



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Samsung Electronics Co., LTD.

1, Samsung-Ro, Giheung-Gu, Yongin-City, Gyeonggi-Do 17113, Korea

Multiple Model: SPMWHX228XXXXXXXXXX
Test Model: SPMWHX228MD5XXW0XX

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	RSZ170525501-10		
Test Date:	2016-05-15 to 2017-04-13		
Report Date:	2017-06-29		
Reviewed By:	Daniel Duan / EE Manager	<i>Daniel Duan</i>	
Test Facility:	Test facility was located at No.69, Pulongcun , Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.		
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun , Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858588		

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).

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

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1 - General Information

1.1 Description of LED Light Sources

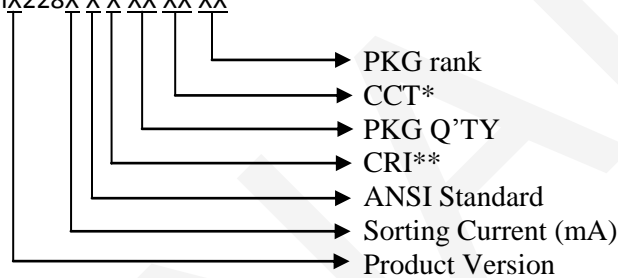
Sample Size:

60 PCS samples were received on 2016-05-14. The samples were numbered from 1 to 20, 21 to 40 and 41 to 60.

Manufacturer: Samsung Electronics Co., LTD.
Part Number: SPMWHX228MD5XXW0XX
Part Type: LED Package
Drive Level: DC 75mA
Nominal CCT: 2700K

Covered models and nomenclature:

Multiple Models: SPMWHX228X X X XX XX XX



* The CCT can be W0=2700K, V0=3000K, U0=3500K, T0=4000K, R0=5000K, Q0=5700K, P0=6500K

** The CRI of the previous report (RSZ160514501-10) is 80.

Note:

1、 The applicant Samsung Electronics Co., LTD. declared that their product with model SPMWHX228MD5XXW0XX are the same to the product in report# RSZ160514501-10 and is authorized by original applicant to use their test data.

2、 All the data in previous report (RSZ160514501-10) is shared in report.

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	G115987CJ73 21114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20015	25°C~130°C	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	(50/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(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 $2^{\circ}C$ below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to $5^{\circ}C$ 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, 75mA

Part Number: SPMWHX228MD5XXW0XX
Number of Units: 20
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 75mA
Measurement Current: 75mA

Data Set 2: 85°C,75mA

Part Number: SPMWHX228MD5XXW0XX
Number of Units: 20
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 75mA
Measurement Current: 75mA

Data Set 3: 105°C,75mA

Part Number: SPMWHX228MD5XXW0XX
Number of Units: 20
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 75mA
Measurement Current: 75mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	20	0	1000	9000	>54,000hours
2	20	0	1000	9000	>54,000hours
3	20	0	1000	9000	>54,000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.11%	99.90%	99.68%	99.45%	99.25%	99.03%	98.83%	98.62%	98.42%
2	99.91%	99.64%	99.38%	99.13%	98.89%	98.65%	98.40%	98.13%	97.89%
3	99.79%	99.49%	99.21%	98.92%	98.64%	98.33%	98.07%	97.76%	97.46%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
2	0.0004	0.0006	0.0007	0.0009	0.0013	0.0016	0.0019	0.0022	0.0025
3	0.0005	0.0006	0.0008	0.0010	0.0014	0.0018	0.0021	0.0024	0.0027

