

## Lead (Pb)-free Thick Film, Rectangular Commodity Chip Resistors



### FEATURES

- High volume product suitable for commercial applications
- Stability ( $\Delta R/R \leq 1\%$  for 1000 h at 70 °C)
- Lead (Pb)-free solder contacts on Ni barrier layer
- Metal glaze on ceramic
- 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

| MODEL        | CASE SIZE INCH | CASE SIZE METRIC | POWER RATING $P_{70\text{ }^{\circ}\text{C}}$ W | LIMITING ELEMENT VOLTAGE MAX. V $\equiv$ | TEMPERATURE COEFFICIENT ppm/K                                                                 | TOLERANCE % | RESISTANCE RANGE $\Omega$ | E-SERIES |
|--------------|----------------|------------------|-------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------|-------------|---------------------------|----------|
| CRCW0402...C | 0402           | RR 1005M         | 0.063                                           | 50                                       | $\pm 100$                                                                                     | $\pm 1$     | 1R0 to 10M                | E24; E96 |
|              |                |                  |                                                 |                                          | $\pm 200$                                                                                     | $\pm 5$     | 1R0 to 10M                | E24      |
|              |                |                  |                                                 |                                          | Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 1.5 A |             |                           |          |
| CRCW0603...C | 0603           | RR 1608M         | 0.10                                            | 75                                       | $\pm 100$                                                                                     | $\pm 1$     | 1R0 to 10M                | E24; E96 |
|              |                |                  |                                                 |                                          | $\pm 200$                                                                                     | $\pm 5$     | 1R0 to 10M                | E24      |
|              |                |                  |                                                 |                                          | Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 2.0 A |             |                           |          |
| CRCW0805...C | 0805           | RR 2012M         | 0.125                                           | 150                                      | $\pm 100$                                                                                     | $\pm 1$     | 1R0 to 10M                | E24; E96 |
|              |                |                  |                                                 |                                          | $\pm 200$                                                                                     | $\pm 5$     | 1R0 to 10M                | E24      |
|              |                |                  |                                                 |                                          | Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 2.5 A |             |                           |          |
| CRCW1206...C | 1206           | RR 3216M         | 0.25                                            | 200                                      | $\pm 100$                                                                                     | $\pm 1$     | 1R0 to 10M                | E24; E96 |
|              |                |                  |                                                 |                                          | $\pm 200$                                                                                     | $\pm 5$     | 1R0 to 10M                | E24      |
|              |                |                  |                                                 |                                          | Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 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
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material

### TECHNICAL SPECIFICATIONS

| PARAMETER                                        | UNIT            | CRCW0402...C         | CRCW0603...C | CRCW0805...C | CRCW1206...C |
|--------------------------------------------------|-----------------|----------------------|--------------|--------------|--------------|
| Rated dissipation at 70°C <sup>(1)</sup>         | W               | 0.063                | 0.10         | 0.125        | 0.25         |
| Limiting element voltage $U_{\text{max. AC/DC}}$ | V               | 50                   | 75           | 150          | 200          |
| Insulation voltage $U_{\text{ins.}}$ (1 min)     | V               | > 75                 | > 100        | > 200        | > 300        |
| Insulation resistance                            | $\Omega$        | > $10^9$             |              |              |              |
| Category temperature range                       | °C              | - 55 to + 155        |              |              |              |
| Failure rate                                     | $\text{h}^{-1}$ | $0.1 \times 10^{-9}$ |              |              |              |
| Weight/1000 pieces                               | g               | 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: CRCW0603562RFKECC**

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| C | R | C | W | 0 | 6 | 0 | 3 | 5 | 6 | 2 | R | F | K | E | C | C |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|

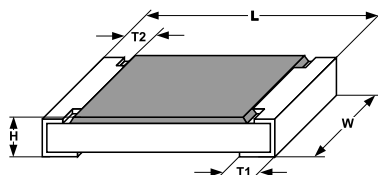
| MODEL/SIZE                                   | VALUE                                                       | TOLERANCE                                        | TCR                                                      | PACKAGING                | SPECIAL                         |
|----------------------------------------------|-------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|--------------------------|---------------------------------|
| CRCW0402<br>CRCW0603<br>CRCW0805<br>CRCW1206 | R = decimal<br>K = thousand<br>M = million<br>0000 = jumper | F = $\pm 1.0\%$<br>J = $\pm 5.0\%$<br>Z = jumper | K = $\pm 100$ ppm/K<br>N = $\pm 200$ ppm/K<br>0 = jumper | EA, EB,<br>EC, ED,<br>EE | Up to 2 digits<br>C = commodity |

