



UL-CCIC Company Limited  
No.2 Chengwan Road,  
Suzhou Industrial Park  
Suzhou 215122, China  
86-512-68086400



## Photometric Test Report

### Relevant Standards

- IES LM-79-2008
- ANSI C82.77-2002
- UL1598-2008/ UL1993-2012

### Prepared For

**P.Q.L., Inc.**

2285 Ward Avenue  
Simi Valley, CA 93065

### Catalog Number

55227

### Project Number

4787668865

### Report Number

4787668865\_29

### Test Date

11/10/2016-11/16/2016

### Issue Date

12/1/2016

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 v4.1

<i>High-bay Luminaires for Commercial and Industrial Buildings</i>				
Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	10000lm	20368.70	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 (20°-50°)	IES LM-79-2008	30%	53.40%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	130lm/W	128.42	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5700	5831	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	84.24	Pass
L70 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES LM-80-2015 IES TM-21-2011	N/A	N/A	N/A
Power Factor	ANSI C82.77-2002	≥0.9	0.9715	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	9.30%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	62.9	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	81	56.2	N/A
Minimum Luminaire Warranty (years)	N/A	5	5	Pass

\*Defined by ANSI C78.377-2011‡

‡ANSI C78.377-2015 also referred to for Duv and (x,y) chromaticity coordinates tolerances for indoor categories.



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### 3.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	11/10/2016	55227	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	11/14/2016	LED FLAT 2' HIGH BAY 162W 5700K	Elvis Wu
3	Goniophotometer Test	11/16/2016	55227	Elvis Wu
4	THD and PF Test	11/10/2016	55227	Elvis Wu
5	In-Situ Temperature Measurement Test	11/11/2016	55227	Elvis Wu

#### Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Laboratory Project Management (LPM) database.



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#### 4.0 Production Description

