

IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

ShenZhen JuFei Optoelectronics Co., Ltd.

NO.65, Chuangyi Road, Dalang Street, Baoan District, Shenzhen, Guangdong Province, CHINA

Model: 2835 White SMD LED

Report Type: 6000 Hours Test Report		Product Type: LED Package	
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Report Date:	2013-12-03		
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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: 2835 White SMD LED
 Part Name: SMD
 Part Type: LED Package
 Nominal CCT: 6500K

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	#2	N/A	2013-03-25	2014-03-25
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	(50/15A)	2013-03-26	2014-03-26

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

Data Set 1: 55 °C, 75mA

Part Number:	2835 White SMD LED
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 54.3 \text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 51.5 \text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F = 75\text{mA}$
Measurement Current:	$I_F = 75\text{mA}$

Data Set 2: 85 °C,75mA

Part Number:	2835 White SMD LED
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 84.3 \text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 82.5 \text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F = 75\text{mA}$
Measurement Current:	$I_F = 75\text{mA}$

Data Set 3: 95 °C, 75mA

Part Number:	2835 White SMD LED
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 94.4 \text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 92.3 \text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F = 75\text{mA}$
Measurement Current:	$I_F = 75\text{mA}$

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 75mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.67%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0014
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 85 °C, 75mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.24%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0015
Reported TM-21 L ₇₀ Lifetime	>36,000 hours

Data Set:	Data Set 3, 95 °C, 75mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	95.60%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime	>36,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 75 mA (Lumen Maintenance)

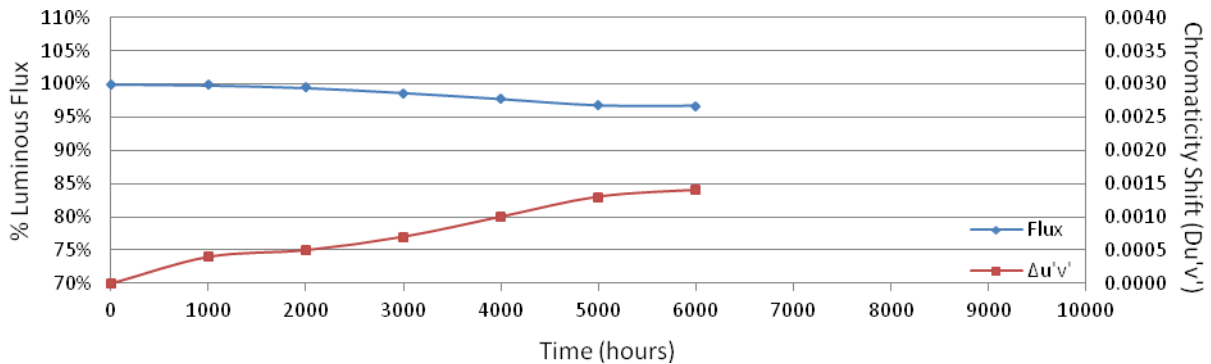
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.015	29.67	99.80	99.36	98.62	97.84	96.66	96.63
2	3.037	31.36	99.87	99.36	98.47	97.77	96.52	96.46
3	3.044	30.89	99.77	99.32	98.71	97.73	96.89	96.86
4	3.015	31.03	99.87	99.29	98.58	97.65	97.04	96.94
5	3.040	30.39	99.80	99.24	98.65	97.56	96.74	96.71
6	3.019	30.16	99.90	99.44	98.47	97.91	96.65	96.58
7	3.024	31.31	99.90	99.46	98.66	97.89	96.87	96.77
8	3.043	30.83	99.84	99.51	98.48	97.86	96.98	96.95
9	3.024	31.32	99.78	99.33	98.66	97.54	96.78	96.74
10	3.015	30.37	99.93	99.57	98.81	97.83	96.84	96.81
11	3.045	31.23	99.87	99.52	98.85	97.95	96.86	96.73
12	3.028	31.11	99.87	99.23	98.65	97.78	96.59	96.56
13	3.019	31.10	99.84	99.58	98.84	97.85	96.88	96.78
14	3.031	31.69	99.87	99.59	98.74	97.76	97.03	97.00
15	3.035	31.33	99.78	99.55	98.85	97.57	96.65	96.58
16	3.020	32.05	99.72	99.50	98.88	97.60	96.47	96.44
17	3.017	31.21	99.81	99.49	98.72	97.66	96.54	96.51
18	3.021	31.87	99.81	99.34	98.62	97.58	96.61	96.55
19	3.053	31.27	99.87	99.49	98.53	97.54	96.55	96.51
20	3.038	32.12	99.88	99.41	98.82	97.67	96.48	96.45
21	3.055	31.36	99.84	99.52	98.69	97.54	96.84	96.78
22	3.062	31.36	99.84	99.46	98.47	97.51	96.75	96.72
23	3.057	31.34	99.84	99.49	98.56	97.83	96.49	96.46
24	3.018	31.38	99.87	99.39	98.66	97.77	97.07	96.72
25	3.039	31.59	99.81	99.49	98.48	97.69	96.58	96.52
Ave.	3.033	31.17	99.84	99.44	98.66	97.72	96.74	96.67
Med.	3.031	31.31	99.84	99.46	98.66	97.73	96.74	96.71
st dev	0.0146	0.5634	0.0492	0.1047	0.1326	0.1344	0.1877	0.1674
Min.	3.015	29.67	99.72	99.23	98.47	97.51	96.47	96.44
Max.	3.062	32.12	99.93	99.59	98.88	97.95	97.07	97.00

