



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-
- ANSI C82.77-2002
- UL1598-2008/ UL1993-2012

Prepared For

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Catalog Number

BLHE-321DUXX[Blank,MS]

Project Number

4788259862

Report Number

4788259862_3

Test Date

11/17/2016-11/21/2016

Issue Date

12/1/2017

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

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	41044.40	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%	52.70%	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	128.93	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5700	5241	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	0.9638	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	9.50%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	61.5	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	89	64.2	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	2016/11/21	BLHE-321DU40[Blank,MS]	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	2016/11/17	BLHE-321DU50[Blank,MS]	Elvis Wu
3	Goniophotometer Test	2016/11/17	BLHE-321DU40[Blank,MS]	Elvis Wu
4	THD and PF Test	2016/11/21	BLHE-321DU40[Blank,MS]	Elvis Wu
5	In-Situ Temperature Measurement Test	2016/11/17	BLHE-321DU40[Blank,MS]	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: BLHE-321DU40[Blank,MS]

Rated Voltage: 120~277V

Frequency: 50/60 Hz

LED Package: STWxA2PD-xx

Family Model and Variation: BLHE-321DU50[Blank,MS]

Photos of Luminaire Characteristics





5.0 LM-79 Measurement and Test Results

5.1 Integrating Sphere Test for the lower CCT

Model No.	BLHE-321DU40[Blank,MS]	Sample ID.	644070-001
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- The sample was tested according to the IES LM-79-2008.
- 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.
- 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.

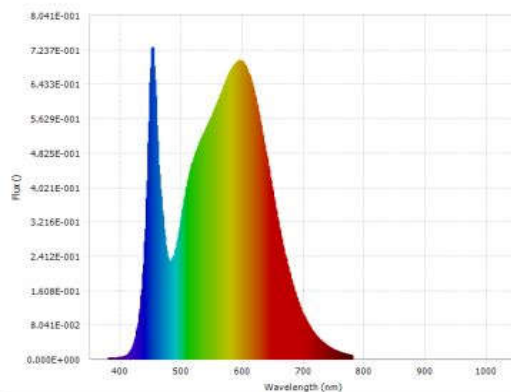
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
24.9	120.08	60	2.671	318.34	0.9925	9.30%

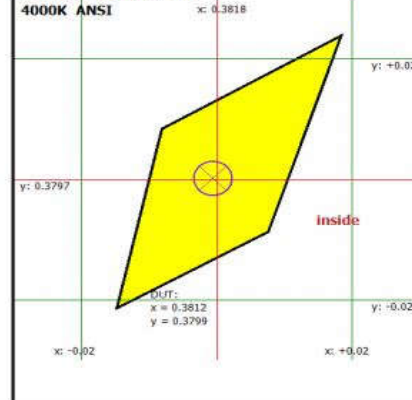
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
4000	84.22	0.0013	41044.4	128.93

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	41044.4 (lm)	Chrom x	0.3812
Chrom y	0.3799	Chrom u	0.2243
Chrom v	0.3354	Duv	0.0013
Chrom u'	0.2243	Chrom v'	0.5031
CCT	4000.0 (K)	Luminous Efficacy η	128.93 (lm/W)
Ra	84.22	R1	82.6
R2	90.2	R3	95.4
R4	82.7	R5	82.4
R6	86.1	R7	87.2
R8	67.1	R9	15.6
R10	76.3	R11	81.5
R12	63.1	R13	84.5
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.	BLHE-321DU50[Blank,MS]	Sample ID.	644070-002
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- The sample was tested according to the IES LM-79-2008.
- 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.
- 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.

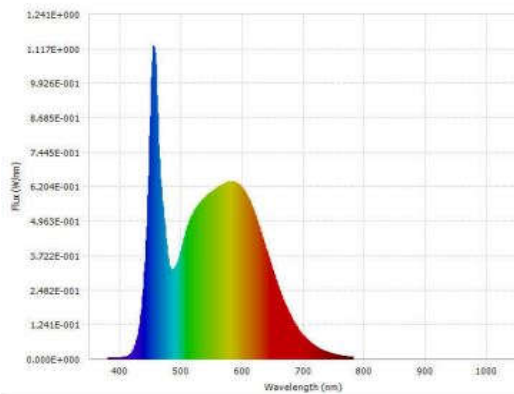
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.5	120.14	60	2.6797	319.64	0.9928	9.30%

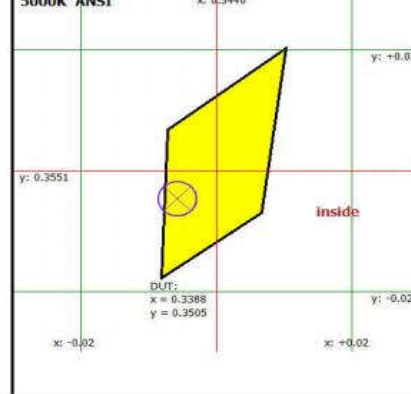
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5241	85.35	0.0021	41243.1	129.03

