LedEngin, Inc.

High Luminous Efficacy Amber Power LedFlex™ Emitter

LZ4-00A115

Key Features

- High Luminous Efficacy 15W Amber LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (>90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.6°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Industry's highest Luminous Flux density
- High ESD protection (>8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

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

LedEngin's LZ4-00A115 Amber Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00A115 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
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 (“15” for 15W 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 luminous 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:

			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 1000 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
N	146	182	185
P	182	228	215
Q	228	285	270
R	285	356	335

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 = 1000mA [1,2] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 1000mA [1,2] (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:
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.

Forward Voltage Bins

Table 4:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
C	9.92	10.88
D	10.88	11.84
E	11.84	12.80
F	12.80	13.76
G	13.76	14.72

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	1500	mA
Peak Pulsed Forward Current [2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +125	°C
Junction Temperature	T_J	125	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity [4]		> 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 8 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00A115 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 = 1000mA)	Φ_V	250	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	265	lm
Dominant Wavelength [1]	λ_D	590	nm
Viewing Angle [2]	$2\Theta_{1/2}$	95	Degrees
Total Included Angle [3]	$\Theta_{0.9V}$	110	Degrees

Notes for Table 6:
1. Amber LEDs have a significant shift in wavelength over temperature; please refer to Figure 4 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.
2. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
3. 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 = 1000mA)	V_F	10.9	V
Forward Voltage (@ I_F = 1500mA)	V_F	12.0	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-11.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.6	°C/W

Mechanical Dimensions (mm)

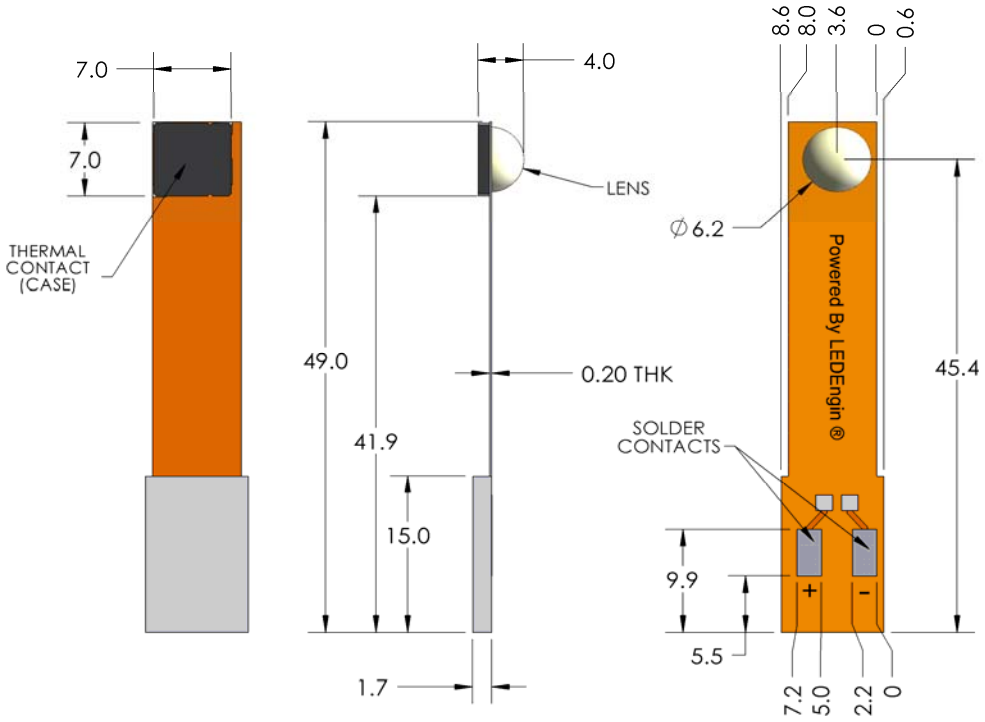

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled "+" for Anode and "-" for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

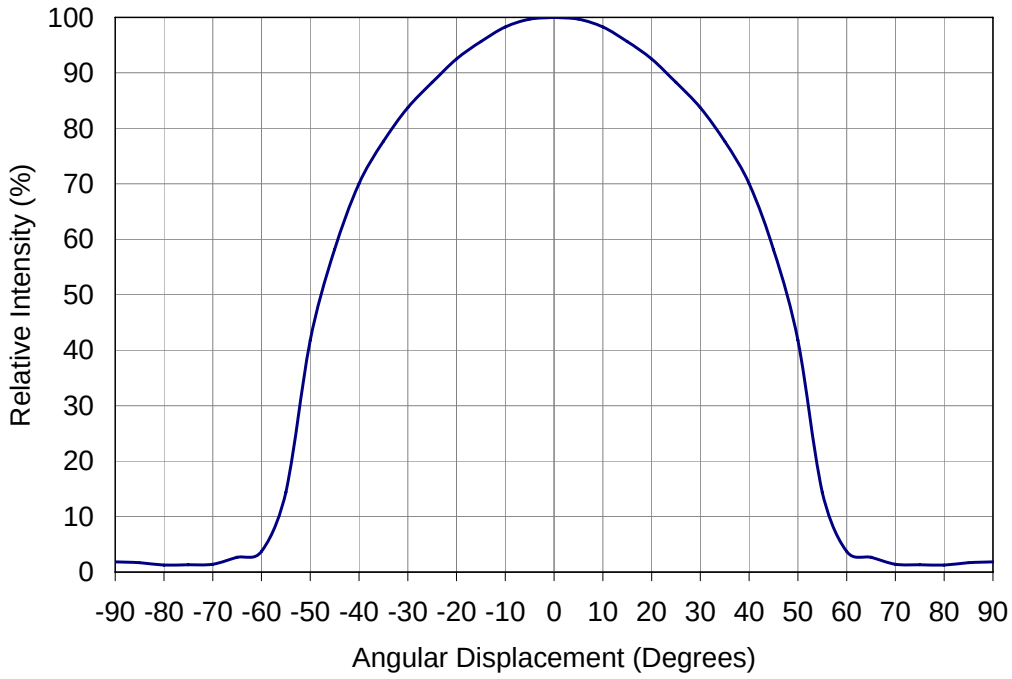

Figure 2: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

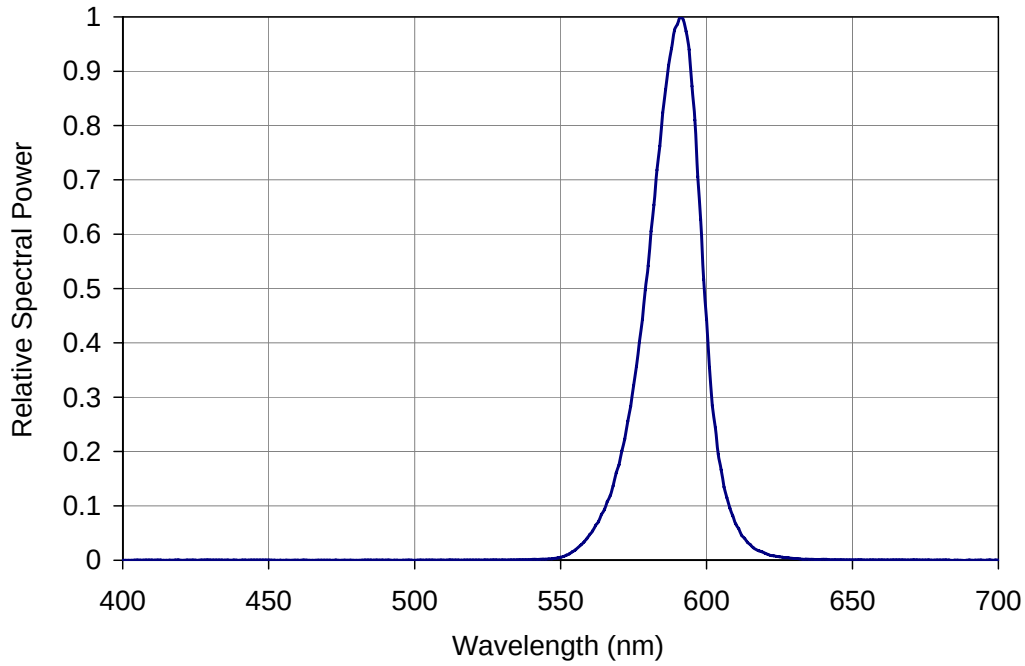

Figure 3: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Dominant Wavelength Shift over Temperature

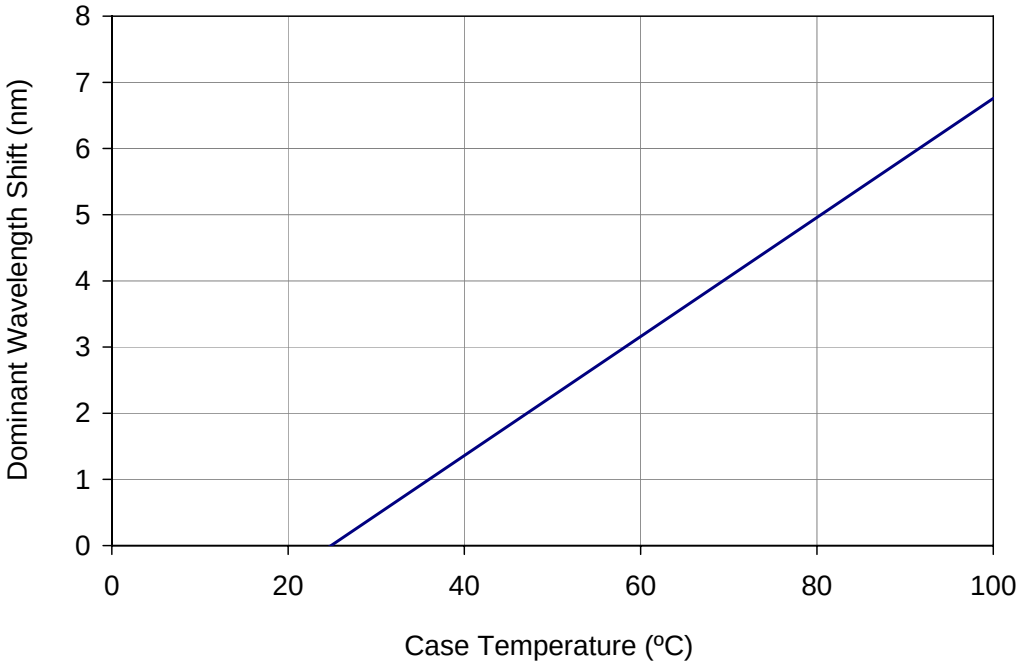

Figure 4: Typical dominant wavelength shift vs. case temperature.

Typical Relative Light Output

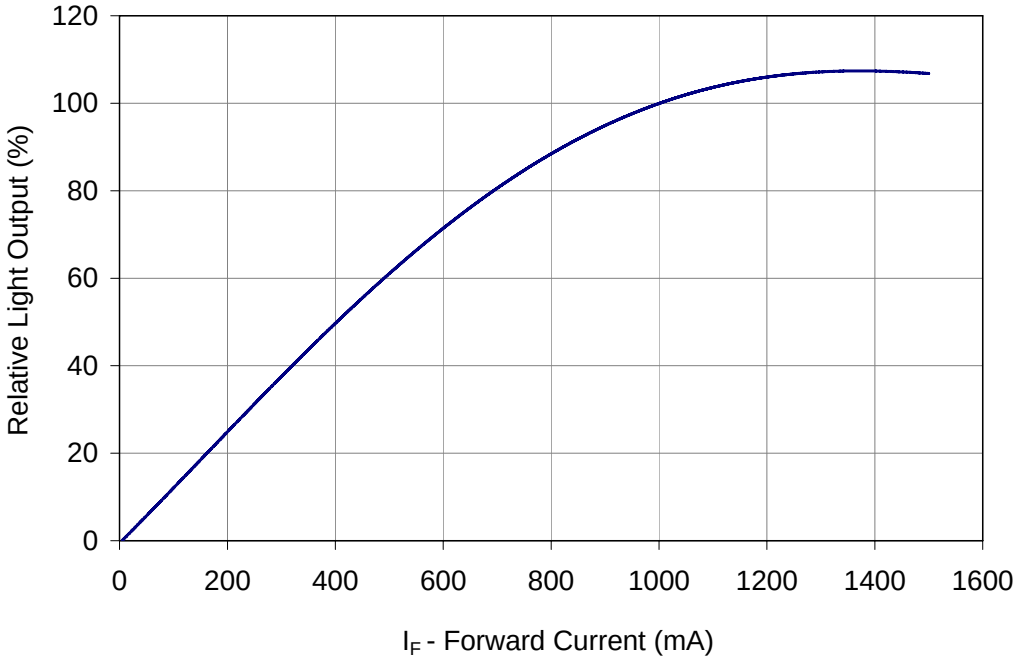

Figure 5: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

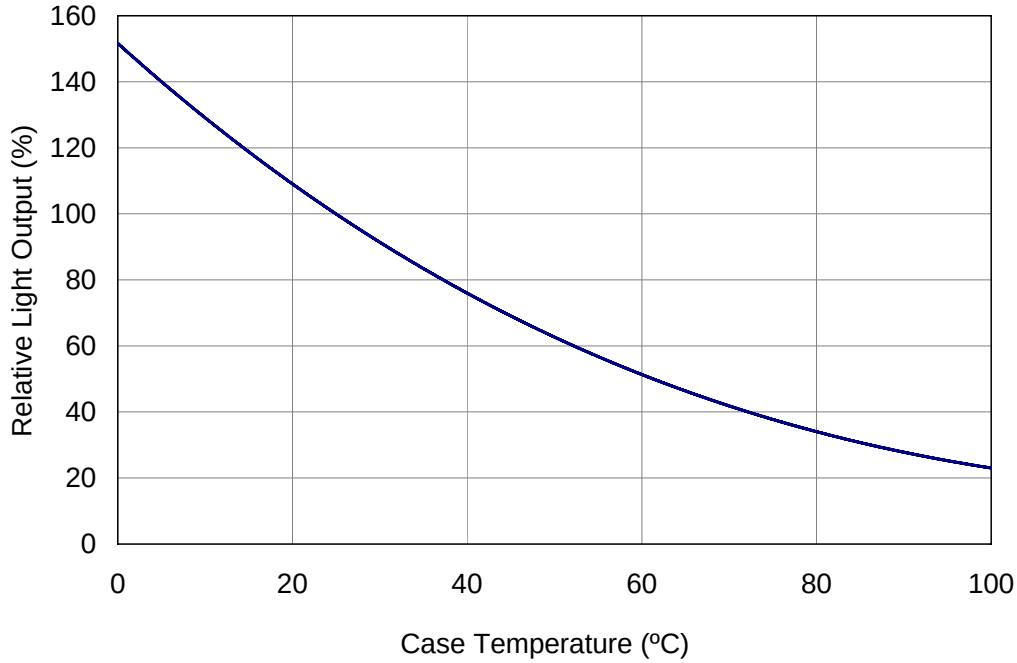

Figure 6: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

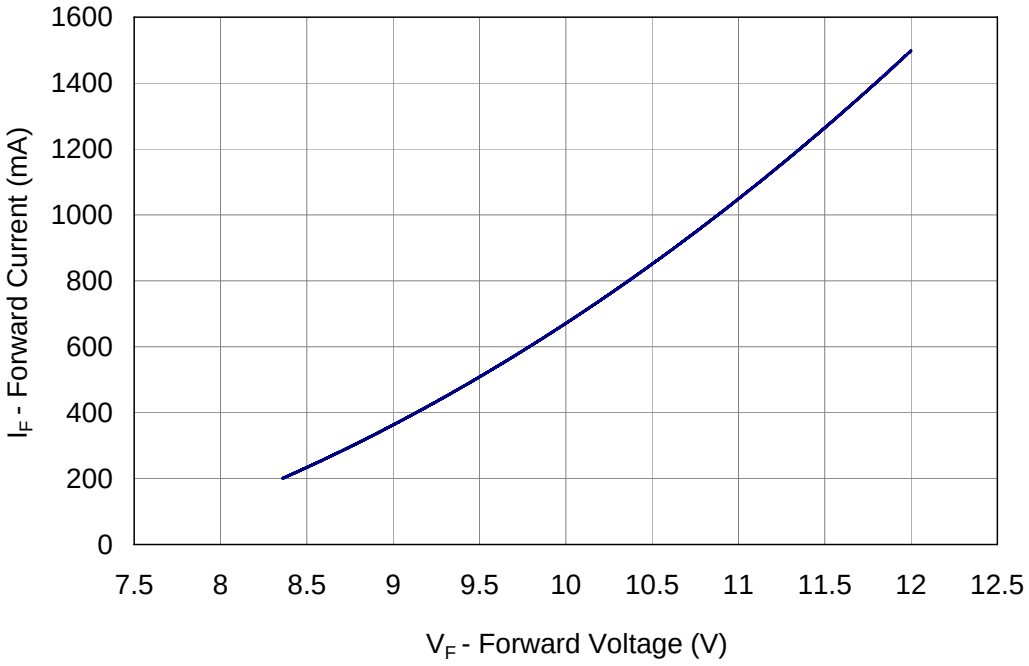

Figure 7: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

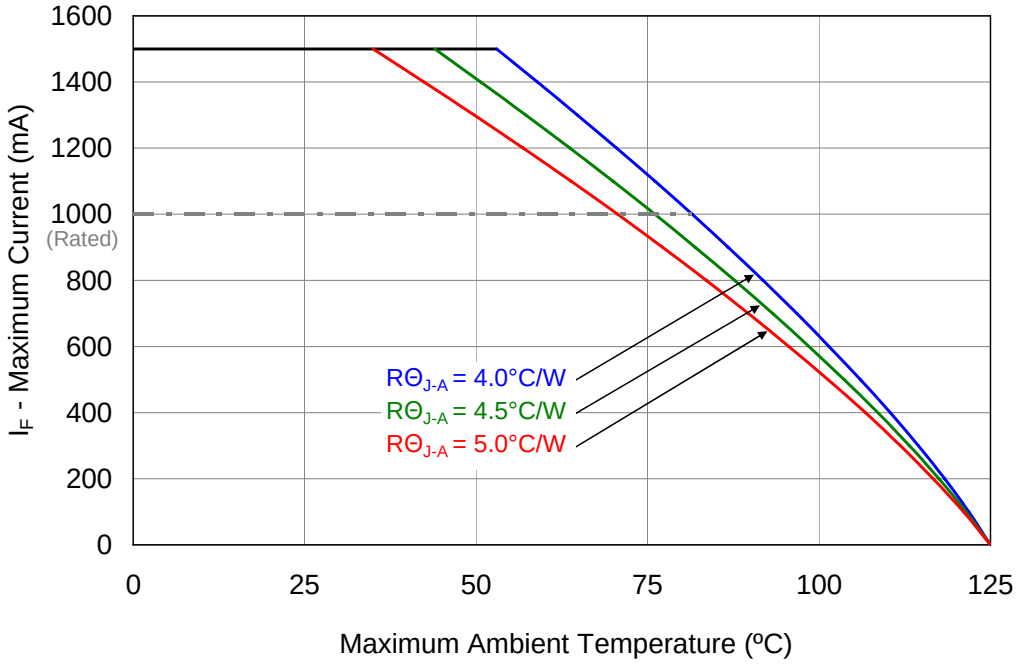

Figure 8: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 125°C.

