

## OLY6D-FKC: RGB LEDs

### with OptiLamp™ Technology



#### PRODUCT DESCRIPTION

The OLY6D FKC is a full color RGB LED that merges an integrated ASIC driver in a 2.8x2.8 mm package. Designed for video wall, signage, and next generation display systems, it delivers high brightness, low power, smooth grayscale, with high dynamic range. Its advanced OptiLamp™ driver technology replaces external driver circuitry, dramatically simplifying PCB design while enabling high speed bidirectional data communication and monitoring—including chip level temperature sensing, voltage measurement, leakage detection, and CRC based error protection.

By placing a dedicated driver at the pixel level, the OLY6D FKC achieves visually flawless grayscale, high color depth, and fast performance, eliminating visible scan lines and unlocking true high fidelity image reproduction. The result is a smarter, cleaner, and more capable LED purpose-built for the display industry that demands premium visual quality and reliability.

#### FEATURES

- Size (mm): 2.8 x 2.8 x 2.5
- Typical pitch range: 6-12 mm
- Typical luminous intensity: R/G/B: 500/1280/280 mcd @8mA
- Water resistant (IPX6/IPX8)\*
- Moisture sensitivity level: 5a
- Lead free
- RoHS compliant
- Integrated proprietary driver
- Direct 1/1 scan rate
- Maximized brightness control
- Power saving at standard nit levels
- 24-bit color depth per channel
- PWM and Analog
- Full-off LED control
- Flawless grayscale
- Long communication strings
- Bidirectional communication
- Single supply (2.5V - 3.6V)
- 4 active pins: Vcc, GND, DIO A-B
- ESD protection
- Temperature compensation
- Health monitoring
- CRC error detection
- Data decompression (gamma)
- Selectable currents
- Calibration optimization

#### APPLICATIONS

- Outdoor Full-Color Video Screen
- Decorative Lighting
- Stadium Screen
- Billboard Display
- Traffic Displays
- Message Display
- Amusement
- Transparent Installations

\*:This part is tested under the condition of assembling it on a PCB with isolating the electrical path by silicone.

The leads area of the LED is not IPX8 rated and it's required to insulate for moisture by customer in outdoor application

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27713 USA / +1.919.313.5330 / [www.cree-led.com](http://www.cree-led.com)

## 2. ESTIMATED NIT LEVEL

Scan Rate is 1/1 for all cases.

| Screen Pitch | Estimated Maximum Nits |
|--------------|------------------------|
| P4           | 101550                 |
| P6           | 45150                  |
| P8           | 25400                  |
| P10          | 16250                  |
| P12          | 11300                  |
| P15          | 7200                   |

### Notes

- Approximate LED Drive current of 8mA

## 3. DISPLAY ENABLING CHARACTERITICS

Projected Nit Level relative to screen pitch. Scan Rate is 1/1 for all cases.

| Parameter               | Condition      | Min  | Max    | Units            |
|-------------------------|----------------|------|--------|------------------|
| Maximum Refresh Rate    |                |      | 11,800 | Hz               |
| Color Depth Per Channel |                |      | 24     | bit              |
| Maximum Color Bit Depth |                |      | 72     | bit              |
| Scan Rate               |                | 1    | 1      |                  |
| Maximum String Length   |                |      | >4000  | pixel            |
| Gray Scale              |                |      | 24     | bit              |
| Power Consumption       | P8, 10000 nits | 11.3 | <425   | W/m <sup>2</sup> |
| Bit Rate                |                |      | 3      | Mbps             |

|                                                     | Color Depth | 30 FPS | 60 FPS | 120 FPS |
|-----------------------------------------------------|-------------|--------|--------|---------|
| Approximate Maximum String Length per Color and FPS | 24          | 4150   | 2050   | 1000    |
|                                                     | 48          | 2050   | 1000   | 500     |
|                                                     | 72          | 1350   | 650    | 300     |

### Notes

- Maximum accessible ranges.
- Actual range of characteristics may be limited by specific usage case parameters.

## 4. ELECTRICAL AND OPTICAL CHARACTERISTICS

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

| Parameter                                             | Symbol | Min  | Max | Units            |
|-------------------------------------------------------|--------|------|-----|------------------|
| Supply Voltage                                        | Vcc    | -0.5 | 3.6 | V                |
| Output Voltage                                        | Vccio  | -0.5 | 3.6 | V                |
| Supply Current                                        | $I_f$  |      | 25  | mA               |
| Storage Temperature                                   |        | -65  | 150 | $^\circ\text{C}$ |
| Junction Temperature (operation expected to shutdown) | $T_j$  | -40  | 125 | $^\circ\text{C}$ |
| ESD Protection on all pads (HBM)                      |        |      | 2   | kV               |
| ESD Protection on all pads (CDM)                      |        |      | 500 | V                |
| Latch-up: I-test                                      |        |      | 100 | mA               |
| Latch-up: V-test                                      |        |      | 5.4 | V                |

#### Note:

1. Stress above those listed under the "Absolute Maximum Ratings" may cause permanent damage to the device.
2. All voltages referenced to GND.

