

GENERATION BRANDS, LLC TEST REPORT

SCOPE OF WORK

Performance Testing for Luminaires

MODEL NUMBER

700FJBRM*****

PROJECT NUMBER

G104207161

REPORT NUMBER

104207161CRT-008

ISSUE DATE

8/24/2020

REVISED DATE

None

TEST DATES

August 12, 2020 to August 24, 2020

DOCUMENT CONTROL NUMBER

RTTDS-R-AMER-Test-3407

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REPORT NUMBER

104207161CRT-008

REPORT RENDERED TO:

GENERATION BRANDS, LLC
7400 LINDER AVE.
SKOKIE, IL 60077

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-01040731-2.

TEST STANDARDS

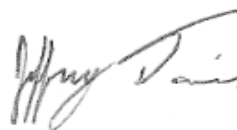
ENERGY STAR[®] Program Requirements for Luminaires Version 2.2
CEC-400-2018-021-CMF Appendix JA8 - Qualification Requirements for High Efficacy Light Sources
CEC-400-2018-021-CMF Appendix JA10 - Test Method for Measuring Flicker of Lighting Systems
IESNA LM-79 - 2008: Electrical and Photometric Measurements 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
ANSI/IEEE C62.41.2-2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power
NEMA 77-2017 : Temporal Light Artifacts: Test Methods and Guidance for Acceptance Criteria

In Charge of Testing:



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SAMPLE INFORMATION

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ITEMS RECEIVED

Item No.	Control No.	Model No.	Description	Type	Received
1	CRT2008071057-001	700FJBRM*****	Brim Head LED Engine	Prototype	8/7/2020

SAMPLE PHOTOS - TESTED CONFIGURATIONS



SUMMARY

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PRODUCT INFORMATION AND SUMMARY OF DATA

Product Model No.:	700FJBRM*****
Product Description:	BRIM HEAD LED ENGINE
LED Model No.:	CITIZEN CLU028-1203c4
Driver Model No.:	L.T.F TA60WA12LED65B15-0000 and DL17W20C36T24-0000
Light Source:	LED
CEC Product Type:	LED Engine
Minimum Claimed Dimming %:	10
Dimmer Make and Model:	Lutron: DVELV-300P
Dimming Technology:	Reverse Phase Cut Controls

Criteria	Results			Compliance
Light Output (lumens)	757.8			Complies
Input Power (W)	10.12			--
Lumen Efficacy (lm/W)	74.9			Complies
Input Power Factor ()	0.919			Complies
Correlated Color Temperature (K)	3035			Complies
Color Rendering Index - Ra ()	93.8			Complies
Color Rendering Index - R9 ()	63.2			Complies
DUV ()	0.0002			--
Chromaticity Coordinate (x)	0.434			--
Chromaticity Coordinate (y)	0.403			--
Chromaticity Coordinate (u')	0.249			--
Chromaticity Coordinate (v')	0.520			--
Max LED Source Temperature (°C)	57.3			Complies
Start Time (ms)	69.2			Complies
Dimming (%)	5.5			Complies
Percent Amplitude Modulation (%)	100% Dim	20% Dim	Min Dim	
Unfiltered	6.1	3.8	5.4	--
1000Hz	0.2	0.4	0.9	--
400Hz	0.1	0.3	0.6	--
200Hz	0.1	0.2	0.3	Complies
90Hz	0.1	0.2	0.2	Complies
40Hz	0.1	0.1	0.2	Complies

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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)	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. Rated Life: The light source shall have a minimum rated lifetime of 15,000 hours.
Dimming, Reduced Flicker Operation and Audible Noise* (JA 8.4.6)	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. 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. 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. Light source shall not emit audible noise above 24dBA measured at 1 meter from the light source when tested at full light output. Light sources shall also be tested and shown to comply with (c) and (d) while at 20% light output.

*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.

