

IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Guangzhou Hongli Opto-Electronic Co., Ltd.

No.1, Xianke 1st Road, Huadong Town, Huadu District, Guangzhou, China

Model: HL-A-2835DW-S1-08-HR3

Report Type: 6000 Hours Test Report (See Section 1.9 Report Revision)		Product Type: LED Package	
Test Engineer:	Daniel Duan <i>Daniel Duan</i>		
Report Number:	RSZ120424502-10-M4		
Test Date:	2012-04-26 to 2013-11-25		
Report Date:	2014-01-14		
Reviewed By:	Jeanne Han /Safety Manager <i>Jeanne Han</i>		
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588		

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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TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	3
1.1 DESCRIPTION OF LED LIGHT SOURCES	3
1.2 STANDARDS USED	3
1.3 TEST FACILITY	3
1.4 DESCRIPTION OF AUXILIARY EQUIPMENT	3
1.5 OPERATING CYCLE	4
1.6 AMBIENT CONDITIONS	4
1.7 PHOTOMETRY MEASUREMENT UNCERTAINTY	4
1.8 SAMPLE SET	5
1.9 REPORT REVISION	5
2 - SUMMARY OF TEST RESULT	6
3 - TEST DATA	7
3.1 DATA SET 1, 55 °C, 150MA (LUMEN MAINTENANCE)	7
3.2 DATA SET 1, 55 °C, 150MA (CHROMATICITY SHIFT)	8
3.3 DATA SET 2, 75°C, 150MA (LUMEN MAINTENANCE)	9
3.4 DATA SET 2, 75°C, 150MA (CHROMATICITY SHIFT)	10
3.5 DATA SET 3, 85 °C, 150MA (LUMEN MAINTENANCE)	11
3.6 DATA SET 3, 85 °C, 150MA (CHROMATICITY SHIFT)	12
APPENDIX A – EUT PHOTO	13
A.1 MECHANICAL DIMENSIONS (TA = 25 °C)	13
A.2 EUT PHOTO	13

1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: HL-A-2835DW-S1-08-HR3
 Part Name: /
 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 Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3M	1011119	380-780nm, length:0.3M ,0-1999LUMEN	2013-03-08	2014-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2013-03-25	2014-03-25
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2013-03-08	2014-03-08
Standard Light Source	EVERFINE	D062	1011064	2856K	2013-05-23	2014-05-23
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987CJ 7321114	300VA	2013-03-25	2014-03-25
LM-80 Aging equipment	BACL	N/A	#1	N/A	2013-03-25	2014-03-25
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50V/15A)	2013-03-25	2014-03-25
Multilayer LM-80 aging machine	BACL	B2-270	20013	270pcs	2013-08-01	2014-08-01
Multi-channel DC source	Tai Shan Xing Guang	T01000F2	ST04392	5V/1000mA	2013-08-01	2014-08-01

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 $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, 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;

The 25pcs samples tested at T_s 85 °C were received at 2012-02-24 and tested during 2012-04-26 to 2013-01-04. The samples were numbered from 1 to 25.

The other 50pcs samples tested at T_s 55 °C and T_s 75 °C were received at 2013-03-15 and tested during 2013-03-19 to 2013-11-25. The samples were numbered from 26 to 50 and 51 to 75.

Data Set 1: 55 °C, 150mA (Tested during 2013-03-19 to 2013-11-25)

Part Number:	HL-A-2835DW-S1-08-HR3
Number of Units:	25
Actual Case Temperature(T_s):	T_s =54.3 °C
Actual Ambient Temperature(T_A):	T_A =53.8 °C
Life Test Drive Current:	I_F = 150mA
Measurement Current:	I_F = 150mA

Data Set 2: 75 °C, 150mA (Tested during 2013-03-19 to 2013-11-25)

Part Number:	HL-A-2835DW-S1-08-HR3
Number of Units:	25
Actual Case Temperature(T_s):	T_s =74.1 °C
Actual Ambient Temperature(T_A):	T_A =73.6 °C
Life Test Drive Current:	I_F = 150mA
Measurement Current:	I_F = 150mA

