IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Destar Opto-Electronics Co.,LTD

6th floor,3 building,HanHaiDa 7th Industry park,GongMing YuLv Village,Guangming New district,ShenZhen,GuangDong

Model: 2N138-AKKAAK-ZJP-1-9

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Daniel Duan
Report Number:	R2DG150420060-10-9000
Test Date:	2015-04-20 to 2016-05-10
Report Date:	2016-05-12
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1 - General Information

1.1 Description of LED Light Sources

Devices tested

Part Number: 2N138-AKKAAK-ZJP-1-9
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	0.3m	2016-03-10	2017-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2016-03-04	2017-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2015-09-17	2016-09-16
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2016-03-04	2017-03-03
Multilayer aging machine	BACL	B2-270	20023	25℃~110℃	2016-03-04	2017-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50/15A)	2016-03-04	2017-03-03

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.
Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

Sample Size:
Total 60Pcs;
Each Ts test condition 30Pcs
The samples tested at Ts 85℃ and T_S 105℃ were received at 2015-04-20 and tested during 2015-04-20 to 2016-05-10. The samples were numbered from 1 to 30 and 31 to 60

Data Set 1: 85℃, 100mA	
Part Number:	2N138-AKKAAK-ZJP-1-9
Number of Units:	30
Actual Case Temperature(T_S):	T_S =84.2℃
Actual Ambient Temperature(T_A):	T_A =82.5℃
Life Test Drive Current:	I_F = 100mA
Measurement Current:	I_F = 100mA

Data Set 2: 105℃,100mA	
Part Number:	2N138-AKKAAK-ZJP-1-9
Number of Units:	30
Actual Case Temperature(T_S):	T_S =104.1℃
Actual Ambient Temperature(T_A):	T_A =103.5℃
Life Test Drive Current:	I_F =100mA
Measurement Current:	I_F = 100mA

2 - Summary of Test Result

Data Set:	**Data Set 1, 85℃, 100mA**
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	97.86%
Average. Lumen Maintenance at 9000 hours:	96.60%
Average Chromaticity Shift at 6000 hours(Δu'v'):	0.0013
Average Chromaticity Shift at 9000 hours(Δu'v'):	0.0020
Reported TM-21 L_{70} Lifetime:	>54,000 hours

Data Set:	**Data Set 2, 105℃, 100mA**
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	96.90%
Average. Lumen Maintenance at 9000 hours:	95.33%
Average Chromaticity Shift at 6000 hours(Δu'v'):	0.0015
Average Chromaticity Shift at 9000 hours(Δu'v'):	0.0022
Reported TM-21 L_{70} Lifetime:	>54,000 hours

