

# Direct Attach DA1000™ LEDs

## CxxxDA1000-Sxx000

### Data Sheet

Cree's Direct Attach DA1000 LEDs are the next generation of solid-state LED emitters that combine highly efficient InGaN materials with Cree's proprietary device technology and silicon-carbide substrates to deliver superior value for the TV-backlighting and general-illumination markets. The DA1000 LEDs are among the brightest in the lighting market while delivering a low forward voltage, resulting in a very bright and highly efficient solution. The bondpad-down design allows for eutectic die attach and enables superior performance from improved thermal management.

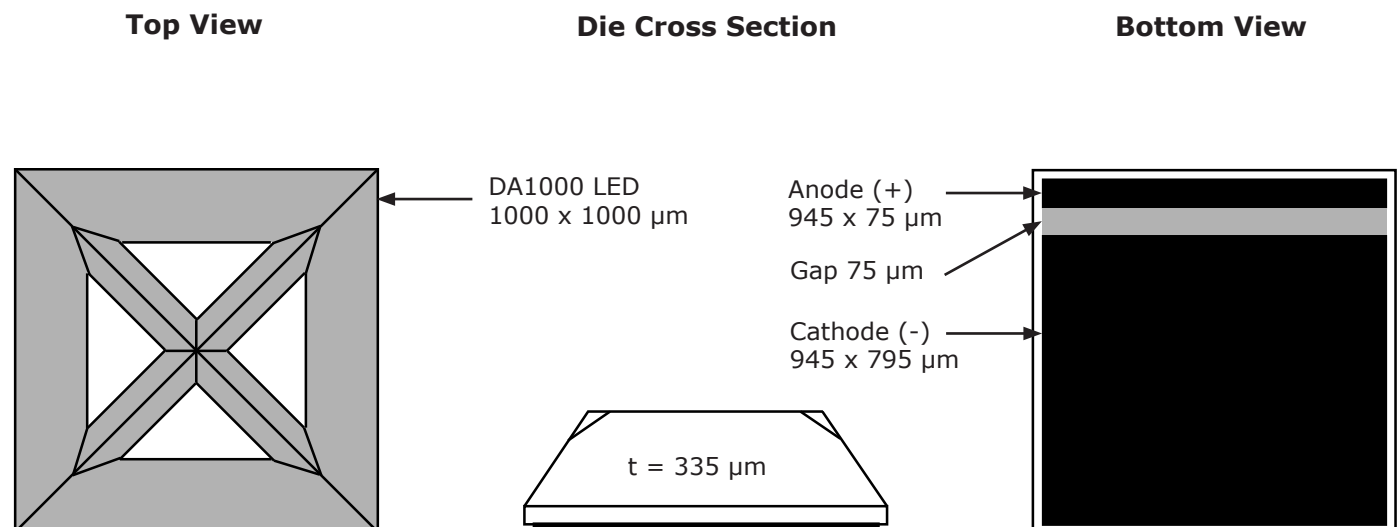
#### FEATURES

- Direct Attach LED Technology
- Rectangular LED RF Performance
  - 450 & 460 nm – 455 mW min
- High Reliability - Eutectic Attach
- Low Forward Voltage (Vf) – 3.15 V Typical at 350 mA
- Maximum DC Forward Current – 1000 mA
- InGaN Junction-down design for improved thermal management

#### APPLICATIONS

- General Illumination
  - Aircraft
  - Decorative Lighting
  - Task Lighting
  - Outdoor Illumination
- White LEDs
- Camera Flash
- Projection Displays
- Automotive

#### CxxxDA1000-Sxx000 Chip Diagram





Maximum Ratings at $T_A = 25^\circ\text{C}$ <small>Notes 1&amp;2</small>		CxxxDA1000-Sxx000
DC Forward Current		1000 mA
Peak Forward Current (1/10 duty cycle @ 1 kHz)		1250 mA
LED Junction Temperature		150°C
Reverse Voltage		5 V
Operating Temperature Range		-40°C to +100°C
Storage Temperature Range		-40°C to +100°C

Typical Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$ , $I_f = 350\text{ mA}$ <small>Note 2</small>					
Part Number	Forward Voltage ( $V_f$ , V)			Reverse Current [ $I(V_r=5V)$ , $\mu\text{A}$ ]	Full Width Half Max ( $\lambda_D$ , nm)
	Min.	Typ.	Max.		
C450DA1000-Sxx000	2.7	3.15	3.5	2	20
C460DA1000-Sxx000	2.7	3.15	3.5	2	21

