

# Cree LED RazerThin<sup>®</sup> RT230<sup>™</sup> LEDs

## CxxxRT230-Sxxxx

### Data Sheet

Cree LED's RazerThin LEDs are a new generation of solid-state LED emitters that combine highly efficient InGaN materials with Cree LED's proprietary G-SiC<sup>®</sup> substrate to deliver superior price/performance for high-intensity blue and green LEDs. These vertically structured LED chips are approximately 85 microns in height and feature a low forward voltage. As with all of Cree LED's vertical LED chips, the RazerThin series LEDs have the ability to withstand 2000 V ESD. Applications for RazerThin LEDs include a wide range of indicator lighting where sub-miniaturization and thinner form factors are preferred or required.

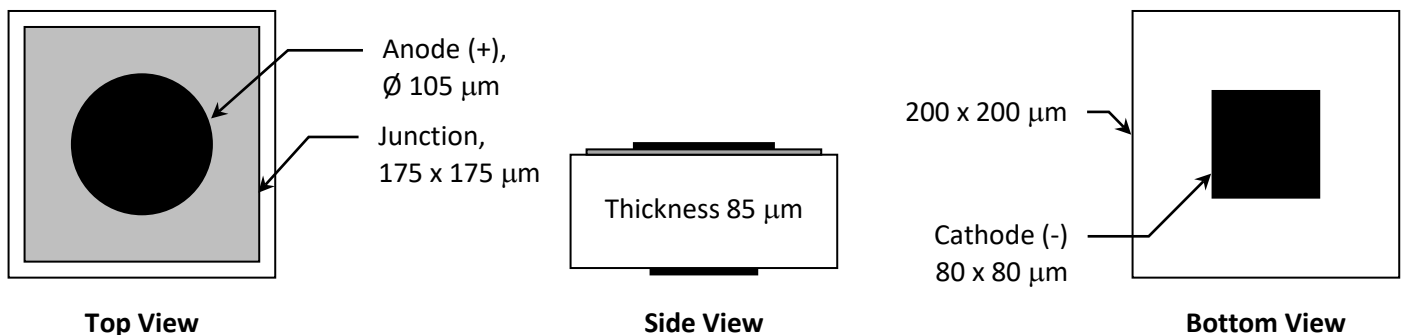
#### FEATURES

- 85  $\mu\text{m}$  Chip Thickness
- Dominant Wavelength and Forward Voltage binned at 5 mA or 20 mA
- Low Forward Voltage
  - 2.9 V Typical at 5 mA
  - 3.2 V Typical at 20 mA
- RazerThin RF Performance (@ 20 mA)
  - 460 nm - 2.0+ mW
  - 470 nm - 2.0+ mW
  - 527 nm - 1.5+ mW
- Single Wire Bond Structure
- 2kV Class-2 ESD Rating

#### APPLICATIONS

- White Goods Indicators
  - Blue LEDs
  - Green LEDs
  - Blue for White LEDs
- Automotive Indicators
  - Meter Cluster
  - Center Console
  - Switch Illumination
- LED Video Displays
- Audio Product Displays

#### CxxxRT230-Sxxxx Chip Diagram





Maximum Ratings at $T_A = 25^\circ\text{C}$ <small>Notes 1&amp;3</small>		CxxxRT230-Sxxxx
DC Forward Current		30 mA
Peak Forward Current (1/10 duty cycle @ 1kHz)		100 mA
LED Junction Temperature		125°C
Reverse Voltage		5 V
Operating Temperature Range		-40°C to +100°C
LED Chip Storage Temperature Range (LED Chip only, not for Die Sheet Storage)		-40°C to +100°C
Recommended Die Sheet Storage Conditions		$\leq 30^\circ\text{C}$ / $\leq 85\%$ RH
Electrostatic Discharge Threshold (HBM) <sup>Note 2</sup>		2000 V
Electrostatic Discharge Classification (MIL-STD-883E) <sup>Note 2</sup>		Class 2

Typical Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$ <small>Note 3</small>								
Part Number	Forward Voltage ( $V_F$ , V), 5 mA			Forward Voltage ( $V_F$ , V), 20 mA			Reverse Current [ $I(V_R=5V)$ , $\mu\text{A}$ ]	Full Width Half Max ( $\lambda_D$ , nm)
	Min.	Typ.	Max.	Min.	Typ.	Max.	Max.	Typ.
C460RT230-Sxxxx	2.6	2.9	3.1	2.7	3.2	3.7	2	21
C470RT230-Sxxxx	2.6	2.9	3.1	2.7	3.2	3.7	2	22
C527RT230-Sxxxx	2.6	2.9	3.2	2.7	3.3	3.7	2	35

