FS3 Series Tri-Lens
for SEOUL SEMICONDUCTOR Z-POWER P4™ LEDs

- **High efficiency**
- **3 beams available**
- **MR-16 size tri-lens**

The FS3 tri-lens offers MR16 size lenses specifically designed for the Seoul Semiconductor P4® LEDs (1).

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

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

Lens holders are white polycarbonate, 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 heat-staked to the PCB, to provide a secure assembly.

Typical applications are:

- MR-16 LED lamps
- Architectural lighting
- General illumination
- Street lights

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

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For pricing and availability, please contact our Certified Distribution Network. Distribution contact information is available on our website:
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General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	PC, white 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 following FS3 series tri-lenses.

Lens and holder (assembly):

- FS3-N1-SSP4-H
- FS3-M1-SSP4-H
- FS3-W1-SSP4-H

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Optical Characteristics – Beam Angle (degrees, full angle at ½ peak)

Lens Part Number	Type of lens	Cool White ○	Warm White ○	Blue ●	Green ●	Red ●
FS3-N1-SSP4-H	Narrow beam	6	*	6	5	6
FS3-M1-SSP4-H	Medium beam	26	*	26	26	25
FS3-W1-SSP4-H	Wide beam	40	*	40	37	34

(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 ●
FS3-N1-SSP4-H	Narrow beam	24	*	24	31	30
FS3-M1-SSP4-H	Medium beam	2.9	*	2.9	3.4	3.7
FS3-W1-SSP4-H	Wide beam	1.4	*	1.4	1.7	0.8

(2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Seoul P4 LED used. See “Illumination Calculations” below. For more detail on flux binning please check the Seoul P4 LED datasheet at http://www.seoulsemicon.com/en/product/prd/zpowerLEDp4.asp

(3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Seoul P4 LED datasheet for more details on flux binning and mechanical tolerances.

(4) Typical illuminance was measured in candela per lumen with typical Seoul P4 LED. To estimate the illuminance in lux, multiply the typical illuminance by the flux (lumens) of your LED. See “Illumination Calculations” below.

* Configuration not yet measured.

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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 P4 LED datasheet http://www.seoulsemicon.com/en/product/prd/zpowerLEDp4.asp for nominal lumens values). Or for a more accurate value, refer to their .pdf spec for intensity binning.

Example calculation:
If the Fraen narrow beam tri-lens FS3-N1-SSP4-H is used on a cool (“pure”) white Seoul P4 LED at 350 mA, the typical luminous flux of each LED is 80 lumens:
The calculation is: (24 candela/lumen) x (80 lumens) = 1920 candela peak on-axis. For three 80 lumen LEDs and a tri-lens: 1920 x 3 = 5760 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 1920 candela, or 960 candelas.
1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 1920 lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be 1920 / (2^2) = 480 lux. At 3 meters distance, the peak intensity will be 19200 / (3^2) = 213 lux.

