

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.

<u>APPLICATIONS</u>

- 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

 $J = \pm 5\%$

 $K = \pm 10\%$

 $M = \pm 20\%$

(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 x standard power 7W = 7 inch dia. Reel & 3 x standard power 7W = 7 inch dia. Reel & 3 x standard power

47 = 7 inch dia. Reel & 4xstandard power

(6) RESISTANCE VALUE

$I \Omega \le R \le I00 K\Omega$

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

number

XXXK

 $(100 \text{ K}\Omega)$

Letter L is the system default code for ordering only. (Note)

 $100K = 100.000 \Omega$

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

Resistance rule of global part

ORDERING EXAMPLE

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



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SR

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

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

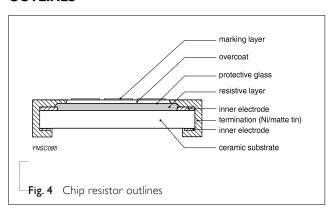
NOTE

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



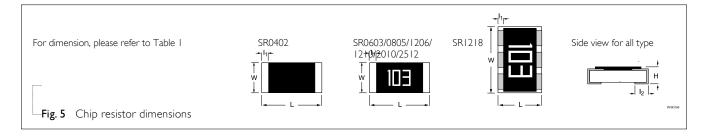
DIMENSIONS

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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	0.55±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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ELECTRICAL CHARACTERISTICS

Table 2

Table 2				CLIAD	ACTERISTIC	·c	
TYPE	POWER	RESISTANCE RANGE	Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
SR0402	1/16W 1/8W 1/5W			50 V	100 V	100 V	
SR0603	1/10W 1/5W 1/4W		-	75V	150V	150V	
SR0805	1/8 W 1/4W 1/3W 1/2W	E24 5%, 10%, 20% 1 Ω ≤ R ≤ 100 KΩ	-55 °C to +155 °C	150V	300V	300V	±200 ppm/°C
SR1206	1/4 W 1/2W 3/4W		-	200 V	400 V	500 V	
SR1210	1/2W		-	200 V	400 V	500 V	
SR1218	IW		=	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".



MRA632

155

T_{amb} (℃)

5 8

 P_{max}

(%Prated)

100

50

0

-55

0

50 70

as a function of the operating ambient temperature (T_{amb})

-Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power

100

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; 7T=1/5WSR0603: 07 = 1/10W; 7W = 1/5W; 7T=1/4W

SR0805: 07 = 1/8W; 7W = 1/4W; 7T=1/3W; 47=1/2W

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

SR1210: 07 = 1/2WSR1218: 07 = IW SR2010: 07 = 3/4W

SR2512: 07 = IW; 7W=2W

RATED VOLTAGE

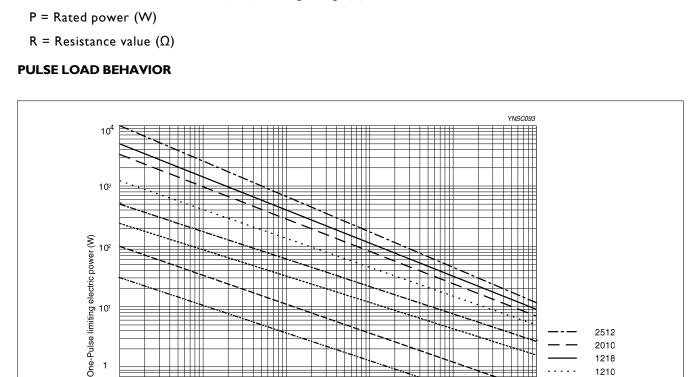
The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

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

Where

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

10-1



10¹

10²

Pulse duration (ms)

10³

Pulse-Load behavior Fig. 7

10-1 10-2

YAGEO Phicomp

 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 ₁ =resistance at reference temperature in ohms	
		R ₂ =resistance at test temperature in ohms	
Short Time Overload	IEC60115-1 4.13	2. F. times of instead voltage on manyimum availaged	1/2 0% 10 0F ()
Shore time Overload	12000113-1 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 hours on, 0.5 hour off, still-air required	±(3.0%+0.05 Ω)
	MIL-STD-202 Method 108	nours on, 0.5 nour on, sun-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 I cycle per hour, with I,000 cycles. Devices mounted	±(1.0%+0.05 Ω)



Product specification

7 8

Chin	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 PCB (FR4)	$\pm (1.0\% + 0.05 \Omega)$
		Bending for 0402: 5mm 0603 & 0805: 3mm 1206 and above: 2mm	
		Holding time: minimum 60 seconds	

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REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 6	Oct. 02, 2017	-	- Add SR0402 7T (triple power), SR0805 47 (quadruple power), SR2512 7W (double power)
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 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	-	-

[&]quot;The reimbursement is limited to the value of the products."



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