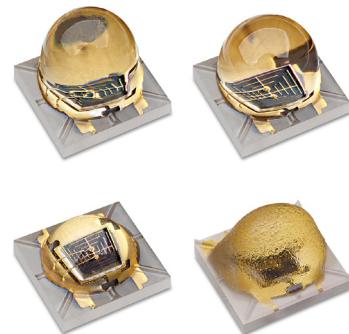


# LUXEON IR Domed Line

High power infrared emitters with engineered primary optics for high efficiency and beam control

The LUXEON IR Domed Line is a product line of high power infrared emitters tailored to application needs by offering a variety of products at multiple infrared wavelengths and optical radiation patterns. LUXEON IR Domed Line is designed with innovative LUXEON technology to provide industry-leading performance. Through best-in-class thermal conductivity, LUXEON IR Domed Line has excellent performance at actual operating conditions. The LUXEON IR Domed Line uses an industry standard footprint for ease of integration and upgrading existing system designs.



## FEATURES AND BENEFITS

Radiant Power: 1350mW (850nm) and 1450mW (940nm) for a greater system performance

Four emission patterns: 60°, 90° and 150° as well as an asymmetric radiation pattern of 95 x 58° to address diverse application needs

3.7mm x 3.7mm package with a 3 pad configuration that is compatible with the industry standard footprint to enable a direct upgrade in existing designs

Ultra-low  $R_{th}$  of 2.5°C/W, the industry's best thermal conductivity, solves thermal challenges and supports space saving designs

## PRIMARY APPLICATIONS

Surveillance / CCTV

Machine Vision

3D Scanning / Time of Flight

Biometric Identification

User Interface Control

Augmented / Virtual Reality

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# General Product Information

## Product Test Conditions

LUXEON IR Domed Line emitters are tested and binned with a 20ms monopulse of 1000mA at a junction temperature,  $T_j$ , of 25°C.

## Part Number Nomenclature

Part numbers for LUXEON IR Domed Line follow the convention below:

L 1 I 0 - 0 **A A A** **B B B B** X X X X X

Where:

- A A A** - designates nominal peak wavelength
- B B B B** - designates full width half maximum of the emitter's radiation pattern
- X X X X X - reserved for further customization

Therefore, the following part number is used for a LUXEON IR Domed emitter with a peak wavelength of 850nm and a FWHM beam angle of 60°:

L 1 I 0 - 0 **8 5 0 0 6 0** 0 0 0 0 0

## Radiometric Power Maintenance

Please contact your local Sales Representative or Lumileds Technical Solutions Manager for more information about the long-term performance of this product.

## Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON IR Domed Line is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS Directive 2011/65/EU and REACH Regulation (EC) 1907/2006. Lumileds LLC will not intentionally add the following restricted materials to its products: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

# Performance Characteristics

## Product Selection Guide

Table 1. Product performance and optical characteristics of LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

| PEAK WAVELENGTH <sup>[1]</sup> (nm) | TYPICAL FWHM BEAM ANGLE (°) | RADIOMETRIC POWER <sup>[2]</sup> (mW) |         | TYPICAL RADIANT INTENSITY (mW/sr) | TYPICAL SPECTRUM FWHM (nm) | PART NUMBER        |
|-------------------------------------|-----------------------------|---------------------------------------|---------|-----------------------------------|----------------------------|--------------------|
|                                     |                             | MINIMUM                               | TYPICAL |                                   |                            |                    |
| 850                                 | 150                         | 1000                                  | 1350    | 335                               | 35                         | L1I0-085015000000  |
| 850                                 | 90                          | 1000                                  | 1350    | 750                               | 35                         | L1I0-085009000000  |
| 850                                 | 60                          | 1000                                  | 1350    | 1150                              | 35                         | L1I0-085006000000  |
| 850                                 | 95 x 58                     | 1000                                  | 1350    | 650                               | 35                         | L1I0-0850955800000 |
| 940                                 | 150                         | 1100                                  | 1450    | 350                               | 50                         | L1I0-094015000000  |
| 940                                 | 90                          | 1100                                  | 1450    | 780                               | 50                         | L1I0-094009000000  |
| 940                                 | 60                          | 1100                                  | 1450    | 1190                              | 50                         | L1I0-094006000000  |
| 940                                 | 95 x 58                     | 1100                                  | 1450    | 700                               | 50                         | L1I0-0940955800000 |

Notes for Table 1:

1. Lumileds maintains a tolerance of  $\pm 2\text{nm}$  on peak wavelength measurements.
2. Lumileds maintains a tolerance of  $\pm 7\%$  on radiometric power measurements.

## Electrical and Thermal Characteristics

Table 2. Electrical and thermal characteristics for LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

| PART NUMBER        | FORWARD VOLTAGE <sup>[1]</sup> (V <sub>f</sub> ) |         |         | TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE <sup>[2]</sup> (mV/°C) | TYPICAL TEMPERATURE COEFFICIENT OF PEAK WAVELENGTH <sup>[2]</sup> (nm/°C) | TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W) | TYPICAL RISE TIME (ns) | TYPICAL FALL TIME (ns) |
|--------------------|--------------------------------------------------|---------|---------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------|------------------------|------------------------|
|                    | MINIMUM                                          | TYPICAL | MAXIMUM |                                                                           |                                                                           |                                                          |                        |                        |
| L1I0-0850xxxx00000 | 2.7                                              | 3.2     | 3.7     | -4.6                                                                      | 0.26                                                                      | 2.5                                                      | 12                     | 16                     |
| L1I0-0940xxxx00000 | 2.3                                              | 2.9     | 3.4     | -2.6                                                                      | 0.29                                                                      | 2.5                                                      | 12                     | 16                     |

Notes for Table 2:

1. Lumileds maintains a tolerance of  $\pm 1\%$  on forward voltage measurements.
2. Measured between  $25^\circ\text{C}$  and  $85^\circ\text{C}$ .

