SEOUL SEMICONDUCTOR

IES LM-80-08 TEST REPORT

Measuring Lumen Maintenance of LED Light Sources

Manufacturer : Seoul Semiconductor Co., Ltd.

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

Classification : LED Package

Test Sample : 5630D
(STW8Q14D)

Test Date : Aug. 25, 2014 ~ Oct. 15, 2015

Report Date : Oct. 27, 2015

Report Number : I-140818-15-K-02

Revision Number : 02

Tested by		Reviewed by	
In Hoi Sim	(signature)	Jung Hee Lee	(signature)
Engineer		Technical Manager	

The above test certificate is the accredited test results by
Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA

SEOUL SEMICONDUCTOR CO., LTD.

Accredited by KOLAS, Republic of KOREA

1. Summary

1.1 Test Result

Items	Condition 1	Condition 2	Condition 3
Required Temperature	55 ℃	85 ℃	105 ℃
Number of LED light sources tested (ea)	20	20	20
Test Duration (h)	9 000	9 000	9 000
Drive Current (mA)	100	100	100
Actual Case Temperature (℃)	53.0	83.3	103.0
Actual Ambient Temperature (℃)	51.5	81.1	101.0
Air flow velocity (m/s)	0.92	0.63	0.21
Average Initial Luminous Flux (lm)	43.223	42.692	42.676
Average Initial CCT (K)	2 775	2 776	2 764
Average Initial Volatge (V)	2.89	2.90	2.90
Average Lumen maintenance (%)	98.7	96.0	92.8
Average Chromaticity Shift	0.001 2	0.002 2	0.002 8

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

1.2 Lumen Maintenance Projection (IES TM-21-11)

Table 1: Report at each LM-80 Test Condition

Description of LED Light Source Tested (manufacturer, model, catalog number)	5630D_100mA_9kh				
Test Condition 1 - 55°C Case Temp		**Test Condition 2 - 85°C Case Temp**		**Test Condition 3 - 105°C Case Temp**	
Sample size	20	Sample size	20	Sample size	20
Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	100	DUT drive current used in the test (mA)	100	DUT drive current used in the test (mA)	100
Test duration (hours)	9,000	Test duration (hours)	9,000	Test duration (hours)	9,000
Test duration used for projection (hour to hour)	4,000 - 9,000	Test duration used for projection (hour to hour)	4,000 - 9,000	Test duration used for projection (hour to hour)	4,000 - 9,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	105
α	8.990E-07	α	4.484E-06	α	9.684E-06
B	0.996	B	1.003	B	1.016
Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	38,000

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

2.1 Number of LED Light Sources tested

- 20 Packages tested at actual case temperature 53.0 ℃
- 20 Packages tested at actual case temperature 83.3 ℃
- 20 Packages tested at actual case temperature 103.0 ℃

2.2 Description of LED light Sources

- LED Package Part Number : STW8Q14D
- LED Forward Current [IF] : 100 mA
- LED Package Dimension : 5.6 mm X 3.0 mm

2.3 Description of Auxiliary equipment

- 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.

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

2.4 Operating Cycle

- Drive Current : 100 mA
- Typical Voltage : 2.89 V
  All tested LED packages are driven with a constant direct current.

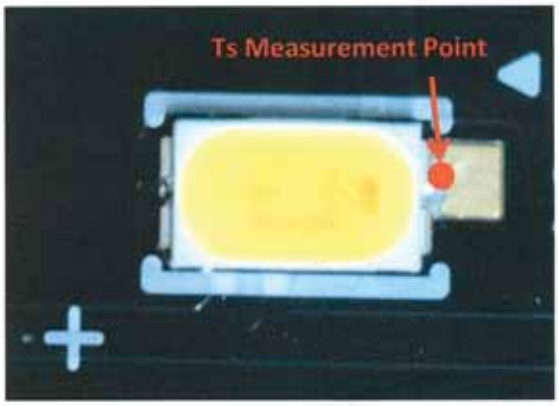
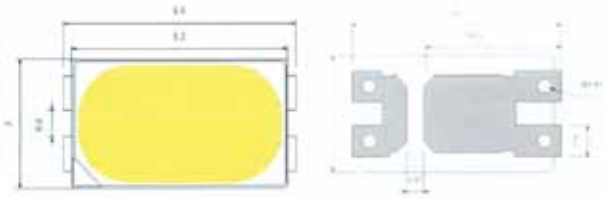
2.5 Ambient conditions including airflow, temperature and relative humidity

- Controlled ambient conditions

Ambient temperature	- 5 ℃
Air flow velocity	< 1 m/s
Relative humidity	< 65 RH

2.6 Case Temperature (Test Point temperature)

- LED temperature measurement point is shown in the picture below.

Case Temperature Measurement Point	Package Dimension
	

2.7 Drive Current of the LED light source during lifetime test

- See the Test Result.

2.8 Lumen maintenance data for each individual LED light source

- See the Test Data.