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

**Model Number:** 55227

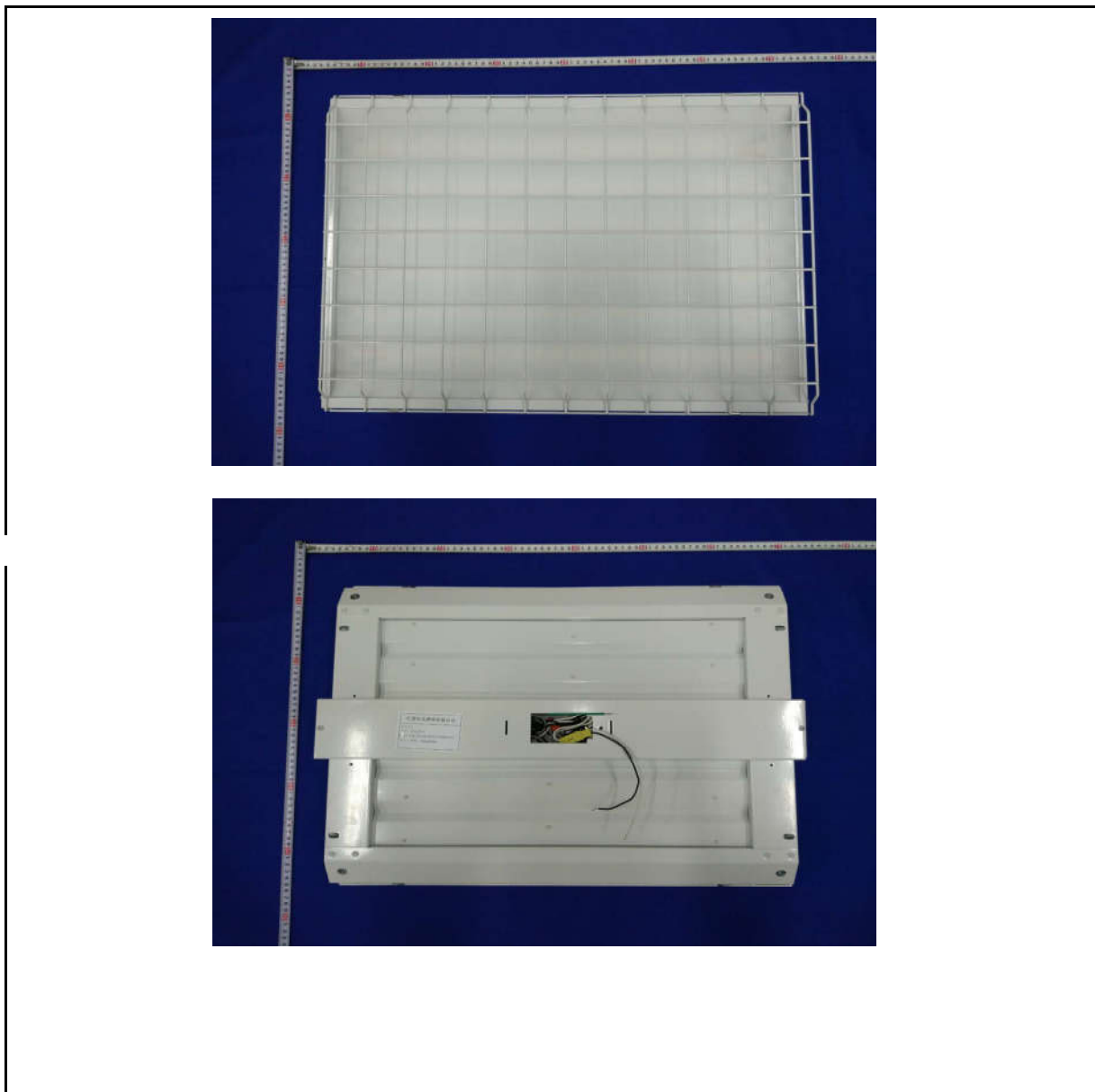
**Rated Voltage:** 120~277V

**Frequency:** 50/60 Hz

**LED Package:** STWxA2PD-xx

**Family Model and Variation:** LED FLAT 2' HIGH BAY 162W 5700K

#### Photos of Luminaire Characteristics





## 5.0 LM-79 Measurement and Test Results

### 5.1 Integrating Sphere Test for the lower CCT

Model No.	55227	Sample ID.	628448-001
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 an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ .
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. 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.

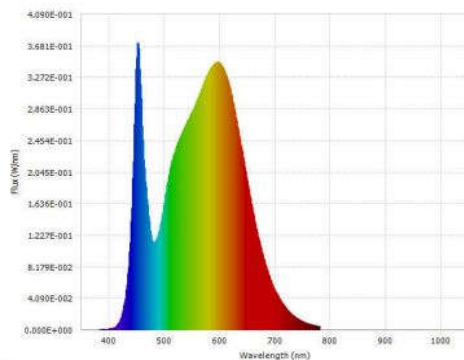
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.01	60	1.3243	158.61	0.9979	5.20%

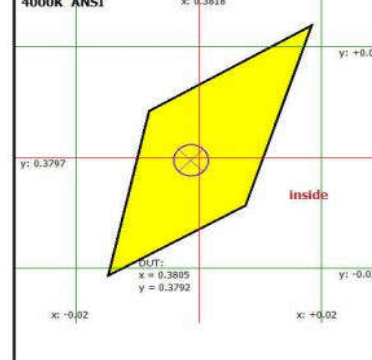
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
4014	84.24	0.0012	20368.7	128.42

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	20368.7 (lm)	Chrom x	0.3805
Chrom y	0.3792	Chrom u	0.2242
Chrom v	0.3351	Duv	0.0012
Chrom u'	0.2242	Chrom v'	0.5027
CCT	4014.0 (K)	Luminous Efficacy $\eta$	128.42 (lm/W)
Ra	84.24	R1	82.6
R2	90.1	R3	95.4
R4	82.9	R5	82.5
R6	86.1	R7	87.2
R8	67.1	R9	15.3
R10	76.2	R11	81.8
R12	63.1	R13	84.6
R14	97.6	R15	77.0
Rf	83	Rg	95



## 5.0 LM-79 Measurement and Test Results

### 5.2 Integrating Sphere Test for the higher CCT

<b>Model No.</b>	ELED FLAT 2' HIGH BAY 162W 5700K	<b>Sample ID.</b>	628448-003
<b>Opreate 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 paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}C \pm 1^{\circ}C$ .
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. 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.

