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-AG-2016H421W-LVR5-S1-PCT-HR3

Report Type: 10000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	SZ2230424-21873E-EE-10000
Test Date:	2023-04-26 to 2024-07-16
Report Date:	2024-07-23
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: +86-0769-86858888 Fax:+86-0769-86858588

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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 2023-04-24. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-AG-2016H421W-LVR5-S1-PCT-HR3
Part Type:	LED Package
#Drive Level:	DC 60mA
#Nominal CCT:	2700K
#Power:	0.2W
#Average Current Density per LED die:	344.445mA/mm^2
#Average Power Density per LED die:	1.1481W//mm^2
#CRI:	80
#Die Spacing:	N/A

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-AG-2016H421W-LVR5-S1-PCT-HR3	80	60	0.2	2700	1	60	344.445	0.0625	/
Multiple model	HL-AG-2016H421W-LVR5-S1-PCT-HR3-SH	80	10	0.03	2200-6500	1	10	57.4075	0.0094	/
Multiple model	HL-AG-2016H421W-LVR5-S1-PCT-HR3-P5-SH	80	10	0.03	2200-6500	1	10	57.4075	0.0094	/
Multiple model	HL-**-2016H***W-***-S1-PCT-HR*-**-***	70-80	60	0.2	2200-6500	1	60	344.445	0.0625	/
Multiple model	HL-**-2016H***W-***-S1-PCT-HR*-**-***	70-80	30	0.09	2200-6500	1	30	172.222	0.0281	/
Multiple model	HL-**-2016H***W-***-S1-PCT-HR*-**-***	70-80	20	0.06	2200-6500	1	20	114.815	0.0188	/
Multiple model	HL-**-2016H***W-***-S1-PCT-HR*-**-***	70-80	10	0.03	2200-6500	1	10	57.4075	0.0094	/
Multiple model	HL-**-2016D***W-***-S1-PCT-HR*-**-***	70-80	60	0.2	2200-6500	1	60	344.445	0.0625	/
Multiple model	HL-**-2016D***W-***-S1-PCT-HR*-**-***	70-80	30	0.09	2200-6500	1	30	172.222	0.0281	/
Multiple model	HL-**-2016D***W-***-S1-PCT-HR*-**-***	70-80	20	0.06	2200-6500	1	20	114.815	0.0188	/
Multiple model	HL-**-2016D***W-***-S1-PCT-HR*-**-***	70-80	10	0.03	2200-6500	1	10	57.4075	0.0094	/

Note: The model name begins with "HL", such as “HL-**-2016H***W-***-S1-PCT-HR*-**-***”, " *" is described in detail as follows:

1. The first“**” is a letter A or AG which stands for the Market demand.
2. The second“***” is a number from 1 to 999 which stands for the brightness level.
3. The third "***" which stands for the Zener chip code or none, no impact on product performances, Zener chip code refers to the electrostatic capacity.
4. The fourth“*”is the number 1 or 2 or 3 which stands for the different CRI style.
5. The fifth“**”is the letter, which stands for the different direction of application or none.
6. The sixth“***”is the letter, which stands for the customer code or none.

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	2023-09-02	2024-09-01
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2023-09-02	2024-09-01
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2023-09-02	2024-09-01
Standard Light Source	EVERFINE	D062	M133799CM1381112	2023-05-12	2025-05-11
LED device life aging system	BACL	BP0-230-200-3	60103	2023-09-03	2024-09-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	2023-09-02	2024-09-01

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: 85°C, 60mA

Part Number:	HL-AG-2016H421W-LVR5-S1-PCT-HR3
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	60mA
Measurement Current:	60mA

Data Set 2: 105°C, 60mA

Part Number:	HL-AG-2016H421W-LVR5-S1-PCT-HR3
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	α	β	Reported TM-21 L_{70} Lifetime	Reported TM-21 L_{90} Lifetime
1	25	0	1000hrs	10000hrs	2.256E-06	1.003	>60000 hours	48000 hours
2	25	0	1000hrs	10000hrs	2.639E-06	1.003	>60000 hours	41000 hours