Data Set 3: 85 °C, 150mA (Tested during 2012-04-26 to 2013-01-04)

Part Number:	HL-A-2835DW-S1-08-HR3
Number of Units:	25
Actual Case Temperature(T_s):	T_s =84.2 °C
Actual Ambient Temperature(T_A):	T_A =82.3 °C
Life Test Drive Current:	I_F = 150mA
Measurement Current:	I_F = 150mA

1.9 Report Revision

Report Number	Report Date	Contents
RSZ120424502-10	2013-01-23	Original report.
RSZ120424502-10-M1	2013-04-03	Update the product photo in page 8.
RSZ120424502-10-M2	2013-05-27	A footnote is added in the first page.
RSZ120424502-10-M3	2014-01-09	Add test results for samples at T_s 55 °C and T_s 75 °C and update rated CCT
RSZ120424502-10-M4	2014-01-14	Update the format

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h (Tested during 2013-03-19 to 2013-11-25)
Average. Lumen Maintenance at 6000 hours:	97.34%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0009
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 75 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h (Tested during 2013-03-19 to 2013-11-25)
Average. Lumen Maintenance at 6000 hours:	96.95%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0009
Reported TM-21 L ₇₀ Lifetime	>36,000 hours

Data Set:	Data Set 3, 85 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h (Tested during 2012-04-26 to 2013-01-04)
Average. Lumen Maintenance at 6000 hours:	95.19%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0011
Reported TM-21 L ₇₀ Lifetime	35,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 150mA (Lumen Maintenance)

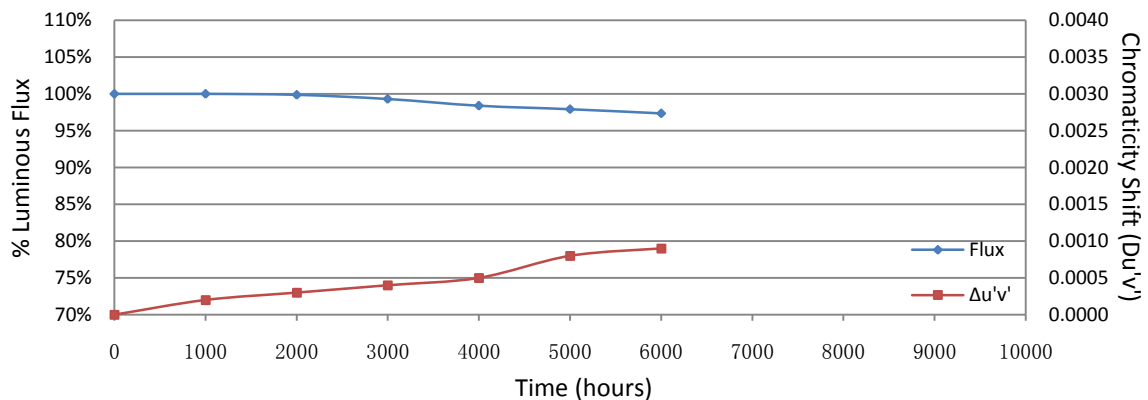
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.146	36.93	100.30	99.86	99.49	99.19	98.56	96.99
27	3.136	38.58	100.05	99.64	99.27	100.21	96.63	96.60
28	3.144	38.03	100.26	100.18	99.32	100.42	98.32	98.95
29	3.145	37.34	99.71	99.57	99.01	98.74	98.45	98.58
30	3.098	38.30	99.35	99.11	98.85	96.92	97.15	96.08
31	3.162	37.90	99.18	98.94	98.76	97.07	97.04	95.88
32	3.125	37.02	102.81	102.92	102.13	101.13	100.27	99.38
33	3.119	37.85	99.71	99.45	98.89	97.91	98.18	96.94
34	3.163	37.84	99.42	99.39	99.15	96.01	95.80	96.62
35	3.117	38.13	99.40	99.32	99.29	98.51	98.06	97.61
36	3.151	37.05	99.87	98.60	98.33	95.92	95.28	95.25
37	3.138	37.71	100.40	99.73	99.71	98.54	98.81	97.83
38	3.116	37.95	100.03	99.55	99.08	97.92	98.26	97.44
39	3.154	38.45	99.14	98.73	98.52	98.05	98.31	97.63
40	3.151	38.14	101.44	100.63	99.58	98.77	98.22	97.82
41	3.136	38.54	99.95	99.74	99.46	99.01	98.31	97.82
42	3.114	38.66	100.21	99.07	98.89	97.34	97.62	96.64
43	3.165	37.26	100.16	99.30	99.06	97.32	96.99	96.11
44	3.144	37.03	98.60	100.73	100.19	98.92	98.14	98.62
45	3.138	37.17	99.68	100.78	100.32	98.57	98.84	98.82
46	3.100	37.65	100.98	101.41	100.64	98.62	96.73	97.61
47	3.307	35.87	100.03	100.20	99.16	98.72	97.91	96.52
48	3.151	38.30	99.32	100.73	99.77	98.93	98.85	98.67
49	3.163	36.14	99.94	99.06	97.76	98.45	98.70	95.85
50	3.144	37.72	99.81	99.87	97.69	98.22	98.75	97.35
Ave.	3.145	37.66	99.99	99.86	99.29	98.38	97.93	97.34
Med.	3.144	37.84	99.94	99.64	99.16	98.54	98.22	97.44
st dev	0.0387	0.7245	0.0083	0.0095	0.0091	0.0122	0.0107	0.0110
Min.	3.098	35.87	98.60	98.60	97.69	95.92	95.28	95.25
Max.	3.307	38.66	102.81	102.92	102.13	101.13	100.27	99.38

