DLC V4.0TEST REPORT

Applicant's name .....:	P.Q.L., Inc.
Address .....:	2285 Ward Avenue / Simi Valley, CA 93065
Brand Name.....:	Superior Life®
Report No......:	BTR66.181.16.0005.43
Product Name.....:	Outdoor Wall-mounted Area Luminaires
Basic Model .....:	83333, 83334
Tested by (printed name and signature) .....:	David Zhang .....
Title .....:	**Test Engineer**
Approved by (printed name and signature) .....:	Steven Su .....
Title .....:	**Approved Signatory**
Date of issue .....:	Sept 29, 2016
Testing Laboratory Name .....:	BEST Test Service Shenzhen Co., Ltd.
Address .....:	1st Floor, 1st Building, Weitai Industrial Park, Yingrenshi, Shiyan, Baoan, Shenzhen, China TEL: + 86-755-28236006; FAX: + 86-755-23467087 Email: certification@bestcert.cn
Accrediation .....:	DLC/Lighting Facts/UL/ETL/ELI/NVLAP/EPA/DOE
Test specification	
Standard .....:	DLC V4.0
Test procedure .....:	DLC Test Procedure
Non-standard test method .....:	No
Test Report Form No.	BEST_ DLC-V4.0
TRF originator.....:	BEST Test Service Shenzhen Co., Ltd. Mr Tseng
Master TRF .....:	BEST_DLC V4.0.doc

Note:

Product description:		
Sample received date .....:	Sept 23, 2016	
Sample Quantity .....:	1 pcs per model	
Model Number .....:	83333, 83334	
Rating(s) (V; Hz) .....:	AC 120V-277V	
Nominal Power.....:	80W	
Nominal Power Factor .....:	N/A	
Nominal Lumen Output.....:	8000lm; 8160lm	
Nominal CCT .....:	4000K; 5000K	
Nominal CRI(Ra) .....:	80	
Nominal Life.....:	50000H	
Product Classification .....:	☐Premium	☒Standard
Category .....:	☐Indoor	☐Indoor Retrofit Kit
	☒Outdoor	☐Outdoor Retrofit Kit
	☐Linear Replacement Lamp	☐E39 Replacements for HID Lamps
General Applicant .....:	Outdoor –Mid Output	
Primary use.....:	Outdoor Non-Cutoff and Semi-Cutoff Wall-mounted Area Luminaires	
Dimmable .....:	☒Yes,	☐No
If Yes, Select Dimming Mechanism ...:	☒Continuous dimming,	☐Step dimming
If Yes, Mini Dimming Level .....:	10%	
Integral Controller .....:	☒Yes,	☐No
LED Lighting Source Manufacture.....:	Seoul Semiconductor Co.,Ltd	
LED Lighting Source Model .....:	STWxC2SB	
LED Driver Brand.....:	N/A	
LED Driver Model Number.....	N/A	
Maximum Recommended Temperature (ºC) During Normal Operation .....:	N/A	
Fixtures Band (Retrofit Kit/Lamp Only) .....:	N/A	
Fixtures Model No. (Retrofit Kit/Lamp Only) .....:	N/A	

