

IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

G.H. Opto-Electronic Co Ltd & Kwaliti Photonics P Ltd.

Model: KLSL 5630W

Report Type: 7000 Hours Test Report		Product Type: LED Package
Test Engineer:	Daniel Duan	<i>Daniel Duan</i>
Report Number:	RSZ130118508-10-7000	
Test Date:	2013-01-26 to 2013-11-14	
Report Date:	2013-11-18	
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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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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.	3
1.6 AMBIENT CONDITIONS	4
1.7 PHOTOMETRY MEASUREMENT UNCERTAINTY	4
1.8 SAMPLE SET	4
1.9 REPORT REVISION	4
2 - SUMMARY OF TEST RESULT	5
3 - TEST DATA	6
3.1 DATA SET 1, 55 °C, 150mA (LUMEN MAINTENANCE)	6
3.2 DATA SET 1, 55 °C, 150mA (CHROMATICITY SHIFT)	7
3.3 DATA SET 2, 85 °C, 150mA (LUMEN MAINTENANCE)	8
3.4 DATA SET 2, 85 °C, 150mA (CHROMATICITY SHIFT)	9
APPENDIX A – EUT PHOTO	10
A.1 MECHANICAL DIMENSIONS (TA = 25 °C)	10
A.2 EUT PHOTO	10

1 - GENERAL INFORMATION

1.1 Description of LED Light Sources

Devices tested

Part Number: KLSL 5630W
 Part Type: LED Package
 Nominal CCT: 6000K-6500K

1.2 Standards Used:

- IESNA LM-80-08: IESNA 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	380-780nm, length:0.3M ,0-1999LUMEN	2013-03-08	2014-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2013-03-25	2014-03-25
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2013-03-08	2014-03-08
Standard Light Source	EVERFINE	D062	1011093	3000K	2013-05-23	2014-05-23
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987CJ 7321114	300VA	2013-03-25	2014-03-25
LM-80 Aging equipment	Bacl	N/A	#2	N/A	2013-03-25	2014-03-25
Digital CC&CV DC Power Supply	everfine	WY5015	11090004	(50/15A)	2013-03-26	2014-03-26

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 IES 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 IES LM-80 tests.

Sample Size:

Total 50Pcs;

Each T_s test condition 25Pcs

Data Set 1: 55 $^{\circ}\text{C}$, 150mA

Part Number:	KLSL 5630W
Number of Units:	25
Actual Case Temperature(T_s):	$T_s = 55.6\text{ }^{\circ}\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 55.1\text{ }^{\circ}\text{C}$
Life Test Drive Current:	$I_F = 150\text{mA}$
Measurement Current:	$I_F = 150\text{mA}$

Data Set 2: 85 $^{\circ}\text{C}$, 150mA

Part Number:	KLSL 5630W
Number of Units:	25
Actual Case Temperature(T_s):	$T_s = 85.9\text{ }^{\circ}\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 85.3\text{ }^{\circ}\text{C}$
Life Test Drive Current:	$I_F = 150\text{mA}$
Measurement Current:	$I_F = 150\text{mA}$

1.9 Report Revision

2013-11-18 Initial Issued

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h
Average. Lumen Maintenance at 6000 hours:	96.54%
Average. Lumen Maintenance at 7000 hours:	96.33%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0014
Average Chromaticity Shift at 7000 hours ($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime:	>42,000 hours

Data Set:	Data Set 2, 85 °C, 150mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h
Average. Lumen Maintenance at 6000 hours:	96.04%
Average. Lumen Maintenance at 7000 hours:	95.75%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0015
Average Chromaticity Shift at 7000 hours ($\Delta u'v'$):	0.0017
Reported TM-21 L ₇₀ Lifetime	>42,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 150mA (Lumen Maintenance)

