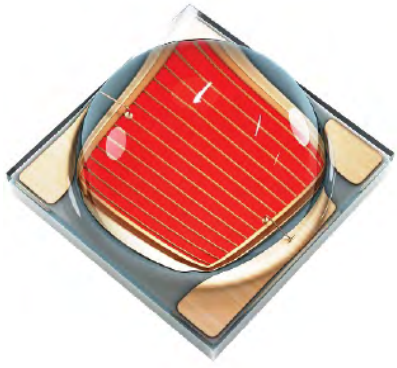
LUMILEDS

ILLUMINATION

LUXEON SunPlus HPE

Best in class performance and efficacy high power LED for horticulture applications



LUXEON SunPlus HPE achieves the highest PPF and PPE with an industry-standard footprint of 3.5mm x 3.5mm. It enables growers to improve crop growth, reduce energy consumption, and make agriculture more sustainable. The LUXEON SunPlus HPE is a deep red LED with a peak wavelength of 660nm and is designed specifically to enable the highest-quality LED solutions for horticulture applications.

FEATURES AND BENEFITS

- High power deep red ceramic LED with 660nm peak wavelength
- High PPF and PPE specified at 25°C and 85°C
- Industry standard footprint 3.5mm x 3.5mm

PRIMARY APPLICATIONS

- Horticulture
- Grow lights

c UL us No. E352519 / E507562

RoHS COMPLIANT

Table of Contents

General Product Information

Product Test Conditions

LUXEON SunPlus HPE LEDs are tested and binned with a DC drive current of 700mA, at a junction temperature, T_j , of 85°C.

Part Number Nomenclature

Part numbers for LUXEON SunPlus HPE follow the convention below:

L 1 S P – **A A A** 0 2 0 3 E 0 0 0 0 0

Where:

A A A – designates color (DRD=Deep Red)

Therefore, the following part number is used for a LUXEON SunPlus HPE Deep Red LED:

L 1 S P – **D R D** 0 2 0 3 E 0 0 0 0 0

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON SunPlus HPE 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 of LUXEON SunPlus HPE at 700mA.

COLOR	PEAK WAVELENGTH (nm)		PPF (µmol/s) [1] in PAR (400 to 700nm) [2]			PPF/W (µmol/J)		PART NUMBER
	MINIMUM	MAXIMUM	MINIMUM	TYPICAL at T_J=85ºC	TYPICAL at T_J=25ºC	TYPICAL at T_J=85ºC	TYPICAL at T_J=25ºC	
Deep Red	655	680	4.5	5.25	5.82	3.75	4.01	L1SP-DRD0203E00000

Notes for Table 1:
1. Lumileds maintains a tolerance of ±6.5% on µmol/s for LUXEON SunPlus HPE.
2. PAR is the photosynthetic active radiation from 400 to 700nm.

Optical Characteristics

Table 2. Optical characteristics for LUXEON SunPlus HPE at 700mA, T_j=85°C.

PART NUMBER	TYPICAL SPECTRAL HALF-WIDTH [1] (nm)	TYPICAL TEMPERATURE COEFFICIENT OF PEAK WAVELENGTH (nm/°C)	TYPICAL TOTAL INCLUDED ANGLE [2]	TYPICAL VIEWING ANGLE [3]
L1SP-DRD0203E00000	20	0.16	142º	126º

Notes for Table 2:
1. Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
2. Total angle at which 90% of the total luminous flux is captured.
3. Viewing angle is the off axis angle from the LED centerline where the luminous intensity is ½ of the peak value.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON SunPlus HPE at 700mA.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)				TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE [2] (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	TYPICAL at T_J=85ºC	TYPICAL at T_J=25ºC	MAXIMUM		
L1SP-DRD0203E00000	1.70	2.00	2.07	2.30	-1.7	2.61

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Measured between 25°C and 110°C.

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON SunPlus HPE.

