

## High Luminous Efficacy Infrared LED Emitter **LZ4-00R400**



### Key Features

- High Efficacy 10W Infrared LED
- Ultra-small foot print – 7.0mm x 7.0mm x 4.3mm
- Surface mount ceramic package with integrated glass lens
- Very low Thermal Resistance (1.1°C/W)
- Individually addressable die
- Very high Radiant Flux density
- Autoclave compliant (JEDEC JESD22-A102-C)
- JEDEC Level 1 for Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant
- Reflow solderable (up to 6 cycles)
- Emitter available on [Standard](#) or [Serially Connected](#) MCPCB (optional)

### Typical Applications

- Inspection
- Security lighting

### Description

The LZ4-00R400 Infrared LED emitter provides 10W power in an extremely small package. With a 7.0mm x 7.0mm x 4.3mm ultra-small footprint, this package provides exceptional radiant flux density. The patent-pending design has unparalleled thermal and optical performance. The high quality materials used in the package are chosen to optimize light output and minimize stresses which results in monumental reliability and lumen maintenance. The robust product design thrives in outdoor applications with high ambient temperatures and high humidity.

## Product Nomenclature

The LZ Series part number designation is defined as follows:

**L Z A – B C D E F G**

Where:

A – designates the number of LED die in the package (“4” for 4-die)

B – designates the package level (“0” for Emitter, 4 for emitter on a 1-channel star MCPCB, 2 for emitter on a 4-channel star MCPCB)

C – designates the radiation pattern (“0” for Lambertian)

D and E – designate the color (“R4” for Infrared – 850nm Peak Wavelength)

F and G – designate “00”

Ordering information:

For ordering LedEngin products, please reference the base part number. The base part number represents any of the flux, dominant wavelength, or forward voltage bins specified in the binning tables below. For ordering products with special bin selections, please contact a LedEngin sales representative or authorized distributor.

## IPC/JEDEC Moisture Sensitivity Level

Table 1 - IPC/JEDEC J-STD-20 MSL Classification:

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard Time (hrs)	Standard Conditions	Accelerated Time (hrs)	Accelerated Conditions
1	1 Year	≤ 30°C/ 85% RH	168 +5/-0	85°C/ 85% RH	n/a	n/a

Notes for Table 1:

1. The standard soak time is the sum of the default value of 24 hours for the semiconductor manufacturer’s exposure time (MET) between bake and bag and the floor life of maximum time allowed out of the bag at the end user of distributor’s facility.

## Average Radiant Flux Maintenance Projections

Based on long-term WHTOL testing, LedEngin projects that the LZ Series will deliver, on average, 70% Radiant Flux Maintenance at 100,000 hours of operation at a forward current of 1000 mA. This projection is based on constant current operation with junction temperature maintained at or below 110°C.

## Radiant Flux Bins

Table 2:

<b>Bin Code</b>	<b>Minimum Radiant Flux (<math>\Phi</math>) @ <math>I_F = 700\text{mA}</math><sup>[1,2]</sup> (W)</b>	<b>Maximum Radiant Flux (<math>\Phi</math>) @ <math>I_F = 700\text{mA}</math><sup>[1,2]</sup> (W)</b>
N	1.2	1.6
P	1.6	2.0
Q	2.0	2.4

Notes for Table 2:

1. Radiant flux performance guaranteed within published operating conditions. LedEngin maintains a tolerance of  $\pm 10\%$  on flux measurements.
2. Future products will have even higher levels of radiant flux performance. Contact LedEngin Sales for updated information.

## Peak Wavelength Bin

Table 3:

<b>Bin Code</b>	<b>Minimum Peak Wavelength (<math>\lambda_P</math>) @ <math>I_F = 700\text{mA}</math><sup>[1]</sup> (nm)</b>	<b>Maximum Peak Wavelength (<math>\lambda_P</math>) @ <math>I_F = 700\text{mA}</math><sup>[1]</sup> (nm)</b>
0	840	870

Notes for Table 3:

1. LedEngin maintains a tolerance of  $\pm 2.0\text{nm}$  on peak wavelength measurements.

## Forward Voltage Bins

Table 4:

<b>Bin Code</b>	<b>Minimum Forward Voltage (<math>V_F</math>) @ <math>I_F = 700\text{mA}</math><sup>[1,2]</sup> (V)</b>	<b>Maximum Forward Voltage (<math>V_F</math>) @ <math>I_F = 700\text{mA}</math><sup>[1,2]</sup> (V)</b>
0	7.04	10.88

Notes for Table 4:

1. Forward Voltage is binned with all four LED dice connected in series.
2. LedEngin maintains a tolerance of  $\pm 0.16\text{V}$  for forward voltage measurements for the four LEDs.

## Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current at $T_{jmax}=100^{\circ}\text{C}$ <sup>[1]</sup>	$I_F$	1200	mA
DC Forward Current at $T_{jmax}=125^{\circ}\text{C}$ <sup>[1]</sup>	$I_F$	1000	mA
Peak Pulsed Forward Current <sup>[2]</sup>	$I_{FP}$	1500	mA
Reverse Voltage	$V_R$	See Note 3	V
Storage Temperature	$T_{stg}$	-40 ~ +125	$^{\circ}\text{C}$
Junction Temperature	$T_J$	125	$^{\circ}\text{C}$
Soldering Temperature <sup>[4]</sup>	$T_{sol}$	260	$^{\circ}\text{C}$
Allowable Reflow Cycles		6	
Autoclave Conditions <sup>[5]</sup>		121 $^{\circ}\text{C}$ at 2 ATM, 100% RH for 168 hours	
ESD Sensitivity <sup>[6]</sup>		> 8,000 V HBM Class 3B JESD22-A114-D	

Notes for Table 5:

- Maximum DC forward current (per die) is determined by the overall thermal resistance and ambient temperature. Follow the curves in Figure 10 for current derating.
- Pulse forward current conditions: Pulse Width  $\leq$  10msec and Duty Cycle  $\leq$  10%.
- LEDs are not designed to be reverse biased.
- Solder conditions per JEDEC 020D. See Reflow Soldering Profile Figure 3.
- Autoclave Conditions per JEDEC JESD22-A102-C.
- LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00R400 in an electrostatic protected area (EPA). An EPA may be adequately protected by ESD controls as outlined in ANSI/ESD S6.1.

## Optical Characteristics @ $T_C = 25^{\circ}\text{C}$

Table 6:

Parameter	Symbol	Typical	Unit
Radiant Flux (@ $I_F = 700\text{mA}$ ) <sup>[1]</sup>	$\Phi$	1.5	W
Radiant Flux (@ $I_F = 1000\text{mA}$ ) <sup>[1]</sup>	$\Phi$	2.0	W
Peak Wavelength	$\lambda_P$	850	nm
Viewing Angle <sup>[2]</sup>	$2\Theta_{1/2}$	95	Degrees
Total Included Angle <sup>[3]</sup>	$\Theta_{0.9}$	110	Degrees

Notes for Table 6:

- Radiant flux typical value is for all four LED dice operating concurrently at rated current.
- Viewing Angle is the off axis angle from emitter centerline where the radiant power is  $\frac{1}{2}$  of the peak value.
- Total Included Angle is the total angle that includes 90% of the total radiant flux.

## Electrical Characteristics @ $T_C = 25^{\circ}\text{C}$

Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ $I_F = 700\text{mA}$ ) <sup>[1]</sup>	$V_F$	7.4	V
Forward Voltage (@ $I_F = 1000\text{mA}$ ) <sup>[1]</sup>	$V_F$	8.0	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-8.0	mV/ $^{\circ}\text{C}$
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	1.1	$^{\circ}\text{C}/\text{W}$

Notes for Table 7:

- Forward Voltage typical value is for all four LED dice connected in series.

## Mechanical Dimensions (mm)

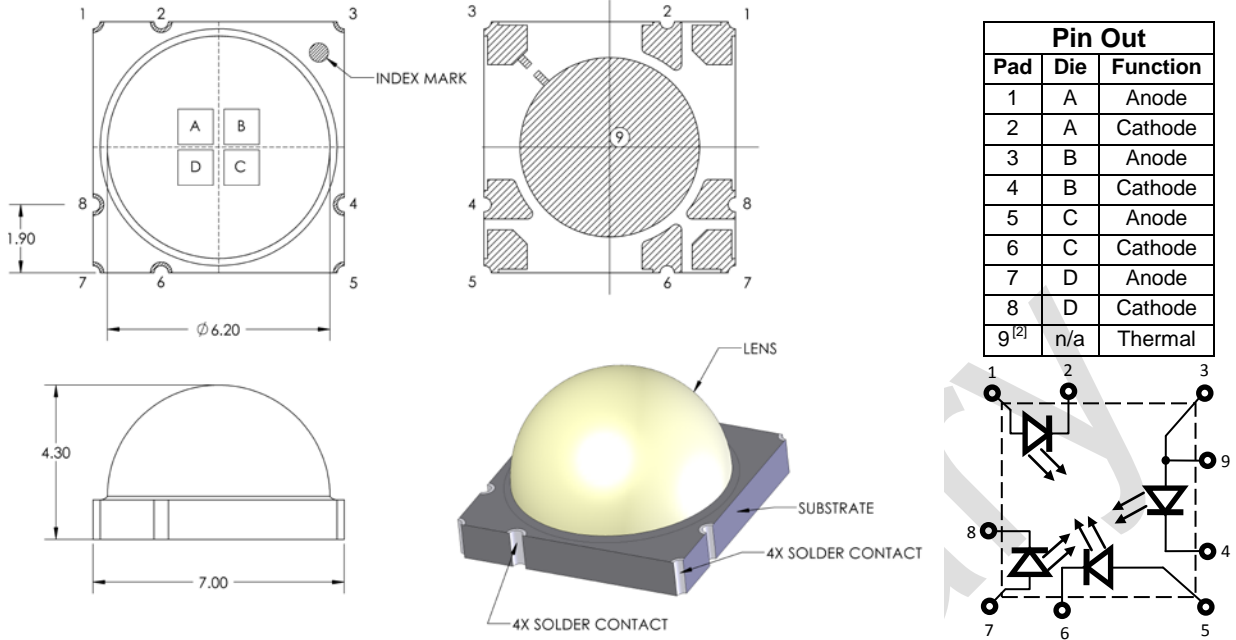


Figure 1: Package outline drawing.