Test Method Description

ANSI C78.376-2001 Specifications for the Chromaticity of Fluorescent Lamps
ANSI/NEMA/ANSLG C78.377-2011 Specifications for the Chromaticity of Solid State Lighting Products
ANSI C78.5-2003 Specifications for Performance of Self-ballasted Compact Fluorescent Lamps
ANSI/ANSLG C78.81-2010 Double-Capped Fluorescent Lamps—Dimensional and Electrical Characteristics
ANSI C78.901-2014 Single-Based Fluorescent Lamps—Dimensional and Electrical Characteristics
ANSI/ANSLG C81.61-2009 Specifications for Bases (Caps) for Electric Lamps
ANSI/ANSLG C81.62-2009 Lamp holders for Electric Lamps
ANSI C82.11-2011High-Frequency Fluorescent Lamp Ballasts
ANSI/ANSLG C82.16-2015 (anticipated) Light Emitting Diode Drivers—Methods of Measurement
ANSI C82.2-2002 Method of Measurement of Fluorescent Lamp Ballasts
ANSI C82.77-10:2014 Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
ANSI/IEEE C62.41.1-2002 IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
ANSI/IEEE C62.41.2-2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits
ANSI/UL 153-2002 Standard for Safety of Portable Electric Luminaires
ANSI/UL 935-2009 Standard for Safety of Fluorescent-Lamp Ballasts
ANSI/UL 1310-2010 Standard for Safety of Class 2 Power Units
ANSI/UL 1574-2004 Standard for Safety of Track Lighting Systems
ANSI/UL 1598-2008 Standard for Safety of Luminaires
ANSI/UL 1598C Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
ANSI/UL 1598B-2010 Standard for Supplemental Requirements for Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires
ANSI/UL 1993-2009 Standard for Safety of Self-Ballasted Lamps and Lamp Adapters
ANSI/UL 2108-2004 Standard for Low-Voltage Lighting Systems
ANSI/UL 8750-2009 Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
ASTM E283-04 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
CIE Pub. No. 13.3-1995 Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004 Colorimetry
EU Directive 2002/95/EC Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the Use of Certain Hazardous Substances In Electrical and Electronic Equipment
FCC CFR Title 47 Part 15 Radio Frequency Devices
FCC CFR Title 47 Part 18 Industrial, Scientific, and Medical Equipment
IEC 60061-1 (2012) Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety – Part 1: Lamp Caps
IEC 60081 Amend 4 Ed 5.0 (2010) Double-capped Fluorescent Lamps - Performance Specifications
IEC 60901 (2011) Single-capped Fluorescent Lamps - Performance Specifications
IEC 62301 ED.2.0 B:2011 Household electrical appliances - Measurement of standby power
IEC 61347-2-3-am2 ed1.0 b.2011 Amendment 2 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. Supplied Electronic Ballasts for Fluorescent Lamps
IEC 62321 Ed. 1.0 Electrotechnical Products - Determination Of Levels Of Six Regulated Substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)
IEEE PAR1789 IEEE Recommending Practices for Modulating Current in High Brightness LEDs for Mitigating Health Risks to Viewers
IES LM-9-09 Electric and Photometric Measurements of Fluorescent Lamps
IES LM-10-96 or LM-10-XX Photometric Testing of Outdoor Fluorescent Luminaires (2015 update anticipated)
IES LM-31-95 Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps
IES LM-40-10 Life Testing of Fluorescent Lamps
IES LM-41-14 Approved Method for Photometric Testing of Indoor Fluorescent Luminaries
IES LM-46-04 Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps
IES LM-49-12 Life Testing of Incandescent Filament Lamps
IES LM-58-13 Method for Spectroradiometric Measurement Methods for Light Sources
IES LM-65-14 Life Testing of Compact Fluorescent Lamps
IES LM-66-14 Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps
IES LM-79-08 Electrical and Photometric Measurements of Solid-State Lighting Products
IES LM-80-08 Measuring Lumen Maintenance of LED Light Sources
IES LM-82-12 Method for the Characterization of LED Light Engines and Integrated LED Lamps for Electrical and Photometric Properties as a Function of Temperature
IES LM-84-14 Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires
IES RP-16-10 Nomenclature and Definitions for Illuminating Engineering
IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Sources
IES TM-28-14 Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaries
NEMA LL 9-2009 Dimming of T8 Fluorescent Lighting Systems
NEMA LSD 45-2009 Recommendations for Solid State Lighting Sub-Assembly Interfaces for Luminaires
NEMA SSL 7A-2013 Phase Cut Dimming for Solid State Lighting: Basic Compatibility

