





Report No. : SLED-16-019

LM80 Test Report

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

Samsung Electronics LED Business Report

Report No. : SLED-16-019
Test Initiated Date : 2015.03.12
Test End Date : 2016.06.28
Report issued Date : 2016.07.05

Test result reported for	Testing performed by
SAMSUNG ELECTRONICS LED BUSINESS Lighting Marketing Group	SAMSUNG ELECTRONICS LED BUSINESS 1, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do 17113, Korea
Tested By JaeYun Song	Approved by DooSung Park
	
Test Personal Name & Signatory	Approval Name & Signatory

**SAMSUNG ELECTRONICS LED BUSINESS Executive Vice President
Accredited by KOLAS, Republic of KOREA**

The above testing certificate is the accredited testing items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

■ Test Summary ■

Life test condition			Summary of result		
Test condition	Current (mA)	Case temperature (°C)	Test duration (h)	Average lumen maintenance (%)	Maximum chromaticity shift ($\Delta u'v'$)
1	1 000	55.2 °C	10 000	97.7	0.000 7
2	1 000	85.0 °C	10 000	96.6	0.002 4
3	1 000	105.1 °C	10 000	95.9	0.003 2

1. Number of LED light sources tested

- 20 Packages tested at actual case temperature 55.2 °C
- 20 Packages tested at actual case temperature 85.0 °C
- 20 Packages tested at actual case temperature 105.1 °C

2. Description of LED light sources

- IF = 1000 mA , CCT(Nominal) = 3 000 K
- Package Dimension : (3.5 × 3.5) mm
- Samsung Electronics LED Package : LH351B series
(SPHWH1L3D3xxxxxxxx, SPHWH2L3D3xxxxxxxx, SPHWH3L3D3xxxxxxxx, SPHWHAL3D3xxxxxxxx, SPHWHBL3D3xxxxxxxx)

3. Description of auxiliary equipment

- 1) Instrument Integrating sphere ISP1000-100
- 2) Instrument CAS140-CT
- 3) Keithley 2425 Sourcemeater

4. Operating time

- 10 000 h at (55.2 °C , 85.0 °C , 105.1 °C)
- Drive current : 1000 mA
- Typical voltage : 3.1 V
- * LED packages are driven with a constant direct current.

5. Ambient conditions including airflow, temperature and relative humidity

The minimal airflow is maintained in chamber.

The ambient temperature around the LED packages inside chamber is controlled by air flowing and the thermocouple readings are monitored.

- Case temperature : Contorlled to -2 °C
- Surrounding air temperature : Contorlled to -5 °C
- Relative humidity : < 65 % R.H.

6. Case temperature (Test point temperature)



Case Temperature Measurement Point

7. Drive current of the LED light source during lifetime test

See Sub-clause 9.1, 9.2 and 9.3

8. Initial luminous flux and forward voltage

See the table

9. Lumen maintenance data for each individual LED light source

See the table



Report No. : SLED-16-019

9.1 Test condition 1 55 °C
 Drive Current 1000 mA
 Measurement Current 1000 mA

No.	Flux (lm)	Vf (V)	Lumen Maintenance (%)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	181.5	3.107	99.2	97.9	98.3	97.8	97.3	98.1	97.4
2	187.1	3.161	99.4	97.9	98.1	97.5	98.0	97.7	97.6
3	181.3	3.165	99.2	98.1	98.3	97.7	97.5	98.0	98.0
4	180.3	3.084	99.1	98.6	97.8	97.7	97.4	97.8	98.2
5	186.1	3.086	100.2	98.9	99.4	98.7	98.4	98.9	98.4
6	186.7	3.068	99.1	98.6	98.1	98.6	98.2	97.7	98.4
7	188.4	3.057	99.2	98.8	98.3	97.7	98.2	97.7	98.2
8	188.1	3.095	99.0	98.6	98.0	98.6	98.2	97.6	98.2
9	183.2	3.088	99.3	98.9	98.4	97.8	98.4	97.8	98.5
10	186.5	3.053	99.2	97.9	98.4	98.0	97.5	98.0	97.8
11	186.1	3.121	99.2	98.7	98.3	98.6	98.4	97.7	98.6
12	182.9	3.086	99.4	98.1	98.7	98.0	97.7	98.1	97.8
13	185.4	3.157	98.9	98.6	98.2	98.5	98.2	97.8	98.5
14	181.6	3.162	99.2	98.0	98.3	97.8	98.3	97.9	97.9
15	177.4	3.124	99.6	98.7	98.9	98.0	98.4	98.4	98.3
16	183.2	3.070	100.1	99.0	99.0	99.1	98.4	98.5	98.5
17	183.5	3.106	99.6	98.7	98.8	99.0	98.3	98.5	98.4
18	186.9	3.124	98.8	98.7	98.1	98.2	97.6	97.7	98.5
19	185.7	3.098	99.0	97.9	98.5	98.5	97.8	97.9	97.7
20	178.0	3.080	99.2	98.2	98.5	97.9	98.1	98.3	98.1
Mean	184.0	3.10	99.3	98.4	98.4	98.2	98.0	98.0	98.1
Median	184.4	3.10	99.2	98.6	98.3	98.0	98.2	97.9	98.2
std.dev	3.2	0.04	0.3	0.4	0.4	0.5	0.4	0.3	0.3
Max	188.4	3.17	100.2	99.0	99.4	99.1	98.4	98.9	98.6
Min	177.4	3.05	98.8	97.9	97.8	97.5	97.3	97.6	97.4



