



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Fujian Lightning Optoelectronic Co.,Ltd.Shenzhen Branch

5F, Building B, second phase of Chuangjian Industrial Area, YingRenShi community, Shiyan Street,
Baoan District, Shenzhen,China

Model: T3C

Report Type: 9000 Hours Test Report	Product Type: LED Package
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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: T3C27821C-01AA
 Part Name: 3030
 Part Type: LED Package
 Nominal CCT: 2700K
 Test Drive Current: 200mA

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 appendix 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)	Number of Dies	Current (mA)
3030 EMC	T3C27821C-01AA	2700	2	200
3030 EMC	T3C27721Q-01AA	2700	2	200
3030 EMC	T3C27821Q-01AA	2700	2	200
3030 EMC	T3C27821Q-02AA	2700	2	200
3030 EMC	T3C27821Q-03AA	2700	2	200
3030 EMC	T3C27821Q-04AA	2700	2	200
3030 EMC	T3C27921Q-01AA	2700	2	200
3030 EMC	T3C30721Q-01AA	3000	2	200
3030 EMC	T3C30821Q-01AA	3000	2	200
3030 EMC	T3C30821Q-02AA	3000	2	200
3030 EMC	T3C30821Q-03AA	3000	2	200
3030 EMC	T3C30821Q-04AA	3000	2	200
3030 EMC	T3C30921Q-01AA	3000	2	200
3030 EMC	T3C35721Q-01AA	3500	2	200
3030 EMC	T3C35821Q-01AA	3500	2	200
3030 EMC	T3C40721Q-01AA	4000	2	200
3030 EMC	T3C40821Q-01AA	4000	2	200
3030 EMC	T3C40821Q-02AA	4000	2	200
3030 EMC	T3C40821Q-03AA	4000	2	200
3030 EMC	T3C40921Q-01AA	4000	2	200
3030 EMC	T3C50721Q-01AA	5000	2	200
3030 EMC	T3C50821Q-01AA	5000	2	200
3030 EMC	T3C50821Q-02AA	5000	2	200
3030 EMC	T3C50921Q-01AA	5000	2	200
3030 EMC	T3C57821Q-02AA	5700	2	200
3030 EMC	T3C65721Q-01AA	6500	2	200
3030 EMC	T3C65821Q-01AA	6500	2	200
3030 EMC	T3C65821Q-02AA	6500	2	200
3030 EMC	T3C65821Q-03AA	6500	2	200
3030 EMC	T3C65821Q-04AA	6500	2	200

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
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016 T	380-780nm	2015-03-25	2016-03-25
Standard Light Source	EVERFINE	D062	1011093	N/A	2014-08-05	2015-08-05
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987 CJ73211 14	300VA	2015-03-05	2016-03-05
LM-80 Aging equipment	BACL	N/A	#5	N/A	2015-03-19	2016-03-19
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#4	(120V/1A)	2014-12-04	2015-12-04
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#5	(120V/1A)	2014-12-04	2015-12-04
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#6	(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 samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2014-04-17 and tested during 2014-05-06 to 2015-05-20. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

Data Set 1: 55 °C, 200mA

Part Number:	T3C27821C-01AA
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 54.6$ °C
Actual Ambient Temperature(T_A):	$T_A = 51.9$ °C
Life Test Drive Current:	$I_F = 200$ mA
Measurement Current:	$I_F = 200$ mA

Data Set 2: 85 °C,200mA

Part Number:	T3C27821C-01AA
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 84.3$ °C
Actual Ambient Temperature(T_A):	$T_A = 82.9$ °C
Life Test Drive Current:	$I_F = 200$ mA
Measurement Current:	$I_F = 200$ mA

Data Set 3: 105 °C, 200mA

Part Number:	T3C27821C-01AA
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 104.1$ °C
Actual Ambient Temperature(T_A):	$T_A = 103.4$ °C
Life Test Drive Current:	$I_F = 200$ mA
Measurement Current:	$I_F = 200$ mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 200mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h 9000h
Average. Lumen Maintenance at 6000 hours:	97.61%
Average. Lumen Maintenance at 9000 hours:	95.25%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0018
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0033
Reported TM-21 L ₇₀ Lifetime:	>52,000 hours

Data Set:	Data Set 2, 85 °C, 200mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h 9000h
Average. Lumen Maintenance at 6000 hours:	96.93%
Average. Lumen Maintenance at 9000 hours:	94.40%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0031
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0038
Reported TM-21 L ₇₀ Lifetime:	>48,000 hours

Data Set:	Data Set 3, 105 °C, 200mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h 9000h
Average. Lumen Maintenance at 6000 hours:	96.30%
Average. Lumen Maintenance at 9000 hours:	93.62%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0033
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0046
Reported TM-21 L ₇₀ Lifetime:	>46,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 200 mA (Lumen Maintenance)