TYPE C GONIOPHOTOMETER DISTRIBUTION TESTING

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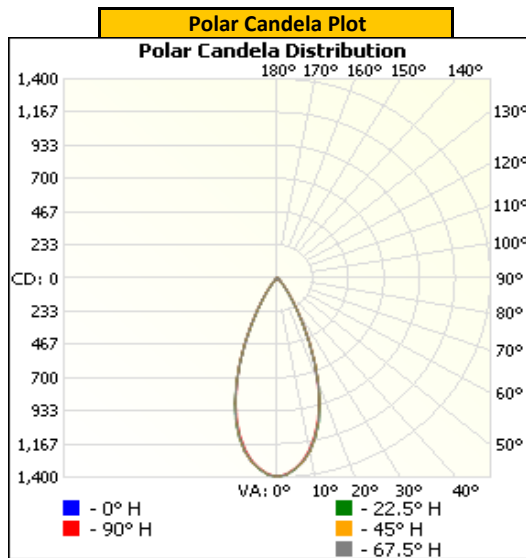
PHOTOMETRIC AND ELECTRICAL MEASUREMENTS (25°C +/- 1°C)

Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (I)
Up	120.03	91.4	10.13	0.924

Light Output (lm)	Lumen Efficacy (lm/W)
753.1	74.4

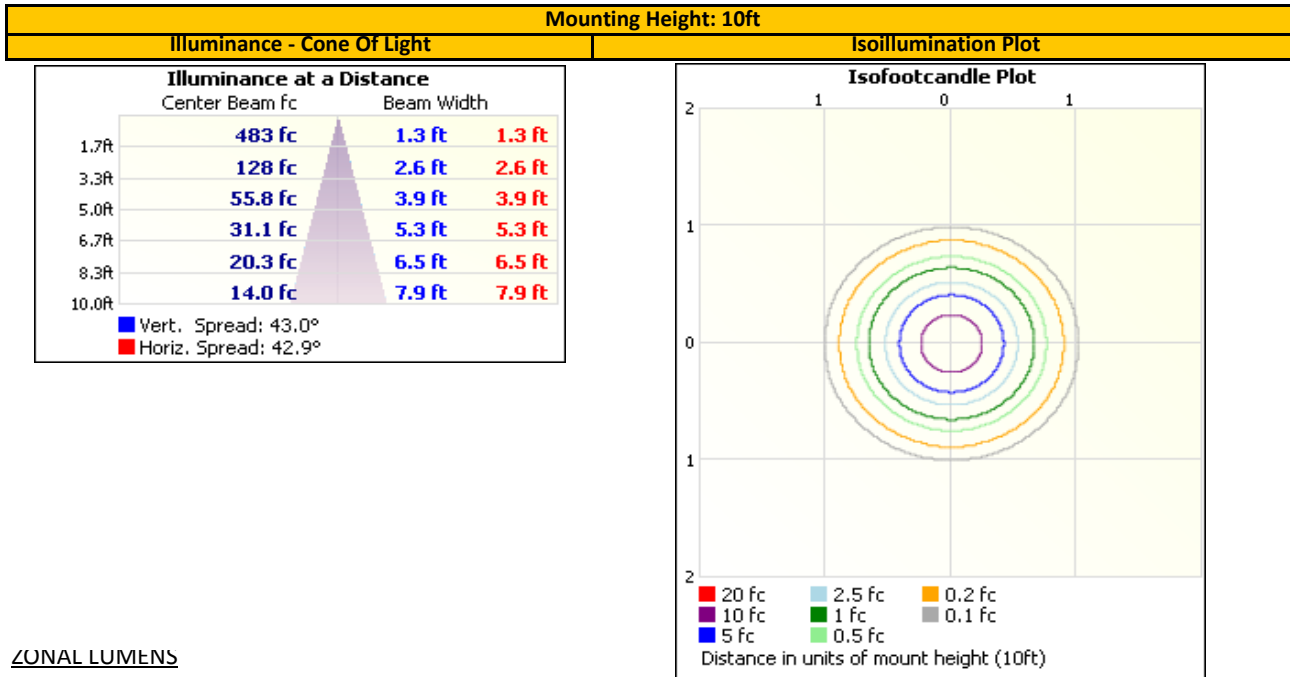
INTENSITY SUMMARY - CANDELA

Angle	0	22.5	45	67.5	90
0	1396	1396	1396	1396	1396
5	1348	1348	1344	1344	1341
10	1235	1235	1235	1232	1221
15	1043	1049	1042	1041	1031
20	783	785	785	783	778
25	494	498	501	500	503
30	258	257	266	275	273
35	122	122	127	133	133
40	58	57	60	63	63
45	28	28	29	30	30
50	14	14	14	14	14
55	6	6	6	6	6
60	2	2	2	2	2
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
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



