



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Guangzhou Hongli Opto-Electronic Co., Ltd.

No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

Model:HL-EMC-3030DW-2C-S1-HR3

Report Type: 6000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Daniel Duan	<i>Daniel Duan</i>	
Report Number:	RSZ131220507-10		
Test Date:	2013-12-25 to 2014-09-01		
Report Date:	2014-09-12		
Reviewed By:	Jeanne Han /Safety Manager	<i>Jeanne Han</i>	
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.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.

TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	3
1.1 DESCRIPTION OF LED LIGHT SOURCES	3
1.2 STANDARDS USED:.....	3
1.3 TEST FACILITY	3
1.4 DESCRIPTION OF AUXILIARY EQUIPMENT	3
1.5 OPERATING CYCLE.....	4
1.6 AMBIENT CONDITIONS	4
1.7 PHOTOMETRY MEASUREMENT UNCERTAINTY	4
1.8 SAMPLE SET	5
2 - SUMMARY OF TEST RESULT	6
3 - TEST DATA	7
3.1 DATA SET 1, 85 °C, 150 mA (LUMEN MAINTENANCE).....	7
3.2 DATA SET 1, 85 °C, 150 mA (CHROMATICITY SHIFT)	8
3.3 DATA SET 2, 105 °C, 150 mA (LUMEN MAINTENANCE).....	9
3.4 DATA SET 2, 105 °C, 150mA (CHROMATICITY SHIFT)	10
APPENDIX A – EUT PHOTO	11
A.1 MECHANICAL DIMENSIONS (TA = 25 °C)	11
A.2 EUT PHOTO	11

1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: HL-EMC-3030DW-2C-S1-HR3
 Part Type: LED Package
 Nominal CCT: 2700K

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	Manufacturer	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	G115987CJ7321114	300VA	2014-03-12	2015-03-12
LM-80 Aging equipment	Bacl	N/A	#5	N/A	2014-03-19	2015-03-19
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#4	(120V/1A)	2013-12-04	2014-12-04

Device	Manufacturer	Model No	Serial No	Test Range	Calibration date	Calibration due date
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#5	(120V/1A)	2013-12-04	2014-12-04
Adjustable constant-current DC switching power supply	GOTER	LLA12001112-U	#6	(120V/1A)	2013-12-04	2014-12-04

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 50Pcs;

Each Ts test condition 25Pcs

The samples tested at Ts 85 °C, 105 °C were received at 2013-12-20 and tested during 2013-12-25 to 2014-09-01. The samples were numbered from 1 to 25, 26 to 50.

Data Set 1: 85 °C, 150mA

Part Number:	HL-EMC-3030DW-2C-S1-HR3
Number of Units:	25
Actual Case Temperature(T _S):	T _S =84.2 °C
Actual Ambient Temperature(T _A):	T _A =82.5 °C
Life Test Drive Current:	I _F = 150mA
Measurement Current:	I _F = 150mA

Data Set 2: 105 °C,150mA

Part Number:	HL-EMC-3030DW-2C-S1-HR3
Number of Units:	25
Actual Case Temperature(T _S):	T _S =104.1 °C
Actual Ambient Temperature(T _A):	T _A =102.5 °C
Life Test Drive Current:	I _F =150mA
Measurement Current:	I _F = 150mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 85 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.58%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0018
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 105 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.97%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0021
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

