LedEngin, Inc.

High Luminous Efficacy
Green LED Emitter

LZ4-00G110

Key Features

- High Luminous Efficacy 10W Green 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 (2.7°C/W)
- Individually addressable die
- Very high Luminous Flux density
- New industry standard for Lumen Maintenance (>90% at 100,000 Hours)
- JEDEC Level 2 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

- Architectural lighting
- Automotive and Marine lighting
- Stage and Studio lighting
- Buoys
- Beacons
- Airfield lighting and signs
- RGB fixtures

Description

The LZ4-00G110 Green 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 LZ4-00G110 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 (“G1” for Green – 525nm 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-20 MSL Classification:

			Soak Requirements			
	Floor Life		Standard		Accelerated	
Level	Time	Conditions	Time (hrs)	Conditions	Time (hrs)	Conditions
2	1 Year	≤ 30°C/ 60% RH	168 +5/-0	85°C/ 60% 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 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 125°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)
S	356	445	486
T	445	556	607
U	556	695	759

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 = 350mA [1,2,3] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 350mA [1,2,3] (nm)
G1	515	520
G2	520	525
G3	525	530
G4	530	535

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.
3. Refer to Figure 6 for typical dominant wavelength shift over forward current.

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)
F	12.80	13.76
G	13.76	14.72
H	14.72	15.68
J	15.68	16.64
K	16.64	17.60

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 for the four LEDs.

Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current [1]	I_F	1000	mA
Peak Pulsed Forward Current [2]	I_{FP}	1500	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°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]		> 1,000 V HBM Class 1C 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 11 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 LZ4-00G110 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	425	lm
Luminous Flux (@ I_F = 1000mA) [1]	Φ_V	530	lm
Dominant Wavelength (@ I_F = 350mA) [2]	λ_D	525	nm
Viewing Angle [3]	$2\Theta_{1/2}$	95	Degrees
Total Included Angle [4]	$\Theta_{0.9V}$	115	Degrees

Notes for Table 6:

1. Luminous flux typical value is for all four LED dice operating concurrently at rated current.
2. Refer to Figure 6 for typical dominant wavelength shift over forward current.
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

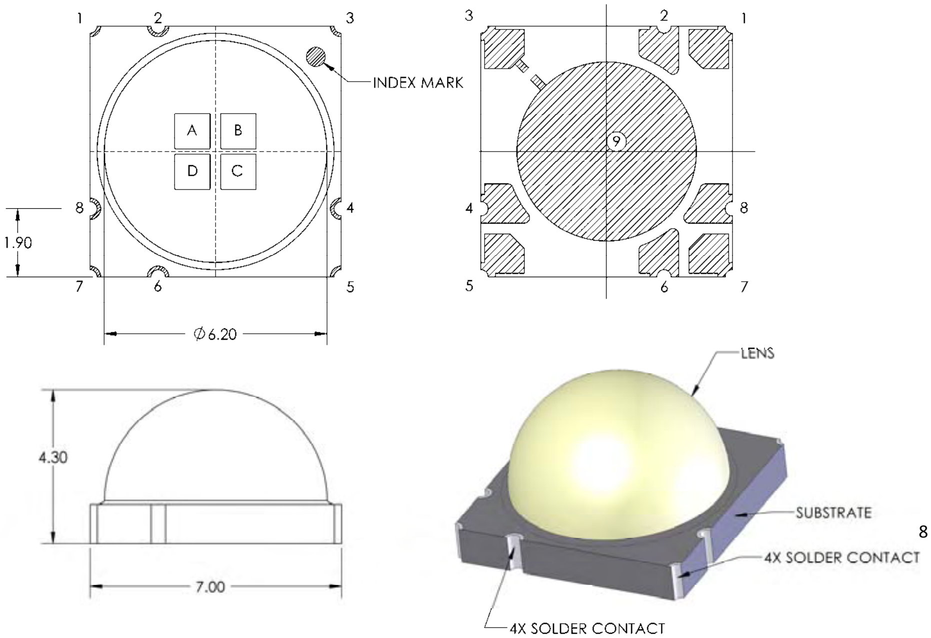
Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ I_F = 700mA) [1]	V_F	14.4	V
Forward Voltage (@ I_F = 1000mA) [1]	V_F	15.0	V
Temperature Coefficient of Forward Voltage [1]	$\Delta V_F/\Delta T_J$	-10.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.7	°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

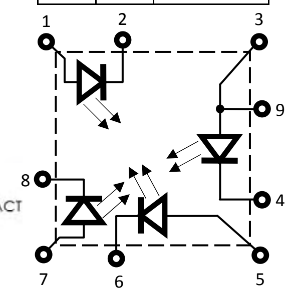


Figure 1: Package outline drawing.

