

DATA SHEET

HIGH VOLTAGE CHIP RESISTORS

RV series
5%, 1%

sizes 0603/0805/1206/2512

RoHS compliant



SCOPE

This specification describes RV0603/0805/1206/2512 high voltage chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- Converter
- Printer equipment
- Battery charger
- Computer
- Automotive industry
- Power supply

FEATURES

- RoHS compliant
 - Products with lead free terminations meet RoHS requirements
 - Pb-glass contained in electrodes
 - Resistor element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production
- Halogen Free Epoxy

ORDERING INFORMATION - GLOBAL PART NUMBER & I2NC

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

(1) SIZE

0603/0805/1206/2512

(2) TOLERANCE

F = ±1%
 J = ±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 L is system default code for ordering only ^(Note)

Resistance rule of global part number

Resistance code rule	Example
XXXX (10 to 97.6 KΩ)	10K = 10,000 Ω 97K6 = 97,600 Ω
XXXX (100 to 976 KΩ)	100K = 10,000Ω 976K = 976,000Ω
XMXX (1 to 9.76 MΩ)	1M = 1,000,000 Ω 9M76 = 9,760,000 Ω
XXMX (10 to 16 MΩ)	10M = 10,000,000 Ω 27M = 27,000,000 Ω

ORDERING EXAMPLE

The ordering code of a RV1206 chip resistor, value 1 MΩ with ±5% tolerance, supplied in 7-inch tape reel is: RV1206JR-071ML.

NOTE

1. All our RSMD products meet RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

PHYCOMP BRAND ordering codes

Both GLOBAL PART NUMBER (preferred) and I2NC (traditional) codes are acceptable to order Phycomp brand products.

GLOBAL PART NUMBER (PREFERRED)

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2.

I2NC CODE

SIZE	TYPE	2322 XXX XXXXX L				EMBOSSED (2) TAPE ON REEL 4,000	PAPER/PE (2) TAPE ON REEL (units) 5,000
		(1)	(2)	(3)	(4)		
		START IN (1)	TOL. (%)	RESISTANCE RANGE			
0805	VRC11	2322	±5%	100K to 10M Ω	-	792 61xxx	
	VRC12	2322	±1%	100K to 10M Ω	-	793 6xxxx	
1206	VRC01	2322	±5%	100K to 27M Ω	-	790 61xxx	
	VRC02	2322	±1%	100K to 10M Ω	-	791 6xxxx	
2512	VPRC221	2322	±5%	4.7M to 16M Ω	-	762 98xxx	

Resistance decade (3)	Last digit
0.01 to 0.0976 X	0
0.1 to 0.976 X	7
1 to 9.76 X	8
10 to 97.6 X	9
100 to 976 X	1
1 to 9.76 KX	2
10 to 97.6 KX	3
100 to 976 KX	4
1 to 9.76 MX	5
10 to 97.6 MX	6

- (1) The resistors have a 12-digit ordering code starting with 2322.
- (2) The subsequent 4 or 5 digits indicate the resistor tolerance and packaging.
- (3) The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of I2NC".
- (4) "L" is optional symbol (Note).

Example:

0.02 X	=	0200 or 200
0.3 X	=	3007 or 307
1 X	=	1008 or 108
33 KX	=	3303 or 333
10 MX	=	1006 or 106

ORDERING EXAMPLE

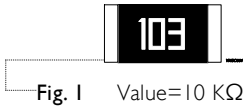
The ordering code of a VRC01 resistor, value 1 MX with ±5% tolerance, supplied in tape of 5,000 units per reel is: 232279061105L or RV1206JR-071ML.

NOTE

- 1. All our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
- 2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

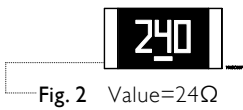
MARKING

RV0603/0805/1206/2512



E-24 series: 3 digits, ±5%
First two digits for significant figure and 3rd digit for number of zeros

RV0603

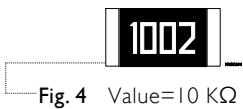


E-24 series: 3 digits, ±1%
One short bar under marking letter



E-96 series: 3 digits, ±1%
First two digits for E-96 marking rule and 3rd letter for number of zeros

RV0805/1206/2512



Both E-24 and E-96 series: 4 digits, ±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

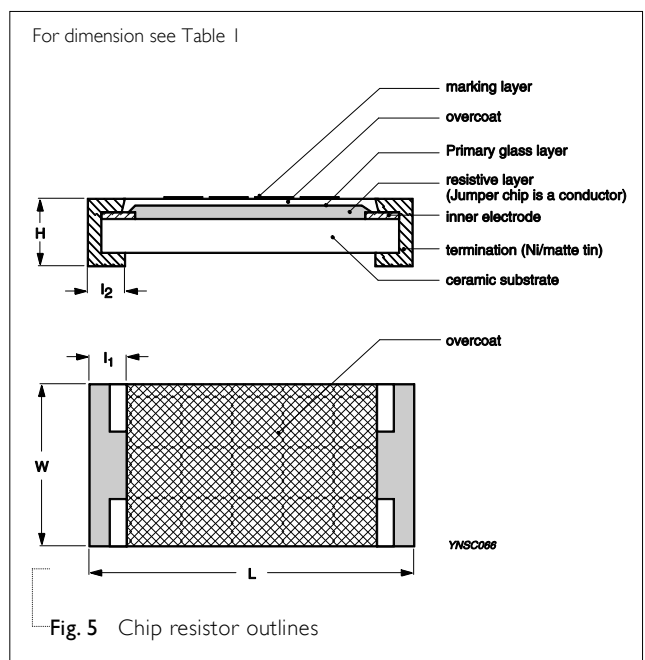
The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environment 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)	l ₁ (mm)	l ₂ (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	0.40 ±0.20	0.45 ±0.20
RV2512	6.35 ±0.10	3.10 ±0.15	0.55 ±0.10	0.60 ±0.20	0.50 ±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) 10KΩ to 1MΩ	1/10W			350V	500V	500V
	1% (E-24/E-96) 10KΩ to 1MΩ						
RV0805	5% (E-24) 100K Ω to 10M Ω	1/8 W	-55 °C to +155 °C	400 V	800 V	800 V	±200 ppm/°C
	1% (E-24/E-96) 100K Ω to 10M Ω						
RV1206	5% (E-24) 100K Ω to 27M Ω	1/4 W		500 V	1,000 V	1,000 V	
	1% (E-24/E-96) 100K Ω to 10M Ω						
RV2512	5% (E-24) 4.7M Ω to 16M Ω	1 W		500 V	1,000 V	1,000 V	

