



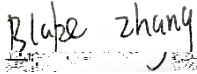
TEST REPORT

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: 10000 Hours Test Report		Product Type: LED Package	
Reviewed By:	Pote Wang		
Report Number:	SZ2220402-12243E-10-10000		
Test Date:	2022-04-09 to 2023-07-03		
Report Date:	2023-07-07		
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 - General Information

1.1 Description of LED Light Sources[#]

Sample Size:

50 PCS test samples were in good condition and received on 2022-04-02. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-A-3528H343W-S1-13HL-HR3
Part Type:	LED Package
Drive Level:	DC 20mA
Nominal CCT:	2700K
Power:	0.064W
Average Current Density per LED die:	246.032mA/mm ²
Average Power Density per LED die:	0.787W/mm ²
CRI:	80
Die Spacing:	/

Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

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)

This report covers the following models:

Series Name	Model Name	CRI (typ.)	Total Input Current(mA)	Power (W)	CCT (K)	Number of dies	Driver current per die(mA)	Current Density per Die(mA/mm ²)	Power Density per PCB (W/mm ²)	Die Spacing (mm)
Test model	HL-A-3528H343W-S1-13HL-HR3	80	20	0.064	2700	1	20	246.032	0.00653	/
Multiple model	HL-A-3528H***W-S1-13** ⁻ HR* ⁻ ***	70-80	20	0.064	2700-6500	1	20	246.032	0.00653	/
Multiple model	HL-A-3528H***W-S1-13** ⁻ HR*(R9) ⁻ ***	70-80	20	0.064	2700-6500	1	20	246.032	0.00653	/
Multiple model	HL-A-3528H***W-S1-** ⁻ HR* ⁻ ***	70-80	20	0.064	2700-6500	1	20	246.032	0.00653	/
Multiple model	HL-A-3528H***W-S1-** ⁻ HR*(R9) ⁻ ***	70-80	20	0.064	2700-6500	1	20	246.032	0.00653	/

Note:

-A-3528H***W-S1-13**⁻HR*⁻

1. is the number from 1 to 999 which stands for the brightness level.
- 2.
- 3.
4. h 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 (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	2022-11-18	2023-11-17
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2022-11-18	2023-11-17
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-11-18	2023-11-17
Standard Light Source	EVERFINE	D062	1011093	2021-09-15	2023-09-14
Multilayer aging machine	BACL	B2-270	20015	2022-10-19	2023-10-18
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	2022-11-10	2023-11-09

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 _{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 $2^{\circ}C$ below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to $5^{\circ}C$ below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with

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 $25^{\circ}C \pm 2^{\circ}C$, 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 driven by DC power supply. The forward current was regulated to within $\pm 0.5\%$ of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to $25^{\circ}C \pm 2^{\circ}C$, 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 $U=0.8671^{\circ}C$ ($K=2$), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).



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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



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	10000hrs	2.079E-06	1.004	>60,000 hours
2	25	0	1000hrs	10000hrs	2.541E-06	1.004	>60,000 hours

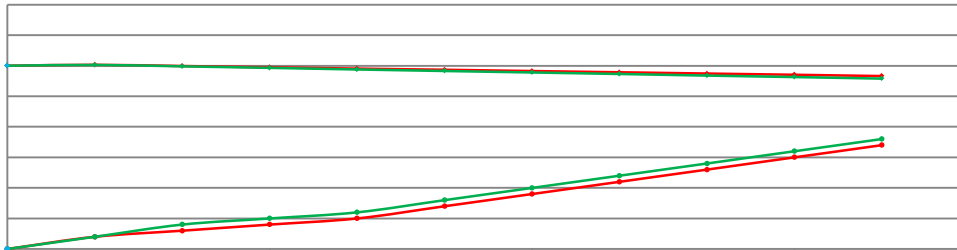
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.15%	99.95%	99.74%	99.53%	99.34%	99.13%	98.93%	98.72%	98.52%	98.31%
2	100.13%	99.90%	99.65%	99.39%	99.14%	98.90%	98.65%	98.39%	98.15%	97.89%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017
2	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018

Average Lumen Maintenance and Chromaticity Shift VS. Time





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Test Data

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

Ohr(Initial)	Lumen Maintenance (%)									
	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
7.862	100.20	99.99	99.75	99.62	99.39	99.16	99.05	98.89	98.74	98.66
7.810	100.22	100.06	99.92	99.64	99.46	99.14	98.87	98.72	98.62	98.53
7.753	100.22	99.97	99.75	99.54	99.42	99.25	98.96	98.66	98.28	97.99
7.738	100.10	100.01	99.79	99.68	99.46	99.34	99.12	98.90	98.69	98.58

