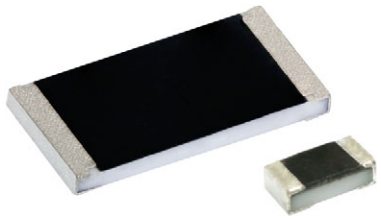
# Sulfur Resistant Thick Film Chip Resistors



## LINKS TO ADDITIONAL RESOURCES

3D Models

The sulfur resistant, thick film chip resistors series is the perfect choice for most fields of harsh environment electronics operation, where reliability and stability are of major concern. Typical applications include automotive, ADAS, industrial, and commercial applications which operate in harsh environment.

## FEATURES

- Superior resistance against sulfur containing atmosphere, according to ASTM B809-95 and ANSI/EIA-977
- Stability at different environmental conditions $\Delta R/R \leq 1$ % (1000 h rated power at 70 °C)
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

- Automotive
- ADAS
- Industrial
- Commercial

## TECHNICAL SPECIFICATIONS

| DESCRIPTION | RCA0402 e3 | RCA0603 e3 | RCA0805 e3 | RCA1206 e3 | RCA1210 e3 | RCA1218 e3 | RCA2010 e3 | RCA2512 e3 |
|---|---|---|---|---|---|---|---|---|
| Imperial size | 0402 | 0603 | 0805 | 1206 | 1210 | 1218 | 2010 | 2512 |
| Metric size code | RR1005M | RR1608M | RR2012M | RR3216M | RR3225M | RR3246M | RR5025M | RR6332M |
| Resistance range | 1 Ω to 10 MΩ; jumper (0 Ω) | | | | | 1 Ω to 2.2 MΩ; jumper (0 Ω) | 1 Ω to 10 MΩ; jumper (0 Ω) | |
| Resistance tolerance | ± 5 %; ± 1 %; ± 0.5 % | | | | | | | |
| Temperature coefficient | ± 200 ppm/K; ± 100 ppm/K; ± 50 ppm/K | | | | | | | |
| Rated dissipation, $P_{70}$ (1) | 0.063 W | 0.10 W | 0.125 W | 0.25 W | 0.5 W | 1.0 W | 0.75 W | 1.0 W |
| Operating voltage, $U_{max.}$ $AC_{RMS}$/DC | 50 V | 75 V | 150 V | 200 V | 200 V | 200 V | 400 V | 500 V |
| Permissible film temperature, $\vartheta_{F\ max.}$ (1) | 155 °C | | | | | | | |
| Operating temperature range | -55 °C to +155 °C | | | | | | | |
| Maximum resistance change at $P_{70}$ for resistance range, $\lvert\Delta R/R\rvert$ after: 1000 h | ≤ 1.0 % | | | | | | | |
| Permissible voltage against ambient (insulation): 1 min, $U_{ins}$ | 75 V | 100 V | 200 V | 300 V | 300 V | 300 V | 300 V | 300 V |
| Failure rate: $FIT_{observed}$ | ≤ 0.1 x $10^{-9}$/h | | | | | | | |

**Note**

(1) Please refer to APPLICATION INFORMATION below

## APPLICATION INFORMATION

When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.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| TEMPERATURE COEFFICIENT AND RESISTANCE RANGE | | | | |
|---|---|---|---|---|
| **TYPE / SIZE** | **TCR** | **TOLERANCE** | **RESISTANCE** | **E-SERIES** |
| **RCA0402 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 200 ppm/K | ± 1 % | 1.0 Ω to 9.76 Ω | E24; E96 |
| | ± 100 ppm/K | ± 1 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 1.0 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 1.0 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 1.5 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA0603 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 10 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 2.0 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA0805 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 10 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 2.5 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA1206 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 10 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 3.5 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA1210 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 1.0 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 1.0 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 5.0 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA1218 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 2.2 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 2.2 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 100 Ω to 2.2 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 2.2 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 7.0 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA2010 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 10 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 6.0 A | ≤ 20 mΩ | 0 Ω | - |
| **RCA2512 e3** | ± 200 ppm/K | ± 5 % | 1.0 Ω to 10 MΩ | E24 |
| | ± 100 ppm/K | ± 1 % | 1.0 Ω to 10 MΩ | E24; E96 |
| | ± 100 ppm/K | ± 0.5 % | 10 Ω to 10 MΩ | E24; E96 |
| | ± 50 ppm/K | ± 0.5 %; ± 1 % | 100 Ω to 10 MΩ | E24; E96 |
| | Jumper, $I_{max.}$ = 7.0 A | ≤ 20 mΩ | 0 Ω | - |

