

# Luxeon™ 1-Watt Emitter

power light source

## Technical Data DS25

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 Emitters give you total design freedom and unmatched brightness, creating a new world of light.

Luxeon Emitters can be purchased in reels for high volume assembly.

Sample kits are also available for prototyping and design evaluation.

A sample kit contains a strip of 50 taped emitters. To order a sample kit, add a "K" to the end of the emitter part number (for example, LXHL-BW01K). For more information, consult your local Lumileds representative.

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



Luxeon Emitter is available in white, green, blue, royal blue, cyan, red, red-orange and amber.

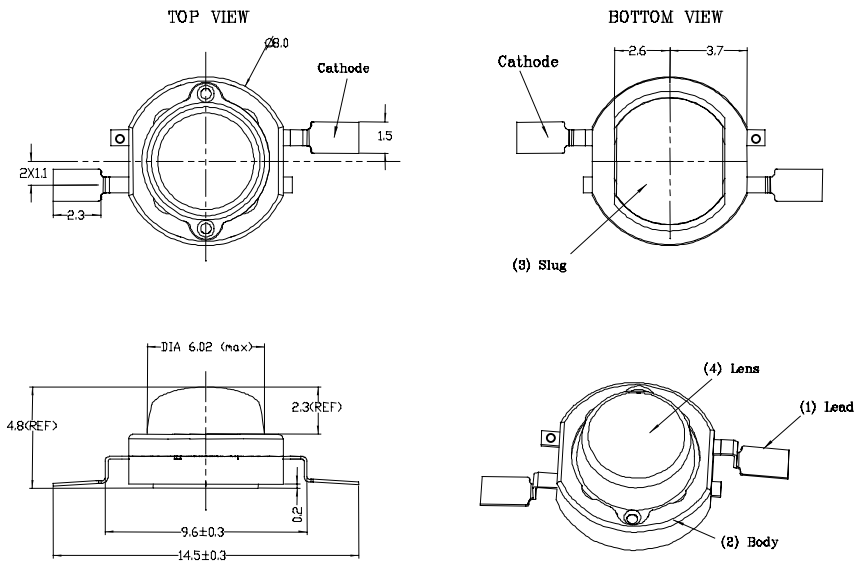
### Features

- Highest Flux per LED family in the world
- Very long operating life (up to 100k hours)
- Available in White, Green, Blue, Royal Blue, Cyan, Red, Red-Orange and Amber
- Lambertian, Batwing or Side Emitting radiation 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)
- 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
- Automotive Exterior (Stop-Tail-Turn, CHMSL, Mirror Side Repeat)
- Edge-Lit Signs (Exit, Point Of Sale)
- LCD Backlights / Light Guides

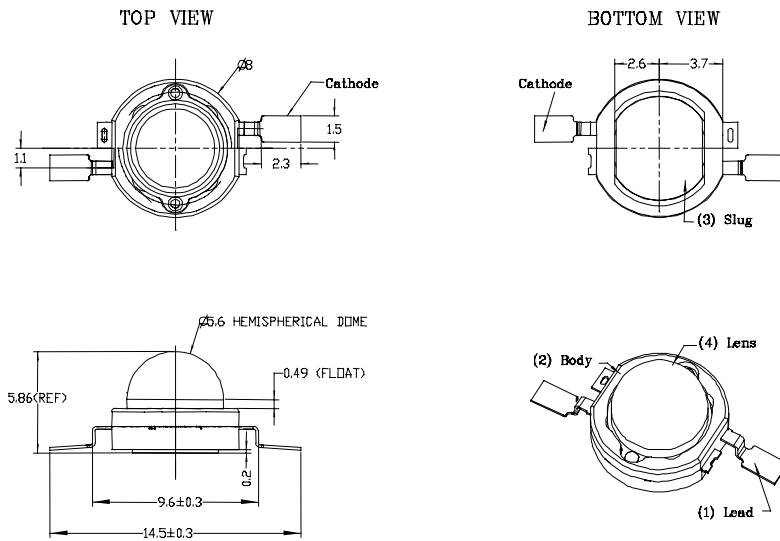
# Mechanical Dimensions



## Batwing (Low Dome)

### Notes:

1. The anode side of the device is denoted by a hole in the lead frame. Electrical insulation between the case and the board is required – slug of device is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.
2. Drawings not to scale.
3. All dimensions are in millimeters.
4. All dimensions without tolerances are for reference only.

