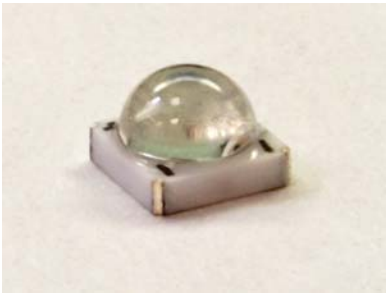
LedEngin, Inc.

High Luminous Efficacy
Red LED Emitter

LZ1-0R101



Key Features

- High Luminous Efficacy 1W Red LED
- Ultra-small foot print – 4.4mm x 4.4mm x 3.1mm
- Surface mount ceramic package with integrated glass lens
- Electrically neutral thermal path
- Very high Luminous Flux per area
- New industry standard for Lumen Maintenance (>90% at 100,000 Hours)
- JEDEC Level 2 for Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant
- Reflow solderable (up to 6 cycles)
- Available on tape and reel or with MCPCB

Typical Applications

- Indoor and outdoor Architectural Lighting
- Stage and Entertainment Lighting
- Backlighting
- Traffic and signal Lights
- Full Color Displays
- Projectors
- Emergency Lighting
- Medical
- Automotive

Description

The LZ1-0R101 Red LED emitter provides 1W power in an extremely small package. With a 4.4mm x 4.4mm x 3.1mm ultra-small footprint, this package provides exceptional luminous flux per area, up to 3 times greater than competitors' equivalent 1W products. LedEngin's Red LED offers ultimate design flexibility with separate electrical and thermal paths. The patent-pending design has unparalleled thermal and optical performance and excellent UV resistance. 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.

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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 M N P Q R S T)

Where:
A – designates the number of LED die in the package
B – designates the radiation pattern (“0” for Lambertian)
C and D – designate the color (“R1” for Red - 625nm Dominant Wavelength)
E and F – designate the Power (“01” for 1W typical rating)
G – designates the minimum Flux bin (See Table 2)
H and J – designate the Peak Wavelength, Hue or CCT bin groups (see Table 3)
K – designates the maximum V_F bin (See Table 4)
L through T are reserved for future products

IPC/JEDEC Moisture Sensitivity Level

Table 1 - IPC/JEDEC J-STD 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	30°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 350 mA. 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 = 350mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 350mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 500mA [2] (lm)
E	24	31	37
F	31	38	46
G	38	48	58
H	48	60	73

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] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 350mA [1] (nm)
R2	620	630
R4	630	640
R6	640	650

Notes for Table 3:
1. Dominant wavelength is derived from the CIE 1931 Chromaticity Diagram and represents the perceived hue. 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 = 350mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 350mA [1] (V)
A	2.00	2.24
B	2.24	2.48
C	2.48	2.72
D	2.72	2.96

Notes for Table 4:
1. LedEngin maintains a tolerance of ± 0.04V for forward voltage measurements.

Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current [1]	I_F	500	mA
Peak Pulsed Forward Current [2]	I_{FP}	700	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	
ESD Sensitivity		> 8,000 V HBM Class 3B JESD22-A114-D	

Notes for Table 5:
1. Maximum DC forward current 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 020c. See Reflow Soldering Profile Figure 3.

Optical Characteristics @T_A = 25°C

Table 6:

Parameter	Symbol	Typical	Unit
Luminous Flux (@ I_F = 350mA)	Φ_V	38	lm
Luminous Flux (@ I_F = 500mA)	Φ_V	51	lm
Dominant Wavelength	λ_D	625	nm
Viewing Angle [1]	$2\Theta_{1/2}$	90	Degrees
Total Included Angle [2]	$\Theta_{0.9V}$	100	Degrees

