

## IES LM-80-08

### MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCE

Report Number	Q131001
Test Sample	2T0301WW11000002
Rating	DC 300mA 1W
Normal CCT	2,700 K
Test Date	October 3,2013 to December 25 ,2014
Test Address	9F, NO.800, Chung-Cheng Rd., Chung-Ho Dist., New Taipei City 235, Taiwan
Test Standard	IES LM-80-08 Approved Method : Measuring Lumen Maintenance of Led Lighting Sources
Temp. Measure point	See page 3
Description of test equipment	See page 3
Test Engineer	Amos Huang <i>Amos Huang</i>
Review By	Kenny Yen <i>Kenny yen</i>

Notes:

1. The test center executes the test operations with prudent manners. All the test results are detail stated in the report. All test service meet under the regulations of ISO/IEC 17025.
2. The report is only responsible to the assigned test. It shall not be any of the bases of Compliance judgments.
3. There are 11 pages in the test report (include the cover page). It is invalid when being used separately.
4. The test report is forbidden to reproduce in separate pages. The complete report copy is unrestricted.
5. The recorded contents in this report shall not be used as advertising, publications or merchandising purposes without written permissions by the test center.
6. Lumen maintenance(lm) uncertainty=1.601%(K=1.97) at 95% confidence level.
7. Chromaticity(x,y) uncertainty=0.000018 (K=2) at 95% confidence level.

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## EDISON OPTO Laboratory Test Report

According to section 3 item 7 and section 4 item 5 of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the test report also applies to the following products:

Part Number	Normal CCT	Watt	W/mm <sup>2</sup>
2T0301CW1400001	5000K/5700K/6500K	1W	0.102
2T0301NW1100002	4000K	1W	0.102
2T0301WW1100002	2700K/3000K/3500K	1W	0.102

# EDISON OPTO Laboratory Test Report

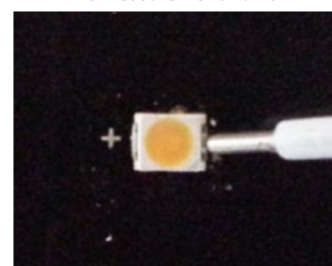
## 1. Test Summary

Case temperature (Ts)	83°C ≤ Ts	103°C ≤ Ts
Ambient conditions (T <sub>A</sub> )	80°C ≤ T <sub>A</sub> R.H. < 65 % Minimized airflow	100°C ≤ T <sub>A</sub> R.H. < 65 % Minimized airflow
Sample Size	24	24
Drive current of the LED	300mA	300mA
Initial flux (lm) / V <sub>f</sub> (V)	95.07 / 3.47	93.63 / 3.50
Lumen maintenance at 10,000 hrs	95.33% Page 5	93.70% Page 8
LED failure	0	0
Monitoring interval (hrs)	0,1000,2000,3000,4000,5000,6000,7000,8000,9000,10000	
Chromaticity shift	Page 7	Page 10

## 2. Case and ambient temperature

The case temperature T<sub>s</sub> is the temperature on the substrate; the ambient temperature T<sub>A</sub> is the temperature of the air at a distance of 50 mm above substrate.

