



DesignLights Consortium Test Report

Reference Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

P.Q.L., Inc.

2285 Ward Avenue

Simi Valley, CA 93065

Test Laboratory:

UL-CCIC Company Limited

Test Laboratory Address:

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Catalog Number

55097

Project Number

4790285215

Report Number

4790285215_17R01

Test Date

2022-02-25~2022-03-02

Issue Date

2022-03-08

Revision Date

2022-04-07

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Wu, Elvis

The results contained in this report pertain only to the tested sample.

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Test Summary

DLC Technical Requirements V5.1- issued 2020-02-14

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	IES LM-79-2008	≥2000	-10%	5356.1
Minimum Luminaire Efficacy (lm/W)-Luminaires	IES LM-79-2008	≥110	-3%	124.85
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	±0.1	1.22
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	±0.1	1.28
Zonal Lumen Requirement 1(0°-60°)	IES LM-79-2008	≥75%	-3%	76.70%
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3496
Allowable CCT (5000K)	IES LM-79-2008/ANSI C78.377-2015	5029±283	N/A	5043
Minimum CRI	IES LM-79-2008/CIE 13.3-1995	≥80	-1	83
Minimum R9	IES LM-79-2008	≥0	-1	11.0
Minimum Rg	IES LM-79-2008	≥89	-1	95
Minimum Rf	IES LM-79-2008	≥70	-1	83
Rcs,h1	IES LM-79-2008	-12%-23%	-1%	-12%
Unified Glare Rating (UGR)	IES LM-79-2008	≤22	N/A	21.7
L70 Lumen maintenance (Hours)	N/A	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	N/A	≥36000	N/A	≥36000
Power Factor	ANSI C82.77-10-2014	≥0.9	-0.03	0.9579
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	5%	12.59%
In-Situ Temperature Measurement Test for LED 1 (°C)	UL1598-2008	≤105	N/A	47.1
In-Situ Temperature Measurement Test for Driver 1 (°C)	UL1598-2008	≤90	N/A	60.6
Max Chromaticity Shift (1000-6000h)	N/A	≤0.004	0.0004	0.0024
Minimum Luminaire Warranty (Years)	N/A	≥5	N/A	≥5



Test List

Sample Received Date: 2022-02-24

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2022-03-01	55102	Yang, Gavin X
Integrating Sphere Test	2022-02-28	55104	Yang, Gavin X
Goniophotometer Test	2022-02-25	55102	Yang, Gavin X
THD and PF Test	2022-02-25	55102	Yang, Gavin X
THD and PF Test	2022-02-25	55104	Yang, Gavin X
In-Situ Temperature Measurement Test	2022-03-02	55102	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. The accuracy method decision rule is applied when the compliance or verdict is made to the results of this report.
3. This report replace 4790285215_17, the report 4790285215_17 is terminated.



Product Description

Lamp/Luminaire Description: Integrated Retrofit Kits for 2x4 Luminaires

Model Number: 55102

Electrical Parameter: 120-277V, 50/60Hz

LED Package: STW8A2PD-XX

Family Model and Variation: 55097, 55104

Dimming Information: Continuous dimming capability

Remark: Housing Model Number: Lithonia 2GT8-4-32-A12-MVOLT-1/4

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
55097	4000k	5670	45	126
55104	5000k	5715	45	127

Photos of Products Characteristics





Integrating Sphere Test

Model No.	55102	Sample ID.	4702779
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assumed to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

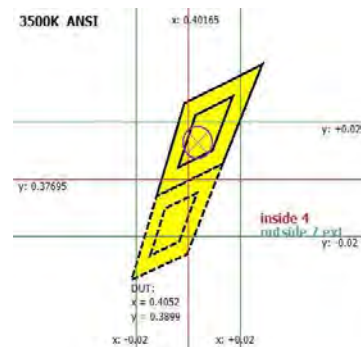
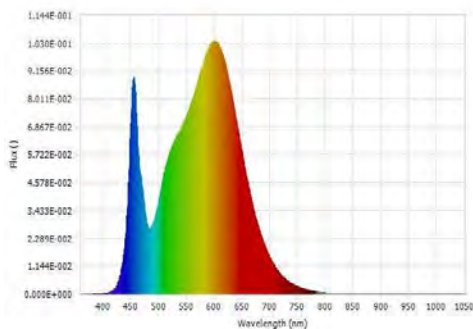
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.5	119.95	60	0.3613	42.931	0.9907	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3496	84	12.0	-0.0003	5393.66	125.64	N/A



