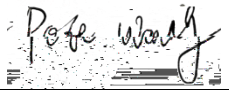
TEST REPORT

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-A-2835HW-2-S1-08L-HR3

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Pote Wang 
Report Number:	RSZ161206501-10-9000-M2
Test Date:	2016-12-08 to 2017-12-18
Report Date:	2019-01-14
Reviewed By:	Daniel Duan / EE Manager
Revised Note:	The previous report RSZ161206501-10-9000-M1 is replaced by this report on 2019-01-14
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

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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	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2017-03-03	2018-03-03
Multilayer aging machine	BACL	B2-270	20015	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	2017-03-03	2018-03-03

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	2017-03-03	2018-03-03

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 ±3% of the specified value of the manufacturer during maintenance test, and was within ±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 $_{LED}$)
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
.

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within ±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°C ± 2°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*. 2 measurement was used and sample was drived by DC power supply. Luminous flux and chromaticity coordinate was scaled by halogen reference lamp. The ambient temperature during test was set to 25°C ± 2°C, RH <65%.

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°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, 65mA

Part Number:	HL-A-2835HW-2-S1-08L-HR3
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	65mA
Measurement Current:	65mA

Data Set 2: 85°C,65mA

Part Number:	HL-A-2835HW-2-S1-08L-HR3
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	65mA
Measurement Current:	65mA

Data Set 3: 105°C,65mA

Part Number:	HL-A-2835HW-2-S1-08L-HR3
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	65mA
Measurement Current:	65mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval (hours)	Test Duration (hours)	Reported TM-21 L_{70} Lifetime	Reported TM-21 L_{90} Lifetime
1	25	0	1000	9000	>54000 hours	>54000 hours
2	25	0	1000	9000	>54000 hours	44000 hours
3	25	0	1000	9000	>54000 hours	38000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.32%	100.16%	99.97%	99.79%	99.61%	99.44%	99.27%	99.08%	98.86%
2	100.10%	99.88%	99.65%	99.41%	99.17%	98.93%	98.70%	98.45%	98.18%
3	99.91%	99.61%	99.33%	99.04%	98.77%	98.48%	98.22%	97.93%	97.63%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0002	0.0003	0.0006	0.0007	0.0009	0.0011	0.0013	0.0017	0.0021
2	0.0004	0.0007	0.0008	0.0010	0.0013	0.0014	0.0016	0.0019	0.0023
3	0.0008	0.0013	0.0015	0.0017	0.0019	0.0019	0.0021	0.0024	0.0027

3.2 Data Set 1, 55°C, 65mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	2.736	2.737	2.754	2.739	2.739	2.736	2.736	2.737	2.736	2.739
2	2.749	2.751	2.758	2.749	2.751	2.749	2.748	2.749	2.750	2.751
3	2.748	2.749	2.756	2.747	2.749	2.748	2.747	2.747	2.748	2.751
4	2.740	2.741	2.747	2.739	2.742	2.739	2.740	2.742	2.742	2.744
5	2.743	2.744	2.745	2.742	2.744	2.742	2.742	2.745	2.744	2.744
6	2.740	2.742	2.745	2.741	2.745	2.741	2.743	2.744	2.743	2.743
7	2.734	2.736	2.742	2.734	2.736	2.735	2.733	2.737	2.738	2.736
8	2.747	2.748	2.753	2.747	2.750	2.747	2.746	2.749	2.747	2.748
9	2.738	2.740	2.745	2.738	2.741	2.739	2.738	2.740	2.739	2.740
10	2.735	2.736	2.740	2.735	2.741	2.735	2.735	2.737	2.736	2.737
11	2.738	2.740	2.746	2.739	2.740	2.738	2.739	2.739	2.740	2.739
12	2.737	2.739	2.743	2.739	2.739	2.737	2.741	2.738	2.739	2.739
13	2.738	2.740	2.744	2.739	2.740	2.739	2.738	2.739	2.744	2.739
14	2.737	2.739	2.745	2.746	2.739	2.738	2.737	2.742	2.793	2.739
15	2.735	2.738	2.742	2.737	2.739	2.736	2.739	2.740	2.746	2.739
16	2.739	2.741	2.745	2.740	2.743	2.740	2.739	2.743	2.742	2.742
17	2.740	2.742	2.745	2.739	2.742	2.740	2.740	2.745	2.744	2.742
18	2.741	2.745	2.748	2.746	2.745	2.743	2.742	2.744	2.756	2.745
19	2.736	2.739	2.744	2.739	2.739	2.737	2.736	2.740	2.760	2.740
20	2.740	2.743	2.746	2.742	2.743	2.740	2.739	2.743	2.741	2.744

