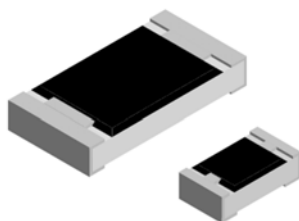


# Thick Film Surface Mount Chip Resistors, Wraparound, Extremely Low Value (0.01 $\Omega$ to 0.976 $\Omega$ )



## FEATURES

- Extremely low resistance values (0.01  $\Omega$  to 0.976  $\Omega$ )
- Enhanced power rating due to long side terminal construction (0612, 1020 types)
- Suitable for current sensing and shunts
- Metal glaze on high quality ceramic
- Protective overglaze
- Lead (Pb)-free solder contacts on Ni barrier layer
- AEC-Q200 qualified
- 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 |           |                                               |                                                          |                              |                              |                         |
|------------------------------------|-----------|-----------------------------------------------|----------------------------------------------------------|------------------------------|------------------------------|-------------------------|
| GLOBAL MODEL                       | CASE SIZE | POWER RATING<br>$P_{70^{\circ}\text{C}}$<br>W | TEMPERATURE COEFFICIENT<br>$\pm$ ppm/ $^{\circ}\text{C}$ | RESISTANCE RANGE<br>$\Omega$ | TOLERANCE<br>$\pm$ %         | E-SERIES <sup>(2)</sup> |
| RCWE0402                           | 0402      | 0.125                                         | 400                                                      | 0.033 to 0.05                | 5.0                          | 24                      |
|                                    |           |                                               | 200                                                      | 0.051 to 0.18                | 1.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 100                                                      | 0.2 to 0.976                 | 0.5, 1.0, 5.0 <sup>(1)</sup> |                         |
| RCWE0603                           | 0603      | 0.2                                           | 700                                                      | 0.010 to 0.018               | 5.0                          | 24                      |
|                                    |           |                                               | 400                                                      | 0.02 to 0.03                 | 1.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 200                                                      | 0.033 to 0.105               | 1.0, 5.0                     |                         |
| RCWE0805                           | 0805      | 0.25                                          | 100                                                      | 0.11 to 0.976                | 0.5, 1.0, 5.0 <sup>(1)</sup> | 24; 96                  |
|                                    |           |                                               | 400                                                      | 0.010 to 0.018               | 5.0                          |                         |
|                                    |           |                                               | 300                                                      | 0.02 to 0.03                 | 1.0, 5.0                     | 24; 96                  |
| RCWE0612                           | 0612      | 1.0                                           | 200                                                      | 0.033 to 0.05                | 1.0, 5.0                     |                         |
|                                    |           |                                               | 100                                                      | 0.051 to 0.976               | 0.5, 1.0, 5.0 <sup>(1)</sup> | 24; 96                  |
|                                    |           |                                               | 300                                                      | 0.010 to 0.016               | 2.0, 5.0                     |                         |
| RCWE1206                           | 1206      | 0.5                                           | 200                                                      | 0.018 to 0.2                 | 2.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 100                                                      | 0.205 to 0.976               | 1.0, 5.0                     |                         |
|                                    |           |                                               | 600                                                      | 0.010 to 0.018               | 5.0                          | 24                      |
| RCWE1210                           | 1210      | 1.0                                           | 300                                                      | 0.02 to 0.03                 | 1.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 200                                                      | 0.033 to 0.05                | 1.0, 5.0                     |                         |
|                                    |           |                                               | 100                                                      | 0.051 to 0.976               | 0.5, 1.0, 5.0 <sup>(1)</sup> | 24; 96                  |
| RCWE1020                           | 1020      | 2.0                                           | 200                                                      | 0.010 to 0.016               | 2.0, 5.0                     |                         |
|                                    |           |                                               | 100                                                      | 0.0162 to 0.976              | 1.0, 5.0                     | 24; 96                  |
| RCWE2010                           | 2010      | 1.0                                           | 600                                                      | 0.010 to 0.018               | 5.0                          | 24                      |
|                                    |           |                                               | 300                                                      | 0.02 to 0.03                 | 1.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 200                                                      | 0.033 to 0.05                | 1.0, 5.0                     |                         |
| RCWE2512                           | 2512      | 2.0                                           | 100                                                      | 0.051 to 0.976               | 0.5, 1.0, 5.0 <sup>(1)</sup> | 24; 96                  |
|                                    |           |                                               | 600                                                      | 0.010 to 0.018               | 5.0                          |                         |
|                                    |           |                                               | 300                                                      | 0.02 to 0.03                 | 1.0, 5.0                     | 24                      |
| RCWE2512                           | 2512      | 2.0                                           | 200                                                      | 0.033 to 0.05                | 1.0, 5.0                     | 24; 96                  |
|                                    |           |                                               | 100                                                      | 0.051 to 0.976               | 0.5, 1.0, 5.0 <sup>(1)</sup> |                         |
|                                    |           |                                               | 600                                                      | 0.010 to 0.018               | 5.0                          | 24                      |