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 5.773E-06
 β : 1.008
Calculated L₇₀: 63,000hours
Reported L₇₀: >36,000hours

3.2 Data Set 1, 55 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2607	0.5267	2741	0.0001	0.0002	0.0003	0.0006	0.0007	0.0009
27	0.2606	0.5279	2737	0.0001	0.0002	0.0004	0.0005	0.0012	0.0011
28	0.2586	0.5242	2798	0.0003	0.0002	0.0001	0.0004	0.0009	0.0007
29	0.2592	0.5256	2777	0.0001	0.0002	0.0005	0.0003	0.0007	0.0006
30	0.2617	0.5254	2724	0.0001	0.0001	0.0003	0.0006	0.0008	0.0010
31	0.2594	0.5242	2780	0.0002	0.0005	0.0006	0.0006	0.0008	0.0010
32	0.2598	0.5245	2769	0.0005	0.0005	0.0004	0.0003	0.0004	0.0004
33	0.2620	0.5259	2717	0.0001	0.0002	0.0004	0.0004	0.0005	0.0007
34	0.2588	0.5251	2788	0.0001	0.0002	0.0004	0.0007	0.0011	0.0008
35	0.2595	0.5258	2770	0.0003	0.0002	0.0003	0.0002	0.0006	0.0006
36	0.2606	0.5278	2738	0.0002	0.0003	0.0007	0.0008	0.0013	0.0011
37	0.2601	0.5250	2760	0.0000	0.0001	0.0002	0.0002	0.0001	0.0003
38	0.2585	0.5249	2796	0.0001	0.0002	0.0004	0.0004	0.0007	0.0008
39	0.2586	0.5248	2794	0.0005	0.0003	0.0003	0.0003	0.0005	0.0006
40	0.2606	0.5273	2741	0.0003	0.0002	0.0001	0.0002	0.0007	0.0007
41	0.2609	0.5265	2737	0.0001	0.0011	0.0009	0.0011	0.0009	0.0009
42	0.2604	0.5277	2742	0.0001	0.0015	0.0017	0.0018	0.0019	0.0020
43	0.2619	0.5260	2719	0.0001	0.0002	0.0003	0.0006	0.0009	0.0010
44	0.2611	0.5249	2739	0.0003	0.0001	0.0000	0.0002	0.0007	0.0005
45	0.2602	0.5253	2757	0.0002	0.0001	0.0001	0.0002	0.0004	0.0004
46	0.2602	0.5251	2758	0.0001	0.0002	0.0001	0.0002	0.0009	0.0007
47	0.2601	0.5243	2764	0.0001	0.0001	0.0003	0.0003	0.0008	0.0009
48	0.2603	0.5259	2753	0.0001	0.0002	0.0001	0.0001	0.0005	0.0006
49	0.2595	0.5249	2775	0.0001	0.0004	0.0015	0.0014	0.0017	0.0021
50	0.2604	0.5254	2752	0.0003	0.0001	0.0005	0.0003	0.0005	0.0007
Ave.	0.2601	0.5256	2757	0.0002	0.0003	0.0004	0.0005	0.0008	0.0009
Med.	0.2602	0.5254	2757	0.0001	0.0002	0.0003	0.0004	0.0007	0.0007
st dev	0.00098	0.00111	23.76356	0.00013	0.00031	0.00041	0.00040	0.00040	0.00043
Min.	0.2585	0.5242	2717	0.0000	0.0001	0.0000	0.0001	0.0001	0.0003
Max.	0.2620	0.5279	2798	0.0005	0.0015	0.0017	0.0018	0.0019	0.0021



