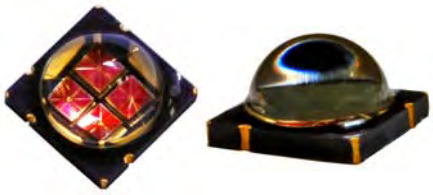
LedEngin, Inc.

High Luminous Efficacy
Amber LED Emitter

LZ4-00A110



Key Features

- High Luminous Efficacy 10W Amber 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 (1.8°C/W)
- Individually addressable die
- Electrically neutral thermal path
- Very high Luminous Flux density
- New industry standard for Lumen Maintenance (>90% at 100,000 Hours)
- JEDEC Level 1 for Moisture Sensitivity Level
- Autoclave compliant (JEDEC JESD22-A102-C)
- Lead (Pb) free and RoHS compliant
- Reflow solderable (up to 6 cycles)
- Emitter available on Standard or Serially Connected MCPCB (optional)

Typical Applications

- Emergency vehicle lighting
- Strobe and warning lights
- Marine and buoy lighting
- Aviation and obstruction lighting
- Roadway beacons and traffic signaling
- Architectural lighting
- Stage and studio lighting
- Landscape lighting
- Automotive signal and marker lights

Description

The LZ4-00A110 Amber 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 luminous flux density. LedEngin's LZ4-00A110 LED offers ultimate design flexibility with individually addressable die. 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.

Table of Contents

Product Nomenclature

The LZ Series part number designation is defined as follows:

L Z A – B C D E F G - H J K L

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 10W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“A1” for Amber – 590nm Dominant Wavelength)
F and G – designate the Power (“10” for 10W typical rating)
H – designates the Flux bin (See Table 2)
J and K – designate the Dominant Wavelength bin (see Table 3)
L – designates the V_F bin (See Table 4)

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-20D.1 MSL Classification:

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

Notes for Table 1:
1. The standard soak time includes a default value of 24 hours for semiconductor manufacturer’s exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor’s facility.

Average Lumen Maintenance Projections

Lumen maintenance generally describes the ability of a lamp to retain its output over time. The useful lifetime for solid state lighting devices (Power LEDs) is also defined as Lumen Maintenance, with the percentage of the original light output remaining at a defined time period.

Based on long-term WHTOL testing, LedEngin projects that the LZ Series will deliver, on average, 90% Lumen Maintenance at 100,000 hours of operation at a forward current of 700 mA per die. This projection is based on constant current operation with junction temperature maintained at or below 110°C.

Luminous Flux Bins

Table 2:

Bin Code	Minimum Luminous Flux (Φ_V) @ I_F = 700mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 700mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1000mA [2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
P	182	228	280	335
Q	228	285	335	400
R	285	356	415	500
S	356	445	520	625

Notes for Table 2:
1. Luminous flux performance guaranteed within published operating conditions. LedEngin maintains a tolerance of ± 10% on flux measurements.
2. Future products will have even higher levels of luminous flux performance. Contact LedEngin Sales for updated information.

Dominant Wavelength Bins

Table 3:

Bin Code	Minimum Dominant Wavelength (λ_D) @ I_F = 700mA [1,2] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 700mA [1,2] (nm)
A1	582.5	585.0
A2	585.0	587.5
A3	587.5	590.0
A4	590.0	592.5
A5	592.5	595.0
A6	595.0	597.5

Notes for Table 3:
1. Dominant wavelength is derived from the CIE 1931 Chromaticity Diagram and represents the perceived hue.
2. LedEngin maintains a tolerance of ± 0.5nm on dominant wavelength measurements.

Forward Voltage Bins

Table 4:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 700mA [1,2] (V)	Maximum Forward Voltage (V_F) @ I_F = 700mA [1,2] (V)
B	8.96	9.92
C	9.92	10.88
D	10.88	11.84
E	11.84	12.80
F	12.80	13.76

Notes for Table 4:
1. Forward Voltage is binned with all four LED dice connected in series.
2. LedEngin maintains a tolerance of ± 0.16V for forward voltage measurements.

