



FOR THE SCOPE OF  
ACCREDITATION UNDER NVLAP LAB  
CODE 100402-0.

# REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100888297

Date: October 10, 2012

REPORT NO. 100888297CRT-002A

TEST OF ONE LED ROADWAY LUMINAIRE

FIXTURE MODEL NO. SL3N5DLGG

LED MODEL NO. CREE XLAMP XTE

RENDERED TO

DIALIGHT CORPORATION  
1501 ROUTE 34 SOUTH  
FARMINGDALE, NJ 08005

TEST: Electrical and Photometric tests as required to the IESNA test standard.

LABORATORY NOTE: The laboratory that conducted the testing detailed in this report has been Qualified, Verified, and Recognized for LM-79 Testing for ENERGY STAR for SSL by US DOE's CALiPER program.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number 500403100.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79: 2008 Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products

ANSI ANSLG C38.377: 2012 Specifications of the Chromaticity of Solid State Lighting Products

Energy Star Version 1.1 (2008): Program Requirements for Solid-State Lighting Luminaires

Energy Star Manufacturer's Guide Version 2.0 (2009): Guide for Qualifying Solid State Lighting Luminaires

DESCRIPTION OF SAMPLE: The client submitted two samples of model number SL3N5DLGG. The samples were received by Intertek on September 11, 2012, in undamaged condition, and both samples were tested as received. The sample designations were 254989 and 254990.

DATES OF TESTS: September 20, 2012 through September 28, 2012

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SUMMARY

Model No.:	SL3N5DLGG
Description:	LED Roadway Luminaire

Criteria	Result
Total Lumen Output	6782 Lumens
Total Power	82.98 W
Luminaire Efficacy	81.73
Power Factor (at 120 Vac)	0.992
Power Factor (at 277 Vac)	0.926
Current ATHD (at 120 Vac)	9.85%
Current ATHD (at 277 Vac)	15.64%
Correlated Color Temperature (CCT)	4284 K
Color Rendering Index (CRI) - Ra	74.6
Color Rendering Index (CRI) - R9	-11.0
Duv	0.004
Chromaticity Coordinate (x)	0.371
Chromaticity Coordinate (y)	0.380
Chromaticity Coordinate (u')	0.218
Chromaticity Coordinate (v')	0.502
Maximum In-Situ Source Temperature Point	54.3°C
Backlight Rating	B 2
Uplight Rating	U 1
Glare Rating	G 2

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Calibration Date	Calibration Due Date
Leeds & Northup Standard Resistor	Manganin	Y089	02/24/12	02/24/13
Data Precision Digital Voltmeter	3600	V124	02/24/12	02/24/13
Fluke Multimeter	45	M133	02/24/12	02/24/13
Kikusui DC Power Supply	35-10L	E160	---	---
Sorenson DC Power Supply	DLM150-20E	---	---	---
NIST Spectral Flux Standard Source	RF1024	---	09/18/10	100 hours of use
LSI High Speed Mirror Goniometer	6440	---	09/10/12	10/10/12
Elgar Power Supply	CW1251	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	04/19/12	04/19/13
Extech Hygro-Thermometer	445703	T1359	10/26/11	10/26/12
Yokogawa Power Analyzer	WT1600	E462	07/06/12	07/06/13
LABSPHERE 3M	W/ CDS 1100	N307	VBU	VBU
Fluke Temperature Meter	53 II	T1318	03/12/12	03/12/13
Extech Hygro-Thermometer	445703	T1366	10/26/11	10/26/12
Fluke Multimeter	87 V	D590	03/23/12	03/23/13
Fluke Temperature Meter	53 II	D587	03/12/12	04/13/13

## TEST METHODS

### Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

### Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

### Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and Two Meter or Ten Foot Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

### In-Situ Maximum Measured Power Supply Case and LED Source Point Temperature

Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source temperature measurements were measured at the  $TMP_{PS}$  or  $T_S$  point as indicated by the included diagram in accordance with manufacturers declared hot spot location, or at a hot spot location found with a thermal camera when no diagram from the manufacturer is given. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598 or UL 153 as applicable.



