



TEST REPORT

ACCORDING TO IES LM-80-2015
For

FUJIAN LIGHTNING OPTOELECTRONIC Co.,LTD

Optoelectronic Industry Park,Hutou town,Anxi County Quanzhou city,Fujian province
362411,P.R.China

Model: T2827831Q

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang <i>Pote Wang</i>		
Report Number:	RSZ160603510-10-9000-M1		
Test Date:	2016-06-14 to 2017-06-26		
Report Date:	2017-07-27		
Revised Note:	The previous report RSZ160603510-10-9000 is replaced by this report on 2017-07-27		
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Test Facility:	Test facility was located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China		
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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

Sample Size:

75 PCS samples were received on 2016-06-03. The samples were numbered from 1 to 25 , 26 to 50 and 51 to 75.

Manufacturer: FUJIAN LIGHTNING OPTOELECTRONIC Co.,LTD
 Part Number: T2827831Q
 Part Type: LED Package
 Drive Level: DC 120mA
 Nominal CCT: 2700K

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. 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)	Current Density (mA/mm ²)
PCT2835	T2822731*-*	2200	120	1.200	0.122	620.001
PCT2835	T2822831*-*	2200	120	1.200	0.122	620.001
PCT2835	T2822931*-*	2200	120	1.200	0.122	620.001
PCT2835	T2822721*-*	2200	120	0.720	0.073	620.001
PCT2835	T2822821*-*	2200	120	0.720	0.073	620.001
PCT2835	T2822921*-*	2200	120	0.720	0.073	620.001
PCT2835	T2822711*-*	2200	120	0.360	0.037	620.001
PCT2835	T2822811*-*	2200	120	0.360	0.037	620.001
PCT2835	T2822911*-*	2200	120	0.360	0.037	620.001
PCT2835	T2825731*-*	2500	120	1.200	0.122	620.001
PCT2835	T2825831*-*	2500	120	1.200	0.122	620.001
PCT2835	T2825931*-*	2500	120	1.200	0.122	620.001
PCT2835	T2825721*-*	2500	120	0.720	0.073	620.001
PCT2835	T2825821*-*	2500	120	0.720	0.073	620.001
PCT2835	T2825921*-*	2500	120	0.720	0.073	620.001
PCT2835	T2825711*-*	2500	120	0.360	0.037	620.001
PCT2835	T2825811*-*	2500	120	0.360	0.037	620.001
PCT2835	T2825911*-*	2500	120	0.360	0.037	620.001
PCT2835	T2827731*-*	2700	120	1.200	0.122	620.001
PCT2835	T2827831*-*	2700	120	1.200	0.122	620.001
PCT2835	T2827931*-*	2700	120	1.200	0.122	620.001
PCT2835	T2827721*-*	2700	120	0.720	0.073	620.001
PCT2835	T2827821*-*	2700	120	0.720	0.073	620.001

Series Name	Model Name	CCT (K)	Current (mA)	Power(W)	Power Density (W/mm ²)	Current Density (mA/mm ²)
PCT2835	T2827921*.*	2700	120	0.720	0.073	620.001
PCT2835	T2827711*.*	2700	120	0.360	0.037	620.001
PCT2835	T2827811*.*	2700	120	0.360	0.037	620.001
PCT2835	T2827911*.*	2700	120	0.360	0.037	620.001
PCT2835	T2830731*.*	3000	120	1.200	0.122	620.001
PCT2835	T2830831*.*	3000	120	1.200	0.122	620.001
PCT2835	T2830931*.*	3000	120	1.200	0.122	620.001
PCT2835	T2830721*.*	3000	120	0.720	0.073	620.001
PCT2835	T2830821*.*	3000	120	0.720	0.073	620.001
PCT2835	T2830921*.*	3000	120	0.720	0.073	620.001
PCT2835	T2830711*.*	3000	120	0.360	0.037	620.001
PCT2835	T2830811*.*	3000	120	0.360	0.037	620.001
PCT2835	T2830911*.*	3000	120	0.360	0.037	620.001
PCT2835	T2835731*.*	3500	120	1.200	0.122	620.001
PCT2835	T2835831*.*	3500	120	1.200	0.122	620.001
PCT2835	T2835931*.*	3500	120	1.200	0.122	620.001
PCT2835	T2835721*.*	3500	120	0.720	0.073	620.001
PCT2835	T2835821*.*	3500	120	0.720	0.073	620.001
PCT2835	T2835921*.*	3500	120	0.720	0.073	620.001
PCT2835	T2835711*.*	3500	120	0.360	0.037	620.001
PCT2835	T2835811*.*	3500	120	0.360	0.037	620.001
PCT2835	T2835911*.*	3500	120	0.360	0.037	620.001
PCT2835	T2840731*.*	4000	120	1.200	0.122	620.001
PCT2835	T2840831*.*	4000	120	1.200	0.122	620.001
PCT2835	T2840931*.*	4000	120	1.200	0.122	620.001
PCT2835	T2840721*.*	4000	120	0.720	0.073	620.001
PCT2835	T2840821*.*	4000	120	0.720	0.073	620.001
PCT2835	T2840921*.*	4000	120	0.720	0.073	620.001
PCT2835	T2840711*.*	4000	120	0.360	0.037	620.001
PCT2835	T2840811*.*	4000	120	0.360	0.037	620.001
PCT2835	T2840911*.*	4000	120	0.360	0.037	620.001
PCT2835	T2845731*.*	4500	120	1.200	0.122	620.001
PCT2835	T2845831*.*	4500	120	1.200	0.122	620.001
PCT2835	T2845931*.*	4500	120	1.200	0.122	620.001
PCT2835	T2845721*.*	4500	120	0.720	0.073	620.001
PCT2835	T2845821*.*	4500	120	0.720	0.073	620.001
PCT2835	T2845921*.*	4500	120	0.720	0.073	620.001
PCT2835	T2845711*.*	4500	120	0.360	0.037	620.001
PCT2835	T2845811*.*	4500	120	0.360	0.037	620.001
PCT2835	T2845911*.*	4500	120	0.360	0.037	620.001
PCT2835	T2850731*.*	5000	120	1.200	0.122	620.001
PCT2835	T2850831*.*	5000	120	1.200	0.122	620.001

