

# Lead (Pb)-free Commodity Thick Film Chip Resistors



## FEATURES

- High volume product suitable for commercial applications
- Pure tin solder contacts on Ni barrier layer provides compatibility with lead (Pb)-free and lead containing soldering processes
- Metal glaze on high quality ceramic
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## STANDARD ELECTRICAL SPECIFICATIONS

| MODEL                                                                            | CASE SIZE INCH | CASE SIZE METRIC | POWER RATING<br>$P_{70}$<br>W | LIMITING ELEMENT VOLTAGE<br>$U_{max.}$<br>AC <sub>RMS</sub> /DC<br>V | TEMPERATURE COEFFICIENT<br>ppm/K | TOLERANCE<br>% | RESISTANCE RANGE<br>$\Omega$ | SERIES   |
|----------------------------------------------------------------------------------|----------------|------------------|-------------------------------|----------------------------------------------------------------------|----------------------------------|----------------|------------------------------|----------|
| CRCW0201                                                                         | 0201           | RR 0603M         | 0.05                          | 30                                                                   | ± 200                            | ± 0.5          | 10.0 to 10M                  | E96      |
|                                                                                  |                |                  |                               |                                                                      | - 200/+ 400                      |                | 1.0 to 9.76                  |          |
|                                                                                  |                |                  |                               |                                                                      | ± 100                            | ± 1            | 47.0 to 1M                   | E24; E96 |
|                                                                                  |                |                  |                               |                                                                      | ± 200                            |                | 10.0 to 10M                  |          |
|                                                                                  |                |                  |                               |                                                                      | - 200/+ 400                      |                | 1.0 to 9.76                  |          |
|                                                                                  |                |                  |                               |                                                                      | ± 200                            | ± 5            | 10.0 to 10M                  | E24      |
|                                                                                  |                |                  |                               |                                                                      | - 200/+ 400                      |                | 1.0 to 9.1                   |          |
| Zero-Ohm-Resistor: $R_{max.} = 50 \text{ m}\Omega$ , $I_{max.}$ at 70 °C = 1.0 A |                |                  |                               |                                                                      |                                  |                |                              |          |

## Notes

- 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.
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

## TECHNICAL SPECIFICATIONS

| PARAMETER                                              | UNIT             | CRCW0201      |
|--------------------------------------------------------|------------------|---------------|
| Rated Dissipation at $70^\circ\text{C}$ <sup>(1)</sup> | W                | 0.05          |
| Operating Voltage $U_{max. AC RMS/DC}$                 | V                | 30            |
| Insulation Voltage $U_{ins}$ (1 min)                   | V                | 50            |
| Insulation Resistance                                  | $\Omega$         | $> 10^9$      |
| Operating Temperature Range                            | $^\circ\text{C}$ | - 55 to + 155 |
| Weight                                                 | mg               | 0.17          |

## Note

- <sup>(1)</sup> The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of  $155^\circ\text{C}$  is not exceeded.

**PART NUMBER AND PRODUCT DESCRIPTION**
**PART NUMBER: CRCW02011K00FNED**

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | R | C | W | 0 | 2 | 0 | 1 | 1 | K | 0 | 0 | F | K | E | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

|                 |
|-----------------|
| MODEL           |
| <b>CRCW0201</b> |

|                                                             |
|-------------------------------------------------------------|
| VALUE                                                       |
| R = Decimal<br>K = Thousand<br>M = Million<br>0000 = Jumper |

|                                                         |
|---------------------------------------------------------|
| TOLERANCE                                               |
| D = ± 0.5 %<br>F = ± 1.0 %<br>J = ± 5.0 %<br>Z = Jumper |

|                                                                                 |
|---------------------------------------------------------------------------------|
| TCR                                                                             |
| K = ± 100 ppm/K<br>N = ± 200 ppm/K<br>X = - 200 ppm/K/+ 400 ppm/K<br>0 = Jumper |

|                |
|----------------|
| PACKAGING      |
| ED<br>EE<br>EI |

**PRODUCT DESCRIPTION: CRCW0201 100 1K0 1 % ET7 e3**

|                 |
|-----------------|
| CRCW0201        |
| MODEL           |
| <b>CRCW0201</b> |

|                                                 |
|-------------------------------------------------|
| 100                                             |
| TCR                                             |
| ± 200 ppm/K<br>± 100 ppm/K<br>- 200/+ 400 ppm/K |

|                                                                                    |
|------------------------------------------------------------------------------------|
| 562R                                                                               |
| RESISTANCE<br>VALUE                                                                |
| 1R0 = 1 Ω<br>10R = 10 Ω<br>1K0 = 1 kΩ<br>10K = 10 kΩ<br>1M0 = 1 MΩ<br>0R0 = Jumper |

