



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

LIGHTNING OPTOELECTRONIC TECHNOLOGY (SZ)

Co., LTD.

Building B.WenTao Technological Park. Yingrenshi Community. Shiyan Street. Baoan District.ShenZhen.518108 China

Model:T3C

Report Type: 9000 Hours Test Report		Product Type: LED Package	
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Report Number:	RSZ130913508-10-9000		
Test Date:	2013-09-19 to 2014-10-11		
Report Date:	2014-10-24		
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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: T3C
 Part Name: 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 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	2014-03-04	2015-03-04
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2014-03-12	2015-03-12
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2013-12-26	2014-12-26
Standard Light Source	EVERFINE	D062	1011093	N/A	2014-05-06	2015-05-06
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987CJ 7321114	300VA	2014-03-12	2015-03-12
LM-80 Aging equipment	BACL	N/A	#1	N/A	2014-03-19	2015-03-19
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50V/15A)	2014-03-12	2015-03-12

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;

Each Ts test condition 25Pcs

The 75pcs samples tested at T_S 55 °C, 85 °C and T_S 105 °C were received at 2013-09-13 and tested during 2013-09-19 to 2014-10-11. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Data Set 1: 55 °C, 150mA

Part Number:	T3C
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 54.3$ °C
Actual Ambient Temperature(T_A):	$T_A = 53.6$ °C
Life Test Drive Current:	$I_F = 150$ mA
Measurement Current:	$I_F = 150$ mA

Data Set 2: 85°C, 150mA

Part Number:	T3C
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 85.5$ °C
Actual Ambient Temperature(T_A):	$T_A = 83.6$ °C
Life Test Drive Current:	$I_F = 150$ mA
Measurement Current:	$I_F = 150$ mA

Data Set 3: 105 °C, 150mA

Part Number:	T3C
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 104.4$ °C
Actual Ambient Temperature(T_A):	$T_A = 103.6$ °C
Life Test Drive Current:	$I_F = 150$ mA
Measurement Current:	$I_F = 150$ mA

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,7000hrs, 8000hrs,9000hrs
Average. Lumen Maintenance at 6000 hours:	96.88%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0020
Average. Lumen Maintenance at 9000 hours:	95.94%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0027
Reported TM-21 L ₇₀ Lifetime:	>54,000 hours

Data Set:	Data Set 2, 85°C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000hrs, 8000hrs,9000hrs
Average. Lumen Maintenance at 6000 hours:	96.16%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0022
Average. Lumen Maintenance at 9000 hours:	94.99%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0029
Reported TM-21 L ₇₀ Lifetime	>54,000 hours

Data Set:	Data Set 3, 105 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000hrs, 8000hrs,9000hrs
Average. Lumen Maintenance at 6000 hours:	95.38%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0026
Average. Lumen Maintenance at 9000 hours:	94.24%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0032
Reported TM-21 L ₇₀ Lifetime	>54,000 hours

