

TEST REPORT

According to ANSI/IES LM-80-15
For

Shenzhen Runlite Technology Co.,Ltd

Building A15, Tantou the 4th Industrial Estate, SongGang Town, BaoAn District, ShenZhen, China

Model: P30302-W30PC8C9FB1B3-LX00-PL

Report Type: 9000 Hours Test Report		Product Type: LED Package
Reviewed By:	Pote Wang <i>Pote Wang</i>	
Report Number:	SZ2210715-01590E-10-9000	
Test Date:	2021-07-17 to 2022-07-31	
Report Date:	2022-12-22	
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 1 st Road, Tangxia Town, Dongguan, Guangdong, China.	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.(Shenzhen). This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, or any agency of the U.S. Government.

TABLE OF CONTENTS

1 - General Information.....	3
1.1 Description of LED Light Sources [#]	3
1.2 Standards and Reference Documentations	3
1.3 Testing Equipment	3
1.4 Drive Level	4
1.5 Ambient Conditions for Maintenance Test	4
1.6 Photometric Measurement Method and Uncertainty.....	4
1.7 Statement of Traceability	4
1.8 Sample Set.....	5
2 - Summary of Test Result.....	6
3 - Test Data.....	8
3.1 Data Set 1, 55°C, 150mA (Lumen Maintenance).....	8
3.2 Data Set 1, 55°C, 150mA (400-700nm Photon Flux Maintenance).....	9
3.3 Data Set 1, 55°C, 150mA (Chromaticity Shift)	10
3.4 Data Set 1, 55°C, 150mA (Forward Voltage).....	11
3.5 Data Set 1, 55°C, 150mA (Wavelength)	12
3.6 Data Set 2, 85°C, 150mA (Lumen Maintenance).....	13
3.7 Data Set 2, 85°C, 150mA (400-700nm Photon Flux Maintenance).....	14
3.8 Data Set 2, 85°C, 150mA (Chromaticity Shift)	15
3.9 Data Set 2, 85°C, 150mA (Forward Voltage).....	16
3.10 Data Set 2, 85°C, 150mA (Wavelength)	17
3.11 Data Set 3, 105°C, 150mA (Lumen Maintenance)	18
3.12 Data Set 3, 105°C, 150mA (400-700nm Photon Flux Maintenance).....	19
3.13 Data Set 3, 105°C, 150mA (Chromaticity Shift)	20
3.14 Data Set 3, 105°C, 150mA (Forward Voltage).....	21
3.15 Data Set 3, 105°C, 150mA (Wavelength)	22
4 - DUT Photo	23
4.1 Mechanical Dimensions	23
4.2 DUT Photo.....	23
Directions.....	24

1 - General Information

1.1 Description of LED Light Sources[#]

Sample Size:

75 PCS test samples were in good condition and received on 2021-07-15. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	Shenzhen Runlite Technology Co.,Ltd
Part Number:	P30302-W30PC8C9FB1B3-LX00-PL
Part Type:	LED Package
Drive Level:	DC 150mA
Nominal CCT:	3000K
Power:	0.5W
Average Current Density per LED die:	258.34mA/mm ²
Average Power Density per LED die:	1.74W/mm ²
CRI:	80
Die Spacing:	0.3mm

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 Name	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)
P30302-W30PC8C9FB1B3-LX00-PL	150	0.5	3000	2	75	258.34	0.056	0.3±0.1
X3030X-WXXXXXXXXXXXX-XXXX-XX	150	0.5	≥3000	2	75	258.34	0.056	0.3±0.1
X3030X-WXXXXXXXXXXXX-XXXX-XX	75	0.5	≥3000	2	75	258.34	0.056	0.3±0.1
X3030X-WXXXXXXXXXXXX-XXXX-XX	75	0.25	≥3000	1	75	258.34	0.056	/

Table "X" means internal code number; it can be Number or letters

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)
- *ANSI/ASABE S640 JUL2017 Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms) (This standard was not accredited by NVLAP)
- *ANSI/ASABE S642 SEP2018: Recommended Methods for Measurement and Testing of LED Products for Plant Growth and Development (This standard was not accredited by NVLAP)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
--------	-------------	----------	-----------	------------------	----------------------

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2021-10-21	2022-10-20
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2021-09-27	2022-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-01-05	2023-01-04
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20013	2022-01-04	2023-01-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	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 $\pm 3\%$ 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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%.

1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure spectral power distribution and photon flux. 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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

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: P30302-W30PC8C9FB1B3-LX00-PL
Number of Units: 25
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 150mA
Measurement Current: 150mA

Data Set 2: 85°C, 150mA

Part Number: P30302-W30PC8C9FB1B3-LX00-PL
Number of Units: 25
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 150mA
Measurement Current: 150mA

Data Set 3: 105°C, 150mA

Part Number: P30302-W30PC8C9FB1B3-LX00-PL
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	Reported TM-21 L ₉₀ Lifetime
1	25	0	1000hrs	9000hrs	2.121E-06	1.004	>54000 hours	51000 hours
2	25	0	1000hrs	9000hrs	2.482E-06	1.004	>54000 hours	44000 hours
3	25	0	1000hrs	9000hrs	2.934E-06	1.004	>54000 hours	37000 hours

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	β	Reported TM-21 Q ₇₀ Lifetime	Reported TM-21 Q ₉₀ Lifetime
1	25	0	1000hrs	9000hrs	2.092E-06	1.004	>54000 hours	52000 hours
2	25	0	1000hrs	9000hrs	2.456E-06	1.004	>54000 hours	44000 hours
3	25	0	1000hrs	9000hrs	2.897E-06	1.004	>54000 hours	38000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.14%	99.93%	99.74%	99.53%	99.32%	99.11%	98.90%	98.69%	98.48%
2	100.08%	99.84%	99.60%	99.37%	99.12%	98.88%	98.64%	98.39%	98.14%
3	100.02%	99.74%	99.45%	99.18%	98.91%	98.61%	98.32%	98.02%	97.75%

Average Photon Flux Maintenance, Photosynthetic 400-700nm (PFM_P) (Percentage of Initial)