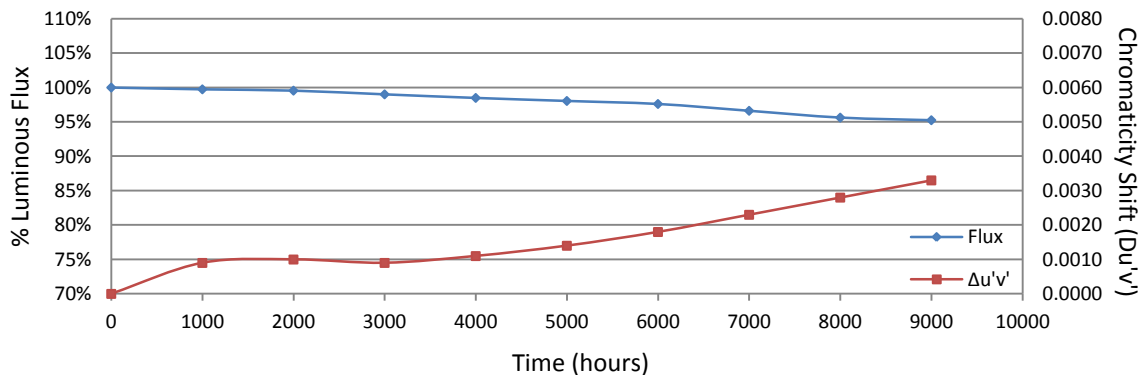
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	6.478	143.6	99.72	99.37	98.68	98.26	97.91	97.56	96.80	95.82	95.33
2	6.449	142.3	99.58	99.51	98.95	98.52	97.96	97.68	96.63	95.64	95.36
3	6.515	145.5	99.66	99.31	98.83	98.35	97.94	97.25	96.49	95.46	95.05
4	6.575	143.8	99.44	99.37	98.82	98.33	98.19	97.64	97.43	96.59	96.18
5	6.463	141.5	99.72	99.58	98.94	98.30	97.95	97.53	97.53	96.54	95.90
6	6.480	141.9	99.79	99.72	99.51	98.52	97.82	97.18	96.90	96.12	95.77
7	6.469	142.5	99.72	99.44	98.95	98.46	98.25	97.89	96.91	95.93	95.79
8	6.463	142.9	99.86	99.02	98.39	97.97	97.62	97.48	96.92	95.87	95.31
9	6.479	141.7	99.72	99.65	98.94	98.59	98.02	97.53	96.12	95.13	94.85
10	6.509	145.3	99.59	99.31	98.97	98.62	98.00	97.38	96.08	94.98	94.70
11	6.457	142.3	99.65	99.58	98.95	98.66	98.10	97.75	95.71	94.73	94.31
12	6.473	143.7	99.72	99.65	99.10	98.68	97.84	97.22	96.10	95.20	94.92
13	6.506	146.2	99.73	99.45	98.63	98.22	97.95	97.67	96.44	95.49	95.01
14	6.472	141.9	99.79	99.65	99.30	98.59	97.96	97.39	96.90	96.12	95.63
15	6.445	143.5	99.58	99.44	98.89	98.33	97.70	97.21	96.38	95.19	94.91
16	6.502	146.4	99.80	99.73	99.45	98.77	98.02	97.40	96.17	95.01	94.47
17	6.465	141.9	99.72	99.65	99.01	98.52	98.31	98.10	96.90	95.91	95.49
18	6.462	141.8	99.86	99.58	99.01	98.59	98.10	97.81	96.54	95.56	95.13
19	6.493	144.2	100.00	99.79	99.17	98.61	98.20	97.71	96.12	95.35	94.87
20	6.466	142.2	100.07	99.93	99.58	99.16	98.59	97.96	96.69	95.64	95.22
21	6.473	142.6	99.72	99.65	99.02	98.60	98.25	97.76	96.84	95.72	95.51
22	6.454	140.6	99.86	99.43	99.00	98.51	97.87	97.37	96.51	95.31	95.09
23	6.502	146.0	99.73	99.59	98.97	98.49	98.22	97.95	96.58	95.48	95.07
24	6.465	141.8	99.86	99.79	99.44	98.59	98.52	98.03	97.18	96.12	95.84
25	6.465	141.1	99.72	99.50	98.80	98.02	97.94	97.73	96.67	95.75	95.61
Ave.	6.479	143.09	99.74	99.55	99.01	98.49	98.05	97.61	96.62	95.63	95.25
Med.	6.472	142.50	99.72	99.58	98.97	98.52	98.00	97.64	96.63	95.64	95.22
st dev	0.0276	1.6732	0.1327	0.1913	0.2780	0.2418	0.2288	0.2662	0.4329	0.4686	0.4616
Min.	6.445	140.60	99.44	99.02	98.39	97.97	97.62	97.18	95.71	94.73	94.31
Max.	6.575	146.40	100.07	99.93	99.58	99.16	98.59	98.10	97.53	96.59	96.18

