

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 Phi(comp



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 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

(1) (2) (3) (4) (5) (6) (7)

(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

07 = 7 inch dia. Reel	7W = 7 inch dia. Reel & 2 x standard power
13 = 13 inch dia. Reel	$7T = 7$ inch dia. Reel & $3 \times$ standard power

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

(6) RESISTANCE VALUE

 $I \Omega \le R \le I00 K\Omega$

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. I K2, not I K20.

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 rule	Example
XRXX (1 to 9.76 Ω)	IR = I Ω IR5 = I.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 (Ι to 9.76 Κ Ω)	1K = 1,000 Ω 9K76 = 9760 Ω
XXKX (10 to 97.6 KΩ)	$10K = 10,000 \Omega$ 97K6= 976,000 Ω
XXXK (100 KΩ)	100K = 100,000 Ω

Resistance rule of global part

ORDERING EXAMPLE

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



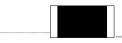
Chip Resistor Surface Mount

SR SERIES

0402/0603/0805/1206/1210/1218/2010/2512

MARKING

SR0402



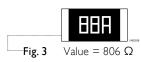
No Marking

Fig. I

SR0603

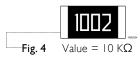


1%, 0.5%,E24 exception values 10/11/13/15/20/75 of E24 series



 $1\%,\,0.5\%,\,E96$ 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

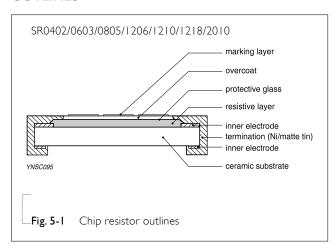
For further marking information, please refer to data sheet "Chip resistors marking".

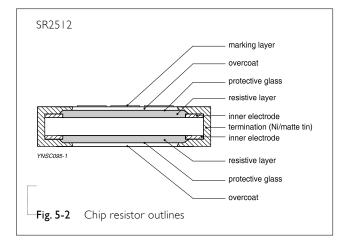
CONSTRUCTION

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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.

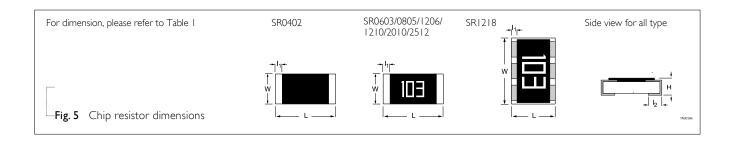
OUTLINES





DIMENSIONS

Table I					
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





ELECTRICAL CHARACTERISTICS

Table 2

Table 2	_		CHARACTERISTICS				
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			150V 300V		300V	
SR0805	1/4W				2001/		
5110005	1/3W	E24/E96 0.5%, 1%	–55 °C to +155 °C		2007	±200 ppm/°C	
	1/2W	$I \Omega \le R \le I00 K\Omega$	_33 C t0 +133 C				±200 ppm/ C
	1/4 W						
SR1206	1/2W			200 V	400 V	500 V	
	3/4W		_				
SR1210	1/2W			200 V	400 V	500 V	
SR1218	IW		-	200 V	400 V	500 V	
SR2010	3/4 W		_	200 V	400 V	500 V	
SR2512	IW		_	200.17	400.17	F00.1/	
31(2312	2W			200 V	400 V	500 V	

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

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:

SR0402: 07 = 1/16W; 7W = 1/8W; 7T=1/5WSR0603: 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 = 1/2WSR1218: 07 = IW SR2010: 07 = 3/4W

