



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Fujian Lightning Optoelectronic Co., Ltd. Shenzhen Branch.

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Baoan District, Shenzhen, 518108 China.

Model: T1D

Report Type: 6000 Hours Test Report	Product Type: LED Module
Test Engineer: Pote Wang	<i>Pote Wang</i>
Report Number: RSZ160122501-10	
Test Date: 2016-02-03 to 2016-10-10	
Report Date: 2016-10-31	
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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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TABLE OF CONTENTS

1 - General Information	3
1.1 Description of LED Light Sources	3
1.2 Standards Used:.....	4
1.3 Test Facility.....	4
1.4 Description of Auxiliary Equipment	5
1.5 Operating Cycle.....	5
1.6 Ambient Conditions	5
1.7 Photometry Measurement Uncertainty	5
1.8 Sample Set.....	6
2 - Summary of Test Result.....	7
3 - Test Data	8
3.1 Data Set 1, 55°C, 600mA (Lumen Maintenance).....	8
3.2 Data Set 1, 55°C, 600mA (Chromaticity Shift).....	9
3.3 Data Set 2, 85°C, 600mA (Lumen Maintenance).....	10
3.4 Data Set 2, 85°C, 600mA (Chromaticity Shift).....	11
3.5 Data Set 3, 105°C, 600mA (Lumen Maintenance).....	12
3.6 Data Set 3, 105°C, 600mA (Chromaticity Shift).....	13
Attachment A – EUT Photo	14
A.1 Mechanical Dimensions (Ta = 25°C).....	14
A.2 EUT Photo.....	14
Attachment B – Family declaration Letter.....	14

1 - General Information

1.1 Description of LED Light Sources

Devices tested

Part Number: T1D
 Part Type: LED Module
 Nominal CCT: 3000K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report base on the declaration letter of manufacturer (see attachment B for more information). The information of these models shows that the covered products meet all section 3 item 7 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 9, 2011)

Series Name	Model Name	CCT (K)	Current (mA)	Power (W)	Power Density (W/mm ²)	Die Spacing (mm)	Chip Number (pcs)
EMC1A1A	T1D277C3R-*****	2700	600	22.2	0.22	0.30	36
EMC1A1A	T1D278C3R-*****	2700	600	22.2	0.22	0.30	36
EMC1A1A	T1D279C3R-*****	2700	600	22.2	0.22	0.30	36
EMC1A1A	T1D27CC3R-*****	2700	600	22.2	0.22	0.30	36
EMC1A1A	T1D307C3R-*****	3000	600	22.2	0.22	0.30	36
EMC1A1A	T1D308C3R-*****	3000	600	22.2	0.22	0.30	36
EMC1A1A	T1D309C3R-*****	3000	600	22.2	0.22	0.30	36
EMC1A1A	T1D30CC3R-*****	3000	600	22.2	0.22	0.30	36
EMC1A1A	T1D357C3R-*****	3500	600	22.2	0.22	0.30	36
EMC1A1A	T1D358C3R-*****	3500	600	22.2	0.22	0.30	36
EMC1A1A	T1D359C3R-*****	3500	600	22.2	0.22	0.30	36
EMC1A1A	T1D35CC3R-*****	3500	600	22.2	0.22	0.30	36
EMC1A1A	T1D407C3R-*****	4000	600	22.2	0.22	0.30	36
EMC1A1A	T1D408C3R-*****	4000	600	22.2	0.22	0.30	36
EMC1A1A	T1D409C3R-*****	4000	600	22.2	0.22	0.30	36
EMC1A1A	T1D40CC3R-*****	4000	600	22.2	0.22	0.30	36
EMC1A1A	T1D457C3R-*****	4500	600	22.2	0.22	0.30	36
EMC1A1A	T1D458C3R-*****	4500	600	22.2	0.22	0.30	36
EMC1A1A	T1D459C3R-*****	4500	600	22.2	0.22	0.30	36
EMC1A1A	T1D45CC3R-*****	4500	600	22.2	0.22	0.30	36
EMC1A1A	T1D507C3R-*****	5000	600	22.2	0.22	0.30	36
EMC1A1A	T1D508C3R-*****	5000	600	22.2	0.22	0.30	36
EMC1A1A	T1D509C3R-*****	5000	600	22.2	0.22	0.30	36
EMC1A1A	T1D50CC3R-*****	5000	600	22.2	0.22	0.30	36
EMC1A1A	T1D537C3R-*****	5300	600	22.2	0.22	0.30	36
EMC1A1A	T1D538C3R-*****	5300	600	22.2	0.22	0.30	36
EMC1A1A	T1D539C3R-*****	5300	600	22.2	0.22	0.30	36
EMC1A1A	T1D53CC3R-*****	5300	600	22.2	0.22	0.30	36
EMC1A1A	T1D577C3R-*****	5700	600	22.2	0.22	0.30	36
EMC1A1A	T1D578C3R-*****	5700	600	22.2	0.22	0.30	36
EMC1A1A	T1D579C3R-*****	5700	600	22.2	0.22	0.30	36