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 7.212E-06
 β : 1.016
Calculated L₇₀: 52,000hours
Reported L₇₀: 52,000hours

3.2 Data Set 1, 55 °C, 200 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2598	0.5303	2743	0.0009	0.0013	0.0015	0.0017	0.0023	0.0028	0.0034	0.0038	0.0043
2	0.2599	0.5290	2748	0.0010	0.0010	0.0010	0.0011	0.0015	0.0020	0.0025	0.0030	0.0037
3	0.2602	0.5286	2742	0.0008	0.0009	0.0009	0.0012	0.0014	0.0019	0.0023	0.0028	0.0034
4	0.2609	0.5294	2725	0.0010	0.0012	0.0013	0.0015	0.0016	0.0019	0.0024	0.0029	0.0035
5	0.2608	0.5308	2722	0.0007	0.0010	0.0010	0.0012	0.0014	0.0016	0.0022	0.0026	0.0032
6	0.2599	0.5283	2752	0.0008	0.0010	0.0011	0.0012	0.0015	0.0019	0.0024	0.0028	0.0034
7	0.2603	0.5295	2738	0.0006	0.0010	0.0010	0.0011	0.0014	0.0017	0.0022	0.0026	0.0033
8	0.2592	0.5297	2758	0.0006	0.0006	0.0006	0.0009	0.0012	0.0017	0.0022	0.0027	0.0032
9	0.2612	0.5300	2716	0.0008	0.0009	0.0009	0.0011	0.0013	0.0015	0.0022	0.0026	0.0032
10	0.2602	0.5281	2744	0.0008	0.0010	0.0010	0.0012	0.0015	0.0018	0.0024	0.0028	0.0032
11	0.2603	0.5292	2738	0.0011	0.0010	0.0009	0.0011	0.0013	0.0016	0.0022	0.0025	0.0030
12	0.2588	0.5299	2768	0.0010	0.0011	0.0011	0.0013	0.0015	0.0017	0.0023	0.0027	0.0032
13	0.2601	0.5300	2738	0.0011	0.0008	0.0009	0.0012	0.0015	0.0017	0.0024	0.0028	0.0033
14	0.2600	0.5304	2739	0.0011	0.0010	0.0009	0.0010	0.0013	0.0018	0.0023	0.0026	0.0033
15	0.2599	0.5302	2744	0.0009	0.0009	0.0009	0.0010	0.0013	0.0018	0.0024	0.0029	0.0033
16	0.2594	0.5284	2761	0.0009	0.0010	0.0009	0.0011	0.0014	0.0019	0.0024	0.0028	0.0033
17	0.2593	0.5281	2765	0.0012	0.0007	0.0007	0.0009	0.0012	0.0016	0.0022	0.0027	0.0032
18	0.2607	0.5297	2728	0.0012	0.0012	0.0006	0.0009	0.0012	0.0016	0.0022	0.0027	0.0031
19	0.2604	0.5297	2734	0.0008	0.0011	0.0009	0.0011	0.0013	0.0015	0.0024	0.0029	0.0033
20	0.2595	0.5287	2757	0.0009	0.0008	0.0009	0.0010	0.0013	0.0016	0.0022	0.0026	0.0031
21	0.2601	0.5307	2735	0.0008	0.0010	0.0009	0.0010	0.0013	0.0016	0.0022	0.0027	0.0030
22	0.2633	0.5313	2669	0.0008	0.0009	0.0009	0.0010	0.0014	0.0016	0.0024	0.0027	0.0032
23	0.2596	0.5300	2749	0.0010	0.0010	0.0008	0.0011	0.0015	0.0018	0.0022	0.0027	0.0031
24	0.2607	0.5307	2723	0.0005	0.0009	0.0007	0.0010	0.0014	0.0017	0.0019	0.0026	0.0028
25	0.2604	0.5294	2736	0.0010	0.0010	0.0009	0.0011	0.0015	0.0019	0.0022	0.0027	0.0031
Ave.	0.2602	0.5296	2739	0.0009	0.0010	0.0009	0.0011	0.0014	0.0018	0.0023	0.0028	0.0033
Med.	0.2601	0.5297	2739	0.0009	0.0010	0.0009	0.0011	0.0014	0.0017	0.0023	0.0027	0.0032
st dev	0.0009	0.0009	19.8480	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0003
Min.	0.2588	0.5281	2669	0.0005	0.0006	0.0006	0.0009	0.0012	0.0015	0.0019	0.0025	0.0028
Max.	0.2633	0.5313	2768	0.0012	0.0013	0.0015	0.0017	0.0023	0.0028	0.0034	0.0038	0.0043



