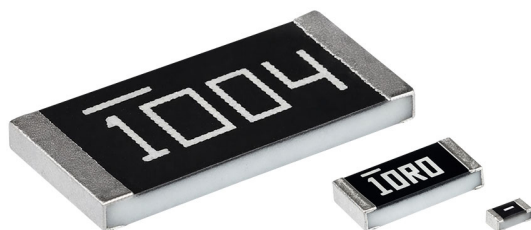


# Superior Sulfur Resistant Thick Film Chip Resistors



## LINKS TO ADDITIONAL RESOURCES



The sulfur resistant standard thick film chip resistors are the perfect choice for most fields of modern electronics where high reliability and stability are of major concern. Typical applications include automotive, industrial, and information and communication technology (ICT).

## FEATURES

- Stability at different environmental conditions  
 $\Delta R/R \leq 1\%$  (1000 h rated power at 70 °C)
- Resistance against sulfur containing atmosphere, according to ASTM B809-25 and ANSI/EIA-977
- PFAS-free series
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?999912](http://www.vishay.com/doc?999912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Automotive (ADAS, xEV)
- Industrial
- Information and communication technology (servers, data center)

## TECHNICAL SPECIFICATIONS

| DESCRIPTION                                                        | CRCW<br>0201-SR e3                                        | CRCW<br>0402-SR e3 | CRCW<br>0603-SR e3 | CRCW<br>0805-SR e3 | CRCW<br>1206-SR e3 | CRCW<br>1210-SR e3 | CRCW<br>2010-SR e3 | CRCW<br>2512-SR e3 |
|--------------------------------------------------------------------|-----------------------------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Imperial size                                                      | 0201                                                      | 0402               | 0603               | 0805               | 1206               | 1210               | 2010               | 2512               |
| Metric size code                                                   | RR0603M                                                   | RR1005M            | RR1608M            | RR2012M            | RR3216M            | RR3225M            | RR3246M            | RR6332M            |
| Resistance range                                                   | 1 $\Omega$ to 1 M $\Omega$ ; jumper (0 $\Omega$ )         |                    |                    |                    |                    |                    |                    |                    |
| Resistance tolerance                                               | $\pm 5\%$ ; $\pm 1\%$                                     |                    |                    |                    |                    |                    |                    |                    |
| Temperature coefficient <sup>(1)</sup>                             | $\pm 200$ ppm/K; $\pm 100$ ppm/K; -200 ppm/K / +400 ppm/K |                    |                    |                    |                    |                    |                    |                    |
| Rated dissipation, $P_{70}$ <sup>(2)</sup>                         | 0.05 W                                                    | 0.063 W            | 0.1 W              | 0.125 W            | 0.25 W             | 0.5 W              | 0.75 W             | 1.0 W              |
| Operating voltage,<br>$U_{max}$ , AC <sub>RMS</sub> /DC            | 25 V                                                      | 50 V               | 75 V               | 150 V              | 200 V              | 200 V              | 200 V              | 200 V              |
| Permissible film<br>temperature, $\vartheta_{Fmax}$ <sup>(2)</sup> | 155 °C                                                    |                    |                    |                    |                    |                    |                    |                    |
| Operating<br>temperature range                                     | -55 °C to +155 °C                                         |                    |                    |                    |                    |                    |                    |                    |

### Notes

<sup>(1)</sup> Please refer to TEMPERATURE COEFFICIENT AND RESISTANCE RANGE table

<sup>(2)</sup> 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.