3.3 Data Set 2, 75°C, 150mA (Lumen Maintenance)

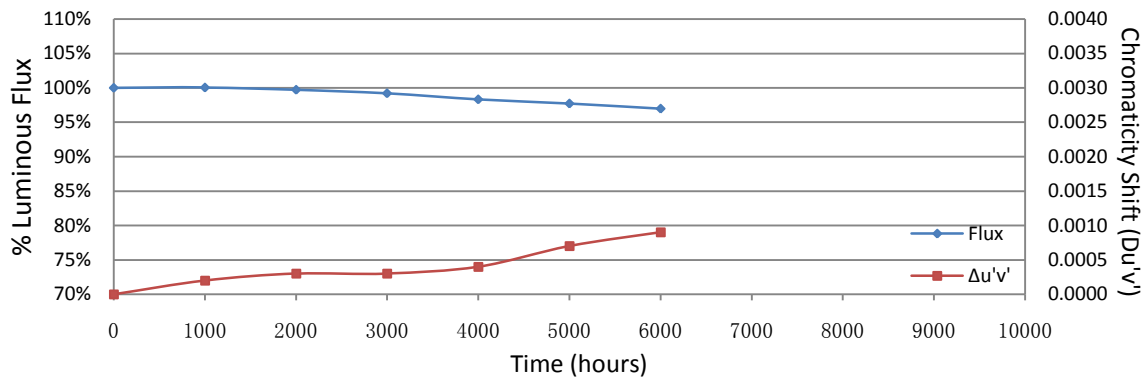
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	3.145	37.09	99.68	99.19	98.54	98.27	97.84	97.55
52	3.154	37.89	100.05	99.87	98.94	98.73	98.18	97.70
53	3.128	37.15	99.87	99.62	99.43	98.90	98.57	97.63
54	3.115	38.67	99.66	99.20	98.68	97.78	97.36	95.99
55	3.132	37.25	99.89	99.30	98.90	98.77	98.26	97.53
56	3.109	37.14	99.97	99.65	98.90	97.90	97.39	96.90
57	3.111	38.30	100.10	99.63	99.22	98.80	98.22	97.36
58	3.122	38.23	100.52	99.79	99.40	98.48	98.04	97.15
59	3.115	36.99	100.70	99.41	99.84	99.19	98.92	98.30
60	3.132	37.10	101.40	101.40	99.97	97.39	97.06	96.60
61	3.153	36.70	99.18	99.37	99.48	98.80	97.87	94.11
62	3.145	37.61	99.84	100.48	99.15	98.40	97.87	97.23
63	3.095	38.10	100.16	100.52	99.63	98.98	98.14	97.22
64	3.125	36.99	100.03	101.11	100.19	98.19	98.95	98.30
65	3.138	37.75	99.60	99.07	99.05	97.99	97.51	97.22
66	3.148	37.91	99.89	100.00	99.87	98.84	97.92	97.49
67	3.316	36.96	99.54	99.13	98.67	98.05	96.92	96.67
68	3.114	38.48	100.57	99.56	99.79	98.34	98.00	97.69
69	3.148	37.62	99.81	99.47	98.25	97.50	96.15	95.43
70	3.107	37.46	100.32	100.13	99.71	99.33	99.28	98.88
71	3.155	37.82	101.56	99.42	99.02	98.44	97.28	97.67
72	3.121	38.24	99.48	99.29	98.77	97.96	96.97	95.95
73	3.112	38.51	100.13	99.35	99.14	97.84	97.04	96.34
74	3.130	38.63	99.69	98.91	98.60	97.57	97.33	95.08
75	3.162	37.95	99.71	99.39	98.45	97.60	95.47	95.78
Ave.	3.137	37.70	100.05	99.69	99.18	98.32	97.70	96.95
Med.	3.130	37.75	99.89	99.47	99.14	98.34	97.87	97.22
st dev	0.0413	0.5952	0.0055	0.0062	0.0053	0.0055	0.0086	0.0109
Min.	3.095	36.70	99.18	98.91	98.25	97.39	95.47	94.11
Max.	3.316	38.67	101.56	101.40	100.19	99.33	99.28	98.88