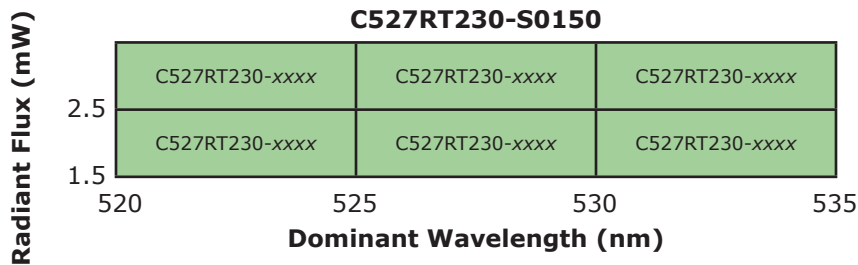
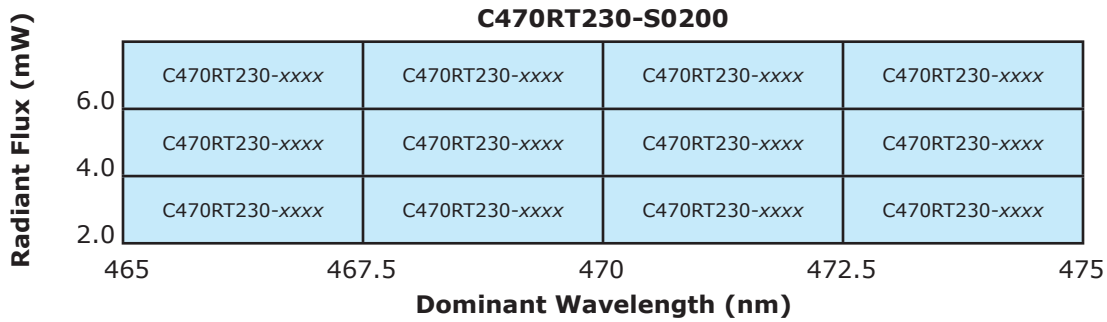
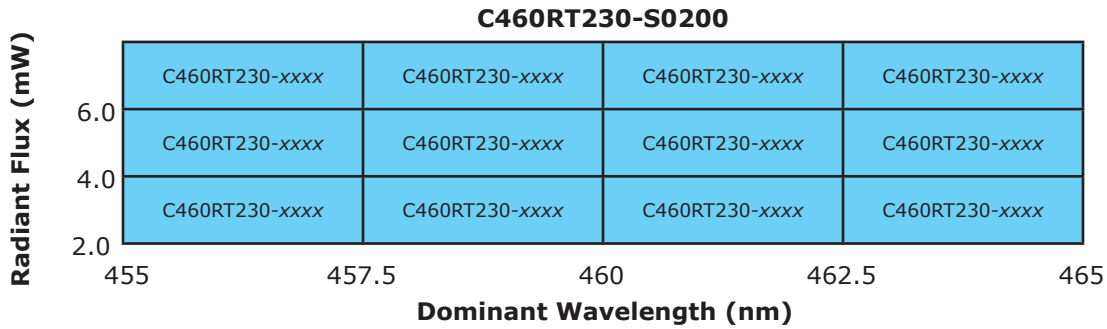
Mechanical Specifications		CxxxRT230-Sxxxx	
Description	Dimension	Tolerance	
P-N Junction Area ( $\mu\text{m}$ )	175 x 175	$\pm 25$	
Top Area ( $\mu\text{m}$ )	200 x 200	$\pm 25$	
Bottom Area ( $\mu\text{m}$ )	200 x 200	$\pm 25$	
Chip Thickness ( $\mu\text{m}$ )	85	$\pm 15$	
Au Bond Pad Diameter ( $\mu\text{m}$ )	105	-5/+15	
Au Bond Pad Thickness ( $\mu\text{m}$ )	1.2	$\pm 0.5$	
Back Contact Metal Area ( $\mu\text{m}$ )	80 x 80	$\pm 25$	

