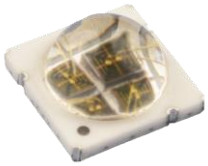
850nm Dual Junction Infrared LED Emitter

# LZ4-00R608



## Key Features

- 850nm Dual Junction Infrared LED
- Ultra-small foot print – 7.0mm x 7.0mm
- Surface mount ceramic package with integrated glass lens
- Low Thermal Resistance (2.8°C/W)
- Individually addressable die
- Ultra-high Radiant Flux density
- JEDEC Level 1 for Moisture Sensitivity Level
- Lead (Pb) free and RoHS compliant
- Reflow solderable
- Emitter available on Serially Connected MCPCB (optional)

## Typical Applications

- Surveillance cameras
- Traffic management
- Gesture recognition
- Machine vision
- Biometric sensing

## Description

The LZ4-00R608 850nm Dual Junction Infrared LED emitter generates 3.2W nominal output at 8.5W power dissipation in an extremely small package. With a 7.0mm x 7.0mm ultra-small footprint, this package provides exceptional radiant flux density. The patent-pending design has unparalleled thermal and optical performance. The high quality materials used in the package are chosen to optimize optical performance and minimize stresses which results in monumental reliability and flux maintenance. The robust product design thrives in outdoor applications with high ambient temperatures and high humidity.

## Notes

This product emits non visible infrared light, which can be hazardous depending on total system configuration (including, but not limited to optics, drive current and temperature). Observe safety precaution given in IEC 62471 when operating this product.

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# Part number options

## Base part number

| Part number | Description |
|---|---|
| LZ4-00R608-xxxx | LZ4 Infrared 850nm Dual Junction Emitter |
| LZ4-40R608-xxxx | LZ4 Infrared 850nm Dual Junction Emitter on 1 channel Standard Star MCPCB |

## Bin kit option codes

| R6, Infrared Dual Junction (850nm) | | | |
|---|---|---|---|
| **Kit number suffix** | **Min flux Bin** | **Wavelength Bin Range** | **Description** |
| 0000 | RS | F08 | full distribution flux; full distribution wavelength |

Notes:
1. Default bin kit option is -0000


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## Radiant Flux Bins

Table 1:

| Bin Code | Minimum Radiant Flux (Φ) @ $I_F$ = 700mA [1,2] (W) | Maximum Radiant Flux (Φ) @ $I_F$ = 700mA [1,2] (W) |
|---|---|---|
| RS | 2.40 | 3.80 |

Notes for Table 1:
1. Radiant flux performance is measured at 10ms pulse, $T_C$ = 25°C. LED Engin maintains a tolerance of ± 10% on flux measurements.
2. Future products will have even higher levels of radiant flux performance. Contact LED Engin Sales for updated information.

## Peak Wavelength Bin

Table 2:

| Bin Code | Minimum Peak Wavelength ($\lambda_P$) @ $I_F$ = 700mA [1] (nm) | Maximum Peak Wavelength ($\lambda_P$) @ $I_F$ = 700mA [1] (nm) |
|---|---|---|
| F08 | 835 | 875 |

Notes for Table 2:
1. Peak wavelength is measured at 10ms pulse, $T_C$ = 25°C. LED Engin maintains a tolerance of ± 2.0nm on peak wavelength measurements.

## Forward Voltage Bins

Table 3:

| Bin Code | Minimum Forward Voltage ($V_F$) @ $I_F$ = 700mA [1,2,3] (V) | Maximum Forward Voltage ($V_F$) @ $I_F$ = 700mA [1,2,3] (V) |
|---|---|---|
| 0 | 10.8 | 14.8 |

Notes for Table 3:
1. Forward voltage is measured at 10ms pulse, $T_C$ = 25°C.
2. Forward Voltage is binned with all four LED dice connected in series.
3. LED Engin maintains a tolerance of ± 0.16V for forward voltage measurements for the four LEDs.

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## Absolute Maximum Ratings

Table 4:

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| DC Forward Current [1] | $I_F$ | 1000 | mA |
| Peak Pulsed Forward Current [2] | $I_{FP}$ | 5000 | mA |
| Reverse Voltage | $V_R$ | See Note 3 | V |
| Storage Temperature | $T_{stg}$ | -40 ~ +125 | °C |
| Junction Temperature | $T_{J(MAX)}$ | 145 | °C |
| Soldering Temperature [4] | $T_{sol}$ | 260 | °C |

Notes for Table 4:
1. Maximum DC forward current (per die) is determined by the overall thermal resistance and ambient temperature. Follow the curves in Figure 11 for current derating.
2: Pulse forward current conditions: Pulse Width ≤ 150μs and Duty Cycle ≤ 10%.
3. LEDs are not designed to be reverse biased.
4. Solder conditions per JEDEC 020D. See Reflow Soldering Profile Figure 3.
5. LED Engin recommends taking reasonable precautions towards possible ESD damages and handling the LZ4-00R608 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 5:

| Parameter | Symbol | Typical | Unit |
|---|---|---|---|
| Radiant Flux (@ $I_F$ = 700mA) [1,2] | Φ | 3.2 | W |
| Radiant Flux (@ $I_F$ = 1000mA) [1,2] | Φ | 4.5 | W |
| Wall Plug Efficiency (@ $I_F$ = 700mA) | η | 37 | % |
| Peak Wavelength | $\lambda_P$ | 850 | nm |
| Viewing Angle [3] | $2\Theta_{1/2}$ | 100 | Degrees |
| Total Included Angle [4] | $\Theta_{0.9}$ | 120 | Degrees |

Notes for Table 5:
1. This product emits non visible infrared light, which can be hazardous depending on total system configuration (including, but not limited to optics, drive current and temperature). Observe safety precaution given in IEC 62471 when operating this product.
2. Radiant flux typical value is for all four LED dice operating concurrently at rated current.
3. Viewing Angle is the off axis angle from emitter centerline where the radiant power is ½ of the peak value.
4. Total Included Angle is the total angle that includes 90% of the total radiant flux.

## Electrical Characteristics @ $T_C$ = 25°C

Table 6:

| Parameter | Symbol | Typical | Unit |
|---|---|---|---|
| Forward Voltage (@ $I_F$ = 700mA) [1] | $V_F$ | 12.4 | V |
| Forward Voltage (@ $I_F$ = 1000mA) [1] | $V_F$ | 12.8 | V |
| Temperature Coefficient of Forward Voltage | $\Delta V_F/\Delta T_J$ | -8.0 | mV/°C |
| Thermal Resistance (Junction to Case) | $R\Theta_{J-C}$ | 2.8 | °C/W |

Notes for Table 6:
1. Forward Voltage typical value is for all four LED dice connected in series.