EMC1A1A	T1D657C3R-*****	6500	600	22.2	0.22	0.30	36
EMC1A1A	T1D658C3R-*****	6500	600	22.2	0.22	0.30	36
EMC1A1A	T1D659C3R-*****	6500	600	22.2	0.22	0.30	36
EMC1A1A	T1D277C2R-*****	2700	400	15	0.15	0.50	24
EMC1A1A	T1D278C2R-*****	2700	400	15	0.15	0.50	24
EMC1A1A	T1D279C2R-*****	2700	400	15	0.15	0.50	24
EMC1A1A	T1D27CC2R-*****	2700	400	15	0.15	0.50	24
EMC1A1A	T1D307C2R-*****	3000	400	15	0.15	0.50	24
EMC1A1A	T1D308C2R-*****	3000	400	15	0.15	0.50	24
EMC1A1A	T1D309C2R-*****	3000	400	15	0.15	0.50	24
EMC1A1A	T1D30CC2R-*****	3000	400	15	0.15	0.50	24
EMC1A1A	T1D357C2R-*****	3500	400	15	0.15	0.50	24
EMC1A1A	T1D358C2R-*****	3500	400	15	0.15	0.50	24
EMC1A1A	T1D359C2R-*****	3500	400	15	0.15	0.50	24
EMC1A1A	T1D35CC2R-*****	3500	400	15	0.15	0.50	24
EMC1A1A	T1D407C2R-*****	4000	400	15	0.15	0.50	24
EMC1A1A	T1D408C2R-*****	4000	400	15	0.15	0.50	24
EMC1A1A	T1D409C2R-*****	4000	400	15	0.15	0.50	24
EMC1A1A	T1D40CC2R-*****	4000	400	15	0.15	0.50	24
EMC1A1A	T1D457C2R-*****	4500	400	15	0.15	0.50	24
EMC1A1A	T1D458C3R-*****	4500	400	15	0.15	0.50	24
EMC1A1A	T1D459C2R-*****	4500	400	15	0.15	0.50	24
EMC1A1A	T1D45CC2R-*****	4500	400	15	0.15	0.50	24
EMC1A1A	T1D507C2R-*****	5000	400	15	0.15	0.50	24
EMC1A1A	T1D508C2R-*****	5000	400	15	0.15	0.50	24
EMC1A1A	T1D509C2R-*****	5000	400	15	0.15	0.50	24
EMC1A1A	T1D50CC2R-*****	5000	400	15	0.15	0.50	24
EMC1A1A	T1D537C2R-*****	5300	400	15	0.15	0.50	24
EMC1A1A	T1D538C2R-*****	5300	400	15	0.15	0.50	24
EMC1A1A	T1D539C2R-*****	5300	400	15	0.15	0.50	24
EMC1A1A	T1D53CC2R-*****	5300	400	15	0.15	0.50	24
EMC1A1A	T1D577C2R-*****	5700	400	15	0.15	0.50	24
EMC1A1A	T1D578C2R-*****	5700	400	15	0.15	0.50	24
EMC1A1A	T1D579C2R-*****	5700	400	15	0.15	0.50	24
EMC1A1A	T1D657C2R-*****	6500	400	15	0.15	0.50	24
EMC1A1A	T1D658C2R-*****	6500	400	15	0.15	0.50	24
EMC1A1A	T1D659C2R-*****	6500	400	15	0.15	0.50	24

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
1.0m integrating sphere	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
spectroradiometer	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
DC Power Supply	Hanshenpuyuan	HSPY-100-05	2013010210003	N/A	2016-05-18	2017-05-17
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Multilayer aging machine	BACL	B2-270	20024	25°C~110°C	2016-03-04	2017-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2016-07-07	2017-07-06
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50/15A)	2016-03-04	2017-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	(50/15A)	2016-03-04	2017-03-03

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 $25^\circ\text{C} \pm 2^\circ\text{C}$, 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 66 Pcs;

Each Ts test condition 66 Pcs

The samples tested at Ts 55°C, Ts 85°C and Ts 105°C were received at 2016-01-12 and tested during 2016-02-03 to 2016-10-10. The samples were numbered from 1 to 22, 23 to 44 and 45 to 66.