3 - Test Data

3.1 Data Set 2, 85℃, 100mA (Lumen Maintenance)

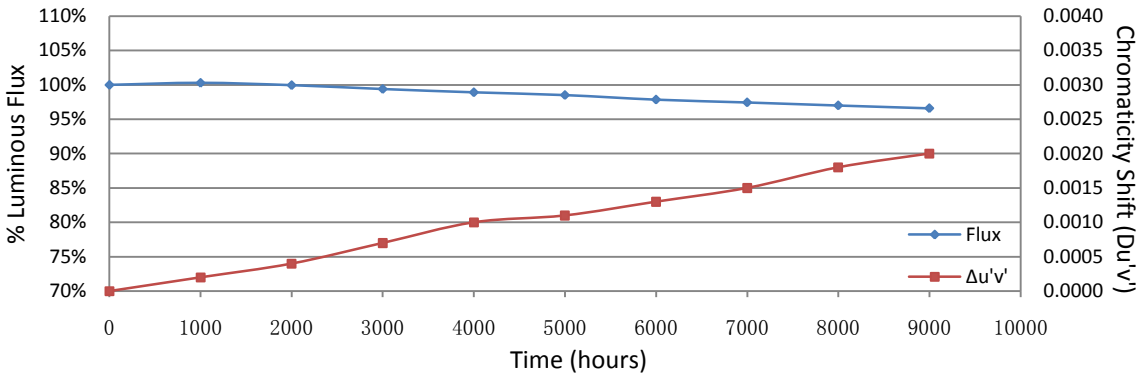
No.	V_F(V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	8.826	135.10	100.37	99.19	98.82	98.30	98.00	97.26	96.89	96.52	96.15
2	8.835	132.40	100.23	100.08	99.55	99.09	98.87	98.34	98.11	97.73	97.28
3	8.827	133.50	100.22	99.85	99.33	98.95	98.73	98.35	98.20	97.60	97.15
4	8.824	133.40	100.15	99.85	99.25	98.88	98.65	98.28	98.05	97.53	97.08
5	8.834	133.40	100.30	99.85	99.18	98.80	98.58	97.68	97.23	96.93	96.63
6	8.839	133.20	100.38	100.00	99.47	99.10	98.80	98.50	98.05	97.45	97.07
7	8.806	132.90	100.15	99.85	99.32	98.95	98.65	98.27	97.97	97.52	97.22
8	8.818	132.40	100.30	100.08	99.55	99.17	98.56	97.81	97.36	96.98	96.60
9	8.828	134.00	100.37	99.93	99.55	99.18	98.73	97.99	97.39	97.09	96.64
10	8.813	133.80	100.45	100.15	100.00	99.70	99.25	98.43	97.83	97.38	97.01
11	8.840	133.80	100.37	100.07	99.70	99.48	99.25	98.51	97.91	97.46	97.16
12	8.832	134.20	100.15	99.93	99.63	99.33	99.11	98.29	97.76	97.32	96.94
13	8.822	131.90	100.30	99.92	99.70	99.62	99.47	98.71	98.64	98.10	97.65
14	8.813	134.10	100.30	100.07	99.18	98.66	98.28	97.69	97.09	96.72	96.20
15	8.827	133.90	100.30	100.00	99.18	98.58	98.06	97.46	97.09	96.79	96.42
16	8.812	131.40	100.15	100.00	99.92	99.47	99.01	98.48	98.10	97.72	97.34
17	8.811	132.60	100.38	100.15	99.77	99.10	98.64	97.96	97.21	96.68	96.30
18	8.814	130.90	100.38	100.08	99.54	98.93	98.24	97.48	96.87	96.41	96.10
19	8.816	133.40	100.22	100.00	99.40	98.65	98.20	97.53	96.93	96.48	95.95
20	8.804	132.40	100.30	100.15	99.40	98.64	98.04	97.28	96.98	96.37	95.77
21	8.822	132.60	100.38	100.23	99.55	98.94	98.34	97.66	97.13	96.46	95.85
22	8.796	132.10	100.53	100.00	99.47	98.79	98.41	97.80	97.35	96.90	96.44
23	8.825	132.70	100.38	99.92	99.40	98.64	98.27	97.66	97.06	96.76	96.23
24	8.812	132.10	100.38	100.15	99.70	99.02	98.64	98.03	97.58	96.97	96.67
25	8.815	133.40	100.22	99.78	99.10	98.35	97.90	97.08	96.78	96.55	96.25
26	8.820	133.90	100.22	99.93	99.10	98.51	98.06	97.31	97.09	96.56	96.19
27	8.816	134.50	100.22	99.70	98.88	98.44	97.92	97.25	96.73	96.36	95.91
28	8.811	134.00	100.30	99.70	98.81	98.43	98.06	97.39	97.16	96.87	96.42
29	8.816	133.30	100.38	100.15	99.40	99.02	98.50	97.67	97.52	97.22	96.70
30	8.804	132.40	100.23	99.92	99.17	98.87	98.34	97.73	97.36	96.98	96.60
Ave.	8.819	133.12	100.30	99.96	99.40	98.92	98.52	97.86	97.45	97.01	96.60
Med.	8.817	133.35	100.30	100.00	99.40	98.94	98.53	97.77	97.35	96.95	96.60
st dev	0.0107	0.9547	0.0950	0.1990	0.2985	0.3677	0.4223	0.4595	0.5009	0.4754	0.4989
Min.	8.840	135.10	100.15	99.19	98.81	98.30	97.90	97.08	96.73	96.36	95.77
Max.	8.796	130.90	100.53	100.23	100.00	99.70	99.47	98.71	98.64	98.10	97.65

