



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Yuji-Xinguang Optoelectronic Tech Co., LTD.

Rm808,Sci.&Tech.Tower,No.9 zhongguancun South Street ,Haidian District, Beijing, P.R. China

Model: YJ-BC-3030

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	R2DG160511050-10-M1		
Test Date:	2016-05-12 to 2017-06-26		
Report Date:	2017-12-11		
Revised Note:	The previous report R2DG160511050-10 is replaced by this report on 2017-12-11		
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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 Bay Area Compliance Laboratories Corp. (Dongguan).
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1 - General Information

1.1 Description of LED Light Sources

Devices tested

Part Number: YJ-BC-3030
 Part Type: LED Package
 Nominal CCT: 2700K

1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at No.69,Pulongcun ,Puxihu Industrial Area, Tangxia , Dongguan, Guangdong, China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ 7321114	300VA	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20005	25°C~130°C	2016-09-01	2017-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	(50/15A)	2016-12-15	2017-12-15
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	(50/15A)	2017-03-03	2018-03-03

1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature T_A was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

For photometry measurement, temperature was set to $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%.

1.7 Photometry Measurement Uncertainty

The uncertainty of the light output measurements is $U=1.59\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=21\text{K}$ ($K=2$), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

1.8 Sample Set

Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

Sample Size:

Total 75Pcs;

Each Ts test condition 25Pcs

The 75pcs samples tested at Ts 55°C, 85°C and Ts 105°C were received at 2016-05-11 and tested during 2016-05-12 to 2017-06-26. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

Data Set 1: 55°C, 300mA

Part Number:	YJ-BC-3030
Number of Units:	25
Actual Case Temperature(T _S):	T _S =54.8°C
Actual Ambient Temperature(T _A):	T _A =52.7°C
Life Test Drive Current:	I _F = 300mA
Measurement Current:	I _F = 300mA

Data Set 2: 85°C,300mA

Part Number:	YJ-BC-3030
Number of Units:	25
Actual Case Temperature(T _S):	T _S =83.2°C
Actual Ambient Temperature(T _A):	T _A =82.1°C
Life Test Drive Current:	I _F =300mA
Measurement Current:	I _F = 300mA

Data Set 3: 105°C, 300mA

Part Number:	YJ-BC-3030
Number of Units:	25
Actual Case Temperature(T _S):	T _S =104.5°C
Actual Ambient Temperature(T _A):	T _A =102.6°C
Life Test Drive Current:	I _F = 300mA
Measurement Current:	I _F = 300mA

2 - Summary OF Test Result

Data Set:	Data Set 1, 55°C, 300mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	98.65%
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0023
Reported TM-21 L ₇₀ Lifetime:	>54,000 hours

Data Set:	Data Set 2, 85°C, 300mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	97.97%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0025
Reported TM-21 L ₇₀ Lifetime	>54,000 hours

Data Set:	Data Set 3, 105°C, 300mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	97.48%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0028
Reported TM-21 L ₇₀ Lifetime	>54,000 hours