Initial Photometric and Electrical Test Data

EUT	Input Voltage (V)	Frequency (Hz)	Input Current (A)	ITHD	Input Power (W)	Power Factor	Lumen Output (Lumens)	Efficiency Lumen/w
83333	120.0	60.0	0.641	4.2%	76.83	0.999	8148.49	106.06
83333	277.0	60.0	0.283	7.6%	75.07	0.957	/	/

EUT	CCT (K)	CRI Ra	R9	x CIE1931	y CIE1931
83333	4252	83.9	14	0.3710	0.3749
83334	5213	83.1	13	0.3396	0.3501

EUT	u' CIE1976	v' CIE1976	Duv	Rf	Rg
83333	0.2197	0.4994	0.0020	83	94
83334	0.2082	0.4831	0.0015	82	96

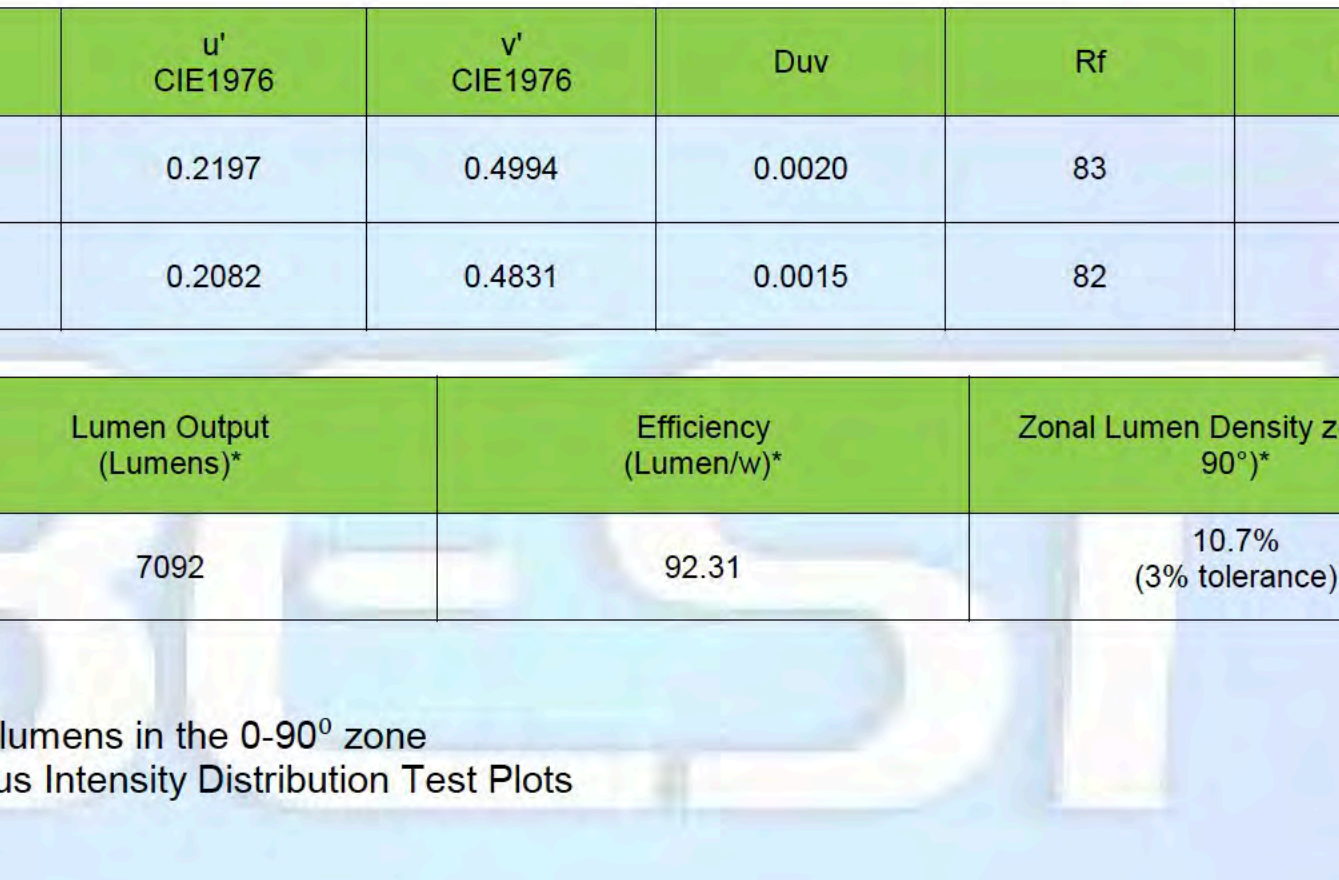
EUT	Lumen Output (Lumens)*	Efficiency (Lumen/w)*	Zonal Lumen Density zone (80-90°)*
83333	7092	92.31	10.7% (3% tolerance)

