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Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

ELEC-TECH INTERNATIONAL CO LTD

**No.1 Jinfeng Road, Tangjiawan Town, Xiangzhou District,
ZhuhaiCity, Guangdong Province, P.R. China 519085**

For products:

Inseparable SSL Luminaire

Models No.:

531864##(##=01-11)

(The product is a color tunable luminaire, tunable to 2700K, 3000K, 4000K and ## can be 01-11 and represent different client and sales districts.)

Test Date: Jun. 27, 2017
Test Item: Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.
Test Lab.: **LCTECH (Zhongshan) Testing Service Co., Ltd**
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Template No.: LC-RT-PL/LM79-08/01
Test Note: *This product is a color tunable luminaire, all the tests were tested at 2700K setting.*

Complied by:

Fish Tan

Project Engineer

Jun. 29, 2017

Reviewed by:

Richard Li

Technical Manager

Jun. 29, 2017

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1. General

1.1 Product Information

Brand Name	ETI
Product Type	SSL Downlight retrofit kits
Model Number	531864##(##=01-11)
Rated Inputs	120VAC, 50/60Hz
Rated Power	11W
Rated Light output	800lm
Declared CCT	2700K
Power Supply	LED Driver
LED Package, Array or Module	Model: SPMWHX221FXXXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO
Receipt Samples	1 unit
Sample Code of lab.	17061211018
Date of Receipt Samples	Jun. 12, 2017
Note	All the tests are tested in a Can. Auxiliary test can mode: HALO H71CAT

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377-2011	Specifications for the Chromaticity of Solid State Lighting Products
ANSI C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CIE Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004	Colorimetry
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-923	CHP-500	2017-02-04	2018-02-03
AC Power supply	LC-I-987	APW-110N	2017-02-04	2018-02-03
Power analyzer	LC-I-928	WT210	2017-01-19	2018-01-19
Power analyzer	LC-I-954	WT210	2017-02-04	2018-02-03
Multimeter	LC-I-972	Fluke 17B	2016-08-10	2017-08-09
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-PL-I-002	24V100W	2016-10-08	2017-10-07
Luminous Flux Standard Lamp	LC-PL-I-001	110V/200W	2016-09-24	2017-09-23
Goniophotometer(with mirror)	LC-I-902	GMS2000	2017-05-07	2018-05-07
Wireless temperature transmitter	LC-I-978	DWRF-B	2017-02-10	2018-02-10
Wireless temperature transmitter	LC-I-979	DWRF-B	2017-02-10	2018-02-10

2. Test conducted and method

The luminaire was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25\text{ }^{\circ}\text{C} \pm 1^{\circ}\text{C}$; the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval, $k=2$).

2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured by both type C goniophotometer system and a sphere (2 meter)-spectroradiometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	120.00 V~60Hz	120.06 V~60Hz
Input Current(A)	0.091	0.091
Total Power(W)	10.39	10.39
Power Factor	0.951	0.951
I-THD	-	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	870.20	874.14
Luminaire Efficacy(Lm/W)	83.75	84.13
Correlated Color Temperature (CCT)(K)	2648	-
Color Rendering Index (CRI)	92.2	-
R9	57	-
Chromaticity Coordinate (x,y)	x = 0.4613 y = 0.4065	-
Chromaticity Coordinate (u,v)	u = 0.2653 v =0.3507	-
Chromaticity Coordinate (u',v')	u' = 0.2653 v' = 0.5260	-
Duv	-0.0016	-
Zone Lumens between 0-60 °	-	86.96%

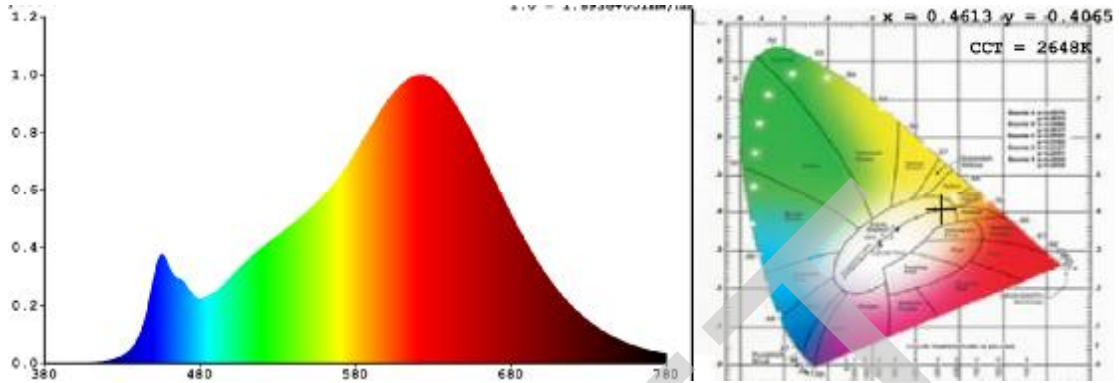
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
94	99	96	92	94	96	88	78
R9	R10	R11	R12	R13	R14	R15	-
57	97	93	85	95	99	89	-

