

IES LM-80 Test Report

Report Issue Date : February 14, 2020

Report Number :

I-180117-003-I-05

Testing Start Date : January 23, 2018

Testing Completion Date :

November 07, 2019

Revision Number : 05

Test Duration :

14 000 h

Manufacturer Information :
Applicant :

Seoul Semiconductor Co., LTD

Address :

97-11, Sandan-ro 163, Danwon-gu, Ansan, Gyeonggi-do, Korea 15429

Description of Test Samples :
Classification :

LED Package

PKG Name :

5050

Part Number :

STW8LCPA

Drive Current :

250 mA

Test Procedure :

IES LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources

Tested by



InHoi SIM, Research Engineer

Approved by

YoungJoon WON, Laboratory Manager



Seoul Semiconductor Testing Laboratory(TL-688) is accredited to ISO/IEC 17025:2005 for the above test procedure by IAS, USA which is a signatory to ILAC-MRA.

Seoul Semiconductor Testing Laboratory

If you need to verify the authenticity of this report, please contact the below address.

97-11, Sandan-ro 163, Danwon-gu, Ansan, Gyeonggi-do, Korea 15429, E-mail: LM80@seoulsemicon.com

Applicable Series Model Numbers

This LM-80 report is applicable to the following

Model Name	Forward Current	Typical VF	Power	LED Number	Power Density	Current Density	Minimum Spacing	CCT
STW8LCPA Tested	250 mA	9.4 V	2.4 W	12	0.56 W/mm ²	178 mA/mm ²	0.2 mm	≥2200 K
ST75LAPA	400 mA	6.0 V	2.4 W	10	0.42 W/mm ²	140 mA/mm ²	0.2 mm	≥2200 K
STW8L8PA	400 mA	6.0 V	2.4 W	8	0.53 W/mm ²	175 mA/mm ²	0.3 mm	≥2200 K
STW0L8PA	400 mA	6.0 V	2.4 W	8	0.53 W/mm ²	175 mA/mm ²	0.3 mm	≥2200 K

