



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 : Z5M2**

**(SZ5-M2-WW-C8)**

**Test Date : Sep. 02, 2014 ~ Nov. 09, 2015**

**Report Date : Apr. 12, 2016**

**Report Number : I-140826-22-K-03**

**Revision Number : 03**

<b>Tested by</b>	<b>Reviewed by</b>
Kyung yong Kim (signature)	Young Joon Won (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**

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## 1. Summary

### 1.1 Test Results

Items	Condition 1	Condition 2	Condition 3
Required Temperature	55 °C	85 °C	105 °C
Number of LED light sources tested (ea)	25	25	25
Test Duration (h)	11 000	11 000	11 000
Drive Current (mA)	700	700	700
Actual Case Temperature (°C)	53.7	83.4	103.0
Actual Ambient Temperature (°C)	51.0	80.2	100.8
Air flow velocity (m/s)	0.81	0.49	0.12
Average Initial Luminous Flux (lm)	203.304	203.552	202.230
Average Initial CCT (K)	2 797	2 796	2 794
Average Initial Volatge (V)	3.20	3.19	3.19
Average Lumen maintenance (%)	99.6	97.6	96.8
Average Chromaticity Shift	0.004 4	0.004 5	0.004 6

※ 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)		Z5M2_SZ5-M2-WW-C8					
Test Condition 1 - 55°C Case Temp		Test Condition 2 - 85°C Case Temp		Test Condition 3 - 105°C Case Temp			
Sample size	25	Sample size	25	Sample size	25		
Number of failures	0	Number of failures	0	Number of failures	0		
DUT drive current used in the test (mA)	700	DUT drive current used in the test (mA)	700	DUT drive current used in the test (mA)	700		
Test duration (hours)	11,000	Test duration (hours)	11,000	Test duration (hours)	11,000		
Test duration used for projection (hour to hour)	5,000 - 11,000	Test duration used for projection (hour to hour)	5,000 - 11,000	Test duration used for projection (hour to hour)	5,000 - 11,000		
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	105		
$\alpha$	4.738E-07	$\alpha$	1.619E-06	$\alpha$	2.626E-06		
B	0.997	B	0.991	B	0.994		
Reported L70(11k) (hours)	>66000	Reported L70(11k) (hours)	>66000	Reported L70(11k) (hours)	>66000		



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

#### 2.1 Number of LED Light Sources tested

- 25 Packages tested at actual case temperature 53.7 °C
- 25 Packages tested at actual case temperature 83.4 °C
- 25 Packages tested at actual case temperature 103.0 °C

#### 2.2 Description of LED light Sources

- LED Package Part Number : SZ5-M2-WW-C8
- LED Forward Current [IF] : 700 mA
- LED Package Dimension : 3.5 mm X 3.5 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 : 700 mA
  - Typical Voltage : 3.19 V
- All tested LED packages are driven with a constant direct current.

#### 2.5 Ambient conditions including airflow, temperature and relative humidity

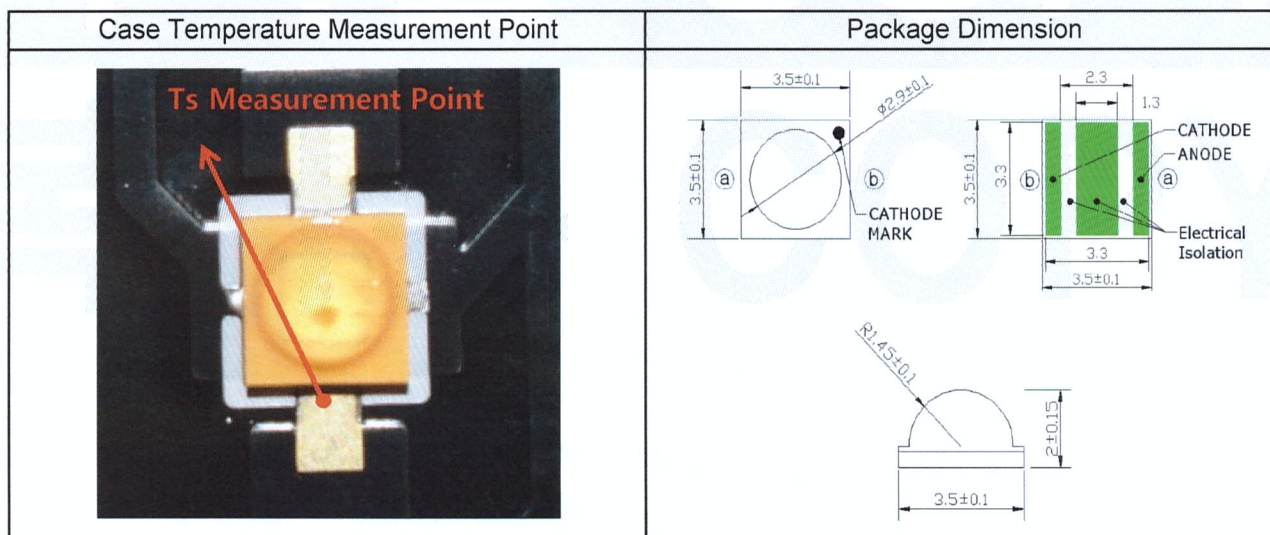
- Controlled ambient conditions

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

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### 2.6 Case Temperature (Test Point temperature)

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



### 2.7 Drive Current of the LED light source during lifetime test

- See the Test Data No. 1, 2 and 3

### 2.8 Lumen maintenance data for each individual LED light source

- See the Test Data No. 1, 2 and 3

### 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 maintains a tolerance of  $\pm 3.0\%$  on flux measurements for LM-80 testing

