



IES LM-80-08 Test Report

For



Bridgelux Inc.

101 Portola Avenue, Livermore, CA 94551 USA

3V, 150mA LED Chip

Model: BXEN-27E-11M-3A

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ16090030b/R3

This report is replaced by the old report HZ16090030b/R2 dated Oct. 24, 2016

The test data in this report base on the report HZ15020020r dated Jun. 22 2016

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Test specifications:

Date of Receipt	: Feb. 03, 2015
Date of Test	: Feb. 10, 2015 to Jun. 14, 2016
Test item	: 10000 hours Lumen Maintenance, 10000 hours Chromaticity Shift
Reference Standard	: IES LM-80-2008 Approved Method for Measuring Lumen Maintenance of LED Light Source

Review by:

Engineer: April Zou
Oct. 25, 2016

Approved



Manager: Jim Zhang
Oct. 25, 2016

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Model Number: BXEN-27E-11M-3A

Rated Ts (°C)	Measured Ts (°C)	Drive Current (A)	Number of LED Light Sources Tested	Average Lumen Maintenance (%) at 10000 hours	Average Chromaticity (Δu^*v^*) at 10000 hours
105	103	0.15	25	94.1%	0.0027

IES LM-80-08 Test Report Requirement:

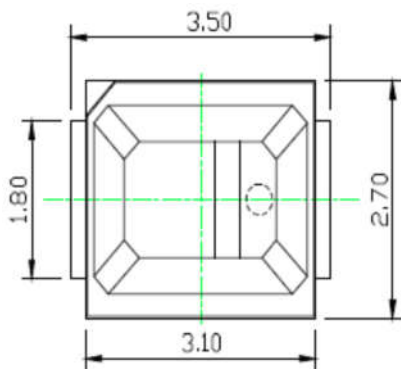
1. Number of LED Light Sources Tested

See test summary.

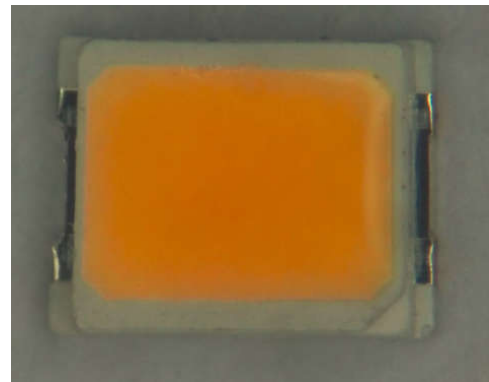
2. Description of LED light sources

Device under test is LED CHIP with model number: BXEN-27E-11M-3A, Nominal CCT 2700K.
The BXEN-27E-11M-3A part number covers all the BXEN part numbers in the following list.

CRI70	CRI80	CRI90
BXEN-27C-11M-3A	BXEN-27E-11M-3A	BXEN-27G-11M-3A
BXEN-30C-11M-3A	BXEN-30E-11M-3A	BXEN-30G-11M-3A
BXEN-35C-11M-3A	BXEN-35E-11M-3A	BXEN-35G-11M-3A
BXEN-40C-11M-3A	BXEN-40E-11M-3A	BXEN-40G-11M-3A
BXEN-45C-11M-3A	BXEN-45E-11M-3A	BXEN-45G-11M-3A
BXEN-50C-11M-3A	BXEN-50E-11M-3A	BXEN-50G-11M-3A
BXEN-57C-11M-3A	BXEN-57E-11M-3A	BXEN-57G-11M-3A
BXEN-65C-11M-3A	BXEN-65E-11M-3A	BXEN-65G-11M-3A



