

TEST REPORT-SMD2835

According to ANSI/IES LM-80-15

Report Type	9000 hours lumen maintenance test report
Report Number	RA2019072303
Report Date	November 13 , 2020
Applicant's name	Bridgelux, Inc.
Applicant's address	46430 Fremont Boulevard , Fremont ,CA 94538 USA
Product Model #	BXEN-27E-14H-12B
Test Date	July 24, 2019 to Aug 13, 2020
Test Standard	ANSI/IES LM-80-15: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
Decision Rule	NO
Test Facility	Bridgelux Kaistar Laboratory 101 Xiang Xing Rd., Xiang An Branch, Torch Hi-Tech Industrial Development Zone, Xiamen, China 361101
Accreditation	IAS Accreditation Number TL-855

Prepared by: Tianlei Chen

Audit by : Yale Hong

Verified by: Robert Lo

Tian lei chen

Yale Hong

Robert Lo

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Kaistar Lighting Corp.

Report # RA2019072303



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Tested Product Information

DUT manufacturer	Bridgelux, Inc.
DUT identification / model number	BXEN-27E-14H-12B
Description of DUT	LED
Nominal CCT	2700 K
Total input power	1.1 W
Typical voltage	12 VDC
Drive current	90mA
Average current density per LED die	738 mA/mm ²
Average power density per LED die	2.21W/mm ²
Number of dies	4
Die Spacing (mm)	0.12

25 pieces of LED samples are randomly selected from different production dates of this product.



Tests conducted on Model: BXEN-27E-14H-12B were considered representative of the following series,

BXEN-(A)(B)-(C)(D)(E)-(F)(G)

BXEN: Designates product family

(A) CCT Variation, can be 22-65, for 2200K~6500K;

(B) CRI

(C) Parallel connected variation, can be 1~9, (total chip number is less than 9)

(D) Series connected variation, can be 1~9 (total chip number is less than 9)

(E) Power

(F) Voltage

(G) Customer code: can be 0~ZZ

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Test Specifications

Description of Auxiliary Equipment

- Photometry Tester: Automated LED tester
- Temperature control systems to achieve and maintain required conditions
- Software controlled power supply to provide regulated constant currents to drive LED light sources in life testing

Operating Cycle and Ambient Conditions

Sample case temperature and ambient conditions:

Surrounding Temperature	Actual Case Temperature	Nominal Case Temperature	Relative Humidity
53°C	55°C	55°C	<60%
83°C	85°C	85°C	<60%
103°C	105°C	105°C	<60%

- Nominal temperatures are 55°C 、 85°C 、 105°C; actual case temperatures are maintained not lower by more than 2 °C than the nominal during life testing.
- Temperature of the air surrounding DUTs is controlled to be less than 5°C below the case temperature.
- Airflow is kept to minimum to maintain the required temperature uniformity.

Physical Condition of DUTs at each Photometry Measurement

- No cracks
- No discoloration
- No electrical discontinuity

LED Light Source Monitoring Interval

Measurements have been taken after the following durations for Tc of both 55°C 、 85°C 、 105°C: 0, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, hours

Initial Photometry Measurement

Initial luminous flux, forward voltage and correlated color temperature at photometric measurement current

Data Set 1 (Tc = 55°C, If=90mA)

NO	Initial Flux, lm	Forward Voltage, V	CCT,K
1	143.3	12.88	2734
2	142.9	12.63	2774
3	140.2	12.88	2787
4	141.0	12.77	2747
5	141.7	12.38	2730
6	142.9	12.81	2782
7	143.4	12.79	2792
8	142.5	12.76	2742
9	141.9	12.58	2760
10	142.6	12.58	2748
11	143.1	12.72	2739
12	143.0	12.68	2748
13	141.1	12.98	2778
14	142.2	12.68	2774
15	141.5	12.44	2725
16	141.5	12.93	2751
17	142.7	12.66	2759
18	141.8	13.13	2738
19	142.9	12.73	2747
20	142.3	12.49	2746
21	140.6	12.77	2734
22	141.5	12.62	2752
23	141.5	12.94	2729
24	142.5	12.66	2784
25	141.7	12.47	2762
AVG	142.1	12.72	2754
Med	142.2	12.72	2748
ST dev	0.9	0.18	20
Max	143.4	13.13	2792
Min	140.2	12.38	2725

Data Set 2 (Tc = 85°C, If=90mA)

NO	Initial Flux, lm	Forward Voltage, V	CCT,K
26	143.8	12.93	2787
27	142.1	12.68	2738
28	140.9	12.96	2726
29	141.2	12.82	2729
30	140.7	12.61	2696
31	141.6	12.82	2739
32	141.7	12.85	2739
33	142.1	13.05	2740
34	142.9	12.76	2789
35	142.1	12.52	2767
36	140.8	12.83	2722
37	142.6	12.72	2814
38	139.5	13.15	2710
39	140.3	12.89	2776
40	140.7	12.64	2706
41	141.3	12.95	2732
42	142.0	12.72	2752
43	142.2	13.05	2745
44	143.0	12.62	2748
45	142.3	12.58	2743
46	143.6	12.80	2746
47	141.4	12.61	2752
48	142.7	12.94	2781
49	141.2	12.75	2750
50	141.7	12.40	2798
AVG	141.8	12.79	2749
Med	141.7	12.80	2745
ST dev	1.0	0.18	29
Max	143.8	13.15	2814
Min	139.5	12.40	2696

Data Set 3 (Tc = 105°C, If=90mA)

