TEST REPORT

A

Blake zhang

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Multiple models	HL-LH021D102W-5B1C16(Ra2)-FC	80	2700K 6500K	16	1	0.0316	582.4	120	0.4478	120
Multiple models	HL-LH022D101W-12B1C26(Ra2)-S-FC	80	2700K 6500K	26	1	0.0642	598.08	150	0.7748	150
Multiple models	HL-LH022D101W-12B1C26(Ra2) -FC	80	2700K 6500K	26	1	0.0642	598.08	150	0.7748	150
Multiple models	HL-LH022D102W-7B1C26(Ra2)-S -FC	80	2700K 6500K	26	1	0.0514	582.4	120	0.7748	120
Multiple models	HL-LH022D102W-7B1C26(Ra2) -FC	80	2700K 6500K	26	1	0.0514	582.4	120	0.7748	120
Multiple models	HL-LH022D101W-18B1C36(Ra2)-S-FC	80	2700K 6500K	36	1	0.0888	598.08	150	0.6987	150
Multiple models	HL-LH022D101W-18B1C36(Ra2)-FC	80	2700K 6500K	36	1	0.0888	598.08	150	0.6987	150
Multiple models	HL-LH022D102W-10B1C36(Ra2)-S-FC	80	2700K 6500K	36	1	0.0711	582.4	120	0.6987	120
Multiple models	HL-LH022D102W-10B1C36(Ra2)-FC	80	2700K 6500K	36	1	0.0711	582.4	120	0.6987	120
Multiple models	HL-LH022D101W-20B1C42(Ra2)-S-FC	80	2700K 6500K	42	1	0.1037	598.08	150	0.4832	150
Multiple models	HL-LH022D101W-20B1C42(Ra2)-FC	80	2700K 6500K	42	1					

Multiple models	HL-LH022D101W-20B2C21(Ra2)-S-FC	80	2700K 6500K

Multiple models	HL-LH023D102W-18B2C30(Ra2)-FC	80	2700K 6500K	30	2	0.0599	582.4	120	0.5469	240
Multiple models	HL-LH023D101W-30B2C36(Ra2)-S-FC	80	2700K 6500K	36	2	0.0897	598.08	150	0.6248	300
Multiple models	HL-LH023D101W-30B2C36(Ra2)-FC	80	2700K 6500K	36	2	0.0897	598.08	150	0.6248	300
Multiple models	HL-LH023D102W-20B2C36(Ra2)-S-FC	80	2700K 6500K	36	2	0.0718	582.4	120	0.6248	240
Multiple models	HL-LH023D102W-20B2C36(Ra2)-FC	80	2700K 6500K	36	2	0.0718	582.4	120	0.6248	240
Multiple models	HL-LH023D101W-36B2C39(Ra2)-S-FC	80	2700K 6500K	39	2	0.0972	598.08	150	0.5762	300
Multiple models	HL-LH023D101W-36B2C39(Ra2)-FC	80	2700K 6500K	39	2	0.0972	598.08	150	0.5762	300
Multiple models	HL-LH023D102W-22B2C39(Ra2)-S-FC	80	2700K 6500K	39	2	0.0778	582.4	120	0.5762	240
Multiple models	HL-LH023D102W-22B2C39(Ra2) -FC	80	2700K 6500K	39	2	0.0778	582.4	120	0.5762	240
Multiple models	HL-LH023D101W-15B3C24(Ra2)-S-FC	80	2700K 6500K	24	3	0.0897	598.08	150	0.6248	450
Multiple models	HL-LH023D101W-15B3C24(Ra2)-FC	80	2700K 6500K	24	3	0.0897	598.08	150	0.6248	450
Multiple models	HL-LH023D102W-15B3C24(Ra2)-S-FC	80	2700K 6500K	24	3	0.0718	582.4	120	0.6248	360
Multiple models	HL-LH023D102W-15B3C24(Ra2)-FC	80	2700K 6500K	24	3	0.0718	582.4	120	0.6248	360
Multiple models	HL-LH024D101W-36B8C12(Ra2)-S-FC-PM	80	2700K 6500K	12	8	0.1197	598.08	150	0.4157	1200
Multiple models	HL-LH024D102W-28B8C12(Ra2)-S-FC-PM	80	2700K 6500K	12	8	0.0958	582.4	120	0.4157	960
Multiple models	HL-LH024D101W-35B2C40(Ra2)-S-FC	80	2700K 6500K	40	2	0.0997	598.08	150	0.7052	300
Multiple models	HL-LH024D101W-35B2C40(Ra2)-FC	80	2700K 6500K	40	2	0.0997	598.08	150	0.7052	300
Multiple models	HL-LH024D102W-24B2C40(Ra2)-S-FC	80	2700K 6500K	40	2	0.0798	582.4	120	0.7052	240
Multiple models	HL-LH024D102W-24B2C40(Ra2) -FC	80	2700K 6500K	40	2	0.0798	582.4	120	0.7052	240