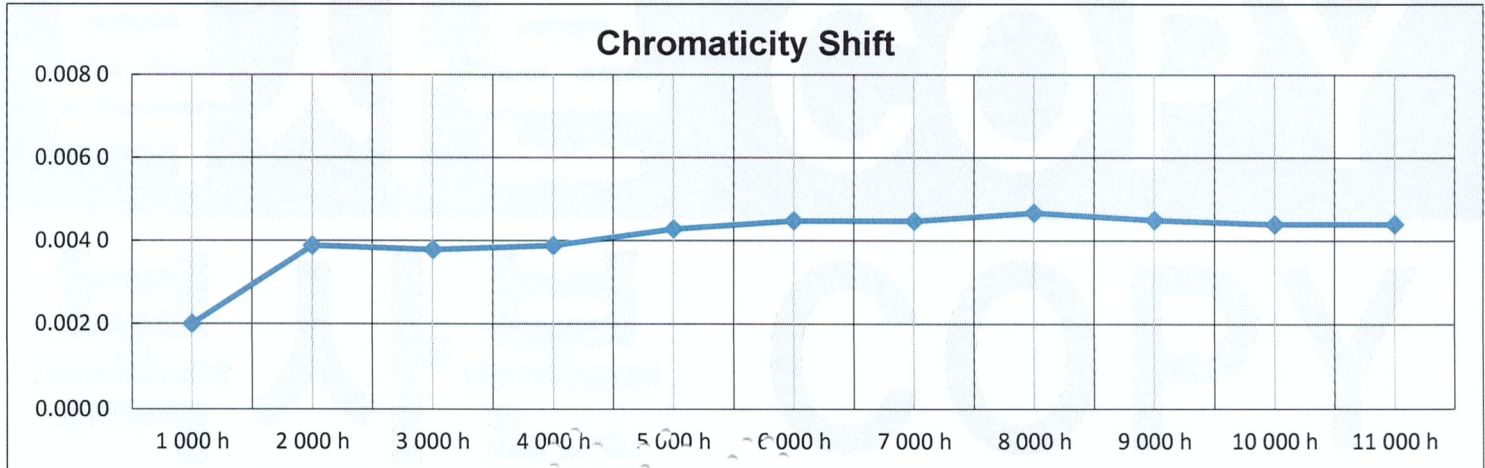
### 2.12 Chromaticity shift over the measurement time

- See the Test Data No. 1, 2 and 3



**[ 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	10 000 h	11 000 h
1	0.258 1	0.530 8	0.001 8	0.003 7	0.003 6	0.003 8	0.004 2	0.004 3	0.004 4	0.004 5	0.004 5	0.004 3	0.0043
2	0.259 0	0.530 2	0.001 8	0.003 8	0.003 5	0.003 7	0.004 2	0.004 1	0.004 1	0.004 4	0.004 2	0.004 3	0.0043
3	0.259 5	0.530 9	0.001 8	0.003 6	0.003 6	0.003 8	0.004 0	0.004 4	0.004 3	0.004 6	0.004 4	0.004 2	0.0042
4	0.259 1	0.530 2	0.002 2	0.004 1	0.003 9	0.004 0	0.004 4	0.004 5	0.004 5	0.004 9	0.004 5	0.004 5	0.0044
5	0.258 1	0.529 4	0.001 9	0.003 7	0.003 6	0.003 7	0.004 2	0.004 5	0.004 4	0.004 6	0.004 4	0.004 2	0.0043
6	0.259 4	0.529 9	0.002 3	0.004 1	0.004 1	0.004 3	0.004 7	0.004 8	0.004 9	0.005 1	0.004 8	0.004 8	0.0048
7	0.261 6	0.532 4	0.002 2	0.004 0	0.004 0	0.004 3	0.004 4	0.004 7	0.004 6	0.005 0	0.004 6	0.004 4	0.0044
8	0.258 8	0.529 5	0.002 1	0.004 0	0.003 9	0.004 0	0.004 4	0.004 6	0.004 5	0.004 9	0.004 7	0.004 4	0.0045
9	0.259 1	0.530 4	0.001 9	0.003 8	0.003 8	0.003 8	0.004 2	0.004 3	0.004 4	0.004 4	0.004 2	0.004 2	0.0041
10	0.258 5	0.528 9	0.002 1	0.004 0	0.003 8	0.004 0	0.004 2	0.004 6	0.004 6	0.004 6	0.004 7	0.004 7	0.0045
11	0.258 0	0.529 5	0.002 2	0.004 0	0.003 9	0.003 9	0.004 4	0.004 7	0.004 6	0.004 7	0.004 5	0.004 5	0.0046
12	0.260 1	0.530 9	0.002 3	0.004 1	0.004 1	0.004 3	0.004 7	0.004 9	0.004 8	0.004 9	0.004 9	0.004 8	0.0047
13	0.261 3	0.531 8	0.002 0	0.003 7	0.003 9	0.004 0	0.004 2	0.004 5	0.004 6	0.004 8	0.004 6	0.004 5	0.0044
14	0.259 9	0.530 3	0.001 7	0.003 7	0.003 7	0.003 7	0.004 1	0.004 4	0.004 3	0.004 7	0.004 4	0.004 3	0.0045
15	0.258 2	0.529 0	0.001 7	0.003 7	0.003 6	0.003 6	0.004 1	0.004 3	0.004 2	0.004 5	0.004 2	0.004 2	0.0042
16	0.257 7	0.528 6	0.002 0	0.003 7	0.003 7	0.003 8	0.004 1	0.004 4	0.004 5	0.004 5	0.004 4	0.004 3	0.0044
17	0.258 5	0.530 0	0.001 6	0.003 5	0.003 4	0.003 6	0.003 8	0.004 1	0.004 3	0.004 3	0.004 2	0.004 2	0.0043
18	0.259 2	0.530 2	0.002 0	0.003 8	0.003 7	0.003 8	0.004 2	0.004 5	0.004 5	0.004 7	0.004 6	0.004 5	0.0044
19	0.258 5	0.529 4	0.002 4	0.004 2	0.004 2	0.004 3	0.004 7	0.004 9	0.004 9	0.005 1	0.004 9	0.004 8	0.0049
20	0.259 5	0.530 5	0.001 8	0.003 8	0.003 6	0.003 7	0.004 1	0.004 4	0.004 3	0.004 6	0.004 4	0.004 4	0.0044
21	0.259 9	0.530 9	0.001 8	0.003 9	0.003 9	0.003 9	0.004 2	0.004 5	0.004 5	0.004 6	0.004 4	0.004 4	0.0043
22	0.258 4	0.529 8	0.001 9	0.003 7	0.003 7	0.003 7	0.004 2	0.004 3	0.004 5	0.004 5	0.004 5	0.004 3	0.0044
23	0.260 0	0.530 9	0.002 0	0.003 9	0.003 8	0.004 1	0.004 2	0.004 5	0.004 6	0.004 8	0.004 5	0.004 4	0.0044
24	0.259 3	0.530 7	0.002 0	0.004 1	0.003 8	0.004 0	0.004 4	0.004 6	0.004 5	0.005 0	0.004 8	0.004 5	0.0045
25	0.258 6	0.529 9	0.002 0	0.004 0	0.003 8	0.003 9	0.004 2	0.004 6	0.004 5	0.004 7	0.004 5	0.004 5	0.0045
Max.	0.261 6	0.532 4	0.002 4	0.004 2	0.004 2	0.004 3	0.004 7	0.004 9	0.004 9	0.005 1	0.004 9	0.004 8	0.004 9
Ave.	0.259 1	0.530 2	0.002 0	0.003 9	0.003 8	0.003 9	0.004 3	0.004 5	0.004 5	0.004 7	0.004 5	0.004 4	0.004 4
Min.	0.257 7	0.528 6	0.001 6	0.003 5	0.003 4	0.003 6	0.003 8	0.004 1	0.004 1	0.004 3	0.004 2	0.004 2	0.004 1
Med.	0.259 1	0.530 2	0.002 0	0.003 8	0.003 8	0.003 9	0.004 2	0.004 5	0.004 5	0.004 7	0.004 5	0.004 4	0.004 4
Std.	0.001 0	0.000 9	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2