TM-21 Projection:

Test Duration:	9,000 hours
Failures Observed:	0
α:	4.834E-06
β:	1.008
Calculated L_{70}:	76,000 hours
Reported L_{70}:	>54,000 hours

3.2 Data Set 2, 85℃, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2494	0.5263	2998	0.0003	0.0006	0.0008	0.0011	0.0012	0.0014	0.0016	0.0019	0.0020
2	0.2504	0.5226	2996	0.0002	0.0006	0.0010	0.0012	0.0013	0.0014	0.0017	0.0019	0.0022
3	0.2492	0.5231	3024	0.0001	0.0004	0.0008	0.0010	0.0011	0.0013	0.0014	0.0017	0.0020
4	0.2499	0.5237	3003	0.0003	0.0004	0.0007	0.0009	0.0011	0.0012	0.0014	0.0017	0.0020
5	0.2509	0.5239	2976	0.0002	0.0006	0.0009	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022
6	0.2491	0.5227	3027	0.0001	0.0004	0.0007	0.0010	0.0012	0.0013	0.0015	0.0017	0.0020
7	0.2491	0.5211	3039	0.0002	0.0004	0.0008	0.0011	0.0013	0.0014	0.0016	0.0021	0.0023
8	0.2501	0.5244	2993	0.0001	0.0003	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0020
9	0.2491	0.5237	3022	0.0002	0.0004	0.0008	0.0011	0.0012	0.0013	0.0016	0.0018	0.0021
10	0.2483	0.5218	3055	0.0002	0.0003	0.0007	0.0009	0.0011	0.0013	0.0014	0.0018	0.0019
11	0.2476	0.5214	3075	0.0003	0.0004	0.0008	0.0010	0.0012	0.0013	0.0015	0.0018	0.0020
12	0.2490	0.5231	3028	0.0003	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015	0.0018	0.0021
13	0.2490	0.5221	3034	0.0003	0.0004	0.0008	0.0009	0.0012	0.0013	0.0015	0.0018	0.0020
14	0.2491	0.5241	3020	0.0002	0.0004	0.0007	0.0012	0.0013	0.0015	0.0016	0.0018	0.0021
15	0.2497	0.5232	3010	0.0002	0.0004	0.0007	0.0010	0.0011	0.0013	0.0015	0.0018	0.0020
16	0.2475	0.5220	3073	0.0001	0.0002	0.0004	0.0007	0.0009	0.0010	0.0011	0.0015	0.0018
17	0.2473	0.5209	3086	0.0003	0.0004	0.0007	0.0010	0.0012	0.0013	0.0016	0.0017	0.0020
18	0.2487	0.5220	3044	0.0002	0.0006	0.0007	0.0010	0.0011	0.0013	0.0014	0.0017	0.0019
19	0.2473	0.5219	3078	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016	0.0017	0.0019
20	0.2511	0.5232	2977	0.0002	0.0004	0.0005	0.0009	0.0010	0.0012	0.0015	0.0017	0.0019
21	0.2484	0.5219	3052	0.0002	0.0005	0.0007	0.0008	0.0010	0.0012	0.0014	0.0017	0.0020
22	0.2504	0.5221	3000	0.0002	0.0005	0.0006	0.0009	0.0011	0.0012	0.0014	0.0017	0.0019
23	0.2494	0.5233	3017	0.0003	0.0005	0.0007	0.0009	0.0012	0.0013	0.0016	0.0018	0.0021
24	0.2496	0.5222	3018	0.0001	0.0002	0.0004	0.0007	0.0008	0.0009	0.0012	0.0015	0.0018
25	0.2480	0.5224	3058	0.0003	0.0006	0.0007	0.0010	0.0012	0.0016	0.0018	0.0018	0.0021
26	0.2485	0.5219	3049	0.0003	0.0006	0.0007	0.0011	0.0013	0.0014	0.0016	0.0018	0.0020
27	0.2476	0.5210	3078	0.0001	0.0005	0.0007	0.0010	0.0011	0.0013	0.0016	0.0019	0.0021
28	0.2491	0.5238	3020	0.0001	0.0004	0.0006	0.0009	0.0011	0.0012	0.0015	0.0018	0.0019
29	0.2502	0.5236	2994	0.0001	0.0003	0.0005	0.0008	0.0010	0.0013	0.0014	0.0017	0.0018
30	0.2499	0.5222	3012	0.0002	0.0003	0.0007	0.0009	0.0011	0.0012	0.0014	0.0017	0.0019
Ave.	0.2491	0.5227	3029	0.0002	0.0004	0.0007	0.0010	0.0011	0.0013	0.0015	0.0018	0.0020
Med.	0.2491	0.5225	3023	0.0002	0.0004	0.0007	0.0010	0.0011	0.0013	0.0015	0.0018	0.0020
st dev	0.0010	0.0012	30.8777	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2511	0.5263	3086	0.0001	0.0002	0.0004	0.0007	0.0008	0.0009	0.0011	0.0015	0.0018
Max.	0.2473	0.5209	2976	0.0003	0.0006	0.0010	0.0012	0.0014	0.0016	0.0018	0.0021	0.0023


