



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 1st Road, Huadong Town, Huadu District, Guangzhou, China

Model:HL-EMC-3535DW-2-S1-HR3

Report Type: 6000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Daniel Duan	<i>Daniel Duan</i>	
Report Number:	RSZ130118507-10-M1		
Test Date:	2013-01-26 to 2013-11-06		
Report Date:	2015-03-04		
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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).

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: HL-EMC-3535DW-2-S1-HR3
 Part Name: /
 Part Type: LED Package
 Nominal CCT: 2700K

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
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987CJ 7321114	300VA	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	#1	N/A	2013-03-25	2014-03-25
Digital CC&CV DC Power Supply	everfine	WY5015	11090007	(50/15A)	2013-03-25	2014-03-25

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 °C,300mA

Part Number:	HL-EMC-3535DW-2-S1-HR3
Number of Units:	25
Actual Case Temperature(T_s):	$T_s=55.8\text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A=55.2\text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F=300\text{mA}$
Measurement Current:	$I_F=300\text{mA}$

Data Set 2: 85 °C, 300mA

Part Number:	HL-EMC-3535DW-2-S1-HR3
Number of Units:	25
Actual Case Temperature(T_s):	$T_s=85.7\text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A=85.1\text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F=300\text{mA}$
Measurement Current:	$I_F=300\text{mA}$

1.9 Report Revision

Report Number	Report Date	Contents
RSZ130118507-10	2013-11-12	Original report.
RSZ130118507-10-M1	2015-03-04	Update the logo of accredited body

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 300mA
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:	96.43%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0015
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 85 °C, 300mA
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:	96.03%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime	>36,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 300mA (Lumen Maintenance)

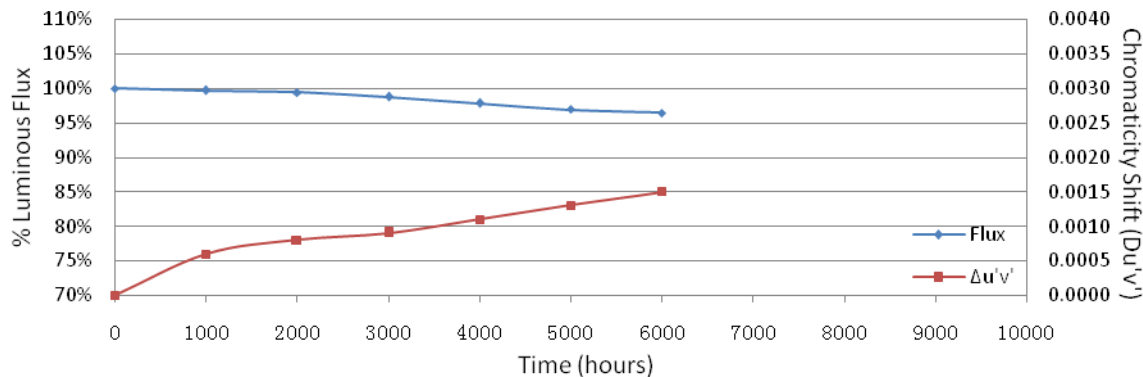
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs
1	3.136	89.17	99.71	99.47	98.77	97.94	96.97	96.28
2	3.125	87.61	99.67	99.33	98.70	97.87	97.16	96.30
3	3.155	86.74	99.22	99.40	98.82	97.99	97.07	96.47
4	3.155	88.57	99.72	99.49	98.75	97.66	96.71	96.34
5	3.152	85.51	99.81	99.59	98.68	97.64	96.89	96.43
6	3.163	86.21	99.70	99.54	98.74	97.85	96.84	96.47
7	3.154	84.90	99.68	99.49	98.80	97.68	96.90	96.45
8	3.144	86.79	99.72	99.41	98.66	97.82	96.94	96.50
9	3.134	84.85	99.65	99.30	98.68	97.62	96.74	96.36
10	3.147	87.83	99.75	99.52	98.68	97.68	96.86	96.29
11	3.148	87.98	99.72	99.41	98.60	97.62	97.04	96.37
12	3.151	87.36	99.75	99.45	98.70	97.83	97.10	96.45
13	3.147	86.80	99.75	99.46	98.73	97.95	97.14	96.58
14	3.150	87.19	99.68	99.35	98.59	97.67	96.80	96.41
15	3.135	84.95	99.65	99.32	98.92	98.01	97.14	96.37
16	3.161	85.92	99.77	99.56	98.85	98.07	97.16	96.59
17	3.151	87.14	99.68	99.48	98.69	97.69	96.88	96.42
18	3.127	86.43	99.70	99.50	98.62	97.73	96.81	96.30
19	3.115	87.21	99.67	99.37	98.83	98.09	96.94	96.67
20	3.123	85.21	99.74	99.42	98.63	97.66	96.70	96.46
21	3.124	86.16	99.68	99.45	98.71	97.98	96.88	96.45
22	3.121	87.37	99.69	99.42	98.84	97.86	96.89	96.36
23	3.119	85.88	99.69	99.42	98.74	97.66	96.77	96.41
24	3.107	83.73	99.65	99.40	98.85	97.74	96.87	96.52
25	3.127	88.09	99.72	99.57	98.67	97.78	96.98	96.54
Ave.	3.139	86.62	99.69	99.45	98.73	97.80	96.93	96.43
Med.	3.144	86.79	99.70	99.45	98.71	97.78	96.89	96.43
st dev	0.0157	1.3038	0.1057	0.0784	0.0867	0.1490	0.1414	0.1001
Min.	3.107	83.73	99.22	99.30	98.59	97.62	96.70	96.28
Max.	3.163	89.17	99.81	99.59	98.92	98.09	97.16	96.67

