

SPECTRUM LIGHTING INC.

TEST REPORT

SCOPE OF WORK

Electrical and Photometric tests as required to the IESNA test standard and Insitu Temperature Measurement Tests.

MODEL NUMBER

PR1605LEDLX140L35KEX/CD3X

PROJECT NUMBER

G103482968

REPORT NUMBER

103482968CRT-001

ISSUE DATE

April 28, 2018

REVISION DATE

None

PAGES

13

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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TEST REPORT**REPORT NO.: 103482968CRT-001****REPORT DATE: April 28, 2018**

TEST OF (1) LED HIGH BAY

MODEL NO. PR1605LEDLX140L35KEX/CD3X

RENDERED TO:

SPECTRUM LIGHTING INC.
994 JEFFERSON ST.
FALL RIVER MA 02721**STATEMENT OF LIMITATION**

NVLAP Lab Code 100402-0. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION

The testing performed was authorized by signed quote number Qu-00876905.

STANDARDS USED

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

ANSI NEMA ANSLG C78.377: 2015: Specifications of the Chromaticity of Solid State Lighting Products

UL 1598-2009: Standard for Safety - Luminaires.

SAMPLE INFORMATION

CONTROL NO.	MODEL/SERIAL NO.	DESCRIPTION	TYPE	RECEIVED
CRT1804171150-001	PR1605LEDLX140L35KEX/CD	LED High Bay	Production	4/17/2018

DATE OF TESTS

April 23, 2018 through April 25, 2018.

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TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

SUMMARY

MODEL NO:	PR1605LEDLX140L35KEX/CD3X
DESCRIPTION:	LED High Bay
LED MODEL NO:	Nichia NFSL757DT-V1
DRIVER MODEL NO:	Osram 79369

CRITERIA	RESULTS	
	INTEGRATING SPHERE	GONIOPHOTOMETER
Lumen Output (lumens)	12620.1	12774.6
Input Power (W) @ 120 (VAC)	108.81	109.12
Lumen Efficacy (lm/W)	116.0	117.1
Input Power Factor () @ 120 (VAC)	0.995	0.996

CRITERIA	RESULTS
Input Current ATHD (%) @ 120 (VAC)	4.00
Correlated Color Temperature (K)	3548
Color Rendering Index - Ra ()	82.5
Color Rendering - R9 ()	9.3
DUV ()	0.0006
Chromaticity Coordinate (x)	0.403
Chromaticity Coordinate (y)	0.391
Chromaticity Coordinate (u')	0.234
Chromaticity Coordinate (v')	0.511
Maximum Measured Source Temperature (°C)	71.2
Maximum Measured Driver Temperature (°C)	59.4
Input Power Factor () @ 277 (VAC)	0.918
Input Current ATHD (%) @ 277 (VAC)	8.22

TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

EQUIPMENT LIST

EQUIPMENT USED	MODEL NO.	CONTROL NO.	LAST CAL DATE	CAL DUE DATE
LSI High Speed Mirror Goniometer	6440	---	4/9/2018	5/9/2018
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	5/2/2017	5/2/2018
Omega Thermometer	DPI8-C24	M263	5/2/2017	5/2/2018
M-D Building Products Digital Level	Smart Tool	E499	6/22/2017	6/22/2018
NIST Luminous Intensity Standard Source	NBS10322	N1427	1/9/2017	1/9/2019
NIST Luminous Intensity Standard Source	NBS10332	N1435	1/9/2017	1/9/2019
NIST Luminous Intensity Standard Source	NBS10265	N1437	1/9/2017	1/9/2019
NIST Luminous Flux Standard Source	NBS10428	N1424	1/11/2017	1/11/2019
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XFR 150-8	---	VBU	VBU
Yokogawa Power Analyzer	WT1600	E474	5/4/2017	5/4/2018
Fluke Thermometer	53 II	T1318	4/9/2018	4/9/2019
Fluke Multimeter	87V	D590	4/28/2017	4/28/2018
3M Integrating Sphere Spectrometer System	CDS 1100	---	4/23/2018	5/23/2018
Fisher Scientific Stopwatch	14-649-9	N1132	2/15/2018	2/15/2019
Secondary Spectral Intensity Standard Source	BS5186	RF5186	1/28/2018	1/28/2019
Secondary Luminous Flux Standard Source	BS3616	--	1/28/2018	1/28/2019
Secondary Luminous Flux Standard Source	BS4116	--	1/28/2018	1/28/2019
Secondary Luminous Flux Standard Source	6836	--	1/28/2018	1/28/2019
Extech Hygro-Thermometer	445703	T1359	3/16/2018	3/16/2019
Fluke Multimeter	87 V	D589	11/30/2017	11/30/2018
Fluke Temperature Meter	53 II	D588	4/27/2017	4/27/2018