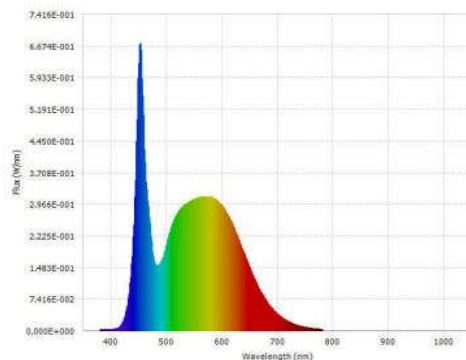
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.02	60	1.3021	156.13	0.9979	5.00%

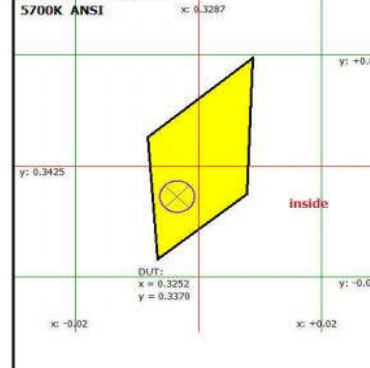
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5831	84.84	0.0013	20607.6	131.99

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	20607.6 (lm)	Chrom x	0.3252
Chrom y	0.3370	Chrom u	0.2034
Chrom v	0.3163	Duv	0.0013
Chrom u'	0.2034	Chrom v'	0.4744
CCT	5831.0 (K)	Luminous Efficacy $\eta$	131.99 (lm/W)
Ra	84.84	R1	83.9
R2	89.4	R3	91.6
R4	84.7	R5	84.0
R6	83.6	R7	88.8
R8	72.8	R9	19.8
R10	73.4	R11	83.8
R12	59.8	R13	85.6
R14	95.5	R15	80.3
Rf	82	Rg	96



## 5.0 LM-79 Measurement and Test Results

### 5.3 Goniophotometer Test

<b>Model No.</b>	55227	<b>Sample ID.</b>	628448-001
<b>Opreate 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 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.
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 0.5° vertical intervals and 22.5° horizontal intervals.

#### Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
25.5	119.95	60	1.3275	158.82	0.9972	horizontal

#### Test Result

Flux (lm)	Zonal Lumen Requirement (20°-50°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
20629.7	53.4%	154.3	155.2	103.3	104.3	129.89



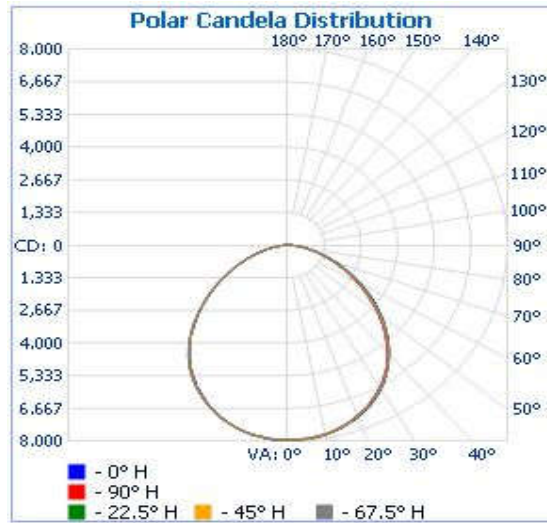
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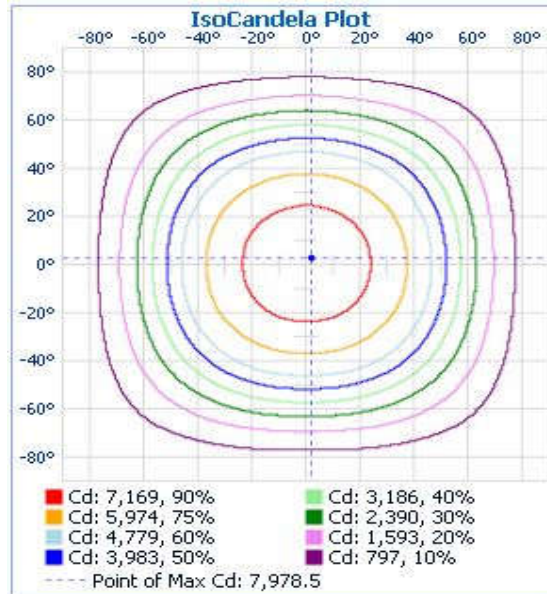
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## 5.2 Goniophotometer Test (Cont'd)