PARAMETER	DEEP RED
DC Forward Current [1, 2]	1.4A
Peak Pulsed Forward Current [1, 3]	2.0A
LED Junction Temperature [1] (DC & Pulse)	150°C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 3B
Operating Case Temperature [1]	-40°C to 135°C
LED Storage Temperature	-40°C to 135°C
Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Reverse Voltage [4] ($V_{reverse}$)	LUXEON LEDs are not designed to be driven in reverse bias

Notes for Table 4:
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," with frequencies ≥100Hz and amplitude of ≤15% of the maximum allowable DC forward current are acceptable, assuming the average current throughout each cycle does not exceed the maximum allowable DC forward current at the corresponding maximum junction temperature.
3. Pulsed operation with a peak drive current equal to the stated peak pulsed forward current is acceptable if the pulse-on time is ≤5ms per cycle and the duty cycle is ≤50%.
4. Transient reverse voltages and surge currents due to electrical switching or supply interruptions are acceptable if these events do not last for more than 10ms, the amplitude of the reverse voltage does not exceed 5V and the reverse current is less than 220uA.

Characteristic Curves

Spectral Power Distribution Characteristics

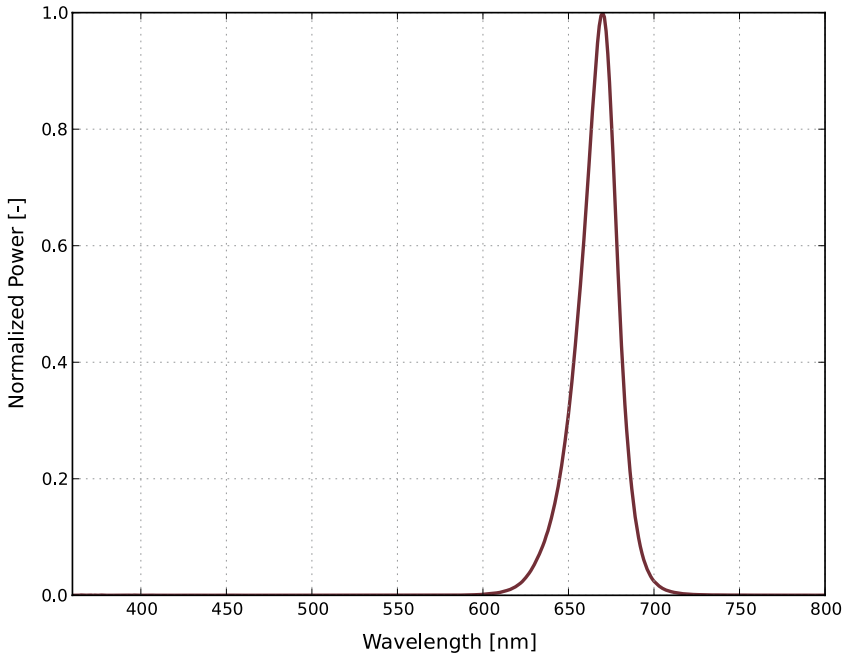


Figure 1. Typical normalized power vs. wavelength for LUXEON SunPlus HPE at 700mA, T_j=85°C.