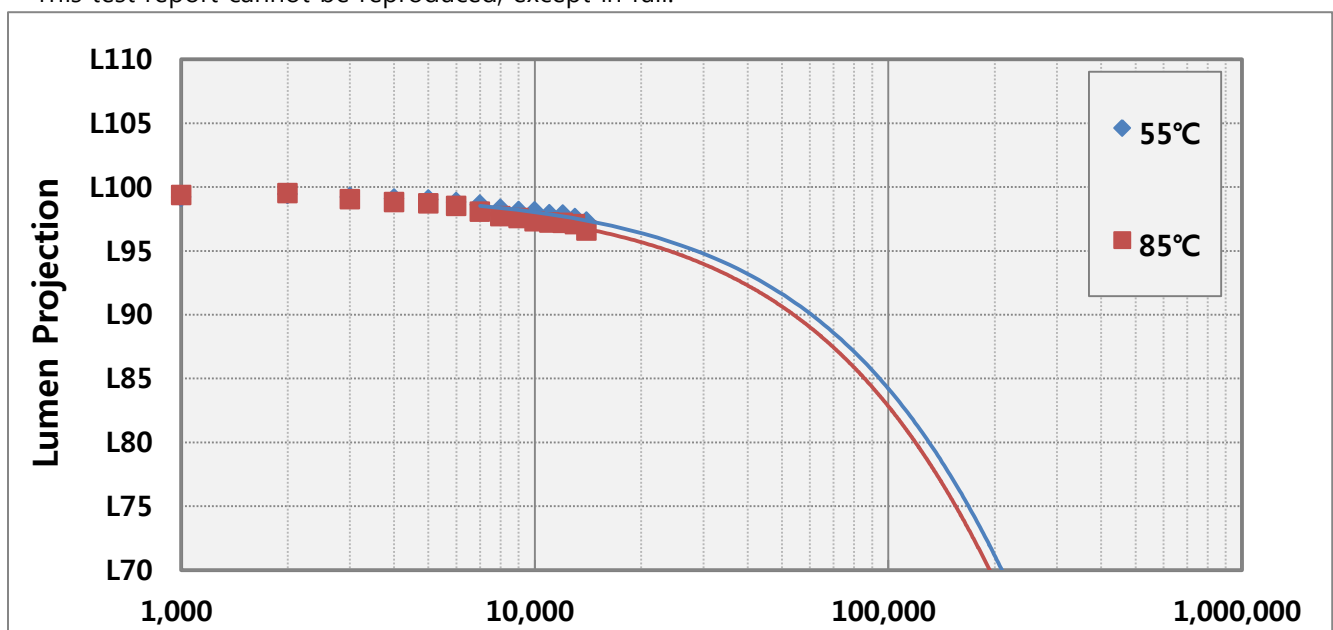


SEOUL SEMICONDUCTOR

1. Test Summary

Items	Nominal Case Temperature		
	55 °C	85 °C	
Number of LED tested	20	20	
Drive and Measurement Current	250 mA	250 mA	
Test Duration	14 000 h	14 000 h	
Actual Case Temperature	≥53.6 °C	≥84.0 °C	
Actual Ambient Temperature	≥52.6 °C	≥81.4 °C	
Air Flow Velocity	≤0.90 m/s	≤0.35 m/s	
Averaged Initial Luminous Flux	337.8 lm	337.8 lm	
Initial Nominal CCT	2700 K	2700 K	
Average Initial CRI	81	81	
Total Input Power	2.2 W	2.2 W	
Average Current Density (mA/mm ²)	178	178	
Average Power Density (W/mm ²)	0.53	0.53	
Minimum Spacing from die edge to die edge	0.2 mm	0.2 mm	
Average Lumen Maintenance	97.3 %	96.6 %	
Average Chromacity Shift	0.000 6	0.001 3	
α	1.689E-06	1.803E-06	
B	0.997	0.992	
TM-21 Projection L ₇₀	>84000	>84000	
TM-21 Projection L ₈₀	>84000	>84000	
TM-21 Projection L ₉₀	61000	54000	

※ The results shown in this certificate refer only to the sample(s) tested unless otherwise stated.
This test report cannot be reproduced, except in full.



2. IES LM-80-08 Test Report Requirement :

Number of LED Light Sources Tested

See the Test Summary

Description of LED Light Sources

See the Description of Test samples at the cover of certificate

Description of auxiliary equipment

Active cooling Test System

Temperature controlling chamber for LED package/array/module consists of the water cooling heat-sink plates to control the case temperature of each device and of the power supply required by LM-80 test conditions.

Measurement System

Photometric measurement tester for LED package/array/module consists of the integrating sphere with temperature controlling system(TEC) and of programmable current source meter.

Operating Cycle

Constant Direct Current (DC)

Ambient Conditions Including Airflow, Temperature and Relative Humidity

Airflow : < 1 m/s

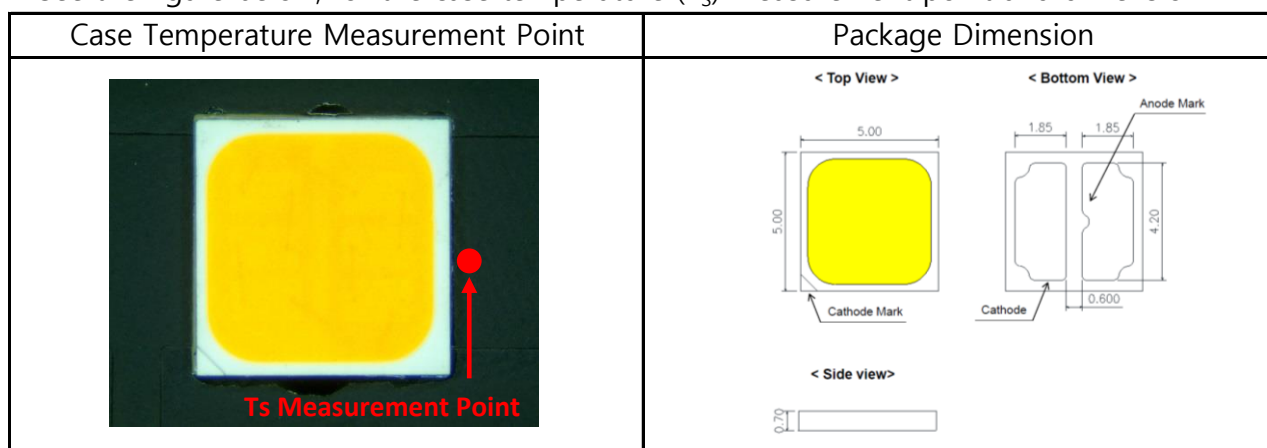
Ambient temperature : $\geq -5^{\circ}\text{C}$ of Nominal T_A

