



# IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

## MEASUREMENT AND TEST REPORT

For

### LIGHTNING OPTOELECTRONIC TECHNOLOGY (SZ) Co., LTD.

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**Model:T20**

<b>Report Type:</b> 6000 Hours Report	<b>Product Type:</b> LED Package
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<b>Report Number:</b>	RSZ140322501-10-6000-M1
<b>Test Date:</b>	2014-04-08 to 2014-12-17
<b>Report Date:</b>	2014-12-18
<b>Reviewed By:</b>	Jeanne Han /EE Manager <i>Jeanne Han</i>
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**Note:** The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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## 1 - GENERAL INFORMATION

### 1.1 Description of LED Light Sources

Devices tested

Part Number: T20  
 Part Type: LED Package  
 Nominal CCT: 2700K  
 Test Driver Current: 80 mA

LIGHTNING OPTOELECTRNIC TECHNOLOGY (SZ) Co., LTD. declare that their LED products listed in the following table use the same LED chip, identical materials and identical construction processes.

According to program guidance from ENERGY STAR, warm white and cool white products can be covered by tested model.

The tested model and the other LED package which attest similarity are designed with identical material and identical construction processes. The differences between the tested model and the other LED package which attest similarity are only sizes. The tested model is the largest LED package, with the greatest number of LED dies, the smallest die spacing, the greatest power density, and listed in the following table:

Model Name	CCT (K)	CRI	Number of Dies	Current (mA)	Volt (V)	Series	Parallel	Current Per Die (mA)	Current Density (mA/m <sup>2</sup> )	Power Density (W/mm <sup>2</sup> )
T2027811P-01AA	2700	80	1	80	3	1	1	80	413	1240
T2027811A-08125TME	2700	80	1	80	3	1	1	80	316	949
T2027811A-10125TME	2700	80	1	80	3	1	1	80	188	564

### 1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

### 1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.

### 1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	380-780nm, Diameter:0.3m,0-1999Lumen	2014-03-04	2015-03-04
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2014-03-12	2015-03-12

High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2013-12-26	2014-12-26
Standard Light Source	EVERFINE	D062	1011093	N/A	2014-05-06	2015-05-06
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987CJ 7321114	300VA	2014-03-12	2015-03-12
LM-80 Aging equipment	BACL	N/A	#5	N/A	2014-03-19	2015-03-19
Adjustable constant-current DC switching power supply	GOTER	LLA1200111 2-U	#1	(120V/1A)	2014-12-04	2015-12-04
Adjustable constant-current DC switching power supply	GOTER	LLA1200111 2-U	#2	(120V/1A)	2014-12-04	2015-12-04
Adjustable constant-current DC switching power supply	GOTER	LLA1200111 2-U	#3	(120V/1A)	2014-12-04	2015-12-04

### 1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

### 1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature  $T_A$  was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

For photometry measurement, temperature was set to  $25\text{ }^\circ\text{C} \pm 2\text{ }^\circ\text{C}$ , RH <65%.

### 1.7 Photometry Measurement Uncertainty

The uncertainty of the light output measurements is  $U=1.59\%$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=21\text{K}$  ( $K=2$ ), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

## 1.8 Sample Set

### Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days. These manufacturing lots are picked to represent a wide parametric distribution. Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

### Sample Size:

Total 75Pcs;

Each Ts test condition 25Pcs

The 75pcs samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2014-04-06 and tested during 2014-04-08 to 2014-12-17. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

#### Data Set 1: 55 °C, 80mA

Part Number:	T20
Number of Units:	25
Actual Case Temperature(T <sub>S</sub> ):	T <sub>S</sub> =54.3 °C
Actual Ambient Temperature(T <sub>A</sub> ):	T <sub>A</sub> =52.6 °C
Life Test Drive Current:	I <sub>F</sub> = 80mA
Measurement Current:	I <sub>F</sub> = 80mA

#### Data Set 2: 85°C, 80mA

Part Number:	T20
Number of Units:	25
Actual Case Temperature(T <sub>S</sub> ):	T <sub>S</sub> =83.5 °C
Actual Ambient Temperature(T <sub>A</sub> ):	T <sub>A</sub> =81.6 °C
Life Test Drive Current:	I <sub>F</sub> = 80mA
Measurement Current:	I <sub>F</sub> = 80mA