Light Output Characteristics

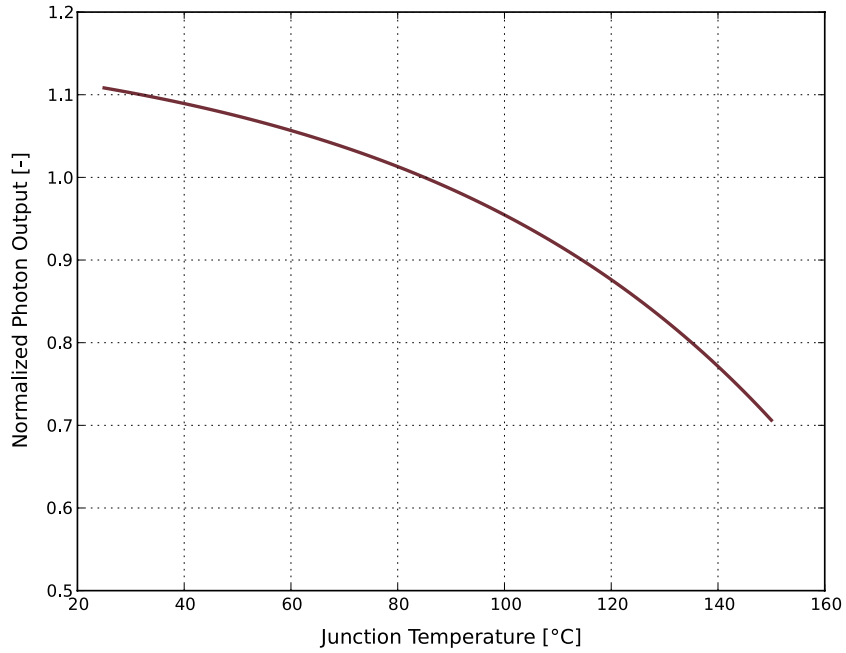


Figure 2. Typical normalized photon output vs. junction temperature for LUXEON SunPlus HPE at 700mA.

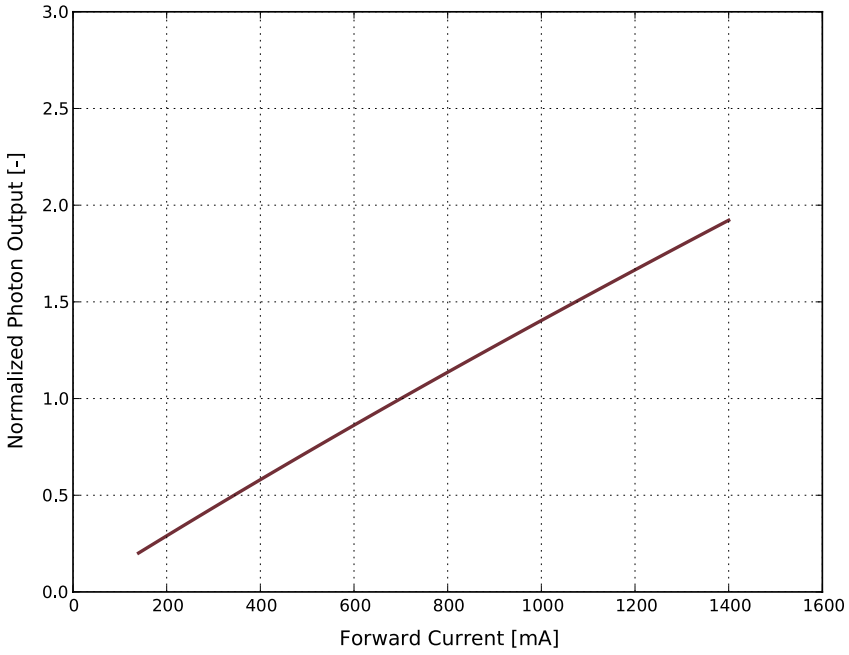


Figure 3. Typical normalized photon output vs. forward current for LUXEON SunPlus HPE at 700mA, T_j=85°C.