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## Peak Pulse Forward Current ($I_{FP}$) Capability

Table 7:

| Parameter | Value | Unit |
|---|---|---|
| $t_p$ = 150µs, D=10% | 5000 | mA |
| $t_p$ = 10ms, D=20% | 2000 | mA |

Notes:
1. tp = Pulse Width, T = Period, D = Duty Cycle = tp/T.

## IPC/JEDEC Moisture Sensitivity Level

Table 8 - IPC/JEDEC J-STD-20 MSL Classification:

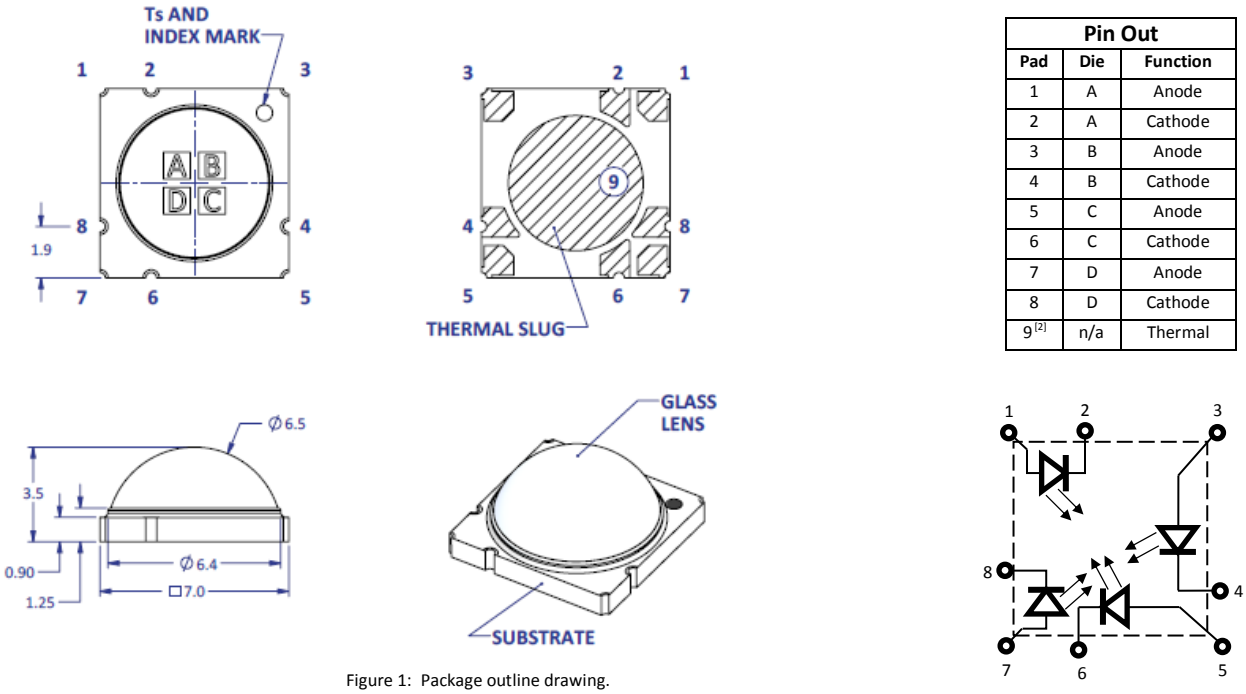
| | | | Soak Requirements | | | |
|---|---|---|---|---|---|---|
| | Floor Life | | Standard | | Accelerated | |
| **Level** | Time | Conditions | Time (hrs) | Conditions | Time (hrs) | Conditions |
| 1 | 1 Year | ≤ 30°C/ 85% RH | 168 +5/-0 | 85°C/ 85% RH | n/a | n/a |

Notes for Table 8:
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.


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## Mechanical Dimensions (mm)




| Pin Out | | |
|---|---|---|
| **Pad** | **Die** | **Function** |
| 1 | A | Anode |
| 2 | A | Cathode |
| 3 | B | Anode |
| 4 | B | Cathode |
| 5 | C | Anode |
| 6 | C | Cathode |
| 7 | D | Anode |
| 8 | D | Cathode |
| 9 [2] | n/a | Thermal |

Figure 1: Package outline drawing.

Notes for Figure 1:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. Thermal contact, Pad 9, is electrically neutral.

## Recommended Solder Pad Layout (mm)

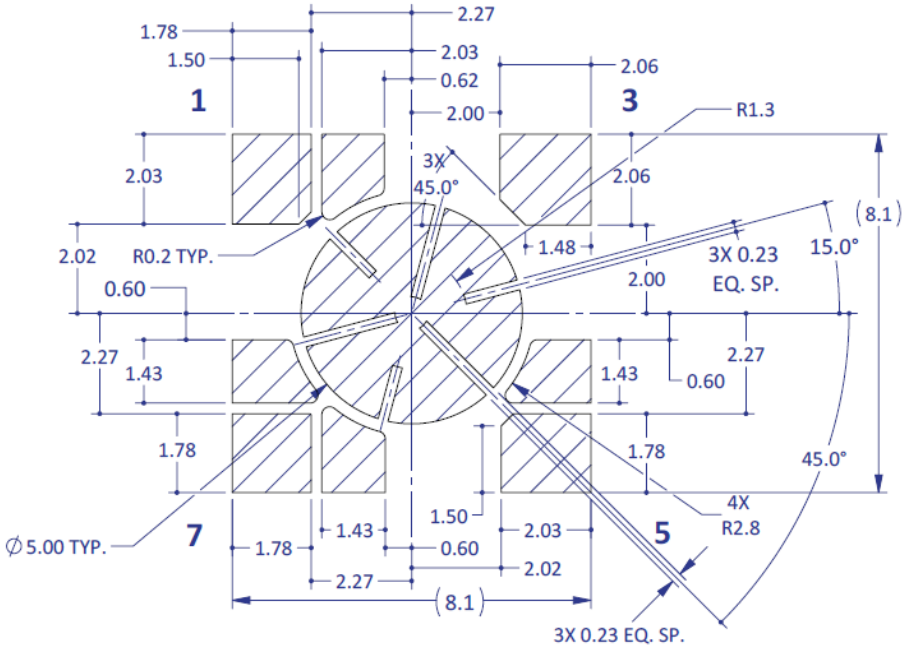



Figure 2a: Recommended solder pad layout for anode, cathode, and thermal pad.

Note for Figure 2a:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.
2. This pad layout is “patent pending”.

