IESNA LM-80-08

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

EVERSTAR OPTO ELECTRONICS

1011,FILIX TOWERS,LBS MARG , BHANDUP WEST, MUMBAI 400078, INDIA.

Model: ES-2835-109V-L1-830

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Daniel Duan
Report Number:	R2DG180607052-10
Test Date:	2014-09-21 to 2016-03-03
Report Date:	2018-06-08
Reviewed By:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588

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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TABLE OF CONTENTS

FINAL

1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number:	ES-2835-109V-L1-830
Part Name:	2835
Part Type:	LED Package
Nominal CCT:	3000K
Power:	1W
Average Current Density per LED die:	553.5725mA/mm^2
Average Power Density per LED die:	1.845W/mm^2
CRI:	80
Die Spacing:	0.127mm

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)

This report covers the following models:

Model Number	CCT（K）
Tested Model: ES-2835-109V-L1-830	3000K
ES-2835-109V-**-827	2700K
ES-2835-109V-**-830	3000K
ES-2835-109V-**-840	4000K
ES-2835-109V-**-857	5700K
ES-2835-109V-**-860	6000K
ES-2835-109V-**-865	6500K

Note: The first and second *means Sorting revision

Note:

1. The applicant EVERSTAR OPTO ELECTRONICS declare that their products with model ES-2835-109V-L1-830 are the same to the products in report# R2DG140918050-10-9000 and is authorized by original applicant to use their test data.

2. All the data in previous report (R2DG140918050-10-9000) is shared in this report.

1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs (This standard was not accredited by IAS)
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	2015-03-25	2016-03-24
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2015-03-05	2016-03-04
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2015-03-25	2016-03-24
Standard Light Source	EVERFINE	D062	1011093	2015-09-17	2016-09-16
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2015-03-05	2016-03-04
Multilayer aging machine	BACL	B2-270	20024	2015-03-05	2016-03-04
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	2015-03-05	2016-03-04
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	2015-07-08	2016-07-07
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	2015-07-08	2016-07-07

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℃ ±2℃, 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=21K (K=2), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

FINAL

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.

Sample Size:
Total 25Pcs;
Each Ts test condition 25Pcs
The samples tested at T_S 105℃ were received at 2014-09-18 and tested during 2014-09-21 to 2016-03-03.
The samples were numbered from 1 to 25.

Data Set 1: 105℃, 100mA	
Part Number:	ES-2835-109V-L1-830
Number of Units:	25
Actual Case Temperature(T_S):	T_S =104.5℃
Actual Ambient Temperature(T_A):	T_A =103.3℃
Life Test Drive Current:	I_F = 100mA
Measurement Current:	I_F = 100mA

FINAL

2 - SUMMARY OF TEST RESULT

Data Set:	**Data Set 1, 105 ℃, 100mA**
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:	96.98%
Average. Lumen Maintenance at 9000 hours:	95.69%
Average Chromaticity Shift at 6000 hours (Δu'v'):	0.0025
Average Chromaticity Shift at 9000 hours (Δu'v'):	0.0031
Reported TM-21 L_{70} Lifetime:	>54,000 hours

