EZ400-p™ (Anode-up) LED Chips

C*xxx*EZ400-S*xxx*00-*x*

PRODUCT DESCRIPTION

Cree LED's EZBright® LED Chips are the latest generation of solid-state LED emitters that combine highly efficient InGaN materials with Cree LED's proprietary optical design and device technology to deliver superior value for high-intensity LEDs. The optical design maximizes light extraction efficiency and enables a Lambertian radiation pattern.

EZ™ LED Chips are attachable with the flux eutectic method, as well as conductive epoxy, solder paste or solder preforms. These vertically structured, low forward voltage LED chips are approximately 170 µm in height. Cree LED's EZ chips are tested for conformity to optical and electrical specifications. These LEDs are useful in a broad range of applications, including automotive lighting, wearable devices, video displays and LCD backlighting.

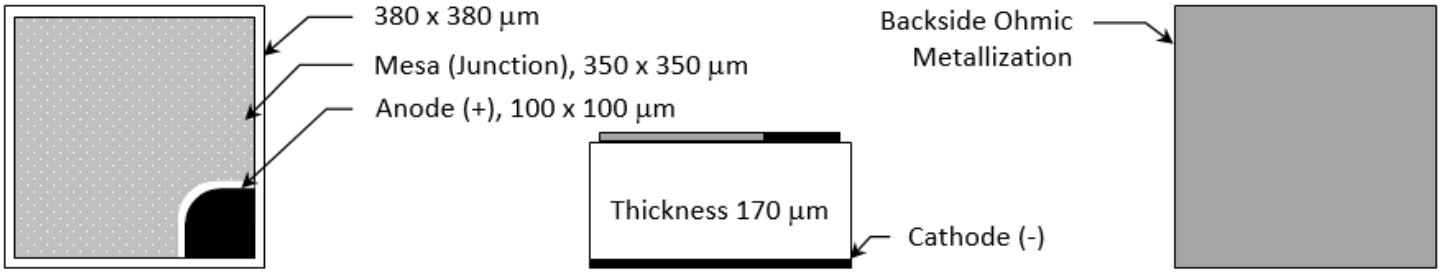
FEATURES

- Lambertian Radiation Pattern
- Anode-up design (p-pad up)
- Binned at 175 mA
- Radiant Flux (RF) performance:
  - 450 nm – 220+ mW
  - 460 nm – 220+ mW
  - 470 nm – 180+ mW
  - 527 nm – 70+ mW
- Typical Forward Voltage (Vf) – 3.2V
- Backside Metal:
  - AuSn for use with Flux Eutectic Attach, Conductive Adhesives, Solder Paste & Solder Preforms
- 2kV Class 2 ESD Rating

APPLICATIONS

- General Illumination
  - Aircraft
  - Decorative Lighting
  - Task Lighting
  - Outdoor Illumination
- White LEDs
- Wearable Devices
- Projection Displays
- Automotive Interior
- Automotive Exterior

Mobile Flash



Top View **Side View** **Bottom View**

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27713 USA / +1.919.313.5330 / www.cree-led.com

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MECHANICAL SPECIFICATIONS

Description	Dimension	Tolerance
P-N Junction Area (µm) - reference only	(350 x 350)	-
Chip Area (µm)	380 x 380	± 35
Chip Thickness (µm) - 170 µm nominal	170	± 25
Top Au Bond Pad Diameter (µm)	110 x 110	± 15
Au Bond Pad Thickness (µm)	1.0	± 0.5
Backside Ohmic Metal Area (µm)	380 x 380	± 35
Backside Ohmic Metal Thickness (µm) – AuSn	3.0	± 1.5

