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-2835-023V-L1-830

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Daniel Duan
Report Number:	R2DG180607050-10
Test Date:	2012-12-21 to 2016-08-27
Report Date:	2018-06-12
Reviewed By:	Blake Zhang / EE Engineer
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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:	ES-2835-023V-L1-830
Part Name:	/
Part Type:	LED Package
Nominal CCT:	3000K
Power:	0.2W
Average Current Density per LED die:	516.6677mA/mm^2
Average Power Density per LED die:	1.55W/mm^2
CRI:	80
Die Spacing:	N/A

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 Name	CCT
Tested Model: ES-2835-023V-L1-830	3000K
ES-2835-023V-**-827	2700K
ES-2835-023V-**-830	3000K
ES-2835-023V-**-840	4000K
ES-2835-023V-**-857	5700K
ES-2835-023V-**-860	6000K
ES-2835-023V-**-865	6500K

Note: The first and second *means Sorting revision

Note:

1. The applicant EVERSTAR OPTO ELECTRONICS declare that their products with model ES-2835-023V-L1-830 are the same to the products in report #R2DG130129050-10-9000 and is authorized by original applicant to use their test data.

2. All the data in previous report (R2DG130129050-10-9000) is shared in this report.

1.2 Standards Used:

- IESNA LM-80-08: IESNA 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 Industry 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	2016-03-10	2017-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	2016-03-04	2017-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	2016-03-10	2017-03-09
Standard Light Source	EVERFINE	D062	1011093	2016-09-13	2017-09-12
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	2016-03-04	2017-03-03
Multilayer aging machine	BACL	B2-270	20023	2016-03-04	2017-03-03
Multi-channel DC source	Taishan Xingguang	T01000F2	ST04392	2016-08-29	2017-08-29

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).

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

Data Set 1: 85°C, 60mA	
Part Number:	ES-2835-023V-L1-830
Number of Units:	25
Actual Case Temperature(T_S):	T_S =84.1℃
Actual Ambient Temperature(T_A):	T_A =82.5℃
Life Test Drive Current:	I_F = 60mA
Measurement Current:	I_F =60mA

2 - SUMMARY OF TEST RESULT

Data Set:	**Data Set 1,85℃, 60mA**
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 9000 hours:	94.61%
Average Chromaticity Shift at 9000 hours(Δu'v'):	0.0024
Reported TM-21 L_{70} Lifetime	44,000 hours

