

IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT For

Guangzhou Tianxin Photoelectric Co., Ltd.

Registered address: commercial road East 1 Room 348, Xinhua Street, Huadu District of Guangzhou

Model:2548SW21

Report Type: 6000 Hours Test Report		Product Type: LED Array	
Test Engineer:	Pote Wang	<i>Pote Wang</i>	
Report Number:	R2DG160901050-10-M1		
Test Date:	2016-09-04 to 2017-05-12		
Report Date:	2017-05-23		
Revised Note:	The previous report R2DG160901050-10 is replaced by this report on 2019-02-26		
Reviewed By:	Daniel Duan / EE Manager	<i>Daniel Duan</i>	
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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:	2548SW21
Part Type:	LED Array
Nominal CCT:	2700K
Power:	48 W
Average Current Density per LED die:	603 mA/mm ²
Average Power Density per LED die:	1.8 W/ mm ²
CRI:	80
Die Spacing:	0.7mm

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)

This report covers the following models:

Model Name	Total Input Current (mA)	Power (W)	CCT (K)	Series	Parallel	Number of dies	Driver current per die (mA)	Current Density per Die(mA/mm ²)	Power Density per PCB(W/mm ²)	Die Spacing (mm)
2548SW21	1400	48	2700-6500	11	4	44	350	603	0.084	0.7
1936SW17	1050	36	2700-6500	11	3	33	350	603	0.083	0.7
1824SW14	700	24	2700-6500	11	2	22	350	603	0.075	0.7
1812SW14	700	24	2700-6500	11	2	11	350	603	0.038	0.7
1512SW11	350	12	2700-6500	11	1	11	350	603	0.048	0.7
1508SW11	350	12	2700-6500	11	1	7	350	603	0.032	0.7
1308SW08	350	8	2700-6500	7	1	7	350	603	0.045	0.7
1936SW17	1050	36	2700-6500	12	3	36	350	530	0.083	0.7
1824SW14	700	24	2700-6500	12	2	24	350	530	0.075	0.7
1812SW14	700	12	2700-6500	12	2	12	350	530	0.038	0.7
1512SW11	350	12	2700-6500	12	1	12	350	530	0.048	0.7
1508SW11	350	8	2700-6500	8	1	8	350	530	0.032	0.7
1308SW08	350	8	2700-6500	8	1	8	350	530	0.045	0.7

1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard 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 Industrial Area, Tangxia , Dongguan, Guangdong, China.

1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
1.0m integrating sphere	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
spectroradiometer	SENSING	SCD-20008	N/A	N/A	2016-07-11	2017-07-10
DC Power Supply	Hanshenpuyuan	HSPY-100-05	2013010210003	N/A	2016-05-18	2017-05-17
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Multilayer aging machine	BACL	B2-270	20013	25°C~130°C	2016-09-01	2017-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2016-07-07	2017-07-06
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2016-07-07	2017-07-06

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 26Pcs;

Each Ts test condition 13Pcs

The samples tested at Ts 85°C and Ts 105°C were received at 2016-09-01 and tested during 2016-09-04 to 2017-05-12. The samples were numbered from 1 to 13, 14 to 26.

Data Set 1: 85°C,1400mA

Part Number:	2548SW21
Number of Units:	13
Actual Case Temperature(T _S):	T _S =84.3°C
Actual Ambient Temperature(T _A):	T _A =81.6°C
Life Test Drive Current:	I _F =1400mA
Measurement Current:	I _F = 1400mA

Data Set 2: 105°C, 1400mA

Part Number:	2548SW21
Number of Units:	13
Actual Case Temperature(T _S):	T _S =104.6°C
Actual Ambient Temperature(T _A):	T _A =102.5°C
Life Test Drive Current:	I _F = 1400mA
Measurement Current:	I _F = 1400mA

2 - Summary of Test Result

Data Set:	Data Set 1, 85°C, 1400mA
Number of Units:	13
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	97.40%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0009
Reported TM-21 L_{70} Lifetime:	>33000 hours

Data Set:	Data Set 2, 105°C, 1400mA
Number of Units:	13
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.73%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0011
Reported TM-21 L_{70} Lifetime:	>33000 hours