#### Data Set 3: 105 °C, 80mA

Part Number:	T20
Number of Units:	25
Actual Case Temperature(T <sub>S</sub> ):	T <sub>S</sub> =104.4 °C
Actual Ambient Temperature(T <sub>A</sub> ):	T <sub>A</sub> =102.5 °C
Life Test Drive Current:	I <sub>F</sub> = 80mA
Measurement Current:	I <sub>F</sub> = 80mA

## 2 - SUMMARY OF TEST RESULT

<b>Data Set:</b>	<b>Data Set 1, 55 °C, 80mA</b>
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.60%
Average Chromaticity Shift at 6000 hours ( $\Delta u'v'$ ):	0.0017
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000hrs

<b>Data Set:</b>	<b>Data Set 2, 85°C, 80mA</b>
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.87%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0024
Reported TM-21 L <sub>70</sub> Lifetime	>36,000hrs

<b>Data Set:</b>	<b>Data Set 3, 105 °C, 80mA</b>
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.10%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0030
Reported TM-21 L <sub>70</sub> Lifetime	>36,000hrs

### 3 - Test Data

#### 3.1 Data Set 1, 55 °C, 80mA (Lumen Maintenance)

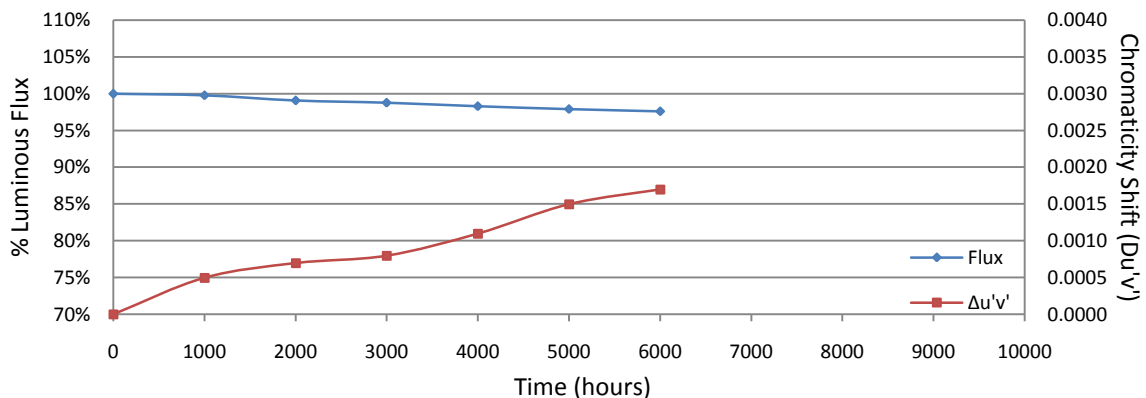
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.128	29.28	99.59	98.84	98.63	98.33	97.71	97.20
2	3.125	29.25	99.83	99.15	98.84	98.32	97.91	97.71
3	3.124	28.99	99.86	98.97	98.83	98.52	97.96	97.90
4	3.128	29.18	99.86	98.94	98.63	97.60	97.05	96.92
5	3.132	29.27	99.56	98.80	98.94	98.57	98.43	97.92
6	3.128	29.08	99.76	99.79	99.28	98.59	98.01	97.49
7	3.131	29.25	99.90	98.77	98.50	98.29	97.78	97.47
8	3.128	29.26	99.66	98.50	98.43	97.92	97.74	97.54
9	3.126	29.13	99.79	98.63	98.46	98.35	97.46	97.15
10	3.123	28.52	99.68	98.77	98.67	98.11	97.90	97.65
11	3.124	28.78	99.86	99.24	98.92	98.33	98.16	97.81
12	3.127	28.82	99.76	99.20	98.92	98.65	98.44	98.16
13	3.127	29.03	99.76	99.24	99.14	98.83	98.69	98.38
14	3.139	29.17	99.83	99.11	98.70	98.11	98.08	97.74
15	3.125	29.29	99.76	98.94	99.04	98.43	98.29	97.75
16	3.124	29.28	99.66	99.15	98.50	98.22	98.05	97.58
17	3.124	29.29	99.83	99.32	98.57	97.78	97.30	97.17
18	3.120	29.43	99.66	99.01	98.61	98.27	97.83	97.38
19	3.124	29.27	99.56	98.91	98.46	97.88	97.64	97.40
20	3.125	28.01	99.57	99.07	98.50	97.97	97.36	96.93
21	3.128	29.27	99.76	99.15	98.91	98.46	98.09	97.92
22	3.127	29.33	99.83	99.11	98.67	98.26	98.09	97.92
23	3.126	29.08	100.17	99.21	98.73	98.21	97.73	97.63
24	3.127	29.24	100.03	99.25	98.70	98.19	97.54	97.09
25	3.122	29.19	100.14	99.59	99.59	99.04	98.53	98.25
Ave.	3.126	29.11	99.79	99.07	98.77	98.29	97.91	97.60
Med.	3.126	29.24	99.76	99.11	98.70	98.29	97.91	97.63
st dev	0.0037	0.3040	0.1612	0.2816	0.2824	0.3220	0.3988	0.3918
Min.	3.120	28.01	99.56	98.50	98.43	97.60	97.05	96.92
Max.	3.139	29.43	100.17	99.79	99.59	99.04	98.69	98.38

