

PUREEDGE LIGHTING LLC

TEST REPORT

SCOPE OF WORK

Performance Testing for Luminaires

MODEL NUMBER

CFDB-7W-***-48-***K-**

PROJECT NUMBER

G104797632

REPORT NUMBER

104797632CHI-041

ISSUE DATE

7/21/2022

REVISED DATE

None

TEST DATES

6/27/2022 - 7/21/2022

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104797632CHI-041

MODEL NUMBER(s)

CFDB-7W-***-48-**K-**

REPORT RENDERED TO:

PUREEDGE LIGHTING LLC
1718 W. FULLERTON AVE
CHICAGO, IL 60614
COUNTRY

STATEMENT OF LIMITATION

NVLAP Lab Code 600186-0. 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-01199885-2.

TEST STANDARDS

CEC-400-2018-021-CMF Appendix JA8 - Qualification Requirements for High Efficacy Light Sources
CEC-400-2018-021-CMF Appendix JA10 - Test Method for Measuring Flicker of Lighting Systems
IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2017: Specifications of the Chromaticity of Solid State Lighting Products
UL 1598-2009: Standard for Safety - Luminaires

In Charge of Testing:



Maximilian Carvajal
Engineer
Lighting Division

Reviewer:



Jeff Davis
N.A. Technical Lead
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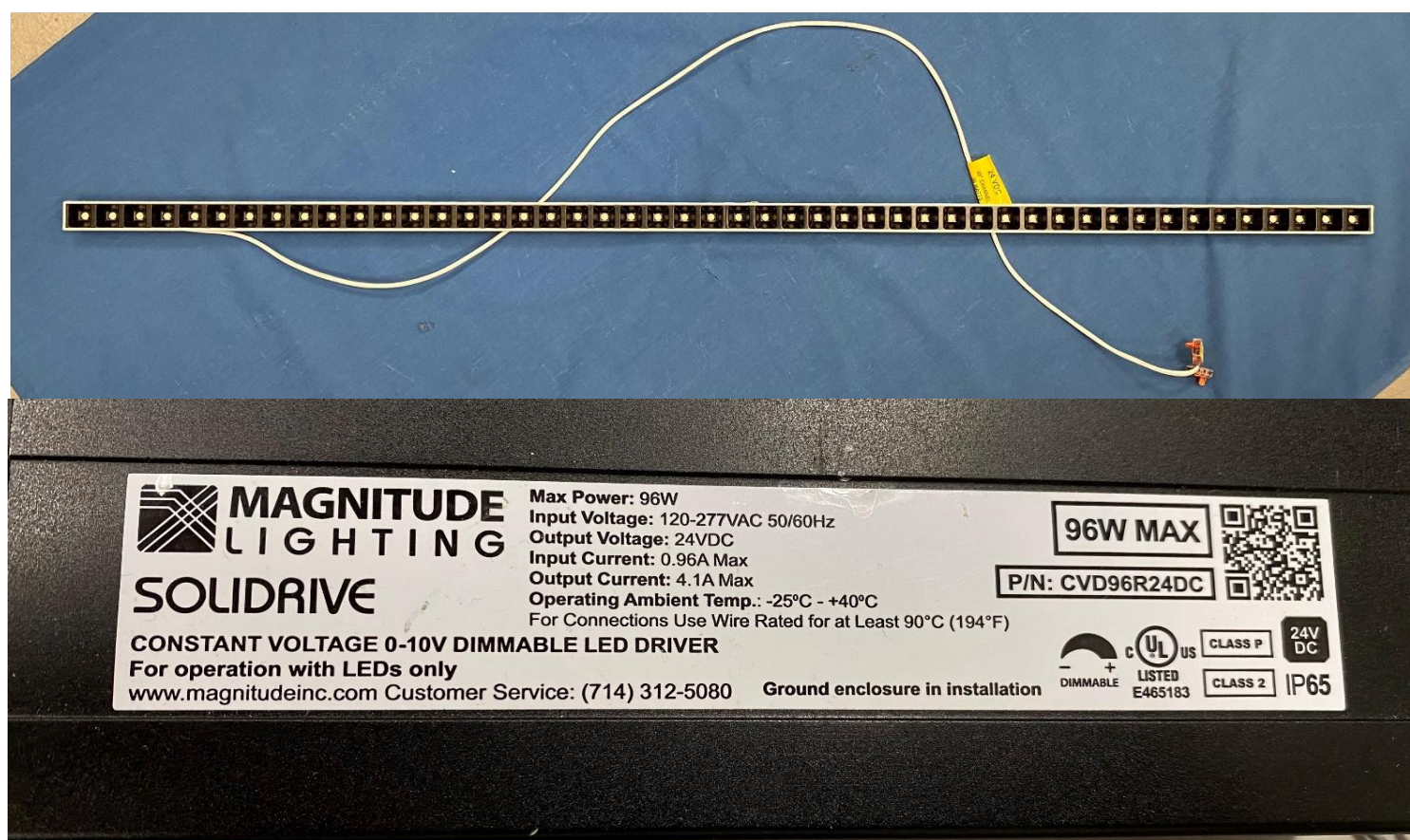
SAMPLE INFORMATION

