



TEST REPORT

According to ANSI/IES LM-80-15
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-AM-2835HVW-S1-08-HR3

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	RSZ171030502-10-M1		
Test Date:	2017-11-01 to 2018-11-19		
Report Date:	2019-01-14		
Revised Note:	The previous report RSZ171030502-10 is replaced by this report on 2019-01-14		
Reviewed By:	Daniel Duan / EE Engineer	<i>Daniel</i>	
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.		
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Accreditation:	The IAS Accreditation Number TL-460.		

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 2017-10-30. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-AM-2835HVW-S1-08-HR3
Part Type:	LED Package
Drive Level:	DC 30mA
Nominal CCT:	2700K
Power:	0.294W
Average Current Density per LED die:	184.3mA/mm ²
Average Power Density per LED die:	1.81W/mm ²
CRI:	80
Die Spacing:	N/A

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.

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- AM-2835HVW-S1-08-HR3	HL- AM-2835HVW-S1-08-HR3(R9)	Only different Model name for different market.
	HL- AM-2835HVW-S1-08HL-HR3	
	HL- AM-2835HVW-S1-08HL-HR3(R9)	

1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2018-03-18	2019-03-18
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2018-03-26	2019-03-26
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2018-03-18	2019-03-18
Standard Light Source	EVERFINE	D062	1011064	2018-01-15	2019-01-15
Precision digital stabilized DC power	EVERFINE	WY605-V110	G115987CJ7321114	2018-03-26	2019-03-26

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
supply					
Multilayer aging machine	BACL	B2-270	20015	2018-03-13	2019-03-13
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	2018-06-15	2019-06-15
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	2018-06-15	2019-06-15
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	2018-03-26	2019-03-26

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 $25^{\circ}C \pm 2^{\circ}C$, RH <65%.

1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate $u'v'$. 2π measurement was used and sample was driven by DC power supply. The forward current was regulated to within $\pm 0.5\%$ of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to $25^{\circ}C \pm 2^{\circ}C$, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

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 $U=21K$ ($K=2$), at the 95% confidence level.

The uncertainty of the temperature is $U=0.8671^{\circ}C$ ($K=2$), 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, 30mA

Part Number: HL-AM-2835HVW-S1-08-HR3
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 30mA
Measurement Current: 30mA

Data Set 2: 85°C, 30mA

Part Number: HL-AM-2835HVW-S1-08-HR3
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 30mA
Measurement Current: 30mA

Data Set 3: 105°C, 30mA

Part Number: HL-AM-2835HVW-S1-08-HR3
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 30mA
Measurement Current: 30mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	β	Reported TM-21 L ₇₀ Lifetime
1	25	0	1000hrs	9000hrs	3.175E-06	1.006	>54000
2	25	0	1000hrs	9000hrs	3.830E-06	1.006	>54000
3	25	0	1000hrs	9000hrs	4.401E-06	1.005	>54000

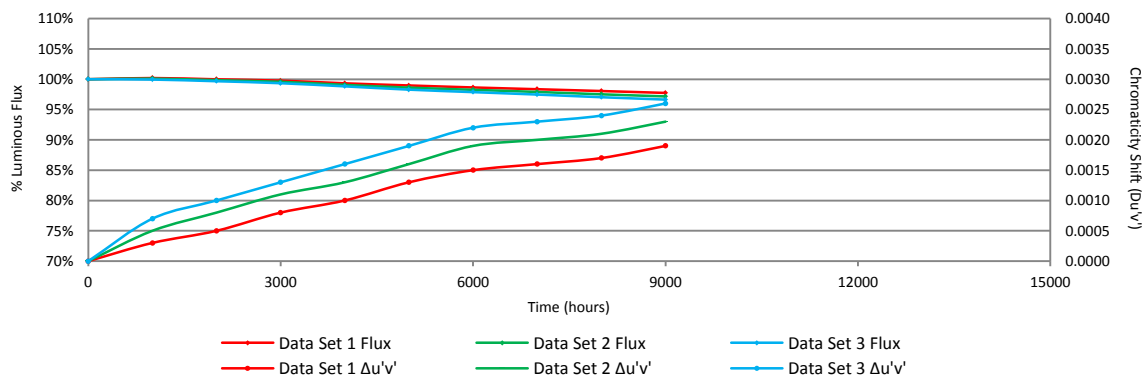
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.19%	99.98%	99.76%	99.32%	98.97%	98.64%	98.35%	98.05%	97.74%
2	100.09%	99.84%	99.57%	99.06%	98.61%	98.25%	97.90%	97.51%	97.16%
3	99.94%	99.67%	99.34%	98.82%	98.28%	97.87%	97.47%	97.03%	96.64%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0003	0.0005	0.0008	0.0010	0.0013	0.0015	0.0016	0.0017	0.0019
2	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0020	0.0021	0.0023
3	0.0007	0.001	0.0013	0.0016	0.0019	0.0022	0.0023	0.0024	0.0026

