



Test Report issued under the responsibility of:



TEST REPORT
IEC 62031
LED modules for general lighting – Safety specifications

Report Number..... : 4787042467-1
Date of issue..... : 2016-01-19
Total number of pages 112 including attachments

Name of Testing Laboratory UL RTP
preparing the Report : 12 Laboratory Drive
Research Triangle Park, NC 27709, USA

Applicant's name : Xicato Inc
Address..... : 101 Daggett Drive,
San Jose, CA 95134-2110, USA

Test specification:
Standard : IEC 62031:2008 (First Edition) + A1:2012 + A2:2014
Test procedure : CB Scheme
Non-standard test method : N/A

Test Report Form No. : IEC62031C
Test Report Form(s) Originator : Intertek Semko AB
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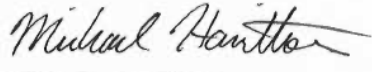

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Test item description..... :		LED Modules	
Trade Mark..... :		XICATO®	
Manufacturer..... :		Same as Applicant	
Model/Type reference..... :		XIMQQXXVVYYCCW See GPI for details	
Ratings..... :		56 V $\overline{\text{---}}$ max, 800 mA max, Tc=90°C	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
<input checked="" type="checkbox"/>	CB Testing Laboratory:	UL RTP	
Testing location/ address:		12 Laboratory Drive Research Triangle Park, NC 27709, USA	
<input type="checkbox"/>	Associated CB Testing Laboratory:		
Testing location/ address:			
Tested by (name, function, signature)..... :		Michael Hamilton Project Engineer	
Approved by (name, function, signature)... :		Teddy Sandiford Staff Engineer	
<input type="checkbox"/>	Testing procedure: TMP/CTF Stage 1:		
Testing location/ address..... :			
Tested by (name, function, signature)..... :			
Approved by (name, function, signature)... :			
<input type="checkbox"/>	Testing procedure: WMT/CTF Stage 2:		
Testing location/ address..... :			
Tested by (name + signature)..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature)... :			
<input type="checkbox"/>	Testing procedure: SMT/CTF Stage 3 or 4:		
Testing location/ address..... :			
Tested by (name, function, signature)..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature)... :			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment):

Section	Attachment	Pages
Test Results	--	24
Creepage and Clearances	1	3
IEC/EN 62778 Photobiological Safety Assessment	2	1
IEC/EN 60838-2-2: Requirements for Connectors/holders for LED-Modules	3	14
IEC/EN 61347-2-13: Requirements for D.C. or A.C. Supplied Electronic Controlgear for LED Modules	4	18
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Schematic and PCB Trace Layout	6	15
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Specification Sheet	9	25

Summary of testing:

Tests performed (name of test and test clause):		Verdict	Testing location: UL - RTP 12 Laboratory Drive, Research Triangle Park, NC 27709, USA
Marking	7	P	
Terminals	8	P	
Provision for Protective Earthing	9	N/A	
Protection Against Accidental Contact with Live Parts	10	P	
Moisture Resistance and Insulation	11	P	
Electric Strength	12	P	
Fault Conditions	13	P	
Conformity Testing During Manufacturer	14	N/A	
Construction	15	P	
Creepage and Clearance	16	P	
Screws, Current Carrying Parts and Connections	17	P	
Resistance to Heat, Fire, and Tracking	18	P	
Resistance to Corrosion	19	N/A	
Heat Management	21	N/A	
Photobiological Safety	22	P	
Annexes	A	P	
Annexes	B-C-D	N/A	

The results of the above tests were Favourable

The measurement uncertainties stated in this Test Report have been made in accordance with our procedure for Estimating Uncertainty of Measurement, 00-LC-S0278

If requested, UL LLC will be able to estimate the uncertainty contribution for all the quantities stated in this Test Report

Summary of compliance with National Differences:

List of countries addressed

No National differences, Common Differences, Group Differences are declared on current CB bulletin.

