

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-4014H489W-S1-HR3-DM-HL

Report Type: 10000 Hours Test Report		Product Type: LED Package	
Reviewed By:	Pote Wang	<i>Pote Wang</i>	
Report Number:	SZ2220119-02803E-10-10000		
Test Date:	2022-01-26 to 2023-04-12		
Report Date:	2023-04-19		
Approved by:	Blake Zhang / EE Engineer	<i>Blake Zhang</i>	
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Test Facility:	Test facility was located at No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China.		

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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 2022-01-19. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-A-4014H489W-S1-HR3-DM-HL
Part Type:	LED Package
Drive Level:	DC 60mA
Nominal CCT:	2700K
Power:	0.204W
Average Current Density per LED die:	738.096mA/mm ²
Average Power Density per LED die:	2.510W/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:

Model type	Model name of private label	CRI (typ.)	CCT (K)	Series	Parallel	Power density (W/mm ²)	Current density per LED die (mA/mm ²)	Current per die (mA)	Distance between of dies (mm)	Current (mA)
Test model	HL-A-4014H489W-S1-HR3-DM-HL	80	2700	1	1	0.0365	738.096	60	/	60
Multiple model	HL-A-4014H***W-S1-HR3-DM-***	80	2700-6500	1	1	0.0365	738.096	60	/	60
	HL-A-4014H***W-S1-HR3(R9)-DM-***	80	2700-6500	1	1	0.0365	738.096	60	/	60
	HL-A-4014D***W-S1-HR3-DM-***	80	2700-6500	1	1	0.0365	738.096	60	/	60
	HL-A-4014D***W-S1-HR3(R9)-DM-***	80	2700-6500	1	1	0.0365	738.096	60	/	60

Note:

The model name begins with "HL", such as "A-4014H***W-S1-HR3-DM-***", "***" is described in detail as follows :

1. The first "***" is a number from 1 to 999 which stands for the brightness level.
2. The second "***" is a letter HL or L, None which stands for the bonding wire style.
3. The third "***" is the letter, which 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	2022-09-27	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	11090009	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°C \pm 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 π 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°C \pm 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. (Shenzhen) 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-A-4014H489W-S1-HR3-DM-HL
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-A-4014H489W-S1-HR3-DM-HL
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
1	25	0	1000hrs	10000hrs	2.042E-06	1.002	>60000 hours
2	25	0	1000hrs	10000hrs	2.354E-06	1.000	>60000 hours

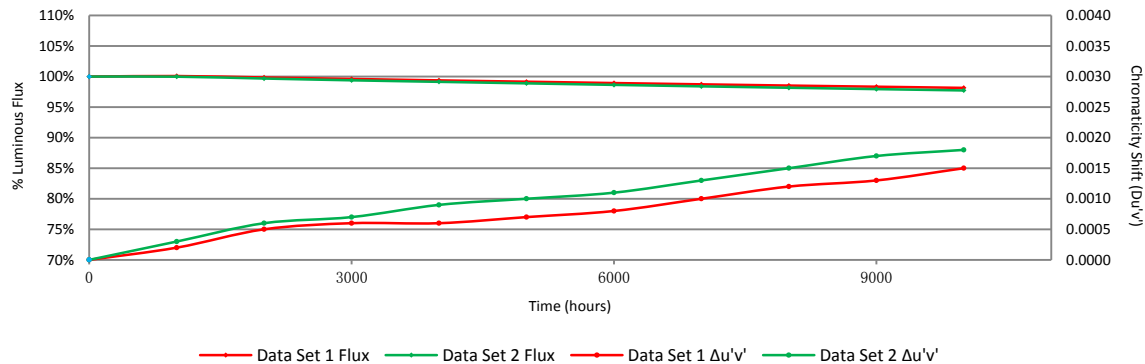
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.09%	99.85%	99.61%	99.38%	99.16%	98.94%	98.73%	98.53%	98.34%	98.15%
2	99.98%	99.68%	99.39%	99.14%	98.89%	98.64%	98.40%	98.17%	97.95%	97.73%