110%
105%
100%
95%
90%
85%
80%
75%
70%
% Luminous Flux
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Chromaticity Shift (Du'v')
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Time (hours)
Flux
Δu'v'

3.3 Data Set 3, 105 ℃, 100mA (Lumen Maintenance)

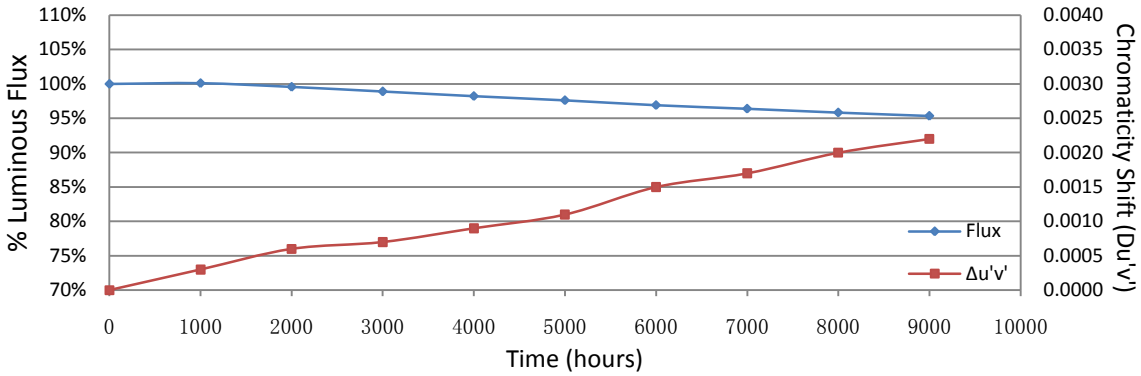
No.	V_F(V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	8.819	132.60	100.00	99.40	99.17	98.64	97.96	97.29	96.61	96.08	95.48
32	8.813	133.80	100.15	99.40	98.73	98.80	98.06	97.16	96.49	96.04	95.67
33	8.811	132.90	100.15	99.62	98.95	98.42	97.74	97.22	96.46	96.01	95.79
34	8.832	134.00	100.22	99.78	99.18	98.36	98.13	97.61	97.01	96.42	96.12
35	8.820	133.70	100.15	99.63	99.25	98.35	97.91	97.16	96.86	96.26	95.81
36	8.807	132.70	100.08	99.55	98.79	98.04	97.21	96.53	96.16	95.63	95.18
37	8.825	133.00	100.08	99.77	99.40	98.57	97.74	96.99	96.62	95.94	95.49
38	8.821	134.60	100.07	99.41	98.59	97.70	97.33	96.58	96.21	95.54	95.17
39	8.811	134.30	100.30	99.55	98.81	97.99	97.54	96.87	96.35	95.90	95.53
40	8.819	133.20	100.00	99.62	98.80	97.97	97.52	96.92	96.32	95.80	95.35
41	8.814	134.10	100.07	99.48	98.58	97.84	97.32	96.64	96.35	95.67	95.23
42	8.817	131.00	100.00	99.47	98.70	98.32	97.86	97.18	96.87	96.26	95.88
43	8.808	133.50	100.15	99.55	99.03	98.28	97.45	96.78	96.18	95.43	94.91
44	8.800	132.60	100.15	99.70	99.17	98.57	97.81	97.06	96.53	96.08	95.40
45	8.814	132.40	100.15	100.00	99.55	98.79	98.11	97.36	97.05	96.45	96.00
46	8.810	131.70	100.15	99.32	99.54	98.63	97.95	97.27	97.11	96.51	96.13
47	8.805	133.40	100.00	99.40	98.88	98.05	97.38	96.78	96.25	95.73	95.13
48	8.824	133.70	100.22	99.70	99.03	98.50	97.83	97.16	96.63	96.19	95.59
49	8.810	133.90	100.07	99.48	98.51	98.06	97.46	96.86	96.27	95.82	95.29
50	8.812	132.10	100.00	99.39	98.64	98.03	97.43	96.82	96.21	95.61	95.00
51	8.800	131.30	100.23	99.39	98.48	97.94	97.33	96.73	96.27	95.73	95.13
52	8.802	130.90	100.15	99.62	98.78	97.86	97.25	96.64	96.03	95.42	94.81
53	8.814	132.70	100.00	99.40	98.42	97.51	96.76	96.16	95.70	95.03	94.65
54	8.816	131.40	100.23	99.62	98.71	98.25	97.64	96.80	96.19	95.59	94.98
55	8.816	132.90	100.08	99.55	98.72	98.19	97.52	97.29	96.84	96.16	95.49
56	8.825	134.80	100.00	99.55	98.81	98.15	97.55	96.66	95.77	95.25	94.58
57	8.802	133.70	100.00	99.55	98.80	98.13	97.53	96.63	96.11	95.74	95.29
58	8.829	134.00	100.07	99.85	99.10	98.21	97.54	96.72	95.97	95.60	95.30
59	8.831	133.00	100.15	99.62	98.95	98.20	97.67	95.94	95.64	95.11	94.51
60	8.823	134.30	100.15	99.70	98.96	98.29	97.69	97.10	96.43	95.76	95.16
Ave.	8.815	133.07	100.11	99.57	98.90	98.22	97.61	96.90	96.38	95.82	95.33
Med.	8.814	133.10	100.11	99.55	98.81	98.20	97.55	96.87	96.33	95.78	95.30
st dev	0.0089	1.0641	0.0853	0.1572	0.2963	0.3115	0.3041	0.3563	0.3833	0.3797	0.4270
Min.	8.832	134.80	100.00	99.32	98.42	97.51	96.76	95.94	95.64	95.03	94.51
Max.	8.800	130.90	100.30	100.00	99.55	98.80	98.13	97.61	97.11	96.51	96.13

TM-21 Projection:

Test Duration:	9,000 hours
Failures Observed:	0
α:	5.996E-06
β:	1.005
Calculated L_{70}:	60,000 hours
Reported L_{70}:	>54,000 hours