(See the Test Summary for actual T_A)

Relative Humidity : $\leq 65\%$ RH

Case Temperature (Test Point Temperature)

See the figure below, for the case temperature (T_S) measurement point and dimension



Drive Current of the LED Light Source During Lifetime Test

See the Test Summary

Initial Luminous Flux and Forward Voltage at Photometric Measurement Current

See the Test Summary

Lumen Maintenance Data for Each Individual LED Light Source Along with Median Value, Standard Deviation, Minimum and Maximum Lumen Maintenance Value for All of the LED Light Sources

See the table of each data set

Observation of LED light Sources Failures

No failure observed

LED Light Source Monitoring Interval

See the table of each data set

Photometric Measurement Uncertainty

Seoul Semiconductor maintain a tolerance of $\pm 3.0 \%$ at 95 % confidence level ($k = 2$)

Chromaticity Shift Over the Measurement Time

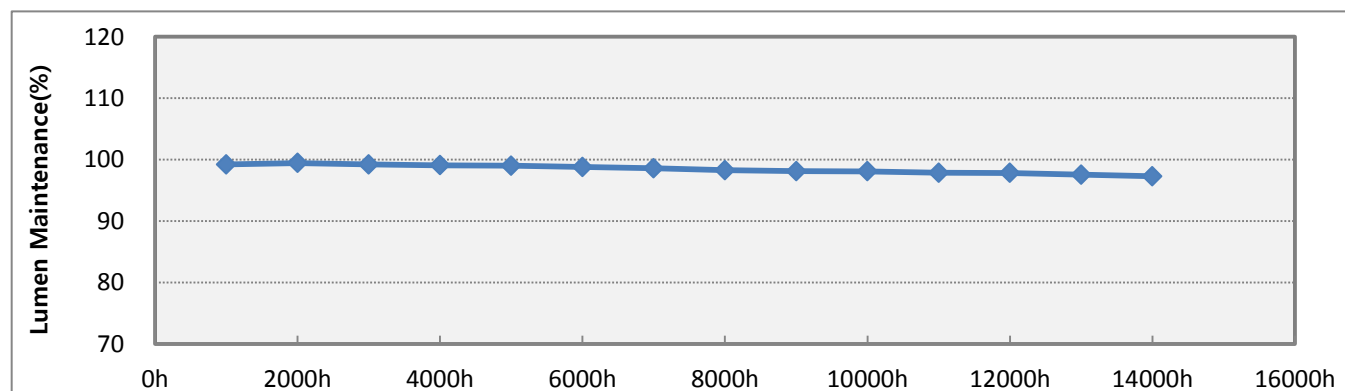
See the table of each data set

DUT Sampling Method

Each test units is made with 20 samples that are randomly taken from 40 samples of 3 manufacturing lot. 2 units are tested for LM-80 under 2 different temperature condition.