### Light Distribution Curve



### IsoCandela Plot







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## 5.2 Goniophotometer Test (Cont'd)

### Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	6,187.7	30%
0-40	10,075.4	48.8%
0-60	17,088.6	82.8%
60-90	3,486.6	16.9%
70-100	1,351.1	6.6%
90-120	18.1	0.1%
0-90	20,575.2	99.7%
90-180	52.1	0.3%
0-180	20,627.4	100%

### Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	190.1	0.9%	90-95	4.0	0%
5-10	564.5	2.7%	95-100	3.0	0%
10-15	920.2	4.5%	100-105	2.7	0%
15-20	1,243.8	6.0%	105-110	2.6	0%
20-25	1,522.9	7.4%	110-115	2.7	0%
25-30	1,746.2	8.5%	115-120	3.1	0%
30-35	1,903.9	9.2%	120-125	3.1	0%
35-40	1,983.8	9.6%	125-130	3.4	0%
40-45	1,973.1	9.6%	130-135	3.6	0%
45-50	1,873.3	9.1%	135-140	3.9	0%
50-55	1,697.9	8.2%	140-145	4.0	0%
55-60	1,468.9	7.1%	145-150	3.8	0%
60-65	1,208.0	5.9%	150-155	3.5	0%
65-70	934.5	4.5%	155-160	3.0	0%
70-75	663.9	3.2%	160-165	2.4	0%
75-80	420.1	2.0%	165-170	1.8	0%
80-85	207.8	1.0%	170-175	1.2	0%
85-90	52.3	0.3%	175-180	0.4	0%



