

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 1
- 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 = $\pm 5\%$

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

13 = 13 inch dia. Reel 7T = 7 inch dia. Reel & 3 x standard power

47 = 7 inch dia. Reel & 4xstandard 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".

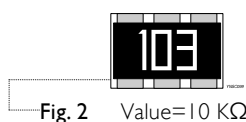
(7) DEFAULT CODE

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

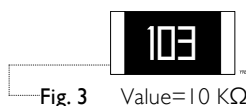
Resistance rule of global part number	
Resistance coding rule	Example
XXXX (1 to 9.76 Ω)	1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω
XXRX (10 to 97.6 Ω)	10R = 10 Ω 97R6 = 97.6 Ω
XXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (1 to 9.76 K Ω)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 K Ω)	10K = 10,000 Ω 97K6 = 976,000 Ω
XXXK (100 K Ω)	100K = 100,000 Ω

ORDERING EXAMPLE

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

MARKING**SR0402****No Marking****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**

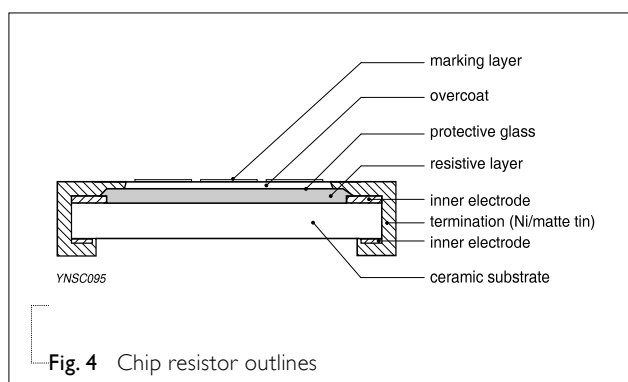
First two digits for significant figure and 3rd digit for number of zeros

NOTE

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

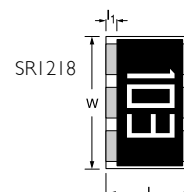
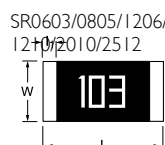
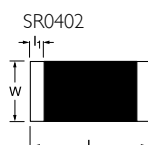
CONSTRUCTION

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.

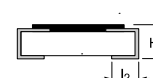
OUTLINES**Fig. 4** Chip resistor outlines**DIMENSIONS****Table 1**

TYPE	L (mm)	W (mm)	H (mm)	l ₁ (mm)	l 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

For dimension, please refer to Table 1



Side view for all type

**Fig. 5** Chip resistor dimensions**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	E24 5%, 10%, 20% 1 Ω ≤ R ≤ 100 KΩ	−55 °C to +155 °C	50 V	100 V	100 V	±200 ppm/°C
	1/8W						
	1/5W						
SR0603	1/10W			75V	150V	150V	
	1/5W						
	1/4W						
SR0805	1/8 W			150V	300V	300V	
	1/4W						
	1/3W						
	1/2W						
SR1206	1/4 W			200 V	400 V	500 V	
	1/2W						
	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	
	2W						

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

1. 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; 7T=1/5W

SR0603: 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 = 1/2W

SR1218: 07 = 1W

SR2010: 07 = 3/4W

SR2512: 07 = 1W; 7W=2W

RATED VOLTAGE

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

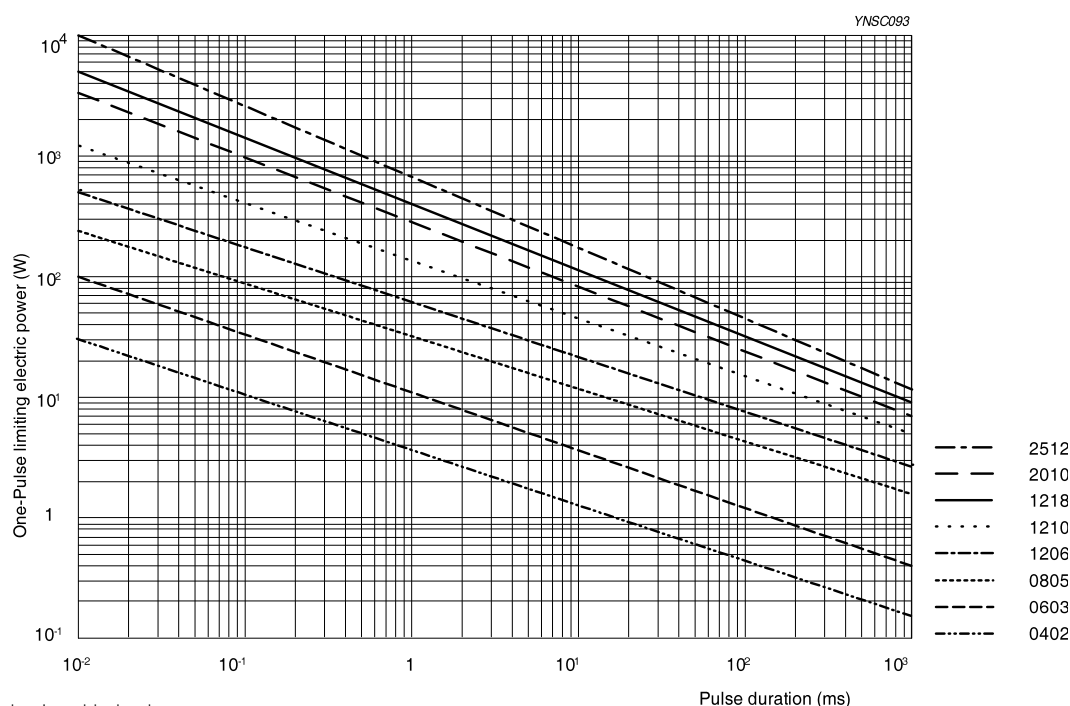
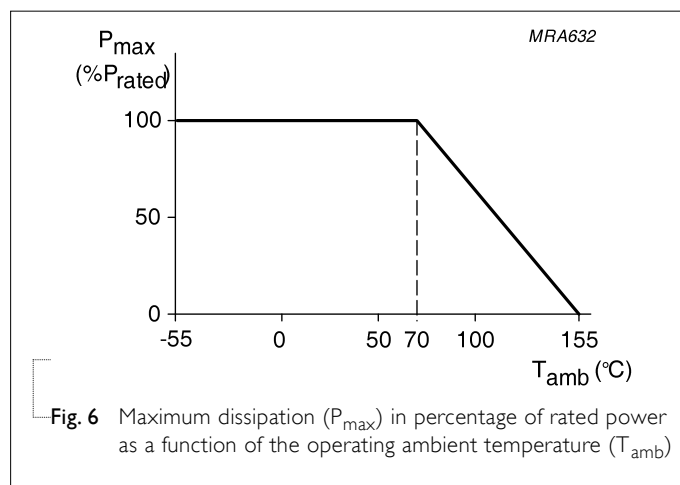
$$V = \sqrt{(P \times R)}$$

Where

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

P = Rated power (W)

R = Resistance value (Ω)

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 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	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 _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. 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) Bending for 0402: 5mm 0603 & 0805: 3mm 1206 and above: 2mm Holding time: minimum 60 seconds	±(1.0%+0.05 Ω)

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 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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