



## Photometric Test Report

### Relevant Standards

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

### Prepared For

## Elec-Tech International Co., Ltd.

1 JINFENG RD TANGJIAWAN TOWN XIANGZHOU DISTRICT, ZHUHAI, GUANGDONG, 519085, CN  
Sean Luo, luolixue@etissl.com.cn

Test Laboratory: UL Verification Services (Guangzhou) Co., Ltd.

Test Laboratory Address: Building A1, 1F & 2F, Nansha Science and Technology Innovation Center, No. 25,  
South Huanshi Avenue, Nansha District, Guangzhou 511458, China

### Catalog Number

545981##(##=41-50), 545982##(##=41-50)

### Project Number

4788771469

### Report Number

4788771469-1a

### Test Date

11/19/2018-11/20/2018

### Issue Date

12/25/2018

### Revision Date

N/A

Prepared By

*Susie Shao*

Susie Shao

Approved By

*Dendi Lin*

Dendi Lin

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

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## 1.0 Test Summary

DLC Technical Requirements v4.4- issued 2018-10-18

Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm/ft)	IES LM-79-2008	≥375	1423.3	Pass
Minimum 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 (0°-60°)	IES LM-79-2008	≥40%	66.7%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	≥105	113.47	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs (K)	IES LM-79-2008 ANSI C78.377-2015	≤5000	4094	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	85.7	Pass
L70 Lumen maintenance (hours)	IES TM-21-2011*	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES TM-21-2011*	N/A	N/A	N/A
Power Factor	ANSI C82.77-10-2014	≥0.9	0.902	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤25%	23.43%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008	≤105	59.2	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008	N/A	N/A	N/A
Minimum Luminaire Warranty (years)	N/A	5	5	Pass

\* The standards are NOT covered by the NVLAP scope of test laboratory UL Verification Services (Guangzhou) Co., Ltd.



**2.0 Test List (Samples Received On: 2018-11-19)**

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test	11/19/2018	54598241	Joe Chen
2	Goniophotometer Test	11/19/2018	54598241	Joe Chen
3	THD and PF Test	11/19/2018	54598241	Joe Chen
4	In-Situ Temperature Measurement Test	11/20/2018	54598241	Joe Chen

**Remark** (if any)

- 1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
- 2. All samples were brand new and without seasoning before being tested.



