



Photometric Test Report

Relevant Standards

IES LM-79-2008
ANSI C82.77-10-2014
UL1598-2008/UL1993-2012

Prepared For

ATG Electronics Corp.

10700 7th Street, Rancho Cucamonga
Owen He (877) 461-5333 owenh@atgelectronics.com

Test Laboratory:

UL-CCIC Company Limited

Test Laboratory Address:

No.2, Chengwan Road, Suzhou Industrial Park, Suzhou 21522, China

Catalog Number

HBEL-2FT-90-40-F-XX

Project Number

4788990454

Report Number

4788990454 _1

Test Date

09/07/2018 - 09/14/2018

Issue Date

05/05/2019

Revision Date

N/A

Prepared By

Jonathan Xu

Approved By

Duff Yang

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

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Test Summary

Designlights Consortium Technical requirements table v4.3- issued 03/26/2018

Requirement Category	Test Method	Requirements	Test Value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	10000lm	11725lm	Pass
Zonal Lumen Requirement (20°-50°)	IES LM-79-2008	30.0%	53.3%	Pass
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	126.1lm/W	131.31lm/W	Pass
Allowable CCTs (K)	IES LM-79-2008/ANSI C78.377-2015	4746K~5312K	5061K	Pass
Minimum CRI	IES LM-79-2008/CIE 13.3-1995	70.0	82.71	Pass
L90 Lumen maintenance (Hours)	IES LM-80-2015/IES TM-21-2018	36000.0H	36000.0H	Pass
L70 Lumen maintenance (Hours)	IES LM-80-2015/IES TM-21-2018	50000.0H	50000.0H	Pass
Power Factor	ANSI C82.77-10-2014	0.9	0.9714	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	20.00%	9.29%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008/UL1993-2012	105.0°C	44.3°C	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008/UL1993-2012	90.0°C	60.5°C	Pass
Minimum Luminaire Warranty (Years)	N/A	5.0Years	5.0Years	Pass



Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	09/10/2018	HBEL-2FT-90-40-F-XX	Elvis Wu
2	Integrating Sphere Test for the Higher CCT	09/10/2018	HBEL-2FT-90-50-F-XX	Elvis Wu
3	Goniophotometer Test for the Lower CCT	09/07/2018	HBEL-2FT-90-40-F-XX	Elvis Wu
4	THD and PF Test	09/07/2018	HBEL-2FT-90-40-F-XX	Elvis Wu
5	In-Situ Temperature Measurement Test	09/14/2018	HBEL-2FT-90-40-F-XX	Elvis Wu

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.



Production Description

Luminaire Description: High-bay Luminaires for Commercial and Industrial Buildings

Model Number: HBEL-2FT-90-40-F-XX

Rated Voltage: 120-277V

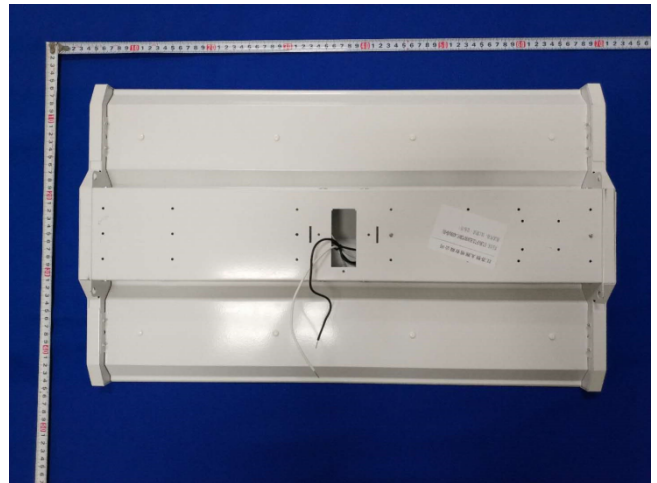
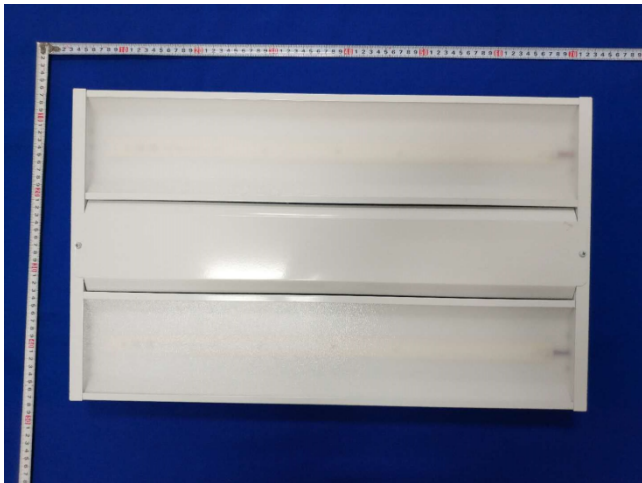
Frequency: 50/60Hz