Notes for Figure 8:

1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00A115 is typically 2.6°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].

Company Information

The LZ4-00A115 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.

LedEngin, Inc.

High Luminous Efficacy Blue Power LedFlex™ Emitter

LZ4-00B215

Key Features

- High Luminous Efficacy 15W Blue LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.6°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Industry's highest Luminous Flux density
- High ESD protection (> 8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

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

Description

LedEngin's LZ4-00B215 Blue Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00B215 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“B2” for Blue – 465nm typical Dominant Wavelength)
F and G – designate the Power (“15” for 15W 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 luminous 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 MSL-20 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 1000 mA. 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
M	117	146	180
N	146	182	213
P	182	228	266

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 = 1000mA [1,2] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 1000mA [1,2] (nm)
B4	455	460
B5	460	465
B6	465	470
B7	470	475

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.

Forward Voltage Bins

Table 4:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
F	12.80	13.76
G	13.76	14.72
H	14.72	15.68
J	15.68	16.64

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	1500	mA
Peak Pulsed Forward Current[2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity[4]		> 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 7 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00B215 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 = 1000mA)	Φ_V	158	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	205	lm
Dominant Wavelength[1]	λ_D	465	nm
Viewing Angle[2]	$2\Theta_{1/2}$	110	Degrees
Total Included Angle[3]	$\Theta_{0.9V}$	120	Degrees

Notes for Table 6:
1. Observe IEC 60825-1 class 2 rating for eye safety. Do not stare into the beam.
2. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
3. 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 = 1000mA)	V_F	14.5	V
Forward Voltage (@ I_F = 1500mA)	V_F	15.1	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-8.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.6	°C/W

Mechanical Dimensions (mm)

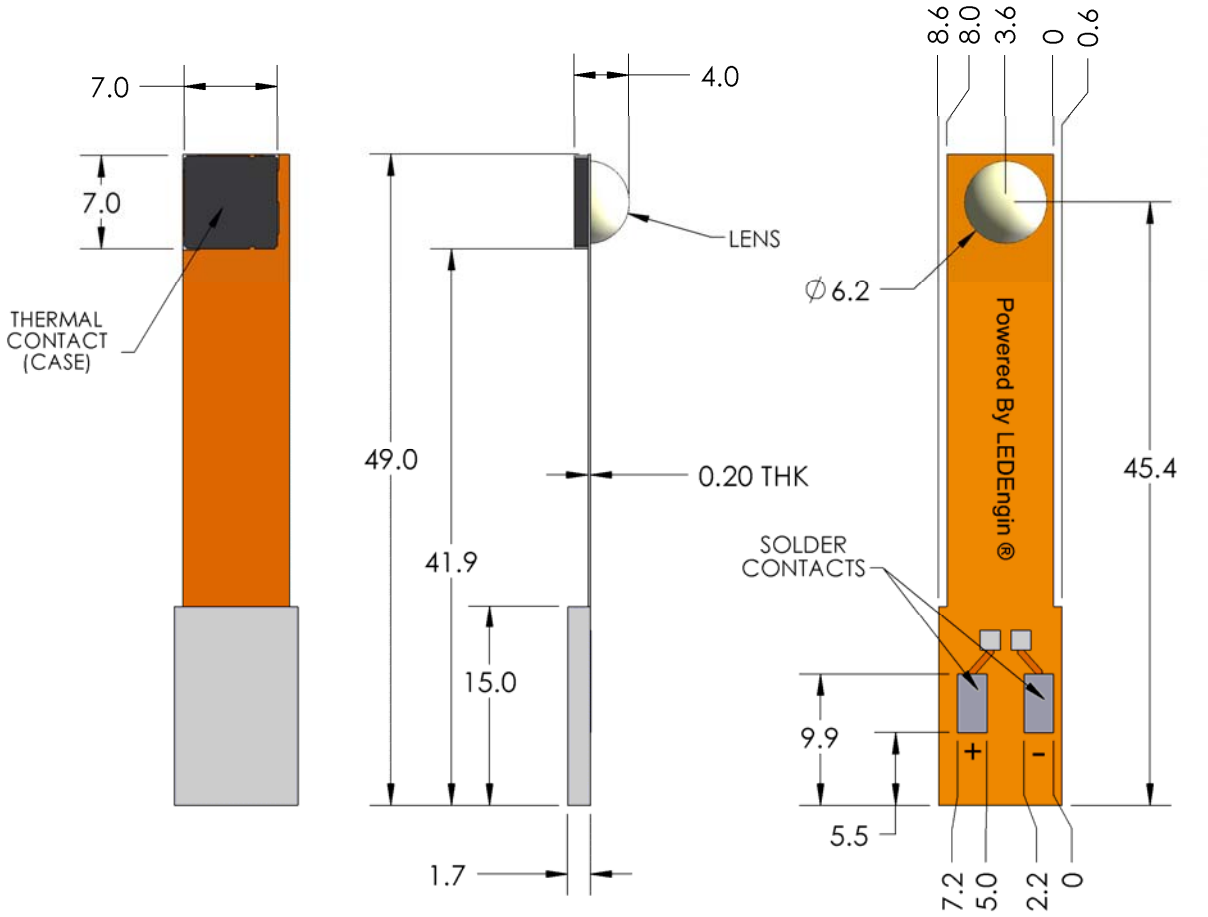

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled “+” for Anode and “-” for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

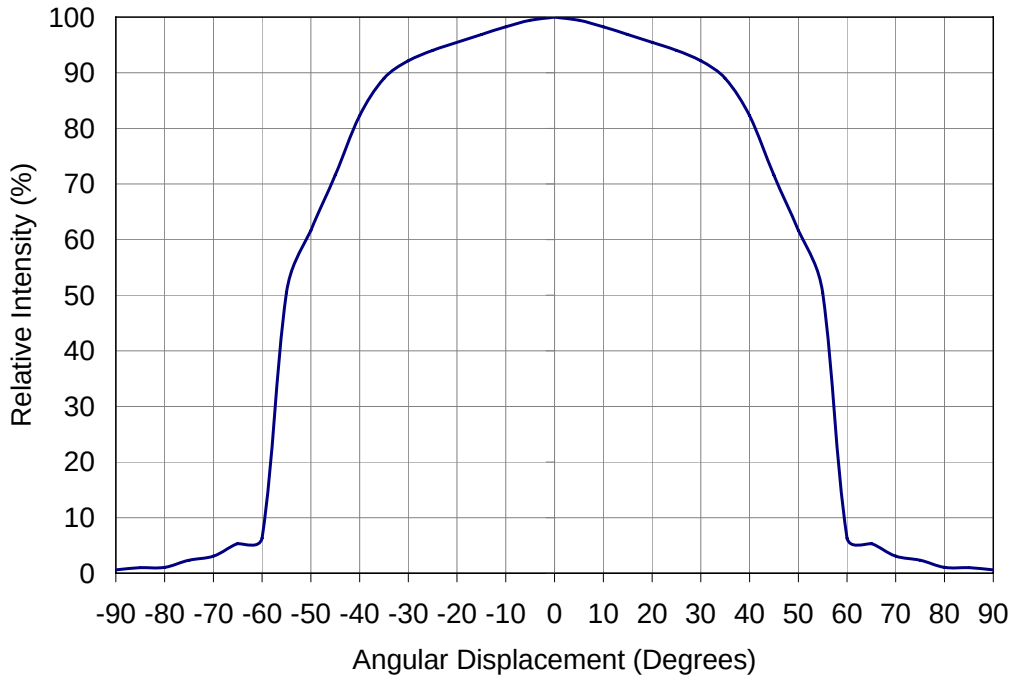

Figure 2: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

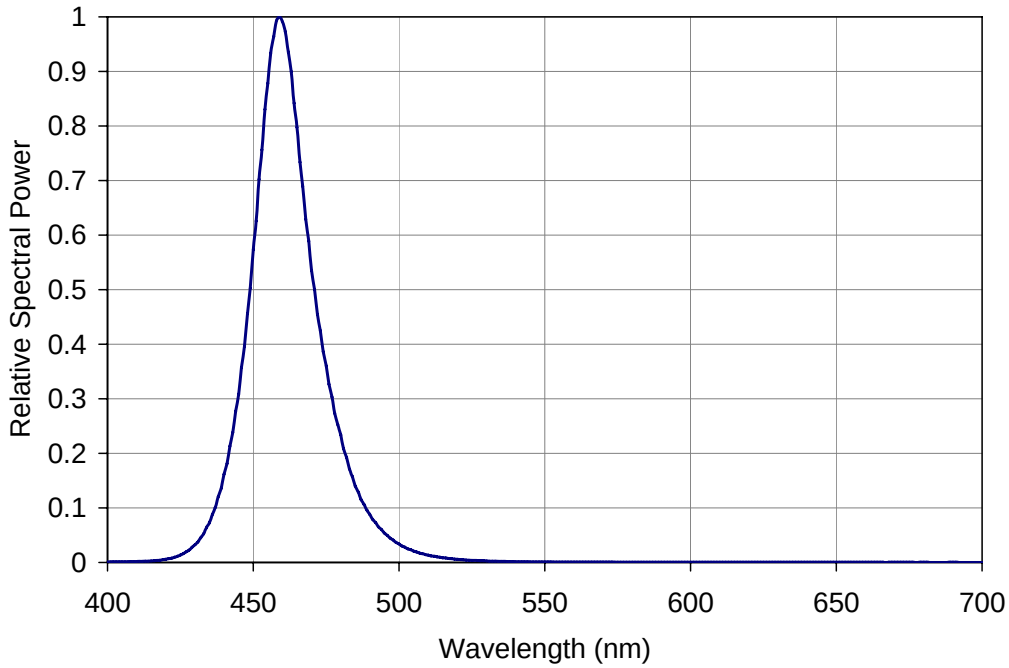

Figure 3: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Relative Light Output

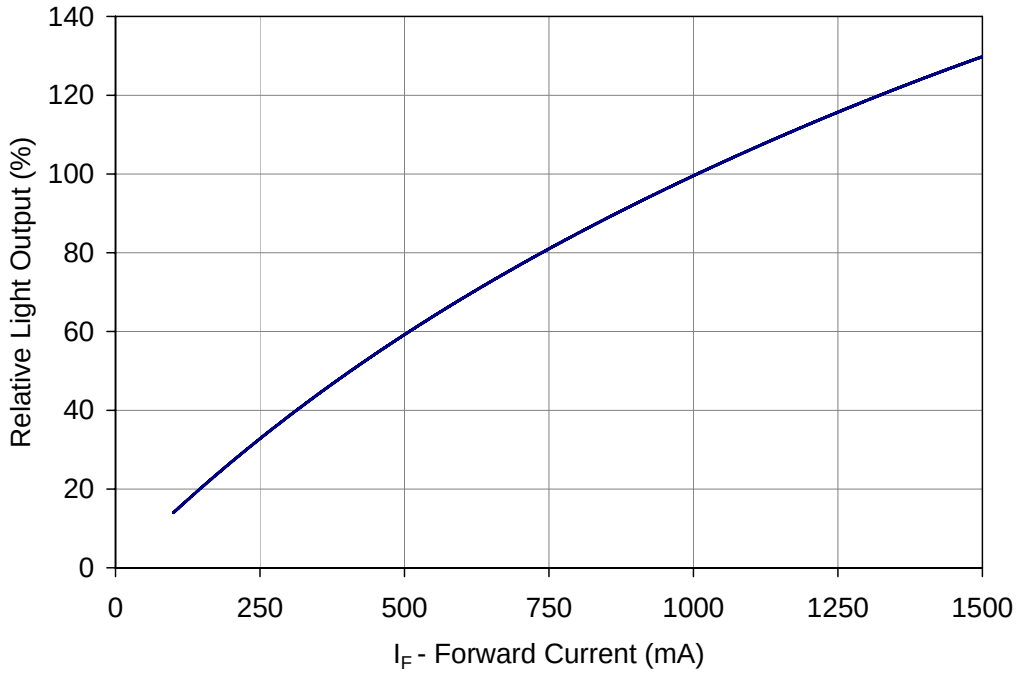

Figure 4: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

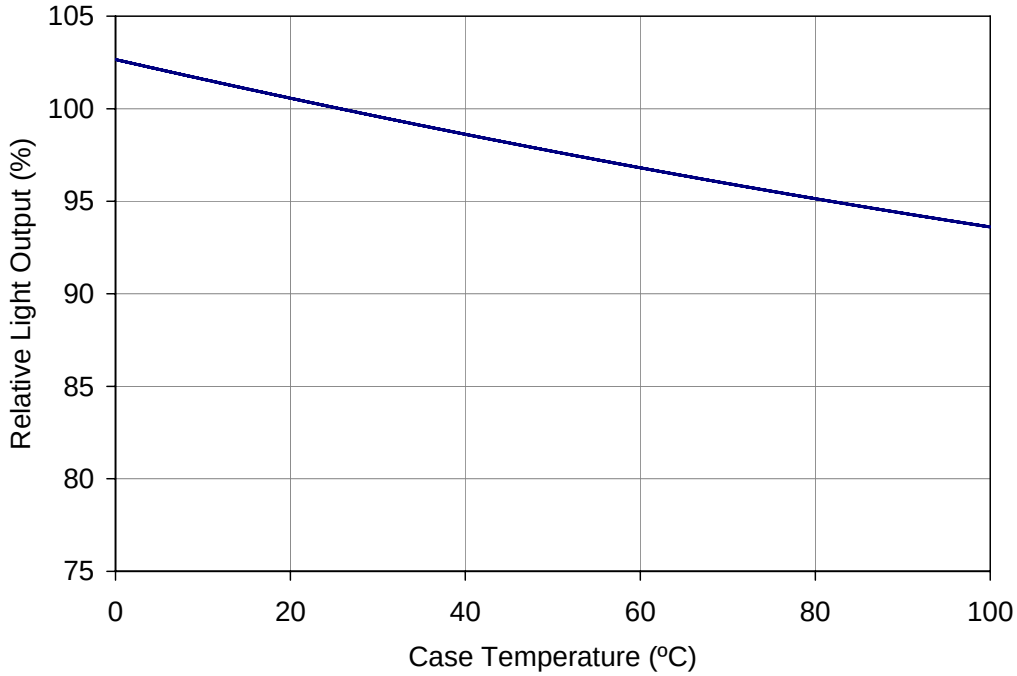

Figure 5: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

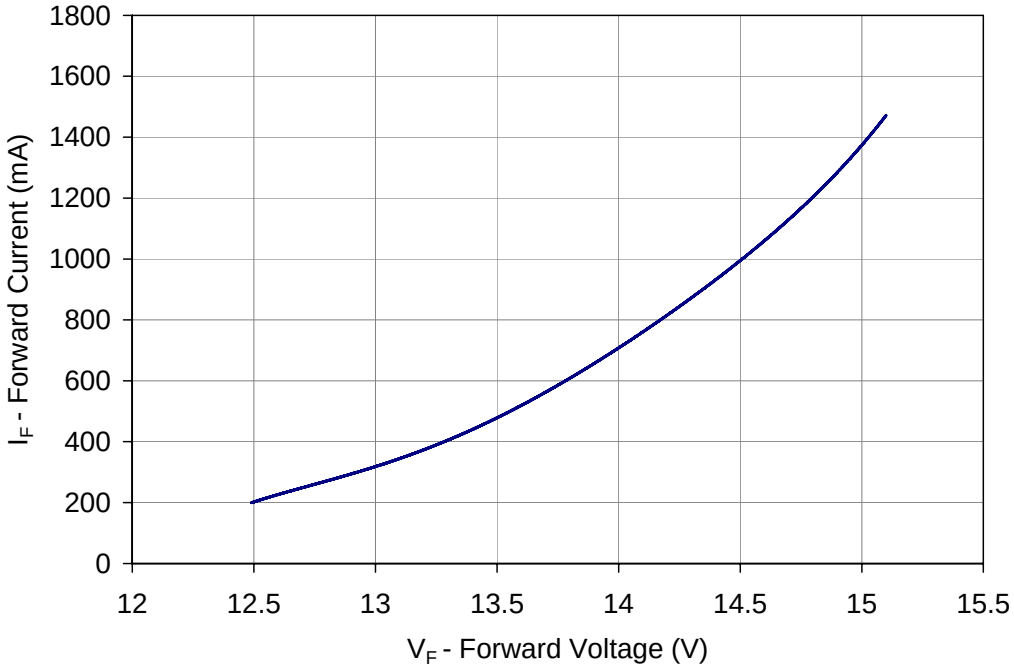

Figure 6: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

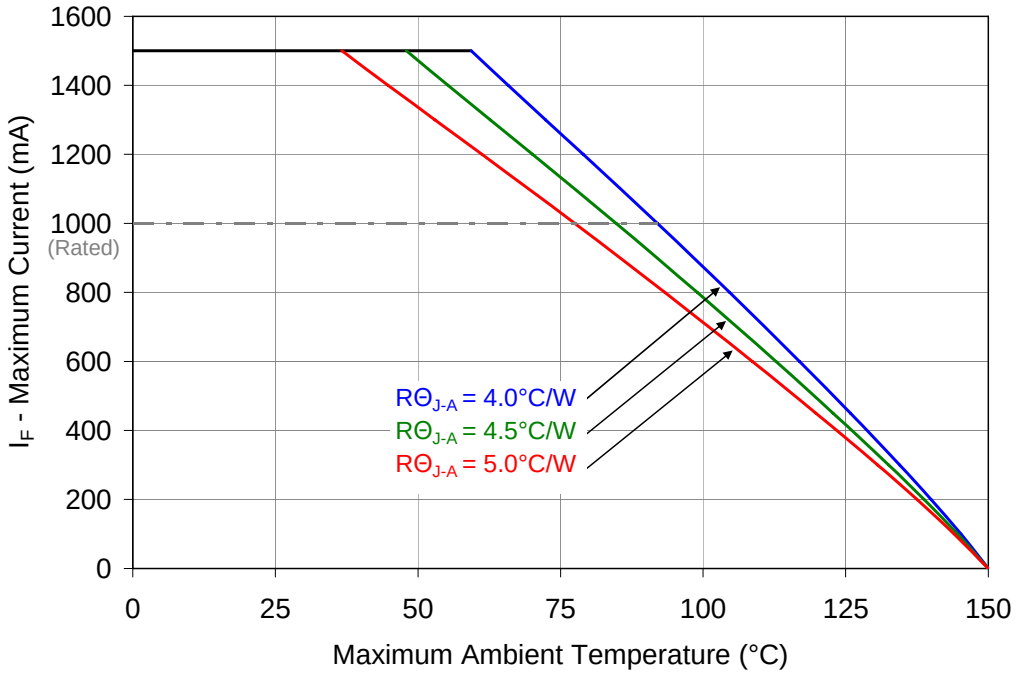

Figure 7: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 7:
1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00B215 is typically 2.6°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].

