



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: T3B

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Daniel Duan <i>Daniel Duan</i>		
Report Number:	RSZ140122506-10-9000		
Test Date:	2014-01-25 to 2015-05-05		
Report Date:	2015-05-12		
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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: T3B
 Part Name: 3014
 Part Type: LED Package
 Nominal CCT: 4000K

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, diameter:0.3m ,0-1999Lumen	2015-03-04	2016-03-04
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2015-03-05	2016-03-05
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2014-12-26	2015-12-26
Standard Light Source	EVERFINE	D062	1011093	N/A	2014-05-06	2015-05-06
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987C J7321114	300VA	2015-03-05	2016-03-05
Multilayer aging machine	BACL	B2-270	20013	N/A	2014-08-11	2015-08-11
Multi-channel DC source	Taishan Xingguang	T01000F2	ST04346	N/A	2014-08-01	2015-08-01

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;

Each Ts test condition 25Pcs

The 75pcs samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2014-01-22 and tested during 2014-01-25 to 2015-05-05 The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Data Set 1: 55 °C, 100mA

Part Number:	T3B
Number of Units:	25
Actual Case Temperature(T _S):	T _S =54.3 °C
Actual Ambient Temperature(T _A):	T _A =52.0 °C
Life Test Drive Current:	I _F = 100mA
Measurement Current:	I _F = 100mA

Data Set 2: 85 °C,100mA

Part Number:	T3B
Number of Units:	25
Actual Case Temperature(T _S):	T _S =83.2 °C
Actual Ambient Temperature(T _A):	T _A =81.6 °C
Life Test Drive Current:	I _F = 100mA
Measurement Current:	I _F = 100mA

Data Set 3: 105 °C, 100mA

Part Number:	T3B
Number of Units:	25
Actual Case Temperature(T _S):	T _S =104.1 °C
Actual Ambient Temperature(T _A):	T _A =102.5 °C
Life Test Drive Current:	I _F = 100mA
Measurement Current:	I _F = 100mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 100mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h, 4000h, 5000h, 6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	97.67%
Average. Lumen Maintenance at 9000 hours:	96.20%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0020
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0034
Reported TM-21 L ₇₀ Lifetime:	>54,000hrs

Data Set:	Data Set 2, 85 °C, 100mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h, 4000h, 5000h, 6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	97.17%
Average. Lumen Maintenance at 9000 hours:	95.67%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0022
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0033
Reported TM-21 L ₇₀ Lifetime	>54,000hrs

Data Set:	Data Set 3, 105 °C, 100mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h, 4000h, 5000h, 6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	96.20%
Average. Lumen Maintenance at 9000 hours:	95.04%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0025
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0038
Reported TM-21 L ₇₀ Lifetime	>54,000hrs