Absolute Maximum Ratings

Table 5:

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

Notes for Table 5:
1. 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.
2: Pulse forward current conditions: Pulse Width ≤ 10msec and Duty Cycle ≤ 10%.
3. LEDs are not designed to be reverse biased.
4. Solder conditions per JEDEC 020D. See Reflow Soldering Profile Figure 3.
5. Autoclave Conditions per JEDEC JESD22-A102-C.
6. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00A110 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°C

Table 6:

Parameter	Symbol	Typical	Unit
Luminous Flux (@ I_F = 700mA) [1]	Φ_V	295	lm
Luminous Flux (@ I_F = 1000mA) [1]	Φ_V	385	lm
Luminous Flux (@ I_F = 1500mA) [1]	Φ_V	460	lm
Dominant Wavelength (@ I_F = 700mA) [2]	λ_D	590	nm
Viewing Angle [3]	$2\Theta_{1/2}$	95	Degrees
Total Included Angle [4]	$\Theta_{0.9V}$	110	Degrees

Notes for Table 6:
1. Luminous flux typical value is for all four LED dice operating concurrently at rated current.
2. Amber LEDs have a significant shift in wavelength over temperature; please refer to Figure 6 for details. Caution must be exercised if designing to meet a regulated color space due to this behavior as product may shift out of legal color space under elevated temperatures.
3. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
4. Total Included Angle is the total angle that includes 90% of the total luminous flux.

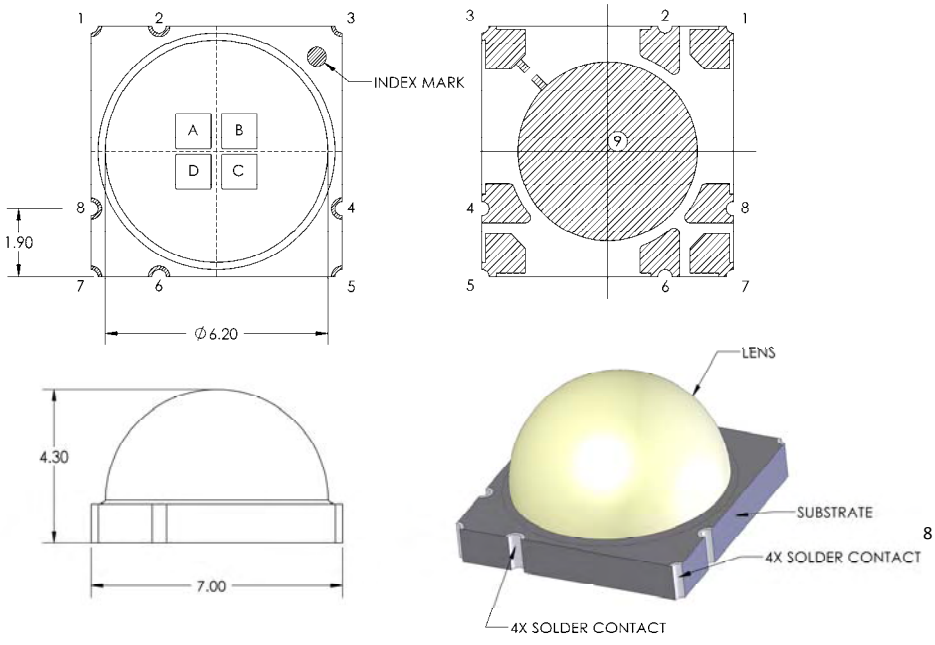
Electrical Characteristics @ T_C = 25°C

Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ I_F = 700mA) [1]	V_F	9.7	V
Forward Voltage (@ I_F = 1000mA) [1]	V_F	10.4	V
Temperature Coefficient of Forward Voltage [1]	$\Delta V_F/\Delta T_J$	-7.6	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	1.8	°C/W

Notes for Table 7:
1. Forward Voltage typical value is for all four LED dice connected in series.

Mechanical Dimensions (mm)



Pin Out		
Pad	**Die**	**Function**
1	A	Anode
2	A	Cathode
3	B	Anode
4	B	Cathode
5	C	Anode
6	C	Cathode
7	D	Anode
8	D	Cathode
9 [2]	n/a	Thermal

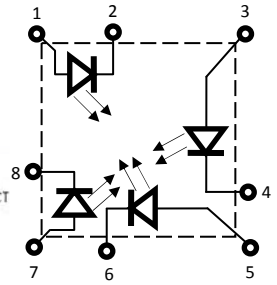


Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Thermal contact, Pad 9, is electrically neutral.