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.239E-06
 β : 1.007
Calculated L₇₀: 50,000 hours
Reported L₇₀: >36,000 hours

3.2 Data Set 1, 55 °C, 75 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2034	0.4578	6811	0.0002	0.0006	0.0008	0.0011	0.0015	0.0015
2	0.2036	0.4596	6669	0.0004	0.0006	0.0007	0.0010	0.0014	0.0015
3	0.2030	0.4639	6428	0.0005	0.0008	0.0010	0.0015	0.0017	0.0018
4	0.2026	0.4623	6557	0.0003	0.0005	0.0008	0.0009	0.0013	0.0014
5	0.2033	0.4604	6634	0.0007	0.0009	0.0010	0.0014	0.0015	0.0016
6	0.2039	0.4567	6856	0.0004	0.0006	0.0009	0.0013	0.0014	0.0015
7	0.2040	0.4610	6545	0.0001	0.0004	0.0006	0.0012	0.0015	0.0017
8	0.2037	0.4577	6791	0.0004	0.0004	0.0008	0.0013	0.0015	0.0017
9	0.2032	0.4639	6419	0.0001	0.0005	0.0007	0.0007	0.0014	0.0014
10	0.2030	0.4588	6771	0.0003	0.0004	0.0005	0.0006	0.0013	0.0014
11	0.2034	0.4645	6363	0.0005	0.0005	0.0007	0.0009	0.0013	0.0013
12	0.2043	0.4600	6592	0.0004	0.0005	0.0006	0.0006	0.0012	0.0013
13	0.2043	0.4635	6363	0.0004	0.0008	0.0010	0.0013	0.0014	0.0014
14	0.2036	0.4620	6503	0.0004	0.0007	0.0008	0.0011	0.0013	0.0014
15	0.2031	0.4616	6567	0.0006	0.0005	0.0008	0.0008	0.0011	0.0011
16	0.2042	0.4641	6338	0.0004	0.0007	0.0009	0.0011	0.0014	0.0014
17	0.2042	0.4562	6866	0.0002	0.0004	0.0006	0.0011	0.0013	0.0014
18	0.2038	0.4666	6212	0.0005	0.0003	0.0006	0.0008	0.0011	0.0011
19	0.2049	0.4635	6327	0.0001	0.0006	0.0006	0.0010	0.0014	0.0015
20	0.2026	0.4642	6442	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009
21	0.2034	0.4613	6565	0.0004	0.0002	0.0003	0.0005	0.0009	0.0012
22	0.2030	0.4628	6498	0.0004	0.0004	0.0007	0.0009	0.0013	0.0016
23	0.2034	0.4610	6592	0.0005	0.0006	0.0007	0.0010	0.0012	0.0014
24	0.2025	0.4582	6846	0.0004	0.0005	0.0008	0.0010	0.0013	0.0015
25	0.2031	0.4613	6592	0.0003	0.0005	0.0006	0.0007	0.0013	0.0014
Ave.	0.2035	0.4613	6566	0.0004	0.0005	0.0007	0.0010	0.0013	0.0014
Med.	0.2034	0.4613	6565	0.0004	0.0005	0.0007	0.0010	0.0013	0.0014
st dev	0.0006	0.0027	183.0779	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002
Min.	0.2025	0.4562	6212	0.0001	0.0002	0.0003	0.0005	0.0008	0.0009
Max.	0.2049	0.4666	6866	0.0007	0.0009	0.0010	0.0015	0.0017	0.0018