Luminous Flux (lm)	5393.66	Chrom x	0.4052
Chrom y	0.3899	Chrom u	0.2360
Chrom v	0.3406	Duv	-0.0003
Chrom u'	0.2360	Chrom v'	0.5109
CCT (K)	3496	Luminous Efficacy (lm/W)	125.64
Ra	84	R1	83.0
R2	92.0	R3	96.0
R4	81.0	R5	82.0
R6	88.0	R7	84.0
R8	63.0	R9	12.0
R10	80.0	R11	80.0
R12	65.0	R13	85.0
R14	99.0	R15	76.0
Rf	84	Rg	95
Rcs,h1	-12%		



Integrating Sphere Test (Cont'd)

TM-30 Report

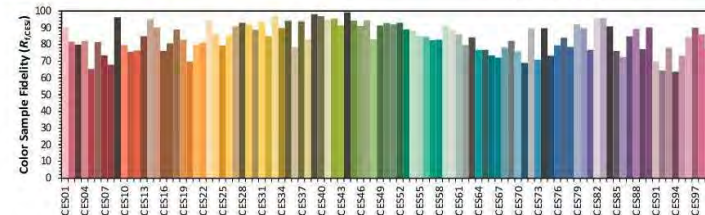
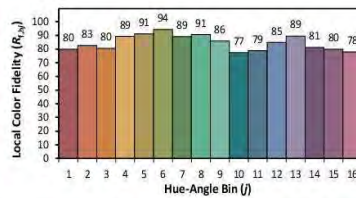
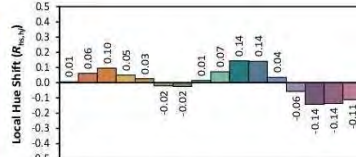
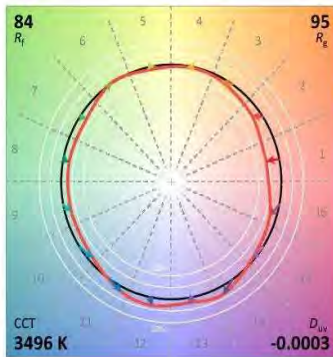
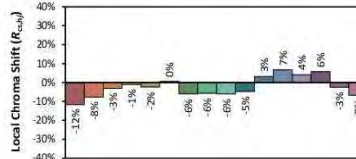
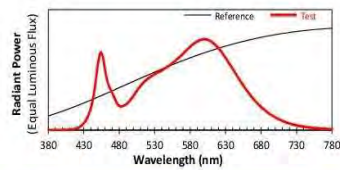
ANSI/IES TM-30-18 Color Rendition Report

Source: STW8A2PD-XX

Manufacturer: P.Q.L., Inc.

Date: 3/1/2022

Model: 55102



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.4052
 y 0.3899
 u' 0.2360
 v' 0.5109

CIE 13.3-1995 (CRI)

R_a 84
 R_9 12

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.



Integrating Sphere Test

Model No.	55104	Sample ID.	4702782
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assumed to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

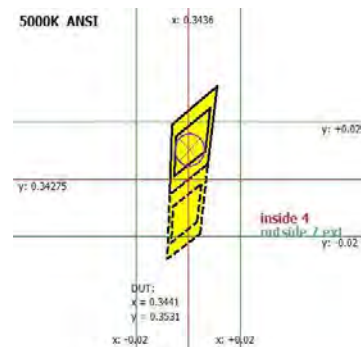
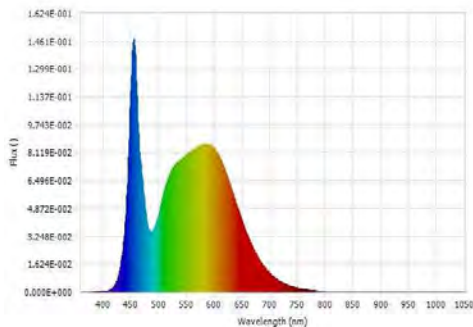
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.5	119.95	60	0.3629	43.127	0.9907	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
5043	83	11.0	0.0011	5445.15	126.26	N/A



Luminous Flux (lm)	5445.15	Chrom x	0.3441
Chrom y	0.3531	Chrom u	0.2102
Chrom v	0.3235	Duv	0.0011
Chrom u'	0.2102	Chrom v'	0.4852
CCT (K)	5043	Luminous Efficacy (lm/W)	126.26
Ra	83	R1	82.0
R2	90.0	R3	93.0
R4	82.0	R5	82.0
R6	84.0	R7	87.0
R8	68.0	R9	11.0
R10	74.0	R11	80.0
R12	59.0	R13	85.0
R14	97.0	R15	77.0
Rf	83	Rg	95
Rcs,h1	-12%		



