FCM SERIES LENSES

for SEOUL SEMICONDUCTOR Z-POWER P5™ LEDs

- **Highly efficient color mixing lens**
- **Available in 3 different beams**

The FCM lens series is a range of four lenses specifically designed for the Seoul Semiconductor LEDs : Z-Power P5 ™.
www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of four different lens models: narrow , medium and wide beam.

The high collection efficiency reaches 80% of the total flux emitted from the LED.

Typical applications are:

- Architectural Lighting
- Entertainment lighting
- Wall washing
- Applications requiring excellent uniformity of colormixing

(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

FRAEN CORPORATION
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Fax: +39-02-335.456.239
info@fraen.com

To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
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 alcohol, as it will damage the plastic.

Scope

This datasheet provides information about the FCM series lenses:

- FCM-N1-SSP5-0
- FCM-M1-SSP5-0
- FCM-W1-SSP5-0

Optical Characteristics – Beam Angle (degrees, Full Angle)

Lens Part Number	Type of lens	Blue LED	Green LED	Red LED	White LED (composite)
FCM-N1-SSP5-0	Narrow beam	17	17	16	17
FCM-M1-SSP5-0	Medium beam	32	30	33	31
FCM-W1-SSP5-0	Wide beam	42	40	42	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	Blue LEDs	Green LEDs	Red LEDs	White LED (composite)
FCM-N1-SSP5-0	Narrow beam	5	7.5	8	8
FCM-M1-SSP5-0	Medium beam	2	3	3	3.5
FCM-W1-SSP5-0	Wide beam	1.5	2	2	2.3

(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 P5 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

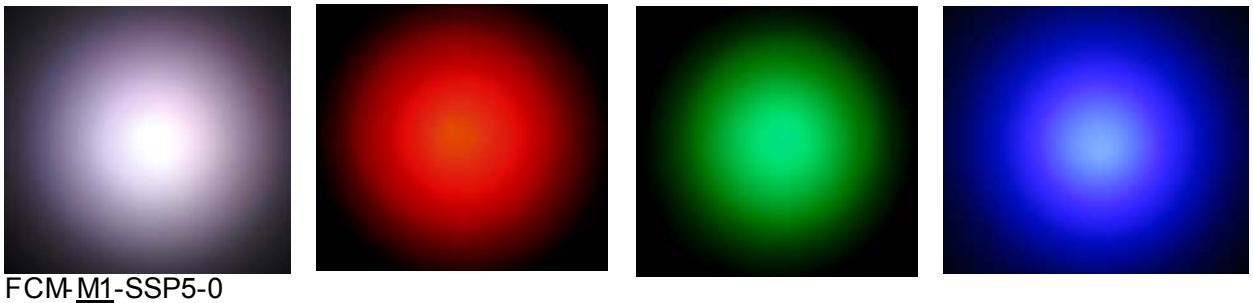
To calculate peak candela: Find the central spot "on-axis intensity" value in the table above, then multiply this value by the lumens output from your LED (refer to the Seoul F5038x LED datasheet (http://seoulsemicon.co.kr/_homepage/home_kor/product/product_P5fullcolor.asp?topCODE=2&midCODE=4) for nominal lumens values. OR for a more accurate calculation, refer to the intensity "ranking" (binning) tables on the datasheet for the specific LED.

Example calculations:

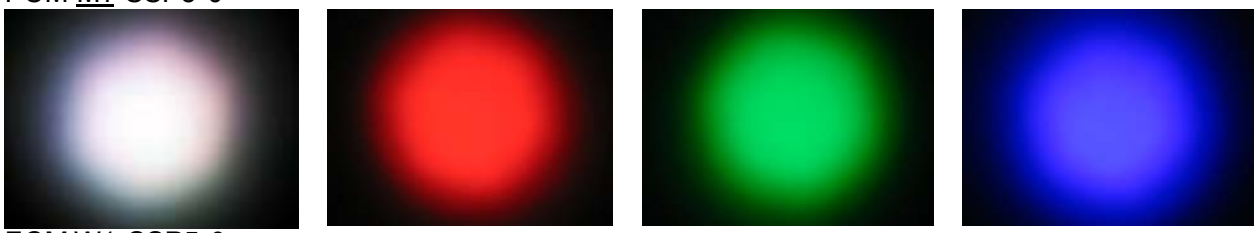
If the Fraen narrow beam lens FCM-N1-SSP5-0 is used on Seoul F5038x LED running green only at 350mA, the typical luminous flux of the LED is 38 lumens:
The calculation is: (8 candela/lumen) x (38 lumens) = 304 candela peak on-axis.
The beam angle specified in the table above is 17 degrees full beam-width measured at half-peak.
This means at 8.5 degrees off-axis (half of 17 degrees), the intensity should be half of 304 candela, or 152 candelas.
1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 304lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be $304 / (2^2) = 76$ lux. At 3 meters distance, the peak intensity will be $304 / (3^2) = 33.8$ lux.

Beam Pictures

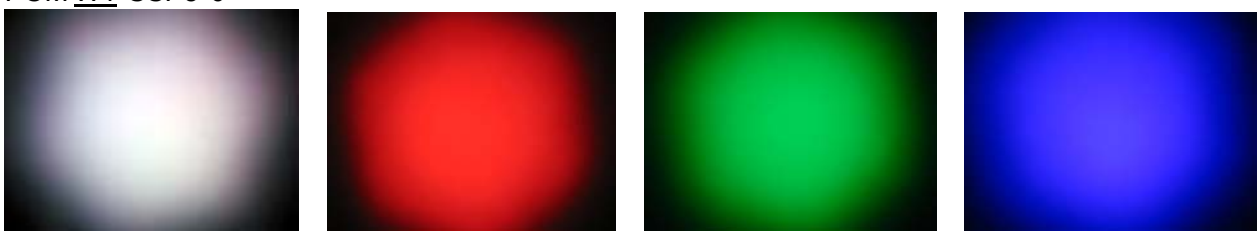
FCM-N1-SSP5-0



FCM-M1-SSP5-0



FCM-W1-SSP5-0



Mechanical Characteristics

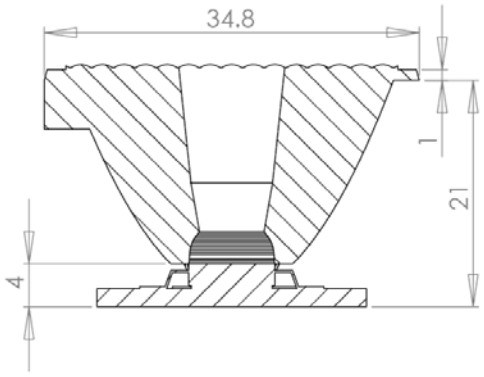
Figure 1. Identifying the lenses by their front views

FCM-N1-SSP5-0 FCM-M1-SSP5-0 FCM-W1-SSP5-0

Figure 2. Correct vertical position of the FCM lens and Seoul P5 LED

NOTE: The user must provide a mechanical method to set the correct position of the FCM 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 21.0 mm from the lens flange to the user's PC board. When the lens is positioned correctly, the bottom of the lens touches the LED. There are features on the lens that help to center the lens to the LED.

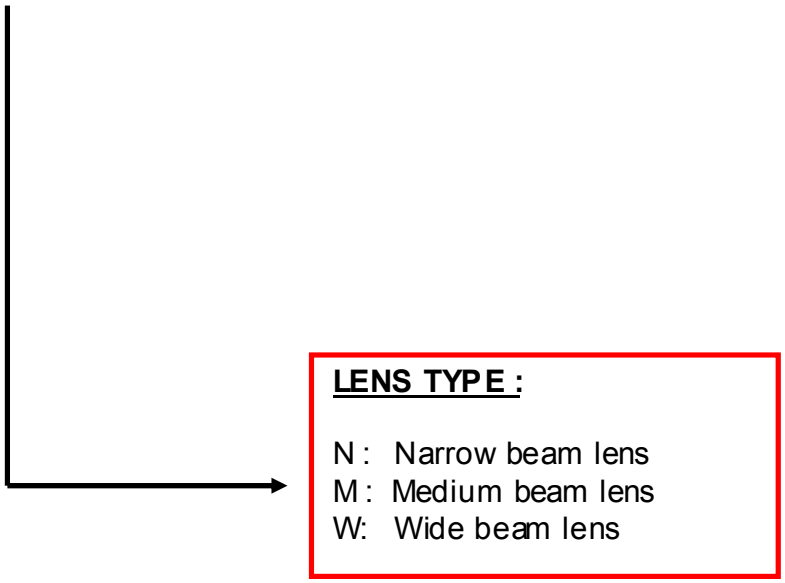
FCM-M1-SSP5-0



Tolerances: +/- 0.2 mm

Ordering part numbers

FCM-_1-SSP5-0



Document Revision Record

Rev	Date	Author	Description
00	15-Jan-08	**C. Jones**	Initial Draft

FP3 SERIES LENSES
for SEOUL SEMICONDUCTOR Z-POWER P3™ LEDs

- **High efficiency**
- **Available in 2 different beams**
- **35mm diameter, sized for MR11 lamp applications**
- **Patent Pending**

The FP3 series offers a complete range of lenses especially designed for the Seoul Semiconductor LEDs : Z-Power P3 ™.
www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of two different lens models: narrow beam and medium beam.

The high collection efficiency reaches 85% of the total flux emitted from the LED.

These lenses are assembled with a 35mm diameter holder. The holder assures the proper relative placement between the lens and the Z-Power P3™ LEDs. Heat staking the three legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN, at www.fraensrl.com).

Typical applications are:
- Reading lamps
- Internal fittings with MR11 standard
- Architectural Lighting
- Flash lights
- Application where uniformity and high intensity over a wide angle is required.

(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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To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
Holder and ring spacer Material	PC ABS
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 alcohol, as it will damage the plastic.

Optical Characteristics:

		Typical total divergence (degrees)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FP3-HNB1-SSP3-H	Narrow beam	18.0	13.0	8.5	13.0
FP3-HMB1-SSP3-H	Medium beam	16.5	17.0	16.0	19.5

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.

		Typical on-axis efficiency (cd/lm) (3)(4)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FSP-HNB1-SSP3-H	Narrow beam	7.2	13.1	18.6	10.0
FSP-HMB1-SSP3-H	Medium beam	5.0	7.7	4.5	5.5

(2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Z-Power LED used. For more detail on flux binning please check the Z-Power LED datasheet at http://www.seoulsemiconductor.com/ .

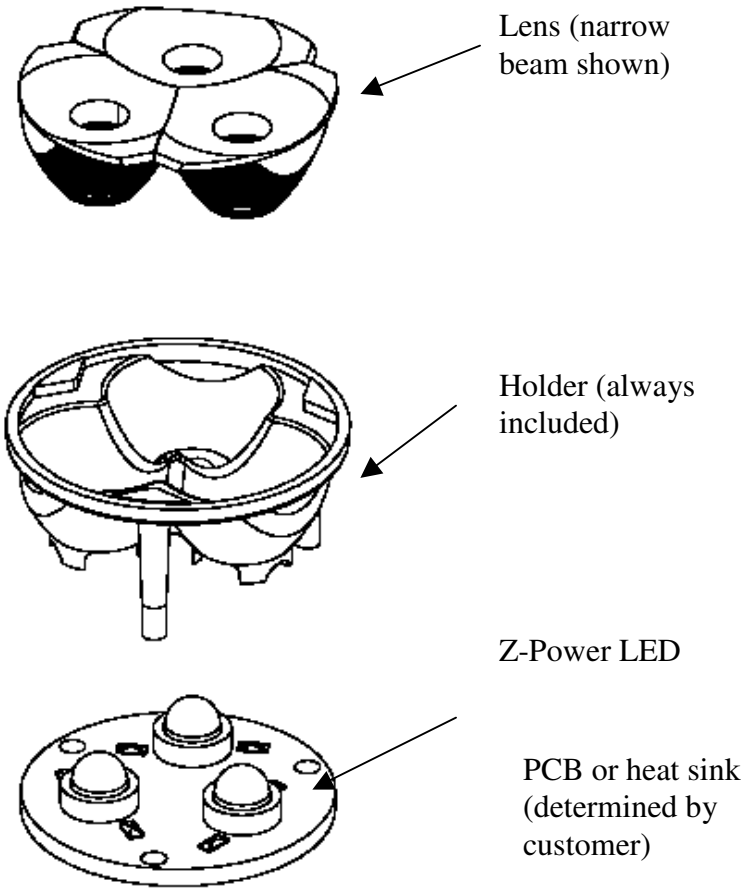
(3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Z-Power datasheet for more details on flux binning and mechanical tolerances.

