TEST REPORT

ACCORDING TO IES LM-80-2015
For

LEDYI LIGHTING CO.,LTD

Yuechang Industrial Park,Shiyan,Bao'an,Shenzhen,China

Model: 3528 White SMD LED

Report Type: 9000 Hours Test Report	**Product Type:** LED Package
Test Engineer:	Pote Wang
Report Number:	R2DG160721051-10-9000
Test Date:	2016-07-26 to 2017-08-05
Report Date:	2017-08-16
Reviewed By:	Daniel Duan / EE Manager
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.
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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

75 PCS samples were received on 2016-07-21. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	LEDYI LIGHTING CO.,LTD
Part Number:	3528 White SMD LED
Part Type:	LED Package
Drive Level:	DC 20mA
Nominal CCT:	2700K

1.2 Standards Used:

- IESNA LM-80-15: 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 Testing 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	20015	25°C~130°C	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	(50V/15A)	2016-12-15	2017-12-14

1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within ±3% of the specified value of

the manufacturer during maintenance test, and was within ±0.5% during photometric and electrical measurement test.

1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within ±3% of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to 25°C ± 2°C, RH <65%.

1.6 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=21K (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

1.8 Sample Set

Data Set 1: 55°C, 20mA

Part Number:	3528 White SMD LED
Number of Units:	25
Case Temperature:	>53°C
Ambient Temperature:	>50°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

Data Set 2: 70°C,20mA

Part Number:	3528 White SMD LED
Number of Units:	25
Case Temperature:	>68°C
Ambient Temperature:	>65°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

Data Set 3: 85° C,20mA

Part Number:	3528 White SMD LED
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	20mA
Measurement Current:	20mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L_{70} Lifetime
1	25	0	1000	9000	>54000hours
2	25	0	1000	9000	>54000hours
3	25	0	1000	9000	>54000hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.31%	100.12%	100.01%	99.83%	99.67%	99.52%	99.33%	99.16%	98.97%
2	100.22%	99.95%	99.77%	99.58%	99.37%	99.18%	98.97%	98.72%	98.49%
3	100.11%	99.75%	99.50%	99.26%	98.92%	98.70%	98.42%	98.14%	97.85%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	0.0001	0.0003	0.0005	0.0007	0.0010	0.0012	0.0014	0.0018	0.0021
2	0.0002	0.0004	0.0005	0.0008	0.0012	0.0012	0.0015	0.0020	0.0021
3	0.0004	0.0005	0.0008	0.0011	0.0014	0.0015	0.0017	0.0021	0.0023

3 - Test Data

3.1 Data Set 1, 55°C, 20mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	7.631	100.38	100.24	100.12	100.01	99.92	99.76	99.55	99.32	99.23
2	7.649	100.31	100.12	100.10	99.96	99.90	99.74	99.66	99.57	99.48
3	7.611	100.32	100.03	99.82	99.61	99.50	99.40	99.30	99.09	98.96
4	7.633	100.17	100.07	99.97	99.83	99.63	99.48	99.25	99.12	98.85
5	7.668	100.20	100.12	100.09	99.77	99.69	99.60	99.57	99.43	99.19
6	7.561	100.41	100.16	99.99	99.89	99.71	99.62	99.39	99.27	99.06
7	7.629	100.21	99.88	99.74	99.69	99.54	99.44	99.23	99.02	98.70
8	7.480	100.40	100.23	100.15	99.93	99.75	99.52	99.45	99.33	99.21
9	7.596	100.38	100.17	100.05	99.92	99.75	99.62	99.49	99.28	99.24
10	7.691	100.13	99.90	99.73	99.38	99.28	99.21	98.96	98.61	98.54
11	7.557	100.24	100.16	100.08	100.04	99.92	99.78	99.76	99.59	99.25
12	7.615	100.35	100.08	99.95	99.76	99.67	99.58	99.41	99.26	98.98
13	7.660	100.30	100.16	99.92	99.84	99.60	99.30	99.09	99.01	98.85
14	7.576	100.37	100.29	100.21	100.08	99.92	99.83	99.72	99.59	99.55
15	7.751	100.36	100.15	100.06	99.81	99.57	99.39	99.19	98.99	98.53
16	7.606	100.41	100.33	100.22	100.20	100.01	99.88	99.59	99.30	99.11
17	7.752	100.44	100.08	99.94	99.78	99.69	99.66	99.51	99.47	99.24
18	7.554	100.30	100.04	99.99	99.84	99.55	99.30	99.02	98.73	98.54
19	7.531	100.36	100.21	100.09	99.96	99.79	99.60	99.42	99.26	99.08
20	7.574	100.28	100.13	100.11	99.92	99.74	99.50	99.30	99.08	98.84
21	7.692	100.29	100.07	99.78	99.48	99.41	99.28	99.08	99.06	98.80
22	7.598	100.26	100.11	99.96	99.83	99.63	99.41	99.04	99.00	98.87
23	7.435	100.32	100.23	100.12	99.85	99.69	99.61	99.26	99.13	98.99
24	7.721	100.28	100.04	100.03	99.79	99.48	99.38	99.08	98.77	98.45
25	7.638	100.30	100.04	100.01	99.66	99.28	99.08	98.97	98.77	98.69
Ave.	7.616	100.31	100.12	100.01	99.83	99.67	99.52	99.33	99.16	98.97
Med.	7.615	100.31	100.12	100.03	99.84	99.69	99.52	99.30	99.13	98.98
st dev	0.0761	0.0790	0.1063	0.1350	0.1805	0.1902	0.2020	0.2411	0.2693	0.2954
Min.	7.435	100.13	99.88	99.73	99.38	99.28	99.08	98.96	98.61	98.45
Max.	7.752	100.44	100.33	100.22	100.20	100.01	99.88	99.76	99.59	99.55

