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

NVLAP LAB CODE: 600106-0

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
55225

Project Number
4787655531
Report Number
4787655531_11

Test Date
10/25/2016-11/4/2016

Issue Date
11/8/2016

Prepared By	Approved By
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1.0 Test Summary

☑ DLC Technical Requirements v4.1

High-bay Luminaires for Commercial and Industrial Buildings				
Requirement Category	**Test Method**	**Requirements**	**Test value**	**Results (Fail/Pass)**
Minimum Light Output (lm)	IES LM-79-2008	10000lm	11600.5	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%	53.60%	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	131.01	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Alowable CCTs* (K)	IES LM-79-2008	≤5700	5863	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥70	84.23	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	0.9629	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	9.60%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	57.7	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	81	48.6	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.

3.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	10/25/2016	55225	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	11/4/2016	LED FLAT 2' HIGH BAY 90W 5700K	Elvis Wu
3	Goniophotometer Test	10/25/2016	55225	Elvis Wu
4	THD and PF Test	10/25/2016	55225	Elvis Wu
5	In-Situ Temperature Measurement Test	10/25/2016	55225	Elvis Wu

Remark (if any)

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

4.0 Production Description

Luminaire Description: High-bay Luminaires for Commercial and Industrial Buildings
Model Number: 55225
Rated Voltage: 120~277V
Frequency: 50/60 Hz
LED Packagr: STWxA2PD-xx
Family Model and Variation: LED FLAT 2' HIGH BAY 90W 5700K

Photos of Luminaire Characteristics

5.0 LM-79 Measurement and Test Results

5.1 Integrating Sphere Test for the lower CCT

Model No.	55225	Sample ID.	613669-001
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

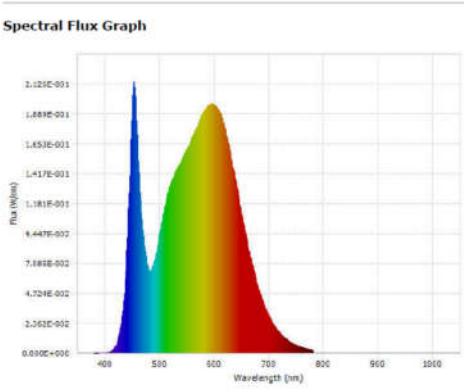
1. The sample was tested according to the IES LM-79-2008.
2. Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.
3. The sample measurements were made using a spectroradiometer 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.

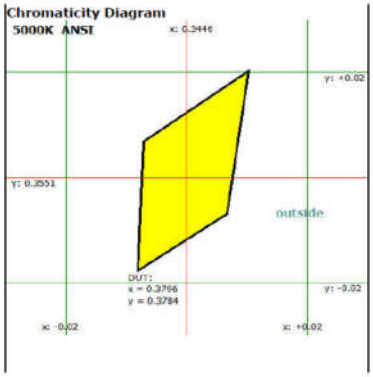
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.03	60	0.7393	88.55	0.9979	4.30%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
4033	84.23	0.0011	11600.5	131.01





Spectral Result

Luminous Flux Φ(v)	11600.5 (lm)	Chrom x	0.3796
Chrom y	0.3784	Chrom u	0.2239
Chrom v	0.3348	Duv	0.0011
Chrom u'	0.2239	Chrom v'	0.5022
CCT	4033.0 (K)	Luminous Efficacy η	131.01 (lm/W)
Ra	84.23	R1	82.6
R2	90.1	R3	95.3
R4	82.9	R5	82.5
R6	86.0	R7	87.2
R8	67.2	R9	15.4
R10	76.1	R11	81.8
R12	62.9	R13	84.6
R14	97.5	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 2' HIGH BAY 90W 5700K	Sample ID.	632604-002
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

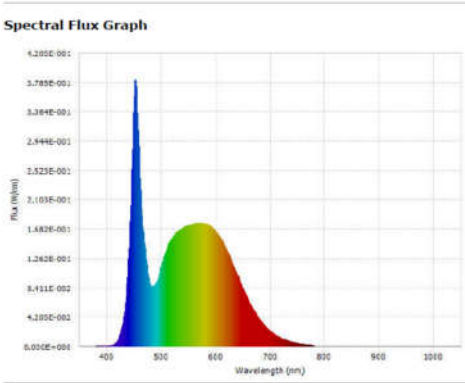
1. The sample was tested according to the IES LM-79-2008.
2. Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.
3. The sample measurements were made using a spectroradiometer 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.