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 6.474E-06
 β : 1.009
Calculated L₇₀: 56,000hours
Reported L₇₀: >36,000hours

3.4 Data Set 2, 75°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	0.2600	0.5247	2764	0.0003	0.0003	0.0005	0.0008	0.0008	0.0010
52	0.2603	0.5248	2757	0.0002	0.0003	0.0003	0.0004	0.0011	0.0015
53	0.2608	0.5256	2743	0.0001	0.0003	0.0000	0.0001	0.0005	0.0007
54	0.2582	0.5238	2808	0.0005	0.0002	0.0002	0.0004	0.0007	0.0011
55	0.2594	0.5256	2773	0.0003	0.0003	0.0002	0.0001	0.0006	0.0008
56	0.2603	0.5262	2752	0.0001	0.0002	0.0003	0.0003	0.0007	0.0009
57	0.2598	0.5267	2760	0.0001	0.0003	0.0002	0.0002	0.0006	0.0008
58	0.2586	0.5236	2801	0.0001	0.0003	0.0001	0.0007	0.0007	0.0009
59	0.2612	0.5261	2732	0.0001	0.0002	0.0001	0.0001	0.0004	0.0006
60	0.2604	0.5254	2752	0.0002	0.0003	0.0002	0.0004	0.0003	0.0005
61	0.2617	0.5256	2725	0.0002	0.0003	0.0002	0.0002	0.0006	0.0014
62	0.2607	0.5261	2744	0.0001	0.0002	0.0003	0.0003	0.0006	0.0009
63	0.2588	0.5247	2790	0.0001	0.0001	0.0002	0.0002	0.0006	0.0008
64	0.2619	0.5255	2721	0.0001	0.0002	0.0001	0.0002	0.0005	0.0007
65	0.2610	0.5265	2734	0.0001	0.0002	0.0002	0.0004	0.0006	0.0009
66	0.2606	0.5264	2744	0.0000	0.0002	0.0001	0.0001	0.0006	0.0009
67	0.2603	0.5256	2753	0.0002	0.0003	0.0004	0.0009	0.0008	0.0009
68	0.2608	0.5256	2743	0.0002	0.0004	0.0003	0.0005	0.0008	0.0010
69	0.2606	0.5276	2739	0.0001	0.0005	0.0005	0.0003	0.0009	0.0011
70	0.2593	0.5255	2776	0.0001	0.0004	0.0002	0.0003	0.0004	0.0005
71	0.2601	0.5244	2763	0.0003	0.0002	0.0003	0.0003	0.0007	0.0008
72	0.2593	0.5250	2777	0.0002	0.0002	0.0004	0.0003	0.0008	0.0010
73	0.2570	0.5242	2833	0.0001	0.0002	0.0003	0.0003	0.0008	0.0010
74	0.2605	0.5253	2751	0.0002	0.0003	0.0003	0.0004	0.0007	0.0013
75	0.2597	0.5251	2768	0.0005	0.0005	0.0002	0.0005	0.0010	0.0011
Ave.	0.2601	0.5254	2760	0.0002	0.0003	0.0003	0.0004	0.0007	0.0009
Med.	0.2603	0.5255	2753	0.0001	0.0003	0.0002	0.0003	0.0007	0.0009
st dev	0.00110	0.00092	26.63068	0.00012	0.00009	0.00012	0.00020	0.00018	0.00023
Min.	0.2570	0.5236	2721	0.0000	0.0001	0.0000	0.0001	0.0003	0.0005
Max.	0.2619	0.5276	2833	0.0005	0.0005	0.0005	0.0009	0.0011	0.0015



