

# DATA SHEET

## AUTOMOTIVE GRADE HIGH VOLTAGE CHIP RESISTORS (LEAD FREE)

RV\_P series

0.5%, 1%, 5%

sizes 0603/0805/1206/2010/2512

IEC 62368-1 Safety Certificate issued by UL Demko:  
sizes 0603/0805/1206



## SCOPE

This specification describes RV0603/0805/1206/2010/2512 high voltage chip resistors made by thick film process.

## APPLICATIONS

- Total lead free without RoHS exemption
- Converter
- Printer equipment
- Battery charger
- Computer
- Power supply
- Car electronics

## FEATURES

- AEC-Q200 qualified
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Non-forbidden materials used in products/production
- Halogen Free Epoxy
- Moisture sensitivity level: MSL 1
- IEC 62368-1: 2018 safety certificate issued by UL Demko for the following sizes and resistance ranges:
  - 0603: 100K $\Omega$  to 12M $\Omega$
  - 0805: 100K $\Omega$  to 24M $\Omega$
  - 1206: 100K $\Omega$  to 27M $\Omega$

\* Please refer to UL certification

\* Waiting for establishing

## ORDERING INFORMATION - GLOBAL PART NUMBER

Both part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

**YAGEO BRAND ordering code**

**GLOBAL PART NUMBER (PREFERRED)**

**RV XXXX X X X XX XXXX P**  
(1) (2) (3) (4) (5) (6) (7)

### (1) SIZE

0603/0805/1206/2010/2512

### (2) TOLERANCE

D =  $\pm 0.5\%$

F =  $\pm 1\%$

J =  $\pm 5\%$

### (3) PACKAGING TYPE

R = Paper/PE taping reel

K = Embossed taping reel

### (4) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Base on spec

### (5) TAPING REEL

07 = 7 inch dia. Reel

### (6) RESISTANCE VALUE

There are 2~4 digits indicated the resistor 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 resistance rules show in table of "Resistance rule of global part number".

### (7) DEFAULT CODE

Letter P is lead free (without RoHS exemption)

Resistance rule of global part number	
Resistance code rule	Example
XXXX (10 to 97.6 K $\Omega$ )	10K = 10,000 $\Omega$ 97K6 = 97,600 $\Omega$
XXXXK (100 to 976 K $\Omega$ )	100K = 100,000 $\Omega$ 976K = 976,000 $\Omega$
XXXXM (1 to 9.76 M $\Omega$ )	1M = 1,000,000 $\Omega$ 9M76 = 9,760,000 $\Omega$
XXMX (10 to 16 M $\Omega$ )	10M = 10,000,000 $\Omega$ 27M = 27,000,000 $\Omega$

## ORDERING EXAMPLE

The ordering code of a RV1206 chip resistor, value 1 M $\Omega$  with  $\pm 5\%$  tolerance, supplied in 7-inch tape reel is: RV1206JR-071MP.

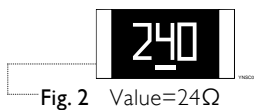
**MARKING**

RV0603/0805/1206/2010/2512

E-24 series: 3 digits,  $\pm 5\%$ 

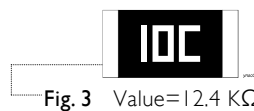
First two digits for significant figure and 3rd digit for number of zeros