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
1.0m integrating sphere	SENSING	SCD-20008	N/A	2019-10-22	2020-10-21
spectroradiometer	SENSING	SCD-20008	N/A	2019-10-22	2020-10-21
DC Power Supply	Hanshenpuyuan	HSPY-100-05	2013010210003	2019-07-23	2020-07-22
Standard Light Source	EVERFINE	D204	N/A	2019-07-19	2020-07-18
DC Power Supply	BACL	B25001	90020	2020-01-07	2021-01-07
Multilayer aging machine	BACL	B2-270	20022	2020-03-11	2021-03-10
Programmable dc power supply	Xinnuoer	PDF 1200-300	NA	2019-07-23	2020-07-22

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 FRODHVW '87 9¶ 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 $6 7 0 (7 D E O H 3 6 S H F L D O / L P L W V ´

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 ¶¶2 Œmeasurement 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, 300mA

Part Number:	HL ±LH023D101W-40B2C54(Ra2)-S-FC
Number of Units:	12
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	300mA
Measurement Current:	300mA

Data Set 2: 105°C, 300Ma

Part Number:	HL ±LH023D101W-40B2C54(Ra2)-S-FC
Number of Units:	12
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	300mA
Measurement Current:	300mA

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_{80} Lifetime	Reported TM-21 L_{90} Lifetime
1	12	0	1000hrs	7000hrs	3.445E-06	0.994	>39000 hours	>39000 hours	29000 hours
2	12	0	1000hrs	7000hrs	4.422E-06	0.991	>39000 hours	>39000 hours	22000 hours

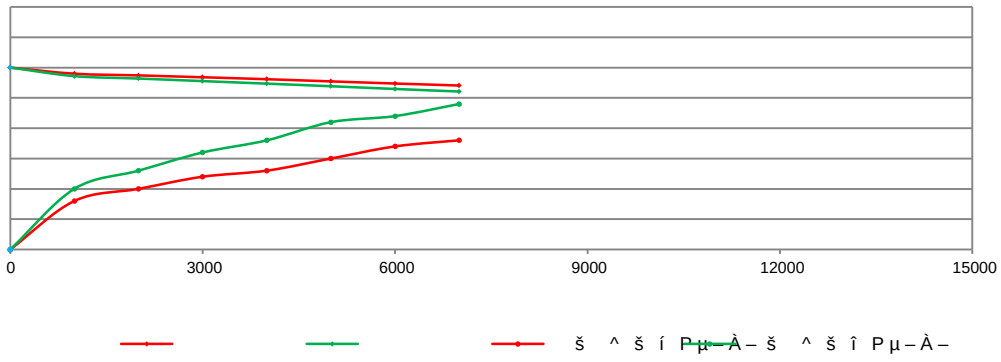
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	98.99%	98.71%	98.40%	98.08%	97.72%	97.37%	97.04%
2	98.59%	98.19%	97.77%	97.35%	96.92%	96.47%	96.05%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	0.0008	0.001	0.0012	0.0013	0.0015	0.0017	0.0018
2	0.001	0.0013	0.0016	0.0018	0.0021	0.0022	0.0024

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 300mA (Lumen Maintenance)