TM-21 Projection:

**Test Duration:** 6000hrs  
**Failures Observed:** 0  
 $\alpha$ : 4.319E-06  
 $\beta$ : 1.001  
**Calculated L<sub>70</sub>:** 83,000hrs  
**Reported L<sub>70</sub>:** >36,000hrs

**3.2 Data Set 1, 55 °C, 80mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2589	0.5317	2757	0.0004	0.0006	0.0006	0.0010	0.0014	0.0016
2	0.2594	0.5299	2753	0.0004	0.0006	0.0006	0.0008	0.0013	0.0016
3	0.2586	0.5319	2762	0.0002	0.0008	0.0006	0.0009	0.0014	0.0017
4	0.2594	0.5303	2752	0.0005	0.0007	0.0007	0.0013	0.0022	0.0026
5	0.2587	0.5318	2761	0.0004	0.0007	0.0007	0.0009	0.0016	0.0020
6	0.2603	0.5314	2730	0.0006	0.0005	0.0008	0.0011	0.0016	0.0020
7	0.2599	0.5306	2741	0.0007	0.0008	0.0008	0.0010	0.0015	0.0019
8	0.2594	0.5323	2743	0.0006	0.0006	0.0007	0.0010	0.0015	0.0016
9	0.2583	0.5311	2772	0.0007	0.0008	0.0012	0.0013	0.0016	0.0019
10	0.2608	0.5322	2715	0.0007	0.0008	0.0011	0.0015	0.0017	0.0020
11	0.2596	0.5314	2744	0.0007	0.0008	0.0008	0.0011	0.0013	0.0017
12	0.2611	0.5317	2712	0.0002	0.0006	0.0006	0.0009	0.0013	0.0016
13	0.2594	0.5313	2748	0.0001	0.0005	0.0006	0.0010	0.0016	0.0019
14	0.2592	0.5302	2756	0.0006	0.0007	0.0011	0.0014	0.0014	0.0016
15	0.2600	0.5317	2734	0.0007	0.0009	0.0007	0.0011	0.0011	0.0015
16	0.2601	0.5307	2737	0.0006	0.0009	0.0009	0.0012	0.0012	0.0016
17	0.2621	0.5322	2689	0.0006	0.0008	0.0011	0.0016	0.0022	0.0023
18	0.2583	0.5309	2773	0.0006	0.0009	0.0010	0.0013	0.0017	0.0019
19	0.2625	0.5316	2684	0.0008	0.0009	0.0009	0.0011	0.0013	0.0016
20	0.2587	0.5308	2765	0.0008	0.0009	0.0011	0.0014	0.0012	0.0015
21	0.2594	0.5301	2752	0.0002	0.0006	0.0011	0.0014	0.0012	0.0014
22	0.2570	0.5311	2800	0.0002	0.0006	0.0009	0.0012	0.0014	0.0015
23	0.2604	0.5318	2725	0.0004	0.0007	0.0008	0.0011	0.0015	0.0017
24	0.2604	0.5306	2731	0.0005	0.0006	0.0008	0.0010	0.0013	0.0016
25	0.2584	0.5310	2770	0.0005	0.0007	0.0008	0.0011	0.0011	0.0014
Ave.	0.2596	0.5312	2744	0.0005	0.0007	0.0008	0.0011	0.0015	0.0017
Med.	0.2594	0.5313	2748	0.0006	0.0007	0.0008	0.0011	0.0014	0.0016
st dev	0.0012	0.0007	26.1427	0.0002	0.0001	0.0002	0.0002	0.0003	0.0003
Min.	0.2570	0.5299	2684	0.0001	0.0005	0.0006	0.0008	0.0011	0.0014
Max.	0.2625	0.5323	2800	0.0008	0.0009	0.0012	0.0016	0.0022	0.0026





