

High Luminous Efficacy
Amber LED Emitter

LZ1-00A103



Key Features

- High Luminous Efficacy 3W Amber LED
- Ultra-small foot print – 4.4mm x 4.4mm x 3.1mm
- Surface mount ceramic package with integrated glass lens
- Very high Luminous Flux density
- New industry standard for Lumen Maintenance (>90% at 100,000 Hours)
- Autoclave compliant (JEDEC JESD22-A102-C)
- JEDEC Level 2 for Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant
- Reflow solderable (up to 6 cycles)
- Emitter available on [Standard](#) or [Miniature](#) 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 LZ1-00A103 Amber LED emitter provides 3W 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 density, up to 3 times greater than competitors' equivalent 3W products. 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.

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Product Nomenclature

The LZ Series part number designation is defined as follows:



Where:

- A – designates the number of LED die in the package (“1” for 3W)
- 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 (“03” for 3W 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 MSL Classification:

| Level | Floor Life | | Soak Requirements | | | |
|-------|------------|-------------------|-------------------|-----------------|------------|------------|
| | Time | Conditions | Standard | Accelerated | 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. 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) @ $I_F = 700\text{mA}$ ^[1,2] (lm) | Maximum Luminous Flux (Φ_V) @ $I_F = 700\text{mA}$ ^[1,2] (lm) | Typical Luminous Flux (Φ_V) @ $I_F = 1000\text{mA}$ ^[2] (lm) |
|----------|---|---|--|
| G | 38 | 48 | 60 |
| H | 48 | 60 | 70 |
| J | 60 | 75 | 85 |
| K | 75 | 93 | 105 |

Notes for Table 2:

- Luminous flux performance guaranteed within published operating conditions. LedEngin maintains a tolerance of $\pm 10\%$ on flux measurements.
- 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) @ $I_F = 700\text{mA}$ ^[1] (nm) | Maximum Dominant Wavelength (λ_D) @ $I_F = 700\text{mA}$ ^[1] (nm) |
|----------|--|--|
| A1 | 582.5 | 585 |
| A2 | 585 | 587.5 |
| A3 | 587.5 | 590 |
| A4 | 590 | 592.5 |
| A5 | 592.5 | 595 |
| A6 | 595 | 597.5 |

Notes for Table 3:

- Dominant wavelength is derived from the CIE 1931 Chromaticity Diagram and represents the perceived hue.
- LedEngin maintains a tolerance of $\pm 0.5\text{nm}$ on dominant wavelength measurements.

Forward Voltage Bins

Table 4:

| Bin Code | Minimum Forward Voltage (V_F) @ $I_F = 700\text{mA}$ ^[1] (V) | Maximum Forward Voltage (V_F) @ $I_F = 700\text{mA}$ ^[1] (V) |
|----------|---|---|
| B | 2.24 | 2.48 |
| C | 2.48 | 2.72 |
| D | 2.72 | 2.96 |
| E | 2.96 | 3.20 |
| F | 3.20 | 3.44 |

Notes for Table 4:

- LedEngin maintains a tolerance of $\pm 0.04\text{V}$ for forward voltage measurements.

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 ~ +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:

- Maximum DC forward current 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 LZ1-00A103 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 |
|--|-----------------|---------|---------|
| Luminous Flux (@ $I_F = 700\text{mA}$) | Φ_V | 60 | lm |
| Luminous Flux (@ $I_F = 1000\text{mA}$) | Φ_V | 75 | lm |
| Dominant Wavelength ^[1] | λ_D | 590 | nm |
| Viewing Angle ^[2] | $2\Theta_{1/2}$ | 90 | Degrees |
| Total Included Angle ^[3] | $\Theta_{0.9V}$ | 110 | Degrees |

Notes for Table 6:

- 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.
- Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is $\frac{1}{2}$ of the peak value.
- Total Included Angle is the total angle that includes 90% of the total luminous flux.