**Notes:**

- Maximum ratings are package dependent. The above ratings were determined using a thru-hole package (with Hysol™ OS4000 encapsulant) for characterization. Ratings for other packages may differ. The forward currents (DC and Peak) are not limited by the die but by the effect of the LED junction temperature on the package. The junction temperature limit of 125°C is a limit of the thru-hole package; junction temperature should be characterized in a specific package to determine limitations. Assembly processing temperature must not exceed 325°C (< 5 seconds).
- Product resistance to electrostatic discharge (ESD) according to the HBM is measured by simulating ESD using a rapid avalanche energy test (RAET). The RAET procedures are performed on each die and are designed to approximate the minimum ESD ratings shown. The ESD classification of Class 2 is based on sample testing according to MIL-STD-883E.
- All products conform to the listed minimum and maximum specifications for electrical and optical characteristics when assembled and operated within the maximum ratings shown above at 5 mA or 20 mA. Efficiency decreases at higher currents. Typical values given are within the range of average values expected by the manufacturer in large quantities and are provided for information only. All measurements were made using lamps in thru-hole packages (with Hysol OS4000 encapsulant). The amount of die attach adhesive used will affect light output; it is recommended that the adhesive amount be optimized to meet the requirements of each specific application. Optical characteristics are measured in an integrating sphere using Illuminance E.
- Specifications are subject to change without notice.

## Standard Bins for RT230

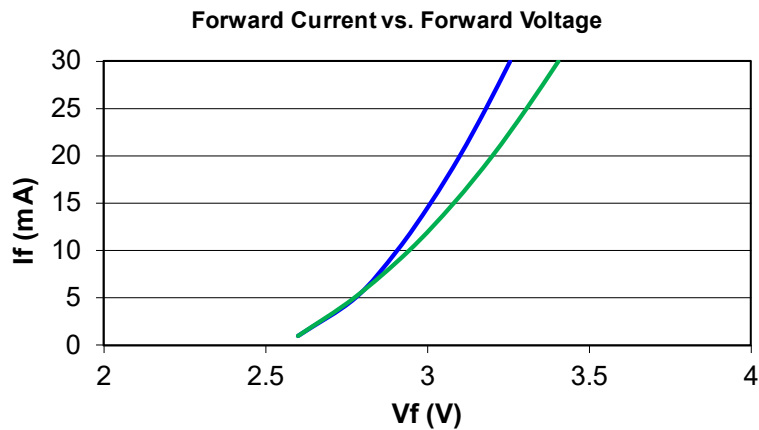
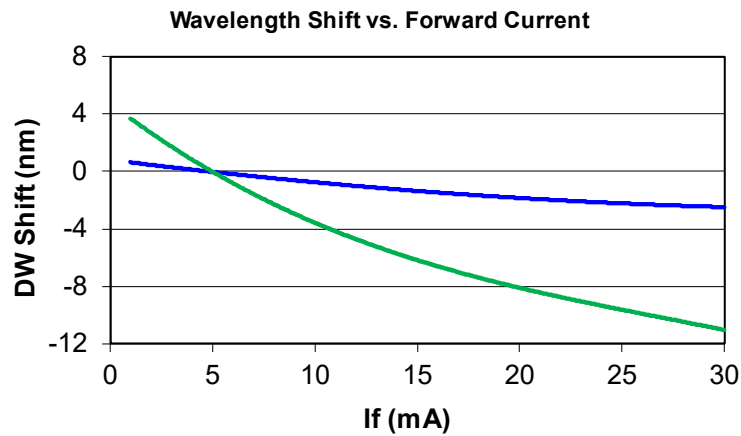
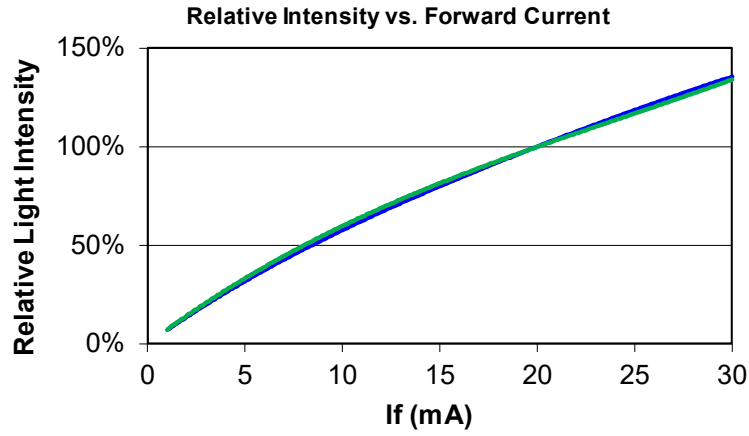
All LED chips are sorted by Dominant Wavelength (DW) and Radiant Flux (RF) onto Sorted Die Sheets (SDSs). Binning examples are shown below. Sorted die kits (CxxxRT230-Sxxxx) may be filled with any or all bins (CxxxRT230-xxxx) contained in the kit. RF values are specified at  $I_f = 20$  mA. DW values are specified at  $I_f = 5$  or  $20$  mA (see Note).