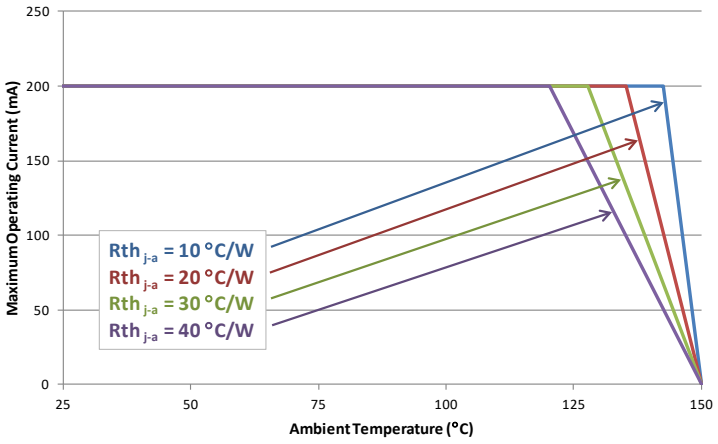
MAXIMUM RATINGS & TYPICAL CHARACTERISTICS

Maximum Ratings at T_A = 25°C Note 1	C*xxx*EZ400-S*xxx*00-*x*
DC Forward Current	200 mA
Peak Forward Current (10% Duty Cycle @ 1 kHz)	350 mA Note 3
LED Junction Temperature	150°C
Reverse Voltage	5 V
Operating Temperature Range	-40°C to +100°C
LED Chip Storage Temperature Range (LED Chip storage only, not for Die Sheet Storage)	-40°C to +120°C
Recommended Die Sheet Storage Conditions	≤30°C / ≤85% RH
Electrostatic Discharge Threshold (HBM) Note 2	2000 V
Electrostatic Discharge Classification (MIL-STD-883K) Note 2	Class 2

Typical Electrical/Optical Characteristics at T_A = 25°C, If = 175 mA Note 2					
Part Number	Forward Voltage (V_F, V)			Reverse Current [I(Vr=5 V), µA]	Full Width Half Max (λ_D, nm)
	Min.	Typ.	Max.	Max.	Typ.
C450EZ400-S*xxx*00-*x*	2.8	3.2	3.5	2	17
C460EZ400-S*xxx*00-*x*	2.8	3.2	3.5	2	18
C470EZ400-S*xxx*00-*x*	2.8	3.2	3.5	2	20
C527EZ400-S*xxx*00-*x*	2.8	3.1	3.5	2	27

Notes:

1. Maximum ratings are package-dependent. The above ratings were determined using a silicone encapsulated chip on a ceramic substrate for characterization. Ratings for other packages may differ. The junction temperature should be characterized in a specific package to determine limitations. Assembly processing temperature must not exceed 325°C (< 5 seconds). See the Cree LED EZBright Applications Note for assembly-process information.
2. 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 designed to approximate the maximum ESD ratings shown. The RAET procedure is performed on each die. The ESD classification of Class 2 is based on sample testing according to MIL-STD-883K.
3. All products conform to the listed minimum and maximum specifications for electrical and optical characteristics when assembled and operated at 175 mA within the maximum ratings shown above. 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 a Au-plated TO header without an encapsulant. Optical characteristics were measured in an integrating sphere.
4. The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end-product to be designed in a manner that minimizes the thermal resistance from the LED junction to ambient in order to optimize product performance.
5. Specifications are subject to change without notice.



