

## Lead (Pb)-Bearing Thick Film, Rectangular Chip Resistors



### FEATURES

- Stability  $\Delta R/R = 1\%$  for 1000 h at 70 °C
- Lead (Pb)-bearing termination plating on Ni barrier layer
- Metal glaze on high quality ceramic
- Halogen-free according to IEC 61249-2-21 definition
- AEC-Q200 qualified, rev. C compliant

**HALOGEN  
FREE**

### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL        | SIZE |          | RATED DISSIPATION<br>$P_{70}$<br>W                                            | LIMITING ELEMENT<br>VOLTAGE<br>$U_{max. AC/DC}$ | TEMPERATURE<br>COEFFICIENT<br>ppm/K | TOLERANCE<br>%     | RESISTANCE<br>RANGE<br>$\Omega$ | SERIES          |
|--------------|------|----------|-------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------|--------------------|---------------------------------|-----------------|
|              | INCH | METRIC   |                                                                               |                                                 |                                     |                    |                                 |                 |
| D10/CRCW0402 | 0402 | RR 1005M | 0.063                                                                         | 50                                              | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 1.5\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| D11/CRCW0603 | 0603 | RR 1608M | 0.10                                                                          | 75                                              | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.0\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| D12/CRCW0805 | 0805 | RR 2012M | 0.125                                                                         | 150                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.5\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| D25/CRCW1206 | 1206 | RR 3216M | 0.25                                                                          | 200                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 3.5\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| CRCW1210     | 1210 | RR 3225M | 0.50                                                                          | 200                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 5.0\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| CRCW1218     | 1218 | RR 3246M | 1.0                                                                           | 200                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 2M2                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 7.0\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| CRCW2010     | 2010 | RR 5025M | 0.75                                                                          | 400                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 6.0\text{ A}$ |                                                 |                                     |                    |                                 |                 |
| CRCW2512     | 2512 | RR 6332M | 1.0                                                                           | 500                                             | $\pm 100$<br>$\pm 200$              | $\pm 1$<br>$\pm 5$ | 1R0 to 10M                      | E24; E96<br>E24 |
|              |      |          | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 7.0\text{ A}$ |                                                 |                                     |                    |                                 |                 |

#### 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.
- Marking: See datasheet "Surface Mount Resistor Marking" (document number 20020).
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

**TECHNICAL SPECIFICATIONS**

| PARAMETER                                     | UNIT     | D10/<br>CRCW0402       | D11/<br>CRCW0603 | D12/<br>CRCW0805 | D25/<br>CRCW1206 | CRCW1210 | CRCW1218 | CRCW2010 | CRCW2512 |
|-----------------------------------------------|----------|------------------------|------------------|------------------|------------------|----------|----------|----------|----------|
| Rated dissipation at 70 °C <sup>(1)</sup>     | W        | 0.063                  | 0.1              | 0.125            | 0.25             | 0.5      | 1.0      | 0.75     | 1.0      |
| Limiting element voltage<br>$U_{MAX}$ , AC/DC | V        | 50                     | 75               | 150              | 200              | 200      | 200      | 400      | 500      |
| Insulation voltage $U_{INS}$ ,<br>(1 min)     | V        | > 75                   | > 100            | > 200            | > 300            | > 300    | > 300    | > 300    | > 300    |
| Insulation resistance                         | $\Omega$ | > $10^9$               |                  |                  |                  |          |          |          |          |
| Category temperature range                    | °C       | - 55 to + 155          |                  |                  |                  |          |          |          |          |
| Failure rate                                  | $h^{-1}$ | < $0.1 \times 10^{-9}$ |                  |                  |                  |          |          |          |          |
| Weight                                        | mg       | 0.65                   | 2                | 5.5              | 10               | 16       | 29.5     | 25.5     | 40.5     |

