



FCG Lens Series for Cree XLamp® 7090 XR and XR-E LEDs

- **Narrow peak**
- **High efficiency**
- **4 beams available**

The FCG lens offers lenses specifically designed for the XLamp® 7090XR and XR-E LEDs⁽¹⁾ from Cree.

A software-optimized aspheric profile enables the generation of different beam output patterns: narrow, medium, and elliptical patterns.

The high collection efficiency reaches 85% of the total flux emitted by the LEDs.

Typical applications are:

- Portable Lighting
- Reading Lamps
- Signs
- Architectural Lighting
- Street Lights



Cree® XLamp is a trademark of Cree, Inc. For technical information about these LEDs please refer to the Cree® XLamp datasheet or visit <http://www.cree.com/products/xlamp.asp> or http://www.cree.com/products/xlamp7090_xre.asp

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General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	PC, black color
Operating Temperature range	-40deg C / + 80 deg C
Storage Temperature range	-40deg C / + 80 deg C

Average transmittance in visible spectrum (400 – 700nm) >90%, as measured using 3mm thick Optical Grade PMMA.

Please note that flow lines and weld lines on the external surfaces of the lenses are acceptable if the optical performance of the lens is within the specification described in the section "OPTICAL CHARACTERISTICS"

IMPORTANT NOTE – Lenses handling and cleaning:

- Handling: Always use gloves to handle lenses and/or handle the lenses only by the flange. Never touch the outside surfaces of the lenses with fingers; finger oils and contamination will absorb or refract light.
- Cleaning: Clean lenses only if necessary. Use only soap and water to clean the surfaces and lenses. Never expose the lenses to solvents such as alcohol, as it will damage the plastic.

Scope

This datasheet provides information about the new FCG lens series.

Lens alone:

- FCG-N1-XR79-0R
- FCG-M1-XR79-0R
- FCG-E1-XR79-0R

Lens and holder:

- FCG-N1-XR79-H
- FCG-M1-XR79-H
- FCG-E1-XR79-H



Optical Characteristics – Beam Angle (degrees, Full Angle)

Lens Part Number	Type of lens	Cool White ○	Warm White ○	Blue ●	Green ●	Red ●
FCG-N1-XR79-H	Narrow beam	6	*	8	8	6
FCG-M1-XR79-H	Medium beam	21	*	21	21	21
FCG-E1-XR79-H	Elliptical beam	7 x 43	*	9 x 46	9 x 45	8 x 41

(1) The typical divergence varies with LED color due to different chip size and chip position tolerance. The typical total divergence is the full angle measured where the luminous intensity is half of the peak value.

Optical Characteristics – On-Axis Intensity (candela/lumen)

Lens Part Number	Type of lens	Cool White ○	Warm White ○	Blue ●	Green ●	Red ●
FCG-N1-XR79-H	Narrow beam	48	*	23	36	39
FCG-M1-XR79-H	Medium beam	4.5	*	2.8	3.6	3.7
FCG-E1-XR79-H	Elliptical beam	5.8	*	4.0	6.0	7.0

- (2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Cree XLamp 7090® XR and XR-E LED used. See "Illumination Calculations" below. For more detail on flux binning please check the Cree LED datasheet at <http://www.cree.com/products/xlamp.asp>
- (3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Cree XLamp datasheet for more details on flux binning and mechanical tolerances.
- (4) Typical illuminance measured in lux per lumen (E) with typical Cree 7090 XR-E LED. To estimate the illuminance in lux, multiply the typical illuminance E by the flux in lumen of the LED used. See "Illumination Calculations" below.

* Configuration not yet measured.



Illumination Calculations

To calculate peak candela: Find the central spot “on-axis intensity” value in the table above, then multiply this value by the lumens output from your LED (refer to the XLamp LED datasheet <http://www.cree.com/products/pdf/XLamp7090XR-E.pdf> or <http://www.cree.com/products/pdf/XLamp7090XR.pdf> for nominal lumens values). Or for a more accurate calculation, refer to the intensity binning tables http://www.cree.com/products/xlamp_docs.asp.

