



Guangdong Meide Testing Technology Co., Ltd.



TEST REPORT OF ANSI/IES LM-80-15

Approved Method for Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules

Client..... : SHENZHEN LVMING PHOTOELECTRIC CO., LTD

Address..... : 5F Jingdiao Industrial Zone, 92# Xinhua Road, Redstar Community, Gong ming Town,
Guang ming Area, Shen Zhen

Test Model..... : LM3030WW-6V-1W

Brand Name..... : --

Testing Laboratory.... : Guangdong Meide Testing Technology Co., Ltd.

Address..... : 1st floor, B Area, Jinbaisheng Industrial Park, Headquarters 2 Road, Songshan Lake
Hi-tech Industrial Development Zone, Dongguan City, Guangdong Pr., China.

Testing Location..... : As above

Report No..... : C02A20010294L07001

Test Date..... : 2020-01-06 to 2021-01-22

Report Date..... : 2021-01-27

Tested by:

Tim

Tim Qian/ Test Engineer

Checked by:

Luke lei

Luke Lei/ Project Engineer

Approved by:



Jessie Li/ Technical Manager

Note 1: The test data was only valid for the test sample(s). 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 Guangdong Meide Testing Technology Co., Ltd. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Note 2: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



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1. General Information

1.1 Description of LED Light Sources

Sample Size:

60Pcs samples were received on 2020-01-03, The samples were numbered from S1 to S20, S21 to S40 and S41 to S60.

Manufacture: SHENZHEN LVMING PHOTOELECTRIC CO., LTD

Part Number: LM3030WW-6V-1W

Part Type: LED Package

Drive Level: DC 150mA

Nominal CCT: 2700K

Power: 1W

CRI: 80

Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from 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 Used

- ANSI/IES LM-80-15 IES Approved Method for Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules

1.3 Test equipment list

Test Equipment	Serial No	Model No	Calibration due date
Integrating Sphere System	MD-E033	0.5m	2021/05/19
Standard Light Source	MD-E034	D062	2021/05/19
High Accuracy Array Spectroradio Meter	MD-E011	HAAS-3000	2021/09/29
Digital Power Meter	MD-E008	PF310	2021/09/29
Precision digital stabilized DC power supply	MD-E009	WY305	2021/09/29
Temperature Tester	MD-E038	UFS-D8036	2021/06/17

Statement of Traceability: Guangdong Meide Testing Technology Co., Ltd. attested that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit(SI).



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1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to 25°C $\pm$ 2°C, RH < 65%.

1.6 Photometric Measurement Method

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate u'v'. 2 π measurement was used and sample was driven by DC power supply. The forward current was regulated to within $\pm 0.5\%$ of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to 25°C $\pm$ 2°C, RH < 65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

The uncertainty of the light output (luminous flux) measurements is U=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=18K (K=2), at the 95% confidence level. The uncertainty of the temperature is U=0.5°C (K=2), at the 95% confidence level.



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1.7 Sample Set

Data Set 1:55°C,150mA	
Part number:	LM3030WW-6V-1W
Number of Units:	20
Case Temperature(T_S):	$> 53^{\circ}\text{C}$
Ambient Temperature(T_A):	$> 50^{\circ}\text{C}$
Life Test Drive Current:	150mA
Measurement Current:	150mA

Data Set 2:85°C,150mA	
Part number:	LM3030WW-6V-1W
Number of Units:	20
Case Temperature(T_S):	$> 83^{\circ}\text{C}$
Ambient Temperature(T_A):	$> 80^{\circ}\text{C}$
Life Test Drive Current:	150mA
Measurement Current:	150mA

Data Set 3:105°C,150mA	
Part number:	LM3030WW-6V-1W
Number of Units:	20
Case Temperature(T_S):	$> 103^{\circ}\text{C}$
Ambient Temperature(T_A):	$> 100^{\circ}\text{C}$
Life Test Drive Current:	150mA
Measurement Current:	150mA



