

# Cree® TR2227™ LEDs

## Data Sheet

### CxxxTR2227-Sxx00

Cree's TR™ LEDs are the newest 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 LCD sideview market. The TR LEDs are among the brightest in the sideview market while delivering a low forward voltage resulting in a very bright and highly efficient solution for the 0.4-mm, 0.6-mm and 0.8-mm sideview market. The design is optimally suited for industry standard sideview packages as it is die attachable with clear epoxy and has two top contacts, consistent with industry standard packaging.

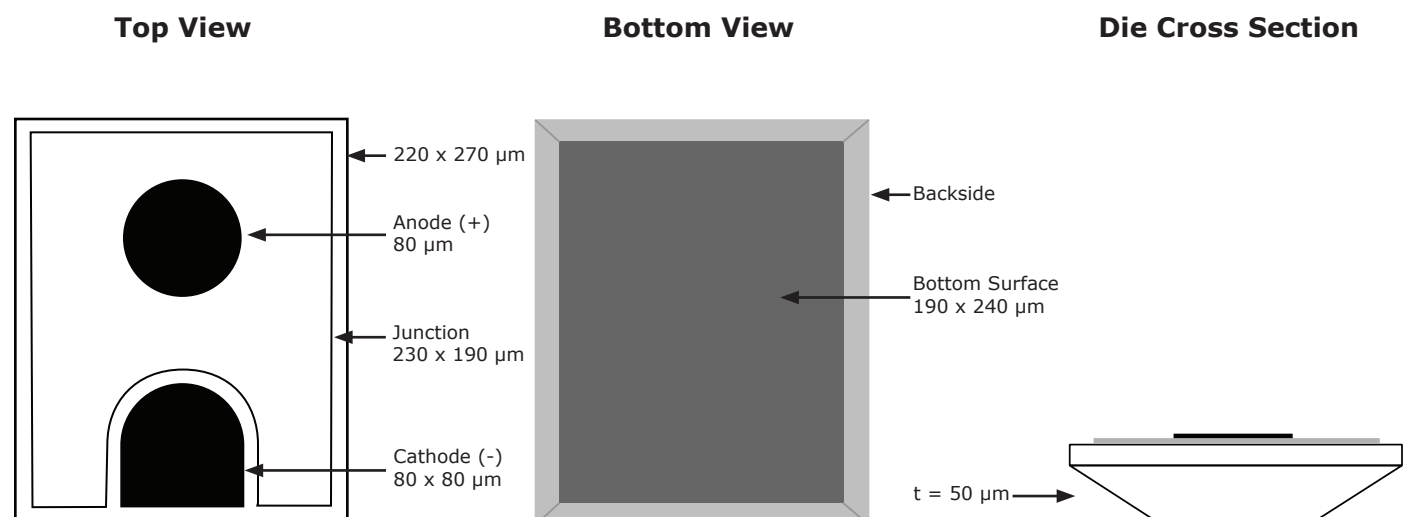
#### FEATURES

- Rectangular LED Rf Performance
  - 450 & 460 nm
    - ♦ TR-21™ - 21 mW min.
  - 527 nm
    - ♦ TR-06™ - 6 mW min.
- Epoxy Die Attach
- Low Forward Voltage - 3.3 V Typical at 20 mA
- 1000-V ESD Threshold Rating
- InGaN Junction on Thermally Conductive SiC Substrate

#### APPLICATIONS

- Mobile Backlighting – 0.8 mm, 0.6 mm & 0.4 mm sideview packages
  - Mobile Appliances
  - Digital Cameras
  - Car Navigation Systems
- LCD Backlighting – 0.8 mm, 0.6 mm & 0.4 mm sideview packages
  - Portable PCs
  - Monitors
- LED Video Displays

#### CxxxTR2227-Sxx00 Chip Diagram



Maximum Ratings at $T_A = 25^\circ\text{C}$ <small>Notes 1&amp;3</small>		CxxxTR2227-Sxx00
DC Forward Current		30 mA
Peak Forward Current (1/10 duty cycle @ 1 kHz)		70 mA
LED Junction Temperature		125°C
Reverse Voltage		5 V
Operating Temperature Range		-40°C to +100°C
Storage Temperature Range		-40°C to +100°C
Electrostatic Discharge Threshold (HBM) <small>Note 2</small>		1000 V
Electrostatic Discharge Classification (MIL-STD-883E) <small>Note 2</small>		Class 2