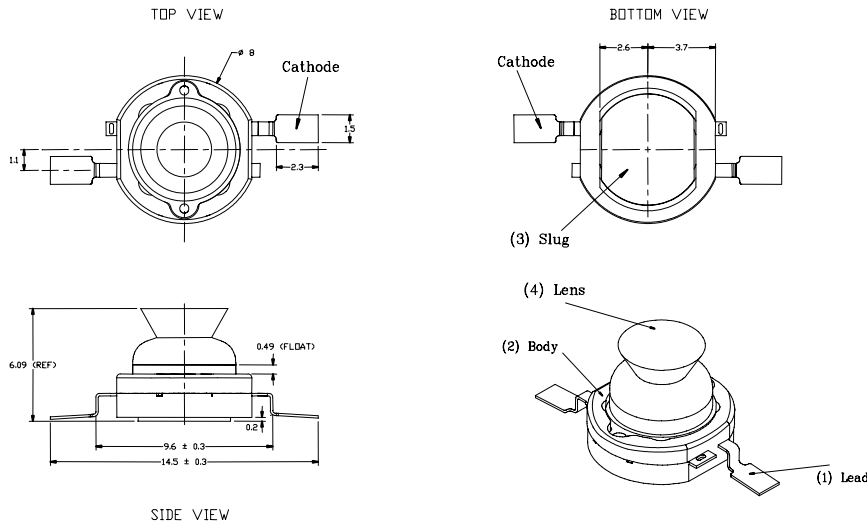


## Lambertian (High Dome)

### Notes:

1. The anode side of the device is denoted by a hole in the lead frame. Electrical insulation between the case and the board is required – slug of device is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.
2. Drawings not to scale.
3. All dimensions are in millimeters.
4. All dimensions without tolerances are for reference only.

# Mechanical Dimensions



## Side Emitting

### Notes:

1. The anode side of the device is denoted by a hole in the lead frame. Electrical insulation between the case and the board is required – slug of device is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.
2. Caution must be used in handling this device to avoid damage to the lens surfaces that will reduce optical efficiency.
3. Drawings not to scale.
4. All dimensions are in millimeters.
5. All dimensions without tolerances are for reference only.

## Flux Characteristics at 350mA, 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-BWO I	13.9	18	BATWING (LOW DOME)
GREEN	LXHL-BMO I	13.9	25	
CYAN	LXHL-BEO I	13.9	30	
BLUE <sup>[3]</sup>	LXHL-BBO I	3.8	5	
ROYAL BLUE <sup>[4]</sup>	LXHL-BRO2	55 MW	100 MW	
RED	LXHL-BDO I	13.9	25	
AMBER	LXHL-BLO I	10.7	20	
WHITE	LXHL-PWO I	13.9	18	LAMBERTIAN (HIGH DOME)
GREEN	LXHL-PMO I	13.9	25	
CYAN	LXHL-PEO I	13.9	30	
BLUE <sup>[3]</sup>	LXHL-PBO I	3.8	5	
ROYAL BLUE <sup>[4]</sup>	LXHL-PRO3	55 MW	100 MW	
RED	LXHL-PDO I	30.6	44	
RED-ORANGE	LXHL-PHO I	39.8	55	
AMBER	LXHL-PLO I	23.5	36	
WHITE	LXHL-DWO I	13.9	16	SIDE EMITTING
GREEN	LXHL-DMO I	13.9	23	
CYAN	LXHL-DEO I	13.9	27	
BLUE <sup>[3]</sup>	LXHL-DBO I	3.8	5	
ROYAL BLUE <sup>[4]</sup>	LXHL-DRO I	55 MW	90 MW	
RED	LXHL-DDO I	30.6	40	
AMBER	LXHL-DLO I	23.5	32	

### 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 2.9 lm at 460 nm to a typical of 8 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 350mA, Junction Temperature, T<sub>J</sub> = 25°C