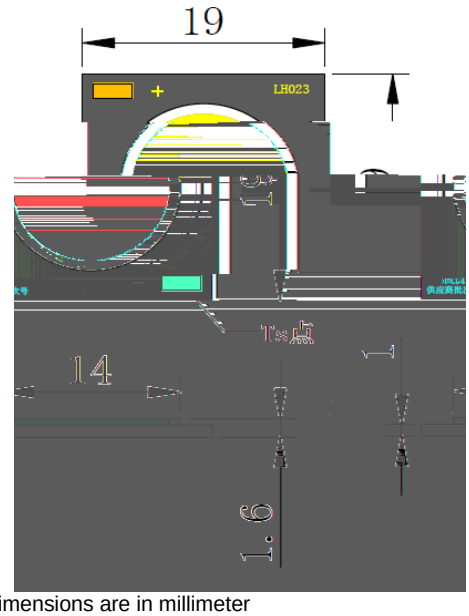
No.	- O P	Lumen Maintenance (%)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	4990.29	99.36	99.07	98.69	98.45	97.84	97.58	97.21
2	5201.40	99.52	99.37	99.06	98.92	98.62	98.18	97.83
3	5224.86	98.75	98.63	98.35	97.86	97.71	97.23	97.09
4	5166.21	99.33	99.03	98.79	98.45	97.97	97.59	97.15
5	5172.08	98.79	98.40	98.12	97.88	97.52	97.10	96.85
6	5207.26	98.60	98.37	98.14	97.68	97.39	97.21	96.80
7	5189.67	98.88	98.46	98.10	97.66	97.23	97.03	96.66
8	5189.67	98.57	98.22	97.89	97.52	97.33	96.78	96.50
9	5183.81	99.13	98.94	98.61	98.33	97.86	97.56	97.14
10	5172.08	98.83	98.44	98.03	97.69	97.38	96.94	96.68
11	5218.99	98.80	98.49	98.16	97.93	97.73	97.48	97.23
12	5195.54	99.35	99.08	98.82	98.54	98.03	97.77	97.37
Avg.	5175.99	98.99	98.71	98.40	98.08	97.72	97.37	97.04
Med.	5189.67	98.85	98.56	98.26	97.90	97.72	97.36	97.12
st dev	61.27	0.33	0.37	0.38	0.45	0.39	0.40	0.37
Min.	4990.29	98.57	98.22	97.89	97.52	97.23	96.78	96.50
Max.	5224.86	99.52	99.37	99.06	98.92	98.62	98.18	97.83

3.2 Data Set 1, 85°C, 300mA (Forward Voltage)

No.	Forward Voltage (V)							
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	159.38	158.77	158.36	158.60	158.53	158.70	158.80	158.77
2	159.96	159.06	157.96	158.03	157.60	157.24	156.45	156.50
3	160.44	159.93	158.42	158.68	158.03	157.64	156.60	156.87
4	161.73	160.51	159.08	159.68	159.45	159.32	158.96	158.17
5	160.31	159.11	158.02	158.13	157.75	157.48	156.83	156.61
6	160.34	159.49	158.27	158.26	157.63	156.99	156.72	156.51
7	160.21	158.15	157.56	157.73	157.91			

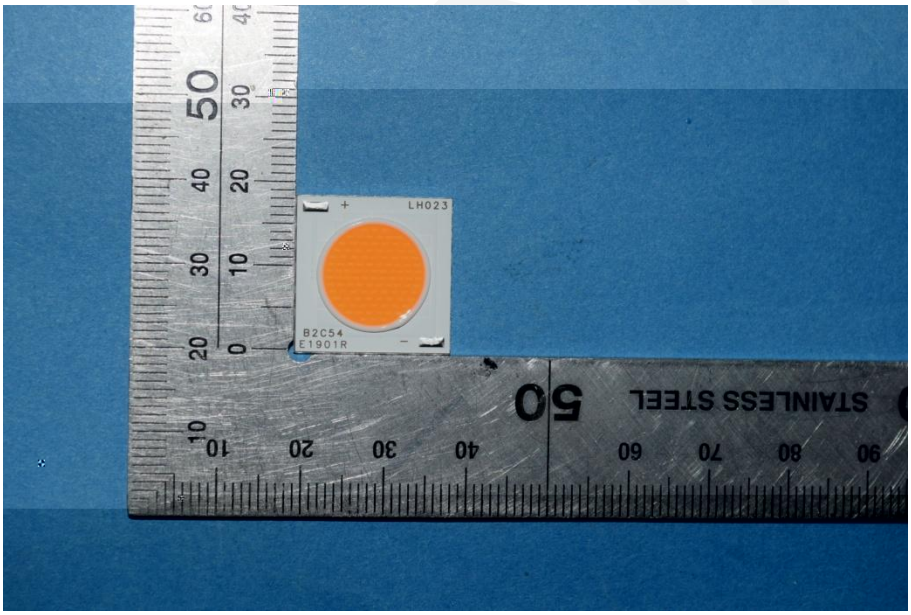
4 - DUT Photo

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 with the 95% confidence interval.
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