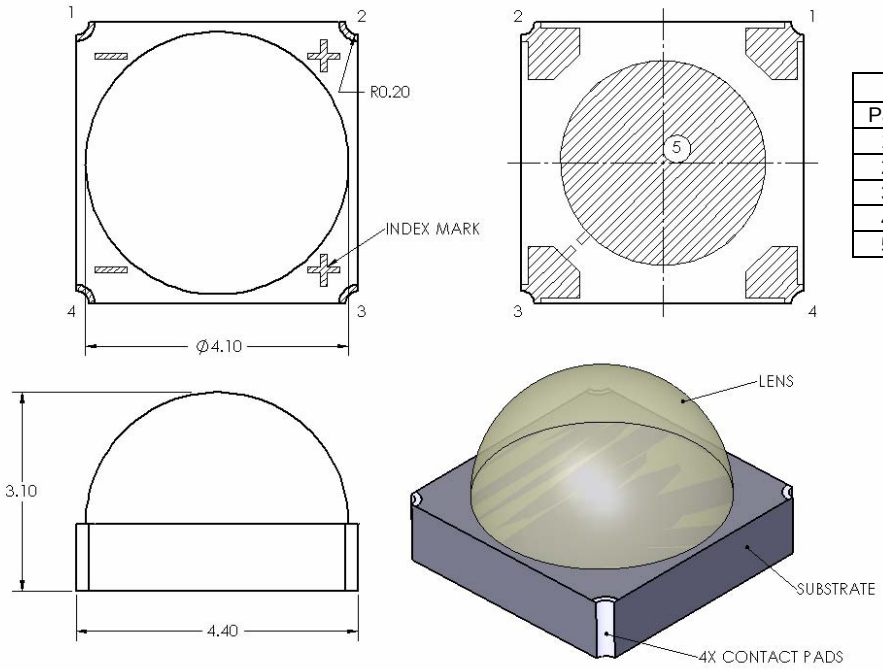
Notes for Table 6:
1. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
2. Total Included Angle is the total angle that includes 90% of the total luminous flux.

Electrical Characteristics @T_A = 25°C

Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ I_F = 350mA)	V_F	2.1	V
Forward Voltage (@ I_F = 500mA)	V_F	2.2	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-2.0	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	12	°C/W

Mechanical Dimensions (mm)



Pin Out	
Pad	Function
1	Cathode
2	Anode
3	NC
4	Cathode
5	Thermal

Figure 1: Package Outline Drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Pad 5, Thermal, is electrically neutral.

Recommended Solder Pad Layout (mm)