Average Chromaticity Shift

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

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

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

No.	Φ(lm)	Lumen Maintenance (%)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	24.60	100.28	99.88	99.76	99.47	99.27	99.07	98.78	98.50	98.29	98.05
2	24.68	100.20	99.92	99.80	99.64	99.43	99.31	99.07	98.87	98.74	98.58
3	25.25	100.12	99.92	99.72	99.56	99.37	99.09	98.93	98.65	98.42	98.22
4	25.25	100.08	99.88	99.72	99.56	99.29	99.05	98.85	98.73	98.46	98.26
5	24.93	100.24	100.16	99.84	99.68	99.56	99.28	99.08	98.96	98.80	98.68
6	25.55	100.20	99.96	99.57	99.22	99.02	98.79	98.59	98.36	98.08	97.89
7	24.89	100.00	99.76	99.48	99.16	98.92	98.71	98.51	98.35	98.11	97.91
8	25.13	100.28	99.96	99.72	99.40	99.12	98.85	98.61	98.41	98.29	98.09
9	24.84	100.36	100.20	99.88	99.60	99.44	99.15	98.95	98.79	98.59	98.47
10	25.20	99.88	99.60	99.29	99.05	98.85	98.65	98.37	98.13	97.94	97.74
11	24.84	100.24	99.96	99.68	99.44	99.19	98.95	98.67	98.47	98.31	98.15
12	25.56	100.04	99.88	99.53	99.30	99.02	98.83	98.55	98.24	97.97	97.69
13	24.92	100.12	99.96	99.68	99.48	99.32	99.16	98.92	98.76	98.48	98.35
14	25.01	99.84	99.44	99.16	98.92	98.64	98.44	98.20	98.00	97.80	97.60
15	25.65	100.16	99.92	99.73	99.45	99.30	99.10	98.91	98.67	98.52	98.36
16	25.00	99.88	99.56	99.20	98.92	98.64	98.52	98.40	98.28	98.12	98.00
17	25.06	100.20	99.88	99.76	99.56	99.40	99.24	99.08	98.88	98.64	98.36
18	25.13	100.32	99.92	99.68	99.40	99.20	99.01	98.81	98.61	98.41	98.29
19	25.05	99.88	99.72	99.48	99.32	99.08	98.88	98.72	98.52	98.24	97.96
20	24.90	100.20	99.96	99.76	99.60	99.36	99.20	99.00	98.80	98.67	98.51
21	24.98	100.08	99.92	99.60	99.40	99.20	98.88	98.68	98.48	98.20	98.00
22	25.27	99.96	99.84	99.53	99.33	99.09	98.85	98.65	98.42	98.26	98.02
23	25.54	99.84	99.65	99.45	99.26	99.10	98.86	98.67	98.47	98.32	98.08
24	25.45	99.92	99.72	99.61	99.41	99.14	98.86	98.74	98.55	98.43	98.23
25	25.04	99.92	99.56	99.52	99.28	99.04	98.84	98.60	98.44	98.32	98.16
Avg.	25.11	100.09	99.85	99.61	99.38	99.16	98.94	98.73	98.53	98.34	98.15
Med.	25.05	100.12	99.88	99.68	99.40	99.19	98.88	98.72	98.50	98.32	98.15
st dev	0.28	0.16	0.18	0.19	0.21	0.23	0.23	0.23	0.24	0.25	0.27
Min.	24.60	99.84	99.44	99.16	98.92	98.64	98.44	98.20	98.00	97.80	97.60
Max.	25.65	100.36	100.20	99.88	99.68	99.56	99.31	99.08	98.96	98.80	98.68

