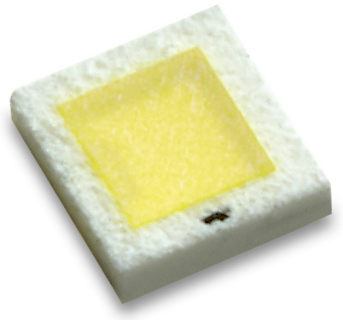
LUMILEDS

AUTOMOTIVE

LUXEON Neo 0.5mm²

Industry-leading solutions for matrix head-lighting

LUXEON Neo LEDs, with their miniaturized form factor and low mechanical tolerances, are the ideal LED components for matrix head-lighting. All LUXEON Neo LEDs are hot binned at 85°C and IEC 60810 qualified.



FEATURES AND BENEFITS

- Higher drive current capability for increased flux performance
- Low thermal resistance for better hot lumen performance
- Miniaturized package for dense population of boards
- Hot binned at 85°C monopulse (MP) to match closer to operating conditions
- IEC/PAS 62707-1 White LED

PRIMARY APPLICATIONS

- Adaptive Lighting
  - AFS
- Headlight
  - Low Beam
  - High Beam

Table of Contents

General Information

Product Test Conditions

LUXEON Neo 0.5mm² LEDs are tested and binned using a 20ms monopulse (MP) at 500mA drive current, case temperature, T_C, of 85°C.

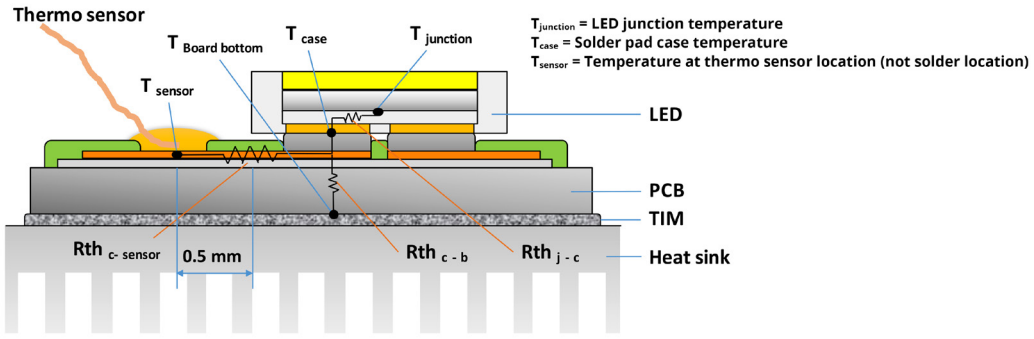


Figure 1. Example of case temperature location on sample board for LUXEON Neo 0.5mm².

Part Number Nomenclature

Part numbers for LUXEON Neo 0.5mm² follow the convention below:

A 1 N 1 – **B B B B** C D E **F G G G G H**

Where:

A 1	–	designates Automotive LED
N 1	–	designates LUXEON Neo product family, second revision
B B B B	–	designates color temperature
C	–	designates die size (0=0.5mm²)
D	–	designates binning current (B=500mA)
E	–	designates binning condition (H=85°C)
F	–	designates options for detailed product specification (default 0)
G G G G	–	designates minimum luminous flux or custom part number
H	–	designates options for detailed product specification (default 0)

Therefore, the following part number is used for a LUXEON Neo 0.5mm² with a minimum luminous flux of 125 lumens, hot binned at 500mA:

A 1 N 1 – **5 8 5 0** 0 B H 0 **0 1 2 5** 0

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Neo 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 selection for LUXEON Neo 0.5mm² at 20ms MP, 500mA, T_C=85°C.

MINIMUM LUMINOUS FLUX [1] (lm)	TEST CURRENT (mA)	PART NUMBER
125	500	A1N1-58500BH001250
130	500	A1N1-58500BH001300
135	500	A1N1-58500BH001350
140	500	A1N1-58500BH001400
145	500	A1N1-58500BH001450
150	500	A1N1-58500BH001500
155	500	A1N1-58500BH001550
160	500	A1N1-58500BH001600
165	500	A1N1-58500BH001650

Notes for Table 1:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON Neo 0.5mm² at 20ms MP, 500mA, T_C=85°C.

PART NUMBER	CORRELATED COLOR TEMPERATURE		TOTAL INCLUDED ANGLE [1] $\theta_{0.90V}$	VIEWING ANGLE [2] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
A1N1-58500BHxxxxxx	5500K	6250K	148°	128°

Notes for Table 2:
1. Total angle at which 90% of total luminous flux is captured.
2. 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 Characteristics for LUXEON Neo 0.5mm² at 20ms MP, 500mA, T_C=85°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)		DYNAMIC RESISTANCE [2] (Ω) R_D	THERMAL RESISTANCE— JUNCTION TO CASE (K/W)			
				$R\theta_{j\text{-}c}$ el [3, 5]		$R\theta_{j\text{-}c}$ real [4, 5]	
	MINIMUM	MAXIMUM		TYPICAL	MAXIMUM [5]	TYPICAL	MAXIMUM [5]
A1N1-58500BHxxxxxx	2.55	3.51	0.3	4.0	5.0	5.5	6.9

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Dynamic resistance is the inverse of the slope in linear forward voltage model for LEDs. See forward voltage vs. forward current (Figure 4).
3. $R\theta_{j\text{-}c}$ el: Electrical thermal resistance (junction to case).
4. $R\theta_{j\text{-}c}$ real: Real thermal resistance (junction to case) with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.
5. Calculated values (5s).

Absolute Ratings

Table 4. Absolute ratings for LUXEON Neo 0.5mm².

PARAMETER	PERFORMANCE
Minimum DC Forward Current	25mA
Maximum DC Forward Current	750mA
Maximum Junction Temperature [1]	150°C
Operating Case Temperature at Test Current [1]	-40°C to 125°C
Operating Case Temperature at Maximum Current [1]	-40°C to 125°C
LED Storage Temperature	-40°C to 130°C
Soldering Temperature	260°C
Allowable Reflow Cycles	3
ESD Sensitivity [2]	±2 kV HBM, ±200V MM, ±500 CDM
Reverse Voltage ($V_{reverse}$)	LUXEON LEDs are not designed to be driven in reverse bias
Autoclave Conditions	121°C at 2 ATM 100% Relative Humidity for 96 Hours Maximum

Notes for Table 4:
1. Proper current derating must be used to maintain junction temperature below the maximum. LUXEON Neo LEDs driven at or above maximum LED case temperature may have shorter lifetime.
2. Measured using human body model (per JESD22 A114), machine model (per JESD22 A115) and charged device model (per JESD22 C101).

