

# Luxeon™ 5-Watt Star power light source

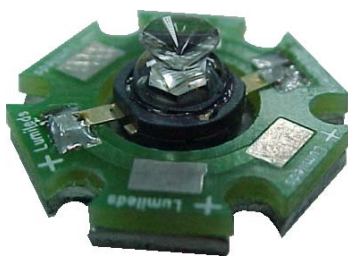
## Technical Data

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

The Luxeon 5-Watt offers extreme luminous density, providing lumens per package of 4X a Luxeon 1-Watt or up to 50X that of alternative solid state light sources creating new opportunities for solid state lighting to displace conventional lighting technologies.

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



Luxeon 5-Watt is available in white, green, blue, royal blue and cyan.

## Features

- Highest Flux per LED in the world – 4X the Flux of a comparable Luxeon 1-Watt and up to 50X the Flux of standard through hole LEDs
- Extreme Luminous Density – 20X the  $\text{lm}/\text{mm}^2$  of a standard through hole LED
- Very long operating life (up to 100k hours)
- Available in White, Green, Blue, Royal Blue, and Cyan
- Lambertian or Side Emitting Distribution Pattern
- 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

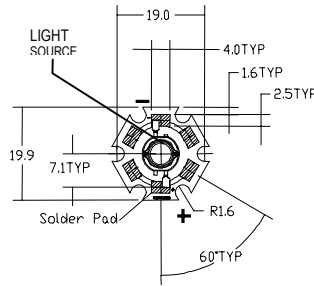
- Reading lights (car, bus, aircraft)
- Portable (flashlight, bicycle)
- Task and Accent Lighting
- Architectural Detail Lighting
- Decorative
- Fiber Optic Alternative
- Medical Applications
- Power Signaling / Airfield / Taxiway Lighting
- Edge-Lit Signs (Exit, Point Of Sale)
- LCD Backlights / Light Guides

# Mechanical Dimensions

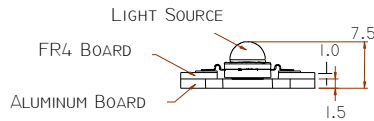
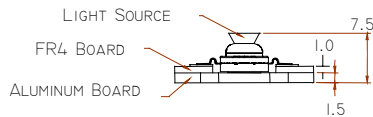
## Luxeon Star 5-Watt



Side Emitting



Lambertian (Dome)



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

COLOR	PART NUMBER	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-LW5C	87.4	120	LAMBERTIAN
GREEN	LXHL-LM5C	67.2	120	
CYAN	LXHL-LE5C	67.2	120	
BLUE <sup>[3]</sup>	LXHL-LB5C	18.1	30	
ROYAL BLUE <sup>[4]</sup>	LXHL-LR5C	275 mW	500 mW	
WHITE	LXHL-FW5C	87.4	110	SIDE EMITTING
GREEN	LXHL-FM5C	67.2	110	
CYAN	LXHL-FE5C	67.2	110	
BLUE <sup>[3]</sup>	LXHL-FB5C	18.1	27	
ROYAL BLUE <sup>[4]</sup>	LXHL-FR5C	275 mW	450 mW	

### 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. Drawings not to scale.
4. All dimensions are in millimeters.

### 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. Minimum 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 minimum of 13.9 lm at 460 nm to a typical of 40 lm at 480 nm 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.

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

RADIATION PATTERN	COLOR	DOMINANT WAVELENGTH <sup>[1]</sup> $\lambda_D$ , PEAK WAVELENGTH <sup>[2]</sup> $\lambda_P$ , OR COLOR TEMPERATURE <sup>[3]</sup> CCT			SPECTRAL HALF-WIDTH <sup>[4]</sup> $\Delta\lambda_{1/2}$ (nm)	TEMPERATURE COEFFICIENT OF DOMINANT WAVELENGTH $(\text{nm}/^\circ\text{C})$ $\Delta\lambda_D/\Delta T_J$
		MIN.	TYP.	MAX.		
LAMBERTIAN	WHITE	4500 K	5500 K	8000 K	----	----
	GREEN	520 nm	530 nm	550 nm	35	0.04
	CYAN	490 nm	505 nm	520 nm	30	0.04
	BLUE	460 nm	470 nm	490 nm	25	0.04
	ROYAL BLUE <sup>[21]</sup>	440 nm	455 nm	460 nm	20	0.04
SIDE EMITTING	WHITE	4500 K	5500 K	8000 K	----	----
	GREEN	520 nm	530 nm	550 nm	35	0.04
	CYAN	490 nm	505 nm	520 nm	30	0.04
	BLUE	460 nm	470 nm	490 nm	25	0.04
	ROYAL BLUE <sup>[21]</sup>	440 nm	455 nm	460 nm	20	0.04