Mechanical Characteristics

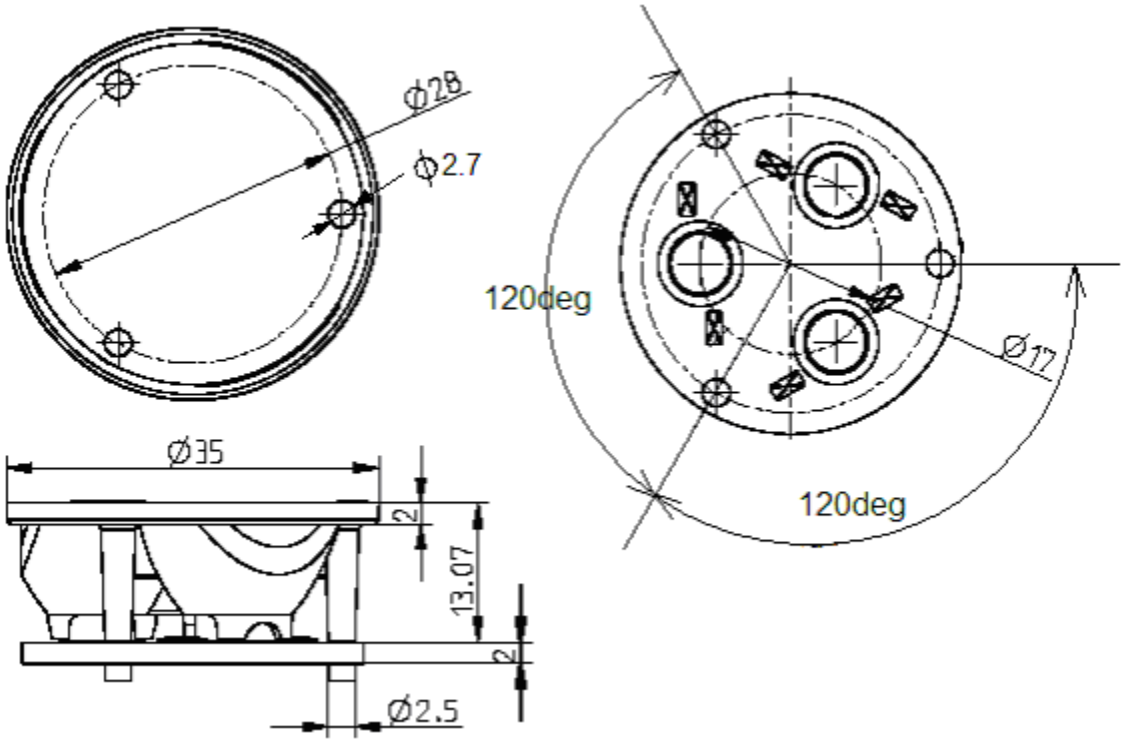
The FP3 series of tri-lenses has been specifically optimized for the Z-Power P3 LEDs.

For best optical performance (shown above), correct mechanical position of the lens on the LEDs is critical. To achieve correct lens position on the LED, the module comes pre-assembled in a holder.

View of the assembly lens + holder:



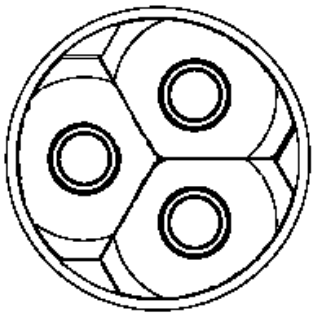
Lens + holder assembly view and dimensions:



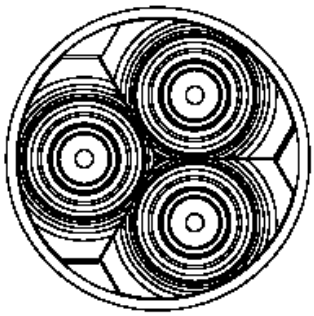
The outer geometries of the Tri-lenses (Narrow and Medium beam) are the same for both except the top of the lens. The lens can be identified by the top view:

Top Lens views:

Narrow beam lens

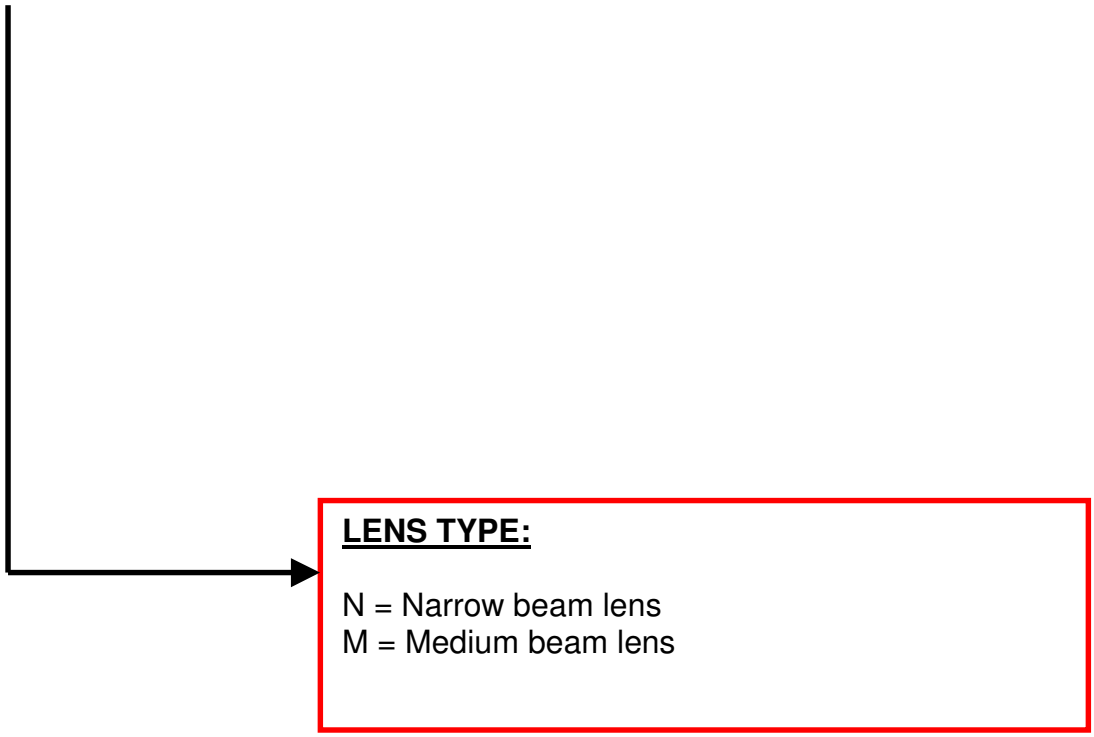


Medium beam lens *(light texture on the top lens)*



Ordering part numbers

FP3-HxB1-SSP3-H

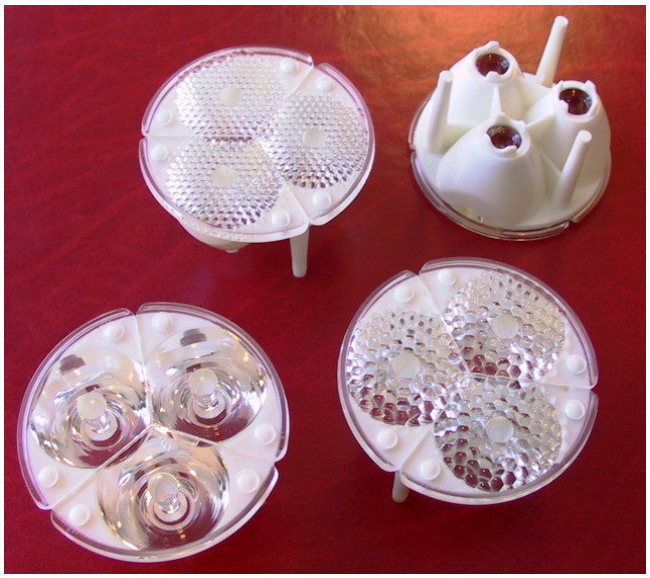


Document Revision Record

Rev	Date	Author	Description
00	09-27-2006	S.A.H	Initial Release

FS3 SERIES LENSES
for SEOUL SEMICONDUCTOR Z-POWER P3™ LEDs

- **High efficiency**
- **Available in 3 different beams**
- **50mm diameter sized for MR16 lamp applications**
- **Patent Pending**



The FS3 series Low Profile Tri-lens module is available for the Seoul Semiconductor LEDs : Z-Power P3 ™.www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of three different lens models: narrow, medium and wide beam.

The high collection efficiency reaches 85% of the total flux emitted from the LED.

These lenses are assembled with a 50mm diameter holder. The holder assures the proper relative placement between the lens and the Z-Power P3™ LEDs. Heat staking the three legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN, at www.fraensrl.com).

Typical applications are:

- Reading lamps
- Internal fittings with MR16 standard
- Architectural Lighting
- Flash lights
- Most application where uniformity and high intensity over a wide angle is required.

(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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To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	PC ABS
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 alcohol, as it will damage the plastic.

Optical Characteristics:

		Typical total divergence* (degrees)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FS3-HNB1-SSP3-H	Narrow beam	10.0	10.0	9.5	13.0
FS3-HMB1-SSP3-H	Medium beam	22.0	21.5	21.0	22.5
FS3-HWB1-SSP3-H	Wide beam	47.0	46.5	45.5	44.5

- 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.

		Typical on-axis efficiency* (cd/lm) (2)(3)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FS3-HNB1-SSP3-H	Narrow beam	13.9	24.1	19.6	14.7
FS3-HMB1-SSP3-H	Medium beam	3.5	4.9	3.3	3.8
FS3-HWB1-SSP3-H	Wide beam	1.4	1.6	1.2	1.6

(2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Z-Power LED used. For more detail on flux binning please check the Z-Power LED datasheet at http://www.seoulsemiconductor.com/ .

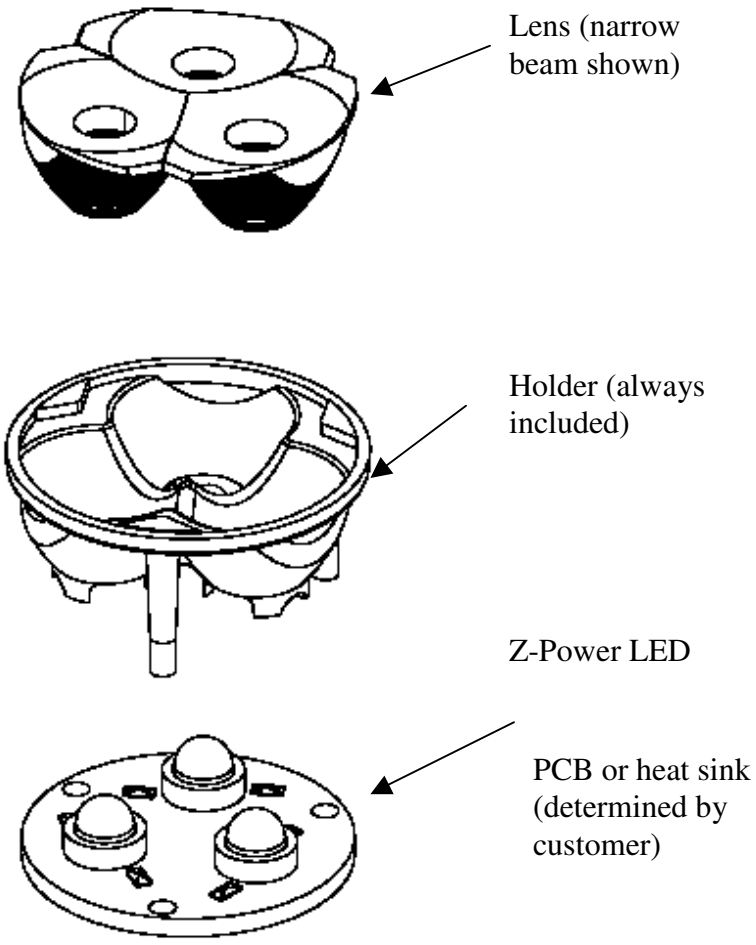
(3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Z-Power datasheet for more details on flux binning and mechanical tolerances.