### Typical Electrical & Optical Characteristics ( $T_A = 25^\circ\text{C}$ )

| Symbol          | Parameter                 | Condition     | Min | Typ   | Max | Units |
|-----------------|---------------------------|---------------|-----|-------|-----|-------|
| Vcc             | Supply Voltage            |               |     | 3.3   |     | V     |
| $I_F$           | LED Forward Current       | All 3 LEDs    |     | 8     |     | mA    |
| $I_{dyn}$       | ASIC Operation Current    | 3.3V, RGB off |     | 0.275 |     | mA    |
| $\lambda_{DOM}$ | Dominant Wavelength       | Red (8mA)     |     | 620   |     | nm    |
|                 |                           | Green (8mA)   |     | 528   |     |       |
|                 |                           | Blue (8mA)    |     | 470   |     |       |
| $\Delta\lambda$ | Spectral Bandwidth (FWHM) | Red (8mA)     |     | 14    |     | nm    |
|                 |                           | Green (8mA)   |     | 25    |     |       |
|                 |                           | Blue (8mA)    |     | 19    |     |       |
| IV (avg)        | Luminous Intensity        | Red (8mA)     |     | 500   |     | mcd   |
|                 |                           | Green (8mA)   |     | 1280  |     |       |
|                 |                           | Blue (8mA)    |     | 280   |     |       |

#### Note:

1. All voltages referenced to GND unless stated otherwise.
2. Color Order = 1

## 5. INTENSITY BIN LIMIT

| Red (8 mA) |           |           | Green (8 mA) |           |           | Blue (8 mA) |           |           |
|------------|-----------|-----------|--------------|-----------|-----------|-------------|-----------|-----------|
| Bin Code   | Min.(mcd) | Max.(mcd) | Bin Code     | Min.(mcd) | Max.(mcd) | Bin Code    | Min.(mcd) | Max.(mcd) |
| hj         | 403       | 505       | st           | 1010      | 1260      | bc          | 202       | 252       |
| J          | 450       | 560       | P            | 1120      | 1400      | F           | 224       | 280       |
| km         | 505       | 635       | vw           | 1260      | 1600      | de          | 252       | 318       |
|            |           |           |              |           |           | G           | 280       | 355       |

\* Tolerance of measurement of luminous intensity is  $\pm 10\%$ .

## 6. COLOR BIN LIMIT

| Red (8 mA) |          |          | Green (8 mA) |          |          | Blue (8 mA) |          |          |
|------------|----------|----------|--------------|----------|----------|-------------|----------|----------|
| Bin Code   | Min.(nm) | Max.(nm) | Bin Code     | Min.(nm) | Max.(nm) | Bin Code    | Min.(nm) | Max.(nm) |
| RB         | 619      | 624      | G23          | 522.5    | 527.5    | B4          | 465      | 470      |
|            |          |          | G8           | 525      | 530      | B45         | 467.5    | 472.5    |
|            |          |          | G45          | 527.5    | 532.5    | B5          | 470      | 475      |
|            |          |          | G9           | 530      | 535      | B67         | 472.5    | 477.5    |
|            |          |          | G67          | 532.5    | 537.5    | B6          | 475      | 480      |
|            |          |          | Ga           | 535      | 540      |             |          |          |

\* Tolerance of measurement of dominant wavelength is  $\pm 1$  nm.