3.5 Data Set 3, 85 °C, 150mA (Lumen Maintenance)

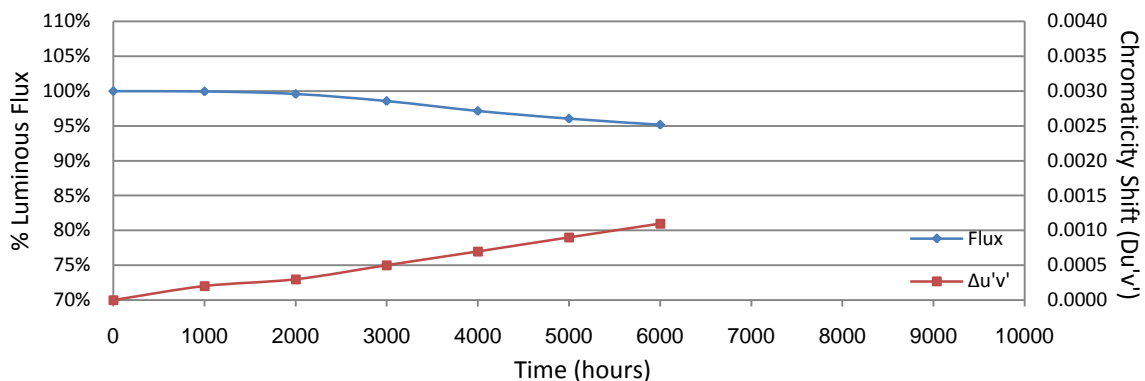
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.212	37.940	99.95	99.68	98.55	97.21	95.91	94.99
2	3.242	37.060	99.87	99.51	98.54	97.14	96.06	95.33
3	3.214	37.770	99.81	99.52	98.54	97.17	95.82	95.02
4	3.227	37.060	100.13	99.76	98.62	97.14	96.17	95.47
5	3.217	37.600	99.87	99.63	98.46	97.07	95.98	95.13
6	3.220	37.810	99.92	99.66	98.55	97.25	96.24	95.45
7	3.230	38.230	99.90	99.63	98.56	97.04	96.05	95.21
8	3.234	37.180	99.95	99.57	98.74	97.36	96.26	95.37
9	3.248	37.400	99.87	99.55	98.61	97.27	96.02	95.16
10	3.221	37.670	99.92	99.63	98.59	97.05	95.91	95.27
11	3.223	37.130	99.87	99.60	98.73	97.25	96.18	95.18
12	3.220	37.220	100.05	99.73	98.52	97.07	95.94	95.19
13	3.224	37.620	99.97	99.57	98.72	97.26	96.09	95.16
14	3.227	37.370	99.87	99.52	98.53	97.03	95.83	95.10
15	3.237	37.190	100.13	99.68	98.41	97.12	96.29	95.40
16	3.220	37.550	99.97	99.60	98.64	97.23	96.17	95.23
17	3.234	38.220	99.97	99.69	98.67	97.20	95.76	95.03
18	3.229	37.880	99.92	99.68	98.60	97.15	96.12	95.22
19	3.212	36.990	99.97	99.59	98.51	97.08	96.08	95.35
20	3.215	37.550	99.84	99.52	98.62	97.26	96.19	95.10
21	3.227	37.870	100.03	99.71	98.57	97.10	96.09	95.17
22	3.230	37.350	100.00	99.57	98.61	97.11	96.01	95.07
23	3.242	36.600	99.95	99.51	98.63	97.19	95.90	94.95
24	3.211	37.720	99.95	99.63	98.73	97.32	96.05	95.02
25	3.217	38.400	99.90	99.51	98.54	97.21	95.96	95.26
Ave.	3.225	37.535	99.94	99.61	98.59	97.17	96.04	95.19
Med.	3.224	37.550	99.95	99.60	98.59	97.17	96.05	95.18
st dev	0.0101	0.4331	0.0823	0.0749	0.0832	0.0909	0.1421	0.1447
Min.	3.211	36.600	99.81	99.51	98.41	97.03	95.76	94.95
Max.	3.248	38.400	100.13	99.76	98.74	97.36	96.29	95.47

