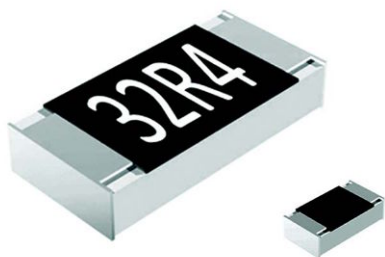


## Green Thick Film Chip Resistors



### FEATURES

- Green resistor - does not use RoHS exemptions
- Stability  $\Delta R/R = 1\%$  for 1000 h at 70 °C
- 2 mm pitch packaging option for 0603 size
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### STANDARD ELECTRICAL SPECIFICATIONS

| TYPE    | CASE SIZE<br>IMPERIAL | CASE SIZE<br>METRIC | POWER RATING<br>$P_{70}$<br>W | LIMITING ELEMENT<br>VOLTAGE<br>$U_{max.}$<br>$AC_{RMS}/DC$<br>V | TEMPERATURE<br>COEFFICIENT<br>$\pm$ ppm/K                                     | TOLERANCE<br>$\pm$ % | RESISTANCE<br>RANGE<br>$\Omega$ | SERIES   |
|---------|-----------------------|---------------------|-------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------|---------------------------------|----------|
| RCG0402 | 0402                  | RR1005M             | 0.063                         | 50                                                              | 100                                                                           | 0.5, 1               | 150 to 10M                      | E24; E96 |
|         |                       |                     |                               |                                                                 | 150                                                                           |                      | 1.0 to 147                      |          |
|         |                       |                     |                               |                                                                 | 200                                                                           | 5                    | 1.0 to 10M                      | E24      |
|         |                       |                     |                               |                                                                 | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 1.5\text{ A}$ |                      |                                 |          |
| RCG0603 | 0603                  | RR1608M             | 0.1                           | 75                                                              | 100                                                                           | 0.5, 1               | 1.0 to 10M                      | E24; E96 |
|         |                       |                     |                               |                                                                 | 200                                                                           |                      |                                 |          |
|         |                       |                     |                               |                                                                 |                                                                               | 5                    |                                 | E24      |
|         |                       |                     |                               |                                                                 | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.0\text{ A}$ |                      |                                 |          |
| RCG0805 | 0805                  | RR2012M             | 0.125                         | 150                                                             | 100                                                                           | 0.5, 1               | 1.0 to 10M                      | E24; E96 |
|         |                       |                     |                               |                                                                 | 200                                                                           |                      |                                 |          |
|         |                       |                     |                               |                                                                 |                                                                               | 5                    |                                 | E24      |
|         |                       |                     |                               |                                                                 | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.5\text{ A}$ |                      |                                 |          |
| RCG1206 | 1206                  | RR3216M             | 0.25                          | 200                                                             | 100                                                                           | 0.5, 1               | 1.0 to 10M                      | E24; E96 |
|         |                       |                     |                               |                                                                 | 200                                                                           |                      |                                 |          |
|         |                       |                     |                               |                                                                 |                                                                               | 5                    |                                 | E24      |
|         |                       |                     |                               |                                                                 | Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 3.5\text{ A}$ |                      |                                 |          |

### 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     | RCG0402       | RCG0603 | RCG0805 | RCG1206 |
|--------------------------------------------|----------|---------------|---------|---------|---------|
| Rated dissipation $P_{70}$ <sup>(1)</sup>  | 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                      | $\Omega$ | $> 10^9$      |         |         |         |
| Operating temperature range                | °C       | - 55 to + 155 |         |         |         |
| Mass                                       | mg       | 0.65          | 2       | 5.5     | 10      |

### 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: RCG080510K0FKEA

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

| TYPE    |
|---------|
| RCG0402 |
| RCG0603 |
| RCG0805 |
| RCG1206 |

| VALUE                    |
|--------------------------|
| R = Decimal              |
| K = Thousand             |
| M = Million              |
| 0000 = 0 $\Omega$ Jumper |

| TOLERANCE       |
|-----------------|
| D = $\pm 0.5\%$ |
| F = $\pm 1.0\%$ |
| J = $\pm 5.0\%$ |
| Z = Jumper      |

| TCR                 |
|---------------------|
| K = $\pm 100$ ppm/K |
| L = $\pm 150$ ppm/K |
| N = $\pm 200$ ppm/K |
| 0 = Jumper          |

| PACKAGING                           |
|-------------------------------------|
| EA, EB,<br>EC, ED,<br>EE, EI,<br>EL |

PRODUCT DESCRIPTION: RCG0805 100 10K 1 % EA

| RCG0805 |
|---------|
| TYPE    |
| RCG0402 |
| RCG0603 |
| RCG0805 |
| RCG1206 |

| 100             |
|-----------------|
| TCR             |
| $\pm 100$ ppm/K |
| $\pm 150$ ppm/K |
| $\pm 200$ ppm/K |

