

# High Radiant Flux Density 400nm Violet LED Emitter **LZP-00UA00**



## Key Features

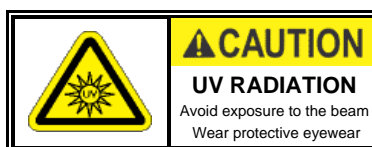
- Ultra-bright, compact 24-die, 400nm Violet LED
- Very high Radiant Flux density, 30 W/cm<sup>2</sup>
- Small high density foot print, 12.0mm x 12.0mm x 6.7mm package
- Surface mount ceramic package with integrated glass lens
- Exceptionally low Thermal Resistance (0.6°C/W)
- Electrically neutral thermal slug
- Autoclave complaint (JEDEC JESD22-A102-C)
- JEDEC Level 1 for Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant
- Reflow solderable (up to 6 cycles)
- Emitter available on MCPCB (optional)

## Typical Applications

- Curing
- Sterilization
- Medical
- Currency Verification
- Fluorescence Microscopy
- Inspection of dyes, rodent and animal contamination,
- Leak detection
- Forensics

## Description

The LZP-series emitter is rated for 90W power handling in an ultra compact package. With a small 12.0mm x 12.0mm x 6.7mm footprint, this package provides exceptional radiant flux density. The patented design has unparalleled thermal and optical performance. The high quality materials used in the package are chosen to optimize Radiant Flux and minimize stresses which results in monumental reliability and radiant flux 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 0 0**

Where:

A – designate the number of available LED die locations (“P” for 25-die package)

B – designate the package level (“0” for Emitter)

C – designate the radiation pattern (“0” for Lambertian)

D and E – designate the color (“UA” for Violet - 400nm Peak Wavelength)

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:

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard Time (hrs)	Standard Conditions	Accelerated Time (hrs)	Accelerated 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 Radiant Flux Maintenance Projections

Lumen maintenance generally describes the ability of an emitter to retain its output over time. The useful lifetime for power LEDs is also defined as Radiant Flux 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, 70% Radiant Flux Maintenance (RP70%) at 25,000 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 Radiant Flux ( $\Phi$ ) @ $I_F = 700\text{mA}$ <sup>[1,2]</sup> (mW)	Maximum Radiant Flux ( $\Phi$ ) @ $I_F = 700\text{mA}$ <sup>[1,2]</sup> (mW)
Y	9500	12000
Z	12000	15000

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 Peak Wavelength ( $\lambda_P$ ) @ $I_F = 700\text{mA}$ <sup>[1]</sup> (nm)	Maximum Peak Wavelength ( $\lambda_P$ ) @ $I_F = 700\text{mA}$ <sup>[1]</sup> (nm)
U5	390	395
U6	395	400
U7	400	405
U8	405	410

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 ( $V_F/\text{Ch}$ ) @ $I_F = 700\text{mA}$ <sup>[1,2]</sup> (V)	Maximum Forward Voltage ( $V_F/\text{Ch}$ ) @ $I_F = 700\text{mA}$ <sup>[1,2]</sup> (V)
0	20.64	23.52

Notes for Table 4:

- LedEngin maintains a tolerance of  $\pm 0.24\text{V}$  for forward voltage measurements.
- All 4 Channels have matched  $V_f$  for parallel operation
- Forward Voltage is binned with 6 LED dies connected in series. The LED is configured with 4 Channels of 6 dies in series each.

## Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current <sup>[1]</sup>	$I_F$	1000 /Channel	mA
Peak Pulsed Forward Current <sup>[2]</sup>	$I_{FP}$	1000 /Channel	mA
Reverse Voltage	$V_R$	See Note 3	V
Storage Temperature	$T_{stg}$	-40 ~ +150	°C
Junction Temperature	$T_J$	125	°C
Soldering Temperature <sup>[4]</sup>	$T_{sol}$	260	°C
Allowable Reflow Cycles		6	
ESD Sensitivity <sup>[5]</sup>		> 2,000 V HBM Class 2B JESD22-A114-D	

Notes for Table 5:

- 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.
- 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.
- LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZP-00UA00 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 (@ $I_F = 700\text{mA}$ ) <sup>[1]</sup>	$\Phi_V$	12400	mW
Peak Wavelength	$\lambda_D$	400	nm
Viewing Angle <sup>[2]</sup>	$2\Theta_{1/2}$	95	Degrees
Total Included Angle <sup>[3]</sup>	$\Theta_{0.9V}$	115	Degrees

Notes for Table 6:

- Luminous flux typical value is for all four LED dice operating concurrently at rated current.
- 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 (@ $I_F = 700\text{mA}$ ) <sup>[1]</sup>	$V_F$	22 /Channel	V
Temperature Coefficient of Forward Voltage <sup>[1]</sup>	$\Delta V_F / \Delta T_J$	-14.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	0.6	°C/W

Notes for Table 7:

- Forward Voltage is measured for a single string of 6 dies connected in series. The LED is configured with 4 Channels of 6 dies in series each.

## Mechanical Dimensions (mm)

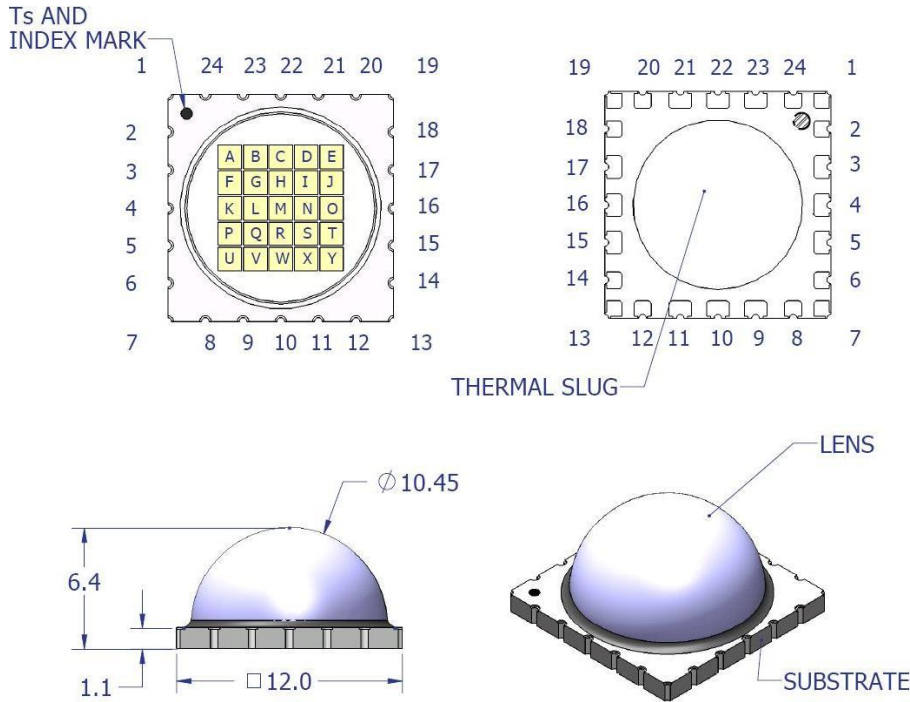


Figure 3: Package outline drawing.

Notes for Figure 3:

1. Unless otherwise noted, the tolerance =  $\pm 0.20$  mm.
2. Thermal slug is electrically isolated
3. Ts is a thermal reference point

Pin Out				
Ch.	Pad	Die	Color	Function
1	18	E	UA	Anode
		D	UA	na
		C	UA	na
		B	UA	na
		A	UA	na
2	24	F	UA	Cathode
	17	J	UA	Anode
		I	UA	na
		H	UA	na
		G	UA	na
3	3	L	UA	na
	15	O	UA	Anode
		N	UA	na
		S	UA	na
		R	UA	na
4	5	Q	UA	na
	14	T	UA	Anode
		Y	UA	na
		X	UA	na
		W	UA	na
5	8	V	UA	na
	2	U	UA	Cathode
	23	M	-	na
		M	-	na