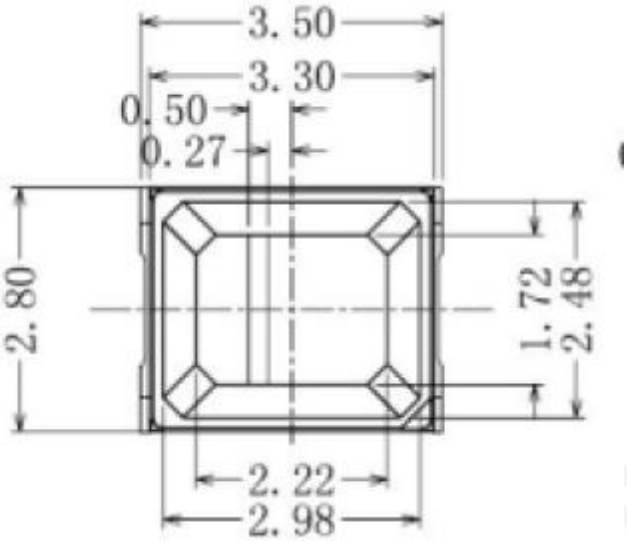
3.4 Data Set 3, 105 ℃, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
31	0.2495	0.5215	3025	0.0003	0.0004	0.0006	0.0009	0.0010	0.0014	0.0016	0.0019	0.0021
32	0.2470	0.5217	3087	0.0004	0.0007	0.0008	0.0009	0.0013	0.0016	0.0020	0.0021	0.0022
33	0.2508	0.5244	2975	0.0004	0.0005	0.0007	0.0009	0.0012	0.0013	0.0016	0.0019	0.0021
34	0.2495	0.5233	3016	0.0003	0.0006	0.0007	0.0009	0.0011	0.0015	0.0016	0.0019	0.0021
35	0.2506	0.5260	2971	0.0004	0.0006	0.0007	0.0009	0.0011	0.0015	0.0016	0.0019	0.0020
36	0.2499	0.5227	3009	0.0003	0.0006	0.0009	0.0011	0.0013	0.0016	0.0018	0.0021	0.0022
37	0.2483	0.5207	3062	0.0002	0.0004	0.0006	0.0009	0.0010	0.0013	0.0016	0.0020	0.0023
38	0.2490	0.5219	3037	0.0004	0.0006	0.0008	0.0010	0.0013	0.0016	0.0018	0.0021	0.0024
39	0.2484	0.5224	3047	0.0002	0.0004	0.0004	0.0008	0.0010	0.0013	0.0015	0.0018	0.0021
40	0.2486	0.5223	3043	0.0004	0.0006	0.0007	0.0010	0.0012	0.0016	0.0018	0.0022	0.0024
41	0.2480	0.5213	3065	0.0002	0.0005	0.0006	0.0010	0.0012	0.0015	0.0017	0.0020	0.0023
42	0.2503	0.5238	2992	0.0002	0.0005	0.0006	0.0009	0.0010	0.0013	0.0016	0.0019	0.0022
43	0.2486	0.5227	3042	0.0004	0.0008	0.0009	0.0012	0.0013	0.0017	0.0019	0.0023	0.0025
44	0.2494	0.5218	3026	0.0002	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017	0.0019	0.0023
45	0.2472	0.5225	3077	0.0002	0.0004	0.0005	0.0007	0.0009	0.0012	0.0015	0.0018	0.0021
46	0.2502	0.5231	2999	0.0004	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018	0.0020	0.0022
47	0.2481	0.5222	3057	0.0003	0.0006	0.0008	0.0009	0.0012	0.0016	0.0018	0.0020	0.0023