Report No. : SLED-16-019

9.1 Test condition 1 55 °C
Drive Current 1000 mA
Measurement Current 1000 mA

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	97.6	98.1	97.5	97.3					
2	97.7	98.0	97.9	97.8					
3	97.0	97.7	97.8	97.9					
4	97.5	97.9	97.9	98.0					
5	97.1	98.4	98.4	97.6					
6	97.5	98.4	98.2	97.9					
7	96.7	98.1	97.0	97.4					
8	97.0	98.0	97.8	98.1					
9	97.9	98.0	98.0	97.6					
10	96.6	97.7	97.8	97.6					
11	97.6	98.3	97.9	97.7					
12	97.8	97.6	98.0	97.6					
13	97.8	97.3	97.6	97.6					
14	97.9	98.6	98.0	97.6					
15	97.7	98.0	97.9	98.0					
16	97.5	98.5	98.4	98.0					
17	97.8	98.1	98.0	97.6					
18	97.6	97.3	98.0	97.3					
19	96.8	97.2	97.5	97.3					
20	97.2	98.0	97.5	97.6					
Mean	97.4	98.0	97.9	97.7					
Median	97.6	98.0	97.9	97.6					
std.dev	0.4	0.4	0.3	0.2					
Max	97.9	98.6	98.4	98.1	0.0	0.0	0.0	0.0	0.0
Min	96.6	97.2	97.0	97.3	0.0	0.0	0.0	0.0	0.0

9.1 Test condition 1 **55 °C**
Drive Current **1000 mA**
Measurement Current **1000 mA**

No.	Cx	Cy	Chromaticity Shift ($\Delta u'v'$)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.435 5	0.402 3	0.000 2	0.000 3	0.000 0	0.000 1	0.000 0	0.000 1	0.000 0
2	0.434 0	0.401 0	0.000 1	0.000 5	0.000 1	0.000 1	0.000 2	0.000 0	0.000 3
3	0.432 9	0.398 0	0.000 2	0.000 3	0.000 1	0.000 2	0.000 1	0.000 2	0.000 3
4	0.434 3	0.400 7	0.000 2	0.000 2	0.000 3	0.000 1	0.000 1	0.000 4	0.000 2
5	0.434 4	0.400 1	0.000 1	0.000 2	0.000 0	0.000 1	0.000 0	0.000 1	0.000 0
6	0.436 8	0.402 1	0.000 1	0.000 1	0.000 0	0.000 1	0.000 2	0.000 1	0.000 3
7	0.436 3	0.401 4	0.000 3	0.000 3	0.000 2	0.000 3	0.000 0	0.000 2	0.000 0
8	0.434 5	0.401 7	0.000 1	0.000 0	0.000 0	0.000 0	0.000 1	0.000 1	0.000 1
9	0.434 7	0.400 1	0.000 1	0.000 2	0.000 1	0.000 2	0.000 1	0.000 0	0.000 1
10	0.434 8	0.400 5	0.000 2	0.000 5	0.000 4	0.000 4	0.000 3	0.000 2	0.000 3
11	0.435 6	0.401 2	0.000 1	0.000 1	0.000 0	0.000 0	0.000 2	0.000 2	0.000 2
12	0.436 6	0.401 2	0.000 1	0.000 3	0.000 1	0.000 2	0.000 2	0.000 0	0.000 0
13	0.433 8	0.399 8	0.000 0	0.000 1	0.000 0	0.000 1	0.000 0	0.000 1	0.000 2
14	0.435 4	0.400 0	0.000 3	0.000 4	0.000 1	0.000 2	0.000 1	0.000 1	0.000 4
15	0.436 5	0.402 7	0.000 0	0.000 1	0.000 1	0.000 1	0.000 0	0.000 1	0.000 1
16	0.434 5	0.402 6	0.000 2	0.000 3	0.000 0	0.000 1	0.000 2	0.000 2	0.000 1
17	0.437 5	0.404 0	0.000 1	0.000 6	0.000 4	0.000 4	0.000 4	0.000 4	0.000 4
18	0.439 5	0.404 7	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
19	0.438 3	0.404 2	0.000 5	0.000 6	0.000 5	0.000 6	0.000 5	0.000 5	0.000 6
20	0.435 8	0.400 6	0.000 1	0.000 7	0.000 5	0.000 7	0.000 5	0.000 6	0.000 5
Mean	0.435 6	0.401 4	0.000 2	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
Median	0.435 5	0.401 2	0.000 1	0.000 3	0.000 1	0.000 2	0.000 2	0.000 2	0.000 2
std.dev	0.001 6	0.001 6	0.000 1	0.000 2	0.000 2	0.000 2	0.000 1	0.000 2	0.000 2
Max	0.439 5	0.404 7	0.000 5	0.000 7	0.000 5	0.000 7	0.000 5	0.000 6	0.000 6
Min	0.432 9	0.398 0	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0



