ViviLux™ High Luminous Flux Density
Warm White CRI90 LED Emitter + Lens Kit

LZC-x0WHyy

Key Features

- Emitter and TIR Lens Combination to meet lighting grade lux and efficacy in down lighting and accent lighting applications
  - High Luminous Flux Density 12-die Warm White Emitter
  - Range of Beam options: 24° / 35° / 45°
- CRI> 90 and R9> 80 for accurate color rendition
- Specified at realistic lamp system operating temperatures of Tj=100°C; equivalent to $T_{heat\ sink}$ of 65°C
- 100 lm/W typical luminous efficacy emitter only at 350mA and Tj=100°C; >85 lm/W including TIR lens
- 2000 lumens typical emitter only at Tj=100°C; 1700 lumens including TIR lens
- Single 2.5 SDCM CCT bins at 2700K and 3000K color temperatures for consistent white color
- 100W Halogen / 35W Metal Halide replacement light source
- Compact 9.0mm x 9.0mm footprint
- Very low Thermal Resistance (0.7°C/W)
- Based on LuxiGen LZC-series 12-die high power density product platform
- Emitter available with several MCPCB options

Typical Applications

- High-end retail lighting
- Down lighting
- Accent lighting
- Hospitality lighting
- Architectural lighting
- Stage and Studio lighting

Description

ViviLux delivers bold, vivid, and energy-efficient Lux-on-Target™ directional lighting for retail and commercial lighting. The powerful, yet compact emitter and lens combinations lead the industry in terms of 'lux efficacy' or lux/Watt. Under steady-state, real world conditions of Tj=100°C, ViviLux produces 1700 lumens at 700mA after the secondary lens. This equates to an emitter luminous efficacy of 100 lumens/Watt at 350mA; Tj=100°C.
With a high color rendering index (CRI), ViviLux ensures accurate color rendition in even the most demanding applications. Furthermore, emitter-to-emitter variations of less than 2.5 SDCM guarantee lighting consistency. ViviLux, which is based on LED Engin's proven LuxiGen™ emitter technology, is available in three beam options: 24°/ 35°/45°, providing flexibility and freedom in lighting design.

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Part number options

ViviLux Kits are identified by the ViviLux Kit part number; an integration of emitter and lens options. Component parts will also have sub- part number for reference.

ViviLux Part Numbers

Part number	Description
LZC-x0WHNF-0H27	LZC ViviLux emitter with Narrow Flood (24^o) Lens and Holder; 2700K
LZC-x0WHFL-0H27	LZC ViviLux emitter with Flood (35^o) Lens and Holder; 2700K
LZC-x0WHWF-0H27	LZC ViviLux emitter with Wide Flood (45^o) Lens and Holder; 2700K
LZC-x0WHNF-0H30	LZC ViviLux emitter with Narrow Flood (24^o) Lens and Holder; 3000K
LZC-x0WHFL-0H30	LZC ViviLux emitter with Flood (35^o) Lens and Holder; 3000K
LZC-x0WHWF-0H30	LZC ViviLux emitter with Wide Flood (45^o) Lens and Holder; 3000K

MCPCB Mounting Options

Part number	Description
LZC-0xxxxx	LZC emitter and TIR lens without MCPCB
LZC-7xxxxx	LZC emitter on 1 channel 1x12 Star MCPCB
LZC-Cxxxxx	LZC emitter on 2 channel 2x6 Star MCPCB
LZC-Exxxxx	LZC emitter on 1 channel 1x12 Connectorized MCPCB + Thermistor
LZC-Fxxxxx	LZC emitter on 1 channel 2x6 parallel / serial Connectorized MCPCB + Thermistor

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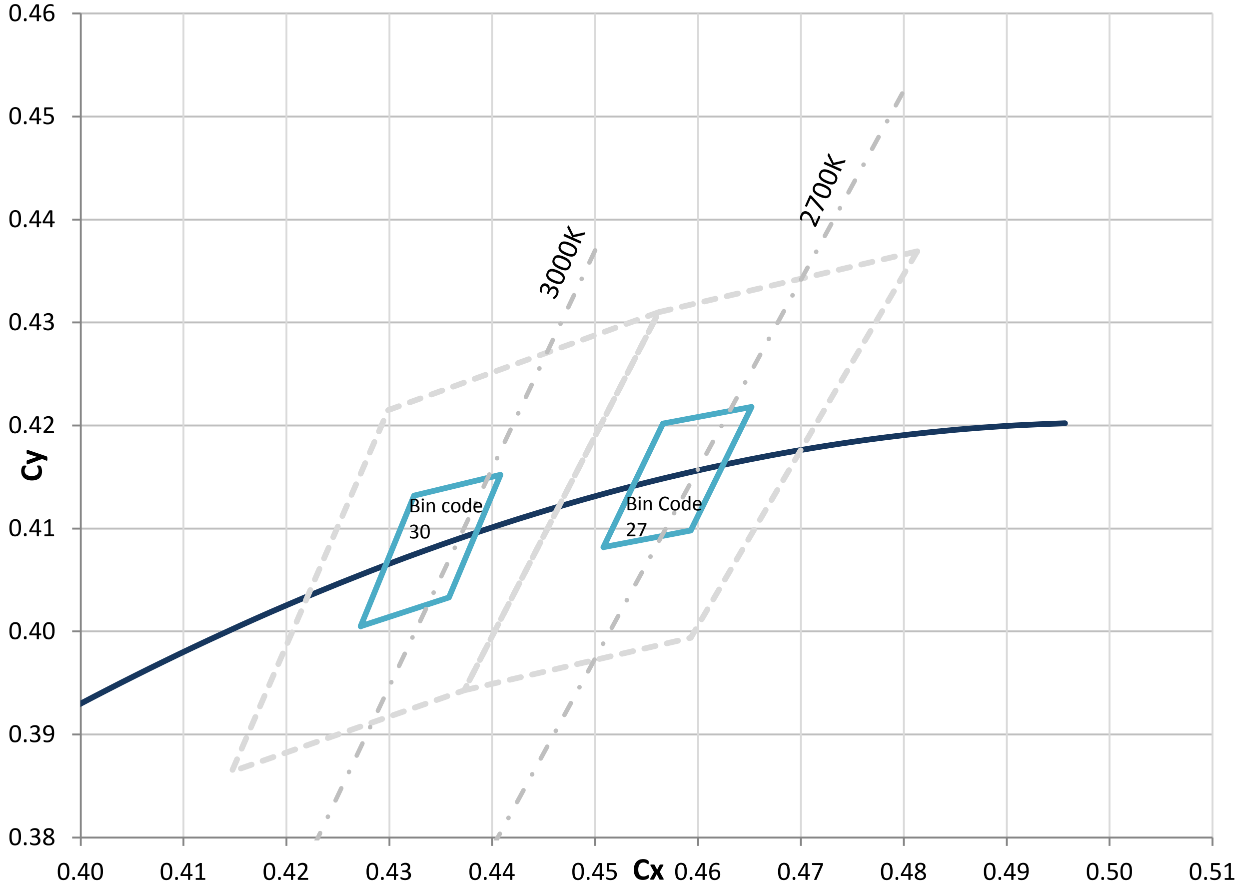
Warm White Chromaticity Bins @ Tj=100°C
2.5 SDCM Single Bins



Standard Chromaticity Groups plotted on excerpt from the CIE 1931 (2°) x-y Chromaticity Diagram.
Bin coordinates are listed below in the table.