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 55°C, 30mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	38.57	100.23	99.97	99.79	99.43	99.07	98.73	98.31	97.95	97.72
2	37.99	100.08	99.92	99.68	99.50	99.11	98.82	98.37	98.21	97.84
3	38.31	100.16	100.05	99.82	99.30	99.14	98.77	98.41	98.23	98.04
4	38.59	100.08	100.03	99.74	99.43	99.07	98.78	98.55	97.98	97.64
5	38.74	100.23	99.87	99.74	99.28	98.89	98.68	98.53	98.24	97.96
6	38.49	100.13	99.82	99.61	99.25	98.83	98.47	98.34	98.00	97.77
7	37.90	100.26	100.05	99.84	99.26	98.92	98.60	98.36	98.07	97.76
8	38.72	100.23	100.10	99.79	99.28	98.79	98.42	98.06	97.96	97.47
9	38.29	100.34	100.24	99.90	99.32	98.82	98.54	98.25	97.86	97.62
10	36.44	100.19	100.03	99.73	99.37	99.07	98.57	98.52	98.27	97.80
11	37.99	100.13	99.92	99.68	99.24	98.84	98.50	98.39	97.92	97.50
12	38.88	100.36	100.15	99.97	99.56	99.20	98.71	98.25	97.89	97.56
13	38.22	100.34	100.16	99.97	99.74	99.37	99.08	98.46	98.22	98.01
14	37.65	100.24	100.05	99.89	99.36	99.15	98.91	98.70	98.35	98.17
15	38.71	100.05	99.82	99.61	99.15	98.79	98.53	98.32	97.83	97.42
16	38.25	100.24	99.92	99.61	99.22	98.80	98.48	98.01	97.83	97.52
17	38.63	100.18	99.84	99.51	98.94	98.52	98.16	98.03	97.95	97.70
18	38.64	100.26	100.10	99.97	99.59	99.17	98.81	98.40	97.96	97.57
19	37.24	100.16	99.95	99.92	99.27	98.95	98.71	98.34	98.07	97.77
20	38.55	100.34	100.13	99.95	99.66	99.35	99.20	98.91	98.83	98.57
21	36.75	100.33	100.16	99.84	99.48	99.27	98.91	98.42	98.23	98.01
22	38.43	100.23	100.10	99.97	99.64	99.22	98.80	98.54	98.13	97.76
23	38.30	100.03	99.82	99.56	99.03	98.69	98.49	98.30	97.91	97.55
24	37.75	99.92	99.60	99.21	98.70	98.46	98.17	97.93	97.75	97.43
25	38.51	100.13	99.77	99.58	99.04	98.65	98.21	97.92	97.64	97.40
Avg.	38.18	100.19	99.98	99.76	99.32	98.97	98.64	98.35	98.05	97.74
Med.	38.31	100.23	100.03	99.79	99.30	98.95	98.68	98.36	97.98	97.72
st dev	0.62	0.11	0.15	0.19	0.24	0.25	0.26	0.23	0.24	0.27
Min.	36.44	99.92	99.60	99.21	98.70	98.46	98.16	97.92	97.64	97.40
Max.	38.88	100.36	100.24	99.97	99.74	99.37	99.20	98.91	98.83	98.57

3.2 Data Set 1, 55°C, 30mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.365	9.373	9.405	9.379	9.354	9.375	9.340	9.361	9.334	9.377
2	9.411	9.411	9.454	9.415	9.397	9.384	9.398	9.412	9.380	9.425
3	9.286	9.296	9.340	9.304	9.291	9.268	9.276	9.296	9.265	9.313
4	9.315	9.318	9.353	9.328	9.310	9.297	9.293	9.320	9.374	9.331
5	9.443	9.450	9.483	9.445	9.425	9.425	9.425	9.441	9.413	9.460
6	9.311	9.327	9.366	9.327	9.304	9.304	9.311	9.324	9.283	9.337
7	9.307	9.309	9.348	9.310	9.302	9.282	9.299	9.300	9.273	9.324
8	9.304	9.301	9.306	9.317	9.298	9.285	9.296	9.303	9.312	9.319
9	9.300	9.322	9.351	9.327	9.305	9.296	9.291	9.312	9.277	9.332
10	9.422	9.440	9.471	9.432	9.407	9.408	9.415	9.425	9.492	9.443
11	9.354	9.365	9.404	9.377	9.355	9.338	9.341	9.367	9.348	9.380
12	9.369	9.395	9.419	9.390	9.354	9.353	9.350	9.368	9.357	9.389
13	9.415	9.435	9.456	9.431	9.406	9.391	9.395	9.416	9.384	9.429
14	9.409	9.433	9.462	9.427	9.397	9.400	9.395	9.418	9.411	9.433
15	9.356	9.378	9.396	9.370	9.334	9.336	9.342	9.364	9.325	9.370
16	9.277	9.285	9.311	9.276	9.270	9.260	9.263	9.282	9.248	9.270
17	9.375	9.404	9.426	9.399	9.373	9.369	9.362	9.385	9.348	9.400
18	9.347	9.374	9.393	9.365	9.334	9.333	9.329	9.348	9.323	9.367
19	9.261	9.281	9.312	9.285	9.262	9.246	9.252	9.270	9.235	9.288
20	9.391	9.404	9.425	9.400	9.372	9.366	9.377	9.382	9.357	9.400
21	9.323	9.339	9.361	9.332	9.309	9.295	9.304	9.323	9.288	9.334
22	9.363	9.379	9.404	9.372	9.348	9.338	9.342	9.357	9.315	9.377
23	9.373	9.392	9.410	9.383	9.356	9.342	9.341	9.374	9.331	9.386
24	9.386	9.409	9.430	9.403	9.377	9.364	9.370	9.393	9.354	9.403
25	9.321	9.335	9.368	9.339	9.314	9.306	9.309	9.325	9.286	9.343
Avg.	9.351	9.366	9.394	9.365	9.342	9.334	9.337	9.355	9.333	9.369
Med.	9.356	9.374	9.404	9.372	9.348	9.338	9.341	9.361	9.331	9.377
st dev	0.049	0.052	0.051	0.048	0.045	0.049	0.047	0.048	0.059	0.049
Min.	9.261	9.281	9.306	9.276	9.262	9.246	9.252	9.270	9.235	9.270
Max.	9.443	9.450	9.483	9.445	9.425	9.425	9.425	9.441	9.492	9.460