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	41243.1 (lm)	Chrom x	0.3388
Chrom y	0.3505	Chrom u	0.2076
Chrom v	0.3221	Duv	0.0021
Chrom u'	0.2076	Chrom v'	0.4832
CCT	5241.0 (K)	Luminous Efficacy η	129.03 (lm/W)
Ra	85.35	R1	84.3
R2	91.8	R3	94.7
R4	83.2	R5	84.0
R6	86.8	R7	87.7
R8	70.4	R9	19.1
R10	79.1	R11	82.3
R12	62.4	R13	86.8
R14	97.5	R15	79.9
Rf	82	Rg	94



5.0 LM-79 Measurement and Test Results

5.3 Goniophotometer Test

Model No.	BLHE-321DU40[Blank,MS]	Sample ID.	644070-001
Operate time (Min.)	90	Stabilization time (Min.)	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	Current (A)	Power (W)	Power Factor	Orientation
25.5	120.01	60	2.6842	319.58	0.9920	horizontal

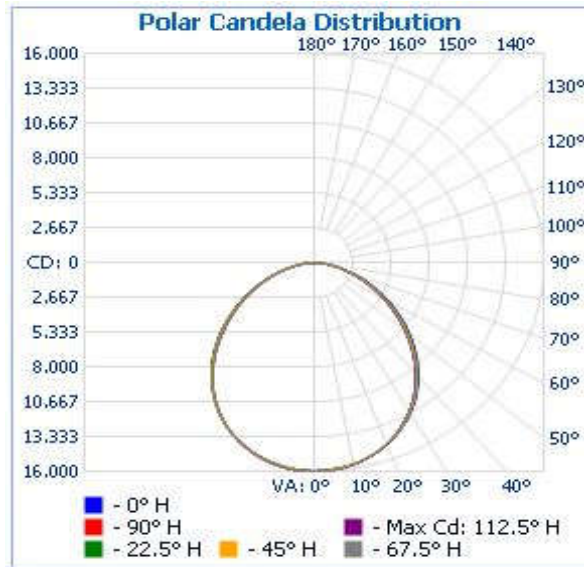
Test Result

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	
41232.1	52.7%	154.5	156.2	102.3	104.8	129.02