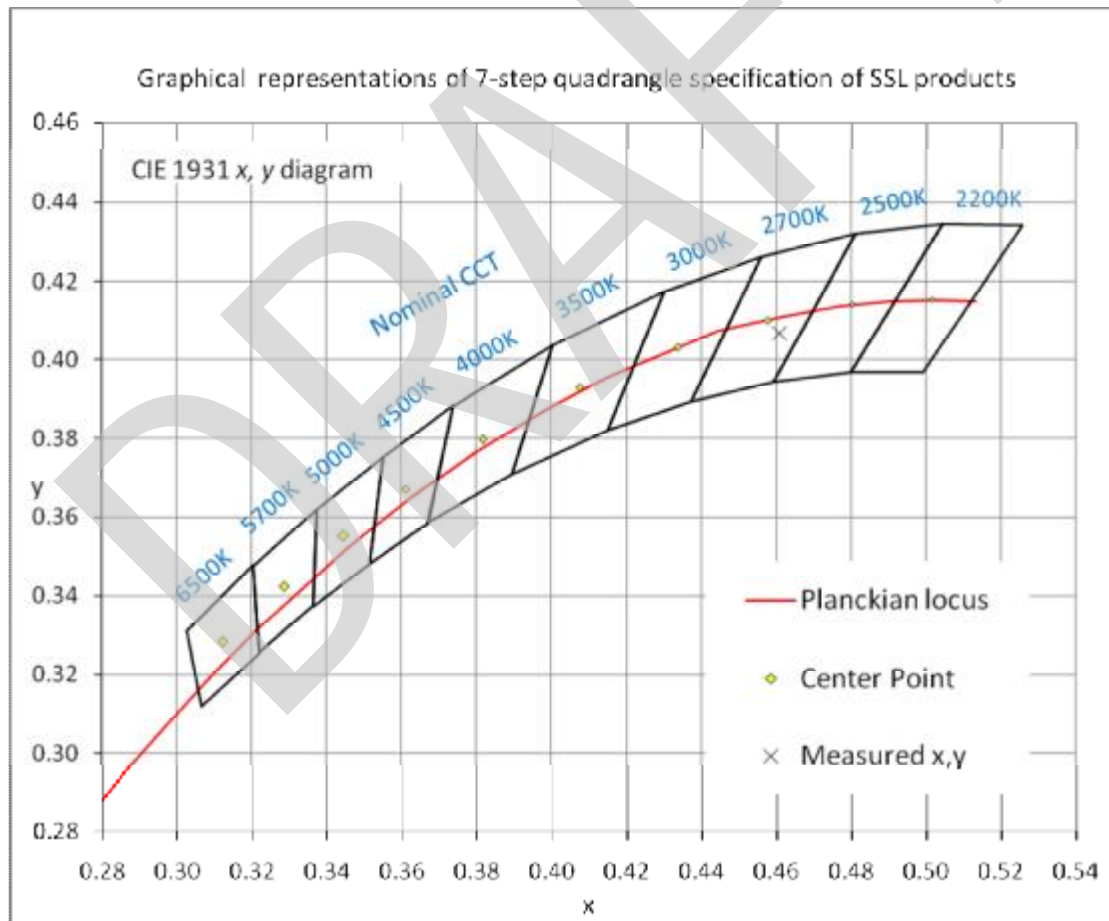
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram



4.3 Goniometry Test Data

CIE Type	Direct	Basic Luminous Shape	Circular
Spacing Criteria (0-180)	1.20	Luminous Length	0.12 m (Diameter)
Spacing Criteria (90-270)	1.22	Luminous Width	0.12 m (Diameter)
Spacing Criteria (Diagonal)	1.30	Luminous Height	0.00 m
Test Distance	29.65 m		

