IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Refond Optoelectronic Co., Ltd.

6th wing, 2nd block of Baiwangxin Industry Park, Songbai Road, Nanshan District, Shenzhen,China

Model: RF-W2HI32DS-DF-N-Y

Report Type: 15000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Daniel Duan
Report Number:	R2DG150306053-10-15000
Test Date:	2015-03-09 to 2017-10-28
Report Date:	2017-11-07
Reviewed By:	Jeanne Han /EE Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industry 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).
This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

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1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: RF-W2HI32DS-DF-N-Y
Part Type: LED Package
Nominal CCT: 2700K

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. 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)	Current(mA)	Volt(V)
2835	RF- I32DS- - N(-Y) Test model RF-W27HI32DS-DF-N-Y	2700/3000/4000/ 5000/5700/6000/6500	60	3
2835	RT- I32DS- - N(-Y)	2700/3000/4000/ 5000/5700/6000/6500	60	3

Model Number Format

RF - ____ ____ ____ I32DS - ____ - ____ (-Y)
A1 A2 A3 A4 A5 A6 A7 A8

Note:

A1: Letter RF can be RF or RT, It is an internal Market code which does not affect property;

A2: Letter * represent customer name, it can be C D H K L M P S T W Y

A3: Letter ** represent CCT, it can be 27 30 35 40 45 50 57 60 62 65; ** don t mean only two numbers, it maybe also as mentioned 2 3 4 5 6 7.

A4: Letter * represent workshop code, it can be R, M, H, T or Q&S which does not affect product property

A5: Letter I32DS is a fixed code

A6: Letter ** can be BF, CF, DF, EF, FF or FH, it is an internal Market code which does not affect product property

A7: Letter *N can be 1N, 2N, 3N, it is an internal Market code which does not affect product property

A8: A (-Y) on behalf of the centrifugal power equipment is not used. No (-Y) on behalf of using centrifugal power equipment

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 No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, 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	2017-03-09	2018-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E				

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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 90Pcs;
Each Ts test condition 30Pcs
The samples tested at Ts 55℃, Ts 85℃ and Ts 105℃ were received at 2015-03-06 and tested during 2015-03-09 to 2017-04-02. The samples were numbered from 1 to 30, 31 to 60 and 61 to 90

Data Set 1: 55℃, 60mA	
Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature(T_S):	T_S =53.2℃
Actual Ambient Temperature(T_A):	T_A =52.7℃
Life Test Drive Current:	I_F = 60mA
Measurement Current:	I_F = 60mA

Data Set 2: 85℃,60mA	
Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature(T_S):	T_S =83.5℃
Actual Ambient Temperature(T_A):	T_A =82.6℃
Life Test Drive Current:	I_F =60mA
Measurement Current:	I_F = 60mA

Data Set 3: 105℃, 60mA	
Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature(T_S):	T_S =104.1℃
Actual Ambient Temperature(T_A):	T_A =103.4℃
Life Test Drive Current:	I_F = 60mA
Measurement Current:	I_F = 60mA

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Data Set:	**Data Set 3, 105℃, 60mA**
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h,10000h,11000h,12000h,13000h,14000h,15000h
Average. Lumen Maintenance at 6000 hours:	96.04%
Average. Lumen Maintenance at 9000 hours:	94.54%
Average. Lumen Maintenance at 10000 hours:	94.15%
Average. Lumen Maintenance at 15000 hours:	92.65%
	0.0017
Average Chromaticity Shift at 9000 hours (	0.0028
Average Chromaticity Shift at 10000 hours (	0.0031
Average Chromaticity Shift at 15000 hours (	0.0043
Reported TM-21 L_{70} Lifetime:	>90,000 hours

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3 - Test Data

3.1 Data Set 1, 55℃, 60mA (Lumen Maintenance)

No.	V_F(V)