### Notes for Figure 1:

1. Unless otherwise noted, the tolerance =  $\pm 0.20$  mm.
2. Thermal contact, Pad 9, is electrically connected to Pad 3. Do not connect any pad to the thermal contact, Pad 9. When mounting the LZ4-00R400 onto a MCPCB, by default its dielectric layer provides for the necessary electrical insulation in between all contact pads. LedEngin offers [LZ4-20R400](#) and [LZ4-40R400](#) MCPCB options which provide for electrical insulation between all contact pads. Please refer to Application Note MCPCB Option 2 and Option 4, or contact a LedEngin sales representative for more information.

## Recommended Solder Pad Layout (mm)

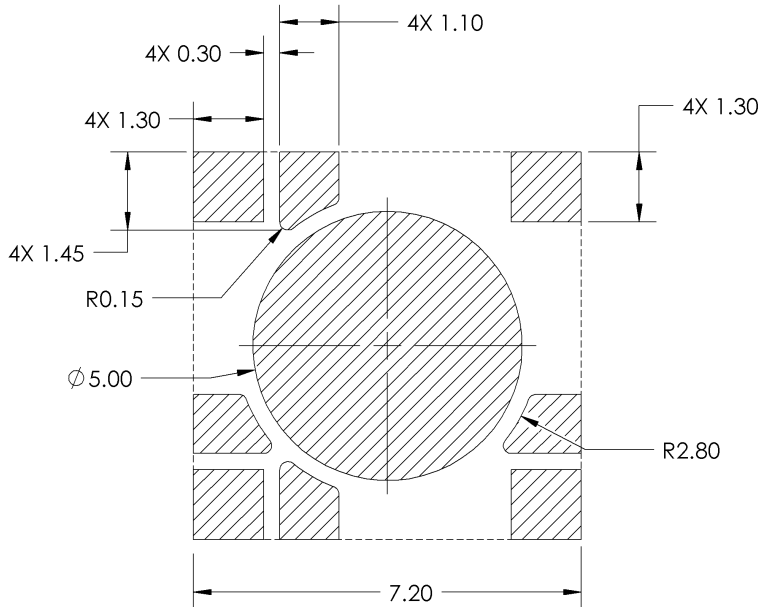


Figure 2: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

### Note for Figure 2:

1. Unless otherwise noted, the tolerance =  $\pm 0.20$  mm.

## Reflow Soldering Profile

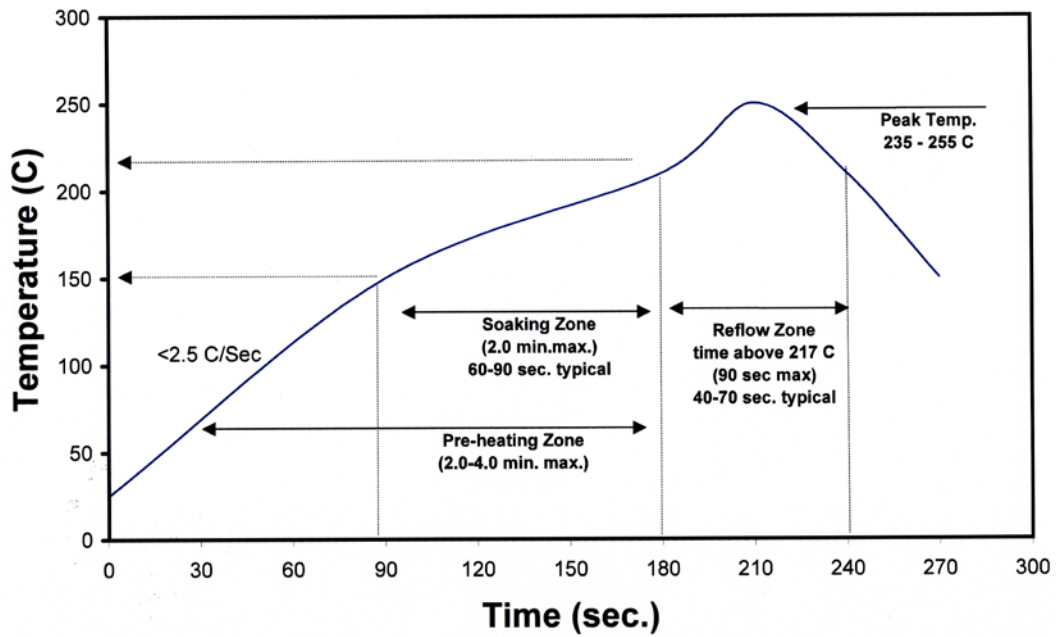


Figure 3: Reflow soldering profile for lead free soldering.

