



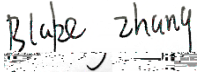
TEST REPORT

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-A-3528H343W-S1-13HL-HR3

Report Type: 6000 Hours Test Report		Product Type: LED Package	
Reviewed By:	Pote Wang		
Report Number:	SZ2220402-12243E-10-6000		
Test Date:	2022-04-09 to 2022-12-15		
Report Date:	2023-01-12		
Approved by:	Blake Zhang / EE Engineer		
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 5/F(B-West) -7/F, the 3rd Phase of Wan Li Industrial Building D, Shihua Road, Futian Free Trade Zone Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008		
Test Facility:	Test facility was located at No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China.		

Note: 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.(Shenzhen). This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, or any agency of the U.S. Government.



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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 (This standard was not accredited by NVLAP)
- *ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by NVLAP)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2022-09-27	2023-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2022-09-27	2023-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-11-18	2023-11-17
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2023-10-14
Multilayer aging machine	BACL	B2-270	20015	2022-11-18	2023-11-17
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	2022-11-18	2023-11-17

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°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 $\pm 3\%$ 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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%.

1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate $u'v'$



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1.8 Sample Set

Data Set 1: 55°C, 20mA

Part Number: HL-A-3528H343W-S1-13HL-HR3
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 20mA
Measurement Current: 20mA

Data Set 2: 85°C, 20mA

Part Number: HL-A-3528H343W-S1-13HL-HR3
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 20mA
Measurement Current: 20mA



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2 - Summary of Test Result

Data Set:	Sample Size	Fai
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3 - Test Data

3.1 Data Set 1, 55°C, 20mA (Lumen Maintenance)

No.	(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	7.862	100.20	99.99	99.75	99.62	99.39	99.16
2	7.810	100.22	100.06	99.92	99.64	99.46	99.14
3	7.753	100.22	99.97	99.75	99.54	99.42	99.25
4	7.738	100.10	100.01	99.79	99.68	99.46	99.34
5	7.835	100.05	99.76	99.55	99.32	99.20	98.93
6	7.885	100.18	99.99	99.85	99.64	99.34	99.00
7	7.870	100.09	99.87	99.63	99.47	99.30	99.16
8	7.818	100.06	99.96	99.83	99.57	99.32	99.17
9	7.934	100.09	100.01	99.79	99.56	99.28	99.03
10	7.885	100.13	99.90	99.63	99.29	99.00	98.77
11	8.001	100.21	99.95	99.73	99.51	99.34	99.08
12	7.904	100.15	99.95	99.76	99.43	99.25	99.04
13	7.960	100.21	100.05	99.76	99.61	99.33	99.06
14	7.884	100.08	99.94	99.72	99.58	99.44	99.32
15	7.831	100.15	99.90	99.72	99.45	99.31	99.13
16	7.841	100.09	99.80	99.55	99.32	99.08	98.81
17	7.852	100.13	99.95	99.75	99.49	99.27	99.02