(*) Measurements are made with preliminary lenses. Values can be different with full production.

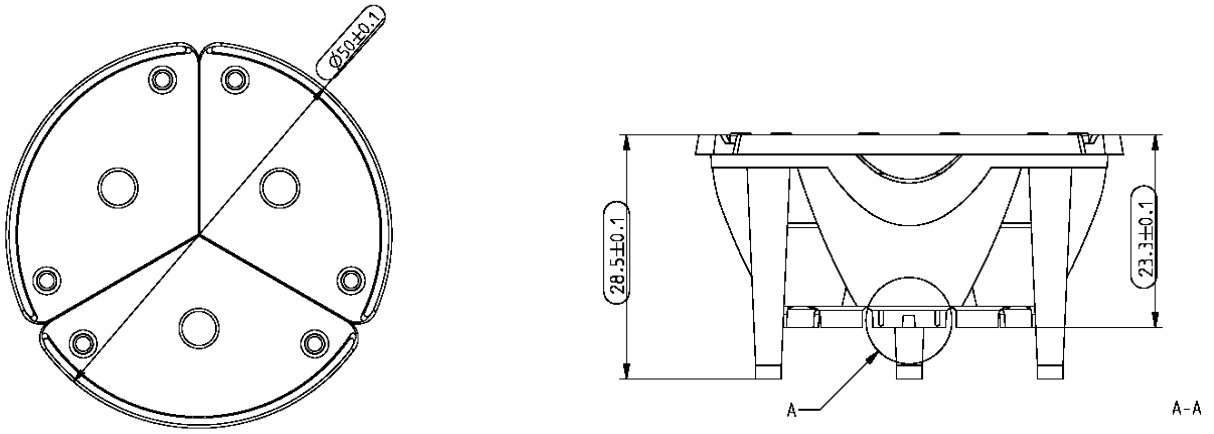
Mechanical Characteristics

The FS3 series of tri-lenses has been specifically optimized for the Z-Power P3 LEDs. For best optical performance (shown above), correct mechanical position of the lens on the LEDs is critical. To achieve correct lens position on the LED, the module comes pre-assembled in a holder.

View of the assembly lens + holder:



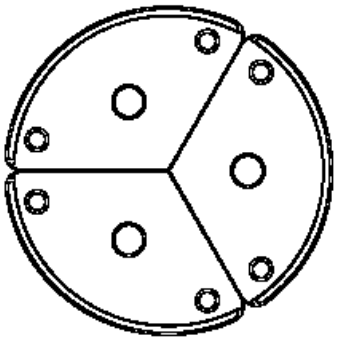
Lens + holder assembly view and dimensions:



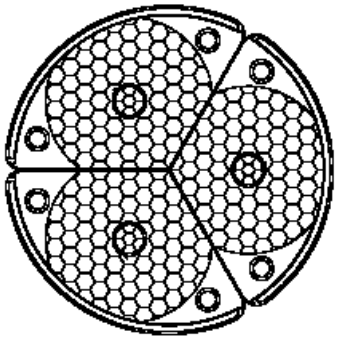
The outer geometry of all the Tri-lenses (Narrow, Medium and Wide beam) are the same except for the fronts of the lenses. The lens can be identified by the front view:

Front Lens views:

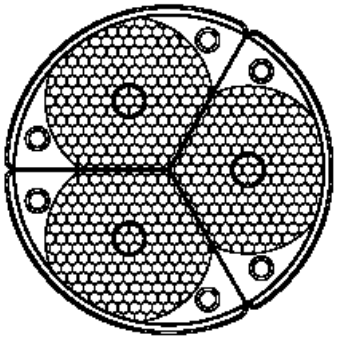
Narrow beam lens



Medium beam lens

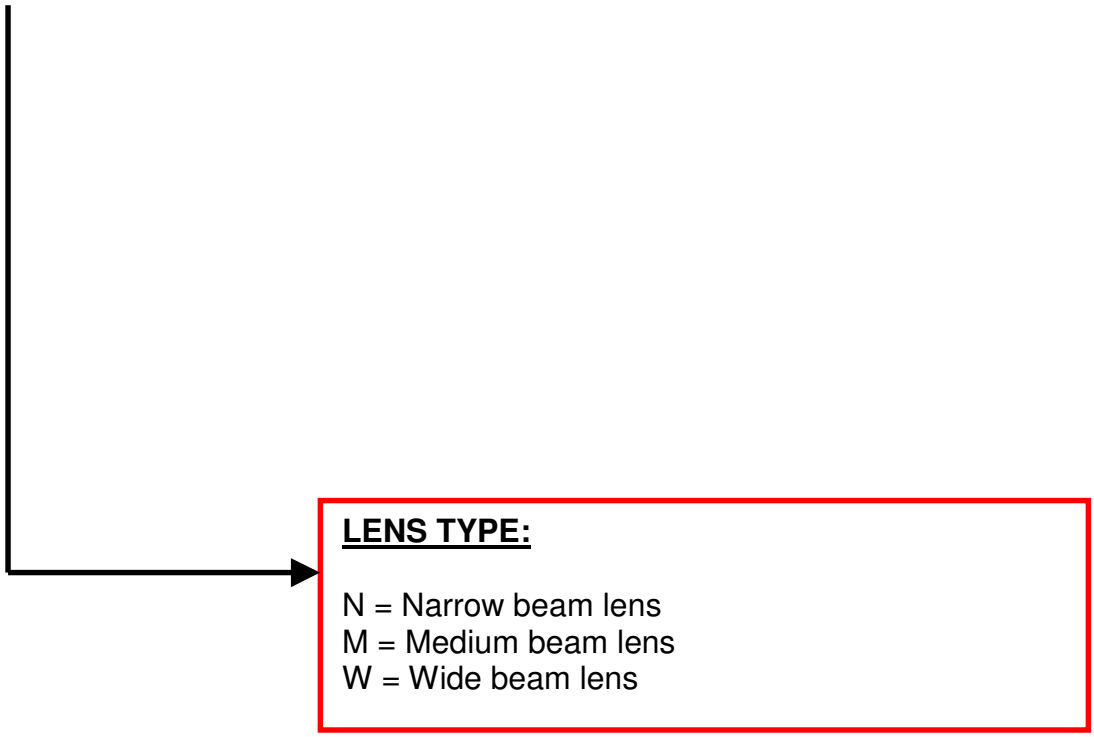


Wide beam lens



Ordering part numbers

FS3-HxB1-SSP3-H



Document Revision Record

Rev	Date	Author	Description
00	08-17-2006	S.A.H.	Initial Release
01	09-29-2006	S.A.H.	Corrected Part Number

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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Website: www.fraensrl.com

For pricing and availability, please contact our Certified Distribution Network. Distribution contact information is available on our website:
http://www.fraensrl.com/contact.html

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

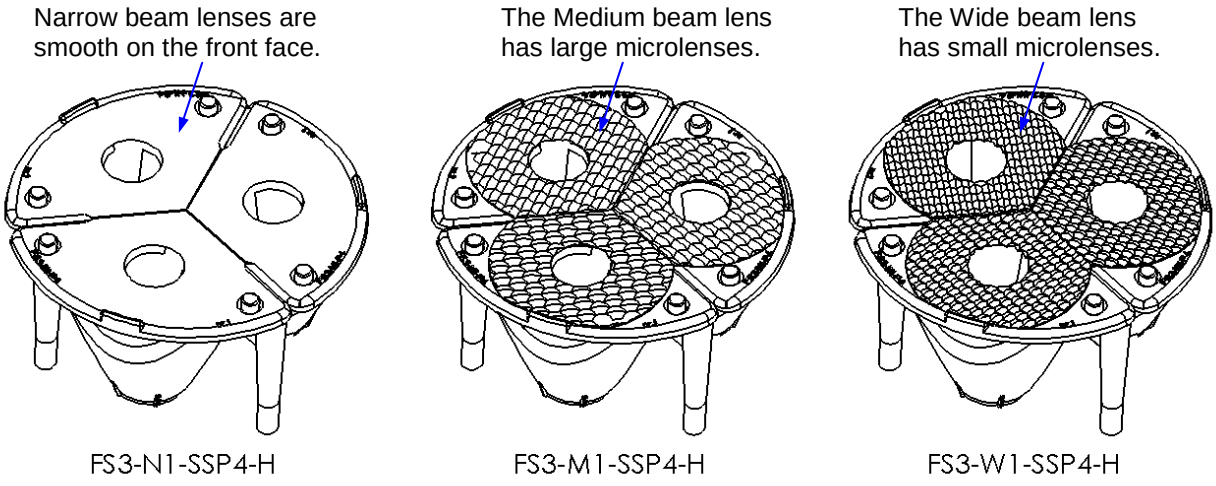


Figure 1: The tri-lens assemblies can be identified by the face surfaces of the lenses. The FS3 series tri-lenses are available only assembled to a holder. The holder provides the correct alignment of the lenses to the LEDs.

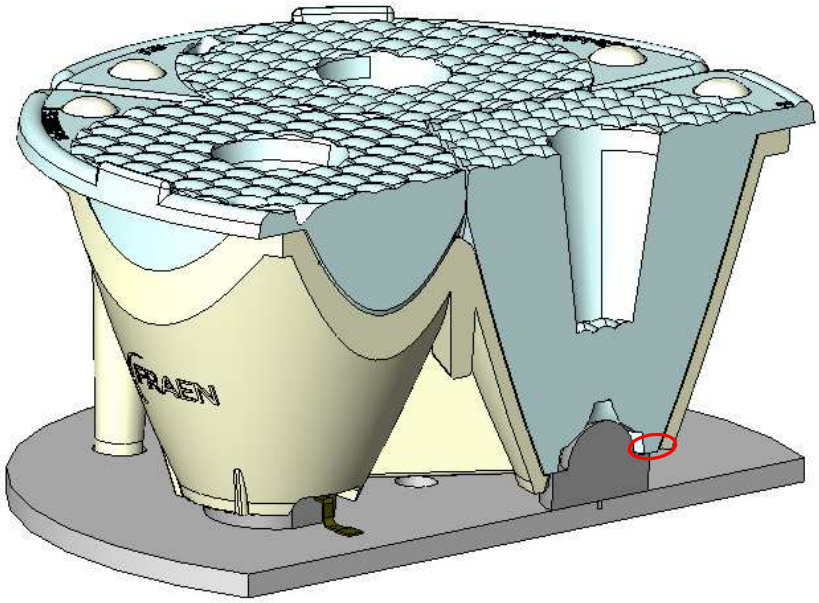
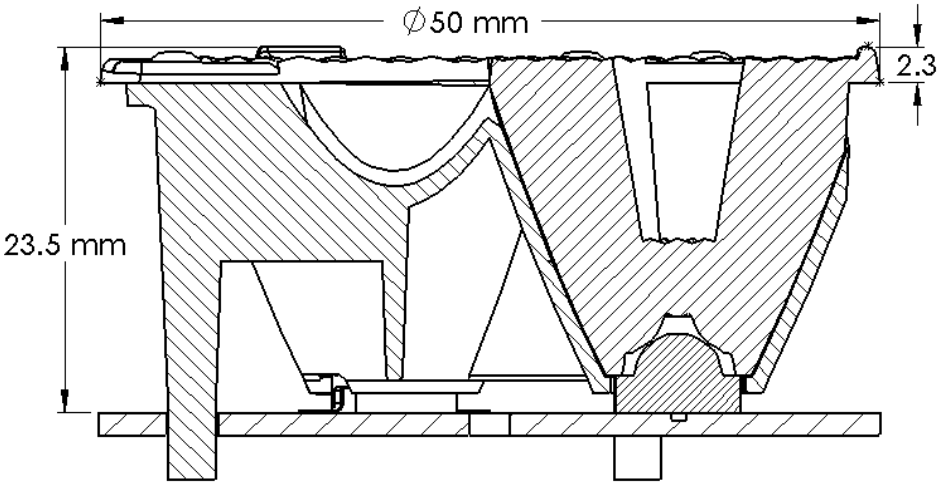


Figure 2: X-section view shows the lenses touch the Seoul P4 LEDs, and the holder aligns the lenses to the LED.