3 - Test Data

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

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	33.59	100.09	99.94	99.64	99.46	99.32	99.23	99.02	98.78	98.60
2	34.12	99.91	99.68	99.47	99.36	99.30	99.09	98.86	98.68	98.42
3	33.33	100.09	99.88	99.70	99.37	99.25	99.10	98.77	98.65	98.44
4	33.64	100.24	99.97	99.64	99.35	99.17	98.99	98.75	98.66	98.37
5	33.67	100.18	100.06	99.82	99.64	99.41	99.05	98.84	98.63	98.31
6	33.90	100.09	99.85	99.65	99.50	99.32	99.26	99.14	98.82	98.50
7	33.53	100.21	100.09	99.94	99.85	99.64	99.52	99.40	99.28	99.05
8	33.82	100.03	99.62	99.32	99.23	99.05	98.91	98.67	98.61	98.49
9	34.11	100.15	99.97	99.79	99.47	99.15	98.94	98.86	98.65	98.36
10	33.84	100.03	99.94	99.62	99.35	99.17	98.88	98.76	98.52	98.43
11	33.43	99.91	99.79	99.70	99.46	99.25	98.83	98.80	98.59	98.47
12	33.64	100.06	99.70	99.52	99.35	99.20	99.11	98.84	98.60	98.34
13	33.46	100.15	99.82	99.73	99.46	99.25	99.07	98.80	98.68	98.36
14	33.37	100.18	99.94	99.64	99.37	99.10	98.89	98.71	98.56	98.32
15	33.63	100.12	99.79	99.61	99.32	99.11	98.87	98.66	98.48	98.42
16	33.82	100.18	100.09	99.85	99.50	99.32	99.02	98.85	98.55	98.52
17	33.49	100.12	99.85	99.76	99.52	99.31	98.95	98.63	98.45	98.36
18	33.93	100.06	99.82	99.56	99.32	99.06	98.76	98.59	98.29	98.05
19	33.57	100.15	100.03	99.61	99.29	99.05	98.81	98.54	98.27	98.06
20	34.12	100.21	100.09	99.94	99.74	99.53	99.33	99.03	98.71	98.53
Ave.	33.70	100.11	99.90	99.68	99.45	99.25	99.03	98.83	98.62	98.42
Med.	33.64	100.12	99.91	99.64	99.42	99.25	99.01	98.80	98.62	98.42
st dev	0.2464	0.0895	0.1403	0.1520	0.1544	0.1560	0.1916	0.2020	0.2081	0.2009
Min.	33.33	99.91	99.62	99.32	99.23	99.05	98.76	98.54	98.27	98.05
Max.	34.12	100.24	100.09	99.94	99.85	99.64	99.52	99.40	99.28	99.05

TM-21 Projection:

Test Duration: 9,000 hours

Failures Observed: 0

α: 2.091E-06

β: 1.003

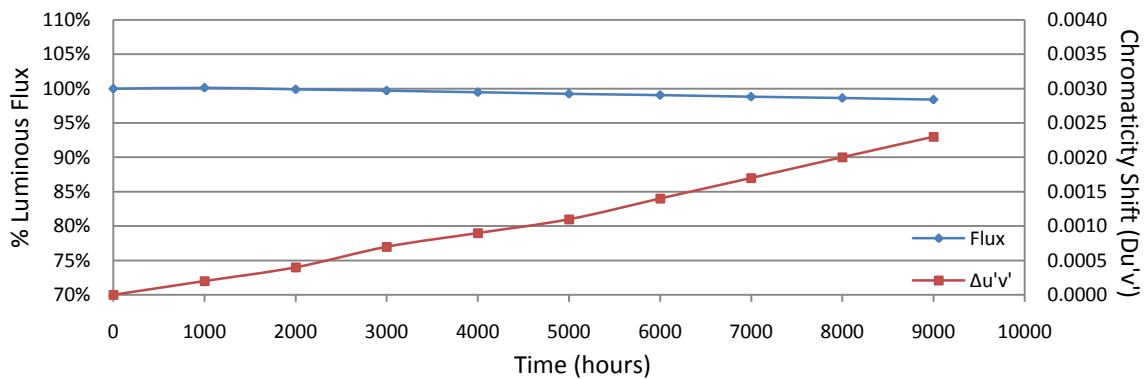
Reported L₇₀: >54,000 hours

3.2 Data Set 1, 55°C, 75mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.048	2.958	2.961	2.937	2.936	2.944	2.991	2.948	2.939	2.937
2	3.022	2.956	2.976	2.954	2.954	2.959	2.970	2.967	2.954	2.956
3	2.982	2.974	2.955	2.938	2.935	2.941	2.951	2.944	2.936	2.944
4	2.998	3.020	2.959	2.950	2.956	2.962	2.974	2.953	2.955	2.955
5	2.965	2.969	2.933	2.930	2.938	2.935	2.933	2.934	2.934	2.933
6	2.975	2.948	2.933	2.930	2.937	2.942	2.932	2.932	2.932	2.940
7	3.022	2.971	2.948	2.943	2.946	2.948	2.940	2.938	2.937	2.960
8	3.058	2.992	2.966	2.966	2.970	2.971	2.964	2.967	2.970	2.969
9	2.976	2.956	2.948	2.950	2.949	2.948	2.942	2.945	2.959	2.951
10	3.069	2.974	2.962	2.969	2.968	2.983	2.962	2.964	2.971	2.976
11	2.968	2.962	2.942	2.985	2.987	2.949	2.943	2.946	2.953	2.945
12	2.959	2.953	2.939	2.938	2.981	2.945	2.941	2.937	2.944	2.943
13	2.965	2.956	2.943	2.947	2.957	2.957	2.963	2.943	2.945	2.946
14	2.984	2.963	2.964	3.016	2.965	2.958	2.978	2.959	2.967	2.962
15	2.946	2.953	2.944	2.944	2.944	2.942	2.943	2.936	2.941	2.940
16	3.037	2.941	2.934	2.949	2.939	2.944	2.946	2.936	2.937	2.937
17	2.954	2.950	2.943	2.961	2.950	2.949	2.949	2.965	2.942	2.938
18	2.949	2.949	2.943	2.945	2.952	2.948	2.953	2.947	2.950	2.948
19	2.955	2.938	2.938	2.939	2.947	2.937	2.944	2.942	2.938	2.940
20	2.960	2.956	2.957	2.955	2.962	2.968	2.956	2.955	2.961	2.961
Ave.	2.990	2.962	2.949	2.952	2.954	2.952	2.954	2.948	2.948	2.949
Med.	2.976	2.956	2.946	2.948	2.951	2.948	2.950	2.946	2.945	2.946
st dev	0.0389	0.0185	0.0123	0.0202	0.0148	0.0123	0.0158	0.0115	0.0124	0.0118
Min.	2.946	2.938	2.933	2.930	2.935	2.935	2.932	2.932	2.932	2.933
Max.	3.069	3.020	2.976	3.016	2.987	2.983	2.991	2.967	2.971	2.976