3 - Test Data

3.1 Data Set 1, 85°C, 60mA (Lumen Maintenance)

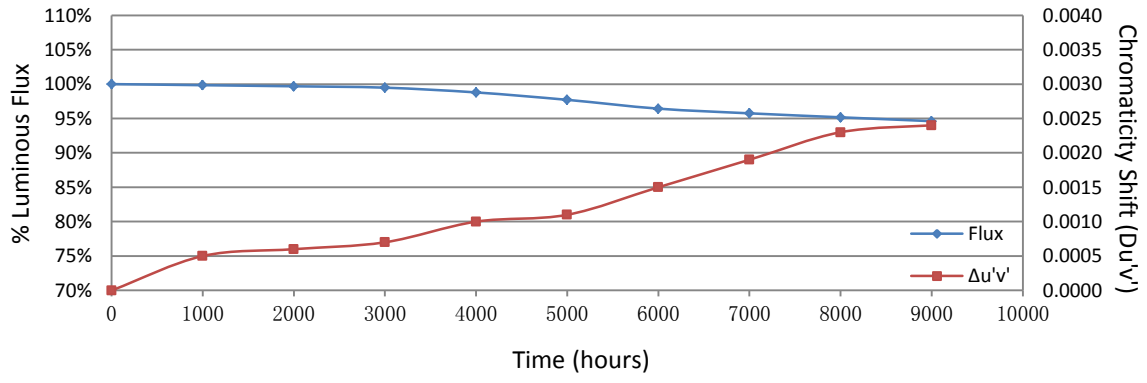
No.	V_F(V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.180	22.29	99.96	99.78	99.55	98.79	97.71	96.32	95.69	95.15	94.57
2	3.186	22.84	99.69	99.74	99.34	98.60	97.68	96.67	96.28	95.84	95.36
3	3.136	21.46	99.91	99.67	99.58	98.74	97.72	96.32	95.71	94.92	94.45
4	3.122	21.56	100.00	99.68	99.54	98.79	97.73	96.43	95.92	95.41	95.04
5	3.142	21.92	99.73	99.64	99.50	98.68	97.58	96.26	95.85	95.12	94.53
6	3.139	21.68	99.91	99.63	99.45	98.71	97.51	96.45	95.76	95.34	94.74
7	3.153	21.83	99.86	99.68	99.40	98.76	97.53	96.56	95.97	95.33	94.64
8	3.160	22.99	99.83	99.65	99.35	98.74	97.83	96.39	95.61	94.95	94.48
9	3.152	21.44	99.72	99.63	99.44	98.97	97.67	96.41	95.66	95.15	94.54
10	3.150	21.77	99.63	99.59	99.54	98.85	97.57	96.60	95.96	95.36	94.72
11	3.185	23.00	99.83	99.65	99.35	98.91	97.74	96.26	95.48	94.83	94.39
12	3.184	22.46	99.96	99.69	99.47	98.80	97.73	96.30	95.46	94.97	94.43
13	3.183	23.37	99.66	99.57	99.44	98.63	97.52	96.58	95.89	95.25	94.74
14	3.195	23.15	100.00	99.83	99.61	98.66	97.75	96.29	95.68	95.12	94.38
15	3.195	22.87	99.87	99.69	99.48	98.82	97.68	96.28	95.41	94.88	94.40
16	3.175	20.95	99.95	99.76	99.52	98.76	97.85	96.32	95.56	94.84	94.32
17	3.224	20.37	99.61	99.56	99.46	98.82	97.50	96.27	95.68	94.99	94.45
18	3.300	22.94	99.65	99.56	99.52	98.87	97.82	96.38	95.60	95.12	94.46
19	3.132	21.36	99.67	99.63	99.49	98.97	97.66	96.49	95.74	95.08	94.48
20	3.150	21.68	99.86	99.77	99.54	98.80	97.69	96.68	95.89	95.43	95.02
21	3.171	22.19	99.73	99.59	99.41	98.92	97.88	96.58	95.85	95.45	94.73
22	3.203	21.16	99.95	99.72	99.43	98.82	97.97	96.46	95.79	95.23	94.61
23	3.124	23.31	100.04	99.70	99.57	98.67	97.73	96.31	95.67	94.98	94.34
24	3.153	21.70	99.86	99.77	99.63	98.85	97.88	96.36	95.67	95.07	94.52
25	3.145	21.93	100.09	99.95	99.45	98.77	97.95	96.67	96.03	95.49	94.94
Ave.	3.170	22.09	99.84	99.68	99.48	98.79	97.71	96.43	95.75	95.17	94.61
Med.	3.160	21.92	99.86	99.68	99.48	98.79	97.72	96.39	95.71	95.12	94.53
st dev	0.0378	0.8020	0.1406	0.0916	0.0788	0.0985	0.1339	0.1405	0.1971	0.2416	0.2531
Min.	3.122	20.37	99.61	99.56	99.34	98.60	97.50	96.26	95.41	94.83	94.32
Max.	3.300	23.37	100.09	99.95	99.63	98.97	97.97	96.68	96.28	95.84	95.36

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
α: 8.636E-06
β: 1.020
Reported L_{70}: 44,000 hours

