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-AM-2835H421W-S1-08HL-HR6

Report Type: 6000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	SZ2220119-02805E-10-6000
Test Date:	2022-01-26 to 2022-10-13
Report Date:	2022-10-31
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 1st 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-AM-2835H421W-S1-08HL-HR6
Part Type:	LED Package
Drive Level:	DC 150mA
Nominal CCT:	2700K
Power:	0.51 W
Average Current Density per LED die:	861.113 mA/mm^2
Average Power Density per LED die:	2.928W/mm^2
CRI:	95
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.

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	2022-01-05	2023-01-04
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2023-10-14
Multilayer aging machine	BACL	B2-270	20015	2022-01-04	2023-01-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	2022-01-05	2023-01-04

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. (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, 150mA

Part Number:	HL-AM-2835H421W-S1-08HL-HR6
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	150mA
Measurement Current:	150mA

Data Set 2: 105°C, 150mA

Part Number:	HL-AM-2835H421W-S1-08HL-HR6
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	150mA
Measurement Current:	150mA

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	6000hrs	2.214E-06	1.003	>36000 hours
2	25	0	1000hrs	6000hrs	2.610E-06	1.002	>36000 hours

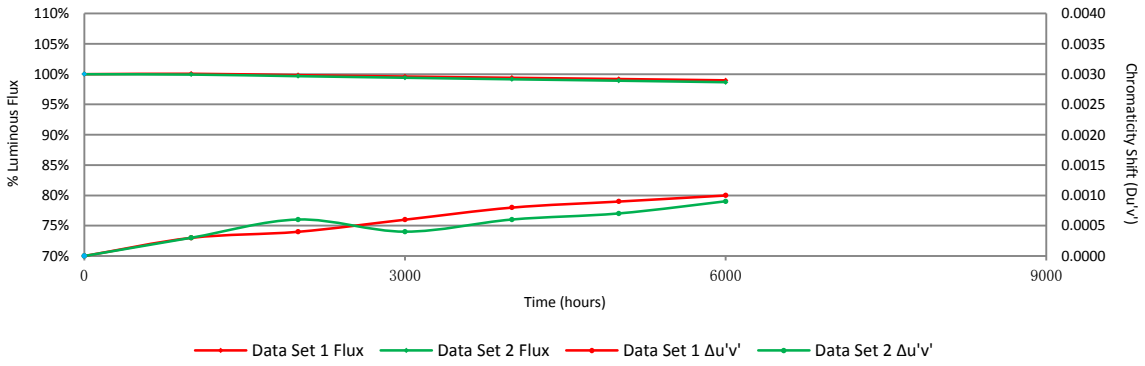
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	100.07%	99.83%	99.60%	99.39%	99.18%	98.96%
2	99.94%	99.67%	99.40%	99.14%	98.90%	98.64%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010
2	0.0003	0.0006	0.0004	0.0006	0.0007	0.0009

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 55°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	44.79	100.11	99.98	99.80	99.60	99.35	99.06
2	45.75	100.09	99.80	99.78	99.58	99.41	99.23
3	45.52	100.04	99.89	99.54	99.38	99.19	98.90
4	45.24	100.15	99.93	99.82	99.56	99.23	98.96
5	45.85	100.07	99.78	99.63	99.35	99.08	98.87
6	45.42	99.98	99.76	99.27	99.10	98.88	98.63
7	45.15	100.11	99.80	99.27	99.07	98.80	98.58
8	46.01	99.93	99.83	99.74	99.48	99.22	99.09
9	45.32	100.09	99.69	99.40	99.14	98.92	98.72
10	46.19	100.11	99.81	99.35	99.16	98.96	98.77
11	46.06	100.22	99.83	99.65	99.35	99.15	98.96
12	45.80	100.15	99.96	99.76	99.52	99.28	99.13
13	44.74	100.22	99.98	99.62	99.44	99.26	99.04
14	46.03	99.93	99.61	99.26	99.04	98.81	98.50
15	46.18	100.11	99.94	99.83	99.65	99.46	99.22
16	46.27	100.28	99.98	99.85	99.63	99.44	99.24
17	45.80	100.04	99.93	99.65	99.39	99.21	99.00
18	45.11	100.07	99.62	99.38	99.16	99.02	98.80
19	45.04	100.02	99.76	99.22	98.98	98.82	98.60
20	46.22	100.02	99.83	99.76	99.55	99.31	99.09
21	44.81	99.93	99.73	99.51	99.40	99.24	99.02
22	45.96	99.98	99.91	99.89	99.70	99.54	99.35
23	45.82	100.13	99.96	99.89	99.78	99.61	99.41
24	45.59	100.04	99.89	99.63	99.47	99.21	98.95
25	45.28	100.02	99.69	99.49	99.29	99.09	98.90
Avg.	45.60	100.07	99.83	99.60	99.39	99.18	98.96
Med.	45.75	100.07	99.83	99.63	99.40	99.21	98.96
st dev	0.48	0.09	0.11	0.22	0.22	0.23	0.24
Min.	44.74	99.93	99.61	99.22	98.98	98.80	98.50
Max.	46.27	100.28	99.98	99.89	99.78	99.61	99.41