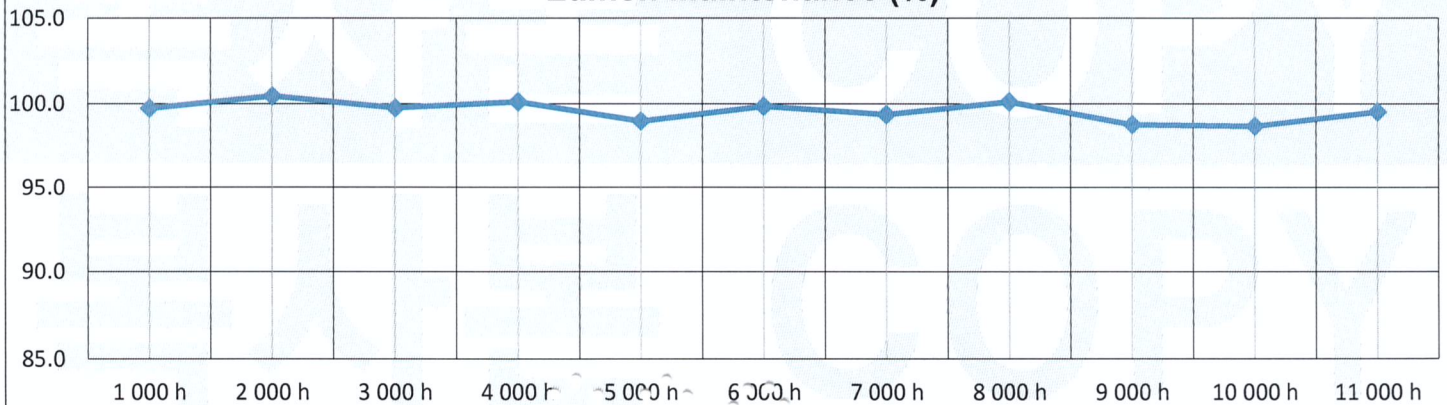
### 3. Test Data

#### 3.1 Condition 1 : [ $T_s = 55\text{ }^{\circ}\text{C}$ ]

#### [ 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	10 000 h	11 000 h
1	3.19	206.02	2 816	99.2	100.5	99.6	99.9	99.2	99.4	99.6	99.7	99.1	98.5	99.0
2	3.21	205.82	2 800	99.0	100.3	98.6	99.5	98.9	98.5	98.3	99.4	98.0	98.7	99.5
3	3.18	204.45	2 786	99.5	100.0	99.5	100.4	98.5	100.3	99.0	100.2	99.1	98.3	99.0
4	3.19	204.80	2 797	99.6	100.8	99.4	100.1	99.0	99.5	99.1	100.8	98.6	99.0	99.5
5	3.21	202.98	2 823	100.3	101.0	100.5	100.8	100.3	101.3	100.6	101.3	100.2	99.5	100.9
6	3.15	200.29	2 792	100.6	100.8	100.1	100.4	99.7	100.1	99.9	100.2	98.8	99.1	99.9
7	3.21	196.82	2 736	99.5	99.0	98.5	99.6	97.4	98.7	97.9	99.6	97.5	97.4	97.9
8	3.22	204.09	2 807	99.6	99.6	99.3	99.8	98.4	99.3	98.5	100.2	98.9	97.7	99.0
9	3.21	203.44	2 796	100.1	100.9	100.7	100.5	99.7	100.2	100.4	100.1	99.3	99.2	99.8
10	3.22	202.28	2 816	100.5	101.4	100.3	100.9	99.5	101.4	100.7	100.8	100.3	100.6	100.5
11	3.20	205.02	2 823	99.9	101.0	100.3	100.3	99.8	101.3	100.4	100.4	99.4	99.5	100.5
12	3.24	203.85	2 773	99.6	100.0	99.6	100.3	99.3	100.2	99.3	99.8	99.2	99.1	99.4
13	3.17	201.23	2 745	99.7	99.3	99.9	99.6	97.9	99.0	99.1	99.9	98.4	98.0	98.6
14	3.18	205.14	2 780	99.2	100.6	99.9	99.9	98.8	99.7	98.9	100.5	98.2	98.4	99.9
15	3.16	202.93	2 821	99.4	100.4	99.4	99.4	99.2	99.5	98.8	100.0	98.2	98.1	98.8
16	3.18	200.73	2 834	99.4	99.1	99.0	99.0	97.8	98.9	99.0	99.2	98.3	98.1	99.2
17	3.18	203.55	2 810	99.4	100.1	99.3	99.9	98.1	98.9	99.2	99.1	97.9	98.0	99.3
18	3.19	205.71	2 794	99.9	100.8	99.9	100.0	99.3	100.1	99.3	100.2	99.1	99.1	99.8
19	3.20	202.30	2 814	100.4	100.8	100.5	100.6	99.4	100.1	99.7	100.3	98.9	98.8	100.3
20	3.17	201.34	2 788	100.2	100.9	99.8	100.1	99.0	100.0	99.2	100.5	98.8	99.0	99.8
21	3.20	202.79	2 778	99.8	101.0	100.7	100.6	99.5	100.9	100.1	100.5	98.8	98.9	99.6
22	3.21	203.91	2 813	99.5	100.2	99.6	99.6	98.5	99.1	99.3	98.8	98.3	97.6	99.1
23	3.23	204.08	2 776	99.9	100.7	99.7	100.8	98.7	99.6	99.6	100.3	98.1	98.6	99.2
24	3.22	203.92	2 792	99.8	101.5	99.9	100.8	99.8	99.9	98.9	100.9	99.5	98.6	99.7
25	3.20	205.12	2 809	99.9	101.4	100.6	100.8	99.4	100.9	100.1	100.8	99.2	99.8	100.5
Max.	3.24	206.02	2 834	100.6	101.5	100.7	100.9	100.3	101.4	100.7	101.3	100.3	100.6	100.9
Ave.	3.20	203.30	2 797	99.8	100.5	99.8	100.2	99.0	99.9	99.4	100.1	98.8	98.7	99.6
Min.	3.15	196.82	2 736	99.0	99.0	98.5	99.0	97.4	98.5	97.9	98.8	97.5	97.4	97.9
Med.	3.20	203.85	2 797	99.7	100.7	99.8	100.1	99.2	99.9	99.3	100.2	98.8	98.7	99.5
Std.	0.02	2.08	24	0.4	0.7	0.6	0.5	0.7	0.8	0.7	0.6	0.7	0.7	0.7