3 - Test Data

3.1 Data Set 1, 55°C, 300mA (Lumen Maintenance)

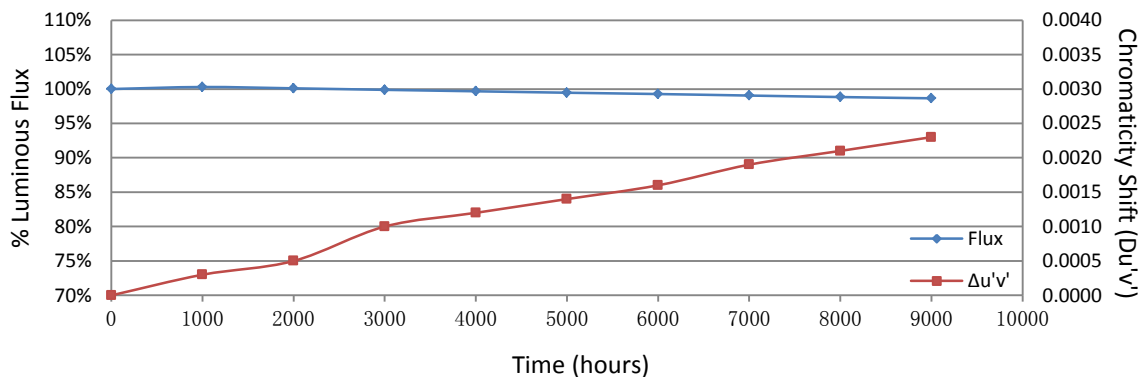
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.454	90.25	100.25	100.01	99.89	99.68	99.49	99.35	99.15	98.93	98.73
2	3.604	91.12	100.35	100.18	99.91	99.79	99.71	99.45	99.20	98.94	98.71
3	3.446	89.16	100.19	99.85	99.55	99.34	99.29	99.08	98.88	98.77	98.73
4	3.472	89.75	100.26	100.14	99.99	99.71	99.58	99.31	99.08	98.91	98.80
5	3.439	91.24	100.39	100.33	100.02	99.82	99.52	99.36	99.20	99.11	98.89
6	3.549	88.62	100.37	100.25	100.15	99.86	99.81	99.47	99.32	99.13	99.11
7	3.398	91.08	100.15	99.93	99.70	99.36	99.03	98.87	98.57	98.30	98.17
8	3.428	90.57	100.25	100.13	99.80	99.59	99.29	99.15	98.40	98.29	98.08
9	3.451	90.28	100.29	99.96	99.69	99.47	99.27	99.12	98.80	98.47	98.24
10	3.580	90.52	100.32	100.11	99.82	99.66	99.29	99.11	98.86	98.48	98.23
11	3.566	89.60	100.33	100.18	99.98	99.78	99.36	99.32	98.93	98.91	98.64
12	3.441	91.26	100.18	99.96	99.84	99.72	99.35	99.15	98.92	98.85	98.81
13	3.374	89.99	100.24	100.02	99.74	99.69	99.67	99.50	99.41	99.07	98.82
14	3.413	92.24	100.17	100.01	99.79	99.52	99.40	99.13	99.04	98.73	98.41
15	3.439	90.24	100.35	100.23	99.92	99.62	99.32	99.12	98.91	98.85	98.59
16	3.444	90.07	100.38	100.13	99.93	99.90	99.73	99.32	99.00	98.79	98.76
17	3.566	91.24	100.24	100.15	99.95	99.59	99.23	99.11	99.08	98.83	98.71
18	3.405	89.86	100.26	100.02	99.78	99.55	99.31	99.03	98.82	98.68	98.46
19	3.599	90.68	100.39	100.23	100.03	99.82	99.59	99.40	99.23	98.89	98.59
20	3.532	91.35	100.33	100.13	99.98	99.81	99.75	99.72	99.68	99.44	99.22
21	3.425	91.02	100.23	100.03	99.85	99.77	99.45	99.26	99.12	99.04	98.86
22	3.414	89.53	100.44	100.36	99.98	99.88	99.80	99.77	99.45	99.22	99.06
23	3.427	91.23	100.24	100.03	99.82	99.56	99.31	99.16	99.02	98.68	98.49
24	3.387	89.05	100.33	100.13	99.93	99.58	99.54	99.16	99.00	98.83	98.66
25	3.448	92.38	100.36	100.01	99.91	99.68	99.44	99.27	99.06	98.74	98.44
Ave.	3.468	90.49	100.29	100.10	99.88	99.67	99.46	99.27	99.05	98.83	98.65
Med.	3.444	90.52	100.29	100.13	99.91	99.68	99.44	99.26	99.04	98.85	98.71
st dev	0.070	0.94	0.0775	0.1243	0.1285	0.1521	0.2025	0.2073	0.2697	0.2685	0.2880
Min.	3.374	88.62	100.15	99.85	99.55	99.34	99.03	98.87	98.40	98.29	98.08
Max.	3.604	92.38	100.44	100.36	100.15	99.90	99.81	99.77	99.68	99.44	99.22

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 2.078E-06
 β : 1.005
Reported L₇₀: >54,000 hours