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

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2594	0.5210	2794	0.0001	0.0004	0.0006	0.0010	0.0012	0.0014	0.0017	0.0021	0.0024
2	0.2579	0.5183	2842	0.0003	0.0004	0.0007	0.0009	0.0012	0.0015	0.0017	0.0021	0.0024
3	0.2598	0.5214	2783	0.0005	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0024
4	0.2579	0.5182	2842	0.0004	0.0003	0.0007	0.0009	0.0011	0.0014	0.0016	0.0020	0.0023
5	0.2597	0.5214	2785	0.0004	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0021	0.0023
6	0.2584	0.5191	2826	0.0001	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
7	0.2598	0.5224	2779	0.0003	0.0003	0.0006	0.0008	0.0011	0.0012	0.0016	0.0020	0.0022
8	0.2575	0.5205	2840	0.0002	0.0004	0.0006	0.0009	0.0011	0.0014	0.0016	0.0020	0.0022
9	0.2600	0.5227	2773	0.0002	0.0003	0.0006	0.0009	0.0011	0.0014	0.0016	0.0019	0.0022
10	0.2582	0.5194	2830	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
11	0.2590	0.5203	2806	0.0002	0.0003	0.0006	0.0008	0.0010	0.0013	0.0016	0.0020	0.0022
12	0.2595	0.5217	2790	0.0002	0.0004	0.0007	0.0008	0.0011	0.0014	0.0017	0.0020	0.0023
13	0.2595	0.5203	2797	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
14	0.2593	0.5186	2809	0.0002	0.0003	0.0006	0.0008	0.0011	0.0013	0.0017	0.0021	0.0023
15	0.2608	0.5235	2752	0.0003	0.0004	0.0007	0.0009	0.0012	0.0015	0.0018	0.0020	0.0023
16	0.2599	0.5238	2770	0.0002	0.0004	0.0006	0.0009	0.0011	0.0014	0.0017	0.0019	0.0022
17	0.2603	0.5219	2771	0.0002	0.0004	0.0006	0.0008	0.0011	0.0013	0.0016	0.0019	0.0022
18	0.2585	0.5224	2809	0.0002	0.0004	0.0007	0.0009	0.0012	0.0015	0.0017	0.0020	0.0023
19	0.2592	0.5196	2804	0.0002	0.0004	0.0007	0.0008	0.0011	0.0013	0.0017	0.0020	0.0023
20	0.2586	0.5218	2808	0.0001	0.0003	0.0004	0.0008	0.0010	0.0013	0.0016	0.0019	0.0022
Ave.	0.2592	0.5209	2801	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
Med.	0.2594	0.5212	2801	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
st dev	0.0009	0.0017	26.0071	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2575	0.5182	2752	0.0001	0.0003	0.0004	0.0008	0.0010	0.0012	0.0016	0.0019	0.0022
Max.	0.2608	0.5238	2842	0.0005	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0024