3.3 Data Set 2, 85 °C, 200 mA (Lumen Maintenance)

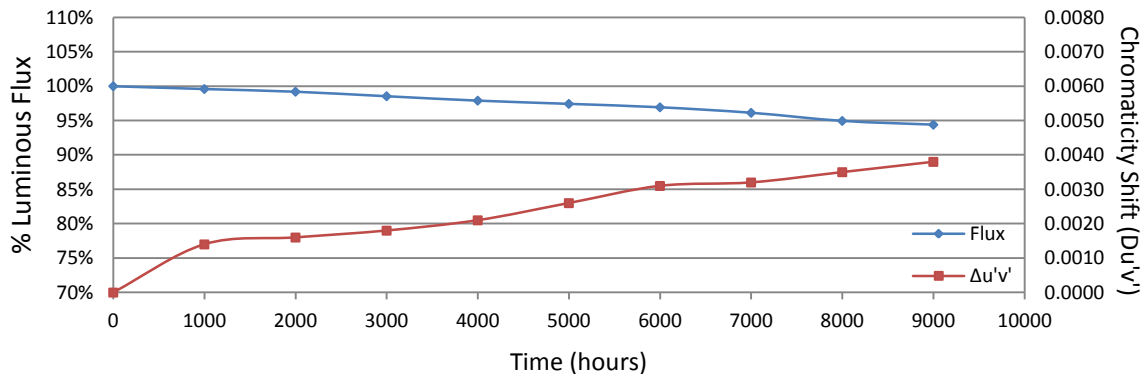
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	6.493	144.7	99.45	99.24	98.69	98.00	97.58	96.89	96.41	95.30	94.75
27	6.503	145.6	99.93	99.38	98.70	97.94	97.73	96.77	96.57	95.33	94.85
28	6.436	140.2	99.71	99.43	98.43	97.72	97.50	97.08	96.65	95.51	94.94
29	6.445	141.1	99.65	99.15	98.58	97.73	97.31	96.95	96.88	95.75	95.04
30	6.477	138.7	99.78	98.99	98.63	97.76	97.40	96.90	96.83	95.67	94.95
31	6.474	141.5	99.65	99.15	98.37	97.81	97.24	96.68	96.11	94.84	94.35
32	6.492	146.2	99.79	99.11	98.43	97.88	97.20	96.85	94.80	93.50	92.89
33	6.508	143.9	99.51	99.37	99.03	98.26	97.50	96.80	96.25	95.27	94.86
34	6.514	145.9	99.59	99.45	99.04	98.49	97.67	96.78	95.07	93.97	93.35
35	6.467	140.1	99.50	99.14	98.29	97.64	97.22	96.79	95.15	94.00	93.43
36	6.443	142.0	99.51	99.44	98.94	98.24	97.75	97.11	95.63	94.37	93.73
37	6.509	146.2	99.73	99.18	98.50	97.88	97.26	96.85	95.42	94.19	93.43
38	6.445	141.4	99.65	99.22	98.44	97.74	97.38	96.89	95.33	94.13	93.56
39	6.474	142.3	99.51	99.30	98.81	98.10	97.82	97.47	96.13	94.94	94.45
40	6.508	145.9	99.31	99.04	98.49	97.88	97.40	96.92	95.61	94.52	93.97
41	6.437	141.8	99.29	98.87	97.95	97.32	97.18	97.04	95.70	94.64	94.22
42	6.463	141.8	99.58	99.44	98.80	98.31	97.39	96.83	95.77	94.78	94.29
43	6.470	141.5	99.36	99.08	98.52	97.88	97.60	96.96	96.68	95.12	94.63
44	6.507	145.4	99.52	98.97	98.21	97.66	97.32	96.77	96.35	95.19	94.57
45	6.441	143.6	99.65	99.23	98.54	98.12	97.49	97.08	96.59	95.19	94.64
46	6.502	144.7	99.59	99.31	98.69	98.00	97.65	97.24	96.75	95.51	95.23
47	6.462	143.0	99.65	98.88	98.25	97.55	96.99	96.78	96.01	94.90	94.34
48	6.497	145.0	99.66	99.24	98.55	97.93	97.59	97.10	97.17	96.00	95.45
49	6.512	146.3	99.73	99.18	98.29	97.81	97.33	96.86	96.86	95.76	95.22
50	6.435	141.1	99.57	99.08	98.23	97.73	97.31	96.88	96.53	95.46	94.90
Ave.	6.477	143.20	99.59	99.20	98.54	97.90	97.43	96.93	96.13	94.95	94.40
Med.	6.474	143.00	99.59	99.18	98.52	97.88	97.40	96.89	96.25	95.12	94.57
st dev	0.0280	2.2739	0.1496	0.1702	0.2653	0.2586	0.2056	0.1749	0.6511	0.6520	0.6775
Min.	6.435	138.70	99.29	98.87	97.95	97.32	96.99	96.68	94.80	93.50	92.89
Max.	6.514	146.30	99.93	99.45	99.04	98.49	97.82	97.47	97.17	96.00	95.45