Notes for Figure 1:

1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Thermal contact, Pad 9, is electrically connected to Pad 3. Do not connect any pad to the thermal contact, Pad 9. When mounting the LZ4-00G110 onto a MCPCB, by default its dielectric layer provides for the necessary electrical insulation in between all contact pads. LedEngin offers LZ4-20G110 and LZ4-40G110 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)

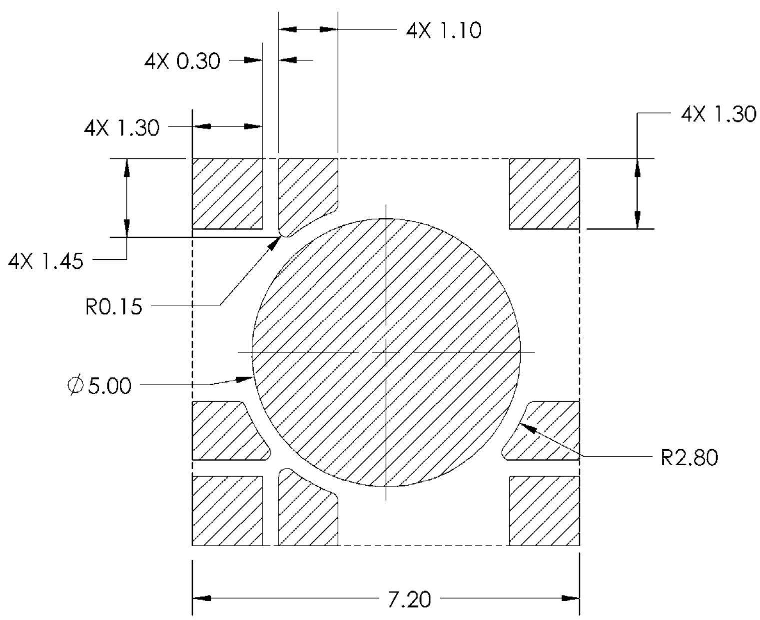


Figure 2: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 2:

1. Unless otherwise noted, the tolerance = ± 0.20 mm.

Reflow Soldering Profile

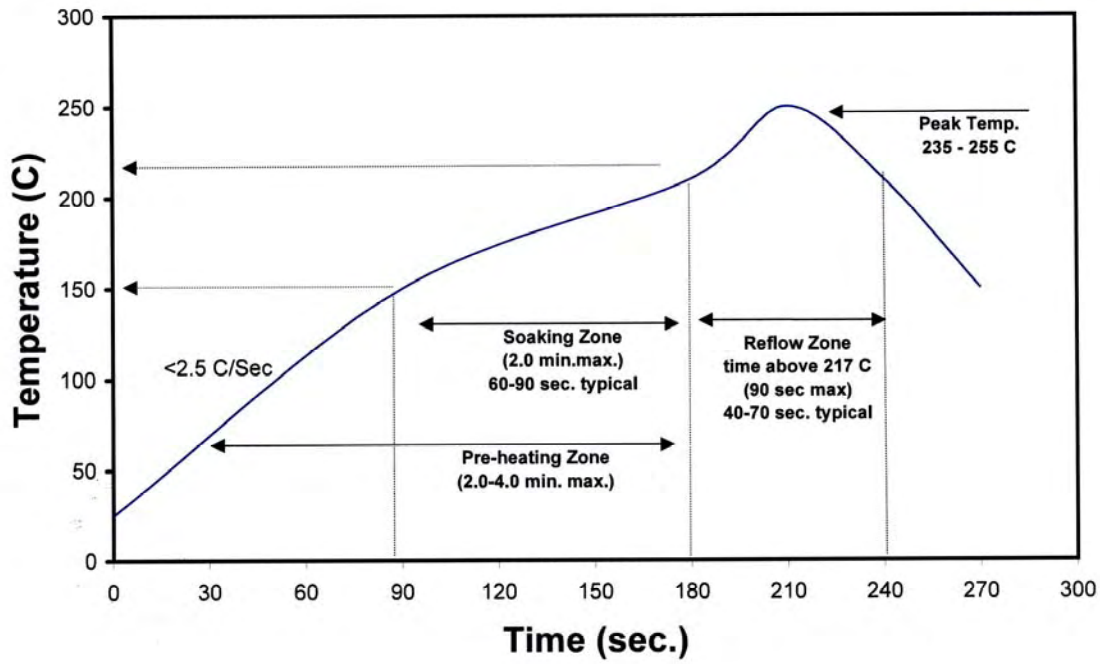


Figure 3: Reflow soldering profile for lead free soldering.

