



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Hongli Zhihui Group Co.,Ltd. Guangzhou Branch

Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

Model: HL-AS-2835DW-2C-S1-08-PCT-HR3 (R9)

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	RSZ160826506-10-9000-M1		
Test Date:	2016-08-26 to 2017-09-05		
Report Date:	2019-01-14		
Revised Note:	The previous report RSZ160826506-10-9000 is replaced by this report on 2019-01-14		
Reviewed By:	Daniel Duan / EE Manager	<i>Daniel</i>	
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial 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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TABLE OF CONTENTS

1 -	General Information	3
1.1	Description of LED Light Sources	3
1.2	Standards Used:	4
1.3	Testing Equipment	4
1.4	Drive Level.....	5
1.5	Ambient Conditions for Maintenance Test.....	5
1.6	Measurement Uncertainty	5
1.7	Statement of Traceability.....	5
1.8	Sample Set.....	6
2 -	Summary of Test Result	7
3 -	Test Data	8
3.1	Data Set 1, 55°C, 150mA (Lumen Maintenance)	8
3.2	Data Set 1, 55°C, 150mA (Forward Voltage)	9
3.3	Data Set 1, 55°C, 150mA (Chromaticity Shift)	10
3.4	Data Set 2, 105°C, 150mA (Lumen Maintenance)	11
3.5	Data Set 2, 105°C, 150mA (Forward Voltage)	12
3.6	Data Set 2, 105°C, 150mA (Chromaticity Shift)	13
4 -	EUT Photo.....	14
4.1	Mechanical Dimensions.....	14
4.2	EUT Photo	14
4.3	Report Revision	14

1 - General Information

1.1 Description of LED Light Sources

Sample Size:

60 PCS samples were received on 2016-08-26. The samples were numbered from 1 to 30 and 31 to 60.

Manufacturer:	Hongli Zihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-AS-2835DW-2C-S1-08-PCT-HR3 (R9)
Part Type:	LED Package
Drive Level:	DC 150mA
Nominal CCT:	2700K
Power:	1.224W
Average Current Density per LED die:	401.88mA/mm ²
Average Power Density per LED die:	1.64 W/mm ²
CRI:	80
Die Spacing:	0.15mm

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)

Test Model Number	Multiple Models	Details
HL-AS-2835DW-2C-S1-08-PCT-HR3(R9)	HL-AS-2835DW-2C-S1-08-PCT-HR3	Only different Model name for different market.
	HL-AS-PU2835DW-2C-S1-08-PCT-HR3	
	HL-AS-PU2835DW-2C-S1-08-PCT-HR3(R9)	
	HL-AS-2835HW-2C-S1-08-PCT-HR3	
	HL-AS-2835HW-2C-S1-08-PCT-HR3(R9)	
	HL-AS-PU2835HW-2C-S1-08-PCT-HR3	
	HL-AS-PU2835HW-2C-S1-08-PCT-HR3(R9)	
	HL-A-2835DW-2C-S1-08-PCT-HR3	
	HL-A-2835DW-2C-S1-08-PCT-HR3(R9)	
	HL-A-PU2835DW-2C-S1-08-PCT-HR3	
	HL-A-PU2835DW-2C-S1-08-PCT-HR3(R9)	
	HL-A-2835HW-2C-S1-08-PCT-HR3	
	HL-A-2835HW-2C-S1-08-PCT-HR3(R9)	
	HL-A-PU2835HW-2C-S1-08-PCT-HR3	
	HL-A-PU2835HW-2C-S1-08-PCT-HR3(R9)	
	HL-AS-2835DW-2C-S1-08L-PCT-HR3(R9)	
	HL-AS-2835DW-2C-S1-08L-PCT-HR3	
	HL-AS-PU2835DW-2C-S1-08L-PCT-HR3	
	HL-AS-PU2835DW-2C-S1-08L-PCT-HR3(R9)	
	HL-AS-2835HW-2C-S1-08L-PCT-HR3	

Test Model Number	Multiple Models	Details
	HL-AS-2835HW-2C-S1-08L-PCT-HR3(R9)	
	HL-AS-PU2835HW-2C-S1-08L-PCT-HR3	
	HL-AS-PU2835HW-2C-S1-08L-PCT-HR3(R9)	
	HL-A-2835DW-2C-S1-08L-PCT-HR3	
	HL-A-2835DW-2C-S1-08L-PCT-HR3(R9)	
	HL-A-PU2835DW-2C-S1-08L-PCT-HR3	
	HL-A-PU2835DW-2C-S1-08L-PCT-HR3(R9)	
	HL-A-2835HW-2C-S1-08L-PCT-HR3	
	HL-A-2835HW-2C-S1-08L-PCT-HR3(R9)	
	HL-A-PU2835HW-2C-S1-08L-PCT-HR3	
	HL-A-PU2835HW-2C-S1-08L-PCT-HR3(R9)	