Ts Measurement Point



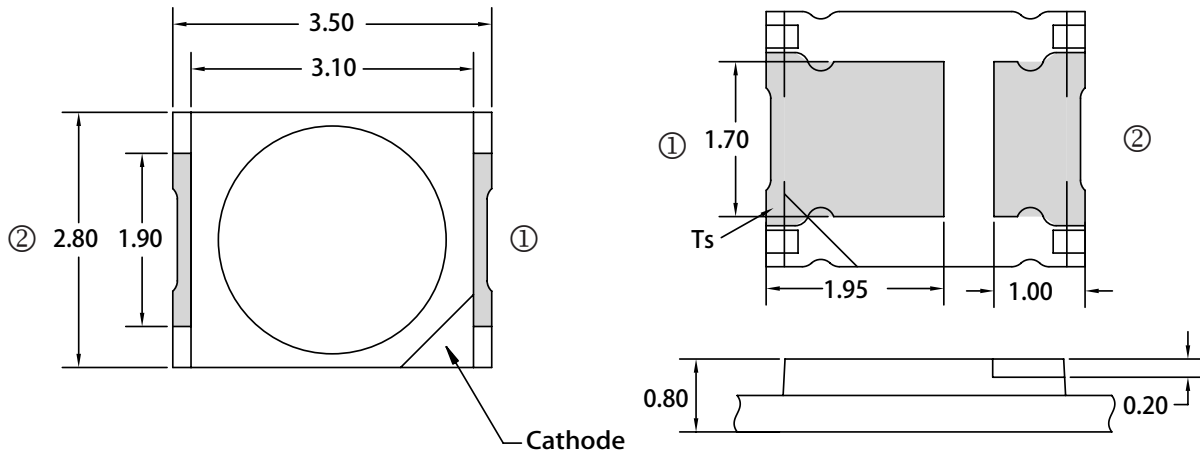
## 3. Description of test equipment

Equipment	Model No. / Serial No.	Cal. Laboratory/ Standard	Report No.	Effective Date
Integrating sphere	ISP250 45392012	Standard Light Source L7386A	14-11-BAC-498- 01L	01.12.2015
DC power source	KEITHLEY 2425 1347276	SGS Taiwan Ltd.	ECAC1606814	16.06.2015
Temperature controlled test	VEKTREX/ SpikeSafe 200	SGS Taiwan Ltd.	ECAC0780614A	27.03.2015
	VEKTREX/ ITCS 428		ECAC0780214A	
	VEKTREX/ ITCS 429		ECAC0780314A	
	VEKTREX/ ITCS 430		ECAC0780414A	
	VEKTREX/ ITCS 454		ECAC0780514A	

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**EDISON OPTO Laboratory Test Report**

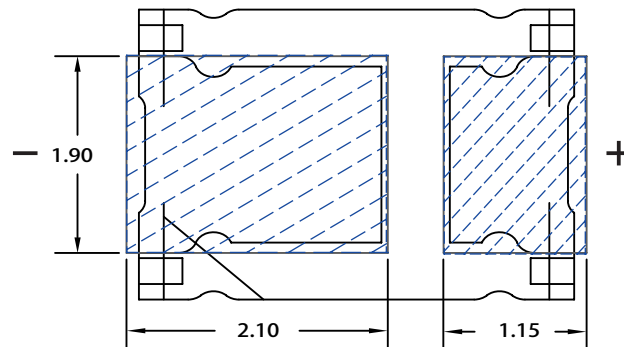
**Emitter Type Dimension**



**Circuit**



**Solder Pad**



- Notes:
1. All dimensions are measured in mm.
  2. Tolerance :  $\pm 0.1$  mm
  3. Ts = Soldering temperature (cathode side)