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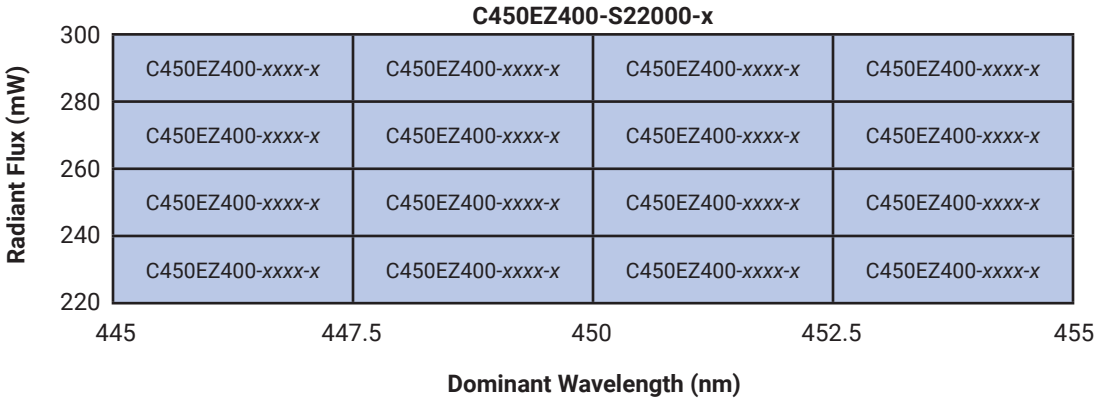
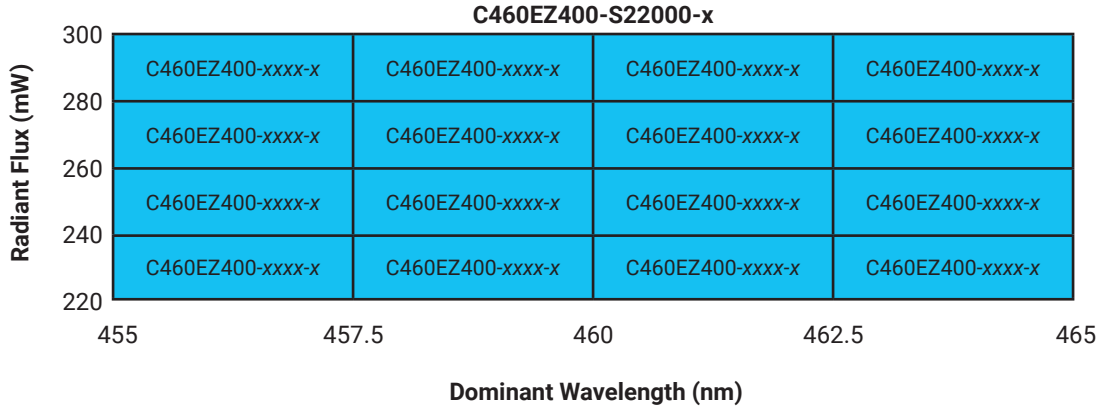
STANDARD BINS

LED chips are sorted to **dominant wavelength** (DW) and **radiant flux** (RF) bins (C*xxx*EZ400-0*xxx-x*). Each sorted die sheet (SDS) contains die from only one DW/RF bin. A die kit (C*xxx*EZ400-S*xxx*00-*x*) includes multiple bins. Die kit orders may be filled with any or all bins contained within the kit. DW and RF values are binned at 175 mA. RF is measured using Au-plated headers without encapsulant.





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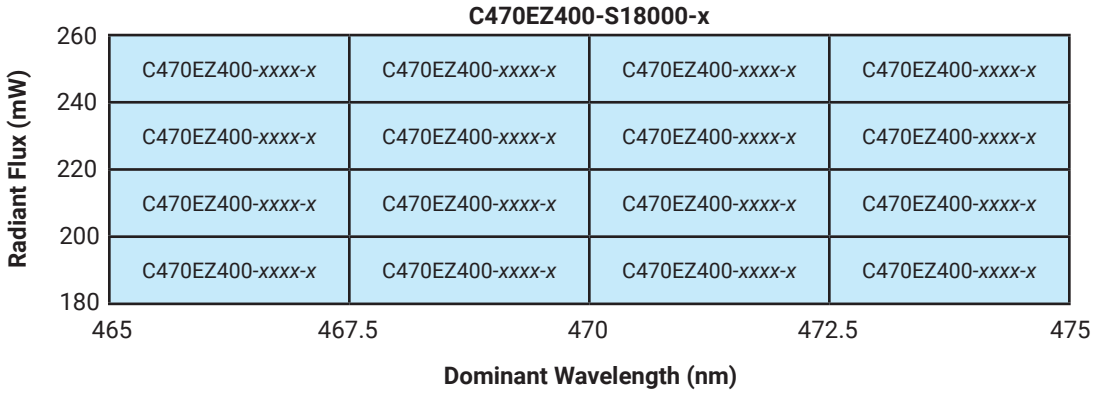