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ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	AH05192022111730	CFDB-7W-***-48-**K- **	LINEAR LOW VOLTAGE	Production	5/19/2022

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

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PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	CFDB-7W-***-48-**K-**
Product Description:	LINEAR LOW VOLTAGE
LED Model No.:	Lumileds 2835
Driver Model No.:	Magnitude Lighting / CVD96R24DC
Light Source:	LED
CEC Product Type:	SSL Luminaire
Minimum Claimed Dimming %:	0
Dimmer Make and Model:	Leviton Illumatech IP710-DL
Dimming Technology:	0-10 Volt DC Controls

Criteria	Results	
	Goniophotometer	Integrating Sphere
Light Output (lumens)	2567.6	2568.9
Input Power (W)	44.04	43.56
Lumen Efficacy (lm/W)	58.3	59.0
Input Power Factor ()	0.992	0.994

Criteria	Results			Compliance
Lumen Efficacy (lm/W)	58.3			Compliant
Input Power Factor ()	0.992			Compliant
Correlated Color Temperature (K)	3450			Compliant
Color Rendering Index - Ra ()	94.0			Compliant
Color Rendering Index - R9 ()	85.5			Compliant
Duv ()	-0.0022			--
Chromaticity Coordinate (x)	0.406			--
Chromaticity Coordinate (y)	0.386			--
Chromaticity Coordinate (u')	0.238			--
Chromaticity Coordinate (v')	0.509			--
Max LED Source Temperature (°C)	68.0			Compliant
Start Time (ms)	399.6			Compliant
Dimming (%)	0.0			Compliant
Percent Amplitude Modulation (%)	100% Dim	20% Dim	Min Dim	--
Unfiltered	0.9	100.0	100.0	--
1000Hz	0.1	16.0	41.9	--
400Hz	0.1	11.9	30.9	--
200Hz	0.0	8.1	26.6	--
90Hz	0.0	6.8	18.5	Compliant
40Hz	0.0	5.7	14.3	Compliant
Minimum reported L70 Hours using LM-80 Report, TM-21 calculator, and Insitu Results (Hours)	>36,000 Hours			Compliant

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CEC TITLE 24 APPENDIX JA8 REQUIREMENTS

Property	Requirements
Luminous Efficacy (JA 8.4.1)	The luminous efficacy of the light source shall be equal to or greater than either the applicable State or federal appliance efficiency standard or 45 lumens/Watt, whichever is higher, when tested at its full light output.
Power Factor (JA 8.4.2)	The light source shall have a power factor equal to or greater than 0.90 when tested at its full light output.
Start Time (JA 8.4.3)	The light source shall have a start time no greater than 0.5 seconds. (the point where the light source is continuously illuminated, and the light output is either constant or increasing.)
Color Characteristics (JA 8.4.4)	All light sources shall be capable of providing a nominal Correlated Color Temperature (CCT) of 4000 Kelvin or less and shall provide a Color Rendering Index (CRI) of 90 or higher and color rendering R9 value of 50 or higher.
Lumen Maintenance, Rated Life and Survival Rate* (JA 8.4.5)	<p>Lumen Maintenance: The percentage of initial light output shall either be 86.7 percent after 6,000 hours or 93.1 percent after 3,000 hours, based on whether the product is reporting final or interim test data. Light sources tested using LM-80 and TM-21, as specified in the ENERGY STAR product specifications, may use the ENERGY STAR TM-21 calculator to determine lumen maintenance at 3,000 or 6,000 hours.</p> <p>Rated Life: The light source shall have a minimum rated lifetime of 15,000 hours.</p> <p>Survival Rate: For tests using a sample group of ten units, 90 percent of tested units shall be operational for the duration of the test. For tests using a sample size less than ten, all tested units shall be operational for the duration of the test.</p>
Dimming, Reduced Flicker Operation and Audible Noise* (JA 8.4.6)	<p>The light source shall be dimmable down to 10 percent light output where 100 percent full light output is defined as operating the light source at the maximum setting provided by the control.</p> <p>LED-based light sources designed to be connected with or dimmed by forward phase cut dimmers shall meet the requirements of NEMA standard SSL 7A.</p> <p>Light source in combination with specified control shall provide "reduced flicker operation" when tested at full light output as specified in JA10, where reduced flicker operation is defined as having percent amplitude modulation (percent flicker) less than 30 percent at frequencies less than 200Hz.</p> <p>Light source shall not emit audible noise above 24dBA measured at 1 meter from the light source when tested at full light output.</p> <p>Light sources shall also be tested and shown to comply with (c) and (d) while at 20% light output.</p>

*Not NVLAP Accredited

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TEST METHODS

SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS

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

INTEGRATING SPHERE TESTING

A spectroradiometer and integrating sphere were used to measure the spectral distribution for each EUT resulting in photometric and colorimetric data. Electrical measurements of the unit were measured using a power analyzer. Each EUT was operated at the rated input voltage of the system in its designated orientation. The ambient temperature was measured at a position inside the sphere and stabilization procedures to LM-79 were followed.

