T=1/3W

SR1206: 07 = 1/4W; 7W = 1/2W; 7T=3/4W

SR1210: 07 = 1/2W

SR1218: 07 = 1W

SR2010: 07 = 3/4W

SR2512: 07 = 1W

**RATED VOLTAGE**

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

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

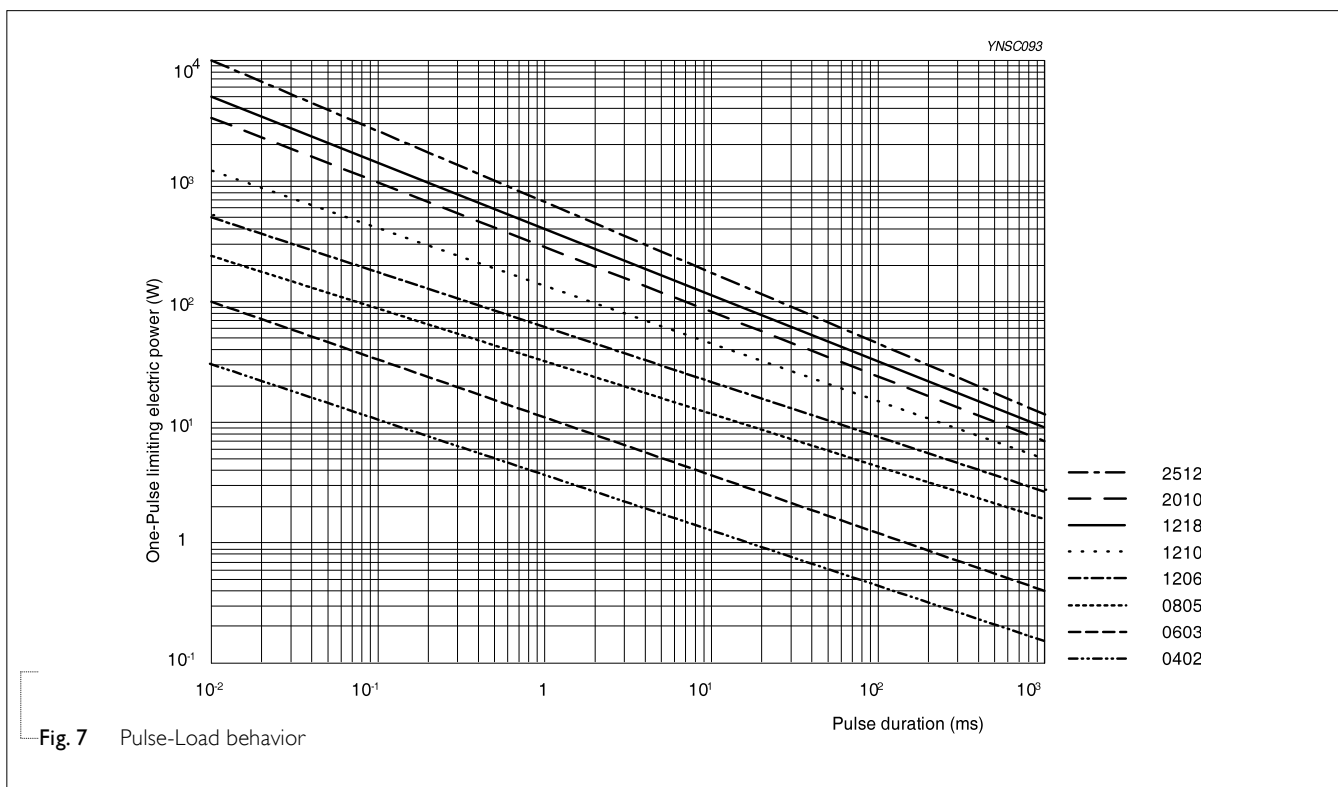
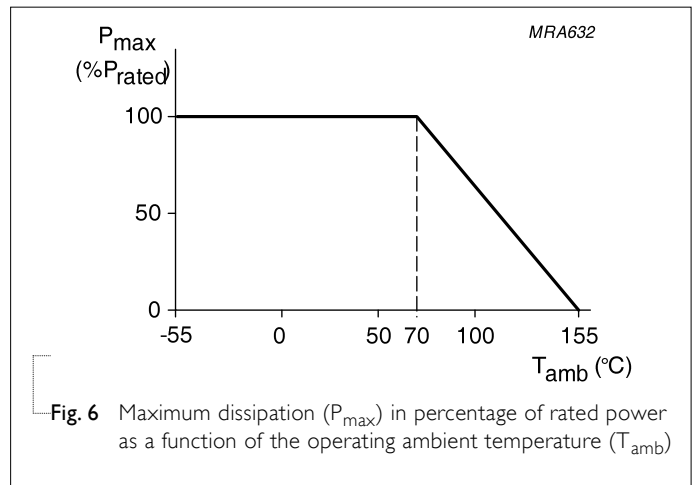
Where

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 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
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 4.13	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 <sub>A</sub> = 155 °C ±5 °C, unpowered	±(3.0%+0.05 Ω)
Humidity	IEC 60115-1 4.24.2	Steady state for 1,000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour off	±(3.0%+0.05 Ω)
Life	IEC 60115-1 4.25.1 MIL-STD-202 Method 108	1,000 hours at 70±2 °C, RCWV applied for 1.5 hours on, 0.5 hour off, still-air required	±(3.0%+0.05 Ω)
Resistance to Soldering Heat	IEC 60115-1 4.18 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%+0.05 Ω) No visible damage
Temperature Cycling	JESD22-A104C	-55/+125 °C for 1 cycle per hour, with 1,000 cycles. Devices mounted	±(1.0%+0.05 Ω)

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

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
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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