Recommended Solder Pad Layout (mm)

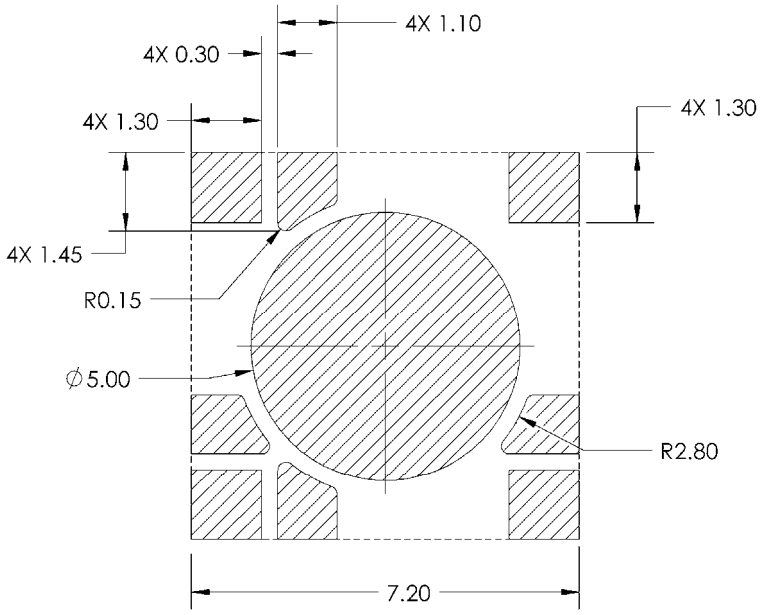


Figure 2: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 2:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.

Reflow Soldering Profile

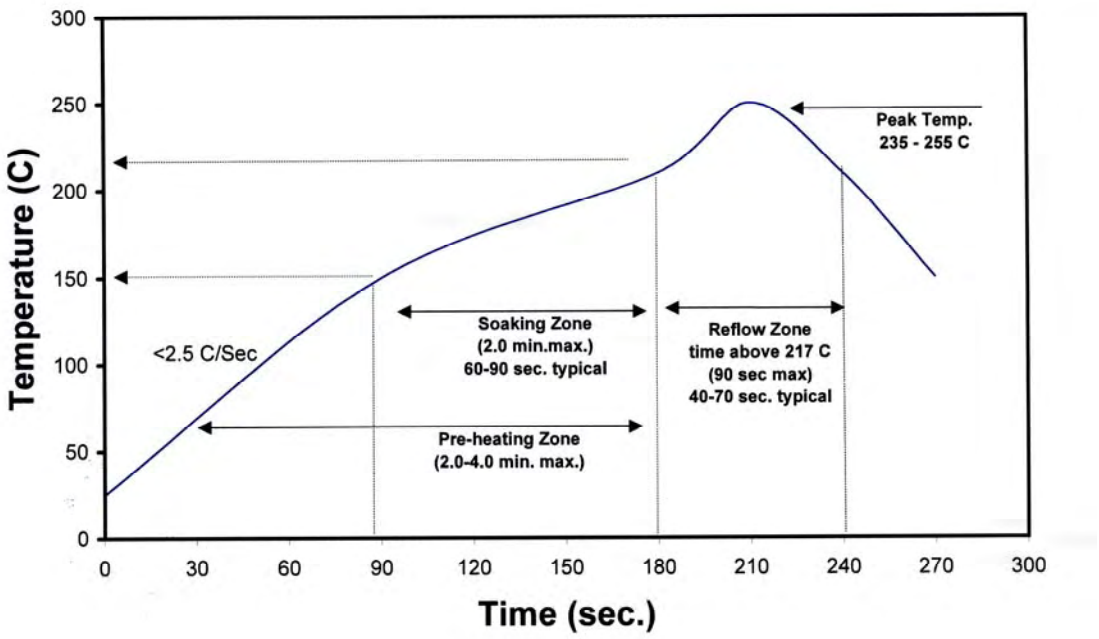


Figure 3: Reflow soldering profile for lead free soldering.