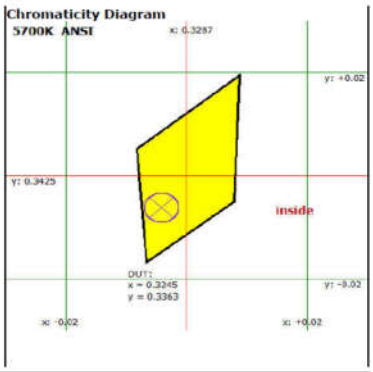
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.02	60	0.7282	87.21	0.9979	4.40%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5863	84.82	0.0012	11596.8	132.98





Spectral Result

Luminous Flux Φ(v)	11596.8 (lm)	Chrom x	0.3245
Chrom y	0.3363	Chrom u	0.2033
Chrom v	0.3159	Duv	0.0012
Chrom u'	0.2033	Chrom v'	0.4739
CCT	5863.0 (K)	Luminous Efficacy η	132.98 (lm/W)
Ra	84.82	R1	83.9
R2	89.4	R3	91.4
R4	84.7	R5	84.0
R6	83.5	R7	88.8
R8	72.9	R9	19.9
R10	73.3	R11	83.9
R12	59.6	R13	85.6
R14	95.5	R15	80.4
Rf	82	Rg	96

5.0 LM-79 Measurement and Test Results

5.3 Goniophotometer Test

Model No.	55225	Sample ID.	613669-001
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.
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

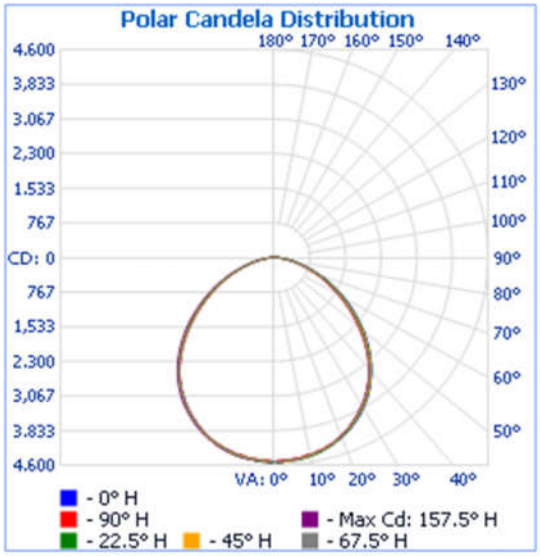
Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
25.5	120.02	60	0.7382	88.41	0.9979	horizontal

Test Result

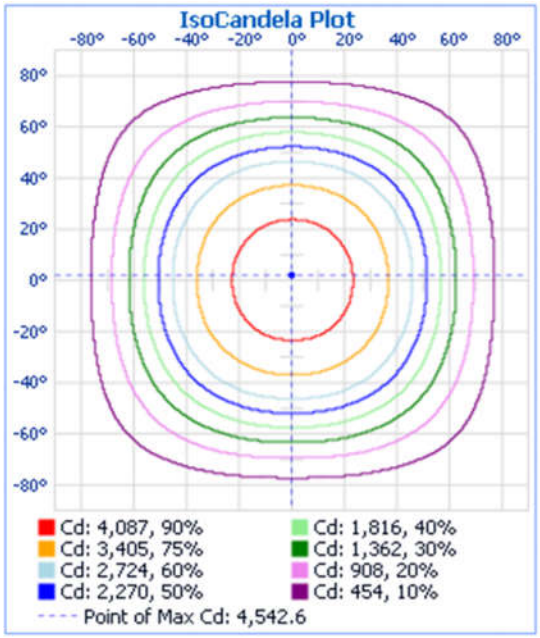
Flux (lm)	Zonal Lumen Requirement (20°-50°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
11606	53.6%	153.4	155.1	102.2	104.3	131.27