Data Set 1: 55°C, 600mA

Part Number:	T1D
Number of Units:	22
Actual Case Temperature(T _S):	T _S =54.3°C
Actual Ambient Temperature(T _A):	T _A =52.3°C
Life Test Drive Current:	I _F = 600mA
Measurement Current:	I _F = 600mA

Data Set 2: 85°C,600mA

Part Number:	T1D
Number of Units:	22
Actual Case Temperature(T _S):	T _S =84.5°C
Actual Ambient Temperature(T _A):	T _A =82.1°C
Life Test Drive Current:	I _F =600mA
Measurement Current:	I _F = 600mA

Data Set 3: 105°C, 600mA

Part Number:	T1D
Number of Units:	22
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 = 600mA
Measurement Current:	I _F = 600mA

2 - Summary of Test Result

Data Set:	Data Set 1, 55°C, 600mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	98.54%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime:	>36000 hours

Data Set:	Data Set 2, 85°C, 600mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.78%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime:	>36000 hours

Data Set:	Data Set 3, 105°C, 600mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.02%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0019
Reported TM-21 L ₇₀ Lifetime:	>36000 hours

3 - Test Data

3.1 Data Set 1, 55°C, 600mA (Lumen Maintenance)

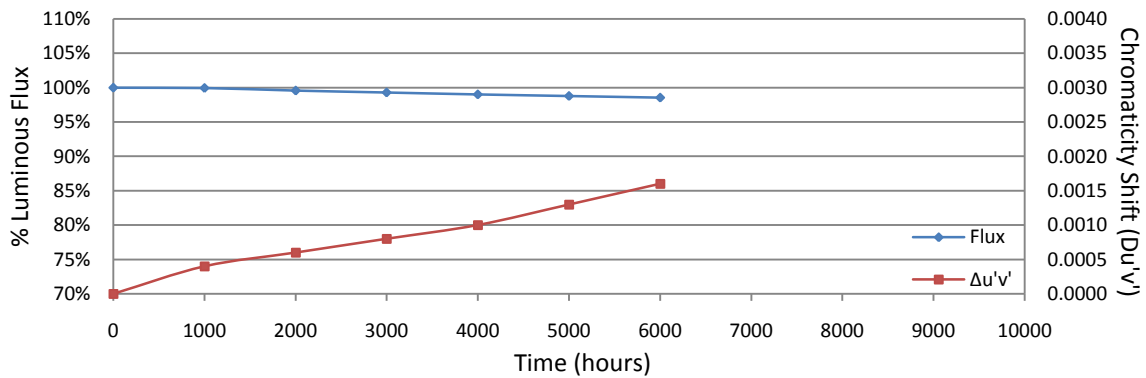
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	37.30	2716.86	100.39	99.91	99.45	99.04	98.91	98.68
2	37.76	2728.73	100.15	99.68	99.30	99.28	98.91	98.46
3	37.16	2747.69	100.06	99.67	99.58	99.07	98.83	98.43
4	37.26	2606.51	99.85	99.36	98.99	98.67	98.58	98.42
5	37.13	2665.74	99.87	99.52	99.25	99.15	98.81	98.67
6	37.40	2808.06	100.03	99.73	99.53	99.44	98.98	98.71
7	36.59	2764.27	100.04	99.92	99.55	99.07	98.87	98.59
8	36.83	2786.16	99.84	99.53	99.19	98.75	98.51	98.44
9	36.80	2654.79	99.87	99.72	99.50	99.36	99.20	98.87
10	37.01	2785.85	99.85	99.56	99.30	98.97	98.95	98.75
11	37.19	2660.81	99.85	99.60	99.27	99.14	98.81	98.50
12	36.76	2758.55	100.06	99.66	99.51	99.10	99.02	98.48
13	37.00	2761.41	99.75	99.61	99.19	98.98	98.79	98.58
14	37.03	2663.37	99.96	99.37	99.27	99.04	98.94	98.83
15	37.08	2750.52	99.75	99.19	98.85	98.71	98.60	98.54
16	36.80	2777.75	99.56	99.28	98.91	98.62	98.49	98.19
17	36.87	2794.09	99.66	99.45	99.27	98.70	98.37	97.82
18	36.83	2764.09	99.76	99.31	99.07	98.81	98.34	98.26
19	36.72	2777.19	100.07	99.65	99.46	99.39	99.10	98.82
20	36.82	2684.62	99.87	99.77	99.34	99.10	98.72	98.61
21	36.76	2777.19	99.78	99.49	99.36	98.95	98.74	98.55
22	36.85	2776.91	100.08	99.60	99.37	99.14	98.97	98.77
Ave.	37.00	2736.87	99.91	99.57	99.30	99.02	98.79	98.54
Med.	36.94	2759.98	99.87	99.60	99.30	99.06	98.82	98.56
st dev	0.2719	55.9499	0.1850	0.1910	0.2032	0.2370	0.2289	0.2408
Min.	36.59	2606.51	99.56	99.19	98.85	98.62	98.34	97.82
Max.	37.76	2808.06	100.39	99.92	99.58	99.44	99.20	98.87

