



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Fujian Lightning Optoelectronic Co.,Ltd.Shenzhen Branch

5F, Building B, second phase of Chuangjian Industrial Area, YingRenShi community, Shiyuan Street,
Baonan District,

Model: T34

Report Type: 3000 Hours Test Report	Product Type: LED Package
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Report Number: RSZ150323501-10	
Test Date: 2015-03-25 to 2015-07-28	
Report Date: 2015-08-10	
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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: T34
 Part Name: 3020
 Part Type: LED Package
 Nominal CCT: 3000K

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	Manufacture	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	2015-03-25	2016-03-25
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2015-03-05	2016-03-05
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2015-03-25	2016-03-25
Standard Light Source	EVERFINE	D062	1011093	N/A	2015-08-05	2016-08-05
Precision digital stabilized DC power supply	EVERFINE	WY605	G115987C J7321114	300VA	2015-03-05	2016-03-05
Multilayer aging machine	BACL	B2-270	20022	25°C~110°C	2014-10-27	2015-10-27
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50V/15A)	2015-03-05	2016-03-05
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2015-07-08	2016-07-07

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50V/15A)	2015-7-8	2016-7-7

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 66Pcs;

Each Ts test condition 22Pcs

The samples tested at Ts 55 °C, Ts 85 °C and Ts 105 °C were received at 2015-03-23 and tested during 2015-03-25 to 2015-07-28. The samples were numbered from 1 to 22, 23 to 44 and 45 to 66

Data Set 1: 55 °C, 100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature(T _S):	T _S =54.4 °C
Actual Ambient Temperature(T _A):	T _A =51.3 °C
Life Test Drive Current:	I _F = 100mA
Measurement Current:	I _F = 100mA

Data Set 2: 85 °C,100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature(T _S):	T _S =84.3 °C
Actual Ambient Temperature(T _A):	T _A =82.2 °C
Life Test Drive Current:	I _F =100mA
Measurement Current:	I _F = 100mA

Data Set 3: 105 °C, 100mA

Part Number:	T34
Number of Units:	22
Actual Case Temperature(T _S):	T _S =104.3 °C
Actual Ambient Temperature(T _A):	T _A =103.1 °C
Life Test Drive Current:	I _F = 100mA
Measurement Current:	I _F = 100mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 100mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h
Average. Lumen Maintenance at 3000 hours:	98.43%
Average Chromaticity Shift at 3000 hours ($\Delta u'v'$):	0.0008
Reported TM-21 L ₇₀ Lifetime:	>TBD hours

Data Set:	Data Set 2, 85 °C, 100mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h
Average. Lumen Maintenance at 3000 hours:	97.98%
Average Chromaticity Shift at 3000 hours($\Delta u'v'$):	0.0010
Reported TM-21 L ₇₀ Lifetime:	>TBD hours

Data Set:	Data Set 3, 105 °C, 100mA
Number of Units:	22
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h
Average. Lumen Maintenance at 3000 hours:	97.40%
Average Chromaticity Shift at 3000 hours($\Delta u'v'$):	0.0015
Reported TM-21 L ₇₀ Lifetime:	>TBD hours

