

# DATA SHEET

**SURGE CHIP RESISTORS** 

SR series

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



YAGEO Phícomp



#### SCOPE

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

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#### **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 (2) (3) (4) (1) (5)

### (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 x standard power		
13 = 13 inch dia. Reel	$7T = 7$ inch dia. Reel & $3 \times$ standard power		
$47 = 7$ inch dia. Reel & $4 \times$ standard power			

#### (6) RESISTANCE VALUE

#### $|\Omega \le R \le |M\Omega|$

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. I K2, not I K20.

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)

number Resistance coding rule	Example
XRXX (1 to 9.76 Ω)	IR = I Ω IR5 = I.5 Ω 9R76 = 9.76 Ω
XXRX (10 to 97.6 Ω)	$10R = 10 \Omega$ $97R6 = 97.6 \Omega$
XXXR (100 to 976 <b>Ω)</b>	100R = 100 Ω
XKXX (Ι to 9.76 Κ <b>Ω)</b>	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6 = 976,000 Ω
XXXK (100 KΩ <b>)</b>	100Κ = 100,000 Ω

Resistance rule of global part

### **ORDERING EXAMPLE**

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



## **Chip Resistor Surface Mount**

SR SERIES

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

### MARKING

### SR0402

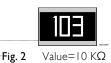


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No Marking

Fig. I

### 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

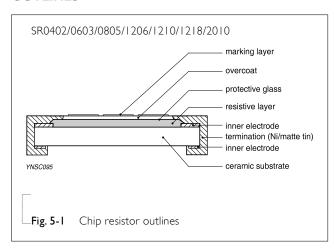
		P	OWER, W (P70)	
TYPE			CODING	
	07	7W	7T	47
0402	1/16	1/8	1/5	-
0603	1/10	1/5	1/4	-
0805	1/8	1/4	1/3	1/2
1206	1/4	1/2	3/4	1
1210	1/2		-	-
1218	1	1.5	-	-
2010	3/4	1.25	-	-
2512	1	2	=	-

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**CONSTRUCTION** 

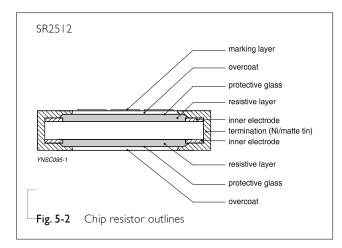
The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive glaze. The resistive glaze is covered by a lead-free glass. The composition of the glaze is adjusted to give the approximately required resistance value. The whole 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**



5.00±0.10

6.35±0.10



0.55±0.15

060+020

#### **DIMENSIONS**

SR2010

SR2512

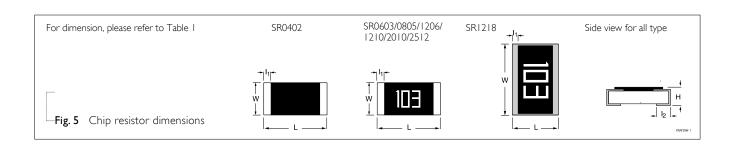
-Table 2 **TYPE** L (mm) W (mm) H (mm)  $I_1$  (mm)  $I_2$  (mm) SR0402 1.00±0.05  $0.50\pm0.05$  $0.35 \pm 0.05$ 0.20±0.10 0.25±0.10 SR0603 1.60±0.10  $0.80 \pm 0.10$ 0.45±0.10 0.25±0.15 0.25±0.15 SR0805 2.00±0.10 1.25±0.10 0.50±0.10 0.35±0.20 0.35±0.20 SR1206 3.10±0.10 1.60±0.10 0.55±0.10 0.45±0.20 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

0.55±0.10

0.55±0.10

2.50±0.15

3.10±0.15



0.50±0.20

0.50±0.20

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### **ELECTRICAL CHARACTERISTICS**