Forward Current Characteristics

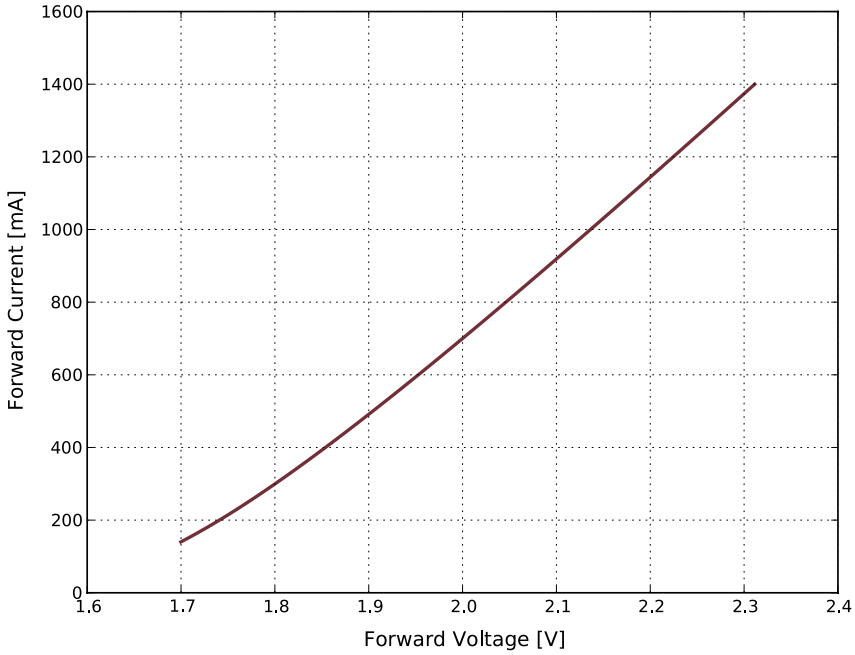


Figure 4. Typical forward current vs. forward voltage for LUXEON SunPlus HPE at T_j=85°C.

Radiation Pattern Characteristics

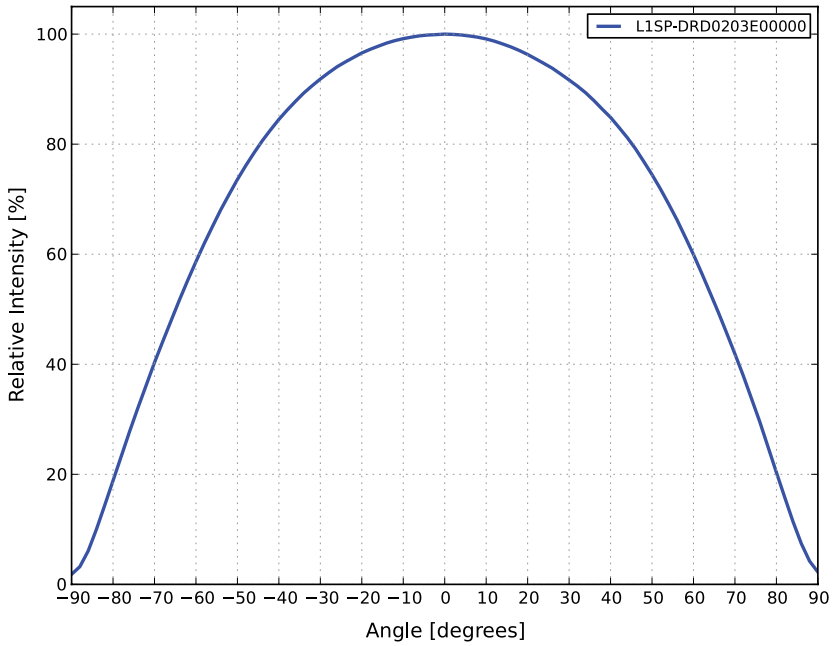


Figure 5. Typical radiation pattern for LUXEON SunPlus HPE at 700mA, T_j=85°C.

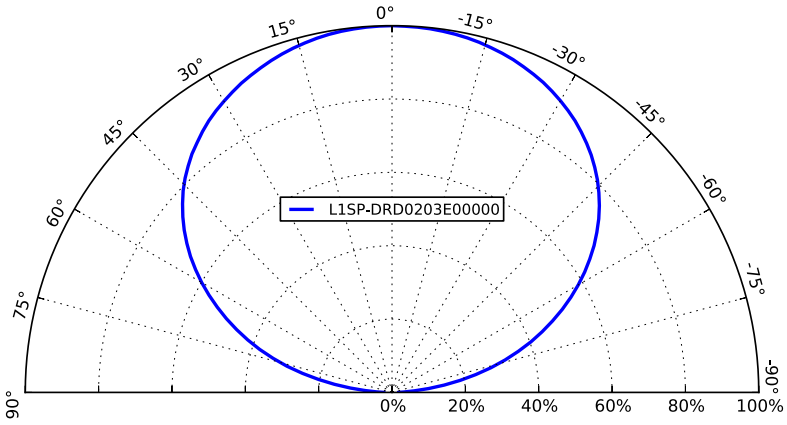


Figure 6. Typical polar radiation pattern for LUXEON SunPlus HPE at 700mA, T_j=85°C.

