



# IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

## MEASUREMENT AND TEST REPORT

For

### Shenzhen Runlite Technology Co., Ltd

Building 15, Tantou Wset Industrial Zone, Songgang Street, Baoan District, Shenzhen City, China.

**Model: T4014**

<b>Report Type:</b> 6000 hours test report of 55°C 6000 hours test report of 85°C 9000 hours test report of 105 °C		<b>Product Type:</b> LED Package
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<b>Report Number:</b>	RSZ141117511-10-9000-M1	
<b>Test Date:</b>	2014-11-22 to 2015-12-02	
<b>Report Date:</b>	2016-07-26	
<b>Revised Note:</b>	The previous report RSZ141117511-10-9000 is replaced by this report on 2016-07-26	
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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: T4014  
 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 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	20005	25°C~110°C	2015-09-14	2016-09-13
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50V/15A)	2015-07-11	2016-07-11
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	11090007	(50V/15A)	2015-03-05	2016-03-05

## 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  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 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 75Pcs;

Each Ts test condition 25Pcs

The samples tested at Ts 55°C, Ts 85°C and Ts 105°C were received at 2014-11-17 and tested during 2014-11-22 to 2015-12-02. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

#### Data Set 1: 55°C, 150mA

Part Number:	T4014
Number of Units:	25
Actual Case Temperature( $T_S$ ):	$T_S = 54.3^\circ\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 51.4^\circ\text{C}$
Life Test Drive Current:	$I_F = 150\text{mA}$
Measurement Current:	$I_F = 150\text{mA}$

#### Data Set 2: 85°C,150mA

Part Number:	T4014
Number of Units:	25
Actual Case Temperature( $T_S$ ):	$T_S = 84.3^\circ\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 82.2^\circ\text{C}$
Life Test Drive Current:	$I_F = 150\text{mA}$
Measurement Current:	$I_F = 150\text{mA}$

#### Data Set 3: 105°C, 150mA

Part Number:	T4014
Number of Units:	25
Actual Case Temperature( $T_S$ ):	$T_S = 104.3^\circ\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 103.2^\circ\text{C}$
Life Test Drive Current:	$I_F = 150\text{mA}$
Measurement Current:	$I_F = 150\text{mA}$

## 2 - SUMMARY OF TEST RESULT

<b>Data Set:</b>	<b>Data Set 1, 55°C, 150mA</b>
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:	98.16%
Average Chromaticity Shift at 6000 hours ( $\Delta u'v'$ ):	0.0017
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000 hours
Reported TM-21 L <sub>90</sub> Lifetime:	23,000 hours

<b>Data Set:</b>	<b>Data Set 2, 85°C, 150mA</b>
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:	97.17%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0018
Reported TM-21 L <sub>70</sub> Lifetime:	>36,000 hours
Reported TM-21 L <sub>90</sub> Lifetime:	17,000 hours

<b>Data Set:</b>	<b>Data Set 3, 105°C, 150mA</b>
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:	96.77%
Average. Lumen Maintenance at 9000 hours:	94.59%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0022
Average Chromaticity Shift at 9000 hours ( $\Delta u'v'$ ):	0.0034
Reported TM-21 L <sub>70</sub> Lifetime:	46,000 hours
Reported TM-21 L <sub>90</sub> Lifetime:	14,000 hours

