



TEST REPORT

According to IES LM-80-2015
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-EMC-5050D90W-B1C12-S1-HR3

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Reviewed By:	Pote Wang	<i>Pote Wang</i>	
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Test Date:	2016-12-13 to 2017-12-23		
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Approved by:	Blake Zhang / EE Engineer		
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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

50 PCS samples were received on 2016-10-27. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Part Number:	HL-EMC-5050D90W-B1C12-S1-HR3
Part Type:	LED Package
#Drive Level:	DC 120mA
#Nominal CCT:	2700K
#Power:	4.5W
#Current Density per LED die:	241.5mA/mm ²
#Power Density per LED die:	0.755W/mm ²
#CRI:	80
#Die Spacing:	0.24mm

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	CRI	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)
Master model	HL-EMC-5050D90W-B1C12-S1-HR3	80	2700	12	1	0.1728	241.5	120	0.24	120
multiple model	HL-EMC-5050D***W-B1C12-S1-HR3-***	80	2200-6500	12	1	0.1728	241.5	120	0.24	120
	HL-EMC-5050D***W-B1C10-S1-HR3-***	80	2200-6500	10	1	0.1728	241.5	120	0.24	120
	HL-EMC-5050D***W-B2C6-S1-HR3-***	80	2200-6500	6	2	0.1728	241.5	120	0.24	240
	HL-EMC-5050D***W-B2C6-S1-HR3-***	80	2200-6500	6	2	0.1728	241.5	75	0.24	150
	HL-EMC-5050D***W-B3C4-S1-HR3-***	80	2200-6500	4	3	0.1728	241.5	120	0.24	360
	HL-EMC-5050D***W-B4C3-S1-HR3-***	80	2200-6500	3	4	0.1728	241.5	120	0.24	480
	HL-EMC-5050D***W-B6C2-S1-HR3-***	80	2200-6500	2	6	0.1728	241.5	120	0.24	720

Model type	Model name	CRI	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)
multiple model	HL-EMC-5050F***W-B1C12-S1-HR3-***	80	2200-6500	12	1	0.1728	241.5	120	0.24	120
	HL-EMC-5050F***W-B1C10-S1-HR3-***	80	2200-6500	10	1	0.1728	241.5	120	0.24	120
	HL-EMC-5050F***W-B2C6-S1-HR3-***	80	2200-6500	6	2	0.1728	241.5	120	0.24	240
	HL-EMC-5050F***W-B2C6-S1-HR3-***	80	2200-6500	6	2	0.1728	241.5	75	0.24	150
	HL-EMC-5050F***W-B3C4-S1-HR3-***	80	2200-6500	4	3	0.1728	241.5	120	0.24	360
	HL-EMC-5050F***W-B4C3-S1-HR3-***	80	2200-6500	3	4	0.1728	241.5	120	0.24	480
	HL-EMC-5050F***W-B6C2-S1-HR3-***	80	2200-6500	2	6	0.1728	241.5	120	0.24	720

Note:

The model name begins with "HL", such as "HL-EMC-5050D***W- B1C12-S1-HR3-****", **** 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 the letter or None, which stands for the customer code.

Note:

1. The applicant Hongli Zhihui Group Co.,Ltd. Guangzhou Branch declare that their products with model HL-EMC-5050D90W-B1C12-S1-HR3 are the same to the products in report# R2DG161027051-10-M1 and is authorized by original applicant to use their test data.
2. All the data in previous report (R2DG161027051-10-M1) is shared in this report.

1.2 Standards Used:

- IESNA 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 IAS)
- 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
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2017-03-09	2018-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2017-03-03	2018-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2017-03-09	2018-03-09
Standard Light Source	EVERFINE	D062	1011093	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2017-03-03	2018-03-03

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Multilayer aging machine	BACL	B2-270	20022	2017-12-08	2018-12-08
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	2017-03-03	2018-03-03

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 $2^{\circ}C$ below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to $5^{\circ}C$ 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 $25^{\circ}C \pm 2^{\circ}C$, 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 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 $25^{\circ}C \pm 2^{\circ}C$, 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 $U=0.8671^{\circ}C$ ($K=2$), 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, 120mA

Part Number: HL-EMC-5050D90W-B1C12-S1-HR3
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 120mA
Measurement Current: 120mA

Data Set 2: 105°C, 120mA

Part Number: HL-EMC-5050D90W-B1C12-S1-HR3
Number of Units: 25
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 120mA
Measurement Current: 120mA