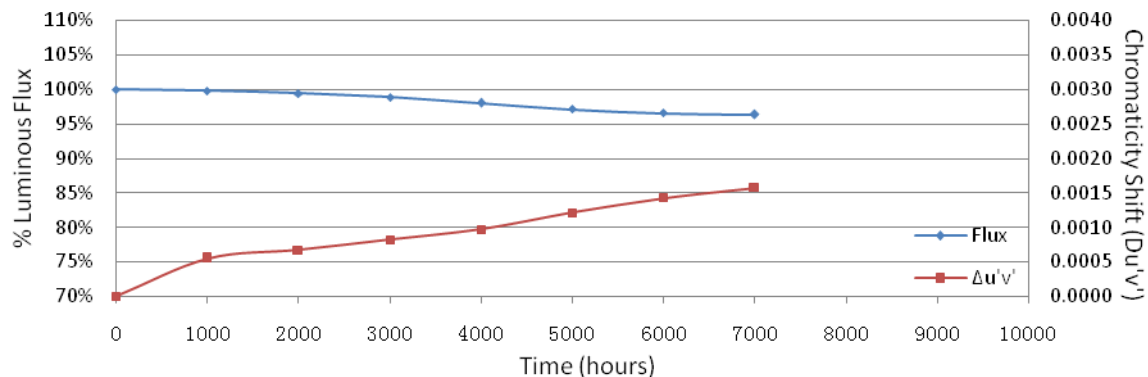
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)						
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	3.204	49.22	99.76	99.41	99.00	98.17	97.24	96.57	96.40
2	3.202	49.14	99.76	99.27	98.90	97.99	97.17	96.76	96.60
3	3.174	49.23	99.80	99.63	98.94	98.03	97.07	96.69	96.40
4	3.171	49.54	99.74	99.48	98.87	97.88	97.23	96.69	96.55
5	3.171	49.59	99.80	99.56	98.81	98.04	97.00	96.33	96.17
6	3.170	49.94	99.84	99.48	98.74	97.96	96.98	96.42	96.24
7	3.194	48.80	99.77	99.45	98.91	98.22	96.91	96.39	96.19
8	3.159	48.58	99.77	99.46	98.76	97.94	97.24	96.62	96.46
9	3.170	48.75	99.82	99.41	98.87	97.83	97.05	96.55	96.39
10	3.162	48.12	99.75	99.33	98.73	97.88	97.01	96.59	96.36
11	3.166	48.71	99.86	99.43	99.04	98.23	97.39	96.69	96.59
12	3.168	48.84	99.82	99.51	98.91	97.99	97.13	96.68	96.50
13	3.161	49.14	99.76	99.35	98.88	98.17	97.07	96.62	96.28
14	3.162	48.86	99.88	99.43	98.73	97.87	97.01	96.38	96.11
15	3.196	49.12	99.82	99.53	98.82	97.98	97.15	96.52	96.32
16	3.196	49.35	99.86	99.49	98.97	98.14	97.26	96.58	96.25
17	3.201	49.15	99.76	99.43	98.74	97.82	96.91	96.54	96.20
18	3.154	48.81	99.80	99.45	99.06	98.18	97.28	96.44	96.17
19	3.170	48.84	99.84	99.37	98.81	97.97	97.09	96.56	96.21
20	3.157	49.74	99.82	99.52	98.83	97.85	96.98	96.52	96.28
21	3.173	49.35	99.76	99.39	98.93	97.87	97.06	96.31	96.25
22	3.197	48.82	99.75	99.41	98.87	97.81	97.03	96.54	96.39
23	3.192	49.14	99.72	99.47	98.76	97.92	97.03	96.62	96.36
24	3.154	48.83	99.84	99.49	98.83	97.99	96.97	96.31	96.17
25	3.188	48.64	99.86	99.61	98.83	97.80	97.12	96.53	96.38
Ave.	3.176	49.05	99.80	99.45	98.86	97.98	97.10	96.54	96.33
Med.	3.171	49.12	99.80	99.45	98.87	97.97	97.07	96.55	96.32
st dev	0.0166	0.4024	0.0444	0.0829	0.0940	0.1352	0.1246	0.1271	0.1389
Min.	3.154	48.12	99.72	99.27	98.73	97.80	96.91	96.31	96.11
Max.	3.204	49.94	99.88	99.63	99.06	98.23	97.39	96.76	96.60

TM-21 Projection:

Test Duration: 7000 hours
Failures Observed: 0
 α : 6.847E-06
 β : 1.008
Calculated L₇₀: 53,000 hours
Reported L₇₀: >42,000 hours

