

DATA SHEET

AUTOMOTIVE GRADE SURGE CHIP RESISTORS (LEAD FREE)

SR_P series

0.5%, 1%, 5%, 10%, 20%

sizes 0201/0402/0603/0805/1206



SCOPE

This specification describes SR0201 to SR1206 chip resistors made by thick film process.

APPLICATIONS

- Total lead free without RoHS exemption
- Telecommunications
- Power supplies
- Car electronics

FEATURES

- AEC-Q200 qualified
- Superior to RC series in pulse withstanding voltage and surge withstanding voltage.
- MSL class: MSL I
- Halogen free epoxy
- 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 P
 (1) (2) (3) (4) (5) (6) (7)

(1) SIZE

0201/ 0402/ 0603/ 0805/ 1206

(2) TOLERANCE

- D = ±0,5%
- F = ±1%
- J = ±5%
- K = ±10%
- M = ±20%

(3) PACKAGING TYPE

R = Paper 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
- 7T = 7 inch dia. Reel & 3 x standard power
- 47 = 7 inch dia. Reel & 4 x standard power

(6) RESISTANCE VALUE

1 Ω ≤ R ≤ 1MΩ
 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 P is lead free (without RoHS exemption).

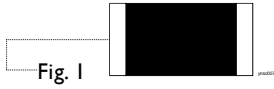
Resistance coding rule	Example
XRXX (1 to 9.76 Ω)	1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω
XXRX (10 to 97.6 Ω)	10R = 10 Ω 97R6 = 97.6 Ω
XXXR (100 to 976 Ω)	100R = 100 Ω
XKXX (1 to 9.76 KΩ)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6 = 97,600 Ω
XXXXK (100 KΩ)	100K = 100,000 Ω

ORDERING EXAMPLE

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

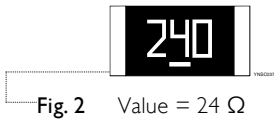
MARKING

SR0201/ 0402

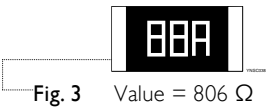


No Marking

SR0603

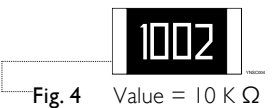


1%, 0.5%, E24 exception values 10/11/13/15/20/75 of E24 series



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

SR0805 /1206



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”.

TAPING REEL & POWER

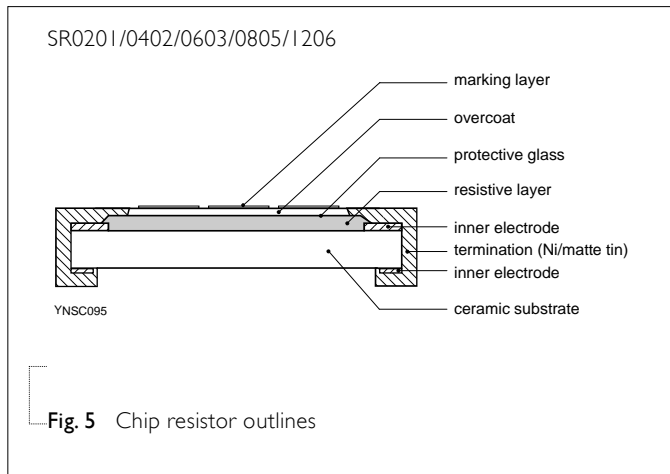
Table I

TYPE	POWER, W (P70)			
	CODING			
	07	7W	7T	47
0201	1/20	1/10	-	1/5
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	-

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.

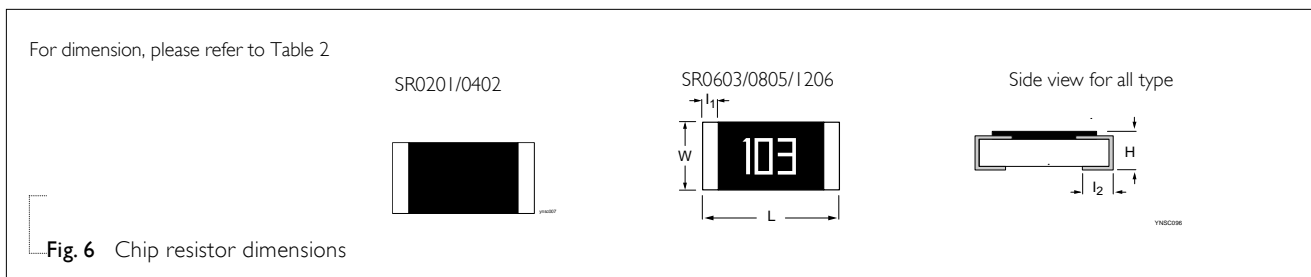
OUTLINES



DIMENSIONS

Table 2

TYPE	L (mm)	W (mm)	H (mm)	l ₁ (mm)	l ₂ (mm)
SR0201	0.60±0.03	0.30±0.03	0.23±0.03	0.12±0.05	0.15±0.05
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	0.45±0.20