RADIATION PATTERN	COLOR	DOMINANT WAVELENGTH <sup>[11]</sup> λ <sub>D</sub> , PEAK WAVELENGTH <sup>[21]</sup> λ <sub>P</sub> , OR COLOR TEMPERATURE <sup>[31]</sup> CCT			SPECTRAL HALF- WIDTH <sup>[41]</sup> (NM) Δλ <sub>1/2</sub>	TEMP COEFFICIENT OF DOMINANT WAVELENGTH (NM/°C) Δλ <sub>D</sub> / ΔT <sub>J</sub>	TOTAL INCLUDED ANGLE <sup>[51]</sup> (DEGREES) θ <sub>0.90V</sub>	VIEWING ANGLE <sup>[61]</sup> (DEGREES) 2θ 1/2
		MIN.	TYP.	MAX.				
BATWING (LOW DOME)	WHITE	4500 K	5500 K	8000 K	---	---	110	110
	GREEN	520 NM	530 NM	550 NM	35	0.04	110	110
	CYAN	490 NM	505 NM	520 NM	30	0.04	110	110
	BLUE	460 NM	470 NM	490 NM	25	0.04	110	110
	ROYAL BLUE <sup>[21]</sup>	440 NM	455 NM	460 NM	20	0.04	110	110
	RED	620.5 NM	625 NM	645 NM	20	0.05	110	110
	AMBER	584.5 NM	590 NM	597 NM	14	0.09	110	110
	LAMBERTIAN (HIGH DOME)	WHITE	4500 K	5500 K	8000 K	---	---	160
	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 <sup>[21]</sup>	440 NM	455 NM	460 NM	20	0.04	160	140
	RED	620.5 NM	627 NM	645 NM	20	0.05	160	140
	ORANGE	613.5 NM	617 NM	620.5 NM	20	0.06	160	140
	AMBER	584.5 NM	590 NM	597 NM	14	0.09	160	140

## Optical Characteristics at 350mA, Junction Temperature, T<sub>J</sub> = 25°C, Continued

RADIATION PATTERN	COLOR	DOMINANT WAVELENGTH <sup>[11]</sup> λ <sub>D</sub> , PEAK WAVELENGTH <sup>[21]</sup> λ <sub>P</sub> , OR COLOR TEMPERATURE <sup>[31]</sup> CCT			SPECTRAL HALF- WIDTH <sup>[41]</sup> (NM) Δλ <sub>1/2</sub>	TEMP COEFFICIENT OF DOMINANT WAVELENGTH (NM/°C) Δλ <sub>D</sub> / ΔT <sub>J</sub>	TYPICAL TOTAL FLUX PERCENT WITHIN FIRST 45° <sup>[71]</sup> CUM Φ <sub>45°</sub>	TYPICAL ANGLE OF PEAK INTENSITY <sup>[81]</sup> θ <sub>PEAK</sub>
		MIN.	TYP.	MAX.				
SIDE EMITTING	WHITE	4500 K	5500 K	8000 K	---	---	< 15%	75° - 85°
	GREEN	520 NM	530 NM	550 NM	35	0.04	< 15%	75° - 85°
	CYAN	490 NM	505 NM	520 NM	30	0.04	< 15%	75° - 85°
	BLUE	460 NM	470 NM	490 NM	25	0.04	< 15%	75° - 85°
	ROYAL BLUE <sup>[21]</sup>	440 NM	455 NM	460 NM	20	0.04	< 15%	75° - 85°
	RED	620.5 NM	627 NM	645 NM	20	0.05	< 15%	75° - 85°
	AMBER	584.5 NM	590 NM	597 NM	14	0.09	< 15%	75° - 85°

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 ± 0.5nm 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 ± 2nm for peak wavelength measurements.
- CRI (Color Rendering Index) for White product types is 70. CCT ±5% tester tolerance.
- Spectral width at ½ of the peak intensity.
- Total angle at which 90% of total luminous flux is captured.
- θ½ is the off axis angle from lamp centerline where the luminous intensity is ½ of the peak value.
- Cumulative flux percent within ± 45° from optical axis.
- Off axis angle from lamp centerline where the luminous intensity reaches the peak value.
- All red, red-orange and amber products built with Aluminum Indium Gallium Phosphide (AlInGaP).
- 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 350mA, Junction Temperature, $T_J = 25^\circ\text{C}$

