

IESNA LM-80-08

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT For

ShenZhen JuFei Optoelectronics Co., Ltd.

No.4 Eling Industrial Park, Egongling Community, Pinghu Subdistrict, Longgang District, Shenzhen City

Model: 01.JT.CG2835W80P03

Report Type: 10000 Hours Test Report	Product Type: LED Package
Test Engineer:	Pote Wang <i>Pote Wang</i>
Report Number:	R2DG180928054-10-M1
Test Date:	2016-09-02 to 2017-10-23
Report Date:	2019-05-17
Reviewed By:	Daniel Duan / EE Engineer <i>Daniel Duan</i>
Revised Note:	The previous report R2DG180928054-10 is replaced by this report on 2019-05-17
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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:	01.JT.CG2835W80P03
Part Type:	LED Package
Nominal CCT:	3500K
Power:	0.50W
Average Current Density per LED die:	775.00mA/mm ²
Average Power Density per LED die:	2.58W/mm ²
CRI:	82
Die Spacing:	N/A

Family products covered by this report:

According to *ENERGY STAR® Requirements for the Use of LM-80 Data*, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of *ENERGY STAR® Requirements for the Use of LM-80 Data* (September 28, 2017)

This report covers the following models:

Series Name	Model Name	Total Input Current (mA)	Power (W)	CCT (K)	Number of dies	Current Density per Die (mA/mm ²)	Power Density per PCB (W/mm ²)	Die Spacing (mm)	Series	Parallel
SMD2835	01.JT.CG2835W80P03	150	0.5	2700-6500	1	775.00	0.05	0	1	1
	01.JT.CG2835W*N*	150	0.5	2700-6500	1	775.00	0.05	0	1	1
	01.JT.CG2835W*P*	150	0.5	2700-6500	1	775.00	0.05	0	1	1
	01.JT.DG2835W*N*	150	0.5	2700-6500	1	775.00	0.05	0	1	1
	01.JT.DG2835W*P*	150	0.5	2700-6500	1	775.00	0.05	0	1	1

Note 1:

Table “*CG*” and “*DG*” are Internal code, mean 0.5W POWER LED, “*P*” or “*N*” means the market code, It can be Numbers or letters.

Note 2:

1. The applicant ShenZhen JuFei Optoelectronics Co., Ltd. declared that their product with model 01.JT.CG2835W80P03 are the same to the products in report # R2DG160825052-10-10000.
2. All the data in previous report (R2DG160825052-10-10000) is shared in this report.

1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard 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 ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20015	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	2017-03-03	2018-03-02

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).

FINAL

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 samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2016-08-25 and tested during 2016-09-02 to 2017-10-23. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

Data Set 1: 55 °C, 150mA

Part Number:	01.JT.CG2835W80P03
Number of Units:	25
Actual Case Temperature(T _S):	T _S =54.4 °C
Actual Ambient Temperature(T _A):	T _A =52.3 °C
Life Test Drive Current:	I _F = 150mA
Measurement Current:	I _F = 150mA

Data Set 2: 85 °C,150mA

Part Number:	01.JT.CG2835W80P03
Number of Units:	25
Actual Case Temperature(T _S):	T _S =84.2 °C
Actual Ambient Temperature(T _A):	T _A =81.6 °C
Life Test Drive Current:	I _F =150mA
Measurement Current:	I _F = 150mA

Data Set 3: 105 °C, 150mA

Part Number:	01.JT.CG2835W80P03
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 = 150mA
Measurement Current:	I _F = 150mA

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,7000h,8000,9000h,10000h
Average. Lumen Maintenance at 6000 hours:	99.38%
Average. Lumen Maintenance at 10000 hours:	98.56%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0015
Average Chromaticity Shift at 10000 hours($\Delta u'v'$):	0.0026
Reported TM-21 L ₇₀ Lifetime:	>60000 hours
Reported TM-21 L ₉₀ Lifetime:	55000 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,7000h,8000,9000h,10000h
Average. Lumen Maintenance at 6000 hours:	98.97%
Average. Lumen Maintenance at 10000 hours:	97.97%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0017
Average Chromaticity Shift at 10000 hours($\Delta u'v'$):	0.0027
Reported TM-21 L ₇₀ Lifetime:	>60000 hours
Reported TM-21 L ₉₀ Lifetime:	43000 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,7000h,8000,9000h,10000h
Average. Lumen Maintenance at 6000 hours:	98.60%
Average. Lumen Maintenance at 10000 hours:	97.40%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0020
Average Chromaticity Shift at 10000 hours($\Delta u'v'$):	0.0030
Reported TM-21 L ₇₀ Lifetime:	>60000 hours
Reported TM-21 L ₉₀ Lifetime:	36000 hours