## Notes

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.
- Part marking: Reference "Surface Mount Resistor Marking" ([www.vishay.com/doc?20020](http://www.vishay.com/doc?20020)).
- (1) Tight tolerance of 0.5 % is available for resistance values above 0.200  $\Omega$ .
- (2) Use E24 decade values for 5.0 % tolerance parts and E96 decade values for 0.5 % and 1.0 %. Refer to Standard Decade Table ([www.vishay.com/doc?31001](http://www.vishay.com/doc?31001)).

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: RCWE060351L0FNEA (visit [www.vishay.net](http://www.vishay.net) Vishay Dale parts numbering manual for all options)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | C | W | E | 0 | 6 | 0 | 3 | 5 | 1 | L | 0 | F | N | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

### GLOBAL MODEL (8 digits)

RCWE0402  
RCWE0603  
RCWE0805  
RCWE0612  
RCWE1206  
RCWE1210  
RCWE1020  
RCWE2010  
RCWE2512

### VALUE (4 digits)

L = mΩ \*  
R = decimal  
10L0 = 0.01 Ω  
R470 = 0.47 Ω

#### Note:

\* Use "L" for resistance values < 0.1 Ω

### TOLERANCE (1 digit)

D = ± 0.5 %  
F = ± 1.0 %  
G = ± 2.0 %  
J = ± 5.0 %

### TCR (1 digit)

K = ± 100 ppm/°C  
N = ± 200 ppm/°C  
M = ± 300 ppm/°C  
Q = ± 400 ppm/°C  
P = ± 500 ppm/°C  
T = ± 600 ppm/°C  
G = ± 700 ppm/°C

### PACKAGING (2 digits)

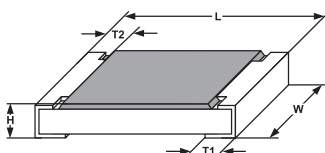
EA = lead (Pb)-free, tape/reel

## TECHNICAL SPECIFICATIONS

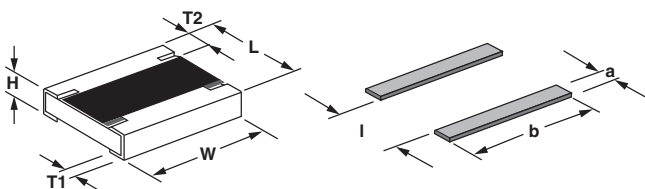
| PARAMETER                                   | UNIT | RCWE0402               | RCWE0603 | RCWE0805 | RCWE0612 | RCWE1206 | RCWE1210 | RCWE1020 | RCWE2010 | RCWE2512 |
|---------------------------------------------|------|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Operating temp. range                       | °C   | -55 to +155            |          |          |          |          |          |          |          |          |
| Maximum operating voltage                   | V    | (P × R) <sup>1/2</sup> |          |          |          |          |          |          |          |          |
| Insulation voltage U <sub>ins</sub> (1 min) | V    | > 75                   | > 100    | > 200    | > 100    | > 300    | > 300    | > 300    | > 300    | > 300    |
| Insulation resistance                       | Ω    | > 10 <sup>9</sup>      |          |          |          |          |          |          |          |          |
| Weight/1000 pieces (typical)                | g    | 0.7                    | 3        | 5.5      | 11.5     | 10.5     | 17.5     | 27.5     | 26       | 40.5     |

