



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

ESPEN TECHNOLOGY ,INC

12257 FLORENCE SANTA FE SPRINGS CA 90670-3805 USA

ERIC YU, 562-529-2938, eric@espentech.com

Catalog Number

VEKT2X4/8XX/23

Project Number

4788813688

Report Number

4788813688_3

Test Date

3/16/2017-3/24/2017

Issue Date

2/20/2019

Prepared By

Jonathan Xu

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>Integrated Retrofit Kits for 2x4 Luminaires</i>				
Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	3000lm	2975.64	Pass
Minimum Lamp Output (lm)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	1.24	N/A
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	1.28	N/A
Zonal Lumen Requirement (0°-60°)	IES LM-79-2008	75%	75.30%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	125lm/W	130.65	Pass
Minimum Lamp Efficacy (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008	≤5000	5044	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	84.02	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	0.9618	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	7.00%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	≤105	32.5	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	79	35.9	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	2017/3/20	VEKT2X4/835/23	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	2017/3/16	VEKT2X4/850/23	Elvis Wu
3	Goniophotometer Test	2017/3/20	VEKT2X4/835/23	Elvis Wu
4	THD and PF Test	2017/3/20	VEKT2X4/835/23	Elvis Wu
5	In-Situ Temperature Measurement Test	2017/3/24	VEKT2X4/835/23	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: Integrated Retrofit Kits for 2x4 Luminaires

Model Number: VEKT2X4/835/23

Rated Voltage: 120~277V

Frequency: 50/60 Hz

LED Package: STW8A2PD-XX

Family Model and Variation: VEKT2X4/850/23

Housing Model Number: Lithonia 2GT8 2 32 A12 MVOLT GEB10IS

Photos of Luminaire Characteristics





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5.0 LM-79 Measurement and Test Results

5.1 Integrating Sphere Test for the lower CCT

Model No.	VEKT2X4/835/23	Sample ID.	853732-001
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008 in fixture Lithonia 2GT8 2 32 A12 MVOLT GEB10IS.
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.

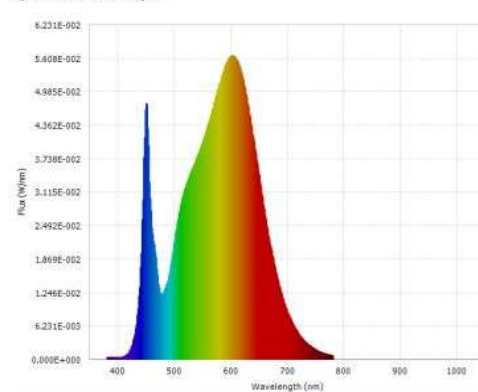
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
24.7	120.07	60	0.1901	22.776	0.9979	3.60%

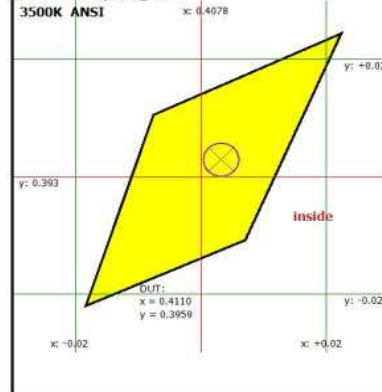
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3417	84.02	0.001	2975.64	130.65

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	2975.64 (lm)	Chrom x	0.4110
Chrom y	0.3959	Chrom u	0.2373
Chrom v	0.3428	Duv	0.001
Chrom u'	0.2373	Chrom v'	0.5143
CCT	3417.0 (K)	Luminous Efficacy η	130.65 (lm/W)
Ra	84.02	R1	82.4
R2	89.8	R3	95.9
R4	83.4	R5	82.4
R6	86.7	R7	86.3
R8	65.2	R9	15.1
R10	76.3	R11	82.8
R12	66.8	R13	84.1
R14	97.7	R15	76.1
Rf	84	Rg	97



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5.0 LM-79 Measurement and Test Results

5.2 Integrating Sphere Test for the higher CCT

Model No.	VEKT2X4/850/23	Sample ID.	853734-001
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008 in fixture Lithonia 2GT8 2 32 A12 MVOLT GEB10IS.
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.