3.2 Data Set 1, 55 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	0.2570	0.5267	2821	0.0008	0.0009	0.0012	0.0013	0.0014	0.0016	0.0017
2	0.2585	0.5283	2780	0.0005	0.0005	0.0005	0.0006	0.0007	0.0009	0.0012
3	0.2593	0.5314	2750	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0011
4	0.2584	0.5297	2775	0.0003	0.0005	0.0006	0.0008	0.0011	0.0014	0.0016
5	0.2581	0.5278	2792	0.0004	0.0004	0.0004	0.0006	0.0014	0.0016	0.0017
6	0.2577	0.5309	2786	0.0006	0.0008	0.0010	0.0012	0.0013	0.0016	0.0018
7	0.2591	0.5306	2757	0.0006	0.0009	0.0010	0.0011	0.0013	0.0015	0.0018
8	0.2599	0.5262	2759	0.0005	0.0005	0.0007	0.0009	0.0012	0.0014	0.0015
9	0.2600	0.5307	2738	0.0004	0.0006	0.0006	0.0007	0.0009	0.0015	0.0017
10	0.2618	0.5290	2708	0.0004	0.0006	0.0008	0.0009	0.0010	0.0013	0.0013
11	0.2600	0.5309	2737	0.0004	0.0006	0.0009	0.0010	0.0014	0.0016	0.0016
12	0.2585	0.5288	2779	0.0004	0.0004	0.0007	0.0008	0.0012	0.0013	0.0015
13	0.2601	0.5309	2735	0.0005	0.0006	0.0006	0.0009	0.0012	0.0015	0.0017
14	0.2584	0.5286	2781	0.0006	0.0009	0.0011	0.0010	0.0013	0.0016	0.0017
15	0.2578	0.5285	2794	0.0005	0.0007	0.0008	0.0011	0.0013	0.0014	0.0016
16	0.2572	0.5290	2806	0.0006	0.0007	0.0008	0.0009	0.0011	0.0014	0.0016
17	0.2586	0.5288	2777	0.0007	0.0007	0.0007	0.0008	0.0011	0.0014	0.0016
18	0.2587	0.5297	2770	0.0006	0.0007	0.0010	0.0012	0.0015	0.0016	0.0017
19	0.2609	0.5312	2717	0.0005	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013
20	0.2574	0.5312	2791	0.0008	0.0008	0.0009	0.0011	0.0014	0.0016	0.0017
21	0.2587	0.5283	2776	0.0006	0.0008	0.0010	0.0013	0.0016	0.0017	0.0017
22	0.2597	0.5306	2746	0.0006	0.0007	0.0011	0.0012	0.0014	0.0015	0.0017
23	0.2591	0.5312	2755	0.0008	0.0008	0.0008	0.0009	0.0012	0.0013	0.0014
24	0.2588	0.5277	2778	0.0006	0.0008	0.0008	0.0009	0.0010	0.0012	0.0014
25	0.2587	0.5290	2774	0.0005	0.0007	0.0008	0.0011	0.0013	0.0015	0.0015
Ave.	0.2589	0.5294	2767	0.0005	0.0007	0.0008	0.0010	0.0012	0.0014	0.0016
Med.	0.2587	0.5290	2775	0.0005	0.0007	0.0008	0.0009	0.0012	0.0015	0.0016
st dev	0.0011	0.0015	26.9591	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2570	0.5262	2708	0.0003	0.0004	0.0004	0.0006	0.0007	0.0009	0.0011
Max.	0.2618	0.5314	2806	0.0008	0.0009	0.0012	0.0013	0.0016	0.0017	0.0018