INSITU TEMPERATURE MEASUREMENT TESTING

Thermal measurements were taken on the EUT using a thermocouple and temperature meter. The EUT was allowed to reach thermal equilibrium for three and a half to seven and a half hours before measurements were taken. Temperatures 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.

START TIME

An oscilloscope was used to measure the starting time at ambient temperature. Measured start time was the time between supplied voltage and measured light output by a photometer. Each EUT was operated at rated input voltage in its designated orientation during the tests.

DIMMING AND AUDIBLE NOISE

Dimming tests were performed with a photodetector and oscilloscope. Each EUT was allowed to stabilize at its highest dimming point and a relative light output measurement was taken. The EUT was then dimmed to its lowest point without flickering and another relative light output measurement was taken. The dimming range percentage was then calculated. Noise was conducted at 20% light output at a distance of 1 meter. Six different positions were measured, the maximum was recorded. Noise data is reported separately through our Acoustical Department, Cortland, NY.

REDUCED FLICKER

An integrating sphere, photodetector, and oscilloscope were used to measure the percent amplitude modulation for each EUT. Measurements were recorded at each dimming level by $\pm 2\%$ light output. For each dimming level, measurements were recorded in volts from test equipment with readings taken at intervals of no greater than 50 microseconds. These readings were recorded for a test period of no less than one second. The ambient temperature was measured at a position inside the sphere and stabilization procedures to LM-79 were followed. The percent amplitude modulation was calculated at unfiltered frequency, 1000Hz, 400Hz, 200Hz, 90Hz, and 40Hz for each dimming level. The dimming levels per JA10 are 100% light output (on a dimmer, but not dimmed), 20% light output, and the minimum claimed dim level). Industry accepted MATLAB coding was used to calculate the percent amplitude modulation.

INTEGRATING SPHERE TESTING

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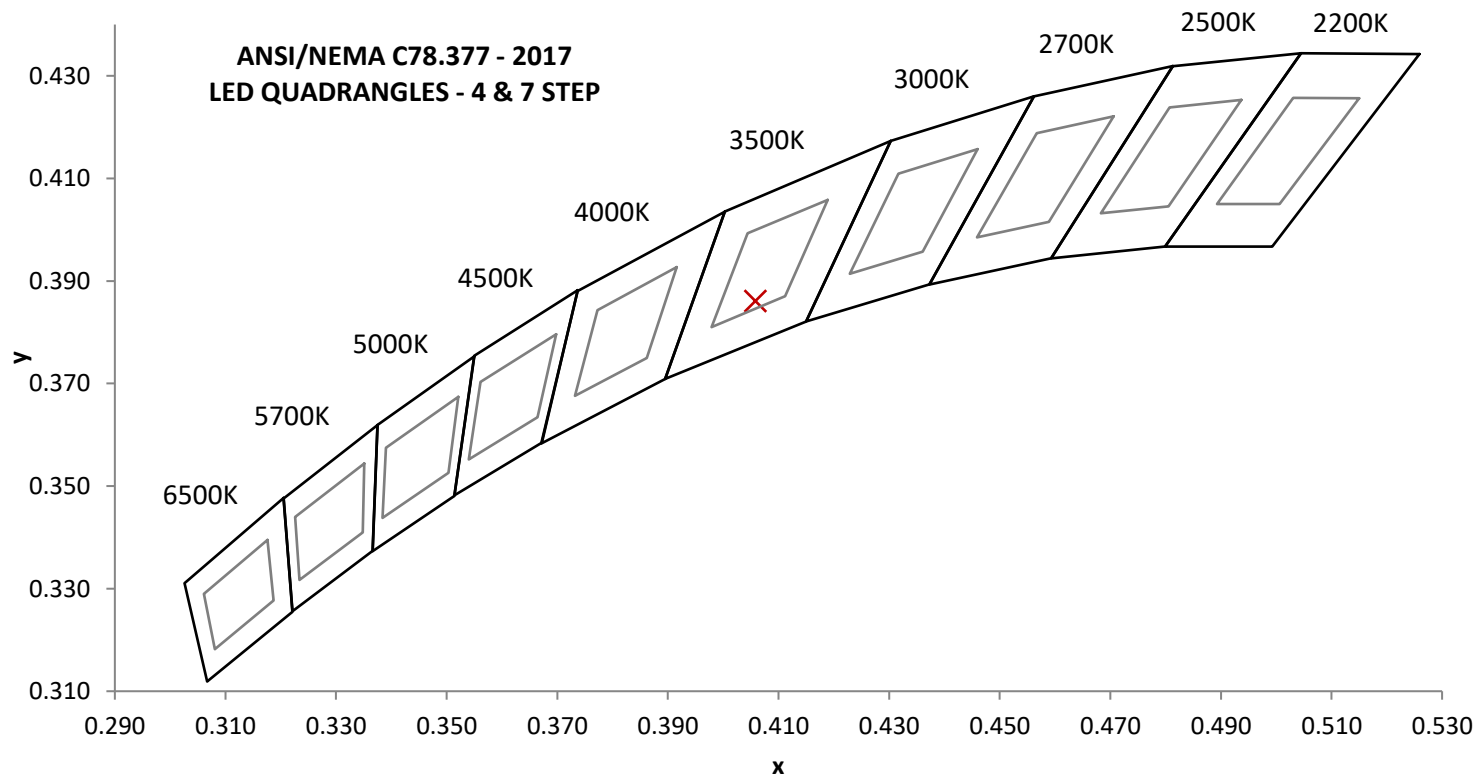
PHOTOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS (25°C +/- 1°C)