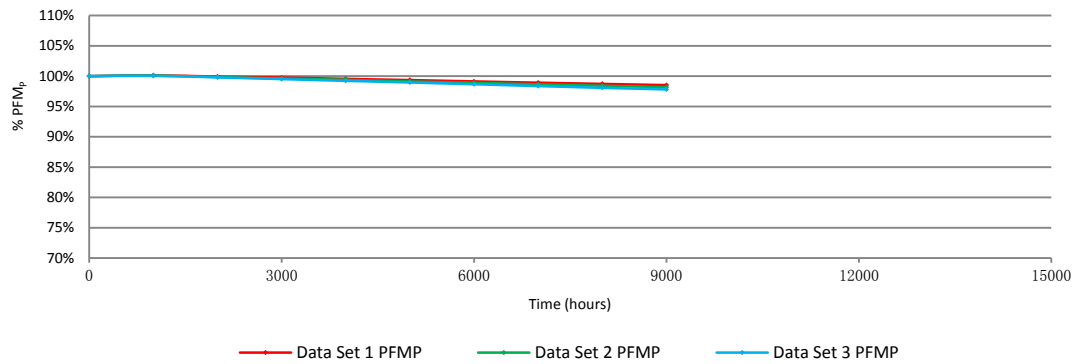
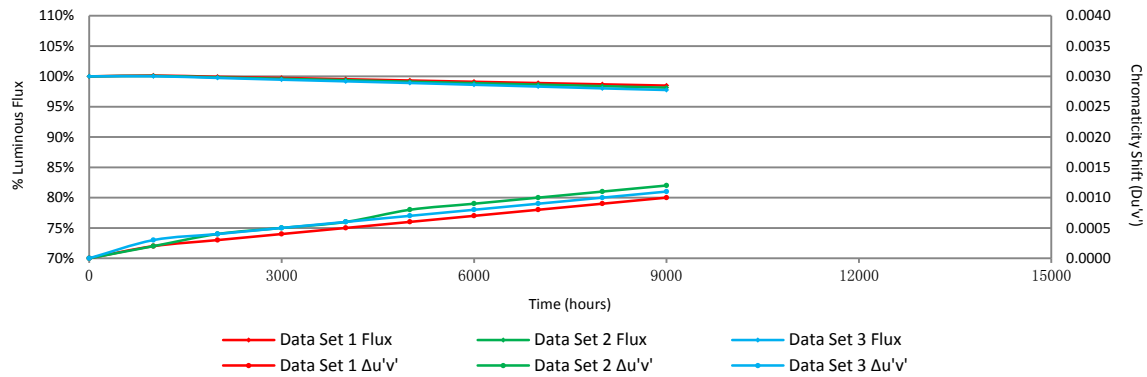
Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.13%	99.92%	99.76%	99.55%	99.35%	99.13%	98.92%	98.72%	98.52%
2	100.09%	99.85%	99.61%	99.39%	99.12%	98.90%	98.64%	98.41%	98.17%
3	100.05%	99.79%	99.51%	99.22%	98.95%	98.66%	98.36%	98.07%	97.81%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
2	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012
3	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011

Average Wavelength

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	600.7	601.2	600.6	600.7	600.7	600.9	600.5	601.0	600.4
2	600.5	601.1	600.5	600.9	600.7	600.6	600.6	600.7	600.4
3	600.3	601.2	600.9	601.0	600.6	600.7	600.4	600.7	600.1



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	7000hrs	8000hrs	9000hrs
1	87.48	100.23	99.94	99.73	99.49	99.28	99.05	98.79	98.51	98.30
2	89.58	100.18	100.01	99.79	99.62	99.44	99.17	99.05	98.78	98.57
3	88.42	100.14	99.91	99.69	99.45	99.34	99.10	98.97	98.72	98.48
4	88.87	100.09	99.91	99.76	99.53	99.39	99.12	98.84	98.69	98.42
5	88.36	100.19	99.91	99.68	99.54	99.28	99.04	98.78	98.64	98.42
6	88.66	100.17	99.94	99.71	99.41	99.13	98.85	98.68	98.35	98.21
7	88.40	100.09	99.94	99.80	99.57	99.33	99.10	98.83	98.70	98.42
8	89.05	100.10	99.98	99.78	99.54	99.40	99.17	98.97	98.71	98.47
9	88.49	100.11	99.98	99.71	99.47	99.25	99.14	98.88	98.64	98.49
10	99.83	100.16	99.88	99.66	99.41	99.23	99.03	98.78	98.65	98.52
11	89.50	100.11	99.94	99.80	99.66	99.44	99.33	99.07	98.79	98.54
12	88.04	100.15	99.86	99.75	99.51	99.27	99.06	98.90	98.71	98.47
13	88.65	100.11	99.83	99.68	99.54	99.29	99.13	98.89	98.77	98.50
14	89.23	100.11	99.84	99.73	99.50	99.20	98.94	98.82	98.67	98.45
15	89.56	100.19	99.93	99.67	99.52	99.27	99.16	98.92	98.62	98.46
16	89.97	100.19	99.97	99.80	99.66	99.41	99.11	98.84	98.64	98.52
17	88.57	100.12	99.97	99.80	99.63	99.38	99.24	99.05	98.95	98.75
18	88.69	100.15	99.98	99.80	99.65	99.44	99.20	98.99	98.75	98.52
19	90.12	100.11	99.96	99.82	99.58	99.36	99.10	98.88	98.71	98.51
20	88.59	100.11	99.91	99.63	99.41	99.16	99.05	98.92	98.70	98.61
21	88.67	100.18	99.92	99.75	99.55	99.33	99.04	98.88	98.64	98.40
22	87.87	100.16	99.94	99.68	99.41	99.16	98.88	98.67	98.53	98.25
23	88.22	100.09	99.83	99.67	99.43	99.30	99.15	98.95	98.69	98.47
24	88.64	100.17	99.98	99.86	99.74	99.64	99.37	99.19	98.91	98.68
25	88.88	100.19	100.01	99.79	99.53	99.35	99.25	99.03	98.82	98.69
Avg.	89.21	100.14	99.93	99.74	99.53	99.32	99.11	98.90	98.69	98.48
Med.	88.66	100.15	99.94	99.75	99.53	99.33	99.11	98.89	98.70	98.48
st dev	2.30	0.04	0.05	0.06	0.09	0.11	0.12	0.12	0.12	0.12
Min.	87.48	100.09	99.83	99.63	99.41	99.13	98.85	98.67	98.35	98.21
Max.	99.83	100.23	100.01	99.86	99.74	99.64	99.37	99.19	98.95	98.75

