



# LM80 Test Report

IES LM-80-15 Approved Method for Measuring Lumen  
Maintenance of LED Light Sources

## Samsung Electronics LED Business Report

Report No. : SLED-18-011-R01  
Test Initiated Date : 2017.01.26  
Test End Date : 2019.01.14  
Report Issued Date : 2018.05.30  
Report Revised Date : 2019.07.04

Test result reported for	Testing performed by
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Tested By KyungYeup Kwak	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.

※ If you need confirmation about the authenticity of the test report, please contact the above contact information.

## ■ Revision History ■

Data	Revision History	Writer	
		Drawn	Approved
2018.05.30	New Version(10kh)	K.Y.KWAK	S.Y.CHOI
2019.07.04	Extended Evaluation Time(15kh)	K.Y.KWAK	D.S.PARK

## ■ 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	700	55.1	15 000	97.5	0.001 3
2	700	85.2	15 000	97.2	0.001 5
3	700	104.9	15 000	95.8	0.002 0

### 1. Number of LED light sources tested

#### 1) Sample size

- 20 Packages tested at actual case temperature 55.1 °C
- 20 Packages tested at actual case temperature 85.2 °C
- 20 Packages tested at actual case temperature 104.9 °C

#### 2) Sampling method

- Minimum three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

### 2. Description of LED light sources

- Tested model code : SCP8WTF1HEL1WUK34E
- Sample manufacturer : Samsung Electronics
- Sample Type : LED Package
- Package dimension : ( 2.36 × 2.36 ) mm
- Minimum die spacing : -
- CCT / CRI (Nominal) : 2 700 K / 80

### 3. Description of auxiliary equipment

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

## 4. Operating time

### 1) Electrical condition

- Drive current : 700 mA
- Typical voltage : 3.01 V
- Total input power : 2.11 W
- Average current density per LED die : 307 mA/mm<sup>2</sup>
- Average power density per LED die : 0.92 W/mm<sup>2</sup>
- \* LED packages are driven with a constant direct current.

### 2) Test duration

- 15 000 h

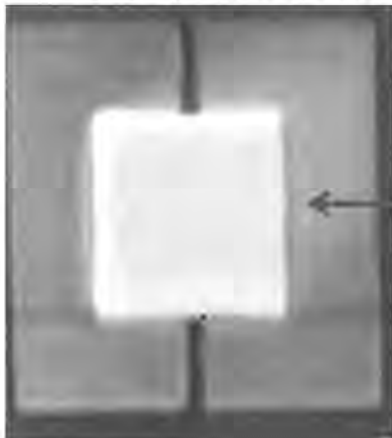
## 5. Ambient conditions including airflow, temperature and relative humidity

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 : Controlled to -2 °C
- Surrounding air temperature : Controlled 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

### 9.1 Test condition 1

55 °C

### Drive Current

700 mA

### Measurement Current

700 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	271.8	3.033	99.7	99.2	98.9	98.3	98.2	98.1	98.2
2	272.7	3.052	99.4	99.1	98.7	98.4	98.2	98.2	98.0
3	271.6	3.008	99.5	99.0	98.7	98.4	98.2	98.2	98.0
4	272.4	2.992	99.5	99.0	98.7	98.4	98.2	98.1	98.1
5	274.6	2.980	99.6	99.2	98.9	98.4	98.3	98.2	98.1
6	275.4	3.040	99.5	99.2	98.8	98.4	98.3	98.2	98.2
7	275.0	2.995	99.6	99.1	98.8	98.5	98.3	98.2	98.2
8	273.2	3.039	99.5	99.1	98.7	98.4	98.2	98.2	98.0
9	274.7	3.029	99.6	99.1	98.8	98.5	98.3	98.1	98.2
10	274.1	3.031	99.5	98.9	98.7	98.5	98.3	98.1	98.1
11	277.6	3.029	99.5	98.9	98.6	98.3	98.2	97.9	97.9
12	278.5	3.017	99.5	98.9	98.6	98.3	98.2	98.0	97.9
13	276.0	2.988	99.7	99.1	98.8	98.4	98.2	98.1	98.1
14	272.8	2.979	99.6	99.2	98.7	98.5	98.3	98.2	98.1
15	277.7	3.012	99.7	99.0	98.7	98.2	98.1	98.0	98.0
16	275.9	3.000	99.5	99.1	98.6	98.3	98.2	98.1	98.0
17	275.4	3.037	99.4	99.0	98.5	98.2	98.0	97.9	97.8
18	273.1	3.020	99.5	98.9	98.6	98.2	98.1	98.0	97.9
19	271.6	3.009	99.5	98.9	98.6	98.3	98.1	97.9	97.9
20	273.9	3.003	99.6	99.0	98.7	98.2	98.2	97.9	97.9
Mean	274.4	3.01	99.5	99.0	98.7	98.4	98.2	98.1	98.0
Median	274.3	3.01	99.5	99.0	98.7	98.4	98.2	98.1	98.0
std.dev	2.0	0.02	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	278.5	3.05	99.7	99.2	98.9	98.5	98.3	98.2	98.2
Min	271.6	2.98	99.4	98.9	98.5	98.2	98.0	97.9	97.8