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

No.	Forward Voltage (V)										
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	3.074	3.091	3.092	3.090	3.100	3.097	3.084	3.105	3.081	3.099	3.092
2	3.093	3.082	3.091	3.087	3.077	3.082	3.096	3.084	3.084	3.110	3.078
3	3.084	3.074	3.086	3.102	3.101	3.071	3.082	3.103	3.081	3.097	3.106
4	3.109	3.091	3.102	3.097	3.088	3.097	3.105	3.076	3.095	3.081	3.107
5	3.076	3.078	3.109	3.106	3.087	3.105	3.100	3.104	3.100	3.084	3.086
6	3.082	3.105	3.101	3.078	3.101	3.091	3.092	3.095	3.109	3.093	3.080
7	3.091	3.080	3.086	3.074	3.089	3.094	3.077	3.095	3.096	3.102	3.096
8	3.086	3.072	3.073	3.065	3.092	3.082	3.106	3.091	3.104	3.103	3.077
9	3.105	3.091	3.094	3.093	3.094	3.091	3.091	3.092	3.082	3.097	3.101
10	3.097	3.084	3.097	3.114	3.083	3.104	3.096	3.091	3.095	3.082	3.094
11	3.102	3.103	3.101	3.102	3.094	3.109	3.095	3.100	3.099	3.097	3.103
12	3.082	3.074	3.087	3.083	3.091	3.104	3.102	3.098	3.105	3.101	3.109
13	3.088	3.084	3.084	3.079	3.077	3.108	3.098	3.091	3.093	3.100	3.076
14	3.107	3.088	3.087	3.084	3.103	3.101	3.092	3.090	3.100	3.092	3.079
15	3.093	3.084	3.106	3.106	3.079	3.092	3.106	3.083	3.094	3.091	3.107
16	3.095	3.095	3.123	3.119	3.099	3.083	3.092	3.104	3.103	3.103	3.108
17	3.080	3.078	3.089	3.094	3.081	3.109	3.095	3.094	3.078	3.108	3.104
18	3.070	3.072	3.079	3.090	3.109	3.079	3.077	3.074	3.101	3.102	3.080
19	3.082	3.078	3.097	3.092	3.099	3.094	3.076	3.099	3.092	3.093	3.092
20	3.084	3.078	3.102	3.098	3.095	3.093	3.095	3.091	3.097	3.109	3.110
21	3.088	3.091	3.094	3.112	3.090	3.101	3.096	3.079	3.090	3.095	3.090
22	3.099	3.097	3.103	3.101	3.106	3.088	3.095	3.108	3.087	3.097	3.106
23	3.082	3.074	3.070	3.067	3.101	3.088	3.084	3.078	3.101	3.084	3.107
24	3.086	3.086	3.092	3.102	3.106	3.097	3.097	3.096	3.082	3.108	3.102
25	3.097	3.095	3.105	3.100	3.090	3.086	3.098	3.079	3.072	3.098	3.079
Avg.	3.089	3.085	3.094	3.093	3.093	3.094	3.093	3.092	3.093	3.097	3.095
Med.	3.088	3.084	3.094	3.094	3.094	3.094	3.095	3.092	3.095	3.097	3.096
st dev	0.010	0.009	0.012	0.014	0.009	0.010	0.009	0.010	0.010	0.008	0.012
Min.	3.070	3.072	3.070	3.065	3.077	3.071	3.076	3.074	3.072	3.081	3.076
Max.	3.109	3.105	3.123	3.119	3.109	3.109	3.106	3.108	3.109	3.110	3.110

