



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 – October 02, 2017 V.6







YAGEO Phicomp

Chip Resistor Surface Mount SR SERIES

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<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.

(7)

GLOBAL PART NUMBER

SR XXXX X X X XX XXXX L

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

(I) SIZE

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

(2) TOLERANCE

- J = ±5%
- $K = \pm 10\%$
- $M = \pm 20\%$

(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

- 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 & 4xstandard power

(6) RESISTANCE VALUE

$\mid \Omega \leq R \leq \mid \! 00 \; \text{K}\Omega$

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			
Resistance coding rule	Example		
XRXX (1 to 9.76 Ω)	R = Ω R5 = .5 Ω 9R76 = 9.76 Ω		
XXRX (10 to 97.6 Ω)	IOR = IO Ω 97R6 = 97.6 Ω		
XXXR (100 to 976 Ω)	100R = 100 Ω		
XKXX (Ι to 9.76 K Ω)	IK = 1,000 Ω 9K76 = 9760 Ω		
XXKX (10 to 97.6 K Ω)	10K = 10,000 Ω 97K6= 976,000 Ω		
XXXK (100 KΩ)	100Κ = 100,000 Ω		

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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<u>Marking</u> 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 / SR1	1210 / 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

DIMENSIONS

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



Table I TYPE W (mm) L (mm) H (mm) I₁ (mm) SR0402 1.00±0.05 0.50±0.05 0.35±0.05 0.20±0.10 SR0603 1.60±0.10 0.80±0.10 0.45±0.10 0.25±0.15 SR0805 2,00±0,10 1.25±0.10 0.50±0.10 0.35±0.20 SR1206 3.10±0.10 1.60±0.10 0.55±0.10 0.45±0.20 SR1210 3.10±0.10 2.60±0.15 0.55±0.10 0.45±0.15 SR1218 3.10±0.10 4.60±0.10 0.55±0.10 0.45±0.20 SR2010 5.00±0.10 2.50±0.15 0.55±0.10 0.55±0.15 SR2512 3.10±0.15 0.55±0.10 6.35±0.10 0.60±0.20

l₂ (mm)

0.25±0.10

0.25±0.15

0.35±0.20

0.40±0.20

0.50±0.20

0.40±0.20

0.50±0.20

0.50±0.20

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ELECTRICAL CHARACTERISTICS

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						
SR0805	1/4W			150V	300V	300V	
	1/3W	E24 5%, 10%, 20%	E24 5%, 10%, 20% -55 °C to +155 °C	1500	1307 5007 500	5001	±200 ppm/°C
	1/2W	$ \Omega \leq R \leq 00 \text{ K}\Omega $					
	1/4 W						
SR1206	1/2W			200 V	400 V	500 V	
	3/4W		_				
SR1210	1/2W		_	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	IW			200 V	400 V	500 V	
	2W			200 V	100 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		

ΝΟΤΕ

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

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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

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 601 15-1 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 601 15-1 4.18	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 1 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= $T_{\rm C.R}=\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6 (\text{ppm/°C})$ 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 ohms R_2=resistance at test temperature in ohms R_2=resistance at test temperature in ohms (voltage whichever is less for 5 sec at room temperatureIEC 60115-1 4.132.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperatureIEC 60068-2-21,000 hours at T_A = 155 °C ±5 °C, unpoweredIEC 60115-1 4.24.2Steady state for 1,000 hours at 40 °C / 95% R.H. RCWV applied for 1.5 hours on and 0.5 hour offIEC 60115-1 4.25.11,000 hours at 70±2 °C, RCWV applied for 1.5 hours on, 0.5 hour off, still-air requiredMIL-STD-202 Method 108Condition 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

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

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REVISION HISTORY

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DATE	CHANGE NOTIFICATION	DESCRIPTION
Oct. 02, 2017	-	- Add SR0402 7T (triple power), SR0805 47 (quadruple power), SR2512 7W (double power)
Nov.11, 2016	-	- Update 7T power for 1206
Sep. 01, 2015	-	- Update SR0603 Dielectric Withstanding Voltage to 150V
		- Update 7T power for 0603/0805 & 7W for 1210
Jul. 31, 2015	-	- Comply with AEC-Q200 standard
Jan. 06, 2014	-	- Add SR0402/0603/1210
		- Update electrical characteristic
Mar 18, 2011	-	- Change to dual brand datasheet that describes SR0805 to SR2512 with RoHS compliant
		- Define global part number
Oct 19, 2004	-	-
	Oct. 02, 2017 Nov.11, 2016 Sep. 01, 2015 Jul. 31, 2015 Jan. 06, 2014 Mar 18, 2011	Oct. 02, 2017 - Nov.11, 2016 - Sep. 01, 2015 - Jul. 31, 2015 - Jan. 06, 2014 - Mar 18, 2011 -

SERIES

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