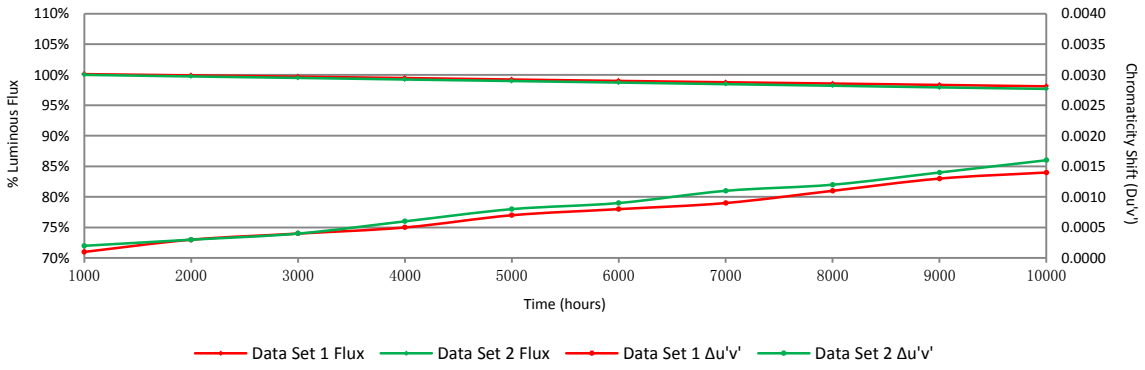
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.10%	99.89%	99.68%	99.46%	99.22%	98.99%	98.77%	98.56%	98.33%	98.10%
2	99.98%	99.72%	99.48%	99.22%	98.97%	98.72%	98.46%	98.20%	97.93%	97.68%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.0001	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
2	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014	0.0016

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 60mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	25.67	99.92	99.73	99.61	99.45	99.30	99.14	98.87	98.68	98.40	98.17
2	26.27	100.15	100.04	99.81	99.58	99.28	99.05	98.71	98.44	98.21	98.02
3	25.36	100.24	100.04	99.80	99.41	99.13	98.86	98.70	98.46	98.30	98.19
4	25.92	100.12	99.96	99.77	99.54	99.38	99.00	98.69	98.57	98.46	98.26
5	26.20	100.19	99.92	99.66	99.50	99.24	99.05	98.78	98.63	98.44	98.24
6	25.37	100.04	99.80	99.57	99.41	99.21	98.94	98.66	98.54	98.34	98.07
7	26.20	100.08	99.77	99.62	99.35	99.16	98.82	98.63	98.40	98.17	98.02
8	25.44	99.92	99.80	99.57	99.37	99.21	99.06	98.90	98.55	98.27	98.00
9	25.18	99.96	99.84	99.60	99.48	99.29	99.17	98.85	98.65	98.49	98.25
10	25.92	100.08	99.88	99.61	99.46	99.27	98.96	98.80	98.65	98.50	98.30
11	25.90	100.08	99.92	99.61	99.42	99.15	98.96	98.76	98.61	98.34	98.19
12	26.04	100.15	99.92	99.62	99.42	99.23	99.08	98.85	98.54	98.35	98.08
13	25.88	100.19	99.92	99.73	99.50	99.19	98.96	98.69	98.42	98.26	98.03
14	25.96	100.19	99.92	99.81	99.50	99.31	99.00	98.77	98.61	98.38	98.15
15	25.98	100.08	99.88	99.73	99.54	99.35	99.15	98.92	98.61	98.34	98.04
16	25.38	100.20	99.92	99.72	99.53	99.37	99.17	98.94	98.74	98.50	98.15
17	25.83	100.15	99.96	99.73	99.50	99.19	98.99	98.76	98.53	98.34	98.10
18	26.31	100.08	99.92	99.73	99.47	99.13	98.90	98.71	98.48	98.29	97.99
19	25.76	100.08	99.88	99.69	99.53	99.18	98.91	98.68	98.52	98.25	97.94
20	25.23	99.92	99.80	99.64	99.45	99.21	98.93	98.69	98.57	98.30	98.10
21	25.93	100.12	99.92	99.73	99.54	99.27	99.07	98.77	98.61	98.38	98.23
22	25.86	100.23	99.96	99.69	99.46	99.19	98.92	98.80	98.57	98.22	97.95
23	25.47	100.08	99.80	99.65	99.41	99.02	98.78	98.70	98.35	98.04	97.88
24	24.78	100.12	99.76	99.60	99.39	99.19	98.95	98.75	98.59	98.43	98.14
25	25.93	100.19	99.85	99.61	99.27	99.07	98.92	98.77	98.57	98.34	98.11
Avg.	25.75	100.10	99.89	99.68	99.46	99.22	98.99	98.77	98.56	98.33	98.10
Med.	25.88	100.12	99.92	99.66	99.46	99.21	98.96	98.76	98.57	98.34	98.10
st dev	0.38	0.09	0.08	0.08	0.07	0.09	0.11	0.08	0.09	0.11	0.11
Min.	24.78	99.92	99.73	99.57	99.27	99.02	98.78	98.63	98.35	98.04	97.88
Max.	26.31	100.24	100.04	99.81	99.58	99.38	99.17	98.94	98.74	98.50	98.30

