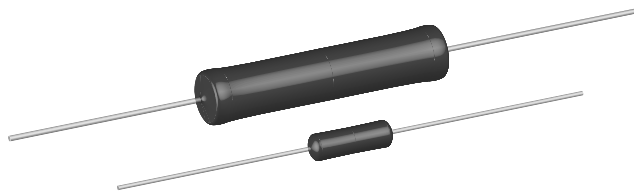


## Wirewound Resistors, High Surge Immunity, Silicone Coated, Axial Lead



### FEATURES

- High voltage surge immunity, up to 12 kV
- High temperature silicone coating
- Complete welded construction
- Excellent stability in operation
- High power to size ratio
- Material categorization:  
For definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS\***  
Available

**HALOGEN**  
**FREE**  
Available

**GREEN**  
**(5-2008)**  
Available

### Note

\* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information/tables in this datasheet for details.

### STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | POWER RATING <sup>(1)</sup><br>$P_{25^{\circ}\text{C}}$ W<br>CHARACTERISTIC U<br>+250 °C | POWER RATING <sup>(1)</sup><br>$P_{25^{\circ}\text{C}}$ W<br>CHARACTERISTIC V<br>+350 °C | RESISTANCE RANGE<br>$\Omega$ | TOLERANCE<br>$\pm$ % | WEIGHT (max.)<br>g |
|--------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------|----------------------|--------------------|
| CW001...HS   | 1.0                                                                                      | -                                                                                        | 0.1 to 6.37K                 | 5, 10                | 0.34               |
| CW02B...HS   | 3.0                                                                                      | 3.75                                                                                     | 0.1 to 15K                   | 5, 10                | 0.7                |
| CW005...HS   | 5.0                                                                                      | 6.5                                                                                      | 0.1 to 58.5K                 | 5, 10                | 4.2                |
| CW010...HS   | 10.0                                                                                     | 13.0                                                                                     | 0.1 to 167K                  | 5, 10                | 9.0                |

### Note

<sup>(1)</sup> Vishay Dale CW models have two power ratings, depending on operating temperature and stability requirements.

### TECHNICAL SPECIFICATIONS

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

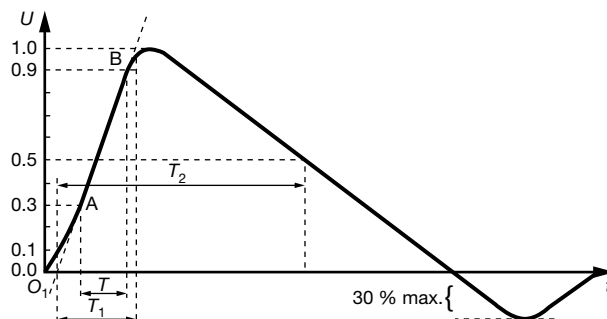
### GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: CW02B10K00JB12HS (preferred part number format)

|                                  |   |                                                                |   |                                            |   |                                                                                                                                                                                                                                                                  |   |   |   |   |   |                       |   |   |   |
|----------------------------------|---|----------------------------------------------------------------|---|--------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|-----------------------|---|---|---|
| C                                | W | 0                                                              | 2 | B                                          | 1 | 0                                                                                                                                                                                                                                                                | K | 0 | 0 | J | B | 1                     | 2 | H | S |
| GLOBAL MODEL<br>(5 digits)       |   | VALUE<br>(5 digits)                                            |   | TOLERANCE<br>(1 digit)                     |   | PACKAGING<br>(3 digits)                                                                                                                                                                                                                                          |   |   |   |   |   | SPECIAL<br>(2 digits) |   |   |   |
| CW001<br>CW02B<br>CW005<br>CW010 |   | 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. (CW001 and CW02B)<br>E73 = Lead (Pb)-free, tape/reel, 500 pcs.<br>E12 = Lead (Pb)-free, bulk<br><br>S70 = Tin/lead, tape/reel, 1K pcs. (CW001 and CW02B)<br>S73 = Tin/lead, tape/reel, 500 pcs.<br>B12 = Tin/lead, bulk |   |   |   |   |   | HS =<br>High Surge    |   |   |   |

## HIGH VOLTAGE SURGE

The surge handling capability is based upon applying an exponential open circuit voltage waveform according to specification IEC 61000-4-5 (1.2  $\mu$ s/50  $\mu$ s) as shown below at an ambient temperature of 25 °C.