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

Table 7:

| Parameter | Symbol | Typical | Unit |
|--|---------------------------|---------|-------|
| Forward Voltage (@ $I_F = 700\text{mA}$) | V_F | 2.5 | V |
| Forward Voltage (@ $I_F = 1000\text{mA}$) | V_F | 2.7 | V |
| Temperature Coefficient of Forward Voltage | $\Delta V_F / \Delta T_J$ | -2.8 | mV/°C |
| Thermal Resistance (Junction to Case) | $R\Theta_{J-C}$ | 12 | °C/W |

Mechanical Dimensions (mm)

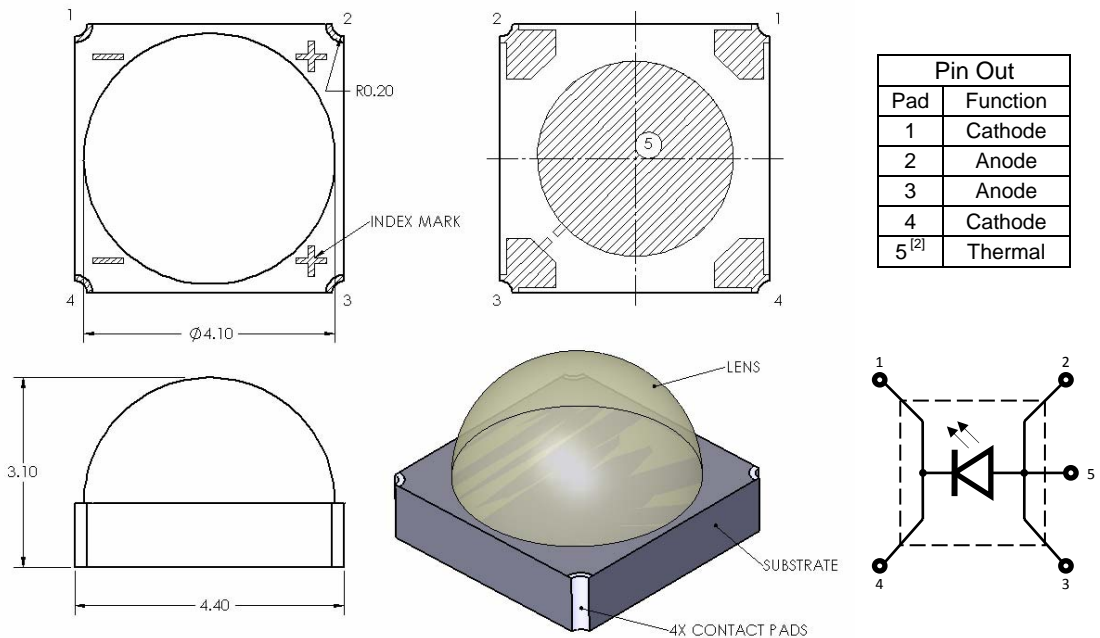


Figure 3: Package outline drawing.

Notes for Figure 3:

1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Thermal contact, Pad 5, is electrically connected to the Anode, Pads 2 and 3. Do not connect any pad to the thermal contact, Pad # 5. When mounting the LZ1-00A103 onto a MCPCB, by default its dielectric layer provides for the necessary electrical insulation in between all contact pads. LedEngin offers [LZ1-10A103](#) [Option 1] and [LZ1-30A103](#) [Option 3] MCPCB options which provide for electrical insulation between all contact pads. Please refer to Application Note MCPCB Option 1 and Option 3, or contact a LedEngin sales representative for more information.

Recommended Solder Pad Layout (mm)

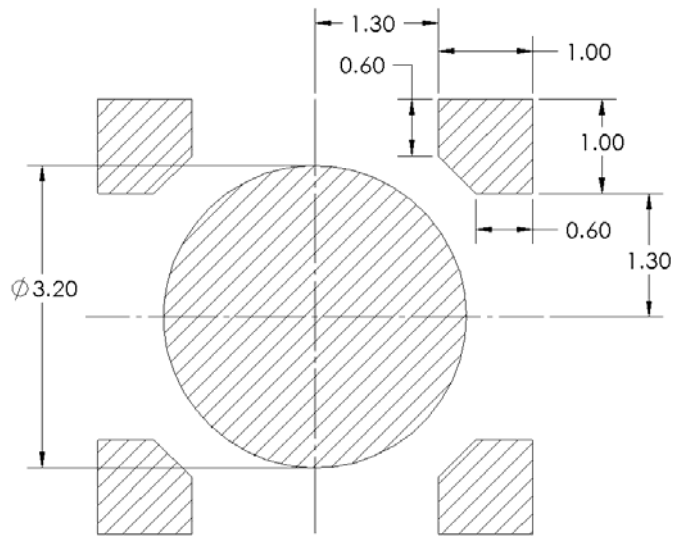


Figure 4: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 4:

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

Reflow Soldering Profile

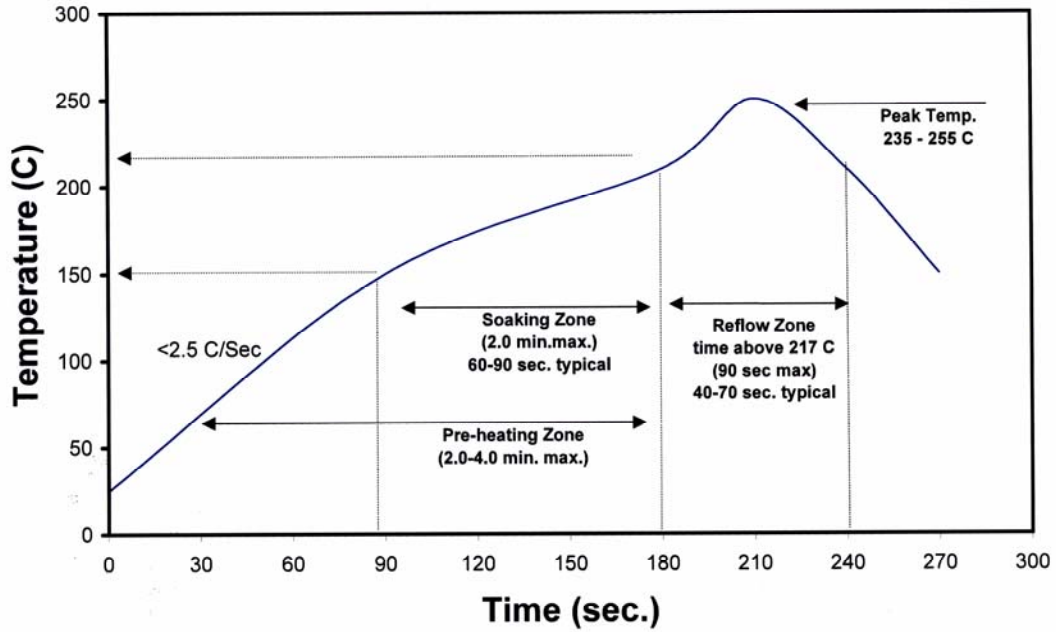


Figure 3: Reflow soldering profile for lead free soldering.

