



Photometric Test Report

Relevant Standards

- IES LM-79-2008
- ANSI C82.77-10-2014
- UL1598-2008

Prepared For

P.Q.L., Inc
2285 Ward Avenue
Simi Valley, CA 93065

Catalog Number

55222, 55223

Project Number

4788259862

Report Number

4788259862_14

Test Date

1/5/2018-1/9/2018

Issue Date

1/16/2018

Revision Date

Prepared By

Jonathan Xu

Approved By

Duff Yang

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

This report shall not be reproduced, except in full, without written approval of Underwriters Laboratories.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.



1.0 Test Summary

DLC Technical Requirements v4.2- issued 2017-04-28

Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	10000	13482.70	Pass
Minimum Bare Lamp Output (lm)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (0-180°)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (90-270°)	IES LM-79-2008	N/A	N/A	N/A
Zonal Lumen Requirement 1 (20°-50°)	IES LM-79-2008	30%	54.0%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	126.1	128.22	Pass
Minimum Bare Lamp Efficacy (lm/W)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008 ANSI C78.377-2015	5029±283	5141	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥70	82.45	Pass
L70 Lumen maintenance (hours)	IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES TM-21-2011	≥36000	≥36000	Pass
Power Factor	ANSI C82.77-10-2014	≥0.9	0.9625	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	9.38%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008	≤85	73.2	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008	≤90	52.8	Pass
Minimum Luminaire Warranty (years)	N/A	5	5	Pass



2.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	1/7/2018	55222	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	1/9/2018	55222	Elvis Wu
3	Goniophotometer Test	1/5/2018	55222	Elvis Wu
4	THD and PF Test	1/8/2018	55222	Elvis Wu
5	In-Situ Temperature Measurement Test	1/8/2018	55222	Elvis Wu

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.



3.0 Production Description

Luminaire Description: High-bay Luminaires for Commercial and Industrial Buildings

Model Number: 55222

Rated Voltage: 120-277V

Frequency: 50/60Hz

LED Package: STWxA2PD-xx

Family Model and Variation: 55222

Remark:

Photos of Luminaire Characteristics

Model Number	CCT (K)	Light Output (lm)	Power (W)	Luminous Efficacy (lm/W)
55222	4000	14300	110	130
55223	5000	14410	110	131





4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test for the lower CCT

Model No.	55222	Sample ID.	1335209
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.6A omnidirectional incandescent lamp and was calibrated by china seprei laboratory.

