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: 10000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	RSZ200925503-10-10000
Test Date:	2020-09-30 to 2021-12-11
Report Date:	2022-01-10
Approved by:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China. Tel: +86-

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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 2020-09-25. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-AS-2835DVW-2C-S1-08L-PCT-HR5
Part Type:	LED Package
#Drive Level:	DC 60mA
#Nominal CCT:	2700K
#Power:	1.2W
#Average Current Density per LED die:	270.334mA/mm^2
#Average Power Density per LED die:	2.703W/mm^2
#CRI:	90
#Die Spacing:	0.15mm

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:

Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies	Current (mA)
HL-AS-2835DVW-2C-S1-08L-PCT-HR5	90	2700K	2	1	0.1225	270.334	60	0.15	60
HL-**-2835DV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-2835DV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-2835DV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.0612	135.167	30	0.15	30
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.0612	135.167	30	0.15	30
HL-**-2835DV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.0612	135.167	30	0.15	30
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.0612	135.167	30	0.15	30
HL-**-2835DV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0612	270.334	60	/	60
HL-**-PU2835DV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0612	270.334	60	/	60
HL-**-2835DV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0612	270.334	60	/	60
HL-**-PU2835DV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0612	270.334	60	/	60

Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies	Current (mA)
HL-**-2835DV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0306	135.167	30	/	30
HL-**-PU2835DV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0306	135.167	30	/	30
HL-**-2835DV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0306	135.167	30	/	30
HL-**-PU2835DV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0306	135.167	30	/	30
HL-**-2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
HL-**-2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
HL-**-2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
HL-**-2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
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HL-**-PU2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0612	135.167	30	0.15	60
HL-**-2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0306	67.583	15	0.15	30
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0306	67.583	15	0.15	30
HL-**-2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0306	67.583	15	0.15	30
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0306	67.583	15	0.15	30
HL-**-2835HV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0612	255.495	30	0.15	60
HL-**-PU2835HV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0612	255.495	30	0.15	60
HL-**-2835HV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0612	255.495	30	0.15	60
HL-**-PU2835HV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0612	255.495	30	0.15	60
HL-**-2835HV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0306	127.748	15	0.15	30
HL-**-PU2835HV***W-2-S1-08*-PCT-HR5-***	90	2200-6500K	1	2	0.0306	127.748	15	0.15	30
HL-**-2835HV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0306	127.748	15	0.15	30
HL-**-PU2835HV***W-2-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	2	0.0306	127.748	15	0.15	30
HL-**-2835HV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.0612	255.495	30	0.15	30
HL-**-PU2835HV***W-2C-S1-08*-PCT-HR5-***	90	2200-6500K	2	1	0.0612	255.495	30	0.15	30
HL-**-2835HV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.0612	255.495	30	0.15	30

Model name	CRI (typ.)	CCT (typ.)	Series	Parallel	Power density (W/mm^2)	Current density per LED die (mA/mm^2)	Current per die (mA)	Distance between of dies	Current (mA)
HL-**-PU2835HV***W-2C-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	2	1	0.0612	255.495	30	0.15	30
HL-**-2835HV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0306	255.495	30	/	30
HL-**-PU2835HV***W-S1-08*-PCT-HR5-***	90	2200-6500K	1	1	0.0306	255.495	30	/	30
HL-**-2835HV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0306	255.495	30	/	30
HL-**-PU2835HV***W-S1-08*-PCT-HR5(R9)-***	90	2200-6500K	1	1	0.0306	255.495	30	/	30
HL-**-2835DV***W-2C-S1-08*-PCT-HR5-T6-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5-T6-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-2835DV***W-2C-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
HL-**-PU2835DV***W-2C-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	2	1	0.1225	270.334	60	0.15	60
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HL-**-2835DV***W-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	1	1	0.0612	270.334	60	/	60
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HL-**-PU2835DV***W-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	1	1	0.0306	135.167	30	/	30
HL-**-2835DV***W-2-S1-08*-PCT-HR5-T6-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
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HL-**-PU2835DV***W-2-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	1	2	0.1225	270.334	60	0.15	120
HL-**-2835DV***W-2-S1-08*-PCT-HR5-T6-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
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HL-**-2835DV***W-2-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5(R9)-T6-***	90	2200-6500K	1	2	0.1021	225.278	50	0.15	100
HL-**-2835DV***W-2-S1-08*-PCT-HR5-T6-***	90	2200-6500K	1	2	0.0612	135.167	30	0.15	60
HL-**-PU2835DV***W-2-S1-08*-PCT-HR5-T6-***	90	2200-6500K	1	2	0.0612	135.167	30	0.15	60