LED Package: STW8A2PD-XX

Family Model and Variation: HBEL-2FT-90-50-F-XX

Photos of Luminaire Characteristics

Model Number	CCT	Light Output (lm)	Power (W)	Luminous Efficacy (lm/W)
HBEL-2FT-90-40-F-XX	4000	11700	90	130
HBEL-2FT-90-50-F-XX	5000	11790	90	131





LM-79 Measurement and Test Results

Integrating Sphere Test for the Lower CCT

Model No.	HBEL-2FT-90-40-F-XX	Sample ID.	1790572
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by Labsphere, Inc., Optical Calibration Laboratory.
- 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. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result.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. Testing Orientation of this product is horizontal.

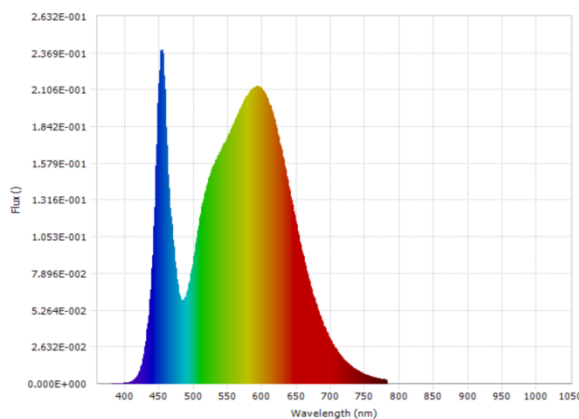
Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.4	120.02	60	0.7461	89.09	0.9948	N/A

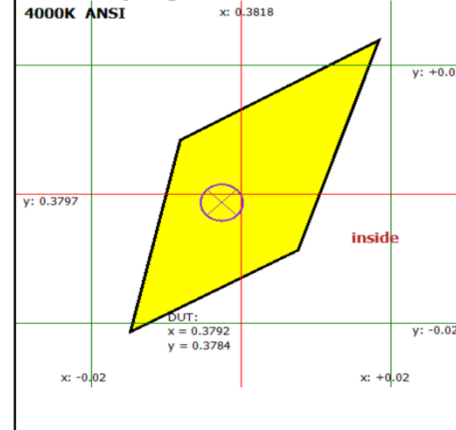
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
4044	81.95	0.0011	11735.4	131.73	N/A

Spectral Flux Graph



Chromaticity Diagram



Luminous Flux	11735.4	Chrom x	0.3792
Chrom y	0.3784	Chrom u	0.2236
Chrom v	0.3347	Duv	0.0011
Chrom u'	0.2236	Chrom v'	0.5021
CCT	4044	Luminous Efficacy	131.73
Ra	81.95	R1	80.1
R2	88.1	R3	93.5
R4	80.3	R5	79.6
R6	82.8	R7	86.5
R8	64.7	R9	7.8
R10	71.0	R11	78.1
R12	56.6	R13	82.1
R14	96.4	R15	74.7
Rf	80.8	Rg	94.7



Integrating Sphere Test for the Higher CCT

Model No.	HBEL-2FT-90-40-F-XX 850 (A3+B3)	Sample ID.	1790574
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by Labsphere, Inc., Optical Calibration Laboratory.
- 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. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result.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. Testing Orientation of this product is horizontal.

