

Cree® EZ400-p™ LEDs

Data Sheet (Anode-up)

CxxxEZ400-Sxxx00-x

Cree's EZBright® LEDs are the latest generation of solid-state LED emitters that combine highly efficient InGaN materials with Cree'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™ LEDs 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 available in standard or reduced height. Cree'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.

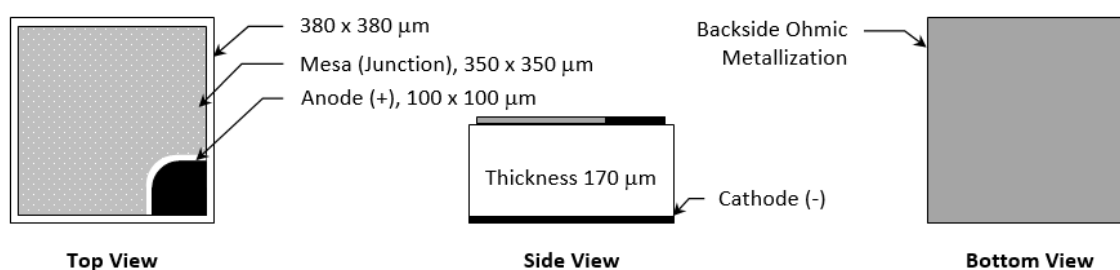
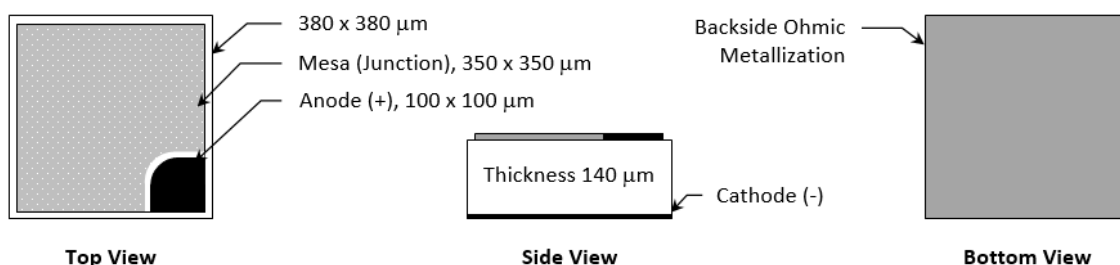
FEATURES

- Lambertian Radiation Pattern
- Anode-up design (p-pad up)
- EZBright LED Technology, binned @ 175 mA
 - 450 nm - 180+ mW
 - 460 nm - 180+ mW
 - 470 nm - 160+ mW
 - 527 nm - 40+ mW
- Forward Voltage (Vf) - 3.4 V Typical at 175 mA
- Maximum DC Forward Current - 200 mA
- Backside Metal versions for various attach methods:
 - A (AuSn) for use with Conductive Adhesives, Flux Eutectic Attach, Solder Paste & Solder Preforms
 - H (Au) for Conductive Adhesives (i.e. Ag paste)
- 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

CxxxEZ400-Sxxx00-x Chip Diagram



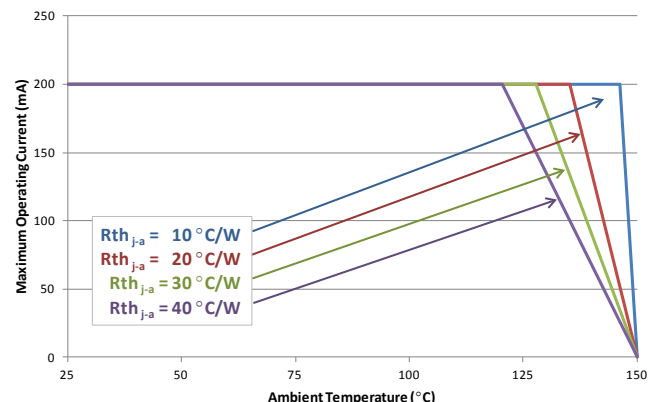
Maximum Ratings at $T_A = 25^\circ\text{C}$ <small>Note 1</small>		CxxxEZ400-Sxxx00-x
DC Forward Current		200 mA
Peak Forward Current (10% Duty Cycle @ 1 kHz)		350 mA <small>Note 3</small>
LED Junction Temperature		150°C
Reverse Voltage		5 V
Operating Temperature Range		-40°C to +100°C
LED Chip Storage Temperature		-40°C to +120°C
Recommended Die Sheet Storage Conditions		$\leq 30^\circ\text{C}$ / $\leq 85\%$ RH
Electrostatic Discharge Threshold (HBM) <small>Note 2</small>		2000 V
Electrostatic Discharge Classification (MIL-STD-883E) <small>Note 2</small>		Class 2