Company Information

The LZ4-00B215 Power LedFlex™ 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, Dental Blue, Blue, Green, Red, RGB, 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.

LedEngin, Inc.

High Luminous Efficacy White
Power LedFlex™ Emitter

LZ4-00CW15

Key Features

- High Luminous Efficacy 15W White LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.6°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Exceptional spatial color uniformity across radiation pattern
- Industry's highest Luminous Flux density
- High ESD protection (> 8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

- Architectural lighting
- Street lighting
- Stage and Studio lighting
- Task and Accent lighting
- Medical lighting

Description

LedEngin's LZ4-00CW15 White Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00CW15 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's patent-pending thermally insulated phosphor layer provides for exceptional spatial color uniformity across the radiation pattern and a consistent CCT over time and temperature. 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“CW” for Cool White: 5000 K < CCT < 10000 K)
F and G – designate the Power (“15” for 15W typical rating)
H – designates the Flux bin (See Table 2)
J and K – designate the CCT bin groups (see Figure 1 and Table 4)
L – designates the V_F bin (See Table 3)

Ordering information:
For ordering LedEngin products, please reference the base part number. The base part number represents any of the luminous flux, chromaticity groups, 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	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 1000 mA. 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
S	356	445	538
T	445	556	637
U	556	695	796
V	695	868	995

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.

Forward Voltage Bins

Table 3:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
F	12.80	13.76
G	13.76	14.72
H	14.72	15.68
J	15.68	16.64

Notes for Table 3:
1. LedEngin maintains a tolerance of ± 0.04V for forward voltage measurements.

Cool White Chromaticity Groups

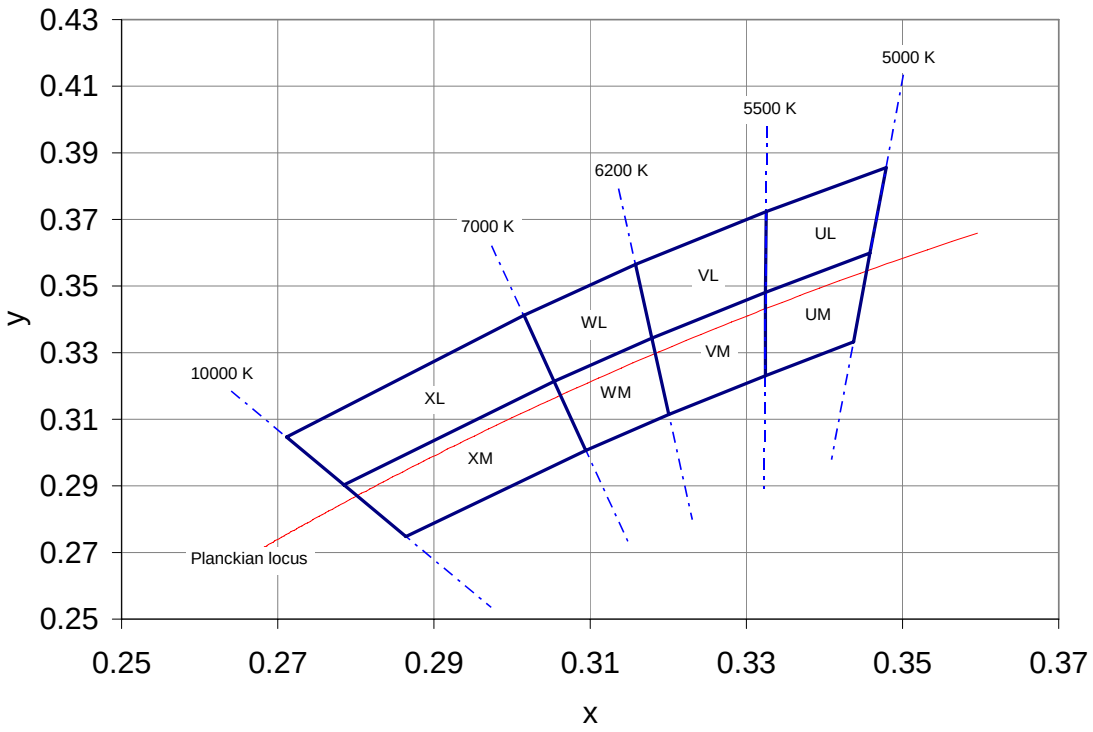

Figure 1: Standard Chromaticity Groups plotted on excerpt from the CIE 1931 (2°) x-y Chromaticity Diagram. Coordinates are listed below in Table 4.

Cool White Chromaticity Coordinates

Table 4:

Bin Code	x	y	Typical CCT (K)
UL	0.348	0.386	5250
	0.346	0.360	
	0.332	0.348	
	0.333	0.372	
UM	0.346	0.360	5250
	0.344	0.333	
	0.332	0.323	
	0.332	0.348	
VL	0.333	0.372	5850
	0.332	0.348	
	0.318	0.334	
	0.316	0.357	
VM	0.332	0.348	5850
	0.332	0.323	
	0.320	0.311	
	0.318	0.334	

Bin Code	x	y	Typical CCT (K)
WL	0.316	0.357	6600
	0.318	0.334	
	0.305	0.321	
	0.302	0.341	
WM	0.318	0.334	6600
	0.320	0.311	
	0.309	0.301	
	0.305	0.321	
XL	0.302	0.341	8500
	0.305	0.321	
	0.278	0.290	
	0.271	0.305	
XM	0.305	0.321	8500
	0.309	0.301	
	0.286	0.275	
	0.278	0.290	

Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current[1]	I_F	1500	mA
Peak Pulsed Forward Current[2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity[4]		> 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 8 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00CW15 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 = 1000mA)	Φ_V	552	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	703	lm
Correlated Color Temperature[1]	CCT	6200	K
Chromaticity Coordinates	x,y	0.318, 0.330	
Viewing Angle[2]	$2\Theta_{1/2}$	105	Degrees
Total Included Angle[3]	$\Theta_{0.9V}$	135	Degrees

Notes for Table 6:
1. Typical Color Rendering Index (CRI) is 75.
2. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
3. 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 = 1000mA)	V_F	14.5	V
Forward Voltage (@ I_F = 1500mA)	V_F	15.1	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-8.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.6	°C/W

Mechanical Dimensions (mm)

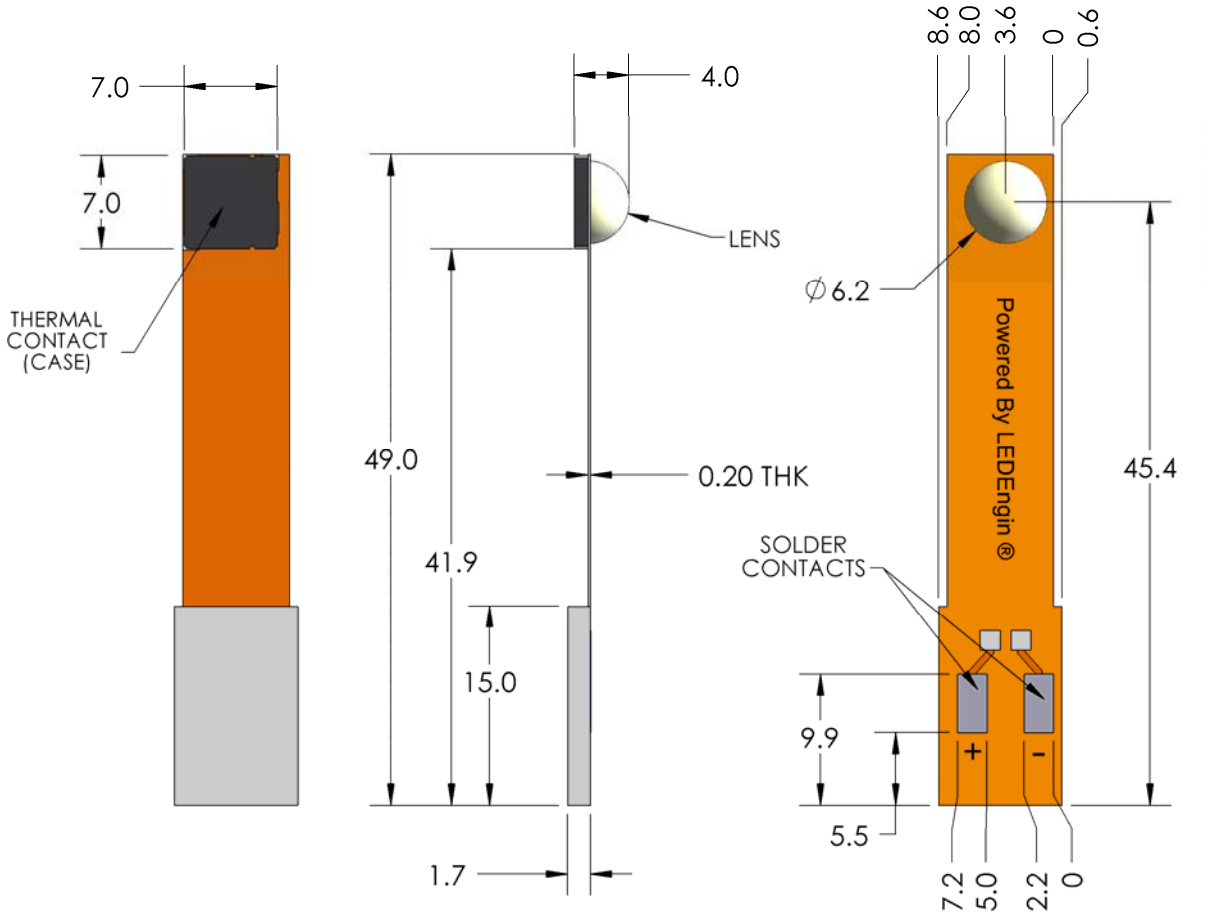

Figure 2: Package outline drawing.

Notes for Figure 2:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled “+” for Anode and “-” for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

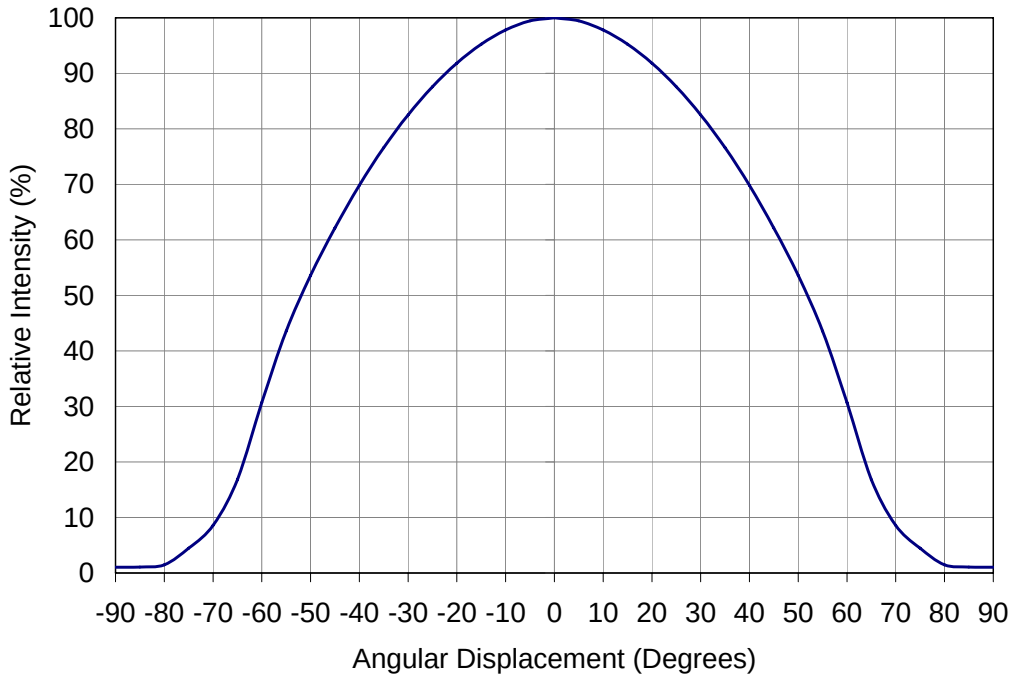

Figure 3: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

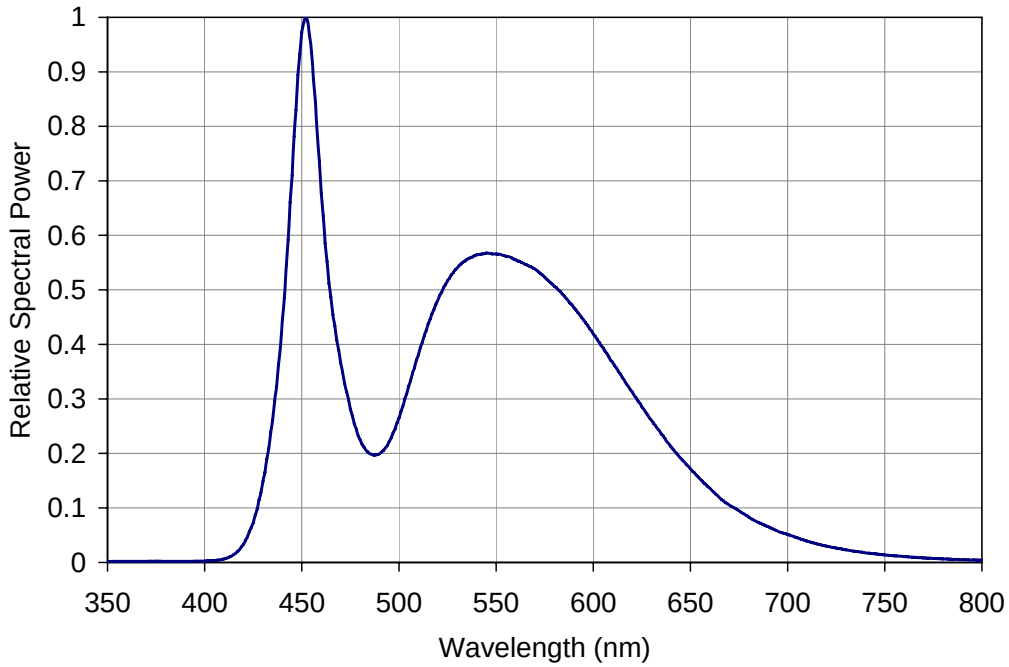

Figure 4: Relative spectral power vs. wavelength.