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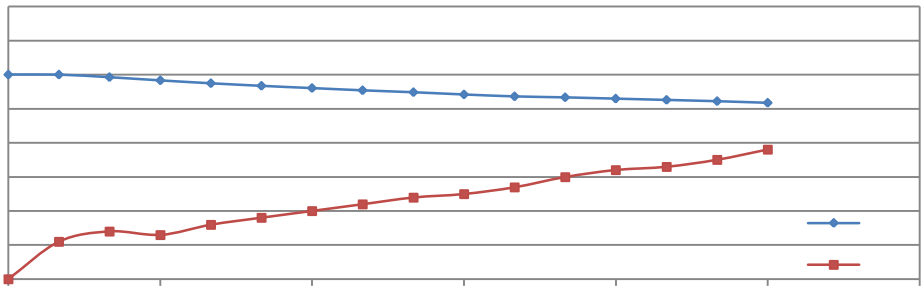
No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
1	97.55	97.26	97.05	97.01	96.85	96.69	96.28	96.07
2	97.87	97.54	97.29	97.17	97.05	96.88	96.80	96.64
3	96.68	96.40	95.95	95.83	95.55	95.22	94.98	94.62
4	96.10	95.85	95.68	95.60	95.43	95.05	94.76	94.47
5	97.25	96.93	96.84	96.64	96.52	96.43	96.35	96.23
6	98.02	97.78	97.57	97.36	97.12	97.03	96.87	96.50
7	97.73	97.45	97.24	97.04	96.80	96.76	96.55	96.23
8	96.68	96.31	95.90	95.77	95.56	95.36	95.19	94.94
9	96.45	96.00	95.68	95.47	95.27	95.11	94.90	94.62
10	97.31	97.11	96.83	96.63	96.39	96.22	96.10	95.94
11	97.69	97.40	97.19	96.95	96.66	96.53	96.37	96.12
12	98.02	97.55	97.42	97.30	96.96	96.71	96.66	96.33
13	96.41	96.12	95.75	95.46	95.42	95.29	95.13	95.00
14	96.96	96.64	96.43	96.19	95.90	95.73	95.49	95.32
15	98.53	98.19	97.88	97.80	97.67	97.41	97.24	96.98
16	98.48	98.11	97.83	97.74	97.54	97.29	97.17	96.92
17	96.49	96.24	96.16	96.03	95.99	95.86	95.56	95.35
18	97.59	97.43	96.98	96.73	96.49	96.33	96.08	95.92
19	96.82	96.57	96.25	96.17	96.13	96.09	95.89	95.81
20	97.82	97.62	97.30	97.21	97.05	96.97	96.81	96.65
21	98.39	98.10	97.73	97.65	97.40	97.23	97.07	96.82
22	98.32	97.95	97.74	97.61	97.53	97.27	97.15	96.98
23	96.35	96.06	95.57	95.40	95.19	95.07	94.94	94.70
24	97.31	97.06	96.60	96.44	96.19	95.98	95.86	95.45
25	97.71	97.43	96.82	96.73	96.57	96.41	96.12	96.08
26	97.10	96.77	96.57	96.40	96.24	96.07	95.90	95.70
27	97.81	97.40	97.08	96.84	96.75	96.63	96.31	96.11
28	97.64	97.40	97.24	96.95	96.67	96.46	96.18	96.14
29	97.61	97.29	96.93	96.68	96.56	96.36	96.28	95.91
30	97.54	97.26	96.81	96.69	96.33	96.05	95.68	95.44
Ave.	97.41	97.11	96.81	96.65	96.46	96.28	96.09	95.87
Med.	97.57	97.27	96.88	96.71	96.54	96.38	96.15	96.01
st dev	0.6762	0.6702	0.6897	0.7027	0.6968	0.7058	0.7287	

