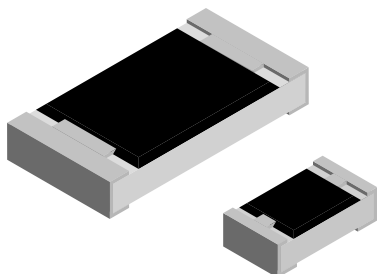


## Lead (Pb)-Bearing Thick Film, Rectangular High Value Chip Resistor



### FEATURES

**HALOGEN  
FREE**

- High resistance values (up to 470M)
- Suitable for voltage dividers and hybrids
- Lead (Pb)-bearing termination plating on Ni barrier layer
- Metal glaze on high quality ceramic
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### 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 $\Omega$ | SERIES |
|-----------------|----------------|------------------|-------------------------|---------------------------------------------------|-------------------------------|-------------|---------------------------|--------|
| D11/CRCW0603-HR | 0603           | RR 1608M         | 0.10                    | 75                                                | $\pm 500$                     | $\pm 5$     | 11M to 470M               | E24    |
| D12/CRCW0805-HR | 0805           | RR 2012M         | 0.125                   | 150                                               | $\pm 500$                     | $\pm 5$     | 11M to 470M               | E24    |
| D25/CRCW1206-HR | 1206           | RR 3216M         | 0.25                    | 200                                               | $\pm 500$                     | $\pm 5$     | 11M to 470M               | E24    |

### Notes

- These resistors do not feature a limited lifetime when operated within the limits of rated dissipation, permissible operating voltage, and permissible film temperature. However, the resistance typically increase due to the resistor's film temperature over operating time, generally known as drift. The drift may exceed the stability requirements of an individual application circuit and thereby limits the functional time.
- Marking and packaging: See datasheet "Surface Mount Resistor Marking" ([www.vishay.com/doc?20020](http://www.vishay.com/doc?20020))
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

### TECHNICAL SPECIFICATIONS

| PARAMETER                                    | UNIT        | D11/CRCW0603-HR                    | D12/CRCW0805-HR | D25/CRCW1206-HR |
|----------------------------------------------|-------------|------------------------------------|-----------------|-----------------|
| Rated Dissipation at $P_{70}$ <sup>(1)</sup> | W           | 0.1                                | 0.125           | 0.25            |
| Operating Voltage $U_{max. AC_{RMS}/DC}$     | V           | 75                                 | 150             | 200             |
| Voltage Coefficient                          | %/V         | $< 100M: < 0.1$<br>$> 100M: < 0.3$ |                 |                 |
| Insulation Voltage $U_{ins}$ (1 min)         | V           | 100                                | 200             | 300             |
| Insulation Resistance                        | $\Omega$    | $> 10^9$                           |                 |                 |
| Operating Temperature Range                  | $^{\circ}C$ | - 55 to + 155                      |                 |                 |
| Weight                                       | mg          | 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  $^{\circ}C$  is not exceeded.

**PART NUMBER AND PRODUCT DESCRIPTION**

Part Number: CRCW060316M0JPTBHR

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | R | C | W | 0 | 6 | 0 | 3 | 1 | 6 | M | 0 | J | P | T | B | H | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

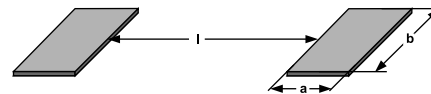
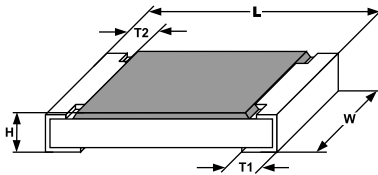
| MODEL/SIZE                       | RESISTANCE  | TOLERANCE | TCR             | PACKAGING    | SPECIAL                           |
|----------------------------------|-------------|-----------|-----------------|--------------|-----------------------------------|
| CRCW0603<br>CRCW0805<br>CRCW1206 | M = Million | J = ± 5 % | P = ± 500 ppm/K | TA, TB<br>TC | Up to 2 digits<br>HR = High value |

