

Lumen Maintenance Package for LUXEON 3030 2D, LUXEON 3030 HE & LUXEON 3030 HE Plus Deep Dimming

(published: Aug 20, 2021)

Section 1 - Model Description, Models Covered, Energy
Star LM-80 Cover Sheet and TM-21-11 Data

Section 2 - LM-80 Test Reports

Section 1

1.1 Models Description

LUXEON 3030 2D with model number L130-3080003000W21 (nominal CCT 3000K, 2-die in series) was used in this LM-80 testing. Figure 1 shows the overall mechanical dimension of this product in mm.

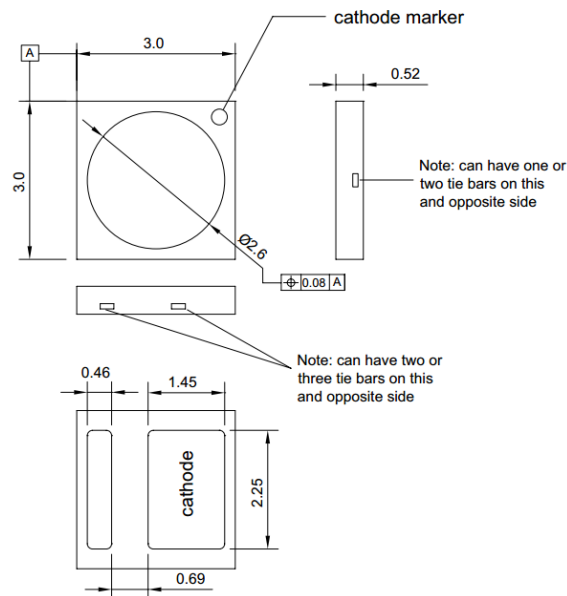


Figure 1. Mechanical drawings for LUXEON 3030 2D Line

1.2 Additional Models Covered

The LM-80 test result here can be applied to the following part numbers per the [Energy Star Requirements for the Use of LM-80 data](#) document. All of these products share similar package size.

Product Family	Part Number	Die Configuration	Equivalent maintenance current
LUXEON 3030 2D	L130-aabb0030xxcxx	2 die in series	100mA, 150mA
LUXEON 3030 HE	L130-aabbHB30xxxxx	1 die	100mA, 150mA
LUXEON 3030 HE Plus	L130-aabbHA30xxxxx	2 die in parallel	200mA, 300mA
LUXEON 3030 HE Plus Deep Dimming	L130-aabbHA3000DD1	2 die in parallel	200mA, 300mA

Notes:

- aa: designates nominal CCT from 2700K to 6500K (27 = 2700K, 30 = 3000K, etc)
- bb: designates minimum CRI (70 = 70CRI, 80 = 80CRI, etc)
- c: designates W (round LES) or X (square LES)
- x: designates for marketing use (e.g. binning, etc)

1.3 ENERGY STAR® Cover Sheet

ENERGY STAR® LM-80 Cover Sheet

Administrative Information

Tested subcomponent series: LUXEON 3030 2D

Tested subcomponent model number: L130-3080003000W21 (nominal 3000K)

Report issue date: Feb 24, 2021 (see Section 2 for details)

Report revision date (if applicable): n/a

Testing start date: Aug 24, 2016

Testing completion date: Nov 26, 2020

DUT sampling method: 50 samples per test condition

DUT Identification

DUT manufacturer's name: Lumileds LLC

DUT identification, e.g., model number: L130-3080003000W21

Description of DUT, including if the DUT is an LED package or module: LED package

DUT Characteristics

Total input power (W): 0.90 W initial average power at max maintenance current

Average current density per LED die (mA/mm²): 300 mA/mm² at max current

Average power density per LED die (W/mm²): 0.14 W/mm² at max current

Representative CRI (R_a) of the tested sample set: 83

(Indicate whether the reported value is the mean
or median value of the sample set, or per unit)

Minimum die edge to die edge spacing: 0.15mm

1.4 TM-21-11 Data

Lumen maintenance L_{70} lifetimes are calculated according to IESNA TM-21-11 method with 20,000 hrs of maintenance data and sample size of 50 per test condition.

Test Conditions	alpha	B	L ₇₀ (hrs)	
			Reported	Projected
100mA_85degC	2.1723E-06	0.9993	120,000	163,889
150mA_105degC	2.5348E-06	0.9926	120,000	137,793

Additional Projected L_{xx} per TM-21-11:

Projected L_{80}

	If = 100mA	If = 150mA
T _S = 85°C	102,418	-
T _S = 105°C	-	85,114

Projected L_{90}

	If = 100mA	If = 150mA
T _S = 85°C	48,197	-
T _S = 105°C	-	38,647

Section 2. LM-80 Test Report

Report Reference No.	Current	Ts Temperature
R2SH160822052-10-20000-M2	100mA	85°C
R2SH160822054-10-20000-M2	150mA	105°C



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Lumileds Holding B.V.

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

Model: L130-3080003000W21

Report Type: 20000 Hours Test Report	Product Type: LED Package
Test Engineer:	Pote Wang <i>Pote Wang</i>
Report Number:	R2SH160822052-10-20000-M2
Test Date:	2016-08-24 to 2020-11-26
Report Date:	2021-02-24
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
Revised Note:	The previous report R2SH160822052-10-20000-M1 is replaced by this report on 2021-02-24
Test Facility:	Test facility was located at No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China.
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858588



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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

50 PCS samples were received on 2016-08-22. The samples were numbered from 1 to 50.

Manufacturer: Lumileds Holding B.V.
Part Number: L130-3080003000W21
Part Type: LED Package
Drive Level: DC 100mA
Nominal CCT: 3000K

1.2 Standards Used:

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2020-03-08	2021-03-07
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2020-03-08	2021-03-07
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2020-03-08	2021-03-07
Standard Light Source	EVERFINE	D062	1011093	2020-10-20	2021-10-19
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2020-03-16	2021-03-15
Multilayer aging machine	BACL	B2-270	20023	2020-03-11	2021-03-10
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	2020-07-01	2021-06-30

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 ±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 Measurement Uncertainty

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

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

1.7 Statement of Traceability

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

1.8 Sample Set

Data Set 1: 85°C, 100mA

Part Number: L130-3080003000W21

Number of Units: 50

Case Temperature: >83°C

Ambient Temperature: >80°C

Life Test Drive Current: 100mA

Measurement Current: 100mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	50	0	1000	20000	>120000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000
1	99.91%	99.72%	99.54%	99.34%	99.08%	98.84%	98.62%	98.38%	98.13%	97.88%	97.62%	97.36%	97.11%
	14000	15000	16000	17000	18000	19000	20000						
	96.89%	96.64%	96.41%	96.32%	96.13%	95.94%	95.75%						

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000
1	0.0005	0.0007	0.0009	0.0012	0.0015	0.0017	0.0021	0.0024	0.0028	0.0031	0.0033	0.0035	0.0037
	14000	15000	16000	17000	18000	19000	20000						
	0.0039	0.0041	0.0041	0.0044	0.0046	0.0049	0.0051						

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	107.8	99.91	99.81	99.63	99.26	98.89	98.70	98.52	98.24	97.96	97.68	97.40	97.12
2	107.1	100.09	99.91	99.81	99.53	99.25	98.97	98.69	98.51	98.32	97.95	97.76	97.48
3	107.7	100.19	100.09	99.91	99.72	99.44	99.07	98.89	98.61	98.42	98.33	98.05	97.86
4	108.4	100.28	100.18	99.91	99.82	99.63	99.35	99.08	98.89	98.71	98.52	98.25	97.97
5	108.7	100.18	99.82	99.72	99.45	99.17	99.08	98.99	98.90	98.53	98.44	98.25	98.07
6	106.5	100.19	100.09	99.81	99.62	99.34	99.15	98.87	98.78	98.50	98.31	98.12	97.93
7	109.3	99.82	99.63	99.54	99.45	99.18	98.99	98.81	98.63	98.44	98.08	97.90	97.62
8	107.0	99.91	99.72	99.63	99.53	99.35	98.97	98.79	98.69	98.41	98.13	97.85	97.57
9	108.7	99.82	99.63	99.45	99.26	98.99	98.80	98.71	98.53	98.44	98.16	97.88	97.61
10	109.2	99.73	99.45	99.18	98.99	98.81	98.53	98.35	97.99	97.71	97.44	97.07	96.70
11	106.9	99.91	99.81	99.72	99.53	99.25	99.06	98.88	98.69	98.41	98.13	97.94	97.57
12	106.4	99.62	99.44	99.34	99.25	98.97	98.87	98.50	98.31	98.03	97.65	97.56	97.18
13	106.4	99.81	99.72	99.44	99.15	98.78	98.68	98.59	98.12	97.93	97.74	97.46	97.27
14	108.6	99.91	99.82	99.63	99.36	99.08	98.80	98.62	98.25	97.88	97.70	97.33	97.15
15	108.1	99.81	99.63	99.54	99.35	99.17	98.89	98.61	98.33	98.15	97.87	97.69	97.32
16	108.7	99.91	99.72	99.63	99.45	99.26	99.17	98.99	98.90	98.53	98.34	97.98	97.70
17	107.5	100.09	99.91	99.72	99.53	99.35	99.16	98.98	98.79	98.60	98.42	98.23	98.05
18	107.9	99.91	99.81	99.54	99.35	99.07	98.89	98.70	98.42	98.15	97.87	97.59	97.41
19	108.3	99.82	99.63	99.45	99.26	98.89	98.80	98.61	98.34	97.88	97.78	97.41	97.14
20	107.2	100.09	99.91	99.63	99.35	99.07	98.88	98.51	98.41	98.04	97.85	97.57	97.29
21	105.9	100.19	100.09	99.91	99.81	99.62	99.34	99.15	98.96	98.77	98.49	98.30	98.11
22	106.6	99.91	99.81	99.62	99.34	99.16	98.78	98.50	98.12	97.75	97.47	97.19	96.90
23	109.0	99.82	99.54	99.36	99.17	98.99	98.72	98.35	98.07	97.89	97.52	97.25	96.79
24	107.6	99.91	99.72	99.63	99.35	99.07	98.70	98.51	98.23	97.86	97.68	97.49	97.12
25	107.7	99.81	99.54	99.35	98.98	98.79	98.51	98.24	98.05	97.86	97.49	97.12	96.94
26	109.7	99.64	99.45	99.36	99.18	99.00	98.72	98.36	98.18	97.99	97.72	97.45	97.17
27	107.4	99.91	99.63	99.53	99.44	99.26	98.98	98.70	98.32	98.23	98.14	97.95	97.77
28	108.5	99.82	99.63	99.35	99.08	98.89	98.80	98.43	98.16	97.97	97.70	97.51	97.24
29	107.0	100.09	99.72	99.63	99.35	99.07	98.79	98.60	98.32	98.13	97.85	97.48	97.29
30	108.3	99.91	99.82	99.54	99.45	99.17	98.80	98.61	98.43	98.15	97.97	97.51	97.32
31	108.4	99.72	99.63	99.35	99.17	98.99	98.71	98.43	98.06	97.88	97.69	97.32	97.05
32	108.4	99.63	99.35	99.26	99.08	98.80	98.62	98.52	98.25	98.06	97.79	97.51	97.14
33	107.7	99.72	99.54	99.35	99.26	99.07	98.79	98.61	98.51	98.33	98.14	97.77	97.40
34	108.7	99.82	99.72	99.54	99.17	98.99	98.62	98.34	98.07	97.98	97.79	97.52	97.24
35	107.7	99.91	99.63	99.44	99.35	99.07	98.89	98.61	98.24	98.05	97.77	97.40	97.31
36	109.3	99.73	99.54	99.45	99.27	99.18	98.99	98.81	98.54	98.26	97.90	97.71	97.35
37	106.7	100.09	99.81	99.63	99.44	99.06	98.88	98.78	98.59	98.41	98.13	97.84	97.66
38	107.0	99.72	99.63	99.44	99.35	99.07	98.69	98.41	98.22	98.04	97.76	97.48	97.20
39	106.6	99.62	99.53	99.25	99.06	98.87	98.59	98.50	98.22	97.84	97.75	97.65	97.28
40	107.6	99.81	99.54	99.44	99.16	98.88	98.61	98.23	98.05	97.77	97.49	97.21	97.12
41	108.4	100.09	99.91	99.63	99.35	98.99	98.62	98.34	98.06	97.69	97.60	97.14	96.96
42	107.9	99.91	99.81	99.63	99.44	99.17	98.89	98.61	98.42	98.15	97.78	97.41	97.22
43	106.0	100.19	99.91	99.81	99.53	99.34	99.06	98.87	98.58	98.21	97.83	97.55	97.17
44	108.4	100.09	99.82	99.72	99.54	99.26	99.17	98.99	98.71	98.52	98.15	97.97	97.69
45	108.4	99.91	99.72	99.54	99.45	99.17	98.99	98.71	98.52	98.25	97.97	97.79	97.51
46	107.2	99.81	99.53	99.44	99.25	99.16	98.97	98.79	98.51	98.23	97.85	97.57	97.39
47	108.0	99.91	99.54	99.26	99.17	98.80	98.61	98.33	98.24	98.06	97.78	97.59	97.50
48	106.8	100.09	99.91	99.53	99.16	98.69	98.41	98.31	98.13	97.75	97.57	97.47	97.28
49	108.1	99.72	99.54	99.26	98.98	98.61	98.24	97.87	97.59	97.41	97.13	96.95	96.67
50	109.0	100.09	99.91	99.72	99.36	99.08	98.81	98.62	98.26	97.89	97.71	97.43	97.34
Ave.	107.8	99.91	99.72	99.54	99.34	99.08	98.84	98.62	98.38	98.13	97.88	97.62	97.36
Med.	107.9	99.91	99.72	99.54	99.35	99.07	98.81	98.61	98.33	98.10	97.81	97.55	97.30
st dev	0.9	0.1717	0.1863	0.1835	0.1953	0.2149	0.2261	0.2506	0.2842	0.2940	0.3017	0.33	0.34
Min.	105.9	99.62	99.35	99.18	98.98	98.61	98.24	97.87	97.59	97.41	97.13	96.95	96.67
Max.	109.7	100.28	100.18	99.91	99.82	99.63	99.35	99.15	98.96	98.77	98.52	98.30	98.11