Mechanical Characteristics

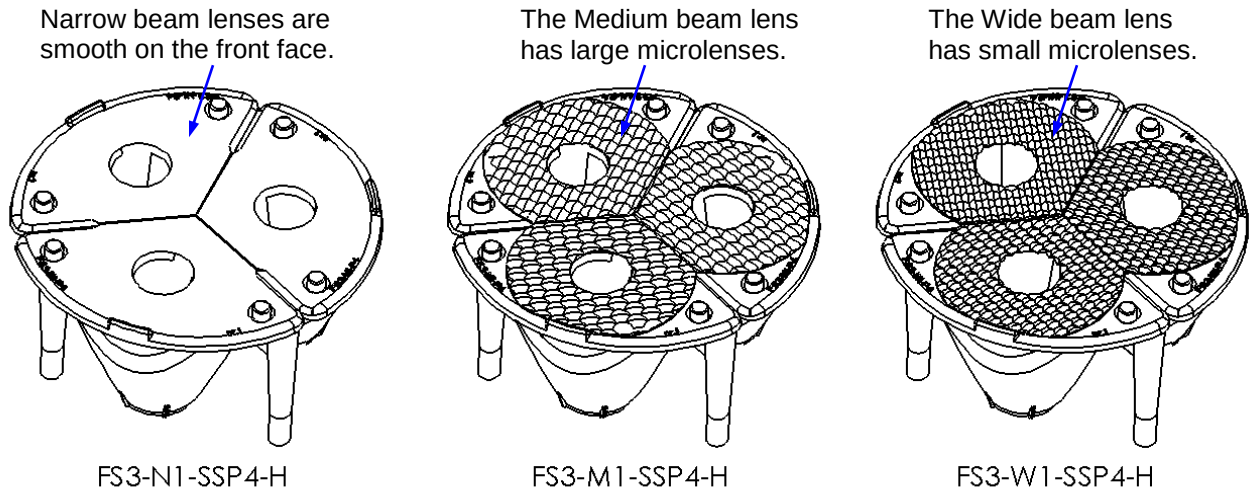


Figure 1: The tri-lens assemblies can be identified by the face surfaces of the lenses. The FS3 series tri-lenses are available only assembled to a holder. The holder provides the correct alignment of the lenses to the LEDs.

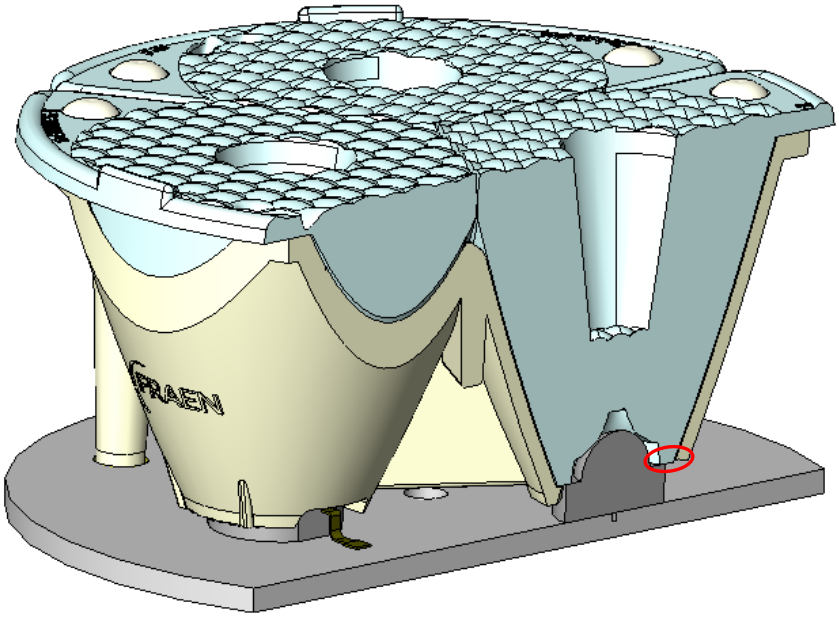
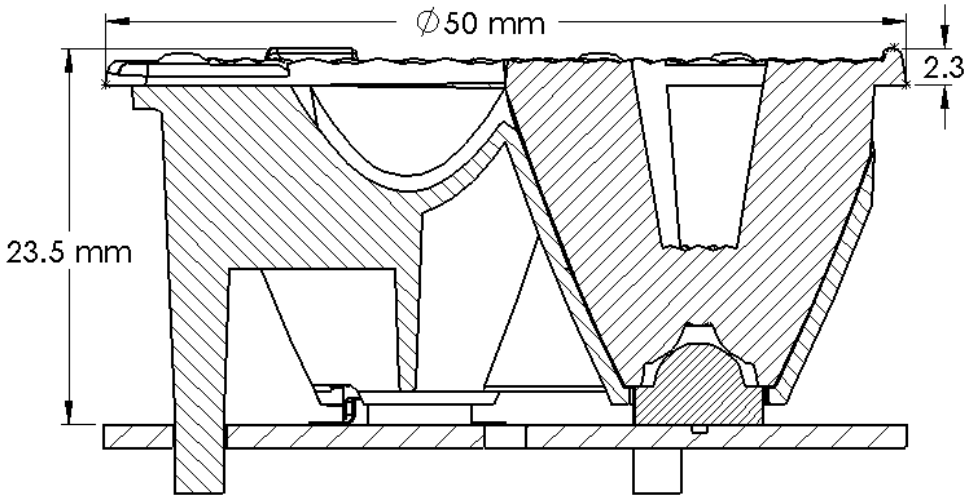


Figure 2: X-section view shows the lenses touch the Seoul P4 LEDs, and the holder aligns the lenses to the LED.



Dimension tolerance: +/- 0.2 mm

Figure 3: X-section view. The dimension “23.5 mm” represents the distance from the top of the lens holder to the bottom of the LEDs.