3 - Test Data

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

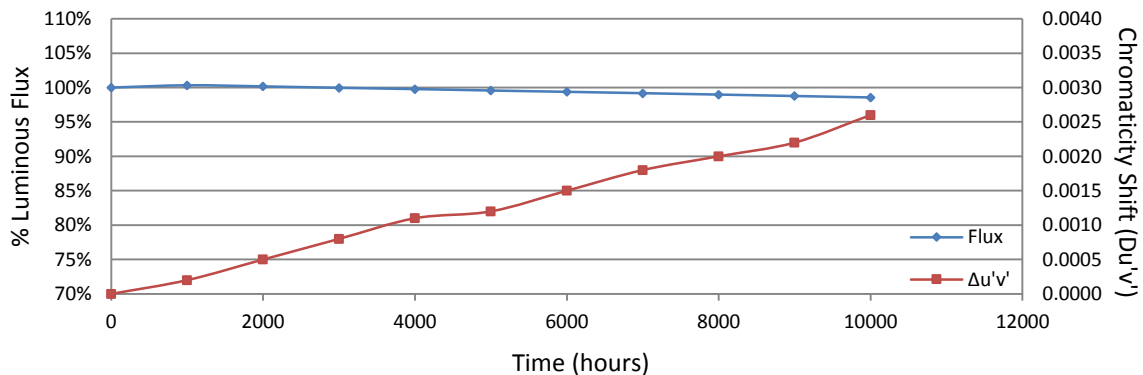
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2.956	68.56	100.47	100.32	100.13	100.03	99.91	99.78	99.55	99.34	99.17	98.95
2	2.982	68.66	100.25	99.91	99.74	99.58	99.40	99.17	98.89	98.60	98.31	98.03
3	2.912	68.37	100.34	100.20	100.03	99.77	99.56	99.47	99.25	99.06	98.98	98.89
4	2.917	68.47	100.41	100.26	99.88	99.65	99.40	99.37	99.12	98.88	98.66	98.44
5	2.900	69.89	100.26	100.17	100.14	99.94	99.64	99.50	99.47	99.34	99.10	98.74
6	2.888	71.07	100.31	100.25	100.08	99.96	99.83	99.65	99.58	99.30	99.04	98.90
7	2.921	68.99	100.26	100.16	99.94	99.84	99.62	99.41	99.19	99.04	98.85	98.68
8	2.876	69.96	100.10	99.94	99.79	99.60	99.27	99.03	98.80	98.57	98.38	98.27
9	2.925	68.81	100.36	100.23	100.10	99.93	99.91	99.69	99.62	99.43	99.42	99.27
10	2.927	68.67	100.32	100.20	100.13	99.85	99.78	99.52	99.36	99.29	99.00	98.75
11	2.876	70.08	100.41	100.27	100.10	99.94	99.79	99.73	99.54	99.36	99.14	98.82
12	2.869	69.17	100.20	100.01	99.60	99.31	98.87	98.58	98.21	97.93	97.83	97.64
13	2.917	68.67	100.45	100.29	100.22	99.90	99.72	99.55	99.43	99.23	98.92	98.76
14	2.919	68.84	100.36	100.20	100.16	99.99	99.75	99.45	99.30	99.11	98.88	98.62
15	2.985	68.65	100.31	100.09	99.90	99.77	99.61	99.36	99.08	98.82	98.69	98.44
16	2.899	70.71	100.47	100.37	100.20	99.84	99.70	99.59	99.29	99.12	98.93	98.64
17	2.942	69.25	100.45	100.35	99.91	99.80	99.47	99.12	98.89	98.64	98.43	98.19
18	2.881	70.91	100.32	100.06	99.94	99.66	99.28	99.14	99.08	98.82	98.56	98.43
19	2.879	70.34	100.30	100.26	99.96	99.83	99.67	99.45	99.30	99.10	98.82	98.62
20	2.890	70.96	100.28	100.17	100.04	99.92	99.80	99.66	99.53	99.24	99.07	98.87
21	2.958	69.45	100.23	100.09	100.01	99.80	99.65	99.41	99.22	99.09	98.96	98.85
22	2.934	66.45	100.30	100.03	99.70	99.59	99.20	98.83	98.51	98.21	97.95	97.83
23	3.003	69.08	100.35	100.06	99.80	99.61	99.54	99.45	99.15	98.99	98.87	98.62
24	2.912	71.38	100.22	100.01	99.47	99.30	99.03	98.81	98.66	98.37	98.07	97.77
25	2.878	71.56	100.41	100.31	100.13	100.04	99.87	99.79	99.57	99.52	99.20	99.05
Ave.	2.918	69.48	100.33	100.17	99.96	99.78	99.57	99.38	99.18	98.98	98.77	98.56
Med.	2.917	69.17	100.32	100.20	100.01	99.83	99.64	99.45	99.25	99.09	98.88	98.64
st dev	0.0369	1.1915	0.0911	0.1279	0.1952	0.1992	0.2734	0.3158	0.3613	0.4007	0.4069	0.4103
Min.	2.869	66.45	100.10	99.91	99.47	99.30	98.87	98.58	98.21	97.93	97.83	97.64
Max.	3.003	71.56	100.47	100.37	100.22	100.04	99.91	99.79	99.62	99.52	99.42	99.27