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

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
21	33.23	100.09	99.91	99.58	99.40	99.22	99.10	98.98	98.77	98.34
22	33.86	99.97	99.73	99.53	99.20	98.91	98.73	98.55	98.41	98.29
23	33.92	99.91	99.71	99.41	99.20	98.91	98.61	98.29	98.00	97.79
24	34.22	99.97	99.80	99.59	99.30	99.18	98.89	98.54	98.22	97.95
25	34.15	100.03	99.59	99.30	99.06	98.74	98.51	98.30	98.10	97.86
26	34.16	99.94	99.65	99.27	98.86	98.51	98.33	98.04	97.75	97.63
27	34.05	99.97	99.74	99.50	99.27	98.94	98.77	98.59	98.38	98.09
28	33.34	100.03	99.79	99.64	99.43	99.13	98.92	98.59	98.26	98.14
29	33.77	99.94	99.73	99.56	99.26	98.90	98.64	98.46	98.25	98.02
30	33.59	99.79	99.67	99.32	99.05	98.87	98.69	98.33	98.18	97.98
31	33.42	99.91	99.73	99.52	99.22	99.07	98.74	98.56	98.35	98.17
32	34.04	99.88	99.68	99.38	98.91	98.85	98.44	98.21	97.94	97.74
33	33.32	99.79	99.64	99.49	99.31	99.19	98.89	98.50	98.11	97.87
34	33.31	99.61	99.40	99.01	98.74	98.50	98.29	98.17	97.87	97.54
35	33.47	99.88	99.40	99.07	98.89	98.63	98.21	98.00	97.76	97.37
36	33.87	99.79	99.38	99.00	98.79	98.55	98.29	97.90	97.64	97.34
37	33.19	99.88	99.43	99.25	99.04	98.82	98.64	98.25	97.92	97.71
38	33.84	99.97	99.53	99.29	99.05	98.91	98.76	98.55	98.11	97.87
39	33.55	99.88	99.49	99.23	99.02	98.87	98.69	98.51	98.15	97.82
40	33.43	99.91	99.85	99.67	99.58	99.19	98.83	98.62	98.44	98.21
Ave.	33.69	99.91	99.64	99.38	99.13	98.89	98.65	98.40	98.13	97.89
Med.	33.68	99.91	99.67	99.40	99.13	98.91	98.69	98.48	98.13	97.87
st dev	0.3397	0.1059	0.1571	0.2037	0.2253	0.2271	0.2394	0.2565	0.2745	0.2817
Min.	33.19	99.61	99.38	99.00	98.74	98.50	98.21	97.90	97.64	97.34
Max.	34.22	100.09	99.91	99.67	99.58	99.22	99.10	98.98	98.77	98.34

TM-21 Projection:

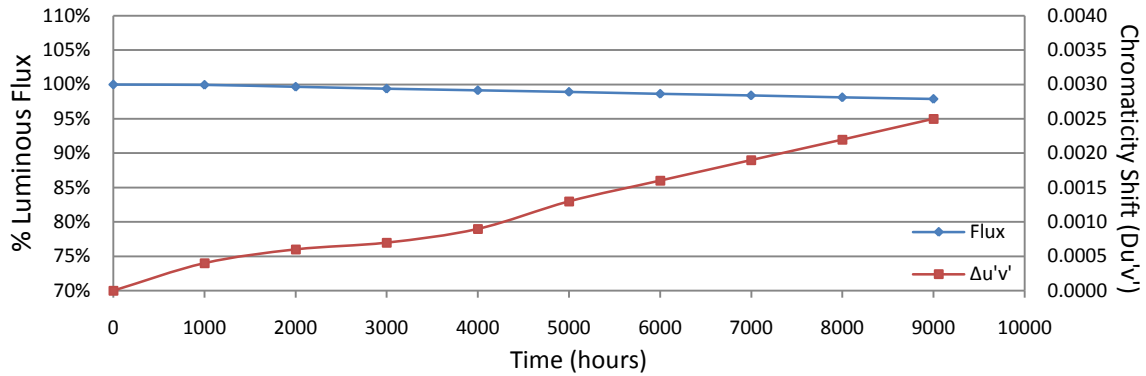
Test Duration: 9,000 hours
Failures Observed: 0
 α : 2.532E-06
 β : 1.001
Reported L₇₀: >54,000 hours