3.3 Data Set 1, 55°C, 30mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2595	0.5318	2745	0.0002	0.0004	0.0006	0.0010	0.0012	0.0014	0.0012	0.0016	0.0018
2	0.2591	0.5324	2749	0.0003	0.0005	0.0007	0.0010	0.0012	0.0015	0.0015	0.0018	0.0019
3	0.2615	0.5317	2704	0.0002	0.0004	0.0005	0.0009	0.0011	0.0014	0.0013	0.0018	0.0017
4	0.2588	0.5321	2757	0.0002	0.0004	0.0007	0.0010	0.0013	0.0015	0.0014	0.0017	0.0019
5	0.2606	0.5315	2722	0.0003	0.0004	0.0006	0.0009	0.0010	0.0013	0.0014	0.0016	0.0018
6	0.2591	0.5320	2752	0.0004	0.0005	0.0009	0.0011	0.0014	0.0015	0.0020	0.0024	0.0025
7	0.2610	0.5296	2721	0.0003	0.0006	0.0008	0.0010	0.0013	0.0014	0.0016	0.0019	0.0021
8	0.2568	0.5305	2807	0.0003	0.0006	0.0008	0.0011	0.0015	0.0016	0.0019	0.0020	0.0022
9	0.2551	0.5317	2839	0.0004	0.0006	0.0009	0.0011	0.0014	0.0015	0.0018	0.0021	0.0022
10	0.2574	0.5294	2800	0.0002	0.0004	0.0006	0.0008	0.0011	0.0013	0.0014	0.0018	0.0019
11	0.2617	0.5318	2699	0.0007	0.0009	0.0013	0.0014	0.0018	0.0019	0.0021	0.0021	0.0023
12	0.2598	0.5315	2739	0.0002	0.0005	0.0009	0.0011	0.0014	0.0017	0.0019	0.0021	0.0023
13	0.2596	0.5297	2750	0.0001	0.0004	0.0008	0.0009	0.0011	0.0014	0.0017	0.0018	0.0019
14	0.2580	0.5288	2790	0.0003	0.0006	0.0009	0.0011	0.0013	0.0016	0.0014	0.0017	0.0019
15	0.2603	0.5302	2735	0.0003	0.0006	0.0009	0.0014	0.0012	0.0015	0.0013	0.0017	0.0020
16	0.2586	0.5293	2773	0.0003	0.0006	0.0009	0.0010	0.0012	0.0016	0.0015	0.0011	0.0012
17	0.2587	0.5307	2766	0.0003	0.0005	0.0009	0.0011	0.0012	0.0015	0.0016	0.0019	0.0021
18	0.2558	0.5286	2839	0.0003	0.0005	0.0009	0.0010	0.0012	0.0015	0.0018	0.0017	0.0019
19	0.2556	0.5282	2844	0.0003	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016	0.0018	0.0021
20	0.2600	0.5316	2735	0.0002	0.0005	0.0007	0.0009	0.0012	0.0013	0.0018	0.0013	0.0016
21	0.2568	0.5307	2806	0.0005	0.0008	0.0010	0.0013	0.0015	0.0017	0.0021	0.0020	0.0023
22	0.2580	0.5297	2786	0.0003	0.0006	0.0009	0.0011	0.0013	0.0015	0.0014	0.0014	0.0016
23	0.2591	0.5298	2760	0.0002	0.0005	0.0008	0.0010	0.0011	0.0014	0.0013	0.0013	0.0014
24	0.2600	0.5295	2743	0.0002	0.0005	0.0007	0.0009	0.0011	0.0014	0.0012	0.0015	0.0017
25	0.2605	0.5306	2729	0.0003	0.0006	0.0009	0.0012	0.0012	0.0015	0.0013	0.0014	0.0017
Avg.	0.2589	0.5305	2764	0.0003	0.0005	0.0008	0.0010	0.0013	0.0015	0.0016	0.0017	0.0019
Med.	0.2591	0.5306	2752	0.0003	0.0005	0.0008	0.0010	0.0012	0.0015	0.0015	0.0018	0.0019
st dev	0.0018	0.0012	41	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0003	0.0003	0.0003
Min.	0.2551	0.5282	2699	0.0001	0.0004	0.0005	0.0008	0.0010	0.0013	0.0012	0.0011	0.0012
Max.	0.2617	0.5324	2844	0.0007	0.0009	0.0013	0.0014	0.0018	0.0019	0.0021	0.0024	0.0025

