

High Efficacy
UV LED Emitter
LZ1-00UA05



Key Features

- High Efficacy 5W UV LED
- Ultra-small foot print – 4.4mm x 4.4mm x 3.2mm
- Surface mount ceramic package with integrated glass lens
- Very low Thermal Resistance (5.5°C/W)
- Very high Radiant Flux density
- New industry standard for Radiometric Power Maintenance (>90% at 100,000 Hours)
- Autoclave complaint (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

- Dental Curing and Teeth Whitening
- Sterilization and Medical
- DNA Gel

Description

The LZ1-00UA05 UV LED emitter provides superior radiometric power in the wavelength range specifically required for sterilization, dental curing lights, and numerous medical applications. With a 4.4mm x 4.4mm x 3.2mm ultra-small footprint, this package provides exceptional optical power density. The radiometric power performance and optimal peak wavelength of this LED are matched to the response curves of dental resins, resulting in a significantly reduced curing time. The patent-pending design has unparalleled thermal and optical performance. The high quality materials used in the package are chosen to optimize light output, have excellent UV resistance, and minimize stresses which results in monumental reliability and radiant flux maintenance.



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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 5W)
- B – designates the package level (“0” for Emitter)
- C – designates the radiation pattern (“0” for Lambertian)
- D and E – designate the color (“UA” -Typical UV Peak Wavelength = 400nm)
- F and G – designate the Power (“05” for 5W typical rating)
- H – designates the Radiant Flux bin (See Table 2)
- J and K – designate the Peak 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 radiant flux, peak 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	Soak Requirements					
	Floor Life		Standard		Accelerated	
	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 Radiant Flux Maintenance Projections

Based on long-term WHTOL testing, LedEngin projects that the LZ Series will deliver, on average, 90% Radiant Flux 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 115°C.

Radiant Flux Bins

Table 2:

Bin Code	Minimum Radiant Flux (Φ) @ $I_F = 700\text{mA}$ ^[1,2] (mW)	Maximum Radiant Flux (Φ) @ $I_F = 700\text{mA}$ ^[1,2] (mW)	Typical Radiant Flux (Φ) @ $I_F = 1000\text{mA}$ ^[2] (mW)
H	410	512	620
J	512	640	740
K	640	800	920
L	800	1000	1150

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 Bins

Table 3:

Bin Code	Minimum Peak Wavelength (λ_P) @ $I_F = 700\text{mA}$ ^[1] (nm)	Maximum Peak Wavelength (λ_P) @ $I_F = 700\text{mA}$ ^[1] (nm)
U5	390	395
U6	395	400
U7	400	405
U8	405	410

Notes for Table 3:

1. LedEngin maintains a tolerance of $\pm 2.0\text{nm}$ on peak 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)
F	3.20	3.44
G	3.44	3.68
H	3.68	3.92
J	3.92	4.16
K	4.16	4.40

Notes for Table 4:

1. 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}	1000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	125	°C
Soldering Temperature ^[4]	T_{sol}	180	°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:

- 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.
- Use low temperature solders. LedEngin recommends 58Bi-42Sn (wt.%) Solder. 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 LZ1-00UA05 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 (@ $I_F = 700\text{mA}$)	Φ	550	mW
Radiant Flux (@ $I_F = 1000\text{mA}$)	Φ	700	mW
Peak Wavelength ^[1]	λ_P	400	nm
Viewing Angle ^[2]	$2\Theta_{1/2}$	85	Degrees
Total Included Angle ^[3]	$\Theta_{0.9V}$	100	Degrees

Notes for Table 6:

- When operating the UV LED, observe IEC 60825-1 class 3B rating. Avoid exposure to the beam.
- Viewing Angle is the off axis angle from emitter centerline where the radiometric 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 (@ $I_F = 700\text{mA}$)	V_F	3.9	V
Forward Voltage (@ $I_F = 1000\text{mA}$)	V_F	4.1	V
Temperature Coefficient of Forward Voltage	$\Delta V_F / \Delta T_J$	-3.7	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	5.5	°C/W

Mechanical Dimensions (mm)