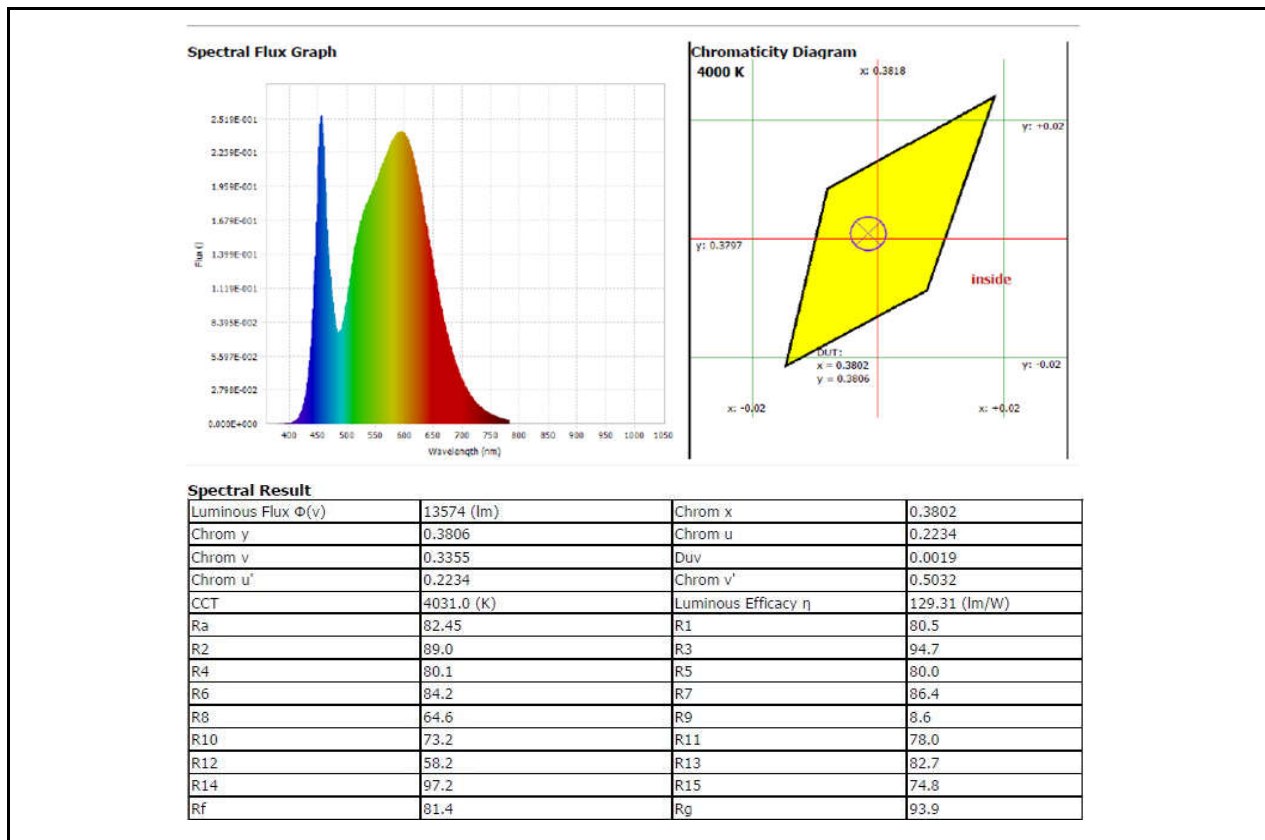
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption 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 (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.1	120.00	60	0.8809	104.97	0.9927	9.70%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
4031	82.45	0.0019	13574	129.31	N/A





4.0 LM-79 Measurement and Test Results

4.2 Integrating Sphere Test for the higher CCT

Model No.	55223	Sample ID.	1335211
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