3.3 Data Set 2, 85 °C, 150mA (Lumen Maintenance)

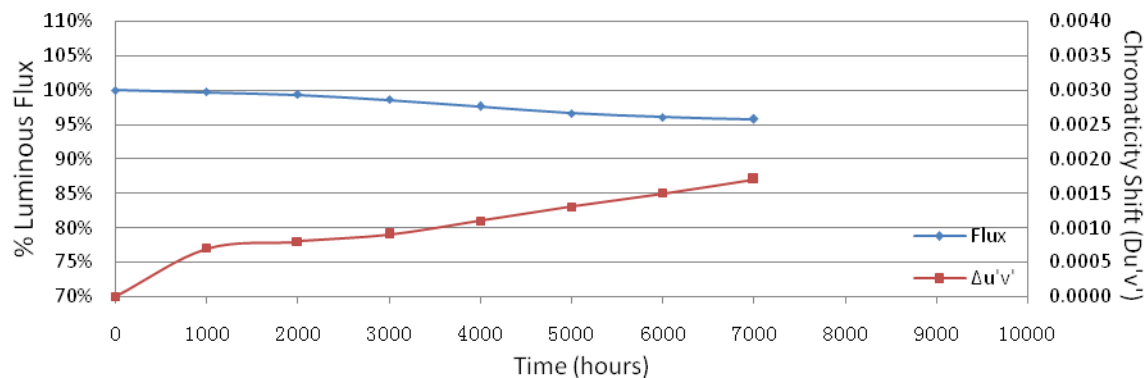
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)						
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
26	3.200	49.20	99.74	99.41	98.62	97.70	96.67	96.16	95.87
27	3.170	49.21	99.76	99.29	98.46	97.60	96.65	96.16	95.92
28	3.198	49.30	99.59	99.11	98.62	97.71	96.84	96.41	96.04
29	3.199	49.03	99.73	99.49	98.63	97.74	96.57	96.27	95.72
30	3.198	49.08	99.71	99.21	98.74	97.70	96.80	96.01	95.72
31	3.178	48.93	99.71	99.47	98.57	97.69	96.65	96.08	95.65
32	3.194	48.89	99.75	99.30	98.77	97.50	96.71	95.97	95.68
33	3.195	49.88	99.66	99.46	98.74	97.71	96.75	96.11	95.81
34	3.176	48.94	99.78	99.22	98.65	97.51	96.47	95.95	95.65
35	3.165	48.89	99.61	99.39	98.57	97.59	96.60	96.01	95.91
36	3.195	49.45	99.66	99.39	98.42	97.47	96.40	95.89	95.71
37	3.190	48.58	99.73	99.30	98.58	97.51	96.71	96.13	95.72
38	3.195	49.59	99.74	99.25	98.75	97.56	96.49	95.91	95.60
39	3.169	49.34	99.72	99.29	98.44	97.41	96.57	96.01	95.78
40	3.151	49.26	99.70	99.53	98.56	97.71	96.89	96.31	95.72
41	3.167	49.00	99.78	99.39	98.47	97.49	96.41	95.88	95.61
42	3.193	49.13	99.76	99.39	98.68	97.54	96.56	96.01	95.87
43	3.202	48.91	99.67	99.41	98.65	97.69	96.85	96.07	95.89
44	3.165	49.12	99.63	99.39	98.64	97.68	96.64	96.03	95.93
45	3.189	48.78	99.67	99.41	98.48	97.50	96.54	95.86	95.65
46	3.193	48.44	99.57	99.17	98.62	97.73	96.78	95.97	95.75
47	3.196	49.16	99.67	99.29	98.76	97.80	96.68	95.95	95.55
48	3.153	48.59	99.84	99.22	98.60	97.57	96.65	95.97	95.64
49	3.196	49.19	99.72	99.31	98.56	97.56	96.44	95.89	95.69
50	3.167	49.44	99.72	99.31	98.62	97.75	96.52	95.93	95.61
Ave.	3.184	49.09	99.70	99.34	98.61	97.62	96.63	96.04	95.75
Med.	3.193	49.12	99.72	99.31	98.62	97.60	96.65	96.01	95.72
st dev	0.0159	0.3232	0.0618	0.1048	0.1008	0.1085	0.1385	0.1395	0.1263
Min.	3.151	48.44	99.57	99.11	98.42	97.41	96.40	95.86	95.55
Max.	3.202	49.88	99.84	99.53	98.77	97.80	96.89	96.41	96.04

TM-21 Projection:

Test Duration: 7000 hours
Failures Observed: 0
 α : 7.813E-06
 β : 1.008
Calculated L₇₀: 47,000 hours
Reported L₇₀: >42,000 hours