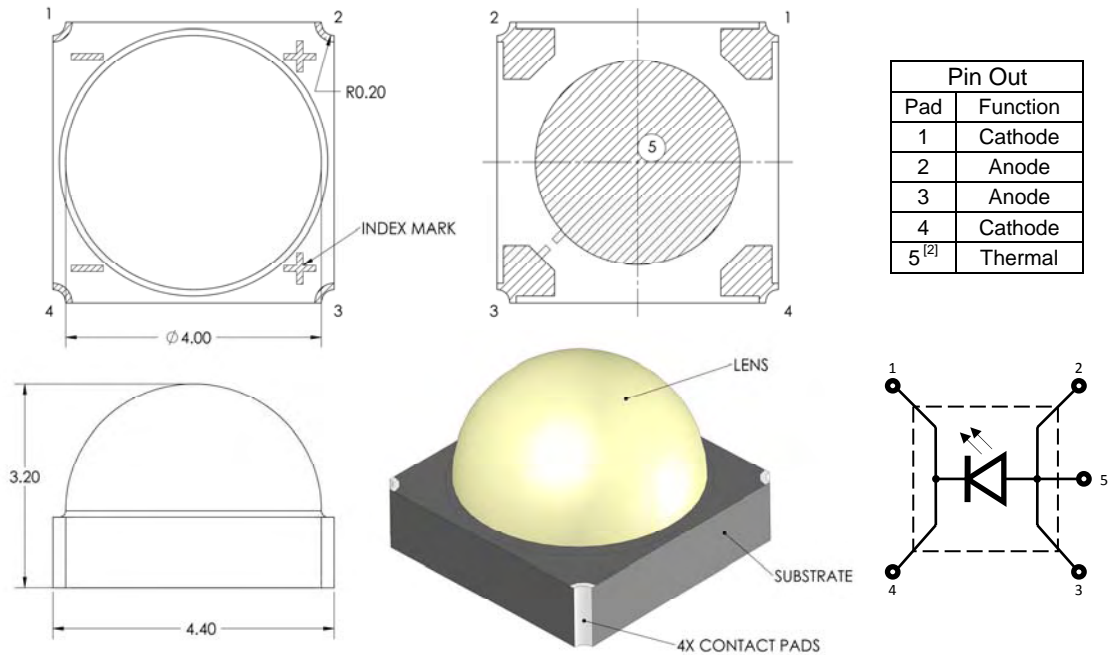


Figure 1: Package outline drawing.

Notes for Figure 1:

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 electrically connect any electrical pads to the thermal contact, Pad 5. LedEngin recommends mounting the LZ1-00UA05 to a MCPCB that provides insulation between all electrical pads and the thermal contact, Pad 5. LedEngin offers [LZ1-10UA05](#) and [LZ1-30UA05](#) MCPCB options which provide both electrical and thermal contact insulation with low thermal resistance. Please refer to Application Note MCPCB Options 1 and 3, or contact a LedEngin sales representative for more information.

Recommended Solder Pad Layout (mm)

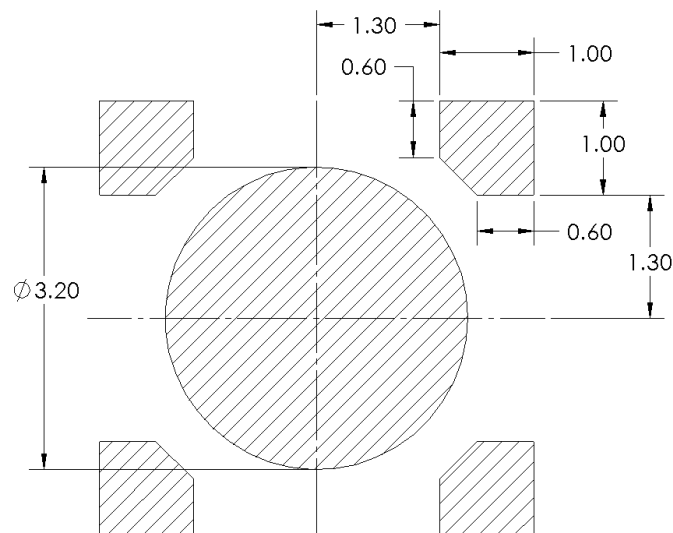


Figure 2: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 2:

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

Reflow Soldering Profile

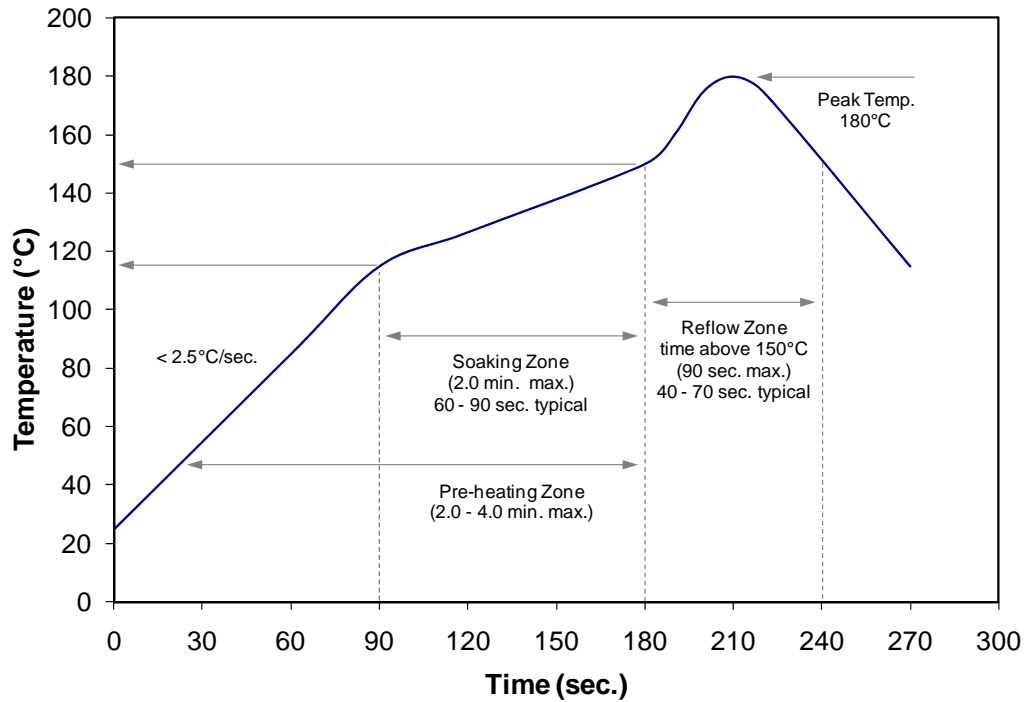


Figure 3: Reflow soldering profile for lead free soldering.

Notes for Figure 3:

1. Solder profile for low temperature solder. LedEngin recommends 58Bi-42Sn (wt.%) Solder for the LZ1-00UA05.

Typical Radiation Pattern

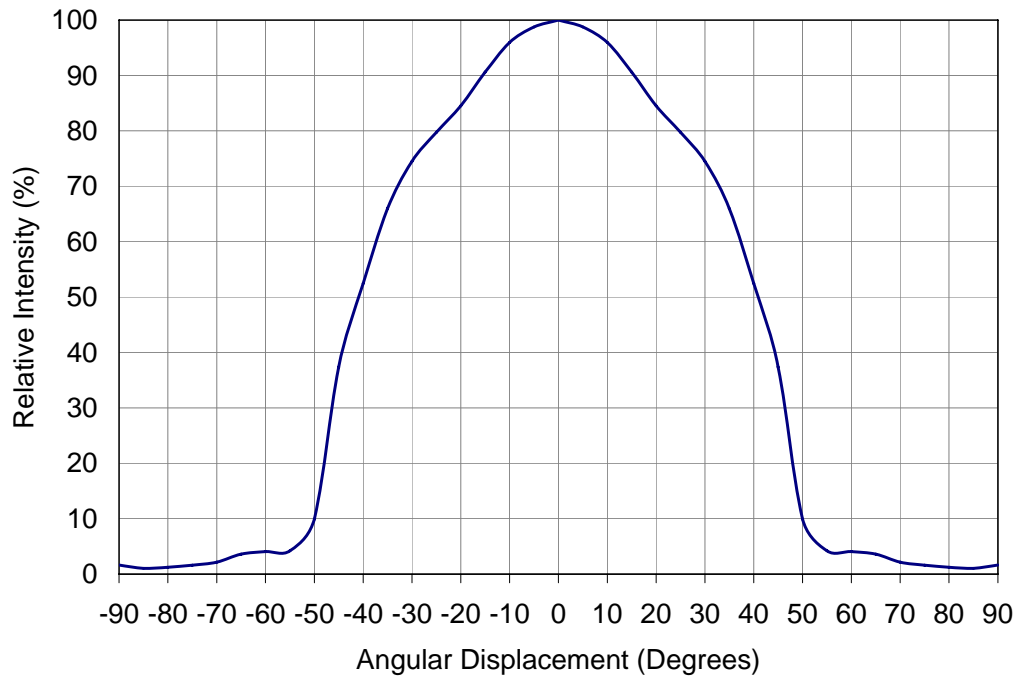


Figure 4: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

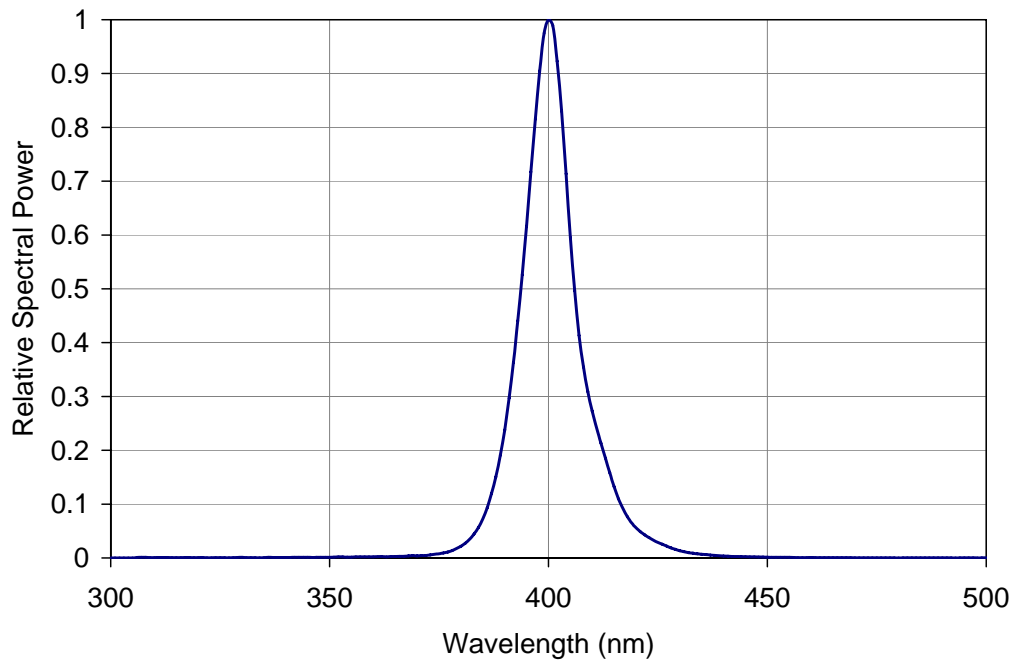


Figure 5: Typical relative spectral power vs. wavelength @ $T_c = 25^\circ\text{C}$.

