



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Destar Opto-Electronics Co.,LTD

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BaoAn District, Shenzhen

Model:2NC17-EKEE

Report Type: 6000 Hours Test Report		Product Type: LED Package
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Report Number:	R2DG130929051-10-M1	
Test Date:	2013-10-17 to 2014-06-23	
Report Date:	2014-12-16	
Reviewed By:	Jeanne Han /EE Manager	<i>Jeanne Han</i>
Revised Note:	This version report "No. R2DG130929051-10-M1" at 2014-12-16 replaced the previous report "No. R2DG130929051-10" at 2014-06-25	
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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: 2NC17-EKEE
 Part Name: SMD2835
 Part Type: LED Package
 Nominal CCT: 3000K

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	G115987C J7321114	300VA	2014-03-12	2015-03-12
Multilayer aging machine	BACL	B2-270	20013	N/A	2013-08-01	2014-08-01
Digital CC&CV DC Power Supply	everfine	WY5015	11090006	(50/15A)	2014-03-12	2015-03-12
Digital CC&CV DC Power Supply	everfine	WY5015	11090007	(50/15A)	2014-03-12	2015-03-12

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 40Pcs;

Each Ts test condition 20Pcs

The samples tested at T_s 55 °C, 85 °C were received at 2013-10-15 and tested during 2013-10-17 to 2014-06-23. The samples were numbered from 1to 20, 21 to 40.

Data Set 1: 55 °C, 150mA

Part Number:	2NC17-EKEE
Number of Units:	20
Actual Case Temperature(T_s):	T_s =54.5 °C
Actual Ambient Temperature(T_A):	T_A =52.7 °C
Life Test Drive Current:	I_F = 150mA
Measurement Current:	I_F = 150mA

Data Set 2: 85 °C,150mA

Part Number:	2NC17-EKEE
Number of Units:	20
Actual Case Temperature(T_s):	T_s =84.1 °C
Actual Ambient Temperature(T_A):	T_A =82.6 °C
Life Test Drive Current:	I_F =150mA
Measurement Current:	I_F = 150mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 150mA
Number of Units:	20
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 L70 Lifetime:	>36,000 hours

Data Set:	Data Set 2, 85 °C, 150mA
Number of Units:	20
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.21%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0026
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 150mA (Lumen Maintenance)