**3.3 Data Set 2, 85°C, 80mA (Lumen Maintenance)**

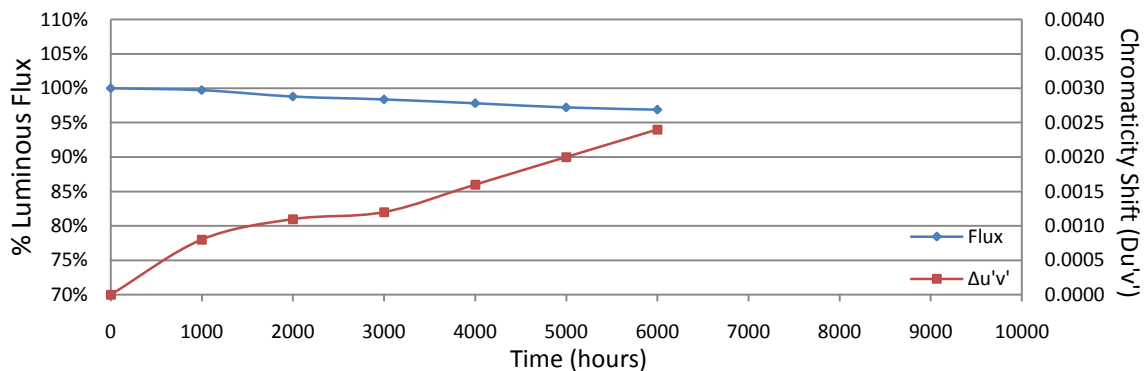
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.125	29.29	99.90	98.70	98.46	97.85	97.27	96.65
27	3.124	29.27	99.76	98.67	98.50	97.95	97.57	96.99
28	3.127	29.14	99.83	98.80	98.32	97.60	96.60	96.47
29	3.125	28.83	99.83	98.79	98.13	97.71	97.23	97.12
30	3.123	29.46	99.63	98.71	98.51	98.10	97.56	97.25
31	3.128	29.16	99.69	98.59	98.32	97.57	97.39	97.12
32	3.122	28.64	99.86	98.95	98.11	97.52	96.54	96.19
33	3.126	29.30	99.62	98.81	98.50	97.68	96.93	96.35
34	3.117	28.73	99.76	99.03	98.68	97.91	96.90	96.55
35	3.123	28.92	99.72	98.51	98.37	97.93	97.65	97.54
36	3.121	28.95	99.76	98.96	98.62	98.17	97.55	96.96
37	3.117	28.99	99.79	98.90	98.55	98.10	97.55	97.21
38	3.131	29.11	99.83	98.87	98.56	97.87	97.53	97.42
39	3.135	29.30	99.69	98.70	98.12	97.71	97.24	97.06
40	3.121	29.29	99.39	99.11	98.53	97.78	97.47	97.23
41	3.106	28.81	99.97	99.41	98.58	97.67	97.29	97.19
42	3.123	29.05	99.62	99.00	98.52	98.04	97.66	97.38
43	3.118	29.19	99.35	98.46	98.18	97.60	97.36	97.12
44	3.117	29.41	99.46	98.61	98.20	97.45	96.53	96.36
45	3.116	29.04	99.55	98.55	98.11	97.62	96.90	96.28
46	3.129	29.34	99.59	98.64	98.47	97.75	97.55	97.14
47	3.124	28.77	99.72	98.92	98.23	97.84	97.22	96.80
48	3.122	28.69	99.65	99.06	98.57	97.98	97.11	96.86
49	3.115	29.23	99.93	98.94	98.80	98.36	96.96	96.51
50	3.120	29.11	99.93	98.52	98.08	97.53	96.63	96.02
Ave.	3.122	29.08	99.71	98.81	98.40	97.81	97.21	96.87
Med.	3.123	29.11	99.72	98.80	98.47	97.78	97.27	96.99
st dev	0.0059	0.2364	0.1636	0.2248	0.2062	0.2295	0.3639	0.4257
Min.	3.106	28.64	99.35	98.46	98.08	97.45	96.53	96.02
Max.	3.135	29.46	99.97	99.41	98.80	98.36	97.66	97.54