3.2 Data Set 1, 55°C, 150mA (400-700nm Photon Flux Maintenance)

No.	$\Phi_p (\mu\text{mol} \times \text{s}^{-1})$	400-700nm Photon Flux Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	1.2310	99.43	99.11	98.94	98.70	98.54	98.29	97.97	97.73	97.48
2	1.2520	100.24	100.08	99.84	99.68	99.52	99.28	99.12	98.80	98.64
3	1.2370	100.24	99.92	99.84	99.51	99.27	98.87	98.63	98.38	98.14
4	1.2440	100.08	99.92	99.76	99.52	99.36	99.12	98.79	98.71	98.39
5	1.2380	100.24	99.92	99.76	99.60	99.27	99.03	98.79	98.63	98.47
6	1.2410	100.16	99.92	99.76	99.44	99.27	99.03	98.87	98.71	98.55
7	1.2390	100.16	100.08	99.84	99.68	99.44	99.19	98.95	98.79	98.55
8	1.2450	100.16	100.08	99.84	99.60	99.44	99.20	99.04	98.71	98.55
9	1.2390	100.08	99.92	99.68	99.52	99.27	99.11	98.87	98.63	98.55
10	1.4020	100.14	99.86	99.71	99.43	99.22	99.07	98.79	98.64	98.57
11	1.2510	100.16	99.92	99.84	99.68	99.60	99.36	99.12	98.88	98.56
12	1.2360	100.24	99.92	99.84	99.60	99.35	99.19	98.95	98.79	98.54
13	1.2480	100.16	99.84	99.76	99.60	99.36	99.20	98.88	98.80	98.56
14	1.2450	100.08	99.92	99.84	99.52	99.28	98.96	98.88	98.71	98.55
15	1.2520	100.16	99.84	99.68	99.52	99.28	99.20	99.04	98.72	98.40
16	1.2520	100.24	99.92	99.84	99.60	99.52	99.36	99.20	98.96	98.72
17	1.2490	100.24	100.08	99.92	99.76	99.52	99.36	99.12	99.04	98.80
18	1.2400	100.16	100.08	99.76	99.60	99.44	99.19	99.11	98.87	98.71
19	1.2520	100.16	99.92	99.84	99.60	99.36	99.04	98.88	98.72	98.48
20	1.2410	100.16	99.92	99.68	99.52	99.27	99.03	98.95	98.71	98.63
21	1.2400	100.24	100.16	99.84	99.60	99.52	99.35	99.03	98.87	98.71
22	1.2370	99.60	99.35	99.68	99.43	99.19	98.87	98.79	98.63	98.30
23	1.2370	100.32	100.24	99.76	99.51	99.35	99.19	98.95	98.71	98.54
24	1.2420	100.24	100.08	99.92	99.84	99.76	99.44	99.28	99.03	98.79
25	1.2520	100.24	100.08	99.84	99.60	99.36	99.28	99.04	98.88	98.72
Avg.	1.2497	100.13	99.92	99.76	99.55	99.35	99.13	98.92	98.72	98.52
Med.	1.2420	100.16	99.92	99.84	99.60	99.36	99.19	98.95	98.72	98.55
st dev	0.0323	0.20	0.24	0.18	0.20	0.21	0.23	0.25	0.25	0.26
Min.	1.2310	99.43	99.11	98.94	98.70	98.54	98.29	97.97	97.73	97.48
Max.	1.4020	100.32	100.24	99.92	99.84	99.76	99.44	99.28	99.04	98.80

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

No.	u'	v'	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2553	0.5228	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0009
2	0.2549	0.5240	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0008	0.0009
3	0.2556	0.5243	0.0001	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0009	0.0009
4	0.2547	0.5233	0.0001	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
5	0.2564	0.5244	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0008	0.0009
6	0.2567	0.5257	0.0001	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
7	0.2572	0.5250	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
8	0.2564	0.5251	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011
9	0.2541	0.5231	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
10	0.2558	0.5232	0.0001	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
11	0.2560	0.5249	0.0001	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0011
12	0.2570	0.5243	0.0001	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010
13	0.2573	0.5236	0.0002	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
14	0.2562	0.5258	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011
15	0.2548	0.5239	0.0001	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
16	0.2554	0.5262	0.0002	0.0004	0.0004	0.0006	0.0005	0.0006	0.0007	0.0008	0.0009
17	0.2578	0.5235	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0011
18	0.2561	0.5251	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010	0.0011
19	0.2529	0.5243	0.0001	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011
20	0.2565	0.5247	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
21	0.2562	0.5251	0.0002	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0009	0.0010
22	0.2563	0.5227	0.0002	0.0002	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0009
23	0.2568	0.5246	0.0002	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0011
24	0.2559	0.5239	0.0002	0.0003	0.0005	0.0006	0.0007	0.0008	0.0008	0.0008	0.0009
25	0.2573	0.5235	0.0002	0.0004	0.0004	0.0005	0.0006	0.0007	0.0008	0.0008	0.0010
Avg.	0.2560	0.5243	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
Med.	0.2562	0.5243	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
st dev	0.0011	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2529	0.5227	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
Max.	0.2578	0.5262	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011

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

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.050	3.049	3.061	3.050	3.027	3.044	3.069	3.025	3.038	3.019
2	3.056	3.036	3.055	3.034	3.058	3.057	3.040	3.038	3.049	3.054
3	3.069	3.040	3.039	3.020	3.044	3.036	3.026	3.037	3.047	3.063
4	3.018	3.036	3.023	3.037	3.036	3.023	3.037	3.042	3.049	3.037
5	2.971	3.045	3.064	3.027	3.028	3.021	3.040	3.067	3.035	3.016
6	3.010	3.041	3.042	3.052	3.072	3.030	3.049	3.052	3.043	3.033
7	3.007	3.034	3.062	3.039	3.045	3.039	3.044	3.033	3.035	3.015
8	2.980	3.027	3.037	3.013	3.022	3.029	3.044	3.046	3.047	3.040
9	3.028	3.055	3.027	3.048	3.049	3.026	3.037	3.062	3.029	3.027
10	3.056	3.042	3.027	3.061	3.051	3.031	3.039	3.044	3.049	3.029
11	3.032	3.041	3.058	3.017	3.033	3.005	3.040	3.059	3.047	3.038
12	2.988	3.050	3.060	3.069	3.048	3.020	3.032	3.051	3.033	3.035
13	3.060	3.057	3.029	3.051	3.057	3.021	3.065	3.057	3.054	3.051
14	2.960	3.050	3.036	3.055	3.034	3.039	3.069	3.048	3.032	3.044
15	2.960	3.040	3.048	3.024	3.031	3.049	3.029	3.059	3.055	3.036
16	2.991	3.056	3.054	3.064	3.063	3.033	3.057	3.038	3.038	3.022
17	3.014	3.055	3.066	3.018	3.059	3.015	3.017	3.032	3.044	3.018
18	3.008	3.017	3.060	3.048	3.021	3.047	3.053	3.045	3.066	3.025
19	3.067	3.027	3.045	3.030	3.052	3.052	3.051	3.038	3.059	3.021
20	3.038	3.034	3.024	3.015	3.037	3.028	3.030	3.039	3.038	3.053
21	3.091	3.064	3.084	3.063	3.013	3.032	3.036	3.064	3.040	3.055
22	3.027	3.035	3.035	3.026	3.018	3.008	3.027	3.066	3.038	3.021
23	3.050	3.028	3.027	3.044	3.028	3.020	3.046	3.030	3.049	3.036
24	3.031	3.034	3.029	3.054	3.046	3.042	3.055	3.048	3.040	3.044
25	3.013	3.036	3.047	3.041	3.072	3.036	3.039	3.046	3.053	3.035
Avg.	3.023	3.041	3.046	3.040	3.042	3.031	3.043	3.047	3.044	3.035
Med.	3.027	3.040	3.045	3.041	3.044	3.031	3.040	3.046	3.044	3.035
st dev	0.035	0.011	0.016	0.017	0.016	0.013	0.013	0.012	0.009	0.014
Min.	2.960	3.017	3.023	3.013	3.013	3.005	3.017	3.025	3.029	3.015
Max.	3.091	3.064	3.084	3.069	3.072	3.057	3.069	3.067	3.066	3.063