RV0603

E-24 series: 3 digits,  $\pm 0.5\%$  &  $\pm 1\%$ 

Exception values 10/11/13/15/20/75 of E24 series

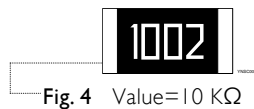
One short bar under marking letter

E-96 series: 3 digits,  $\pm 0.5\%$  &  $\pm 1\%$ 

Including values 10/11/13/15/20/75 of E24 series

First two digits for E-96 marking rule and 3rd letter for number of zeros

RV0805/1206/2010/2512

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

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

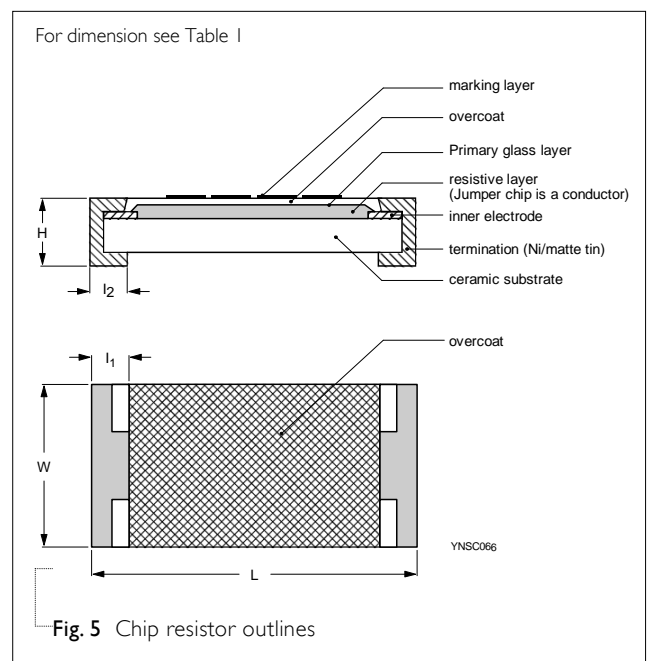
**CONSTRUCTION**

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environment influences. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the two external terminations (matte tin on Ni-barrier) are added. See fig.5

**DIMENSIONS**

Table I For outlines see fig. 5

TYPE	L (mm)	W (mm)	H (mm)	I <sub>1</sub> (mm)	I <sub>2</sub> (mm)
RV0603	1.60 ±0.10	0.80 ±0.10	0.45 ±0.10	0.25 ±0.15	0.25 ±0.15
RV0805	2.00 ±0.10	1.25 ±0.10	0.50 ±0.10	0.35 ±0.20	0.35 ±0.20
RV1206	3.10 ±0.10	1.60 ±0.10	0.55 ±0.10	0.45 ±0.20	0.45 ±0.20
RV2010	5.00 ±0.10	2.50 ±0.15	0.55 ±0.10	0.55 ±0.15	0.55 ±0.20
RV2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.60 ±0.20

**OUTLINES**

**ELECTRICAL CHARACTERISTICS**

Table 2

TYPE	RESISTANCE RANGE	CHARACTERISTICS					
		Rated Power	Operating Temperature Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Temperature Coefficient of Resistance
RV0603	5% (E-24) 47Ω to 10MΩ	1/10W		350V	500V	500V	
	1% (E-24/E-96) 47Ω to 10MΩ						
	0.5% (E-24/E-96) 47Ω to 10MΩ						
RV0805	5% (E-24) 47Ω to 22MΩ	1/8 W		400 V	800 V	800 V	
	1% (E-24/E-96) 47Ω to 22MΩ						
	0.5% (E-24/E-96) 47Ω to 10MΩ						
RV1206	5% (E-24) 47Ω to 27MΩ	1/4 W	-55 °C to +155 °C	500 V	1,000 V	1,000 V	47Ω ≤ R ≤ 10MΩ ±100 ppm °C R > 10MΩ ±200 ppm °C
	1% (E-24/E-96) 47Ω to 27MΩ						
	0.5% (E-24/E-96) 47Ω to 15MΩ						
RV2010	5% (E-24) 47Ω to 22MΩ	3/4W		500 V	1,000 V	1,000 V	
	1% (E-24/E-96) 47Ω to 22MΩ						
	0.5% (E-24/E-96) 47Ω to 10MΩ						
RV2512	5% (E-24) 47Ω to 16MΩ	1 W		500 V	1,000 V	1,000 V	
	1% (E-24/E-96) 47Ω to 16MΩ						
	0.5% (E-24/E-96) 47Ω to 10MΩ						