3.5 Data Set 2, 85°C, 75mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
21	2.948	2.945	2.943	2.944	2.946	2.948	2.948	2.949	2.948	2.949
22	2.938	2.943	2.936	2.937	2.937	2.960	2.939	2.939	2.938	2.941
23	2.951	2.950	2.957	2.952	2.959	2.960	2.957	2.953	2.956	2.956
24	2.961	2.964	2.965	2.960	2.972	2.977	2.967	2.992	2.978	2.964
25	2.954	2.953	2.955	2.954	2.960	3.020	2.956	3.006	2.954	2.953
26	2.949	2.958	2.951	2.945	2.946	2.972	3.006	2.974	2.959	2.950
27	2.951	2.977	2.950	2.973	2.957	2.959	2.956	2.966	2.954	2.956
28	2.929	2.932	2.930	2.932	2.934	2.935	2.938	2.938	2.931	2.931
29	2.944	2.947	2.941	2.945	2.945	2.945	2.941	2.949	2.944	2.953
30	2.941	2.937	2.941	2.939	2.943	2.944	2.941	2.947	2.947	2.944
31	2.943	2.935	2.932	2.933	2.937	2.932	2.934	2.951	2.939	2.936
32	2.974	2.970	2.971	2.986	2.970	2.968	2.968	2.971	2.969	2.969
33	2.944	2.979	2.943	2.936	2.939	2.938	2.941	2.955	2.945	2.942
34	2.969	2.965	2.975	2.956	2.955	2.960	2.956	2.960	2.960	2.959
35	2.925	2.937	2.932	2.925	2.936	2.930	2.927	2.931	2.931	2.930
36	2.957	2.987	2.966	2.964	2.958	2.961	2.960	2.980	2.961	2.959
37	2.941	2.947	2.950	2.941	2.946	2.956	2.947	2.944	2.946	2.942
38	2.950	2.950	2.951	2.953	2.952	2.973	2.962	2.960	2.956	2.955
39	2.949	2.948	2.949	2.946	2.946	2.960	2.953	2.949	2.949	2.944
40	2.937	2.952	2.939	2.940	2.961	2.956	2.967	2.945	2.954	2.943
Ave.	2.948	2.954	2.949	2.948	2.950	2.958	2.953	2.958	2.951	2.949
Med.	2.949	2.950	2.950	2.945	2.946	2.960	2.955	2.952	2.952	2.950
st dev	0.0119	0.0154	0.0130	0.0147	0.0112	0.0200	0.0171	0.0188	0.0118	0.0105
Min.	2.925	2.932	2.930	2.925	2.934	2.930	2.927	2.931	2.931	2.930
Max.	2.974	2.987	2.975	2.986	2.972	3.020	3.006	3.006	2.978	2.969

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

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
21	0.2587	0.5179	2826	0.0004	0.0004	0.0007	0.0009	0.0013	0.0016	0.0019	0.0022	0.0026
22	0.2609	0.5217	2759	0.0004	0.0006	0.0007	0.0010	0.0015	0.0017	0.0019	0.0023	0.0026
23	0.2589	0.5220	2802	0.0005	0.0006	0.0009	0.0011	0.0014	0.0018	0.0021	0.0023	0.0026
24	0.2586	0.5232	2801	0.0003	0.0006	0.0007	0.0009	0.0012	0.0016	0.0019	0.0022	0.0025
25	0.2584	0.5234	2805	0.0004	0.0006	0.0008	0.0010	0.0013	0.0016	0.0019	0.0022	0.0026
26	0.2606	0.5226	2761	0.0004	0.0007	0.0008	0.0009	0.0013	0.0017	0.0020	0.0023	0.0026
27	0.2588	0.5206	2810	0.0003	0.0005	0.0006	0.0006	0.0009	0.0012	0.0016	0.0019	0.0021
28	0.2626	0.5229	2715	0.0004	0.0005	0.0007	0.0008	0.0012	0.0016	0.0019	0.0022	0.0024
29	0.2583	0.5202	2824	0.0004	0.0007	0.0008	0.0010	0.0014	0.0017	0.0021	0.0024	0.0026
30	0.2602	0.5208	2777	0.0005	0.0006	0.0010	0.0011	0.0014	0.0018	0.0021	0.0024	0.0027
31	0.2588	0.5219	2804	0.0004	0.0007	0.0007	0.0009	0.0014	0.0016	0.0019	0.0022	0.0026
32	0.2595	0.5204	2795	0.0003	0.0005	0.0007	0.0009	0.0013	0.0017	0.0019	0.0022	0.0025
33	0.2598	0.5215	2783	0.0005	0.0006	0.0007	0.0009	0.0014	0.0017	0.0019	0.0022	0.0026
34	0.2596	0.5208	2791	0.0005	0.0006	0.0007	0.0009	0.0012	0.0016	0.0019	0.0022	0.0024
35	0.2598	0.5205	2789	0.0004	0.0006	0.0008	0.0009	0.0012	0.0016	0.0018	0.0022	0.0025
36	0.2577	0.5185	2846	0.0003	0.0006	0.0007	0.0009	0.0013	0.0016	0.0018	0.0022	0.0025
37	0.2600	0.5206	2784	0.0004	0.0006	0.0006	0.0008	0.0013	0.0016	0.0018	0.0022	0.0025
38	0.2573	0.5198	2849	0.0004	0.0005	0.0006	0.0008	0.0011	0.0016	0.0018	0.0022	0.0024
39	0.2595	0.5205	2795	0.0004	0.0006	0.0007	0.0008	0.0012	0.0016	0.0018	0.0022	0.0026
40	0.2600	0.5206	2783	0.0004	0.0005	0.0007	0.0008	0.0011	0.0015	0.0018	0.0021	0.0024
Ave.	0.2594	0.5210	2795	0.0004	0.0006	0.0007	0.0009	0.0013	0.0016	0.0019	0.0022	0.0025
Med.	0.2595	0.5207	2795	0.0004	0.0006	0.0007	0.0009	0.0013	0.0016	0.0019	0.0022	0.0025
st dev	0.0012	0.0014	30.3028	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2573	0.5179	2715	0.0003	0.0004	0.0006	0.0006	0.0009	0.0012	0.0016	0.0019	0.0021
Max.	0.2626	0.5234	2849	0.0005	0.0007	0.0010	0.0011	0.0015	0.0018	0.0021	0.0024	0.0027