2.9 Observation of LED light source failures

- No failures

2.10 LED Light source monitoring interval

- All tested package measurement at each case temperature conditions have 1 000 h interval.
  0, 1 000, 2 000, 3 000, 4 000, 5 000, 6 000, 7 000, 8 000 and 9 000 h

2.11 Photometric measurement uncertainty

- Seoul Semiconductor maintain a tolerance of ± 3.0 % on flux measurements for LM-80 testing

2.12 Chromaticity shift over the measurement time

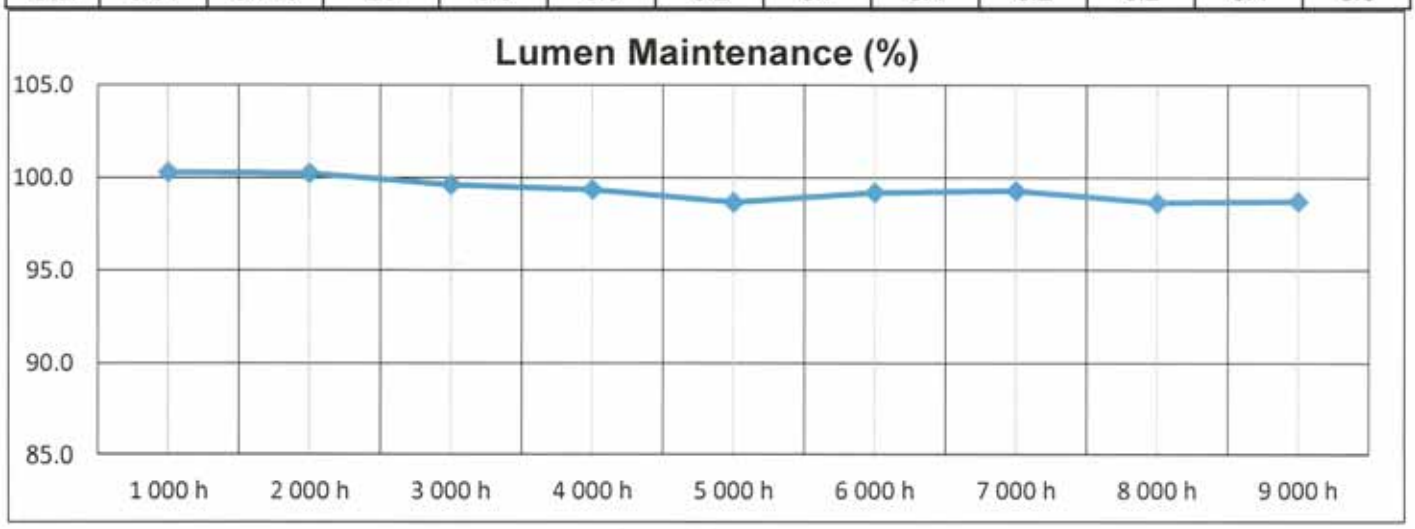
- See the Test Data.

3. Test Data

3.1 Condition 1 : [Ts = 55 ℃]

[LUMEN MAINTENANCE]