3.4 Data Set 2, 85°C, 30mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	38.40	100.03	99.71	99.48	99.04	98.59	98.36	97.97	97.53	97.27
27	38.32	99.95	99.84	99.50	98.85	98.49	98.12	97.65	97.44	97.08
28	38.43	100.26	100.10	99.71	99.30	98.93	98.70	98.54	97.92	97.58
29	38.51	99.90	99.74	99.48	98.88	98.36	98.05	97.53	97.35	97.12
30	37.88	100.11	99.79	99.55	99.26	98.86	98.42	98.07	97.78	97.33
31	38.15	100.10	99.87	99.66	99.16	98.82	98.43	98.30	97.93	97.59
32	38.77	100.13	99.82	99.54	98.99	98.58	98.27	97.83	97.29	96.85
33	38.28	100.18	99.90	99.71	99.27	98.75	98.38	98.17	97.83	97.47
34	38.72	99.92	99.64	99.35	98.68	98.19	97.83	97.65	97.11	96.77
35	38.13	100.13	100.05	99.69	99.16	98.61	98.30	98.06	97.61	97.19
36	38.64	99.84	99.53	99.25	98.76	98.21	97.98	97.49	97.23	97.02
37	38.72	100.13	99.85	99.48	98.99	98.42	98.14	97.70	97.49	97.11
38	37.08	100.16	99.95	99.70	99.33	98.87	98.49	98.33	97.98	97.63
39	37.62	100.21	99.92	99.63	99.28	98.64	98.22	97.55	97.24	97.02
40	37.49	100.08	99.79	99.49	98.85	98.45	98.00	97.79	97.09	96.75
41	37.84	100.21	99.84	99.68	99.02	98.73	98.39	97.94	97.57	97.15
42	38.71	100.03	99.85	99.61	99.17	98.66	98.35	97.86	97.29	97.00
43	38.27	100.24	100.05	99.82	99.14	98.80	98.43	98.33	97.86	97.49
44	38.67	100.10	99.90	99.69	99.22	98.78	98.37	98.27	97.93	97.67
45	37.32	100.29	100.08	99.81	99.33	98.95	98.58	97.99	97.43	97.13
46	38.91	100.05	99.69	99.36	98.66	98.12	97.64	97.12	97.04	96.79
47	37.44	100.16	99.81	99.60	99.07	98.77	98.37	97.94	97.20	96.85
48	38.02	99.92	99.61	99.37	98.92	98.42	98.05	97.55	97.11	96.82
49	38.54	100.13	99.95	99.71	99.20	98.70	98.29	98.03	97.64	97.12
50	38.27	99.90	99.71	99.45	99.03	98.46	98.07	97.88	97.78	97.23
Avg.	38.21	100.09	99.84	99.57	99.06	98.61	98.25	97.90	97.51	97.16
Med.	38.28	100.11	99.84	99.60	99.07	98.64	98.30	97.94	97.49	97.12
st dev	0.50	0.12	0.15	0.15	0.20	0.23	0.24	0.33	0.31	0.28
Min.	37.08	99.84	99.53	99.25	98.66	98.12	97.64	97.12	97.04	96.75
Max.	38.91	100.29	100.10	99.82	99.33	98.95	98.70	98.54	97.98	97.67

3.5 Data Set 2, 85°C, 30mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	9.374	9.403	9.427	9.410	9.369	9.352	9.359	9.380	9.344	9.402
27	9.415	9.431	9.454	9.437	9.391	9.401	9.401	9.412	9.371	9.428
28	9.431	9.435	9.470	9.450	9.414	9.398	9.415	9.425	9.392	9.445
29	9.327	9.340	9.366	9.351	9.312	9.305	9.311	9.315	9.288	9.340
30	9.390	9.403	9.427	9.401	9.378	9.369	9.379	9.395	9.346	9.401
31	9.352	9.364	9.389	9.377	9.341	9.320	9.342	9.349	9.309	9.364
32	9.369	9.382	9.406	9.385	9.346	9.349	9.352	9.363	9.336	9.384
33	9.367	9.393	9.416	9.393	9.364	9.351	9.357	9.376	9.346	9.392
34	9.409	9.410	9.445	9.434	9.398	9.390	9.399	9.404	9.411	9.423
35	9.425	9.437	9.472	9.450	9.422	9.404	9.427	9.434	9.394	9.452
36	9.338	9.362	9.387	9.363	9.329	9.332	9.342	9.345	9.313	9.367
37	9.404	9.415	9.437	9.415	9.387	9.380	9.392	9.398	9.357	9.416
38	9.423	9.435	9.474	9.457	9.418	9.414	9.424	9.428	9.428	9.446
39	9.340	9.344	9.378	9.351	9.326	9.314	9.322	9.344	9.334	9.357
40	9.388	9.388	9.463	9.402	9.363	9.369	9.378	9.392	9.352	9.401
41	9.447	9.455	9.491	9.472	9.419	9.422	9.428	9.447	9.407	9.461
42	9.378	9.393	9.435	9.415	9.372	9.367	9.376	9.390	9.354	9.405
43	9.419	9.444	9.474	9.453	9.402	9.409	9.415	9.427	9.392	9.446
44	9.337	9.352	9.394	9.359	9.326	9.325	9.339	9.351	9.317	9.367
45	9.398	9.413	9.444	9.421	9.379	9.384	9.383	9.401	9.363	9.420
46	9.373	9.394	9.430	9.397	9.376	9.360	9.374	9.384	9.389	9.407
47	9.394	9.400	9.439	9.408	9.378	9.380	9.385	9.393	9.361	9.417
48	9.334	9.338	9.367	9.335	9.311	9.317	9.325	9.354	9.306	9.346
49	9.379	9.384	9.417	9.394	9.366	9.359	9.369	9.384	9.342	9.393
50	9.418	9.416	9.457	9.436	9.400	9.400	9.408	9.415	9.419	9.432
Avg.	9.385	9.397	9.430	9.407	9.371	9.367	9.376	9.388	9.359	9.404
Med.	9.388	9.400	9.435	9.408	9.376	9.369	9.378	9.392	9.354	9.405
st dev	0.034	0.033	0.036	0.037	0.033	0.034	0.034	0.033	0.038	0.034
Min.	9.327	9.338	9.366	9.335	9.311	9.305	9.311	9.315	9.288	9.340
Max.	9.447	9.455	9.491	9.472	9.422	9.422	9.428	9.447	9.428	9.461