**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 °C is not exceeded.

**PART NUMBER AND PRODUCT DESCRIPTION**

Part Number: CRCW0805562RFKTA <sup>(2)</sup>

|          |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   |                |  |
|----------|---|---|---|---------------|---|---|---|---------------|---|---|---|-----------------------|---|---|---|----------------|--|
| C        | R | C | W | 0             | 8 | 0 | 5 | 5             | 6 | 2 | R | F                     | K | T | A |                |  |
| MODEL    |   |   |   | VALUE         |   |   |   | TOLERANCE     |   |   |   | TCR                   |   |   |   | PACKAGING      |  |
| CRCW0402 |   |   |   | R = Decimal   |   |   |   | F = $\pm 1\%$ |   |   |   | K = $\pm 100$ ppm/K   |   |   |   | TA             |  |
| CRCW0603 |   |   |   | K = Thousand  |   |   |   | J = $\pm 5\%$ |   |   |   | N = $\pm 200$ ppm/K   |   |   |   | TB             |  |
| CRCW0805 |   |   |   | M = Million   |   |   |   | Z = Jumper    |   |   |   | S = Jumper or special |   |   |   | TC             |  |
| CRCW1206 |   |   |   | 0000 = Jumper |   |   |   |               |   |   |   |                       |   |   |   | TD             |  |
| CRCW1210 |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | TE             |  |
| CRCW1218 |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | TF             |  |
| CRCW2010 |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | TG             |  |
| CRCW2512 |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | TH             |  |
|          |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | TK             |  |
|          |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | SPECIAL        |  |
|          |   |   |   |               |   |   |   |               |   |   |   |                       |   |   |   | Up to 2 digits |  |

Product Description: CRCW0805 100 562R 1 % RT1

|          |                 |                       |           |           |
|----------|-----------------|-----------------------|-----------|-----------|
| CRCW0805 | 100             | 562R                  | 1 %       | RT1       |
| MODEL    | TCR             | RESISTANCE VALUE      | TOLERANCE | PACKAGING |
| CRCW0402 | $\pm 100$ ppm/K | 10R = 10 $\Omega$     | $\pm 1\%$ | RT1       |
| CRCW0603 | $\pm 200$ ppm/K | 562R = 562 $\Omega$   | $\pm 5\%$ | RT5       |
| CRCW0805 |                 | 10K = 10.0 k $\Omega$ |           | RT6       |
| CRCW1206 |                 | 1M = 1 M $\Omega$     |           | RT7       |
| CRCW1210 |                 | 0R0 = Jumper          |           | RF4       |
| CRCW1218 |                 |                       |           | R02       |
| CRCW2010 |                 |                       |           | R67       |
| CRCW2512 |                 |                       |           | R82       |
|          |                 |                       |           | RT9       |

**Note**

<sup>(2)</sup> Preferred way for ordering products is by use of the PART NUMBER.

**PACKAGING**

| MODEL        | UNIT          | PAPER TAPE<br>ACC. IEC 60286-3, TYPE I |             |               | BLISTER TAPE<br>ACC. IEC 60286-3, TYPE II |             |               |
|--------------|---------------|----------------------------------------|-------------|---------------|-------------------------------------------|-------------|---------------|
|              |               | QUANTITY                               | PART NUMBER | PRODUCT DESC. | QUANTITY                                  | PART NUMBER | PRODUCT DESC. |
| D10/CRCW0402 | 180 mm/7"     | 10 000                                 | TD          | RT7           |                                           |             |               |
|              | 330 mm/13"    | 50 000                                 | TE          | RF4           |                                           |             |               |
| D11/CRCW0603 | 180 mm/7"     | 5000                                   | TA          | RT1           |                                           |             |               |
|              | 285 mm/11.25" | 10 000                                 | TB          | RT5           |                                           |             |               |
|              | 330 mm/13"    | 20 000                                 | TC          | RT6           |                                           |             |               |
| D12/CRCW0805 | 180 mm/7"     | 5000                                   | TA          | RT1           |                                           |             |               |
|              | 285 mm/11.25" | 10 000                                 | TB          | RT5           |                                           |             |               |
|              | 330 mm/13"    | 20 000                                 | TC          | RT6           |                                           |             |               |
| D25/CRCW1206 | 180 mm/7"     | 5000                                   | TA          | RT1           |                                           |             |               |
|              | 285 mm/11.25" | 10 000                                 | TB          | RT5           |                                           |             |               |
|              | 330 mm/13"    | 20 000                                 | TC          | RT6           |                                           |             |               |
| CRCW1210     | 180 mm/7"     | 5000                                   | TA          | RT1           |                                           |             |               |
|              | 285 mm/11.25" | 10 000                                 | TB          | RT5           |                                           |             |               |
|              | 330 mm/13"    | 20 000                                 | TC          | RT6           |                                           |             |               |
| CRCW1218     | 180 mm/7"     |                                        |             |               | 4000                                      | TK          | RT9           |
| CRCW2010     | 180 mm/7"     |                                        |             |               | 4000                                      | TF          | R02           |
| CRCW2512     | 180 mm/7"     |                                        |             |               | 2000                                      | TG          | R67           |
|              |               |                                        |             |               | 4000                                      | TH          | R82           |