TEST REPORT**REPORT NO.: 103482968CRT-001****REPORT DATE: April 28, 2018****TEST METHODS****SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS**

No seasoning was performed in accordance with IESNA LM-79.

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD

A Spectroradiometer and integrating sphere were used to measure light output, correlated color temperature, chromaticity coordinates, color rendering index, and the spectral distribution for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD

A Type C Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

IN-SITU MAXIMUM MEASURED POWER SUPPLY CASE AND LED SOURCE POINT TEMPERATURE

Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and temperature meter. The SSL sample was allowed to reach thermal equilibrium for three and a half to seven and a half hours before measurements were taken. Power supply or source temperature measurements were measured at the TMPps or Ts point as indicated by the included diagram in accordance with manufacturers declared thermal test point location, or at a thermal test point location found with a thermal camera when no diagram from the manufacturer is given. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598, UL 153, or UL 1993 as applicable.

TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

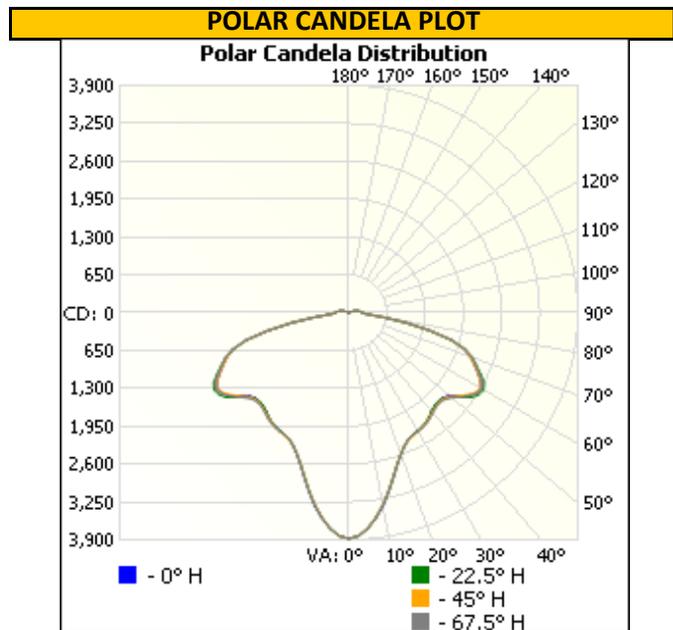
RESULTS OF TESTS

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

INTERTEK CONTROL NO.	BASE POSITION	INPUT VOLTAGE (VAC)	INPUT CURRENT (mA)	INPUT POWER (W)	INPUT POWER FACTOR ()	LIGHT OUTPUT (lm)	LUMEN EFFICACY (lm/W)
CRT1804171150-001	Base Up	120.01	912.5	109.12	0.996	12774.6	117.1