## Typical Radiation Pattern

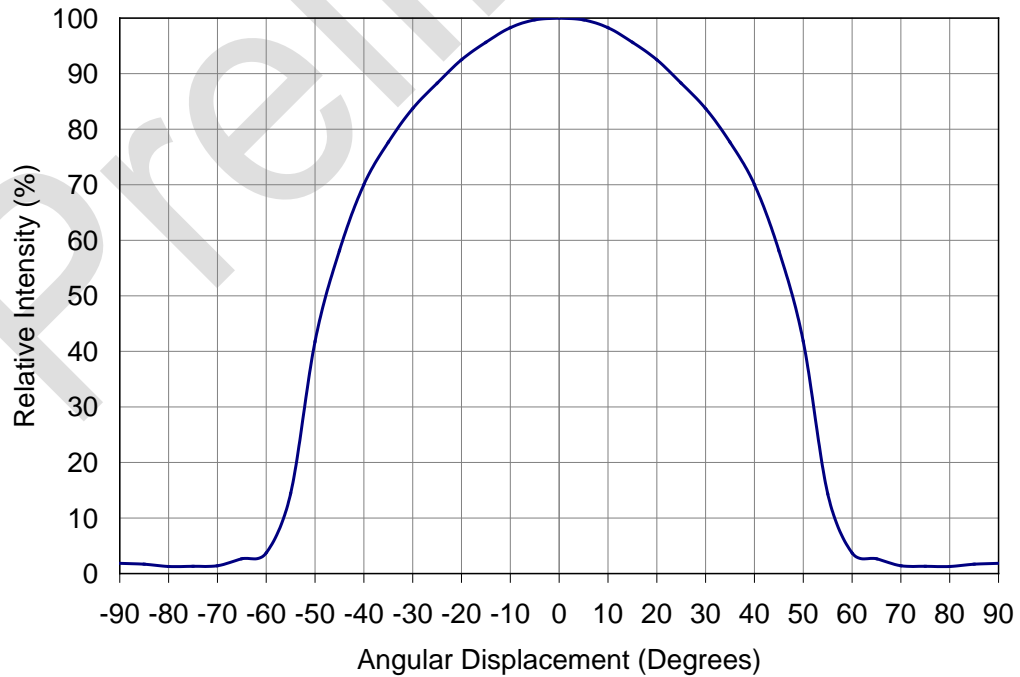


Figure 4: Typical representative spatial radiation pattern.

## Typical Relative Spectral Power Distribution

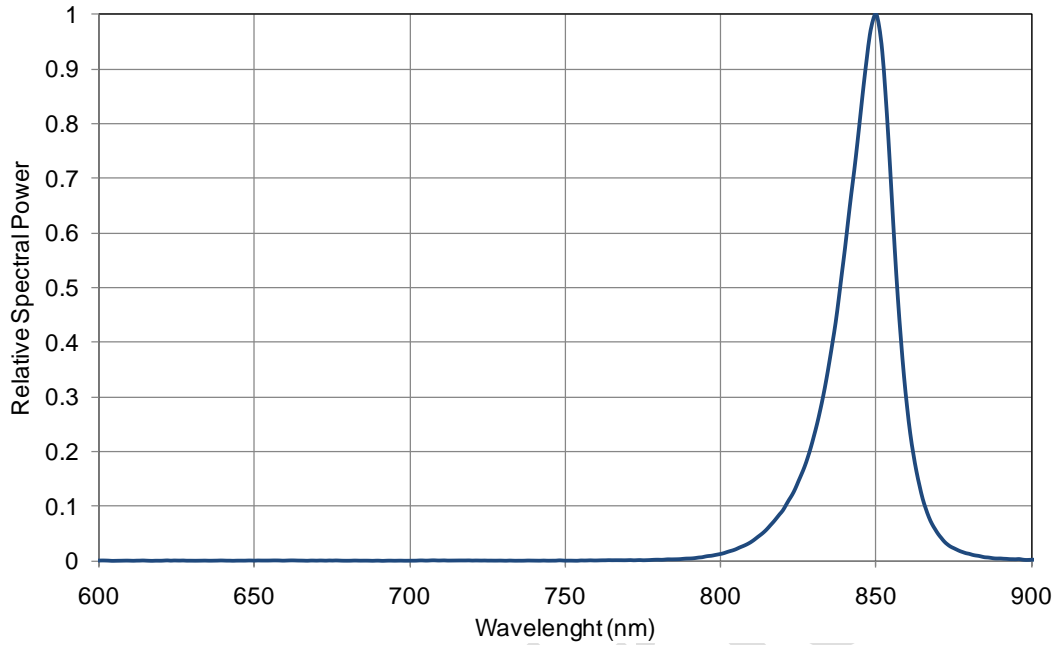


Figure 5: Relative spectral power vs. wavelength @  $T_c = 25^\circ\text{C}$ .