RADIATION PATTERN	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.			
BATWING (LOW DOME)	WHITE	2.79	3.42	3.99	1.0	-2.0	15
	GREEN	2.79	3.42	3.99	1.0	-2.0	15
	CYAN	2.79	3.42	3.99	1.0	-2.0	15
	BLUE	2.79	3.42	3.99	1.0	-2.0	15
	ROYAL BLUE	2.79	3.42	3.99	1.0	-2.0	15
	RED	2.31	2.85	3.27	2.4	-2.0	15
	AMBER	2.31	2.85	3.27	2.4	-2.0	15
LAMBERTIAN (HIGH DOME)	WHITE	2.79	3.42	3.99	1.0	-2.0	15
	GREEN	2.79	3.42	3.99	1.0	-2.0	15
	CYAN	2.79	3.42	3.99	1.0	-2.0	15
	BLUE	2.79	3.42	3.99	1.0	-2.0	15
	ROYAL BLUE	2.79	3.42	3.99	1.0	-2.0	15
	RED	2.31	2.95	3.51	2.4	-2.0	18
	RED-ORANGE	2.31	2.95	3.51	2.4	-2.0	18
	AMBER	2.31	2.95	3.51	2.4	-2.0	18
SIDE EMITTING	WHITE	2.79	3.42	3.99	1.0	-2.0	15
	GREEN	2.79	3.42	3.99	1.0	-2.0	15
	CYAN	2.79	3.42	3.99	1.0	-2.0	15
	BLUE	2.79	3.42	3.99	1.0	-2.0	15
	ROYAL BLUE	2.79	3.42	3.99	1.0	-2.0	15
	RED	2.31	2.95	3.51	2.4	-2.0	18
	AMBER	2.31	2.95	3.51	2.4	-2.0	18

## 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  $I_F = 350\text{mA}$ .

# Absolute Maximum Ratings

PARAMETER	WHITE/GREEN/CYAN/ BLUE/ROYAL BLUE	RED/AMBER/ RED-ORANGE
DC FORWARD CURRENT (mA) <sup>[1]</sup>	350	385
PEAK PULSED FORWARD CURRENT (mA)	500	550
AVERAGE FORWARD CURRENT (mA)	350	350
REVERSE VOLTAGE (V) <sup>[2]</sup>	> 5	> 5
LED JUNCTION TEMPERATURE ( $^\circ\text{C}$ )	120	120
STORAGE TEMPERATURE ( $^\circ\text{C}$ )	-40 to +120	-40 to +120
SOLDERING TEMPERATURE ( $^\circ\text{C}$ ) <sup>[3]</sup>	260 FOR 5 SECONDS MAX	260 FOR 5 SECONDS MAX

## 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. 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. Measured at leads, during lead soldering and slug attach, body temperature must not exceed  $120^\circ\text{C}$ . Luxeon emitters cannot be soldered by general IR or Vapor-phase reflow, nor by wave soldering. Lead soldering is limited to selective heating of the leads, such as by hot-bar reflow, fiber focussed IR, or hand soldering. The package back plane (slug) may not be attached by soldering, but rather with a thermally conductive adhesive. Electrical insulation between the slug and the board is required. Please consult Lumileds' Application Brief AB10 on Luxeon Emitter Assembly Information for further details on assembly methods.

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

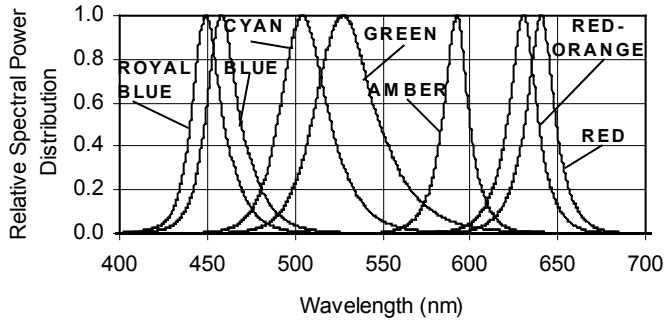


Figure 1a.  
Relative Intensity vs. Wavelength

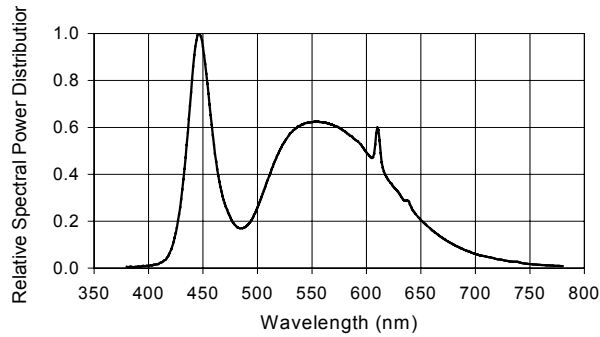


Figure 1b.  
White Color Spectrum.