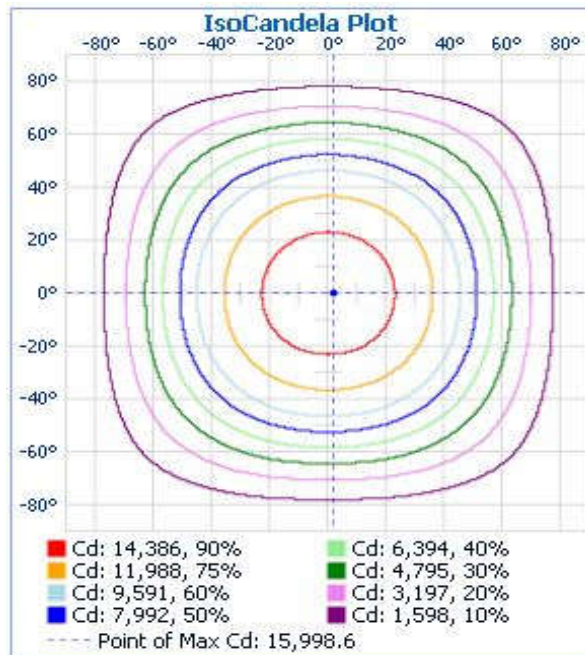


5.2 Goniophotometer Test (Cont'd)

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	12,322.3	29.9%
0-40	19,979.3	48.5%
0-60	33,917.7	82.3%
60-90	7,225.8	17.5%
70-100	2,799.8	6.8%
90-120	30.2	0.1%
0-90	41,143.4	99.8%
90-180	84.0	0.2%
0-180	41,227.5	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	380.9	0.9%	90-95	6.8	0%
5-10	1,129.6	2.7%	95-100	5.1	0%
10-15	1,838.4	4.5%	100-105	4.7	0%
15-20	2,480.3	6.0%	105-110	4.4	0%
20-25	3,030.1	7.3%	110-115	4.4	0%
25-30	3,463.1	8.4%	115-120	4.8	0%
30-35	3,757.6	9.1%	120-125	5.5	0%
35-40	3,899.4	9.5%	125-130	5.3	0%
40-45	3,877.6	9.4%	130-135	5.7	0%
45-50	3,699.6	9.0%	135-140	6.0	0%
50-55	3,387.6	8.2%	140-145	6.0	0%
55-60	2,973.6	7.2%	145-150	5.7	0%
60-65	2,486.5	6.0%	150-155	5.2	0%
65-70	1,951.5	4.7%	155-160	4.6	0%
70-75	1,401.1	3.4%	160-165	3.8	0%
75-80	873.3	2.1%	165-170	3.2	0%
80-85	414.3	1.0%	170-175	2.2	0%
85-90	99.2	0.2%	175-180	0.8	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	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974	15974
1	15930	15948	15963	15994	15998	15999	15971	15945	15945	15945	15971	15999	15998	15994	15963	15948	15930
2	15923	15944	15948	15998	15995	15978	15956	15930	15917	15930	15956	15978	15995	15998	15948	15944	15923
3	15916	15926	15945	15967	15974	15979	15939	15914	15905	15914	15939	15979	15974	15967	15945	15926	15916
4	15902	15898	15917	15954	15950	15950	15918	15890	15897	15890	15918	15950	15950	15954	15917	15898	15902
5	15884	15867	15889	15932	15952	15915	15880	15863	15870	15863	15880	15915	15952	15932	15889	15867	15884
6	15840	15848	15867	15900	15907	15897	15841	15828	15835	15828	15841	15897	15907	15900	15867	15848	15840
7	15816	15807	15826	15863	15870	15859	15808	15803	15793	15803	15808	15859	15870	15863	15826	15807	15816
8	15759	15756	15771	15822	15826	15802	15774	15750	15762	15750	15774	15802	15826	15822	15771	15756	15759
9	15739	15710	15732	15774	15763	15756	15712	15706	15695	15706	15712	15756	15763	15774	15732	15710	15739
10	15659	15669	15673	15714	15721	15698	15656	15642	15625	15642	15656	15698	15721	15714	15673	15669	15659
11	15606	15607	15611	15668	15668	15638	15602	15585	15585	15602	15638	15668	15668	15611	15607	15606	15606
12	15562	15535	15552	15591	15589	15581	15538	15509	15497	15509	15538	15581	15589	15591	15552	15535	15562
13	15486	15458	15478	15504	15503	15502	15473	15438	15432	15438	15473	15502	15503	15504	15478	15458	15486
14	15404	15397	15401	15424	15431	15412	15380	15366	15341	15366	15380	15412	15431	15424	15401	15397	15404
15	15323	15302	15300	15332	15334	15324	15305	15276	15265	15276	15305	15324	15332	15334	15300	15302	15323
16	15259	15219	15216	15236	15239	15222	15207	15192	15167	15192	15207	15222	15239	15236	15216	15219	15259
17	15148	15117	15121	15133	15146	15130	15108	15092	15068	15092	15108	15130	15146	15133	15121	15117	15148
18	15043	15033	15015	15015	15019	15023	15010	14982	14970	14982	15010	15023	15019	15015	15015	15033	15043
19	14941	14910	14899	14903	14920	14907	14900	14879	14861	14879	14900	14907	14920	14903	14899	14910	14941
20	14844	14798	14778	14776	14786	14788	14781	14764	14732	14764	14781	14788	14786	14776	14778	14798	14844
25	14187	14128	14100	14087	14076	14076	14095	14108	14096	14108	14095	14076	14076	14087	14100	14128	14187
30	13369	13314	13282	13215	13199	13212	13246	13266	13273	13266	13246	13212	13199	13215	13282	13314	13369
35	12393	12343	12283	12206	12173	12196	12247	12270	12265	12270	12247	12196	12173	12206	12283	12343	12393
40	11293	11234	11162	11061	10994	11019	11087	11149	11123	11149	11087	11019	10994	11061	11162	11234	11293
45	10060	9964	9872	9730	9680	9731	9826	9912	9914	9912	9826	9731	9680	9730	9872	9964	10060
50	8730	8639	8495	8353	8313	8371	8473	8586	8575	8586	8473	8371	8313	8353	8495	8639	8730
55	7412	7266	7130	6997	6922	6976	7095	7208	7195	7208	7095	6976	6922	6997	7130	7266	7412
60	6069	5930	5791	5639	5602	5634	5741	5877	5856	5877	5741	5634	5602	5639	5791	5930	6069
65	4755	4616	4481	4366	4319	4345	4439	4567	4541	4567	4439	4345	4319	4366	4481	4616	4755
70	3501	3366	3256	3166	3132	3151	3227	3330	3277	3330	3227	3151	3132	3166	3256	3366	3501
75	2332	2230	2141	2075	2043	2053	2101	2183	2141	2183	2101	2053	2043	2075	2141	2230	2332
80	1311	1231	1164	1117	1091	1100	1135	1201	1175	1201	1135	1100	1091	1117	1164	1231	1311
85	514	460	417	383	363	373	399	439	424	439	399	373	363	383	417	460	514
90	28	20	20	21	17	18	16	17	16	17	16	18	17	21	20	20	28
95	14	11	11	10	9	8	11	12	14	12	11	8	9	10	11	11	14
100	9	9	9	8	7	8	8	12	8	12	8	8	7	8	9	9	9
105	10	12	10	6	5	8	9	13	9	13	9	8	5	6	10	12	10
110	8	8	8	7	6	8	8	10	10	10	8	8	6	7	8	8	8
115	11	8	12	8	5	9	12	8	9	8	12	9	5	8	12	8	11
120	9	9	9	13	9	13	10	9	12	9	10	13	9	13	9	9	9
125	12	10	12	12	14	13	11	13	11	13	11	13	14	12	12	10	12
130	10	13	12	13	11	14	14	13	14	13	14	14	11	13	12	13	10
135	14	14	14	17	12	16	16	15	16	15	16	16	12	17	14	14	14
140	18	17	17	17	13	16	20	18	17	18	20	16	13	17	17	17	18
145	20	19	20	17	15	16	21	22	21	22	21	16	15	17	20	19	20
150	19	20	20	18	15	19	23	22	22	22	23	19	15	18	20	20	19
155	21	24	23	18	17	19	23	24	24	24	23	19	17	18	23	24	21
160	23	25	24	20	20	19	23	26	25	26	23	19	20	20	24	25	23
165	26	27	26	23	23	23	22	26	28	26	22	23	23	23	26	27	26
170	27	29	32	33	31	28	26	26	25	26	26	28	31	33	32	29	27
175	26	28	32	35	38	35	30	27	27	27	30	35	38	35	32	28	26
180	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33