NO	Initial Flux, lm	Forward Voltage, V	CCT,K
51	142.8	12.98	2762
52	142.1	12.69	2726
53	140.4	12.99	2724
54	142.9	12.88	2770
55	141.3	12.64	2737
56	142.8	12.96	2766
57	141.7	12.76	2762
58	141.8	13.13	2799
59	142.7	12.63	2757
60	142.9	12.65	2792
61	142.9	12.82	2802
62	141.4	12.68	2779
63	140.9	13.00	2772
64	142.5	12.84	2759
65	142.1	12.53	2751
66	140.8	12.68	2783
67	141.2	12.75	2700
68	141.4	13.15	2698
69	142.0	12.51	2699
70	141.3	12.50	2690
71	142.9	12.59	2783
72	141.6	12.66	2706
73	141.3	12.98	2709
74	142.4	12.75	2773
75	142.2	12.46	2755
AVG	141.9	12.77	2750
Med	142.0	12.75	2759
ST dev	0.8	0.20	34
Max	142.9	13.15	2802
Min	140.4	12.46	2690

Ambient temperature during lumen and chromaticity measurements was maintained at 25°C ±2°C.

Test Result: Summary of lumen Maintenance test Result

Data Set	Sample Size	Failures Observed	Tc (C)	Drive Current [IF] mA	Test Duration (Hours)	Average Lumen Maintenance	Reported L70(9k) (Hours)	Calculated L90(9k) (Hours)
1	25	0	55 C	90	9000	98.81%	>54000	>54000
2	25	0	85 C	90	9000	97.84%	>54000	43000
3	25	0	105 C	90	9000	97.22%	>54000	36000

Detailed Lumen Maintenance Data

Table 1: Lumen maintenance data at Tc = 55°C, If=90mA

NO	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.11%	99.95%	99.89%	99.63%	99.45%	99.20%	98.90%	98.82%	98.72%
2	100.13%	100.04%	99.91%	99.82%	99.56%	99.49%	99.22%	99.14%	99.00%
3	100.16%	100.08%	99.96%	99.86%	99.78%	99.47%	99.25%	99.12%	99.05%
4	100.22%	99.96%	99.88%	99.78%	99.68%	99.52%	99.19%	98.98%	98.87%
5	100.14%	99.86%	99.77%	99.63%	99.58%	99.41%	99.18%	98.95%	98.74%
6	100.03%	100.01%	99.82%	99.79%	99.64%	99.43%	99.25%	98.94%	98.85%
7	100.09%	99.97%	99.70%	99.59%	99.49%	99.22%	99.16%	98.91%	98.83%
8	100.12%	100.02%	99.85%	99.78%	99.72%	99.58%	99.41%	99.20%	99.03%
9	100.12%	100.05%	99.85%	99.82%	99.61%	99.39%	99.04%	98.91%	98.73%
10	100.11%	100.03%	99.94%	99.77%	99.62%	99.39%	99.13%	99.09%	98.99%
11	100.20%	99.98%	99.89%	99.68%	99.49%	99.39%	99.12%	98.92%	98.81%
12	99.95%	99.93%	99.83%	99.56%	99.31%	99.12%	98.95%	98.72%	98.66%
13	99.95%	99.89%	99.76%	99.59%	99.38%	99.24%	99.11%	98.73%	98.60%
14	100.14%	99.93%	99.82%	99.76%	99.53%	99.38%	99.16%	98.98%	98.91%
15	100.12%	100.04%	99.87%	99.85%	99.78%	99.62%	99.52%	99.25%	99.03%
16	100.13%	99.95%	99.80%	99.62%	99.46%	99.25%	98.94%	98.73%	98.55%
17	100.14%	100.02%	99.79%	99.68%	99.59%	99.47%	99.30%	99.04%	98.83%
18	100.01%	99.98%	99.79%	99.60%	99.51%	99.37%	99.24%	99.10%	99.04%
19	100.04%	99.98%	99.89%	99.79%	99.52%	99.39%	99.17%	98.92%	98.81%
20	99.96%	99.73%	99.69%	99.38%	99.25%	98.95%	98.69%	98.39%	98.22%
21	100.14%	100.03%	99.98%	99.92%	99.73%	99.56%	99.40%	99.24%	99.04%
22	100.17%	100.06%	99.94%	99.82%	99.75%	99.58%	99.27%	99.12%	98.97%
23	100.02%	99.95%	99.82%	99.84%	99.61%	99.48%	99.32%	99.07%	98.73%
24	100.12%	99.97%	99.77%	99.61%	99.55%	99.35%	99.16%	98.85%	98.76%
25	99.98%	99.87%	99.47%	99.47%	99.33%	99.16%	98.89%	98.61%	98.41%
AVG	100.09%	99.97%	99.83%	99.71%	99.56%	99.38%	99.16%	98.95%	98.81%
Med	100.12%	99.98%	99.83%	99.76%	99.56%	99.39%	99.17%	98.95%	98.83%
ST dev	0.08%	0.08%	0.11%	0.13%	0.14%	0.16%	0.18%	0.20%	0.21%
Max	100.22%	100.08%	99.98%	99.92%	99.78%	99.62%	99.52%	99.25%	99.05%
Min	99.95%	99.73%	99.47%	99.38%	99.25%	98.95%	98.69%	98.39%	98.22%