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	9000hrs	2.700E-06	1.003	>54000hours
2	25	0	1000hrs	9000hrs	3.511E-06	1.001	>54000hours

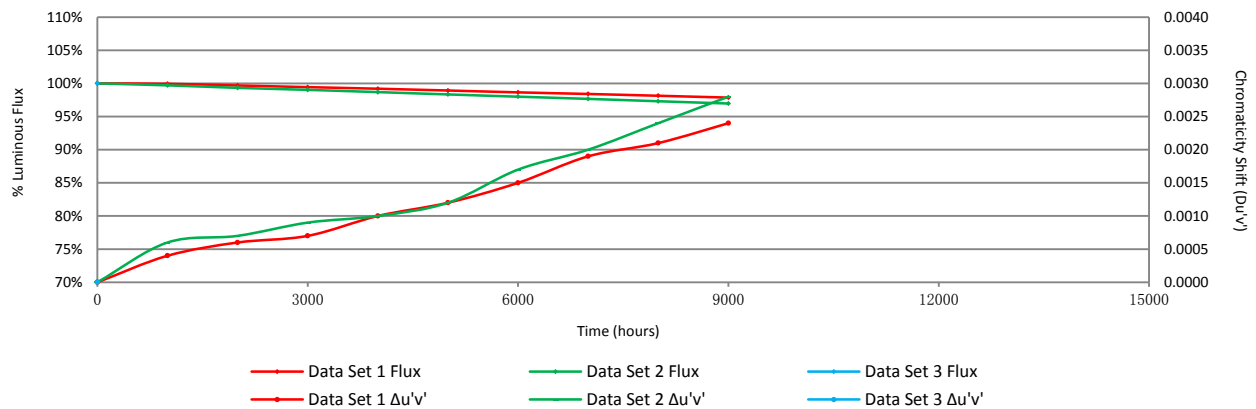
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	99.94%	99.69%	99.44%	99.20%	98.93%	98.65%	98.41%	98.14%	97.86%
2	99.71%	99.33%	99.03%	98.69%	98.34%	98.00%	97.67%	97.31%	96.97%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0004	0.0006	0.0007	0.0010	0.0012	0.0015	0.0019	0.0021	0.0024
2	0.0006	0.0007	0.0009	0.0010	0.0012	0.0017	0.0020	0.0024	0.0028

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 120mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	709.5	99.93	99.62	99.39	99.11	98.79	98.73	98.48	98.11	97.83
2	717.9	99.80	99.37	99.12	98.82	98.50	98.12	97.94	97.67	97.31
3	723.0	99.82	99.47	99.24	98.95	98.58	98.27	97.90	97.58	97.29
4	707.6	99.92	99.65	99.48	99.15	98.90	98.56	98.28	98.11	97.74
5	724.8	99.97	99.57	99.45	99.23	99.16	98.92	98.72	98.47	98.29
6	723.9	99.83	99.43	99.10	98.85	98.59	98.36	98.22	98.00	97.72
7	719.1	99.85	99.67	99.35	99.11	98.94	98.62	98.30	98.12	97.91
8	721.8	99.88	99.70	99.57	99.38	99.13	98.78	98.68	98.35	97.94
9	684.8	100.01	99.69	99.39	99.07	98.73	98.57	98.34	98.00	97.72
10	719.9	100.03	99.71	99.33	99.18	98.92	98.68	98.29	98.07	97.74
11	729.9	99.95	99.64	99.52	99.34	99.22	98.84	98.81	98.59	98.44
12	718.5	99.96	99.94	99.72	99.44	99.22	98.97	98.80	98.59	98.41
13	721.1	100.11	100.08	99.86	99.69	99.39	99.03	98.82	98.47	98.27
14	707.1	99.97	99.55	99.15	98.94	98.78	98.50	98.35	98.19	97.98
15	704.7	99.90	99.63	99.29	99.13	98.84	98.47	98.21	98.08	97.73
16	720.6	100.10	99.92	99.65	99.61	99.33	99.00	98.82	98.47	98.24
17	723.0	100.03	99.68	99.47	99.20	98.85	98.59	98.31	97.93	97.66
18	722.7	99.99	99.93	99.65	99.49	99.25	98.91	98.82	98.56	98.22
19	702.9	100.11	99.74	99.60	99.30	99.20	99.03	98.69	98.38	98.14
20	718.0	99.97	99.81	99.42	99.21	99.05	98.87	98.77	98.66	98.30
21	722.0	99.81	99.58	99.38	99.07	98.71	98.41	98.09	97.76	97.41
22	718.1	100.06	99.89	99.60	99.30	98.94	98.76	98.31	97.99	97.90
23	706.4	99.89	99.76	99.52	99.32	98.99	98.66	98.32	97.99	97.69
24	715.6	99.78	99.62	99.48	99.11	98.66	98.35	98.07	97.72	97.37
25	720.6	99.79	99.49	99.17	98.93	98.60	98.24	97.93	97.61	97.32
Ave.	716.1	99.94	99.69	99.44	99.20	98.93	98.65	98.41	98.14	97.86
Med.	719.1	99.95	99.67	99.45	99.18	98.92	98.66	98.32	98.11	97.83
st dev	9.6038	0.1025	0.1715	0.1934	0.2219	0.2574	0.2647	0.3092	0.3269	0.3572
Min.	684.8	99.78	99.37	99.10	98.82	98.50	98.12	97.90	97.58	97.29
Max.	729.9	100.11	100.08	99.86	99.69	99.39	99.03	98.82	98.66	98.44

