



Photometric Test Report

Relevant Standards

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

Prepared For

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Catalog Number

15A513

Project Number

4788381111

Report Number

4788381111_7

Test Date

1/18/2018-1/22/2018

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Revision Date

Prepared By

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Approved By

Duff Yang

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

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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	375lm/ft	1225.85	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°-60°)	IES LM-79-2008	40%	68.9%	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	130.52	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	4980	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥70	82.02	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	0.9473	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	4.58%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008	≤85	42.8	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008	≤90	58.7	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	1/22/2018	15A513-102	Gavin Yang
2	Integrating Sphere Test for the Higher CCT	1/19/2018	15A513-105	Gavin Yang
3	Goniophotometer Test	1/18/2018	15A513-102	Gavin Yang
4	THD and PF Test	1/18/2018	15A513-102	Gavin Yang
5	In-Situ Temperature Measurement Test	1/22/2018	15A513-102	Gavin Yang

Remark (if any)

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



3.0 Production Description

Luminaire Description: Direct Linear Ambient Luminaires

Model Number: 15A513-102

Rated Voltage: 120-277V

Frequency: 50/60Hz

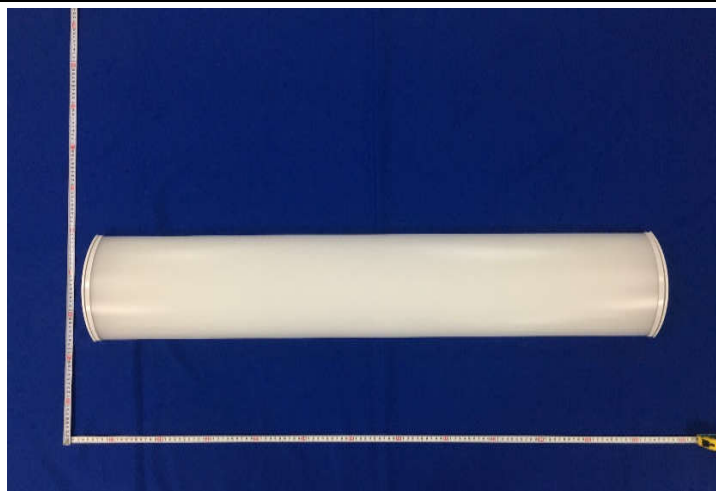
LED Package: STWxA2PD-xx

Family Model and Variation: 15A513-105

Remark:

Photos of Luminaire Characteristics

Model Number	CCT (K)	Light Output (lm)	Power (W)	Luminous Efficacy (lm/W)
15A513-102	3500	5200	40	130
15A513-103	4000	5240	40	131
15A513-105	5000	5280	40	132





4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test for the lower CCT

Model No.	15A513-102	Sample ID.	1362799-001
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.