4.4 Zonal Lumen Summary

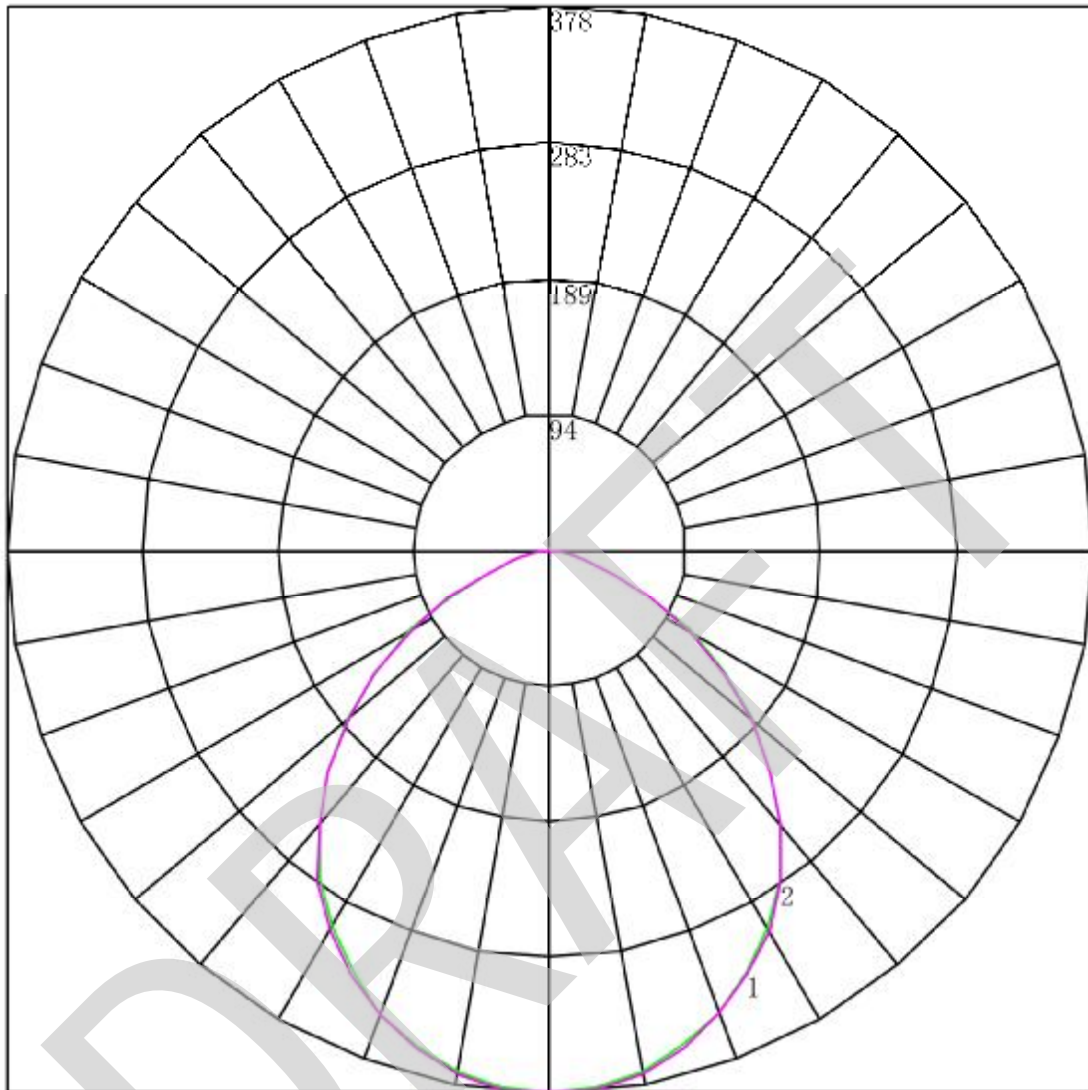
Zone	Lumens	%Lamp	%Fixt
0-20	136.69	15.60	15.60
0-30	286.64	32.80	32.80
0-40	461.03	52.70	52.70
0-60	760.15	87.00	87.00
0-80	866.65	99.10	99.10
0-90	873.41	99.90	99.90
10-90	837.75	95.80	95.80
20-40	324.34	37.10	37.10
20-50	491.75	56.30	56.30
40-70	377.03	43.10	43.10
60-80	106.50	12.20	12.20
70-80	28.58	3.30	3.30
80-90	6.76	0.80	0.80
90-110	0.14	0.00	0.00
90-120	0.21	0.00	0.00
90-130	0.29	0.00	0.00
90-150	0.50	0.10	0.10
90-180	0.73	0.10	0.10
110-180	0.59	0.10	0.10
0-180	874.14	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	35.65
10-20	101.04
20-30	149.95
30-40	174.39
40-50	167.41
50-60	131.72
60-70	77.91
70-80	28.58
80-90	6.76
90-100	0.10
100-110	0.04
110-120	0.07
120-130	0.08
130-140	0.11
140-150	0.10
150-160	0.11
160-170	0.09
170-180	0.04