3.5 Data Set 1, 55°C, 150mA (Wavelength)

No.	Wavelength (nm)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	600.6	601.7	601.2	600.0	600.8	600.7	600.0	600.1	601.7	601.1
2	599.7	600.0	601.8	601.6	599.3	599.3	601.8	599.4	601.9	601.6
3	601.7	600.6	601.9	600.8	601.9	599.3	601.6	599.7	601.6	599.3
4	600.4	601.2	601.6	599.4	599.5	600.1	601.6	600.6	601.5	598.5
5	601.8	600.7	600.3	601.8	600.9	601.7	601.6	599.2	601.6	598.9
6	601.1	600.4	601.2	601.2	601.7	598.8	600.0	600.7	602.1	601.6
7	601.7	600.8	600.3	600.8	600.9	601.8	601.8	601.7	601.5	601.7
8	601.6	600.3	601.8	601.2	599.9	599.3	600.7	601.1	598.6	599.2
9	601.2	601.5	601.2	598.5	601.1	601.8	601.0	599.6	599.6	599.1
10	601.5	599.8	602.1	601.2	601.9	600.2	601.1	600.3	601.0	599.3
11	601.6	599.1	601.6	601.5	599.2	601.6	600.8	601.7	601.0	599.0
12	601.9	600.1	599.4	601.6	599.3	601.3	599.2	600.3	601.8	599.8
13	599.4	601.1	601.6	600.6	600.8	601.6	601.7	599.4	601.3	601.2
14	600.2	601.8	600.4	598.3	601.8	600.7	600.4	600.8	599.3	601.8
15	601.5	600.9	601.1	600.3	601.6	601.2	601.2	599.1	600.9	600.8
16	601.5	601.0	599.4	600.3	600.6	601.6	599.1	600.2	600.9	599.7
17	601.6	599.4	601.9	601.6	601.2	601.7	601.2	601.4	601.0	601.7
18	600.4	601.6	601.8	599.2	601.7	600.8	600.2	600.9	601.8	600.5
19	599.0	599.9	601.1	601.7	598.9	601.6	601.2	600.8	599.4	599.1
20	601.3	599.2	601.9	600.2	601.0	599.6	599.9	599.2	599.9	599.1
21	601.7	601.3	601.0	601.9	600.4	601.8	601.0	600.5	601.5	601.8
22	601.2	600.9	602.0	601.9	601.1	598.2	601.8	601.4	601.4	601.6
23	600.7	601.6	600.5	600.3	599.9	600.9	600.2	600.9	601.7	599.8
24	600.9	601.1	600.7	599.9	601.1	599.5	602.0	600.9	601.4	601.8
25	601.6	601.5	601.8	600.0	601.8	601.9	600.5	601.6	599.4	601.7
Avg.	601.0	600.7	601.2	600.6	600.7	600.7	600.9	600.5	601.0	600.4
Med.	601.3	600.9	601.2	600.8	600.9	600.9	601.0	600.6	601.4	600.5
st dev	0.8	0.8	0.8	1.0	0.9	1.1	0.8	0.8	1.0	1.2
Min.	599.0	599.1	599.4	598.3	598.9	598.2	599.1	599.1	598.6	598.5
Max.	601.9	601.8	602.1	601.9	601.9	601.9	602.0	601.7	602.1	601.8

3.6 Data Set 2, 85°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	87.59	100.09	99.92	99.65	99.39	99.21	98.86	98.68	98.36	98.18
27	88.05	100.15	99.90	99.58	99.25	99.05	98.69	98.57	98.36	98.07
28	88.52	100.07	99.93	99.66	99.54	99.28	99.12	98.83	98.54	98.25
29	88.55	100.06	99.86	99.65	99.37	99.06	98.83	98.57	98.20	98.02
30	89.01	100.09	99.73	99.51	99.18	98.82	98.71	98.56	98.24	98.01
31	89.04	100.06	99.74	99.60	99.43	99.29	99.05	98.85	98.73	98.45
32	89.19	100.07	99.72	99.60	99.34	99.04	98.85	98.52	98.31	98.16
33	89.13	100.08	99.91	99.78	99.61	99.30	99.16	99.04	98.84	98.70
34	88.77	100.05	99.90	99.56	99.28	99.12	98.77	98.41	98.11	97.75
35	89.70	100.12	99.78	99.44	99.16	98.99	98.85	98.75	98.47	98.37
36	88.74	100.07	99.76	99.50	99.29	99.12	98.86	98.59	98.44	98.08
37	88.25	100.08	99.91	99.60	99.27	98.93	98.72	98.61	98.40	98.27
38	88.01	100.07	99.73	99.56	99.41	99.19	98.89	98.57	98.26	97.91
39	88.42	100.08	99.88	99.52	99.33	99.08	98.79	98.51	98.17	97.96
40	87.60	100.13	99.98	99.85	99.62	99.36	99.26	98.90	98.70	98.33
41	88.73	100.09	99.79	99.57	99.29	99.01	98.75	98.53	98.28	97.99
42	88.70	100.15	99.93	99.66	99.37	99.03	98.92	98.60	98.35	98.02
43	89.78	100.08	99.87	99.50	99.37	99.09	98.75	98.46	98.23	97.97
44	88.37	100.08	99.91	99.77	99.64	99.35	99.06	98.82	98.56	98.35
45	88.41	100.07	99.81	99.46	99.25	98.89	98.57	98.31	97.99	97.70
46	88.12	100.05	99.82	99.59	99.40	99.26	99.00	98.69	98.51	98.26
47	86.81	100.09	99.75	99.42	99.27	99.09	98.92	98.68	98.36	98.06
48	89.25	100.12	99.79	99.69	99.34	99.17	98.96	98.66	98.43	98.11
49	89.01	100.03	99.73	99.46	99.22	99.11	98.91	98.70	98.58	98.38
50	88.51	100.08	99.94	99.71	99.51	99.15	98.87	98.63	98.42	98.17
Avg.	88.57	100.08	99.84	99.60	99.37	99.12	98.88	98.64	98.39	98.14
Med.	88.55	100.08	99.86	99.59	99.34	99.11	98.86	98.61	98.36	98.11
st dev	0.66	0.03	0.08	0.11	0.13	0.14	0.16	0.16	0.20	0.22
Min.	86.81	100.03	99.72	99.42	99.16	98.82	98.57	98.31	97.99	97.70
Max.	89.78	100.15	99.98	99.85	99.64	99.36	99.26	99.04	98.84	98.70