3.3 Data Set 1, 55°C, 65mA (Chromaticity Shift) 0.0009

No.			CCT(K)									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2563	0.5291	2824	0.0005	0.0006	0.0006	0.0008	0.0011	0.0014	0.0020	0.0022	0.0025
2	0.2584	0.5343	2756	0.0001	0.0002	0.0004	0.0006	0.0008	0.0010	0.0014	0.0018	0.0021
3	0.2579	0.5323	2775	0.0001	0.0002	0.0006	0.0008	0.0009	0.0011	0.0015	0.0017	0.0022
4	0.2579	0.5321	2776	0.0001	0.0002	0.0006	0.0006	0.0009	0.0011	0.0016	0.0017	0.0023
5	0.2563	0.5325	2809	0.0001	0.0002	0.0005	0.0008	0.0009	0.0011	0.0014	0.0016	0.0021
6	0.2586	0.5325	2760	0.0002	0.0003	0.0006	0.0008	0.0010	0.0012	0.0017	0.0018	0.0022
7	0.2581	0.5305	2779	0.0001	0.0003	0.0005	0.0008	0.0009	0.0011	0.0013	0.0017	0.0022
8	0.2586	0.5337	2754	0.0000	0.0003	0.0005	0.0008	0.0009	0.0011	0.0013	0.0017	0.0021
9	0.2589	0.5315	2757	0.0001	0.0002	0.0005	0.0007	0.0008	0.0011	0.0012	0.0017	0.0020

3.5 Data Set 2, 85°C, 65mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.735	2.740	2.746	2.736	2.739	2.737	2.736	2.738	2.740	2.739
27	2.734	2.738	2.745	2.736	2.737	2.737	2.736	2.737	2.739	2.738
28	2.735	2.739	2.745	2.736	2.738	2.736	2.736	2.738	2.739	2.739
29	2.733	2.738	2.753	2.735	2.736	2.736	2.737	2.736	2.739	2.738
30	2.735	2.739	2.753	2.737	2.739	2.738	2.737	2.740	2.738	2.739
31	2.736	2.739	2.746	2.736	2.739	2.738	2.739	2.755	2.739	2.739
32	2.734	2.738	2.744	2.734	2.737	2.736	2.735	2.739	2.737	2.737
33	2.734	2.739	2.744	2.736	2.736	2.738	2.737	2.738	2.738	2.738
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3.6 Data Set 2, 85°C, 65mA (Chromaticity Shift)

No.			CCT(K)									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2578	0.5308	2784									

3.7 Data Set 3, 105°C, 65mA (Lumen Maintenance)

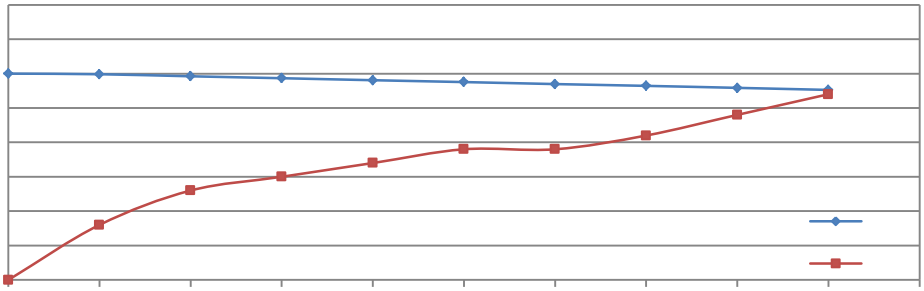
No.		Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	31.63	99.91	99.68	99.43	99.15	99.02	98.77	98.61	98.39	98.13
52	31.97	99.62	99.44	99.09	98.87	98.56	98.34	98.12	97.78	97.56
53	31.79	99.94	99.65	99.43	99.21	98.68	98.36	98.08	97.64	97.39
54	30.89	100.10	99.94	99.74	99.55	99.16	98.80	98.41	98.25	98.09
55	31.98	99.84	99.41	99.28	98.97	98.66	98.37	98.16	97.78	97.56
56	32.28	99.63	99.38	99.23	98.95	98.57	98.33	98.11	97.89	97.58
57	31.92	100.06	99.66	99.34	99.12	98.87	98.59	98.43	98.15	97.81
58	31.27	100.16	99.78	99.52	99.30	99.10	98.82	98.53	98.11	97.76
59	31.71	100.13	99.91	99.65	99.31	98.93	98.52	98.27	97.92	97.54
60	31.77	99.84	99.46	99.24	98.96	98.65	98.36	97.95	97.70	97.26
61	31.48	100.13	99.87	99.56	99.21	99.02	98.70	98.41	98.13	97.84
62	31.42	100.19	99.90	99.55	99.33	99.11	98.70	98.44	98.19	97.80
63	31.95	100.03	99.78	99.50	99.22	99.06	98.81	98.50	98.22	97.84
						98.83	98.59	98.46	98.09	97.88

3.8 Data Set 3, 105°C, 65mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	2.734	2.738	2.746	2.737	2.737	2.737	2.736	2.735	2.738	2.742
52	2.743	2.748	2.763	2.747	2.747	2.745	2.744	2.744	2.745	2.749
53	2.738	2.743	2.757	2.745	2.741	2.741	2.739	2.745	2.744	2.742
54	2.734	2.739	2.750	2.738	2.736	2.737	2.736	2.736	2.735	2.741
55	2.741	2.745	2.762	2.744	2.743	2.742	2.742	2.744	2.742	2.744
56	2.739	2.742	2.750	2.743	2.741	2.741	2.742	2.741	2.740	2.743
57	2.739	2.744	2.751	2.743	2.742	2.741	2.742	2.743	2.742	2.744