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## Recommended Solder Mask Layout (mm)

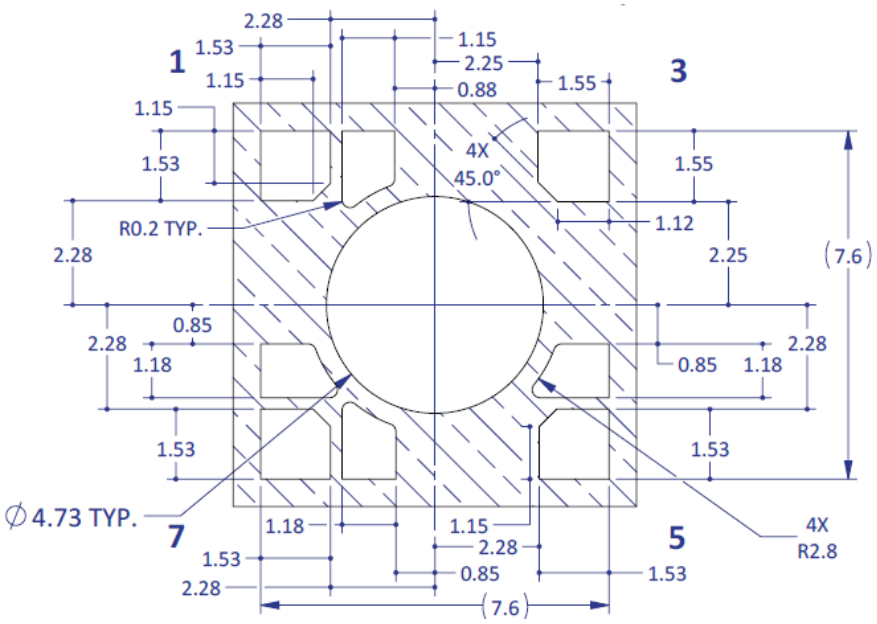



Figure 2b: Recommended solder mask opening for anode, cathode, and thermal pad

Note for Figure 2b:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.

## Recommended 8 mil Stencil Apertures Layout (mm)

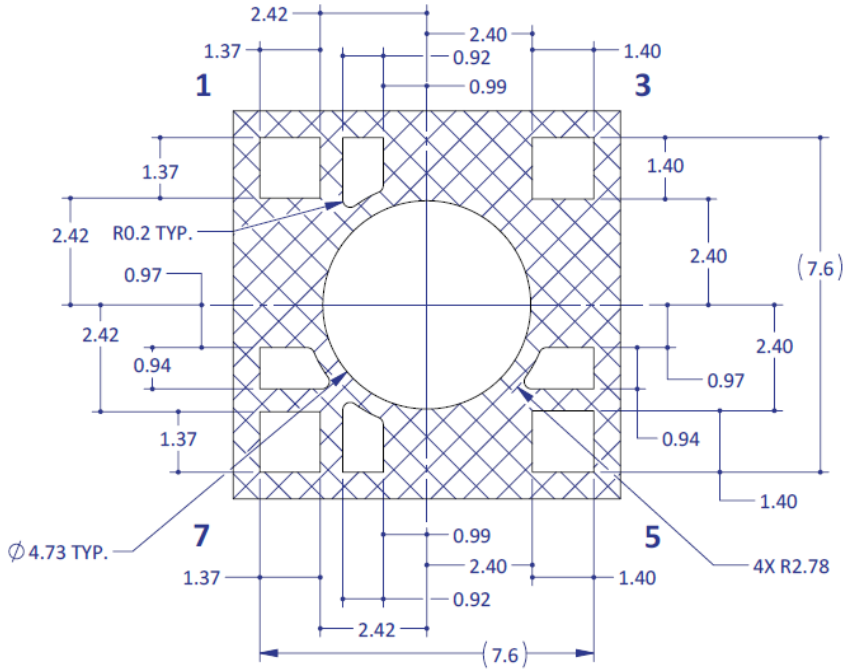



Figure 2c: Recommended 8mil stencil apertures layout for anode, cathode, and thermal pad

Note for Figure 2c:
1. Unless otherwise noted, the tolerance = ± 0.20 mm.



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## Reflow Soldering Profile

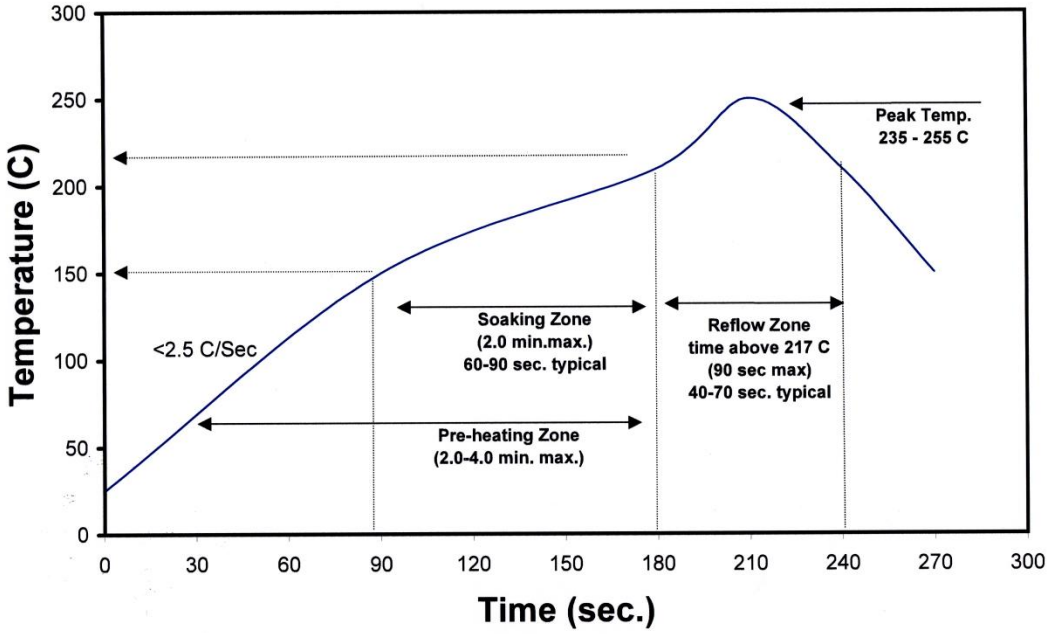



Figure 3: Reflow soldering profile for lead free soldering.