3 - Test Data

3.1 Data Set 1, 55 °C, 100 mA (Lumen Maintenance)

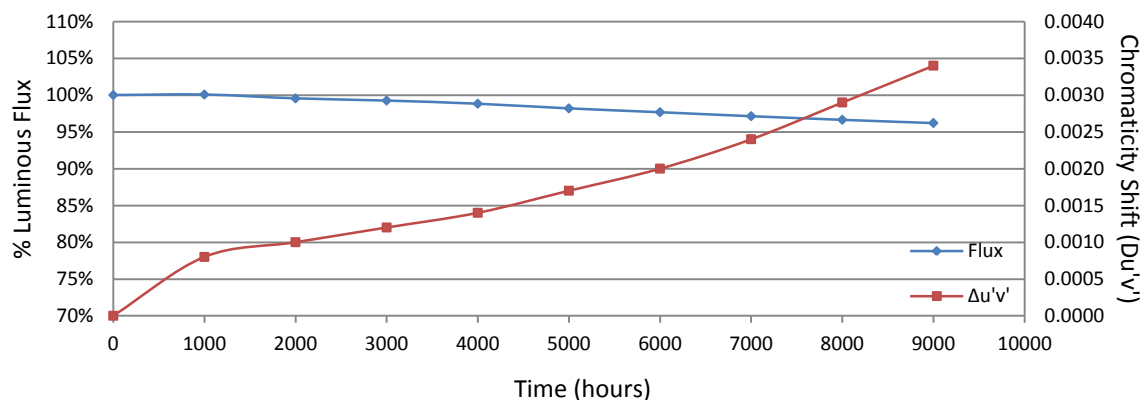
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.332	39.44	100.00	99.59	99.32	98.73	98.15	97.79	97.59	97.19	96.63
2	3.334	39.67	100.23	99.72	99.60	98.99	98.49	97.68	96.72	96.09	95.59
3	3.283	39.20	99.90	99.85	99.41	98.90	98.19	97.68	96.81	96.66	96.10
4	3.280	39.51	100.28	99.32	98.99	98.48	98.66	98.05	97.42	97.01	96.68
5	3.322	39.14	99.92	99.95	99.82	99.05	98.39	97.96	97.57	96.60	96.27
6	3.325	39.98	100.08	99.95	99.20	98.12	97.65	97.07	96.25	95.37	94.87
7	3.327	39.57	100.23	99.60	99.12	98.76	98.13	97.80	97.37	97.02	96.66
8	3.272	39.01	100.23	99.77	99.00	98.33	97.80	97.39	97.00	96.51	96.05
9	3.296	39.09	99.92	99.59	99.03	98.95	98.31	97.88	97.57	97.67	97.19
10	3.297	40.55	100.35	99.63	99.06	98.79	98.22	97.73	97.29	96.52	96.10
11	3.309	39.44	99.90	99.57	99.06	98.91	97.90	97.39	96.81	96.35	95.92
12	3.305	40.19	100.50	99.18	98.98	98.81	98.21	97.66	97.06	96.52	96.17
13	3.278	39.71	100.08	99.35	99.02	98.94	98.69	98.31	98.14	97.71	97.38
14	3.284	38.78	99.79	99.48	99.36	99.20	98.56	97.73	97.24	97.29	96.75
15	3.271	39.22	99.87	99.31	99.29	99.21	98.39	97.81	97.20	96.12	95.82
16	3.357	39.10	99.74	98.75	99.57	99.41	98.67	98.21	96.62	95.83	95.47
17	3.316	39.69	100.08	99.70	99.32	99.19	98.39	97.93	97.63	97.63	97.18
18	3.286	39.58	99.97	99.52	99.22	99.17	98.71	98.21	97.63	96.94	96.49
19	3.332	40.11	99.78	99.05	98.93	98.35	97.51	96.98	96.63	96.24	95.76
20	3.261	40.24	100.42	99.38	99.28	98.41	97.99	97.54	97.04	96.69	96.12
21	3.309	39.43	100.15	99.77	99.59	99.04	98.28	97.77	97.29	96.02	95.59
22	3.294	39.29	100.00	99.75	99.54	99.39	98.47	97.91	97.43	97.28	96.92
23	3.272	39.07	99.97	99.67	99.18	98.69	98.00	97.39	96.93	96.52	96.11
24	3.270	39.00	99.92	99.67	99.41	98.74	98.10	97.64	97.08	96.77	96.28
25	3.298	39.48	100.43	99.72	99.09	98.02	96.78	96.35	95.97	95.39	94.88
Ave.	3.300	39.50	100.07	99.55	99.25	98.82	98.19	97.67	97.13	96.64	96.20
Med.	3.297	39.44	100.00	99.60	99.22	98.90	98.22	97.73	97.20	96.60	96.12
st dev	0.0252	0.4437	0.2139	0.2800	0.2379	0.3706	0.4325	0.4222	0.4775	0.6389	0.6494
Min.	3.261	38.78	99.74	98.75	98.93	98.02	96.78	96.35	95.97	95.37	94.87
Max.	3.357	40.55	100.50	99.95	99.82	99.41	98.71	98.31	98.14	97.71	97.38

TM-21 Projection:

Test Duration: 9000hrs
Failures Observed: 0
 α : 5.361E-06
 β : 1.009
Calculated L₇₀: 68,000hrs
Reported L₇₀: >54,000hrs