3 - Test Data

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

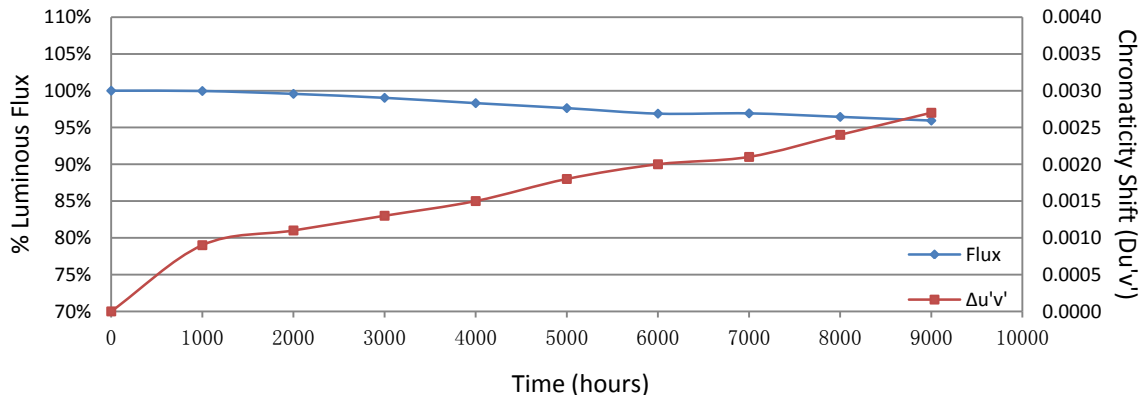
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	6.297	95.03	100.38	99.96	99.68	98.60	97.73	96.85	97.16	96.90	96.51
2	6.294	95.86	100.05	99.11	98.82	98.22	97.18	97.01	96.81	96.35	95.83
3	6.304	95.17	100.04	98.79	98.57	98.16	97.46	96.92	96.81	96.36	95.97
4	6.318	95.42	99.93	99.86	99.21	98.39	97.55	97.09	97.36	96.85	96.39
5	6.306	96.36	100.03	100.43	99.87	98.80	98.25	97.73	97.60	96.98	96.58
6	6.296	96.21	100.03	100.15	99.72	98.63	97.67	96.85	96.64	96.09	95.29
7	6.289	96.06	100.04	99.29	98.87	98.25	97.65	96.92	97.30	96.82	96.33
8	6.314	96.65	99.80	99.60	99.05	97.92	97.23	96.62	96.82	96.35	95.85
9	6.305	95.46	99.86	99.44	98.84	98.10	97.24	96.50	96.64	96.04	95.54
10	6.341	96.07	99.98	100.30	99.76	98.71	97.95	97.20	97.36	96.91	96.38
11	6.328	94.90	99.89	99.27	98.25	98.01	97.36	96.72	96.40	95.86	95.45
12	6.315	95.90	99.84	99.17	98.39	97.94	97.39	96.63	96.83	96.23	95.74
13	6.318	95.64	99.86	98.31	98.19	97.79	97.12	96.21	96.17	95.56	95.09
14	6.328	97.56	99.96	99.58	99.03	98.22	98.06	97.07	97.12	96.94	96.41
15	6.240	94.24	100.01	99.47	98.98	98.10	97.81	96.35	96.35	95.84	95.38
16	6.303	96.69	99.87	99.69	99.25	98.47	97.97	97.35	97.32	96.82	96.41
17	6.313	96.34	99.99	99.25	98.36	98.16	97.72	97.19	97.28	96.79	96.07
18	6.300	95.60	99.95	100.09	99.70	98.57	97.86	96.83	96.74	96.35	95.86
19	6.303	95.33	100.00	99.31	98.79	98.51	97.10	96.14	96.38	95.80	95.38
20	6.316	97.01	100.03	99.20	99.08	98.57	97.94	97.65	97.53	97.05	96.52
21	6.310	95.27	100.13	99.69	99.21	98.67	97.85	97.02	97.21	96.65	96.02
22	6.315	97.36	99.83	99.95	99.29	98.39	97.91	96.64	96.73	96.27	95.79
23	6.233	94.32	99.94	99.90	98.85	98.06	97.52	96.85	96.72	96.20	95.70
24	6.317	97.31	99.63	99.62	98.67	97.97	97.47	96.48	96.53	96.14	95.67
25	6.312	95.66	100.01	99.71	99.23	98.53	97.67	97.24	97.29	96.95	96.47
Ave.	6.305	95.90	99.96	99.57	99.03	98.31	97.63	96.88	96.92	96.44	95.94
Med.	6.310	95.86	99.98	99.60	99.03	98.25	97.67	96.85	96.82	96.35	95.86
st dev	0.0236	0.8840	0.1364	0.4783	0.4787	0.2848	0.3137	0.3965	0.4022	0.4398	0.4446
Min.	6.233	94.24	99.63	98.31	98.19	97.79	97.10	96.14	96.17	95.56	95.09
Max.	6.341	97.56	100.38	100.43	99.87	98.80	98.25	97.73	97.60	97.05	96.58

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 4.525E-06
 β : 0.999
Calculated L₇₀: 79,000hours
Reported L₇₀: >54,000 hours