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® Requirements for the Use of LM-80 Data (This standard 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	G115987C J7321114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20005	25°C~130°C	2017-09-01	2018-09-01
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, 150mA

Part Number: HL-AS-2835DW-2C-S1-08-PCT-HR3 (R9)
Number of Units: 30
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 150mA
Measurement Current: 150mA

Data Set 2: 105°C,150mA

Part Number: HL-AS-2835DW-2C-S1-08-PCT-HR3 (R9)
Number of Units: 30
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 150mA
Measurement Current: 150mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	30	0	1000	9000	>54000 hours
2	30	0	1000	9000	>54000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.25%	100.03%	99.83%	99.62%	99.37%	99.10%	98.86%	98.66%	98.45%
2	99.81%	99.48%	99.15%	98.82%	98.50%	98.17%	97.90%	97.62%	97.34%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0003	0.0008	0.0011	0.0012	0.0015	0.0017	0.0020	0.0025	0.0028
2	0.0007	0.001	0.0015	0.0017	0.0019	0.0022	0.0023	0.0028	0.0031

3 - Test Data

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

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	112.4	100.27	100.18	99.91	99.64	99.29	99.11	98.93	98.67	98.58
2	112.1	100.18	99.82	99.64	99.46	99.38	99.02	98.66	98.48	98.13
3	112.0	100.36	100.18	99.91	99.82	99.55	99.29	99.20	99.11	99.02
4	109.0	100.09	99.82	99.63	99.45	99.17	98.90	98.53	98.44	98.17
5	111.0	100.36	100.09	99.91	99.82	99.64	99.46	99.19	98.92	98.74
6	110.3	100.27	99.91	99.64	99.37	99.09	98.91	98.55	98.37	98.19
7	122.6	100.16	99.92	99.67	99.51	99.18	98.78	98.37	98.12	97.88
8	119.6	100.17	100.08	99.92	99.58	99.16	98.75	98.58	98.24	97.99
9	111.3	100.36	100.18	100.09	99.82	99.73	99.28	98.92	98.74	98.38
10	113.6	100.18	100.09	99.91	99.82	99.56	99.47	99.21	98.94	98.68
11	111.5	100.09	99.91	99.73	99.46	99.37	99.01	98.74	98.48	98.12
12	111.9	100.18	99.82	99.55	99.37	99.29	99.02	98.84	98.57	98.30
13	111.4	100.27	100.18	99.91	99.64	99.37	99.19	98.92	98.56	98.20
14	123.1	100.32	100.08	99.92	99.68	99.59	99.35	99.19	98.94	98.70
15	111.3	100.27	100.09	99.91	99.55	99.37	99.10	98.92	98.74	98.65
16	110.7	100.18	99.91	99.73	99.55	99.28	99.19	98.92	98.64	98.55
17	121.8	100.33	100.16	99.92	99.67	99.43	99.26	99.18	98.85	98.69
18	119.7	100.25	99.92	99.67	99.50	99.08	98.83	98.75	98.66	98.50
19	113.4	100.35	100.09	99.82	99.74	99.38	99.12	98.94	98.85	98.59
20	110.8	100.27	100.18	100.09	99.82	99.64	99.28	99.10	98.92	98.74
21	120.1	100.17	100.08	99.92	99.83	99.67	99.58	99.42	99.25	99.08
22	126.9	100.32	100.16	100.08	99.76	99.68	99.45	99.37	99.21	99.05
23	122.9	100.24	100.08	99.84	99.76	99.59	99.35	99.10	98.94	98.78
24	110.2	100.36	100.09	99.82	99.64	99.46	99.27	99.09	99.00	98.91
25	109.7	100.27	99.91	99.82	99.64	99.18	98.72	98.45	98.27	98.09
26	111.1	100.09	99.82	99.64	99.19	98.74	98.38	98.20	97.93	97.84
27	110.9	100.36	100.18	100.09	99.82	99.46	99.01	98.65	98.38	98.20
28	110.8	100.27	100.09	99.91	99.82	99.55	99.10	98.83	98.65	98.38
29	115.1	100.26	99.91	99.83	99.57	99.39	99.04	98.70	98.61	98.35
30	120.5	100.17	99.92	99.59	99.34	98.92	98.76	98.42	98.26	97.93
Ave.	114.6	100.25	100.03	99.83	99.62	99.37	99.10	98.86	98.66	98.45
Med.	112.0	100.27	100.08	99.87	99.64	99.38	99.11	98.92	98.65	98.44
st dev	5.2	0.0862	0.1296	0.1549	0.1758	0.2360	0.2697	0.3094	0.3238	0.3564
Min.	109.0	100.09	99.82	99.55	99.19	98.74	98.38	98.20	97.93	97.84
Max.	126.9	100.36	100.18	100.09	99.83	99.73	99.58	99.42	99.25	99.08