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 2.727E-06
 β : 1.001
Reported L₇₀: >36000 hours

3.2 Data Set 1, 55°C, 600mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2518	0.5268	2936	0.0003	0.0005	0.0009	0.0013	0.0016	0.0018
2	0.2519	0.5265	2935	0.0006	0.0008	0.0012	0.0014	0.0017	0.0019
3	0.2515	0.5267	2945	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011
4	0.2494	0.5255	3003	0.0005	0.0008	0.0011	0.0014	0.0018	0.0022
5	0.2501	0.5258	2984	0.0003	0.0004	0.0007	0.0008	0.0010	0.0014
6	0.2532	0.5270	2903	0.0003	0.0006	0.0008	0.0012	0.0016	0.0019
7	0.2523	0.5268	2928	0.0002	0.0006	0.0009	0.0011	0.0014	0.0017
8	0.2524	0.5274	2921	0.0004	0.0006	0.0010	0.0014	0.0017	0.0019
9	0.2504	0.5264	2970	0.0002	0.0003	0.0004	0.0007	0.0008	0.0013
10	0.2526	0.5284	2909	0.0005	0.0004	0.0004	0.0006	0.0008	0.0008
11	0.2497	0.5250	2999	0.0003	0.0005	0.0007	0.0008	0.0014	0.0017
12	0.2528	0.5281	2909	0.0004	0.0009	0.0011	0.0014	0.0017	0.0021
13	0.2532	0.5264	2909	0.0001	0.0004	0.0006	0.0008	0.0010	0.0014
14	0.2509	0.5270	2958	0.0006	0.0009	0.0011	0.0013	0.0016	0.0020
15	0.2533	0.5260	2906	0.0004	0.0005	0.0007	0.0010	0.0013	0.0015
16	0.2529	0.5276	2909	0.0004	0.0007	0.0008	0.0010	0.0012	0.0013
17	0.2529	0.5276	2908	0.0005	0.0006	0.0009	0.0011	0.0013	0.0013
18	0.2512	0.5264	2952	0.0004	0.0006	0.0007	0.0009	0.0012	0.0015
19	0.2529	0.5276	2907	0.0003	0.0005	0.0008	0.0010	0.0011	0.0011
20	0.2504	0.5249	2983	0.0006	0.0009	0.0010	0.0011	0.0012	0.0015
21	0.2528	0.5271	2914	0.0005	0.0006	0.0008	0.0010	0.0011	0.0014
22	0.2523	0.5274	2923	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013
Ave.	0.2519	0.5267	2937	0.0004	0.0006	0.0008	0.0010	0.0013	0.0016
Med.	0.2523	0.5268	2926	0.0004	0.0006	0.0008	0.0010	0.0012	0.0015
st dev	0.0012	0.0009	32.6632	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
Min.	0.2494	0.5249	2903	0.0001	0.0003	0.0004	0.0006	0.0008	0.0008
Max.	0.2533	0.5284	3003	0.0006	0.0009	0.0012	0.0014	0.0018	0.0022



