

DATA SHEET

SURGE CHIP RESISTORS

AUTOMOTIVE GRADE SR series

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



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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) (5) (7)**(I)**

(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 x standard power

47 = 7 inch dia. Reel & $4 \times$ standard power

(6) RESISTANCE VALUE

 $I \Omega \leq R \leq IM \Omega$

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)

number Resistance coding Example rule $IR = I \Omega$ XRXX $IR5 = 1.5 \Omega$ (1 to 9.76 Ω) $9R76 = 9.76 \Omega$ $IOR = IO \Omega$ **XXRX** (10 to 97.6 Ω) $97R6 = 97.6 \Omega$ **XXXR** $100R = 100 \Omega$ (100 to 976 Ω) XKXX $IK = 1,000 \Omega$ (I to 9.76 K Ω) $9K76 = 9760 \Omega$ $10K = 10,000 \Omega$ XXKX (10 to 97.6 K Ω) 97K6= 976,000 ΩXXXK $100K = 100,000 \Omega$ $(100 \text{ K}\Omega)$

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.





SR0402



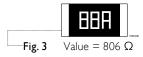
No Marking

rıg.

SR0603

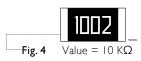


1%, 0.5%,E24 exception values 10/11/13/15/20/75 of E24 series



 $1\%,\,0.5\%,\,E96$ refer to EIA-96 marking method, including values 10/11/13/15/20/75 of E24 series

SR0805 / SR1206 / SR1210 / SR1218 / SR2010 / SR2512



Both E-24 and E-96 series: 4 digits, $\pm 0.5\%$ & $\pm 1\%$

First three digits for significant figure and 4th digit for number of zeros

NOTE

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

TAPING REEL & POWER

Table I

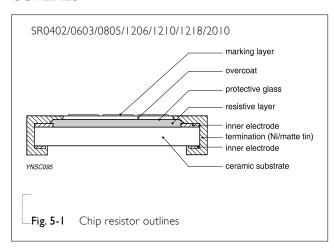
		F	POWER, W (P70)		
TYPE			CODING		
	07	7W	7T	47	
0402	1/16	1/8	1/5	-	
0603	1/10	1/5	1/4	-	
0805	1/8	1/4	1/3	1/2	
1206	1/4	1/2	3/4	-	
1210	1/2	-	-	-	
1218	1	-	-	-	
2010	3/4	-	-	-	
2512	1	2	-	-	

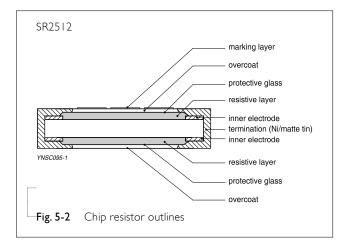


CONSTRUCTION

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

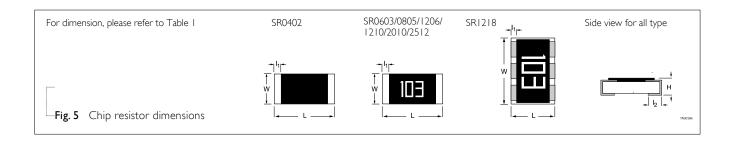




DIMENSIONS

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Table 2					
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



Chip Resistor Surface Mount

ELECTRICAL CHARACTERISTICS

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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						
SR0805 -	1/4W			150)/	2001/	2001/	
	1/3W			150V	300V	300V	$10\Omega < R \le 1M\Omega$
	1/2W						±100 ppm/°C
	1/4 W	_ I \(\O \le R \le I \(\O \le \)	55 % +0 +155 %	200 V	400 V	500 V	
SR1206	1/2W						$1\Omega \le R \le 10\Omega$
	3/4W						±200 ppm/°C
CDIDIO	1/2W			200.1/	400.17	F00.\/	
SR1210	3/4W		_	200 V	400 V	500 V	
SR1218	IW			200 V	400 V	500 V	
JK1210	1.5W		_	200 V	400 V	300 V	
SR2010	3/4W			200 V	400 V	500 V	
	1.5W		-	200 V	100 V	J00 V	
SR2512				200 V	400 V	500 V	
3K2312	2W			200 V	T00 V	J00 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

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 °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

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

RATED VOLTAGE

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

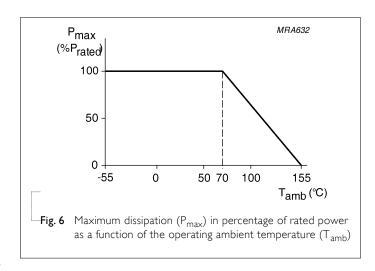
$$V = \sqrt{(P \times R)}$$

Where

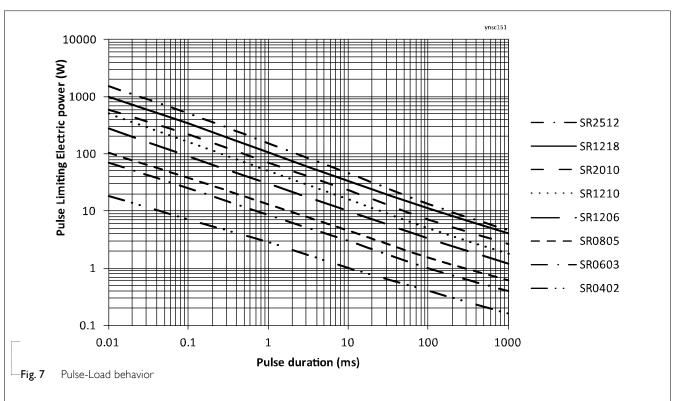
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

 $R = Resistance value (\Omega)$



PULSE LOAD BEHAVIOR

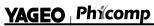


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TESTS AND REQUIREMENTS

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 _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	±(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 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	±(2.0%+0.05 Ω)
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)



 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	$\pm (1.0\% + 0.05 \Omega)$
		PCB (FR4) 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
			- Extend resistance range of 0402 ~ 2512 to 1Mohm
Version 3	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 I 206
Version 0	Dec. 01, 2015	-	- New product datasheet

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