



FDP SERIES LENSES For OSRAM GOLDEN DRAGON PLUS LEDs

- High efficiency
- Available in 4 different beams
- Meets IEC 60601 Part 2-41 light field distribution

The FDP Series offers low-profile lenses specifically designed for the Golden Dragon Plus ⁽¹⁾ LEDs from Osram Opto-Semiconductor.

A software-optimized aspheric profile combined with shaped front surfaces and micro-lens arrays enables the generation of narrow, medium, wide and elliptical beam patterns⁽²⁾.

The high collection efficiency typically captures up to 85% of the total flux emitted by the LEDs.

Lens holders are available in Black PC and provide the proper alignment between the LEDs and the lenses.

The lens holder can be glued to the PCB to provide a secure assembly.

Typical applications are:

- Reading lamps
- Architectural lighting
- Entertainment lighting
- Interior lighting
- Portable lighting



- (1) Golden Dragon Plus is a trademark of Osram Opto-Semiconductor. For technical specification on LEDs please refer to the Golden Dragon datasheet or visit www.osram-os.com
- (2) Typical beam divergence may change with different color LEDs.

For ordering instructions, please contact

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General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	Black PC
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 handle the lenses only by the flange and/or use gloves. 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 alcohol, as it will damage the plastic.

Scope

This datasheet provides information about the FDP series lenses:

Lens Alone:






- FDP-N1-GDP-0R
- FDP-M1-GDP-0R
- FDP-W1-GDP-0R
- FDP-E1-GDP-0R

Lens and Holder (Assembly):

- FDP-N1-GDP-HRF
- FDP-M1-GDP-HRF
- FDP-W1-GDP-HRF
- FDP-E1-GDP-HRF








Optical Characteristics – Beam Angle (degrees, Full Angle, Field Angle)^{1,2}

Lens Part Number	Beam Shape	Cool White 	Warm White 	Red/Amber 	Green 	Blue 
FDP-N1-GDP-0R	Narrow	8° FWHM 16° Field	8° FWHM 15° Field	7° FWHM 13° Field	7° FWHM 16° Field	9° FWHM 16° Field
FDP-M1-GDP-0R	Medium	23° FWHM 42° Field	23° FWHM 41° Field	23° FWHM 40° Field	23° FWHM 42° Field	23° FWHM 41° Field
FDP-W1-GDP-0R	Wide	39° FWHM 58° Field	38° FWHM 58° Field	38° FWHM 56° Field	38° FWHM 60° Field	39° FWHM 58° Field
FDP-E1-GDP-0R	Elliptical	11°x41° FWHM 19°x55° Field	9°x42° FWHM 18°x55° Field	8°x43° FWHM 16°x54° Field	9°x42° FWHM 20°x57° Field	9°x43° FWHM 18°x56° Field

- (1) FWHM is the full angle where the beam intensity is half the on-axis peak intensity
(2) Field angle is the full angle where the beam intensity is 10% of the on-axis peak intensity

Optical Characteristics – On-Axis Intensity (candela/lumen)^{3,4,5}

Lens Part Number	Beam Shape	Cool White 	Warm White 	Red/Amber 	Green 	Blue 
FDP-N1-GDP-0R	Narrow	33	31	41	29	20
FDP-M1-GDP-0R	Medium	4	4	4	4	3
FDP-W1-GDP-0R	Wide	2	2	2	2	1.4
FDP-E1-GDP-0R	Elliptical	6	6	7	6	4

- (3) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Osram LED used. See “Illumination Calculations” below.
(4) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Osram LED datasheet for more details on flux binning and mechanical tolerances.
(5) Typical illuminance was measured in candela per lumen with typical Osram Golden Dragon LED. To estimate the illuminance in lux, multiply the typical illuminance by the flux (lumens) of your LED. See “Illumination Calculations” below



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 Golden Dragon Plus LED datasheet for nominal lumens values). Or for a more accurate value, refer to their Product Sheet for intensity binning at the Osram website. (http://www.osram-os.com/osram_os/EN/)

Example calculation:

If the Fraen narrow beam lens FDP-N1-GDP-0R is used on a Warm White Golden Dragon Plus LED at 350 mA, the typical luminous flux of the LED is 90 lumens:

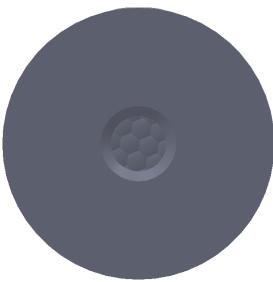
The calculation is: (31 candela/lumen) x (90 lumens) = 2790 candela peak on-axis.

The beam angle specified in the table above is 8 degrees full beam-width measured at half-peak.

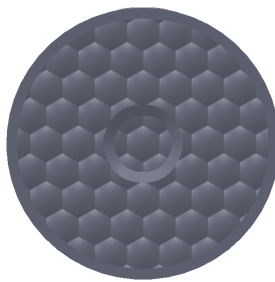
This means at 4 degrees off-axis (half of 8 degrees), the intensity should be half of 2790 candela, or 1395 candelas.