3 - Test Data

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

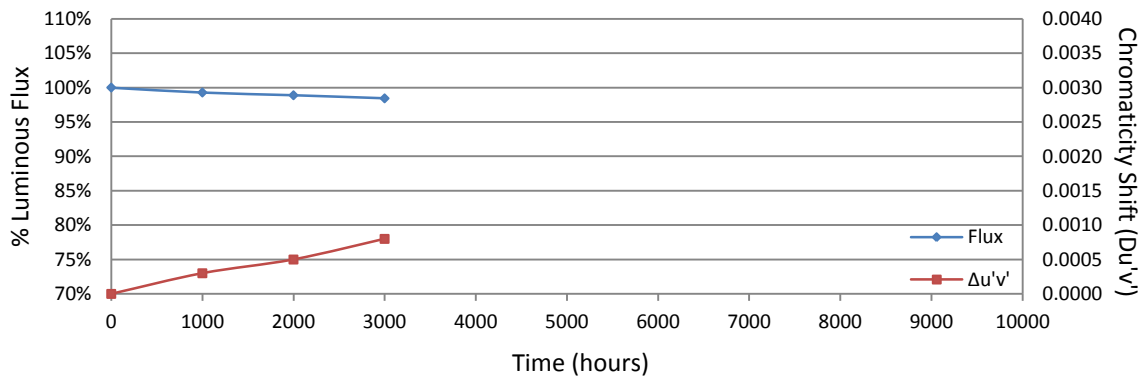
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	6.521	82.97	99.52	99.00	98.53	TBD	TBD	TBD
2	6.509	82.25	98.78	98.67	98.27	TBD	TBD	TBD
3	6.533	82.88	99.29	98.97	98.54	TBD	TBD	TBD
4	6.525	82.96	99.10	98.75	98.54	TBD	TBD	TBD
5	6.526	83.29	99.53	99.15	98.72	TBD	TBD	TBD
6	6.514	82.51	100.12	99.62	99.24	TBD	TBD	TBD
7	6.539	83.35	99.60	99.26	98.97	TBD	TBD	TBD
8	6.523	82.46	99.33	98.97	98.54	TBD	TBD	TBD
9	6.546	84.07	99.52	99.00	98.31	TBD	TBD	TBD
10	6.511	82.70	99.24	98.92	98.74	TBD	TBD	TBD
11	6.498	82.09	99.32	98.77	98.57	TBD	TBD	TBD
12	6.529	83.08	99.17	98.70	98.10	TBD	TBD	TBD
13	6.533	82.85	99.44	99.01	98.25	TBD	TBD	TBD
14	6.506	82.44	99.27	98.88	97.45	TBD	TBD	TBD
15	6.508	82.00	99.41	98.85	98.56	TBD	TBD	TBD
16	6.525	82.22	99.14	98.67	98.36	TBD	TBD	TBD
17	6.533	83.13	99.10	98.75	98.28	TBD	TBD	TBD
18	6.523	82.73	99.03	98.59	98.30	TBD	TBD	TBD
19	6.515	83.48	99.37	98.97	98.48	TBD	TBD	TBD
20	6.528	82.55	98.97	98.49	97.86	TBD	TBD	TBD
21	6.513	81.89	99.04	98.74	98.42	TBD	TBD	TBD
22	6.493	83.69	98.92	98.53	98.37	TBD	TBD	TBD
Ave.	6.521	82.80	99.28	98.88	98.43	TBD	TBD	TBD
Med.	6.523	82.79	99.28	98.87	98.45	TBD	TBD	TBD
st dev	0.0132	0.5639	0.2878	0.2570	0.3600	TBD	TBD	TBD
Min.	6.493	81.89	98.78	98.49	97.45	TBD	TBD	TBD
Max.	6.546	84.07	100.12	99.62	99.24	TBD	TBD	TBD

TM-21 Projection:

Test Duration: 3000 hours
Failures Observed: 0
α: TBD
β: TBD
Calculated L₇₀: TBD hours
Reported L₇₀: TBD hours

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

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2485	0.5241	3035	0.0005	0.0008	0.0008	TBD	TBD	TBD
2	0.2478	0.5236	3054	0.0002	0.0002	0.0003	TBD	TBD	TBD
3	0.2472	0.5236	3070	0.0004	0.0005	0.0006	TBD	TBD	TBD
4	0.2466	0.5237	3083	0.0003	0.0004	0.0011	TBD	TBD	TBD
5	0.2482	0.5250	3036	0.0004	0.0004	0.0015	TBD	TBD	TBD
6	0.2473	0.5230	3071	0.0002	0.0003	0.0012	TBD	TBD	TBD
7	0.2487	0.5251	3022	0.0003	0.0005	0.0011	TBD	TBD	TBD
8	0.2473	0.5245	3061	0.0003	0.0004	0.0008	TBD	TBD	TBD
9	0.2475	0.5259	3046	0.0002	0.0003	0.0009	TBD	TBD	TBD
10	0.2480	0.5253	3039	0.0002	0.0004	0.0008	TBD	TBD	TBD
11	0.2483	0.5244	3037	0.0002	0.0004	0.0008	TBD	TBD	TBD
12	0.2493	0.5240	3015	0.0002	0.0005	0.0008	TBD	TBD	TBD
13	0.2485	0.5246	3030	0.0002	0.0005	0.0008	TBD	TBD	TBD
14	0.2468	0.5230	3084	0.0002	0.0004	0.0011	TBD	TBD	TBD
15	0.2472	0.5241	3066	0.0002	0.0005	0.0008	TBD	TBD	TBD
16	0.2479	0.5249	3043	0.0002	0.0004	0.0005	TBD	TBD	TBD
17	0.2486	0.5243	3031	0.0003	0.0005	0.0009	TBD	TBD	TBD
18	0.2488	0.5251	3021	0.0004	0.0005	0.0004	TBD	TBD	TBD
19	0.2472	0.5247	3062	0.0003	0.0004	0.0004	TBD	TBD	TBD
20	0.2480	0.5236	3049	0.0004	0.0006	0.0007	TBD	TBD	TBD
21	0.2474	0.5236	3065	0.0005	0.0007	0.0009	TBD	TBD	TBD
22	0.2495	0.5245	3007	0.0005	0.0007	0.0007	TBD	TBD	TBD
Ave.	0.2479	0.5243	3047	0.0003	0.0005	0.0008	TBD	TBD	TBD
Med.	0.2480	0.5244	3045	0.0003	0.0005	0.0008	TBD	TBD	TBD
st dev	0.0008	0.0008	21.6496	0.0001	0.0001	0.0003	TBD	TBD	TBD
Min.	0.2466	0.5230	3007	0.0002	0.0002	0.0003	TBD	TBD	TBD
Max.	0.2495	0.5259	3084	0.0005	0.0008	0.0015	TBD	TBD	TBD