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	RV2512
Paper/PE taping reel (R)	7" (178 mm)	5,000	5,000	5,000	---
Embossed taping reel (K)	7" (178 mm)	---	---	---	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;
 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 (Ω)

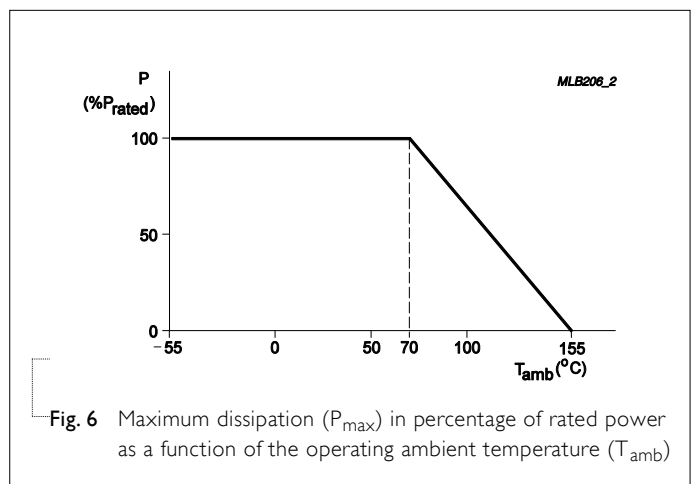


Fig. 6 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

TESTS AND REQUIREMENTS
Table 4 Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Life/ Operational Life/ Endurance	MIL-STD-202G-method 108A IEC 60115-1 4.25.1 JIS C 5202-7.10	1,000 hours at 70±5 °C applied RCWV 1.5 hours on, 0.5 hour off, still air required	±(2%+0.05 Ω)
High Temperature Exposure/ Endurance at upper category temperature	MIL-STD-202G-method 108A IEC 60115-1 4.25.3 JIS C 5202-7.11	1,000 hours at maximum operating temperature depending on specification, unpowered No direct impingement of forced air to the parts Tolerances: 155±3 °C	±(1%+0.05 Ω)
Moisture Resistance	MIL-STD-202G-method 106F IEC 60115-1 4.24.2	Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered Parts mounted on test-boards, without condensation on parts Measurement at 24±2 hours after test conclusion	±(2%+0.05 Ω)
Thermal Shock	MIL-STD-202G-method 107G	-55/+155 °C Note: Number of cycles required is 300. Devices unmounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air	±(0.5%+0.05 Ω) for 10 KΩ to 10 MΩ ±(1%+0.05 Ω) for others
Short time overload	MIL-R-55342D-para 4.7.5 IEC60115-1 4.13	2.5 times RCWV or maximum overload voltage whichever is less for 5 sec at room temperature	±(2%+0.05 Ω) No visible damage
Board Flex/ Bending	IEC60115-1 4.33	Device mounted on PCB test board as described, only 1 board bending required Bending for 0603 & 0805: 3mm 1206 & above: 2mm Holding time: minimum 60 seconds Ohmic value checked during bending	±(1%+0.05 Ω) No visible damage

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS
Solderability - Wetting	IPC/JEDECJ-STD-002B test B IEC 60068-2-58	Electrical Test not required	Well tinned ($\geq 95\%$ covered) No visible damage
		Magnification 50X SMD conditions: 1 st step: method B, aging 4 hours at 155 °C dry heat 2 nd step: leadfree solder bath at 245±3 °C Dipping time: 3±0.5 seconds	
- Leaching	IPC/JEDECJ-STD-002B test D IEC 60068-2-58	Leadfree solder, 260 °C, 30 seconds immersion time	No visible damage
- Resistance to Soldering Heat	MIL-STD-202G-method 210F IEC 60068-2-58	Condition B, no pre-heat of samples	±(1%+0.05 Ω)
		Leadfree solder, 270 °C, 10 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol	No visible damage

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 3	Aug. 26, 2013	-	- Add RV0603
Version 2	Sep 29, 2011	-	- Type error correction
Version 1	Nov 19, 2008	-	- Change to dual brand datasheet that describes RV0805/1206/2512 with RoHS compliant - Description of "Halogen Free Epoxy" added - Define global part number
Version 0	Feb 14, 2006	-	- New datasheet for high voltage chip resistors sizes of 0805/1206/2512, 5%, 1% tolerance with lead-free terminations - Replace the 0805/1206/2512 parts of pdf files: VRC01_02_11_12_51_3.pdf, VPRC221_5_3.pdf, and combine into a document. - Test method and procedure updated - PE tape added (paper tape will be replaced by PE tape)

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