3 - Test Data

3.1 Data Set 1, 85 °C, 150 mA (Lumen Maintenance)

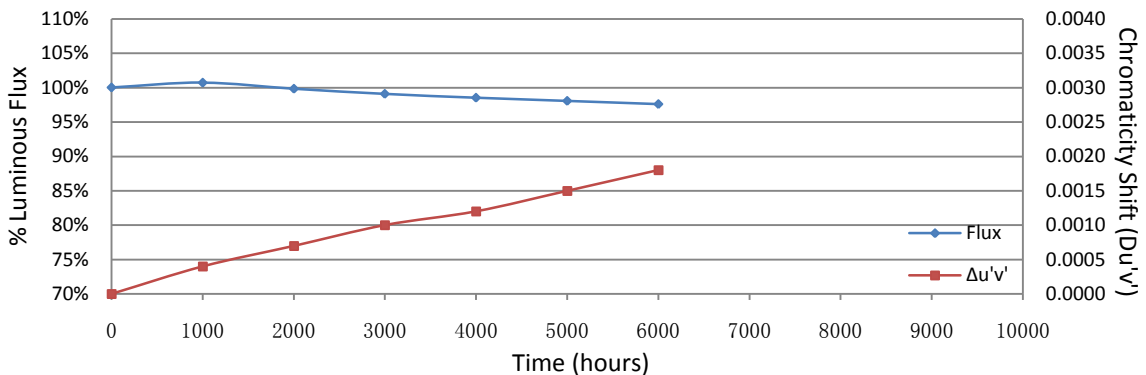
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	5.864	93.49	100.41	99.36	98.25	97.80	97.39	97.07
2	5.818	94.21	101.03	100.10	99.18	98.55	97.71	97.22
3	5.883	93.24	100.25	99.31	98.33	97.87	97.54	96.99
4	5.920	93.78	100.25	99.49	98.50	97.91	97.57	97.06
5	5.824	94.17	100.48	99.45	98.67	98.19	97.61	97.15
6	5.837	96.27	101.18	100.43	99.76	99.29	98.85	98.27
7	5.831	93.87	101.15	100.21	99.55	98.92	98.35	97.92
8	5.796	95.83	99.81	98.85	98.17	97.92	97.26	96.65
9	5.815	95.95	100.69	99.78	98.79	98.59	97.84	97.45
10	5.921	94.38	101.38	100.54	99.86	99.29	98.60	98.15
11	5.921	95.95	100.75	99.84	99.12	98.59	97.88	96.81
12	5.895	94.09	100.61	99.59	98.88	98.59	98.15	97.51
13	5.909	97.01	100.49	99.61	98.95	98.51	98.11	97.48
14	5.813	97.98	100.58	99.71	98.74	98.15	97.80	97.22
15	5.833	93.50	100.63	99.97	99.08	98.51	98.21	97.61
16	5.900	94.90	100.74	100.16	99.36	98.67	98.45	97.93
17	5.860	93.59	100.46	99.42	98.91	98.29	97.97	97.29
18	5.875	95.78	100.69	99.87	98.99	98.28	97.78	97.69
19	5.863	93.08	99.95	99.28	98.72	98.15	97.59	96.94
20	5.805	96.81	102.05	101.27	100.72	100.22	99.63	99.03
21	5.935	94.15	100.63	99.69	98.99	98.28	98.07	97.53
22	5.876	93.40	100.28	99.48	98.62	98.04	97.73	97.46
23	5.831	96.30	100.86	100.02	99.34	98.66	98.33	98.06
24	5.826	93.62	100.91	99.98	98.93	98.46	97.91	97.68
25	5.798	96.25	101.98	100.96	100.28	99.79	99.64	99.44
Ave.	5.858	94.86	100.73	99.85	99.07	98.54	98.08	97.58
Med.	5.860	94.21	100.63	99.78	98.95	98.51	97.91	97.48
st dev	0.043	1.41	0.53	0.54	0.61	0.59	0.60	0.65
Min.	5.796	93.08	99.81	98.85	98.17	97.80	97.26	96.65
Max.	5.935	97.98	102.05	101.27	100.72	100.22	99.64	99.44

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 6.225E-06
 β : 1.011
Calculated L₇₀: 59,000hours
Reported L₇₀: >36,000hours