# Absolute Maximum Ratings

Table 3. Absolute maximum ratings for LUXEON IR Domed Line.

| PARAMETER                                                | MAXIMUM PERFORMANCE                                          |
|----------------------------------------------------------|--------------------------------------------------------------|
| DC Forward Current <sup>[1, 2]</sup>                     | 1000mA                                                       |
| Peak Pulsed Forward Current <sup>[1, 3]</sup>            | 3000mA                                                       |
| Emitter Junction Temperature <sup>[1]</sup> (DC & Pulse) | 145°C                                                        |
| ESD Sensitivity<br>(ANSI/ESDA/JEDEC JS-001-2012)         | Class 3B                                                     |
| Operating Case Temperature <sup>[1]</sup>                | -40°C to 125°C                                               |
| Emitter Storage Temperature                              | -40°C to 125°C                                               |
| SMD Process Classification Temperature                   | 260°C per JEDEC J-STD-020E                                   |
| Allowable Reflow Cycles                                  | 3                                                            |
| Reverse Voltage ( $V_{reverse}$ )                        | LUXEON IR LEDs are not designed to be driven in reverse bias |

Notes for Table 3:

1. Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple," are acceptable if the following conditions are met:
  - The frequency of the ripple current is 100Hz or higher
  - The average current for each cycle does not exceed the maximum allowable DC forward current
  - The maximum amplitude of the ripple does not exceed the maximum peak pulsed forward current
3. For pulse handling capability details see figure 9.

# Characteristic Curves

## Spectral Power Distribution Characteristics

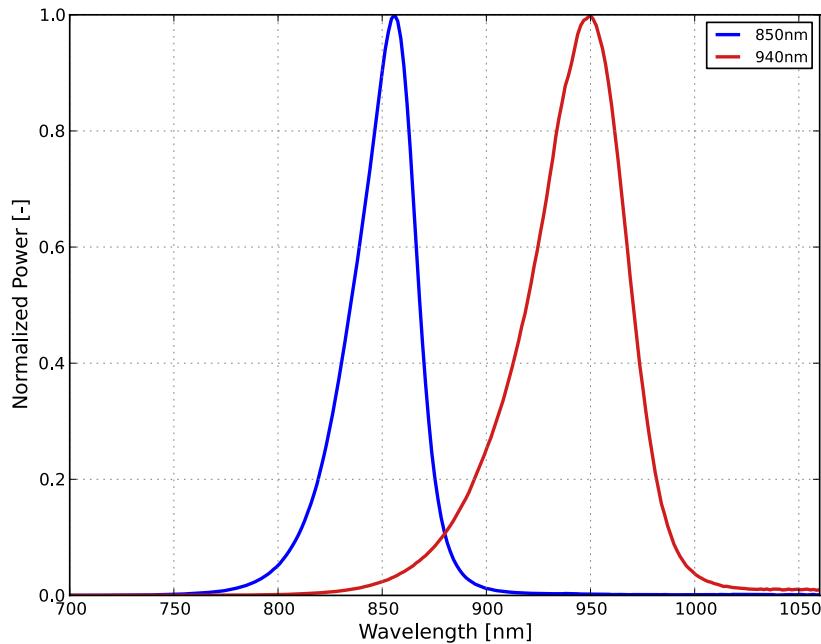


Figure 1. Typical normalized power vs. wavelength for LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

## Light Output Characteristics

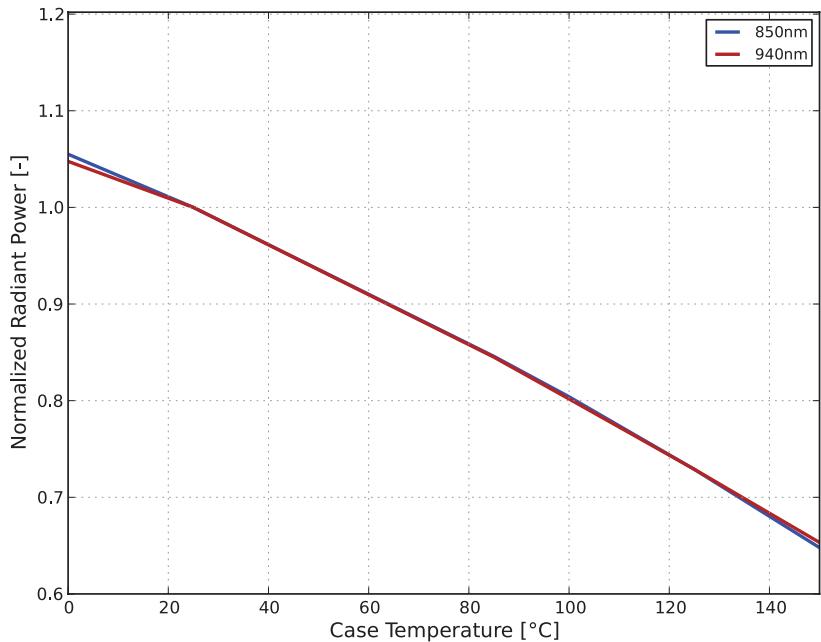


Figure 2. Typical normalized radiant power vs. case temperature for LUXEON IR Domed Line at 1000mA.

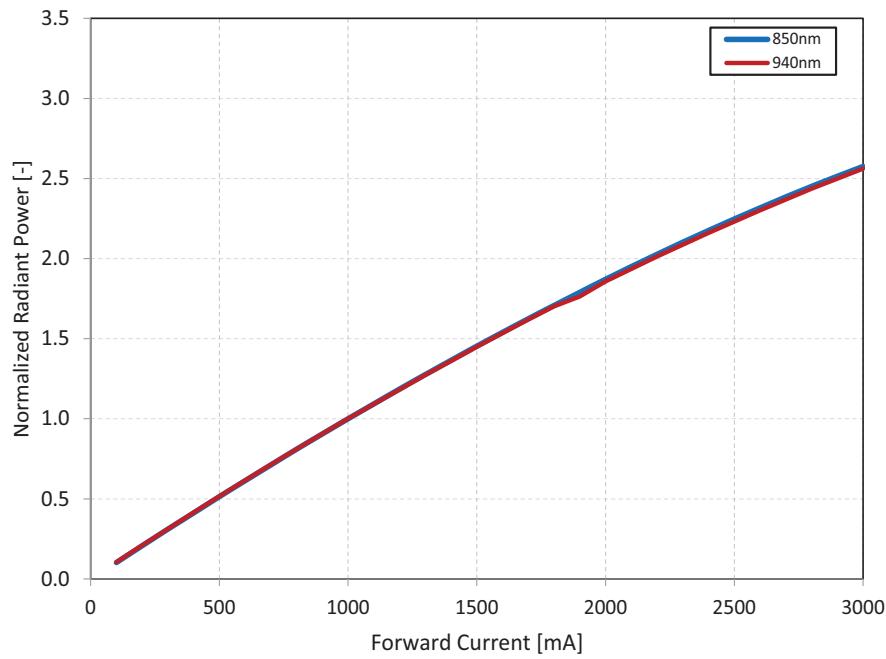


Figure 3. Typical normalized radiant power vs. forward current for LUXEON IR Domed Line at  $T_j=25^\circ\text{C}$ .

