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-PST-1608H343W-LVR5-SH

Report Type: 6000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	RSZ210115504-10-6000
Test Date:	2021-01-22 to 2021-10-20
Report Date:	2021-11-02
Approved by:	Blake Zhang / EE Engineer
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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	2021-10-20	2022-10-19
Multilayer aging machine	BACL	B2-270	20013	2021-02-24	2022-02-23
Program-controlled D.C. Stabilized Voltage Supply	Hanshenpuyuan	HSPY-60-03	N/A	2021-06-30	2022-06-29

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 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 ±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'. 2π measurement 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: 55°C, 10mA

Part Number:	HL-PST-1608H343W-LVR5-SH
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	10mA
Measurement Current:	10mA

Data Set 2: 85°C, 10mA

Part Number:	HL-PST-1608H343W-LVR5-SH
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	10mA
Measurement Current:	10mA

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2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration			Reported TM-21 L_{70} Lifetime
1	25	0	1000hrs	6000hrs	2.654E-06	1.004	>36000 hours
2	25	0	1000hrs	6000hrs	3.178E-06	1.004	>36000 hours

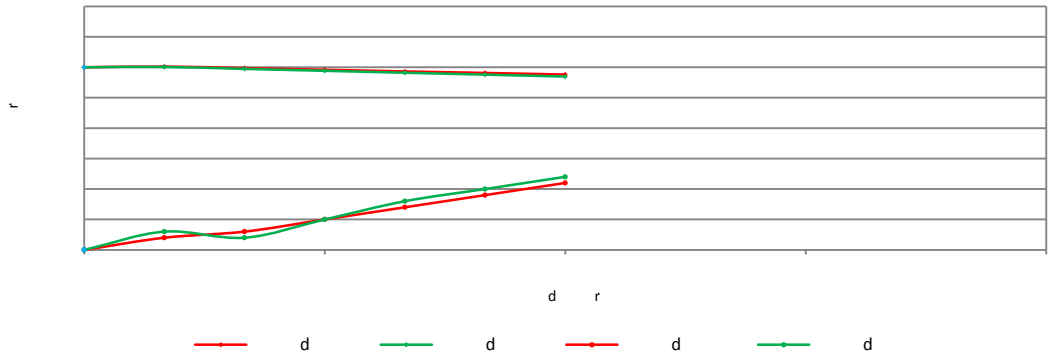
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	100.12%	99.86%	99.59%	99.32%	99.07%	98.80%
2	100.05%	99.73%	99.42%	99.10%	98.79%	98.47%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.0002	0.0003	0.0005	0.0007	0.0009	0.0011
2	0.0003	0.0002	0.0005	0.0008	0.0010	0.0012

Average Lumen Maintenance and Chromaticity Shift VS. Time



3.2 Data Set 1, 55°C, 10mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	2.751	2.750	2.749	2.756	2.750	2.750	2.750
2	2.760	2.760	2.760	2.768	2.759	2.757	2.761
3	2.760	2.760	2.758	2.760	2.760	2.762	2.760
4	2.745	2.744	2.743	2.745	2.746	2.743	2.744
5	2.753	2.752	2.752	2.757	2.753	2.751	2.753
6	2.767	2.767	2.768	2.783	2.767	2.767	2.767
7	2.759	2.760	2.758	2.776	2.764	2.758	2.759
8	2.765	2.765	2.763	2.763	2.765	2.765	2.763
9	2.763	2.765	2.764	2.765	2.765	2.766	2.765
10	2.752	2.753	2.753	2.756	2.754	2.761	2.753
11	2.758	2.758	2.758	2.760	2.760	2.758	2.759
12	2.750	2.749	2.749	2.749	2.749	2.748	2.751
13	2.751	2.750	2.750	2.751	2.751	2.755	2.752
14	2.753	2.753	2.753	2.755	2.753	2.754	2.753
15	2.758	2.758	2.757	2.760	2.760	2.760	2.760
16	2.751	2.751	2.751	2.753	2.751	2.756	2.751
17	2.760	2.761	2.761	2.762	2.762	2.764	2.761
18	2.762	2.762	2.763	2.763	2.764	2.762	2.763
19	2.746	2.747	2.746	2.748	2.748	2.749	2.748
20	2.750	2.749	2.750	2.751	2.751	2.751	2.750
21	2.758	2.756	2.756	2.757	2.757	2.757	2.758
22	2.756	2.754	2.755	2.755	2.755	2.756	2.755
23	2.749	2.748	2.748	2.747	2.748	2.749	2.750
24	2.760	2.758	2.757	2.758	2.759	2.758	2.759
25	2.748	2.749	2.748	2.748	2.749	2.750	2.749
Avg.	2.755	2.755	2.755	2.758	2.756	2.756	2.756
Med.	2.756	2.754	2.755	2.757	2.755	2.757	2.755
st dev	0.006	0.006	0.006	0.009	0.006	0.006	0.006
Min.	2.745	2.744	2.743	2.745	2.746	2.743	2.744
Max.	2.767	2.767	2.768	2.783	2.767	2.767	2.767