## Recommended Solder Pad Layout (mm)

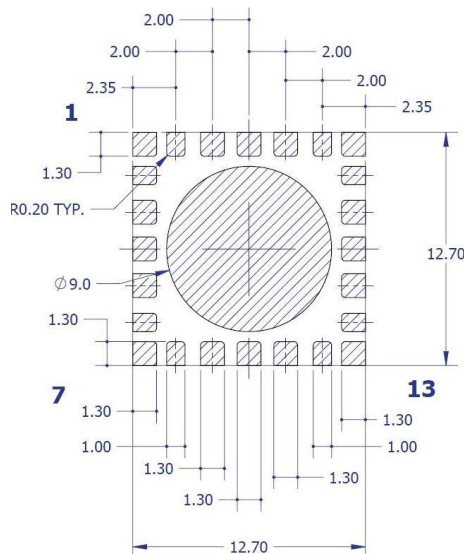


Figure 4: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 4:

1. Unless otherwise noted, the tolerance =  $\pm 0.20$  mm.

## Reflow Soldering Profile

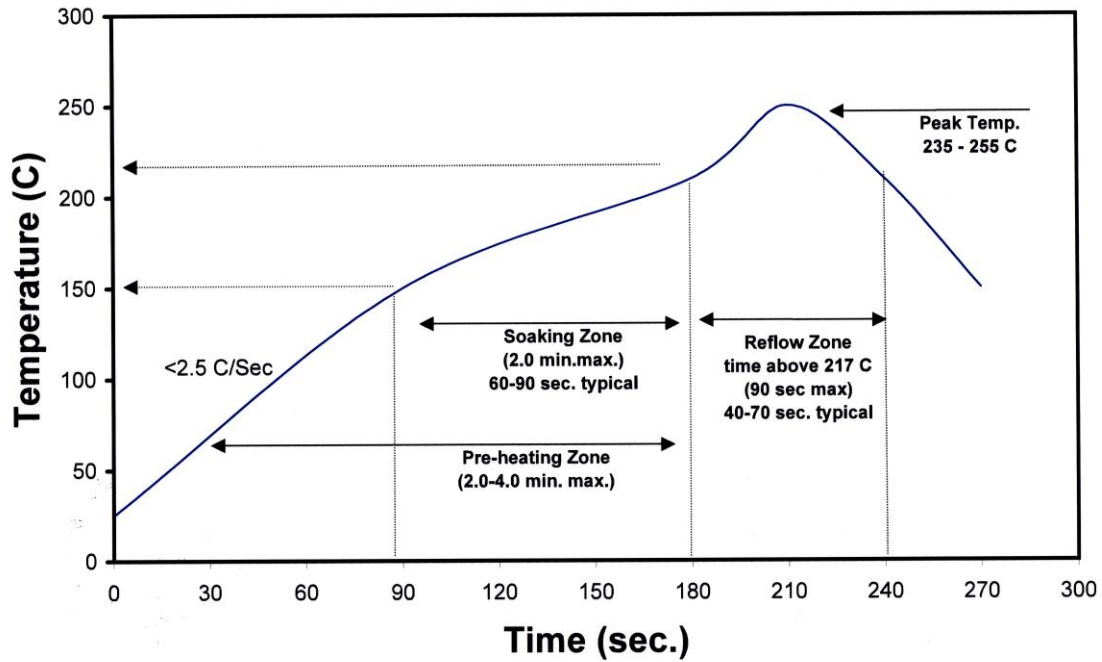


Figure 3: Reflow soldering profile for lead free soldering.