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	7000hrs	8000hrs	9000hrs
1	0.2614	0.5338	2698	0.0008	0.0011	0.0014	0.0016	0.0020	0.0024	0.0023	0.0025	0.0028
2	0.2624	0.5348	2674	0.0009	0.0012	0.0014	0.0016	0.0019	0.0023	0.0024	0.0026	0.0028
3	0.2623	0.5342	2677	0.0009	0.0014	0.0014	0.0015	0.0018	0.0024	0.0025	0.0027	0.0031
4	0.2606	0.5338	2714	0.0009	0.0013	0.0015	0.0017	0.0017	0.0020	0.0023	0.0026	0.0029
5	0.2608	0.5324	2714	0.0011	0.0014	0.0016	0.0017	0.0020	0.0021	0.0024	0.0026	0.0029
6	0.2613	0.5329	2703	0.0009	0.0010	0.0012	0.0014	0.0017	0.0017	0.0019	0.0021	0.0025
7	0.2614	0.5336	2698	0.0011	0.0011	0.0014	0.0015	0.0020	0.0019	0.0021	0.0025	0.0029
8	0.2615	0.5342	2694	0.0010	0.0012	0.0014	0.0016	0.0019	0.0021	0.0022	0.0025	0.0028
9	0.2614	0.5336	2698	0.0008	0.0011	0.0013	0.0014	0.0018	0.0022	0.0023	0.0026	0.0028
10	0.2609	0.5328	2712	0.0009	0.0011	0.0013	0.0016	0.0017	0.0021	0.0022	0.0023	0.0026
11	0.2617	0.5347	2687	0.0008	0.0010	0.0013	0.0015	0.0016	0.0018	0.0019	0.0021	0.0025
12	0.2618	0.5346	2685	0.0008	0.0008	0.0011	0.0012	0.0016	0.0018	0.0019	0.0022	0.0025
13	0.2611	0.5335	2705	0.0010	0.0013	0.0015	0.0017	0.0019	0.0026	0.0024	0.0030	0.0033
14	0.2614	0.5332	2700	0.0011	0.0013	0.0016	0.0017	0.0019	0.0022	0.0020	0.0022	0.0024
15	0.2622	0.5341	2680	0.0008	0.0011	0.0013	0.0014	0.0019	0.0020	0.0019	0.0022	0.0025
16	0.2608	0.5324	2714	0.0010	0.0011	0.0014	0.0015	0.0018	0.0018	0.0019	0.0021	0.0024
17	0.2617	0.5335	2691	0.0011	0.0012	0.0014	0.0017	0.0018	0.0019	0.0020	0.0023	0.0027
18	0.2609	0.5328	2711	0.0009	0.0010	0.0010	0.0014	0.0016	0.0015	0.0016	0.0018	0.0022
19	0.2625	0.5349	2671	0.0010	0.0011	0.0013	0.0015	0.0017	0.0021	0.0023	0.0026	0.0030
20	0.2614	0.5337	2697	0.0009	0.0007	0.0013	0.0014	0.0014	0.0018	0.0016	0.0019	0.0023
21	0.2616	0.5338	2693	0.0008	0.0007	0.0010	0.0013	0.0014	0.0018	0.0020	0.0021	0.0023
22	0.2601	0.5338	2723	0.0008	0.0009	0.0011	0.0015	0.0019	0.0022	0.0024	0.0026	0.0030
23	0.2617	0.5340	2691	0.0008	0.0011	0.0012	0.0016	0.0020	0.0022	0.0024	0.0027	0.0030
24	0.2623	0.5339	2678	0.0010	0.0011	0.0014	0.0015	0.0019	0.0018	0.0020	0.0024	0.0028
25	0.2607	0.5326	2717	0.0009	0.0011	0.0012	0.0016	0.0017	0.0019	0.0021	0.0023	0.0026
Ave.	0.2614	0.5337	2697	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020	0.0021	0.0024	0.0027
Med.	0.2614	0.5338	2698	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020	0.0021	0.0024	0.0028
st dev	0.0006	0.0007	14.5373	0.0001	0.0002	0.0002	0.0001	0.0002	0.0003	0.0259%	0.0003	0.0003
Min.	0.2601	0.5324	2671	0.0008	0.0007	0.0010	0.0012	0.0014	0.0015	0.0016	0.0018	0.0022
Max.	0.2625	0.5349	2723	0.0011	0.0014	0.0016	0.0017	0.0020	0.0026	0.0025	0.0030	0.0033