### 3.0 Product Description

**Luminaire Description:** Linear Ambient, Direct Linear Ambient Luminaires.

**Model Number:** 54598241

**Ratings:** 120-277Vac, 50/60Hz, 50W, 4000K

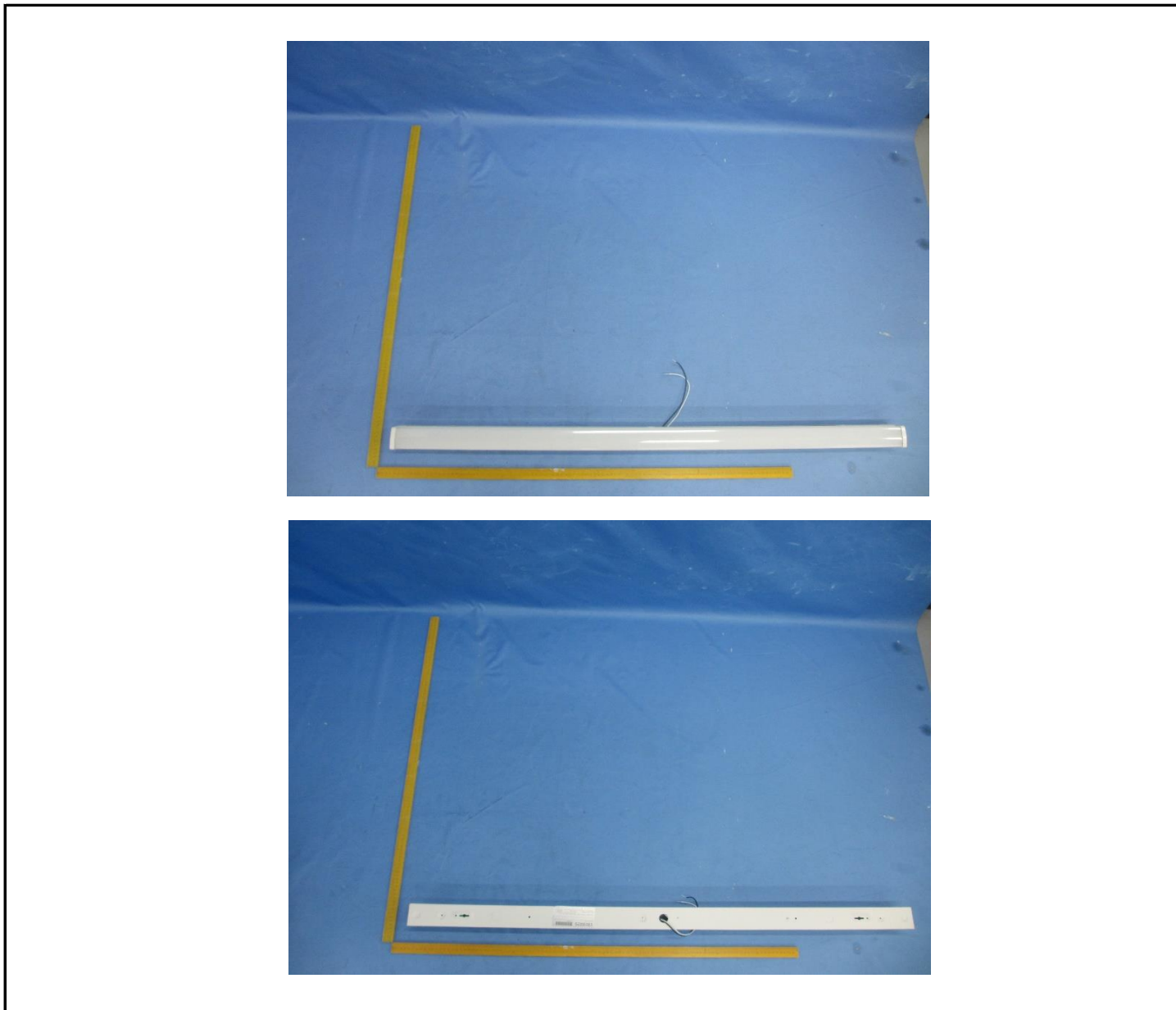
**LED Package:** SPMWH1228FD5WATGME

**Driver Model Number:** ETI-AD05300600081SDA

**Family Model and Variation:** 545981##(##=41-50), 545982##(##=41-50)

545981##(##=41-50) is with combine function, 545982##(##=41-50) is without combine function.

#### Photos of Luminaire Characteristics





#### 4.0 LM-79 Measurement and Test Results

Model No.	54598241	Sample ID.	1928926
Operate time (Min.)	50	Stabilization time (Min.)	45