3.2 Data Set 1, 55°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.147	3.122	3.117	3.124	3.142	3.142	3.128
2	3.172	3.149	3.155	3.152	3.137	3.132	3.132
3	3.155	3.128	3.155	3.137	3.139	3.125	3.120
4	3.164	3.134	3.160	3.128	3.142	3.128	3.138
5	3.172	3.141	3.137	3.147	3.154	3.136	3.149
6	3.162	3.136	3.154	3.155	3.142	3.144	3.150
7	3.132	3.113	3.118	3.127	3.141	3.147	3.139
8	3.141	3.122	3.123	3.127	3.135	3.139	3.139
9	3.155	3.124	3.120	3.146	3.140	3.149	3.140
10	3.151	3.134	3.140	3.138	3.135	3.115	3.141
11	3.145	3.136	3.137	3.150	3.140	3.147	3.154
12	3.155	3.145	3.142	3.141	3.131	3.127	3.151
13	3.145	3.136	3.151	3.154	3.130	3.142	3.142
14	3.155	3.134	3.150	3.162	3.128	3.129	3.120
15	3.139	3.118	3.131	3.145	3.140	3.138	3.138
16	3.156	3.147	3.155	3.154	3.142	3.145	3.136
17	3.157	3.132	3.137	3.115	3.139	3.121	3.137
18	3.134	3.122	3.121	3.130	3.145	3.136	3.142
19	3.143	3.128	3.133	3.121	3.129	3.130	3.145
20	3.139	3.132	3.133	3.143	3.138	3.140	3.153
21	3.124	3.118	3.124	3.133	3.133	3.132	3.146
22	3.143	3.134	3.129	3.138	3.133	3.139	3.130
23	3.145	3.139	3.135	3.133	3.151	3.144	3.156
24	3.143	3.132	3.144	3.152	3.141	3.145	3.148
25	3.139	3.136	3.136	3.138	3.137	3.134	3.142
Avg.	3.149	3.132	3.137	3.140	3.139	3.136	3.141
Med.	3.145	3.134	3.137	3.138	3.139	3.138	3.141
st dev	0.012	0.009	0.013	0.012	0.006	0.009	0.010
Min.	3.124	3.113	3.117	3.115	3.128	3.115	3.120
Max.	3.172	3.149	3.160	3.162	3.154	3.149	3.156