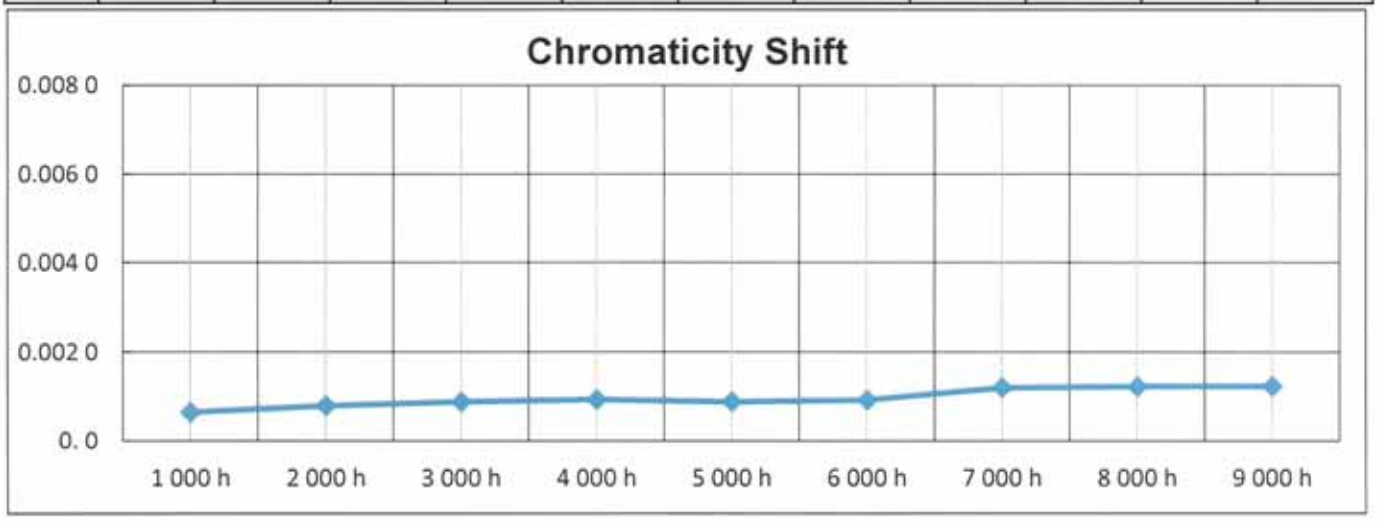
No.	Vf(V)	Flux(lm)	CCT(K)	Lumen Maintenance (%)								
	0 h			1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	2.89	42.379	2 801	99.6	100.0	99.3	99.8	98.4	99.0	99.1	98.6	98.0
2	2.88	43.294	2 759	99.9	100.2	99.5	99.9	98.6	99.1	99.2	98.7	98.4
3	2.89	43.452	2 790	100.0	100.1	99.4	99.4	98.4	99.0	99.0	98.4	98.2
4	2.89	43.213	2 803	100.2	100.1	99.4	99.2	98.3	99.0	99.2	98.7	98.8
5	2.89	43.161	2 799	100.3	100.2	99.5	99.0	98.4	99.1	99.3	98.6	98.7
6	2.90	42.335	2 771	100.4	100.1	99.7	98.7	98.4	99.4	99.3	98.4	98.8
7	2.89	42.020	2 760	100.2	99.6	99.2	97.9	97.8	99.0	99.0	98.0	98.8
8	2.90	43.475	2 731	100.1	100.3	99.8	100.1	99.0	99.2	99.5	99.0	98.5
9	2.90	43.872	2 799	100.4	100.5	99.8	100.0	99.2	99.3	99.6	98.9	98.7
10	2.90	43.958	2 785	100.3	100.5	99.8	100.0	99.0	99.4	99.5	99.0	98.9
11	2.90	44.192	2 724	100.1	100.3	99.6	99.5	98.7	98.8	99.1	98.7	98.6
12	2.89	43.685	2 791	100.5	100.6	99.9	99.8	98.9	99.4	99.7	99.1	98.8
13	2.89	43.571	2 747	100.4	100.6	99.7	99.7	98.9	99.2	99.3	99.0	98.9
14	2.89	43.337	2 776	100.6	100.5	99.9	99.4	98.9	99.5	99.4	98.9	99.1
15	2.90	42.489	2 778	100.5	100.2	99.8	99.3	99.0	99.8	99.4	98.7	99.4
16	2.90	41.342	2 771	100.7	99.8	99.3	97.4	97.9	99.1	99.0	97.6	98.9
17	2.90	43.719	2 778	100.4	100.5	99.9	99.9	99.2	99.3	99.6	98.9	98.8
18	2.90	43.999	2 741	100.3	100.3	99.7	99.6	99.0	99.2	99.4	98.9	98.8
19	2.90	43.346	2 795	100.2	100.0	99.3	99.0	98.5	98.9	99.1	98.5	98.5
20	2.89	43.619	2 804	100.7	100.6	99.9	99.7	99.1	99.5	99.4	98.8	99.0
Max.	2.90	44.192	2 804	100.7	100.6	99.9	100.1	99.2	99.8	99.7	99.1	99.4
Ave.	2.89	43.223	2 775	100.3	100.2	99.6	99.4	98.7	99.2	99.3	98.7	98.7
Min.	2.88	41.342	2 724	99.6	99.6	99.2	97.4	97.8	98.8	99.0	97.6	98.0
Med.	2.89	43.399	2 778	100.3	100.3	99.7	99.6	98.8	99.2	99.3	98.7	98.8
Std.	0.01	0.740	25	0.3	0.3	0.2	0.7	0.4	0.2	0.2	0.4	0.3



SEOUL SEMICONDUCTOR

[CHROMATICITY SHIFT]