Note:
1. * evaluated based on the lumens in the 0-90^0 zone
2. See the annex of Luminous Intensity Distribution Test Plots

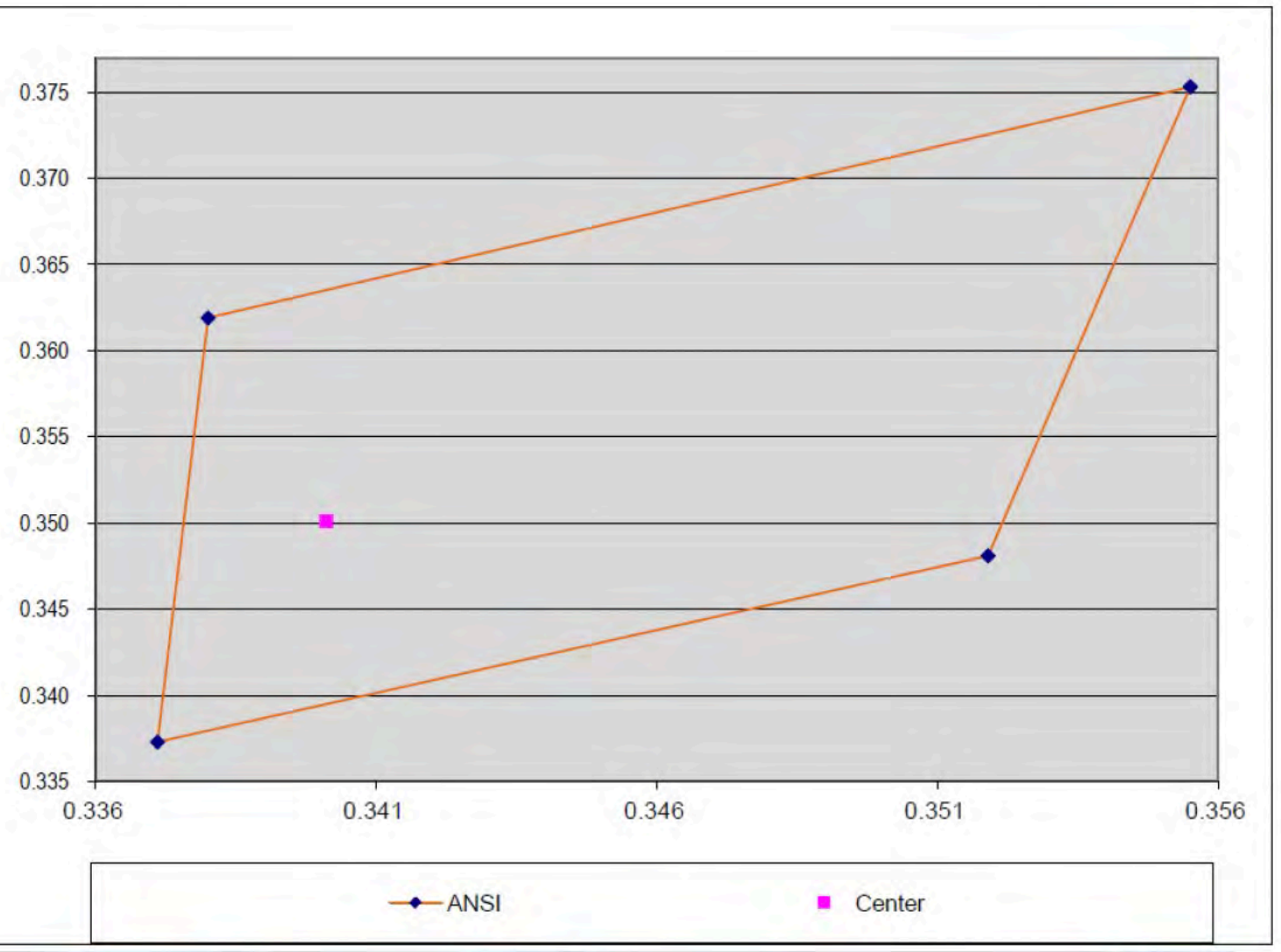
7 Step Quadrangle

83333

	4000K quadrangle	
	x	y
ANSI 78.377-2015	0.4003	0.4035
	0.3737	0.3880
	0.3671	0.3583
	0.3895	0.3709
	0.4003	0.4035
Center		
1	0.3710	0.3749
2		
3		
4		
5		
6		
7		
8		
9		
10		



	5000K Quadrangle	
	x	y
ANSI 78.377-2015	0.3550	0.3753
	0.3375	0.3619
	0.3366	0.3373
	0.3514	0.3481
	0.3550	0.3753
Center		
1	0.3396	0.3501
2		
3		
4		
5		
6		
7		
8		
9		
10		



Spectral Energy Distribution

83333

WL(nm)	Spectrum	Spectrum	WL(nm)	Spectrum	Spectrum
380	0.0176	2.4020	585	0.8424	115.1000
385	0.0122	1.6660	590	0.8463	115.6000
390	0.0084	1.1500	595	0.8445	115.3000
395	0.0063	0.8650	600	0.8371	114.3000
400	0.0069	0.9414	605	0.8211	112.1000
405	0.0093	1.2730	610	0.8012	109.4000
410	0.0160	2.1820	615	0.7704	105.2000
415	0.0306	4.1800	620	0.7361	100.5000
420	0.0571	7.8000	625	0.6936	94.7300
425	0.1023	13.9800	630	0.6489	88.6300
430	0.1742	23.8000	635	0.6019	82.2000
435	0.2771	37.8400	640	0.5525	75.4600
