



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

912XX_30K, 91275, 91276

912XX_30K was selected as the representative model,
all measurements are the same except CCT.

Project Number

4787662398

Report Number

4787662398_1a

Test Date

11/24/2016-11/30/2016

Issue Date

12/1/2016

Prepared By

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Duff Yang

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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

Four-foot Linear Replacement Lamps				
Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm/ft)	IES LM-79-2008	N/A	N/A	N/A
Minimum Lamp Output Bare Lamp (lm)	IES LM-79-2008	1600	1623.24	Pass
Minimum Lamp Output In luminaire (lm)	IES LM-79-2009	2700	2739.726	Pass
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	1.22	Pass
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	1.32	Pass
Zonal Lumen Requirement (0°-60°)	IES LM-79-2008	75%	84.50%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	N/A	N/A	N/A
Minimum Lamp Efficacy Bare lamp (lm/W)	IES LM-79-2008	110	133.99	Pass
Minimum Lamp Efficacy In luminaire (lm/W)	IES LM-79-2009	100	113.25	Pass
Allowable CCTs* (K)	IES LM-79-2008	≤5000	5038	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥80	83.95	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	0.9111	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-2002	≤20%	16.53%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/ UL1993-2012	105	40.1	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/ UL1993-2012	N/A	N/A	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	11/24/2016	912XX_30K	Blaire Xiong
2	Integrating Sphere Test for the Higher CCT	11/24/2016	91276	Blaire Xiong
3	Goniophotometer Test	11/30/2016	912XX_30K	Blaire Xiong
4	THD and PF Test	11/30/2016	912XX_30K	Blaire Xiong
5	In-Situ Temperature Measurement Test	11/30/2016	912XX_30K	Blaire Xiong

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: Four-foot Linear Replacement Lamps