3.7 Data Set 2, 85°C, 150mA (400-700nm Photon Flux Maintenance)

No.	$\Phi_p (\mu\text{mol} \times \text{s}^{-1})$	400-700nm Photon Flux Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	1.230	100.08	99.92	99.67	99.43	99.27	98.86	98.70	98.37	98.21
27	1.241	100.24	99.92	99.60	99.27	99.03	98.71	98.55	98.39	98.15
28	1.244	100.08	99.92	99.68	99.52	99.28	99.12	98.79	98.55	98.31
29	1.244	100.16	99.92	99.68	99.44	99.12	98.87	98.55	98.23	98.07
30	1.246	99.60	99.28	99.04	98.64	98.31	98.23	98.07	97.75	97.59
31	1.247	100.08	99.76	99.68	99.52	99.36	99.04	98.88	98.80	98.56
32	1.250	100.08	99.76	99.60	99.36	99.04	98.96	98.56	98.32	98.24
33	1.245	100.16	99.92	99.84	99.68	99.36	99.20	99.04	98.88	98.71
34	1.242	100.08	99.92	99.60	99.28	99.11	98.79	98.47	98.15	97.75
35	1.249	100.16	99.76	99.44	99.20	99.04	98.88	98.72	98.48	98.40
36	1.245	99.84	99.76	99.52	99.28	99.12	98.88	98.55	98.39	98.07
37	1.233	100.16	99.92	99.76	99.35	99.03	98.78	98.70	98.54	98.38
38	1.232	99.92	99.76	99.59	99.51	99.27	98.94	98.62	98.30	97.97
39	1.239	100.08	99.92	99.52	99.44	99.11	98.79	98.55	98.22	97.98
40	1.228	100.16	100.08	99.92	99.76	99.43	99.35	99.02	98.78	98.45
41	1.242	100.16	99.84	99.60	99.36	99.03	98.79	98.39	98.31	98.07
42	1.246	100.08	99.92	99.68	99.44	99.04	98.96	98.64	98.39	98.07
43	1.252	100.16	99.92	99.52	99.36	99.12	98.72	98.48	98.24	98.00
44	1.234	100.16	100.08	99.92	99.68	99.35	99.19	98.95	98.70	98.46
45	1.239	100.08	99.84	99.44	99.27	98.87	98.55	98.31	97.98	97.74
46	1.239	100.08	99.84	99.68	99.44	99.27	99.11	98.79	98.55	98.31
47	1.219	100.16	99.84	99.43	99.34	99.10	98.93	98.69	98.36	98.11
48	1.250	100.16	99.76	99.68	99.36	99.12	98.96	98.64	98.40	98.08
49	1.243	100.08	99.76	99.52	99.20	99.12	98.95	98.71	98.63	98.39
50	1.239	100.16	99.92	99.76	99.60	99.19	98.87	98.71	98.47	98.22
Avg.	1.241	100.09	99.85	99.61	99.39	99.12	98.90	98.64	98.41	98.17
Med.	1.242	100.08	99.92	99.60	99.36	99.12	98.88	98.64	98.39	98.15
st dev	0.008	0.13	0.15	0.18	0.21	0.22	0.22	0.22	0.25	0.26
Min.	1.219	99.60	99.28	99.04	98.64	98.31	98.23	98.07	97.75	97.59
Max.	1.252	100.24	100.08	99.92	99.76	99.43	99.35	99.04	98.88	98.71

3.8 Data Set 2, 85°C, 150mA (Chromaticity Shift)

No.	u'	v'	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2543	0.5224	0.0002	0.0004	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0012
27	0.2578	0.5237	0.0002	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
28	0.2562	0.5233	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0012
29	0.2565	0.5237	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0009	0.0011	0.0012
30	0.2556	0.5239	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011	0.0012
31	0.2556	0.5239	0.0001	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
32	0.2563	0.5244	0.0001	0.0003	0.0004	0.0005	0.0007	0.0009	0.0010	0.0011	0.0012
33	0.2554	0.5248	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0010	0.0012
34	0.2563	0.5250	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0011	0.0013
35	0.2542	0.5247	0.0002	0.0003	0.0005	0.0007	0.0007	0.0011	0.0011	0.0013	0.0013
36	0.2566	0.5246	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0014	0.0015
37	0.2555	0.5246	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0010	0.0012
38	0.2550	0.5236	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012
39	0.2554	0.5236	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0008	0.0009	0.0011
40	0.2557	0.5236	0.0001	0.0004	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011
41	0.2573	0.5258	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
42	0.2578	0.5248	0.0002	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
43	0.2550	0.5248	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0010	0.0011	0.0012
44	0.2547	0.5243	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0009	0.0010
45	0.2550	0.5234	0.0002	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009	0.0010
46	0.2577	0.5245	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012
47	0.2569	0.5245	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012
48	0.2562	0.5246	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0010	0.0011
49	0.2568	0.5260	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0009	0.0009	0.0012
50	0.2566	0.5256	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0009	0.0011	0.0013
Avg.	0.2560	0.5243	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012
Med.	0.2562	0.5245	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0011	0.0012
st dev	0.0010	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2542	0.5224	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010
Max.	0.2578	0.5260	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013	0.0014	0.0015

3.9 Data Set 2, 85°C, 150mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.994	3.024	3.024	3.036	3.059	3.029	3.050	3.062	3.037	3.060
27	2.964	3.052	3.041	3.036	3.039	3.012	3.036	3.044	3.041	3.040
28	3.053	3.050	3.047	3.042	3.048	3.024	3.041	3.048	3.021	3.046
29	3.045	3.047	3.040	3.023	3.062	3.011	3.044	3.047	3.055	3.031
30	3.003	3.052	3.045	3.042	3.039	3.045	3.048	3.024	3.023	3.043
31	2.922	3.013	3.036	3.007	3.068	3.009	3.038	3.021	3.027	3.060
32	3.036	3.053	3.038	3.039	3.047	3.017	3.025	3.036	3.036	3.033
33	3.068	3.056	3.049	3.044	3.060	3.040	3.045	3.048	3.014	3.062
34	3.084	3.048	3.052	3.044	3.056	3.044	3.046	3.056	3.043	3.046
35	3.014	3.030	3.017	3.003	3.041	3.024	3.022	3.050	3.044	3.014
36	3.087	3.033	3.063	3.035	3.046	3.042	3.041	3.053	3.029	3.040
37	2.996	3.065	3.024	3.030	3.036	3.045	3.043	3.042	3.012	3.026
38	3.075	3.052	3.053	3.029	3.041	3.061	3.024	3.041	3.033	3.059
39	3.067	3.041	3.046	3.049	3.059	3.051	3.052	3.047	3.018	3.053
40	2.964	3.052	3.048	3.021	3.029	3.044	3.038	3.026	3.029	3.052
41	3.097	3.028	3.060	3.023	3.052	3.014	3.025	3.040	3.043	3.063
42	3.004	3.006	3.027	3.003	3.058	3.027	3.026	3.024	3.028	3.022
43	3.030	3.029	3.045	3.044	3.060	3.037	3.044	3.066	3.054	3.044
44	2.993	3.022	3.041	3.025	3.057	3.024	3.042	3.045	3.021	3.031
45	3.054	3.024	3.020	3.017	3.051	3.021	3.033	3.041	3.016	3.037
46	3.000	3.028	3.024	3.017	3.029	3.020	3.011	3.035	3.037	3.030
47	2.984	3.020	3.015	3.035	3.059	3.015	3.045	3.036	3.015	3.051
48	3.088	3.051	3.030	3.024	3.043	3.055	3.013	3.052	3.018	3.045
49	2.997	3.041	3.052	3.023	3.039	3.046	3.058	3.063	3.044	3.037
50	3.012	3.010	3.031	3.019	3.022	3.028	3.036	3.024	3.034	3.026
Avg.	3.025	3.037	3.039	3.028	3.048	3.031	3.037	3.043	3.031	3.042
Med.	3.014	3.041	3.041	3.029	3.048	3.028	3.041	3.044	3.029	3.043
st dev	0.046	0.016	0.013	0.013	0.012	0.015	0.012	0.013	0.012	0.013
Min.	2.922	3.006	3.015	3.003	3.022	3.009	3.011	3.021	3.012	3.014
Max.	3.097	3.065	3.063	3.049	3.068	3.061	3.058	3.066	3.055	3.063