Series Name	Model Name	CCT (K)	Current (mA)	Power(W)	Power Density (W/mm ²)	Current Density (mA/mm ²)
PCT2835	T2850931*-*	5000	120	1.200	0.122	620.001
PCT2835	T2850721*-*	5000	120	0.720	0.073	620.001
PCT2835	T2850821*-*	5000	120	0.720	0.073	620.001
PCT2835	T2850921*-*	5000	120	0.720	0.073	620.001
PCT2835	T2850711*-*	5000	120	0.360	0.037	620.001
PCT2835	T2850811*-*	5000	120	0.360	0.037	620.001
PCT2835	T2850911*-*	5000	120	0.360	0.037	620.001

Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Bay Area Compliance Laboratories Corp. (Dongguan) isn't responsible or gives any guarantees for the truthfulness of the technical information.

1.2 Standards Used:

- IESNA LM-80-15: 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 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-02
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-08
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20005	25°C~130°C	2016-09-01	2017-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	(50/15A)	2016-12-15	2017-12-14

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	(50/15A)	2017-03-03	2018-03-02

1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%.

1.6 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.

The uncertainty of the temperature is $U=0.8671^{\circ}\text{C}$ ($K=2$), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set

Data Set 1: 55°C, 120mA

Part Number: T2827831Q
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 120mA
Measurement Current: 120mA

Data Set 2: 105°C,120mA

Part Number: T2827831Q
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 120mA
Measurement Current: 120mA

Data Set 3: 115° C,120mA

Part Number: T2827831Q
Number of Units: 25
Case Temperature: >113°C
Ambient Temperature: >110°C
Life Test Drive Current: 120mA
Measurement Current: 120mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	25	0	1000	9000	>54000hours
2	25	0	1000	9000	>54000hours
3	25	0	1000	9000	>54000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.32%	100.11%	99.93%	99.74%	99.55%	99.33%	99.15%	98.95%	98.74%
2	100.16%	99.75%	99.40%	99.12%	98.83%	98.50%	98.18%	97.90%	97.61%
3	100.06%	99.58%	99.19%	98.84%	98.43%	98.04%	97.71%	97.39%	97.05%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0002	0.0004	0.0005	0.0008	0.0011	0.0014	0.0017	0.002	0.0024
2	0.0003	0.0008	0.0009	0.0011	0.0013	0.0018	0.0022	0.0024	0.0028
3	0.0005	0.0010	0.0012	0.0014	0.0016	0.0021	0.0025	0.0028	0.0031

3 - Test Data

3.1 Data Set 1, 55°C, 120mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	157.1	100.38	100.19	99.94	99.62	99.43	99.17	98.98	98.85	98.60
2	157.2	100.45	100.32	100.06	99.81	99.68	99.49	99.24	99.05	98.79
3	157.8	100.44	100.19	99.94	99.87	99.62	99.43	99.18	99.11	98.99
4	156.4	100.38	100.32	100.19	100.06	99.74	99.49	99.42	99.23	99.04
5	157.5	100.32	100.19	100.13	99.81	99.68	99.43	99.30	99.11	99.05
6	157.3	100.19	99.94	99.81	99.75	99.55	99.43	99.36	99.24	99.05
7	158.1	100.38	100.06	99.75	99.62	99.49	99.30	99.11	99.05	98.86
8	156.0	100.32	100.13	99.87	99.55	99.29	99.10	99.04	98.85	98.78
9	155.9	100.38	100.26	100.13	99.87	99.55	99.23	98.97	98.72	98.40
10	156.6	100.26	100.19	99.94	99.74	99.55	99.36	99.23	98.98	98.79
11	155.1	100.39	100.13	100.06	99.94	99.61	99.29	99.10	98.97	98.65
12	157.3	100.25	100.13	99.94	99.81	99.68	99.55	99.24	99.11	98.86
13	156.5	100.26	99.94	99.81	99.74	99.55	99.36	99.11	98.79	98.47
14	155.9	100.45	100.19	100.06	99.94	99.74	99.68	99.62	99.42	99.23
15	156.3	100.32	100.13	99.94	99.62	99.55	99.30	99.10	98.98	98.91
16	155.6	100.19	99.94	99.81	99.61	99.42	99.23	99.10	98.78	98.52
17	156.5	100.32	100.19	100.13	99.94	99.62	99.30	99.11	98.91	98.72
18	155.4	100.19	99.94	99.74	99.68	99.42	99.03	98.84	98.58	98.46
19	156.3	100.32	100.13	99.94	99.87	99.81	99.55	99.42	99.10	98.91
20	155.7	100.19	100.06	99.74	99.61	99.42	99.23	99.17	98.91	98.65
21	156.8	100.26	100.06	99.68	99.49	99.30	99.17	98.98	98.85	98.60
22	157.8	100.32	99.94	99.75	99.49	99.18	98.99	98.73	98.54	98.29
23	156.5	100.38	100.26	100.13	99.74	99.55	99.30	99.04	98.72	98.47
24	157.5	100.44	100.13	100.06	99.81	99.68	99.37	99.17	98.92	98.60
25	155.1	100.26	99.94	99.68	99.55	99.48	99.36	99.10	98.90	98.77
Ave.	156.6	100.32	100.11	99.93	99.74	99.55	99.33	99.15	98.95	98.74
Med.	156.5	100.32	100.13	99.94	99.74	99.55	99.30	99.11	98.92	98.77
st dev	0.9	0.0849	0.1223	0.1591	0.1538	0.1534	0.1644	0.1889	0.2048	0.2372
Min.	155.1	100.19	99.94	99.68	99.49	99.18	98.99	98.73	98.54	98.29
Max.	158.1	100.45	100.32	100.19	100.06	99.81	99.68	99.62	99.42	99.23