# EDISON OPTO Laboratory Test Report

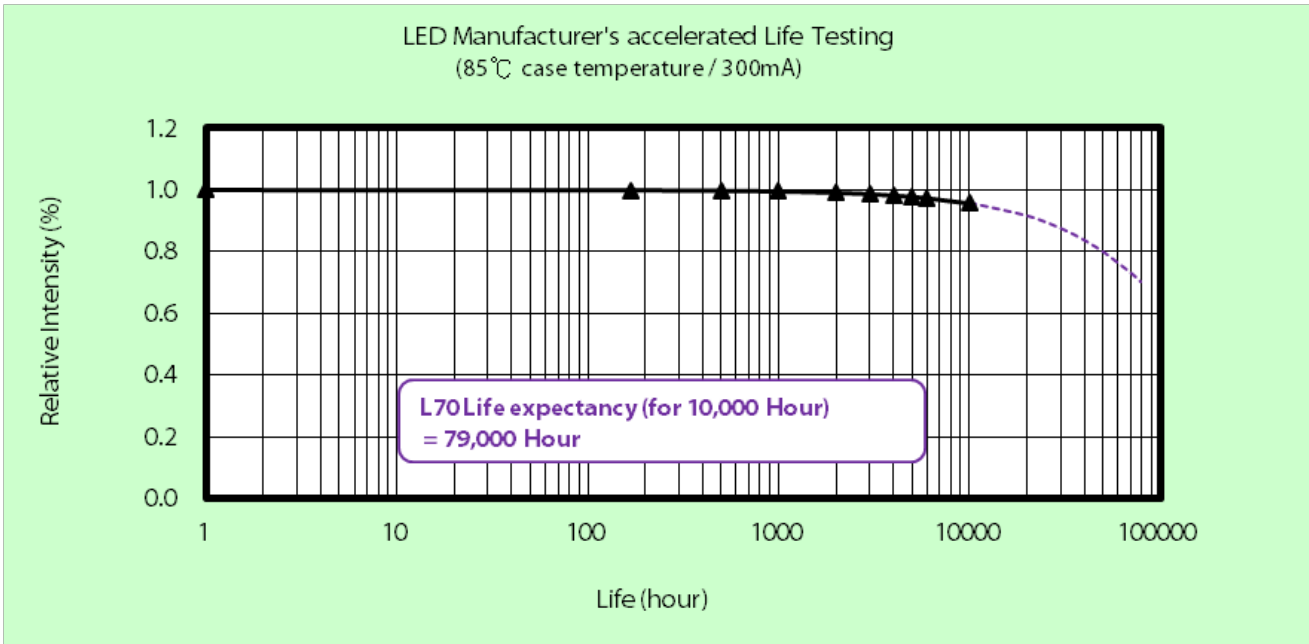
## 4. Test Results

### 4.1 Lumen and Color Maintenance data (85 °C)

#### ■ Lumen Maintenance data (85 °C)

No.	Im(Initial)	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	93.29	1	1.005	1.000	0.995	0.992	0.990	0.974	0.972	0.964	0.961	0.945
2	91.96	1	0.997	0.989	0.987	0.991	0.989	0.978	0.976	0.972	0.968	0.950
3	96.16	1	1.000	0.993	0.989	0.989	0.991	0.969	0.965	0.964	0.958	0.944
4	93.96	1	1.002	0.992	0.990	0.985	0.983	0.979	0.974	0.967	0.964	0.948
5	95.09	1	0.999	0.996	0.991	0.986	0.981	0.978	0.974	0.972	0.967	0.952
6	95.58	1	0.997	0.990	0.997	0.996	0.988	0.971	0.968	0.963	0.958	0.944
7	93.71	1	0.998	0.985	0.990	0.993	1.006	1.001	0.992	0.992	0.984	0.966
8	94.36	1	1.001	0.998	1.004	1.007	0.999	0.988	0.979	0.978	0.970	0.954
9	94.05	1	1.000	0.988	0.991	0.985	0.992	1.001	0.992	0.991	0.983	0.972
10	94.18	1	1.000	0.993	0.993	0.990	0.993	0.986	0.978	0.983	0.974	0.962
11	97.43	1	1.005	0.996	0.989	0.995	0.996	1.002	0.994	0.988	0.983	0.969
12	95.00	1	1.001	0.994	0.994	0.987	0.995	0.981	0.977	0.981	0.972	0.956
13	94.85	1	0.996	0.989	0.989	0.989	0.982	0.978	0.971	0.969	0.962	0.944
14	92.62	1	1.000	0.996	0.990	0.992	0.979	0.976	0.978	0.970	0.968	0.952
15	91.61	1	0.999	0.999	0.988	0.987	0.989	0.980	0.973	0.975	0.967	0.954
16	93.54	1	0.995	0.990	0.976	0.979	0.978	0.979	0.976	0.974	0.969	0.955
17	93.05	1	1.001	0.998	0.996	0.989	0.971	0.963	0.951	0.947	0.947	0.931
18	93.46	1	1.004	1.000	0.994	0.995	0.996	0.988	0.978	0.978	0.974	0.958
19	96.20	1	0.994	0.995	0.991	0.986	0.980	0.969	0.969	0.968	0.968	0.957
20	93.45	1	1.001	0.998	0.989	0.987	0.987	0.975	0.972	0.977	0.965	0.954
21	93.27	1	1.000	0.987	0.983	0.991	0.992	0.988	0.987	0.984	0.977	0.965
22	94.53	1	0.997	0.991	0.991	0.984	0.982	0.983	0.976	0.978	0.965	0.951
23	92.21	1	0.994	0.988	1.000	1.005	0.998	0.982	0.977	0.974	0.976	0.958
24	94.19	1	0.994	0.994	0.983	0.968	0.962	0.966	0.960	0.959	0.954	0.938
AVG	94.07	1	0.999	0.993	0.991	0.990	0.987	0.981	0.975	0.974	0.968	0.953
MIN	91.61	1	0.994	0.985	0.976	0.968	0.962	0.963	0.951	0.947	0.947	0.931
MAX	97.43	1	1.005	1.000	1.004	1.007	1.006	1.002	0.994	0.992	0.984	0.972