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 LED components for luminous flux or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON SunPlus HPE LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

A B B C

Where:

- **A** – designates PPF bin (example: E=4.8 to 5.0 µmol/s, F=5.0 to 5.2 µmol/s, G=5.2 to 5.4 µmol/s)
- **B** – designates peak wavelength bin (example: 10=655 to 680nm)
- **C** – designates forward voltage bin (example: A=1.7 to 1.9V, B=1.9 to 2.1V)

Therefore, a LUXEON SunPlus HPE Deep Red with a PPF range of 5.2 to 5.4 µmol/s, peak wavelength of 655 to 680nm and a forward voltage range of 1.9 to 2.1V has the following CAT code:

G 1 0 B

PPF Bins

Table 5 lists the standard PPF bins for LUXEON SunPlus HPE. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 5. PPF bin definitions for LUXEON SunPlus HPE.

BIN	PPF [1] (µmol/s)	
	MINIMUM	MAXIMUM
C	4.4	4.6
D	4.6	4.8
E	4.8	5.0
F	5.0	5.2
G	5.2	5.4
H	5.4	5.6
J	5.6	5.8

Notes for Table 5:
1. Lumileds maintains a tolerance of ±6.5% on µmol/s measurements.

Peak Wavelength Bins

Table 6. Peak wavelength bins for LUXEON SunPlus HPE at specified test conditions.

PRODUCT	COLOR	BIN	PEAK WAVELENGTH [1] (nm)	
			MINIMUM	MAXIMUM
LUXEON SunPlus HPE	Deep Red	10	655	680

Notes for Table 6:
1. Lumileds maintains a tolerance of ±2.0nm on peak wavelength measurements.

Forward Voltage Bins

Table 7. Forward voltage bin definitions for LUXEON SunPlus HPE.

BIN	FORWARD VOLTAGE [1] (V_f)	
	MINIMUM	MAXIMUM
A	1.7	1.9
B	1.9	2.1
C	2.1	2.3

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements for LUXEON SunPlus HPE.