3.2 Data Set 1, 85°C, 60mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	2.841	2.843	2.841	2.842	2.840	2.842	2.844	2.839	2.840	2.842	2.840
2	2.857	2.858	2.855	2.859	2.855	2.858	2.858	2.855	2.857	2.857	2.854
3	2.872	2.871	2.870	2.872	2.871	2.874	2.874	2.870	2.869	2.871	2.868
4	2.845	2.846	2.845	2.846	2.845	2.849	2.848	2.845	2.844	2.845	2.843
5	2.845	2.844	2.845	2.847	2.843	2.848	2.847	2.843	2.845	2.843	2.843
6	2.838	2.838	2.837	2.840	2.838	2.839	2.839	2.837	2.836	2.836	2.836
7	2.876	2.874	2.874	2.878	2.875	2.878	2.876	2.875	2.874	2.873	2.873
8	2.857	2.855	2.855	2.857	2.855	2.857	2.859	2.854	2.855	2.855	2.854
9	2.845	2.845	2.845	2.847	2.845	2.845	2.846	2.845	2.843	2.844	2.842
10	2.867	2.867	2.867	2.869	2.870	2.868	2.869	2.865	2.866	2.866	2.866
11	2.851	2.848	2.849	2.851	2.852	2.851	2.851	2.849	2.848	2.850	2.848
12	2.843	2.842	2.844	2.845	2.846	2.846	2.846	2.843	2.841	2.842	2.841
13	2.845	2.842	2.847	2.846	2.848	2.847	2.845	2.844	2.845	2.845	2.844
14	2.853	2.850	2.853	2.854	2.856	2.853	2.854	2.852	2.851	2.851	2.851
15	2.865	2.864	2.868	2.867	2.867	2.867	2.866	2.866	2.864	2.864	2.866
16	2.846	2.846	2.847	2.850	2.846	2.851	2.847	2.847	2.844	2.846	2.846
17	2.869	2.867	2.871	2.872	2.869	2.870	2.870	2.867	2.866	2.867	2.867
18	2.862	2.861	2.864	2.864	2.863	2.863	2.865	2.861	2.861	2.861	2.860
19	2.875	2.873	2.877	2.877	2.877	2.874	2.876	2.874	2.873	2.873	2.874
20	2.849	2.848	2.850	2.851	2.851	2.851	2.852	2.849	2.848	2.848	2.848
21	2.848	2.845	2.849	2.848	2.849	2.848	2.849	2.846	2.846	2.846	2.846
22	2.852	2.851	2.852	2.854	2.853	2.852	2.853	2.850	2.850	2.850	2.850
23	2.863	2.866	2.864	2.871	2.866	2.863	2.864	2.863	2.864	2.863	2.861
24	2.848	2.851	2.848	2.855	2.849	2.850	2.848	2.847	2.848	2.847	2.846
25	2.852	2.854	2.855	2.859	2.855	2.854	2.855	2.852	2.854	2.851	2.852
Avg.	2.855	2.854	2.855	2.857	2.855	2.856	2.856	2.854	2.853	2.853	2.853
Med.	2.852	2.851	2.852	2.854	2.853	2.852	2.853	2.850	2.850	2.850	2.850
st dev	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Min.	2.838	2.838	2.837	2.840	2.838	2.839	2.839	2.837	2.836	2.836	2.836
Max.	2.876	2.874	2.877	2.878	2.877	2.878	2.876	2.875	2.874	2.873	2.874