Typical Radiation Pattern

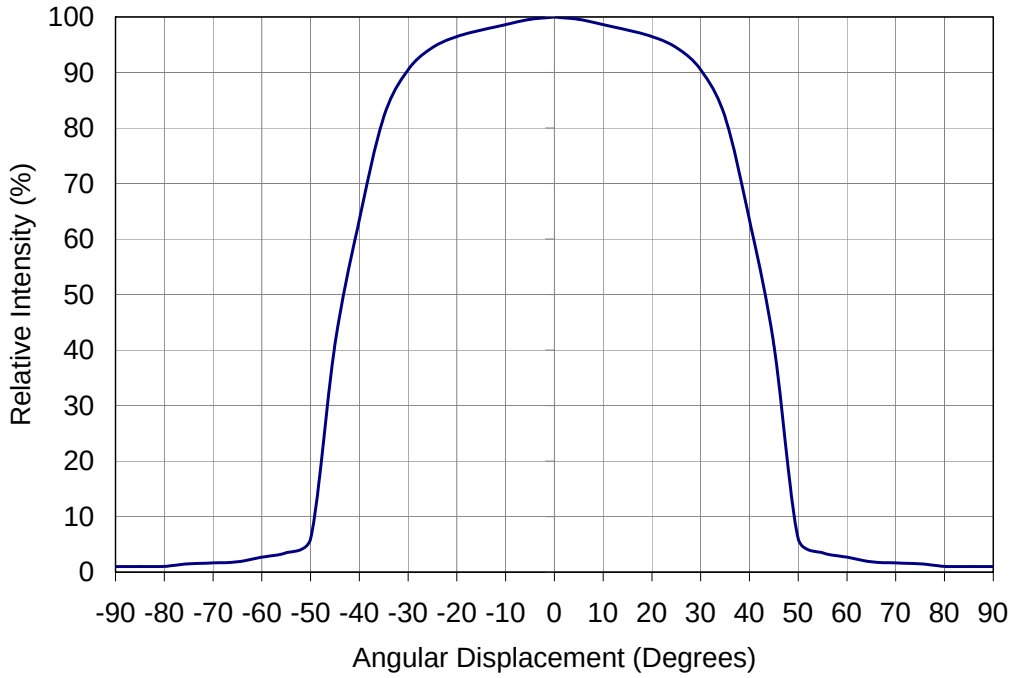


Figure 4: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

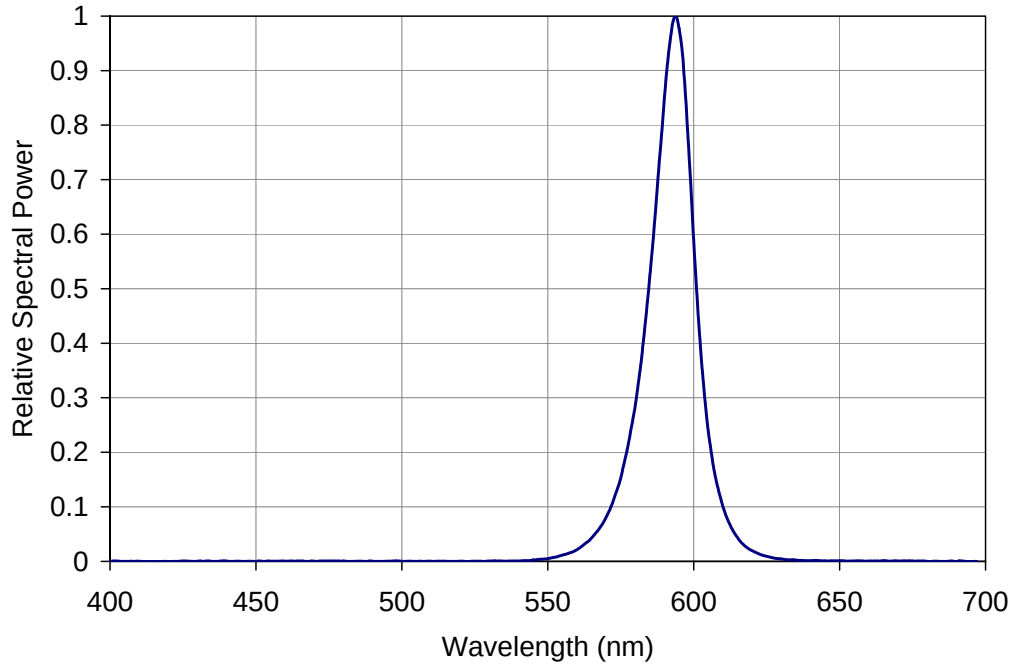


Figure 5: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Dominant Wavelength Shift over Temperature