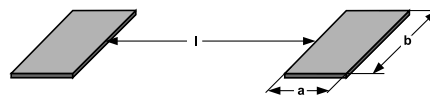
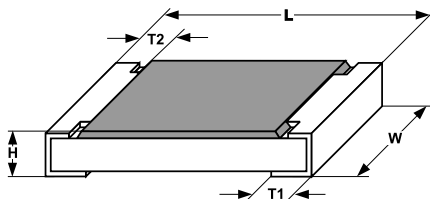
| 10K                 |
|---------------------|
| RESISTANCE VALUE    |
| 10R = 10 $\Omega$   |
| 10K = 10 k $\Omega$ |
| 1M = 1 M $\Omega$   |
| 0R0 = Jumper        |

| 1 %         |
|-------------|
| TOLERANCE   |
| $\pm 0.5\%$ |
| $\pm 1\%$   |
| $\pm 5\%$   |

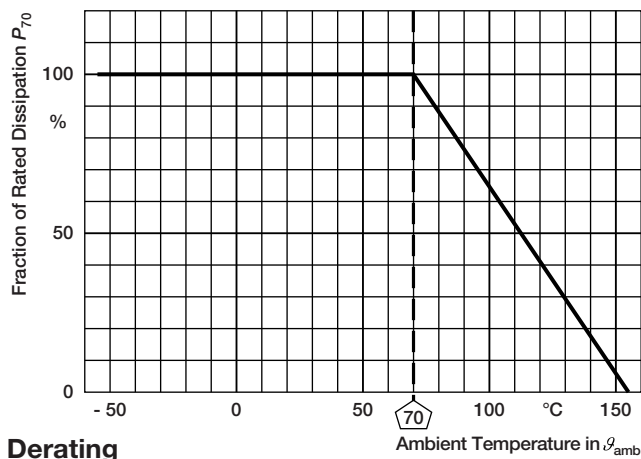
| EA                                  |
|-------------------------------------|
| PACKAGING                           |
| EA, EB,<br>EC, ED,<br>EE, EI,<br>EL |

**PACKAGING**

| TYPE    | CODE | QUANTITY | CARRIER TAPE                                 | WIDTH | PITCH | REEL DIAMETER |
|---------|------|----------|----------------------------------------------|-------|-------|---------------|
| RCG0402 | ED   | 10 000   | Paper tape acc.<br>to IEC 60286-3<br>Type 1a | 8 mm  | 2 mm  | 180 mm/7"     |
|         | EE   | 50 000   |                                              |       |       | 330 mm/13"    |
| RCG0603 | EI   | 5000     | Paper tape acc.<br>to IEC 60268-3<br>Type 1a | 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.<br>to IEC 60268-3<br>Type 1a | 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.<br>to IEC 60268-3<br>Type 1a | 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.<br>to IEC 60268-3<br>Type 1a | 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 |     |     |
| IMPERIAL | METRIC  | L                                      | W           | H           | T1                                    | T2        | a                     | b   | l   | a              | b   | l   |
| 0402     | RR1005M | 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     | RR1608M | 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     | RR2012M | 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     | RR3216M | 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 |