3. 55°C Data Set

No.	Initial Characteristics			Lumen Maintenance								
	Vf (V)	Flux (lm)	CCT (K)	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h
01	8.93	339.29	2764	99.7	99.9	99.8	99.6	99.6	99.3	99.1	99.1	98.7
02	8.84	328.58	2756	98.7	98.8	98.8	98.3	98.4	98.3	97.8	98.0	97.3
03	8.98	338.17	2742	99.4	99.0	98.7	99.0	99.1	98.6	98.6	97.8	98.1
04	8.88	340.26	2735	99.6	99.9	99.7	99.6	99.5	99.3	99.0	99.0	98.6
05	8.88	333.61	2791	98.8	99.0	98.9	98.6	98.7	98.5	98.2	98.3	97.7
06	8.82	343.14	2772	99.4	99.6	99.2	99.2	99.2	98.7	98.6	98.5	98.2
07	8.72	345.25	2753	99.4	99.5	99.1	99.0	99.0	98.7	98.4	98.4	97.9
08	8.88	329.27	2717	99.0	99.4	99.0	98.7	98.8	98.5	98.3	98.4	97.8
09	8.87	330.95	2756	98.6	98.7	98.6	98.4	98.3	98.5	98.3	96.8	98.0
10	8.86	338.34	2768	99.2	99.5	99.3	99.1	98.8	98.7	98.5	98.2	97.9
11	8.85	339.87	2782	99.3	99.7	99.1	98.9	98.9	98.5	98.4	98.3	97.9
12	8.97	342.12	2763	99.6	100.0	99.9	99.7	99.5	99.3	99.0	99.0	98.6
13	8.86	335.55	2791	99.1	99.3	99.3	99.0	98.9	98.9	98.9	97.7	98.4
14	8.99	341.30	2720	99.1	99.6	99.3	99.2	99.1	98.9	98.8	98.6	98.2
15	8.74	344.30	2822	99.2	99.6	99.0	99.0	98.7	98.5	98.3	98.1	97.6
16	8.83	340.40	2766	99.7	100.2	99.8	99.9	99.6	99.4	99.0	98.9	98.5
17	8.91	333.70	2783	99.7	99.9	99.6	99.7	99.5	99.1	98.8	99.0	98.3
18	8.87	327.98	2711	98.4	98.4	98.6	98.2	98.3	98.5	98.4	96.4	98.0
19	8.88	342.02	2816	99.3	99.6	99.5	99.4	99.3	99.2	98.9	98.6	98.5
20	8.86	342.67	2759	99.3	99.4	99.1	99.0	98.8	98.8	98.6	98.4	98.0
Ave.	8.87	337.84	2763	99.2	99.4	99.2	99.1	99.0	98.8	98.6	98.3	98.1
Med.	8.87	339.58	2764	99.3	99.5	99.2	99.0	99.0	98.7	98.6	98.4	98.1
Min.	8.72	327.98	2711	98.4	98.4	98.6	98.2	98.3	98.3	97.8	96.4	97.3
Max.	8.99	345.25	2822	99.7	100.2	99.9	99.9	99.6	99.4	99.1	99.1	98.7
σ	0.07	5.42	30	0.4	0.5	0.4	0.5	0.4	0.3	0.3	0.7	0.4