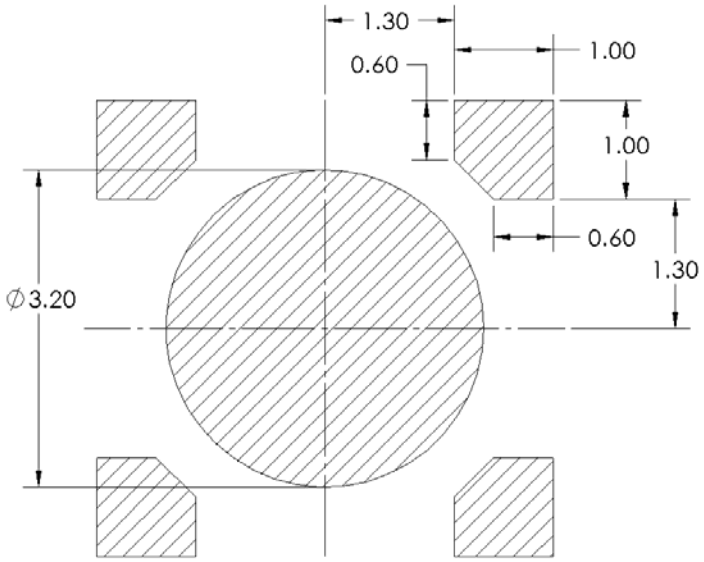


Figure 2: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

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

Reflow Soldering Profile

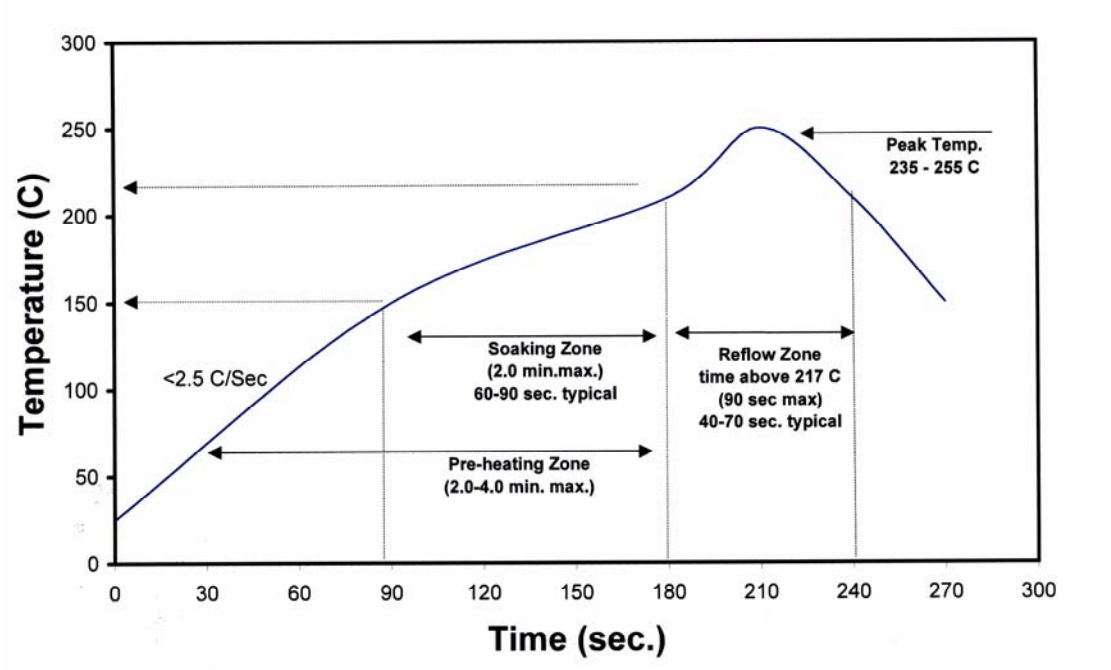


Figure 3: Reflow Soldering Profile for lead free soldering.

Typical Radiation Pattern

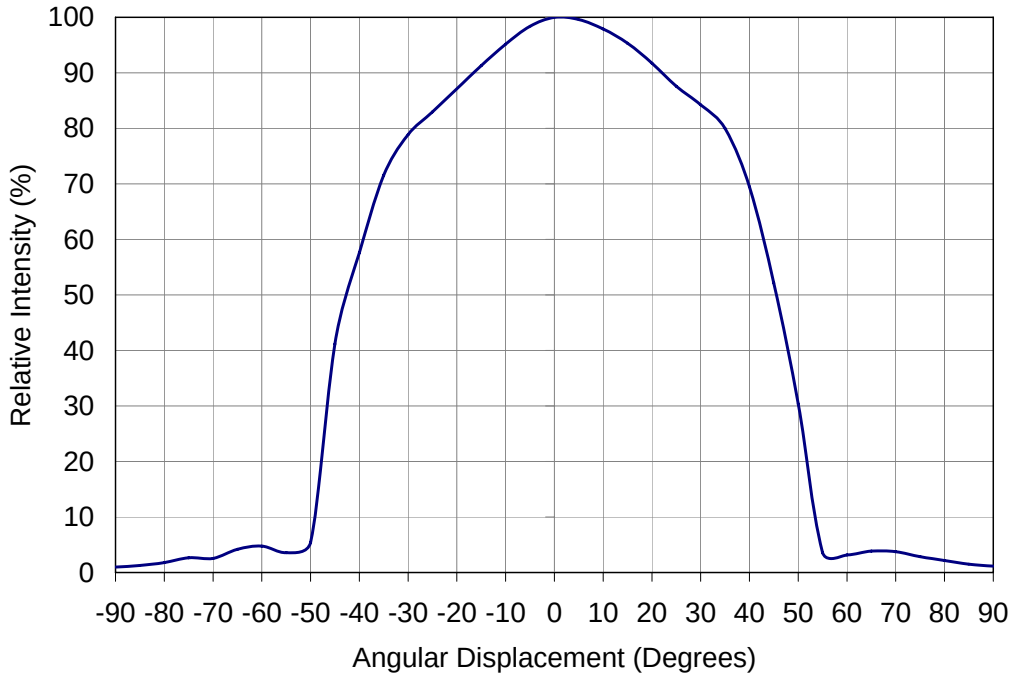


Figure 4: Typical Representative Spatial Radiation Pattern @ T_A = 25°C.