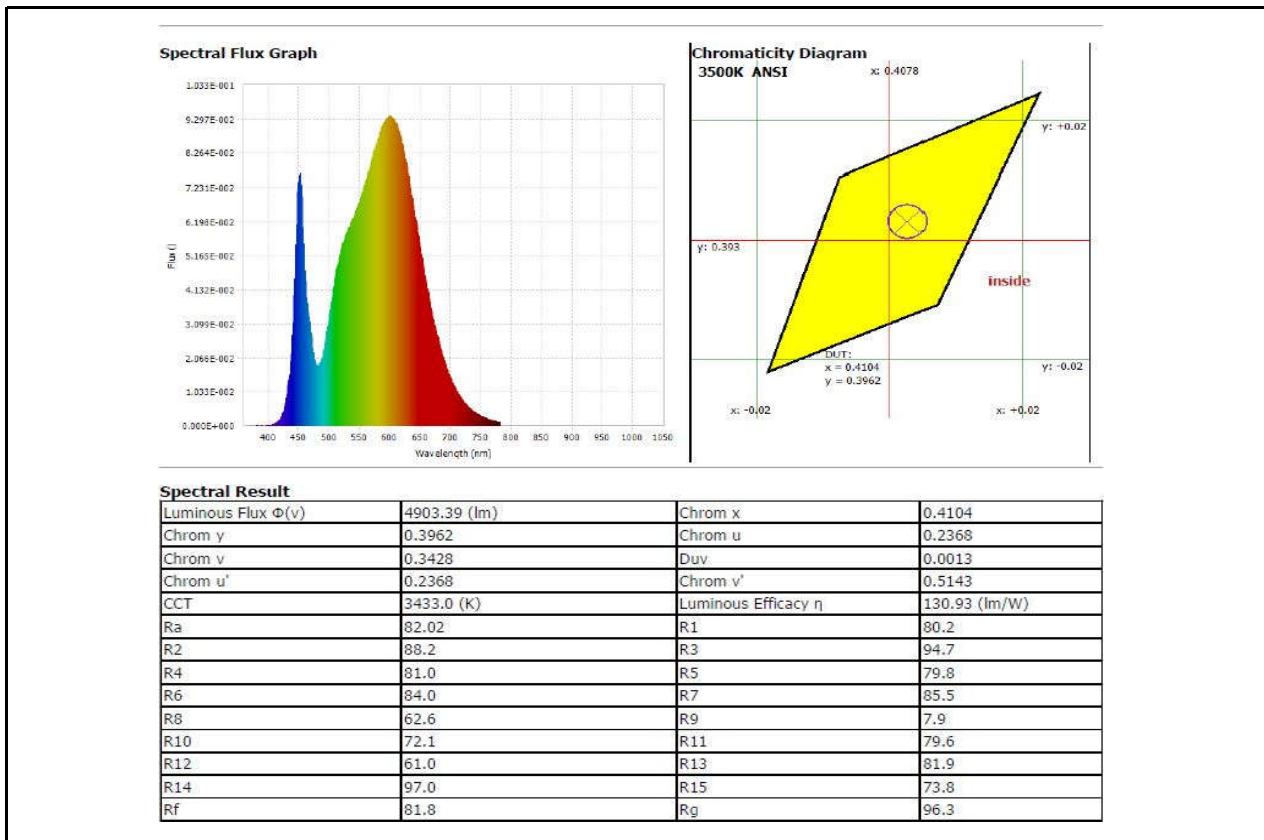
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.1	120.08	60	0.3172	37.451	0.995	5.29%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
3433	82.02	0.0013	4903.39	130.93	1225.85





4.0 LM-79 Measurement and Test Results

4.2 Integrating Sphere Test for the higher CCT

Model No.	15A513-105	Sample ID.	1362799-003
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.