The product fulfils the requirements of IEC 62031:2008 (First Edition) + A1:2012 + A2:2014

This test report also covers testing according to EN 62031:2008 + A1:2013 + A2:2015

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



The following is located on the package



Test item particulars	:
Classification of installation and use	Built-in LED Module
Supply Connection	Connector
.....	:
Possible test case verdicts:	

<p>- test case does not apply to the test object..... : N/A</p> <p>- test object does meet the requirement : P (Pass)</p> <p>- test object does not meet the requirement..... : F (Fail)</p>	
<p>Testing</p> <p>Date of receipt of test item : 2015-09-17, 2015-10-23, 2015-12-11</p> <p>Date (s) of performance of tests..... : 2015-11-02 through 2015-12-30</p>	
<p>General remarks:</p> <p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p> <p>Clause numbers between brackets refer to clauses in IEC 61347-1</p>	
<p>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:</p>	
<p>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided</p>	<p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> Not applicable</p>
<p>When differences exist; they shall be identified in the General product information section.</p>	
<p>Name and address of factory (ies)..... : Xicato Inc 101 Daggett Drive San Jose, CA 95134-2110, USA</p>	
<p>General product information:</p> <p>The unit is a Built-In LED Module for use in luminaires and evaluated for connection to a LED controlgear providing maximum 56 V^{AC} Constant Voltage .The module consists of single chip on board (COB) LED Array and integral LED driver and controller within a polymeric housing/holder. The controller is provided with a connector for connection in the end product and may be optionally dimmable. On models with 0-10V dimming, the 0-10V analog current source provides output from controller PCB. On models with DALI dimming, the dimming is an isolated input. The unit may also be provided with an optional Bluetooth module for wireless connectivity.</p> <p>The LED module shall be isolated from the metal housing of the end product when powered by a non-isolated or basic insulated driver output.</p> <p>The unit was evaluated with the units mounted on a ribbed heatsink measuring 10 cm diameter, 5 cm high connector to a DC source limited to 1.5A.</p> <p>The LED Module has also been evaluated to check the photobiological effects in accordance with the standard IEC/EN 62778 and have been assigned Risk Group 1 (RG1)</p> <p>MODEL NOMENCLATURE:</p> <p>XIM Series – model XIMQQXXVYYCCW where: QQ - any alpha-numeric code or blank for identifying LES (Light Emitting Surface) area XX - any alpha-numeric code or blank for identifying Color Rendering</p>	

VV - any alpha-numeric code for the Color Temperature
YY - any alpha-numeric code for identifying Flux
CC - any alpha-numeric code to identify dimming type or feature option (when provided)
W - any alpha-numeric code for Revision history

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
4	GENERAL REQUIREMENTS		-
4.4	Integral modules tested assembled in the luminaire	Evaluated as built-in	N/A
4.5	Independent modules complies with requirements in IEC 60598-1		N/A
5	GENERAL TEST REQUIREMENTS		-
5.5	SELV-operated LED modules comply with Annex I of IEC 61347-2-13	(see Annex 1)	N/A
	General conditions for tests in Annex A	(see Annex A)	P
6	CLASSIFICATION		-
	Built-in module	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	—
	Independent module.....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Integral module	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	For Integral module; Note to 1.2.1 in IEC 60598-1 applies.		—
7	MARKING		--
7.1	Mandatory markings for built-in or independent modules		-
	a) mark of origin	Xicato moulded in plastic case	P
	b) model number, type reference	XIM Series	P
	c1) constant voltage module; rated supply voltage and supply frequency	56 V $\overline{\text{---}}$ MAX	P
	c2) constant current module; rated supply current and supply frequency		N/A
	d) nominal power	see Attachment 9	P
	e) indication of connections, wiring diagram	mating connector used	N/A
	f) value of t_c and place on the module	$t_c=90^\circ\text{C}$ and location moulded in plastic case	P
	g) E_{thr} if required		N/A
	h) symbol for built-in modules	On packaging	P
	i) heat transfer temperature t_d		N/A
	j) power for heat-conduction P_d		N/A
	k) working voltage for insulation	48 V $\overline{\text{---}}$ in spec sheet, see Attachment 9	P
7.2	Location of marking		--
	- marking of a), b), c) and f) on the modules		P