TEST METHODS (cont'd)

BUG Ratings (Backlight, Uplight, Glare) – for Outdoor Fixtures Only

Zonal Lumens were calculated and grouped using the formula in IESNA TM-15-11 for each zone as defined in the BUG addendum. The maximum lumen rating in each zone was compared against the BUG zonal requirements of Energy Star.

**RATING TABLE: BACKLIGHT**

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

	B0	B1	B2	B3	B4	B5
BH	110	500	1000	2500	5000	>5000
BM	220	1000	2500	5000	8500	>8500
BL	110	500	1000	2500	5000	>5000

**RATING TABLE: UPLIGHT**

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

	U0	U1	U2	U3	U4	U5
UH	0	10	50	500	1000	>1000
UL	0	10	50	500	1000	>1000

**GLARE RATINGS**

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

FOR ASYMMETRICAL LUMINAIRE TYPES (I, II, III, IV)

	G0	G1	G2	G3	G4	G5
FVH	10	100	225	500	750	>750
BVH	10	100	225	500	750	>750
FH	660	1800	5000	7500	12000	>12000
BH	110	500	1000	2500	5000	>5000

FOR QUADRILATERAL SYMMETRICAL LUMINAIRE TYPES (V, VSQUARE)

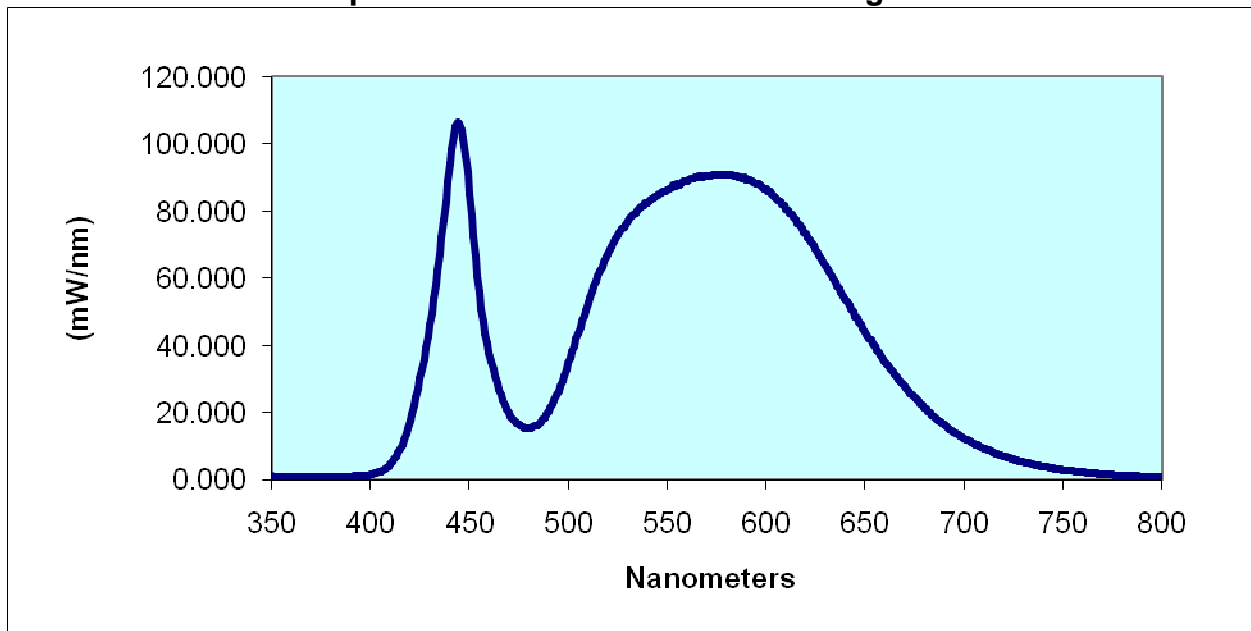
	G0	G1	G2	G3	G4	G5
FVH	10	100	225	500	750	>750
BVH	10	100	225	500	750	>750
FH	660	1800	5000	7500	12000	>12000
BH	660	1800	5000	7500	12000	>12000