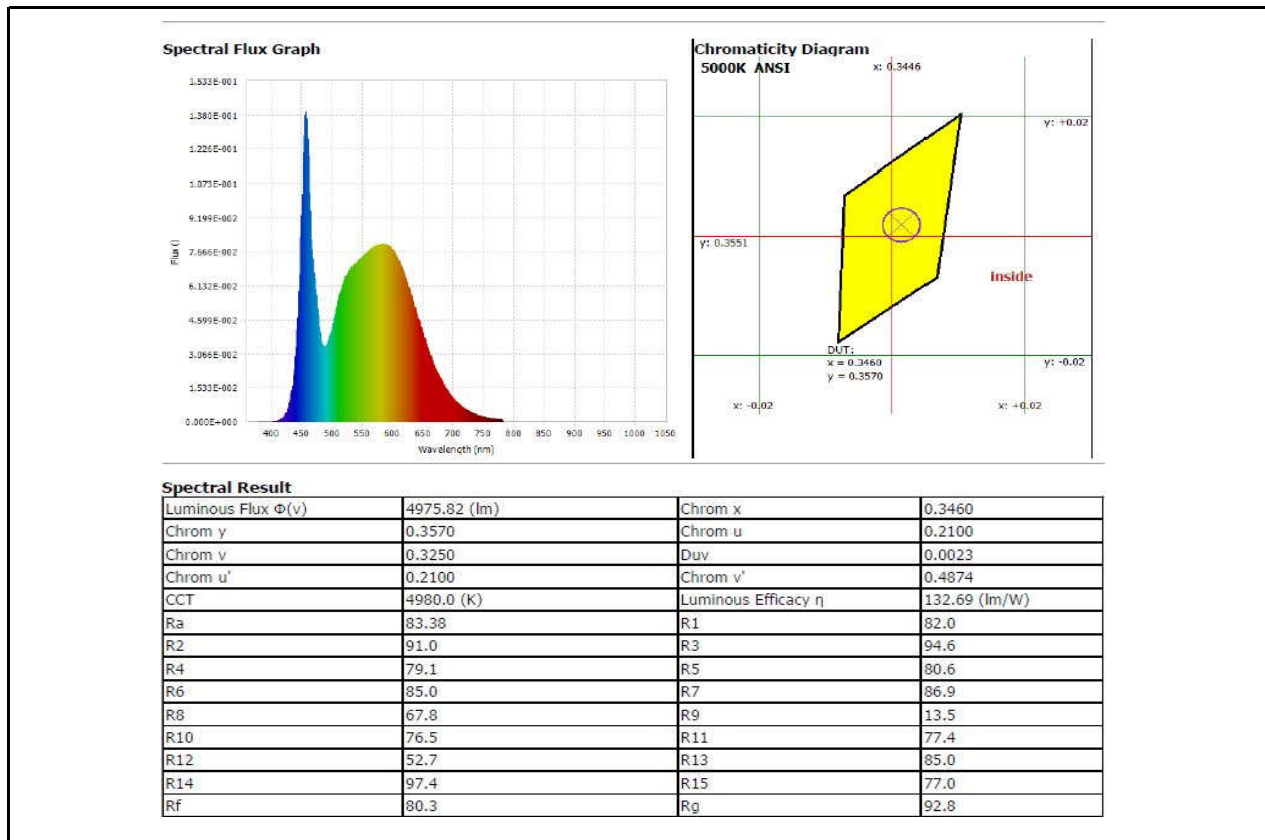
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption 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	0.3175	37.5	0.9950	5.76%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
4980	83.38	0.0023	4975.82	132.69	1243.96





5.0 LM-79 Measurement and Test Results

Model No.	15A513-102	Sample ID.	1362799-001
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

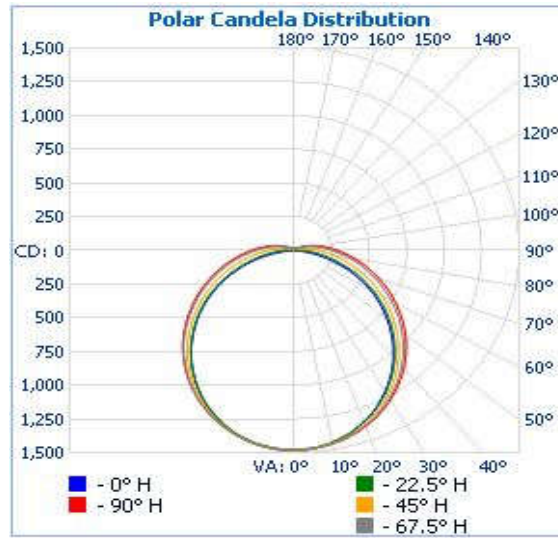
Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	120.14	60	0.31358	37.465	0.9950	5.29%	Horizontal

Test Result

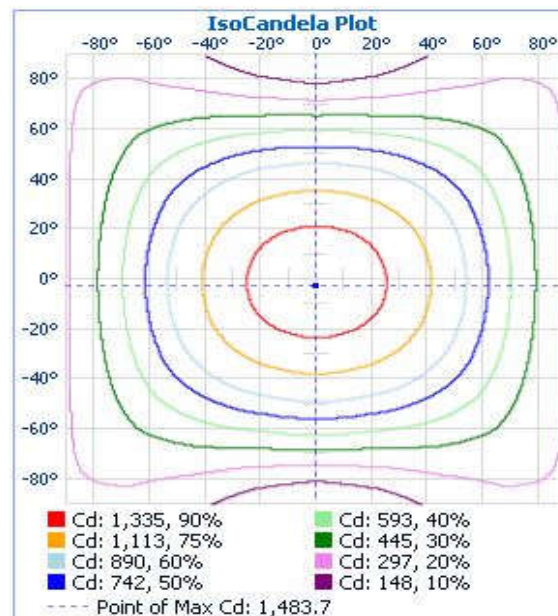
Flux (lm)	Zonal Lumen Requirement 1 (0°-60°)	Zonal Lumen Requirement 2	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
			Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
4890	68.9%	N/A	158.8	158.8	124	108.6	130.52
SC	SC						
0~180°	90°~270°						
N/A	N/A						



