Innovative Service Around the Globe YAGEO

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

YAGEO Phycomp

Product specification – October 02, 2017 V.2

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

D = ±0.5%

F = ±1%

(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

13 = 13 inch dia. Reel

7W = 7 inch dia. Reel & 2 x standard power

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

47 = 7 inch dia. Reel & 4 x standard power

(6) RESISTANCE VALUE

1 Ω ≤ R ≤ 100 KΩ

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
XRXX (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 KΩ)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6= 976,000 Ω
XXXK (100 KΩ)	100K = 100,000 Ω

ORDERING EXAMPLE

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

MARKING

SR0402

Fig. 1

No Marking

SR0603

Fig. 2 Value = 24 Ω

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

Fig. 3 Value = 806 Ω

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

Fig. 4 Value = 10 KΩ

Both E-24 and E-96 series: 4 digits, ±0.5% & ±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".

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

SR0402/0603/0805/1206/1210/1218/2010

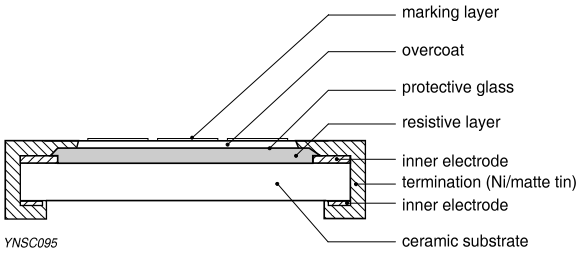

Fig. 5-1 Chip resistor outlines

SR2512

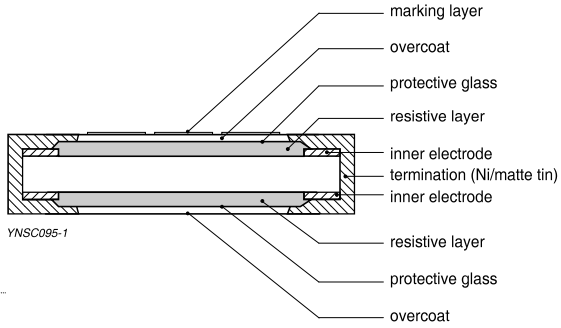

Fig. 5-2 Chip resistor outlines

DIMENSIONS

Table 1

TYPE	L (mm)	W (mm)	H (mm)	I_1 (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

For dimension, please refer to Table 1

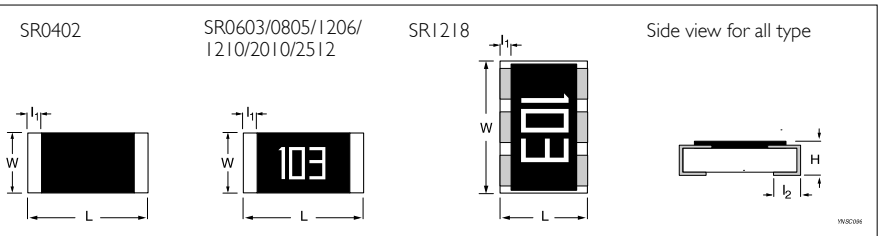

Fig. 5 Chip resistor dimensions

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/E96 0.5%, 1% 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

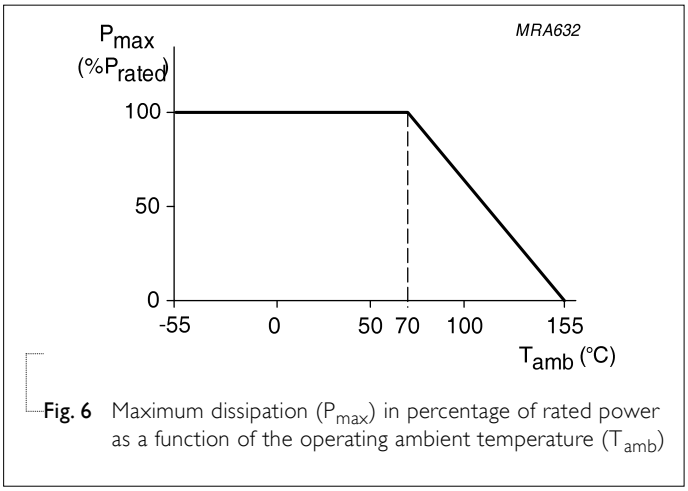

Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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