No.	Lumen Maintenance (%)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	96.85	96.57	96.38	96.20	96.10	96.01	95.92	95.83
2	97.20	96.83	96.55	96.27	96.36	96.27	96.17	95.99
3	97.49	97.21	96.75	96.56	96.66	96.47	96.29	96.10
4	97.79	97.51	97.14	96.96	96.86	96.68	96.59	96.40
5	97.70	97.42	97.15	96.96	96.87	96.69	96.50	96.32
6	97.75	97.56	97.28	96.90	96.81	96.43	96.24	96.06
7	97.35	97.16	96.98	96.80	96.89	96.71	96.52	96.34
8	97.29	97.01	96.73	96.64	96.73	96.54	96.36	96.17
9	97.42	97.15	96.96	96.78	96.69	96.41	96.14	95.95
10	96.34	96.15	95.97	95.70	95.60	95.42	95.15	94.96
11	97.38	97.10	97.01	96.63	96.54	96.26	96.16	95.88
12	96.80	96.62	96.43	96.15	95.86	95.58	95.49	95.30
13	96.99	96.80	96.43	96.24	96.15	96.05	95.86	95.68
14	96.87	96.69	96.41	96.13	96.13	96.04	95.95	95.67
15	97.13	97.04	96.76	96.58	96.48	96.30	96.02	95.84
16	97.33	97.15	96.78	96.50	96.32	96.14	95.95	95.77
17	97.86	97.67	97.21	96.93	97.02	96.84	96.65	96.47
18	97.13	97.03	96.94	96.66	96.76	96.39	96.11	96.01
19	96.77	96.58	96.49	96.31	96.12	96.03	95.84	95.66
20	97.11	96.92	96.64	96.27	96.36	96.27	96.08	95.80
21	97.83	97.73	97.54	97.26	97.07	96.79	96.60	96.41
22	96.72	96.44	96.34	95.97	95.87	95.68	95.50	95.31
23	96.51	96.33	96.24	96.06	95.96	95.78	95.60	95.41
24	96.93	96.75	96.28	96.00	96.10	95.91	95.82	95.72
25	96.75	96.56	96.38	96.01	95.82	95.64	95.45	95.17
26	96.90	96.72	96.35	96.08	95.90	95.72	95.53	95.26
27	97.49	97.30	97.11	97.02	97.11	96.93	96.65	96.46
28	96.96	96.87	96.59	96.22	96.13	96.04	95.85	95.58
29	97.10	96.92	96.64	96.45	96.17	96.07	95.89	95.70
30	97.14	96.95	96.68	96.49	96.40	96.31	95.94	95.75
31	96.77	96.68	96.31	96.13	95.94	95.76	95.57	95.39
32	96.96	96.68	96.22	95.94	95.76	95.57	95.39	95.11
33	97.12	96.94	96.75	96.66	96.47	96.19	95.91	95.73
34	96.87	96.60	96.32	96.14	95.95	95.77	95.68	95.49
35	96.94	96.66	96.38	96.19	96.10	95.91	95.82	95.64
36	97.07	96.89	96.61	96.43	96.34	96.07	95.88	95.61
37	97.38	97.19	97.09	96.91	96.63	96.25	95.97	95.78
38	97.01	96.82	96.64	96.45	96.36	96.26	96.07	95.89
39	97.19	96.90	96.72	96.62	96.53	96.34	96.15	95.97
40	96.93	96.75	96.56	96.28	96.38	96.10	95.82	95.72
41	96.68	96.49	96.22	95.85	95.66	95.48	95.39	95.20
42	96.94	96.76	96.39	96.11	95.83	95.74	95.64	95.55
43	96.79	96.51	96.42	96.23	95.85	95.66	95.47	95.28
44	97.60	97.32	96.86	96.77	96.68	96.40	96.13	95.85
45	97.23	97.05	96.59	96.40	96.13	95.94	95.76	95.57
46	97.01	96.74	96.55	96.36	96.08	95.90	95.71	95.52
47	97.41	97.13	97.04	96.85	96.94	96.76	96.67	96.48
48	97.00	96.72	96.63	96.54	96.63	96.16	95.88	95.69
49	96.48	96.39	96.30	96.02	96.02	95.84	95.65	95.47
50	97.06	96.79	96.42	96.15	96.06	95.87	95.60	95.41
Ave.	97.11	96.89	96.64	96.41	96.32	96.13	95.94	95.75
Med.	97.07	96.85	96.60	96.38	96.33	96.09	95.90	95.72
st dev	0.35	0.34	0.33	0.35	0.40	0.38	0.37	0.38
Min.	96.34	96.15	95.97	95.70	95.60	95.42	95.15	94.96
Max.	97.86	97.73	97.54	97.26	97.11	96.93	96.67	96.48

TM-21 Projection:

Test Duration: 20000 hours
Failures Observed: 0
 α : 2.172E-06
 β : 0.999
Reported L₇₀: >120000 hours

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

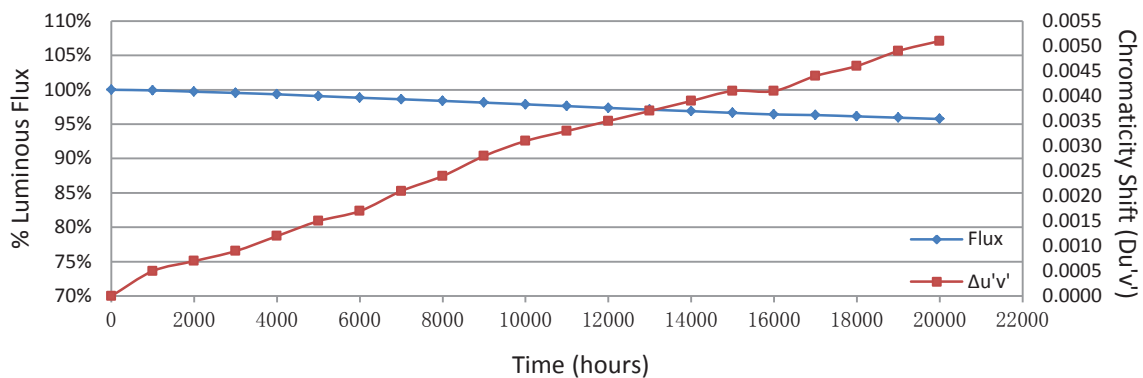
No.	Forward Voltage (V)												
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	5.763	5.767	5.763	5.795	5.777	5.878	5.764	5.761	5.760	5.764	5.763	5.786	5.768
2	5.761	5.794	5.746	5.761	5.747	5.759	5.738	5.757	5.731	5.735	5.737	5.738	5.738
3	5.792	5.997	5.780	5.796	5.788	5.787	5.787	5.776	5.777	5.777	5.777	5.785	5.781
4	5.742	6.466	5.754	5.757	5.751	5.755	5.745	5.742	5.744	5.745	5.740	5.749	5.745
5	5.754	5.800	5.755	5.867	5.740	5.757	5.745	5.737	5.735	5.739	5.738	5.749	5.742
6	5.765	5.713	5.819	5.831	5.796	5.753	5.712	5.709	5.705	5.709	5.708	5.714	5.721
7	5.765	5.773	5.800	5.782	5.767	5.771	5.771	5.765	5.766	5.784	5.767	5.773	5.774
8	5.721	5.720	5.951	5.737	5.730	5.723	5.720	5.717	5.715	5.723	5.713	5.721	5.797
9	5.815	5.793	5.796	5.900	5.810	5.831	5.790	5.785	5.803	5.789	5.785	5.865	5.794
10	5.769	5.778	6.149	5.812	5.793	5.770	5.776	5.771	5.762	5.766	5.764	5.770	5.768
11	5.763	5.766	5.764	5.781	5.868	5.778	5.776	5.998	5.758	5.852	5.760	5.772	5.769
12	5.786	6.164	5.922	5.790	5.746	5.747	5.744	5.740	5.754	5.738	5.741	5.749	5.742
13	5.747	5.853	5.745	5.778	5.750	5.751	5.745	5.738	5.742	5.740	5.772	5.750	5.742
14	5.781	5.793	5.781	5.805	5.788	5.791	6.136	5.779	5.780	5.786	5.785	5.786	5.788
15	5.775	5.782	5.782	5.811	5.782	6.069	5.787	5.777	5.776	5.781	5.778	5.787	5.790
16	5.771	5.808	5.825	5.819	5.829	5.778	5.792	5.770	5.771	5.774	5.770	5.779	5.779
17	5.732	5.741	6.137	5.746	5.738	5.739	5.739	5.733	5.735	5.735	5.732	5.739	5.740
18	5.952	5.810	5.820	5.798	5.882	5.783	5.781	5.774	5.776	5.779	5.775	5.781	5.782
19	5.763	5.774	5.774	5.793	5.778	5.776	5.774	5.769	5.763	5.767	5.770	5.775	5.772
20	5.754	5.758	5.758	5.768	5.762	5.760	5.761	5.752	5.750	5.755	5.758	5.758	5.760
21	5.827	5.773	5.770	5.781	5.895	5.767	5.765	5.760	5.760	5.762	5.759	5.768	5.764
22	5.795	5.866	5.791	5.880	5.797	5.798	5.795	5.787	5.784	5.794	5.790	5.796	5.796
23	5.722	5.744	5.729	5.763	5.728	5.732	5.727	5.721	5.719	5.725	5.723	5.725	5.729
24	5.768	5.767	5.772	5.766	5.763	5.759	5.758	5.748	5.747	5.754	5.749	5.755	5.756
25	5.779	5.780	5.976	5.725	5.714	5.733	5.713	5.709	5.749	5.714	5.711	5.713	5.713
26	5.786	5.822	5.788	5.801	5.809	5.788	5.788	5.779	5.707	5.784	5.784	5.790	5.788
27	5.721	5.722	5.727	5.736	5.729	5.728	5.934	5.722	5.724	5.722	5.722	5.727	5.728
28	5.791	5.795	5.797	5.807	5.798	5.801	5.799	5.788	5.790	5.799	5.793	5.816	5.797
29	5.706	5.710	5.716	5.718	5.707	5.715	5.707	5.702	5.704	5.707	5.706	5.714	5.710
30	5.727	5.726	5.738	5.740	5.740	5.732	5.732	5.727	5.724	5.726	5.728	5.730	5.731
31	5.751	5.752	5.749	5.761	5.755	5.760	5.869	5.748	5.746	5.748	5.749	5.755	5.754
32	5.734	5.889	5.741	5.755	5.744	5.743	5.741	5.740	5.735	5.740	5.752	5.743	5.742
33	5.755	5.760	5.766	5.772	5.761	5.751	5.751	5.752	5.745	5.750	5.750	5.751	5.757
34	5.771	5.846	5.856	5.806	5.784	5.780	5.775	5.771	5.772	5.776	5.787	5.782	5.781
35	5.720	5.956	5.726	5.755	5.728	5.732	5.726	5.730	5.722	5.724	5.720	5.775	5.727
36	5.776	5.888	5.745	5.755	5.910	5.758	5.742	5.742	5.741	5.742	5.738	5.744	5.745
37	5.742	5.725	5.731	5.743	5.728	5.734	5.727	5.723	5.814	5.725	5.724	5.728	5.728
38	5.821	5.792	5.731	5.744	5.731	5.735	5.730	5.732	5.726	5.727	5.728	5.731	5.733
39	5.772	5.730	5.709	5.726	5.708	5.718	5.711	5.709	5.720	5.705	5.706	5.716	5.708
40	5.699	5.744	5.721	5.714	5.702	5.667	5.707	5.706	5.701	5.701	5.703	5.705	5.704
41	5.819	5.771	5.776	5.785	5.773	5.799	5.773	5.770	5.769	5.767	5.767	5.771	5.770
42	5.869	5.753	5.735	5.758	5.837	5.743	5.744	5.744	5.734	5.734	5.735	5.739	5.738
43	5.780	5.788	5.790	5.942	5.810	5.838	5.790	5.787	5.783	5.784	5.787	5.789	5.792
44	5.736	5.807	5.740	5.752	5.741	5.748	5.741	5.740	5.739	5.741	5.737	5.739	5.744
45	5.774	5.798	5.775	5.753	5.745	5.760	5.744	5.739	5.733	5.737	5.738	5.742	5.744
46	5.732	5.737	5.732	5.748	5.733	5.738	5.738	5.749	5.728	5.732	5.733	5.736	5.735
47	5.730	5.736	5.738	5.753	5.738	5.740	5.737	5.732	5.726	5.730	5.733	5.733	5.739
48	5.745	5.718	5.722	5.726	5.717	5.812	5.718	5.747	5.714	5.711	5.714	5.717	5.715
49	5.749	5.756	5.748	5.761	5.748	5.763	5.757	5.775	5.739	5.744	5.746	5.768	5.750
50	5.788	5.781	5.784	5.797	5.785	5.812	5.792	5.779	5.777	5.781	5.782	5.788	5.783
Ave.	5.767	5.806	5.789	5.779	5.770	5.769	5.766	5.754	5.748	5.750	5.749	5.756	5.754
Med.	5.764	5.776	5.765	5.767	5.758	5.759	5.748	5.748	5.745	5.743	5.748	5.751	5.748
st dev	0.042	0.124	0.091	0.046	0.048	0.056	0.067	0.043	0.027	0.030	0.026	0.031	0.026
Min.	5.699	5.710	5.709	5.714	5.702	5.667	5.707	5.702	5.701	5.701	5.703	5.705	5.704
Max.	5.952	6.466	6.149	5.942	5.910	6.069	6.136	5.998	5.814	5.852	5.793	5.865	5.797