3.7 Data Set 3, 105°C, 75mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
41	33.74	99.97	99.79	99.59	99.44	99.05	98.73	98.49	98.25	98.04
42	33.96	100.15	99.82	99.56	99.18	98.85	98.50	98.32	97.97	97.64
43	33.73	99.91	99.64	99.50	99.29	98.90	98.70	98.34	98.01	97.69
44	33.69	99.82	99.58	99.47	99.35	99.14	98.69	98.52	98.19	97.77
45	33.65	99.70	99.41	99.14	98.90	98.72	98.48	98.22	97.95	97.74
46	33.70	99.79	99.41	98.99	98.81	98.61	98.31	98.10	97.74	97.48
47	33.54	99.61	99.31	99.05	98.72	98.66	98.45	98.18	97.85	97.56
48	33.91	99.71	99.53	99.26	98.82	98.50	98.23	98.02	97.73	97.55
49	33.91	99.68	99.53	99.20	98.94	98.64	98.35	98.20	97.70	97.35
50	33.89	99.73	99.50	99.32	99.14	98.88	98.52	98.32	97.85	97.40
51	33.66	99.70	99.44	99.23	98.96	98.69	98.51	98.28	97.86	97.50
52	33.78	99.79	99.50	99.11	98.88	98.52	98.25	97.99	97.78	97.57
53	33.49	99.73	99.46	99.10	98.63	98.36	98.09	97.94	97.73	97.52
54	33.99	100.03	99.56	99.15	98.68	98.29	98.06	97.85	97.62	97.32
55	33.85	99.68	99.47	99.08	98.79	98.46	98.11	97.81	97.49	97.10
56	33.47	99.49	99.16	98.80	98.51	98.30	97.88	97.55	97.31	96.95
57	33.05	99.85	99.64	99.46	99.24	98.76	98.37	97.97	97.70	97.46
58	34.15	99.77	99.33	99.06	98.83	98.48	98.04	97.66	97.36	97.13
59	33.87	99.82	99.32	99.03	98.61	98.46	98.11	97.70	97.46	97.20
60	33.56	99.79	99.49	99.14	98.75	98.48	98.24	97.88	97.59	97.26
Ave.	33.73	99.79	99.49	99.21	98.92	98.64	98.33	98.07	97.76	97.46
Med.	33.74	99.78	99.50	99.14	98.85	98.62	98.33	98.06	97.74	97.49
st dev	0.2395	0.1475	0.1582	0.2091	0.2654	0.2385	0.2411	0.2742	0.2488	0.2594
Min.	33.05	99.49	99.16	98.80	98.51	98.29	97.88	97.55	97.31	96.95
Max.	34.15	100.15	99.82	99.59	99.44	99.14	98.73	98.52	98.25	98.04

TM-21 Projection:

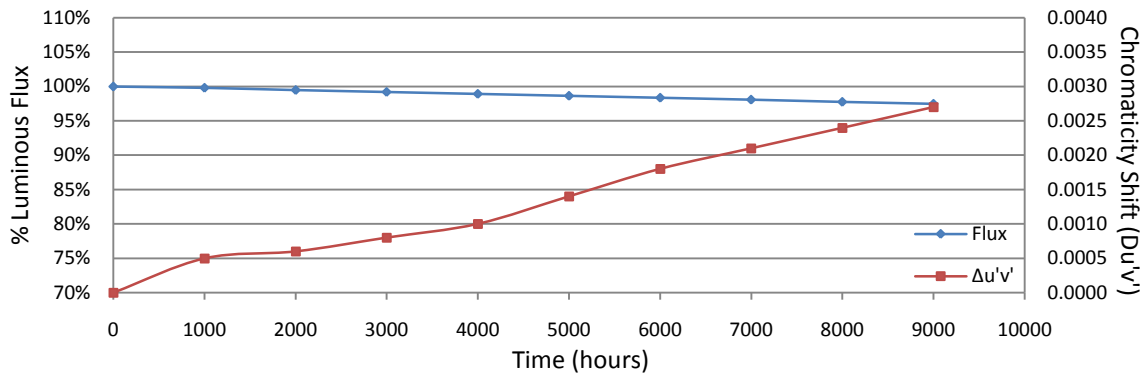
Test Duration: 9,000 hours
Failures Observed: 0
α: 2.968E-06
β: 1.001
Reported L₇₀: >54,000 hours

