



# IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

## MEASUREMENT AND TEST REPORT

For

### Fujian Lightning Optoelectronic Co., Ltd. Shenzhen Branch

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Baoan District, Shenzhen, 518108 China

**Model: T34**

<b>Report Type:</b> 6000 Hours Test Report		<b>Product Type:</b> LED Package	
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<b>Report Number:</b>	RSZ150430501-10-6000		
<b>Test Date:</b>	2015-05-05 to 2016-01-10		
<b>Report Date:</b>	2016-01-19		
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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: T34  
 Part Type: LED Package  
 Nominal CCT: 3000K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report base on the declaration letter of manufacturer (see attachment B for more information). The information of these models shows that the covered products meet all section 3 item 7 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 9, 2011)

Series Name	Model Name	CCT(K)
3020 EMC	T3427731C*-**	2700
3020 EMC	T3427831C*-**	2700
3020 EMC	T3427931C*-**	2700
3020 EMC	T3430731C*-**	3000
3020 EMC	T3430831C*-**	3000
3020 EMC	T3430931C*-**	3000
3020 EMC	T3435731C*-**	3500
3020 EMC	T3435831C*-**	3500
3020 EMC	T3435931C*-**	3500
3020 EMC	T3440731C*-**	4000
3020 EMC	T3440831C*-**	4000
3020 EMC	T3440931C*-**	4000
3020 EMC	T3445731C*-**	4500
3020 EMC	T3445831C*-**	4500
3020 EMC	T3445931C*-**	4500
3020 EMC	T3450731C*-**	5000
3020 EMC	T3450831C*-**	5000
3020 EMC	T3450931C*-**	5000
3020 EMC	T3453731C*-**	5300
3020 EMC	T3453831C*-**	5300
3020 EMC	T3453931C*-**	5300
3020 EMC	T3457731C*-**	5700

Series Name	Model Name	CCT(K)
3020 EMC	T3457831C*._**	5700
3020 EMC	T3457931C*._**	5700
3020 EMC	T3465731C*._**	6500
3020 EMC	T3465831C*._**	6500
3020 EMC	T3465931C*._**	6500
3020 EMC	T3427C31C*._**	2700
3020 EMC	T3430C31C*._**	3000
3020 EMC	T3435C31C*._**	3500
3020 EMC	T3440C31C*._**	4000
3020 EMC	T3445C31C*._**	4500
3020 EMC	T3450C31C*._**	5000
3020 EMC	T3453C31C*._**	5300

#### Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Bay Area Compliance Laboratories Corp. (Dongguan) isn't responsible or gives any guarantees for the truthfulness of the technical information.

#### 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	2015-03-25	2016-03-25
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2015-03-05	2016-03-05

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2015-03-25	2016-03-25
Standard Light Source	EVERFINE	D062	1011093	N/A	2015-08-05	2016-08-05
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987C J7321114	300VA	2015-03-05	2016-03-05
Multilayer aging machine	BACL	B2-270	20015	25°C~110°C	2015-03-05	2016-03-05
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50V/15A)	2015-03-05	2016-03-05

### 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 (luminous flux) 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. The uncertainty of the CRI is  $U=1.7$  ( $K=2$ ), 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 66Pcs;

Each Ts test condition 22Pcs

The samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2015-04-30 and tested during 2015-05-05 to 2016-01-10. The samples were numbered from 1 to 22, 23 to 44 and 45 to 66

#### Data Set 1: 55 °C, 100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature( $T_S$ ):	$T_S = 54.3$ °C
Actual Ambient Temperature( $T_A$ ):	$T_A = 51.5$ °C
Life Test Drive Current:	$I_F = 100$ mA
Measurement Current:	$I_F = 100$ mA

#### Data Set 2: 85 °C,100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature( $T_S$ ):	$T_S = 84.2$ °C
Actual Ambient Temperature( $T_A$ ):	$T_A = 82.5$ °C
Life Test Drive Current:	$I_F = 100$ mA
Measurement Current:	$I_F = 100$ mA