Warm White Bin Coordinates @ Tj=100°C
2.5 SDCM Single Bins

Bin code	CIEx	CIEy	Bin code	CIEx	CIEy
27	0.4508	0.4032	30	0.4272	0.3955
	0.4566	0.4152		0.4324	0.4082
	0.4652	0.4168		0.4408	0.4102
	0.4593	0.4048		0.4358	0.3983

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Luminous Flux Bins – Emitter Only @ Tj=100°C

Table 1:

Bin Code	Minimum Luminous Flux (Φ_V) @ I_F = 700mA [1,2] (lm)	Maximum Luminous Flux (Φ_V) @ I_F = 700mA [1,2] (lm)
Z	1,696	2,120
C2	2,120	2,350

Notes for Table 1:
1. Luminous flux performance guaranteed within published operating conditions. LED Engin maintains a tolerance of ± 10% on flux measurements.
2. Luminous Flux typical value is for all 12 LED dice operating concurrently at rated current and temperature.

Forward Voltage Range per String @ Tj=100°C

Table 2:

Bin Code	Minimum Forward Voltage (V_F) @ I_F = 700mA [1,2] (V)	Maximum Forward Voltage (V_F) @ I_F = 700mA [1,2] (V)
0	16.5	19.5

Notes for Table 2:
1. LED Engin maintains a tolerance of ± 0.48V for forward voltage measurements.
2. Forward Voltage is tested with 6 LED dice connected in series. The actual LED is configured with two strings of 6 dice in series.

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Absolute Maximum Ratings

Table 3:

Parameter	Symbol	Value	Unit
DC Forward Current at T_{jmax}=130C [1]	I_F	1000	mA
Peak Pulsed Forward Current [2]	I_{FP}	1000	mA
Reverse Voltage	V_R	See Note 3	V
Storage / Operating Temperature Range - Lens	T_{stg}	-40 ~ +110	°C
Storage Temperature Range - Emitter	T_{stg}	-40 ~ +150	°C
Junction Temperature	T_J	150	°C
Soldering Temperature [4]	T_{sol}	260	°C
Allowable Reflow Cycles		6	
ESD Sensitivity [5]		> 8,000 V HBM Class 3B JESD22-A114-D	

Notes for Table 3:
1. Maximum DC forward current (per die) may result in CCT being outside single bin if Tj exceeds 100°C
   See Figure 11 for settings to maintain T_j=100°C.
2: Pulse forward current conditions: Pulse Width≤ 10msec and Duty cycle ≤ 10%.
3. LEDs are not designed to be reverse biased.
4. Solder conditions per JEDEC 020D. See Reflow Soldering Profile Figure 5.
5. LED Engin recommends taking reasonable precautions towards possible ESD damages and handling the LZC-x0WHyy in an electrostatic protected area (EPA). An EPA may be adequately protected by ESD controls as outlined in ANSI/ESD S6.1.

Optical Characteristics @ Tj=100°C

Table 4:

Parameter	Symbol	Typical	Unit
Luminous Flux - kit (@ I_F = 700mA) [1][2]	Φ_V	1700	lm
Luminous Efficacy - kit (@ I_F = 350mA) [1][2]		85	lm/W
Luminous Flux – Emitter only (@ I_F = 700mA) [2]	Φ_V	2000	lm
Luminous Efficacy – Emitter only (@ I_F = 350mA)		100	lm/W
Correlated Color Temperature	CCT	2700, 3000	K
Color Rendering Index (CRI) / R_9	R_a / R_9	92 / 80	

Notes for Table 4:
1. Kit is defined as emitter + lens; lumens are exiting lens.
2. Luminous flux typical value is for all 12 LED dice operating concurrently at rated current.

Beam Characteristics @ Tj=100°C

Table 5:

Lens Description	**Beam angle [1] FWHM (degrees)**	**Field angle [2] (degrees)**	**CBCP (cd) @700mA**
Narrow Flood	24°	53°	4500
Flood	35°	83°	2700
Wide Flood	45°	89°	2000

Notes for Table 5:
1. Beam angle is defined as the full width at 50% of the max intensity (FWHM).
2. Field angle is defined as the full width at 10% of the max intensity.

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Electrical Characteristics @ Tj=100°C

Table 6:

Parameter	Symbol	Typical	Unit
Forward Voltage per string (@ I_F = 700mA) [1]	V_F	18.0	V
Forward Voltage per string (@ I_F = 1000mA) [1]	V_F	19.2	V
Temperature Coefficient of Forward Voltage per string [1]	$\Delta V_F/\Delta T_J$	-14.5	mV/°C
Thermal Resistance (Junction to Case)	$R\Theta_{J-C}$	0.7	°C/W

Notes for Table 6:

1. Forward Voltage is tested with 6 LED dice connected in series. The actual LED is configured with two strings of 6 dice in series.

IPC/JEDEC Moisture Sensitivity Level

Table 7 - IPC/JEDEC J-STD-20.1 MSL Classification:

			Soak Requirements			
	Floor Life		Standard		Accelerated	
Level	Time	Conditions	Time (hrs)	Conditions	Time (hrs)	Conditions
1	unlimited	≤ 30°C/ 85% RH	168 +5/-0	85°C/ 85% RH	n/a	n/a

Notes for Table 7:

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 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 LM80 testing, LED Engin projects that the LZC Series will deliver, on average, 70% Lumen Maintenance at 70,000 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.

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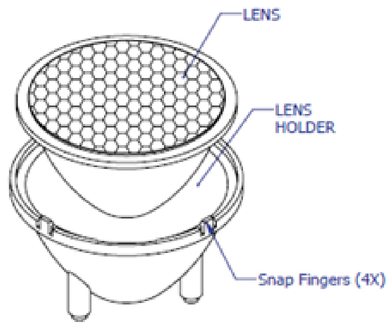
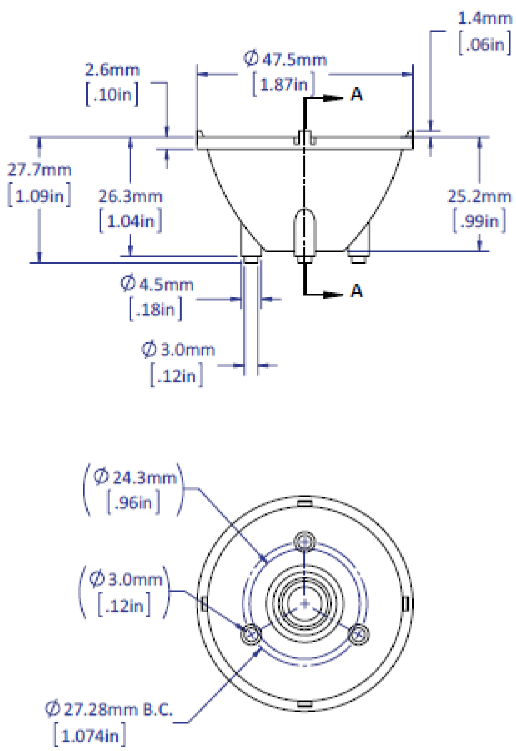
Mechanical Dimensions – TIR Lenses

LLNF, LLFL, LLWF-4T08-H



Lens with Holder



Lens only

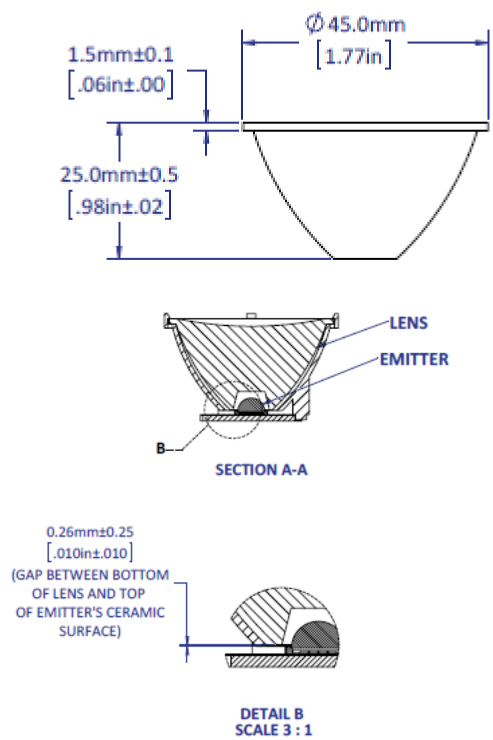


Figure 1: Lens Mechanical Dimensions

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Lens Assembly Instructions

Lens holders can be assembled to the PCB using an epoxy or polyurethane-based adhesive (example: Dow Corning 3145 RTV).
Cyanoacrylate (superglue) adhesive should not be used to avoid contamination of the lens (blooming of the epoxy).