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 7.648E-06
 β : 1.012
Calculated L₇₀: 48,000hours
Reported L₇₀: 48,000hours

3.4 Data Set 2, 85 °C, 200mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2607	0.5299	2727	0.0011	0.0013	0.0017	0.0019	0.0024	0.0029	0.0015	0.0023	0.0024
27	0.2594	0.5282	2763	0.0011	0.0013	0.0016	0.0019	0.0037	0.0048	0.0022	0.0024	0.0025
28	0.2622	0.5313	2692	0.0012	0.0015	0.0019	0.0023	0.0029	0.0035	0.0025	0.0032	0.0032
29	0.2608	0.5305	2722	0.0015	0.0016	0.0018	0.0022	0.0026	0.0030	0.0034	0.0027	0.0029
30	0.2615	0.5290	2714	0.0013	0.0015	0.0019	0.0023	0.0027	0.0031	0.0035	0.0032	0.0031
31	0.2595	0.5286	2758	0.0016	0.0017	0.0020	0.0023	0.0029	0.0032	0.0036	0.0033	0.0032
32	0.2588	0.5285	2772	0.0014	0.0015	0.0016	0.0018	0.0021	0.0024	0.0017	0.0018	0.0016
33	0.2617	0.5299	2706	0.0014	0.0017	0.0018	0.0021	0.0025	0.0028	0.0032	0.0037	0.0036
34	0.2602	0.5287	2742	0.0016	0.0018	0.0021	0.0024	0.0029	0.0032	0.0036	0.0041	0.0044
35	0.2631	0.5301	2678	0.0012	0.0014	0.0016	0.0020	0.0028	0.0032	0.0037	0.0040	0.0043
36	0.2605	0.5306	2728	0.0014	0.0016	0.0019	0.0022	0.0026	0.0030	0.0034	0.0038	0.0040
37	0.2598	0.5287	2751	0.0013	0.0017	0.0021	0.0024	0.0028	0.0031	0.0036	0.0040	0.0042
38	0.2603	0.5301	2735	0.0015	0.0018	0.0021	0.0024	0.0031	0.0034	0.0038	0.0042	0.0046
39	0.2603	0.5308	2733	0.0015	0.0017	0.0019	0.0022	0.0026	0.0030	0.0034	0.0039	0.0042
40	0.2607	0.5302	2727	0.0014	0.0015	0.0017	0.0018	0.0025	0.0032	0.0035	0.0040	0.0043
41	0.2609	0.5293	2725	0.0013	0.0014	0.0016	0.0019	0.0023	0.0027	0.0033	0.0038	0.0042
42	0.2588	0.5290	2771	0.0012	0.0014	0.0016	0.0018	0.0025	0.0029	0.0036	0.0040	0.0046
43	0.2607	0.5304	2725	0.0015	0.0017	0.0017	0.0019	0.0025	0.0028	0.0035	0.0038	0.0044
44	0.2608	0.5295	2726	0.0013	0.0016	0.0017	0.0019	0.0024	0.0027	0.0035	0.0038	0.0041
45	0.2598	0.5299	2746	0.0012	0.0013	0.0015	0.0019	0.0025	0.0028	0.0034	0.0038	0.0041
46	0.2599	0.5292	2746	0.0014	0.0017	0.0018	0.0020	0.0026	0.0031	0.0035	0.0038	0.0042
47	0.2598	0.5294	2748	0.0013	0.0016	0.0018	0.0021	0.0026	0.0031	0.0035	0.0038	0.0042
48	0.2604	0.5302	2733	0.0013	0.0015	0.0016	0.0017	0.0023	0.0028	0.0032	0.0035	0.0040
49	0.2597	0.5299	2747	0.0016	0.0017	0.0018	0.0021	0.0027	0.0031	0.0033	0.0036	0.0040
50	0.2600	0.5305	2740	0.0014	0.0016	0.0019	0.0022	0.0026	0.0031	0.0033	0.0037	0.0040
Ave.	0.2604	0.5297	2734	0.0014	0.0016	0.0018	0.0021	0.0026	0.0031	0.0032	0.0035	0.0038
Med.	0.2603	0.5299	2733	0.0014	0.0016	0.0018	0.0021	0.0026	0.0031	0.0034	0.0038	0.0041
st dev	0.0010	0.0008	22.2317	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0006	0.0008
Min.	0.2588	0.5282	2678	0.0011	0.0013	0.0015	0.0017	0.0021	0.0024	0.0015	0.0018	0.0016
Max.	0.2631	0.5313	2772	0.0016	0.0018	0.0021	0.0024	0.0037	0.0048	0.0038	0.0042	0.0046