**DIMENSIONS**

| SIZE |        | DIMENSIONS in millimeters              |             |             |                                       |           | SOLDER PAD DIMENSIONS in millimeters |     |     |                |     |     |
|------|--------|----------------------------------------|-------------|-------------|---------------------------------------|-----------|--------------------------------------|-----|-----|----------------|-----|-----|
|      |        |                                        |             |             |                                       |           | REFLOW SOLDERING                     |     |     | WAVE SOLDERING |     |     |
| INCH | METRIC | L                                      | W           | H           | T1                                    | T2        | a                                    | b   | l   | a              | b   | l   |
| 0402 | 1005   | 1.0 ± 0.05                             | 0.5 ± 0.05  | 0.35 ± 0.05 | 0.25 ± 0.05                           | 0.2 ± 0.1 | 0.4                                  | 0.6 | 0.5 |                |     |     |
| 0603 | 1608   | 1.55 <sup>+0.10</sup> <sub>-0.05</sub> | 0.85 ± 0.1  | 0.45 ± 0.05 | 0.3 ± 0.2                             | 0.3 ± 0.2 | 0.5                                  | 0.9 | 1.0 | 0.9            | 0.9 | 1.0 |
| 0805 | 2012   | 2.0 <sup>+0.20</sup> <sub>-0.10</sub>  | 1.25 ± 0.15 | 0.45 ± 0.05 | 0.3 <sup>+0.20</sup> <sub>-0.10</sub> | 0.3 ± 0.2 | 0.7                                  | 1.3 | 1.2 | 0.9            | 1.3 | 1.3 |
| 1206 | 3216   | 3.2 <sup>+0.10</sup> <sub>-0.20</sub>  | 1.6 ± 0.15  | 0.55 ± 0.05 | 0.45 ± 0.2                            | 0.4 ± 0.2 | 0.9                                  | 1.7 | 2.0 | 1.1            | 1.7 | 2.3 |
| 1210 | 3225   | 3.2 ± 0.2                              | 2.5 ± 0.2   | 0.55 ± 0.05 | 0.45 ± 0.2                            | 0.4 ± 0.2 | 0.9                                  | 2.5 | 2.0 | 1.1            | 2.5 | 2.2 |
| 1218 | 3246   | 3.2 <sup>+0.10</sup> <sub>-0.20</sub>  | 4.6 ± 0.15  | 0.55 ± 0.05 | 0.45 ± 0.2                            | 0.4 ± 0.2 | 1.05                                 | 4.9 | 1.9 | 1.25           | 4.8 | 1.9 |
| 2010 | 5025   | 5.0 ± 0.15                             | 2.5 ± 0.15  | 0.6 ± 0.1   | 0.6 ± 0.2                             | 0.6 ± 0.2 | 1.0                                  | 2.5 | 3.9 | 1.2            | 2.5 | 3.9 |
| 2512 | 6332   | 6.3 ± 0.2                              | 3.15 ± 0.15 | 0.6 ± 0.1   | 0.6 ± 0.2                             | 0.6 ± 0.2 | 1.0                                  | 3.2 | 5.2 | 1.2            | 3.2 | 5.2 |