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 2.010E-06

β: 1.005

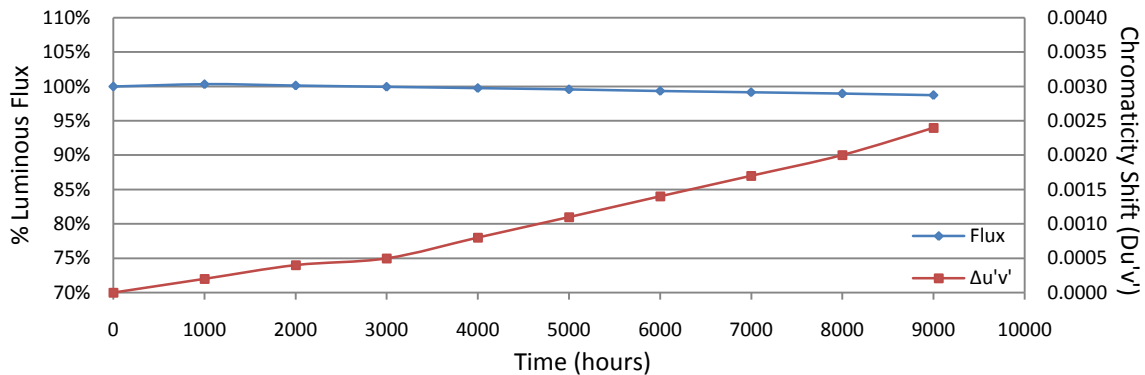
Reported L₇₀: >54000 hours

3.2 Data Set 1, 55°C, 120mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.652	9.793	9.681	9.659	9.612	9.597	9.597	9.591	9.593	9.597
2	9.683	9.714	9.686	9.662	9.608	9.600	9.595	9.591	9.595	9.600
3	9.713	9.713	9.694	9.673	9.619	9.605	9.604	9.585	9.517	9.608
4	9.638	9.727	9.627	9.597	9.547	9.542	9.535	9.534	9.533	9.533
5	9.649	9.798	9.693	9.669	9.613	9.608	9.594	9.589	9.588	9.609
6	9.691	9.778	9.723	9.698	9.653	9.638	9.638	9.625	9.588	9.648
7	9.589	9.602	9.675	9.650	9.596	9.590	9.584	9.568	9.590	9.587
8	9.748	9.769	9.677	9.650	9.591	9.592	9.584	9.573	9.589	9.588
9	9.806	9.715	9.780	9.754	9.593	9.593	9.596	9.667	9.682	9.589
10	9.677	9.701	9.652	9.631	9.573	9.569	9.568	9.553	9.550	9.571
11	9.745	9.749	9.670	9.648	9.592	9.590	9.578	9.570	9.568	9.590
12	9.648	9.685	9.644	9.616	9.560	9.560	9.551	9.534	9.550	9.555
13	9.606	9.732	9.621	9.594	9.540	9.540	9.528	9.517	9.489	9.531
14	9.655	9.668	9.640	9.613	9.559	9.560	9.541	9.540	9.493	9.550
15	9.865	9.851	9.783	9.855	9.697	9.629	9.684	9.673	9.683	9.584
16	9.859	9.797	9.774	9.849	9.682	9.628	9.677	9.668	9.674	9.578
17	9.701	9.843	9.657	9.630	9.575	9.569	9.564	9.548	9.563	9.572
18	9.934	9.921	9.939	9.921	9.763	9.702	9.751	9.733	9.745	9.557
19	9.748	9.819	9.670	9.646	9.583	9.587	9.576	9.567	9.575	9.588
20	9.720	9.767	9.657	9.636	9.580	9.578	9.567	9.556	9.585	9.571
21	9.887	9.845	9.832	9.791	9.646	9.648	9.692	9.720	9.685	9.638
22	9.780	9.817	9.719	9.701	9.636	9.637	9.633	9.620	9.621	9.629
23	9.712	9.849	9.679	9.654	9.604	9.604	9.583	9.578	9.582	9.586
24	9.695	9.707	9.712	9.687	9.631	9.631	9.611	9.607	9.609	9.612
25	9.911	9.866	9.897	9.897	9.673	9.669	9.763	9.741	9.733	9.654
Ave.	9.732	9.769	9.711	9.695	9.613	9.603	9.608	9.602	9.599	9.589
Med.	9.712	9.769	9.681	9.659	9.604	9.597	9.594	9.585	9.588	9.588
st dev	0.096	0.074	0.081	0.094	0.052	0.039	0.062	0.064	0.068	0.032
Min.	9.589	9.602	9.621	9.594	9.540	9.540	9.528	9.517	9.489	9.531
Max.	9.934	9.921	9.939	9.921	9.763	9.702	9.763	9.741	9.745	9.654