INTENSITY SUMMARY - CANDELAS

Angle	0	22.5	45	67.5	90
0	3875	3875	3875	3875	3875
5	3716	3716	3715	3704	3710
10	3362	3345	3344	3347	3351
15	2929	2916	2917	2922	2925
20	2589	2585	2583	2582	2587
25	2401	2400	2409	2394	2411
30	2346	2340	2355	2350	2364
35	2293	2291	2298	2313	2307
40	2200	2197	2216	2233	2232
45	2154	2150	2172	2184	2178
50	2217	2254	2238	2270	2220
55	2475	2537	2456	2489	2437
60	2595	2649	2588	2621	2555
65	2419	2473	2422	2453	2415
70	2200	2229	2202	2241	2179
75	1816	1796	1806	1815	1788
80	998	983	997	1014	991
85	354	362	362	370	359
90	231	232	231	233	231
95	205	207	205	208	205
100	166	168	167	170	166
105	120	123	121	124	120
110	76	79	77	79	76
115	44	46	45	47	44
120	23	24	24	24	24
125	8	8	8	8	8



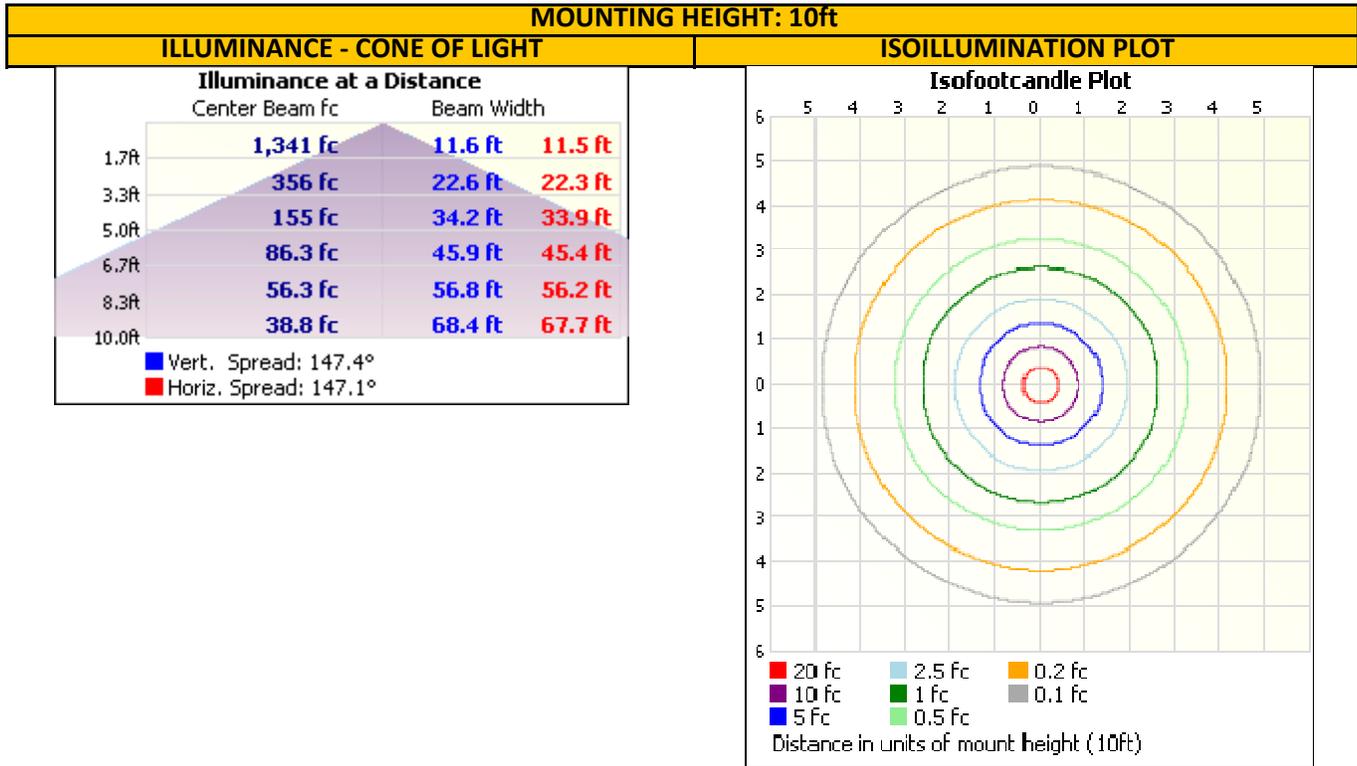
TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