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3.3 Data Set 1, 55°C, 10mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2600	0.5334	2727	0.0004	0.0003	0.0006	0.0009	0.0010	0.0013
2	0.2595	0.5329	2739	0.0001	0.0002	0.0005	0.0008	0.0011	0.0013
3	0.2600	0.5334	2726	0.0003	0.0001	0.0004	0.0005	0.0008	0.0012
4	0.2592	0.5320	2750	0.0001	0.0001	0.0004	0.0006	0.0009	0.0012
5	0.2607	0.5334	2712	0.0001	0.0006	0.0007	0.0009	0.0011	0.0013
6	0.2611	0.5340	2702	0.0001	0.0003	0.0003	0.0005	0.0006	0.0008
7	0.2591	0.5331	2747	0.0002	0.0001	0.0003	0.0006	0.0008	0.0010
8	0.2598	0.5339	2729	0.0003	0.0005	0.0004	0.0008	0.0009	0.0010
9	0.2604	0.5312	2728	0.0002	0.0005	0.0005	0.0007	0.0009	0.0010
10	0.2598	0.5332	2732	0.0002	0.0001	0.0004	0.0007	0.0009	0.0013
11	0.2612	0.5340	2700	0.0001	0.0003	0.0001	0.0003	0.0005	0.0007
12	0.2602	0.5338	2721	0.0004	0.0003	0.0003	0.0005	0.0006	0.0009
13	0.2600	0.5335	2726	0.0003	0.0004	0.0005	0.0008	0.0010	0.0013
14	0.2602	0.5341	2721	0.0003	0.0006	0.0007	0.0008	0.0009	0.0011
15	0.2594	0.5313	2748	0.0005	0.0006	0.0008	0.0011	0.0013	0.0016
16	0.2595	0.5335	2737	0.0001	0.0001	0.0006	0.0006	0.0009	0.0011
17	0.2602	0.5332	2724	0.0001	0.0003	0.0004	0.0007	0.0009	0.0011
18	0.2598	0.5324	2736	0.0002	0.0000	0.0006	0.0009	0.0012	0.0013
19	0.2593	0.5324	2746	0.0001	0.0002	0.0005	0.0006	0.0009	0.0011
20	0.2604	0.5323	2724	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009
21	0.2603	0.5330	2722	0.0002	0.0002	0.0005	0.0008	0.0010	0.0011
22	0.2597	0.5332	2734	0.0000	0.0003	0.0005	0.0007	0.0009	0.0012
23	0.2607	0.5345	2708	0.0002	0.0002	0.0004	0.0006	0.0009	0.0011
24	0.2602	0.5332	2725	0.0004	0.0003	0.0006	0.0009	0.0012	0.0016
25	0.2591	0.5334	2746	0.0004	0.0002	0.0002	0.0004	0.0005	0.0006

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3.5 Data Set 2, 85°C, 10mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	2.757	2.756	2.756	2.756	2.756	2.757	2.757
27	2.768	2.766	2.767	2.767	2.767	2.767	2.768
28	2.753	2.752	2.752	2.754	2.754	2.753	2.753
29	2.761	2.760	2.760	2.761	2.761	2.760	2.763
30	2.743	2.742	2.743	2.743	2.744	2.742	2.743
31	2.756	2.755	2.756	2.760	2.756	2.755	2.756
32	2.763	2.761	2.761	2.763	2.762	2.762	2.762
33	2.769	2.766	2.766	2.768	2.768	2.768	2.768
34	2.763	2.762	2.762	2.764	2.763	2.763	2.763
35	2.757	2.755	2.757	2.758	2.757	2.756	2.756
36	2.767	2.763	2.765	2.765	2.767	2.765	2.767
37	2.755	2.751	2.753	2.754	2.755	2.754	2.753
38	2.746	2.744	2.744	2.745	2.745	2.745	2.745
39	2.762	2.760	2.760	2.762	2.764	2.763	2.762
40	2.750	2.748	2.748	2.751	2.753	2.752	2.749
41	2.750	2.747	2.749	2.749	2.752	2.755	2.750
42	2.753	2.751	2.752	2.756	2.760	2.753	2.754
43	2.754	2.751	2.752	2.755	2.761	2.753	2.753
44	2.749	2.748	2.748	2.750	2.754	2.749	2.749
45	2.743	2.742	2.743	2.746	2.748	2.753	2.746
46	2.748	2.745	2.746	2.749	2.749	2.748	2.747
47	2.745	2.743	2.743	2.746	2.746	2.746	2.744
48	2.751	2.751	2.750	2.755			

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Directions

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