3.9 Data Set 3, 105°C, 65mA (Chromaticity Shift)

No.			CCT(K)									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2562	0.5301	2821	0.0005	0.0009	0.0011	0.0012	0.0012	0.0016	0.0016	0.0021	0.0025
52	0.2593	0.5327	2745	0.0007	0.0011	0.0014	0.0015	0.0016	0.0018	0.0019	0.0023	0.0026
53	0.2581	0.5315	2774	0.0006	0.0011	0.0014	0.0016	0.0015	0.0018	0.0018	0.0022	0.0026
54	0.2611	0.5326	2708	0.0006	0.0012	0.0014	0.0016	0.0017	0.0016	0.0017	0.0022	0.0026
55	0.2584	0.5313	2770	0.0008	0.0013	0.0015	0.0018	0.0018	0.0019	0.0020	0.0025	0.0028
56	0.2572	0.5328	2787	0.0004	0.0012	0.0014	0.0017	0.0019	0.0017	0.0017	0.0022	0.0026
57	0.2562	0.5302	2822	0.0008	0.0012	0.0013	0.0016	0.0018	0.0017	0.0017	0.0022	0.0025
58	0.2588	0.5331	2754	0.0004	0.0011	0.0014	0.0016	0.0019	0.0017	0.0020	0.0021	0.0025
59	0.2598	0.5343	2728	0.0006	0.0011	0.0014	0.0017	0.0019	0.0019	0.0020	0.0022	0.0026
60	0.2585	0.5322	2763	0.0009	0.0013	0.0014	0.0017	0.0020	0.0018	0.0021	0.0023	0.0026
61	0.2566	0.5296	2816	0.0006	0.0011	0.0014	0.0017	0.0019	0.0018	0.0020	0.0023	0.0026
62	0.2575	0.5291	2798	0.0007	0.0014	0.0016	0.0018	0.0020	0.0020	0.0023	0.0026	0.0028
63	0.2572	0.5301	2800	0.0008	0.0013	0.0016	0.0017	0.0021	0.0019	0.0022	0.0025	0.0028
64	0.2592	0.5338	2743	0.0009	0.0015	0.0016	0.0018	0.0020	0.0020	0.0024	0.0026	0.0028
65	0.2608	0.5342	2709	0.0009	0.0016	0.0016	0.0018	0.0022	0.0021	0.0024	0.0026	0.0030
66	0.2574	0.5330	2783	0.0009	0.0014	0.0016	0.0018	0.0020	0.0020	0.0022	0.0026	0.0028
67	0.2569	0.5293	2810	0.0006	0.0013	0.0016	0.0017	0.0021	0.0020	0.0022	0.0026	0.0028
68	0.2575	0.5304	2792	0.0008	0.0015	0.0017	0.0019	0.0021	0.0021	0.0023	0.0026	0.0029
69	0.2580	0.5316	2777	0.0009	0.0014	0.0015	0.0018	0.0020	0.0020	0.0024	0.0026	0.0029
70	0.2609	0.5350	2703	0.0008	0.0014	0.0017	0.0019	0.0022	0.0021	0.0024	0.0027	0.0029
71	0.2589	0.5319	2756	0.0009	0.0014	0.0016	0.0018	0.0021	0.0021	0.0022	0.0026	0.0029
72	0.2589	0.5319	2757	0.0005	0.0008	0.0010	0.0012	0.0016	0.0014	0.0015	0.0018	0.0021
73	0.2587	0.5333	2755	0.0010	0.0016	0.0017	0.0019	0.0022	0.0021	0.0024	0.0027	0.0029
74	0.2569	0.5314	2802	0.0011	0.0016	0.0017	0.0019	0.0024	0.0024	0.0024	0.0028	0.0030
75	0.2589	0.5330	2752	0.0011	0.0015	0.0017	0.0018	0.0021	0.0026	0.0022	0.0029	0.0031
Ave.	0.2583	0.5319	2769	0.0008	0.0013	0.0015	0.0017	0.0019	0.0019	0.0021	0.0024	0.0027
Med.	0.2584	0.5319	2770	0.0008	0.0013	0.0015	0.0017	0.0020	0.0019	0.0022	0.0025	0.0028
st dev	0.0014	0.0016	34.8222	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002
Min.	0.2562	0.5291	2703	0.0004	0.0008	0.0010	0.0012	0.0012	0.0014	0.0015	0.0018	0.0021
Max.	0.2611	0.5350	2822	0.0011	0.0016	0.0017	0.0019	0.0024	0.0026	0.0024	0.0029	0.0031



4.3 Report Revision (LM-80)

Report Number	Report Date	Contents
RSZ161206501-10-9000	2017-12-25	Original report.
RSZ161206501-10-9000-M1	2018-03-02	Update the Power Density per LED die in page 3.
RSZ161206501-10-9000-M2	2018-03-02	Update the Logo of lab on the Page1 Update Company name and address on page 1.

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