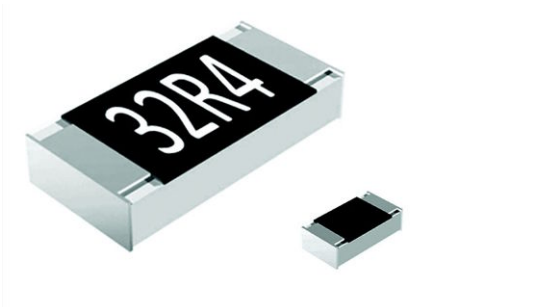
# Fully RoHS Compliant, Green, Thick Film, Rectangular Chip Resistors




## FEATURES

- Fully Green resistor body with pure tin solder contacts
- Stability $\Delta R/R$ = 1 % for 1000 h at 70 ° C
- 2 mm pitch packaging option for 0603 size
- Metal glaze on high quality ceramic
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

GREEN (5-2008)

## STANDARD ELECTRICAL SPECIFICATIONS

| MODEL | CASE SIZE INCH | CASE SIZE METRIC | POWER RATING $P_{70}$ W | LIMITING ELEMENT VOLTAGE $U_{max.}$ $AC_{RMS}$/DC V | TEMPERATURE COEFFICIENT ± ppm/K | TOLERANCE ± % | RESISTANCE RANGE Ω | SERIES |
|---|---|---|---|---|---|---|---|---|
| RCG0402 | 0402 | RR 1005M | 0.063 | 50 | 100<br>200 | 1<br>5 | 1R0 to 10M | E24; E96<br>E24 |
| | | | Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ = 1.5 A | | | | | |
| RCG0603 | 0603 | RR 1608M | 0.1 | 75 | 100<br>200 | 1<br>5 | 1R0 to 10M | E24; E96<br>E24 |
| | | | Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ = 2.0 A | | | | | |
| RCG0805 | 0805 | RR 2012M | 0.125 | 150 | 100<br>200 | 1<br>5 | 1R0 to 10M | E24; E96<br>E24 |
| | | | Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ = 2.5 A | | | | | |
| RCG1206 | 1206 | RR 3216M | 0.25 | 200 | 100<br>200 | 1<br>5 | 1R0 to 10M | E24; E96<br>E24 |
| | | | Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ = 3.5 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 | RCG0402 | RCG0603 | RCG0805 | RCG1206 |
|---|---|---|---|---|---|
| Rated dissipation $P_{70}$ (1) | W | 0.063 | 0.1 | 0.125 | 0.25 |
| Operating voltage $U_{max.}$ $AC_{RMS}$/DC | V | 50 | 75 | 150 | 200 |
| Insulation voltage $U_{ins}$ (1 min) | V | 75 | 100 | 200 | 300 |
| Insulation resistance | Ω | > $10^9$ | | | |
| Operating temperature range | °C | - 55 to + 155 | | | |
| Weight | mg | 0.65 | 2 | 5.5 | 10 |

**Note**

(1) 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: RCG080510K0FKEA**

| R | C | G | 0 | 8 | 0 | 5 | 1 | 0 | K | 0 | F | K | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| MODEL | VALUE | TOLERANCE | TCR | PACKAGING |
|---|---|---|---|---|
| **RCG0402**<br>**RCG0603**<br>**RCG0805**<br>**RCG1206** | **R** = Decimal<br>**K** = Thousand<br>**M** = Million<br>**0000** = 0 Ω Jumper | **F** = ± 1.0 %<br>**J** = ± 5.0 %<br>**Z** = Jumper | **K** = ± 100 ppm/K<br>**N** = ± 200 ppm/K<br>**0** = Jumper | **EA, EB,**<br>**EC, ED,**<br>**EE, EI,**<br>**EL** |