### 9.1 Test condition 1

55 °C

### Drive Current

700 mA

### Measurement Current

700 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	98.2	98.2	98.1	98.1	97.9	97.8	97.9	97.7	97.6
2	98.1	98.2	98.1	98.1	97.9	97.9	97.8	97.7	97.5
3	98.0	98.1	98.1	98.0	97.8	97.6	97.7	97.6	97.4
4	98.1	98.1	98.1	98.0	97.8	97.6	97.7	97.7	97.4
5	98.1	98.1	97.9	97.9	97.9	97.7	97.7	97.5	97.5
6	98.1	98.2	98.1	98.1	98.0	97.9	97.9	97.8	97.6
7	98.2	98.2	98.2	98.1	98.0	97.9	97.9	97.9	97.6
8	98.0	98.0	98.0	97.9	97.8	97.7	97.7	97.6	97.4
9	98.2	98.2	98.1	98.0	98.0	98.0	97.9	97.9	97.8
10	98.1	98.1	97.9	97.9	97.9	97.8	97.8	97.6	97.5
11	97.9	97.9	97.7	97.8	97.7	97.7	97.6	97.6	97.4
12	97.9	97.9	97.8	97.7	97.7	97.7	97.7	97.6	97.5
13	98.1	97.9	97.9	97.6	97.6	97.6	97.8	97.6	97.6
14	98.1	98.1	97.9	97.8	97.7	97.8	97.9	97.8	97.7
15	98.0	97.8	97.9	97.9	97.5	97.6	97.7	97.6	97.5
16	98.0	97.9	97.9	97.7	97.6	97.7	97.7	97.7	97.5
17	97.8	97.8	97.8	97.7	97.5	97.5	97.4	97.3	97.2
18	97.9	97.9	97.9	97.8	97.6	97.5	97.5	97.5	97.3
19	97.8	97.8	97.7	97.7	97.5	97.5	97.5	97.5	97.4
20	97.9	97.9	97.8	97.7	97.6	97.4	97.4	97.4	97.4
Mean	98.0	98.0	97.9	97.9	97.8	97.7	97.7	97.6	97.5
Median	98.1	98.0	97.9	97.9	97.8	97.7	97.7	97.6	97.5
std.dev	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1
Max	98.2	98.2	98.2	98.1	98.0	98.0	97.9	97.9	97.8
Min	97.8	97.8	97.7	97.6	97.5	97.4	97.4	97.3	97.2





### 9.1 Test condition 1

55 °C

### Drive Current

700 mA

### Measurement Current

700 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 9	0.000 8	0.000 7	0.000 9	0.000 8	0.001 0	0.001 1	0.001 0	0.001 2
2	0.000 8	0.000 8	0.000 9	0.000 8	0.001 0	0.001 2	0.001 1	0.001 2	0.001 2
3	0.000 8	0.000 7	0.000 8	0.000 8	0.000 9	0.001 0	0.001 1	0.001 1	0.001 2
4	0.000 8	0.000 8	0.000 7	0.000 7	0.000 9	0.000 9	0.001 0	0.000 9	0.001 1
5	0.000 9	0.000 9	0.000 8	0.000 9	0.001 0	0.001 1	0.001 1	0.001 1	0.001 3
6	0.000 7	0.000 7	0.000 8	0.000 7	0.000 8	0.000 9	0.000 9	0.001 0	0.001 0
7	0.000 7	0.000 6	0.000 5	0.000 6	0.000 8	0.000 8	0.000 9	0.001 0	0.001 0
8	0.000 7	0.000 6	0.000 7	0.000 6	0.000 8	0.000 8	0.000 9	0.000 9	0.001 0
9	0.000 8	0.000 7	0.000 7	0.000 7	0.000 9	0.000 9	0.001 0	0.001 1	0.001 1
10	0.000 8	0.000 7	0.000 7	0.000 7	0.000 9	0.000 9	0.001 0	0.000 9	0.001 1
11	0.000 7	0.000 7	0.000 6	0.000 7	0.000 8	0.000 9	0.000 9	0.001 0	0.001 1
12	0.000 8	0.000 7	0.000 7	0.000 7	0.000 9	0.000 9	0.001 0	0.000 9	0.001 1
13	0.000 9	0.000 7	0.000 7	0.000 6	0.000 8	0.001 0	0.001 1	0.001 0	0.001 2
14	0.000 7	0.000 6	0.000 7	0.000 6	0.000 8	0.000 9	0.000 9	0.001 0	0.001 0
15	0.000 9	0.000 7	0.000 8	0.000 8	0.000 8	0.000 9	0.001 0	0.001 0	0.001 2
16	0.000 8	0.000 7	0.000 8	0.000 7	0.000 8	0.001 0	0.000 9	0.001 0	0.001 0
17	0.000 7	0.000 7	0.000 7	0.000 6	0.000 8	0.000 9	0.000 9	0.000 9	0.000 9
18	0.000 8	0.000 7	0.000 8	0.000 7	0.000 8	0.000 9	0.000 9	0.001 0	0.001 0
19	0.000 6	0.000 6	0.000 5	0.000 5	0.000 7	0.000 8	0.000 8	0.000 7	0.000 9
20	0.000 8	0.001 0	0.000 9	0.000 8	0.001 0	0.001 0	0.001 1	0.001 0	0.001 2
Mean	0.000 8	0.000 7	0.000 7	0.000 7	0.000 9	0.000 9	0.001 0	0.001 0	0.001 1
Median	0.000 8	0.000 7	0.000 7	0.000 7	0.000 8	0.000 9	0.001 0	0.001 0	0.001 1
std.dev	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Max	0.000 9	0.001 0	0.000 9	0.000 9	0.001 0	0.001 2	0.001 1	0.001 2	0.001 3
Min	0.000 6	0.000 6	0.000 5	0.000 5	0.000 7	0.000 8	0.000 8	0.000 7	0.000 9