Typical Radiation Pattern

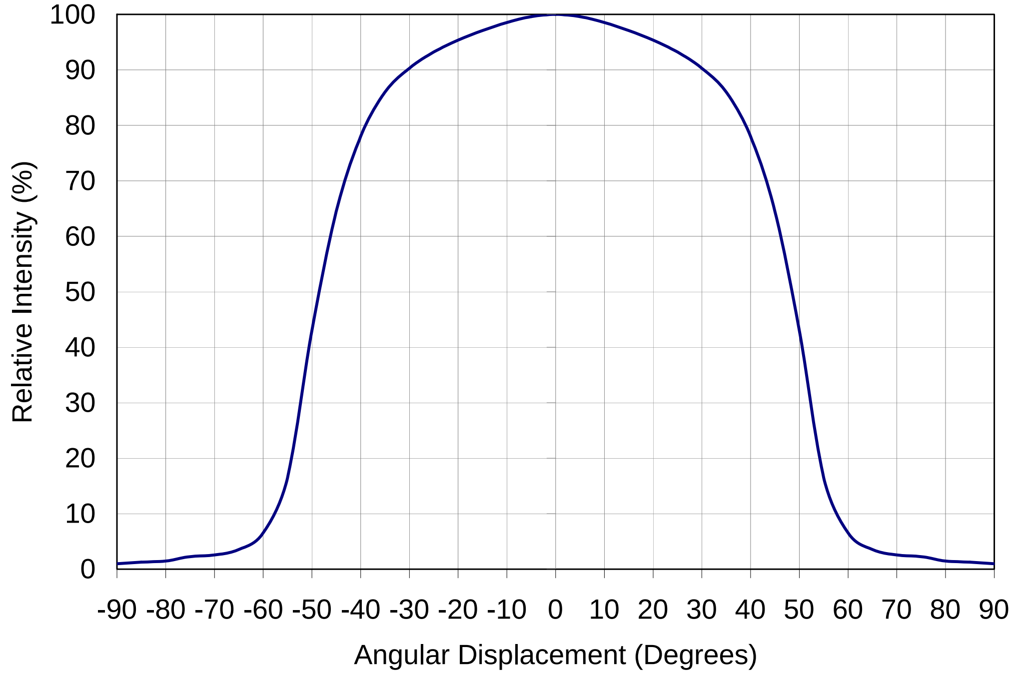


Figure 4: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

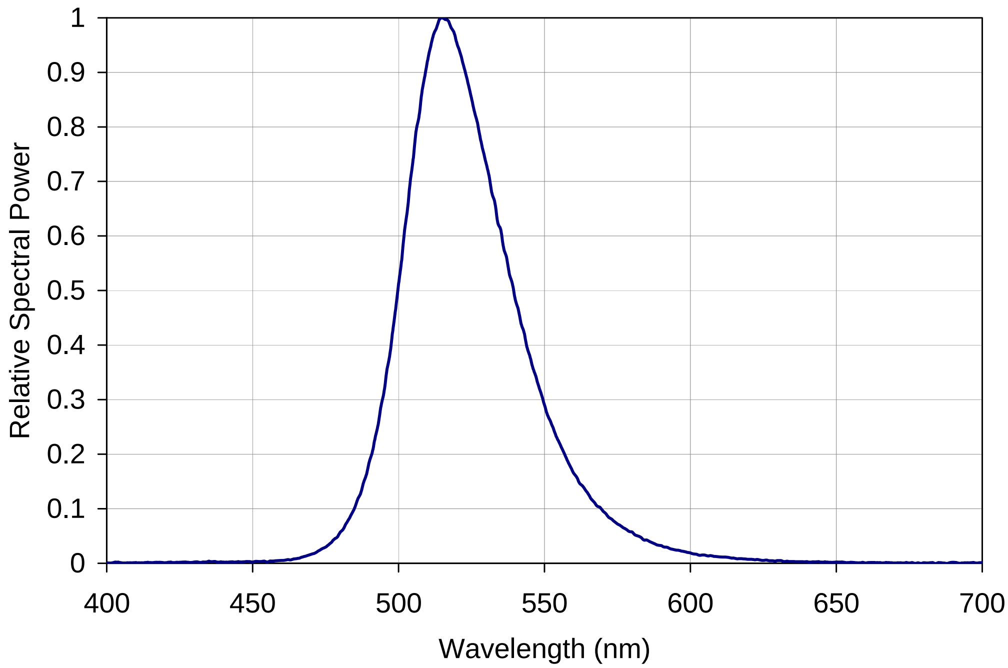


Figure 5: Typical relative spectral power vs. wavelength @ T_C = 25°C.

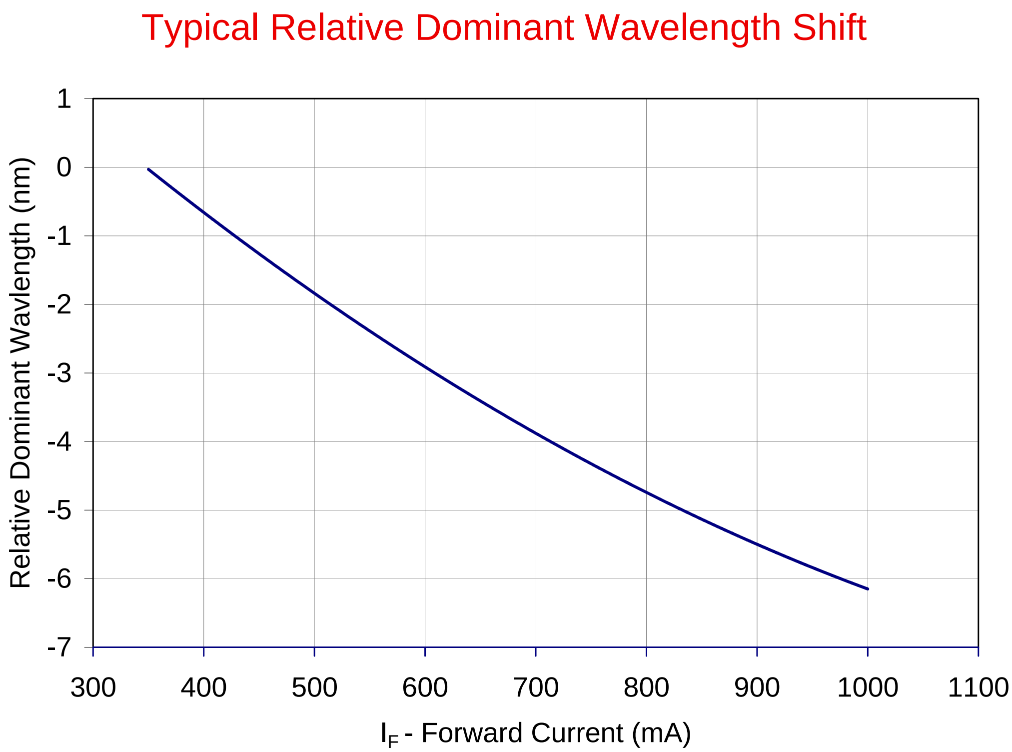


Figure 6: Typical relative dominant wavelength shift vs. forward current @ T_C = 25°C.