Mechanical Dimensions

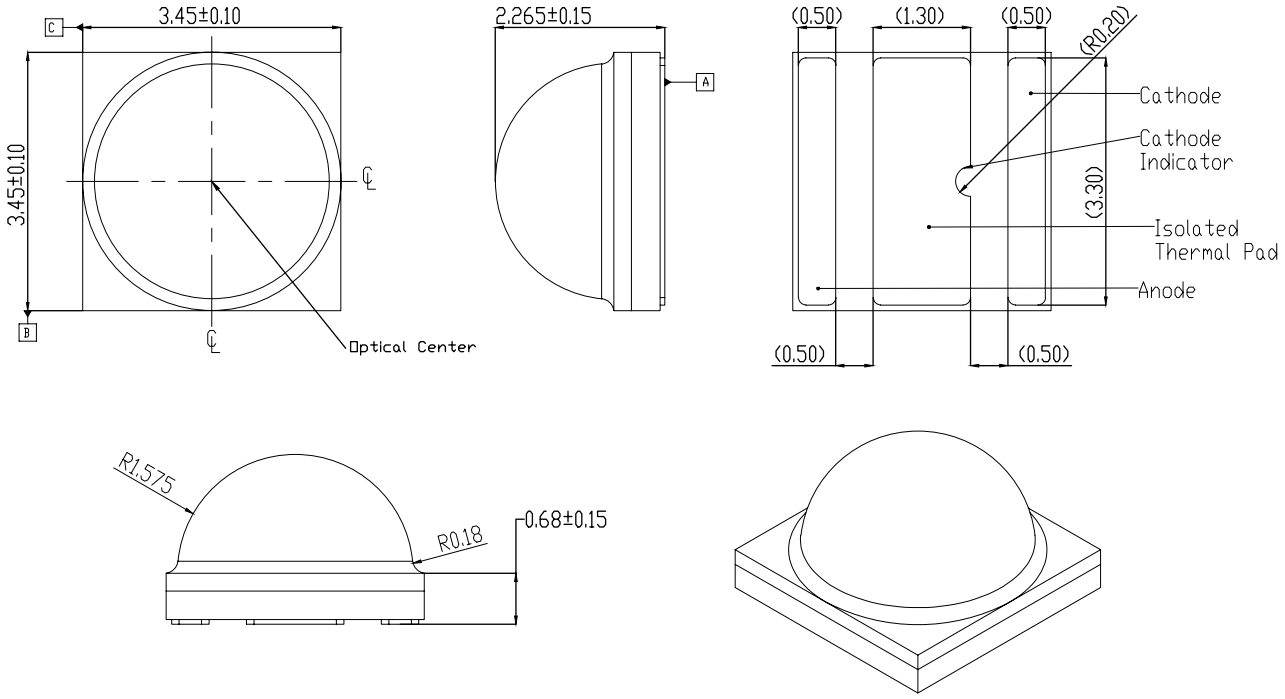


Figure 7. Mechanical dimensions for LUXEON SunPlus HPE.

Notes for Figure 7:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Do not handle the device by the dome. Excessive force on the dome may damage the dome itself or the interior of the device.

Reflow Soldering Guidelines

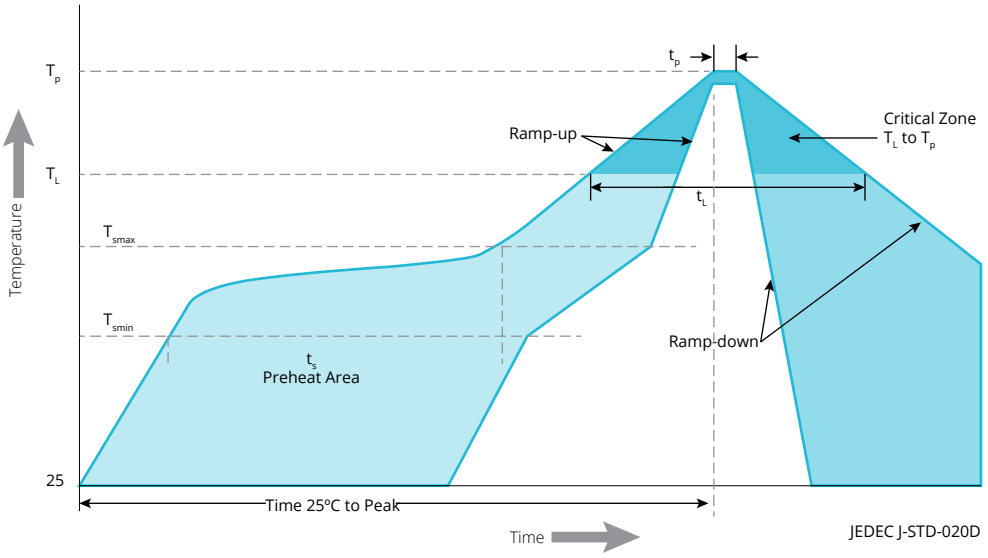


Figure 8. Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON SunPlus HPE.

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})	60 to 180 seconds
Ramp-Up Rate (T_L to T_p)	3°C / second maximum
Liquidus Temperature (T_L)	217°C
Time Maintained Above Temperature T_L (t_L)	60 to 150 seconds
Peak / Classification Temperature (T_p)	260°C
Time Within 5°C of Actual Temperature (t_p)	20 to 40 seconds
Ramp-Down Rate (T_p to T_L)	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

Notes for Table 8:
1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

JEDEC Moisture Sensitivity

Table 9. Moisture sensitivity levels for LUXEON SunPlus HPE.