**Note**

- The temperature coefficient of resistance (TCR) is not specified for 0 Ω jumpers


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## PACKAGING

| TYPE / SIZE | CODE | QUANTITY | PACKAGING STYLE | WIDTH | PITCH | PACKAGING DIMENSIONS |
|---|---|---|---|---|---|---|
| **RCA0402 e3** | ED = ET7<br>EE = EF4 | 10 000<br>50 000 | Paper tape according to IEC 60286-3, type 1a | 8 mm | 2 mm | Ø 180 mm / 7"<br>Ø 330 mm / 13" |
| **RCA0603 e3** | EA = ET1<br>EC = ET6 | 5000<br>20 000 | | 8 mm | 4 mm | Ø 180 mm / 7"<br>Ø 330 mm / 13" |
| **RCA0805 e3** | EA = ET1<br>EC = ET6 | 5000<br>20 000 | | 8 mm | 4 mm | Ø 180 mm / 7"<br>Ø 330 mm / 13" |
| **RCA1206 e3** | EA = ET1<br>EC = ET6 | 5000<br>20 000 | | 8 mm | 4 mm | Ø 180 mm / 7"<br>Ø 330 mm / 13" |
| **RCA1210 e3** | EA = ET1<br>EC = ET6 | 5000<br>20 000 | | 8 mm | 4 mm | Ø 180 mm / 7"<br>Ø 330 mm / 13" |
| **RCA1218 e3** | EK = ET9 | 4000 | Blister tape according to IEC 60286-3, type 2a | 12 mm | 4 mm | Ø 180 mm / 7" |
| **RCA2010 e3** | EF = E02 | 4000 | | 12 mm | 4 mm | Ø 180 mm / 7" |
| **RCA2512 e3** | EG = E67<br>EH = E82 | 2000<br>4000 | | 12 mm | 8 mm<br>4 mm | Ø 180 mm / 7" |

## PART NUMBER AND PRODUCT DESCRIPTION

**Part Number: RCA080510K0FKEA**
**Part Number: RCA08050000ZSEC**

| R | C | A | 0 | 8 | 0 | 5 | 1 | 0 | K | 0 | F | K | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TYPE / SIZE | VALUE | TOLERANCE | TCR | PACKAGING |
|---|---|---|---|---|
| **RCA0402**<br>**RCA0603**<br>**RCA0805**<br>**RCA1206**<br>**RCA1210**<br>**RCA1218**<br>**RCA2010**<br>**RCA2512** | **R** = decimal<br>**K** = thousand<br>**M** = million<br>**0000** = 0 Ω jumper | **D** = ± 0.5 %<br>**F** = ± 1 %<br>**J** = ± 5 %<br>**Z** = jumper | **H** = ± 50 ppm/K<br>**K** = ± 100 ppm/K<br>**N** = ± 200 ppm/K<br>**S** = jumper | **EA, EC, ED, EE, EF, EG, EH, EK** |

**Product Description: RCA0805 100 10K 1 % ET1 e3**
**Product Description: RCA0805 0R0 ET6 e3**

| RCA0805 | 100 | 10K | 1 % | ET1 | e3 |
|---|---|---|---|---|---|
| TYPE / SIZE | TCR | RESISTANCE | TOLERANCE | PACKAGING | LEAD (Pb)-FREE |
| **RCA0402**<br>**RCA0603**<br>**RCA0805**<br>**RCA1206**<br>**RCA1210**<br>**RCA1218**<br>**RCA2010**<br>**RCA2512** | **± 50** ppm/K<br>**± 100** ppm/K<br>**± 200** ppm/K | **10R** = 10 Ω<br>**10K** = 10 kΩ<br>**1M** = 1 MΩ<br>**0R0** = jumper | **± 0.5 %**<br>**± 1 %**<br>**± 5 %** | **ET1, ET6, ET7, EF4, E02, E67, E82, ET9** | **e3** = pure tin termination finish |


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## DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A cermet film layer and a glass-over are deposited on a high grade ($Al_2O_3$) ceramic substrate with its prepared inner contacts on both sides. A special laser is used to achieve the target value by smoothly fine trimming the resistive layer without damaging the ceramics. A special process is used to ensure resistor long term operation in harsh environment (sulfur atmosphere). The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure on 100 % of the individual chip resistors. Only accepted products are laid directly into the tape in accordance with **IEC 60286-3 Type 1a and Type 2a** [(1)].

## ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering wave, reflow or vapor phase as shown in **IEC 61760-1** [(1)]. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings, potting compounds and their processes, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system.

The resistors are RoHS-compliant, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years. The immunity of the plating against tin whisker growth has been proven under extensive testing.

## MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein [(2)]
- The Global Automotive Declarable Substance List (GADSL) [(3)]
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) [(4)] for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

## APPROVALS

The resistors are qualified according to AEC-Q200. Where applicable, the resistors are tested in accordance with **EN 140401-802** which refers to **EN 60115-1**, **EN 60115-8** and the variety of environmental test procedures of the **IEC 60068** [(1)] series.

## RELATED PRODUCTS

D/CRCW e3 series is not designed for sulfur-containing environment applications. For ordering D/CRCW e3 products please refer to latest edition of datasheet: www.vishay.com/doc?20035.

For products with sulfur resistance, superior surge and pulse performance, please refer to datasheet:

RCA-IF e3, Pulse Proof Thick Film Chip Resistors www.vishay.com/doc?20059.

For products with sulfur resistance and high power rating, please refer to datasheet:

RCA-HP e3, Pulse Proof High Power Thick Film Chip Resistors
www.vishay.com/doc?20067.

**Notes**

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents
(2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at http://std.iec.ch/iec62474
(3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org
(4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at http://echa.europa.eu/candidate-list-table


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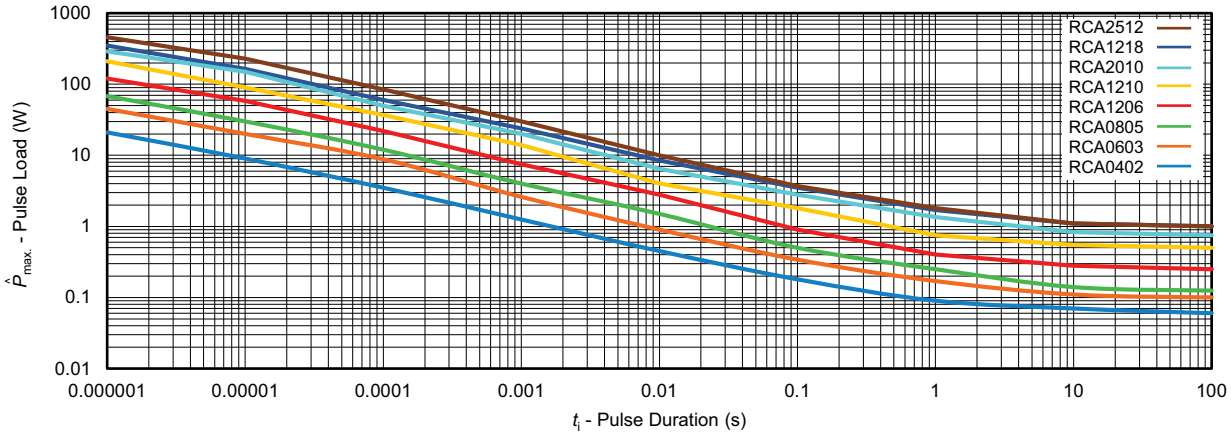
## FUNCTIONAL PERFORMANCE