**TEMPERATURE COEFFICIENT AND RESISTANCE RANGE**

| TYPE / SIZE    | TCR                         | TOLERANCE            | RESISTANCE                     | E-SERIES |
|----------------|-----------------------------|----------------------|--------------------------------|----------|
| CRCW0201-SR e3 | $\pm 200$                   | $\pm 5$              | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | $\pm 200$                   | $\pm 1$              | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 0.5$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW0402-SR e3 | $\pm 200$                   | $\pm 5$              | 10 $\Omega$ to 91.0 $\Omega$   | E24      |
|                | $\pm 100$                   | $\pm 5$              | 100 $\Omega$ to 910 k $\Omega$ | E24      |
|                | $\pm 200$                   | $\pm 1$              | 10 $\Omega$ to 97.6 $\Omega$   | E24; E96 |
|                | $\pm 100$                   | $\pm 1$              | 100 $\Omega$ to 1 M $\Omega$   | E24; E96 |
|                | Jumper, $I_{\max.} = 1.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW0603-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 1.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW0805-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 2.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW1206-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 2.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW1210-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 2.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW2010-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 2.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |
| CRCW2512-SR e3 | -200 ppm/K / +400 ppm/K     | $\pm 5$ %            | 1 $\Omega$ to 9.1 $\Omega$     | E24      |
|                | $\pm 200$                   | $\pm 5$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24      |
|                | -200 ppm/K / +400 ppm/K     | $\pm 1$ %            | 1 $\Omega$ to 9.76 $\Omega$    | E24; E96 |
|                | $\pm 100$                   | $\pm 1$ %            | 10 $\Omega$ to 1 M $\Omega$    | E24; E96 |
|                | Jumper, $I_{\max.} = 2.0$ A | $\leq 50$ m $\Omega$ | 0 $\Omega$                     | -        |

**Note**

- The temperature coefficient of resistance (TCR) is not specified for 0  $\Omega$  jumpers

**PACKAGING**

| TYPE / SIZE    | CODE     | QUANTITY | PACKAGING STYLE                            | WIDTH | PITCH | PACKAGING DIMENSIONS |
|----------------|----------|----------|--------------------------------------------|-------|-------|----------------------|
| CRCW0201-SR e3 | ED = ET7 | 10 000   | Paper tape acc. to IEC 60286-3, Type 1a    | 8 mm  | 2 mm  | Ø 180 mm / 7"        |
| CRCW0402-SR e3 | ED = ET7 | 10 000   |                                            |       |       |                      |
| CRCW0603-SR e3 | EA = ET1 | 5000     |                                            |       | 4 mm  |                      |
| CRCW0805-SR e3 | EA = ET1 | 5000     |                                            |       |       |                      |
| CRCW1206-SR e3 | EA = ET1 | 5000     |                                            |       |       |                      |
| CRCW1210-SR e3 | EA = ET1 | 5000     | Blister tape acc. to IEC 60286-3, Type 2 a | 12 mm | 4 mm  |                      |
| CRCW2010-SR e3 | EF = E02 | 4000     |                                            |       |       |                      |
| CRCW2512-SR e3 | EH = E82 | 4000     |                                            |       |       |                      |

**PART NUMBER AND PRODUCT DESCRIPTION**

Part Number: CRCW06031K00FKEASR

Part Number: CRCW06030000ZSEASR

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | R | C | W | 0 | 6 | 0 | 3 | 1 | K | 0 | 0 | F | K | E | A | S | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| TYPE / SIZE                                                                                                                                          | RESISTANCE                                                                              | TOLERANCE                                                         | TCR                                                                                                                     | PACKAGING                     | SPECIAL                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------|
| <b>CRCW0201</b><br><b>CRCW0402</b><br><b>CRCW0603</b><br><b>CRCW0805</b><br><b>CRCW1206</b><br><b>CRCW1210</b><br><b>CRCW2010</b><br><b>CRCW2512</b> | <b>R</b> = decimal<br><b>K</b> = thousand<br><b>M</b> = million<br><b>0000</b> = jumper | <b>F</b> = $\pm 1\%$<br><b>J</b> = $\pm 5\%$<br><b>Z</b> = jumper | <b>K</b> = $\pm 100$ ppm/K<br><b>N</b> = $\pm 200$ ppm/K<br><b>X</b> = $-200$ ppm/K / $+400$ ppm/K<br><b>0</b> = jumper | <b>EA, EB, ED, EF, EH, EN</b> | <b>SR</b> = sulfur resistant |