3.3 Data Set 2, 85 °C, 75 mA (Lumen Maintenance)

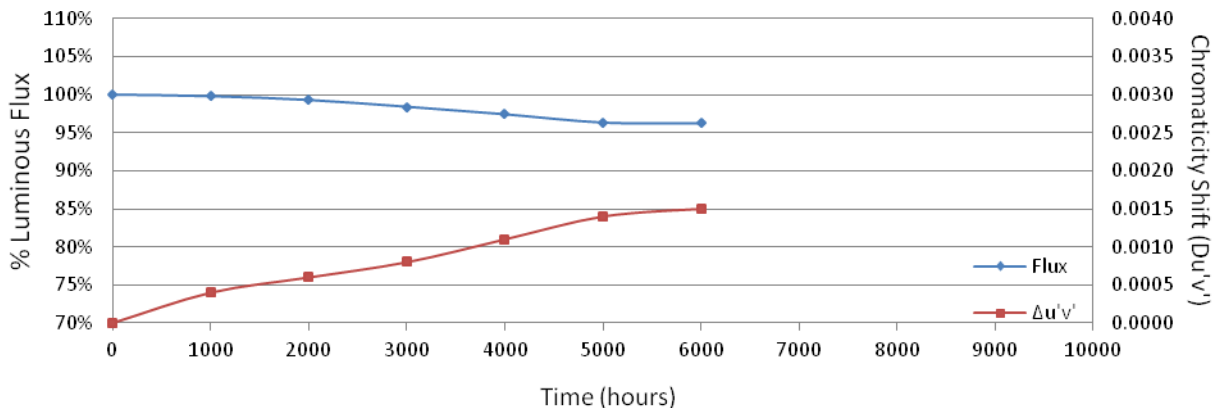
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.021	31.37	99.84	99.36	98.37	97.45	96.30	96.27
27	3.043	31.43	99.81	99.14	98.35	97.45	96.56	96.53
28	3.036	30.83	99.74	99.22	98.61	97.44	96.63	96.53
29	3.037	31.90	99.75	99.22	98.40	97.27	96.21	96.18
30	3.042	31.64	99.81	99.37	98.48	97.53	96.21	96.14
31	3.040	31.49	99.78	99.33	98.48	97.30	96.32	96.22
32	3.020	31.61	99.78	99.46	98.39	97.50	96.33	96.24
33	3.035	30.46	99.87	99.24	98.23	97.47	96.49	96.45
34	3.073	31.80	99.81	99.37	98.24	97.26	96.16	96.07
35	3.038	31.20	99.78	99.46	98.62	97.63	96.60	96.54
36	3.040	31.62	99.84	99.30	98.48	97.60	96.17	96.14
37	3.039	30.78	99.87	99.25	98.28	97.21	96.20	96.13
38	3.033	31.11	99.84	99.36	98.36	97.59	96.50	96.37
39	3.038	31.45	99.71	99.33	98.31	97.58	96.28	96.15
40	3.022	31.98	99.78	99.28	98.56	97.56	96.28	96.22
41	3.034	31.53	99.62	99.11	98.41	97.43	96.42	96.32
42	3.017	31.66	99.84	99.43	98.39	97.35	96.30	96.08
43	3.022	31.82	99.72	99.34	98.65	97.30	96.48	96.39
44	3.036	31.53	99.84	99.18	98.22	97.43	96.57	96.35
45	3.054	31.25	99.87	99.17	98.43	97.66	96.13	96.10
46	3.032	31.91	99.75	99.40	98.59	97.46	96.15	96.08
47	3.028	31.94	99.84	99.19	98.31	97.40	96.27	96.09
48	3.027	29.88	99.90	99.30	98.59	97.39	96.25	96.12
49	3.028	31.31	99.78	99.30	98.40	97.54	96.30	96.07
50	3.044	31.23	99.74	99.30	98.43	97.28	96.35	96.25
Ave.	3.035	31.39	99.80	99.30	98.42	97.44	96.34	96.24
Med.	3.036	31.49	99.81	99.30	98.40	97.45	96.30	96.22
st dev	0.0118	0.4925	0.0633	0.0967	0.1264	0.1265	0.1513	0.1542
Min.	3.017	29.88	99.62	99.11	98.22	97.21	96.13	96.07
Max.	3.073	31.98	99.90	99.46	98.65	97.66	96.63	96.54