REPORT NO. 000000000CRT-001AB

ILLUMINANCE SUMMARY



ZONAL LUMENS

Zonal Lumen Summary								
Zone	Lumens	% Lum	Zone	Lumens	% Total	Zone	Lumens	% Total
0-30	636.7	84.6%	0-10	124.8	16.6%	90-100	0.0	0.0%
0-40	722.6	96.0%	10-20	284.3	37.7%	100-110	0.0	0.0%
0-60	752.8	100.0%	20-30	227.7	30.2%	110-120	0.0	0.0%
60-90	0.3	0.0%	30-40	85.8	11.4%	120-130	0.0	0.0%
70-100	0.0	0.0%	40-50	24.2	3.2%	130-140	0.0	0.0%
90-120	0.0	0.0%	50-60	6.0	0.8%	140-150	0.0	0.0%
0-90	753.1	100.0%	60-70	0.3	0.0%	150-160	0.0	0.0%
90-180	0.0	0.0%	70-80	0.0	0.0%	160-170	0.0	0.0%
0-180	753.1	100.0%	80-90	0.0	0.0%	170-180	0.0	0.0%

INTEGRATING SPHERE TESTING

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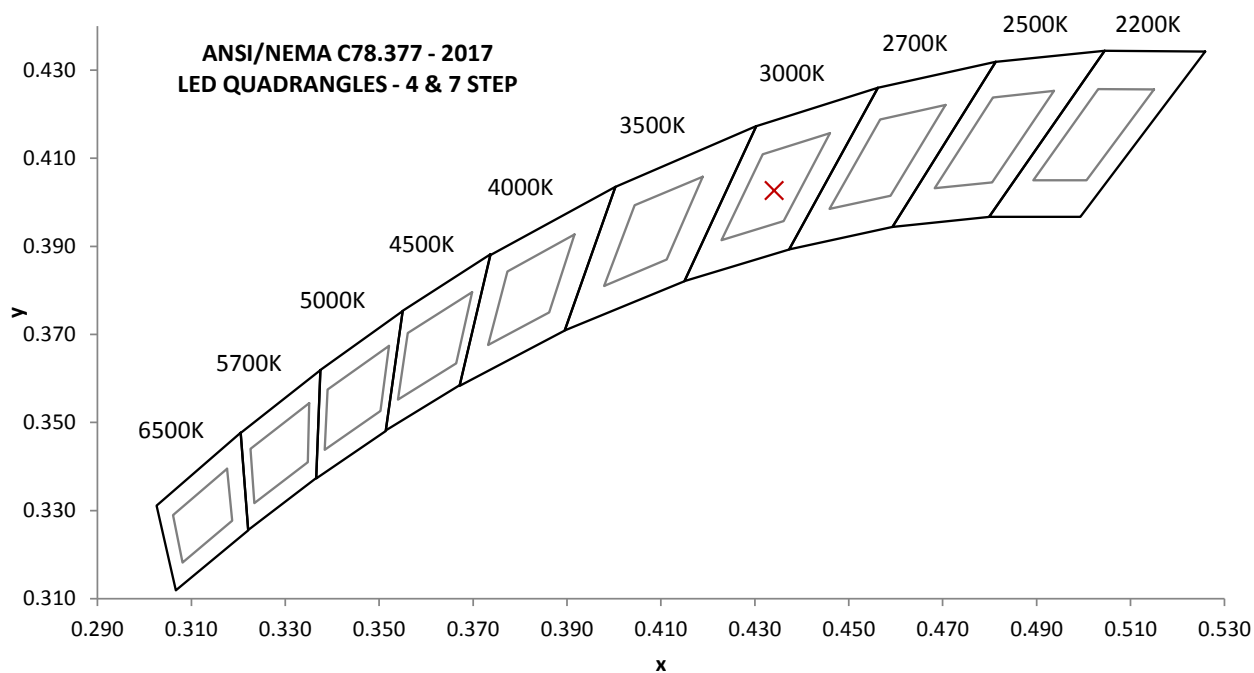
PHOTOMETRIC, COLORIMETRIC, AND ELECTRICAL MEASUREMENTS (25°C +/- 1°C)