No.	Forward Voltage (V)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	5.776	5.819	5.793	5.793	5.787	5.801	5.819	5.791
2	5.748	5.787	5.823	5.813	5.758	5.773	5.773	5.778
3	5.796	5.825	5.838	5.857	5.831	5.824	5.821	5.821
4	5.756	5.790	5.799	5.773	5.769	5.759	5.755	5.781
5	5.757	5.789	5.794	5.788	5.763	5.752	5.756	5.759
6	5.727	5.759	5.767	5.726	5.737	5.727	5.738	5.779
7	5.785	5.829	5.827	5.783	5.790	5.773	5.773	5.796
8	5.737	5.771	5.776	5.744	5.759	5.762	5.790	5.801
9	5.807	5.836	5.858	5.873	5.813	5.788	5.813	5.753
10	5.783	5.812	5.820	5.822	5.791	5.782	5.792	5.793
11	5.781	5.809	5.823	5.834	5.790	5.777	5.783	5.810
12	5.758	5.811	5.810	5.821	5.781	5.772	5.783	5.785
13	5.758	5.819	5.801	5.820	5.768	5.755	5.770	5.772
14	5.799	5.798	5.846	5.771	5.806	5.786	5.811	5.806
15	5.801	5.822	5.842	5.798	5.806	5.790	5.792	5.818
16	5.788	5.819	5.840	5.774	5.799	5.778	5.792	5.805
17	5.753	5.789	5.794	5.731	5.761	5.748	5.775	5.809
18	5.797	5.829	5.835	5.774	5.803	5.791	5.818	5.813
19	5.786	5.815	5.830	5.795	5.794	5.778	5.771	5.788
20	5.770	5.803	5.809	5.755	5.780	5.771	5.797	5.804
21	5.777	5.810	5.816	5.780	5.788	5.780	5.790	5.802
22	5.804	5.840	5.852	5.810	5.816	5.800	5.800	5.804
23	5.738	5.768	5.789	5.725	5.749	5.749	5.743	5.777
24	5.767	5.821	5.818	5.808	5.776	5.754	5.771	5.804
25	5.725	5.758	5.774	5.727	5.759	5.764	5.811	5.803
26	5.798	5.847	5.847	5.822	5.819	5.811	5.810	5.801
27	5.743	5.778	5.791	5.751	5.751	5.761	5.771	5.771
28	5.808	5.844	5.857	5.771	5.818	5.799	5.807	5.796
29	5.723	5.751	5.764	5.724	5.734	5.724	5.734	5.724
30	5.742	5.773	5.789	5.783	5.756	5.773	5.813	5.810
31	5.791	5.794	5.810	5.831	5.772	5.754	5.770	5.764
32	5.756	5.784	5.801	5.767	5.762	5.773	5.779	5.786
33	5.766	5.789	5.870	5.736	5.775	5.770	5.767	5.813
34	5.792	5.819	5.837	5.807	5.811	5.805	5.813	5.815
35	5.742	5.768	5.786	5.763	5.748	5.730	5.757	5.756
36	5.761	5.787	5.813	5.777	5.766	5.779	5.771	5.786
37	5.739	5.771	5.792	5.763	5.755	5.758	5.763	5.771
38	5.746	5.774	5.787	5.795	5.752	5.787	5.789	5.766
39	5.724	5.748	5.768	5.734	5.729	5.731	5.750	5.753
40	5.717	5.752	5.760	5.743	5.734	5.728	5.723	5.752
41	5.784	5.812	5.823	5.788	5.793	5.783	5.788	5.803
42	5.751	5.792	5.800	5.750	5.768	5.776	5.772	5.816
43	5.801	5.842	5.827	5.819	5.813	5.819	5.829	5.805
44	5.757	5.788	5.795	5.767	5.765	5.755	5.753	5.781
45	5.757	5.785	5.804	5.796	5.763	5.772	5.780	5.773
46	5.748	5.776	5.801	5.772	5.759	5.767	5.772	5.785
47	5.752	5.776	5.799	5.770	5.760	5.771	5.782	5.784
48	5.729	5.757	5.776	5.751	5.739	5.762	5.763	5.777
49	5.761	5.795	5.805	5.733	5.778	5.771	5.819	5.800
50	5.794	5.831	5.845	5.789	5.808	5.791	5.803	5.808
Ave.	5.765	5.797	5.810	5.780	5.776	5.772	5.782	5.789
Med.	5.760	5.793	5.807	5.776	5.771	5.773	5.781	5.792
st dev	0.026	0.027	0.027	0.035	0.026	0.023	0.025	0.021
Min.	5.717	5.748	5.760	5.724	5.729	5.724	5.723	5.724
Max.	5.808	5.847	5.870	5.873	5.831	5.824	5.829	5.821