## Light Output Characteristics

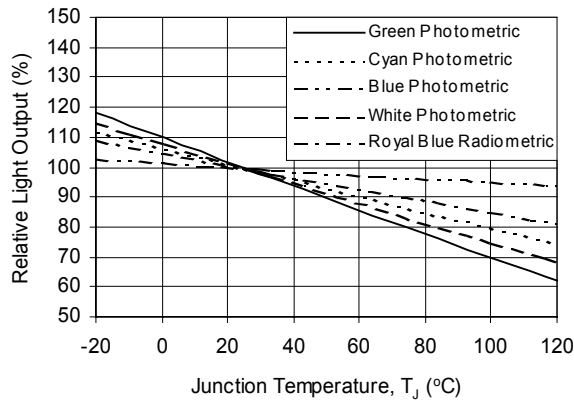


Figure 2a.  
Relative Light Output vs. Junction Temperature for White, Green, Cyan, Blue and Royal Blue.

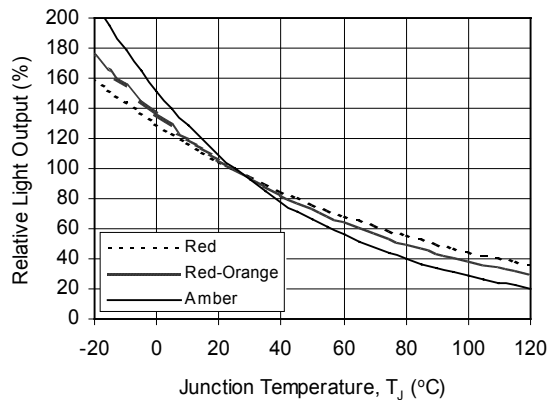


Figure 2b.  
Relative Light Output vs. Junction Temperature for Red, Red-Orange and Amber.

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

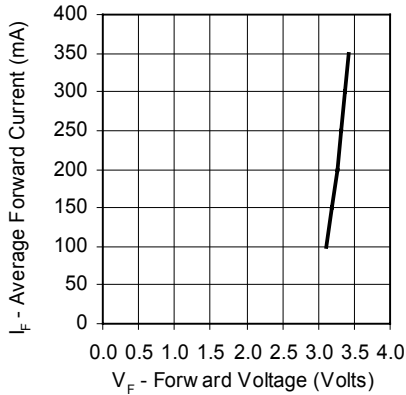


Figure 3a.  
Forward Current vs. Forward Voltage for White, Green, Cyan, Blue, and Royal Blue.

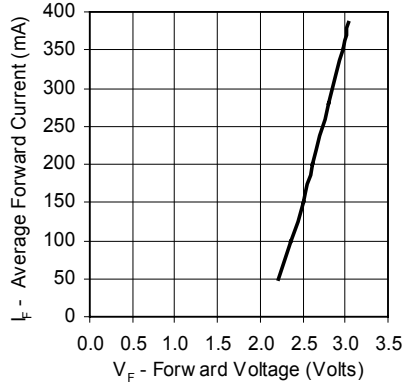


Figure 3b.  
Forward Current vs. Forward Voltage for Red, Red-Orange and Amber.

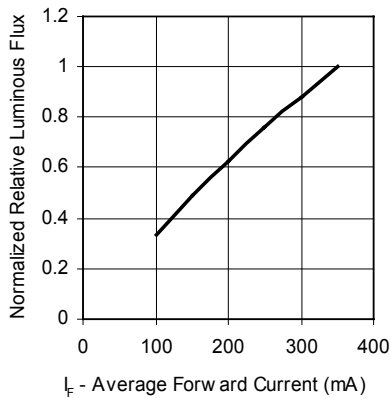


Figure 4a.  
Relative Luminous Flux vs. Forward Current for White, Green, Cyan, Blue, and Royal Blue at  $T_J = 25^\circ\text{C}$  maintained.