RESULTS OF TESTS

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)



ZONAL LUMEN SUMMARY AND PERCENTAGES

ZONE	LUMENS	% LUMINAIRE
0-30	2283.0	17.9
0-40	3721.8	29.1
0-60	7629.6	59.7
60-90	4736.9	37.1
0-90	12366.5	96.8
90-180	408.0	3.2
0-180	12774.6	100.0

ZONE	LUMENS	% LUMINAIRE
0-10	341.8	2.7
10-20	820.7	6.4
20-30	1120.5	8.8
30-40	1438.7	11.3
40-50	1696.8	13.3
50-60	2211.0	17.3
60-70	2413.5	18.9
70-80	1818.5	14.2
80-90	504.9	4.0
90-100	222.0	1.7
100-110	129.6	1.0
110-120	47.6	0.4
120-130	8.8	0.1

TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

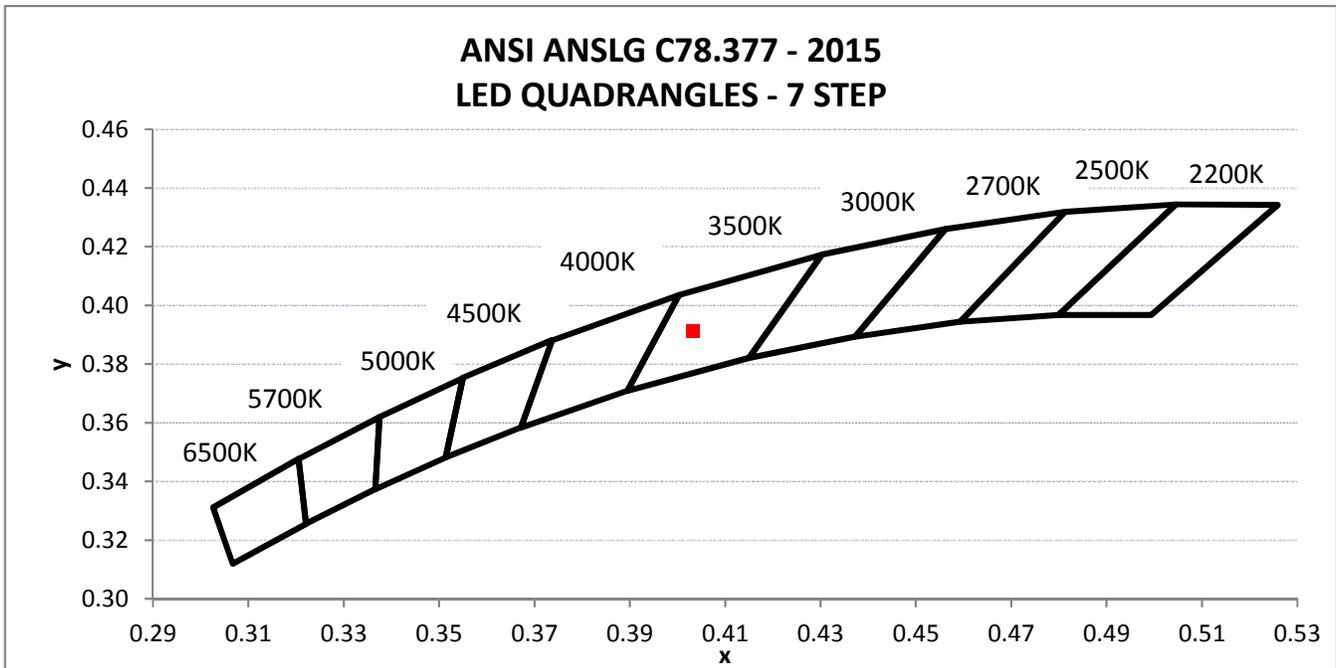
RESULTS OF TESTS

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)