3.2 Data Set 1, 85°C, 120mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	35.45	35.41	35.46	35.38	35.36	35.39	35.40	35.42	35.39	35.40
2	35.42	35.38	35.42	35.34	35.34	35.38	35.36	35.40	35.36	35.38
3	35.49	35.45	35.49	35.40	35.41	35.43	35.45	35.46	35.43	35.44
4	35.38	35.32	35.36	35.31	35.31	35.33	35.34	35.35	35.34	35.32
5	35.50	35.47	35.49	35.45	35.45	35.47	35.49	35.50	35.50	35.48
6	35.50	35.44	35.48	35.42	35.41	35.40	35.44	35.45	35.45	35.42
7	35.45	35.39	35.45	35.36	35.35	35.37	35.38	35.38	35.41	35.40
8	35.42	35.33	35.38	35.34	35.30	35.33	35.35	35.35	35.36	35.36
9	35.43	35.37	35.41	35.35	35.34	35.36	35.36	35.37	35.38	35.37
10	35.46	35.40	35.44	35.38	35.36	35.38	35.40	35.40	35.41	35.40
11	35.46	35.41	35.44	35.38	35.36	35.38	35.39	35.40	35.40	35.40
12	35.49	35.44	35.50	35.43	35.41	35.41	35.43	35.44	35.43	35.43
13	35.40	35.35	35.41	35.35	35.31	35.30	35.35	35.33	35.35	35.36
14	35.49	35.45	35.49	35.44	35.42	35.43	35.44	35.43	35.45	35.45
15	35.42	35.37	35.42	35.37	35.34	35.38	35.36	35.37	35.39	35.39
16	35.34	35.30	35.35	35.30	35.28	35.28	35.30	35.31	35.34	35.32
17	35.35	35.32	35.36	35.31	35.28	35.29	35.31	35.26	35.34	35.32
18	35.47	35.43	35.48	35.42	35.38	35.41	35.70	35.39	35.44	35.43
19	35.45	35.43	35.47	35.42	35.37	35.41	35.42	35.46	35.43	35.43
20	35.41	35.39	35.43	35.37	35.34	35.37	35.37	35.45	35.40	35.39
21	35.45	35.40	35.46	35.40	35.35	35.39	35.40	35.43	35.40	35.40
22	35.34	35.30	35.35	35.29	35.27	35.29	35.29	35.32	35.28	35.31
23	35.50	35.47	35.52	35.46	35.44	35.46	35.46	35.47	35.48	35.48
24	35.35	35.32	35.35	35.31	35.27	35.30	35.33	35.33	35.30	35.30
25	35.47	35.45	35.48	35.45	35.41	35.43	35.43	35.45	35.45	35.44
Ave.	35.44	35.39	35.44	35.38	35.35	35.37	35.40	35.40	35.40	35.39
Med.	35.45	35.40	35.44	35.38	35.35	35.38	35.39	35.40	35.40	35.40
st dev	0.0518	0.0539	0.0528	0.0510	0.0529	0.0537	0.0815	0.0593	0.0538	0.0510
Min.	35.34	35.30	35.35	35.29	35.27	35.28	35.29	35.26	35.28	35.30
Max.	35.50	35.47	35.52	35.46	35.45	35.47	35.70	35.50	35.50	35.48