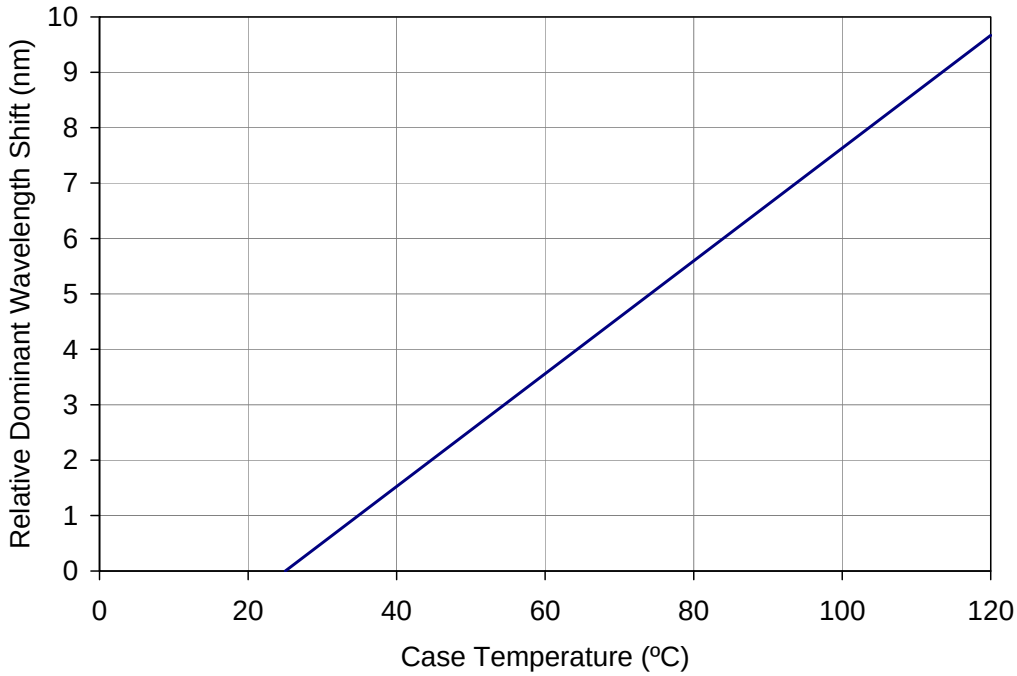


Figure 6: Typical dominant wavelength shift vs. case temperature.