Product Description: CRCW0603-SR 100 1K0 1 % ET1 e3

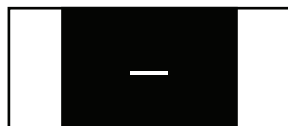
Product Description: CRCW0603-SR 0R0 ET1 e3

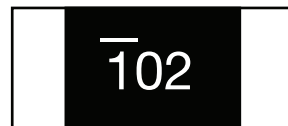
| CRCW0603-SR                                                                                                                                                                                          | 100                                                       | 1K0                                                                                                                                               | 1 %                    | ET1                                 | e3                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------|-----------------------------------------|
| TYPE / SIZE                                                                                                                                                                                          | TCR                                                       | RESISTANCE                                                                                                                                        | TOLERANCE              | PACKAGING                           | LEAD (Pb)-FREE                          |
| <b>CRCW0201-SR e3</b><br><b>CRCW0402-SR e3</b><br><b>CRCW0603-SR e3</b><br><b>CRCW0805-SR e3</b><br><b>CRCW1206-SR e3</b><br><b>CRCW1210-SR e3</b><br><b>CRCW2010-SR e3</b><br><b>CRCW2512-SR e3</b> | $\pm 100$ ppm/K<br>$\pm 200$ ppm/K<br>$-200 / +400$ ppm/K | <b>1R</b> = $1\ \Omega$<br><b>10R</b> = $10\ \Omega$<br><b>1K</b> = $1\ \text{k}\Omega$<br><b>1M</b> = $1\ \text{M}\Omega$<br><b>0R0</b> = jumper | $\pm 1\%$<br>$\pm 5\%$ | <b>ET1, ET5, ET7, E02, E82, EF3</b> | <b>e3</b> = pure tin termination finish |

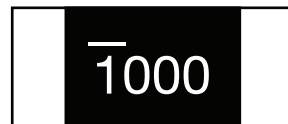
**MARKING**

CRCW0201-SR components: no marking

CRCW0402-SR components:


CRCW0603-SR to CRCW2512-SR components in  $\pm 5\%$  tolerance:

The nominal resistance is expressed in three digits; the first two digits represent the significant figures of nominal resistance in  $\Omega$ , and the third digit represents exponent for base of 10, e.g.  $\overline{102} = 10 \times 10^2 = 1000\ \Omega = 1\ \text{k}\Omega$ 

CRCW0805-SR to CRCW2512-SR components in  $\pm 1\%$  tolerance:

The nominal resistance is expressed in four digits; the first three digits represent the significant figures of nominal resistance in  $\Omega$ , and the fourth digit represents exponent for base of 10, e.g.  $\overline{1000} = 100 \times 10^0 = 100\ \Omega$ 


**MARKING**
**CRCW0603-SR components in  $\pm 1\%$  tolerance:**

When the marking space is too small in such small-sized resistors as CRCW0603-SR, the marking cannot be made by four digits and maybe made by two digits combined with one English capital

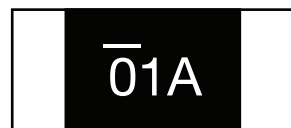
**Symbol for E96 series nominal resistance value**