3.6 Data Set 2, 85°C, 30mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2600	0.5305	2738	0.0004	0.0007	0.0009	0.0010	0.0014	0.0017	0.0017	0.0015	0.0017
27	0.2549	0.5289	2856	0.0004	0.0007	0.0010	0.0010	0.0014	0.0017	0.0018	0.0021	0.0022
28	0.2573	0.5307	2796	0.0003	0.0006	0.0010	0.0010	0.0012	0.0016	0.0016	0.0018	0.0021
29	0.2597	0.5310	2744	0.0004	0.0007	0.0010	0.0013	0.0014	0.0017	0.0023	0.0026	0.0028
30	0.2572	0.5290	2806	0.0008	0.0010	0.0013	0.0017	0.0019	0.0020	0.0020	0.0021	0.0024
31	0.2583	0.5294	2779	0.0002	0.0005	0.0007	0.0009	0.0013	0.0015	0.0015	0.0020	0.0021
32	0.2613	0.5313	2709	0.0004	0.0008	0.0010	0.0013	0.0016	0.0018	0.0019	0.0021	0.0023
33	0.2602	0.5315	2730	0.0006	0.0009	0.0011	0.0014	0.0019	0.0021	0.0017	0.0016	0.0018
34	0.2599	0.5328	2731	0.0006	0.0005	0.0011	0.0013	0.0017	0.0021	0.0020	0.0020	0.0022
35	0.2583	0.5322	2768	0.0005	0.0007	0.0010	0.0013	0.0016	0.0019	0.0018	0.0019	0.0021
36	0.2605	0.5328	2718	0.0005	0.0008	0.0011	0.0015	0.0018	0.0021	0.0021	0.0020	0.0022
37	0.2575	0.5314	2788	0.0011	0.0011	0.0010	0.0014	0.0017	0.0021	0.0019	0.0019	0.0021
38	0.2584	0.5316	2768	0.0008	0.0010	0.0013	0.0014	0.0018	0.0022	0.0020	0.0021	0.0022
39	0.2590	0.5319	2754	0.0004	0.0007	0.0010	0.0013	0.0017	0.0020	0.0020	0.0021	0.0021
40	0.2568	0.5257	2830	0.0004	0.0007	0.0010	0.0013	0.0016	0.0021	0.0022	0.0027	0.0029
41	0.2561	0.5297	2825	0.0006	0.0007	0.0011	0.0013	0.0016	0.0019	0.0023	0.0024	0.0025
42	0.2577	0.5314	2783	0.0004	0.0007	0.0010	0.0013	0.0015	0.0019	0.0018	0.0021	0.0022
43	0.2567	0.5286	2819	0.0006	0.0009	0.0012	0.0015	0.0017	0.0021	0.0020	0.0025	0.0027
44	0.2615	0.5318	2703	0.0005	0.0007	0.0010	0.0012	0.0015	0.0020	0.0020	0.0022	0.0024
45	0.2574	0.5290	2801	0.0005	0.0007	0.0010	0.0014	0.0015	0.0020	0.0020	0.0022	0.0024
46	0.2619	0.5320	2694	0.0002	0.0007	0.0009	0.0013	0.0015	0.0018	0.0018	0.0019	0.0020
47	0.2569	0.5290	2813	0.0005	0.0007	0.0010	0.0014	0.0015	0.0020	0.0017	0.0021	0.0023
48	0.2586	0.5309	2767	0.0006	0.0009	0.0011	0.0016	0.0018	0.0021	0.0020	0.0021	0.0024
49	0.2622	0.5307	2693	0.0005	0.0007	0.0011	0.0015	0.0017	0.0021	0.0022	0.0022	0.0024
50	0.2562	0.5301	2822	0.0007	0.0010	0.0013	0.0016	0.0017	0.0022	0.0025	0.0024	0.0025
Avg.	0.2586	0.5306	2769	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0020	0.0021	0.0023
Med.	0.2583	0.5309	2768	0.0005	0.0007	0.0010	0.0013	0.0016	0.0020	0.0020	0.0021	0.0022
st dev	0.0020	0.0016	47	0.0002	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2549	0.5257	2693	0.0002	0.0005	0.0007	0.0009	0.0012	0.0015	0.0015	0.0015	0.0017
Max.	0.2622	0.5328	2856	0.0011	0.0011	0.0013	0.0017	0.0019	0.0022	0.0025	0.0027	0.0029