### 9.1 Test condition 1

55 °C

### Drive Current

700 mA

### Measurement Current

700 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	2 749	2 744	2 743	2 739	2 738	2 735	2 734	2 730
2	2 759	2 754	2 751	2 749	2 745	2 743	2 741	2 740
3	2 754	2 751	2 750	2 746	2 743	2 739	2 738	2 737
4	2 786	2 782	2 781	2 776	2 773	2 769	2 772	2 768
5	2 770	2 764	2 762	2 759	2 757	2 752	2 753	2 750
6	2 757	2 756	2 752	2 751	2 746	2 742	2 742	2 742
7	2 742	2 741	2 741	2 736	2 733	2 729	2 731	2 727
8	2 756	2 754	2 751	2 750	2 746	2 742	2 743	2 740
9	2 714	2 711	2 711	2 706	2 703	2 699	2 700	2 697
10	2 745	2 743	2 741	2 738	2 734	2 731	2 732	2 729
11	2 724	2 721	2 720	2 716	2 712	2 708	2 710	2 707
12	2 769	2 765	2 765	2 761	2 757	2 753	2 756	2 752
13	2 725	2 721	2 719	2 716	2 714	2 711	2 711	2 707
14	2 731	2 729	2 727	2 724	2 721	2 717	2 716	2 716
15	2 752	2 747	2 747	2 743	2 741	2 738	2 737	2 734
16	2 747	2 745	2 742	2 741	2 736	2 732	2 732	2 731
17	2 770	2 768	2 765	2 763	2 759	2 755	2 756	2 754
18	2 734	2 730	2 730	2 727	2 722	2 719	2 718	2 717
19	2 743	2 741	2 739	2 736	2 732	2 728	2 731	2 727
20	2 732	2 729	2 728	2 723	2 722	2 715	2 718	2 715
Mean	2 748	2 745	2 743	2 740	2 737	2 733	2 733	2 731
Median	2 748	2 745	2 742	2 740	2 737	2 734	2 733	2 730
std.dev	18	18	18	18	18	18	18	18
Max	2 786	2 782	2 781	2 776	2 773	2 769	2 772	2 768
Min	2 714	2 711	2 711	2 706	2 703	2 699	2 700	2 697



### 9.1 Test condition 1

55 °C

### Drive Current

700 mA

### Measurement Current

700 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	2 732	2 733	2 734	2 732	2 732	2 729	2 727	2 728	2 726
2	2 741	2 742	2 740	2 742	2 737	2 734	2 736	2 734	2 733
3	2 738	2 740	2 737	2 739	2 735	2 734	2 732	2 731	2 730
4	2 769	2 770	2 770	2 771	2 767	2 765	2 763	2 765	2 762
5	2 751	2 753	2 753	2 752	2 749	2 747	2 747	2 747	2 744
6	2 742	2 744	2 742	2 744	2 740	2 739	2 738	2 737	2 736
7	2 728	2 731	2 731	2 730	2 726	2 725	2 724	2 722	2 721
8	2 741	2 744	2 742	2 744	2 740	2 740	2 739	2 738	2 736
9	2 698	2 700	2 700	2 700	2 696	2 695	2 694	2 692	2 692
10	2 729	2 730	2 731	2 730	2 726	2 726	2 725	2 725	2 722
11	2 708	2 709	2 710	2 709	2 706	2 705	2 704	2 702	2 701
12	2 752	2 754	2 754	2 753	2 749	2 749	2 748	2 748	2 745
13	2 708	2 711	2 711	2 713	2 708	2 706	2 704	2 705	2 701
14	2 716	2 718	2 717	2 719	2 714	2 711	2 713	2 711	2 709
15	2 734	2 739	2 736	2 736	2 734	2 733	2 731	2 731	2 728
16	2 732	2 733	2 732	2 733	2 730	2 727	2 729	2 726	2 726
17	2 755	2 756	2 755	2 756	2 753	2 750	2 751	2 750	2 750
18	2 718	2 720	2 718	2 720	2 716	2 715	2 715	2 714	2 713
19	2 729	2 731	2 732	2 731	2 728	2 726	2 725	2 727	2 723
20	2 715	2 714	2 714	2 716	2 713	2 713	2 711	2 712	2 708
Mean	2 732	2 734	2 733	2 734	2 730	2 729	2 728	2 727	2 725
Median	2 732	2 733	2 733	2 733	2 731	2 728	2 728	2 727	2 726
std.dev	18	18	18	18	18	18	18	18	18
Max	2 769	2 770	2 770	2 771	2 767	2 765	2 763	2 765	2 762
Min	2 698	2 700	2 700	2 700	2 696	2 695	2 694	2 692	2 692