3.3 Data Set 1, 55°C, 120mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2637	0.5278	2674	0.0002	0.0003	0.0005	0.0008	0.0010	0.0013	0.0015	0.0019	0.0022
2	0.2612	0.5270	2729	0.0003	0.0004	0.0006	0.0009	0.0011	0.0014	0.0018	0.0021	0.0024
3	0.2612	0.5268	2728	0.0002	0.0003	0.0004	0.0007	0.0010	0.0012	0.0016	0.0018	0.0022
4	0.2624	0.5275	2701	0.0003	0.0003	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0023
5	0.2610	0.5246	2742	0.0003	0.0002	0.0004	0.0008	0.0010	0.0012	0.0016	0.0018	0.0022
6	0.2613	0.5275	2724	0.0002	0.0002	0.0005	0.0008	0.0010	0.0012	0.0016	0.0018	0.0022
7	0.2601	0.5268	2753	0.0003	0.0003	0.0006	0.0009	0.0011	0.0014	0.0017	0.0020	0.0024
8	0.2612	0.5273	2727	0.0002	0.0003	0.0005	0.0007	0.0010	0.0014	0.0017	0.0019	0.0024
9	0.2627	0.5271	2697	0.0002	0.0004	0.0006	0.0008	0.0010	0.0013	0.0017	0.0021	0.0025
10	0.2601	0.5262	2756	0.0001	0.0002	0.0004	0.0006	0.0009	0.0013	0.0016	0.0018	0.0021
11	0.2609	0.5274	2733	0.0002	0.0003	0.0004	0.0007	0.0010	0.0012	0.0017	0.0019	0.0023
12	0.2593	0.5278	2765	0.0002	0.0003	0.0004	0.0007	0.0010	0.0013	0.0017	0.0018	0.0022
13	0.2626	0.5282	2694	0.0002	0.0003	0.0004	0.0008	0.0010	0.0013	0.0014	0.0017	0.0023
14	0.2638	0.5278	2672	0.0002	0.0005	0.0006	0.0009	0.0012	0.0016	0.0019	0.0022	0.0026
15	0.2612	0.5265	2730	0.0003	0.0005	0.0006	0.0009	0.0011	0.0016	0.0019	0.0022	0.0025
16	0.2601	0.5253	2760	0.0004	0.0008	0.0010	0.0011	0.0016	0.0021	0.0024	0.0027	0.0030
17	0.2616	0.5276	2718	0.0003	0.0005	0.0006	0.0009	0.0011	0.0014	0.0018	0.0021	0.0024
18	0.2606	0.5286	2734	0.0003	0.0004	0.0006	0.0008	0.0011	0.0014	0.0018	0.0020	0.0024
19	0.2614	0.5272	2724	0.0001	0.0003	0.0004	0.0006	0.0009	0.0013	0.0016	0.0018	0.0021
20	0.2637	0.5274	2675	0.0003	0.0004	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0022
21	0.2595	0.5261	2768	0.0001	0.0003	0.0004	0.0006	0.0009	0.0013	0.0016	0.0019	0.0022
22	0.2622	0.5281	2704	0.0001	0.0004	0.0005	0.0007	0.0009	0.0013	0.0016	0.0018	0.0023
23	0.2628	0.5262	2699	0.0002	0.0004	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0023
24	0.2620	0.5273	2711	0.0001	0.0004	0.0006	0.0008	0.0010	0.0014	0.0018	0.0020	0.0024
25	0.2611	0.5275	2729	0.0003	0.0007	0.0006	0.0008	0.0011	0.0014	0.0018	0.0021	0.0025
Ave.	0.2615	0.5271	2722	0.0002	0.0004	0.0005	0.0008	0.0011	0.0014	0.0017	0.0020	0.0024
Med.	0.2612	0.5273	2727	0.0002	0.0003	0.0005	0.0008	0.0010	0.0013	0.0017	0.0019	0.0023
st dev	0.0013	0.0009	28	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.2593	0.5246	2672	0.0001	0.0002	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0021
Max.	0.2638	0.5286	2768	0.0004	0.0008	0.0010	0.0011	0.0016	0.0021	0.0024	0.0027	0.0030



3.4 Data Set 2, 105°C, 120mA (Lumen Maintenance)

No.	Φ(lm) Ohr(Initial)	Lumen Maintenance (%)								
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	154.4	100.32	99.81	99.42	99.22	99.03	98.70	98.38	98.19	97.93
27	155.1	100.26	99.94	99.61	99.29	99.16	98.77	98.52	98.19	97.81
28	156.8	100.13	99.68	99.36	98.98	98.53	98.21	98.02	97.64	97.32
29	157.8	100.19	99.94	99.68	99.43	99.11	98.86	98.48	98.23	98.04
30	156.9	100.13	99.62	99.43	99.24	99.04	98.92	98.53	98.28	98.02
31	156.5	100.26	99.94	99.55	99.23	98.91	98.59	98.34	97.89	97.70
32	156.3	100.19	99.81	99.49	99.30	98.91	98.66	98.40	98.27	98.02
33	156.1	100.32	99.87	99.49	99.23	98.98	98.65	98.27	98.01	97.89
34	156.9	100.19	99.87	99.43	99.17	98.85	98.60	98.34	98.02	97.77
35	157.7	100.13	99.68	99.30	99.05	98.92	98.48	98.29	98.03	97.78
36	157.0	100.19	99.68	99.36	99.04	98.79	98.41	98.09	97.90	97.71
37	156.0	100.13	99.68	99.29	99.04	98.85	98.40	98.08	97.82	97.44
38	157.8	100.06	99.68	99.37	98.92	98.61	98.29	97.78	97.47	97.02
39	156.7	100.19	99.68	99.36	98.92	98.53	98.21	97.77	97.51	97.06
40	157.6	100.13	99.75	99.49	99.18	98.98	98.60	98.16	97.84	97.53
41	156.3	99.94	99.68	99.36	99.04	98.85	98.46	97.95	97.50	97.18
42	157.1	100.19	99.75	99.49	99.24	98.98	98.66	98.28	98.03	97.84
43	156.8	100.26	99.74	99.30	98.98	98.79	98.60	98.09	97.70	97.51
44	156.6	100.13	99.81	99.49	99.23	98.79	98.53	98.15	97.89	97.57
45	155.3	100.06	99.74	99.36	99.10	98.78	98.45	98.07	97.75	97.30
46	156.3	100.19	99.68	99.42	99.04	98.66	98.27	98.02	97.89	97.57
47	157.8	100.06	99.68	99.30	98.99	98.61	98.16	97.97	97.72	97.34
48	155.8	100.26	99.81	99.36	99.04	98.59	98.20	98.01	97.75	97.37
49	156.4	100.06	99.62	99.10	99.04	98.59	98.27	98.02	97.83	97.63
50	156.8	100.13	99.62	99.23	99.11	98.79	98.60	98.47	98.15	97.96
Ave.	156.6	100.16	99.75	99.40	99.12	98.83	98.50	98.18	97.90	97.61
Med.	156.7	100.19	99.74	99.37	99.10	98.85	98.53	98.15	97.89	97.63
st dev	0.9	0.0892	0.1005	0.1219	0.1322	0.1823	0.2122	0.2194	0.2397	0.3006
Min.	154.4	99.94	99.62	99.10	98.92	98.53	98.16	97.77	97.47	97.02
Max.	157.8	100.32	99.94	99.68	99.43	99.16	98.92	98.53	98.28	98.04