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## 5.2 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	337.5	360
0	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963	7963
1	7958	7974	7960	7971	7956	7960	7963	7974	7958	7974	7963	7960	7956	7971	7960	7974	7958
2	7969	7967	7967	7959	7943	7950	7963	7975	7956	7975	7963	7950	7943	7959	7967	7975	7969
3	7955	7970	7963	7948	7935	7948	7949	7960	7968	7960	7949	7948	7935	7948	7963	7970	7955
4	7955	7971	7968	7953	7928	7938	7939	7952	7967	7952	7939	7938	7928	7953	7968	7971	7955
5	7945	7964	7947	7932	7929	7945	7928	7930	7938	7930	7928	7945	7929	7932	7947	7964	7945
6	7928	7951	7929	7922	7921	7914	7929	7917	7942	7917	7929	7914	7921	7922	7929	7951	7928
7	7925	7928	7913	7924	7887	7885	7893	7892	7889	7892	7893	7885	7887	7924	7913	7928	7925
8	7904	7913	7897	7895	7887	7879	7879	7886	7877	7886	7879	7879	7887	7895	7897	7913	7904
9	7883	7893	7887	7877	7853	7853	7853	7852	7854	7852	7853	7853	7853	7877	7887	7893	7883
10	7855	7872	7858	7846	7825	7816	7823	7845	7850	7845	7823	7816	7825	7846	7858	7872	7855
11	7840	7842	7826	7810	7800	7799	7794	7800	7806	7800	7794	7799	7800	7810	7826	7842	7840
12	7808	7817	7802	7789	7774	7774	7775	7772	7767	7772	7775	7774	7774	7789	7802	7817	7808
13	7781	7774	7765	7759	7727	7732	7732	7727	7732	7727	7732	7732	7727	7759	7765	7774	7781
14	7738	7747	7720	7712	7696	7679	7691	7702	7686	7702	7691	7679	7696	7712	7720	7747	7738
15	7707	7700	7678	7677	7653	7651	7658	7654	7664	7654	7658	7651	7653	7677	7678	7700	7707
16	7656	7660	7639	7623	7613	7611	7616	7603	7593	7603	7616	7611	7613	7623	7639	7660	7656
17	7612	7606	7611	7588	7567	7555	7572	7553	7554	7553	7572	7555	7567	7588	7611	7606	7612
18	7570	7560	7553	7532	7522	7509	7516	7512	7487	7512	7516	7509	7522	7532	7553	7560	7570
19	7540	7516	7498	7480	7462	7460	7462	7463	7453	7463	7462	7460	7462	7480	7498	7516	7540
20	7482	7463	7447	7415	7413	7406	7399	7395	7389	7395	7399	7406	7413	7415	7447	7463	7482
25	7180	7144	7125	7117	7081	7081	7069	7075	7044	7075	7069	7081	7081	7117	7125	7144	7180
30	6789	6751	6740	6720	6694	6664	6650	6661	6645	6661	6650	6664	6694	6720	6740	6751	6789
35	6307	6296	6278	6240	6220	6192	6190	6172	6152	6172	6190	6192	6220	6240	6278	6296	6307
40	5736	5736	5730	5682	5628	5620	5613	5588	5580	5588	5613	5620	5628	5682	5730	5736	5736
45	5101	5087	5055	5019	4971	4961	4955	4939	4898	4939	4955	4961	4971	5019	5055	5087	5101
50	4418	4379	4342	4286	4230	4221	4224	4224	4179	4224	4224	4221	4230	4286	4342	4379	4418
55	3702	3651	3608	3543	3492	3480	3488	3497	3451	3497	3488	3480	3492	3543	3608	3651	3702
60	2987	2932	2885	2824	2774	2765	2773	2789	2751	2789	2773	2765	2774	2824	2885	2932	2987
65	2310	2257	2207	2154	2114	2101	2107	2124	2094	2124	2107	2101	2114	2154	2207	2257	2310
70	1687	1628	1582	1543	1515	1500	1498	1512	1478	1512	1498	1500	1515	1543	1582	1628	1687
75	1133	1081	1045	1012	990	976	972	984	959	984	972	976	990	1012	1045	1081	1133
80	657	622	595	571	554	542	535	543	529	543	535	542	554	571	595	622	657
85	274	249	232	215	204	197	191	191	185	191	191	197	204	215	232	249	274
90	28	22	19	14	11	10	10	12	9	12	10	10	11	14	19	22	28
95	7	5	6	6	6	6	4	6	7	6	4	6	6	6	6	5	7
100	9	6	6	6	4	6	5	6	5	6	5	6	4	6	6	6	9
105	6	6	5	4	4	5	5	7	5	7	5	5	4	4	5	6	6
110	4	7	5	4	3	5	5	7	6	7	5	5	3	4	5	7	4
115	4	6	7	5	4	6	7	5	6	5	7	6	4	5	7	6	4
120	5	6	5	6	4	8	7	6	6	6	7	8	4	6	5	6	5
125	7	6	7	11	8	9	7	8	9	8	7	9	8	11	7	6	7
130	7	7	9	9	7	10	9	7	7	7	9	10	7	9	9	7	7
135	9	10	11	11	6	10	13	9	9	9	13	10	6	11	11	10	9
140	12	12	13	13	7	10	13	12	10	12	13	10	7	13	13	12	12
145	15	14	15	12	8	12	15	13	14	13	15	12	8	12	15	14	15
150	15	16	15	13	8	12	14	15	12	15	14	12	8	13	15	16	15
155	19	17	16	11	9	12	16	16	17	16	16	12	9	11	16	17	19
160	17	17	15	13	10	12	15	15	16	15	15	12	10	13	15	17	17
165	16	16	17	15	11	13	14	17	17	17	14	13	11	15	17	16	16
170	16	19	19	16	14	15	16	15	17	15	16	15	14	16	19	19	16
175	21	19	17	17	17	15	16	16	17	16	16	15	17	17	17	19	21
180	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16



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## 6.0 THD and PF Test

<b>Model No.</b>	55227	<b>Sample ID.</b>	628448-001
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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° 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	Current (A)	Power (W)	Power Factor	Current THD
25.5	276.92	60	0.5667	152.46	0.9715	9.30%



## 7.0 In-Situ Temperature Measurement Test

<b>Model No.</b>	55227	<b>Sample ID.</b>	628448-001
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### Test Method

- In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5.
- 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	Current (A)	Power (W)	Power Factor	Orientation
26.4	120.01	60	1.3243	158.61	0.9979	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	100	64.3	62.9	STWxA2PD-xx	300	85
Ambient temperature	N/A	26.4	25.0			