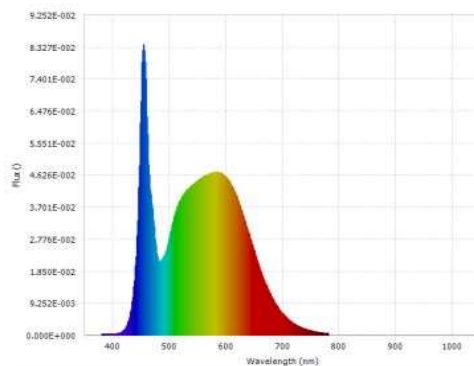
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
24.7	119.97	60	0.1935	23.169	0.9983	2.50%

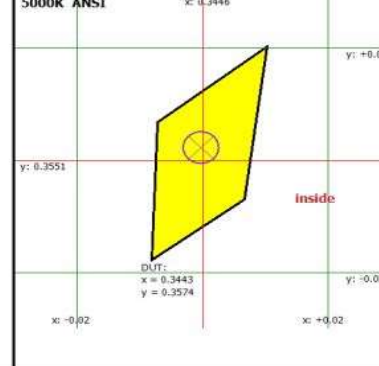
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5044	84.73	0.0032	3051.01	131.69

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	3051.01 (lm)	Chrom x	0.3443
Chrom y	0.3574	Chrom u	0.2087
Chrom v	0.3249	Duv	0.0032
Chrom u'	0.2087	Chrom v'	0.4874
CCT	5044.0 (K)	Luminous Efficacy η	131.69 (lm/W)
Ra	84.73	R1	83.3
R2	90.6	R3	94.3
R4	83.1	R5	83.2
R6	85.7	R7	87.9
R8	69.7	R9	16.8
R10	76.6	R11	82.2
R12	60.5	R13	85.5
R14	97.2	R15	78.5
Rf	82	Rg	94



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5.0 LM-79 Measurement and Test Results

5.3 Goniophotometer Test

Model No.	VEKT2X4/835/23	Sample ID.	853732-001
Opreate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008 in fixture Lithonia 2GT8 2 32 A12 MVOLT GEB10IS.
2. Photometric paramters were measured using a type C goniophotometer and software.
3. The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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	119.99	60	0.19184	22.972	0.9979	horizontal

Test Result

Flux (lm)	Zonal Lumen Requirement (0°-60°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
3012.08	75.3%	169.9	157.7	126.8	105	131.12
SC	SC					
0°~180°	90°~270°					
1.24	1.28					



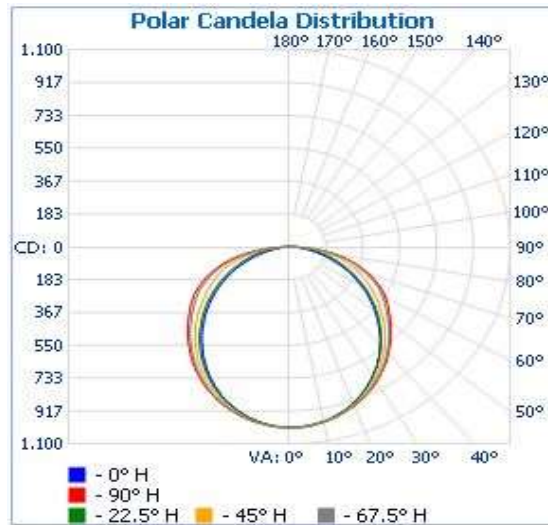
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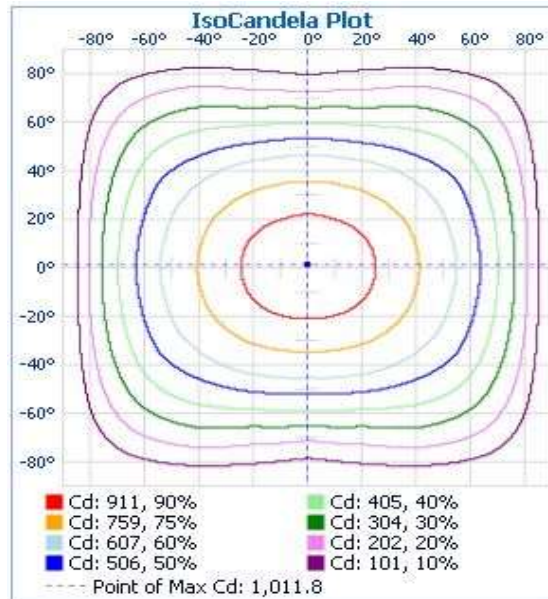
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5.2 Goniophotometer Test (Cont'd)