9.1 Test condition 1

55 °C

Report No. : SLED-16-019

Dirve Current

1000 mA

Measurement Current

1000 mA

No.	Chromaticity Shift ($\Delta u'v'$)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	0.000 5	0.000 5	0.000 5	0.000 3					
2	0.000 5	0.000 5	0.000 5	0.000 6					
3	0.000 4	0.000 5	0.000 5	0.000 4					
4	0.000 6	0.000 5	0.000 7	0.000 5					
5	0.000 4	0.000 6	0.000 6	0.000 5					
6	0.000 5	0.000 7	0.000 7	0.000 5					
7	0.000 5	0.000 4	0.000 5	0.000 5					
8	0.000 5	0.000 8	0.000 7	0.000 6					
9	0.000 5	0.000 5	0.000 5	0.000 5					
10	0.000 5	0.000 5	0.000 5	0.000 3					
11	0.000 5	0.000 8	0.000 8	0.000 7					
12	0.000 4	0.000 5	0.000 5	0.000 2					
13	0.000 6	0.000 5	0.000 4	0.000 5					
14	0.000 5	0.000 5	0.000 5	0.000 6					
15	0.000 5	0.000 7	0.000 8	0.000 6					
16	0.000 5	0.000 7	0.000 7	0.000 6					
17	0.000 6	0.000 7	0.000 7	0.000 6					
18	0.000 7	0.000 6	0.000 7	0.000 6					
19	0.000 6	0.000 6	0.000 5	0.000 4					
20	0.000 7	0.000 7	0.000 7	0.000 5					
Mean	0.000 5	0.000 6	0.000 6	0.000 5					
Median	0.000 5	0.000 5	0.000 6	0.000 5					
std.dev	0.000 1	0.000 1	0.000 1	0.000 1					
Max	0.000 7	0.000 8	0.000 8	0.000 7					
Min	0.000 4	0.000 4	0.000 4	0.000 2	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0

9.1 Test condition 1
55 °C
Drive Current
1000 mA
Measurement Current
1000 mA

No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	3 019	3 016	3 018	3 016					
2	3 039	3 034	3 034	3 034					
3	3 031	3 031	3 033	3 032					
4	3 034	3 031	3 031	3 028					
5	3 023	3 023	3 024	3 024					
6	2 992	2 994	2 994	2 997					
7	2 999	2 996	3 002	3 002					
8	3 036	3 033	3 032	3 033					
9	3 021	3 019	3 021	3 018					
10	3 022	3 019	3 019	3 015					
11	3 008	3 005	3 004	3 002					
12	2 990	2 989	2 993	2 989					
13	3 034	3 029	3 029	3 027					
14	3 008	3 003	3 003	3 000					
15	3 008	3 005	3 012	3 006					
16	3 038	3 038	3 038	3 035					
17	3 007	3 004	3 006	3 005					
18	2 981	2 978	2 981	2 978					
19	2 995	2 994	2 993	2 990					
20	3 013	3 011	3 008	3 005					
Mean	3 015	3 013	3 014	3 012					
Median	3 016	3 014	3 015	3 011					
std.dev	18	17	16	17					
Max	3 039	3 038	3 038	3 035	00	00	00	00	00
Min	2 981	2 978	2 981	2 978	00	00	00	00	00

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 SLED-TP-22-03(04)



9.2 Test condition 2 85 °C
 Drive Current 1000 mA
 Measurement Current 1000 mA

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	97.5	97.3	96.8	96.8					
2	97.0	97.1	96.9	96.5					
3	97.5	97.4	97.0	97.5					
4	97.0	97.1	97.1	97.2					
5	97.5	97.1	97.4	97.0					
6	97.5	96.9	97.0	97.3					
7	97.0	96.7	96.4	96.6					
8	97.6	97.0	97.1	97.3					
9	96.6	96.1	96.5	96.1					
10	97.8	97.0	96.6	96.3					
11	97.6	96.3	96.1	96.2					
12	96.5	95.9	96.2	95.8					
13	96.4	96.6	96.2	96.1					
14	96.4	95.8	95.8	96.1					
15	97.1	96.8	96.5	96.3					
16	97.1	96.4	96.5	96.0					
17	96.5	96.5	96.4	96.0					
18	97.6	96.4	97.4	96.5					
19	97.0	97.0	96.7	96.0					
20	97.7	96.9	97.1	97.3					
Mean	97.2	96.7	96.7	96.6					
Median	97.1	96.9	96.7	96.4					
std.dev	0.5	0.4	0.4	0.5					
Max	97.8	97.4	97.4	97.5	0.0	0.0	0.0	0.0	0.0
Min	96.4	95.8	95.8	95.8	0.0	0.0	0.0	0.0	0.0