| SYMBOL | E96 | SYMBOL | E96 | SYMBOL | E96 | SYMBOL | E96 |
|--------|-----|--------|-----|--------|-----|--------|-----|
| 01     | 100 | 25     | 178 | 49     | 316 | 73     | 562 |
| 02     | 102 | 26     | 182 | 50     | 324 | 74     | 576 |
| 03     | 105 | 27     | 187 | 51     | 332 | 75     | 590 |
| 04     | 107 | 28     | 191 | 52     | 340 | 76     | 604 |
| 05     | 110 | 29     | 196 | 53     | 348 | 77     | 619 |
| 06     | 113 | 30     | 200 | 54     | 357 | 78     | 634 |
| 07     | 115 | 31     | 205 | 55     | 365 | 79     | 649 |
| 08     | 118 | 32     | 210 | 56     | 374 | 80     | 665 |
| 09     | 121 | 33     | 215 | 57     | 383 | 81     | 681 |
| 10     | 124 | 34     | 221 | 58     | 392 | 82     | 698 |
| 11     | 127 | 35     | 226 | 59     | 402 | 83     | 715 |
| 12     | 130 | 36     | 232 | 60     | 412 | 84     | 732 |
| 13     | 133 | 37     | 237 | 61     | 422 | 85     | 750 |
| 14     | 137 | 38     | 243 | 62     | 432 | 86     | 768 |
| 15     | 140 | 39     | 249 | 63     | 442 | 87     | 787 |
| 16     | 143 | 40     | 255 | 64     | 453 | 88     | 806 |
| 17     | 147 | 41     | 261 | 65     | 464 | 89     | 825 |
| 18     | 150 | 42     | 267 | 66     | 475 | 90     | 845 |
| 19     | 154 | 43     | 274 | 67     | 487 | 91     | 866 |
| 20     | 158 | 44     | 280 | 68     | 499 | 92     | 887 |
| 21     | 162 | 45     | 287 | 69     | 511 | 93     | 909 |
| 22     | 165 | 46     | 294 | 70     | 523 | 94     | 931 |
| 23     | 169 | 47     | 301 | 71     | 536 | 95     | 953 |
| 24     | 174 | 48     | 309 | 72     | 549 | 96     | 976 |

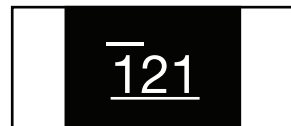
**Symbol for multipliers**

| SYMBOL      | A      | B      | C      | D      | E      | F      | G      | H      | X         | Y         | Z         |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|-----------|-----------|
| Multipliers | $10^0$ | $10^1$ | $10^2$ | $10^3$ | $10^4$ | $10^5$ | $10^6$ | $10^7$ | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ |

E.g.  $\overline{0}1A = 100 \times 10^0 = 100 \Omega$



When the resistance is not in E96 series, three digitals with underline in E24 series is used as a mark, e.g. 0603, 120  $\Omega$ ,  $\pm 1\%$  - marking is  $\underline{121}$


**CRCW0603-SR to CRCW2512-SR, Jumpers:**

e.g.  $\overline{0} = 0 \Omega$



## DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A special cermet film layer and a glass-over are deposited on a high grade (Al<sub>2</sub>O<sub>3</sub>) ceramic substrate. Specially designed inner contacts are deposited 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 matte 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** <sup>(1)</sup>.

## ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1** <sup>(1)</sup>. 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 matte 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 <sup>(2)</sup>
- The Global Automotive Declarable Substance List (GADSL) <sup>(3)</sup>
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) <sup>(4)</sup> 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](http://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](http://www.vishay.com/doc?49037).

## APPROVALS

The resistors are qualified according to AEC-Q200.

([www.aecouncil.com/Documents/AEC\\_Q200\\_Rev\\_E\\_Base\\_Document.pdf](http://www.aecouncil.com/Documents/AEC_Q200_Rev_E_Base_Document.pdf))

## RELATED PRODUCTS

For more information about products which combine superior resistance against sulfur together with better tolerance and TCR, please refer to latest edition of RCA e3 datasheet ([www.vishay.com/doc?20037](http://www.vishay.com/doc?20037)).

For more information about products with standard sulfur resistance please refer to RCA-SR e3 datasheet ([www.vishay.com/doc?20132](http://www.vishay.com/doc?20132)).