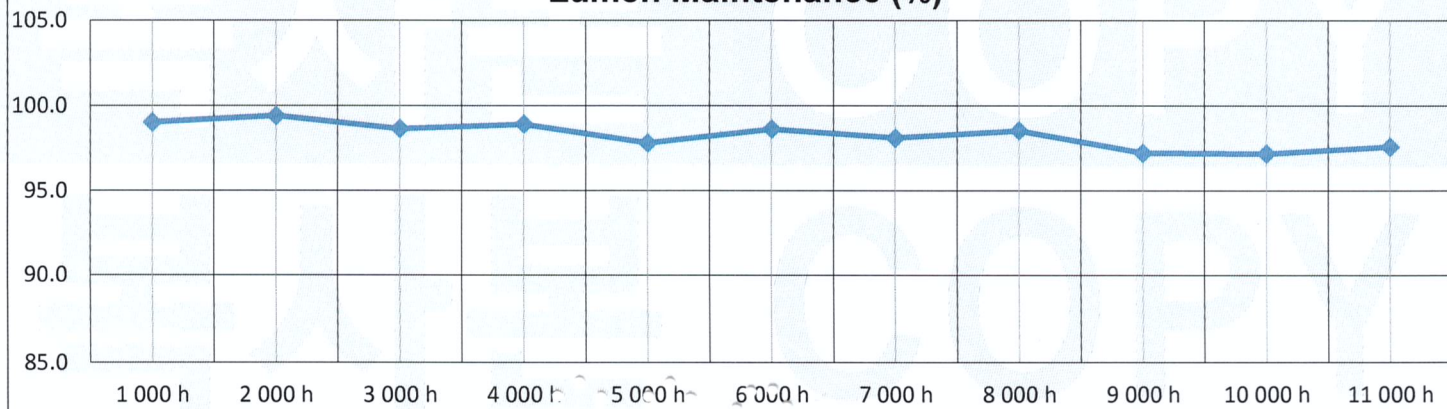
#### Lumen Maintenance (%)