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 3.096E-06

β: 1.004

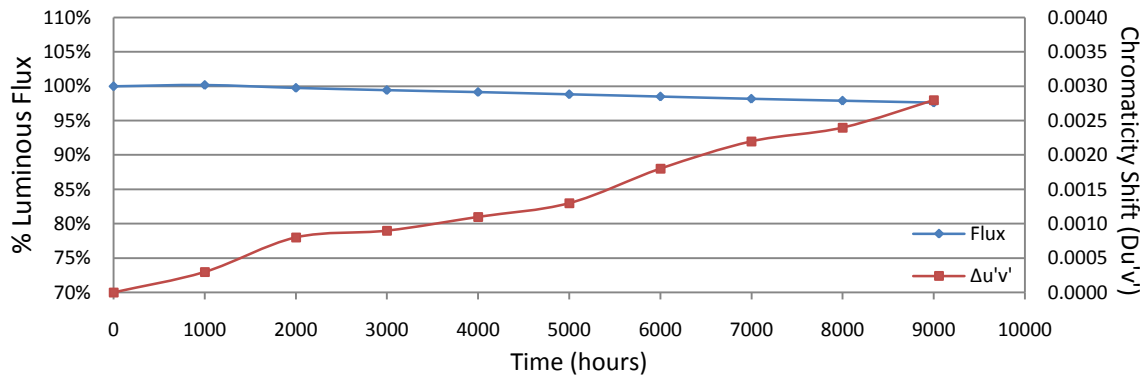
Reported L₇₀: >54000 hours

3.5 Data Set 2, 105°C, 120mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	9.802	9.776	9.805	9.767	9.787	9.736	9.745	9.754	9.770	9.778
27	9.745	9.676	9.778	9.727	9.754	9.706	9.702	9.730	9.694	9.743
28	9.827	9.846	9.864	9.820	9.843	9.800	9.792	9.812	9.826	9.824
29	9.777	9.707	9.803	9.763	9.783	9.742	9.728	9.759	9.769	9.774
30	9.872	9.849	9.853	9.814	9.840	9.787	9.786	9.815	9.791	9.820
31	9.817	9.795	9.781	9.739	9.752	9.716	9.701	9.727	9.739	9.747
32	9.867	9.821	9.817	9.774	9.794	9.757	9.752	9.776	9.779	9.792
33	9.714	9.741	9.771	9.721	9.747	9.700	9.690	9.723	9.688	9.737
34	9.788	9.784	9.864	9.824	9.847	9.799	9.794	9.819	9.825	9.831
35	9.826	9.868	9.865	9.820	9.854	9.806	9.791	9.822	9.831	9.829
36	9.823	9.829	9.875	9.835	9.857	9.806	9.804	9.822	9.835	9.842
37	9.736	9.880	9.749	9.808	9.832	9.779	9.775	9.801	9.813	9.816
38	9.731	9.766	9.804	9.761	9.775	9.740	9.725	9.758	9.765	9.773
39	9.803	9.928	9.865	9.821	9.845	9.793	9.790	9.813	9.819	9.824
40	9.683	9.839	9.690	9.747	9.770	9.724	9.713	9.741	9.696	9.749
41	9.753	9.716	9.795	9.754	9.775	9.733	9.719	9.750	9.755	9.765
42	9.640	9.846	9.624	9.783	9.706	9.760	9.740	9.777	9.786	9.788
43	9.733	9.769	9.800	9.767	9.784	9.740	9.721	9.759	9.762	9.767
44	9.740	9.845	9.798	9.758	9.778	9.732	9.714	9.747	9.761	9.758
45	9.777	9.796	9.803	9.750	9.781	9.731	9.722	9.752	9.765	9.760
46	9.912	9.929	9.859	9.809	9.834	9.780	9.767	9.798	9.767	9.817
47	9.922	9.888	9.896	9.843	9.791	9.719	9.713	9.738	9.766	9.750
48	9.816	9.738	9.789	9.740	9.769	9.719	9.705	9.743	9.774	9.755
49	9.899	10.020	9.855	9.856	9.884	9.835	9.822	9.843	9.796	9.854
50	9.722	9.787	9.728	9.736	9.753	9.713	9.695	9.733	9.747	9.738
Ave.	9.789	9.818	9.805	9.781	9.797	9.754	9.744	9.772	9.773	9.785
Med.	9.788	9.821	9.803	9.767	9.784	9.740	9.728	9.759	9.769	9.774
st dev	0.071	0.078	0.062	0.040	0.044	0.038	0.040	0.036	0.041	0.036
Min.	9.640	9.676	9.624	9.721	9.706	9.700	9.690	9.723	9.688	9.737
Max.	9.922	10.020	9.896	9.856	9.884	9.835	9.822	9.843	9.835	9.854