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.

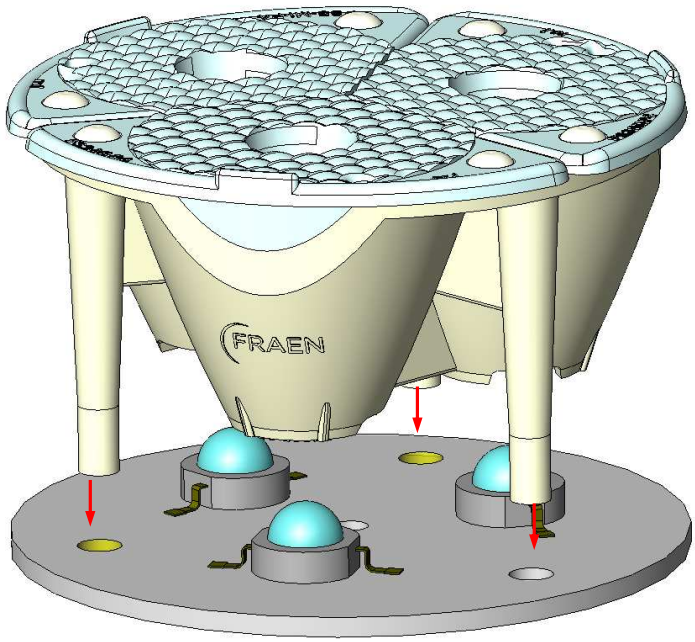


Figure 4: The 3 legs on the tri-lens require clearance holes in the circuit board. The holder has a ring feature around each lens, to align the holder to the LEDs.

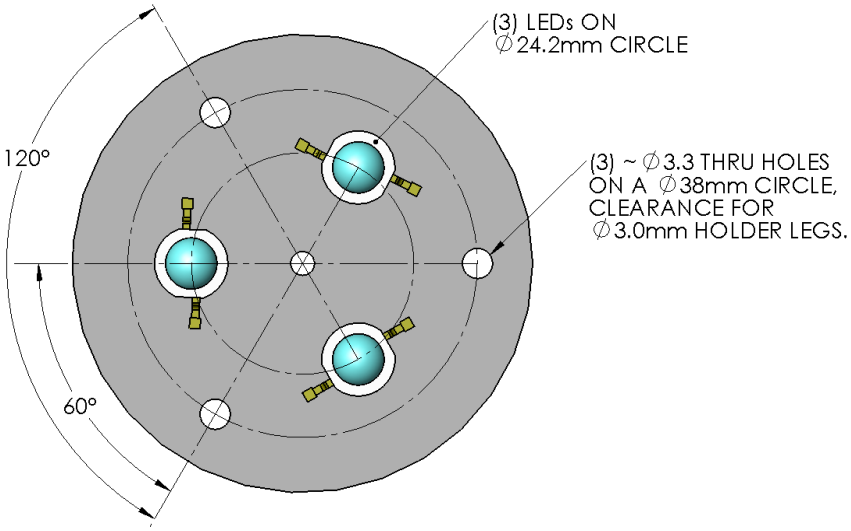
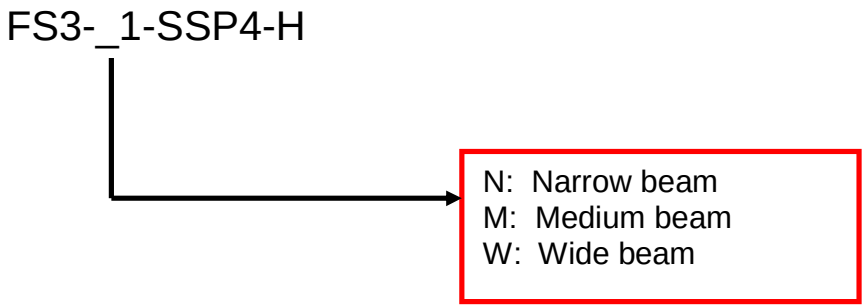


Figure 5: For best fit to the FS3 tri-lens, the PCB should have thru holes and LEDs located as shown above. The rotation/orientation of the LEDs should to be as shown, for the LED wires to align with the clearance slots in the lens holder. This is also shown in Figure 2.

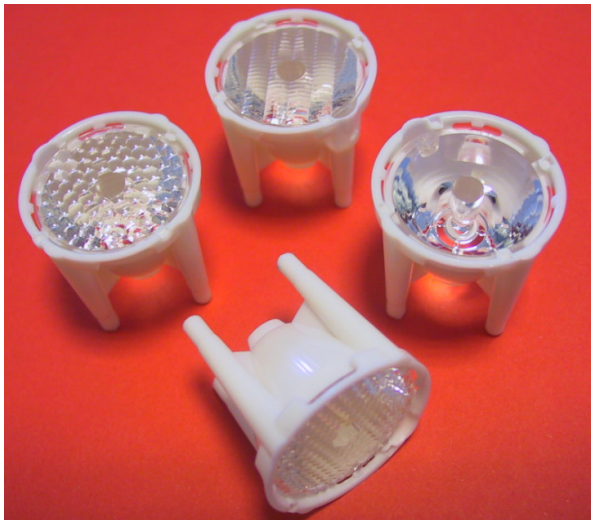
Ordering part numbers



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

FSG SERIES LENSES
for SEOUL SEMICONDUCTOR Z-POWER P3™ LEDs

- **High efficiency**
- **Available in 4 different beams**
- **Patent Pending**



The FSG series offers a complete range of lenses especially designed for the Seoul Semiconductor LED : Z-Power P3 ™.
www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of four different lens models: narrow beam, medium beam, wide beam, and elliptical pattern (2).

The high collection efficiency reaches 85% of the total flux emitted from the LED.

Each of these lenses is available assembled with Fraen's Lens Holder. The holder assures the proper relative placement between the lens and the Z-Power (P3 series) ™ LED. Heat staking the four legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN (at www.fraensrl.com).

Typical applications are:

- Reading lamps
- Signs
- Architectural Lighting
- Street Lights
- Most application where uniformity and high intensity over a wide angle is required.

(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
(2) Typical beam divergence may change with different color LEDs.

For ordering instructions, please contact

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Fax: +39 02-335.456.239
info@fraen.com

To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	Transparent 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 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 alcohol, as it will damage the plastic.

Optical Characteristics :

		Typical Total Divergence * (deg)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FSG-HNB1-SSP3-z	Narrow beam	10.0	10.0	9.5	13.0
FSG-HMB1-SSP3-z	Medium beam	22.0	21.5	21.0	22.5
FSG-HWB1-SSP3-z	Wide beam	47.0	46.5	45.5	44.5
FSG-HEB1-SSP3-z	Elliptical beam	**22.0 * 12.0**	**22.0 * 12.0**	**21.0 * 11.0**	**22.0 * 12.0**

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

		Typical on-axis Efficiency (cd/lm)			
Lens Part Number	Type of lens	Blue LEDs (14.2 lm)	Green LEDs (60.2 lm)	Red LEDs (41.9 lm)	White LEDs (45.4 lm)
FSG-HNB1-SSP3-z	Narrow beam	12.8	18.9	14.4	12.7
FSG-HMB1-SSP3-z	Medium beam	2.8	4.4	2.9	3.9
FSG-HWB1-SSP3-z	Wide beam	0.8	1.3	0.8	1.4
FSG-HEB1-SSP3-z	Elliptical beam	5.7	8.6	5.8	6.2

To calculate on-axis intensity, multiply on-axis efficiency of lens (cd/lm) by the total flux of the Z-Power LED used. For more detail on flux binning please check the Z-Power LED datasheet at http://www.seoulsemiconductor.com/
Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the LEDs datasheet for more details on flux binning and mechanical tolerances.

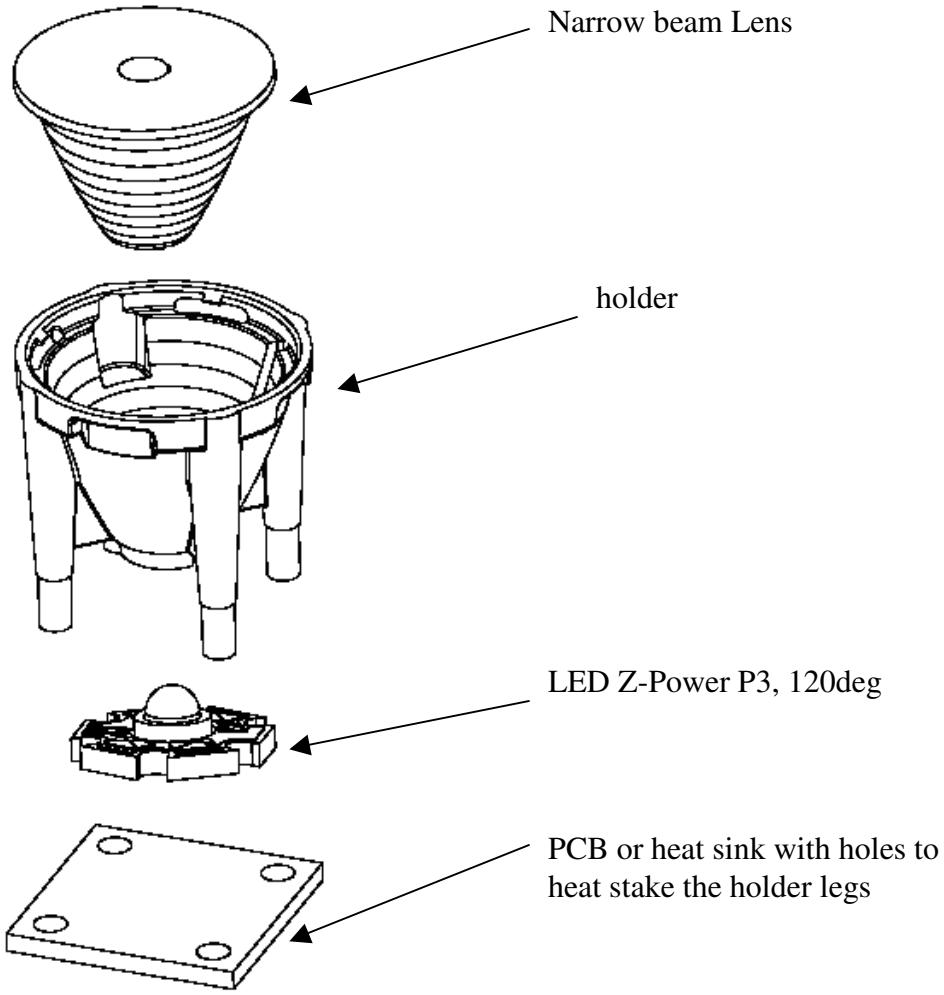
Mechanical Characteristics

IMPORTANT - Assembly information:

For best optical performance (shown above), correct mechanical position of the lens on the LED is critical.