3.3 Data Set 1, 85°C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2594	0.5327	2743	0.0001	0.0002	0.0003	0.0004	0.0006	0.0009	0.0011	0.0013	0.0015	0.0016
2	0.2554	0.5316	2831	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0012	0.0014
3	0.2579	0.5301	2786	0.0001	0.0002	0.0004	0.0006	0.0009	0.0009	0.0011	0.0011	0.0012	0.0014
4	0.2583	0.5325	2766	0.0001	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
5	0.2557	0.5302	2833	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0009	0.0010	0.0012	0.0014
6	0.2588	0.5321	2758	0.0001	0.0003	0.0004	0.0006	0.0008	0.0008	0.0009	0.0010	0.0012	0.0015
7	0.2548	0.5286	2860	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0013	0.0015
8	0.2576	0.5310	2786	0.0001	0.0002	0.0003	0.0005	0.0007	0.0009	0.0011	0.0012	0.0013	0.0015
9	0.2561	0.5282	2834	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014
10	0.2559	0.5277	2839	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014	0.0014	0.0017
11	0.2592	0.5322	2749	0.0002	0.0004	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014
12	0.2575	0.5313	2789	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014
13	0.2558	0.5311	2826	0.0001	0.0004	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0014
14	0.2589	0.5324	2754	0.0001	0.0003	0.0003	0.0006	0.0007	0.0009	0.0011	0.0011	0.0014	0.0016
15	0.2580	0.5312	2778	0.0001	0.0002	0.0004	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016
16	0.2591	0.5276	2771	0.0001	0.0003	0.0004	0.0005	0.0007	0.0007	0.0009	0.0010	0.0013	0.0015
17	0.2573	0.5322	2790	0.0001	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0012	0.0015
18	0.2548	0.5333	2837	0.0001	0.0002	0.0002	0.0004	0.0004	0.0006	0.0007	0.0009	0.0011	0.0014
19	0.2548	0.5290	2859	0.0001	0.0002	0.0003	0.0003	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012
20	0.2571	0.5326	2790	0.0001	0.0004	0.0005	0.0006	0.0006	0.0007	0.0009	0.0011	0.0014	0.0014
21	0.2578	0.5338	2770	0.0001	0.0002	0.0004	0.0005	0.0006	0.0006	0.0010	0.0010	0.0012	0.0013
22	0.2574	0.5290	2801	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0011	0.0011	0.0012	0.0014
23	0.2580	0.5283	2790	0.0001	0.0002	0.0004	0.0006	0.0008	0.0008	0.0009	0.0010	0.0013	0.0013
24	0.2580	0.5304	2782	0.0001	0.0003	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013
25	0.2583	0.5345	2759	0.0001	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013
Avg.	0.2573	0.5309	2795	0.0001	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
Med.	0.2576	0.5312	2789	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
st dev	0.0015	0.0020	35	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2548	0.5276	2743	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012
Max.	0.2594	0.5345	2860	0.0002	0.0004	0.0005	0.0006	0.0009	0.0009	0.0011	0.0014	0.0015	0.0017