## Typical Radiation Pattern

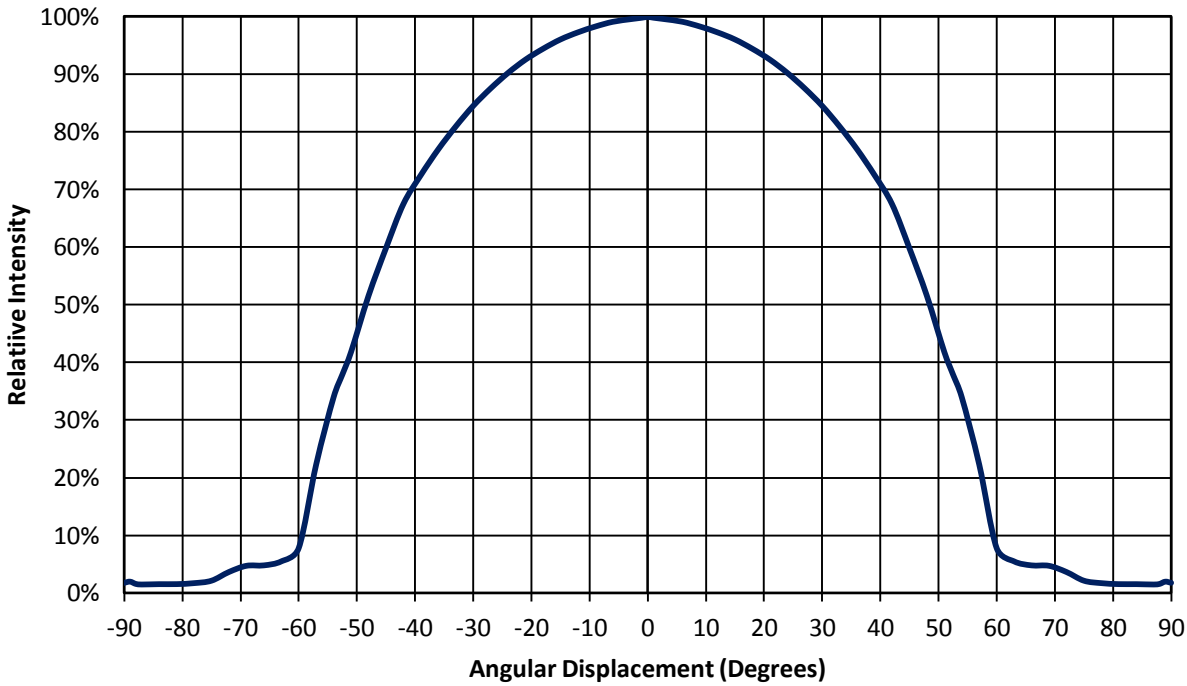



Figure 4: Typical representative spatial radiation pattern.



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## Typical Relative Spectral Power Distribution

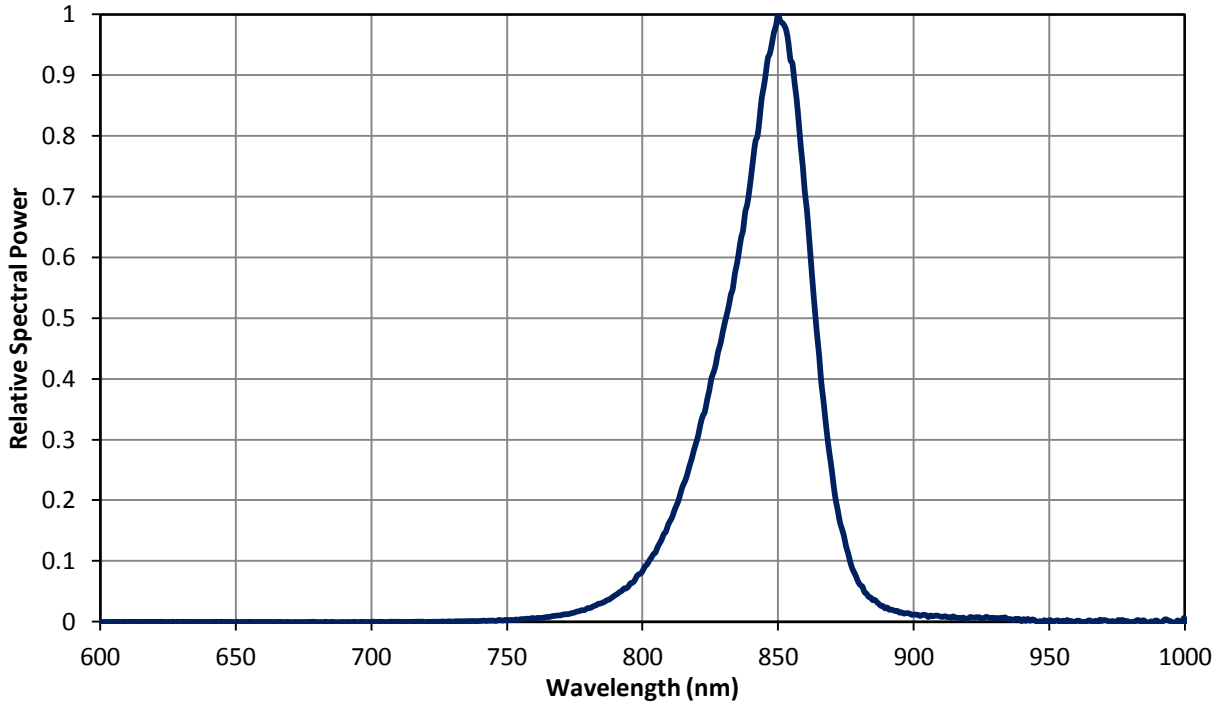



Figure 5: Relative spectral power vs. wavelength @ $T_C$ = 25°C.