3.2 Data Set 1, 85 °C, 150 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2653	0.5296	2634	0.0003	0.0007	0.0012	0.0015	0.0018	0.0021
2	0.2628	0.5286	2688	0.0004	0.0008	0.0013	0.0015	0.0018	0.0021
3	0.2597	0.5263	2764	0.0005	0.0009	0.0015	0.0017	0.0021	0.0023
4	0.2624	0.5300	2692	0.0007	0.0012	0.0016	0.0018	0.0022	0.0025
5	0.2624	0.5281	2700	0.0003	0.0006	0.0011	0.0014	0.0016	0.0021
6	0.2654	0.5293	2635	0.0002	0.0005	0.0007	0.0008	0.0011	0.0013
7	0.2629	0.5279	2689	0.0006	0.0009	0.0013	0.0015	0.0019	0.0021
8	0.2618	0.5271	2715	0.0003	0.0005	0.0009	0.0010	0.0013	0.0016
9	0.2644	0.5293	2653	0.0004	0.0006	0.0007	0.0008	0.0011	0.0013
10	0.2624	0.5294	2694	0.0008	0.0009	0.0010	0.0012	0.0015	0.0017
11	0.2618	0.5299	2704	0.0008	0.0008	0.0011	0.0013	0.0017	0.0021
12	0.2618	0.5286	2710	0.0003	0.0005	0.0009	0.0013	0.0016	0.0020
13	0.2639	0.5307	2659	0.0005	0.0008	0.0011	0.0014	0.0017	0.0019
14	0.2635	0.5287	2675	0.0007	0.0011	0.0014	0.0016	0.0018	0.0020
15	0.2620	0.5276	2708	0.0004	0.0006	0.0009	0.0011	0.0013	0.0016
16	0.2617	0.5299	2706	0.0004	0.0008	0.0013	0.0016	0.0018	0.0021
17	0.2639	0.5276	2671	0.0004	0.0004	0.0006	0.0008	0.0011	0.0012
18	0.2616	0.5280	2715	0.0004	0.0008	0.0010	0.0012	0.0015	0.0016
19	0.2630	0.5291	2683	0.0002	0.0004	0.0007	0.0009	0.0012	0.0015
20	0.2604	0.5267	2747	0.0004	0.0006	0.0010	0.0013	0.0014	0.0017
21	0.2595	0.5269	2765	0.0004	0.0004	0.0008	0.0010	0.0013	0.0016
22	0.2628	0.5292	2687	0.0002	0.0003	0.0006	0.0009	0.0012	0.0014
23	0.2607	0.5268	2740	0.0002	0.0005	0.0008	0.0011	0.0014	0.0017
24	0.2610	0.5275	2730	0.0003	0.0004	0.0008	0.0011	0.0014	0.0016
25	0.2616	0.5282	2714	0.0006	0.0003	0.0006	0.0009	0.0011	0.0012
Ave.	0.2623	0.5284	2699	0.0004	0.0007	0.0010	0.0012	0.0015	0.0018
Med.	0.2624	0.5286	2700	0.0004	0.0006	0.0010	0.0012	0.0015	0.0017
st dev	0.0015	0.0012	34.5402	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004
Min.	0.2595	0.5263	2634	0.0002	0.0003	0.0006	0.0008	0.0011	0.0012
Max.	0.2654	0.5307	2765	0.0008	0.0012	0.0016	0.0018	0.0022	0.0025