## Notes

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

<sup>(2)</sup> The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>

<sup>(3)</sup> The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at [www.gadsl.org](http://www.gadsl.org)

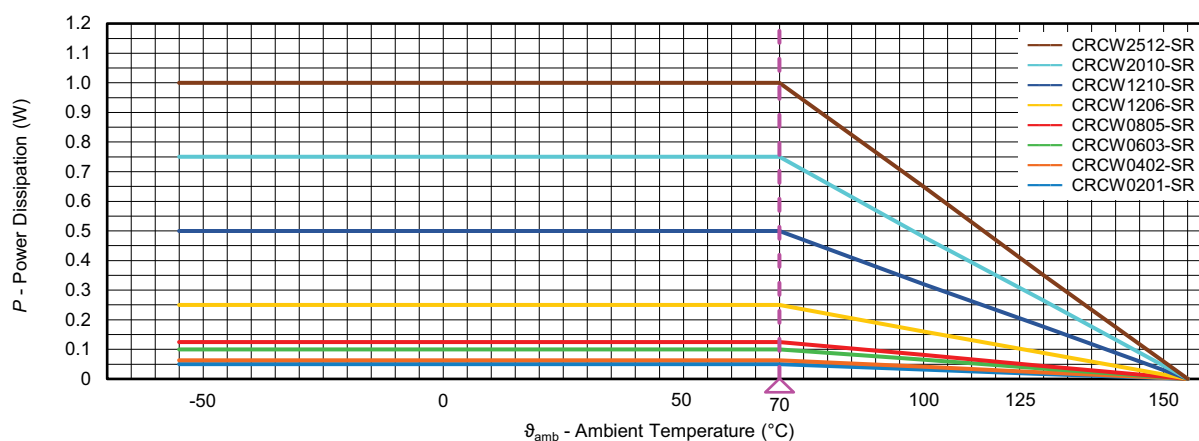
<sup>(4)</sup> The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>



## FUNCTIONAL PERFORMANCE

| PERFORMANCE IN SULFUR-CONTAINING AMBIANCE  |                                                                                                                            |                                                   |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| TEST NAME                                  | HUMID SULFUR VAPOR TEST                                                                                                    | DRY SULFUR TEST FOS 105                           |
| Reference specification                    | ASTM B809-25                                                                                                               | ANSI/EIA-977                                      |
| Test conditions (temperature, humidity)    | 90 °C ± 2 °C<br>76 % to 95 % RH                                                                                            | 105 °C ± 2 °C<br>RH not specified, not applicable |
| Aggressive agent                           | Sulfur (saturated vapor)                                                                                                   | Sulfur, sublimed                                  |
| Failure criteria in VI under magnification | No silver sulfide growth at the interface<br>between termination and protective overcoat.<br>No signs of mechanical damage | Not applicable                                    |
| Failure criteria in electrical test        | See "Test Procedures and Requirements" table                                                                               |                                                   |
| Test duration                              | 1000 h                                                                                                                     | 1000 h                                            |