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	1,149.1	23.5%
0-40	1,884.4	38.5%
0-60	3,367.5	68.9%
60-90	1,238.7	25.3%
70-100	789.5	16.1%
90-120	236.6	4.8%
0-90	4,606.2	94.2%
90-180	283.6	5.8%
0-180	4,889.8	100%

Lumens Per Zone

Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	35.3	0.7%	90-95	76.9	1.6%
5-10	104.7	2.1%	95-100	56.7	1.2%
10-15	170.5	3.5%	100-105	41.1	0.8%
15-20	230.5	4.7%	105-110	28.9	0.6%
20-25	282.7	5.8%	110-115	19.7	0.4%
25-30	325.4	6.7%	115-120	13.3	0.3%
30-35	357.3	7.3%	120-125	9.0	0.2%
35-40	377.9	7.7%	125-130	6.5	0.1%
40-45	386.6	7.9%	130-135	5.1	0.1%
45-50	383.4	7.8%	135-140	4.6	0.1%
50-55	368.9	7.5%	140-145	4.4	0.1%
55-60	344.2	7.0%	145-150	4.1	0.1%
60-65	311.1	6.4%	150-155	3.7	0.1%
65-70	271.7	5.6%	155-160	3.2	0.1%
70-75	228.0	4.7%	160-165	2.7	0.1%
75-80	183.1	3.7%	165-170	2.0	0%
80-85	140.5	2.9%	170-175	1.3	0%
85-90	104.2	2.1%	175-180	0.4	0%



5.0 Goniophotometer Test (Cont'd)

Intensity Data(cd)