TM-21 Projection:

**Test Duration:** 6000hrs  
**Failures Observed:** 0  
 $\alpha$ : 5.699E-06  
 $\beta$ : 1.001  
**Calculated L<sub>70</sub>:** 63,000hrs  
**Reported L<sub>70</sub>:** >36,000hrs

### 3.4 Data Set 2, 85°C, 80mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2569	0.5299	2808	0.0007	0.0009	0.0009	0.0012	0.0019	0.0022
27	0.2583	0.5316	2770	0.0006	0.0009	0.0010	0.0013	0.0017	0.0023
28	0.2594	0.5319	2746	0.0009	0.0012	0.0015	0.0018	0.0028	0.0034
29	0.2611	0.5322	2710	0.0009	0.0011	0.0014	0.0016	0.0019	0.0024
30	0.2614	0.5330	2701	0.0008	0.0012	0.0012	0.0015	0.0018	0.0023
31	0.2601	0.5321	2730	0.0007	0.0011	0.0012	0.0015	0.0017	0.0023
32	0.2589	0.5309	2760	0.0009	0.0011	0.0013	0.0017	0.0019	0.0024
33	0.2609	0.5316	2717	0.0010	0.0014	0.0014	0.0017	0.0019	0.0024
34	0.2596	0.5309	2745	0.0009	0.0012	0.0013	0.0017	0.0022	0.0026
35	0.2599	0.5317	2736	0.0010	0.0014	0.0014	0.0016	0.0017	0.0019
36	0.2600	0.5311	2737	0.0009	0.0012	0.0014	0.0017	0.0021	0.0025
37	0.2619	0.5313	2697	0.0010	0.0011	0.0013	0.0016	0.0019	0.0020
38	0.2590	0.5305	2761	0.0006	0.0010	0.0012	0.0017	0.0020	0.0024
39	0.2618	0.5301	2704	0.0006	0.0010	0.0012	0.0015	0.0019	0.0022
40	0.2617	0.5325	2695	0.0008	0.0009	0.0011	0.0017	0.0019	0.0021
41	0.2595	0.5318	2744	0.0003	0.0007	0.0009	0.0016	0.0018	0.0021
42	0.2622	0.5322	2686	0.0004	0.0009	0.0010	0.0014	0.0019	0.0021
43	0.2600	0.5322	2732	0.0009	0.0011	0.0012	0.0015	0.0018	0.0022
44	0.2581	0.5329	2768	0.0007	0.0011	0.0015	0.0018	0.0020	0.0024
45	0.2603	0.5294	2737	0.0007	0.0013	0.0013	0.0016	0.0017	0.0021
46	0.2590	0.5306	2760	0.0008	0.0013	0.0014	0.0018	0.0020	0.0022
47	0.2572	0.5289	2805	0.0009	0.0012	0.0015	0.0019	0.0031	0.0035
48	0.2601	0.5323	2730	0.0009	0.0010	0.0012	0.0015	0.0022	0.0027
49	0.2617	0.5310	2702	0.0008	0.0011	0.0011	0.0013	0.0017	0.0024
50	0.2607	0.5315	2719	0.0007	0.0013	0.0013	0.0015	0.0021	0.0028
Ave.	0.2600	0.5314	2736	0.0008	0.0011	0.0012	0.0016	0.0020	0.0024
Med.	0.2600	0.5316	2736	0.0008	0.0011	0.0013	0.0016	0.0019	0.0023
st dev	0.0014	0.0010	32.0611	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004
Min.	0.2569	0.5289	2686	0.0003	0.0007	0.0009	0.0012	0.0017	0.0019
Max.	0.2622	0.5330	2808	0.0010	0.0014	0.0015	0.0019	0.0031	0.0035