**3.2 Condition 2 : [ Ts = 85 °C ]**
**[ LUMEN MAINTENANCE ]**

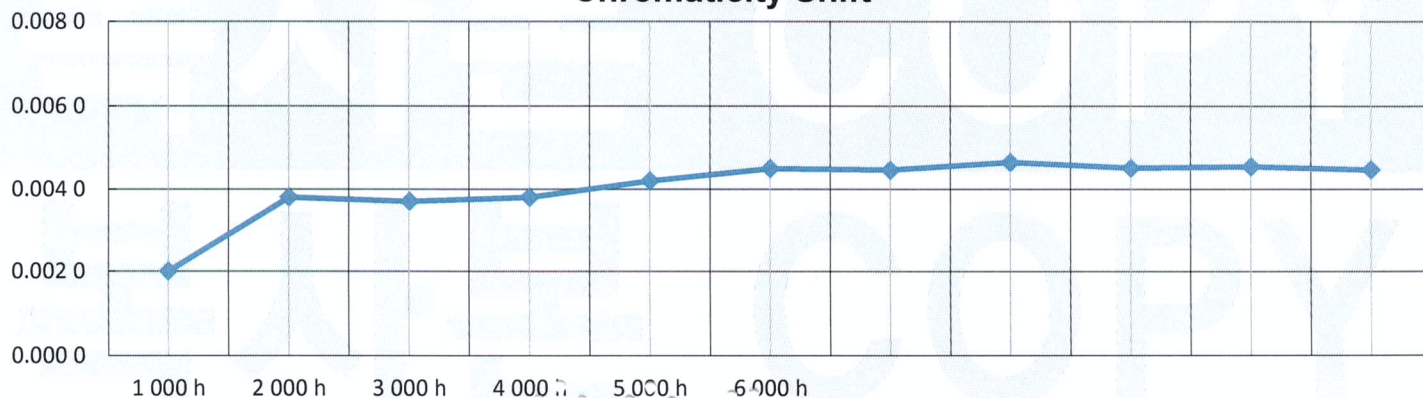
No.	Vf(V)	Flux(lm)	CCT(K)	Lumen Maintenance (%)										
				0 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h	10 000 h
1	3.18	201.37	2 726	99.4	99.8	99.0	99.1	98.6	100.1	98.8	99.3	98.1	97.6	97.9
2	3.16	203.13	2 809	98.8	98.8	97.8	99.2	98.1	98.7	98.2	98.5	96.5	97.2	97.8
3	3.16	200.94	2 812	98.4	98.9	97.9	98.7	98.3	99.2	99.1	98.9	97.8	97.5	98.1
4	3.18	205.40	2 830	98.5	98.6	97.8	98.6	97.9	98.7	98.5	99.1	98.7	98.2	98.1
5	3.19	202.28	2 804	99.0	99.1	98.0	98.4	98.2	98.7	97.7	98.0	96.4	96.4	97.5
6	3.20	205.13	2 801	98.6	99.7	98.5	98.4	97.1	98.2	98.2	98.5	96.8	97.4	97.4
7	3.20	201.26	2 785	99.4	99.6	99.0	99.4	98.1	98.8	98.7	98.7	97.2	97.2	97.8
8	3.19	204.37	2 818	99.0	99.4	98.5	98.7	97.9	98.9	98.8	99.1	97.2	97.8	97.5
9	3.19	201.30	2 798	99.0	98.6	97.9	98.7	97.3	98.0	97.4	98.0	97.0	96.1	96.5
10	3.21	205.57	2 798	98.4	99.5	98.4	98.6	97.7	97.8	97.5	98.3	96.5	96.6	96.5
11	3.21	207.29	2 812	98.6	99.9	98.9	99.4	97.6	99.4	98.2	98.6	97.1	96.6	96.9
12	3.21	204.01	2 739	99.0	99.1	98.7	99.5	97.9	98.8	98.4	98.6	97.1	97.4	97.4
13	3.15	203.31	2 794	99.2	99.3	98.3	98.8	97.3	97.8	97.6	97.8	96.9	96.5	97.3
14	3.19	203.23	2 761	99.2	99.1	99.3	98.7	97.9	98.5	98.0	98.3	97.1	97.2	97.2
15	3.17	198.81	2 749	99.5	98.5	98.9	98.4	97.3	98.4	97.4	99.2	97.5	97.0	97.4
16	3.19	205.05	2 796	99.1	100.1	98.6	98.6	97.5	98.0	97.5	98.2	96.6	96.7	97.0
17	3.19	206.07	2 826	98.8	99.4	99.3	98.8	98.1	98.9	98.5	98.8	97.8	97.7	98.2
18	3.20	206.55	2 795	99.1	99.7	98.8	98.9	97.6	98.5	98.2	98.3	96.7	97.3	97.6
19	3.18	204.32	2 806	99.2	100.3	99.3	99.3	98.6	99.0	98.8	98.6	98.2	97.3	98.5
20	3.15	198.36	2 798	99.3	98.6	98.6	98.4	97.1	97.8	97.3	97.6	96.8	96.6	97.0
21	3.21	202.21	2 788	98.8	99.2	98.1	98.6	96.5	97.9	96.8	97.3	96.4	96.3	96.6
22	3.20	203.48	2 827	99.5	99.5	99.2	99.4	97.8	98.6	97.9	98.4	97.7	97.7	97.7
23	3.22	206.70	2 827	99.0	99.9	99.0	99.1	98.0	98.5	98.2	99.0	97.0	97.5	98.5
24	3.22	204.80	2 800	99.2	99.6	98.7	98.8	97.8	99.2	98.1	98.9	97.4	98.1	98.5
25	3.21	203.88	2 794	99.4	100.3	99.0	99.7	98.2	98.7	98.6	98.7	97.7	97.2	98.3
Max.	3.22	207.29	2 830	99.5	100.3	99.3	99.7	98.6	100.1	99.1	99.3	98.7	98.2	98.5
Ave.	3.19	203.55	2 796	99.0	99.4	98.6	98.9	97.8	98.6	98.1	98.5	97.2	97.2	97.6
Min.	3.15	198.36	2 726	98.4	98.5	97.8	98.4	96.5	97.8	96.8	97.3	96.4	96.1	96.5
Med.	3.19	203.88	2 798	99.0	99.4	98.7	98.8	97.9	98.7	98.2	98.6	97.1	97.2	97.5
Std.	0.02	2.32	27	0.3	0.5	0.5	0.4	0.5	0.6	0.6	0.5	0.6	0.6	0.6