3.2 Data Set 1, 55°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	2.796	2.811	2.809	2.809	2.839	2.816	2.834
2	2.815	2.829	2.826	2.815	2.829	2.824	2.816
3	2.797	2.810	2.808	2.813	2.818	2.816	2.824
4	2.801	2.816	2.812	2.817	2.832	2.813	2.823
5	2.795	2.813	2.808	2.808	2.801	2.804	2.808
6	2.808	2.836	2.820	2.821	2.812	2.835	2.811
7	2.799	2.814	2.811	2.815	2.833	2.813	2.825
8	2.794	2.807	2.804	2.804	2.813	2.829	2.816
9	2.796	2.807	2.807	2.805	2.817	2.824	2.825
10	2.801	2.813	2.811	2.812	2.827	2.827	2.828
11	2.803	2.816	2.815	2.813	2.818	2.815	2.817
12	2.813	2.826	2.823	2.826	2.835	2.818	2.834
13	2.810	2.824	2.821	2.824	2.813	2.835	2.812
14	2.801	2.814	2.812	2.819	2.824	2.831	2.812
15	2.801	2.813	2.813	2.814	2.832	2.834	2.811
16	2.798	2.809	2.807	2.819	2.824	2.839	2.823
17	2.802	2.815	2.813	2.815	2.839	2.812	2.800
18	2.823	2.835	2.834	2.831	2.840	2.846	2.847
19	2.804	2.815	2.812	2.814	2.821	2.821	2.817
20	2.799	2.811	2.809	2.813	2.814	2.832	2.812
21	2.803	2.815	2.814	2.825	2.825	2.823	2.825
22	2.795	2.807	2.805	2.813	2.824	2.833	2.819
23	2.801	2.812	2.811	2.805	2.823	2.812	2.835
24	2.800	2.813	2.809	2.816	2.820	2.820	2.814
25	2.799	2.814	2.811	2.814	2.815	2.827	2.826
Avg.	2.802	2.816	2.813	2.815	2.824	2.824	2.821
Med.	2.801	2.814	2.811	2.814	2.824	2.824	2.819
st dev	0.007	0.008	0.007	0.007	0.010	0.010	0.010
Min.	2.794	2.807	2.804	2.804	2.801	2.804	2.800
Max.	2.823	2.836	2.834	2.831	2.840	2.846	2.847



3.3 Data Set 1, 55°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (u'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2613	0.5303	2712	0.0001	0.0004	0.0005	0.0007	0.0010	0.0010
2	0.2573	0.5315	2791	0.0001	0.0004	0.0006	0.0007	0.0011	0.0013
3	0.2593	0.5302	2754	0.0002	0.0003	0.0005	0.0005	0.0006	0.0009
4	0.2600	0.5286	2747	0.0002	0.0004	0.0005	0.0004	0.0004	0.0008
5	0.2605	0.5288	2735	0.0001	0.0006	0.0007	0.0008	0.0006	0.0007
6	0.2609	0.5314	2717	0.0002	0.0004	0.0005	0.0005	0.0006	0.0007
7	0.2605	0.5293	2733	0.0001	0.0004	0.0007	0.0007	0.0008	0.0010
8	0.2588	0.5295	2769	0.0001	0.0003	0.0005	0.0006	0.0006	0.0008
9	0.2597	0.5326	2737	0.0001	0.0003	0.0006	0.0007	0.0008	0.0010
10	0.2579	0.5317	2779	0.0002	0.0003	0.0002	0.0001	0.0004	0.0005
11	0.2591	0.5293	2763	0.0001	0.0002	0.0003	0.0004	0.0004	0.0007
12	0.2596	0.5307	2747	0.0001	0.0001	0.0002	0.0003	0.0005	0.0007
13	0.2592	0.5303	2758	0.0003	0.0004	0.0005	0.0005	0.0007	0.0009
14	0.2591	0.5318	2752	0.0002	0.0002	0.0004	0.0004	0.0005	0.0009
15	0.2594	0.5303	2753	0.0001	0.0003	0.0003	0.0002	0.0003	0.0004
16	0.2577	0.5304	2789	0.0002	0.0002	0.0001	0.0001	0.0004	0.0007
17	0.2587	0.5294	2771	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003
18	0.2592	0.5285	2764	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008
19	0.2598	0.5289	2749	0.0001	0.0001	0.0004	0.0005	0.0006	0.0010
20	0.2590	0.5312	2756	0.0001	0.0003	0.0006	0.0006	0.0008	0.0009
21	0.2608	0.5293	2728	0.0002	0.0001	0.0004	0.0006	0.0007	0.0009
22	0.2581	0.5296	2783	0.0002	0.0002	0.0005	0.0006	0.0009	0.0010
23	0.2581	0.5289	2787	0.0001	0.0006	0.0005	0.0005	0.0005	0.0005
24	0.2574	0.5301	2796	0.0002	0.0004	0.0004	0.0005	0.0010	0.0012
25	0.2596	0.5290	2754	0.0002	0.0001	0.0003	0.0004	0.0014	0.0016
Avg.	0.2592	0.5301	2757	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009
Med.	0.2592	0.5301	2754	0.0001	0.0003	0.0005	0.0005	0.0006	0.0009
st dev	0.0011	0.0011			0.0001			0.0003	
Min.	0.2573								