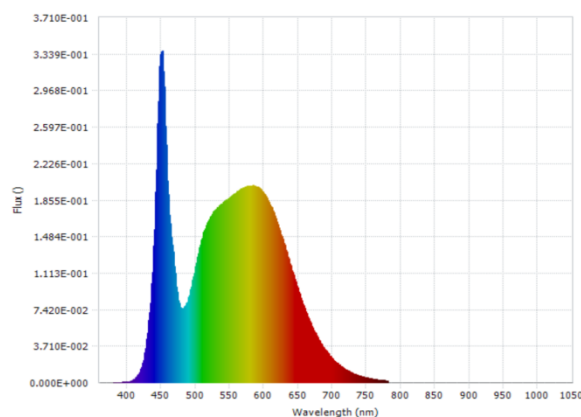
Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.4	120.04	60	0.7508	89.66	0.9949	N/A

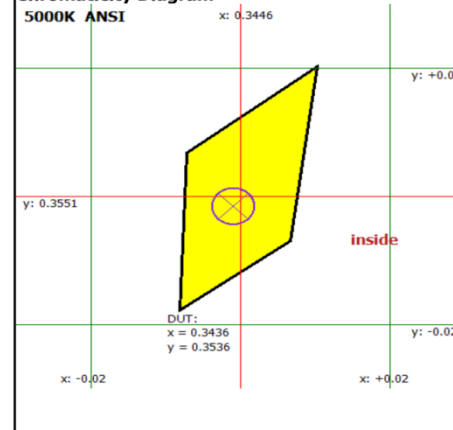
Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
5061	82.71	0.0016	11969.2	133.50	N/A

Spectral Flux Graph



Chromaticity Diagram



Luminous Flux	11969.2	Chrom x	0.3436
Chrom y	0.3536	Chrom u	0.2096
Chrom v	0.3236	Duv	0.0016
Chrom u'	0.2096	Chrom v'	0.4854
CCT	5061	Luminous Efficacy	133.50
Ra	82.71	R1	81.3
R2	87.3	R3	91.2
R4	83.0	R5	81.9
R6	82.1	R7	86.8
R8	68.0	R9	8.6
R10	69.5	R11	82.3
R12	61.0	R13	82.7
R14	95.2	R15	76.4
Rf	81.3	Rg	96.0



Goniophotometer Test

Model No.	HBEL-2FT-90-40-F-XX	Sample ID.	1790572
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 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. The reference standard lamp is rated current 3.875A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology, China.
- 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° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product. Testing Orientation of this product is horizontal.

Goniophotometer Test Conditions

Temperature($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.1	119.95	60	0.7481	89.290	0.9948	Horizontal

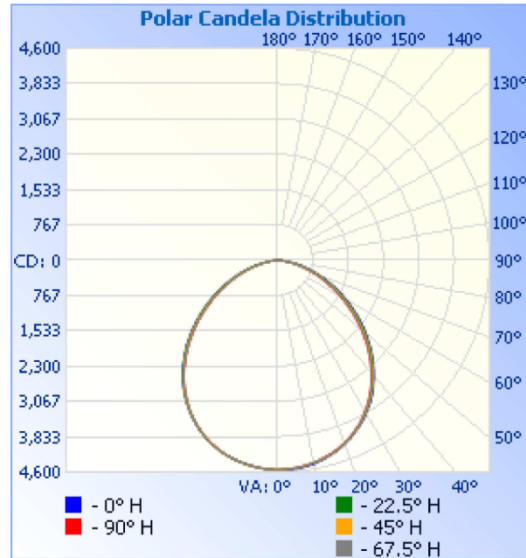
Test Results

Flux (lm)	Zonal Lumen Requirement	Zonal Lumen Requirement	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
	20°-50°	N/A	Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
11725.1	53.3%	N/A	153.3	156	102.5	105.2	131.31
SC	SC						
0~180°	90°~270°						
N/A	N/A						