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2. SUMMARY OF TEST RESULT

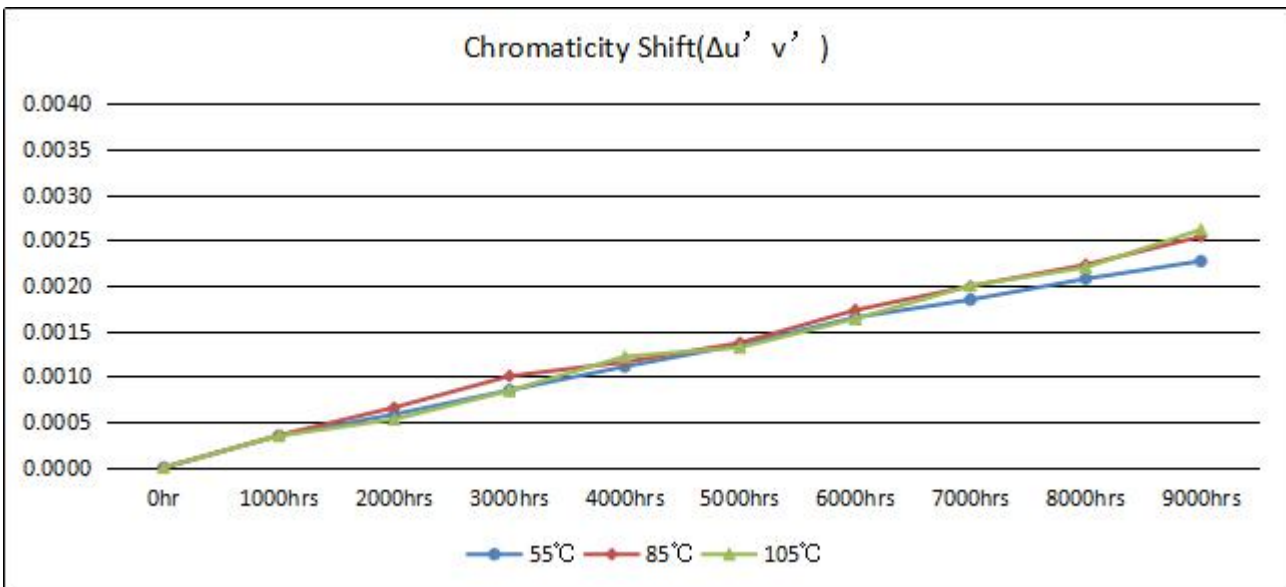
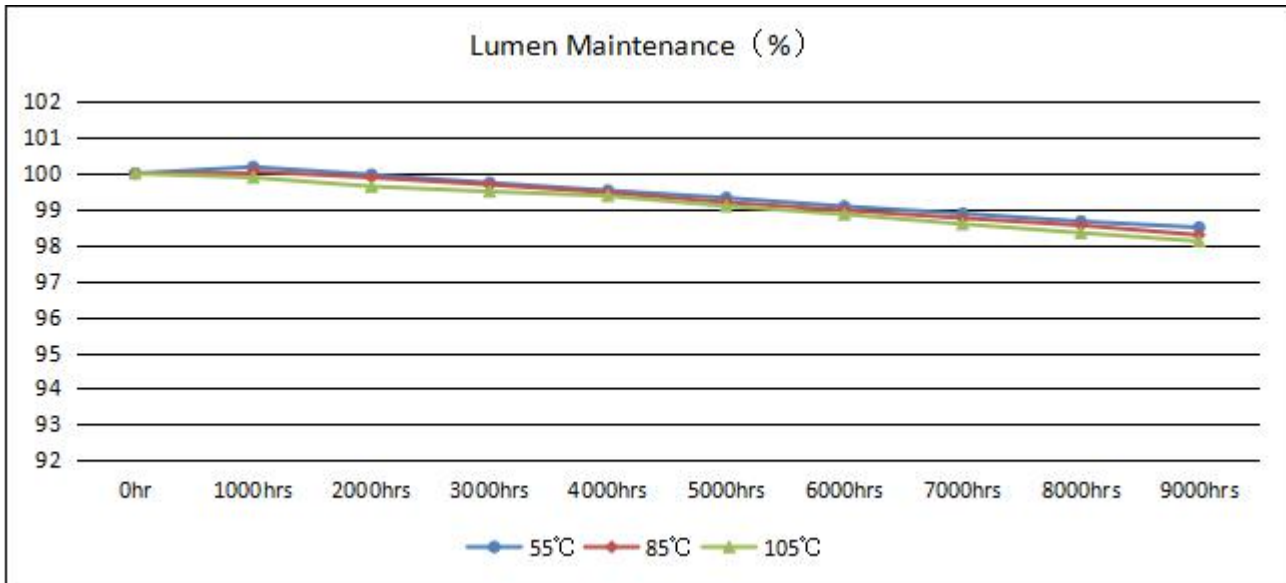
Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	B	Reported TM-21 L ₇₀ Lifetime	Reported TM-21 L ₉₀ Lifetime
1	20	0	1000hrs	9000hrs	2.112E-06	1.004	>54000hours	52000hours
2	20	0	1000hrs	9000hrs	2.329E-06	1.004	>54000hours	47000hours
3	20	0	1000hrs	9000hrs	2.554E-06	1.004	>54000hours	43000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	100.18%	99.97%	99.74%	99.52%	99.32%	99.08%	98.88%	98.66%	98.49%
2	100.06%	99.89%	99.69%	99.47%	99.19%	98.97%	98.75%	98.55%	98.28%
3	99.89%	99.64%	99.50%	99.37%	99.09%	98.86%	98.59%	98.34%	98.11%

Average Chromaticity Shift ($\Delta u'v'$)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0004	0.0006	0.0009	0.0011	0.0014	0.0017	0.0018	0.0021	0.0023
2	0.0004	0.0007	0.0010	0.0012	0.0014	0.0017	0.0020	0.0022	0.0025
3	0.0004	0.0005	0.0008	0.0012	0.0013	0.0016	0.0020	0.0022	0.0026