### 3 - Test Data

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

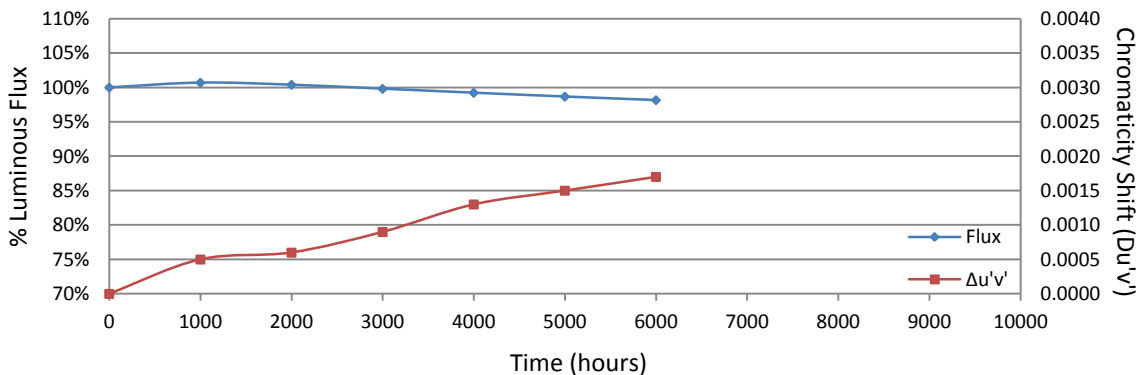
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	3.235	54.14	100.83	100.59	100.04	99.43	98.85	98.26
2	3.241	53.64	100.84	100.06	99.53	98.88	98.34	97.65
3	3.243	54.02	100.37	99.91	98.96	98.45	97.80	97.43
4	3.245	53.77	100.20	99.78	99.14	98.59	98.05	97.25
5	3.239	53.46	101.23	101.18	99.21	98.71	98.17	97.47
6	3.248	53.15	100.92	100.56	99.57	98.97	98.51	98.10
7	3.255	53.45	100.32	100.64	99.93	99.27	98.77	97.92
8	3.354	53.96	100.65	100.78	99.98	99.43	98.74	98.52
9	3.242	53.26	101.41	101.03	100.47	99.96	99.46	99.16
10	3.234	54.29	100.77	100.81	100.22	99.71	99.15	98.66
11	3.237	53.52	100.86	100.75	100.28	99.61	99.07	98.86
12	3.253	53.82	100.63	100.15	100.09	99.46	98.96	98.79
13	3.239	53.57	101.12	100.50	100.22	99.63	98.99	98.39
14	3.309	53.68	100.82	100.69	100.19	99.57	98.96	98.64
15	3.248	54.54	100.28	100.15	99.76	99.39	98.94	98.55
16	3.257	53.12	100.45	100.15	100.06	99.51	98.96	98.44
17	3.241	53.28	101.03	100.38	100.00	99.31	98.87	98.50
18	3.286	53.78	100.67	100.43	98.31	97.77	97.21	96.75
19	3.243	53.46	99.68	99.46	99.08	98.54	98.04	97.46
20	3.238	52.92	101.04	100.66	100.40	99.92	99.21	98.72
21	3.237	53.40	100.49	100.04	99.89	99.33	98.67	98.22
22	3.241	53.45	100.82	100.56	100.34	99.78	99.27	98.39
23	3.240	53.85	100.87	100.22	99.78	99.02	98.44	97.81
24	3.240	53.35	100.96	100.34	100.22	99.68	98.99	98.13
25	3.393	54.25	100.31	100.04	99.47	98.89	98.38	98.05
Ave.	3.258	53.65	100.70	100.39	99.81	99.23	98.67	98.16
Med.	3.242	53.57	100.82	100.43	99.98	99.39	98.85	98.26
st dev	0.0390	0.3988	0.3771	0.4017	0.5309	0.5275	0.5195	0.5792
Min.	3.234	52.92	99.68	99.46	98.31	97.77	97.21	96.75
Max.	3.393	54.54	101.41	101.18	100.47	99.96	99.46	99.16

TM-21 Projection:

**Test Duration:** 6000 hours  
**Failures Observed:** 0  
 $\alpha$ : 5.297E-06  
 $\beta$ : 1.014  
**Calculated L<sub>70</sub>:** 70,000hours  
**Reported L<sub>70</sub>:** >36,000hours