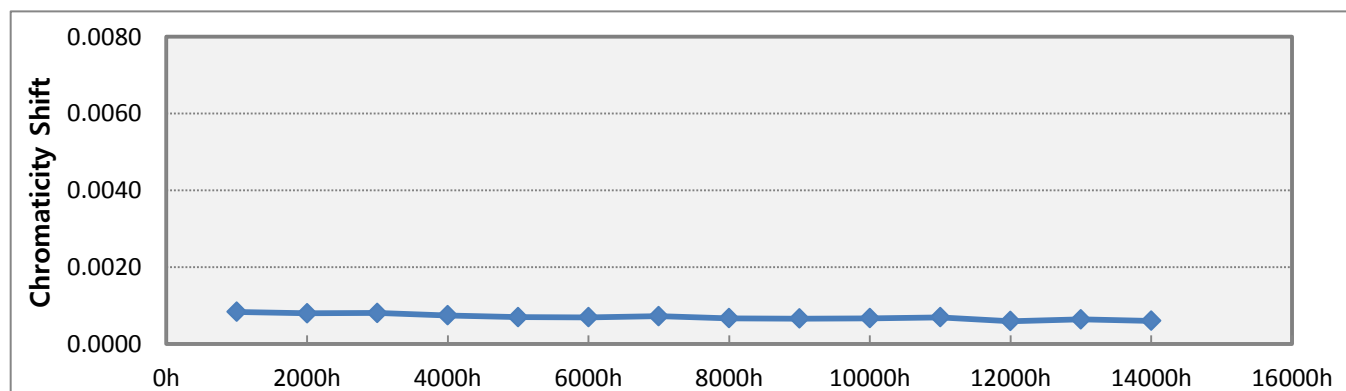


3. 55°C Data Set

No.				Lumen Maintenance								
				10000 h	11000 h	12000 h	13000 h	14000 h				
01				98.5	98.2	98.3	98.0	97.5				
02				97.7	97.4	97.3	96.6	96.6				
03				98.0	97.6	97.3	97.7	97.2				
04				98.4	98.3	98.3	97.9	97.6				
05				97.7	97.6	97.5	96.9	96.7				
06				98.2	97.9	97.9	97.6	97.3				
07				98.1	97.7	98.0	97.6	97.4				
08				97.9	97.8	97.7	96.8	96.8				
09				97.8	97.6	97.1	97.4	97.4				
10				97.9	97.7	97.9	97.6	97.3				
11				97.8	97.8	98.0	97.5	97.2				
12				98.6	98.2	98.5	98.2	97.8				
13				98.3	98.1	97.6	97.7	97.6				
14				98.2	97.8	98.0	97.7	97.3				
15				97.7	97.4	97.6	97.3	97.0				
16				98.6	98.3	98.3	97.9	97.5				
17				98.4	98.3	98.3	97.7	97.3				
18				97.8	97.6	96.9	97.1	97.1				
19				98.4	98.1	98.2	97.9	97.6				
20				98.1	97.9	98.0	97.6	97.4				
Ave.				98.1	97.9	97.8	97.6	97.3				
Med.				98.1	97.8	97.9	97.6	97.3				
Min.				97.7	97.4	96.9	96.6	96.6				
Max.				98.6	98.3	98.5	98.2	97.8				
σ				0.3	0.3	0.5	0.4	0.3				

3. 55°C Data Set

No.	Initial Characteristics			Chromaticity Shift du'v'								
	u'	v'	CRI	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h
01	0.2603	0.5233	81	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007	0.0007
02	0.2604	0.5246	81	0.0007	0.0006	0.0005	0.0005	0.0005	0.0004	0.0005	0.0004	0.0004
03	0.2610	0.5249	81	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006
04	0.2612	0.5252	81	0.0009	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0007	0.0007
05	0.2593	0.5221	81	0.0011	0.0011	0.0010	0.0009	0.0009	0.0008	0.0009	0.0008	0.0008
06	0.2599	0.5236	81	0.0008	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
07	0.2604	0.5254	82	0.0007	0.0007	0.0007	0.0006	0.0005	0.0005	0.0005	0.0004	0.0004
08	0.2620	0.5256	81	0.0008	0.0008	0.0013	0.0012	0.0011	0.0010	0.0009	0.0009	0.0008
09	0.2605	0.5240	81	0.0010	0.0009	0.0009	0.0009	0.0008	0.0010	0.0009	0.0009	0.0009
10	0.2604	0.5221	81	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
11	0.2596	0.5227	81	0.0009	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0006
12	0.2601	0.5243	81	0.0008	0.0009	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007
13	0.2594	0.5218	81	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007
14	0.2620	0.5250	81	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
15	0.2581	0.5215	82	0.0009	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0006	0.0005
16	0.2601	0.5235	81	0.0009	0.0008	0.0009	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007
17	0.2593	0.5237	81	0.0008	0.0007	0.0008	0.0007	0.0007	0.0006	0.0007	0.0007	0.0007
18	0.2623	0.5256	81	0.0009	0.0009	0.0009	0.0008	0.0007	0.0007	0.0008	0.0007	0.0006
19	0.2583	0.5216	81	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
20	0.2604	0.5236	81	0.0007	0.0008	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Ave.	0.2602	0.5237	81	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Med.	0.2603	0.5236	81	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Min.	0.2581	0.5215	81	0.0007	0.0006	0.0005	0.0005	0.0005	0.0004	0.0005	0.0004	0.0004
Max.	0.2623	0.5256	82	0.0011	0.0011	0.0013	0.0012	0.0011	0.0010	0.0009	0.0009	0.0009
σ	0.0011	0.0014	0.3	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