ELECTRICAL CHARACTERISTICS

Table 3

TYPE	POWER	RESISTANCE RANGE	CHARACTERISTICS					
			Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance	
SR0201	1/20W			25V	50V	50V	$1\Omega \leq R \leq 10\Omega$ $-100 \sim +350 \text{ppm}^\circ\text{C}$ $10\Omega < R \leq 1M\Omega$ $\pm 200 \text{ppm}^\circ\text{C}$	
	1/10W							
	1/5W							
SR0402	1/16W			75V	100V	100V		
	1/8W							
	1/5W							
SR0603	1/10W	E24 5%, 10%, 20%	-55 °C to +155 °C	75V	150V	150V		
	1/5W							$1\Omega \leq R \leq 1M\Omega$
	1/4W							E24/E96 0.5%, 1%
	1/8W							$1\Omega \leq R \leq 1M\Omega$
SR0805	1/4W			150V	300V	300V	$1\Omega \leq R \leq 10\Omega$ $\pm 200 \text{ppm}^\circ\text{C}$ $10\Omega < R \leq 1M\Omega$ $\pm 100 \text{ppm}^\circ\text{C}$	
	1/3W							
	1/2W							
SR1206	1/4W			200 V	400 V	500V		
	1/2W							
	3/4W							

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	SR0201/0402	SR0603/0805/1206
Paper taping reel (R)	7" (178 mm)	10,000	5,000

NOTE

I. 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:

SR0201: 1/20W, 1/10W, 1/5W

SR0402: 1/16W, 1/8W, 1/5W

SR0603: 1/10W, 1/5W, 1/4W

SR0805: 1/8W, 1/4W, 1/3W, 1/2W

SR1206: 1/4W, 1/2W, 3/4W

RATED VOLTAGE

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

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

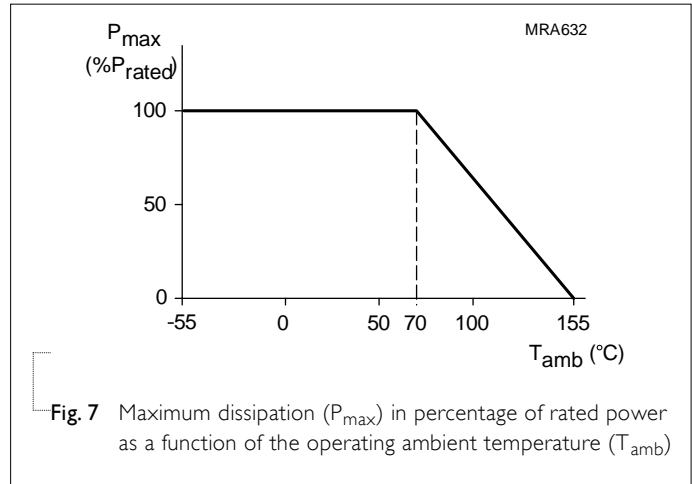
or max. working voltage whichever is less