## Typical Radiation Pattern

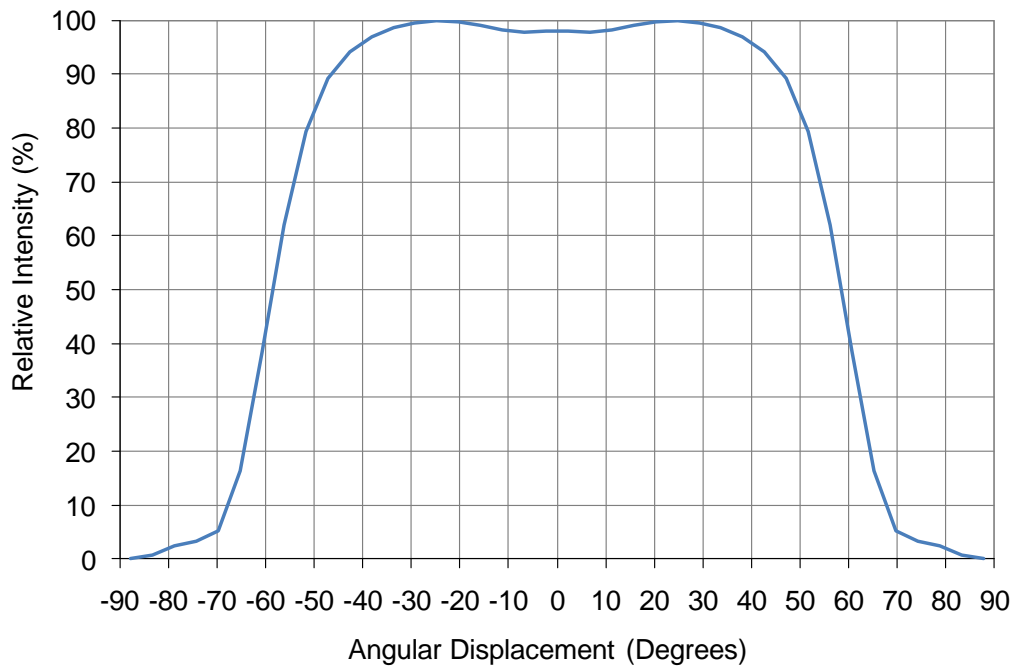


Figure 4: Typical representative spatial radiation pattern.

## Typical Relative Spectral Power Distribution

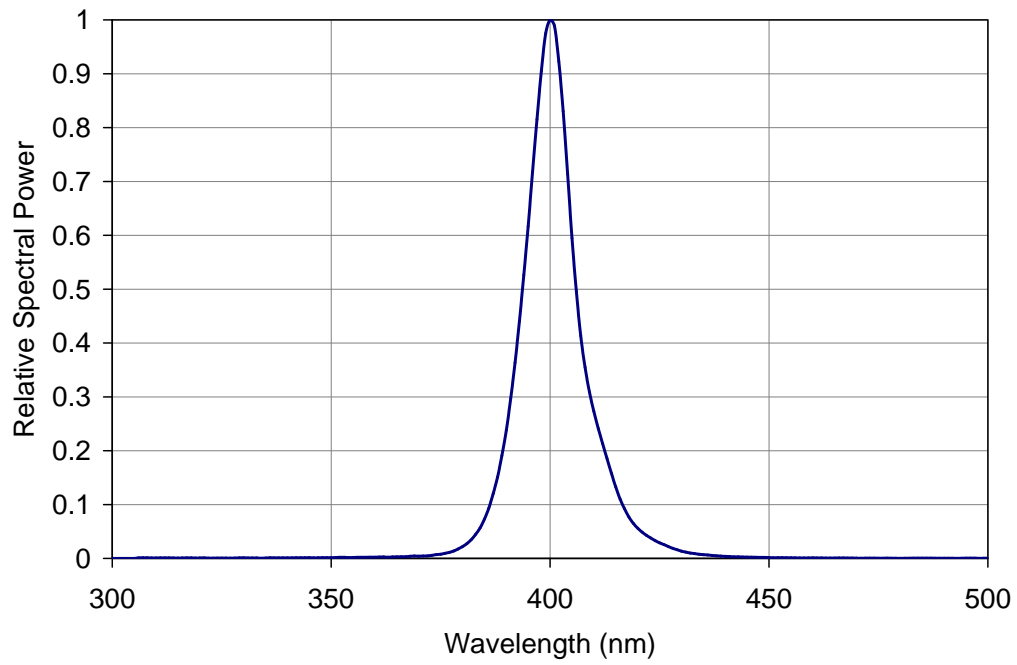


Figure 5: Relative spectral power vs. wavelength @  $T_c = 25^\circ\text{C}$ .