#### Data Set 3: 105 °C, 100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature( $T_S$ ):	$T_S = 104.4$ °C
Actual Ambient Temperature( $T_A$ ):	$T_A = 102.1$ °C
Life Test Drive Current:	$I_F = 100$ mA
Measurement Current:	$I_F = 100$ mA

## 2 - SUMMARY OF TEST RESULT

<b>Data Set:</b>	<b>Data Set 1, 55 °C, 100mA</b>
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.87%
Average Chromaticity Shift at 6000 hours ( $\Delta u'v'$ ):	0.0018
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000 hours

<b>Data Set:</b>	<b>Data Set 2, 85 °C, 100mA</b>
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.84%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0028
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000 hours

<b>Data Set:</b>	<b>Data Set 3, 105 °C, 100mA</b>
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.08%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0027
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000 hours

### 3 - Test Data

#### 3.1 Data Set 1, 55 °C, 100mA (Lumen Maintenance)

No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	9.375	110.6	99.64	99.28	99.10	98.64	98.55	98.10
2	9.457	111.8	99.82	99.37	99.11	98.84	98.66	98.57
3	9.457	112.4	99.56	99.20	99.11	98.84	98.67	98.40
4	9.339	111.6	99.37	99.19	99.10	98.75	98.39	97.94
5	9.385	110.4	99.55	99.18	99.00	98.55	98.46	98.10
6	9.354	110.8	99.28	99.01	98.74	98.47	98.29	98.10
7	9.403	112.0	99.46	98.84	98.66	98.21	98.13	97.86
8	9.386	110.2	99.73	99.55	99.36	98.82	98.37	98.19
9	9.357	112.0	99.29	99.11	98.93	98.04	97.68	97.32
10	9.325	111.4	99.46	99.28	98.92	98.38	98.03	97.40
11	9.417	112.2	99.47	98.93	98.75	98.48	97.15	96.97
12	9.360	112.0	99.55	99.20	99.11	98.84	96.52	96.43
13	9.372	110.5	99.64	99.19	99.00	98.82	98.28	98.01
14	9.403	111.0	99.55	99.37	99.28	98.47	98.20	98.02
15	9.438	111.9	99.55	99.37	99.20	98.93	98.57	98.21
16	9.370	112.4	99.38	99.29	99.11	98.67	98.22	98.04
17	9.344	109.6	99.91	99.64	99.54	98.72	98.45	97.90
18	9.343	110.4	99.82	99.55	99.46	99.00	98.73	98.64
19	9.347	110.7	99.64	99.46	99.37	98.83	98.55	98.10
20	9.452	111.9	99.64	99.37	99.20	98.84	98.66	98.30
21	9.349	110.6	99.46	99.01	98.82	98.46	97.92	97.29
22	9.382	109.5	99.63	99.18	99.00	98.36	97.99	97.35
Ave.	9.383	111.2	99.56	99.25	99.08	98.63	98.20	97.87
Med.	9.374	111.2	99.55	99.24	99.10	98.69	98.33	98.03
st dev	0.040	0.9	0.1658	0.2028	0.2313	0.2496	0.5292	0.5380
Min.	9.325	109.5	99.28	98.84	98.66	98.04	96.52	96.43
Max.	9.457	112.4	99.91	99.64	99.54	99.00	98.73	98.64

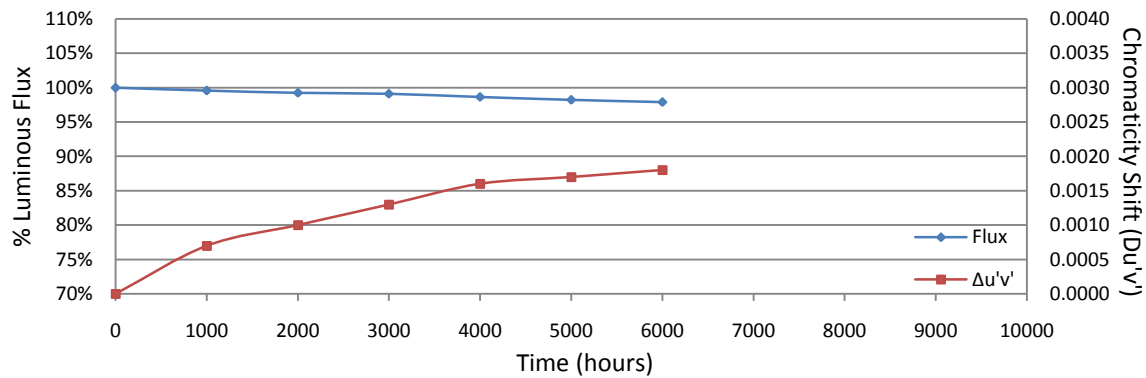
#### TM-21 Projection:

**Test Duration:** 6000 hours  
**Failures Observed:** 0  
 $\alpha$ : 3.487E-06  
 $\beta$ : 1.000  
**Calculated L<sub>70</sub>:** 102,000 hours  
**Reported L<sub>70</sub>:** >36,000 hours



### 3.2 Data Set 1, 55 °C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2485	0.5207	3057	0.0007	0.0009	0.0011	0.0012	0.0013	0.0014
2	0.2478	0.5212	3070	0.0006	0.0009	0.0012	0.0013	0.0013	0.0015
3	0.2477	0.5210	3074	0.0006	0.0009	0.0013	0.0014	0.0016	0.0017
4	0.2465	0.5176	3129	0.0006	0.0009	0.0012	0.0014	0.0015	0.0016
5	0.2474	0.5193	3095	0.0006	0.0010	0.0012	0.0014	0.0016	0.0016
6	0.2476	0.5177	3100	0.0006	0.0008	0.0013	0.0015	0.0017	0.0017
7	0.2480	0.5192	3080	0.0007	0.0009	0.0013	0.0014	0.0016	0.0019
8	0.2480	0.5209	3069	0.0007	0.0010	0.0013	0.0014	0.0017	0.0019
9	0.2470	0.5203	3097	0.0006	0.0009	0.0011	0.0013	0.0015	0.0016
10	0.2491	0.5191	3051	0.0007	0.0010	0.0012	0.0014	0.0016	0.0017
11	0.2475	0.5174	3105	0.0008	0.0011	0.0008	0.0010	0.0011	0.0012
12	0.2476	0.5200	3085	0.0007	0.0010	0.0007	0.0009	0.0008	0.0009
13	0.2475	0.5195	3090	0.0005	0.0009	0.0015	0.0016	0.0016	0.0014
14	0.2471	0.5189	3105	0.0007	0.0010	0.0017	0.0025	0.0014	0.0011
15	0.2466	0.5188	3118	0.0006	0.0009	0.0017	0.0021	0.0017	0.0011
16	0.2488	0.5199	3054	0.0008	0.0010	0.0017	0.0020	0.0016	0.0017
17	0.2485	0.5191	3066	0.0008	0.0011	0.0017	0.0020	0.0018	0.0018
18	0.2466	0.5182	3124	0.0007	0.0010	0.0014	0.0019	0.0020	0.0017
19	0.2470	0.5172	3120	0.0009	0.0010	0.0016	0.0022	0.0024	0.0026
20	0.2483	0.5203	3063	0.0006	0.0009	0.0009	0.0014	0.0021	0.0023
21	0.2479	0.5191	3082	0.0007	0.0010	0.0019	0.0026	0.0034	0.0035
22	0.2490	0.5205	3045	0.0007	0.0009	0.0010	0.0017	0.0025	0.0031
Ave.	0.2477	0.5194	3085	0.0007	0.0010	0.0013	0.0016	0.0017	0.0018
Med.	0.2477	0.5193	3084	0.0007	0.0010	0.0013	0.0014	0.0016	0.0017
st dev	0.0008	0.0012	24.9221	0.0001	0.0001	0.0003	0.0005	0.0005	0.0006
Min.	0.2465	0.5172	3045	0.0005	0.0008	0.0007	0.0009	0.0008	0.0009
Max.	0.2491	0.5212	3129	0.0009	0.0011	0.0019	0.0026	0.0034	0.0035