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2021-09-27	2022-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2021-09-27	2022-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2021-09-24	2022-09-23
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20023	2021-02-24	2022-02-23
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090003	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 % . 1_{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 " 4 . & 4 - .

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 . 2 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, 60mA

Part Number:	HL-AS-2835DVW-2C-S1-08L-PCT-HR5
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	60mA
Measurement Current:	60mA

Data Set 2: 105°C, 60mA

Part Number:	HL-AS-2835DVW-2C-S1-08L-PCT-HR5
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	60mA
Measurement Current:	60mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration

3 - Test Data

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

No.		Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	121.20	100.25	100.08	99.92	99.50	99.34	99.26	99.01	98.84	98.76	98.68
2	121.00	100.08	99.75	99.59	99.26	99.01	98.60	98.43	98.35	97.93	97.69
3	122.00	100.49	100.33	100.16	99.84	99.34	98.85	98.52	98.03	97.87	97.62
4	122.10	100.08	99.92	99.67	99.59	99.51	99.43	99.26	98.69	98.44	98.20
5	119.60	100.42	100.33	100.25	99.92	99.75	99.50	99.16	98.75	98.49	98.33
6	121.50	100.08	99.92	99.75	99.75	99.42	99.18	99.01	98.85	98.68	98.44
7	122.80	100.16	99.92	99.59	99.35	98.78	98.21	97.96	97.80	97.72	97.64
8	121.70	99.84	99.67	99.42	99.34	98.85	98.77	98.52	97.95	97.53	97.37
9	121.50	99.84	99.59	99.34	99.09	98.52	98.27	97.94	97.78	97.45	97.04
10	120.40	99.92	99.58	99.50	99.42	99.09	98.75	98.50	98.34	98.01	97.76
11	122.00	100.08	99.43	99.26	99.18	99.10	98.77	98.61	98.28	97.87	97.70
12	122.60	99.92	99.67	99.43	99.35	99.10	98.94	98.69	98.21	97.88	97.55
13	120.70	99.92	99.75	99.42	99.34	99.17	98.92	98.67	98.59	98.43	98.18
14	120.80	99.92	99.67	99.42	99.25	99.09	99.01	98.68	98.43	98.10	98.01
15	121.90	99.84	99.75	99.43	99.18	98.93	98.69	98.36	98.28	98.20	97.87
16	121.50	99.92	99.67	99.34	99.09	99.01	98.68	98.44	98.27	97.86	97.70
17	122.50	100.08	99.84	99.43	99.18	99.02	98.86	98.53	98.37	98.04	97.71
18	122.10	100.33	99.92	99.67	99.34	99.18	99.10	98.85	98.77	98.61	98.20
19	120.80	100.17	99.67	99.59	99.34	99.09	99.01	98.76	98.51	98.34	98.18
20	120.90	99.92	99.83	99.59	99.34	99.26	99.17	98.84	98.76	98.59	98.18
21	123.70	100.16	99.76	99.43	99.11	98.79	98.14	97.82	97.57	97.25	97.01
22	121.70	99.92	99.67	99.51	99.10	98.77	98.52	98.36	98.11	97.95	97.45
23	123.00	99.76	99.51	99.27	99.19	99.02	98.94	98.70	98.54	98.21	97.89
24	121.60	99.84	99.75	99.42	99.26	99.18	99.10	98.77	98.68	98.27	97.94
25	121.80	99.75	99.67	99.43	99.10	98.77	98.60	98.44	98.19	98.11	97.78
Avg.	121.66	100.03	99.79	99.55	99.34	99.08	98.85	98.59	98.36	98.10	97.84
Med.	121.70	99.92	99.75	99.43	99.34	99.09	98.86	98.61	98.35	98.10	97.78
st dev	0.89	0.20	0.22	0.25	0.23	0.27	0.35	0.35	0.35	0.39	0.40
Min.	119.60	99.75	99.43	99.26	99.09	98.52	98.14	97.82	97.57	97.25	97.01
Max.	123.70	100.49	100.33	100.25	99.92	99.75	99.50	99.26	98.85	98.76	98.68