3.2 Data Set 1, 55°C, 300mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2638	0.5293	2666	0.0003	0.0007	0.0010	0.0012	0.0016	0.0019	0.0019	0.0022	0.0024
2	0.2616	0.5262	2723	0.0002	0.0005	0.0011	0.0013	0.0016	0.0020	0.0019	0.0021	0.0024
3	0.2653	0.5292	2636	0.0003	0.0006	0.0012	0.0014	0.0018	0.0020	0.0023	0.0024	0.0026
4	0.2625	0.5245	2711	0.0001	0.0004	0.0011	0.0013	0.0016	0.0018	0.0020	0.0021	0.0025
5	0.2621	0.5280	2705	0.0002	0.0003	0.0009	0.0011	0.0012	0.0018	0.0019	0.0021	0.0023
6	0.2630	0.5270	2690	0.0003	0.0004	0.0011	0.0013	0.0015	0.0020	0.0022	0.0022	0.0025
7	0.2618	0.5269	2716	0.0002	0.0004	0.0009	0.0011	0.0012	0.0015	0.0019	0.0021	0.0024
8	0.2622	0.5276	2705	0.0002	0.0004	0.0009	0.0010	0.0015	0.0014	0.0018	0.0021	0.0022
9	0.2634	0.5275	2680	0.0001	0.0004	0.0009	0.0010	0.0012	0.0014	0.0018	0.0020	0.0022
10	0.2622	0.5260	2712	0.0002	0.0004	0.0008	0.0010	0.0013	0.0015	0.0018	0.0020	0.0022
11	0.2617	0.5267	2719	0.0002	0.0006	0.0010	0.0012	0.0014	0.0015	0.0019	0.0020	0.0023
12	0.2637	0.5285	2672	0.0004	0.0004	0.0010	0.0010	0.0013	0.0016	0.0019	0.0020	0.0022
13	0.2611	0.5261	2735	0.0003	0.0005	0.0011	0.0013	0.0015	0.0016	0.0019	0.0021	0.0025
14	0.2629	0.5275	2692	0.0005	0.0007	0.0011	0.0013	0.0014	0.0015	0.0019	0.0020	0.0024
15	0.2646	0.5285	2652	0.0001	0.0006	0.0009	0.0012	0.0014	0.0015	0.0019	0.0021	0.0022
16	0.2630	0.5285	2685	0.0003	0.0006	0.0011	0.0013	0.0014	0.0017	0.0019	0.0021	0.0024
17	0.2614	0.5255	2731	0.0001	0.0004	0.0008	0.0010	0.0013	0.0015	0.0017	0.0021	0.0022
18	0.2625	0.5265	2703	0.0001	0.0004	0.0009	0.0011	0.0015	0.0015	0.0019	0.0021	0.0023
19	0.2647	0.5286	2650	0.0002	0.0002	0.0009	0.0012	0.0014	0.0015	0.0018	0.0021	0.0023
20	0.2633	0.5276	2682	0.0003	0.0006	0.0009	0.0011	0.0013	0.0014	0.0017	0.0020	0.0022
21	0.2627	0.5277	2695	0.0003	0.0005	0.0008	0.0010	0.0013	0.0015	0.0017	0.0020	0.0022
22	0.2663	0.5303	2613	0.0004	0.0009	0.0010	0.0013	0.0016	0.0016	0.0020	0.0021	0.0023
23	0.2620	0.5274	2709	0.0002	0.0005	0.0009	0.0011	0.0012	0.0014	0.0017	0.0021	0.0023
24	0.2643	0.5278	2662	0.0002	0.0006	0.0008	0.0009	0.0012	0.0013	0.0016	0.0019	0.0022
25	0.2622	0.5279	2705	0.0003	0.0005	0.0009	0.0010	0.0015	0.0015	0.0017	0.0020	0.0022
Ave.	0.2630	0.5275	2690	0.0003	0.0005	0.0010	0.0012	0.0014	0.0016	0.0019	0.0021	0.0023
Med.	0.2627	0.5276	2695	0.0002	0.0005	0.0009	0.0011	0.0014	0.0015	0.0019	0.0021	0.0023
st dev	0.0013	0.0013	30	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001
Min.	0.2611	0.5245	2613	0.0001	0.0002	0.0008	0.0009	0.0012	0.0013	0.0016	0.0019	0.0022
Max.	0.2663	0.5303	2735	0.0005	0.0009	0.0012	0.0014	0.0018	0.0020	0.0023	0.0024	0.0026