## Typical Forward Current Characteristics

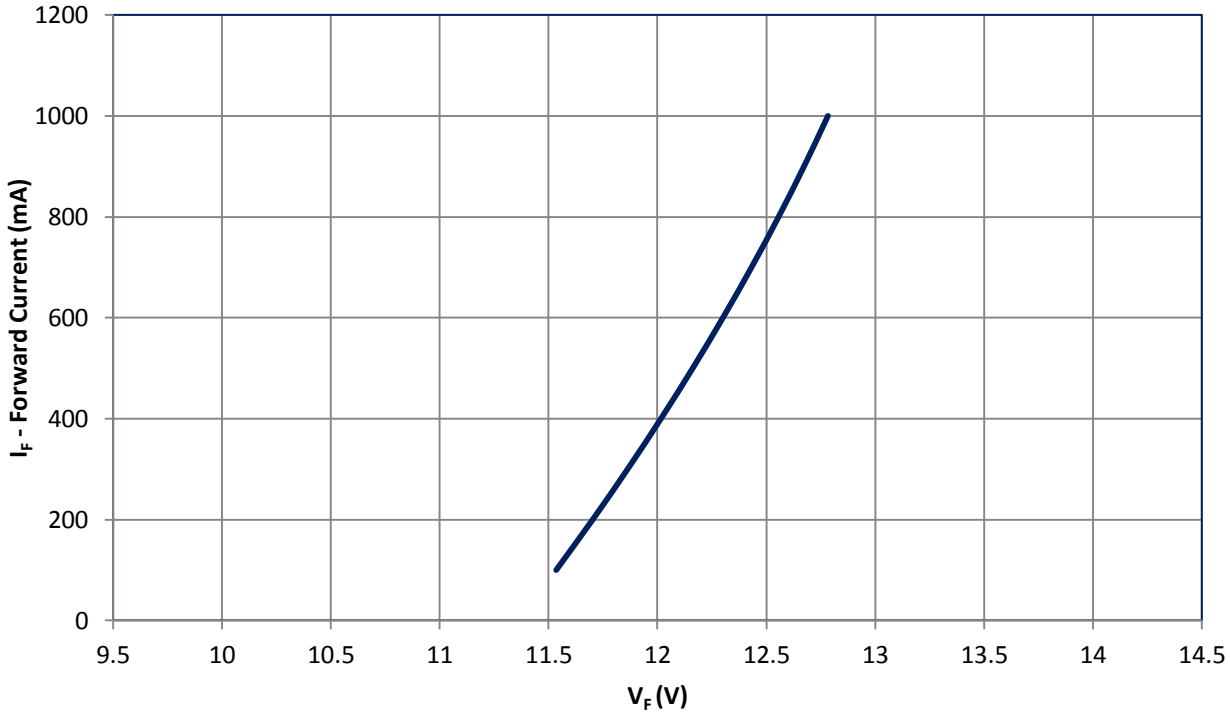



Figure 6: Typical forward current vs. forward voltage @ $T_C$ = 25°C.

Notes:
1. Forward Voltage curve assumes that all four LED dice are connected in series.



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## Typical Normalized Radiant Flux over Current

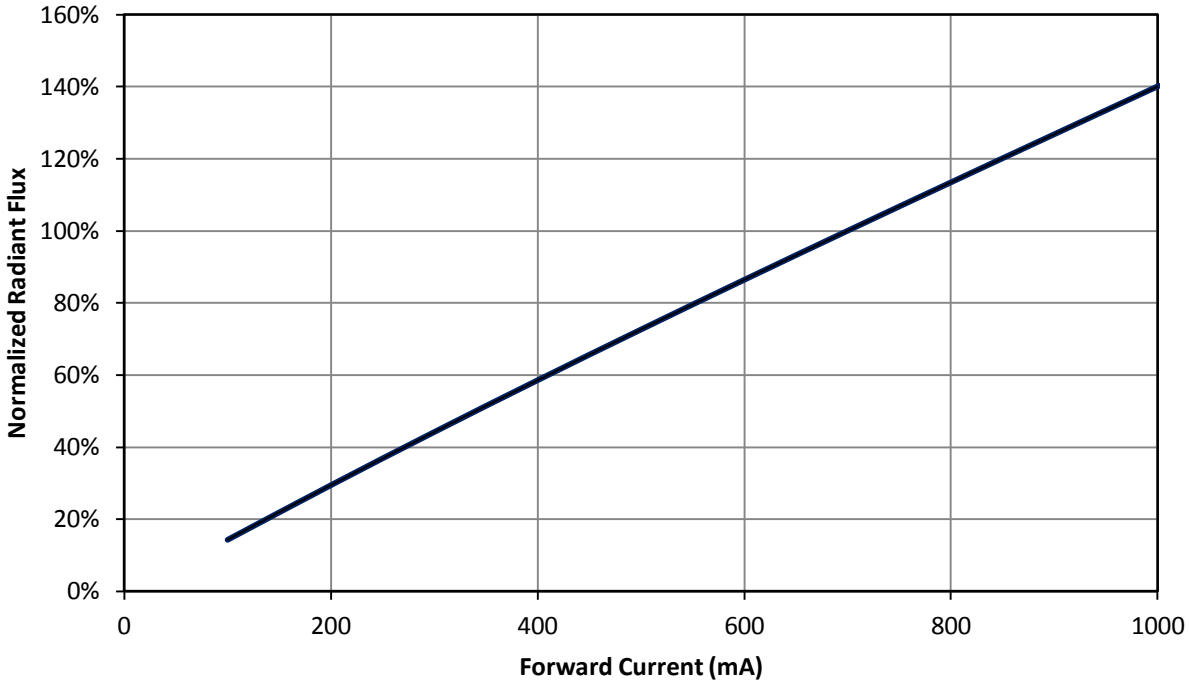



Figure 7: Typical normalized radiant flux vs. forward current @ $T_C$ = 25°C.