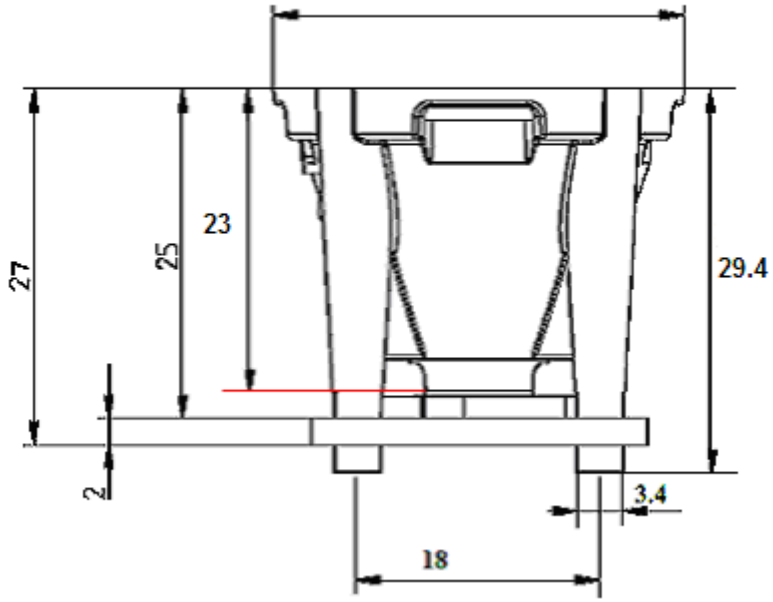
To achieve correct lens position on the LED, the lens must be used either a holder, or spacer ring

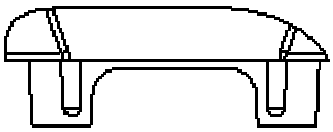
Lens + holder assembly view:



Lens + holder assembly dimensions :

with standard holder = 30,5mm
with MR11 holder = 34,9mm



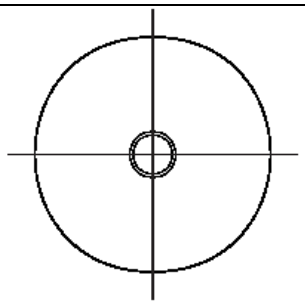
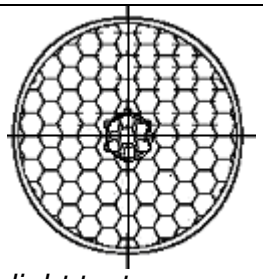
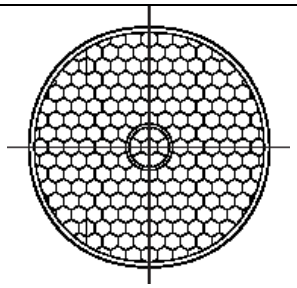
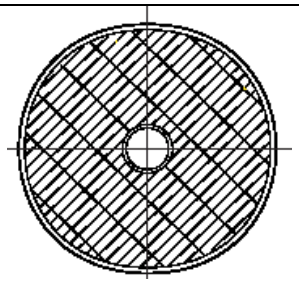


Detail of bottom level of the holder

Dimensions tolerance is +/-0.2mm

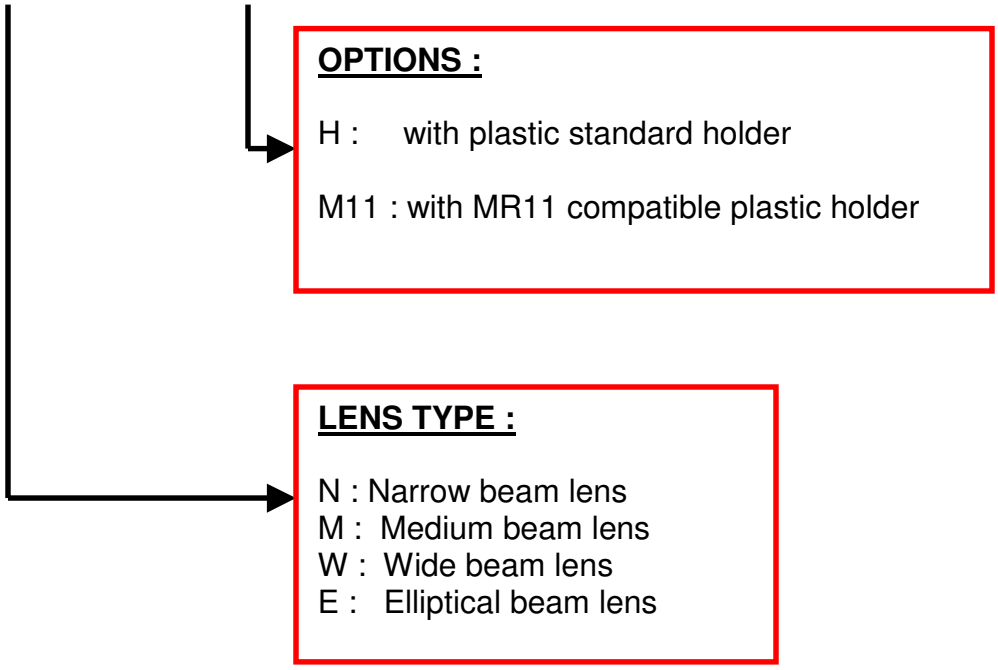
The outside mechanical dimensions of all the lenses (Narrow, Medium, Wide and Elliptical beam) are the same for the different beams, except the top of the lens.

The lenses can be identified by their **top view**:

Narrow Beam lens: FSG-HNB1-SSP3-z	Medium Beam lens: FSG-HMB1-SSP3-z	Wide beam lens: FSG-HWB1-SSP3-z	Elliptical lens: FSG-HEB1-SSP3-z
	 *light texture on microlens*		
Flat surface	2.6mm hexagonal shaped microlens array	1.7mm hexagonal shaped microlens array	1.0 x 3.7mm rectangular shaped microlens array

Ordering part numbers

FSG-HxB1-SSP3-z



Document Revision Record

Rev	Date	Author	Description
00	08-21-06	S.A.H.	Initial Release
01	08-23-06	S.A.H.	Lens Data added

FSG Lens Series
for SEOUL SEMICONDUCTOR Z-POWER P4™ LEDs

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

The FSG lens offers lenses specifically designed for the Z-Power® P4 series LEDs from Seoul.

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

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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info@fraen.com

Website: www.fraensrl.com

For ordering information, please contact:

NAFTA Countries	**ARROW** Telephone: 1-888-9LIGHT1 email: lightingsolutions@arrow.com
European Countries	Please contact Fraen S.r.l. for distributor's information Email: info@fraen.com

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 following FSG series lenses.

Lens alone:

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

Lens and holder (assembly):

- FSG-N1-SSP4-HR
- FSG-M1-SSP4-HR
- FSG-W1-SSP4-HR
- FSG-E1-SSP4-HR

Optical Characteristics – Beam Angle (degrees, Full Angle)

Lens Part Number	Type of lens	Cool White	Warm White	Blue	Green	Red
FSG-N1-SSP4-HR	Narrow beam	6	*	6	5	6
FSG-M1-SSP4-HR	Medium beam	24	*	24	23	23
FSG-W1-SSP4-HR	Wide beam	37	*	37	37	38
FSG-E1-SSP4-HR	Elliptical beam	14 x 32	*	*	*	*

(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
FSG-N1-SSP4-HR	Narrow beam	31	*	32	37	29
FSG-M1-SSP4-HR	Medium beam	3.5	*	3.1	4.2	4.0
FSG-W1-SSP4-HR	Wide beam	1.6	*	1.3	1.8	1.7
FSG-E1-SSP4-HR	Elliptical beam	3.1	*	*	*	*

(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.

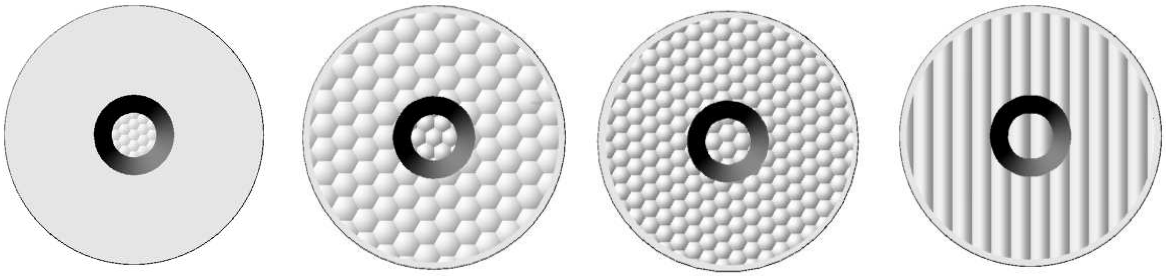
Illumination Calculations

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 lens FSG-N1-SSP4-0R is used on a cool ("pure") white Seoul P4 LED at 350 mA, the typical luminous flux of the LED is 80 lumens:
The calculation is: (31 candela/lumen) x (80 lumens) = 2480 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 2480 candela, or 1240 candelas.
1 candela at 1-meter distance produces 1 Lux. This means the peak intensity at 1 meter will be 2480 lux. The intensity decreases as a function of the distance squared, so at 2 meters the peak intensity will be 2480 / (2^2) = 620 lux. At 3 meters distance, the peak intensity will be 2480 / (3^2) = 276 lux.

Mechanical Characteristics

Figure 1. Identifying the lenses by their front views



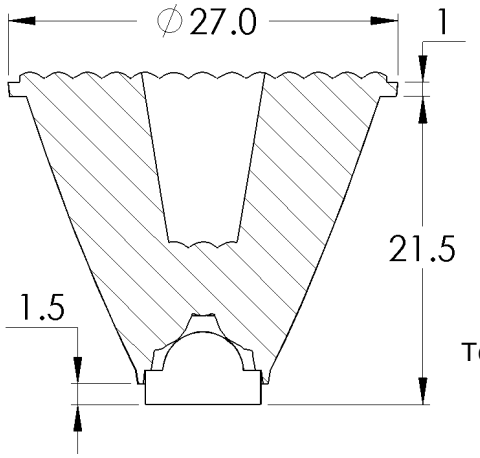
FSG-N1-SSP4-HR FSG-M1-SSP4-HR FSG-W1-SSP4-HR FSG-E1-SSP4-HR

Continued on next page…

Figure 2. Correct vertical distance between FSG lens and Seoul P4 LED

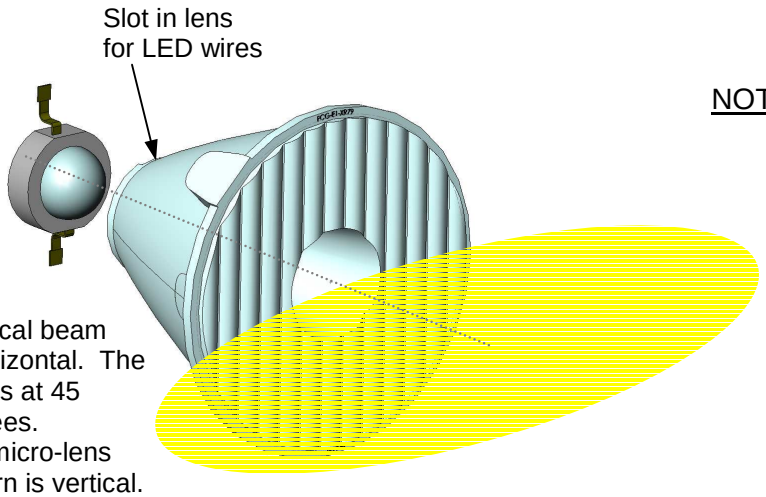
The lens is correctly positioned as shown in the figure below. The Fraen lens touches the LED package, but not the LED dome lens. The Fraen lens is self-centering on the LED package.

FSG-E1-SSP4-0R



Tolerances: +/- 0.2 mm

Figure 3. Elliptical beam orientation

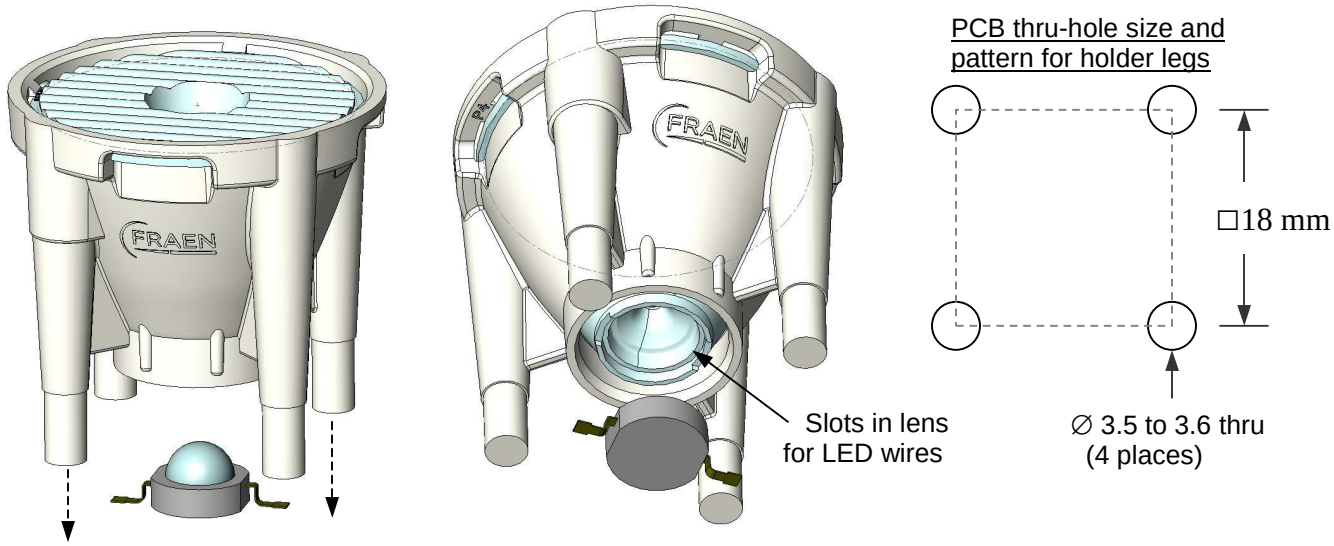


Elliptical beam is horizontal. The gate is at 45 degrees.
The micro-lens pattern is vertical.