3.3 Data Set 1, 55°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2624	0.5280	2700	0.0002	0.0005	0.0005	0.0007	0.0009	0.0011
2	0.2607	0.5286	2733	0.0003	0.0004	0.0006	0.0007	0.0011	0.0012
3	0.2619	0.5285	2707	0.0001	0.0003	0.0007	0.0009	0.0011	0.0013
4	0.2599	0.5259	2761	0.0003	0.0003	0.0008	0.0010	0.0011	0.0013
5	0.2606	0.5262	2745	0.0002	0.0005	0.0006	0.0007	0.0008	0.0009
6	0.2598	0.5257	2764	0.0001	0.0002	0.0005	0.0005	0.0008	0.0010
7	0.2602	0.5260	2754	0.0002	0.0004	0.0008	0.0010	0.0011	0.0012
8	0.2609	0.5291	2726	0.0005	0.0002	0.0004	0.0004	0.0006	0.0008
9	0.2607	0.5252	2748	0.0004	0.0009	0.0008	0.0010	0.0011	0.0011
10	0.2588	0.5270	2781	0.0001	0.0006	0.0008	0.0009	0.0011	0.0013
11	0.2587	0.5264	2784	0.0002	0.0005	0.0006	0.0007	0.0009	0.0011
12	0.2608	0.5282	2733	0.0002	0.0002	0.0002	0.0003	0.0005	0.0008
13	0.2615	0.5263	2725	0.0002	0.0002	0.0002	0.0003	0.0005	0.0007
14	0.2573	0.5279	2809	0.0003	0.0006	0.0005	0.0007	0.0007	0.0008
15	0.2605	0.5294	2733	0.0002	0.0004	0.0007	0.0009	0.0010	0.0012
16	0.2576	0.5295	2795	0.0006	0.0005	0.0008	0.0010	0.0011	0.0012
17	0.2613	0.5293	2718	0.0004	0.0004	0.0006	0.0007	0.0007	0.0008
18	0.2613	0.5275	2724	0.0001	0.0005	0.0007	0.0009	0.0009	0.0010
19	0.2624	0.5272	2703	0.0003	0.0005	0.0009	0.0010	0.0010	0.0012
20	0.2578	0.5266	2804	0.0007	0.0004	0.0003	0.0005	0.0006	0.0008
21	0.2607	0.5278	2735	0.0003	0.0004	0.0007	0.0010	0.0011	0.0013
22	0.2608	0.5270	2737	0.0001	0.0005	0.0004	0.0006	0.0006	0.0008
23	0.2603	0.5277	2744	0.0002	0.0001	0.0006	0.0007	0.0007	0.0008
24	0.2602	0.5259	2756	0.0006	0.0002	0.0009	0.0011	0.0011	0.0014
25	0.2619	0.5286	2707	0.0004	0.0004	0.0007	0.0009	0.0011	0.0012
Avg.	0.2604	0.5274	2745	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010
Med.	0.2607	0.5275	2737	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011
st dev	0.0014	0.0013	31	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2573	0.5252	2700	0.0001	0.0001	0.0002	0.0003	0.0005	0.0007
Max.	0.2624	0.5295	2809	0.0007	0.0009	0.0009	0.0011	0.0011	0.0014

3.4 Data Set 2, 105°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	44.73	99.91	99.66	99.28	99.02	98.68	98.44
27	46.02	99.98	99.70	99.44	99.17	98.89	98.76
28	44.87	100.22	99.98	99.64	99.35	99.15	98.86
29	45.44	100.02	99.82	99.74	99.47	99.23	98.94
30	45.27	99.76	99.62	99.25	98.96	98.65	98.37
31	45.35	99.98	99.58	99.32	99.12	98.88	98.63
32	46.33	100.13	99.87	99.57	99.29	98.99	98.75
33	45.73	99.89	99.63	99.19	98.93	98.73	98.45
34	45.81	99.83	99.48	99.17	98.91	98.69	98.43
35	46.05	99.83	99.61	99.24	98.98	98.72	98.37
36	46.14	99.80	99.59	99.39	99.13	98.85	98.61
37	46.19	99.85	99.48	99.35	99.07	98.85	98.55
38	46.26	99.83	99.52	99.31	99.07	98.83	98.55
39	45.32	100.20	99.93	99.54	99.25	98.96	98.61
40	45.77	100.15	99.93	99.83	99.56	99.34	99.15
41	45.38	100.04	99.69	99.32	99.03	98.77	98.44
42	46.34	100.11	99.94	99.74	99.46	99.22	98.92
43	45.54	99.87	99.82	99.43	99.21	99.01	98.84
44	45.06	99.82	99.33	99.07	98.87	98.65	98.45
45	45.14	100.16	99.96	99.78	99.49	99.22	98.98
46	46.46	100.19	99.96	99.55	99.35	99.12	98.90
47	45.73	99.89	99.58	99.34	99.08	98.80	98.53
48	46.19	99.65	99.35	99.16	98.94	98.64	98.46
49	45.68	99.67	99.23	98.95	98.66	98.47	98.27
50	46.13	99.70	99.41	99.33	99.15	99.05	98.81
Avg.	45.72	99.94	99.67	99.40	99.14	98.90	98.64
Med.	45.73	99.89	99.63	99.34	99.12	98.85	98.61
st dev	0.49	0.17	0.22	0.23	0.22	0.23	0.23
Min.	44.73	99.65	99.23	98.95	98.66	98.47	98.27
Max.	46.46	100.22	99.98	99.83	99.56	99.34	99.15

