



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Runlite Technology Co., Ltd

Building A15, Tantou the 4th Industrial Estate, SongGang Town, BaoAn District, ShenZhen, China.

Model:T2835

Report Type: 6000 Hours Test Report of 55 °C 9000 Hours Test Report of 105 °C	Product Type: LED Package
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Report Number:	RSZ150925508-10-9000
Test Date:	2015-09-30 to 2017-02-24
Report Date:	2017-03-23
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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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1 - General Information

1.1 Description of LED Light Sources

Devices tested

Part Number: T2835
 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 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	1008002	15V/2000mA	2017-03-03	2018-03-02
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-08
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20005	25 °C~130 °C	2016-09-01	2017-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	(50V/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50V/15A)	2017-03-03	2018-03-02

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 55 °C and Ts 105 °C were received at 2015-09-25 and tested during 2015-09-30 to 2017-02-24. The samples were numbered from 1 to 25 and 26 to 50.

Data Set 1: 55 °C, 100mA

Part Number:	T2835
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 54.2 \text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 51.5 \text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F = 100\text{mA}$
Measurement Current:	$I_F = 100\text{mA}$

Data Set 2: 105 °C, 100mA

Part Number:	T2835
Number of Units:	25
Actual Case Temperature(T_S):	$T_S = 104.5 \text{ }^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 103.1 \text{ }^\circ\text{C}$
Life Test Drive Current:	$I_F = 100\text{mA}$
Measurement Current:	$I_F = 100\text{mA}$

2 - Summary of Test Result

Data Set:	Data Set 1, 55 °C, 100mA
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:	98.70%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0016
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 105 °C, 100mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h, 7000h,8000h,9000h
Average. Lumen Maintenance at 6000 hours:	97.34%
Average. Lumen Maintenance at 9000 hours:	96.36%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0015
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0026
Reported TM-21 L ₇₀ Lifetime:	>54,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 100mA (Lumen Maintenance)

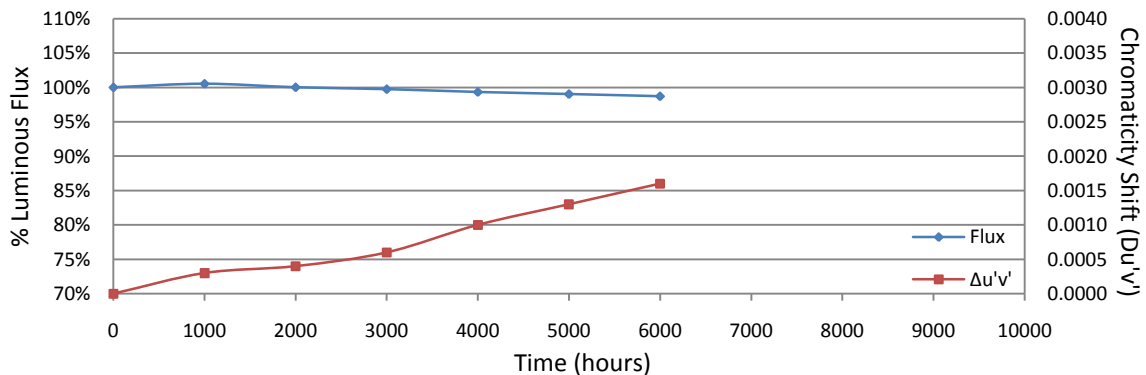
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	9.043	128.4	100.23	99.92	99.38	99.14	98.83	98.44
2	9.098	126.7	100.47	99.84	99.68	99.13	98.74	98.66
3	9.123	127.9	100.08	99.37	99.22	98.83	98.59	98.44
4	9.117	127.8	100.47	99.92	99.45	99.14	98.59	98.44
5	9.108	120.4	100.42	99.83	99.67	99.34	99.25	99.09
6	9.063	125.9	100.95	100.79	100.56	100.32	99.92	99.60
7	9.035	127.9	100.55	99.92	99.69	99.30	99.14	98.91
8	9.034	126.7	100.08	99.76	99.61	99.13	98.97	98.50
9	9.028	127.8	100.23	100.16	100.08	99.53	99.30	98.75
10	9.045	127.2	100.79	100.24	100.08	99.53	99.37	99.29
11	9.029	127.2	100.16	99.76	99.45	99.06	98.43	98.35
12	9.035	129.3	100.54	99.85	99.61	99.23	99.07	98.53
13	9.322	128.1	100.70	100.47	100.16	99.53	99.14	98.99
14	9.064	125.9	100.95	99.52	99.36	98.81	98.73	98.33
15	9.080	128.0	100.70	100.39	99.92	99.61	99.22	98.91
16	9.021	126.4	100.16	100.08	99.60	99.13	98.97	98.50
17	9.003	126.0	100.40	100.32	100.08	99.44	99.29	98.81
18	9.030	125.8	100.79	100.16	99.92	99.60	99.13	98.73
19	9.038	125.1	100.88	99.92	99.76	99.44	98.96	98.56
20	9.010	125.2	100.56	99.84	99.60	99.04	98.40	98.24
21	9.089	126.1	100.79	99.92	99.52	99.29	98.89	98.33
22	9.029	127.5	100.55	99.84	99.61	99.14	98.82	98.43
23	9.020	126.1	100.71	100.56	100.08	99.76	99.52	99.13
24	9.132	126.5	100.63	99.84	99.45	99.13	98.89	98.66
25	9.036	124.8	100.16	100.08	99.84	99.36	99.28	98.96
Ave.	9.065	126.6	100.52	100.01	99.73	99.32	99.02	98.70
Med.	9.038	126.7	100.55	99.92	99.67	99.29	98.97	98.66
st dev	0.0651	1.7196	0.2755	0.3188	0.3109	0.3176	0.3486	0.3390
Min.	9.003	120.4	100.08	99.37	99.22	98.81	98.40	98.24
Max.	9.322	129.3	100.95	100.79	100.56	100.32	99.92	99.60