Model Number: 912XX_30K

Rated Voltage: 100~277V AC

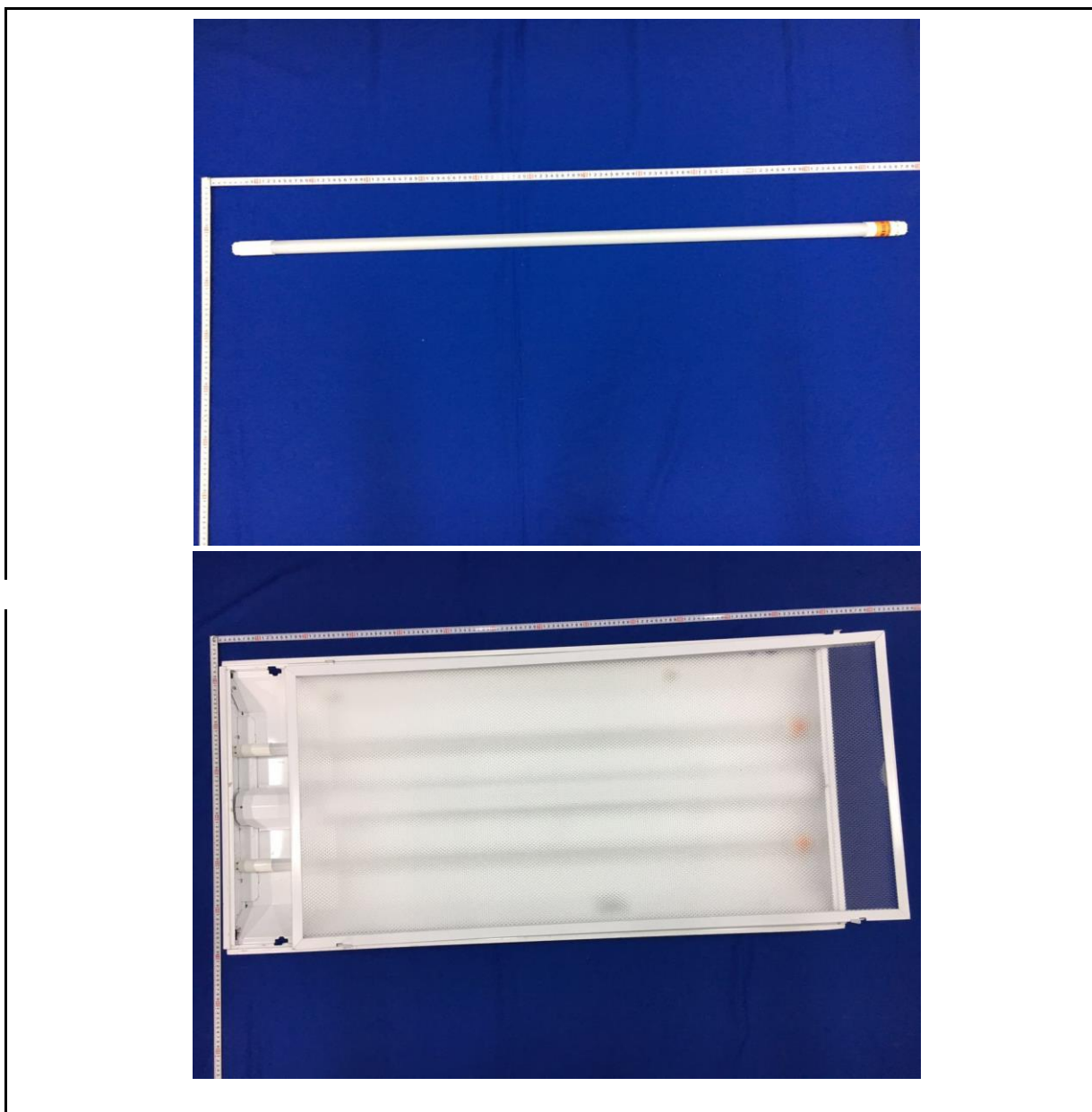
Frequency: 50/60 HZ

LED Package: SPMWH1228FD5WAW0S3

Family Model and Variation: 91276

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

Photos of Luminaire Characteristics





5.0 LM-79 Measurement and Test Results

5.1 Integrating Sphere Test for the lower CCT

Model No.	912XX_30K	Sample ID.	670096-006
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 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.

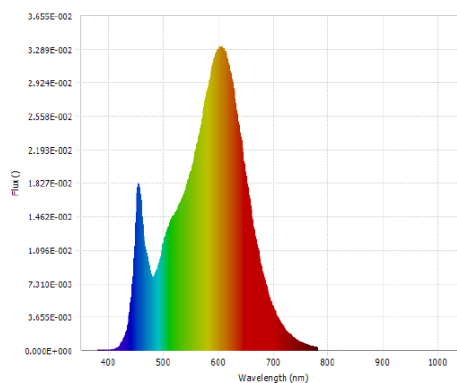
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.04	60	0.1047	12.115	0.96	horizontal

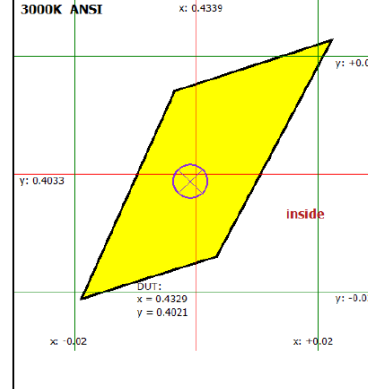
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
3050	82.92	0.0003	1623.24	133.99

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	1623.24 (lm)	Chrom x	0.4329
Chrom y	0.4021	Chrom u	0.2489
Chrom v	0.3467	Duv	0.0003
Chrom u'	0.2489	Chrom v'	0.5200
CCT	3050.0 (K)	Luminous Efficacy η	133.99 (lm/W)
Ra	82.92	R1	82.0
R2	93.2	R3	93.7
R4	80.2	R5	82.6
R6	92.2	R7	81.3
R8	58.1	R9	7.0
R10	84.9	R11	80.0
R12	75.1	R13	84.9
R14	97.1	R15	74.0
Rf	83	Rg	94



5.0 LM-79 Measurement and Test Results

5.2 Integrating Sphere Test for the higher CCT

Model No.	91276	Sample ID.	670096-008
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