3.3 Data Set 2, 85°C, 150mA (Lumen Maintenance)

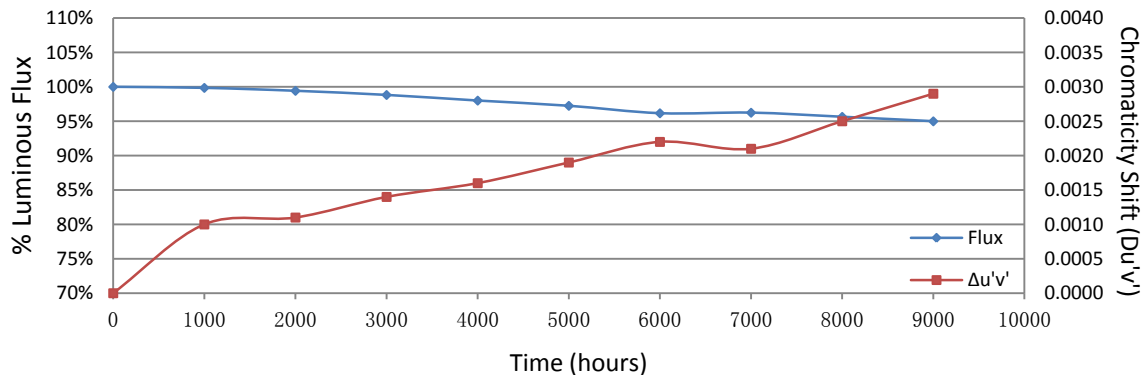
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
			Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	6.312	96.16	99.62	99.17	98.67	97.90	97.05	96.40	96.34	95.84	95.14
27	6.309	96.99	99.97	100.02	99.48	98.22	97.59	96.43	96.54	96.08	95.42
28	6.323	97.59	99.90	99.52	98.76	97.91	97.59	96.80	96.68	96.26	95.72
29	6.321	98.17	99.80	99.77	98.95	98.08	97.36	95.82	95.66	95.04	94.33
30	6.308	97.25	99.60	99.57	99.16	98.11	97.83	96.76	97.18	96.97	96.24
31	6.304	95.91	99.92	99.99	99.59	98.59	97.91	96.83	97.03	96.52	95.71
32	6.284	95.16	99.93	99.15	98.75	98.01	97.72	96.63	96.60	95.88	95.52
33	6.314	96.99	99.48	98.62	98.25	97.56	96.77	95.48	95.74	94.96	94.40
34	6.286	96.32	100.08	99.50	99.06	98.33	97.11	95.63	95.92	95.19	94.55
35	6.298	95.67	99.99	100.01	99.46	98.51	97.66	96.50	96.81	96.22	95.56
36	6.305	94.45	100.15	99.20	98.37	97.87	96.91	96.08	96.03	95.27	94.43
37	6.311	96.88	100.15	99.40	98.85	98.16	97.61	96.12	96.53	95.87	95.06
38	6.240	93.93	99.69	98.70	98.38	97.63	96.88	95.90	96.16	95.51	94.85
39	6.315	94.63	99.65	99.37	98.85	97.84	97.05	96.09	96.22	95.54	94.91
40	6.306	96.28	100.28	100.01	99.10	98.07	97.39	95.61	95.88	95.27	94.66
41	6.332	97.09	99.96	99.95	99.35	98.17	97.36	96.22	96.40	95.85	95.17
42	6.319	95.81	99.71	98.95	98.34	97.64	97.00	95.45	95.53	94.93	94.40
43	6.308	95.42	100.39	99.92	99.32	98.08	97.02	96.45	96.65	96.03	95.44
44	6.285	96.48	99.53	98.81	98.36	97.78	96.90	95.52	95.65	94.90	94.27
45	6.302	96.28	99.71	98.89	98.69	97.90	97.01	96.11	96.41	95.79	95.23
46	6.315	96.40	100.07	99.35	98.74	98.35	97.25	96.96	96.87	96.29	95.58
47	6.324	95.30	99.51	98.98	98.38	97.60	96.90	95.54	95.51	94.67	94.03
48	6.315	95.25	99.53	99.57	98.44	97.76	96.91	96.50	95.99	95.38	94.80
49	6.318	97.01	100.00	99.85	98.73	97.99	97.28	96.30	96.26	95.63	95.03
50	6.320	96.09	99.59	99.15	98.56	97.82	96.99	95.74	95.55	95.08	94.24
Ave.	6.307	96.14	99.85	99.42	98.82	98.00	97.24	96.16	96.24	95.64	94.99
Med.	6.311	96.28	99.90	99.40	98.75	97.99	97.11	96.12	96.26	95.63	95.03
st dev	0.0184	1.0154	0.2572	0.4459	0.4014	0.2738	0.3378	0.4683	0.4895	0.5750	0.5734
Min.	6.240	93.93	99.48	98.62	98.25	97.56	96.77	95.45	95.51	94.67	94.03
Max.	6.332	98.17	100.39	100.02	99.59	98.59	97.91	96.96	97.18	96.97	96.24