Mechanical Specifications		CxxxDA1000-Sxx000
Description	Dimension	Tolerance
P-N Junction Area ( $\mu\text{m}$ )	945 x 945	$\pm 35$
Chip Bottom Area ( $\mu\text{m}$ )	1000 x 1000	$\pm 35$
Chip Top Area ( $\mu\text{m}$ )	640 x 640	$\pm 35$
Chip Thickness ( $\mu\text{m}$ )	335	$\pm 25$
AuSn Bond Pad Width – Anode ( $\mu\text{m}$ )	75	$\pm 15$
AuSn Bond Pad Length – Anode ( $\mu\text{m}$ )	945	$\pm 35$
AuSn Bond Pad Width – Cathode ( $\mu\text{m}$ )	795	$\pm 35$
AuSn Bond Pad Length – Cathode ( $\mu\text{m}$ )	945	$\pm 35$
Bond Pad Gap ( $\mu\text{m}$ )	75	$\pm 15$
AuSn Bond Pad Thickness ( $\mu\text{m}$ )	3	$\pm 0.5$

**Notes:**

1. Maximum ratings are package-dependent. The above ratings were determined using a Cree 3.45-mm x 3.45-mm SMT package (with silicone encapsulation and intrinsic AuSn metal die attach) for characterization. Ratings for other packages may differ. Junction temperature should be characterized in a specific package to determine limitations. Assembly processing temperature must not exceed 325°C (< 5 seconds).
2. All products conform to the listed minimum and maximum specifications for electrical and optical characteristics when assembled and operated at 350 mA within the maximum ratings shown above. Efficiency decreases at higher currents. Typical values given are within the range of average values expected by manufacturer in large quantities and are provided for information only. All measurements were made using lamps in T-1¾ packages (with Hysol OS4000 epoxy encapsulant and intrinsic AuSn metal die attach). Optical characteristics measured in an integrating sphere using Illuminance E.



## Standard Bins for CxxxDA1000-Sxx000

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 (CxxxDA1000-Sxxxxx) orders may be filled with any or all bins (CxxxDA1000-xxxxx) contained in the kit. All radiant flux and dominant wavelength values shown and specified are at  $I_f = 350$  mA.

### C450DA1000-S45500

Radiant Flux (mW)	625	C450DA1000-0225	C450DA1000-0226	C450DA1000-0227	C450DA1000-0228
	585	C450DA1000-0221	C450DA1000-0222	C450DA1000-0223	C450DA1000-0224
	550	C450DA1000-0217	C450DA1000-0218	C450DA1000-0219	C450DA1000-0220
	515	C450DA1000-0213	C450DA1000-0214	C450DA1000-0215	C450DA1000-0216
	485	C450DA1000-0209	C450DA1000-0210	C450DA1000-0211	C450DA1000-0212
	455	C450DA1000-0205	C450DA1000-0206	C450DA1000-0207	C450DA1000-0208
		445	447.5	450	452.5

**Dominant Wavelength (nm)**

### C460DA1000-S45500

Radiant Flux (mW)	625	C460DA1000-0225	C460DA1000-0226	C460DA1000-0227	C460DA1000-0228
	585	C460DA1000-0221	C460DA1000-0222	C460DA1000-0223	C460DA1000-0224
	550	C460DA1000-0217	C460DA1000-0218	C460DA1000-0219	C460DA1000-0220
	515	C460DA1000-0213	C460DA1000-0214	C460DA1000-0215	C460DA1000-0216
	485	C460DA1000-0209	C460DA1000-0210	C460DA1000-0211	C460DA1000-0212
	455	C460DA1000-0205	C460DA1000-0206	C460DA1000-0207	C460DA1000-0208
		455	457.5	460	462.5

**Dominant Wavelength (nm)**

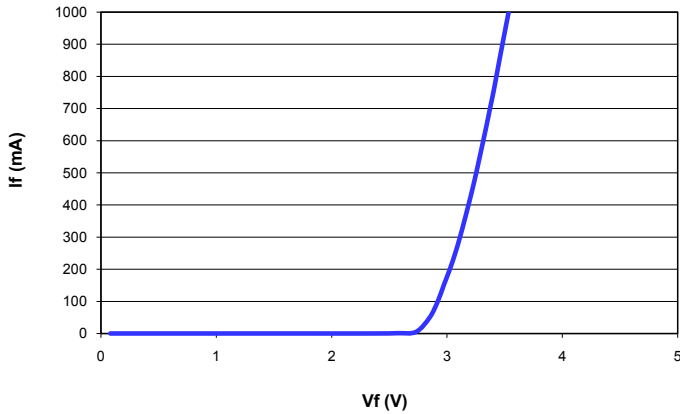
Note: The radiant-flux values above are representative of the die in a T-1 $\frac{3}{4}$  encapsulated 5-mm lamp.