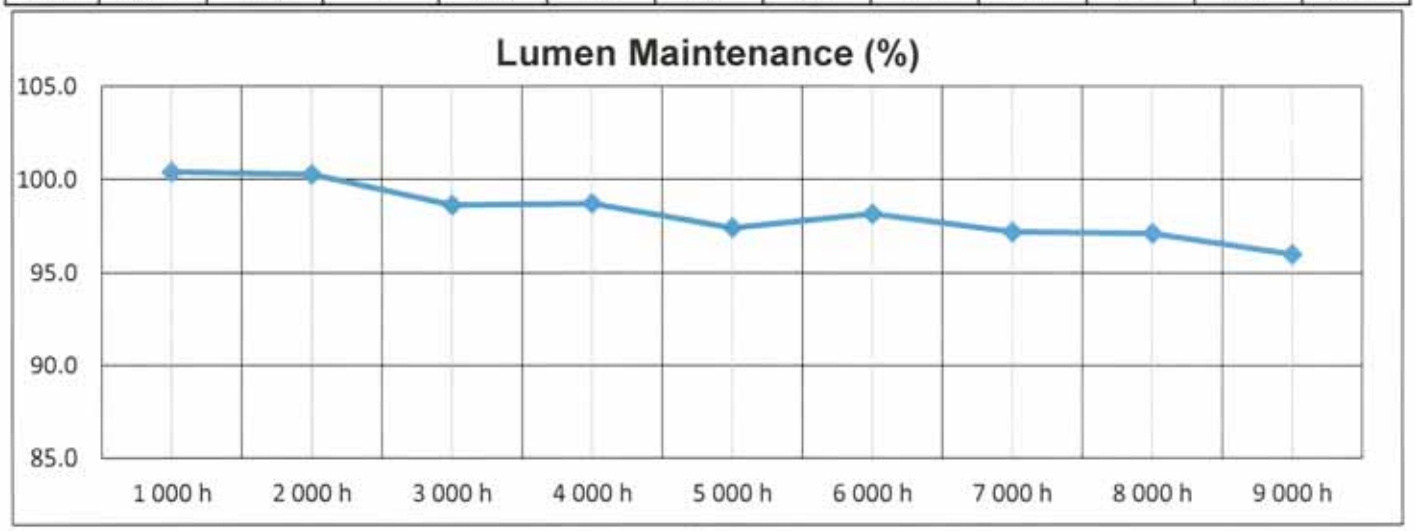
No.	u'	v'	Chromaticity Shift								
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	0.259	0.523	0.000 6	0.000 8	0.000 9	0.001 0	0.000 9	0.000 9	0.001 2	0.001 2	0.001 2
2	0.261	0.523	0.000 6	0.000 8	0.000 9	0.000 9	0.000 8	0.000 8	0.001 0	0.001 1	0.001 2
3	0.259	0.524	0.000 7	0.000 8	0.000 9	0.001 0	0.001 0	0.001 0	0.001 3	0.001 3	0.001 3
4	0.259	0.523	0.000 7	0.000 9	0.001 0	0.001 0	0.001 0	0.001 0	0.001 3	0.001 3	0.001 3
5	0.259	0.524	0.000 7	0.000 8	0.000 9	0.001 0	0.001 0	0.000 9	0.001 2	0.001 2	0.001 1
6	0.260	0.524	0.000 6	0.000 7	0.000 9	0.001 0	0.000 9	0.000 9	0.001 2	0.001 1	0.001 1
7	0.260	0.523	0.000 7	0.000 8	0.000 8	0.000 9	0.000 9	0.000 9	0.001 2	0.001 2	0.001 2
8	0.262	0.524	0.000 6	0.000 8	0.000 9	0.000 9	0.000 8	0.000 8	0.001 1	0.001 1	0.001 2
9	0.259	0.523	0.000 6	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9	0.001 2	0.001 2	0.001 2
10	0.259	0.525	0.000 8	0.000 8	0.000 9	0.000 9	0.000 9	0.001 0	0.001 3	0.001 3	0.001 3
11	0.262	0.526	0.000 5	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.001 1	0.001 1	0.001 1
12	0.259	0.523	0.000 7	0.000 8	0.000 9	0.001 0	0.000 9	0.001 0	0.001 2	0.001 2	0.001 3
13	0.261	0.522	0.000 7	0.000 8	0.000 9	0.000 9	0.000 8	0.000 9	0.001 2	0.001 2	0.001 2
14	0.260	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.000 9	0.001 1	0.001 4	0.001 4	0.001 4
15	0.260	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9	0.001 4	0.001 4	0.001 3
16	0.260	0.525	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.001 0	0.001 3	0.001 4	0.001 3
17	0.260	0.523	0.000 6	0.000 9	0.000 9	0.000 9	0.000 8	0.000 9	0.001 1	0.001 2	0.001 2
18	0.261	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9	0.001 1	0.001 2	0.001 2
19	0.259	0.523	0.000 7	0.000 8	0.000 9	0.001 0	0.001 0	0.001 1	0.001 4	0.001 4	0.001 4
20	0.259	0.522	0.000 6	0.000 8	0.000 9	0.000 9	0.000 8	0.000 8	0.001 2	0.001 2	0.001 2
Max.	0.262	0.526	0.000 8	0.000 9	0.001 0	0.001 0	0.001 0	0.001 1	0.001 4	0.001 4	0.001 4
Ave.	0.260	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9	0.001 2	0.001 2	0.001 2
Min.	0.259	0.522	0.000 5	0.000 7	0.000 8	0.000 8	0.000 8	0.000 8	0.001 0	0.001 1	0.001 1
Med.	0.260	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9	0.001 2	0.001 2	0.001 2
Std.	0.001	0.001	0.000 1	0.000 0	0.000 0	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1



3.2 Condition 2 : [Ts = 85 ℃]

[LUMEN MAINTENANCE]