Typical Peak Wavelength Shift over Temperature

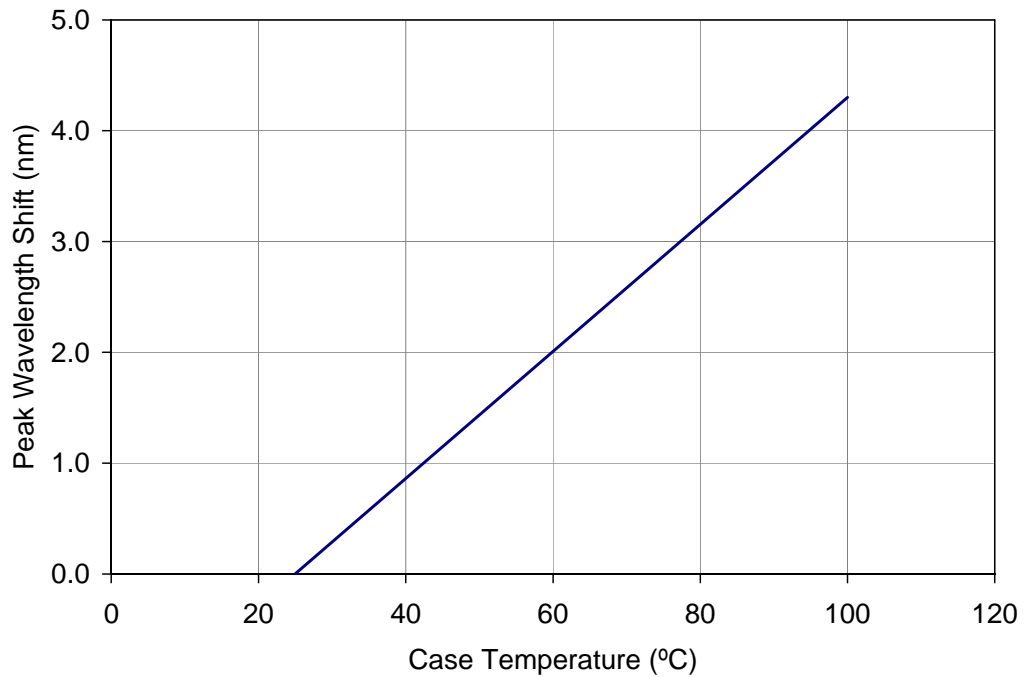


Figure 6: Typical peak wavelength shift vs. case temperature.

Typical Normalized Radiant Flux

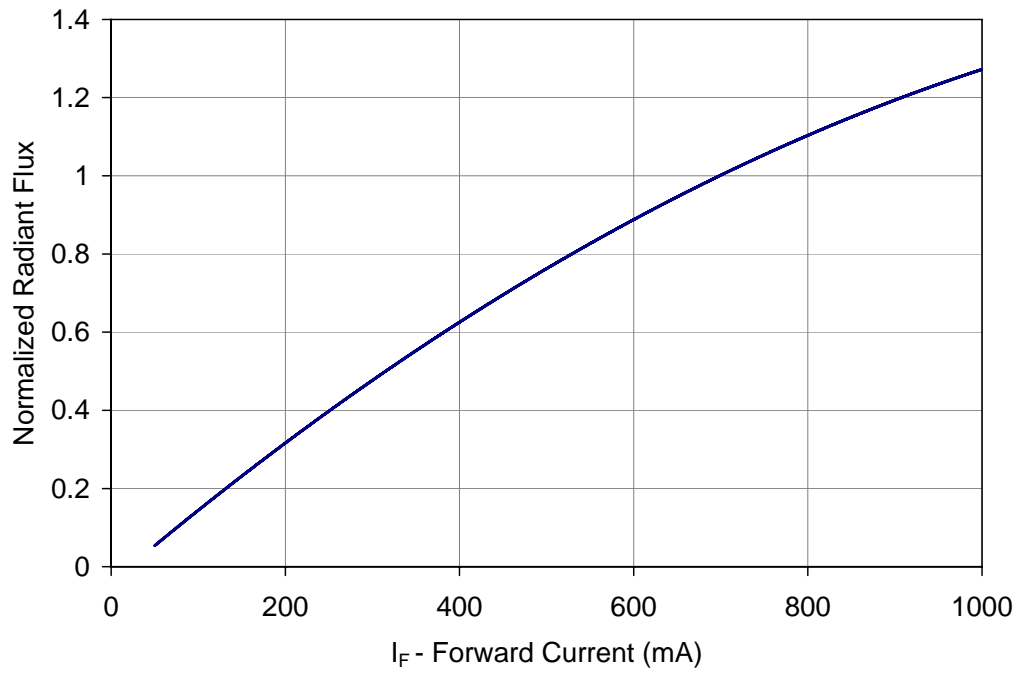


Figure 7: Typical normalized radiant flux vs. forward current @ $T_C = 25^\circ\text{C}$.