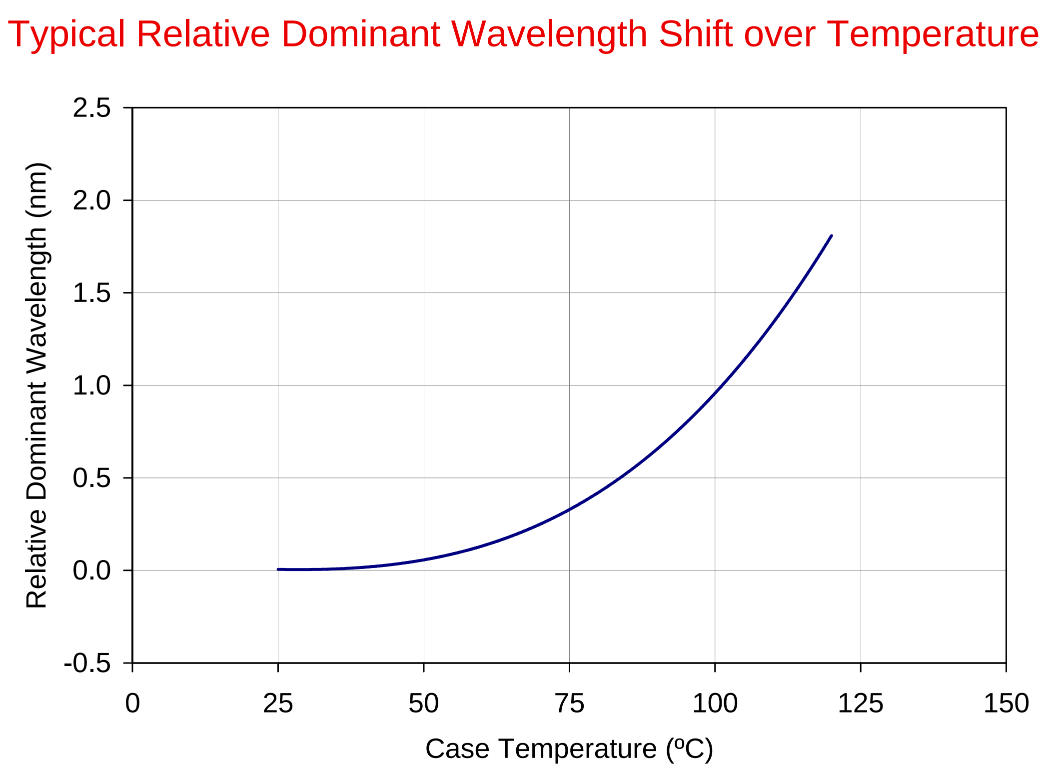


Figure 7: Typical relative dominant wavelength shift vs. case temperature.