## Forward Current Characteristics

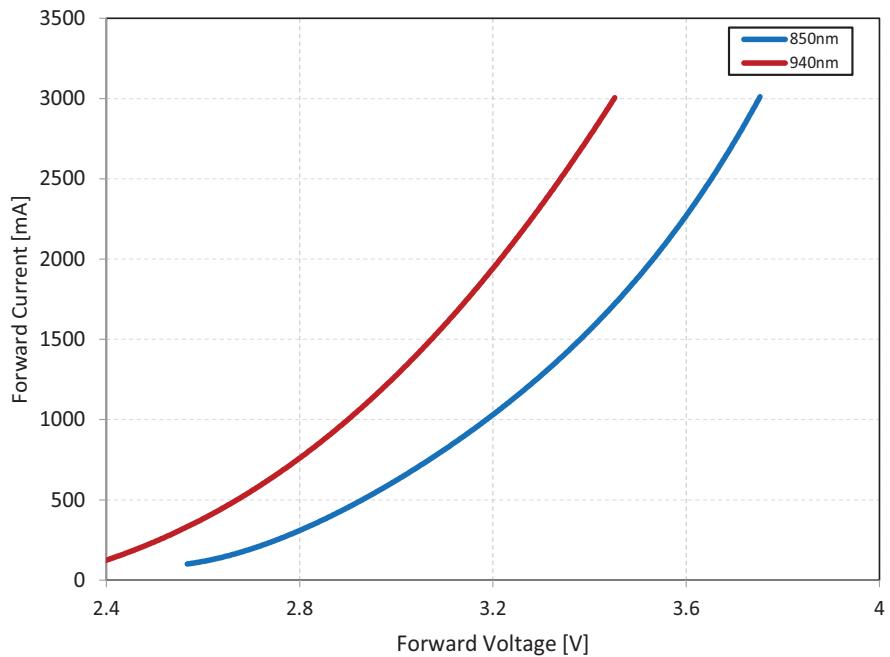


Figure 4. Typical forward current vs. forward voltage for LUXEON IR Domed Line at  $T_j=25^\circ\text{C}$ .

## Wavelength Shift Characteristics

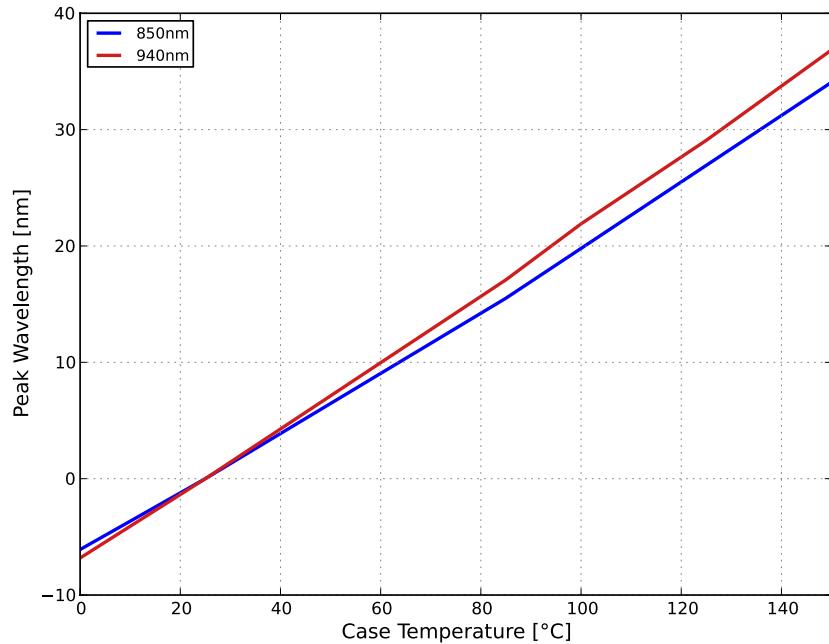


Figure 5. Typical peak wavelength shift vs. case temperature for LUXEON IR Domed Line at 1000mA.

## Radiation Pattern Characteristics

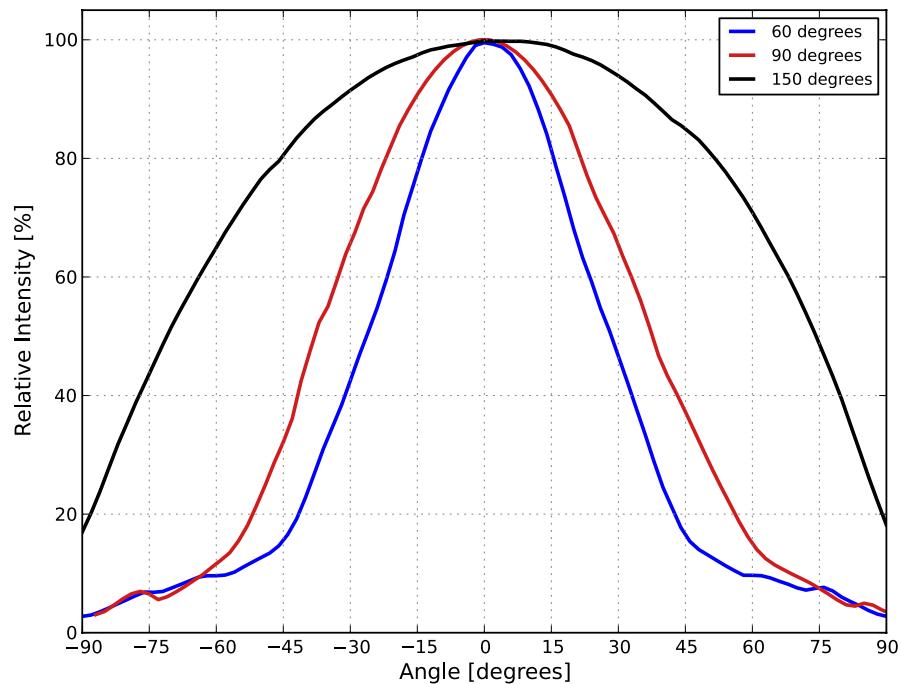


Figure 6a. Typical radiation pattern for L1I0-0xxx060000000, L1I0-0xxx090000000, and L1I0-0xxx150000000 at 1000mA,  $T_j=25^\circ\text{C}$ .