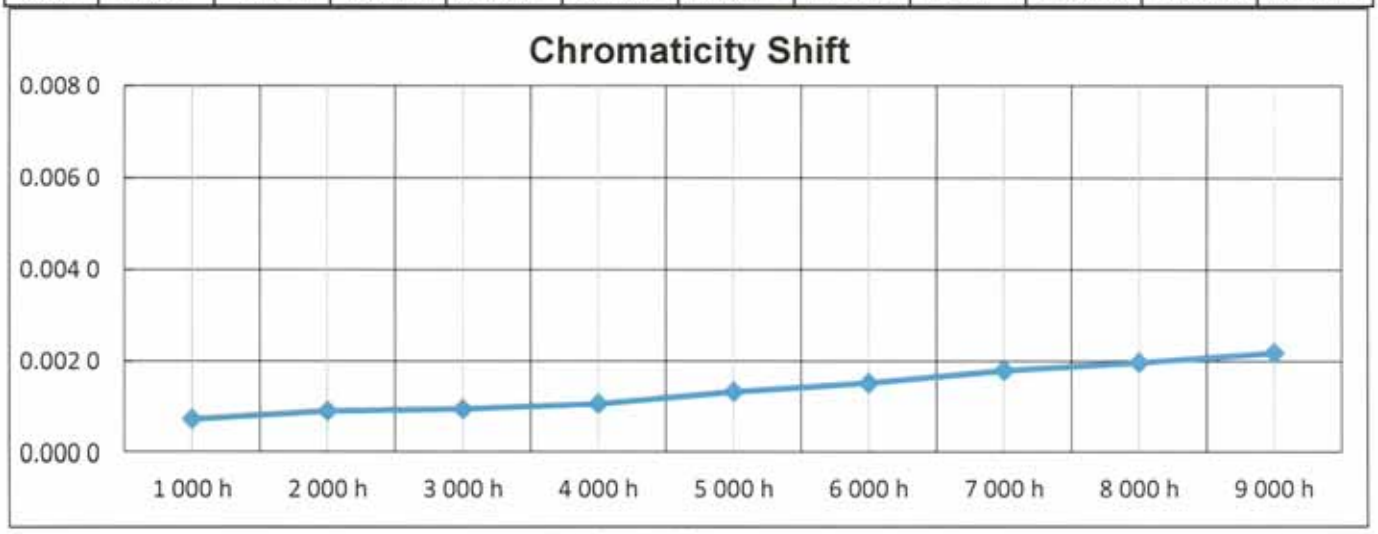
No.	Vf(V)	Flux(lm)	CCT(K)	Lumen Maintenance (%)								
	0 h			1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	2.89	41.803	2 781	99.7	100.0	98.4	99.4	97.2	97.5	96.8	96.6	95.3
2	2.90	43.023	2 792	100.1	100.4	98.6	99.6	97.6	98.1	97.2	97.2	96.2
3	2.90	43.379	2 787	99.9	99.0	98.1	96.2	96.7	97.7	96.8	96.8	95.8
4	2.89	43.108	2 797	100.1	100.1	98.3	98.8	96.9	97.5	96.9	97.1	96.1
5	2.88	43.318	2 773	99.8	99.8	98.1	98.1	96.0	97.7	96.7	96.6	95.4
6	2.89	41.428	2 764	100.9	100.4	98.9	98.5	97.6	98.9	97.7	97.5	96.4
7	2.91	39.626	2 760	101.3	100.2	98.9	97.6	97.7	99.1	98.0	98.0	96.7
8	2.89	42.887	2 766	99.8	100.2	98.4	99.4	97.4	97.6	96.6	96.8	95.8
9	2.89	43.435	2 784	100.2	100.4	98.7	99.2	97.5	97.9	97.1	97.0	96.3
10	2.89	43.616	2 746	100.6	100.9	99.1	99.4	98.0	98.4	97.8	97.7	97.0
11	2.89	43.685	2 760	100.2	100.4	98.6	99.2	97.5	98.1	97.6	97.6	96.8
12	2.90	43.503	2 776	99.9	100.1	98.4	98.7	97.1	97.8	96.7	96.6	95.4
13	2.91	40.998	2 800	101.3	100.4	98.9	98.2	97.7	99.2	97.9	97.9	96.8
14	2.90	42.948	2 754	100.1	100.2	98.5	99.1	97.3	97.7	96.9	96.7	95.4
15	2.89	43.706	2 732	100.2	100.3	98.5	99.1	97.4	97.7	96.8	96.8	95.9
16	2.90	43.758	2 802	100.3	100.5	98.8	99.4	97.8	98.0	97.6	97.2	96.5
17	2.90	43.702	2 797	100.5	100.7	98.7	99.0	97.6	98.0	97.0	96.9	95.6
18	2.90	43.490	2 808	100.3	100.5	98.7	99.0	97.5	98.2	97.0	96.6	95.2
19	2.90	43.455	2 786	100.3	100.2	98.4	98.5	97.4	98.0	96.9	97.0	96.0
20	2.91	38.981	2 762	101.8	100.1	98.9	97.3	98.0	99.7	97.5	97.3	95.2
Max.	2.91	43.758	2 808	101.8	100.9	99.1	99.6	98.0	99.7	98.0	98.0	97.0
Ave.	2.90	42.692	2 776	100.4	100.2	98.6	98.7	97.4	98.1	97.2	97.1	96.0
Min.	2.88	38.981	2 732	99.7	99.0	98.1	96.2	96.0	97.5	96.6	96.6	95.2
Med.	2.90	43.348	2 779	100.2	100.3	98.6	99.0	97.5	98.0	97.0	97.0	95.9
Std.	0.01	1.398	21	0.6	0.4	0.3	0.8	0.5	0.6	0.4	0.5	0.6



SEOUL SEMICONDUCTOR

[CHROMATICITY SHIFT]

