TEST REPORT

According to ANSI/IES LM-80-15
For

Lumileds Holding B.V.

370 W. Trimble Road, San Jose, CA 95131, USA

Model: L128-2780RC35000A1

Report Type: 17000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	DG3230206-05007E-EE
Test Date:	2020-11-10 to 2022-10-19
Report Date:	2023-02-07
Approved by:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 5/F(B-West) -7/F, the 3rd Phase of Wan Li Industrial Building D, Shihua Road, Futian Free Trade Zone Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

TABLE OF CONTENTS

1 - General Information

1.1 Description of LED Light Sources#

Sample Size:

50 PCS test samples were in good condition and received on 2020-11-09. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Lumileds Holding B.V.
Part Number:	L128-2780RC35000A1
Part Type:	LED Package
Drive Level:	DC 100mA
Nominal CCT:	2700K
Power:	1W
Average Current Density per LED die:	344.45mA/mm^2
Average Power Density per LED die:	1.033W/mm^2
CRI:	80
Die Spacing:	0.13mm

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:

Tested model	Multiple model	Total Input Current (mA)	Power (W)	CCT (K)	Current Density per Die（mA/mm^2)	Power Density per PCB(W/mm^2)	Die Spacing (mm)
L128-2780RC35000A1	L128-xxxxRC35xxxxx	100	1	2200-6500	344.45	0.102	0.13

Notes:
1. The first and second x denote designates nominal CCT (22=2200K,27=2700K, 30=3000K, 35=3500K, 40=4000K,45=4500K,50=5000K,57=5700K,60=6000K,65=6500K).
2. The three and four x is a different product solution (Color coordinate and applications and special solution etc.).
3. The last five x denote designates= Lumileds internal codes (000A1, 000B1, 000C1, etc. =shares the same base part).
4. The materials and workmanship of all series models are consistent with the test model.

Note:

1、The applicant Lumileds Holding B.V. declare that their products with model L128-2780RC35000A1 are the same to the products in report# DG3201109-19900E-10-17000 and is authorized by original applicant to use their test data.

2、All the data in previous report (DG3201109-19900E-10-17000) is shared in this report.

1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- *CIE 127:2007: Measurement of LEDs (This standard was not accredited by NVLAP)
- *ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by NVLAP)

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2022-09-27	2023-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2022-09-27	2023-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-11-18	2023-11-17
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2023-10-14
Multilayer aging machine	BACL	B2-270	20023	2022-11-18	2023-11-17
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	2022-11-18	2023-11-17

1.4 Drive Level

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

1.5 Ambient Conditions for Maintenance Test

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

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

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

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

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

1.6 Photometric Measurement Method and Uncertainty

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

The uncertainty of the light output measurements is U=1.59% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=21K (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set

Data Set 1: 85°C, 100mA

Part Number:	L128-2780RC35000A1
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	100mA
Measurement Current:	100mA

Data Set 2: 105°C, 100mA

Part Number:	L128-2780RC35000A1
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	100mA
Measurement Current:	100mA

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	17000hrs	2.156E-06	1.004	>102000 hours	51,000 hours
2	25	0	1000hrs	17000hrs	2.720E-06	1.004	>102000 hours	40,000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	100.22%	99.97%	99.75%	99.53%	99.33%	99.11%	98.89%	98.67%	98.46%	98.24%	98.02%	97.80%
2	100.08%	99.83%	99.57%	99.31%	99.03%	98.78%	98.51%	98.25%	97.99%	97.72%	97.44%	97.16%

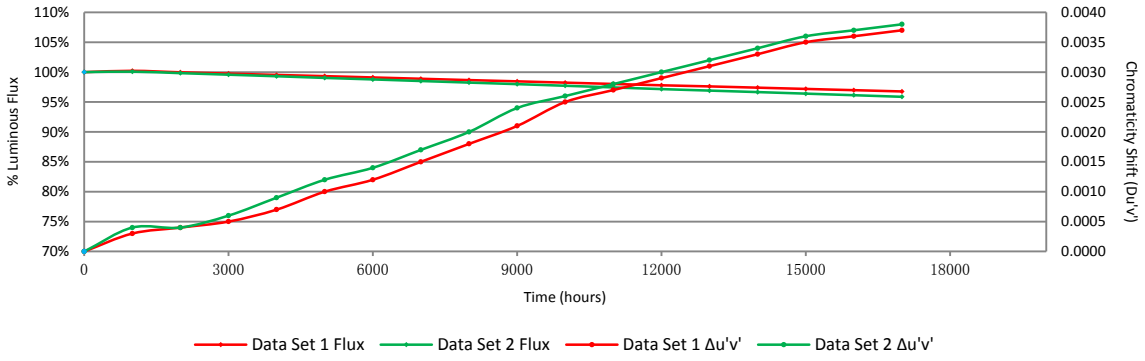
13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
97.61%	97.40%	97.19%	96.98%	96.77%
96.91%	96.66%	96.40%	96.14%	95.87%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	0.0003	0.0004	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0025	0.0027	0.0029
2	0.0004	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0024	0.0026	0.0028	0.0030

13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
0.0031	0.0033	0.0035	0.0036	0.0037
0.0032	0.0034	0.0036	0.0037	0.0038