3.7 Data Set 3, 105°C, 30mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	38.38	100.08	99.84	99.61	99.04	98.49	98.15	97.73	97.52	97.24
52	38.38	99.92	99.53	99.17	98.67	98.05	97.81	97.34	96.95	96.77
53	38.51	99.82	99.56	99.14	98.86	98.36	98.00	97.64	97.20	96.91
54	37.79	100.13	99.76	99.52	98.99	98.49	98.07	97.64	97.46	97.20
55	38.30	99.92	99.77	99.35	98.77	98.30	97.86	97.68	97.13	96.66
56	38.46	99.87	99.66	99.32	98.73	98.10	97.63	97.19	96.62	96.13
57	37.73	99.79	99.60	99.36	98.62	98.28	97.83	97.54	97.08	96.55
58	38.55	99.97	99.64	99.30	98.96	98.34	97.90	97.67	97.15	96.73
59	38.54	99.92	99.58	99.25	98.60	98.13	97.87	97.66	97.22	96.83
60	37.13	100.19	100.03	99.84	99.25	98.68	98.30	97.60	97.31	96.93
61	38.27	99.76	99.50	99.22	98.75	98.17	97.67	97.10	96.50	96.19
62	38.88	99.85	99.56	99.15	98.77	98.41	97.76	97.43	96.84	96.32
63	38.94	100.13	99.85	99.56	99.02	98.51	98.10	97.84	97.43	97.05
64	38.29	100.08	99.84	99.53	99.09	98.51	98.09	97.62	97.00	96.58
65	38.57	99.69	99.40	99.20	98.60	98.26	98.03	97.90	97.56	97.10
66	38.64	99.82	99.48	99.20	98.71	98.16	97.83	97.72	97.18	96.92
67	38.35	100.13	99.95	99.53	98.96	98.44	97.91	97.39	96.79	96.32
68	37.43	99.89	99.65	99.31	98.66	98.10	97.65	97.36	96.74	96.26
69	38.05	100.16	99.84	99.55	99.16	98.55	98.11	97.50	96.98	96.61
70	38.74	99.92	99.61	99.30	98.74	98.35	97.88	97.24	96.70	96.31
71	38.64	99.84	99.64	99.09	98.63	97.85	97.54	97.08	96.69	96.25
72	38.37	99.92	99.61	99.35	98.59	97.94	97.58	97.37	97.05	96.66
73	38.87	99.97	99.74	99.43	98.87	98.20	97.92	97.32	97.02	96.68
74	38.17	99.95	99.69	99.24	98.77	98.06	97.59	97.07	96.65	96.18
75	38.21	99.69	99.45	99.06	98.64	98.14	97.67	97.04	97.02	96.52
Avg.	38.33	99.94	99.67	99.34	98.82	98.28	97.87	97.47	97.03	96.64
Med.	38.38	99.92	99.64	99.31	98.77	98.28	97.87	97.50	97.02	96.66
st dev	0.44	0.14	0.16	0.19	0.19	0.21	0.20	0.25	0.29	0.33
Min.	37.13	99.69	99.40	99.06	98.59	97.85	97.54	97.04	96.50	96.13
Max.	38.94	100.19	100.03	99.84	99.25	98.68	98.30	97.90	97.56	97.24