TM-21 Projection:

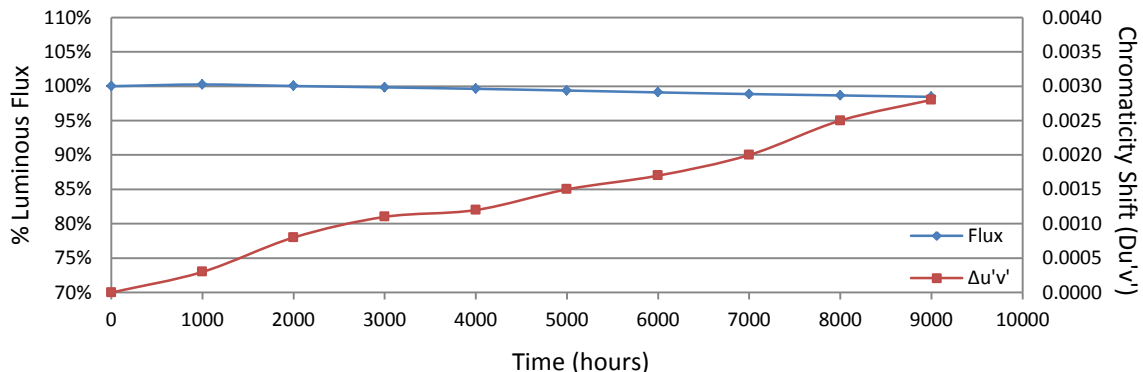
Test Duration: 9000 hours
Failures Observed: 0
 α : 2.372E-06
 β : 1.005
Reported L₇₀: >54000 hours

3.2 Data Set 1, 55°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	6.035	6.041	6.034	6.033	6.047	6.042	6.058	6.031	6.033	6.041
2	6.057	6.058	6.044	6.050	6.055	6.054	6.055	6.043	6.049	6.053
3	6.053	6.054	6.043	6.042	6.055	6.047	6.052	6.037	6.035	6.045
4	6.053	6.055	6.044	6.045	6.055	6.050	6.052	6.040	6.049	6.045
5	6.064	6.060	6.055	6.054	6.056	6.059	6.057	6.049	6.056	6.055
6	6.037	6.042	6.029	6.027	6.038	6.035	6.036	6.026	6.032	6.032
7	6.047	6.050	6.037	6.043	6.043	6.045	6.044	6.030	6.039	6.039
8	6.058	6.062	6.052	6.059	6.057	6.061	6.057	6.059	6.056	6.055
9	6.037	6.043	6.032	6.033	6.038	6.038	6.036	6.034	6.024	6.032
10	6.048	6.050	6.043	6.040	6.043	6.046	6.045	6.033	6.039	6.039
11	6.055	6.056	6.045	6.055	6.045	6.049	6.049	6.043	6.040	6.044
12	6.043	6.047	6.032	6.043	6.041	6.038	6.042	6.030	6.024	6.033
13	6.042	6.043	6.034	6.050	6.040	6.037	6.040	6.029	6.025	6.033
14	6.063	6.062	6.051	6.050	6.056	6.058	6.059	6.047	6.042	6.051
15	6.047	6.052	6.041	6.042	6.047	6.046	6.044	6.033	6.031	6.040
16	6.051	6.058	6.042	6.046	6.052	6.053	6.051	6.035	6.043	6.044
17	6.053	6.055	6.048	6.061	6.051	6.055	6.049	6.036	6.038	6.047
18	6.055	6.061	6.047	6.051	6.055	6.060	6.060	6.044	6.039	6.052
19	6.041	6.043	6.035	6.035	6.043	6.044	6.043	6.029	6.028	6.041
20	6.046	6.056	6.042	6.047	6.052	6.050	6.049	6.047	6.049	6.045
21	6.050	6.054	6.042	6.046	6.052	6.056	6.051	6.042	6.044	6.047
22	6.043	6.051	6.040	6.059	6.049	6.047	6.046	6.040	6.040	6.044
23	6.037	6.045	6.030	6.041	6.039	6.040	6.038	6.027	6.027	6.035
24	6.039	6.045	6.036	6.040	6.042	6.039	6.043	6.031	6.033	6.041
25	6.033	6.043	6.034	6.045	6.038	6.042	6.037	6.031	6.031	6.035
26	6.039	6.047	6.036	6.053	6.042	6.047	6.044	6.033	6.037	6.037
27	6.029	6.031	6.022	6.042	6.030	6.030	6.031	6.019	6.024	6.024
28	6.049	6.054	6.046	6.053	6.052	6.055	6.051	6.041	6.055	6.046
29	6.035	6.043	6.029	6.042	6.038	6.037	6.040	6.028	6.023	6.035
30	6.035	6.037	6.025	6.036	6.036	6.034	6.036	6.027	6.023	6.028
Ave.	6.046	6.050	6.039	6.045	6.046	6.046	6.047	6.036	6.037	6.041
Med.	6.047	6.051	6.041	6.045	6.046	6.047	6.046	6.034	6.038	6.041
st dev	0.009	0.008	0.008	0.008	0.007	0.008	0.008	0.008	0.010	0.008
Min.	6.029	6.031	6.022	6.027	6.030	6.030	6.031	6.019	6.023	6.024
Max.	6.064	6.062	6.055	6.061	6.057	6.061	6.060	6.059	6.056	6.055