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

No.			CCT(K)										
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2613	0.5303	2712	0.0001	0.0004	0.0005	0.0007	0.0010	0.0010	0.0013	0.0013	0.0012	0.0013
2	0.2573	0.5315	2791	0.0001	0.0004	0.0006	0.0007	0.0011	0.0013	0.0014	0.0016	0.0019	0.0018
3	0.2593	0.5302	2754	0.0002	0.0003	0.0005	0.0005	0.0006	0.0009	0.0013	0.0013	0.0015	0.0018
4	0.2600	0.5286	2747	0.0002	0.0004	0.0005	0.0004	0.0004	0.0008	0.0010	0.0011	0.0012	0.0014
5	0.2605	0.5288	2735	0.0001	0.0006	0.0007	0.0008	0.0006	0.0007	0.0008	0.0011	0.0014	0.0017
6	0.2609	0.5314	2717	0.0002	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0011	0.0013	0.0016
7	0.2605	0.5293	2733	0.0001	0.0004	0.0007	0.0007	0.0008	0.0010	0.0009	0.0009	0.0012	0.0015
8	0.2588	0.5295	2769	0.0001	0.0003	0.0005	0.0006	0.0006	0.0008	0.0007	0.0009	0.0009	0.0013
9	0.2597	0.5326	2737	0.0001	0.0003	0.0006	0.0007	0.0008	0.0010	0.0012	0.0014	0.0014	0.0017
10	0.2579	0.5317	2779	0.0002	0.0003	0.0002	0.0001	0.0004	0.0005	0.0008	0.0011	0.0012	0.0013
11	0.2591	0.5293	2763	0.0001	0.0002	0.0003	0.0004	0.0004	0.0007	0.0009	0.0010	0.0013	0.0015
12	0.2596	0.5307	2747	0.0001	0.0001	0.0002	0.0003	0.0005	0.0007	0.0009	0.0009	0.0013	0.0016
13	0.2592	0.5303	2758	0.0003	0.0004	0.0005	0.0005	0.0007	0.0009	0.0011	0.0013	0.0017	0.0019
14	0.2591	0.5318	2752	0.0002	0.0002	0.0004	0.0004	0.0005	0.0009	0.0010	0.0012	0.0016	0.0017
15	0.2594	0.5303	2753	0.0001	0.0003	0.0003	0.0002	0.0003	0.0004	0.0008	0.0012	0.0016	0.0017
16	0.2577	0.5304	2789	0.0002	0.0002	0.0001	0.0001	0.0004	0.0007	0.0008	0.0011	0.0013	0.0017
17	0.2587	0.5294	2771	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003	0.0007	0.0007	0.0012	0.0012
18	0.2592	0.5285	2764	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0011	0.0014	0.0016	0.0016
19	0.2598	0.5289	2749	0.0001	0.0001	0.0004	0.0005	0.0006	0.0010	0.0012	0.0015	0.0017	0.0017
20	0.2590	0.5312	2756	0.0001	0.0003	0.0006	0.0006	0.0008	0.0009	0.0017	0.0017	0.0016	0.0017
21	0.2608	0.5293	2728	0.0002	0.0001	0.0004	0.0006	0.0007	0.0009	0.0012	0.0014	0.0016	0.0017
22	0.2581	0.5296	2783	0.0002	0.0002	0.0005	0.0006	0.0009	0.0010	0.0013	0.0015	0.0018	0.0021
23	0.2581	0.5289	2787	0.0001	0.0006	0.0005	0.0005	0.0005	0.0005	0.0008	0.0013	0.0013	0.0017
24	0.2574	0.5301	2796	0.0002	0.0004	0.0004	0.0005	0.0010	0.0012	0.0014	0.0018	0.0021	0.0023
25	0.2596	0.5290	2754	0.0002	0.0001	0.0003	0.0004	0.0014	0.0016	0.0017	0.0019	0.0021	0.0025
Avg.	0.2592	0.5301	2757	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017
Med.	0.2592	0.5301	2754	0.0001	0.0003	0.0005	0.0005	0.0006	0.0009	0.0010	0.0013	0.0014	0.0017
st dev	0.0011	0.0011	23	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Min.	0.2573	0.5285	2712	0.0001	0.0001	0.0001	0.0001	0.0003	0.0003	0.0007	0.0007	0.0009	0.0012
Max.	0.2613	0.5326	2796	0.0003	0.0006	0.0007	0.0008	0.0014	0.0016	0.0017	0.0019	0.0021	0.0025