Where

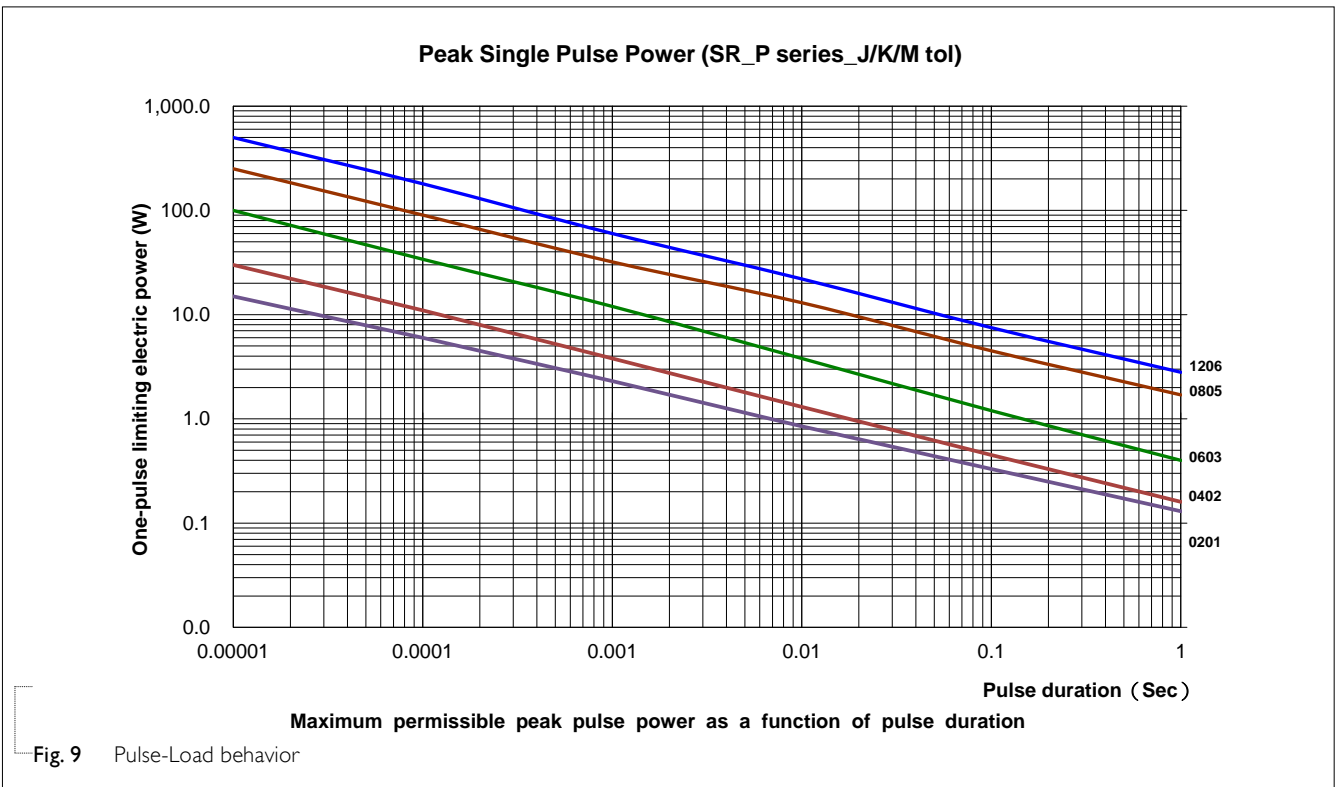
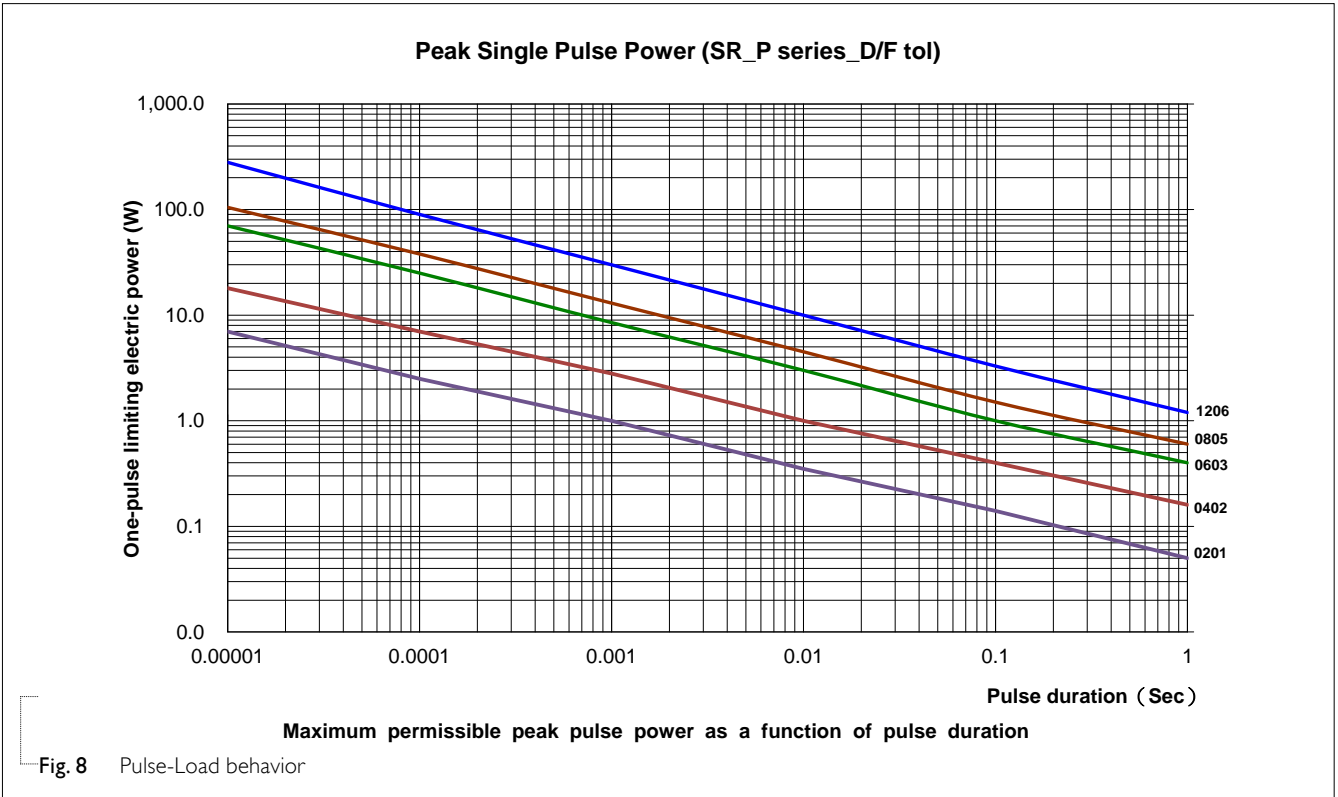
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value (Ω)



