



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**  
55230

**Project Number**  
4787668865  
**Report Number**  
4787668865\_33

**Test Date**  
11/10/2016-11/17/2016

**Issue Date**  
12/5/2016

Prepared By

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Approved By

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## 1.0 Test Summary

DLC Technical Requirements v4.1

<b>High-bay Luminaires for Commercial and Industrial Buildings</b>				
<b>Requirement Category</b>	<b>Test Method</b>	<b>Requirements</b>	<b>Test value</b>	<b>Results (Fail/Pass)</b>
Minimum Light Output (lm)	IES LM-79-2008	10000lm	26985.90	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%	53.30%	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	128.27	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5700	5864	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	84.22	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	0.9667	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	14.16%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	60.2	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	81	54.3	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	55230	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	11/17/2016	LED FLAT 4' HIGH BAY 223W 5700K	Elvis Wu
3	Goniophotometer Test	11/10/2016	55230	Elvis Wu
4	THD and PF Test	11/10/2016	55230	Elvis Wu
5	In-Situ Temperature Measurement Test	11/10/2016	55230	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:** 55230

**Rated Voltage:** 120~277V

**Frequency:** 50/60 Hz

**LED Package:** STWxA2PD-xx

**Family Model and Variation:** LED FLAT 4' HIGH BAY 223W 5700K

#### Photos of Luminaire Characteristics





## 5.0 LM-79 Measurement and Test Results

### 5.1 Integrating Sphere Test for the lower CCT

Model No.	55230	Sample ID.	628450-001
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.

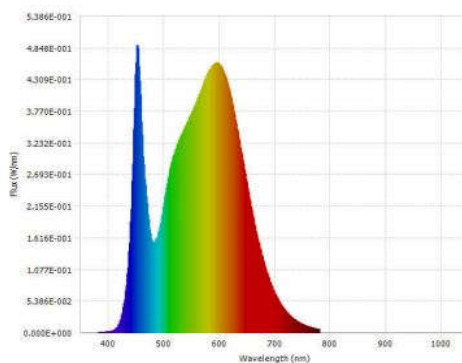
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.07	60	1.7569	210.38	0.9973	6.50%

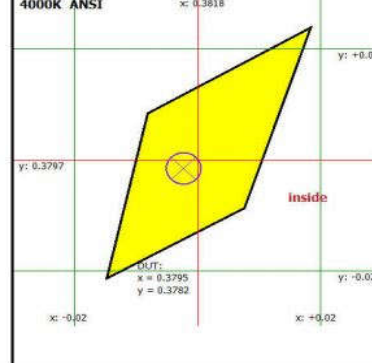
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
4033	84.22	0.001	26985.9	128.27

Spectral Flux Graph



Chromaticity Diagram 4000K ANSI



Spectral Result

Luminous Flux $\Phi(v)$	26985.7 (lm)	Chrom x	0.3795
Chrom y	0.3782	Chrom u	0.2239
Chrom v	0.3347	Duv	0.001
Chrom u'	0.2239	Chrom v'	0.5021
CCT	4033.0 (K)	Luminous Efficacy $\eta$	128.27 (lm/W)
Ra	84.22	R1	82.6
R2	90.3	R3	95.4
R4	82.7	R5	82.5
R6	86.2	R7	87.1
R8	67.0	R9	15.1
R10	76.5	R11	81.6
R12	63.3	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

Model No.	LED FLAT 4' HIGH BAY 223W 5700K	Sample ID.	628450-003
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  $25^{\circ}C \pm 1^{\circ}C$ .
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.