## Typical Normalized Radiant Flux over Case Temperature

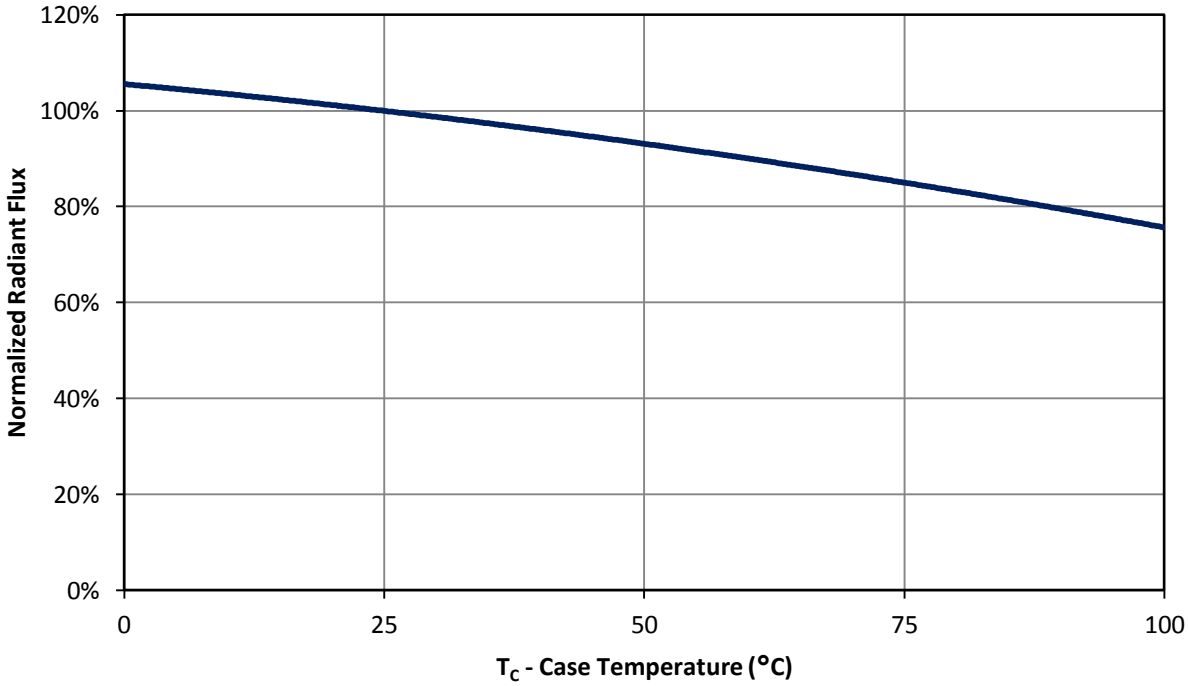



Figure 8: Typical normalized radiant flux vs. case temperature.



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## Typical Peak Wavelength Shift over Current

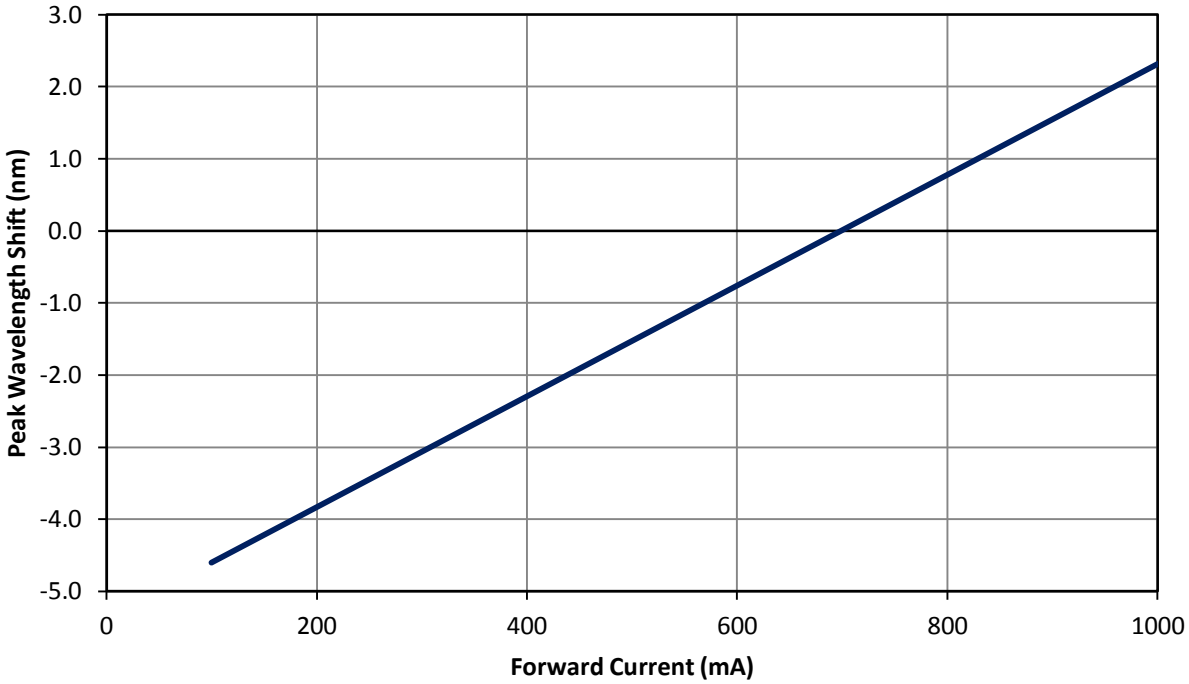



Figure 9: Typical peak wavelength shift vs. forward current @ Tc = 25°C

## Typical Peak Wavelength Shift over Case Temperature

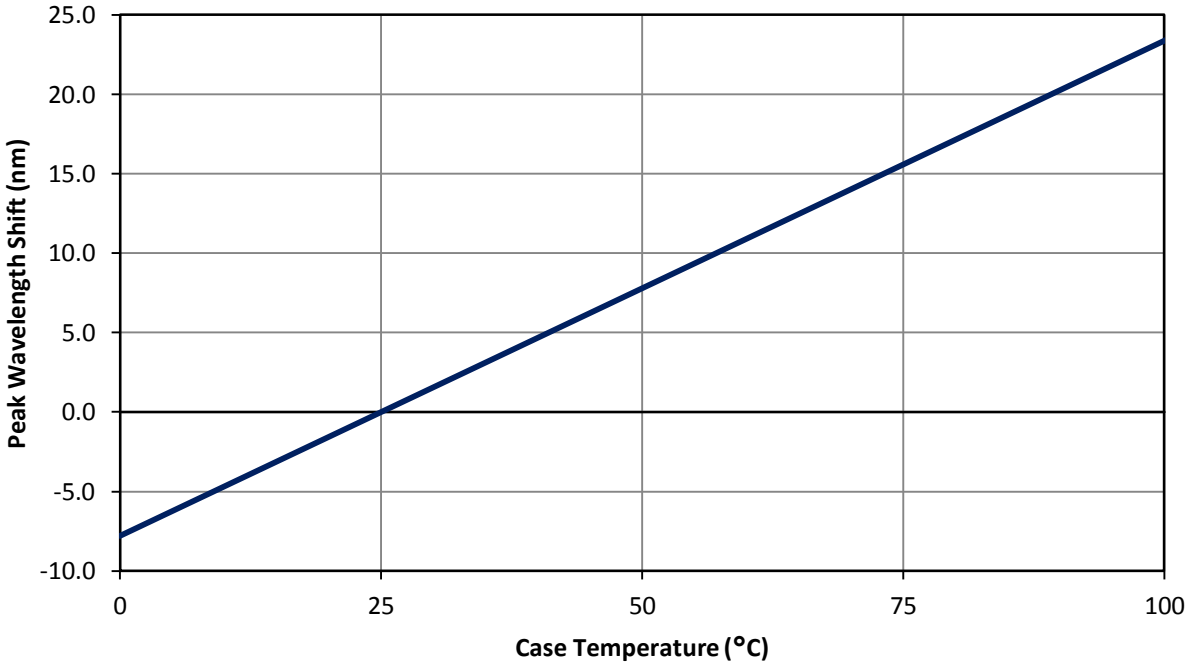



Figure 10: Typical peak wavelength shift vs. case temperature.

