

Long Side Termination Thick Film Chip Resistors



FEATURES

- Enhanced power rating
- Long side terminations
- Pure tin solder contacts on Ni barrier layer, provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- AEC-Q200 qualified



RoHS
COMPLIANT
HALOGEN
FREE

| STANDARD ELECTRICAL SPECIFICATIONS | | | | | | | | |
|------------------------------------|------|----------|------------------------------------|---|----------------------------------|----------------|------------------------------|-----------|
| MODEL | SIZE | | RATED DISSIPATION P_{70} W | LIMITING ELEMENT VOLTAGE $U_{max. AC/DC}$ V | TEMPERATURE COEFFICIENT ppm/K | TOLERANCE % | RESISTANCE RANGE Ω | SERIES |
| | INCH | METRIC | | | | | | |
| RCL0612 e3 | 0612 | RR 1632M | 0.5 | 75 | ± 100 | ± 1 | 1R0 to 1M | E24; E96 |
| | | | | | | | | ± 200 |
| RCL1218 e3 | 1218 | RR 3246M | 1.0 | 200 | ± 100 | ± 1 | 1R0 to 2.2M | E24; E96 |
| | | | | | | | | ± 200 |
| RCL1225 e3 | 1225 | RR 3263M | 2.0 ⁽¹⁾ | 200 | ± 100 | ± 1 | 1R0 to 1M | E24; E96 |
| | | | | | | | | ± 200 |

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.
- ⁽¹⁾ Specified power rating requires dedicated mounting conditions to achieve the required thermal resistance.

| TECHNICAL SPECIFICATIONS | | | | |
|--|--------------------|---------------|---------|--------------------|
| DESCRIPTION | UNIT | RCL0612 | RCL1218 | RCL1225 |
| Rated Dissipation P_{70} ⁽²⁾ | W | 0.5 | 1.0 | 2.0 ⁽³⁾ |
| Limiting Element Voltage $U_{max. AC/DC}$ | V | 75 | 200 | 200 |
| Insulation Voltage U_{ins} (1 min) | V | > 100 | > 300 | > 300 |
| Insulation Resistance | Ω | > 10^9 | | |
| Category Temperature Range | $^{\circ}\text{C}$ | - 55 to + 155 | | |
| Weight | mg | 11 | 29.5 | 55 |

Notes

- ⁽²⁾ The power dissipation on the resistors 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.
- ⁽³⁾ Specified power rating requires dedicated mounting conditions to achieve the required thermal resistance.

| PART NUMBER AND PRODUCT DESCRIPTION | | | | | | | | | | | | | | | | |
|--|---|-----------------------------------|---|--|---|---|---|--|---|--|---|---|---|--|---|---|
| PART NUMBER: RCL061210K0FKEA | | | | | | | | | | | | | | | | |
| R | C | L | 0 | 6 | 1 | 2 | 1 | 0 | K | 0 | F | K | E | A | 0 | 0 |
| MODEL/SIZE RCL0612 RCL1218 RCL1225 | | | RESISTANCE R = Decimal K = Thousand M = Million 0000 = Jumper | | | TOLERANCE F = ± 1 % J = ± 5 % Z = Jumper | | | TCR K = ± 100 ppm/K N = ± 200 ppm/K 0 = Jumper | | | PACKAGING EA EB EC EK EG | | SPECIAL Up to 2 digits 00 = Standard | | |
| PRODUCT DESCRIPTION: RCL0612 100 10K 1% ET1 e3 | | | | | | | | | | | | | | | | |
| RCL0612 | | 100 | | 10K | | 1% | | ET1 | | e3 | | | | | | |
| MODEL RCL0612 RCL1218 RCL1225 | | TCR ± 100 ppm/K ± 200 ppm/K | | RESISTANCE 10R = 10 Ω 10K = 10 kΩ 1M = 1 MΩ 0R0 = Jumper | | TOLERANCE ± 1 % ± 5 % | | PACKAGING ET1 ET5 ET6 ET9 E67 | | LEAD (Pb)-FREE e3 = Pure tin termination finish | | | | | | |

| PACKAGING | | | | | | | |
|-----------|---------------|---|-------------|---------------|--|-------------|---------------|
| MODEL | UNIT | PAPER TAPE ON REEL ACC. TO IEC 60286-3, TYPE I | | | BLISTER TAPE ON REEL ACC. TO IEC 60286-3, TYPE II | | |
| | | QUANTITY | PART NUMBER | PRODUCT DESC. | QUANTITY | PART NUMBER | PRODUCT DESC. |
| RCL0612 | 180 mm/7" | 5000 | EA | ET1 | | | |
| | 285 mm/11.25" | 10 000 | EB | ET5 | | | |
| | 330 mm/13" | 20 000 | EC | ET6 | | | |
| RCL1218 | 180 mm/7" | | | | 4000 | EK | ET9 |
| RCL1225 | 180 mm/7" | | | | 2000 | EG | E67 |