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.

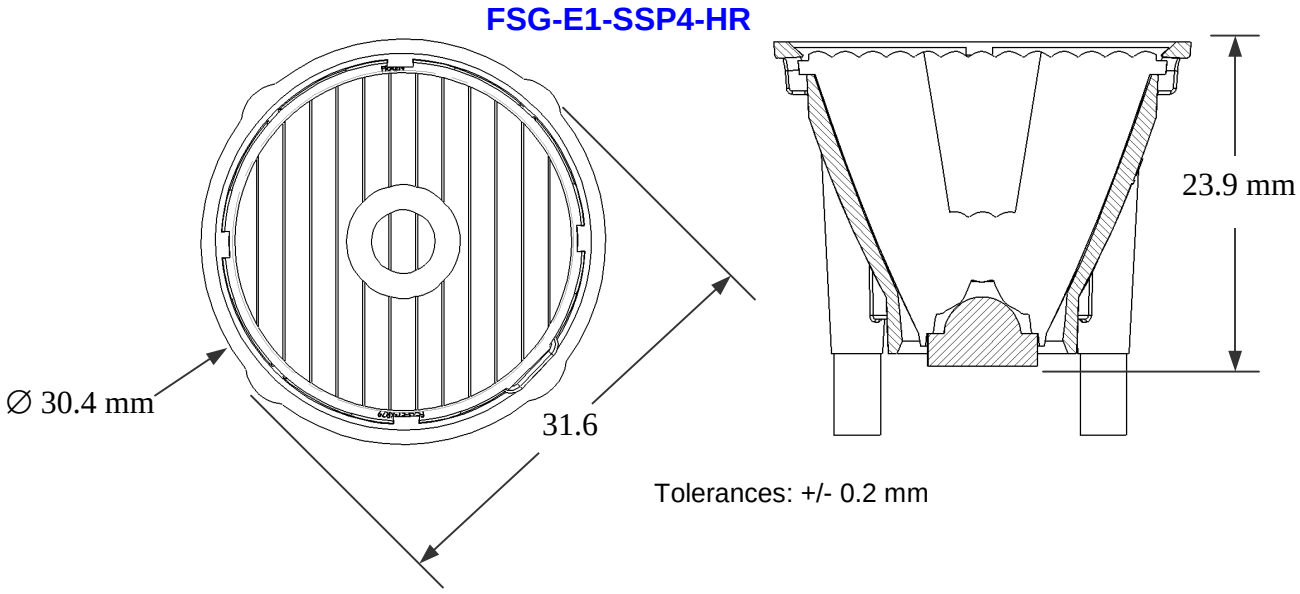
Figure 4. Installation of lens assembly onto Seoul LED



For installation onto a printed circuit board, holes thru the PCB will allow the legs of the holder to protrude through the PCB and can be heat-staked or glued in place. See Fraen Application Note FAN-01EN http://www.fraensrl.com/images/FRN_FHSLenses_HeatStake.pdf 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 FSG- 1-SSP4-HR series lens assemblies



Ordering part numbers

FSG-_1-SSP4-__

0R: Lens alone (no holder)
HR: Lens with white PC holder

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

Caution: The orientation of the elliptical beam lens is controlled by the slot on the bottom of the lens (see Figure 3 and 4).

Rev	Date	Author	Description
00	08 December 2008	C. Jones	Initial Release

FSG SERIES LENSES
for SEOUL SEMICONDUCTOR Z-POWER P5™ LEDs

- **Highly efficient color mixing lens**
- **Available in 2 different beams**
- **Patent Pending**

The FSG lens series is a range of two lenses specifically designed for the Seoul Semiconductor LEDs : Z-Power P5 ™.
www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of two different lens models: narrow beam and medium beam.

The high collection efficiency reaches 85% of the total flux emitted from the LED.

Each of these lenses is available assembled with Fraen's Lens Holder. The holder assures the proper relative placement between the lens and the Z-Power ™ P5 LED.

Heat staking the four legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN (at www.fraensrl.com).

Typical applications are:

- Architectural Lighting
- Entertainment lighting
- Wall washing
- Internal lighting.
- Applications requiring excellent uniformity of color mixing

(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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Fax: +39 02-335.456.239
info@fraen.com

To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	PC ABS
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 alcohol, as it will damage the plastic.

Optical Characteristics :

		Typical Total Divergence (degrees)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FSG-M1-SSP5-H	Medium beam	22.5	23.5	21.0	23.0
FSG-W1-SSP5-H	Wide beam	30.0	29.0	27.0	28.0

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

		Typical on-axis Intensity (cd/lm)			
Lens Part Number	Type of lens	Blue LEDs	Green LEDs	Red LEDs	White LEDs
FSG-M1-SSP5-H	Medium beam	2.9	3.9	2.8	3.2
FSG-W1-SSP5-H	Wide beam	1.8	2.7	1.7	2.1

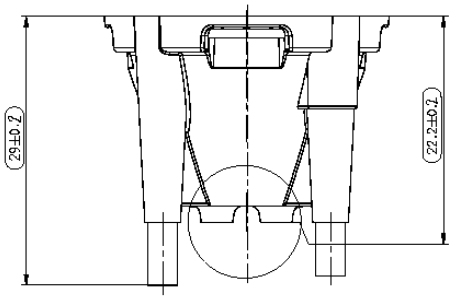
Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the LEDs datasheet for more details on flux binning and mechanical tolerances.

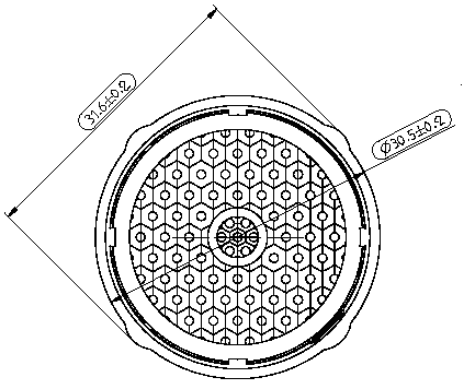
IMPORTANT - Assembly information:

For best optical performance (shown above), correct mechanical position of the lens on the LED is critical. To achieve correct lens position on the LED, the lens must be used with a holder.

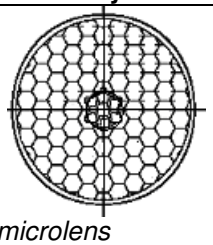
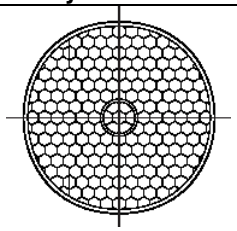
Mechanical Characteristics

Lens + holder assembly view





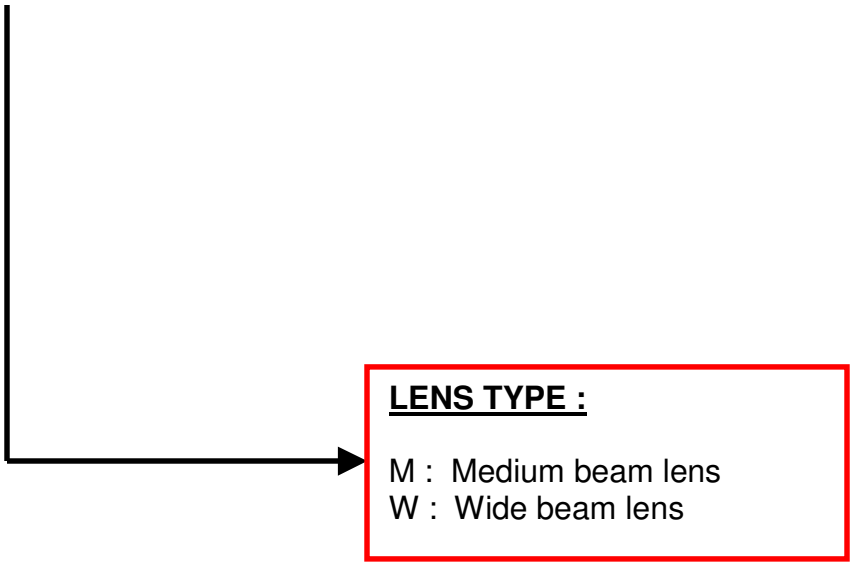
The outside mechanical dimensions of all the lenses (Medium and Wide beam) are the same, except the fronts of the lens. Each can be identified by their **top view**:

Medium Beam assembly: FSG-M1-SSP5-H	**Wide beam assembly:** FSG-W1-SSP5-H
 *light texture on microlens*	
2.6mm hexagonal shaped microlens array	1.7mm hexagonal shaped microlens array

Light texture on the micro-lenses improves evenness of the beam.

Ordering part numbers

FSG-x1-SSP5-H



Document Revision Record

Rev	Date	Author	Description
00	08-17-2006	S.A.H.	Initial Release
01	08-24-2006	S.A.H.	Replace Preliminary Data with Actual Data

FSP SERIES LENSES
for SEOUL SEMICONDUCTOR Z-POWER P3™ LEDs

- **High efficiency**
- **Available in 2 different beams**
- **Patent Pending**

The FSP series offers low profile lenses especially designed for the Seoul Semiconductor LEDs : Z-Power P3 ™.
www.seoulsemiconductor.com

A software-optimized aspheric profile combined with front shaped micro-lens arrays enable the generation of two beam output patterns: narrow and medium.

The high collection efficiency reaches 85% of the total flux emitted from the LED.

Lens holders are available and provide the proper alignment between the LED and lens.

Heat staking the four legs of the holder to the customer's PCB or heat sink provides excellent optical and mechanical assembly (see Fraen Application Note FAN01-EN (at www.fraensrl.com).

Typical applications are:

- Reading lamps
- Signs
- Architectural Lighting
- Street Lights
- Most application where uniformity and high intensity over a wide angle is required.

(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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To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

General Characteristics

Lens Material	Optical Grade PMMA
Holder Material	PC ABS
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 alcohol, as it will damage the plastic.

Optical Characteristics:

		Typical total divergence* (degrees)			
Lens Part Number	Type of lens	Blue LEDs ●	Green LEDs ●	Red LEDs ●	White LEDs ○
FSP-HNB1-SSP3-z	Narrow beam	18.0	13.0	8.5	13.0
FSP-HMB1-SSP3-z	Medium beam	16.5	17	16	19

- 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.

.

		Typical on-axis efficiency* (cd/lm) (3)(4)			
Lens Part Number	Type of lens	Blue LEDs ●	Green LEDs ●	Red LEDs ●	White LEDs ○
FSP-HNB1-SSP3-z	Narrow beam	7.2	13.1	19.0	10.0
FSP-HMB1-SSP3-z	Medium beam	5.0	7.7	4.6	5.5

(2) To calculate the on-axis intensity, multiply the on-axis efficiency of the lens (cd/lm) by the total flux of the Z-Power LED used. For more detail on flux binning please check the Z-Power LED datasheet at http://www.seoulsemiconductor.com/ .