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3. Test Data

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

Sample Number	$\Phi(lm)$	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S1	111.5	100.19	99.90	99.77	99.59	99.37	99.20	98.97	98.63	98.54
S2	110.7	100.14	99.98	99.73	99.47	99.26	99.04	98.76	98.53	98.33
S3	109.8	100.30	100.01	99.82	99.51	99.35	98.95	98.69	98.47	98.33
S4	109.1	100.32	100.19	100.08	99.82	99.50	99.27	99.01	98.80	98.59
S5	108.4	100.17	99.98	99.74	99.67	99.51	99.19	98.94	98.78	98.70
S6	107.9	100.21	100.14	99.74	99.59	99.48	99.27	99.09	98.93	98.81
S7	105.1	100.38	100.22	99.90	99.67	99.36	98.97	98.74	98.49	98.30
S8	110.8	100.23	100.14	99.92	99.59	99.44	99.28	99.11	98.98	98.72
S9	109.9	99.98	99.82	99.51	99.35	99.20	98.98	98.80	98.54	98.33
S10	109.0	100.35	100.19	99.90	99.82	99.64	99.51	99.33	99.09	98.86
S11	108.2	100.15	99.94	99.75	99.42	99.13	98.88	98.75	98.51	98.33
S12	107.6	100.31	99.83	99.71	99.60	99.44	99.20	99.03	98.71	98.54
S13	107.0	100.02	99.67	99.43	99.13	98.81	98.58	98.41	98.18	98.09
S14	106.2	100.25	100.14	99.90	99.68	99.53	99.34	99.00	98.86	98.76
S15	105.5	99.90	99.67	99.59	99.35	99.17	98.88	98.68	98.46	98.25
S16	104.9	100.18	99.85	99.63	99.39	99.18	98.97	98.89	98.71	98.40
S17	104.5	99.92	99.74	99.60	99.38	99.21	98.92	98.83	98.64	98.51
S18	104.1	100.22	100.14	99.91	99.59	99.35	99.19	99.06	98.78	98.71
S19	104.5	100.25	99.92	99.71	99.57	99.40	99.18	99.01	98.74	98.63
S20	103.7	100.14	99.85	99.43	99.28	99.02	98.81	98.54	98.40	98.13
Ave.	107.4	100.18	99.97	99.74	99.52	99.32	99.08	98.88	98.66	98.49
Med.	107.8	100.20	99.96	99.74	99.58	99.36	99.11	98.92	98.68	98.53
St dev	2.4793	0.1358	0.1760	0.1720	0.1770	0.1973	0.2187	0.2160	0.2198	0.2278
Min.	103.7	99.90	99.67	99.43	99.13	98.81	98.58	98.41	98.18	98.09
Max.	111.5	100.38	100.22	100.08	99.82	99.64	99.51	99.33	99.09	98.86



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

Sample Number	Forward Voltage(V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S1	6.212	6.200	6.213	6.216	6.205	6.217	6.211	6.206	6.214	6.229
S2	6.200	6.205	6.209	6.204	6.204	6.209	6.204	6.202	6.212	6.199
S3	6.185	6.199	6.176	6.181	6.192	6.177	6.187	6.181	6.185	6.186
S4	6.174	6.148	6.174	6.177	6.176	6.169	6.168	6.175	6.170	6.175
S5	6.165	6.154	6.174	6.164	6.171	6.171	6.162	6.173	6.172	6.171
S6	6.158	6.143	6.159	6.164	6.154	6.162	6.160	6.157	6.159	6.149
S7	6.152	6.150	6.147	6.148	6.149	6.142	6.157	6.150	6.146	6.155
S8	6.239	6.229	6.239	6.245	6.241	6.245	6.234	6.243	6.270	6.236
S9	6.220	6.232	6.237	6.227	6.241	6.231	6.232	6.242	6.240	6.233
S10	6.205	6.183	6.205	6.207	6.206	6.206	6.198	6.206	6.239	6.206
S11	6.193	6.202	6.186	6.196	6.192	6.188	6.196	6.198	6.190	6.198
S12	6.183	6.171	6.171	6.167	6.168	6.171	6.167	6.171	6.170	6.161
S13	6.208	6.236	6.205	6.205	6.211	6.200	6.207	6.205	6.205	6.207
S14	6.195	6.182	6.198	6.205	6.228	6.190	6.200	6.205	6.196	6.198
S15	6.184	6.175	6.187	6.189	6.176	6.191	6.182	6.183	6.189	6.202
S16	6.177	6.172	6.183	6.178	6.199	6.171	6.176	6.177	6.175	6.183
S17	6.170	6.196	6.177	6.172	6.168	6.164	6.171	6.169	6.167	6.169
S18	6.165	6.146	6.168	6.169	6.154	6.179	6.169	6.159	6.195	6.165
S19	6.223	6.227	6.243	6.237	6.241	6.246	6.234	6.242	6.241	6.240
S20	6.209	6.223	6.207	6.206	6.212	6.202	6.214	6.206	6.206	6.212
Ave.	6.191	6.189	6.193	6.193	6.194	6.192	6.191	6.193	6.197	6.194
Med.	6.189	6.190	6.187	6.193	6.196	6.189	6.192	6.191	6.193	6.198
St dev	0.0236	0.0310	0.0267	0.0263	0.0295	0.0281	0.0253	0.0279	0.0319	0.0277
Min.	6.152	6.143	6.147	6.148	6.149	6.142	6.157	6.150	6.146	6.149
Max.	6.239	6.236	6.243	6.245	6.241	6.246	6.234	6.243	6.270	6.240