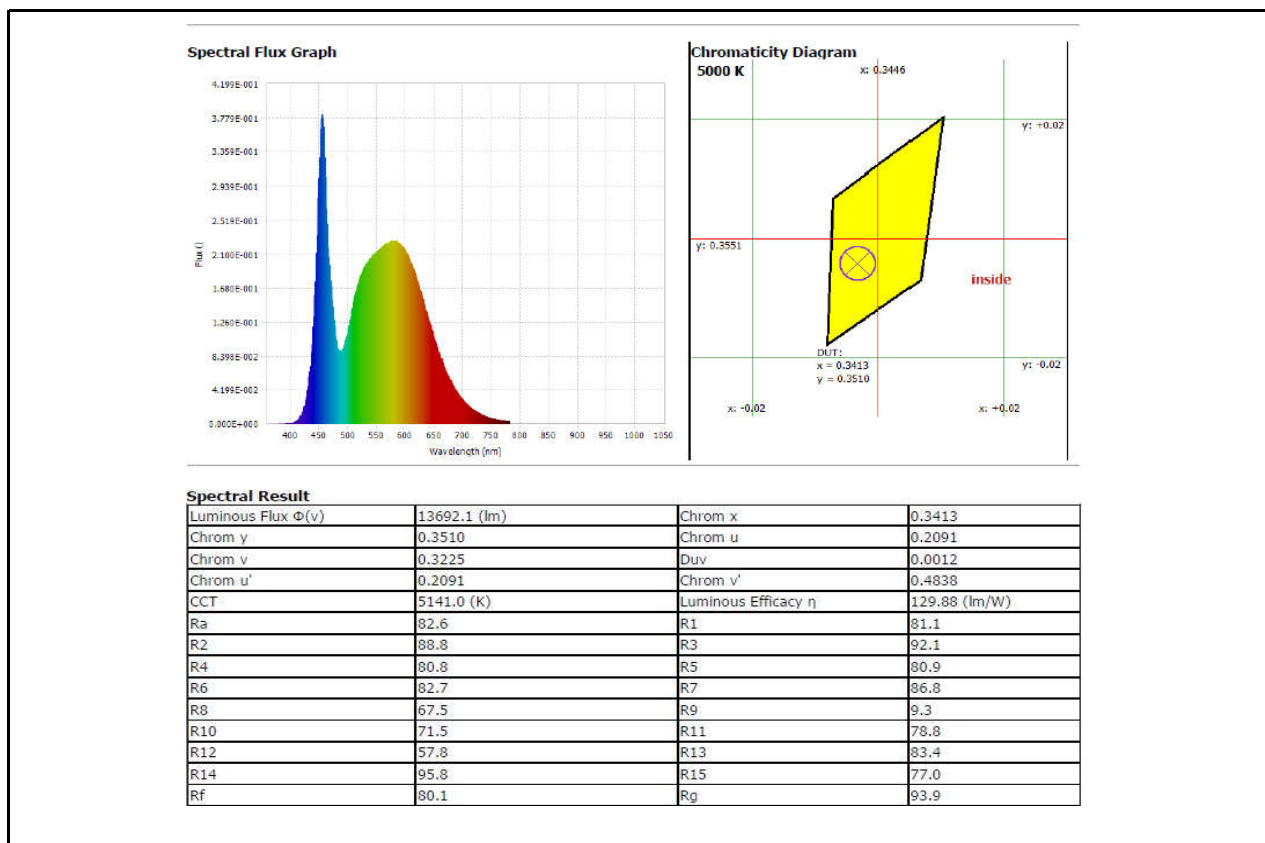
1.The sample was tested according to the IES LM-79-2008.
 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C ± 1° C.The reference standard lamp is rated current 2.6A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.
 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 was 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 (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.1	120.04	60	0.8851	105.42	0.9922	10.20%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
5141	82.6	0.0012	13692.1	129.88	N/A





5.0 LM-79 Measurement and Test Results

Model No.	55222	Sample ID.	1335209
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008.
- 2.Photometric paramters 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 3.865A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen 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

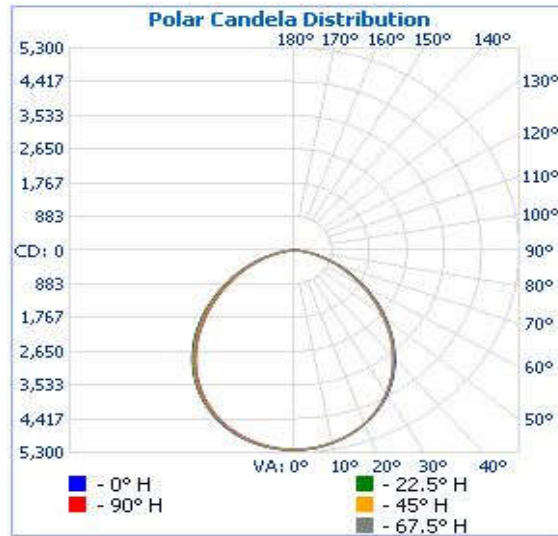
Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	120.02	60	0.8824	105.15	0.9928	9.71%	Horizontal