48	0.2481	0.5247	3039	0.0003	0.0006	0.0007	0.0009	0.0012	0.0014	0.0017	0.0021	0.0023
49	0.2480	0.5219	3062	0.0003	0.0004	0.0008	0.0009	0.0011	0.0014	0.0018	0.0020	0.0023
50	0.2500	0.5224	3006	0.0003	0.0006	0.0008	0.0009	0.0011	0.0015	0.0018	0.0020	0.0023
51	0.2481	0.5210	3064	0.0004	0.0006	0.0008	0.0010	0.0012	0.0015	0.0018	0.0020	0.0023
52	0.2492	0.5219	3030	0.0002	0.0004	0.0006	0.0008	0.0010	0.0014	0.0017	0.0019	0.0022
53	0.2511	0.5240	2972	0.0003	0.0004	0.0006	0.0009	0.0011	0.0014	0.0017	0.0020	0.0021
54	0.2502	0.5241	2992	0.0002	0.0004	0.0006	0.0009	0.0010	0.0013	0.0017	0.0019	0.0020
55	0.2517	0.5265	2943	0.0004	0.0005	0.0007	0.0009	0.0011	0.0014	0.0017	0.0020	0.0023
56	0.2462	0.5213	3111	0.0004	0.0006	0.0007	0.0009	0.0011	0.0014	0.0018	0.0020	0.0023
57	0.2490	0.5227	3030	0.0004	0.0007	0.0007	0.0009	0.0011	0.0015	0.0019	0.0020	0.0024
58	0.2492	0.5235	3021	0.0004	0.0006	0.0006	0.0009	0.0011	0.0015	0.0018	0.0020	0.0024
59	0.2488	0.5216	3044	0.0003	0.0006	0.0009	0.0009	0.0011	0.0018	0.0021	0.0021	0.0023
60	0.2498	0.5251	2997	0.0004	0.0007	0.0009	0.0011	0.0012	0.0015	0.0018	0.0020	0.0022
Ave.	0.2491	0.5228	3028	0.0003	0.0006	0.0007	0.0009	0.0011	0.0015	0.0017	0.0020	0.0022
Med.	0.2491	0.5225	3030	0.0003	0.0006	0.0007	0.0009	0.0011	0.0015	0.0017	0.0020	0.0023
st dev	0.0013	0.0015	37.9205	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2517	0.5265	3111	0.0002	0.0004	0.0004	0.0007	0.0009	0.0012	0.0015	0.0018	0.0020
Max.	0.2462	0.5207	2943	0.0004	0.0008	0.0009	0.0012	0.0013	0.0018	0.0021	0.0023	0.0025


