

# DATA SHEET

## HIGH VOLTAGE CHIP RESISTORS

RV series (Pb Free)  
5%, 1%  
sizes 0805/1206/2512



SCOPE

This specification describes RV0805/1206/2512 high voltage chip resistors with lead-free terminations made by thick film process.

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

**YAGEO ORDERING CODE****CTC CODE**

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

**(1) SIZE**

0805/1206/2512

**(2) TOLERANCE**

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**

5R6, 56R, 560R, 56K, 27M

**(7) RESISTOR TERMINATIONS <sup>(a)</sup>**

L = Lead-free terminations (matte tin)

APPLICATIONS

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

**ORDERING EXAMPLE**

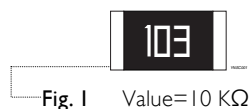
The ordering code of a RV1206 chip resistor, value 1M  $\Omega$  with  $\pm 5\%$  tolerance, supplied in 7-inch tape reel is: RV1206JR-071ML.

**NOTE**

- The “L” at the end of the code is only for ordering. On the reel label, the standard CTC or I2NC will be mentioned an additional stamp “LFP”= lead free production.
- Products with lead in terminations fulfil the same requirements as mentioned in this datasheet.
- Products with lead in terminations will be phased out in the coming months (before July 1st, 2006)

MARKING

RV0805/1206/2512



E-24 series: 3 digits

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



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

First three digits for significant figure and 4th digit for number of zeros

For marking codes, please see EIA-marking code rules in data sheet “Chip resistors marking”.

CONSTRUCTION

The resistors are constructed out of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a high voltage resistive paste. The composition of the paste is adjusted to give the approximate required resistance and laser cutting of this resistive layer that achieves tolerance trims the value. The resistive layer is covered with an overcoat and printed with the resistance value. Finally, the two external terminations (matte tin) are added. See fig. 3.

DIMENSIONS

Table I For outlines see fig. 3

| TYPE   | L (mm)          | W (mm)          | H (mm)          | $l_1$ (mm)      | $l_2$ (mm)      |
|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| RV0805 | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.50 \pm 0.10$ | $0.35 \pm 0.20$ | $0.35 \pm 0.20$ |
| RV1206 | $3.10 \pm 0.10$ | $1.60 \pm 0.15$ | $0.55 \pm 0.10$ | $0.45 \pm 0.20$ | $0.40 \pm 0.20$ |
| RV2512 | $6.35 \pm 0.10$ | $3.10 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.50 \pm 0.20$ |

OUTLINES

For dimension see Table I

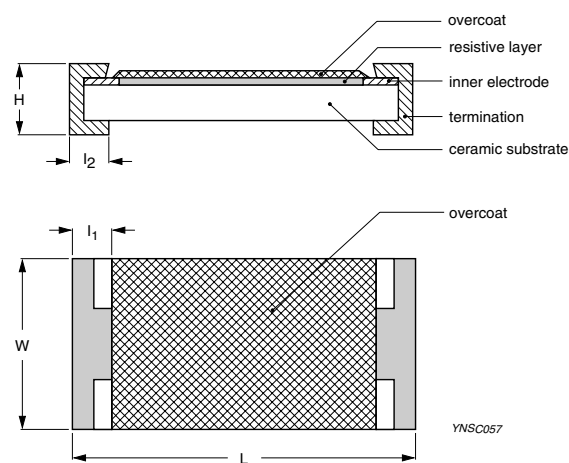


Fig. 3 Chip resistor outlines

**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 |
| RV0805 | 5% (E-24) 100K $\Omega$ to 10M $\Omega$      | 1/8 W           | -55 °C to +155 °C           | 400 V                | 800 V                 | 800 V                           | $\pm 200$ ppm/°C                      |
|        | 1% (E-24/E-96) 100K $\Omega$ to 10M $\Omega$ |                 |                             | 500 V                | 1,000 V               | 1,000 V                         |                                       |
| RV1206 | 5% (E-24) 100K $\Omega$ to 27M $\Omega$      | 1/4 W           | -55 °C to +155 °C           | 500 V                | 1,000 V               | 1,000 V                         | $\pm 200$ ppm/°C                      |
|        | 1% (E-24/E-96) 100K $\Omega$ to 10M $\Omega$ |                 |                             |                      |                       |                                 |                                       |
| RV2512 | 5% (E-24) 4.7M $\Omega$ to 16M $\Omega$      | 1 W             |                             | 500 V                | 1,000 V               | 1,000 V                         |                                       |

**FOOTPRINT AND SOLDERING PROFILES**

For recommended footprint and soldering profiles, please see the special data sheet “Chip resistors mounting”.