Typical Relative Light Output

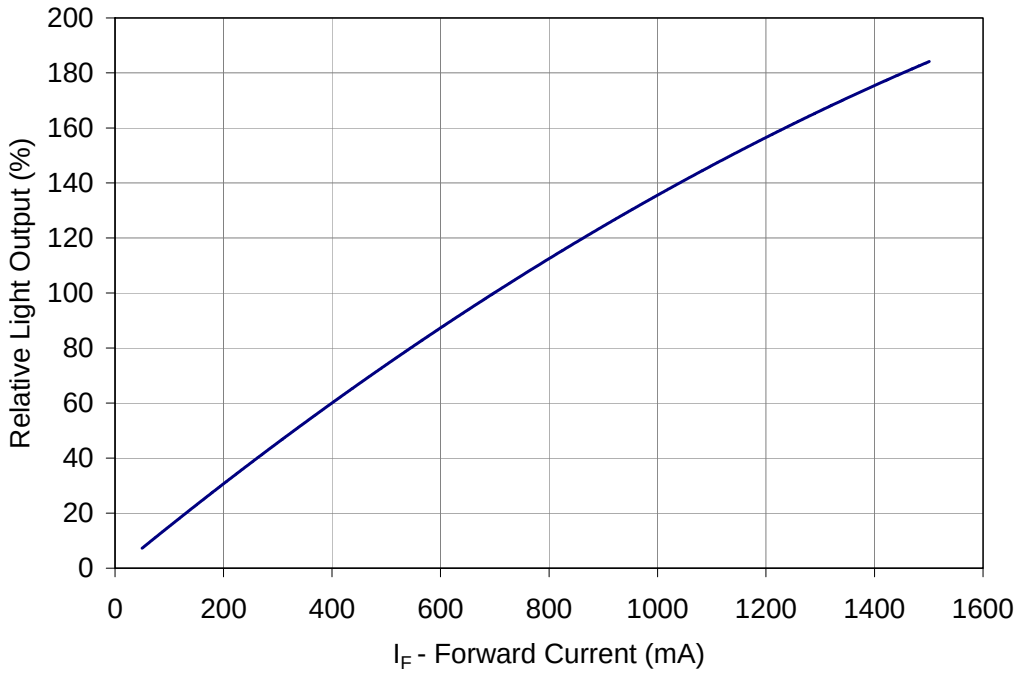


Figure 7: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

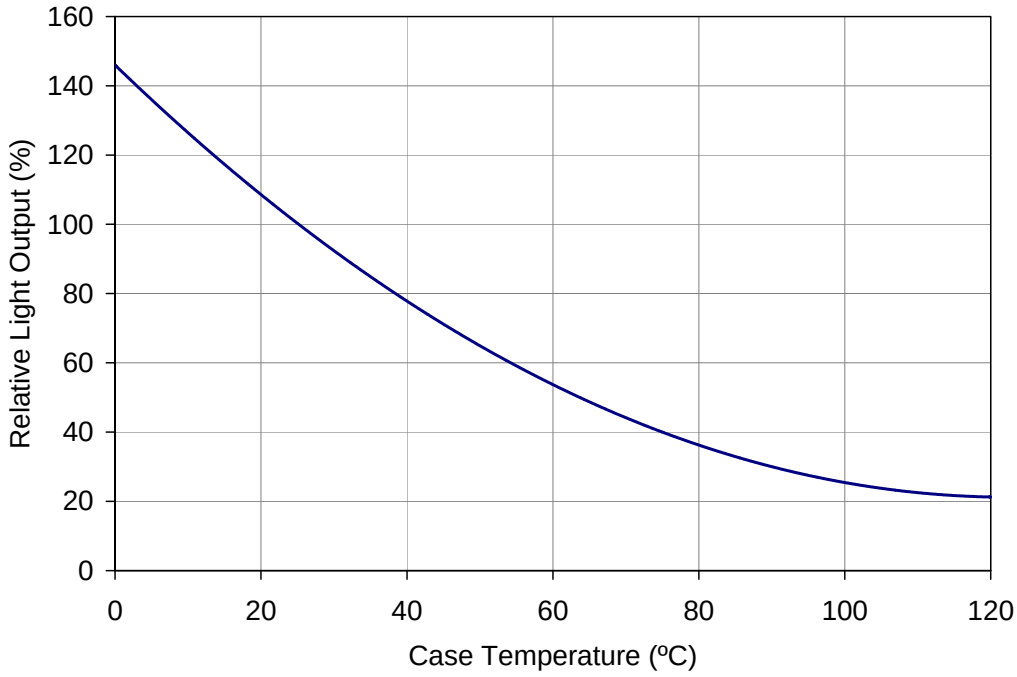


Figure 8: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

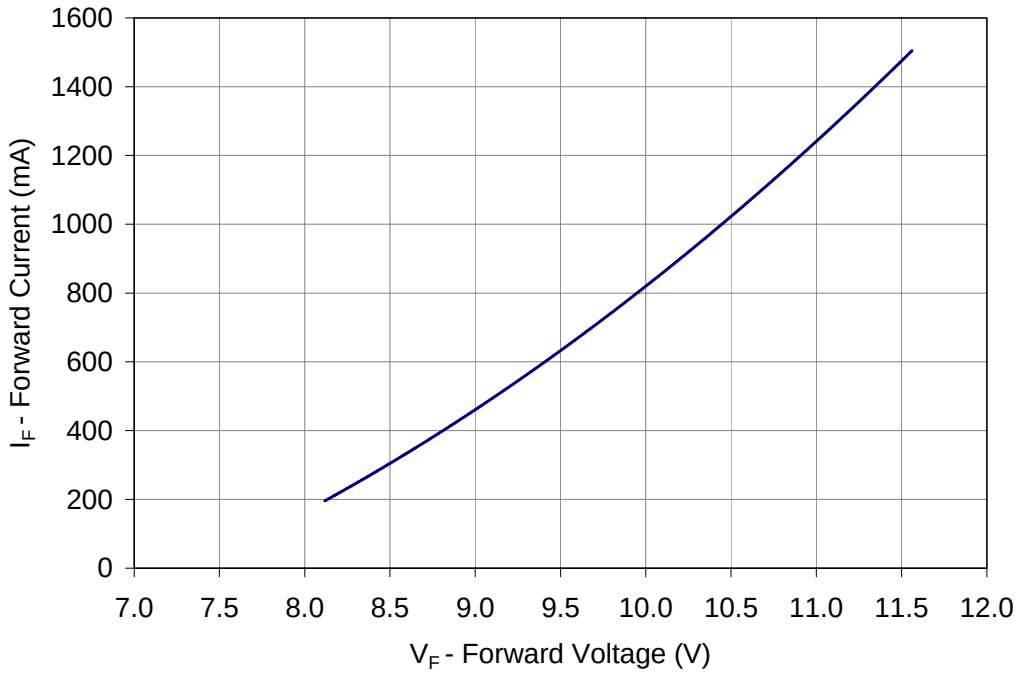


Figure 9: Typical forward current vs. forward voltage @ T_C = 25°C.

Note for Figure 9:
1. Forward Voltage curve assumes that all four LED dice are connected in series.

Current Derating