3 - Test Data

3.1 Data Set 1, 85°C, 1400mA (Lumen Maintenance)

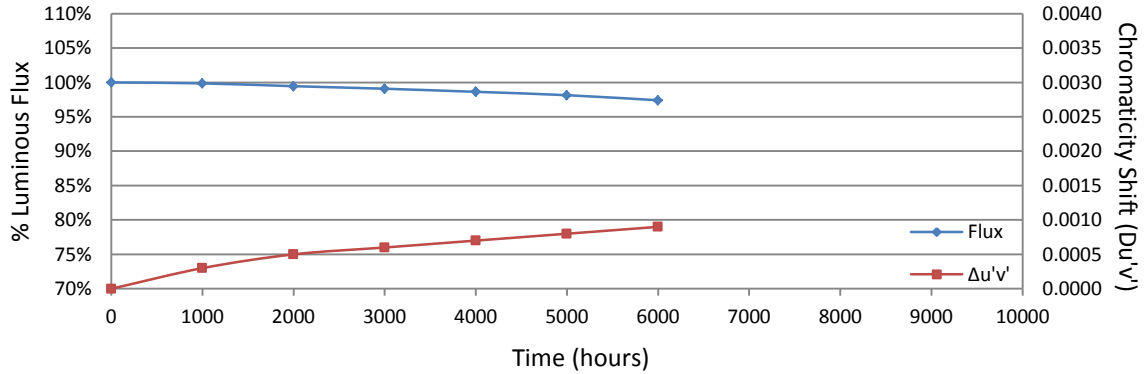
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	32.67	4121.51	99.77	99.56	99.26	98.55	98.05	97.53
2	32.99	4127.10	100.19	99.77	99.59	98.94	98.40	97.59
3	33.02	4115.92	100.05	99.70	99.38	99.04	98.55	97.69
4	32.75	4065.58	100.03	99.46	99.14	98.45	98.00	97.22
5	32.79	4037.62	100.02	99.52	99.25	98.85	98.41	97.74
6	32.82	4110.32	99.91	99.56	99.24	98.70	98.20	97.35
7	32.82	4015.25	99.72	99.44	98.90	98.45	97.97	97.18
8	32.60	4065.58	99.61	99.16	98.66	98.43	98.01	97.37
9	32.89	4076.77	99.75	99.45	99.05	98.64	98.08	97.41
10	32.59	4082.36	99.90	99.31	98.76	98.44	97.90	97.11
11	32.65	3864.26	99.94	99.33	98.88	98.35	97.86	97.36
12	32.86	4059.99	99.61	99.30	98.82	98.62	98.12	97.24
13	32.65	4138.28	99.65	99.34	99.11	98.76	98.26	97.36
Ave.	32.78	4067.73	99.86	99.45	99.08	98.63	98.14	97.40
Med.	32.79	4076.77	99.90	99.45	99.11	98.62	98.08	97.36
st dev	0.14	71.27	0.1868	0.1698	0.2680	0.2155	0.2129	0.1952
Min.	32.59	3864.26	99.61	99.16	98.66	98.35	97.86	97.11
Max.	33.02	4138.28	100.19	99.77	99.59	99.04	98.55	97.74

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 4.830E-06
 β : 1.004
Reported L₇₀: >33000 hours

3.2 Data Set 1, 85°C, 1400mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs
1	0.2629	0.5272	2692	0.0001	0.0006	0.0009	0.0011	0.0013	0.0015
2	0.2631	0.5273	2688	0.0001	0.0007	0.0009	0.0012	0.0013	0.0014
3	0.2627	0.5270	2698	0.0004	0.0006	0.0009	0.0010	0.0013	0.0015
4	0.2615	0.5275	2720	0.0004	0.0007	0.0008	0.0012	0.0011	0.0009
5	0.2639	0.5272	2672	0.0002	0.0004	0.0008	0.0008	0.0007	0.0008
6	0.2632	0.5274	2686	0.0003	0.0006	0.0005	0.0004	0.0007	0.0010
7	0.2625	0.5282	2696	0.0004	0.0006	0.0006	0.0008	0.0008	0.0007
8	0.2614	0.5272	2722	0.0003	0.0006	0.0008	0.0009	0.0008	0.0007
9	0.2637	0.5274	2674	0.0004	0.0006	0.0004	0.0006	0.0006	0.0006
10	0.2645	0.5278	2658	0.0002	0.0004	0.0003	0.0001	0.0001	0.0002
11	0.2627	0.5275	2694	0.0004	0.0004	0.0006	0.0008	0.0005	0.0008
12	0.2626	0.5272	2698	0.0002	0.0004	0.0002	0.0003	0.0005	0.0007
13	0.2626	0.5273	2698	0.0003	0.0001	0.0002	0.0004	0.0003	0.0005
Ave.	0.2629	0.5274	2692	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009
Med.	0.2627	0.5273	2694	0.0003	0.0006	0.0006	0.0008	0.0007	0.0008
st dev	0.0009	0.0003	18	0.0001	0.0002	0.0003	0.0003	0.0004	0.0004
Min.	0.2614	0.5270	2658	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002
Max.	0.2645	0.5282	2722	0.0004	0.0007	0.0009	0.0012	0.0013	0.0015