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

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)									
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2628	0.5304	2682	0.0002	0.0004	0.0004	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009
2	0.2632	0.5290	2678	0.0001	0.0007	0.0008	0.0005	0.0002	0.0004	0.0007	0.0008	0.0010	0.0012
3	0.2594	0.5294	2756	0.0001	0.0002	0.0002	0.0005	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013
4	0.2621	0.5320	2689	0.0002	0.0005	0.0006	0.0009	0.0012	0.0013	0.0015	0.0016	0.0017	0.0019
5	0.2597	0.5305	2744	0.0001	0.0006	0.0009	0.0004	0.0005	0.0006	0.0009	0.0011	0.0013	0.0014
6	0.2625	0.5309	2686	0.0003	0.0011	0.0008	0.0004	0.0006	0.0009	0.0011	0.0014	0.0015	0.0018
7	0.2597	0.5272	2760	0.0003	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0013
8	0.2603	0.5285	2741	0.0001	0.0006	0.0007	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010
9	0.2587	0.5273	2781	0.0001	0.0003	0.0005	0.0003	0.0004	0.0007	0.0008	0.0009	0.0010	0.0013
10	0.2602	0.5285	2744	0.0002	0.0008	0.0006	0.0007	0.0008	0.0010	0.0012	0.0015	0.0016	0.0017
11	0.2587	0.5274	2780	0.0005	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0010	0.0011	0.0014
12	0.2624	0.5310	2687	0.0001	0.0006	0.0008	0.0010	0.0012	0.0013	0.0014	0.0017	0.0020	0.0023
13	0.2607	0.5310	2723	0.0004	0.0009	0.0009	0.0005	0.0008	0.0008	0.0010	0.0012	0.0013	0.0015
14	0.2594	0.5290	2759	0.0001	0.0006	0.0007	0.0003	0.0004	0.0005	0.0006	0.0009	0.0010	0.0012
15	0.2592	0.5302	2757	0.0003	0.0004	0.0004	0.0004	0.0004	0.0007	0.0008	0.0009	0.0010	0.0011
16	0.2619	0.5326	2691	0.0002	0.0006	0.0004	0.0001	0.0003	0.0003	0.0005	0.0007	0.0008	0.0011
17	0.2589	0.5264	2780	0.0005	0.0007	0.0009	0.0006	0.0007	0.0008	0.0009	0.0012	0.0013	0.0016
18	0.2606	0.5283	2736	0.0005	0.0003	0.0007	0.0007	0.0007	0.0008	0.0009	0.0010	0.0012	0.0014
19	0.2571	0.5278	2813	0.0004	0.0003	0.0005	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014
20	0.2635	0.5304	2668	0.0002	0.0003	0.0007	0.0009	0.0010	0.0012	0.0013	0.0014	0.0016	0.0018
21	0.2575	0.5282	2802	0.0003	0.0009	0.0008	0.0010	0.0013	0.0014	0.0015	0.0016	0.0017	0.0020
22	0.2620	0.5315	2694	0.0001	0.0004	0.0008	0.0004	0.0006	0.0007	0.0008	0.0011	0.0011	0.0013
23	0.2590	0.5300	2762	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0012	0.0014	0.0017	0.0019
24	0.2571	0.5277	2813	0.0000	0.0008	0.0010	0.0012	0.0013	0.0016	0.0019	0.0021	0.0022	0.0024
25	0.2589	0.5266	2780	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0011	0.0014	0.0016
Avg.	0.2602	0.5293	2740	0.0002	0.0005	0.0006	0.0006	0.0007	0.0008	0.0010	0.0012	0.0013	0.0015