Typical Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$ , $I_f = 20\text{ mA}$ <small>Note 3</small>					
Part Number	Forward Voltage ( $V_f$ , V)			Reverse Current [ $I(V_r=5V)$ , $\mu\text{A}$ ]	Full Width Half Max ( $\lambda_p$ , nm)
	Min.	Typ.	Max.	Max.	Typ.
C450TR2227-Sxx00	2.7	3.3	3.7	2	20
C460TR2227-Sxx00	2.7	3.3	3.7	2	21
C527TR2227-Sxx00	2.9	3.4	3.9	2	34

Mechanical Specifications		CxxxTR2227-Sxx00	
Description	Dimension	Tolerance	
P-N Junction Area ( $\mu\text{m}$ )	190 x 230	$\pm 35$	
Chip Area ( $\mu\text{m}$ )	220 x 270	$\pm 35$	
Chip Thickness ( $\mu\text{m}$ )	50	$\pm 15$	
Au Bond Pad Diameter Anode ( $\mu\text{m}$ )	80	-5, +15	
Au Bond Pad Thicknesses ( $\mu\text{m}$ )	1.0	$\pm 0.5$	
Au Bond Pad Area Cathode ( $\mu\text{m}$ )	80 x 80	-5, +15	
Bottom Area ( $\mu\text{m}$ )	190 x 240	$\pm 35$	

**Notes:**

- Maximum ratings are package-dependent. The above ratings were determined using a T-1 3/4 package (with Hysol OS4000 epoxy) 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 T-1 3/4 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 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 20 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-1 3/4 packages (with Hysol OS4000 epoxy). Optical characteristics measured in an integrating sphere using Illuminance E.
- Specifications are subject to change without notice.

## Standard Bins for CxxxTR2227-Sxx00

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 (CxxxTR2227-Sxx00) orders may be filled with any or all bins (CxxxTR2227-xxxx) contained in the kit. All Radiant Flux (RF) values and all dominant wavelength values shown are specified at  $I_f = 20 \text{ mA}$ .

### TR 450 nm Kits

#### TR-21

#### C450TR2227-S2100

Radiant Flux	27.0 mW	C450TR2227-0213	C450TR2227-0214	C450TR2227-0215	C450TR2227-0216	
	24.0 mW	C450TR2227-0209	C450TR2227-0210	C450TR2227-0211	C450TR2227-0212	
	21.0 mW	C450TR2227-0205	C450TR2227-0206	C450TR2227-0207	C450TR2227-0208	
		445 nm	447.5 nm	450 nm	452.5 nm	455 nm

**Dominant Wavelength**

### TR 460 nm Kits

#### TR-21

#### C460TR2227-S2100

Radiant Flux	27.0 mW	C460TR2227-0213	C460TR2227-0214	C460TR2227-0215	C460TR2227-0216	
	24.0 mW	C460TR2227-0209	C460TR2227-0210	C460TR2227-0211	C460TR2227-0212	
	21.0 mW	C460TR2227-0205	C460TR2227-0206	C460TR2227-0207	C460TR2227-0208	
		455 nm	457.5 nm	460 nm	462.5 nm	465 nm