When integrating the lens into a fixture without the lens holder, special attention needs to be placed on maintaining the distance between the lens bottom and the emitter top. Variation in this distance will result in variation of the beam profile and reduction in lux. See mechanical detail B. on previous page.

Lens Cleaning

Use a lint-free soft cloth to dust off the lens. For deeper cleaning a solution of neutral detergent (example: dishwashing soap) can be used. Do not use any solvents or abrasive liquid/ fabric.

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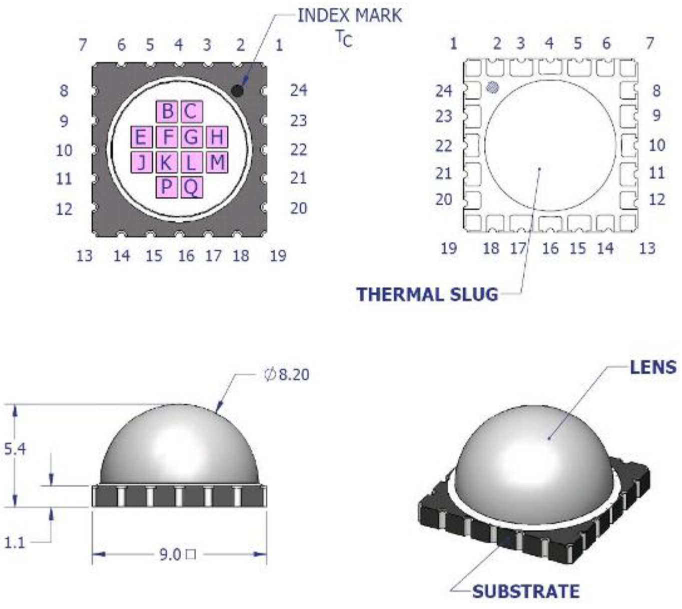
Mechanical Dimensions - Emitter



Pin Out		
Pad	**Series**	**Function**
2	1	Anode
3	1	Anode
5	2	Anode
6	2	Anode
14	2	Cathode
15	2	Cathode
17	1	Cathode
18	1	Cathode

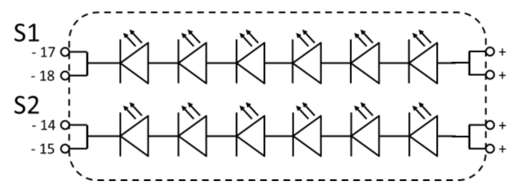


Figure 2: Package outline drawing.

Notes for Figure 2:
1. All dimensions in mm.
2. Unless otherwise noted, the tolerance = ± 0.20 mm.
3. Thermal contact, Pad is electrically neutral.

Recommended Solder Pad Layout

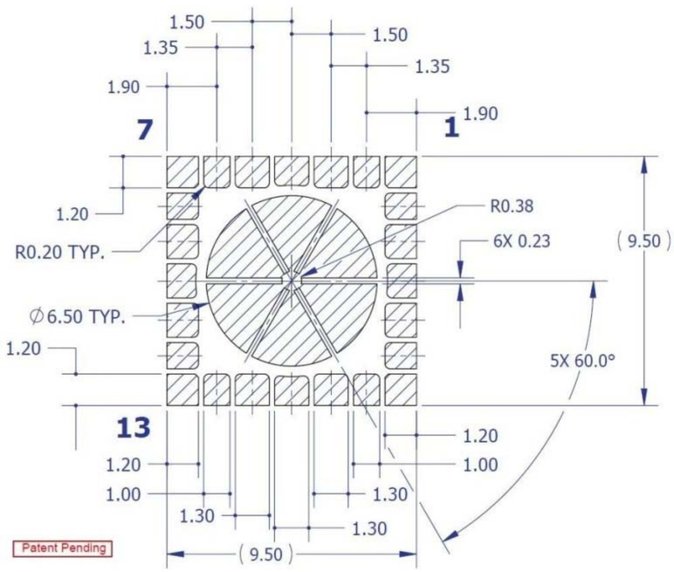


Figure 2a: Recommended solder pad layout for anode, cathode, and thermal pad.

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

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Recommended Solder Mask Layout

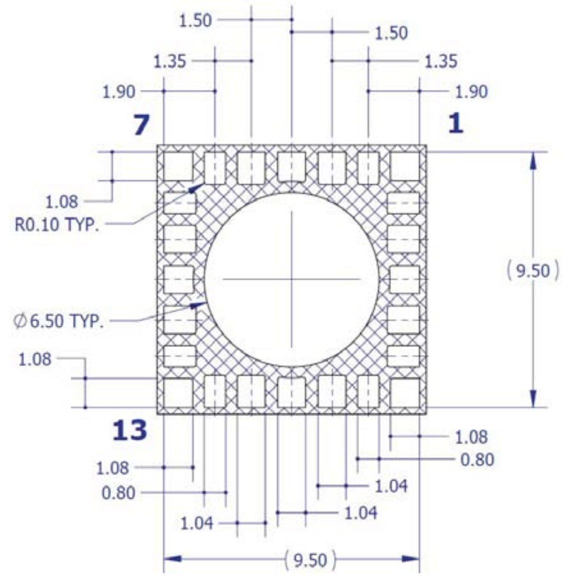

Figure 2b: Recommended solder mask opening (hatched area) for anode, cathode, and thermal pad.

Note for Figure 2b:

1. All dimensions in mm.
2. Unless otherwise noted, the tolerance = ± 0.20 mm.

Reflow Soldering Profile

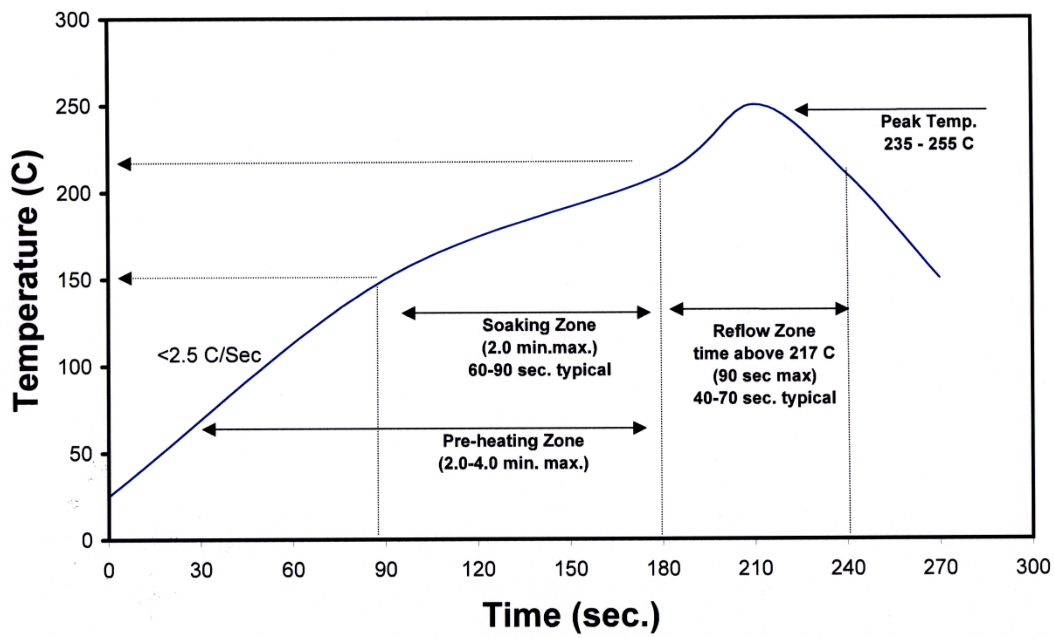

Figure 3: Reflow soldering profile for lead free soldering.