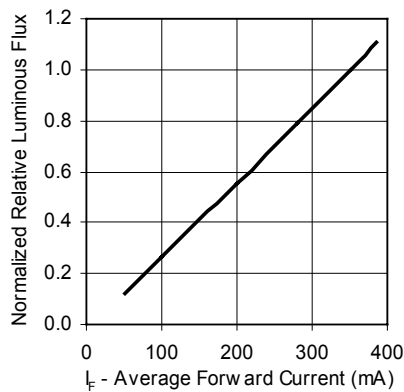


Figure 4b.  
Relative Luminous Flux vs. Forward Current for Red, Red-Orange and Amber at  $T_J = 25^\circ\text{C}$  maintained.

### 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.

## Current Derating Curves

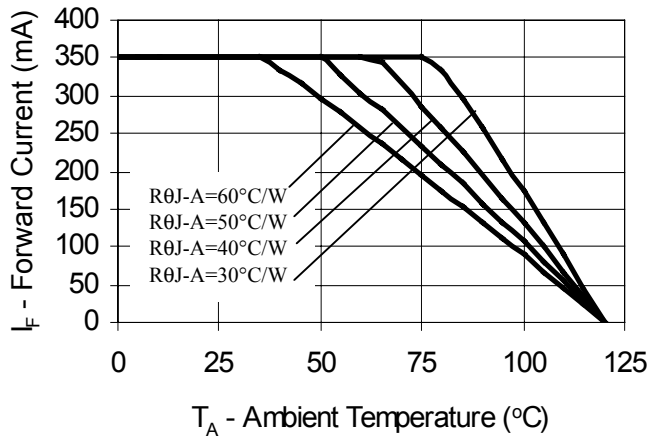


Figure 5a.  
Maximum Forward Current vs. Ambient Temperature. Derating based on  $T_{JMAX} = 120^{\circ}\text{C}$  for White, Green, Cyan, Blue, and Royal Blue.

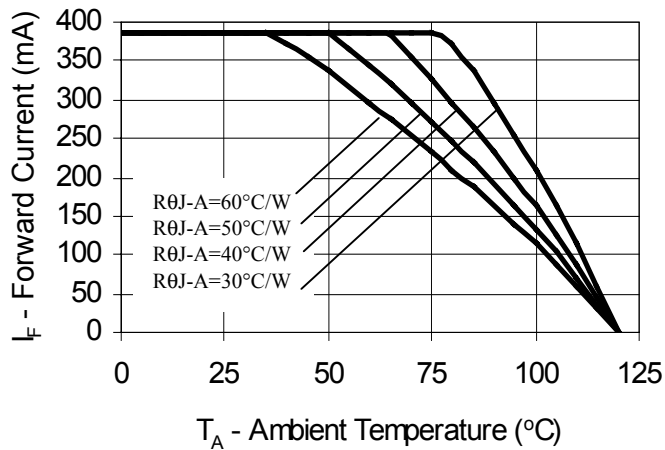


Figure 5b.  
Maximum Forward Current vs. Ambient Temperature. Derating based on  $T_{JMAX} = 120^{\circ}\text{C}$  for Red, Red-Orange and Amber.



# Representative Spatial Radiation Pattern

## Batwing Radiation Pattern

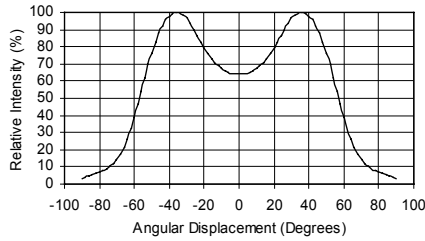


Figure 6a.  
Representative Spatial Radiation Pattern for Luxeon Emitter White.