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

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs
1	0.2618	0.5291	2708	0.0006	0.0006	0.0007	0.0011	0.0012	0.0017
2	0.2628	0.5312	2678	0.0004	0.0005	0.0006	0.0011	0.0011	0.0016
3	0.2601	0.5289	2743	0.0006	0.0006	0.0005	0.0007	0.0009	0.0013
4	0.2621	0.5283	2704	0.0004	0.0005	0.0007	0.0007	0.0009	0.0015
5	0.2602	0.5286	2743	0.0006	0.0006	0.0005	0.0012	0.0013	0.0013
6	0.2628	0.5303	2682	0.0005	0.0006	0.0009	0.0012	0.0013	0.0016
7	0.2606	0.5294	2730	0.0005	0.0007	0.0010	0.0015	0.0018	0.0018
8	0.2630	0.5312	2675	0.0004	0.0005	0.0009	0.0013	0.0015	0.0017
9	0.2615	0.5307	2707	0.0005	0.0004	0.0008	0.0011	0.0013	0.0017
10	0.2619	0.5290	2706	0.0004	0.0005	0.0010	0.0014	0.0015	0.0019
11	0.2629	0.5308	2678	0.0004	0.0007	0.0010	0.0013	0.0016	0.0017
12	0.2615	0.5304	2709	0.0004	0.0005	0.0010	0.0013	0.0017	0.0017
13	0.2592	0.5268	2773	0.0005	0.0007	0.0011	0.0014	0.0017	0.0018
14	0.2622	0.5301	2695	0.0006	0.0006	0.0009	0.0013	0.0016	0.0018
15	0.2621	0.5280	2706	0.0004	0.0006	0.0010	0.0013	0.0015	0.0018
16	0.2626	0.5283	2695	0.0006	0.0006	0.0011	0.0014	0.0016	0.0018
17	0.2621	0.5281	2705	0.0006	0.0006	0.0011	0.0015	0.0017	0.0019
18	0.2613	0.5281	2721	0.0005	0.0006	0.0007	0.0010	0.0012	0.0017
19	0.2629	0.5308	2678	0.0004	0.0008	0.0013	0.0014	0.0015	0.0017
20	0.2640	0.5316	2654	0.0006	0.0005	0.0009	0.0011	0.0013	0.0013
21	0.2629	0.5306	2678	0.0005	0.0005	0.0010	0.0014	0.0017	0.0017
22	0.2647	0.5316	2639	0.0006	0.0005	0.0009	0.0011	0.0012	0.0015
23	0.2621	0.5288	2703	0.0006	0.0007	0.0011	0.0015	0.0017	0.0017
24	0.2625	0.5302	2688	0.0003	0.0006	0.0010	0.0014	0.0017	0.0017
25	0.2621	0.5315	2691	0.0004	0.0005	0.0010	0.0017	0.0019	0.0017
Ave.	0.2621	0.5297	2700	0.0005	0.0006	0.0009	0.0013	0.0015	0.0017
Med.	0.2621	0.5301	2703	0.0005	0.0006	0.0010	0.0013	0.0015	0.0017
st dev	0.0012	0.0014	28.6328	0.0001	0.0001	0.0002	0.0002	0.0003	0.0002
Min.	0.2592	0.5268	2639	0.0003	0.0004	0.0005	0.0007	0.0009	0.0013
Max.	0.2647	0.5316	2773	0.0006	0.0008	0.0013	0.0017	0.0019	0.0019