Example calculation:

If the Fraen narrow beam lens FCG-N1-XR79-0R is used on a cool white Cree XR-E LED at 350 mA, the typical luminous flux of the LED is 80 lumens:

The calculation is: (48 candela/lumen) x (80 lumens) = 3840 candela peak on-axis.

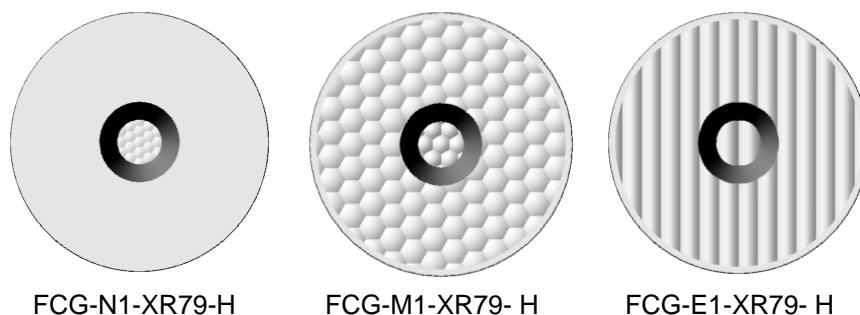
The beam angle specified in the table above is 6 degrees full beam-width measured at half-peak.

This means at 3 degrees off-axis (half of 6 degrees), the intensity should be half of 3840 candela, or 1920 candelas.

1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 3840 lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be $3840 / (2^2) = 960$ lux. At 3 meters distance, the peak intensity will be $3840 / (3^2) = 427$ lux.

Mechanical Characteristics

Figure 1. Identifying the lenses by their front views



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Figure 2. Correct vertical distance between FCG lens and 7090 XR-E LED

NOTE: The lens is correctly positioned vertically as shown in the figure below. The lens provides mechanical reference to the LED.

FCG-N1-XR79-0R

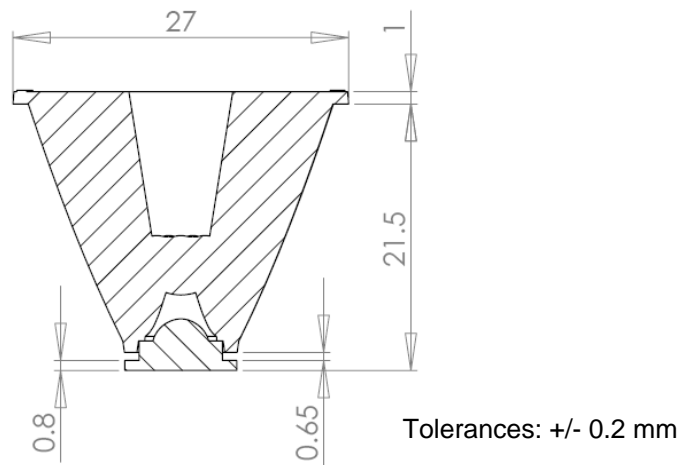
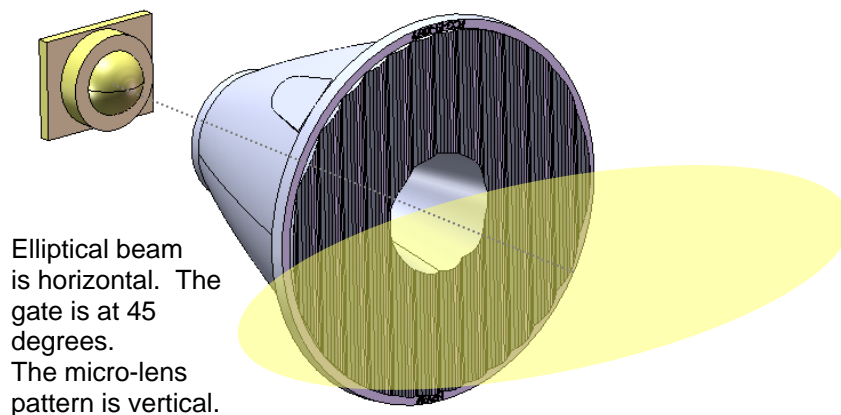