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 5.855E-06
 β : 1.001
Calculated L₇₀: 61,000 hours
Reported L₇₀: >54,000 hours

3.4 Data Set 2, 85°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2618	0.5334	2691	0.0013	0.0016	0.0016	0.0017	0.0021	0.0024	0.0023	0.0027	0.0032
27	0.2604	0.5327	2721	0.0012	0.0012	0.0014	0.0015	0.0019	0.0019	0.0018	0.0020	0.0024
28	0.2610	0.5337	2706	0.0007	0.0010	0.0011	0.0014	0.0016	0.0015	0.0013	0.0015	0.0018
29	0.2606	0.5342	2712	0.0005	0.0005	0.0009	0.0013	0.0021	0.0025	0.0021	0.0024	0.0027
30	0.2621	0.5343	2682	0.0008	0.0009	0.0012	0.0015	0.0021	0.0025	0.0019	0.0022	0.0025
31	0.2609	0.5342	2705	0.0005	0.0006	0.0010	0.0013	0.0018	0.0022	0.0018	0.0021	0.0025
32	0.2621	0.5346	2680	0.0008	0.0008	0.0013	0.0014	0.0018	0.0020	0.0019	0.0022	0.0025
33	0.2614	0.5336	2698	0.0013	0.0015	0.0017	0.0018	0.0020	0.0026	0.0025	0.0030	0.0033
34	0.2615	0.5343	2694	0.0009	0.0009	0.0013	0.0017	0.0020	0.0023	0.0023	0.0026	0.0031
35	0.2617	0.5345	2688	0.0011	0.0011	0.0014	0.0017	0.0019	0.0021	0.0021	0.0025	0.0028
36	0.2608	0.5332	2712	0.0010	0.0011	0.0016	0.0017	0.0022	0.0025	0.0023	0.0028	0.0033
37	0.2614	0.5338	2696	0.0013	0.0014	0.0016	0.0019	0.0021	0.0026	0.0026	0.0030	0.0033
38	0.2622	0.5349	2676	0.0008	0.0010	0.0014	0.0016	0.0017	0.0022	0.0022	0.0025	0.0030
39	0.2601	0.5336	2724	0.0013	0.0016	0.0016	0.0017	0.0021	0.0026	0.0025	0.0028	0.0031
40	0.2609	0.5339	2706	0.0010	0.0012	0.0014	0.0015	0.0020	0.0021	0.0020	0.0025	0.0028
41	0.2616	0.5339	2693	0.0009	0.0012	0.0015	0.0016	0.0020	0.0021	0.0021	0.0024	0.0028
42	0.2610	0.5343	2703	0.0010	0.0016	0.0016	0.0017	0.0020	0.0023	0.0024	0.0027	0.0032
43	0.2608	0.5329	2713	0.0009	0.0011	0.0015	0.0017	0.0019	0.0020	0.0019	0.0023	0.0028
44	0.2615	0.5334	2697	0.0010	0.0012	0.0015	0.0018	0.0020	0.0021	0.0020	0.0026	0.0030
45	0.2615	0.5334	2697	0.0009	0.0010	0.0015	0.0017	0.0019	0.0019	0.0018	0.0022	0.0025
46	0.2607	0.5340	2710	0.0008	0.0010	0.0014	0.0015	0.0019	0.0022	0.0021	0.0025	0.0028
47	0.2596	0.5337	2735	0.0011	0.0013	0.0016	0.0017	0.0017	0.0022	0.0026	0.0030	0.0035
48	0.2611	0.5343	2701	0.0012	0.0010	0.0014	0.0017	0.0019	0.0018	0.0023	0.0025	0.0030
49	0.2617	0.5342	2689	0.0010	0.0009	0.0013	0.0016	0.0018	0.0019	0.0022	0.0026	0.0030
50	0.2619	0.5342	2686	0.0011	0.0010	0.0014	0.0016	0.0018	0.0019	0.0023	0.0026	0.0031
Ave.	0.2612	0.5339	2701	0.0010	0.0011	0.0014	0.0016	0.0019	0.0022	0.0021	0.0025	0.0029
Med.	0.2614	0.5339	2698	0.0010	0.0011	0.0014	0.0017	0.0019	0.0022	0.0021	0.0025	0.0030
st dev	0.0006	0.0005	14.2332	0.0002	0.0003	0.0002	0.0002	0.0001	0.0003	0.0003	0.0003	0.0004
Min.	0.2596	0.5327	2676	0.0005	0.0005	0.0009	0.0013	0.0016	0.0015	0.0013	0.0015	0.0018
Max.	0.2622	0.5349	2735	0.0013	0.0016	0.0017	0.0019	0.0022	0.0026	0.0026	0.0030	0.0035