Typical Relative Light Output

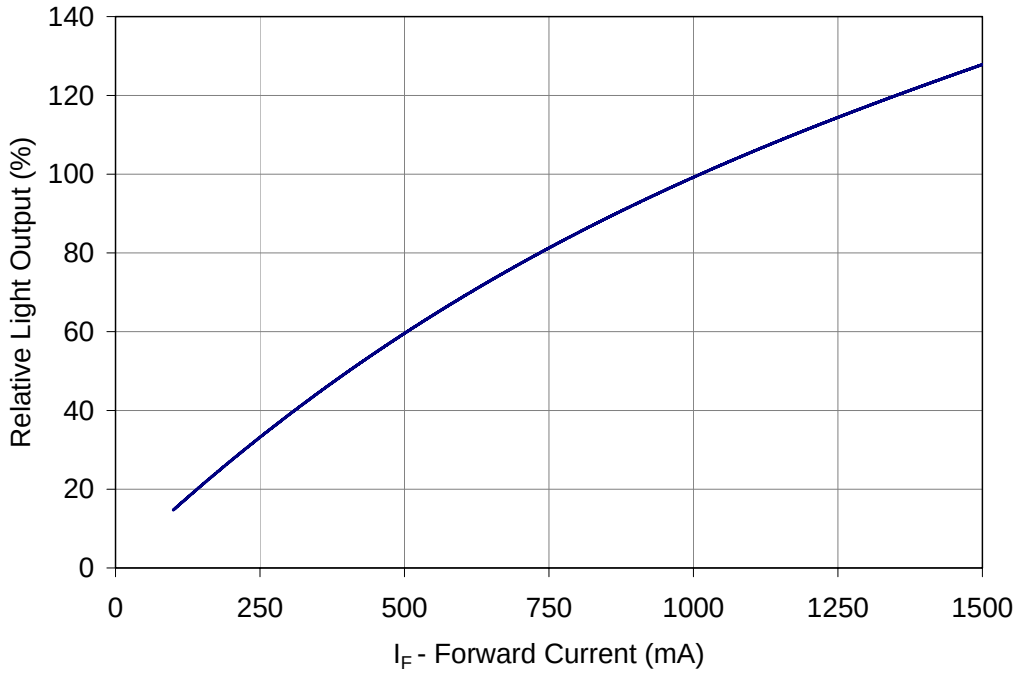

Figure 5: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

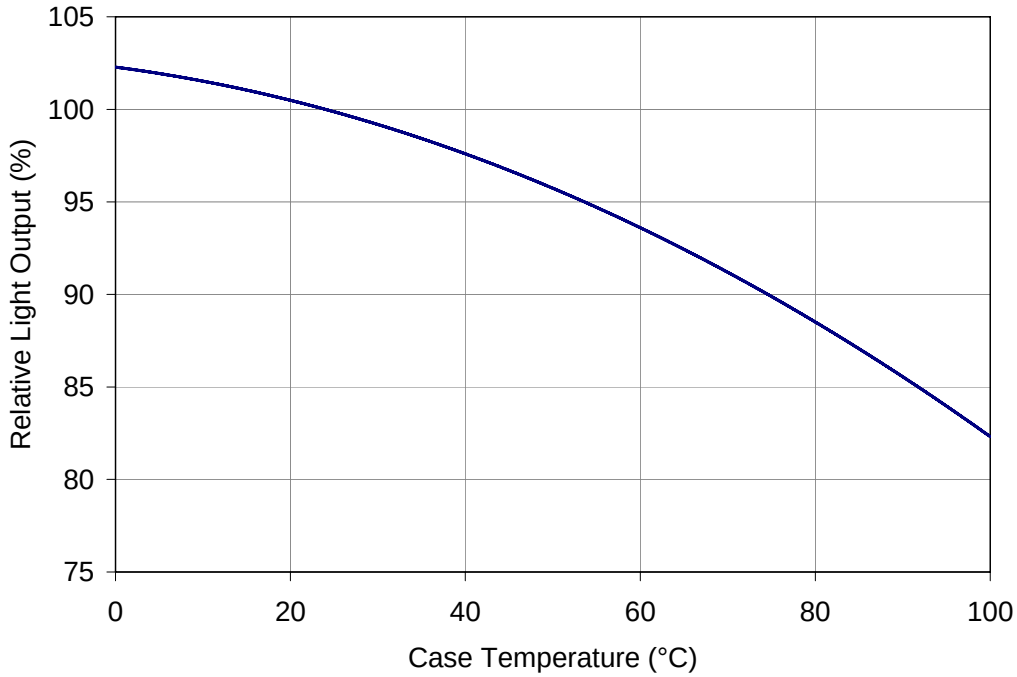

Figure 6: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

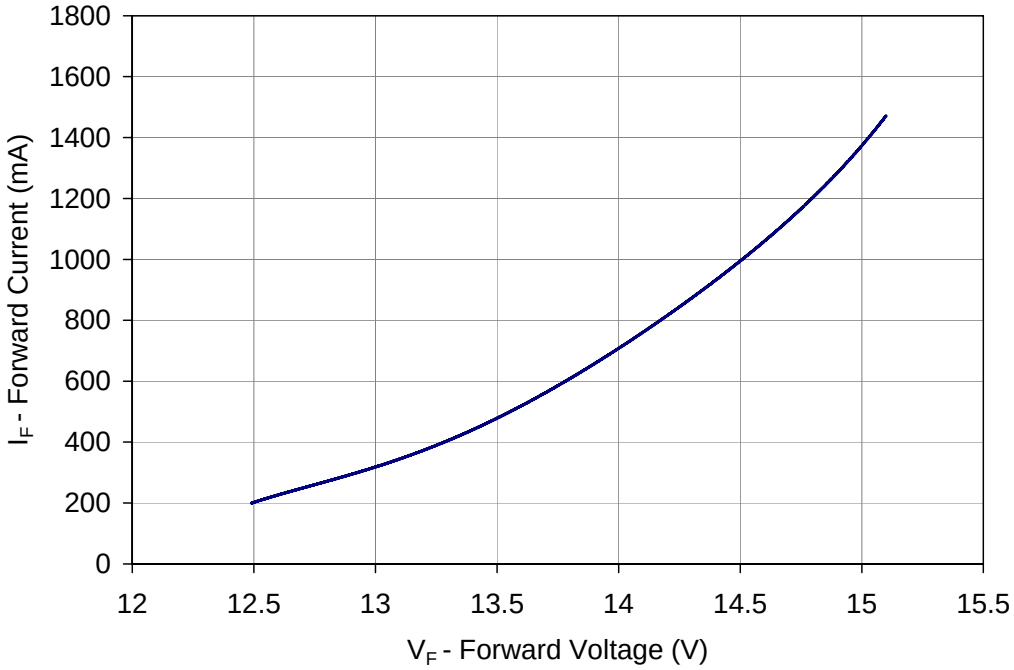

Figure 7: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

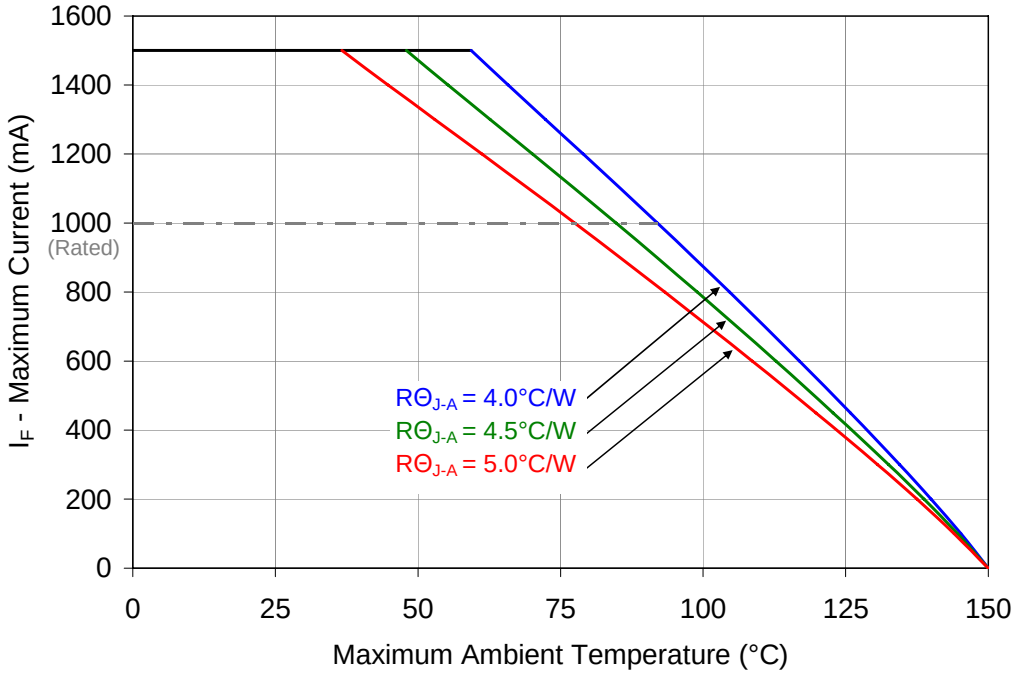

Figure 8: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 8:
1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00CW15 is typically 2.6°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].

Company Information

The LZ4-00CW15 Power LedFlex™ 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, Dental Blue, Blue, Green, Red, RGB, 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.

LedEngin, Inc.

High Efficacy Dental Blue Power LedFlex™ Emitter

LZ4-00DB15

Key Features

- High Efficacy 15W Dental Blue Emitter
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Radiant Flux Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.6°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Industry's highest Radiant Flux density
- High ESD protection (> 8 kV HBM)
- Autoclave complaint (JEDEC JESD22-A102-C)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

- Dental Curing
- Teeth Whitening

Description

LedEngin's LZ4-00DB15 Dental Blue Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional radiometric power in the wavelength range specifically required for dental curing light applications. 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 LZ4-00DB15 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“DB” for Dental Blue)
F and G – designate the Power (“15” for 15W 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:

			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 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 1000 mA. This projection is based on constant current operation with junction temperature maintained at or below 125°C.

Radiant Flux Bins

Table 2:

Bin Code	Minimum Radiant Flux (Φ) @ I_F = 1000mA [1,2] (W)	Maximum Radiant Flux (Φ) @ I_F = 1000mA [1,2] (W)	Typical Radiant Flux (Φ) @ I_F = 1500mA [2] (W)
R	2.4	3.0	3.7
S	3.0	3.8	4.5
T	3.8	4.8	5.6

Notes for Table 2:
1. Radiant 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 radiant flux performance. Contact LedEngin Sales for updated information.

Peak Wavelength Bin

Table 3:

Bin Code	Minimum Peak Wavelength (λ_P) @ I_F = 1000mA [1] (nm)	Maximum Peak Wavelength (λ_P) @ I_F = 1000mA [1] (nm)
D1	457	463

Notes for Table 3:
1. LedEngin maintains a tolerance of ± 2.0nm on peak wavelength measurements.

Forward Voltage Bin

Table 4:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
0	12.80	16.64

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	1500	mA
Peak Pulsed Forward Current[2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature	T_{sol}	260	°C
Autoclave Conditions[4]		121°C at 2 ATM, 100% RH for 168 hours	
ESD Sensitivity[5]		> 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 7 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. Autoclave Conditions per JEDEC JESD22-A102-C.
5. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00DB15 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
Radiant Flux (@ I_F = 1000mA)	Φ	3.3	W
Radiant Flux (@ I_F = 1500mA)	Φ	4.3	W
Peak Wavelength[1]	λ_P	460	nm
Viewing Angle[2]	$2\Theta_{½}$	110	Degrees
Total Included Angle[3]	$\Theta_{0.9}$	120	Degrees

Notes for Table 6:
1. Observe IEC 60825-1 class 2 rating for eye safety. Do not stare into the beam.
2. Viewing Angle is the off axis angle from emitter centerline where the radiant power is ½ of the peak value.
3. Total Included Angle is the total angle that includes 90% of the total radiant flux.

Electrical Characteristics @ T_C = 25°C

Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ I_F = 1000mA)	V_F	14.5	V
Forward Voltage (@ I_F = 1500mA)	V_F	15.1	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-8.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.6	°C/W

Mechanical Dimensions (mm)

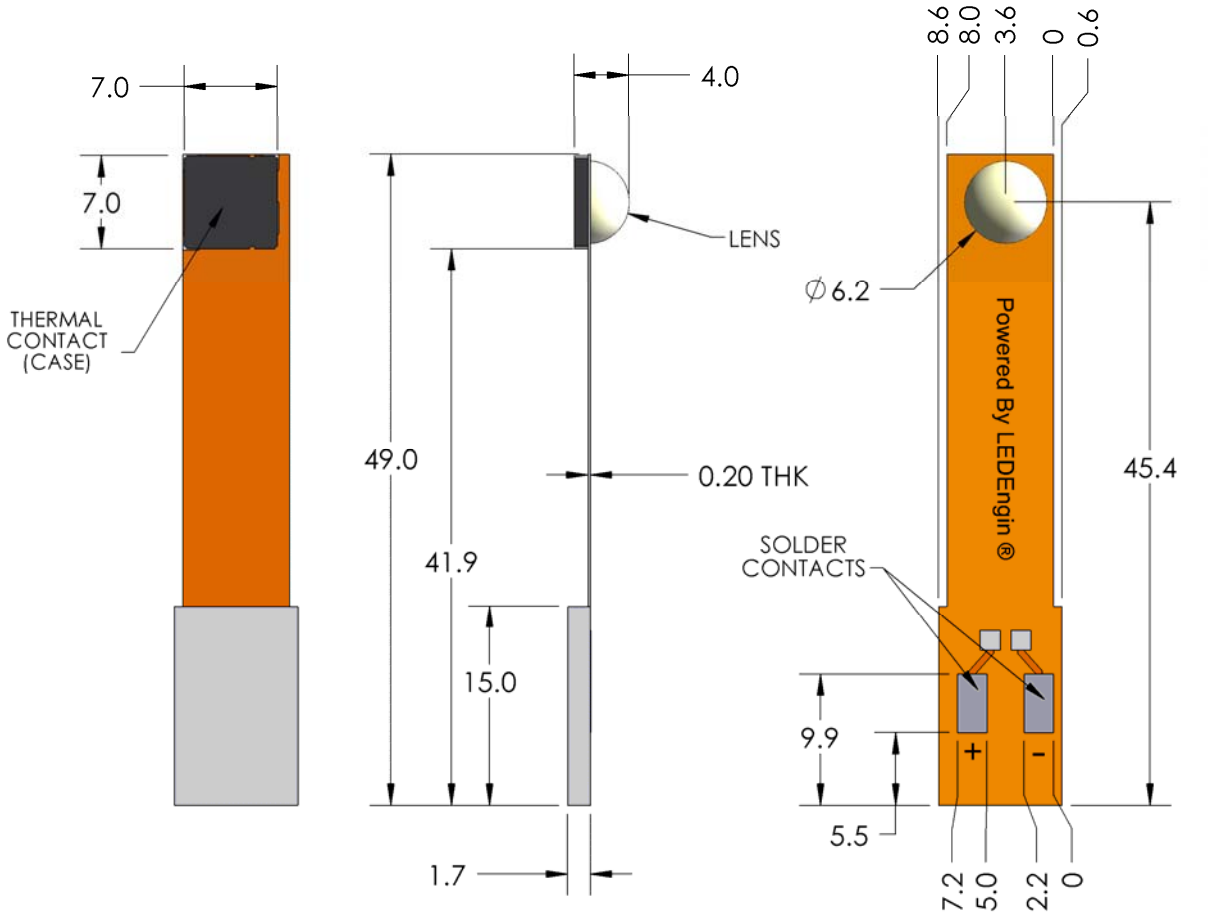

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled “+” for Anode and “-” for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

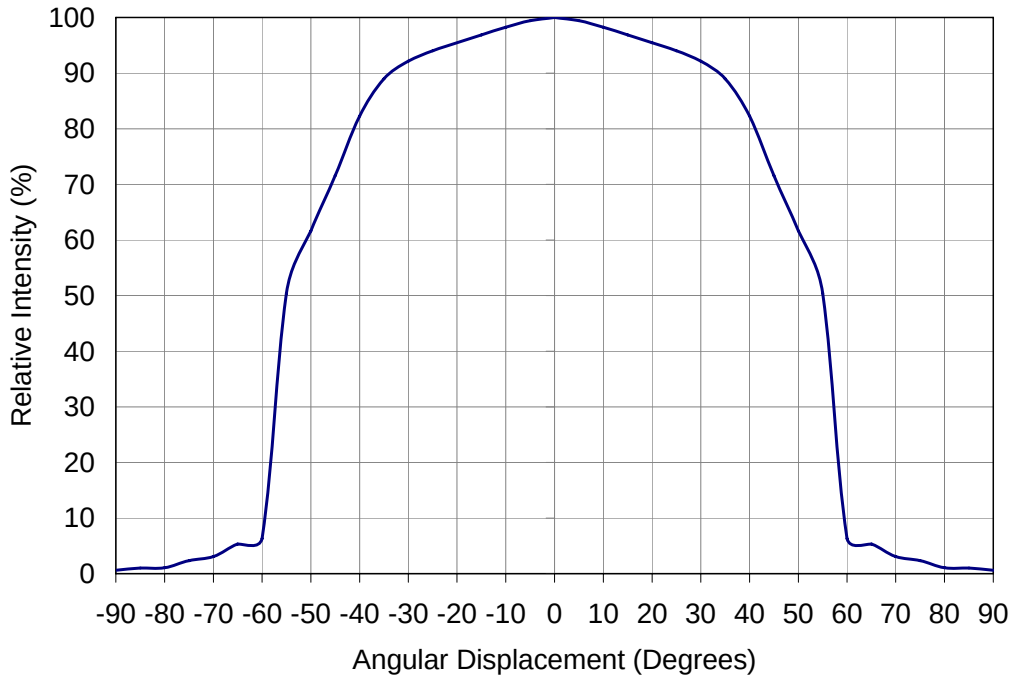

Figure 2: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

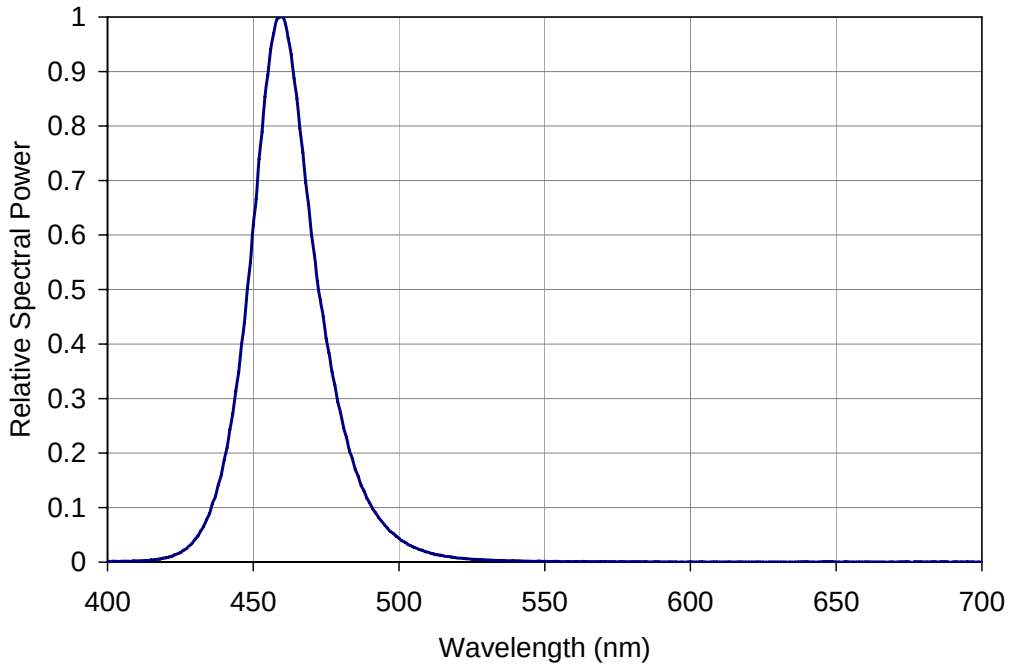

Figure 3: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Normalized Radiant Flux

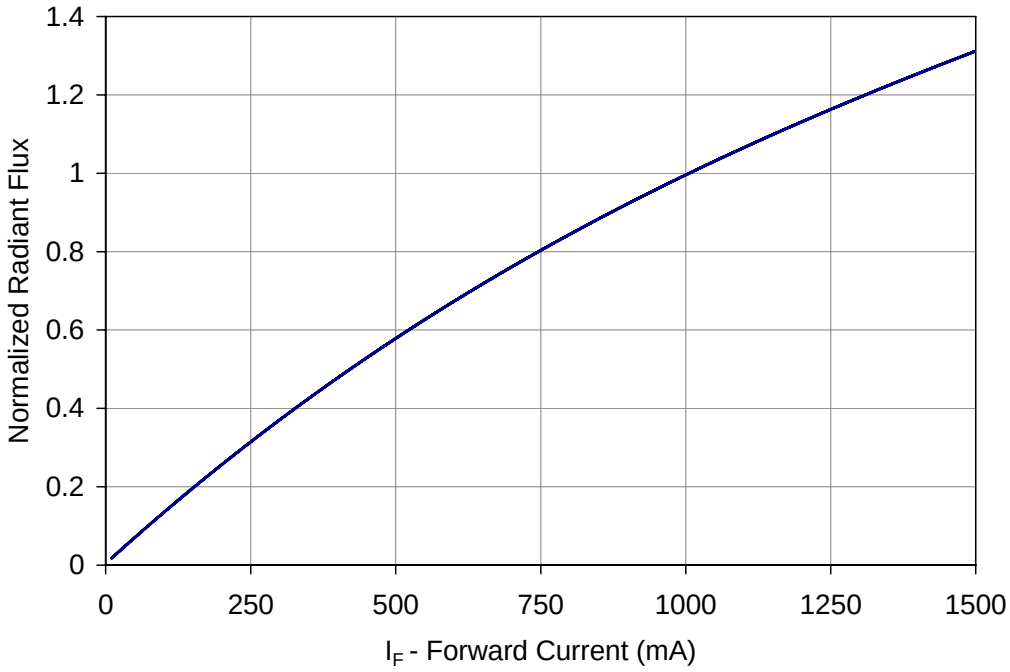

Figure 4: Typical normalized radiant flux vs. forward current @ T_C = 25°C.