**FOOTPRINT AND SOLDERING PROFILES**

For 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	RV0603	RV0805	RV1206	RV2010	RV2512
Paper/PE taping reel (R)	7" (178 mm)	5,000	5,000	5,000	---	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	4,000	4,000

**NOTE**

1. For Paper/PE/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:

RV0603=1/10W; RV0805=1/8W; RV1206=1/4W;

RV2010=3/4W; RV2512=1W

**RATED VOLTAGE**

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

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

or max. working voltage whichever is less

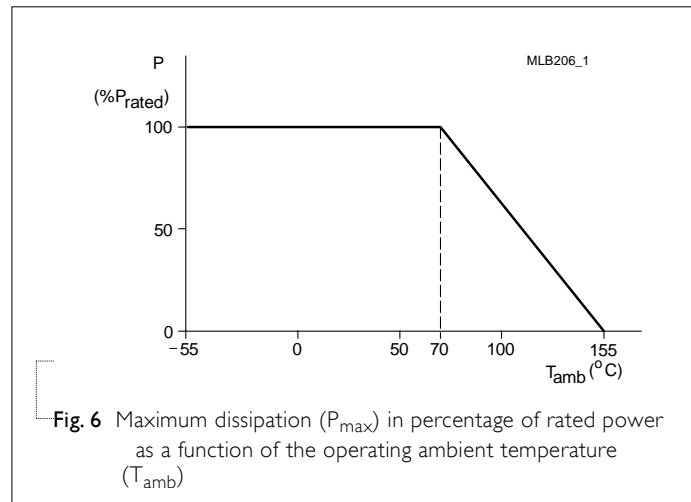
Where

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

P = Rated power (W)

R = Resistance value ( $\Omega$ )

Maximum working voltage can be applicable to resistors only if the resistance value is equal to or higher than the critical resistance value.



## TESTS AND REQUIREMENTS

Table 4 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 $T_A = 155\text{ }^{\circ}\text{C}$ , unpowered	$\pm(1.0\%+0.05\Omega)$
Moisture Resistance	MIL-STD-202 Method 106	Each temperature / humidity cycle is defined at 8 hours, 3 cycles / 24 hours for 10d. with $25\text{ }^{\circ}\text{C}$ / $65\text{ }^{\circ}\text{C}$ 95% R.H, without steps 7a & 7b, unpowered	$\pm(2.0\%+0.05\Omega)$
Biased Humidity	AEC-Q200 Test 7 MIL-STD-202 Method 103	1,000 hours; $85\text{ }^{\circ}\text{C}$ / 85% RH 10% of operating power Measurement at $24\pm 4$ hours after test conclusion.	$\pm(5.0\%+0.05\Omega)$
Operational Life	AEC-Q200 Test 8 MIL-STD-202 Method 108	1,000 hours at $125\text{ }^{\circ}\text{C}$ , derated voltage applied for 1.5 hours on, 0.5 hour off, still-air required	$\pm(3.0\%+0.05\Omega)$
Resistance to Soldering Heat	AEC-Q200 Test 15 MIL-STD-202 Method 210	Condition B, no pre-heat of samples Lead-free solder; $260\pm 5\text{ }^{\circ}\text{C}$ , $10\pm 1$ seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	$\pm(1.0\%+0.05\Omega)$ No visible damage
Thermal Shock	MIL-STD-202 Method 107	$-55/+125\text{ }^{\circ}\text{C}$ Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	$\pm(1.0\%+0.05\Omega)$
ESD	AEC-Q200 Test 17 AEC-Q200-002	Human Body Model, $I_{\text{pos.}} + I_{\text{neg.}}$ discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV	$\pm(4.0\%+0.05\Omega)$

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability - Wetting	AEC-Q200 Test I8 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
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 <sub>1</sub> =+25 °C or specified room temperature t <sub>2</sub> =-55 °C or +125 °C test temperature R <sub>1</sub> =resistance at reference temperature in ohms R <sub>2</sub> =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 I	Feb. 20, 2025	-	- Upgrade TCR
Version 0	May. 10, 2022	-	- First issue of this specification



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