**PRODUCT DESCRIPTION: RCG0805 100 10K 1 % EA**

| RCG0805 | 100 | 10K | 1 % | EA |
|---|---|---|---|---|
| MODEL | TCR | RESISTANCE | TOLERANCE | PACKAGING |
| **RCG0402**<br>**RCG0603**<br>**RCG0805**<br>**RCG1206** | **± 100** ppm/K<br>**± 200** ppm/K | **10R** = 10 Ω<br>**10K** = 10 kΩ<br>**1M** = 1 MΩ<br>**0R0** = Jumper | **± 1 %**<br>**± 5 %** | **EA, EB,**<br>**EC, ED,**<br>**EE, EI,**<br>**EL** |

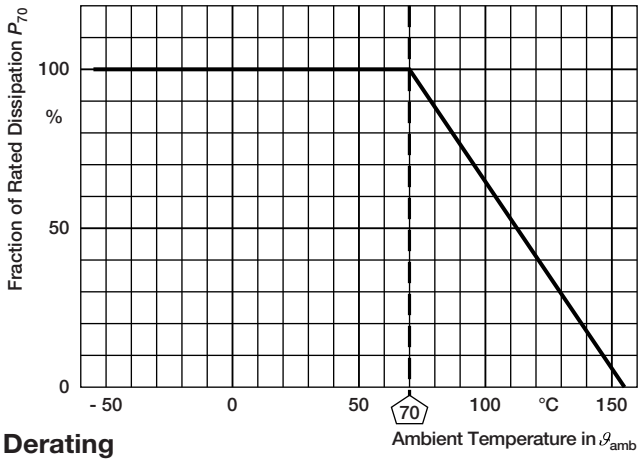
## PACKAGING

| MODEL | CODE | QUANTITY | CARRIER TAPE | WIDTH | PITCH | REEL DIAMETER |
|---|---|---|---|---|---|---|
| RCG0402 | ED | 10 000 | Paper tape acc. to IEC 60068-3 Type I | 8 mm | 2 mm | 180 mm/7" |
| | EE | 50 000 | | | | 330 mm/13" |
| RCG0603 | EI | 5000 | Paper tape acc. to IEC 60068-3 Type I | 8 mm | 2 mm | 180 mm/7" |
| | ED | 10 000 | | | | 180 mm/7" |
| | EL | 20 000 | | | | 285 mm/11.25" |
| | EE | 50 000 | | | | 330 mm/13" |
| | EA | 5000 | Paper tape acc. to IEC 60068-3 Type I | 8 mm | 4 mm | 180 mm/7" |
| | EB | 10 000 | | | | 285 mm/11.25" |
| | EC | 20 000 | | | | 330 mm/13" |
| RCG0805 | EA | 5000 | Paper tape acc. to IEC 60068-3 Type I | 8 mm | 4 mm | 180 mm/7" |
| | EB | 10 000 | | | | 285 mm/11.25" |
| | EC | 20 000 | | | | 330 mm/13" |
| RCG1206 | EA | 5000 | Paper tape acc. to IEC 60068-3 Type I | 8 mm | 4 mm | 180 mm/7" |
| | EB | 10 000 | | | | 285 mm/11.25" |
| | EC | 20 000 | | | | 330 mm/13" |

## 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 |
| 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 $^{+0.10}_{-0.05}$ | 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 $^{+0.20}_{-0.10}$ | 1.25 ± 0.15 | 0.45 ± 0.05 | 0.3 $^{+0.20}_{-0.10}$ | 0.3 ± 0.2 | 0.7 | 1.3 | 1.2 | 0.9 | 1.3 | 1.3 |
| 1206 | 3216 | 3.2 $^{+0.10}_{-0.20}$ | 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 |

## FUNCTIONAL PERFORMANCE

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## GREEN REQUIREMENTS

| SUBSTANCES | CONCENTRATION LIMIT |
|---|---|
| Lead (Pb) | < 1000 ppm |
| Mercury (Hg) | < 1000 ppm |
| Cadmium (Cd) | < 100 ppm |
| Hexavalent Chronium | < 1000 ppm |
| Polybrominated Biphenyl (PBB) | < 1000 ppm |
| Polybrominated Diphenyl Ether (PBDE) | < 1000 ppm |
| Bromine (Br) | < 900 ppm |
| Chlorine (Cl) | < 900 ppm |
| Sum of Bromine and Chlorine | ≤ 1500 ppm max. |
| Antimony (Sb) | < 900 ppm |
| Red Phosphorous | < 100 ppm |