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

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	25.58	100.16	99.92	99.73	99.41	99.02	98.83	98.51	98.32	98.08	97.93
27	25.56	100.12	99.88	99.57	99.37	99.14	98.94	98.75	98.51	98.20	97.93
28	24.32	100.08	99.88	99.55	99.30	99.01	98.73	98.52	98.36	98.03	97.78
29	25.39	99.84	99.53	99.41	99.17	98.94	98.78	98.58	98.27	97.99	97.79
30	25.35	100.16	99.84	99.61	99.29	98.93	98.74	98.54	98.34	98.03	97.79
31	25.64	99.92	99.69	99.53	99.30	99.10	98.83	98.52	98.36	98.05	97.74
32	24.26	100.04	99.84	99.59	99.34	99.13	98.85	98.64	98.35	97.98	97.61
33	24.87	100.16	99.84	99.60	99.32	98.99	98.75	98.51	98.23	97.83	97.59
34	25.39	99.96	99.72	99.41	98.98	98.86	98.66	98.50	98.31	98.03	97.76
35	25.69	99.84	99.69	99.46	99.14	98.87	98.56	98.33	98.13	97.86	97.55
36	25.86	99.88	99.65	99.42	99.30	98.99	98.80	98.49	98.18	97.87	97.56
37	24.99	99.96	99.68	99.48	99.28	99.04	98.76	98.40	98.08	97.80	97.60
38	25.04	100.04	99.72	99.40	99.20	99.00	98.72	98.40	98.20	97.88	97.60
39	25.80	99.92	99.61	99.42	99.11	98.99	98.68	98.41	98.10	97.75	97.52
40	25.62	99.84	99.61	99.38	99.02	98.75	98.59	98.40	98.13	97.89	97.58
41	25.56	99.92	99.65	99.49	99.30	99.10	98.79	98.51	98.32	98.00	97.65
42	25.51	100.04	99.73	99.45	99.18	98.98	98.71	98.43	98.16	97.92	97.69
43	25.37	100.08	99.76	99.41	99.17	98.94	98.66	98.42	98.03	97.75	97.48
44	25.26	99.96	99.72	99.45	99.05	98.89	98.65	98.38	98.06	97.82	97.55
45	25.23	99.84	99.64	99.41	99.13	98.89	98.61	98.30	97.94	97.62	97.50
46	25.32	99.76	99.49	99.33	99.17	98.97	98.66	98.34	98.06	97.87	97.71
47	26.12	99.85	99.66	99.54	99.16	98.85	98.58	98.39	98.16	98.01	97.78
48	25.40	100.12	99.80	99.53	99.25	98.90	98.74	98.43	98.19	98.03	97.72
49	25.30	100.08	99.88	99.57	99.37	99.05	98.70	98.34	97.94	97.79	97.67
50	25.84	99.81	99.61	99.42	99.23	98.92	98.68	98.45	98.34	98.07	97.83
Avg.	25.37	99.98	99.72	99.48	99.22	98.97	98.72	98.46	98.20	97.93	97.68
Med.	25.39	99.96	99.72	99.46	99.23	98.98	98.72	98.43	98.19	97.92	97.67
st dev	0.43	0.12	0.12	0.09	0.11	0.10	0.09	0.10	0.14	0.13	0.13
Min.	24.26	99.76	99.49	99.33	98.98	98.75	98.56	98.30	97.94	97.62	97.48
Max.	26.12	100.16	99.92	99.73	99.41	99.14	98.94	98.75	98.51	98.20	97.93

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

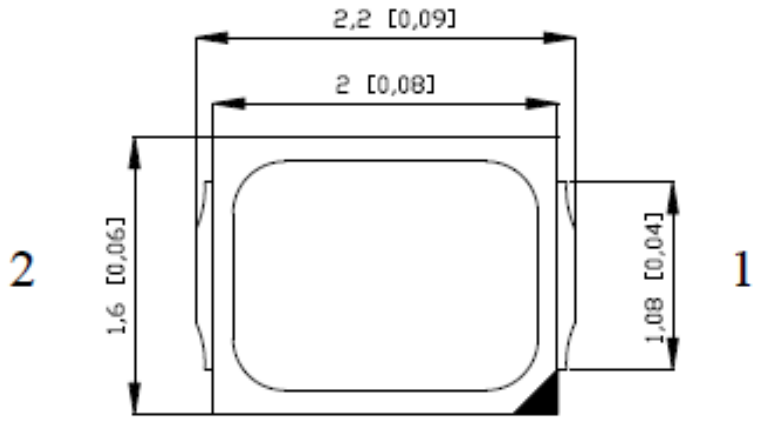
No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	2.840	2.845	2.843	2.845	2.848	2.843	2.843	2.841	2.842	2.842	2.842
27	2.859	2.862	2.863	2.863	2.867	2.864	2.864	2.861	2.862	2.861	2.863
28	2.852	2.853	2.852	2.854	2.857	2.853	2.854	2.853	2.853	2.851	2.851
29	2.853	2.855	2.852	2.854	2.857	2.853	2.853	2.852	2.852	2.852	2.852
30	2.841	2.843	2.843	2.843	2.848	2.842	2.843	2.843	2.841	2.841	2.841
31	2.874	2.878	2.877	2.877	2.872	2.877	2.876	2.875	2.876	2.875	2.875
32	2.847	2.848	2.849	2.847	2.851	2.849	2.851	2.847	2.847	2.847	2.846
33	2.847	2.846	2.847	2.845	2.847	2.846	2.849	2.845	2.843	2.843	2.843
34	2.842	2.845	2.846	2.842	2.849	2.849	2.844	2.842	2.842	2.841	2.842
35	2.847	2.849	2.852	2.848	2.850	2.854	2.849	2.848	2.847	2.847	2.847
36	2.866	2.869	2.871	2.871	2.872	2.874	2.868	2.871	2.868	2.869	2.869
37	2.846	2.848	2.849	2.850	2.851	2.852	2.849	2.846	2.849	2.846	2.847
38	2.840	2.841	2.843	2.841	2.841	2.848	2.842	2.840	2.841	2.840	2.841
39	2.854	2.855	2.857	2.857	2.855	2.859	2.855	2.854	2.855	2.854	2.854
40	2.847	2.848	2.850	2.848	2.848	2.852	2.847	2.846	2.847	2.846	2.847
41	2.843	2.845	2.845	2.843	2.844	2.847	2.843	2.842	2.842	2.845	2.842
42	2.869	2.871	2.872	2.872	2.870	2.879	2.870	2.870	2.870	2.871	2.869
43	2.838	2.839	2.842	2.840	2.839	2.841	2.838	2.836	2.836	2.839	2.837
44	2.846	2.848	2.849	2.847	2.846	2.848	2.847	2.845	2.845	2.846	2.844
45	2.846	2.847	2.849	2.845	2.845	2.847	2.846	2.845	2.845	2.845	2.845
46	2.847	2.849	2.849	2.847	2.848	2.851	2.849	2.847	2.848	2.850	2.847
47	2.856	2.856	2.856	2.855	2.855	2.858	2.858	2.854	2.854	2.855	2.853
48	2.846	2.847	2.849	2.846	2.847	2.850	2.849	2.846	2.845	2.847	2.846
49	2.857	2.859	2.859	2.858	2.858	2.860	2.857	2.857	2.856	2.857	2.855
50	2.841	2.844	2.843	2.841	2.843	2.848	2.843	2.841	2.841	2.842	2.842
Avg.	2.850	2.852	2.852	2.851	2.852	2.854	2.851	2.850	2.850	2.850	2.850
Med.	2.847	2.848	2.849	2.847	2.849	2.851	2.849	2.846	2.847	2.847	2.847
st dev	0.009	0.010	0.010	0.010	0.009	0.010	0.010	0.010	0.010	0.010	0.010
Min.	2.838	2.839	2.842	2.840	2.839	2.841	2.838	2.836	2.836	2.839	2.837
Max.	2.874	2.878	2.877	2.877	2.872	2.879	2.876	2.875	2.876	2.875	2.875