Base Orientation
Up

Input Voltage Select One	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
119.98	365.3	43.56	0.994	6.38
277.05	187.30	43.15	0.83	8.67

Light Output (lm)	Lumen Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
2568.9	59.0	3450	94.0	85.5

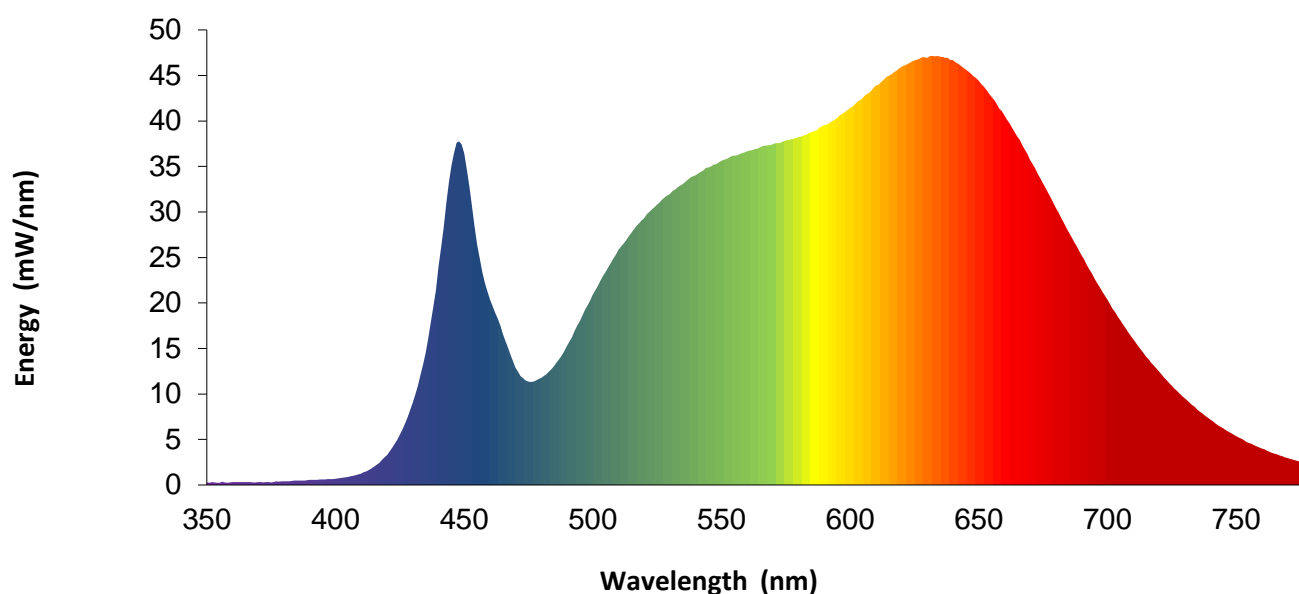
Duv (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
-0.0022	0.406	0.386	0.238	0.509



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SPECTRAL DISTRIBUTION OVER WAVELENGTHS

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.3		460	20.4		570	37.5		680	30.5
355	0.3		465	16.6		575	37.8		685	27.8
360	0.3		470	12.9		580	38.2		690	25.2
365	0.3		475	11.4		585	38.8		695	22.7
370	0.3		480	11.7		590	39.5		700	20.4
375	0.3		485	13.0		595	40.3		705	18.1
380	0.4		490	15.3		600	41.5		710	16.0
385	0.5		495	18.0		605	42.6		715	14.1
390	0.5		500	20.9		610	43.9		720	12.5
395	0.6		505	23.4		615	44.9		725	10.9
400	0.7		510	25.8		620	46.0		730	9.5
405	0.9		515	27.7		625	46.6		735	8.3
410	1.3		520	29.3		630	47.0		740	7.2
415	2.0		525	30.8		635	47.1		745	6.2
420	3.3		530	32.0		640	46.7		750	5.4
425	5.6		535	33.1		645	45.6		755	4.6
430	9.1		540	34.1		650	44.4		760	4.0
435	14.5		545	34.9		655	42.7		765	3.4
440	24.0		550	35.6		660	40.6		770	3.0
445	35.1		555	36.2		665	38.3		775	2.5
450	36.4		560	36.7		670	35.7		780	2.2
455	26.4		565	37.1		675	33.1		---	---