3.3 Data Set 1, 85°C, 120mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2618	0.5264	2718	0.0003	0.0005	0.0005	0.0008	0.0011	0.0014	0.0017	0.0021	0.0024
2	0.2614	0.5244	2736	0.0004	0.0008	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0026
3	0.2621	0.5281	2706	0.0005	0.0008	0.0007	0.0007	0.0010	0.0015	0.0018	0.0021	0.0025
4	0.2628	0.5264	2697	0.0004	0.0006	0.0006	0.0006	0.0010	0.0014	0.0018	0.0021	0.0026
5	0.2601	0.5249	2762	0.0004	0.0008	0.0006	0.0009	0.0011	0.0015	0.0019	0.0021	0.0026
6	0.2613	0.5270	2727	0.0004	0.0007	0.0007	0.0009	0.0012	0.0015	0.0019	0.0020	0.0025
7	0.2614	0.5271	2724	0.0004	0.0007	0.0008	0.0008	0.0009	0.0014	0.0017	0.0018	0.0023
8	0.2611	0.5246	2741	0.0005	0.0007	0.0009	0.0011	0.0012	0.0016	0.0019	0.0022	0.0025
9	0.2599	0.5250	2764	0.0004	0.0005	0.0009	0.0010	0.0011	0.0016	0.0018	0.0021	0.0024
10	0.2611	0.5269	2730	0.0004	0.0006	0.0008	0.0010	0.0011	0.0015	0.0018	0.0021	0.0023
11	0.2608	0.5254	2744	0.0004	0.0007	0.0009	0.0012	0.0012	0.0016	0.0021	0.0022	0.0026
12	0.2612	0.5258	2734	0.0005	0.0006	0.0009	0.0011	0.0011	0.0016	0.0021	0.0022	0.0025
13	0.2616	0.5260	2724	0.0003	0.0006	0.0007	0.0009	0.0013	0.0014	0.0019	0.0020	0.0023
14	0.2619	0.5271	2713	0.0004	0.0006	0.0007	0.0010	0.0012	0.0015	0.0019	0.0021	0.0023
15	0.2618	0.5258	2722	0.0005	0.0006	0.0009	0.0011	0.0013	0.0016	0.0021	0.0022	0.0024
16	0.2610	0.5253	2739	0.0003	0.0005	0.0007	0.0009	0.0011	0.0014	0.0018	0.0019	0.0023
17	0.2606	0.5253	2748	0.0004	0.0006	0.0008	0.0011	0.0013	0.0015	0.0021	0.0022	0.0024
18	0.2607	0.5255	2745	0.0003	0.0006	0.0007	0.0009	0.0010	0.0013	0.0017	0.0021	0.0023
19	0.2605	0.5241	2756	0.0003	0.0005	0.0007	0.0011	0.0011	0.0014	0.0018	0.0023	0.0024
20	0.2611	0.5241	2743	0.0003	0.0005	0.0008	0.0009	0.0012	0.0015	0.0016	0.0022	0.0024
21	0.2610	0.5256	2740	0.0005	0.0006	0.0009	0.0011	0.0013	0.0015	0.0019	0.0024	0.0025
22	0.2617	0.5264	2721	0.0004	0.0006	0.0008	0.0011	0.0012	0.0016	0.0020	0.0023	0.0024
23	0.2618	0.5267	2718	0.0004	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0022	0.0022
24	0.2609	0.5252	2742	0.0004	0.0004	0.0007	0.0009	0.0012	0.0014	0.0017	0.0022	0.0023
25	0.2604	0.5244	2758	0.0004	0.0006	0.0007	0.0011	0.0012	0.0015	0.0019	0.0024	0.0025
Ave.	0.2612	0.5257	2734	0.0004	0.0006	0.0007	0.0010	0.0012	0.0015	0.0019	0.0021	0.0024
Med.	0.2611	0.5256	2736	0.0004	0.0006	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0024
st dev	0.0007	0.0011	17.2045	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2599	0.5241	2697	0.0003	0.0004	0.0005	0.0006	0.0009	0.0013	0.0016	0.0018	0.0022
Max.	0.2628	0.5281	2764	0.0005	0.0008	0.0009	0.0012	0.0013	0.0016	0.0021	0.0024	0.0026