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

RADIATION PATTERN	COLOR	TOTAL INCLUDED ANGLE <sup>[5]</sup> (DEGREE) $\theta_{0,90V}$	VIEWING ANGLE <sup>[6]</sup> (DEGREE) $2\theta_{1/2}$
		LAMBERTIAN	WHITE
GREEN	150		150
CYAN	150		150
BLUE	150		150
ROYAL BLUE	150		150

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

RADIATION PATTERN	COLOR	TYPICAL TOTAL FLUX PERCENT WITHIN FIRST $45^\circ$ <sup>[7]</sup> $\text{CUM } \Phi_{45^\circ}$	TYPICAL ANGLE OF PEAK INTENSITY <sup>[8]</sup> $\theta_{\text{PEAK}}$
		SIDE EMITTING	WHITE
GREEN	<30%		75° - 85°
CYAN	<30%		75° - 85°
BLUE	<30%		75° - 85°
ROYAL BLUE	<30%		75° - 85°

### Notes: (for three 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.
- 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. On axis peak may be higher than off axis peak.
- All products built with Indium Gallium Nitride (InGaN).
- All 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) <sup>[1]</sup>			DYNAMIC RESISTANCE <sup>[2]</sup> ( $\Omega$ ) $R_D$	TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE <sup>[3]</sup> (mV/ $^\circ\text{C}$ ) $\Delta V_F / \Delta T_J$	THERMAL RESISTANCE, JUNCTION TO BOARD ( $^\circ\text{C}/\text{W}$ ) $R_{\theta_{jB}}$
	MIN.	TYP.	MAX.			
WHITE	5.43	6.84	7.83	1.0	-4.0	
GREEN	5.43	6.84	7.83	1.0	-4.0	
CYAN	5.43	6.84	7.83	1.0	-4.0	
BLUE	5.43	6.84	7.83	1.0	-4.0	
ROYAL BLUE	5.43	6.84	7.83	1.0	-4.0	

### 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 Figure 3.
3. Measured between  $25^\circ\text{C} \leq T_J \leq 110^\circ\text{C}$  at  $I_F = 700\text{mA}$ .

## Absolute Maximum Ratings

PARAMETER	WHITE/GREEN/CYAN/ BLUE/ROYAL BLUE
DC FORWARD CURRENT (mA) <sup>[1]</sup>	700
PEAK PULSED FORWARD CURRENT (mA)	1000
AVERAGE FORWARD CURRENT (mA)	700
REVERSE VOLTAGE (V) <sup>[2]</sup>	> 5
LED JUNCTION TEMPERATURE ( $^\circ\text{C}$ )	135
ALUMINUM-CORE PCB TEMPERATURE ( $^\circ\text{C}$ ) <sup>[3]</sup>	75
STORAGE & OPERATING TEMPERATURE ( $^\circ\text{C}$ )	-40 to +105

### Notes:

1. Proper current derating must be observed to maintain junction temperature below the maximum. For more information, consult Luxeon Design Guide, available upon request.
2. Measured at  $I_F = 100 \mu\text{A}$ . LEDs are not designed to be driven in reverse bias. All products are not sensitive to ESD damage ( $\pm 16,000$  Volts by HBM condition).
3. Allowable MCPCB temperature to avoid exceeding maximum junction temperature at maximum  $V_F$  limit based on thermal resistance of Star assembly. MCPCB temperature is limited to  $105^\circ\text{C}$  based on the materials in the assembly.

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

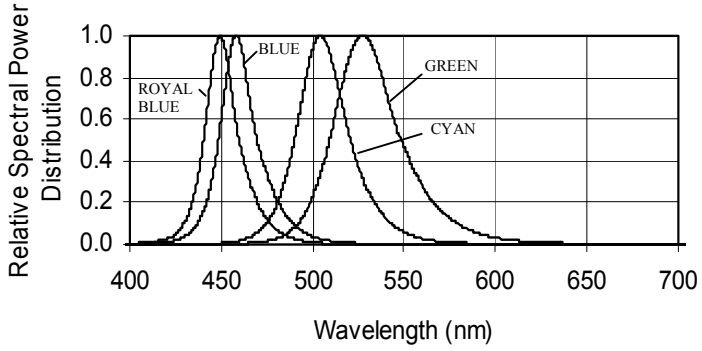


Figure 1a.  
Relative Intensity vs. Wavelength.