**FUNCTIONAL PERFORMANCE**
**Single Pulse**

**Continuous Pulse**

**Pulse Voltage**


## Derating



## Non-Linearity



## Current Noise



**TEST PROCEDURES AND REQUIREMENTS**

| EN<br>60115-1<br>CLAUSE | IEC<br>60082-2<br>TEST<br>METHOD | TEST                                          | PROCEDURE                                                                                                                                | REQUIREMENTS PERMISSIBLE<br>CHANGE ( $\Delta R$ )                                         |                                                                |
|-------------------------|----------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------|
|                         |                                  |                                               |                                                                                                                                          | STABILITY CLASS 1<br>OR BETTER                                                            | STABILITY CLASS 2<br>OR BETTER                                 |
|                         |                                  |                                               | Stability for product types:<br><br><b>D/CRCW</b>                                                                                        | 1 $\Omega$ to 10 M $\Omega$                                                               | 1 $\Omega$ to 10 M $\Omega$                                    |
| 4.5                     | -                                | Resistance                                    | -                                                                                                                                        | $\pm 1 \%$                                                                                | $\pm 5 \%$                                                     |
| 4.7                     | -                                | Voltage proof                                 | $U = 1.4 \cdot U_{ins}$ ; 60 s                                                                                                           | No flashover or breakdown                                                                 |                                                                |
| 4.13                    | -                                | Short time overload                           | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ ;<br>duration: Acc. to style                                              | $\pm (0.25 \% R + 0.05 \Omega)$                                                           | $\pm (0.5 \% R + 0.05 \Omega)$                                 |
| 4.17.2                  | 58 (Td)                          | Solderability                                 | Solder bath method; Sn60Pb40;<br>non-activated flux;<br>(235 $\pm$ 5) $^{\circ}\text{C}$ ; (2 $\pm$ 0.2) s                               | Good tinning ( $\geq 95 \%$<br>covered);<br>no visible damage                             |                                                                |
| 4.8.4.2                 | -                                | Temperature coefficient                       | (20/- 55/20) $^{\circ}\text{C}$ and<br>(20/125/20) $^{\circ}\text{C}$                                                                    | $\pm 100 \text{ ppm/K}$                                                                   | $\pm 200 \text{ ppm/K}$                                        |
| 4.32                    | 21 (Uu <sub>3</sub> )            | Shear (adhesion)                              | RR 1608 and smaller: 9 N<br>RR 2012 and larger: 45 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>$\pm (0.25 \% R + 0.05 \Omega)$ |                                                                |
| 4.19                    | 14 (Na)                          | Rapid change of temperature                   | 30 min. at - 55 $^{\circ}\text{C}$ ;<br>30 min. at 125 $^{\circ}\text{C}$<br>5 cycles<br>1000 cycles                                     | $\pm (0.25 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$                           | $\pm (0.5 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$ |
| 4.23                    | -                                | Climatic sequence:                            | -                                                                                                                                        | $\pm (1 \% R + 0.05 \Omega)$                                                              | $\pm (2 \% R + 0.1 \Omega)$                                    |
| 4.23.2                  | 2 (Ba)                           | Dry heat                                      | 125 $^{\circ}\text{C}$ ; 16 h                                                                                                            |                                                                                           |                                                                |
| 4.23.3                  | 30 (Db)                          | Damp heat, cyclic                             | 55 $^{\circ}\text{C}$ ; $\geq 90 \% \text{ RH}$ ;<br>24 h; 1 cycle                                                                       |                                                                                           |                                                                |
| 4.23.4                  | 1 (Aa)                           | Cold                                          | - 55 $^{\circ}\text{C}$ ; 2 h                                                                                                            |                                                                                           |                                                                |
| 4.23.5                  | 13 (M)                           | Low air pressure                              | 1 kPa; (25 $\pm$ 10) $^{\circ}\text{C}$ ; 1 h                                                                                            |                                                                                           |                                                                |
| 4.23.6                  | 30 (Db)                          | Damp heat, cyclic                             | 55 $^{\circ}\text{C}$ ; $\geq 90 \% \text{ RH}$ ;<br>24 h; 5 cycles                                                                      |                                                                                           |                                                                |
| 4.23.7                  | -                                | DC load                                       | $U = \sqrt{P_{70} \times R}$                                                                                                             |                                                                                           |                                                                |
| 4.25.1                  | -                                | Endurance at 70 $^{\circ}\text{C}$            | $U = \sqrt{(P_{70} \times R)} \leq U_{max.}$<br>1.5 h on; 0.5 h off;<br>70 $^{\circ}\text{C}$ ; 1000 h<br>70 $^{\circ}\text{C}$ ; 8000 h | $\pm (1 \% R + 0.05 \Omega)$<br>$\pm (2 \% R + 0.1 \Omega)$                               | $\pm (2 \% R + 0.1 \Omega)$<br>$\pm (4 \% R + 0.1 \Omega)$     |
| 4.18.2                  | 58 (Td)                          | Resistance to soldering heat                  | Solder bath method<br>(260 $\pm$ 5) $^{\circ}\text{C}$ ; (10 $\pm$ 1) s                                                                  | $\pm (0.25 \% R + 0.05 \Omega)$                                                           | $\pm (0.5 \% R + 0.05 \Omega)$                                 |
| 4.35                    | -                                | Flamability, 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) $^{\circ}\text{C}$ ;<br>(93 $\pm$ 3) $\% \text{ RH}$ ; 56 days                                                              | $\pm (1 \% R + 0.05 \Omega)$                                                              |                                                                |
| 4.25.3                  | -                                | Endurance at upper<br>category temperature    | 155 $^{\circ}\text{C}$ ; 1000 h                                                                                                          | $\pm (1 \% R + 0.05 \Omega)$                                                              | $\pm (2 \% R + 0.1 \Omega)$                                    |
| 4.40                    | -                                | Electrostatic discharge<br>(human body model) | IEC 61340-3-1;<br>3 pos. + 3 neg. discharges;<br>ESD test voltage acc. to size                                                           | $\pm (1 \% R + 0.05 \Omega)$                                                              |                                                                |
| 4.29                    | 45 (XA)                          | Component solvent resistance                  | Isopropyl alcohol;<br>50 $^{\circ}\text{C}$ ; method 2                                                                                   | No visible damage                                                                         |                                                                |
| 4.30                    | 45 (XA)                          | Solvent resistance of marking                 | Isopropyl alcohol;<br>50 $^{\circ}\text{C}$ ; method 1, toothbrush                                                                       | Marking legible,<br>no visible damage                                                     |                                                                |