Portrayed color in graphic is estimated by wavelength (nm) and may not be exact - it is a visual representation only

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

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Test Configuration	Tested Model No.	Pass/Fail/NA
1	CFDB-7W-***-48-**K-**	NA

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

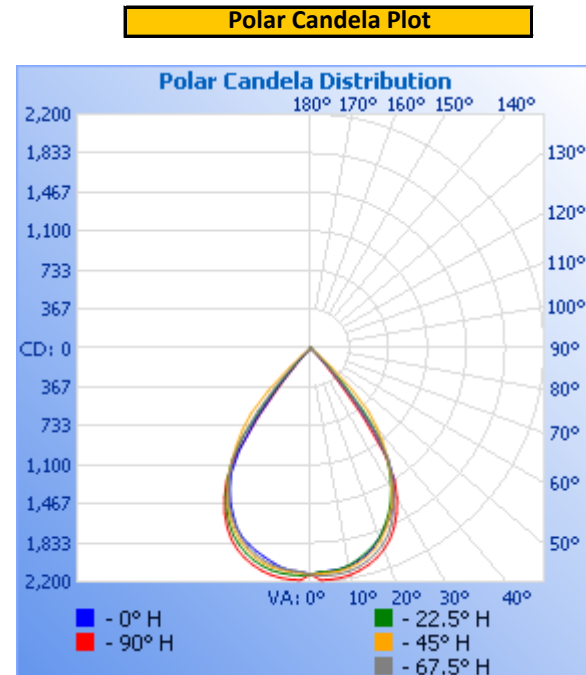
Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (I)
Up	120.00	370.0	44.04	0.992