**3.3 Data Set 2, 85 °C, 100mA (Lumen Maintenance)**

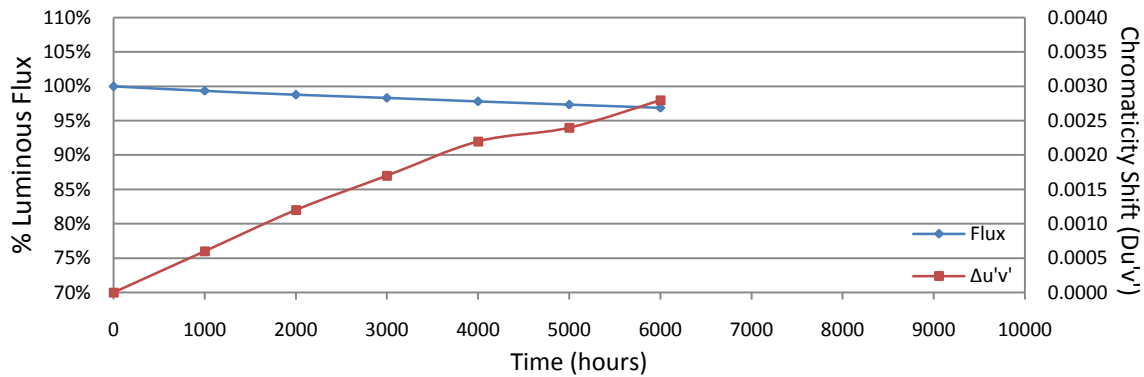
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	9.408	111.7	99.37	98.93	98.66	98.03	97.76	97.22
24	9.366	111.0	99.46	98.74	98.38	97.66	97.30	96.76
25	9.382	110.4	99.55	99.09	98.73	98.01	97.64	97.01
26	9.435	111.4	99.64	99.01	98.56	98.47	97.58	96.95
27	9.388	110.8	99.28	98.74	98.29	96.75	96.66	96.12
28	9.328	110.5	99.19	98.64	98.28	97.83	97.65	96.83
29	9.322	110.9	99.28	98.38	97.93	97.29	97.02	96.66
30	9.395	110.7	99.64	99.19	98.74	98.37	97.92	97.29
31	9.388	111.9	99.29	98.66	98.03	97.41	97.14	96.78
32	9.384	111.6	99.19	98.75	98.21	97.67	97.04	96.77
33	9.386	109.6	99.54	99.09	98.63	98.27	97.35	97.17
34	9.378	110.6	99.37	98.82	98.37	97.92	97.47	96.84
35	9.354	112.9	99.29	98.67	98.23	97.79	97.61	97.17
36	9.374	110.5	99.28	98.91	98.46	98.01	97.29	96.83
37	9.387	112.7	99.02	98.58	98.14	97.60	97.25	96.72
38	9.332	110.8	99.19	98.83	98.56	97.92	97.38	96.93
39	9.324	111.0	99.10	98.65	98.20	97.93	97.30	96.76
40	9.351	111.1	99.28	98.74	98.29	97.93	97.57	97.03
41	9.332	111.0	99.19	98.56	98.02	97.66	97.30	97.21
42	9.327	111.5	99.10	98.48	97.94	97.58	96.77	96.50
43	9.391	112.1	99.20	98.39	97.68	97.50	96.88	96.25
44	9.338	111.4	99.37	98.65	98.38	98.11	97.49	96.68
Ave.	9.367	111.2	99.31	98.75	98.30	97.81	97.33	96.84
Med.	9.376	111.0	99.28	98.74	98.29	97.87	97.33	96.83
st dev	0.031	0.8	0.1701	0.2198	0.2802	0.3809	0.3213	0.2975
Min.	9.322	109.6	99.02	98.38	97.68	96.75	96.66	96.12
Max.	9.435	112.9	99.64	99.19	98.74	98.47	97.92	97.29

TM-21 Projection:

**Test Duration:** 6000 hours  
**Failures Observed:** 0  
 $\alpha$ : 4.982E-06  
 $\beta$ : 0.998  
**Calculated L<sub>70</sub>:** 71,000 hours  
**Reported L<sub>70</sub>:** >36,000 hours

