

power light source
Luxeon® III Star

Technical Datasheet DS46

Luxeon III is a revolutionary, energy efficient and ultra compact new light source, combining the lifetime and reliability advantages of Light Emitting Diodes with the brightness of conventional lighting.

Luxeon III is rated for up to 1000mA operation, delivering increased lumens per package.

Luxeon Power Light Sources give you total design freedom and unmatched brightness, creating a new world of light.

For high volume applications, custom Luxeon power light source designs are available upon request, to meet your specific needs.



Luxeon III Star is available in 5500K white, green, blue, royal blue and cyan.

Features

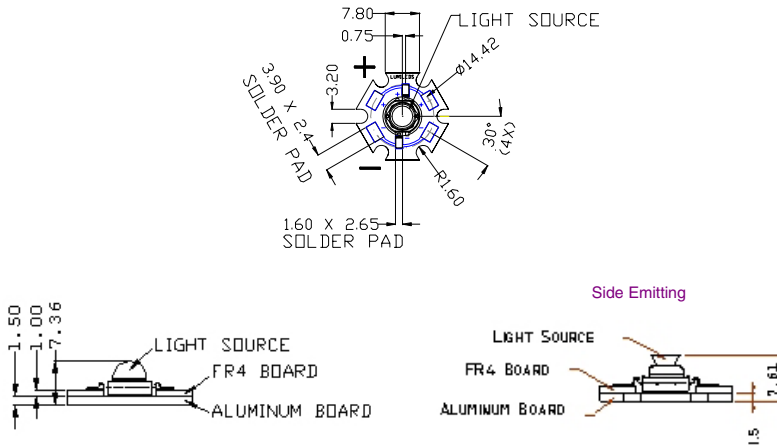
- Highest flux per LED family in the world
- Very long operating life (up to 100k hours)
- Available in 5500K white, green, blue, royal blue, cyan
- Lambertian and side emitting radiation patterns
- More energy efficient than incandescent and most halogen lamps
- Low voltage DC operated
- Cool beam, safe to the touch
- Instant light (less than 100 ns)
- Fully dimmable
- No UV
- Superior ESD protection

Typical Applications

- Reading lights (car, bus, aircraft)
- Portable (flashlight, bicycle)
- Mini-accent / Uplighters / Downlighters / Orientation lighting
- Fiber Optic Alternative / Decorative / Entertainment lighting
- Bollards / Security / Garden lighting
- Cove / Undershelf / Task lighting
- Traffic signaling / Beacons / Rail crossing and Wayside lighting
- Indoor and Outdoor Commercial and Residential Architectural lighting
- Edge-Lit Signs (Exit, Point Of Sale)
- LCD Backlights / Light Guides

Mechanical Dimensions

Luxeon III Star



Notes:

1. Slots in aluminum-core PCB for M3 or #4 mounting screw.
2. Electrical interconnection pads labeled on the aluminum-core PCB with “+” and “-” to denote positive and negative, respectively. All positive pads are interconnected, as are all negative pads, allowing for flexibility in array interconnection.
3. Electrical insulation between neighboring Stars is required – aluminum board is not electrically neutral.
4. Drawings not to scale.
5. All dimensions are in millimeters.

Flux Characteristics at 700mA, Junction Temperature, $T_j = 25^\circ\text{C}$

COLOR	LUXEON EMITTER	MINIMUM LUMINOUS FLUX (LM) OR RADIOMETRIC POWER (mW) $\Phi_v^{[1,2]}$	TYPICAL LUMINOUS FLUX (LM) OR RADIOMETRIC POWER (mW) $\Phi_v^{[2]}$	RADIATION PATTERN
WHITE	LXHL-LW3C	60.0	65	LAMBERTIAN
GREEN	LXHL-LM3C	51.7	64	
CYAN	LXHL-LE3C	51.7	64	
BLUE ^[3]	LXHL-LB3C	13.9	23	
ROYAL BLUE ^[4]	LXHL-LR3C	275 mW	340 mW	
WHITE	LXHL-FW3C	51.7	58	SIDE EMITTING
GREEN	LXHL-FM3C	51.7	58	
BLUE ^[3]	LXHL-FB3C	13.9	21	

Notes:

1. Minimum luminous flux or radiometric power performance guaranteed within published operating conditions. Lumileds maintains a tolerance of $\pm 10\%$ on flux and power measurements.
2. Luxeon types with even higher luminous flux levels will become available in the future. Please consult your Lumileds Authorized Distributor or Lumileds sales representative for more information.
3. Typical flux value for 470 nm devices. Due to the CIE eye response curve in the short blue wavelength range, the minimum luminous flux will vary over the Lumileds blue color range. Luminous flux will vary from a typical of 17 lm for the 460-465nm bin to a typical of 30 lm for the 475-480 nm bin due to this effect. Although the luminous power efficiency is lower in the short blue wavelength range, radiometric power efficiency increases as wavelength decreases. For more information, consult the Luxeon Design Guide, available upon request.
4. Royal Blue product is binned by radiometric power and peak wavelength rather than photometric lumens and dominant wavelength.

Flux Characteristics at 1000mA, Junction Temperature, $T_j = 25^\circ\text{C}$

COLOR	LUXEON EMITTER	TYPICAL LUMINOUS FLUX (LM) OR RADIOMETRIC POWER (mW) $\Phi_v^{[1,2]}$ 1000mA	RADIATION PATTERN
WHITE	LXHL-LW3C	80	LAMBERTIAN
GREEN	LXHL-LM3C	80	
CYAN	LXHL-LE3C	80	
BLUE ^[3]	LXHL-LB3C	30	
ROYAL BLUE ^[4]	LXHL-LR3C	450 mW	
WHITE	LXHL-FW3C	70	SIDE EMITTING
GREEN	LXHL-FM3C	70	
BLUE ^[3]	LXHL-FB3C	27	

Optical Characteristics at 700mA, Junction Temperature, $T_J = 25^\circ\text{C}$

RADIATION PATTERN	COLOR	DOMINANT WAVELENGTH ⁽¹⁾ λ_D , PEAK WAVELENGTH ⁽²⁾ λ_P , OR COLOR TEMPERATURE ⁽³⁾ CCT			SPECTRAL HALF- WIDTH ⁽⁴⁾ (nm) $\Delta\lambda_{1/2}$	TEMP COEFFICIENT OF DOMINANT WAVELENGTH (nm/ $^\circ\text{C}$) $\Delta\lambda_D / \Delta T_J$	TOTAL INCLUDED ANGLE ⁽⁵⁾ (DEGREES) $\theta_{0.90V}$	VIEWING ANGLE ⁽⁶⁾ (DEGREES) $2\theta_{1/2}$
		MIN.	TYP.	MAX.				
LAMBERTIAN	WHITE	4500 K	5500 K	10000 K	---	---		
	GREEN	520 nm	530 nm	550 nm	35	0.04	160	140
	CYAN	490 nm	505 nm	520 nm	30	0.04	160	140
	BLUE	460 nm	470 nm	490 nm	25	0.04	160	140
	ROYAL BLUE ⁽²⁾	440 nm	455 nm	460 nm	20	0.04	160	140

Optical Characteristics at 700mA, Junction Temperature, $T_J = 25^\circ\text{C}$, Continued

RADIATION PATTERN	COLOR	DOMINANT WAVELENGTH ⁽¹⁾ λ_D , OR COLOR TEMPERATURE ⁽³⁾ CCT			SPECTRAL HALF- WIDTH ⁽⁴⁾ (nm) CUM Φ_{45°	TEMP COEFFICIENT OF DOMINANT WAVELENGTH (nm/ $^\circ\text{C}$) $\Delta\lambda_D / \Delta T_J$	TYPICAL TOTAL FLUX PERCENT WITHIN FIRST 45 ^o ⁽⁷⁾ CUM Φ_{45°	TYPICAL ANGLE OF PEAK INTENSITY ⁽⁸⁾ θ_{PEAK}
		MIN.	TYP.	MAX.				
SIDE EMITTING	WHITE	4500 K	5500 K	10000 K	---	---	< 15%	75 ^o - 85 ^o
	GREEN	520 nm	530 nm	550 nm	35	0.04	< 15%	75 ^o - 85 ^o
	BLUE	460 nm	470 nm	490 nm	20	0.04	< 15%	75 ^o - 85 ^o

Notes: (for both optical tables)