3.2 Data Set 1, 55 °C, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2226	0.5064	4012	0.0010	0.0008	0.0011	0.0016	0.0019	0.0022	0.0026	0.0029	0.0036
2	0.2226	0.5068	4003	0.0009	0.0009	0.0011	0.0016	0.0020	0.0023	0.0027	0.0033	0.0036
3	0.2224	0.5061	4021	0.0008	0.0011	0.0011	0.0016	0.0019	0.0023	0.0025	0.0033	0.0034
4	0.2228	0.5084	3972	0.0007	0.0010	0.0013	0.0015	0.0015	0.0018	0.0022	0.0030	0.0039
5	0.2235	0.5049	4003	0.0009	0.0008	0.0011	0.0012	0.0013	0.0016	0.0020	0.0020	0.0022
6	0.2217	0.5063	4044	0.0008	0.0008	0.0010	0.0013	0.0016	0.0020	0.0024	0.0029	0.0035
7	0.2226	0.5063	4012	0.0009	0.0007	0.0009	0.0012	0.0015	0.0017	0.0020	0.0026	0.0031
8	0.2235	0.5063	3980	0.0008	0.0012	0.0009	0.0010	0.0011	0.0014	0.0019	0.0033	0.0038
9	0.2247	0.5059	3944	0.0009	0.0011	0.0012	0.0017	0.0018	0.0022	0.0026	0.0033	0.0038
10	0.2225	0.5087	3975	0.0007	0.0009	0.0012	0.0015	0.0016	0.0019	0.0023	0.0029	0.0033
11	0.2228	0.5081	3976	0.0009	0.0010	0.0013	0.0015	0.0017	0.0020	0.0025	0.0028	0.0031
12	0.2221	0.5074	4012	0.0009	0.0008	0.0011	0.0012	0.0014	0.0015	0.0019	0.0023	0.0022
13	0.2231	0.5071	3981	0.0008	0.0009	0.0012	0.0014	0.0016	0.0018	0.0021	0.0027	0.0029
14	0.2229	0.5047	4028	0.0009	0.0009	0.0013	0.0012	0.0015	0.0019	0.0021	0.0025	0.0029
15	0.2214	0.5071	4041	0.0008	0.0011	0.0013	0.0015	0.0020	0.0022	0.0024	0.0030	0.0040
16	0.2235	0.5070	3970	0.0009	0.0016	0.0017	0.0021	0.0024	0.0026	0.0031	0.0041	0.0047
17	0.2225	0.5077	3993	0.0008	0.0009	0.0012	0.0014	0.0016	0.0019	0.0024	0.0026	0.0034
18	0.2236	0.5062	3977	0.0008	0.0009	0.0011	0.0014	0.0017	0.0021	0.0025	0.0033	0.0040
19	0.2234	0.5094	3932	0.0008	0.0011	0.0014	0.0017	0.0019	0.0021	0.0024	0.0032	0.0035
20	0.2222	0.5088	3987	0.0007	0.0008	0.0012	0.0014	0.0017	0.0019	0.0024	0.0030	0.0035
21	0.2239	0.5077	3943	0.0010	0.0008	0.0014	0.0015	0.0018	0.0021	0.0026	0.0030	0.0033
22	0.2245	0.5067	3939	0.0009	0.0012	0.0013	0.0013	0.0015	0.0019	0.0023	0.0027	0.0033
23	0.2224	0.5058	4028	0.0009	0.0015	0.0015	0.0016	0.0018	0.0021	0.0025	0.0031	0.0035
24	0.2226	0.5064	4010	0.0008	0.0012	0.0013	0.0014	0.0016	0.0018	0.0023	0.0025	0.0030
25	0.2216	0.5048	4075	0.0008	0.0011	0.0013	0.0015	0.0018	0.0020	0.0023	0.0029	0.0033
Ave.	0.2229	0.5068	3994	0.0008	0.0010	0.0012	0.0014	0.0017	0.0020	0.0024	0.0029	0.0034
Med.	0.2226	0.5067	3993	0.0008	0.0009	0.0012	0.0015	0.0017	0.0020	0.0024	0.0029	0.0034
st dev	0.0008	0.0012	35.4245	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004	0.0005
Min.	0.2214	0.5047	3932	0.0007	0.0007	0.0009	0.0010	0.0011	0.0014	0.0019	0.0020	0.0022
Max.	0.2247	0.5094	4075	0.0010	0.0016	0.0017	0.0021	0.0024	0.0026	0.0031	0.0041	0.0047



