



## ENERGY STAR® Luminaire Test Report

ENERGY STAR® Program Requirements Product Specification for Luminaires - Version 2.0 - Issued 2015-05-29

Prepared For

### L-TECH CORPORATION

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Catalog Number

ULD103W-##90, ULD103BZ-##90, ULD103BK-##90

(##=00-11 intends CCT 2700K, 3000K and 3500K, ##=20-30 intends CCT 2700K, 3000K and 4000K.)

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

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## 1.0 Test Summary

ENERGY STAR® Program Requirements Product Specification for Luminaires - Version 2.0 - Issued 2015-05-29

<b>(Under Cabinet Mount)</b>				
Requirement Category	Test Method	Requirement	Test Value	Results (Pass/Fail)
Efficacy (lm/W)	IES LM-79-08	Non-directional: 65 lm/W; Directional: 50 lm/W; Inseparable SSL Luminaire: 70 lm/W.	72.4	Pass
Light Output (lm)	IES LM-79-08	Luminous Flux (lm)	881.44	Pass
		Under Cabinet: 125 lm/ft	364.23	
Zonal Lumen Density	IES LM-79-08	For directional luminaires only. (0°~60°C) >60%	78.10%	Pass
CCT (K)	ANSI C78.377-2011	fall within the corresponding 7-step chromaticity quadrangles	2786	Pass
CRI	IES LM-79-08, CIE 13.3-1995	Ra ≥ 80	93.2	Pass
R9	IES LM-79-08, CIE 13.3-1995	R9 > 0	59	Pass
Color Angular Uniformity	IES LM-79-08, CIE 15: 2004	≤ 0.006 on the CIE 1976 (u',v') diagram	0.00076	Pass
Lumen Maintenance & Light Source Life (hours)	IES LM-80-08*, IES TM-21-11*	L70 ≥ 25,000 hours for indoor; L70 ≥ 35,000 hours for outdoor; L70 ≥ 50,000 h for inseparable luminaires	60000	Pass
Color Maintenance	IES LM-80-08*, IES LM-84-14	≤ 0.007 on the CIE 1976 (u',v') diagram	0.0031	Pass
Source Start Time (ms)	ENERGY STAR Start Time Test Method	1 s for connected luminaires; 750 ms for other luminaires.	136	Pass
Source Run-Up Time (s)	ENERGY STAR Run Up Time Test Method	≤ 45 seconds	N/A	N/A
Power Factor	C82.77-10:2014	power ≤ 5 watts: PF ≥ 0.5; power > 5 watts: PF ≥ 0.7	0.973	Pass
Transient Protection	IEEE C62.41.2-2002	Survival	Validated	Pass
Standby Power Consumption (W)	IEC 62301 ED.2.0 B	Shall not draw power in the off state.	0.01	Pass
Operating Frequency (Hz)	N/A	Frequency ≥ 120 Hz	120.1	Pass

\* The standards are NOT covered by the NVLAP scope of test laboratory UL Verification Services (Guangzhou) Co., Ltd.



## 1.0 Test Summary (Cont'd)

Requirement Category	Test Method	Requirement	Test Value	Results (Pass/Fail)
Light Source Replaceability	N/A	Fluorescent & Directional LED luminaire	Validated	Pass
LED Tc Temperature (°C)	ANSI/UL 153:2002 ANSI/UL 1598:2008	Within the highest test temperature in LM-80 report	36.5	Pass
Driver Case Temperature (°C)	ANSI/UL 153:2002 ANSI/UL 1598:2008	≤ TMPC marked on the the driver	53.1	Pass
Recessed Downlight Thermal Performance	ANSI/UL 1598-2008 ASTM E283-04*	Insulation contact & Airtight construction	N/A	N/A
SAFETY REQUIREMENTS for luminaire and driver	UL Safety standards	Safety documentation	Validated	Pass
Dimming: Range (Minimum)	N/A	≤20%	9.36%	Pass
Dimming: Noise	N/A	24dBA at 1 meter	17.8	Pass
Labeling & Packaging	N/A	Relevant document	Validated	Pass
WARRANTY REQUIREMENTS	N/A	no less than 3 years	Validated	Pass
Lighting Toxics Reduction Requirements	RoHS Directive, 2003*	Relevant Documentations	Validated	Pass

\* The standards are NOT covered by the NVLAP scope of test laboratory UL Verification Services (Guangzhou) Co., Ltd.