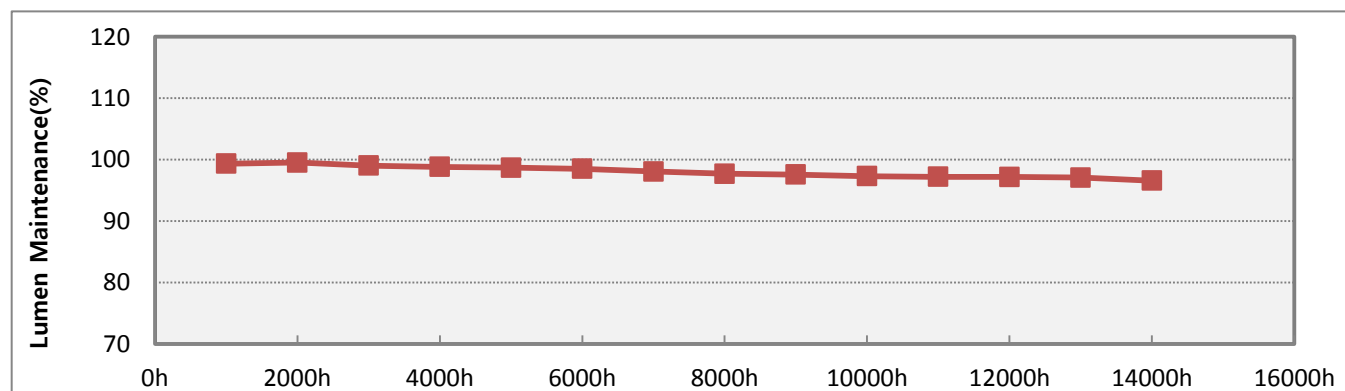


3. 55°C Data Set

[illegible]

4. 85°C Data Set

No.	Initial Characteristics			Lumen Maintenance								
	Vf (V)	Flux (lm)	CCT (K)	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h
01	8.85	343.18	2763	98.9	99.3	99.0	98.6	98.5	98.0	97.6	97.3	97.2
02	8.82	343.84	2754	99.3	99.5	99.4	99.0	98.9	98.7	98.4	98.0	97.8
03	8.87	336.21	2736	99.6	100.0	99.4	99.0	99.0	98.7	98.2	97.9	97.7
04	8.85	328.94	2825	98.7	98.3	97.8	97.9	98.0	98.2	97.9	97.5	97.3
05	8.95	339.21	2738	99.6	99.9	99.5	99.5	99.3	99.0	98.7	98.4	98.1
06	8.92	339.40	2746	99.5	99.7	99.4	99.0	99.2	98.9	98.4	98.0	97.9
07	8.73	345.89	2834	99.4	99.5	99.0	98.7	98.4	98.3	97.9	97.3	97.3
08	8.88	328.04	2714	99.4	99.7	99.2	98.9	98.8	98.4	97.9	97.5	97.4
09	8.71	342.61	2823	99.3	99.3	98.7	98.4	98.3	98.0	97.5	97.0	97.0
10	8.83	342.99	2733	99.2	99.4	98.9	98.6	98.6	98.4	98.0	97.6	97.4
11	8.91	325.82	2774	99.6	99.9	99.3	98.8	98.5	98.0	97.3	97.3	97.1
12	8.83	339.20	2811	98.7	98.6	97.9	97.8	97.6	97.6	97.1	96.7	96.6
13	8.89	342.51	2793	99.7	100.1	99.3	98.9	99.0	98.9	98.4	98.1	97.8
14	8.87	340.22	2764	99.2	99.5	99.1	98.9	98.8	98.6	98.2	97.9	97.8
15	8.92	334.47	2725	99.6	99.9	99.5	99.0	99.0	98.6	98.2	97.8	97.8
16	8.85	329.57	2775	99.0	98.6	98.0	98.5	98.1	98.7	98.2	97.9	97.6
17	8.85	342.55	2803	99.6	99.9	99.4	99.4	99.3	99.2	98.5	98.3	98.2
18	8.86	341.81	2788	99.5	99.8	99.4	99.1	99.1	99.0	98.5	98.0	98.0
19	8.92	341.07	2725	99.3	99.6	99.2	99.1	98.9	98.6	98.3	97.9	97.8
20	8.96	327.84	2777	99.8	100.0	99.5	99.1	98.9	98.5	98.1	97.7	97.7
Ave.	8.86	337.77	2770	99.4	99.5	99.0	98.8	98.7	98.5	98.1	97.7	97.6
Med.	8.87	339.81	2769	99.4	99.6	99.2	98.9	98.8	98.6	98.2	97.8	97.7
Min.	8.71	325.82	2714	98.7	98.3	97.8	97.8	97.6	97.6	97.1	96.7	96.6
Max.	8.96	345.89	2834	99.8	100.1	99.5	99.5	99.3	99.2	98.7	98.4	98.2
σ	0.06	6.34	36	0.3	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.4