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)											
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	138.30	100.14	99.93	99.64	99.42	99.20	98.92	98.70	98.48	98.34	98.12	97.90	97.69
2	137.20	100.29	100.07	99.93	99.71	99.56	99.27	98.98	98.76	98.62	98.40	98.18	97.96
3	138.50	100.14	99.86	99.64	99.35	99.13	98.84	98.70	98.48	98.27	98.05	97.76	97.55
4	136.10	100.07	99.85	99.71	99.49	99.34	99.12	98.97	98.75	98.60	98.38	98.16	98.02
5	135.70	100.29	100.15	99.93	99.78	99.56	99.34	99.12	98.97	98.67	98.53	98.31	98.08
6	137.70	100.22	99.93	99.78	99.56	99.35	99.13	98.91	98.69	98.47	98.26	98.04	97.82
7	137.60	100.29	100.07	99.93	99.64	99.35	99.13	98.98	98.76	98.55	98.40	98.18	97.97
8	137.00	100.22	99.93	99.71	99.56	99.42	99.20	98.91	98.76	98.47	98.25	98.10	97.88
9	136.60	100.22	99.93	99.78	99.49	99.27	99.12	98.90	98.61	98.46	98.24	97.95	97.73
10	136.70	100.29	100.15	99.93	99.78	99.56	99.27	99.05	98.83	98.68	98.46	98.24	97.95
11	136.80	100.29	99.93	99.63	99.42	99.12	98.83	98.54	98.32	98.03	97.73	97.44	97.22
12	136.50	100.15	99.93	99.63	99.49	99.34	99.19	99.05	98.83	98.61	98.46	98.24	98.02
13	137.10	100.15	99.93	99.71	99.49	99.27	99.12	98.91	98.76	98.47	98.25	98.03	97.74
14	136.40	100.29	100.07	99.78	99.56	99.41	99.27	99.05	98.83	98.61	98.31	98.09	97.95
15	139.60	100.14	99.93	99.71	99.57	99.36	99.21	99.00	98.85	98.64	98.42	98.28	98.14
16	136.40	100.29	100.07	99.85	99.56	99.34	99.19	98.97	98.68	98.39	98.09	97.87	97.65
17	135.40	100.30	100.07	99.93	99.70	99.56	99.41	99.19	98.97	98.74	98.52	98.30	98.08
18	136.90	100.22	99.93	99.71	99.49	99.34	99.05	98.83	98.69	98.47	98.32	98.03	97.81
19	136.70	100.29	99.85	99.63	99.41	99.20	98.98	98.76	98.54	98.32	98.10	97.95	97.73
20	138.90	100.22	99.93	99.64	99.35	99.06	98.78	98.49	98.20	97.91	97.62	97.41	97.19
21	138.20	100.29	99.93	99.71	99.49	99.35	99.20	99.06	98.84	98.70	98.55	98.41	98.19
22	137.10	100.29	100.07	99.85	99.64	99.42	99.20	98.98	98.76	98.54	98.32	98.03	97.81
23	137.50	100.07	99.93	99.64	99.49	99.27	99.05	98.76	98.62	98.47	98.25	98.11	97.82
24	138.70	100.07	99.86	99.64	99.42	99.21	98.99	98.77	98.56	98.41	98.27	98.05	97.84
25	138.30	100.29	100.07	99.78	99.49	99.20	98.92	98.63	98.34	98.05	97.76	97.54	97.25
Avg.	137.28	100.22	99.97	99.75	99.53	99.33	99.11	98.89	98.67	98.46	98.24	98.02	97.80
Med.	137.10	100.22	99.93	99.71	99.49	99.34	99.13	98.91	98.75	98.47	98.27	98.05	97.82
st dev	1.04	0.08	0.09	0.11	0.12	0.14	0.16	0.18	0.20	0.21	0.25	0.26	0.27
Min.	135.40	100.07	99.85	99.63	99.35	99.06	98.78	98.49	98.20	97.91	97.62	97.41	97.19
Max.	139.60	100.30	100.15	99.93	99.78	99.56	99.41	99.19	98.97	98.74	98.55	98.41	98.19

No.	Lumen Maintenance (%)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	97.40	97.25	97.04	96.89	96.53
2	97.67	97.38	97.16	97.01	96.72
3	97.40	97.26	97.11	96.97	96.82
4	97.72	97.58	97.28	97.13	96.84
5	97.86	97.57	97.42	97.20	97.05
6	97.60	97.46	97.17	96.88	96.59
7	97.75	97.46	97.17	97.02	96.73
8	97.74	97.59	97.45	97.23	97.08
9	97.58	97.29	97.00	96.78	96.63
10	97.81	97.51	97.22	97.07	96.93
11	97.08	96.93	96.78	96.64	96.49
12	97.73	97.44	97.22	96.92	96.70
13	97.52	97.37	97.08	96.94	96.64
14	97.73	97.51	97.36	97.07	96.85
15	97.92	97.64	97.42	97.13	96.85
16	97.36	97.14	96.85	96.70	96.48
17	97.93	97.71	97.56	97.34	97.19
18	97.66	97.37	97.08	96.86	96.64
19	97.59	97.37	97.15	96.93	96.78
20	97.12	96.98	96.83	96.69	96.54
21	98.05	97.83	97.68	97.40	97.18
22	97.59	97.45	97.23	97.01	96.86
23	97.67	97.60	97.45	97.24	97.09
24	97.55	97.40	97.19	96.90	96.68
25	97.11	96.89	96.75	96.60	96.46
Avg.	97.61	97.40	97.19	96.98	96.77
Med.	97.66	97.44	97.17	96.97	96.73
st dev	0.25	0.23	0.24	0.21	0.22
Min.	97.08	96.89	96.75	96.60	96.46
Max.	98.05	97.83	97.68	97.40	97.19