Typical Relative Spectral Power Distribution

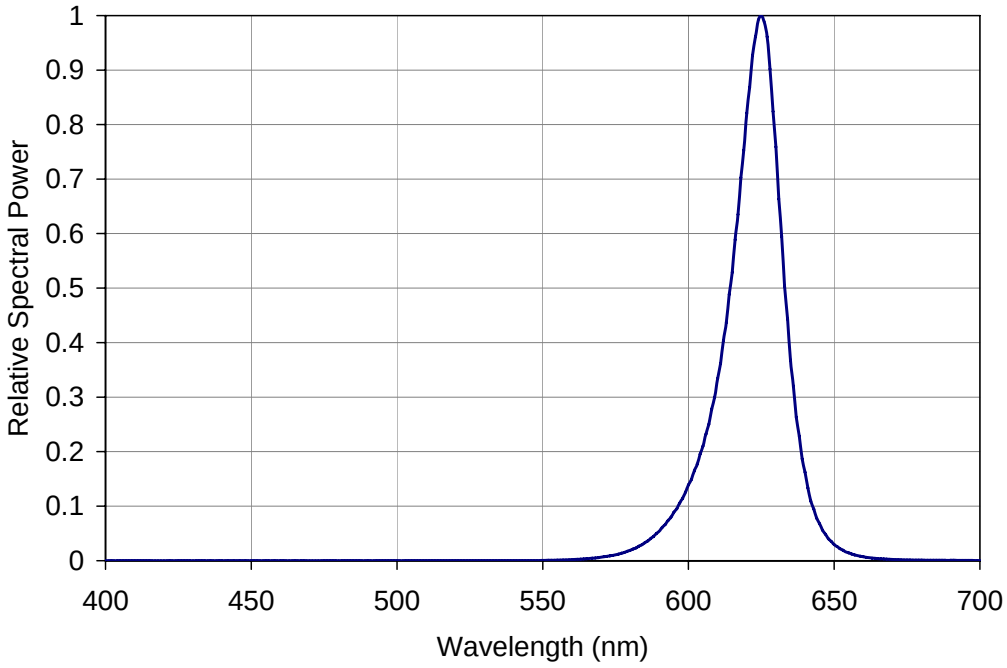


Figure 5: Relative Spectral Power vs. Wavelength @ T_A = 25°C.