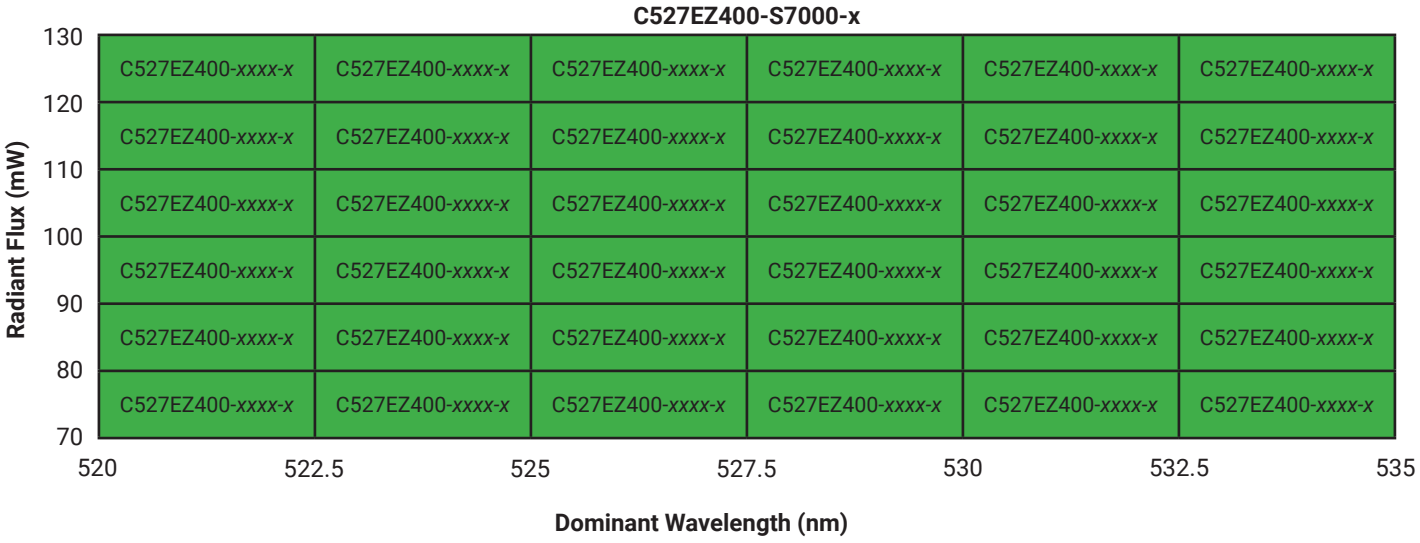

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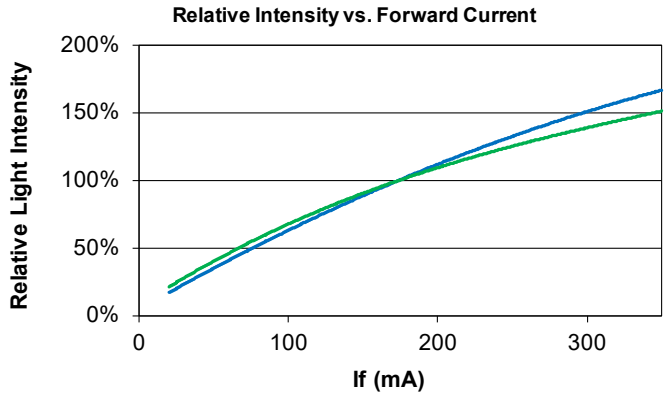
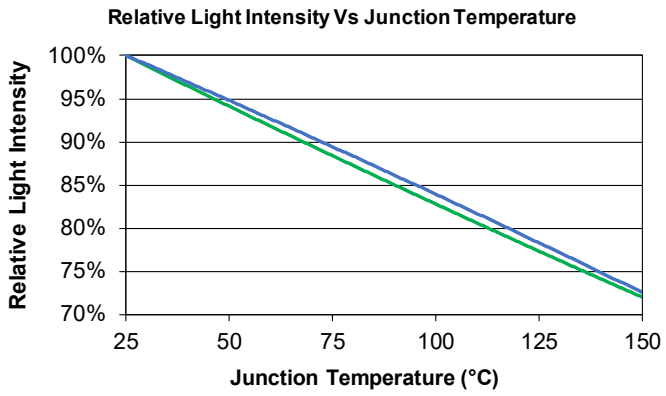
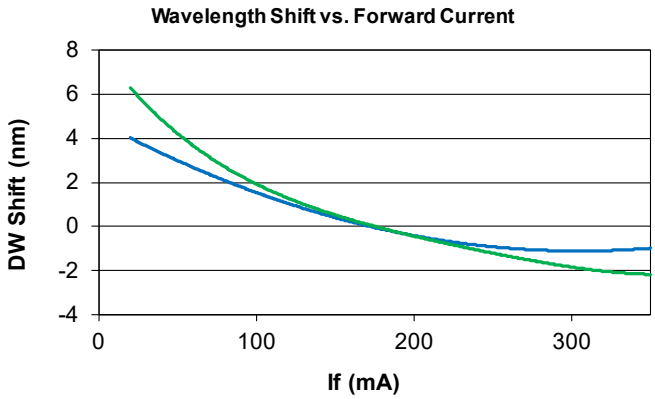
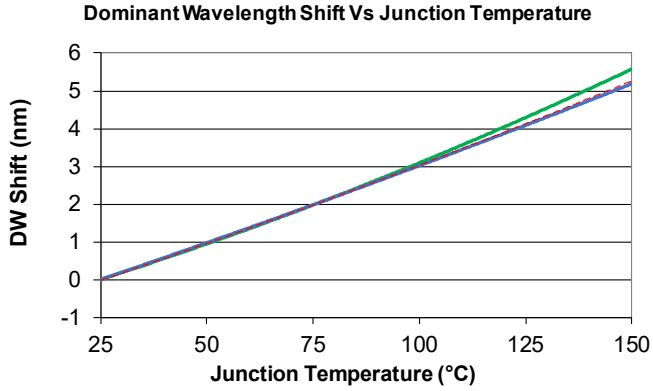
CHARACTERISTIC CURVES

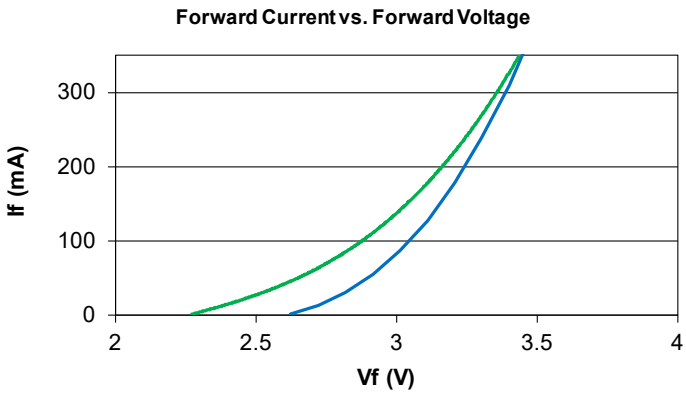
These are representative measurements for the EZ LED product. Actual curves will vary slightly for the various radiant flux and dominant wavelength bins.