Figure 1: Lumen maintenance curve at Tc = 55°C, If=90mA

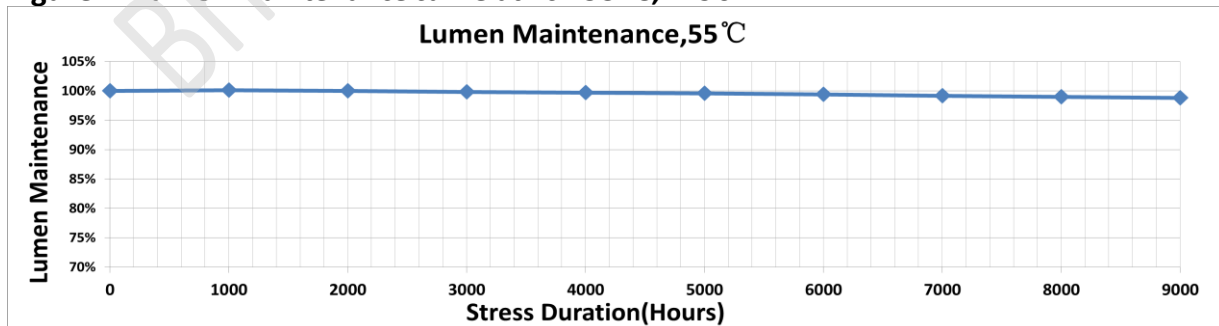


Table 2: Lumen maintenance data at Tc = 85°C, If=90mA

NO	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	99.92%	99.34%	99.16%	98.95%	98.79%	98.48%	98.25%	97.98%	97.80%
27	99.96%	99.29%	99.11%	98.89%	98.65%	98.29%	98.02%	97.80%	97.60%
28	99.60%	99.47%	99.39%	99.08%	98.83%	98.63%	98.42%	98.21%	97.97%
29	100.02%	99.56%	99.42%	99.38%	99.17%	98.91%	98.72%	98.40%	98.21%
30	99.80%	99.39%	99.36%	99.19%	98.88%	98.59%	98.33%	98.04%	97.79%
31	100.02%	99.56%	99.43%	99.19%	98.95%	98.63%	98.46%	98.22%	98.02%
32	99.90%	99.44%	99.40%	99.07%	98.89%	98.72%	98.48%	98.27%	98.12%
33	99.92%	99.37%	99.14%	98.89%	98.79%	98.62%	98.28%	98.02%	97.70%
34	99.89%	99.39%	99.25%	99.09%	98.94%	98.79%	98.63%	98.44%	98.18%
35	99.97%	99.35%	99.20%	99.06%	98.89%	98.69%	98.53%	98.32%	98.22%
36	99.98%	99.33%	99.08%	98.89%	98.62%	98.37%	98.13%	97.91%	97.68%
37	99.88%	99.37%	99.04%	98.77%	98.69%	98.39%	98.16%	97.82%	97.74%
38	99.95%	99.40%	99.29%	98.86%	98.59%	98.36%	98.06%	97.71%	97.36%
39	99.78%	99.69%	99.56%	99.29%	99.18%	98.83%	98.56%	98.21%	97.95%
40	99.78%	99.55%	99.35%	99.22%	98.96%	98.78%	98.55%	98.31%	98.24%
41	99.73%	99.57%	99.42%	99.29%	99.09%	98.83%	98.71%	98.43%	98.28%
42	99.81%	99.53%	99.39%	99.26%	99.02%	98.79%	98.62%	98.41%	98.18%
43	99.89%	99.29%	99.23%	98.93%	98.78%	98.53%	98.21%	97.90%	97.65%
44	99.86%	99.37%	99.19%	98.78%	98.47%	98.27%	97.94%	97.66%	97.34%
45	99.63%	99.38%	99.11%	98.83%	98.48%	98.29%	97.96%	97.66%	97.43%
46	99.68%	99.29%	98.97%	98.56%	98.18%	97.98%	97.75%	97.49%	97.21%
47	99.96%	99.39%	99.29%	98.97%	98.79%	98.42%	98.19%	98.06%	97.83%
48	99.62%	99.59%	99.44%	99.22%	99.06%	98.78%	98.39%	98.18%	97.84%
49	99.52%	99.24%	99.11%	98.69%	98.59%	98.43%	98.21%	97.92%	97.83%
50	99.70%	99.26%	99.13%	98.88%	98.78%	98.43%	98.27%	97.81%	97.78%
AVG	99.83%	99.42%	99.26%	99.01%	98.80%	98.55%	98.31%	98.05%	97.84%
Med	99.88%	99.39%	99.25%	98.97%	98.79%	98.59%	98.28%	98.04%	97.83%
ST dev	0.14%	0.12%	0.15%	0.21%	0.23%	0.23%	0.26%	0.27%	0.30%
Max	100.02%	99.69%	99.56%	99.38%	99.18%	98.91%	98.72%	98.44%	98.28%
Min	99.52%	99.24%	98.97%	98.56%	98.18%	97.98%	97.75%	97.49%	97.21%