- Dominant wavelength is derived from the CIE 1931 Chromaticity diagram and represents the perceived color. Lumileds maintains a tolerance of $\pm 0.5\text{nm}$ for dominant wavelength measurements.
- Royal Blue product is binned by radiometric power and peak wavelength rather than photometric lumens and dominant wavelength. Lumileds maintains a tolerance of $\pm 2\text{nm}$ for peak wavelength measurements.
- CRI (Color Rendering Index) for White product types is 70. CRI for Warm White product type is 90 with typical Rg value of 70. CCT $\pm 5\%$ tester tolerance.
- Spectral width at $1/2$ of the peak intensity.
- Total angle at which 90% of total luminous flux is captured.
- $\theta_{1/2}$ is the off axis angle from lamp centerline where the luminous intensity is $1/2$ of the peak value.
- Cumulative flux percent within $\pm 45^\circ$ from optical axis.
- Off axis angle from lamp centerline where the luminous intensity reaches the peak value.
- All white, green, cyan, blue and royal blue products built with Indium Gallium Nitride (InGaN).
- Blue and Royal Blue power light sources represented here are IEC825 Class 2 for eye safety.

Electrical Characteristics at 700mA, Junction Temperature, $T_J = 25^\circ\text{C}$

COLOR	FORWARD VOLTAGE V_F (V) ^[1]			DYNAMIC RESISTANCE ^[2] (Ω) R_D	TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ^[3] (mV/ $^\circ\text{C}$) $\Delta V_F / \Delta T_J$	THERMAL RESISTANCE, JUNCTION TO CASE ($^\circ\text{C}/\text{W}$) $R_{\theta J-C}$
	MIN.	TYP.	MAX.			
WHITE	3.03	3.70	4.47	0.8	-2.0	17
GREEN	3.03	3.70	4.47	0.8	-2.0	17
CYAN	3.03	3.70	4.47	0.8	-2.0	17
BLUE	3.03	3.70	4.47	0.8	-2.0	17
ROYAL BLUE	3.03	3.70	4.47	0.8	-2.0	17

Notes:

1. Lumileds maintains a tolerance of $\pm 0.06\text{V}$ on forward voltage measurements.
2. Dynamic resistance is the inverse of the slope in linear forward voltage model for LEDs. See Figures 3a and 3b.
3. Measured between $25^\circ\text{C} \leq T_J \leq 110^\circ\text{C}$ at $I_F = 700\text{mA}$.

Typical Electrical Characteristics at 1000mA, Junction Temperature, $T_J = 25^\circ\text{C}$

COLOR	TYPICAL FORWARD VOLTAGE V_F (V) ^[1] 1000mA
WHITE	3.90
GREEN	3.90
CYAN	3.90
BLUE	3.90
ROYAL BLUE	3.90

Notes:

1. Proper current derating must be observed to maintain junction temperature below the maximum. For more information, consult the Luxeon Design Guide, available upon request.
2. Allowable board temperature to avoid exceeding maximum junction temperature at maximum V_f limit at 700 mA based on thermal resistance of Star assembly.
3. LEDs are not designed to be driven in reverse bias. Please consult Lumileds Application Brief AB11 for further information.

Absolute Maximum Ratings

PARAMETER	WHITE/GREEN/CYAN/ BLUE/ROYAL BLUE
DC FORWARD CURRENT (mA) ^[1]	1000
PEAK PULSED FORWARD CURRENT (mA)	1000
AVERAGE FORWARD CURRENT (mA)	1000
LED JUNCTION TEMPERATURE ($^\circ\text{C}$)	135
ALUMINUM-CORE PCB TEMPERATURE ($^\circ\text{C}$) ^[2]	70
STORAGE & OPERATING TEMPERATURE ($^\circ\text{C}$)	-40 to +120
ESD SENSITIVITY ^[3]	$\pm 16,000\text{V HBM}$

Wavelength Characteristics, $T_J = 25^\circ\text{C}$

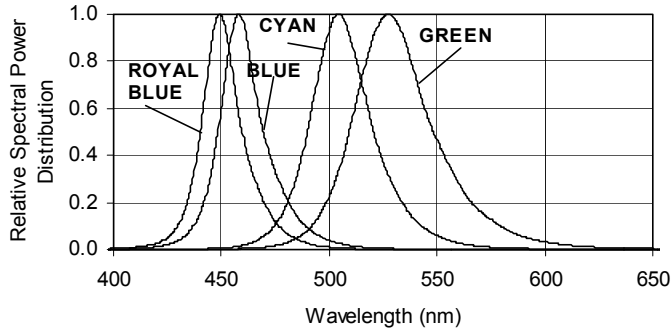


Figure 1a.
Relative Intensity vs. Wavelength.

