Cree® 5mm Round LED
C503D-WAN

PRODUCT DESCRIPTION

Round LEDs offer superior light output for excellent readability in sunlight and dependable performance. They provide extremely stable light output over long periods of time.

These lamps are made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance performance in lighting and illumination applications.

FEATURES

- Size (mm): 5
- Color Temperatures(K): Cool White: Min. (4600) / Typical (9000)
- Luminous Intensity (mcd) C503D-WAN (28200-64600)
- Viewing angle: 15 degree
- Lead-Free
- RoHS Compliant

APPLICATIONS

- Torch
- Channel Letter
- Retail Display Lighting
### ABSOLUTE MAXIMUM RATINGS \( (T_A = 25°C) \)

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>Absolute Maximum Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Current</td>
<td>( I_F )</td>
<td>30</td>
<td>mA</td>
</tr>
<tr>
<td>Peak Forward Current ( \text{Note} )</td>
<td>( I_{FP} )</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>( V_R )</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>( P_D )</td>
<td>120</td>
<td>mW</td>
</tr>
<tr>
<td>Operation Temperature</td>
<td>( T_{opr} )</td>
<td>-40 ~ +95</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>-40 ~ +100</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Soldering Temperature</td>
<td>( T_{sol} )</td>
<td>Max. 260°C for 3 sec. max. (3 mm from the base of the epoxy bulb)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Pulse width ≤0.1 msec, duty ≤1/10.

### TYPICAL ELECTRICAL & OPTICAL CHARACTERISTICS \( (T_A = 25°C) \)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Condition</th>
<th>Unit</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Voltage</td>
<td>( V_F )</td>
<td>( I_F = 20 \text{ mA} )</td>
<td>V</td>
<td>3.2</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Reverse Current</td>
<td>( I_R )</td>
<td>( V_R = 5 \text{ V} )</td>
<td>( \mu \text{A} )</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Luminous Intensity</td>
<td>( I_V )</td>
<td>( I_F = 20 \text{ mA} )</td>
<td>( \text{mcd} )</td>
<td>28200</td>
<td>48000</td>
<td></td>
</tr>
<tr>
<td>Chromaticity Coordinates</td>
<td>( x )</td>
<td>( I_F = 20 \text{ mA} )</td>
<td></td>
<td></td>
<td>0.2895</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( y )</td>
<td>( I_F = 20 \text{ mA} )</td>
<td></td>
<td></td>
<td>0.2905</td>
<td></td>
</tr>
<tr>
<td>50% Power Angle</td>
<td>28½</td>
<td>( I_F = 20 \text{ mA} )</td>
<td>( \text{deg} )</td>
<td></td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Continuous reverse voltage can cause LED damage.
Cree 5-mm Round LED
C503D-WAN

INTENSITY BIN LIMIT ($I_F = 20$ mA)

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Min. (mcd)</th>
<th>Max. (mcd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cb</td>
<td>28200</td>
<td>32900</td>
</tr>
<tr>
<td>Da</td>
<td>32900</td>
<td>39500</td>
</tr>
<tr>
<td>Db</td>
<td>39500</td>
<td>46100</td>
</tr>
<tr>
<td>Ea</td>
<td>46100</td>
<td>55350</td>
</tr>
<tr>
<td>Eb</td>
<td>55350</td>
<td>64600</td>
</tr>
</tbody>
</table>

- Tolerance of measurement of luminous intensity is ±15%

VF BIN LIMIT ($I_F = 20$ mA)

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Min. (V)</th>
<th>Max. (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>2.8</td>
<td>3.0</td>
</tr>
<tr>
<td>28</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>29</td>
<td>3.2</td>
<td>3.4</td>
</tr>
<tr>
<td>2a</td>
<td>3.4</td>
<td>3.6</td>
</tr>
<tr>
<td>2b</td>
<td>3.6</td>
<td>3.8</td>
</tr>
<tr>
<td>2c</td>
<td>3.8</td>
<td>4.0</td>
</tr>
</tbody>
</table>