### Test Results(Driver1)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp. (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of Driver	57.6	56.2	VPL100-240	81
Ambient temperature	26.4	25.0		

### Test Results(Driver2)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp. (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of Driver	55.4	54.0	VPL50-120-MVHDA-PD-1C	85
Ambient temperature	26.4	25.0		



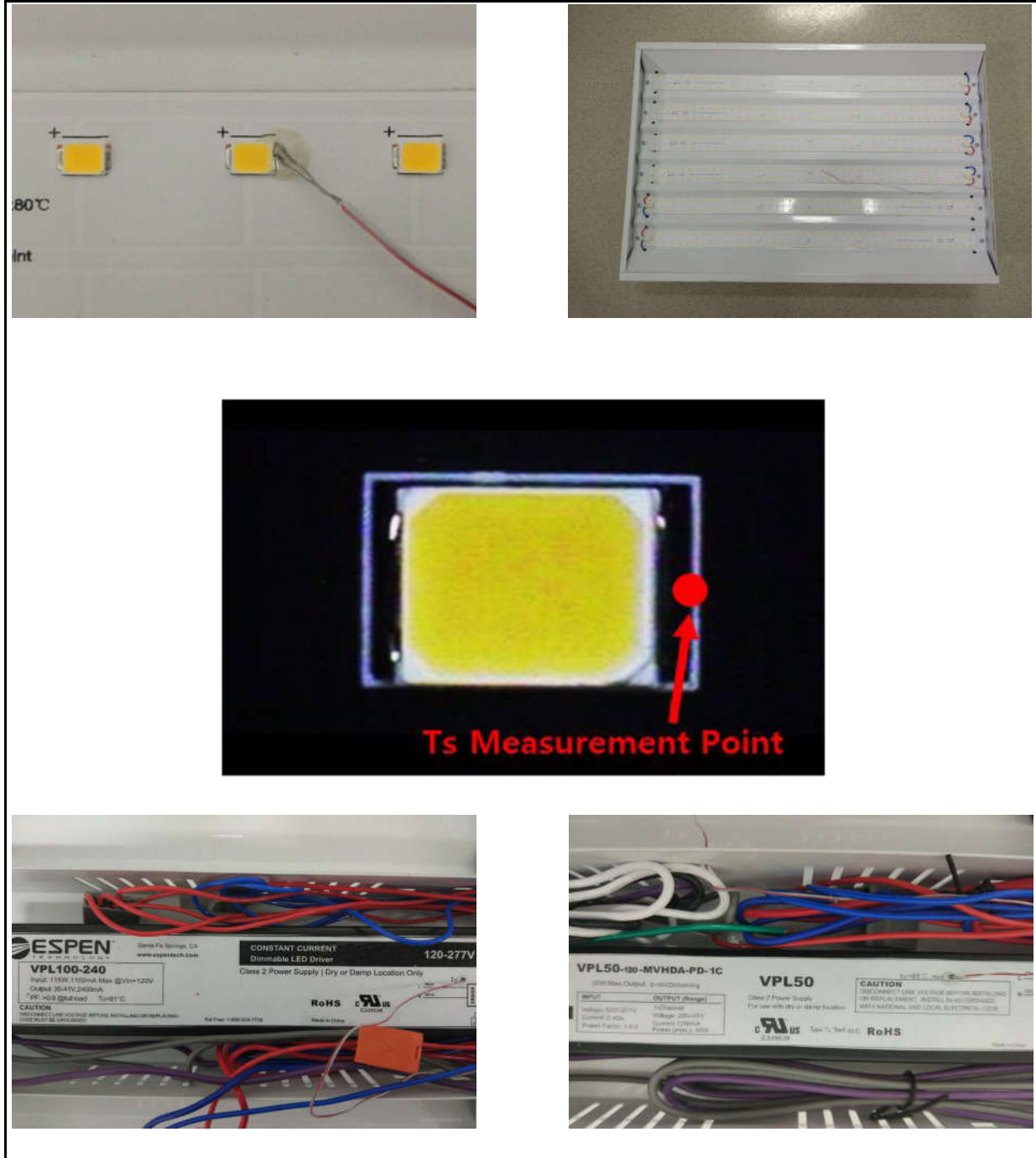
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## 7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Tc Point of LED Packages





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