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.220E-06
 β : 1.007
Calculated L₇₀: 50,000 hours
Reported L₇₀: >36,000 hours

3.2 Data Set 1, 55 °C, 300mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2592	0.5301	2758	0.0007	0.0008	0.0006	0.0007	0.0009	0.0013
2	0.2588	0.5321	2758	0.0003	0.0005	0.0004	0.0004	0.0005	0.0012
3	0.2566	0.5292	2816	0.0003	0.0005	0.0006	0.0008	0.0009	0.0013
4	0.2582	0.5306	2777	0.0004	0.0007	0.0009	0.0010	0.0013	0.0016
5	0.2580	0.5264	2799	0.0007	0.0016	0.0011	0.0012	0.0013	0.0015
6	0.2595	0.5292	2755	0.0009	0.0009	0.0011	0.0013	0.0015	0.0016
7	0.2610	0.5280	2729	0.0006	0.0010	0.0013	0.0015	0.0017	0.0018
8	0.2591	0.5311	2754	0.0006	0.0008	0.0008	0.0010	0.0014	0.0016
9	0.2589	0.5291	2768	0.0009	0.0011	0.0011	0.0012	0.0013	0.0015
10	0.2583	0.5298	2778	0.0006	0.0007	0.0005	0.0007	0.0011	0.0014
11	0.2581	0.5294	2784	0.0009	0.0009	0.0011	0.0012	0.0013	0.0016
12	0.2575	0.5292	2799	0.0008	0.0009	0.0011	0.0013	0.0014	0.0016
13	0.2576	0.5304	2789	0.0007	0.0008	0.0010	0.0013	0.0016	0.0018
14	0.2573	0.5302	2798	0.0011	0.0012	0.0012	0.0015	0.0017	0.0018
15	0.2602	0.5301	2737	0.0011	0.0011	0.0012	0.0014	0.0016	0.0018
16	0.2556	0.5294	2839	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012
17	0.2578	0.5317	2780	0.0003	0.0004	0.0006	0.0006	0.0008	0.0011
18	0.2561	0.5272	2837	0.0005	0.0007	0.0009	0.0011	0.0014	0.0017
19	0.2582	0.5290	2785	0.0007	0.0009	0.0012	0.0013	0.0014	0.0015
20	0.2580	0.5309	2779	0.0007	0.0008	0.0009	0.0011	0.0014	0.0017
21	0.2556	0.5281	2845	0.0008	0.0009	0.0011	0.0013	0.0016	0.0017
22	0.2567	0.5289	2816	0.0005	0.0009	0.0010	0.0011	0.0013	0.0015
23	0.2586	0.5275	2781	0.0006	0.0007	0.0011	0.0014	0.0015	0.0016
24	0.2599	0.5267	2758	0.0003	0.0008	0.0010	0.0012	0.0015	0.0017
25	0.2567	0.5299	2811	0.0002	0.0004	0.0006	0.0008	0.0012	0.0015
Ave.	0.2581	0.5294	2785	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015
Med.	0.2581	0.5294	2781	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016
st dev	0.0014	0.0015	30.5246	0.0002	0.0003	0.0002	0.0003	0.0003	0.0002
Min.	0.2556	0.5264	2729	0.0002	0.0004	0.0004	0.0004	0.0005	0.0011
Max.	0.2610	0.5321	2845	0.0011	0.0016	0.0013	0.0015	0.0017	0.0018