3.2 Data Set 1, 55℃, 60mA (Chromaticity Shift)

No.			CCT(K)							
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	0.2583	0.5281	2785	0.0009	0.0012	0.0012	0.0017	0.0019	0.0022	0.0024
2	0.2612	0.5294	2720	0.0011	0.0013	0.0014	0.0017	0.0019	0.0021	0.0023
3	0.2598	0.5297	2747	0.0012	0.0013	0.0015	0.0018	0.0021	0.0024	0.0025
4	0.2619	0.5302	2702	0.0013	0.0014	0.0017	0.0020	0.0023	0.0026	0.0027
5	0.2604	0.5300	2732	0.0018	0.0020	0.0015	0.0011	0.0011	0.0012	0.0015
6	0.2601	0.5285	2745	0.0009	0.0011	0.0010	0.0016	0.0017	0.0020	0.0023
7	0.2620	0.5317	2694	0.0010	0.0013	0.0011	0.0016	0.0018	0.0020	0.0022
8	0.2595	0.5276	2763	0.0011	0.0014	0.0013	0.0019	0.0021	0.0023	0.0026
9	0.2605	0.5301	2730	0.0012	0.0014	0.0014	0.0020	0.0021	0.0025	0.0028
10	0.2597	0.5305	2746	0.0018	0.0019	0.0013	0.0012	0.0011	0.0013	0.0015
11	0.2622	0.5311	2693	0.0010	0.0013	0.0011	0.0017	0.0019	0.0021	0.0025
12	0.2621	0.5304	2697	0.0010	0.0013	0.0011	0.0016	0.0019	0.0021	0.0024
13	0.2604	0.5285	2739	0.0012	0.0014	0.0014	0.0020	0.0022	0.0025	0.0028
14	0.2612	0.5299	2716	0.0012	0.0014	0.0014	0.0019	0.0022	0.0024	0.0027
15	0.2579	0.5270	2801	0.0012	0.0019	0.0021	0.0013	0.0012	0.0011	0.0013
16	0.2612	0.5302	2716	0.0011	0.0013	0.0010	0.0017	0.0019	0.0021	0.0026
17	0.2593	0.5276	2767	0.0011	0.0014	0.0010	0.0015	0.0017	0.0019	0.0023
18	0.2595	0.5297	2754	0.0012	0.0017	0.0014	0.0019	0.0022	0.0025	0.0027
19	0.2587	0.5296	2771	0.0010	0.0016	0.0013	0.0018	0.0020	0.0023	0.0026
20	0.2579	0.5298	2787	0.0010	0.0016	0.0015	0.0011	0.0007	0.0006	0.0006
21	0.2598	0.5274	2757	0.0010	0.0012	0.0014	0.0019	0.0023	0.0025	0.0026
22	0.2596	0.5291	2755	0.0011	0.0013	0.0011	0.0016	0.0019	0.0021	0.0023
23	0.2602	0.5309	2733	0.0012	0.0016	0.0015	0.0022	0.0024	0.0026	0.0028
24	0.2598	0.5290	2750	0.0011	0.0014	0.0012	0.0016	0.0019	0.0021	0.0024
25	0.2605	0.5297	2732	0.0018	0.0020	0.0014	0.0012	0.0011	0.0012	0.0012
26	0.2601	0.5297	2741	0.0010	0.0019	0.0015	0.0011	0.0011	0.0013	0.0015
27	0.2607	0.5324	2716	0.0006	0.0009	0.0008	0.0014	0.0016	0.0019	0.0021
28	0.2616	0.5319	2700	0.0006	0.0009	0.0007	0.0013	0.0016	0.0018	0.0023
29	0.2588	0.5301	2766	0.0006	0.0008	0.0007	0.0013	0.0015	0.0018	0.0022
30	0.2584	0.5298	2776	0.0007	0.0008	0.0006	0.0011	0.0010	0.0012	0.0016
Ave.	0.2601	0.5297	2741	0.0011	0.0014	0.0013	0.0016	0.0018	0.0020	0.0022
Med.	0.2601	0.5298	2743	0.0011	0.0014	0.0013	0.0016	0.0019	0.0021	0.0023
st dev	0.0012	0.0013	29	0.0003	0.0003	0.0003	0.0003	0.0004	0.0005	0.0006
Min.	0.2579	0.5270	2693	0.0006	0.0008	0.0006	0.0011	0.0007	0.0006	0.0006
Max.	0.2622	0.5324	2801	0.0018	0.0020	0.0021	0.0022	0.0024	0.0026	0.0028