**Note** - Dominant Wavelength shifts shorter with increased forward current ( $I_f$ ). For reference only, the typical DW shift from 5 to 20 mA is -2 nm for Blue LEDs (4xx nm) and -7 nm for Green LEDs (5xx nm).

## Characteristic Curves


These are representative measurements for RT230 products. Actual curves will vary slightly for the various radiant flux and dominant wavelength bins.



## Product Content Information and Warnings

**This information is not intended as legal advice. Consult a qualified lawyer if you are unfamiliar with the applicability of China RoHS 2 and/or California Proposition 65 to your business and products.**

### China RoHS 2


	<p>This green “e” logo is included on this product datasheet to indicate that the Cree LED product described herein does not include any of chemicals regulated under China RoHS 2 above permissible threshold limits. As applicable, each customer that incorporates this Cree LED product into its higher-level product needs to decide on the appropriate China RoHS 2 label for its higher-level product based on any other regulated content used in its product. If no other regulated content is present, this green “e” logo also may be used for the customer’s product.</p>
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Pursuant to Management Methods for Restricted Use of Hazardous Substances in Electrical and Electronic Products, an administrative order published by the Chinese Ministry of Industry and Information Technology (MIIT) and effective as of July 1, 2016 (more commonly known as “China RoHS 2”), electronic and electrical end products (EEPs) sold into China must be marked with a logo to indicate whether or not they contain any of the chemicals regulated under China RoHS 2 (i.e., lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, or polybrominated diphenyl ethers) above the permissible threshold limits. As of March 2018, the list of EEPs includes refrigerators, air conditioners, washing machines, water heaters, printers, copiers, fax machines, TV sets, monitors, microcomputers, cell phones, and telephones. This list is subject to modification by the MIIT.

According to MIIT guidance, suppliers supporting the manufacture of EEPs (i.e., component suppliers) may—but are not required to—include a label on their component products. However, if a component product includes one of the regulated substances, the component supplier must provide the purchaser with information in a prescribed tabular format to facilitate labeling EEPs. The table must disclose the type and location of the hazardous substances contained in the component product. If a component product that could be used in an EEP is sold separately in the market, the component product falls within the scope of China RoHS unless the final purpose is known to be out of scope. A supplier that does not directly sell products in China should nevertheless comply with China RoHS 2 if there is a possibility that its products or products incorporating its products will be sold in China. For more information about China RoHS, please refer to <http://www.chinarohs.com/docs.html>.

### California Proposition 65 Warnings

This Cree LED semiconductor die product (excluding packaging) does not contain any chemicals that must be disclosed under California Proposition 65 (officially titled the Safe Drinking Water and Toxic Enforcement Act of 1986, codified at Cal. Health & Saf. Code §§ 25249.5–.13) enacted by the State of California. This die product, however, is packaged using PVC die transfer film that contains Diisononyl Phthalate (DINP), a chemical known to the State of California to cause cancer and/or birth defects or other reproductive harm. If you are located in the State of California, the presence of DINP in the PVC die transfer film results in the need for you to provide an occupational warning under Proposition 65. Pursuant to California Health and Safety Code § 25606, you must post Proposition 65 compliant warnings at your place(s) of business in California to warn your employees and contractors who may come into contact with the PVC die transfer film during use and handling of the Cree LED die products, including in connection with the development or manufacture of higher-level products. Specifically, for indoor environments or outdoor spaces with clearly defined entrances, a warning sign must be posted at all public entrances to the affected area and, in no smaller than 72-point type, read substantially as follows:

	<p><b>WARNING:</b> Entering this area may expose you to Diisononyl Phthalate (DINP), a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. DINP is present in the PVC die transfer film on which certain semiconductor die products sold by CreeLED, Inc. or one of its affiliates are delivered. Please refer to the Cree LED website at <a href="http://www.cree-led.com/about/suppliers-contractors/prop-65">www.cree-led.com/about/suppliers-contractors/prop-65</a> to verify which Cree LED semiconductor die products are delivered on this type of PVC die transfer film. For more information on California’s Proposition 65 warnings, go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a>.</p>
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This occupational warning must be provided in English and in any other language used on other signage in the affected area. Since the Cree LED die products themselves do not contain DINP, their incorporation into your products will not create an obligation for you to include a Proposition 65 warning on your products. Please insure ensure that the PVC die transfer film is properly handled and properly disposed of as a hazardous material after die removal.

Please refer to the Cree LED website at [www.cree-led.com/about/suppliers-contractors/prop-65](http://www.cree-led.com/about/suppliers-contractors/prop-65) to verify which Cree LED semiconductor die products are delivered on this type of PVC die transfer film.