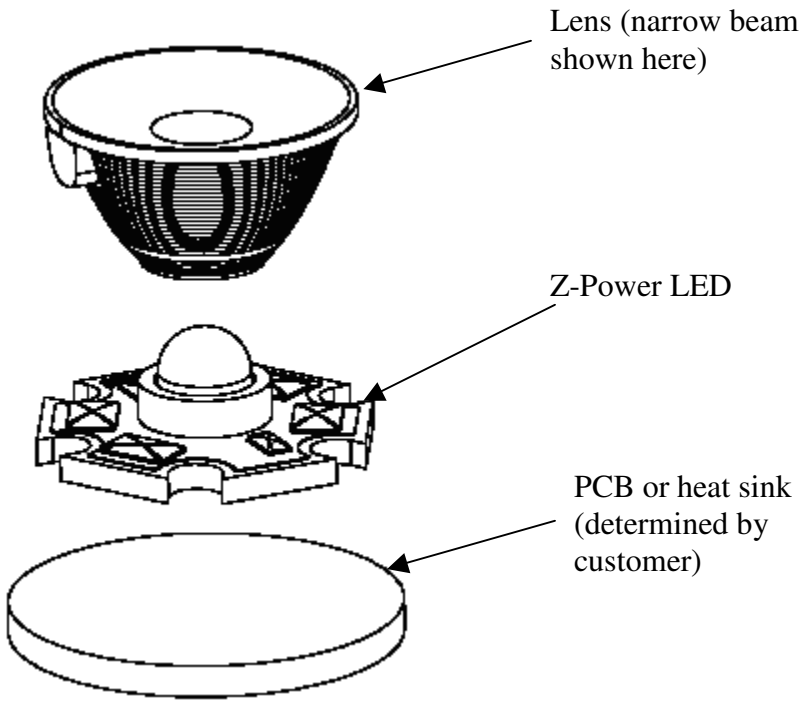
(3) Luminous intensity depends on the flux binning and tolerances of the LEDs. Please refer to the Z-Power datasheet for more details on flux binning and mechanical tolerances.

Mechanical Characteristics

The FSP series of lenses has been specifically optimized for the Z-Power LEDs. For best optical performance (shown above), correct mechanical position of the lens on the LED is critical.

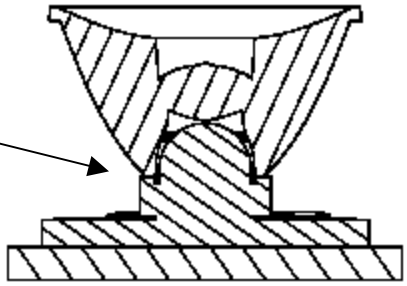
The FSP lenses can be used either **alone** or **with its unique holder**.

View of the assembly with the lens (if no holder is used):



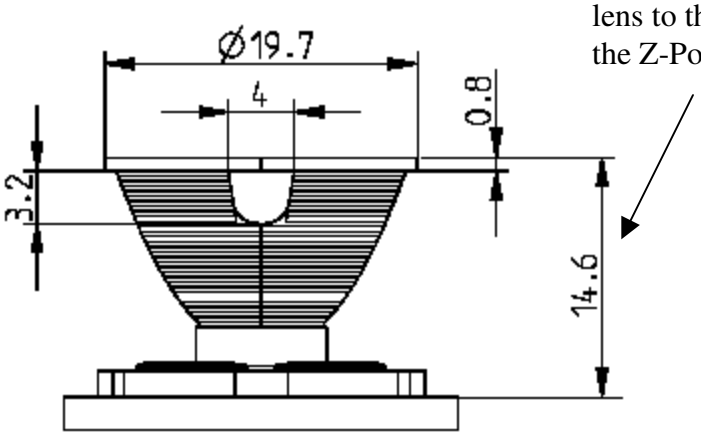
Assembly with the lens (if no holder is used):

The bottom of the lens sits on the ring of the Z-Power LEDs



B–B

This dimension represents the distance from the top of the lens to the bottom of the Z-Power.

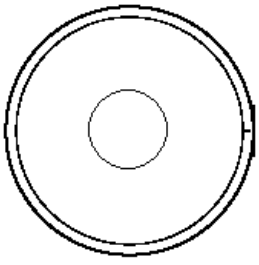


Dimensions tolerance is +/-0.2mm

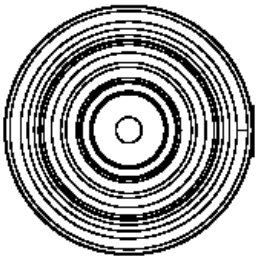
The outside mechanical dimensions of the lenses (Narrow and Medium beam) are the same, except the front of the lens. The lens can be recognized by the front view:

Front views:

Narrow beam lens

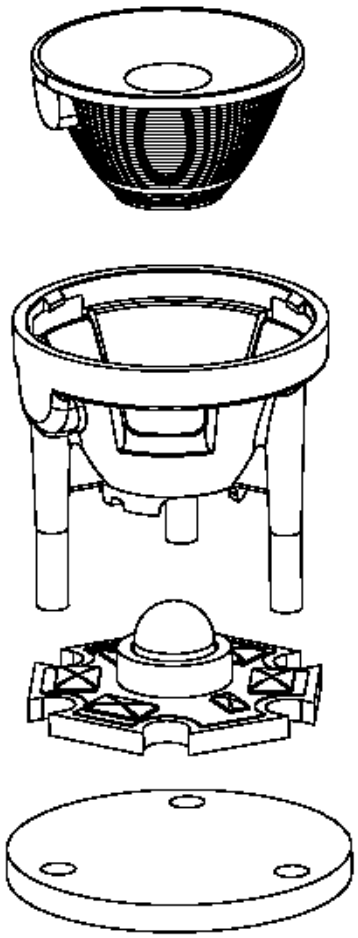


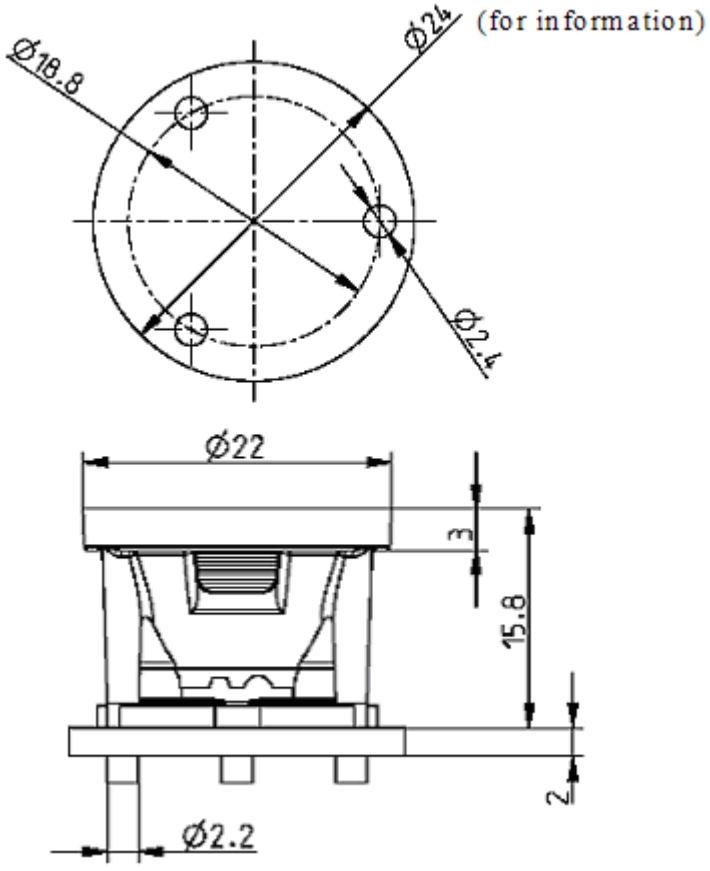
Medium beam lens *(light texture* on the front of lens)*



Light texture on the micro-lenses improves evenness of the beam.

Lens + holder assembly view and dimensions:

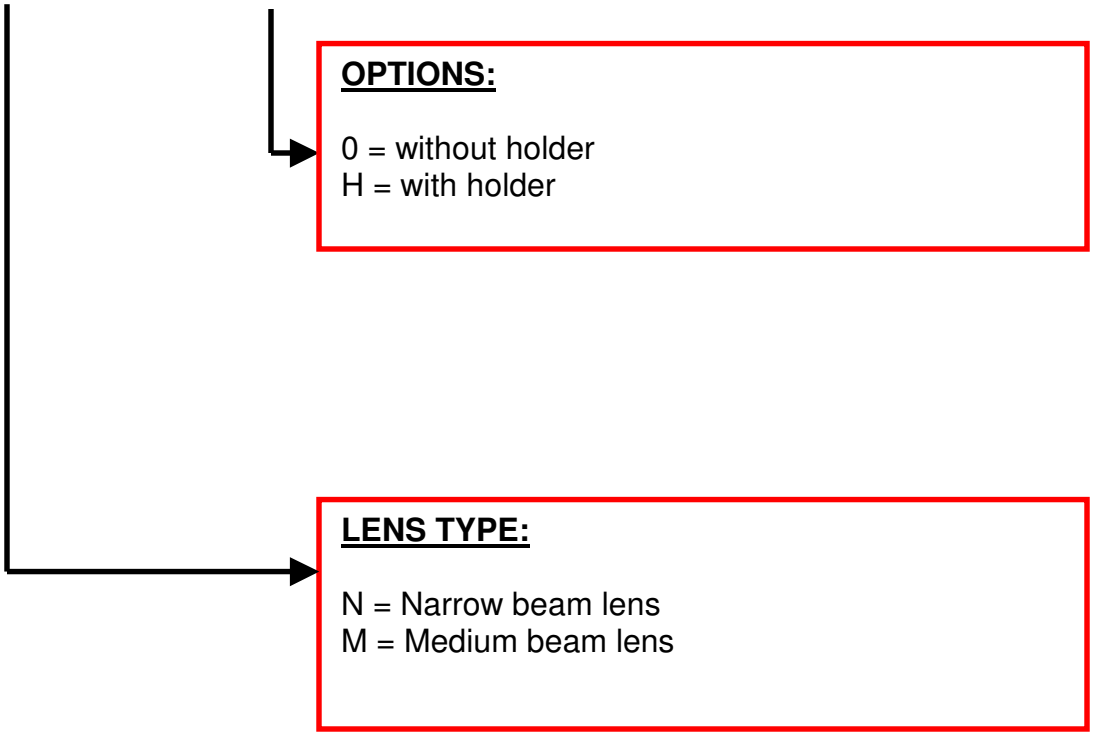




Dimensions tolerance is +/-0.2mm

Ordering part numbers

FSP-HxB1-SSP3-z



Document Revision Record

Rev	Date	Author	Description
00	08-17-2006	S.A.H.	Initial Release
01	08-23-2006	S.A.H.	Replaced preliminary lens data with production lens data

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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info@fraen.com

To find a local distributor, check the Fraen website.

Website: www.fraensrl.com

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

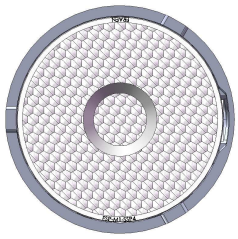
To calculate peak candela: Find the central spot “on-axis intensity” value in the table above, then multiply this value by the lumens output from your LED (refer to the Seoul x4218x LED datasheet http://www.seoulsemicon.com/en/product/prd/zpowerLEDp4.asp) for nominal lumens values. OR for a more accurate 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.

