



FSP SERIES LENSES

for SEOUL SEMICONDUCTOR Z-POWER P4™ LEDs

- **High efficiency**
- **4 beams available**
- **Easy assembly**

The FSP lens offers low-profile lenses specifically designed for the P4 Power LEDs from Seoul Semiconductor.

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

The high collection efficiency reaches 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, and set the correct distance between the lens and LED.

The lens holder can be glued and/or screwed to the PCB to provide a secure assembly.

Typical applications are:

- Reading lamps
- Signs
- Architectural Lighting
- Street Lights



(1) Z-Power is a trademark of Seoul Semiconductor. For technical specification on LEDs please refer to the Z-Power datasheet or visit www.seoulsemiconductor.com

For ordering instructions, please contact

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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 FSP series lenses:

- FSP-N1-SSP4-0R
- FSP-M1-SSP4-0R
- FSP-W1-SSP4-0R
- FSP-E1-SSP4-0R

and lens assemblies:

- FSP-N1-SSP4-HRF
- FSP-M1-SSP4-HRF
- FSP-W1-SSP4-HRF
- FSP-E1-SSP4-HRF



Optical Characteristics – Beam Angle (degrees, Full Angle)

Lens Part Number	Type of lens	White LED 	Blue LED 	Green LED 	Red LED 
FSP-N1-SSP4-HRF	Narrow beam	10	9	9	9
FSP-M1-SSP4-HRF	Medium beam	24	24	23	25
FSP-W1-SSP4-HRF	Wide beam	38	37	38	37
FSP-E1-SSP4-HRF	Elliptical beam	12 x 47	11 x 49	12 x 45	11 x 50

(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	White LED 	Blue LEDs 	Green LEDs 	Red LEDs 
FSP-N1-SSP4-HRF	Narrow beam	18	19	26	20
FSP-M1-SSP4-HRF	Medium beam	5	4	6	6
FSP-W1-SSP4-HRF	Wide beam	2	2	2	3
FSP-E1-SSP4-HRF	Elliptical beam	4	4	4	4

(2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Seoul Semiconductor P4 LED used. See "Illumination Calculations" below. For more detail on flux ranking (binning) please check the LED datasheet at

(3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the LED datasheet for more details on flux ranking and mechanical tolerances.

(4) Typical illuminance measured in lux per lumen (E) with typical LEDs. To estimate the illuminance in lux, multiply the typical illuminance E by the flux in lumen of the LED used. 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 Seoul x4218x LED datasheet

<http://www.seoulsemicon.com/en/product/prd/zpowerLEDp4.asp>) for nominal lumens values. OR for a more accurate calculation, refer to the intensity “ranking” (binning) tables on the datasheet for the specific LED.

Example calculations:

If the Fraen narrow beam lens FSP-N1-SSP4-HRF is used on Seoul W42180 LED running at 350mA, the typical luminous flux of the LED is 80 lumens:

The calculation is: (18 candela/lumen) x (80 lumens) = 1440 candela peak on-axis.

The beam angle specified in the table above is 10 degrees full beam-width measured at half-peak.

This means at 5 degrees off-axis (half of 10 degrees), the intensity should be half of 1440 candela, or 720 candelas.

1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 1440 lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be $1440 / (2^2) = 360$ lux. At 3 meters distance, the peak intensity will be $1440 / (3^2) = 160$ lux.

Mechanical Characteristics

Figure 1. Identifying the lenses by their front views





Figure 2. Correct vertical position of the FSP lens and Seoul P4 LED

NOTE: The user must provide a mechanical method to set the correct position of the FSP lens on the LED. For example, the lens flange can be located in the lamp housing to center the lens to the LED and establish 9.5mm from the lens flange to the user's PC board. When the lens is positioned correctly, the bottom of the lens touches the LED.

