

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



YAGEO Phícomp



SCOPE

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

YAGEO , Phiícomp

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) (5) (1)

(I) SIZE

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

(2) TOLERANCE

 $| = \pm 5\%$

 $K = \pm 10\%$

 $M = \pm 20\%$

(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 & $2 \times$ standard power
13 = 13 inch dia. Reel	7T = 7 inch dia. Reel & 3 x standard power

(6) RESISTANCE VALUE

 $1 \Omega \le R \le 100 K\Omega$

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. 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 Ω 97R6 = 97.6 Ω
XXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (Ι to 9.76 Κ Ω)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 KΩ)	$10K = 10,000 \Omega$ 97K6= 976,000 Ω
XXXK (100 KΩ)	100K = 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.



MARKING

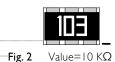
SR0402



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

rig. 3 Value 10 K

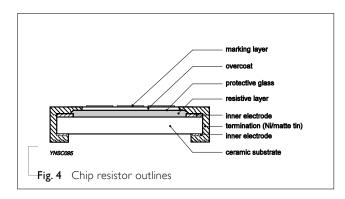
NOTE

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

<u>CONSTRUCTION</u>

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



<u>DIMENSIONS</u>

Table I					
TYPE	L (mm)	W (mm)	H (mm)	I _I (mm)	I 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	0.50±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



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ELECTRICAL CHARACTERISTICS

Table 2

			CHARACTERISTICS				
TYPE	POWER	RESISTANCE RANGE	Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
SR0402	1/16W			F0.\/			
3110 102	1/8			50 V	100 V	100 V	
	1/10W						
SR0603	1/5W			75V	150V	150V	
	1/4W						
	1/8 W						
SR0805	805 1/4\/		150V 300\	300V	300V		
	1/3W	E24 5%, 10%, 20% I Ω ≤ R ≤ 100 KΩ	-55 °C to +155 °C _				±200 ppm/°C
SR1206	1/4 W	1 22 21/ 2 100 1/22		200.17	400 \ /		
31(1200	1/2W			200 V	400 V	500 V	
SR1210	1/2W		-	200.17	400.17	F00.1/	
31(1210	3/4W			200 V	400 V	500 V	/
SR1218	I W		-	200 V	400 V	500 V	
SR2010	3/4 W			200 V	400 V	500 V	
SR2512	I 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".



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FUNCTIONAL DESCRIPTION

OPERATING TEMPERATURE RANGE

Range: -55 °C to +155 °C

POWER RATING

Each type rated power at $70 \,^{\circ}$ 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

SR1210: 07 = I/2W; 7W=3/4W

SR1218: 07 = 1W SR2010: 07 = 3/4W

SR2512: 07 = IW

RATED VOLTAGE

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

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

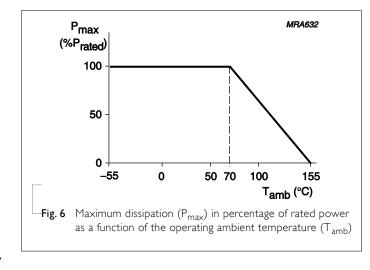
Where

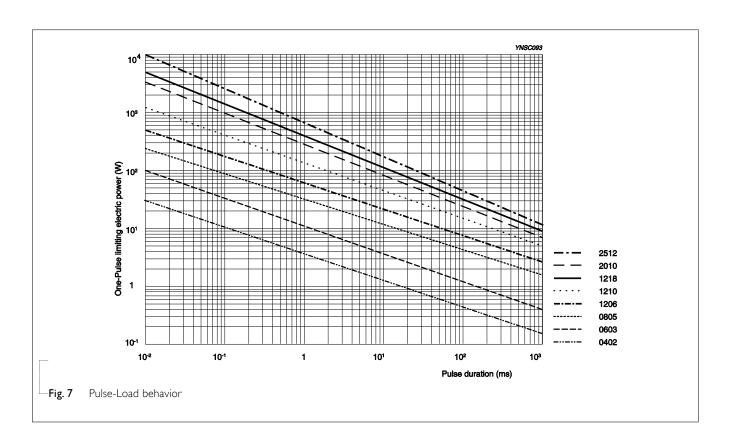
V = Continuous rated DC or AC (rms) working voltage (V)

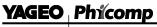
P = Rated power (W)

 $R = Resistance value (\Omega)$

PULSE LOAD BEHAVIOR







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

TESTS AND REQUIREMENTS

Table 4 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 _I =resistance at reference temperature in ohms	
		R ₂ =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	±(3.0%+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	±(3.0%+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 I cycle per hour, with I,000 cycles. Devices mounted	±(1.0%+0.05 Ω)



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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 ± 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)
	120 00113 1 1.33	PCB (FR4)	±(1,0/0+0,05 22)
		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	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
	1. 0/ 2014		A 11 CD0403/0703/1310
Version 2	Jan. 06, 2014	-	- Add SR0402/0603/1210
			- Update electrical characteristic
Version I	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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