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

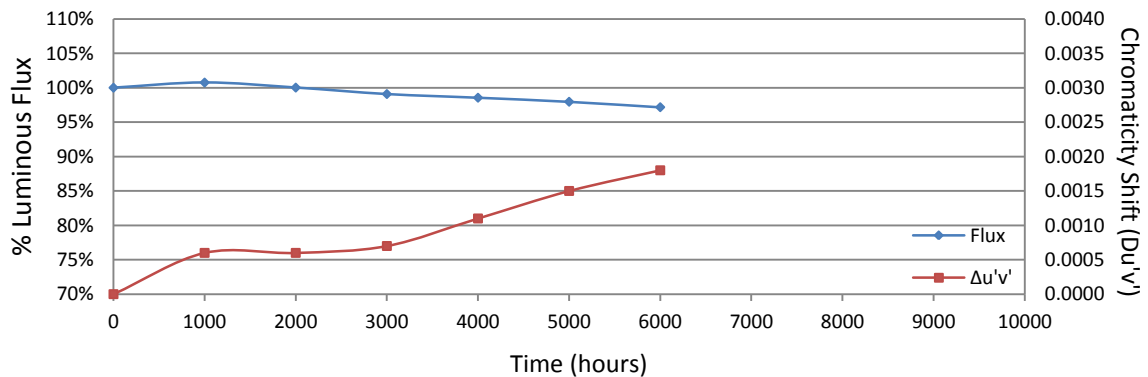
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	3.240	53.94	100.19	99.98	99.37	98.83	98.24	97.42
27	3.240	53.18	100.85	100.49	100.17	99.64	99.00	97.91
28	3.241	54.11	101.16	99.91	99.67	99.26	98.72	98.19
29	3.263	53.86	100.72	99.35	99.18	98.53	97.99	97.20
30	3.239	53.50	101.16	99.76	99.21	98.64	98.04	97.29
31	3.234	53.73	100.97	100.19	100.07	99.53	98.96	98.23
32	3.257	52.82	100.09	99.39	99.68	99.11	98.47	97.20
33	3.253	53.86	101.24	99.94	99.50	99.03	98.55	97.77
34	3.240	52.86	101.61	100.49	100.34	99.77	99.00	98.32
35	3.241	54.20	100.54	99.32	97.82	97.38	96.79	96.25
36	3.241	53.49	101.07	99.93	99.36	98.90	98.21	97.59
37	3.248	54.73	100.44	98.92	98.41	98.01	97.46	96.75
38	3.250	53.71	100.82	99.44	98.70	98.25	97.60	97.08
39	3.238	54.38	100.83	99.47	99.34	98.71	98.18	97.35
40	3.245	54.31	100.72	99.26	98.27	97.64	97.18	96.04
41	3.235	54.37	101.03	99.82	98.66	97.98	97.20	96.74
42	3.247	53.47	100.15	99.78	98.43	98.04	97.49	96.58
43	3.246	53.45	100.80	101.12	99.21	98.62	98.02	97.08
44	3.255	53.69	100.71	100.99	99.18	98.58	98.03	97.21
45	3.327	53.04	100.58	101.06	98.94	98.25	97.68	96.44
46	3.245	53.89	100.52	101.08	99.11	98.52	97.94	96.92
47	3.244	53.29	100.92	98.97	99.02	98.65	98.10	97.50
48	3.240	53.92	100.26	100.67	98.46	97.90	97.24	96.48
49	3.266	53.93	100.69	100.46	98.11	97.61	97.01	96.44
50	3.240	54.37	100.64	100.75	98.88	98.46	97.88	97.28
Ave.	3.249	53.76	100.75	100.02	99.08	98.55	97.96	97.17
Med.	3.244	53.86	100.72	99.93	99.18	98.58	98.02	97.20
st dev	0.0182	0.4962	0.3645	0.6777	0.6376	0.6303	0.6197	0.6212
Min.	3.234	52.82	100.09	98.92	97.82	97.38	96.79	96.04
Max.	3.327	54.73	101.61	101.12	100.34	99.77	99.00	98.32

**TM-21 Projection:**

**Test Duration:** 6000 hours  
**Failures Observed:** 0  
 $\alpha$ : 7.106E-06  
 $\beta$ : 1.014  
**Calculated L<sub>70</sub>:** 52,000hours  
**Reported L<sub>70</sub>:** >36,000hours