JEDEC Moisture Sensitivity

Table 5. Moisture sensitivity levels for LUXEON Neo 0.5mm².

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

Characteristic Curves

Spectral Power Distribution Characteristics

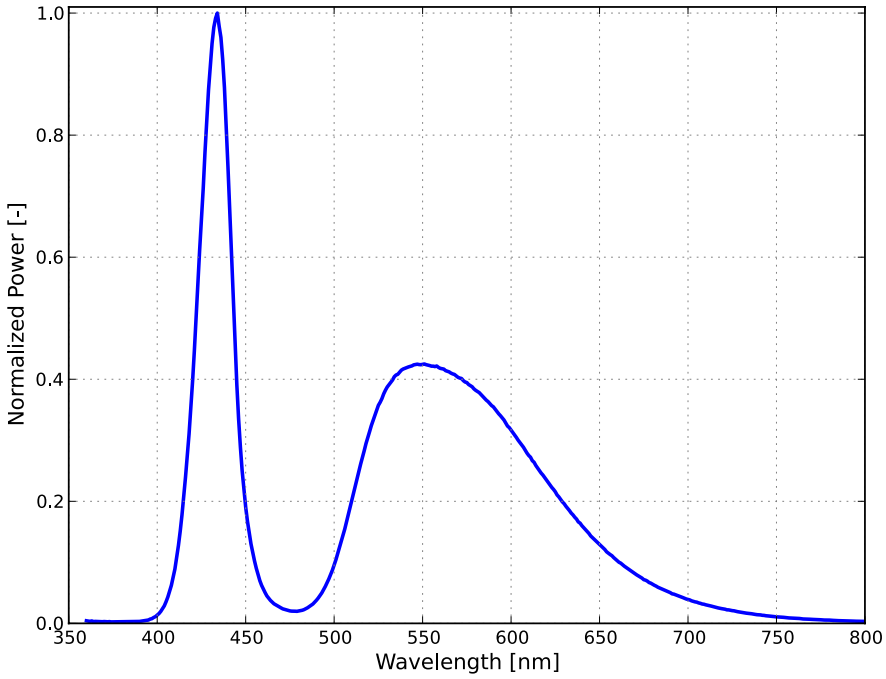


Figure 2. Typical normalized power vs. wavelength for LUXEON Neo 0.5mm² at 20ms MP, 500mA, T_C=85°C.

Light Output Characteristics

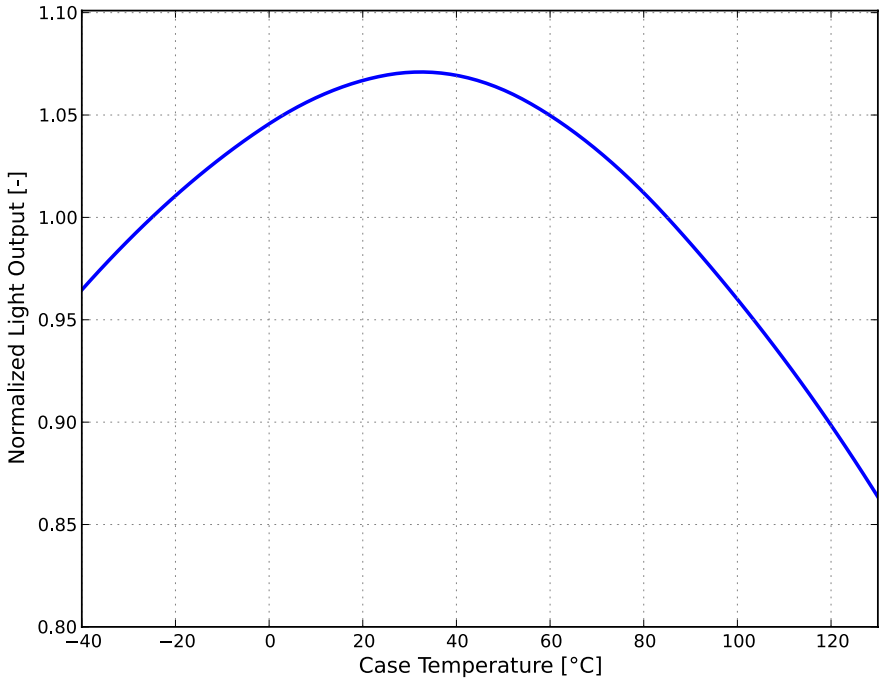


Figure 3a. Typical normalized light output vs. case temperature for LUXEON Neo 0.5mm² at 20ms MP, 500mA.

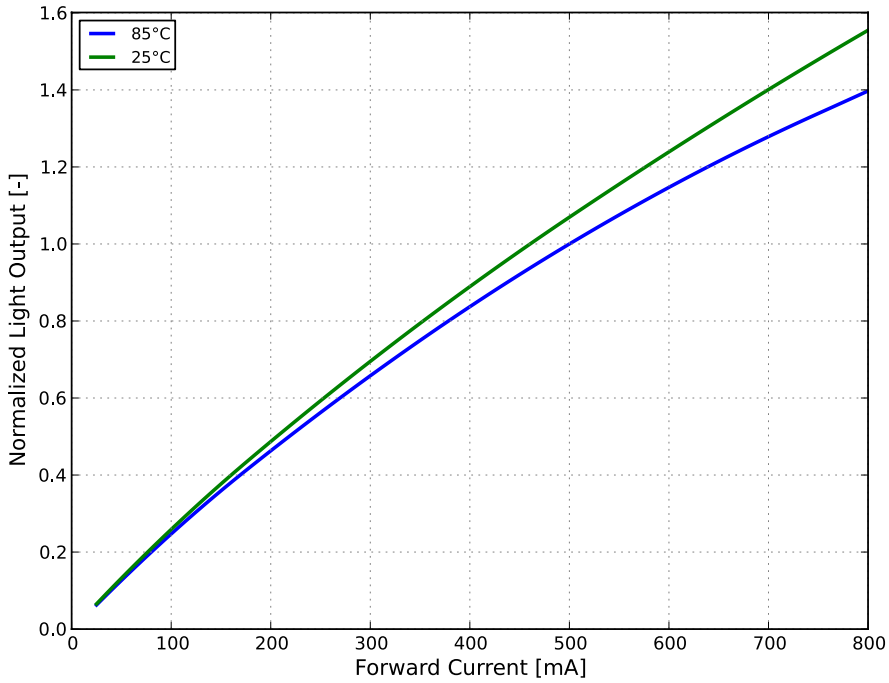


Figure 3b. Typical normalized light output vs. forward current for LUXEON Neo 0.5mm² at T_C=85°C.