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	- marking of d), e), g), h), i) and j) on the modules or data sheet		P
	- marking of k) in manufactures literature		P
	- integral modules a) to g) in literature		N/A
7.3	Durable and legibility of marking		-
	- marking of a), b), c) and f) legible after test with water		P
	- marking of d) to j) inspection of compliance		P
8	TERMINALS		-
	Screw terminals according section 14 of IEC 60598-1:		-
	Separately approved; component list		N/A
	Part of the luminaire		N/A
	Screwless terminals according section 15 of IEC 60598-1:		-
	Separately approved; component list		N/A
	Part of the luminaire	See Annex 4	P
	Connectors according IEC 60838-2-2:		-
	Separately approved; component list	Integral LED connector/holder, see Attachment 1	P
9 (9)	PROVISION FOR PROTECTIVE EARTHING		-
- (9.1)	Provisions for protective earthing		-
	Terminal complying with clause 8		N/A
	Locked against loosening and not possible to loosen by hand		N/A
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	Earthing via means of fixing		N/A
	Earthing terminal only used for the earthing of the control gear		N/A
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material		N/A
	Contact surface bare metal		N/A
- (9.2)	Provision for functional earthing		-
	Comply with clause 8 and 9.1		N/A
- (9.3)	Earth contact via the track on the printed board		-

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Test with a current of 25 A between earthing terminal and each of the accessible metal parts; measured resistance (Ω) at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
- (9.4)	Earthing of built-in lamp controlgear		-
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		N/A
	Earthing terminal only for earthing the built-in controlgear		N/A
- (9.5)	Earthing via independent controlgear		-
- (9.5.1)	Earth connection to other equipment		-
	Looping or through connection, conductor min. 1,5 mm ² and of copper or equivalent		N/A
	Protective earthing wires in line with 5.3.1.1 and clause 7		N/A
- (9.5.2)	Earthing of the lamp compartments powered via the independent lamp controlgear		-
	Test with a current of 25 A between input and output earth terminals; measured resistance (Ω) between earthing terminal and each of the accessible metal parts at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A
10 (10)	PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS		-
- (10.1)	Controlgear protected against accidental contact with live parts	Built-in LED module	N/A
- (A2)	The current flowing between the part concerned and earth is measured and does not exceed 0,7 mA (peak) or 2 mA d.c.		N/A
- (A2)	For frequencies above 1 kHz, the current does not exceed 0,7 mA (peak) multiplied by the value of the frequency in kilohertz or 70 mA (peak)		N/A
- (A3)	The voltage between the part concerned and any accessible part is measured and does not exceed 34 V (peak).....		N/A
- (10.1)	Lacquer or enamel not used for protection or insulation		N/A
	Adequate mechanical strength on parts providing protection		N/A
- (10.2)	Capacitors $> 0,5 \mu\text{F}$: voltage after 1 min (V): < 50 V		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
- (10.3)	Controlgear providing SELV		-
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear		N/A
	No connection between output circuit and the body or protective earthing circuit		N/A
	No possibility of connection between output circuit and the body or protective earthing circuit through other conductive parts		N/A
	SELV outputs separated by at least basic insulation		N/A
	ELV conductive parts insulated as live parts		N/A
	Tests according Annex L of IEC 61347-1		N/A
- (10.4)	Accessible conductive parts in SELV circuits		-
	Output voltage under load ≤ 25 V r.m.s. or ≤ 60 V d.c.		N/A
	If output voltage > 25 V r.m.s. or > 60 V d.c.; No load output ≤ 35 V peak or ≤ 60 V d.c and touch current does not exceed 0,7 mA (peak) or 2 mA d.c. :		N/A
	One conductive part is insulated if output voltage or current exceeding the values above and withstand test voltage 500 V		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A
11 (11)	MOISTURE RESISTANCE AND INSULATION		-
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V (M Ω):		P
	For basic insulation ≥ 2 M Ω :	> 10 M Ω between input and accessible metal, and between input and DALI dimming input	P
	For double or reinforced insulation ≥ 4 M Ω :		N/A
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
12 (12)	ELECTRIC STRENGTH		-
	Immediately after clause 11 electric strength test for 1 min		P
	Basic insulation for SELV, test voltage 500 V		N/A
	Working voltage ≤ 50 V, test voltage 500 V	Between input and accessible metal Between input and Control (DALI) input	P
	Working voltage > 50 V ≤ 1000 V, test voltage (V):		-
	Basic insulation, $2U + 1000$ V		N/A
	Supplementary insulation, $2U + 1000$ V		N/A
	Double or reinforced insulation, $4U + 2000$ V		N/A
	No flashover or breakdown		
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		N/A
13 (14)	FAULT CONDITIONS		-
- (14)	When operated under fault conditions the controlgear:		-
	- does not emit flames or molten material		P
	- does not produce flammable gases		P
	- protection against accidental contact not impaired		N/A
	Thermally protected controlgear does not exceed the marked temperature value		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	See appended table	P
- (14.1)	Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (except between live parts and accessible metal parts)	See appended table	P
	Creepage distances on printed boards less than specified in clause 16 in Part 1 provided with coating according to IEC 60664-3		N/A
- (14.2)	Short-circuit or interruption of semiconductor devices	See appended table	P
- (14.3)	Short-circuit across insulation consisting of lacquer, enamel or textile		N/A
- (14.4)	Short-circuit across electrolytic capacitors		N/A
- (14.5)	After the tests has been carried out on three samples:		-
	The insulation resistance ≥ 1 M Ω	>10M Ω	P