**ENVIRONMENTAL DATA**

For material declaration information (IMDS-data) of the products, please see the separated info “Environmental data” conformed to EU RoHS.

**PACKING STYLE AND PACKAGING QUANTITY**

Table 3 Packing style and packaging quantity

| PACKING STYLE            | REEL DIMENSION | RV0805 | RV1206 | RV2512 |
|--------------------------|----------------|--------|--------|--------|
| Paper/PE taping reel (R) | 7" (178 mm)    | 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 see the special data sheet “Packing” document.

## FUNCTIONAL DESCRIPTION

### PRODUCT CHARACTERIZATION

Standard values of nominal resistance are taken from the E24 series or E96 series for resistors with a tolerance of 5% or 1%. The values of the E24/E96 series are in accordance with "IEC publication 60063".

### OPERATING TEMPERATURE RANGE

Range: -55°C to +155°C

### LIMITING VALUES

Table 4

| TYPE   | LIMITING VOLTAGE <sup>(1)</sup><br>(V) | LIMITING POWER <sup>(2)</sup><br>(W) |
|--------|----------------------------------------|--------------------------------------|
| VR0805 | 400                                    | 1/8                                  |
| VR1206 | 500                                    | 1/4                                  |
| VR2512 | 500                                    | 1                                    |

### NOTES

1. The maximum voltage that may be continuously applied to the resistor element, see "IEC publication 60115-8" and "IEC publication 60115-2".
2. Each type rated power at 70°C.

### POWER RATING

The power that the resistor can dissipate depends on the operating temperature; see Fig. 4.

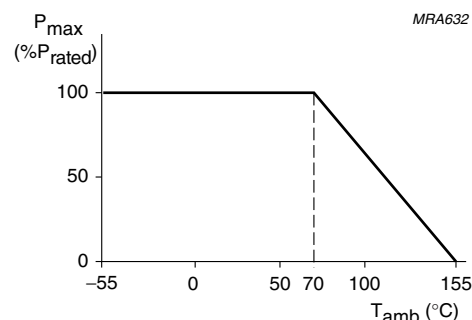


Fig. 4 Maximum dissipation ( $P_{max}$ ) in percentage of rated power as a function of the operating ambient temperature ( $T_{amb}$ )