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

Sample Number	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S1	0.2602	0.5329	2726	0.0003	0.0006	0.0008	0.0010	0.0012	0.0015	0.0017	0.0022	0.0023
S2	0.2603	0.5332	2721	0.0004	0.0008	0.0011	0.0013	0.0012	0.0015	0.0018	0.0022	0.0024
S3	0.2601	0.5328	2728	0.0004	0.0005	0.0008	0.0012	0.0013	0.0016	0.0017	0.0019	0.0021
S4	0.2603	0.5327	2724	0.0003	0.0006	0.0009	0.0012	0.0015	0.0018	0.0019	0.0020	0.0023
S5	0.2603	0.5331	2723	0.0002	0.0004	0.0007	0.0011	0.0014	0.0017	0.0020	0.0022	0.0024
S6	0.2605	0.5333	2718	0.0003	0.0006	0.0008	0.0011	0.0014	0.0019	0.0020	0.0022	0.0023
S7	0.2601	0.5323	2729	0.0005	0.0007	0.0010	0.0013	0.0016	0.0018	0.0020	0.0022	0.0023
S8	0.2597	0.5328	2736	0.0003	0.0005	0.0008	0.0011	0.0014	0.0017	0.0018	0.0020	0.0022
S9	0.2599	0.5331	2731	0.0002	0.0006	0.0008	0.0009	0.0012	0.0013	0.0018	0.0020	0.0024
S10	0.2595	0.5327	2740	0.0004	0.0006	0.0008	0.0009	0.0010	0.0015	0.0018	0.0021	0.0023
S11	0.2599	0.5326	2733	0.0003	0.0005	0.0008	0.0011	0.0014	0.0017	0.0018	0.0019	0.0021
S12	0.2597	0.5330	2735	0.0003	0.0007	0.0009	0.0012	0.0014	0.0017	0.0019	0.0020	0.0023
S13	0.2600	0.5335	2728	0.0005	0.0007	0.0010	0.0010	0.0012	0.0014	0.0017	0.0021	0.0021
S14	0.2596	0.5324	2739	0.0004	0.0004	0.0007	0.0010	0.0012	0.0017	0.0018	0.0020	0.0022
S15	0.2601	0.5336	2725	0.0003	0.0005	0.0008	0.0012	0.0015	0.0018	0.0019	0.0021	0.0022
S16	0.2593	0.5341	2738	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018	0.0019	0.0021	0.0023
S17	0.2598	0.5337	2730	0.0003	0.0006	0.0008	0.0012	0.0015	0.0017	0.0018	0.0019	0.0021
S18	0.2610	0.5337	2705	0.0005	0.0006	0.0008	0.0011	0.0014	0.0017	0.0019	0.0021	0.0024
S19	0.2611	0.5343	2702	0.0004	0.0005	0.0008	0.0010	0.0013	0.0014	0.0017	0.0020	0.0023
S20	0.2598	0.5342	2728	0.0003	0.0006	0.0009	0.0011	0.0014	0.0018	0.0020	0.0023	0.0024
Ave.	0.2601	0.5332	2727	0.0004	0.0006	0.0009	0.0011	0.0014	0.0017	0.0018	0.0021	0.0023
Med.	0.2601	0.5331	2728	0.0003	0.0006	0.0008	0.0011	0.0014	0.0017	0.0018	0.0021	0.0023
St dev	0.0005	0.0006	10.0078	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
Min.	0.2593	0.5323	2702	0.0002	0.0004	0.0007	0.0009	0.0010	0.0013	0.0017	0.0019	0.0021
Max.	0.2611	0.5343	2740	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0020	0.0023	0.0024