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

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	0.2572	0.5302	2799	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0011	0.0011	0.0012	0.0014
27	0.2566	0.5277	2825	0.0002	0.0003	0.0004	0.0006	0.0008	0.0008	0.0009	0.0010	0.0014	0.0015
28	0.2544	0.5266	2880	0.0001	0.0002	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0012
29	0.2576	0.5287	2799	0.0003	0.0004	0.0005	0.0005	0.0008	0.0009	0.0011	0.0013	0.0015	0.0018
30	0.2565	0.5284	2825	0.0002	0.0004	0.0004	0.0005	0.0008	0.0009	0.0011	0.0012	0.0013	0.0013
31	0.2551	0.5301	2847	0.0001	0.0003	0.0004	0.0005	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013
32	0.2564	0.5305	2816	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011	0.0013	0.0013
33	0.2537	0.5302	2876	0.0001	0.0002	0.0004	0.0007	0.0007	0.0008	0.0010	0.0012	0.0014	0.0014
34	0.2579	0.5279	2794	0.0001	0.0004	0.0007	0.0009	0.0011	0.0012	0.0013	0.0016	0.0018	0.0020
35	0.2573	0.5293	2803	0.0002	0.0003	0.0004	0.0007	0.0009	0.0009	0.0010	0.0012	0.0015	0.0017
36	0.2532	0.5305	2887	0.0002	0.0002	0.0003	0.0004	0.0007	0.0008	0.0009	0.0010	0.0013	0.0014
37	0.2565	0.5264	2832	0.0001	0.0004	0.0004	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013	0.0014
38	0.2567	0.5278	2821	0.0001	0.0002	0.0003	0.0005	0.0007	0.0008	0.0011	0.0012	0.0013	0.0016
39	0.2534	0.5274	2898	0.0001	0.0002	0.0004	0.0004	0.0006	0.0007	0.0010	0.0011	0.0013	0.0015
40	0.2538	0.5292	2879	0.0002	0.0004	0.0006	0.0007	0.0008	0.0011	0.0012	0.0014	0.0015	0.0018
41	0.2595	0.5305	2749	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0014	0.0018
42	0.2582	0.5304	2778	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0015
43	0.2596	0.5315	2744	0.0004	0.0005	0.0006	0.0008	0.0009	0.0012	0.0013	0.0014	0.0015	0.0017
44	0.2562	0.5301	2822	0.0003	0.0004	0.0007	0.0009	0.0011	0.0011	0.0013	0.0016	0.0017	0.0018
45	0.2585	0.5315	2766	0.0001	0.0002	0.0005	0.0006	0.0009	0.0010	0.0012	0.0014	0.0018	0.0021
46	0.2558	0.5317	2822	0.0001	0.0002	0.0003	0.0005	0.0007	0.0010	0.0013	0.0013	0.0015	0.0018
47	0.2577	0.5356	2765	0.0002	0.0004	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0014	0.0016
48	0.2576	0.5320	2784	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0009	0.0011	0.0012	0.0015
49	0.2557	0.5315	2826	0.0001	0.0004	0.0004	0.0006	0.0007	0.0009	0.0010	0.0013	0.0014	0.0017
50	0.2532	0.5306	2887	0.0002	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015
Avg.	0.2563	0.5299	2821	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014	0.0016
Med.	0.2565	0.5302	2822	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0014	0.0015
st dev	0.0019	0.0020	45	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002
Min.	0.2532	0.5264	2744	0.0001	0.0002	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0012
Max.	0.2596	0.5356	2898	0.0004	0.0005	0.0007	0.0009	0.0011	0.0012	0.0013	0.0016	0.0018	0.0021