No.								
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
1	0.0026	0.0028	0.0031	0.0034	0.0036	0.0037	0.0041	0.0041
2	0.0025	0.0026	0.0030	0.0032	0.0033	0.0034	0.0037	0.0038
3	0.0027	0.0028	0.0032	0.0035	0.0036	0.0037	0.0040	0.0041
4	0.0029	0.0030	0.0032	0.0037	0.0037	0.0039	0.0043	0.0044
5	0.0016	0.0017	0.0016	0.0020	0.0021	0.0022	0.0024	0.0026
6	0.0025	0.0026	0.0028	0.0033	0.0033	0.0034	0.0037	0.0041
7	0.0025	0.0026	0.0028	0.0032	0.0033	0.0035	0.0037	0.0039
8	0.0026	0.0028	0.0030	0.0034	0.0036	0.0037	0.0040	0.0043
9	0.0029	0.0030	0.0032	0.0036	0.0037	0.0039	0.0040	0.0043
10	0.0015	0.0015	0.0016	0.0020	0.0021	0.0022	0.0025	0.0026
11	0.0026	0.0027	0.0029	0.0034	0.0034	0.0035	0.0038	0.0040
12	0.0026	0.0026	0.0029	0.0032	0.0033	0.0035	0.0038	0.0040
13	0.0032	0.0029	0.0018	0.0021	0.0022	0.0022	0.0025	0.0027
14	0.0028	0.0029	0.0033	0.0037	0.0036	0.0039	0.0042	0.0044
15	0.0012	0.0012	0.0011	0.0016	0.0017	0.0017	0.0021	0.0023
16	0.0026	0.0027	0.0029	0.0033	0.0034	0.0035	0.0038	0.0042
17	0.0025	0.0026	0.0028	0.0032	0.0034	0.0035	0.0038	0.0041
18	0.0029	0.0030	0.0033	0.0037	0.0037	0.0039	0.0041	0.0046
19	0.0027	0.0028	0.0030	0.0034	0.0036	0.0037	0.0039	0.0043
20	0.0012	0.0013	0.0014	0.0016	0.0019	0.0019	0.0022	0.0025
21	0.0031	0.0030	0.0033	0.0037	0.0039	0.0040	0.0043	0.0047
22	0.0026	0.0027	0.0030	0.0033	0.0035	0.0036	0.0039	0.0043
23	0.0031	0.0031	0.0035	0.0037	0.0039	0.0039	0.0042	0.0047
24	0.0027	0.0027	0.0031	0.0035	0.0036	0.0037	0.0037	0.0044
25	0.0015	0.0015	0.0016	0.0019	0.0021	0.0022	0.0024	0.0030
26	0.0016	0.0015	0.0016	0.0019	0.0021	0.0022	0.0020	0.0025
27	0.0024	0.0024	0.0027	0.0031	0.0033	0.0033	0.0033	0.0039
28	0.0023	0.0025	0.0027	0.0030	0.0033	0.0034	0.0033	0.0039
29	0.0023	0.0024	0.0027	0.0031	0.0032	0.0033	0.0033	0.0039
30	0.0023	0.0024	0.0027	0.0030	0.0031	0.0033	0.0037	0.0039
Ave.	0.0024	0.0025	0.0027	0.0030	0.0032	0.0033	0.0035	0.0038
Med.	0.0026	0.0027	0.0029	0.0033	0.0034	0.0035	0.0038	0.0040
st dev	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Min.	0.0012	0.0012	0.0011	0.0016	0.0017	0.0017	0.0020	0.0023
Max.	0.0032	0.0031	0.0035	0.0037	0.0039	0.0040	0.0043	0.0047



3.3 Data Set 2, 85 ℃, 60mA (Lumen Maintenance) 4 2 4 2

No.	V_F(V)		Lumen Maintenance (%)						
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
31	2.944	24.47	99.84	99.39	98.08	97.71	97.26	96.85	96.57
32	2.933	24.59	100.45	99.80	99.76	99.35	98.94	98.25	97.84
33	2.935	24.45	100.29	99.67	99.43	98.90	98.36	97.79	97.34
34	2.935	24.64	100.37	99.76	99.59	99.03	98.42	97.85	97.32
35	2.937	24.66	100.24	99.68	99.19	98.82	98.34	97.69	96.92
36	2.935	24.05	99.04	98.59	97.84	97.13	96.67	96.05	95.72
37	2.943	24.42	100.33	99.75	99.43	98.89	98.44	97.91	97.50
38	2.937	24.14	100.17	99.63	99.17	98.59	98.18	97.64	97.06
39	2.940	24.61	100.28	99.51	98.98	98.33	97.93	97.40	96.91
[redacted]						98.14	97.73	97.15	96.74
						97.89	97.32	96.90	96.24
						98.60	98.11	97.49	96.87