**RESULTS OF TESTS**

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	1.129	460	37.798	570	90.405	680	21.429
355	0.960	465	26.917	575	90.695	685	18.787
360	0.862	470	19.964	580	90.782	690	16.426
365	0.961	475	16.337	585	90.568	695	14.317
370	0.852	480	15.512	590	89.347	700	12.419
375	0.817	485	16.647	595	88.229	705	10.817
380	0.830	490	20.387	600	86.542	710	9.390
385	0.934	495	26.389	605	83.898	715	8.155
390	0.961	500	34.683	610	80.646	720	7.134
395	1.163	505	43.640	615	77.322	725	6.121
400	1.531	510	52.791	620	73.159	730	5.330
405	2.504	515	60.619	625	68.587	735	4.594
410	4.653	520	67.323	630	63.582	740	3.982
415	9.260	525	72.824	635	58.794	745	3.474
420	17.514	530	77.234	640	53.920	750	2.982
425	30.168	535	80.082	645	48.688	755	2.654
430	46.398	540	82.505	650	44.053	760	2.324
435	67.203	545	84.807	655	39.820	765	1.991
440	94.191	550	86.349	660	35.365	770	1.718
445	106.111	555	88.025	665	31.475	775	1.508
450	85.262	560	89.038	670	27.760	780	1.331
455	55.688	565	90.047	675	24.416		

**Sample No. 254989**  
**Spectral Data Over Visible Wavelengths**



## RESULTS OF TESTS (cont'd)

### Photometric and Electrical Measurements at 25°C – Integrating Sphere Method

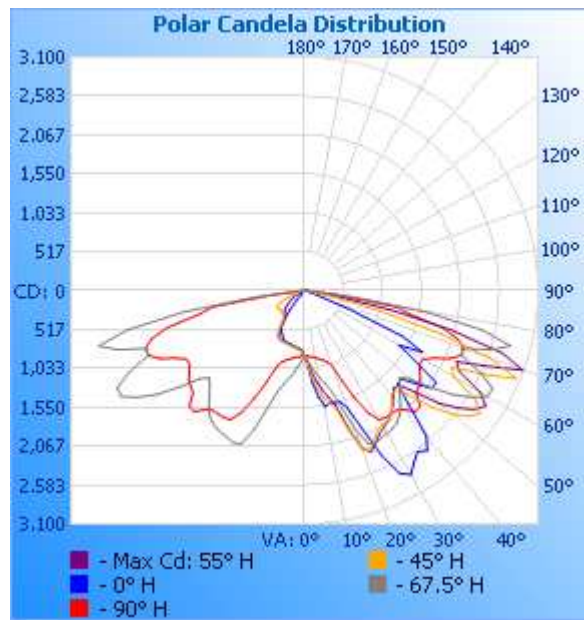
Intertek Sample No.	Correlated Color			DUV	CIE 31' Chromaticity Coordinate	CIE 31' Chromaticity Coordinate	CIE 76' Chromaticity Coordinate	CIE 76' Chromaticity Coordinate
	Temperature (K)	CRI -Ra	CRI -R9		(x)	(y)	(u')	(v')
254989	4284	74.6	-11.0	0.004	0.371	0.380	0.218	0.502
Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)		
254989	UP	120.0	698.2	83.15	0.992	9.85		
Intertek Sample No.	Input Voltage (Vac)	Input Power (Watts)	Input Power Factor	Current ATHD (%)				
254989	277.0	84.94	0.926	15.64				

### Photometric and Electrical Measurements – Distribution Method

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
254989	UP	120.0	696.1	82.98	0.993	6782	81.73