3.4 Data Set 2, 105°C, 120mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	718.7	99.60	99.14	98.79	98.39	97.94	97.54	97.27	96.84	96.59
27	718.0	99.93	99.74	99.48	99.12	98.83	98.50	98.25	97.92	97.45
28	708.3	99.83	99.65	99.44	99.04	98.74	98.35	98.14	98.01	97.59
29	715.3	99.85	99.30	99.08	98.87	98.53	98.18	97.92	97.54	97.40
30	723.4	99.81	99.53	99.41	98.99	98.56	98.19	97.65	97.40	96.99
31	690.8	99.65	99.41	99.16	98.74	98.45	98.10	97.83	97.38	97.13
32	724.1	99.68	99.19	98.70	98.55	98.11	97.71	97.57	97.25	96.71
33	713.5	99.73	99.50	99.10	98.67	98.32	98.19	97.77	97.59	97.14
34	715.1	99.50	99.34	98.92	98.36	98.08	97.89	97.45	97.15	96.94
35	725.5	99.82	99.39	99.23	99.02	98.65	98.33	97.86	97.55	97.31
36	710.0	99.59	99.31	99.14	98.93	98.56	98.11	97.63	97.44	97.18
37	723.6	99.61	99.12	98.95	98.65	98.20	97.95	97.58	97.25	96.88
38	715.5	99.71	99.19	98.97	98.77	98.42	98.02	97.67	97.15	96.93
39	709.0	99.75	99.22	99.11	98.69	98.24	97.91	97.50	97.28	96.76
40	721.2	99.72	99.17	98.74	98.49	98.13	97.70	97.56	97.13	96.60
41	725.7	99.74	99.32	98.90	98.73	98.25	97.89	97.48	97.06	96.89
42	707.7	99.73	99.49	99.03	98.77	98.33	97.94	97.64	97.15	96.86
43	717.1	99.79	99.51	99.14	98.90	98.61	98.23	98.08	97.60	97.16
44	710.8	99.54	99.06	98.59	98.24	98.03	97.79	97.44	97.27	97.07
45	715.6	99.62	99.08	98.71	98.43	98.11	97.92	97.54	97.14	96.84
46	708.2	99.70	99.15	98.90	98.43	97.98	97.61	97.20	96.81	96.46
47	707.2	99.83	99.49	99.29	98.81	98.43	98.06	97.68	97.26	96.69
48	711.4	99.75	99.37	99.16	98.68	98.51	98.10	97.72	97.23	96.94
49	721.5	99.58	99.24	98.96	98.63	98.39	98.12	97.69	97.21	96.80
50	718.7	99.81	99.26	98.86	98.39	98.00	97.75	97.63	97.23	96.87
Ave.	715.0	99.71	99.33	99.03	98.69	98.34	98.00	97.67	97.31	96.97
Med.	715.5	99.73	99.31	99.03	98.69	98.33	98.02	97.64	97.25	96.93
st dev	7.7968	0.1075	0.1795	0.2348	0.2385	0.2516	0.2398	0.2449	0.2795	0.2798
Min.	690.8	99.50	99.06	98.59	98.24	97.94	97.54	97.20	96.81	96.46
Max.	725.7	99.93	99.74	99.48	99.12	98.83	98.50	98.25	98.01	97.59