Typical Normalized Radiant Flux over Temperature

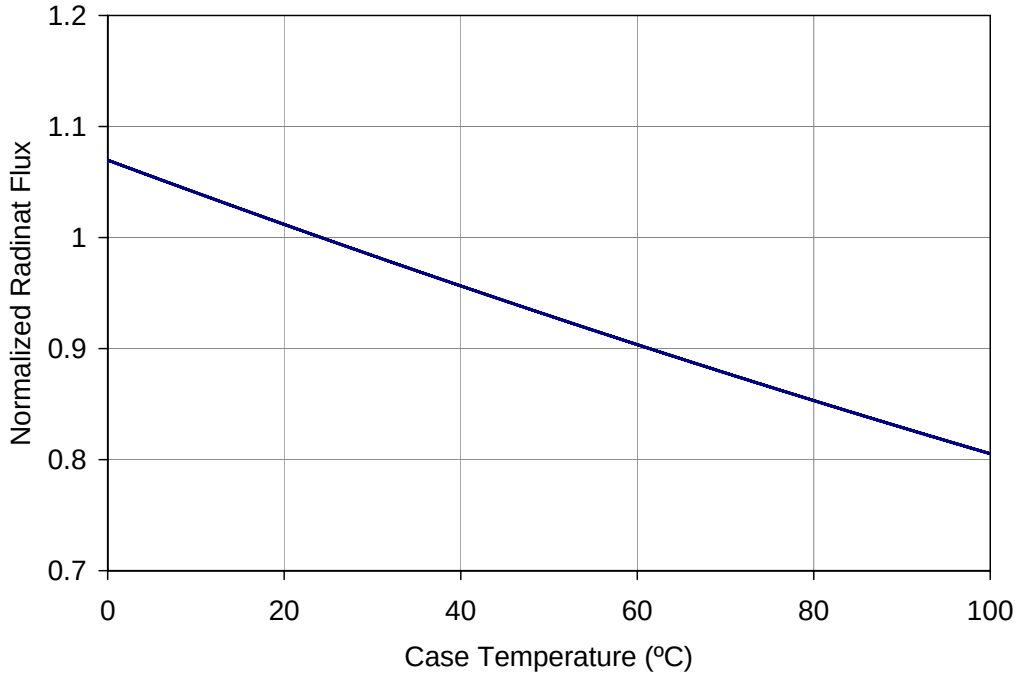

Figure 5: Typical normalized radiant flux vs. case temperature.

Typical Forward Current Characteristics

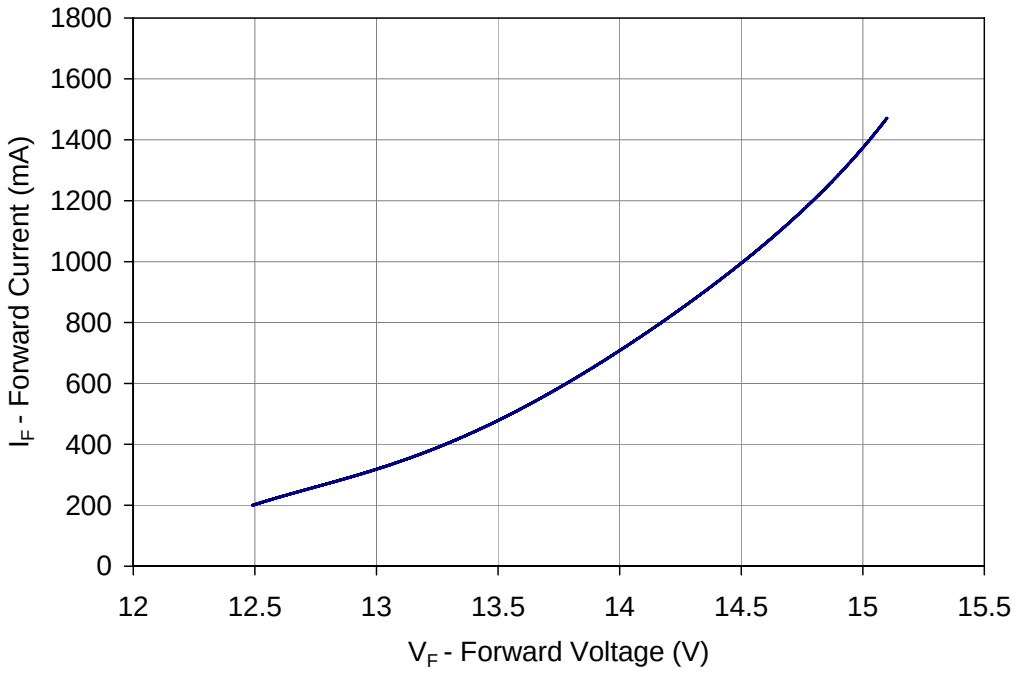

Figure 6: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

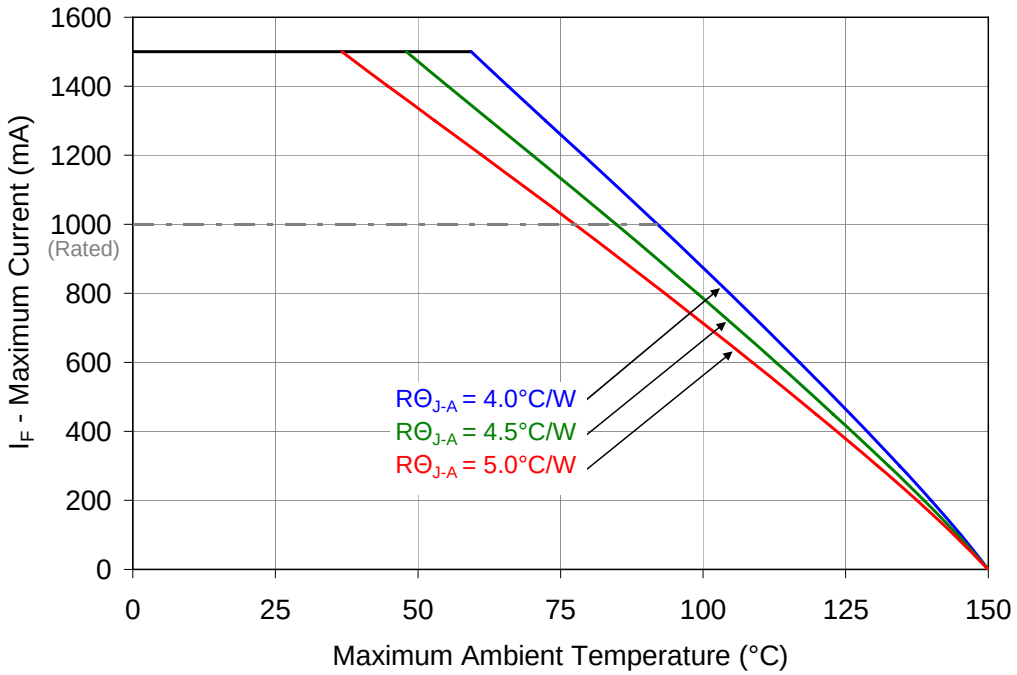

Figure 7: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 7:
1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00DB15 is typically 2.6°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].

Company Information

The LZ4-00DB15 Power LedFlex™ 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, Dental Blue, Blue, Green, Red, RGB, 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.

LedEngin, Inc.

High Luminous Efficacy Green
Power LedFlex™ Emitter

LZ4-00G115

Key Features

- High Luminous Efficacy 15W Green LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.0°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Industry's highest Luminous Flux density
- High ESD protection (> 8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

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

Description

LedEngin's LZ4-00G115 Green Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00G115 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
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 typical Dominant Wavelength)
F and G – designate the Power (“15” for 15W 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 luminous 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 MSL-20 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 1000 mA. 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
S	356	445	526
T	445	556	622
U	556	695	777

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 = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
F	12.80	13.76
G	13.76	14.72
H	14.72	15.68
J	15.68	16.64

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	1500	mA
Peak Pulsed Forward Current[2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity[4]		> 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 8 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00G115 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 = 1000mA)	Φ_V	532	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	661	lm
Dominant Wavelength (@ I_F = 350mA)[1]	λ_D	525	nm
Viewing Angle[2]	$2\Theta_{1/2}$	95	Degrees
Total Included Angle[3]	$\Theta_{0.9V}$	115	Degrees

Notes for Table 6:
1. Refer to Figure 6 for typical dominant wavelength shift over forward current.
2. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
3. 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 = 1000mA)	V_F	14.5	V
Forward Voltage (@ I_F = 1500mA)	V_F	15.4	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-7.4	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.0	°C/W

Mechanical Dimensions (mm)

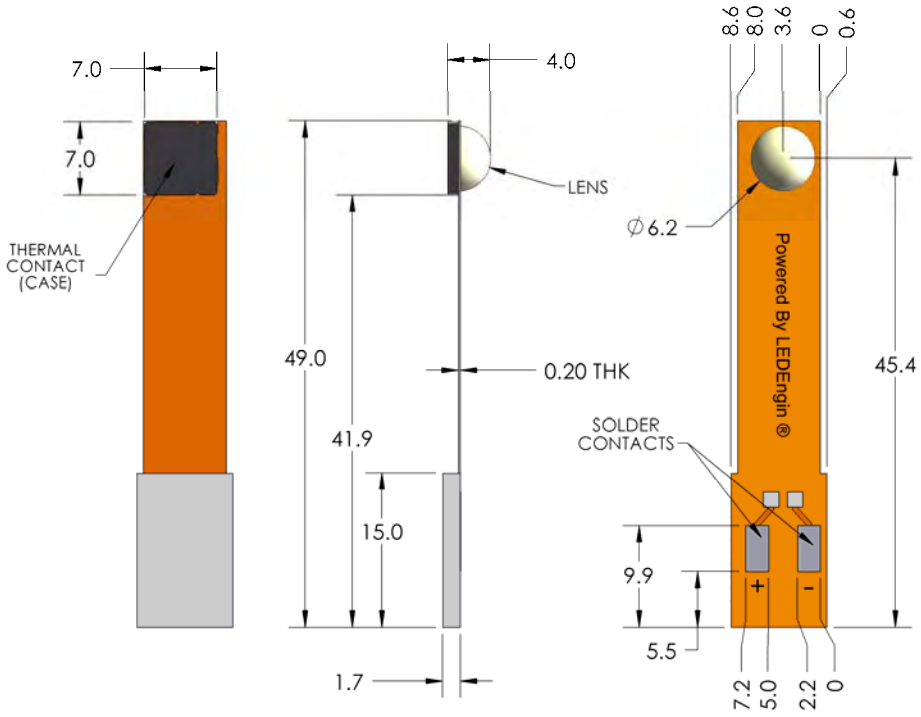

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled "+" for Anode and "-" for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

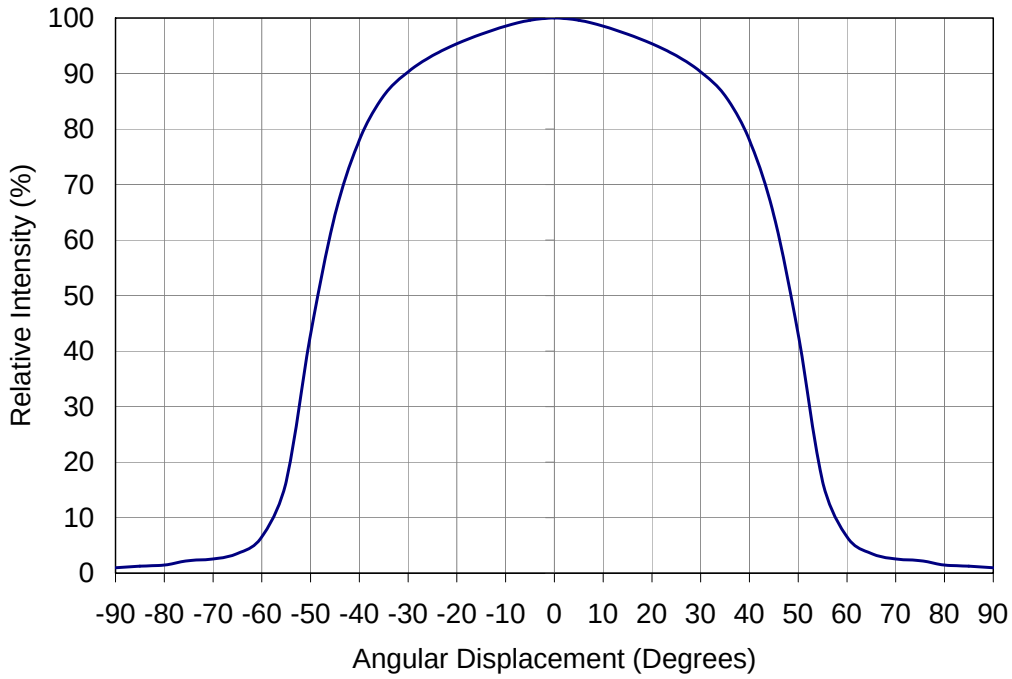

Figure 2: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

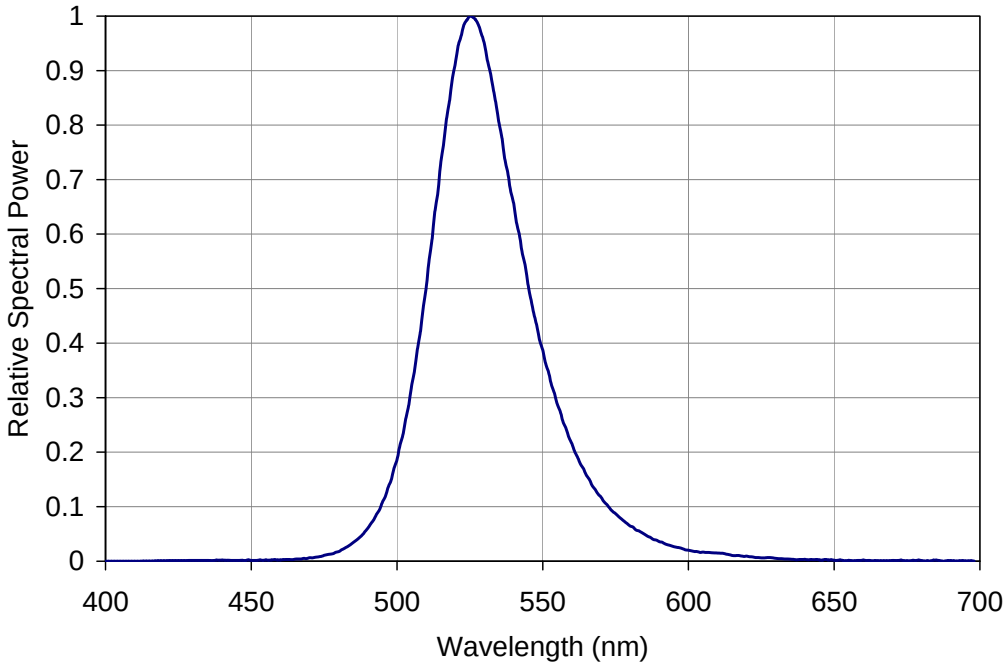

Figure 3: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Relative Light Output