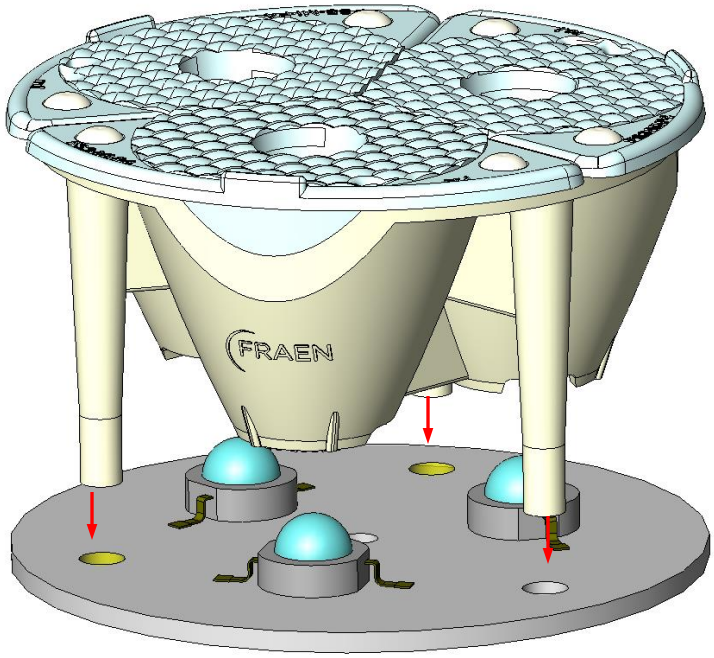


Figure 4: The 3 legs on the tri-lens require clearance holes in the circuit board. The holder has a ring feature around each lens, to align the holder to the LEDs.

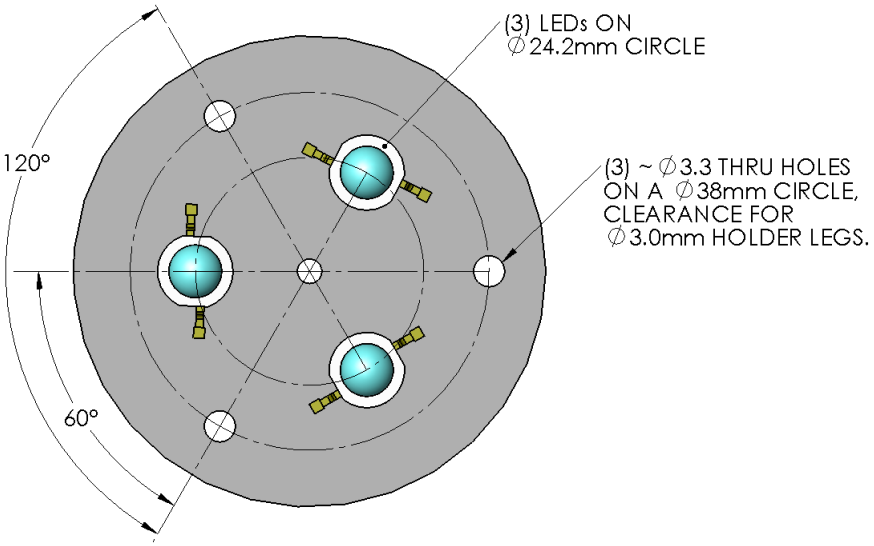
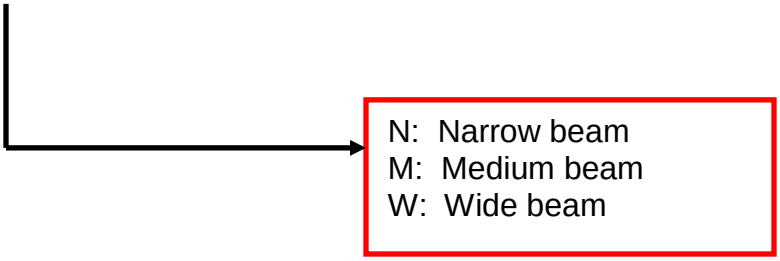


Figure 5: For best fit to the FS3 tri-lens, the PCB should have thru holes and LEDs located as shown above. The rotation/orientation of the LEDs should to be as shown, for the LED wires to align with the clearance slots in the lens holder. This is also shown in Figure 2.

Ordering part numbers

FS3-_1-SSP4-H



Rev	Date	Author	Description
00	13 January 2009	C. Jones	Initial Release