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

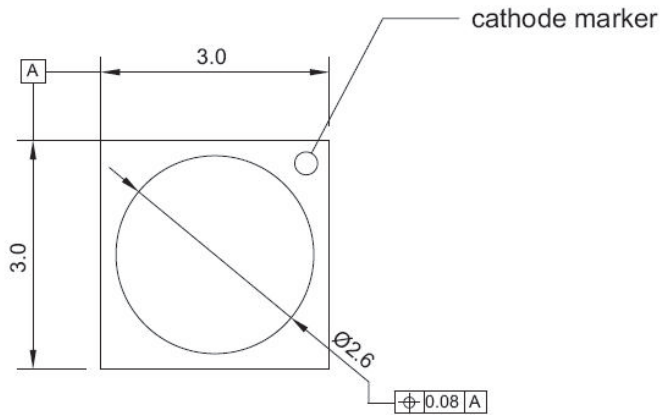
No.	u'	v'	CCT (K)	Chromaticity Shift ($\Delta u'v'$)											
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	0.2472	0.5184	3105	0.0004	0.0007	0.0008	0.0013	0.0017	0.0019	0.0022	0.0024	0.0026	0.0030	0.0033	0.0036
2	0.2470	0.5183	3112	0.0006	0.0008	0.0009	0.0013	0.0017	0.0019	0.0021	0.0026	0.0028	0.0030	0.0034	0.0036
3	0.2487	0.5191	3062	0.0006	0.0007	0.0009	0.0012	0.0015	0.0018	0.0019	0.0023	0.0027	0.0030	0.0033	0.0036
4	0.2467	0.5184	3119	0.0008	0.0011	0.0014	0.0017	0.0020	0.0022	0.0025	0.0028	0.0032	0.0035	0.0038	0.0041
5	0.2462	0.5191	3127	0.0008	0.0009	0.0011	0.0015	0.0018	0.0021	0.0022	0.0026	0.0030	0.0032	0.0035	0.0038
6	0.2461	0.5177	3140	0.0004	0.0006	0.0008	0.0009	0.0013	0.0016	0.0019	0.0021	0.0025	0.0030	0.0033	0.0036
7	0.2468	0.5191	3110	0.0004	0.0006	0.0009	0.0012	0.0014	0.0018	0.0020	0.0023	0.0026	0.0029	0.0032	0.0034
8	0.2464	0.5180	3129	0.0004	0.0006	0.0009	0.0012	0.0015	0.0018	0.0020	0.0022	0.0026	0.0030	0.0032	0.0035
9	0.2463	0.5184	3131	0.0006	0.0008	0.0009	0.0014	0.0016	0.0020	0.0021	0.0024	0.0029	0.0031	0.0033	0.0036
10	0.2458	0.5204	3129	0.0006	0.0009	0.0010	0.0014	0.0017	0.0020	0.0022	0.0029	0.0032	0.0034	0.0037	0.0039
11	0.2461	0.5184	3135	0.0004	0.0005	0.0008	0.0011	0.0014	0.0017	0.0020	0.0022	0.0026	0.0029	0.0031	0.0034
12	0.2467	0.5167	3132	0.0008	0.0009	0.0011	0.0016	0.0017	0.0020	0.0022	0.0025	0.0030	0.0032	0.0035	0.0037
13	0.2466	0.5167	3135	0.0006	0.0009	0.0010	0.0015	0.0016	0.0020	0.0022	0.0026	0.0028	0.0032	0.0033	0.0035
14	0.2462	0.5188	3130	0.0005	0.0008	0.0009	0.0013	0.0015	0.0019	0.0022	0.0024	0.0027	0.0031	0.0032	0.0034
15	0.2469	0.5189	3111	0.0006	0.0007	0.0010	0.0014	0.0015	0.0020	0.0022	0.0025	0.0029	0.0032	0.0033	0.0035
16	0.2463	0.5190	3125	0.0004	0.0006	0.0009	0.0012	0.0014	0.0019	0.0022	0.0024	0.0028	0.0031	0.0032	0.0034
17	0.2467	0.5168	3132	0.0005	0.0006	0.0008	0.0012	0.0013	0.0017	0.0019	0.0022	0.0026	0.0029	0.0030	0.0033
18	0.2460	0.5192	3133	0.0004	0.0005	0.0007	0.0010	0.0012	0.0016	0.0019	0.0022	0.0025	0.0029	0.0030	0.0032
19	0.2486	0.5180	3073	0.0005	0.0005	0.0008	0.0011	0.0013	0.0018	0.0020	0.0023	0.0026	0.0030	0.0031	0.0034
20	0.2461	0.5200	3124	0.0006	0.0007	0.0010	0.0013	0.0015	0.0020	0.0022	0.0025	0.0028	0.0031	0.0033	0.0035
21	0.2482	0.5185	3080	0.0009	0.0010	0.0012	0.0015	0.0016	0.0021	0.0024	0.0026	0.0030	0.0033	0.0034	0.0037
22	0.2513	0.5231	2973	0.0006	0.0009	0.0011	0.0013	0.0015	0.0021	0.0023	0.0026	0.0029	0.0033	0.0034	0.0036
23	0.2480	0.5182	3087	0.0006	0.0007	0.0009	0.0012	0.0014	0.0019	0.0021	0.0025	0.0028	0.0031	0.0033	0.0035
24	0.2467	0.5181	3122	0.0005	0.0006	0.0009	0.0012	0.0015	0.0020	0.0021	0.0025	0.0029	0.0032	0.0034	0.0036
25	0.2464	0.5198	3116	0.0005	0.0005	0.0009	0.0012	0.0014	0.0019	0.0021	0.0039	0.0027	0.0031	0.0033	0.0035
26	0.2447	0.5196	3162	0.0004	0.0005	0.0008	0.0011	0.0014	0.0019	0.0020	0.0021	0.0028	0.0031	0.0032	0.0035
27	0.2465	0.5185	3122	0.0002	0.0006	0.0008	0.0010	0.0012	0.0017	0.0020	0.0021	0.0025	0.0028	0.0030	0.0033
28	0.2469	0.5192	3107	0.0006	0.0006	0.0009	0.0011	0.0014	0.0018	0.0020	0.0022	0.0027	0.0030	0.0030	0.0034
29	0.2475	0.5186	3097	0.0005	0.0007	0.0009	0.0011	0.0014	0.0019	0.0021	0.0023	0.0027	0.0031	0.0031	0.0034
30	0.2465	0.5177	3130	0.0006	0.0008	0.0010	0.0013	0.0016	0.0020	0.0022	0.0024	0.0028	0.0032	0.0033	0.0036
31	0.2454	0.5188	3151	0.0004	0.0006	0.0009	0.0011	0.0013	0.0019	0.0020	0.0022	0.0027	0.0031	0.0032	0.0035
32	0.2453	0.5194	3150	0.0006	0.0007	0.0008	0.0012	0.0014	0.0013	0.0022	0.0023	0.0028	0.0031	0.0032	0.0035
33	0.2461	0.5192	3128	0.0005	0.0007	0.0010	0.0012	0.0014	0.0013	0.0021	0.0023	0.0028	0.0030	0.0032	0.0034
34	0.2473	0.5179	3108	0.0006	0.0007	0.0008	0.0012	0.0014	0.0012	0.0022	0.0023	0.0027	0.0031	0.0032	0.0035
35	0.2471	0.5190	3103	0.0004	0.0006	0.0009	0.0012	0.0014	0.0014	0.0021	0.0023	0.0028	0.0030	0.0032	0.0035
36	0.2460	0.5190	3132	0.0006	0.0008	0.0010	0.0012	0.0015	0.0015	0.0022	0.0024	0.0028	0.0032	0.0033	0.0037
37	0.2463	0.5174	3137	0.0006	0.0006	0.0009	0.0012	0.0013	0.0013	0.0021	0.0023	0.0028	0.0031	0.0033	0.0036
38	0.2476	0.5178	3101	0.0006	0.0008	0.0009	0.0012	0.0014	0.0015	0.0023	0.0025	0.0030	0.0032	0.0034	0.0036
39	0.2469	0.5182	3116	0.0006	0.0008	0.0009	0.0013	0.0014	0.0015	0.0021	0.0024	0.0029	0.0031	0.0033	0.0036
40	0.2464	0.5180	3131	0.0005	0.0007	0.0009	0.0012	0.0014	0.0014	0.0020	0.0023	0.0028	0.0030	0.0032	0.0035
41	0.2458	0.5189	3140	0.0004	0.0006	0.0008	0.0011	0.0013	0.0015	0.0020	0.0023	0.0027	0.0030	0.0032	0.0035
42	0.2481	0.5175	3088	0.0004	0.0006	0.0009	0.0012	0.0013	0.0013	0.0020	0.0022	0.0027	0.0029	0.0031	0.0034
43	0.2525	0.5219	2949	0.0004	0.0006	0.0009	0.0011	0.0013	0.0013	0.0019	0.0021	0.0025	0.0030	0.0030	0.0034
44	0.2456	0.5192	3142	0.0004	0.0008	0.0009	0.0011	0.0013	0.0013	0.0020	0.0022	0.0027	0.0030	0.0032	0.0034
45	0.2468	0.5183	3118	0.0004	0.0007	0.0009	0.0011	0.0013	0.0014	0.0019	0.0023	0.0027	0.0030	0.0032	0.0035
46	0.2467	0.5180	3121	0.0005	0.0006	0.0009	0.0012	0.0013	0.0013	0.0022	0.0024	0.0028	0.0031	0.0033	0.0036
47	0.2471	0.5183	3109	0.0004	0.0006	0.0009	0.0011	0.0013	0.0013	0.0019	0.0022	0.0026	0.0029	0.0031	0.0033
48	0.2471	0.5186	3108	0.0006	0.0007	0.0009	0.0013	0.0013	0.0014	0.0020	0.0024	0.0028	0.0030	0.0032	0.0035
49	0.2481	0.5185	3081	0.0008	0.0009	0.0012	0.0015	0.0017	0.0016	0.0023	0.0025	0.0030	0.0033	0.0035	0.0039
50	0.2468	0.5188	3114	0.0007	0.0009	0.0011	0.0014	0.0017	0.0017	0.0024	0.0027	0.0031	0.0034	0.0036	0.0038
Ave.	0.2469	0.5187	3112	0.0005	0.0007	0.0009	0.0012	0.0015	0.0017	0.0021	0.0024	0.0028	0.0031	0.0033	0.0035
Med.	0.2467	0.5185	3122	0.0005	0.0007	0.0009	0.0012	0.0014	0.0018	0.0021	0.0024	0.0028	0.0031	0.0033	0.0035
st dev	0.0013	0.0011	37	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0001	0.0003	0.0002	0.0001	0.0002	0.0002
Min.	0.2447	0.5167	2949	0.0002	0.0005	0.0007	0.0009	0.0012	0.0012	0.0019	0.0021	0.0025	0.0028	0.0030	0.0032
Max.	0.2525	0.5231	3162	0.0009	0.0011	0.0014	0.0017	0.0020	0.0022	0.0025	0.0039	0.0032	0.0035	0.0038	0.0041

No.	Chromaticity Shift ($\Delta u'v'$)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	0.0038	0.0039	0.0042	0.0043	0.0044	0.0046	0.0047	0.0048
2	0.0040	0.0042	0.0042	0.0042	0.0044	0.0046	0.0048	0.0051
3	0.0040	0.0042	0.0044	0.0040	0.0043	0.0045	0.0048	0.0051
4	0.0044	0.0046	0.0049	0.0049	0.0049	0.0050	0.0051	0.0052
5	0.0042	0.0043	0.0048	0.0050	0.0052	0.0054	0.0056	0.0057
6	0.0039	0.0041	0.0047	0.0047	0.0053	0.0054	0.0054	0.0055
7	0.0037	0.0038	0.0042	0.0043	0.0044	0.0046	0.0048	0.0050
8	0.0038	0.0039	0.0043	0.0044	0.0044	0.0044	0.0044	0.0044
9	0.0038	0.0039	0.0043	0.0042	0.0046	0.0049	0.0053	0.0057
10	0.0042	0.0044	0.0045	0.0047	0.0049	0.0050	0.0051	0.0052
11	0.0037	0.0038	0.0041	0.0042	0.0044	0.0045	0.0047	0.0047
12	0.0039	0.0040	0.0041	0.0037	0.0037	0.0039	0.0041	0.0040
13	0.0038	0.0040	0.0049	0.0048	0.0046	0.0045	0.0043	0.0042
14	0.0037	0.0038	0.0044	0.0047	0.0047	0.0047	0.0048	0.0048
15	0.0037	0.0039	0.0039	0.0042	0.0046	0.0050	0.0051	0.0054
16	0.0036	0.0038	0.0041	0.0043	0.0047	0.0050	0.0054	0.0055
17	0.0034	0.0035	0.0036	0.0038	0.0040	0.0043	0.0045	0.0048
18	0.0033	0.0034	0.0034	0.0035	0.0040	0.0045	0.0051	0.0056
19	0.0036	0.0038	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049
20	0.0036	0.0037	0.0037	0.0039	0.0044	0.0046	0.0048	0.0051
21	0.0038	0.0039	0.0040	0.0039	0.0044	0.0049	0.0053	0.0058
22	0.0037	0.0039	0.0039	0.0041	0.0045	0.0049	0.0054	0.0055
23	0.0036	0.0038	0.0039	0.0038	0.0042	0.0047	0.0051	0.0056
24	0.0035	0.0037	0.0039	0.0040	0.0043	0.0046	0.0049	0.0052
25	0.0036	0.0038	0.0042	0.0041	0.0045	0.0049	0.0053	0.0057
26	0.0036	0.0037	0.0043	0.0041	0.0045	0.0049	0.0053	0.0057
27	0.0033	0.0034	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044
28	0.0034	0.0036	0.0039	0.0040	0.0041	0.0042	0.0043	0.0044
29	0.0035	0.0037	0.0040	0.0040	0.0041	0.0042	0.0044	0.0045
30	0.0037	0.0039	0.0042	0.0044	0.0044	0.0044	0.0045	0.0045
31	0.0036	0.0038	0.0039	0.0039	0.0043	0.0046	0.0050	0.0054
32	0.0035	0.0036	0.0040	0.0038	0.0041	0.0045	0.0048	0.0051
33	0.0036	0.0037	0.0039	0.0037	0.0041	0.0045	0.0049	0.0054
34	0.0035	0.0037	0.0039	0.0037	0.0040	0.0043	0.0047	0.0050
35	0.0036	0.0037	0.0040	0.0041	0.0040	0.0039	0.0038	0.0037
36	0.0039	0.0040	0.0042	0.0044	0.0050	0.0052	0.0053	0.0054
37	0.0037	0.0038	0.0038	0.0041	0.0044	0.0048	0.0051	0.0054
38	0.0038	0.0039	0.0041	0.0040	0.0042	0.0045	0.0048	0.0051
39	0.0037	0.0039	0.0041	0.0041	0.0043	0.0045	0.0047	0.0050
40	0.0036	0.0036	0.0039	0.0038	0.0044	0.0045	0.0046	0.0049
41	0.0037	0.0038	0.0038	0.0038	0.0044	0.0050	0.0051	0.0053
42	0.0036	0.0037	0.0038	0.0038	0.0041	0.0044	0.0047	0.0049
43	0.0034	0.0036	0.0040	0.0037	0.0041	0.0045	0.0049	0.0053
44	0.0036	0.0037	0.0040	0.0039	0.0041	0.0043	0.0045	0.0048
45	0.0036	0.0039	0.0043	0.0042	0.0044	0.0046	0.0049	0.0052
46	0.0038	0.0040	0.0045	0.0043	0.0046	0.0049	0.0052	0.0056
47	0.0034	0.0036	0.0042	0.0041	0.0041	0.0041	0.0042	0.0044
48	0.0036	0.0037	0.0042	0.0040	0.0045	0.0050	0.0054	0.0057
49	0.0040	0.0042	0.0046	0.0046	0.0047	0.0049	0.0050	0.0052
50	0.0040	0.0042	0.0045	0.0043	0.0047	0.0052	0.0054	0.0056
Ave.	0.0037	0.0039	0.0041	0.0041	0.0044	0.0046	0.0049	0.0051
Med.	0.0037	0.0038	0.0041	0.0041	0.0044	0.0046	0.0049	0.0052
st dev	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0005
Min.	0.0033	0.0034	0.0034	0.0035	0.0037	0.0039	0.0038	0.0037
Max.	0.0044	0.0046	0.0049	0.0050	0.0053	0.0054	0.0056	0.0058