3.2 Data Set 1, 85°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)												
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	8.911	8.911	8.973	8.917	8.990	8.940	8.980	8.910	8.920	8.986	8.960	8.994	8.977
2	8.983	8.994	8.996	8.994	8.909	8.900	8.954	8.908	8.978	8.971	8.941	8.946	8.909
3	8.929	8.943	8.935	8.910	8.929	8.974	8.983	8.929	8.941	8.949	8.948	8.927	8.975
4	8.908	8.975	9.004	8.959	8.913	8.921	8.974	8.955	8.920	8.952	8.978	8.962	8.964
5	8.934	8.949	8.964	8.904	8.919	8.971	8.974	8.908	8.969	8.964	8.909	8.941	8.913
6	8.921	8.972	8.927	8.988	8.934	8.993	8.960	8.954	8.908	8.965	8.957	8.914	8.922
7	8.921	8.934	8.960	8.941	8.955	8.909	8.978	8.929	8.935	8.910	8.935	8.935	8.913
8	8.909	8.986	8.955	8.972	8.945	8.935	8.994	8.946	8.940	8.979	8.921	8.973	8.957
9	8.930	9.001	8.991	8.929	8.919	8.952	8.970	8.960	8.902	8.973	8.979	8.982	8.969
10	8.939	8.943	8.926	8.935	8.937	8.924	8.982	8.954	8.940	8.904	8.927	8.948	8.916
11	8.912	8.942	8.969	8.919	8.940	8.918	8.959	8.914	8.906	8.946	8.974	8.946	8.940
12	8.963	8.906	8.936	8.993	8.941	8.948	8.950	8.934	8.954	8.935	8.998	8.980	8.972
13	8.933	8.983	8.966	8.949	8.930	8.945	8.965	8.943	8.951	8.991	8.906	8.955	8.931
14	8.981	8.935	8.984	8.953	8.904	8.985	8.932	8.971	8.985	8.928	8.918	8.972	8.941
15	8.960	8.923	8.934	8.962	8.929	8.996	8.930	8.980	8.973	8.953	8.920	8.977	8.901
16	8.911	8.991	8.955	8.989	8.938	8.923	8.941	8.988	8.914	8.936	8.903	8.922	8.911
17	8.909	8.958	8.978	8.926	8.956	8.981	8.959	8.941	8.951	8.954	8.990	8.990	8.922
18	8.906	9.001	8.906	8.912	9.004	8.998	8.930	8.916	8.930	8.912	8.968	8.961	8.988
19	8.959	8.978	8.909	8.953	8.929	8.929	8.934	8.941	8.972	8.920	8.997	8.955	8.993
20	8.944	8.962	8.925	8.902	8.966	8.903	8.912	8.903	8.947	8.976	8.951	8.999	8.978
21	8.932	8.955	8.976	8.900	8.930	8.943	8.904	8.928	8.904	8.969	8.992	8.918	8.952
22	8.955	8.942	8.981	8.934	8.988	8.931	8.970	8.986	8.930	8.904	8.916	8.914	8.928
23	8.906	8.936	8.942	8.913	9.005	8.937	8.941	8.920	8.954	8.979	8.930	8.949	8.960
24	8.892	8.904	8.952	8.975	8.971	8.915	8.911	8.907	8.912	8.929	8.989	8.942	8.930
25	8.915	8.910	8.986	8.930	8.938	8.919	8.931	8.970	8.951	8.992	8.926	8.958	8.961
Avg.	8.931	8.953	8.957	8.942	8.945	8.944	8.953	8.940	8.939	8.951	8.949	8.954	8.945
Med.	8.929	8.949	8.960	8.935	8.938	8.937	8.959	8.941	8.940	8.953	8.948	8.955	8.941
st dev	0.025	0.030	0.027	0.030	0.028	0.030	0.025	0.026	0.025	0.028	0.031	0.025	0.028
Min.	8.892	8.904	8.906	8.900	8.904	8.900	8.904	8.903	8.902	8.904	8.903	8.914	8.901
Max.	8.983	9.001	9.004	8.994	9.005	8.998	8.994	8.988	8.985	8.992	8.998	8.999	8.993

No.	Forward Voltage (V)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	8.983	8.933	8.965	8.970	8.969
2	8.968	8.903	8.961	8.961	8.963
3	8.953	8.935	8.940	8.944	8.942
4	8.978	8.958	8.965	8.965	8.967
5	9.010	8.903	8.909	8.911	8.915
6	8.962	8.943	8.953	8.953	8.950
7	8.951	8.953	8.952	8.956	8.954
8	8.914	8.906	8.915	8.915	8.914
9	8.961	8.965	8.967	8.969	8.967
10	8.921	8.923	8.924	8.926	8.927
11	8.987	8.991	8.997	8.997	8.997
12	8.967	8.970	8.974	8.978	8.974
13	8.969	8.969	8.973	8.979	8.981
14	8.982	8.947	8.953	8.954	8.956
15	8.941	8.903	8.909	8.913	8.911
16	8.989	8.950	8.952	8.957	8.959
17	8.924	8.904	8.912	8.912	8.915
18	9.021	8.998	8.907	8.908	8.906
19	8.981	8.964	8.969	8.969	8.972
20	8.909	8.989	8.997	8.901	8.902
21	8.947	8.941	8.944	8.948	8.948
22	8.915	8.908	8.913	8.911	8.910
23	9.002	8.991	8.991	8.993	8.997
24	8.927	8.909	8.913	8.919	8.913
25	8.920	8.906	8.907	8.913	8.910
Avg.	8.959	8.942	8.946	8.945	8.945
Med.	8.962	8.943	8.952	8.953	8.950
st dev	0.032	0.032	0.030	0.029	0.030
Min.	8.909	8.903	8.907	8.901	8.902
Max.	9.021	8.998	8.997	8.997	8.997