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

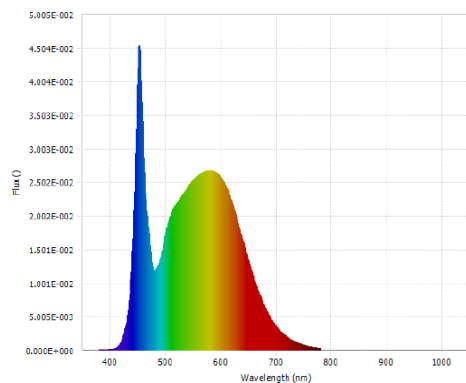
Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency(Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.05	60	0.1057	12.227	0.96	horizontal

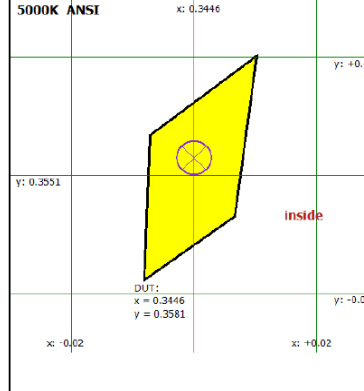
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)
5038	83.95	0.0035	1720.68	140.73

Spectral Flux Graph



Chromaticity Diagram



Spectral Result

Luminous Flux $\Phi(v)$	1720.68 (lm)	Chrom x	0.3446
Chrom y	0.3581	Chrom u	0.2086
Chrom v	0.3251	Duv	0.0035
Chrom u'	0.2086	Chrom v'	0.4877
CCT	5038.0 (K)	Luminous Efficacy η	140.73 (lm/W)
Ra	83.95	R1	82.0
R2	89.3	R3	93.9
R4	83.1	R5	82.6
R6	84.6	R7	87.6
R8	68.4	R9	11.8
R10	74.4	R11	82.3
R12	62.8	R13	83.9
R14	96.9	R15	76.9
Rf	83	Rg	95



5.0 LM-79 Measurement and Test Results

5.3 Goniophotometer Test

Model No.	912XX_30K	Sample ID.	670096-006, 670096-007
Operate 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 MVOL GEB10IS.
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
25.2	120.03	60	0.20694	24.191	0.974	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	
2739.726	84.5%	160.6	153.9	105.2	96.8	113.25
SC: 0-180°	SC: 90-270°					
1.22	1.32					



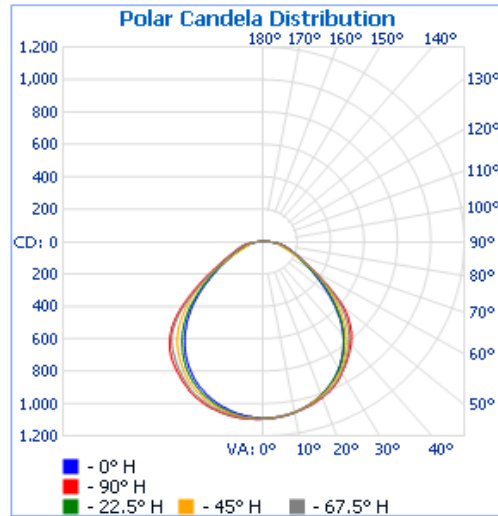
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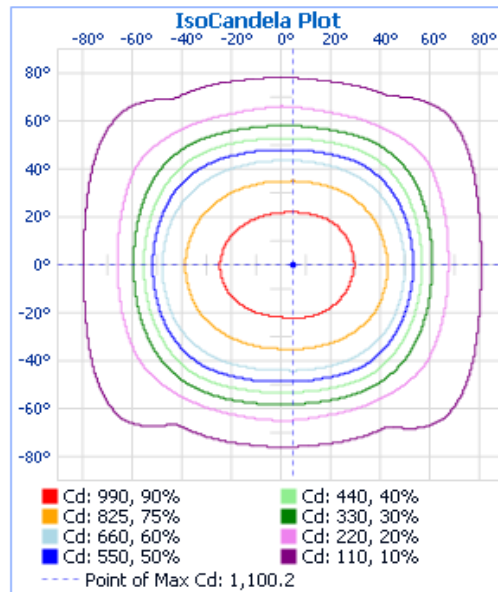
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5.2 Goniophotometer Test (Cont'd)