TM-21 Projection:

Test Duration: 10000 hours
Failures Observed: 0
α: 2.042E-06
β: 1.006
Reported L₇₀: >60000 hours
Reported L₉₀: 55000 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	0.2424	0.5044	3365	0.0002	0.0003	0.0008	0.0010	0.0012	0.0015	0.0017	0.0019	0.0022	0.0026
2	0.2439	0.5067	3295	0.0003	0.0006	0.0009	0.0010	0.0012	0.0015	0.0018	0.0019	0.0023	0.0026
3	0.2434	0.5053	3325	0.0005	0.0005	0.0008	0.0012	0.0015	0.0017	0.0020	0.0020	0.0024	0.0027
4	0.2433	0.5045	3336	0.0003	0.0007	0.0007	0.0012	0.0013	0.0016	0.0019	0.0020	0.0021	0.0026
5	0.2428	0.5060	3336	0.0002	0.0006	0.0007	0.0011	0.0013	0.0016	0.0018	0.0020	0.0022	0.0026
6	0.2418	0.5073	3354	0.0006	0.0010	0.0010	0.0015	0.0017	0.0020	0.0022	0.0024	0.0026	0.0030
7	0.2412	0.5029	3418	0.0001	0.0005	0.0008	0.0011	0.0011	0.0015	0.0016	0.0019	0.0022	0.0026
8	0.2419	0.5071	3353	0.0002	0.0004	0.0007	0.0010	0.0013	0.0015	0.0018	0.0019	0.0022	0.0025
9	0.2427	0.5040	3358	0.0001	0.0005	0.0008	0.0010	0.0012	0.0015	0.0018	0.0020	0.0022	0.0026
10	0.2431	0.5053	3335	0.0005	0.0006	0.0011	0.0013	0.0016	0.0018	0.0020	0.0020	0.0025	0.0028
11	0.2426	0.5059	3343	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017	0.0019	0.0020	0.0023	0.0026
12	0.2428	0.5100	3297	0.0004	0.0004	0.0005	0.0005	0.0008	0.0010	0.0013	0.0014	0.0016	0.0019
13	0.2424	0.5044	3364	0.0001	0.0006	0.0008	0.0010	0.0014	0.0015	0.0018	0.0020	0.0022	0.0026
14	0.2425	0.5033	3374	0.0001	0.0004	0.0007	0.0010	0.0012	0.0014	0.0017	0.0019	0.0022	0.0025
15	0.2420	0.5054	3365	0.0001	0.0004	0.0007	0.0009	0.0011	0.0015	0.0017	0.0020	0.0022	0.0025
16	0.2423	0.5067	3345	0.0002	0.0005	0.0007	0.0009	0.0014	0.0014	0.0016	0.0018	0.0021	0.0025
17	0.2406	0.5028	3439	0.0002	0.0006	0.0009	0.0012	0.0013	0.0016	0.0019	0.0021	0.0023	0.0026
18	0.2424	0.5081	3327	0.0002	0.0005	0.0008	0.0010	0.0012	0.0015	0.0018	0.0020	0.0022	0.0025
19	0.2441	0.5080	3277	0.0001	0.0004	0.0009	0.0009	0.0010	0.0015	0.0017	0.0020	0.0021	0.0025
20	0.2433	0.5101	3283	0.0002	0.0005	0.0009	0.0010	0.0013	0.0015	0.0019	0.0020	0.0022	0.0025
21	0.2440	0.5055	3304	0.0002	0.0006	0.0009	0.0014	0.0015	0.0018	0.0022	0.0024	0.0025	0.0029
22	0.2410	0.5034	3419	0.0001	0.0004	0.0009	0.0011	0.0011	0.0014	0.0017	0.0018	0.0020	0.0025
23	0.2417	0.5045	3385	0.0000	0.0005	0.0006	0.0010	0.0011	0.0015	0.0019	0.0020	0.0022	0.0026
24	0.2442	0.5111	3245	0.0001	0.0005	0.0009	0.0010	0.0012	0.0016	0.0019	0.0020	0.0022	0.0025
25	0.2428	0.5102	3297	0.0003	0.0007	0.0011	0.0011	0.0012	0.0015	0.0019	0.0020	0.0022	0.0025
Ave.	0.2426	0.5061	3342	0.0002	0.0005	0.0008	0.0011	0.0012	0.0015	0.0018	0.0020	0.0022	0.0026
Med.	0.2426	0.5055	3343	0.0002	0.0005	0.0008	0.0010	0.0012	0.0015	0.0018	0.0020	0.0022	0.0026
st dev	0.0009	0.0024	46.3268	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2406	0.5028	3245	0.0000	0.0003	0.0005	0.0005	0.0008	0.0010	0.0013	0.0014	0.0016	0.0019
Max.	0.2442	0.5111	3439	0.0006	0.0010	0.0011	0.0015	0.0017	0.0020	0.0022	0.0024	0.0026	0.0030



