Innovative Service Around the Globe YAGEO

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 Phycomp

Product specification – October 02, 2017 V.6

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 = ±5%
K = ±10%
M = ±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
13 = 13 inch dia. Reel
47 = 7 inch dia. Reel & 4xstandard power
7W = 7 inch dia. Reel & 2 x standard power
7T = 7 inch dia. Reel & 3 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

SR1218

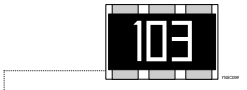

Fig. 2 Value=10 KΩ

E-24 series: 3 digits
First two digits for significant figure and 3rd digit for number of zeros

SR0603 / SR0805 / SR1206 / SR1210 / SR2010 / SR2512

Fig. 3 Value=10 KΩ

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

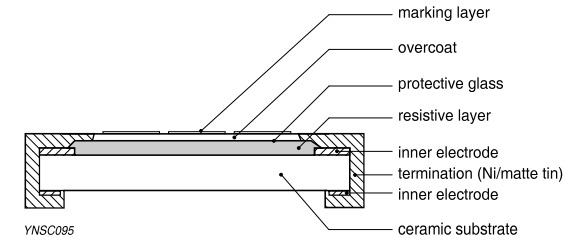

Fig. 4 Chip resistor outlines

DIMENSIONS

Table 1

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

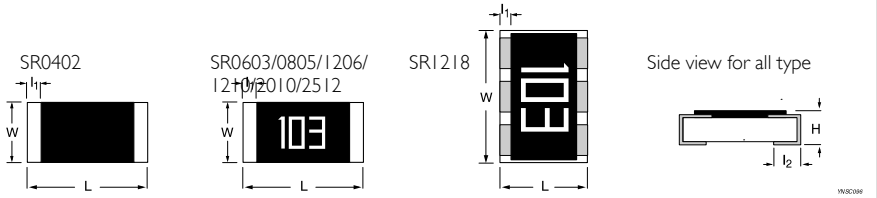

Fig. 5 Chip resistor dimensions

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

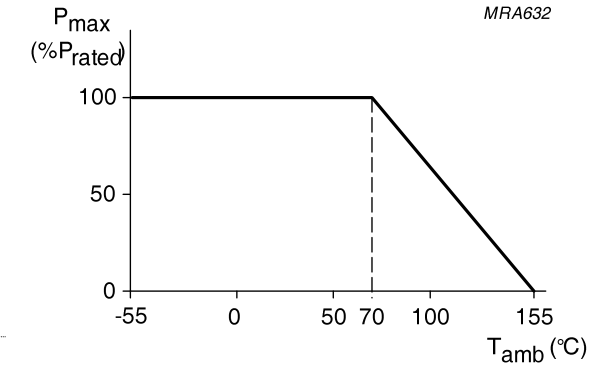

Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

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

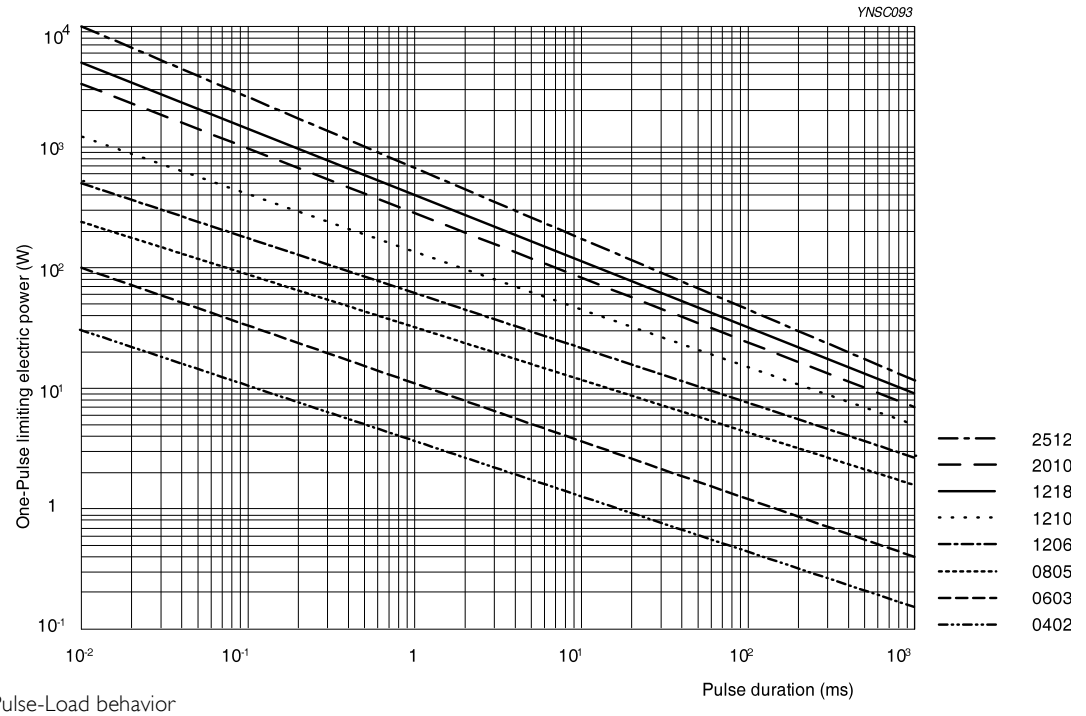

Fig. 7 Pulse-Load behavior

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	±(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	-	-

Mouser Electronics

Authorized Distributor