Figure 2: Lumen maintenance curve at Tc = 85°C, If=90mA

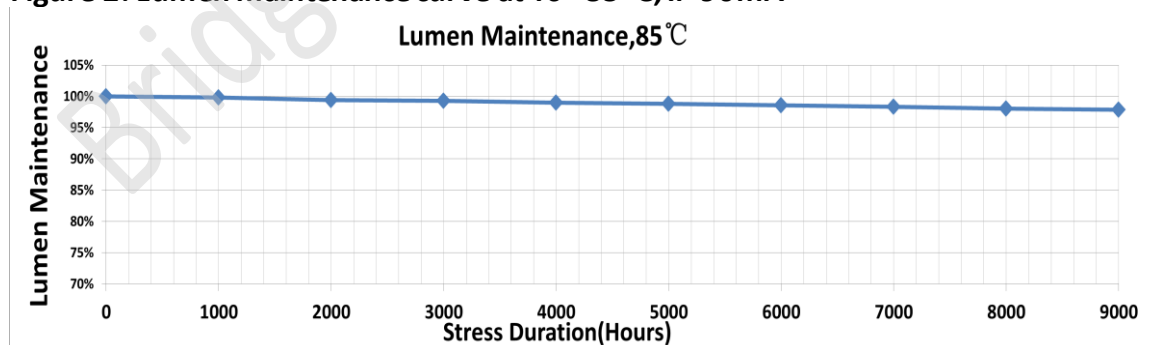
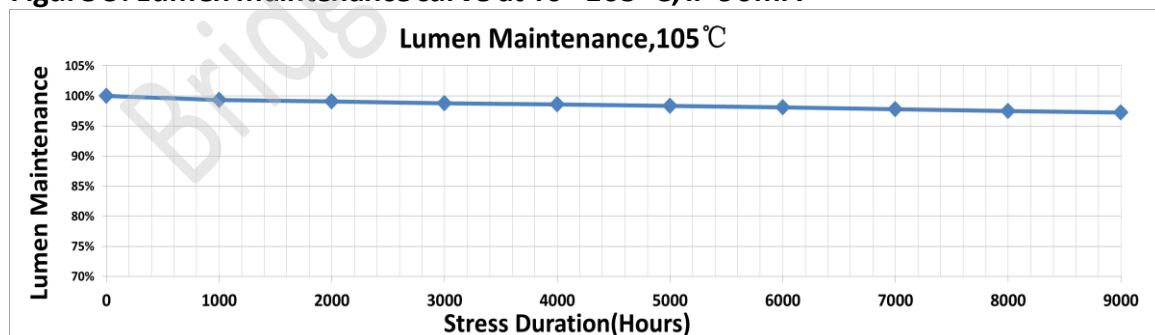


Table 3: Lumen maintenance at Tc = 105°C, If=90mA

NO	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	99.49%	99.21%	99.03%	98.93%	98.79%	98.62%	98.42%	98.23%	97.82%
52	99.36%	99.01%	98.62%	98.38%	98.29%	98.02%	97.88%	97.55%	97.32%
53	99.29%	99.12%	98.82%	98.62%	98.32%	98.15%	97.91%	97.53%	97.32%
54	99.32%	99.02%	98.78%	98.64%	98.31%	97.97%	97.68%	97.45%	97.22%
55	99.20%	98.91%	98.50%	98.26%	98.02%	97.74%	97.32%	97.05%	96.74%
56	99.36%	99.07%	98.82%	98.50%	98.29%	98.20%	97.76%	97.34%	97.00%
57	99.52%	99.31%	99.16%	99.05%	98.72%	98.41%	98.12%	97.84%	97.56%
58	99.36%	99.19%	98.95%	98.72%	98.49%	98.14%	97.96%	97.54%	97.15%
59	99.59%	99.33%	98.98%	98.80%	98.62%	98.26%	98.15%	97.74%	97.42%
60	99.36%	99.01%	98.86%	98.61%	98.56%	98.31%	97.95%	97.68%	97.42%
61	99.49%	99.19%	98.80%	98.64%	98.47%	98.19%	97.79%	97.72%	97.46%
62	99.22%	98.84%	98.64%	98.49%	98.18%	97.81%	97.56%	97.36%	97.13%
63	99.31%	98.95%	98.61%	98.59%	98.18%	97.92%	97.58%	97.21%	97.17%
64	99.33%	99.03%	98.65%	98.26%	97.92%	97.51%	97.20%	96.79%	96.33%
65	99.20%	98.95%	98.53%	98.29%	98.12%	97.83%	97.69%	97.36%	97.00%
66	99.59%	99.31%	98.95%	98.64%	98.33%	98.01%	97.74%	97.47%	97.24%
67	99.33%	99.09%	98.79%	98.49%	98.36%	98.14%	97.89%	97.55%	97.42%
68	99.26%	99.10%	98.74%	98.52%	98.23%	97.81%	97.64%	97.37%	97.00%
69	99.28%	99.12%	98.96%	98.79%	98.49%	98.30%	98.11%	97.55%	97.28%
70	99.26%	98.95%	98.62%	98.50%	98.49%	98.12%	97.79%	97%	97.32%
71	99.32%	98.96%	98.74%	98.38%	97.97%	97.79%	97.51%	97.26%	96.98%
72	99.21%	99.09%	98.81%	98.79%	98.59%	98.35%	97.94%	97.64%	97.37%
73	99.45%	99.15%	98.88%	98.73%	98.49%	98.11%	97.76%	97.55%	97.35%
74	99.36%	99.18%	98.80%	98.59%	98.13%	97.82%	97.59%	97.46%	97.03%
75	99.44%	99.26%	98.94%	98.78%	98.48%	98.24%	97.96%	97.53%	97.39%
AVG	99.36%	99.09%	98.80%	98.60%	98.35%	98.07%	97.80%	97.49%	97.22%
Med	99.33%	99.09%	98.80%	98.61%	98.33%	98.12%	97.79%	97.53%	97.28%
ST dev	0.11%	0.13%	0.16%	0.20%	0.23%	0.25%	0.27%	0.27%	0.29%
Max	99.59%	99.33%	99.16%	99.05%	98.79%	98.62%	98.42%	98.23%	97.82%
Min	99.20%	98.84%	98.50%	98.26%	97.92%	97.51%	97.20%	96.79%	96.33%