Typical Normalized Radiant Flux over Temperature

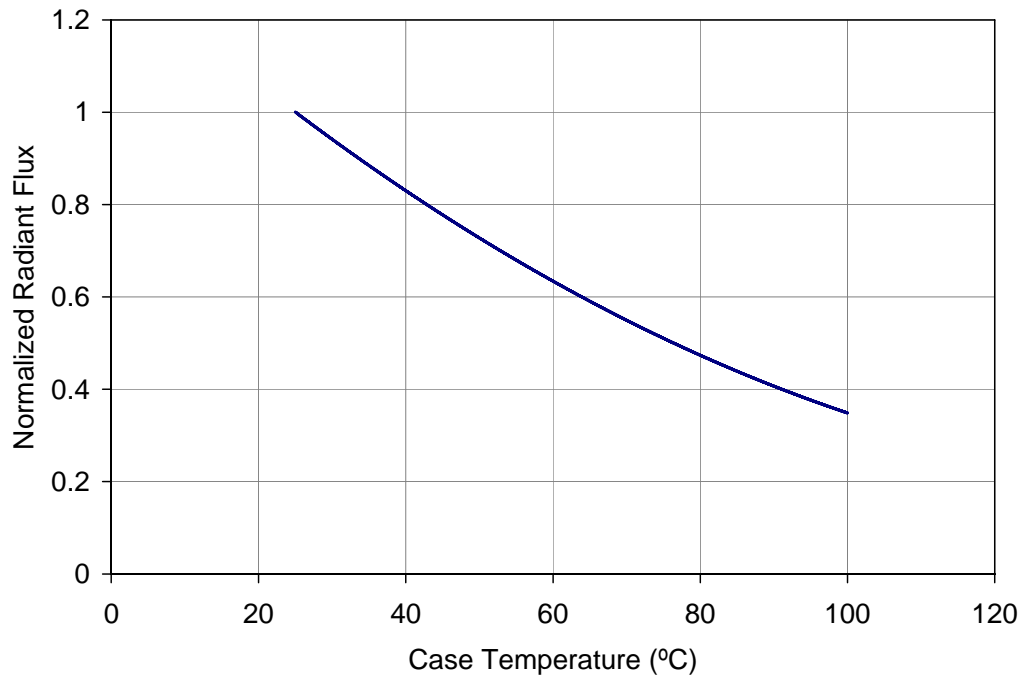


Figure 8: Typical normalized radiant flux vs. case temperature.

Typical Forward Current Characteristics

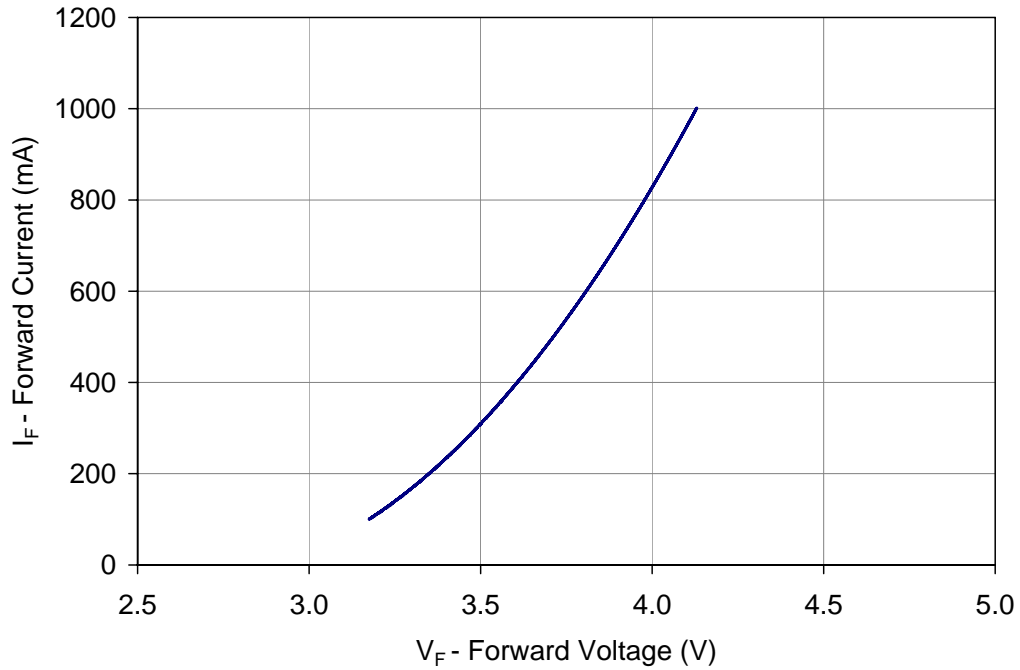


Figure 9: Typical forward current vs. forward voltage @ $T_C = 25^\circ\text{C}$.

