



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

**55187, 5518X\_50K**

### Project Number

4787915028

### Report Number

4787915028\_4

### Test Date

3/31/2017-4/10/2017

### Issue Date

4/18/2017

Prepared By

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Approved By

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

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NVLAP LAB CODE: 600106-0

## 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	10000	11025.60	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%	54.80%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	126.1lm/W	128.47	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5000	5149	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	83.59	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	0.9699	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	7.50%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	40.3	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	90	49.1	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	4/5/2017	55187	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	3/31/2017	5518X_50K	Elvis Wu
3	Goniophotometer Test	3/31/2017	55187	Elvis Wu
4	THD and PF Test	4/5/2017	55187	Elvis Wu
5	In-Situ Temperature Measurement Test	4/10/2017	55187	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:** 55187

**Rated Voltage:** 120~277V

**Frequency:** 50/60 Hz

**LED Package:** STWxA2PD-xx

**Family Model and Variation:** 5518X\_50K

#### Photos of Luminaire Characteristics





## 5.0 LM-79 Measurement and Test Results

### 5.1 Integrating Sphere Test for the lower CCT

Model No.	55187	Sample ID.	879778-001
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° C ± 1° 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.

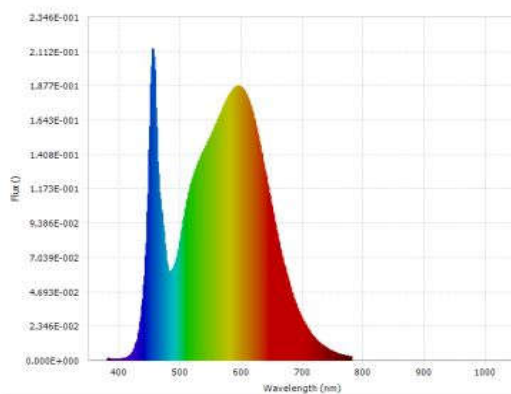
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
24.7	119.91	60	0.7223	85.82	0.9908	11.00%

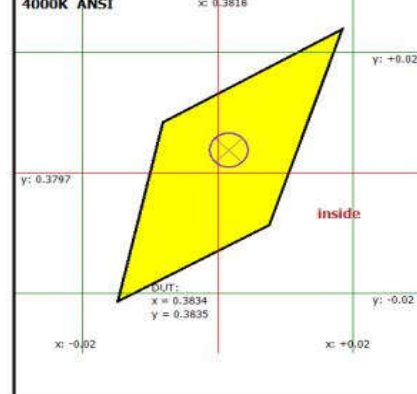
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3967	83.59	0.0023	11025.6	128.47

Spectral Flux Graph



Chromaticity Diagram 4000K ANSI



Spectral Result

Luminous Flux $\Phi(v)$	11025.6 (lm)	Chrom x	0.3834
Chrom y	0.3835	Chrom u	0.2244
Chrom v	0.3366	Duv	0.0023
Chrom u'	0.2244	Chrom v'	0.5050
CCT	3967.0 (K)	Luminous Efficacy $\eta$	128.47 (lm/W)
Ra	83.59	R1	81.9
R2	90.3	R3	95.7
R4	81.0	R5	81.2
R6	85.9	R7	86.8
R8	66.1	R9	13.8
R10	76.1	R11	79.3
R12	58.8	R13	84.1
R14	97.8	R15	76.2
Rf	82	Rg	94



## 5.0 LM-79 Measurement and Test Results

### 5.2 Integrating Sphere Test for the higher CCT

Model No.	5518X_50K	Sample ID.	879778-002
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.
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.

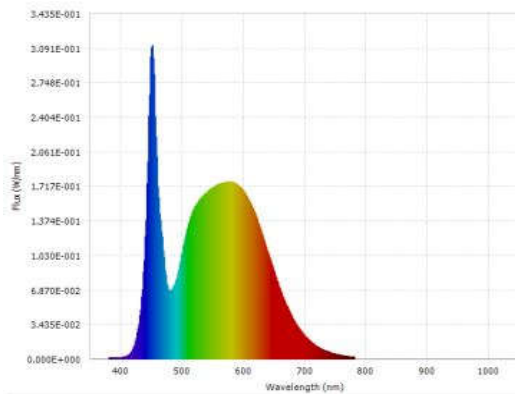
#### Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
24.7	120.03	60	0.7243	86.15	0.9910	10.60%