Forward Current and Forward Voltage Characteristics

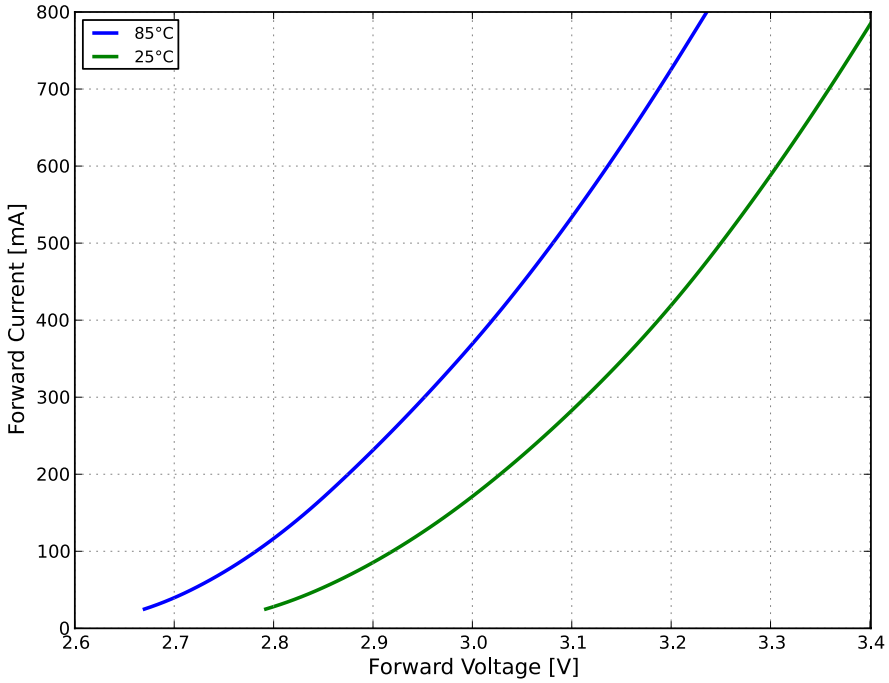


Figure 4a. Typical forward current vs. forward voltage for LUXEON Neo 0.5mm² at T_C=85°C.

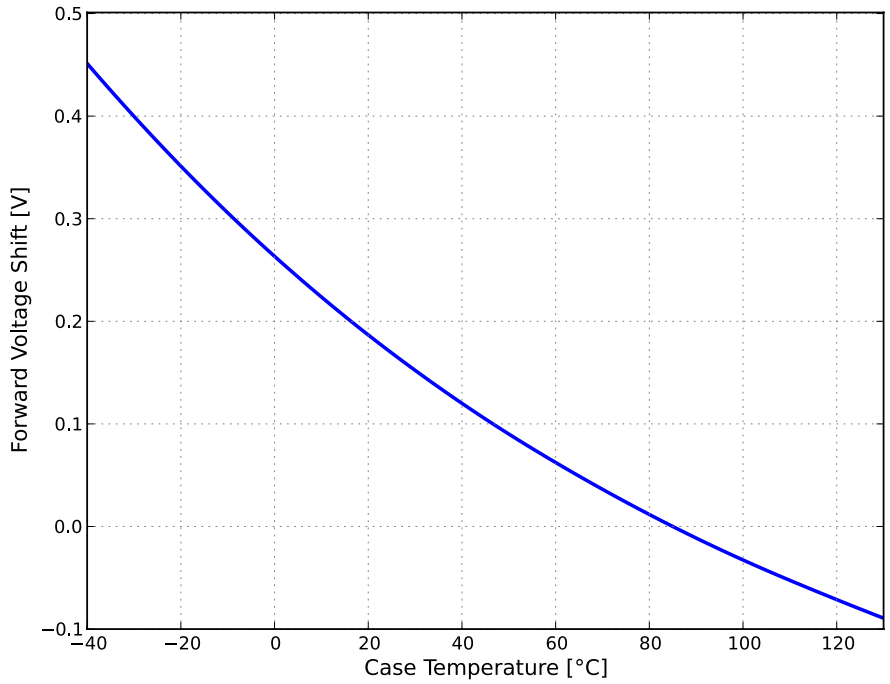


Figure 4b. Typical forward voltage shift vs. case temperature for LUXEON Neo 0.5mm².