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 8.067E-06
 β : 1.007
Calculated L₇₀: 45,000 hours
Reported L₇₀: >36,000 hours

3.4 Data Set 2, 85 °C, 75 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2036	0.4590	6710	0.0006	0.0007	0.0009	0.0013	0.0014	0.0014
27	0.2041	0.4619	6476	0.0003	0.0005	0.0007	0.0012	0.0013	0.0015
28	0.2035	0.4660	6273	0.0005	0.0009	0.0011	0.0013	0.0015	0.0016
29	0.2028	0.4650	6376	0.0004	0.0008	0.0010	0.0012	0.0016	0.0018
30	0.2034	0.4653	6314	0.0005	0.0008	0.0009	0.0010	0.0016	0.0016
31	0.2039	0.4675	6159	0.0001	0.0004	0.0006	0.0011	0.0012	0.0014
32	0.2033	0.4621	6523	0.0001	0.0005	0.0007	0.0009	0.0013	0.0015
33	0.2033	0.4526	7225	0.0004	0.0003	0.0004	0.0006	0.0015	0.0016
34	0.2046	0.4669	6146	0.0001	0.0004	0.0005	0.0008	0.0011	0.0013
35	0.2045	0.4644	6302	0.0006	0.0005	0.0009	0.0011	0.0016	0.0017
36	0.2039	0.4659	6248	0.0006	0.0004	0.0007	0.0012	0.0014	0.0015
37	0.2040	0.4582	6735	0.0002	0.0005	0.0008	0.0011	0.0015	0.0016
38	0.2038	0.4624	6473	0.0002	0.0004	0.0006	0.0012	0.0014	0.0015
39	0.2032	0.4615	6565	0.0005	0.0006	0.0009	0.0011	0.0014	0.0015
40	0.2032	0.4672	6226	0.0001	0.0004	0.0005	0.0010	0.0015	0.0016
41	0.2032	0.4606	6629	0.0004	0.0006	0.0007	0.0011	0.0014	0.0014
42	0.2048	0.4599	6560	0.0003	0.0006	0.0007	0.0010	0.0013	0.0014
43	0.2033	0.4658	6297	0.0006	0.0006	0.0007	0.0011	0.0013	0.0015
44	0.2035	0.4629	6459	0.0004	0.0005	0.0008	0.0011	0.0014	0.0014
45	0.2038	0.4631	6425	0.0003	0.0006	0.0007	0.0010	0.0012	0.0012
46	0.2040	0.4628	6425	0.0004	0.0006	0.0009	0.0013	0.0014	0.0015
47	0.2036	0.4659	6270	0.0004	0.0005	0.0006	0.0013	0.0014	0.0016
48	0.2029	0.4556	7015	0.0006	0.0008	0.0011	0.0015	0.0016	0.0016
49	0.2030	0.4638	6439	0.0004	0.0009	0.0010	0.0013	0.0014	0.0015
50	0.2031	0.4614	6581	0.0004	0.0005	0.0006	0.0014	0.0015	0.0016
Ave.	0.2036	0.4627	6474	0.0004	0.0006	0.0008	0.0011	0.0014	0.0015
Med.	0.2035	0.4629	6439	0.0004	0.0005	0.0007	0.0011	0.0014	0.0015
st dev	0.0005	0.0037	253.1329	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
Min.	0.2028	0.4526	6146	0.0001	0.0003	0.0004	0.0006	0.0011	0.0012
Max.	0.2048	0.4675	7225	0.0006	0.0009	0.0011	0.0015	0.0016	0.0018