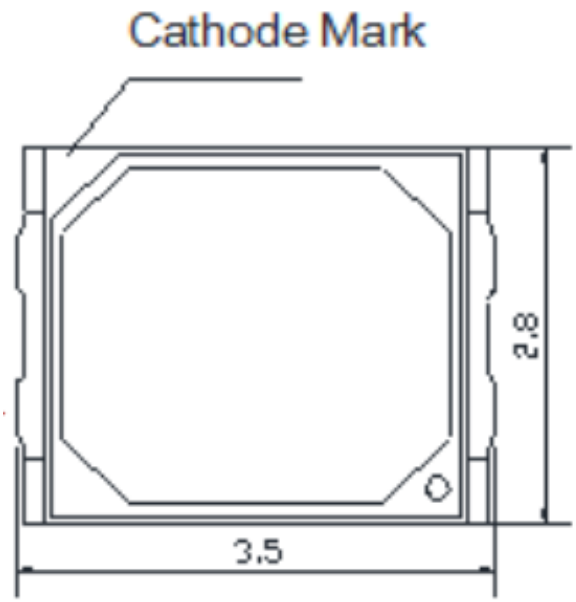
3.2 Data Set 1, 85°C, 60mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2453	0.5250	3107	0.0005	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016	0.0019	0.0021
2	0.2457	0.5235	3109	0.0004	0.0004	0.0004	0.0007	0.0009	0.0011	0.0015	0.0020	0.0022
3	0.2501	0.5217	3010	0.0004	0.0006	0.0007	0.0009	0.0010	0.0012	0.0019	0.0025	0.0025
4	0.2479	0.5152	3110	0.0006	0.0007	0.0009	0.0011	0.0012	0.0013	0.0014	0.0022	0.0023
5	0.2486	0.5161	3085	0.0005	0.0007	0.0008	0.0012	0.0014	0.0017	0.0025	0.0030	0.0031
6	0.2481	0.5164	3098	0.0005	0.0006	0.0007	0.0006	0.0008	0.0015	0.0016	0.0022	0.0021
7	0.2507	0.5236	2983	0.0005	0.0005	0.0007	0.0008	0.0010	0.0014	0.0019	0.0020	0.0021
8	0.2442	0.5239	3145	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0018	0.0024	0.0027
9	0.2506	0.5237	2984	0.0005	0.0005	0.0007	0.0007	0.0013	0.0017	0.0020	0.0026	0.0024
10	0.2491	0.5221	3033	0.0006	0.0007	0.0009	0.0010	0.0015	0.0017	0.0022	0.0025	0.0026
11	0.2445	0.5233	3140	0.0006	0.0008	0.0008	0.0012	0.0009	0.0013	0.0018	0.0026	0.0029
12	0.2455	0.5244	3108	0.0006	0.0007	0.0009	0.0013	0.0014	0.0016	0.0019	0.0020	0.0022
13	0.2454	0.5246	3107	0.0004	0.0006	0.0005	0.0009	0.0011	0.0015	0.0019	0.0024	0.0025
14	0.2449	0.5236	3129	0.0004	0.0005	0.0005	0.0008	0.0009	0.0017	0.0018	0.0024	0.0027
15	0.2442	0.5231	3149	0.0007	0.0008	0.0008	0.0012	0.0013	0.0014	0.0017	0.0021	0.0024
16	0.2511	0.5194	2999	0.0006	0.0006	0.0007	0.0009	0.0011	0.0014	0.0015	0.0022	0.0024
17	0.2502	0.5201	3018	0.0006	0.0007	0.0007	0.0009	0.0011	0.0013	0.0021	0.0023	0.0025
18	0.2465	0.5243	3083	0.0003	0.0003	0.0005	0.0007	0.0009	0.0014	0.0021	0.0026	0.0029
19	0.2508	0.5210	2998	0.0005	0.0006	0.0006	0.0008	0.0011	0.0015	0.0021	0.0027	0.0026
20	0.2509	0.5254	2968	0.0005	0.0006	0.0006	0.0008	0.0010	0.0012	0.0013	0.0015	0.0012
21	0.2442	0.5242	3141	0.0006	0.0008	0.0008	0.0011	0.0012	0.0015	0.0017	0.0022	0.0025
22	0.2506	0.5204	3006	0.0006	0.0007	0.0010	0.0014	0.0015	0.0017	0.0022	0.0024	0.0027
23	0.2449	0.5221	3139	0.0007	0.0008	0.0009	0.0013	0.0013	0.0015	0.0024	0.0032	0.0033
24	0.2453	0.5214	3134	0.0007	0.0007	0.0010	0.0010	0.0011	0.0012	0.0017	0.0018	0.0021
25	0.2473	0.5161	3120	0.0007	0.0007	0.0009	0.0013	0.0014	0.0016	0.0016	0.0020	0.0023
Ave.	0.2475	0.5218	3076	0.0005	0.0006	0.0007	0.0010	0.0011	0.0015	0.0019	0.0023	0.0024
Med.	0.2473	0.5231	3107	0.0005	0.0006	0.0007	0.0009	0.0011	0.0014	0.0018	0.0023	0.0025
st dev	0.0026	0.0030	61.7632	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0004	0.0004
Min.	0.2442	0.5152	2968	0.0003	0.0003	0.0004	0.0006	0.0008	0.0011	0.0013	0.0015	0.0012
Max.	0.2511	0.5254	3149	0.0007	0.0008	0.0010	0.0014	0.0015	0.0017	0.0025	0.0032	0.0033