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	No flammable gases		P
	No accessible parts have become live		P
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		P
- (14.6)	Relevant fault condition tests with high-power supply	DC Input limited with 1.5A fuse	N/A
13.2	Overpower condition		-
	Module withstands overpower condition >15 min.	78 V $\sqrt{3}$, 48 W, Tc=54.4°C @ 40°C ambient	P
	Module with automatic protective device or power limiter, test performed 15 min. at limit.		P
	No fire, smoke or flammable gas is produced		P
	Molten material does not ignite tissue paper, spread below the module		P
15	CONSTRUCTION		-
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
16 (16)	CREEPAGE DISTANCES AND CLEARANCES		-
- (16)	Creepage and distances and clearances in compliance with IEC 61347-1	See Attachment 1	P
	Insulating lining of metallic enclosures		N/A
	Basic insulation on printed boards tested according to clause 14		N/A
	Distances subjected to both sinusoidal voltage as non-sinusoidal pulses not less than value in Table 16		N/A
	Creepage distances not less than minimum clearance		P
16 (-)	Conductive accessible parts in compliance with applicable parts of IEC 60598-1	See Attachment 1	P
17 (17)	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		-
	Cl. 17 refer to Cl. 17 of IEC 61347-1 which refer to Cl. 4.11 and 4.12 of IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		—
(4.11)	Electrical connections		-
(4.11.1)	Contact pressure		P
(4.11.2)	Screws:		-
	- self-tapping screws	Cover secured using machine screws into metal base	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:		-
	- spring washer	Built-in module	N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood or mounting surface		P
(4.11.6)	Electro-mechanical contact systems		N/A
(4.12)	Mechanical connections and glands		-
(4.12.1)	Screws not made of soft metal		P
	Screws of insulating material		N/A
	Torque test: torque (Nm); part.....:	Module cover screw, Ø1.9 mm Required torque 0.40 Nm.	P
	Torque test: torque (Nm); part.....:		N/A
	Torque test: torque (Nm); part.....:		N/A
(4.12.2)	Screws with diameter < 3 mm screwed into metal		P
(4.12.4)	Locked connections:		-
	- fixed arms; torque (Nm)		N/A
	- lampholder; torque (Nm)		N/A
	- push-button switches; torque 0,8 Nm		N/A
(4.12.5)	Screwed glands; force (Nm).....:		N/A
18 (18)	RESISTANCE TO HEAT, FIRE AND TRACKING		-
- (18.1)	Ball-pressure test	See Test Table 18 (18.1)	P
- (18.3)	Glow-wire test (650°C)	See Test Table 18 (18.3)	P
- (18.4)	Needle-flame test (10 s)	See Test Table 18 (18.4)	P
- (18.5)	Proof tracking test	See Test Table 18 (18.5)	N/A
19 (19)	RESISTANCE TO CORROSION		-
	- test according 4.18.1 of IEC 60598-1		N/A
	- adequate varnish on the outer surface		N/A
20	INFORMATION FOR LUMINAIRE DESIGN		-
	Information in Annex D (informative)		—
21	HEAT MANAGEMENT		-
21.1	General		-