No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
31	96.16	95.59	95.26	95.01	94.77	94.65	94.28	93.99
32	97.32	97.03	96.71	96.54	96.42	96.22	95.89	95.65
33	96.93	96.52	96.24	95.99	95.71	95.50	95.34	95.09
34	96.96	96.43	96.14	95.74	95.45	95.21	95.09	94.85
35	96.59	96.15	95.82	95.42	95.21	94.89	94.57	94.20
36	95.43	95.14	94.89	94.59	94.26	94.01	93.76	93.51
37	97.05	96.68	96.44	95.99	95.82	95.66	95.45	95.17
38	96.60	96.02	95.65	95.48	95.32	95.11	94.86	94.61
39	96.46	96.18	95.86	95.61	95.33	95.08	94.84	94.47
40	96.41	96.00	95.46	95.05	94.89	94.60	94.39	94.19
41	95.66	95.13	94.67	94.42	94.13	93.85	93.60	93.39
42	96.42	96.05	95.72	95.64	95.56	95.19	94.86	94.61
43	96.88	96.54	96.24	96.07	95.81	95.64	95.25	95.00
44	96.72	96.39	96.14	95.69	95.36	95.07	94.94	94.53
45	96.76	96.39	95.98	95.73	95.48	95.28	94.95	94.74
46	95.71	95.17	94.85	94.56	94.27	94.03	93.70	93.46
47	96.05	95.50	95.12	95.03	94.95	94.78	94.69	94.44
48	95.72	95.31	95.03	94.94	94.78	94.46	94.25	94.01
49	95.57	95.11	94.58	94.33	94.05	93.97	93.72	93.43
50	96.10	95.55	95.34	94.96	94.67	94.38	94.04	93.66
51	95.77	95.40	95.12	94.87	94.63	94.42	94.26	94.02
52	95.48	95.19	94.87	94.58	94.42	94.17	94.01	93.68
53	96.02	95.61	95.24	95.04	94.76	94.51	94.23	93.90
54	95.34	94.85	94.56	94.16	93.99	93.83	93.67	93.42
55	95.00	94.70	94.24	93.95	93.69	93.48	93.40	93.15
56	94.81	94.48	93.88	93.55	93.31	93.19	92.90	92.66
57	94.92	94.55	94.34	93.97	93.68	93.44	92.90	92.61
58	95.24	94.71	94.42	94.26	93.94	93.69	93.37	93.16
59	95.08	94.67	94.09	93.96	93.76	93.55	93.22	93.01
60	95.55	94.94	94.47	94.17	93.95	93.69	93.56	93.39
Ave.	96.02	95.60	95.25	94.98	94.75	94.52	94.27	94.00
Med.	96.03	95.53	95.18	94.99	94.76	94.48	94.26	94.00
st dev	0.7087	0.7199	0.7631	0.7618	0.7796	0.7727	0.7831	0.7734
Min.	94.81	94.48	93.88	93.55	93.31	93.19	92.90	92.61
Max.	97.32	97.03	96.71	96.54	96.42	96.22	95.89	95.65

TM-21 Projection:

3.4 Data Set 2, 85℃, 60mA (Chromaticity Shift)

No.			CCT(K)						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
31	0.2616	0.5316	2701	0.0018	0.0019	0.0016	0.0013	0.0011	0.0012	0.0013
32	0.2592	0.5282	2767	0.0007	0.0010	0.0011	0.0011	0.0017	0.0019	0.0021
33	0.2606	0.5297	2730	0.0006	0.0009	0.0010	0.0010	0.0016	0.0017	0.0020
34	0.2605	0.5312	2726	0.0006	0.0009	0.0010	0.0011	0.0017	0.0019	0.0021
35	0.2581	0.5284	2788	0.0006	0.0009	0.0009	0.0010	0.0015	0.0018	0.0020
36	0.2628	0.5293	2687	0.0019	0.0018	0.0017	0.0013	0.0012	0.0013	0.0015
37	0.2596	0.5306	2746	0.0006	0.0010	0.0009	0.0009	0.0014	0.0016	0.0018
38	0.2595	0.5280	2761	0.0007	0.0009	0.0010	0.0011	0.0016	0.0018	0.0020
39	0.2602	0.5317	2730	0.0007	0.0009	0.0011	0.0012	0.0017	0.0019	0.0022
40	0.2618	0.5316	2699	0.0005	0.0008	0.0008	0.0010	0.0014	0.0017	0.0020
41	0.2600	0.5292	2745	0.0018	0.0018	0.0016	0.0011	0.0011	0.0012	0.0015
42	0.2590	0.5277	2772	0.0010	0.0008	0.0006	0.0010	0.0015	0.0018	0.0020
43	0.2586	0.5287	2777	0.0009	0.0008	0.0008	0.0011	0.0016	0.0018	0.0021
44	0.2615	0.5297	2711	0.0009	0.0009	0.0006	0.0010	0.0015	0.0018	0.0021
45	0.2588	0.5289	2772	0.0009	0.0009	0.0006	0.0012	0.0016	0.0018	0.0021