3.3 Data Set 2, 85 °C, 300mA (Lumen Maintenance)

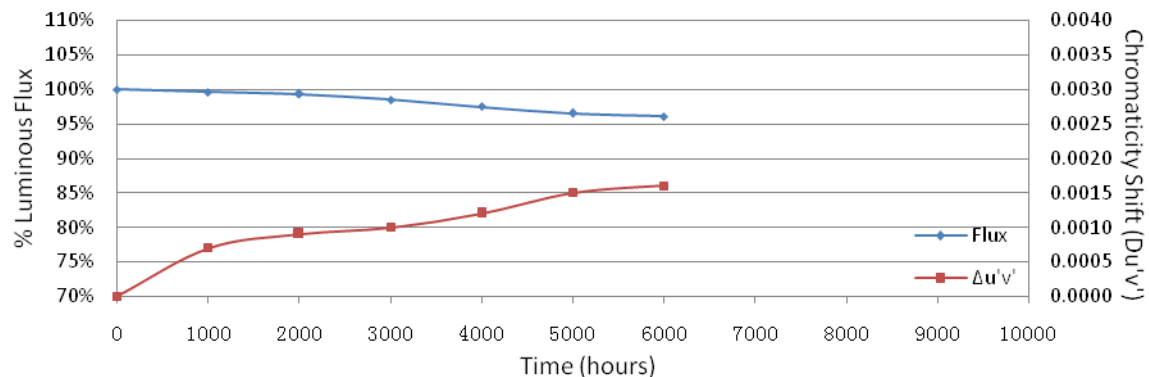
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.130	88.86	99.64	99.28	98.36	97.43	96.58	95.86
27	3.128	86.59	99.63	99.24	98.52	97.68	96.33	95.92
28	3.131	86.23	99.65	99.28	98.55	97.69	96.57	96.20
29	3.131	87.13	99.61	99.32	98.44	97.33	96.41	96.01
30	3.122	87.91	99.56	99.15	98.42	97.68	96.64	96.23
31	3.132	88.64	99.65	99.38	98.54	97.74	96.75	96.22
32	3.124	86.11	99.67	99.30	98.50	97.39	96.54	95.81
33	3.130	87.43	99.62	99.28	98.44	97.50	96.50	95.92
34	3.121	87.70	99.58	99.33	98.48	97.65	96.49	95.92
35	3.116	88.35	99.59	99.31	98.44	97.57	96.71	96.12
36	3.132	87.85	99.53	99.26	98.57	97.53	96.51	96.04
37	3.128	85.62	99.56	99.36	98.38	97.40	96.45	95.89
38	3.128	86.22	99.65	99.36	98.31	97.34	96.37	95.95
39	3.117	86.70	99.58	99.34	98.43	97.47	96.53	95.97
40	3.127	86.95	99.62	99.39	98.49	97.57	96.71	96.22
41	3.125	88.05	99.65	99.36	98.42	97.68	96.74	96.27
42	3.134	86.81	99.63	99.27	98.41	97.51	96.43	95.86
43	3.131	83.88	99.58	99.24	98.51	97.35	96.48	95.93
44	3.128	87.08	99.55	99.29	98.52	97.39	96.52	96.20
45	3.131	87.09	99.60	99.38	98.48	97.31	96.31	95.82
46	3.129	85.71	99.66	99.38	98.58	97.43	96.30	95.93
47	3.128	86.75	99.55	99.22	98.57	97.51	96.54	96.25
48	3.131	86.06	99.57	99.24	98.48	97.41	96.40	96.07
49	3.132	87.15	99.62	99.32	98.39	97.40	96.52	96.02
50	3.126	85.47	99.60	99.32	98.53	97.66	96.77	96.14
Ave.	3.128	86.89	99.61	99.30	98.47	97.51	96.52	96.03
Med.	3.128	86.95	99.61	99.31	98.48	97.50	96.52	96.01
st dev	0.0046	1.1171	0.0400	0.0604	0.0710	0.1335	0.1371	0.1495
Min.	3.116	83.88	99.53	99.15	98.31	97.31	96.30	95.81
Max.	3.134	88.86	99.67	99.39	98.58	97.74	96.77	96.27