Typical Radiation Pattern

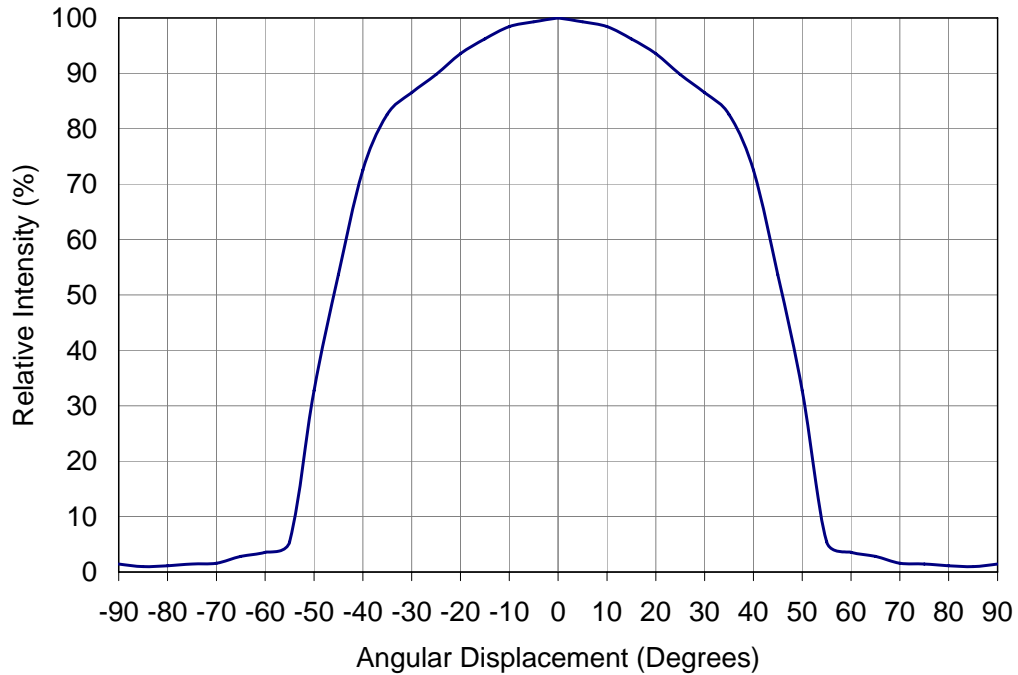


Figure 4: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

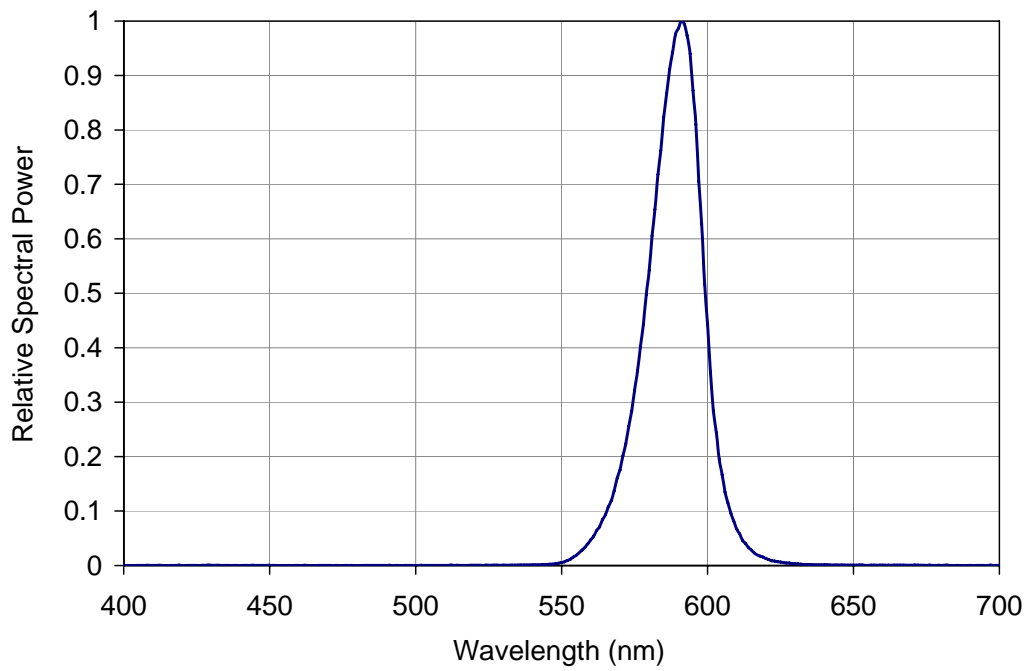


Figure 5: Relative spectral power vs. wavelength @ $T_c = 25^\circ\text{C}$.