**PRODUCT DESCRIPTION: CRCW0603-C 100 562R 1 % ET6 E3**

| CRCW0603-C                                           | 100                                | 562R                                                                                                   | 1 %                    | ET6                           | e3                                     |
|------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------|-------------------------------|----------------------------------------|
| MODEL                                                | TCR                                | RESISTANCE VALUE                                                                                       | TOLERANCE              | PACKAGING                     | LEAD (Pb)-FREE                         |
| CRCW0402-C<br>CRCW0603-C<br>CRCW0805-C<br>CRCW1206-C | $\pm 200$ ppm/K<br>$\pm 100$ ppm/K | 10R = 10 $\Omega$<br>562R = 562 $\Omega$<br>10K = 10.0 k $\Omega$<br>1M = 1 M $\Omega$<br>0R0 = jumper | $\pm 5\%$<br>$\pm 1\%$ | ET1, ET5,<br>ET6, ET7,<br>EF4 | e3 = pure tin<br>termination<br>finish |

**PACKAGING**

| TYPE / SIZE  | CODE     | QUANTITY | PACKAGING STYLE                            | WIDTH | PITCH | PACKAGING DIMENSIONS |
|--------------|----------|----------|--------------------------------------------|-------|-------|----------------------|
| CRCW0402...C | ED = ET7 | 10 000   | Paper tape acc. to<br>IEC 60286-3, Type 1a | 8 mm  | 2 mm  | Ø 180 mm/7"          |
|              | EE = EF4 | 50 000   |                                            |       |       | Ø 330 mm/13"         |
| CRCW0603...C | EA = ET1 | 5000     |                                            |       | 4 mm  | Ø 180 mm/7"          |
|              | EB = ET5 | 10 000   |                                            |       |       | Ø 254 mm/10"         |
|              | EC = ET6 | 20 000   |                                            |       |       | Ø 330 mm/13"         |
| CRCW0805...C | EA = ET1 | 5000     |                                            |       | 4 mm  | Ø 180 mm/7"          |
|              | EB = ET5 | 10 000   |                                            |       |       | Ø 254 mm/10"         |
|              | EC = ET6 | 20 000   |                                            |       |       | Ø 330 mm/13"         |
| CRCW1206...C | EA = ET1 | 5000     |                                            |       | 4 mm  | Ø 180 mm/7"          |
|              | EB = ET5 | 10 000   |                                            |       |       | Ø 254 mm/10"         |
|              | EC = ET6 | 20 000   |                                            |       |       | Ø 330 mm/13"         |

**DIMENSIONS**


| SIZE |        | DIMENSIONS (in millimeters) |                 |                         |                 |                | SOLDER PAD DIMENSIONS <sup>(1)</sup> (in millimeters) |     |     |                |     |     |
|------|--------|-----------------------------|-----------------|-------------------------|-----------------|----------------|-------------------------------------------------------|-----|-----|----------------|-----|-----|
|      |        |                             |                 |                         |                 |                | REFLOW SOLDERING                                      |     |     | WAVE SOLDERING |     |     |
| INCH | METRIC | L                           | W               | H                       | T1              | T2             | a                                                     | b   | l   | a              | b   | l   |
| 0402 | 1005   | 1.0 $\pm$ 0.10              | 0.5 $\pm$ 0.05  | 0.30 $\pm$ 0.05         | 0.25 $\pm$ 0.10 | 0.2 $\pm$ 0.1  | 0.4                                                   | 0.6 | 0.5 |                |     |     |
| 0603 | 1608   | 1.60 $\pm$ 0.10             | 0.80 $\pm$ 0.10 | 0.45 $\pm$ 0.10         | 0.3 $\pm$ 0.2   | 0.3 $\pm$ 0.2  | 0.5                                                   | 0.9 | 1.0 | 0.9            | 0.9 | 1.0 |
| 0805 | 2012   | 2.0 $\pm$ 0.10              | 1.25 $\pm$ 0.15 | 0.50 $\pm$ 0.10         | 0.35 $\pm$ 0.15 | 0.35 $\pm$ 0.2 | 0.7                                                   | 1.3 | 1.2 | 0.9            | 1.3 | 1.3 |
| 1206 | 3216   | 3.05 $\pm$ 0.10             | 1.55 $\pm$ 0.10 | 0.55 $^{+0.10}_{-0.05}$ | 0.35 $\pm$ 0.15 | 0.45 $\pm$ 0.2 | 0.9                                                   | 1.7 | 2.0 | 1.1            | 1.7 | 2.3 |

**Note**

<sup>(1)</sup> The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or of power dissipation may raise the temperature of the solder joint, hence special solder alloys or board materials may be required to maintain the reliability of the assembly. Specified power rating above 125 °C requires dedicated heat-sink pads, which depend on board materials. The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x, or in publication IPC-7351. They do not guarantee any supposed thermal properties, particularly as these are also strongly influenced by many other parameters. Still the given solder pad dimensions will be found adequate for most general applications