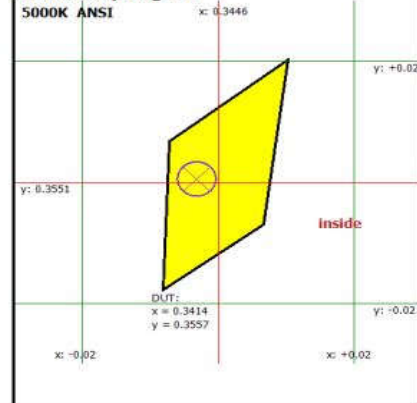
#### Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5149	82.57	0.0035	11390.4	132.22

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	11390.4 (lm)	Chrom x	0.3414
Chrom y	0.3557	Chrom u	0.2074
Chrom v	0.3241	Duv	0.0035
Chrom u'	0.2074	Chrom v'	0.4861
CCT	5149.0 (K)	Luminous Efficacy $\eta$	132.22 (lm/W)
Ra	82.57	R1	80.8
R2	86.7	R3	90.7
R4	83.0	R5	81.5
R6	81.5	R7	87.5
R8	68.9	R9	9.7
R10	68.3	R11	82.1
R12	59.9	R13	82.1
R14	95.0	R15	75.9
Rf	82	Rg	96



## 5.0 LM-79 Measurement and Test Results

### 5.3 Goniophotometer Test

<b>Model No.</b>	55187	<b>Sample ID.</b>	879778-001
<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.
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 (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120.02	60	0.7198	85.9	0.9943	horizontal

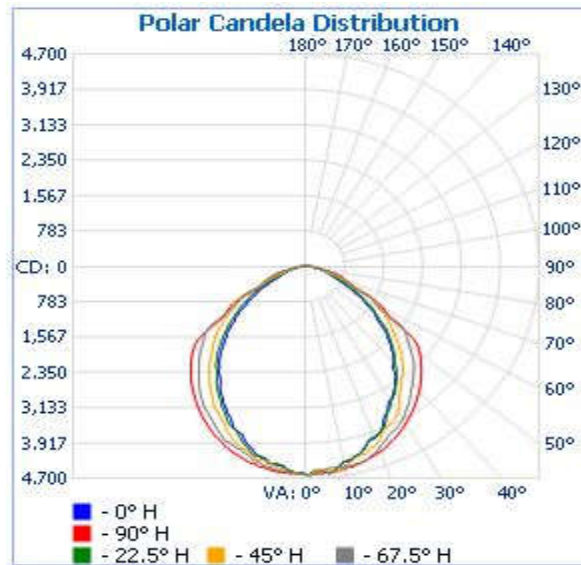
#### Test Result

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	
11060.9	54.8%	151.8	142.1	109.6	91.1	128.76

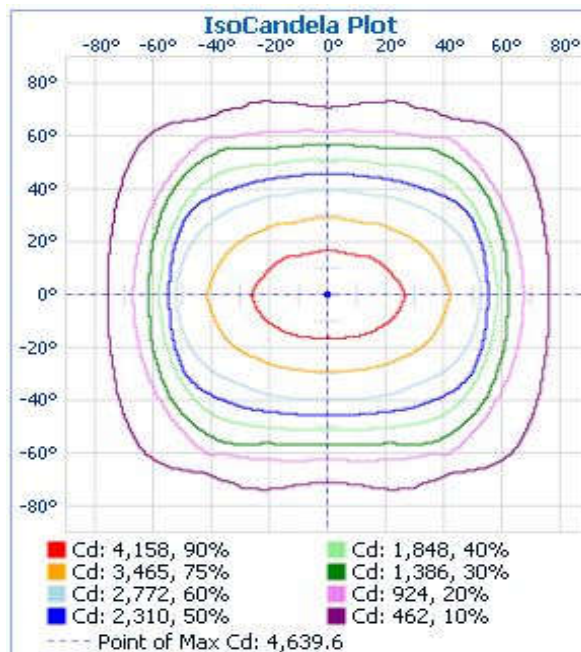


## 5.2 Goniophotometer Test (Cont'd)

### 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	3,464.9	31.3%
0-40	5,586.7	50.5%
0-60	9,442.4	85.4%
60-90	1,617.1	14.6%
70-100	621.6	5.6%
90-120	0	0%
0-90	11,059.6	100%
90-180	0	0%
0-180	11,059.6	100%