## 9.2 Test condition 2

85 °C

### Drive Current

700 mA

### Measurement Current

700 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	97.9	97.7	97.8	97.7	97.3	97.5	97.4	97.3	97.0
2	97.8	97.7	97.8	97.7	97.4	97.4	97.3	97.4	97.2
3	97.8	97.6	97.6	97.6	97.3	97.4	97.3	97.3	97.1
4	97.7	97.6	97.5	97.6	97.3	97.2	97.2	97.1	97.0
5	97.9	97.8	97.6	97.4	97.2	97.1	97.2	97.2	96.9
6	97.7	97.7	97.6	97.6	97.5	97.5	97.3	97.4	97.1
7	97.6	97.6	97.5	97.4	97.4	97.3	97.2	97.1	97.0
8	97.7	97.7	97.6	97.6	97.5	97.4	97.3	97.2	97.1
9	97.9	97.7	97.8	97.8	97.5	97.5	97.4	97.3	97.3
10	97.7	97.6	97.7	97.6	97.5	97.6	97.4	97.4	97.3
11	97.6	97.5	97.4	97.4	97.2	97.1	97.0	97.0	96.8
12	97.6	97.4	97.4	97.3	97.3	97.1	97.1	97.1	96.9
13	98.0	98.0	97.9	97.8	97.6	97.7	97.6	97.5	97.4
14	97.9	97.9	97.9	97.8	97.7	97.7	97.5	97.6	97.3
15	97.9	97.9	98.0	97.9	97.7	97.6	97.6	97.6	97.4
16	97.9	97.9	97.8	97.8	97.7	97.5	97.5	97.4	97.4
17	98.0	97.9	97.9	98.0	97.8	97.6	97.6	97.5	97.4
18	98.0	97.9	98.0	97.8	97.6	97.5	97.5	97.5	97.3
19	98.0	97.9	97.9	97.9	97.7	97.6	97.5	97.6	97.5
20	97.8	97.7	97.7	97.7	97.6	97.5	97.4	97.3	97.3
Mean	97.8	97.7	97.7	97.7	97.5	97.4	97.4	97.3	97.2
Median	97.9	97.7	97.7	97.7	97.5	97.5	97.4	97.4	97.2
std.dev	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Max	98.0	98.0	98.0	98.0	97.8	97.7	97.6	97.6	97.5
Min	97.6	97.4	97.4	97.3	97.2	97.1	97.0	97.0	96.8











## 9.2 Test condition 2

85 °C

### Drive Current

700 mA

### Measurement Current

700 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	2 718	2 722	2 719	2 720	2 720	2 717	2 720	2 719	2 722
2	2 709	2 711	2 709	2 709	2 710	2 708	2 708	2 707	2 709
3	2 742	2 745	2 743	2 742	2 743	2 743	2 742	2 741	2 743
4	2 681	2 684	2 684	2 683	2 682	2 681	2 682	2 682	2 682
5	2 719	2 723	2 723	2 723	2 723	2 720	2 719	2 720	2 722
6	2 703	2 704	2 703	2 702	2 703	2 703	2 701	2 699	2 703
7	2 706	2 709	2 709	2 708	2 707	2 707	2 707	2 707	2 707
8	2 693	2 696	2 695	2 694	2 695	2 694	2 693	2 694	2 694
9	2 730	2 735	2 733	2 732	2 734	2 731	2 731	2 731	2 731
10	2 736	2 739	2 736	2 737	2 737	2 733	2 737	2 734	2 737
11	2 732	2 734	2 737	2 735	2 735	2 734	2 734	2 733	2 734
12	2 719	2 722	2 721	2 719	2 720	2 719	2 720	2 722	2 721
13	2 718	2 719	2 719	2 717	2 720	2 717	2 717	2 717	2 718
14	2 742	2 744	2 742	2 743	2 743	2 739	2 742	2 739	2 742
15	2 731	2 733	2 731	2 731	2 731	2 730	2 731	2 728	2 730
16	2 711	2 714	2 714	2 712	2 713	2 712	2 711	2 712	2 712
17	2 729	2 731	2 731	2 729	2 729	2 728	2 728	2 728	2 728
18	2 698	2 700	2 698	2 699	2 699	2 699	2 698	2 696	2 698
19	2 728	2 730	2 729	2 728	2 728	2 727	2 726	2 724	2 727
20	2 708	2 709	2 709	2 707	2 707	2 707	2 707	2 707	2 708
Mean	2 718	2 720	2 719	2 718	2 719	2 718	2 718	2 717	2 718
Median	2 718	2 722	2 720	2 720	2 720	2 718	2 720	2 719	2 722
std.dev	16	17	16	16	17	16	17	16	16
Max	2 742	2 745	2 743	2 743	2 743	2 743	2 742	2 741	2 743
Min	2 681	2 684	2 684	2 683	2 682	2 681	2 682	2 682	2 682