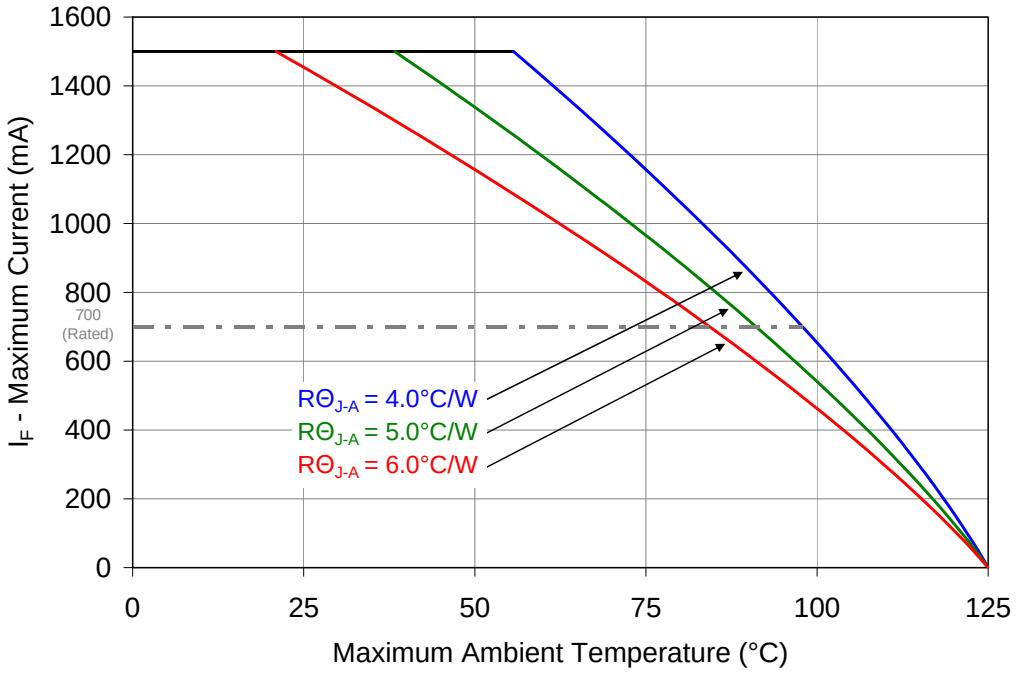


Figure 10: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 125°C.

Notes for Figure 10:
1. Maximum current assumes that all four LED dice are operating concurrently at the same current.
2. $RΘ_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00A110 is typically 1.8°C/W.
3. $RΘ_{J-A}$ [Junction to Ambient Thermal Resistance] = $RΘ_{J-C}$ + $RΘ_{C-A}$ [Case to Ambient Thermal Resistance].

Emitter Tape and Reel Specifications (mm)

