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-AS-2835DVW-2C-S1-08L-PCT-HR5

Report Type: 6000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	RSZ200925503-10-6000
Test Date:	2020-09-30 to 2021-06-30
Report Date:	2021-07-20
Approved by:	Blake Zhang / EE Engineer
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TABLE OF CONTENTS

1 - General Information 3
1.1 Description of LED Light Sources 3
1.2 Standards and Reference Documentations 5
1.3 Testing Equipment 5
1.4 Drive Level 5
1.5 Ambient Conditions for Maintenance Test 5
1.6 Photometric Measurement Method and Uncertainty 6
1.7 Statement of Traceability 6
1.8 Sample Set 6
2 - Summary of Test Result 7
3 - Test Data 8
3.1 Data Set 1, 55°C, 60mA (Lumen]TJoTJETBT1 0 0 1 485.86 504.43 Tm[.....4 /P <</MCID 15/Lang (en-US)>.

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Model name	CRI (typ.)	CCT (K)	Series	Parallel	Power density per PCB (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies(mm)	Current (mA)
HL-**-PU2835HV***W-S1-08*-PCT-HR5-***	90	2200-6500	1	1	0.0306	255.495	30	/	30
HL-**-2835HV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500	1	1	0.0306	255.495	30	/	30
HL-**-PU2835HV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500	1	1	0.0306	255.495	30	/	30

Note:

The model name begins with "HL", such as "HL-**-2835DV***W-2C-S1-08*-PCT-HR5-***","*" is described in detail as follows:

1. The first [illegible] is [illegible]
2. The second [illegible] is [illegible]
3. The third [illegible] is [illegible]
4. The fourth [illegible] is the letter, which stands for the customer code.

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
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2020-10-22	2021-10-21
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2020-10-22	2021-10-21
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2020-10-21	2021-10-20
Standard Light Source	EVERFINE	D062	1011093	2020-10-20	2021-10-19
Multilayer aging machine	BACL	B2-270	20023	2021-02-24	2022-02-23
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090003	2020-07-01	2021-06-30

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 soldered to the [illegible] 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 [illegible]

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 ¶ ¶2 Œmeasurement was used and sample was drived by DC power supply. The forward current was regulated to within ±0.5% of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to 25°C ± 2°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°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: 5548.47 520ll calib4 519.67 Tm[(1)-3(.8)]7024 65TBT1 Tf1 0 0 1 120.26 48.75 Tm[(5)4(5)4(44.47 520)4(l4.47 q72.031 4

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3 - Test Data

3.1 Data Set 1, 55°C, 60mA (Lumen Maintenance)

No.	- O P	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	121.20	100.25	100.08	99.92	99.50	99.34	99.26
2	121.00	100.08	99.75	99.59	99.26	99.01	98.60
3	122.00	100.49	100.33	100.16	99.84	99.34	98.85
4	122.10	100.08	99.92	99.67	99.59	99.51	99.43
5	119.60	100.42	100.33	100.25	99.92	99.75	99.50
6	121.50	100.08	99.92	99.75	99.75	99.42	99.18
7	122.80	100.16	99.92	99.59	99.35	98.78	98.21
8	121.70	99.84	99.67	99.42	99.34	98.85	98.77
9	121.50	99.84	99.59	99.34	99.09	98.52	98.27
10	120.40	99.92	99.58	99.50	99.42	99.09	98.75
11	122.00	100.08	99.43	99.26	99.18	99.10	98.77
12	122.60	99.92	99.67	99.43	99.35	99.10	98.94
13	120.70	99.92	99.75	99.42	99.34	99.17	98.92
14	120.80	99.92	99.67	99.42	99.25	99.09	99.01
15	121.90	99.84	99.75	99.43	99.18	98.93	98.69
16	121.50	99.92	99.67	99.34	99.09	99.01	98.68
17	122.50	100.08	99.84	99.43	99.18	99.02	98.86
18	122.10	100.33	99.92	99.67	99.34	99.18	99.10
19	120.80	100.17	99.67	99.59	99.34	99.09	99.01
20	120.90	99.92	99.83	99.59	99.34	99.26	99.17
21	123.70	100.16	99.76	99.43	99.11	98.79	98.14
22	121.70	99.92	99.67	99.51	99.10	98.77	98.52
23	123.00	99.76	99.51	99.27	99.19	99.02	98.94
24	121.60	99.84	99.75	99.42	99.26	99.18	99.10
25	121.80	99.75	99.67	99.43	99.10	98.77	98.60
Avg.	121.66	100.03	99.79	99.55	99.34	99.08	98.85
Med.	121.70	99.92	99.75	99.43	99.34	99.09	98.86
st dev	0.89	0.20	0.22	0.25	0.23	0.27	0.35
Min.	119.60	99.75	99.43	99.26	99.09	98.52	98.14
Max.	123.70	100.49	100.33	100.25	99.92	99.75	99.50