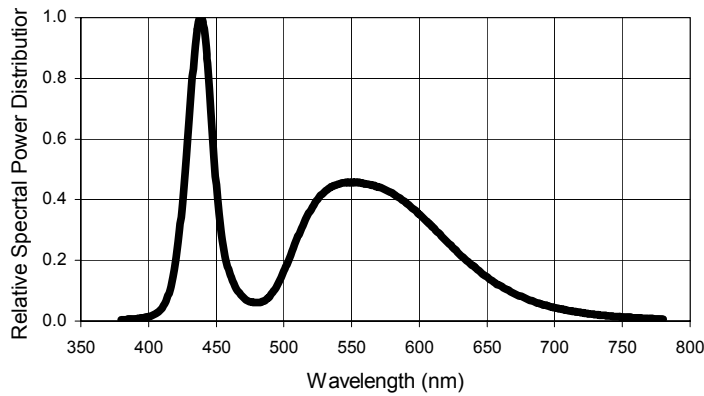


Figure 1b.
White Color Spectrum of Typical
5500K CCT Part, Integrated
Measurement.

Light Output Characteristics

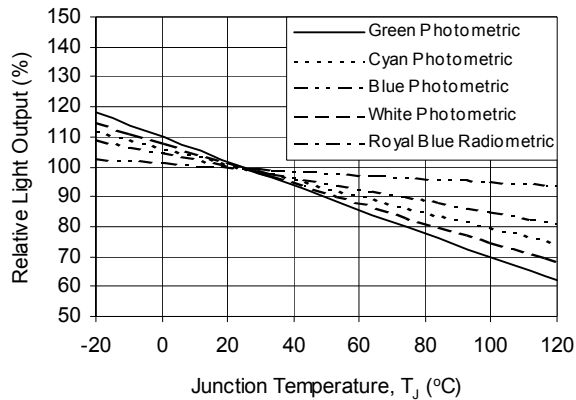
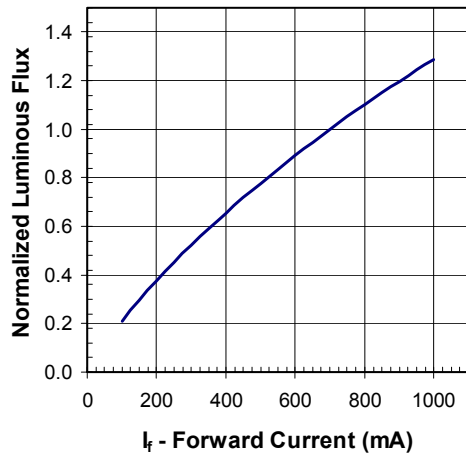
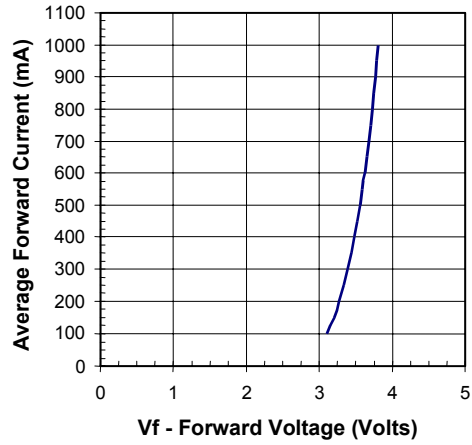


Figure 2.
Relative Light Output vs. Junction
Temperature for White, Green, Cyan, Blue
and Royal Blue.

Forward Current Characteristics, $T_J = 25^\circ\text{C}$



Note:

Driving these high power devices at currents less than the test conditions may produce unpredictable results and may be subject to variation in performance. Pulse width modulation (PWM) is recommended for dimming effects.

Figure 3.
Forward Current vs. Forward Voltage for White, Green, Cyan, Blue, and Royal Blue.

Figure 4.
Relative Luminous Flux vs. Forward Current for White, Green, Cyan, Blue, and Royal Blue at $T_J = 25^\circ\text{C}$ maintained.