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

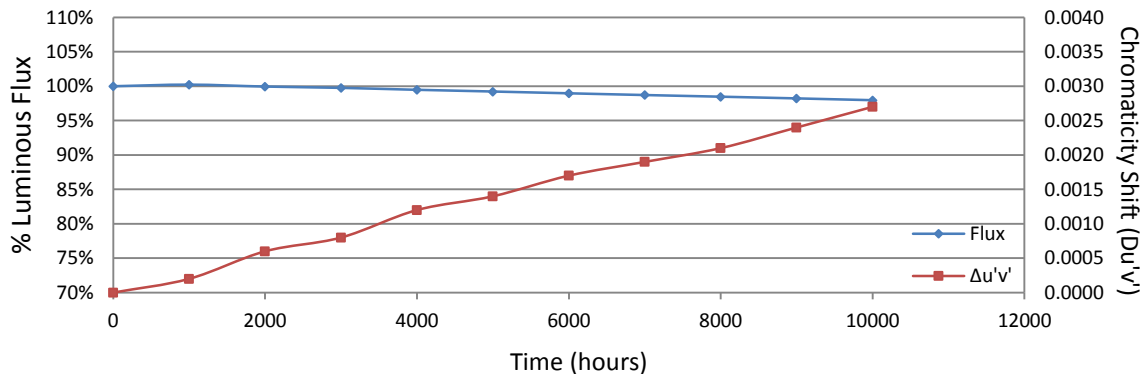
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)									
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	2.903	69.59	100.19	99.77	99.64	99.38	99.09	98.89	98.62	98.40	98.07	97.86
27	2.938	68.30	100.25	99.93	99.80	99.56	99.12	98.86	98.77	98.52	98.35	98.13
28	2.920	67.69	100.43	100.28	100.01	99.59	99.26	98.80	98.51	98.45	98.32	98.14
29	2.888	70.02	100.37	100.16	99.96	99.61	99.24	98.86	98.57	98.41	98.20	97.99
30	2.918	68.05	100.28	100.07	99.85	99.62	99.37	99.22	98.97	98.71	98.44	98.30
31	2.883	69.79	100.34	100.16	99.84	99.67	99.63	99.37	99.08	98.84	98.77	98.58
32	2.878	70.51	100.28	99.86	99.76	99.50	99.21	98.88	98.68	98.55	98.33	98.03
33	2.917	69.66	100.17	99.99	99.73	99.43	99.34	99.12	98.89	98.72	98.45	98.38
34	2.914	68.37	100.25	99.88	99.69	99.41	99.15	99.01	98.83	98.55	98.24	97.91
35	2.914	68.22	100.18	99.85	99.63	99.40	99.18	98.99	98.77	98.53	98.30	98.15
36	2.918	68.90	100.07	99.70	99.62	99.23	98.80	98.53	98.30	98.08	97.87	97.72
37	2.879	71.10	100.21	99.89	99.68	99.23	99.07	98.87	98.66	98.45	98.38	98.03
38	2.933	68.44	100.23	99.91	99.72	99.63	99.40	99.21	98.92	98.61	98.38	98.17
39	2.938	68.14	100.28	99.93	99.85	99.72	99.52	99.22	98.90	98.64	98.40	98.09
40	2.922	68.84	100.29	100.06	99.84	99.67	99.46	99.20	98.88	98.53	98.36	98.05
41	2.916	68.97	100.04	99.80	99.64	99.38	99.26	99.07	98.96	98.80	98.61	98.33
42	2.913	70.47	100.20	99.97	99.67	99.43	99.09	98.78	98.57	98.20	97.87	97.62
43	2.888	70.64	100.17	99.84	99.76	99.53	99.43	99.04	98.74	98.44	98.20	97.88
44	2.919	67.90	100.38	100.06	99.93	99.66	99.34	99.15	98.85	98.67	98.35	98.11
45	2.921	68.88	100.22	99.88	99.81	99.49	99.25	99.10	98.87	98.61	98.40	98.05
46	2.903	68.23	100.19	100.04	99.82	99.50	99.08	98.68	98.37	98.04	97.61	97.17
47	2.914	68.60	100.06	99.96	99.65	99.34	98.94	98.69	98.48	98.27	97.90	97.67
48	2.881	69.31	100.25	99.87	99.65	99.32	99.13	98.86	98.49	98.15	97.69	97.39
49	2.883	71.22	100.21	99.97	99.66	99.23	99.06	98.74	98.48	98.32	98.06	97.80
50	2.892	71.73	100.31	99.99	99.75	99.37	99.29	99.02	98.76	98.44	98.19	97.78
Ave.	2.908	69.26	100.23	99.95	99.76	99.48	99.23	98.97	98.72	98.48	98.23	97.97
Med.	2.914	68.90	100.23	99.93	99.75	99.49	99.24	98.99	98.76	98.52	98.32	98.03
st dev	0.0187	1.1533	0.0952	0.1319	0.1096	0.1480	0.1864	0.2062	0.2045	0.2122	0.2734	0.3100
Min.	2.878	67.69	100.04	99.70	99.62	99.23	98.80	98.53	98.30	98.04	97.61	97.17
Max.	2.938	71.73	100.43	100.28	100.01	99.72	99.63	99.37	99.08	98.84	98.77	98.58