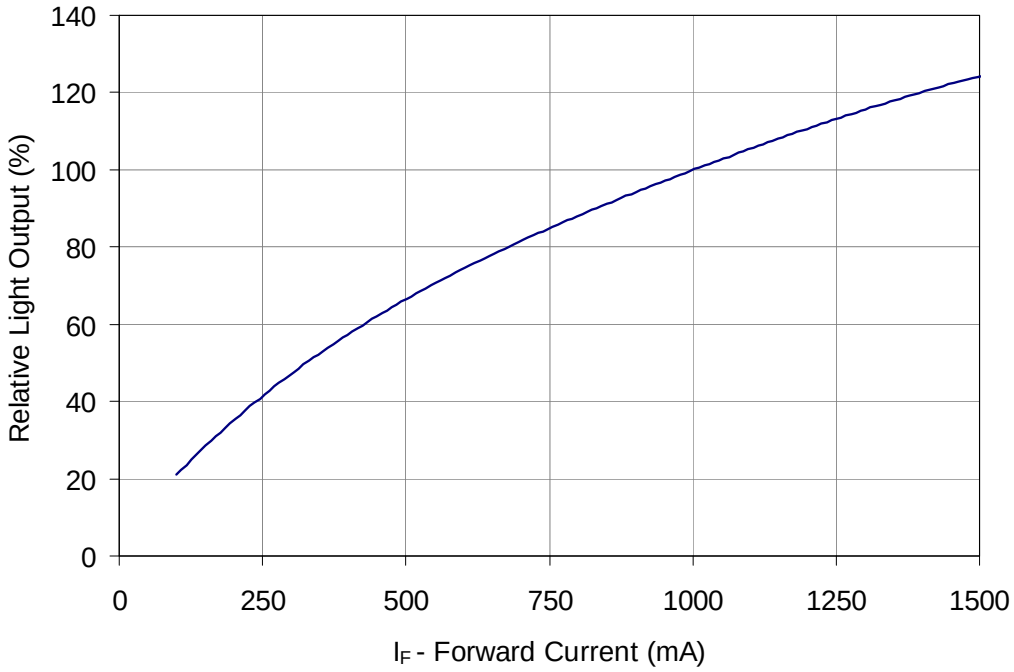

Figure 4: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

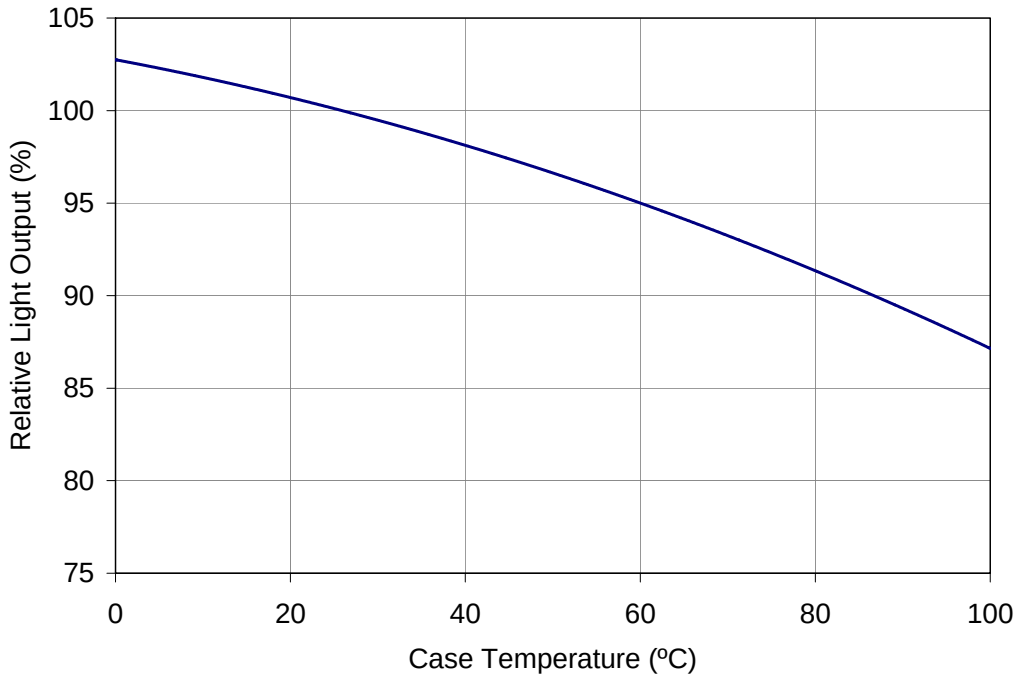

Figure 5: Typical relative light output vs. case temperature.

Typical Relative Dominant Wavelength Shift

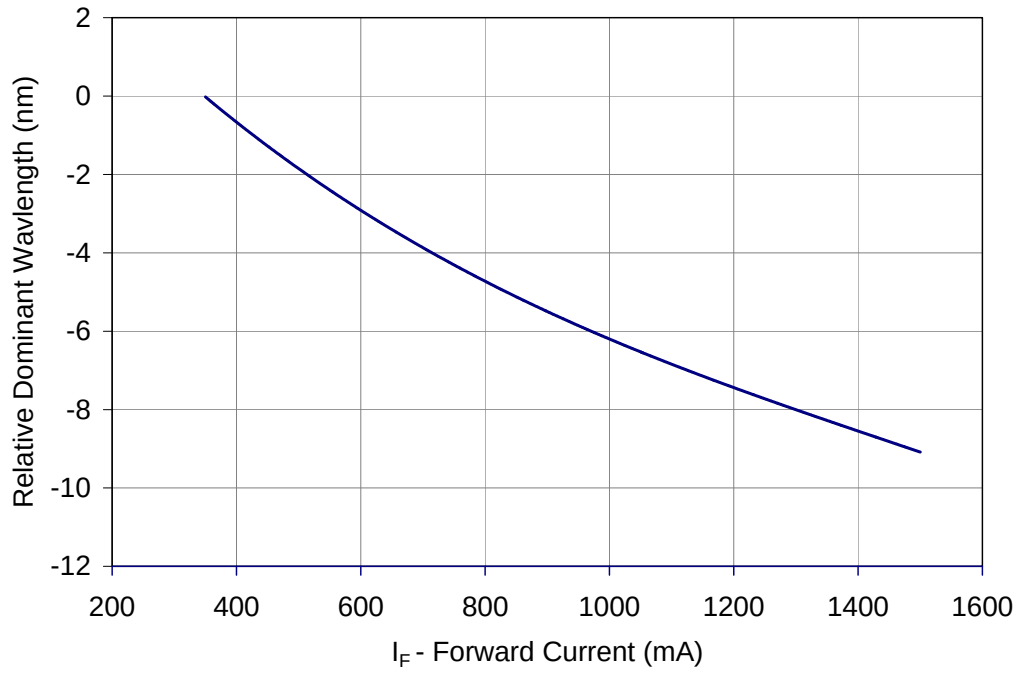

Figure 6: Typical dominant wavelength shift vs. forward current @ T_C = 25°C.

Typical Forward Current Characteristics

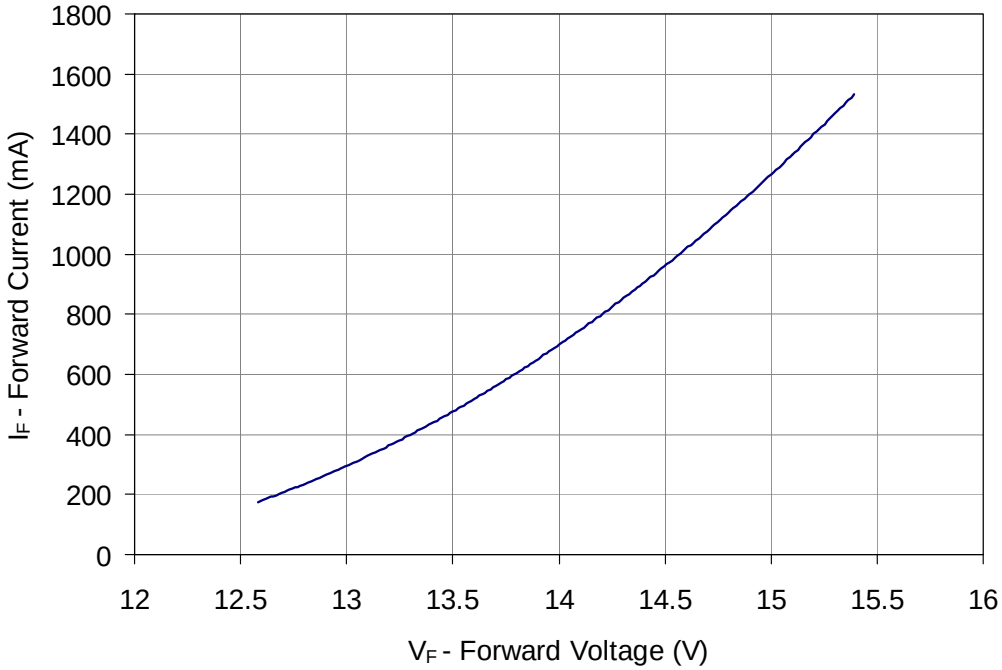

Figure 7: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

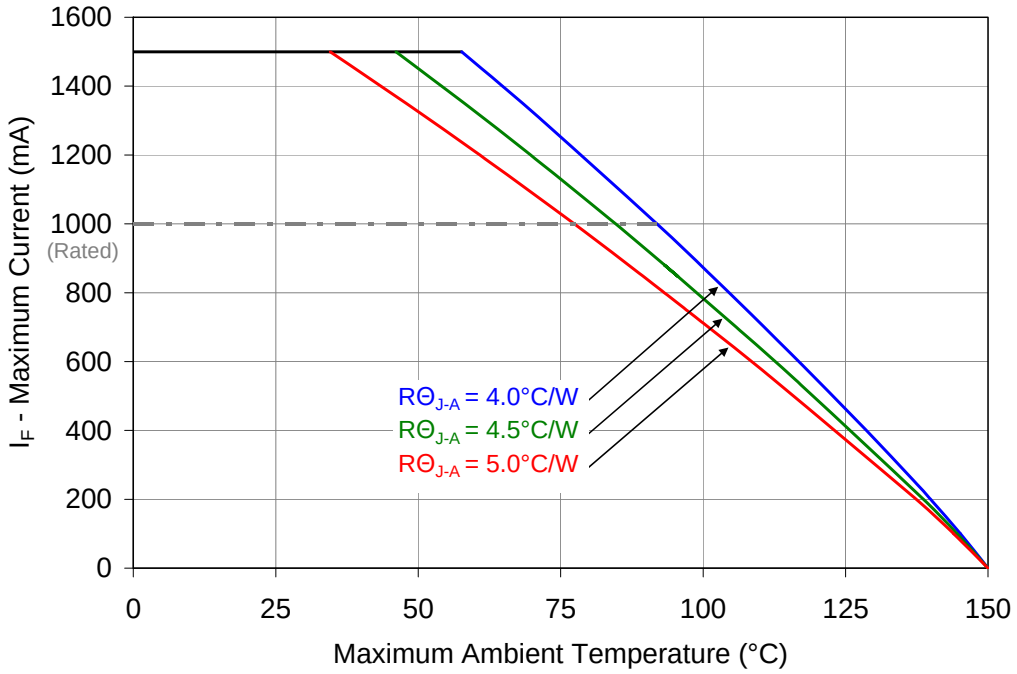

Figure 8: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 7:
1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00G115 is typically 2.0°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].

Company Information

The LZ1-00G115 LED emitter is developed, manufactured, and marketed by LedEngin, Inc., located in Santa Clara, CA. LedEngin is a global 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.

LedEngin, Inc.

High Luminous Efficacy Red Power LedFlex™ Emitter

LZ4-00R115

Key Features

- High Luminous Efficacy 15W Red LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.6°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Industry's highest Luminous Flux density
- High ESD protection (> 8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

- Architectural Lighting
- Emergency lighting
- Automotive and Marine lighting
- Stage and Studio lighting
- Beacons and Buoys
- Airfield lighting and signs
- Machine vision
- RGB fixtures

Description

LedEngin's LZ4-00R115 Red Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00R115 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“R1” for Red - 628nm Dominant Wavelength)
F and G – designate the Power (“15” for 15W 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 luminous 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	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 1000 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
Q	228	285	315
R	285	356	372
S	356	445	465

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 = 1000mA [1,2] (nm)	Maximum Dominant Wavelength (λ_D) @ I_F = 1000mA [1,2] (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.
2. 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 = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
B	8.96	9.92
C	9.92	10.88
D	10.88	11.84
E	11.84	12.80

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	1500	mA
Peak Pulsed Forward Current[2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +125	°C
Junction Temperature	T_J	125	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity[4]		> 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 7 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00R115 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 = 1000mA)	Φ_V	324	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	377	lm
Dominant Wavelength	λ_D	628	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_C = 25°C

Table 7:

Parameter	Symbol	Typical	Unit
Forward Voltage (@ I_F = 1000mA)	V_F	10.4	V
Forward Voltage (@ I_F = 1500mA)	V_F	11.4	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-6.0	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.6	°C/W

Mechanical Dimensions (mm)

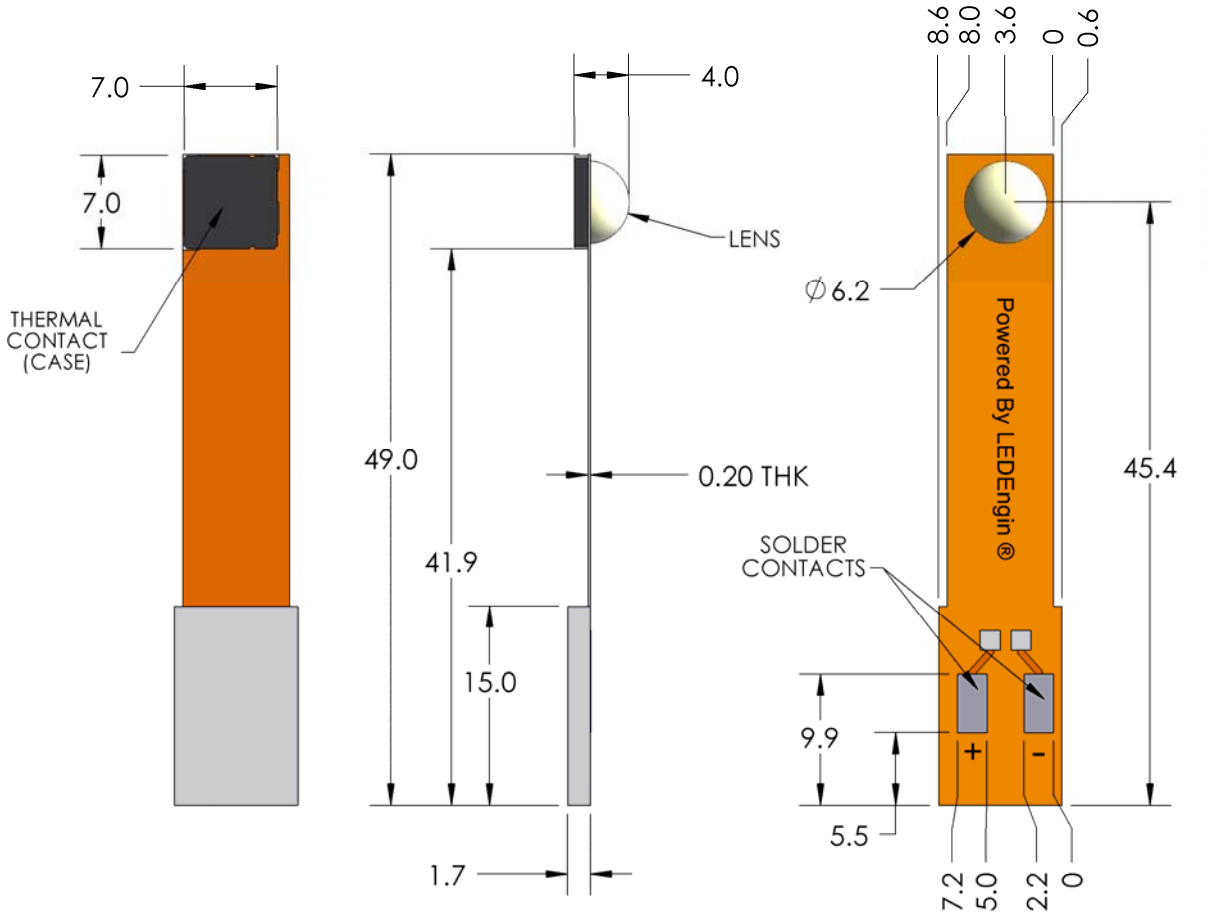

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled "+" for Anode and "-" for Cathode.
3. LedEngin recommends using thermally conductive tapes or adhesives when attaching Thermal Contact to a heat sink.

Typical Radiation Pattern

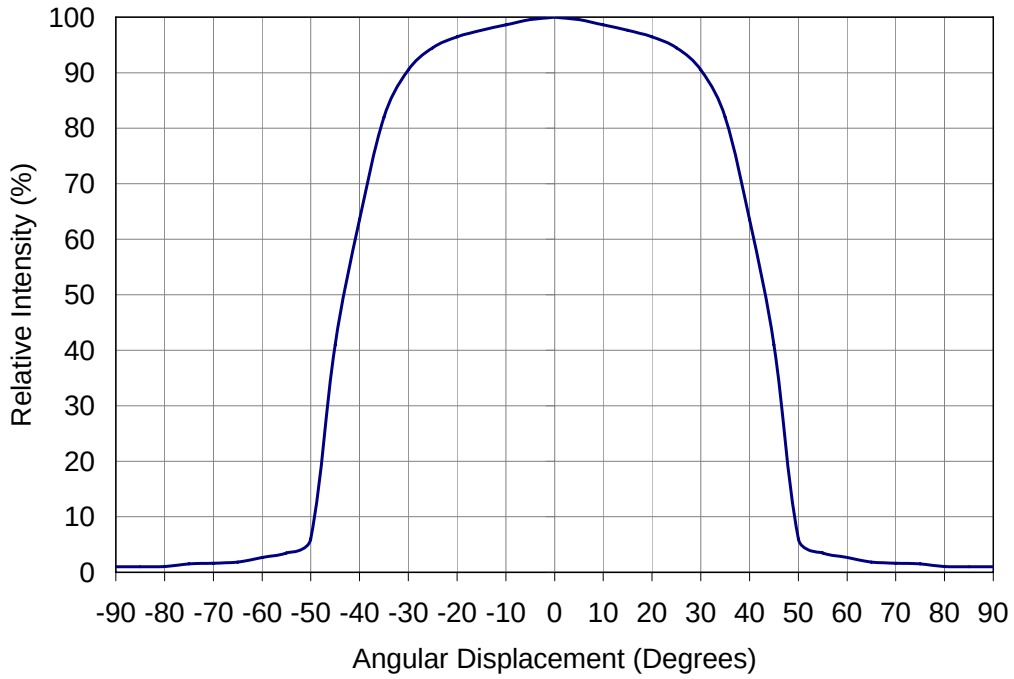

Figure 2: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

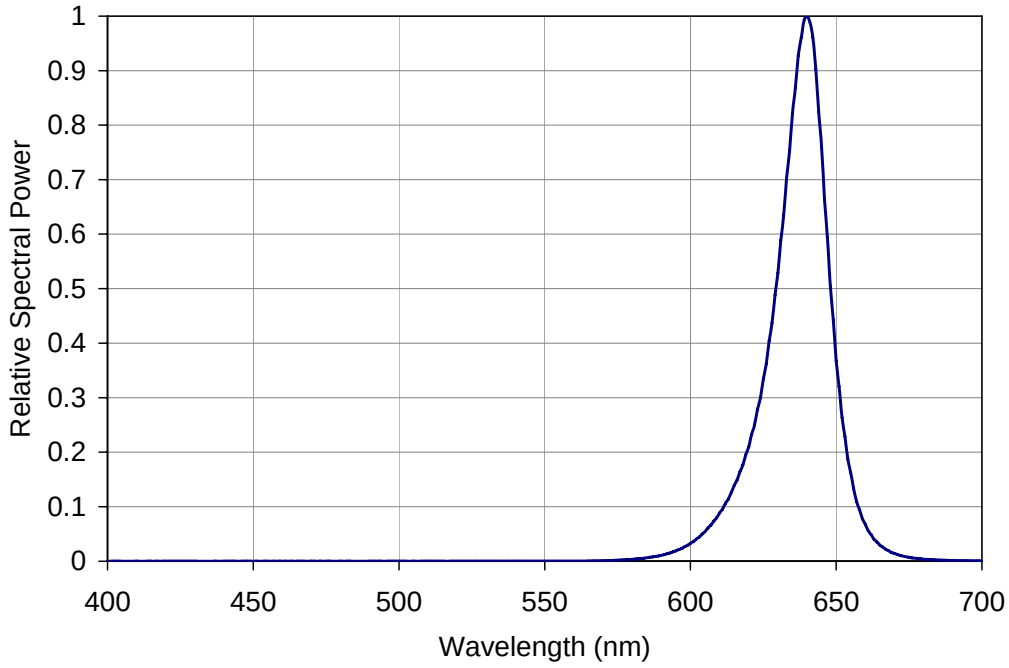

Figure 3: Relative spectral power vs. wavelength @ T_C = 25°C.