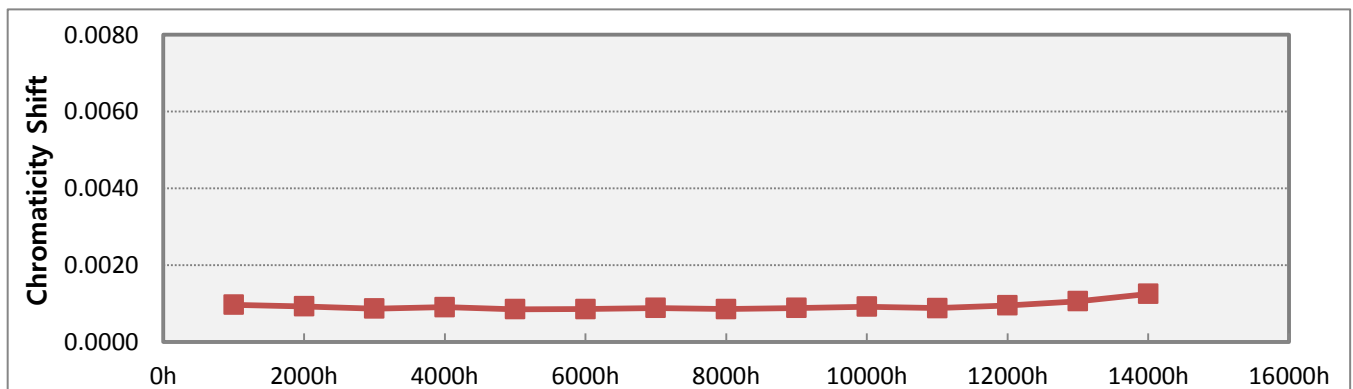


4. 85°C Data Set

No.				Lumen Maintenance								
				10000 h	11000 h	12000 h	13000 h	14000 h				
01				96.9	96.8	96.9	96.7	96.2				
02				97.7	97.5	97.6	97.4	97.0				
03				97.7	97.6	97.6	97.3	96.8				
04				96.6	96.4	96.0	96.7	96.2				
05				97.9	97.8	97.9	97.8	97.5				
06				97.7	97.6	97.8	97.6	97.3				
07				97.0	96.8	97.1	96.7	96.3				
08				97.3	97.3	97.6	97.2	96.8				
09				96.6	96.6	96.5	96.3	95.9				
10				97.3	97.1	97.3	97.1	96.7				
11				96.9	96.8	96.7	96.2	95.4				
12				95.9	95.9	95.4	96.1	95.5				
13				97.5	97.4	97.7	97.7	97.4				
14				97.7	97.6	97.6	97.3	96.8				
15				97.8	97.6	97.7	97.1	96.4				
16				96.8	97.0	96.0	97.1	96.5				
17				97.8	97.7	97.8	97.7	97.1				
18				97.6	97.5	97.6	97.2	96.6				
19				97.6	97.5	97.6	97.3	96.8				
20				97.8	97.7	97.6	97.0	96.4				
Ave.				97.3	97.2	97.2	97.1	96.6				
Med.				97.5	97.5	97.6	97.2	96.7				
Min.				95.9	95.9	95.4	96.1	95.4				
Max.				97.9	97.8	97.9	97.8	97.5				
σ				0.5	0.5	0.7	0.5	0.6				