Color Shift Characteristics

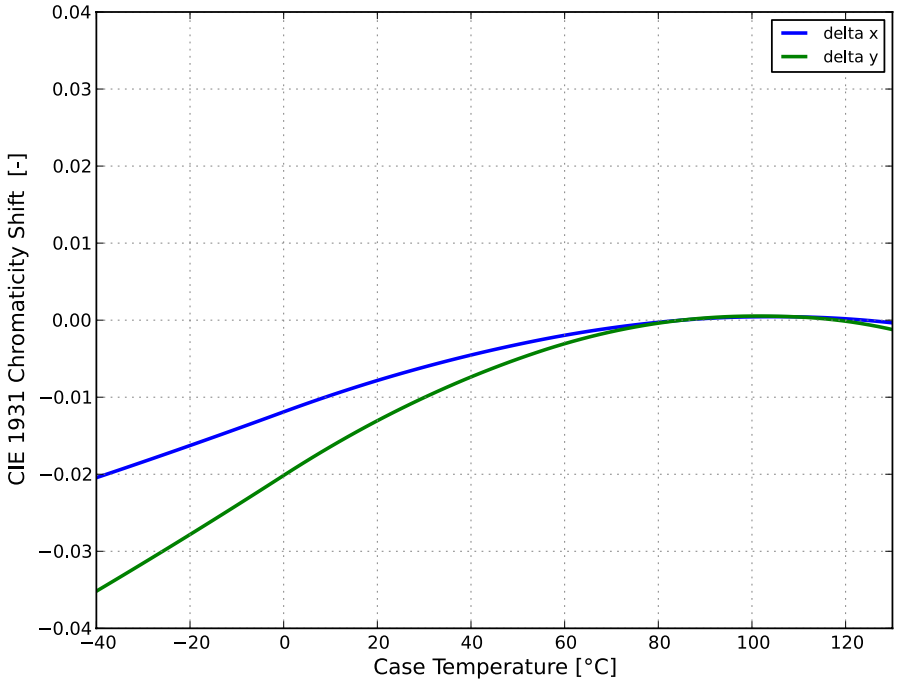


Figure 5a. Typical color shift in CIE 1931 x, y coordinates vs. case temperature for LUXEON Neo 0.5mm² at 20ms MP, 500mA.

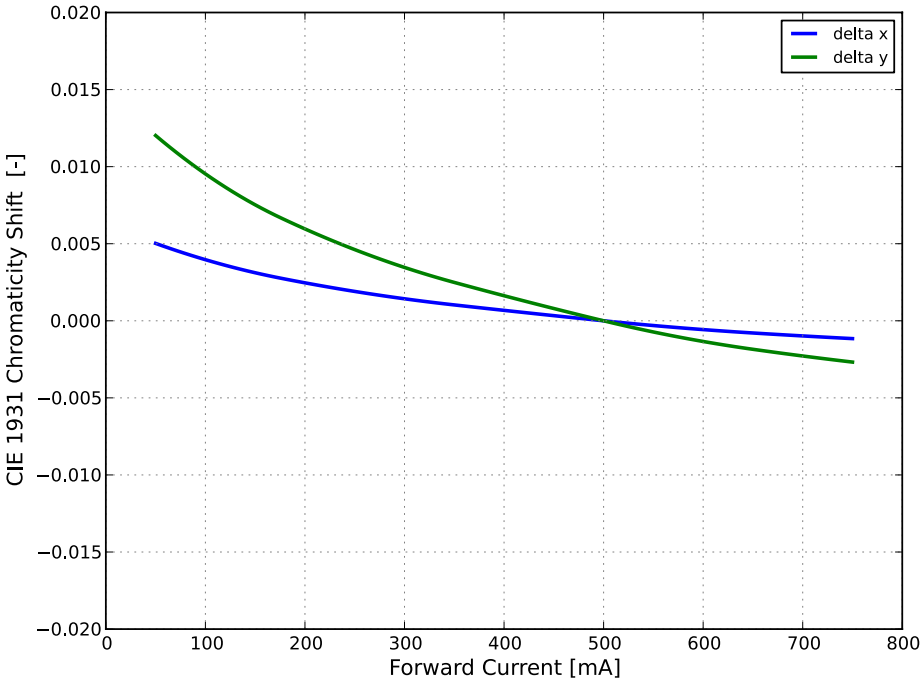


Figure 5b. Typical color shift in CIE 1931 x, y coordinates vs. forward current for LUXEON Neo 0.5mm² at 20ms MP, T_c=85°C.

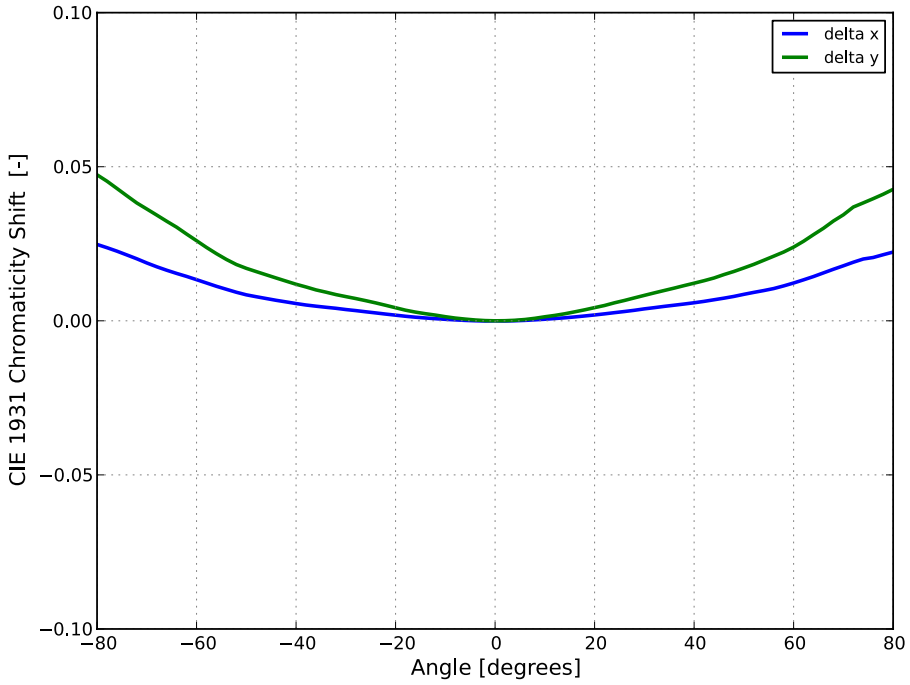


Figure 5c. Typical color shift in CIE 1931 x, y coordinates vs. angle for LUXEON Neo 0.5mm² at 20ms MP, 500mA.