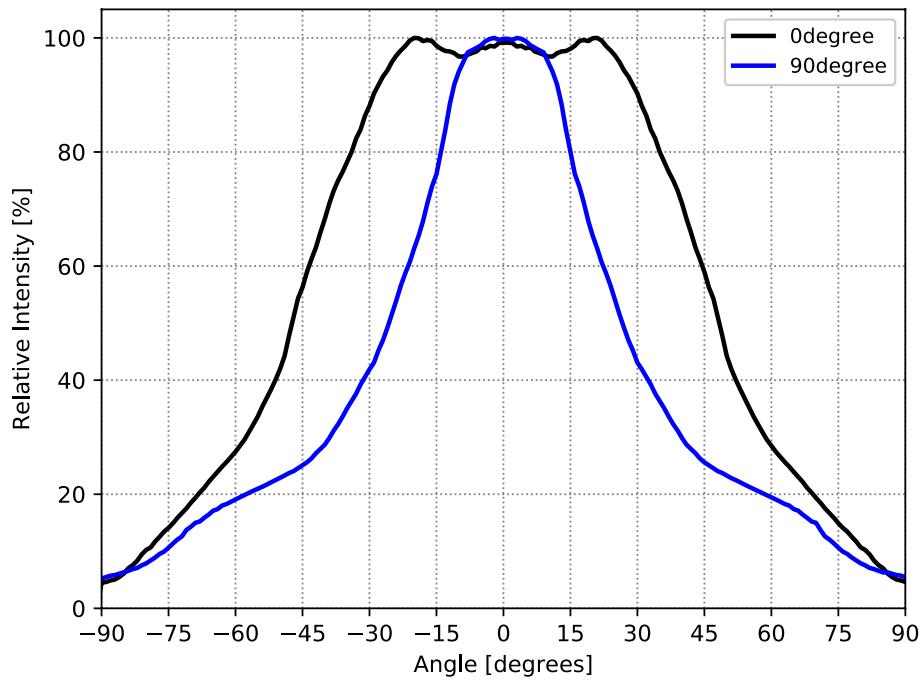


Figure 6b. Typical radiation pattern for L1I0-0xxx955800000 at 1000mA,  $T_j=25^\circ\text{C}$ .

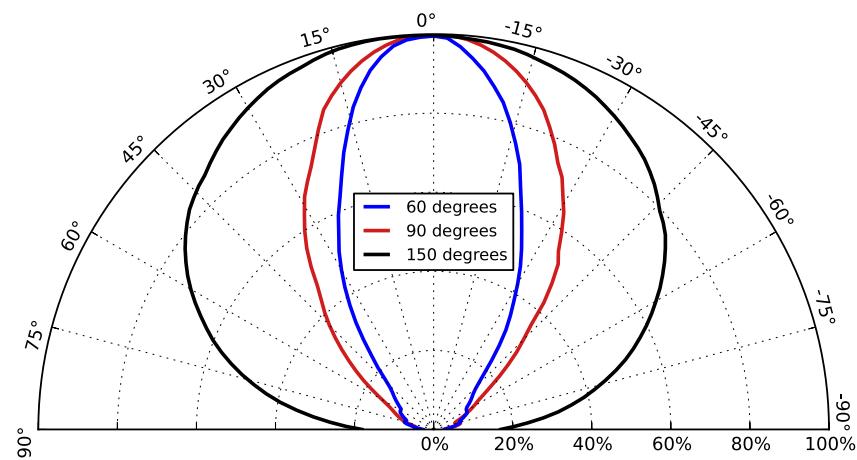


Figure 7a. Typical polar radiation pattern for L1I0-0xxx060000000, L1I0-0xxx090000000, and L1I0-0xxx150000000 at 1000mA,  $T_j=25^\circ\text{C}$ .

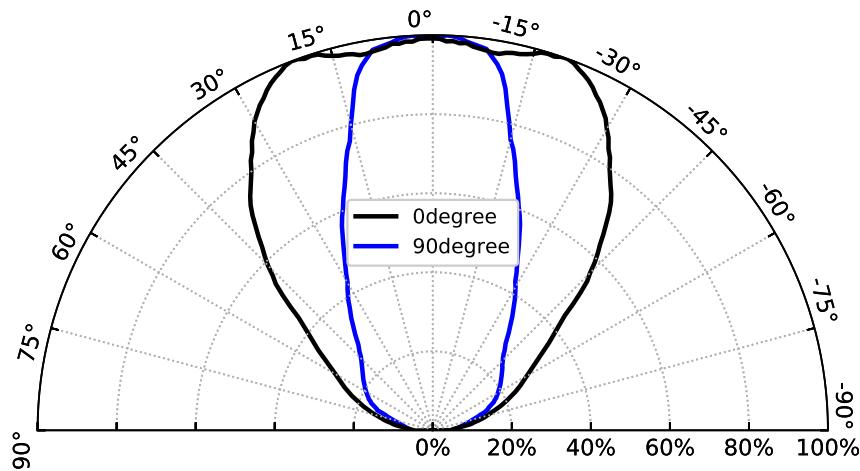


Figure 7b. Typical polar radiation pattern for L1I0-0xxx955800000 at 1000mA,  $T_j=25^\circ\text{C}$ .

## Permissible Pulse Handling Characteristics

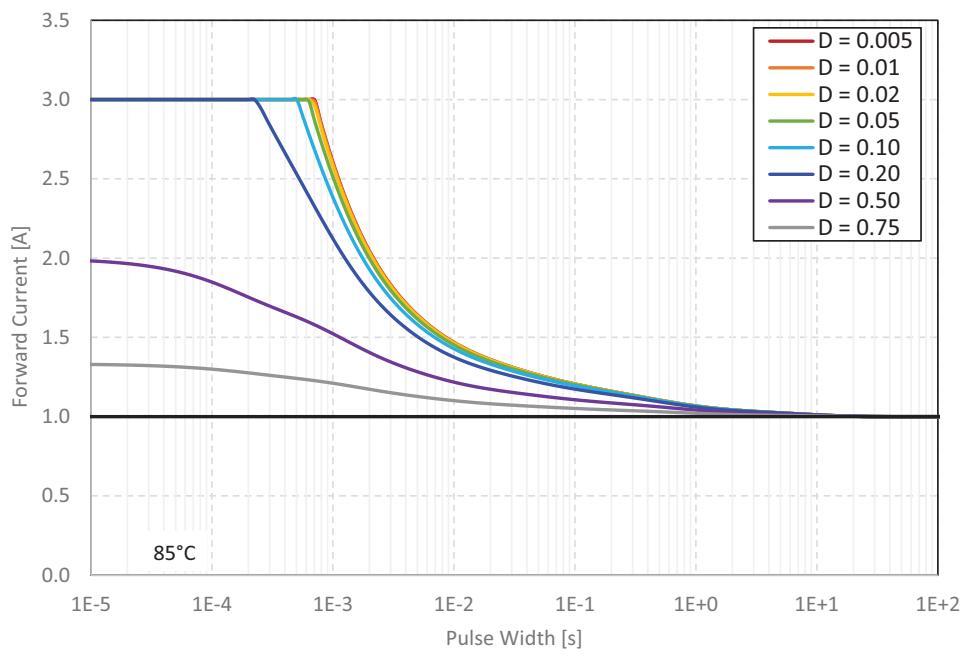


Figure 8. Permissible pulse handling capability for LUXEON IR Domed Line at  $T_c=85^\circ\text{C}$  for various duty cycles (D).