Dominant Wavelength Shift over Temperature

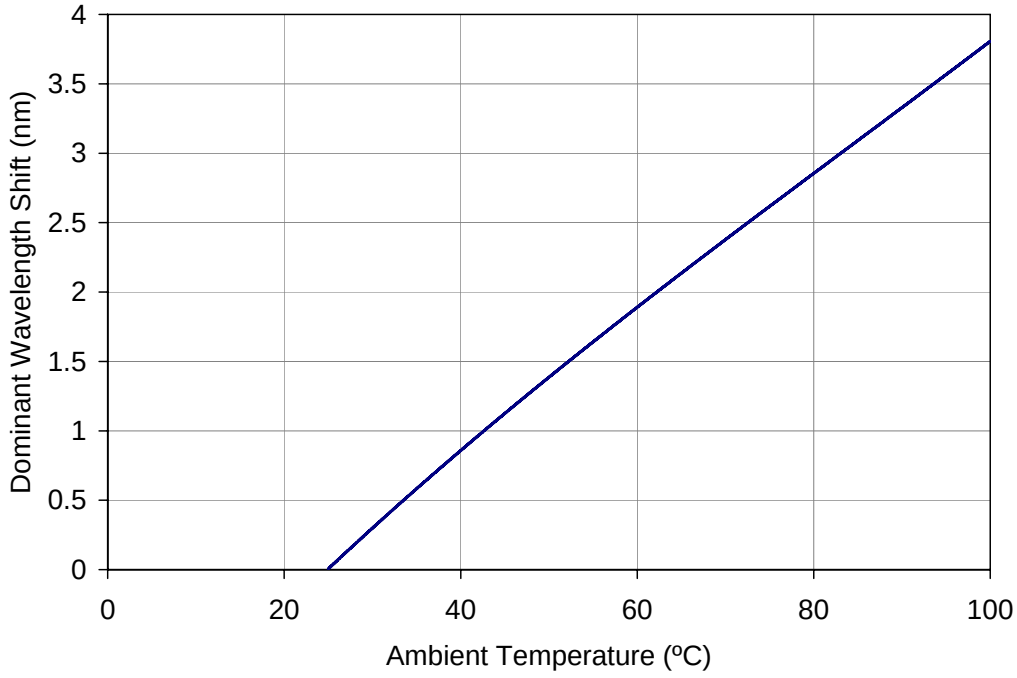


Figure 6: Typical Dominant Wavelength shift vs. ambient temperature.

Typical Relative Light Output @ T_A = 25°C

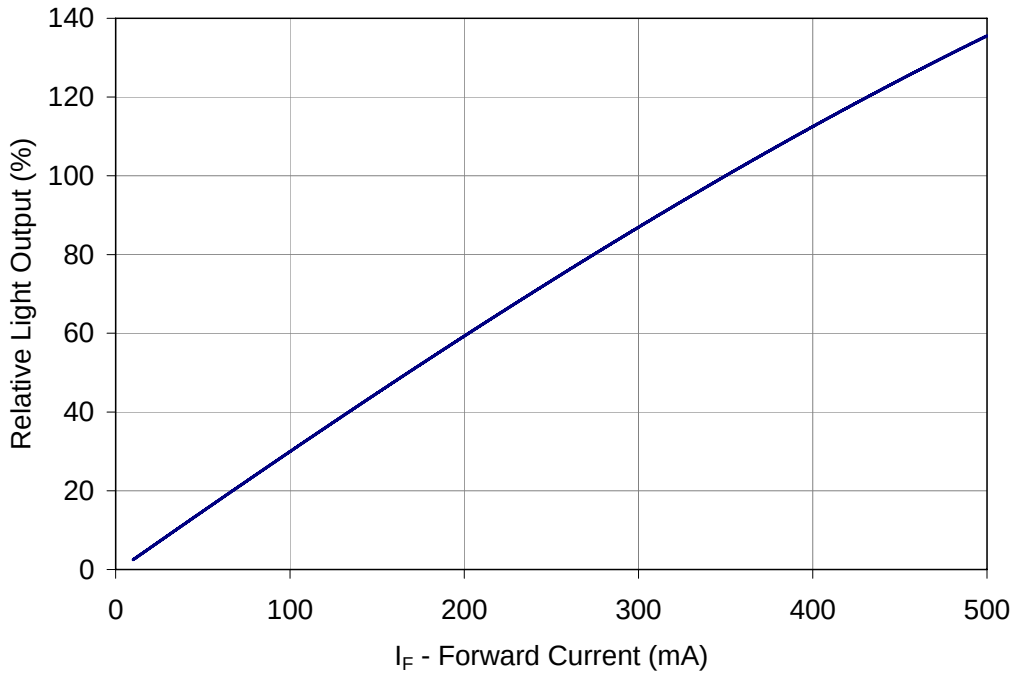


Figure 7: Typical relative light output vs. forward current @ T_A = at 25°C.