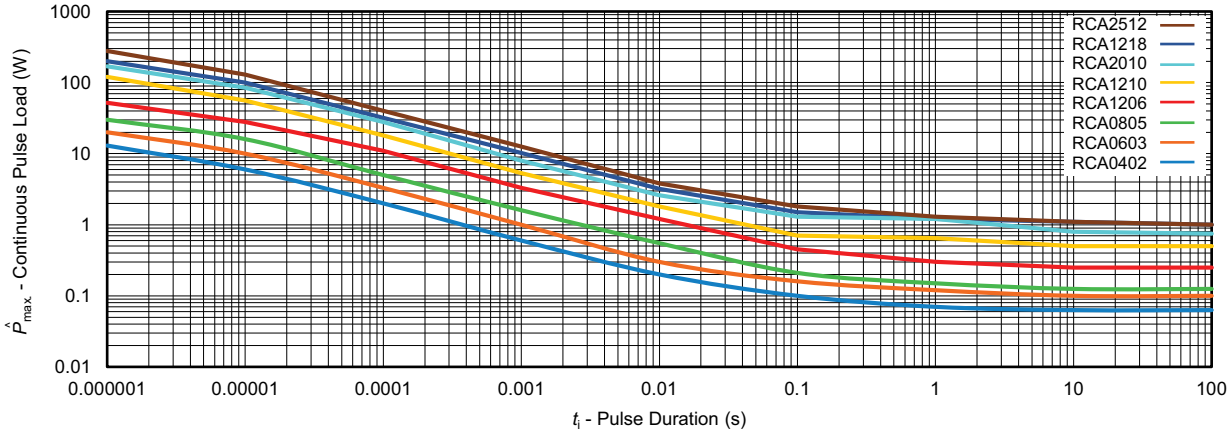
| PERFORMANCE IN SULFUR-CONTAINING AMBIANCE | | | |
|---|---|---|---|
| **TEST NAME** | **HUMID SULFUR VAPOR TEST** | **HUMID SULFUR VAPOR TEST** | **DRY SULFUR TEST FOS-105** |
| Reference specification | ASTM B809-95 | ASTM B809-95 accelerated conditions | ANSI/EIA-977 |
| Test conditions (temperature, humidity) | 60 °C ± 2 °C<br>85 % ± 4 % RH | 90 °C ± 2 °C<br>74 % ± 7 % RH | 105 °C ± 2 °C<br>RH not specified, not applicable |
| Aggressive agent | Sulfur (saturated vapor) | Sulfur (saturated vapor) | Sulfur, sublimed |
| Failure criteria in VI under magnification | No silver sulfide growth at the interface between termination and protective overcoat. No signs of mechanical damage. | No silver sulfide growth at the interface between termination and protective overcoat. No signs of mechanical damage. | Not applicable |
| Failure criteria in electrical test | ≤ (± 1 % $R$ + 0.05 Ω) | ≤ (± 1 % $R$ + 0.05 Ω) | ≤ (± 1 % $R$ + 0.05 Ω) |
| Test duration | 8000 h | 1000 h | 750 h |

### Single Pulse




Maximum pulse load, single pulse; applicable if $\overline{P} \rightarrow 0$ and n < 1000 and $\hat{U} = \hat{U}_{max.}$;
for permissible resistance change equivalent to 8000 h operation