Light Output (lm)	Lumen Efficacy (lm/W)
2567.6	58.3

INTENSITY SUMMARY - CANDELA

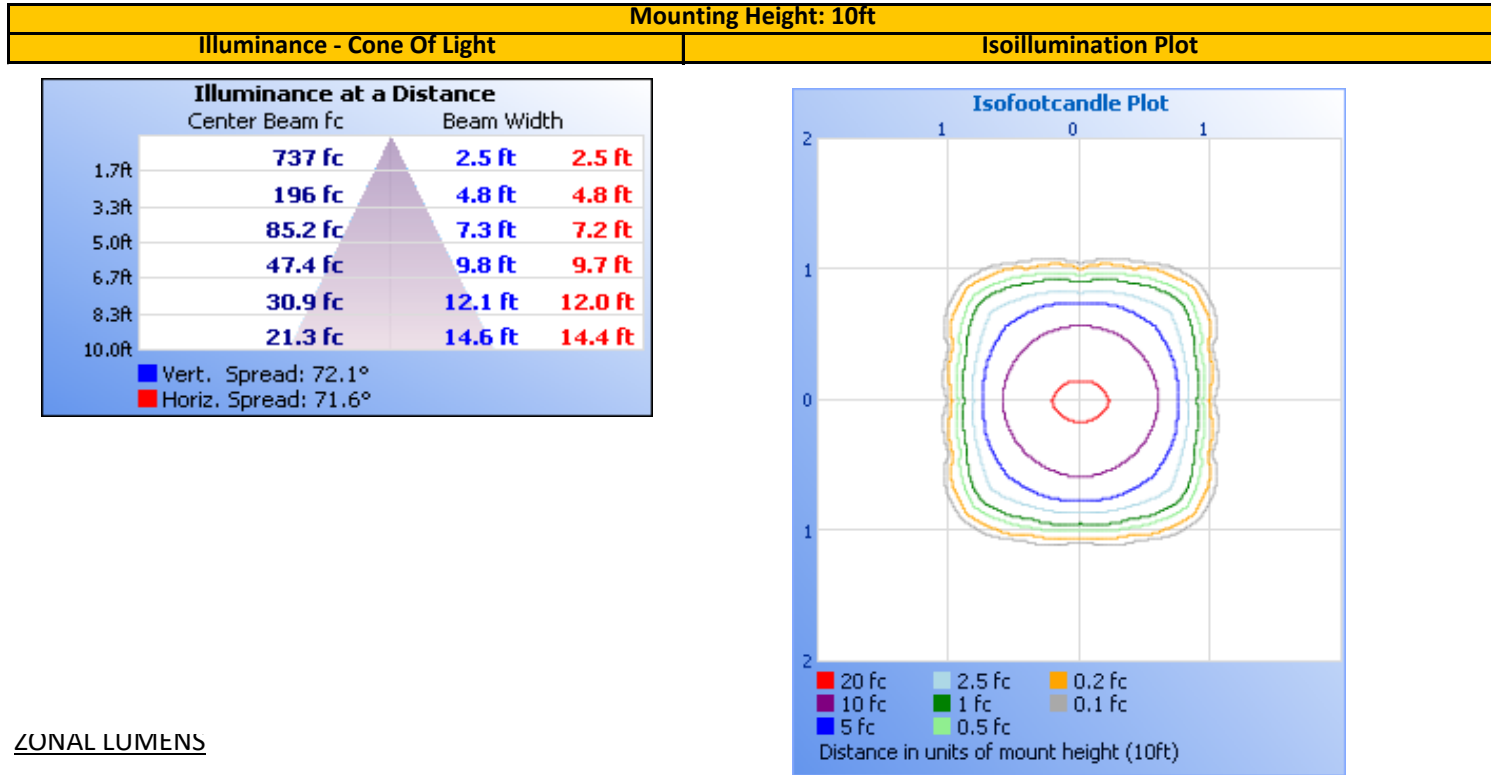
Angle	0	22.5	45	67.5	90
0	2129.0	2129.0	2129.0	2129.0	2129.0
5	2105.1	2108.3	2121.7	2145.3	2185.6
10	2082.2	2075.8	2098.7	2129.1	2166.8
15	2019.7	1996.7	2033.5	2072.3	2110.4
20	1896.7	1897.9	1926.2	1974.2	2017.7
25	1764.6	1732.9	1755.7	1810.1	1862.6
30	1559.3	1522.7	1538.6	1574.3	1624.7
35	1266.9	1254.3	1267.0	1273.5	1221.6
40	628.4	777.8	962.9	654.6	408.6
45	111.3	220.8	546.8	120.5	34.3
50	5.4	15.8	104.7	6.7	2.4
55	1.4	1.4	4.8	1.3	1.3
60	0.9	0.9	0.9	0.8	0.8
65	0.6	0.6	0.6	0.6	0.6
70	0.5	0.5	0.5	0.5	0.5
75	0.3	0.3	0.3	0.3	0.3
80	0.2	0.2	0.2	0.2	0.2
85	0.1	0.1	0.1	0.1	0.1
90	0	0	0	0	0
95	0	0	0	0	0
100	0	0	0	0	0
105	0	0	0	0	0
110	0	0	0	0	0
115	0	0	0	0	0
120	0	0	0	0	0
125	0	0	0	0	0
130	0	0	0	0	0
135	0	0	0	0	0
140	0	0	0	0	0
145	0	0	0	0	0
150	0	0	0	0	0
155	0	0	0	0	0
160	0	0	0	0	0
165	0	0	0	0	0
170	0	0	0	0	0
175	0	0	0	0	0
180	0	0	0	0	0

Entire luminous intensity matrix found in .IES file



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ILLUMINANCE SUMMARY



ZONAL LUMENS

Zonal Lumen Summary					
Zone	Lumens	Luminaire	Zone	Lumens	Total
0-30	1,590.3	61.9%	0-10	202.3	7.9%
0-40	2,342.5	91.2%	10-20	573.8	22.3%
0-60	2,566.4	100.0%	20-30	814.3	31.7%
60-90	1.1	0.0%	30-40	752.2	29.3%
70-100	0.5	0.0%	40-50	217.9	8.5%
90-120	0.0	0.0%	50-60	6.1	0.2%
0-90	2,567.6	100.0%	60-70	0.6	0.0%
90-180	0.0	0.0%	70-80	0.4	0.0%
0-180	2,567.6	100.0%	80-90	0.1	0.0%
			90-100	0.0	0.0%
			100-110	0.0	0.0%
			110-120	0.0	0.0%
			120-130	0.0	0.0%
			130-140	0.0	0.0%
			140-150	0.0	0.0%
			150-160	0.0	0.0%
			160-170	0.0	0.0%
			170-180	0.0	0.0%

INSITU TEMPERATURE MEASUREMENT TESTING

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LED MEASUREMENTS AND RATINGS

Mounting Type	Input Voltage Select One
Ceiling Surface	120 VAC

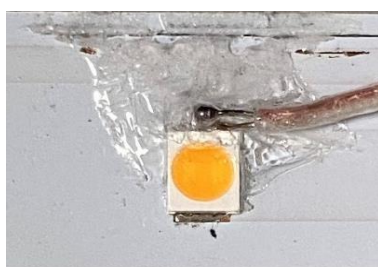
LED Model No.	Lumileds 2835
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Max Junction Temp - Tj (°C)	Max Thermal Resistance - Rth (°C/W)	Max Forward Voltage - Vf (V)
125.0	21.0	3.2

Measured LED Current (mA)	Measured LED Temp - Ts (°C)	Max LED Temp - Ts Max (°C)
234.8	68.0	109.2

Max LED Temp = Max Junction Temp – (LED Wattage x Thermal Resistance)

ISTMT Photo - Ts



ISTMT Photo - Ts Location



LED SOURCE MANUFACTURER'S SUPPORTING DOCUMENTATION

LED Junction Temperature^[1] (DC & Pulse)

115°C for L128-xxxxEA3500001
125°C for L128-xxxxCx35000x1
125°C for L128-xxxxNA35000x1
125°C for L128-xxxxHA35000x1

Table 3. Electrical and thermal characteristics for LUXEON 2835 Architectural at specified test current, T_j=25°C.