3.3 Data Set 2, 85 °C, 100 mA (Lumen Maintenance)

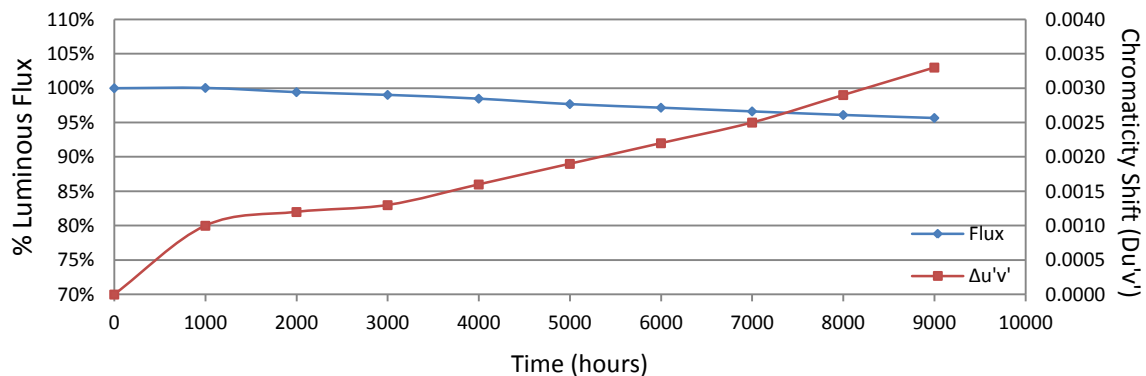
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	3.300	38.31	99.87	99.14	99.01	98.75	98.02	97.44	96.82	96.24	95.72
27	3.304	39.02	99.90	98.90	98.82	98.28	97.49	96.98	96.28	95.28	94.87
28	3.322	38.89	99.74	98.64	98.59	97.89	96.94	96.37	95.91	95.42	95.01
29	3.317	39.49	100.56	99.32	99.11	98.73	97.82	97.32	96.76	96.18	95.77
30	3.284	39.43	100.53	99.95	99.62	98.99	98.25	97.82	97.59	97.31	96.98
31	3.291	39.49	99.75	99.42	99.06	98.48	97.87	97.44	96.99	96.25	95.72
32	3.275	40.03	100.05	99.63	99.15	98.55	97.93	97.35	96.90	96.28	95.83
33	3.258	39.71	100.68	99.37	98.94	98.41	97.83	97.31	96.98	96.83	96.37
34	3.314	39.15	99.51	98.57	98.39	97.85	96.73	96.02	95.17	94.71	94.38
35	3.292	39.27	99.80	99.39	99.03	98.62	97.66	97.15	96.94	96.79	96.33
36	3.299	39.10	99.87	99.34	98.93	98.52	98.08	97.49	97.11	96.91	96.37
37	3.256	39.75	100.55	99.97	99.07	98.42	97.74	97.23	96.45	96.05	95.45
38	3.298	39.84	100.40	99.85	99.55	99.25	98.87	98.34	97.72	96.41	95.86
39	3.308	39.12	99.80	99.34	98.62	98.21	96.55	95.99	95.45	95.27	94.84
40	3.267	39.35	100.10	99.85	98.98	98.78	97.81	97.26	96.59	96.19	95.71
41	3.263	38.58	100.00	99.40	98.86	97.85	97.05	96.60	96.47	95.75	95.33
42	3.249	39.23	100.15	99.80	99.46	98.73	98.06	97.65	96.53	96.07	95.59
43	3.285	39.42	100.05	99.52	99.26	98.58	97.67	97.29	96.83	96.78	96.30
44	3.296	39.24	99.75	99.57	98.85	98.27	97.81	97.30	96.92	96.66	96.28
45	3.270	38.97	99.77	99.15	98.97	98.36	97.49	97.00	96.33	95.15	94.74
46	3.266	39.46	99.70	99.37	99.21	98.66	97.52	97.01	96.27	95.64	95.21
47	3.272	38.75	100.10	99.43	98.84	98.27	97.42	96.83	96.39	96.21	95.92
48	3.314	39.52	100.33	99.85	99.16	98.51	97.75	97.29	96.58	96.10	95.75
49	3.273	39.40	100.15	99.85	99.49	99.01	98.68	98.12	97.79	97.36	96.85
50	3.304	38.81	99.85	99.23	98.66	97.94	97.22	96.57	95.85	94.85	94.46
Ave.	3.287	39.25	100.04	99.43	99.03	98.48	97.69	97.17	96.63	96.11	95.67
Med.	3.291	39.27	100.00	99.40	99.01	98.51	97.75	97.29	96.59	96.19	95.72
st dev	0.0211	0.3995	0.3160	0.3742	0.3045	0.3613	0.5347	0.5618	0.6251	0.7138	0.6948
Min.	3.249	38.31	99.51	98.57	98.39	97.85	96.55	95.99	95.17	94.71	94.38
Max.	3.322	40.03	100.68	99.97	99.62	99.25	98.87	98.34	97.79	97.36	96.98

TM-21 Projection:

Test Duration: 9000hrs
Failures Observed: 0
 α : 5.692E-06
 β : 1.006
Calculated L₇₀: 64,000hrs
Reported L₇₀: >54,000hrs