**FUNCTIONAL PERFORMANCE**

**GREEN REQUIREMENTS**

| SUBSTANCES                           | CONCENTRATION LIMIT |
|--------------------------------------|---------------------|
| Lead (Pb)                            | < 1000 ppm          |
| Mercury (Hg)                         | < 1000 ppm          |
| Cadmium (Cd)                         | < 100 ppm           |
| Hexavalent Chromium                  | < 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<br>CLAUSE             | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                             | PROCEDURE                                                                                                           | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ )         |                                        |
|                                  |                                  |                                                  | Stability for product types:                                                                                        | <b>STABILITY CLASS 1<br/>OR BETTER</b>                    | <b>STABILITY CLASS 2<br/>OR BETTER</b> |
|                                  |                                  |                                                  | <b>RCG e3</b>                                                                                                       | 1 $\Omega$ to 10 M $\Omega$                               | 1 $\Omega$ to 10 M $\Omega$            |
| 4.5                              | -                                | Resistance                                       | -                                                                                                                   | $\pm 0.5 \%$ , $\pm 1 \%$                                 | $\pm 5 \%$                             |
| 4.7                              | -                                | Voltage proof                                    | $U = 1.4 \times U_{ins}$ ; 60 s                                                                                     | No flashover or breakdown                                 |                                        |
| 4.13                             | -                                | Short time overload                              | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ ;<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;<br>Sn96.5Ag3Cu0.5<br>non-activated flux;<br>(245 $\pm$ 5) $^{\circ}\text{C}$<br>(3 $\pm$ 0.3) s | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage |                                        |
| 4.8.4.2                          | -                                | Temperature<br>coefficient                       | (20/- 55/20) $^{\circ}\text{C}$ and<br>(20/125/20) $^{\circ}\text{C}$                                               | $\pm 100 \text{ ppm/K}$ , $\pm 150 \text{ ppm/K}$         | $\pm 200 \text{ ppm/K}$                |
| 4.32                             | 21 ( $U_{u3}$ )                  | Shear<br>(adhesion)                              | RR 1608 and smaller: 9 N<br>RR 2012 and larger: 45 N                                                                | No visible damage                                         |                                        |
| 4.33                             | 21 ( $U_{u1}$ )                  | Substrate bending                                | Depth 2 mm;<br>3 times                                                                                              | No visible damage, no open circuit in bent position       |                                        |
|                                  |                                  |                                                  |                                                                                                                     | $\pm (0.25 \% R + 0.05 \Omega)$                           | $\pm (0.5 \% R + 0.05 \Omega)$         |
| 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 $^{\circ}\text{C}$ ; $\geq 90 \%$ 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 $^{\circ}\text{C}$ ; $\geq 90 \%$ RH;<br>24 h; 5 cycles                                                          |                                                           |                                        |
| 4.23.7                           | -                                | DC load                                          | $U = \sqrt{P_{70} \times R}$                                                                                        | $\pm (1 \% R + 0.05 \Omega)$                              | $\pm (2 \% R + 0.1 \Omega)$            |
| 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              |                                                           |                                        |
| 4.18.2                           | 58 (Td)                          | Resistance to<br>soldering heat                  | Solder bath method<br>(260 $\pm$ 5) $^{\circ}\text{C}$ ;<br>(10 $\pm$ 1) s                                          | $\pm (0.25 \% R + 0.05 \Omega)$                           | $\pm (0.5 \% R + 0.05 \Omega)$         |
| 4.35                             | -                                | Flamability,<br>needle flame test                | IEC 60695-11-5;<br>10 s                                                                                             | No burning after 30 s                                     |                                        |
| 4.24                             | 78 (Cab)                         | Damp heat,<br>steady state                       | (40 $\pm$ 2) $^{\circ}\text{C}$ ;<br>(93 $\pm$ 3) % RH;<br>56 days                                                  | $\pm (1 \% R + 0.05 \Omega)$                              | $\pm (1 \% R + 0.1 \Omega)$            |
| 4.25.3                           | -                                | Endurance at<br>upper category<br>temperature    | 155 $^{\circ}\text{C}$ , 1000 h                                                                                     | $\pm (1 \% R + 0.05 \Omega)$                              | $\pm (2 \% R + 0.1 \Omega)$            |
| 4.40                             | -                                | Electrostatic<br>discharge<br>(human body model) | IEC 61340-3-1;<br>3 pos. + 3 neg. discharges;<br>ESD test voltage acc. to size                                      | $\pm (1 \% R + 0.05 \Omega)$                              |                                        |

| TEST PROCEDURES AND REQUIREMENTS |                                  |                                                               |                                                                                                              |                                                   |                                        |
|----------------------------------|----------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------|
| EN 60115-1<br>CLAUSE             | IEC<br>60068-2<br>TEST<br>METHOD | TEST                                                          | PROCEDURE                                                                                                    | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ ) |                                        |
|                                  |                                  |                                                               | Stability for product types:                                                                                 | <b>STABILITY CLASS 1<br/>OR BETTER</b>            | <b>STABILITY CLASS 2<br/>OR BETTER</b> |
|                                  |                                  |                                                               | <b>RCG e3</b>                                                                                                | 1 $\Omega$ to 10 M $\Omega$                       | 1 $\Omega$ to 10 M $\Omega$            |
| 4.29                             | 45 (XA)                          | Component solvent resistance                                  | Isopropyl alcohol;<br>50 °C; method 2                                                                        | No visible damage                                 |                                        |
| 4.30                             | 45 (XA)                          | Solvent resistance of marking                                 | Isopropyl alcohol;<br>50 °C; method 1,<br>toothbrush                                                         | Marking legible,<br>no visible damage             |                                        |
| 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                                    | $U = \sqrt{15 \times P_{70} \times R}$<br>$\leq 2 \times U_{\max.}$ ;<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,<br>10 $\mu$ s/700 $\mu$ s | $\dot{U} = 10 \times \sqrt{P_{70} \times R}$<br>$\leq 2 \times U_{\max.}$ ;<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 tapes according to IEC 60286-3.



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