## Derating

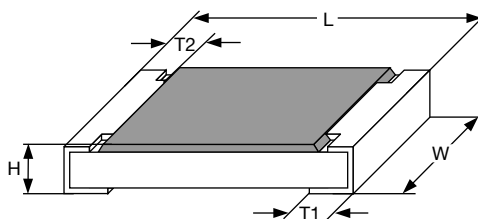




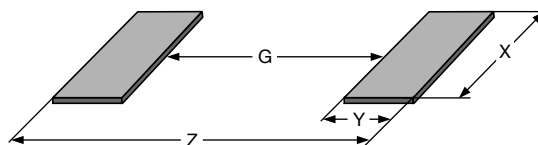
| TEST PROCEDURES AND REQUIREMENTS                 |                                                |                                                                                                                                                                                                  |                                                                      |                             |                                  |                              |
|--------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------|
| TEST                                             | REFERENCE STANDARD                             | PROCEDURE                                                                                                                                                                                        | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )                       |                             |                                  |                              |
|                                                  |                                                | Stability for product types:                                                                                                                                                                     | STABILITY CLASS 1 OR BETTER                                          | STABILITY CLASS 2 OR BETTER | STABILITY CLASS 1 OR BETTER      | STABILITY CLASS 2 OR BETTER  |
|                                                  |                                                |                                                                                                                                                                                                  | CRCW0201-SR e3                                                       |                             | CRCW0402-SR e3 TO CRCW2512-SR e3 |                              |
|                                                  |                                                |                                                                                                                                                                                                  | 10 $\Omega$ to 1 M $\Omega$                                          |                             | 1 $\Omega$ to 1 M $\Omega$       |                              |
| Initial measurements of resistance and tolerance | IEC 60115-1 6.1                                | -                                                                                                                                                                                                | $\pm 1 \%$                                                           | $\pm 5 \%$                  | $\pm 1 \%$                       | $\pm 5 \%$                   |
| Temperature coefficient of resistance            | IEC 60115-1 6.2                                | At 25 °C / -55 °C and +25 °C / +125 °C                                                                                                                                                           | According to table<br>"Temperature Coefficient and Resistance Range" |                             |                                  |                              |
| Short-term overload                              | IEC 60115-1 8.1                                | 2.5 x rated voltage for 5 s                                                                                                                                                                      | $\pm (3 \% R + 0.1 \Omega)$                                          |                             | $\pm (1 \% R + 0.05 \Omega)$     |                              |
| High temperature exposure (storage)              | AEC-Q200-REV. E Test 3 MIL-STD-202 Method 108  | 155 °C $\pm 5$ °C; 1000 h                                                                                                                                                                        | $\pm (3 \% R + 0.1 \Omega)$                                          |                             | $\pm (1 \% R + 0.05 \Omega)$     | $\pm (2 \% R + 0.1 \Omega)$  |
| Temperature cycling                              | AEC-Q200-REV. E Test 4 JESD22 Method JA-104    | 1000 cycles -55 °C to +155 °C<br>Dwell time: 30 min max.<br>Transition time: 1 min max.                                                                                                          | $\pm (2 \% R + 0.1 \Omega)$                                          |                             | $\pm (1 \% R + 0.05 \Omega)$     |                              |
| Humidity bias                                    | AEC-Q200-REV. E Test 7 MIL-STD-202 Method 103  | 1000 h 85 °C / 85 % RH,<br>10 % of operating power<br>Measurement at 24 h $\pm 2$ h after test conclusion                                                                                        | $\pm (5 \% R + 0.1 \Omega)$                                          |                             | $\pm (3 \% R + 0.1 \Omega)$      |                              |
| High temperature operating life                  | AEC-Q200-REV. E Test 8 MIL-STD-202 Method 108  | 1000 h at $U = \sqrt{P_{70} \times R} \leq U_{\max.}$ ;<br>1.5 h on; 0.5 h off, 70 °C, 1000 h                                                                                                    | $\pm (5 \% R + 0.1 \Omega)$                                          |                             | $\pm (1 \% R + 0.05 \Omega)$     | $\pm (3 \% R + 0.1 \Omega)$  |
| Resistance to solvents                           | AEC-Q200-REV. E Test 12 MIL-STD-202 Method 215 | According to the standard method                                                                                                                                                                 | No visible damage                                                    |                             |                                  |                              |
| Mechanical shock                                 | AEC-Q200-REV. E Test 13 MIL-STD-202 Method 213 | According to method 213 condition C, peak value: 100 g, waveform: half-sine                                                                                                                      | $\pm (1 \% R + 0.05 \Omega)$                                         |                             |                                  |                              |
| Vibration                                        | AEC-Q200-REV. E Test 14 MIL-STD-202 Method 204 | 5 g's for 20 min.,<br>12 cycles each of 3 orientations.<br>Test from 10 Hz to 2000 Hz                                                                                                            | $\pm (1 \% R + 0.05 \Omega)$                                         |                             |                                  |                              |
| Resistance to soldering heat                     | AEC-Q200-REV. E Test 15 MIL-STD-202 Method 210 | Condition K, time above 217 °C, 60 s to 150 s                                                                                                                                                    | $\pm (2 \% R + 0.1 \Omega)$                                          |                             | $\pm (0.5 \% R + 0.05 \Omega)$   | $\pm (1 \% R + 0.05 \Omega)$ |
| ESD                                              | AEC-Q200-REV. E Test 17                        | ESD voltage according to the size:<br>CRCW0201-SR: 250 V<br>CRCW0402-SR: 500 V<br>CRCW0603-SR: 800 V<br>CRCW0805-SR: 1000 V<br>CRCW1206-SR: 2000 V<br>CRCW1210-SR to CRCW2512-SR: $\geq 2000$ V  | $\pm (2 \% R + 0.1 \Omega)$                                          |                             | $\pm (1 \% R + 0.05 \Omega)$     |                              |
| Solderability                                    | AEC-Q200-REV. E Test 18 J-STD-00               | Dry heat the part for 4 h $\pm 15$ min at 155 °C.<br>Method B1: 245 °C $\pm 5$ °C, 5 s $\pm 0.5$ s, lead (Pb)-free solder<br>Method D: 260 °C $\pm 5$ °C, 5 s $\pm 0.5$ s, lead (Pb)-free solder | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage            |                             |                                  |                              |
| Flammability                                     | AEC-Q200-REV. E Test 20 IEC 60695-11-5         | IEC 60695-11-5; 10 s                                                                                                                                                                             | No burning after 30 s                                                |                             |                                  |                              |
| Board flex                                       | AEC-Q200-REV. E Test 21                        | The forces shall be applied for 60 (+ 5) s<br>3 mm deflection (CRCW0201-SR to CRCW1210-SR)<br>2 mm deflection (CRCW2010-SR to CRCW2512-SR)                                                       | $\pm (1 \% R + 0.05 \Omega)$                                         |                             | $\pm (0.5 \% R + 0.05 \Omega)$   | $\pm (1 \% R + 0.05 \Omega)$ |