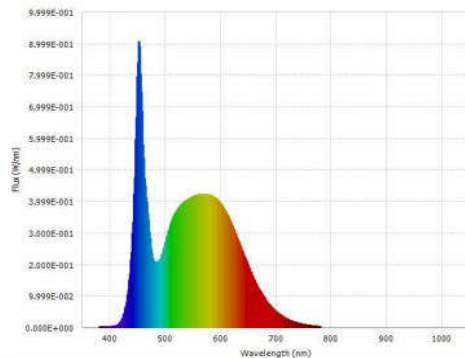
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.05	60	1.7187	205.76	0.9972	6.40%

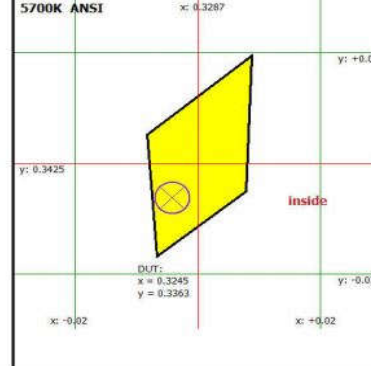
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5864	84.88	0.0012	27751.7	134.87

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	27751.7 (lm)	Chrom x:	0.3245
Chrom y	0.3363	Chrom u	0.2032
Chrom v	0.3159	Duv	0.0012
Chrom u'	0.2032	Chrom v'	0.4739
CCT	5864.0 (K)	Luminous Efficacy $\eta$	134.87 (lm/W)
Ra	84.88	R1	83.9
R2	89.5	R3	91.6
R4	84.7	R5	84.0
R6	83.7	R7	88.9
R8	72.8	R9	19.9
R10	73.6	R11	83.8
R12	59.8	R13	85.7
R14	95.6	R15	80.4
Rf	82	Rg	96



## 5.0 LM-79 Measurement and Test Results

### 5.3 Goniophotometer Test

<b>Model No.</b>	55230	<b>Sample ID.</b>	628450-001
<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	119.98	60	1.7621	210.71	0.9966	horizontal

#### Test Result

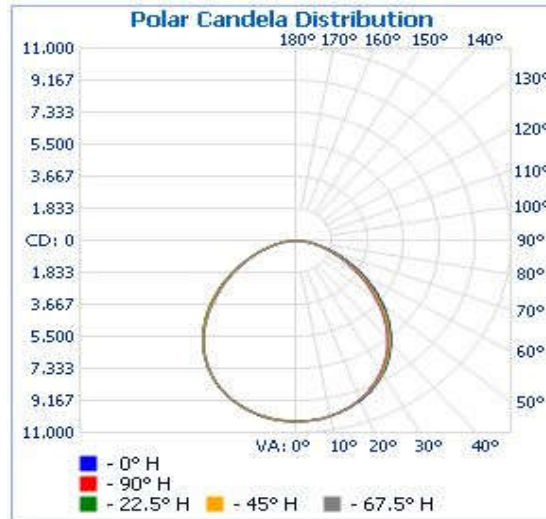
Flux (lm)	Zonal Lumen Requirement (20°-50°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
26980.7	53.3%	153.9	155.8	102.9	106.1	128.05



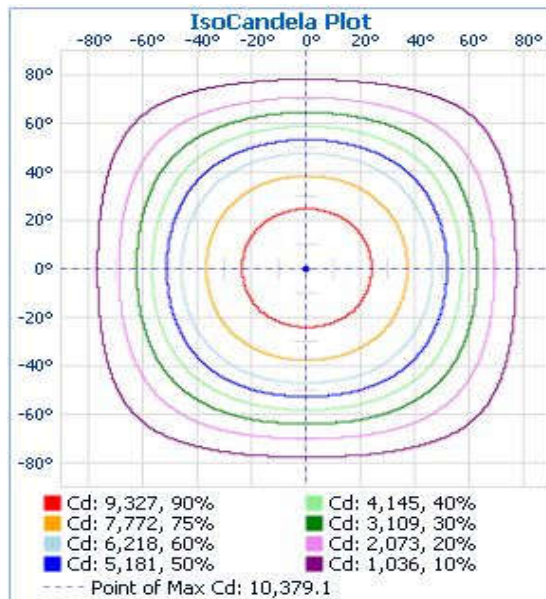


## 5.2 Goniophotometer Test (Cont'd)

### 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	8,056.8	29.9%
0-40	13,129.8	48.7%
0-60	22,337.3	82.8%
60-90	4,578.2	17%
70-100	1,769.5	6.6%
90-120	22.7	0.1%
0-90	26,915.5	99.8%
90-180	62.1	0.2%
0-180	26,977.6	100%

### Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	247.2	0.9%	90-95	5.1	0%
5-10	733.8	2.7%	95-100	3.9	0%
10-15	1,195.8	4.4%	100-105	3.7	0%
15-20	1,618.3	6.0%	105-110	3.4	0%
20-25	1,984.3	7.4%	110-115	3.3	0%
25-30	2,277.4	8.4%	115-120	3.4	0%
30-35	2,484.0	9.2%	120-125	3.5	0%
35-40	2,589.1	9.6%	125-130	4.1	0%
40-45	2,580.5	9.6%	130-135	4.4	0%
45-50	2,457.7	9.1%	135-140	4.5	0%
50-55	2,234.7	8.3%	140-145	4.6	0%
55-60	1,934.6	7.2%	145-150	4.3	0%
60-65	1,589.1	5.9%	150-155	3.8	0%
65-70	1,228.6	4.6%	155-160	3.2	0%
70-75	874.0	3.2%	160-165	2.7	0%
75-80	550.1	2.0%	165-170	2.2	0%
80-85	269.6	1.0%	170-175	1.5	0%
85-90	66.8	0.2%	175-180	0.5	0%



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## 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	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363	10363
1	10360	10362	10379	10367	10362	10378	10366	10336	10339	10336	10366	10378	10362	10367	10379	10362	10360
2	10356	10334	10371	10369	10357	10358	10361	10345	10355	10345	10361	10358	10357	10369	10371	10334	10356
3	10343	10350	10369	10352	10352	10345	10356	10314	10327	10314	10356	10345	10352	10352	10369	10350	10343
4	10331	10327	10356	10336	10346	10338	10335	10306	10335	10306	10335	10338	10346	10336	10356	10327	10331
5	10334	10318	10342	10326	10331	10320	10318	10293	10309	10293	10318	10320	10331	10326	10342	10318	10334
6	10322	10302	10314	10313	10310	10305	10294	10276	10272	10294	10305	10310	10313	10314	10302	10322	10322
7	10305	10286	10293	10284	10313	10265	10270	10246	10278	10246	10270	10265	10313	10284	10293	10286	10305
8	10285	10254	10269	10262	10276	10245	10250	10212	10246	10212	10250	10245	10276	10262	10269	10254	10285
9	10253	10233	10247	10236	10238	10222	10206	10192	10188	10192	10206	10222	10238	10236	10247	10233	10253
10	10211	10180	10206	10211	10204	10176	10169	10143	10187	10143	10169	10176	10204	10211	10206	10180	10211
11	10182	10159	10178	10166	10149	10143	10140	10124	10136	10124	10140	10143	10149	10166	10178	10159	10182
12	10146	10130	10134	10135	10124	10110	10090	10066	10083	10066	10090	10110	10124	10135	10134	10130	10146
13	10109	10080	10095	10092	10065	10051	10052	10023	10044	10023	10052	10051	10065	10092	10095	10080	10109
14	10069	10033	10054	10026	10017	10022	10001	9985	9998	9985	10001	10022	10017	10026	10054	10033	10069
15	10019	9987	10000	9984	9970	9973	9956	9935	9924	9935	9956	9973	9970	9984	10000	9987	10019
16	9976	9946	9934	9917	9926	9909	9893	9873	9876	9873	9893	9909	9926	9917	9934	9946	9976
17	9917	9894	9892	9863	9861	9850	9847	9826	9823	9826	9847	9850	9861	9863	9892	9894	9917
18	9854	9832	9821	9794	9783	9786	9778	9756	9756	9756	9778	9786	9783	9794	9821	9832	9854
19	9809	9770	9744	9740	9727	9721	9718	9699	9702	9699	9718	9721	9727	9740	9744	9770	9809
