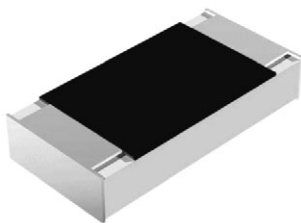


# Lead (Pb)-Free Commodity Thick Film Chip Resistors



## 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                                                                   | ± 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 $70^\circ\text{C} = 1.0 \text{ A}$ |                |                              |          |

## 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    |
| CRCW0201 |

|                                                             |
|-------------------------------------------------------------|
| VALUE                                                       |
| R = decimal<br>K = thousand<br>M = million<br>0000 = jumper |

|                                                  |
|--------------------------------------------------|
| TOLERANCE                                        |
| F = $\pm 1.0\%$<br>J = $\pm 5.0\%$<br>Z = jumper |

|                                                                                             |
|---------------------------------------------------------------------------------------------|
| TCR                                                                                         |
| K = $\pm 100$ ppm/K<br>N = $\pm 200$ 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    |
| CRCW0201 |

|                                                           |
|-----------------------------------------------------------|
| 100                                                       |
| TCR                                                       |
| $\pm 200$ ppm/K<br>$\pm 100$ ppm/K<br>- 200 / + 400 ppm/K |

|                                                                                                   |
|---------------------------------------------------------------------------------------------------|
| 562R                                                                                              |
| RESISTANCE<br>VALUE                                                                               |
| 1R0 = 1 $\Omega$<br>10R = 10 $\Omega$<br>10K = 10 k $\Omega$<br>1M = 1 M $\Omega$<br>0R0 = jumper |

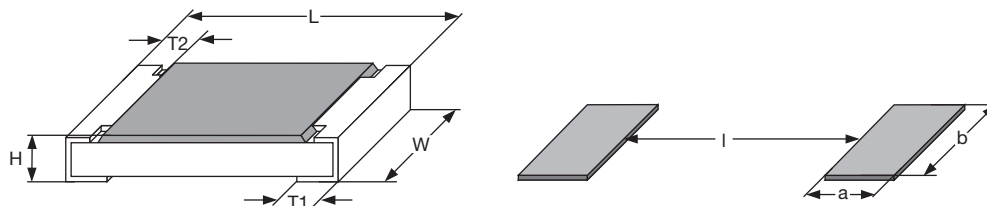
|                        |
|------------------------|
| 1 %                    |
| TOLERANCE<br>VALUE     |
| $\pm 1\%$<br>$\pm 5\%$ |

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

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

**PACKAGING**

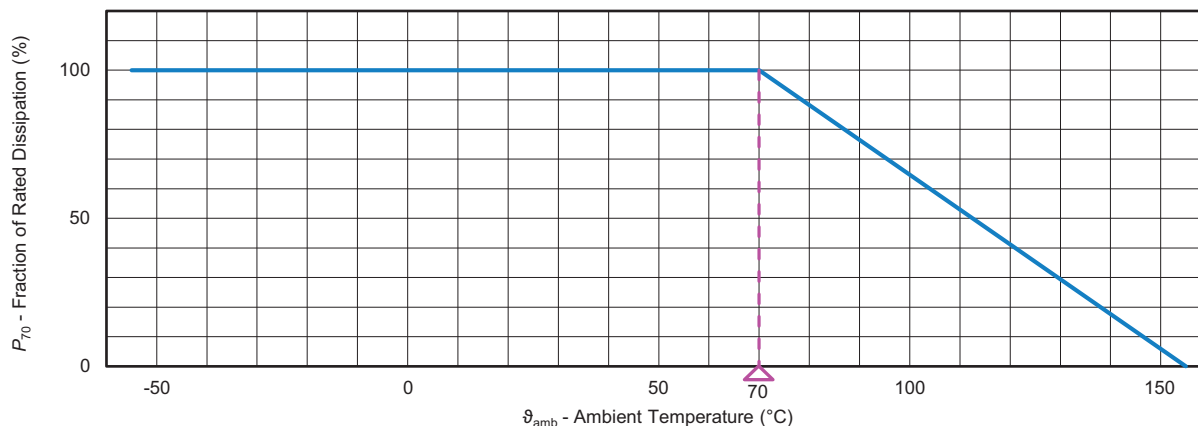
| MODEL    | CODE     | QUANTITY | CARRIER TAPE                                  | WIDTH | PITCH | REEL DIAMETER |
|----------|----------|----------|-----------------------------------------------|-------|-------|---------------|
| CRCW0201 | ED = ET7 | 10 000   | Paper tape according<br>to IEC 60068-3 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    | l    |
| 0201 | 0603   | 0.6 $\pm$ 0.03 | 0.3 $\pm$ 0.03 | 0.23 $\pm$ 0.03 | 0.15 $\pm$ 0.05 | 0.10 $\pm$ 0.05 | 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                     | -                                                                                                   | $\pm 1\%$ ; $\pm 5\%$                                                                   |
| 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                        | $U = \sqrt{P_{70} \times R} \leq U_{max.}$                                                          |                                                                                         |
| 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                                                                                       | $\pm (4\% R + 0.1 \Omega)$                                                              |

| 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:                                                                             |                                                   |
|                                  |                                  |                                            | <b>CRCW0201 e3</b>                                                                                       | 1 $\Omega$ to 10 M $\Omega$                       |
| 4.18.2                           | 58 (Td)                          | Resistance to soldering heat               | Solder bath method<br>(260 $\pm$ 5) $^{\circ}$ C; (10 $\pm$ 1) s                                         | $\pm$ (1 % $R$ + 0.05 $\Omega$ )                  |
| 4.35                             | -                                | Flammability,<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) $^{\circ}$ C; (93 $\pm$ 3) % RH; 56 days                                                    | $\pm$ (2 % $R$ + 0.1 $\Omega$ )                   |
| 4.25.3                           | -                                | Endurance at upper<br>category temperature | 155 $^{\circ}$ C, 1000 h                                                                                 | $\pm$ (2 % $R$ + 0.1 $\Omega$ )                   |
| 4.29                             | 45 (XA)                          | Component<br>solvent resistance            | Isopropyl alcohol;<br>50 $^{\circ}$ 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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