Med.	0.2597	0.5290	2744	0.0002	0.0005	0.0007	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014
st dev	0.0019	0.0017	45	0.0001	0.0003	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004
Min.	0.2571	0.5264	2668	0.0000	0.0001	0.0002	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009
Max.	0.2635	0.5326	2813	0.0005	0.0011	0.0010	0.0012	0.0013	0.0016	0.0019	0.0021	0.0022	0.0024

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	25.66	99.96	99.53	99.38	99.06	98.79	98.56	98.32	98.05	97.78	97.47
27	24.89	100.08	99.56	99.32	99.08	98.83	98.59	98.35	98.11	97.87	97.63
28	25.64	100.08	99.84	99.45	99.18	98.95	98.75	98.44	98.21	97.93	97.66
29	25.25	100.20	99.96	99.80	99.60	99.37	99.05	98.85	98.65	98.42	98.22
30	25.66	100.16	99.96	99.57	99.30	99.06	98.87	98.67	98.40	98.17	97.90
31	25.40	99.76	99.61	99.21	98.98	98.78	98.54	98.23	97.99	97.68	97.48
32	24.37	100.12	99.88	99.59	99.38	99.14	98.93	98.65	98.44	98.32	98.15
33	25.85	100.19	99.85	99.54	99.30	99.07	98.80	98.49	98.26	97.95	97.68
34	25.20	100.08	99.88	99.52	99.29	99.01	98.73	98.49	98.25	98.02	97.82
35	25.66	100.19	99.81	99.45	99.18	98.91	98.64	98.44	98.21	97.93	97.70
36	24.86	100.12	99.92	99.56	99.28	99.07	98.75	98.51	98.39	98.23	98.07
37	25.43	99.96	99.76	99.45	99.21	99.02	98.74	98.47	98.23	97.96	97.76
38	25.60	99.92	99.73	99.38	99.18	98.98	98.79	98.55	98.44	98.32	98.16
39	25.71	99.84	99.46	99.07	98.83	98.60	98.33	98.02	97.78	97.55	97.28
40	25.71	99.73	99.57	99.49	99.30	98.99	98.72	98.44	98.17	97.94	97.63
41	25.27	99.88	99.53	99.25	99.01	98.77	98.54	98.34	98.18	98.10	97.94
42	24.80	99.84	99.52	99.31	99.07	98.83	98.59	98.31	98.06	97.78	97.58
43	25.19	99.84	99.52	99.33	99.05	98.73	98.53	98.21	97.94	97.66	97.42
44	25.62	99.84	99.41	99.22	98.95	98.75	98.52	98.28	98.05	97.93	97.78
45	25.51	100.20	99.96	99.69	99.41	99.14	98.86	98.59	98.47	98.31	98.12
46	25.36	99.88	99.72	99.37	99.05	98.70	98.46	98.26	97.99	97.75	97.48
47	25.08	100.16	99.88	99.68	99.40	99.12	98.88	98.60	98.33	98.17	98.01
48	26.04	99.81	99.35	98.96	98.66	98.39	98.12	97.96	97.73	97.50	97.43
49	25.54	99.69	99.41	99.02	98.71	98.39	98.12	97.89	97.65	97.42	97.10
50	25.58	99.84	99.49	99.22	99.02	98.83	98.67	98.51	98.36	98.08	97.85
Avg.	25.40	99.98	99.68	99.39	99.14	98.89	98.64	98.40	98.17	97.95	97.73
Med.	25.51	99.96	99.72	99.38	99.18	98.91	98.67	98.44	98.21	97.94	97.70
st dev	0.38	0.17	0.20	0.21	0.22	0.23	0.23	0.22	0.24	0.27	0.29
Min.	24.37	99.69	99.35	98.96	98.66	98.39	98.12	97.89	97.65	97.42	97.10
Max.	26.04	100.20	99.96	99.80	99.60	99.37	99.05	98.85	98.65	98.42	98.22