Typical Relative Intensity over Angle – TIR Optics

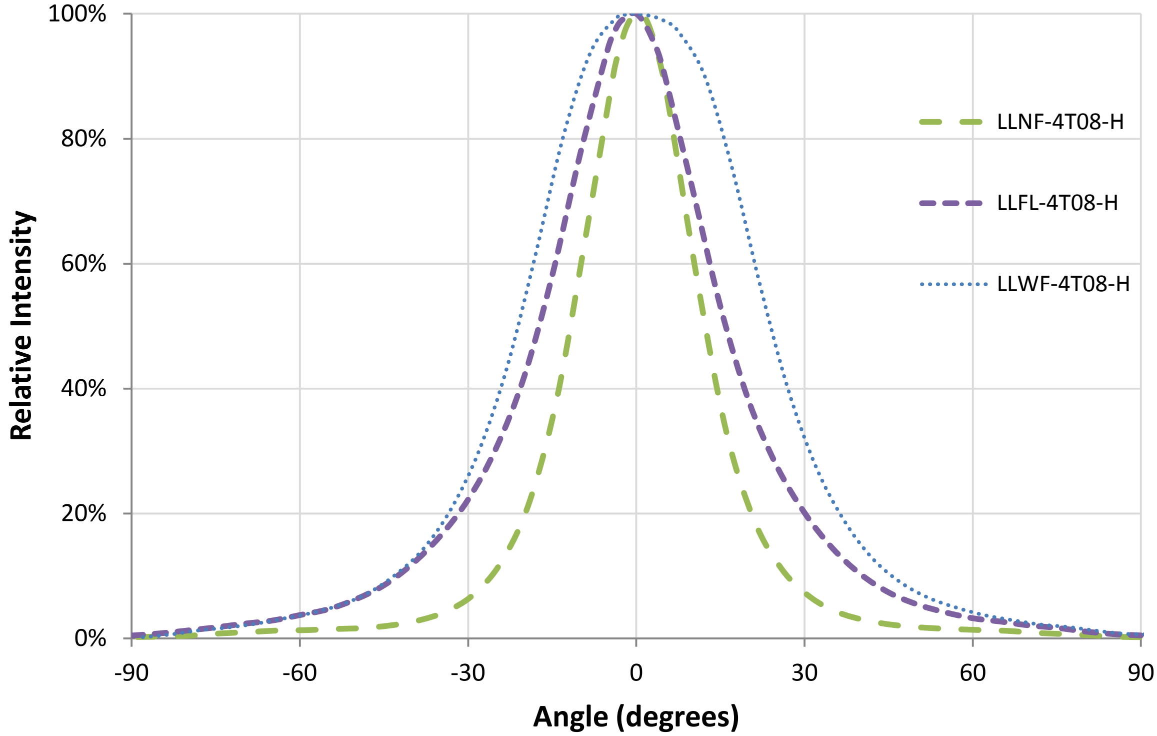

Figure 4: Typical relative Intensity over Angle.

Typical Relative Spectral Power Distribution @ Tj=100°C

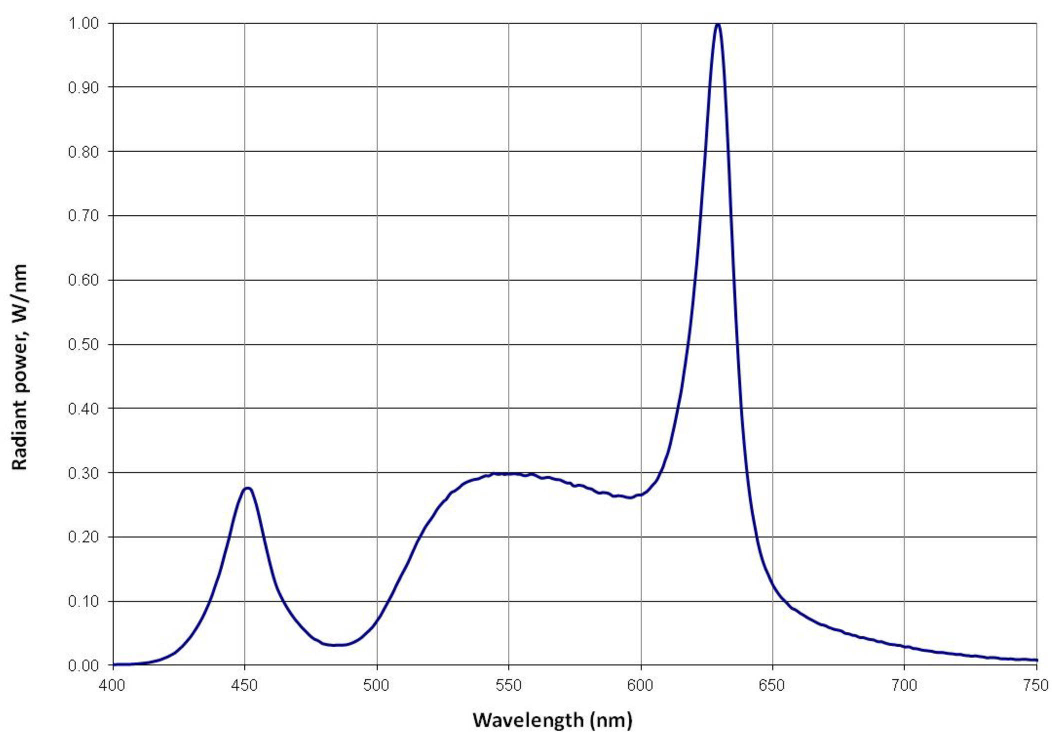

Figure 5: Typical relative spectral power vs. wavelength.

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Typical Relative Light Output @ Tj=100°C

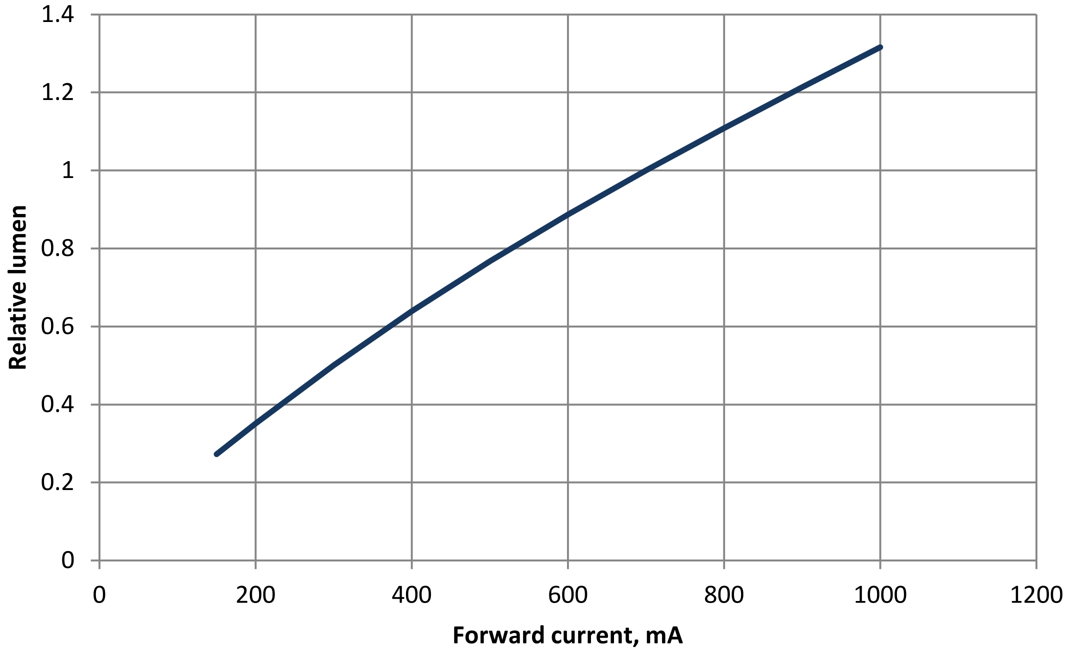

Figure 6: Typical relative light output vs. forward current

Notes for Figure 6:
1. Luminous Flux typical value is for all 12 LED dice operating concurrently at rated current.