Typical Dominant Wavelength Shift over Temperature

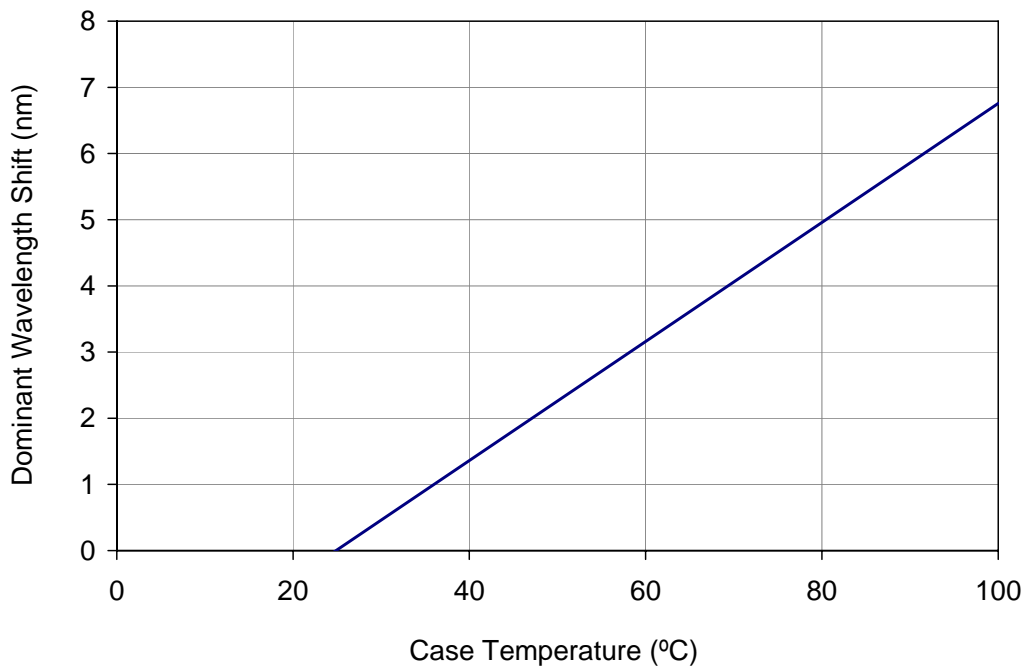


Figure 6: Typical dominant wavelength shift vs. case temperature.

Typical Relative Light Output @ $T_C = 25^\circ\text{C}$

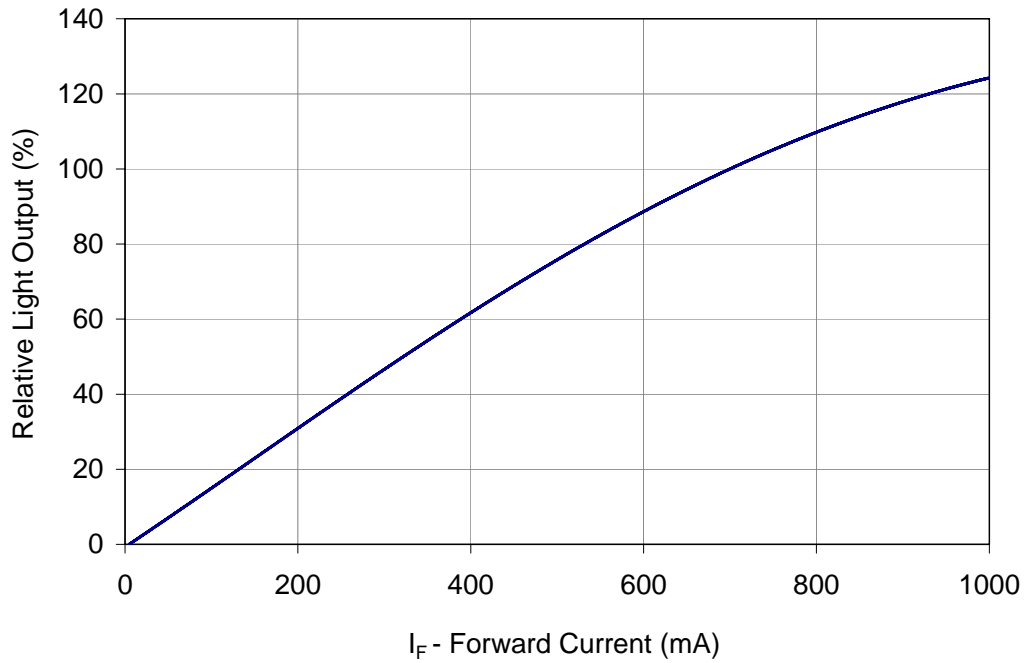


Figure 7: Typical relative light output vs. forward current @ $T_C = 25^\circ\text{C}$.