3.4 Data Set 2, 85 °C, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2229	0.5084	3965	0.0008	0.0011	0.0015	0.0018	0.0022	0.0025	0.0027	0.0030	0.0035
27	0.2233	0.5059	3994	0.0008	0.0011	0.0013	0.0015	0.0017	0.0020	0.0024	0.0029	0.0027
28	0.2212	0.5060	4068	0.0008	0.0009	0.0015	0.0018	0.0020	0.0023	0.0027	0.0033	0.0037
29	0.2244	0.5083	3916	0.0008	0.0011	0.0013	0.0015	0.0019	0.0022	0.0025	0.0030	0.0037
30	0.2223	0.5076	4003	0.0008	0.0011	0.0011	0.0013	0.0015	0.0017	0.0022	0.0026	0.0029
31	0.2219	0.5077	4014	0.0011	0.0009	0.0014	0.0016	0.0018	0.0021	0.0024	0.0030	0.0037
32	0.2213	0.5074	4041	0.0010	0.0012	0.0011	0.0013	0.0015	0.0018	0.0022	0.0026	0.0033
33	0.2240	0.5079	3936	0.0010	0.0014	0.0013	0.0015	0.0019	0.0021	0.0025	0.0029	0.0032
34	0.2216	0.5029	4109	0.0011	0.0009	0.0016	0.0025	0.0030	0.0035	0.0039	0.0043	0.0051
35	0.2231	0.5051	4012	0.0009	0.0012	0.0011	0.0017	0.0018	0.0021	0.0025	0.0028	0.0028
36	0.2228	0.5069	3994	0.0010	0.0011	0.0012	0.0016	0.0019	0.0023	0.0026	0.0030	0.0032
37	0.2213	0.5065	4058	0.0010	0.0012	0.0010	0.0015	0.0018	0.0021	0.0024	0.0027	0.0029
38	0.2225	0.5088	3976	0.0010	0.0014	0.0013	0.0014	0.0016	0.0020	0.0023	0.0025	0.0023
39	0.2210	0.5055	4082	0.0010	0.0013	0.0014	0.0019	0.0022	0.0024	0.0026	0.0031	0.0035
40	0.2231	0.5061	3997	0.0009	0.0013	0.0010	0.0016	0.0019	0.0023	0.0026	0.0029	0.0038
41	0.2230	0.5052	4017	0.0010	0.0016	0.0017	0.0017	0.0019	0.0023	0.0028	0.0033	0.0038
42	0.2223	0.5057	4035	0.0010	0.0013	0.0012	0.0013	0.0016	0.0017	0.0020	0.0021	0.0026
43	0.2220	0.5054	4048	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024	0.0027	0.0031	0.0031
44	0.2208	0.5062	4080	0.0010	0.0013	0.0014	0.0016	0.0016	0.0019	0.0022	0.0026	0.0026
45	0.2213	0.5040	4098	0.0010	0.0013	0.0014	0.0020	0.0023	0.0026	0.0030	0.0036	0.0040
46	0.2218	0.5072	4028	0.0011	0.0012	0.0014	0.0017	0.0021	0.0025	0.0031	0.0033	0.0041
47	0.2238	0.5047	3995	0.0011	0.0010	0.0012	0.0015	0.0018	0.0022	0.0025	0.0030	0.0035
48	0.2230	0.5061	4002	0.0010	0.0012	0.0011	0.0012	0.0015	0.0019	0.0022	0.0024	0.0030
49	0.2227	0.5082	3977	0.0009	0.0012	0.0011	0.0010	0.0012	0.0014	0.0017	0.0022	0.0024
50	0.2215	0.5056	4065	0.0010	0.0011	0.0013	0.0015	0.0017	0.0020	0.0023	0.0027	0.0031
Ave.	0.2224	0.5064	4020	0.0010	0.0012	0.0013	0.0016	0.0019	0.0022	0.0025	0.0029	0.0033
Med.	0.2223	0.5061	4014	0.0010	0.0012	0.0013	0.0016	0.0018	0.0021	0.0025	0.0029	0.0032
st dev	0.0010	0.0015	48.5807	0.0001	0.0002	0.0002	0.0003	0.0004	0.0004	0.0004	0.0005	0.0006
Min.	0.2208	0.5029	3916	0.0008	0.0009	0.0010	0.0010	0.0012	0.0014	0.0017	0.0021	0.0023
Max.	0.2244	0.5088	4109	0.0011	0.0016	0.0017	0.0025	0.0030	0.0035	0.0039	0.0043	0.0051