9.2 Test condition 2

85 °C

Report No. : SLED-16-019

Drive Current

1000 mA

Measurement Current

1000 mA

No.	Cx	Cy	Chromaticity Shift ($\Delta u'v'$)						
	0 h		500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.433 8	0.400 7	0.000 1	0.000 1	0.000 2	0.000 0	0.000 2	0.000 0	0.000 4
2	0.433 0	0.397 5	0.000 0	0.000 1	0.000 2	0.000 3	0.000 5	0.000 3	0.000 4
3	0.439 3	0.404 1	0.000 1	0.000 0	0.000 2	0.000 2	0.000 2	0.000 1	0.000 2
4	0.437 3	0.403 6	0.000 1	0.000 0	0.000 0	0.000 0	0.000 0	0.000 1	0.000 1
5	0.436 1	0.402 8	0.000 0	0.000 1	0.000 1	0.000 2	0.000 0	0.000 3	0.000 0
6	0.434 4	0.400 4	0.000 1	0.000 1	0.000 2	0.000 2	0.000 3	0.000 3	0.000 2
7	0.433 5	0.399 8	0.000 1	0.000 2	0.000 1	0.000 2	0.000 2	0.000 2	0.000 1
8	0.438 2	0.403 1	0.000 1	0.000 2	0.000 1	0.000 3	0.000 1	0.000 0	0.000 0
9	0.434 1	0.402 6	0.001 2	0.001 7	0.001 8	0.002 0	0.002 1	0.002 1	0.002 4
10	0.434 9	0.402 5	0.000 8	0.001 3	0.001 4	0.001 5	0.001 6	0.001 8	0.002 0
11	0.435 1	0.402 4	0.001 3	0.001 8	0.002 0	0.002 1	0.002 1	0.002 3	0.002 6
12	0.436 3	0.404 3	0.001 2	0.001 7	0.001 9	0.001 9	0.002 0	0.002 2	0.002 5
13	0.438 5	0.404 5	0.001 1	0.001 3	0.001 6	0.001 7	0.001 8	0.001 7	0.002 1
14	0.435 3	0.403 2	0.000 2	0.001 2	0.001 5	0.001 6	0.001 7	0.001 8	0.002 0
15	0.435 2	0.404 2	0.000 8	0.001 2	0.001 4	0.001 5	0.001 5	0.001 6	0.001 8
16	0.431 9	0.400 6	0.001 0	0.001 3	0.001 6	0.001 6	0.001 7	0.001 8	0.002 0
17	0.432 3	0.401 0	0.000 6	0.001 5	0.001 8	0.001 7	0.002 0	0.002 0	0.002 1
18	0.436 7	0.404 3	0.001 0	0.001 2	0.001 4	0.001 4	0.001 6	0.001 6	0.001 8
19	0.436 4	0.404 1	0.001 1	0.001 3	0.001 6	0.001 6	0.001 9	0.001 9	0.002 1
20	0.436 0	0.402 8	0.001 1	0.001 5	0.001 8	0.001 7	0.001 9	0.002 0	0.002 4
Mean	0.435 4	0.402 4	0.000 6	0.000 9	0.001 0	0.001 1	0.001 2	0.001 2	0.001 4
Median	0.435 3	0.402 8	0.000 7	0.001 2	0.001 4	0.001 5	0.001 6	0.001 7	0.001 9
std.dev	0.002 0	0.001 9	0.000 5	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.001 0
Max	0.439 3	0.404 5	0.001 3	0.001 8	0.002 0	0.002 1	0.002 1	0.002 3	0.002 6
Min	0.431 9	0.397 5	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0	0.000 0

9.2 Test condition 2 85 °C
 Dirve Current 1000 mA
 Measurement Current 1000 mA

No.	CCT (K)							
	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	3 029	3 027	3 031	3 023	3 028	3 022	3 028	3 017
2	3 017	3 017	3 014	3 012	3 008	3 005	3 008	3 007
3	2 962	2 960	2 962	2 958	2 958	2 958	2 960	2 957
4	2 992	2 990	2 993	2 991	2 992	2 992	2 993	2 989
5	3 006	3 005	3 008	3 004	3 011	3 006	3 014	3 005
6	3 016	3 018	3 014	3 012	3 010	3 008	3 009	3 010
7	3 027	3 029	3 033	3 029	3 031	3 031	3 033	3 029
8	2 973	2 977	2 979	2 974	2 981	2 974	2 974	2 972
9	3 039	3 012	3 004	3 000	3 000	2 999	3 000	2 989
10	3 025	3 008	3 001	2 995	2 998	2 996	2 994	2 984
11	3 020	2 992	2 983	2 976	2 977	2 979	2 975	2 966
12	3 015	2 989	2 979	2 975	2 976	2 974	2 972	2 962
13	2 978	2 958	2 954	2 948	2 950	2 948	2 947	2 939
14	3 024	3 025	3 003	2 996	2 995	2 995	2 994	2 984
15	3 033	3 017	3 008	3 004	3 005	3 006	3 004	2 995
16	3 062	3 041	3 037	3 030	3 034	3 033	3 030	3 020
17	3 057	3 047	3 027	3 021	3 026	3 024	3 022	3 014
18	3 008	2 987	2 984	2 979	2 982	2 981	2 980	2 972
19	3 012	2 989	2 985	2 979	2 981	2 978	2 977	2 967
20	3 008	2 984	2 976	2 972	2 975	2 974	2 972	2 961
Mean	3 015	3 004	2 999	2 994	2 996	2 994	2 994	2 987
Median	3 017	3 007	3 002	2 995	2 996	2 995	2 994	2 987
std.dev	25	25	23	23	24	23	24	25
Max	3 062	3 047	3 037	3 030	3 034	3 033	3 033	3 029
Min	2 962	2 958	2 954	2 948	2 950	2 948	2 947	2 939