**3.5 Data Set 3, 105 °C, 80mA (Lumen Maintenance)**

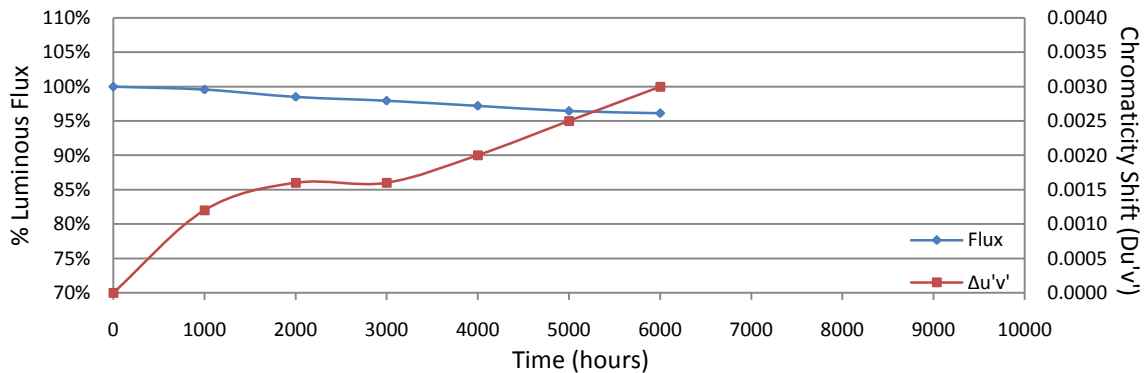
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
51	3.120	28.88	99.76	98.51	98.20	97.44	96.61	96.19
52	3.124	29.26	99.52	98.29	97.78	97.23	96.27	95.66
53	3.121	29.27	99.35	98.43	97.71	96.96	96.21	95.52
54	3.119	29.31	99.45	98.26	97.82	97.00	95.91	95.46
55	3.120	29.15	99.49	98.42	98.22	97.63	96.67	96.43
56	3.122	29.43	99.49	98.47	97.83	96.91	95.65	95.28
57	3.124	29.12	99.55	98.49	97.94	97.15	96.57	96.36
58	3.119	29.20	99.55	98.49	98.05	97.33	96.58	96.34
59	3.116	29.27	99.35	98.16	97.71	97.06	96.17	96.07
60	3.118	29.03	99.59	98.38	98.04	97.52	96.97	96.62
61	3.125	29.31	99.62	98.53	97.95	97.24	96.45	96.14
62	3.118	29.18	99.69	98.53	97.81	97.22	96.95	96.54
63	3.111	28.86	99.55	98.41	98.13	97.09	96.40	96.15
64	3.123	29.13	99.73	98.56	98.11	97.19	96.70	96.57
65	3.119	29.07	99.45	98.73	98.14	97.25	96.56	96.39
66	3.121	28.66	99.69	98.99	98.22	97.77	96.58	96.23
67	3.115	28.93	99.48	98.58	97.75	97.06	96.27	95.85
68	3.113	29.08	99.45	98.45	97.76	97.18	96.18	95.84
69	3.120	28.91	99.41	98.48	98.06	97.37	97.09	96.54
70	3.124	29.27	99.52	98.53	97.75	96.89	95.93	95.49
71	3.119	29.22	99.62	98.56	97.88	96.92	96.03	95.62
72	3.111	29.26	99.59	98.74	98.09	97.13	96.51	96.17
73	3.116	29.50	99.49	98.41	97.97	97.22	96.92	96.68
74	3.117	28.87	99.62	98.34	97.82	97.19	96.78	96.33
75	3.121	29.13	99.62	98.42	97.73	96.98	96.64	96.09
Ave.	3.119	29.13	99.55	98.49	97.94	97.20	96.46	96.10
Med.	3.119	29.15	99.55	98.48	97.94	97.19	96.56	96.17
st dev	0.0038	0.1967	0.1082	0.1654	0.1742	0.2221	0.3617	0.4062
Min.	3.111	28.66	99.35	98.16	97.71	96.89	95.65	95.28
Max.	3.125	29.50	99.76	98.99	98.22	97.77	97.09	96.68