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3.2 Data Set 1, 55°C, 60mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	18.45	18.48	18.50	18.49	18.51	18.51	18.52
2	18.59	18.56	18.58	18.58	18.60	18.55	18.60
3	18.36	18.34	18.35	18.35	18.36	18.33	18.36
4	18.65	18.64	18.66	18.65	18.67	18.65	18.67
5	18.40	18.41	18.43	18.42	18.45	18.41	18.44
6	18.43	18.43	18.46	18.46	18.48	18.44	18.46
7	18.54	18.53	18.54	18.55	18.56	18.53	18.55
8	18.52	18.50	18.53	18.52	18.54	18.51	18.52
9	18.46	18.46	18.46	18.47	18.49	18.45	18.47
10	18.49	18.49	18.51	18.50	18.53	18.48	18.49
11	18.53	18.52	18.55	18.53	18.55	18.53	18.32
12	18.32	18.32	18.33	18.33	18.35	18.31	18.54
13	18.60	18.60	18.61	18.60	18.63	18.60	18.61
14	18.57	18.56	18.57	18.56	18.59	18.56	18.56
15	18.44	18.44	18.45	18.45	18.47	18.44	18.45
16	18.31	18.31	18.32	18.32	18.34	18.30	18.31
17	18.58	18.59	18.59	18.58	18.61	18.59	18.58
18	18.43	18.44	18.44	18.44	18.46	18.44	18.45
19	18.59	18.61	18.61	18.61	18.62	18.60	18.61
20	18.34	18.34	18.34	18.34	18.37	18.34	18.35
21	18.43	18.41	18.40	18.40	18.41	18.39	18.39
22	18.43	18.40	18.41	18.41	18.44	18.40	18.40
23	18.58	18.55	18.55	18.55	18.58	18.57	18.54
24	18.56	18.53	18.53	18.54	18.55	18.55	18.53
25	18.64	18.61	18.61	18.63	18.64	18.63	18.62
Avg.	18.49	18.48	18.49	18.49	18.51	18.48	18.49
Med.	18.49	18.49	18.51	18.50	18.53	18.51	18.52
st dev	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Min.	18.31	18.31	18.32	18.32	18.34	18.30	18.31
Max.	18.65	18.64	18.66	18.65	18.67	18.65	18.67

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3.3 Data Set 1, 55°C, 60mA (Chromaticity Shift)

No.	X ¶	Y ¶	CCT(K)	& K U R P D W L F L W \ 6 K L I W ¨ X ¶ Y ¶					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2571	0.5346	2782	0.0002	0.0002	0.0001	0.0007	0.0009	0.0009
2	0.2571	0.5348	2781	0.0001	0.0003	0.0003	0.0011	0.0012	0.0010
3	0.2574	0.5328	2784	0.0004	0.0005	0.0006	0.0006	0.0005	0.0005
4	0.2584	0.5365	2747	0.0004	0.0004	0.0004	0.0006	0.0004	0.0007
5	0.2583	0.5356	2752	0.0003	0.0000	0.0002	0.0009	0.0006	0.0009
6	0.2561	0.5355	2799	0.0002	0.0001	0.0001	0.0011	0.0010	0.0012
7	0.2572	0.5352	2778	0.0005	0.0004	0.0005	0.0005	0.0002	0.0004
8	0.2573	0.5352	2775	0.0004	0.0003	0.0002	0.0007	0.0009	0.0010
9	0.2586	0.5343	2752	0.0004	0.0003	0.0002	0.0008	0.0006	0.0012
10	0.2574	0.5354	2772	0.0004	0.0006	0.0004	0.0004	0.0005	0.0007
11	0.2594	0.5357	2730	0.0005	0.0006	0.0004	0.0006	0.0004	0.0006
12	0.2571	0.5358	2776	0.0004	0.0005	0.0004	0.0004	0.0005	0.0012
13	0.2579	0.5355	2761	0.0006	0.0006	0.0005	0.0004	0.0005	0.0006
14	0.2581	0.5355	2759	0.0006	0.0007	0.0006	0.0003	0.0002	0.0001
15	0.2585	0.5350	2752	0.0004	0.0004	0.0004	0.0005	0.0008	0.0008
16	0.2569	0.5351	2785	0.0004	0.0004	0.0004	0.0006	0.0009	0.0007
17	0.2564	0.5350	2795	0.0006	0.0006	0.0006	0.0004	0.0004	0.0007
18	0.2596	0.5362	2724	0.0002	0.0001	0.0001	0.0009	0.0006	0.0009
19	0.2591	0.5359	2736	0.0005	0.0005	0.0004	0.0003	0.0004	0.0004
20	0.2566	0.5341	2795	0.0004	0.0005	0.0004	0.0005	0.0002	0.0005
21	0.2587	0.5354	2745	0.0004	0.0004	0.0004	0.0007	0.0008	0.0010
22	0.2592	0.5351	2736	0.0008	0.0006	0.0007	0.0003	0.0002	0.0005
23	0.2578	0.5351	2765	0.0006	0.0005	0.0006	0.0003	0.0004	0.0004
24	0.2568	0.5333	2795	0.0005	0.0006	0.0006	0.0006	0.0003	0.0004
25	0.2565	0.5355	2791	0.0007	0.0006	0.0005	0.0003	0.0003	0.0005
Avg.	0.2577	0.5351	2767	0.0004	0.0004	0.0004	0.0006	0.0006	0.0007
Med.	0.2574	0.5352	2772	0.0004	0.0005	0.0004	0.0006	0.0005	0.0007
st dev	0.0010	0.0008	22	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2561	0.5328	2724	0.0001	0.0000	0.0001	0.0003	0.0002	0.0001
Max.	0.2596	0.5365	2799	0.0008	0.0007	0.0007	0.0011	0.0012	0.0012