TM-21 Projection:

Test Duration: 6,000 hours
Failures Observed: 0
 α : 3.581E-06
 β : 1.008
Reported L₇₀: >36,000 hours

3.2 Data Set 1, 55 °C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2620	0.5288	2704	0.0002	0.0001	0.0003	0.0005	0.0009	0.0011
2	0.2637	0.5278	2675	0.0002	0.0004	0.0006	0.0012	0.0016	0.0018
3	0.2631	0.5289	2682	0.0004	0.0005	0.0007	0.0016	0.0017	0.0018
4	0.2626	0.5265	2702	0.0003	0.0006	0.0007	0.0013	0.0015	0.0011
5	0.2605	0.5274	2741	0.0002	0.0001	0.0004	0.0012	0.0016	0.0018
6	0.2647	0.5295	2646	0.0002	0.0001	0.0004	0.0009	0.0014	0.0014
7	0.2638	0.5265	2677	0.0002	0.0001	0.0004	0.0009	0.0013	0.0015
8	0.2645	0.5290	2653	0.0002	0.0001	0.0005	0.0011	0.0014	0.0018
9	0.2632	0.5288	2679	0.0002	0.0001	0.0004	0.0011	0.0014	0.0018
10	0.2626	0.5268	2700	0.0002	0.0004	0.0004	0.0010	0.0014	0.0017
11	0.2617	0.5284	2712	0.0002	0.0004	0.0005	0.0008	0.0013	0.0017
12	0.2629	0.5297	2683	0.0002	0.0005	0.0005	0.0009	0.0013	0.0018
13	0.2635	0.5300	2669	0.0001	0.0001	0.0004	0.0009	0.0011	0.0015
14	0.2631	0.5279	2686	0.0002	0.0009	0.0012	0.0015	0.0015	0.0017
15	0.2624	0.5268	2704	0.0002	0.0001	0.0005	0.0008	0.0012	0.0015
16	0.2625	0.5260	2707	0.0002	0.0006	0.0005	0.0009	0.0012	0.0014
17	0.2632	0.5282	2683	0.0002	0.0003	0.0006	0.0009	0.0011	0.0015
18	0.2644	0.5291	2654	0.0001	0.0006	0.0009	0.0013	0.0014	0.0017
19	0.2620	0.5272	2710	0.0015	0.0014	0.0011	0.0006	0.0008	0.0013
20	0.2631	0.5281	2684	0.0003	0.0003	0.0008	0.0008	0.0010	0.0013
21	0.2620	0.5271	2712	0.0002	0.0003	0.0006	0.0009	0.0013	0.0017
22	0.2631	0.5288	2681	0.0002	0.0004	0.0004	0.0010	0.0013	0.0017
23	0.2624	0.5280	2700	0.0001	0.0005	0.0007	0.0007	0.0010	0.0014
24	0.2634	0.5292	2674	0.0003	0.0005	0.0009	0.0006	0.0010	0.0014
25	0.2632	0.5297	2676	0.0003	0.0005	0.0008	0.0009	0.0012	0.0016
Ave.	0.2629	0.5282	2688	0.0003	0.0004	0.0006	0.0010	0.0013	0.0016
Med.	0.2631	0.5282	2683	0.0002	0.0004	0.0005	0.0009	0.0013	0.0016
st dev	0.0009	0.0011	21.5760	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002
Min.	0.2605	0.5260	2646	0.0001	0.0001	0.0003	0.0005	0.0008	0.0011
Max.	0.2647	0.5300	2741	0.0015	0.0014	0.0012	0.0016	0.0017	0.0018