## Typical Peak Wavelength Shift over Temperature

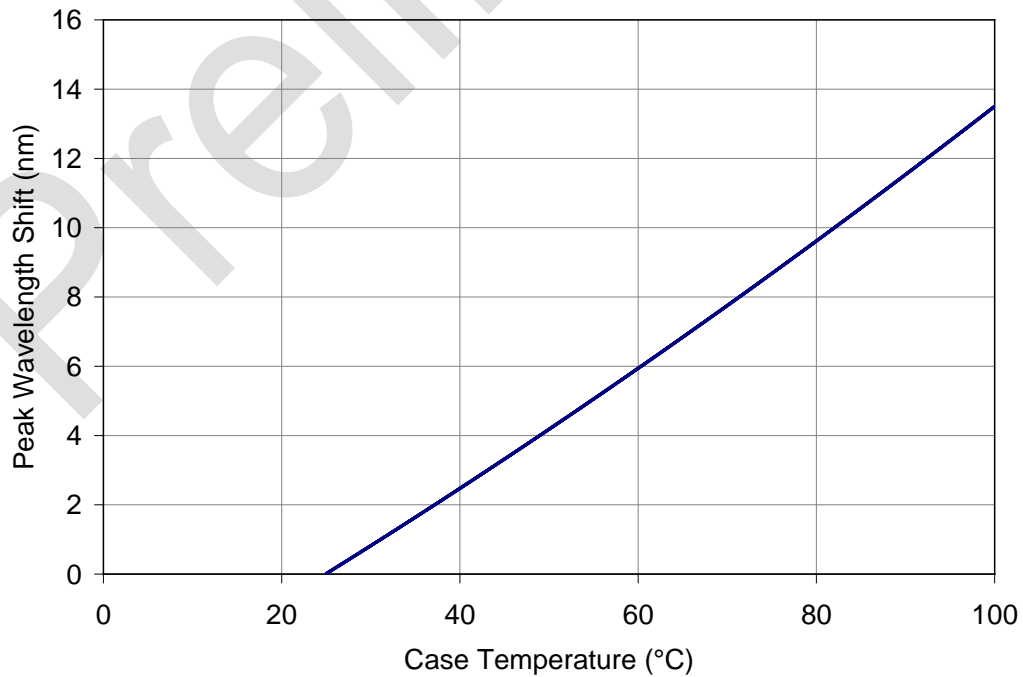


Figure 6: Typical peak wavelength shift vs. case temperature.

## Typical Normalized Radiant Flux

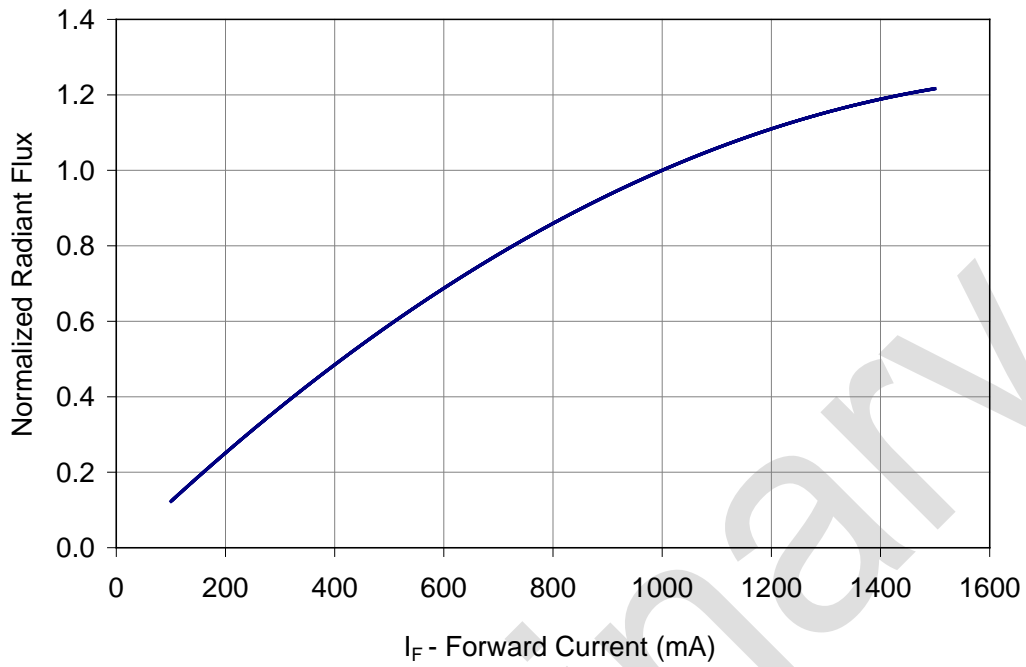


Figure 7: Typical normalized radiant flux vs. forward current @  $T_C = 25^\circ\text{C}$ .