Figure 3. Elliptical beam orientation

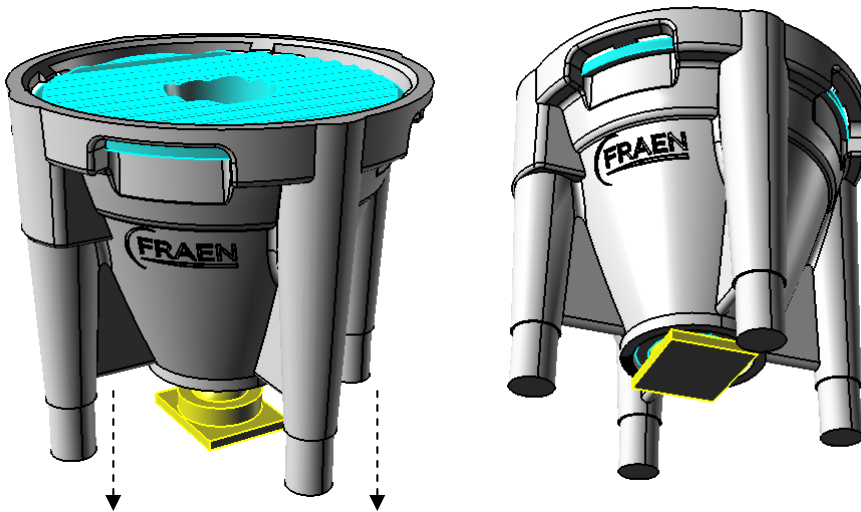


NOTE: The elliptical beam lens produces a beam shape that is perpendicular to the microlens pattern on the output face of the lens. It is important to consider the orientation of the LEDs and the desired elliptical beam orientation when designing the printed circuit board layout.

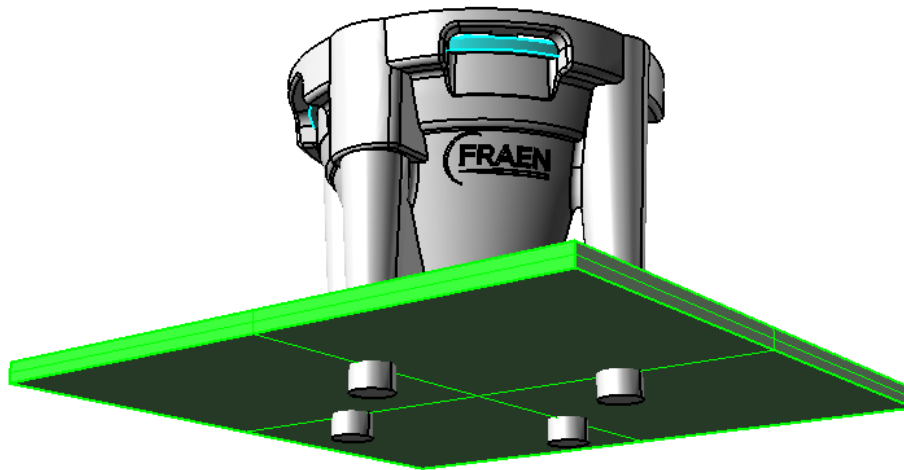
To produce a horizontal elliptical beam, the lens needs to be orientated such that the micro-lenses are positioned vertically. The LED orientation on the PC board should be coordinated with the beam orientation.