440	0.4119	56.2600	645	0.5031	68.7100
445	0.6214	84.8700	650	0.4531	61.8800
450	0.9145	124.9000	655	0.4080	55.7300
455	0.9660	131.9000	660	0.3652	49.8700
460	0.6932	94.6700	665	0.3259	44.5100
465	0.5196	70.9600	670	0.2887	39.4400
470	0.4346	59.3600	675	0.2531	34.5600
475	0.3481	47.5500	680	0.2237	30.5500
480	0.3144	42.9400	685	0.1951	26.6500
485	0.3336	45.5600	690	0.1697	23.1800
490	0.3725	50.8700	695	0.1479	20.2000
495	0.4197	57.3300	700	0.1277	17.4500
500	0.4737	64.7000	705	0.1110	15.1600
505	0.5186	70.8300	710	0.0958	13.0900
510	0.5540	75.6700	715	0.0823	11.2400
515	0.5787	79.0400	720	0.0709	9.6820
520	0.5642	77.0700	725	0.0610	8.3310
525	0.6115	83.5200	730	0.0526	7.1880
530	0.6433	87.8700	735	0.0455	6.2090
535	0.6646	90.7800	740	0.0390	5.3310
540	0.6911	94.3900	745	0.0337	4.6020
545	0.7117	97.2100	750	0.0292	3.9820
550	0.7377	100.8000	755	0.0252	3.4410
555	0.7609	103.9000	760	0.0223	3.0430
560	0.7796	106.5000	765	0.0191	2.6090
565	0.8000	109.3000	770	0.0164	2.2360
570	0.8136	111.1000	775	0.0143	1.9590
575	0.8266	112.9000	780	0.0132	1.8040
580	0.8377	114.4000			