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 1.730E-06

β: 1.005

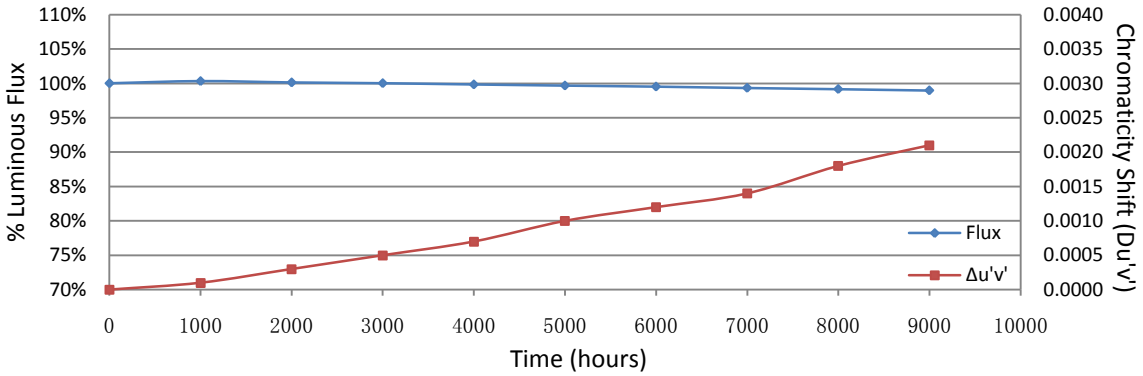
Reported L_{70}: >54000 hours

3.2 Data Set 1, 55°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	2.811	2.801	2.803	2.807	2.810	2.809	2.802	2.800	2.795	2.801
2	2.795	2.800	2.801	2.805	2.808	2.808	2.800	2.799	2.796	2.800
3	2.799	2.803	2.807	2.808	2.810	2.811	2.803	2.802	2.800	2.803
4	2.796	2.802	2.806	2.807	2.809	2.807	2.801	2.801	2.799	2.799
5	2.794	2.800	2.801	2.804	2.807	2.807	2.799	2.797	2.796	2.797
6	2.794	2.800	2.804	2.805	2.808	2.806	2.800	2.799	2.796	2.799
7	2.794	2.799	2.802	2.801	2.805	2.806	2.798	2.797	2.794	2.798
8	2.797	2.800	2.804	2.803	2.806	2.807	2.800	2.797	2.797	2.799
9	2.798	2.801	2.803	2.804	2.808	2.805	2.799	2.797	2.797	2.797
10	2.798	2.800	2.804	2.802	2.807	2.806	2.799	2.797	2.797	2.799
11	2.798	2.800	2.803	2.802	2.807	2.841	2.799	2.799	2.797	2.799
12	2.801	2.801	2.803	2.804	2.810	2.808	2.801	2.801	2.802	2.800
13	2.813	2.800	2.801	2.801	2.808	2.805	2.798	2.798	2.799	2.799
14	2.799	2.801	2.804	2.803	2.810	2.807	2.801	2.800	2.797	2.801
15	2.799	2.800	2.801	2.803	2.806	2.805	2.798	2.798	2.795	2.799
16	2.796	2.800	2.803	2.803	2.808	2.805	2.798	2.798	2.797	2.798
17	3.142	2.801	2.804	2.803	2.809	2.807	2.800	2.800	2.799	2.799
18	2.794	2.798	2.800	2.801	2.805	2.804	2.797	2.796	2.794	2.794
19	2.802	2.800	2.803	2.801	2.807	2.806	2.799	2.799	2.796	2.798
20	2.795	2.800	2.803	2.802	2.808	2.805	2.799	2.798	2.795	2.796
21	2.959	2.800	2.803	2.802	2.807	2.805	2.799	2.799	2.795	2.798
22	2.797	2.802	2.803	2.806	2.808	2.807	2.801	2.801	2.797	2.799
23	2.796	2.797	2.802	2.803	2.807	2.804	2.798	2.798	2.795	2.798
24	3.044	2.799	2.801	2.803	2.807	2.805	2.798	2.798	2.795	2.796
25	2.797	2.800	2.803	2.806	2.807	2.806	2.800	2.800	2.796	2.798
Ave.	2.828	2.800	2.803	2.804	2.808	2.808	2.799	2.799	2.797	2.799
Med.	2.798	2.800	2.803	2.803	2.808	2.806	2.799	2.799	2.796	2.799
st dev	0.0872	0.0012	0.0016	0.0020	0.0014	0.0071	0.0014	0.0016	0.0019	0.0018
Min.	2.794	2.797	2.800	2.801	2.805	2.804	2.797	2.796	2.794	2.794
Max.	3.142	2.803	2.807	2.808	2.810	2.841	2.803	2.802	2.802	2.803