## Typical Relative Dominant Wavelength Shift over Temperature

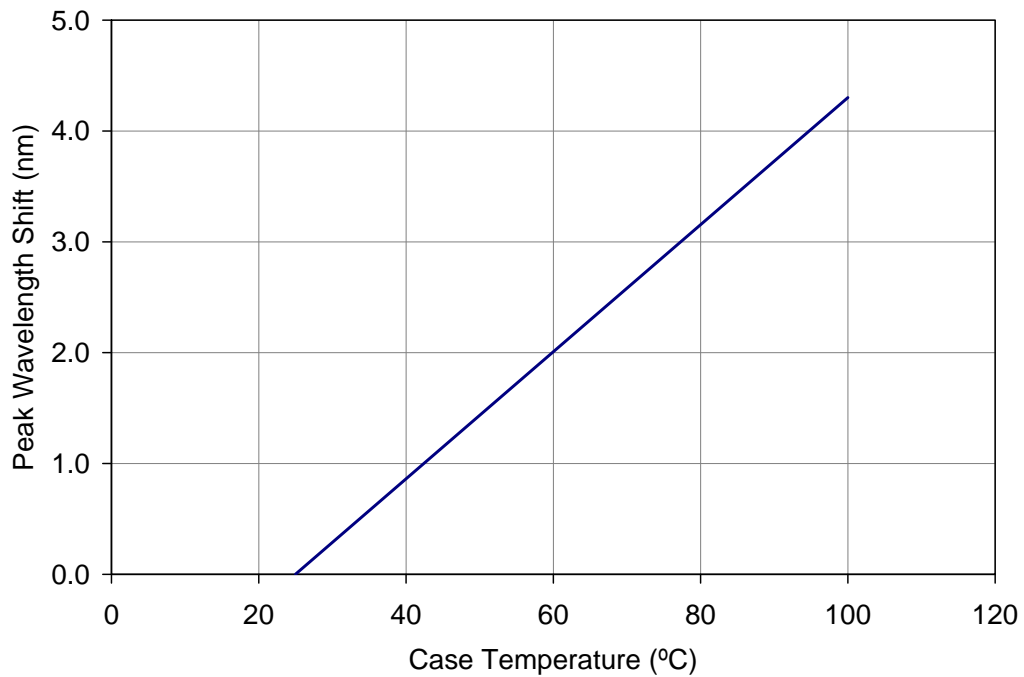


Figure 6: Typical dominant wavelength shift vs. case temperature.



## Typical Relative Radiant Flux

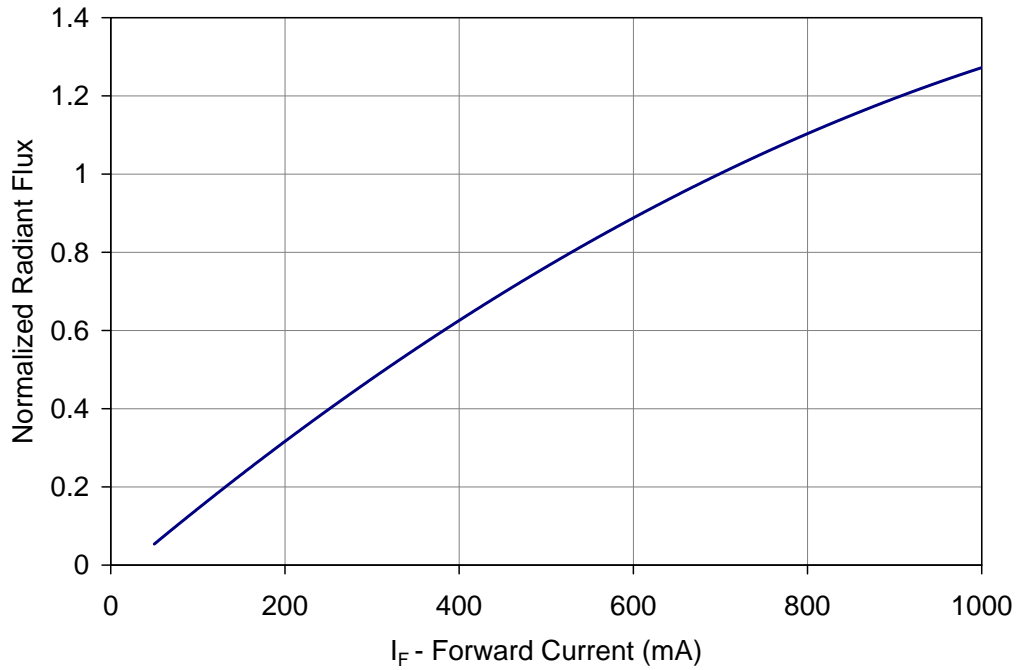


Figure 7: Typical relative Radiant Flux vs. forward current @  $T_c = 25^\circ\text{C}$ .