3.5 Data Set 3, 105 °C, 100 mA (Lumen Maintenance)

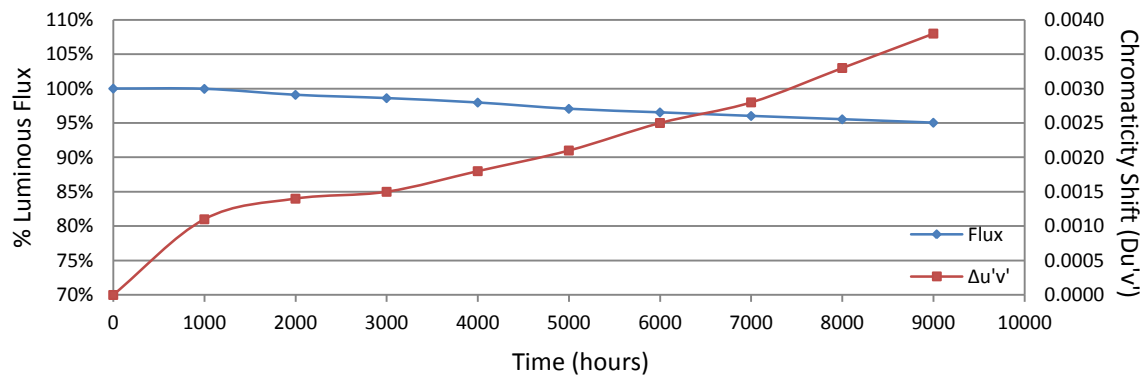
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	3.303	39.29	100.00	98.93	98.60	98.09	97.33	96.84	96.49	96.03	95.60
52	3.331	38.87	99.79	98.79	98.40	97.61	96.73	96.12	95.63	95.11	94.62
53	3.260	39.45	99.90	99.59	99.01	98.45	97.36	96.91	96.53	95.79	95.36
54	3.314	38.53	99.77	98.99	98.18	97.53	96.34	95.80	95.41	95.48	95.02
55	3.316	39.77	99.82	99.20	98.89	98.34	97.38	96.83	96.30	96.00	95.35
56	3.297	39.13	99.54	98.24	98.29	97.39	96.19	95.58	94.97	94.66	94.12
57	3.297	39.03	99.80	99.03	98.80	98.16	97.34	96.64	96.05	95.72	95.13
58	3.311	39.45	99.72	98.78	98.05	97.03	96.15	95.61	95.01	94.65	94.20
59	3.266	38.63	99.79	99.09	98.91	98.29	97.49	96.95	96.48	96.40	95.94
60	3.330	39.71	100.20	99.57	99.07	98.61	97.99	97.58	97.26	96.78	96.27
61	3.297	39.58	100.15	99.49	99.32	98.81	98.13	97.70	97.32	96.31	95.83
62	3.242	38.66	100.05	98.99	98.47	98.19	97.26	96.69	96.17	95.68	95.16
63	3.311	39.27	100.10	98.88	98.50	98.04	97.10	96.64	95.93	95.80	95.37
64	3.314	39.44	100.15	99.09	98.66	98.33	97.29	96.83	96.35	95.51	94.95
65	3.307	39.37	100.03	99.06	98.70	97.66	96.70	96.19	95.58	94.54	94.01
66	3.310	38.55	100.03	98.68	98.42	97.28	96.63	96.06	95.62	95.12	94.60
67	3.304	39.51	100.18	99.22	98.73	98.46	97.57	96.96	96.43	95.80	95.49
68	3.248	39.90	100.23	98.77	98.57	97.99	97.22	96.69	95.96	95.91	95.49
69	3.329	39.04	100.18	98.98	98.80	98.39	97.41	96.95	96.49	95.21	94.75
70	3.269	39.32	100.00	98.60	98.07	97.86	96.72	96.26	95.70	95.02	94.28
71	3.278	39.16	100.05	99.74	98.95	98.39	97.37	96.83	96.02	95.81	95.07
72	3.313	39.47	99.95	99.47	98.48	97.64	96.93	96.35	95.74	94.73	94.25
73	3.298	39.11	99.82	99.36	98.11	97.32	96.24	95.70	95.42	94.96	94.60
74	3.298	39.34	99.77	99.57	98.75	97.84	97.08	96.59	96.06	96.09	95.70
75	3.317	38.99	99.95	99.03	98.49	97.51	96.64	96.18	95.61	95.28	94.77
Ave.	3.298	39.22	99.96	99.09	98.61	97.97	97.06	96.54	96.02	95.54	95.04
Med.	3.304	39.29	100.00	99.03	98.60	98.04	97.22	96.64	96.02	95.68	95.07
st dev	0.0245	0.3733	0.1800	0.3585	0.3273	0.4697	0.5259	0.5519	0.5863	0.5934	0.6120
Min.	3.242	38.53	99.54	98.24	98.05	97.03	96.15	95.58	94.97	94.54	94.01
Max.	3.331	39.90	100.23	99.74	99.32	98.81	98.13	97.70	97.32	96.78	96.27