3.5 Data Set 2, 105°C, 120mA (Forward Voltage)

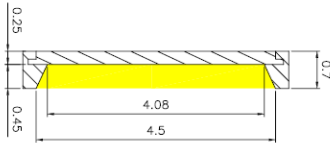
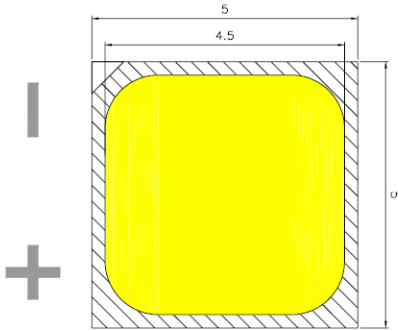
No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	35.47	35.40	35.43	35.39	35.36	35.37	35.41	35.40	35.39	35.41
27	35.43	35.38	35.43	35.37	35.34	35.36	35.38	35.38	35.40	35.39
28	35.42	35.38	35.43	35.37	35.33	35.37	35.38	35.38	35.42	35.38
29	35.49	35.45	35.49	35.43	35.39	35.43	35.44	35.43	35.48	35.44
30	35.46	35.43	35.47	35.40	35.34	35.41	35.45	35.41	35.44	35.41
31	35.50	35.46	35.50	35.45	35.46	35.49	35.49	35.45	35.47	35.45
32	35.43	35.39	35.42	35.37	35.38	35.39	35.37	35.38	35.39	35.38
33	35.67	35.65	35.67	35.62	35.61	35.63	35.61	35.62	35.64	35.61
34	35.51	35.48	35.51	35.46	35.44	35.47	35.45	35.46	35.48	35.46
35	35.45	35.43	35.44	35.38	35.36	35.40	35.41	35.39	35.44	35.41
36	35.51	35.49	35.51	35.48	35.44	35.48	35.47	35.48	35.50	35.48
37	35.39	35.35	35.40	35.34	35.31	35.40	35.35	35.34	35.38	35.36
38	35.43	35.40	35.45	36.11	35.35	35.41	35.38	35.36	35.41	35.38
39	35.38	35.33	35.40	35.36	35.29	35.37	35.35	35.34	35.39	35.33
40	35.39	35.36	35.39	35.35	35.30	35.36	35.33	35.34	35.37	35.34
41	35.56	35.53	35.57	35.51	35.48	35.53	35.51	35.48	35.54	35.52
42	35.24	35.21	35.26	35.22	35.18	35.21	35.20	35.18	35.22	35.21
43	35.33	35.32	35.37	35.31	35.28	35.31	35.29	35.29	35.31	35.29
44	35.46	35.43	35.48	35.43	35.43	35.45	35.42	35.41	35.45	35.43
45	35.48	35.45	35.48	35.42	35.42	35.45	35.43	35.44	35.45	35.43
46	35.52	35.48	35.52	35.48	35.47	35.50	35.47	35.48	35.49	35.47
47	35.48	35.46	35.50	35.45	35.48	35.45	35.44	35.44	35.47	35.45
48	35.43	35.40	35.45	35.40	35.41	35.41	35.39	35.41	35.41	35.42
49	35.53	35.50	35.55	35.51	35.49	35.50	35.49	35.50	35.51	35.51
50	35.33	35.30	35.34	35.30	35.27	35.29	35.29	35.30	35.30	35.31
Ave.	35.45	35.42	35.46	35.44	35.38	35.42	35.41	35.40	35.43	35.41
Med.	35.46	35.43	35.45	35.40	35.38	35.41	35.41	35.41	35.44	35.41
st dev	0.0849	0.0864	0.0810	0.1618	0.0913	0.0848	0.0833	0.0847	0.0838	0.0815
Min.	35.24	35.21	35.26	35.22	35.18	35.21	35.20	35.18	35.22	35.21
Max.	35.67	35.65	35.67	36.11	35.61	35.63	35.61	35.62	35.64	35.61