3.8 Data Set 3, 105°C, 30mA (Forward Voltage)

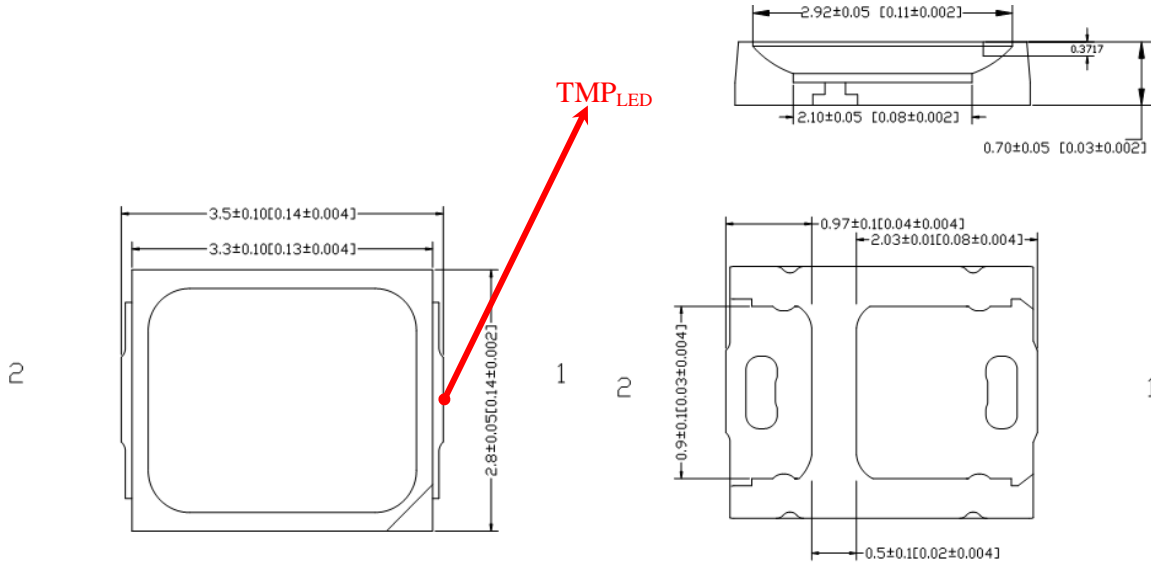
No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	9.396	9.415	9.448	9.426	9.393	9.387	9.406	9.409	9.375	9.419
52	9.311	9.323	9.363	9.342	9.311	9.294	9.308	9.324	9.354	9.338
53	9.421	9.432	9.465	9.436	9.412	9.393	9.412	9.425	9.396	9.440
54	9.403	9.401	9.444	9.425	9.397	9.390	9.383	9.414	9.377	9.425
55	9.402	9.427	9.459	9.439	9.398	9.401	9.403	9.420	9.390	9.436
56	9.395	9.415	9.450	9.417	9.397	9.379	9.384	9.413	9.377	9.425
57	9.409	9.424	9.460	9.430	9.410	9.399	9.391	9.421	9.382	9.435
58	9.365	9.372	9.409	9.385	9.348	9.347	9.338	9.371	9.338	9.383
59	9.276	9.285	9.339	9.297	9.279	9.272	9.273	9.291	9.256	9.306
60	9.417	9.414	9.464	9.435	9.399	9.398	9.394	9.416	9.388	9.436
61	9.415	9.426	9.458	9.436	9.404	9.396	9.394	9.415	9.382	9.435
62	9.303	9.316	9.346	9.312	9.298	9.291	9.289	9.304	9.271	9.327
63	9.350	9.363	9.406	9.387	9.349	9.351	9.353	9.364	9.331	9.387
64	9.408	9.431	9.468	9.428	9.422	9.394	9.403	9.418	9.390	9.438
65	9.427	9.429	9.476	9.449	9.428	9.413	9.414	9.429	9.398	9.449
66	9.354	9.367	9.401	9.365	9.345	9.343	9.343	9.358	9.334	9.378
67	9.286	9.294	9.326	9.304	9.272	9.265	9.278	9.294	9.250	9.308
68	9.409	9.408	9.452	9.428	9.392	9.397	9.397	9.414	9.375	9.427
69	9.311	9.330	9.359	9.337	9.319	9.313	9.313	9.320	9.294	9.337
70	9.404	9.402	9.447	9.422	9.401	9.380	9.393	9.405	9.373	9.412
71	9.416	9.402	9.449	9.410	9.397	9.393	9.387	9.416	9.377	9.413
72	9.416	9.422	9.453	9.431	9.409	9.394	9.408	9.421	9.382	9.422
73	9.452	9.448	9.486	9.462	9.440	9.428	9.440	9.447	9.415	9.454
74	9.431	9.424	9.469	9.441	9.423	9.403	9.405	9.429	9.390	9.429
75	9.266	9.256	9.296	9.273	9.260	9.240	9.246	9.264	9.231	9.269
Avg.	9.378	9.385	9.424	9.397	9.372	9.362	9.366	9.384	9.353	9.397
Med.	9.403	9.408	9.449	9.425	9.397	9.390	9.391	9.414	9.377	9.422
st dev	0.054	0.054	0.054	0.054	0.053	0.053	0.053	0.053	0.052	0.052
Min.	9.266	9.256	9.296	9.273	9.260	9.240	9.246	9.264	9.231	9.269
Max.	9.452	9.448	9.486	9.462	9.440	9.428	9.440	9.447	9.415	9.454