Typical Relative Light Output

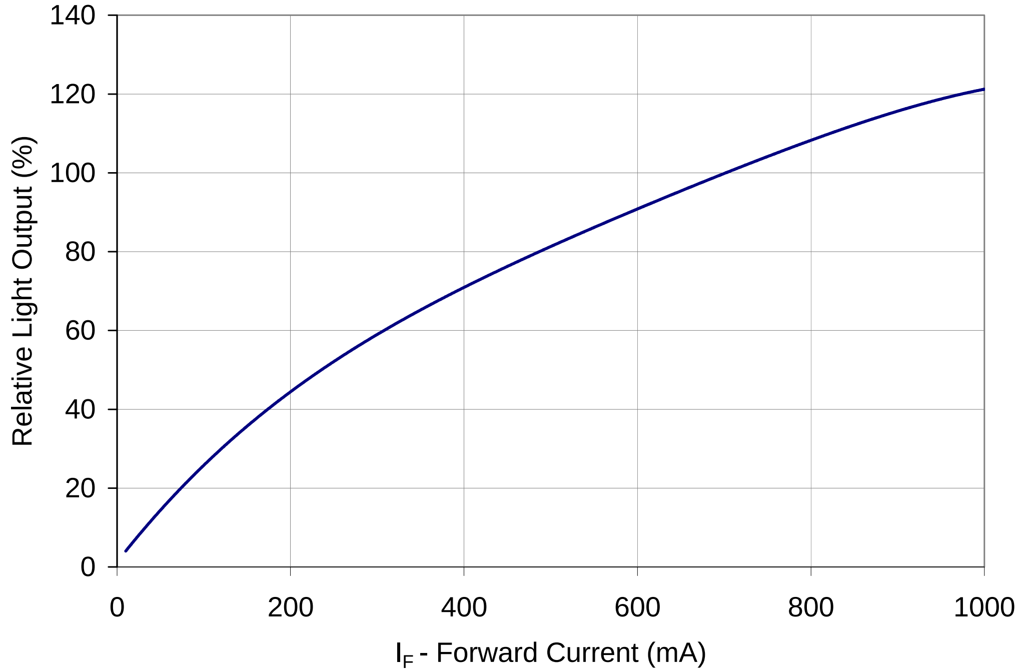


Figure 8: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

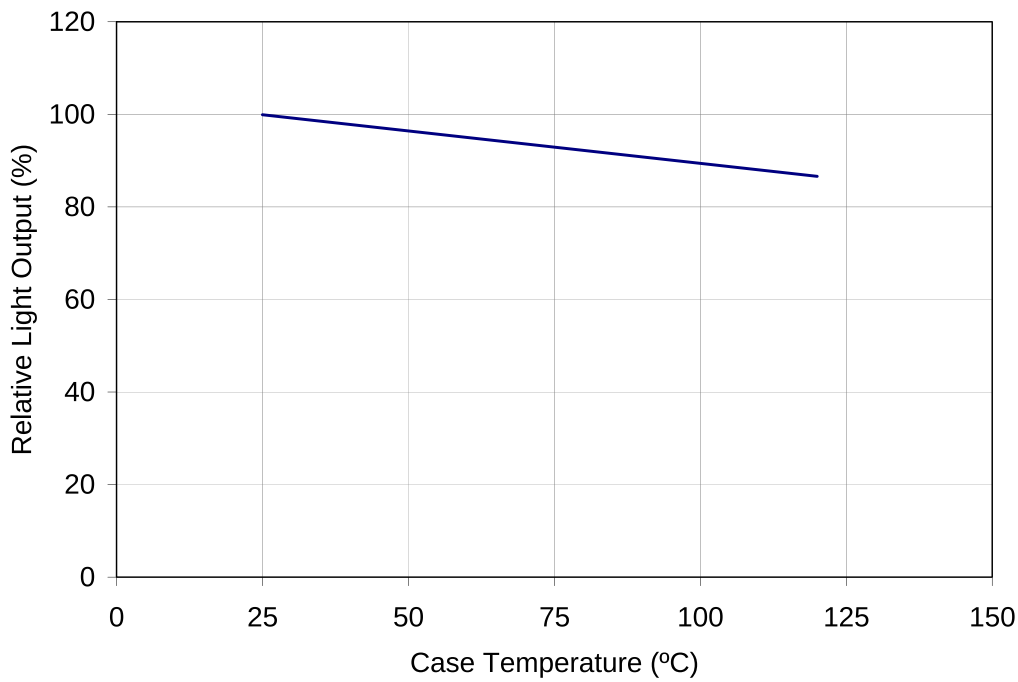


Figure 9: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

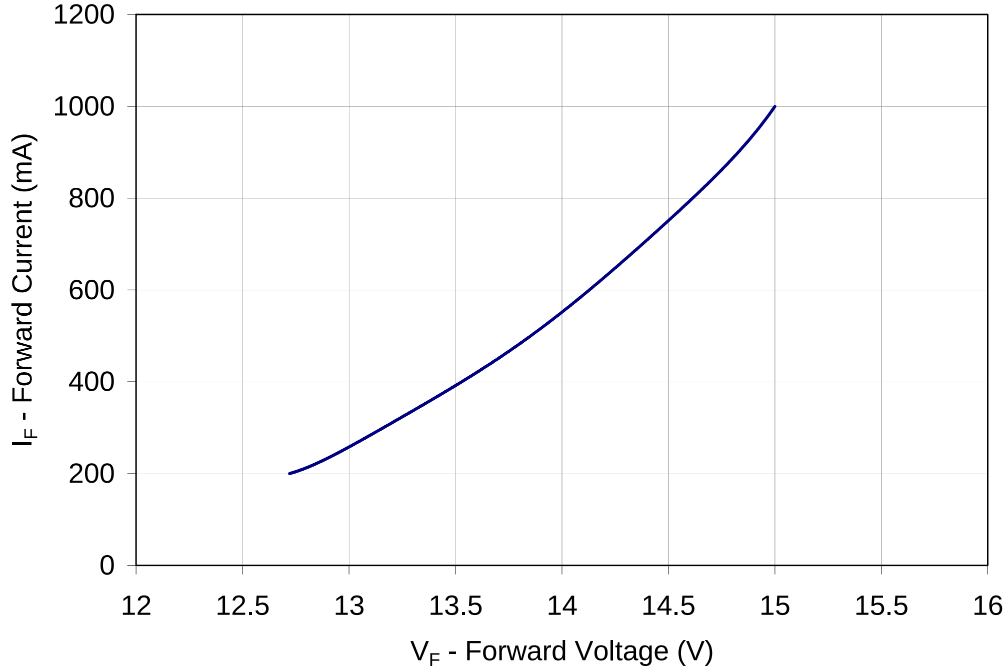


Figure 10: Typical forward current vs. forward voltage @ T_C = at 25°C.