#### Test Method

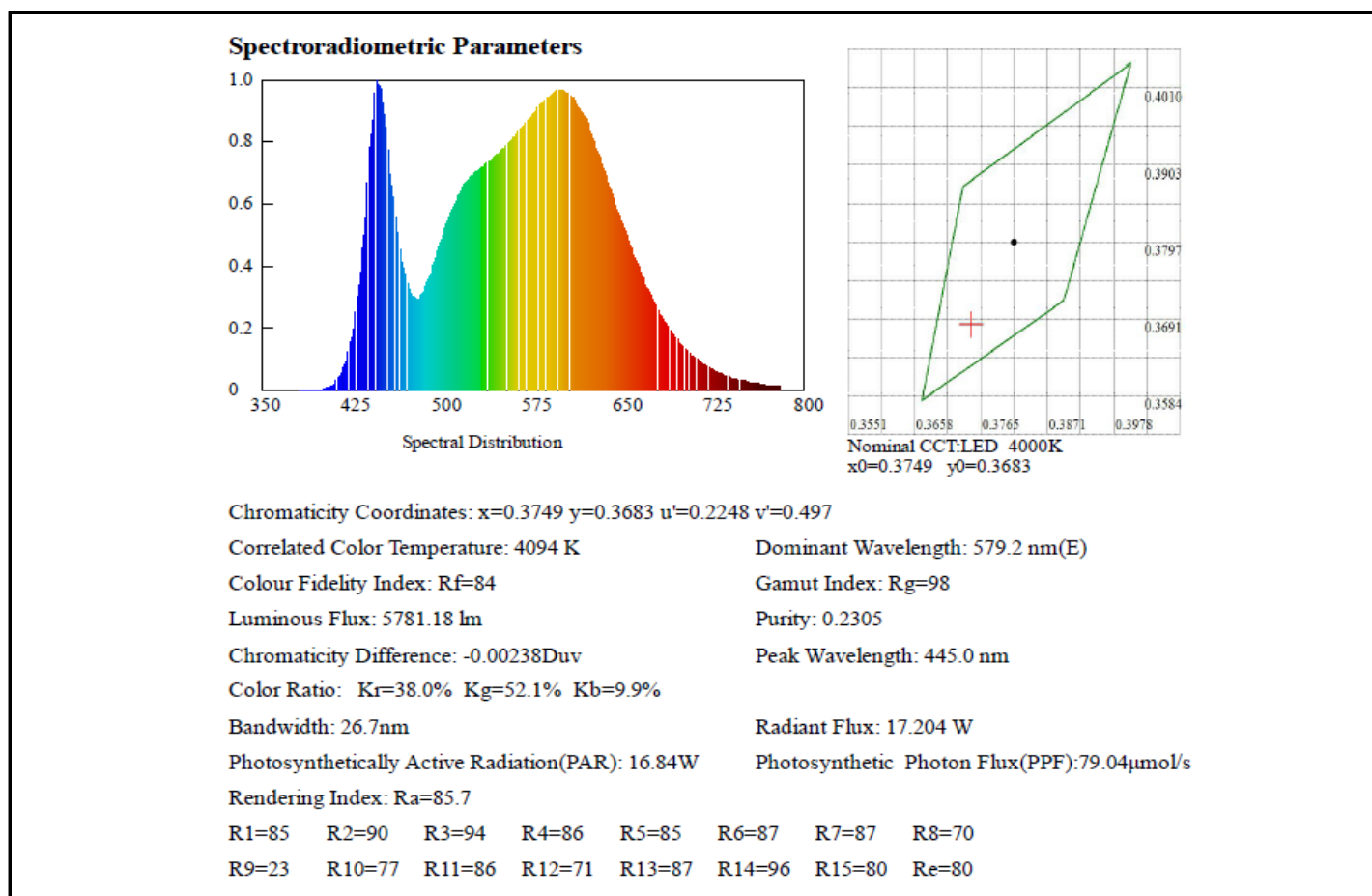
1. The sample was tested according to the IES LM-79-2008.  
 2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25° C ± 1° C. The reference standard lamp is rated current 0.9018A omni-directional Incandescent lamp and was calibrated by NIM.  
 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 5 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	Orientation
25.1	120.01	60	0.459	50.28	0.913	Horizontal

#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Flux (lm/ft)	Luminous Efficacy (lm/W)
4094	85.7	-0.0024	5781.2	1445.3	114.98





### 5.0 LM-79 Measurement and Test Results

<b>Model No.</b>	54598241	<b>Sample ID.</b>	1928926
<b>Operate time (Min.)</b>	90	<b>Stabilization time (Min.)</b>	45

#### Test Method

1. The sample was tested according to the IES LM-79-2008.  
 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 3.812A omni-directional Incandescent lamp and was calibrated by NIM.  
 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	Orientation
25.1	120.02	60	0.458	50.18	0.913	Horizontal

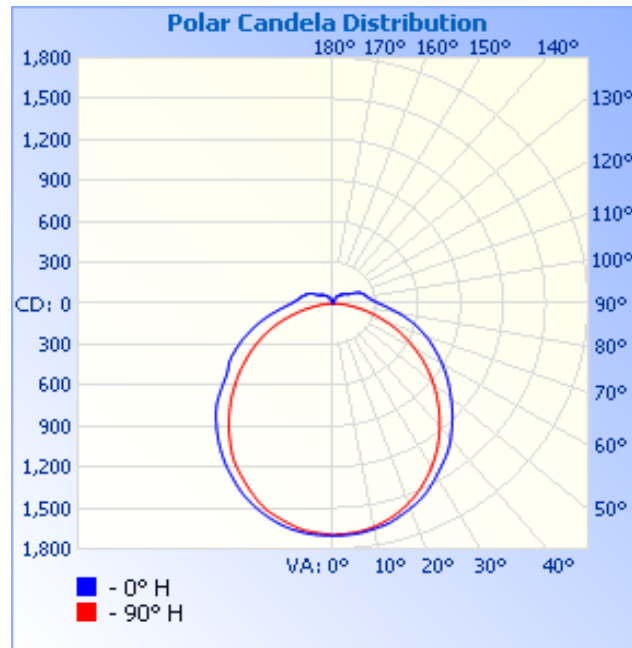
#### Test Result

Flux (lm)	Zonal Lumen Requirement (0-60°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
5693.3	66.7%	158.9	230.2	105	121.1	113.47
<b>Flux (lm/ft)</b>						
1423.3						