3.9 Data Set 3, 105°C, 30mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2614	0.5309	2709	0.0006	0.0010	0.0013	0.0015	0.0018	0.0021	0.0020	0.0023	0.0024
52	0.2594	0.5318	2746	0.0005	0.0009	0.0012	0.0016	0.0018	0.0021	0.0023	0.0023	0.0025
53	0.2578	0.5318	2779	0.0006	0.0010	0.0013	0.0015	0.0018	0.0022	0.0023	0.0024	0.0026
54	0.2616	0.5309	2704	0.0007	0.0011	0.0014	0.0017	0.0021	0.0023	0.0022	0.0023	0.0026
55	0.2560	0.5290	2831	0.0006	0.0009	0.0012	0.0015	0.0019	0.0022	0.0019	0.0022	0.0024
56	0.2563	0.5318	2812	0.0008	0.0011	0.0013	0.0016	0.0020	0.0023	0.0026	0.0025	0.0027
57	0.2556	0.5284	2843	0.0007	0.0010	0.0013	0.0017	0.0021	0.0024	0.0024	0.0025	0.0026
58	0.2594	0.5321	2745	0.0007	0.0010	0.0013	0.0016	0.0019	0.0022	0.0024	0.0024	0.0026
59	0.2568	0.5321	2799	0.0006	0.0010	0.0013	0.0016	0.0018	0.0021	0.0024	0.0025	0.0026
60	0.2595	0.5317	2745	0.0005	0.0008	0.0010	0.0013	0.0016	0.0019	0.0021	0.0023	0.0024
61	0.2556	0.5284	2843	0.0005	0.0009	0.0011	0.0015	0.0019	0.0022	0.0022	0.0023	0.0026
62	0.2602	0.5303	2735	0.0006	0.0011	0.0014	0.0017	0.0019	0.0022	0.0023	0.0025	0.0027
63	0.2588	0.5307	2764	0.0007	0.0010	0.0013	0.0017	0.0019	0.0022	0.0022	0.0024	0.0025
64	0.2566	0.5310	2809	0.0008	0.0011	0.0014	0.0016	0.0020	0.0022	0.0025	0.0025	0.0027
65	0.2592	0.5292	2762	0.0006	0.0009	0.0013	0.0016	0.0019	0.0022	0.0024	0.0025	0.0026
66	0.2572	0.5293	2803	0.0006	0.0010	0.0013	0.0014	0.0018	0.0021	0.0021	0.0023	0.0025
67	0.2586	0.5325	2760	0.0006	0.0009	0.0013	0.0016	0.0018	0.0021	0.0023	0.0024	0.0025
68	0.2585	0.5291	2777	0.0007	0.0011	0.0014	0.0016	0.0018	0.0022	0.0028	0.0030	0.0031
69	0.2609	0.5306	2720	0.0004	0.0009	0.0012	0.0014	0.0016	0.0020	0.0023	0.0028	0.0029
70	0.2570	0.5305	2802	0.0008	0.0010	0.0014	0.0016	0.0018	0.0022	0.0024	0.0023	0.0025
71	0.2595	0.5304	2751	0.0008	0.0012	0.0015	0.0017	0.0019	0.0023	0.0024	0.0023	0.0025
72	0.2581	0.5331	2768	0.0007	0.0010	0.0013	0.0016	0.0018	0.0021	0.0024	0.0022	0.0023
73	0.2604	0.5323	2723	0.0006	0.0009	0.0013	0.0015	0.0018	0.0021	0.0024	0.0023	0.0024
74	0.2574	0.5321	2788	0.0008	0.0011	0.0015	0.0016	0.0019	0.0022	0.0025	0.0025	0.0026
75	0.2585	0.5273	2786	0.0009	0.0011	0.0015	0.0017	0.0020	0.0023	0.0024	0.0026	0.0029
Avg.	0.2584	0.5307	2772	0.0007	0.0010	0.0013	0.0016	0.0019	0.0022	0.0023	0.0024	0.0026
Med.	0.2585	0.5309	2768	0.0006	0.0010	0.0013	0.0016	0.0019	0.0022	0.0024	0.0024	0.0026
st dev	0.0018	0.0015	40	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
Min.	0.2556	0.5273	2704	0.0004	0.0008	0.0010	0.0013	0.0016	0.0019	0.0019	0.0022	0.0023
Max.	0.2616	0.5331	2843	0.0009	0.0012	0.0015	0.0017	0.0021	0.0024	0.0028	0.0030	0.0031

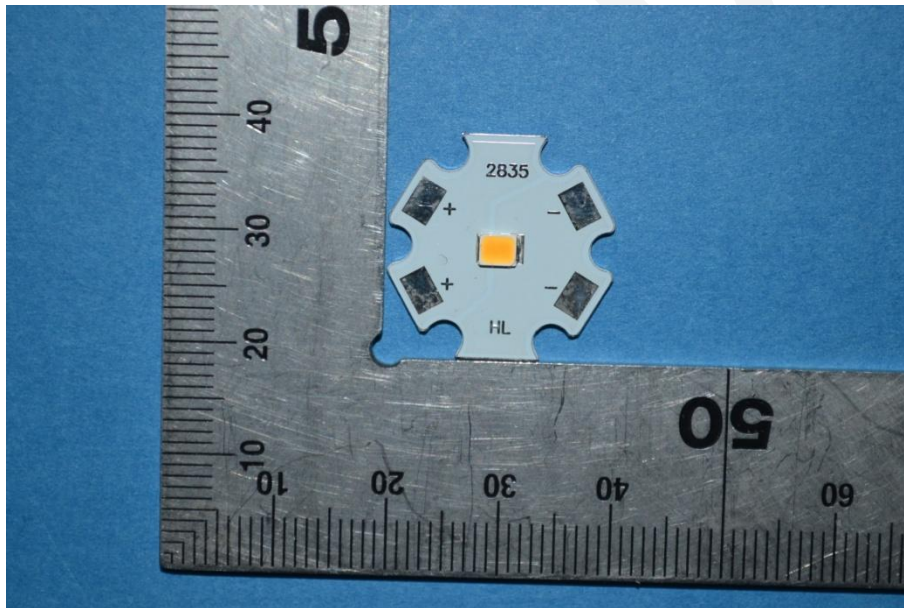
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



4.3 Report Revision

Report Number	Report Date	Contents
RSZ160329508-10	2017-05-05	Original report.
RSZ160329508-10-M1	2019-01-14	Update Company name and address on page 1. Update the Family products on page 3

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

FINAL