TM-21 Projection:

Test Duration: 9000hrs
Failures Observed: 0
 α : 5.845E-06
 β : 1.001
Calculated L₇₀: 61,000hrs
Reported L₇₀: >54,000hrs

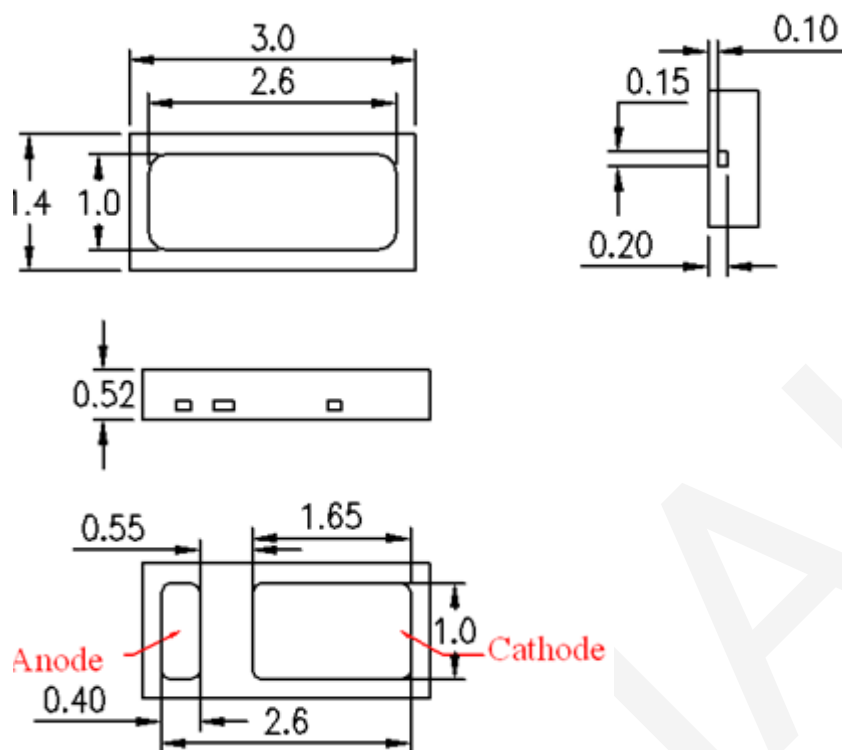
3.6 Data Set 3, 105 °C, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2208	0.5062	4078	0.0011	0.0012	0.0014	0.0016	0.0019	0.0024	0.0026	0.0030	0.0031
52	0.2226	0.5042	4048	0.0011	0.0012	0.0014	0.0017	0.0021	0.0024	0.0029	0.0035	0.0038
53	0.2217	0.5074	4026	0.0010	0.0012	0.0012	0.0016	0.0020	0.0023	0.0027	0.0030	0.0037
54	0.2227	0.5066	4003	0.0010	0.0010	0.0013	0.0019	0.0025	0.0029	0.0032	0.0037	0.0043
55	0.2214	0.5068	4048	0.0011	0.0013	0.0013	0.0017	0.0021	0.0024	0.0028	0.0031	0.0037
56	0.2214	0.5051	4075	0.0011	0.0014	0.0015	0.0021	0.0026	0.0031	0.0037	0.0040	0.0045
57	0.2218	0.5055	4055	0.0011	0.0013	0.0013	0.0017	0.0019	0.0023	0.0029	0.0033	0.0037
58	0.2209	0.5071	4058	0.0010	0.0014	0.0014	0.0018	0.0021	0.0023	0.0030	0.0035	0.0039
59	0.2229	0.5052	4019	0.0011	0.0015	0.0016	0.0022	0.0026	0.0028	0.0034	0.0037	0.0042
60	0.2206	0.5071	4071	0.0010	0.0013	0.0012	0.0016	0.0019	0.0021	0.0028	0.0032	0.0035
61	0.2215	0.5032	4107	0.0011	0.0014	0.0015	0.0014	0.0016	0.0019	0.0023	0.0026	0.0034
62	0.2225	0.5059	4024	0.0011	0.0014	0.0016	0.0019	0.0021	0.0025	0.0028	0.0032	0.0040
63	0.2222	0.5052	4044	0.0010	0.0013	0.0015	0.0017	0.0021	0.0024	0.0028	0.0030	0.0035
64	0.2211	0.5049	4089	0.0010	0.0012	0.0014	0.0017	0.0021	0.0025	0.0028	0.0034	0.0037
65	0.2234	0.5081	3954	0.0010	0.0014	0.0017	0.0017	0.0023	0.0025	0.0028	0.0033	0.0039
66	0.2206	0.5040	4127	0.0011	0.0013	0.0015	0.0019	0.0023	0.0026	0.0028	0.0034	0.0037
67	0.2231	0.5073	3979	0.0010	0.0015	0.0016	0.0017	0.0021	0.0024	0.0025	0.0029	0.0037
68	0.2220	0.5092	3987	0.0011	0.0014	0.0014	0.0017	0.0018	0.0022	0.0026	0.0030	0.0036
69	0.2241	0.5059	3966	0.0011	0.0015	0.0015	0.0017	0.0021	0.0024	0.0026	0.0032	0.0037
70	0.2212	0.5038	4109	0.0012	0.0017	0.0016	0.0019	0.0023	0.0026	0.0029	0.0033	0.0041
71	0.2232	0.5070	3980	0.0011	0.0016	0.0016	0.0017	0.0021	0.0024	0.0026	0.0031	0.0037
72	0.2220	0.5063	4035	0.0011	0.0016	0.0016	0.0018	0.0020	0.0023	0.0025	0.0031	0.0035
73	0.2219	0.5047	4068	0.0011	0.0014	0.0016	0.0021	0.0025	0.0029	0.0032	0.0035	0.0042
74	0.2221	0.5045	4058	0.0010	0.0014	0.0016	0.0019	0.0022	0.0026	0.0029	0.0034	0.0042
75	0.2228	0.5063	4007	0.0011	0.0016	0.0017	0.0017	0.0022	0.0026	0.0030	0.0036	0.0042
Ave.	0.2220	0.5059	4041	0.0011	0.0014	0.0015	0.0018	0.0021	0.0025	0.0028	0.0033	0.0038
Med.	0.2220	0.5059	4048	0.0011	0.0014	0.0015	0.0017	0.0021	0.0024	0.0028	0.0033	0.0037
st dev	0.0009	0.0014	46.1068	0.0001	0.0002	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Min.	0.2206	0.5032	3954	0.0010	0.0010	0.0012	0.0014	0.0016	0.0019	0.0023	0.0026	0.0031
Max.	0.2241	0.5092	4127	0.0012	0.0017	0.0017	0.0022	0.0026	0.0031	0.0037	0.0040	0.0045