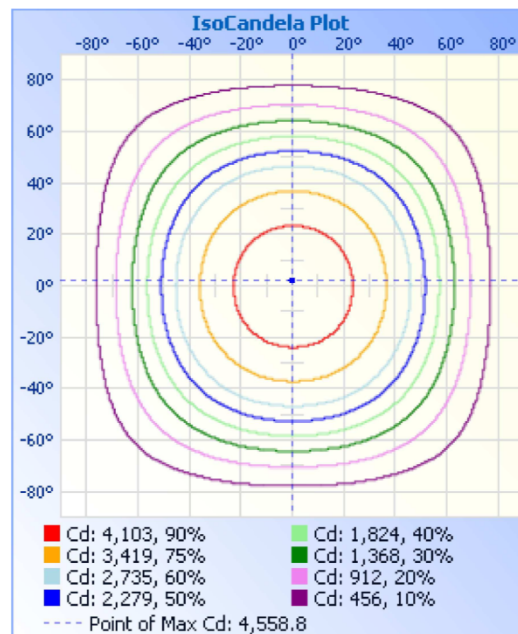


Goniophotometer Test (Cont'd)

Light Distribution Curve



IsoCandela Plot





Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	3,524.8	30.1%
0-40	5,726.3	48.8%
0-60	9,722.8	82.9%
60-90	2,002.2	17.1%
70-100	758.4	6.5%
90-120	0.2	0%
0-90	11,724.9	100%
90-180	0.2	0%
0-180	11,725.1	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	108.4	0.9%	90-95	0.2	0%
5-10	321.6	2.7%	95-100	0	0%
10-15	524.4	4.5%	100-105	0	0%
15-20	709.2	6.0%	105-110	0	0%
20-25	867.7	7.4%	110-115	0	0%
25-30	993.5	8.5%	115-120	0	0%
30-35	1,079.8	9.2%	120-125	0	0%
35-40	1,121.6	9.6%	125-130	0	0%
40-45	1,115.9	9.5%	130-135	0	0%
45-50	1,064.5	9.1%	135-140	0	0%
50-55	970.8	8.3%	140-145	0	0%
55-60	845.2	7.2%	145-150	0	0%
60-65	700.2	6.0%	150-155	0	0%
65-70	543.7	4.6%	155-160	0	0%
70-75	385.8	3.3%	160-165	0	0%
75-80	236.7	2.0%	165-170	0	0%
80-85	110.5	0.9%	170-175	0	0%
85-90	25.2	0.2%	175-180	0	0%



Intensity Data(cd)