INTERTEK CONTROL NO.	BASE POSITION	INPUT VOLTAGE (VAC)	INPUT CURRENT (mA)	INPUT POWER (W)	INPUT POWER FACTOR ()	INPUT CURRENT ATHD (%)
CRT1804171150-001	Base Up	120.03	911.0	108.81	0.995	4.00
		277.01	427.5	108.71	0.918	8.22

LIGHT OUTPUT (lm)	LUMEN EFFICACY (lm/W)	CORRELATED COLOR TEMPERATURE - CCT (K)	CRI - Ra ()	CRI - R9 ()	DUV ()
12620.1	116.0	3548	82.5	9.3	0.0006

CIE 1931 CHROMATICITY COORDINATE (x)	CIE 1931 CHROMATICITY COORDINATE (y)	CIE 1976 CHROMATICITY COORDINATE (u')	CIE 1976 CHROMATICITY COORDINATE (v')
0.403	0.391	0.234	0.511



TEST REPORT

REPORT NO.: 103482968CRT-001

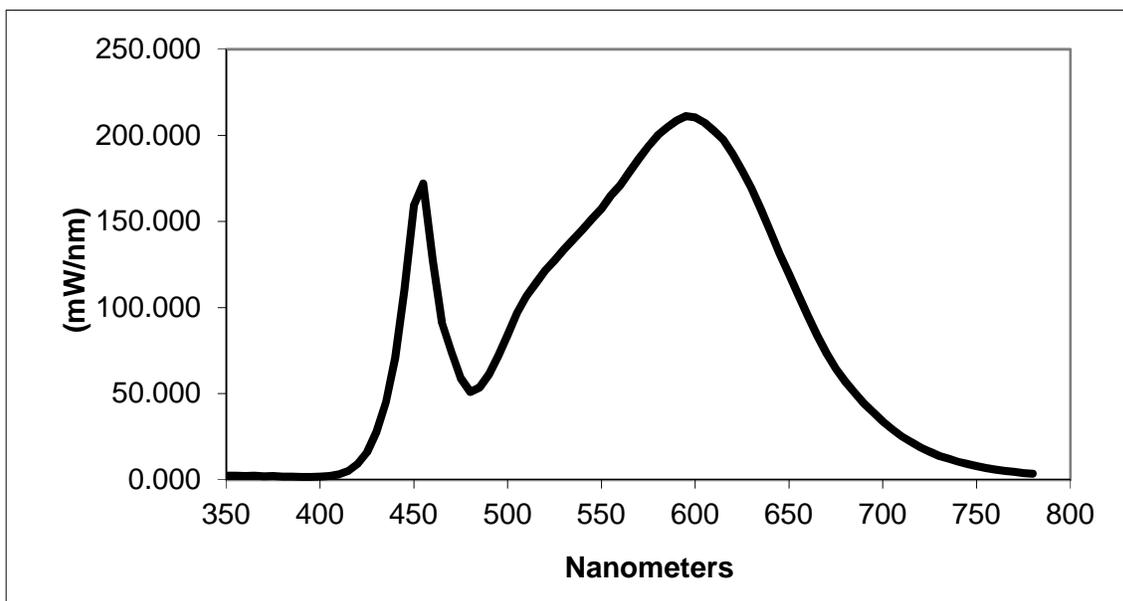
REPORT DATE: April 28, 2018

RESULTS OF TESTS

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)