20	9759	9709	9684	9664	9647	9651	9642	9635	9627	9635	9642	9651	9647	9664	9684	9709	9759
25	9353	9345	9290	9244	9210	9198	9222	9210	9238	9210	9222	9198	9210	9244	9290	9345	9353
30	8878	8852	8808	8719	8694	8668	8702	8721	8695	8721	8702	8668	8694	8719	8808	8852	8878
35	8291	8250	8197	8095	8062	8044	8084	8082	8100	8082	8084	8044	8062	8095	8197	8250	8291
40	7576	7545	7477	7350	7287	7303	7345	7366	7356	7366	7345	7303	7287	7350	7477	7545	7576
45	6783	6726	6631	6482	6407	6425	6504	6541	6535	6541	6504	6425	6407	6482	6631	6726	6783
50	5888	5823	5690	5541	5464	5495	5581	5643	5606	5643	5581	5495	5464	5541	5690	5823	5888
55	4973	4863	4726	4573	4500	4535	4608	4697	4659	4697	4608	4535	4500	4573	4726	4863	4973
60	4024	3918	3776	3629	3562	3580	3666	3758	3717	3758	3666	3580	3562	3629	3776	3918	4024
65	3113	3007	2884	2760	2702	2711	2785	2869	2825	2869	2785	2711	2702	2760	2884	3007	3113
70	2268	2168	2071	1979	1935	1938	1988	2048	2005	2048	1988	1938	1935	1979	2071	2168	2268
75	1517	1444	1370	1301	1265	1262	1286	1326	1292	1326	1286	1262	1265	1301	1370	1444	1517
80	881	821	773	728	704	693	704	725	705	725	704	693	704	728	773	821	881
85	363	323	298	273	257	251	247	255	238	255	247	251	257	273	298	323	363
90	31	22	22	20	18	14	13	12	11	12	13	14	18	20	22	22	31
95	8	8	7	8	5	6	5	8	9	8	5	6	5	8	7	8	8
100	8	9	7	7	5	5	6	9	9	9	6	5	5	7	9	9	8
105	7	8	8	7	5	6	7	9	8	9	7	6	5	7	8	8	7
110	8	8	7	7	6	5	7	8	9	8	7	5	6	7	7	8	8
115	6	6	7	7	6	7	8	6	6	6	8	7	6	7	7	6	6
120	7	7	8	8	5	6	7	8	6	8	7	6	5	8	8	7	7
125	10	9	8	8	5	9	11	9	7	9	11	9	5	8	8	9	10
130	10	11	10	10	7	12	11	10	10	10	11	12	7	10	10	11	10
135	10	11	13	12	11	12	15	11	13	11	15	12	11	12	13	11	10
140	13	14	14	10	11	12	15	15	13	15	15	12	11	10	14	14	13
145	15	17	15	12	10	13	16	16	16	16	16	13	10	12	15	17	15
150	17	16	18	13	12	12	15	16	17	16	15	12	12	13	18	16	17
155	19	16	18	14	13	15	14	17	17	17	14	15	13	14	18	16	19
160	18	18	14	16	16	13	16	18	17	18	16	13	16	16	14	18	18
165	17	18	19	18	16	15	18	16	19	16	18	15	16	18	19	18	17
170	19	22	24	22	21	18	17	20	17	20	17	18	21	22	24	22	19
175	16	20	21	24	27	24	22	19	18	19	22	24	27	24	21	20	16
180	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22



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## 6.0 THD and PF Test

<b>Model No.</b>	55230	<b>Sample ID.</b>	628450-001
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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	276.96	60	0.7653	204.8	0.9667	14.16%



## 7.0 In-Situ Temperature Measurement Test

Model No.	55230	Sample ID.	628450-001
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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	120.07	60	1.7569	210.38	0.9973	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	61.6	60.2	STWxA2PD-xx	300	85
Ambient temperature	N/A	26.4	25.0			