Typical Relative Light Output over Temperature

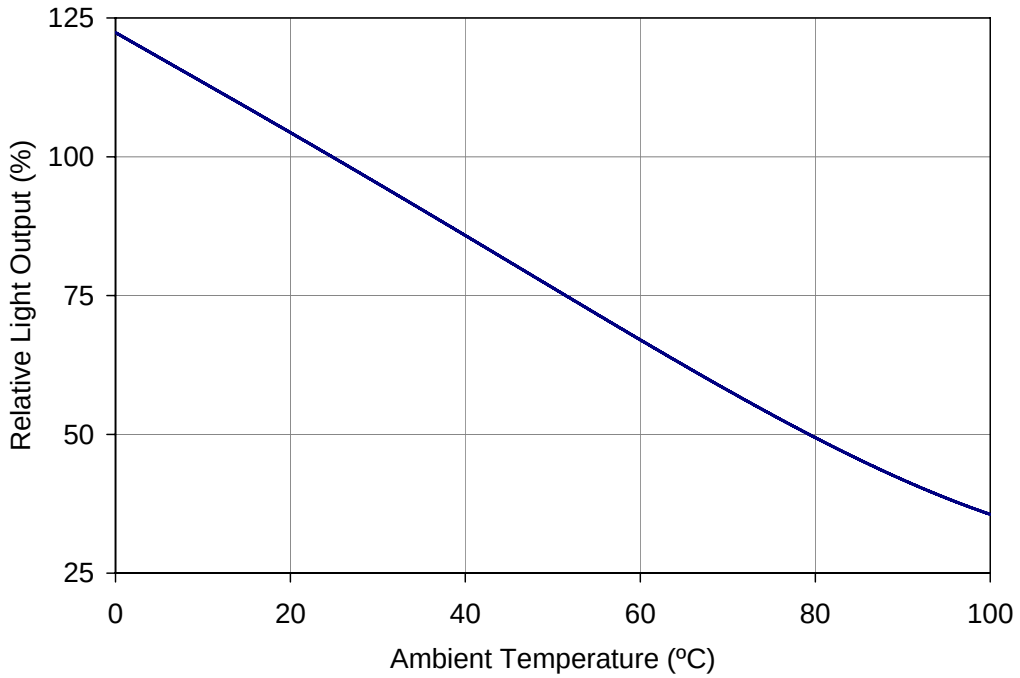


Figure 8: Typical relative light output vs. ambient temperature.

Typical Forward Current Characteristics

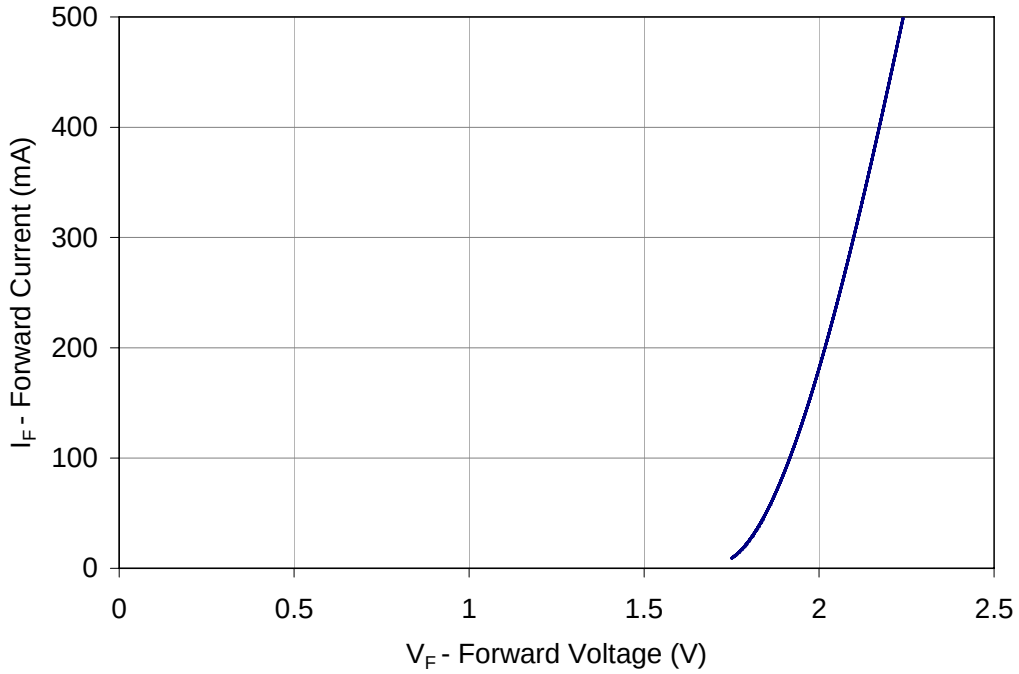


Figure 9: Typical forward current vs. forward voltage @ T_A = at 25°C.