FINAL

FINAL

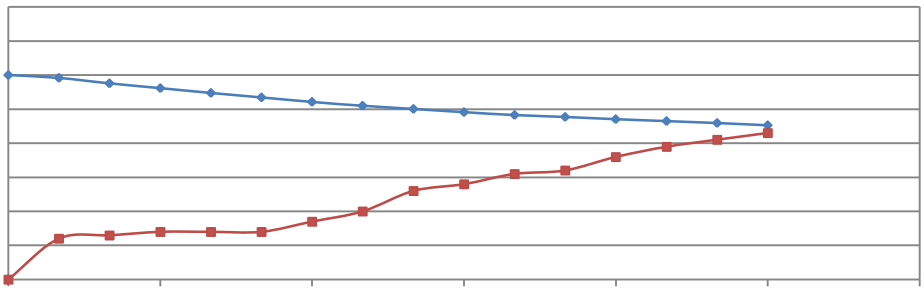
3.5 Data Set 3, 105℃, 60mA (Lumen Maintenance)

No.	V_F(V)		Lumen Maintenance (%)						
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
61	2.936	24.43	100.16	99.30	98.12	97.46	96.85	96.07	95.42
62	2.940	24.49	100.20	99.43	98.12	97.47	96.90	96.12	95.51
63	2.950	24.27	99.71	99.05	98.35	97.69	97.03	96.46	95.76
64	2.948	24.67	99.76	99.07	98.34	97.69	96.96	96.35	95.62
65	2.932	24.47	99.84	99.14	98.37	97.63	96.98	96.32	95.75
66	2.946	24.40	99.80	99.02	98.24	97.54	96.89	96.23	95.45
67	2.946	24.21	99.55	99.01	98.31	97.52	96.86	96.28	95.83
68	2.936	24.61	99.47	98.70	98.25	97.60	96.87	96.06	95.81
69	2.945	24.41	99.39	98.69	98.20	97.54	96.89	96.11	95.62
70	2.940	24.26	99.79	98.76	98.31	97.44	96.70	95.92	95.63
71	2.938	24.21	99.50	98.68	98.27	97.69	96.94	96.12	95.66
72	2.947	24.72	100.20	99.51	97.98	97.41	96.84	96.00	95.63
73	2.940	24.46	100.16	99.43	98.20	97.51	96.97	96.20	95.67
74	2.949	24.43	99.96	99.10	98.61	97.95	97.18	96.44	95.99
75	2.950	24.58	99.27	98.45	98.25	97.56	96.87	96.05	95.61
76	2.935	24.28	99.30	98.48	98.02	97.36	96.87	96.09	95.63
77	2.949	24.13	99.30	98.47	97.97	97.18	96.81	96.10	95.57
78	2.940	24.10	99.67	98.55	98.09	97.30	96.56	95.89	95.35
79	2.937	24.39	99.63	98.77	98.07	97.21	96.47	95.86	94.92
80	2.939	24.15	99.83	99.05	98.30	97.47	96.73	96.02	95.28
81	2.944	24.41	99.34	98.65	98.03	97.34	96.64	95.90	95.41
82	2.920	24.65	99.11	98.42	97.77	97.20	96.55	95.86	95.33
83	2.939	24.47	99.06	98.41	97.63	97.02	96.40	95.75	95.34
84	2.946	24.66	99.15	98.54	97.81	97.20	96.55	95.90	95.62
85	2.933	23.97	99.04	98.46	97.71	97.12	96.41	95.79	95.29
86	2.944	23.97	99.33	98.50	97.79	96.95	96.58	95.87	95.16
87	2.943	24.20	99.42	98.47	97.77	97.07	96.61	95.95	95.12
88	2.944	24.46	99.39	98.36	97.75	96.93	96.28	95.58	94.97
89	2.927	24.06	99.42	98.46	98.21	97.34	96.72	96.05	95.34
90	2.945	24.55	99.27	98.33	97.76	97.19	96.42	95.72	95.44
Ave.	2.941	24.37	99.57	98.77	98.09	97.39	96.74	96.04	95.49
Med.	2.942	24.41	99.49	98.68	98.12	97.43	96.83	96.05	95.54
st dev	0.007	0.21	0.3457	0.3572	0.2459	0.2443	0.2199	0.2107	0.2510
Min.	2.920	23.97	99.04	98.33	97.63	96.93	96.28	95.58	94.92
Max.	2.950	24.72	100.20	99.51	98.61	97.95	97.18	96.46	95.99

