

DATA SHEET

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SURGE CHIP RESISTORS AUTOMOTIVE GRADE SR series

20%, 10%, 5% sizes 0402/0603/0805/1206/1210/1218/2010/2512 RoHS compliant & Halogen free

Product specification – September 01, 2015 V.4



YAGEO Phícomp

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Chip Resistor Surface Mount SR SERIES

<u>SCOPE</u>

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

 $J = \pm 5\%$ K = ±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
13 = 13 inch dia. Reel

7W =	7	inch	dia.	Ree	8	2 x	stan	daro	d power
	_			-		~			

n dia. Reel 7T = 7 inch dia. Reel & $3 \times$ standard power

(6) RESISTANCE VALUE

$| \Omega \leq R \leq |00 \text{ K}\Omega|$

There are $2\sim4$ 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. IK2, not IK20.

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

Example
$ R = \Omega$
$IR5 = I.5 \Omega$
9R76 = 9.76 Ω
10R = 10 Ω
97R6 = 97.6 Ω
$100R = 100 \Omega$
IK = 1,000 Ω
9K76 = 9760 Ω
$10K = 10,000 \Omega$
97K6= 976,000 Ω
1001 - 100 000 0
$100K = 100,000 \Omega$

ORDERING EXAMPLE

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



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MARKING SR0402 Fig. 1 No Marking Fig. 1 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

ΝΟΤΕ

Fig. 3

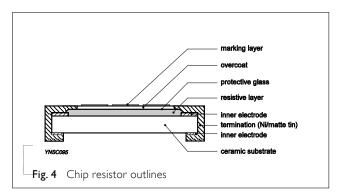
For further marking information, please refer to data sheet "Chip resistors marking".

CONSTRUCTION

Value=10 KΩ

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



DIMENSIONS

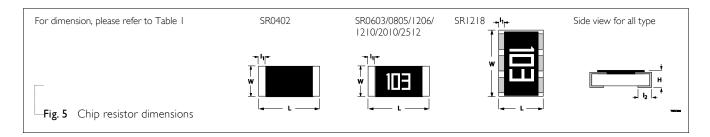
Table I

ТҮРЕ	L (mm)	W (mm)	H (mm)	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	0.50±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



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ELECTRICAL CHARACTERISTICS

				CHAR	ACTERISTIC	S	
ТҮРЕ	POWER	RESISTANCE RANGE	Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
SR0402	1/16W			50 V	100 V	100 V	
	1/8		_	50 V	100 1	100 ¥	
	1/10W						
SR0603	1/5W			75V	150V	150V	
	1/4W		_				
	1/8 W						
SR0805	1/4W			150V	300V	300V	
	1/3W	E24 5%, 10%, 20% I Ω ≤ R ≤ 100 KΩ	–55 ℃ to +155 ℃ _				±200 ppm/°C
SR1206	1/4 W			200.14	400.17	F00.)/	
51(1200	1/2W			200 V	400 V	500 V	
SR1210	1/2W			200.14	400.14	F00.)/	
51(1210	3/4W		2	200 V	400 V	500 V	
SR1218	I W		-	200 V	400 V	500 V	
SR2010	3/4 W		-	200 V	400 V	500 V	
SR2512	I W		-	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 a	nd 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

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I. For paper/embossed tape and reel specification/dimensions, please refer to data sheet "Chip resistors packing".