3.5 Data Set 3, 105 °C, 200 mA (Lumen Maintenance)

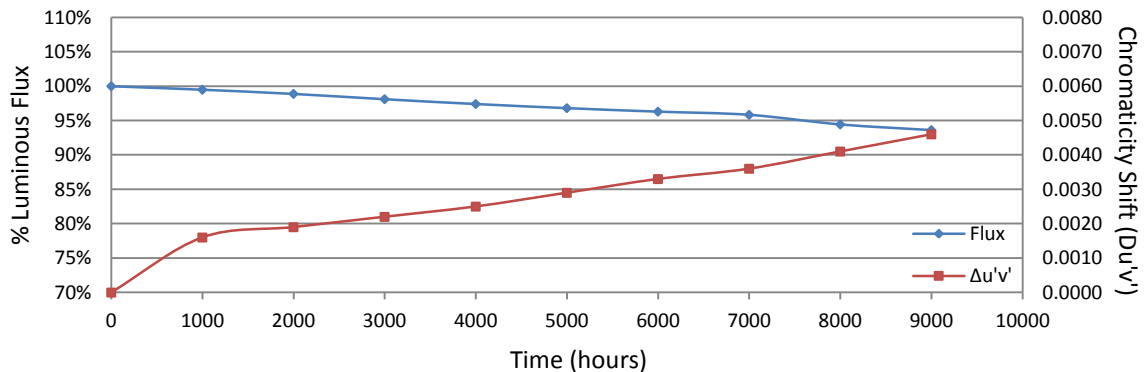
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	6.498	143.8	99.79	99.17	98.54	97.71	97.36	96.73	96.66	95.13	94.30
52	6.502	145.5	99.38	98.83	98.14	97.39	96.36	95.81	95.33	93.95	93.13
53	6.471	142.8	99.30	98.88	98.25	97.41	96.36	96.01	95.38	93.77	92.86
54	6.466	143.2	99.58	98.60	97.70	96.93	96.09	95.81	95.11	93.85	92.81
55	6.471	140.8	99.86	99.01	98.37	97.66	96.80	96.16	95.53	94.25	93.39
56	6.516	146.3	99.73	98.97	98.02	97.33	96.51	95.97	95.42	94.19	93.37
57	6.495	144.3	99.45	99.03	98.06	97.30	96.81	96.26	95.70	94.39	93.49
58	6.509	145.4	99.52	98.56	97.80	97.32	96.91	96.42	95.80	94.57	93.67
59	6.476	139.6	99.71	99.00	98.28	97.64	96.85	96.63	96.13	94.84	94.05
60	6.458	141.6	99.44	99.01	98.38	97.67	96.96	96.54	95.83	94.49	93.71
61	6.446	142.1	99.58	99.01	98.38	97.68	96.69	96.13	95.99	94.58	93.81
62	6.514	145.9	99.38	98.90	98.15	97.60	97.12	96.78	96.50	95.07	94.17
63	6.452	141.4	99.50	99.43	98.59	97.95	97.52	96.89	96.53	94.91	94.20
64	6.472	143.2	99.58	98.60	97.77	96.86	96.30	95.81	95.67	94.27	93.58
65	6.508	143.8	99.24	98.89	98.33	97.36	97.15	96.87	96.87	95.41	94.65
66	6.470	142.6	99.23	97.97	97.19	96.63	96.21	95.86	95.16	94.18	93.48
67	6.514	144.3	99.51	99.03	98.13	97.44	96.60	96.26	95.63	94.25	93.56
68	6.503	142.6	99.37	98.88	98.11	97.55	97.41	96.98	96.35	94.88	94.25
69	6.475	142.3	99.44	99.02	98.24	97.47	96.63	95.92	95.71	94.17	93.32
70	6.445	141.0	99.50	98.87	98.09	97.30	97.02	96.17	95.89	94.47	93.40
71	6.438	142.3	99.37	99.02	98.17	97.61	96.84	95.92	95.15	93.68	92.83
72	6.501	143.5	99.30	98.89	97.91	97.28	96.93	96.66	96.24	94.70	93.66
73	6.495	143.6	99.44	99.03	98.12	97.28	97.01	96.45	95.82	94.36	93.80
74	6.468	141.0	99.43	98.87	98.16	97.45	96.95	96.31	96.10	94.61	93.76
75	6.450	142.7	99.51	98.67	97.97	97.34	96.92	96.22	95.37	94.04	93.13
Ave.	6.481	143.02	99.49	98.88	98.11	97.41	96.81	96.30	95.84	94.44	93.62
Med.	6.475	142.80	99.45	98.90	98.14	97.41	96.85	96.26	95.80	94.39	93.58
st dev	0.0246	1.6808	0.1619	0.2666	0.2917	0.2849	0.3687	0.3739	0.4916	0.4385	0.4777
Min.	6.438	139.60	99.23	97.97	97.19	96.63	96.09	95.81	95.11	93.68	92.81
Max.	6.516	146.30	99.86	99.43	98.59	97.95	97.52	96.98	96.87	95.41	94.65