# Product Bin and Labeling Definitions

## Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheet. For this reason, Lumileds bins components for luminous flux or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON IR Domed Line emitters are labeled using a 4-digit alphanumeric CAT code following the format below:

**A B C D**

Where:

**A** – designates radiometric power bin (example: J=900 to 950mW, N=1200 to 1300mW)

**B C** – designates peak wavelength bin (example: 8K=845nm to 850nm, 9H=935nm to 940nm)

**D** – designates forward voltage bin (example: D=2.5 to 3.0V, F=3.5 to 4.0V)

Therefore, a LUXEON IR Domed emitter with a radiometric power range of 1200 to 1300mW, peak wavelength range of 845 to 850nm and a forward voltage range of 2.5 to 3.0V has the following CAT code:

**N 8 K D**

## Radiometric Power Bins

Table 4 lists the standard radiometric power bins for LUXEON IR Domed Line emitters. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all CCTs.

Table 4. Radiometric power bin definitions for LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

| BIN | RADIOMETRIC POWER <sup>[1]</sup> (mW) |         |
|-----|---------------------------------------|---------|
|     | MINIMUM                               | MAXIMUM |
| J   | 900                                   | 950     |
| K   | 950                                   | 1000    |
| L   | 1000                                  | 1100    |
| M   | 1100                                  | 1200    |
| N   | 1200                                  | 1300    |
| P   | 1300                                  | 1400    |
| Q   | 1400                                  | 1500    |
| R   | 1500                                  | 1600    |

Notes for Table 4:

1. Lumileds maintains a tolerance of  $\pm 7\%$  on radiometric power measurements.

## Peak Wavelength Bins

Table 5. Peak wavelength bins for LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

| BIN | PEAK WAVELENGTH <sup>[1]</sup> (nm) |         |
|-----|-------------------------------------|---------|
|     | MINIMUM                             | MAXIMUM |
| 8J  | 840                                 | 845     |
| 8K  | 845                                 | 850     |
| 8L  | 850                                 | 855     |
| 8M  | 855                                 | 860     |
| 8N  | 860                                 | 865     |
| 8P  | 865                                 | 870     |
| 8Q  | 870                                 | 875     |
| 9F  | 925                                 | 930     |
| 9G  | 930                                 | 935     |
| 9H  | 935                                 | 940     |
| 9J  | 940                                 | 945     |
| 9K  | 945                                 | 950     |
| 9L  | 950                                 | 955     |
| 9M  | 955                                 | 960     |

Notes for Table 5:

1. Lumileds maintains a tolerance of  $\pm 2\text{nm}$  on peak wavelength measurements.

## Forward Voltage Bins

Table 6. Forward voltage bin definitions for LUXEON IR Domed Line at 1000mA,  $T_j=25^\circ\text{C}$ .

| BIN | FORWARD VOLTAGE <sup>[1]</sup> (V <sub>f</sub> ) |         |
|-----|--------------------------------------------------|---------|
|     | MINIMUM                                          | MAXIMUM |
| C   | 2.0                                              | 2.5     |
| D   | 2.5                                              | 3.0     |
| E   | 3.0                                              | 3.5     |
| F   | 3.5                                              | 4.0     |

Notes for Table 6:

1. Lumileds maintains a tolerance of  $\pm 1\%$  on forward voltage measurements.

## Mechanical Dimensions

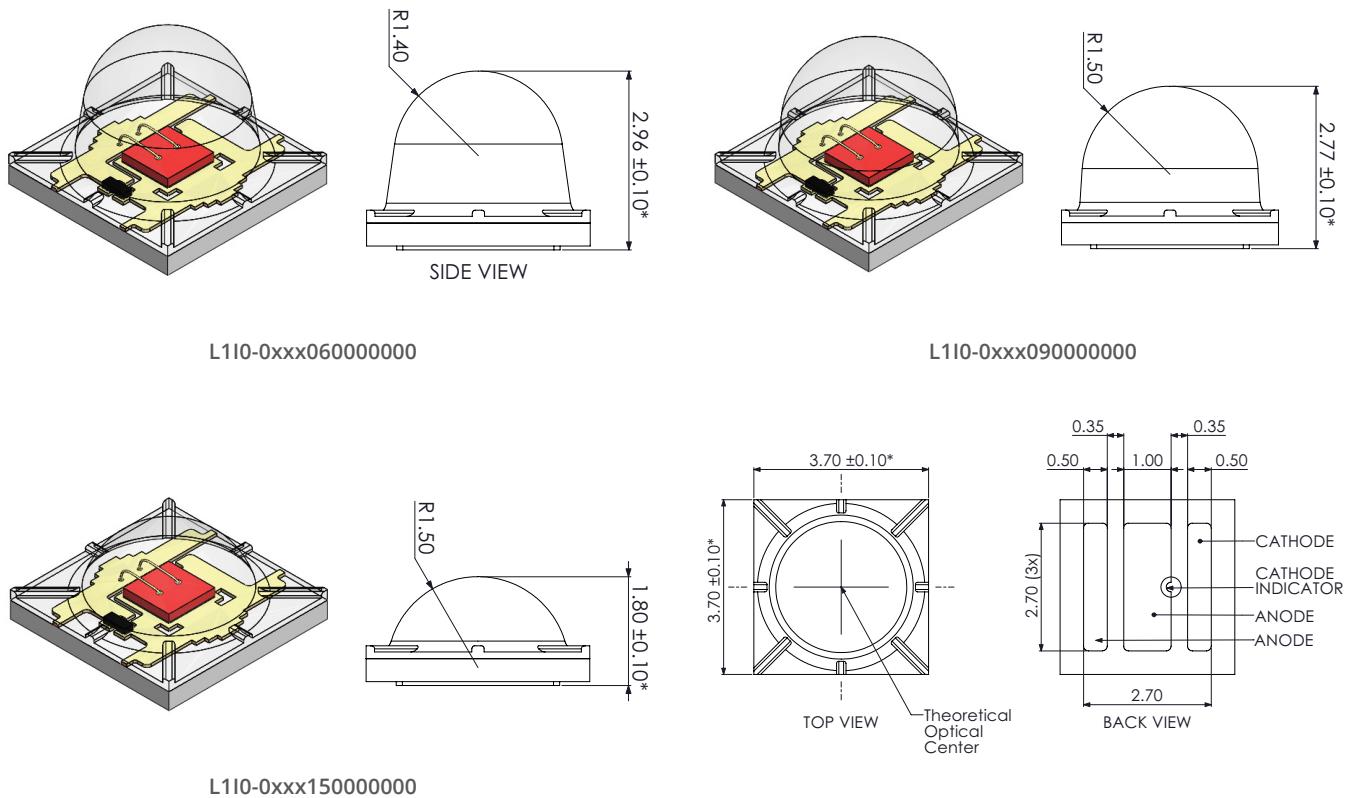


Figure 9a. Mechanical dimensions for L1I0-0xxx060000000, L1I0-0xxx090000000, and L1I0-0xxx150000000.

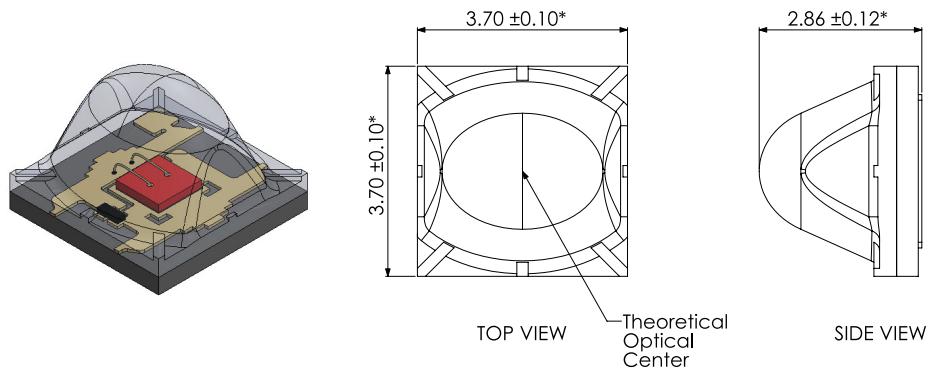


Figure 9b. Mechanical dimensions for L1I0-0xxx955800000.

### Notes for Figures 9a and 9b:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

# Reflow Soldering Guidelines

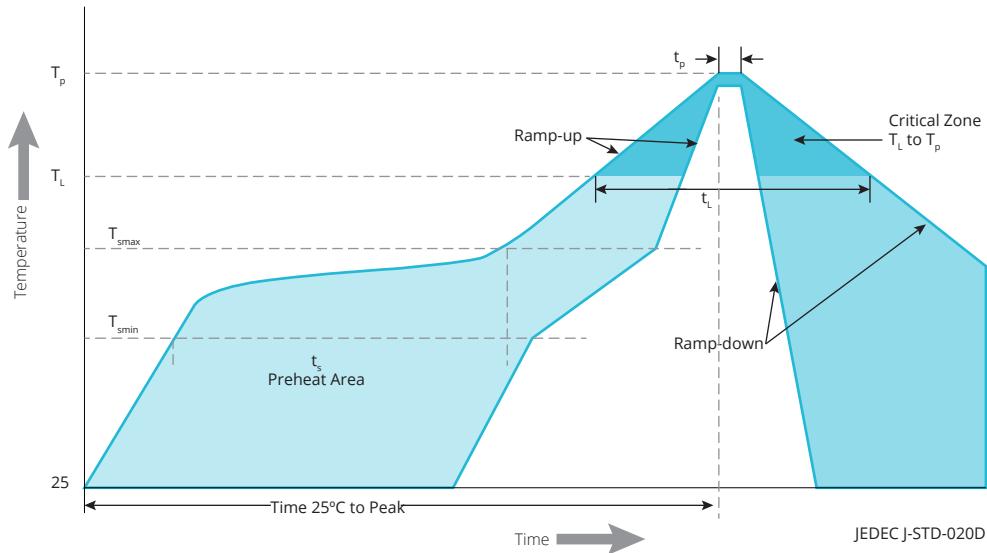


Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 7.

Table 7. Reflow profile characteristics for LUXEON IR Domed Line.

| PROFILE FEATURE                                      | LEAD-FREE ASSEMBLY   |
|------------------------------------------------------|----------------------|
| Preheat Minimum Temperature ( $T_{smin}$ )           | 150°C                |
| Preheat Maximum Temperature ( $T_{smax}$ )           | 200°C                |
| Preheat Time ( $t_{smin}$ to $t_{smax}$ )            | 120 seconds          |
| Ramp-Up Rate ( $T_L$ to $T_p$ )                      | 3°C / second maximum |
| Liquidous Temperature ( $T_L$ )                      | 217°C                |
| Time Maintained Above Temperature $T_L$ ( $t_L$ )    | 150 seconds          |
| Peak / Classification Temperature ( $T_p$ )          | 260°C                |
| Time Within 5°C of Actual Peak Temperature ( $t_p$ ) | 10 to 30 seconds     |
| Ramp-Down Rate ( $T_p$ to $T_L$ )                    | 6°C / second maximum |
| Time 25°C to Peak Temperature                        | 8 minutes maximum    |

## JEDEC Moisture Sensitivity

Table 8. Moisture sensitivity levels for LUXEON IR Domed Line.

| LEVEL | FLOOR LIFE |                                           | SOAK REQUIREMENTS STANDARD |                                      |
|-------|------------|-------------------------------------------|----------------------------|--------------------------------------|
|       | TIME       | CONDITIONS                                | TIME                       | CONDITIONS                           |
| 1     | Unlimited  | $\leq 30^\circ\text{C} / 85\% \text{ RH}$ | 168 Hours +5 / -0          | $85^\circ\text{C} / 85\% \text{ RH}$ |