TM-21 Projection:

**Test Duration:** 6000hrs  
**Failures Observed:** 0  
 $\alpha$ : 7.041E-06  
 $\beta$ : 1.001  
**Calculated L<sub>70</sub>:** 51,000  
**Reported L<sub>70</sub>:** >36,000hrs

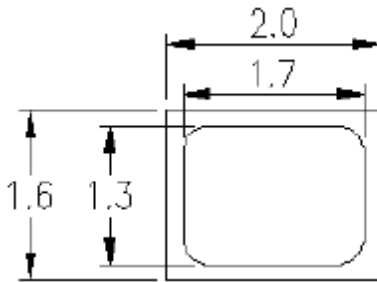
**3.6 Data Set 3, 105 °C, 80mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs
51	0.2607	0.5318	2720	0.0009	0.0012	0.0013	0.0016	0.0023	0.0028
52	0.2600	0.5311	2737	0.0011	0.0015	0.0015	0.0018	0.0025	0.0030
53	0.2607	0.5323	2717	0.0010	0.0015	0.0018	0.0021	0.0025	0.0028
54	0.2590	0.5312	2757	0.0010	0.0015	0.0016	0.0019	0.0026	0.0030
55	0.2608	0.5315	2717	0.0015	0.0016	0.0016	0.0019	0.0023	0.0028
56	0.2611	0.5326	2709	0.0015	0.0017	0.0018	0.0022	0.0025	0.0028
57	0.2612	0.5320	2709	0.0014	0.0017	0.0017	0.0020	0.0024	0.0028
58	0.2603	0.5304	2733	0.0007	0.0015	0.0016	0.0021	0.0022	0.0027
59	0.2597	0.5307	2745	0.0008	0.0013	0.0014	0.0017	0.0025	0.0030
60	0.2611	0.5310	2714	0.0007	0.0012	0.0013	0.0016	0.0021	0.0025
61	0.2601	0.5320	2730	0.0009	0.0013	0.0016	0.0019	0.0029	0.0033
62	0.2603	0.5319	2727	0.0012	0.0015	0.0016	0.0019	0.0026	0.0030
63	0.2599	0.5318	2735	0.0012	0.0015	0.0013	0.0017	0.0022	0.0028
64	0.2589	0.5325	2753	0.0012	0.0017	0.0016	0.0021	0.0026	0.0031
65	0.2596	0.5315	2744	0.0012	0.0016	0.0019	0.0024	0.0025	0.0031
66	0.2592	0.5318	2750	0.0012	0.0014	0.0017	0.0019	0.0029	0.0036
67	0.2604	0.5316	2727	0.0010	0.0016	0.0018	0.0021	0.0023	0.0030
68	0.2596	0.5306	2746	0.0011	0.0016	0.0016	0.0020	0.0023	0.0029
69	0.2604	0.5311	2728	0.0011	0.0016	0.0017	0.0021	0.0030	0.0036
70	0.2608	0.5306	2723	0.0012	0.0016	0.0016	0.0019	0.0026	0.0030
71	0.2598	0.5320	2738	0.0012	0.0017	0.0016	0.0020	0.0025	0.0029
72	0.2585	0.5299	2774	0.0010	0.0014	0.0015	0.0020	0.0026	0.0030
73	0.2594	0.5297	2754	0.0014	0.0017	0.0016	0.0020	0.0025	0.0029
74	0.2600	0.5313	2737	0.0014	0.0018	0.0019	0.0023	0.0025	0.0031
75	0.2627	0.5323	2678	0.0015	0.0019	0.0019	0.0022	0.0024	0.0029
Ave.	0.2602	0.5314	2732	0.0012	0.0016	0.0016	0.0020	0.0025	0.0030
Med.	0.2601	0.5315	2733	0.0012	0.0016	0.0016	0.0020	0.0025	0.0030
st dev	0.0009	0.0008	19.6700	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2585	0.5297	2678	0.0007	0.0012	0.0013	0.0016	0.0021	0.0025
Max.	0.2627	0.5326	2774	0.0015	0.0019	0.0019	0.0024	0.0030	0.0036