Base Orientation
Up

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
120.02	91.8	10.12	0.919	29.1

Light Output (lm)	Lumen Efficacy (lm/W)	CCT (K)	CRI - Ra (l)	CRI - R9 (l)
757.8	74.9	3035	93.8	63.2

DUV (l)	1931 Chrom (x)	1931 Chrom (y)	1976 Chrom (u')	1976 Chrom (v')
0.0002	0.434	0.403	0.249	0.520

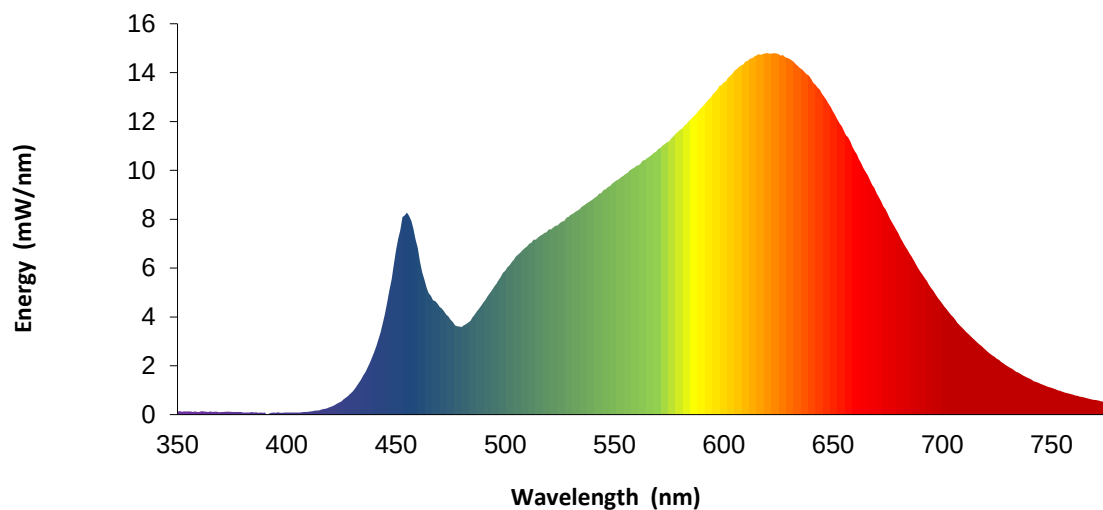


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SPECTRAL DISTRIBUTION OVER WAVELENGTHS

nm	mW/nm		nm	mW/nm		nm	mW/nm		nm	mW/nm
350	0.1		460	6.8		570	10.9		680	7.4
355	0.1		465	5.0		575	11.2		685	6.6
360	0.1		470	4.4		580	11.7		690	5.9
365	0.1		475	3.9		585	12.1		695	5.2
370	0.1		480	3.6		590	12.6		700	4.5
375	0.1		485	4.0		595	13.1		705	4.0
380	0.1		490	4.6		600	13.6		710	3.5
385	0.1		495	5.2		605	14.1		715	3.0
390	0.1		500	5.9		610	14.5		720	2.6
395	0.1		505	6.5		615	14.7		725	2.3
400	0.1		510	6.9		620	14.8		730	2.0
405	0.1		515	7.3		625	14.8		735	1.7
410	0.1		520	7.6		630	14.6		740	1.5
415	0.2		525	7.8		635	14.2		745	1.3
420	0.3		530	8.2		640	13.7		750	1.1
425	0.5		535	8.5		645	13.1		755	0.9
430	0.9		540	8.8		650	12.4		760	0.8
435	1.6		545	9.2		655	11.6		765	0.7
440	2.5		550	9.5		660	10.8		770	0.6
445	4.1		555	9.9		665	9.9		775	0.5
450	6.7		560	10.2		670	9.1		780	0.4
455	8.3		565	10.5		675	8.2		---	---

Without correction of sample absorption.



