

## Thick Film Surface Mount Chip Resistors, Wraparound, Low Value (0.1 Ω to 0.91 Ω)



### FEATURES

- Low resistance values (0.1 Ω to 0.91 Ω)
- Suitable for current sensing and shunts
- Metal glaze on high quality ceramic
- Protective overglaze
- Solder contacts on Ni barrier layer
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition



### Note

\* Pb containing terminations are not RoHS compliant, exemptions may apply

| 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 |
| RCWL0402                           | 0402      | 0.063   | 600  | 0.22 to 0.43                 | 5                    | 24       |
|                                    |           |   | 400  | 0.47 to 0.91                 |                      |          |
| RCWL0603                           | 0603      | 0.1   | 400  | 0.10 to 0.43                 | 5                    | 24       |
|                                    |           |   | 200  | 0.47 to 0.91                 |                      |          |
| RCWL0805                           | 0805      | 0.125   | 300  | 0.10 to 0.43                 | 5                    | 24       |
|                                    |           |   | 200  | 0.47 to 0.91                 |                      |          |
| RCWL1206                           | 1206      | 0.25  | 300  | 0.10 to 0.43                 | 5                    | 24       |
|                                    |           |   | 200  | 0.47 to 0.91                 |                      |          |
| RCWL1210                           | 1210      | 0.33  | 200  | 0.10 to 0.91                 | 5                    | 24       |
| RCWL1218                           | 1218      | 1.0   | 200  | 0.10 to 0.91                 | 5                    | 24       |
| RCWL2010                           | 2010      | 0.5   | 200  | 0.10 to 0.91                 | 5                    | 24       |
| RCWL2512                           | 2512      | 1.0   | 200  | 0.10 to 0.91                 | 5                    | 24       |

### Note

- 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 document number 20020.
- The resistance is measured from the top side.

| GLOBAL PART NUMBER INFORMATION   |   |   |   |                              |   |   |   |                 |   |  |   |   |  |   |   |
|--|---|---|---|------------------------------|---|---|---|-----------------|---|--|---|---|--|---|---|
| Part Number: RCWL0402R470JQE A   |   |   |   |                              |   |   |   |                 |   |  |   |   |  |   |   |
| R  | C | W | L | 0                            | 4 | 0 | 2 | R               | 4 | 7  | 0 | J | Q  | E | A |
| GLOBAL MODEL   |   |   |   | VALUE                        |   |   |   | TOLERANCE       |   | TCR  |   |   | PACKAGING  |   |   |
| RCWL0402<br>RCWL0603<br>RCWL0805<br>RCWL1206<br>RCWL1210<br>RCWL1218<br>RCWL2010<br>RCWL2512 |   |   |   | R = Decimal<br>R470 = 0.47 Ω |   |   |   | J = $\pm$ 5.0 % |   | N = $\pm$ 200 ppm/ $^{\circ}\text{C}$<br>M = $\pm$ 300 ppm/ $^{\circ}\text{C}$<br>Q = $\pm$ 400 ppm/ $^{\circ}\text{C}$<br>T = $\pm$ 600 ppm/ $^{\circ}\text{C}$ |   |   | EA = Lead (Pb)-free,<br>tape/reel<br><br>TA = Tin/lead,<br>tape/reel |   |   |

| TECHNICAL SPECIFICATIONS             |          |                      |          |          |          |          |          |          |          |
|--------------------------------------|----------|----------------------|----------|----------|----------|----------|----------|----------|----------|
| PARAMETER                            | UNIT     | RCWL0402             | RCWL0603 | RCWL0805 | RCWL1206 | RCWL1210 | RCWL1218 | RCWL2010 | RCWL2512 |
| Operating temp. range                | °C       | - 55 to + 155        |          |          |          |          |          |          |          |
| Maximum operating voltage            | V        | $(P \times R)^{1/2}$ |          |          |          |          |          |          |          |
| Insulation voltage $U_{ins}$ (1 min) | V        | > 75                 | > 100    | > 200    | > 300    | > 300    | > 300    | > 300    | > 300    |
| Insulation resistance                | $\Omega$ | > $10^9$             |          |          |          |          |          |          |          |
| Weight/1000 pieces (typical)         | g        | 0.65                 | 2        | 5.5      | 10       | 16       | 29.5     | 25.5     | 40.5     |