# EDISON OPTO Laboratory Test Report



Test Condition 1 - 85°C Case Temp	
Sample size	24
Number of failures	0
DUT drive current used in the test (mA)	300
Test duration (hours)	10,000
Test duration used for projection (hour to hour)	5,000 – 10,000
Tested case temperature (°C)	85
$\alpha$	4.654E-06
B	1.009
Calculated L70(10k) (hours)	79,000
Reported L70(10k) (hours)	>60000



# EDISON OPTO Laboratory Test Report

■ Color Maintenance data (85 °C)

$\Delta u'v'$

No.	CCT Initial	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	2688.7	0	0.0002	0.0007	0.0016	0.0015	0.0017	0.0018	0.0020	0.0023	0.0025	0.0027
2	2703.18	0	0.0001	0.0007	0.0015	0.0015	0.0012	0.0017	0.0020	0.0022	0.0023	0.0026
3	2651.65	0	0.0001	0.0007	0.0015	0.0015	0.0016	0.0016	0.0019	0.0020	0.0023	0.0026
4	2605.91	0	0.0002	0.0006	0.0014	0.0014	0.0009	0.0018	0.0019	0.0021	0.0022	0.0026
5	2625.26	0	0.0001	0.0007	0.0015	0.0015	0.0007	0.0019	0.0019	0.0020	0.0022	0.0023
6	2637.28	0	0.0002	0.0007	0.0015	0.0014	0.0010	0.0018	0.0020	0.0020	0.0022	0.0026
7	2695.15	0	0.0001	0.0007	0.0015	0.0015	0.0009	0.0018	0.0018	0.0020	0.0021	0.0024
8	2637.86	0	0.0002	0.0007	0.0014	0.0015	0.0007	0.0016	0.0017	0.0019	0.0021	0.0024
9	2634.06	0	0.0002	0.0004	0.0013	0.0013	0.0011	0.0018	0.0019	0.0020	0.0023	0.0025
10	2682.05	0	0.0001	0.0006	0.0014	0.0014	0.0014	0.0018	0.0021	0.0020	0.0023	0.0025
11	2730.64	0	0.0002	0.0007	0.0015	0.0016	0.0015	0.0018	0.0019	0.0020	0.0022	0.0024
12	2652.21	0	0.0002	0.0006	0.0014	0.0015	0.0014	0.0015	0.0016	0.0019	0.0021	0.0026
13	2664.58	0	0.0001	0.0007	0.0015	0.0016	0.0010	0.0017	0.0017	0.0017	0.0019	0.0022
14	2648.84	0	0.0001	0.0006	0.0015	0.0015	0.0010	0.0017	0.0016	0.0018	0.0019	0.0022
15	2698.08	0	0.0001	0.0006	0.0013	0.0014	0.0013	0.0017	0.0014	0.0016	0.0018	0.0021
16	2645.04	0	0.0001	0.0008	0.0020	0.0018	0.0015	0.0021	0.0023	0.0023	0.0023	0.0026
17	2724.16	0	0.0001	0.0006	0.0014	0.0010	0.0006	0.0012	0.0014	0.0014	0.0016	0.0018
18	2625.03	0	0.0002	0.0007	0.0013	0.0014	0.0012	0.0015	0.0015	0.0016	0.0017	0.0017
19	2667.92	0	0.0002	0.0004	0.0012	0.0012	0.0006	0.0013	0.0016	0.0018	0.0022	0.0024
20	2666.12	0	0.0002	0.0006	0.0016	0.0016	0.0009	0.0017	0.0017	0.0018	0.0021	0.0022
21	2630.54	0	0.0002	0.0006	0.0013	0.0014	0.0010	0.0015	0.0017	0.0018	0.0022	0.0024
22	2676.75	0	0.0002	0.0006	0.0014	0.0014	0.0014	0.0018	0.0019	0.0020	0.0022	0.0023
23	2641.44	0	0.0002	0.0008	0.0015	0.0015	0.0012	0.0016	0.0019	0.0020	0.0018	0.0021
24	2623.03	0	0.0002	0.0006	0.0015	0.0015	0.0006	0.0016	0.0018	0.0019	0.0022	0.0025
AVG	2660.64	0	0.0002	0.0006	0.0015	0.0015	0.0011	0.0017	0.0018	0.0019	0.0021	0.0024
MIN	2605.91	0	0.0001	0.0004	0.0012	0.0010	0.0006	0.0012	0.0014	0.0014	0.0016	0.0017
MAX	2730.64	0	0.0002	0.0008	0.0020	0.0018	0.0017	0.0021	0.0023	0.0023	0.0025	0.0027