3.6 Data Set 2, 105°C, 120mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2627	0.5280	2692	0.0002	0.0005	0.0007	0.0009	0.0011	0.0016	0.0020	0.0023	0.0025
27	0.2629	0.5290	2685	0.0002	0.0007	0.0008	0.0010	0.0011	0.0015	0.0020	0.0023	0.0026
28	0.2603	0.5262	2752	0.0003	0.0008	0.0010	0.0012	0.0015	0.0019	0.0023	0.0026	0.0029
29	0.2619	0.5279	2710	0.0004	0.0010	0.0011	0.0013	0.0015	0.0020	0.0024	0.0027	0.0030
30	0.2609	0.5269	2734	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0021	0.0024	0.0026
31	0.2632	0.5286	2681	0.0004	0.0008	0.0010	0.0012	0.0014	0.0018	0.0023	0.0025	0.0030
32	0.2623	0.5273	2704	0.0004	0.0008	0.0008	0.0010	0.0012	0.0017	0.0021	0.0023	0.0027
33	0.2616	0.5271	2721	0.0004	0.0008	0.0008	0.0010	0.0013	0.0017	0.0021	0.0024	0.0026
34	0.2617	0.5261	2721	0.0004	0.0009	0.0010	0.0012	0.0015	0.0019	0.0023	0.0027	0.0030
35	0.2631	0.5280	2686	0.0004	0.0008	0.0009	0.0011	0.0013	0.0017	0.0022	0.0025	0.0028
36	0.2617	0.5260	2723	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0022	0.0024	0.0027
37	0.2617	0.5274	2716	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0020	0.0023	0.0026
38	0.2620	0.5268	2712	0.0003	0.0009	0.0009	0.0012	0.0014	0.0018	0.0023	0.0025	0.0029
39	0.2619	0.5274	2713	0.0005	0.0010	0.0011	0.0013	0.0016	0.0021	0.0025	0.0027	0.0031
40	0.2624	0.5274	2703	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0021	0.0024	0.0026
41	0.2627	0.5279	2694	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0021	0.0023	0.0027
42	0.2609	0.5258	2740	0.0003	0.0007	0.0008	0.0010	0.0012	0.0017	0.0021	0.0024	0.0026
43	0.2618	0.5289	2708	0.0003	0.0009	0.0009	0.0011	0.0013	0.0018	0.0022	0.0025	0.0028
44	0.2601	0.5251	2759	0.0002	0.0006	0.0007	0.0009	0.0011	0.0016	0.0020	0.0022	0.0026
45	0.2625	0.5267	2702	0.0003	0.0008	0.0010	0.0011	0.0013	0.0019	0.0023	0.0025	0.0030
46	0.2618	0.5272	2714	0.0003	0.0007	0.0009	0.0010	0.0012	0.0017	0.0021	0.0023	0.0026
47	0.2616	0.5302	2706	0.0004	0.0008	0.0010	0.0012	0.0014	0.0017	0.0022	0.0025	0.0028
48	0.2609	0.5274	2733	0.0004	0.0007	0.0009	0.0011	0.0013	0.0018	0.0022	0.0025	0.0028
49	0.2616	0.5265	2723	0.0004	0.0010	0.0011	0.0012	0.0015	0.0020	0.0024	0.0027	0.0031
50	0.2606	0.5269	2742	0.0004	0.0009	0.0009	0.0011	0.0013	0.0018	0.0022	0.0024	0.0027
Ave.	0.2618	0.5273	2715	0.0003	0.0008	0.0009	0.0011	0.0013	0.0018	0.0022	0.0024	0.0028
Med.	0.2618	0.5273	2713	0.0003	0.0008	0.0009	0.0011	0.0013	0.0017	0.0022	0.0024	0.0027
st dev	0.0008	0.0011	20	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	0.2601	0.5251	2681	0.0002	0.0005	0.0007	0.0009	0.0011	0.0015	0.0020	0.0022	0.0025
Max.	0.2632	0.5302	2759	0.0005	0.0010	0.0011	0.0013	0.0016	0.0021	0.0025	0.0027	0.0031



3.7 Data Set 3, 115° C, 120mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
		0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	156.0	100.19	99.68	99.23	98.85	98.53	98.14	97.88	97.50	97.24
52	156.4	100.13	99.49	99.17	98.98	98.59	98.15	97.76	97.63	97.25
53	155.4	99.94	99.42	98.91	98.58	98.26	97.68	97.23	97.04	96.78
54	155.8	100.19	99.81	99.36	98.84	98.46	98.07	97.75	97.24	96.92
55	156.2	100.26	99.74	99.42	99.30	98.78	98.40	97.95	97.63	97.18
56	155.5	99.94	99.68	99.16	98.91	98.46	98.01	97.62	97.36	96.91
57	157.3	100.19	99.75	99.30	98.98	98.60	98.35	98.16	97.97	97.65
58	156.0	100.06	99.55	99.29	98.97	98.65	98.27	97.95	97.69	97.44
59	155.5	99.87	99.49	99.16	98.78	98.33	98.07	97.75	97.43	97.17
60	156.2	99.94	99.42	99.10	98.66	98.27	97.82	97.57	97.31	96.93
61	158.4	100.13	99.56	99.12	98.67	98.23	97.73	97.47	97.16	96.72
62	156.9	100.06	99.55	99.17	98.66	98.22	97.83	97.45	97.07	96.75
63	158.6	100.13	99.50	99.05	98.68	98.23	97.86	97.41	96.97	96.66
64	156.4	99.87	99.49	99.17	98.72	98.34	97.89	97.63	97.19	96.80
65	155.9	99.94	99.36	99.10	98.78	98.20	97.82	97.50	97.18	96.86
66	155.9	100.06	99.62	99.17	98.85	98.46	98.14	97.75	97.50	97.11
67	157.5	100.13	99.75	99.43	99.11	98.79	98.35	98.10	97.78	97.46
68	156.2	100.19	99.68	99.30	98.85	98.34	97.95	97.63	97.38	97.12
69	156.9	99.87	99.55	99.11	98.98	98.60	98.28	97.90	97.64	97.45
70	157.4	100.06	99.49	98.98	98.60	98.16	97.84	97.52	97.14	96.82
71	157.4	100.13	99.68	99.30	98.86	98.48	98.03	97.78	97.40	97.14
72	155.8	100.06	99.55	99.17	98.78	98.40	97.88	97.63	97.30	96.92
73	157.7	99.94	99.30	98.86	98.54	98.10	97.78	97.46	97.21	96.83
74	156.3	100.06	99.68	99.30	99.04	98.59	98.14	97.76	97.38	96.87
75	156.4	100.13	99.68	99.30	99.10	98.72	98.47	98.02	97.76	97.38
Ave.	156.6	100.06	99.58	99.19	98.84	98.43	98.04	97.71	97.39	97.05
Med.	156.3	100.06	99.55	99.17	98.85	98.46	98.03	97.75	97.38	96.93
st dev	0.9	0.1151	0.1315	0.1433	0.1859	0.1998	0.2250	0.2294	0.2573	0.2736
Min.	155.4	99.87	99.30	98.86	98.54	98.10	97.68	97.23	96.97	96.66
Max.	158.6	100.26	99.81	99.43	99.30	98.79	98.47	98.16	97.97	97.65