## 2.0 Test List

Test Item	Test	Test Date	Test Model	Tests Conducted By
1	Integrating Sphere Test	2107-12-13	ULD103W-0190	Lily Chen
		2107-12-23	ULD103W-2090	Lily Chen
2	Goniophotometer Test	2107-12-18	ULD103W-0190	Lily Chen
3	Color Angular Uniformity	2107-12-18	ULD103W-0190	Lily Chen
4	Source Start Time & Run-Up time	2107-12-13	ULD103W-0190	Lily Chen
5	Operating Frequency Test	2107-12-13	ULD103W-0190	Lily Chen
6	Transient Protection Test	2107-12-18	ULD103W-0190	Lily Chen
7	Standby Power Consumption	2107-12-18	ULD103W-0190	Lily Chen
8	Dimming Test	2107-12-18	ULD103W-0190	Lily Chen
9	In-Situ Temperature Measurement Test	2107-12-18	ULD103W-0190	Lily Chen

### Remark (if any)

1, UL test equipment information is recorded on Meter Use in UL's Aurora database.  
2, The product belong to Color Tunable, where ##=00-11 intends CCT 2700K, 3000K and 3500K, ##=20-30 intends CCT 2700K, 3000K and 4000K. The default settings and maximum power are at 2700K color temperature states.



### 3.0 Production Description

**Luminaire Description:** Indoor Directional Luminaires, LED Under cabinet for Color Tunable  
120Vac, 60Hz, 13W, CRI 90, CCT 2700K - 4000K, Length 29 inch

**Lighting Source:** 2T03X2WWxx000xxx made by Edison Opto Corporation

**Mounting:** Under Cabinet Mount

**LED Driver:** ULD10

**Family Model and Variation:** ULD103W-##90, ULD103BZ-##90, ULD103BK-##90, W, BZ and BK intends the color of product appearance, W=White, BZ=Brown, BK=Black, ##=00-11 intends CCT 2700K, 3000K and 3500K; ##=20-30 intends CCT 2700K, 3000K and 4000K. All of the CCT corresponding LED is 0.2 W series model 2T03X2WWxx000xxx except the model name with ##=20-30 of CCT 2700K products use LED is 0.5W series model 2T03X5WWxx000xxx.

#### Photos of Luminaire Characteristics





## 4.0 Photometric Measurements

### 4.1 Integrating Sphere Test

Model No.	ULD103W-0190	Sample ID.	1298525-S001	Temperature (°C)	25.1
Operate time (Min.)	50	Stabilization time (Min.)	45		

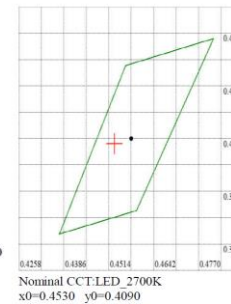
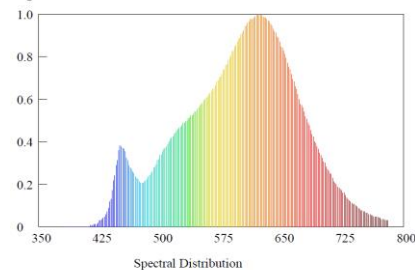
#### Test Method

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 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 120 Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 5 nm intervals over the range of 380 to 780 nm.

#### Integrating Sphere Conditions and Results

Model Number	Orientation	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	CCT (K)	CRI (Ra)	R9	Luminous Flux (lm)	Luminous Efficacy (lm/W)
ULD103W-0190	Horizontal	120.05	60	0.104	12.18	0.973	2786	93.2	59	881.44	72.4

Spectroradiometric Parameters





## 4.0 Photometric Measurements

### 4.2 Integrating Sphere Test

Model No.	ULD103W-2090	Sample ID.	1291150-S001	Temperature (°C)	25.1
Operate time (Min.)	50	Stabilization time (Min.)	45		