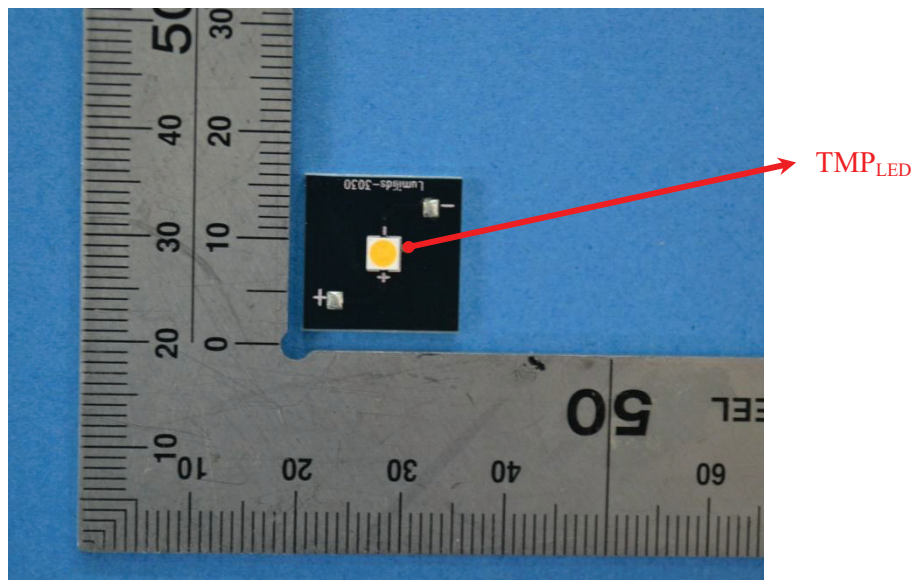
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



5 - Report Revision

Report Number	Report Date	Contents
R2SH160822052-10-20000	2020-12-08	Original report.
R2SH160822052-10-20000-M1	2020-12-15	Update description of the multiple models.
R2SH160822052-10-20000-M2	2021-02-24	Remove the DUT characteristics and family products covered

Directions

1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of the Company.
6. 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*****



TEST REPORT

ACCORDING TO IES LM-80-2015
For

Lumileds Holding B.V.

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

Model: L130-3080003000W21

Report Type: 20000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang <i>Pote Wang</i>		
Report Number:	R2SH160822054-10-20000-M2		
Test Date:	2016-08-24 to 2020-11-26		
Report Date:	2021-02-24		
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>		
Revised Note:	The previous report R2SH160822054-10-20000-M1 is replaced by this report on 2021-02-24		
Test Facility:	Test facility was located at No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China.		
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858888		



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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

50 PCS samples were received on 2016-08-22. The samples were numbered from 1 to 50.

Manufacturer: Lumileds Holding B.V.
Part Number: L130-3080003000W21
Part Type: LED Package
Drive Level: DC 150mA
Nominal CCT: 3000K

1.2 Standards Used:

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs

1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
0.3m integrating sphere	EVERFINE	Diameter 0.3m	1011119	2020-03-08	2021-03-07
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2020-03-08	2021-03-07
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2020-03-08	2021-03-07
Standard Light Source	EVERFINE	D062	1011093	2020-10-20	2021-10-19
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2020-03-16	2021-03-15
Multilayer aging machine	BACL	B2-270	20023	2020-03-11	2021-03-10
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	2020-03-16	2021-03-15

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 ±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 Measurement Uncertainty

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

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

1.7 Statement of Traceability

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

1.8 Sample Set

Data Set 1: 105°C, 150mA

Part Number: L130-3080003000W21

Number of Units: 50

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	Reported TM-21 L ₇₀ Lifetime
1	50	0	1000	20000	>120000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
1	99.66%	99.34%	99.04%	98.71%	98.38%	98.08%	97.77%	97.47%	97.16%	96.86%	96.60%	96.26%
	13000	14000	15000	16000	17000	18000	19000	20000				
	96.00%	95.77%	95.49%	95.25%	95.04%	94.85%	94.64%	94.44%				

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
1	0.0008	0.0011	0.0014	0.0019	0.0021	0.0022	0.0026	0.0029	0.0032	0.0036	0.0039	0.0042
	13000	14000	15000	16000	17000	18000	19000	20000				
	0.0044	0.0046	0.0049	0.0049	0.0052	0.0053	0.0054	0.0055				

3 - Test Data

3.1 Data Set 1, 105°C, 150mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)											
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	155.2	99.68	99.29	99.03	98.71	98.39	98.07	97.94	97.62	97.29	96.97	96.84	96.46
2	154.3	99.55	99.29	98.83	98.44	97.93	97.60	97.21	96.89	96.44	96.24	96.18	95.66
3	154.0	99.81	99.42	99.09	98.77	98.38	97.92	97.60	97.21	96.88	96.62	96.30	95.91
4	155.4	99.61	99.29	98.91	98.52	98.20	97.88	97.62	97.30	97.10	96.78	96.46	96.07
5	155.8	99.29	98.97	98.72	98.40	98.07	97.82	97.43	96.98	96.66	96.41	96.08	95.83
6	153.7	99.28	98.96	98.63	98.44	98.05	97.85	97.53	97.20	96.88	96.55	96.23	95.77
7	156.9	99.49	99.04	98.66	98.41	98.22	97.96	97.83	97.45	97.20	96.94	96.62	96.24
8	154.7	99.61	99.35	99.03	98.58	98.19	98.00	97.87	97.61	97.41	97.29	97.03	96.77
9	154.8	99.68	99.35	99.10	98.77	98.39	97.93	97.61	97.29	96.90	96.64	96.51	96.25
10	155.9	99.74	99.62	99.42	99.23	98.91	98.65	98.20	97.69	97.31	96.99	96.79	96.47
11	155.5	99.81	99.61	99.36	99.04	98.78	98.52	98.26	97.94	97.68	97.30	96.85	96.46
12	155.4	99.87	99.49	99.36	98.97	98.65	98.26	98.01	97.75	97.43	97.23	96.91	96.59
13	153.0	99.67	99.41	99.02	98.63	98.30	98.04	97.71	97.45	97.06	96.73	96.41	96.21
14	152.6	99.93	99.80	99.61	99.28	99.08	98.62	98.36	98.03	97.64	97.44	97.25	96.99
15	156.2	99.49	99.23	98.85	98.59	98.21	97.95	97.63	97.38	97.06	96.80	96.67	96.35
16	155.4	99.61	99.29	99.03	98.65	98.13	97.75	97.36	97.10	96.85	96.53	96.27	95.82
17	156.2	99.87	99.49	99.23	99.04	98.59	98.21	97.76	97.31	96.86	96.54	96.29	95.97
18	155.9	99.62	99.42	99.04	98.59	98.33	98.08	97.63	97.24	96.92	96.54	96.47	96.22
19	157.0	99.75	99.43	99.11	98.79	98.47	98.15	97.77	97.45	97.01	96.75	96.62	96.37
20	155.1	99.81	99.48	99.23	98.77	98.39	98.13	97.74	97.49	97.16	96.91	96.58	96.20
21	154.8	99.42	99.16	98.77	98.39	98.06	97.87	97.55	97.22	96.83	96.51	96.12	95.67
22	153.3	99.74	99.35	99.02	98.56	98.11	97.85	97.46	97.13	96.80	96.54	96.09	95.69
23	153.0	100.13	99.80	99.54	99.35	98.95	98.50	98.30	98.10	97.84	97.58	97.25	96.99
24	157.2	99.49	99.24	98.92	98.54	98.09	97.84	97.65	97.33	97.01	96.69	96.50	96.18
25	155.7	99.55	99.23	98.91	98.59	98.27	97.94	97.50	97.24	96.92	96.53	96.27	95.95
26	156.2	99.42	99.17	98.78	98.59	98.27	97.82	97.31	96.99	96.73	96.54	96.29	95.84
27	155.8	99.61	99.29	98.91	98.65	98.20	97.88	97.56	97.30	96.92	96.66	96.41	96.02
28	155.2	99.81	99.48	99.10	98.78	98.45	98.13	97.87	97.62	97.42	97.16	96.97	96.65
29	154.7	99.68	99.42	99.29	98.84	98.64	98.38	98.13	97.80	97.41	97.16	96.83	96.44
30	153.8	99.54	99.41	99.02	98.63	98.31	97.98	97.92	97.66	97.53	97.14	96.88	96.62
31	156.2	99.62	99.36	98.98	98.66	98.34	98.21	98.08	97.89	97.57	97.25	96.86	96.48
32	153.5	99.87	99.54	99.15	98.96	98.70	98.37	97.98	97.72	97.46	97.26	97.20	96.87
33	154.0	99.55	99.29	98.96	98.51	98.12	97.92	97.60	97.47	97.21	96.75	96.36	96.10
34	155.8	99.68	99.36	98.97	98.59	98.20	97.82	97.37	97.18	96.98	96.66	96.60	96.21
35	156.0	99.87	99.42	99.04	98.65	98.21	97.88	97.50	97.12	96.92	96.67	96.60	96.15
36	157.0	99.55	99.30	98.92	98.60	98.34	97.96	97.58	97.39	97.01	96.56	96.24	95.86
37	154.6	99.61	99.22	98.77	98.64	98.38	98.12	97.80	97.41	96.96	96.77	96.44	96.05
38	156.4	99.87	99.55	99.23	98.98	98.59	98.40	98.02	97.76	97.38	97.06	96.74	96.29
39	153.8	99.67	99.22	99.09	98.76	98.50	98.24	97.98	97.85	97.53	97.07	97.01	96.62
40	154.2	99.74	99.35	99.09	98.70	98.44	98.31	97.92	97.67	97.54	97.15	96.89	96.69
41	154.9	99.68	99.48	99.29	98.84	98.64	98.26	98.13	97.87	97.61	97.22	96.97	96.58
42	153.7	99.61	99.28	99.02	98.83	98.57	98.31	98.05	97.85	97.53	97.46	97.20	96.88
43	158.0	99.43	99.18	98.80	98.61	98.48	98.16	97.72	97.59	97.28	97.15	96.71	96.58
44	154.6	99.55	99.09	98.84	98.38	98.06	97.80	97.41	97.15	96.90	96.57	96.38	95.99
45	155.4	99.49	99.23	99.03	98.71	98.33	98.07	97.75	97.30	96.98	96.72	96.40	95.95
46	158.2	99.56	99.12	98.93	98.67	98.29	97.98	97.91	97.53	97.09	96.84	96.71	96.27
47	156.0	99.49	99.17	98.91	98.53	98.27	97.82	97.56	97.37	96.99	96.67	96.54	96.28
48	155.8	99.87	99.49	99.29	98.91	98.59	98.14	97.88	97.43	97.18	96.85	96.73	96.34
49	153.2	99.67	99.22	98.96	98.76	98.63	98.37	97.91	97.45	97.26	96.93	96.41	96.02
50	153.2	99.87	99.48	99.15	98.69	98.37	98.17	97.78	97.52	97.39	96.87	96.21	95.89
Ave.	155.1	99.66	99.34	99.04	98.71	98.38	98.08	97.77	97.47	97.16	96.86	96.60	96.26
Med.	155.3	99.64	99.35	99.03	98.65	98.34	98.05	97.75	97.45	97.10	96.79	96.59	96.23
st dev	1.3200	0.1700	0.1787	0.2119	0.2206	0.2488	0.2389	0.2706	0.2851	0.3047	0.3099	0.32	0.35
Min.	152.6	99.28	98.96	98.63	98.38	97.93	97.60	97.21	96.89	96.44	96.24	96.08	95.66
Max.	158.2	100.13	99.80	99.61	99.35	99.08	98.65	98.36	98.10	97.84	97.58	97.25	96.99