Typical Relative Light Output

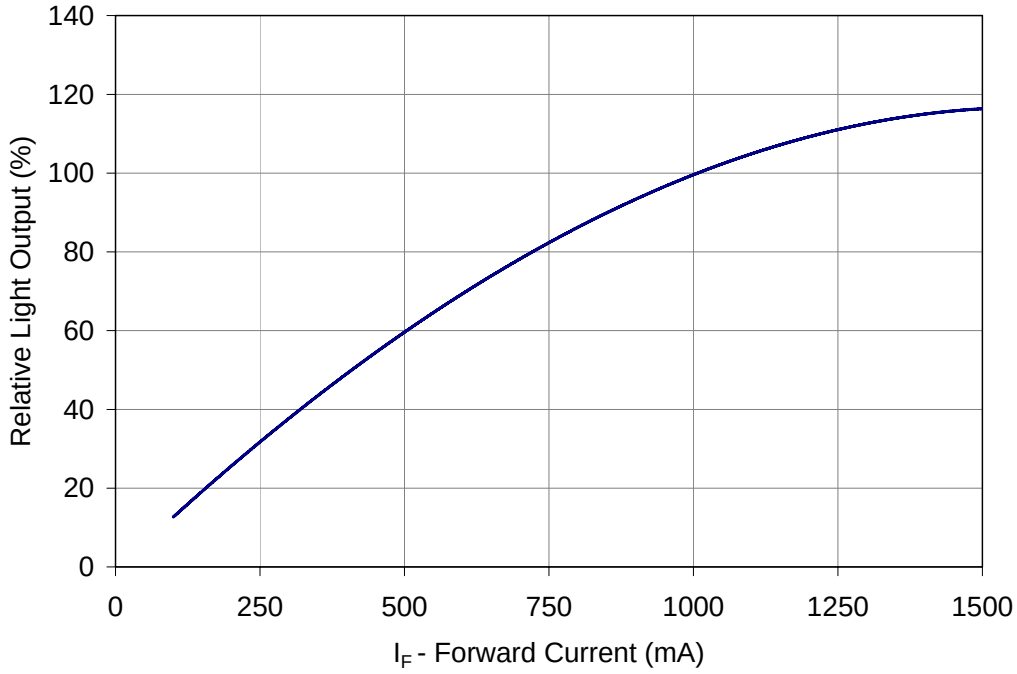

Figure 4: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

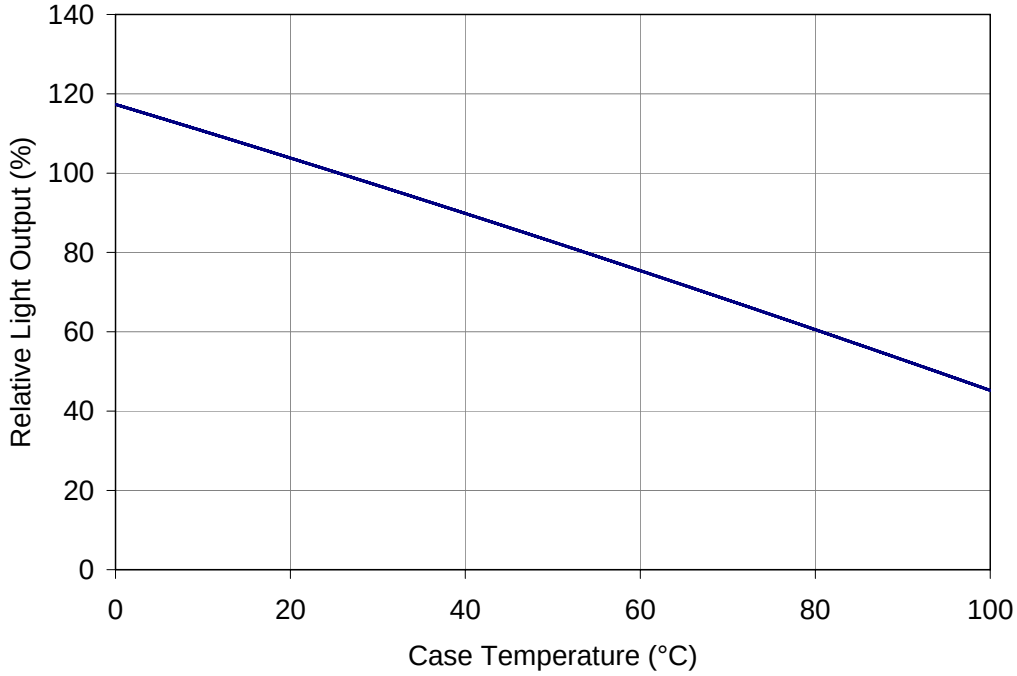

Figure 5: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

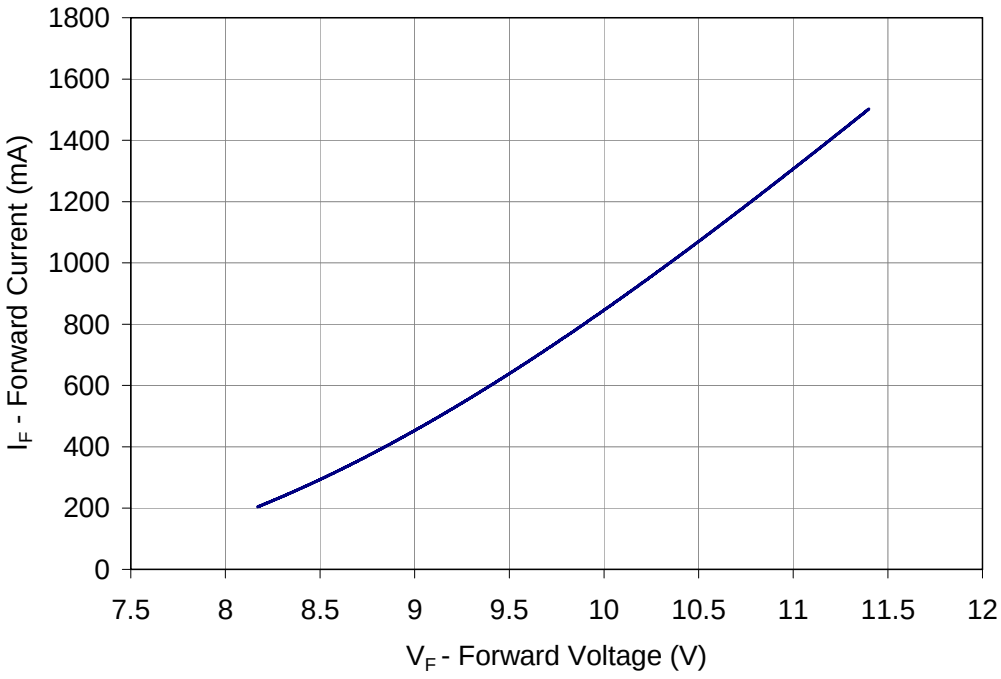

Figure 6: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

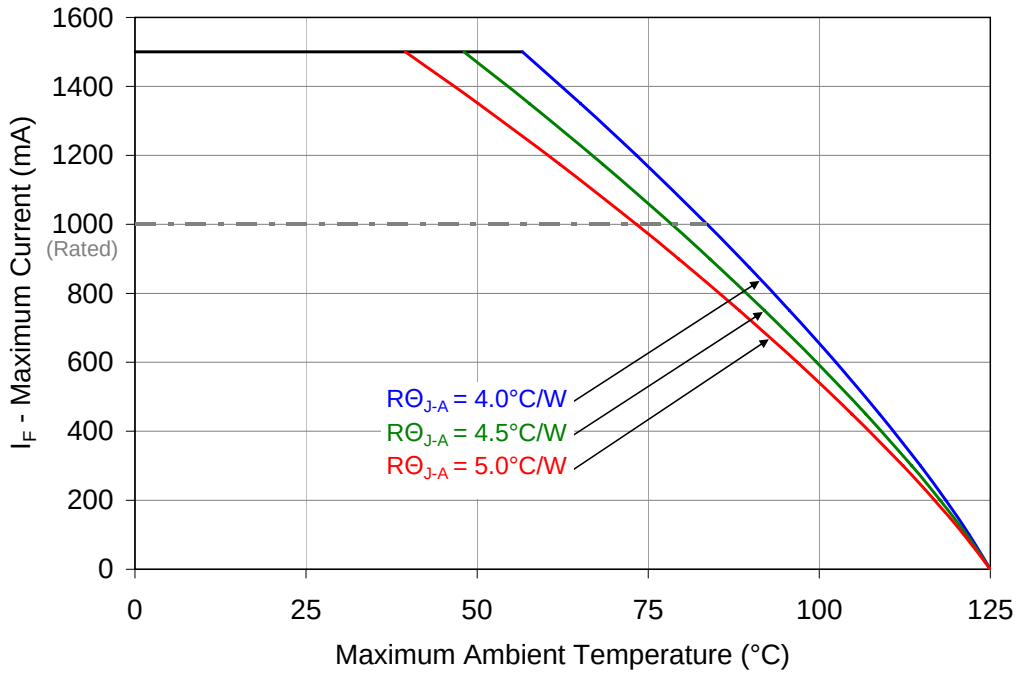

Figure 7: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 125°C.

Company Information

The LZ4-00R115 Power LedFlex™ 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, Dental Blue, Blue, Green, Red, RGB, 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.

LedEngin, Inc.

High Luminous Efficacy Warm White
Power LedFlex™ Emitter

LZ4-00WW15

Key Features

- High Luminous Efficacy 15W Warm White LED
- Unique package design with ceramic substrate, integrated glass lens and Flex PCB
- New industry standard for Lumen Maintenance (> 90% at 100,000 Hours)
- Extremely low Thermal Resistance (2.5°C/W)
- Isolated thermal path - electrical connections on Flex PCB
- Mount directly to heatsink - MCPCB not required
- Exceptional spatial color uniformity across radiation pattern
- Industry's highest Luminous Flux density
- High ESD protection (> 8 kV HBM)
- JEDEC Level 2 Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant

Typical Applications

- General Lighting
- Museum Lighting
- Retail & Display Lighting
- Hospitality Lighting
- Accent & Task Lighting
- Architectural Detail Lighting

Description

LedEngin's LZ4-00WW15 Warm White Power LedFlex™ emitter is capable of 15W power dissipation and provides exceptional luminous flux density. The LZ4-00WW15 offers ultimate design flexibility with separate electrical and thermal paths. The thermal contact can be mounted directly to a heatsink, eliminating the requirement for a MCPCB. The Anode and Cathode contacts are remotely located on the Flex PCB, allowing for connection versatility and unobstructed access to the optics. LedEngin's patent-pending thermally insulated phosphor layer provides for exceptional spatial color uniformity across the radiation pattern and a consistent CCT over time and temperature. 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.

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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

Base Part Number — Bin Code

Where:
A – designates the number of LED die in the package (“4” for 15W)
B – designates the package level (“0” for Emitter)
C – designates the radiation pattern (“0” for Lambertian)
D and E – designate the color (“WW” for Warm White: 2870 K < CCT < 3700 K)
F and G – designate the Power (“15” for 15W typical rating)
H – designates the Flux bin (See Table 2)
J and K – designate the CCT bin groups (see Figure 1 and Table 4)
L – designates the V_F bin (See Table 3)

Ordering information:
For ordering LedEngin products, please reference the base part number. The base part number represents any of the luminous flux, chromaticity groups, 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 1000 mA. 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 = 1000mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 1000mA [1,2] (lm)	Typical Luminous Flux (Φ_V) @ I_F = 1500mA [2] (lm)
S	356	445	500
T	445	556	630
U	556	695	790

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.

Forward Voltage Bins

Table 3:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)	Maximum Forward Voltage (V_F) @ I_F = 1000mA [1] (V)
F	12.80	13.76
G	13.76	14.72
H	14.72	15.68
J	15.68	16.64

Notes for Table 3:
1. LedEngin maintains a tolerance of ± 0.04V for forward voltage measurements.

Warm White Chromaticity Groups

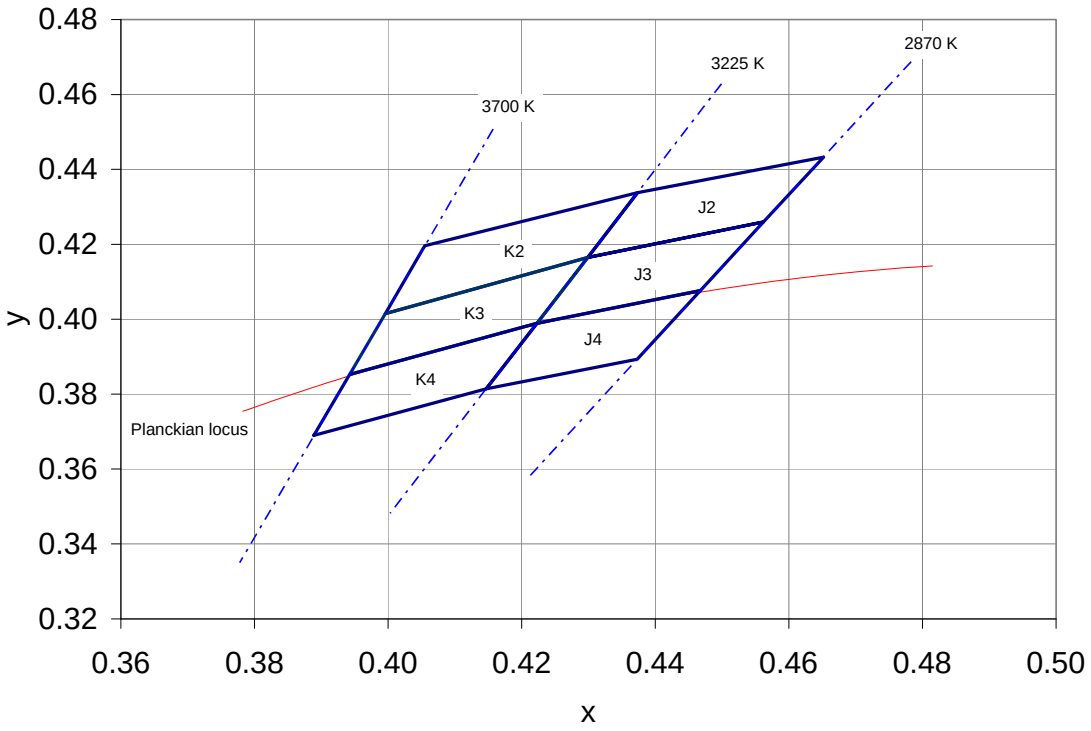

Figure 1: Standard Chromaticity Groups plotted on excerpt from the CIE 1931 (2°) x-y Chromaticity Diagram. Coordinates are listed below in Table 3.