### 9.3 Test condition 3

105 °C

### Drive Current

700 mA

### Measurement Current

700 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	271.8	2.993	99.5	99.2	98.6	98.2	97.8	97.8	97.5
2	274.5	3.057	99.5	99.0	98.6	98.2	97.9	97.7	97.7
3	271.5	3.038	99.6	99.1	98.7	98.2	97.9	97.8	97.6
4	272.1	3.018	99.4	99.2	98.7	98.3	98.0	97.9	97.6
5	271.4	3.026	99.7	99.3	98.7	98.4	98.1	97.8	97.6
6	272.3	3.077	99.4	99.1	98.6	98.2	98.0	97.8	97.5
7	275.1	3.057	99.5	99.2	98.7	98.2	97.9	97.9	97.6
8	275.7	2.987	99.4	99.0	98.6	98.2	97.9	97.8	97.5
9	273.1	2.974	99.6	99.2	98.6	98.4	98.1	97.8	97.6
10	276.2	3.033	99.5	99.2	98.6	98.2	98.0	97.7	97.4
11	276.2	3.022	99.5	99.2	98.6	98.2	97.9	97.8	97.5
12	273.9	3.000	99.6	99.1	98.7	98.3	98.0	97.9	97.5
13	274.1	2.999	99.6	99.2	98.6	98.4	98.1	97.8	97.7
14	272.3	2.987	99.5	99.2	98.5	98.3	98.1	97.8	97.4
15	278.2	3.030	99.6	99.2	98.6	98.1	98.0	97.6	97.3
16	273.4	3.037	99.5	99.1	98.7	98.2	97.9	97.7	97.4
17	274.5	3.011	99.5	99.0	98.4	98.1	97.9	97.6	97.5
18	273.7	2.995	99.5	99.3	98.6	98.3	98.0	97.7	97.4
19	274.6	3.037	99.5	99.2	98.6	98.1	98.0	97.7	97.4
20	271.9	3.081	99.5	99.2	98.7	98.2	98.1	97.8	97.5
Mean	273.8	3.02	99.5	99.2	98.6	98.2	98.0	97.8	97.5
Median	273.8	3.02	99.5	99.2	98.6	98.2	98.0	97.8	97.5
std.dev	1.8	0.03	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	278.2	3.08	99.7	99.3	98.7	98.4	98.1	97.9	97.7
Min	271.4	2.97	99.4	99.0	98.4	98.1	97.8	97.6	97.3

### 9.3 Test condition 3

105 °C

### Drive Current

700 mA

### Measurement Current

700 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	97.4	97.2	97.0	97.0	96.7	96.4	96.1	95.7	95.5
2	97.5	97.1	97.1	97.1	96.9	96.8	96.7	96.3	96.1
3	97.5	97.1	97.0	97.0	96.8	96.7	96.4	96.1	95.8
4	97.5	97.3	97.1	97.0	96.8	96.5	96.4	96.0	95.7
5	97.5	97.2	97.0	97.0	96.8	96.8	96.6	96.4	96.2
6	97.4	97.1	96.9	96.9	96.7	96.6	96.4	96.0	95.8
7	97.2	97.1	96.8	96.7	96.6	96.5	96.4	95.9	95.6
8	97.2	96.9	96.8	96.6	96.6	96.5	96.2	96.0	95.6
9	97.4	97.1	96.9	96.7	96.5	96.5	96.4	96.0	95.8
10	97.2	97.0	96.7	96.6	96.6	96.4	96.3	95.8	95.7
11	97.4	97.1	96.9	96.8	96.7	96.5	96.5	96.3	95.9
12	97.2	96.9	96.8	96.7	96.7	96.6	96.3	96.1	95.7
13	97.4	97.1	96.8	96.5	96.5	96.4	96.4	96.0	95.8
14	97.3	97.0	96.6	96.5	96.4	96.6	96.4	95.7	95.6
15	97.2	96.8	96.6	96.5	96.3	96.2	96.1	95.6	95.4
16	97.1	97.0	96.7	96.7	96.6	96.5	96.2	96.0	95.6
17	97.2	96.9	96.8	96.8	96.4	96.2	96.0	95.6	95.5
18	97.3	97.1	96.8	96.9	96.5	96.4	96.2	96.1	95.8
19	97.3	97.2	96.9	96.7	96.5	96.4	96.3	96.0	95.9
20	97.4	97.2	96.9	96.9	96.7	96.5	96.4	96.2	96.0
Mean	97.3	97.1	96.9	96.8	96.6	96.5	96.3	96.0	95.8
Median	97.4	97.1	96.8	96.7	96.6	96.5	96.4	96.0	95.7
std.dev	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Max	97.5	97.3	97.1	97.1	96.9	96.8	96.7	96.4	96.2
Min	97.1	96.8	96.6	96.5	96.3	96.2	96.0	95.6	95.4