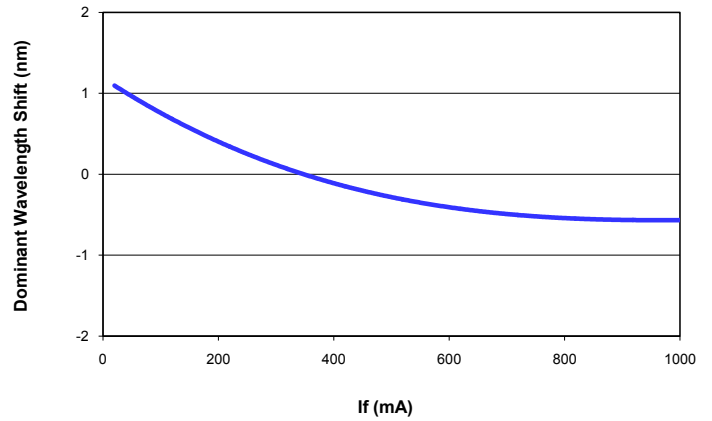
## Characteristic Curves

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

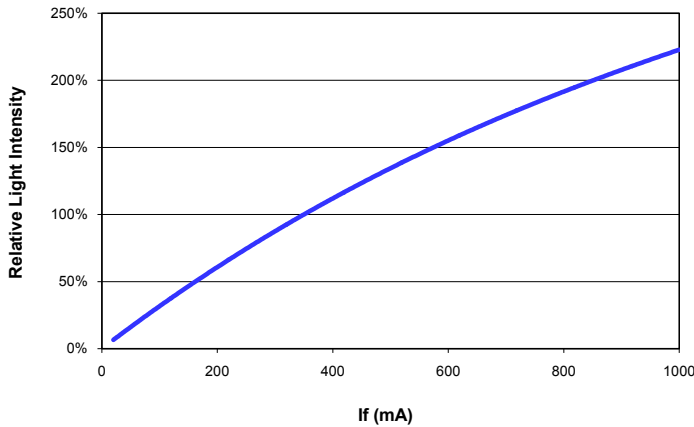
### Forward Current vs. Forward Voltage



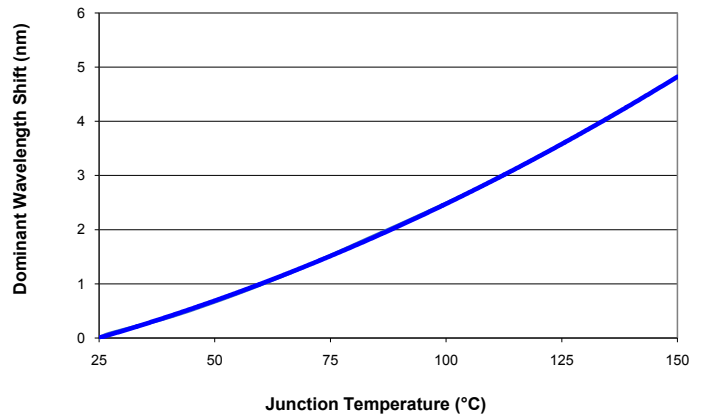
### Wavelength Shift vs. Forward Current



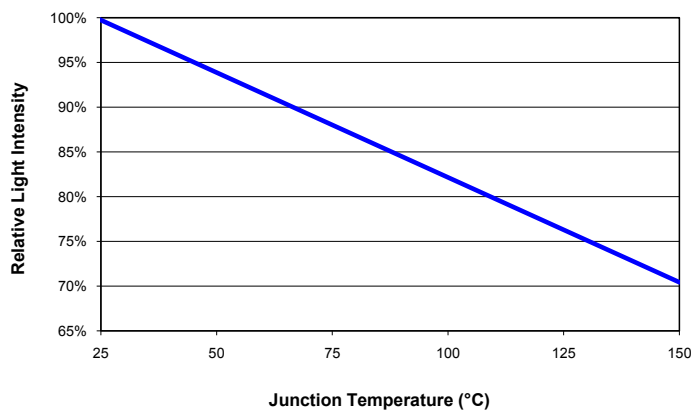
### Relative Intensity vs. Forward Current



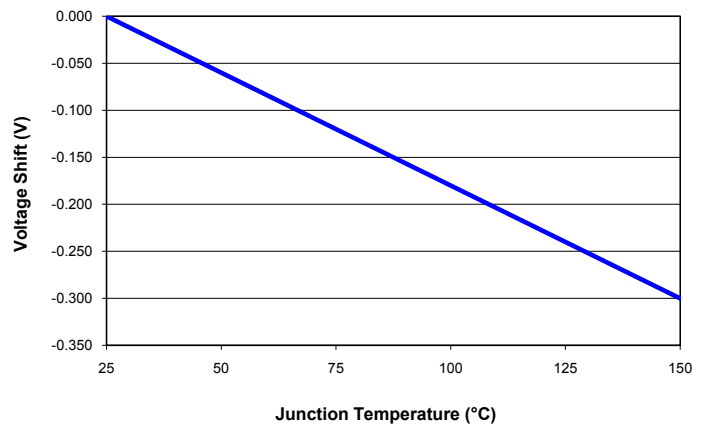
### Dominant Wavelength Shift Vs Junction Temperature



### Relative Light Intensity Vs Junction Temperature



### Voltage Shift Vs Junction Temperature



## Radiation Pattern

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