INSITU TEMPERATURE MEASUREMENT TESTING

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LED MEASUREMENTS AND RATINGS

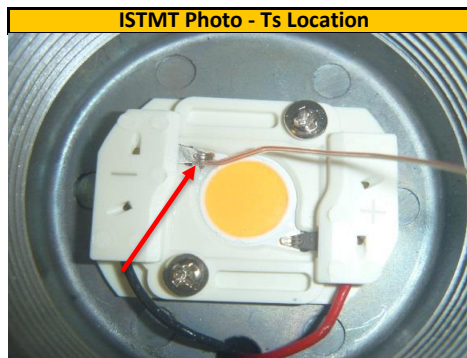
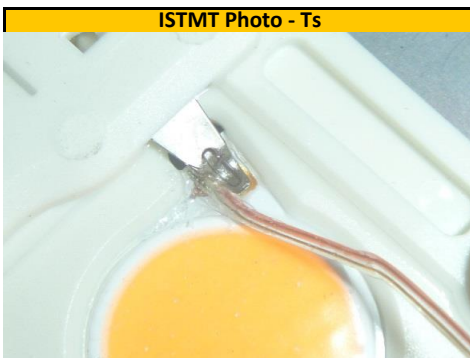
Mounting Type	Input Voltage (Vac)
Ceiling Surface	120.00

LED Model No.	CITIZEN CLU028-1203c4
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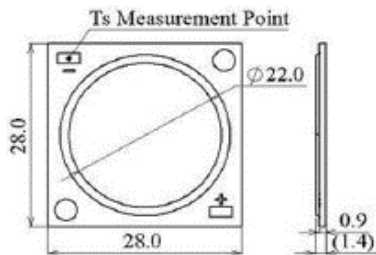
Max Junction Temp - Tj (°C)	Max Thermal Resistance - Rth (°C/W)	Max Forward Voltage - Vf (V)
150.0	1.0	36.8

Measured LED Current (mA)	Measured LED Temp - Ts (°C)	Max LED Temp - Ts Max (°C)
198.0	57.3	142.7

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



LED SOURCE MANUFACTURER'S SUPPORTING DOCUMENTATION



2-2. Absolute Maximum Ratings

Parameter	Symbol	Rating
Input Power (W)	Pi	29.2
Forward Current (mA)	If	690
Reverse Current (mA)	Ir	1
Operating Temperature (°C)	Top	-40 ~ +100
Storage Temperature (°C)	Tst	-40 ~ +100
Case Temperature (°C)	Tc	120
Junction Temperature (°C)	Tj	150

Thermal Resistance Rj-c (°C/W)		
1.0		
Voltage (V)		
Min.	Typ.	Max
31.2	34.0	36.8