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

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	0.2629	0.5312	2678	0.0009	0.0007	0.0011	0.0011	0.0015	0.0017
27	0.2642	0.5323	2648	0.0005	0.0006	0.0011	0.0012	0.0015	0.0017
28	0.2631	0.5313	2673	0.0006	0.0006	0.0012	0.0016	0.0020	0.0021
29	0.2629	0.5300	2682	0.0006	0.0006	0.0012	0.0016	0.0019	0.0020
30	0.2608	0.5296	2726	0.0006	0.0006	0.0011	0.0015	0.0017	0.0019
31	0.2618	0.5304	2702	0.0005	0.0004	0.0009	0.0014	0.0017	0.0019
32	0.2666	0.5330	2598	0.0007	0.0005	0.0011	0.0015	0.0018	0.0019
33	0.2614	0.5296	2714	0.0005	0.0005	0.0010	0.0015	0.0019	0.0021
34	0.2625	0.5316	2684	0.0005	0.0005	0.0007	0.0010	0.0013	0.0017
35	0.2626	0.5292	2691	0.0006	0.0005	0.0013	0.0018	0.0022	0.0026
36	0.2623	0.5309	2691	0.0006	0.0006	0.0009	0.0015	0.0018	0.0024
37	0.2618	0.5301	2703	0.0005	0.0004	0.0006	0.0012	0.0015	0.0021
38	0.2626	0.5314	2681	0.0006	0.0006	0.0005	0.0010	0.0014	0.0019
39	0.2613	0.5300	2714	0.0006	0.0007	0.0004	0.0009	0.0013	0.0016
40	0.2613	0.5283	2722	0.0006	0.0006	0.0004	0.0009	0.0012	0.0016
41	0.2616	0.5317	2702	0.0005	0.0005	0.0006	0.0011	0.0015	0.0018
42	0.2611	0.5292	2722	0.0006	0.0005	0.0006	0.0009	0.0013	0.0017
43	0.2630	0.5306	2677	0.0005	0.0006	0.0004	0.0007	0.0010	0.0016
44	0.2626	0.5306	2685	0.0005	0.0006	0.0004	0.0008	0.0012	0.0015
45	0.2594	0.5242	2779	0.0006	0.0005	0.0005	0.0010	0.0014	0.0018
46	0.2628	0.5321	2675	0.0005	0.0006	0.0003	0.0006	0.0009	0.0016
47	0.2575	0.5252	2818	0.0006	0.0006	0.0005	0.0012	0.0014	0.0022
48	0.2626	0.5296	2689	0.0004	0.0006	0.0005	0.0005	0.0009	0.0014
49	0.2622	0.5303	2694	0.0004	0.0004	0.0005	0.0008	0.0012	0.0016
50	0.2619	0.5300	2703	0.0005	0.0005	0.0006	0.0009	0.0013	0.0016
Ave.	0.2621	0.5301	2698	0.0006	0.0006	0.0007	0.0011	0.0015	0.0018
Med.	0.2623	0.5303	2691	0.0006	0.0006	0.0006	0.0011	0.0014	0.0018
st dev	0.0016	0.0020	40.3583	0.0001	0.0001	0.0003	0.0003	0.0003	0.0003
Min.	0.2575	0.5242	2598	0.0004	0.0004	0.0003	0.0005	0.0009	0.0014
Max.	0.2666	0.5330	2818	0.0009	0.0007	0.0013	0.0018	0.0022	0.0026