Typical Relative Light Output over Temperature

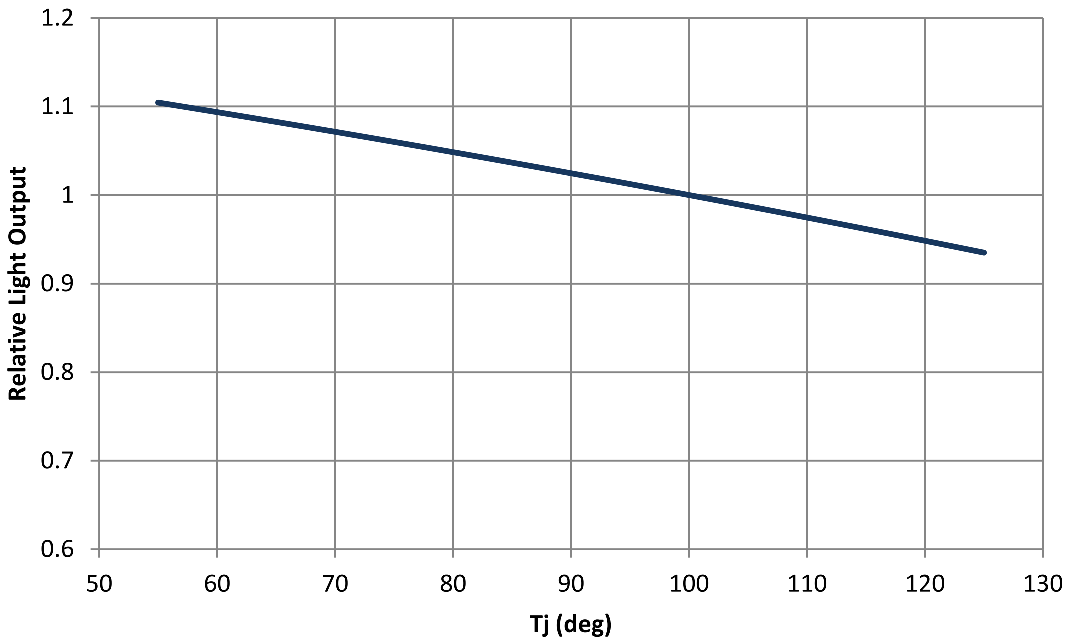

Figure 7: Typical relative light output vs. junction temperature, T_j.

Notes for Figure 7:
1. Luminous Flux typical value is for all 12 LED dice operating concurrently at rated current.

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Typical xy CCT Coordinates over Junction Temperature

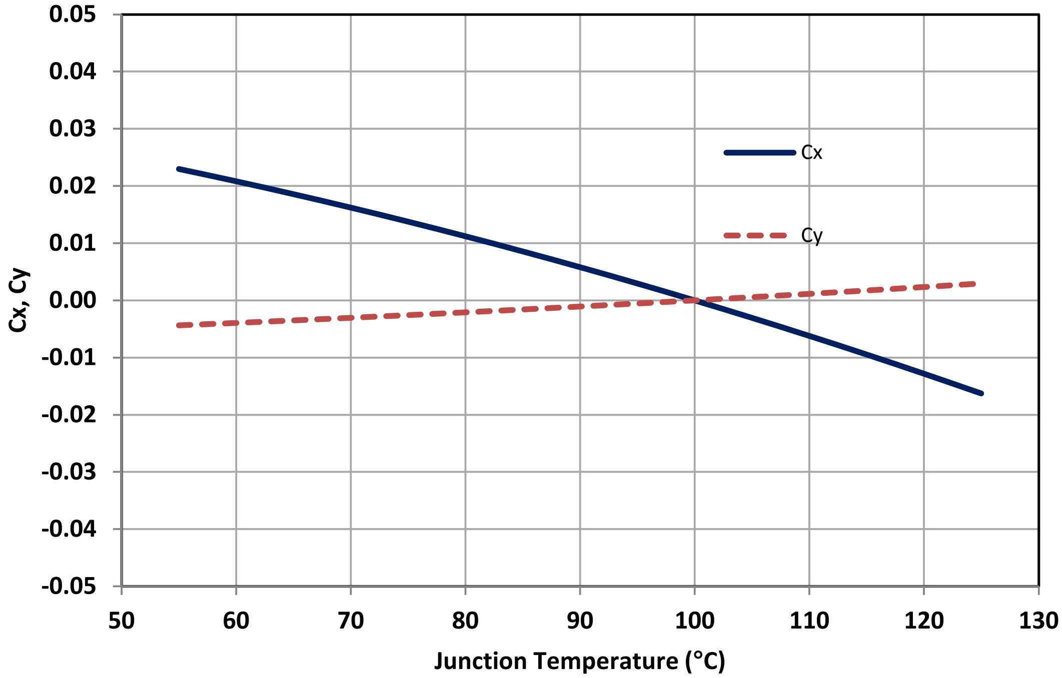

Figure 8: Typical xy CCT coordinates vs. junction temperature.

Typical xy CCT Coordinates over If @ Tj=100°C

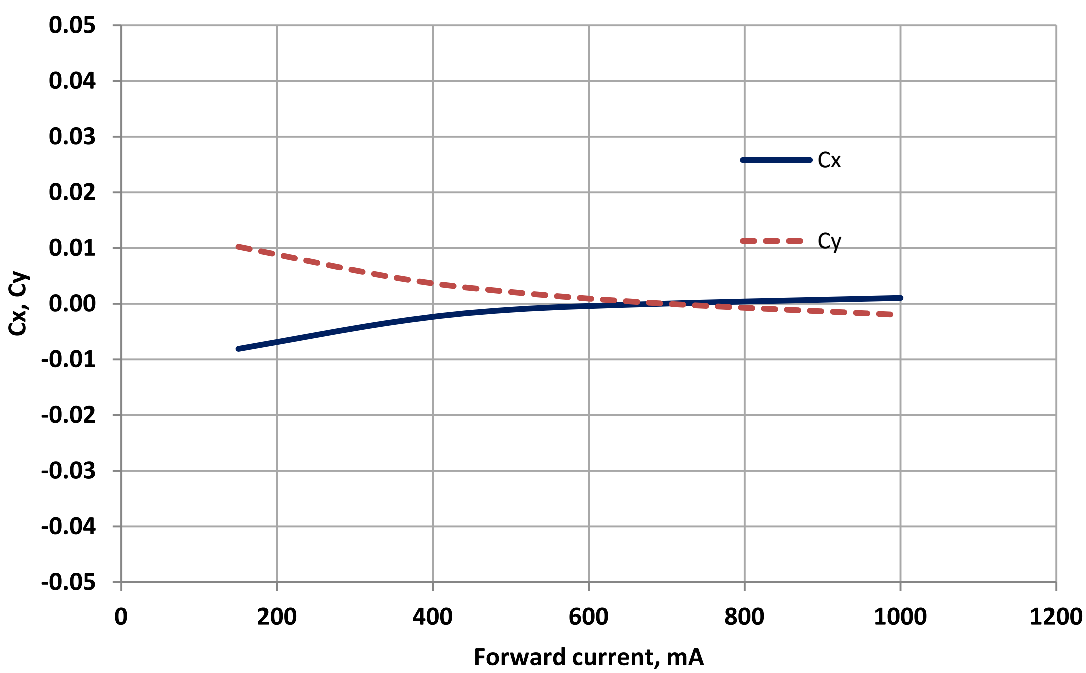

Figure 9: Typical xy CCT coordinates vs If.