Typical Relative Light Output over Temperature

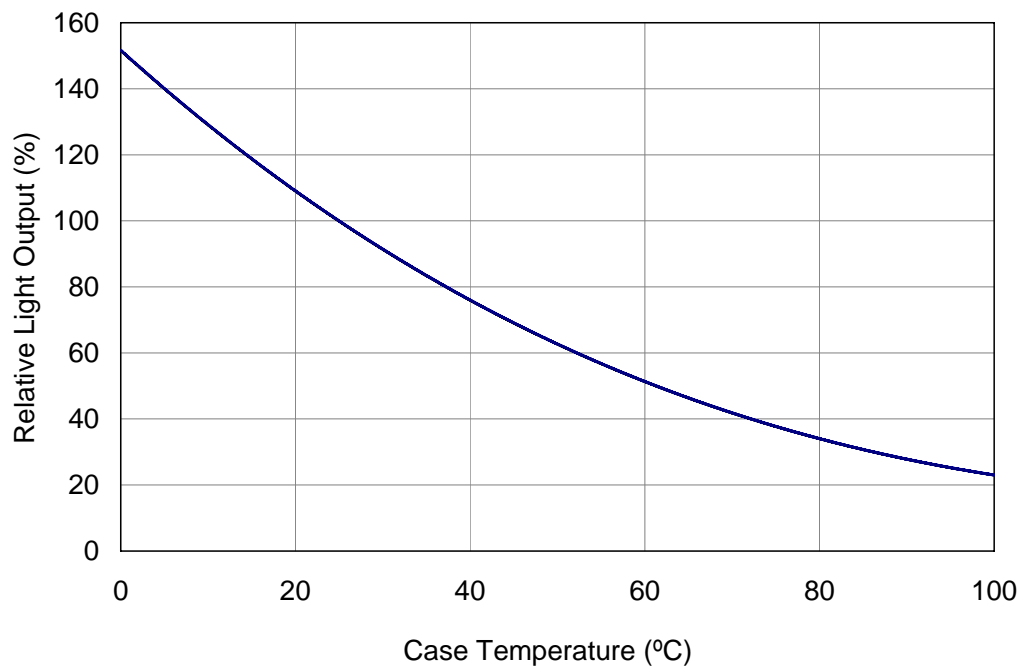


Figure 8: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

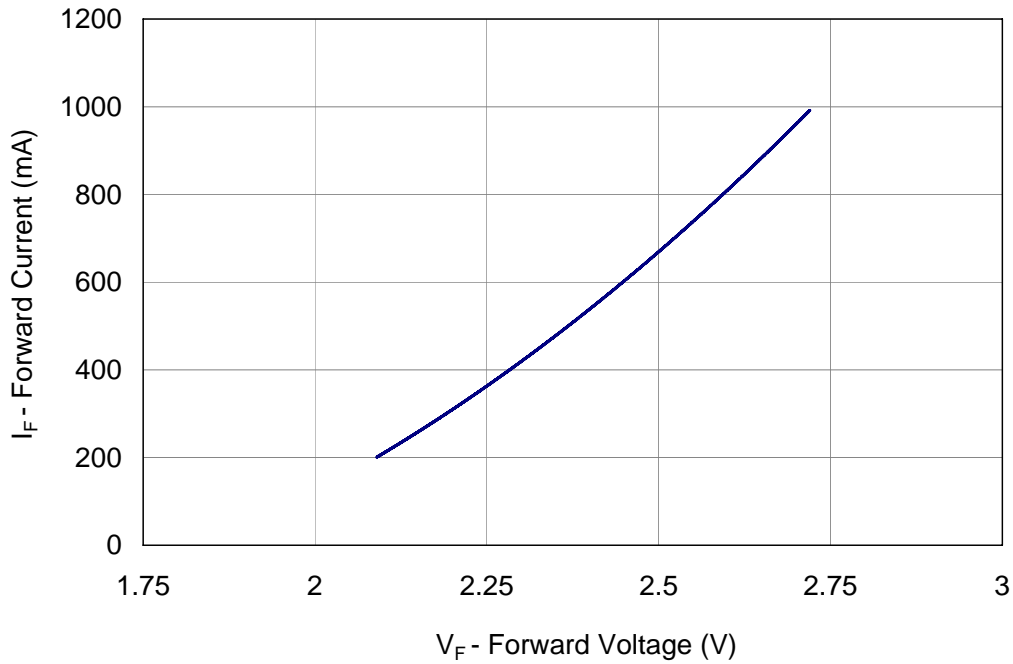


Figure 9: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

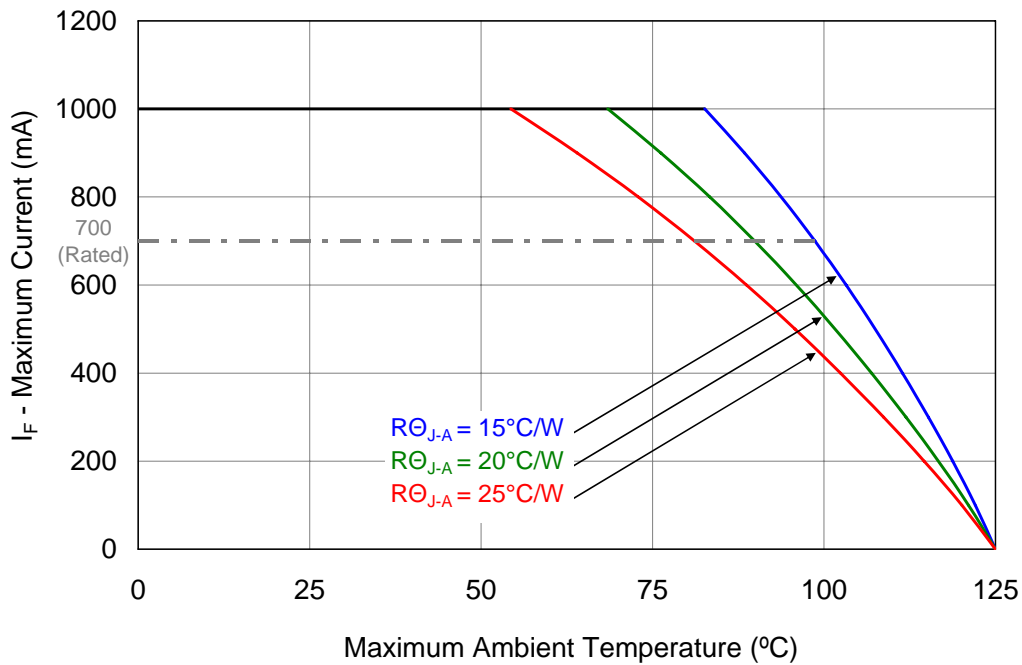


Figure 10: Maximum forward current vs. ambient temperature based on T_{J(MAX)} = 125°C.

Notes for Figure 10:

1. R_{θJ-C} [Junction to Case Thermal Resistance] for the LZ1-00A103 is typically 12°C/W.
2. R_{θJ-A} [Junction to Ambient Thermal Resistance] = R_{θJ-C} + R_{θC-A} [Case to Ambient Thermal Resistance].

Emitter Tape and Reel Specifications (mm)