3.5 Data Set 2, 105°C, 150mA (Forward Voltage)

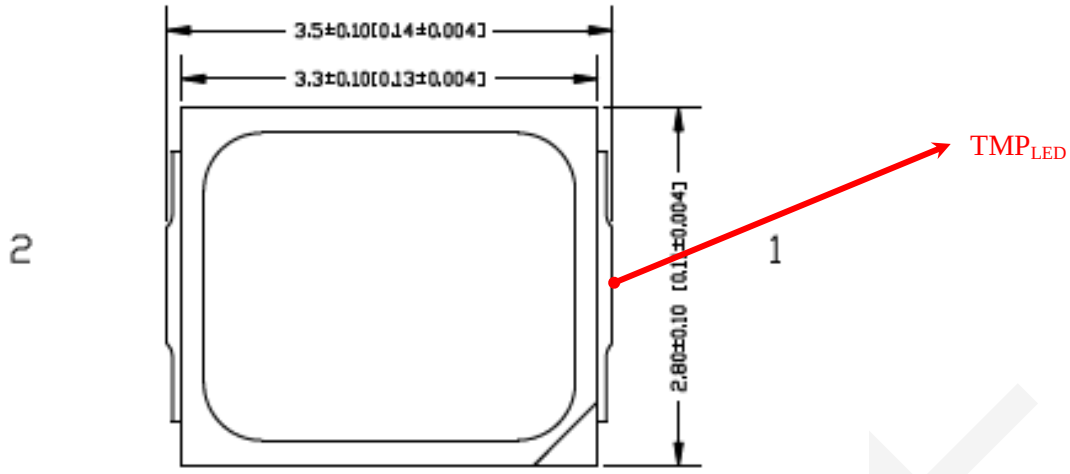
No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.143	3.134	3.142	3.137	3.163	3.150	3.140
27	3.147	3.136	3.132	3.128	3.143	3.164	3.131
28	3.147	3.130	3.150	3.140	3.127	3.126	3.132
29	3.153	3.136	3.158	3.150	3.158	3.152	3.145
30	3.172	3.134	3.130	3.122	3.138	3.147	3.134
31	3.149	3.136	3.143	3.135	3.130	3.133	3.135
32	3.143	3.134	3.138	3.117	3.141	3.143	3.130
33	3.149	3.141	3.138	3.136	3.137	3.140	3.138
34	3.151	3.134	3.125	3.117	3.148	3.127	3.142
35	3.124	3.118	3.110	3.119	3.130	3.124	3.122
36	3.157	3.128	3.130	3.137	3.135	3.130	3.135
37	3.130	3.126	3.129	3.127	3.157	3.143	3.160
38	3.136	3.132	3.133	3.130	3.140	3.148	3.136
39	3.136	3.130	3.132	3.132	3.155	3.127	3.134
40	3.139	3.136	3.146	3.146	3.139	3.152	3.143
41	3.143	3.139	3.136	3.128	3.142	3.149	3.150
42	3.153	3.147	3.146	3.146	3.125	3.154	3.142
43	3.141	3.130	3.134	3.156	3.155	3.137	3.150
44	3.124	3.122	3.127	3.128	3.148	3.129	3.127
45	3.132	3.128	3.131	3.127	3.143	3.132	3.127
46	3.145	3.136	3.135	3.133	3.130	3.126	3.140
47	3.132	3.122	3.127	3.126	3.143	3.131	3.141
48	3.153	3.143	3.135	3.136	3.145	3.149	3.148
49	3.145	3.143	3.149	3.150	3.131	3.133	3.145
50	3.147	3.145	3.149	3.147	3.143	3.132	3.136
Avg.	3.144	3.134	3.136	3.134	3.142	3.139	3.139
Med.	3.145	3.134	3.135	3.133	3.142	3.137	3.138
st dev	0.011	0.007	0.010	0.011	0.010	0.011	0.009
Min.	3.124	3.118	3.110	3.117	3.125	3.124	3.122
Max.	3.172	3.147	3.158	3.156	3.163	3.164	3.160