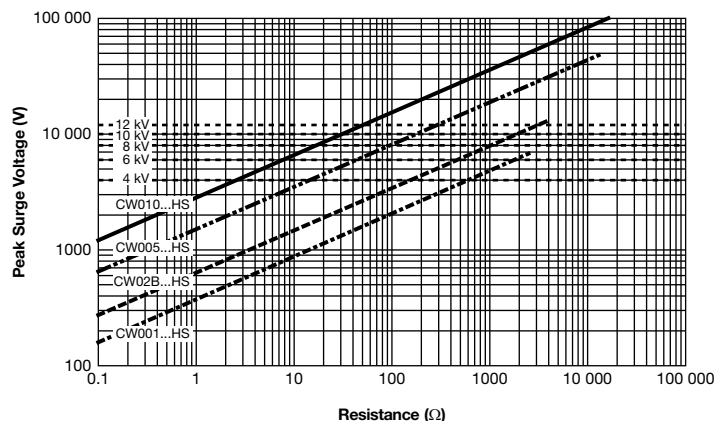


Front time:  $T_1 = 1.67 \times T = 1.2 \mu\text{s} \pm 30 \%$

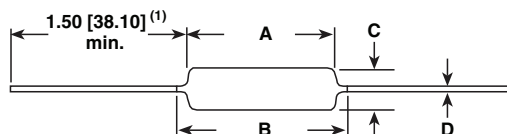
Time to half-value:  $T_2 = 50 \mu\text{s} \pm 20 \%$

Open circuit voltage waveform at the output of the pulse generator

## PEAK SURGE VOLTAGE - IEC 61000-4-5 (1.2 $\mu$ s/50 $\mu$ s pulse)



| MINIMUM RESISTANCE VALUE FOR SURGE VOLTAGE |                    |              |                |                |                |
|--------------------------------------------|--------------------|--------------|----------------|----------------|----------------|
| GLOBAL MODEL                               | PEAK SURGE VOLTAGE |              |                |                |                |
|                                            | 4 kV               | 6 kV         | 8 kV           | 10 kV          | 12 kV          |
| CW001...HS                                 | 586 $\Omega$       | 1.7 $\Omega$ | -              | -              | -              |
| CW02B...HS                                 | 151 $\Omega$       | 457 $\Omega$ | 1.0 k $\Omega$ | 1.8 k $\Omega$ | 3.0 k $\Omega$ |
| CW005...HS                                 | 15 $\Omega$        | 43 $\Omega$  | 94 $\Omega$    | 171 $\Omega$   | 281 $\Omega$   |
| CW010...HS                                 | 2.6 $\Omega$       | 7.6 $\Omega$ | 17 $\Omega$    | 30 $\Omega$    | 50 $\Omega$    |

**DIMENSIONS** in inches (millimeters)

| MODEL      | DIMENSIONS in inches [millimeters] |                            |                              |                               |
|------------|------------------------------------|----------------------------|------------------------------|-------------------------------|
|            | A                                  | B [MAXIMUM] <sup>(2)</sup> | C                            | D                             |
| CW001...HS | 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] |
| CW02B...HS | 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] |
| CW005...HS | 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]  |
| CW010...HS | 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]  |

**Notes**

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

<sup>(2)</sup> 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

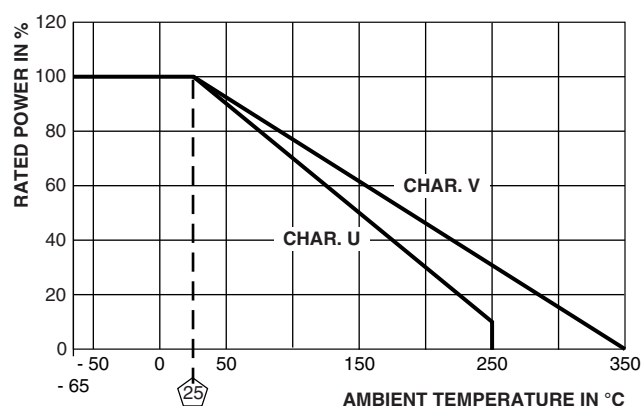
**Standard Terminals:** Tinned Copperweld®

**End Caps:** Stainless steel

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

**Note**

<sup>(3)</sup> Wattage marked on resistor will be "V" characteristic.

**DERATING**

| PERFORMANCE                     |                                                                                    |                                                  |
|---------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------|
| TEST                            | CONDITIONS OF TEST                                                                 | TEST LIMITS <sup>(4)</sup><br>(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**

<sup>(4)</sup> 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.



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