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 3.618E-06

β: 1.002

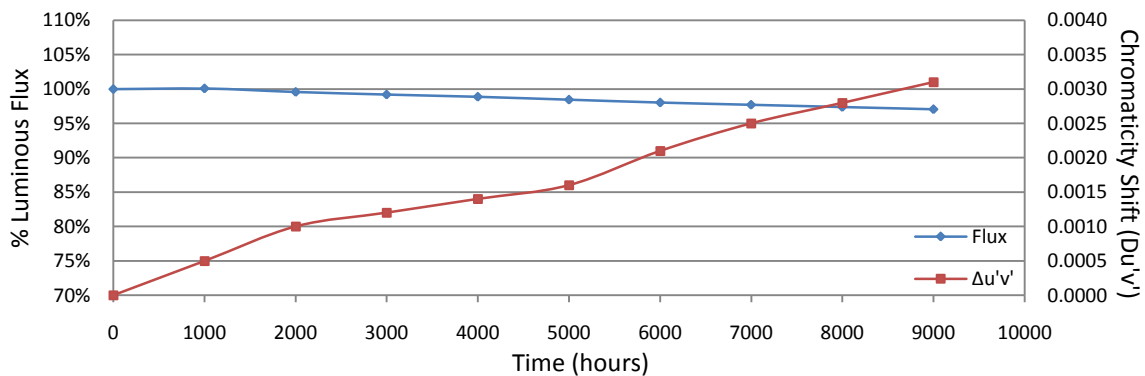
Reported L₇₀: >54000 hours

3.8 Data Set 3, 115° C, 120mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	9.704	9.758	9.742	9.693	9.690	9.656	9.715	9.714	9.716	9.697
52	9.573	9.653	9.655	9.610	9.605	9.572	9.637	9.633	9.635	9.622
53	9.765	9.785	9.699	9.754	9.647	9.613	9.689	9.679	9.677	9.660
54	9.898	9.886	9.894	9.846	9.737	9.699	9.702	9.714	9.722	9.658
55	9.777	9.772	9.705	9.762	9.657	9.625	9.683	9.678	9.682	9.663
56	9.706	9.748	9.691	9.642	9.643	9.609	9.664	9.665	9.663	9.655
57	9.633	9.647	9.690	9.652	9.641	9.612	9.670	9.670	9.667	9.658
58	9.698	9.862	9.742	9.700	9.690	9.654	9.720	9.714	9.688	9.697
59	9.688	9.778	9.745	9.696	9.697	9.660	9.721	9.719	9.719	9.709
60	9.811	9.897	9.723	9.774	9.671	9.640	9.701	9.693	9.702	9.684
61	9.750	9.813	9.692	9.649	9.638	9.610	9.675	9.661	9.666	9.655
62	9.565	9.623	9.609	9.660	9.658	9.628	9.688	9.682	9.684	9.672
63	9.720	9.894	9.681	9.632	9.622	9.591	9.654	9.650	9.653	9.645
64	9.685	9.894	9.717	9.676	9.672	9.643	9.703	9.691	9.663	9.688
65	9.755	9.835	9.780	9.738	9.731	9.704	9.765	9.754	9.763	9.743
66	9.754	9.682	9.695	9.652	9.644	9.615	9.674	9.667	9.681	9.659
67	9.756	9.700	9.735	9.694	9.687	9.652	9.717	9.709	9.732	9.701
68	9.701	9.787	9.672	9.622	9.613	9.586	9.652	9.638	9.663	9.638
69	9.772	9.815	9.777	9.742	9.729	9.702	9.766	9.757	9.759	9.748
70	9.788	9.853	9.721	9.686	9.675	9.647	9.700	9.695	9.707	9.685
71	9.676	9.640	9.692	9.649	9.637	9.611	9.668	9.665	9.672	9.651
72	9.826	9.791	9.784	9.746	9.629	9.647	9.669	9.652	9.669	9.645
73	9.796	9.886	9.718	9.771	9.664	9.639	9.702	9.684	9.695	9.683
74	9.725	9.705	9.685	9.697	9.686	9.658	9.726	9.721	9.718	9.708
75	9.766	9.772	9.752	9.713	9.706	9.668	9.728	9.731	9.731	9.712
Ave.	9.732	9.779	9.720	9.698	9.667	9.638	9.696	9.689	9.693	9.677
Med.	9.750	9.785	9.717	9.694	9.664	9.640	9.700	9.684	9.684	9.672
st dev	0.074	0.087	0.054	0.057	0.036	0.035	0.032	0.033	0.033	0.032
Min.	9.565	9.623	9.609	9.610	9.605	9.572	9.637	9.633	9.635	9.622
Max.	9.898	9.897	9.894	9.846	9.737	9.704	9.766	9.757	9.763	9.748