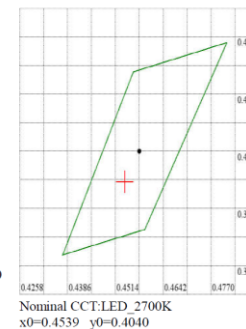
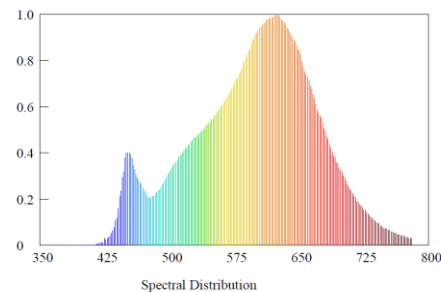
#### Test Method

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 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 120 Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 5 nm intervals over the range of 380 to 780 nm.

#### Integrating Sphere Conditions and Results

Model Number	Orientation	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	CCT (K)	CRI (Ra)	R9	Luminous Flux (lm)	Luminous Efficacy (lm/W)
ULD103W-2090	Horizontal	120.05	60	0.098	11.46	0.97	2733	92.8	58	976.32	85.2

Spectroradiometric Parameters





## 5.0 Photometric Measurements

### 5.1 Goniophotometer Test

<b>Model No.</b>	ULD103W-0190	<b>Sample ID.</b>	1298525-S001
<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  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , 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  $1^{\circ}$  vertical intervals and  $22.5^{\circ}$  horizontal intervals.

#### Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
25	120.02	60	0.1046	12.217	0.9733	Horizontal

#### Test Results

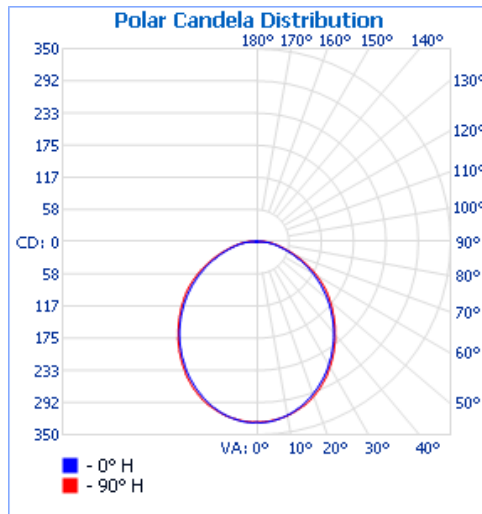
Flux (lm)	Zonal Lumen Requirement (0-60°)	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
		Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
875.6	78.10%	163.6	161	100.8	98.2	71.7



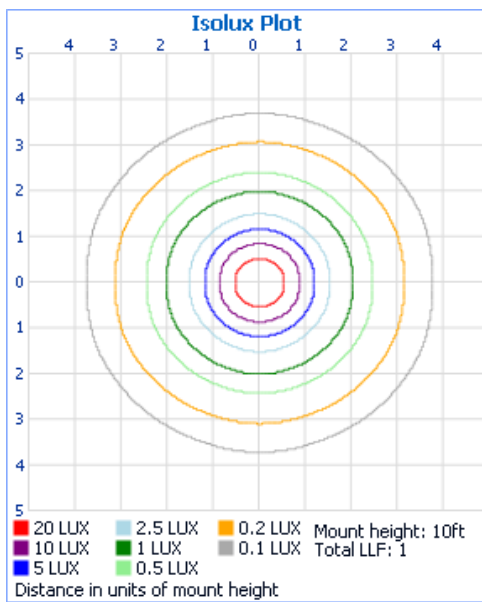


## 5.1 Goniophotometer Test (Cont'd)

### Light Distribution Curve



### Isolux Plot





## 5.1 Goniophotometer Test (Cont'd)

### Zonal Lumen Summary

#### **Zonal Lumen Summary**

Zone	Lumens	% Luminaire
0-30	247.3	28.2%
0-40	399.0	45.6%
0-60	683.5	78.1%
60-90	184.5	21.1%
70-100	92.7	10.6%
90-120	6.8	0.8%
0-90	868.0	99.1%
90-180	7.6	0.9%
0-180	875.6	100%