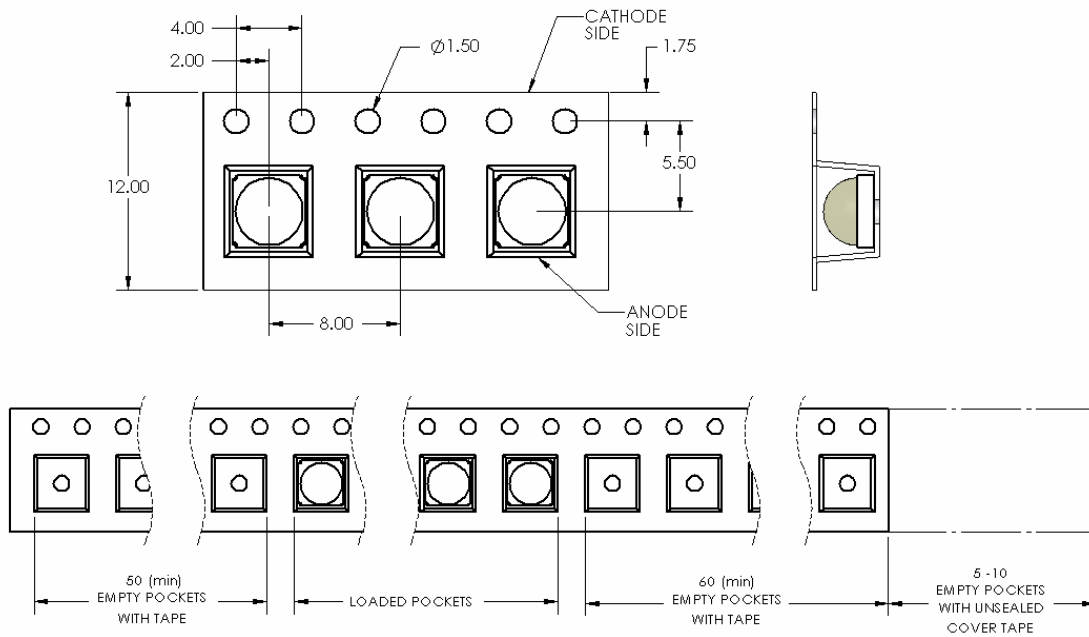


Figure 11: Emitter carrier tape specifications (mm).

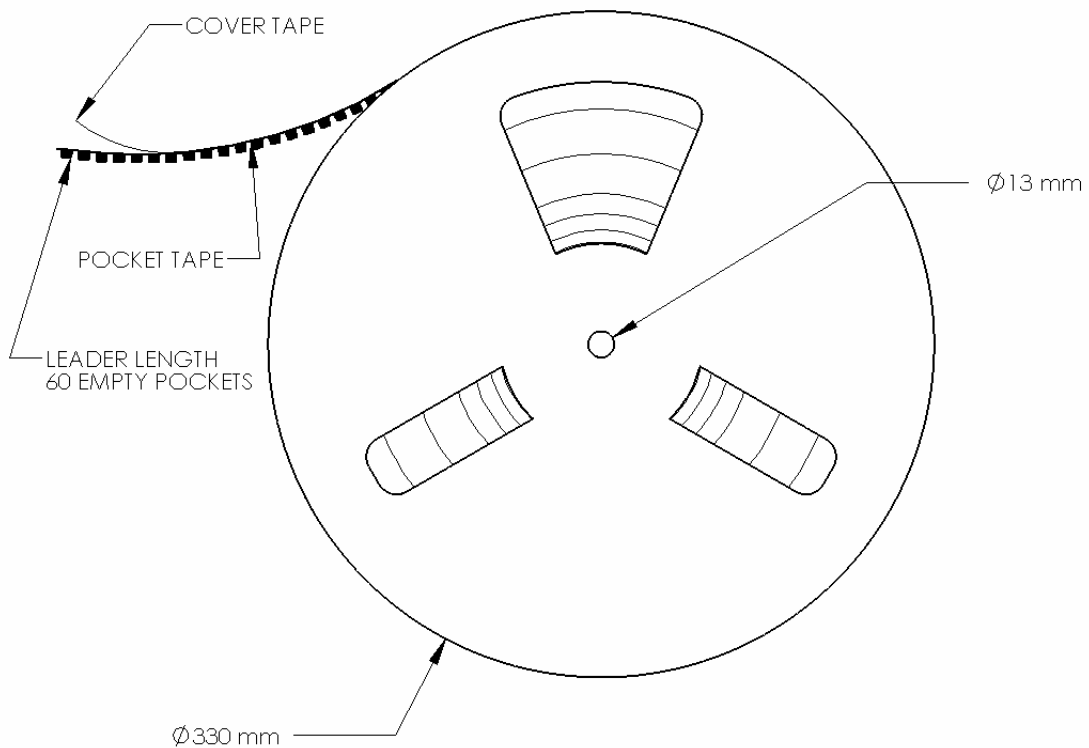


Figure 12: Emitter reel specifications (mm).

Company Information

The LZ1-00A103 Amber 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 White, Red, Green, Blue, Amber, RGB, RGBA, 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.