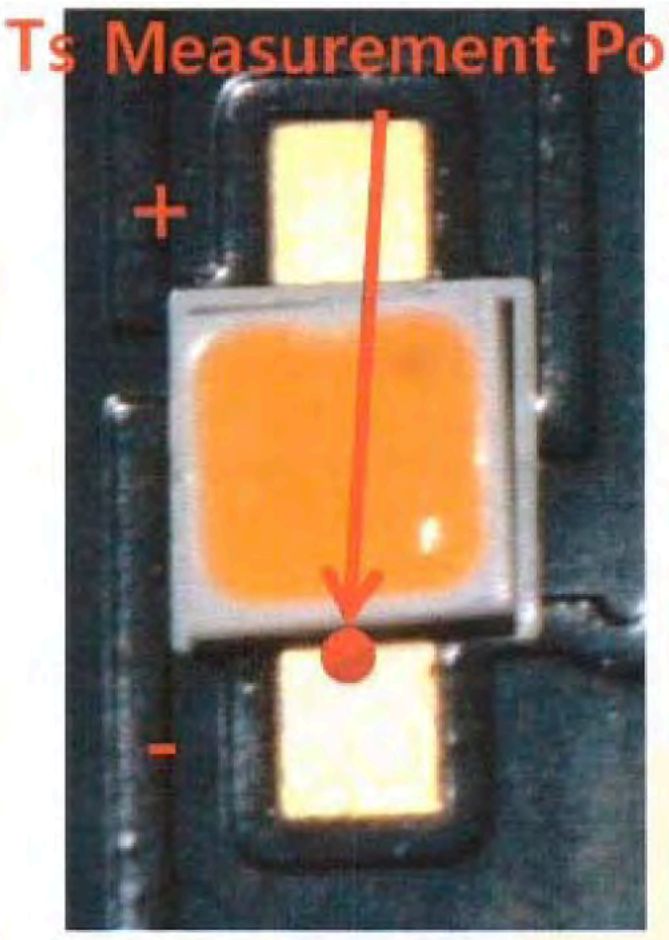
83334

WL(nm)	Spectrum	Spectrum	WL(nm)	Spectrum	Spectrum
380	0.0167	3.0460	585	0.5724	104.3000
385	0.0114	2.0730	590	0.5655	103.0000
390	0.0076	1.3870	595	0.5571	101.5000
395	0.0062	1.1320	600	0.5447	99.2700
400	0.0060	1.0960	605	0.5297	96.5200
405	0.0085	1.5530	610	0.5116	93.2300
410	0.0159	2.9060	615	0.4887	89.0600
415	0.0312	5.6910	620	0.4642	84.5900
420	0.0604	11.0100	625	0.4366	79.5700
425	0.1136	20.7000	630	0.4061	74.0000
430	0.2004	36.5100	635	0.3752	68.3700
435	0.3243	59.1000	640	0.3439	62.6700
440	0.5039	91.8200	645	0.3114	56.7500
445	0.7971	145.3000	650	0.2799	51.0100
450	1.0000	182.2000	655	0.2528	46.0700
455	0.8021	146.2000	660	0.2253	41.0600
460	0.5340	97.3200	665	0.2019	36.7900
465	0.4100	74.7100	670	0.1785	32.5200
470	0.3109	56.6500	675	0.1572	28.6400
475	0.2455	44.7400	680	0.1379	25.1300
480	0.2366	43.1200	685	0.1209	22.0300
485	0.2546	46.4000	690	0.1054	19.2200
490	0.2874	52.3800	695	0.0919	16.7400
495	0.3323	60.5600	700	0.0801	14.6000
500	0.3786	68.9900	705	0.0690	12.5800
505	0.4152	75.6600	710	0.0595	10.8400
510	0.4437	80.8500	715	0.0514	9.3670
515	0.4632	84.4200	720	0.0446	8.1190
520	0.4516	82.2900	725	0.0385	7.0080
525	0.4873	88.8100	730	0.0332	6.0480
530	0.5107	93.0700	735	0.0285	5.2010
535	0.5234	95.3900	740	0.0248	4.5190
540	0.5389	98.2000	745	0.0214	3.8970
545	0.5517	100.5000	750	0.0185	3.3750
550	0.5637	102.7000	755	0.0161	2.9410
555	0.5726	104.4000	760	0.0141	2.5770
560	0.5781	105.3000	765	0.0122	2.2240
565	0.5826	106.2000	770	0.0107	1.9520
570	0.5826	106.2000	775	0.0093	1.7000
575	0.5804	105.8000	780	0.0086	1.5760
580	0.5777	105.3000			