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3.4 Data Set 2, 85°C, 20mA (Lumen Maintenance)

No.	(lm)	Lumen Maintenance (%)					
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	7.898	100.10	99.89	99.59	99.38	99.08	98.84
27	7.801	100.06	99.90	99.71	99.51	99.22	99.06
28	7.896	100.23	100.01	99.73	99.51	99.40	99.08
29	7.710	100.19	99.96	99.74	99.49	99.30	99.03
30	7.710	100.23	100.01	99.70	99.49	99.23	99.03
31	7.793	99.87	99.79	99.59	99.38	99.13	98.83
32	7.880	100.18	99.96	99.72	99.49	99.23	98.98
33	7.789	100.23	99.91	99.65	99.36	99.19	98.95
34	7.742	100.23	99.85	99.56	99.35	99.06	98.67
35	7.744	100.26	99.99	99.73	99.39	99.04	98.72
36	7.887	100.16	99.90	99.58	99.20	98.90	98.74
37	7.919	100.16	99.87	99.65	99.29	99.13	98.90
38	7.849	99.94	99.77	99.58	99.41	99.20	99.04
39	7.753	100.19	99.97	99.73	99.57	99.30	99.08
40	7.687	100.17	99.93	99.74	99.49	99.30	98.99
41	7.748	100.23	99.95	99.66	99.45	99.14	98.89
42	7.801	100.22	99.92	99.71	99.50	99.27	98.92
43	7.749	99.88	99.74	99.54	99.20	99.08	98.89
44	7.802	100.28	99.97	99.76	99.45	99.06	98.91



3.5 Data Set 2, 85°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)						
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	2.805	2.820	2.817	2.819	2.817	2.825	2.814
27	2.795	2.808	2.807	2.807	2.813	2.823	2.815
28	2.796	2.810	2.809	2.799	2.820	2.804	2.821
29	2.798	2.813	2.811	2.794	2.802	2.837	2.815
30	2.798	2.812	2.810	2.814	2.821	2.822	2.813
31	2.803	2.822	2.817	2.821	2.825	2.827	2.812
32	2.792	2.807	2.803	2.811	2.801	2.805	2.804
33	2.820	2.835	2.832	2.811	2.810	2.801	2.803
34	2.806	2.818	2.815	2.817	2.845	2.809	2.817
35	2.793	2.807	2.804	2.793	2.813	2.811	2.809
36	2.793	2.810	2.807	2.804	2.834	2.811	2.839
37	2.804	2.820	2.817	2.825	2.808	2.804	2.819
38	2.801	2.815	2.812	2.819	2.822	2.817	2.804
39	2.792	2.808	2.805	2.830	2.818	2.805	2.801
40	2.796	2.810	2.807	2.836	2.808	2.810	2.816
41	2.814	2.831	2.825	2.809	2.837	2.809	2.818
42	2.792	2.807	2.804	2.804	2.818	2.806	2.833
43	2.798	2.815	2.811	2.817	2.846	2.817	2.817
44	2.802	2.818	2.816	2.823	2.819	2.829	2.817
45	2.785	2.798	2.795	2.804	2.817	2.833	2.816
46	2.796	2.811	2.808	2.804	2.823	2.815	2.824
47	2.795	2.808	2.807	2.816	2.820	2.815	2.814
48	2.792	2.807	2.801	2.803	2.816	2.812	2.823
49	2.802	2.817	2.815	2.820	2.832	2.812	2.814
50	2.795	2.810	2.808	2.816	2.847	2.807	2.802
Avg.	2.799	2.813	2.811	2.813	2.821	2.815	2.815
Med.	2.796	2.811	2.809	2.814	2.819	2.812	2.815
st dev	0.008	0.008	0.008	0.011	0.013	0.010	0.009
Min.	2.785	2.798	2.795	2.793	2.801	2.801	2.801
Max.	2.820	2.835	2.832	2.836	2.847	2.837	2.839