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 7.943E-06
 β : 1.007
Calculated L₇₀: 46,000 hours
Reported L₇₀: >36,000 hours

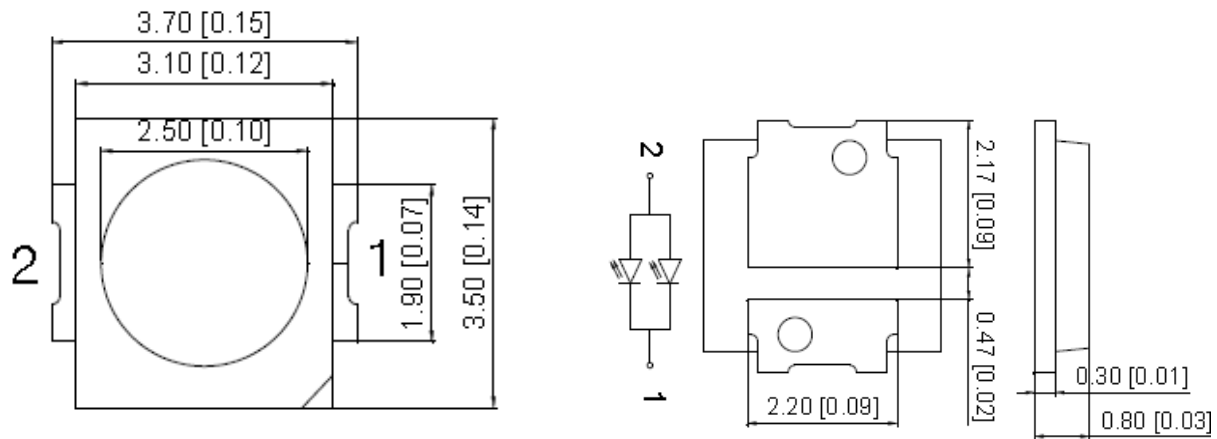
3.4 Data Set 2, 85 °C, 300mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2575	0.5307	2791	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012
27	0.2569	0.5268	2823	0.0004	0.0006	0.0008	0.0009	0.0014	0.0016
28	0.2598	0.5309	2742	0.0008	0.0011	0.0014	0.0016	0.0017	0.0018
29	0.2589	0.5281	2772	0.0006	0.0009	0.0012	0.0015	0.0016	0.0017
30	0.2579	0.5303	2784	0.0009	0.0011	0.0013	0.0015	0.0017	0.0018
31	0.2580	0.5306	2780	0.0009	0.0010	0.0013	0.0014	0.0016	0.0017
32	0.2595	0.5294	2754	0.0008	0.0009	0.0011	0.0014	0.0016	0.0018
33	0.2579	0.5315	2779	0.0007	0.0009	0.0012	0.0013	0.0014	0.0015
34	0.2571	0.5298	2804	0.0013	0.0014	0.0015	0.0017	0.0018	0.0020
35	0.2568	0.5287	2817	0.0008	0.0009	0.0008	0.0009	0.0016	0.0018
36	0.2576	0.5292	2795	0.0006	0.0009	0.0009	0.0012	0.0014	0.0015
37	0.2586	0.5323	2761	0.0008	0.0009	0.0009	0.0010	0.0011	0.0012
38	0.2591	0.5291	2765	0.0005	0.0007	0.0008	0.0011	0.0015	0.0017
39	0.2621	0.5328	2686	0.0004	0.0007	0.0008	0.0008	0.0009	0.0013
40	0.2582	0.5313	2773	0.0005	0.0007	0.0009	0.0013	0.0016	0.0018
41	0.2570	0.5305	2802	0.0005	0.0008	0.0010	0.0012	0.0013	0.0014
42	0.2600	0.5313	2737	0.0006	0.0008	0.0011	0.0013	0.0016	0.0017
43	0.2579	0.5300	2785	0.0006	0.0005	0.0009	0.0009	0.0013	0.0016
44	0.2580	0.5301	2784	0.0003	0.0004	0.0007	0.0006	0.0011	0.0014
45	0.2604	0.5316	2726	0.0008	0.0011	0.0011	0.0014	0.0016	0.0017
46	0.2564	0.5297	2819	0.0010	0.0011	0.0011	0.0012	0.0014	0.0015
47	0.2575	0.5306	2791	0.0010	0.0011	0.0013	0.0014	0.0017	0.0019
48	0.2584	0.5295	2778	0.0009	0.0010	0.0013	0.0016	0.0017	0.0018
49	0.2557	0.5283	2842	0.0006	0.0007	0.0009	0.0011	0.0014	0.0015
50	0.2618	0.5317	2697	0.0004	0.0005	0.0007	0.0009	0.0012	0.0018
Ave.	0.2584	0.5302	2775	0.0007	0.0009	0.0010	0.0012	0.0015	0.0016
Med.	0.2580	0.5303	2780	0.0006	0.0009	0.0010	0.0012	0.0015	0.0017
st dev	0.0016	0.0014	37.0643	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002
Min.	0.2557	0.5268	2686	0.0003	0.0004	0.0007	0.0006	0.0009	0.0012
Max.	0.2621	0.5328	2842	0.0013	0.0014	0.0015	0.0017	0.0018	0.0020