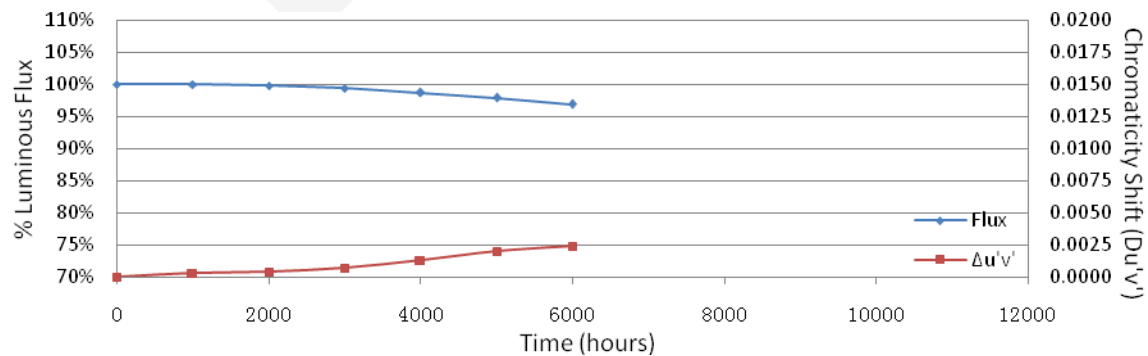
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.155	68.02	100.09	99.82	99.57	99.26	98.29	96.71
2	3.165	68.03	100.01	99.74	99.44	99.07	98.15	96.72
3	3.164	68.09	100.01	99.82	99.49	98.81	98.06	96.89
4	3.161	68.30	100.00	99.85	99.33	98.73	97.91	96.87
5	3.142	66.03	100.03	99.88	99.35	98.68	98.21	97.05
6	3.162	68.84	100.15	99.96	99.52	98.90	97.75	97.05
7	3.134	68.03	100.01	99.88	99.41	98.81	97.78	97.15
8	3.136	68.54	100.07	99.90	99.56	98.32	97.75	96.94
9	3.147	68.21	99.96	99.59	99.18	98.17	97.57	96.69
10	3.161	68.49	100.00	99.74	99.42	98.53	97.88	96.77
11	3.138	69.78	100.14	99.66	99.10	98.38	97.28	96.53
12	3.130	69.60	99.99	99.80	99.35	99.07	98.09	97.31
13	3.124	66.66	100.17	99.97	99.56	98.48	98.06	97.39
14	3.128	69.28	99.99	99.86	99.34	98.60	97.94	96.84
15	3.162	69.03	100.00	99.86	99.32	98.36	97.84	96.64
16	3.130	70.03	100.04	99.94	99.26	98.47	97.80	96.46
17	3.129	69.30	99.96	99.65	99.26	98.31	97.68	96.58
18	3.119	65.31	100.14	99.95	99.51	99.13	98.33	97.43
19	3.153	68.06	100.09	99.71	99.13	98.62	97.85	96.72
20	3.117	65.93	100.12	99.74	99.48	98.65	98.00	96.66
Ave.	3.14	68.18	100.05	99.82	99.38	98.67	97.91	96.87
Med.	3.140	68.26	100.02	99.84	99.38	98.63	97.89	96.81
st dev	0.0164	1.3016	0.0668	0.1105	0.1432	0.3042	0.2536	0.2811
Min.	3.117	65.31	99.96	99.59	99.10	98.17	97.28	96.46
Max.	3.165	70.03	100.17	99.97	99.57	99.26	98.33	97.43

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 6.475E-06
 β : 1.010
Calculated L₇₀: 57,000hours
Reported L₇₀: >36,000hours

3.2 Data Set 1, 55 ℃, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2485	0.5328	2981	0.0003	0.0004	0.0007	0.0013	0.0020	0.0023
2	0.2482	0.5343	2980	0.0002	0.0004	0.0006	0.0011	0.0022	0.0025
3	0.2496	0.5367	2933	0.0002	0.0004	0.0008	0.0011	0.0021	0.0023
4	0.2481	0.5322	2994	0.0003	0.0005	0.0007	0.0010	0.0020	0.0024
5	0.2443	0.5180	3187	0.0004	0.0005	0.0007	0.0012	0.0018	0.0029
6	0.2479	0.5351	2980	0.0003	0.0005	0.0008	0.0011	0.0018	0.0025
7	0.2483	0.5337	2981	0.0003	0.0004	0.0009	0.0011	0.0018	0.0024
8	0.2476	0.5321	3005	0.0003	0.0006	0.0007	0.0013	0.0021	0.0025
9	0.2506	0.5415	2888	0.0002	0.0004	0.0007	0.0014	0.0020	0.0022
10	0.2489	0.5329	2971	0.0002	0.0004	0.0007	0.0015	0.0021	0.0024
11	0.2475	0.5323	3006	0.0002	0.0005	0.0006	0.0014	0.0021	0.0024
12	0.2480	0.5331	2991	0.0002	0.0005	0.0007	0.0014	0.0021	0.0024
13	0.2482	0.5356	2972	0.0003	0.0005	0.0006	0.0014	0.0020	0.0023
14	0.2486	0.5330	2977	0.0003	0.0004	0.0006	0.0014	0.0022	0.0024
15	0.2482	0.5358	2971	0.0003	0.0004	0.0006	0.0012	0.0021	0.0024
16	0.2488	0.5337	2968	0.0002	0.0004	0.0007	0.0013	0.0022	0.0024
17	0.2486	0.5314	2987	0.0003	0.0003	0.0006	0.0014	0.0021	0.0025
18	0.2483	0.5344	2976	0.0003	0.0003	0.0007	0.0016	0.0022	0.0024
19	0.2500	0.5381	2917	0.0002	0.0004	0.0006	0.0015	0.0022	0.0023
20	0.2470	0.5314	3024	0.0003	0.0004	0.0007	0.0016	0.0021	0.0025
Ave.	0.2483	0.5334	2984	0.0003	0.0004	0.0007	0.0013	0.0020	0.0024
Med.	0.2483	0.5334	2980	0.0003	0.0004	0.0007	0.0013	0.0021	0.0024
st dev	0.0013	0.0044	56.7056	0.0000	0.0001	0.0001	0.0002	0.0001	0.0001
Min.	0.2443	0.5180	2888	0.0002	0.0003	0.0006	0.0010	0.0018	0.0022
Max.	0.2506	0.5415	3187	0.0004	0.0006	0.0009	0.0016	0.0022	0.0029