3.3 Data Set 2, 85°C, 600mA (Lumen Maintenance)

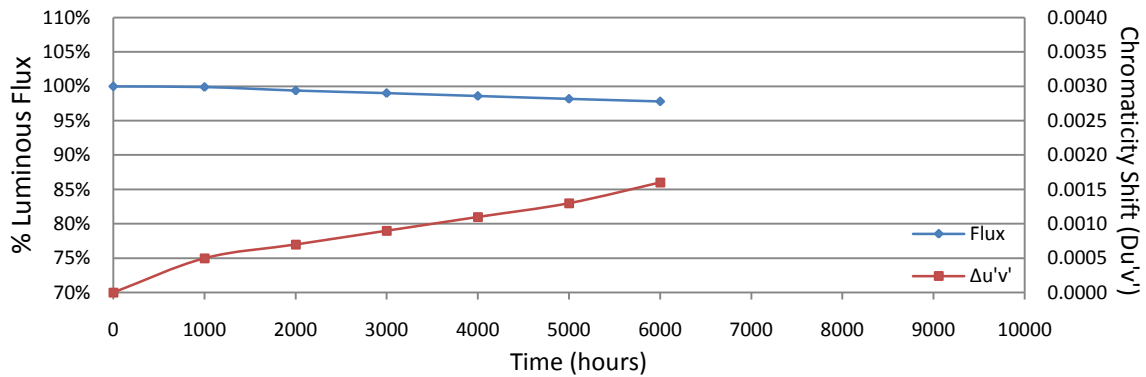
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	37.07	2766.02	99.88	99.48	99.06	98.65	98.37	97.79
24	36.87	2765.75	99.84	99.56	99.05	98.46	97.92	97.39
25	37.00	2770.36	99.87	99.68	99.27	98.87	98.24	98.06
26	37.07	2709.13	99.92	99.75	99.37	99.14	98.71	98.15
27	37.35	2758.09	100.09	99.57	99.16	98.93	98.56	98.18
28	37.12	2764.36	100.06	99.71	99.40	98.79	98.15	97.54
29	37.22	2742.60	99.66	99.29	98.97	98.41	97.87	97.68
30	36.87	2711.58	99.80	99.22	98.53	98.06	97.79	97.53
31	36.63	2684.89	99.98	99.39	99.11	98.84	98.34	98.07
32	36.70	2785.85	99.88	99.15	98.86	98.60	98.34	97.82
33	36.78	2770.36	100.04	99.50	99.04	98.48	97.97	97.54
34	36.80	2792.97	99.61	98.98	98.42	97.87	97.57	97.16
35	37.07	2760.30	99.58	99.24	98.76	98.56	98.18	97.89
36	36.82	2771.19	99.78	99.05	98.57	98.20	97.87	97.20
37	36.92	2738.53	99.97	99.63	99.35	99.09	98.65	98.15
38	36.76	2789.34	100.10	99.43	99.06	98.48	98.11	97.80
39	36.92	2740.46	100.10	99.36	98.67	98.28	97.98	97.66
40	36.83	2749.19	99.78	99.45	99.13	98.84	98.51	97.97
41	36.76	2727.37	99.78	99.14	98.90	98.47	98.12	97.91
42	36.91	2737.18	100.02	99.43	99.31	98.78	98.37	97.98
43	36.87	2769.90	99.82	99.32	98.65	98.25	97.70	97.45
44	37.13	2738.00	99.79	99.25	98.85	98.54	98.29	98.16
Ave.	36.93	2751.97	99.88	99.39	98.98	98.57	98.16	97.78
Med.	36.89	2759.20	99.87	99.41	99.05	98.55	98.17	97.81
st dev	0.1791	27.2854	0.1543	0.2131	0.2856	0.3236	0.3082	0.3117
Min.	36.63	2684.89	99.58	98.98	98.42	97.87	97.57	97.16
Max.	37.35	2792.97	100.10	99.75	99.40	99.14	98.71	98.18

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 4.222E-06
 β : 1.003
Reported L₇₀: >36000 hours