FINAL

3 - Test Data

3.1 Data Set 1, 105 ℃, 100 mA (Lumen Maintenance)

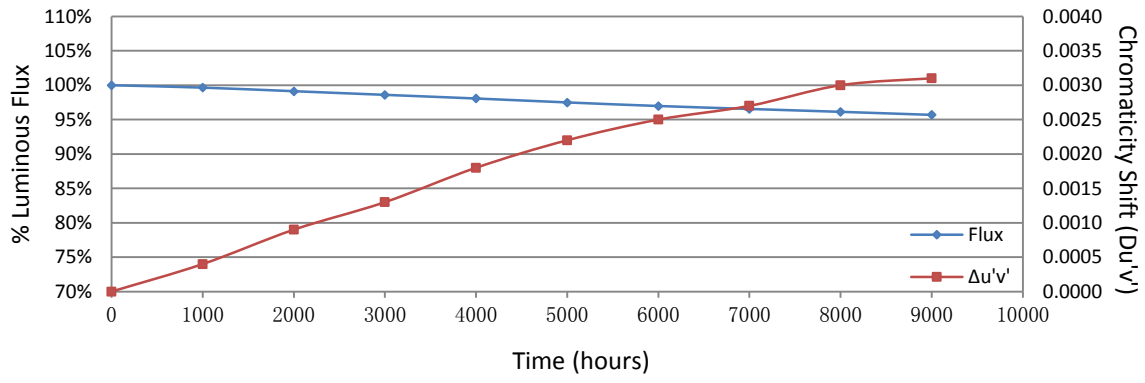
No.	V_F(V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	9.140	99.53	99.75	99.10	98.62	98.06	97.61	97.05	96.49	96.39	96.07
2	9.132	99.25	99.71	99.18	98.54	98.03	97.50	97.00	96.60	96.36	95.81
3	9.159	101.00	99.60	99.01	98.53	98.03	97.46	96.86	96.63	96.40	95.73
4	9.214	99.54	99.74	99.25	98.83	98.39	97.78	97.34	97.15	96.71	96.69
5	9.024	98.74	99.68	99.36	98.83	98.24	97.65	96.96	96.24	95.41	95.02
6	9.057	100.90	99.70	99.07	98.50	97.86	97.21	96.70	96.47	96.07	95.37
7	9.181	98.56	99.68	99.00	98.54	97.98	97.58	97.08	96.82	96.58	95.91
8	9.023	98.65	99.65	99.02	98.50	97.89	97.39	96.74	96.16	95.66	95.51
9	9.184	98.45	99.67	99.28	98.69	98.26	97.85	97.27	96.74	96.67	96.41
10	9.145	101.60	99.70	99.31	98.62	98.08	97.40	96.85	96.24	95.54	95.15
11	9.123	99.18	99.76	99.17	98.67	98.19	97.74	97.41	96.74	96.56	96.35
12	9.171	99.15	99.50	99.04	98.49	98.05	97.51	97.12	96.62	96.31	95.81
13	9.210	100.80	99.70	99.31	98.71	97.93	97.41	96.77	96.10	95.41	94.93
14	9.161	98.88	99.66	99.04	98.46	97.90	97.33	96.98	96.56	96.01	95.42
15	9.099	100.30	99.50	98.97	98.54	98.02	97.31	96.79	96.39	95.79	95.22
16	9.221	97.92	99.78	99.32	98.94	98.46	97.85	97.35	96.84	96.51	96.17
17	9.200	100.40	99.56	99.13	98.55	97.92	97.32	96.75	96.19	95.58	94.83
18	9.104	100.50	99.60	99.06	98.37	98.04	97.34	96.96	96.54	96.34	95.80
19	9.121	101.30	99.70	99.01	98.45	97.92	97.35	96.83	96.35	95.81	95.11
20	9.135	98.40	99.57	99.07	98.62	98.05	97.39	96.73	96.42	96.06	95.72
21	9.109	97.51	99.81	99.29	98.66	98.26	97.58	96.92	96.60	95.89	95.49
22	9.159	99.49	99.70	99.13	98.75	98.28	97.73	97.30	96.83	96.57	96.25
23	9.084	101.20	99.51	99.01	98.52	98.01	97.52	97.07	96.59	95.96	95.28
24	9.385	100.10	99.52	99.04	98.42	97.87	97.21	96.75	96.69	96.23	95.87
25	9.182	100.50	99.60	99.07	98.64	98.11	97.52	97.01	96.78	96.51	96.31
Ave.	9.149	99.67	99.65	99.13	98.60	98.07	97.50	96.98	96.55	96.13	95.69
Med.	9.145	99.53	99.68	99.07	98.55	98.04	97.50	96.96	96.59	96.23	95.73
st dev	0.0730	1.1387	0.0894	0.1219	0.1381	0.1641	0.1862	0.2160	0.2527	0.4092	0.5083
Min.	9.023	97.51	99.50	98.97	98.37	97.86	97.21	96.70	96.10	95.41	94.83
Max.	9.385	101.60	99.81	99.36	98.94	98.46	97.85	97.41	97.15	96.71	96.69

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
α: 4.85E-06
β: 1.00
Reported L_{70}: >54,000 hours