**3.5 Data Set 3, 105°C, 150 mA (Lumen Maintenance)**

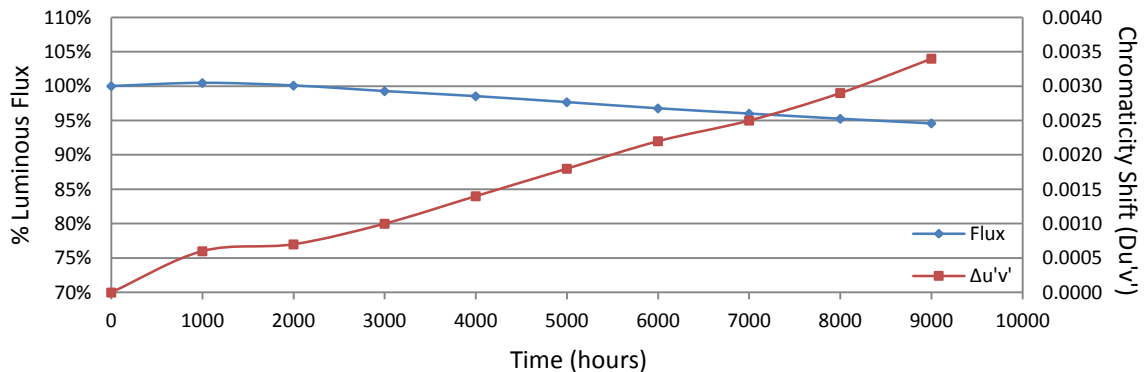
No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)								
			0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	3.277	52.75	99.55	98.92	98.14	97.50	96.63	96.04	95.37	94.79	94.05
52	3.252	54.10	99.74	99.43	99.02	98.30	97.52	97.39	95.95	95.80	95.40
53	3.259	54.19	99.78	99.02	98.03	97.18	96.35	95.26	94.67	93.93	93.15
54	3.242	54.21	100.39	100.22	99.52	98.75	97.86	96.85	96.55	95.65	94.78
55	3.248	53.66	100.75	100.52	100.19	99.44	98.66	97.76	97.34	96.72	96.03
56	3.240	54.29	100.79	100.92	99.76	99.06	98.23	97.22	96.30	95.54	95.01
57	3.233	54.53	100.40	100.39	99.32	98.68	97.89	96.57	95.98	95.25	94.77
58	3.242	54.36	99.80	99.85	98.31	97.65	96.76	95.90	95.05	94.11	93.43
59	3.244	53.92	100.63	100.50	99.67	98.78	97.96	97.31	96.68	95.77	95.09
60	3.235	54.17	99.96	100.44	99.22	98.49	97.58	96.75	95.46	94.50	93.83
61	3.240	53.58	100.91	100.34	100.84	99.94	99.20	98.45	97.54	97.03	96.44
62	3.240	53.18	100.94	100.43	100.26	99.68	98.76	97.84	97.14	96.24	95.58
63	3.245	53.73	101.14	100.78	100.41	99.55	98.72	97.58	97.28	96.31	95.66
64	3.369	54.02	99.80	99.87	99.33	98.63	97.76	96.72	96.35	95.39	94.56
65	3.256	53.98	100.54	99.89	98.98	98.22	97.42	96.41	95.61	94.74	93.94
66	3.265	52.86	101.06	100.66	99.60	98.88	98.05	96.80	96.54	95.71	94.89
67	3.250	53.73	100.82	100.67	98.98	98.16	97.25	95.57	95.18	94.55	93.86
68	3.260	53.56	100.58	98.84	97.93	97.12	96.19	95.01	94.32	93.41	92.72
69	3.246	52.84	100.34	98.98	96.99	96.27	95.46	94.78	94.28	93.47	92.75
70	3.235	53.95	99.76	99.59	98.94	98.15	97.16	96.66	95.72	94.87	94.09
71	3.255	53.57	99.72	98.60	98.34	97.61	96.66	96.40	95.35	95.02	94.42
72	3.248	54.31	100.94	101.09	100.07	99.26	98.43	97.53	97.20	96.35	95.71
73	3.242	53.88	100.87	100.61	100.13	99.39	98.48	97.90	96.71	95.75	95.03
74	3.233	52.37	101.32	101.22	99.68	99.01	98.07	97.90	96.30	95.78	95.11
75	3.242	53.36	101.01	100.28	100.13	99.49	98.65	96.66	95.31	94.92	94.34
Ave.	3.252	53.72	100.46	100.08	99.27	98.53	97.67	96.77	96.01	95.26	94.59
Med.	3.245	53.88	100.58	100.34	99.33	98.68	97.86	96.75	95.98	95.39	94.77
st dev	0.0266	0.5624	0.5427	0.7509	0.9222	0.9177	0.9328	0.9586	0.9423	0.9505	0.9793
Min.	3.233	52.37	99.55	98.60	96.99	96.27	95.46	94.78	94.28	93.41	92.72
Max.	3.369	54.53	101.32	101.22	100.84	99.94	99.20	98.45	97.54	97.03	96.44