## Typical Relative Radiant Flux over Temperature

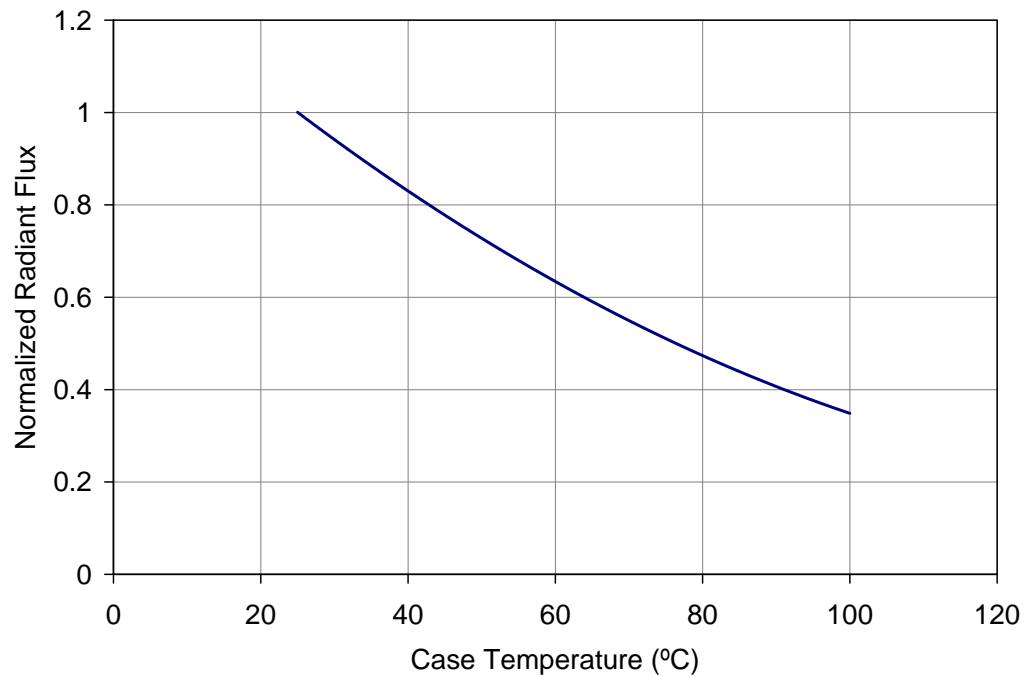


Figure 8: Typical relative Radiant Flux vs. case temperature.

## Typical Forward Current Characteristics

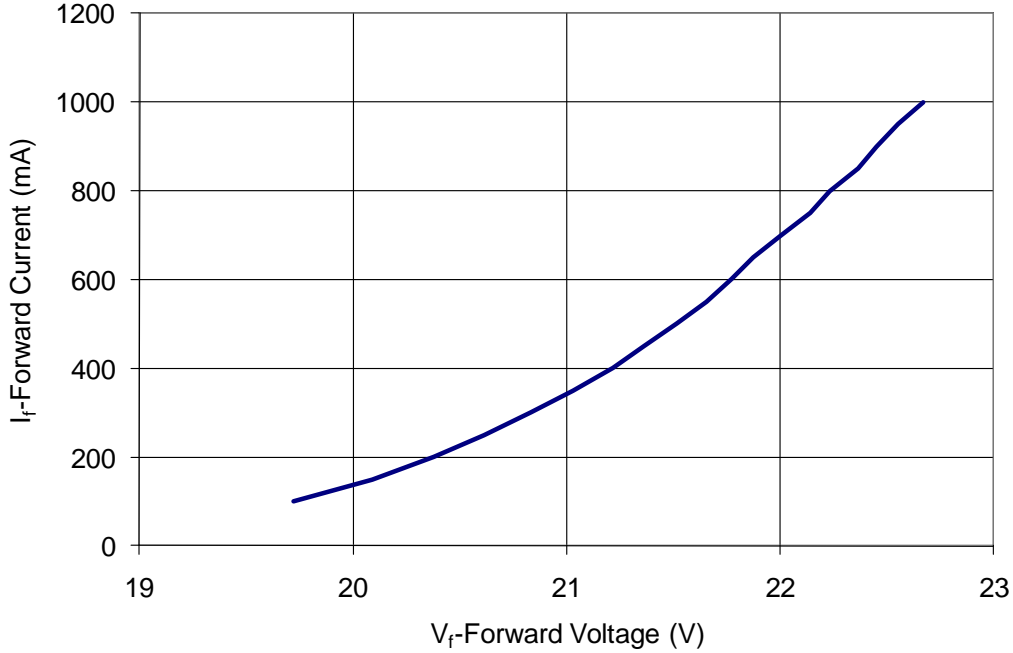


Figure 9: Typical forward current vs. forward voltage @ T<sub>c</sub> = 25°C.