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L.T.F. LED DRIVER

Model: TA60WA12LED65B15-0000

Class 2

PRI: 120V AC 0.5A 50/60Hz

SEC: 12V AC 0.80W

SHORT CIRCUIT & OVERLOAD PROTECTED

Compatible with Reverse Phase (ELV) type dimmers

UL US E364143

CE Part 15 Class B

IP65

RoHS COMPLIANT

PRI 120V~ BUKAWAT

SEC 12V~ BUKAWAT

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Powered by LTF

L.T.F. LED DRIVER

Model: TA60WA12LED6B15-0000

Class 2

PRI: 120V AC, 0.5A 50/60Hz

SEC: 12V AC, 0-60W

• Tc

SOFT START SHORT CIRCUIT & OVERLOAD PROTECTED

Dimmable with Reverse Phase (ELV) type dimmers

CE

FC

IP65

RoHS COMPLIANT

PRI: 120V ~ BLACK/WT

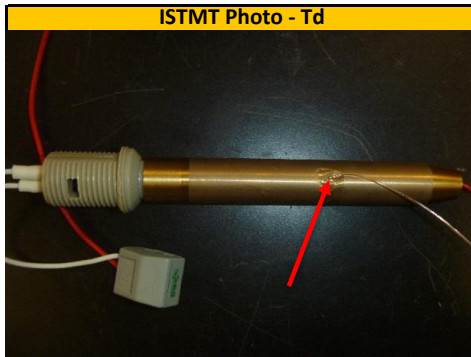
SEC: 12V ~ RED/WT

© 2014 L.T.F. E364143 Part 10 of Class 2

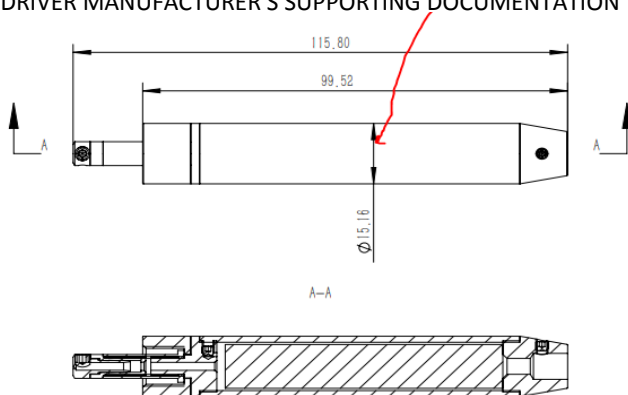
Efficiency	> 85%
Power Factor	> 98%
Case TC	90°C Max.
Protection	Input / Output
Storage	-30°C / +90°C
Humidity	95% RH Max.
IP Rating	IP 65
Class	Class 2 Power Supply
Dimming	ELV, Optional 0-10V

DRIVER MEASUREMENTS AND RATINGS

Measured Case Temp - Td (°C)	Max Case Temp (°C)
51.5	90.0
L.T.F. DL17W20C36T24-0000	



DRIVER MANUFACTURER'S SUPPORTING DOCUMENTATION



TC location diagram and maximum rated temperature provided by LTF Technology.

FLICKER TESTING - REDUCED FLICKER

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Dimmer Make and Model	Dimming Technology	Minimum Claimed Dim Level (%)
Lutron: DVELV-300P	Reverse Phase Cut Controls	10

100% DIM LEVEL - FULL ON WITH DIMMER

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
118.00	96.7	10.39	0.911	31.62

CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
6.06	0.19	0.14	0.10	0.08	0.07

20% DIM LEVEL

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
65.26	58.1	2.44	0.642	118.91

CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
3.80	0.39	0.27	0.22	0.17	0.14

MINIMUM CLAIMED DIM LEVEL

Input Voltage (Vac)	Input Current (mA)	Input Power (W)	Input Power Factor (l)	Input ATHD (%)
56.63	46.9	1.36	0.511	150.17

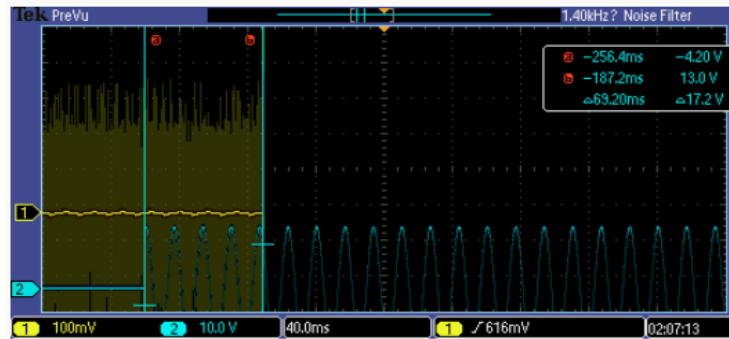
CEC Title 24 JA10 Metrics (% Flicker)					
Unfiltered	1000Hz	400Hz	200Hz	90Hz	40Hz
5.38	0.85	0.58	0.32	0.23	0.20

ELECTRICAL PERFORMANCE TESTS

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START TIME

First Light Output - Start Time (ms)
69.2



DIMMING

Dimmer Make and Model	Dimming Technology	Minimum Claimed Dim Level (%)
Lutron: DVELV-300P	Reverse Phase Cut Controls	10.0