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

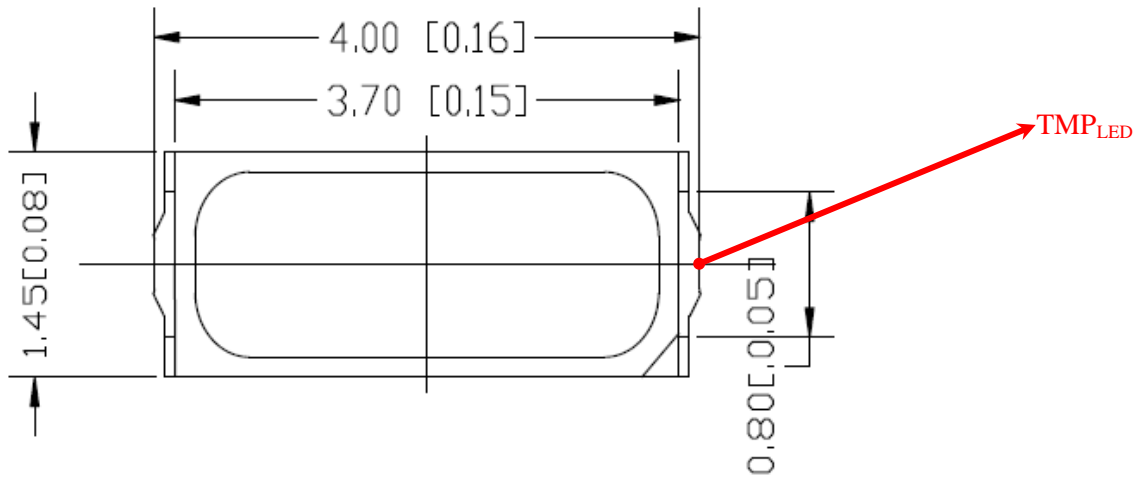
No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	3.084	3.082	3.086	3.084	3.084	3.093	3.094	3.096	3.093	3.091	3.094
27	3.088	3.086	3.087	3.103	3.091	3.105	3.092	3.096	3.104	3.092	3.095
28	3.108	3.118	3.117	3.109	3.099	3.106	3.095	3.106	3.107	3.086	3.099
29	3.091	3.093	3.073	3.080	3.088	3.093	3.095	3.100	3.094	3.098	3.092
30	3.074	3.072	3.075	3.092	3.084	3.100	3.097	3.082	3.093	3.100	3.099
31	3.095	3.091	3.102	3.106	3.099	3.095	3.105	3.092	3.108	3.094	3.099
32	3.086	3.084	3.091	3.115	3.100	3.102	3.109	3.092	3.088	3.107	3.088
33	3.070	3.070	3.079	3.077	3.086	3.089	3.086	3.086	3.098	3.099	3.095
34	3.103	3.099	3.103	3.103	3.096	3.092	3.099	3.093	3.093	3.105	3.094
35	3.105	3.105	3.103	3.101	3.091	3.107	3.084	3.098	3.097	3.110	3.096
36	3.097	3.097	3.101	3.101	3.100	3.108	3.099	3.091	3.100	3.104	3.082
37	3.097	3.095	3.096	3.095	3.096	3.101	3.099	3.092	3.093	3.086	3.102
38	3.088	3.091	3.091	3.103	3.090	3.081	3.097	3.090	3.094	3.084	3.099
39	3.082	3.082	3.091	3.108	3.096	3.092	3.081	3.086	3.093	3.102	3.092
40	3.101	3.101	3.105	3.106	3.093	3.104	3.098	3.108	3.094	3.099	3.106
41	3.088	3.091	3.098	3.095	3.090	3.110	3.098	3.083	3.091	3.083	3.095
42	3.074	3.076	3.082	3.098	3.098	3.093	3.098	3.110	3.091	3.099	3.094
43	3.084	3.084	3.089	3.083	3.087	3.090	3.097	3.095	3.091	3.107	3.107
44	3.084	3.082	3.092	3.103	3.108	3.095	3.091	3.095	3.094	3.108	3.096
45	3.063	3.065	3.075	3.087	3.110	3.107	3.107	3.083	3.102	3.091	3.093
46	3.109	3.118	3.106	3.102	3.099	3.093	3.090	3.108	3.108	3.100	3.093
47	3.063	3.065	3.074	3.086	3.086	3.107	3.085	3.095	3.097	3.109	3.082
48	3.086	3.086	3.099	3.103	3.096	3.100	3.096	3.105	3.091	3.103	3.100
49	3.099	3.099	3.102	3.098	3.097	3.082	3.097	3.098	3.093	3.084	3.096
50	3.084	3.084	3.087	3.091	3.087	3.080	3.092	3.104	3.090	3.098	3.091
Avg.	3.088	3.089	3.092	3.097	3.094	3.097	3.095	3.095	3.096	3.098	3.095
Med.	3.088	3.086	3.091	3.101	3.096	3.095	3.097	3.095	3.094	3.099	3.095
st dev	0.013	0.014	0.012	0.010	0.007	0.009	0.007	0.008	0.006	0.008	0.006
Min.	3.063	3.065	3.073	3.077	3.084	3.080	3.081	3.082	3.088	3.083	3.082
Max.	3.109	3.118	3.117	3.115	3.110	3.110	3.109	3.110	3.108	3.110	3.107