Note for Figure 10:

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

Current Derating

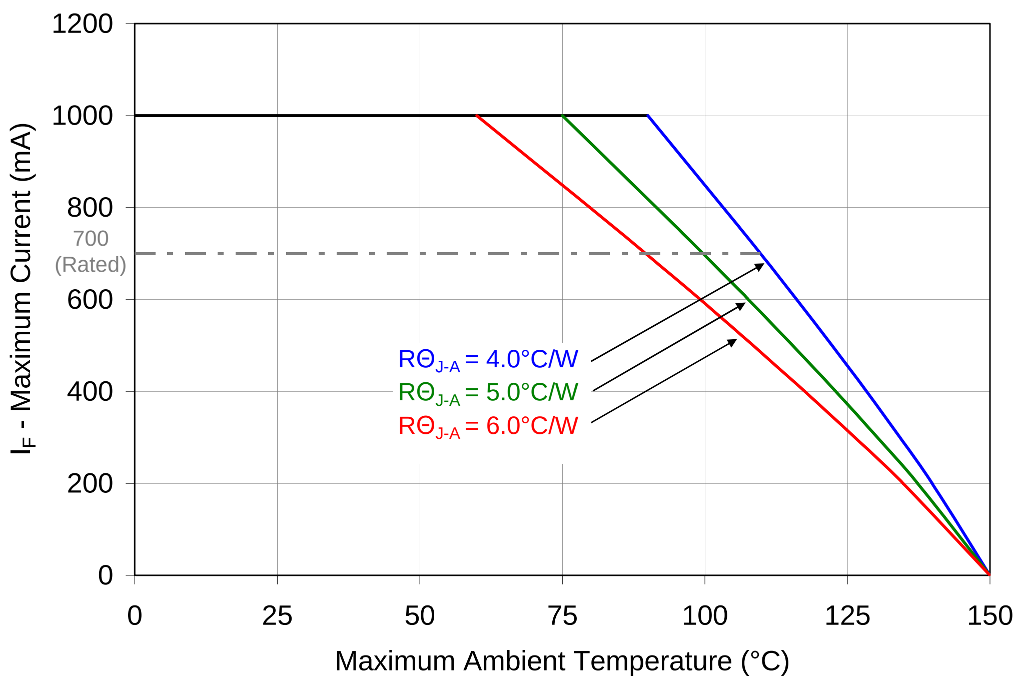


Figure 11: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 11:

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 LZ4-00G110 is typically 2.7°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)