Test Result

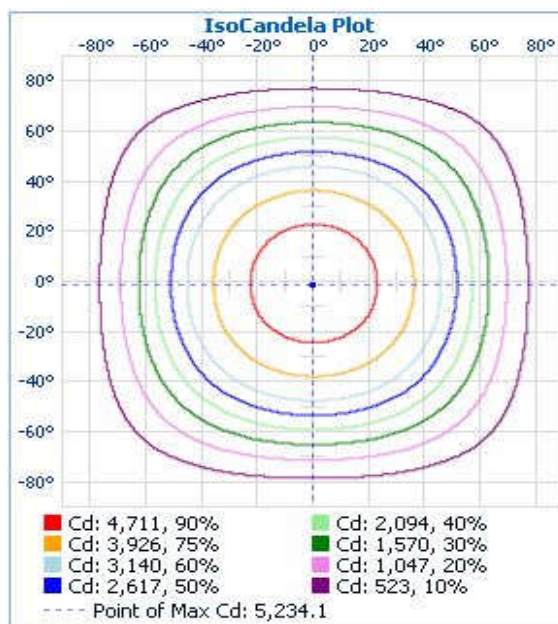
Flux (lm)	Zonal Lumen Requirement 1 (20°-50°)	Zonal Lumen Requirement 2	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
			Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
13482.7	54.0%	N/A	153.9	155.7	102.8	105.4	128.22
SC	SC						
0~180°	90°~270°						
N/A	N/A						



5.0 Goniophotometer Test (Cont'd)
Light Distribution Curve



IsoCandela Plot





5.0 Goniophotometer Test (Cont'd)
Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	4,039.7	30%
0-40	6,562.3	48.7%
0-60	11,160.0	82.8%
60-90	2,321.1	17.2%
70-100	880.2	6.5%
90-120	0	0%
0-90	13,481.1	100%
90-180	0	0%
0-180	13,481.1	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	124.6	0.9%	90-95	0	0%
5-10	369.4	2.7%	95-100	0	0%
10-15	601.5	4.5%	100-105	0	0%
15-20	812.6	6.0%	105-110	0	0%
20-25	993.7	7.4%	110-115	0	0%
25-30	1,137.8	8.4%	115-120	0	0%
30-35	1,237.0	9.2%	120-125	0	0%
35-40	1,285.6	9.5%	125-130	0	0%
40-45	1,280.6	9.5%	130-135	0	0%
45-50	1,223.0	9.1%	135-140	0	0%
50-55	1,118.5	8.3%	140-145	0	0%
55-60	975.6	7.2%	145-150	0	0%
60-65	809.4	6.0%	150-155	0	0%
65-70	631.5	4.7%	155-160	0	0%
70-75	448.7	3.3%	160-165	0	0%
75-80	275.1	2.0%	165-170	0	0%
80-85	127.6	0.9%	170-175	0	0%
85-90	28.8	0.2%	175-180	0	0%