3.4 Data Set 2, 85°C, 600mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	0.2527	0.5272	2918	0.0004	0.0004	0.0008	0.0011	0.0013	0.0016
24	0.2509	0.5258	2964	0.0005	0.0007	0.0008	0.0010	0.0012	0.0014
25	0.2524	0.5275	2920	0.0002	0.0005	0.0007	0.0008	0.0010	0.0011
26	0.2504	0.5270	2970	0.0004	0.0007	0.0009	0.0012	0.0015	0.0019
27	0.2524	0.5249	2933	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
28	0.2520	0.5270	2934	0.0002	0.0004	0.0007	0.0010	0.0010	0.0013
29	0.2507	0.5254	2972	0.0002	0.0004	0.0005	0.0007	0.0010	0.0013
30	0.2512	0.5265	2954	0.0005	0.0009	0.0011	0.0014	0.0017	0.0021
31	0.2510	0.5259	2964	0.0004	0.0007	0.0010	0.0014	0.0016	0.0021
32	0.2525	0.5279	2914	0.0003	0.0004	0.0006	0.0009	0.0011	0.0012
33	0.2529	0.5272	2910	0.0006	0.0010	0.0012	0.0014	0.0015	0.0018
34	0.2528	0.5277	2910	0.0004	0.0009	0.0011	0.0016	0.0018	0.0019
35	0.2521	0.5257	2937	0.0005	0.0006	0.0008	0.0010	0.0013	0.0015
36	0.2527	0.5277	2912	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013
37	0.2513	0.5270	2948	0.0005	0.0008	0.0010	0.0011	0.0015	0.0018
38	0.2524	0.5274	2921	0.0005	0.0006	0.0007	0.0011	0.0011	0.0013
39	0.2518	0.5268	2938	0.0004	0.0008	0.0012	0.0013	0.0014	0.0017
40	0.2523	0.5270	2926	0.0011	0.0012	0.0015	0.0017	0.0018	0.0021
41	0.2511	0.5257	2964	0.0005	0.0007	0.0009	0.0011	0.0014	0.0019
42	0.2515	0.5265	2948	0.0005	0.0007	0.0010	0.0012	0.0016	0.0019
43	0.2532	0.5294	2893	0.0006	0.0007	0.0009	0.0010	0.0012	0.0014
44	0.2524	0.5263	2927	0.0002	0.0006	0.0008	0.0011	0.0014	0.0018
Ave.	0.2519	0.5268	2935	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016
Med.	0.2522	0.5270	2934	0.0005	0.0007	0.0009	0.0011	0.0014	0.0017
st dev	0.0008	0.0010	22.5418	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004
Min.	0.2504	0.5249	2893	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009
Max.	0.2532	0.5294	2972	0.0011	0.0012	0.0015	0.0017	0.0018	0.0021