Radiation Pattern Characteristics

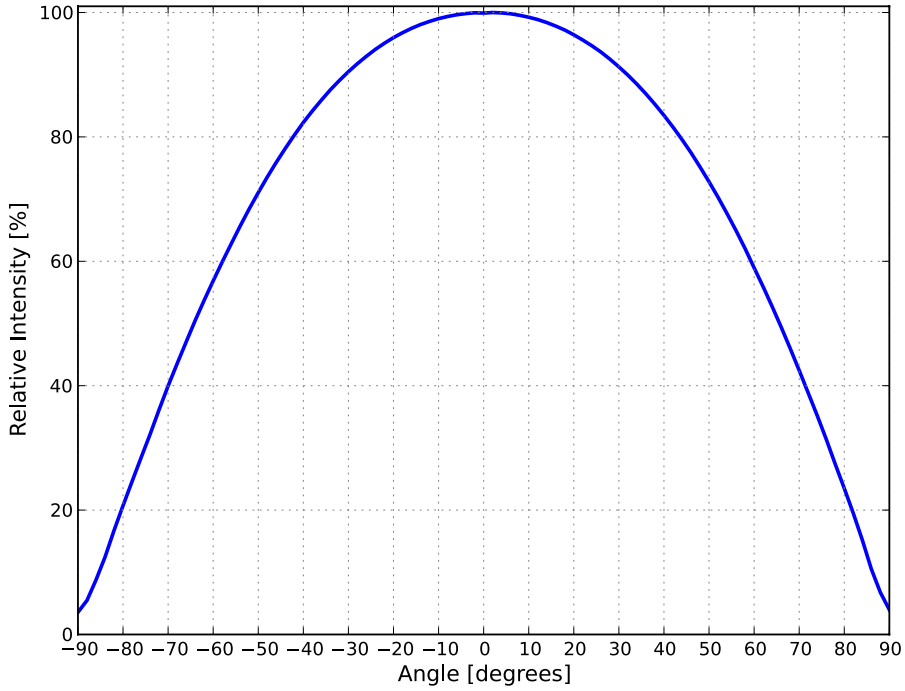


Figure 6. Typical radiation pattern for LUXEON Neo 0.5mm² at 20ms MP, 500mA, T_C=85°C.

Operating Limits Characteristics

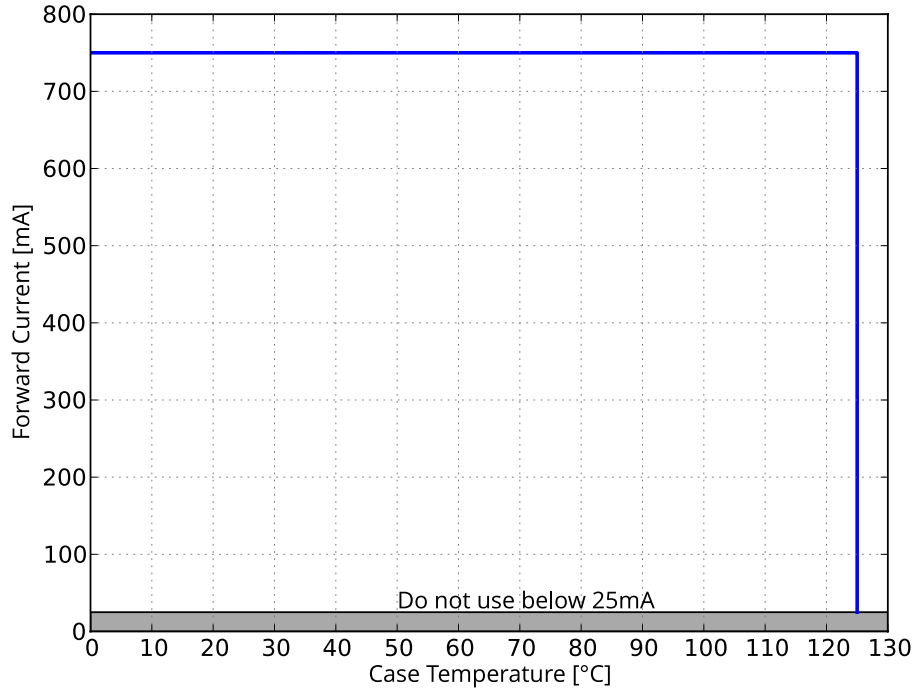


Figure 7. Maximum forward current vs. case temperature for LUXEON Neo 0.5mm².

Permissible Pulse Handling Characteristics

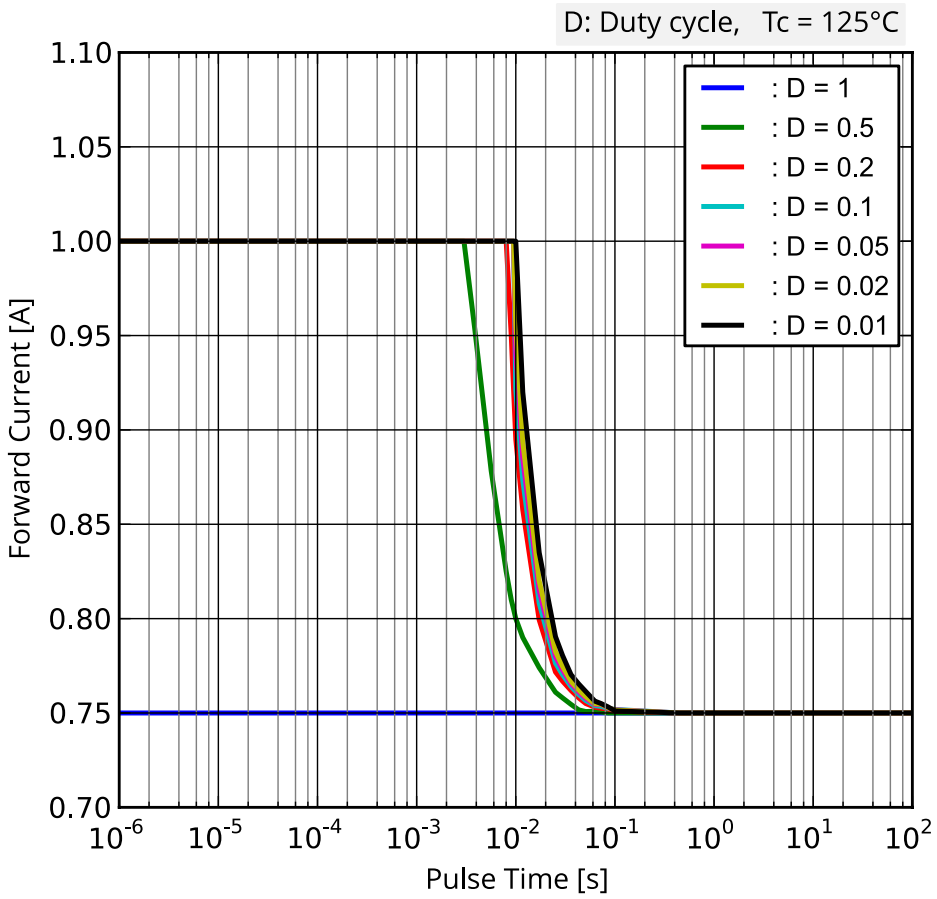


Figure 8. Permissible pulse handling capability for LUXEON Neo 0.5mm².