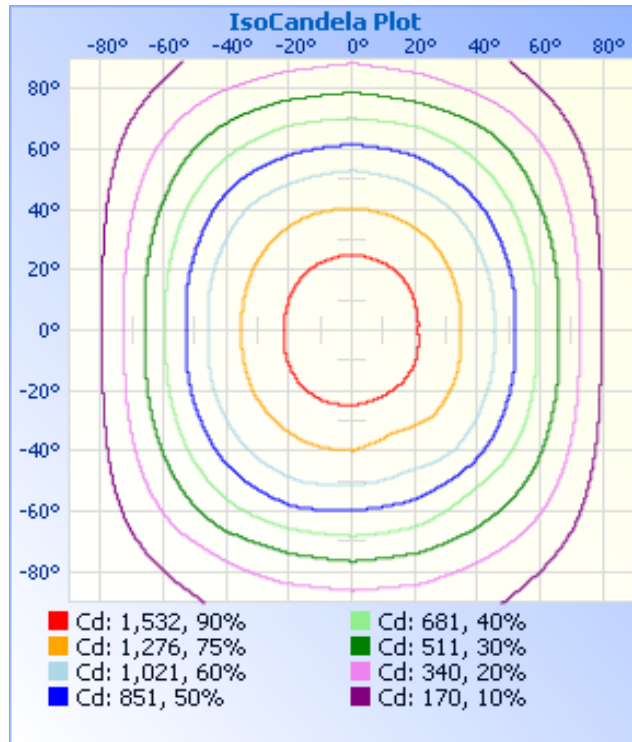


### 5.2 Goniophotometer Test (Cont'd)

#### Light Distribution Curve



#### IsoCandela Plot





## 5.2 Goniophotometer Test (Cont'd)

### Zonal Lumen Summary

#### Zonal Lumen Summary

Zone	Lumens	% Luminaire
0-30	1,315.5	23.1%
0-40	2,145.3	37.7%
0-60	3,797.0	66.7%
60-90	1,381.4	24.3%
70-100	894.7	15.7%
90-120	387.1	6.8%
0-90	5,178.4	91%
90-180	514.8	9%
0-180	5,693.3	100%

### Lumens Per Zone

#### Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	161.1	2.8%	90-100	167.7	2.9%
10-20	460.8	8.1%	100-110	131.0	2.3%
20-30	693.6	12.2%	110-120	88.5	1.6%
30-40	829.9	14.6%	120-130	55.1	1%
40-50	858.7	15.1%	130-140	36.6	0.6%
50-60	793.0	13.9%	140-150	21.9	0.4%
60-70	654.4	11.5%	150-160	10.3	0.2%
70-80	462.5	8.1%	160-170	3.2	0.1%
80-90	264.5	4.6%	170-180	0.6	0%