3.3 Data Set 2, 85 °C, 150mA (Lumen Maintenance)

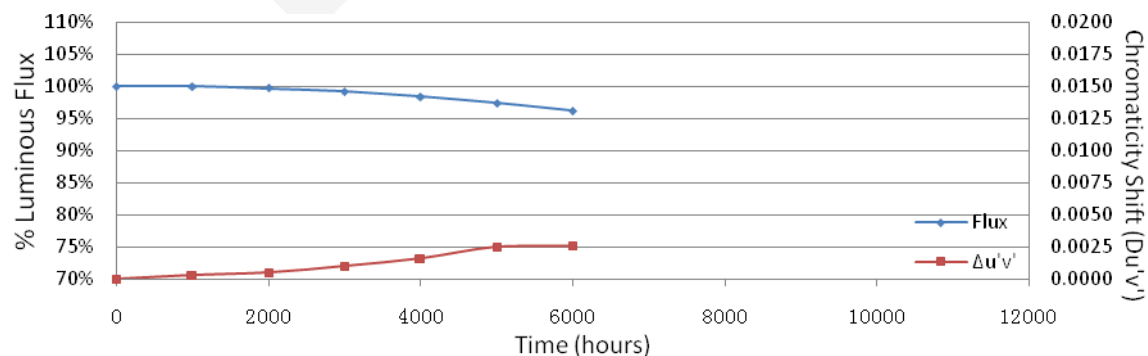
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	3.117	59.05	100.02	99.75	99.29	98.88	98.02	96.73
22	3.111	66.96	100.16	99.69	99.28	98.18	97.09	96.79
23	3.116	66.87	100.04	99.88	99.18	97.92	96.83	96.19
24	3.145	67.88	100.00	99.84	99.19	97.85	96.99	95.83
25	3.161	68.60	100.13	99.78	99.17	98.03	96.95	96.17
25	3.122	66.18	100.06	99.95	99.44	98.37	97.61	96.51
27	3.146	67.67	100.10	99.73	99.13	98.42	97.31	96.25
28	3.130	66.60	100.02	99.62	99.10	98.05	97.18	96.11
29	3.143	67.35	100.01	99.66	99.12	98.29	97.28	96.33
30	3.133	67.59	100.15	99.82	99.29	99.04	97.72	96.12
31	3.127	61.54	100.19	99.97	99.55	99.03	98.41	96.78
32	3.117	68.03	99.97	99.63	99.00	98.24	97.43	95.87
33	3.095	66.96	100.03	99.70	99.15	98.43	97.58	96.04
34	3.165	69.20	100.01	99.62	99.05	98.38	97.50	96.00
35	3.135	65.45	100.02	99.86	99.42	98.84	97.85	96.61
36	3.154	67.81	99.96	99.50	98.91	98.32	97.26	95.75
37	3.157	67.47	99.99	99.54	98.93	98.58	97.32	95.82
38	3.160	68.37	100.04	99.88	99.40	98.16	97.44	96.08
39	3.131	64.75	100.03	99.75	99.51	98.33	97.33	96.31
40	3.160	68.23	100.04	99.69	99.43	98.34	97.23	95.98
Ave.	3.14	66.63	100.05	99.74	99.23	98.38	97.42	96.21
Med.	3.134	67.41	100.03	99.74	99.18	98.34	97.32	96.14
st dev	0.0197	2.4386	0.0657	0.1299	0.1871	0.3407	0.3773	0.3237
Min.	3.165	69.20	99.96	99.50	98.91	97.85	96.83	95.75
Max.	3.095	59.05	100.19	99.97	99.55	99.04	98.41	96.79