3.3 Data Set 2, 85 °C, 100 mA (Lumen Maintenance)

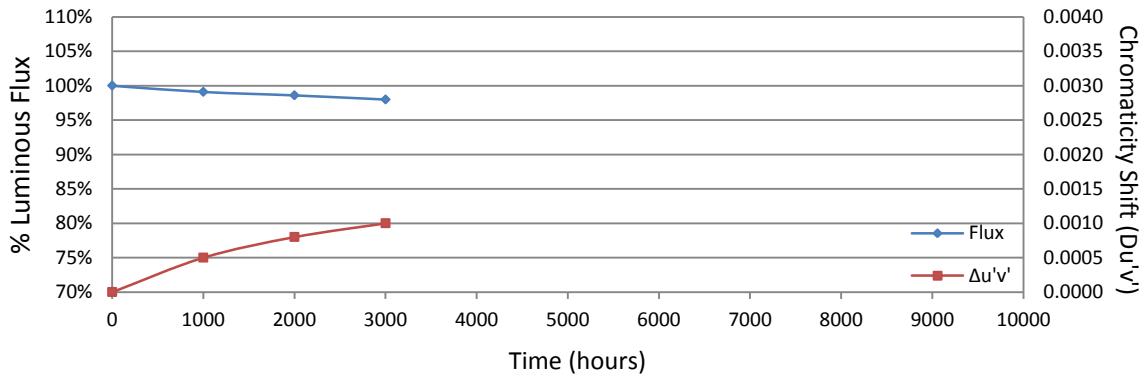
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	6.521	83.56	99.57	99.09	98.55	TBD	TBD	TBD
24	6.539	81.23	99.22	98.77	98.24	TBD	TBD	TBD
25	6.519	82.33	98.81	98.29	97.64	TBD	TBD	TBD
26	6.515	82.21	98.71	98.15	97.57	TBD	TBD	TBD
27	6.497	82.13	98.53	97.94	97.20	TBD	TBD	TBD
28	6.582	84.21	99.06	98.47	97.87	TBD	TBD	TBD
29	6.530	83.15	99.10	98.56	98.26	TBD	TBD	TBD
30	6.527	83.43	98.53	97.91	97.39	TBD	TBD	TBD
31	6.525	82.70	98.86	98.37	97.47	TBD	TBD	TBD
32	6.529	83.80	98.93	98.39	97.58	TBD	TBD	TBD
33	6.511	81.82	99.51	98.91	98.50	TBD	TBD	TBD
34	6.509	82.05	98.83	98.20	97.84	TBD	TBD	TBD
35	6.525	82.63	99.36	98.86	98.38	TBD	TBD	TBD
36	6.533	83.36	98.97	98.42	97.80	TBD	TBD	TBD
37	6.527	83.92	99.42	99.18	98.55	TBD	TBD	TBD
38	6.521	83.69	99.37	99.01	98.94	TBD	TBD	TBD
39	6.513	82.62	99.32	98.97	98.70	TBD	TBD	TBD
40	6.513	82.29	99.42	99.00	98.41	TBD	TBD	TBD
41	6.529	83.54	98.70	98.20	97.63	TBD	TBD	TBD
42	6.502	82.20	98.88	98.31	97.07	TBD	TBD	TBD
43	6.519	82.75	99.50	99.09	98.32	TBD	TBD	TBD
44	6.520	83.06	99.47	98.95	97.57	TBD	TBD	TBD
Ave.	6.523	82.85	99.09	98.59	97.98	TBD	TBD	TBD
Med.	6.521	82.73	99.08	98.51	97.86	TBD	TBD	TBD
st dev	0.0166	0.7779	0.3364	0.4001	0.5257	TBD	TBD	TBD
Min.	6.497	81.23	98.53	97.91	97.07	TBD	TBD	TBD
Max.	6.582	84.21	99.57	99.18	98.94	TBD	TBD	TBD