# EDISON OPTO Laboratory Test Report

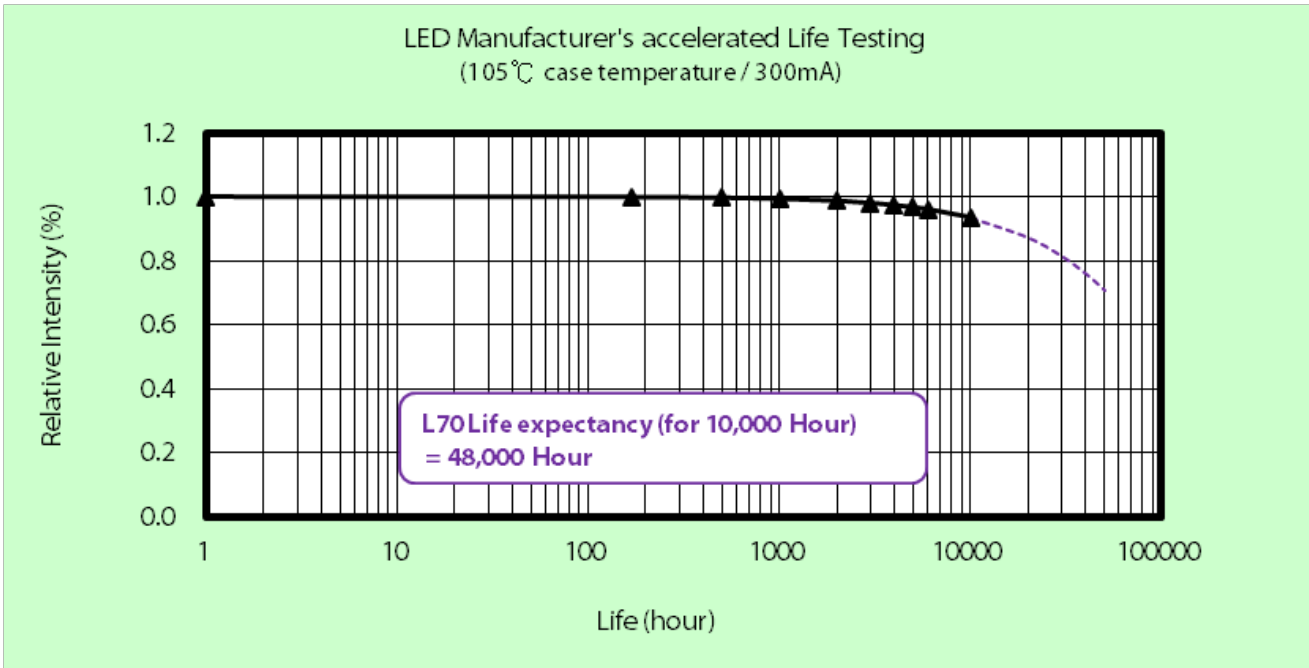
## 4.2 Lumen and Color Maintenance data (105 °C)