### 3.4 Data Set 2, 85 °C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	0.2471	0.5189	3106	0.0008	0.0015	0.0017	0.0021	0.0025	0.0030
24	0.2489	0.5181	3063	0.0008	0.0011	0.0016	0.0021	0.0026	0.0034
25	0.2473	0.5198	3093	0.0006	0.0009	0.0008	0.0015	0.0022	0.0031
26	0.2465	0.5187	3122	0.0007	0.0013	0.0007	0.0010	0.0017	0.0024
27	0.2489	0.5203	3048	0.0006	0.0011	0.0012	0.0015	0.0020	0.0027
28	0.2472	0.5197	3095	0.0006	0.0011	0.0015	0.0016	0.0016	0.0023
29	0.2485	0.5184	3071	0.0006	0.0011	0.0021	0.0022	0.0019	0.0026
30	0.2477	0.5208	3075	0.0005	0.0009	0.0018	0.0019	0.0016	0.0022
31	0.2489	0.5198	3051	0.0006	0.0011	0.0024	0.0025	0.0024	0.0026
32	0.2479	0.5189	3085	0.0008	0.0013	0.0023	0.0028	0.0026	0.0028
33	0.2465	0.5189	3122	0.0006	0.0011	0.0019	0.0026	0.0025	0.0026
34	0.2477	0.5201	3082	0.0006	0.0012	0.0018	0.0026	0.0024	0.0025
35	0.2467	0.5188	3115	0.0006	0.0011	0.0019	0.0026	0.0026	0.0026
36	0.2473	0.5197	3094	0.0005	0.0010	0.0018	0.0025	0.0028	0.0030
37	0.2482	0.5197	3070	0.0006	0.0012	0.0019	0.0026	0.0029	0.0031
38	0.2477	0.5205	3078	0.0007	0.0014	0.0021	0.0028	0.0031	0.0033
39	0.2468	0.5188	3114	0.0006	0.0011	0.0016	0.0025	0.0029	0.0029
40	0.2477	0.5188	3091	0.0006	0.0011	0.0016	0.0025	0.0027	0.0030
41	0.2478	0.5194	3083	0.0006	0.0012	0.0017	0.0025	0.0026	0.0027
42	0.2471	0.5186	3108	0.0007	0.0012	0.0018	0.0023	0.0024	0.0028
43	0.2477	0.5196	3085	0.0006	0.0013	0.0019	0.0024	0.0030	0.0030
44	0.2471	0.5192	3103	0.0006	0.0011	0.0018	0.0022	0.0027	0.0028
Ave.	0.2476	0.5193	3089	0.0006	0.0012	0.0017	0.0022	0.0024	0.0028
Med.	0.2477	0.5193	3088	0.0006	0.0011	0.0018	0.0024	0.0025	0.0028
st dev	0.0007	0.0007	21.0727	0.0001	0.0001	0.0004	0.0005	0.0004	0.0003
Min.	0.2465	0.5181	3048	0.0005	0.0009	0.0007	0.0010	0.0016	0.0022
Max.	0.2489	0.5208	3122	0.0008	0.0015	0.0024	0.0028	0.0031	0.0034