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS STANDARD	
	TIME	CONDITIONS	TIME	CONDITIONS
1	Unlimited	≤30°C / 85% RH	168 Hours +5 / -0	85°C / 85% RH

Solder Pad Design

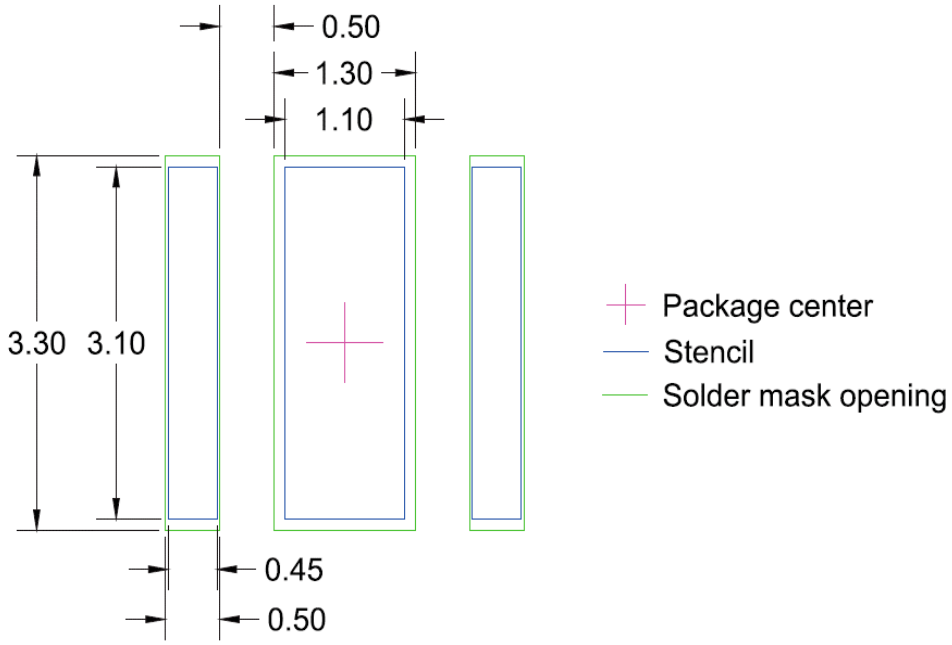


Figure 9. Recommended PCB solder pad layout for LUXEON SunPlus HPE.