Current Derating

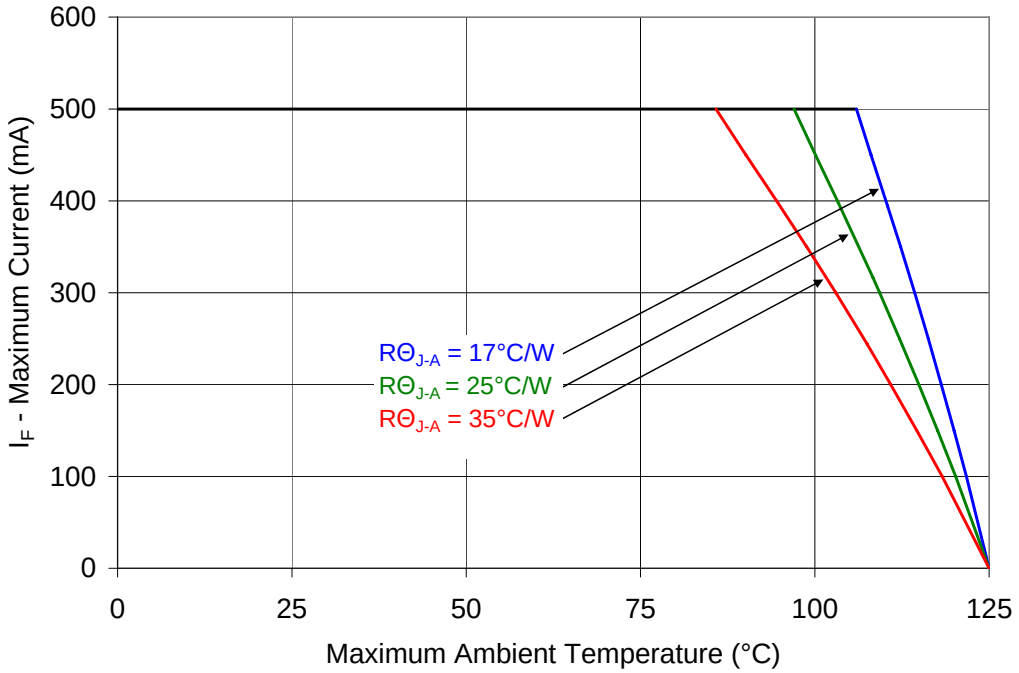


Figure 10: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 125°C.

Emitter Tape and Reel Specifications (mm)