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

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)									
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2591	0.5318	2753	0.0003	0.0001	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014	0.0017	0.0019
27	0.2619	0.5302	2701	0.0004	0.0005	0.0009	0.0010	0.0011	0.0014	0.0014	0.0017	0.0019	0.0019
28	0.2563	0.5302	2821	0.0001	0.0004	0.0009	0.0011	0.0012	0.0014	0.0015	0.0016	0.0019	0.0021
29	0.2610	0.5306	2718	0.0004	0.0008	0.0006	0.0008	0.0009	0.0011	0.0011	0.0014	0.0015	0.0016
30	0.2607	0.5289	2732	0.0004	0.0006	0.0004	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014	0.0014
31	0.2577	0.5286	2796	0.0002	0.0004	0.0005	0.0007	0.0009	0.0012	0.0013	0.0016	0.0016	0.0018
32	0.2648	0.5291	2646	0.0002	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017	0.0018
33	0.2598	0.5309	2741	0.0005	0.0004	0.0007	0.0008	0.0010	0.0011	0.0012	0.0014	0.0017	0.0018
34	0.2592	0.5272	2770	0.0002	0.0006	0.0011	0.0012	0.0013	0.0016	0.0016	0.0019	0.0019	0.0022
35	0.2574	0.5317	2790	0.0003	0.0009	0.0003	0.0004	0.0004	0.0006	0.0007	0.0009	0.0012	0.0013
36	0.2609	0.5294	2724	0.0005	0.0003	0.0002	0.0002	0.0004	0.0005	0.0007	0.0010	0.0012	0.0013
37	0.2621	0.5312	2694	0.0003	0.0003	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0014	0.0017
38	0.2595	0.5302	2750	0.0003	0.0006	0.0004	0.0004	0.0005	0.0005	0.0007	0.0009	0.0012	0.0014
39	0.2607	0.5289	2732	0.0004	0.0008	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016	0.0019
40	0.2574	0.5312	2792	0.0003	0.0008	0.0011	0.0013	0.0013	0.0014	0.0016	0.0016	0.0017	0.0019
41	0.2598	0.5282	2752	0.0004	0.0009	0.0009	0.0012	0.0013	0.0015	0.0016	0.0017	0.0019	0.0019
42	0.2619	0.5302	2702	0.0004	0.0002	0.0012	0.0015	0.0017	0.0020	0.0022	0.0025	0.0026	0.0028
43	0.2625	0.5290	2694	0.0003	0.0009	0.0010	0.0011	0.0013	0.0014	0.0017	0.0019	0.0020	0.0021
44	0.2588	0.5308	2763	0.0004	0.0005	0.0005	0.0007	0.0009	0.0010	0.0012	0.0012	0.0014	0.0014
45	0.2634	0.5308	2668	0.0006	0.0010	0.0011	0.0013	0.0014	0.0015	0.0017	0.0019	0.0021	0.0021
46	0.2626	0.5309	2684	0.0001	0.0006	0.0006	0.0009	0.0009	0.0011	0.0012	0.0014	0.0016	0.0017
47	0.2611	0.5328	2706	0.0001	0.0001	0.0005	0.0006	0.0008	0.0010	0.0011	0.0013	0.0014	0.0016
48	0.2581	0.5323	2772	0.0002	0.0002	0.0004	0.0006	0.0007	0.0009	0.0012	0.0013	0.0016	0.0017
49	0.2584	0.5302	2774	0.0002	0.0004	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011
50	0.2588	0.5287	2772	0.0002	0.0010	0.0011	0.0012	0.0014	0.0016	0.0018	0.0021	0.0022	0.0022
Avg.	0.2602	0.5302	2738	0.0003	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017	0.0018
Med.	0.2598	0.5302	2741	0.0003	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014	0.0016	0.0018
st dev	0.0021	0.0014	44	0.0001	0.0003	0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
Min.	0.2563	0.5272	2646	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011
Max.	0.2648	0.5328	2821	0.0006	0.0010	0.0012	0.0015	0.0017	0.0020	0.0022	0.0025	0.0026	0.0028

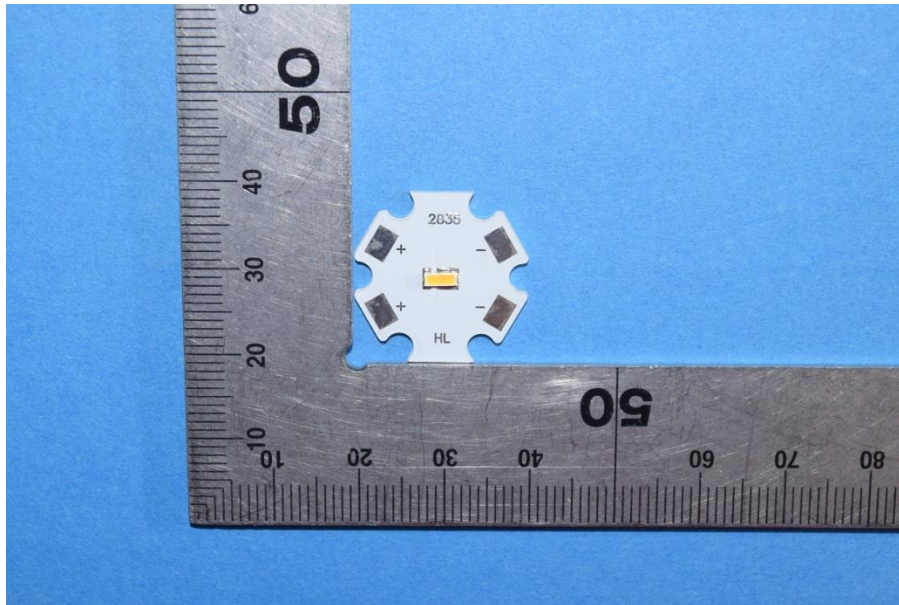
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



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