4. 85°C Data Set

No.	Initial Characteristics			Chromaticity Shift du'v'								
	u'	v'	CRI	1000 h	2000 h	3000 h	4000 h	5000 h	6000 h	7000 h	8000 h	9000 h
01	0.2603	0.5235	81	0.0013	0.0012	0.0011	0.0012	0.0011	0.0012	0.0011	0.0010	0.0011
02	0.2603	0.5253	81	0.0010	0.0010	0.0009	0.0009	0.0008	0.0009	0.0008	0.0009	0.0008
03	0.2613	0.5248	81	0.0010	0.0010	0.0010	0.0010	0.0009	0.0009	0.0010	0.0009	0.0009
04	0.2581	0.5209	82	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
05	0.2611	0.5254	81	0.0008	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007	0.0007	0.0007
06	0.2610	0.5238	81	0.0009	0.0009	0.0008	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009
07	0.2575	0.5216	82	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007	0.0008	0.0008	0.0008
08	0.2621	0.5261	81	0.0009	0.0009	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0009
09	0.2578	0.5225	82	0.0009	0.0009	0.0008	0.0009	0.0008	0.0009	0.0009	0.0009	0.0008
10	0.2614	0.5250	81	0.0008	0.0009	0.0008	0.0009	0.0009	0.0008	0.0009	0.0008	0.0009
11	0.2600	0.5227	81	0.0010	0.0010	0.0009	0.0011	0.0010	0.0010	0.0011	0.0010	0.0010
12	0.2584	0.5224	82	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
13	0.2592	0.5222	81	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
14	0.2603	0.5231	81	0.0009	0.0009	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0009
15	0.2617	0.5253	81	0.0010	0.0010	0.0010	0.0010	0.0009	0.0009	0.0009	0.0009	0.0010
16	0.2599	0.5230	81	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0009	0.0009	0.0009
17	0.2588	0.5221	81	0.0010	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009	0.0008	0.0009
18	0.2595	0.5220	81	0.0008	0.0008	0.0007	0.0008	0.0007	0.0008	0.0008	0.0008	0.0009
19	0.2616	0.5258	81	0.0009	0.0009	0.0008	0.0009	0.0008	0.0008	0.0008	0.0009	0.0009
20	0.2598	0.5229	81	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0007	0.0008
Ave.	0.2600	0.5235	81	0.0010	0.0009	0.0009	0.0009	0.0008	0.0009	0.0009	0.0009	0.0009
Med.	0.2601	0.5230	81	0.0009	0.0009	0.0008	0.0009	0.0008	0.0008	0.0009	0.0009	0.0009
Min.	0.2575	0.5209	81	0.0008	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007	0.0007	0.0007
Max.	0.2621	0.5261	82	0.0013	0.0012	0.0011	0.0012	0.0011	0.0012	0.0011	0.0010	0.0011
σ	0.0014	0.0016	0.5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001



4. 85°C Data Set

No.					Chromaticity Shift du'v'							
					10000 h	11000 h	12000 h	13000 h	14000 h			
01					0.0010	0.0011	0.0012	0.0014	0.0016			
02					0.0009	0.0009	0.0010	0.0011	0.0012			
03					0.0009	0.0009	0.0010	0.0011	0.0014			
04					0.0008	0.0008	0.0008	0.0009	0.0011			
05					0.0007	0.0007	0.0007	0.0008	0.0009			
06					0.0009	0.0009	0.0009	0.0010	0.0011			
07					0.0008	0.0007	0.0008	0.0009	0.0010			
08					0.0010	0.0009	0.0009	0.0010	0.0012			
09					0.0009	0.0008	0.0009	0.0011	0.0013			
10					0.0010	0.0010	0.0010	0.0011	0.0013			
11					0.0012	0.0012	0.0013	0.0015	0.0017			
12					0.0008	0.0007	0.0008	0.0009	0.0011			
13					0.0010	0.0009	0.0010	0.0010	0.0012			
14					0.0009	0.0008	0.0009	0.0010	0.0012			
15					0.0009	0.0009	0.0010	0.0012	0.0014			
16					0.0009	0.0010	0.0011	0.0012	0.0015			
17					0.0009	0.0008	0.0009	0.0010	0.0012			
18					0.0009	0.0008	0.0009	0.0010	0.0012			
19					0.0009	0.0008	0.0009	0.0010	0.0011			
20					0.0008	0.0008	0.0009	0.0011	0.0013			
Ave.					0.0009	0.0009	0.0010	0.0011	0.0013			
Med.					0.0009	0.0009	0.0009	0.0010	0.0012			
Min.					0.0007	0.0007	0.0007	0.0008	0.0009			
Max.					0.0012	0.0012	0.0013	0.0015	0.0017			
σ					0.0001	0.0001	0.0001	0.0002	0.0002			