### Lumens Per Zone

#### Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	109.2	1.0%	90-95	0	0%
5-10	322.9	2.9%	95-100	0	0%
10-15	522.7	4.7%	100-105	0	0%
15-20	699.4	6.3%	105-110	0	0%
20-25	848.5	7.7%	110-115	0	0%
25-30	962.1	8.7%	115-120	0	0%
30-35	1,041.9	9.4%	120-125	0	0%
35-40	1,079.9	9.8%	125-130	0	0%
40-45	1,082.2	9.8%	130-135	0	0%
45-50	1,040.4	9.4%	135-140	0	0%
50-55	954.7	8.6%	140-145	0	0%
55-60	778.5	7.0%	145-150	0	0%
60-65	597.1	5.4%	150-155	0	0%
65-70	398.4	3.6%	155-160	0	0%
70-75	287.4	2.6%	160-165	0	0%
75-80	184.2	1.7%	165-170	0	0%
80-85	104.4	0.9%	170-175	0	0%
85-90	45.6	0.4%	175-180	0	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	338	360
0	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620	4620
1	4612	4617	4632	4640	4610	4608	4609	4576	4582	4576	4609	4608	4610	4640	4632	4617	4612
2	4573	4530	4563	4613	4592	4601	4588	4590	4595	4590	4588	4601	4592	4613	4563	4530	4573
3	4540	4523	4528	4574	4596	4574	4611	4579	4573	4579	4611	4574	4596	4574	4528	4523	4540
4	4531	4538	4521	4552	4609	4590	4595	4546	4551	4546	4595	4590	4609	4552	4521	4538	4531
5	4583	4586	4563	4520	4592	4560	4536	4510	4519	4510	4536	4560	4592	4520	4563	4586	4583
6	4620	4583	4580	4497	4598	4580	4536	4482	4439	4482	4536	4580	4598	4497	4580	4583	4620
7	4570	4578	4582	4498	4590	4565	4511	4430	4449	4430	4511	4565	4590	4498	4582	4578	4570
8	4521	4505	4594	4511	4588	4541	4478	4414	4433	4414	4478	4541	4588	4511	4594	4505	4521
9	4456	4457	4560	4517	4570	4518	4430	4424	4444	4424	4430	4518	4570	4517	4560	4457	4456
10	4399	4408	4528	4499	4555	4505	4404	4432	4382	4432	4404	4505	4555	4499	4528	4408	4399
11	4403	4385	4459	4519	4534	4502	4392	4365	4332	4365	4392	4502	4534	4519	4459	4385	4403
12	4393	4374	4421	4514	4545	4460	4390	4315	4339	4315	4390	4460	4545	4514	4421	4374	4393
13	4323	4351	4366	4496	4504	4445	4402	4307	4307	4307	4402	4445	4504	4496	4366	4351	4323
14	4320	4310	4340	4500	4511	4411	4362	4319	4266	4319	4362	4411	4511	4500	4340	4310	4320
15	4277	4285	4325	4472	4483	4372	4307	4276	4206	4276	4307	4372	4483	4472	4325	4285	4277
16	4212	4233	4337	4459	4467	4330	4261	4209	4148	4209	4261	4330	4467	4459	4337	4233	4212
17	4148	4159	4291	4409	4440	4316	4249	4158	4109	4158	4249	4316	4440	4409	4291	4159	4148
18	4073	4074	4232	4379	4414	4279	4228	4116	4034	4116	4228	4279	4414	4379	4232	4074	4073
19	4063	4034	4206	4347	4394	4267	4199	4056	3953	4056	4199	4267	4394	4347	4206	4034	4063
20	4047	4022	4178	4287	4374	4242	4157	3980	3920	3980	4157	4242	4374	4287	4178	4022	4047
25	3712	3799	3900	4070	4210	4097	3886	3770	3659	3770	3886	4097	4210	4070	3900	3799	3712
30	3429	3414	3712	3904	4023	3860	3652	3454	3368	3454	3652	3860	4023	3904	3712	3414	3429
35	3121	3169	3341	3638	3804	3652	3354	3154	3021	3154	3354	3638	3804	3638	3341	3169	3121
40	2766	2768	3038	3352	3563	3364	3043	2830	2722	2830	3043	3352	3563	3352	3038	2768	2766
45	2390	2444	2701	3077	3290	3049	2676	2447	2318	2447	2676	3049	3290	3077	2701	2444	2390
50	1914	2048	2314	2717	2994	2742	2363	2056	1882	2056	2363	2742	2994	2717	2314	2048	1914
55	1508	1630	1953	2394	2268	2421	1949	1635	1468	1635	1949	2421	2268	2394	1953	1630	1508
60	1095	1205	1651	1588	1743	1584	1669	1232	1095	1232	1669	1584	1743	1588	1651	1205	1095
65	702	809	1000	938	1023	950	1022	841	674	841	1022	950	1023	938	1000	809	702
70	498	512	619	739	808	730	686	520	488	520	686	730	808	739	619	512	498
75	350	426	393	567	571	557	405	511	343	511	405	557	571	567	393	426	350
80	214	225	297	267	204	262	317	240	209	240	317	262	204	267	297	225	214
85	91	107	142	178	124	179	150	125	99	125	150	179	124	178	142	107	91
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