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging Information

Pocket Tape Dimensions

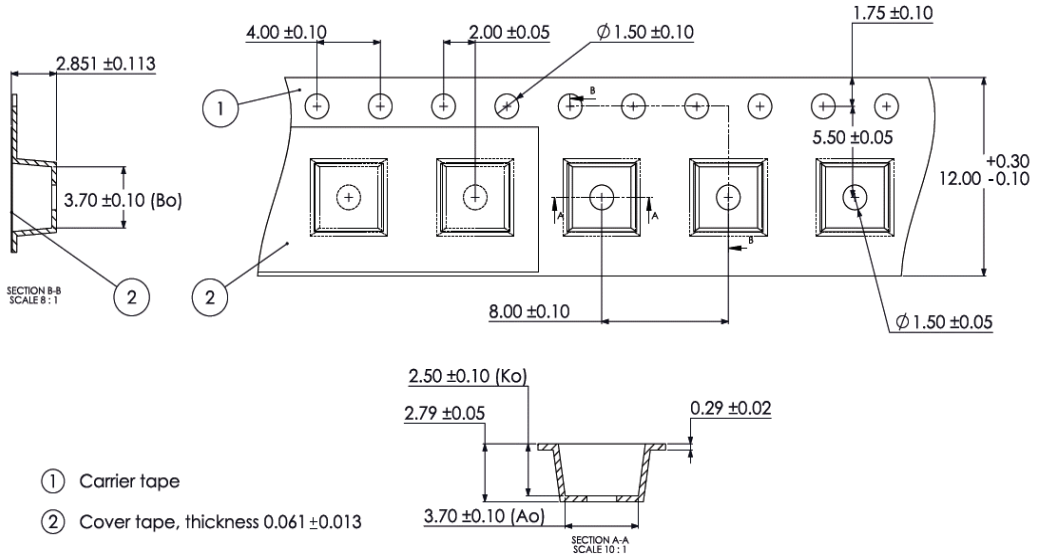


Figure 10. Pocket tape dimensions for LUXEON SunPlus HPE.

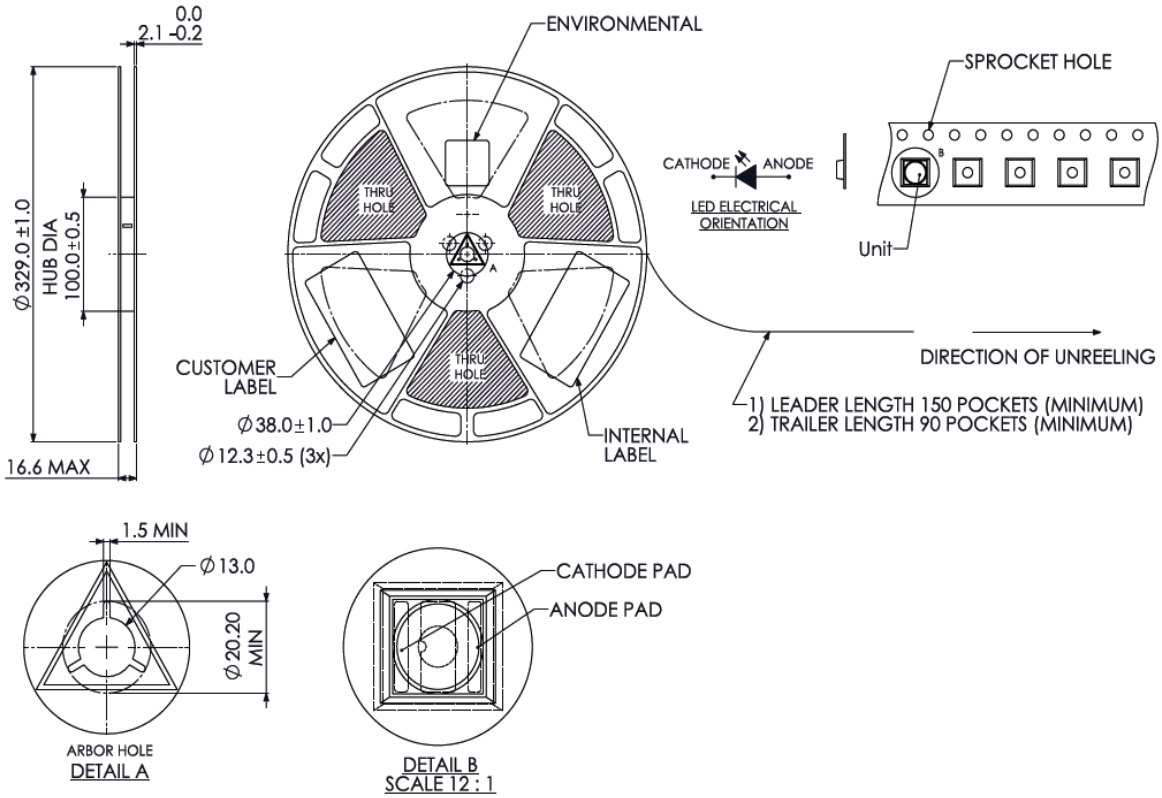


Figure 11. Reel dimensions for LUXEON SunPlus HPE.

Notes for Figures 10 and 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. 1,000 pieces per reel.

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.