Typical Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$, $I_f = 175\text{ mA}$ <small>Note 2</small>					
Part Number	Forward Voltage (V_f , V)			Reverse Current [$I(V_r=5\text{ V})$, μA]	Full Width Half Max (λ_D , nm)
	Min.	Typ.	Max.	Max.	Typ.
C450EZ400-Sxxx00-x	3.1	3.4	3.7	2	19
C460EZ400-Sxxx00-x	3.1	3.4	3.7	2	20
C470EZ400-Sxxx00-x	3.1	3.4	3.7	2	23
C527EZ400-Sxxx00-x	3.2	3.5	3.8	2	35

Mechanical Specifications		CxxxEZ400-Sxxx00-x	
Description	Dimension	Tolerance	
P-N Junction Area (μm)	350 x 350	± 35	
Chip Area (μm)	380 x 380	± 35	
Chip Thickness (μm) - 140 μm nominal	140	-15/+10	
Chip Thickness (μm) - 170 μm nominal	170	± 25	
Top Au Bond Pad Diameter (μm)	100 x 100	-15/+5	
Au Bond Pad Thickness (μm)	1.0	± 0.5	
Backside Ohmic Metal Area (μm)	380 x 380	± 35	
Backside Ohmic Metal Thickness (μm) - "A" (AuSn)	3.0	± 1.5	
Backside Ohmic Metal Thickness (μm) - "H" (Au)	(0.050)		

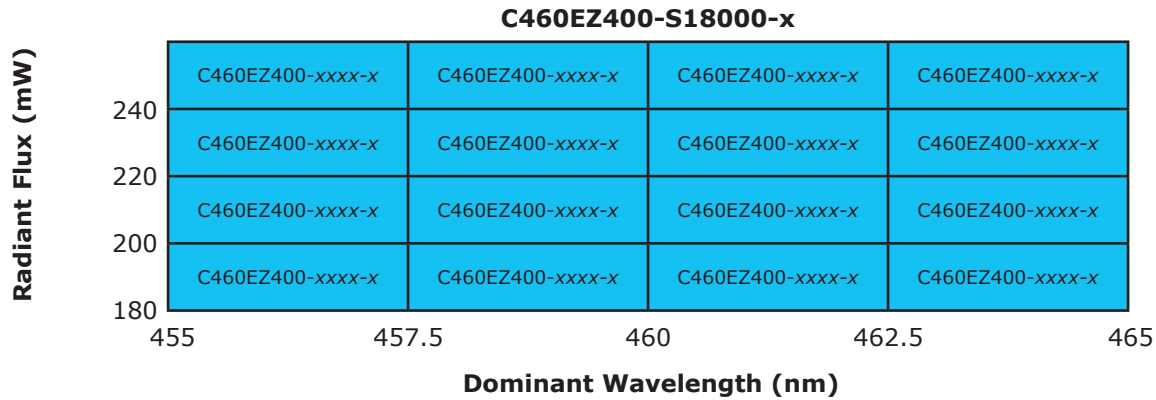
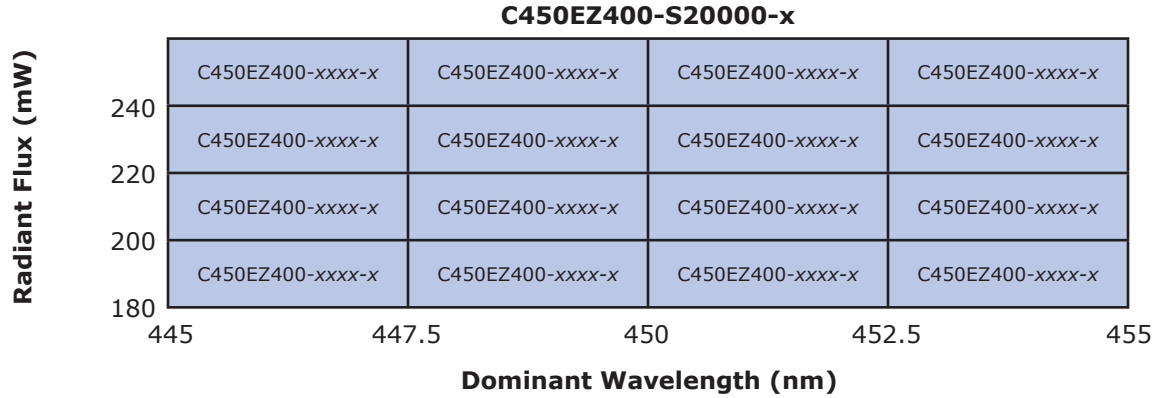
Notes:

- Maximum ratings are package-dependent. The above ratings were determined using a silicone encapsulated chip on MCPCB for characterization. The junction temperature should be characterized in a specific package to determine limitations. Assembly processing temperature limit is $< 325^\circ\text{C}$ (< 5 seconds). See the Cree EZBright Applications Note for assembly-process information.
- 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-883E.
- 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 header without an encapsulant. Optical characteristics were measured in an integrating sphere using Illuminance E.
- 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.
- Specifications are subject to change without notice.