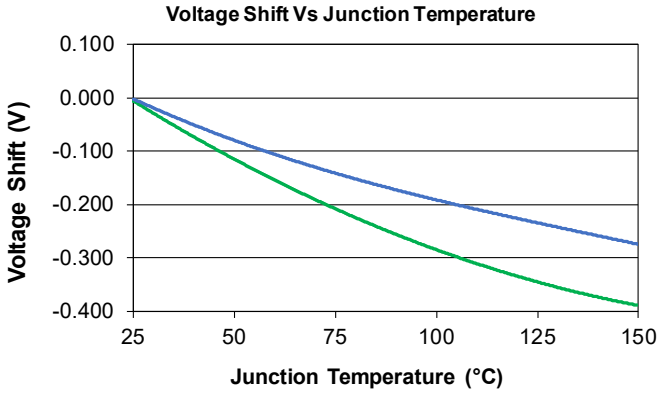












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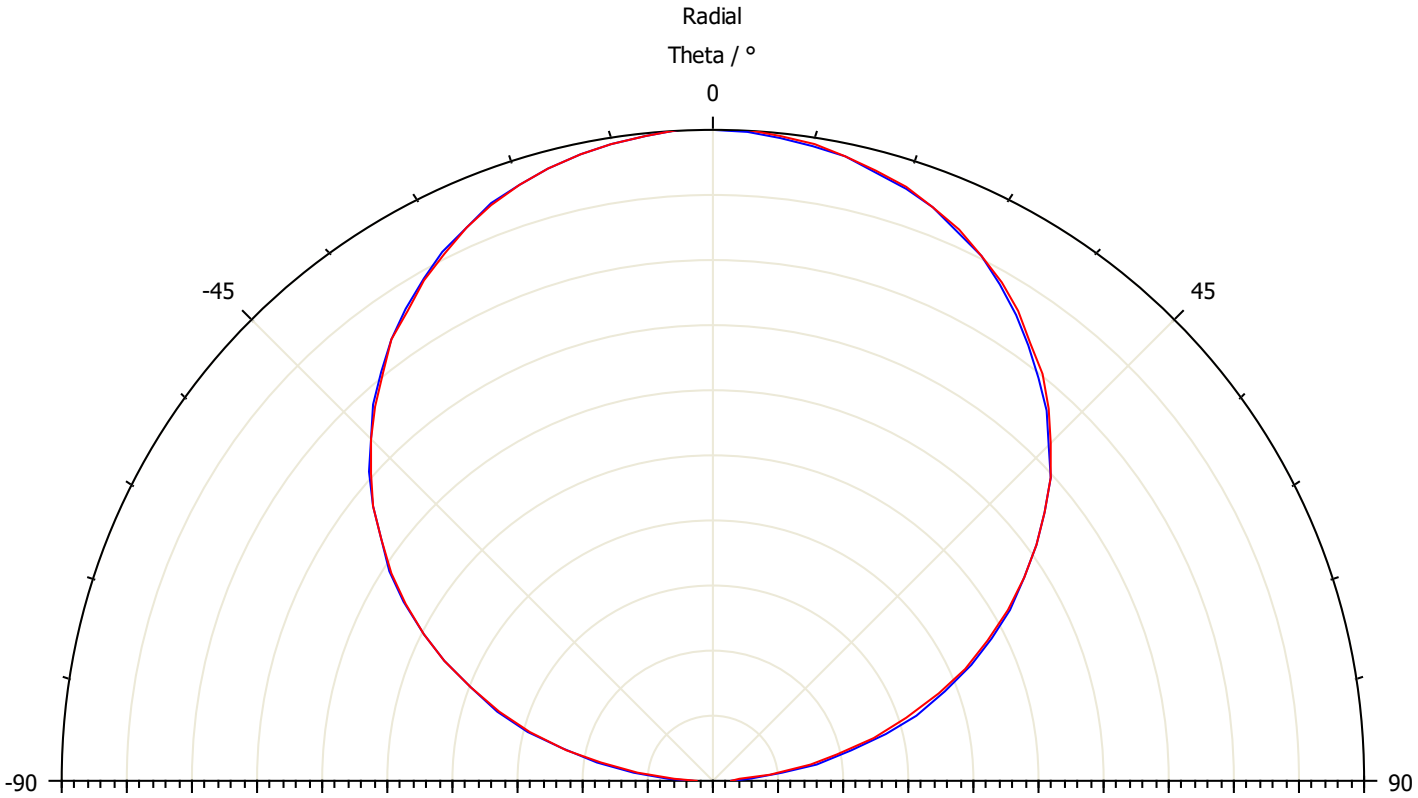
RADIATION PATTERN

This is a representative radiation pattern for the EZ LED product. Actual patterns will vary slightly for each chip.



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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

	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.

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:

	WARNING: 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 **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. For more information on California's Proposition 65 warnings, go to **www.P65Warnings.ca.gov**.

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** to verify which Cree LED semiconductor die products are delivered on this type of PVC die transfer film.

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