## DIMENSIONS

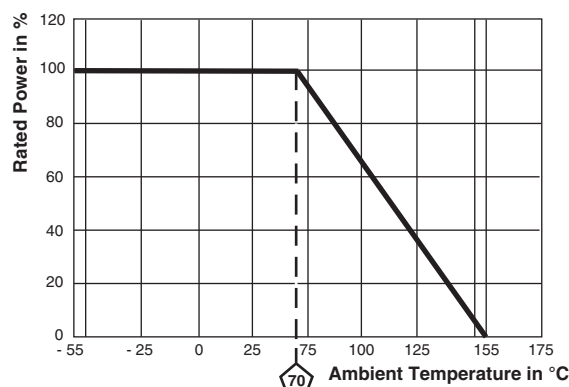
### RCWE0402 to RCWE2512



### RCWE0612, RCWE1020



| MODEL    | RESISTANCE RANGE<br>Ω | DIMENSIONS in millimeters |             |            |             |             | SOLDER PAD DIMENSIONS in millimeters |     |     |
|----------|-----------------------|---------------------------|-------------|------------|-------------|-------------|--------------------------------------|-----|-----|
|          |                       | L                         | W           | H          | T1          | T2          | a                                    | b   | l   |
| RCWE0402 | 0.033 to 0.976        | 1.05 ± 0.05               | 0.55 ± 0.05 | 0.35 ± 0.1 | 0.3 ± 0.15  | 0.25 ± 0.1  | 0.7                                  | 0.7 | 0.3 |
| RCWE0603 | 0.01 to 0.03          | 1.6 ± 0.1                 | 0.85 ± 0.1  | 0.5 ± 0.1  | 0.5 ± 0.2   | 0.3 ± 0.2   | 0.9                                  | 1.0 | 0.4 |
|          | 0.033 to 0.976        |                           |             |            | 0.3 ± 0.2   |             | 0.7                                  | 1.0 | 0.8 |
| RCWE0805 | 0.01 to 0.03          | 2.0 ± 0.15                | 1.3 ± 0.1   | 0.55 ± 0.1 | 0.6 ± 0.2   | 0.35 ± 0.2  | 1.0                                  | 1.4 | 0.6 |
|          | 0.033 to 0.976        |                           |             |            | 0.4 ± 0.2   |             | 0.8                                  | 1.4 | 1.0 |
| RCWE0612 | 0.01 to 0.976         | 1.6 ± 0.2                 | 3.2 ± 0.2   | 0.6 ± 0.1  | 0.4 ± 0.15  | 0.25 ± 0.15 | 0.9                                  | 3.5 | 0.8 |
| RCWE1206 | 0.01 to 0.03          | 3.1 ± 0.15                | 1.6 ± 0.15  | 0.6 ± 0.1  | 0.9 ± 0.2   | 0.45 ± 0.2  | 1.3                                  | 1.8 | 1.0 |
|          | 0.033 to 0.05         |                           |             |            | 0.8 ± 0.2   |             | 1.2                                  | 1.8 | 1.2 |
|          | 0.051 to 0.976        |                           |             |            | 0.45 ± 0.2  |             | 1.0                                  | 1.8 | 1.6 |
| RCWE1210 | 0.01 to 0.03          | 3.1 ± 0.2                 | 2.5 ± 0.2   | 0.6 ± 0.1  | 0.8 ± 0.2   | 0.4 ± 0.2   | 1.3                                  | 2.6 | 1.1 |
|          | 0.033 to 0.976        |                           |             |            | 0.4 ± 0.2   |             | 0.9                                  | 2.6 | 2.0 |
| RCWE1020 | 0.01 to 0.976         | 2.5 ± 0.2                 | 5.0 ± 0.2   | 0.6 ± 0.1  | 0.55 ± 0.15 | 0.30 ± 0.15 | 1.2                                  | 5.5 | 1.4 |
| RCWE2010 | 0.01 to 0.03          | 5.0 ± 0.2                 | 2.5 ± 0.15  | 0.6 ± 0.1  | 1.6 ± 0.3   | 0.6 ± 0.2   | 2.3                                  | 3.0 | 1.4 |
|          | 0.033 to 0.05         |                           |             |            | 0.7 ± 0.3   |             | 1.4                                  | 3.0 | 3.2 |
|          | 0.051 to 0.976        |                           |             |            | 0.7 ± 0.3   |             | 1.4                                  | 3.0 | 3.2 |
| RCWE2512 | 0.01 to 0.03          | 6.3 ± 0.2                 | 3.15 ± 0.15 | 0.6 ± 0.1  | 2.0 ± 0.3   | 0.6 ± 0.2   | 2.8                                  | 3.6 | 1.4 |
|          | 0.033 to 0.05         |                           |             |            | 0.8 ± 0.3   |             | 1.6                                  | 3.6 | 3.8 |
|          | 0.051 to 0.976        |                           |             |            | 0.8 ± 0.3   |             | 1.6                                  | 3.6 | 3.8 |