### ■ Lumen Maintenance data (105 °C)

No.	Im(Initial)	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	92.57	1	0.998	1.002	0.997	0.974	0.958	0.956	0.968	0.961	0.938	0.939
2	94.56	1	0.999	0.997	0.992	0.973	0.961	0.962	0.965	0.963	0.944	0.943
3	92.52	1	0.997	0.994	0.997	0.971	0.962	0.951	0.950	0.945	0.925	0.922
4	89.79	1	1.003	0.991	0.988	0.971	0.988	0.981	0.986	0.974	0.961	0.949
5	93.83	1	1.000	0.993	0.993	0.974	0.974	0.972	0.962	0.952	0.934	0.929
6	94.43	1	0.995	0.990	0.993	0.974	0.977	0.964	0.960	0.961	0.938	0.936
7	89.70	1	0.999	0.991	0.996	0.982	0.979	0.958	0.957	0.948	0.932	0.930
8	96.24	1	0.997	0.995	0.986	0.967	0.968	0.974	0.977	0.964	0.946	0.944
9	95.16	1	0.997	0.991	0.981	0.968	0.963	0.983	0.982	0.971	0.954	0.953
10	93.73	1	0.999	0.998	0.993	0.970	0.964	0.957	0.950	0.939	0.922	0.919
11	93.74	1	1.000	0.994	0.990	0.977	0.982	1.000	0.995	0.983	0.965	0.963
12	93.50	1	0.998	0.997	0.984	0.964	0.975	1.000	0.995	0.991	0.970	0.964
13	94.38	1	0.997	0.989	0.986	0.970	0.973	0.970	0.965	0.953	0.934	0.934
14	96.63	1	0.999	0.999	0.994	0.974	0.959	0.948	0.947	0.937	0.921	0.922
15	92.97	1	0.999	0.995	0.987	0.966	0.950	0.980	0.974	0.967	0.947	0.947
16	90.38	1	0.991	0.983	0.997	0.974	0.987	0.969	0.965	0.952	0.937	0.933
17	93.97	1	0.994	0.988	0.981	0.965	0.967	0.995	0.993	0.979	0.962	0.958
18	94.11	1	1.005	0.990	0.993	0.971	0.959	0.948	0.944	0.932	0.921	0.914
19	94.02	1	0.999	0.988	0.984	0.965	0.966	0.968	0.962	0.952	0.936	0.935
20	96.99	1	1.001	0.997	0.987	0.966	0.968	0.977	0.973	0.970	0.949	0.949
21	93.41	1	0.997	0.992	0.988	0.975	0.982	0.970	0.971	0.959	0.943	0.942
22	93.61	1	0.997	0.990	0.992	0.983	0.974	0.957	0.956	0.946	0.926	0.927
23	94.48	1	0.996	0.986	0.980	0.951	0.954	0.950	0.949	0.937	0.923	0.917
24	92.52	1	1.001	0.989	0.978	0.966	0.975	0.956	0.956	0.944	0.926	0.920
AVG	93.63	1	0.998	0.993	0.989	0.970	0.969	0.969	0.967	0.958	0.940	0.937
MIN	89.70	1	0.991	0.983	0.978	0.951	0.950	0.948	0.944	0.932	0.921	0.914
MAX	96.99	1	1.005	1.002	0.997	0.983	0.988	1.000	0.995	0.991	0.970	0.964



# EDISON OPTO Laboratory Test Report



Test Condition 2 - 105°C Case Temp	
Sample size	24
Number of failures	0
DUT drive current used in the test (mA)	300
Test duration (hours)	
Test duration used for projection (hour to hour)	5,000 – 10,000
Tested case temperature (°C)	105
$\alpha$	7.687E-06
B	1.013
Calculated L70(10k) (hours)	48,000
Reported L70(10k) (hours)	48,000

# EDISON OPTO Laboratory Test Report

■ Color Maintenance data (105 °C)