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	779.8	25.9%
0-40	1,274.5	42.3%
0-60	2,268.3	75.3%
60-90	744.2	24.7%
70-100	348.2	11.6%
90-120	0	0%
0-90	3,012.5	100%
90-180	0	0%
0-180	3,012.5	100%

Lumens Per Zone

Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	24.1	0.8%	90-95	0	0%
5-10	71.3	2.4%	95-100	0	0%
10-15	116.1	3.9%	100-105	0	0%
15-20	156.6	5.2%	105-110	0	0%
20-25	191.7	6.4%	110-115	0	0%
25-30	220.0	7.3%	115-120	0	0%
30-35	240.9	8.0%	120-125	0	0%
35-40	253.8	8.4%	125-130	0	0%
40-45	258.8	8.6%	130-135	0	0%
45-50	256.2	8.5%	135-140	0	0%
50-55	246.8	8.2%	140-145	0	0%
55-60	232.0	7.7%	145-150	0	0%
60-65	211.5	7.0%	150-155	0	0%
65-70	184.4	6.1%	155-160	0	0%
70-75	151.2	5.0%	160-165	0	0%
75-80	112.7	3.7%	165-170	0	0%
80-85	67.2	2.2%	170-175	0	0%
85-90	17.2	0.6%	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	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010	1010
1	1012	1008	1011	1010	1006	1009	1011	1008	1010	1008	1011	1009	1006	1010	1011	1008	1012
2	1011	1006	1011	1008	1006	1008	1010	1006	1009	1006	1010	1008	1006	1008	1011	1006	1011
3	1011	1009	1010	1008	1006	1008	1010	1004	1006	1004	1010	1008	1006	1008	1010	1009	1011
4	1009	1005	1008	1007	1006	1008	1009	1004	1007	1004	1009	1008	1006	1007	1008	1005	1009
5	1007	1003	1006	1006	1003	1005	1006	1001	1003	1001	1006	1005	1003	1006	1006	1003	1007
6	1006	1001	1004	1004	1002	1002	1005	998	1002	998	1005	1002	1002	1004	1004	1001	1006
7	1003	998	1002	1001	1000	1000	1001	995	996	995	1001	1000	1000	1001	1002	998	1003
8	997	996	1000	999	996	997	997	992	992	992	997	997	996	999	1000	996	997
9	996	992	996	996	995	997	994	989	989	989	994	997	995	996	996	992	996
10	992	988	993	991	992	992	992	984	983	984	992	992	992	991	993	988	992
11	988	985	990	990	989	988	987	978	979	978	987	988	989	990	990	985	988
12	984	981	984	985	985	984	980	973	974	973	980	984	985	985	984	981	984
13	977	975	982	982	982	981	977	970	968	970	977	981	982	982	982	975	977
14	973	969	975	977	976	976	972	964	961	964	972	976	976	977	975	969	973
15	964	962	971	972	974	971	966	958	953	958	966	971	974	972	971	962	964
16	960	958	965	967	967	964	960	950	949	950	960	964	967	967	965	958	960
17	953	950	959	961	961	962	953	943	940	943	953	962	961	961	959	950	953
18	947	944	952	955	956	954	946	936	932	936	946	954	956	955	952	944	947
19	939	937	945	950	951	947	940	929	924	929	940	947	951	950	945	937	939
20	931	928	938	943	944	941	933	921	917	921	933	941	944	943	938	928	931
25	883	887	899	907	909	906	892	873	867	873	892	906	909	907	899	887	883
30	832	834	850	865	868	860	841	822	811	822	841	860	868	865	850	834	832
35	770	776	795	814	820	811	787	762	747	762	787	811	820	814	795	776	770
40	703	710	737	760	770	757	728	696	680	696	728	757	770	760	737	710	703
45	632	642	673	704	716	699	663	625	605	625	663	699	716	704	673	642	632
50	559	570	607	644	658	638	595	553	532	553	595	638	658	644	607	570	559
55	481	494	542	584	604	580	529	479	454	479	529	580	604	584	542	494	481
60	402	420	472	532	552	525	462	403	375	403	462	525	552	532	472	420	402
65	323	344	409	468	484	460	400	328	297	328	400	460	484	468	409	344	323
70	245	271	344	393	408	385	331	255	219	255	331	385	408	393	344	271	245
75	168	202	269	312	324	303	254	187	143	187	254	303	324	312	269	202	168
80	97	137	188	219	224	208	170	119	75	119	170	208	224	219	188	137	97
85	38	68	96	106	100	90	73	48	22	48	73	90	100	106	96	68	38
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