Product Bin and Labeling Definitions

Designing with LUXEON Neo 0.5mm^2

Flux bins supportable for car programs depend on product color and program start- and end-of-production date. Flux roadmaps by year and product color are maintained and available from the sales representative. Please contact a local sales representative to request the flux bin range with best supportability for program timing.

Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheets. For this reason, Lumileds bins the LED components for luminous flux, color and forward voltage.

LUXEON Neo 0.5mm^2 LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

A B C D

Where:

A – designates luminous flux bin (example: F=140 to 145 lumens)

B C – designates color bin (example: 1D, 2C, 3B, 4A)

D – designates forward voltage bin (example: B=2.55 to 2.79V)

Therefore, a LUXEON Neo 0.5mm^2 with a lumen range of 140 to 145, color bin of 1D, and a forward voltage range of 2.55 to 2.79V has the following CAT code:

F 1 D B

Luminous Flux Bins

Table 6. Luminous flux bins for LUXEON Neo 0.5mm^2 at 20ms MP, 500mA, T_c=85°C.

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
C	125	130
D	130	135
E	135	140
F	140	145
G	145	150
H	150	155
J	155	160
K	160	165
L	165	170

Notes for Table 6:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.

Color Codes

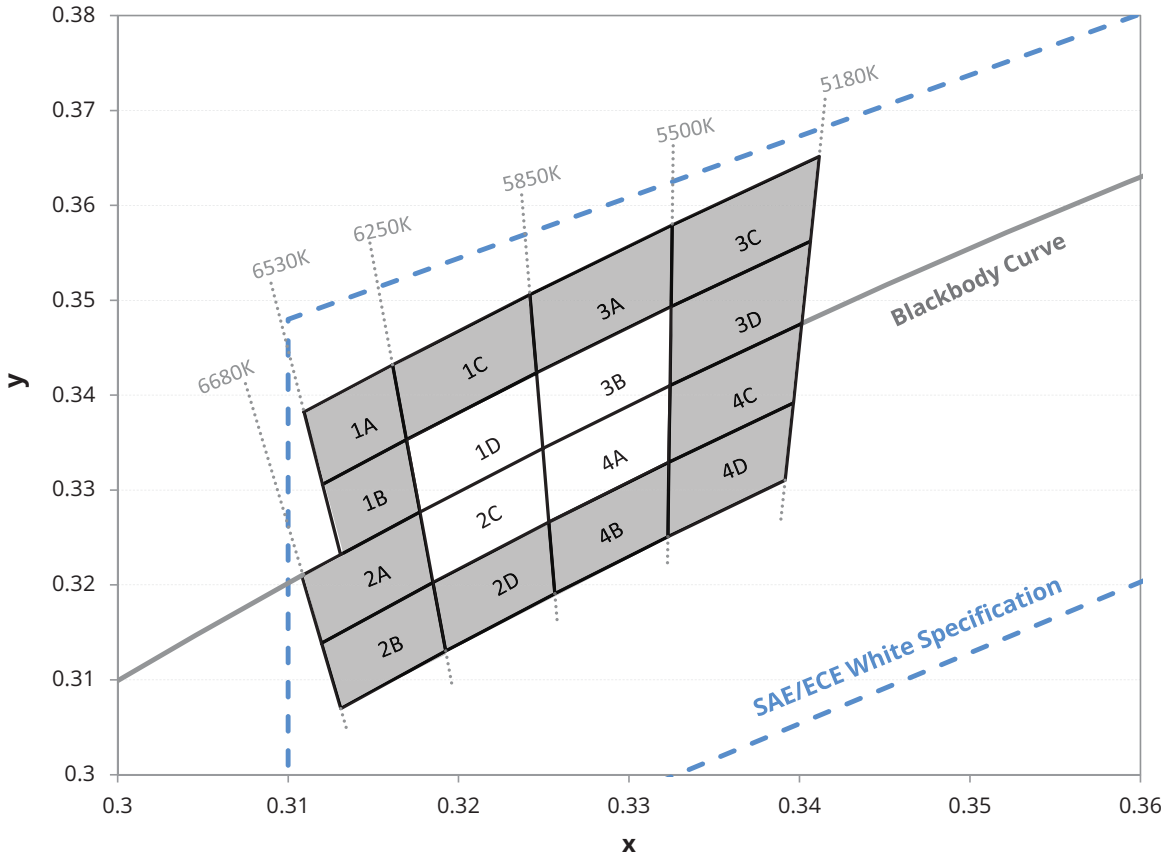


Figure 9. Color bin structure in CIE 1931 color space for LUXEON Neo 0.5mm².

Notes for Figure 9:
1. Lumileds supports the following bins for LUXEON Neo 0.5mm²: 1D, 2C, 3B and 4A.
2. LUXEON Neo color bins must be ordered by fine bin designators, shown below.
   H1 = 1A, 1B, 1C, 1D
   H2 = 2A, 2B, 2C, 2D
   H3 = 3A, 3B, 3C, 3D
   H4 = 4A, 4B, 4C, 4D
   HC = 1D, 2C, 3B, 4A