Current Derating

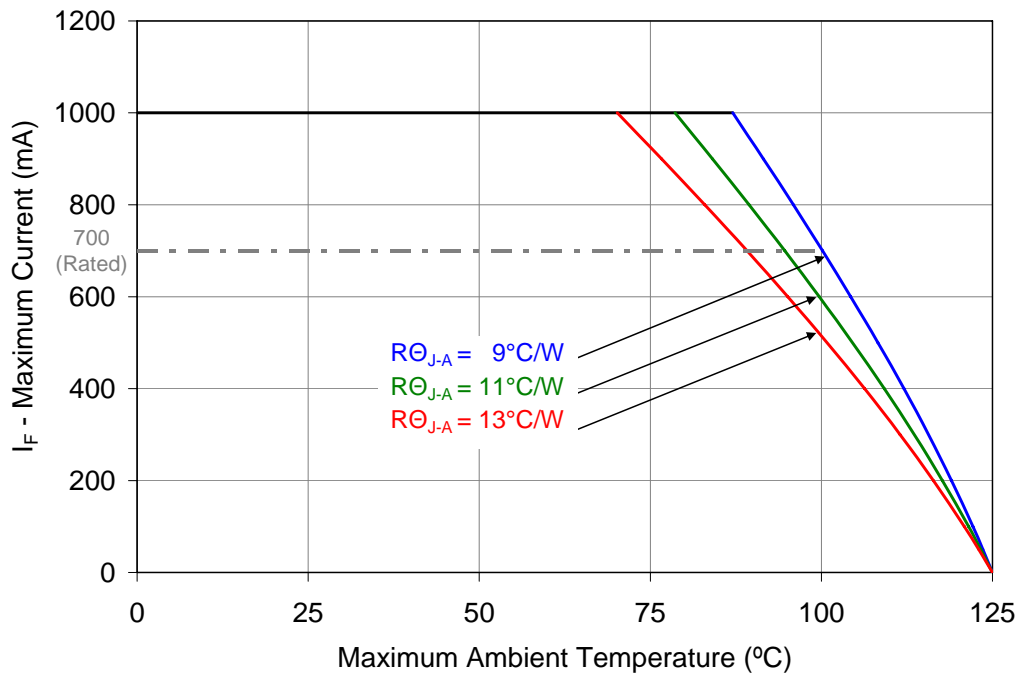


Figure 10: Maximum forward current vs. ambient temperature based on $T_{J(\text{MAX})} = 125^\circ\text{C}$.

Notes for Figure 10:

1. $R_{\theta_{J-C}}$ [Junction to Case Thermal Resistance] for the LZ1-00UA05 is typically 5.5°C/W .
2. $R_{\theta_{J-A}}$ [Junction to Ambient Thermal Resistance] = $R_{\theta_{J-C}} + R_{\theta_{C-A}}$ [Case to Ambient Thermal Resistance].

Emitter Tape and Reel Specifications (mm)