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

Sample Number	$\Phi(lm)$	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S21	105.4	100.05	99.96	99.71	99.54	99.30	99.18	99.02	98.89	98.47
S22	104.3	100.03	99.89	99.56	99.39	99.07	98.72	98.48	98.35	98.16
S23	109.3	100.20	99.99	99.52	99.30	99.01	98.66	98.51	98.28	98.08
S24	108.5	100.18	100.04	99.93	99.83	99.59	99.46	99.30	99.24	98.88
S25	110.8	99.98	99.81	99.71	99.46	99.06	98.78	98.47	98.25	97.91
S26	109.7	100.20	99.96	99.94	99.77	99.51	99.48	99.17	98.87	98.61
S27	108.9	99.80	99.57	99.40	99.15	98.99	98.78	98.47	98.26	97.84
S28	108.2	99.91	99.85	99.65	99.44	99.05	98.90	98.76	98.53	98.34
S29	107.5	100.18	99.91	99.68	99.39	99.16	98.96	98.73	98.59	98.49
S30	107.0	99.97	99.56	99.32	99.13	98.70	98.40	98.09	97.87	97.61
S31	104.3	99.88	99.73	99.56	99.38	99.23	99.02	98.79	98.42	97.96
S32	105.1	100.03	99.88	99.67	99.33	98.94	98.74	98.56	98.43	98.24
S33	106.2	100.04	99.88	99.79	99.69	99.37	99.16	99.01	98.87	98.51
S34	109.0	100.25	100.12	99.86	99.77	99.45	99.24	99.09	98.87	98.68
S35	108.1	99.97	99.82	99.62	99.31	99.12	98.91	98.71	98.29	98.10
S36	107.2	99.98	99.85	99.55	99.38	99.22	98.94	98.78	98.49	98.40
S37	106.6	99.97	99.89	99.55	99.23	98.91	98.70	98.47	98.49	98.14
S38	105.9	100.24	100.04	99.99	99.84	99.60	99.47	99.15	99.00	98.65
S39	105.6	100.17	100.02	99.93	99.46	99.20	98.92	98.70	98.56	98.33
S40	109.3	100.07	99.97	99.79	99.54	99.39	99.03	98.80	98.51	98.25
Ave.	107.3	100.06	99.89	99.69	99.47	99.19	98.97	98.75	98.55	98.28
Med.	107.4	100.04	99.89	99.68	99.42	99.18	98.93	98.75	98.50	98.29
St dev	1.8841	0.1278	0.1438	0.1845	0.2157	0.2401	0.2904	0.3028	0.3212	0.3171
Min.	104.3	99.80	99.56	99.32	99.13	98.70	98.40	98.09	97.87	97.61
Max.	110.8	100.25	100.12	99.99	99.84	99.60	99.48	99.30	99.24	98.88



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

Sample Number	Forward Voltage(V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S21	6.240	6.274	6.244	6.233	6.248	6.254	6.252	6.244	6.256	6.252
S22	6.220	6.217	6.206	6.204	6.208	6.212	6.212	6.209	6.219	6.218
S23	6.205	6.193	6.234	6.221	6.205	6.211	6.209	6.205	6.226	6.216
S24	6.192	6.195	6.197	6.186	6.192	6.174	6.176	6.175	6.178	6.179
S25	6.228	6.240	6.234	6.237	6.229	6.231	6.230	6.233	6.216	6.250
S26	6.210	6.188	6.197	6.207	6.206	6.198	6.205	6.200	6.205	6.207
S27	6.197	6.226	6.211	6.198	6.202	6.212	6.209	6.212	6.215	6.211
S28	6.186	6.160	6.214	6.211	6.204	6.211	6.205	6.201	6.210	6.218
S29	6.178	6.202	6.191	6.178	6.182	6.163	6.162	6.163	6.166	6.172
S30	6.171	6.176	6.161	6.159	6.143	6.150	6.143	6.137	6.149	6.163
S31	6.165	6.152	6.161	6.159	6.169	6.174	6.172	6.167	6.177	6.174
S32	6.161	6.160	6.164	6.176	6.175	6.167	6.175	6.208	6.175	6.183
S33	6.228	6.267	6.247	6.237	6.242	6.238	6.239	6.236	6.244	6.248
S34	6.214	6.233	6.200	6.193	6.190	6.183	6.184	6.185	6.198	6.202
S35	6.198	6.186	6.202	6.193	6.200	6.207	6.203	6.201	6.205	6.229
S36	6.185	6.193	6.174	6.167	6.166	6.167	6.167	6.159	6.171	6.166
S37	6.175	6.197	6.197	6.187	6.192	6.174	6.179	6.174	6.178	6.177
S38	6.167	6.127	6.173	6.169	6.166	6.174	6.164	6.164	6.174	6.173
S39	6.161	6.159	6.141	6.136	6.135	6.142	6.144	6.142	6.144	6.149
S40	6.215	6.189	6.192	6.198	6.197	6.193	6.202	6.213	6.198	6.189
Ave.	6.195	6.197	6.197	6.192	6.193	6.192	6.192	6.191	6.195	6.199
Med.	6.195	6.193	6.197	6.193	6.195	6.188	6.193	6.201	6.198	6.196
St dev	0.0245	0.0378	0.0290	0.0275	0.0289	0.0299	0.0299	0.0305	0.0298	0.0309
Min.	6.161	6.127	6.141	6.136	6.135	6.142	6.143	6.137	6.144	6.149
Max.	6.240	6.274	6.247	6.237	6.248	6.254	6.252	6.244	6.256	6.252