Figure 3: Lumen maintenance curve at Tc = 105°C, If=90mA



Detailed Chromaticity Shift Data

Ambient temperature during chromaticity measurements was maintained at 25°C ±2°C

Table 4: Chromaticity shift (Delta u'v') at Tc = 55°C, If=90mA

No	U'	V'	Chromaticity shift (Delta u'v')								
	0hrs		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2603	0.5303	0.0004	0.0006	0.0011	0.0012	0.0014	0.0017	0.0020	0.0024	0.0025
2	0.2586	0.5291	0.0004	0.0006	0.0011	0.0011	0.0013	0.0018	0.0021	0.0025	0.0025
3	0.2582	0.5283	0.0003	0.0005	0.0009	0.0010	0.0012	0.0016	0.0020	0.0024	0.0026
4	0.2598	0.5297	0.0003	0.0005	0.0009	0.0009	0.0012	0.0017	0.0020	0.0023	0.0023
5	0.2603	0.5309	0.0004	0.0006	0.0010	0.0008	0.0010	0.0015	0.0019	0.0023	0.0024
6	0.2582	0.5295	0.0003	0.0006	0.0010	0.0013	0.0013	0.0018	0.0022	0.0026	0.0029
7	0.2579	0.5286	0.0003	0.0005	0.0010	0.0013	0.0012	0.0017	0.0022	0.0026	0.0028
8	0.2600	0.5297	0.0001	0.0004	0.0008	0.0007	0.0009	0.0014	0.0018	0.0021	0.0024
9	0.2598	0.5270	0.0003	0.0006	0.0011	0.0010	0.0013	0.0018	0.0021	0.0024	0.0027
10	0.2595	0.5309	0.0003	0.0004	0.0009	0.0012	0.0012	0.0017	0.0021	0.0024	0.0026
11	0.2601	0.5302	0.0004	0.0005	0.0010	0.0010	0.0011	0.0016	0.0020	0.0023	0.0025
12	0.2595	0.5307	0.0003	0.0006	0.0010	0.0010	0.0013	0.0016	0.0019	0.0024	0.0025
13	0.2586	0.5286	0.0004	0.0006	0.0010	0.0010	0.0011	0.0016	0.0021	0.0026	0.0028
14	0.2587	0.5285	0.0003	0.0005	0.0008	0.0008	0.0009	0.0014	0.0017	0.0021	0.0024
15	0.2609	0.5293	0.0002	0.0005	0.0010	0.0010	0.0012	0.0017	0.0021	0.0025	0.0026
16	0.2594	0.5306	0.0002	0.0005	0.0009	0.0009	0.0010	0.0016	0.0021	0.0025	0.0028
17	0.2594	0.5291	0.0003	0.0005	0.0010	0.0011	0.0011	0.0016	0.0021	0.0025	0.0027
18	0.2601	0.5300	0.0003	0.0005	0.0010	0.0010	0.0013	0.0016	0.0020	0.0024	0.0028
19	0.2598	0.5296	0.0003	0.0005	0.0009	0.0010	0.0011	0.0016	0.0019	0.0023	0.0025
20	0.2600	0.5288	0.0005	0.0006	0.0011	0.0012	0.0013	0.0018	0.0022	0.0026	0.0029
21	0.2603	0.5302	0.0003	0.0006	0.0010	0.0010	0.0013	0.0019	0.0021	0.0024	0.0025
22	0.2595	0.5299	0.0003	0.0006	0.0009	0.0010	0.0012	0.0016	0.0019	0.0023	0.0026
23	0.2606	0.5301	0.0004	0.0006	0.0010	0.0010	0.0014	0.0019	0.0023	0.0025	0.0028
24	0.2580	0.5299	0.0002	0.0005	0.0010	0.0012	0.0013	0.0017	0.0022	0.0025	0.0027
25	0.2592	0.5289	0.0003	0.0005	0.0009	0.0011	0.0013	0.0017	0.0019	0.0022	0.0025
AVG	0.2595	0.5295	0.0003	0.0005	0.0010	0.0010	0.0012	0.0017	0.0020	0.0024	0.0026
Med	0.2595	0.5297	0.0003	0.0005	0.0010	0.0010	0.0012	0.0017	0.0021	0.0024	0.0026
ST dev	0.0009	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Max	0.2609	0.5309	0.0005	0.0006	0.0011	0.0013	0.0014	0.0019	0.0023	0.0026	0.0029
Min	0.2579	0.5270	0.0001	0.0004	0.0008	0.0007	0.0009	0.0014	0.0017	0.0021	0.0023