Product Description: CRCW0603-HR 500 16M 5% RT5

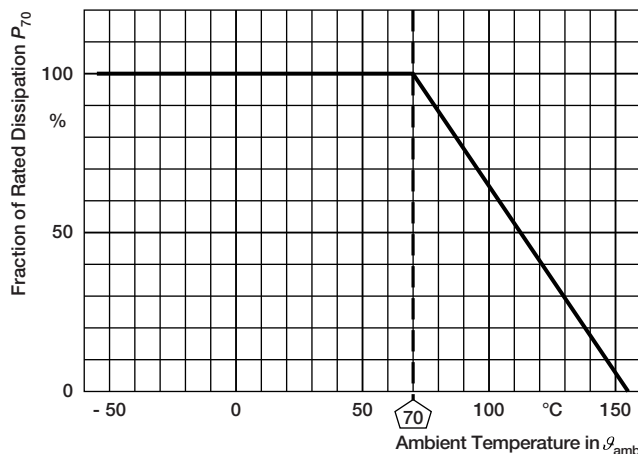
|                                           |             |                              |           |                 |
|-------------------------------------------|-------------|------------------------------|-----------|-----------------|
| CRCW0603-HR                               | 500         | 16M                          | J         | RT5             |
| MODEL                                     | TCR         | RESISTANCE                   | TOLERANCE | PACKAGING       |
| CRCW0603-HR<br>CRCW0805-HR<br>CRCW1206-HR | ± 500 ppm/K | 68M = 68 MΩ<br>220M = 220 MΩ | ± 5 %     | RT1, RT5<br>RT6 |

**PACKAGING**

| MODEL       | CODE     | QUANTITY | CARRIER TAPE                                | WIDTH | PITCH | REEL DIAMETER |
|-------------|----------|----------|---------------------------------------------|-------|-------|---------------|
| CRCW0603-HR | TA = RT1 | 5000     | Paper tape acc. to<br>IEC 60068-3<br>Type I | 8 mm  | 4 mm  | 180 mm/7"     |
|             | TB = RT5 | 10 000   |                                             |       |       | 285 mm/11.25" |
|             | TC = RT6 | 20 000   |                                             |       |       | 330 mm/13"    |
| CRCW0805-HR | TA = RT1 | 5000     |                                             | 8 mm  | 4 mm  | 180 mm/7"     |
|             | TB = RT5 | 10 000   |                                             |       |       | 285 mm/11.25" |
|             | TC = RT6 | 20 000   |                                             |       |       | 330 mm/13"    |
| CRCW1206-HR | TA = RT1 | 5000     |                                             | 8 mm  | 4 mm  | 180 mm/7"     |
|             | TB = RT5 | 10 000   |                                             |       |       | 285 mm/11.25" |
|             | TC = RT6 | 20 000   |                                             |       |       | 330 mm/13"    |

**DIMENSIONS**


| SIZE |        | DIMENSIONS in millimeters                |             |             |                                         |           | SOLDER PAD DIMENSIONS in millimeters |     |     |                |     |     |
|------|--------|------------------------------------------|-------------|-------------|-----------------------------------------|-----------|--------------------------------------|-----|-----|----------------|-----|-----|
|      |        |                                          |             |             |                                         |           | REFLOW SOLDERING                     |     |     | WAVE SOLDERING |     |     |
| INCH | METRIC | L                                        | W           | H           | T1                                      | T2        | a                                    | b   | l   | a              | b   | l   |
| 0603 | 1608   | 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 | 2012   | 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 | 3216   | 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 |