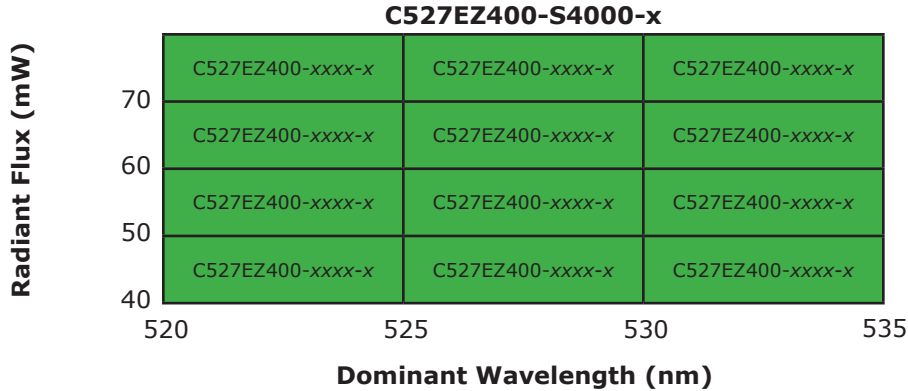
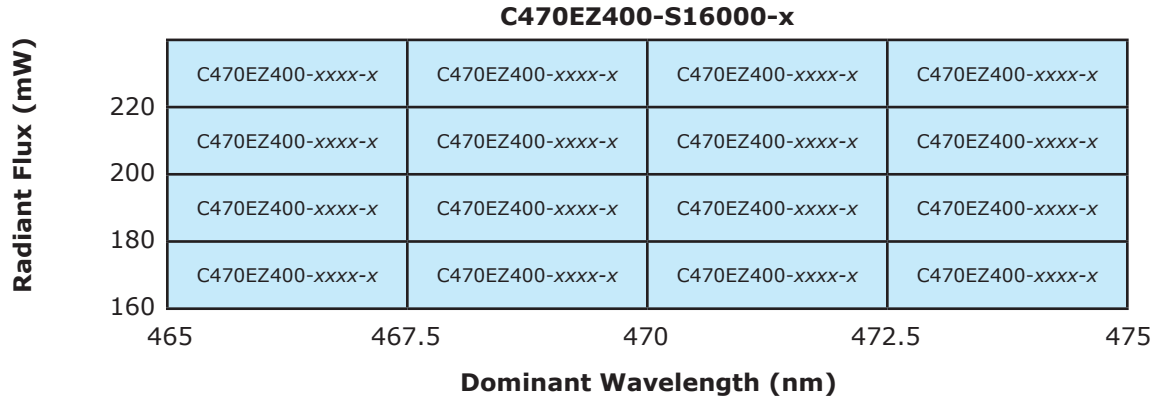
Standard Bins for CxxxEZ400-Sxxx00-x

LED chips are sorted to the **radiant flux** and **dominant wavelength** bins shown. A sorted die sheet contains die from only one bin. Sorted die kit (CxxxEZ400-Sxxx00-x) orders may be filled with any or all bins (CxxxEZ400-0xxx-x) contained in the kit. All radiant flux and all dominant wavelength values shown and specified are at $I_f = 175 \text{ mA}$. Radiant flux values are measured using Au-plated headers without an encapsulant.