3.3 Data Set 2, 85°C, 300mA (Lumen Maintenance)

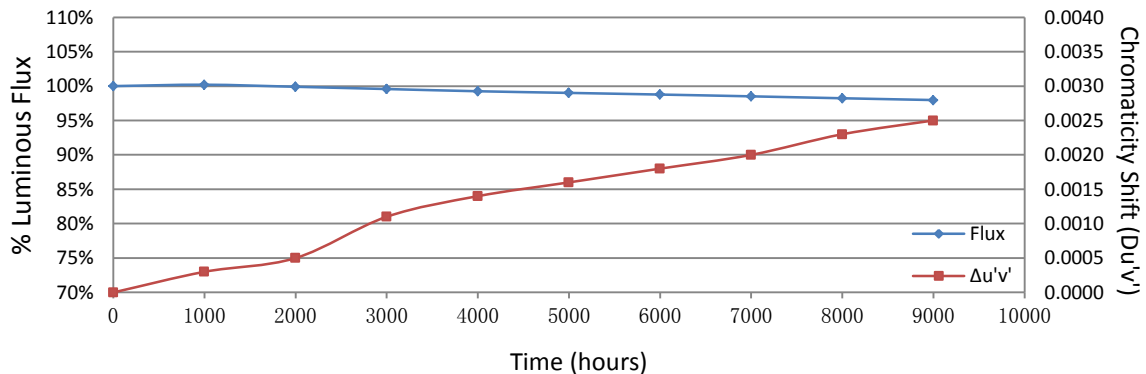
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	3.453	91.30	100.31	100.20	99.92	99.72	99.64	99.54	99.30	99.17	98.86
27	3.402	88.90	100.12	99.90	99.64	99.40	99.21	98.99	98.82	98.59	98.29
28	3.452	90.54	100.29	100.02	99.66	99.38	99.28	98.94	98.77	98.33	98.10
29	3.416	87.90	100.24	99.92	99.58	99.40	99.27	99.07	98.83	98.71	98.58
30	3.568	90.08	100.36	100.12	99.78	99.46	99.12	99.01	98.75	98.43	98.31
31	3.378	90.65	100.20	100.07	99.74	99.45	99.15	98.94	98.67	98.46	98.26
32	3.508	90.09	100.29	99.93	99.69	99.40	99.27	98.96	98.70	98.55	98.26
33	3.535	89.86	100.07	99.61	99.20	98.88	98.51	98.10	98.06	97.77	97.46
34	3.410	89.90	100.04	99.68	99.28	98.89	98.54	98.26	97.85	97.55	97.43
35	3.404	91.20	100.22	99.86	99.61	99.31	99.20	98.82	98.70	98.28	97.88
36	3.436	91.16	100.20	99.81	99.61	99.19	98.90	98.67	98.40	98.19	97.87
37	3.513	91.00	100.26	99.89	99.56	99.25	99.15	98.97	98.93	98.51	98.19
38	3.427	90.47	100.23	99.94	99.68	99.25	98.99	98.70	98.26	98.07	97.93
39	3.463	90.61	100.10	99.87	99.54	99.23	98.82	98.74	98.41	98.07	97.86
40	3.461	88.21	100.17	99.97	99.76	99.52	99.23	99.00	98.72	98.48	98.25
41	3.395	90.36	100.19	99.98	99.58	99.16	99.11	98.75	98.32	97.99	97.70
42	3.430	91.13	100.04	99.81	99.50	99.14	98.68	98.33	97.87	97.43	97.21
43	3.446	90.76	100.11	99.71	99.50	99.18	98.87	98.57	98.40	98.08	97.64
44	3.456	90.07	100.27	99.90	99.48	99.21	98.96	98.70	98.42	98.23	98.01
45	3.420	91.10	100.15	99.78	99.37	99.00	98.80	98.50	98.19	97.86	97.53
46	3.387	90.19	100.29	99.81	99.51	99.07	98.82	98.59	98.27	97.98	97.62
47	3.365	91.43	100.34	100.08	99.57	99.25	98.94	98.63	98.48	98.12	97.77
48	3.422	92.22	100.26	99.95	99.60	99.24	98.87	98.60	98.36	98.10	97.90
49	3.427	91.08	100.08	99.80	99.45	99.19	98.89	98.81	98.50	98.32	98.02
50	3.440	90.22	100.23	99.88	99.53	99.21	99.08	99.01	98.87	98.59	98.32
Ave.	3.441	90.42	100.20	99.90	99.57	99.25	99.01	98.77	98.51	98.23	97.97
Med.	3.430	90.54	100.22	99.90	99.58	99.24	98.99	98.75	98.48	98.23	97.93
st dev	0.049	0.97	0.0919	0.1363	0.1547	0.1896	0.2550	0.2994	0.3386	0.3761	0.3827
Min.	3.365	87.90	100.04	99.61	99.20	98.88	98.51	98.10	97.85	97.43	97.21
Max.	3.568	92.22	100.36	100.20	99.92	99.72	99.64	99.54	99.30	99.17	98.86