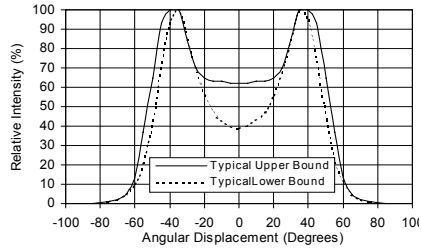


Figure 6b.  
Representative Spatial Radiation Pattern for Luxeon Emitter Red, Amber, Green, Cyan, Blue and Royal Blue.

## Lambertian Radiation Pattern

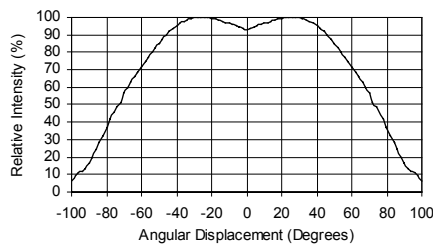


Figure 7a.  
Representative Spatial Radiation Pattern for Luxeon Emitter Red, Red-Orange and Amber.

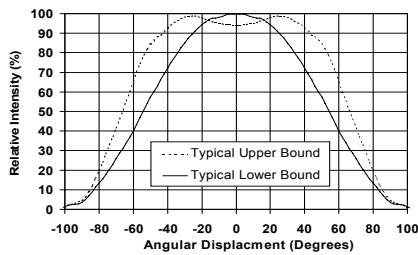


Figure 7b.  
Representative Spatial Radiation Pattern for Luxeon Emitter White, Green, Cyan, Blue and Royal Blue.

## Side Emitting Radiation Pattern

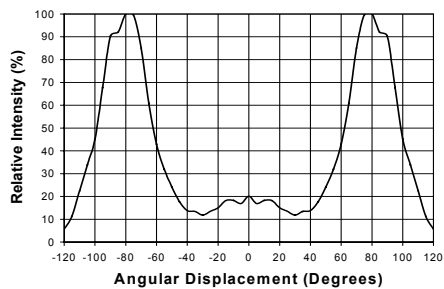


Figure 8a.  
Representative Spatial Radiation Pattern for Luxeon Emitter Red and Amber

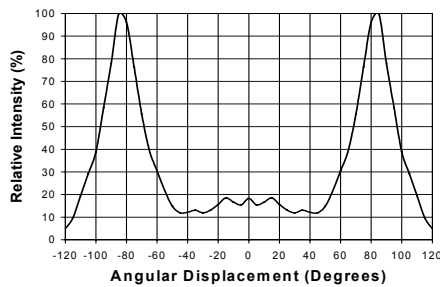


Figure 8b.  
Representative Spatial Radiation Pattern for Luxeon Emitter White, Green, Cyan, Blue and Royal Blue

### Note:

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

# Average Lumen Maintenance Characteristics

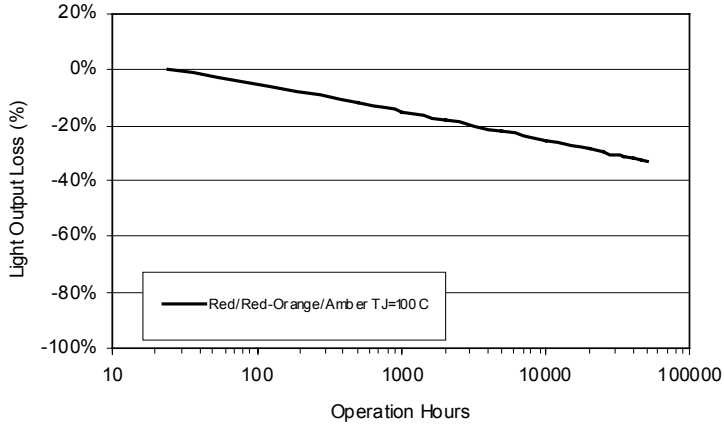


Figure 9.  
Light Output vs. Time for Amber, Red-Orange and Red at I<sub>f</sub> 385mA.