9.2 Test condition 2 **85 °C**
Dirve Current **1000 mA**
Measurement Current **1000 mA**

Report No. : SLED-16-019

No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	3 015	3 010	3 009	3 011					
2	3 026	3 023	3 026	3 024					
3	2 971	2 968	2 967	2 965					
4	3 002	3 002	3 001	2 999					
5	3 015	3 016	3 021	3 018					
6	3 023	3 023	3 020	3 016					
7	3 034	3 036	3 037	3 034					
8	2 986	2 988	2 985	2 982					
9	3 000	3 001	3 001	2 998					
10	2 994	2 995	2 997	2 993					
11	2 975	2 976	2 976	2 976					
12	2 970	2 971	2 974	2 970					
13	2 948	2 950	2 952	2 950					
14	2 994	2 995	2 989	2 990					
15	3 005	3 005	3 009	3 004					
16	3 030	3 032	3 032	3 030					
17	3 025	3 025	3 025	3 022					
18	2 982	2 985	2 983	2 983					
19	2 974	2 973	2 974	2 970					
20	2 975	2 976	2 976	2 974					
Mean	2 997	2 998	2 998	2 995					
Median	2 997	2 998	2 999	2 995					
std.dev	24	24	24	24					
Max	3 034	3 036	3 037	3 034	00	00	00	00	00
Min	2 948	2 950	2 952	2 950	00	00	00	00	00



Report No. : SLED-16-019

9.3 Test condition 3 105 °C
Dirve Current 1000 mA
Measurement Current 1000 mA

No.	Lumen Maintenance (%)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	95.9	95.1	95.6	95.9					
2	97.1	96.4	96.2	95.8					
3	96.6	97.2	96.1	96.7					
4	96.5	96.1	96.2	95.5					
5	97.2	96.4	96.2	95.6					
6	97.3	96.9	96.4	96.1					
7	97.4	96.5	96.4	96.0					
8	96.6	96.5	95.6	95.6					
9	96.8	95.3	96.0	94.5					
10	96.5	96.1	95.4	95.5					
11	96.4	95.4	95.2	95.5					
12	97.0	96.1	95.9	96.5					
13	97.1	96.2	96.4	96.0					
14	97.2	96.0	95.7	95.6					
15	97.3	96.5	96.1	96.9					
16	97.1	96.4	95.8	95.8					
17	97.1	96.6	96.1	95.7					
18	95.5	95.5	95.8	95.8					
19	97.6	96.7	96.5	96.5					
20	97.2	97.4	96.3	96.0					
Mean	96.9	96.3	96.0	95.9					
Median	97.1	96.4	96.1	95.8					
std.dev	0.5	0.6	0.4	0.5					
Max	97.6	97.4	96.5	96.9	0.0	0.0	0.0	0.0	0.0
Min	95.5	95.1	95.2	94.5	0.0	0.0	0.0	0.0	0.0



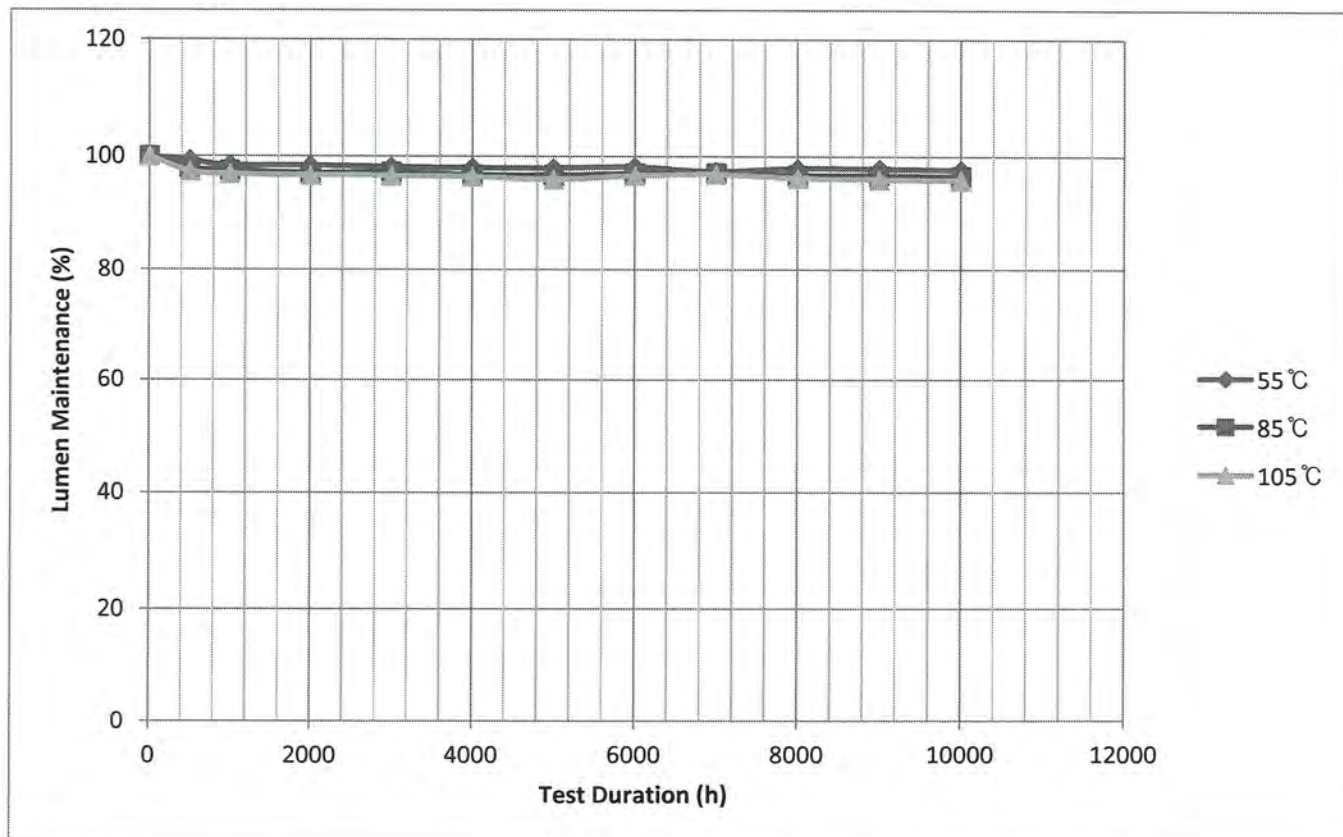
9.3 Test condition 3 105 °C
 Dirve Current 1000 mA
 Measurement Current 1000 mA