TM-21 Projection:

Test Duration: 10000 hours
Failures Observed: 0
α: 2.538E-06
β: 1.005
Reported L₇₀: >60000 hours
Reported L₉₀: 43000 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	9000hrs
26	0.2425	0.5036	3370	0.0003	0.0007	0.0008	0.0015	0.0014	0.0018	0.0021	0.0022	0.0025	0.0029
27	0.2436	0.5041	3330	0.0001	0.0006	0.0009	0.0012	0.0014	0.0017	0.0019	0.0022	0.0022	0.0026
28	0.2419	0.5029	3397	0.0002	0.0007	0.0008	0.0013	0.0012	0.0017	0.0020	0.0023	0.0024	0.0027
29	0.2423	0.5037	3375	0.0001	0.0006	0.0006	0.0011	0.0010	0.0016	0.0019	0.0021	0.0023	0.0026
30	0.2433	0.5061	3319	0.0002	0.0007	0.0011	0.0014	0.0014	0.0017	0.0021	0.0022	0.0025	0.0027
31	0.2424	0.5049	3358	0.0000	0.0005	0.0006	0.0010	0.0009	0.0015	0.0019	0.0020	0.0022	0.0025
32	0.2424	0.5094	3314	0.0001	0.0005	0.0006	0.0012	0.0013	0.0016	0.0018	0.0020	0.0022	0.0025
33	0.2418	0.5072	3355	0.0003	0.0006	0.0008	0.0012	0.0015	0.0017	0.0020	0.0022	0.0025	0.0027
34	0.2417	0.5027	3404	0.0002	0.0007	0.0009	0.0012	0.0015	0.0017	0.0020	0.0021	0.0024	0.0026
35	0.2411	0.5035	3416	0.0002	0.0006	0.0006	0.0010	0.0013	0.0015	0.0017	0.0020	0.0022	0.0025
36	0.2405	0.5027	3444	0.0001	0.0005	0.0009	0.0011	0.0015	0.0016	0.0020	0.0021	0.0024	0.0026
37	0.2412	0.5067	3378	0.0001	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0021	0.0023	0.0025
38	0.2436	0.5061	3311	0.0002	0.0006	0.0007	0.0012	0.0014	0.0016	0.0018	0.0021	0.0022	0.0026
39	0.2430	0.5037	3354	0.0004	0.0007	0.0008	0.0013	0.0016	0.0016	0.0020	0.0021	0.0024	0.0026
40	0.2414	0.5032	3410	0.0002	0.0006	0.0006	0.0011	0.0017	0.0017	0.0020	0.0021	0.0024	0.0026
41	0.2410	0.5037	3416	0.0002	0.0007	0.0007	0.0011	0.0016	0.0017	0.0021	0.0022	0.0025	0.0028
42	0.2420	0.5082	3340	0.0002	0.0006	0.0006	0.0011	0.0015	0.0016	0.0018	0.0021	0.0022	0.0025
43	0.2442	0.5095	3261	0.0003	0.0006	0.0008	0.0011	0.0014	0.0017	0.0019	0.0021	0.0023	0.0025
44	0.2421	0.5026	3391	0.0002	0.0006	0.0006	0.0011	0.0013	0.0016	0.0018	0.0022	0.0023	0.0027
45	0.2437	0.5058	3311	0.0006	0.0009	0.0012	0.0015	0.0018	0.0020	0.0022	0.0025	0.0026	0.0028
46	0.2431	0.5053	3334	0.0002	0.0006	0.0006	0.0013	0.0016	0.0017	0.0020	0.0022	0.0023	0.0029
47	0.2441	0.5059	3296	0.0002	0.0006	0.0007	0.0011	0.0014	0.0017	0.0018	0.0022	0.0023	0.0028
48	0.2420	0.5059	3362	0.0003	0.0006	0.0008	0.0012	0.0015	0.0016	0.0018	0.0020	0.0022	0.0027
49	0.2418	0.5095	3332	0.0002	0.0005	0.0007	0.0012	0.0015	0.0017	0.0019	0.0021	0.0023	0.0028
50	0.2411	0.5069	3378	0.0004	0.0007	0.0009	0.0013	0.0017	0.0018	0.0021	0.0023	0.0025	0.0030
Ave.	0.2423	0.5054	3358	0.0002	0.0006	0.0008	0.0012	0.0014	0.0017	0.0019	0.0021	0.0024	0.0027
Med.	0.2421	0.5053	3358	0.0002	0.0006	0.0008	0.0012	0.0014	0.0017	0.0019	0.0021	0.0023	0.0026
st dev	0.0010	0.0022	43.9292	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	0.2405	0.5026	3261	0.0000	0.0005	0.0006	0.0010	0.0009	0.0015	0.0017	0.0020	0.0022	0.0025
Max.	0.2442	0.5095	3444	0.0006	0.0009	0.0012	0.0015	0.0018	0.0020	0.0022	0.0025	0.0026	0.0030