### Lumens Per Zone

#### **Lumens Per Zone**

Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	7.8	0.9%	90-95	5.1	0.6%
5-10	23.0	2.6%	95-100	1.3	0.1%
10-15	37.3	4.3%	100-105	0.2	0%
15-20	49.9	5.7%	105-110	0.1	0%
20-25	60.5	6.9%	110-115	0.1	0%
25-30	68.8	7.9%	115-120	0.1	0%
30-35	74.4	8.5%	120-125	0.1	0%
35-40	77.3	8.8%	125-130	0.1	0%
40-45	77.3	8.8%	130-135	0.1	0%
45-50	74.7	8.5%	135-140	0.1	0%
50-55	69.7	8.0%	140-145	0.1	0%
55-60	62.8	7.2%	145-150	0.1	0%
60-65	54.1	6.2%	150-155	0.1	0%
65-70	44.0	5.0%	155-160	0.1	0%
70-75	33.7	3.9%	160-165	0.1	0%
75-80	24.5	2.8%	165-170	0.0	0%
80-85	17.4	2.0%	170-175	0.0	0%
85-90	10.8	1.2%	175-180	0.0	0%



## 5.1 Goniophotometer Test (Cont'd)

### Candela Table - Type C

	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	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327	327
1	328	327	327	327	327	327	327	327	328	327	327	327	327	327	327	327	328
2	328	327	327	327	327	327	327	327	328	327	327	327	327	327	327	327	328
3	327	326	326	326	326	326	326	326	327	326	326	326	326	326	326	326	327
4	327	326	326	326	326	326	326	326	327	326	326	326	326	326	326	326	327
5	326	325	325	325	325	325	325	325	326	325	325	325	325	325	325	325	326
6	325	324	324	324	325	324	324	324	325	324	324	324	324	325	324	324	325
7	324	322	323	323	323	323	323	322	324	322	323	323	323	323	323	322	324
8	322	321	322	322	322	322	322	321	322	321	322	322	322	322	322	321	322
9	321	319	320	320	321	338	342	346	321	319	320	320	321	304	302	296	304
10	319	318	319	319	320	319	319	318	319	318	319	319	320	319	319	318	319
11	318	316	318	318	318	318	318	316	318	316	318	318	318	318	318	316	318
12	316	314	316	316	317	316	316	314	316	314	316	316	317	316	316	314	316
13	314	312	314	314	315	314	314	312	314	312	314	314	315	314	314	312	314
14	311	310	312	312	313	312	312	310	311	310	312	312	313	312	312	310	311
15	309	308	310	310	311	310	310	308	309	308	310	310	311	310	310	308	309
16	306	305	308	308	309	308	308	305	306	305	308	308	309	308	308	305	306
17	303	302	305	306	307	306	305	302	303	302	305	306	307	306	305	302	303
18	301	300	303	303	304	303	303	300	301	300	303	303	304	303	303	300	301
19	298	297	300	301	302	301	300	297	298	297	300	301	302	301	300	297	298
20	294	294	298	298	299	298	298	294	294	294	298	298	299	298	298	294	294
25	278	277	282	283	283	283	282	277	278	277	282	283	283	283	282	277	278
30	259	259	265	266	264	266	265	259	259	259	265	266	264	266	265	259	259
35	238	238	245	248	243	248	245	238	238	238	245	248	243	248	245	238	238
40	217	214	223	226	220	226	223	214	217	214	223	226	220	226	223	214	217
45	193	192	200	203	198	203	200	192	193	192	200	203	198	203	200	192	193
50	169	167	173	178	175	178	173	167	169	167	173	178	175	178	173	167	169
55	144	144	148	153	152	153	148	144	144	144	148	153	152	153	148	144	144
60	120	119	123	129	127	129	123	119	120	119	123	129	127	129	123	119	120
65	95	95	99	104	101	104	99	95	95	95	99	104	101	104	99	95	95
70	72	71	75	80	77	80	75	71	72	71	75	80	77	80	75	71	72
75	52	52	55	58	55	58	55	52	52	52	55	58	55	58	55	52	52
80	36	35	39	42	39	42	39	35	36	35	39	42	39	42	39	35	36
85	23	23	26	29	27	29	26	23	23	23	26	29	27	29	26	23	23
90	12	12	14	16	15	16	14	12	12	12	14	16	15	16	14	12	12
95	4	4	5	6	6	6	5	4	4	4	5	6	6	6	5	4	4
100	0	0	0	0	1	0	0	0	0	0	0	0	1	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