3.5 Data Set 3, 105 °C, 150mA (Lumen Maintenance)

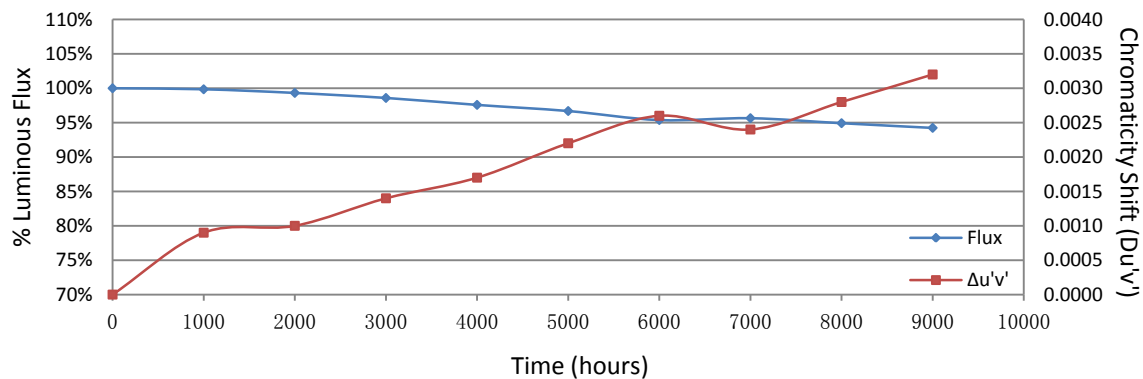
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	6.309	96.70	100.09	99.95	99.19	98.07	97.39	96.00	96.36	95.99	95.45
52	6.307	96.23	99.98	99.92	99.21	98.24	97.33	94.65	95.28	94.65	93.93
53	6.310	95.77	99.85	99.37	98.83	97.94	96.87	95.58	95.91	95.10	94.49
54	6.323	94.32	99.78	99.07	98.47	97.60	96.70	95.44	95.57	94.71	94.24
55	6.309	96.69	100.06	99.62	98.59	97.21	96.28	94.77	95.18	94.19	93.53
56	6.238	94.56	99.77	99.95	98.66	97.36	96.28	95.01	95.97	95.35	94.50
57	6.296	95.52	99.92	99.52	98.75	97.40	96.21	94.76	95.24	94.49	93.78
58	6.291	96.28	99.68	99.50	98.64	97.17	96.43	94.69	95.17	94.51	93.96
59	6.321	95.89	99.94	98.77	98.44	97.86	96.99	95.91	96.05	95.51	94.97
60	6.295	96.63	99.64	99.13	98.85	97.47	96.34	94.72	94.84	94.22	93.57
61	6.312	94.95	99.62	98.68	98.11	97.04	96.08	94.88	94.92	94.26	93.52
62	6.300	96.82	99.76	99.44	98.84	97.80	96.74	94.95	95.09	94.44	93.79
63	6.304	96.20	99.91	99.84	98.95	98.09	97.11	95.20	95.40	94.80	94.00
64	6.304	96.87	99.48	99.49	98.65	97.82	96.77	95.51	95.59	94.87	94.07
65	6.325	96.03	100.18	99.33	98.52	97.66	96.88	95.93	96.34	95.67	94.83
66	6.299	96.61	99.89	99.23	98.44	97.39	96.56	95.54	95.59	94.88	94.18
67	6.326	96.21	99.79	98.84	98.21	97.11	96.55	95.54	95.34	94.70	94.20
68	6.303	95.74	99.96	99.34	98.51	97.65	96.85	96.50	96.48	95.62	95.01
69	6.314	96.85	100.03	99.55	98.65	97.55	96.37	95.35	95.69	95.00	94.33
70	6.322	96.33	99.74	98.97	98.12	97.16	96.48	95.41	95.63	94.74	93.97
71	6.318	95.04	99.83	99.37	98.46	97.26	96.73	96.05	96.53	95.97	95.25
72	6.312	97.00	99.64	98.86	98.28	97.39	96.80	94.79	94.89	93.94	93.42
73	6.322	97.04	99.70	99.20	98.57	97.97	97.30	95.46	95.92	94.92	94.10
74	6.305	96.99	99.70	98.66	98.18	97.07	96.09	95.65	95.61	94.75	93.95
75	6.308	95.44	100.29	99.47	98.70	98.09	97.15	96.25	96.71	95.67	94.97
Ave.	6.307	96.11	99.85	99.32	98.59	97.58	96.69	95.38	95.65	94.92	94.24
Med.	6.309	96.23	99.83	99.37	98.59	97.55	96.73	95.44	95.59	94.80	94.10
st dev	0.0174	0.7793	0.1905	0.3841	0.2935	0.3649	0.3842	0.5315	0.5395	0.5660	0.5641
Min.	6.238	94.32	99.48	98.66	98.11	97.04	96.08	94.65	94.84	93.94	93.42
Max.	6.326	97.04	100.29	99.95	99.21	98.24	97.39	96.50	96.71	95.99	95.45