## Typical Normalized Radiant Flux over Temperature

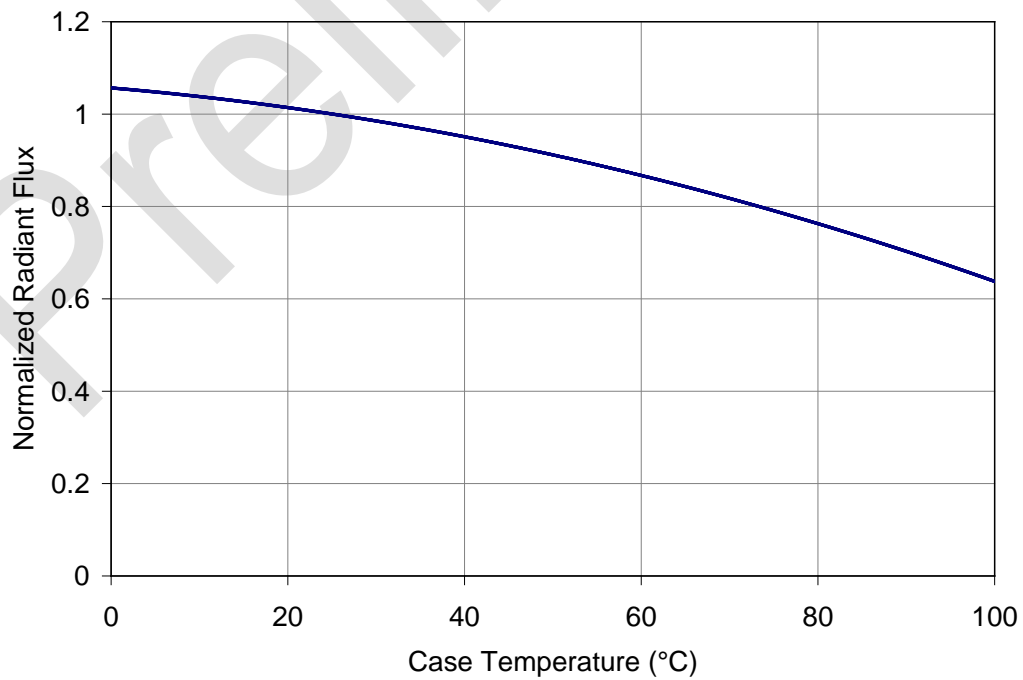


Figure 8: Typical normalized radiant flux vs. case temperature.



## Typical Forward Current Characteristics

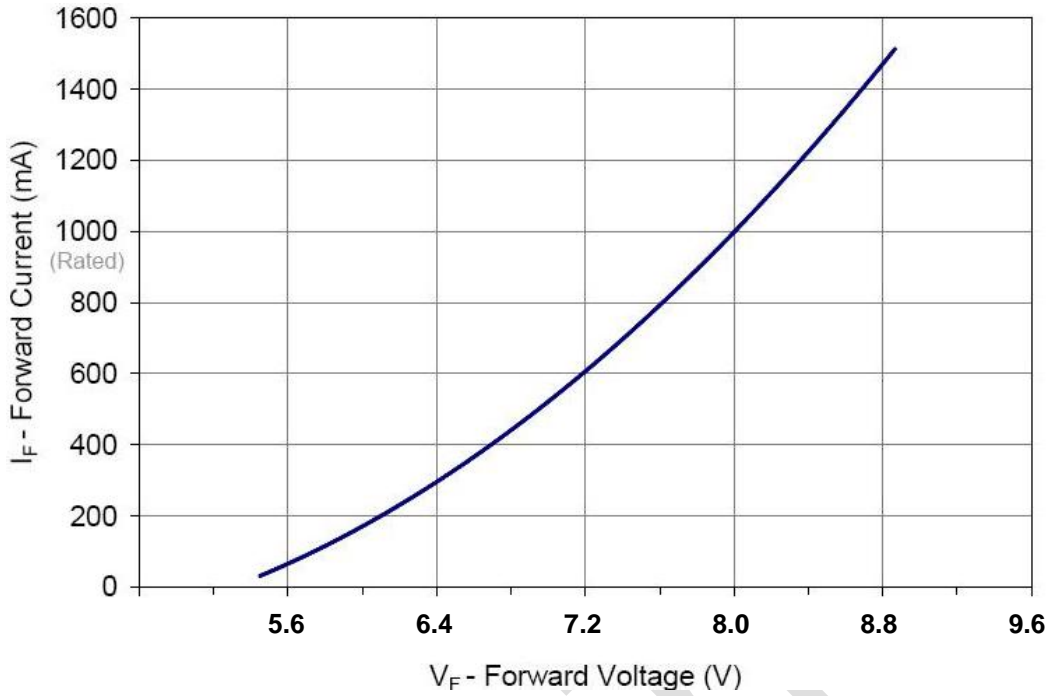


Figure 9: Typical forward current vs. forward voltage @  $T_C = 25^\circ\text{C}$ .