**TM-21 Projection:**

**Test Duration:** 9000 hours  
**Failures Observed:** 0  
**α:** 8.197E-06  
**β:** 1.017  
**Calculated L<sub>70</sub>:** 46,000 hours  
**Reported L<sub>70</sub>:** 46,000 hours

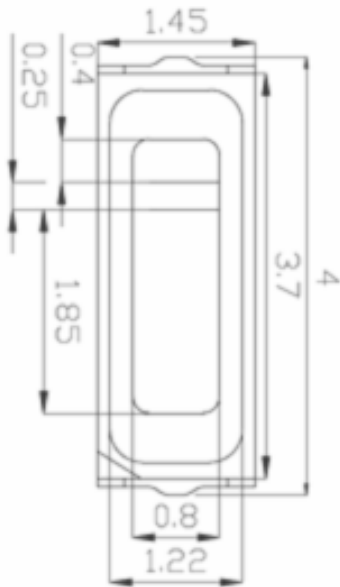
### 3.6 Data Set 3, 105°C, 150 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
51	0.2607	0.5294	2730	0.0005	0.0005	0.0012	0.0017	0.0021	0.0023	0.0026	0.0028	0.0033
52	0.2633	0.5313	2669	0.0004	0.0005	0.0019	0.0025	0.0028	0.0036	0.0039	0.0041	0.0041
53	0.2627	0.5310	2682	0.0008	0.0009	0.0013	0.0029	0.0032	0.0045	0.0046	0.0050	0.0046
54	0.2609	0.5283	2730	0.0006	0.0007	0.0011	0.0013	0.0017	0.0024	0.0032	0.0037	0.0032
55	0.2639	0.5324	2653	0.0004	0.0004	0.0008	0.0011	0.0015	0.0021	0.0028	0.0033	0.0030
56	0.2636	0.5314	2662	0.0005	0.0005	0.0008	0.0013	0.0017	0.0017	0.0025	0.0033	0.0028
57	0.2633	0.5311	2669	0.0005	0.0008	0.0011	0.0017	0.0021	0.0019	0.0023	0.0033	0.0033
58	0.2614	0.5304	2711	0.0005	0.0008	0.0011	0.0018	0.0022	0.0023	0.0024	0.0030	0.0033
59	0.2627	0.5290	2690	0.0005	0.0008	0.0012	0.0015	0.0017	0.0021	0.0022	0.0026	0.0034
60	0.2636	0.5320	2661	0.0006	0.0007	0.0010	0.0017	0.0022	0.0025	0.0026	0.0029	0.0037
61	0.2641	0.5312	2654	0.0005	0.0005	0.0004	0.0011	0.0014	0.0019	0.0021	0.0024	0.0032
62	0.2613	0.5281	2722	0.0006	0.0004	0.0006	0.0011	0.0015	0.0018	0.0020	0.0023	0.0032
63	0.2632	0.5290	2680	0.0006	0.0005	0.0006	0.0009	0.0011	0.0017	0.0022	0.0024	0.0030
64	0.2646	0.5341	2633	0.0006	0.0008	0.0012	0.0014	0.0018	0.0020	0.0025	0.0027	0.0033
65	0.2632	0.5295	2677	0.0005	0.0010	0.0008	0.0009	0.0010	0.0015	0.0020	0.0022	0.0028
66	0.2617	0.5309	2702	0.0005	0.0007	0.0009	0.0009	0.0013	0.0016	0.0018	0.0020	0.0026
67	0.2616	0.5286	2713	0.0006	0.0009	0.0009	0.0011	0.0013	0.0018	0.0021	0.0023	0.0029
68	0.2602	0.5301	2736	0.0006	0.0007	0.0007	0.0012	0.0015	0.0012	0.0018	0.0023	0.0032
69	0.2620	0.5310	2696	0.0005	0.0006	0.0007	0.0013	0.0017	0.0022	0.0025	0.0027	0.0035
70	0.2639	0.5303	2661	0.0008	0.0010	0.0012	0.0016	0.0019	0.0025	0.0028	0.0029	0.0038
71	0.2619	0.5305	2699	0.0006	0.0007	0.0009	0.0015	0.0018	0.0022	0.0025	0.0027	0.0036
72	0.2628	0.5297	2684	0.0006	0.0006	0.0008	0.0013	0.0016	0.0020	0.0024	0.0026	0.0034
73	0.2636	0.5315	2662	0.0004	0.0005	0.0006	0.0011	0.0014	0.0019	0.0022	0.0024	0.0034
74	0.2613	0.5310	2710	0.0005	0.0006	0.0009	0.0015	0.0017	0.0023	0.0025	0.0027	0.0035
75	0.2623	0.5299	2693	0.0006	0.0007	0.0008	0.0013	0.0016	0.0025	0.0028	0.0029	0.0038
Ave.	0.2626	0.5305	2687	0.0006	0.0007	0.0010	0.0014	0.0018	0.0022	0.0025	0.0029	0.0034
Med.	0.2627	0.5305	2684	0.0005	0.0007	0.0009	0.0013	0.0017	0.0021	0.0025	0.0027	0.0033
st dev	0.0012	0.0014	27.5328	0.0001	0.0002	0.0003	0.0005	0.0005	0.0007	0.0006	0.0007	0.0004
Min.	0.2602	0.5281	2633	0.0004	0.0004	0.0004	0.0009	0.0010	0.0012	0.0018	0.0020	0.0026
Max.	0.2646	0.5341	2736	0.0008	0.0010	0.0019	0.0029	0.0032	0.0045	0.0046	0.0050	0.0046