TM-21 Projection:

Test Duration: 3000 hours
Failures Observed: 0
α: TBD
β: TBD
Calculated L₇₀: TBD hours
Reported L₇₀: TBD hours

3.4 Data Set 2, 85 °C, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
23	0.2482	0.5232	3046	0.0002	0.0002	0.0002	TBD	TBD	TBD
24	0.2475	0.5231	3065	0.0003	0.0005	0.0004	TBD	TBD	TBD
25	0.2475	0.5240	3059	0.0004	0.0006	0.0004	TBD	TBD	TBD
26	0.2482	0.5233	3046	0.0004	0.0006	0.0006	TBD	TBD	TBD
27	0.2479	0.5237	3051	0.0005	0.0009	0.0007	TBD	TBD	TBD
28	0.2480	0.5253	3039	0.0004	0.0007	0.0009	TBD	TBD	TBD
29	0.2480	0.5252	3038	0.0004	0.0007	0.0010	TBD	TBD	TBD
30	0.2476	0.5239	3057	0.0005	0.0009	0.0010	TBD	TBD	TBD
31	0.2487	0.5244	3026	0.0005	0.0009	0.0011	TBD	TBD	TBD
32	0.2483	0.5249	3033	0.0003	0.0007	0.0009	TBD	TBD	TBD
33	0.2488	0.5246	3024	0.0005	0.0007	0.0011	TBD	TBD	TBD
34	0.2459	0.5227	3109	0.0005	0.0008	0.0013	TBD	TBD	TBD
35	0.2478	0.5248	3046	0.0007	0.0011	0.0014	TBD	TBD	TBD
36	0.2472	0.5252	3059	0.0007	0.0011	0.0011	TBD	TBD	TBD
37	0.2476	0.5246	3053	0.0005	0.0008	0.0012	TBD	TBD	TBD
38	0.2468	0.5248	3072	0.0004	0.0006	0.0009	TBD	TBD	TBD
39	0.2484	0.5249	3030	0.0004	0.0007	0.0009	TBD	TBD	TBD
40	0.2477	0.5240	3054	0.0004	0.0007	0.0011	TBD	TBD	TBD
41	0.2484	0.5243	3036	0.0004	0.0009	0.0012	TBD	TBD	TBD
42	0.2489	0.5237	3025	0.0003	0.0006	0.0008	TBD	TBD	TBD
43	0.2485	0.5242	3032	0.0014	0.0016	0.0015	TBD	TBD	TBD
44	0.2490	0.5260	3009	0.0013	0.0015	0.0017	TBD	TBD	TBD
Ave.	0.2480	0.5243	3046	0.0005	0.0008	0.0010	TBD	TBD	TBD
Med.	0.2480	0.5244	3046	0.0004	0.0007	0.0010	TBD	TBD	TBD
st dev	0.0007	0.0008	20.8516	0.0003	0.0003	0.0004	TBD	TBD	TBD
Min.	0.2459	0.5227	3009	0.0002	0.0002	0.0002	TBD	TBD	TBD
Max.	0.2490	0.5260	3109	0.0014	0.0016	0.0017	TBD	TBD	TBD