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	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549	4549
1	4556	4546	4548	4547	4540	4549	4548	4548	4553	4548	4548	4549	4540	4547	4548	4546	4556
2	4559	4542	4542	4545	4540	4546	4543	4545	4548	4545	4543	4546	4540	4545	4542	4542	4559
3	4552	4538	4537	4535	4531	4542	4540	4540	4538	4540	4540	4542	4531	4535	4537	4538	4552
4	4548	4531	4531	4531	4525	4534	4533	4532	4531	4532	4533	4534	4525	4531	4531	4531	4548
5	4540	4526	4524	4524	4520	4526	4529	4527	4523	4527	4529	4526	4520	4524	4524	4526	4540
6	4540	4515	4512	4512	4508	4518	4514	4514	4514	4514	4514	4518	4508	4512	4512	4515	4540
7	4524	4506	4505	4502	4500	4504	4504	4507	4499	4507	4504	4504	4500	4502	4505	4506	4524
8	4512	4493	4488	4495	4487	4491	4493	4491	4486	4491	4493	4491	4487	4495	4488	4493	4512
9	4500	4483	4477	4481	4473	4483	4482	4478	4476	4478	4482	4483	4473	4481	4477	4483	4500
10	4491	4467	4466	4465	4462	4468	4467	4464	4460	4464	4467	4468	4462	4465	4466	4467	4491
11	4472	4452	4452	4450	4443	4450	4454	4450	4446	4450	4454	4450	4443	4450	4452	4452	4472
12	4452	4436	4437	4433	4423	4435	4434	4435	4433	4435	4434	4435	4423	4433	4437	4436	4452
13	4436	4420	4418	4414	4407	4417	4414	4412	4414	4412	4414	4417	4407	4414	4418	4420	4436
14	4412	4397	4400	4395	4383	4392	4394	4392	4394	4392	4394	4392	4383	4395	4400	4397	4412
15	4388	4377	4376	4371	4363	4372	4370	4367	4370	4370	4372	4363	4371	4376	4377	4377	4388
16	4364	4352	4353	4348	4337	4345	4348	4350	4346	4350	4348	4345	4337	4348	4353	4352	4364
17	4336	4328	4326	4321	4308	4319	4320	4321	4321	4321	4320	4319	4308	4321	4326	4328	4336
18	4309	4301	4300	4293	4279	4292	4293	4293	4296	4293	4293	4292	4279	4293	4300	4301	4309
19	4280	4272	4267	4264	4251	4259	4263	4263	4264	4263	4263	4259	4251	4264	4267	4272	4280
20	4247	4237	4235	4231	4216	4224	4232	4231	4233	4231	4232	4224	4216	4231	4235	4237	4247
25	4061	4054	4048	4038	4026	4033	4036	4041	4046	4041	4036	4033	4026	4038	4048	4054	4061
30	3834	3826	3814	3801	3788	3796	3801	3810	3810	3810	3801	3796	3788	3801	3814	3826	3834
35	3566	3549	3536	3514	3500	3507	3519	3528	3532	3528	3519	3507	3500	3514	3536	3549	3566
40	3243	3228	3207	3180	3166	3173	3189	3205	3208	3205	3189	3173	3166	3180	3207	3228	3243
45	2888	2873	2845	2810	2791	2798	2825	2844	2852	2844	2825	2798	2791	2810	2845	2873	2888
50	2510	2491	2455	2408	2384	2396	2428	2458	2468	2458	2428	2396	2384	2408	2455	2491	2510
55	2112	2092	2050	1999	1974	1976	2018	2056	2053	2056	2018	1976	1974	1999	2050	2092	2112
60	1723	1699	1650	1598	1571	1581	1618	1657	1666	1657	1618	1581	1571	1598	1650	1699	1723
65	1341	1319	1269	1218	1191	1201	1234	1278	1283	1278	1234	1201	1191	1218	1269	1319	1341
70	984	958	915	870	850	852	882	921	930	921	882	852	850	870	915	958	984
75	657	635	591	558	544	543	559	600	605	600	559	543	544	558	591	635	657
80	368	352	314	299	286	286	292	316	318	316	292	286	286	299	314	352	368
85	149	132	116	104	95	95	98	103	103	103	98	95	95	104	116	132	149
90	8	4	4	3	1	2	1	4	5	4	1	2	1	3	4	4	8
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



THD and PF Test

Model No.	HBEL-2FT-90-40-F-XX	Sample ID.	1790572
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Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
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
24.1	277.01	60	0.3214	86.48	0.9714	9.29%



In-Situ Temperature Measurement Test

Model No.	HBEL-2FT-90-40-F-XX	Sample ID.	1790572
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14 & UL1993-2012.
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/UL1993-2012 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 ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
27.1	119.96	60	0.7483	89.28	0.9948	Horizontal