3.5 Data Set 3, 95 °C, 75 mA (Lumen Maintenance)

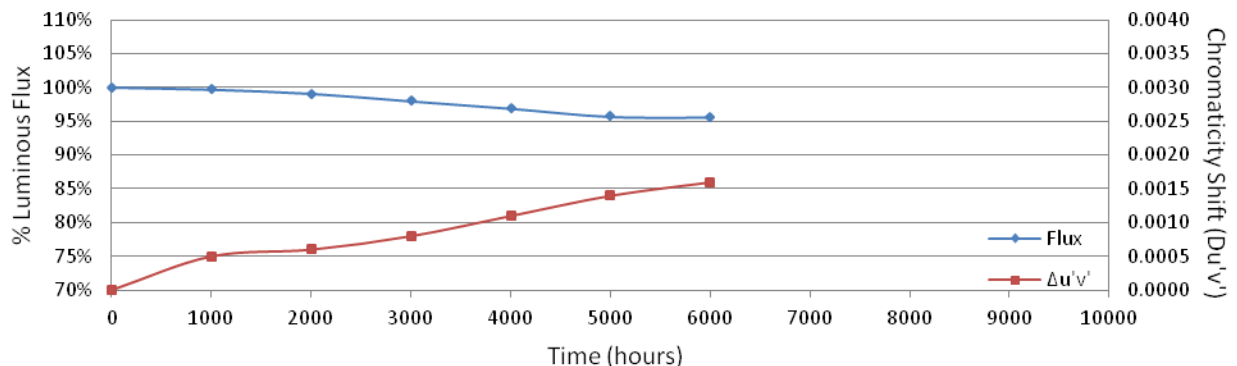
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	3.020	31.88	99.78	98.96	98.02	97.08	95.95	95.89
52	3.030	31.45	99.62	99.01	98.22	96.95	95.64	95.55
53	3.037	30.63	99.71	98.92	97.94	96.83	95.40	95.36
54	3.052	31.15	99.68	99.17	98.01	96.95	95.47	95.41
55	3.031	31.59	99.81	99.05	97.82	96.96	95.82	95.73
56	3.025	30.00	99.67	99.13	98.03	97.03	95.97	95.80
57	3.018	30.83	99.74	99.16	98.02	97.02	95.78	95.72
58	3.010	30.53	99.61	99.12	97.90	97.12	96.07	95.94
59	3.025	31.07	99.77	99.03	97.88	97.01	95.85	95.65
60	3.049	31.01	99.68	99.29	98.26	96.90	95.87	95.78
61	3.025	30.04	99.80	99.07	97.87	96.80	96.04	95.97
62	3.013	30.59	99.64	99.02	97.97	96.73	95.49	95.42
63	3.015	29.15	99.73	99.11	98.08	96.98	95.78	95.57
64	3.049	31.06	99.74	99.00	97.91	97.01	95.65	95.49
65	3.035	31.69	99.75	98.99	97.98	96.94	95.90	95.74
66	3.017	31.75	99.81	99.12	97.80	97.13	95.78	95.62
67	3.015	29.32	99.73	99.05	98.29	96.79	95.84	95.67
68	3.024	29.74	99.60	99.16	98.12	96.74	95.70	95.49
69	3.037	32.02	99.63	99.22	97.97	96.78	95.44	95.41
70	3.030	31.75	99.72	98.93	97.89	96.76	95.59	95.40
71	3.027	31.37	99.71	99.17	97.83	96.88	95.47	95.41
72	3.030	31.57	99.68	99.02	98.07	96.96	95.57	95.38
73	3.024	31.74	99.59	99.21	97.89	96.72	95.46	95.40
74	3.030	31.33	99.68	99.20	97.93	96.78	95.63	95.50
75	3.019	31.64	99.68	99.18	97.95	96.93	95.80	95.64
Ave.	3.027	31.00	99.70	99.09	97.99	96.91	95.72	95.60
Med.	3.025	31.15	99.71	99.11	97.97	96.94	95.78	95.57
st dev	0.0112	0.8122	0.0659	0.0974	0.1316	0.1239	0.1974	0.1859
Min.	3.010	29.15	99.59	98.92	97.80	96.72	95.40	95.36
Max.	3.052	32.02	99.81	99.29	98.29	97.13	96.07	95.97