DIMENSIONS in millimeters



| SIZE | | DIMENSIONS | | | | | SOLDER PAD DIMENSIONS | | | | | |
|------|--------|---|------------|-------------|-------------|-------------|-----------------------|-----|-----|----------------|-----|-----|
| | | | | | | | REFLOW SOLDERING | | | WAVE SOLDERING | | |
| INCH | METRIC | L | W | H | T1 | T2 | a | b | l | a | b | l |
| 0612 | 1632 | 1.6 ± 0.2 | 3.2 ± 0.2 | 0.55 ± 0.1 | 0.35 ± 0.15 | 0.25 ± 0.15 | 0.6 | 3.2 | 1.0 | 1.1 | 3.2 | 1.0 |
| 1218 | 3246 | 3.2 ^{+0.10} / _{-0.20} | 4.6 ± 0.15 | 0.55 ± 0.05 | 0.45 ± 0.2 | 0.4 ± 0.2 | 1.1 | 4.9 | 1.9 | 1.25 | 4.8 | 1.9 |
| 1225 | 3263 | 3.2 ± 0.2 | 6.3 ± 0.2 | 0.75 ± 0.15 | 0.8 ± 0.2 | 0.4 ± 0.2 | 1.9 | 7.6 | 1.2 | 1.9 | 7.6 | 1.2 |

FUNCTIONAL PERFORMANCE

Single Pulse



Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and $n < 1000$ and $\dot{U} \leq \dot{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

Continuous Pulse



Maximum pulse load, continuous pulses; applicable if $\bar{P} \leq P(\vartheta_{amb})$ and $\dot{U} \leq \dot{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

Pulse Voltage



Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{max}$; for permissible resistance change equivalent to 8000 h operation



Derating



| TEST PROCEDURES AND REQUIREMENTS | | | | | |
|----------------------------------|-------------------------|-----------------------------|---|---|-------------------------------|
| EN 60115-1 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE (ΔR) | |
| | | | | STABILITY CLASS 2 OR BETTER | |
| | | | Stability for product types: | | |
| | | | RCL e3 | 1 Ω to 2.2 M Ω | |
| 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 | - | Short time overload | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; 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 non activated flux; (235 \pm 5) °C (2 \pm 0.2) s | Good tinning ($\geq 95\%$ covered); no visible damage | |
| | | | Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; (245 \pm 5) °C (3 \pm 0.3) s | Good tinning ($\geq 95\%$ covered); no visible damage | |
| 4.8.4.2 | - | Temperature coefficient | (20/- 55/20) °C and (20/125/20) °C | ± 100 ppm/K | ± 200 ppm/K |
| 4.32 | 21 (Uu ₃) | Shear (adhesion) | 45N | No visible damage | |
| 4.33 | 21 (Uu ₁) | Substrate bending | Depth 2 mm; 3 times | No visible damage, no open circuit in bent position $\pm (0.25\% R + 0.05 \Omega)$ | |
| 4.19 | 14 (Na) | Rapid change of temperature | 30 min at - 55 °C; 30 min at 125 °C | | |
| | | | 5 cycles | $\pm (0.25\% R + 0.05 \Omega)$ | $\pm (0.5\% R + 0.05 \Omega)$ |
| | | | 1000 cycles | $\pm (1\% R + 0.05 \Omega)$ | $\pm (1\% R + 0.05 \Omega)$ |



| TEST PROCEDURES AND REQUIREMENTS | | | | | |
|----------------------------------|-------------------------|--|--|--|--|
| EN 60115-1 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE (ΔR) | |
| | | | | STABILITY CLASS 2 OR BETTER | |
| | | | Stability for product types: | 1 Ω to 2.2 M Ω | |
| | | | RCL e3 | | |
| 4.23 | - | Climatic sequence: | - | | |
| 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 | $\pm (1\% R + 0.05 \Omega)$ | $\pm (2\% R + 0.1 \Omega)$ |
| 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 | $U = \sqrt{P_{70} \times R}$ | | |
| 4.25.1 | - | Endurance at 70 °C | $U = \sqrt{P_{70} \times R} \leq U_{max.};$ 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h | $\pm (0.5\% R + 0.05 \Omega)$ $\pm (1\% R + 0.05 \Omega)$ | $\pm (2\% R + 0.1 \Omega)$ $\pm (4\% R + 0.1 \Omega)$ |
| 4.18.2 | 58 (Td) | Resistance to soldering heat | Solder bath method (260 \pm 5) °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; 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 | $\pm (1\% R + 0.05 \Omega)$ | |
| 4.25.3 | - | Endurance at upper category temperature | 155 °C, 1000 h | $\pm (1\% R + 0.05 \Omega)$ | $\pm (2\% R + 0.1 \Omega)$ |
| 4.40 | - | Electrostatic discharge (Human Body Model) | IEC 61340-3-1 3 pos. + 3 neg. discharges; ESD voltage: 1000 V | $\pm (1\% R + 0.05 \Omega)$ | |
| 4.29 | 45 (XA) | Component solvent resistance | Isopropyl alcohol; 50 °C; method 2 | No visible damage | |
| 4.30 | 45 (XA) | Solvent resistance of marking | Isopropyl alcohol; 50 °C; method 1, toothbrush | Marking legible, no visible damage | |
| 4.22 | 6 (Fc) | Vibration, endurance by sweeping | f = 10 Hz to 2000 Hz; x, y, z \leq 1.5 mm; A \leq 200 m/s ² ; 10 sweeps per axis | $\pm (0.25\% R + 0.05 \Omega)$ | $\pm (0.5\% R + 0.05 \Omega)$ |
| 4.37 | - | Periodic electric overload | $U = \sqrt{15 \times P_{70} \times R}$ $\leq 2 \times U_{max.};$ 0.1 s on; 2.5 s off; 1000 cycles | $\pm (1\% R + 0.05 \Omega)$ | |
| 4.27 | - | Single pulse high voltage overload, 10 μ s/700 μ s | $\dot{U} = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.};$ 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-x environmental test procedures

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



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