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Typical Forward Current Characteristics @ Tj=100°C

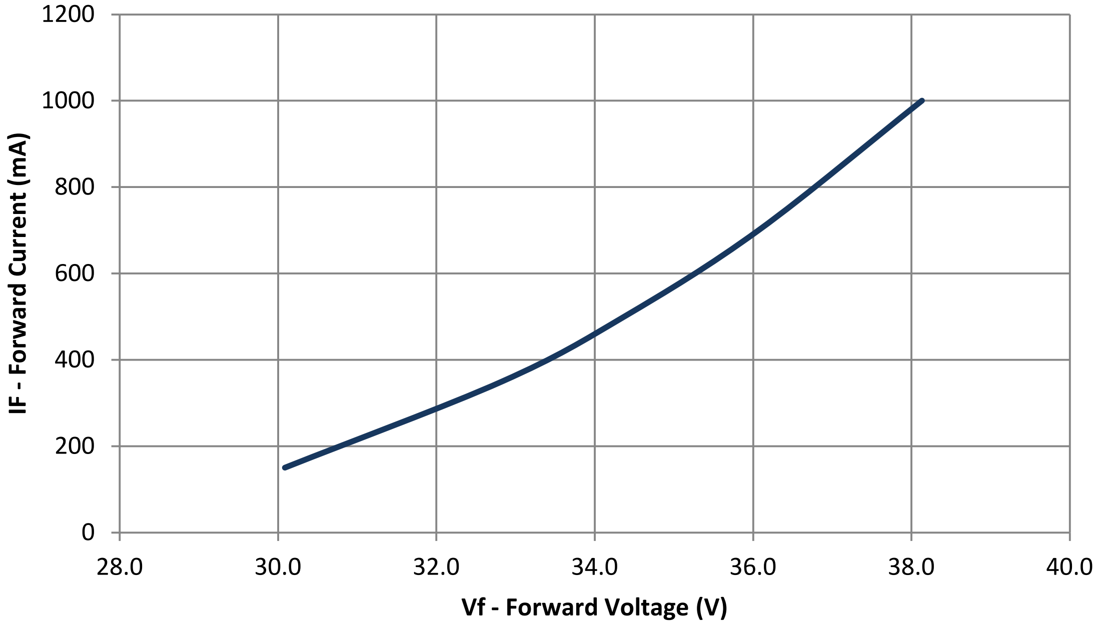

Figure 10: Typical forward current vs. forward voltage

Heat sink thermal resistance (MCPCB – Ambient) to maintain Tj=100°C

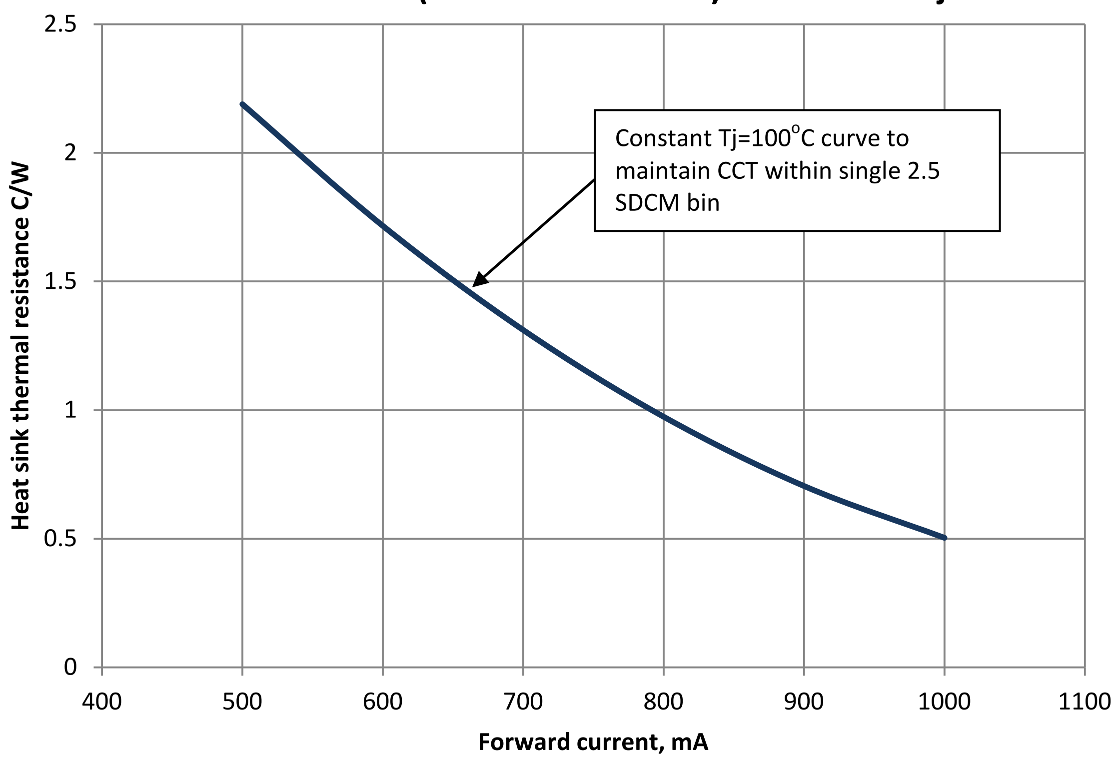

Figure 11: Heat sink thermal Resistance (MCPCB to Ambient) vs. forward current

Notes on Figure 11:

1. This graph shows the relation between the heatsink thermal resistance (MCPCB – Ambient) and the drive current to maintain a constant Tj of 100°C to maintain CCT within a single 2.5 SDCM CCT bin.

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LZC MCPCB Family

Part number	Type of MCPCB	Diameter (mm)	Emitter + MCPCB Thermal Resistance (°C/W)	Typical Vf (V)	Typical If (mA)
LZC-7xxxxx	1-channel	28.3	0.7 + 0.6 = 1.3	34.0	700
LZC-Cxxxxx	2-channel	28.3	0.7 + 0.6 = 1.3	17.0	2 x 700
LZC-ExxxT1	1-channel (1 x 12 string)	49.5	0.7 + 0.6 = 1.3	34.0	700
LZC-FxxxT1	1-channel (2 x 6 strings)	49.5	0.7 + 0.6 = 1.3	17.0	1400