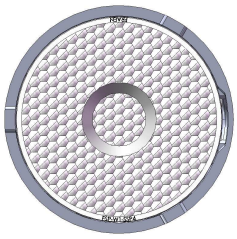
Mechanical Characteristics

Figure 1. Identifying the lenses by their front views

FSP-N1-SSP4-HRF



FSP-M1-SSP4-HRF



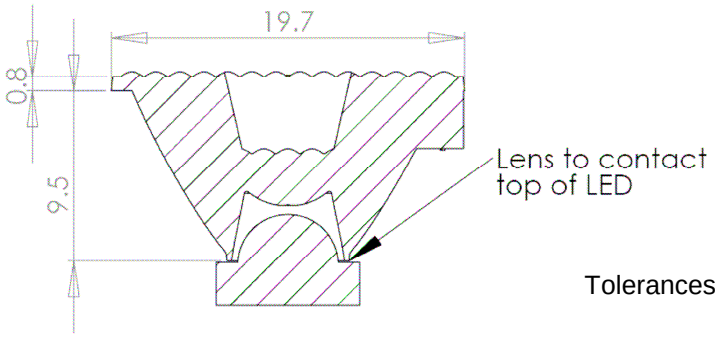
FSP-W1-SSP4-HRF

FSP-E1-SSP4-HRF

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

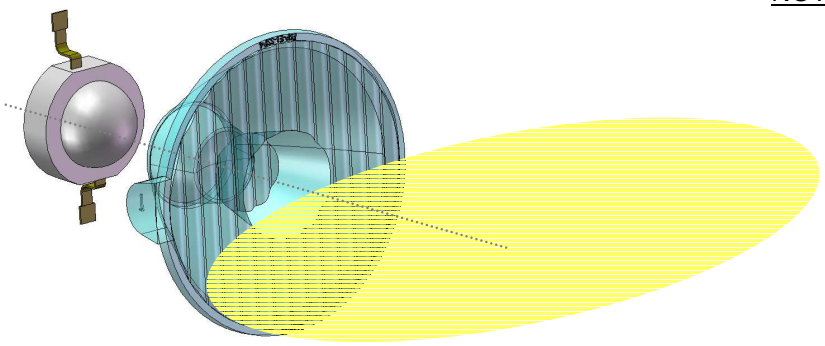
NOTE: The user must provide a mechanical method to set the correct position of the FSP lens on the LED. For example, the lens flange can be located in the lamp housing to center the lens to the LED and establish 9.5mm from the lens flange to the user's PC board. When the lens is positioned correctly,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

FSP-E1-SSP4-0R



Tolerances: +/- 0.2 mm

Figure 3. Elliptical beam orientation

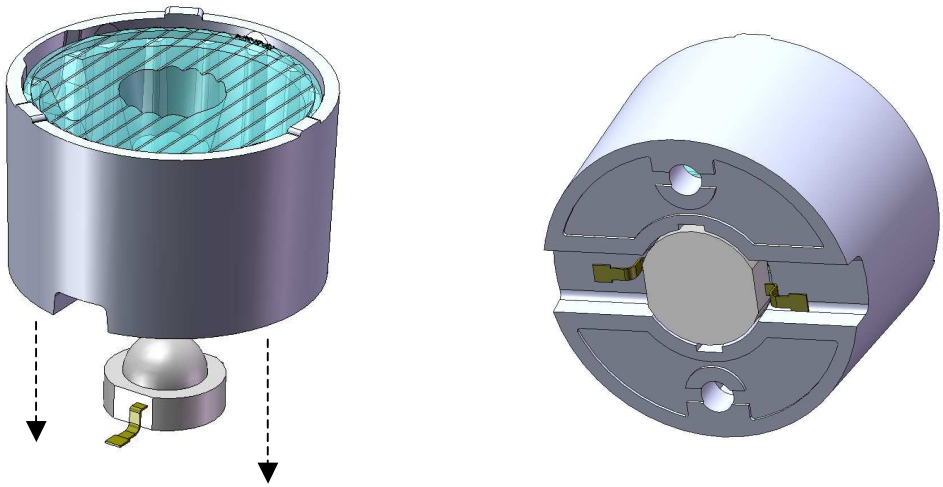


NOTE: The elliptical beam lens produces a beam shape that is perpendicular to the microlens pattern on the output face of the lens. The lens holder is designed to align the elliptical pattern perpendicular to the LED contacts. It is important to consider the orientation of the LEDs and the desired elliptical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

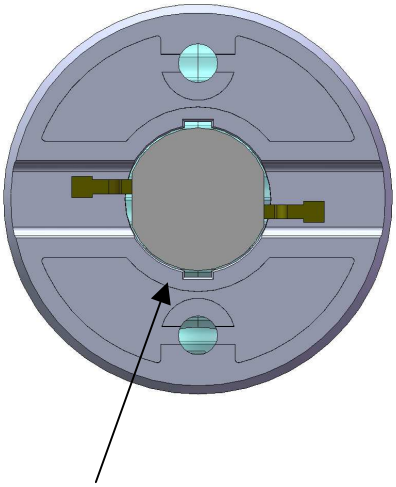
LED contacts are vertical.
The micro-lens pattern is vertical. Elliptical beam and lens gate are horizontal.

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.

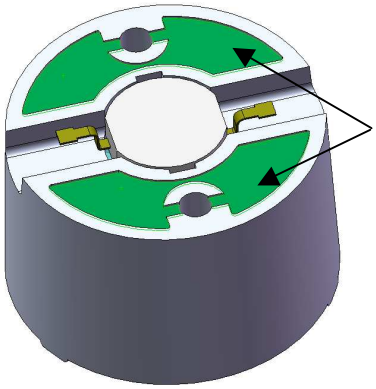
Figure 4. Installation of lens assembly onto Seoul P4 LED



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.

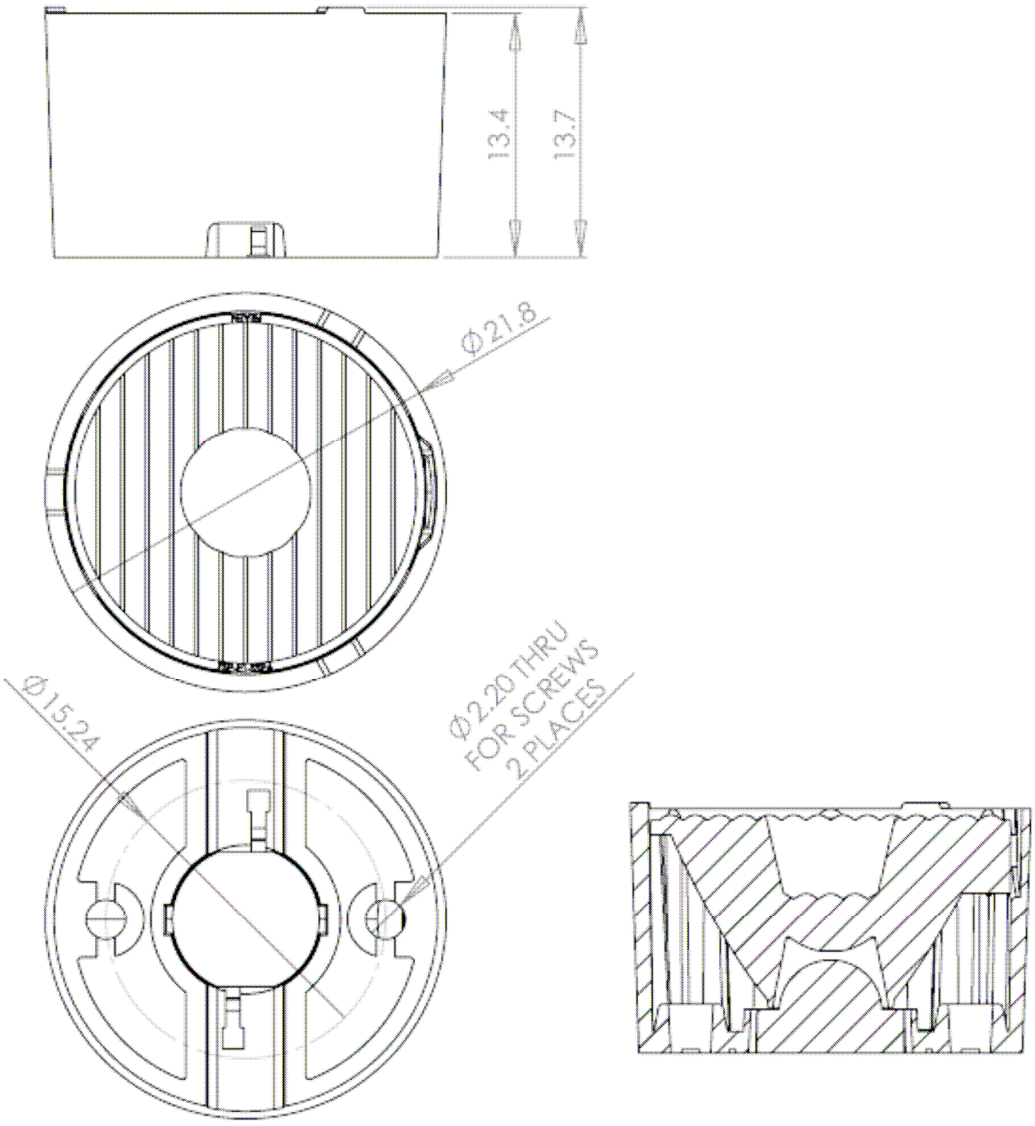


Recessed areas for glue thickness and migration.

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-__

0R: 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

Document Revision Record

Rev	Date	Author	Description
00	28-Apr-08	**C. Jones**	Initial Release

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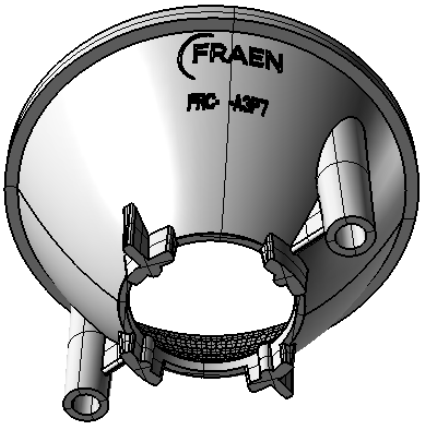
info@fraen.com

Fraen – Preliminary Datasheet (not for official release)

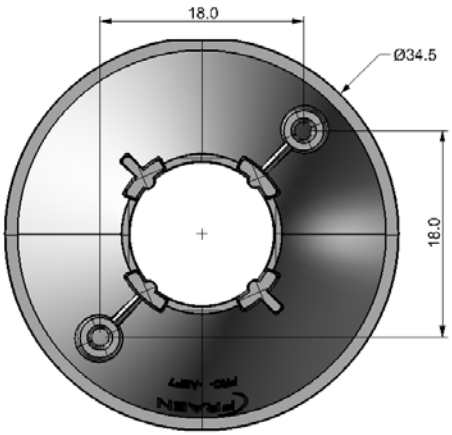
P/N: FRC-_1-A3P7-0R

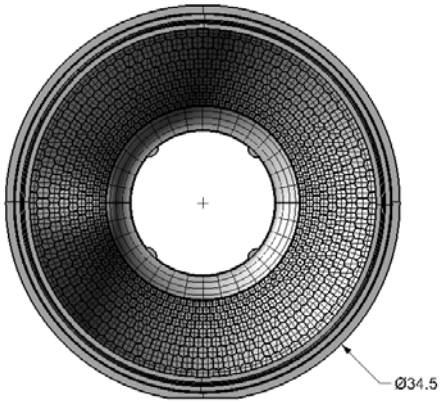


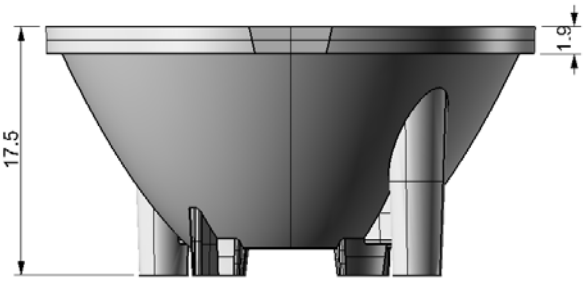
MR-11 Reflector
for
Acriche A3 &
Seoul P7

To find a local distributor, check the Fraen website.

Website: www.fraensrl.com







Units: mm
Tolerance: +/- 0.2mm

Optical Solution	On-axis efficiency (cd/lm)	Divergence (degrees)	Notes
Narrow Beam MR-11 Reflector (P/N: FRC-N1-A3P7-0R)	4.5	15	Good balance of efficiency and uniformity
Medium Beam MR-11 Reflector (P/N: FRC-M1-A3P7-0R)	1.5	29	Excellent uniformity of light output

** The divergence is measured at the Full Width at Half Maximum (FWHM)*
*** Preliminary data and subject to change; P7 results may be better due to smaller LED chip size*