**5.2 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	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
1	1702	1702	1699	1697	1691	1694	1701	1704	1699	1703	1700	1695	1690	1696	1701	1703	1700
2	1702	1703	1700	1697	1692	1695	1702	1703	1701	1702	1699	1697	1690	1695	1699	1702	1699
3	1700	1702	1700	1696	1691	1694	1700	1703	1700	1702	1699	1694	1687	1692	1699	1704	1699
4	1698	1701	1699	1694	1688	1691	1700	1705	1700	1700	1698	1690	1684	1688	1697	1700	1697
5	1698	1699	1698	1691	1686	1689	1698	1704	1698	1699	1696	1690	1682	1683	1692	1700	1695
6	1695	1695	1695	1689	1682	1686	1696	1702	1697	1697	1694	1687	1678	1681	1691	1698	1694
7	1693	1692	1693	1686	1679	1682	1694	1699	1693	1696	1692	1682	1675	1678	1688	1695	1692
8	1687	1691	1686	1681	1674	1678	1691	1696	1690	1691	1686	1675	1668	1674	1683	1692	1690
9	1683	1688	1681	1673	1669	1673	1684	1692	1685	1687	1679	1669	1660	1667	1680	1689	1686
10	1678	1684	1678	1667	1662	1668	1681	1686	1681	1679	1673	1665	1650	1658	1673	1684	1680
11	1673	1675	1669	1659	1654	1662	1675	1681	1674	1672	1665	1657	1642	1650	1666	1675	1672
12	1669	1669	1662	1652	1646	1654	1669	1674	1668	1665	1658	1650	1633	1641	1656	1668	1665
13	1662	1661	1655	1643	1637	1648	1660	1668	1660	1657	1650	1641	1624	1631	1648	1663	1658
14	1656	1652	1647	1636	1628	1638	1651	1658	1652	1650	1643	1630	1614	1623	1640	1652	1650
15	1647	1647	1642	1627	1618	1628	1643	1650	1643	1642	1635	1620	1605	1615	1629	1644	1644
16	1637	1637	1633	1619	1608	1619	1633	1639	1634	1633	1626	1608	1596	1605	1622	1635	1636
17	1628	1628	1623	1610	1596	1609	1621	1629	1625	1622	1615	1596	1587	1596	1612	1626	1628
18	1618	1619	1612	1598	1583	1598	1611	1619	1614	1612	1601	1584	1572	1585	1602	1618	1620
19	1608	1611	1600	1584	1572	1586	1599	1608	1603	1597	1587	1573	1558	1574	1592	1610	1612
20	1596	1602	1585	1568	1558	1571	1588	1596	1591	1583	1572	1560	1543	1559	1581	1600	1600
25	1540	1531	1518	1493	1480	1494	1516	1528	1527	1504	1501	1480	1457	1476	1506	1527	1534
30	1460	1456	1445	1414	1388	1406	1430	1447	1446	1412	1421	1390	1371	1390	1419	1451	1459
35	1381	1380	1350	1309	1285	1306	1335	1358	1361	1291	1322	1293	1262	1292	1337	1373	1385
40	1293	1286	1249	1201	1171	1197	1232	1260	1266	1177	1218	1178	1143	1176	1233	1270	1286
45	1192	1177	1145	1090	1051	1083	1125	1161	1170	1088	1113	1058	1021	1057	1118	1162	1183
50	1088	1067	1041	975	927	964	1017	1057	1050	1001	999	935	895	937	1003	1053	1077
55	990	962	934	860	801	843	905	956	917	909	868	813	770	814	886	954	980
60	890	864	820	734	670	717	788	847	842	814	720	692	646	695	780	856	885
65	790	768	702	608	538	589	670	733	740	707	604	574	524	578	677	761	791
70	694	674	590	489	410	466	552	592	637	602	516	461	394	466	577	667	701
75	599	567	483	374	285	346	428	501	534	499	417	338	264	353	463	550	596
80	494	456	377	261	165	232	319	406	438	407	316	222	146	234	348	442	487
85	398	360	280	161	66	137	237	322	353	326	235	133	53	135	252	349	392
90	326	291	212	99	10	77	180	263	294	266	184	74	6	82	191	283	322
95	280	250	177	79	5	62	156	230	258	233	160	69	4	64	161	244	277
100	253	228	161	72	4	52	143	210	237	214	148	61	4	53	135	221	251
105	235	213	150	52	4	42	123	193	217	196	134	46	4	43	125	206	233
110	216	197	132	49	4	32	99	170	196	178	114	42	4	34	103	174	209
115	188	167	99	45	4	27	66	142	170	151	90	39	4	28	66	144	172
120	139	126	91	42	4	23	56	103	122	117	82	35	4	25	58	105	133
125	119	113	83	38	4	20	46	79	108	104	73	30	4	23	48	82	111
130	108	100	76	34	4	19	41	63	96	91	66	27	4	23	44	68	106
135	94	87	68	31	4	17	35	53	84	77	57	23	4	22	40	58	96
140	82	75	58	28	4	15	32	42	75	65	48	19	4	20	37	47	85
145	71	64	50	24	4	12	29	33	61	54	40	16	4	18	34	37	71
150	57	52	43	20	4	10	25	26	48	44	33	12	4	15	31	30	56
155	45	42	34	16	4	7	19	21	36	34	24	9	4	12	25	25	42
160	22	32	24	12	5	5	13	15	16	22	16	6	5	10	19	21	20
165	15	23	17	9	5	5	8	11	10	14	10	5	5	8	14	16	14
170	10	15	11	7	5	5	5	6	6	8	6	5	5	6	10	11	10
175	7	8	7	6	5	5	5	5	5	5	5	5	5	5	6	6	6
180	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5