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	854.2	31.2%
0-40	1,394.4	50.9%
0-60	2,315.2	84.5%
60-90	418.8	15.3%
70-100	191.9	7%
90-120	2.3	0.1%
0-90	2,734.0	99.8%
90-180	5.7	0.2%
0-180	2,739.7	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	26.1	1.0%	90-95	0.7	0%
5-10	77.4	2.8%	95-100	0.4	0%
10-15	126.3	4.6%	100-105	0.3	0%
15-20	171.2	6.3%	105-110	0.3	0%
20-25	210.7	7.7%	110-115	0.3	0%
25-30	242.5	8.8%	115-120	0.3	0%
30-35	264.3	9.6%	120-125	0.3	0%
35-40	275.8	10.1%	125-130	0.3	0%
40-45	274.4	10.0%	130-135	0.3	0%
45-50	255.5	9.3%	135-140	0.4	0%
50-55	218.5	8.0%	140-145	0.4	0%
55-60	172.4	6.3%	145-150	0.4	0%
60-65	129.9	4.7%	150-155	0.3	0%
65-70	98.0	3.6%	155-160	0.3	0%
70-75	75.6	2.8%	160-165	0.3	0%
75-80	59.4	2.2%	165-170	0.2	0%
80-85	41.0	1.5%	170-175	0.2	0%
85-90	14.8	0.5%	175-180	0.1	0%



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	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093
1	1088	1095	1091	1091	1095	1096	1091	1088	1089	1092	1091	1095	1098	1097	1093	1091	1088
2	1088	1089	1092	1092	1095	1093	1089	1089	1088	1093	1093	1096	1100	1098	1093	1090	1088
3	1088	1089	1087	1092	1094	1091	1089	1087	1087	1091	1092	1095	1098	1098	1092	1091	1088
4	1085	1088	1086	1089	1090	1088	1086	1084	1083	1092	1092	1096	1098	1100	1092	1089	1085
5	1084	1086	1084	1087	1089	1088	1084	1082	1082	1090	1091	1095	1100	1096	1094	1087	1084
6	1080	1082	1082	1083	1085	1083	1082	1080	1082	1087	1090	1096	1098	1096	1092	1087	1080
7	1080	1082	1079	1081	1084	1084	1078	1078	1076	1085	1088	1093	1099	1096	1089	1084	1080
8	1076	1078	1076	1077	1078	1078	1074	1075	1074	1083	1085	1092	1098	1097	1088	1079	1076
9	1072	1074	1070	1074	1078	1076	1072	1071	1071	1078	1082	1091	1096	1094	1084	1079	1072
10	1071	1071	1068	1071	1072	1072	1067	1066	1066	1075	1080	1089	1095	1093	1083	1075	1071
11	1064	1065	1065	1066	1068	1068	1064	1062	1062	1071	1077	1086	1093	1091	1079	1070	1064
12	1061	1060	1061	1063	1063	1064	1057	1058	1054	1066	1074	1085	1090	1087	1076	1066	1061
13	1055	1056	1054	1059	1062	1061	1054	1053	1050	1061	1070	1082	1088	1086	1073	1061	1055
14	1049	1050	1050	1053	1055	1056	1049	1044	1046	1055	1067	1078	1085	1082	1068	1055	1049
15	1043	1044	1044	1049	1052	1050	1044	1041	1038	1051	1062	1074	1081	1078	1064	1051	1043
16	1037	1038	1038	1043	1048	1046	1037	1032	1032	1045	1057	1070	1078	1073	1060	1046	1037
17	1030	1030	1031	1039	1043	1040	1032	1026	1026	1036	1050	1066	1075	1071	1053	1037	1030
18	1024	1023	1026	1031	1037	1034	1026	1022	1018	1031	1044	1061	1070	1066	1048	1032	1024
19	1017	1015	1017	1026	1030	1030	1018	1012	1010	1023	1039	1055	1066	1059	1043	1026	1017
20	1008	1006	1011	1022	1027	1024	1010	1004	1004	1018	1032	1049	1060	1054	1037	1018	1008
25	960	962	970	984	992	985	968	958	955	973	995	1019	1029	1024	1002	975	960
30	902	905	921	933	936	929	911	899	894	916	944	968	984	977	953	922	902
35	827	832	850	870	876	863	844	826	819	844	878	913	932	921	889	850	827
40	740	742	767	797	814	800	771	741	731	757	805	851	874	848	810	763	740
45	629	640	670	705	732	721	683	645	627	656	708	764	783	750	700	654	629
50	508	524	558	592	618	599	567	528	508	530	585	627	652	623	582	535	508
55	392	408	436	451	460	445	438	403	385	405	449	463	488	476	458	414	392
60	303	299	320	330	326	315	305	290	289	290	313	330	347	351	337	304	303
65	236	220	225	245	236	225	196	200	215	203	204	238	250	259	234	224	236
70	184	167	154	189	180	172	130	144	157	147	133	182	188	196	157	169	184
75	137	129	112	144	146	137	99	108	115	110	103	141	151	148	115	129	137
80	100	93	89	103	111	104	83	80	86	79	86	105	115	107	91	90	100
85	54	51	50	59	61	60	48	46	45	44	50	60	62	61	52	50	54
90	4	3	2	3	3	3	2	1	1	1	1	2	4	5	6	5	4
95	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0
105	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1
110	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0
115	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	1
120	0	1	0	1	1	1	1	0	1	0	0	1	1	0	1	0	0
125	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1
130	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
135	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
145	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
150	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
155	1	2	1	2	1	2	1	1	1	1	1	1	1	2	1	1	1
160	2	2	2	1	2	1	2	1	2	1	2	1	2	2	2	1	2
165	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
170	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
175	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2
180	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2