**Dominant Wavelength**

### TR 527 nm Kits

#### TR-06

#### C527TR2227-S0600

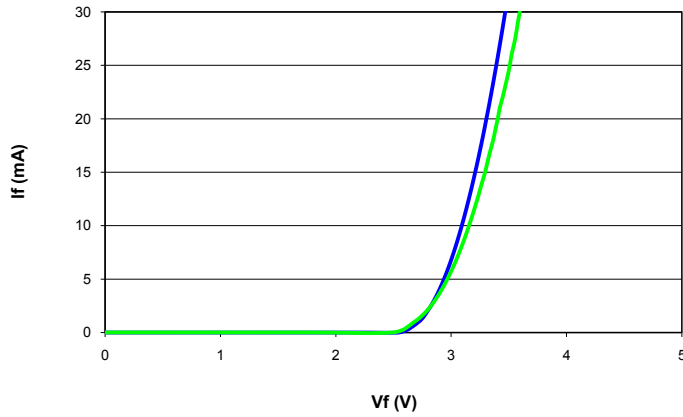
Radiant Flux	10.0 mW	C527TR2227-0213	C527TR2227-0214	C527TR2227-0215	
	9.0 mW	C527TR2227-0210	C527TR2227-0211	C527TR2227-0212	
	8.0 mW	C527TR2227-0207	C527TR2227-0208	C527TR2227-0209	
	7.0 mW	C527TR2227-0204	C527TR2227-0205	C527TR2227-0206	
	6.0 mW	C527TR2227-0201	C527TR2227-0202	C527TR2227-0203	
		520 nm	525 nm	530 nm	535 nm

**Dominant Wavelength**

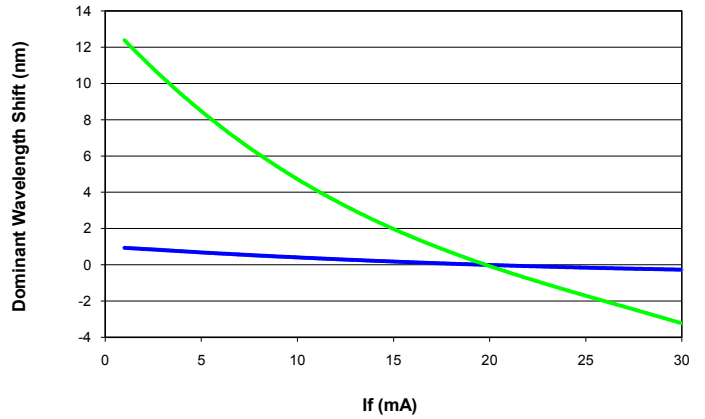
## Characteristic Curves

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

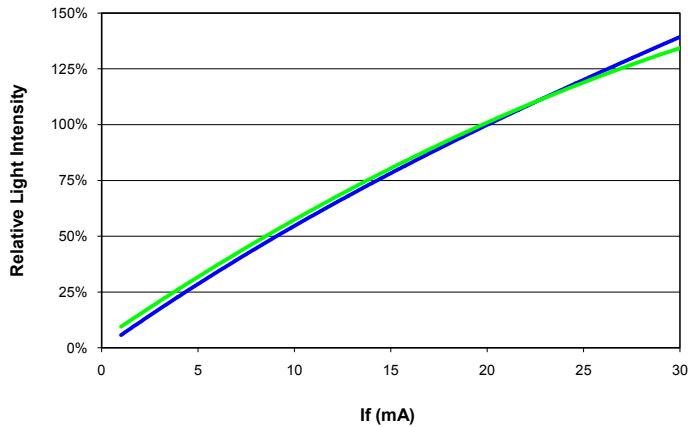
**Forward Current vs. Forward Voltage**



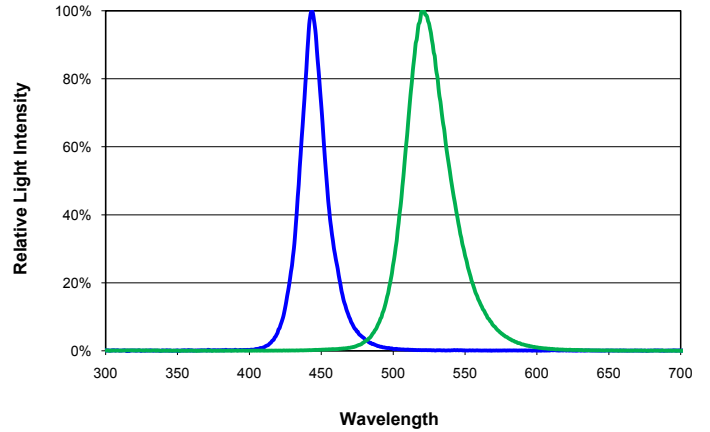
**Wavelength Shift vs. Forward Current**



**Relative Intensity vs. Forward Current**



**Relative Intensity vs. Wavelength**



## Radiation Pattern

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