3.5 Data Set 2, 105 °C, 100mA (Lumen Maintenance)

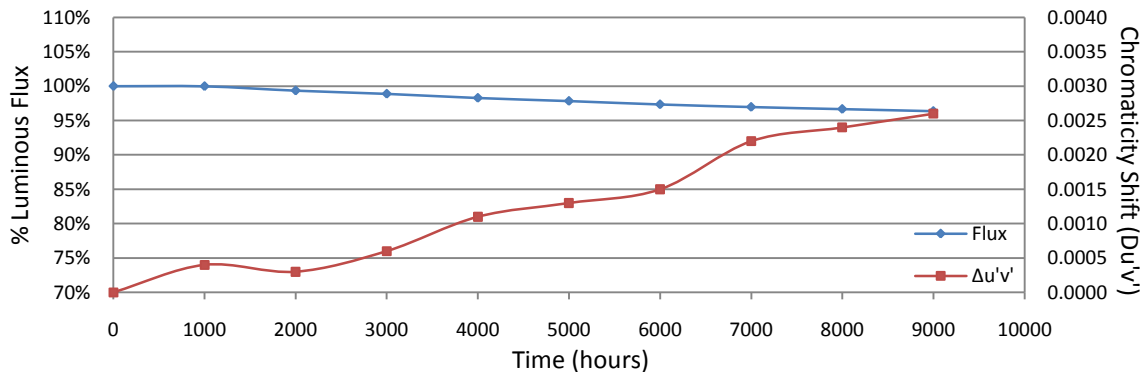
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	9.123	125.7	99.52	99.28	98.73	98.09	97.69	97.30	96.82	96.58	96.18
27	9.045	126.3	99.92	99.21	98.81	98.34	97.86	97.47	97.15	96.75	96.60
28	9.127	125.4	100.48	99.44	99.04	98.41	98.09	97.61	97.13	96.73	96.41
29	9.048	126.5	100.32	99.60	99.05	98.42	97.87	97.39	97.00	96.68	96.28
30	9.124	123.4	100.16	99.27	98.54	97.89	97.57	97.00	96.52	96.03	95.71
31	9.112	128.2	99.38	99.14	98.67	97.97	97.43	97.19	96.96	96.65	96.57
32	9.104	126.3	100.32	99.45	99.05	98.42	98.18	97.62	97.39	97.31	96.91
33	9.123	125.0	99.60	99.28	98.88	98.24	97.76	97.36	96.96	96.72	96.48
34	9.112	128.0	100.63	99.22	98.91	98.28	97.81	97.34	96.88	96.56	96.25
35	9.028	127.4	100.63	99.45	98.90	98.35	97.80	97.17	96.62	96.31	95.84
36	9.026	126.6	100.08	99.68	99.13	98.74	98.10	97.55	97.31	97.08	96.68
37	9.043	128.0	99.84	99.14	98.75	98.20	97.66	97.19	96.88	96.64	96.48
38	9.040	127.3	99.61	99.45	99.21	98.59	97.96	97.17	96.62	96.31	95.99
39	9.029	130.4	99.46	99.16	98.62	98.16	97.55	97.01	96.55	96.32	95.94
40	9.090	126.7	99.68	99.21	98.97	98.26	97.71	97.16	96.92	96.69	96.45
41	9.041	129.0	100.16	99.38	98.99	98.53	97.98	97.52	97.13	96.82	96.59
42	9.020	126.0	100.16	99.84	99.29	98.57	98.10	97.54	97.22	96.98	96.67
43	9.110	129.2	100.23	99.85	99.38	98.61	98.45	98.07	97.68	97.60	97.29
44	9.113	128.5	100.31	99.22	98.68	97.90	97.51	97.12	96.73	96.42	96.19
45	9.028	124.6	100.40	99.04	98.72	97.99	97.67	97.03	96.55	96.15	95.91
46	9.447	128.0	100.31	99.53	98.98	98.36	97.97	97.34	97.03	96.64	96.25
47	9.107	128.5	99.46	99.38	98.91	98.21	97.82	97.43	97.12	96.89	96.65
48	9.188	129.7	99.46	99.07	98.46	97.92	97.53	97.15	96.76	96.38	96.22
49	9.099	125.0	100.16	99.36	98.72	98.40	98.08	97.68	97.36	97.04	96.80
50	9.207	126.7	99.29	98.97	98.50	98.11	97.63	97.08	96.61	96.13	95.66
Ave.	9.101	127.1	99.98	99.35	98.88	98.28	97.83	97.34	96.96	96.66	96.36
Med.	9.104	126.7	100.16	99.28	98.90	98.28	97.81	97.34	96.96	96.65	96.41
st dev	0.0880	1.7120	0.4166	0.2294	0.2411	0.2357	0.2483	0.2539	0.3023	0.3697	0.3906
Min.	9.020	123.4	99.29	98.97	98.46	97.89	97.43	97.00	96.52	96.03	95.66
Max.	9.447	130.4	100.63	99.85	99.38	98.74	98.45	98.07	97.68	97.60	97.29