1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 2790 lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be $2790 / (2^2) = 697.5$ lux. At 3 meters distance, the peak intensity will be $2790 / (3^2) = 310$ lux.

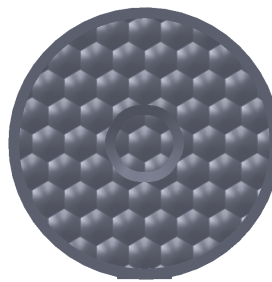
Mechanical Characteristics



Narrow Beam (N1)



Medium Beam (M1)
Textured Micro lenses



Wide Beam (W1)
Polished Micro lenses



Elliptical Beam (E1)

Figure 1. Identifying the lenses by their front views



The FDP series lenses are available either assembled to a holder or without a holder. The holder provides the correct alignment (concentricity, height, and orientation) of the lens to the LED.

NOTE: If the FDP lens is used without a lens holder, the user must provide a mechanical method to set the correct distance between the lens and LED. For example, the lens flange can be located in the lamp housing to center the lens to the LED and establish 11.2 mm from the lens flange to the user's PC board. For N1, M1, W1 and E1 lenses, the lens touches the LED.

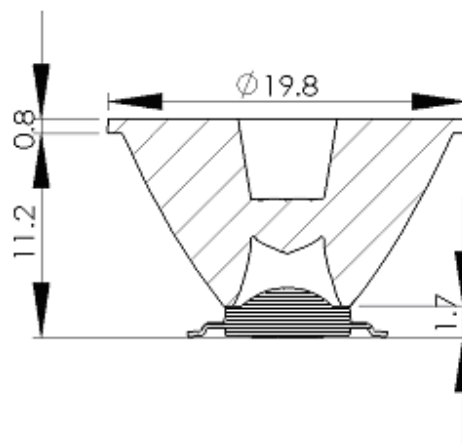
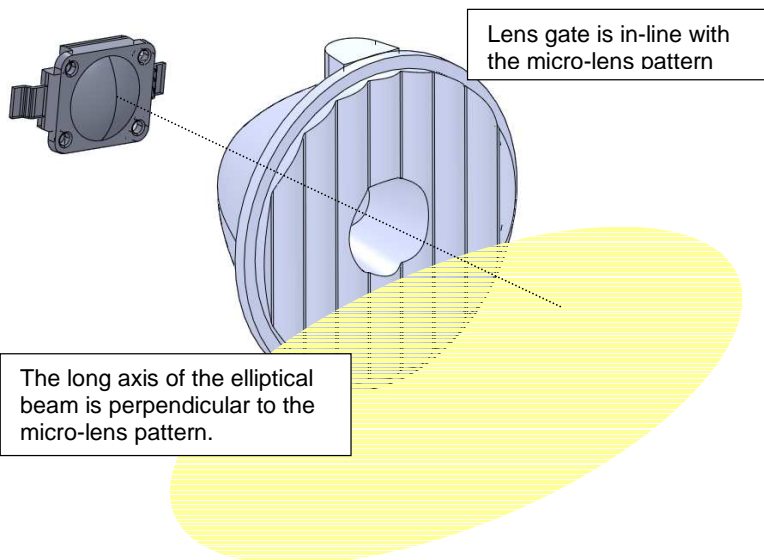


Figure 2. Correct vertical distance between FDP lens and Golden Dragon Plus LED



NOTE: The elliptical beam lens produces a beam shape that is perpendicular to the microlens pattern on the output face of the lens. The lens holder is designed to align the elliptical pattern with the rectangular shape of the Golden Dragon Plus substrate. It is important to consider the orientation of the LEDs and the desired elliptical beam orientation when designing the printed circuit board layout.