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

Sample Number	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S21	0.2598	0.5345	2727	0.0006	0.0009	0.0012	0.0015	0.0016	0.0022	0.0024	0.0024	0.0027
S22	0.2590	0.5326	2752	0.0004	0.0008	0.0012	0.0014	0.0017	0.0021	0.0022	0.0024	0.0026
S23	0.2575	0.5336	2778	0.0003	0.0006	0.0010	0.0013	0.0012	0.0016	0.0019	0.0022	0.0025
S24	0.2626	0.5328	2678	0.0004	0.0006	0.0008	0.0009	0.0012	0.0015	0.0019	0.0022	0.0026
S25	0.2598	0.5333	2732	0.0003	0.0006	0.0010	0.0011	0.0012	0.0015	0.0017	0.0021	0.0025
S26	0.2595	0.5328	2741	0.0003	0.0008	0.0013	0.0014	0.0017	0.0021	0.0022	0.0023	0.0025
S27	0.2598	0.5327	2735	0.0005	0.0007	0.0011	0.0010	0.0012	0.0015	0.0018	0.0022	0.0024
S28	0.2598	0.5331	2733	0.0005	0.0008	0.0011	0.0014	0.0017	0.0022	0.0024	0.0024	0.0027
S29	0.2600	0.5332	2728	0.0005	0.0006	0.0009	0.0009	0.0010	0.0016	0.0019	0.0021	0.0026
S30	0.2596	0.5322	2740	0.0005	0.0009	0.0010	0.0009	0.0014	0.0016	0.0019	0.0023	0.0026
S31	0.2600	0.5334	2728	0.0004	0.0006	0.0009	0.0009	0.0012	0.0014	0.0019	0.0022	0.0025
S32	0.2593	0.5340	2739	0.0002	0.0008	0.0011	0.0012	0.0013	0.0016	0.0019	0.0022	0.0026
S33	0.2623	0.5341	2677	0.0003	0.0006	0.0010	0.0014	0.0015	0.0018	0.0021	0.0023	0.0026
S34	0.2640	0.5337	2645	0.0003	0.0007	0.0011	0.0012	0.0016	0.0019	0.0021	0.0022	0.0024
S35	0.2628	0.5336	2669	0.0001	0.0002	0.0007	0.0010	0.0010	0.0014	0.0017	0.0021	0.0024
S36	0.2619	0.5317	2694	0.0003	0.0007	0.0012	0.0013	0.0015	0.0019	0.0022	0.0023	0.0025
S37	0.2604	0.5328	2720	0.0004	0.0006	0.0011	0.0013	0.0016	0.0020	0.0022	0.0023	0.0025
S38	0.2655	0.5319	2623	0.0002	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0023	0.0026
S39	0.2627	0.5321	2677	0.0003	0.0005	0.0008	0.0010	0.0013	0.0016	0.0017	0.0020	0.0025
S40	0.2627	0.5326	2675	0.0003	0.0007	0.0008	0.0010	0.0012	0.0015	0.0019	0.0021	0.0025
Ave.	0.2610	0.5330	2710	0.0004	0.0007	0.0010	0.0012	0.0014	0.0017	0.0020	0.0022	0.0025
Med.	0.2600	0.5330	2728	0.0003	0.0007	0.0010	0.0012	0.0013	0.0016	0.0019	0.0022	0.0025
St dev	0.0020	0.0008	39.6823	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0001	0.0001
Min.	0.2575	0.5317	2623	0.0001	0.0002	0.0007	0.0009	0.0010	0.0014	0.0017	0.0020	0.0024
Max.	0.2655	0.5345	2778	0.0006	0.0009	0.0013	0.0015	0.0017	0.0022	0.0024	0.0024	0.0027



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

Sample Number	Φ (lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S41	109.8	99.94	99.60	99.58	99.43	99.12	98.95	98.76	98.43	98.21
S42	111.1	99.86	99.63	99.26	99.20	98.88	98.58	98.38	98.03	97.90
S43	107.9	99.97	99.71	99.64	99.60	99.26	99.05	98.75	98.62	98.39
S44	110.5	99.94	99.62	99.47	99.38	99.10	98.94	98.68	98.42	98.11
S45	109.9	99.81	99.60	99.45	99.27	98.99	98.69	98.50	98.27	98.08
S46	109.4	99.98	99.73	99.58	99.43	99.21	99.03	98.75	98.50	98.20
S47	108.9	99.79	99.60	99.50	99.37	99.03	98.71	98.43	98.19	97.88
S48	104.0	99.97	99.77	99.71	99.61	99.30	99.10	98.81	98.66	98.37
S49	104.9	99.89	99.58	99.44	99.32	99.09	98.98	98.65	98.51	98.27
S50	105.8	99.74	99.58	99.52	99.31	98.90	98.60	98.31	98.03	97.86
S51	106.6	99.88	99.61	99.45	99.36	99.09	98.83	98.46	98.22	97.81
S52	115.7	99.92	99.63	99.51	99.33	99.05	98.91	98.66	98.50	98.23
S53	109.2	99.98	99.72	99.64	99.61	99.40	99.17	98.87	98.47	98.23
S54	108.2	99.94	99.73	99.59	99.23	99.03	98.84	98.50	98.25	98.12
S55	107.4	99.92	99.66	99.59	99.52	99.28	99.11	98.83	98.58	98.34
S56	106.7	99.90	99.66	99.58	99.53	99.32	99.05	98.78	98.67	98.33
S57	106.1	99.79	99.56	99.47	99.32	99.04	98.66	98.35	98.12	97.97
S58	105.7	99.88	99.62	99.28	99.25	98.93	98.66	98.44	98.17	97.93
S59	108.0	99.72	99.49	99.21	99.14	98.80	98.56	98.31	97.93	97.83
S60	107.3	99.90	99.61	99.44	99.26	98.93	98.79	98.53	98.29	98.13
Ave.	108.2	99.89	99.64	99.50	99.37	99.09	98.86	98.59	98.34	98.11
Med.	108.0	99.90	99.62	99.51	99.35	99.07	98.88	98.59	98.36	98.13
St dev	2.6120	0.0785	0.0682	0.1304	0.1398	0.1639	0.1950	0.1864	0.2234	0.1921
Min.	104.0	99.72	99.49	99.21	99.14	98.80	98.56	98.31	97.93	97.81
Max.	115.7	99.98	99.77	99.71	99.61	99.40	99.17	98.87	98.67	98.39