3.10 Data Set 2, 85°C, 150mA (Wavelength)

No.	Wavelength (nm)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	599.2	599.5	601.4	601.4	600.9	600.0	601.8	601.2	600.3	599.9
27	601.3	601.6	601.7	600.0	601.3	601.0	601.5	601.8	602.0	601.3
28	601.5	600.3	601.5	601.4	599.4	601.1	601.9	601.5	600.0	600.2
29	599.7	601.2	601.1	600.3	601.6	601.2	599.9	599.6	601.0	600.5
30	599.1	600.0	599.9	601.8	600.3	600.7	601.9	600.9	601.2	599.4
31	601.8	601.7	601.7	599.5	601.9	601.0	601.7	599.5	601.1	599.8
32	599.2	600.9	600.9	600.1	601.8	601.2	601.6	601.7	598.9	601.8
33	601.6	601.3	601.0	601.8	600.0	600.2	600.2	599.1	601.7	599.9
34	601.0	599.7	601.5	599.4	600.0	602.1	600.7	601.0	600.4	600.0
35	599.1	599.1	599.7	599.3	601.0	599.4	601.6	600.2	601.9	600.3
36	601.4	601.6	601.7	601.8	601.3	600.1	599.2	601.8	601.1	600.5
37	601.2	601.5	599.0	600.2	601.8	601.0	600.1	601.5	600.2	599.6
38	600.5	601.0	600.4	599.2	600.3	601.0	600.7	600.5	598.9	600.3
39	601.1	600.2	601.1	601.2	601.1	599.5	600.2	600.7	599.6	599.8
40	599.3	599.9	600.9	600.3	600.8	600.5	600.3	600.2	599.3	600.0
41	601.0	601.3	601.1	600.0	601.8	600.8	600.3	600.4	601.4	600.9
42	601.7	599.6	601.6	599.7	601.1	601.9	601.8	600.0	600.7	600.8
43	600.9	598.9	600.5	600.2	600.2	600.9	601.0	598.8	600.2	600.7
44	601.2	601.2	601.8	600.7	599.9	601.9	601.5	599.3	601.6	598.4
45	600.1	600.4	601.8	601.0	601.3	599.2	599.5	601.1	600.4	601.5
46	601.6	599.5	601.6	601.5	600.7	601.1	599.2	601.7	600.8	601.9
47	601.1	601.8	601.4	599.2	601.7	601.8	600.5	600.0	601.6	601.4
48	600.8	599.4	601.8	599.9	600.0	601.9	599.5	601.6	602.0	601.2
49	601.8	600.3	600.9	600.1	601.0	598.7	599.3	600.3	600.2	601.2
50	599.9	601.4	601.6	601.3	601.6	599.0	599.0	601.4	601.8	599.1
Avg.	600.7	600.5	601.1	600.5	600.9	600.7	600.6	600.6	600.7	600.4
Med.	601.0	600.4	601.4	600.2	601.0	601.0	600.5	600.7	600.8	600.3
st dev	0.9	0.9	0.7	0.9	0.7	1.0	1.0	0.9	0.9	0.9
Min.	599.1	598.9	599.0	599.2	599.4	598.7	599.0	598.8	598.9	598.4
Max.	601.8	601.8	601.8	601.8	601.9	602.1	601.9	601.8	602.0	601.9

3.11 Data Set 3, 105°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	89.66	100.01	99.61	99.42	99.10	98.81	98.56	98.38	98.07	97.94
52	88.34	100.11	99.89	99.48	99.07	98.78	98.64	98.48	98.12	97.85
53	88.44	100.11	99.77	99.36	98.99	98.82	98.56	98.20	98.03	97.61
54	89.33	100.03	99.76	99.55	99.34	99.18	98.90	98.58	98.41	98.07
55	88.82	100.09	99.76	99.39	99.23	99.01	98.71	98.50	98.19	97.82
56	88.68	99.95	99.55	99.36	99.22	98.96	98.60	98.20	97.83	97.70
57	90.73	99.98	99.79	99.63	99.26	98.93	98.52	98.20	98.05	97.71
58	88.41	99.97	99.67	99.50	99.16	98.83	98.62	98.27	97.87	97.73
59	87.37	99.99	99.67	99.42	99.22	98.86	98.55	98.23	98.03	97.65
60	88.90	100.04	99.84	99.45	99.20	99.00	98.73	98.40	98.01	97.84
61	88.60	100.05	99.83	99.59	99.20	98.98	98.78	98.60	98.19	97.80
62	88.83	100.08	99.75	99.43	99.22	98.86	98.60	98.41	98.21	97.82
63	87.53	100.11	99.78	99.54	99.38	99.01	98.63	98.39	98.11	97.91
64	88.51	99.95	99.59	99.21	98.87	98.69	98.35	97.93	97.73	97.54
65	88.89	100.02	99.89	99.73	99.56	99.31	99.17	98.81	98.43	98.23
66	89.34	99.96	99.55	99.28	99.04	98.81	98.49	98.32	97.95	97.54
67	88.99	100.07	99.92	99.57	99.34	99.00	98.58	98.26	97.89	97.55
68	89.31	99.99	99.64	99.48	99.14	98.90	98.57	98.32	98.06	97.85
69	87.72	100.07	99.89	99.49	99.24	98.81	98.67	98.29	98.01	97.70
70	88.02	99.95	99.66	99.25	98.95	98.82	98.61	98.19	97.89	97.64
71	88.28	100.01	99.82	99.66	99.32	99.15	98.78	98.60	98.26	98.01
72	88.02	100.07	99.80	99.56	99.17	98.84	98.55	98.13	97.84	97.57
73	88.53	99.97	99.62	99.20	98.99	98.58	98.28	98.09	97.79	97.61
74	89.02	100.07	99.75	99.53	99.22	99.00	98.61	98.28	98.00	97.61
75	88.02	99.97	99.63	99.22	98.93	98.67	98.27	97.93	97.60	97.35
Avg.	88.65	100.02	99.74	99.45	99.18	98.91	98.61	98.32	98.02	97.75
Med.	88.60	100.02	99.76	99.48	99.20	98.86	98.60	98.29	98.03	97.71
st dev	0.72	0.06	0.11	0.14	0.16	0.16	0.18	0.21	0.20	0.20
Min.	87.37	99.95	99.55	99.20	98.87	98.58	98.27	97.93	97.60	97.35
Max.	90.73	100.11	99.92	99.73	99.56	99.31	99.17	98.81	98.43	98.23