Current Derating Curves

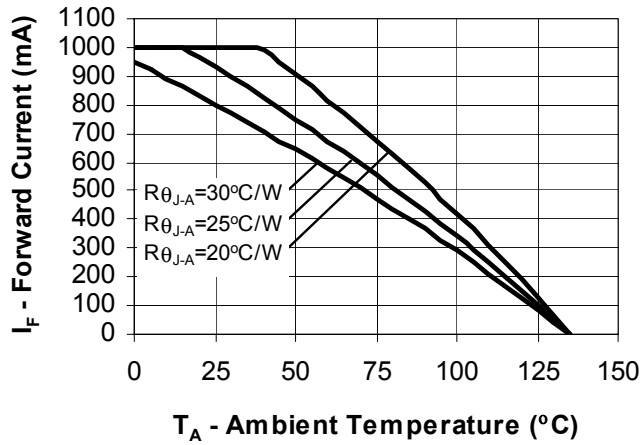


Figure 5. Maximum Forward Current vs. Ambient Temperature. Derating based on $T_{JMAX} = 135\text{ }^{\circ}\text{C}$ for White, Green, Cyan, Blue, and Royal Blue. Since Luxeon III may be driven at up to 1000mA, derating curves may not be applicable for all operating conditions.

Typical Representative Spatial Radiation Pattern

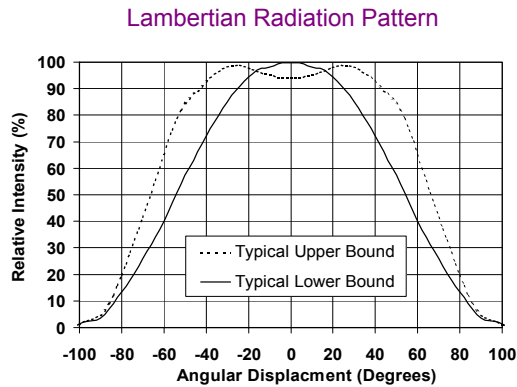


Figure 6. Typical Representative Spatial Radiation Pattern for Luxeon Emitter White, Green, Cyan, Blue and Royal Blue.

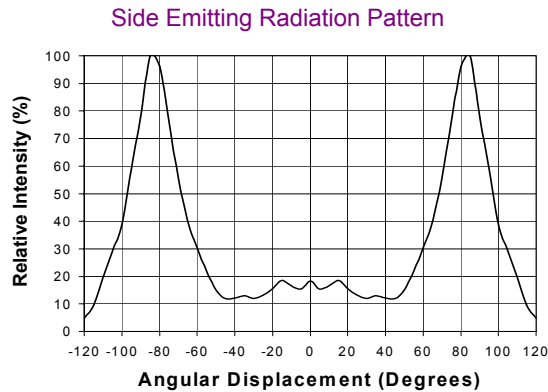


Figure 7. Typical Representative Spatial Radiation Pattern for Luxeon Emitter White, Green and Blue.

Note:

For more detailed technical information regarding Luxeon radiation patterns, please consult your Lumileds Authorized Distributor or Lumileds sales representative.

Average Lumen Maintenance Characteristics

Lifetime for solid-state lighting devices (LEDs) is typically defined in terms of lumen maintenance—the percentage of initial light output remaining after a specified period of time. Lumileds projects that Luxeon III products will deliver, on average, 70% lumen maintenance at 50,000 hours of operation at a 700 mA forward current or 50% lumen maintenance at 20,000 hours of operation at a 1000 mA forward current. This performance is based on independent test data, Lumileds historical data from tests run on similar material systems, and internal Luxeon reliability testing. This projection is based on constant current operation with junction temperature maintained at or below 90°C. Observation of design limits included in this data sheet is required in order to achieve this projected lumen maintenance.

About Luxeon



Luxeon is the new world of solid-state lighting (LED) technology. Luxeon Power Light Source Solutions offer huge advantages over conventional lighting and huge advantages over other LED solutions. Luxeon enables partners to create and market products that, until now, were impossible to create. This means the opportunity to create products with a clear competitive advantage in the market. Products that are smaller, lighter, sleeker, cooler, and brighter. Products that are more fun to use, more efficient, and more environmentally conscious than ever before possible!



Company Information

Luxeon is developed, manufactured and marketed by Lumileds Lighting, U.S., LLC. Lumileds is a world-class supplier of Light Emitting Diodes (LEDs) producing billions of LEDs annually. Lumileds is a fully integrated supplier, producing core LED material in all three base colors (Red, Green, Blue) and White. Lumileds has R&D development centers in San Jose, California and Best, The Netherlands. Production capabilities in San Jose, California and Malaysia.

Lumileds is pioneering the high-flux LED technology and bridging the gap between solid-state LED technology and the lighting world. Lumileds is absolutely dedicated to bringing the best and brightest LED technology to enable new applications and markets in the Lighting world.



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LUMILEDS

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