Note for Figure 9:

1. Forward Voltage curve is pro channel of 6 LED dies connected in series. The LED is configured with 4 Channels of 6 dies in series each.

## Current De-rating

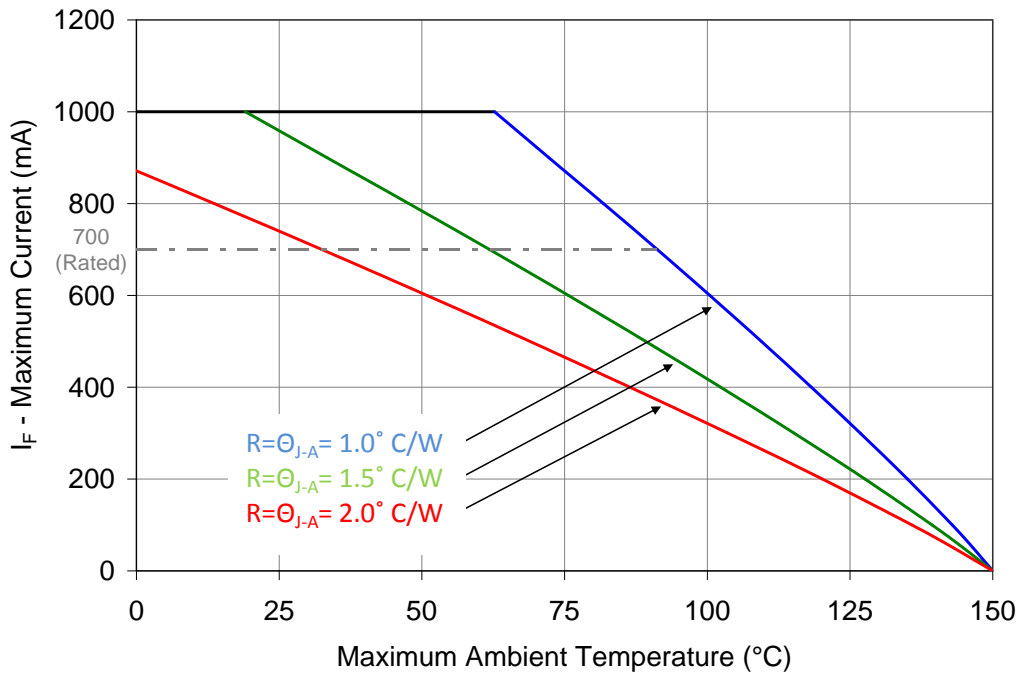


Figure 10: Maximum forward current vs. ambient temperature based on T<sub>J(MAX)</sub> = 150°C.

Notes for Figure 10:

1. Maximum current assumes that all LED dies are operating at rated current.
2. R<sub>θ<sub>J-C</sub></sub> [Junction to Case Thermal Resistance] for the LZP-series is typically 0.6°C/W.
3. R<sub>θ<sub>J-A</sub></sub> [Junction to Ambient Thermal Resistance] = R<sub>θ<sub>J-C</sub></sub> + R<sub>θ<sub>C-A</sub></sub> [Case to Ambient Thermal Resistance].