Table 3

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			CHARACTERISTICS				
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		_	150//	2001/	300V	
SR0805	1/4W						
3110003			150V	300V	3000	100 . 5 . 1140	
	1/2W		_				$10\Omega < R \le IM\Omega$ ±100 ppm/°C
	1/4 W	E24/E96 0.5%, 1%	FF 9C 1		200 V 400 V	500 V	±100 ppi11/ C
SR1206	1/2W	$I \Omega \le R \le IM \Omega$	–55 °C to +155 °C	200 V			$ \Omega \le R \le  0\Omega $
	3/4W			200 V	400 V	300 V	±200 ppm/°C
	IW		_				±200 ppm/ C
SR1210	1/2W			200 V	400 V	500 V	
JK1210	IW		_	200 V	400 V	300 V	
SR1218	IW			200 V	400 V	500 V	
JI(1210	1.5W		_	200 V	700 V	300 V	
SR2010	3/4W		_	200 V	400 V	500 V	
51(2010	1.25W			200 V	V 00F	J00 V	
SR2512	I W			200 V	400 V	500 V	
	2W			200 V	100 V	300 V	

### 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".



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### **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: I/I0W, I/5W, I/4W SR0805: I/8W, I/4W, I/3W, I/2W SR1206: 1/4W, 1/2W, 3/4W, 1W

SR1210: 1/2W, 1W SR1218: IW, 1.5W SR2010: 3/4W, 1.25W SR2512: IW, 2W

#### **RATED VOLTAGE**

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

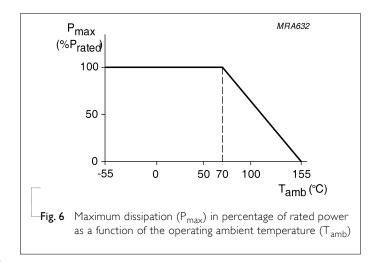
$$V = \sqrt{(P \times R)}$$

Where

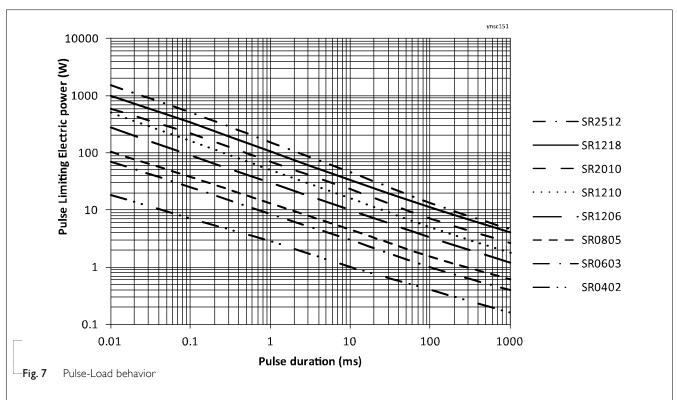
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

 $R = Resistance value (\Omega)$ 



#### **PULSE LOAD BEHAVIOR**

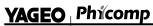


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### TESTS AND REQUIREMENTS

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 <sub>1</sub> =resistance at reference temperature in ohms	
		R <sub>2</sub> =resistance at test temperature in ohms	
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 $T_A$ = 155 °C ±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±5 °C, 10±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.  Devices mounted	±(1.0%+0.05 Ω)
		Devices mounted	



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

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 $245\pm3^{\circ}\text{C}$ for $2\pm0.5$ seconds.	
Board Flex	IEC 60115-1 4.33	Chips mounted on a 90mm glass epoxy resin PCB (FR4)	±(1.0%+0.05 Ω)
		Bending for 0402: 5mm 0603 & 0805: 3mm 1206 and above: 2mm	
		Holding time: minimum 60 seconds	

### 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 Sep. 27, 201	Sep. 27, 2018	-	- Tighten TCR of all sizes for for $10\Omega < R \leq IM\Omega$ 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 I206
Version 0	Dec. 01, 2015	-	- New product datasheet

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MCR01MZPF1601 MCR01MZPF1800 MCR01MZPJ822 MCR03EZHJ103 MCR03EZPFX1272 MCR10EZPF2003 RC0603F1473CS

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