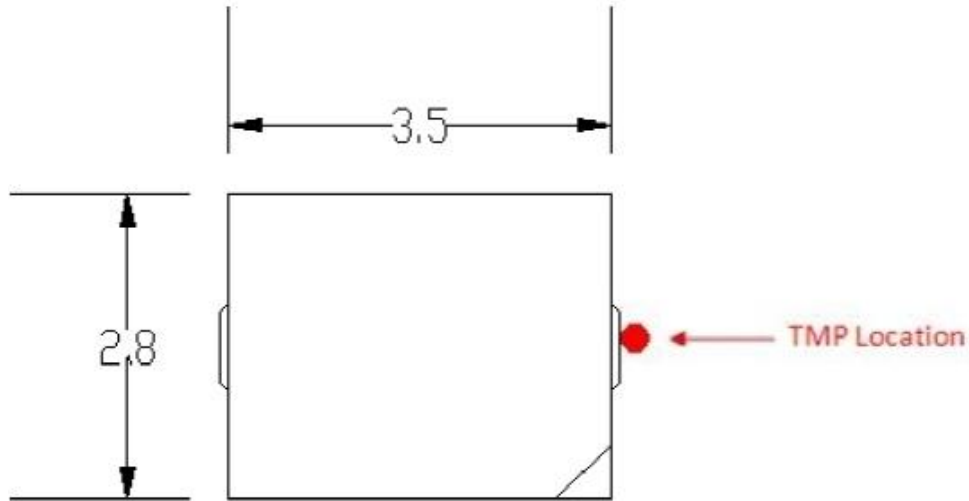
3.9 Data Set 3, 115° C, 120mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2624	0.5272	2703	0.0004	0.0008	0.0010	0.0012	0.0014	0.0019	0.0024	0.0026	0.0029
52	0.2614	0.5268	2726	0.0004	0.0009	0.0011	0.0013	0.0016	0.0020	0.0024	0.0027	0.0031
53	0.2621	0.5261	2714	0.0005	0.0010	0.0012	0.0014	0.0017	0.0021	0.0026	0.0028	0.0032
54	0.2609	0.5259	2739	0.0004	0.0009	0.0011	0.0013	0.0015	0.0020	0.0024	0.0027	0.0030
55	0.2620	0.5278	2710	0.0005	0.0009	0.0011	0.0012	0.0016	0.0020	0.0025	0.0027	0.0030
56	0.2629	0.5307	2679	0.0005	0.0011	0.0014	0.0016	0.0020	0.0025	0.0029	0.0031	0.0035
57	0.2631	0.5283	2683	0.0004	0.0009	0.0012	0.0013	0.0015	0.0020	0.0024	0.0026	0.0030
58	0.2626	0.5270	2700	0.0005	0.0011	0.0013	0.0014	0.0016	0.0022	0.0027	0.0029	0.0032
59	0.2630	0.5274	2689	0.0005	0.0009	0.0012	0.0014	0.0016	0.0021	0.0026	0.0029	0.0032
60	0.2598	0.5268	2760	0.0004	0.0009	0.0010	0.0012	0.0014	0.0019	0.0023	0.0026	0.0029
61	0.2628	0.5297	2684	0.0004	0.0010	0.0011	0.0013	0.0015	0.0020	0.0024	0.0027	0.0031
62	0.2607	0.5267	2740	0.0004	0.0009	0.0011	0.0013	0.0015	0.0020	0.0024	0.0027	0.0030
63	0.2606	0.5256	2748	0.0004	0.0010	0.0011	0.0013	0.0016	0.0020	0.0025	0.0028	0.0030
64	0.2622	0.5276	2705	0.0005	0.0010	0.0012	0.0014	0.0016	0.0021	0.0025	0.0027	0.0031
65	0.2622	0.5274	2706	0.0006	0.0011	0.0013	0.0015	0.0016	0.0022	0.0027	0.0029	0.0032
66	0.2630	0.5264	2695	0.0008	0.0013	0.0016	0.0017	0.0019	0.0024	0.0028	0.0032	0.0036
67	0.2617	0.5270	2718	0.0005	0.0010	0.0012	0.0014	0.0016	0.0021	0.0024	0.0029	0.0032
68	0.2606	0.5262	2744	0.0006	0.0013	0.0014	0.0015	0.0017	0.0023	0.0026	0.0030	0.0033
69	0.2611	0.5277	2728	0.0005	0.0010	0.0012	0.0014	0.0016	0.0020	0.0023	0.0028	0.0030
70	0.2633	0.5269	2685	0.0005	0.0010	0.0012	0.0014	0.0016	0.0022	0.0024	0.0028	0.0031
71	0.2619	0.5265	2717	0.0004	0.0009	0.0011	0.0013	0.0014	0.0019	0.0022	0.0027	0.0030
72	0.2627	0.5268	2697	0.0005	0.0011	0.0012	0.0014	0.0016	0.0021	0.0024	0.0029	0.0032
73	0.2616	0.5278	2717	0.0005	0.0013	0.0016	0.0018	0.0020	0.0024	0.0029	0.0033	0.0035
74	0.2621	0.5273	2707	0.0002	0.0003	0.0013	0.0015	0.0017	0.0020	0.0024	0.0030	0.0032
75	0.2626	0.5297	2689	0.0002	0.0006	0.0012	0.0014	0.0016	0.0019	0.0023	0.0028	0.0031
Ave.	0.2620	0.5273	2711	0.0005	0.0010	0.0012	0.0014	0.0016	0.0021	0.0025	0.0028	0.0031
Med.	0.2621	0.5270	2707	0.0005	0.0010	0.0012	0.0014	0.0016	0.0020	0.0024	0.0028	0.0031
st dev	0.0009	0.0012	22	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2598	0.5256	2679	0.0002	0.0003	0.0010	0.0012	0.0014	0.0019	0.0022	0.0026	0.0029
Max.	0.2633	0.5307	2760	0.0008	0.0013	0.0016	0.0018	0.0020	0.0025	0.0029	0.0033	0.0036



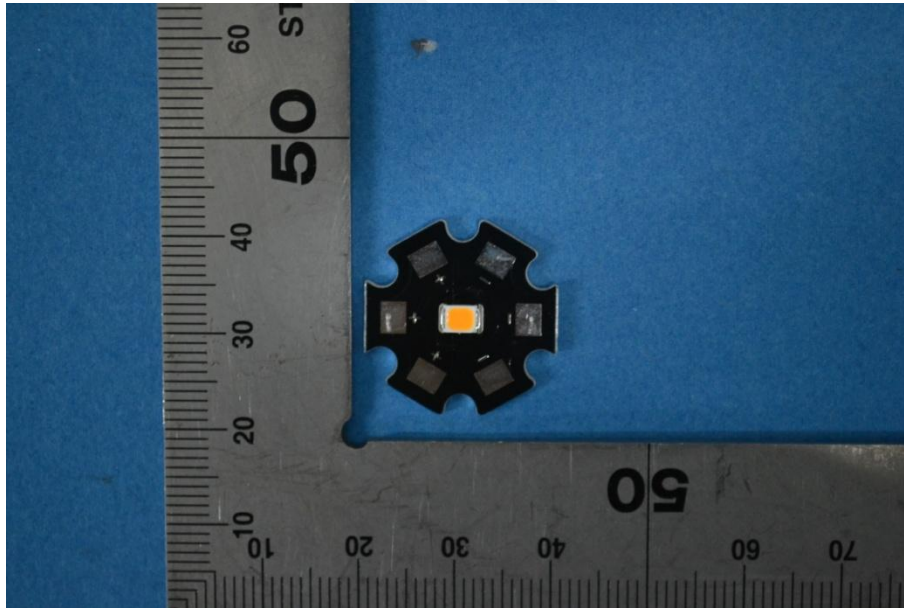
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



5 - Report Revision

Report Number	Report Date	Contents
RSZ160603510-10-9000	2017-07-07	Original report.
RSZ160603510-10-9000-M1	2017-07-27	Revise the Company and address

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

FINAL