Note for Figure 9:

1. Forward Voltage curve assumes that all four LED dice are connected in series.

## Current Derating

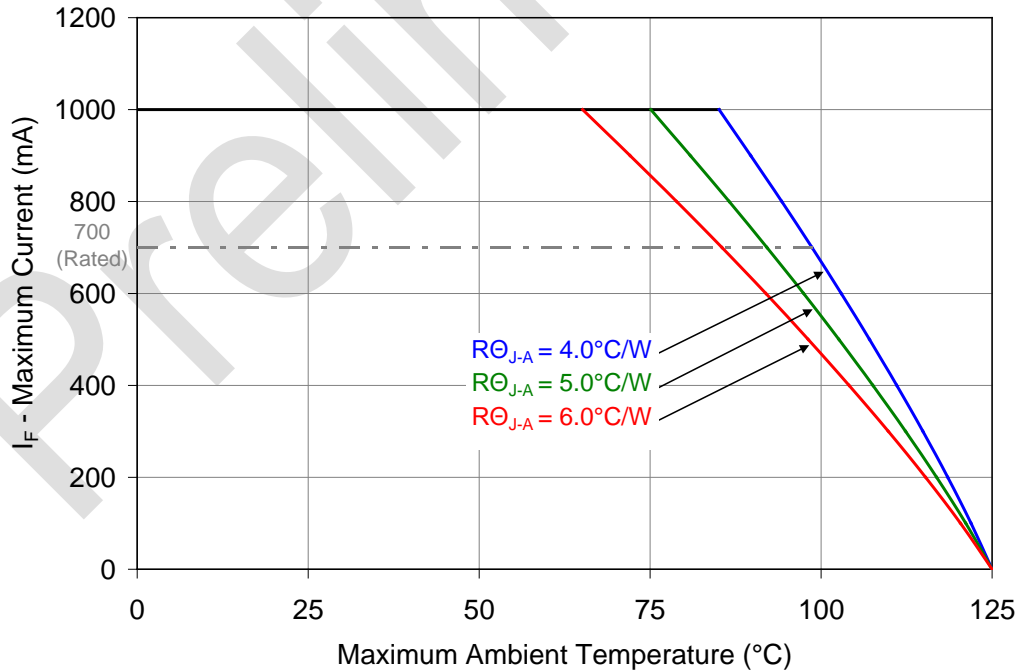


Figure 10: Maximum forward current vs. ambient temperature based on  $T_{J(\text{MAX})} = 125^\circ\text{C}$ .

Notes for Figure 10:

1. Maximum current assumes that all four LED dice are operating concurrently at the same current.
2.  $R_{\theta_{J-C}}$  [Junction to Case Thermal Resistance] for the LZ4-00R400 is typically  $1.1^\circ\text{C/W}$ .
3.  $R_{\theta_{J-A}}$  [Junction to Ambient Thermal Resistance] =  $R_{\theta_{J-C}} + R_{\theta_{C-A}}$  [Case to Ambient Thermal Resistance].