**DERATING**

**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 CLASS 2 OR BETTER                                                            |
|                                                                      |                                                                |                                                                                                                       | Stability for product types:                                                                                                                                                                 | 11 M $\Omega$ to 470 M $\Omega$                                                        |
|                                                                      |                                                                |                                                                                                                       | D/CRCW-HR                                                                                                                                                                                    |                                                                                        |
| 4.5                                                                  | —                                                              | Resistance                                                                                                            | -                                                                                                                                                                                            | $\pm 5 \%$                                                                             |
| 4.13                                                                 | —                                                              | Short time overload                                                                                                   | $U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\max.}$ ;<br>Duration acc. to style                                                                                                  | $\pm (0.5 \% R + 0.05 \Omega)$                                                         |
| 4.17.2                                                               | 58 (Td)                                                        | Solderability                                                                                                         | Solder bath method;<br>Sn60Pb40                                                                                                                                                              | Good tinning ( $\geq 95 \%$ covered); no visible damage                                |
| 4.8.4.2                                                              | —                                                              | Temperature coefficient                                                                                               | 20 °C/- 55 °C/20 °C and<br>20 °C/125 °/20 °C                                                                                                                                                 | $\pm 500$ ppm/K                                                                        |
| 4.32                                                                 | 21 (Uu <sub>3</sub> )                                          | Shear (adhesion)                                                                                                      | RR 1608: 9 N<br>RR 2012 and RR 3216: 45 N                                                                                                                                                    | No visible damage                                                                      |
| 4.33                                                                 | 21 (Uu <sub>1</sub> )                                          | Substrate bending                                                                                                     | Depth 2 mm;<br>3 times                                                                                                                                                                       | No visible damage, no open circuit in bent position<br>$\pm (0.25 \% R + 0.05 \Omega)$ |
| 4.19                                                                 | 14 (Na)                                                        | Rapid change of temperature                                                                                           | 30 min. at - 55 °C;<br>30 min. at 125 °C<br><br>5 cycles<br>1000 cycles                                                                                                                      | $\pm (0.5 \% R + 0.05 \Omega)$<br>$\pm (1 \% R + 0.05 \Omega)$                         |
| 4.23<br>4.23.2<br>4.23.3<br><br>4.23.4<br>4.23.5<br>4.23.6<br>4.23.7 | —<br>2 (Ba)<br>30 (Db)<br><br>1 (Aa)<br>13 (M)<br>30 (Db)<br>— | Climatic sequence:<br>Dry Heat<br>Damp heat, cyclic<br><br>Cold<br>Low air pressure<br>Damp heat, cyclic<br>D.C. Load | —<br><br>125 °C; 16 h<br>55 °C; $\geq 90 \%$ RH;<br>24 h; 1 cycle<br>- 55 °C; 2 h<br>1 kPa; (25 $\pm$ 10) °C; 1 h<br>55 °C; $\geq 90 \%$ RH<br>24 h; 5 cycle<br>$U = \sqrt{P_{70} \times R}$ | $\pm (2 \% R + 0.1 \Omega)$                                                            |
| 4.25.1                                                               | —                                                              | Endurance at<br>70 °C                                                                                                 | $U = \sqrt{P_{70} \times R} \leq U_{\max.}$<br>1.5 h on; 0.5 h off;<br>70 °C; 1000 h<br>70 °C; 8000 h                                                                                        | $\pm (2 \% R + 0.1 \Omega)$<br>$\pm (4 \% R + 0.1 \Omega)$                             |



| 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 CLASS 2 OR BETTER                       |
|                                  |                                  |                                            | Stability for product types:                              | 11 M $\Omega$ to 470 M $\Omega$                   |
|                                  |                                  |                                            | D/CRCW-HR                                                 |                                                   |
| 4.18.2                           | 58 (Td)                          | Resistance to<br>soldering heat            | Solder bath method<br>(260 $\pm$ 5) °C;<br>(10 $\pm$ 1) s | $\pm$ (0.5 % $R$ + 0.05 $\Omega$ )                |
| 4.24                             | 78 (Cab)                         | Damp heat,<br>steady state                 | (40 $\pm$ 2) °C;<br>(93 $\pm$ 3) % RH; 56 days            | $\pm$ (2 % $R$ + 0.1 $\Omega$ )                   |
| 4.25.3                           | —                                | Endurance at upper<br>category temperature | 155 °C; 1000 h                                            | $\pm$ (2 % $R$ + 0.1 $\Omega$ )                   |

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, variety of environmental test procedures

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



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