3.3 Data Set 1, 55°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2625	0.5190	2736	0.0001	0.0003	0.0005	0.0008	0.0009	0.0012	0.0014	0.0017	0.0020
2	0.2634	0.5191	2714	0.0000	0.0003	0.0003	0.0004	0.0008	0.0011	0.0011	0.0015	0.0019
3	0.2625	0.5193	2734	0.0001	0.0003	0.0003	0.0002	0.0008	0.0010	0.0009	0.0016	0.0019
4	0.2627	0.5188	2730	0.0000	0.0002	0.0004	0.0006	0.0009	0.0012	0.0015	0.0020	0.0024
5	0.2605	0.5164	2793	0.0001	0.0002	0.0004	0.0005	0.0010	0.0012	0.0012	0.0017	0.0021
6	0.2628	0.5186	2731	0.0002	0.0003	0.0014	0.0014	0.0018	0.0019	0.0018	0.0021	0.0025
7	0.2641	0.5195	2698	0.0000	0.0002	0.0004	0.0005	0.0009	0.0012	0.0016	0.0019	0.0021
8	0.2625	0.5183	2738	0.0001	0.0003	0.0003	0.0005	0.0008	0.0010	0.0012	0.0018	0.0023
9	0.2646	0.5199	2685	0.0002	0.0005	0.0002	0.0002	0.0006	0.0008	0.0008	0.0014	0.0017
10	0.2636	0.5195	2709	0.0001	0.0001	0.0006	0.0009	0.0011	0.0013	0.0016	0.0021	0.0025
11	0.2640	0.5192	2702	0.0001	0.0004	0.0003	0.0006	0.0008	0.0010	0.0013	0.0017	0.0021
12	0.2627	0.5182	2734	0.0001	0.0001	0.0005	0.0009	0.0011	0.0013	0.0016	0.0022	0.0026
13	0.2622	0.5187	2743	0.0001	0.0002	0.0004	0.0010	0.0011	0.0013	0.0017	0.0020	0.0023
14	0.2641	0.5194	2699	0.0001	0.0004	0.0003	0.0004	0.0008	0.0009	0.0010	0.0015	0.0018
15	0.2620	0.5193	2744	0.0001	0.0001	0.0005	0.0008	0.0010	0.0011	0.0012	0.0017	0.0019
16	0.2622	0.5192	2741	0.0000	0.0003	0.0004	0.0008	0.0009	0.0012	0.0017	0.0023	0.0026
17	0.2638	0.5195	2704	0.0001	0.0005	0.0001	0.0004	0.0007	0.0009	0.0011	0.0014	0.0017
18	0.2630	0.5189	2724	0.0000	0.0002	0.0005	0.0008	0.0010	0.0012	0.0016	0.0019	0.0024
19	0.2632	0.5196	2718	0.0001	0.0004	0.0002	0.0005	0.0007	0.0010	0.0013	0.0017	0.0019
20	0.2634	0.5181	2719	0.0000	0.0001	0.0005	0.0009	0.0010	0.0013	0.0014	0.0019	0.0023
21	0.2611	0.5186	2768	0.0001	0.0002	0.0008	0.0011	0.0012	0.0015	0.0016	0.0017	0.0018
22	0.2630	0.5189	2725	0.0001	0.0002	0.0004	0.0007	0.0009	0.0013	0.0017	0.0019	0.0022
23	0.2626	0.5185	2735	0.0004	0.0007	0.0006	0.0010	0.0012	0.0012	0.0013	0.0016	0.0016
24	0.2627	0.5187	2732	0.0000	0.0002	0.0004	0.0007	0.0009	0.0012	0.0017	0.0019	0.0020
25	0.2618	0.5188	2752	0.0000	0.0002	0.0004	0.0007	0.0010	0.0011	0.0013	0.0016	0.0017
Ave.	0.2628	0.5189	2728	0.0001	0.0003	0.0005	0.0007	0.0010	0.0012	0.0014	0.0018	0.0021
Med.	0.2627	0.5189	2731	0.0001	0.0002	0.0004	0.0007	0.0009	0.0012	0.0014	0.0017	0.0021
st dev	0.0009	0.0007	23.2446	0.0001	0.0001	0.0002	0.0003	0.0002	0.0002	0.0003	0.0002	0.0003
Min.	0.2605	0.5164	2685	0.0000	0.0001	0.0001	0.0002	0.0006	0.0008	0.0008	0.0014	0.0016
Max.	0.2646	0.5199	2793	0.0004	0.0007	0.0014	0.0014	0.0018	0.0019	0.0018	0.0023	0.0026