3.3 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
1	0.2630	0.5295	2681	0.0004	0.0008	0.0012	0.0013	0.0018	0.0021	0.0026	0.0026	0.0030
2	0.2626	0.5290	2692	0.0002	0.0005	0.0007	0.0007	0.0011	0.0015	0.0021	0.0021	0.0025
3	0.2638	0.5289	2668	0.0003	0.0003	0.0004	0.0006	0.0008	0.0013	0.0013	0.0014	0.0015
4	0.2631	0.5252	2695	0.0003	0.0009	0.0012	0.0014	0.0019	0.0020	0.0024	0.0028	0.0031
5	0.2649	0.5288	2646	0.0002	0.0003	0.0006	0.0008	0.0010	0.0014	0.0017	0.0020	0.0024
6	0.2640	0.5272	2671	0.0002	0.0005	0.0009	0.0008	0.0011	0.0015	0.0019	0.0021	0.0025
7	0.2578	0.5311	2783	0.0005	0.0010	0.0015	0.0015	0.0018	0.0021	0.0025	0.0029	0.0033
8	0.2578	0.5288	2793	0.0002	0.0008	0.0013	0.0015	0.0017	0.0020	0.0024	0.0026	0.0030
9	0.2633	0.5274	2683	0.0003	0.0006	0.0010	0.0011	0.0013	0.0015	0.0020	0.0024	0.0027
10	0.2626	0.5273	2698	0.0002	0.0005	0.0009	0.0010	0.0011	0.0014	0.0019	0.0023	0.0026
11	0.2634	0.5271	2682	0.0003	0.0009	0.0014	0.0014	0.0017	0.0017	0.0021	0.0027	0.0031
12	0.2614	0.5258	2730	0.0002	0.0007	0.0009	0.0009	0.0011	0.0012	0.0015	0.0022	0.0026
13	0.2637	0.5253	2682	0.0003	0.0007	0.0009	0.0009	0.0011	0.0011	0.0015	0.0021	0.0024
14	0.2605	0.5316	2724	0.0003	0.0009	0.0013	0.0012	0.0013	0.0014	0.0019	0.0025	0.0030
15	0.2618	0.5264	2719	0.0003	0.0009	0.0012	0.0012	0.0014	0.0017	0.0019	0.0025	0.0030
16	0.2636	0.5293	2671	0.0004	0.0007	0.0012	0.0013	0.0014	0.0017	0.0019	0.0025	0.0029
17	0.2551	0.5303	2844	0.0004	0.0009	0.0013	0.0014	0.0015	0.0017	0.0021	0.0026	0.0030
18	0.2604	0.5303	2732	0.0005	0.0010	0.0014	0.0015	0.0016	0.0017	0.0021	0.0027	0.0031
19	0.2623	0.5269	2705	0.0004	0.0009	0.0013	0.0015	0.0015	0.0016	0.0021	0.0028	0.0030
20	0.2637	0.5277	2674	0.0005	0.0010	0.0014	0.0016	0.0017	0.0017	0.0022	0.0029	0.0032
21	0.2612	0.5296	2719	0.0004	0.0010	0.0014	0.0016	0.0016	0.0017	0.0022	0.0028	0.0032
22	0.2589	0.5328	2753	0.0003	0.0007	0.0011	0.0013	0.0015	0.0015	0.0018	0.0025	0.0028
23	0.2587	0.5328	2757	0.0005	0.0010	0.0014	0.0015	0.0016	0.0019	0.0022	0.0029	0.0032
24	0.2641	0.5255	2675	0.0002	0.0003	0.0005	0.0006	0.0008	0.0007	0.0009	0.0016	0.0020
25	0.2614	0.5237	2739	0.0004	0.0009	0.0014	0.0016	0.0018	0.0021	0.0022	0.0029	0.0033
26	0.2630	0.5261	2694	0.0004	0.0006	0.0010	0.0011	0.0015	0.0016	0.0016	0.0024	0.0027
27	0.2638	0.5261	2677	0.0003	0.0008	0.0011	0.0014	0.0016	0.0018	0.0018	0.0024	0.0028
28	0.2626	0.5265	2702	0.0004	0.0008	0.0011	0.0015	0.0017	0.0019	0.0019	0.0025	0.0029
29	0.2633	0.5291	2677	0.0005	0.0009	0.0013	0.0014	0.0017	0.0020	0.0021	0.0027	0.0031
30	0.2582	0.5316	2772	0.0004	0.0009	0.0012	0.0016	0.0018	0.0020	0.0021	0.0027	0.0031
Ave.	0.2618	0.5283	2711	0.0003	0.0008	0.0011	0.0012	0.0015	0.0017	0.0020	0.0025	0.0028
Med.	0.2626	0.5283	2697	0.0003	0.0008	0.0012	0.0014	0.0015	0.0017	0.0020	0.0025	0.0030
st dev	0.0024	0.0024	45	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004
Min.	0.2551	0.5237	2646	0.0002	0.0003	0.0004	0.0006	0.0008	0.0007	0.0009	0.0014	0.0015
Max.	0.2649	0.5328	2844	0.0005	0.0010	0.0015	0.0016	0.0019	0.0021	0.0026	0.0029	0.0033