Figure 4. Installation of lens assembly onto Cree LED



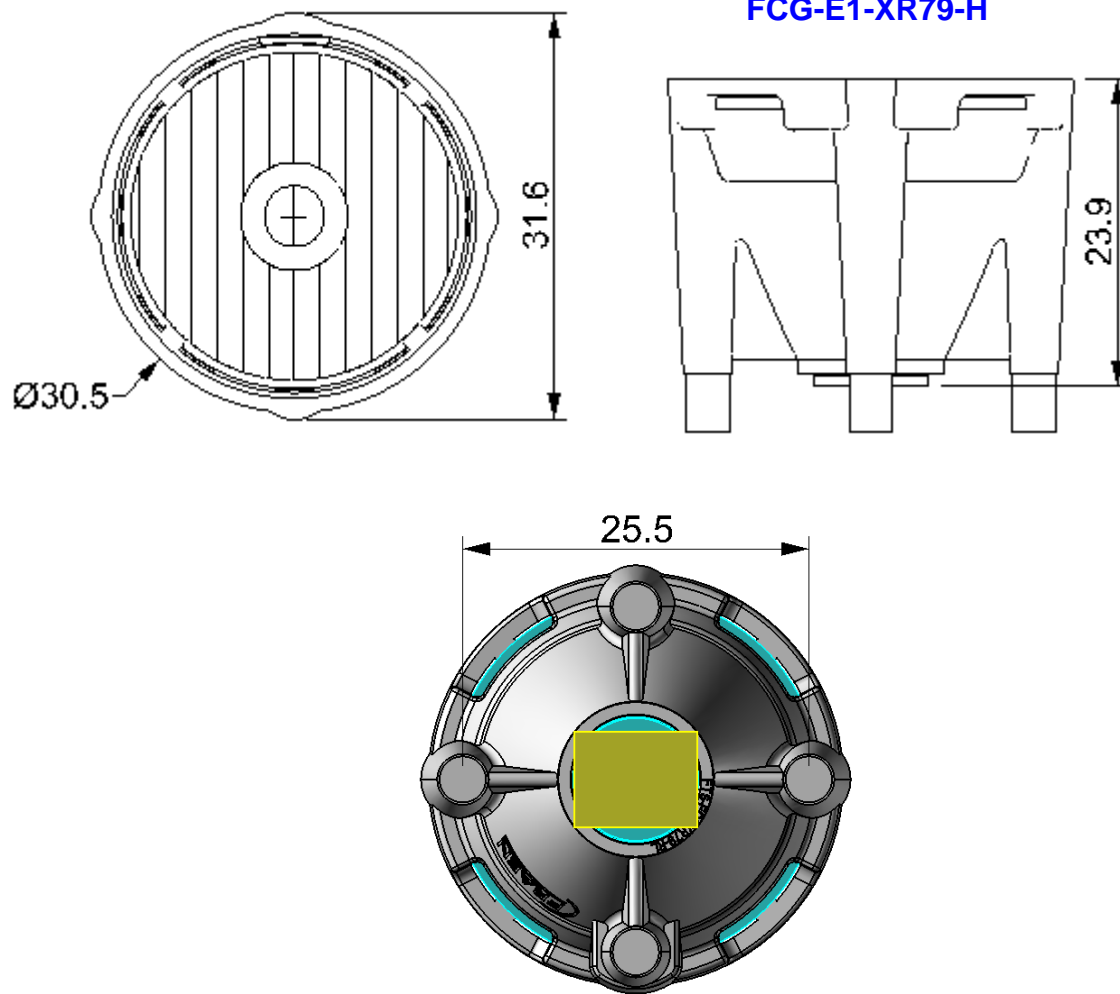
The new FCG-E1-XR79-HRL (and N1, M1 and W1) lens assemblies will fit onto the Cree LED as shown above. After installation, the legs on the holder will protrude through the PCB as shown below. The legs can be heat-staked or glued in place.



The lens assembly can be secured to the PC board by using glue or silicone RTV. To avoid glue on the lens and LED, apply it only on the legs of the lens holder.

CAUTION: Do not use instant glue (containing cyanoacrylates). Always test the glue on a sample assembly and check the results and performance 24 hours later. Some adhesives produce fumes that will damage the surfaces of the plastic lens, lens holder, or LED.

Figure 5. Overall dimensions of FCG- 1-XR79-H series lens assemblies





Ordering part numbers

FCG-__1-XR79-__

OR: Lens alone (no holder)
H: Lens with white PC holder

Caution: If using lens alone (with no holder), lens alignment and spacing must be set by the user. See Figure 2.

N: Narrow beam
M: Medium beam
E: Elliptical beam

Caution: The orientation of the elliptical beam lens is controlled by the lens holder and the LED orientation (see Figure 3).

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Rev	Date	Author	Description
02	23 September 2008	C. Jones	Improved optical design, W1 option removed, -H option added.
01	20 February 2008	C. Jones	Initial Release