3.3 Data Set 2, 105 °C, 150 mA (Lumen Maintenance)

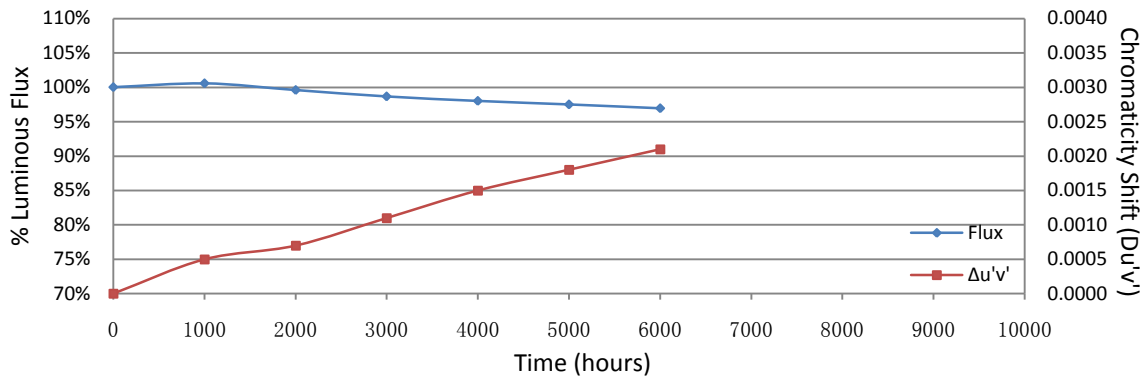
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	5.828	93.54	100.67	99.68	98.72	98.00	97.46	96.90
27	5.794	94.89	101.80	100.61	99.89	99.40	99.15	98.45
28	5.838	94.79	101.65	100.47	99.55	99.17	98.53	97.93
29	5.854	94.16	101.08	99.96	99.05	98.42	98.06	97.53
30	5.854	96.02	101.25	100.48	99.77	99.24	98.77	98.35
31	5.903	95.79	100.84	99.90	98.60	97.79	97.18	96.52
32	5.834	93.76	101.77	100.83	99.56	98.45	97.87	97.48
33	5.838	97.53	100.05	98.90	97.95	96.84	96.22	95.93
34	5.803	95.62	100.56	99.36	98.44	97.76	97.51	96.76
35	5.835	95.14	100.22	99.26	98.37	97.60	97.05	96.35
36	5.810	97.89	101.48	100.52	99.39	98.81	98.36	97.71
37	5.902	93.77	99.94	98.68	97.56	97.18	96.68	96.40
38	5.778	94.87	100.26	99.29	98.72	98.22	97.84	97.50
39	5.813	96.90	101.80	101.07	99.82	99.12	98.20	97.52
40	5.793	95.72	100.23	99.05	98.07	97.34	96.88	96.26
41	5.910	94.19	100.03	98.84	97.61	96.98	96.54	96.09
42	5.835	93.53	100.49	99.64	98.88	98.05	97.59	97.25
43	5.831	94.64	99.74	98.91	97.82	97.31	96.88	96.48
44	5.919	95.48	99.38	98.32	97.47	96.94	96.59	96.16
45	5.893	97.38	100.68	100.09	99.11	98.62	98.24	97.81
46	5.801	94.03	99.67	98.68	98.10	97.67	97.32	96.43
47	5.787	93.55	100.13	99.19	98.50	97.88	97.30	96.92
48	5.820	93.38	100.44	99.72	99.13	98.43	97.39	96.94
49	5.773	93.99	99.81	99.01	98.10	97.45	96.97	96.16
50	5.831	94.14	100.07	99.09	98.36	97.66	97.15	96.41
Ave.	5.835	94.99	100.56	99.58	98.66	98.01	97.51	96.97
Med.	5.831	94.79	100.44	99.36	98.60	97.88	97.39	96.90
st dev	0.042	1.34	0.72	0.76	0.74	0.75	0.75	0.74
Min.	5.773	93.38	99.38	98.32	97.47	96.84	96.22	95.93
Max.	5.919	97.89	101.80	101.07	99.89	99.40	99.15	98.45

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.183E-06
 β : 1.010
Calculated L₇₀: 51,000hours
Reported L₇₀: >36,000hours