TM-21 Projection:

Test Duration: 9,000 hours
Failures Observed: 0
α: 3.962E-06
β: 0.998
Reported L₇₀: >54,000 hours

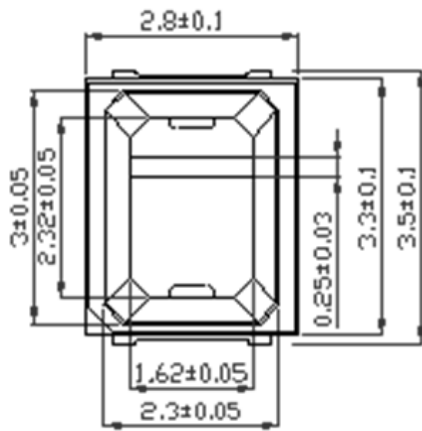
3.6 Data Set 2, 105 °C, 100mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
26	0.2632	0.5278	2685	0.0002	0.0003	0.0005	0.0012	0.0015	0.0021	0.0029	0.0034	0.0038
27	0.2626	0.5288	2693	0.0002	0.0003	0.0007	0.0012	0.0014	0.0018	0.0021	0.0024	0.0024
28	0.2624	0.5291	2696	0.0002	0.0002	0.0005	0.0011	0.0013	0.0018	0.0022	0.0019	0.0024
29	0.2637	0.5295	2667	0.0003	0.0001	0.0005	0.0009	0.0013	0.0018	0.0024	0.0023	0.0027
30	0.2629	0.5289	2685	0.0002	0.0001	0.0004	0.0008	0.0011	0.0015	0.0024	0.0030	0.0036
31	0.2633	0.5293	2676	0.0002	0.0000	0.0004	0.0011	0.0013	0.0016	0.0018	0.0023	0.0028
32	0.2644	0.5304	2650	0.0003	0.0001	0.0004	0.0011	0.0013	0.0014	0.0020	0.0021	0.0017
33	0.2625	0.5285	2696	0.0002	0.0002	0.0004	0.0012	0.0013	0.0013	0.0021	0.0017	0.0021
34	0.2642	0.5288	2660	0.0003	0.0002	0.0004	0.0013	0.0014	0.0015	0.0025	0.0029	0.0031
35	0.2642	0.5292	2658	0.0004	0.0004	0.0005	0.0014	0.0016	0.0018	0.0025	0.0030	0.0037
36	0.2634	0.5295	2673	0.0004	0.0003	0.0006	0.0014	0.0016	0.0019	0.0021	0.0026	0.0033
37	0.2642	0.5280	2662	0.0004	0.0002	0.0002	0.0009	0.0013	0.0013	0.0016	0.0014	0.0018
38	0.2623	0.5273	2705	0.0002	0.0001	0.0003	0.0010	0.0013	0.0012	0.0020	0.0017	0.0019
39	0.2606	0.5275	2739	0.0002	0.0002	0.0003	0.0009	0.0012	0.0014	0.0021	0.0021	0.0020
40	0.2652	0.5301	2634	0.0004	0.0002	0.0002	0.0008	0.0010	0.0016	0.0018	0.0019	0.0014