**Notes**

- No exemptions (e.g. Pb in glass) may be applied to any substances or application for the “Green” category
- All concentration levels are based on homogenous materials

## TEST PROCEDURES AND REQUIREMENTS

| EN 60115-1 CLAUSE | IEC 60068-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R$) | |
|---|---|---|---|---|---|
| | | | Stability for product types: | STABILITY CLASS 2 OR BETTER | |
| | | | RCG e3 | 1 Ω to 10 MΩ | 1 Ω to 10 MΩ |
| 4.5 | - | Resistance | - | ± 1 % | ± 5 % |
| 4.7 | - | Voltage proof | $U$ = 1.4 x $U_{ins}$; 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 | ± (0.25 % $R$ + 0.05 Ω) | ± (0.5 % $R$ + 0.05 Ω) |
| 4.17.2 | 58 (Td) | Solderability | Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; (245 ± 5) °C (3 ± 0.3) s | Good tinning (≥ 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) | RR 1608 and smaller: 9 N RR 2012 and larger: 45 N | No visible damage | |
| 4.33 | 21 ($Uu_1$) | Substrate bending | Depth 2 mm; 3 times | No visible damage, no open circuit in bent position ± (0.25 % $R$ + 0.05 Ω) | |
| 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; ≥ 90 % RH; 24 h; 1 cycle | | |
| 4.23.4 | 1 (Aa) | Cold | - 55 °C; 2 h | ± (1 % $R$ + 0.05 Ω) | ± (2 % $R$ + 0.1 Ω) |
| 4.23.5 | 13 (M) | Low air pressure | 1 kPa; (25 ± 10) °C; 1 h | | |
| 4.23.6 | 30 (Db) | Damp heat, cyclic | 55 °C; ≥ 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 | ± (1 % $R$ + 0.05 Ω) | ± (2 % $R$ + 0.1 Ω) |
| 4.18.2 | 58 (Td) | Resistance to soldering heat | Solder bath method (260 ± 5) °C; (10 ± 1) s | ± (0.25 % $R$ + 0.05 Ω) | ± (0.5 % $R$ + 0.05 Ω) |
| 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 ± 2) °C; (93 ± 3) % RH; 56 days | ± (1 % $R$ + 0.05 Ω) | |
| 4.25.3 | - | Endurance at upper category temperature | 155 °C, 1000 h | ± (1 % $R$ + 0.05 Ω) | ± (2 % $R$ + 0.1 Ω) |
| 4.40 | - | Electrostatic discharge (human body model) | IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD test voltage acc. to size | ± (1 % $R$ + 0.05 Ω) | |

| TEST PROCEDURES AND REQUIREMENTS | | | | | |
|---|---|---|---|---|---|
| **EN 60115-1 CLAUSE** | **IEC 60068-2 TEST METHOD** | **TEST** | **PROCEDURE** | **REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R$)** | |
| | | | Stability for product types: | **STABILITY CLASS 2 OR BETTER** | |
| | | | **RCG e3** | 1 Ω to 10 MΩ | 1 Ω to 10 MΩ |
| 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 ≤ 1.5 mm; A ≤ 200 m/s$^2$; 10 sweeps per axis | ± (0.25 % $R$ + 0.05 Ω) | ± (0.5 % $R$ + 0.05 Ω) |
| 4.37 | - | Periodic electric overload | $U = \sqrt{15 \times P_{70} \times R}$ ≤ 2 x $U_{max.}$; 0.1 s on; 2.5 s off; 1000 cycles | ± (1 % $R$ + 0.05 Ω) | |
| 4.27 | - | Single pulse high voltage overload, 10 µs/700 µs | $\hat{U} = 10 \times \sqrt{P_{70} \times R}$ ≤ 2 x $U_{max.}$; 10 pulses | ± (1 % $R$ + 0.05 Ω) | |

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 tapes according to IEC 60286-3.

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