### 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 ( $\Omega$ )

## TESTS AND REQUIREMENTS

Table 5 Test condition, procedure and requirements

| TEST                                                    | TEST METHOD                                     | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                | REQUIREMENTS                                                                   |
|---------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Temperature<br>Coefficient of<br>Resistance<br>(T.C.R.) | MIL-STD-202F-method 304;<br>JIS C 5202-4.8      | At +25/−55 °C and +25/+125 °C<br><br>Formula:<br>$T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$<br>Where<br>t <sub>1</sub> =+25 °C or specified room temperature<br>t <sub>2</sub> =−55 °C or +125 °C test temperature<br>R <sub>1</sub> =resistance at reference temperature in ohms<br>R <sub>2</sub> =resistance at test temperature in ohms | Refer to table 2                                                               |
| Thermal Shock                                           | MIL-STD-202F-method 107G;<br>IEC 60115-1 4.19   | At −65 (+0/−10) °C for 2 minutes and at +155<br>(+10/−0) °C for 2 minutes; 25 cycles                                                                                                                                                                                                                                                                                     | ±(0.5%+0.05 Ω) for 1% tol.<br>±(1.0%+0.05 Ω) for 5% tol.                       |
| Low<br>Temperature<br>Operation                         | MIL-R-55342D-Para 4.7.4                         | At −65 (+0/−5) °C for 1 hour; RCWV applied<br>for 45 (+5/−0) minutes                                                                                                                                                                                                                                                                                                     | ±(0.5%+0.05 Ω) for 1% tol .<br>±(1.0%+0.05 Ω) for 5% tol.<br>No visible damage |
| Short Time<br>Overload                                  | MIL-R-55342D-Para 4.7.5;<br>IEC 60115-1 4.13    | 2.5 × RCWV applied for 5 seconds<br>(V <sub>otage</sub> ≤ 2 × V <sub>max</sub> ) at room temperature                                                                                                                                                                                                                                                                     | ±(1.0%+0.05 Ω) for 1% tol.<br>±(2.0%+0.05 Ω) for 5% tol.<br>No visible damage  |
| Insulation<br>Resistance                                | MIL-STD-202F-method 302;<br>IEC 60115-1 4.6.1.1 | One DC voltage applied for 1 minute<br>Details see below table 6                                                                                                                                                                                                                                                                                                         | ≥10 GΩ                                                                         |
| Dielectric<br>Withstand<br>Voltage                      | MIL-STD-202F-method 301;<br>IEC 60115-1 4.6.1.1 | One DC voltage applied for 1 minute<br>Details see below table 6                                                                                                                                                                                                                                                                                                         | No breakdown or flashover                                                      |
| Resistance to<br>Soldering<br>Heat                      | MIL-STD-202F-method 210C;<br>IEC 60115-1 4.18   | Unmounted chips; 260 ±5 °C for 10 ±1<br>seconds                                                                                                                                                                                                                                                                                                                          | ±(0.5%+0.05 Ω) for 1% tol.<br>±(1.0%+0.05 Ω) for 5% tol.<br>No visible damage  |
| Life                                                    | MIL-STD-202F-method 108A;<br>IEC 60115-1 4.25.1 | At 70±2 °C for 1,000 hours; RCWV applied for<br>1.5 hours on and 0.5 hour off                                                                                                                                                                                                                                                                                            | ±(1%+0.05 Ω) for 1% tol.<br>±(3%+0.05 Ω) for 5% tol.                           |

Table 5 Test condition, procedure and requirements (continued)

| TEST                     | TEST METHOD                                     | PROCEDURE                                                                                              | REQUIREMENTS                                                                                      |       |
|--------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------|
| Solderability            | MIL-STD-202F-method 208A;<br>IEC 60115-1 4.17   | Solder bath at $245 \pm 3$ °C<br>Dipping time: $2 \pm 0.5$ seconds                                     | Well tinned ( $\geq 95\%$ covered)<br>No visible damage                                           |       |
| Bending Strength         | JIS C 5202.6.14;<br>IEC 60115-1 4.15            | Resistors mounted on a 90 mm glass epoxy resin PCB (FR4)<br>Bending: 5 mm                              | $\pm(1.0\%+0.05 \Omega)$ for 1% tol.<br>$\pm(1.0\%+0.05 \Omega)$ for 5% tol.<br>No visible damage |       |
| Resistance to Solvent    | MIL-STD-202F-method 215;<br>IEC 60115-1 4.29    | Isopropylalcohol ( $C_3H_7OH$ ) or dichloromethane ( $CH_2Cl_2$ ) followed by brushing                 | No smeared                                                                                        |       |
| Noise                    | JIS C 5202 5.9;<br>IEC 60115-1 4.12             | Maximum voltage ( $V_{rms}$ ) applied.                                                                 | Resistors range                                                                                   | Value |
|                          |                                                 |                                                                                                        | $R < 100 \Omega$                                                                                  | 10 dB |
|                          |                                                 |                                                                                                        | $100 \Omega \leq R < 1 K\Omega$                                                                   | 20 dB |
|                          |                                                 |                                                                                                        | $1 K\Omega \leq R < 10 K\Omega$                                                                   | 30 dB |
|                          |                                                 |                                                                                                        | $10 K\Omega \leq R < 100 K\Omega$                                                                 | 40 dB |
|                          |                                                 |                                                                                                        | $100 K\Omega \leq R < 1 M\Omega$                                                                  | 46 dB |
|                          |                                                 |                                                                                                        | $1 M\Omega \leq R \leq 22 M\Omega$                                                                | 48 dB |
| Humidity (steady state)  | JIS C 5202 7.5;<br>IEC 60115-8 4.24.8           | 1,000 hours; $40 \pm 2$ °C; $93(+2/-3)\%$ RH<br>RCWV applied for 1.5 hours on and 0.5 hour off         | $\pm(0.5\%+0.05 \Omega)$ for 1% tol.<br>$\pm(2.0\%+0.05 \Omega)$ for 5% tol.                      |       |
| Leaching                 | EIA/IS 4.13B;<br>IEC 60115-8 4.18               | Solder bath at $260 \pm 5$ °C<br>Dipping time: $30 \pm 1$ seconds                                      | No visible damage                                                                                 |       |
| Intermittent Overload    | JIS C 5202 5.8                                  | At room temperature; $2.5 \times$ RCWV applied for 1 second on and 25 seconds off; total 10,000 cycles | $\pm(1.0\%+0.05 \Omega)$ for 1% tol.<br>$\pm(2.0\%+0.05 \Omega)$ for 5% tol.                      |       |
| Resistance to Vibration  | On request                                      | On request                                                                                             |                                                                                                   |       |
| Moisture Resistance Heat | MIL-STD-202F-method 106F;<br>IEC 60115-1 4.24.2 | 42 cycles; total 1,000 hours<br>Shown as Fig. 5                                                        | $\pm(0.5\%+0.05\Omega)$ for 1% tol.<br>$\pm(2.0\%+0.05\Omega)$ for 5% tol.<br>No visible damage   |       |