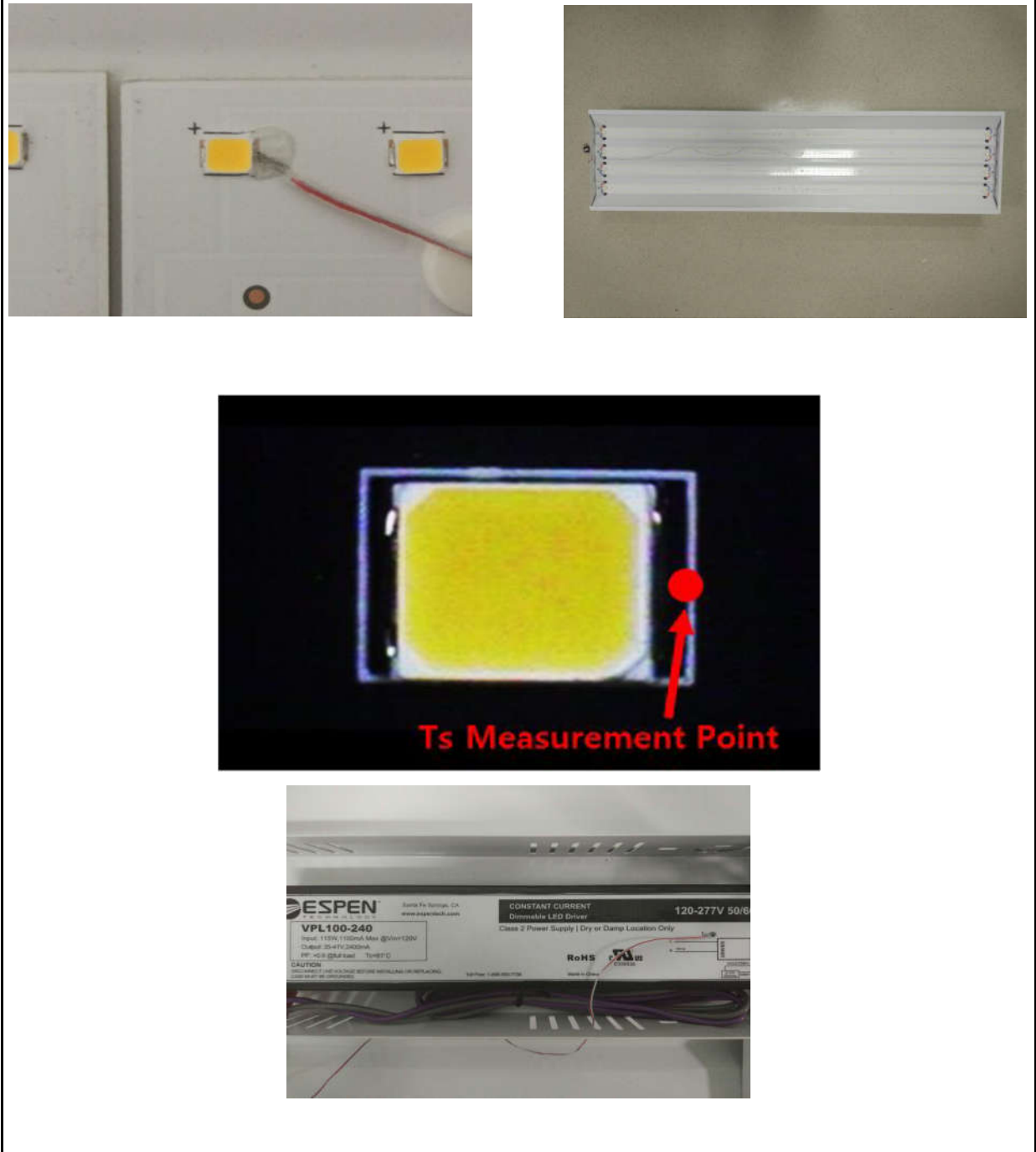
### Test Results(Driver1)

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	55.7	54.3	VPL100-240	81
Ambient temperature	26.4	25.0		



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

### Test Photos for Tc Point of LED Packages





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