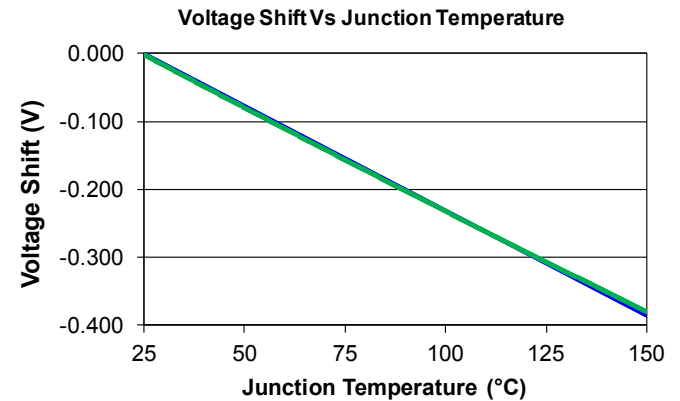
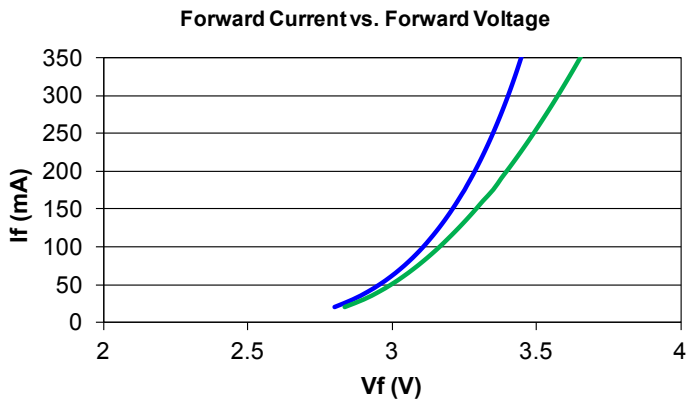
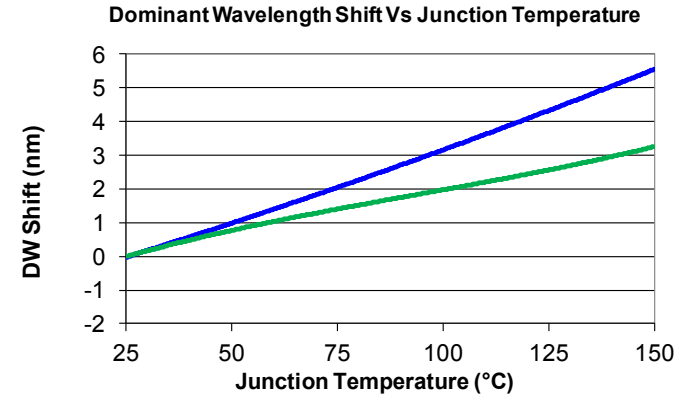
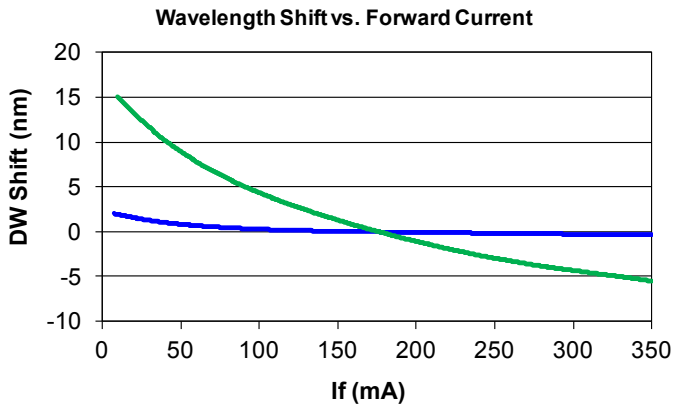
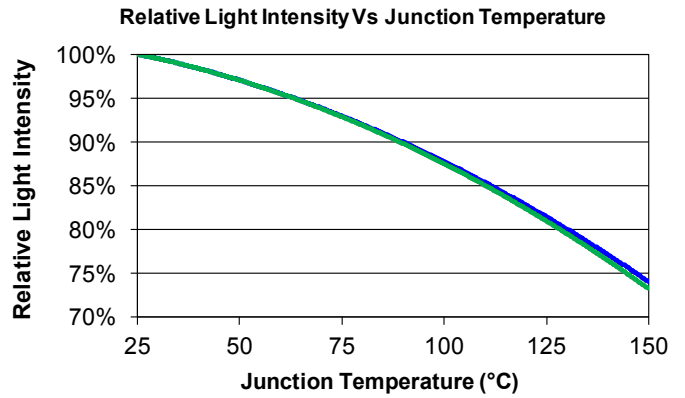
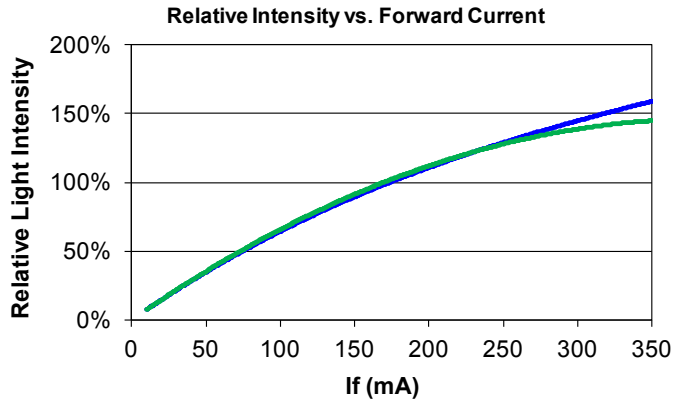
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Characteristic Curves

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



Radiation Pattern

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