3.5 Data Set 3, 105 °C, 100 mA (Lumen Maintenance)

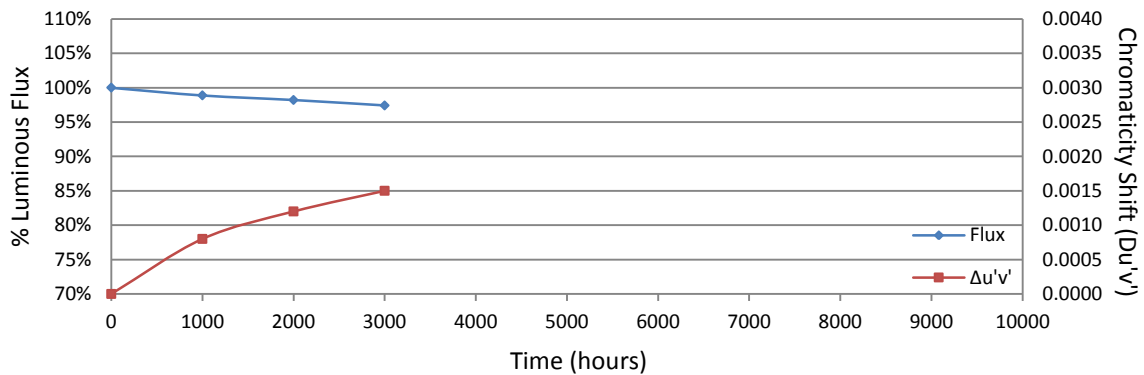
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	6.530	83.02	99.02	98.33	97.63	TBD	TBD	TBD
46	6.522	83.88	98.76	98.10	97.37	TBD	TBD	TBD
47	6.519	83.20	98.76	98.04	97.24	TBD	TBD	TBD
48	6.478	81.91	99.29	98.61	97.28	TBD	TBD	TBD
49	6.515	82.88	99.07	98.44	97.60	TBD	TBD	TBD
50	6.497	82.41	99.30	98.67	97.67	TBD	TBD	TBD
51	6.524	83.60	98.79	98.19	97.61	TBD	TBD	TBD
52	6.513	83.14	98.89	98.32	97.74	TBD	TBD	TBD
53	6.532	83.32	98.97	98.25	97.52	TBD	TBD	TBD
54	6.516	83.30	98.67	98.08	97.53	TBD	TBD	TBD
55	6.507	82.69	98.94	98.33	97.53	TBD	TBD	TBD
56	6.515	82.65	98.78	98.04	97.50	TBD	TBD	TBD
57	6.517	82.75	99.07	98.56	97.73	TBD	TBD	TBD
58	6.529	82.42	98.17	97.48	96.63	TBD	TBD	TBD
59	6.532	81.60	98.31	97.63	96.46	TBD	TBD	TBD
60	6.515	83.04	98.90	98.11	97.30	TBD	TBD	TBD
61	6.511	81.65	99.30	98.58	97.78	TBD	TBD	TBD
62	6.494	81.82	99.29	98.59	98.12	TBD	TBD	TBD
63	6.522	82.03	99.06	98.33	97.89	TBD	TBD	TBD
64	6.512	82.49	98.44	97.66	96.58	TBD	TBD	TBD
65	6.504	81.61	99.01	98.35	97.21	TBD	TBD	TBD
66	6.535	82.85	98.32	97.73	96.97	TBD	TBD	TBD
Ave.	6.515	82.65	98.87	98.20	97.40	TBD	TBD	TBD
Med.	6.516	82.72	98.92	98.28	97.52	TBD	TBD	TBD
st dev	0.0137	0.6606	0.3291	0.3379	0.4264	TBD	TBD	TBD
Min.	6.478	81.60	98.17	97.48	96.46	TBD	TBD	TBD
Max.	6.535	83.88	99.30	98.67	98.12	TBD	TBD	TBD

TM-21 Projection:

Test Duration: 3000 hours
Failures Observed: 0
α: TBD
β: TBD
Calculated L₇₀: TBD hours
Reported L₇₀: TBD hours