## 5.0 Photometric Measurements

### 5.2 Color Angular Uniformity

<b>Model No.</b>	ULD103W-0190	<b>Sample ID.</b>	1298525-S001
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#### 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  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , measured at a point not more than 1 m from the sample and at the same height as the sample.
4. The sample was operated at 120 Volts AC, 60Hz. It was stabilized before measurement was made. Color spatial uniformity was calculated from the software taken at  $1^{\circ}$  vertical intervals and  $90^{\circ}$  horizontal intervals.

#### Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Current (A)	Power (W)	Maximum $\Delta u'v'$
25.1	119.98	60	0.104	12.19	0.00076



## 6.0 Electrical Test

### 6.1 Source Start Time & Run-Up time

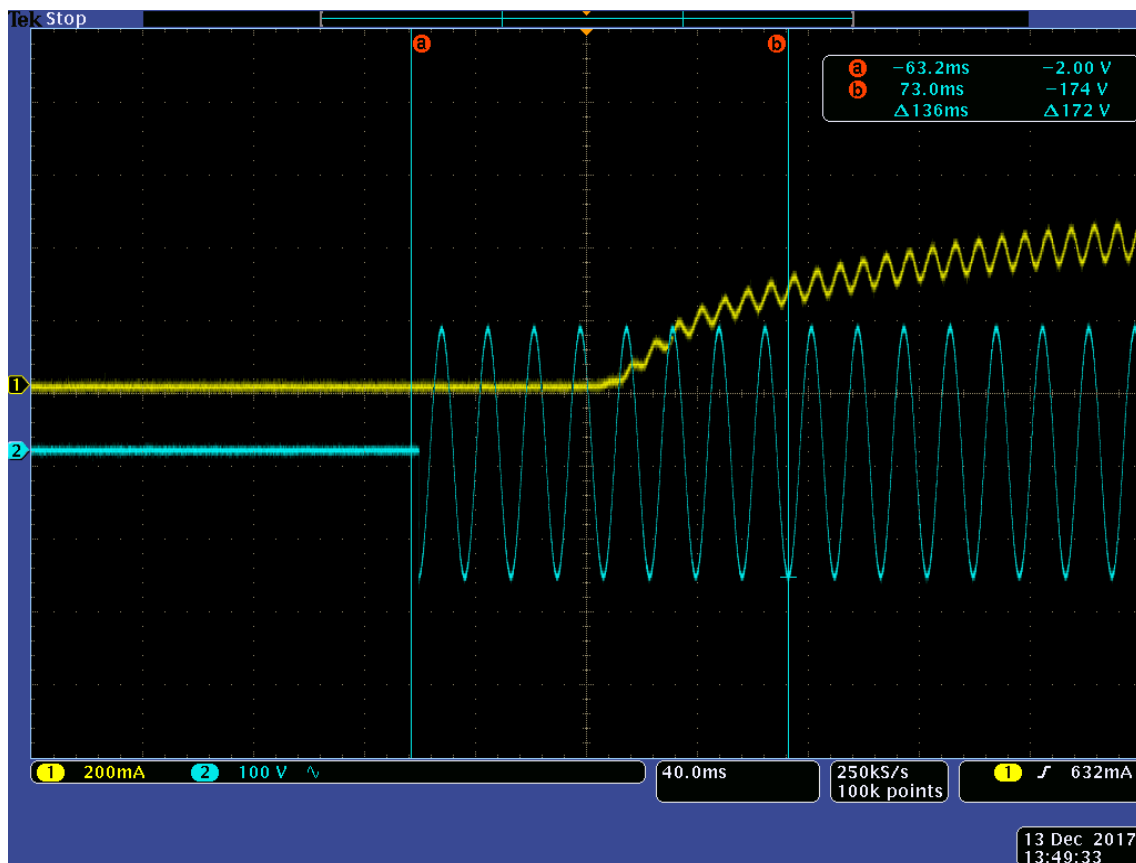
Model No.	ULD103W-0190	Sample ID.	1298525-S001
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#### Test Method

1. The sample was tested according to ENERGY STAR Start Time Test and ENERGY STAR Run-Up Time Test for fluorescent luminaires only.
2. Each test sample was operated in its designated orientation at rated input voltage in a  $25 \pm 5^\circ\text{C}$  ambient. A photodetector is used to monitor the luminaire light output. Time was recorded when the sample was fully illuminated and reached 90% of stabilized lumen output.

#### Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Start Time (ms)	Run-Up time (s)
25.2	120	60	136	N/A





## 6.0 Electrical Test

### 6.2 Operating Frequency Test

Model No.	ULD103W-0190	Sample ID.	1298525-S001
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#### Test Method

1. The sample was tested according to ANSI C82.2-2002 for fluorescent luminaires.
2. Each test sample was operated at rated input voltage. Light output waveform shall be measured with a photodetector, transimpedance amplifier and oscilloscope. The AC ripple on the output DC line was measured and recorded by the oscilloscope according to Energy Star directions.

#### Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Operating Frequency (Hz)
25.1	120.1	60	120.1





## 6.0 Electrical Test

### 6.3 Transient Protection Test

Model No.	ULD103W-0190	Sample ID.	1298525-S001
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#### Test Method

The transient protection tests at ambient temperature were performed on one sample. Each sample was operated at rated input voltage in the specific orientation during the tests. A test system with an 100kHz Ring Wave Module and a Coupler/Decoupler Module was used to generate the 2500 volt ring wave transient strike across the luminaire contacts. Each wave consisted of a 0.5 microsecond rise time. Seven strikes were performed on each sample in accordance with ANSI/IEEE C62.41 (Category A): Recommended Practice on Surge Voltages in Low – Voltage AC Circuits.

#### Test Results

Temperature (°C)	Voltage (Vac)	Frequency	After Test - Seven Strikes (Survival/Dead)
25	120.1	60	Survival



## 6.0 Electrical Test

### 6.4 Standby Power Consumption

Model No.	ULD103W-0190	Sample ID.	1298525-S001
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#### Test Method

A sample was tested according to the IEC 62301-2011 Edition 2. The sample was operated at rated voltage and frequency, working in the active and standby mode\*. For loads greater than or equal to 10 W, at least three significant figures shall be reported. After stability, the electrical parameter would be measured using proper method\*\* and the value of  $U_e$ \*\*\* was calculated according to the Annex D. The test results shall be compliant with the relative requirements#.

#### Test Results

Temperature (°C)	Mode	Voltage (Vac)	Frequency	Current (mA)	Power Factor	Standby Power (W)
25.1	Standby mode	120	60	0.092	0.902	0.01

\* The working mode is controlled stably by the light sensor. When environment gets dim, it works in active mode. If not, it works in standby mode. The sample was tested under different illuminance to change mode.

\*\* The sample was tested with direct meter reading method according to IEC 62301-2011 Section 5.3.4.

\*\*\* The uncertainty of the test equipment (Power Analyzer)  $U_e$  is equal to 0.2% ( $K=2$ , at the 95% confidence level).

# As  $U_e$  is no greater than the permitted value  $U_{ma}$  specified in IEC 62301-2011 Section 4.4.1, the measurement is acceptable.





## 6.0 Electrical Test

### 6.5 Dimming Test

Model No.	ULD103W-0190	Sample ID.	1298525-S001
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#### Dimmer Information

Manufacture	Lutron	Model Number	DVCL-153P
Rated for CFL / LED	LED	Technology / Features	Forward phase-cut

#### Test Method

1. The test was performed using a relative photometry method, according to ENERGY STAR Recommended Practice - Light Output on a Dimmer and ENERGY STAR<sup>®</sup> Recommended Practice - Noise.
2. The measurement was taken one test sample combined with the dimmers. The sample was tested at the rated electrical parameter, and allowed to stabilize and verify by taking light output measurements every minute, until consecutive measurements are no more than 0.5% apart.
3. The noise test shall be conducted on sample in the sound chamber with one microphone. The microphone was located in six position to get the peak noise.