## Solder Pad Design

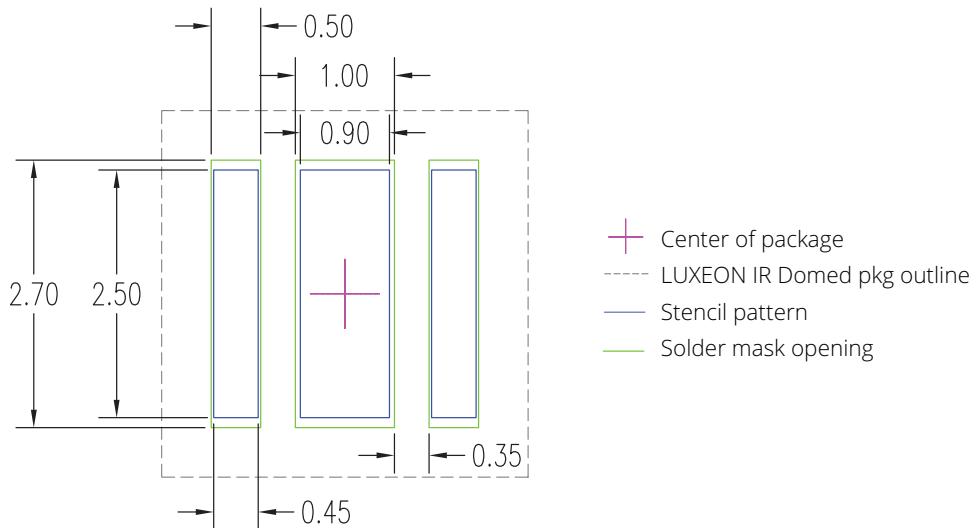


Figure 11. Recommended PCB solder pad layout for LUXEON IR Domed Line.

### Notes for Figure 11:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Electrode pads are symmetric.

## Packaging Information

### Pocket Tape Dimensions

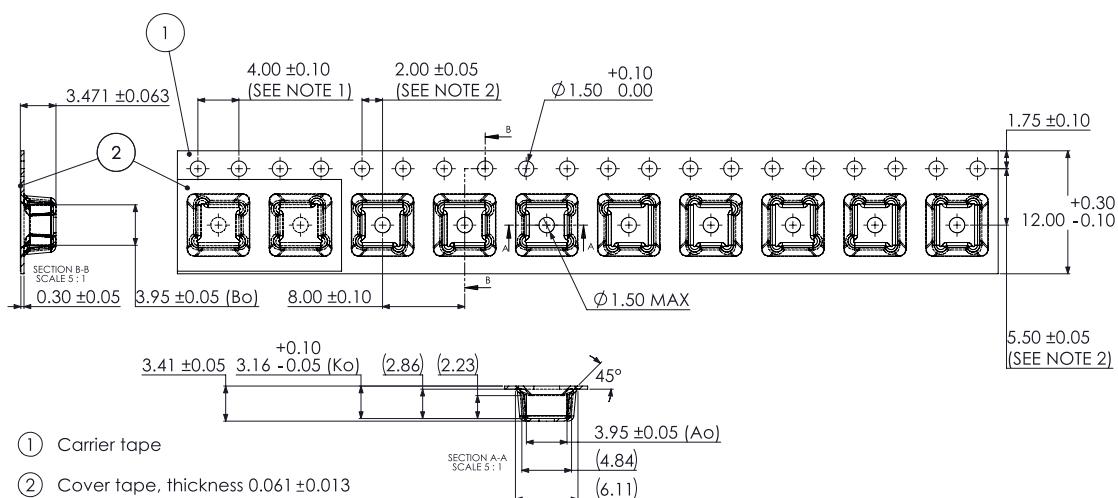


Figure 12a. Pocket tape dimensions for L1I0-0xxx060000000.

### Notes for Figure 12a:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

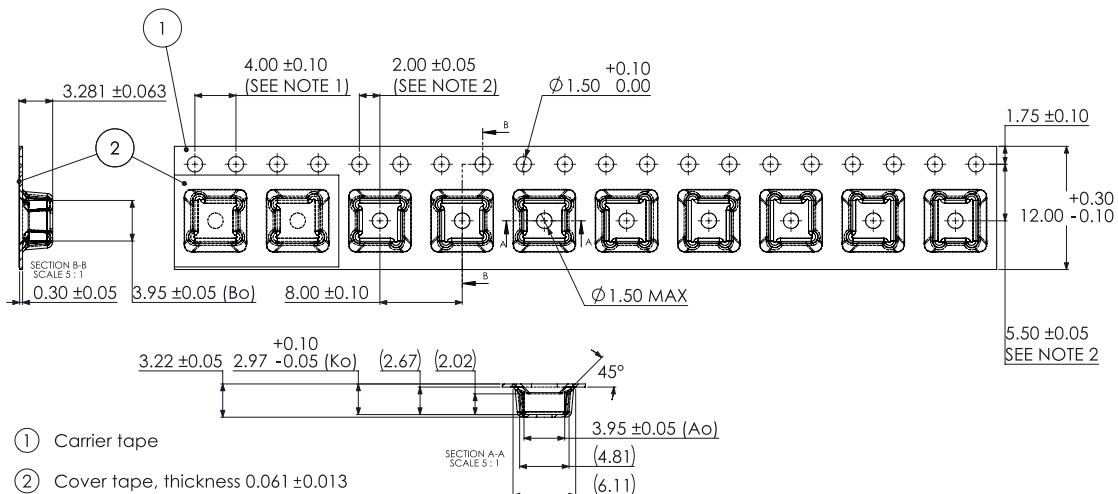


Figure 12b. Pocket tape dimensions for L1I0-0xxx090000000 and L1I0-0xxx955800000.

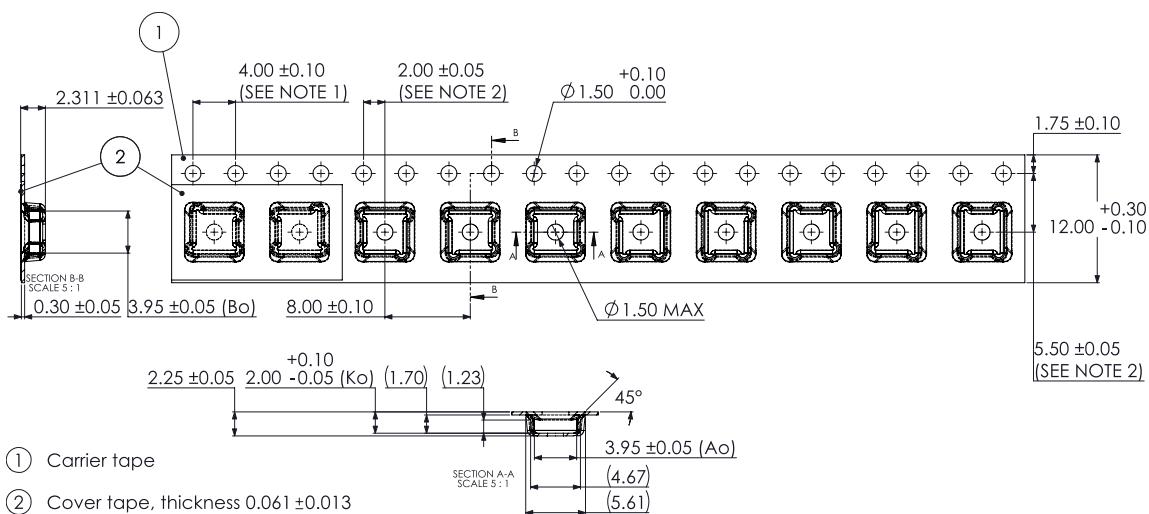


Figure 12c. Pocket tape dimensions for L1I0-0xxx150000000.