3.4 Data Set 2, 70°C, 20mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	7.918	100.27	99.94	99.75	99.66	99.48	99.31	98.89	98.69	98.19
27	7.848	100.22	99.89	99.85	99.63	99.49	99.45	99.31	98.88	98.67
28	7.221	100.17	99.94	99.92	99.85	99.72	99.68	99.57	99.27	98.84
29	7.981	100.35	100.04	99.91	99.71	99.40	99.26	98.99	98.87	98.70
30	6.715	100.12	99.90	99.78	99.55	99.21	98.99	98.87	98.70	98.62
31	7.618	100.30	99.96	99.87	99.74	99.44	99.16	98.79	98.69	98.52
32	7.601	100.25	99.95	99.83	99.76	99.45	99.14	99.09	98.68	98.49
33	7.547	100.09	99.73	99.67	99.51	99.40	99.17	98.81	98.60	98.50
34	7.608	100.29	100.07	99.67	99.42	99.30	99.17	99.08	98.73	98.45
35	7.626	100.26	99.99	99.88	99.76	99.54	99.31	99.00	98.77	98.47
36	7.668	100.22	100.12	99.93	99.74	99.50	99.33	98.96	98.70	98.41
37	7.590	100.24	99.87	99.78	99.62	99.38	99.22	99.09	98.83	98.60
38	7.580	100.13	99.78	99.74	99.62	99.50	99.35	99.18	98.97	98.77
39	7.715	100.23	99.97	99.64	99.35	99.29	99.11	98.90	98.64	98.43
40	7.689	100.09	99.79	99.48	99.27	99.00	98.89	98.82	98.56	98.10
41	7.655	100.21	99.87	99.50	99.16	98.99	98.92	98.80	98.72	98.47
42	7.636	100.20	99.83	99.49	99.07	98.91	98.69	98.39	98.30	98.22
43	7.665	100.16	99.87	99.62	99.33	99.14	98.88	98.72	98.32	98.07
44	7.573	100.24	99.89	99.67	99.43	99.06	98.80	98.55	98.38	98.09
45	7.614	100.32	100.16	99.87	99.74	99.46	99.21	99.05	98.77	98.66
46	7.638	100.37	100.14	99.87	99.69	99.54	99.31	99.08	98.81	98.42
47	7.516	100.32	100.17	100.01	99.71	99.57	99.45	99.35	98.99	98.86
48	7.698	100.21	99.96	99.86	99.79	99.58	99.34	99.06	98.75	98.49
49	7.484	100.17	100.05	99.88	99.76	99.49	99.41	99.20	99.10	99.01
50	7.471	100.15	99.84	99.79	99.64	99.29	99.04	98.67	98.41	98.14
Ave.	7.595	100.22	99.95	99.77	99.58	99.37	99.18	98.97	98.72	98.49
Med.	7.618	100.22	99.94	99.79	99.64	99.44	99.21	98.99	98.72	98.49
st dev	0.2347	0.0765	0.1209	0.1450	0.2085	0.2089	0.2312	0.2572	0.2295	0.2529
Min.	6.715	100.09	99.73	99.48	99.07	98.91	98.69	98.39	98.30	98.07
Max.	7.981	100.37	100.17	100.01	99.85	99.72	99.68	99.57	99.27	99.01