Tolerance: $\pm 0.25\text{mm}$



3. Description of auxiliary equipment

Test Equipment	Model	Calibration Date	Calibration Due Date
Lifetest thermal chamber	NMT 830	Jul. 16, 2016	Jul. 15, 2017
Lifetest thermal chamber	NMT 830	Jul. 17, 2015	Jul. 16, 2016
Lifetest thermal chamber	NMT 830	Jul. 18, 2014	Jul. 17, 2015
Lifetest data recorder	GRAPHTEC GL820	Jul. 16, 2016	Jul. 15, 2017
Lifetest data recorder	GRAPHTEC GL820	Jul. 17, 2015	Jul. 16, 2016
Lifetest data recorder	GRAPHTEC GL820	Jul. 18, 2014	Jul. 17, 2015
Photometric test current source	Itech IT6154	Jul. 16, 2016	Jul. 15, 2017
Photometric test current source	Itech IT6154	Jul. 17, 2015	Jul. 16, 2016
Photometric test current source	Itech IT6154	Jul. 18, 2014	Jul. 17, 2015
Photometric test system	0.5m Integrate Sphere system	Jul. 16, 2016	Jul. 15, 2017
Photometric test system	0.5m Integrate Sphere system	Jul. 17, 2015	Jul. 16, 2016
Photometric test system	0.5m Integrate Sphere system	Jul. 18, 2014	Jul. 17, 2015
Standard Lamp	10W	Jul. 16, 2016	Jul. 15, 2017
Standard Lamp	10W	Sep. 22, 2015	Sep. 21, 2016
Standard Lamp	10W	Sep. 23, 2014	Sep. 22, 2015

4. Operating cycle

LEDs are driven with a constant direct current (DC).

5. Ambient conditions including airflow, temperature, and relative humidity

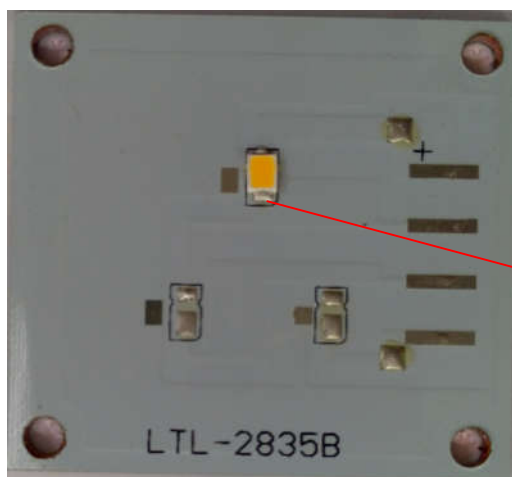
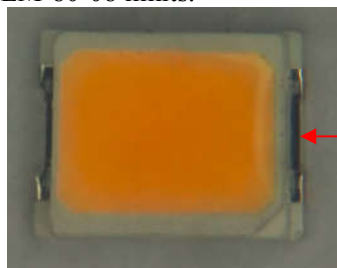
Ambient Temperature (Ta): See Tables

Humidity: <65%

No force air flow

6. Case temperatures (test point temperature)

In all cases, both Ts and Ta meet the IES LM-80-08 limits.



7. Drive current of the LED light source during Lumen maintenance test.

See tables.

8. Initial luminous flux and forward voltage at photometric measurement current

See tables.

9. Lumen maintenance for data for each individual light source along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the light sources

See tables.

10. Observation of LED light source failures including the failure conditions and time of failure

No failures observed.

11. LED light source monitoring interval

See tables

12. Photometric measurement uncertainty

Flux measurement: 1.06% ($k=2$)

13. Chromaticity shift reported over the measurement time

See tables.

14. Sampling Method/Sample size

IES LM-80 tests require LED samples to be operated at a minimum of a single current 150mA and temperatures of 85°C picked by the LED manufacturer.

25 pieces of LED samples are selected randomly from different production date of products. These samples are picked to represent a wide parametric distribution.

Test Result:

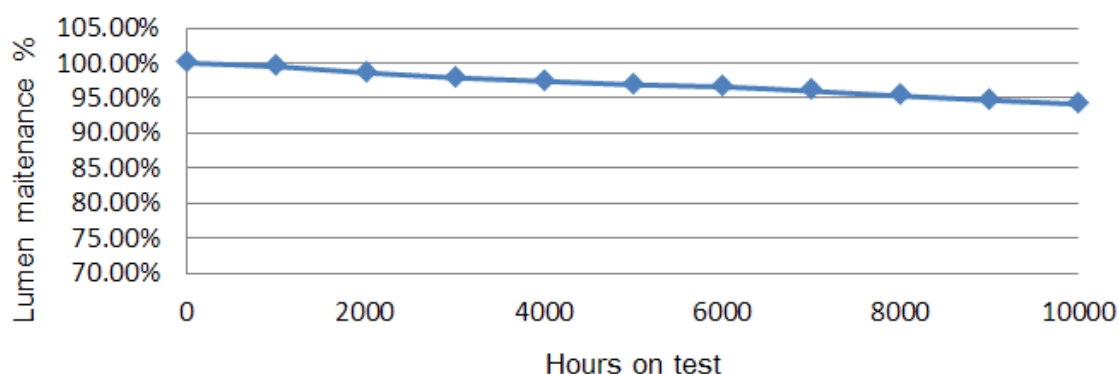
Model Number: BXEN-27E-11M-3A

Case temperature: **105°C**

Drive current: 0.15 A

Lumen Maintenance Data:

Sample No.	0h		Lumen Maintenance (%)									
	Vf(V)	Flux (lm)	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	2.79	53.22	99.70%	98.90%	97.80%	97.40%	97.1%	96.9%	96.0%	95.6%	95.1%	94.9%
2	2.79	52.82	99.70%	98.60%	98.20%	97.70%	97.0%	97.0%	96.2%	95.7%	95.4%	94.7%
3	2.79	52.67	99.40%	98.60%	97.50%	96.80%	96.5%	96.0%	95.5%	95.0%	94.3%	94.1%
4	2.79	53.68	99.50%	98.10%	97.30%	96.70%	96.0%	95.8%	95.1%	94.7%	93.9%	93.2%
5	2.80	53.42	99.60%	98.90%	98.40%	97.70%	97.4%	97.2%	96.7%	95.9%	95.4%	94.6%
6	2.78	51.31	99.50%	99.00%	98.50%	98.10%	97.6%	97.5%	96.7%	95.7%	95.0%	94.4%
7	2.79	53.17	99.40%	98.80%	98.10%	97.80%	97.5%	97.0%	96.4%	95.8%	95.3%	94.4%
8	2.79	52.24	99.40%	98.60%	98.20%	97.80%	97.3%	97.1%	96.6%	95.7%	94.9%	94.0%
9	2.79	53.03	99.60%	98.60%	97.60%	97.00%	96.5%	96.1%	95.3%	94.7%	94.1%	93.9%
10	2.79	52.1	99.30%	98.30%	97.60%	96.90%	96.5%	96.0%	95.5%	94.5%	93.9%	93.3%
11	2.79	52.84	99.60%	98.40%	97.30%	96.80%	96.5%	96.2%	95.6%	94.9%	94.6%	93.8%
12	2.79	51.81	99.50%	98.40%	97.70%	97.20%	96.9%	96.6%	96.0%	95.1%	94.6%	94.2%
13	2.78	52.71	99.50%	98.30%	97.10%	96.70%	96.2%	95.9%	95.5%	95.0%	94.6%	93.7%
14	2.79	52.96	99.40%	98.10%	97.00%	96.80%	96.4%	96.2%	95.4%	94.5%	93.7%	92.9%
15	2.79	52.61	99.50%	98.50%	97.50%	96.90%	96.2%	95.8%	95.2%	94.7%	94.0%	93.4%
16	2.80	53.32	99.70%	99.10%	98.60%	97.90%	97.5%	97.1%	96.3%	95.5%	95.0%	94.4%
17	2.84	52.59	99.50%	98.80%	98.30%	97.90%	97.7%	97.3%	96.5%	95.6%	95.0%	94.7%
18	2.79	52.93	99.60%	98.90%	98.20%	97.50%	96.8%	96.6%	96.1%	95.4%	94.9%	94.6%
19	2.78	51.55	99.70%	98.70%	98.00%	97.60%	96.9%	96.7%	96.2%	95.8%	95.3%	94.7%
20	2.79	52.08	99.60%	99.10%	98.20%	97.70%	97.0%	96.6%	96.2%	95.7%	95.3%	94.7%
21	2.82	53.55	99.30%	98.80%	97.70%	96.40%	96.0%	96.1%	96.5%	95.8%	95.2%	94.6%
22	2.79	52.21	99.50%	98.80%	98.10%	97.50%	96.8%	96.2%	96.5%	94.7%	94.1%	94.3%
23	2.81	51.69	99.60%	98.30%	98.20%	98.00%	97.1%	97.5%	96.6%	95.5%	94.2%	94.4%
24	2.82	53.45	99.40%	98.90%	97.90%	97.4%	96.7%	97.4%	96.5%	95.2%	94.8%	94.4%
25	2.79	53.11	99.40%	98.40%	98.30%	97.80%	97.6%	96.3%	95.5%	95.2%	94.1%	93.2%
Avg	2.79	52.68	99.5%	98.6%	97.9%	97.4%	96.9%	96.6%	96.0%	95.3%	94.7%	94.1%
Max	2.84	53.68	99.7%	99.1%	98.6%	98.1%	97.7%	97.5%	96.7%	95.9%	95.4%	94.9%
Min	2.78	51.31	99.3%	98.1%	97.0%	96.7%	96.0%	95.8%	95.1%	94.5%	93.7%	92.9%