3.4 Data Set 2, 105°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	119.1	99.83	99.66	99.41	98.91	98.66	98.40	98.32	98.15	97.98
32	118.5	99.92	99.58	99.24	99.07	98.82	98.65	98.31	98.06	97.81
33	117.1	99.83	99.57	99.23	98.98	98.46	98.04	97.78	97.52	97.35
34	106.3	100.09	99.81	99.62	99.25	98.87	98.68	98.31	98.21	98.02
35	112.2	99.91	99.82	99.55	99.38	99.11	98.66	98.31	98.04	97.86
36	112.8	99.73	99.47	99.11	98.85	98.58	98.32	97.96	97.61	97.25
37	110.0	99.82	99.55	99.09	98.73	98.64	98.09	97.91	97.55	97.18
38	113.5	99.91	99.65	99.30	99.03	98.77	98.59	98.41	98.15	97.97
39	109.5	99.82	99.45	99.27	98.81	98.63	98.26	98.08	97.99	97.72
40	118.0	99.75	99.41	98.98	98.73	98.47	98.22	97.97	97.71	97.54
41	117.0	99.83	99.57	99.06	98.72	98.46	97.86	97.61	97.35	97.09
42	121.4	99.67	99.34	99.01	98.52	98.19	97.78	97.61	97.20	96.95
43	108.3	99.82	99.45	99.17	99.08	98.71	98.52	98.34	98.06	97.60
44	118.8	99.75	99.24	98.91	98.65	98.32	97.98	97.73	97.56	97.39
45	111.5	99.73	99.37	99.01	98.65	98.30	98.03	97.76	97.31	97.04
46	108.2	99.82	99.45	99.08	98.61	98.24	97.78	97.60	97.32	97.04
47	117.9	99.75	99.41	98.98	98.64	98.05	97.63	97.46	97.20	96.95
48	118.2	99.83	99.32	98.90	98.48	98.05	97.63	97.29	96.87	96.45
49	117.7	99.75	99.32	98.98	98.64	98.39	98.05	97.62	97.20	97.03
50	111.2	99.91	99.64	99.28	99.01	98.65	98.29	98.11	97.75	97.48
51	110.9	99.82	99.46	99.19	98.92	98.56	98.29	98.11	97.75	97.29
52	111.7	99.91	99.55	99.19	98.84	98.57	98.39	98.03	97.76	97.49
53	111.2	99.82	99.46	99.01	98.83	98.56	98.20	97.84	97.66	97.30
54	116.9	99.66	99.23	98.89	98.63	98.29	98.12	97.86	97.52	97.26
55	122.1	99.84	99.34	99.02	98.61	98.28	98.03	97.79	97.30	96.89
56	123.0	99.76	99.43	99.19	98.94	98.54	98.05	97.72	97.32	96.99
57	120.4	99.75	99.42	99.17	98.75	98.59	98.17	97.84	97.43	97.18
58	115.5	99.65	99.39	99.05	98.53	98.18	97.84	97.49	97.40	97.14
59	118.3	99.92	99.66	99.41	98.99	98.56	98.22	98.14	97.97	97.63
60	120.1	99.83	99.50	99.33	98.92	98.50	98.25	97.84	97.67	97.34
Ave.	115.2	99.81	99.48	99.15	98.82	98.50	98.17	97.90	97.62	97.34
Med.	117.0	99.82	99.46	99.14	98.82	98.55	98.19	97.85	97.58	97.30
st dev	4.6	0.0926	0.1475	0.1865	0.2169	0.2413	0.2903	0.2954	0.3459	0.3728
Min.	106.3	99.65	99.23	98.89	98.48	98.05	97.63	97.29	96.87	96.45
Max.	123.0	100.09	99.82	99.62	99.38	99.11	98.68	98.41	98.21	98.02