3.3 Data Set 1, 85°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')											
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	0.2632	0.5270	2687	0.0003	0.0005	0.0006	0.0007	0.0009	0.0011	0.0013	0.0015	0.0019	0.0022	0.0024	0.0025
2	0.2608	0.5231	2754	0.0004	0.0009	0.0007	0.0009	0.0012	0.0014	0.0017	0.0021	0.0023	0.0025	0.0027	0.0030
3	0.2623	0.5237	2719	0.0003	0.0003	0.0006	0.0006	0.0009	0.0011	0.0013	0.0015	0.0019	0.0023	0.0027	0.0029
4	0.2634	0.5258	2687	0.0004	0.0004	0.0005	0.0007	0.0008	0.0013	0.0015	0.0019	0.0022	0.0025	0.0028	0.0029
5	0.2638	0.5254	2680	0.0004	0.0003	0.0004	0.0008	0.0011	0.0014	0.0016	0.0018	0.0021	0.0023	0.0024	0.0026
6	0.2633	0.5258	2690	0.0003	0.0004	0.0004	0.0005	0.0009	0.0013	0.0015	0.0018	0.0021	0.0024	0.0026	0.0029
7	0.2617	0.5264	2721	0.0004	0.0004	0.0006	0.0008	0.0010	0.0014	0.0016	0.0019	0.0022	0.0027	0.0030	0.0033
8	0.2614	0.5244	2736	0.0002	0.0004	0.0005	0.0007	0.0011	0.0014	0.0017	0.0019	0.0023	0.0027	0.0029	0.0030
9	0.2625	0.5227	2718	0.0003	0.0002	0.0004	0.0005	0.0009	0.0013	0.0016	0.0019	0.0022	0.0023	0.0025	0.0028
10	0.2620	0.5234	2728	0.0004	0.0004	0.0008	0.0009	0.0014	0.0017	0.0020	0.0022	0.0026	0.0028	0.0031	0.0034
11	0.2629	0.5243	2705	0.0004	0.0004	0.0004	0.0006	0.0008	0.0011	0.0015	0.0018	0.0021	0.0025	0.0026	0.0028
12	0.2635	0.5238	2694	0.0002	0.0006	0.0006	0.0008	0.0012	0.0013	0.0014	0.0018	0.0021	0.0025	0.0027	0.0030
13	0.2631	0.5223	2708	0.0002	0.0004	0.0006	0.0005	0.0010	0.0012	0.0016	0.0019	0.0022	0.0025	0.0028	0.0030
14	0.2630	0.5249	2700	0.0004	0.0004	0.0005	0.0004	0.0008	0.0012	0.0014	0.0018	0.0022	0.0024	0.0028	0.0030
15	0.2611	0.5248	2740	0.0004	0.0004	0.0006	0.0009	0.0011	0.0013	0.0016	0.0019	0.0022	0.0026	0.0030	0.0033
16	0.2624	0.5236	2717	0.0004	0.0004	0.0006	0.0009	0.0012	0.0014	0.0018	0.0019	0.0022	0.0025	0.0028	0.0031
17	0.2629	0.5233	2708	0.0005	0.0004	0.0006	0.0008	0.0010	0.0012	0.0013	0.0017	0.0019	0.0022	0.0025	0.0028
18	0.2630	0.5224	2710	0.0003	0.0004	0.0006	0.0007	0.0009	0.0014	0.0017	0.0021	0.0023	0.0026	0.0028	0.0030
19	0.2621	0.5255	2716	0.0002	0.0003	0.0004	0.0009	0.0011	0.0013	0.0017	0.0020	0.0023	0.0027	0.0029	0.0031
20	0.2623	0.5255	2713	0.0004	0.0005	0.0005	0.0005	0.0011	0.0013	0.0016	0.0019	0.0021	0.0025	0.0027	0.0029
21	0.2631	0.5269	2690	0.0005	0.0003	0.0006	0.0005	0.0009	0.0012	0.0016	0.0020	0.0023	0.0027	0.0030	0.0032
22	0.2617	0.5230	2735	0.0003	0.0004	0.0006	0.0011	0.0014	0.0016	0.0018	0.0021	0.0024	0.0027	0.0028	0.0030
23	0.2610	0.5243	2744	0.0001	0.0005	0.0005	0.0004	0.0005	0.0006	0.0010	0.0014	0.0016	0.0020	0.0021	0.0022
24	0.2622	0.5252	2716	0.0005	0.0002	0.0003	0.0005	0.0007	0.0011	0.0014	0.0018	0.0020	0.0022	0.0024	0.0025
25	0.2624	0.5244	2714	0.0002	0.0005	0.0004	0.0005	0.0006	0.0006	0.0010	0.0015	0.0017	0.0020	0.0022	0.0023
Avg.	0.2624	0.5245	2713	0.0003	0.0004	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018	0.0021	0.0025	0.0027	0.0029
Med.	0.2624	0.5244	2714	0.0004	0.0004	0.0006	0.0007	0.0010	0.0013	0.0016	0.0019	0.0022	0.0025	0.0027	0.0030
st dev	0.0008	0.0014	19	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2608	0.5223	2680	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0010	0.0014	0.0016	0.0020	0.0021	0.0022
Max.	0.2638	0.5270	2754	0.0005	0.0009	0.0008	0.0011	0.0014	0.0017	0.0020	0.0022	0.0026	0.0028	0.0031	0.0034

No.	Chromaticity Shift (Δu'v')				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
1	0.0025	0.0028	0.0031	0.0035	0.0036
2	0.0031	0.0035	0.0036	0.0037	0.0040
3	0.0029	0.0033	0.0035	0.0035	0.0038
4	0.0031	0.0030	0.0033	0.0035	0.0037
5	0.0029	0.0031	0.0033	0.0035	0.0037
6	0.0032	0.0035	0.0034	0.0037	0.0039
7	0.0034	0.0036	0.0037	0.0040	0.0041
8	0.0035	0.0037	0.0039	0.0038	0.0040
9	0.0030	0.0033	0.0035	0.0033	0.0036
10	0.0035	0.0037	0.0040	0.0039	0.0040
11	0.0030	0.0031	0.0033	0.0034	0.0035
12	0.0034	0.0035	0.0038	0.0039	0.0039
13	0.0030	0.0033	0.0034	0.0037	0.0037
14	0.0032	0.0033	0.0035	0.0035	0.0037
15	0.0034	0.0034	0.0035	0.0037	0.0039
16	0.0033	0.0035	0.0034	0.0033	0.0034
17	0.0030	0.0033	0.0036	0.0037	0.0037
18	0.0032	0.0034	0.0036	0.0037	0.0037
19	0.0033	0.0035	0.0035	0.0036	0.0037
20	0.0031	0.0033	0.0034	0.0036	0.0035
21	0.0030	0.0033	0.0035	0.0038	0.0037
22	0.0032	0.0034	0.0035	0.0038	0.0037
23	0.0025	0.0027	0.0029	0.0033	0.0033
24	0.0028	0.0030	0.0032	0.0035	0.0035
25	0.0025	0.0026	0.0029	0.0032	0.0035
Avg.	0.0031	0.0033	0.0035	0.0036	0.0037
Med.	0.0031	0.0033	0.0035	0.0036	0.0037
st dev	0.0003	0.0003	0.0003	0.0002	0.0002
Min.	0.0025	0.0026	0.0029	0.0032	0.0033
Max.	0.0035	0.0037	0.0040	0.0040	0.0041