	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	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480
1	1483	1476	1482	1480	1478	1480	1483	1477	1483	1477	1483	1480	1478	1480	1482	1476	1483
2	1482	1475	1481	1480	1476	1481	1482	1477	1484	1477	1482	1481	1476	1480	1481	1475	1482
3	1481	1471	1478	1477	1476	1479	1481	1476	1484	1476	1481	1479	1476	1477	1478	1471	1481
4	1478	1471	1476	1477	1474	1477	1479	1475	1481	1475	1479	1477	1474	1477	1476	1471	1478
5	1475	1466	1474	1473	1472	1476	1477	1473	1480	1473	1477	1476	1472	1473	1474	1466	1475
6	1468	1465	1470	1470	1470	1474	1475	1469	1477	1469	1475	1474	1470	1470	1474	1465	1468
7	1465	1460	1466	1467	1467	1472	1472	1466	1472	1466	1472	1472	1467	1467	1466	1460	1465
8	1460	1456	1462	1464	1464	1467	1469	1462	1469	1462	1469	1467	1464	1464	1462	1456	1460
9	1455	1450	1456	1460	1459	1464	1463	1458	1465	1458	1463	1464	1459	1460	1456	1450	1455
10	1446	1444	1452	1454	1456	1459	1460	1453	1461	1453	1460	1459	1456	1454	1452	1444	1446
11	1440	1437	1446	1448	1450	1455	1455	1448	1456	1448	1455	1455	1450	1448	1446	1437	1440
12	1432	1429	1438	1443	1446	1449	1449	1441	1450	1441	1449	1449	1446	1443	1438	1429	1432
13	1424	1422	1432	1438	1440	1444	1444	1434	1444	1434	1444	1444	1440	1438	1432	1422	1424
14	1416	1414	1425	1431	1433	1438	1436	1427	1433	1427	1436	1438	1433	1431	1425	1414	1416
15	1406	1405	1418	1424	1428	1430	1429	1420	1426	1420	1429	1430	1428	1424	1418	1405	1406
16	1397	1396	1408	1416	1420	1424	1421	1411	1417	1411	1421	1424	1420	1416	1408	1396	1397
17	1386	1386	1400	1408	1413	1416	1412	1402	1409	1402	1412	1416	1413	1408	1400	1386	1386
18	1376	1376	1390	1400	1406	1408	1404	1392	1397	1392	1404	1408	1406	1400	1390	1376	1376
19	1363	1366	1382	1391	1396	1400	1395	1384	1387	1384	1395	1400	1396	1391	1382	1366	1363
20	1352	1353	1370	1382	1387	1392	1385	1373	1377	1373	1385	1392	1387	1382	1370	1353	1352
25	1287	1292	1311	1329	1339	1341	1330	1313	1316	1313	1330	1341	1339	1329	1311	1292	1287
30	1209	1217	1243	1266	1280	1280	1264	1243	1245	1243	1264	1280	1280	1266	1243	1217	1209
35	1122	1133	1164	1194	1210	1211	1188	1162	1161	1162	1188	1211	1210	1194	1164	1133	1122
40	1026	1042	1077	1114	1137	1130	1104	1074	1070	1074	1104	1130	1137	1114	1077	1042	1026
45	920	942	983	1028	1053	1046	1011	976	971	976	1011	1046	1053	1028	983	942	920
50	812	836	882	936	966	955	913	873	864	873	913	955	966	936	882	836	812
55	700	726	779	841	872	859	810	764	754	764	810	859	872	841	779	726	700
60	581	612	676	745	780	762	708	652	638	652	708	762	780	745	676	612	581
65	462	496	573	651	688	669	604	536	519	536	604	669	688	651	573	496	462
70	339	385	474	559	598	575	504	422	397	422	504	575	598	559	474	385	339
75	219	279	383	472	511	486	410	315	276	315	410	486	511	472	383	279	219
80	112	187	299	391	430	403	322	218	161	218	322	403	430	391	299	187	112
85	31	114	227	318	354	328	246	137	64	137	246	328	354	318	227	114	31
90	4	63	167	253	287	262	182	78	9	78	182	262	287	253	167	63	4
95	4	34	121	198	230	205	132	42	4	42	132	205	230	198	121	34	4
100	4	18	85	153	180	158	93	23	4	23	93	158	180	153	85	18	4
105	5	11	58	115	139	118	63	12	5	12	63	118	139	115	58	11	5
110	6	8	38	83	102	84	40	7	5	7	40	84	102	83	38	8	6
115	7	8	25	58	72	59	23	6	6	6	23	59	72	58	25	8	7
120	8	9	17	39	49	39	14	7	7	7	14	39	49	39	17	9	8
125	10	10	13	26	33	24	9	8	9	8	9	24	33	26	13	10	10
130	10	11	13	18	22	15	9	9	10	9	9	15	22	18	13	11	10
135	12	12	13	15	15	11	9	10	12	10	9	11	15	15	13	12	12
140	14	14	14	15	14	10	10	12	13	12	10	10	14	15	14	14	14
145	15	15	15	15	14	10	12	13	14	13	12	10	14	15	15	15	15
150	16	16	16	15	14	11	13	14	15	14	13	11	14	15	16	16	16
155	17	17	17	16	14	12	14	16	17	16	14	12	14	16	17	17	17
160	18	18	17	16	14	12	16	16	18	16	16	12	14	16	17	18	18
165	19	19	18	16	14	13	16	18	18	18	16	13	14	16	18	19	19
170	20	19	19	17	15	14	18	18	19	18	18	14	15	17	19	19	20
175	20	20	19	17	17	16	18	19	20	19	18	16	17	17	19	20	20
180	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19



6.0 THD and PF Test

Model No.	15A513-102	Sample ID.	1362799-001
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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	277.03	60	0.1413	37.088	0.9473	4.58%



7.0 In-Situ Temperature Measurement Test

Model No.	15A513-102	Sample ID.	1362799-001
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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
25.0	120.14	60	0.31358	37.465	0.9950	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	85	42.8	42.8	STWxA2PD-xx	300	85
Ambient Temperature	N/A	25.0	25.0			