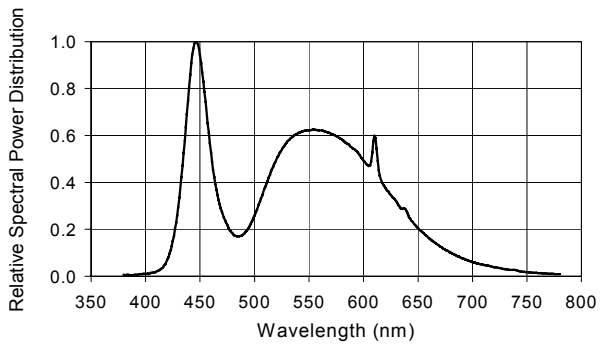


Figure 1b.  
White Color Spectrum.

## Light Output Characteristics

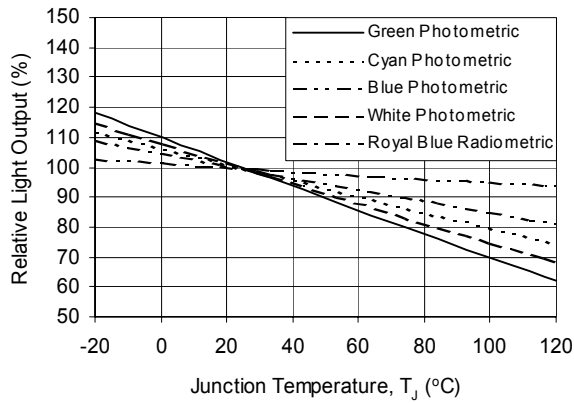


Figure 2.  
Relative Light Output vs. Junction Temperature for White, Green, Cyan, Blue and Royal Blue.

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

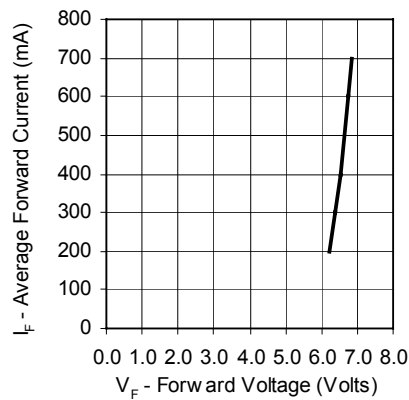


Figure 3.  
Forward Current vs. Forward Voltage for White, Green, Cyan, Blue, and Royal Blue.

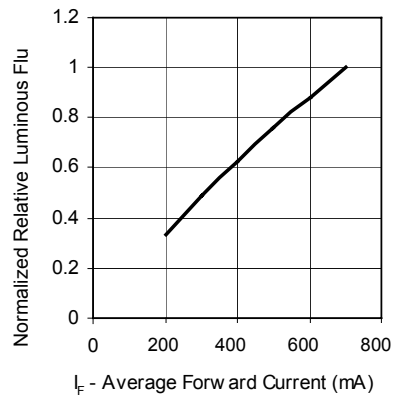
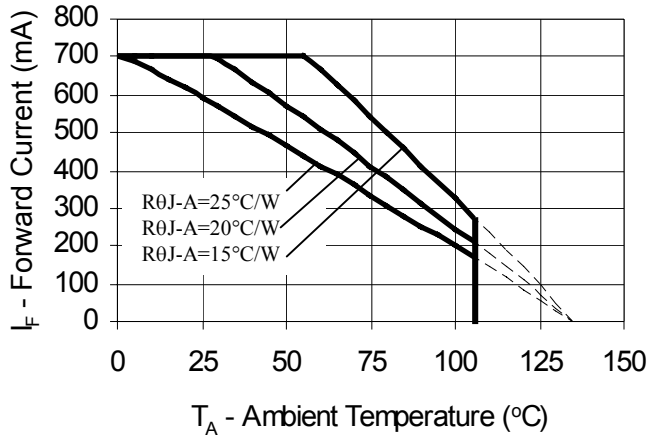


Figure 4.  
Relative Luminous Flux vs. Forward Current for White, Green, Cyan, Blue, and Royal Blue at  $T_j = 25^\circ\text{C}$  maintained.