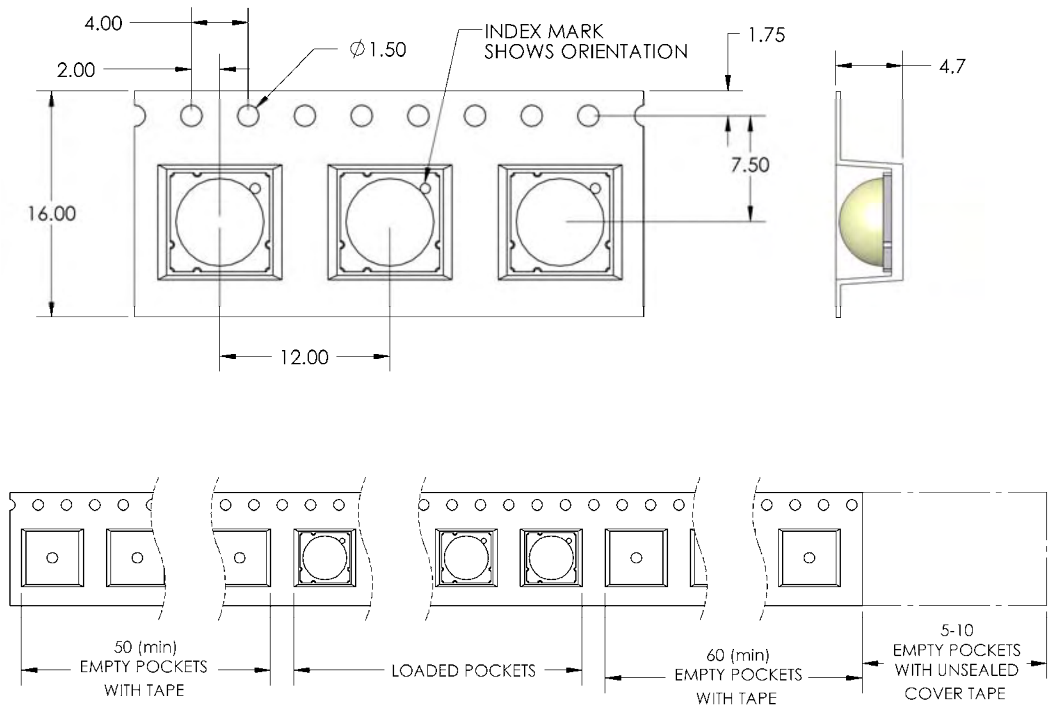


Figure 12: Emitter carrier tape specifications (mm).

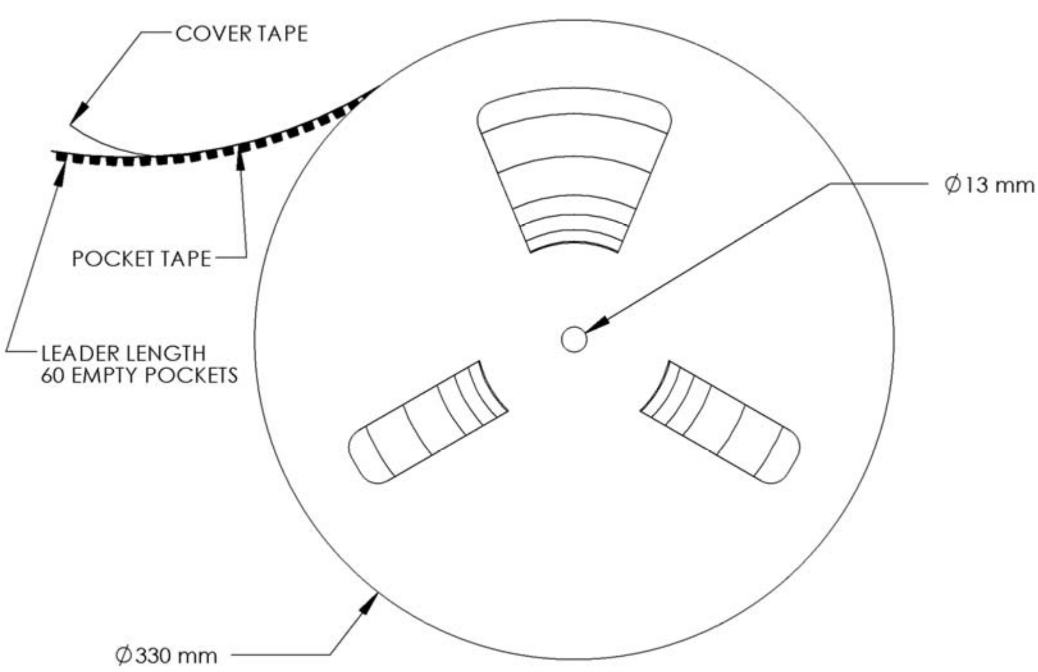


Figure 13: Emitter Reel specifications (mm).

Company Information

The LZ4-00G110 LED emitter is developed, manufactured and marketed by LedEngin, Inc., located in Santa Clara, CA. LedEngin is a global market leader in advanced high-power LED emitters and light-source modules. LedEngin provides total solutions from 3W to 15W in single packages with ultra-small footprints in all colors from Cool White, Neutral White, Warm White, Red, Green, Blue, Amber, RGB, RGBA, Deep Red, Dental Blue, and UV. LedEngin supports customers to generate solid-state lighting designs that conserve natural resources. LedEngin is focused on differentiated Ultra High-Brightness LED solutions for diverse global markets using its patent-pending package designs and manufacturing processes. LedEngin offers catalog as well as full custom solutions to enable flexible system designs for its customers. LedEngin is dedicated to long-term win-win partnering with its customers and suppliers.

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

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