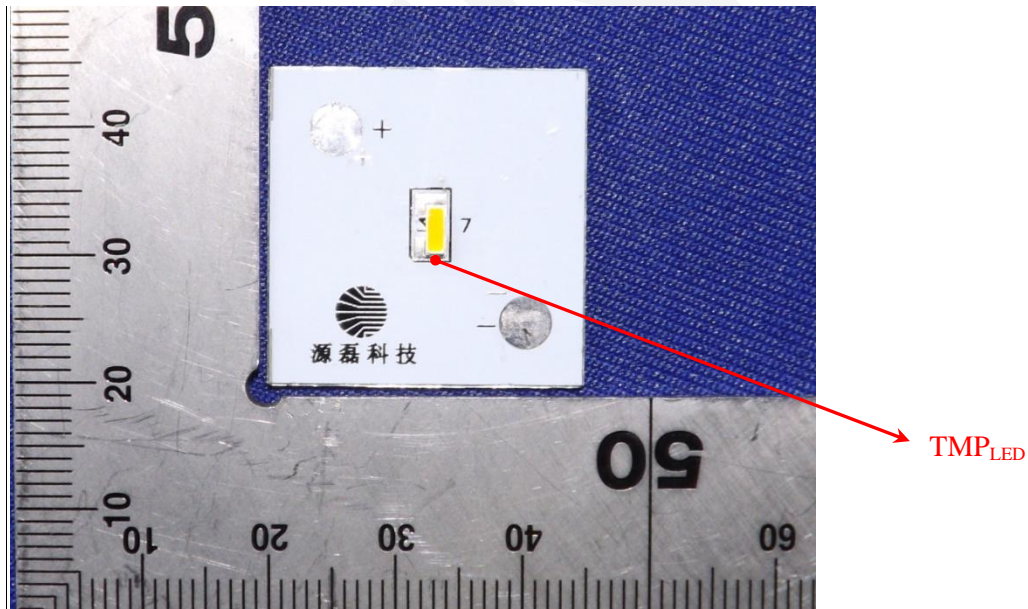
## Appendix A – EUT PHOTO

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



All dimensions are in millimeter

### A.2 EUT Photo



### Report Revision (LM-80)

Report Number	Report Date	Contents
RSZ141117511-10-9000	2015-12-16	Original report.
RSZ141117511-10-9000-M1	2016-07-26	Add L <sub>90</sub> Lifetime.

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