### Intensity (Candlepower) Summary at 25°C - Candelas

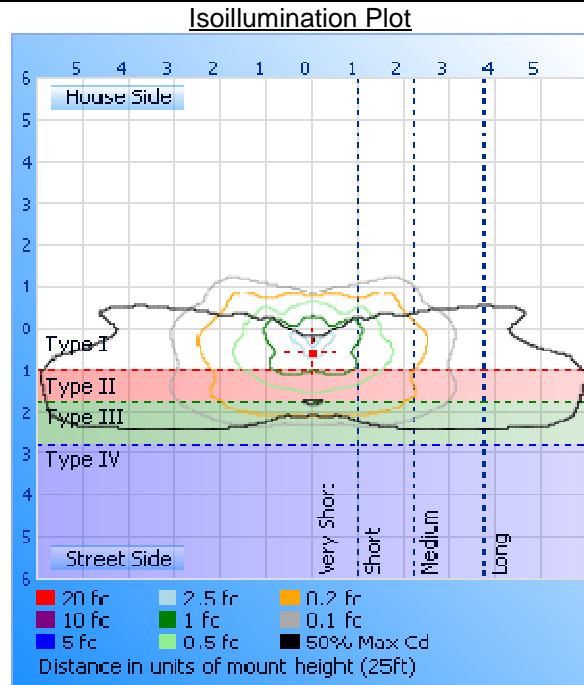
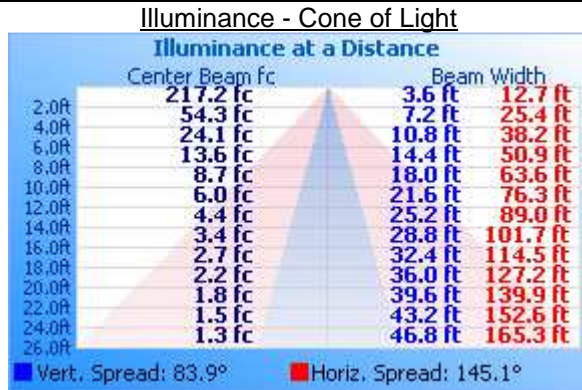
Angle	0	22.5	45	67.5	90
0	869	869	869	869	869
5	1232	1226	1157	1011	878
10	1562	1550	1447	1181	910
15	1540	1614	1639	1380	957
20	1654	2102	2238	1957	1064
25	2404	2201	2185	2232	1577
30	2822	2345	2064	2188	1977
35	2610	2308	1994	2137	2001
40	2513	1954	1800	1981	2062
45	1751	2063	1955	1783	2167
50	1913	2437	2548	1818	1979
55	2132	2248	2834	2405	1867
60	1444	1786	2293	2810	1818
65	1428	2183	2633	2579	2131
70	190	978	2621	2233	2252
75	58	164	1031	2831	1892
80	21	34	146	1645	1245
85	9	13	23	214	16
90	4	6	12	31	4
95	1	2	4	6	3
100	0	0	1	2	2
105	0	0	0	0	1



## RESULTS OF TESTS (cont'd)

### Illumination Plots

Mounting Height: 25 ft.



### Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	1112	16.4
0-40	2043	30.1
0-60	4410	65.0
60-90	2369	34.9
0-90	6778	99.9
90-180	3.6	0.1
0-180	6782	100.0

### Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	95.2	1.4
10-20	333.0	4.9
20-30	683.8	10.1
30-40	931.3	13.7
40-50	1056	15.6
50-60	1311	19.3
60-70	1373	20.2
70-80	872.3	12.9
80-90	123.6	1.8
90-100	3.2	0.0
100-110	0.4	0.0



RESULTS OF TESTS (cont'd)

BUG Rating (Backlight, Uplight, Glare)

Zone	Total Lumens	Frontlight Category	Frontlight Lumens	Backlight Category	Backlight Lumens	Uplight Category	Uplight Lumens
0-30	1111	FL	781	BL	330	--	--
30-60	3297	FM	2464	BM	833	--	--
60-80	2245	FH	1690	BH	555	--	--
80-90	123	FVH	83	BVH	40	--	--
90-100	3					UL	3
100-180	0					UH	0