**Lumen Maintenance (%)**




**[ CHROMATICITY SHIFT ]**

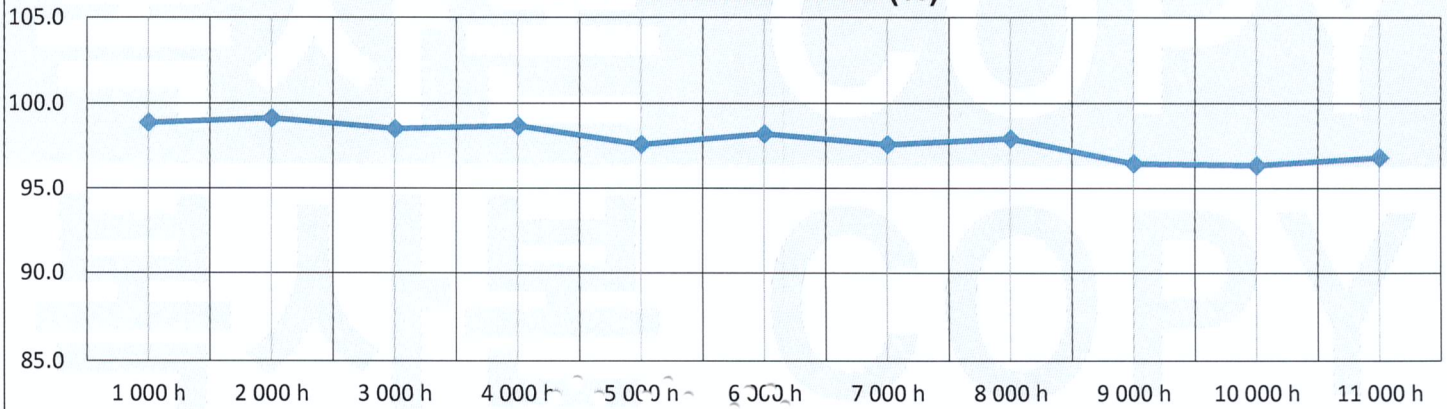
No.	u'	v'	Chromaticity Shift										
	0 h		1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h
1	0.262 2	0.531 9	0.002 1	0.004 0	0.003 9	0.003 9	0.004 4	0.004 7	0.004 5	0.004 7	0.004 6	0.004 5	0.0044
2	0.258 6	0.530 1	0.001 8	0.003 6	0.003 5	0.003 8	0.004 0	0.004 3	0.004 3	0.004 5	0.004 2	0.004 4	0.0043
3	0.258 6	0.529 4	0.001 9	0.003 9	0.003 7	0.003 9	0.004 3	0.004 7	0.004 7	0.004 8	0.004 6	0.004 6	0.0045
4	0.257 7	0.529 6	0.002 1	0.003 8	0.003 6	0.003 8	0.004 1	0.004 4	0.004 5	0.004 8	0.004 8	0.004 8	0.0046
5	0.258 8	0.530 5	0.001 8	0.003 7	0.003 5	0.003 7	0.004 1	0.004 5	0.004 3	0.004 5	0.004 4	0.004 3	0.0044
6	0.259 0	0.530 3	0.001 9	0.003 9	0.003 8	0.003 8	0.004 2	0.004 5	0.004 6	0.004 7	0.004 5	0.004 8	0.0046
7	0.259 7	0.530 2	0.002 3	0.004 2	0.004 2	0.004 3	0.004 5	0.004 8	0.004 9	0.005 0	0.004 8	0.004 9	0.0047
8	0.258 1	0.530 5	0.002 0	0.003 9	0.003 8	0.003 9	0.004 2	0.004 6	0.004 7	0.004 8	0.004 6	0.004 8	0.0045
9	0.259 1	0.530 5	0.001 9	0.003 9	0.003 7	0.003 9	0.004 1	0.004 3	0.004 3	0.004 6	0.004 4	0.004 4	0.0043
10	0.259 2	0.530 0	0.002 0	0.003 9	0.003 8	0.003 8	0.004 2	0.004 3	0.004 4	0.004 6	0.004 4	0.004 4	0.0043
11	0.258 4	0.530 5	0.001 7	0.003 7	0.003 5	0.003 7	0.003 8	0.004 4	0.004 2	0.004 4	0.004 3	0.004 2	0.0042
12	0.261 4	0.532 7	0.002 2	0.004 0	0.003 9	0.004 1	0.004 2	0.004 5	0.004 4	0.004 6	0.004 4	0.004 5	0.0043
13	0.259 2	0.530 5	0.001 9	0.003 7	0.003 5	0.003 6	0.004 0	0.004 3	0.004 4	0.004 5	0.004 4	0.004 4	0.0044
14	0.260 7	0.531 0	0.002 1	0.003 9	0.004 0	0.003 9	0.004 3	0.004 7	0.004 7	0.004 9	0.004 8	0.004 8	0.0047
15	0.261 1	0.532 2	0.002 2	0.003 9	0.004 0	0.003 9	0.004 2	0.004 6	0.004 4	0.004 9	0.004 7	0.004 7	0.0046
16	0.259 3	0.529 9	0.002 0	0.003 9	0.003 7	0.003 7	0.004 2	0.004 4	0.004 4	0.004 6	0.004 4	0.004 4	0.0044
17	0.257 9	0.529 9	0.001 8	0.003 7	0.003 7	0.003 7	0.004 1	0.004 4	0.004 4	0.004 5	0.004 4	0.004 4	0.0043
18	0.259 2	0.530 4	0.001 8	0.003 6	0.003 5	0.003 6	0.003 9	0.004 2	0.004 4	0.004 4	0.004 3	0.004 5	0.0044
19	0.258 9	0.529 2	0.002 0	0.003 9	0.003 8	0.003 9	0.004 3	0.004 5	0.004 6	0.004 6	0.004 7	0.004 5	0.0046
20	0.259 0	0.530 4	0.001 9	0.003 7	0.003 8	0.003 8	0.004 1	0.004 4	0.004 4	0.004 6	0.004 6	0.004 6	0.0044
21	0.259 6	0.530 2	0.001 8	0.003 7	0.003 5	0.003 7	0.003 9	0.004 4	0.004 3	0.004 4	0.004 4	0.004 4	0.0043
22	0.258 1	0.528 6	0.002 1	0.003 9	0.003 8	0.003 9	0.004 3	0.004 5	0.004 5	0.004 6	0.004 5	0.004 6	0.0043
23	0.257 9	0.529 6	0.002 0	0.003 8	0.003 6	0.003 8	0.004 1	0.004 4	0.004 4	0.004 7	0.004 4	0.004 5	0.0046
24	0.259 1	0.530 0	0.002 1	0.003 9	0.003 7	0.003 8	0.004 2	0.004 6	0.004 4	0.004 7	0.004 5	0.004 6	0.0046
25	0.259 1	0.531 2	0.002 1	0.004 0	0.003 9	0.004 1	0.004 4	0.004 7	0.004 7	0.004 8	0.004 7	0.004 7	0.0048
Max.	0.262 2	0.532 7	0.002 3	0.004 2	0.004 2	0.004 3	0.004 5	0.004 8	0.004 9	0.005 0	0.004 8	0.004 9	0.004 8
Ave.	0.259 2	0.530 4	0.002 0	0.003 8	0.003 7	0.003 8	0.004 2	0.004 5	0.004 5	0.004 7	0.004 5	0.004 5	0.004 5
Min.	0.257 7	0.528 6	0.001 7	0.003 6	0.003 5	0.003 6	0.003 8	0.004 2	0.004 2	0.004 4	0.004 2	0.004 2	0.004 2
Med.	0.259 1	0.530 3	0.002 0	0.003 9	0.003 7	0.003 8	0.004 2	0.004 5	0.004 4	0.004 6	0.004 5	0.004 5	0.004 4
Std.	0.001 1	0.000 9	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2