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 9.288E-06
 β : 1.007
Calculated L₇₀: 39,000 hours
Reported L₇₀: >36,000 hours

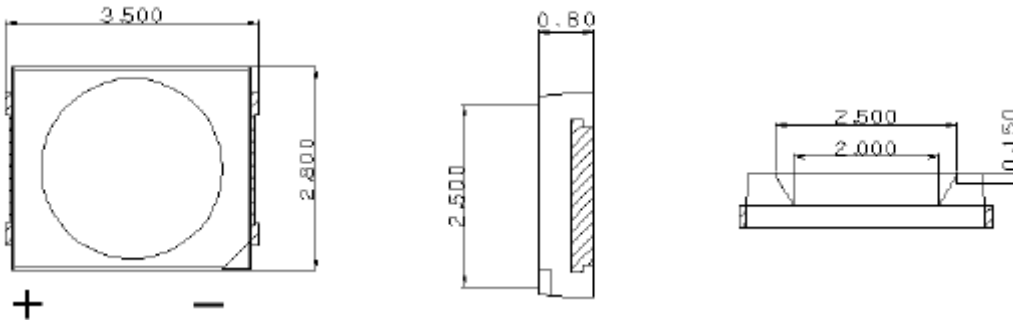
3.6 Data Set 3, 95 °C, 75 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	0.2040	0.4638	6371	0.0005	0.0006	0.0008	0.0013	0.0014	0.0015
52	0.2026	0.4597	6728	0.0005	0.0008	0.0011	0.0013	0.0015	0.0016
53	0.2030	0.4574	6871	0.0003	0.0004	0.0006	0.0015	0.0016	0.0016
54	0.2031	0.4597	6696	0.0003	0.0006	0.0009	0.0013	0.0014	0.0016
55	0.2036	0.4629	6452	0.0004	0.0005	0.0007	0.0012	0.0016	0.0018
56	0.2038	0.4526	7189	0.0007	0.0010	0.0012	0.0014	0.0016	0.0018
57	0.2034	0.4585	6764	0.0004	0.0005	0.0008	0.0009	0.0012	0.0012
58	0.2041	0.4647	6307	0.0005	0.0007	0.0008	0.0010	0.0012	0.0012
59	0.2046	0.4606	6527	0.0004	0.0004	0.0007	0.0009	0.0014	0.0014
60	0.2035	0.4640	6392	0.0006	0.0009	0.0012	0.0015	0.0016	0.0018
61	0.2031	0.4580	6823	0.0008	0.0011	0.0013	0.0014	0.0015	0.0016
62	0.2030	0.4613	6594	0.0005	0.0009	0.0012	0.0014	0.0016	0.0017
63	0.2037	0.4561	6910	0.0004	0.0005	0.0007	0.0009	0.0013	0.0016
64	0.2034	0.4593	6696	0.0002	0.0004	0.0007	0.0008	0.0016	0.0016
65	0.2034	0.4611	6581	0.0005	0.0006	0.0008	0.0009	0.0015	0.0016
66	0.2038	0.4643	6351	0.0003	0.0005	0.0006	0.0010	0.0015	0.0016
67	0.2033	0.4566	6910	0.0004	0.0003	0.0005	0.0006	0.0011	0.0015
68	0.2042	0.4608	6547	0.0006	0.0007	0.0008	0.0011	0.0014	0.0015
69	0.2036	0.4657	6282	0.0004	0.0004	0.0007	0.0012	0.0015	0.0018
70	0.2034	0.4631	6449	0.0005	0.0006	0.0006	0.0011	0.0015	0.0015
71	0.2040	0.4664	6214	0.0004	0.0005	0.0005	0.0010	0.0014	0.0015
72	0.2031	0.4643	6398	0.0005	0.0007	0.0009	0.0013	0.0014	0.0016
73	0.2034	0.4627	6471	0.0002	0.0005	0.0008	0.0009	0.0012	0.0016
74	0.2034	0.4641	6395	0.0007	0.0010	0.0012	0.0014	0.0016	0.0017
75	0.2032	0.4629	6479	0.0006	0.0007	0.0009	0.0010	0.0013	0.0013
Ave.	0.2035	0.4612	6576	0.0005	0.0006	0.0008	0.0011	0.0014	0.0016
Med.	0.2034	0.4613	6527	0.0005	0.0006	0.0008	0.0011	0.0015	0.0016
st dev	0.0004	0.0034	238.9634	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2026	0.4526	6214	0.0002	0.0003	0.0005	0.0006	0.0011	0.0012
Max.	0.2046	0.4664	7189	0.0008	0.0011	0.0013	0.0015	0.0016	0.0018