3.8 Data Set 3, 105°C, 75mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
41	2.941	2.943	2.973	2.962	2.965	2.955	2.977	2.944	2.945	2.939
42	2.960	2.964	2.959	2.962	3.056	2.984	2.964	2.957	2.952	2.950
43	2.970	2.960	2.942	2.943	2.951	2.964	2.956	2.949	2.952	2.944
44	2.946	2.944	2.943	2.944	2.951	2.952	2.970	2.945	2.947	2.945
45	2.955	2.937	2.938	2.944	2.940	2.941	2.937	2.940	2.939	2.937
46	2.954	2.948	2.948	2.946	2.954	2.961	2.955	2.956	3.016	2.954
47	2.945	2.939	2.956	2.942	2.942	2.940	2.942	2.942	3.015	2.944
48	2.949	2.942	2.944	2.947	2.946	2.944	2.974	2.944	2.943	2.941
49	2.956	2.952	2.950	2.951	2.956	2.950	2.948	2.959	2.962	2.975
50	2.962	2.956	2.968	2.961	2.947	2.952	2.949	2.953	2.965	3.051
51	2.950	2.950	2.948	2.955	2.952	2.950	2.969	2.954	2.959	2.953
52	2.944	2.946	2.958	2.945	2.946	2.948	2.954	2.949	2.953	2.949
53	2.964	2.981	2.962	2.968	2.967	2.966	2.962	2.963	2.967	2.968
54	2.931	2.954	2.932	2.935	2.933	2.936	2.981	2.934	2.944	2.935
55	2.962	2.989	2.968	2.968	2.971	2.970	2.971	2.987	2.975	2.972
56	2.945	2.967	2.950	2.956	2.963	2.974	2.974	2.956	2.952	2.956
57	2.937	2.969	2.935	2.942	2.938	2.934	2.974	2.942	2.939	2.945
58	2.955	2.980	2.956	2.958	2.967	2.956	2.966	2.989	2.959	2.958
59	2.948	2.986	2.947	2.943	2.949	2.944	2.965	2.944	2.944	2.948
60	2.936	2.944	2.936	2.935	2.938	2.937	2.950	2.944	2.940	2.952
Ave.	2.951	2.958	2.951	2.950	2.957	2.953	2.962	2.953	2.958	2.956
Med.	2.950	2.953	2.949	2.947	2.951	2.951	2.965	2.949	2.952	2.950
st dev	0.0102	0.0163	0.0117	0.0102	0.0258	0.0135	0.0124	0.0142	0.0219	0.0249
Min.	2.931	2.937	2.932	2.935	2.933	2.934	2.937	2.934	2.939	2.935
Max.	2.970	2.989	2.973	2.968	3.056	2.984	2.981	2.989	3.016	3.051