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 6.478E-06
 β : 0.999
Calculated L₇₀: 55,000 hours
Reported L₇₀: >54,000 hours

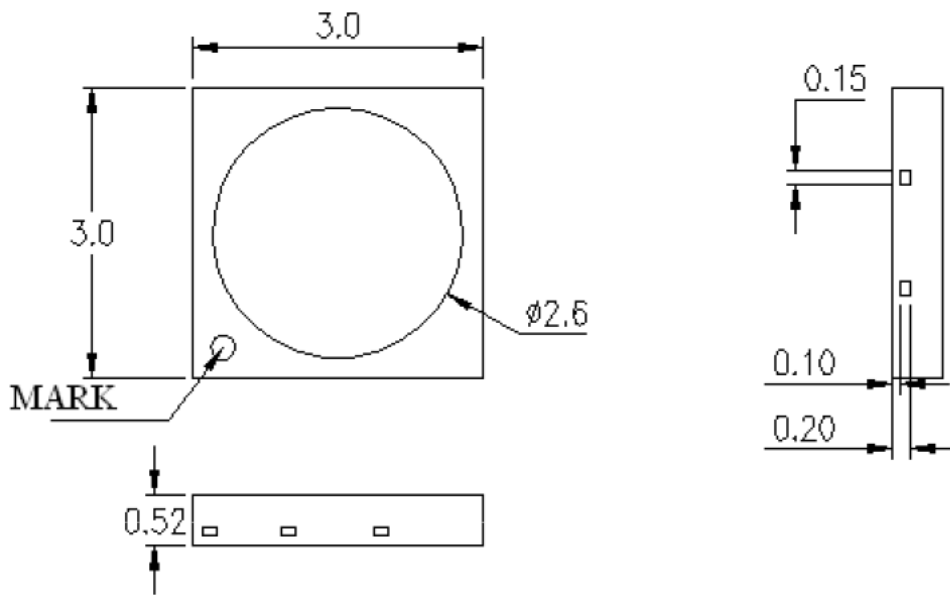
3.6 Data Set 3, 105 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2600	0.5328	2730	0.0010	0.0010	0.0015	0.0018	0.0020	0.0022	0.0020	0.0023	0.0028
52	0.2602	0.5328	2725	0.0010	0.0012	0.0014	0.0017	0.0020	0.0027	0.0023	0.0025	0.0030
53	0.2618	0.5336	2689	0.0006	0.0009	0.0012	0.0016	0.0020	0.0024	0.0022	0.0026	0.0030
54	0.2632	0.5344	2659	0.0008	0.0009	0.0012	0.0014	0.0020	0.0025	0.0023	0.0027	0.0029
55	0.2602	0.5332	2724	0.0010	0.0013	0.0015	0.0017	0.0025	0.0035	0.0031	0.0036	0.0039
56	0.2611	0.5342	2701	0.0007	0.0009	0.0012	0.0016	0.0021	0.0025	0.0024	0.0029	0.0031
57	0.2625	0.5344	2673	0.0008	0.0009	0.0012	0.0016	0.0021	0.0026	0.0025	0.0028	0.0031
58	0.2610	0.5332	2707	0.0008	0.0009	0.0013	0.0017	0.0022	0.0027	0.0027	0.0030	0.0034
59	0.2616	0.5344	2692	0.0008	0.0009	0.0011	0.0017	0.0020	0.0024	0.0024	0.0027	0.0031
60	0.2608	0.5333	2711	0.0009	0.0011	0.0013	0.0016	0.0022	0.0028	0.0026	0.0030	0.0034
61	0.2592	0.5320	2750	0.0011	0.0014	0.0016	0.0018	0.0024	0.0031	0.0029	0.0032	0.0037
62	0.2613	0.5341	2698	0.0009	0.0009	0.0011	0.0015	0.0021	0.0026	0.0026	0.0029	0.0033
63	0.2616	0.5339	2692	0.0008	0.0009	0.0013	0.0016	0.0021	0.0027	0.0027	0.0029	0.0034
64	0.2601	0.5322	2729	0.0009	0.0011	0.0015	0.0016	0.0025	0.0030	0.0026	0.0030	0.0035
65	0.2610	0.5335	2707	0.0009	0.0012	0.0015	0.0017	0.0022	0.0027	0.0026	0.0030	0.0033