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6.0 THD and PF Test

Model No.	BLHE-321DU40[Blank,MS]	Sample ID.	644070-001
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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	Current (A)	Power (W)	Power Factor	Current THD
24.9	277.01	60	1.1612	310.4	0.9638	9.50%



7.0 In-Situ Temperature Measurement Test

Model No.	BLHE-321DU40[Blank,MS]	Sample ID.	644070-001
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Test Method

<p>1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5.</p> <p>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. 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.</p>

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
27.0	120.08	60	2.671	318.34	0.9925	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	63.5	61.5	STWxA2PD-xx	300	85
Ambient temperature	N/A	27	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	66.2	64.2	SIS100-I2400 120-277 W D1 S	89
Ambient temperature	27.0	25.0		

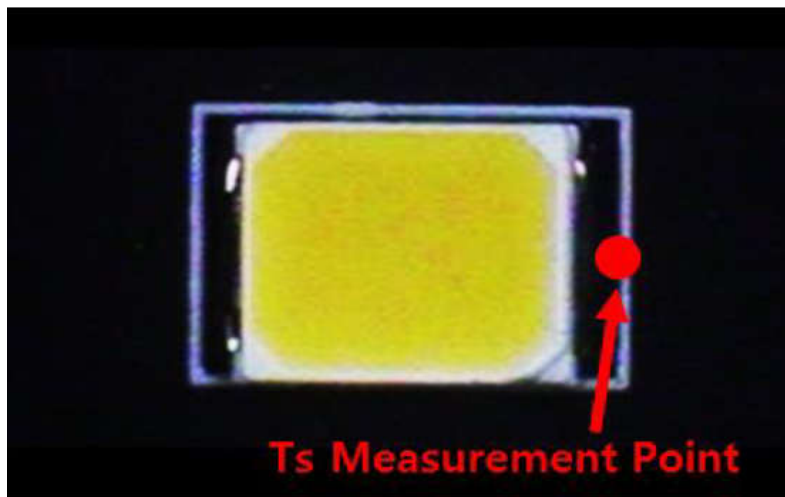
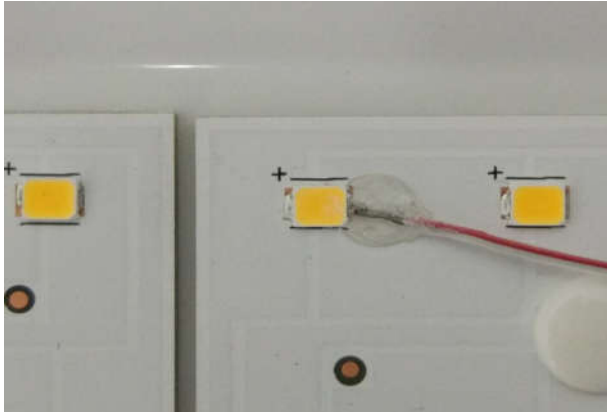


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7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Tc Point of LED Packages





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