3.5 Data Set 3, 105°C, 600mA (Lumen Maintenance)

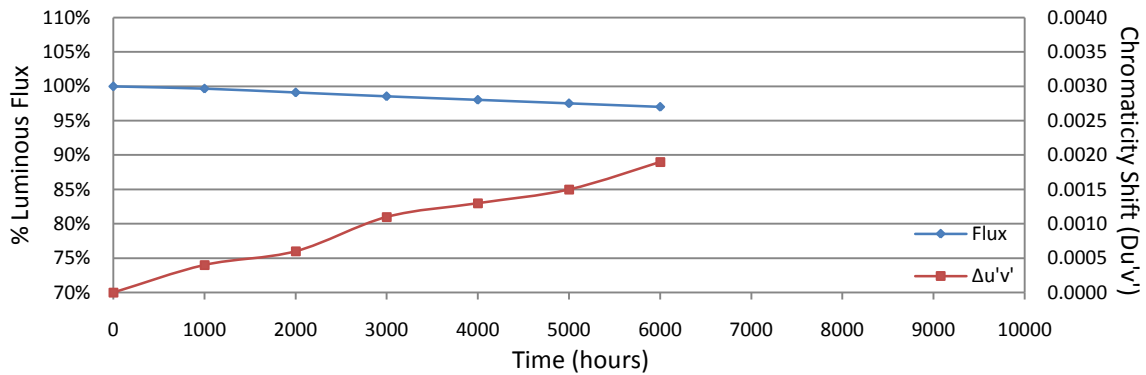
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	36.85	2748.91	99.59	99.03	98.40	97.72	97.28	96.60
46	36.98	2736.09	99.66	99.29	98.67	98.38	97.77	97.27
47	36.62	2746.99	99.63	98.90	98.36	97.78	97.09	96.46
48	36.87	2739.62	99.70	98.97	98.53	97.84	97.49	97.04
49	37.03	2652.48	99.47	98.91	98.67	98.35	97.85	97.38
50	36.78	2712.39	99.68	99.36	98.93	98.34	97.78	97.58
51	36.89	2744.52	99.90	99.50	98.97	98.45	97.95	97.29
52	36.82	2733.63	99.70	99.47	99.07	98.55	98.12	97.68
53	36.78	2771.75	99.90	99.13	98.47	97.98	97.64	97.17
54	36.81	2733.08	100.12	99.64	99.07	98.73	98.38	97.92
55	36.74	2765.75	99.92	99.43	99.07	98.47	98.07	97.39
56	36.70	2689.53	99.32	98.73	98.07	97.57	97.06	96.62
57	36.69	2684.08	99.31	98.73	98.06	97.49	96.84	96.20
58	36.89	2683.55	99.54	99.01	98.27	97.91	97.47	96.75
59	37.03	2743.42	99.74	99.09	98.60	97.96	97.29	96.72
60	36.96	2770.64	99.75	99.37	98.75	98.08	97.69	97.00
61	36.69	2770.64	99.55	98.86	98.17	97.78	97.16	96.59
62	36.81	2742.87	99.57	98.92	98.14	97.63	97.12	96.74
63	37.04	2731.99	99.37	98.90	98.33	97.98	97.31	96.91
64	37.04	2786.41	99.34	98.89	98.12	97.58	97.02	96.67
65	37.00	2748.31	99.76	99.04	98.80	98.26	97.91	97.59
66	36.85	2671.59	99.58	98.84	98.26	97.85	97.39	96.94
Ave.	36.86	2732.19	99.64	99.09	98.53	98.03	97.53	97.02
Med.	36.85	2741.25	99.65	99.02	98.50	97.97	97.48	96.97
st dev	0.1279	35.6773	0.2111	0.2673	0.3451	0.3568	0.4132	0.4472
Min.	36.62	2652.48	99.31	98.73	98.06	97.49	96.84	96.20
Max.	37.04	2786.41	100.12	99.64	99.07	98.73	98.38	97.92

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 5.312E-06
 β : 1.001
Reported L₇₀: >36000 hours

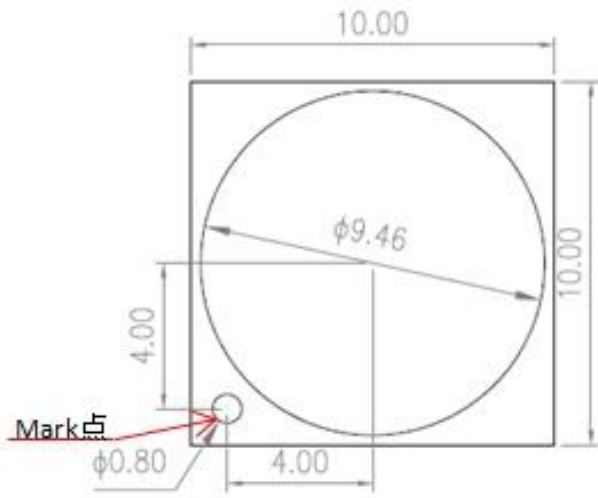
3.6 Data Set 3, 105°C, 600mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	0.2535	0.5269	2899	0.0007	0.0011	0.0016	0.0018	0.0019	0.0025
46	0.2519	0.5268	2937	0.0005	0.0006	0.0010	0.0013	0.0013	0.0016
47	0.2535	0.5264	2899	0.0005	0.0007	0.0012	0.0013	0.0016	0.0019
48	0.2508	0.5261	2967	0.0006	0.0009	0.0015	0.0018	0.0021	0.0025
49	0.2499	0.5259	2988	0.0004	0.0008	0.0012	0.0013	0.0015	0.0023
50	0.2494	0.5250	3006	0.0003	0.0002	0.0008	0.0009	0.0010	0.0012
51	0.2516	0.5272	2941	0.0005	0.0007	0.0013	0.0015	0.0017	0.0020
52	0.2531	0.5253	2917	0.0006	0.0006	0.0011	0.0012	0.0015	0.0021
53	0.2520	0.5273	2929	0.0004	0.0006	0.0012	0.0013	0.0014	0.0017
54	0.2518	0.5223	2964	0.0004	0.0006	0.0010	0.0012	0.0014	0.0018
55	0.2528	0.5270	2915	0.0004	0.0007	0.0011	0.0012	0.0013	0.0016
56	0.2497	0.5238	3006	0.0003	0.0004	0.0012	0.0014	0.0018	0.0021
57	0.2495	0.5251	3004	0.0004	0.0006	0.0010	0.0013	0.0017	0.0019
58	0.2507	0.5266	2966	0.0003	0.0006	0.0011	0.0013	0.0022	0.0024
59	0.2514	0.5270	2947	0.0003	0.0004	0.0007	0.0010	0.0011	0.0014
60	0.2525	0.5270	2921	0.0002	0.0004	0.0008	0.0010	0.0013	0.0013
61	0.2533	0.5274	2899	0.0007	0.0008	0.0014	0.0016	0.0018	0.0021
62	0.2517	0.5269	2940	0.0003	0.0004	0.0008	0.0009	0.0012	0.0016
63	0.2510	0.5258	2963	0.0006	0.0008	0.0012	0.0014	0.0017	0.0023
64	0.2528	0.5275	2912	0.0006	0.0008	0.0013	0.0014	0.0016	0.0017
65	0.2521	0.5282	2923	0.0001	0.0004	0.0009	0.0011	0.0014	0.0018
66	0.2508	0.5267	2963	0.0008	0.0006	0.0008	0.0007	0.0007	0.0013
Ave.	0.2516	0.5263	2946	0.0004	0.0006	0.0011	0.0013	0.0015	0.0019
Med.	0.2518	0.5268	2941	0.0004	0.0006	0.0011	0.0013	0.0015	0.0019
st dev	0.0013	0.0013	34.6687	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004
Min.	0.2494	0.5223	2899	0.0001	0.0002	0.0007	0.0007	0.0007	0.0012
Max.	0.2535	0.5282	3006	0.0008	0.0011	0.0016	0.0018	0.0022	0.0025