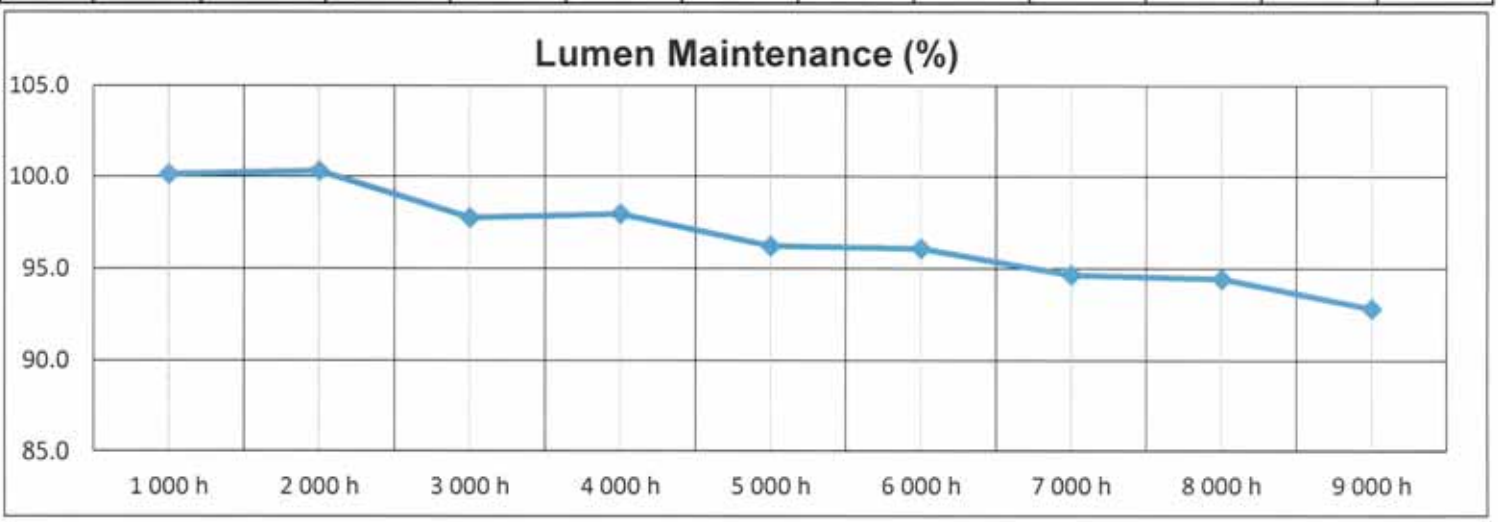
No.	u'	v'	Chromaticity Shift								
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	0.259	0.523	0.000 8	0.000 9	0.000 9	0.001 0	0.001 5	0.001 5	0.001 7	0.001 9	0.002 3
2	0.259	0.523	0.000 7	0.000 8	0.000 9	0.001 0	0.001 2	0.001 4	0.001 6	0.001 8	0.002 0
3	0.259	0.523	0.000 7	0.001 0	0.001 1	0.001 4	0.001 6	0.001 7	0.002 0	0.002 2	0.002 3
4	0.259	0.523	0.000 8	0.001 0	0.001 0	0.001 2	0.001 4	0.001 7	0.001 9	0.002 1	0.002 2
5	0.260	0.522	0.000 9	0.001 0	0.001 0	0.001 2	0.001 4	0.001 7	0.002 0	0.002 2	0.002 4
6	0.260	0.523	0.000 6	0.000 9	0.000 9	0.001 1	0.001 3	0.001 4	0.001 7	0.002 0	0.002 1
7	0.260	0.524	0.000 7	0.001 0	0.001 0	0.001 1	0.001 3	0.001 4	0.001 8	0.001 9	0.002 1
8	0.260	0.524	0.000 7	0.000 8	0.000 9	0.001 0	0.001 1	0.001 3	0.001 8	0.001 9	0.002 0
9	0.259	0.523	0.000 7	0.000 8	0.000 9	0.001 1	0.001 3	0.001 5	0.001 7	0.001 9	0.002 0
10	0.261	0.523	0.000 7	0.000 8	0.000 9	0.000 9	0.001 3	0.001 5	0.001 7	0.001 9	0.002 0
11	0.260	0.524	0.000 8	0.001 0	0.001 0	0.001 1	0.001 5	0.001 7	0.001 9	0.002 0	0.002 1
12	0.260	0.524	0.000 8	0.001 0	0.001 0	0.001 0	0.001 3	0.001 5	0.001 8	0.002 0	0.002 2
13	0.259	0.524	0.000 7	0.000 9	0.000 9	0.001 0	0.001 4	0.001 7	0.001 9	0.002 0	0.002 1
14	0.260	0.525	0.000 7	0.000 9	0.001 0	0.001 1	0.001 3	0.001 5	0.001 8	0.002 1	0.002 4
15	0.262	0.524	0.000 7	0.000 9	0.001 0	0.001 0	0.001 3	0.001 6	0.001 8	0.002 0	0.002 1
16	0.259	0.523	0.000 7	0.001 1	0.001 0	0.001 1	0.001 3	0.001 5	0.001 7	0.001 6	0.002 0
17	0.259	0.523	0.000 7	0.000 8	0.000 9	0.001 0	0.001 2	0.001 4	0.001 7	0.001 9	0.002 3
18	0.258	0.524	0.000 8	0.000 9	0.000 9	0.001 0	0.001 3	0.001 5	0.001 9	0.002 2	0.002 5
19	0.259	0.523	0.000 7	0.000 9	0.001 0	0.001 0	0.001 5	0.001 7	0.002 1	0.002 2	0.002 4
20	0.260	0.526	0.000 7	0.000 8	0.000 8	0.001 0	0.001 1	0.001 4	0.001 4	0.001 7	0.002 0
Max.	0.262	0.526	0.000 9	0.001 1	0.001 1	0.001 4	0.001 6	0.001 7	0.002 1	0.002 2	0.002 5
Ave.	0.260	0.524	0.000 7	0.000 9	0.001 0	0.001 1	0.001 3	0.001 5	0.001 8	0.002 0	0.002 2
Min.	0.258	0.522	0.000 6	0.000 8	0.000 8	0.000 9	0.001 1	0.001 3	0.001 4	0.001 6	0.002 0
Med.	0.260	0.523	0.000 7	0.000 9	0.001 0	0.001 0	0.001 3	0.001 5	0.001 8	0.002 0	0.002 1
Std.	0.001	0.001	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 2	0.000 2	0.000 2