### Continuous Pulse




Maximum pulse load, continuous pulses; applicable if $\overline{P} \leq P\ (\vartheta_{amb})$ and $\hat{U} = \hat{U}_{max.}$;
for permissible resistance change equivalent to 8000 h operation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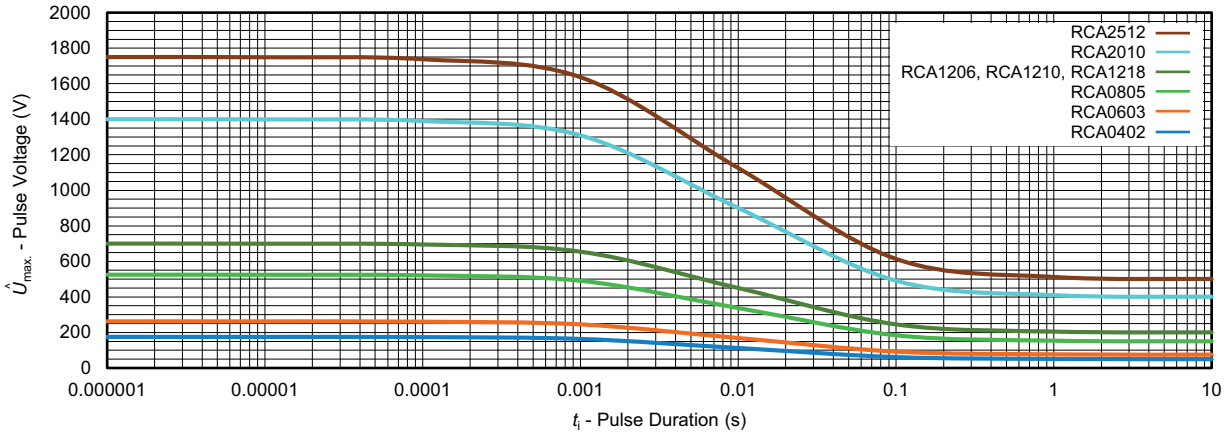
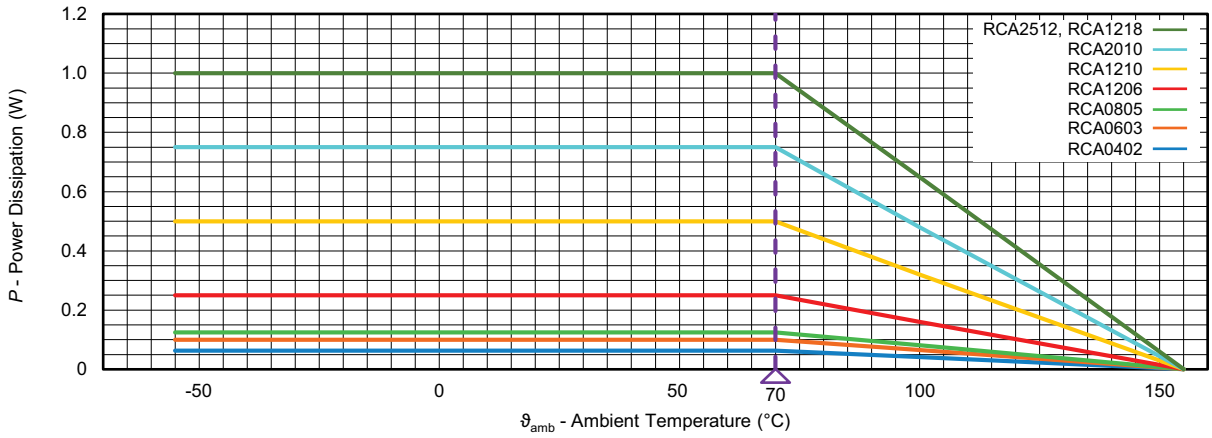
**Pulse Voltage**




Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} = \hat{P}_{max.}$;
for permissible resistance change equivalent to 8000 h operation

**Derating**





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## TESTS AND REQUIREMENTS

All executed tests are carried out in accordance with the following specifications:

EN 60115-1, generic specification

EN 60115-8 (successor of EN 140400), sectional specification

EN 140401-802, detail specification

IEC 60068-2-xx, test methods

The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-802. The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 4.3, whereupon the following values are applied:

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on boards in accordance with EN 60115-8, 2.4.2 unless otherwise specified.

**TEST PROCEDURES AND REQUIREMENTS**

| EN 60115-1 CLAUSE | IEC 60068-2 (1) TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R$) | |
|---|---|---|---|---|---|
| | | | | SIZE 0402 | SIZE 0603 TO 2512 |
| | | | Stability for product types: | STABILITY CLASS 2 OR BETTER | |
| | | | RCA e3 | 1 Ω to 10 MΩ | |
| 6.1 | - | Measurements of resistance and tolerance | - | ± 5 %; ± 1 %; ± 0.5 % | |
| 6.2 | - | Temperature coefficient of resistance | (20 / -55 / 20) °C and (20 / 155 / 20) °C | ± 200 ppm/K; ± 100 ppm/K; ± 50 ppm/K | |
| 7.1 | - | Endurance at rated temperature 70 °C | $U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off<br>70 °C; 1000 h | ± (1 % $R$ + 0.05 Ω) | ± (0.5 % $R$ + 0.05 Ω) |
| 7.3 | - | Endurance at maximum temperature | 155 °C, 1000 h | ± (0.5 % $R$ + 0.05 Ω) | |
| 10.4 | 78 (Cab) | Damp heat, steady state | (40 ± 2) °C; (93 ± 3) % RH; 56 days; | ± (1 % $R$ + 0.05 Ω) | ± (0.5 % $R$ + 0.05 Ω) |
| 10.5 | 67 (Cy) | Damp heat, steady state, accelerated | (85 ± 2) °C; (85 ± 5) % RH; $U = \sqrt{0.1 \times P_{85} \times R}$; $U \leq 100$ V; 1000 h | ± (1 % $R$ + 0.05 Ω) | |
| 10.3 | - | Climatic sequence: | - | ± (1 % $R$ + 0.05 Ω) | |
| 10.3.4.2 | 2 (Ba) | Dry heat | 125 °C; 16 h | | |
| 10.3.4.3 | 30 (Db) | Damp heat, cyclic | 55 °C; ≥ 90 % RH; 24 h; 1 cycle | | |
| 10.3.4.4 | 1 (Ab) | Cold | -55 °C; 2 h | | |
| 10.3.4.5 | 13 (M) | Low air pressure | 1 kPa; 1 h; (25 ± 10) °C<br>55 °C; > 90 % RH | | |
| 10.3.4.6 | 30 (Db) | Damp heat, cyclic | 24 h; 5 cycles | | |
| 10.3.4.7 | - | DC load | $U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1 min; | | |
| - | 1 (Aa) | Cold | -55 °C; 2 h | ± (0.25 % $R$ + 0.05 Ω) | |
| 10.1 | 14 (Na) | Rapid change of temperature | 30 min at -55 °C and 30 min at 125 °C; 1000 cycles | ± (1 % $R$ + 0.05 Ω) | |
| 8.1 | - | Short-term overload | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; whichever is the less severe; 5 s | ± (2 % $R$ + 0.05 Ω) | |