$\Delta u'v'$

No.	CCT Initial	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h	10000h
1	2601.61	0	0.0001	0.0005	0.0012	0.0006	0.0001	0.0014	0.0015	0.0017	0.0020	0.0022
2	2635.66	0	0.0001	0.0006	0.0015	0.0013	0.0010	0.0017	0.0018	0.0018	0.0021	0.0023
3	2653.77	0	0.0002	0.0006	0.0016	0.0013	0.0007	0.0019	0.0020	0.0022	0.0023	0.0024
4	2685.70	0	0.0001	0.0006	0.0015	0.0011	0.0011	0.0017	0.0017	0.0017	0.0018	0.0020
5	2717.51	0	0.0001	0.0005	0.0015	0.0012	0.0008	0.0016	0.0017	0.0016	0.0019	0.0020
6	2684.59	0	0.0001	0.0006	0.0015	0.0011	0.0007	0.0019	0.0020	0.0021	0.0023	0.0026
7	2626.89	0	0.0001	0.0007	0.0013	0.0008	0.0001	0.0018	0.0020	0.0021	0.0024	0.0028
8	2675.23	0	0.0001	0.0006	0.0017	0.0015	0.0012	0.0020	0.0021	0.0022	0.0023	0.0026
9	2662.56	0	0.0001	0.0007	0.0013	0.0008	0.0003	0.0017	0.0019	0.0021	0.0024	0.0027
10	2679.57	0	0.0001	0.0005	0.0013	0.0010	0.0006	0.0018	0.0018	0.0020	0.0022	0.0025
11	2646.17	0	0.0001	0.0005	0.0014	0.0009	0.0002	0.0018	0.0019	0.0019	0.0022	0.0025
12	2611.82	0	0.0001	0.0005	0.0011	0.0006	0.0004	0.0016	0.0017	0.0018	0.0021	0.0024
13	2667.80	0	0.0001	0.0006	0.0013	0.0010	0.0006	0.0019	0.0019	0.0023	0.0025	0.0026
14	2750.93	0	0.0001	0.0005	0.0014	0.0012	0.0006	0.0018	0.0021	0.0024	0.0026	0.0028
15	2614.82	0	0.0001	0.0006	0.0013	0.0009	0.0004	0.0017	0.0018	0.0018	0.0020	0.0024
16	2652.21	0	0.0002	0.0002	0.0018	0.0015	0.0012	0.0022	0.0022	0.0023	0.0025	0.0027
17	2659.23	0	0.0002	0.0006	0.0014	0.0012	0.0009	0.0015	0.0013	0.0014	0.0016	0.0019
18	2646.42	0	0.0002	0.0005	0.0016	0.0009	0.0003	0.0018	0.0019	0.0022	0.0023	0.0026
19	2650.73	0	0.0001	0.0008	0.0019	0.0016	0.0009	0.0023	0.0024	0.0027	0.0028	0.0031
20	2750.84	0	0.0001	0.0005	0.0014	0.0012	0.0010	0.0017	0.0019	0.0022	0.0024	0.0028
21	2674.92	0	0.0001	0.0005	0.0013	0.0012	0.0008	0.0016	0.0017	0.0018	0.0020	0.0022
22	2681.24	0	0.0001	0.0002	0.0012	0.0008	0.0003	0.0016	0.0017	0.0020	0.0022	0.0026
23	2627.97	0	0.0002	0.0006	0.0014	0.0011	0.0008	0.0017	0.0018	0.0019	0.0019	0.0022
24	2601.83	0	0.0001	0.0007	0.0016	0.0013	0.0008	0.0018	0.0019	0.0021	0.0022	0.0024
AVG	2660.83	0	0.0001	0.0006	0.0014	0.0011	0.0007	0.0018	0.0019	0.0020	0.0022	0.0025
MIN	2601.61	0	0.0001	0.0002	0.0011	0.0006	0.0001	0.0014	0.0013	0.0014	0.0016	0.0019
MAX	2750.93	0	0.0002	0.0008	0.0019	0.0016	0.0012	0.0023	0.0024	0.0027	0.0028	0.0031



## EDISON OPTO Laboratory Test Report

### 5. EPA Recognized Certification Laboratory Information

#### EPA Recognized Certification Bodies (CBs) and Laboratories List Results

Notes:

1. Only accredited laboratories are listed on this page. Laboratories that are EPA-recognized through enrolling in a Certification Body's WMTL or SMTL program are not listed here.
2. EPA encourages manufacturers to contact laboratories directly to ensure they have the capability and availability to test the particular products for which certification is sought, as some product types may require special testing equipment or capabilities. Manufacturers must also confirm with an EPA-recognized certification body (CB) that the laboratory is acceptable under the CB's program for that product type.
3. Windows, Doors, and Skylights partners are advised to contact the National Fenestration Rating Council([www.nfrc.org](http://www.nfrc.org) [EXIT ↗](#)) for a complete list of EPA-recognized laboratories for these products.
4. [Lighting \(CFLs, ILLs, Luminaires, and Decorative Light Strings\) Labs](#) and [CBs](#) are listed separately.
5. Please note, EPA recognizes the Association of Home Appliance Manufacturers (AHAM) only for administering verification testing.

Organization ID	Organization Name	Type of Recognized Body	If Lab is it 1st Party?	Programs	Organization Address	City	State	Country
1114690	Edison Opto Corporation - OPTO Testing Laboratory	Accredited Laboratory	Y	Luminaires	4F, NO.800, Chung-Cheng Rd., Chung-Ho Dist.,	New Taipei City	-	TW

### About Edison Opto

Edison Opto is a leading manufacturer of high power LED and a solution provider experienced in LDMS. LDMS is an integrated program derived from the four essential technologies in LED lighting applications- Thermal Management, Electrical Scheme, Mechanical Refinement, Optical Optimization, to provide customer with various LED components and modules. More Information about the company and our products can be found at [www.edison-opto.com](http://www.edison-opto.com)

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