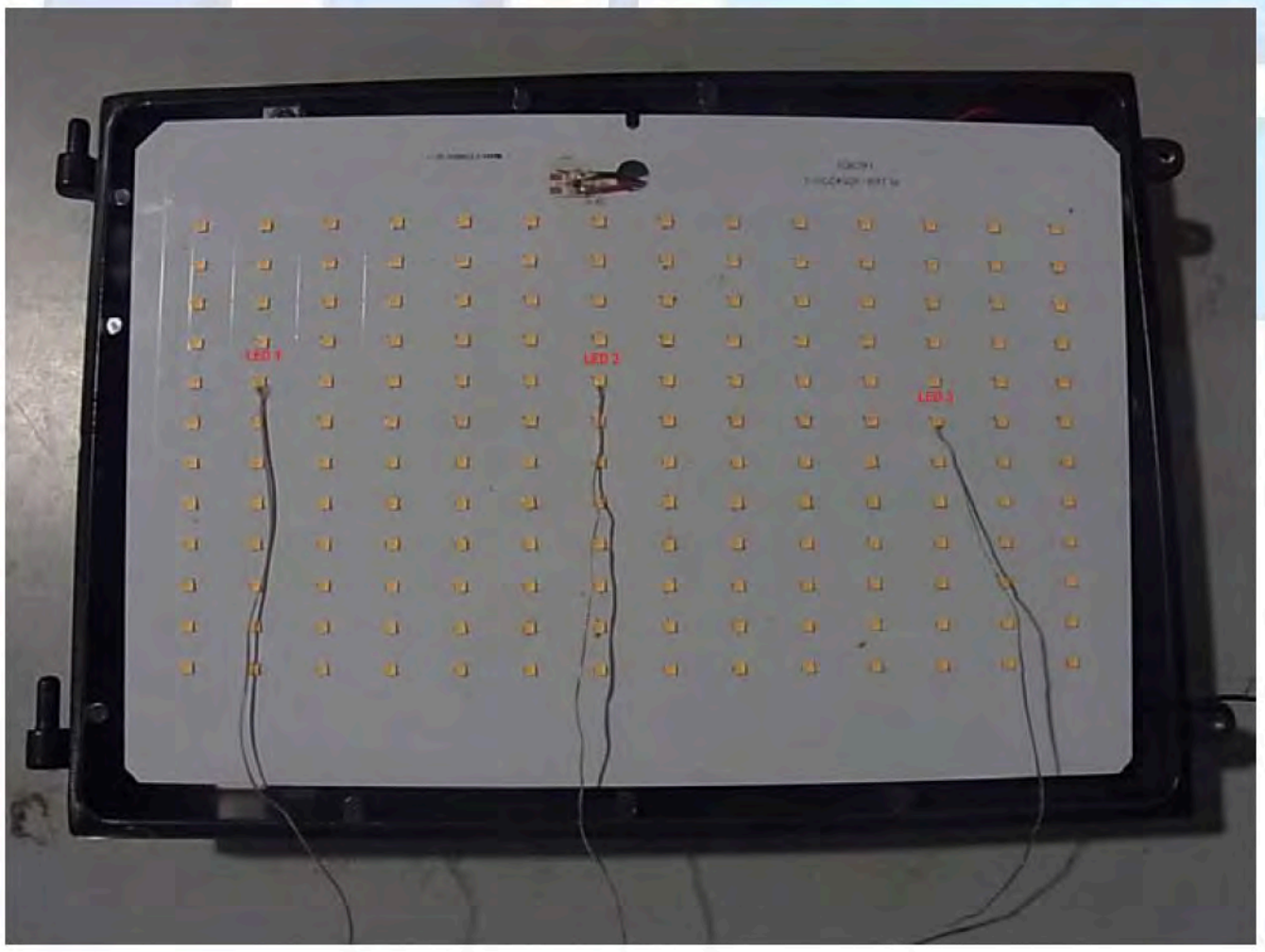
Driver Case Temperature/ LED Drive Current/TMP_{LED} Test Data