Figure 4: Chromaticity shift (Delta u'v') curve at Tc = 55°C, If=90mA

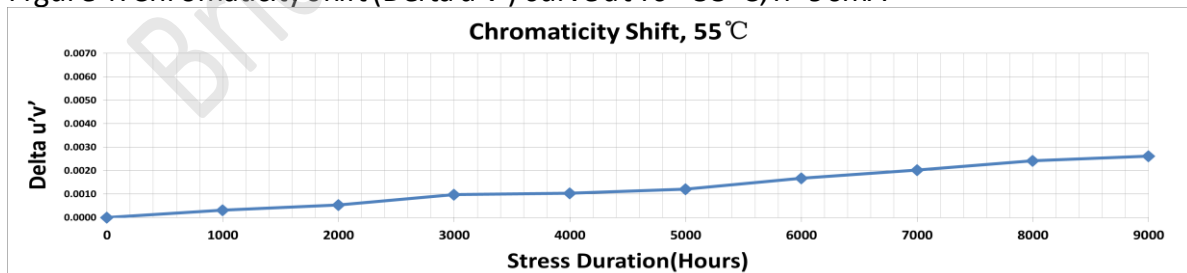


Table 5: Chromaticity shift (Delta u'v') at Tc = 85°C, If=90mA

No	U'	V'	Chromaticity shift (Delta u'v')								
			0hrs	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2581	0.5285	0.0004	0.0008	0.0012	0.0014	0.0016	0.0019	0.0023	0.0027	0.0030
27	0.2601	0.5302	0.0003	0.0007	0.0013	0.0015	0.0016	0.0021	0.0023	0.0026	0.0030
28	0.2611	0.5284	0.0001	0.0007	0.0010	0.0013	0.0015	0.0019	0.0022	0.0025	0.0028
29	0.2604	0.5313	0.0001	0.0007	0.0011	0.0013	0.0015	0.0020	0.0022	0.0024	0.0029
30	0.2621	0.5306	0.0003	0.0009	0.0010	0.0012	0.0016	0.0020	0.0023	0.0026	0.0031
31	0.2602	0.5297	0.0001	0.0007	0.0011	0.0014	0.0017	0.0021	0.0023	0.0025	0.0029
32	0.2601	0.5298	0.0004	0.0007	0.0010	0.0014	0.0018	0.0020	0.0024	0.0027	0.0031
33	0.2601	0.5297	0.0001	0.0008	0.0011	0.0013	0.0018	0.0022	0.0023	0.0026	0.0031
34	0.2582	0.5279	0.0004	0.0008	0.0012	0.0013	0.0014	0.0020	0.0024	0.0027	0.0032
35	0.2590	0.5288	0.0001	0.0006	0.0010	0.0012	0.0016	0.0020	0.0023	0.0025	0.0029
36	0.2608	0.5307	0.0004	0.0007	0.0012	0.0014	0.0016	0.0019	0.0023	0.0026	0.0030
37	0.2572	0.5274	0.0001	0.0006	0.0009	0.0012	0.0016	0.0021	0.0023	0.0027	0.0031
38	0.2613	0.5313	0.0002	0.0007	0.0011	0.0013	0.0015	0.0018	0.0020	0.0024	0.0028
39	0.2586	0.5290	0.0002	0.0007	0.0010	0.0013	0.0018	0.0022	0.0024	0.0027	0.0030
40	0.2616	0.5304	0.0002	0.0008	0.0013	0.0013	0.0016	0.0021	0.0024	0.0027	0.0031
41	0.2603	0.5311	0.0004	0.0007	0.0013	0.0013	0.0016	0.0022	0.0023	0.0027	0.0030
42	0.2596	0.5295	0.0001	0.0007	0.0012	0.0014	0.0017	0.0022	0.0025	0.0026	0.0030
43	0.2598	0.5299	0.0003	0.0007	0.0013	0.0015	0.0019	0.0023	0.0024	0.0026	0.0029
44	0.2594	0.5311	0.0002	0.0007	0.0012	0.0014	0.0018	0.0022	0.0025	0.0029	0.0031
45	0.2601	0.5291	0.0003	0.0007	0.0012	0.0015	0.0018	0.0020	0.0025	0.0027	0.0032
46	0.2594	0.5317	0.0004	0.0007	0.0011	0.0014	0.0017	0.0019	0.0022	0.0023	0.0029
47	0.2593	0.5310	0.0002	0.0007	0.0010	0.0013	0.0015	0.0019	0.0022	0.0026	0.0030
48	0.2581	0.5300	0.0003	0.0006	0.0013	0.0012	0.0016	0.0019	0.0024	0.0026	0.0029
49	0.2598	0.5289	0.0002	0.0007	0.0011	0.0014	0.0018	0.0021	0.0023	0.0029	0.0031
50	0.2580	0.5269	0.0005	0.0008	0.0010	0.0014	0.0017	0.0018	0.0024	0.0026	0.0032
AVG	0.2597	0.5297	0.0003	0.0007	0.0011	0.0013	0.0016	0.0020	0.0023	0.0026	0.0030
Med	0.2598	0.5298	0.0002	0.0007	0.0011	0.0013	0.0016	0.0020	0.0023	0.0026	0.0030
ST dev	0.0012	0.0013	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Max	0.2621	0.5317	0.0005	0.0009	0.0013	0.0015	0.0019	0.0023	0.0025	0.0029	0.0032
Min	0.2572	0.5269	0.0001	0.0006	0.0009	0.0012	0.0014	0.0018	0.0020	0.0023	0.0028

Figure 5: Chromaticity shift (Delta u'v') curve at Tc = 85°C, If=90mA

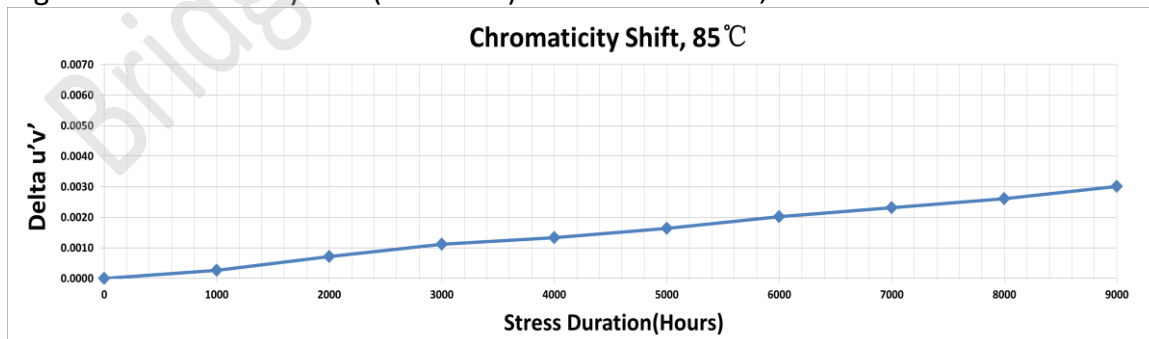
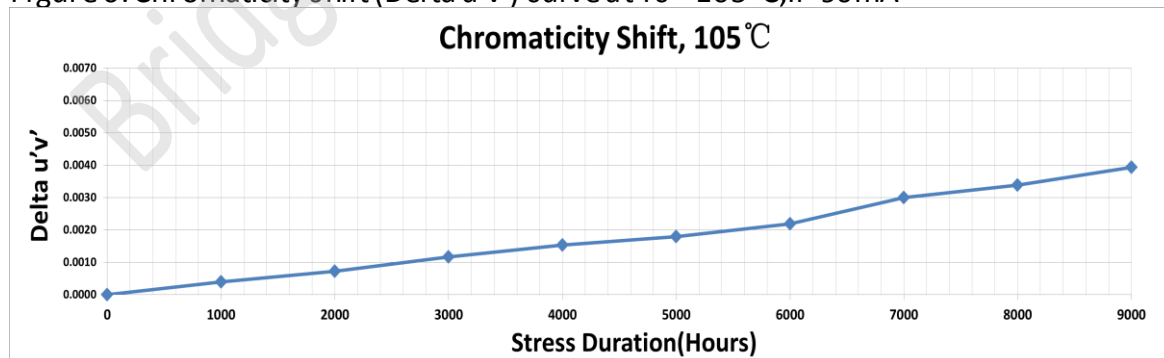