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

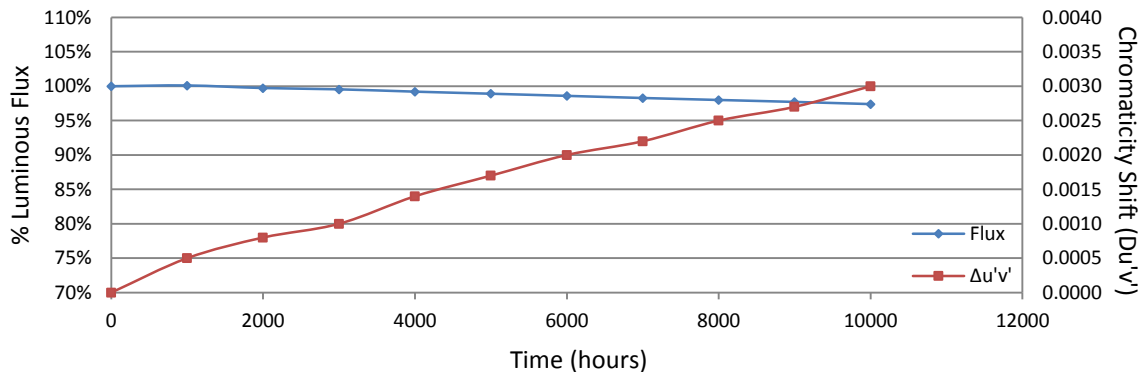
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)									
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	2.885	70.20	100.16	99.80	99.79	99.52	99.29	99.10	98.83	98.48	98.08	97.75
52	2.934	68.94	99.97	99.62	99.36	99.09	98.84	98.67	98.30	98.10	97.75	97.45
53	2.930	68.20	100.18	99.85	99.66	99.28	98.97	98.59	98.28	98.08	97.79	97.51
54	2.888	70.86	100.08	99.79	99.59	99.10	98.83	98.48	98.04	97.70	97.35	97.15
55	2.923	67.92	100.21	99.94	99.76	99.48	99.07	98.67	98.29	97.95	97.63	97.39
56	2.873	70.11	100.16	99.63	99.44	99.22	98.97	98.66	98.47	98.33	98.19	97.92
57	2.945	70.28	100.10	99.72	99.62	99.30	99.19	99.08	98.82	98.51	98.15	97.81
58	2.939	68.78	100.01	99.64	99.37	98.95	98.88	98.46	98.18	97.89	97.56	97.16
59	2.955	69.08	100.13	99.84	99.59	99.25	98.96	98.39	97.99	97.71	97.37	97.00
60	2.888	69.67	100.19	99.97	99.90	99.68	99.43	99.08	98.79	98.51	98.38	98.15
61	2.892	71.54	100.07	99.68	99.52	99.34	98.83	98.71	98.32	98.11	97.89	97.65
62	2.925	67.68	100.18	99.78	99.66	99.26	99.05	98.83	98.55	98.32	98.03	97.62
63	2.921	66.90	100.10	99.49	99.04	98.51	98.09	97.73	97.29	96.98	96.71	96.34
64	2.881	70.41	100.01	99.63	99.53	99.16	98.98	98.69	98.42	98.20	97.86	97.49
65	2.901	69.71	99.90	99.58	99.41	99.05	98.69	98.38	98.18	98.02	97.82	97.43
66	2.919	68.74	100.12	99.75	99.59	99.26	98.81	98.33	97.99	97.67	97.37	96.89
67	2.878	70.48	100.18	99.80	99.60	99.21	98.94	98.72	98.44	97.99	97.73	97.28
68	3.067	68.84	100.23	99.83	99.61	99.20	98.85	98.37	97.95	97.68	97.33	96.98
69	2.888	69.50	100.13	99.81	99.68	99.28	98.98	98.63	98.37	98.01	97.77	97.48
70	3.000	70.98	100.10	99.83	99.75	99.49	99.39	99.06	98.83	98.62	98.46	98.27
71	2.914	68.74	100.23	99.88	99.59	99.21	98.75	98.39	98.14	97.72	97.22	97.03
72	2.917	67.40	100.22	99.67	99.48	99.14	98.80	98.43	98.12	97.76	97.46	97.08
73	2.924	69.22	99.90	99.36	99.03	98.58	98.28	98.04	97.82	97.50	97.37	97.04
74	2.886	70.14	99.94	99.63	99.57	99.32	99.06	98.83	98.52	98.26	98.03	97.90
75	2.933	69.65	100.20	99.89	99.66	99.34	98.95	98.59	98.29	97.98	97.76	97.36
Ave.	2.920	69.36	100.11	99.74	99.55	99.21	98.91	98.60	98.29	98.00	97.72	97.40
Med.	2.919	69.50	100.13	99.78	99.59	99.25	98.95	98.63	98.29	98.01	97.76	97.43
st dev	0.0423	1.1693	0.1005	0.1425	0.2002	0.2549	0.2889	0.3218	0.3518	0.3705	0.3987	0.4328
Min.	2.873	66.90	99.90	99.36	99.03	98.51	98.09	97.73	97.29	96.98	96.71	96.34
Max.	3.067	71.54	100.23	99.97	99.90	99.68	99.43	99.10	98.83	98.62	98.46	98.27