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

	0	22.5	45	67.5	90	113	135	158	180	203	225	247.5	270	293	315	338	360
0	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226	5226
1	5233	5223	5223	5224	5219	5226	5226	5225	5234	5225	5226	5226	5219	5224	5223	5223	5233
2	5229	5219	5219	5219	5215	5223	5223	5232	5223	5223	5223	5223	5215	5219	5219	5219	5229
3	5224	5212	5212	5214	5210	5219	5218	5219	5228	5219	5218	5219	5210	5214	5212	5212	5224
4	5215	5205	5204	5205	5202	5211	5212	5213	5222	5213	5212	5211	5202	5205	5204	5205	5215
5	5207	5195	5194	5196	5192	5202	5204	5205	5214	5205	5204	5202	5192	5196	5194	5195	5207
6	5194	5183	5182	5183	5181	5189	5194	5196	5206	5196	5194	5189	5181	5183	5182	5183	5194
7	5182	5169	5169	5170	5167	5176	5182	5184	5194	5184	5182	5176	5167	5170	5169	5169	5182
8	5167	5155	5154	5155	5151	5162	5168	5172	5182	5172	5168	5162	5151	5155	5154	5155	5167
9	5149	5138	5138	5139	5134	5147	5153	5157	5168	5157	5153	5147	5134	5139	5138	5138	5149
10	5131	5120	5120	5120	5116	5129	5136	5139	5152	5139	5136	5129	5116	5120	5120	5120	5131
11	5110	5100	5100	5101	5095	5110	5117	5122	5134	5122	5117	5110	5095	5101	5100	5100	5110
12	5088	5080	5079	5080	5074	5088	5097	5102	5114	5102	5097	5088	5074	5080	5079	5080	5088
13	5064	5056	5056	5057	5049	5065	5074	5080	5092	5080	5074	5065	5049	5057	5056	5056	5064
14	5039	5031	5032	5032	5024	5040	5050	5056	5070	5056	5050	5040	5024	5032	5032	5031	5039
15	5012	5004	5005	5004	4996	5012	5024	5031	5045	5031	5024	5012	4996	5004	5005	5004	5012
16	4982	4973	4976	4974	4966	4983	4994	5004	5017	5004	4994	4983	4966	4974	4976	4973	4982
17	4952	4943	4943	4942	4934	4951	4964	4973	4989	4973	4964	4951	4934	4942	4943	4943	4952
18	4918	4909	4910	4908	4901	4917	4931	4942	4957	4942	4931	4917	4901	4908	4910	4909	4918
19	4883	4873	4874	4871	4866	4882	4896	4906	4924	4906	4896	4882	4866	4871	4874	4873	4883
20	4845	4836	4835	4832	4828	4843	4858	4870	4888	4870	4858	4843	4828	4832	4835	4836	4845
25	4633	4616	4613	4607	4608	4623	4644	4662	4676	4662	4644	4623	4608	4607	4613	4616	4633
30	4372	4349	4341	4333	4332	4354	4382	4404	4412	4404	4382	4354	4332	4333	4341	4349	4372
35	4054	4029	4018	4004	4003	4030	4065	4092	4099	4092	4065	4030	4003	4004	4018	4029	4054
40	3680	3659	3642	3626	3622	3651	3694	3730	3741	3730	3694	3651	3622	3626	3642	3659	3680
45	3266	3247	3226	3200	3197	3230	3280	3322	3342	3322	3280	3230	3197	3200	3226	3247	3266
50	2828	2806	2779	2749	2745	2778	2835	2886	2899	2886	2835	2778	2745	2749	2779	2806	2828
55	2375	2347	2318	2281	2280	2313	2375	2427	2439	2427	2375	2313	2280	2281	2318	2347	2375
60	1918	1892	1858	1822	1821	1853	1914	1969	1978	1969	1914	1853	1821	1822	1858	1892	1918
65	1485	1462	1426	1396	1398	1425	1480	1536	1544	1536	1480	1425	1398	1396	1426	1462	1485
70	1070	1050	1018	996	1000	1022	1068	1119	1129	1119	1068	1022	1000	996	1018	1050	1070
75	698	679	650	636	647	662	695	738	746	738	695	662	647	636	650	679	698
80	369	352	333	337	349	356	369	403	406	403	369	356	349	337	333	352	369
85	121	109	112	118	125	131	135	142	144	142	135	131	125	118	112	109	121
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



6.0 THD and PF Test

Model No.	55222	Sample ID.	1335209
------------------	-------	-------------------	---------

Test Method

1. The samples were tested according to the ANSI C82.77-2002.
2. The ambient temperature condition was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.1	276.99	60	0.3836	102.28	0.9625	9.38%



7.0 In-Situ Temperature Measurement Test

Model No.	55222	Sample ID.	1335209
-----------	-------	------------	---------

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14.
 2. The testing was conducted in a room with ambient temperature of 25°C ± 5°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. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
27.3	120.02	60	0.8824	105.150	0.9928	Horizontal

Test Results(LED)

Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result Column	Test Result (Correct to 25 °C)			
TMP of LEDs	100	75.5	73.2	STWxA2PD-xx	300	85
Ambient Temperature	N/A	27.3	25.0			