- Tolerance of measurement of VF is ±0.05V.
## COLOR BIN LIMIT (I_p = 20 mA)

### Cool White

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Sub-bin</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>Wa</td>
<td>0.2545</td>
<td>0.2480</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2633</td>
<td>0.2410</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2545</td>
<td>0.2245</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2450</td>
<td>0.2290</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2633</td>
<td>0.2410</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2720</td>
<td>0.2340</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2640</td>
<td>0.2200</td>
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<tr>
<td></td>
<td></td>
<td>0.2545</td>
<td>0.2245</td>
</tr>
<tr>
<td></td>
<td>Wb</td>
<td>0.2545</td>
<td>0.2480</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2640</td>
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<td>Wc</td>
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<td></td>
<td></td>
<td>0.2808</td>
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<tr>
<td></td>
<td>Wf</td>
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<td>0.2735</td>
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<tr>
<th>Bin Code</th>
<th>Sub-bin</th>
<th>x</th>
<th>y</th>
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<tbody>
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<td>0.3150</td>
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<td>Ws</td>
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<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Sub-bin</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3</td>
<td>Wt</td>
<td>0.3300</td>
<td>0.3600</td>
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<td>0.3300</td>
<td>0.3390</td>
</tr>
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<td>Wu</td>
<td>0.3300</td>
<td>0.3390</td>
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<td>0.3300</td>
<td>0.3180</td>
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<td>0.3680</td>
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<td>0.3443</td>
<td>0.3535</td>
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<td>0.3680</td>
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<td>0.3510</td>
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<tr>
<td></td>
<td></td>
<td>0.3430</td>
<td>0.3345</td>
</tr>
</tbody>
</table>

- Tolerance of measurement of the color coordinates is ±0.01.
CIE CHROMATICITY DIAGRAM

The image shows a CIE chromaticity diagram with various temperature ranges indicated by different lines and labels. The x-axis represents the x-coordinate, ranging from 0.2300 to 0.3900, and the y-axis represents the y-coordinate, ranging from 0.1900 to 0.3900. The diagram includes labels for different temperature ranges such as 2000K, 3000K, 4000K, 5000K, 6000K, 7000K, and 9000K.
## ORDER CODE TABLE*

<table>
<thead>
<tr>
<th>Color</th>
<th>Kit Number</th>
<th>Viewing Angle</th>
<th>Luminous Intensity (mcd)</th>
<th>Color Bin Code</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Min.</strong></td>
<td><strong>Max.</strong></td>
<td></td>
</tr>
<tr>
<td>Cool White</td>
<td>C503D-WAN-CCbEb151</td>
<td>15</td>
<td>28200</td>
<td>64600</td>
<td>W1,W2,W3,W4,W5</td>
</tr>
<tr>
<td>Cool White</td>
<td>C503D-WAN-CCbEb231</td>
<td>15</td>
<td>28200</td>
<td>64600</td>
<td>W2,W3</td>
</tr>
<tr>
<td>Cool White</td>
<td>C503D-WAN-CCbEb152</td>
<td>15</td>
<td>28200</td>
<td>64600</td>
<td>W1,W2,W3,W4,W5</td>
</tr>
<tr>
<td>Cool White</td>
<td>C503D-WAN-CCbEb232</td>
<td>15</td>
<td>28200</td>
<td>64600</td>
<td>W2,W3</td>
</tr>
</tbody>
</table>

### Notes:
1. The above kit numbers represent order codes that include multiple intensity-bin and color-bin codes. Only one intensity-bin code and one color-bin code will be shipped on each bulk. Single intensity-bin code and single color-bin codes will not be orderable.
2. Please refer to the "Cree LED Lamp Reliability Test Standards" document #1 for reliability test conditions.
3. Please refer to the "Cree LED Lamp Soldering & Handling" document #2 for information about how to use this LED product safely.