Integrating Sphere Test (Cont'd)

TM-30 Report

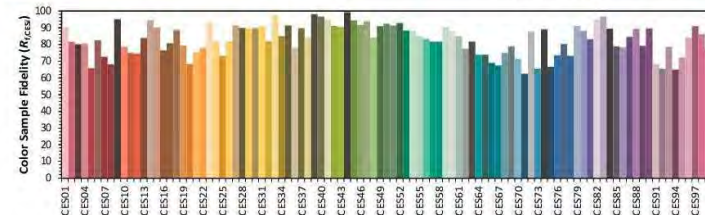
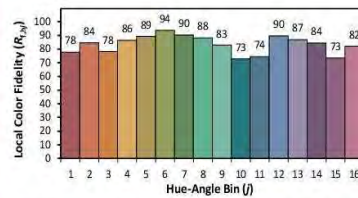
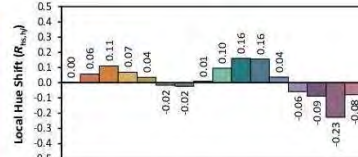
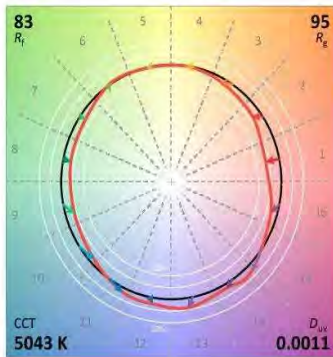
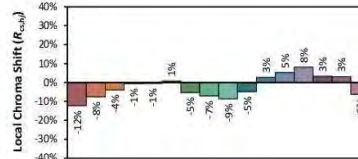
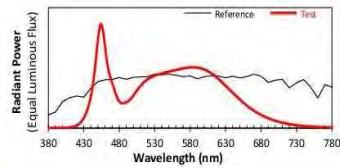
ANSI/IES TM-30-18 Color Rendition Report

Source: STW8A2PD-XX

Manufacturer: P.Q.L., Inc.

Date: 2/28/2022

Model: 55104



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.3441
 y 0.3531
 u' 0.2102
 v' 0.4852

CIE 13.3-1995
 (CRI)

R_a 83
 R₉ 11

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.



Goniophotometer Test

Model No.	55102	Sample ID.	4702779
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric parameters were measured using a type C goniophotometer and software.
- 3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	120.03	60	0.3606	42.90	0.9912	9.73%	Horizontal

Test Results

Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0°-60°	N/A	Horizontal Spread	Vertical Spread	
5356.1	76.70%	N/A	113.3	103.5	124.85

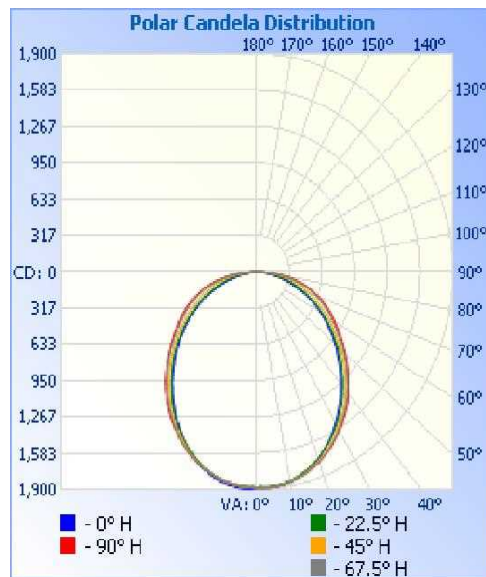
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
19.2	21.7	1.22	1.28