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| TEST PROCEDURES AND REQUIREMENTS | | | | | |
|---|---|---|---|---|---|
| EN 60115-1 CLAUSE | IEC 60068-2 [1] TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R$) | |
| | | | | SIZE 0402 | SIZE 0603 TO 2512 |
| | | | Stability for product types: | STABILITY CLASS 2 OR BETTER | |
| | | | RCA e3 | 1 Ω to 10 MΩ | |
| 8.2 | - | Single pulse high voltage overload 10 µs/700 µs | Severity no. 4: $U = 10 \times \sqrt{P_{70} \times R}$ or $U \leq 2 \times U_{max.}$; whichever is the less severe 10 pulses 10 µs / 700 µs | ± (1 % $R$ + 0.05 Ω) | |
| 8.4 | - | Periodic electric overload | $U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{max.}$; whichever is the less severe; 0.1 s on; 2.5 s off; 1000 cycles | ± (1 % $R$ + 0.05 Ω) | |
| 8.5 | - | Electrostatic discharge (human body model) | IEC 61340-3-1 [1][2]; 3 pos. + 3 neg. discharges; ESD voltage according to the size | ± (1 % $R$ + 0.05 Ω) | |
| 9.11 | 6 (Fc) | Vibration | Endurance by sweeping; 10 Hz to 2000 Hz; no resonance; amplitude ≤ 1.5 mm or ≤ 200 m/s$^2$; 7.5 h | ± (0.25 % $R$ + 0.05 Ω) | |
| 11.1 | 58 (Td) | Solderability | Solder bath method; Sn60Pb40 non-activated flux; (235 ± 5) °C; (2 ± 0.2) s | Good tinning (≥ 95 % covered) no visible damage | |
| | | | Solder bath method; Sn96.5Ag3Cu0.5 or Sn99.3Cu0.7 non-activated flux; (245 ± 5) °C or (250 ± 5) °C (3 ± 0.3) s | | |
| 11.2 | 58 (Td) | Resistance to soldering heat | Solder bath method (260 ± 5) °C; (10 ± 1) s | ± (0.25 % $R$ + 0.05 Ω) | |
| 11.3 | 45 (XA) | Component solvent resistance | Isopropyl alcohol; +50 °C; method 2 | No visible damage | |
| 9.7 | 21 ($Uu_3$) | Shear (adhesion) | RCA0402 and RCA0603: 9 N RCA0805 to RCA2512: 17.7 N | No visible damage | |
| 9.8 | 21 ($Uu_1$) | Substrate bending | Depth 2 mm; 3 times | ± (0.25 % $R$ + 0.05 Ω) no visible damage, no open circuit in bent position | |
| 12.2 | - | Voltage proof | $U = 1.4 \times U_{ins}$; 60 s | No flashover or breakdown | |
| 12.4 | - | Flammability, needle flame test | IEC 60695-11-5 [1]; 10 s | No burning after 30 s | |

**Notes**

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents

(2) This test is new with the 4th edition of IEC 60115-1 and with this European standard, and adopts the prior test of EN 60115-1+A11:2007.4.40