No.	Lumen Maintenance (%)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	96.20	95.94	95.62	95.43	95.30	95.17	95.04	94.85
2	95.33	95.07	94.69	94.43	94.30	94.04	93.78	93.65
3	95.58	95.45	95.06	94.74	94.68	94.42	94.29	93.83
4	95.75	95.62	95.05	94.79	94.66	94.40	94.21	94.02
5	95.44	95.19	95.06	94.80	94.48	94.35	94.16	94.03
6	95.64	95.32	95.19	95.06	94.93	94.80	94.53	94.21
7	95.98	95.79	95.60	95.41	95.22	94.90	94.58	94.46
8	96.57	96.32	95.93	95.73	95.54	95.35	95.22	95.09
9	95.99	95.74	95.54	95.22	95.09	94.96	94.77	94.51
10	96.22	95.89	95.77	95.57	95.38	95.25	95.06	94.80
11	96.27	95.95	95.69	95.56	95.31	94.98	94.79	94.60
12	96.46	96.27	96.01	95.56	95.50	95.30	95.05	94.92
13	95.95	95.69	95.49	95.42	94.97	94.84	94.64	94.51
14	96.72	96.53	96.00	95.87	95.67	95.54	95.28	95.09
15	96.22	95.90	95.39	95.20	94.81	94.75	94.56	94.43
16	95.56	95.30	94.92	94.47	94.34	94.21	94.08	93.95
17	95.77	95.45	95.13	94.94	94.81	94.62	94.37	94.11
18	95.96	95.70	95.64	95.45	95.25	95.13	95.00	94.68
19	96.18	95.99	95.61	95.41	95.16	94.97	94.71	94.52
20	96.07	95.81	95.55	95.29	95.04	94.91	94.58	94.46
21	95.35	95.22	95.16	94.70	94.44	94.19	93.93	93.80
22	95.37	95.11	94.91	94.59	94.46	94.26	94.13	94.00
23	96.80	96.54	96.47	96.34	96.01	95.23	94.90	94.64
24	95.99	95.80	95.36	95.04	94.91	94.78	94.59	94.40
25	95.76	95.50	95.25	94.86	94.73	94.61	94.48	94.35
26	95.58	95.33	95.13	94.81	94.75	94.62	94.49	94.30
27	95.70	95.51	95.38	94.99	94.87	94.74	94.61	94.29
28	96.39	96.20	95.81	95.55	95.43	95.17	94.91	94.72
29	96.32	95.99	95.93	95.73	95.67	95.48	95.35	95.15
30	96.29	96.03	95.77	95.38	95.12	94.86	94.54	94.34
31	96.16	95.97	95.90	95.58	95.39	95.20	94.94	94.75
32	96.55	96.35	96.03	95.90	95.44	95.31	95.18	94.92
33	95.91	95.65	95.26	95.13	94.87	94.61	94.42	94.29
34	95.89	95.70	95.06	94.80	94.67	94.48	94.35	94.16
35	96.03	95.77	95.64	95.51	95.13	94.94	94.81	94.68
36	95.61	95.41	95.16	94.90	94.59	94.46	94.27	93.95
37	95.80	95.60	95.34	95.15	95.08	94.83	94.63	94.31
38	96.10	95.91	95.40	94.76	94.63	94.50	94.25	93.99
39	96.36	96.23	95.90	95.64	95.45	95.38	95.12	94.93
40	96.30	96.11	95.98	95.78	95.65	95.46	95.14	94.94
41	96.38	96.19	95.93	95.74	95.29	95.09	94.90	94.71
42	96.49	96.16	95.71	95.45	95.32	95.12	94.99	94.86
43	96.39	96.08	95.63	95.57	95.13	94.81	94.68	94.49
44	95.73	95.47	95.34	95.15	95.08	94.83	94.63	94.44
45	95.69	95.43	94.79	94.59	94.27	94.02	93.76	93.56
46	95.95	95.70	95.26	95.07	94.88	94.82	94.63	94.31
47	95.90	95.71	95.64	95.51	95.32	95.13	95.00	94.87
48	96.02	95.89	95.76	95.64	95.44	95.31	95.12	94.67
49	95.63	95.50	95.43	95.10	94.91	94.71	94.39	94.26
50	95.69	95.30	95.17	95.10	94.71	94.45	94.26	93.99
Ave.	96.00	95.77	95.49	95.25	95.04	94.85	94.64	94.44
Med.	95.99	95.75	95.52	95.26	95.08	94.83	94.63	94.45
st dev	0.36	0.37	0.38	0.42	0.40	0.39	0.39	0.39
Min.	95.33	95.07	94.69	94.43	94.27	94.02	93.76	93.56
Max.	96.80	96.54	96.47	96.34	96.01	95.54	95.35	95.15

TM-21 Projection:

Test Duration: 20000 hours
Failures Observed: 0
 α : 2.530E-06
 β : 0.993
Reported L₇₀: >120000 hours

3.2 Data Set 1, 105°C, 150mA (Forward Voltage)

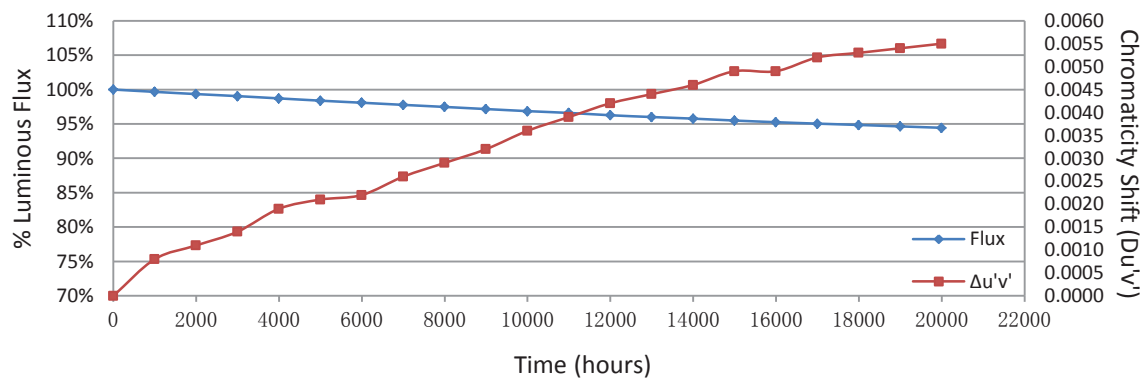
No.	Forward Voltage (V)												
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs
1	6.011	6.018	6.012	6.044	6.023	6.052	6.026	6.053	6.009	6.010	6.012	6.015	6.010
2	5.937	5.931	5.931	5.947	5.946	5.937	5.947	5.957	5.929	5.927	5.931	5.937	5.928
3	6.067	6.155	5.999	6.104	6.006	6.122	5.993	5.998	5.982	5.984	5.984	5.989	5.987
4	5.989	5.956	6.124	6.003	5.966	5.985	6.211	5.962	5.955	5.952	5.955	5.956	5.956
5	5.999	6.266	5.967	6.245	5.975	6.012	6.002	5.977	6.006	5.973	5.962	5.967	5.971
6	5.928	5.937	5.936	5.947	5.945	6.126	5.962	5.927	5.920	5.922	5.925	5.928	5.926
7	6.042	6.029	6.037	6.046	6.045	6.036	6.039	6.037	6.072	6.024	6.029	6.034	6.032
8	5.982	5.981	5.973	5.982	6.064	5.982	5.985	5.981	5.968	5.970	5.971	5.974	6.018
9	6.066	6.009	6.010	6.013	6.160	6.012	6.018	6.008	6.008	6.222	6.008	6.009	6.009
10	5.976	5.946	5.971	5.981	5.985	5.973	5.987	5.959	5.945	5.946	5.949	5.951	5.945
11	5.991	5.965	5.978	6.264	5.972	5.968	5.958	5.952	5.944	5.943	5.945	5.950	5.945
12	6.049	6.010	5.999	6.023	6.018	6.206	6.011	5.999	5.993	5.992	5.998	5.999	6.003
13	5.989	6.169	5.979	6.156	6.007	6.024	5.974	5.966	5.956	5.950	5.958	5.962	5.963
14	6.065	6.020	6.005	6.009	6.008	6.196	6.051	6.005	6.008	5.999	6.002	6.002	6.002
15	6.013	5.970	5.978	5.985	6.000	6.060	5.987	5.974	5.973	5.965	5.977	5.989	5.976
16	5.968	6.016	5.966	5.970	5.971	6.004	6.002	5.961	6.153	5.960	5.964	5.967	5.963
17	6.024	6.196	6.003	5.983	6.015	6.048	5.984	5.973	5.971	5.967	5.978	5.976	5.971
18	5.950	5.925	5.928	5.942	6.034	6.117	5.935	5.923	5.918	5.919	5.925	5.928	5.934
19	6.055	6.197	6.012	6.014	6.015	6.066	6.018	6.006	6.002	6.002	6.009	6.010	6.002
20	5.973	5.974	5.978	6.116	5.985	6.175	5.988	6.154	5.978	5.970	5.977	5.979	5.978
21	5.929	5.939	5.939	6.135	5.972	6.061	5.962	5.957	5.937	5.925	5.927	5.931	5.933
22	6.043	6.037	6.036	6.043	6.216	6.227	6.040	6.265	6.033	6.026	6.031	6.035	6.035
23	5.969	5.964	5.972	6.075	5.989	5.988	5.977	5.974	5.966	5.960	5.969	5.972	5.965
24	6.036	6.070	6.033	6.198	6.050	6.160	6.039	6.035	6.284	6.028	6.030	6.033	6.029
25	5.985	5.985	5.995	6.021	5.992	6.059	5.993	6.106	5.980	5.981	5.983	6.004	5.984
26	5.911	6.129	5.930	5.923	5.926	6.082	5.929	5.967	5.910	5.911	5.917	5.919	5.914
27	6.017	6.110	5.933	5.965	6.007	6.074	5.922	5.943	5.905	5.908	5.911	5.918	5.914
28	6.014	6.022	6.030	6.264	6.026	6.068	6.087	6.044	6.016	6.015	6.030	6.019	6.027
29	6.023	5.947	5.991	5.994	5.956	6.118	5.992	5.951	5.940	5.941	5.950	5.946	5.947
30	6.001	5.996	5.941	5.952	5.947	6.071	5.944	5.974	5.931	5.936	5.941	5.940	5.942
31	6.031	6.002	6.009	6.011	6.008	6.061	6.004	6.003	5.992	5.996	6.000	6.001	5.997
32	6.011	5.929	5.923	5.936	5.932	6.103	5.926	5.922	5.914	5.914	5.922	6.004	5.919
33	6.036	5.990	6.058	6.014	5.998	6.119	6.007	5.991	5.984	5.984	5.993	5.992	5.987
34	5.950	5.995	5.954	5.960	6.121	5.979	5.967	5.951	5.946	5.951	5.956	5.962	5.961
35	6.068	6.012	6.016	6.025	6.024	6.213	6.023	6.010	6.011	6.008	6.011	6.140	6.011
36	6.004	6.076	6.008	6.010	6.010	6.065	6.009	6.005	6.005	5.997	6.008	6.004	6.001
37	5.941	5.990	5.953	5.949	5.956	5.960	5.951	5.939	5.937	5.937	5.945	5.943	5.939
38	6.014	6.142	6.013	6.107	6.022	6.060	6.030	6.013	6.009	6.009	6.020	6.028	6.016
39	5.950	5.976	6.064	5.948	6.015	5.981	5.975	5.936	5.935	5.937	5.940	5.941	5.944
40	6.033	6.018	6.140	6.011	6.027	6.179	6.017	6.008	6.006	6.005	6.012	6.009	6.008
41	6.016	6.102	6.014	6.082	6.077	6.217	6.023	6.022	6.096	6.010	6.015	6.072	6.016
42	5.956	6.022	5.937	5.978	5.948	6.014	5.952	5.943	6.179	5.940	5.961	5.947	5.937
43	6.026	6.322	6.036	6.034	6.016	6.096	6.040	6.027	6.023	6.022	6.046	6.050	6.025
44	5.946	5.980	5.958	6.267	6.001	6.099	5.958	5.951	5.951	5.941	5.949	5.951	5.956
45	5.967	5.988	6.169	5.985	5.984	5.970	5.990	6.197	5.971	5.963	5.974	5.972	5.967
46	6.003	5.955	5.966	5.962	5.989	6.081	5.962	5.953	5.996	5.949	5.957	5.958	5.953
47	5.980	5.965	6.015	5.934	5.943	5.932	5.973	6.170	5.917	5.920	5.943	5.933	5.925
48	6.019	6.013	6.026	6.021	6.027	6.202	6.018	6.009	6.038	6.008	6.012	6.010	6.007
49	5.949	5.951	5.972	5.957	5.962	5.958	5.963	5.987	5.968	5.949	5.962	5.955	5.952
50	6.013	6.305	6.019	6.020	6.164	6.024	6.023	6.016	6.016	6.012	6.022	6.013	6.012
Ave.	5.998	6.032	5.997	6.031	6.009	6.066	5.995	6.001	5.990	5.974	5.976	5.982	5.975
Med.	6.004	6.006	5.997	6.011	6.007	6.061	5.991	5.984	5.979	5.966	5.973	5.975	5.971
st dev	0.0407	0.0972	0.0523	0.0906	0.0582	0.0801	0.0474	0.070	0.070	0.050	0.036	0.043	0.036
Min.	5.911	5.925	5.923	5.923	5.926	5.932	5.922	5.922	5.905	5.908	5.911	5.918	5.914
Max.	6.068	6.322	6.169	6.267	6.216	6.227	6.211	6.265	6.284	6.222	6.046	6.140	6.035