Color Bin Definitions

Table 7. Color bin definitions for LUXEON Neo 0.5mm²

BIN	x	y	6-DIGIT IEC CODE	TYPICAL CCT	BIN	x	y	6-DIGIT IEC CODE	TYPICAL CCT
2B	0.3120	0.3139	ebvG33	6460K	1B	0.3120	0.3306	fbwA23	6390K
	0.3185	0.3203				0.3169	0.3353		
	0.3192	0.3131				0.3177	0.3277		
	0.3131	0.3070				0.3131	0.3232		
2D	0.3185	0.3203	ebyG33	6050K	1D	0.3169	0.3353	fbyA33	6050K
	0.3253	0.3266				0.3246	0.3424		
	0.3256	0.3191				0.3249	0.3344		
	0.3192	0.3131				0.3177	0.3277		
4B	0.3253	0.3266	ecbG33	5680K	3B	0.3246	0.3424	fcbA33	5680K
	0.3323	0.3329				0.3325	0.3493		
	0.3323	0.3251				0.3324	0.3410		
	0.3256	0.3191				0.3249	0.3344		
4D	0.3323	0.3329	eceG33	5350K	3D	0.3325	0.3493	fceA33	5350K
	0.3396	0.3392				0.3406	0.3562		
	0.3392	0.3310				0.3401	0.3476		
	0.3323	0.3251				0.3324	0.3410		
2A	0.3109	0.3211	ebvD33	6460K	1A	0.3109	0.3382	fbwD23	6390K
	0.3177	0.3277				0.3161	0.3432		
	0.3185	0.3203				0.3169	0.3353		
	0.3120	0.3139				0.3120	0.3306		
2C	0.3177	0.3277	ebyD33	6050K	1C	0.3161	0.3432	fbyD33	6050K
	0.3249	0.3344				0.3242	0.3506		
	0.3253	0.3266				0.3246	0.3424		
	0.3185	0.3203				0.3169	0.3353		
4A	0.3249	0.3344	ecbD33	5680K	3A	0.3242	0.3506	fcbD33	5680K
	0.3324	0.3410				0.3325	0.3579		
	0.3323	0.3329				0.3325	0.3493		
	0.3253	0.3266				0.3246	0.3424		
4C	0.3324	0.3410	eceD33	5350K	3C	0.3325	0.3579	fceD33	5350K
	0.3401	0.3476				0.3412	0.3652		
	0.3396	0.3392				0.3406	0.3562		
	0.3323	0.3329				0.3325	0.3493		

Notes for Table 7:
1. Lumileds maintains a tester tolerance of ±0.005 on x and y color coordinates.
2. CIE 1931 x and y coordinate frame.

Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON Neo 0.5mm².

BIN	FORWARD VOLTAGE [1] (V_f)	
	MINIMUM	MAXIMUM
B	2.55	2.79
C	2.79	3.03
D	3.03	3.27
E	3.27	3.51

Notes for Table 8:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Mechanical Dimensions

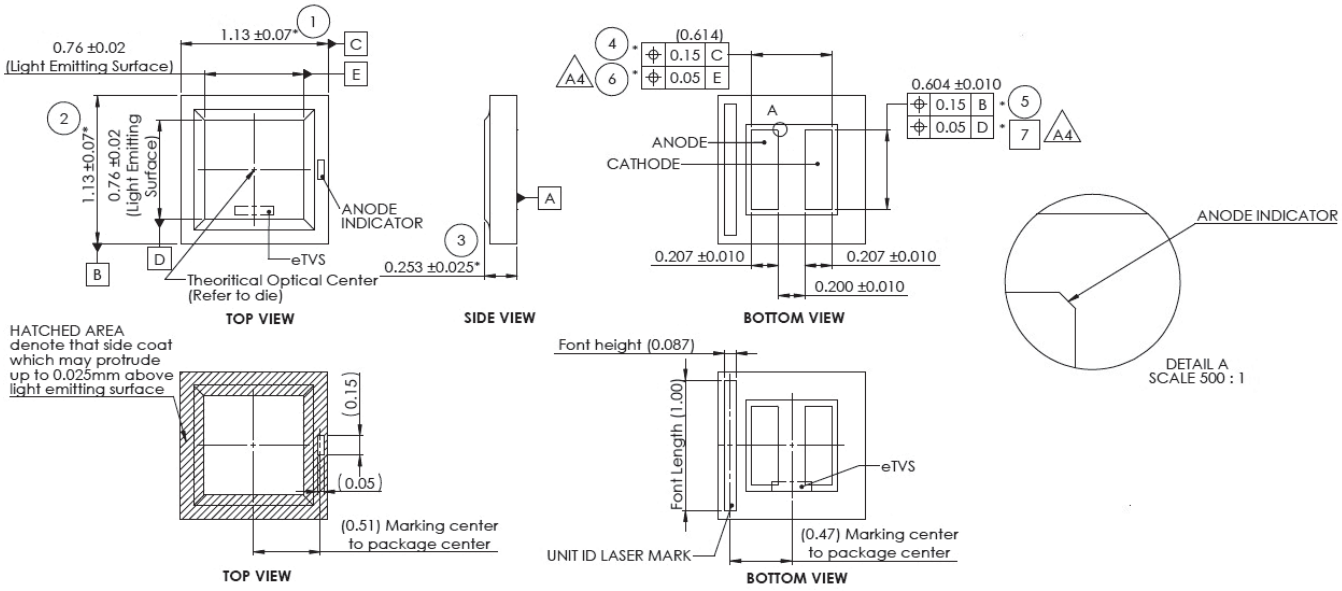


Figure 10. Mechanical dimensions for LUXEON Neo 0.5mm².

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging and Labeling Information