**Chromaticity Shift**




**3.3 Condition 3 : [ Ts = 105 °C]**
**[ LUMEN MAINTENANCE ]**

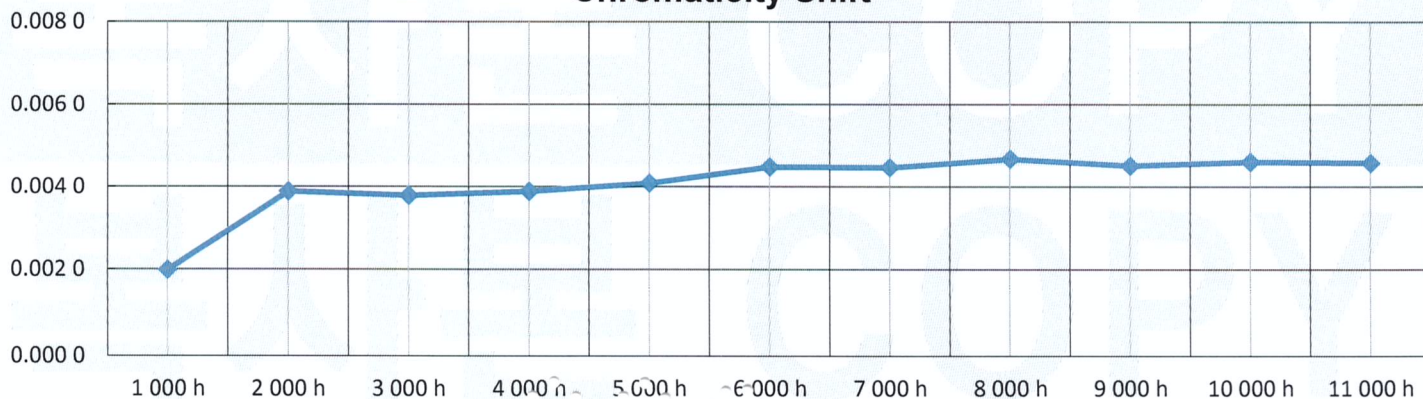
No.	Vf(V)	Flux(lm)	CCT(K)	Lumen Maintenance (%)										
	0 h			1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h
1	3.19	201.77	2 775	98.8	99.1	98.9	99.0	97.7	98.2	97.4	98.2	96.5	97.2	96.3
2	3.18	200.27	2 827	98.7	98.5	97.8	98.2	97.8	98.5	98.0	98.1	96.6	96.3	96.0
3	3.16	202.12	2 808	99.0	99.4	99.0	99.1	98.0	98.8	98.0	98.2	96.8	96.7	97.5
4	3.19	202.77	2 800	98.6	98.9	97.9	99.0	97.6	98.2	98.0	98.1	96.7	96.6	97.3
5	3.19	199.51	2 718	99.7	99.9	99.0	99.6	98.6	98.8	98.2	99.6	96.7	97.3	97.0
6	3.19	201.77	2 802	99.4	99.8	99.2	98.9	98.1	99.3	97.8	98.1	97.2	96.8	97.2
7	3.19	201.53	2 824	99.0	99.0	98.5	98.6	98.0	98.3	98.5	98.0	96.8	96.8	97.5
8	3.23	204.59	2 771	98.6	99.2	98.1	98.9	97.6	98.8	98.4	98.4	96.5	96.7	97.3
9	3.23	205.42	2 782	98.8	100.0	99.0	99.8	98.2	98.9	98.9	98.5	97.3	97.1	97.8
10	3.21	203.92	2 794	98.8	99.4	99.2	98.4	97.9	98.4	97.4	98.9	96.4	96.4	97.1
11	3.23	200.48	2 787	99.2	99.3	98.6	98.3	97.6	98.3	97.3	98.0	96.5	96.3	97.1
12	3.15	200.97	2 809	98.4	98.6	98.0	98.0	96.4	97.0	96.7	96.5	95.7	95.5	95.8
13	3.18	203.99	2 813	98.6	99.0	98.3	98.3	97.3	97.6	97.0	98.1	96.0	96.2	97.4
14	3.17	203.20	2 829	98.7	99.0	98.6	99.1	97.9	98.4	97.7	97.6	96.6	96.0	96.4
15	3.18	203.32	2 791	98.6	98.8	97.8	98.6	96.5	97.7	96.5	96.9	95.7	94.8	95.9
16	3.17	204.67	2 818	99.2	99.9	98.9	99.2	98.5	98.7	98.4	98.6	96.7	96.5	97.5
17	3.21	202.63	2 787	98.5	98.6	98.4	98.3	96.7	98.2	96.9	97.4	96.0	95.6	96.3
18	3.18	201.32	2 805	99.1	99.0	98.7	98.7	97.7	97.9	97.0	97.8	96.0	95.8	96.3
19	3.19	203.28	2 767	98.8	99.6	98.5	99.3	97.3	98.2	98.2	97.7	96.6	97.0	96.6
20	3.19	201.66	2 767	98.8	99.6	99.1	98.4	97.6	98.4	97.3	98.1	97.1	96.5	96.6
21	3.14	196.30	2 786	99.3	98.6	97.6	98.0	97.0	97.7	97.0	97.5	96.1	95.8	96.4
22	3.23	204.27	2 795	98.7	98.6	98.4	98.0	97.4	97.5	97.7	97.5	96.5	96.2	96.8
23	3.20	203.16	2 821	98.6	98.7	98.8	98.8	97.3	97.7	96.9	97.1	95.9	96.3	97.1
24	3.22	200.35	2 823	99.1	98.6	98.3	98.0	96.9	97.6	97.3	97.8	96.4	96.1	96.3
25	3.23	202.49	2 754	99.7	100.0	98.9	99.4	99.0	99.0	98.0	98.1	97.1	97.1	97.4
Max.	3.23	205.42	2 829	99.7	100.0	99.2	99.8	99.0	99.3	98.9	99.6	97.3	97.3	97.8
Ave.	3.19	202.23	2 794	98.9	99.2	98.5	98.7	97.6	98.2	97.6	98.0	96.5	96.4	96.8
Min.	3.14	196.30	2 718	98.4	98.5	97.6	98.0	96.4	97.0	96.5	96.5	95.7	94.8	95.8
Med.	3.19	202.49	2 795	98.8	99.0	98.6	98.7	97.6	98.3	97.7	98.1	96.5	96.4	97.0
Std.	0.03	1.97	26	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.5	0.6	0.6