## 6.0 THD and PF Test

<b>Model No.</b>	54598241	<b>Sample ID.</b>	1928926
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### Test Method

1. The samples were tested according to the ANSI C82.77-2014.
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
25.1	120.02	60	0.458	50.18	0.913	23.02%
25.1	277.00	60	0.199	49.60	0.902	23.43%



## 7.0 In-Situ Temperature Measurement Test

### Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008.
2. The testing was conducted in a room with ambient temperature of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . 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. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

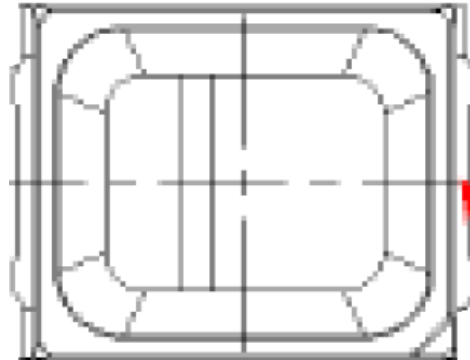
### In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
23.5	120.02	60	0.458	50.18	0.913	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 1	Test result (Correct to 25 °C)			
TMP of LEDs	120	57.7	59.2	SPMWH1228FD5W ATGME	120	105
Ambient temperature	23.5	23.5	25.0			

### TMP point in LM-80 report

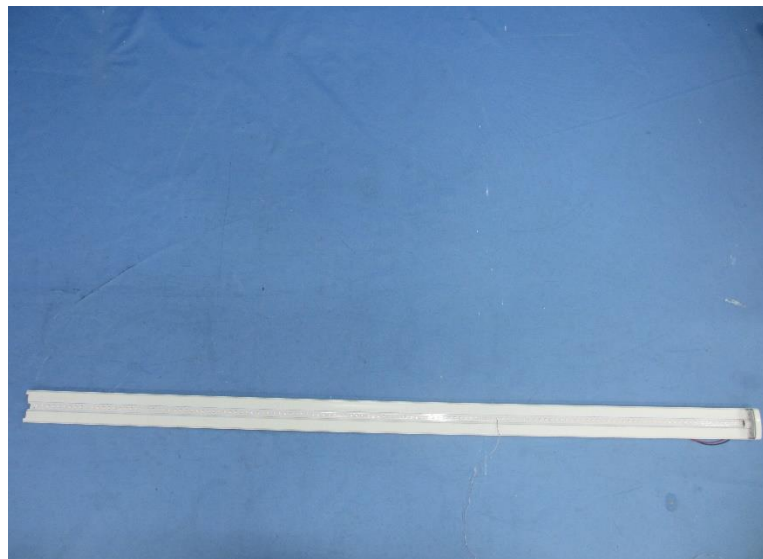
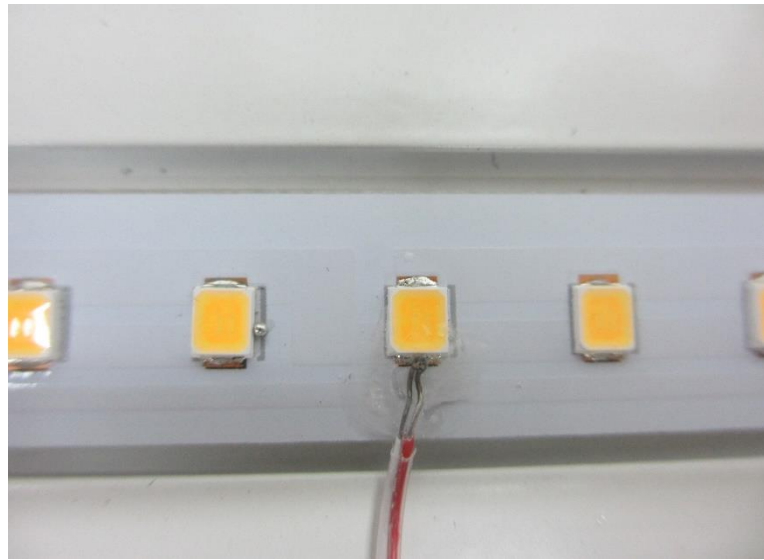


**TMP<sub>LED</sub>**



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

Test Photos for TMP of LED Packages





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