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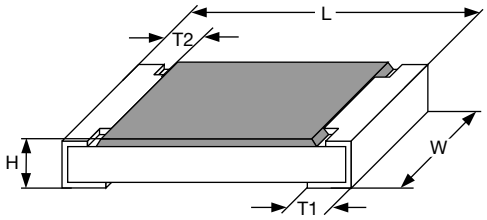
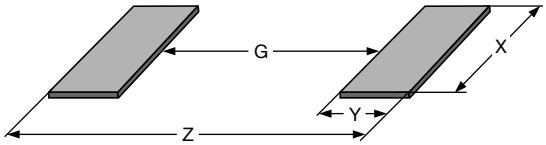
## DIMENSIONS




| DIMENSIONS AND MASS | | | | | | |
|---|---|---|---|---|---|---|
| TYPE / SIZE | L (mm) | W (mm) | H (mm) | T1 (mm) | T2 (mm) | MASS (mg) |
| **RCA0402 e3** | 1.0 ± 0.05 | 0.5 ± 0.05 | 0.35 ± 0.05 | 0.25 ± 0.10 | 0.2 ± 0.10 | 0.65 |
| **RCA0603 e3** | 1.55 + 0.10 / - 0.05 | 0.85 ± 0.1 | 0.45 ± 0.05 | 0.3 ± 0.20 | 0.3 ± 0.20 | 2 |
| **RCA0805 e3** | 2.0 + 0.20 / - 0.10 | 1.25 ± 0.15 | 0.5 ± 0.10 | 0.3 + 0.20 / -0.10 | 0.3 ± 0.20 | 5.5 |
| **RCA1206 e3** | 3.2 + 0.10 / - 0.20 | 1.6 ± 0.15 | 0.55 + 0.05 | 0.45 ± 0.20 | 0.4 ± 0.20 | 10 |
| **RCA1210 e3** | 3.2 ± 0.20 | 2.5 ± 0.20 | 0.55 ± 0.05 | 0.45 ± 0.20 | 0.4 ± 0.20 | 16 |
| **RCA1218 e3** | 3.2 + 0.10 / - 0.20 | 4.6 ± 0.15 | 0.55 ± 0.05 | 0.45 ± 0.20 | 0.4 ± 0.20 | 29.5 |
| **RCA2010 e3** | 5.0 ± 0.15 | 2.5 ± 0.15 | 0.6 ± 0.10 | 0.6 ± 0.20 | 0.6 ± 0.20 | 25.5 |
| **RCA2512 e3** | 6.3 ± 0.20 | 3.15 ± 0.15 | 0.6 ± 0.10 | 0.6 ± 0.20 | 0.6 ± 0.20 | 40.5 |

## SOLDER PAD DIMENSIONS




| RECOMMENDED SOLDER PAD DIMENSIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TYPE / SIZE | WAVE SOLDERING | | | | REFLOW SOLDERING | | | |
| | G (mm) | Y (mm) | X (mm) | Z (mm) | G (mm) | Y (mm) | X (mm) | Z (mm) |
| **RCA0402 e3** | - | - | - | - | 0.45 | 0.60 | 0.60 | 1.65 |
| **RCA0603 e3** | 0.65 | 1.10 | 1.25 | 2.85 | 0.75 | 0.75 | 1.00 | 2.25 |
| **RCA0805 e3** | 0.90 | 1.30 | 1.60 | 3.50 | 1.00 | 0.95 | 1.45 | 2.90 |
| **RCA1206 e3** | 1.40 | 1.40 | 1.95 | 4.20 | 1.50 | 1.05 | 1.80 | 3.60 |
| **RCA1210 e3** | 1.80 | 1.45 | 2.95 | 4.70 | 1.70 | 1.10 | 2.80 | 3.90 |
| **RCA1218 e3** | 1.80 | 1.30 | 5.10 | 4.40 | 1.90 | 1.10 | 4.90 | 4.10 |
| **RCA2010 e3** | 3.40 | 1.65 | 2.85 | 6.70 | 3.50 | 1.45 | 2.80 | 6.40 |
| **RCA2512 e3** | 4.60 | 1.60 | 3.65 | 7.80 | 4.75 | 1.45 | 3.50 | 7.65 |

**Notes**

- The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g in standards IEC 61188-5-x [(1)] or in publication IPC-7351.
  Still, the given solder pad dimensions will be found adequate for most general applications

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents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