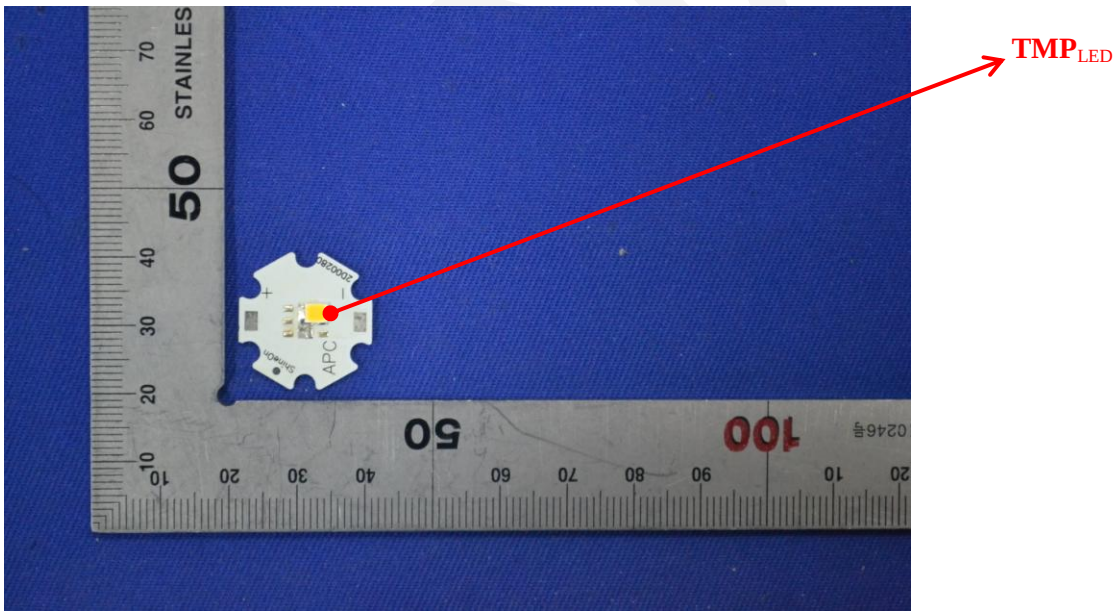
Appendix A – EUT PHOTO

A.1 Mechanical Dimensions (Ta = 25°C)



Unit: mm

A.2 EUT Photo



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