No.	Forward Voltage (V)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	6.025	6.099	6.083	6.043	6.051	6.049	6.055	6.039
2	5.938	5.993	6.077	6.012	5.963	5.979	5.976	5.979
3	5.999	6.059	6.078	5.985	6.023	5.998	6.011	5.979
4	5.977	6.029	6.109	5.991	5.989	5.899	5.907	5.905
5	5.977	6.004	6.043	6.036	5.996	5.979	5.982	5.988
6	5.936	6.006	6.010	6.004	5.959	5.938	5.972	5.965
7	6.051	6.124	6.101	6.060	6.151	6.131	6.142	6.133
8	5.986	6.040	6.028	6.024	6.009	6.020	6.016	6.023
9	6.016	6.080	6.079	5.982	6.046	6.043	6.044	6.042
10	5.953	6.014	6.050	5.986	5.992	5.964	5.942	5.972
11	5.951	6.014	6.033	5.981	6.031	6.059	6.037	6.023
12	6.004	6.062	6.100	6.015	5.995	5.920	5.925	5.935
13	5.968	6.021	6.049	6.003	6.007	5.995	5.987	5.947
14	6.015	6.070	6.082	6.072	6.048	6.044	6.046	6.064
15	5.982	6.038	6.063	6.045	6.021	6.029	6.033	6.025
16	5.983	6.043	6.098	6.021	6.021	6.074	6.027	6.013
17	5.989	6.042	6.035	5.961	6.017	6.029	6.027	6.027
18	5.941	5.993	5.996	5.999	5.963	5.960	5.981	5.989
19	6.020	6.076	6.073	6.055	6.077	6.051	6.067	6.057
20	5.988	6.041	6.064	6.013	6.019	6.004	5.995	5.991
21	5.945	5.998	6.005	5.987	5.977	5.979	5.971	5.975
22	6.042	6.095	6.091	6.048	6.073	6.085	6.072	6.051
23	5.982	6.030	6.047	6.022	6.016	6.015	6.018	6.028
24	6.042	6.099	6.103	6.102	6.071	6.069	6.036	6.041
25	5.996	6.043	6.056	6.001	6.022	6.018	6.035	6.028
26	5.928	5.985	5.966	5.989	5.958	5.980	5.971	5.994
27	5.922	5.997	6.004	5.989	5.952	5.930	5.987	5.977
28	6.033	6.089	6.106	6.092	6.063	6.050	6.038	6.033
29	5.956	6.025	6.015	6.000	6.089	6.073	6.086	6.063
30	5.949	6.011	6.004	5.954	6.041	6.008	6.022	6.013
31	6.011	6.074	6.075	5.971	6.043	6.041	6.011	6.029
32	5.952	5.993	5.978	5.972	5.960	5.972	5.972	5.964
33	6.003	6.055	6.062	6.021	6.035	6.038	6.055	6.055
34	5.968	6.019	6.035	5.986	6.045	6.025	6.024	6.023
35	6.029	6.083	6.084	6.070	6.054	6.054	6.038	6.002
36	6.025	6.068	6.075	6.061	6.045	6.045	6.029	6.023
37	5.953	6.017	6.014	5.967	5.982	5.980	5.993	5.984
38	6.028	6.086	6.094	6.020	6.056	6.048	6.036	6.036
39	5.948	6.002	6.034	6.021	5.977	5.985	5.979	5.976
40	6.019	6.047	6.093	6.056	6.047	6.031	6.026	6.025
41	6.026	6.082	6.081	6.049	6.063	6.045	6.041	6.029
42	5.949	6.003	6.052	6.011	5.982	5.982	5.987	5.974
43	6.042	6.090	6.100	6.072	6.065	6.060	6.048	6.011
44	5.958	6.009	5.998	5.983	5.988	6.008	6.033	6.028
45	5.979	6.032	6.032	6.054	6.014	6.026	5.998	5.982
46	5.964	6.021	6.007	6.032	5.994	6.011	5.990	5.996
47	5.937	5.992	5.993	6.003	5.966	5.969	5.935	5.940
48	6.018	6.076	6.089	6.046	6.046	6.033	6.020	6.024
49	5.967	6.018	6.007	5.994	5.994	6.011	6.008	6.002
50	6.027	6.080	6.076	6.052	6.051	6.056	6.046	6.049
Ave.	5.986	6.041	6.053	6.018	6.021	6.016	6.014	6.009
Med.	5.983	6.039	6.059	6.014	6.021	6.023	6.021	6.018
st dev	0.036	0.036	0.039	0.035	0.041	0.045	0.042	0.040
Min.	5.922	5.985	5.966	5.954	5.952	5.899	5.907	5.905
Max.	6.051	6.124	6.109	6.102	6.151	6.131	6.142	6.133

3.3 Data Set 1, 105°C, 150mA (Chromaticity Shift)

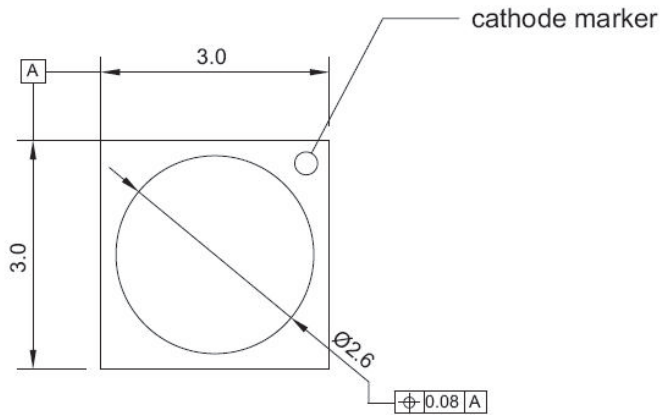
No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2494	0.5249	3007	0.0006	0.0010	0.0014	0.0017	0.0018	0.0021	0.0024	0.0027	0.0030	0.0033
2	0.2459	0.5200	3128	0.0008	0.0010	0.0014	0.0018	0.0020	0.0022	0.0025	0.0028	0.0033	0.0036
3	0.2458	0.5186	3140	0.0007	0.0010	0.0013	0.0017	0.0019	0.0022	0.0024	0.0027	0.0032	0.0035
4	0.2448	0.5211	3150	0.0007	0.0009	0.0013	0.0017	0.0019	0.0021	0.0024	0.0027	0.0032	0.0036
5	0.2461	0.5192	3129	0.0007	0.0010	0.0015	0.0018	0.0021	0.0023	0.0026	0.0028	0.0033	0.0036
6	0.2462	0.5183	3133	0.0009	0.0012	0.0015	0.0019	0.0021	0.0023	0.0026	0.0030	0.0034	0.0038
7	0.2460	0.5190	3133	0.0009	0.0012	0.0015	0.0019	0.0021	0.0023	0.0027	0.0029	0.0034	0.0038
8	0.2464	0.5183	3128	0.0008	0.0011	0.0015	0.0019	0.0021	0.0023	0.0026	0.0030	0.0034	0.0038
9	0.2464	0.5191	3122	0.0009	0.0011	0.0014	0.0018	0.0019	0.0021	0.0025	0.0029	0.0033	0.0036
10	0.2449	0.5202	3152	0.0009	0.0012	0.0016	0.0020	0.0021	0.0023	0.0027	0.0030	0.0033	0.0038
11	0.2452	0.5198	3149	0.0008	0.0010	0.0013	0.0017	0.0019	0.0021	0.0025	0.0029	0.0033	0.0037
12	0.2459	0.5184	3141	0.0007	0.0011	0.0014	0.0019	0.0019	0.0021	0.0024	0.0029	0.0032	0.0036
13	0.2471	0.5170	3119	0.0009	0.0011	0.0014	0.0018	0.0020	0.0023	0.0026	0.0030	0.0034	0.0038
14	0.2466	0.5185	3121	0.0010	0.0012	0.0017	0.0021	0.0021	0.0023	0.0027	0.0031	0.0034	0.0038
15	0.2451	0.5183	3161	0.0008	0.0010	0.0014	0.0018	0.0019	0.0021	0.0026	0.0029	0.0033	0.0036
16	0.2458	0.5194	3137	0.0008	0.0011	0.0014	0.0019	0.0021	0.0022	0.0026	0.0029	0.0034	0.0038
17	0.2438	0.5191	3191	0.0008	0.0011	0.0014	0.0018	0.0020	0.0021	0.0025	0.0028	0.0033	0.0037
18	0.2457	0.5193	3138	0.0008	0.0011	0.0014	0.0019	0.0020	0.0022	0.0025	0.0028	0.0033	0.0036
19	0.2457	0.5192	3138	0.0007	0.0010	0.0013	0.0017	0.0019	0.0020	0.0023	0.0026	0.0030	0.0034
20	0.2454	0.5203	3140	0.0007	0.0009	0.0012	0.0017	0.0019	0.0020	0.0024	0.0027	0.0030	0.0034
21	0.2454	0.5180	3157	0.0009	0.0011	0.0014	0.0021	0.0022	0.0022	0.0026	0.0030	0.0034	0.0037
22	0.2463	0.5189	3127	0.0007	0.0009	0.0013	0.0017	0.0020	0.0020	0.0024	0.0026	0.0029	0.0034
23	0.2457	0.5183	3147	0.0007	0.0009	0.0013	0.0017	0.0020	0.0021	0.0024	0.0027	0.0030	0.0034
24	0.2467	0.5190	3115	0.0009	0.0011	0.0015	0.0019	0.0021	0.0022	0.0026	0.0030	0.0033	0.0037
25	0.2463	0.5178	3135	0.0008	0.0010	0.0014	0.0020	0.0022	0.0022	0.0026	0.0029	0.0031	0.0038
26	0.2457	0.5189	3141	0.0007	0.0009	0.0013	0.0018	0.0020	0.0022	0.0024	0.0028	0.0032	0.0036
27	0.2465	0.5184	3125	0.0009	0.0010	0.0013	0.0018	0.0021	0.0023	0.0024	0.0029	0.0032	0.0036
28	0.2473	0.5179	3106	0.0007	0.0011	0.0014	0.0018	0.0021	0.0023	0.0026	0.0029	0.0033	0.0036
29	0.2451	0.5181	3165	0.0007	0.0010	0.0013	0.0017	0.0020	0.0022	0.0025	0.0028	0.0031	0.0035
30	0.2453	0.5177	3161	0.0008	0.0010	0.0013	0.0019	0.0021	0.0022	0.0023	0.0029	0.0031	0.0035
31	0.2461	0.5190	3129	0.0007	0.0010	0.0013	0.0018	0.0021	0.0023	0.0024	0.0028	0.0030	0.0035
32	0.2463	0.5187	3126	0.0009	0.0011	0.0014	0.0019	0.0021	0.0023	0.0025	0.0028	0.0032	0.0035
33	0.2463	0.5186	3129	0.0008	0.0011	0.0015	0.0019	0.0021	0.0022	0.0026	0.0029	0.0032	0.0037
34	0.2459	0.5188	3136	0.0007	0.0009	0.0014	0.0018	0.0020	0.0022	0.0025	0.0027	0.0032	0.0036
35	0.2462	0.5183	3134	0.0007	0.0010	0.0014	0.0018	0.0020	0.0022	0.0025	0.0028	0.0030	0.0035
36	0.2504	0.5242	2988	0.0010	0.0012	0.0015	0.0020	0.0023	0.0024	0.0028	0.0030	0.0033	0.0037
37	0.2452	0.5188	3155	0.0009	0.0011	0.0014	0.0018	0.0021	0.0023	0.0026	0.0028	0.0032	0.0036
38	0.2497	0.5254	2997	0.0007	0.0009	0.0014	0.0017	0.0020	0.0022	0.0025	0.0027	0.0030	0.0034
39	0.2469	0.5190	3110	0.0009	0.0012	0.0016	0.0021	0.0023	0.0025	0.0028	0.0030	0.0033	0.0040
40	0.2513	0.5237	2968	0.0009	0.0012	0.0015	0.0019	0.0021	0.0023	0.0026	0.0028	0.0032	0.0036
41	0.2455	0.5174	3159	0.0008	0.0011	0.0015	0.0020	0.0022	0.0023	0.0027	0.0029	0.0033	0.0038
42	0.2462	0.5187	3131	0.0010	0.0011	0.0014	0.0019	0.0022	0.0024	0.0026	0.0028	0.0031	0.0035
43	0.2469	0.5192	3109	0.0009	0.0011	0.0013	0.0020	0.0021	0.0023	0.0027	0.0030	0.0032	0.0036
44	0.2461	0.5185	3134	0.0008	0.0011	0.0014	0.0020	0.0021	0.0022	0.0027	0.0028	0.0031	0.0036
45	0.2462	0.5184	3133	0.0009	0.0011	0.0015	0.0020	0.0022	0.0023	0.0028	0.0030	0.0033	0.0038
46	0.2496	0.5271	2988	0.0009	0.0011	0.0015	0.0020	0.0021	0.0023	0.0027	0.0030	0.0034	0.0037
47	0.2463	0.5183	3132	0.0009	0.0011	0.0015	0.0020	0.0022	0.0024	0.0028	0.0030	0.0033	0.0038
48	0.2451	0.5184	3161	0.0007	0.0010	0.0014	0.0018	0.0021	0.0022	0.0025	0.0028	0.0032	0.0035
49	0.2462	0.5184	3132	0.0008	0.0010	0.0014	0.0019	0.0022	0.0023	0.0026	0.0028	0.0031	0.0035
50	0.2460	0.5197	3127	0.0009	0.0012	0.0015	0.0020	0.0022	0.0023	0.0027	0.0029	0.0031	0.0036
Ave.	0.2463	0.5194	3122	0.0008	0.0011	0.0014	0.0019	0.0021	0.0022	0.0026	0.0029	0.0032	0.0036
Med.	0.2461	0.5188	3133	0.0008	0.0011	0.0014	0.0019	0.0021	0.0022	0.0026	0.0029	0.0032	0.0036
st dev	0.0014	0.0021	47.5296	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2438	0.5170	2968	0.0006	0.0009	0.0012	0.0017	0.0018	0.0020	0.0023	0.0026	0.0029	0.0033
Max.	0.2513	0.5271	3191	0.0010	0.0012	0.0017	0.0021	0.0023	0.0025	0.0028	0.0031	0.0034	0.0040