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

Sample Number	Forward Voltage(V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S41	6.224	6.234	6.229	6.220	6.226	6.231	6.225	6.232	6.226	6.222
S42	6.207	6.229	6.236	6.212	6.212	6.214	6.215	6.212	6.212	6.218
S43	6.192	6.189	6.191	6.182	6.188	6.191	6.182	6.188	6.186	6.180
S44	6.180	6.178	6.177	6.179	6.176	6.179	6.172	6.180	6.174	6.180
S45	6.172	6.178	6.180	6.170	6.176	6.165	6.156	6.163	6.156	6.150
S46	6.164	6.178	6.163	6.180	6.181	6.178	6.186	6.190	6.176	6.180
S47	6.159	6.157	6.155	6.161	6.157	6.150	6.163	6.165	6.162	6.165
S48	6.154	6.162	6.147	6.138	6.146	6.141	6.139	6.140	6.140	6.132
S49	6.150	6.166	6.174	6.177	6.176	6.168	6.156	6.163	6.158	6.154
S50	6.148	6.175	6.168	6.162	6.170	6.173	6.160	6.164	6.164	6.161
S51	6.145	6.147	6.135	6.149	6.153	6.154	6.153	6.144	6.149	6.160
S52	6.237	6.257	6.247	6.252	6.253	6.238	6.263	6.253	6.243	6.260
S53	6.225	6.222	6.225	6.234	6.232	6.231	6.237	6.240	6.233	6.236
S54	6.207	6.221	6.219	6.225	6.221	6.214	6.212	6.205	6.215	6.211
S55	6.193	6.204	6.208	6.181	6.180	6.181	6.184	6.190	6.179	6.209
S56	6.182	6.185	6.197	6.190	6.186	6.195	6.192	6.187	6.188	6.189
S57	6.174	6.190	6.185	6.160	6.166	6.185	6.160	6.166	6.164	6.160
S58	6.167	6.187	6.167	6.168	6.166	6.169	6.173	6.180	6.174	6.168
S59	6.201	6.209	6.202	6.210	6.204	6.210	6.206	6.209	6.216	6.239
S60	6.190	6.186	6.210	6.196	6.195	6.202	6.203	6.204	6.198	6.201
Ave.	6.184	6.193	6.191	6.187	6.188	6.188	6.187	6.189	6.186	6.189
Med.	6.181	6.187	6.188	6.181	6.181	6.183	6.183	6.188	6.178	6.180
St dev	0.0272	0.0284	0.0310	0.0299	0.0284	0.0280	0.0322	0.0305	0.0297	0.0344
Min.	6.145	6.147	6.135	6.138	6.146	6.141	6.139	6.140	6.140	6.132
Max.	6.237	6.257	6.247	6.252	6.253	6.238	6.263	6.253	6.243	6.260