3.3 Data Set 2, 105°C, 1400mA (Lumen Maintenance)

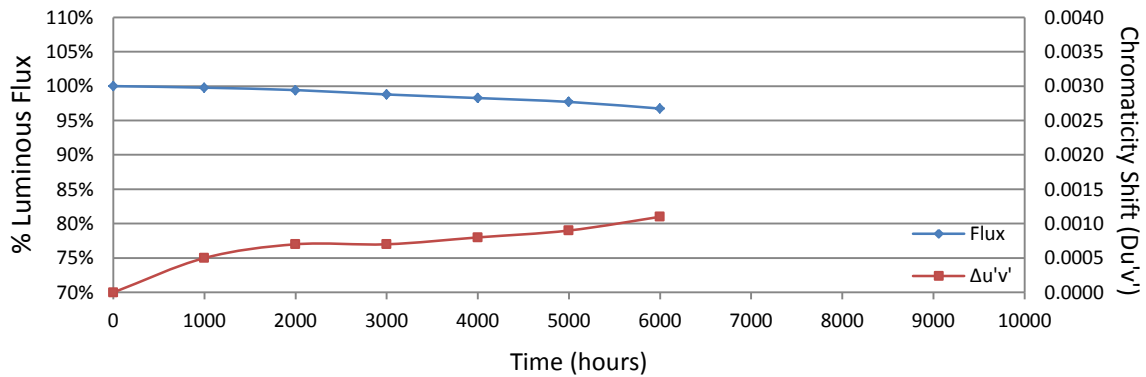
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
14	32.77	4099.14	99.76	99.32	98.70	98.09	97.50	96.51
15	32.74	4054.40	100.02	99.51	98.95	98.70	98.09	97.15
16	32.56	4127.10	99.91	99.50	99.09	98.36	97.82	96.95
17	32.87	4099.14	99.63	99.48	99.02	98.39	97.79	96.82
18	32.55	4121.51	99.70	99.64	98.95	98.56	97.97	97.05
19	32.60	4115.92	99.91	99.77	99.10	98.31	97.82	96.90
20	32.62	4104.73	100.04	99.76	99.21	99.04	98.54	97.76
21	32.70	3987.29	99.57	99.28	98.55	97.96	97.37	96.39
22	32.66	4059.99	99.47	99.33	98.56	98.04	97.48	96.34
23	32.55	4104.73	99.65	99.49	98.83	98.26	97.74	96.98
24	32.99	4104.73	99.77	99.08	98.34	97.75	97.17	96.04
25	32.86	4099.14	99.76	98.93	98.36	98.00	97.37	96.17
26	32.66	3970.52	99.77	99.41	98.55	97.96	97.41	96.39
Ave.	32.70	4080.64	99.77	99.42	98.78	98.26	97.70	96.73
Med.	32.66	4099.14	99.76	99.48	98.83	98.26	97.74	96.82
st dev	0.14	49.83	0.1718	0.2429	0.2941	0.3542	0.3705	0.4752
Min.	32.55	3970.52	99.47	98.93	98.34	97.75	97.17	96.04
Max.	32.99	4127.10	100.04	99.77	99.21	99.04	98.54	97.76

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 6.067E-06
 β : 1.006
Reported L₇₀: >33000 hours

