

# Wirewound Resistors, Commercial Power, Silicone Coated, Axial Lead



## FEATURES

- High performance for low cost
- High temperature silicone coating
- Complete welded construction
- Excellent stability in operation
- High power to size ratio
- Compliant to RoHS Directive 2002/95/EC



## Notes

- \* Pb containing terminations are not RoHS compliant, exemptions may apply  
 \*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | HISTORICAL MODEL | POWER RATING <sup>(1)</sup> P <sub>25 °C</sub> W<br>CHARACTERISTIC U + 250 °C | POWER RATING <sup>(1)</sup> P <sub>25 °C</sub> W<br>CHARACTERISTIC V + 350 °C | RESISTANCE RANGE<br>Ω        | TOLERANCE<br>± % <sup>(2)</sup> | WEIGHT<br>(max.) g |
|--------------|------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------|---------------------------------|--------------------|
| CW1/2        | CW-1/2           | 0.5                                                                           | -                                                                             | 0.1 to 1.77K                 | 5, 10                           | 0.21               |
| CW001        | CW-1             | 1.0                                                                           | -                                                                             | 0.1 to 6.37K                 | 5, 10                           | 0.34               |
| CW01M        | CW-1M            | 1.0                                                                           | -                                                                             | 0.1 to 3.3K                  | 5, 10                           | 0.3                |
| CW002        | CW-2             | 4.0                                                                           | 5.5                                                                           | 0.1 to 28.7K                 | 5, 10                           | 2.1                |
| CW02M        | CW-2M            | 3.0                                                                           | 3.75                                                                          | 0.1 to 12K                   | 5, 10                           | 0.65               |
| CW02B        | CW-2B            | 3.0                                                                           | 3.75                                                                          | 0.1 to 15K                   | 5, 10                           | 0.7                |
| CW02B...13   | CW-2B-13         | 4.0                                                                           | 6.0                                                                           | 0.1 to 10.89K <sup>(3)</sup> | 5, 10                           | 0.9                |
| CW02C        | CW-2C            | 2.5                                                                           | 3.25                                                                          | 0.1 to 19.9K                 | 5, 10                           | 1.8                |
| CW02C...14   | CW-2C-14         | 2.5                                                                           | 3.25                                                                          | 0.1 to 19.9K                 | 5, 10                           | 1.2                |
| CW005        | CW-5             | 5.0                                                                           | 6.5                                                                           | 0.1 to 58.5K                 | 5, 10                           | 4.2                |
| CW005...2    | CW-5-2           | 4.0                                                                           | 5.0                                                                           | 0.1 to 40.3K                 | 5, 10                           | 4.2                |
| CW005...3    | CW-5-3           | 5.0                                                                           | 6.5                                                                           | 0.1 to 58.5K                 | 5, 10                           | 4.2                |
| CW007        | CW-7             | 7.0                                                                           | 9.0                                                                           | 0.1 to 95.2K                 | 5, 10                           | 4.7                |
| CW010        | CW-10            | 10.0                                                                          | 13.0                                                                          | 0.1 to 167K                  | 5, 10                           | 9.0                |
| CW010...3    | CW-10-3          | 10.0                                                                          | 13.0                                                                          | 0.1 to 167K                  | 5, 10                           | 9.0                |

## Notes

- <sup>(1)</sup> Vishay Dale CW models have two power ratings, depending on operating temperature and stability requirements  
<sup>(2)</sup> 3 % tolerance available  
<sup>(3)</sup> Higher values available on request

## TECHNICAL SPECIFICATIONS

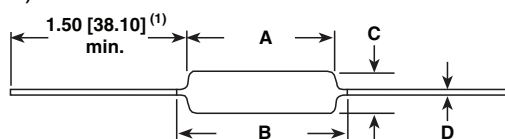
| PARAMETER                       | UNIT            | CW RESISTOR CHARACTERISTICS                                                                                                                                                              |
|---------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient         | ppm/°C          | ± 30 for 10 Ω and above, ± 50 for 1.0 Ω to 9.9 Ω, ± 90 for 0.5 Ω to 0.99 Ω                                                                                                               |
| Dielectric Withstanding Voltage | V <sub>AC</sub> | 1000                                                                                                                                                                                     |
| Short Time Overload             | -               | 5 x rated power for 5 s for 3.75 W size and smaller, 10 x rated power for 5 s for 4 W size and greater                                                                                   |
| Terminal Strength               | lb              | 10 minimum                                                                                                                                                                               |
| Maximum Working Voltage         | V               | (P x R) <sup>1/2</sup>                                                                                                                                                                   |
| Operating Temperature Range     | °C              | Characteristic U = - 65 to + 250, characteristic V = - 65 to + 350                                                                                                                       |
| Power Rating                    | -               | Characteristic U = + 250 °C max. hot spot temperature, ± 0.5 % max. ΔR in 2000 h load life<br>Characteristic V = + 350 °C max. hot spot temperature, ± 3.0 % max. ΔR in 2000 h load life |