SPECTRAL DISTRIBUTION OVER VISIBLE WAVELENGTHS*							
nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	2.385	460	127.432	570	186.642	680	56.948
355	2.362	465	91.166	575	193.540	685	50.484
360	2.140	470	74.064	580	200.020	690	44.359
365	2.353	475	58.924	585	204.439	695	38.982
370	1.997	480	50.963	590	208.557	700	33.710
375	2.190	485	53.533	595	211.209	705	29.414
380	1.919	490	61.277	600	210.529	710	25.265
385	1.856	495	71.996	605	207.267	715	21.932
390	1.713	500	84.016	610	202.749	720	18.848
395	1.651	505	96.945	615	197.372	725	16.247
400	1.810	510	106.657	620	189.133	730	13.932
405	2.180	515	114.210	625	179.314	735	12.245
410	3.110	520	121.347	630	169.376	740	10.529
415	5.158	525	127.555	635	156.866	745	9.136
420	9.203	530	133.780	640	144.258	750	7.906
425	16.011	535	139.597	645	131.420	755	6.843
430	27.634	540	145.317	650	119.337	760	5.957
435	44.984	545	151.495	655	107.317	765	5.179
440	70.810	550	157.386	660	95.080	770	4.556
445	110.328	555	164.998	665	83.962	775	3.907
450	159.513	560	171.093	670	73.364	780	3.425
455	171.971	565	178.914	675	64.488		

*Without correction of sample absorption.



TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

RESULTS OF TESTS

IN-SITU MAXIMUM MEASURED LED SOURCE TEMPERATURE

Maximum Junction Temperature from LED specification (T_j) = 120°C
 Thermal Resistance Formula from LED specification = 19°C/W
 Maximum Forward Voltage (V_f) from LED specification = 3.3V
 Measured LED Current = 118.78mA
 Calculated LED Wattage = $V_f \times$ Measured LED Current = 0.392W
 Maximum Source Temperature (T_s) = $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 112.55^\circ\text{C}$

LED SOURCE MANUFACTURER'S SUPPORTING DOCUMENTATION:

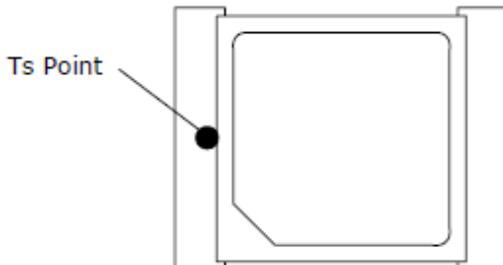
(1) Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	180	mA
Pulse Forward Current	I_{FP}	240	mA
Allowable Reverse Current	I_R	85	mA
Power Dissipation	P_D	594	mW
Operating Temperature	T_{opr}	-40~100	°C
Storage Temperature	T_{stg}	-40~100	°C
Junction Temperature	T_j	120	°C

(2) Initial Electrical/Optical Characteristics

Item	Symbol	Condition	Typ	Max	Unit
Forward Voltage	V_F	$I_F=65\text{mA}$	2.88	-	V
R9050	Luminous Flux	Φ_v $I_F=65\text{mA}$	23.5	-	lm
	Luminous Intensity	I_v $I_F=65\text{mA}$	7.9	-	cd
	Color Rendering Index	R_a $I_F=65\text{mA}$	92	-	-
Chromaticity Coordinate	x	- $I_F=65\text{mA}$	0.41	-	-
	y	- $I_F=65\text{mA}$	0.39	-	-
Thermal Resistance	$R_{\theta JS}$	-	13	19	°C/W