TM-21 Projection:

Test Duration: 10000 hours
Failures Observed: 0
α: 3.051E-06
β: 1.004
Reported L₇₀: >60000 hours
Reported L₉₀: 36000 hours

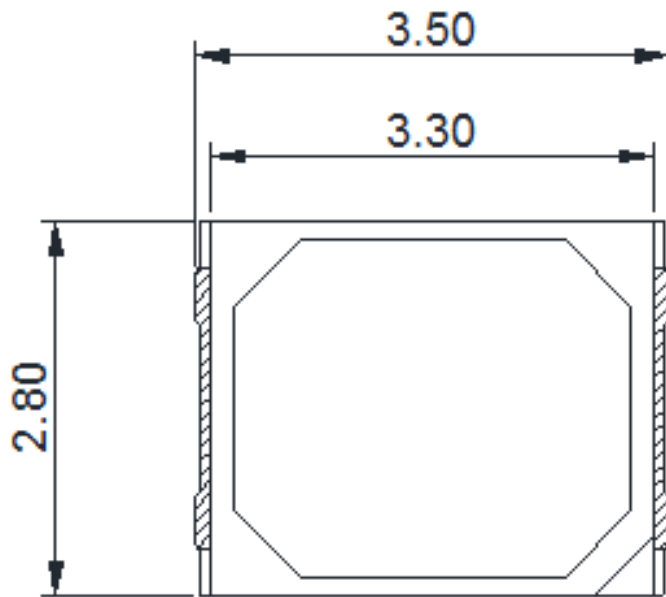
3.6 Data Set 3, 105 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)									
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2425	0.5067	3340	0.0004	0.0007	0.0008	0.0013	0.0014	0.0017	0.0019	0.0023	0.0023	0.0027
52	0.2429	0.5046	3348	0.0005	0.0008	0.0011	0.0014	0.0015	0.0020	0.0022	0.0025	0.0027	0.0029
53	0.2396	0.5021	3482	0.0005	0.0008	0.0011	0.0015	0.0015	0.0020	0.0022	0.0026	0.0027	0.0030
54	0.2438	0.5074	3293	0.0005	0.0008	0.0013	0.0016	0.0019	0.0020	0.0022	0.0025	0.0027	0.0030
55	0.2408	0.5034	3426	0.0004	0.0007	0.0009	0.0013	0.0017	0.0018	0.0020	0.0024	0.0025	0.0028
56	0.2427	0.5064	3336	0.0005	0.0008	0.0011	0.0016	0.0018	0.0021	0.0022	0.0026	0.0027	0.0030
57	0.2413	0.5077	3365	0.0005	0.0008	0.0012	0.0014	0.0018	0.0020	0.0022	0.0025	0.0027	0.0030
58	0.2442	0.5069	3283	0.0004	0.0008	0.0011	0.0014	0.0018	0.0019	0.0022	0.0025	0.0027	0.0029
59	0.2415	0.5041	3396	0.0005	0.0008	0.0009	0.0016	0.0019	0.0021	0.0022	0.0025	0.0027	0.0030
60	0.2435	0.5057	3317	0.0004	0.0007	0.0009	0.0013	0.0017	0.0019	0.0021	0.0025	0.0026	0.0028
61	0.2404	0.5069	3401	0.0005	0.0009	0.0011	0.0014	0.0019	0.0021	0.0023	0.0028	0.0029	0.0031
62	0.2419	0.5027	3400	0.0007	0.0012	0.0014	0.0019	0.0022	0.0024	0.0025	0.0029	0.0031	0.0034
63	0.2415	0.5039	3400	0.0003	0.0007	0.0008	0.0012	0.0017	0.0016	0.0018	0.0021	0.0023	0.0025
64	0.2423	0.5078	3332	0.0004	0.0008	0.0011	0.0015	0.0021	0.0019	0.0023	0.0026	0.0027	0.0030
65	0.2430	0.5065	3327	0.0007	0.0008	0.0012	0.0016	0.0019	0.0022	0.0024	0.0027	0.0029	0.0032
66	0.2420	0.5053	3369	0.0005	0.0008	0.0010	0.0015	0.0018	0.0021	0.0024	0.0026	0.0028	0.0031
67	0.2436	0.5082	3289	0.0004	0.0008	0.0011	0.0014	0.0017	0.0020	0.0025	0.0025	0.0027	0.0029
68	0.2411	0.5018	3433	0.0005	0.0008	0.0010	0.0014	0.0014	0.0021	0.0022	0.0025	0.0028	0.0031
69	0.2442	0.5091	3264	0.0004	0.0007	0.0009	0.0013	0.0015	0.0018	0.0021	0.0023	0.0025	0.0028
70	0.2433	0.5095	3289	0.0006	0.0011	0.0013	0.0017	0.0017	0.0021	0.0024	0.0027	0.0029	0.0031
71	0.2426	0.5076	3327	0.0004	0.0008	0.0009	0.0014	0.0016	0.0020	0.0021	0.0024	0.0026	0.0028
72	0.2437	0.5078	3290	0.0003	0.0007	0.0008	0.0012	0.0013	0.0018	0.0019	0.0022	0.0023	0.0027
73	0.2427	0.5054	3345	0.0004	0.0009	0.0010	0.0014	0.0015	0.0018	0.0021	0.0025	0.0027	0.0030
74	0.2440	0.5068	3292	0.0005	0.0009	0.0011	0.0015	0.0018	0.0021	0.0023	0.0026	0.0027	0.0030
75	0.2435	0.5052	3322	0.0004	0.0008	0.0006	0.0014	0.0017	0.0022	0.0025	0.0027	0.0030	0.0032
Ave.	0.2425	0.5060	3347	0.0005	0.0008	0.0010	0.0014	0.0017	0.0020	0.0022	0.0025	0.0027	0.0030
Med.	0.2427	0.5065	3336	0.0005	0.0008	0.0011	0.0014	0.0017	0.0020	0.0022	0.0025	0.0027	0.0030
st dev	0.0012	0.0021	55.2380	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2396	0.5018	3264	0.0003	0.0007	0.0006	0.0012	0.0013	0.0016	0.0018	0.0021	0.0023	0.0025
Max.	0.2442	0.5095	3482	0.0007	0.0012	0.0014	0.0019	0.0022	0.0024	0.0025	0.0029	0.0031	0.0034