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SR1206JR-072R2L SR1206JR-07150RL SR1206JR-0710RL SR1206JR-0710KL SR1206JR-0736RL SR1206JR-073R3L SR1206JR-074R7L SR1206JR-076R8L SR1206JR-0768RL SR1206JR-0747RL SR1206JR-0733RL SR0805JR-0710KL SR1206JR-07100RL SR1206JR-0712RL SR1206JR-0715RL SR1206JR-071KL SR1206JR-0722RL SR1206JR-0727RL SR1206JR-072KL SR1206JR-073R9L SR1206JR-0751KL SR1206JR-0756RL SR1206JR-075K1L SR1206JR-0782RL SR2512KK-0722RL SR2512MK-071R1L SR0603KR-7W1RL SR1206JR-072K2L SR1206JR-07470RL SR1206JR-07390RL SR1206JR-073K3L SR1206JR-072R7L SR0805JR-0710RL SR0805JR-071RL SR1206JR-0715KL SR1206JR-075R1L SR1206JR-071RL SR1206JR-07200RL SR1206JR-076K8L SR1206JR-0751RL SR0805JR-0730RL SR0805JR-071KL SR1206JR-071R2L SR0805JR-07820RL SR1206JR-7W30RL SR1206JR-074K7L SR1206JR-0730RL SR1206JR-0720RL SR1206JR-0775RL SR0603JR-7W1RL SR1206JR-071R5L SR2512JK-07150RL SR2512JK-072RL SR1206JR-0730KL SR2512JK-07160RL SR0402JR-7W1RL SR1206JR-0739RL SR1206JR-0712KL SR1206JR-075R6L SR1206JR-0718RL SR2512JK-0722RL SR2512JK-0710RL SR2512KK-07150RL SR1206JR-077R5L SR2010JK-07220RL SR2010MK-072K2L SR1206JR-071R1L SR1206JR-072K7L SR2512JK-0715RL SR0805KR-074R7L SR1218JK-0712RL SR2010JK-07750RL SR2512JK-0730RL SR0805JR-07270RL SR0805JR-07200RL SR0805JR-07100RL SR2512KK-071KL SR2512JK-0724RL SR1206KR-07100RL SR0805JR-0775RL SR0805JR-0727RL SR0805JR-078K2L SR1206JR-7W22RL SR1206JR-071K1L SR0805JR-0716RL SR2512JK-07430RL SR0805JR-0733RL SR1206JR-0768KL SR0805JR-071K1L SR0805JR-0751RL SR1218JK-0720KL SR1206JR-0722KL SR0805JR-073R3L SR1206JR-07510RL SR2512MK-071RL SR1206JR-07820RL SR0805JR-07750RL SR2010JK-07510RL SR0805JR-07510RL SR0805JR-0791RL