4.5 Polar Curves

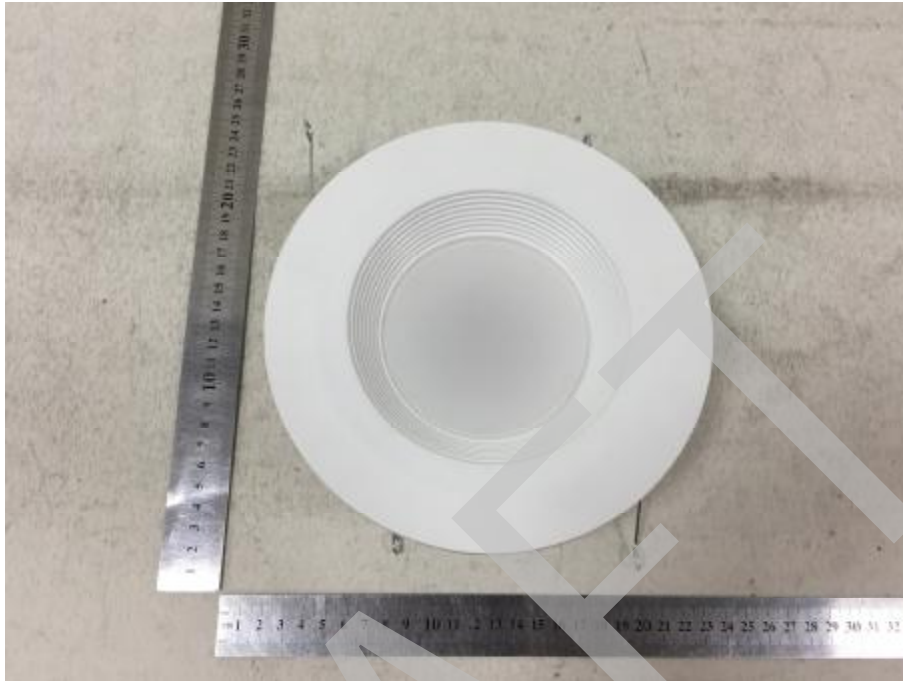


Maximum Candela = 377.877 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

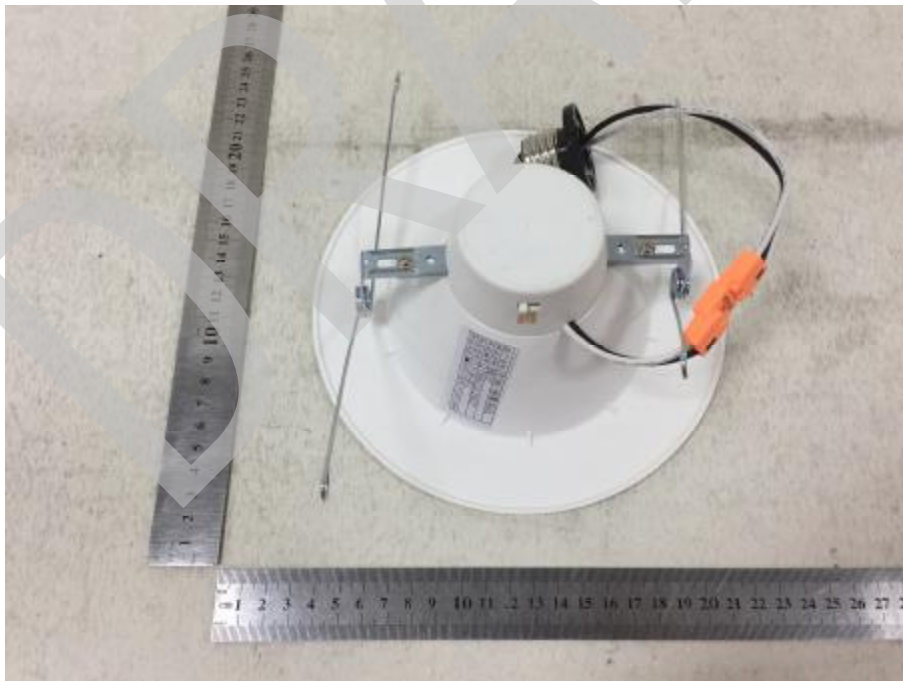
4.6 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	377.877	377.877	377.877	377.877	377.877	377.877	377.877
5	375.017	375.983	375.679	375.481	375.394	375.659	377.230
10	368.331	369.201	368.690	368.756	369.110	369.272	370.585
15	357.817	358.763	358.469	358.095	358.519	358.299	359.173
20	343.828	343.613	343.962	343.698	343.513	343.900	345.089
25	324.913	326.040	325.147	325.587	325.298	325.177	326.646
30	304.017	305.318	304.376	304.091	304.446	304.633	305.758
35	279.207	279.774	279.451	279.188	279.002	279.853	281.272
40	250.085	250.178	250.636	250.174	249.517	249.475	250.497
45	217.664	217.345	217.512	217.359	217.656	217.144	217.760
50	182.824	182.619	182.410	182.477	182.501	182.640	183.503
55	147.368	148.288	147.001	146.738	147.171	147.346	148.139
60	111.823	112.636	112.251	111.328	111.598	112.160	112.390
65	77.247	78.064	78.270	78.006	77.958	78.115	77.914
70	47.202	46.816	47.367	47.323	47.328	47.388	47.646
75	24.415	24.377	23.980	24.002	23.686	23.639	24.149
80	13.197	13.102	13.188	13.188	13.359	13.169	13.320
85	5.675	5.637	5.715	5.671	5.625	5.707	5.676
90	0.616	0.551	0.484	0.220	0.066	0.044	0.000
95	0.088	0.066	0.000	0.022	0.000	0.000	0.044
100	0.000	0.022	0.044	0.022	0.044	0.044	0.000
105	0.088	0.066	0.000	0.066	0.022	0.044	0.000
110	0.044	0.066	0.044	0.066	0.066	0.044	0.087
115	0.088	0.044	0.088	0.088	0.066	0.066	0.044
120	0.132	0.066	0.066	0.088	0.066	0.066	0.044
125	0.088	0.044	0.066	0.066	0.066	0.088	0.131
130	0.088	0.132	0.132	0.132	0.132	0.154	0.131
135	0.132	0.154	0.154	0.176	0.176	0.132	0.131
140	0.088	0.154	0.110	0.154	0.132	0.154	0.087
145	0.176	0.176	0.132	0.132	0.176	0.154	0.087
150	0.176	0.198	0.198	0.176	0.154	0.197	0.174