## 7. ORDER CODE TABLE

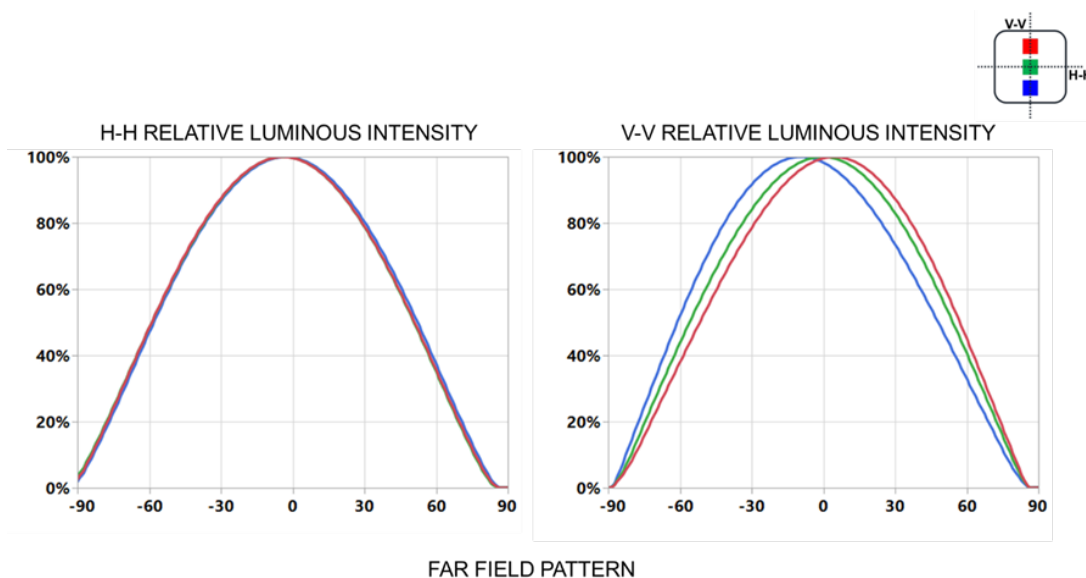
| Kit Number                     | Color | Luminous Intensity (mcd)                     |      | Dominant Wavelength (nm)              |          |           |          | Package |
|--------------------------------|-------|----------------------------------------------|------|---------------------------------------|----------|-----------|----------|---------|
|                                |       | Min.                                         | Max. | Color Bin                             | Min.(nm) | Color Bin | Max.(nm) |         |
| OLY6D-FKC-ChjkmstvwbcGBB23B4C3 | Red   | 403                                          | 635  | RB                                    | 619      | RB        | 624      | Reel    |
|                                | Green | 1010                                         | 1600 | G23                                   | 522.5    | Ga        | 540      | Reel    |
|                                | Blue  | 202                                          | 355  | B4                                    | 465      | B6        | 480      | Reel    |
| OLY6D-FKC-Chj1st1bc1BB23B4C3   | Red   | Any 1 Intensity bin from hj(403) - km(635)   |      | RB                                    | 619      | RB        | 624      | Reel    |
|                                | Green | Any 1 Intensity bin from st(1010) - vw(1600) |      | Any 1 hue bin from G23(522.5)-Ga(540) |          |           |          | Reel    |
|                                | Blue  | Any 1 Intensity bin from bc(202) - G(355)    |      | Any 1 hue bin from B4(465)-B6(480)    |          |           |          | Reel    |
| OLY6D-FKC-Chj1P1F1BB23B4C3     | Red   | Any 1 Intensity bin from hj(403) - km(635)   |      | RB                                    | 619      | RB        | 624      | Reel    |
|                                | Green | Any 1 Intensity bin from P(1120) - vw(1600)  |      | Any 1 hue bin from G23(522.5)-Ga(540) |          |           |          | Reel    |
|                                | Blue  | Any 1 Intensity bin from F(224) - G(355)     |      | Any 1 hue bin from B4(465)-B6(480)    |          |           |          | Reel    |

### Notes:

- The above kit numbers represent order codes that include multiple intensity-bin and color-bin codes. Only one intensity-bin code and one color-bin code will be shipped on each bulk. Single intensity-bin code and single color-bin codes will not be orderable.