Max Relative Light Output	Min Relative Light Output	Percent Dimmable (%)
255541	14157	5.5

EQUIPMENT LIST

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#	Equipment	Model No	Control No.	Last Cal	Cal Due
1	Elgar AC Power Supply	CW1251	---	VBV	VBV
2	Sorenson DC Power Supply	XFR 150-8	---	VBV	VBV
3	Traceable Hygrothermometer	4800	L202	2/17/2020	2/17/2021
4	Yokogawa Power Analyzer	WT1600	E473	6/22/2020	6/22/2021
5	Fluke Thermometer	53 II	N1324	3/19/2020	3/19/2021
6	Fluke Multimeter	87V	D590	6/15/2020	6/15/2021
7	3M Integrating Sphere Spectrometer System	CDS 1100	---	8/4/2020	9/4/2020
8	Fisher Scientific Stopwatch	14-649-9	N1132	3/18/2020	3/18/2021
9	Secondary Spectral Intensity Standard Source	BS5186	RF5186	11/21/2019	11/21/2020
10	Secondary Luminous Flux Standard Source	BS3616	--	11/21/2019	11/21/2020
11	Secondary Luminous Flux Standard Source	BS4116	--	11/21/2019	11/21/2020
12	Secondary Luminous Flux Standard Source	6836	--	11/21/2019	11/21/2020
13	LSI High Speed Mirror Goniometer	6440	---	7/21/2020	8/21/2020
14	Elgar AC Power Supply	CW1251	---	VBV	VBV
15	Yokogawa Power Analyzer	WT210	E464	5/11/2020	5/11/2021
16	Traceable Hygrothermometer	4800	L203	2/17/2020	2/17/2021
17	M-D Building Products Digital Level	Smart Tool	307-L112	5/14/2020	5/14/2021
18	NIST Luminous Intensity Standard Source	NBS10322	N1427	2/11/2019	2/11/2021
19	NIST Luminous Intensity Standard Source	NBS10332	N1435	2/11/2019	2/11/2021
20	NIST Luminous Intensity Standard Source	NBS10265	N1437	2/11/2019	2/11/2021
21	NIST Luminous Flux Standard Source	NBS10428	N1424	1/3/2019	1/3/2021
22	Sorenson DC Power Supply	XG 150-10	---	VBV	VBV
23	Omega Thermometer	DPI8-C24	M263	2/27/2020	2/27/2021
24	Multi Channel Spectroradiometer	OL 770	O230	7/21/2020	7/21/2021
25	Digital Thermometer	Traceable4800	L204	2/17/2020	2/17/2021
26	Tektronix Oscilloscope	DPO 2012	E480	1/9/2020	1/9/2021
27	UDT flexOptometer	S490	O224	VBV	VBV
28	Fluke Multimeter	87III	307-M145	3/19/2020	3/19/2021
29	Digital Thermometer	Fluke 53II	307-T1316	4/15/2020	4/15/2021
30	Fluke Multimeter	87III	307-M145	3/19/2020	3/19/2021
31	Digital Hygrothermometer	Traceable4800	L207	2/17/2020	2/17/2021
32	2M Integrating Sphere Spectrometer System	CSLMS-LED-7660	2M5	VBV	VBV
33	Tektronix Oscilloscope	DPO 2012	E480	1/9/2020	1/9/2021
34	Yokogawa Power Analyzer	WT1600	E474	6/15/2020	6/15/2021
35	Digital Thermometer	Fluke 53 II	D587	1/23/2020	1/23/2021
36	UDT Signal Amplifier	Tramp	---	VBV	VBV
37	Elgar AC power supply	CW1251	---	VBV	VBV
38	UDT flexOptometer	S490	O217	VBV	VBV
39	Digital Stopwatch	130471471	307-N1132	3/18/2020	3/18/2021

REVISION HISTORY

Note: Standard sources listed above are traceable to NIST: National Institute of Standards and Technology

#	Revision Date	Updated By	Reviewed By	Description of Change
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