Pocket Tape Dimensions

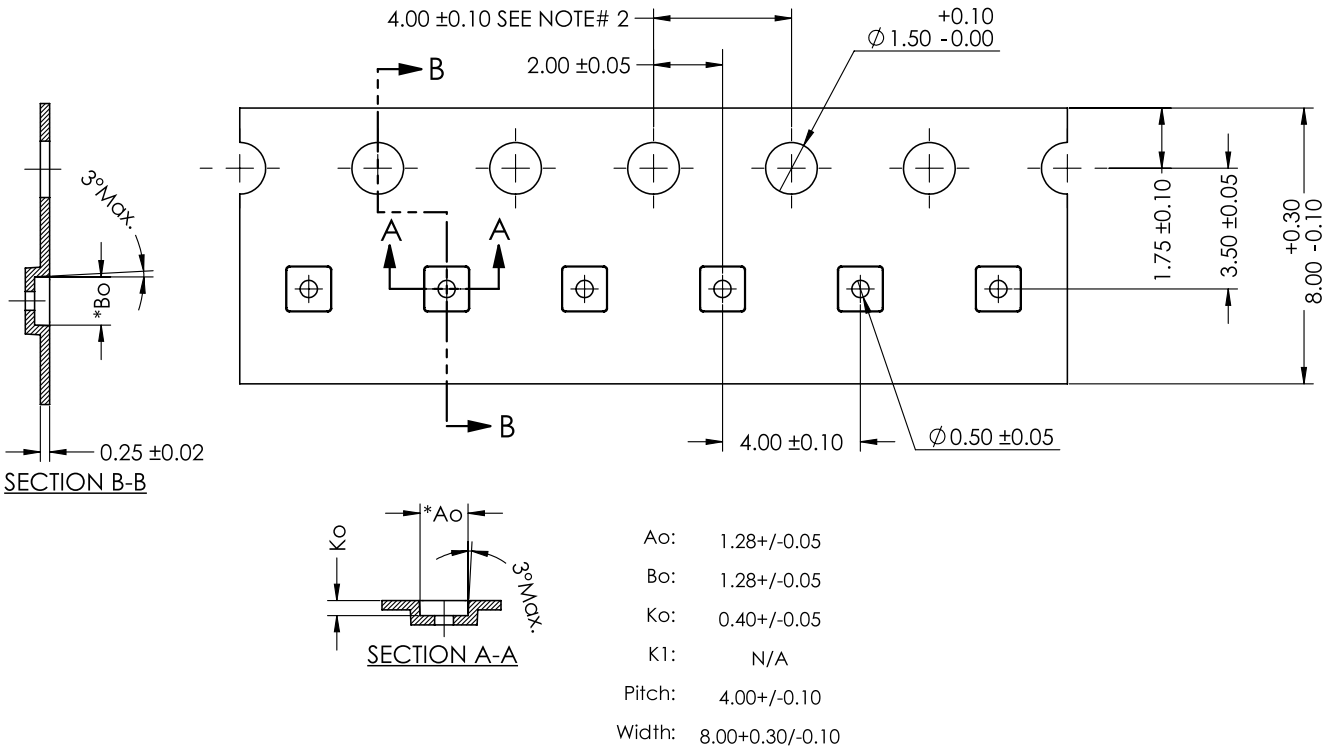


Figure 11. Pocket tape dimensions for LUXEON Neo 0.5mm².

Notes for Figure 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Ao is the length of pocket, Bo is the width of pocket and Ko is the depth of pocket.

Reel Dimensions

PRODUCT RANGE						
GPI P/N	TAPE WIDTH	ØA	ØN	W1	W2 MAX	E
RL081304	08MM	329.2±0.5	100.0±0.5	9.4±0.5	14.4	3.0±0.5

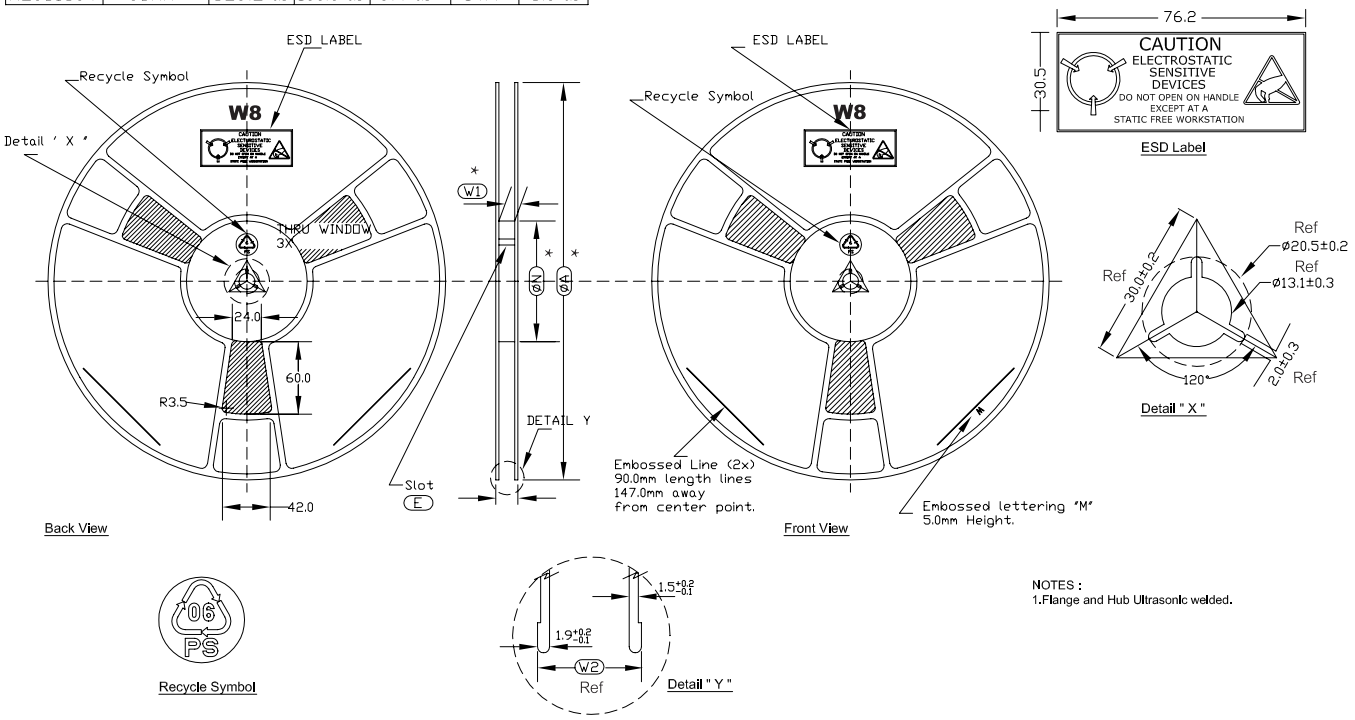


Figure 12. Reel dimensions for LUXEON Neo 0.5mm².

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Product Labeling

Figure 13. Example of a reel label for LUXEON Neo 0.5mm².

Notes for Figure 13 – Reel label descriptions for customer use:
Field labels not described are for Lumileds internal use only.

1. Total number of LED emitters in a shipment box.
2. Lumileds part number
3. Customer part number for custom requests only.
4. LED test date in YYWW format.
5. Unique product lot identification number. This number is required for traceability purposes.
6. Country code of origin of manufacturing of part (e.g. MY for Malaysia, CN for China) according to ISO 3166-1 alpha-2 document.
7. Product bin 4-digit alphanumeric CAT code.

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 safer, better and more beautiful—with light.

To learn more about our lighting solutions, visit lumileds.com.

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