Item	Rank	Min	Max	Unit
Forward Voltage	-	2.4	3.3	V



TEST REPORT

REPORT NO.: 103482968CRT-001

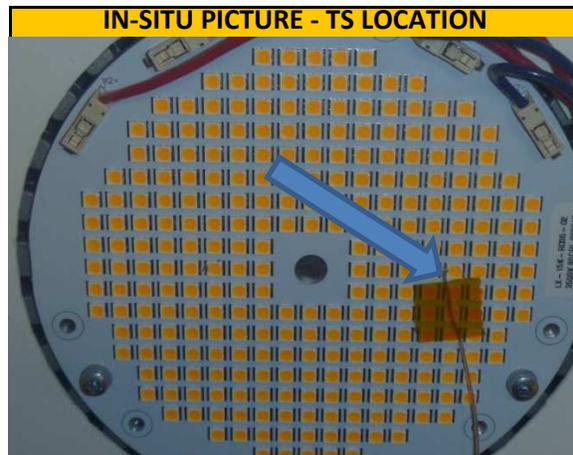
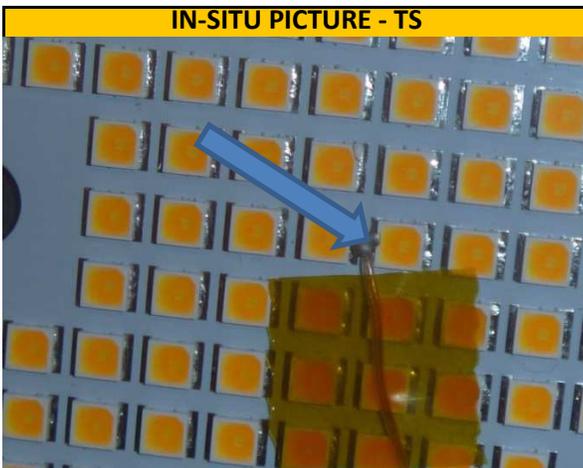
REPORT DATE: April 28, 2018

RESULTS OF TESTS

MAXIMUM MEASURED MANUFACTURER DESIGNATED LED SOURCE TEMPERATURE

INSITU APPARATUS:	Ceiling Pendant
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INTERTEK CONTROL NO.	MAXIMUM MEASURED LED TEMPERATURE (°C)	LOCATION OF THERMOCOUPLE	MAXIMUM RATED LED TEMPERATURE (°C)
CRT1804171150-001	71.2	Per Diagram	112.55



TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

RESULTS OF TESTS

IN-SITU MAXIMUM MEASURED DRIVER SOURCE TEMPERATURE

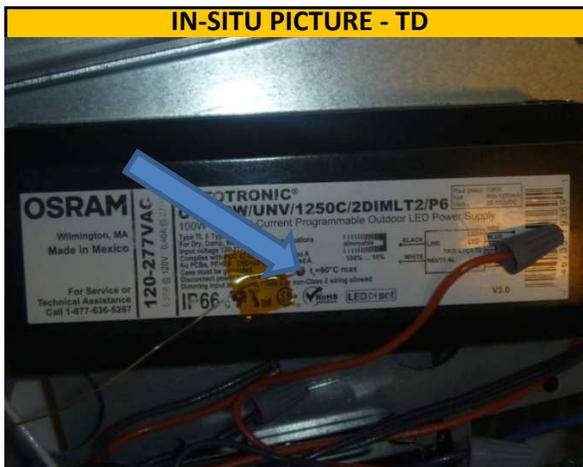
DRIVER SOURCE MANUFACTURER'S SUPPORTING DOCUMENTATION:

ENVIRONMENTAL SPECIFICATIONS	
Ambient Operating Temperature	-40 °C to 55 °C
Case Temperature (Tc)	85°C** 90°C (max)

*Measurement location marked on driver.

MAXIMUM MEASURED MANUFACTURER DESIGNATED DRIVER SOURCE TEMPERATURE

INTERTEK CONTROL NO.	MAXIMUM MEASURED DRIVER TEMPERATURE (°C)	LOCATION OF THERMOCOUPLE	MAXIMUM RATED DRIVER TEMPERATURE (°C)
CRT1804171150-001	59.4	Per Diagram	90.0



End Of Test Results

TEST REPORT

REPORT NO.: 103482968CRT-001

REPORT DATE: April 28, 2018

PICTURES



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Handwritten signature of Gerald Gray in black ink.

Gerald Gray
Associate Engineer
Lighting Division

Report Reviewed By:

Handwritten signature of Jeff Davis in black ink.

Jeff Davis
Engineering Supervisor
Lighting Division

Attachments: IES File

REVISION HISTORY

JOB NUMBER	DATE OF REVISION	PROJECT HANDLER	REVIEWED BY	REVISION NOTE
None				