## 8. GRAPHS

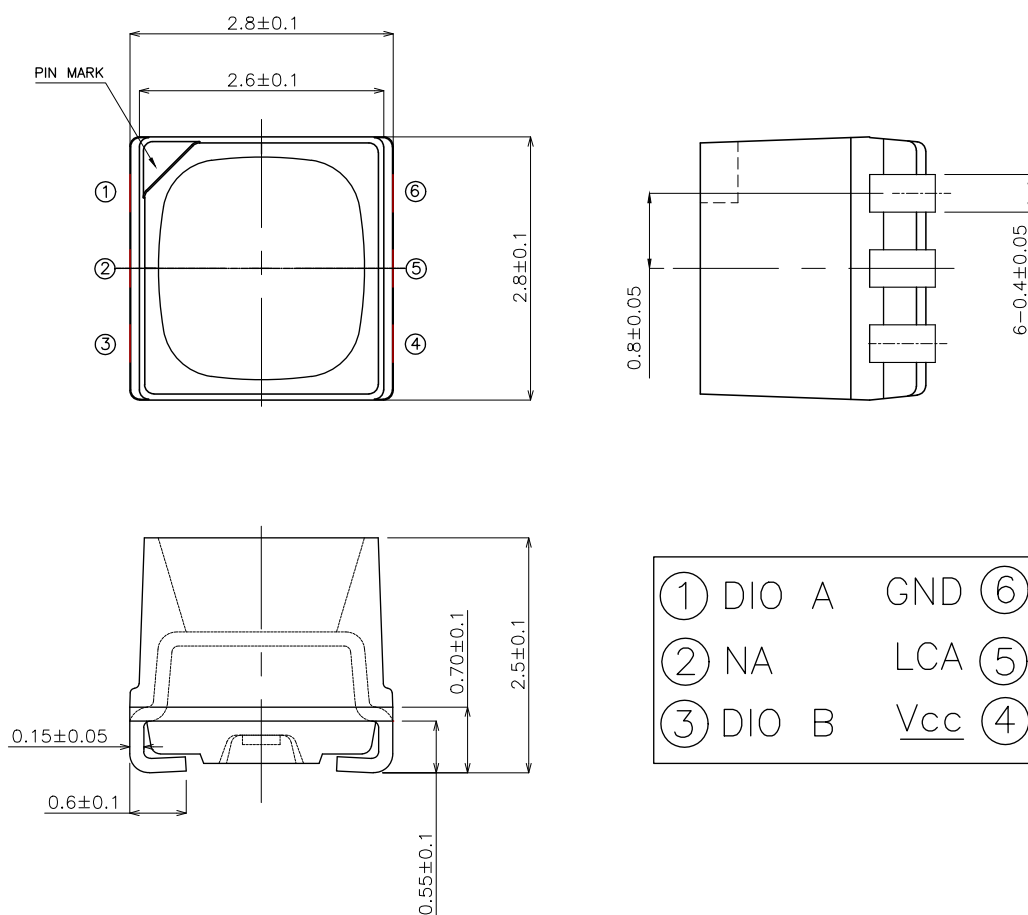
The data below are collected from statistical figures that do not necessarily correspond to the actual parameters of each single LED. Hence, these data will be changed without further notice.



## 9. MECHANICAL DIMENSIONS

All dimensions are in mm.

Tolerance of measurement of the dimension is  $\pm 0.1$ .



## 10. PIN DESCRIPTIONS

Pin Function Table

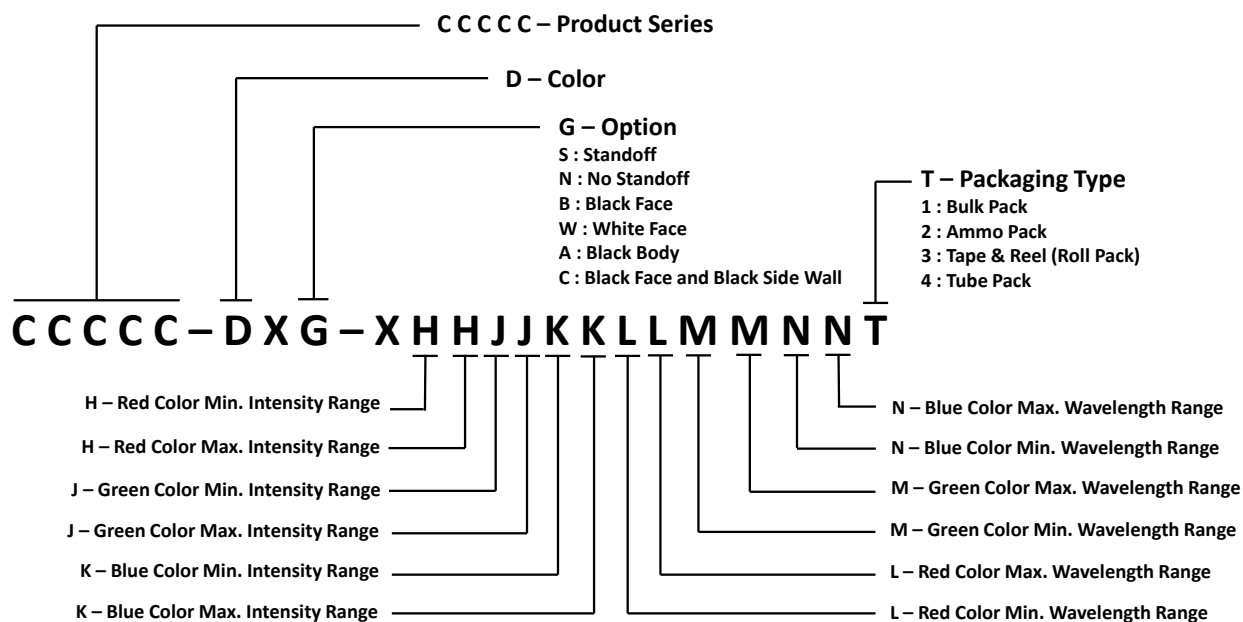
| Pin  | Name    | Description         | Notes                       |
|------|---------|---------------------|-----------------------------|
| 1, 3 | DIO A-B | Digital I/O         | Bidirectional LVCMOS33      |
| 2*   | NA      | No Connection       | Solder, but do not connect. |
| 4    | Vcc     | Supply Voltage, Vcc |                             |
| 5*   | LCA     | LED common anode    | Solder, but do not connect. |
| 6    | GND     | Supply Ground, GND  |                             |