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

No.	Lumen Maintenance (%)			
	0hr(Initial)	1000hrs	2000hrs	3000hrs



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

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	2.805	2.820	2.817	2.819	2.817	2.825	2.814	2.808	2.817	2.825	2.810
27	2.795	2.808	2.807	2.807	2.813	2.823	2.815	2.817	2.813	2.823	2.805



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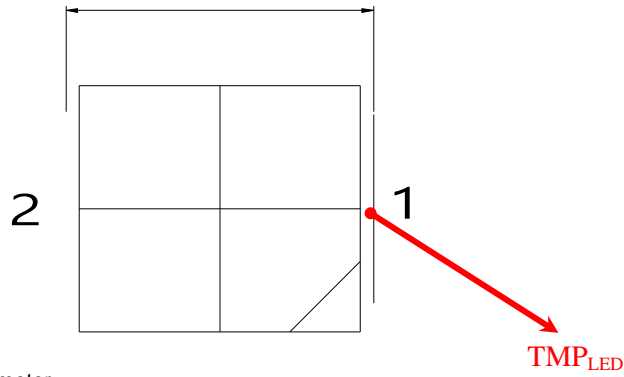
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3.6 Data Set 2, 85°C, 20mA (Chromaticity Shift)

No.			CCT(K)										
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	0.2590	0.5287	2767	0.0002	0.0002	0.0001	0.0002	0.0006	0.0007	0.0013	0.0016	0.0019	0.0021
27	0.2612	0.5304	2715	0.0002	0.0004	0.0006	0.0007	0.0008	0.0011	0.0011	0.0013	0.0016	0.0019
28	0.2596	0.5306	2748	0.0001	0.0004	0.0007	0.0007	0.0007	0.0009	0.0012	0.0014	0.0016	0.0019
29	0.2614	0.5284	2718	0.0002	0.0002	0.0005	0.0006	0.0009	0.0014	0.0013	0.0014	0.0017	0.0019
30	0.2613	0.5290	2718	0.0001	0.0004	0.0006	0.0007	0.0011	0.0012	0.0014	0.0016	0.0018	0.0021
31	0.2588	0.5292	2770	0.0001	0.0002	0.0004	0.0005	0.0009	0.0009	0.0011	0.0014	0.0016	0.0019
							0.0007	0.0008	0.0009	0.0013	0.0016	0.0019	0.0022
33	0.2598	0.5317	2738	0.0002	0.0002	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0016	0.0020
34	0.2619	0.5291	2706	0.0002	0.0004	0.0007	0.0009	0.0010	0.0010	0.0012	0.0014	0.0017	0.0017

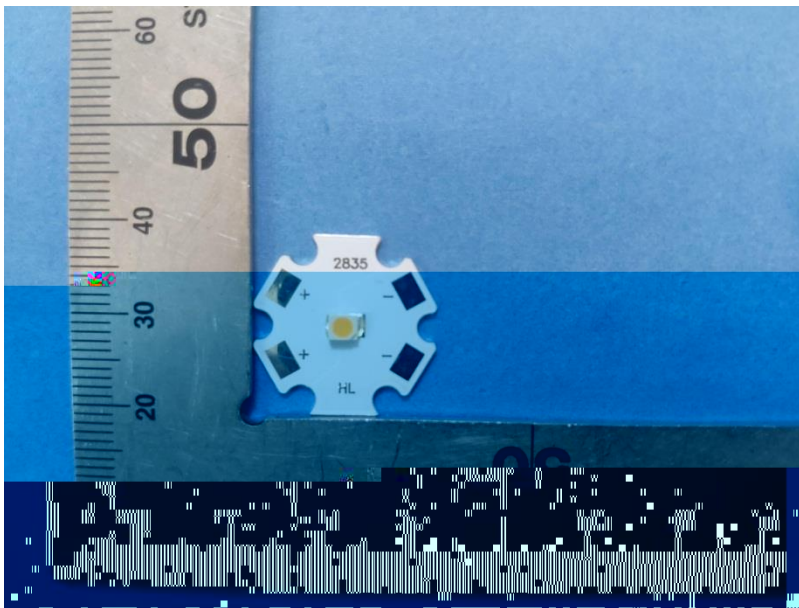
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo





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Directions

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