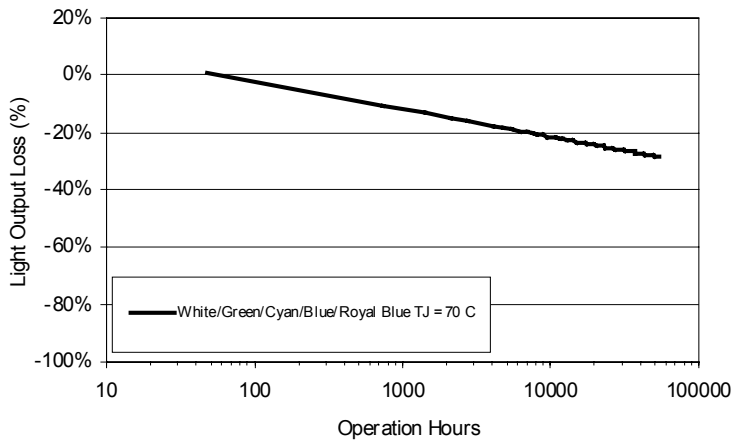


Figure 10.  
Light Output vs. Time for White, Green, Cyan, Blue and Royal Blue at I<sub>f</sub> 350mA, Relative Humidity less than 20%.

# Emitter Reel Packaging

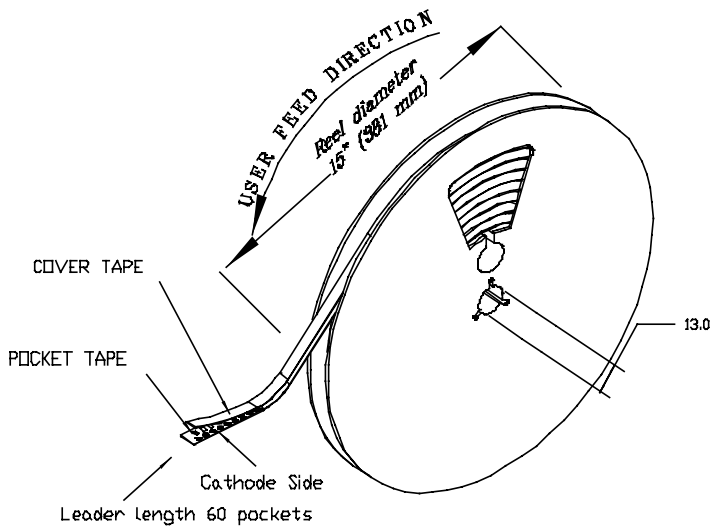


Figure 11.  
Reel dimensions and orientation.

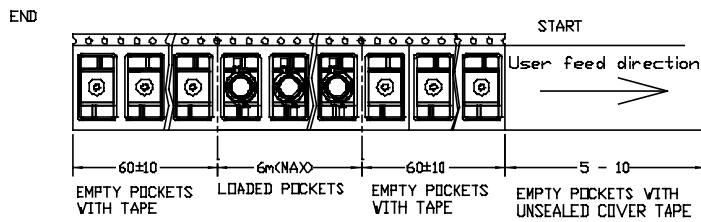
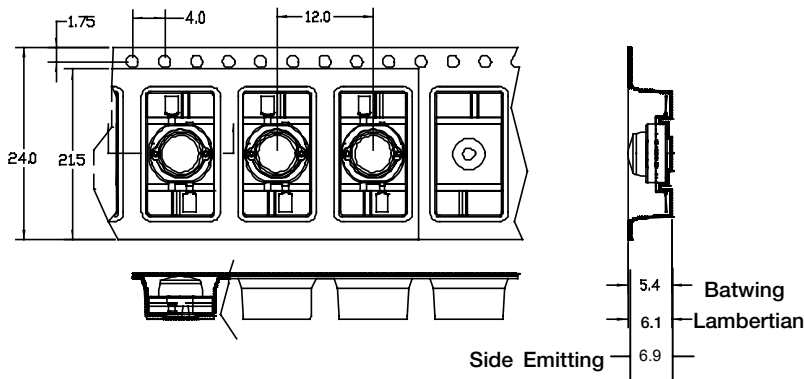


Figure 12.  
Tape dimensions.



**Notes:**

1. Luxeon emitters should be picked up by the body (not the lens) during placement. The inner diameter of the pick-up collet should be greater than or equal to 6.5 mm. Please consult Lumileds' Application Brief AB10 on Luxeon Emitter assembly information for further details on assembly methods.
2. Drawings not to scale.
3. All dimensions are in millimeters.
4. All dimensions without tolerances are for reference only.

## 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.



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### LUMILEDS

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[www.lumileds.com](http://www.lumileds.com)

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