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## 6.0 THD and PF Test

<b>Model No.</b>	55187	<b>Sample ID.</b>	879778-001
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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
24.7	277.01	60	0.3108	83.5	0.9699	7.50%



## 7.0 In-Situ Temperature Measurement Test

<b>Model No.</b>	55187	<b>Sample ID.</b>	879778-001
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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 (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.3	119.91	60	0.7223	85.82	0.9908	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	85	40.6	40.3	STWxA2PD-xx	300	85
Ambient temperature	N/A	25.3	25.0			

### Test Results(Driver)

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	49.4	49.1	SI80-I2000 120-277 W D1 S	90
Ambient temperature	25.3	25.0		



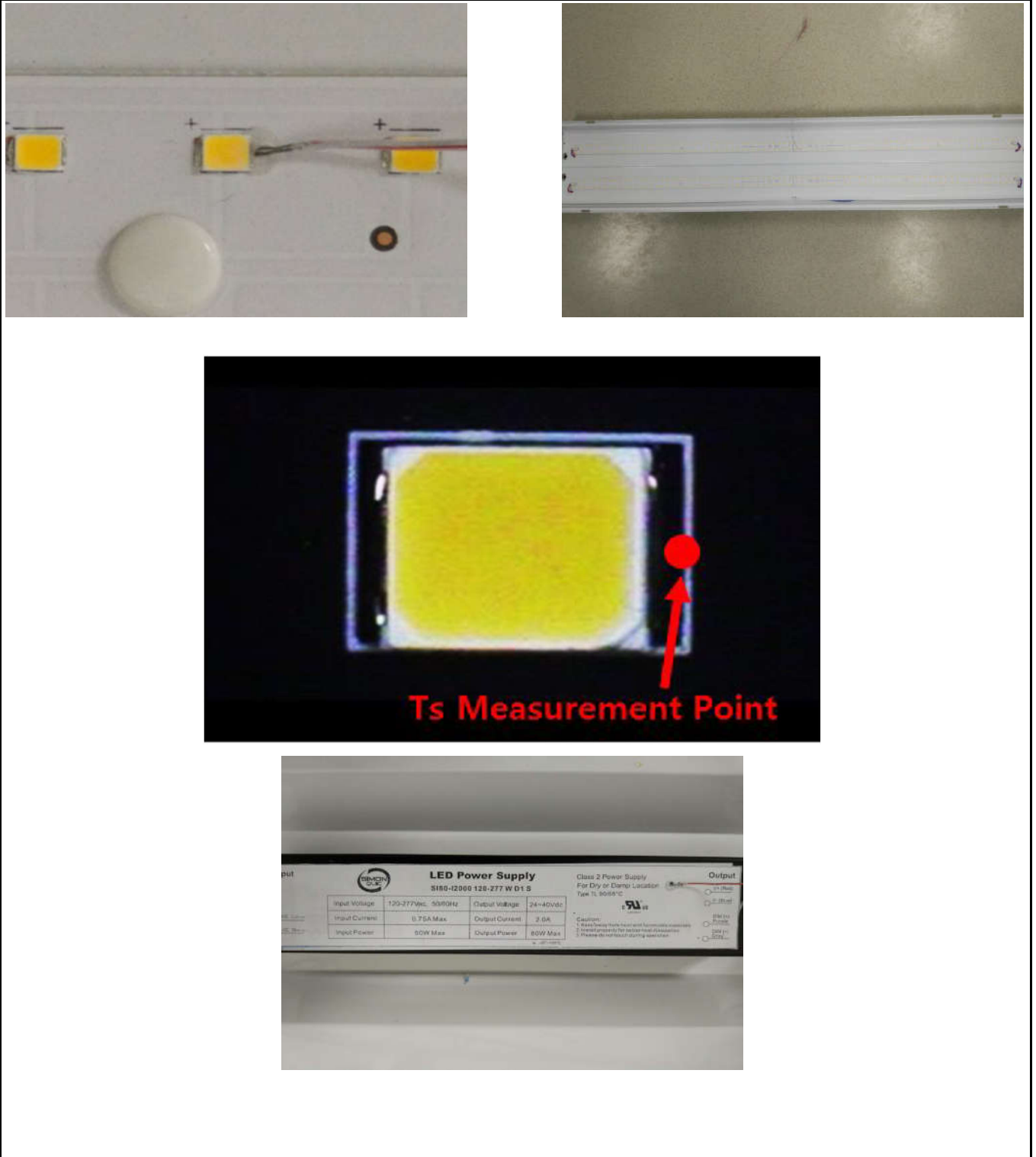
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## 7.0 In-Situ Temperature Measurement Test (Cont'd)

### Test Photos for Tc Point of LED Packages





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