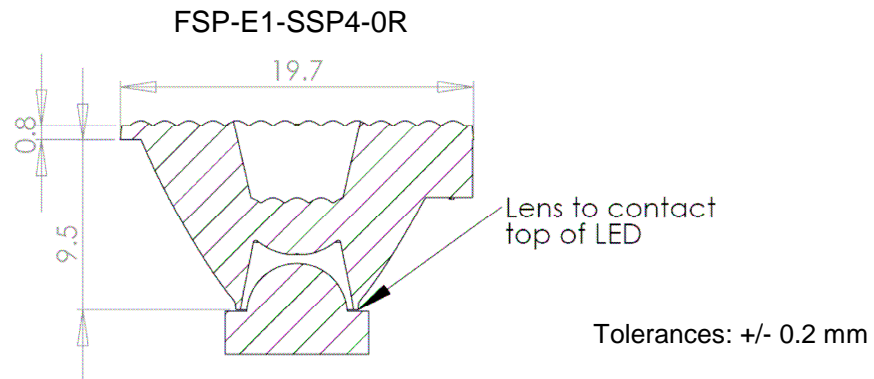
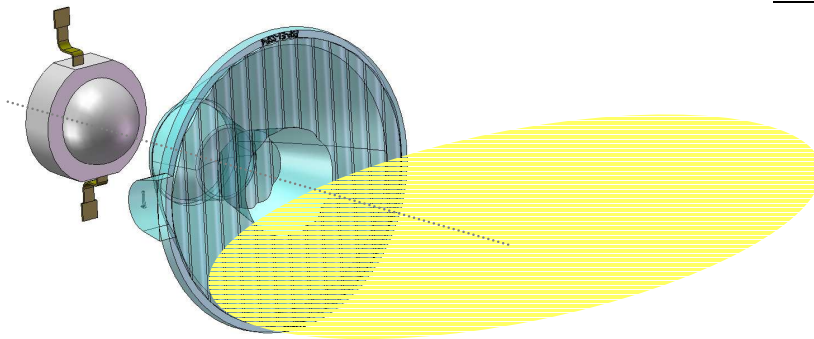


Figure 3. Elliptical beam orientation



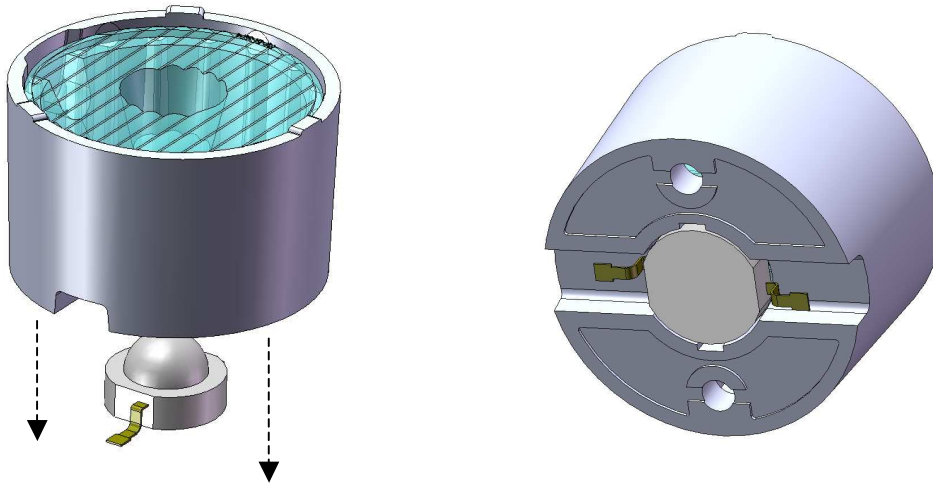
NOTE: The elliptical beam lens produces a beam shape that is perpendicular to the microlens pattern on the output face of the lens. The lens holder is designed to align the elliptical pattern perpendicular to the LED contacts. It is important to consider the orientation of the LEDs and the desired elliptical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

LED contacts are vertical.
The micro-lens pattern is vertical. Elliptical beam and lens gate are horizontal.

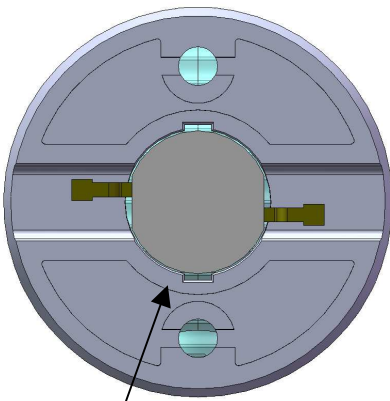
For example, to produce a horizontal elliptical beam the lens needs to be orientated such that the micro-lenses are positioned vertically. The elliptical beam lens assembly (with holder) will only fit the Seoul P4 LED in this orientation (with elliptical beam perpendicular to the orientation of the LED contacts). The LED orientation on the PC board should be coordinated with the beam orientation.



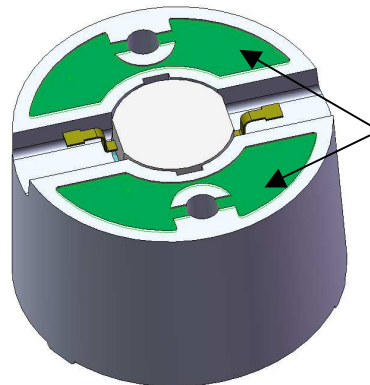
Figure 4. Installation of lens assembly onto Seoul P4 LED



The FSP-E1-SSP4-HRF (and N1, M1 and W1) lens assemblies will fit onto the Seoul P4 LED at only 2 orientations: 0 degrees and 180 degrees. The bottom of this –HRF lens holder has a round shape to control lens position. After installation, the bottom of the holder should be at the same datum/plane as the bottom of the Seoul P4 LED.