**TEST PROCEDURES AND REQUIREMENTS**

| TEST                       | REFERENCE STANDARD      | PROCEDURE                                                                                           | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ ) |                             |                              |                                  |  |
|----------------------------|-------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------|------------------------------|----------------------------------|--|
|                            |                         | Stability for product types:                                                                        | STABILITY CLASS 1 OR BETTER                    | STABILITY CLASS 2 OR BETTER | STABILITY CLASS 1 OR BETTER  | STABILITY CLASS 2 OR BETTER      |  |
|                            |                         |                                                                                                     | CRCW-SR e3                                     | CRCW0201-SR e3              |                              | CRCW0402-SR e3 TO CRCW2512-SR e3 |  |
|                            |                         |                                                                                                     |                                                | 10 $\Omega$ to 1 M $\Omega$ |                              | 1 $\Omega$ to 1 M $\Omega$       |  |
| Terminal strength          | AEC-Q200-REV. E Test 22 | Apply force for 60 s;<br>CRCW0402-SR: 9 N<br>CRCW0603-SR to CRCW2512-SR: 17.7 N<br>CRCW0201-SR: n/a | $\pm (0.5 \% R + 0.05 \Omega)$                 |                             |                              |                                  |  |
| Humid sulfur test (FOS 90) | ASTM B809-25            | 1000 h at 90 °C $\pm$ 2 °C, 76 % to 95 % RH, sulfur (saturated vapor), unpowered                    | $\pm (2 \% R + 0.1 \Omega)$                    | $\pm (3 \% R + 0.1 \Omega)$ | $\pm (1 \% R + 0.05 \Omega)$ | $\pm (2 \% R + 0.1 \Omega)$      |  |
| Dry sulfur test (FOS 105)  | EIA-977 Method B        | 1000 h at 105 °C $\pm$ 2 °C, sulfur sublimed, unpowered                                             | $\pm (2 \% R + 0.1 \Omega)$                    | $\pm (3 \% R + 0.1 \Omega)$ | $\pm (1 \% R + 0.05 \Omega)$ | $\pm (2 \% R + 0.1 \Omega)$      |  |