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## Current De-rating

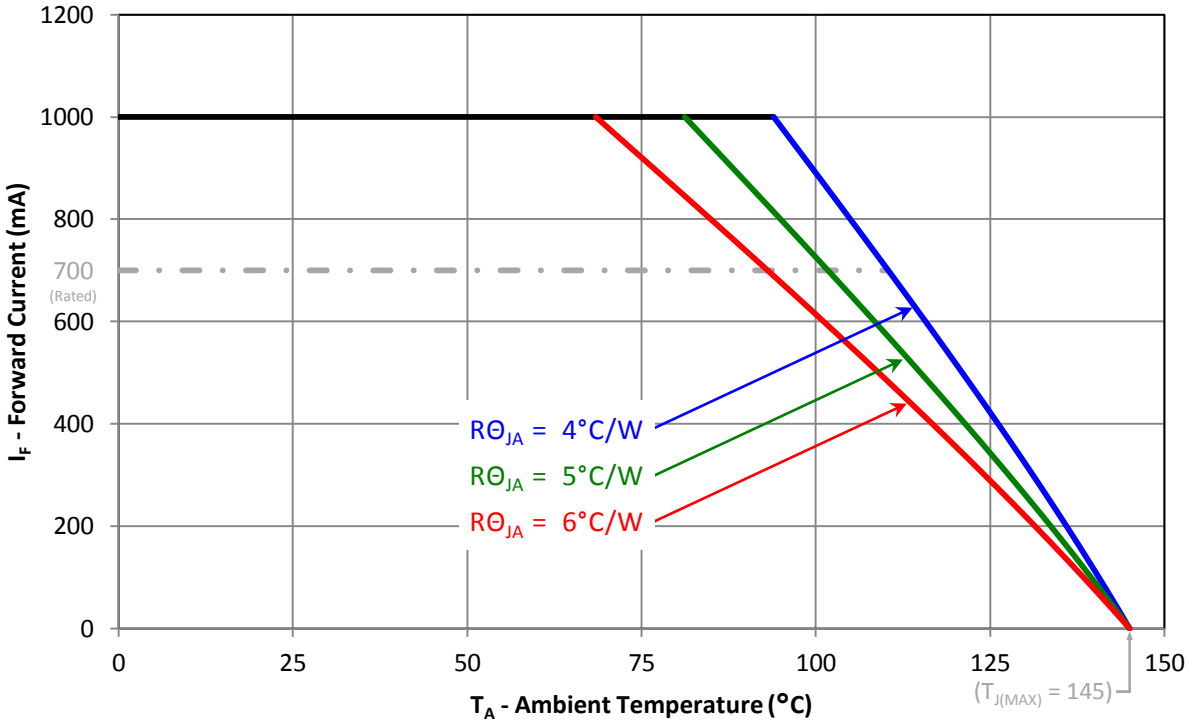



Figure 11: Maximum forward current vs. ambient temperature based on $T_{J(MAX)}$ = 145°C.

Notes:

1. Maximum current assumes that all four LED dice are operating concurrently at the same current.
2. $R\Theta_{J\text{-}C}$ [Junction to Case Thermal Resistance] for the LZ4-00R608 is typically 2.8°C/W.
3. $R\Theta_{J\text{-}A}$ [Junction to Ambient Thermal Resistance] = $R\Theta_{J\text{-}C}$ + $R\Theta_{C\text{-}A}$ [Case to Ambient Thermal Resistance].

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# Emitter Tape and Reel Specifications (mm)

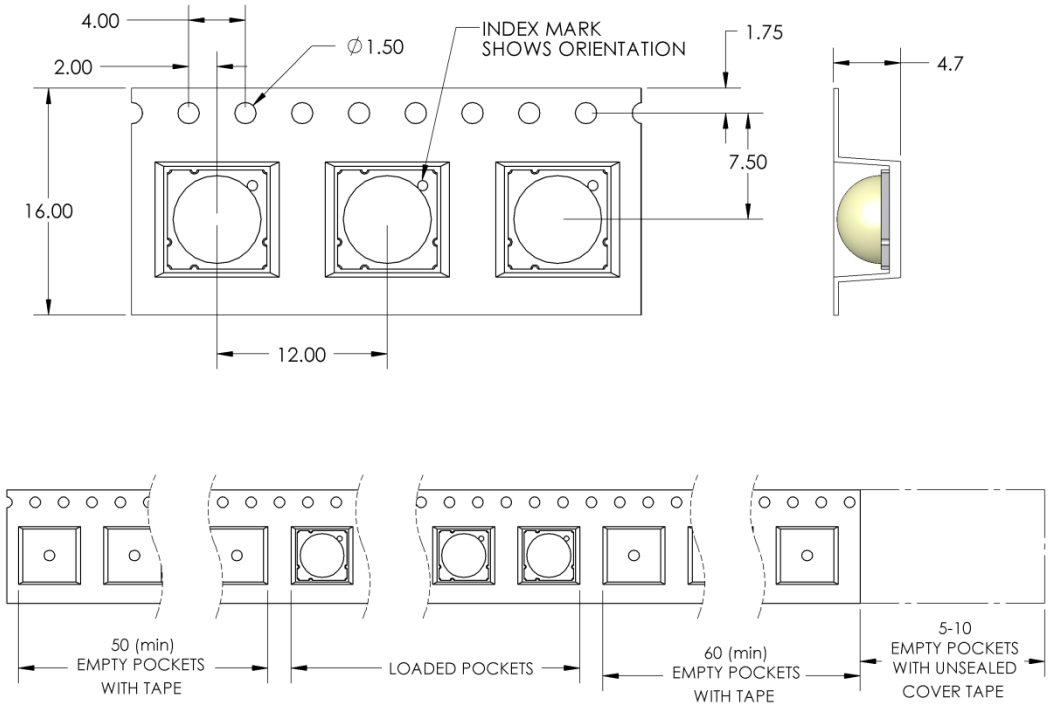



Figure 12: Emitter carrier tape specifications (mm).