TM-21 Projection:

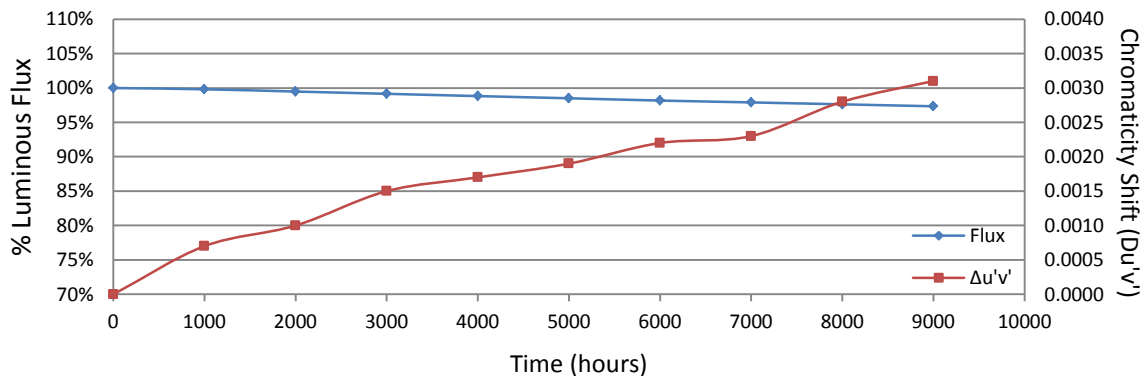
Test Duration: 9000 hours
Failures Observed: 0
 α : 3.004E-06
 β : 1.000
Reported L₇₀: >54000 hours

3.5 Data Set 2, 105°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	6.029	6.042	6.035	6.031	6.037	6.036	6.038	6.022	6.024	6.030
32	6.027	6.043	6.031	6.037	6.037	6.037	6.030	6.027	6.024	6.027
33	6.050	6.062	6.050	6.064	6.055	6.053	6.055	6.042	6.051	6.050
34	6.034	6.048	6.036	6.048	6.039	6.041	6.040	6.031	6.026	6.038
35	6.033	6.042	6.031	6.031	6.043	6.039	6.036	6.029	6.030	6.035
36	6.032	6.040	6.035	6.064	6.043	6.038	6.038	6.030	6.037	6.036
37	6.029	6.036	6.030	6.062	6.031	6.035	6.031	6.022	6.022	6.033
38	6.034	6.043	6.035	6.039	6.047	6.041	6.043	6.032	6.035	6.037
39	6.036	6.045	6.031	6.041	6.043	6.048	6.043	6.026	6.030	6.036
40	6.031	6.041	6.025	6.036	6.038	6.039	6.036	6.021	6.030	6.030
41	6.044	6.050	6.040	6.054	6.045	6.048	6.049	6.035	6.034	6.042
42	6.050	6.061	6.047	6.053	6.060	6.063	6.061	6.049	6.051	6.051
43	6.029	6.042	6.028	6.042	6.037	6.039	6.036	6.034	6.029	6.032
44	6.036	6.043	6.032	6.039	6.042	6.047	6.044	6.028	6.028	6.039
45	6.039	6.051	6.033	6.055	6.041	6.045	6.040	6.031	6.028	6.036
46	6.044	6.054	6.041	6.096	6.050	6.050	6.046	6.046	6.036	6.044
47	6.049	6.053	6.047	6.069	6.055	6.063	6.051	6.040	6.038	6.053
48	6.042	6.046	6.038	6.041	6.044	6.049	6.045	6.037	6.036	6.041
49	6.044	6.054	6.046	6.072	6.053	6.056	6.053	6.039	6.046	6.050
50	6.046	6.055	6.043	6.076	6.055	6.057	6.055	6.045	6.048	6.048
51	6.047	6.055	6.042	6.077	6.055	6.056	6.053	6.046	6.045	6.057
52	6.047	6.050	6.043	6.059	6.052	6.054	6.054	6.040	6.040	6.048
53	6.031	6.037	6.033	6.049	6.036	6.039	6.040	6.023	6.026	6.040
54	6.031	6.034	6.022	6.028	6.032	6.033	6.034	6.026	6.027	6.030
55	6.037	6.043	6.033	6.043	6.054	6.039	6.043	6.030	6.035	6.035
56	6.047	6.052	6.041	6.050	6.054	6.050	6.054	6.039	6.042	6.047
57	6.036	6.040	6.030	6.035	6.038	6.035	6.040	6.024	6.028	6.032
58	6.045	6.049	6.042	6.037	6.047	6.049	6.047	6.040	6.035	6.049
59	6.027	6.030	6.019	6.028	6.031	6.031	6.033	6.022	6.023	6.024
60	6.056	6.061	6.047	6.049	6.062	6.057	6.061	6.051	6.049	6.053
Ave.	6.039	6.047	6.036	6.050	6.045	6.046	6.044	6.034	6.034	6.040
Med.	6.037	6.046	6.035	6.049	6.044	6.046	6.043	6.032	6.035	6.039
st dev	0.008	0.008	0.008	0.017	0.009	0.009	0.009	0.009	0.009	0.009
Min.	6.027	6.030	6.019	6.028	6.031	6.031	6.030	6.021	6.022	6.024
Max.	6.056	6.062	6.050	6.096	6.062	6.063	6.061	6.051	6.051	6.057