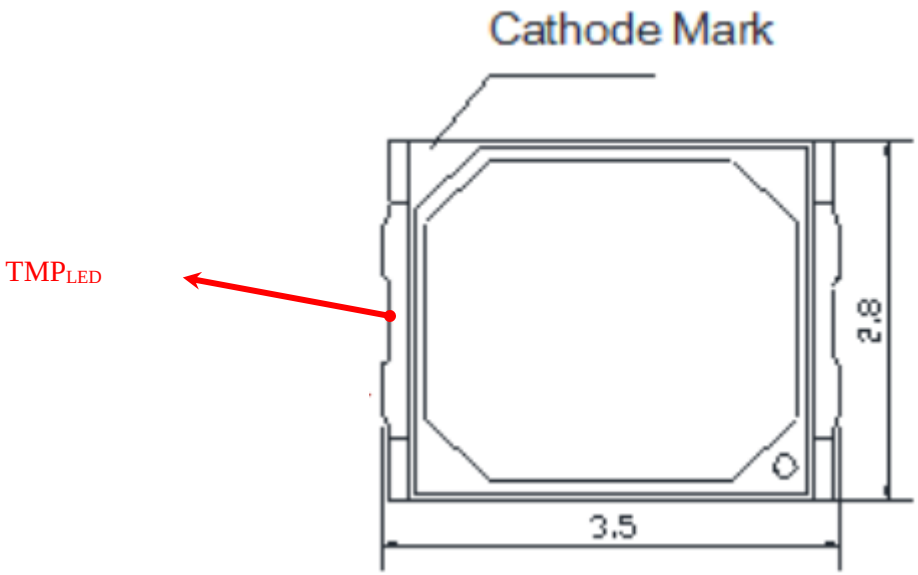
3.2 Data Set 1, 105 ℃, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2532	0.5229	2928	0.0005	0.0013	0.0017	0.0019	0.0022	0.0030	0.0029	0.0033	0.0035
2	0.2527	0.5201	2956	0.0005	0.0013	0.0013	0.0017	0.0019	0.0025	0.0027	0.0031	0.0033
3	0.2527	0.5220	2944	0.0004	0.0010	0.0014	0.0015	0.0018	0.0024	0.0025	0.0029	0.0030
4	0.2519	0.5222	2961	0.0002	0.0009	0.0014	0.0016	0.0017	0.0022	0.0027	0.0030	0.0032
5	0.2520	0.5207	2970	0.0004	0.0010	0.0016	0.0018	0.0018	0.0021	0.0025	0.0031	0.0033
6	0.2527	0.5212	2950	0.0006	0.0011	0.0013	0.0015	0.0016	0.0018	0.0021	0.0027	0.0028
7	0.2511	0.5216	2985	0.0006	0.0013	0.0015	0.0018	0.0018	0.0020	0.0024	0.0029	0.0032
8	0.2523	0.5203	2964	0.0003	0.0009	0.0012	0.0016	0.0017	0.0019	0.0022	0.0028	0.0028
9	0.2520	0.5208	2969	0.0004	0.0008	0.0012	0.0015	0.0017	0.0019	0.0021	0.0027	0.0029
10	0.2533	0.5224	2929	0.0004	0.0009	0.0012	0.0014	0.0016	0.0017	0.0018	0.0023	0.0026
11	0.2517	0.5216	2971	0.0004	0.0010	0.0020	0.0026	0.0029	0.0032	0.0030	0.0034	0.0037
12	0.2533	0.5227	2925	0.0004	0.0009	0.0014	0.0021	0.0025	0.0027	0.0027	0.0027	0.0030
13	0.2535	0.5216	2926	0.0001	0.0006	0.0008	0.0014	0.0018	0.0021	0.0020	0.0019	0.0025
14	0.2537	0.5209	2928	0.0004	0.0008	0.0016	0.0022	0.0026	0.0028	0.0030	0.0033	0.0033
15	0.2540	0.5221	2912	0.0004	0.0008	0.0014	0.0021	0.0024	0.0026	0.0029	0.0030	0.0031
16	0.2527	0.5222	2944	0.0004	0.0008	0.0016	0.0025	0.0028	0.0030	0.0033	0.0035	0.0035
17	0.2538	0.5216	2920	0.0004	0.0007	0.0009	0.0016	0.0020	0.0021	0.0022	0.0025	0.0026
18	0.2517	0.5216	2970	0.0004	0.0007	0.0014	0.0021	0.0026	0.0028	0.0032	0.0034	0.0035
19	0.2531	0.5212	2940	0.0004	0.0008	0.0013	0.0021	0.0028	0.0030	0.0033	0.0034	0.0034
20	0.2516	0.5195	2986	0.0005	0.0008	0.0014	0.0019	0.0027	0.0030	0.0034	0.0035	0.0036
21	0.2541	0.5224	2909	0.0004	0.0008	0.0009	0.0016	0.0021	0.0026	0.0029	0.0030	0.0031
22	0.2530	0.5225	2933	0.0004	0.0007	0.0013	0.0021	0.0027	0.0030	0.0033	0.0034	0.0034
23	0.2528	0.5217	2944	0.0004	0.0007	0.0012	0.0019	0.0025	0.0029	0.0032	0.0033	0.0035
24	0.2528	0.5216	2945	0.0004	0.0007	0.0006	0.0008	0.0016	0.0021	0.0023	0.0024	0.0024
25	0.2540	0.5228	2910	0.0004	0.0009	0.0012	0.0016	0.0021	0.0025	0.0029	0.0030	0.0033
Ave.	0.2528	0.5216	2945	0.0004	0.0009	0.0013	0.0018	0.0022	0.0025	0.0027	0.0030	0.0031
Med.	0.2528	0.5216	2944	0.0004	0.0008	0.0013	0.0018	0.0021	0.0025	0.0027	0.0030	0.0032
st dev	0.0008	0.0009	22.8642	0.0001	0.0002	0.0003	0.0004	0.0004	0.0005	0.0005	0.0004	0.0004
Min.	0.2511	0.5195	2909	0.0001	0.0006	0.0006	0.0008	0.0016	0.0017	0.0018	0.0019	0.0024
Max.	0.2541	0.5229	2986	0.0006	0.0013	0.0020	0.0026	0.0029	0.0032	0.0034	0.0035	0.0037



Appendix A – EUT PHOTO

A.1 Mechanical Dimensions (Ta = 25℃)



All dimensions are in millimeter

A.2 EUT Photo

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