Warm White Chromaticity Coordinates

Table 4:

Bin Code	x	y	Typical CCT (K)
K2	0.3996	0.4015	3450
	0.4299	0.4165	
	0.4374	0.4338	
	0.4055	0.4196	
K3	0.3996	0.4015	3450
	0.4299	0.4165	
	0.4223	0.3990	
	0.3943	0.3853	
K4	0.3889	0.3690	3450
	0.3943	0.3853	
	0.4223	0.3990	
	0.4147	0.3814	

Bin Code	x	y	Typical CCT (K)
J2	0.4299	0.4165	3050
	0.4562	0.4260	
	0.4652	0.4433	
	0.4374	0.4338	
J3	0.4299	0.4165	3050
	0.4562	0.4260	
	0.4468	0.4077	
	0.4223	0.3990	
J4	0.4147	0.3814	3050
	0.4223	0.3990	
	0.4468	0.4077	
	0.4373	0.3893	

Absolute Maximum Ratings

Table 5:

Parameter	Symbol	Value	Unit
DC Forward Current [1]	I_F	1500	mA
Peak Pulsed Forward Current [2]	I_{FP}	2000	mA
Reverse Voltage	V_R	See Note 3	V
Storage Temperature	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature	T_{sol}	260	°C
ESD Sensitivity [4]		> 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 8 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. LedEngin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00WW15 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 = 1000mA)	Φ_V	400	lm
Luminous Flux (@ I_F = 1500mA)	Φ_V	500	lm
Correlated Color Temperature [1]	CCT	3100	K
Chromaticity Coordinates	x,y	0.430, 0.402	
Viewing Angle [2]	$2\Theta_{1/2}$	105	Degrees
Total Included Angle [3]	$\Theta_{0.9V}$	135	Degrees

Notes for Table 6:
1. Typical Color Rendering Index (CRI) is 80.
2. Viewing Angle is the off axis angle from emitter centerline where the luminous intensity is ½ of the peak value.
3. 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 = 1000mA)	V_F	14.5	V
Forward Voltage (@ I_F = 1500mA)	V_F	15.1	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_J$	-8.2	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	2.5	°C/W

Mechanical Dimensions (mm)

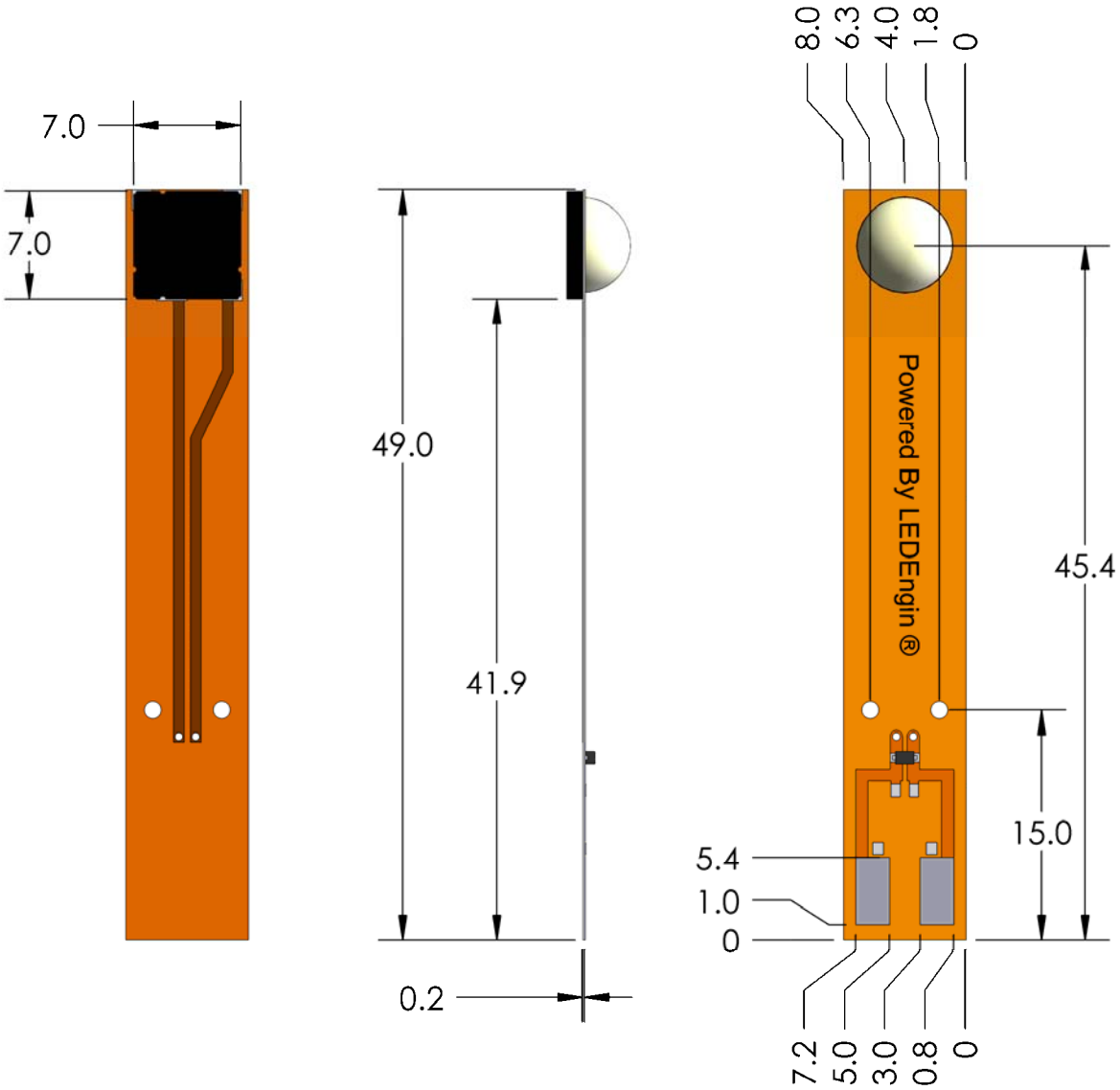

Figure 2: Package outline drawing.

Notes for Figure 2:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Solder contact pads on Flex PCB are labeled “+” for Anode and “-” for Cathode.
3. LedEngin recommends using a thermally conductive adhesive when attaching Thermal Contact to a heat sink. Please contact LedEngin Sales Representative for recommended adhesives.

Typical Radiation Pattern

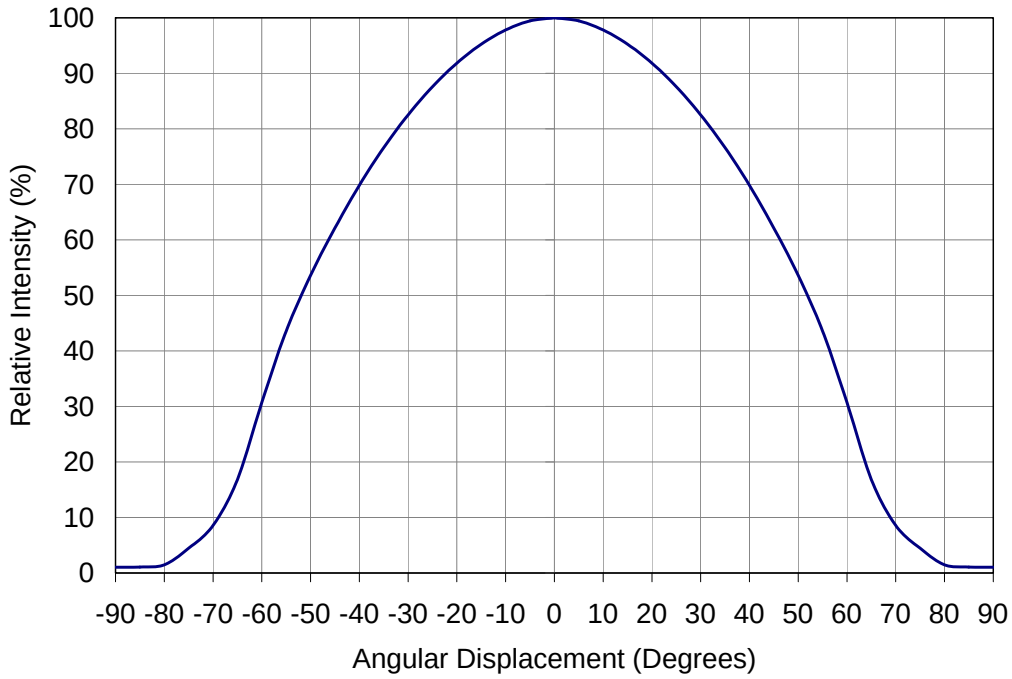

Figure 3: Typical representative spatial radiation pattern.

Typical Relative Spectral Power Distribution

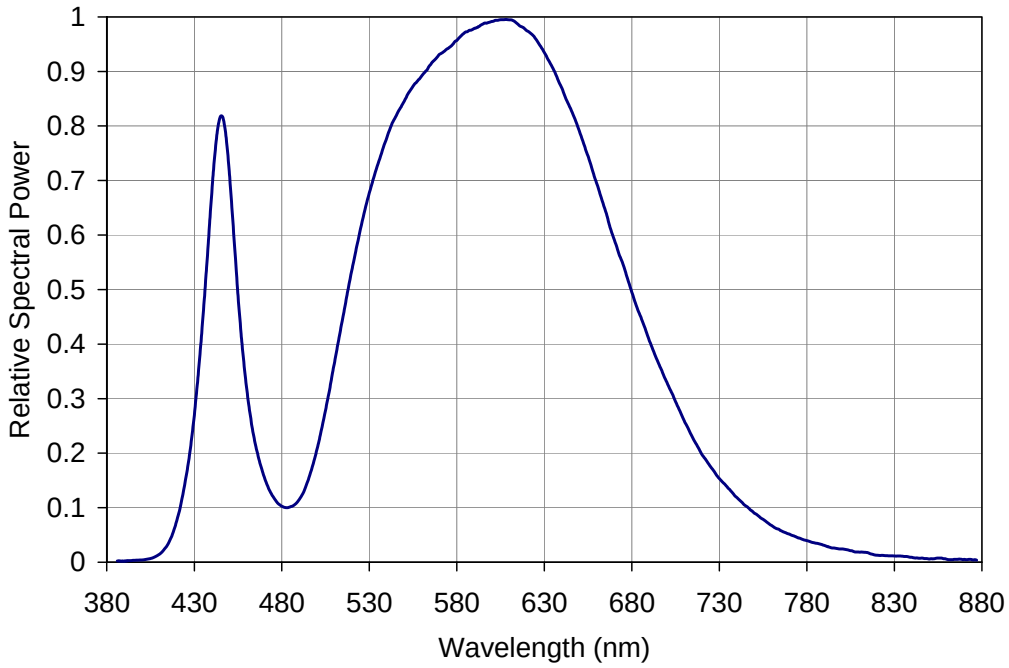

Figure 4: Relative spectral power vs. wavelength.

Typical Relative Light Output

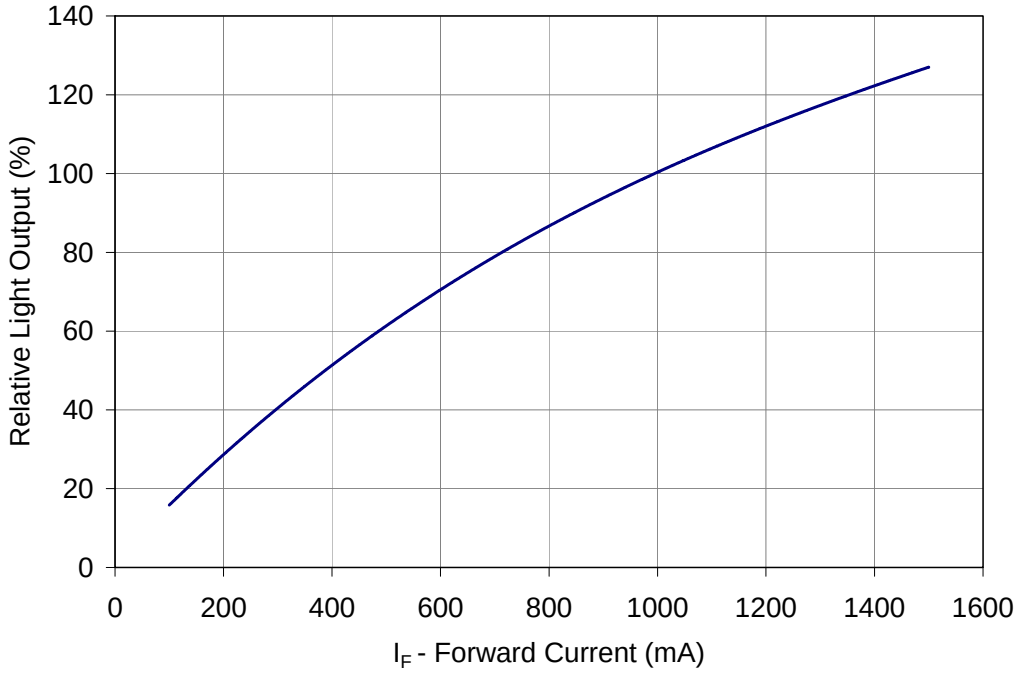

Figure 5: Typical relative light output vs. forward current @ T_C = 25°C.

Typical Relative Light Output over Temperature

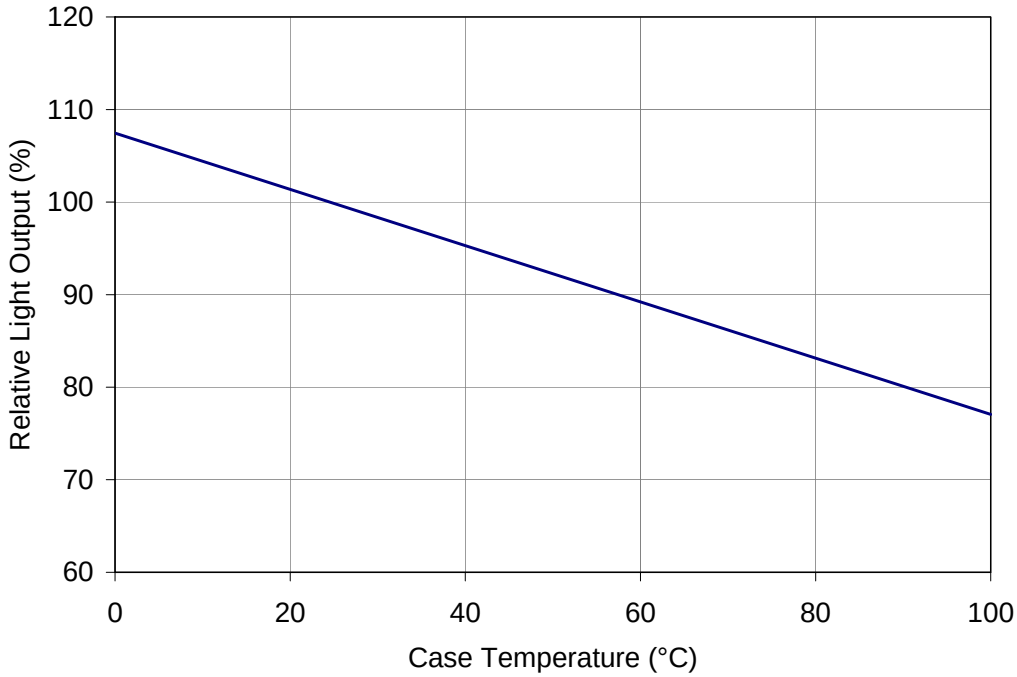

Figure 6: Typical relative light output vs. case temperature.

Typical Forward Current Characteristics

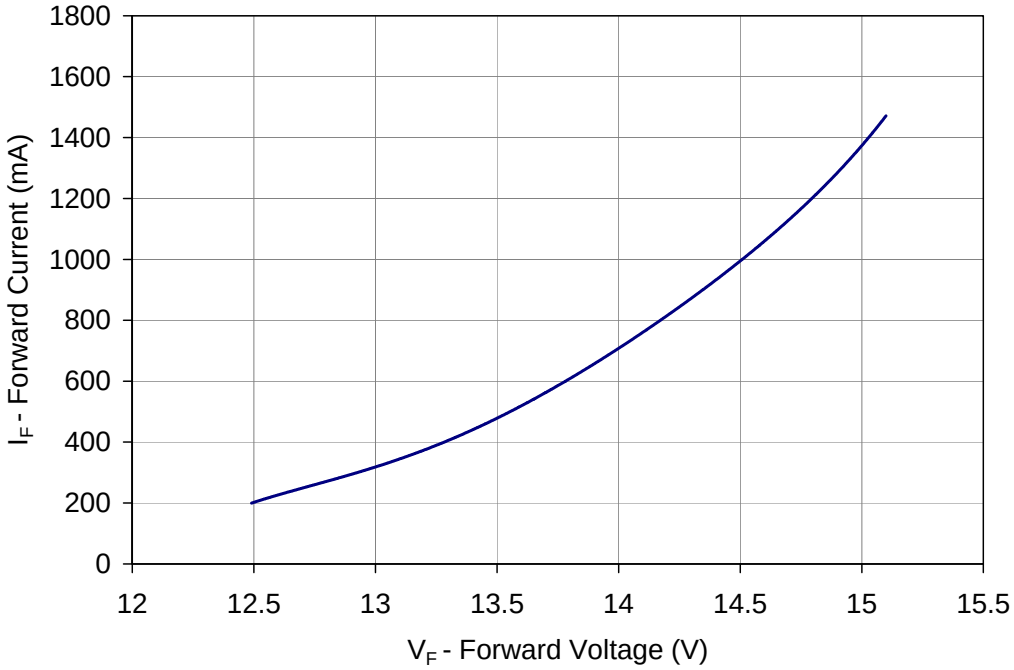

Figure 7: Typical forward current vs. forward voltage @ T_C = 25°C.

Current Derating

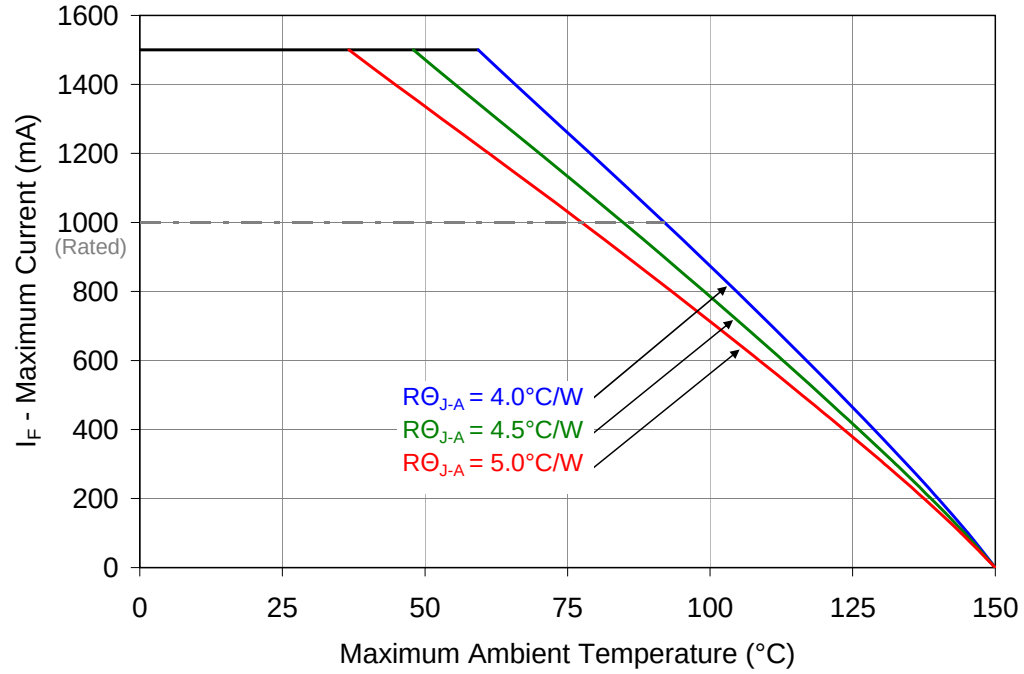

Figure 8: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 150°C.

Notes for Figure 8:
1. $R\Theta_{J-C}$ [Junction to Case Thermal Resistance] for the LZ4-00WW15 is typically 2.5°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].

Company Information

The LZ1-00WW15 Power LedFlex™ is developed, manufactured, and marketed by LedEngin, Inc., located in Santa Clara, CA. LedEngin is a global 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, Warm White, Neutral 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.