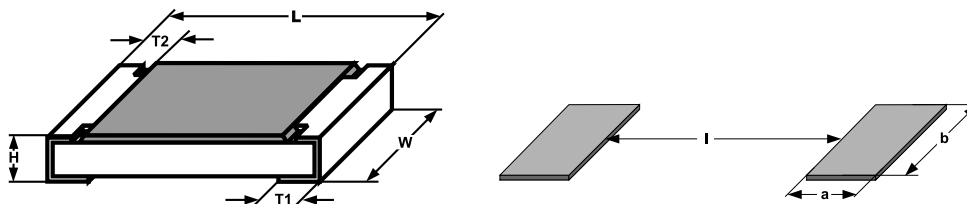
|                           |
|---------------------------|
| 1 %                       |
| TOLERANCE<br>VALUE        |
| ± 0.5 %<br>± 1 %<br>± 5 % |

|                   |
|-------------------|
| ET7               |
| PACKAGING         |
| ET7<br>EF4<br>ET2 |

|                                     |
|-------------------------------------|
| e3                                  |
| LEAD (Pb)-FREE                      |
| e3 = Pure tin<br>termination finish |

**PACKAGING**

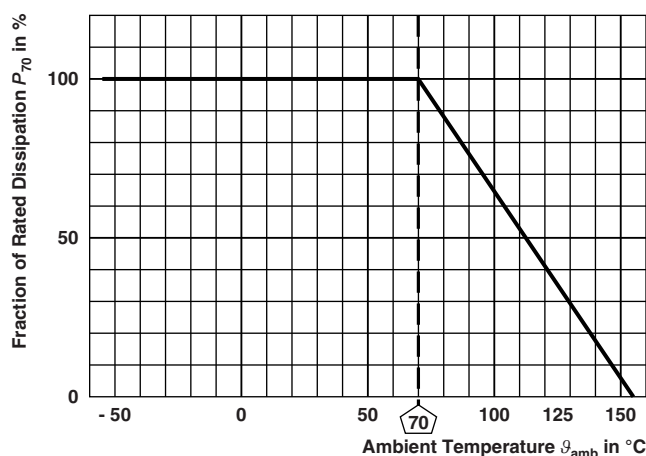
| MODEL    | CODE     | QUANTITY | CARRIER TAPE                                | WIDTH | PITCH | REEL DIAMETER |
|----------|----------|----------|---------------------------------------------|-------|-------|---------------|
| CRCW0201 | ED = ET7 | 10 000   | Paper tape acc.<br>to IEC 60068-3<br>Type I | 8 mm  | 2 mm  | 180 mm/7"     |
|          | EI = ET2 | 20 000   |                                             |       |       | 254 mm/10"    |
|          | EE = EF4 | 50 000   |                                             |       |       | 330 mm/13"    |

**DIMENSIONS** in millimeters


| SIZE |        | DIMENSIONS |            |             |             |                                       | SOLDER PAD DIMENSIONS |      |      |
|------|--------|------------|------------|-------------|-------------|---------------------------------------|-----------------------|------|------|
| INCH | METRIC | L          | W          | H           | T1          | T2                                    | a                     | b    | I    |
| 0201 | 0603   | 0.6 ± 0.05 | 0.3 ± 0.05 | 0.23 ± 0.05 | 0.15 ± 0.05 | 0.2 <sup>+0.05</sup> <sub>-0.10</sub> | 0.28                  | 0.43 | 0.23 |

**Note**

- No marking for 0201 size.