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 2.608E-06
 β : 1.003
Reported L₇₀: >54,000 hours

3.4 Data Set 2, 85°C, 300mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2630	0.5279	2688	0.0003	0.0006	0.0010	0.0013	0.0013	0.0014	0.0017	0.0021	0.0024
27	0.2621	0.5259	2714	0.0002	0.0004	0.0011	0.0014	0.0017	0.0018	0.0019	0.0023	0.0025
28	0.2617	0.5263	2721	0.0001	0.0005	0.0012	0.0015	0.0016	0.0019	0.0020	0.0023	0.0025
29	0.2637	0.5281	2672	0.0003	0.0006	0.0011	0.0014	0.0017	0.0021	0.0021	0.0025	0.0026
30	0.2616	0.5267	2721	0.0002	0.0004	0.0011	0.0014	0.0016	0.0018	0.0019	0.0022	0.0026
31	0.2616	0.5268	2722	0.0001	0.0004	0.0011	0.0015	0.0017	0.0019	0.0020	0.0024	0.0027
32	0.2631	0.5271	2689	0.0003	0.0008	0.0013	0.0017	0.0019	0.0021	0.0022	0.0024	0.0028
33	0.2631	0.5283	2683	0.0002	0.0004	0.0008	0.0013	0.0015	0.0017	0.0017	0.0022	0.0024
34	0.2623	0.5274	2704	0.0003	0.0003	0.0009	0.0012	0.0014	0.0016	0.0016	0.0022	0.0024
35	0.2628	0.5279	2692	0.0003	0.0004	0.0011	0.0015	0.0018	0.0019	0.0020	0.0024	0.0026
36	0.2615	0.5263	2725	0.0003	0.0004	0.0011	0.0014	0.0017	0.0018	0.0019	0.0024	0.0026
37	0.2618	0.5267	2716	0.0002	0.0004	0.0010	0.0013	0.0016	0.0018	0.0018	0.0022	0.0025
38	0.2630	0.5282	2687	0.0002	0.0004	0.0012	0.0015	0.0018	0.0022	0.0022	0.0024	0.0027
39	0.2626	0.5279	2695	0.0003	0.0004	0.0009	0.0013	0.0015	0.0017	0.0019	0.0022	0.0024
40	0.2646	0.5293	2651	0.0003	0.0007	0.0013	0.0016	0.0017	0.0019	0.0022	0.0024	0.0026
41	0.2626	0.5270	2700	0.0004	0.0008	0.0014	0.0017	0.0019	0.0022	0.0026	0.0027	0.0029
42	0.2610	0.5268	2733	0.0003	0.0004	0.0009	0.0014	0.0015	0.0018	0.0021	0.0022	0.0025
43	0.2618	0.5266	2718	0.0002	0.0004	0.0010	0.0013	0.0017	0.0018	0.0022	0.0022	0.0025
44	0.2624	0.5275	2701	0.0003	0.0005	0.0009	0.0014	0.0016	0.0018	0.0021	0.0023	0.0025
45	0.2614	0.5273	2723	0.0002	0.0004	0.0009	0.0013	0.0014	0.0016	0.0020	0.0022	0.0024
46	0.2619	0.5269	2714	0.0002	0.0004	0.0009	0.0013	0.0014	0.0016	0.0019	0.0022	0.0023
47	0.2615	0.5277	2720	0.0003	0.0006	0.0011	0.0013	0.0015	0.0017	0.0020	0.0022	0.0025
48	0.2616	0.5278	2716	0.0002	0.0005	0.0010	0.0013	0.0014	0.0016	0.0020	0.0022	0.0024
49	0.2617	0.5265	2719	0.0003	0.0005	0.0010	0.0014	0.0014	0.0017	0.0021	0.0023	0.0024
50	0.2617	0.5249	2726	0.0004	0.0007	0.0012	0.0014	0.0016	0.0019	0.0022	0.0023	0.0026
Ave.	0.2622	0.5272	2706	0.0003	0.0005	0.0011	0.0014	0.0016	0.0018	0.0020	0.0023	0.0025
Med.	0.2619	0.5271	2714	0.0003	0.0004	0.0011	0.0014	0.0016	0.0018	0.0020	0.0023	0.0025
st dev	0.0008	0.0009	20	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001
Min.	0.2610	0.5249	2651	0.0001	0.0003	0.0008	0.0012	0.0013	0.0014	0.0016	0.0021	0.0023
Max.	0.2646	0.5293	2733	0.0004	0.0008	0.0014	0.0017	0.0019	0.0022	0.0026	0.0027	0.0029