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: CW02C10K00JB1214

C W 0 2 C 1 0 K 0 0 J B 1 2 1 4

| GLOBAL MODEL                                                             | VALUE                                                          | TOLERANCE                                  | PACKAGING                                                                                                                                                                                                                                                                                                                                           | SPECIAL                                                    |
|--------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| (See Standard Electrical Specifications Global Model column for options) | R = Decimal<br>K = Thousand<br>1R500 = 1.5 Ω<br>1K500 = 1.5 kΩ | H = ± 3.0 %<br>J = ± 5.0 %<br>K = ± 10.0 % | E70 = Lead (Pb)-free, tape/reel, 1K pcs (smaller than CW005)<br>E73 = Lead (Pb)-free, tape/reel, 500 pcs<br>E12 = Lead (Pb)-free, bulk<br>D18 = Lead (Pb)-free, R1R80 tape/reel<br>CW02B...13 pack code for Europe use only<br>S70 = Tin/lead, tape/reel, 1K pcs (smaller than CW005)<br>S73 = Tin/lead, tape/reel, 500 pcs<br>B12 = Tin/lead, bulk | (Dash Number) (up to 3 digits) From 1 to 999 as applicable |
| Historical Part Numbering example: CW-2C-14 10 kΩ 5 % B12                |                                                                |                                            |                                                                                                                                                                                                                                                                                                                                                     |                                                            |
| CW-2C-14<br>HISTORICAL MODEL                                             | 10 kΩ<br>RESISTANCE VALUE                                      | 5 %<br>TOLERANCE CODE                      | B12<br>PACKAGING                                                                                                                                                                                                                                                                                                                                    |                                                            |

**DIMENSIONS** in inches (millimeters)


| MODEL      | DIMENSIONS in inches [millimeters] |                            |                              |                               |
|------------|------------------------------------|----------------------------|------------------------------|-------------------------------|
|            | A                                  | B [MAXIMUM] <sup>(2)</sup> | C                            | D                             |
| CW1/2      | 0.250 ± 0.031 [6.35 ± 0.787]       | 0.281 [7.14]               | 0.085 ± 0.020 [2.16 ± 0.508] | 0.020 ± 0.002 [0.508 ± 0.051] |
| CW001      | 0.406 ± 0.031 [10.31 ± 0.787]      | 0.437 [11.10]              | 0.094 ± 0.031 [2.39 ± 0.787] | 0.020 ± 0.002 [0.508 ± 0.051] |
| CW01M      | 0.285 ± 0.025 [7.24 ± 0.635]       | 0.311 [7.90]               | 0.110 ± 0.015 [2.79 ± 0.381] | 0.020 ± 0.002 [0.508 ± 0.051] |
| CW002      | 0.625 ± 0.062 [15.87 ± 1.57]       | 0.765 [19.43]              | 0.250 ± 0.032 [6.35 ± 0.813] | 0.040 ± 0.002 [1.02 ± 0.051]  |
| CW02M      | 0.500 ± 0.062 [12.70 ± 1.57]       | 0.562 [14.27]              | 0.185 ± 0.015 [4.70 ± 0.381] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW02B      | 0.562 ± 0.062 [14.27 ± 1.57]       | 0.622 [15.80]              | 0.188 ± 0.032 [4.78 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW02B...13 | 0.500 ± 0.062 [12.70 ± 1.57]       | 0.563 [14.30]              | 0.188 ± 0.032 [4.78 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW02C      | 0.500 ± 0.062 [12.70 ± 1.57]       | 0.593 [15.06]              | 0.218 ± 0.032 [5.54 ± 0.813] | 0.040 ± 0.002 [1.02 ± 0.051]  |
| CW02C...14 | 0.500 ± 0.062 [12.70 ± 1.57]       | 0.593 [15.06]              | 0.218 ± 0.032 [5.54 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW005      | 0.875 ± 0.062 [22.22 ± 1.57]       | 1.0 [25.40]                | 0.312 ± 0.032 [7.92 ± 0.813] | 0.040 ± 0.002 [1.02 ± 0.051]  |
| CW005...2  | 0.875 ± 0.062 [22.22 ± 1.57]       | 1.0 [25.40]                | 0.250 ± 0.032 [6.35 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW005...3  | 0.875 ± 0.062 [22.22 ± 1.57]       | 1.0 [25.40]                | 0.312 ± 0.032 [7.92 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |
| CW007      | 1.218 ± 0.062 [30.94 ± 1.57]       | 1.281 [32.54]              | 0.312 ± 0.032 [7.92 ± 0.813] | 0.040 ± 0.002 [1.02 ± 0.051]  |
| CW010      | 1.781 ± 0.062 [45.24 ± 1.57]       | 1.875 [47.62]              | 0.375 ± 0.032 [9.52 ± 0.813] | 0.040 ± 0.002 [1.02 ± 0.051]  |
| CW010...3  | 1.781 ± 0.062 [45.24 ± 1.57]       | 1.875 [47.62]              | 0.375 ± 0.032 [9.52 ± 0.813] | 0.032 ± 0.002 [0.813 ± 0.051] |