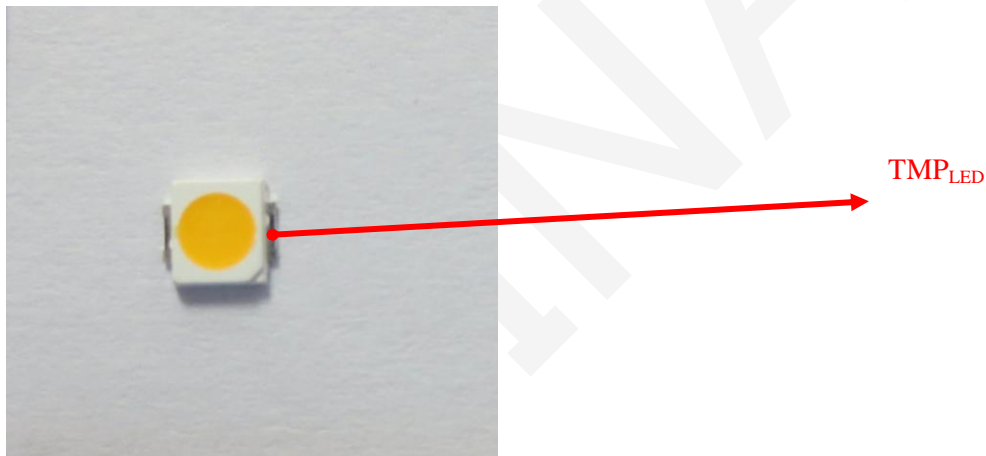
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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