3.5 Data Set 3, 105°C, 300mA (Lumen Maintenance)

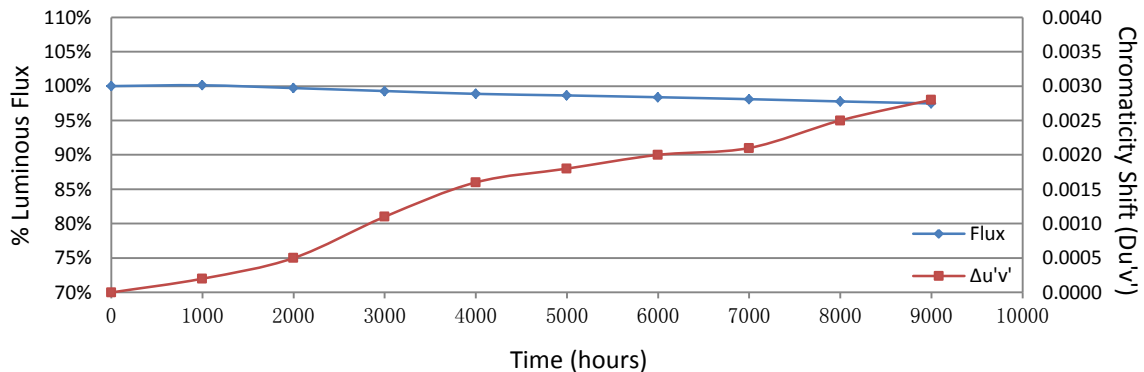
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	3.531	90.62	100.15	99.94	99.53	99.10	99.05	98.92	98.78	98.54	98.33
52	3.583	89.62	100.06	99.61	99.22	98.90	98.55	98.19	97.89	97.76	97.60
53	3.463	89.49	100.31	99.91	99.43	98.96	98.92	98.71	98.45	98.09	97.70
54	3.610	90.77	100.22	99.74	99.32	98.84	98.83	98.46	98.06	97.66	97.31
55	3.504	90.66	100.10	99.60	99.16	98.87	98.39	98.32	98.05	97.67	97.30
56	3.374	92.54	100.13	99.73	99.19	98.81	98.52	98.30	98.08	97.80	97.50
57	3.410	92.00	100.16	99.70	99.22	98.66	98.41	98.16	97.92	97.72	97.59
58	3.556	88.31	100.03	99.74	99.47	99.00	98.64	98.44	98.14	97.71	97.43
59	3.560	91.53	100.08	99.71	99.24	98.81	98.37	98.06	97.79	97.35	96.86
60	3.538	91.23	100.02	99.63	99.10	98.65	98.39	98.05	97.79	97.49	97.15
61	3.592	88.66	100.11	99.71	99.36	99.05	99.00	98.87	98.64	98.23	97.80
62	3.503	89.74	100.21	99.73	99.22	99.01	98.99	98.81	98.54	98.22	97.85
63	3.592	89.54	100.09	99.84	99.37	99.02	98.76	98.59	98.31	98.09	97.96
64	3.534	90.03	100.11	99.89	99.36	98.91	98.90	98.50	98.28	98.01	97.77
65	3.553	89.94	100.22	99.76	99.30	98.71	98.54	98.25	98.10	97.59	97.34
66	3.596	91.66	100.16	99.62	99.32	98.83	98.64	98.36	98.18	97.94	97.61
67	3.366	90.86	100.08	99.54	99.22	98.80	98.51	98.24	98.03	97.73	97.37
68	3.386	91.11	100.04	99.57	99.09	98.75	98.56	98.40	98.07	97.68	97.61
69	3.368	91.55	100.16	99.87	99.44	98.95	98.58	98.29	97.87	97.43	97.13
70	3.487	91.84	100.09	99.81	99.37	99.04	98.55	98.31	98.06	97.81	97.56
71	3.409	89.04	100.08	99.61	99.20	98.82	98.64	98.33	97.93	97.56	97.34
72	3.486	91.58	100.02	99.53	98.89	98.54	98.46	98.20	97.73	97.28	96.96
73	3.397	89.78	100.19	99.58	99.29	98.90	98.44	98.31	98.03	97.69	97.42
74	3.417	90.93	100.09	99.49	99.18	98.83	98.58	98.26	97.92	97.62	97.38
75	3.563	91.19	100.02	99.89	99.42	99.02	98.86	98.29	97.99	97.60	97.25
Ave.	3.495	90.57	100.12	99.71	99.28	98.87	98.64	98.38	98.10	97.77	97.48
Med.	3.504	90.77	100.10	99.71	99.29	98.87	98.58	98.31	98.06	97.71	97.43
st dev	0.082	1.10	0.0745	0.1310	0.1407	0.1404	0.2090	0.2341	0.2652	0.2945	0.3196
Min.	3.366	88.31	100.02	99.49	98.89	98.54	98.37	98.05	97.73	97.28	96.86
Max.	3.610	92.54	100.31	99.94	99.53	99.10	99.05	98.92	98.78	98.54	98.33