3.4 Data Set 2, 105°C, 100mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)											
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	138.20	100.07	99.78	99.49	99.20	98.91	98.70	98.41	98.12	97.83	97.54	97.25	96.96
27	136.70	100.22	99.93	99.63	99.34	99.05	98.76	98.46	98.17	97.88	97.59	97.29	97.00
28	137.40	100.07	99.85	99.64	99.49	99.34	99.13	98.76	98.40	98.03	97.67	97.31	96.94
29	137.50	99.93	99.71	99.56	99.27	99.05	98.84	98.62	98.47	98.33	98.04	97.89	97.67
30	136.30	100.15	99.85	99.63	99.34	99.05	98.90	98.68	98.53	98.31	98.09	97.80	97.51
31	136.70	99.93	99.63	99.41	99.12	98.83	98.54	98.24	98.02	97.73	97.44	97.15	96.85
32	137.90	100.22	99.93	99.64	99.35	98.98	98.69	98.33	97.97	97.68	97.39	97.10	96.81
33	136.50	100.22	99.93	99.63	99.49	99.27	99.05	98.75	98.46	98.17	97.88	97.58	97.22
34	137.90	99.93	99.78	99.49	99.35	99.06	98.77	98.48	98.26	98.04	97.75	97.53	97.39
35	137.60	100.36	100.07	99.71	99.42	98.91	98.62	98.26	97.97	97.67	97.38	97.09	96.80
36	138.00	99.71	99.42	99.28	99.06	98.91	98.77	98.55	98.33	98.12	97.90	97.61	97.32
37	137.30	99.20	98.98	98.76	98.62	98.40	98.18	97.96	97.67	97.45	97.23	97.01	96.80
38	136.50	100.15	99.93	99.71	99.41	99.19	98.97	98.83	98.68	98.53	98.24	97.95	97.66
39	135.60	100.29	100.07	99.78	99.56	99.26	98.97	98.67	98.45	98.16	97.94	97.71	97.42
40	136.60	100.29	99.93	99.63	99.34	99.05	98.76	98.46	98.17	97.88	97.58	97.36	97.07
41	135.90	100.15	99.85	99.56	99.26	98.97	98.68	98.38	98.09	97.79	97.50	97.20	96.98
42	138.00	100.07	99.86	99.57	99.28	99.06	98.77	98.55	98.33	98.04	97.75	97.46	97.25
43	137.90	100.22	99.93	99.64	99.35	99.06	98.77	98.48	98.11	97.82	97.53	97.24	96.95
44	136.20	100.29	100.15	99.93	99.63	99.34	99.05	98.75	98.46	98.16	97.94	97.65	97.36
45	136.60	99.85	99.71	99.56	99.27	98.98	98.76	98.46	98.17	98.02	97.73	97.51	97.29
46	138.60	100.22	99.86	99.57	99.28	98.99	98.70	98.41	98.12	97.84	97.55	97.19	96.90
47	138.90	100.07	99.78	99.50	99.28	98.99	98.70	98.42	98.13	97.84	97.48	97.19	96.90
48	134.50	100.07	99.93	99.63	99.41	99.18	99.03	98.88	98.74	98.51	98.29	98.07	97.77
49	135.80	100.15	99.93	99.78	99.48	99.26	99.04	98.75	98.53	98.31	98.16	97.86	97.64
50	136.90	100.22	99.85	99.49	99.12	98.76	98.47	98.17	97.88	97.59	97.30	97.01	96.64
Avg.	137.04	100.08	99.83	99.57	99.31	99.03	98.78	98.51	98.25	97.99	97.72	97.44	97.16
Med.	136.90	100.15	99.86	99.63	99.34	99.05	98.77	98.48	98.17	98.02	97.67	97.36	97.07
st dev	1.04	0.24	0.23	0.21	0.20	0.20	0.21	0.22	0.26	0.28	0.30	0.31	0.32
Min.	134.50	99.20	98.98	98.76	98.62	98.40	98.18	97.96	97.67	97.45	97.23	97.01	96.64
Max.	138.90	100.36	100.15	99.93	99.63	99.34	99.13	98.88	98.74	98.53	98.29	98.07	97.77