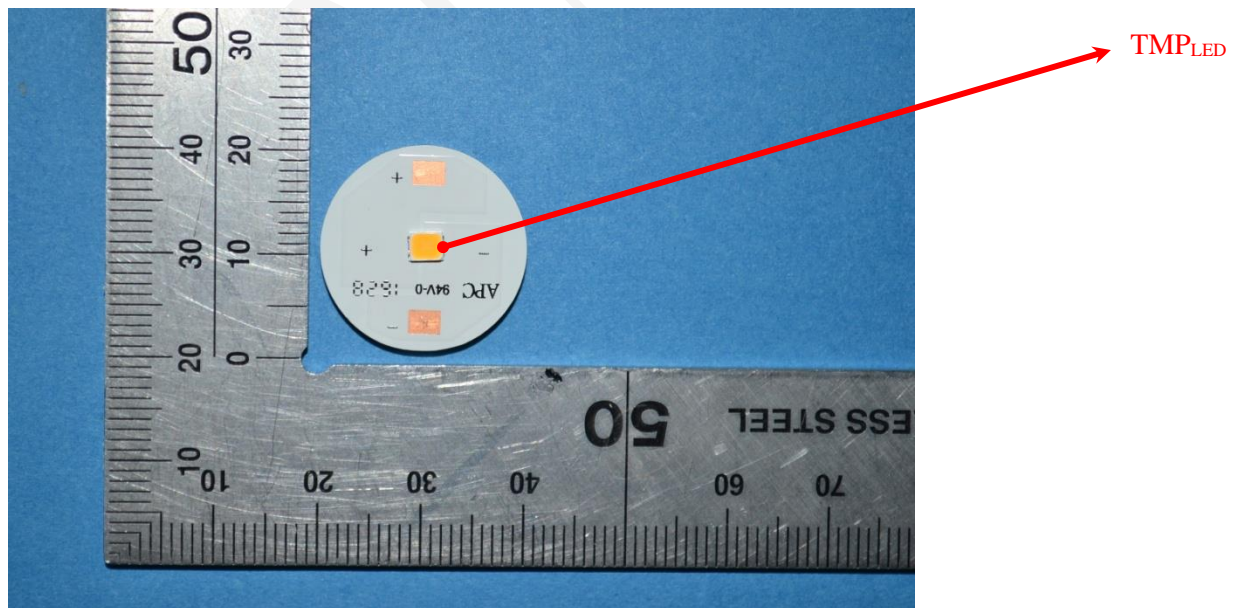
Attachment A – EUT Photo

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



All dimensions are in millimeter

A.2 EUT Photo



Report Revision

Report Number	Report Date	Contents
R2DG180928054-10	2018-09-29	Original report.
R2DG180928054-10-M1	2019-05-17	Add the covered model

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

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