Lumen Maintenance 105 °C


Model Number: E2835UD28 (Nominal CCT 2700K)

Case temperature: **105°C**

Drive current: 0.15 A

Chromaticity Shift Data:

Sample No.	0h			Chromaticity Shift									
	u'	v'	CCT K	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	0.2591	0.5324	2750	0.0009	0.0005	0.0007	0.0007	0.0007	0.0007	0.0007	0.001	0.0013	0.0019
2	0.2592	0.5319	2750	0.0010	0.0007	0.0007	0.0008	0.0009	0.0012	0.0014	0.0018	0.002	0.0023
3	0.2602	0.5331	2724	0.0007	0.0011	0.0013	0.0012	0.0012	0.0011	0.0017	0.0021	0.0025	0.0030
4	0.2597	0.5333	2733	0.0009	0.0013	0.0014	0.0016	0.0017	0.0019	0.0022	0.0025	0.0029	0.0030
5	0.2602	0.5336	2722	0.0007	0.0005	0.0008	0.0010	0.0011	0.0014	0.0017	0.0021	0.0023	0.0030
6	0.2623	0.5333	2680	0.0008	0.0011	0.0013	0.0015	0.0018	0.0018	0.002	0.0024	0.0027	0.0029
7	0.2625	0.5337	2675	0.0008	0.0007	0.0009	0.0011	0.0013	0.0016	0.0016	0.0019	0.0021	0.0020
8	0.2623	0.5333	2681	0.0010	0.0007	0.0007	0.0009	0.0010	0.0011	0.0015	0.0019	0.0021	0.0026
9	0.26	0.5342	2723	0.0010	0.0011	0.0010	0.0012	0.0013	0.0013	0.0013	0.0016	0.002	0.0025
10	0.2601	0.5317	2732	0.0009	0.0011	0.0011	0.0011	0.0010	0.0012	0.0016	0.002	0.0024	0.0030
11	0.2608	0.5346	2705	0.0006	0.0011	0.0013	0.0015	0.0014	0.0014	0.0017	0.0022	0.0025	0.0026
12	0.2613	0.5343	2697	0.0008	0.0009	0.0011	0.0013	0.0015	0.0018	0.002	0.0023	0.0027	0.0029
13	0.2606	0.5327	2718	0.0007	0.0009	0.0008	0.0010	0.0012	0.0015	0.002	0.0023	0.0026	0.0032
14	0.2604	0.5315	2727	0.0007	0.0005	0.0006	0.0006	0.0009	0.0009	0.0015	0.0018	0.0021	0.0026
15	0.2612	0.5327	2705	0.0010	0.0007	0.0009	0.0009	0.0011	0.0013	0.0016	0.002	0.0022	0.0026
16	0.2601	0.5325	2729	0.0007	0.0009	0.0010	0.0012	0.0015	0.0017	0.002	0.0024	0.0026	0.0032
17	0.2603	0.5322	2725	0.0007	0.0007	0.0007	0.0009	0.0011	0.0011	0.0013	0.0016	0.0019	0.0026
18	0.2593	0.5337	2740	0.0009	0.0009	0.0009	0.0008	0.0010	0.0013	0.0018	0.0021	0.0024	0.0024
19	0.2612	0.5327	2706	0.0008	0.0007	0.0007	0.0009	0.0011	0.0012	0.0016	0.0019	0.0022	0.0029
20	0.261	0.5331	2708	0.0009	0.0011	0.0010	0.0012	0.0013	0.0015	0.0019	0.0021	0.0023	0.0030
21	0.2597	0.5317	2681	0.0010	0.0009	0.0008	0.0014	0.0008	0.0015	0.0021	0.0019	0.0016	0.0019
22	0.2623	0.5333	2712	0.0009	0.0012	0.0012	0.0013	0.0015	0.0016	0.0017	0.0019	0.0021	0.0021
23	0.2617	0.5330	2713	0.0006	0.0010	0.0008	0.0014	0.0007	0.0016	0.0021	0.0024	0.0028	0.0030
24	0.2611	0.5328	2691	0.0009	0.0013	0.0009	0.0015	0.0017	0.0016	0.0013	0.001	0.0016	0.0022
25	0.2621	0.5321	2741	0.0008	0.0007	0.0011	0.0010	0.0014	0.0015	0.0016	0.0012	0.0026	0.0031
Avg	0.2607	0.5329	2715	0.0008	0.0009	0.0009	0.0011	0.0012	0.0014	0.0017	0.0019	0.0023	0.0027
Max	0.2625	0.5346	2750	0.0010	0.0013	0.0014	0.0016	0.0018	0.0019	0.0022	0.0025	0.0029	0.0032
Min	0.2591	0.5315	2675	0.0006	0.0005	0.0006	0.0006	0.0007	0.0007	0.0007	0.0010	0.0013	0.0019