No.	Lumen Maintenance (%)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	96.67	96.45	96.24	95.95	95.80
27	96.71	96.49	96.27	95.90	95.68
28	96.72	96.51	96.36	96.22	96.07
29	97.31	97.09	96.80	96.51	96.36
30	97.29	97.07	96.92	96.70	96.40
31	96.63	96.49	96.34	96.20	95.90
32	96.59	96.37	96.23	96.01	95.79
33	97.07	96.92	96.78	96.48	96.12
34	97.10	96.95	96.66	96.52	96.08
35	96.58	96.22	96.08	95.86	95.49
36	97.03	96.81	96.67	96.30	95.94
37	96.58	96.43	96.07	95.85	95.70
38	97.44	97.07	96.85	96.63	96.41
39	97.05	96.76	96.46	96.17	95.94
40	96.85	96.71	96.34	96.05	95.75
41	96.69	96.47	96.25	95.95	95.58
42	96.96	96.67	96.30	96.01	95.65
43	96.66	96.30	96.01	95.72	95.43
44	97.14	96.92	96.70	96.55	96.33
45	97.00	96.63	96.27	96.05	95.68
46	96.61	96.32	95.96	95.60	95.31
47	96.76	96.40	95.97	95.68	95.39
48	97.47	97.17	96.80	96.43	96.06
49	97.42	97.13	96.83	96.54	96.24
50	96.42	96.20	95.91	95.62	95.47
Avg.	96.91	96.66	96.40	96.14	95.87
Med.	96.85	96.63	96.34	96.05	95.80
st dev	0.31	0.31	0.32	0.33	0.33
Min.	96.42	96.20	95.91	95.60	95.31
Max.	97.47	97.17	96.92	96.70	96.41

3.5 Data Set 2, 105°C, 100mA (Forward Voltage)

No.	Forward Voltage (V)												
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	8.911	8.958	8.935	9.013	8.947	8.960	8.940	8.930	8.912	8.940	8.900	8.930	8.928
27	8.937	8.949	8.970	8.930	8.929	8.960	9.028	8.909	8.959	8.923	8.901	8.930	8.933
28	8.944	8.932	8.950	8.960	8.940	8.968	8.960	8.970	8.902	8.965	8.918	8.960	8.981
29	8.936	8.913	8.980	8.900	8.973	8.945	9.029	8.924	8.917	8.954	8.992	8.973	8.988
30	8.919	8.970	8.952	8.920	8.920	8.946	8.965	8.900	8.979	8.907	8.935	8.954	8.909
31	8.908	9.013	8.970	8.970	8.910	8.986	8.981	8.960	8.928	8.915	8.933	8.915	9.011
32	8.949	8.930	8.900	8.900	8.960	8.941	8.994	8.968	8.944	8.975	8.990	8.950	8.902
33	8.919	8.994	8.950	8.970	8.960	8.910	9.000	8.940	8.976	8.950	8.924	8.982	8.994
34	8.912	8.960	8.900	8.960	8.980	8.990	8.990	8.923	8.910	8.911	9.005	8.948	9.012
35	8.913	8.914	8.983	8.970	8.950	8.940	8.910	8.950	8.929	8.935	8.920	9.016	8.931
36	8.896	9.010	8.940	8.940	8.925	8.955	8.901	8.948	8.960	8.911	8.921	8.920	8.920
37	8.905	8.916	8.913	9.019	8.996	8.997	8.935	8.963	8.904	8.957	8.980	8.970	8.955
38	8.907	8.900	8.959	8.960	8.924	8.978	8.943	8.945	8.935	8.900	8.970	8.997	8.900
39	8.931	8.920	8.900	8.930	8.928	8.959	8.970	8.943	8.950	8.940	8.934	8.927	8.927
40	8.939	8.970	8.973	8.918	8.954	8.932	8.925	8.904	8.949	8.944	8.986	8.911	8.905
41	8.939	8.959	8.959	8.933	8.923	8.953	8.927	8.980	8.968	8.950	8.991	8.946	8.979
42	8.898	8.950	8.908	8.921	8.950	8.913	8.960	8.950	9.000	8.910	8.948	9.005	8.900
43	8.942	8.914	8.970	8.980	8.910	8.910	8.900	8.916	8.910	8.920	8.971	8.904	8.902
44	8.930	8.915	8.984	8.930	8.938	8.992	8.920	8.929	8.941	8.905	8.918	8.956	8.912
45	8.894	8.920	8.990	8.980	8.960	8.910	8.940	8.960	8.940	8.940	8.999	8.973	8.911
46	8.947	8.937	8.959	8.950	8.931	8.930	8.912	8.920	8.950	8.914	8.914	8.901	8.940
47	8.935	8.941	8.990	8.950	8.901	9.018	8.970	8.947	8.980	8.949	8.980	8.994	8.970
48	8.938	8.903	8.960	8.998	8.940	8.980	8.992	8.949	8.909	8.928	8.990	9.015	8.922
49	8.949	9.018	8.930	8.937	8.985	8.939	8.910	8.961	8.996	8.935	8.948	8.904	8.931
50	8.958	8.924	8.926	8.953	8.932	8.920	8.972	8.936	8.953	8.954	8.971	8.906	8.904
Avg.	8.926	8.945	8.950	8.952	8.943	8.953	8.955	8.941	8.944	8.933	8.954	8.951	8.939
Med.	8.931	8.937	8.959	8.950	8.940	8.953	8.960	8.945	8.944	8.935	8.948	8.950	8.928
st dev	0.019	0.035	0.029	0.031	0.024	0.030	0.038	0.021	0.029	0.021	0.034	0.036	0.037
Min.	8.894	8.900	8.900	8.900	8.901	8.910	8.900	8.900	8.902	8.900	8.900	8.901	8.900
Max.	8.958	9.018	8.990	9.019	8.996	9.018	9.029	8.980	9.000	8.975	9.005	9.016	9.012