155	0.308	0.198	0.242	0.220	0.264	0.263	0.175
160	0.264	0.308	0.264	0.286	0.308	0.285	0.262
165	0.308	0.330	0.286	0.308	0.330	0.351	0.393
170	0.440	0.352	0.374	0.352	0.351	0.417	0.393
175	0.396	0.374	0.374	0.396	0.374	0.395	0.436
180	0.433	0.433	0.433	0.433	0.433	0.433	0.433

Appendix 1 Product Photo



Picture 1



Picture 2

Appendix 2 U.S. Department of Energy Lighting Facts CM Uniform LM-79 Reporting Template

Laboratory Information

Name of test lab	LCTECH (Zhongshan) Testing Service Co.,Ltd
Date of test report	Jun. 29, 2017
Test report number	LCZP17060295
Laboratory contact name	Richard Li

Product Information

Applicant	ELEC-TECH INTERNATIONAL CO LTD	
Brand name	ETI	
Model number	531864##(##=01-11)	
SKU(if available)	N/A	
Type of luminaire (for integral lamps, list base type and lamp type)	Inseparable SSL Luminaire	
Luminaire aperture	-	in.
Luminaire height	0	in.
Luminaire length	4.7	in.
Luminaire width	4.7	in.
Number of units(modular products)	N/A	

Electrical Measurements	Integrating sphere output	Goniophotometer Output	
Input wattage	10.39	10.39	W
Input current	0.091	0.091	A
Input voltage(AC)	120.00	120.06	V
Power factor	0.951	0.951	
Off-state power	0.0	0.0	W

Photometric Characteristics	Integrating sphere output	Goniophotometer Output	
Total initial lumen output	870.20	874.14	lm
Initial luminaire efficacy	83.75	84.13	lm/W
Correlated color temperature / CCT	2648	K	
Color rendering index/CRI	92.2		
R9value	57		
Duv	-0.0016		

Luminous Intensity Distribution	Integrating sphere output	Goniophotometer Output	
Center beam candle power(if applicable)		377.877	cd
Beam angle(if applicable)		98.2	°
Zonallumensinthe0°-60°zone	--	87.00	%
Zonal lumens in the60°-90° zone		19.82	%
Zonallumensinthe90°-120°zone		0.21	%
Zonallumensinthe120°-180°zone		0.06	%

****End of test report****