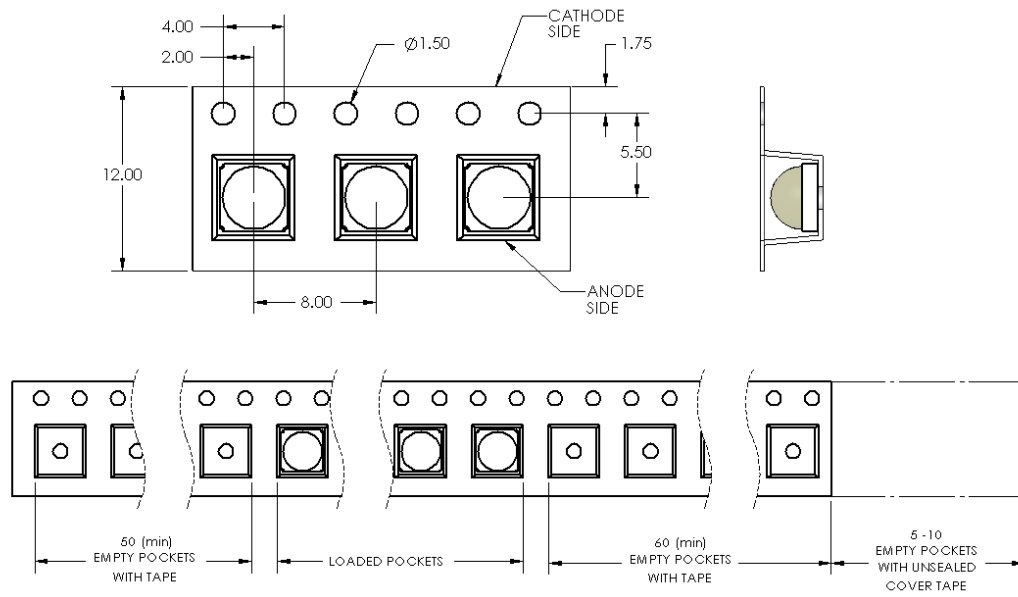


Figure 11: Emitter carrier tape specifications (mm).

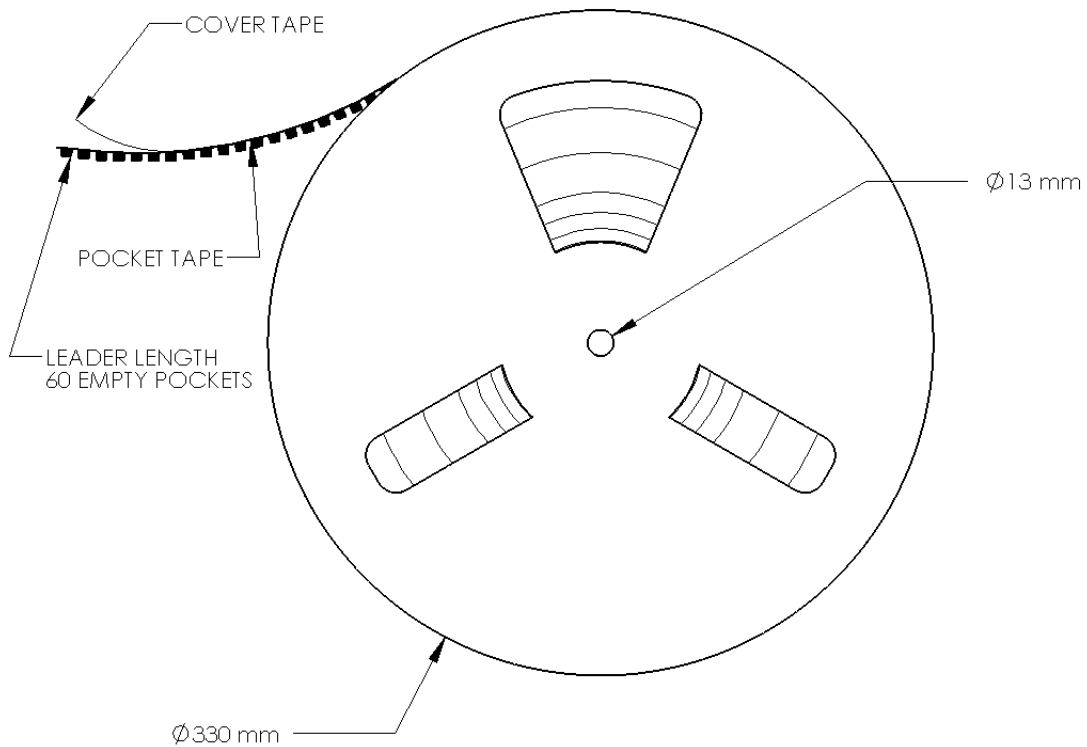


Figure 12: Emitter reel specifications (mm).

Company Information

The LZ4-00UA05 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 for more information.