41	0.2627	0.5271	2698	0.0003	0.0002	0.0006	0.0009	0.0012	0.0013	0.0018	0.0023	0.0018
42	0.2640	0.5286	2665	0.0003	0.0001	0.0008	0.0009	0.0011	0.0015	0.0018	0.0021	0.0021
43	0.2643	0.5298	2655	0.0003	0.0001	0.0005	0.0008	0.0010	0.0015	0.0023	0.0020	0.0016
44	0.2618	0.5261	2720	0.0003	0.0001	0.0004	0.0007	0.0011	0.0011	0.0023	0.0026	0.0022
45	0.2627	0.5287	2691	0.0004	0.0004	0.0008	0.0011	0.0012	0.0014	0.0025	0.0030	0.0029
46	0.2634	0.5280	2678	0.0003	0.0004	0.0009	0.0011	0.0013	0.0016	0.0024	0.0031	0.0035
47	0.2610	0.5280	2728	0.0004	0.0002	0.0007	0.0010	0.0013	0.0015	0.0024	0.0030	0.0036
48	0.2638	0.5288	2669	0.0004	0.0001	0.0006	0.0009	0.0012	0.0015	0.0024	0.0025	0.0030
49	0.2638	0.5293	2665	0.0009	0.0011	0.0016	0.0018	0.0015	0.0014	0.0022	0.0024	0.0025
50	0.2639	0.5273	2672	0.0013	0.0019	0.0017	0.0019	0.0020	0.0020	0.0026	0.0025	0.0027
Ave.	0.2632	0.5286	2681	0.0004	0.0003	0.0006	0.0011	0.0013	0.0015	0.0022	0.0024	0.0026
Med.	0.2634	0.5288	2676	0.0003	0.0002	0.0005	0.0011	0.0013	0.0015	0.0022	0.0024	0.0025
st dev	0.0011	0.0010	24.9098	0.0002	0.0004	0.0004	0.0003	0.0002	0.0003	0.0003	0.0005	0.0007
Min.	0.2606	0.5261	2634	0.0002	0.0000	0.0002	0.0007	0.0010	0.0011	0.0016	0.0014	0.0014
Max.	0.2652	0.5304	2739	0.0013	0.0019	0.0017	0.0019	0.0020	0.0021	0.0029	0.0034	0.0038



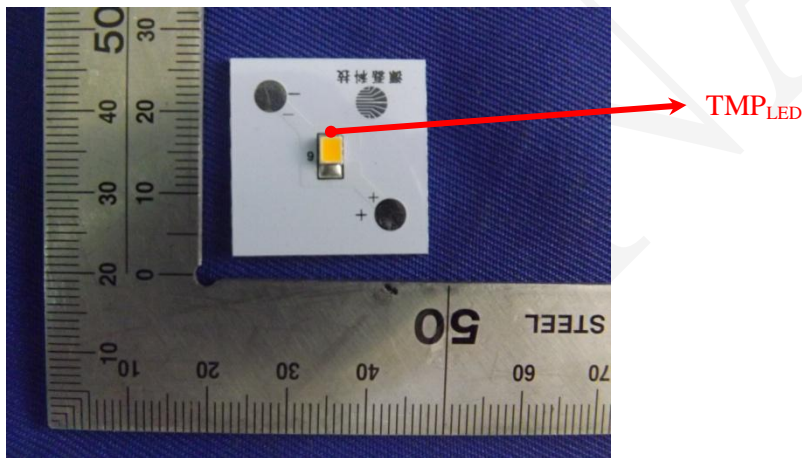
Attachment A – EUT Photo

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



All dimensions are in millimeter

A.2 EUT Photo



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