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

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	18.45	18.48	18.50	18.49	18.51	18.51	18.52	18.55	18.52	18.52
2	18.59	18.56	18.58	18.58	18.60	18.55	18.60	18.63	18.59	18.64
3	18.36	18.34	18.35	18.35	18.36	18.33	18.36	18.41	18.39	18.43
4	18.65	18.64	18.66	18.65	18.67	18.65	18.67	18.72	18.68	18.74
5	18.40	18.41	18.43	18.42	18.45	18.41	18.44	18.49	18.44	18.48
6	18.43	18.43	18.46	18.46	18.48	18.44	18.46	18.51	18.48	18.51
7	18.54	18.53	18.54	18.55	18.56	18.53	18.55	18.61	18.61	18.62
8	18.52	18.50	18.53	18.52	18.54	18.51	18.52	18.58	18.54	18.62
9	18.46	18.46	18.46	18.47	18.49	18.45	18.47	18.52	18.48	18.54
10	18.49	18.49	18.51	18.50	18.53	18.48	18.49	18.56	18.50	18.58
11	18.53	18.52	18.55	18.53	18.55	18.53	18.32	18.61	18.54	18.61
12	18.32	18.32	18.33	18.33	18.35	18.31	18.54	18.38	18.33	18.39
13	18.60	18.60	18.61	18.60	18.63	18.60	18.61	18.68	18.62	18.66
14	18.57	18.56	18.57	18.56	18.59	18.56	18.56	18.63	18.58	18.62
15	18.44	18.44	18.45	18.45	18.47	18.44	18.45	18.51	18.45	18.54
16	18.31	18.31	18.32	18.32	18.34	18.30	18.31	18.38	18.33	18.40
17	18.58	18.59	18.59	18.58	18.61	18.59	18.58	18.66	18.60	18.70
18	18.43	18.44	18.44	18.44	18.46	18.44	18.45	18.50	18.45	18.53
19	18.59	18.61	18.61	18.61	18.62	18.60	18.61	18.68	18.61	18.69
20	18.34	18.34	18.34	18.34	18.37	18.34	18.35	18.41	18.35	18.42
21	18.43	18.41	18.40	18.40	18.41	18.39	18.39	18.46	18.41	18.47

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

No.			CCT(K)	4									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2571	0.5346	2782	0.0002	0.0002	0.0001	0.0007	0.0009	0.0009	0.0011	0.0016	0.0013	0.0013
2	0.2571	0.5348	2781	0.0001	0.0003	0.0003	0.0011	0.0012	0.0010	0.0011	0.0014	0.0014	0.0013
3	0.2574	0.5328	2784	0.0004	0.0005	0.0006	0.0006	0.0005	0.0005				

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

No.		Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs

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rs	10000hrs
7	0.0018
6	0.0011
7	0.0018
9	0.0023
6	0.0009
4	0.0017
7	0.0007
4	0.0017
4	0.0015
8	0.0012
8	0.0013
8	0.0009

Directions

**********END OF REPORT**********