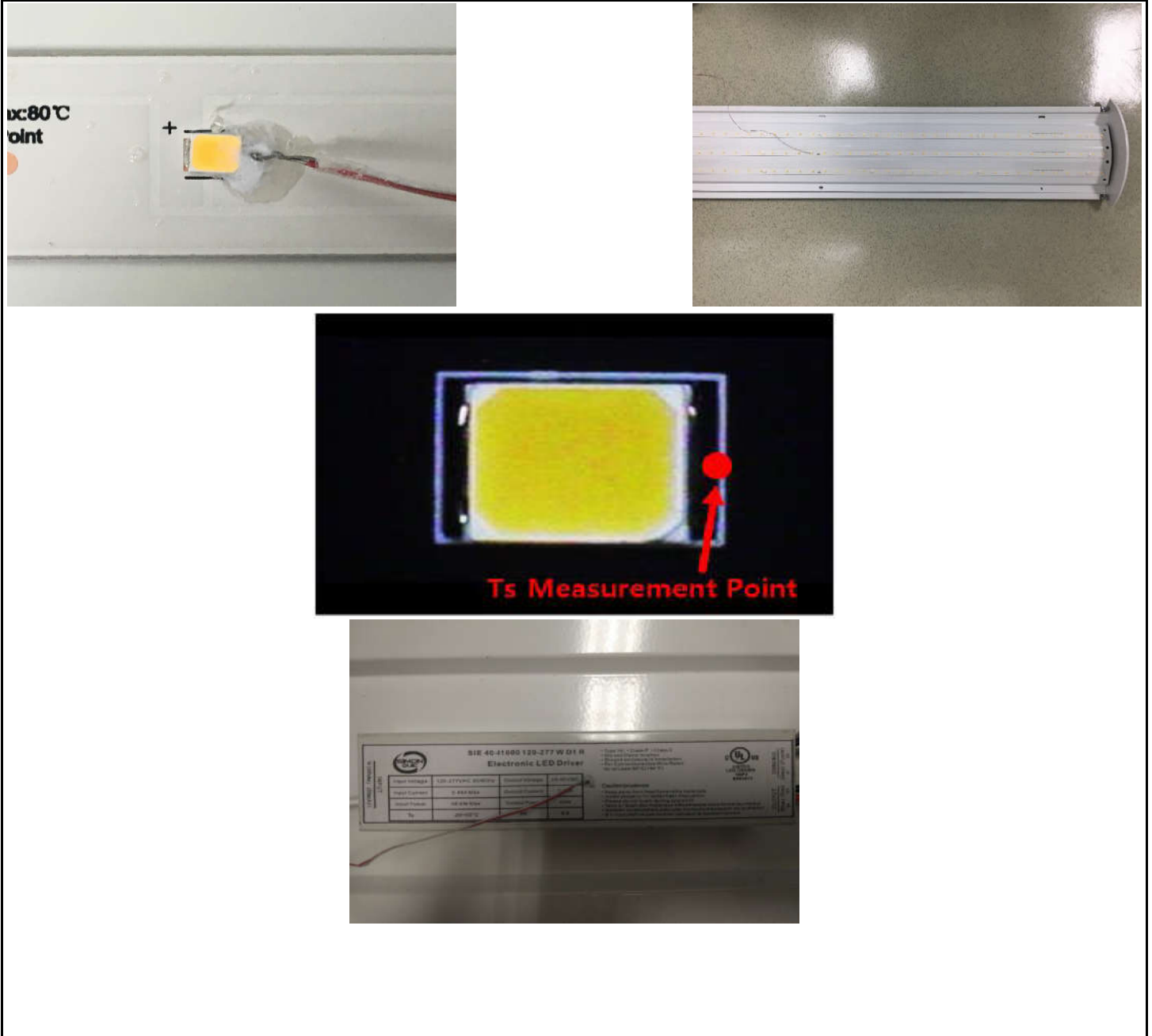
Test Results(Driver)

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	58.7	58.7	SIE40-I1000 120-277 W D1 R	90
Ambient Temperature	25.0	25.0		



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

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





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