| TEST PROCEDURES AND REQUIREMENTS |                                  |                                                            |                                                                                                          |                                                   |                                |
|----------------------------------|----------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|
| EN<br>60115-1<br>CLAUSE          | IEC<br>60082-2<br>TEST<br>METHOD | TEST                                                       | PROCEDURE                                                                                                | REQUIREMENTS PERMISSIBLE<br>CHANGE ( $\Delta R$ ) |                                |
|                                  |                                  |                                                            |                                                                                                          | STABILITY CLASS 1<br>OR BETTER                    | STABILITY CLASS 2<br>OR BETTER |
|                                  |                                  |                                                            | Stability for product types:<br><br>D/CRCW                                                               | 1 $\Omega$ to 10 M $\Omega$                       | 1 $\Omega$ to 10 M $\Omega$    |
| 4.22                             | 6 (Fc)                           | Vibration, endurance 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 | $\pm (0.25 \% R + 0.05 \Omega)$                   | $\pm (0.5 \% R + 0.05 \Omega)$ |
| 4.37                             | -                                | Periodic electric overload                                 | $U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{\max.}$ ;<br>0.1 s on; 2.5 s off;<br>1000 cycles  | $\pm (1 \% R + 0.05 \Omega)$                      |                                |
| 4.27                             | -                                | Single pulse high voltage overload, 10 $\mu$ s/700 $\mu$ s | $\hat{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\max.}$ ;<br>10 pulses                      | $\pm (1 \% R + 0.05 \Omega)$                      |                                |

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, environmental test procedures

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



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