PART NUMBER	FORWARD VOLTAGE ^[1] (V _f)			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ^[2] (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	TYPICAL	MAXIMUM		
L128-xxxxEC3500001	8.4	8.9	9.9	-3.0 to -6.0	15
L128-xxxxEC35000B1	8.7	9.3	9.9	-3.0 to -6.0	15
L128-xxxxEB3500001	5.8	6.1	6.6	-2.0 to -4.0	20
L128-xxxxEA3500001	2.7	2.9	3.1	-1.0 to -2.0	39
L128-xxxxCB3500001	5.8	6.0	6.6	-2.0 to -4.0	11
L128-xxxxCA35000x1	2.9	3.0	3.2	-1.0 to -2.0	21
L128-xxxxNA35000x1	2.68	2.75	2.88	-1.0 to -2.0	14
L128-xxxxHA35000B1	2.66	2.71	2.76	-1.0 to -2.0	10

Notes for Table 3:

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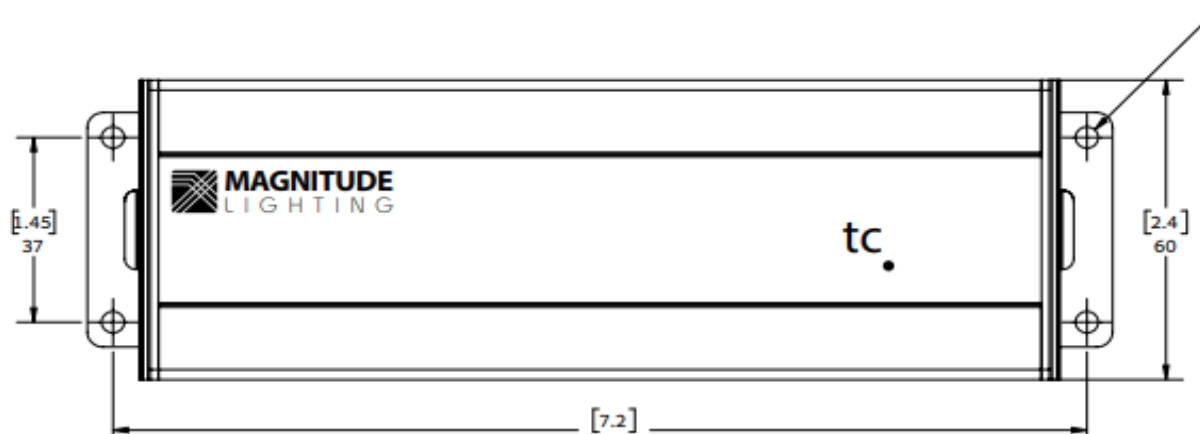
DRIVER MEASUREMENTS AND RATINGS

Measured Case Temp - Td (°C)	Max Case Temp (°C)
42.3	65.0

ISTMT Photo - Td



DRIVER MANUFACTURER'S SUPPORTING DOCUMENTATION



Environmental Specification

Env. Protection Rating	IP65
Operating Ambient temperature	-25°C - +40°C
Max Case Temp. (Tcase)	65°C for a 5 year warranty
Storage temperature	-40°C - +85°C
Expected life time	50K Hours (> 65°C) Tc
Audible Noise	> 24db Class A

LIFETIME PROJECTIONS

LM-80 APPROVED TEST LAB:	SAC-SINGLAS (Cert No: LA-2016-0634-E)
LM-80 REPORT NUMBER:	S662
LM-80 DRIVE CURRENT (mA):	240
LM-80 TEMPERATURE (°C):	85
TM-21 CALCULATED LIFE (hrs):	>36000

FLICKER TESTING - REDUCED FLICKER

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Dimmer Make and Model	Dimming Technology	Minimum Claimed Dim Level (%)
Leviton Illumatech IP710-DL	0-10 Volt DC Controls	0

100% DIM LEVEL - FULL LIGHT OUTPUT WITH DIMMER

Input Voltage Select One	Input Current (mA)	Input Power (W)	Input Power Factor (I)	Input ATHD (%)
199.97	360.3	42.97	0.994	6.20

CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
0.92	0.12	0.07	0.05	0.03	0.02

20% DIM LEVEL

Input Voltage Select One	Input Current (mA)	Input Power (W)	Input Power Factor (I)	Input ATHD (%)
120.04	93.0	9.93	0.890	7.65

CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
100.00	16.00	11.86	8.09	6.80	5.73

MINIMUM CLAIMED DIM LEVEL

Input Voltage Select One	Input Current (mA)	Input Power (W)	Input Power Factor (I)	Input ATHD (%)
120.03	48.5	2.52	0.434	26.10

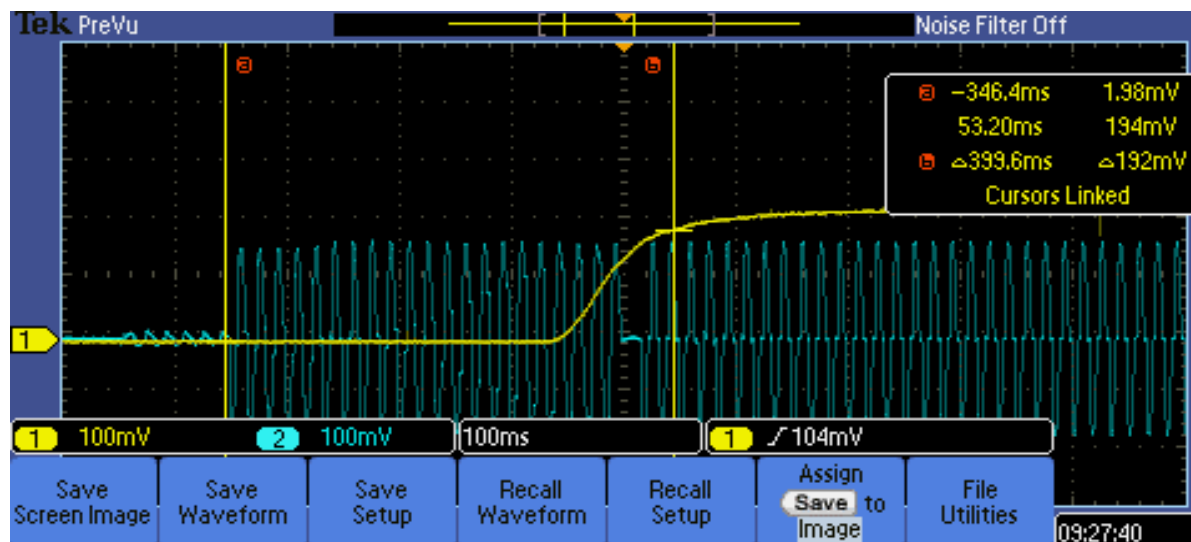
CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
100.00	41.87	30.94	26.58	18.50	14.25

ELECTRICAL PERFORMANCE TESTS

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START TIME

First Light Output - Start Time (ms)
399.6



DIMMING

Dimmer Make and Model	Dimming Technology	Minimum Claimed Dim Level (%)
Leviton Illumatech IP710-DL	0-10 Volt DC Controls	0.0

Max Relative Light Output	Min Relative Light Output	Percent Dimmable (%)
2380.45	0	0.0

EQUIPMENT LIST

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#	Equipment	Model No	Control No.	Last Cal	Cal Due
1	Yokogawa Power Meter	WT310E	CHI0664	3/30/2022	3/30/2023
2	Omega Thermometer	DPI8-C24	146920	10/4/2021	10/4/2022
3	LSI High Speed Mirror Goniometer	6440T	146928	VBU	VBU
4	Newport Thermohygrometer	iServer	CHI0452	2/3/2022	2/3/2023
5	Chroma Power Supply	61604	CHI0371	VBU	VBU
6	Newport Humidity Recorder	iServer	146961	9/21/2021	9/21/2022
7	Labsphere Spectroradiometer	CDS2600	CHI0539	VBU	VBU
8	3 Meter Sphere	SPR600	CHI0088	VBU	VBU
9	Elgar AC Power Supply	CW1251	146112	VBU	VBU
10	Sorenson DC Power Supply	XFR150-8	146846	VBU	VBU
11	Yokogawa Power Meter	WT1600	146767	4/4/2022	4/4/2023
12	Omega thermometer	USB TC08	EQAH002615	4/5/2022	4/5/2023
13	Xitron Power Analyzer	XT-2640	CHI0611	7/6/2022	7/6/2023
14	Yokogawa Power Analyzer	WT210	146761	7/1/2022	7/1/2023
15	Agilent Datalogger	34970A	146441	10/1/2021	10/1/2022
16	Staco Variac	3PN2210B	146360	VBU	VBU
17	Extech Thermohygrometer	SD700	146965	10/14/2021	10/14/2022
18	Tektronix Oscilloscope	DP2012	146917	7/5/2022	7/5/2023
19	UDT TransImpedance Amplifier	TRAMP	CHI0167	VBU	VBU

REVISION HISTORY

#	Revision Date	Updated By	Reviewed By	Description of Change
---	None	---	---	---
---	---	---	---	---
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