Model No.	VEKT2X4/835/23	Sample ID.	853732-001
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Test Method

1. The samples were tested according to the ANSI C82.77-2002 in fixture Lithonia 2GT8 2 32 A12 MVOLT GEB10IS.
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	276.91	60	0.0873	23.25	0.9618	7.00%



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7.0 In-Situ Temperature Measurement Test

Model No.	VEKT2X4/835/23	Sample ID.	853732-001
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL1993-2012, Section 8.5 in fixture Lithonia 2GT8 2 32 A12 MVOLT GEB10IS.

2. The testing was conducted in a room with ambient temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. 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
24.2	120.07	60	0.1901	22.776	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	65	31.7	32.5	STW8A2PD-XX	200	105
Ambient temperature	N/A	24.2	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	35.1	35.9	VEL30054MVHDA-10V-1	79
Ambient temperature	24.2	25.0		

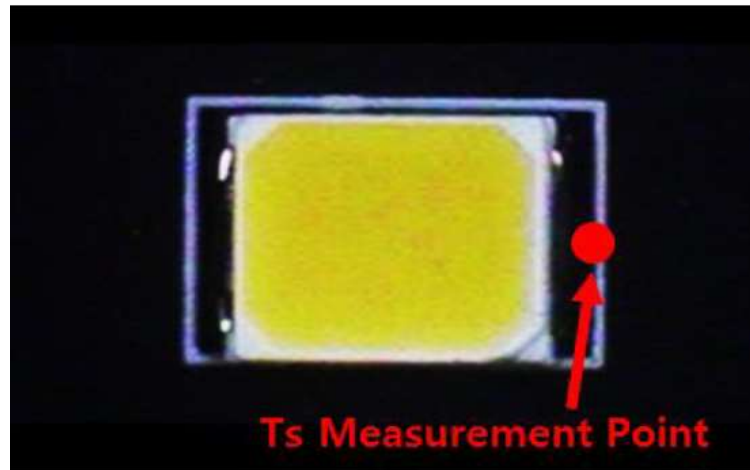
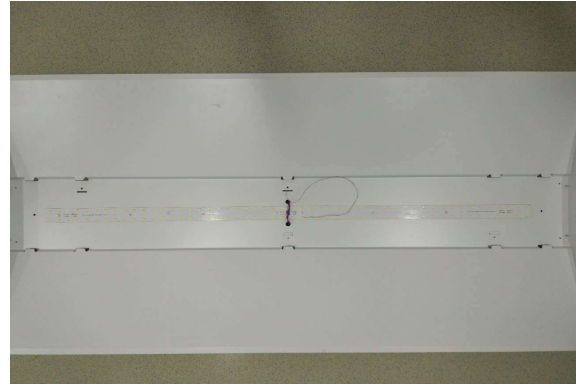
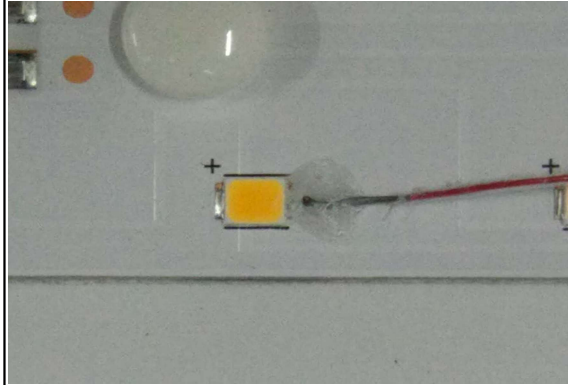


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7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Tc Point of LED Packages





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