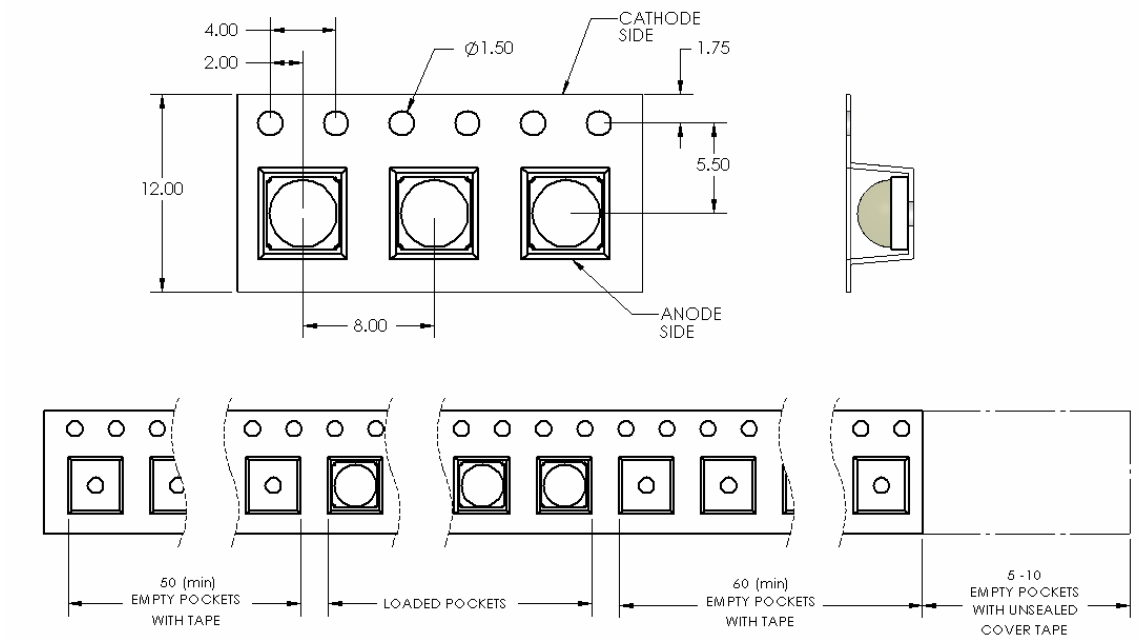


Figure 11: Emitter carrier tape specifications (mm).

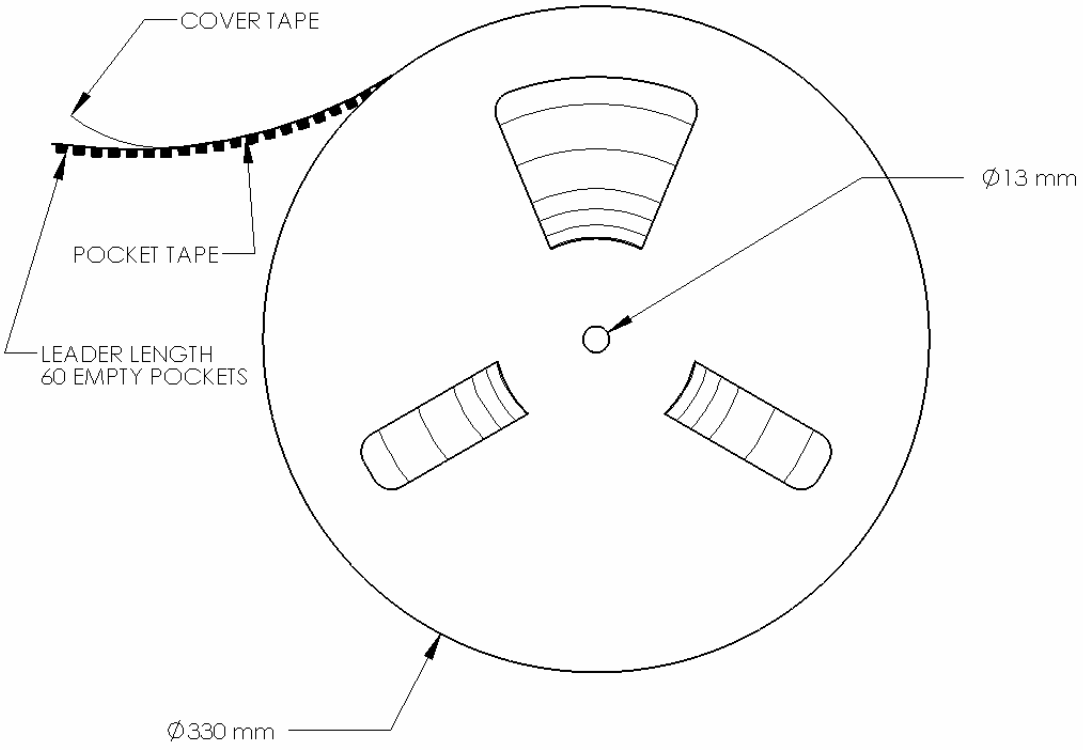


Figure 12: Emitter Reel specifications (mm).

Company Information

The LZ1-0R101 LED emitter is developed, manufactured, and marketed by LedEngin, Inc., located in Santa Clara, CA. LedEngin is a worldwide market leader in advanced high-power LED emitters and light-source modules. LedEngin provides total solutions from 1W to 15W in single packages with ultra-small footprints in all colors from White, Dental Blue, Blue, Green, Red 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 global customers and suppliers.

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

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