\*Pins 2 & 5 should not be connected to any other trace.

## 11. KIT NUMBER SYSTEM

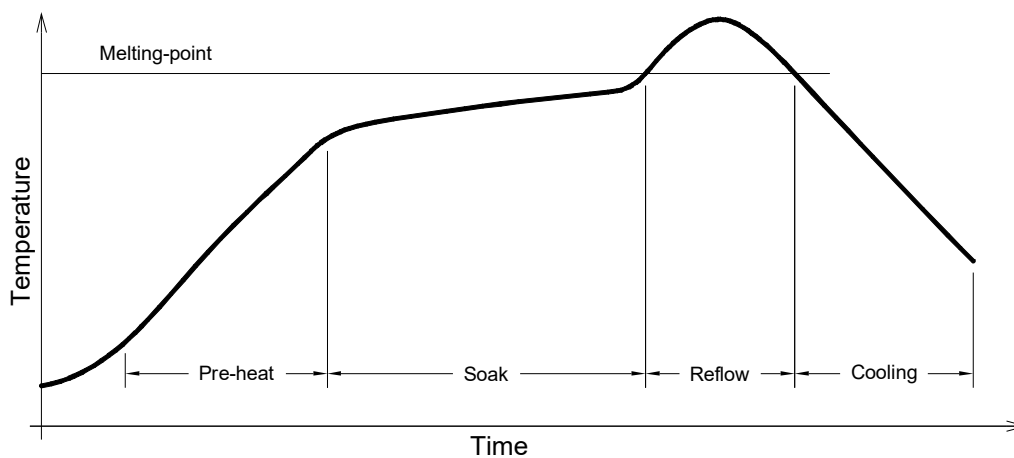
Cree LED lamps are tested and sorted into performance bins. A bin is specified by ranges of color, forward voltage, and brightness.

Cree LEDs are sold by order codes in combinations of bins called kits. Order codes are configured in the following manner:



## 12. REFLOW SOLDERING

- The OLY6D-FKC is rated as a MSL 5a product.
- The recommended floor life out of bag is 24hrs.
- The temperature profile is as below

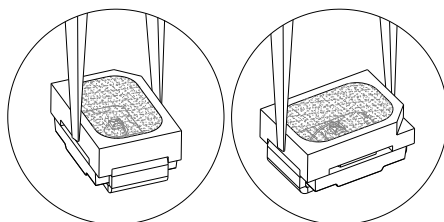


Use only with OLY6D-FKC

| Ramp Details                                           |  |
|--------------------------------------------------------|--|
| Average ramp-up rate = 4 °C/second max.                |  |
| Soak temperature = 150°C-200°C                         |  |
| Soak time = 120 seconds max.                           |  |
| Duration above 217 °C = 60 seconds max.                |  |
| Peak temperature = 250°C max                           |  |
| Time within 5 °C of peak temperature = 10 seconds max. |  |
| Ramp-down rate = 6 °C/second max.                      |  |

### 13. NOTES

- The packaging sizes of this model is very small, and the resin is still soft after solidification. Users are required to handle with care. Never touch the resin surface of SMD products.
- To avoid damaging the product's surface and interior device, it is recommended to choose a special nozzle to pick up the SMD products during the process of SMT production. Touching the package by hand is not suggested.
- Avoid scratching the device surface.
- If handling is necessary, take special care when picking up these products. The following method is necessary:



#### RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree LED representative or from the [Product Ecology](#) section of the Cree LED website.

#### Vision Advisory

**WARNING:** Do not look at an exposed lamp in operation. Eye injury can result.

## 14. PACKAGING

- The boxes are not water resistant and they must be kept away from water and moisture.
- The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags.
- Cardboard boxes will be used to protect the LEDs from mechanical shocks during transportation.
- The reel pack is applied in SMD LED.
- Max 6500 pcs per reel.