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.854E-06
 β : 1.012
Calculated L₇₀: 47,000hours
Reported L₇₀: >36,000hours

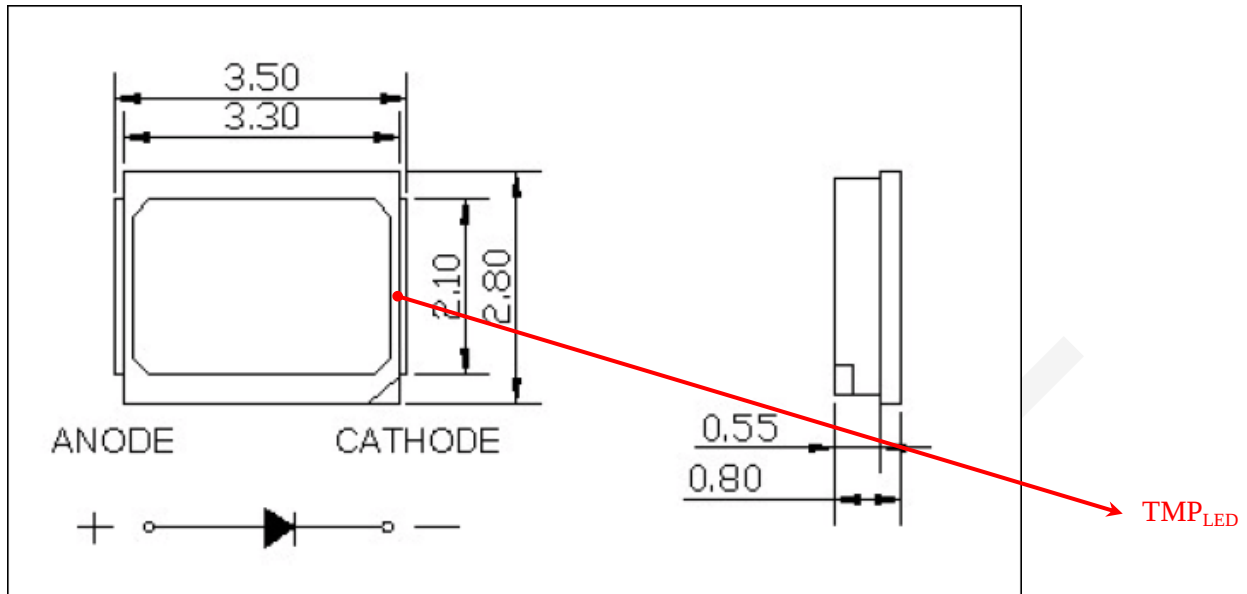
3.4 Data Set 2, 85 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	0.2490	0.5284	2996	0.0002	0.0004	0.0008	0.0013	0.0024	0.0026
22	0.2496	0.5318	2961	0.0001	0.0003	0.0008	0.0016	0.0022	0.0023
23	0.2504	0.5344	2928	0.0003	0.0005	0.0010	0.0014	0.0022	0.0024
24	0.2487	0.5322	2979	0.0003	0.0006	0.0009	0.0015	0.0022	0.0025
25	0.2489	0.5348	2961	0.0003	0.0005	0.0011	0.0017	0.0022	0.0022
25	0.2489	0.5337	2966	0.0004	0.0005	0.0011	0.0016	0.0026	0.0026
27	0.2489	0.5319	2976	0.0003	0.0006	0.0009	0.0016	0.0026	0.0027
28	0.2496	0.5329	2954	0.0004	0.0006	0.0010	0.0014	0.0027	0.0027
29	0.2483	0.5323	2990	0.0003	0.0005	0.0010	0.0018	0.0026	0.0027
30	0.2492	0.5326	2966	0.0004	0.0005	0.0010	0.0018	0.0026	0.0027
31	0.2475	0.5302	3019	0.0004	0.0006	0.0010	0.0016	0.0026	0.0027
32	0.2500	0.5353	2933	0.0003	0.0005	0.0010	0.0016	0.0025	0.0027
33	0.2499	0.5299	2964	0.0004	0.0006	0.0009	0.0017	0.0026	0.0028
34	0.2488	0.5362	2954	0.0003	0.0006	0.0009	0.0014	0.0026	0.0026
35	0.2488	0.5330	2974	0.0002	0.0005	0.0009	0.0016	0.0026	0.0027
36	0.2492	0.5331	2962	0.0003	0.0006	0.0009	0.0017	0.0026	0.0027
37	0.2477	0.5333	2995	0.0004	0.0006	0.0009	0.0015	0.0026	0.0027
38	0.2475	0.5326	3005	0.0004	0.0004	0.0011	0.0016	0.0026	0.0028
39	0.2476	0.5331	2999	0.0003	0.0004	0.0010	0.0017	0.0025	0.0027
40	0.2491	0.5364	2946	0.0004	0.0004	0.0009	0.0017	0.0026	0.0027
Ave.	0.2489	0.5329	2971	0.0003	0.0005	0.0010	0.0016	0.0025	0.0026
Med.	0.2489	0.5330	2966	0.0003	0.0005	0.0010	0.0016	0.0026	0.0027
st dev	0.0008	0.0020	23.8160	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	0.2504	0.5364	3019	0.0001	0.0003	0.0008	0.0013	0.0022	0.0022
Max.	0.2475	0.5284	2928	0.0004	0.0006	0.0011	0.0018	0.0027	0.0028