### 9.3 Test condition 3

105 °C

### Drive Current

700 mA

### Measurement Current

700 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	0.001 0	0.001 1	0.001 3	0.001 5	0.001 5	0.001 6	0.001 8	0.001 8	0.001 8
2	0.001 0	0.000 9	0.001 2	0.001 4	0.001 5	0.001 5	0.001 6	0.001 7	0.001 7
3	0.001 1	0.001 1	0.001 3	0.001 6	0.001 4	0.001 6	0.001 7	0.001 7	0.001 8
4	0.001 0	0.001 1	0.001 3	0.001 4	0.001 5	0.001 5	0.001 8	0.001 8	0.001 8
5	0.001 1	0.001 1	0.001 3	0.001 5	0.001 5	0.001 6	0.001 8	0.001 8	0.001 9
6	0.001 2	0.001 1	0.001 3	0.001 5	0.001 5	0.001 6	0.001 8	0.001 8	0.001 9
7	0.001 1	0.001 2	0.001 4	0.001 5	0.001 6	0.001 6	0.001 9	0.001 9	0.001 8
8	0.001 1	0.001 1	0.001 3	0.001 4	0.001 6	0.001 6	0.001 7	0.001 9	0.001 8
9	0.001 1	0.001 2	0.001 4	0.001 5	0.001 5	0.001 7	0.001 8	0.001 8	0.001 9
10	0.001 2	0.001 1	0.001 3	0.001 5	0.001 5	0.001 5	0.001 8	0.001 8	0.001 9
11	0.001 1	0.001 1	0.001 3	0.001 4	0.001 5	0.001 5	0.001 8	0.001 8	0.001 7
12	0.001 1	0.001 1	0.001 4	0.001 4	0.001 6	0.001 6	0.001 7	0.001 9	0.001 8
13	0.001 2	0.001 2	0.001 4	0.001 5	0.001 4	0.001 6	0.001 8	0.001 8	0.001 9
14	0.001 1	0.001 1	0.001 3	0.001 5	0.001 5	0.001 6	0.001 7	0.001 6	0.001 8
15	0.001 1	0.001 1	0.001 2	0.001 3	0.001 4	0.001 5	0.001 7	0.001 7	0.001 7
16	0.001 0	0.001 2	0.001 3	0.001 4	0.001 5	0.001 6	0.001 7	0.001 8	0.001 8
17	0.001 0	0.001 0	0.001 3	0.001 4	0.001 4	0.001 5	0.001 6	0.001 7	0.001 8
18	0.001 1	0.001 2	0.001 3	0.001 5	0.001 6	0.001 8	0.001 9	0.001 9	0.002 0
19	0.001 2	0.001 1	0.001 3	0.001 4	0.001 5	0.001 6	0.001 8	0.001 8	0.001 9
20	0.001 2	0.001 2	0.001 3	0.001 4	0.001 5	0.001 5	0.001 8	0.001 8	0.001 9
Mean	0.001 1	0.001 1	0.001 3	0.001 4	0.001 5	0.001 6	0.001 8	0.001 8	0.001 8
Median	0.001 1	0.001 1	0.001 3	0.001 4	0.001 5	0.001 6	0.001 8	0.001 8	0.001 8
std.dev	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Max	0.001 2	0.001 2	0.001 4	0.001 6	0.001 6	0.001 8	0.001 9	0.001 9	0.002 0
Min	0.001 0	0.000 9	0.001 2	0.001 3	0.001 4	0.001 5	0.001 6	0.001 6	0.001 7

### 9.3 Test condition 3

105 °C

### Drive Current

700 mA

### Measurement Current

700 mA

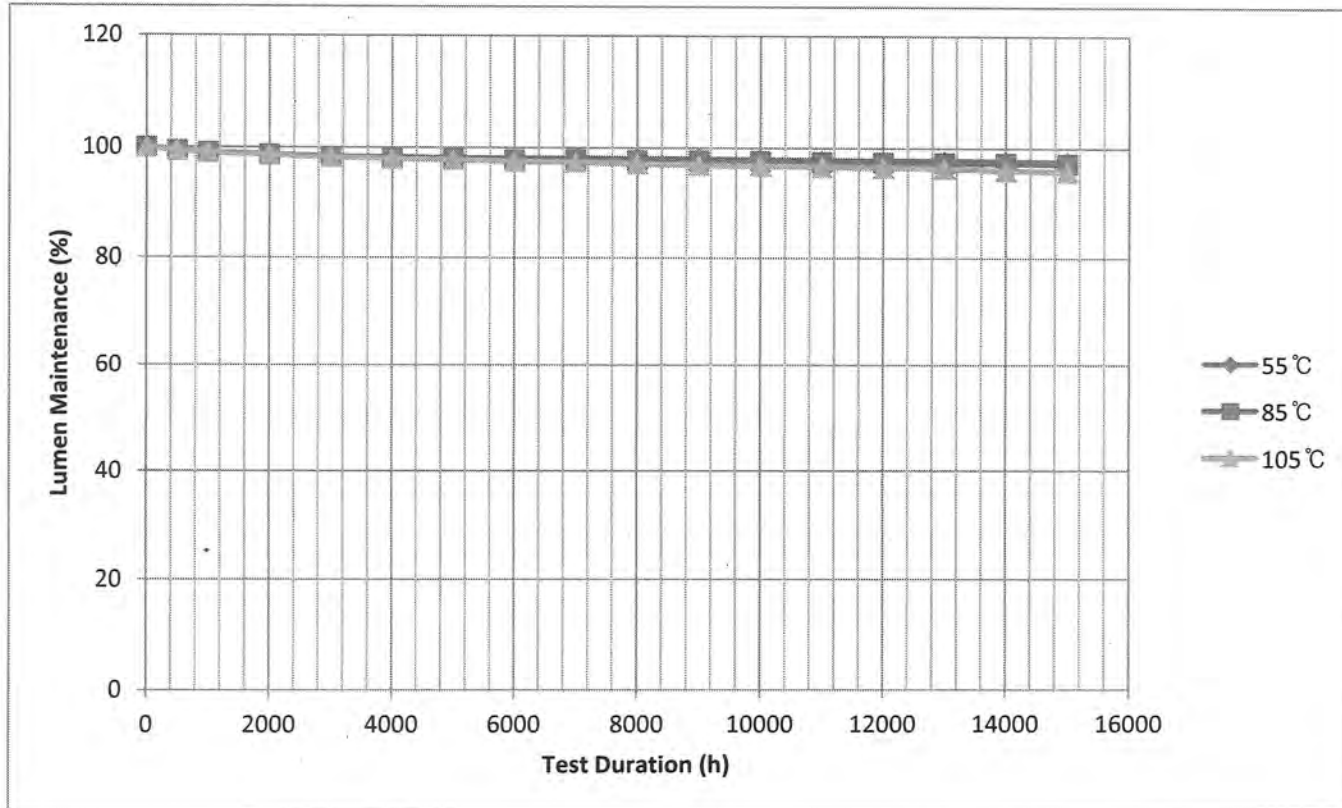
[illegible]