SR2512: 07 = IW; 7W=2W

RATED VOLTAGE

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

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

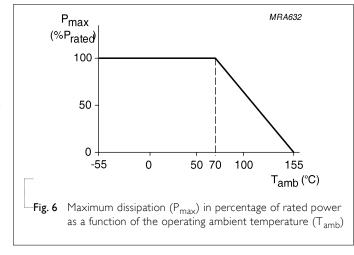
Where

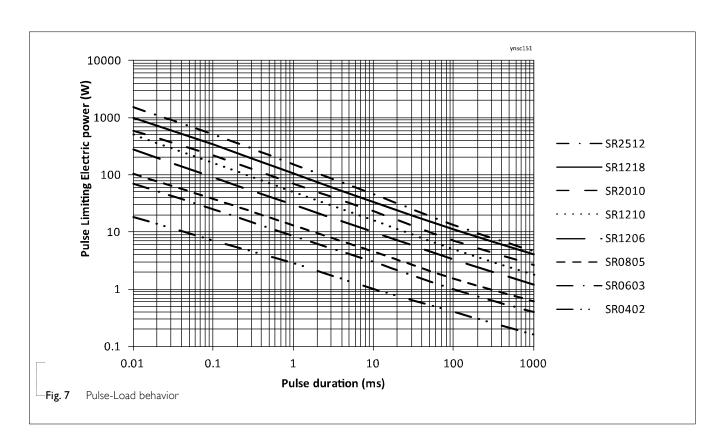
V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

 $R = Resistance value (\Omega)$

PULSE LOAD BEHAVIOR





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TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

TD-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 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature	Refer to table 2 $\pm (2.0\% \pm 0.05~\Omega)$
115-1 4.13	T.C.R= $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6 \text{ (ppm/°C)}$ Where $t_1 = +25 \text{ °C}$ or specified room temperature $t_2 = -55 \text{ °C}$ or $+125 \text{ °C}$ test temperature R_1 =resistance at reference temperature in ohms R_2 =resistance at test temperature in ohms 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	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 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	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 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	R ₁ =resistance at reference temperature in ohms R ₂ =resistance at test temperature in ohms 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	R ₂ =resistance at test temperature in ohms 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
115-1 4.13	voltage whichever is less for 5 sec	±(2.0%+0.05 Ω)
0068-2-2	1,000 hours at T_A = 155 °C ±5 °C, unpowered	±(2.0%+0.05 Ω)
) 15- 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	
) 5- 4.25.	1,000 hours at 70±2 °C, RCWV applied for 1.5	±(2.0%+0.05 Ω)
FD-202 Method 108	hours on, 0.5 hour off, still-air required	,
) 5- 4. 8	Condition B, no pre-heat of samples	±(1.0%+0.05 Ω)
TD- 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	
	-55/+125 °C for I cycle per hour, with I,000 cycles.	±(1.0%+0.05 Ω)
		Lead-free solder, 260±5 °C, 10±1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol



 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 PCB (FR4)	±(1.0%+0.05 Ω)
		Bending for 0402: 5mm 0603 & 0805: 3mm 1206 and above: 2mm	
		Holding time: minimum 60 seconds	

Chip Resistor Surface Mount

SR SERIES

0402/0603/0805/1206/1210/1218/2010/2512

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 I	Nov. 11, 2016	-	- Update 7T power for I206
Version 0	Dec. 01, 2015	-	- New product datasheet

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



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RC1005F471CS RC1005F4751CS RCP0603W100RGED ERJ-1GMF1R00C ERJ-1GMF1R20C ERJ-1GMF2R55C ERJ-1GMF8R66C

25121WF1003T4E 25.501.3653.0 290-1.0M-RC 292-1.0M-RC 292-2.2K-RC 292-4.7K-RC 25121WF4700T4E 292-470K-RC 302-1.0M-RC CPG1206F10KC CRCW02011R00FXED CRCW060315K0FKEE CRCW060320K5FKEE CRG0201F10K RCP2512B100RGWB

RCWP12061K00FKS2 3520510RJT 352075KJT RMC16-102JT RMC1JPTE TR0603MR-075K1L 5-2176094-4 35202K7JT

WF06Q1000FTL ERJ-S14J4R7U CHP2512L4R30GNT WR12X1621FTL RCWP11001K00FKS3 LRC-LRF3W-01-R050-FTR1800 9
2176088-6 NRC06F1002TR20F CRCW02013M30FNED CRCW060343K0FKEE WR04X5360FTL RCA060345K3FKEA

LTR100JZPF33R0 5-2176091-5