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 2.195E-06

β: 1.005

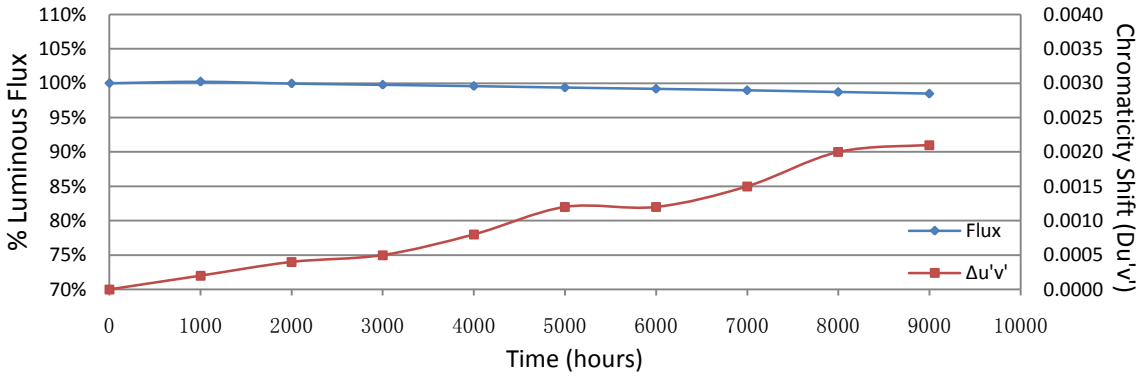
Reported L_{70}: >54000 hours

3.5 Data Set 2, 70°C, 20mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.708	2.709	2.709	2.711	2.713	2.711	2.710	2.708	2.707	2.708
27	2.709	2.708	2.710	2.710	2.714	2.712	2.710	2.708	2.707	2.708
28	2.688	2.688	2.689	2.689	2.693	2.691	2.688	2.686	2.687	2.687
29	2.706	2.705	2.706	2.707	2.709	2.708	2.706	2.704	2.704	2.705
30	2.681	2.681	2.683	2.684	2.686	2.685	2.682	2.682	2.681	2.680
31	2.794	2.795	2.797	2.799	2.803	2.800	2.795	2.792	2.791	2.794
32	2.796	2.798	2.799	2.801	2.806	2.804	2.797	2.795	2.794	2.796
33	2.799	2.799	2.801	2.804	2.807	2.806	2.800	2.797	2.796	2.799
34	2.799	2.800	2.803	2.805	2.807	2.805	2.800	2.798	2.799	2.799
35	2.813	2.799	2.800	2.802	2.808	2.807	2.799	2.798	2.797	2.798
36	2.799	2.798	2.800	2.805	2.807	2.807	2.799	2.797	2.798	2.798
37	2.802	2.801	2.804	2.805	2.810	2.808	2.801	2.800	2.799	2.799
38	2.806	2.801	2.803	2.804	2.811	2.807	2.801	2.799	2.798	2.801
39	2.801	2.796	2.800	2.802	2.807	2.804	2.798	2.796	2.794	2.797
40	2.801	2.798	2.801	2.801	2.807	2.803	2.798	2.798	2.796	2.797
41	2.800	2.799	2.802	2.802	2.808	2.806	2.799	2.799	2.798	2.798
42	2.802	2.797	2.802	2.802	2.807	2.805	2.799	2.799	2.798	2.798
43	2.801	2.798	2.801	2.802	2.805	2.805	2.799	2.798	2.797	2.798
44	2.802	2.798	2.803	2.804	2.808	2.805	2.800	2.800	2.798	2.801
45	2.800	2.800	2.801	2.801	2.808	2.805	2.800	2.800	2.796	2.799
46	3.043	2.795	2.797	2.797	2.804	2.801	2.796	2.794	2.794	2.796
47	2.800	2.797	2.802	2.802	2.806	2.805	2.800	2.797	2.796	2.798
48	2.798	2.797	2.802	2.802	2.806	2.805	2.800	2.799	2.799	2.800
49	2.796	2.794	2.798	2.800	2.803	2.801	2.796	2.796	2.793	2.794
50	2.801	2.800	2.804	2.807	2.807	2.808	2.801	2.801	2.800	2.801
Ave.	2.790	2.778	2.781	2.782	2.786	2.784	2.779	2.778	2.777	2.778
Med.	2.800	2.798	2.801	2.802	2.807	2.805	2.799	2.797	2.796	2.798
st dev	0.0674	0.0411	0.0418	0.0421	0.0427	0.0426	0.0411	0.0412	0.0409	0.0414
Min.	2.681	2.681	2.683	2.684	2.686	2.685	2.682	2.682	2.681	2.680
Max.	3.043	2.801	2.804	2.807	2.811	2.808	2.801	2.801	2.800	2.801

3.6 Data Set 2, 70°C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2628	0.5080	2780	0.0002	0.0004	0.0008	0.0009	0.0012	0.0014	0.0019	0.0021	0.0023
27	0.2649	0.5088	2727	0.0002	0.0005	0.0005	0.0009	0.0013	0.0013	0.0018	0.0022	0.0022
28	0.2638	0.5100	2746	0.0003	0.0004	0.0006	0.0008	0.0012	0.0013	0.0016	0.0021	0.0021
29	0.2662	0.5106	2690	0.0001	0.0004	0.0004	0.0009	0.0012	0.0013	0.0017	0.0022	0.0023
30	0.2636	0.5072	2764	0.0003	0.0004	0.0009	0.0009	0.0014	0.0014	0.0016	0.0022	0.0024
31	0.2624	0.5189	2738	0.0001	0.0002	0.0004	0.0007	0.0011	0.0011	0.0014	0.0019	0.0020
32	0.2632	0.5190	2720	0.0004	0.0004	0.0007	0.0009	0.0013	0.0013	0.0014	0.0021	0.0022
33	0.2636	0.5195	2708	0.0002	0.0003	0.0004	0.0008	0.0011	0.0012	0.0015	0.0020	0.0021
34	0.2627	0.5185	2734	0.0002	0.0004	0.0006	0.0009	0.0013	0.0014	0.0016	0.0022	0.0023
35	0.2625	0.5190	2735	0.0002	0.0004	0.0004	0.0008	0.0011	0.0012	0.0013	0.0019	0.0020
36	0.2626	0.5197	2730	0.0003	0.0004	0.0005	0.0009	0.0011	0.0013	0.0018	0.0022	0.0023
37	0.2622	0.5182	2745	0.0002	0.0004	0.0004	0.0007	0.0011	0.0011	0.0013	0.0017	0.0018
38	0.2630	0.5192	2724	0.0003	0.0004	0.0007	0.0007	0.0012	0.0011	0.0011	0.0016	0.0017
39	0.2608	0.5183	2775	0.0001	0.0002	0.0002	0.0005	0.0010	0.0011	0.0009	0.0015	0.0017
40	0.2628	0.5195	2725	0.0003	0.0004	0.0004	0.0007	0.0011	0.0012	0.0013	0.0021	0.0025
41	0.2622	0.5176	2748	0.0002	0.0004	0.0004	0.0008	0.0011	0.0012	0.0012	0.0017	0.0018
42	0.2630	0.5195	2722	0.0002	0.0003	0.0004	0.0007	0.0011	0.0012	0.0014	0.0020	0.0024
43	0.2637	0.5198	2705	0.0002	0.0004	0.0005	0.0009	0.0013	0.0013	0.0016	0.0022	0.0026
44	0.2644	0.5197	2690	0.0001	0.0002	0.0003	0.0006	0.0009	0.0012	0.0012	0.0018	0.0022
45	0.2626	0.5188	2735	0.0003	0.0004	0.0005	0.0010	0.0013	0.0014	0.0016	0.0018	0.0020
46	0.2628	0.5194	2726	0.0002	0.0004	0.0003	0.0006	0.0010	0.0010	0.0013	0.0015	0.0018
47	0.2609	0.5182	2774	0.0001	0.0004	0.0006	0.0008	0.0012	0.0012	0.0013	0.0016	0.0018
48	0.2634	0.5193	2713	0.0002	0.0003	0.0006	0.0011	0.0013	0.0013	0.0018	0.0019	0.0022
49	0.2624	0.5182	2741	0.0002	0.0004	0.0004	0.0006	0.0013	0.0013	0.0017	0.0020	0.0021
50	0.2609	0.5169	2780	0.0002	0.0004	0.0004	0.0009	0.0011	0.0012	0.0018	0.0022	0.0025
Ave.	0.2629	0.5169	2735	0.0002	0.0004	0.0005	0.0008	0.0012	0.0012	0.0015	0.0020	0.0021
Med.	0.2628	0.5188	2734	0.0002	0.0004	0.0004	0.0008	0.0012	0.0012	0.0015	0.0020	0.0022
st dev	0.0012	0.0042	25.3279	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
Min.	0.2608	0.5072	2690	0.0001	0.0002	0.0002	0.0005	0.0009	0.0010	0.0009	0.0015	0.0017
Max.	0.2662	0.5198	2780	0.0004	0.0005	0.0009	0.0011	0.0014	0.0014	0.0019	0.0022	0.0026