## MCPCB Option – LZP-Dxxxxx

- Emitter heat slug mounts directly onto MCPCB copper core resulting into an extremely low 0.1C/W thermal resistance
- 5 Channels: 4 independent channels with strings of 6 white LED dies in series each; 1 channel for optional center pad function (not used with LZP-0xxx00 emitter)
- MCPCB contains zener diodes for each channel resulting in enhanced ESD protection
- 6 mounting features:
  - Allow for M3 or #4 screws for attaching the MCPCB to a heat sink
  - Allow for alignment of LLxx-3T11 series lens holder

## $RO_{J-B}$ Lookup Table

Table 8:

Product	Typical Emitter $RO_{J-C}$	+	Typical MCPCB $RO_{C-B}$	=	Typical Emitter + MCPCB $RO_{J-B}^{[1]}$
LZP-series	0.6°C/W	+	0.1°C/W	=	0.70°C/W

## 4x6 MCPCB Mechanical Dimensions (mm)

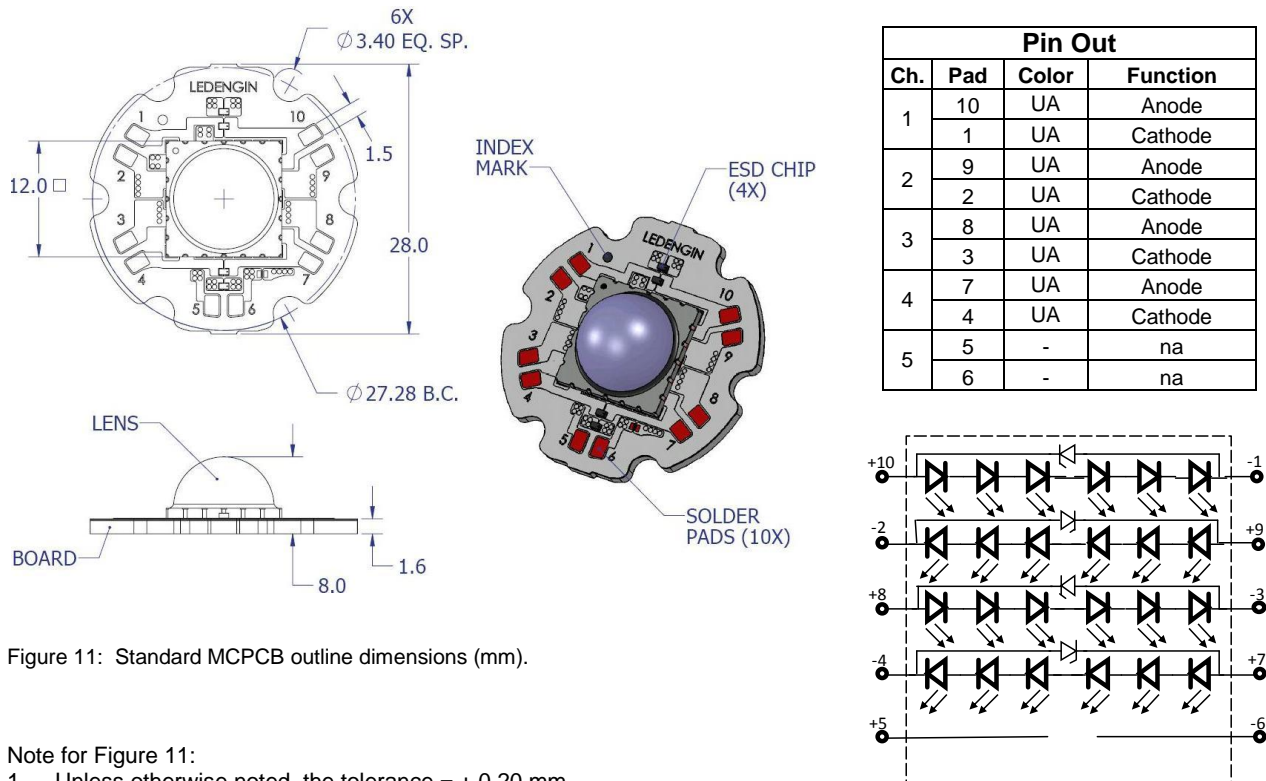


Figure 11: Standard MCPCB outline dimensions (mm).

Note for Figure 11:

1. Unless otherwise noted, the tolerance =  $\pm 0.20$  mm.
2. Slots in MCPCB are for M3 or #4 mounting screws.
3. LedEngin recommends using plastic washers to electrically insulate screws from solder pads and electrical traces.
4. LedEngin recommends using thermally conductive adhesives when attaching the MCPCB to a heat sink.
5. MCPCB thermal resistance is based on tests conducted on a copper based SuperMCPCB from Bridge Semiconductor

## 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 90W 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 5,500 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](mailto:Sales@ledengin.com) or (408) 492-0620 for more information.