#### Test Results

Temperature (°C)	Voltage (Vac)	Frequency	Baseline Light Output (lx)		Maximum Light Output (lx)	Minimum Light Output (lx)
25.1	120	60	754		726	70.6
Ambient Sound (dBA)	Peak Noise at BLO (dBA)	Peak Noise at MaxLO (dBA)	Peak Noise at MinLO (dBA)	Position (degree)	Maximum Light Output Ratio (%)	Minimum Light Output Ratio (%)
17.7	17.8	18	17.8	N/A	96.29%	9.36%



## 7.0 In-Situ Temperature Measurement Test

<b>Model No.</b>	ULD103W-0190	<b>Sample ID.</b>	1298525-S001
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### Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 or UL 153-2002, Sections 124.
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 operating for a minimum of 7.5 hours.

### In-Situ Temperature Measurement Test Conditions

Temperature	Voltage (Vac)	Frequency	Current (A)	Power (W)	Power Factor	Orientation
22.4	120.05	60	0.104	12.18	0.973	Face Down

### Test Results

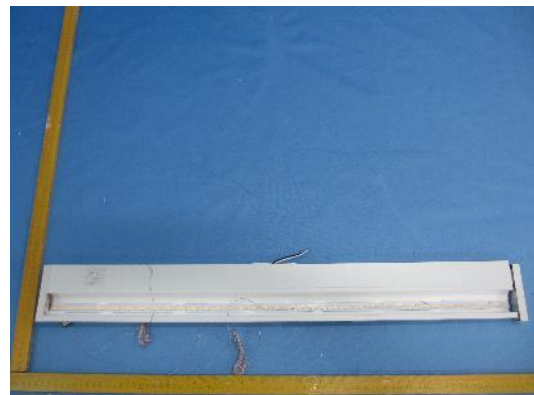
Thermocouple Location	Customer claim Current (mA)	Temperature for Lighting source (°C)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp. (°C)
		Test result column 1	Test result (Correct to 25 °C)			
TMP of LEDs	60	33.9	36.5	2T03X2WWxx00 0xxx	60	85
Ambient temperature	N/A	22.4	25.0			

Thermocouple Location	Temperature for LED driver (°C)		LED driver Model Number	LED Driver Tc Temp. (°C)
	Test result column 1	Test result (Correct to 25 °C)		
TMP of LED drivers	50.5	53.1	ULD10	90
Ambient temperature	22.4	25.0		

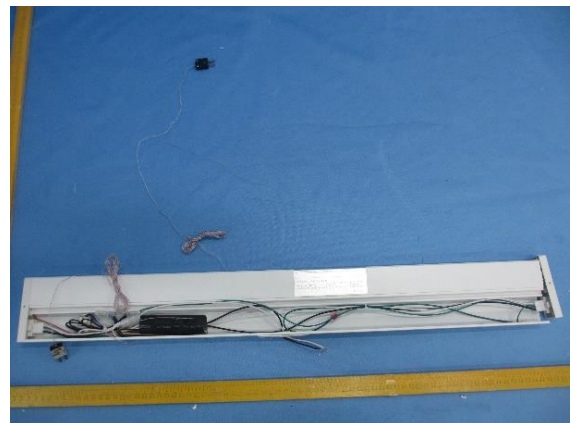
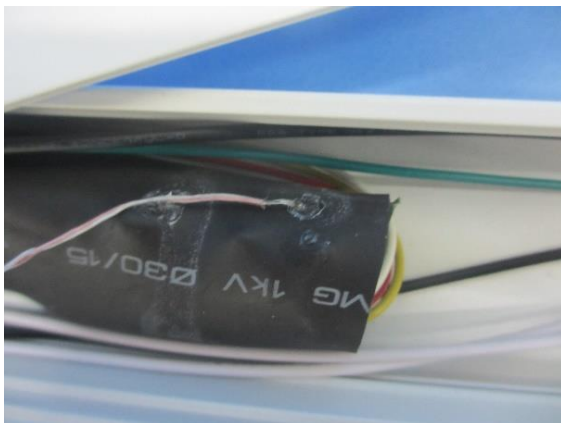


## 7.0 In-Situ Temperature Measurement Test (Cont'd)

### Test Photos for LEDs



### Test Photos for LED Drivers





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