Table 6: Chromaticity shift (Delta u'v') at Tc = 105°C, If=90mA

NO	u'	v'	Chromaticity shift (Delta u'v')								
	0hrs		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2589	0.5307	0.0004	0.0007	0.0011	0.0014	0.0017	0.0020	0.0027	0.0030	0.0036
52	0.2607	0.5302	0.0003	0.0007	0.0010	0.0014	0.0017	0.0021	0.0029	0.0032	0.0039
53	0.2609	0.5299	0.0004	0.0006	0.0010	0.0014	0.0017	0.0021	0.0027	0.0035	0.0039
54	0.2585	0.5303	0.0004	0.0008	0.0013	0.0015	0.0019	0.0021	0.0030	0.0034	0.0040
55	0.2603	0.5299	0.0004	0.0007	0.0014	0.0017	0.0015	0.0021	0.0029	0.0032	0.0040
56	0.2588	0.5306	0.0003	0.0007	0.0012	0.0014	0.0018	0.0022	0.0029	0.0033	0.0038
57	0.2590	0.5299	0.0004	0.0009	0.0010	0.0015	0.0018	0.0021	0.0028	0.0031	0.0041
58	0.2579	0.5274	0.0003	0.0006	0.0011	0.0014	0.0017	0.0021	0.0030	0.0034	0.0041
59	0.2595	0.5288	0.0004	0.0007	0.0013	0.0016	0.0017	0.0023	0.0031	0.0035	0.0039
60	0.2581	0.5275	0.0004	0.0007	0.0011	0.0014	0.0018	0.0023	0.0031	0.0034	0.0038
61	0.2573	0.5290	0.0003	0.0008	0.0011	0.0015	0.0018	0.0023	0.0030	0.0035	0.0040
62	0.2588	0.5272	0.0004	0.0007	0.0012	0.0014	0.0018	0.0021	0.0031	0.0035	0.0039
63	0.2587	0.5295	0.0004	0.0006	0.0012	0.0016	0.0019	0.0022	0.0029	0.0036	0.0038
64	0.2590	0.5307	0.0003	0.0006	0.0011	0.0016	0.0018	0.0022	0.0030	0.0033	0.0038
65	0.2596	0.5298	0.0005	0.0007	0.0011	0.0016	0.0018	0.0022	0.0031	0.0036	0.0041
66	0.2589	0.5257	0.0004	0.0008	0.0013	0.0016	0.0018	0.0023	0.0032	0.0037	0.0040
67	0.2620	0.5299	0.0004	0.0007	0.0010	0.0016	0.0018	0.0023	0.0031	0.0037	0.0041
68	0.2620	0.5308	0.0005	0.0008	0.0012	0.0015	0.0017	0.0021	0.0031	0.0033	0.0039
69	0.2619	0.5309	0.0003	0.0008	0.0011	0.0016	0.0019	0.0021	0.0029	0.0033	0.0040
70	0.2625	0.5301	0.0004	0.0007	0.0014	0.0017	0.0019	0.0023	0.0031	0.0035	0.0041
71	0.2580	0.5300	0.0004	0.0007	0.0012	0.0016	0.0019	0.0024	0.0030	0.0033	0.0038
72	0.2617	0.5301	0.0005	0.0009	0.0011	0.0016	0.0019	0.0023	0.0032	0.0033	0.0037
73	0.2614	0.5308	0.0003	0.0008	0.0011	0.0014	0.0018	0.0022	0.0032	0.0035	0.0040
74	0.2584	0.5303	0.0004	0.0007	0.0013	0.0016	0.0017	0.0020	0.0028	0.0031	0.0040
75	0.2593	0.5300	0.0005	0.0009	0.0011	0.0017	0.0019	0.0024	0.0032	0.0035	0.0041
AVG	0.2597	0.5296	0.0004	0.0007	0.0012	0.0015	0.0018	0.0022	0.0030	0.0034	0.0039
Med	0.2590	0.5300	0.0004	0.0007	0.0011	0.0016	0.0018	0.0022	0.0030	0.0034	0.0040
ST dev	0.0015	0.0013	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
Max	0.2625	0.5309	0.0005	0.0009	0.0014	0.0017	0.0019	0.0024	0.0032	0.0037	0.0041
Min	0.2573	0.5257	0.0003	0.0006	0.0010	0.0014	0.0015	0.0020	0.0027	0.0030	0.0036

