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Test Engineer: Pote Wang

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:

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 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 $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber c0/61 0 0 1 72.024 525.91 T.75 594 38 >4<0e37>-%data set93(

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.	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
 2.372E-06
 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					

3.3 Data Set 1, 55°C, 150mA (Chromaticity Shift)

No.			CCT(K)									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
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	0.0000S								

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

No.	Ohr(Initial)	Lumen Maintenance (%)								
		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							

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

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

FINAL

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		