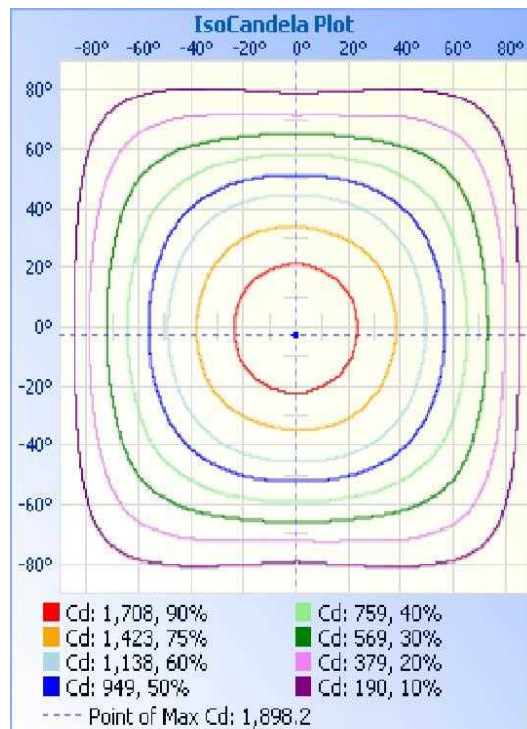


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)
Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1456.9	27.20%
0-40	2363.5	44.10%
0-60	4112.1	76.80%
60-90	1233.4	23.00%
70-100	575.7	10.70%
90-120	4.2	0.10%
0-90	5345.5	99.80%
90-180	10.6	0.20%
0-180	5356.1	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	45.1	0.80%	90-95	1.2	0.00%
5-10	133.9	2.50%	95-100	0.9	0.00%
10-15	217.8	4.10%	100-105	0.6	0.00%
15-20	293.6	5.50%	105-110	0.5	0.00%
20-25	358.0	6.70%	110-115	0.5	0.00%
25-30	408.6	7.60%	115-120	0.5	0.00%
30-35	443.7	8.30%	120-125	0.5	0.00%
35-40	462.8	8.60%	125-130	0.6	0.00%
40-45	465.4	8.70%	130-135	0.6	0.00%
45-50	455.2	8.50%	135-140	0.7	0.00%
50-55	431.1	8.00%	140-145	0.8	0.00%
55-60	396.9	7.40%	145-150	0.7	0.00%
60-65	355.1	6.60%	150-155	0.6	0.00%
65-70	304.7	5.70%	155-160	0.6	0.00%
70-75	246.7	4.60%	160-165	0.5	0.00%
75-80	182.4	3.40%	165-170	0.4	0.00%
80-85	110.5	2.10%	170-175	0.3	0.00%
85-90	34.1	0.60%	175-180	0.1	0.00%



Goniophotometer Test (Cont'd)
Intensity Data(cd)