## Current Derating Curve



Note:

Additional heatsinking is required, even for extremely brief periods. Please consult AB05, Luxeon Thermal Design Guide, for additional information.

Figure 5.  
Maximum Forward Current vs. Ambient Temperature. Derating based on  $T_{JMAX} = 135$  °C and  $T_{AMBIENT MAX} = 105$  °C.

## Average Lumen Maintenance Characteristics

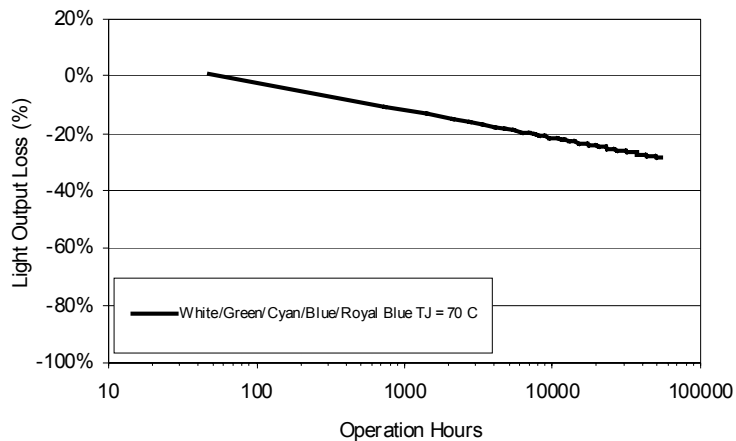


Figure 6.

Light Output vs. Time at  $I_f = 700$  mA, Relative Humidity less than 20%.

# Representative Spatial Radiation Pattern

## Lambertian Radiation Pattern

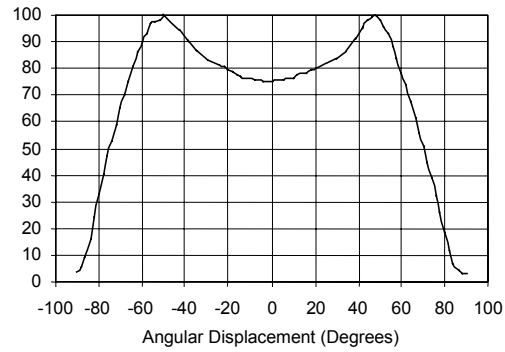


Figure 7a.  
Representative Spatial Radiation Pattern  
for Luxeon 5-Watt Green, Cyan, Blue  
and Royal Blue.

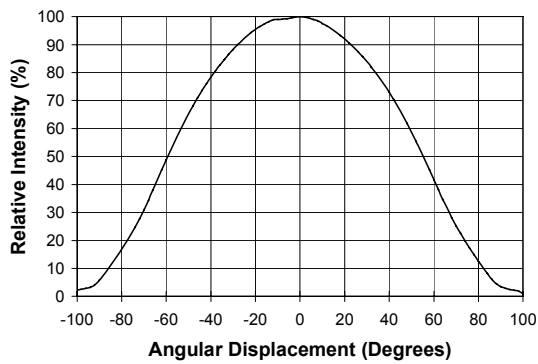


Figure 7b.  
Representative Spatial Radiation Pattern  
for Luxeon 5-Watt White.

## Side Emitting Radiation Pattern

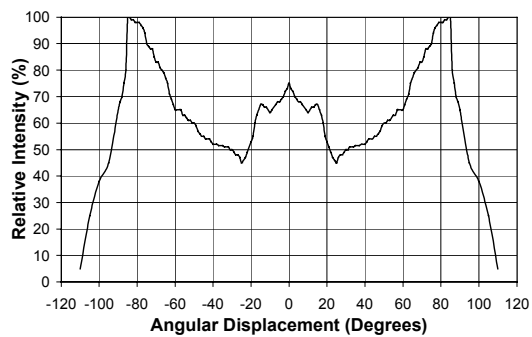


Figure 8.  
Representative Spatial Radiation Pattern  
for Luxeon 5-Watt White, Green, Cyan,  
Blue and Royal Blue.

## 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, 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.



Lumileds may make process or materials changes affecting the performance or other characteristics of Luxeon. These products supplied after such change will continue to meet published specifications, but may not be identical to products supplied as samples or under prior orders.

### LUMILEDS

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