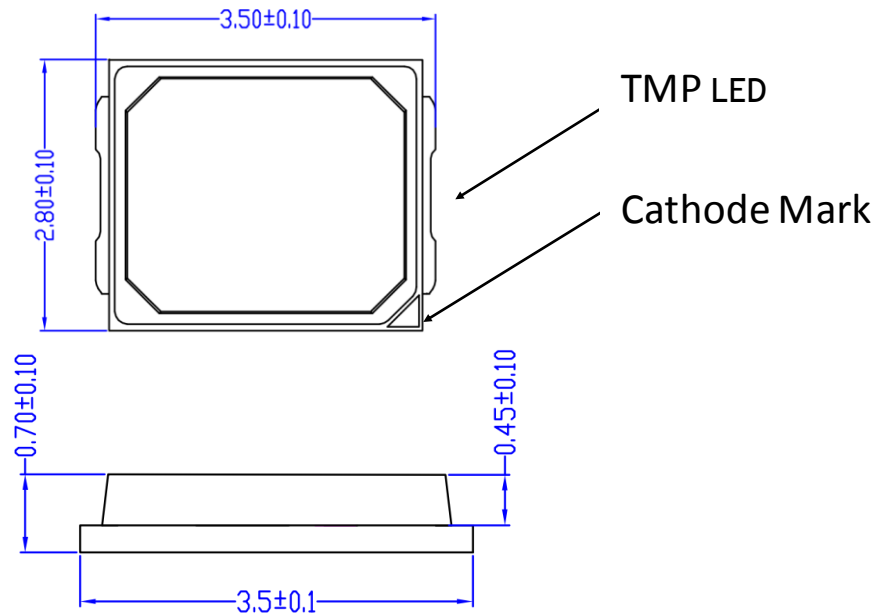
Figure 6: Chromaticity shift (Delta u'v') curve at Tc = 105°C, If=90mA



Observation of LED Light Source Failures

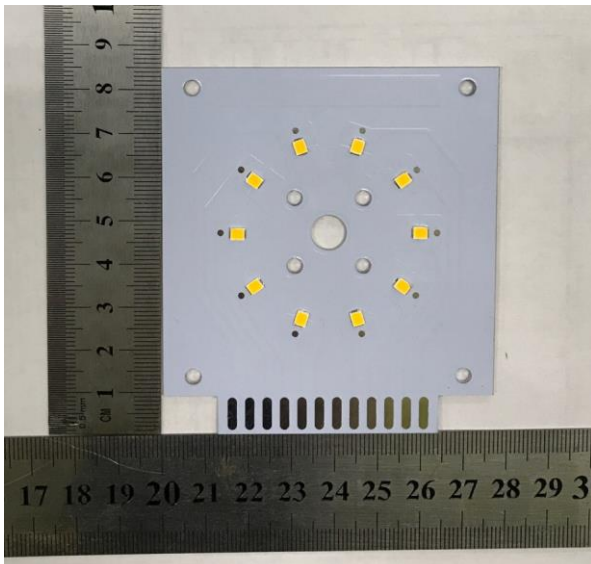
No optical, electrical or mechanical failure of any LED light source was found during life testing.

Mechanical Dimensions



All dimensions are in millimeter

DUT PHOTO



Appendix

Photometric Measurement Uncertainty

The tester is calibrated annually and the calibration data ensures <math><1.00\% (k=2)</math> uncertainty of measurement.

Gauge Study Results

Gauge study shows the following results:

R&R:	2.86%
Standard Deviation:	0.03%

Equipment List

1)

Description: LM-80 Emitter Test system #1

Manufacturer: Nissoku

Model: KL1810-21-LM-2

Last Calibration Date: 20/04/28

Next Calibration Due Date: 21/04/27

2)

Description: LM80-Emitter Photoelectricity measuring system

Manufacturer: EVERFINE

Model: HAAS2000

Last Calibration Date: 20/04/15

Next Calibration Due Date: 21/04/14

3)

Description: Digital Thermometer

Manufacturer: OMEGA

Model: HH801B

Last Calibration Date: 20/04/16

Next Calibration Due Date: 21/04/15

4)

Description: Digital Multi meter

Manufacturer: Fluke

Model: 289C

Last Calibration Date: 20/07/13

Next Calibration Due Date: 21/07/12

Lab Accreditation Certificate



CERTIFICATE OF ACCREDITATION

This is to attest that

BRIDGELUX KAISTAR LABORATORY

NO.101, XIANG XING ROAD, XIANG AN BRANCH, TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE
XIAMEN 361101, PEOPLE'S REPUBLIC OF CHINA

Testing Laboratory TL-855

has met the requirements of AC89, *IAS Accreditation Criteria for Testing Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date July 30, 2020



President

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Accredited to ISO/IEC 17025:2017

Effective Date July 30, 2020

Photometric & Reliability Testing	
ANSI/ESDA/IEDEC JS-001	Electrostatic Discharge (ESD) Sensitivity Testing Human Body Model (HBM)
ANSI/IES LM-80-08	Measuring lumen maintenance of LED light sources
ANSI/IES LM-80-15	Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
CIE Pub. 13.3:1995	Method of measuring and specifying color rendering properties of light sources
CIE Pub. 15:2004	Colorimetry
IES LM-58-13	Spectroradiometric Measurement Methods for Light Sources
IES LM-82-12	Characterization of LED light engines and LED lamps for electrical and photometric properties as a function of temperature
IES TM-21-11	Projecting Long Term Lumen Maintenance of LED Light Sources
IES TM-30-15	IES Method for Evaluating Light Source Color Rendition
IES TM-30-18	IES Method for Evaluating Light Source Color Rendition
JEDEC J-STD-020	Moisture Reflow Sensitivity Classification for Nonhermetic Surface Mount Devices
JESD22-A100	Cycled Temperature-Humidity-Bias Life Test
JESD22-A101	Steady-State Temperature-Humidity Bias Life Test
JESD22-A103	High Temperature Storage Life
JESD22-A104	Temperature Cycling
JESD22-A105	Power and Temperature Cycling
JESD22-A108	Temperature, Bias, and Operating Life
JESD22-A113	Pre-condition of Plastic Surface Mount Devices Prior to Reliability Testing
JESD22-A119	Low Temperature Storage Life

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