**DERATING**


| PERFORMANCE               |                                                                                   |                                         |
|---------------------------|-----------------------------------------------------------------------------------|-----------------------------------------|
| TEST                      | CONDITIONS OF TEST                                                                | TEST LIMITS                             |
| Thermal shock             | MIL-STD-202, method 107, -55 °C to +125 °C, 300 cycles at each extreme            | $\pm (1.0 \% + 0.0005 \Omega) \Delta R$ |
| Short time overload       | 2 x rated power; duration according the model                                     | $\pm (0.5 \% + 0.0005 \Omega) \Delta R$ |
| High temperature exposure | MIL-STD-202, method 108, 1000 h at T = 125 °C, 0 % power                          | $\pm (2.0 \% + 0.0005 \Omega) \Delta R$ |
| Temperature cycling       | JESD 22, method JA-104, 1000 cycles (-55 °C to +125 °C)                           | $\pm (2.0 \% + 0.0005 \Omega) \Delta R$ |
| Biased humidity           | MIL-STD-202, method 103, 1000 h 85 °C/85 % RH, 10 % x $(P \times R)^{1/2}$        | $\pm (2.0 \% + 0.0005 \Omega) \Delta R$ |
| Mechanical shock          | MIL-STD-202, method 213, condition C, 10 g's, 6 ms (half sine), 3 directions      | $\pm (1.0 \% + 0.0005 \Omega) \Delta R$ |
| Vibration                 | MIL-STD-202, method 204, 5 g's, 20 min, 12 cycles, 3 directions, 10 Hz to 2000 Hz | $\pm (1.0 \% + 0.0005 \Omega) \Delta R$ |
| Operational life          | MIL-STD-202, method 108, 1000 h at T = 125 °C at rated power                      | $\pm (2.0 \% + 0.0005 \Omega) \Delta R$ |
| Resistance to solder heat | MIL-STD-202, method 210, +260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence    | $\pm (1.0 \% + 0.0005 \Omega) \Delta R$ |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required                        | $\pm (2.0 \% + 0.0005 \Omega) \Delta R$ |

| PACKAGING |                        |           |       |             |      |
|-----------|------------------------|-----------|-------|-------------|------|
| MODEL     | REEL                   |           |       |             |      |
|           | TAPE WIDTH             | DIAMETER  | PITCH | PIECES/REEL | CODE |
| RCWE0402  | 8 mm/punched paper     | 180 mm/7" | 2 mm  | 10 000      | EA   |
| RCWE0603  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWE0805  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWE0612  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWE1206  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWE1210  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWE1020  | 12 mm/embossed plastic | 180 mm/7" | 4 mm  | 4000        | EA   |
| RCWE2010  | 12 mm/embossed plastic | 180 mm/7" | 4 mm  | 4000        | EA   |
| RCWE2512  | 12 mm/embossed plastic | 180 mm/7" | 8 mm  | 2000        | EA   |

**Note**

- Embossed carrier tape per EIA-481-1A.



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