The LED package will fit into the round hole in the lens holder. This will align the lens to the LED.



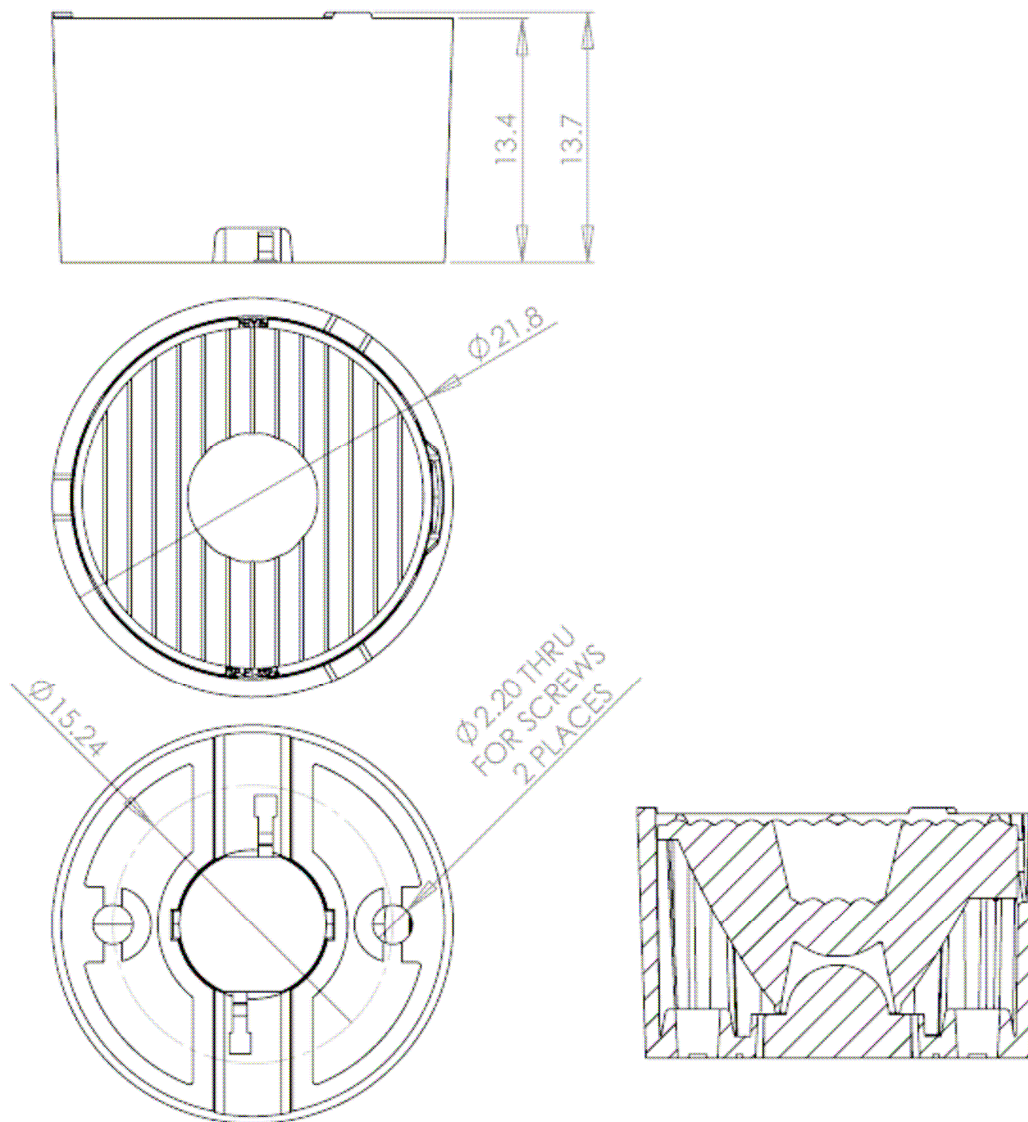
Recessed areas for glue thickness and migration.

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 above in green.

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 FSP- 1-SSP4-HRF series lens assemblies





Ordering part numbers

FSP-__1-SSP4-__

OR: Lens alone (no holder)
HRF: Lens with black PC holder

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

LENS TYPE :

N : Narrow beam lens
M : Medium beam lens
W: Wide beam lens
E: Elliptical beam lens

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