No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
61	94.88	94.47	93.90	93.74	93.41	93.21	93.00	92.75
62	95.22	94.65	94.32	93.88	93.63	93.34	93.14	92.81

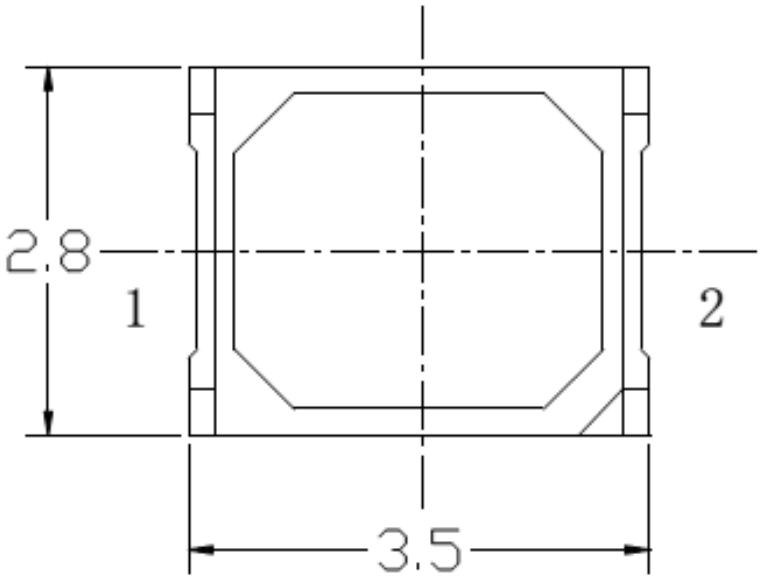
FINAL

No.								
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
61	0.0026	0.0028	0.0030	0.0030	0.0035	0.0038	0.0040	0.0041
62	0.0027	0.0029	0.0032	0.0031	0.0037	0.0040	0.0043	0.0043
63	0.0027	0.0028	0.0031	0.0030	0.0036	0.0038	0.0040	0.0043
64	0.0026	0.0028	0.0031	0.0030	0.0036	0.0039	0.0041	0.0043
65	0.0026	0.0030	0.0031	0.0033	0.0038	0.0040	0.0042	0.0044
66	0.0028	0.0029	0.0031	0.0033	0.0037	0.0039	0.0041	0.0044
67	0.0026	0.0028	0.0031	0.0031	0.0034	0.0039	0.0040	0.0043
68	0.0026	0.0029	0.0031	0.0033	0.0038	0.0040	0.0042	0.0044
69	0.0025	0.0028	0.0031	0.0032	0.0035	0.0038	0.0040	0.0043
70	0.0025	0.0028	0.0030	0.0031	0.0036	0.0038	0.0040	0.0043
71	0.0025	0.0028	0.0030	0.0031	0.0036	0.0038	0.0040	0.0044
72	0.0027	0.0029	0.0032	0.0033	0.0038	0.0039	0.0042	0.0044
73	0.0025	0.0026	0.0030	0.0031	0.0036	0.0038	0.0040	0.0042
74	0.0027	0.0030	0.0033	0.0034	0.0038	0.0040	0.0044	0.0045
75	0.0024	0.0025	0.0030	0.0032	0.0035	0.0038	0.0040	0.0043
76	0.0025	0.0028	0.0031	0.0031	0.0036	0.0038	0.0041	0.0043
77	0.0023	0.0028	0.0030	0.0031	0.0036	0.0037	0.0039	0.0042