66	0.2619	0.5341	2685	0.0008	0.0009	0.0013	0.0016	0.0022	0.0024	0.0024	0.0028	0.0033
67	0.2621	0.5341	2682	0.0008	0.0010	0.0013	0.0017	0.0023	0.0024	0.0025	0.0029	0.0033
68	0.2613	0.5335	2700	0.0009	0.0011	0.0014	0.0017	0.0024	0.0025	0.0024	0.0027	0.0033
69	0.2615	0.5335	2697	0.0009	0.0010	0.0014	0.0016	0.0019	0.0022	0.0022	0.0025	0.0031
70	0.2614	0.5342	2695	0.0007	0.0009	0.0014	0.0017	0.0021	0.0023	0.0019	0.0024	0.0030
71	0.2633	0.5339	2660	0.0009	0.0009	0.0014	0.0016	0.0022	0.0024	0.0020	0.0024	0.0030
72	0.2616	0.5333	2694	0.0008	0.0010	0.0016	0.0017	0.0020	0.0023	0.0020	0.0026	0.0029
73	0.2613	0.5336	2699	0.0007	0.0008	0.0016	0.0016	0.0021	0.0021	0.0017	0.0022	0.0028
74	0.2599	0.5323	2733	0.0011	0.0013	0.0017	0.0018	0.0024	0.0027	0.0023	0.0029	0.0036
75	0.2605	0.5336	2715	0.0010	0.0012	0.0017	0.0019	0.0024	0.0026	0.0020	0.0025	0.0030
Ave.	0.2612	0.5335	2702	0.0009	0.0010	0.0014	0.0017	0.0022	0.0026	0.0024	0.0028	0.0032
Med.	0.2613	0.5336	2699	0.0009	0.0010	0.0014	0.0017	0.0021	0.0025	0.0024	0.0028	0.0031
st dev	0.0010	0.0007	22.1460	0.0001	0.0002	0.0002	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003
Min.	0.2592	0.5320	2659	0.0006	0.0008	0.0011	0.0014	0.0019	0.0021	0.0017	0.0022	0.0028
Max.	0.2633	0.5344	2750	0.0011	0.0014	0.0017	0.0019	0.0025	0.0035	0.0031	0.0036	0.0039



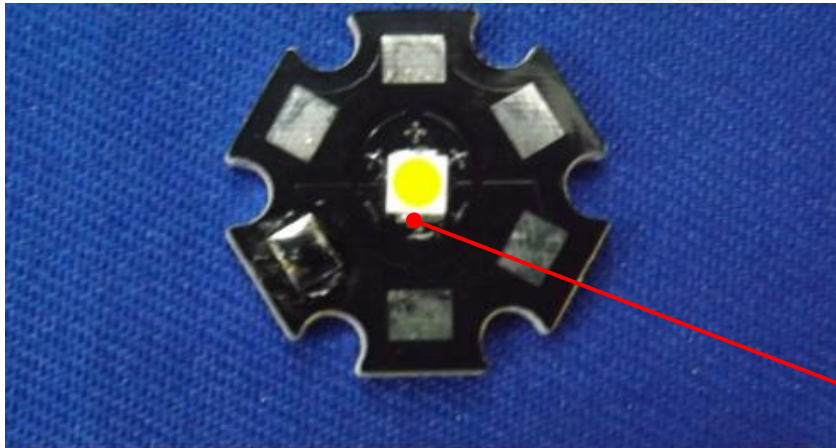
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



TMP_{LED}

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