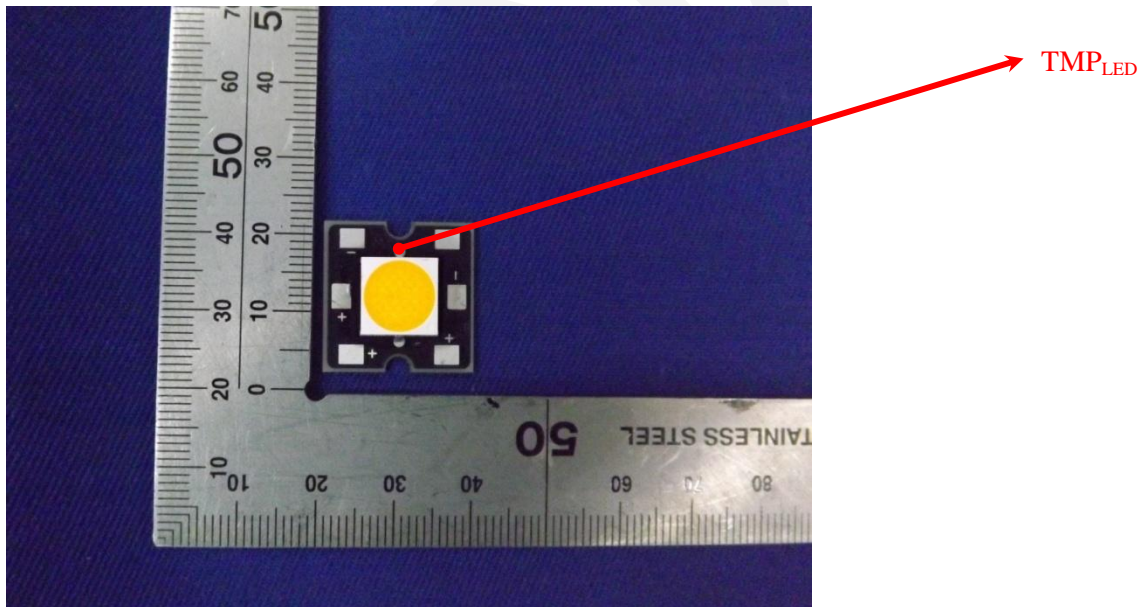
Attachment A – EUT Photo

A.1 Mechanical Dimensions (Ta = 25°C)



All dimensions are in millimeter

A.2 EUT Photo



Attachment B – Family declaration Letter

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

FINAL