EUT	Driver Max Tc (℃)	Driver In-Situ Temperature (℃)	LED In-Situ Current (mA)	LED In-Situ Temperature (℃)(1#)	LED In-Situ Temperature (℃)(2#)	LED In-Situ Temperature (℃)(3#)
83333	N/A	N/A	71.7	77.7	79.8	78.5

LED Lighting Source Temperature Measurement Point in LM-80 Report



LED Lighting Source In Situ Temperature Measurement



TOP: LED 02

Lumen Maintenance and Lighting Source Life Test Data

L70

TM-21 Inputs

Instructions

Yellow fields are completed by the user. Fields not used should be left blank. Cyan fields are calculated based on user entries.

First, enter a description of the LED light source tested. Then complete the fields labeled "LM-80 Testing Details". Test duration must be at least 6,000 hours. If only one case temperature data set is to be used (no interpolation), complete only "Tested case temperature 1". For only two case temperature data sets, complete 1 and 2.

Next, further to the right, in the corresponding box(es) for each tested case temperature, enter the test data along with the time (in hours) at which each measurement was taken. Data entered must be normalized then averaged measured data (per TM-21 sections 5.2.1 and 5.2.2). If case temperatures have different test durations, enter data up to the lowest of the test durations for all of the case temperatures.

Enter drive current, *in-situ* temperature data and the percentage of initial lumens to project to in the fields labeled "*In-Situ* Inputs".

Results can be tailored to estimate lumen maintenance at a specific time by entering a value (t) in the yellow field. A complete TM-21 report will appear on the next tab labeled "Report".

LM-80 Test Inputs

Description of LED Light Source Tested (manufacturer, model, catalog number)
Seoul, 3030B (STWxC2SB)

LM-80 Testing Details	
Total number of units tested per case temperature:	25
Number of failures:	0
Number of units measured:	25
Test duration (hours):	7000
Tested drive current (mA):	200
Tested case temperature 1 (T_c, °C):	55
Tested case temperature 2 (T_c, °C):	85
Tested case temperature 3 (T_c, °C):	105

Test Data for 55°C Case Temperature		Test Data for 85°C Case Temperature		Test Data for 105°C Case Temperature	
Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)	Time (hours)	Lumen Maintenance (%)
0	100.00%	0	100.00%	0	100.00%
1000	101.20%	1000	101.00%	1000	99.20%
2000	100.80%	2000	100.10%	2000	98.10%
3000	101.20%	3000	99.80%	3000	96.90%
4000	101.10%	4000	98.80%	4000	95.90%
5000	100.80%	5000	97.50%	5000	94.30%
6000	99.90%	6000	97.00%	6000	92.30%
7000	99.10%	7000	96.10%	7000	90.20%

***In-Situ* Inputs**

Drive current for each LED package/array/module (mA):	71.7
In-situ case temperature (T_c, °C):	79.8
Percentage of initial lumens to project to (e.g. for L_{70}, enter 70):	70

Results

Time (t) at which to estimate lumen maintenance (hours):	50,000
Lumen maintenance at time (t) (%):	70.14%
Reported L70 (hours):	>42000

EUT Photo