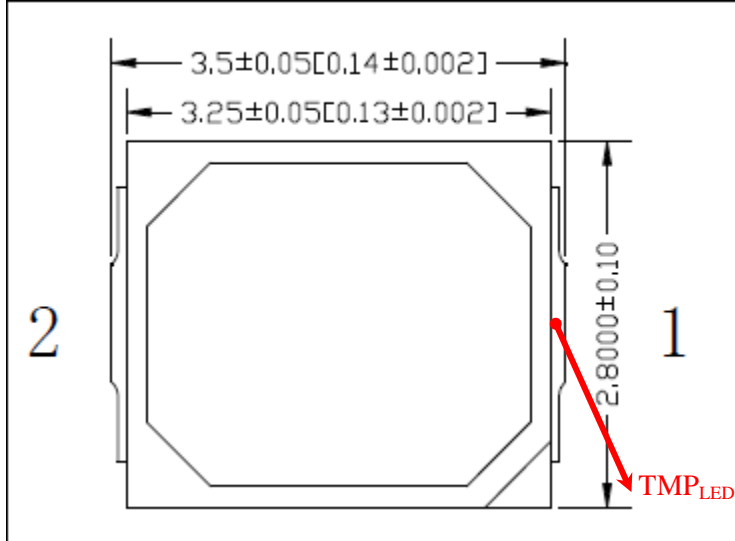
3.6 Data Set 2, 105°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
31	0.2589	0.5291	2767	0.0007	0.0011	0.0014	0.0014	0.0017	0.0020	0.0019	0.0027	0.0031
32	0.2600	0.5299	2742	0.0008	0.0012	0.0017	0.0015	0.0017	0.0018	0.0020	0.0028	0.0032
33	0.2586	0.5317	2763	0.0007	0.0011	0.0015	0.0017	0.0016	0.0017	0.0019	0.0027	0.0030
34	0.2620	0.5238	2724	0.0006	0.0010	0.0016	0.0016	0.0016	0.0021	0.0019	0.0027	0.0031
35	0.2624	0.5259	2707	0.0007	0.0010	0.0017	0.0016	0.0019	0.0021	0.0019	0.0027	0.0031
36	0.2627	0.5287	2691	0.0008	0.0011	0.0015	0.0016	0.0020	0.0021	0.0022	0.0027	0.0031
37	0.2651	0.5293	2640	0.0006	0.0009	0.0014	0.0016	0.0018	0.0020	0.0022	0.0027	0.0031
38	0.2648	0.5295	2645	0.0006	0.0008	0.0013	0.0014	0.0017	0.0018	0.0019	0.0025	0.0029
39	0.2628	0.5261	2699	0.0008	0.0011	0.0016	0.0017	0.0021	0.0023	0.0024	0.0030	0.0033
40	0.2593	0.5286	2762	0.0007	0.0011	0.0016	0.0018	0.0021	0.0021	0.0024	0.0029	0.0032
41	0.2591	0.5299	2762	0.0008	0.0011	0.0016	0.0017	0.0020	0.0025	0.0025	0.0029	0.0032
42	0.2591	0.5311	2755	0.0009	0.0012	0.0017	0.0018	0.0022	0.0026	0.0025	0.0030	0.0034
43	0.2641	0.5267	2670	0.0007	0.0010	0.0014	0.0014	0.0017	0.0021	0.0021	0.0027	0.0030
44	0.2590	0.5309	2759	0.0008	0.0011	0.0015	0.0017	0.0019	0.0022	0.0022	0.0028	0.0031
45	0.2626	0.5288	2692	0.0007	0.0010	0.0016	0.0016	0.0018	0.0021	0.0023	0.0027	0.0030
46	0.2611	0.5219	2753	0.0006	0.0009	0.0013	0.0015	0.0016	0.0020	0.0020	0.0025	0.0028
47	0.2612	0.5297	2718	0.0007	0.0011	0.0016	0.0019	0.0020	0.0023	0.0024	0.0030	0.0033
48	0.2590	0.5271	2775	0.0007	0.0011	0.0017	0.0019	0.0019	0.0024	0.0023	0.0028	0.0033
49	0.2592	0.5307	2755	0.0008	0.0011	0.0016	0.0018	0.0020	0.0024	0.0026	0.0028	0.0032
50	0.2613	0.5258	2732	0.0007	0.0011	0.0015	0.0016	0.0017	0.0021	0.0023	0.0025	0.0028
51	0.2642	0.5265	2669	0.0007	0.0010	0.0014	0.0016	0.0018	0.0022	0.0024	0.0027	0.0030
52	0.2603	0.5233	2764	0.0007	0.0011	0.0016	0.0017	0.0018	0.0021	0.0025	0.0028	0.0030
53	0.2600	0.5222	2775	0.0006	0.0010	0.0014	0.0016	0.0017	0.0020	0.0024	0.0026	0.0030
54	0.2548	0.5276	2866	0.0007	0.0010	0.0015	0.0018	0.0019	0.0022	0.0026	0.0028	0.0032
55	0.2584	0.5317	2768	0.0006	0.0009	0.0014	0.0017	0.0017	0.0020	0.0022	0.0026	0.0029
56	0.2589	0.5316	2757	0.0007	0.0011	0.0015	0.0019	0.0019	0.0022	0.0024	0.0026	0.0030
57	0.2585	0.5327	2761	0.0007	0.0010	0.0015	0.0016	0.0018	0.0022	0.0024	0.0031	0.0034
58	0.2589	0.5302	2764	0.0008	0.0011	0.0016	0.0018	0.0020	0.0024	0.0027	0.0028	0.0032
59	0.2590	0.5299	2762	0.0008	0.0011	0.0015	0.0019	0.0019	0.0023	0.0026	0.0027	0.0031
60	0.2589	0.5302	2763	0.0007	0.0011	0.0016	0.0020	0.0022	0.0025	0.0027	0.0030	0.0033
Ave.	0.2605	0.5284	2739	0.0007	0.0010	0.0015	0.0017	0.0019	0.0022	0.0023	0.0028	0.0031
Med.	0.2597	0.5292	2756	0.0007	0.0011	0.0015	0.0017	0.0019	0.0021	0.0024	0.0027	0.0031
st dev	0.0023	0.0029	46	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002
Min.	0.2548	0.5219	2640	0.0006	0.0008	0.0013	0.0014	0.0016	0.0017	0.0019	0.0025	0.0028
Max.	0.2651	0.5327	2866	0.0009	0.0012	0.0017	0.0020	0.0022	0.0026	0.0027	0.0031	0.0034