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
α: 7.931E-06
β: 1.008
Calculated L₇₀: 46,000 hours
Reported L₇₀: 46,000 hours

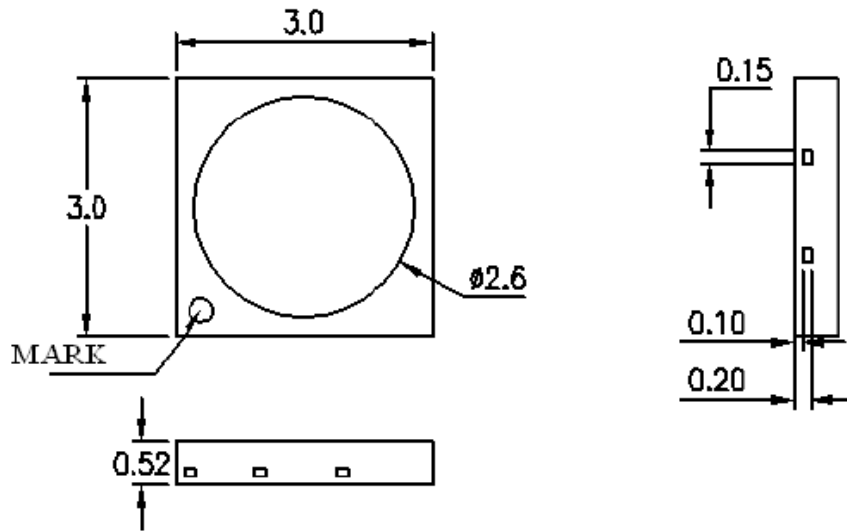
3.6 Data Set 3, 105 °C, 200 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	0.2605	0.5301	2730	0.0016	0.0018	0.0020	0.0024	0.0029	0.0033	0.0036	0.0039	0.0040
52	0.2609	0.5298	2723	0.0013	0.0016	0.0019	0.0024	0.0029	0.0035	0.0036	0.0042	0.0042
53	0.2596	0.5290	2754	0.0016	0.0018	0.0020	0.0024	0.0031	0.0035	0.0037	0.0043	0.0045
54	0.2600	0.5303	2739	0.0017	0.0020	0.0022	0.0023	0.0031	0.0036	0.0037	0.0043	0.0046
55	0.2619	0.5299	2702	0.0016	0.0021	0.0023	0.0027	0.0031	0.0035	0.0037	0.0043	0.0049
56	0.2588	0.5287	2772	0.0016	0.0019	0.0024	0.0027	0.0030	0.0033	0.0037	0.0042	0.0047
57	0.2611	0.5299	2718	0.0015	0.0018	0.0022	0.0026	0.0030	0.0033	0.0034	0.0041	0.0047
58	0.2619	0.5319	2695	0.0013	0.0017	0.0019	0.0023	0.0026	0.0029	0.0033	0.0038	0.0044
59	0.2612	0.5290	2720	0.0013	0.0018	0.0022	0.0025	0.0028	0.0031	0.0035	0.0041	0.0046
60	0.2599	0.5291	2748	0.0017	0.0020	0.0023	0.0026	0.0030	0.0033	0.0035	0.0041	0.0046
61	0.2604	0.5298	2733	0.0016	0.0018	0.0021	0.0025	0.0030	0.0035	0.0037	0.0042	0.0048
62	0.2602	0.5310	2733	0.0017	0.0019	0.0022	0.0026	0.0028	0.0033	0.0035	0.0040	0.0044
63	0.2600	0.5299	2741	0.0014	0.0018	0.0021	0.0024	0.0027	0.0032	0.0035	0.0040	0.0045
64	0.2603	0.5291	2738	0.0015	0.0020	0.0024	0.0029	0.0031	0.0036	0.0038	0.0043	0.0048
65	0.2606	0.5294	2732	0.0018	0.0019	0.0022	0.0026	0.0028	0.0033	0.0036	0.0041	0.0046
66	0.2596	0.5294	2751	0.0013	0.0016	0.0019	0.0023	0.0030	0.0035	0.0037	0.0042	0.0047
67	0.2594	0.5290	2758	0.0017	0.0018	0.0021	0.0025	0.0028	0.0033	0.0037	0.0042	0.0045
68	0.2601	0.5277	2748	0.0018	0.0020	0.0023	0.0027	0.0027	0.0030	0.0034	0.0039	0.0044
69	0.2598	0.5290	2749	0.0016	0.0019	0.0022	0.0026	0.0030	0.0035	0.0039	0.0044	0.0049
70	0.2604	0.5298	2734	0.0014	0.0017	0.0021	0.0025	0.0028	0.0033	0.0035	0.0040	0.0045
71	0.2597	0.5300	2747	0.0016	0.0019	0.0022	0.0026	0.0031	0.0036	0.0038	0.0043	0.0049
72	0.2597	0.5297	2749	0.0017	0.0017	0.0021	0.0025	0.0028	0.0033	0.0036	0.0040	0.0046
73	0.2601	0.5288	2745	0.0018	0.0019	0.0022	0.0025	0.0030	0.0035	0.0038	0.0043	0.0048
74	0.2615	0.5310	2706	0.0016	0.0017	0.0020	0.0023	0.0028	0.0033	0.0035	0.0039	0.0045
75	0.2611	0.5317	2711	0.0017	0.0021	0.0023	0.0026	0.0029	0.0033	0.0036	0.0041	0.0046
Ave.	0.2603	0.5297	2735	0.0016	0.0019	0.0022	0.0025	0.0029	0.0033	0.0036	0.0041	0.0046
Med.	0.2602	0.5298	2738	0.0016	0.0018	0.0022	0.0025	0.0029	0.0033	0.0036	0.0041	0.0046
st dev	0.0008	0.0009	18.6603	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.2588	0.5277	2695	0.0013	0.0016	0.0019	0.0023	0.0026	0.0029	0.0033	0.0038	0.0040
Max.	0.2619	0.5319	2772	0.0018	0.0021	0.0024	0.0029	0.0031	0.0036	0.0039	0.0044	0.0049