**DERATING**


| TEST PROCEDURES AND REQUIREMENTS |                                  |                                |                                                                                                     |                                                                                         |
|----------------------------------|----------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| EN 60115-1<br>CLAUSE             | IEC<br>60068-2<br>TEST<br>METHOD | TEST                           | PROCEDURE                                                                                           | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ )                                       |
|                                  |                                  |                                | Stability for product types:<br><b>CRCW0201 e3</b>                                                  | 1 $\Omega$ to 10 M $\Omega$                                                             |
| 4.5                              | -                                | Resistance                     | -                                                                                                   | $\pm 0.5\%$ ; $\pm 1\%$ ; $\pm 5\%$                                                     |
| 4.7                              | -                                | Voltage proof                  | $U = 1.4 \times U_{ins}$ ; 60 s                                                                     | No flashover or breakdown                                                               |
| 4.13                             | 58 (Td)                          | Solderability                  | Solder bath method;<br>Sn60Pb40<br>non activated flux;<br>(235 $\pm$ 5) °C<br>(2 $\pm$ 0.2) s       | Good tinning ( $\geq 95\%$ covered)<br>no visible damage                                |
|                                  |                                  |                                | Solder bath method;<br>Sn96.5Ag3Cu0.5<br>non-activated flux;<br>(245 $\pm$ 5) °C<br>(3 $\pm$ 0.3) s | Good tinning ( $\geq 95\%$ covered)<br>no visible damage                                |
| 4.8.4.2                          | -                                | Temperature coefficient        | (20/- 55/20) °C and<br>(20/125/20) °C                                                               | $\pm 100$ ppm/K,<br>$\pm 200$ ppm/K,<br>- 200 ppm/K/+ 400 ppm/K                         |
| 4.32                             | 21 (Uu <sub>3</sub> )            | Shear (adhesion)               | 9 N                                                                                                 | No visible damage                                                                       |
| 4.33                             | 21 (Uu <sub>1</sub> )            | Substrate bending              | Depth 2 mm; 3 times                                                                                 | No visible damage,<br>no open circuit in bent position<br>$\pm (0.5\% R + 0.05 \Omega)$ |
| 4.19                             | 14 (Na)                          | Rapid change<br>of temperature | 30 min. at - 55 °C;<br>30 min. at 125 °C                                                            |                                                                                         |
|                                  |                                  |                                | 5 cycles                                                                                            | $\pm (0.5\% R + 0.05 \Omega)$                                                           |
|                                  |                                  |                                | 1000 cycles                                                                                         | $\pm (1\% R + 0.05 \Omega)$                                                             |
| 4.23                             | -                                | Climatic sequence:             | -                                                                                                   | $\pm (2\% R + 0.1 \Omega)$                                                              |
| 4.23.2                           | 2 (Ba)                           | Dry heat                       | 125 °C; 16 h                                                                                        |                                                                                         |
| 4.23.3                           | 30 (Db)                          | Damp heat, cyclic              | 55 °C; $\geq 90\%$ RH; 24 h; 1 cycle                                                                |                                                                                         |
| 4.23.4                           | 1 (Aa)                           | Cold                           | - 55 °C; 2 h                                                                                        |                                                                                         |
| 4.23.5                           | 13 (M)                           | Low air pressure               | 1 kPa; (25 $\pm$ 10) °C; 1 h                                                                        |                                                                                         |
| 4.23.6                           | 30 (Db)                          | Damp heat, cyclic              | 55 °C; $\geq 90\%$ RH; 24 h; 5 cycles                                                               |                                                                                         |
| 4.23.7                           | -                                | DC load                        | $U = \sqrt{P_{70} \times R} \leq U_{max.}$                                                          |                                                                                         |

| TEST PROCEDURES AND REQUIREMENTS |                                  |                                            |                                                                                                          |                                                   |
|----------------------------------|----------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| EN 60115-1<br>CLAUSE             | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                       | PROCEDURE                                                                                                | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ ) |
|                                  |                                  |                                            | Stability for product types:                                                                             | 1 $\Omega$ to 10 M $\Omega$                       |
|                                  |                                  |                                            | <b>CRCW0201 e3</b>                                                                                       |                                                   |
| 4.25.1                           | -                                | Endurance at 70 °C                         | $U = \sqrt{P_{70} \times R} \leq U_{\max.};$<br>1.5 h on; 0.5 h off;                                     |                                                   |
|                                  |                                  |                                            | 70 °C; 1000 h                                                                                            | $\pm (2 \% R + 0.1 \Omega)$                       |
|                                  |                                  |                                            | 70 °C; 8000 h                                                                                            | $\pm (4 \% R + 0.1 \Omega)$                       |
| 4.18.2                           | 58 (Td)                          | Resistance to soldering heat               | Solder bath method<br>(260 $\pm$ 5) °C; (10 $\pm$ 1) s                                                   | $\pm (1 \% R + 0.05 \Omega)$                      |
| 4.35                             | -                                | Flamability,<br>needle flame test          | IEC 60695-11-5;<br>10 s                                                                                  | No burning after 30 s                             |
| 4.24                             | 78 (Cab)                         | Damp heat, steady state                    | (40 $\pm$ 2) °C; (93 $\pm$ 3) % RH; 56 days                                                              | $\pm (2 \% R + 0.1 \Omega)$                       |
| 4.25.3                           | -                                | Endurance at upper<br>category temperature | 155 °C, 1000 h                                                                                           | $\pm (2 \% R + 0.1 \Omega)$                       |
| 4.29                             | 45 (XA)                          | Component<br>solvent resistance            | Isopropyl alcohol;<br>50 °C; method 2                                                                    | No visible damage                                 |
| 4.22                             | 6 (Fc)                           | Vibration, endurance<br>by sweeping        | f = 10 Hz to 2000 Hz;<br>x, y, z $\leq$ 1.5 mm;<br>A $\leq$ 200 m/s <sup>2</sup> ;<br>10 sweeps per axis | $\pm (0.5 \% R + 0.05 \Omega)$                    |

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

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- IEC 60068-2-x, environmental test procedures

Packaging of components is done in paper tapes according to IEC 60286-3.



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