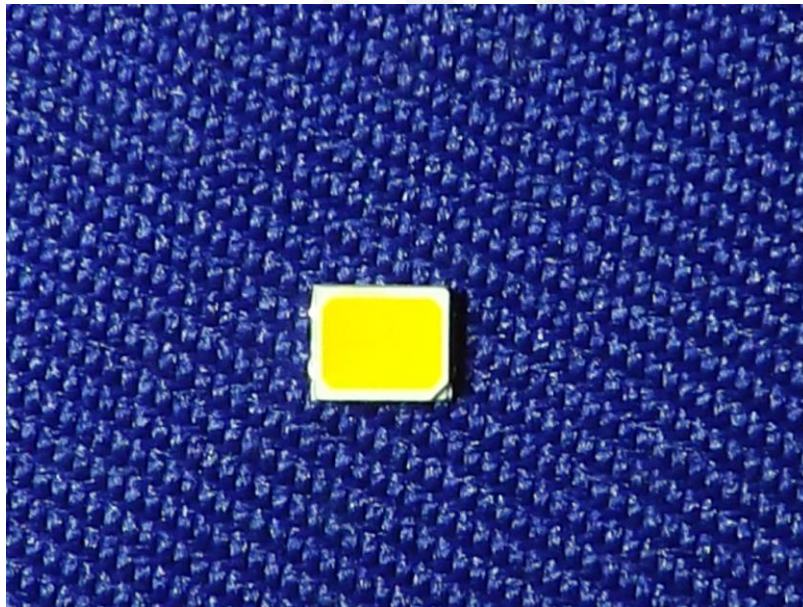
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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