**3.5 Data Set 3, 105 °C, 100mA (Lumen Maintenance)**

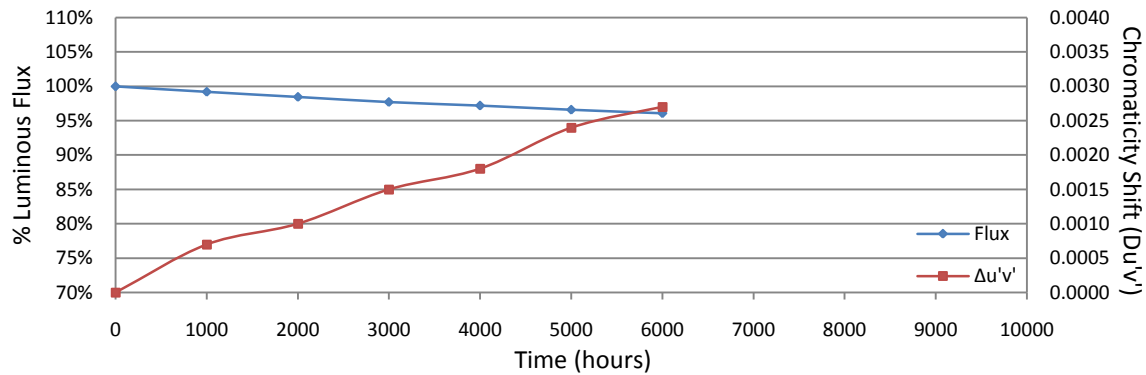
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	9.323	110.0	99.18	98.36	97.82	97.36	97.18	96.64
46	9.375	106.0	99.25	98.49	97.83	97.64	96.70	96.04
47	9.367	108.5	99.08	98.43	97.70	97.14	96.87	96.31
48	9.322	112.1	99.11	98.48	97.68	96.79	96.61	95.99
49	9.300	111.2	99.19	98.65	97.93	97.39	96.58	95.86
50	9.339	111.0	99.10	98.92	98.29	97.93	97.57	97.03
51	9.377	111.4	99.19	98.29	97.58	97.13	96.68	96.50
52	9.334	111.1	99.01	98.38	97.48	96.67	95.86	95.41
53	9.379	112.2	99.02	98.13	97.59	96.97	96.26	95.90
54	9.350	111.4	99.19	98.74	98.03	97.49	96.59	96.05
55	9.322	111.0	99.10	98.65	97.84	96.85	96.58	96.22
56	9.346	111.5	98.92	98.12	97.40	96.86	96.05	95.70
57	9.333	111.5	99.01	98.12	97.40	96.68	95.96	95.87
58	9.378	111.1	99.91	99.19	98.38	97.84	97.12	96.40
59	9.428	111.3	99.28	98.65	97.93	97.39	96.86	96.14
60	9.439	112.5	99.29	98.58	97.96	97.51	97.16	96.53
61	9.342	110.8	99.19	98.38	97.65	97.29	96.75	96.12
62	9.429	111.4	99.28	98.38	97.58	97.40	96.86	96.50
63	9.368	111.5	99.10	98.12	97.31	96.68	95.96	95.34
64	9.351	111.0	99.28	98.20	97.48	97.03	96.40	95.77
65	9.384	110.6	99.28	98.28	97.47	97.02	96.29	95.84
66	9.390	111.9	99.11	98.39	97.50	96.96	95.98	95.53
Ave.	9.363	111.0	99.18	98.45	97.72	97.18	96.58	96.08
Med.	9.359	111.3	99.18	98.39	97.67	97.14	96.60	96.04
st dev	0.037	1.4	0.1923	0.2736	0.2846	0.3694	0.4570	0.4188
Min.	9.300	106.0	98.92	98.12	97.31	96.67	95.86	95.34
Max.	9.439	112.5	99.91	99.19	98.38	97.93	97.57	97.03

TM-21 Projection:

**Test Duration:** 6000 hours  
**Failures Observed:** 0  
 $\alpha$ : 6.339E-06  
 $\beta$ : 0.997  
**Calculated L<sub>70</sub>:** 56,000 hours  
**Reported L<sub>70</sub>:** >36,000 hours