3.4 Data Set 2, 105°C, 60mA (Lumen Maintenance) 9901

No.	- O P	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	120.30	100.25	100.17	99.83	99.75	99.33	99.17
27	121.90	99.75	99.67	99.51	99.34	99.18	99.02
28	122.30	99.84	99.75	99.43	99.26	98.77	98.69
29	121.20	99.67	99.26	99.17	98.76	98.51	98.27
30	120.00	99.75	99.33	99.17	99.00	98.83	98.58
31	123.20	99.84	99.68	99.43	99.11	98.78	98.70
32	122.10	99.92	99.75	99.59	99.26	98.94	98.85
33	122.20	99.92	99.67	99.43	99.18	98.85	98.61
34	120.90	99.92	99.34	99.17	99.09	99.01	98.68
35	123.30	100.08	99.51	99.11	[redacted]		

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3.5 Data Set 2, 105°C, 60mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	18.35	18.35	18.36	18.35	18.39	18.37	18.36
27	18.39	18.37	18.38	18.39	18.41	18.39	18.39
28	18.34	18.31	18.33	18.31	18.34	18.32	18.32
29	18.42	18.39	18.42	18.41	18.44	18.41	18.42
30	18.31	18.30	18.32	18.32	18.34	18.31	18.31
31	18.57	18.52	18.54	18.54	18.56	18.54	18.54
32	18.40	18.38	18.41	18.40	18.42	18.39	18.39
33	18.43	18.41	18.41	18.42	18.44	18.42	18.41
34	18.42	18.41	18.42	18.42	18.44	18.41	18.42
35	18.40	18.40	18.40	18.40	18.42	18.39	18.40
36	18.41	18.41	18.42	18.43	18.45	18.41	18.42
37	18.39	18.38	18.40	18.39	18.42	18.39	18.39
38	18.52	18.51	18.52	18.52	18.55	18.52	18.53
39	18.40	18.40	18.40	18.42	18.43	18.40	18.40
40	18.32	18.33	18.33	18.33	18.35	18.33	18.33
41	18.50	18.51	18.51	18.51	18.53	18.49	18.51
42	18.47	18.48	18.49	18.48	18.50	18.48	18.49
43	18.55	18.56	18.56	18.56	18.58	18.55	18.55
44	18.44	18.44	18.44	18.45	18.48	18.44	18.44
45	18.37	18.38	18.39	18.37	18.41	18.38	18.38
46	18.50	18.50	18.51	18.49	18.53	18.50	18.50
47	18.49	18.51	18.50	18.50	18.53	18.49	18.50
48	18.37	18.37	18.37	18.38	18.40	18.37	18.37
49	18.59	18.60	18.60	18.59	18.62	18.59	18.59
50	18.49	18.49	18.49	18.48	18.51	18.48	18.48
Avg.	18.43	18.43	18.44	18.43	18.46	18.43	18.43
Med.	18.42	18.41	18.42	18.42	18.44	18.41	18.42
st dev	0.08	0.08	0.08	0.08	0.08	0.07	0.08
Min.	18.31	18.30	18.32	18.31	18.34	18.31	18.31
Max.	18.59	18.60	18.60	18.59	18.62	18.59	18.59

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3.6 Data Set 2, 105°C, 60mA (Chromaticity Shift)

No.	X ¶	Y ¶	CCT(K)	& K U R P D W L F L W \ 6 K L I W ¨ X ¶ Y ¶					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2608	0.5358	2702	0.0003	0.0001	0.0001	0.0007	0.0007	0.0009
27	0.2573	0.5354	2774	0.0007	0.0008	0.0008	0.0002	0.0003	0.0004
28	0.2565	0.5339							

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