- **Key Features**
  - Serial configuration allows for easy driver control with low current
  - 2 channel and 2x6 configurations allow for easy driver control with low Vf
  - Connector Boards have additional advantage of easy connections with poke-home connectors
  - Connector Boards have additional feedback through on-board thermistor to monitor MCPCB temperatures
- **ESD protection**
  - MCPCB contains Zener Diodes for enhanced ESD protection
- **Mechanical Mounting of MCPCB**
  - Mechanical stress on the emitter that could be caused by bending the MCPCB should be avoided. The stress can cause the substrate to crack and as a result might lead to cracks in the dies.
  - Therefore special attention needs to be paid to the flatness of the heat sink surface and the torque on the screws. Maximum torque should not exceed 1 Nm (8.9 lbf/in).
  - Care must be taken when securing the board to the heatsink to eliminate bending of the MCPCB. This can be done by tightening the three M3 screws (or #4-40) in steps and not all at once. This is analogous to tightening a wheel of an automobile
  - It is recommended to always use plastic washers in combination with three screws. Two screws could more easily lead to bending of the board.
  - If non taped holes are used with self-tapping screws it is advised to back out the screws slightly after tighten (with controlled torque) and retighten the screws again.
- **Thermal interface material**
  - To properly transfer the heat from the LED to the heatsink a thermally conductive material is required when mounting the MCPCB to the heatsink
  - There are several materials which can be used as thermal interface material, such as thermal paste, thermal pads, phase change materials and thermal epoxies. Each has pro's and con's depending on the application. For our emitter it is critical to verify that the thermal resistance is sufficient for the selected emitter and its environment.
  - To properly transfer the heat from the MCPCB to the heatsink also special attention should be paid to the flatness of the heatsink.
- **Wire soldering for standard MCPCB**
  - For easy soldering of wires to the MCPCB it is advised to preheat the MCPCB on a hot plate to a maximum of 150°. Subsequently apply the solder and additional heat from the solder iron to initiate a good solder reflow. It is recommended to use a solder iron of more than 60W. We advise to use lead free, no-clean solder. For example SN-96.5 AG-3.0 CU 0.5 #58/275 from Kester (pn: 24-7068-7601)

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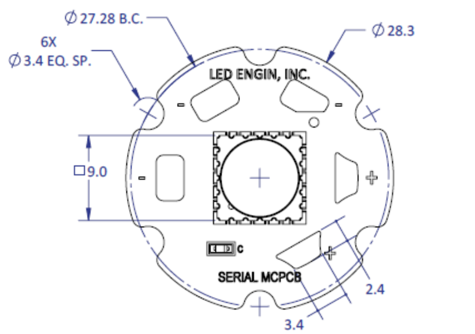
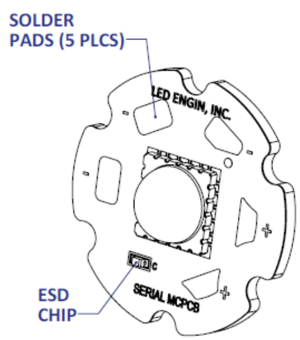
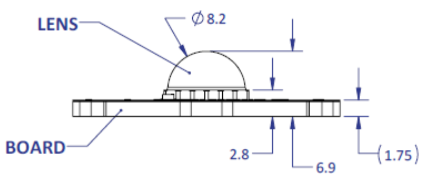
LZC-7xxxxx

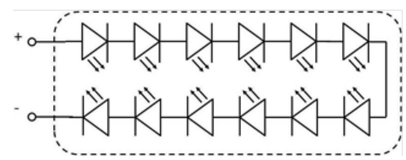
Emitter on 1-channel MCPCB





Pin Out	
Pad	**Function**
+	Anode Ch1
-	Cathode Ch1





Notes:

- All dimensions in mm.
- Unless otherwise noted, the tolerance = ± 0.2 mm.
- Slots in MCPCB are for M3 or #4-40 mounting screws.
- LED Engin recommends plastic washers to electrically insulate screws from solder pads and electrical traces.
- Electrical connection pads on MCPCB are labeled "+" for Anode and "-" for Cathode.
- LED Engin recommends using thermal interface material when attaching the MCPCB to a heatsink.
- The thermal resistance of the MCPCB is: RΘC-B 0.6°C/W

Components used

MCPCB:	HT04503	(Bergquist)
ESD chips:	BZX585-C51	(NPX, for 12 LED dies in series)

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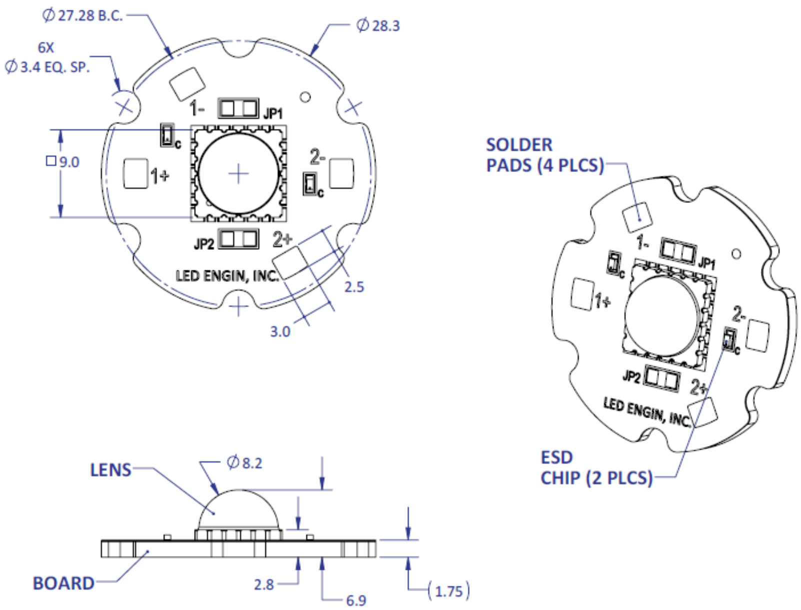
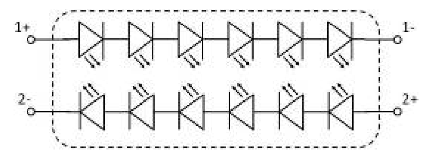
LZC-Cxxxxx

Emitter on 2-channel MCPCB



Pin Out	
Pad	**Function**
1+	Anode Ch1
1-	Cathode Ch1
2+	Anode Ch2
2-	Cathode Ch2



Note:

- All dimensions in mm.
- Unless otherwise noted, the tolerance = ± 0.2 mm.
- Slots in MCPCB are for M3 or #4-40 mounting screws.
- LED Engin recommends plastic washers to electrically insulate screws from solder pads and electrical traces.
- Electrical connection pads on MCPCB are labeled "+" for Anode and "-" for Cathode.
- LED Engin recommends thermal interface material when attaching the MCPCB to a heatsink.
- The thermal resistance of the MCPCB is: RΘC-B 0.6°C/W

Components used

MCPCB:	HT04503	(Bergquist)
ESD chips:	BZT52C36LP	(NPX, for 6 LED dies in series)

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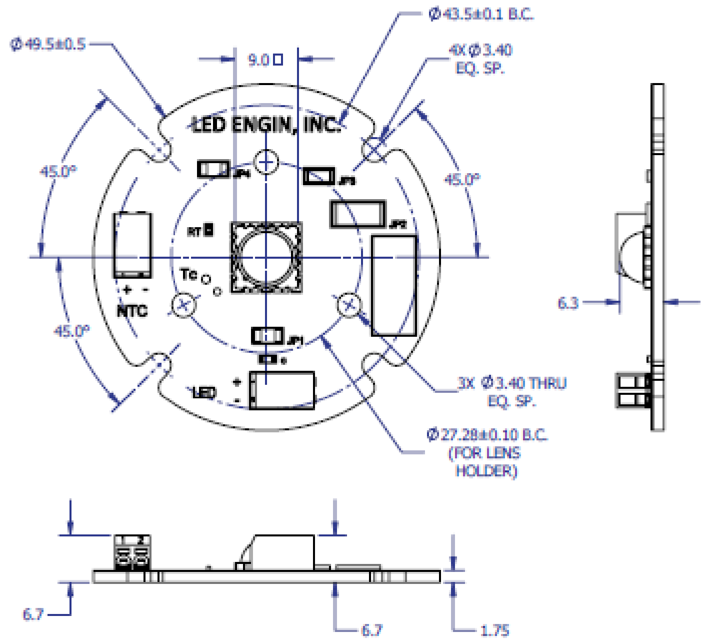
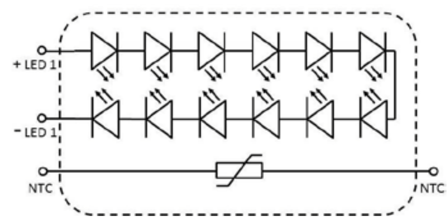
LZC-ExxxT1