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	3,507.8	30.2%
0-40	5,705.7	49.2%
0-60	9,660.0	83.2%
60-90	1,945.9	16.8%
70-100	743.2	6.4%
90-120	0	0%
0-90	11,606.0	100%
90-180	0	0%
0-180	11,606.0	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	107.9	0.9%	90-95	0	0%
5-10	320.1	2.8%	95-100	0	0%
10-15	521.8	4.5%	100-105	0	0%
15-20	705.8	6.1%	105-110	0	0%
20-25	863.4	7.4%	110-115	0	0%
25-30	988.9	8.5%	115-120	0	0%
30-35	1,077.0	9.3%	120-125	0	0%
35-40	1,120.9	9.7%	125-130	0	0%
40-45	1,113.7	9.6%	130-135	0	0%
45-50	1,056.6	9.1%	135-140	0	0%
50-55	957.2	8.2%	140-145	0	0%
55-60	826.8	7.1%	145-150	0	0%
60-65	678.9	5.8%	150-155	0	0%
65-70	523.9	4.5%	155-160	0	0%
70-75	370.4	3.2%	160-165	0	0%
75-80	232.6	2.0%	165-170	0	0%
80-85	113.1	1.0%	170-175	0	0%
85-90	27.1	0.2%	175-180	0	0%

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	292.5	315	338	360
0	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517	4517
1	4518	4542	4519	4511	4502	4510	4517	**4543**	4527	**4543**	4517	4510	4502	4511	4519	4542	4518
2	4541	4529	4528	4518	4494	4511	4524	4524	4523	4524	4524	4511	4494	4518	4528	4529	4541
3	4516	4517	4524	4508	4498	4497	4513	4515	4530	4515	4513	4497	4498	4508	4524	4517	4516
4	4514	4521	4521	4500	4500	4496	4504	4520	4521	4520	4504	4496	4500	4500	4521	4521	4514
5	4492	4508	4505	4498	4475	4498	4493	4510	4514	4510	4493	4498	4475	4498	4505	4508	4492
6	4511	4500	4507	4490	4476	4483	4491	4489	4498	4489	4491	4483	4476	4490	4507	4500	4511
7	4497	4496	4485	4474	4466	4479	4480	4490	4486	4490	4480	4479	4466	4474	4485	4496	4497
8	4482	4489	4476	4462	4455	4464	4469	4476	4476	4476	4469	4464	4455	4462	4476	4489	4482
9	4468	4491	4475	4469	4429	4468	4455	4468	4469	4468	4455	4468	4429	4469	4475	4491	4468
10	4464	4465	4451	4434	4422	4435	4447	4450	4450	4450	4447	4435	4422	4434	4451	4465	4464
11	4433	4452	4432	4420	4423	4421	4415	4446	4430	4446	4415	4421	4423	4420	4432	4452	4433
12	4421	4435	4418	4406	4392	4395	4418	4412	4412	4412	4418	4395	4392	4406	4418	4435	4421
13	4414	4421	4392	4398	4376	4392	4397	4394	4377	4394	4397	4392	4376	4398	4392	4421	4414
14	4386	4389	4378	4368	4364	4356	4355	4370	4375	4370	4355	4356	4364	4368	4378	4389	4386
15	4377	4372	4361	4355	4332	4331	4343	4348	4341	4348	4343	4331	4332	4355	4361	4372	4377
16	4334	4346	4332	4332	4309	4306	4331	4331	4340	4331	4331	4306	4309	4332	4332	4346	4334
17	4326	4324	4307	4300	4296	4287	4298	4304	4301	4304	4298	4287	4296	4300	4307	4324	4326
18	4279	4296	4277	4258	4255	4264	4269	4261	4272	4261	4269	4264	4255	4258	4277	4296	4279
19	4274	4264	4250	4248	4226	4231	4241	4239	4236	4239	4241	4231	4226	4248	4250	4264	4274
20	4236	4232	4217	4204	4195	4201	4210	4208	4203	4208	4210	4201	4195	4204	4217	4232	4236
25	4060	4051	4034	4018	4004	4005	4012	4016	4004	4016	4012	4005	4004	4018	4034	4051	4060
30	3835	3825	3811	3788	3769	3776	3781	3782	3773	3782	3781	3776	3769	3788	3811	3825	3835
35	3564	3558	3544	3518	3497	3502	3511	3506	3505	3506	3511	3502	3497	3518	3544	3558	3564
40	3242	3238	3224	3192	3166	3172	3180	3183	3181	3183	3180	3172	3166	3192	3224	3238	3242
45	2884	2872	2851	2808	2776	2786	2806	2813	2807	2813	2806	2786	2776	2808	2851	2872	2884
50	2490	2472	2443	2394	2362	2372	2396	2415	2402	2415	2396	2372	2362	2394	2443	2472	2490
55	2084	2063	2024	1972	1940	1948	1977	2000	1993	2000	1977	1948	1940	1972	2024	2063	2084
60	1686	1658	1617	1566	1536	1541	1568	1598	1588	1598	1568	1541	1536	1566	1617	1658	1686
65	1301	1275	1231	1188	1164	1165	1188	1220	1208	1220	1188	1165	1164	1188	1231	1275	1301
70	946	917	882	851	830	828	843	869	853	869	843	828	830	851	882	917	946
75	631	606	577	555	539	535	542	560	547	560	542	535	539	555	577	606	631
80	360	347	325	310	298	294	296	307	302	307	296	294	298	310	325	347	360
85	143	136	122	114	106	103	104	105	105	105	104	103	106	114	122	136	143
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