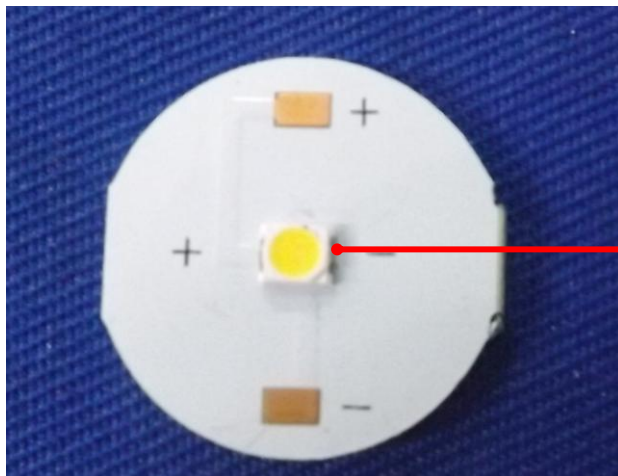
Appendix A – EUT PHOTO

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

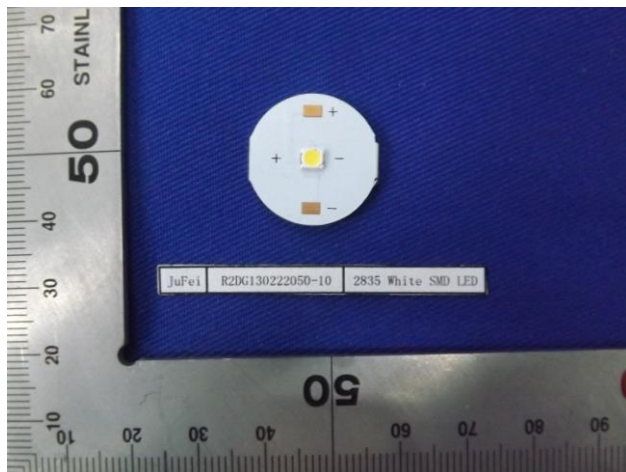


All dimensions are in millimeter

A.2 EUT Photo



TMP_{LED}



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