Emitter on 1-channel MCPCB

Ch.	Pad	Emitter pin	Function
1	LED1+	14, 15	Anode
	LED1-	2, 3	Cathode
T	NTC	na	Anode
	NTC	na	Cathode





Note:

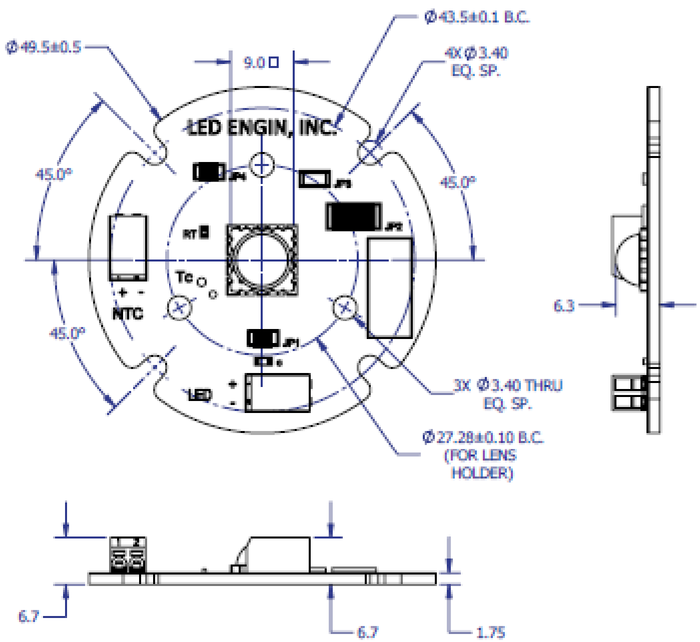
- All dimensions in mm.
- Unless otherwise noted, the tolerance = ± 0.2 mm. angle = ± 1°
- Slots in MCPCB are for M3 or #4-40 mounting screws. Maximum torque should not exceed 1N-m (8.9 lbf-in)
- LED Engin recommends plastic washers to electrically insulate screws from solder pads and electrical traces.
- LED Engin recommends using thermally interface material when attaching the MCPCB to a heatsink
- For the connectors it is recommended to use solid wires with gauge size, 18, 20 or 22 AWG. It is recommended to strip the insulation of the wires to a length of 4-5mm. When stranded wires are used it is recommended to twists the strands at the end of the wire and use wire extraction toll to insert the wires.
- The thermal resistance of the MCPCB is: RΘC-B 0.6°C/W

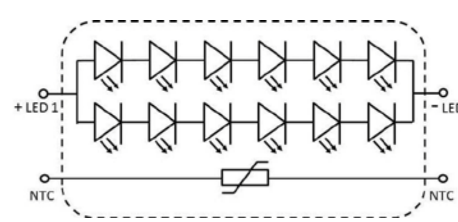
Components used

MCPCB:	HT04503	(Bergquist)
ESD chips:	BZX585-C51	(NXP, for 12 LED dies in series)
Thermistor:	NCP15WF104F03RC	(Murata, 100kOhm, please see www.murata.com for details on calculating the thermistor temperature)
Connectors:	00-9276-002-0-21-1-06	(AVX, poke-home)

LZC-FxxxT1

Emitter on 1-channel MCPCB





Ch.	Pad	Emitter pin	Function
1	LED1+	14, 15, 17, 18	Anode
	LED1-	2, 3, 5, 6	Cathode
T	NTC	na	Anode
	NTC	na	Cathode

Note:
- All dimensions in mm.
- Unless otherwise noted, the tolerance = ± 0.2 mm. angle = ± 1°
- Slots in MCPCB are for M3 or #4-40 mounting screws. Maximum torque should not exceed 1N-m (8.9 lbf-in)
- LED Engin recommends plastic washers to electrically insulate screws from solder pads and electrical traces.
- LED Engin recommends using thermally interface material when attaching the MCPCB to a heatsink
- For the connectors it is recommended to use solid wires with gauge size, 18, 20 or 22 AWG. It is recommended to strip the insulation of the wires to a length of 4-5mm. When stranded wires are used it is recommended to twists the strands at the end of the wire and use wire extraction toll to insert the wires.
- The thermal resistance of the MCPCB is: RΘC-B 0.6°C/W

Components used

MCPCB:	HT04503	(Bergquist)
ESD chips:	BZT52C36LP	(NXP, for 6 LED dies in series)
Thermistor:	NCP15WF104F03RC	(Murata, 100kOhm, please see www.murata.com for details on calculating the thermistor temperature)
Connectors:	00-9276-002-0-21-1-06	(AVX, poke-home)

Wire Insertion and Extraction Instructions for connector boards

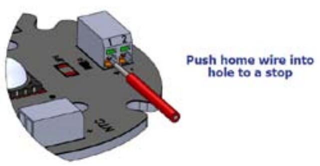
For the connectors it is recommended to use solid wires with gauge size, 18, 20, 22 or 24 AWG. Push in and then give slight tug on the wire to confirm that it is properly engaged.

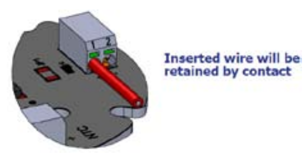
- **Extraction Tool References:**

Thin Blade Wire Extraction Tool: AVX P/N - 0692-7670-0101-000
Miniature Precision Screw Driver, 0.047" Tip Width

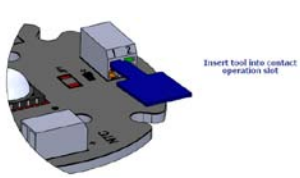
- **Wire Insertion**

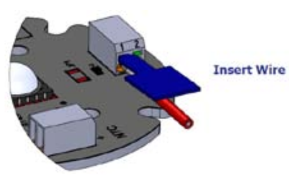
  Solid conductor
  - **Strip insulation length 4-5mm**
  - Insert into appropriate hole to a stop
  - Inserted wire will be retained by contact



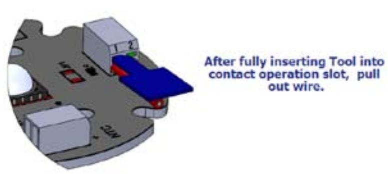


- Stranded wire conductor
  - Twist strands together
  - Insert tool into contact operation slot
  - Insert wire
  - Remove tool





- **Wire extraction**
  - Insert tool into contact
  - Extract wire
  - Remove tool



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Company Information

LED Engin, Inc., based in California's Silicon Valley, specializes in ultra-bright, ultra compact solid state lighting solutions allowing lighting designers & engineers the freedom to create uncompromised yet energy efficient lighting experiences. The LuxiGen™ Platform — an emitter and lens combination or integrated module solution, delivers superior flexibility in light output, ranging from 3W to 90W, a wide spectrum of available colors, including whites, multi-color and UV, and the ability to deliver upwards of 5,000 high quality lumens to a target. The small size combined with powerful output allows for a previously unobtainable freedom of design wherever high-flux density, directional light is required. LED Engin'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.

LED Engin is committed to providing products that conserve natural resources and reduce greenhouse emissions.

LED Engin reserves the right to make changes to improve performance without notice.

Please contact sales@ledengin.com or (408) 920-7200 for more information.

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