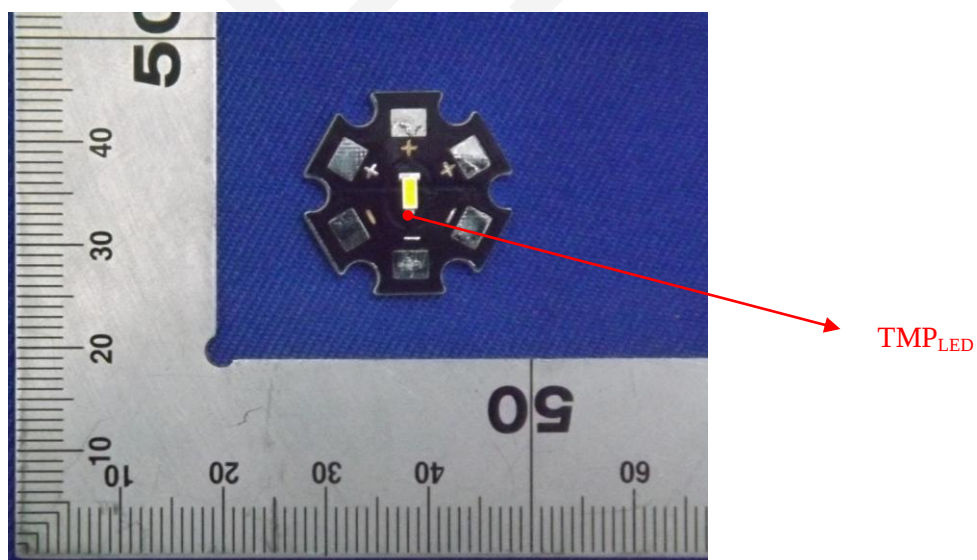
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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