No.	Forward Voltage (V)				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	8.956	8.935	8.934	8.936	8.934
27	8.989	8.953	8.959	8.963	8.963
28	8.918	8.995	8.998	8.997	8.998
29	8.923	8.915	8.918	8.925	8.922
30	8.913	8.906	8.911	8.916	8.915
31	8.993	8.982	8.984	8.989	8.985
32	8.992	8.984	8.984	8.988	8.987
33	9.004	8.998	8.907	8.908	8.903
34	8.999	8.901	8.904	8.906	8.904
35	9.008	8.910	8.912	8.917	8.916
36	8.933	8.931	8.931	8.933	8.934
37	8.973	8.965	8.973	8.971	8.974
38	8.975	8.976	8.976	8.984	8.977
39	8.924	8.932	8.937	8.938	8.934
40	9.012	8.917	8.926	8.922	8.921
41	8.992	8.987	8.996	8.999	8.991
42	8.961	8.957	8.963	8.959	8.961
43	8.987	8.969	8.970	8.977	8.976
44	8.997	8.978	8.984	8.986	8.979
45	8.955	8.943	8.943	8.947	8.948
46	8.919	8.925	8.924	8.925	8.929
47	8.952	8.928	8.930	8.937	8.934
48	8.946	8.953	8.951	8.958	8.957
49	8.907	8.915	8.923	8.929	8.926
50	8.907	8.908	8.909	8.909	8.912
Avg.	8.961	8.947	8.946	8.949	8.947
Med.	8.961	8.943	8.937	8.938	8.934
st dev	0.035	0.031	0.030	0.031	0.030
Min.	8.907	8.901	8.904	8.906	8.903
Max.	9.012	8.998	8.998	8.999	8.998

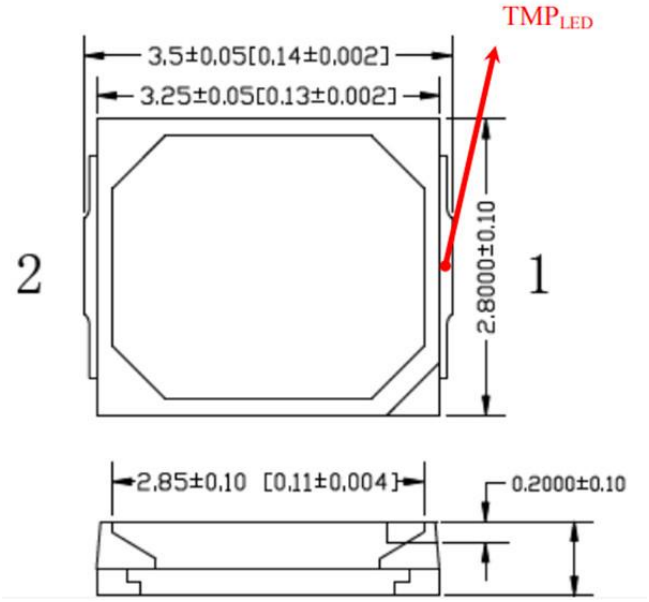
3.6 Data Set 2, 105°C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')											
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
26	0.2609	0.5260	2740	0.0005	0.0006	0.0007	0.0010	0.0012	0.0014	0.0016	0.0018	0.0023	0.0025	0.0027	0.0028
27	0.2628	0.5236	2710	0.0005	0.0006	0.0005	0.0010	0.0012	0.0014	0.0016	0.0019	0.0023	0.0026	0.0028	0.0029
28	0.2607	0.5252	2746	0.0006	0.0005	0.0008	0.0010	0.0012	0.0013	0.0017	0.0023	0.0027	0.0030	0.0033	0.0035
29	0.2632	0.5241	2699	0.0004	0.0004	0.0006	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0026	0.0029	0.0030
30	0.2617	0.5230	2734	0.0004	0.0003	0.0001	0.0009	0.0013	0.0013	0.0016	0.0019	0.0022	0.0026	0.0029	0.0030
31	0.2630	0.5234	2705	0.0005	0.0003	0.0006	0.0010	0.0013	0.0017	0.0019	0.0020	0.0025	0.0027	0.0028	0.0028
32	0.2610	0.5261	2736	0.0003	0.0001	0.0003	0.0004	0.0007	0.0012	0.0016	0.0018	0.0023	0.0027	0.0028	0.0029
33	0.2622	0.5259	2712	0.0003	0.0003	0.0004	0.0006	0.0011	0.0014	0.0017	0.0020	0.0022	0.0026	0.0029	0.0030
34	0.2634	0.5268	2684	0.0004	0.0006	0.0008	0.0013	0.0017	0.0019	0.0021	0.0024	0.0026	0.0029	0.0033	0.0034
35	0.2608	0.5237	2751	0.0004	0.0004	0.0003	0.0009	0.0012	0.0015	0.0016	0.0020	0.0023	0.0025	0.0027	0.0029
36	0.2608	0.5255	2744	0.0001	0.0002	0.0003	0.0006	0.0013	0.0016	0.0019	0.0021	0.0025	0.0027	0.0028	0.0029
37	0.2627	0.5238	2711	0.0003	0.0002	0.0005	0.0007	0.0014	0.0016	0.0017	0.0020	0.0024	0.0027	0.0028	0.0029
38	0.2634	0.5259	2688	0.0005	0.0003	0.0008	0.0012	0.0013	0.0016	0.0019	0.0022	0.0024	0.0027	0.0028	0.0029
39	0.2636	0.5246	2688	0.0004	0.0003	0.0004	0.0010	0.0011	0.0014	0.0019	0.0023	0.0025	0.0028	0.0030	0.0031
40	0.2620	0.5229	2728	0.0002	0.0003	0.0006	0.0009	0.0011	0.0014	0.0016	0.0019	0.0024	0.0027	0.0030	0.0030
41	0.2624	0.5232	2718	0.0002	0.0004	0.0003	0.0005	0.0006	0.0009	0.0010	0.0012	0.0017	0.0018	0.0019	0.0022
42	0.2632	0.5237	2700	0.0003	0.0004	0.0005	0.0008	0.0009	0.0012	0.0017	0.0018	0.0021	0.0022	0.0023	0.0025
43	0.2615	0.5242	2734	0.0004	0.0005	0.0006	0.0006	0.0009	0.0011	0.0016	0.0019	0.0021	0.0024	0.0027	0.0030
44	0.2622	0.5250	2716	0.0003	0.0004	0.0006	0.0010	0.0012	0.0014	0.0018	0.0022	0.0025	0.0026	0.0027	0.0031
45	0.2619	0.5238	2728	0.0001	0.0007	0.0008	0.0010	0.0013	0.0016	0.0018	0.0021	0.0023	0.0025	0.0028	0.0033
46	0.2607	0.5241	2751	0.0002	0.0005	0.0006	0.0011	0.0015	0.0017	0.0018	0.0019	0.0023	0.0024	0.0025	0.0031
47	0.2627	0.5260	2702	0.0001	0.0005	0.0009	0.0011	0.0013	0.0017	0.0019	0.0023	0.0025	0.0026	0.0028	0.0031
48	0.2639	0.5244	2683	0.0004	0.0005	0.0008	0.0013	0.0016	0.0018	0.0021	0.0024	0.0028	0.0029	0.0031	0.0033
49	0.2629	0.5266	2694	0.0003	0.0003	0.0004	0.0008	0.0009	0.0012	0.0015	0.0020	0.0023	0.0026	0.0029	0.0032
50	0.2618	0.5253	2723	0.0004	0.0004	0.0006	0.0007	0.0011	0.0012	0.0014	0.0018	0.0023	0.0027	0.0030	0.0033
Avg.	0.2622	0.5247	2717	0.0004	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0024	0.0026	0.0028	0.0030
Med.	0.2622	0.5244	2716	0.0004	0.0004	0.0006	0.0010	0.0012	0.0014	0.0017	0.0020	0.0023	0.0026	0.0028	0.0030
st dev	0.0010	0.0012	22	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0003	0.0003
Min.	0.2607	0.5229	2683	0.0001	0.0001	0.0001	0.0004	0.0006	0.0009	0.0010	0.0012	0.0017	0.0018	0.0019	0.0022
Max.	0.2639	0.5268	2751	0.0006	0.0007	0.0009	0.0013	0.0017	0.0019	0.0021	0.0024	0.0028	0.0030	0.0033	0.0035