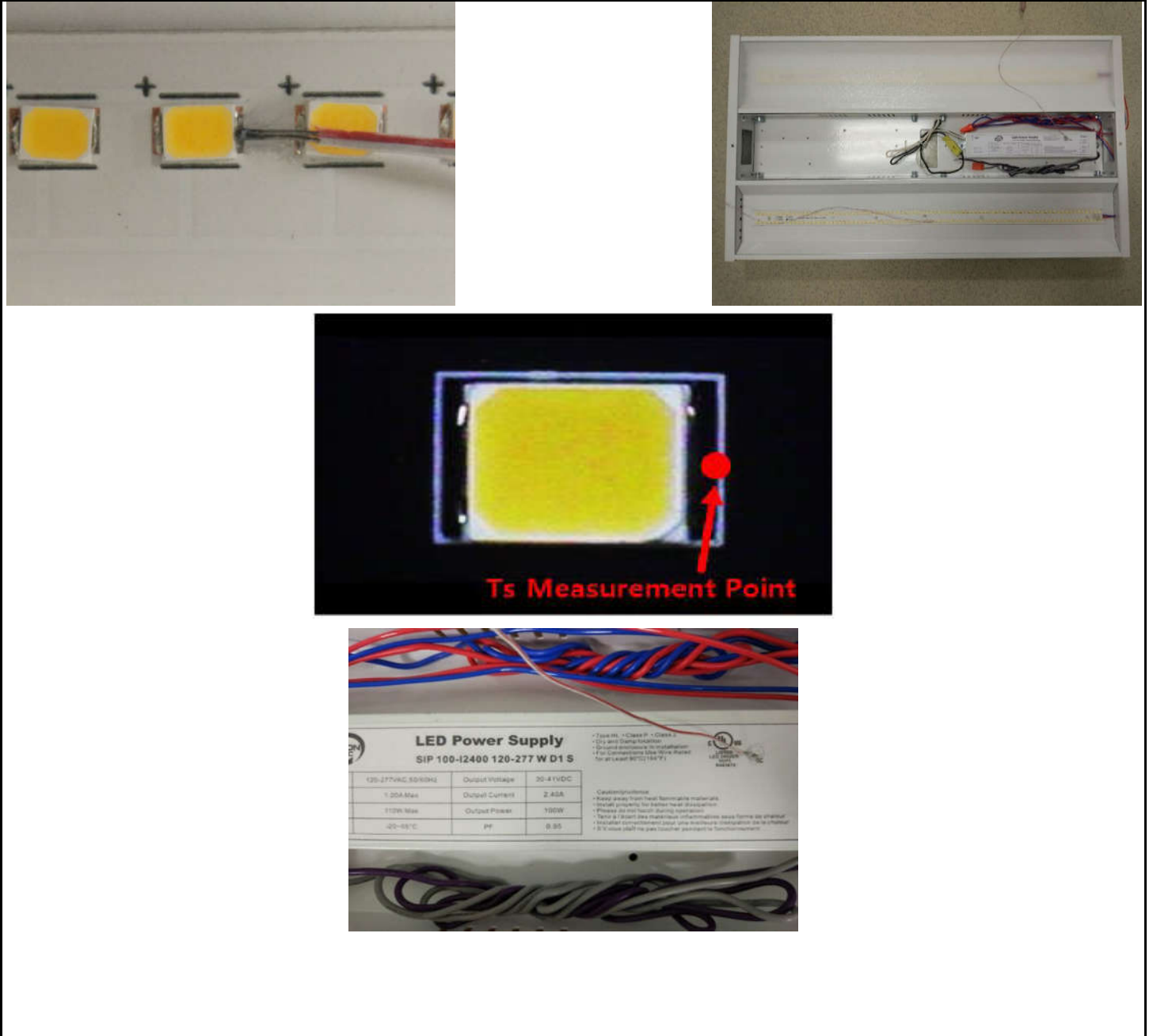
Test Results(Driver)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test result Column	Test result (Correct to 25 °C)		
TMP of Driver	55.1	52.8	SIP100-I2400 120-277 W D1 S	90
Ambient Temperature	27.3	25.0		



7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of LED Packages & Tc Point of Driver





***** END OF REPORT. THIS PAGE INTENTIONALLY LEFT BLANK *****