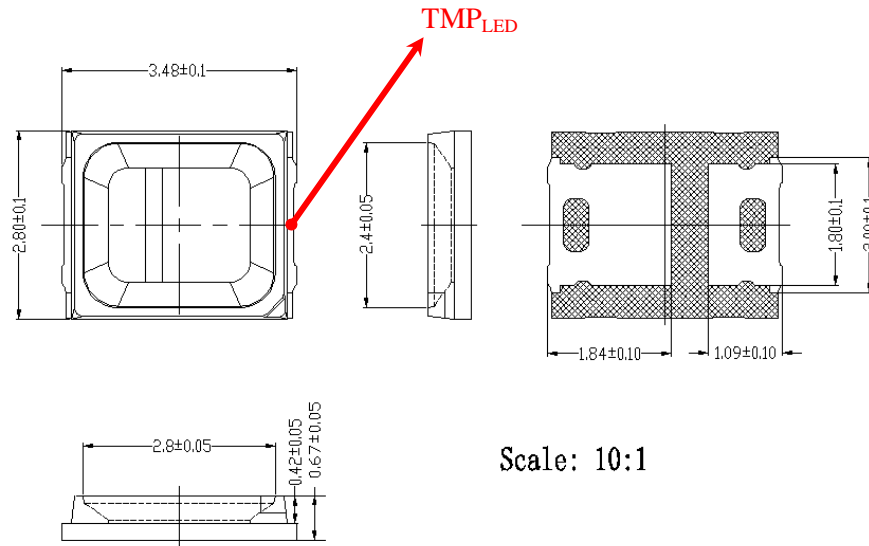
3.9 Data Set 3, 105°C, 75mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
41	0.2600	0.5246	2764	0.0005	0.0006	0.0007	0.0008	0.0014	0.0018	0.0020	0.0023	0.0026
42	0.2592	0.5220	2794	0.0005	0.0006	0.0007	0.0009	0.0014	0.0017	0.0020	0.0024	0.0027
43	0.2602	0.5221	2771	0.0005	0.0006	0.0008	0.0010	0.0015	0.0018	0.0021	0.0024	0.0028
44	0.2617	0.5233	2733	0.0004	0.0005	0.0007	0.0009	0.0014	0.0018	0.0020	0.0023	0.0026
45	0.2576	0.5195	2842	0.0005	0.0006	0.0007	0.0009	0.0014	0.0018	0.0020	0.0024	0.0028
46	0.2581	0.5171	2844	0.0005	0.0006	0.0009	0.0011	0.0016	0.0019	0.0022	0.0025	0.0029
47	0.2588	0.5202	2812	0.0005	0.0005	0.0007	0.0010	0.0015	0.0019	0.0022	0.0025	0.0029
48	0.2576	0.5214	2833	0.0005	0.0005	0.0008	0.0008	0.0014	0.0017	0.0020	0.0023	0.0027
49	0.2585	0.5219	2810	0.0005	0.0006	0.0006	0.0009	0.0014	0.0017	0.0021	0.0024	0.0027
50	0.2580	0.5186	2839	0.0005	0.0006	0.0006	0.0009	0.0014	0.0017	0.0019	0.0022	0.0027
51	0.2606	0.5222	2761	0.0006	0.0007	0.0007	0.0009	0.0015	0.0018	0.0020	0.0023	0.0028
52	0.2581	0.5208	2824	0.0005	0.0007	0.0009	0.0010	0.0015	0.0018	0.0021	0.0024	0.0028
53	0.2612	0.5221	2750	0.0005	0.0007	0.0010	0.0010	0.0015	0.0018	0.0022	0.0024	0.0028
54	0.2574	0.5215	2838	0.0005	0.0006	0.0009	0.0009	0.0014	0.0017	0.0020	0.0023	0.0027
55	0.2597	0.5208	2788	0.0005	0.0007	0.0009	0.0009	0.0014	0.0018	0.0020	0.0024	0.0027
56	0.2584	0.5201	2822	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0024	0.0028
57	0.2617	0.5207	2745	0.0004	0.0007	0.0009	0.0010	0.0014	0.0018	0.0019	0.0023	0.0027
58	0.2586	0.5208	2814	0.0004	0.0006	0.0009	0.0011	0.0014	0.0018	0.0021	0.0024	0.0027
59	0.2586	0.5221	2806	0.0006	0.0007	0.0011	0.0012	0.0015	0.0018	0.0021	0.0025	0.0028
60	0.2611	0.5236	2745	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0023	0.0027
Ave.	0.2593	0.5213	2797	0.0005	0.0006	0.0008	0.0010	0.0014	0.0018	0.0021	0.0024	0.0027
Med.	0.2587	0.5215	2808	0.0005	0.0006	0.0008	0.0010	0.0014	0.0018	0.0020	0.0024	0.0027
st dev	0.0014	0.0017	36.9607	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2574	0.5171	2733	0.0004	0.0005	0.0006	0.0008	0.0014	0.0017	0.0019	0.0022	0.0026
Max.	0.2617	0.5246	2844	0.0006	0.0007	0.0011	0.0012	0.0016	0.0019	0.0022	0.0025	0.0029



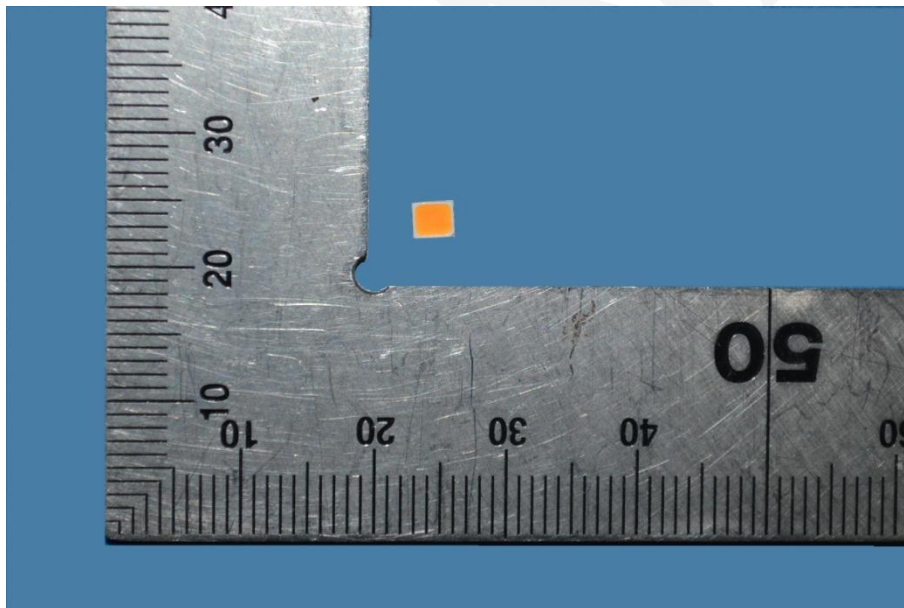
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



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