No.	Chromaticity Shift (Δu'v')				
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs
26	0.0028	0.0030	0.0030	0.0030	0.0030
27	0.0030	0.0032	0.0033	0.0035	0.0035
28	0.0037	0.0038	0.0038	0.0040	0.0042
29	0.0033	0.0035	0.0038	0.0040	0.0041
30	0.0032	0.0034	0.0037	0.0037	0.0039
31	0.0032	0.0032	0.0033	0.0032	0.0035
32	0.0030	0.0031	0.0033	0.0033	0.0033
33	0.0033	0.0034	0.0035	0.0037	0.0037
34	0.0036	0.0037	0.0038	0.0039	0.0039
35	0.0030	0.0035	0.0036	0.0038	0.0038
36	0.0030	0.0033	0.0035	0.0037	0.0038
37	0.0030	0.0032	0.0035	0.0038	0.0040
38	0.0031	0.0033	0.0035	0.0037	0.0040
39	0.0032	0.0033	0.0033	0.0035	0.0037
40	0.0033	0.0036	0.0037	0.0038	0.0040
41	0.0025	0.0029	0.0034	0.0036	0.0037
42	0.0026	0.0030	0.0033	0.0033	0.0036
43	0.0031	0.0031	0.0032	0.0032	0.0035
44	0.0031	0.0031	0.0033	0.0033	0.0037
45	0.0035	0.0035	0.0038	0.0040	0.0040
46	0.0034	0.0035	0.0038	0.0040	0.0040
47	0.0033	0.0035	0.0038	0.0039	0.0039
48	0.0035	0.0037	0.0039	0.0040	0.0040
49	0.0033	0.0034	0.0037	0.0039	0.0040
50	0.0035	0.0036	0.0040	0.0042	0.0043
Avg.	0.0032	0.0034	0.0036	0.0037	0.0038
Med.	0.0032	0.0034	0.0035	0.0037	0.0039
st dev	0.0003	0.0003	0.0003	0.0003	0.0003
Min.	0.0025	0.0029	0.0030	0.0030	0.0030
Max.	0.0037	0.0038	0.0040	0.0042	0.0043

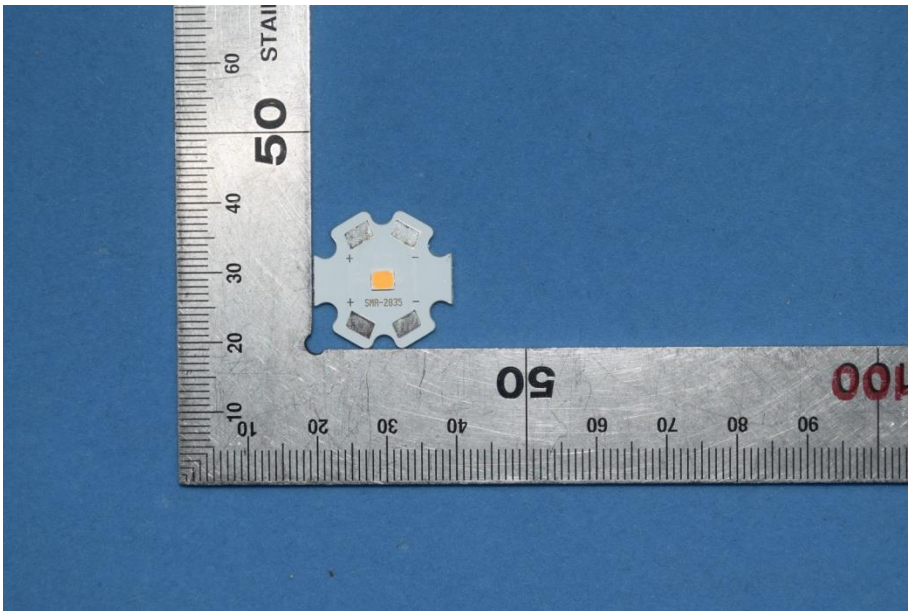
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



Directions

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2. This report includes some test methods are not in NVLAP accreditation scope marked *.
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**********END OF REPORT**********