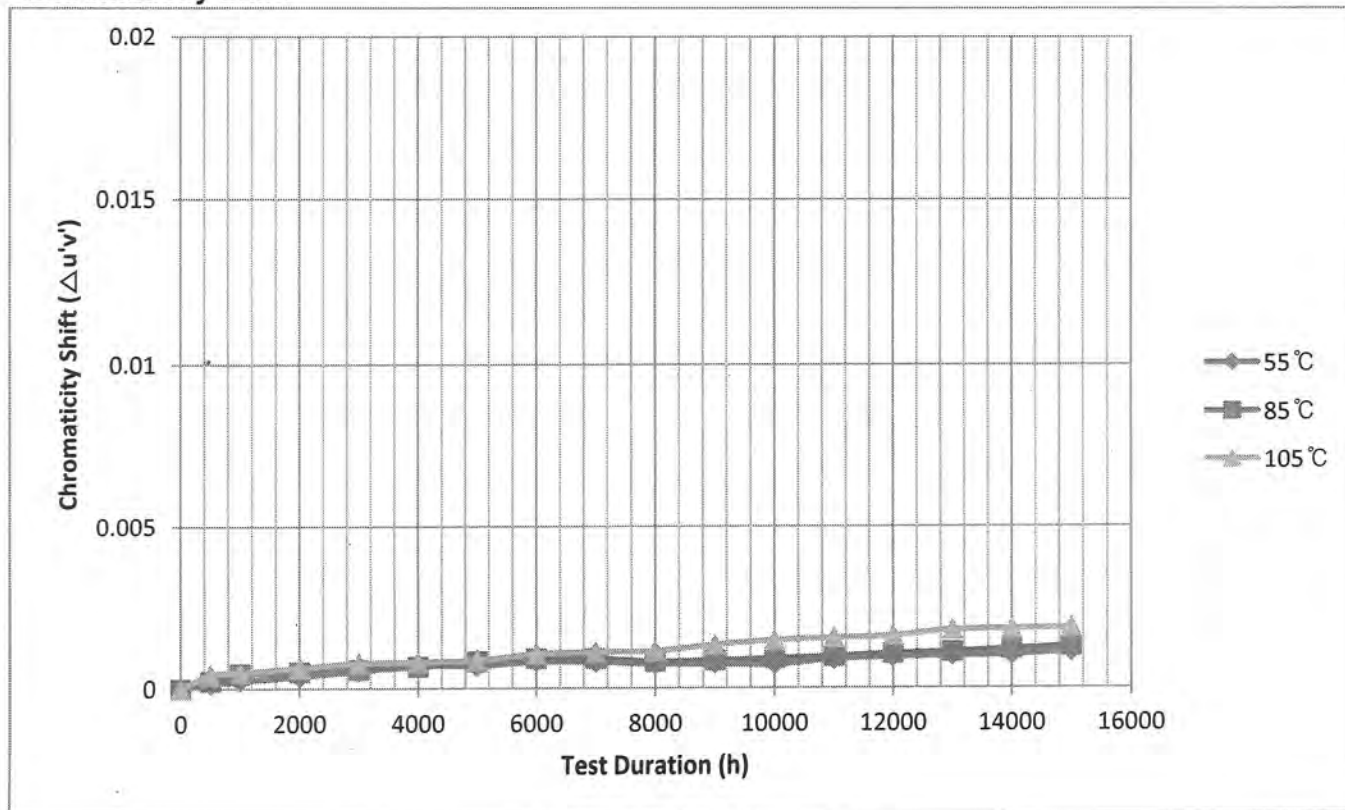


## 9.4 Chart

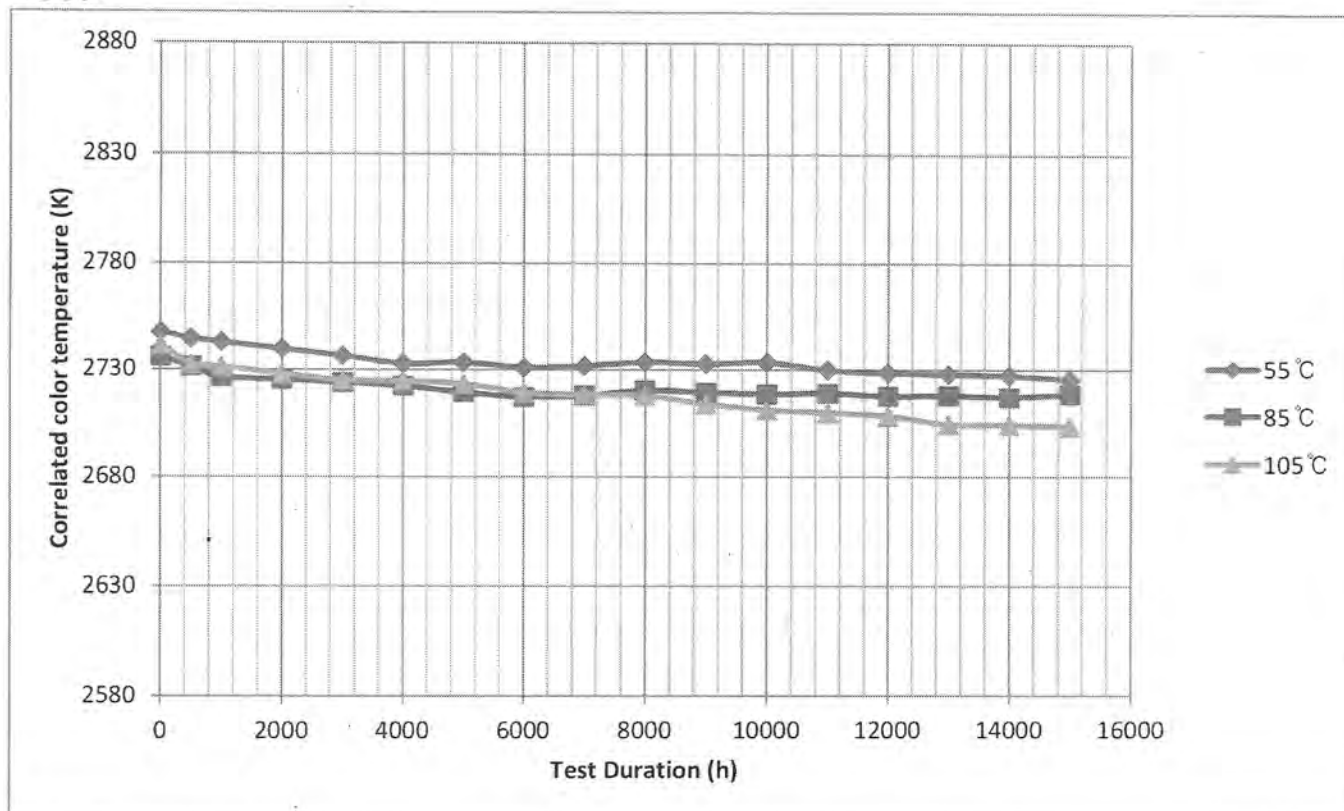
### <Lumen Maintenance>



### <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 11 000 12 000 13 000 14 000 15 000

## 12. Photometric measurement uncertainty

3.5%

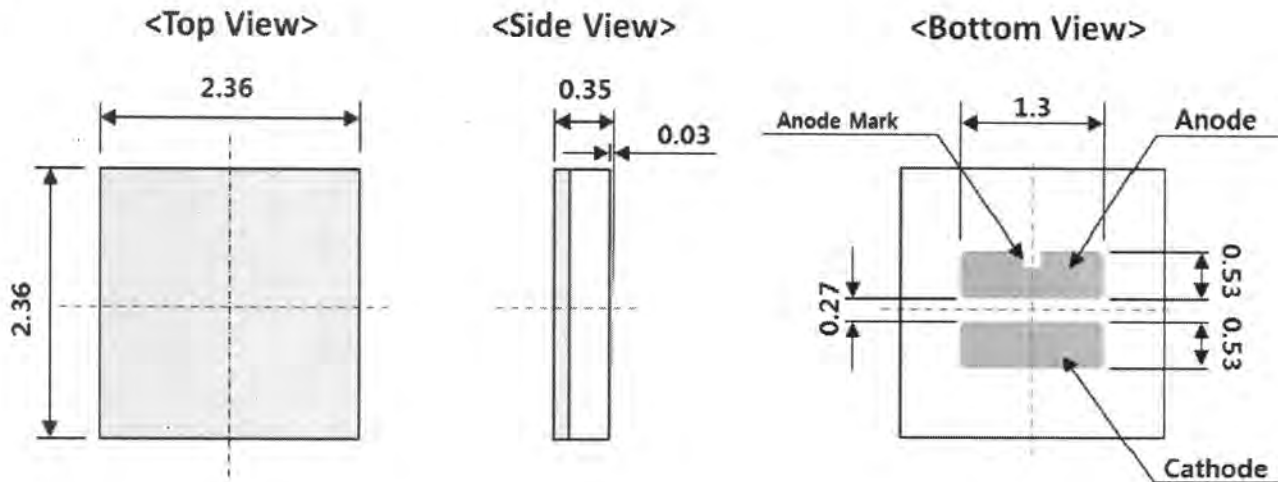
## 13. TM-21-11 Report : Projecting Long Term Lumen Maintenance of LED Light Source

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
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)	15,000	Test duration (hours)	15,000	Test duration (hours)	15,000
Test duration used for projection (hour to hour)	7,000 - 15,000	Test duration used for projection (hour to hour)	7,000 - 15,000	Test duration used for projection (hour to hour)	7,000 - 15,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	105
$\alpha$	6.478E-07	$\alpha$	7.692E-07	$\alpha$	1.864E-06
B	0.985	B	0.984	B	0.986
Reported L90(15k) (hours)	>90000	Reported L90(15k) (hours)	>90000	Reported L90(15k) (hours)	49,000



## 14. Dimension of samples



- Measurement unit: mm
- Tolerance:  $\pm 0.13$  mm

## 15. Cover models

Series Name	Model Name	CCT(K)
LH181B	SCP8WTF1HEL1W*****	2700
LH181B	SCP8VTF1HEL1V*****	3000
LH181B	SCP8UTF1HEL1U*****	3500
LH181B	SCP8TTF1HEL1T*****	4000
LH181B	SCP8RTF1HEL1R*****	5000
LH181B	SCP8QTF1HEL1Q*****	5700
LH181B	SCP8PTF1HEL1P*****	6500

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