Figure 3. Elliptical beam orientation

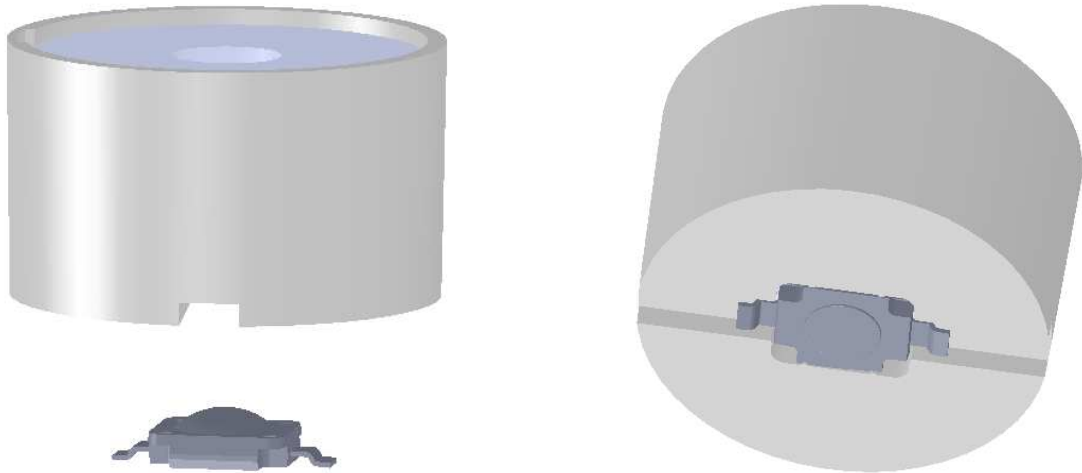
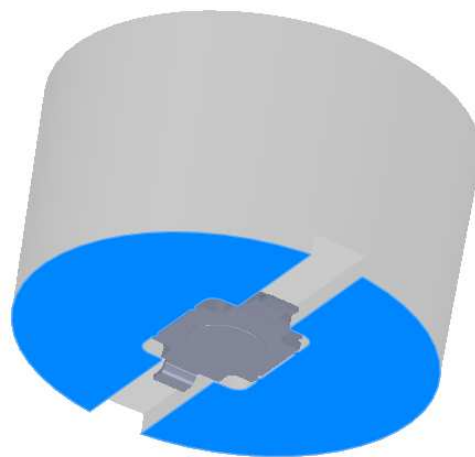


Figure 4. Installation of lens assembly onto Golden Dragon Plus LED

The new FDP-N1-GDP-HRF (and M1, W1 and E1) lens assemblies will fit onto the Golden Dragon Plus LED at only 2 orientations: 0 degrees and 180 degrees. The bottom of this new –HRF lens holder has a rectangle shape to control lens orientation (important for “E1” elliptical beam lens application). After installation, the bottom of the holder should be at the same datum/plane as the bottom of the Golden Dragon Plus LED.



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 along the outside diameter edge, or apply a very thin film on areas shown in blue.

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.

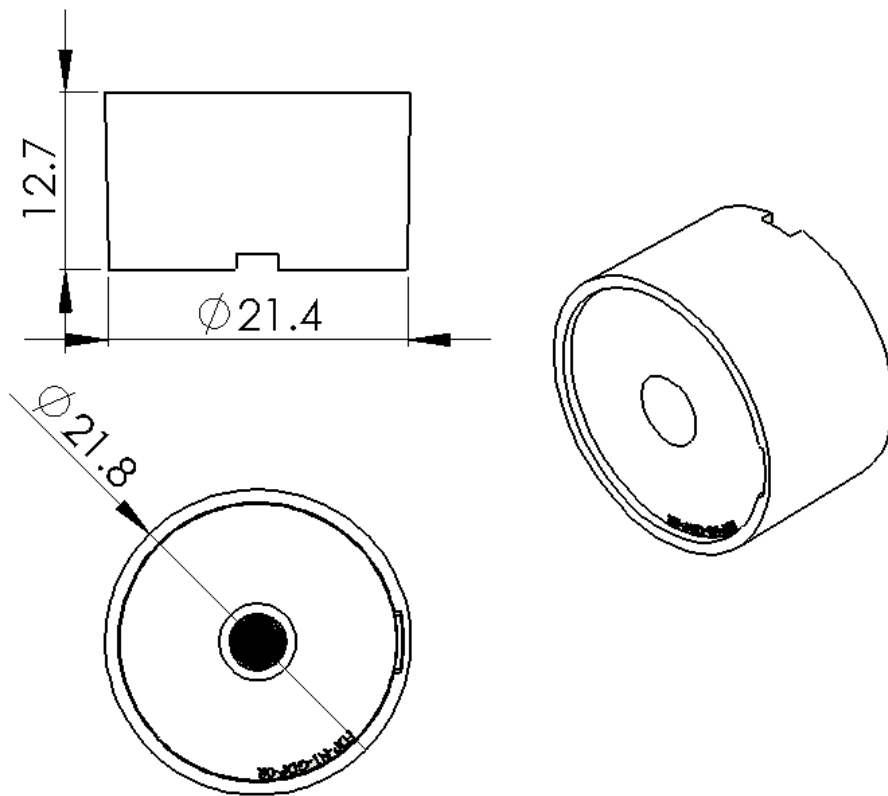


Figure 5. Overall dimensions of FDP-[]1-GDP-HRF series lens assemblies

[] = N, M, W or E



Ordering part numbers

FDP- _1-GDP-[]

OR Round Flange Lens – NO Holder
 HRF Round Flange in Black PC Holder

N1 Narrow Beam
 M1 Medium Beam
 W1 Wide Beam
 E1 Elliptical Beam

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Rev	Date	Author	Description
01	18April11	J. Gilbert	Add N1 lens data, field angles, color LED data
00	13December10	J. Preston	Initial Release