6.0 THD and PF Test

Model No.	55225	Sample ID.	613669-001

Test Method

1. The samples were tested according to the ANSI C82.77-2002.
2. The ambient temperature condition was maintained at 25º C ± 1º 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 thedigital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Current THD
25.5	277.06	60	0.3276	87.39	0.9629	9.60%

7.0 In-Situ Temperature Measurement Test

Model No.	55225	Sample ID.	613669-001

Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5.
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. Thermocpuples 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
26.7	120.03	60	0.7393	88.55	0.9979	horizontal

Test Results(LED)

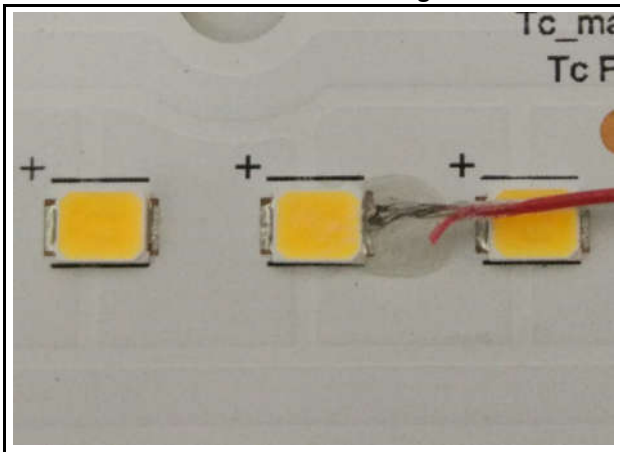
Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP of LEDs	100	59.4	57.7	STWxA2PD-xx	300	85
Ambient temperature	N/A	26.7	25.0			

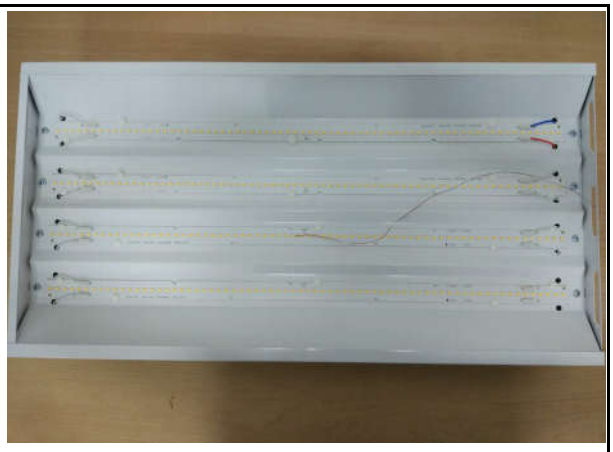
Test Results(Driver1)

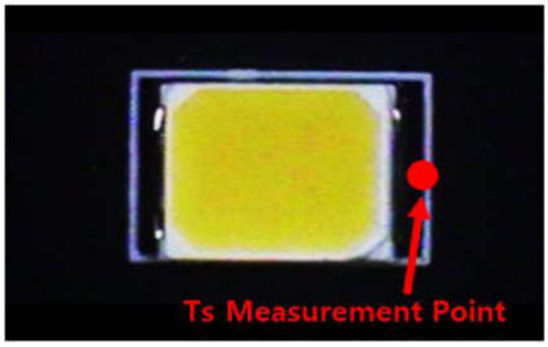
Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp. (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of Driver	50.3	48.6	VPL100-200	81
Ambient temperature	26.7	25.0		

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

Test Photos for Tc Point of LED Packages







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