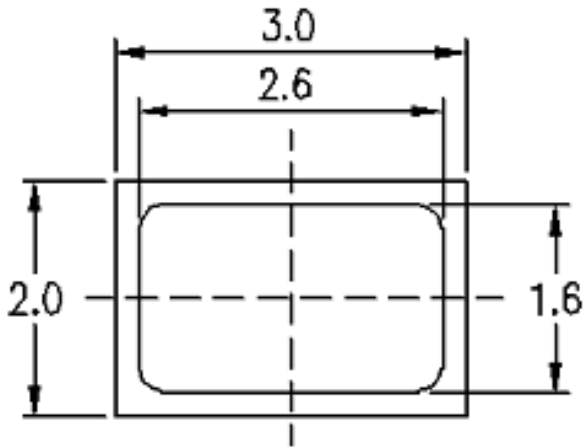
3.6 Data Set 3, 105 °C, 100 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
45	0.2476	0.5247	3053	0.0014	0.0019	0.0021	TBD	TBD	TBD
46	0.2469	0.5249	3069	0.0009	0.0011	0.0016	TBD	TBD	TBD
47	0.2471	0.5234	3073	0.0008	0.0004	0.0007	TBD	TBD	TBD
48	0.2494	0.5239	3013	0.0009	0.0012	0.0014	TBD	TBD	TBD
49	0.2480	0.5246	3044	0.0009	0.0013	0.0017	TBD	TBD	TBD
50	0.2482	0.5232	3048	0.0007	0.0011	0.0015	TBD	TBD	TBD
51	0.2469	0.5247	3070	0.0007	0.0013	0.0018	TBD	TBD	TBD
52	0.2472	0.5243	3065	0.0009	0.0018	0.0021	TBD	TBD	TBD
53	0.2483	0.5252	3031	0.0008	0.0014	0.0018	TBD	TBD	TBD
54	0.2481	0.5242	3043	0.0009	0.0014	0.0018	TBD	TBD	TBD
55	0.2481	0.5243	3043	0.0009	0.0012	0.0015	TBD	TBD	TBD
56	0.2488	0.5246	3024	0.0009	0.0011	0.0016	TBD	TBD	TBD
57	0.2477	0.5232	3059	0.0007	0.0011	0.0014	TBD	TBD	TBD
58	0.2481	0.5252	3037	0.0007	0.0009	0.0014	TBD	TBD	TBD
59	0.2474	0.5235	3065	0.0009	0.0013	0.0015	TBD	TBD	TBD
60	0.2475	0.5238	3060	0.0008	0.0013	0.0016	TBD	TBD	TBD
61	0.2471	0.5238	3070	0.0008	0.0010	0.0016	TBD	TBD	TBD
62	0.2462	0.5228	3101	0.0005	0.0009	0.0013	TBD	TBD	TBD
63	0.2479	0.5238	3051	0.0006	0.0010	0.0014	TBD	TBD	TBD
64	0.2487	0.5238	3032	0.0008	0.0010	0.0015	TBD	TBD	TBD
65	0.2485	0.5235	3037	0.0007	0.0008	0.0011	TBD	TBD	TBD
66	0.2467	0.5239	3080	0.0006	0.0010	0.0013	TBD	TBD	TBD
Ave.	0.2477	0.5241	3053	0.0008	0.0012	0.0015	TBD	TBD	TBD
Med.	0.2478	0.5239	3052	0.0008	0.0011	0.0015	TBD	TBD	TBD
st dev	0.0008	0.0007	20.5030	0.0002	0.0003	0.0003	TBD	TBD	TBD
Min.	0.2462	0.5228	3013	0.0005	0.0004	0.0007	TBD	TBD	TBD
Max.	0.2494	0.5252	3101	0.0014	0.0019	0.0021	TBD	TBD	TBD



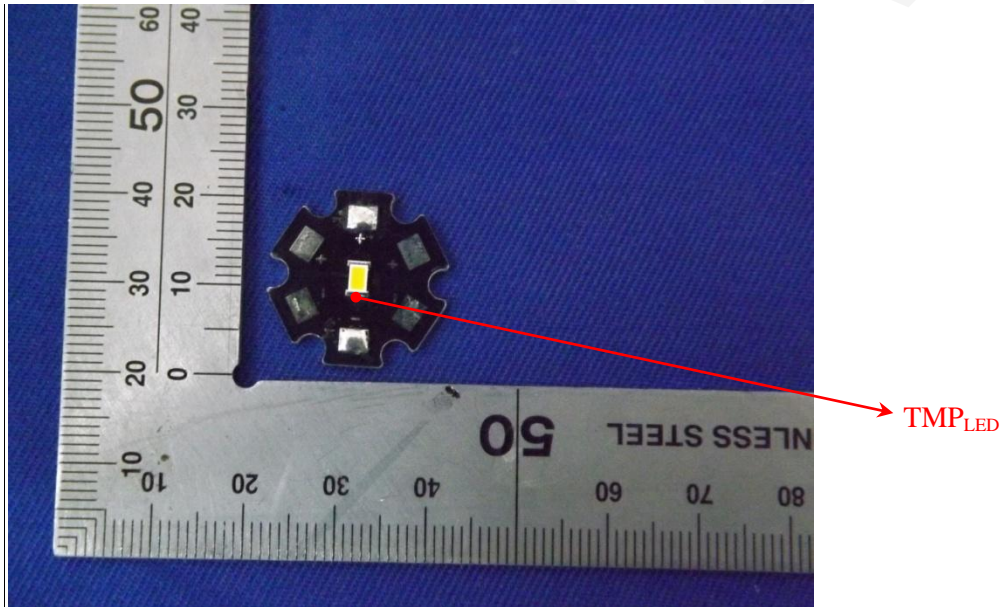
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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