Test Results (LED)

Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source ($^{\circ}\text{C}$)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp ($^{\circ}\text{C}$)
		Test Result Column	Test Result (Correct to 25°C)			
TMP of LEDs	100	71.1	69	STW8A2PD-XX	200	105
Ambient Temperature	N/A	27.1	25.0			

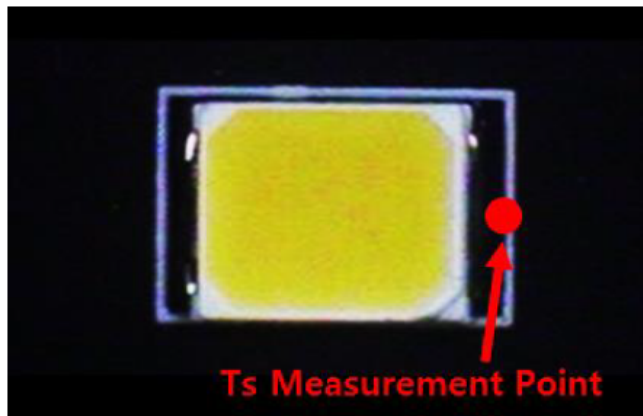
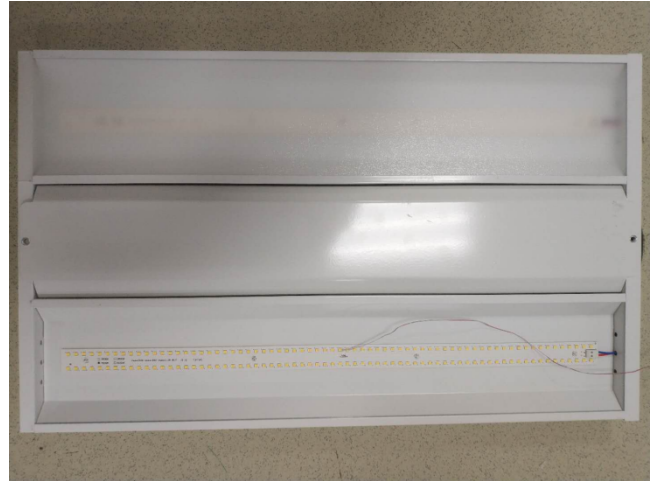
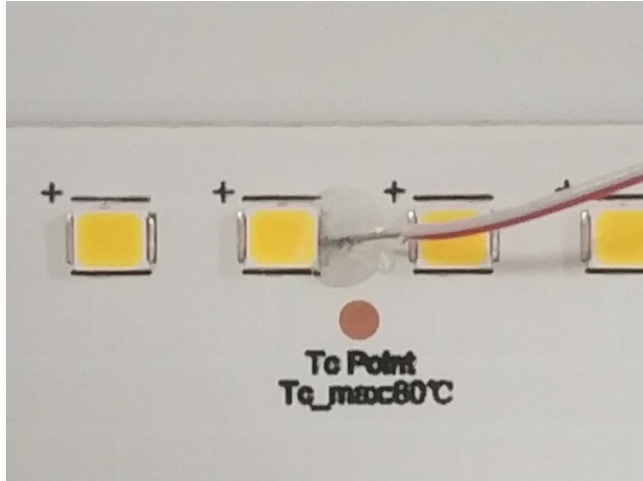
Test Results (Driver)

Thermocouple Location	Temperature for Driver ($^{\circ}\text{C}$)		Driver Model Number	Driver Limit Temp ($^{\circ}\text{C}$)
	Test Result Column	Test Result (Correct to 25°C)		
TMP of Drivers	62.6	60.5	SIP 80-I2000 120-277 W D1 S	90
Ambient Temperature	27.1	25.0		



In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of LED Packages & Tc Point of Driver





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