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 2.863E-06
 β : 1.001
Reported L₇₀: >54,000 hours

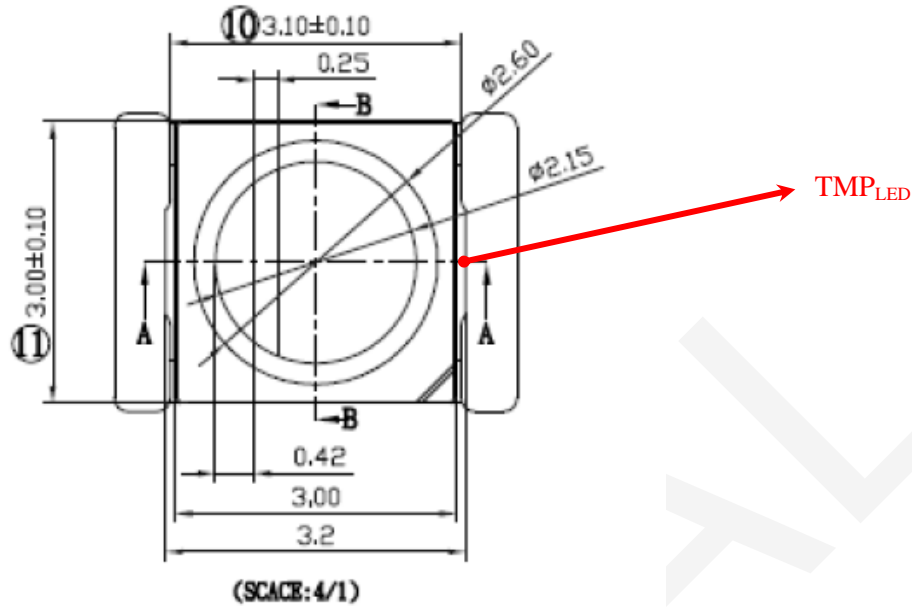
3.6 Data Set 3, 105°C, 300mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	0.2638	0.5289	2668	0.0002	0.0004	0.0011	0.0015	0.0016	0.0018	0.0021	0.0025	0.0028
52	0.2644	0.5281	2658	0.0003	0.0004	0.0013	0.0017	0.0017	0.0020	0.0024	0.0026	0.0029
53	0.2641	0.5286	2662	0.0004	0.0006	0.0013	0.0017	0.0018	0.0024	0.0027	0.0028	0.0032
54	0.2623	0.5275	2704	0.0002	0.0003	0.0011	0.0014	0.0014	0.0018	0.0020	0.0024	0.0027
55	0.2645	0.5285	2654	0.0002	0.0004	0.0011	0.0015	0.0017	0.0018	0.0020	0.0024	0.0027
56	0.2617	0.5269	2718	0.0002	0.0004	0.0010	0.0015	0.0016	0.0016	0.0020	0.0024	0.0026
57	0.2621	0.5278	2705	0.0002	0.0004	0.0011	0.0015	0.0018	0.0021	0.0020	0.0025	0.0027
58	0.2633	0.5268	2685	0.0004	0.0006	0.0014	0.0019	0.0021	0.0025	0.0025	0.0027	0.0030
59	0.2611	0.5263	2734	0.0001	0.0004	0.0011	0.0016	0.0017	0.0019	0.0021	0.0024	0.0027
60	0.2611	0.5270	2730	0.0002	0.0005	0.0012	0.0017	0.0018	0.0021	0.0020	0.0025	0.0027
61	0.2634	0.5279	2678	0.0002	0.0005	0.0014	0.0017	0.0020	0.0023	0.0022	0.0026	0.0029
62	0.2620	0.5263	2715	0.0001	0.0006	0.0013	0.0017	0.0019	0.0021	0.0022	0.0025	0.0028
63	0.2613	0.5254	2733	0.0002	0.0005	0.0012	0.0016	0.0018	0.0020	0.0021	0.0026	0.0027
64	0.2623	0.5280	2702	0.0002	0.0004	0.0011	0.0016	0.0017	0.0019	0.0020	0.0025	0.0027
65	0.2609	0.5273	2734	0.0002	0.0005	0.0013	0.0017	0.0018	0.0021	0.0022	0.0025	0.0028
66	0.2617	0.5274	2717	0.0001	0.0005	0.0009	0.0015	0.0016	0.0019	0.0020	0.0025	0.0026
67	0.2624	0.5265	2706	0.0002	0.0006	0.0012	0.0017	0.0019	0.0021	0.0022	0.0026	0.0029
68	0.2614	0.5261	2728	0.0001	0.0004	0.0011	0.0015	0.0017	0.0019	0.0020	0.0024	0.0027
69	0.2615	0.5260	2726	0.0001	0.0003	0.0011	0.0016	0.0018	0.0021	0.0021	0.0025	0.0027
70	0.2632	0.5282	2682	0.0001	0.0002	0.0010	0.0015	0.0016	0.0019	0.0019	0.0025	0.0026
71	0.2629	0.5274	2693	0.0003	0.0006	0.0012	0.0017	0.0018	0.0021	0.0022	0.0025	0.0028
72	0.2615	0.5249	2732	0.0001	0.0003	0.0009	0.0015	0.0017	0.0019	0.0020	0.0024	0.0027
73	0.2629	0.5277	2691	0.0002	0.0004	0.0011	0.0015	0.0018	0.0020	0.0022	0.0025	0.0028
74	0.2634	0.5281	2678	0.0002	0.0004	0.0010	0.0016	0.0018	0.0020	0.0020	0.0025	0.0028
75	0.2621	0.5267	2711	0.0001	0.0004	0.0010	0.0015	0.0017	0.0021	0.0021	0.0025	0.0027
Ave.	0.2625	0.5272	2702	0.0002	0.0005	0.0011	0.0016	0.0018	0.0020	0.0021	0.0025	0.0028
Med.	0.2623	0.5274	2705	0.0002	0.0004	0.0011	0.0016	0.0018	0.0020	0.0021	0.0025	0.0027
st dev	0.0011	0.0010	26	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001
Min.	0.2609	0.5249	2654	0.0001	0.0002	0.0009	0.0014	0.0014	0.0016	0.0019	0.0024	0.0026
Max.	0.2645	0.5289	2734	0.0004	0.0006	0.0014	0.0019	0.0021	0.0025	0.0027	0.0028	0.0032