**DIMENSIONS**

**DIMENSIONS AND MASS**

| TYPE / SIZE    | L (mm)               | W (mm)          | H (mm)          | T1 (mm)              | T2 (mm)         | MASS (mg) |
|----------------|----------------------|-----------------|-----------------|----------------------|-----------------|-----------|
| CRCW0201-SR e3 | 0.60 $\pm$ 0.03      | 0.30 $\pm$ 0.03 | 0.23 $\pm$ 0.03 | 0.15 $\pm$ 0.05      | 0.10 $\pm$ 0.05 | 0.17      |
| CRCW0402-SR e3 | 1.00 + 0.10 / - 0.05 | 0.50 $\pm$ 0.05 | 0.32 $\pm$ 0.05 | 0.25 $\pm$ 0.10      | 0.20 $\pm$ 0.10 | 0.52      |
| CRCW0603-SR e3 | 1.60 $\pm$ 0.10      | 0.80 $\pm$ 0.10 | 0.45 $\pm$ 0.10 | 0.30 + 0.20 / - 0.10 | 0.30 $\pm$ 0.20 | 2         |
| CRCW0805-SR e3 | 2.00 $\pm$ 0.10      | 1.25 $\pm$ 0.15 | 0.50 $\pm$ 0.10 | 0.40 $\pm$ 0.20      | 0.40 $\pm$ 0.20 | 4.5       |
| CRCW1206-SR e3 | 3.10 $\pm$ 0.10      | 1.55 $\pm$ 0.10 | 0.55 $\pm$ 0.10 | 0.40 $\pm$ 0.20      | 0.50 $\pm$ 0.30 | 9         |
| CRCW1210-SR e3 | 3.10 $\pm$ 0.10      | 2.55 $\pm$ 0.10 | 0.60 $\pm$ 0.10 | 0.40 $\pm$ 0.20      | 0.50 $\pm$ 0.30 | 15        |
| CRCW2010-SR e3 | 5.00 $\pm$ 0.15      | 2.50 $\pm$ 0.15 | 0.60 $\pm$ 0.10 | 0.50 $\pm$ 0.25      | 0.60 $\pm$ 0.30 | 23        |
| CRCW2512-SR e3 | 6.30 $\pm$ 0.20      | 3.20 $\pm$ 0.20 | 0.60 $\pm$ 0.10 | 0.50 $\pm$ 0.25      | 0.60 $\pm$ 0.30 | 38        |

**SOLDER PAD DIMENSIONS**


| RECOMMENDED SOLDER PAD DIMENSIONS |                  |            |            |
|-----------------------------------|------------------|------------|------------|
| TYPE / SIZE                       | REFLOW SOLDERING |            |            |
|                                   | G<br>(mm)        | X<br>(mm)  | Z<br>(mm)  |
| CRCW0201-SR e3                    | 0.25 to 0.3      | 0.3 to 0.4 | 0.7 to 0.9 |
| CRCW0402-SR e3                    | 0.5 to 0.6       | 0.4 to 0.6 | 1.4 to 1.6 |
| CRCW0603-SR e3                    | 0.7 to 0.9       | 0.8 to 1.0 | 2.0 to 2.2 |
| CRCW0805-SR e3                    | 1.0 to 1.4       | 0.9 to 1.4 | 3.2 to 3.8 |
| CRCW1206-SR e3                    | 2.0 to 2.4       | 1.2 to 1.8 | 4.4 to 5.0 |
| CRCW1210-SR e3                    | 2.0 to 2.4       | 2.3 to 3.5 | 4.4 to 5.0 |
| CRCW2010-SR e3                    | 3.3 to 3.7       | 2.3 to 3.5 | 5.7 to 6.5 |
| CRCW2512-SR e3                    | 3.6 to 4.0       | 2.3 to 3.5 | 7.6 to 8.6 |

| REVISION HISTORY |                               |
|------------------|-------------------------------|
| REVISION DATE    | DESCRIPTION                   |
| 02-Sep-2026      | Introduction of new datasheet |



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