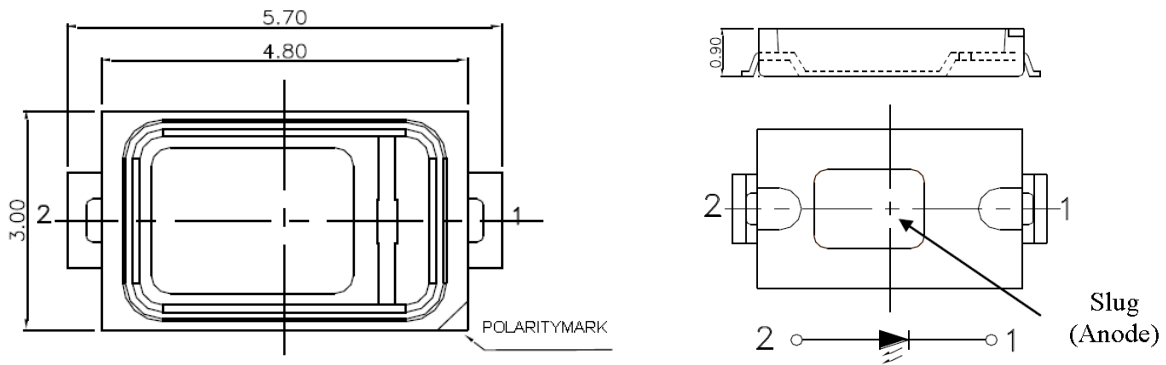
3.4 Data Set 2, 85 °C, 150mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	0.2585	0.5296	2774	0.0008	0.0009	0.0010	0.0011	0.0013	0.0015	0.0016
2	0.2595	0.5287	2758	0.0006	0.0007	0.0008	0.0008	0.0011	0.0012	0.0017
3	0.2578	0.5274	2799	0.0008	0.0010	0.0011	0.0014	0.0015	0.0017	0.0017
4	0.2596	0.5319	2742	0.0006	0.0008	0.0010	0.0010	0.0013	0.0015	0.0015
5	0.2585	0.5305	2772	0.0007	0.0009	0.0012	0.0013	0.0016	0.0017	0.0019
6	0.2599	0.5298	2744	0.0010	0.0011	0.0012	0.0014	0.0015	0.0017	0.0019
7	0.2590	0.5305	2760	0.0008	0.0009	0.0012	0.0012	0.0013	0.0015	0.0019
8	0.2567	0.5297	2812	0.0005	0.0006	0.0008	0.0010	0.0014	0.0017	0.0019
9	0.2591	0.5298	2762	0.0009	0.0011	0.0013	0.0014	0.0016	0.0017	0.0017
10	0.2594	0.5290	2758	0.0005	0.0005	0.0007	0.0010	0.0013	0.0016	0.0017
11	0.2592	0.5314	2752	0.0006	0.0006	0.0008	0.0009	0.0012	0.0014	0.0017
12	0.2591	0.5293	2764	0.0004	0.0004	0.0007	0.0008	0.0009	0.0011	0.0016
13	0.2570	0.5292	2808	0.0005	0.0005	0.0006	0.0008	0.0010	0.0015	0.0017
14	0.2580	0.5277	2794	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
15	0.2586	0.5306	2768	0.0005	0.0006	0.0008	0.0010	0.0011	0.0016	0.0016
16	0.2595	0.5268	2765	0.0005	0.0005	0.0006	0.0008	0.0014	0.0016	0.0019
17	0.2578	0.5300	2789	0.0007	0.0007	0.0008	0.0009	0.0012	0.0015	0.0016
18	0.2593	0.5298	2757	0.0009	0.0010	0.0012	0.0014	0.0015	0.0016	0.0017
19	0.2593	0.5305	2753	0.0009	0.0010	0.0011	0.0013	0.0014	0.0015	0.0016
20	0.2605	0.5326	2721	0.0006	0.0006	0.0007	0.0008	0.0013	0.0015	0.0017
21	0.2598	0.5306	2742	0.0007	0.0008	0.0009	0.0009	0.0015	0.0017	0.0019
22	0.2574	0.5266	2812	0.0004	0.0005	0.0007	0.0008	0.0011	0.0014	0.0017
23	0.2595	0.5297	2752	0.0009	0.0011	0.0011	0.0012	0.0014	0.0015	0.0019
24	0.2592	0.5302	2757	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013	0.0015
25	0.2584	0.5290	2780	0.0007	0.0009	0.0011	0.0012	0.0015	0.0018	0.0018
Ave.	0.2588	0.5296	2768	0.0007	0.0008	0.0009	0.0011	0.0013	0.0015	0.0017
Med.	0.2591	0.5298	2762	0.0007	0.0008	0.0009	0.0010	0.0013	0.0015	0.0017
st dev	0.0009	0.0014	23.4396	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001
Min.	0.2567	0.5266	2721	0.0004	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014
Max.	0.2605	0.5326	2812	0.0010	0.0011	0.0013	0.0014	0.0016	0.0018	0.0019



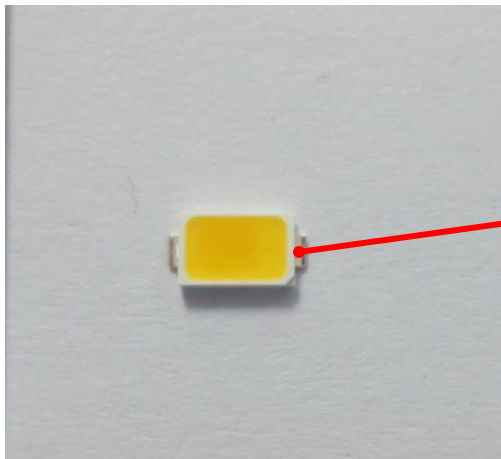
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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