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6.0 THD and PF Test

Model No.	912XX_30K	Sample ID.	670096-006, 670096-007
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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 MVOL GEB10IS.
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
24.9	276.99	60	0.0975	24.61	0.9111	16.53%



7.0 In-Situ Temperature Measurement Test

Model No.	912XX_30K	Sample ID.	670096-006, 670096-007
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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 MVOL GEB10IS.

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.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
25.9	120.03	60	0.20694	24.191	0.97	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	35	41	40.1	SPMWH1228FD5 WAWOS3	150	55
Ambient temperature	N/A	25.9	25.0			



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

Test Photos for Tc Point of LED Packages

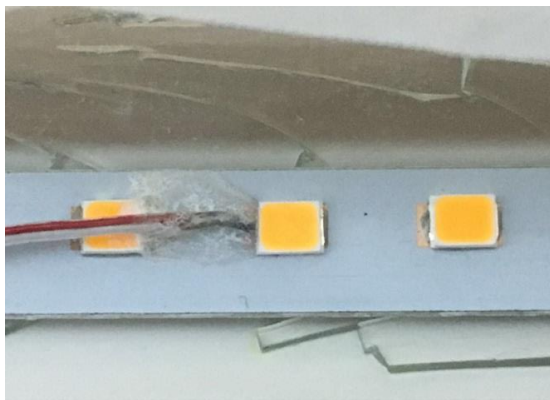
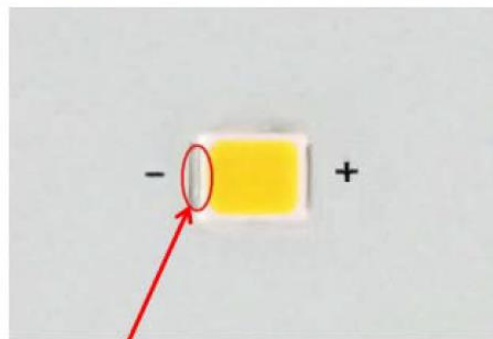


Photo 1 General Appearance of the EUT



Case Temperature
Measurement Point



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