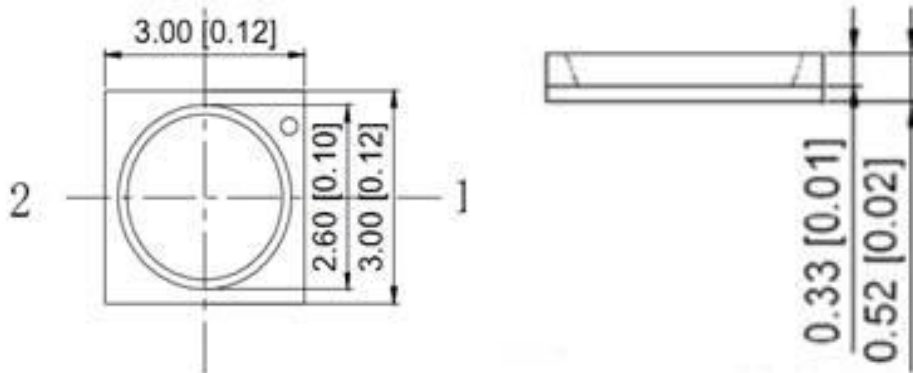
3.4 Data Set 2, 105 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2621	0.5273	2709	0.0001	0.0006	0.0009	0.0012	0.0015	0.0018
27	0.2607	0.5258	2744	0.0006	0.0006	0.0011	0.0014	0.0015	0.0019
28	0.2607	0.5286	2733	0.0005	0.0006	0.0010	0.0014	0.0017	0.0021
29	0.2584	0.5265	2792	0.0005	0.0007	0.0010	0.0014	0.0017	0.0020
30	0.2623	0.5275	2703	0.0006	0.0004	0.0008	0.0010	0.0014	0.0017
31	0.2601	0.5269	2752	0.0003	0.0006	0.0011	0.0015	0.0019	0.0021
32	0.2621	0.5279	2705	0.0003	0.0005	0.0010	0.0014	0.0018	0.0021
33	0.2620	0.5269	2711	0.0006	0.0008	0.0012	0.0018	0.0022	0.0026
34	0.2611	0.5273	2730	0.0005	0.0007	0.0010	0.0014	0.0017	0.0021
35	0.2627	0.5276	2695	0.0006	0.0007	0.0010	0.0013	0.0016	0.0022
36	0.2630	0.5278	2687	0.0008	0.0004	0.0007	0.0009	0.0011	0.0014
37	0.2598	0.5271	2758	0.0004	0.0009	0.0014	0.0018	0.0021	0.0024
38	0.2621	0.5272	2710	0.0006	0.0010	0.0015	0.0018	0.0022	0.0025
39	0.2606	0.5272	2741	0.0007	0.0004	0.0007	0.0011	0.0014	0.0016
40	0.2615	0.5267	2723	0.0005	0.0009	0.0012	0.0014	0.0016	0.0018
41	0.2612	0.5286	2722	0.0006	0.0011	0.0016	0.0022	0.0024	0.0027
42	0.2619	0.5286	2708	0.0007	0.0010	0.0012	0.0016	0.0021	0.0023
43	0.2629	0.5286	2687	0.0008	0.0011	0.0014	0.0016	0.0020	0.0023
44	0.2595	0.5282	2759	0.0005	0.0009	0.0012	0.0014	0.0017	0.0019
45	0.2597	0.5278	2757	0.0002	0.0006	0.0011	0.0015	0.0019	0.0022
46	0.2616	0.5286	2714	0.0004	0.0008	0.0012	0.0016	0.0020	0.0025
47	0.2621	0.5283	2705	0.0002	0.0005	0.0010	0.0014	0.0017	0.0021
48	0.2639	0.5284	2668	0.0005	0.0009	0.0012	0.0016	0.0020	0.0024
49	0.2617	0.5252	2727	0.0006	0.0009	0.0013	0.0017	0.0021	0.0026
50	0.2629	0.5274	2692	0.0004	0.0008	0.0012	0.0015	0.0020	0.0024
Ave.	0.2615	0.5275	2721	0.0005	0.0007	0.0011	0.0015	0.0018	0.0021
Med.	0.2617	0.5275	2714	0.0005	0.0007	0.0011	0.0014	0.0018	0.0021
st dev	0.0013	0.0009	28.4026	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003
Min.	0.2584	0.5252	2668	0.0001	0.0004	0.0007	0.0009	0.0011	0.0014
Max.	0.2639	0.5286	2792	0.0008	0.0011	0.0016	0.0022	0.0024	0.0027



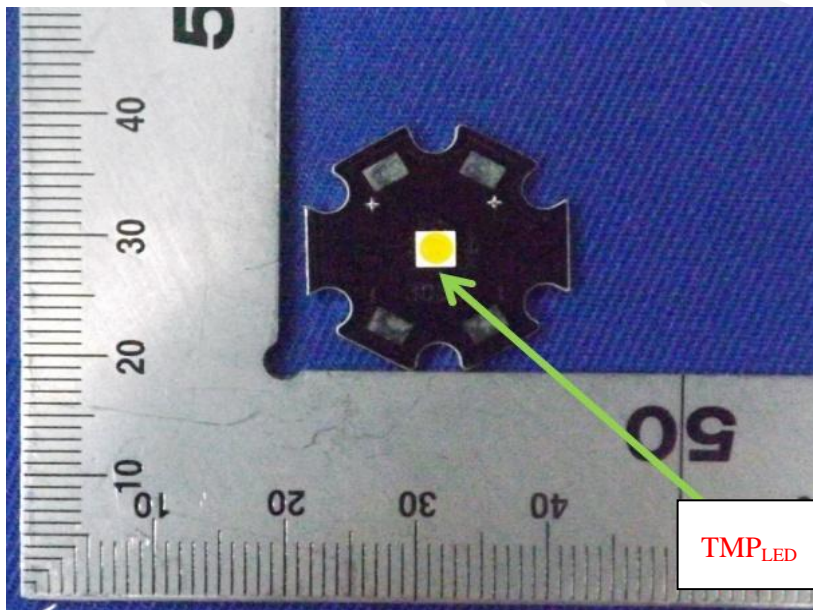
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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