3.12 Data Set 3, 105°C, 150mA (400-700nm Photon Flux Maintenance)

No.	$\Phi_p (\mu\text{mol} \times \text{s}^{-1})$	400-700nm Photon Flux Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	1.2530	100.08	99.60	99.44	99.12	98.80	98.64	98.40	98.08	98.00
52	1.2390	100.16	99.92	99.52	99.11	98.79	98.63	98.47	98.14	97.90
53	1.2400	100.16	99.84	99.44	99.03	98.87	98.55	98.23	98.06	97.66
54	1.2470	99.92	99.84	99.60	99.44	99.20	98.96	98.64	98.48	98.16
55	1.2370	100.16	99.84	99.51	99.27	99.11	98.79	98.54	98.30	97.90
56	1.2430	99.76	99.60	99.44	99.28	99.03	98.63	98.23	97.91	97.75
57	1.2760	99.92	99.84	99.61	99.22	98.98	98.51	98.20	98.04	97.73
58	1.2420	100.08	99.76	99.60	99.28	98.87	98.71	98.31	97.91	97.75
59	1.2230	99.75	99.67	99.43	99.18	98.86	98.53	98.28	98.04	97.71
60	1.2430	100.08	99.92	99.52	99.28	99.03	98.79	98.47	98.07	97.91
61	1.2440	100.16	99.92	99.68	99.36	99.04	98.87	98.71	98.31	97.91
62	1.2410	100.16	99.76	99.44	99.11	98.87	98.63	98.47	98.23	97.90
63	1.2320	100.16	99.84	99.59	99.35	99.11	98.70	98.46	98.21	97.97
64	1.2360	99.84	99.60	99.27	99.11	98.79	98.38	97.98	97.73	97.57
65	1.2440	100.16	99.92	99.76	99.52	99.36	99.20	98.87	98.47	98.23
66	1.2490	100.08	99.60	99.36	99.12	98.88	98.56	98.40	98.00	97.60
67	1.2450	100.08	99.92	99.60	99.36	99.04	98.63	98.23	97.91	97.59
68	1.2370	100.16	99.76	99.60	99.19	98.95	98.71	98.38	98.14	97.98
69	1.2370	100.16	99.92	99.51	99.27	98.87	98.71	98.30	98.06	97.74
70	1.2350	99.92	99.68	99.27	98.95	98.79	98.62	98.14	97.89	97.65
71	1.2370	100.08	99.84	99.76	99.43	99.19	98.79	98.63	98.30	98.06
72	1.2320	100.16	99.92	99.68	99.27	98.94	98.62	98.30	97.97	97.73
73	1.2410	99.92	99.60	99.19	99.03	98.63	98.31	98.15	97.82	97.66
74	1.2480	100.16	99.84	99.60	99.28	99.04	98.64	98.32	98.08	97.68
75	1.2350	100.08	99.76	99.27	99.03	98.79	98.38	97.98	97.65	97.41
Avg.	1.2414	100.05	99.79	99.51	99.22	98.95	98.66	98.36	98.07	97.81
Med.	1.2410	100.08	99.84	99.52	99.27	98.94	98.63	98.32	98.06	97.75
st dev	0.0096	0.13	0.12	0.15	0.14	0.16	0.19	0.21	0.21	0.20
Min.	1.2230	99.75	99.60	99.19	98.95	98.63	98.31	97.98	97.65	97.41
Max.	1.2760	100.16	99.92	99.76	99.52	99.36	99.20	98.87	98.48	98.23

3.13 Data Set 3, 105°C, 150mA (Chromaticity Shift)

No.	u'	v'	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2565	0.5257	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
52	0.2551	0.5231	0.0003	0.0004	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0011
53	0.2567	0.5249	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012
54	0.2556	0.5251	0.0002	0.0004	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011
55	0.2549	0.5252	0.0002	0.0004	0.0005	0.0005	0.0006	0.0008	0.0008	0.0009	0.0011
56	0.2546	0.5233	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
57	0.2552	0.5228	0.0003	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009
58	0.2570	0.5240	0.0003	0.0004	0.0006	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012
59	0.2541	0.5230	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011
60	0.2552	0.5241	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0008	0.0009	0.0010
61	0.2574	0.5247	0.0003	0.0004	0.0005	0.0006	0.0008	0.0008	0.0009	0.0011	0.0012
62	0.2554	0.5246	0.0002	0.0003	0.0004	0.0005	0.0007	0.0007	0.0008	0.0009	0.0010
63	0.2571	0.5241	0.0003	0.0004	0.0004	0.0006	0.0007	0.0009	0.0009	0.0010	0.0011
64	0.2546	0.5244	0.0002	0.0003	0.0004	0.0006	0.0006	0.0007	0.0008	0.0008	0.0008
65	0.2568	0.5252	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0011
66	0.2561	0.5248	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011
67	0.2539	0.5226	0.0003	0.0004	0.0006	0.0006	0.0008	0.0008	0.0009	0.0010	0.0011
68	0.2550	0.5271	0.0004	0.0004	0.0006	0.0006	0.0007	0.0009	0.0009	0.0011	0.0012
69	0.2582	0.5243	0.0002	0.0004	0.0005	0.0006	0.0006	0.0008	0.0009	0.0010	0.0011
70	0.2550	0.5230	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0009	0.0010
71	0.2562	0.5242	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
72	0.2562	0.5247	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010
73	0.2563	0.5245	0.0003	0.0004	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0009
74	0.2551	0.5230	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013
75	0.2561	0.5238	0.0002	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012
Avg.	0.2558	0.5242	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
Med.	0.2556	0.5243	0.0002	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
st dev	0.0011	0.0010	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2539	0.5226	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0008	0.0008
Max.	0.2582	0.5271	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013

3.14 Data Set 3, 105°C, 150mA (Forward Voltage)

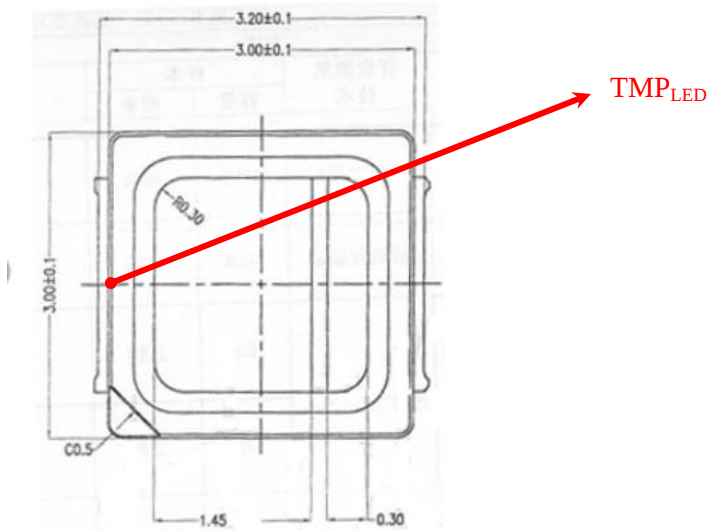
No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	2.959	3.020	3.039	3.054	3.063	3.038	3.030	3.044	3.047	3.046
52	3.085	3.035	3.048	3.042	3.047	3.046	3.048	3.002	3.048	3.046
53	2.984	3.055	3.043	3.038	3.049	3.036	3.049	3.046	3.027	3.040
54	2.991	3.038	3.038	3.046	3.026	3.038	3.022	3.042	3.036	3.038
55	2.958	3.040	3.027	3.048	3.049	3.044	3.048	3.039	3.036	3.030
56	2.960	3.039	3.063	3.050	3.031	3.035	3.035	3.043	3.035	3.038
57	3.018	3.025	3.060	3.037	3.043	3.045	3.046	3.035	3.037	3.039
58	2.963	3.054	3.062	3.053	3.065	3.051	3.069	3.052	3.046	3.047
59	2.980	3.041	3.054	3.035	3.026	3.034	3.030	3.037	3.031	3.040
60	2.972	3.038	3.027	3.042	3.068	3.036	3.057	3.031	3.038	3.038
61	2.985	3.030	3.031	3.029	3.066	3.033	3.047	3.024	3.032	3.043
62	3.003	3.025	3.023	3.034	3.060	3.027	3.065	3.043	3.022	3.028
63	2.961	3.006	3.012	3.022	3.033	3.028	3.065	3.019	3.041	3.023
64	2.949	3.010	3.027	3.030	3.063	3.027	3.062	3.027	3.031	3.028
65	2.981	3.025	3.018	3.044	3.044	3.031	3.043	3.031	3.033	3.038
66	2.937	3.034	3.021	3.027	3.033	3.026	3.060	3.041	3.025	3.033
67	3.031	3.033	3.027	3.035	3.039	3.029	3.040	3.010	3.051	3.028
68	2.941	3.043	3.066	3.054	3.032	3.038	3.038	3.029	3.044	3.039
69	3.031	3.052	3.042	3.048	3.042	3.044	3.042	3.026	3.023	3.043
70	2.995	3.029	3.067	3.039	3.048	3.041	3.057	3.030	3.050	3.037
71	3.011	3.028	3.040	3.051	3.035	3.056	3.049	3.021	3.023	3.050
72	2.971	3.031	3.032	3.024	3.040	3.040	3.039	3.046	3.031	3.013
73	2.975	3.040	3.058	3.058	3.032	3.025	3.025	3.037	3.022	3.041
74	2.979	3.034	3.038	3.034	3.043	3.041	3.045	3.039	3.021	3.024
75	2.959	3.038	3.012	3.041	3.041	3.022	3.052	3.008	3.020	3.030
Avg.	2.983	3.034	3.039	3.041	3.045	3.036	3.047	3.032	3.034	3.036
Med.	2.979	3.034	3.038	3.041	3.043	3.036	3.047	3.035	3.033	3.038
st dev	0.033	0.012	0.017	0.010	0.013	0.009	0.013	0.013	0.010	0.009
Min.	2.937	3.006	3.012	3.022	3.026	3.022	3.022	3.002	3.020	3.013
Max.	3.085	3.055	3.067	3.058	3.068	3.056	3.069	3.052	3.051	3.050

