

# 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.

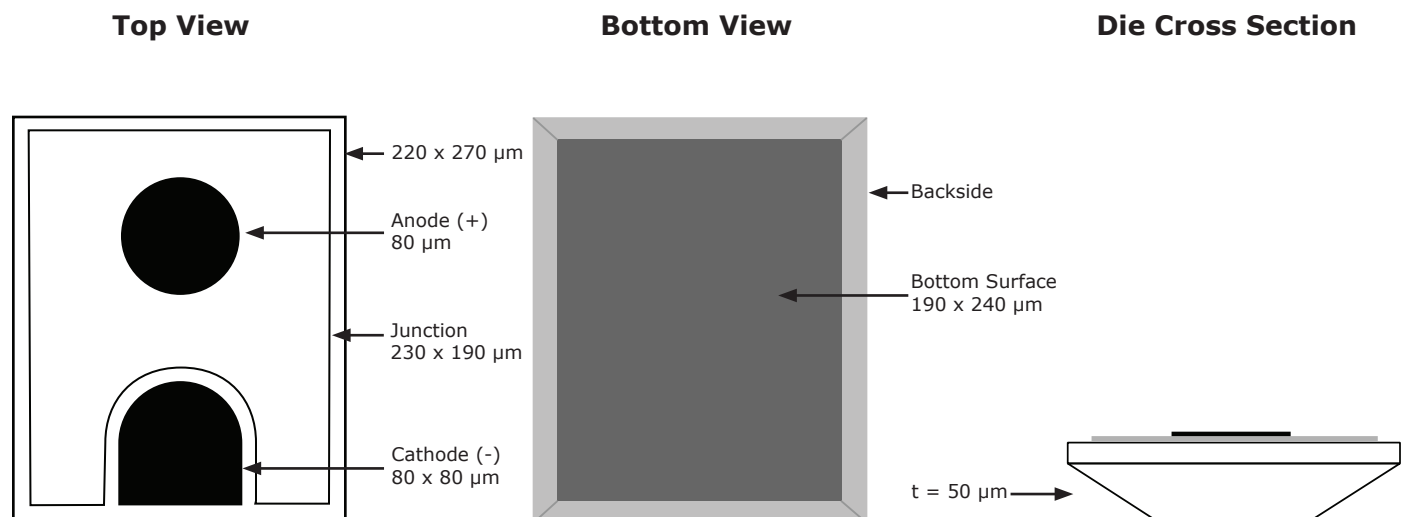
#### FEATURES

- 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:**

1. 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).
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-883E.
3. 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.
4. 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 |

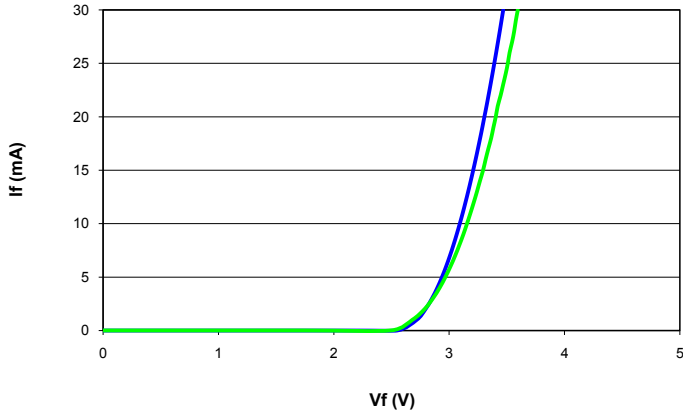
**Dominant Wavelength**



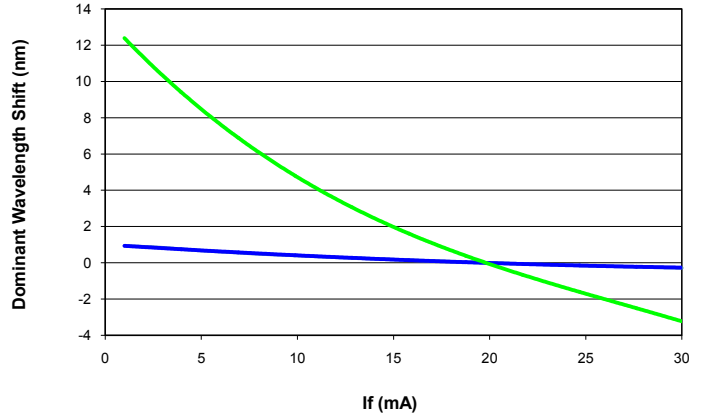
## Characteristic Curves

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

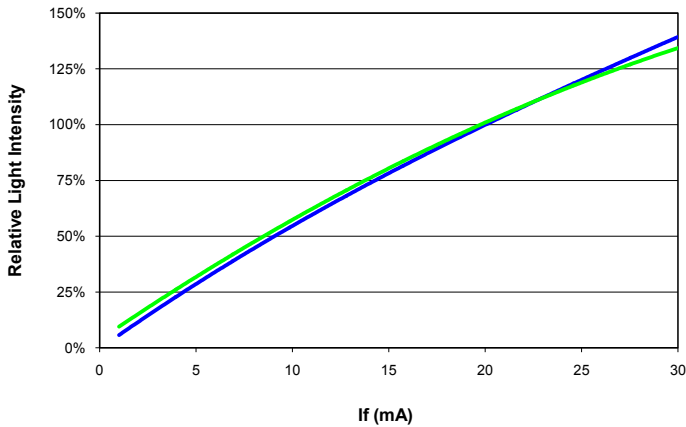
### Forward Current vs. Forward Voltage



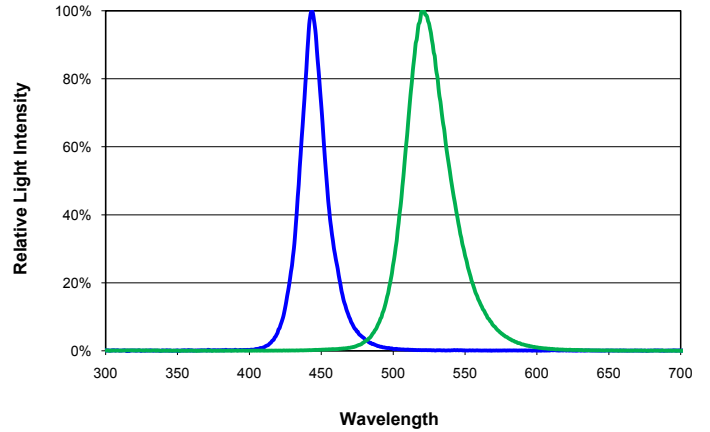
### Wavelength Shift vs. Forward Current



### Relative Intensity vs. Forward Current



### Relative Intensity vs. Wavelength



## Radiation Pattern

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