3.7 Data Set 3, 85° C, 20mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	7.72	100.12	99.75	99.55	99.39	99.04	98.78	98.43	98.25	98.08
52	7.49	100.13	99.91	99.72	99.44	99.33	98.97	98.65	98.39	98.12
53	7.57	100.22	99.92	99.62	99.35	99.12	99.02	98.77	98.67	98.44
54	7.65	100.21	99.88	99.74	99.66	99.31	99.08	98.99	98.74	98.56
55	7.53	100.16	99.89	99.53	99.42	99.16	99.00	98.75	98.58	98.15
56	7.59	100.04	99.75	99.38	99.18	98.88	98.83	98.55	98.30	97.93
57	7.59	100.14	99.63	99.38	98.93	98.46	98.31	98.17	97.92	97.71
58	7.62	100.30	99.87	99.54	99.13	98.68	98.45	98.15	97.86	97.43
59	7.65	100.14	99.84	99.63	99.49	99.16	98.94	98.65	98.28	97.95
60	7.61	100.11	99.66	99.47	99.40	99.03	98.83	98.54	98.07	97.73
61	7.54	100.13	99.75	99.51	99.28	98.85	98.63	98.28	97.93	97.61
62	7.46	100.05	99.67	99.49	99.17	98.95	98.73	98.47	98.20	97.91
63	7.67	99.97	99.69	99.45	99.23	98.97	98.93	98.55	98.17	97.86
64	7.49	100.05	99.65	99.28	99.12	98.84	98.57	98.42	98.17	97.70
65	7.62	100.09	99.71	99.37	99.15	98.75	98.53	98.08	97.76	97.51
66	7.48	100.17	99.87	99.59	99.36	98.86	98.58	98.52	98.26	98.06
67	7.33	100.19	99.85	99.60	99.47	99.13	98.85	98.62	98.43	98.23
68	7.63	100.12	99.58	99.49	99.19	98.65	98.36	97.86	97.61	97.30
69	7.60	100.18	99.68	99.54	99.34	98.95	98.60	98.33	98.00	97.75
70	7.72	99.91	99.57	99.20	98.86	98.56	98.34	97.94	97.71	97.58
71	7.59	100.01	99.74	99.57	99.43	98.89	98.49	98.21	97.81	97.67
72	7.55	99.93	99.66	99.50	99.28	99.01	98.78	98.45	98.14	97.77
73	7.49	100.09	99.63	99.21	98.81	98.60	98.22	98.05	97.86	97.74
74	7.65	100.10	99.69	99.59	99.18	98.85	98.77	98.52	98.14	97.72
75	7.50	100.17	99.81	99.57	99.24	98.93	98.84	98.57	98.27	97.85
Ave.	7.57	100.11	99.75	99.50	99.26	98.92	98.70	98.42	98.14	97.85
Med.	7.59	100.12	99.74	99.53	99.28	98.93	98.77	98.47	98.17	97.77
st dev	0.0891	0.0906	0.1079	0.1372	0.1988	0.2223	0.2436	0.2744	0.2932	0.2988
Min.	7.33	99.91	99.57	99.20	98.81	98.46	98.22	97.86	97.61	97.30
Max.	7.72	100.30	99.92	99.74	99.66	99.33	99.08	98.99	98.74	98.56

TM-21 Projection:

Test Duration: 9000 hours

Failures Observed: 0

α: 2.804E-06

β: 1.004

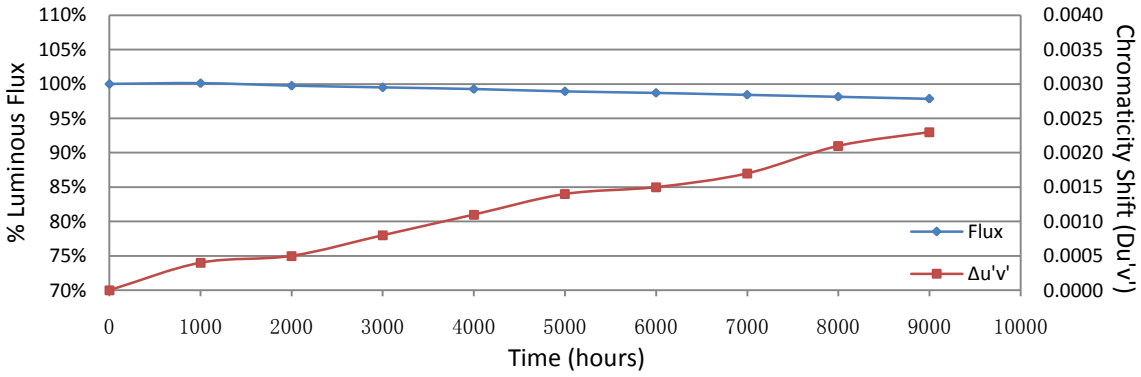
Reported L_{70}: >54000 hours

3.8 Data Set 3, 85° C, 20mA (Forward Voltage)

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	2.797	2.797	2.800	2.805	2.807	2.804	2.799	2.799	2.796	2.799
52	2.799	2.798	2.801	2.804	2.805	2.803	2.798	2.798	2.794	2.798
53	2.799	2.797	2.799	2.803	2.806	2.804	2.798	2.798	2.797	2.798
54	2.801	2.798	2.801	2.805	2.807	2.807	2.799	2.799	2.797	2.800
55	2.800	2.798	2.800	2.802	2.806	2.803	2.798	2.798	2.795	2.797
56	2.802	2.799	2.801	2.807	2.805	2.805	2.799	2.797	2.796	2.799
57	2.801	2.800	2.803	2.803	2.807	2.806	2.800	2.800	2.796	2.800
58	2.801	2.798	2.801	2.801	2.806	2.804	2.799	2.796	2.796	2.798
59	2.802	2.801	2.802	2.806	2.809	2.807	2.802	2.801	2.799	2.802
60	2.800	2.799	2.800	2.802	2.806	2.803	2.798	2.798	2.794	2.799
61	2.799	2.797	2.801	2.803	2.806	2.805	2.799	2.798	2.796	2.799
62	2.800	2.798	2.800	2.803	2.804	2.805	2.798	2.798	2.795	2.938
63	2.799	2.799	2.801	2.802	2.806	2.805	2.799	2.797	2.795	2.797
64	2.803	2.800	2.803	2.806	2.807	2.807	2.802	2.801	2.797	2.801
65	2.795	2.792	2.794	2.796	2.800	2.799	2.794	2.793	2.791	2.793
66	2.800	2.799	2.800	2.803	2.806	2.802	2.799	2.798	2.795	2.798
67	2.810	2.799	2.800	2.802	2.807	2.806	2.801	2.800	2.794	2.800
68	2.800	2.799	2.801	2.804	2.807	2.806	2.801	2.800	2.795	2.800
69	2.801	2.800	2.799	2.801	2.807	2.805	2.800	2.800	2.795	2.799
70	2.800	2.800	2.799	2.803	2.807	2.806	2.801	2.800	2.796	2.799
71	2.802	2.801	2.801	2.804	2.809	2.807	2.802	2.801	2.798	2.801
72	2.797	2.797	2.799	2.801	2.803	2.803	2.799	2.799	2.794	2.797
73	2.800	2.797	2.798	2.801	2.806	2.804	2.800	2.799	2.796	2.797
74	2.796	2.794	2.795	2.797	2.801	2.800	2.796	2.794	2.793	2.794
75	2.799	2.798	2.800	2.802	2.806	2.804	2.800	2.797	2.797	2.799
Ave.	2.800	2.798	2.800	2.803	2.806	2.804	2.799	2.798	2.795	2.804
Med.	2.800	2.798	2.800	2.803	2.806	2.805	2.799	2.798	2.796	2.799
st dev	0.0028	0.0020	0.0020	0.0025	0.0021	0.0021	0.0018	0.0020	0.0017	0.0280
Min.	2.795	2.792	2.794	2.796	2.800	2.799	2.794	2.793	2.791	2.793
Max.	2.810	2.801	2.803	2.807	2.809	2.807	2.802	2.801	2.799	2.938