78	0.0025	0.0028	0.0030	0.0031	0.0036	0.0039	0.0039	0.0043
79	0.0025	0.0028	0.0031	0.0031	0.0038	0.0040	0.0041	0.0044
80	0.0026	0.0028	0.0031	0.0033	0.0037	0.0039	0.0042	0.0044
81	0.0025	0.0028	0.0031	0.0033	0.0037	0.0038	0.0041	0.0043
82	0.0026	0.0029	0.0030	0.0033	0.0036	0.0037	0.0041	0.0043
83	0.0024	0.0029	0.0031	0.0032	0.0036	0.0038	0.0042	0.0044
84	0.0024	0.0028	0.0031	0.0033	0.0036	0.0038	0.0041	0.0043
85	0.0026	0.0028	0.0031	0.0034	0.0037	0.0039	0.0041	0.0043
86	0.0026	0.0029	0.0031	0.0033	0.0037	0.0039	0.0040	0.0044
87	0.0026	0.0028	0.0032	0.0033	0.0036	0.0038	0.0040	0.0043
88	0.0025	0.0027	0.0030	0.0032	0.0035	0.0037	0.0040	0.0042
89	0.0026	0.0030	0.0031	0.0034	0.0037	0.0039	0.0041	0.0044
90	0.0026	0.0028	0.0030	0.0032	0.0036	0.0038	0.0040	0.0043
Ave.	0.0026	0.0028	0.0031	0.0032	0.0036	0.0039	0.0041	0.0043
Med.	0.0026	0.0028	0.0031	0.0032	0.0036	0.0038	0.0041	0.0043
st dev	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.0023	0.0025	0.0030	0.0030	0.0034	0.0037	0.0039	0.0041
Max.	0.0028	0.0030	0.0033	0.0034	0.0038	0.0040	0.0044	0.0045



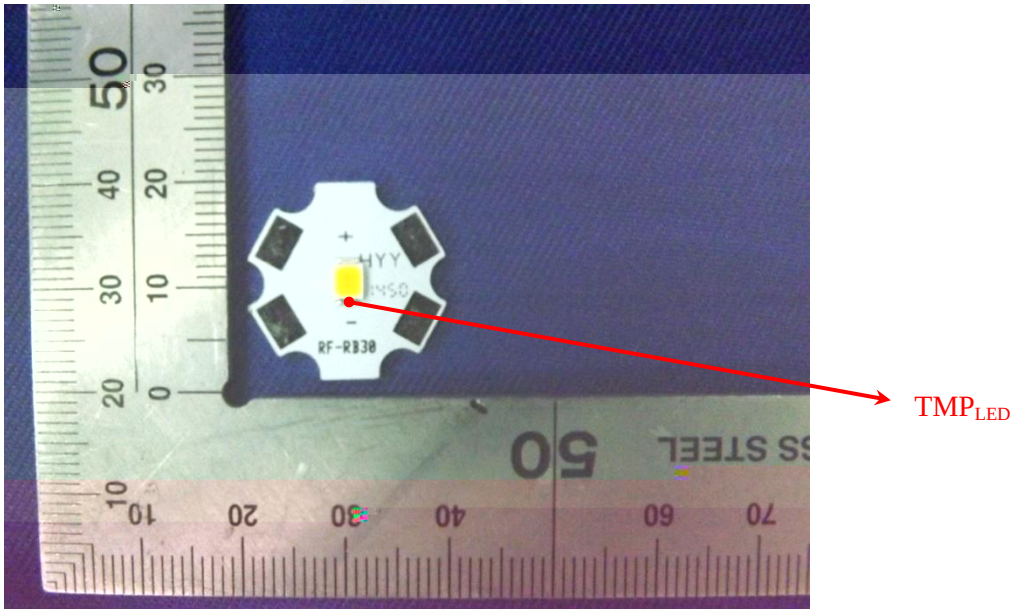
Attachment A EUT PHOTO

A.1 Mechanical Dimensions (Ta = 25℃)



All dimensions are in millimeter

A.2 EUT Photo



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