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SERIES

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 SR0603: 07 = 1/10W; 7W = 1/5W; 7T=1/4W SR0805: 07 = 1/8W; 7W = 1/4W; 7T=1/3W SR1206: 07 = 1/4W; 7W = 1/2W SR1210: 07 = 1/2W; 7W=3/4W SR1218: 07 = 1W SR2010: 07 = 3/4W SR2512: 07 = 1W

RATED VOLTAGE

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

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

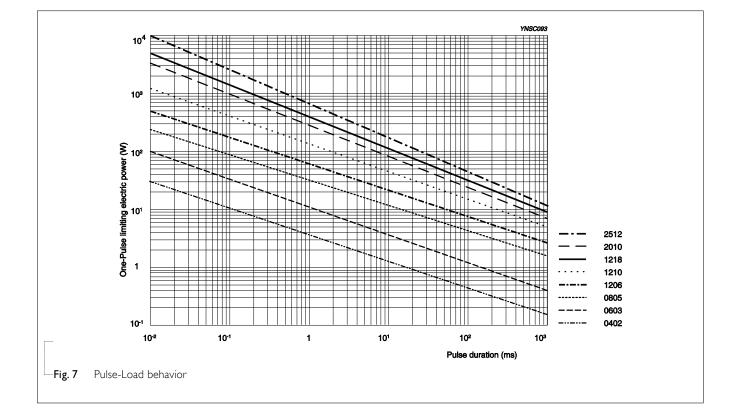
Where

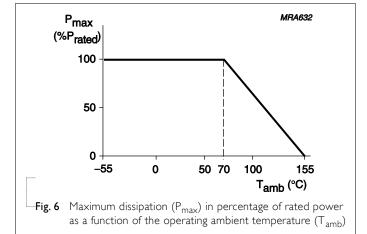
V = Continuous rated DC or AC (rms) working voltage (V)

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

TEST METHOD	PROCEDURE	REQUIREMENTS
MIL-STD-202 Method 304	At +25/–55 °C and +25/+125 °C	Refer to table 2
	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	
IEC60115-14.13	2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature	±(2.0%+0.05 Ω)
IEC 60068-2-2	1,000 hours at TA = 155 °C \pm 5 °C, unpowered	±(3.0%+0.05 Ω)
IEC 60115-1 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	
IEC 60115-1 4.25.1	1,000 hours at 70±2 °C, RCWV applied for 1.5	±(3.0%+0.05 Ω)
MIL-STD-202 Method 108	hours on, 0.5 hour off, still-air required	· · · ·
IEC 60115-14.18	Condition B, no pre-heat of samples	±(1.0%+0.05 Ω)
MIL-STD- 202 Method 210	Lead-free solder, 260 \pm 5 °C, 10 \pm 1 seconds immersion time	No visible damage
	Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	
JESD22-A104C	-55/+125 °C for I cycle per hour, with 1,000 cycles.	±(1.0%+0.05 Ω)
	MIL-STD-202 Method 304 IEC60115-1 4.13 IEC 60068-2-2 IEC 60115-1 4.24.2 IEC 60115-1 4.25.1 MIL-STD-202 Method 108 IEC 60115-1 4.18 MIL-STD- 202 Method 210	MIL-STD-202 Method 304At $\pm 25/-55$ °C and $\pm 25/\pm 125$ °CFormula: T.C.R= $T_c.R=\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6 (ppm/°C)$ Where $t_1 = \pm 25$ °C or specified room temperature $t_2 = -55$ °C or ± 125 °C test temperature $R_1 = resistance at reference temperature in ohmsR_2 = resistance at test temperature in ohmsR_2 = resistance at test temperature in ohmsdvoltage whichever is less for 5 secat room temperatureIEC 60068-2-2I,000 hours at TA = 155 °C ±5 °C, unpoweredIEC 60115-1 4.24.2Steady state for I,000 hours at 40 °C / 95% R.H.RCWV applied for 1.5 hours on and 0.5 hour offIEC 60115-1 4.25.1MIL-STD-202 Method 108I,000 hours at 70±2 °C, RCWV applied for 1.5hours on, 0.5 hour off, still-air requiredIEC 60115-1 4.18MIL-STD- 202 Method 210Condition B, no pre-heat of samplesLead-free solder, 260±5 °C, 10±1 secondsimmersion timeProcedure 2 for SMD: devices fluxed andcleaned with isopropanol$



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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	

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<u>REVISION HISTORY</u>

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
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 I	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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"The reimbursement is limited to the value of the products."