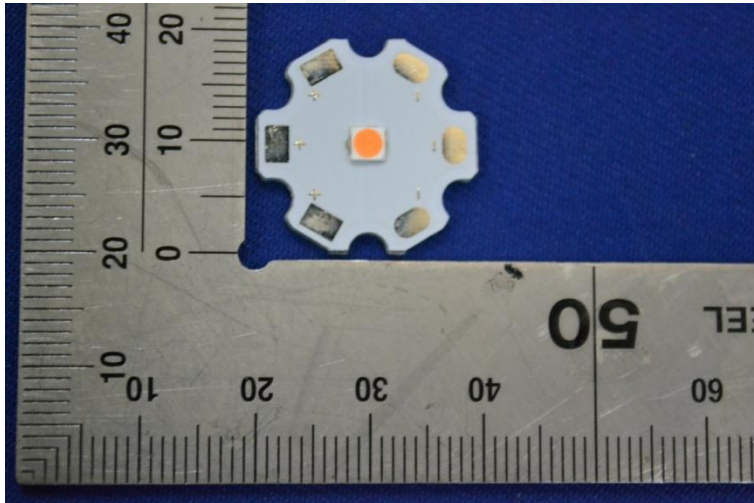
Attachment A – EUT Photo

A.1 Mechanical Dimensions (Ta = 25°C)



All dimensions are in millimeter

A.2 EUT Photo



Report Revision

Report Number	Report Date	Contents
R2DG160511050-10	2017-07-11	Original report.
R2DG160511050-10-M1	2017-12-11	Update the product model number in page 1, page 3 and page 5.

*****END OF REPORT*****