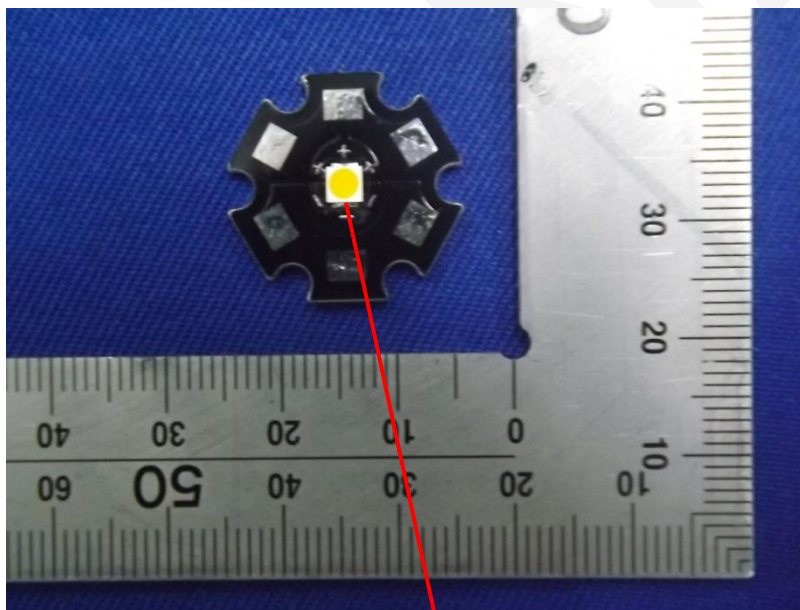
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



TMP_{LED}

Appendix B – Family Declaration



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 LED3030 EMC200mA series are designed with identical material and construction processes. And the tested model T3C27821C-01AA are tested by BACL, the results of which are featured in BACL project RSZ140417504-10.

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 and CRI. The models which have same parameters are only different in model number, because it will be applied in different markets. All model number are 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 ²)	Power Density (W/mm ²)	Die Sp	Chip Size (Mil)
							Series	Parallel					
3030 EMC	T3C27821C-01AA	2700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27721Q-01AA	2700	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27821Q-01AA	2700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27821Q-02AA	2700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27821Q-03AA	2700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27821Q-04AA	2700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C27921Q-01AA	2700	90	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30721Q-01AA	3000	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30821Q-01AA	3000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30821Q-02AA	3000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30821Q-03AA	3000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30821Q-04AA	3000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C30921Q-01AA	3000	90	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C35721Q-01AA	3500	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C35821Q-01AA	3500	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C40721Q-01AA	4000	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C40821Q-01AA	4000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C40821Q-02AA	4000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C40821Q-03AA	4000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C40921Q-01AA	4000	90	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C50721Q-01AA	5000	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C50821Q-01AA	5000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C50821Q-02AA	5000	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C50921Q-01AA	5000	90	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C57821Q-02AA	5700	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C65721Q-01AA	6500	70	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C65821Q-01AA	6500	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C65821Q-02AA	6500	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C65821Q-03AA	6500	80	2	200	6	2	1	200	403	2416		770
3030 EMC	T3C65821Q-04AA	6500	80	2	200	6	2	1	200	403	2416		770

Signature: 
 Print name: Ray Yuan
 Title: NPI Manager
 LIGHTNING OPTOELECTRONIC TECHNOLOGY(SZ) Co.,LTD.

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