Notes for Figures 12b and 12c:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

## Reel Dimensions

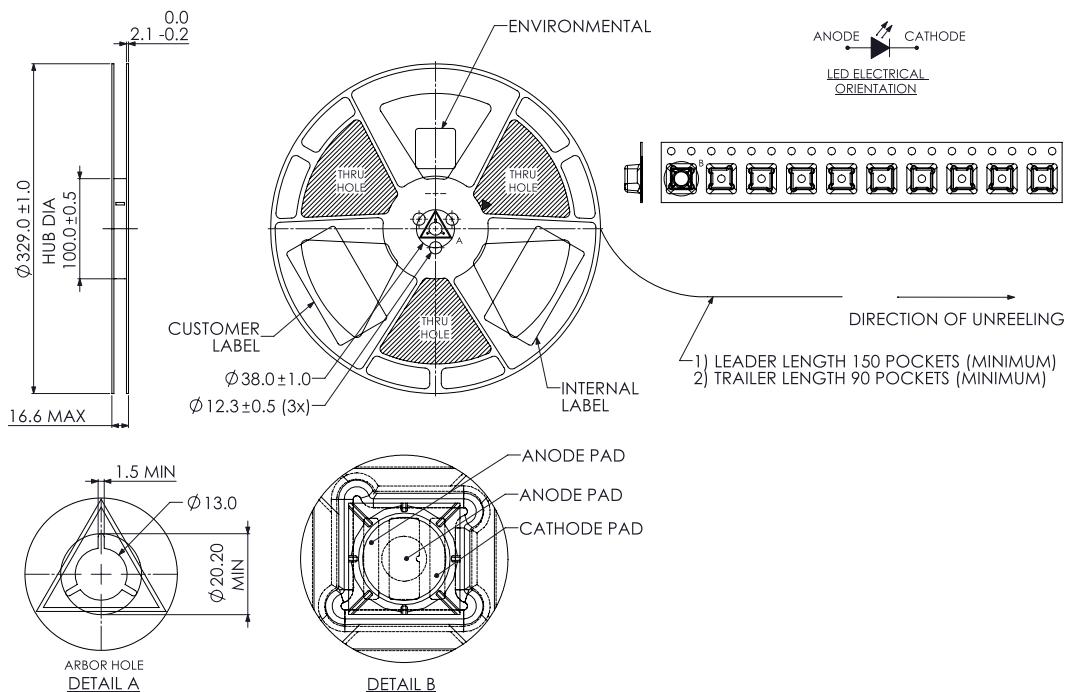


Figure 13a. Reel dimensions for L1I0-0xxx060000000, L1I0-0xxx090000000, and L1I0-0xxx955800000.

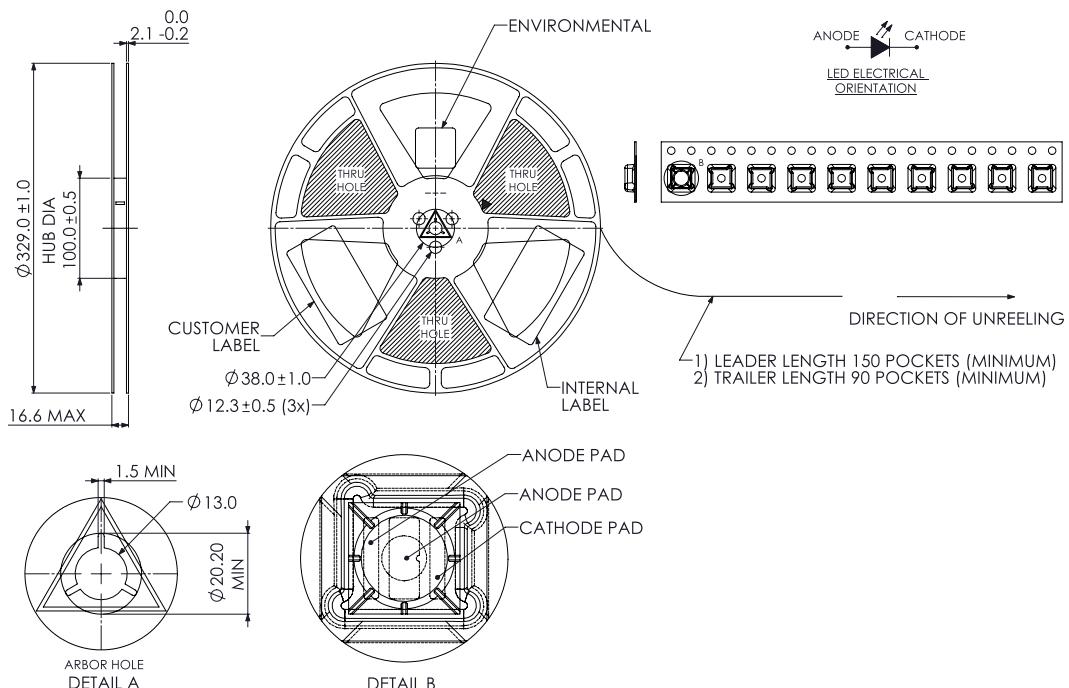


Figure 13b. Reel dimensions for L1I0-0xxx150000000.

### Notes for Figures 13a and 13b:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

## About Lumileds

Companies developing automotive, mobile, IoT and illumination lighting applications need a partner who can collaborate with them to push the boundaries of light. With over 100 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge. As the inventor of Xenon technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation, quality and reliability into its technology, products and every customer engagement. Together with its customers, Lumileds is making the world better, safer, more beautiful—with light.

To learn more about our lighting solutions, visit [lumileds.com](http://lumileds.com).



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