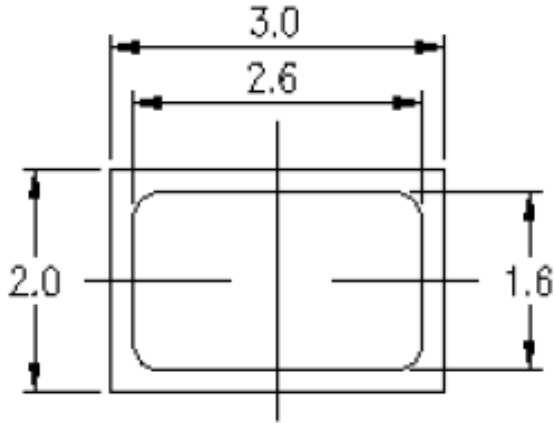
### 3.6 Data Set 3, 105 °C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	0.2477	0.5181	3095	0.0006	0.0011	0.0013	0.0018	0.0023	0.0025
46	0.2484	0.5208	3059	0.0009	0.0017	0.0025	0.0030	0.0035	0.0037
47	0.2476	0.5196	3086	0.0006	0.0006	0.0013	0.0018	0.0024	0.0028
48	0.2477	0.5189	3089	0.0007	0.0010	0.0016	0.0021	0.0026	0.0032
49	0.2480	0.5196	3076	0.0007	0.0008	0.0016	0.0021	0.0026	0.0031
50	0.2478	0.5207	3074	0.0005	0.0008	0.0013	0.0019	0.0024	0.0029
51	0.2499	0.5208	3021	0.0007	0.0011	0.0013	0.0019	0.0025	0.0027
52	0.2474	0.5171	3109	0.0007	0.0011	0.0014	0.0015	0.0006	0.0001
53	0.2480	0.5189	3081	0.0006	0.0010	0.0013	0.0014	0.0023	0.0027
54	0.2467	0.5186	3117	0.0007	0.0011	0.0015	0.0016	0.0023	0.0030
55	0.2469	0.5183	3115	0.0007	0.0011	0.0014	0.0015	0.0023	0.0028
56	0.2486	0.5197	3061	0.0006	0.0010	0.0011	0.0012	0.0021	0.0025
57	0.2493	0.5207	3037	0.0007	0.0011	0.0016	0.0018	0.0025	0.0028
58	0.2472	0.5178	3111	0.0008	0.0011	0.0017	0.0019	0.0026	0.0030
59	0.2485	0.5198	3063	0.0006	0.0010	0.0016	0.0018	0.0024	0.0027
60	0.2483	0.5208	3062	0.0006	0.0010	0.0015	0.0017	0.0023	0.0028
61	0.2475	0.5175	3104	0.0006	0.0010	0.0016	0.0018	0.0025	0.0029
62	0.2474	0.5212	3081	0.0006	0.0010	0.0016	0.0018	0.0024	0.0028
63	0.2478	0.5185	3088	0.0007	0.0011	0.0018	0.0021	0.0022	0.0027
64	0.2472	0.5191	3100	0.0006	0.0010	0.0017	0.0019	0.0026	0.0025
65	0.2479	0.5189	3084	0.0007	0.0011	0.0016	0.0019	0.0025	0.0025
66	0.2479	0.5178	3092	0.0007	0.0011	0.0017	0.0020	0.0026	0.0029
Ave.	0.2479	0.5192	3082	0.0007	0.0010	0.0015	0.0018	0.0024	0.0027
Med.	0.2478	0.5190	3085	0.0007	0.0010	0.0016	0.0018	0.0024	0.0028
st dev	0.0007	0.0012	24.5386	0.0001	0.0002	0.0003	0.0003	0.0005	0.0006
Min.	0.2467	0.5171	3021	0.0005	0.0006	0.0011	0.0012	0.0006	0.0001
Max.	0.2499	0.5212	3117	0.0009	0.0017	0.0025	0.0030	0.0035	0.0037