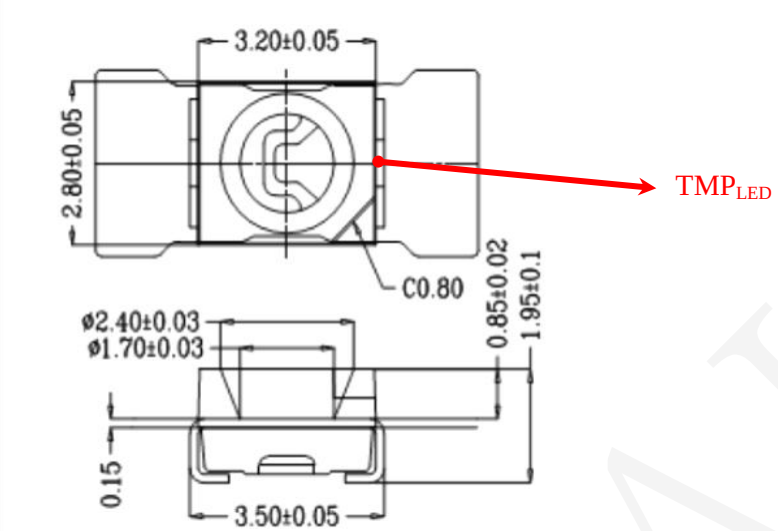
3.9 Data Set 3, 85° C, 20mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2615	0.5188	2757	0.0004	0.0005	0.0010	0.0009	0.0013	0.0013	0.0018	0.0022	0.0024
52	0.2636	0.5188	2711	0.0002	0.0005	0.0009	0.0012	0.0014	0.0013	0.0018	0.0025	0.0025
53	0.2606	0.5178	2783	0.0004	0.0005	0.0007	0.0010	0.0012	0.0011	0.0014	0.0023	0.0023
54	0.2636	0.5195	2710	0.0004	0.0005	0.0007	0.0010	0.0013	0.0015	0.0015	0.0021	0.0022
55	0.2625	0.5179	2739	0.0003	0.0004	0.0006	0.0009	0.0012	0.0013	0.0015	0.0021	0.0024
56	0.2632	0.5192	2719	0.0004	0.0006	0.0008	0.0009	0.0013	0.0013	0.0018	0.0019	0.0020
57	0.2620	0.5187	2748	0.0003	0.0004	0.0006	0.0010	0.0013	0.0015	0.0015	0.0022	0.0024
58	0.2624	0.5188	2738	0.0005	0.0007	0.0008	0.0012	0.0015	0.0016	0.0018	0.0023	0.0026
59	0.2635	0.5196	2712	0.0004	0.0006	0.0009	0.0013	0.0016	0.0016	0.0017	0.0022	0.0023
60	0.2629	0.5187	2728	0.0004	0.0006	0.0008	0.0012	0.0015	0.0016	0.0015	0.0020	0.0021
61	0.2641	0.5188	2701	0.0003	0.0005	0.0008	0.0011	0.0013	0.0015	0.0017	0.0022	0.0024
62	0.2643	0.5194	2695	0.0002	0.0003	0.0009	0.0013	0.0016	0.0017	0.0021	0.0025	0.0026
63	0.2642	0.5198	2695	0.0003	0.0004	0.0007	0.0009	0.0012	0.0012	0.0013	0.0018	0.0021
64	0.2624	0.5177	2743	0.0004	0.0005	0.0008	0.0011	0.0014	0.0014	0.0013	0.0018	0.0020
65	0.2607	0.5170	2784	0.0004	0.0005	0.0010	0.0012	0.0015	0.0017	0.0021	0.0023	0.0024
66	0.2610	0.5179	2774	0.0004	0.0005	0.0009	0.0012	0.0014	0.0017	0.0018	0.0022	0.0025
67	0.2615	0.5197	2753	0.0003	0.0004	0.0008	0.0009	0.0011	0.0011	0.0012	0.0013	0.0017
68	0.2612	0.5180	2769	0.0004	0.0006	0.0008	0.0011	0.0014	0.0017	0.0016	0.0022	0.0026
69	0.2637	0.5190	2709	0.0003	0.0004	0.0008	0.0011	0.0014	0.0016	0.0015	0.0021	0.0022
70	0.2631	0.5189	2723	0.0004	0.0007	0.0013	0.0014	0.0016	0.0017	0.0016	0.0023	0.0025
71	0.2632	0.5195	2717	0.0003	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0023	0.0025
72	0.2637	0.5195	2706	0.0004	0.0005	0.0007	0.0011	0.0014	0.0016	0.0020	0.0022	0.0025
73	0.2635	0.5190	2714	0.0004	0.0006	0.0009	0.0013	0.0016	0.0015	0.0019	0.0022	0.0025
74	0.2625	0.5189	2736	0.0004	0.0006	0.0007	0.0011	0.0015	0.0016	0.0019	0.0023	0.0026
75	0.2615	0.5192	2757	0.0004	0.0005	0.0007	0.0011	0.0014	0.0015	0.0017	0.0022	0.0025
Ave.	0.2627	0.5188	2733	0.0004	0.0005	0.0008	0.0011	0.0014	0.0015	0.0017	0.0021	0.0023
Med.	0.2629	0.5189	2728	0.0004	0.0005	0.0008	0.0011	0.0014	0.0015	0.0017	0.0022	0.0024
st dev	0.0011	0.0007	27.1058	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.2606	0.5170	2695	0.0002	0.0003	0.0006	0.0009	0.0011	0.0011	0.0012	0.0013	0.0017
Max.	0.2643	0.5198	2784	0.0005	0.0007	0.0013	0.0014	0.0016	0.0017	0.0021	0.0025	0.0026



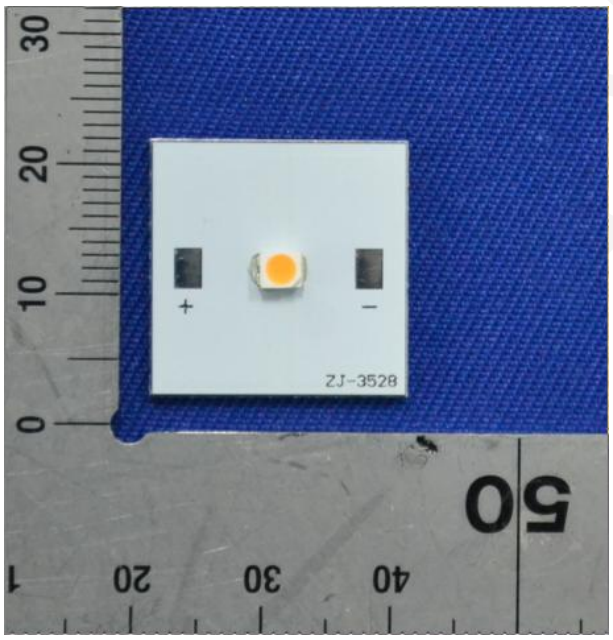
4 - EUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 EUT Photo



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