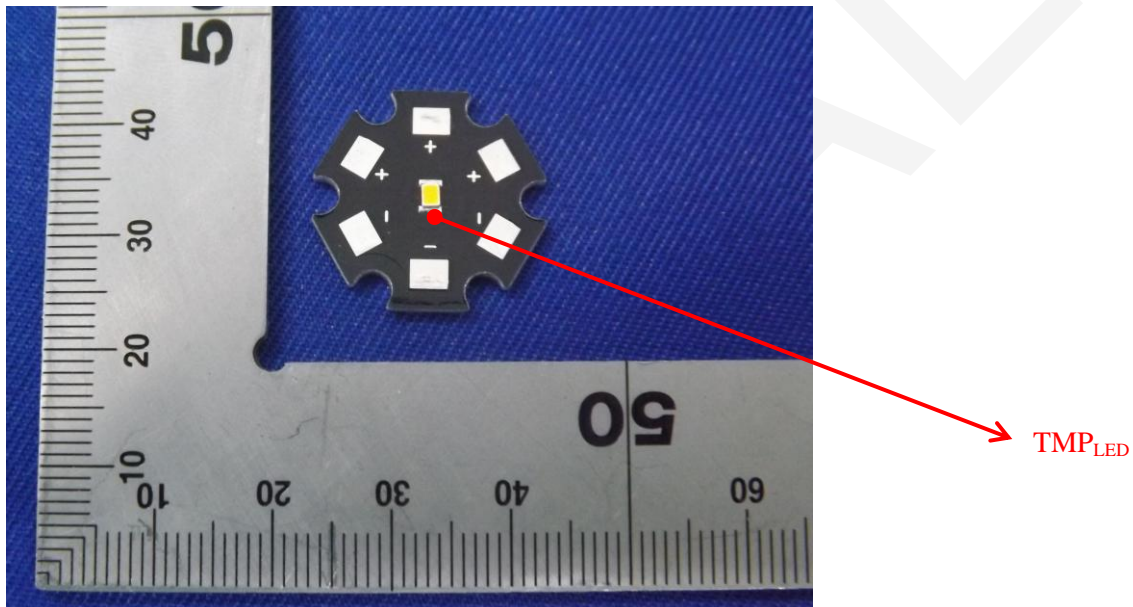
## Appendix A – EUT PHOTO

### A.1 Mechanical Dimensions (Ta = 25 °C)



All dimensions are in millimeter

### A.2 EUT Photo



**Attachment B – Family declaration letter**

LIGHTNING OPTOELECTRONIC TECHNOLOGY (SZ) Co., LTD

Building B, Wen Tao Technological Park, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China

**ATTESTATION OF SIMILARITY**

To Whom It May Concern:

LIGHTNING OPTOELECTRONIC TECHNOLOGY(SZ) Co.,LTD. hereby attest LED2016 EMC80mA series are designed with identical material and construction processes. And the tested model T2027811P-01AA are tested by BACL, the results of which are featured in BACL project RSZ140322501-10.


The tested model and the other LED package which attest similarity are designed with identical material and identical construction processes. The differences between the tested model and the other LED package which attest similarity are only CCT, CRI, current, current density and power density. The tested model is the greatest current, current density and power density, and listed in the following table:

Series Name	Model Name	CCT (K)	CRI	Number of Dies	Current (mA)	Volt (V)	Chip Layout		Current Per Die (mA)	Current Density (mA/mm <sup>2</sup> )	Power Density (W/mm <sup>2</sup> )
							Series	Parallel			
2016 EMC	T2027811P-01AA	2700	80	1	80	3	1	1	80	413	1240
2016 EMC	T2027811A-08125TME	2700	80	1	80	3	1	1	80	316	949
2016 EMC	T2027811A-10125TME	2700	80	1	80	3	1	1	80	188	564

Signature:

Print name: Ray yuan

Title: Manager


 LIGHTNING OPTOELECTRONIC TECHNOLOGY(SZ) Co.,LTD.

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