| MODEL    | DIMENSIONS in millimeters              |             |             |                                       |           |                  |     |     |                |     |     |
|----------|--|-------------|-------------|---------------------------------------|-----------|------------------|-----|-----|----------------|-----|-----|
|          | L                                      | W           | H           | T1                                    | T2        | REFLOW SOLDERING |     |     | WAVE SOLDERING |     |     |
|          |  |             |             |                                       |           | a                | b   | l   | a              | b   | l   |
| RCWL0402 | 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 | 0.5            | 0.6 | 0.5 |
| RCWL0603 | 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 |
| RCWL0805 | 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 |
| RCWL1206 | 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 |
| RCWL1210 | 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 |
| RCWL1218 | 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 |
| RCWL2010 | 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 |
| RCWL2512 | 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 |

**TEMPERATURE RISE**

**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 | ± (2.0 % + 0.005 $\Omega$ ) $\Delta R$ |



| PERFORMANCE               |  |  |
|---------------------------|--|--|
| TEST                      | CONDITIONS OF TEST   | TEST LIMITS                            |
| Short time overload       | 2 x rated power; duration according the model  | $\pm (0.5 \% + 0.005 \Omega) \Delta R$ |
| High temperature exposure | MIL-STD-202, method 108, 1000 h at T = 125 °C, 0 % power                                       | $\pm (2.0 \% + 0.005 \Omega) \Delta R$ |
| Temperature cycling       | JESD 22, method JA-104, 1000 cycles (- 55 °C to + 125 °C)                                      | $\pm (2.0 \% + 0.005 \Omega) \Delta R$ |
| Biased humidity           | MIL-STD-202, method 103, 1000 h 85 °C/85 % RH, 10 % x (P x R) <sup>1/2</sup>                   | $\pm (2.0 \% + 0.005 \Omega) \Delta R$ |
| Mechanical shock          | MIL-STD-202, method 213, condition C, 10 g <sup>3</sup> s, 6 ms (half sine), 3 directions      | $\pm (0.5 \% + 0.005 \Omega) \Delta R$ |
| Vibration                 | MIL-STD-202, method 204, 5 g <sup>3</sup> s, 20 min, 12 cycles, 3 directions, 10 Hz to 2000 Hz | $\pm (0.5 \% + 0.005 \Omega) \Delta R$ |
| Operational life          | MIL-STD-202, method 108, 1000 h at T = 125 °C at rated power                                   | $\pm (2.0 \% + 0.005 \Omega) \Delta R$ |
| Resistance to solder heat | MIL-STD-202, method 210, + 260 °C solder, 10 s to 12 s dwell, 25 mm/s emergence                | $\pm (1.0 \% + 0.005 \Omega) \Delta R$ |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power, 7a and 7b not required                                     | $\pm (2.0 \% + 0.005 \Omega) \Delta R$ |

| PACKAGING |                        |           |       |             |      |
|-----------|------------------------|-----------|-------|-------------|------|
| MODEL     | REEL                   |           |       |             |      |
|           | TAPE WIDTH             | DIAMETER  | PITCH | PIECES/REEL | CODE |
| RCWL0402  | 8 mm/punched paper     | 180 mm/7" | 2 mm  | 10 000      | EA   |
| RCWL0603  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWL0805  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWL1206  | 8 mm/punched paper     | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWL1210  | 12 mm/punched paper    | 180 mm/7" | 4 mm  | 5000        | EA   |
| RCWL1218  | 12 mm/embossed plastic | 180 mm/7" | 4 mm  | 4000        | EA   |
| RCWL2010  | 12 mm/embossed plastic | 180 mm/7" | 4 mm  | 4000        | EA   |
| RCWL2512  | 12 mm/embossed plastic | 180 mm/7" | 8 mm  | 2000        | EA   |

**Note**

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



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