3.6 Data Set 2, 105°C, 120mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2627	0.5266	2700	0.0006	0.0006	0.0008	0.0010	0.0013	0.0016	0.0018	0.0025	0.0026
27	0.2606	0.5254	2748	0.0004	0.0004	0.0007	0.0009	0.0011	0.0017	0.0017	0.0023	0.0028
28	0.2613	0.5256	2732	0.0005	0.0006	0.0007	0.0013	0.0011	0.0017	0.0017	0.0023	0.0028
29	0.2617	0.5265	2721	0.0006	0.0007	0.0008	0.0012	0.0013	0.0017	0.0019	0.0024	0.0031
30	0.2606	0.5251	2750	0.0007	0.0007	0.0008	0.0011	0.0012	0.0017	0.0021	0.0024	0.0029
31	0.2611	0.5264	2734	0.0006	0.0008	0.0008	0.0009	0.0011	0.0017	0.0021	0.0025	0.0029
32	0.2607	0.5242	2751	0.0004	0.0006	0.0007	0.0009	0.0011	0.0017	0.0021	0.0024	0.0028
33	0.2606	0.5263	2745	0.0006	0.0006	0.0007	0.0008	0.0012	0.0017	0.0020	0.0024	0.0029
34	0.2616	0.5270	2720	0.0005	0.0009	0.0008	0.0010	0.0013	0.0018	0.0021	0.0024	0.0029
35	0.2610	0.5266	2734	0.0005	0.0009	0.0010	0.0010	0.0011	0.0017	0.0021	0.0024	0.0028
36	0.2618	0.5269	2717	0.0005	0.0007	0.0009	0.0008	0.0011	0.0015	0.0018	0.0021	0.0026
37	0.2619	0.5268	2716	0.0007	0.0008	0.0009	0.0009	0.0011	0.0017	0.0022	0.0023	0.0028
38	0.2606	0.5253	2748	0.0005	0.0007	0.0009	0.0009	0.0011	0.0016	0.0022	0.0023	0.0028
39	0.2605	0.5250	2751	0.0006	0.0006	0.0008	0.0010	0.0011	0.0016	0.0021	0.0023	0.0029
40	0.2611	0.5248	2739	0.0005	0.0008	0.0009	0.0010	0.0012	0.0017	0.0022	0.0024	0.0029
41	0.2613	0.5273	2724	0.0006	0.0007	0.0009	0.0009	0.0012	0.0016	0.0021	0.0024	0.0027
42	0.2619	0.5243	2724	0.0006	0.0008	0.0009	0.0009	0.0013	0.0017	0.0022	0.0024	0.0030
43	0.2609	0.5241	2748	0.0006	0.0008	0.0009	0.0010	0.0013	0.0017	0.0021	0.0024	0.0029
44	0.2612	0.5256	2735	0.0006	0.0008	0.0009	0.0013	0.0013	0.0017	0.0022	0.0024	0.0029
45	0.2614	0.5267	2726	0.0006	0.0008	0.0011	0.0012	0.0012	0.0016	0.0020	0.0023	0.0029
46	0.2612	0.5258	2733	0.0006	0.0008	0.0010	0.0011	0.0013	0.0017	0.0021	0.0024	0.0028
47	0.2603	0.5247	2757	0.0006	0.0007	0.0008	0.0009	0.0011	0.0015	0.0019	0.0022	0.0027
48	0.2603	0.5244	2758	0.0006	0.0007	0.0009	0.0013	0.0012	0.0017	0.0020	0.0024	0.0027
49	0.2615	0.5272	2721	0.0006	0.0009	0.0009	0.0010	0.0013	0.0017	0.0020	0.0024	0.0028
50	0.2605	0.5243	2756	0.0005	0.0007	0.0009	0.0010	0.0011	0.0015	0.0019	0.0022	0.0027
Ave.	0.2611	0.5257	2736	0.0006	0.0007	0.0009	0.0010	0.0012	0.0017	0.0020	0.0024	0.0028
Med.	0.2611	0.5256	2734	0.0006	0.0007	0.0009	0.0010	0.0012	0.0017	0.0021	0.0024	0.0028
st dev	0.0006	0.0011	15.3735	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2603	0.5241	2700	0.0004	0.0004	0.0007	0.0008	0.0011	0.0015	0.0017	0.0021	0.0026
Max.	0.2627	0.5273	2758	0.0007	0.0009	0.0011	0.0013	0.0013	0.0018	0.0022	0.0025	0.0031

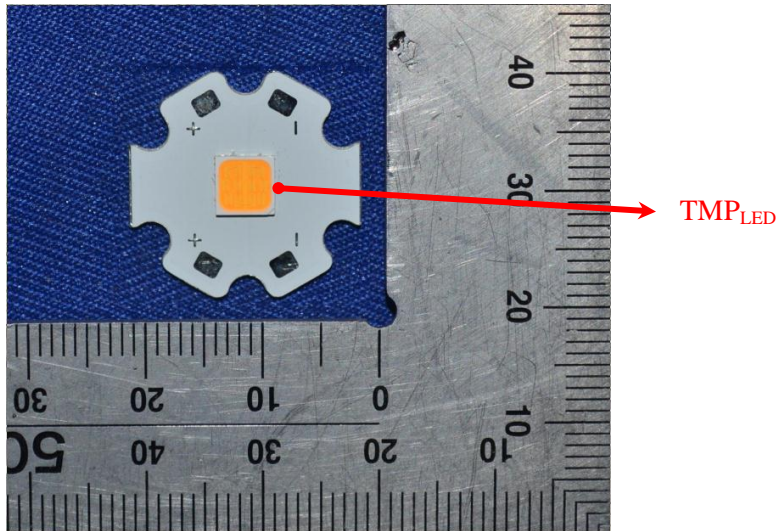
4 - DUT Photo

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