Candela Table - Type C

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
1	1884	1872	1890	1888	1881	1890	1893	1887	1894	1873	1884	1879	1880	1884	1887	1880	1884
2	1888	1879	1888	1889	1886	1892	1894	1891	1896	1880	1882	1882	1877	1884	1888	1881	1888
3	1886	1878	1889	1890	1885	1890	1893	1891	1898	1880	1883	1881	1877	1884	1886	1882	1886
4	1888	1880	1890	1891	1880	1889	1892	1888	1897	1878	1882	1877	1880	1883	1890	1879	1888
5	1887	1876	1885	1883	1879	1891	1892	1885	1893	1878	1878	1876	1874	1878	1883	1876	1887
6	1884	1879	1881	1879	1879	1888	1890	1882	1890	1874	1876	1874	1870	1876	1879	1870	1884
7	1880	1866	1879	1878	1875	1881	1884	1878	1885	1871	1872	1866	1865	1872	1874	1868	1880
8	1876	1865	1875	1876	1874	1878	1882	1872	1882	1863	1868	1862	1864	1866	1869	1862	1876
9	1870	1857	1870	1868	1867	1873	1875	1869	1877	1860	1862	1858	1858	1862	1866	1856	1870
10	1864	1855	1864	1861	1858	1867	1867	1866	1870	1851	1852	1849	1850	1858	1859	1848	1864
11	1853	1846	1858	1855	1858	1863	1860	1849	1865	1842	1845	1844	1842	1849	1849	1838	1853
12	1847	1834	1843	1848	1846	1852	1853	1844	1852	1833	1837	1840	1838	1844	1842	1830	1847
13	1838	1827	1836	1838	1840	1845	1845	1835	1842	1825	1828	1829	1829	1835	1831	1819	1838
14	1825	1811	1830	1831	1833	1837	1836	1823	1832	1812	1818	1817	1821	1824	1822	1811	1825
15	1814	1803	1817	1824	1822	1830	1825	1812	1821	1802	1809	1808	1810	1815	1809	1798	1814
16	1802	1792	1806	1813	1813	1818	1814	1798	1805	1790	1795	1798	1800	1806	1798	1788	1802
17	1785	1778	1791	1800	1801	1809	1799	1786	1794	1778	1782	1789	1787	1796	1789	1773	1785
18	1772	1762	1780	1788	1790	1799	1787	1773	1781	1761	1770	1776	1778	1779	1775	1756	1772
19	1754	1748	1768	1779	1782	1785	1774	1758	1760	1746	1758	1764	1769	1770	1761	1746	1754
20	1741	1737	1754	1767	1769	1769	1760	1745	1741	1735	1744	1751	1755	1754	1745	1730	1741
25	1642	1648	1671	1688	1693	1689	1679	1654	1644	1644	1661	1678	1676	1675	1662	1636	1642
30	1529	1544	1572	1592	1599	1604	1576	1538	1531	1542	1565	1578	1587	1585	1563	1526	1529
35	1401	1427	1462	1481	1499	1496	1458	1410	1404	1427	1454	1474	1487	1482	1442	1397	1401
40	1271	1297	1337	1366	1381	1372	1322	1280	1277	1293	1330	1358	1370	1355	1312	1273	1271
45	1133	1161	1206	1238	1251	1232	1193	1151	1136	1157	1200	1231	1243	1225	1181	1145	1133
50	996	1026	1067	1107	1122	1103	1060	1019	996	1019	1061	1102	1117	1099	1057	1017	996
55	856	882	924	969	988	973	928	881	860	880	925	971	990	970	920	877	856
60	719	743	790	842	873	852	798	743	717	737	793	847	871	852	792	739	719
65	579	603	665	728	758	733	666	601	572	599	667	734	761	731	664	601	579
70	433	462	543	615	639	612	533	459	428	459	542	618	644	614	536	461	433
75	297	335	419	487	508	479	411	325	290	329	418	487	514	485	416	329	297
80	169	215	288	340	358	335	278	204	161	208	285	341	362	340	284	209	169
85	61	102	146	178	188	173	137	91	55	92	139	175	187	176	141	96	61
90	3	3	3	2	3	3	4	2	1	2	3	3	3	3	3	2	3
95	2	2	2	2	2	2	1	2	1	2	2	2	2	1	2	1	2
100	1	2	1	2	2	2	2	1	1	2	1	2	3	2	1	1	1
105	1	1	0	2	2	1	1	1	1	1	1	2	1	1	1	1	1
110	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1
115	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1
120	1	0	2	2	1	1	1	1	1	0	2	1	1	1	1	1	1
125	1	1	1	1	1	2	1	2	2	1	2	0	1	1	2	1	1
130	1	2	2	2	2	1	1	2	1	2	1	1	2	1	2	2	1
135	1	2	2	3	2	2	2	1	1	2	2	2	2	2	2	2	1
140	3	2	2	2	3	2	2	2	2	2	2	2	3	3	1	2	3
145	3	2	2	2	2	3	2	2	2	3	2	3	2	3	3	3	3
150	2	2	3	3	3	3	2	2	2	2	3	3	3	3	3	2	2
155	2	2	3	3	1	3	3	3	3	2	3	2	2	2	2	2	2
160	2	3	3	2	3	3	3	3	3	3	3	2	3	3	3	3	2
165	2	3	4	4	4	3	2	3	3	3	4	3	3	4	3	3	2
170	4	4	5	5	5	4	4	3	4	4	4	5	4	4	4	3	4
175	4	4	4	5	5	5	4	4	3	4	5	6	5	4	4	3	4
180	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4



THD and PF Test

Model No.	55102	Sample ID.	4702779
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	120.03	60	0.3606	42.90	0.9912	9.73%	Horizontal
25.1	276.99	60	0.1637	43.38	0.9579	12.57%	Horizontal



THD and PF Test

Model No.	55104	Sample ID.	4702782
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	120.02	60	0.3625	43.11	0.9911	9.82%	Horizontal
25.1	276.98	60	0.1639	43.61	0.9580	12.59%	Horizontal



In-Situ Temperature Measurement Test

Model No.	55102	Sample ID.	4702779
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.
3. The data and photos in LM-80 test report is provided by the customer/ The data and photos in driver specification is provided by the customer.