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 1.050E-05
 β : 1.014
Calculated L₇₀: 35,000 hours
Reported L₇₀: 35,000 hours

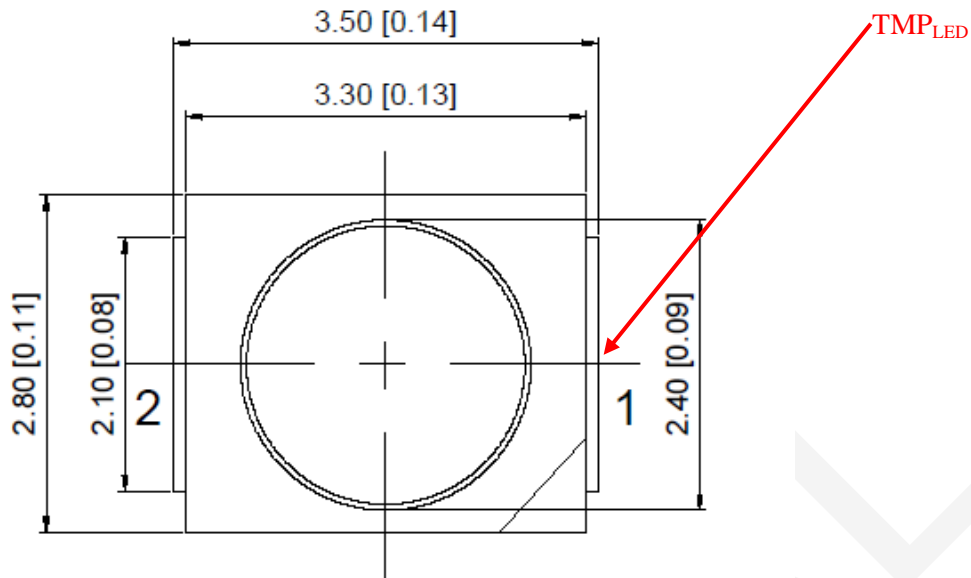
3.6 Data Set 3, 85 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2593	0.5269	2770	0.0002	0.0003	0.0003	0.0009	0.0011	0.0013
2	0.2582	0.5269	2793	0.0003	0.0003	0.0008	0.0009	0.0011	0.0012
3	0.2577	0.5272	2803	0.0001	0.0004	0.0005	0.0004	0.0006	0.0007
4	0.2588	0.5265	2783	0.0001	0.0006	0.0005	0.0005	0.0007	0.0009
5	0.2575	0.5263	2812	0.0004	0.0001	0.0005	0.0007	0.0008	0.0009
6	0.2573	0.5247	2823	0.0002	0.0003	0.0002	0.0009	0.0011	0.0011
7	0.2593	0.5284	2763	0.0003	0.0002	0.0007	0.0004	0.0009	0.0013
8	0.2582	0.5273	2791	0.0002	0.0004	0.0006	0.0005	0.0009	0.0014
9	0.2599	0.5278	2753	0.0002	0.0004	0.0007	0.0004	0.0009	0.0010
10	0.2587	0.5261	2785	0.0002	0.0002	0.0008	0.0006	0.0007	0.0010
11	0.2588	0.5284	2773	0.0002	0.0005	0.0003	0.0002	0.0006	0.0008
12	0.2606	0.5282	2737	0.0003	0.0001	0.0008	0.0008	0.0009	0.0010
13	0.2589	0.5274	2776	0.0004	0.0000	0.0004	0.0006	0.0010	0.0011
14	0.2588	0.5283	2774	0.0002	0.0004	0.0001	0.0005	0.0009	0.0012
15	0.2586	0.5275	2783	0.0001	0.0000	0.0005	0.0009	0.0010	0.0011
16	0.2585	0.5269	2786	0.0002	0.0001	0.0004	0.0008	0.0010	0.0010
17	0.2566	0.5262	2832	0.0003	0.0003	0.0008	0.0010	0.0011	0.0011
18	0.2590	0.5285	2768	0.0003	0.0006	0.0006	0.0006	0.0009	0.0010
19	0.2596	0.5276	2759	0.0004	0.0003	0.0008	0.0004	0.0010	0.0011
20	0.2596	0.5288	2754	0.0002	0.0003	0.0002	0.0003	0.0009	0.0012
21	0.2590	0.5278	2771	0.0002	0.0003	0.0007	0.0010	0.0013	0.0015
22	0.2590	0.5267	2777	0.0003	0.0000	0.0005	0.0006	0.0011	0.0013
23	0.2581	0.5267	2797	0.0001	0.0002	0.0002	0.0004	0.0007	0.0010
24	0.2576	0.5270	2806	0.0002	0.0002	0.0004	0.0006	0.0006	0.0009
25	0.2592	0.5269	2772	0.0004	0.0004	0.0006	0.0010	0.0012	0.0014
Ave.	0.2587	0.5272	2782	0.0002	0.0003	0.0005	0.0007	0.0009	0.0011
Med.	0.2588	0.5272	2777	0.0002	0.0003	0.0005	0.0006	0.0009	0.0011
st dev	0.0009	0.0009	22.2259	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2566	0.5247	2737	0.0001	0.0000	0.0001	0.0002	0.0006	0.0007
Max.	0.2606	0.5288	2832	0.0004	0.0006	0.0008	0.0010	0.0013	0.0015