Chromaticity Shift at 105 °C

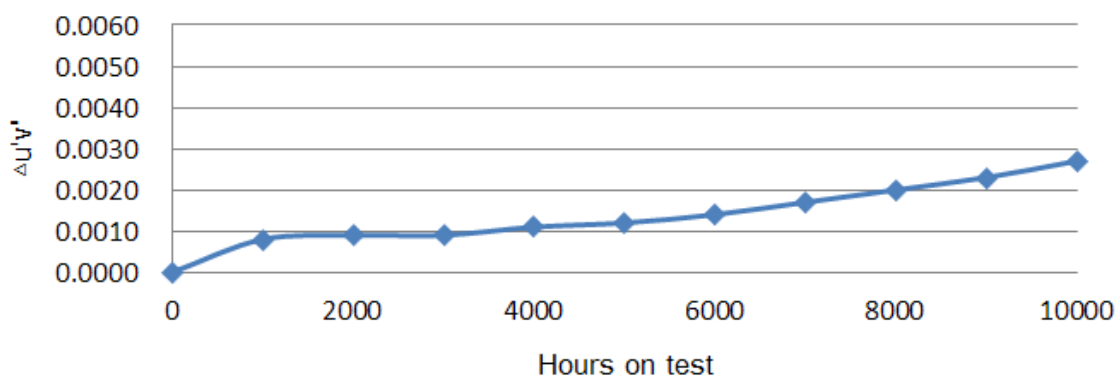


Table 1: Report at each LM-80 Test Condition

Description of LED Light Source Tested (manufacturer, model, catalog number)		Bridgelux. BXEN-27E-11M-3A			
Test Condition 1 - 105°C Case Temp					
Sample size	25	Sample size	-	Sample size	-
Number of failures	0	Number of failures	-	Number of failures	-
DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	-	DUT drive current used in the test (mA)	-
Test duration (hours)	10,000	Test duration (hours)	-	Test duration (hours)	-
Test duration used for projection (hour to hour)	5,000 - 10,000	Test duration used for projection (hour to hour)	-	Test duration used for projection (hour to hour)	-
Tested case temperature (°C)	105	Tested case temperature (°C)	-	Tested case temperature (°C)	-
α	6.01E-06	α	-	α	-
B	1.00	B	-	B	-
Calculated L70(10k) (hours)	59000	Calculated L70(10k) (hours)	-	Calculated L70(10k) (hours)	-
Reported L70(10k) (hours)	59000	Reported L70(10k) (hours)	-	Reported L70(10k) (hours)	-

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200960-0

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This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2015-12-07 through 2016-12-31

Effective Dates



For the National Voluntary Laboratory Accreditation Program

United States Department of Commerce
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2015-01-01 through 2015-12-31

Effective Dates



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ENERGY EFFICIENT LIGHTING PRODUCTS

NVLAP LAB CODE 200960-

22/S24	ANSI C62.41.2:2002	IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits
22/S28	IEC 62301:2011	Household Electrical Appliances - Measurement of Standby Power

SSL Life Tests

<u>Code</u>	<u>Designation</u>	<u>Description</u>
22/S08	IES LM-80:2008	Solid State Lighting Luminaires - Lumen Maintenance
22/S08a	IES LM-80:2015	Solid State Lighting Luminaires - Lumen Maintenance
22/S14	EPA Integral LED Lamps v. 1.4 (Appendix E)	ENERGY STAR® Elevated Temperature Testing for Integral LED Lamps
22/S18	EPA Lamps v. 1.0	Ambient Temperature Life Testing
22/S19	EPA Lamps v. 1.0	Elevated Temperature Life Testing
22/S25	IES LM-84:2014	Approved Method for Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires

End of the Report

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