Report No. : SLED-16-019

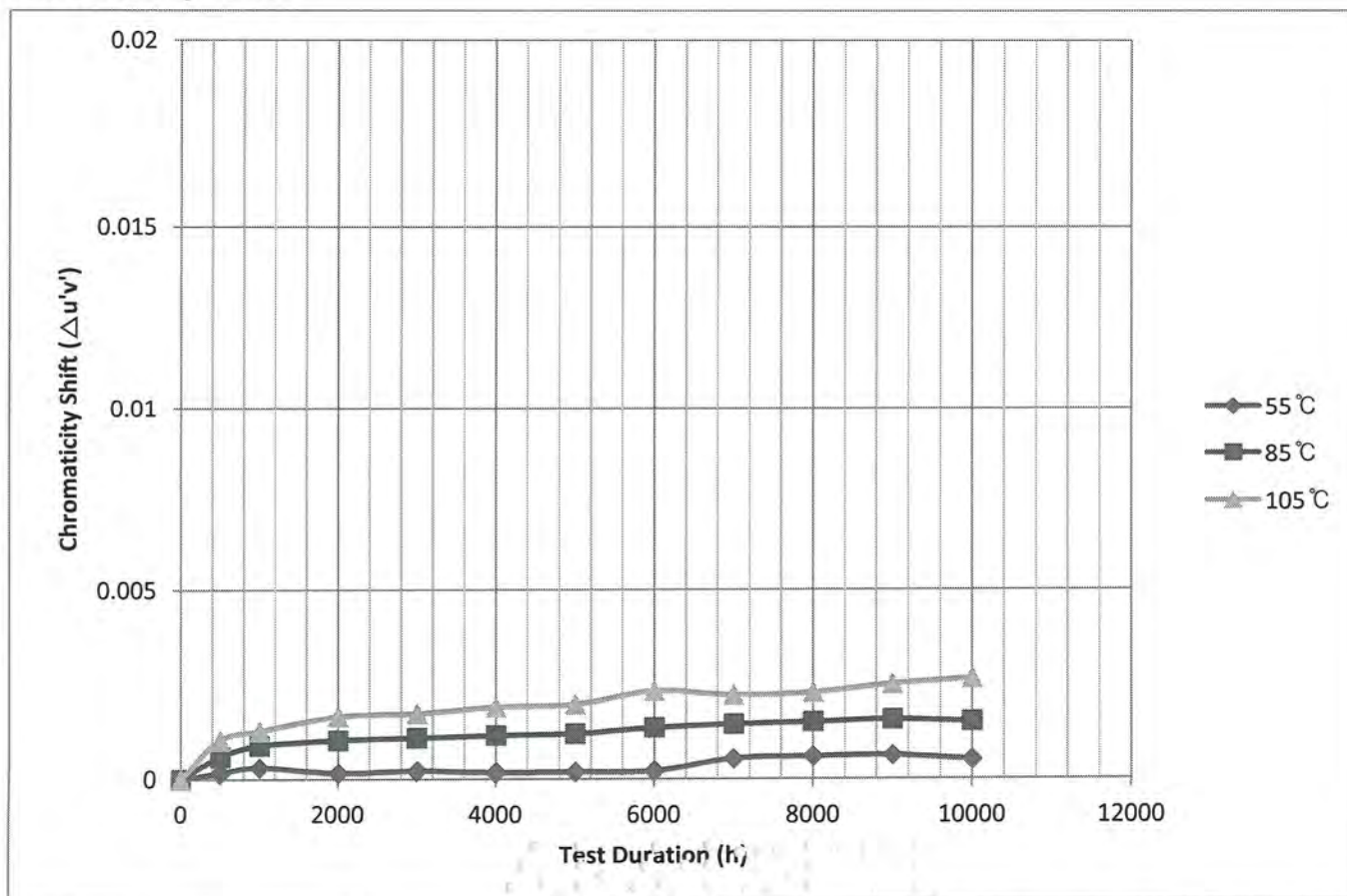
No.	CCT (K)								
	7 000 h	8 000 h	9 000 h	10 000 h	11 000 h	12 000 h	13 000 h	14 000 h	15 000 h
1	2 983	2 981	2 979	2 972					
2	2 972	2 971	2 970	2 967					
3	2 977	2 976	2 973	2 968					
4	2 977	2 975	2 974	2 970					
5	2 992	2 993	2 989	2 985					
6	2 930	2 931	2 928	2 922					
7	2 990	2 990	2 988	2 983					
8	2 961	2 960	2 958	2 951					
9	2 979	2 979	2 977	2 971					
10	2 974	2 973	2 971	2 965					
11	2 971	2 970	2 966	2 962					
12	3 007	3 006	3 004	2 997					
13	3 013	3 014	3 010	3 009					
14	2 989	2 989	2 987	2 981					
15	2 964	2 966	2 961	2 956					
16	2 962	2 966	2 962	2 953					
17	2 989	2 988	2 982	2 978					
18	2 947	2 949	2 946	2 939					
19	2 964	2 961	2 959	2 957					
20	3 001	3 001	2 997	2 992					
Mean	2 977	2 977	2 974	2 969					
Median	2 977	2 976	2 973	2 969					
std.dev	20	20	19	20					
Max	3 013	3 014	3 010	3 009	00	00	00	00	00
Min	2 930	2 931	2 928	2 922	00	00	00	00	00