110%
105%
100%
95%
90%
85%
80%
75%
70%
% Luminous Flux
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Chromaticity Shift (Du'v')
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Time (hours)
Flux
Δu'v'

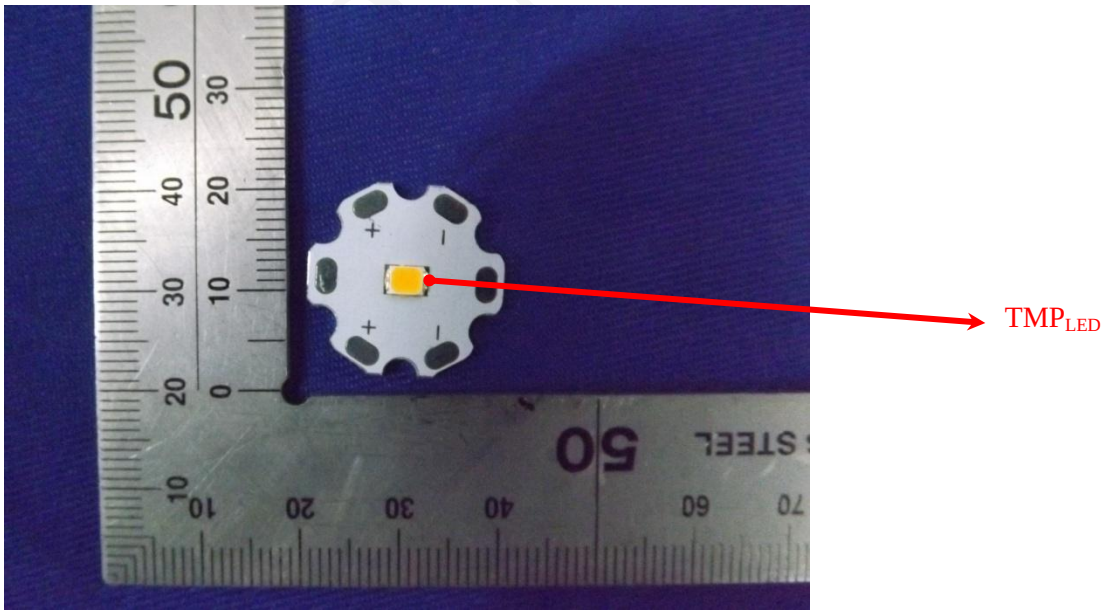
Attachment A – EUT Photo

A.1 Mechanical Dimensions (Ta = 25℃)



All dimensions are in millimeter

A.2 EUT Photo



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