**FUNCTIONAL PERFORMANCE**


| TEST PROCEDURES AND REQUIREMENTS |                               |                                               |                                                                              |                                                                                                     |                                                             |                                                            |
|----------------------------------|-------------------------------|-----------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|
| EN 60115-1<br>CLAUSE             | IEC 60068-2<br>TEST<br>METHOD | TEST                                          | PROCEDURE                                                                    |                                                                                                     | REQUIREMENTS PERMISSIBLE<br>CHANGE ( $\Delta R$ )           |                                                            |
|                                  |                               |                                               |                                                                              |                                                                                                     | STABILITY<br>CLASS 1<br>OR BETTER                           | STABILITY<br>CLASS 2<br>OR BETTER                          |
|                                  |                               |                                               | Stability for product types:                                                 |                                                                                                     | 1 $\Omega$ to 10 M $\Omega$                                 | 1 $\Omega$ to 10 M $\Omega$                                |
|                                  |                               |                                               | CRCW...C e3                                                                  |                                                                                                     |                                                             |                                                            |
| 4.5                              | -                             | Resistance                                    | -                                                                            |                                                                                                     | $\pm 1 \%$                                                  | $\pm 5 \%$                                                 |
| 4.8.4.2                          | -                             | Temperature<br>coefficient                    | (20/- 55/20) °C and<br>(20/125/20) °C                                        |                                                                                                     | $\pm 100$ ppm/K                                             | $\pm 200$ ppm/K                                            |
| 4.13                             | -                             | Short time<br>overload                        | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\max.}; 5 \text{ s}$ |                                                                                                     | $\pm (2 \% R + 0.1 \Omega)$                                 |                                                            |
| 4.17.5                           | 58 (Td)                       | Solderability                                 | Pre-aging<br>4 h at 155 °C,<br>dryheat                                       | Solder bath method;<br>Sn60Pb40<br>non activated flux;<br>(235 $\pm$ 5) °C<br>(2 $\pm$ 0.2) s       | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage   |                                                            |
|                                  |                               |                                               |                                                                              | Solder bath method;<br>Sn96.5Ag3Cu0.5<br>non activated flux;<br>(245 $\pm$ 5) °C<br>(3 $\pm$ 0.3) s | Good tinning ( $\geq 95 \%$ covered)<br>no visible damage   |                                                            |
| 4.18.2                           | 58 (Td)                       | Resistance to<br>soldering heat               | Solder bath method<br>(260 $\pm$ 5) °C; (10 $\pm$ 1) s                       |                                                                                                     | $\pm (1 \% R + 0.05 \Omega)$                                |                                                            |
| 4.19                             | 14 (Na)                       | Rapid change<br>of temperature                | 30 min. at - 55 °C;<br>30 min. at 125 °C;<br>5 cycles                        |                                                                                                     | $\pm (0.25 \% R + 0.05 \Omega)$                             | $\pm (0.5 \% R + 0.05 \Omega)$                             |
| 4.24                             | 78 (Cab)                      | Damp heat,<br>steady state                    | (40 $\pm$ 2) °C;<br>56 days;<br>(93 $\pm$ 3) % RH                            |                                                                                                     | $\pm (1 \% R + 0.05 \Omega)$                                | $\pm (2 \% R + 0.1 \Omega)$                                |
| 4.36                             | -                             | Operation at low<br>temperature               | -55 °C, 1 h                                                                  |                                                                                                     | $\pm (1 \% R + 0.05 \Omega)$                                |                                                            |
| 4.25.1                           | -                             | Endurance<br>at 70 °C                         | $U = \sqrt{P_{70} \times R} \leq U_{\max.};$<br>1.5 h on; 0.5 h off;         |                                                                                                     |                                                             |                                                            |
|                                  |                               |                                               | 70 °C; 1000 h<br>70 °C; 8000 h                                               |                                                                                                     | $\pm (1 \% R + 0.05 \Omega)$<br>$\pm (2 \% R + 0.1 \Omega)$ | $\pm (2 \% R + 0.1 \Omega)$<br>$\pm (4 \% R + 0.1 \Omega)$ |
| 4.25.3                           | -                             | Endurance at<br>upper category<br>temperature | 155 °C, 1000 h                                                               |                                                                                                     | $\pm (1 \% R + 0.05 \Omega)$                                | $\pm (2 \% R + 0.1 \Omega)$                                |



#### APPLICABLE SPECIFICATIONS

- |                 |                                          |
|-----------------|------------------------------------------|
| • EN 60115-1    | Generic specification                    |
| • EN 140400     | Sectional specification                  |
| • EN 140401-802 | Detail specification                     |
| • IEC 60068-2-X | Variety of environmental test procedures |
| • IEC 60286-3   | Packaging of SMD components              |



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