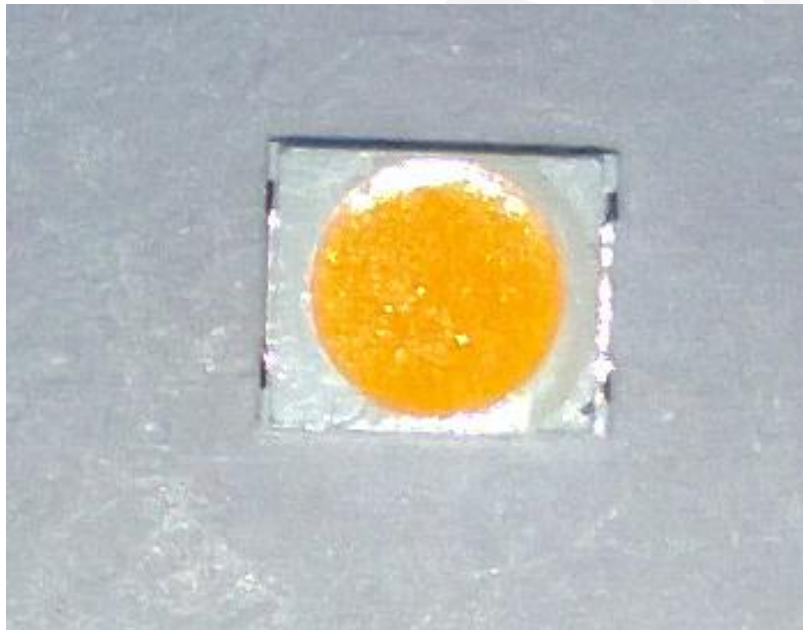
Appendix A – EUT PHOTO

A.1 Mechanical Dimensions (Ta = 25 °C)



Unit: mm

A.2 EUT Photo



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