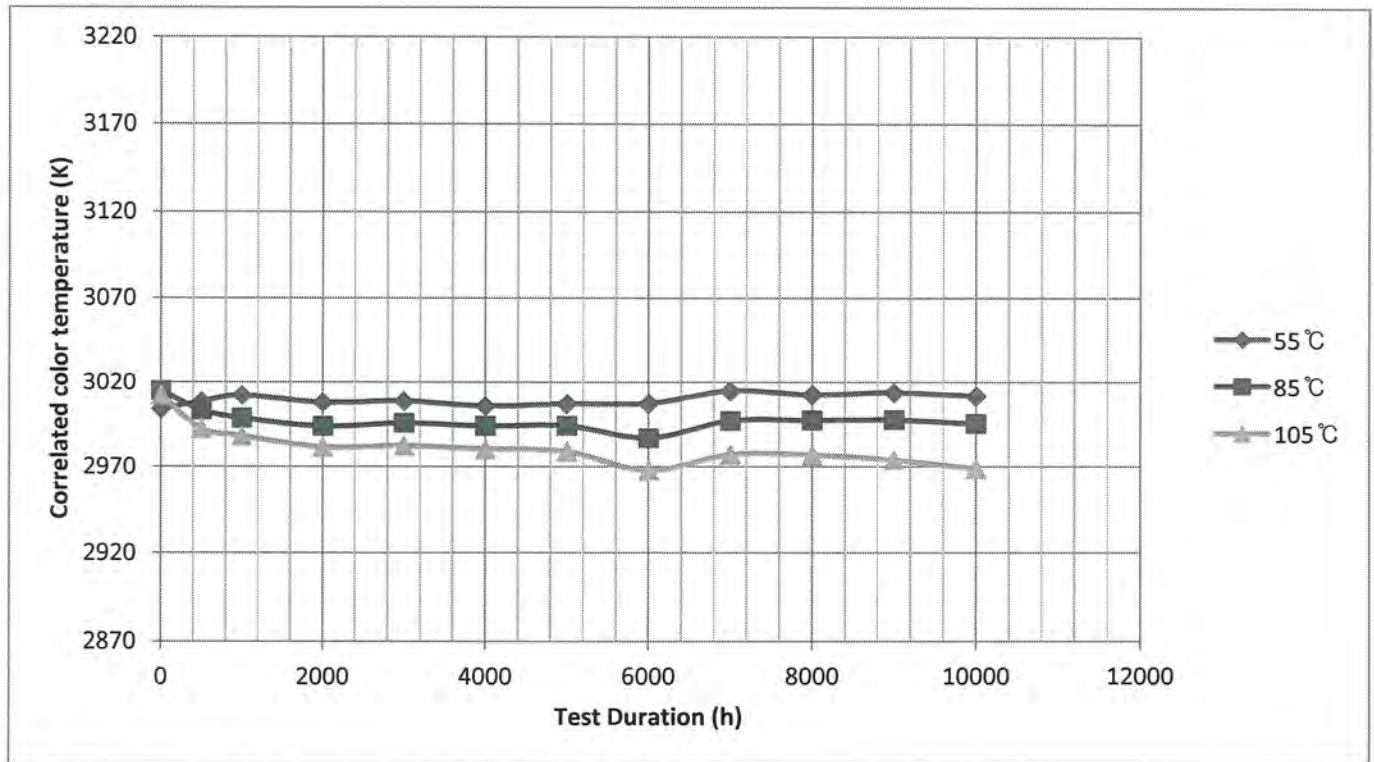
9.4 Chart

<Lumen Maintenance>



<Chromaticity Shift>



<CCT>

10. Observation of failures

No optical, Electrical or mechanical failure of any LED Package was seen during the lifetime testing.