PULSE LOAD BEHAVIOR



TESTS AND REQUIREMENTS

Table 5 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
High Temperature Exposure	AEC-Q200 Test 3 MIL-STD-202 Method 108	1,000 hours at T _A = 155 °C, unpowered	±(2.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for others
Moisture Resistance	MIL-STD-202 Method 106	Each temperature / humidity cycle is defined at 8 hours, 3 cycles / 24 hours for 10d. with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered	±(0.5%+0.05Ω) for D/F tol ±(2.0%+0.05Ω) for others
Biased Humidity	AEC-Q200 Test 7 MIL-STD-202 Method 103	1,000 hours; 85 °C / 85% RH 10% of operating power Measurement at 24±4 hours after test conclusion.	±(1.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for others
Operational Life	AEC-Q200 Test 8 MIL-STD-202 Method 108	1,000 hours at 125 °C, derated voltage applied for 1.5 hours on, 0.5 hour off, still-air required	±(2.0%+0.05Ω) for D/F tol ±(3.0%+0.05Ω) for others
Resistance to Soldering Heat	AEC-Q200 Test 15 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%+0.05Ω) No visible damage
Thermal Shock	MIL-STD-202 Method 107	-55/+125 °C Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(0.5%+0.05Ω) for D/F tol ±(1.0%+0.05Ω) for others
ESD	AEC-Q200 Test 17 AEC-Q200-002	Human Body Model, I _{pos.} + I _{neg.} discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV	±(3.0%+0.05Ω)
Solderability - Wetting	AEC-Q200 Test 18 J-STD-002	Electrical Test not required Magnification 50X SMD conditions: (a) Method B, aging 4 hours at 155 °C dry heat, dipping at 235±3 °C for 5±0.5 seconds. (b) Method B, steam aging 8 hours, dipping at 215±3 °C for 5±0.5 seconds. (c) Method D, steam aging 8 hours, dipping at 260±3 °C for 30±0.5 seconds.	Well tinned (≥95% covered) No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Board Flex	AEC-Q200 Test 21 AEC-Q200-005	Chips mounted on a 100mm x 40mm glass epoxy resin PCB (FR4) Bending for 0201/0402: 5 mm 0603/0805: 3 mm 1206 and above: 2 mm Holding time: minimum 60 seconds	±(1.0%+0.05Ω)
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 8.1	2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature	±(2.0%+0.05Ω)

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 1	Jan. 20, 2022	-	- Add size 0201
Version 0	Feb. 03, 2021	-	- New product datasheet

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