3.3 Condition 3 : [Ts = 105 ℃]

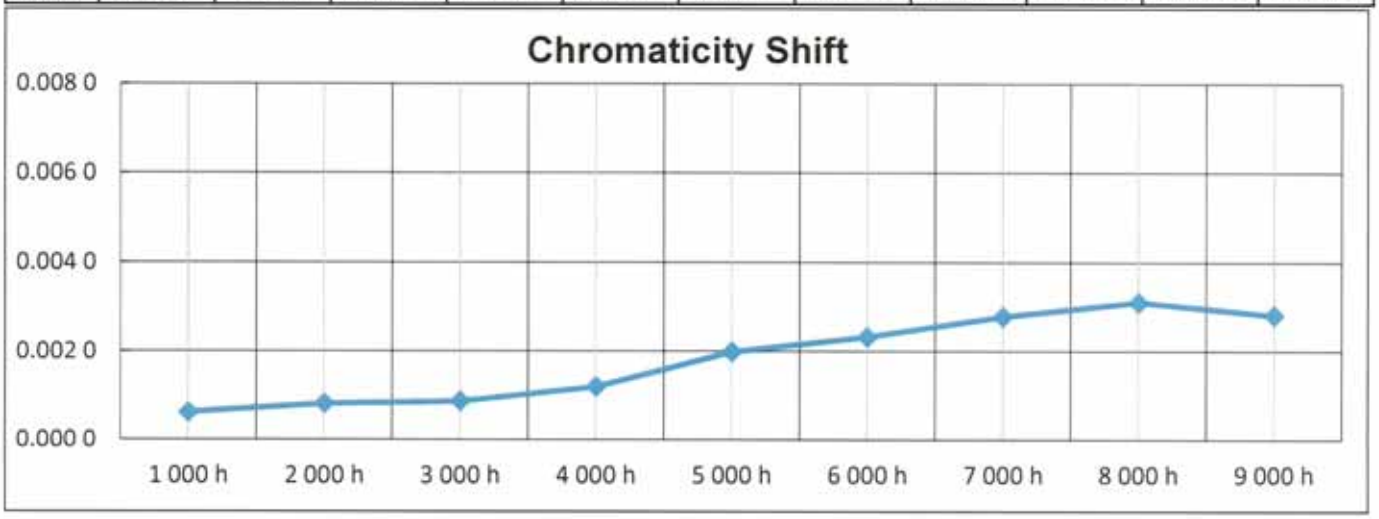
[LUMEN MAINTENANCE]

No.	Vf(V)	Flux(lm)	CCT(K)	Lumen Maintenance (%)								
	0 h			1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	2.90	43.303	2 766	100.1	99.6	97.1	96.8	95.1	95.0	93.6	93.3	92.4
2	2.90	43.570	2 785	100.3	99.8	97.6	97.5	95.8	95.6	94.2	94.0	92.8
3	2.89	43.470	2 749	100.1	100.0	97.7	98.0	96.2	96.1	94.7	94.4	93.0
4	2.89	43.542	2 785	100.3	100.2	97.9	98.4	96.6	96.5	95.1	94.9	93.4
5	2.90	41.581	2 774	99.7	100.5	98.1	98.3	96.6	96.5	95.0	94.8	92.3
6	2.89	39.868	2 784	99.4	100.8	98.1	97.5	95.8	95.7	94.3	94.0	90.7
7	2.89	41.397	2 754	100.6	99.2	97.3	98.1	96.4	96.2	94.8	94.6	91.5
8	2.89	43.227	2 754	100.5	99.6	97.3	97.9	96.2	96.1	94.6	94.4	93.2
9	2.90	44.037	2 769	100.4	100.4	97.7	98.5	96.8	96.6	95.2	95.0	91.5
10	2.90	43.711	2 756	100.3	100.1	97.7	98.4	96.7	96.5	95.1	94.9	92.9
11	2.89	43.619	2 769	100.3	100.3	97.9	98.3	96.5	96.4	95.0	94.8	94.2
12	2.90	42.504	2 781	100.3	100.6	98.0	98.2	96.4	96.3	94.9	94.6	92.3
13	2.90	41.196	2 777	99.6	100.5	98.0	98.1	96.4	96.3	94.8	94.6	94.2
14	2.89	43.988	2 707	100.5	100.0	97.5	98.0	96.3	96.2	94.8	94.5	93.5
15	2.89	43.838	2 758	100.0	100.0	97.4	97.5	95.8	95.7	94.2	94.0	93.0
16	2.90	43.532	2 782	100.5	100.6	98.0	98.1	96.4	96.3	94.8	94.6	92.2
17	2.90	43.293	2 755	100.3	100.5	97.7	98.0	96.3	96.2	94.7	94.5	93.2
18	2.89	42.911	2 766	100.2	100.6	97.7	97.7	96.0	95.9	94.4	94.2	93.3
19	2.90	41.871	2 746	99.6	100.7	97.8	97.7	96.0	95.9	94.5	94.2	93.4
20	2.90	39.063	2 758	99.6	101.7	98.4	97.9	96.2	96.1	94.6	94.4	93.7
Max.	2.90	44.037	2 785	100.6	101.7	98.4	98.5	96.8	96.6	95.2	95.0	94.2
Ave.	2.90	42.676	2 764	100.1	100.3	97.7	97.9	96.2	96.1	94.7	94.4	92.8
Min.	2.89	39.063	2 707	99.4	99.2	97.1	96.8	95.1	95.0	93.6	93.3	90.7
Med.	2.90	43.298	2 766	100.3	100.3	97.7	98.0	96.3	96.2	94.8	94.5	93.0
Std.	0.00	1.406	18	0.3	0.5	0.3	0.4	0.4	0.4	0.4	0.4	0.9