**Notes**

(1) On some standard reel pack methods, the leads may be trimmed to a shorter length than shown

(2) B (maximum) dimension is clean lead to clean lead

**MATERIAL SPECIFICATIONS**

**Element:** Copper-nickel alloy or nickel-chrome alloy, depending on resistance value

**Core:** Ceramic: Steatite or alumina, depending on physical size

**Coating:** Special high temperature silicone

**Standard Terminals:** Tinned Copperweld® (CW02B...13 is tinned copper)

**End Caps:** Stainless steel

**Part Marking:** DALE, model, wattage <sup>(3)</sup>, value, tolerance, date code

**Note**

(3) Wattage marked on resistor will be "V" characteristic, CW1/2 will not be marked with wattage

**DERATING**

**PERFORMANCE**

| TEST                            | CONDITIONS OF TEST                                                                 | TEST LIMITS <sup>(4)</sup> (CHARACTERISTIC V) |
|---------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------|
| Thermal Shock                   | Rated power applied until thermally stable, then a minimum of 15 min at - 55 °C    | ± (2.0 % + 0.05 Ω) ΔR                         |
| Short Time Overload             | 5 x rated power (3.75 W and smaller), 10 x rated power (4 W and larger) for 5 s    | ± (2.0 % + 0.05 Ω) ΔR                         |
| Dielectric Withstanding Voltage | 1000 V <sub>rms</sub> , 1 min                                                      | ± (0.1 % + 0.05 Ω) ΔR                         |
| Low Temperature Storage         | - 65 °C for 24 h                                                                   | ± (2.0 % + 0.05 Ω) ΔR                         |
| High Temperature Exposure       | 250 h at + 350 °C                                                                  | ± (4.0 % + 0.05 Ω) ΔR                         |
| Moisture Resistance             | MIL-STD-202 Method 106, 7b not applicable                                          | ± (2.0 % + 0.05 Ω) ΔR                         |
| Shock, Specified Pulse          | MIL-STD-202 Method 213, 100 g's for 6 ms, 10 shocks                                | ± (0.2 % + 0.05 Ω) ΔR                         |
| Vibration, High Frequency       | Frequency varied 10 Hz to 2000 Hz, 20 g peak, 2 directions 6 h each                | ± (0.2 % + 0.05 Ω) ΔR                         |
| Load Life                       | 2000 h at rated power, + 25 °C, 1.5 h "ON", 0.5 h "OFF"                            | ± (3.0 % + 0.05 Ω) ΔR                         |
| Terminal Strength               | 5 s to 10 s 10 pound pull test; torsion test - 3 alternating directions, 360° each | ± (1.0 % + 0.05 Ω) ΔR                         |

**Note**

(4) All ΔR figures shown are maximum, based upon testing requirements per MIL-PRF-26 at a maximum operating temperature of + 350 °C. ΔR maximum figures are considerably lower when tested at a maximum operating temperature of + 250 °C.



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**