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The above data are collected from statistical figures that do not necessarily correspond to the actual parameters of each single LED. Hence, these data will be changed without further notice.
**MECHANICAL DIMENSIONS**

All dimensions are in mm. Tolerance is ±0.25 mm unless otherwise noted.

An epoxy meniscus may extend about 1.5 mm down the leads.

Burr around bottom of epoxy may be 0.5 mm max.

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**NOTES**

**RoHS Compliance**

The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

**Vision Advisory Claim**

Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.
KIT NUMBER SYSTEM

All dimensions in mm. Cree LED lamps are tested and sorted into performance bins. A bin is specified by ranges of color, forward voltage, and brightness. Sorted LEDs are packaged for shipping in various convenient options. Please refer to the “Cree LED Lamp Packaging Standard” document for more information about shipping and packaging options.

Cree LEDs are sold by order codes in combinations of bins called kits. Order codes are configured in the following manner:

- **CCCCC** - Product Series
- **D** - Color
  - **G** - Option
    - S: Standoff
    - N: No Standoff
    - B: Black Face
    - W: White Face
    - A: Black Body
  - **T** - Packaging Type
    - 1: Bulk Pack
    - 2: Ammo Pack
    - 3: Tape & Reel (Roll Pack)
    - 4: Tube Pack
- **HHKKMMNT**
  - **N** - Maximum Wavelength/Chromaticity Range
  - **M** - Minimum Wavelength/Chromaticity Range
  - **KK** - Maximum Intensity Bin
  - **HH** - Minimum Intensity Bin
REFLOW SOLDERING

The LED soldering specification is shown below (suitable for both leaded solder & lead-free solder):

<table>
<thead>
<tr>
<th>Manual Soldering</th>
<th>Solder Dipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering iron</td>
<td>Preheat</td>
</tr>
<tr>
<td>35 W max</td>
<td>110 ºC max</td>
</tr>
<tr>
<td>Temperature</td>
<td>Preheat time</td>
</tr>
<tr>
<td>300 ºC max</td>
<td>60 seconds max</td>
</tr>
<tr>
<td>Soldering time</td>
<td>Solder-bath temperature</td>
</tr>
<tr>
<td>3 seconds max</td>
<td>260 ºC Max</td>
</tr>
<tr>
<td>Position</td>
<td>Dipping time</td>
</tr>
<tr>
<td>Not less than 3 mm from the base of the package.</td>
<td>5 seconds max</td>
</tr>
<tr>
<td></td>
<td>Position</td>
</tr>
<tr>
<td></td>
<td>Not less than 3 mm from the base of the package.</td>
</tr>
</tbody>
</table>

- Manual soldering onto the PCB is not recommended because soldering time is uncontrollable.
- The recommended wave soldering is as below:

![Wave Soldering Diagram]

- Do not apply any stress to the LED package, particularly when heated.
- Only bottom preheat is suggested & should not preheat on top in order to reduce thermal stress experienced by the LEDs.
- The LEDs must not be reused once they have been extracted from PCB.
- After soldering the LEDs, the package should be protected from mechanical shock or vibration until the LEDs have reached 40 ºC or below.
- Precautions must be taken as mechanical stress on the LEDs may be caused by PCB warpage or from the clinching and cutting of the LED leads.
- When it is necessary to clam the LEDs during soldering, it is important to ensure no mechanical stress is exerted on the LEDs.
- Cut the LED lead at normal room temperature. Lead cutting at high temperature may cause failure of the LEDs.

**PACKAGING**

**Features:**

- The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags.
- Cardboard boxes will be used to protect the LEDs from mechanical shock during transportation.
- The boxes are not water resistant, and they must be kept away from water and moisture.
- The Bulk Pack types of packaging.
- Max 500 pcs per bulk and Max 2500 pcs per ammo.

**Bulk Pack Packaging Type:**

![Bulk Pack Diagram]

**Ammo Pack Packaging Type:**

![Ammo Pack Diagram]