[CHROMATICITY SHIFT]

No.	u'	v'	Chromaticity Shift								
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h
1	0.260	0.522	0.000 7	0.000 8	0.001 0	0.001 5	0.001 7	0.002 0	0.002 5	0.002 7	0.002 9
2	0.259	0.523	0.000 6	0.000 9	0.001 0	0.001 5	0.001 6	0.001 9	0.002 3	0.002 6	0.002 8
3	0.261	0.523	0.000 6	0.000 7	0.000 7	0.001 0	0.001 1	0.001 4	0.002 0	0.002 3	0.002 6
4	0.259	0.523	0.000 6	0.000 9	0.000 9	0.001 3	0.001 5	0.002 0	0.002 3	0.002 6	0.002 9
5	0.260	0.525	0.000 7	0.000 8	0.000 8	0.001 0	0.001 3	0.001 8	0.002 4	0.002 9	0.003 1
6	0.259	0.523	0.000 7	0.000 9	0.001 0	0.001 4	0.001 8	0.002 3	0.003 1	0.003 5	0.003 9
7	0.260	0.525	0.000 5	0.000 7	0.000 8	0.000 9	0.001 0	0.001 4	0.002 0	0.002 3	0.002 7
8	0.261	0.523	0.000 6	0.000 9	0.001 0	0.001 2	0.001 5	0.001 8	0.002 1	0.002 3	0.002 6
9	0.260	0.523	0.000 5	0.000 7	0.000 7	0.000 9	0.003 7	0.004 2	0.004 9	0.005 4	0.003 2
10	0.261	0.523	0.000 6	0.000 9	0.000 9	0.001 3	0.001 8	0.002 3	0.003 1	0.003 5	0.002 8
11	0.260	0.523	0.000 6	0.000 8	0.000 8	0.001 0	0.000 9	0.001 3	0.001 7	0.002 0	0.002 8
12	0.259	0.525	0.000 6	0.000 9	0.000 8	0.001 1	0.000 5	0.000 8	0.001 5	0.002 1	0.002 9
13	0.260	0.523	0.000 6	0.000 7	0.000 9	0.001 1	0.002 4	0.002 4	0.002 9	0.003 2	0.002 6
14	0.262	0.528	0.000 6	0.000 7	0.000 8	0.001 2	0.005 9	0.006 4	0.006 8	0.007 0	0.002 3
15	0.260	0.524	0.000 7	0.000 9	0.001 0	0.001 4	0.004 2	0.004 0	0.004 0	0.004 0	0.002 7
16	0.260	0.523	0.000 5	0.000 7	0.000 8	0.001 1	0.001 6	0.001 7	0.002 2	0.002 7	0.002 9
17	0.261	0.522	0.000 7	0.000 9	0.000 9	0.001 2	0.003 1	0.003 2	0.003 6	0.003 9	0.002 6
18	0.260	0.523	0.000 7	0.000 9	0.001 0	0.001 6	0.000 9	0.001 3	0.001 7	0.001 9	0.002 8
19	0.261	0.523	0.000 7	0.000 9	0.000 9	0.001 1	0.002 6	0.002 8	0.003 1	0.003 4	0.002 6
20	0.261	0.523	0.000 7	0.000 8	0.000 9	0.001 4	0.000 9	0.001 5	0.001 7	0.001 9	0.002 8
Max.	0.262	0.528	0.000 7	0.000 9	0.001 0	0.001 6	0.005 9	0.006 4	0.006 8	0.007 0	0.003 9
Ave.	0.260	0.524	0.000 6	0.000 8	0.000 9	0.001 2	0.002 0	0.002 3	0.002 8	0.003 1	0.002 8
Min.	0.259	0.522	0.000 5	0.000 7	0.000 7	0.000 9	0.000 5	0.000 8	0.001 5	0.001 9	0.002 3
Med.	0.260	0.523	0.000 6	0.000 8	0.000 9	0.001 2	0.001 6	0.001 9	0.002 4	0.002 7	0.002 8
Std.	0.001	0.001	0.000 1	0.000 1	0.000 1	0.000 2	0.001 3	0.001 3	0.001 3	0.001 3	0.000 3



4. Revision History

Revision No.	Revision Date	Contents
01	Sep. 07, 2015	First Issued at 8 000 h
02	Oct. 27, 2015	Second Issued at 9 000 h