Table 6 Criteria of rated continued working voltage and overload voltage

| TYPE                 | RV0805 | RV1206 | RV2512 |
|----------------------|--------|--------|--------|
| Voltage (DC/unit: V) | 800    | 1,000  | 1,000  |

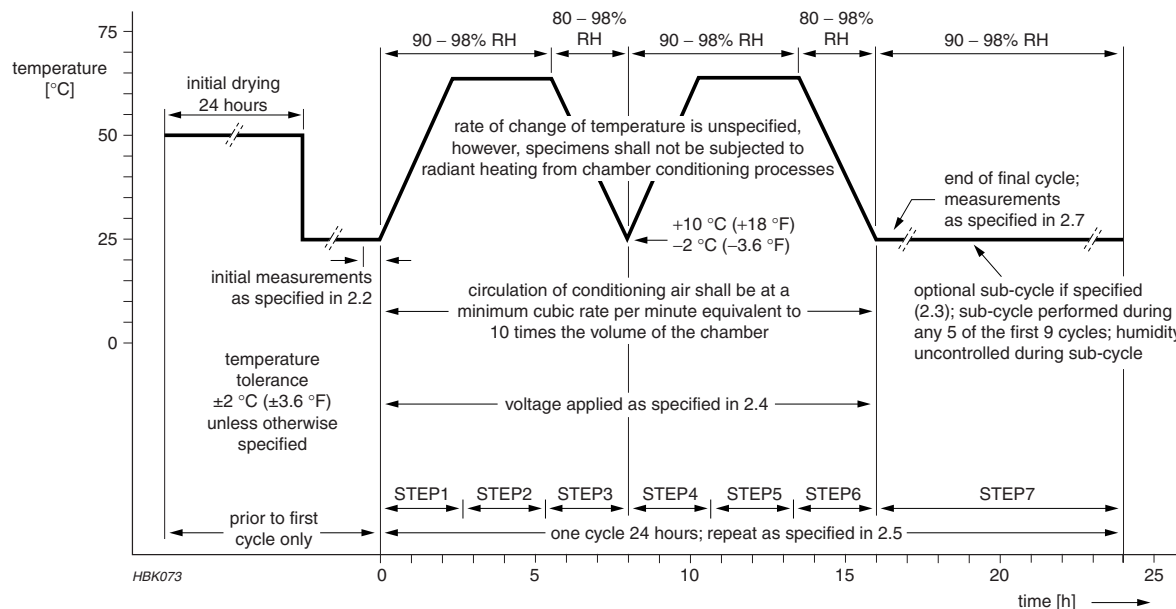


Fig. 5 Moisture resistance test requirements

REVISION HISTORYREVISION    DATE            CHANGE NOTIFICATION    DESCRIPTION

|           |              |   |                                                                                                                       |
|-----------|--------------|---|-----------------------------------------------------------------------------------------------------------------------|
| Version 0 | Feb 14, 2006 | - | - New datasheet for high voltage chip resistors sizes of 0805/1206/2512, 5%, 1% tolerance with lead-free terminations |
|-----------|--------------|---|-----------------------------------------------------------------------------------------------------------------------|