Backlight Rating: B 2

Uplight Rating: U 1

Glare Rating: G 2

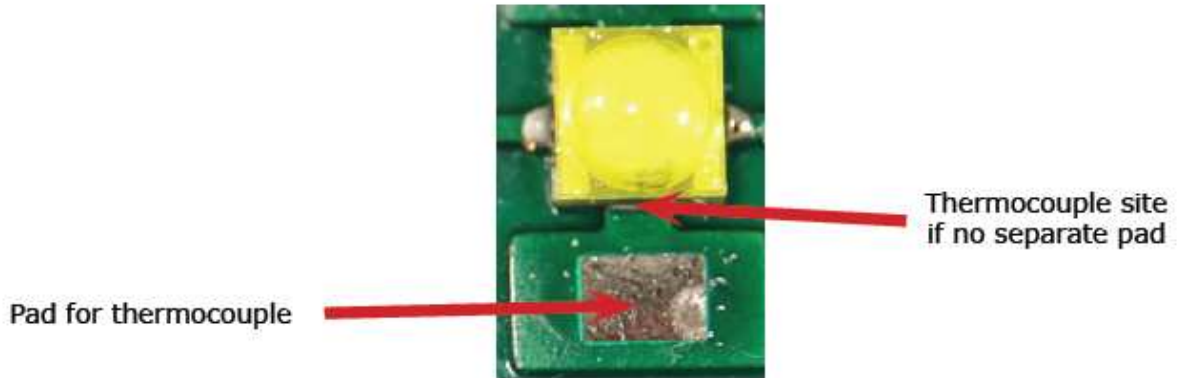


RESULTS OF TESTS (cont'd)

In-Situ Maximum Measured LED Source Temperature

Manufacturer Supplied Documentation:

LED identified as: CREE XLAMP XTE



**PRODUCT CHARACTERISTICS**

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		5	
Viewing angle (FWHM) - white	degrees		115	
Viewing angle (FWHM) - royal blue	degrees		140	
Temperature coefficient of voltage	mV/°C		-2.5	
ESD classification (HBM per Mil-Std-883D)			Class 2	
DC forward current	mA			1500
Reverse voltage	V			5
Forward voltage (@ 350 mA, 85 °C)	V		2.85	3.4
LED junction temperature	°C			150

RESULTS OF TESTS (cont'd)

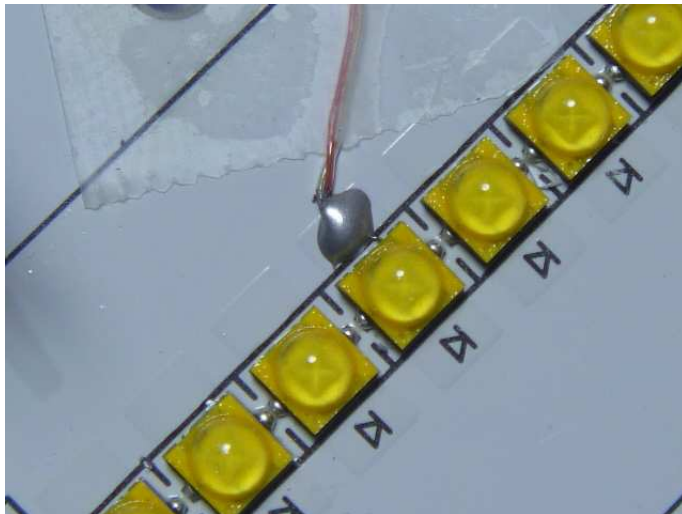
In-Situ Maximum Measured LED Source Temperature

Maximum Junction Temperature from LED specification ( $T_j$ ) = 150°C  
 Thermal Resistance Formula from LED specification = 5°C/W  
 Maximum Forward Voltage ( $V_f$ ) from LED specification = 3.4 V  
 Measured LED Current = 449mA  
 Calculated LED Wattage =  $V_f \times \text{Measured LED Current} = 1.5266 \text{ W}$   
 Maximum Source Temperature ( $T_s$ ) =  $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 142^\circ\text{C}$

Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (°C)	Location	Maximum Rated Source Temperature(°C)
254990	54.3	Per diagram above	142

In-Situ Picture –  $T_s$



In-Situ Picture –  $T_s$  location



Picture (not to scale)



## CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Joe Schledorn  
Engineer  
Lighting Division

Attachment: 254989.IES

Report Reviewed By:

Dave Ellis  
Senior Project Engineer  
Lighting Division