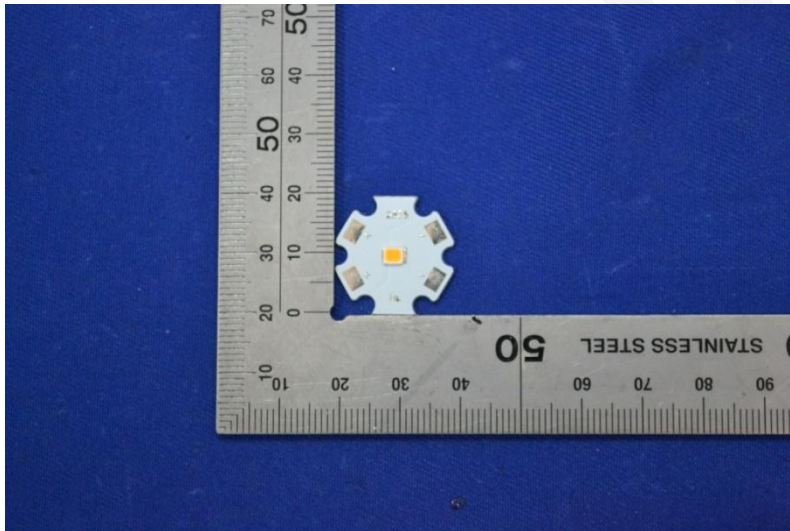
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



4.3 Report Revision

Report Number	Report Date	Contents
RSZ160826506-10-9000	2017-09-11	Original report.
RSZ160826506-10-9000-M1	2019-01-14	Update the Logo of lab on the Page1 Update Company name and address on page 1. Add DUT Characteristics on page 3 according to ENERGY STAR requirements Update the Family products on page 3

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