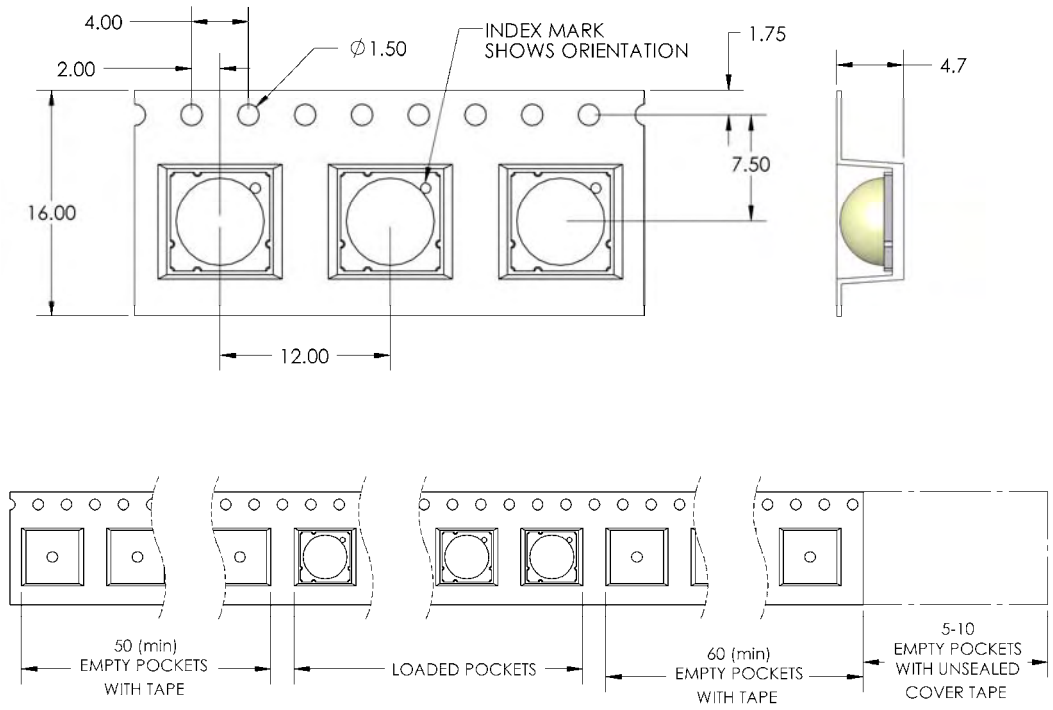


Figure 11: Emitter carrier tape specifications (mm).

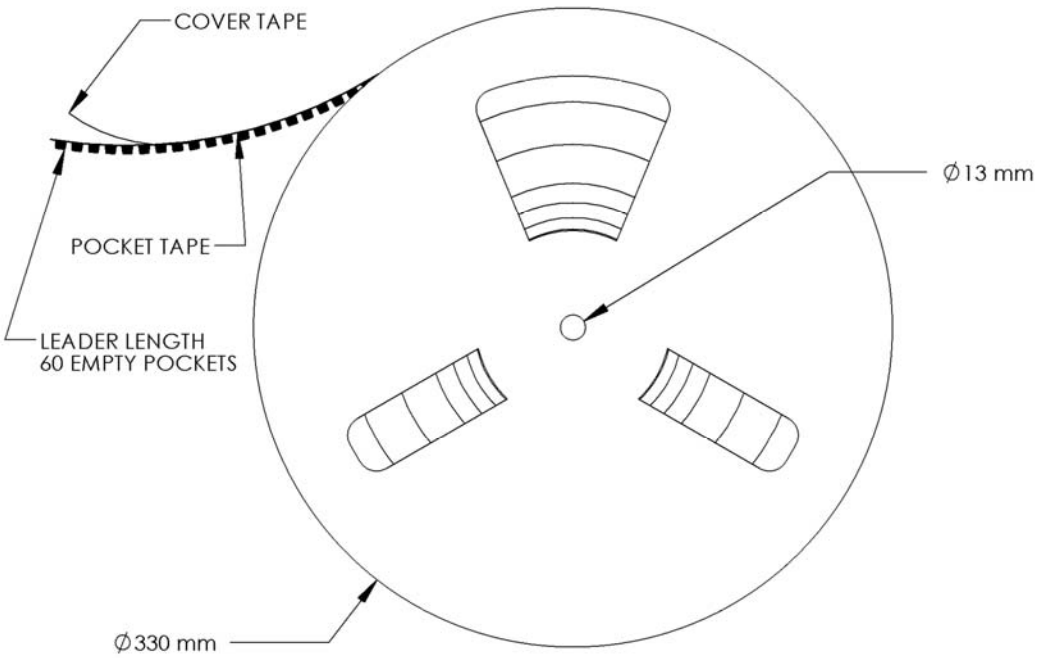


Figure 12: Emitter Reel specifications (mm).

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 40W 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 2,000 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 or (408) 492-0620 for more information.