**Lumen Maintenance (%)**




**[ 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	10 000 h	11 000 h
1	0.259 9	0.531 7	0.001 6	0.003 6	0.003 6	0.003 6	0.003 8	0.004 2	0.004 1	0.004 4	0.004 2	0.004 5	0.004 1
2	0.257 9	0.529 3	0.001 7	0.003 5	0.003 4	0.003 6	0.004 0	0.004 4	0.004 4	0.004 6	0.004 4	0.004 6	0.004 4
3	0.258 6	0.529 9	0.002 2	0.004 0	0.003 8	0.004 0	0.004 2	0.004 5	0.004 5	0.004 7	0.004 5	0.004 6	0.004 7
4	0.259 0	0.530 1	0.002 0	0.003 8	0.003 6	0.003 9	0.004 1	0.004 4	0.004 5	0.004 7	0.004 4	0.004 6	0.004 7
5	0.262 4	0.532 9	0.002 7	0.004 6	0.004 5	0.004 6	0.004 9	0.005 1	0.005 1	0.005 4	0.005 0	0.005 1	0.004 8
6	0.259 0	0.529 8	0.002 1	0.003 9	0.003 7	0.003 8	0.004 1	0.004 5	0.004 4	0.004 6	0.004 6	0.004 7	0.004 8
7	0.258 1	0.529 0	0.001 9	0.003 7	0.003 6	0.003 7	0.004 1	0.004 3	0.004 6	0.004 5	0.004 5	0.004 6	0.004 7
8	0.260 1	0.531 5	0.002 0	0.003 9	0.003 7	0.003 8	0.004 1	0.004 6	0.004 6	0.004 7	0.004 4	0.004 5	0.004 6
9	0.259 7	0.530 8	0.001 8	0.003 7	0.003 5	0.003 7	0.003 9	0.004 2	0.004 4	0.004 5	0.004 3	0.004 5	0.004 5
10	0.259 2	0.530 5	0.002 2	0.004 0	0.004 0	0.003 8	0.004 2	0.004 5	0.004 3	0.004 8	0.004 4	0.004 5	0.004 5
11	0.259 6	0.530 0	0.002 2	0.004 0	0.003 9	0.003 9	0.004 2	0.004 6	0.004 5	0.004 8	0.004 6	0.004 6	0.004 7
12	0.258 6	0.530 1	0.001 9	0.004 0	0.003 8	0.003 9	0.004 0	0.004 3	0.004 5	0.004 6	0.004 6	0.004 7	0.004 5
13	0.258 6	0.529 1	0.001 9	0.003 8	0.003 7	0.003 8	0.004 1	0.004 4	0.004 5	0.004 9	0.004 6	0.004 8	0.004 9
14	0.258 1	0.527 8	0.002 0	0.003 9	0.003 8	0.004 0	0.004 3	0.004 6	0.004 6	0.004 7	0.004 7	0.004 7	0.004 7
15	0.259 3	0.530 7	0.001 6	0.003 5	0.003 3	0.003 6	0.003 8	0.004 3	0.004 1	0.004 4	0.004 4	0.004 3	0.004 5
16	0.258 4	0.528 8	0.002 0	0.003 8	0.003 6	0.003 8	0.004 2	0.004 4	0.004 5	0.004 8	0.004 5	0.004 6	0.004 7
17	0.259 5	0.530 8	0.002 2	0.004 0	0.004 0	0.004 1	0.004 3	0.004 9	0.004 7	0.005 0	0.004 8	0.004 7	0.004 7
18	0.258 8	0.530 1	0.001 8	0.003 5	0.003 5	0.003 6	0.003 9	0.004 2	0.004 2	0.004 5	0.004 3	0.004 3	0.004 3
19	0.260 3	0.531 2	0.002 1	0.004 0	0.003 8	0.004 0	0.004 1	0.004 5	0.004 6	0.004 7	0.004 6	0.004 8	0.004 5
20	0.260 2	0.532 0	0.001 9	0.004 0	0.003 9	0.003 8	0.004 2	0.004 5	0.004 3	0.004 6	0.004 6	0.004 5	0.004 4
21	0.259 7	0.530 0	0.002 3	0.004 3	0.004 1	0.004 2	0.004 5	0.004 9	0.004 8	0.005 1	0.004 9	0.004 9	0.004 8
22	0.259 2	0.530 0	0.002 1	0.003 7	0.003 7	0.003 7	0.004 1	0.004 3	0.004 5	0.004 6	0.004 6	0.004 6	0.004 6
23	0.258 1	0.529 5	0.001 9	0.003 7	0.003 8	0.003 9	0.004 2	0.004 5	0.004 4	0.004 6	0.004 4	0.004 8	0.004 8
24	0.258 1	0.529 0	0.002 0	0.003 7	0.003 6	0.003 6	0.003 9	0.004 2	0.004 3	0.004 5	0.004 4	0.004 4	0.004 3
25	0.260 9	0.531 8	0.002 4	0.004 2	0.003 9	0.004 1	0.004 5	0.004 7	0.004 6	0.004 7	0.004 7	0.004 8	0.004 7
Max.	0.262 4	0.532 9	0.002 7	0.004 6	0.004 5	0.004 6	0.004 9	0.005 1	0.005 1	0.005 4	0.005 0	0.005 1	0.004 9
Ave.	0.259 2	0.530 3	0.002 0	0.003 9	0.003 8	0.003 9	0.004 1	0.004 5	0.004 5	0.004 7	0.004 5	0.004 6	0.004 6
Min.	0.257 9	0.527 8	0.001 6	0.003 5	0.003 3	0.003 6	0.003 8	0.004 2	0.004 1	0.004 4	0.004 2	0.004 3	0.004 1
Med.	0.259 2	0.530 1	0.002 0	0.003 9	0.003 7	0.003 8	0.004 1	0.004 5	0.004 5	0.004 7	0.004 5	0.004 6	0.004 7
Std.	0.001 0	0.001 2	0.000 2	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2

**Chromaticity Shift**






## SEOUL SEMICONDUCTOR

### 4. Additional Test Information

- Covered Models : SZ5-M2-WW-xx, 700mA  
SZ5-M2-WN-xx, 700mA  
SZ5-M2-WC-xx, 700mA
- This report is also applicable to above models with lower LED power.

### 5. Revision History

Revision No.	Revision Date	Contents
01	Jul. 03, 2015	First Issued
02	Nov. 24, 2015	Second Issued for test duration 9 000 h
03	Apr. 12, 2016	Third Issued for test duration 11 000 h