11. LED light source monitoring interval

0 500 1 000 2 000 3 000 4 000 5 000 6 000 7 000 8 000
9 000 10 000

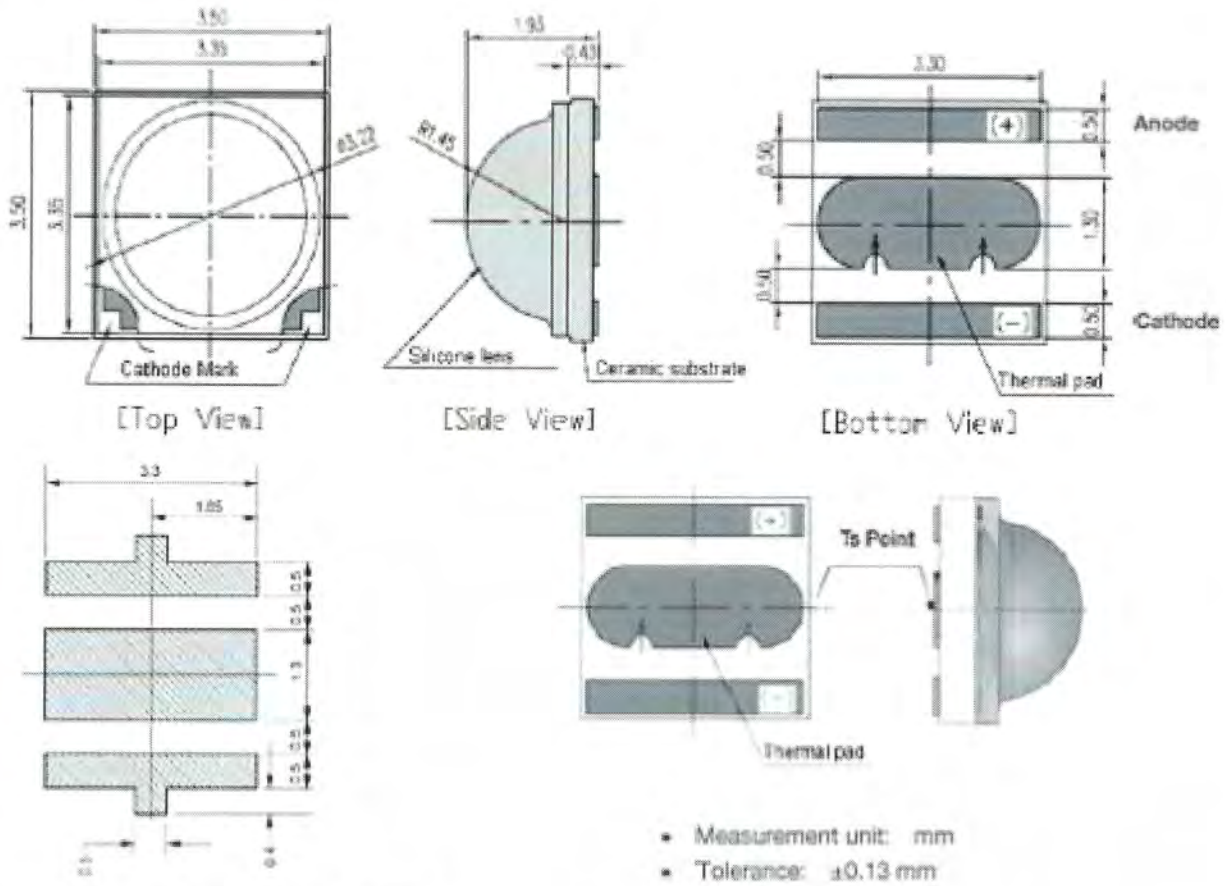
12. Photometric measurement uncertainty

3.5%

13. TM-21-11 Report : Projecting Long Term Lumen Maintenance of LED Light Source
Table 1: Report at each LM-80 Test Condition

Description of LED Light Source Tested (manufacturer, model, catalog number)		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	Sample size	20
Number of failures	0	Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	1000	DUT drive current used in the test (mA)	1000	DUT drive current used in the test (mA)	1000	DUT drive current used in the test (mA)	1000
Test duration (hours)	10,000	Test duration (hours)	10,000	Test duration (hours)	10,000	Test duration (hours)	10,000
Test duration used for projection (hour to hour)	5,000 - 10,000	Test duration used for projection (hour to hour)	5,000 - 10,000	Test duration used for projection (hour to hour)	5,000 - 10,000	Test duration used for projection (hour to hour)	5,000 - 10,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	105	Tested case temperature (°C)	105
α	4.375E-07	α	6.490E-07	α	8.604E-07	α	8.604E-07
B	0.982	B	0.973	B	0.969	B	0.969
Reported L70(10k) (hours)	>60000	Reported L70(10k) (hours)	>60000	Reported L70(10k) (hours)	>60000	Reported L70(10k) (hours)	>60000

14. Dimension of samples



- Measurement unit: mm
- Tolerance: ± 0.13 mm

Recommended Soldering Pattern

***** END OF TEST REPORT *****