3.6 Data Set 2, 85°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (u'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2590	0.5287	2767	0.0002	0.0002	0.0001	0.0002	0.0006	0.0007
27	0.2612	0.5304	2715	0.0002	0.0004	0.0006	0.0007	0.0008	0.0011
28	0.2596	0.5306	2748	0.0001	0.0004	0.0007	0.0007	0.0007	0.0009
29	0.2614	0.5284	2718	0.0002	0.0002	0.0005	0.0006	0.0009	0.0014
30	0.2613	0.5290	2718	0.0001	0.0004	0.0006	0.0007	0.0011	0.0012
31	0.2588	0.5292	2770	0.0001	0.0002	0.0004	0.0005	0.0009	0.0009
32	0.2579	0.5299	2786	0.0002	0.0004	0.0007	0.0007	0.0008	0.0009
33	0.2598	0.5317	2738	0.0002	0.0002	0.0004	0.0005	0.0006	0.0008
34	0.2619	0.5291	2706	0.0002	0.0004	0.0007	0.0009	0.0010	0.0010
35	0.2610	0.5284	2726	0.0001	0.0002	0.0002	0.0003	0.0005	0.0006
36	0.2577	0.5308	2787	0.0001	0.0008	0.0005	0.0004	0.0002	0.0001
37	0.2589	0.5289	2768	0.0002	0.0005	0.0004	0.0005	0.0006	0.0008
38	0.2619	0.5296	2704	0.0001	0.0006	0.0008	0.0009	0.0009	0.0011
39	0.2620	0.5291	2704	0.0002	0.0002	0.0005	0.0005	0.0007	0.0011
40	0.2610	0.5296	2721	0.0002	0.0003	0.0004	0.0004	0.0004	0.0008
41	0.2590	0.5287	2769	0.0003	0.0002	0.0006	0.0006	0.0007	0.0011
42	0.2618	0.5302	2704	0.0001	0.0004	0.0007	0.0008	0.0011	0.0013
43	0.2622	0.5305	2693	0.0001	0.0004	0.0007	0.0008	0.0009	0.0011
44	0.2611	0.5287	2723	0.0001	0.0005	0.0004	0.0004	0.0006	0.0009
45	0.2586	0.5302	2770	0.0002	0.0005	0.0005	0.0006	0.0007	0.0011
46	0.2582	0.5324	2769	0.0002	0.0002	0.0003	0.0005	0.0009	0.0012
47	0.2588	0.5308	2763	0.0001	0.0003	0.0003	0.0004	0.0008	0.0009
48	0.2598	0.5289	2750	0.0001	0.0002	0.0006	0.0007	0.0012	0.0014
49	0.2605	0.5287	2737	0.0001	0.0002	0.0004	0.0005	0.0011	0.0013
50	0.2592	0.5272	2770	0.0002	0.0007	0.0004	0.0004	0.0007	0.0007
Avg.	0.2601	0.5296	2741	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010
Med.	0.2598	0.5292	2738	0.0002	0.0004	0.0005	0.0005	0.0008	0.0010
st dev	0.0014	0.0012	29	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003
Min.	0.2577	0.5272	2693	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001
Max.	0.2622	0.5324	2787	0.0003	0.0008	0.0008	0.0009	0.0012	0.0014



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Directions

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2. This report includes some test methods are not in NVLAP accreditation scope marked *.
3. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
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