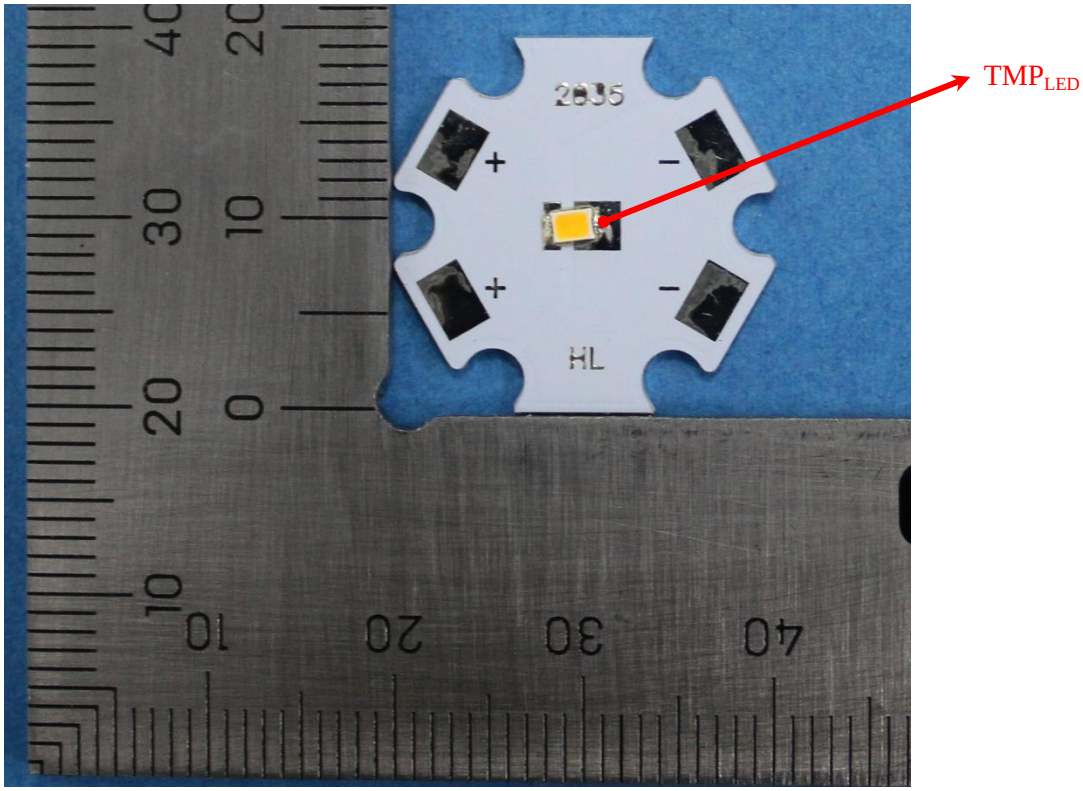
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



Directions

1. The information marked “superscript #” is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K=2 with the 95% confidence interval.
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**********END OF REPORT**********