In-Situ Temperature Measurement Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.1	120.03	60	0.3606	42.90	0.9912	9.73%	Horizontal

Test Results (LEDs)

Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source ($^{\circ}\text{C}$)		Max Chromaticity Shift (1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp ($^{\circ}\text{C}$)
		Test Result	Test Result (Correct to $25\text{ }^{\circ}\text{C}$)				
Ambient TEMP	N/A	24.1	25.0				
TMP of Location 1	120	46.2	47.1	0.0024	STW8A2PD-XX	200	105

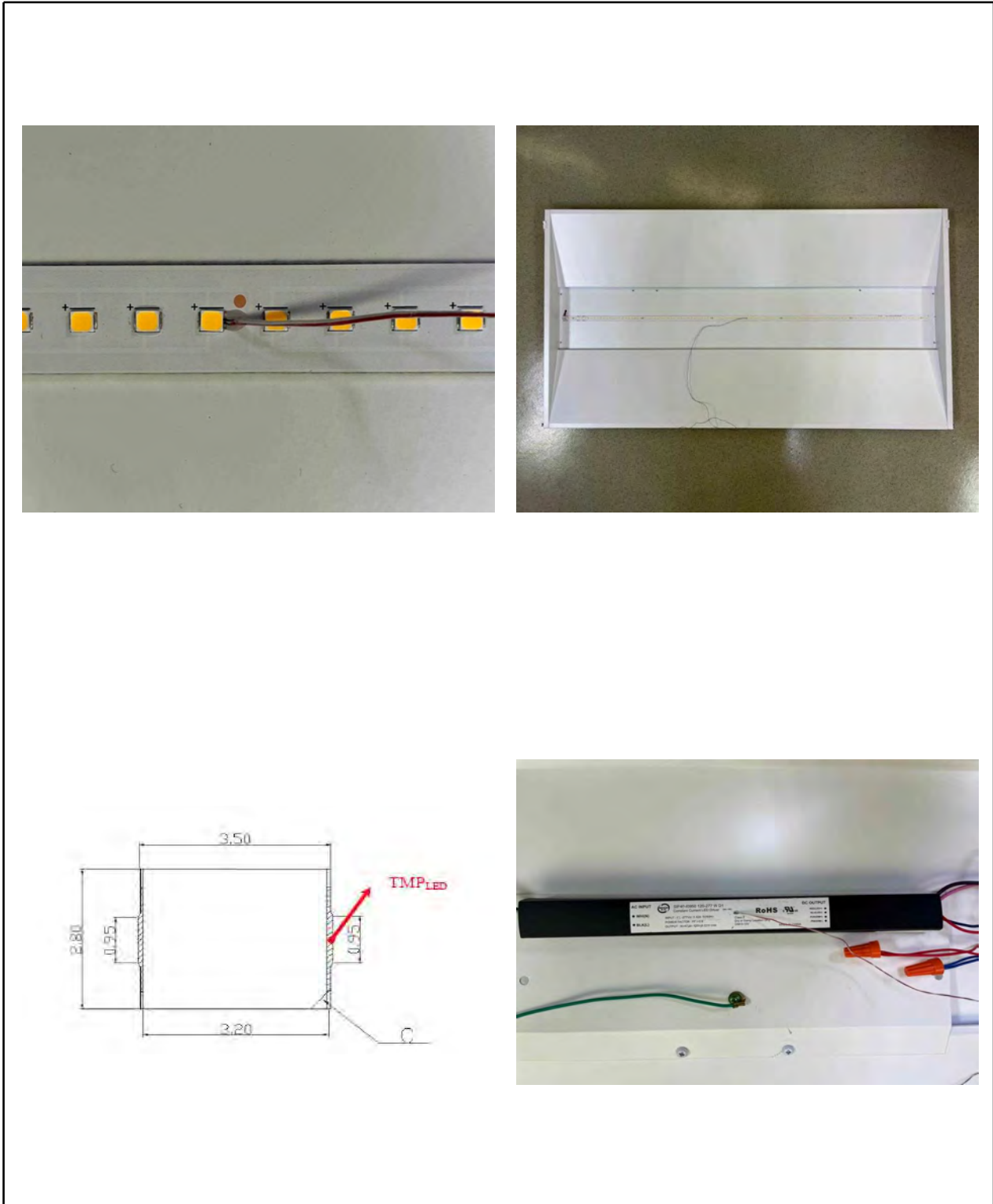
Test Results (Drivers)

Thermocouple Location	Temperature for Driver ($^{\circ}\text{C}$)		Driver Model Number	Driver Limit Temp ($^{\circ}\text{C}$)
	Test Result	Test Result (Correct to $25\text{ }^{\circ}\text{C}$)		
Ambient TEMP	24.1	25.0		
TMP of Location 1	59.7	60.6	SIF 40-I0950 120-277 W D1	85



In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers





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