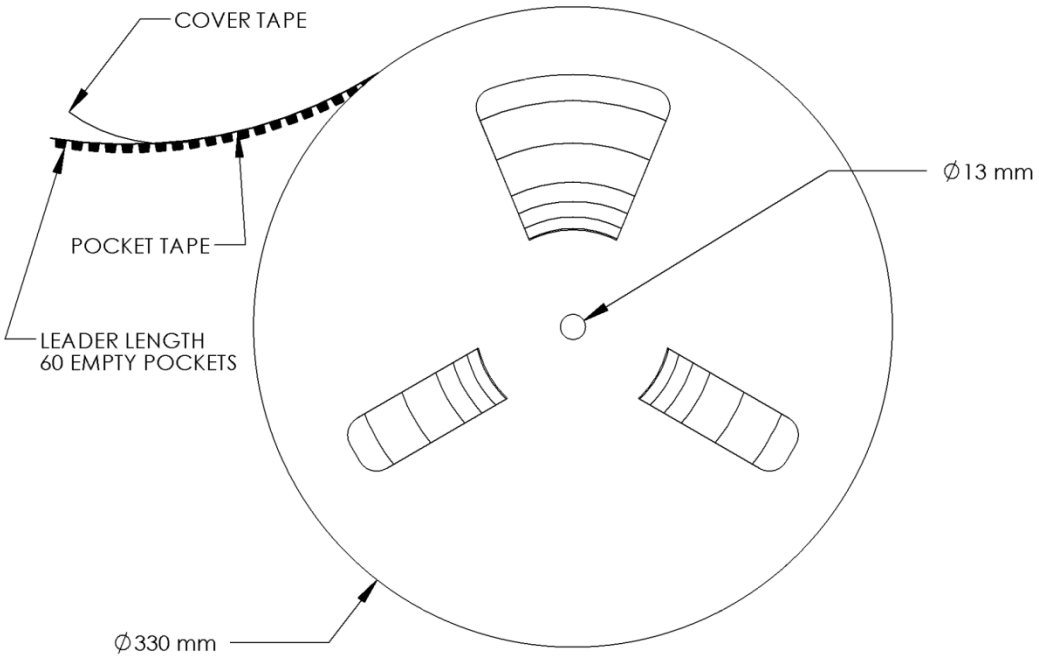



Figure 13: Emitter Reel specifications (mm).

Notes:

1. Reel quantity minimum: 100 emitters. Reel quantity maximum: 1200 emitters.



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# LZ4 MCPCB Family

| Part number | Type of MCPCB | Diameter (mm) | Emitter + MCPCB Thermal Resistance ($^oC/W$) | Typical $V_F$ (V) | Typical $I_F$ (mA) |
|---|---|---|---|---|---|
| **LZ4-4xxxxx** | 1-channel | 19.9 | 2.8 + 1.1 = 3.9 | 12.4 | 700 |

## Mechanical Mounting of MCPCB

- MCPCB bending should be avoided as it will cause mechanical stress on the emitter, which could lead to substrate cracking and subsequently LED dies cracking.
- To avoid MCPCB bending:
  - Special attention needs to be paid to the flatness of the heat sink surface and the torque on the screws.
  - Care must be taken when securing the board to the heat sink. This can be done by tightening three M3 screws (or #4-40) in steps and not all the way through at once. Using fewer than three screws will increase the likelihood of board bending.
  - It is recommended to always use plastics washers in combinations with the three screws.
  - If non-taped holes are used with self-tapping screws, it is advised to back out the screws slightly after tightening (with controlled torque) and then re-tighten the screws again.

## Thermal interface material

- To properly transfer heat from LED emitter to heat sink, a thermally conductive material is required when mounting the MCPCB on to the heat sink.
- There are several varieties of such material: thermal paste, thermal pads, phase change materials and thermal epoxies. An example of such material is Electrolube EHTC.
- It is critical to verify the material's thermal resistance to be sufficient for the selected emitter and its operating conditions.

## Wire soldering

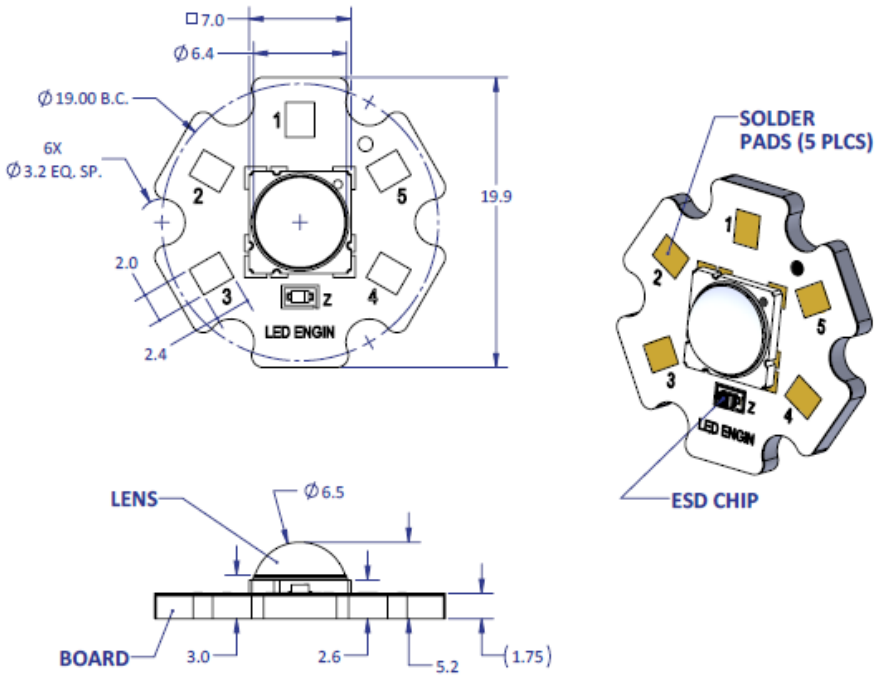
- To ease soldering wire to MCPCB process, it is advised to preheat the MCPCB on a hot plate of 125-150$^o$C. Subsequently, apply the solder and additional heat from the solder iron will initiate a good solder reflow. It is recommended to use a solder iron of more than 60W.
- It is advised to use lead-free, 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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# LZ4-4xxxxx

## 1 channel, Standard Star MCPCB (1x4) Dimensions (mm)




Notes:

- 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.
- LED Engin recommends thermal interface material when attaching the MCPCB to a heatsink
- The thermal resistance of the MCPCB is: $R\Theta_{C\text{-}B}$ 1.1°C/W

## Components used

| | | |
|---|---|---|
| MCPCB: | HT04503 | (Bergquist) |
| ESD chips: | BZX585-C30 | (NXP, for 4 LED dies in series) |

| Pad layout | | | |
|---|---|---|---|
| **Ch.** | **MCPCB Pad** | **String/die** | **Function** |
| 1 | 1, 2, 3 | 1/ABCD | Cathode - |
| | 4, 5 | | Anode + |

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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, IR 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) 922-7200 for more information.**



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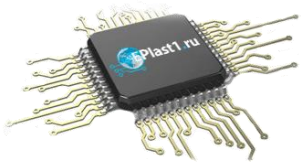
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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