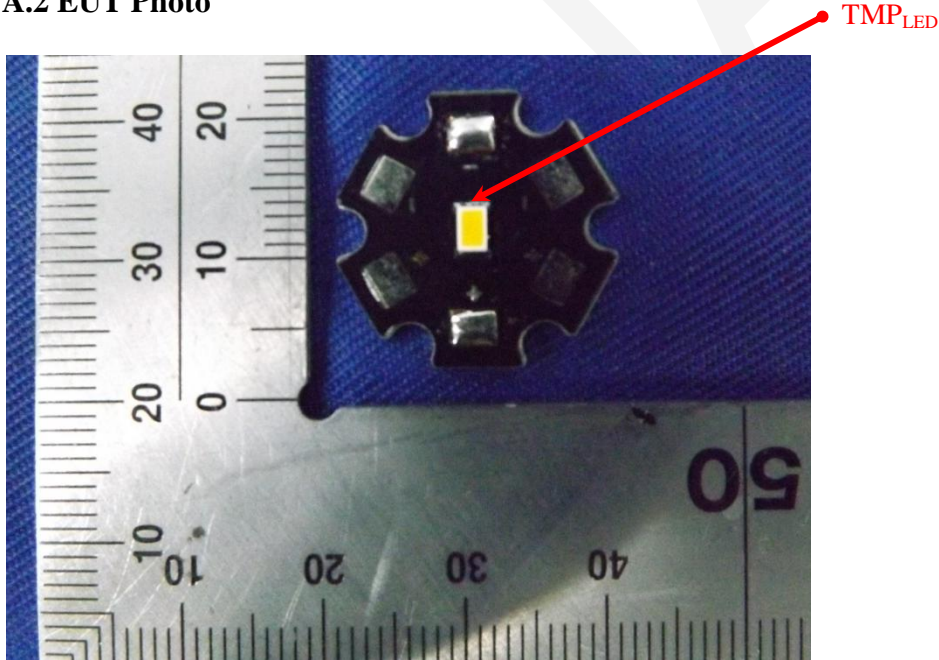
## Attachment A – EUT PHOTO

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



All dimensions are in millimeter

### A.2 EUT Photo



**Attachment B – Family declaration Letter**

Fujian Lightning Optoelectronic Co.,Ltd.Shenzhen Branch

Building B ,Wen Tao Technological Park,YingrenshiCommunity,ShiyanStreet,BaoanDistrict,Shenzhen,China

**ATTESTATION OF SIMILARITY**

To Whom It May Concern:

Fujian Lightning Optoelectronic Co.,Ltd.Shenzhen Branch. hereby attest LED3020 EMC 100mA series are designed with identical material and construction processes. And the tested model T3430831C\*-\* are tested by BAEL, the results of which are featured in BAEL project RSZ150430501-10 . The first "\*" and "\*\*\*" means the Internal code number. It can be Numbers or letters.

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 LEDpackage which attest similarity are only CCT and internal code. The tested model is the greatest current density and power density, and listed in the following table:

Series Name	Model Name	CCT(K)
3020 EMC	T3427731C*-*	2700
3020 EMC	T3427831C*-*	2700
3020 EMC	T3427931C*-*	2700
3020 EMC	T3430731C*-*	3000
3020 EMC	T3430831C*-*	3000
3020 EMC	T3430931C*-*	3000
3020 EMC	T3435731C*-*	3500
3020 EMC	T3435831C*-*	3500
3020 EMC	T3435931C*-*	3500
3020 EMC	T3440731C*-*	4000
3020 EMC	T3440831C*-*	4000
3020 EMC	T3440931C*-*	4000
3020 EMC	T3445731C*-*	4500
3020 EMC	T3445831C*-*	4500
3020 EMC	T3445931C*-*	4500
3020 EMC	T3450731C*-*	5000



Fujian Lightning Optoelectronic Co.,Ltd.Shenzhen Branch

Building B ,Wen Tao Technological Park,YingrenshiCommunity,ShiyanStreet,BaoanDistrict,Shenzhen,China

3020 EMC	T3450831C* **	5000
3020 EMC	T3450931C* **	5000
3020 EMC	T3453731C* **	5300
3020 EMC	T3453831C* **	5300
3020 EMC	T3453931C* **	5300
3020 EMC	T3457731C* **	5700
3020 EMC	T3457831C* **	5700
3020 EMC	T3457931C* **	5700
3020 EMC	T3465731C* **	6500
3020 EMC	T3465831C* **	6500
3020 EMC	T3465931C* **	6500
3020 EMC	T3427C31C* **	2700
3020 EMC	T3430C31C* **	3000
3020 EMC	T3435C31C* **	3500
3020 EMC	T3440C31C* **	4000
3020 EMC	T3445C31C* **	4500
3020 EMC	T3450C31C* **	5000
3020 EMC	T3453C31C* **	5300

Signature: *keren 2016.1.18*

Print name: keren

Title: NPI Engineer

LIGHTNING OPTOELECTRONIC TECHNOLOGY(SZ) Co.,LTD.

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