No.	Chromaticity Shift ($\Delta u'v'$)							
	13000hrs	14000hrs	15000hrs	16000hrs	17000hrs	18000hrs	19000hrs	20000hrs
1	0.0041	0.0042	0.0043	0.0044	0.0043	0.0041	0.0040	0.0039
2	0.0045	0.0047	0.0048	0.0048	0.0049	0.0051	0.0050	0.0050
3	0.0044	0.0046	0.0048	0.0046	0.0047	0.0048	0.0049	0.0050
4	0.0044	0.0046	0.0050	0.0050	0.0050	0.0051	0.0051	0.0052
5	0.0046	0.0047	0.0051	0.0052	0.0053	0.0055	0.0056	0.0056
6	0.0048	0.0050	0.0054	0.0054	0.0057	0.0059	0.0061	0.0062
7	0.0047	0.0048	0.0051	0.0051	0.0052	0.0054	0.0055	0.0056
8	0.0045	0.0047	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051
9	0.0043	0.0045	0.0050	0.0048	0.0049	0.0049	0.0050	0.0050
10	0.0043	0.0045	0.0049	0.0051	0.0051	0.0051	0.0052	0.0052
11	0.0043	0.0045	0.0047	0.0048	0.0049	0.0051	0.0053	0.0054
12	0.0044	0.0046	0.0048	0.0049	0.0050	0.0051	0.0053	0.0052
13	0.0046	0.0048	0.0049	0.0051	0.0054	0.0056	0.0057	0.0057
14	0.0045	0.0047	0.0049	0.0050	0.0056	0.0057	0.0059	0.0060
15	0.0046	0.0048	0.0052	0.0052	0.0057	0.0058	0.0059	0.0059
16	0.0048	0.0050	0.0054	0.0055	0.0059	0.0062	0.0064	0.0064
17	0.0044	0.0046	0.0047	0.0049	0.0051	0.0053	0.0056	0.0055
18	0.0043	0.0045	0.0048	0.0051	0.0051	0.0052	0.0052	0.0053
19	0.0040	0.0041	0.0047	0.0048	0.0048	0.0049	0.0050	0.0051
20	0.0039	0.0041	0.0045	0.0047	0.0048	0.0049	0.0051	0.0052
21	0.0044	0.0045	0.0049	0.0051	0.0051	0.0052	0.0053	0.0054
22	0.0041	0.0042	0.0045	0.0048	0.0048	0.0048	0.0049	0.0050
23	0.0041	0.0042	0.0045	0.0047	0.0048	0.0049	0.0051	0.0053
24	0.0043	0.0044	0.0047	0.0049	0.0052	0.0056	0.0061	0.0061
25	0.0044	0.0045	0.0050	0.0050	0.0055	0.0056	0.0057	0.0059
26	0.0043	0.0044	0.0049	0.0050	0.0054	0.0054	0.0055	0.0056
27	0.0042	0.0044	0.0047	0.0048	0.0049	0.0051	0.0052	0.0054
28	0.0043	0.0044	0.0047	0.0048	0.0050	0.0052	0.0053	0.0054
29	0.0044	0.0045	0.0047	0.0047	0.0049	0.0050	0.0051	0.0051
30	0.0042	0.0044	0.0046	0.0048	0.0052	0.0055	0.0054	0.0055
31	0.0043	0.0045	0.0046	0.0048	0.0050	0.0052	0.0053	0.0055
32	0.0043	0.0045	0.0047	0.0049	0.0052	0.0054	0.0054	0.0056
33	0.0046	0.0048	0.0050	0.0052	0.0056	0.0057	0.0056	0.0057
34	0.0043	0.0045	0.0049	0.0050	0.0051	0.0052	0.0053	0.0054
35	0.0044	0.0046	0.0048	0.0049	0.0052	0.0052	0.0053	0.0054
36	0.0045	0.0047	0.0051	0.0052	0.0058	0.0058	0.0060	0.0062
37	0.0044	0.0045	0.0048	0.0049	0.0052	0.0052	0.0051	0.0053
38	0.0041	0.0043	0.0045	0.0046	0.0049	0.0048	0.0050	0.0050
39	0.0044	0.0045	0.0046	0.0050	0.0055	0.0056	0.0057	0.0058
40	0.0046	0.0048	0.0048	0.0049	0.0054	0.0055	0.0056	0.0057
41	0.0045	0.0047	0.0049	0.0049	0.0051	0.0052	0.0053	0.0054
42	0.0044	0.0045	0.0049	0.0050	0.0052	0.0053	0.0054	0.0055
43	0.0046	0.0047	0.0050	0.0050	0.0055	0.0056	0.0056	0.0058
44	0.0044	0.0046	0.0050	0.0049	0.0052	0.0053	0.0055	0.0056
45	0.0051	0.0053	0.0056	0.0056	0.0057	0.0058	0.0054	0.0055
46	0.0046	0.0048	0.0053	0.0053	0.0059	0.0059	0.0060	0.0062
47	0.0045	0.0046	0.0050	0.0050	0.0051	0.0052	0.0052	0.0052
48	0.0044	0.0045	0.0047	0.0049	0.0049	0.0050	0.0052	0.0053
49	0.0042	0.0044	0.0047	0.0046	0.0048	0.0049	0.0050	0.0051
50	0.0045	0.0047	0.0051	0.0051	0.0052	0.0053	0.0055	0.0056
Ave.	0.0044	0.0046	0.0049	0.0049	0.0052	0.0053	0.0054	0.0055
Med.	0.0044	0.0045	0.0048	0.0049	0.0051	0.0052	0.0053	0.0054
st dev	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0004	0.0004
Min.	0.0039	0.0041	0.0043	0.0044	0.0043	0.0041	0.0040	0.0039
Max.	0.0051	0.0053	0.0056	0.0056	0.0059	0.0062	0.0064	0.0064



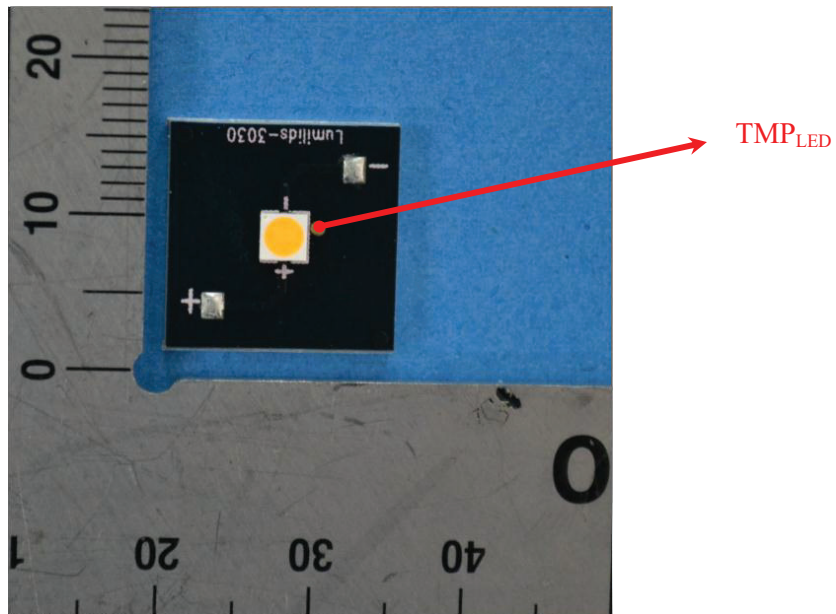
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



5 - Report Revision

Report Number	Report Date	Contents
R2SH160822054-10-20000	2020-12-08	Original report.
R2SH160822054-10-20000-M1	2020-12-15	Update description of the multiple models.
R2SH160822054-10-20000-M2	2021-02-24	Remove the DUT characteristics and family products covered

Directions

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2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
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*****END OF REPORT*****

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