## Emitter Tape and Reel Specifications (mm)

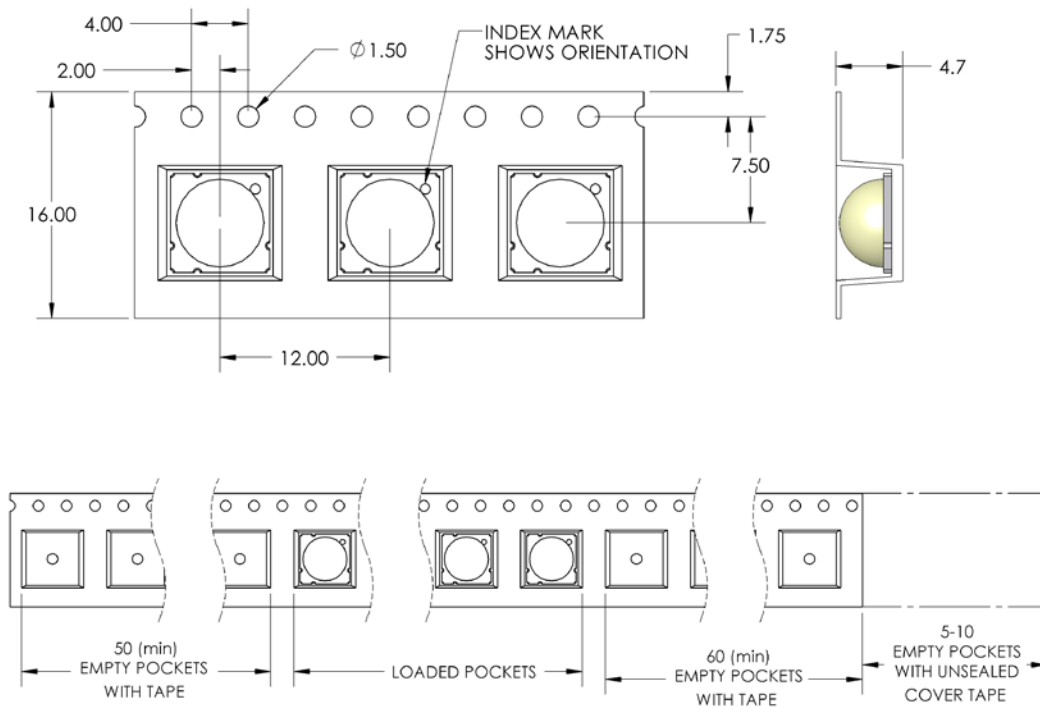


Figure 11: Emitter carrier tape specifications (mm).

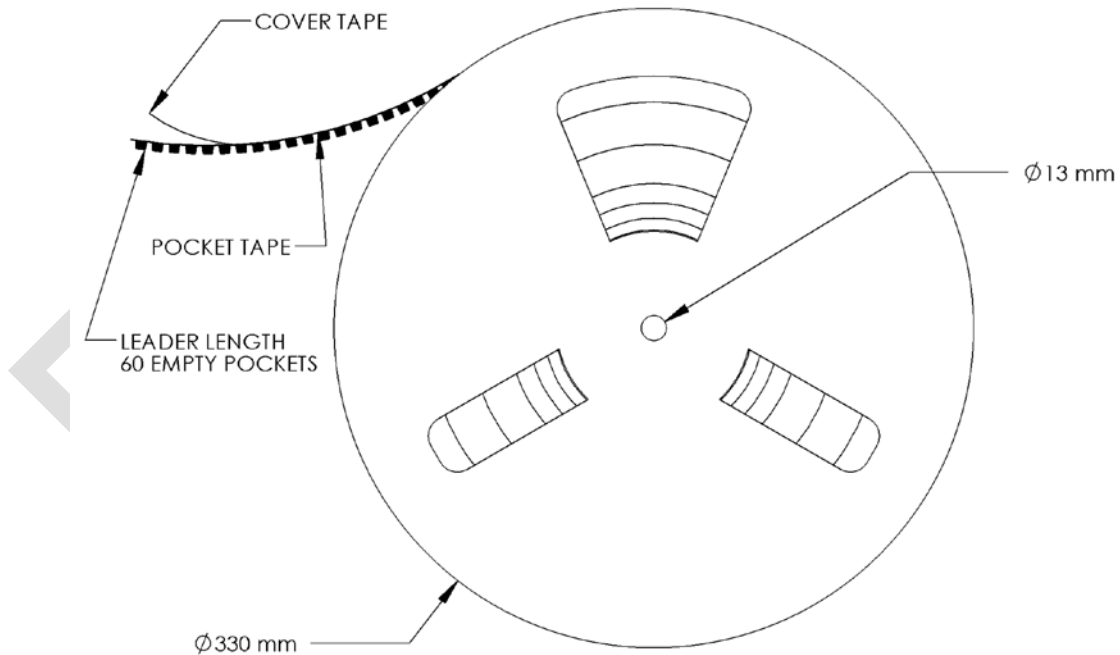


Figure 12: Emitter Reel specifications (mm).

Notes for Figure 12:

1. Reel quantity minimum: 50 emitters. Reel quantity maximum: 1000 emitters.

## Company Information

LedEngin, Inc. is a Silicon Valley based solid-state lighting company specializing in the development and manufacturing of unprecedented high-power LED emitters, modules and replacement lamps. LedEngin's packaging technologies lead the industry with products that feature lowest thermal resistance, highest flux density and consummate reliability, enabling compact and efficient solid state lighting solutions.

LedEngin's LED emitters range from 3W to 90W with ultra-compact footprints and are available in single color products including Cool White, Neutral White, Warm White, Red, Green, Blue, Amber, Deep Red, Far Red, Dental Blue and UV as well as multi-color products with RGB, RGBA and RGBW options. LedEngin's brightest White LEDs are capable of emitting 5,500 lumens.

LedEngin's robust emitters are at the core of its unique line of modules and replacement lamps producing unmatched beam quality resulting in true Lux on Target™ for a wide variety of spot and narrow flood directional lighting applications.

LedEngin is committed to providing products that conserve natural resources and reduce greenhouse emissions.

LedEngin reserves the right to make changes to improve performance without notice.

Please contact [Sales@ledengin.com](mailto:Sales@ledengin.com) or (408) 492-0620 for more information.