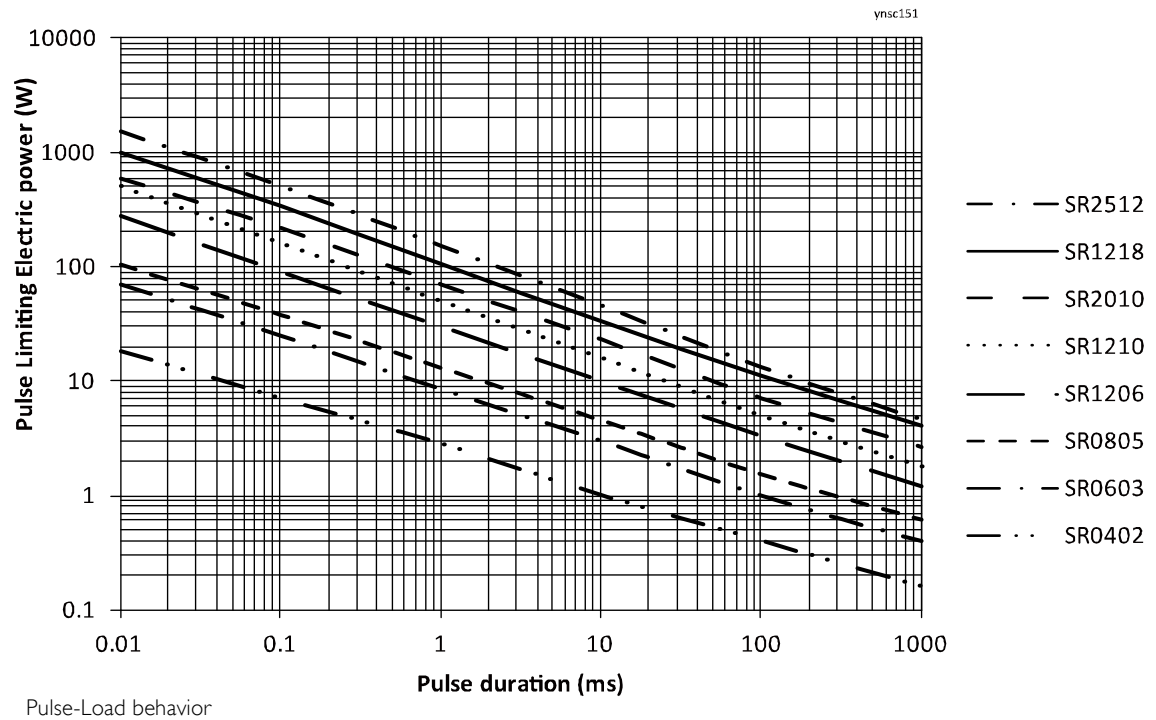

Fig. 7 Pulse-Load behavior

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:** $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6$ (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	±(2.0%+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	±(2.0%+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 2	Oct. 02, 2017	-	- Add SR0402 7T (triple power), SR0805 47 (quadruple power), SR2512 7W (double power)
Version 1	Nov. 11, 2016	-	- Update 7T power for 1206
Version 0	Dec. 01, 2015	-	- New product datasheet

Mouser Electronics

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SR1218KK-071RL SR1218KK-073R3L SR1206FR-7W2R2L SR1206FR-07100RL SR1218KK-0710RL SR0805FR-0710KL SR0805FR-075R6L SR0805FR-7W10RL SR0805FR-074R7L SR0805FR-0712RL SR2010KK-075R6L SR2010KK-0733KL SR1218KK-074K7L SR1206FR-0747RL SR1206FR-071ML SR1206FR-072R49L SR2010KK-07330RL SR1206FR-071R8L SR0805FR-0710RL SR2010KK-078R2L SR1206FR-071RL SR0805FR-076R8L SR0805FR-076R2L SR1206FR-071R2L SR1206FR-7W220RL SR2010KK-076K8L SR1218KK-0733RL SR1206FR-07100KL SR1206FR-073RL SR1206FR-076R8L SR1206FR-074R99L SR2010KK-07820RL SR0805FR-07150RL SR0805FR-0720RL SR1206FR-075R1L SR1206FR-0715RL SR2010KK-0782KL SR0603DR-07100KL SR1218KK-07402RL SR0805FR-078R2L SR2010KK-0768RL SR1218KK-0747RL SR1218KK-0722RL SR2010KK-07220RL SR2010KK-07680RL SR0805FR-0756RL SR2010KK-071RL SR0805FR-0711RL SR0805FR-079R1L SR1206FR-072R7L SR0603DR-0762KL SR1206FR-071KL SR1206FR-7W20K5L SR1206FR-0710RL SR0402FR-0710KL SR0603FR-0710KL SR0603FR-7W510RL SR0402FR-074K99L SR1206FR-074K7L SR1206FR-7W13RL SR1206FR-073R6L SR0402FR-7W39RL SR0805FR-0747KL SR1210FR-7W51RL SR0603FR-7W20RL SR0805FR-7T75RL SR2512FK-0736RL SR0402FR-0715KL SR1206FR-7W2KL SR0402FR-07200RL SR1206FR-072R2L SR0805DR-0760R4L SR2512FK-0722RL SR0402FR-07150RL SR1206FR-7W270RL SR0402FR-07100KL SR1210FR-07100KL SR0603FR-7W1K5L SR0805FR-7W4R7L SR0402FR-07100RL SR0805FR-7T10KL SR1206FR-074R7L SR1206DR-7W10KL SR2512FK-0747RL SR1206FR-072K2L SR0805FR-7T10RL SR0805FR-7W12RL SR0603FR-7W1KL SR0603FR-7W100RL SR0603FR-0712KL SR0603FR-074K99L SR0805FR-7T12RL SR0402FR-7W200RL SR0402FR-0768KL SR1210FR-073K3L SR1206FR-7T15KL SR1206FR-7T16RL SR1206FR-7T75RL SR0603FR-7T470RL SR2512FK-7W100RL