3.15 Data Set 3, 105°C, 150mA (Wavelength)

No.	Wavelength (nm)									
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	601.8	601.7	601.8	600.5	601.0	601.7	601.8	600.6	601.6	601.0
52	601.5	598.4	601.8	601.1	600.8	600.8	601.6	601.1	599.1	598.5
53	601.7	601.2	601.9	600.1	601.9	601.6	601.7	600.1	601.9	599.6
54	599.4	601.9	600.4	598.4	599.7	599.7	601.2	601.9	599.6	599.3
55	600.4	601.8	601.6	600.4	600.4	600.1	600.0	601.4	601.7	601.6
56	600.3	600.1	601.8	600.7	601.5	600.4	600.1	599.6	601.0	599.1
57	599.7	600.4	601.6	600.5	600.9	600.7	601.2	598.4	601.0	599.2
58	601.8	599.7	601.6	601.0	600.8	599.7	600.5	601.0	600.5	599.9
59	600.4	599.3	600.2	601.0	601.7	599.2	601.1	600.9	600.6	600.9
60	601.2	601.2	600.5	601.1	601.7	601.2	601.5	601.6	599.1	600.2
61	601.3	600.0	601.7	601.6	600.5	601.6	600.4	598.5	601.9	601.5
62	600.0	601.6	601.5	600.5	602.0	600.8	601.2	600.9	600.2	600.8
63	600.7	601.6	601.8	601.0	601.0	601.8	601.9	600.2	601.8	600.5
64	600.1	598.8	600.7	601.6	601.7	602.0	599.7	600.1	600.8	599.6
65	601.5	599.6	601.7	600.2	601.5	600.1	600.3	600.1	600.3	600.1
66	599.4	600.3	599.5	600.4	600.5	600.0	599.2	600.6	598.0	600.5
67	600.2	599.9	600.9	601.2	601.6	599.2	598.6	598.4	601.6	600.0
68	601.2	599.5	601.7	601.3	601.3	601.0	600.8	600.6	601.7	598.1
69	601.8	600.5	601.9	601.6	601.8	600.9	601.1	601.8	601.0	599.8
70	601.3	600.8	600.4	601.1	602.0	598.5	601.7	600.8	600.4	600.9
71	601.7	601.2	601.3	601.9	600.8	600.6	601.6	601.0	599.1	598.9
72	601.6	599.3	600.1	601.3	599.5	601.6	600.0	598.3	599.9	600.2
73	601.5	600.0	601.6	600.6	599.9	600.7	599.0	600.9	601.7	601.6
74	599.5	598.2	600.7	601.2	601.2	601.2	601.7	599.7	600.3	600.6
75	600.9	601.1	601.7	601.7	600.2	599.6	600.4	600.4	601.9	601.2
Avg.	600.8	600.3	601.2	600.9	601.0	600.6	600.7	600.4	600.7	600.1
Med.	601.2	600.3	601.6	601.0	601.0	600.7	601.1	600.6	600.8	600.2
st dev	0.8	1.1	0.7	0.7	0.7	0.9	0.9	1.0	1.1	1.0
Min.	599.4	598.2	599.5	598.4	599.5	598.5	598.6	598.3	598.0	598.1
Max.	601.8	601.9	601.9	601.9	602.0	602.0	601.9	601.9	601.9	601.6

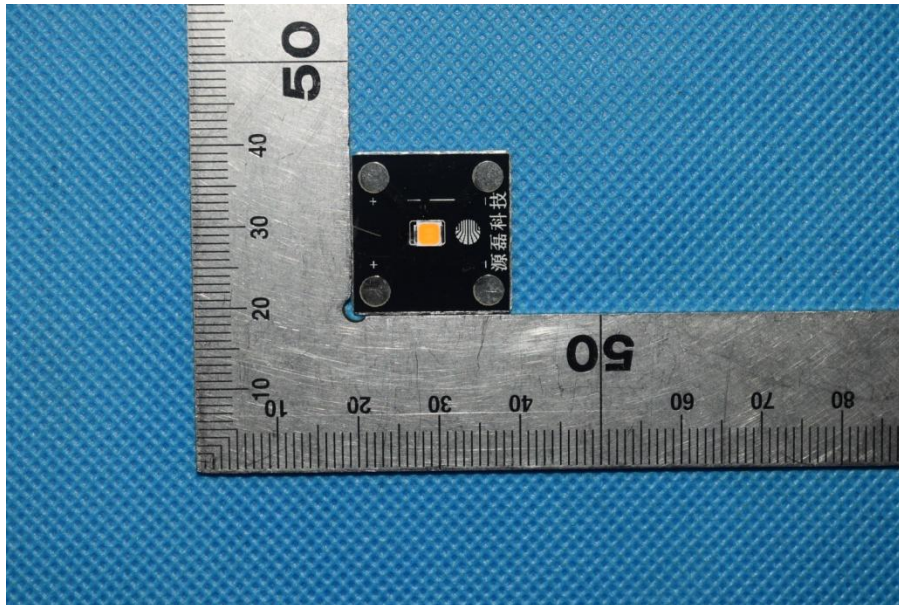
4 - DUT Photo

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. 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.
5. 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.
6. This report cannot be reproduced except in full, without prior written approval of the Company.
7. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

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