3.6 Data Set 2, 105°C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2622	0.5261	2712	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008
27	0.2612	0.5299	2717	0.0004	0.0007	0.0005	0.0006	0.0009	0.0010
28	0.2619	0.5275	2711	0.0001	0.0005	0.0007	0.0009	0.0010	0.0012
29	0.2595	0.5267	2766	0.0004	0.0001	0.0005	0.0006	0.0008	0.0010
30	0.2604	0.5253	2753	0.0001	0.0006	0.0006	0.0007	0.0009	0.0010
31	0.2598	0.5258	2763	0.0001	0.0003	0.0001	0.0004	0.0005	0.0006
32	0.2599	0.5282	2751	0.0003	0.0003	0.0002	0.0004	0.0004	0.0006
33	0.2597	0.5255	2767	0.0004	0.0003	0.0005	0.0006	0.0008	0.0010
34	0.2601	0.5279	2747	0.0004	0.0007	0.0007	0.0009	0.0010	0.0012
35	0.2609	0.5267	2737	0.0002	0.0006	0.0003	0.0001	0.0001	0.0004
36	0.2595	0.5292	2755	0.0004	0.0013	0.0016	0.0016	0.0017	0.0018
37	0.2580	0.5263	2801	0.0000	0.0006	0.0002	0.0004	0.0005	0.0006
38	0.2578	0.5267	2803	0.0003	0.0008	0.0004	0.0005	0.0006	0.0006
39	0.2609	0.5263	2737	0.0002	0.0006	0.0002	0.0004	0.0003	0.0006
40	0.2597	0.5254	2767	0.0004	0.0006	0.0002	0.0003	0.0004	0.0006
41	0.2593	0.5253	2777	0.0004	0.0007	0.0003	0.0004	0.0005	0.0007
42	0.2595	0.5275	2762	0.0003	0.0008	0.0003	0.0004	0.0006	0.0006
43	0.2610	0.5264	2735	0.0002	0.0004	0.0003	0.0004	0.0005	0.0007
44	0.2626	0.5286	2694	0.0002	0.0006	0.0005	0.0006	0.0007	0.0008
45	0.2622	0.5282	2702	0.0004	0.0005	0.0004	0.0005	0.0005	0.0008
46	0.2581	0.5265	2799	0.0002	0.0008	0.0005	0.0006	0.0007	0.0011
47	0.2599	0.5279	2753	0.0001	0.0009	0.0005	0.0006	0.0008	0.0010
48	0.2605	0.5259	2749	0.0003	0.0007	0.0004	0.0005	0.0007	0.0008
49	0.2593	0.5253	2776	0.0002	0.0009	0.0004	0.0006	0.0007	0.0010
50	0.2587	0.5257	2789	0.0004	0.0004	0.0002	0.0003	0.0005	0.0006
Avg.	0.2601	0.5268	2753	0.0003	0.0006	0.0004	0.0006	0.0007	0.0009
Med.	0.2599	0.5265	2753	0.0003	0.0006	0.0004	0.0005	0.0006	0.0008
st dev	0.0013	0.0013	30	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003
Min.	0.2578	0.5253	2694	0.0000	0.0001	0.0001	0.0001	0.0001	0.0004
Max.	0.2626	0.5299	2803	0.0004	0.0013	0.0016	0.0016	0.0017	0.0018

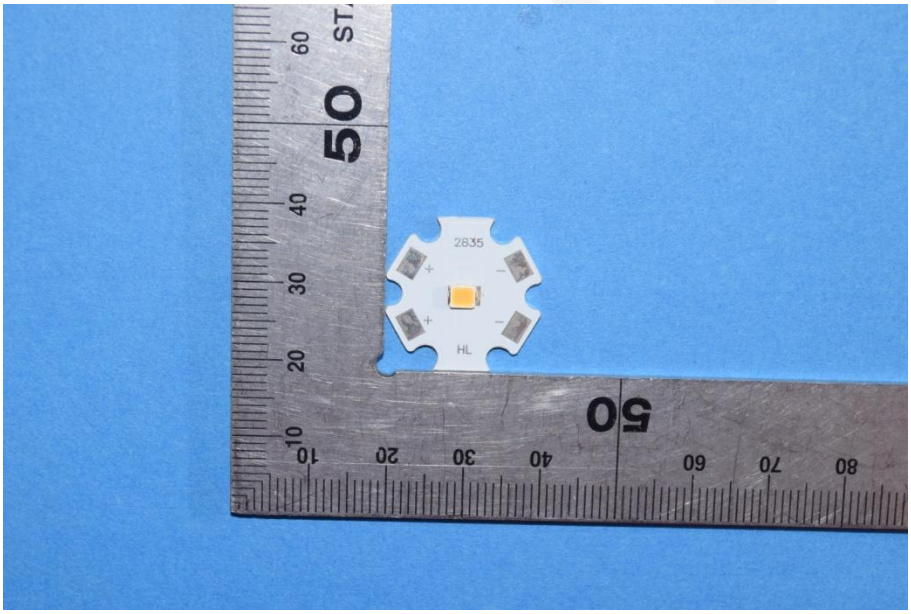
4 - DUT Photo

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