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

Sample Number	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
S41	0.2627	0.5327	2674	0.0004	0.0006	0.0008	0.0011	0.0014	0.0018	0.0020	0.0022	0.0025
S42	0.2624	0.5323	2682	0.0003	0.0005	0.0008	0.0014	0.0015	0.0015	0.0018	0.0023	0.0027
S43	0.2628	0.5322	2675	0.0003	0.0004	0.0008	0.0010	0.0013	0.0016	0.0021	0.0023	0.0028
S44	0.2627	0.5325	2676	0.0007	0.0010	0.0013	0.0018	0.0017	0.0018	0.0023	0.0024	0.0026
S45	0.2629	0.5327	2672	0.0003	0.0004	0.0006	0.0010	0.0010	0.0013	0.0019	0.0021	0.0025
S46	0.2625	0.5317	2682	0.0005	0.0007	0.0010	0.0013	0.0014	0.0015	0.0019	0.0020	0.0025
S47	0.2630	0.5329	2668	0.0004	0.0005	0.0008	0.0012	0.0013	0.0019	0.0021	0.0023	0.0028
S48	0.2623	0.5334	2682	0.0003	0.0007	0.0010	0.0013	0.0014	0.0016	0.0019	0.0022	0.0026
S49	0.2627	0.5330	2675	0.0002	0.0004	0.0009	0.0013	0.0015	0.0018	0.0021	0.0023	0.0027
S50	0.2639	0.5330	2651	0.0003	0.0005	0.0006	0.0011	0.0014	0.0016	0.0021	0.0023	0.0025
S51	0.2628	0.5331	2672	0.0003	0.0005	0.0008	0.0011	0.0015	0.0017	0.0020	0.0021	0.0025
S52	0.2594	0.5332	2740	0.0004	0.0005	0.0009	0.0014	0.0014	0.0019	0.0023	0.0024	0.0029
S53	0.2593	0.5319	2748	0.0002	0.0002	0.0006	0.0012	0.0014	0.0020	0.0021	0.0022	0.0027
S54	0.2590	0.5314	2756	0.0002	0.0004	0.0008	0.0011	0.0010	0.0014	0.0019	0.0021	0.0024
S55	0.2593	0.5314	2750	0.0003	0.0004	0.0005	0.0008	0.0009	0.0012	0.0017	0.0018	0.0025
S56	0.2593	0.5318	2748	0.0003	0.0006	0.0010	0.0013	0.0014	0.0018	0.0018	0.0022	0.0027
S57	0.2595	0.5319	2744	0.0002	0.0002	0.0007	0.0010	0.0011	0.0014	0.0019	0.0022	0.0027
S58	0.2591	0.5308	2756	0.0004	0.0007	0.0010	0.0015	0.0014	0.0014	0.0019	0.0021	0.0025
S59	0.2596	0.5324	2740	0.0005	0.0008	0.0010	0.0012	0.0012	0.0017	0.0020	0.0021	0.0025
S60	0.2589	0.5330	2752	0.0005	0.0006	0.0010	0.0013	0.0012	0.0018	0.0022	0.0024	0.0027
Ave.	0.2612	0.5324	2707	0.0004	0.0005	0.0008	0.0012	0.0013	0.0016	0.0020	0.0022	0.0026
Med.	0.2624	0.5325	2682	0.0003	0.0005	0.0008	0.0012	0.0014	0.0017	0.0020	0.0022	0.0026
St dev	0.0018	0.0007	38.8415	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
Min.	0.2589	0.5308	2651	0.0002	0.0002	0.0005	0.0008	0.0009	0.0012	0.0017	0.0018	0.0024
Max.	0.2639	0.5334	2756	0.0007	0.0010	0.0013	0.0018	0.0017	0.0020	0.0023	0.0024	0.0029

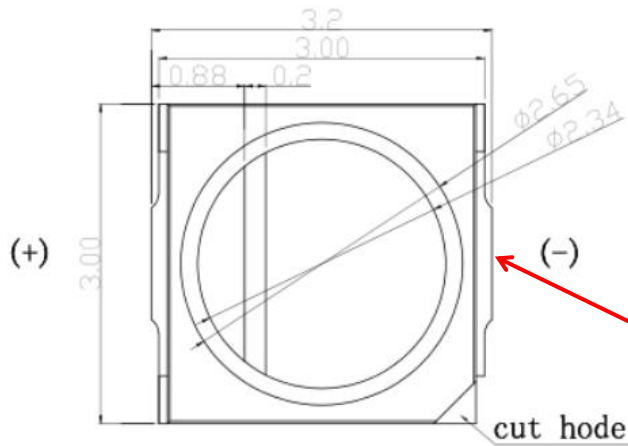


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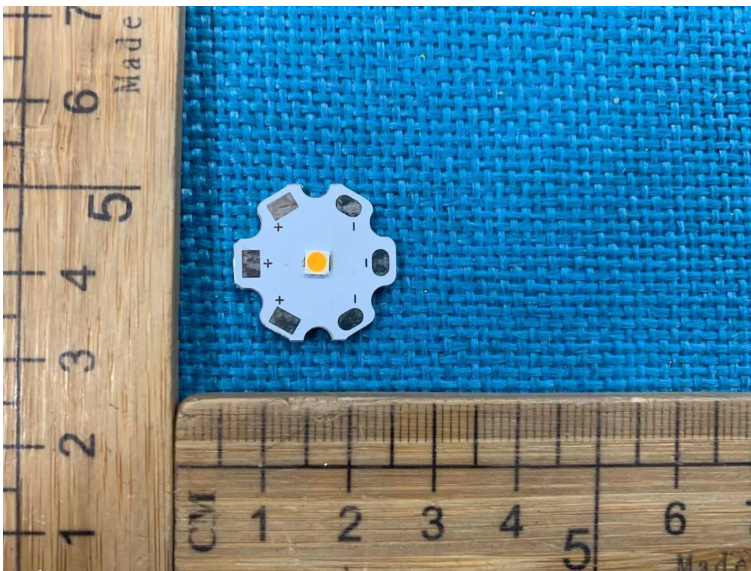
4 . EUT PHOTO

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



***** END OF THE TEST REPORT*****