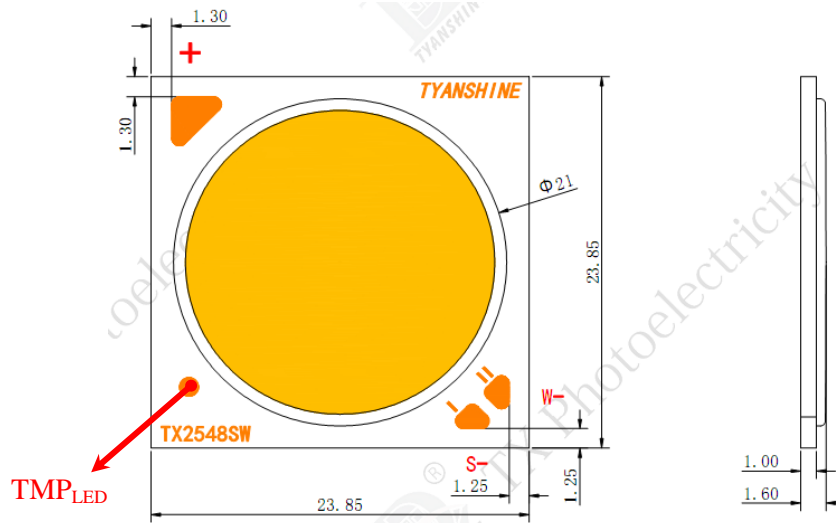
3.4 Data Set 2, 105°C, 1400mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
14	0.2631	0.5279	2684	0.0004	0.0003	0.0005	0.0007	0.0008	0.0008
15	0.2628	0.5277	2692	0.0006	0.0010	0.0011	0.0013	0.0016	0.0019
16	0.2635	0.5268	2680	0.0004	0.0007	0.0008	0.0007	0.0011	0.0016
17	0.2635	0.5273	2680	0.0005	0.0007	0.0006	0.0006	0.0010	0.0014
18	0.2632	0.5276	2686	0.0006	0.0008	0.0006	0.0006	0.0010	0.0015
19	0.2629	0.5269	2694	0.0005	0.0007	0.0008	0.0008	0.0008	0.0008
20	0.2636	0.5278	2676	0.0006	0.0006	0.0003	0.0003	0.0002	0.0005
21	0.2643	0.5275	2662	0.0004	0.0006	0.0008	0.0011	0.0010	0.0009
22	0.2617	0.5276	2716	0.0004	0.0006	0.0005	0.0007	0.0006	0.0006
23	0.2634	0.5273	2682	0.0006	0.0006	0.0007	0.0007	0.0004	0.0002
24	0.2625	0.5271	2702	0.0006	0.0008	0.0007	0.0009	0.0008	0.0008
25	0.2626	0.5267	2700	0.0005	0.0007	0.0009	0.0013	0.0011	0.0016
26	0.2639	0.5273	2672	0.0005	0.0004	0.0007	0.0009	0.0007	0.0011
Ave.	0.2632	0.5273	2687	0.0005	0.0007	0.0007	0.0008	0.0009	0.0011
Med.	0.2632	0.5273	2684	0.0005	0.0007	0.0007	0.0007	0.0008	0.0009
st dev	0.0007	0.0004	14	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005
Min.	0.2617	0.5267	2662	0.0004	0.0003	0.0003	0.0003	0.0002	0.0002
Max.	0.2643	0.5279	2716	0.0006	0.0010	0.0011	0.0013	0.0016	0.0019



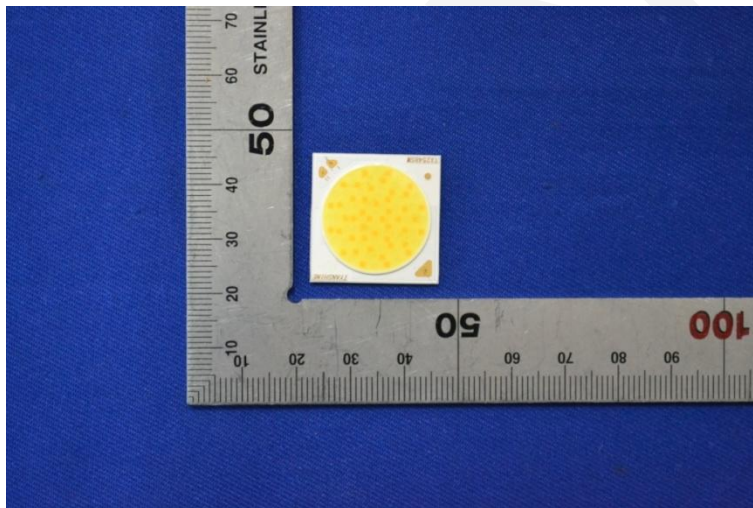
Attachment A – EUT Photo

A.1 Mechanical Dimensions (Ta = 25°C)



All dimensions are in millimeter

A.2 EUT Photo



A.3 Report Revision

Report Number	Report Date	Contents
R2DG160901050-10	2017-05-23	Original report.
R2DG160901050-10-M1	2019-02-26	Update the Logo of lab on the Page1 Update the Model on Page1&3&6 Add DUT Characteristics on page 3 according to ENERGY STAR requirements Add the Family products on page 3

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