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Clause	Requirement + Test	Result - Remark	Verdict
	Exchangeability is safeguarded by cap or base		N/A
21.2	Heat-conducting foil and paste		-
	Heat-conducting foil delivered with the module if necessary		N/A

22	PHOTOBIOLOGICAL SAFETY		-
22.1	UV radiation		-
	Luminous radiation not exceed 2mW/klm		N/A
22.2	Blue light hazard		-
	Assessed according to IEC TR 62778	See Attachment 2	P
22.3	Infrared radiation		-
	Requirements for infrared radiation when required		N/A

A	ANNEX A - TESTS		-
	All tests performed in accordance with the advice given in Annex H of IEC 61347-1, if applicable		P

13 (14)	TABLE: tests of fault conditions		
Part	Simulated fault		Hazard
U2	Pin 2-10, S/C - Sample shut down, Tc=52.3°C		NO
U3	Pin 1-5, S/C – LED dimmed, Tc=50.5°C		NO
U2*	Pin 1-2, S/C - LED dimmed, Tc=65.0°C		NO
U4*	Pin 7-8, S/C - Sample shut down, Tc=42.0°C		NO

*Trace spacing fault

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Clause	Requirement + Test	Result - Remark	Verdict

16 (16)	TABLES: Creepage distances and clearances						N/A
Table 3	Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages						-
RMS working voltage (V) not exceeding	50	150	250	500	750	1000	
Creepage distances							
Required basic insulation, PTI \geq 600	0,6	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required basic insulation, PTI < 600	1,2	1,6	2,5	5	8	10	
Measured: See Clause 16 and Attachment 1	-	-	-	-	-	-	
Required supplementary insulation PTI \geq 600	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required supplementary insulation PTI < 600	-	1,6	2,5	5	8	10	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	3,2	5	6	8	11	
Measured	-	-	-	-	-	-	
Clearances							
Required basic insulation	0,2	0,8	1,5	3	4	5,5	
Measured: See Clause 16 and Attachment 1	-	-	-	-	-	-	
Required supplementary insulation	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	1,6	3	6	8	11	
Measured	-	-	-	-	-	-	
Table 4	Minimum distances (mm) for non-sinusoidal pulse voltages						
Rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
Required clearances	1,0	1,5	2	3	4	5,5	8
Measured							
Rated pulse voltage (peak kV)	10	12	15	20	25	30	40
Required clearances	11	14	18	25	33	40	60
Measured							
Rated pulse voltage (peak kV)	50	60	80	100	-	-	-
Required clearances	75	90	130	170	-	-	-
Measured							

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

18 (18.1)	TABLE: Ball Pressure Test of Thermoplastics			P
Allowed impression diameter (mm)		2 mm		—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Holder/Cover, Type 3030	Chang Chun plastic	125	1.8	
Connector (J1) Type 6T Nylon 30% GF	Tyco Electronics	125	0.6	
Contact Material Type UWT 1779	Unicolour Polymer Technology,	125	1.0	
Supplementary information:				

18 (18.3)	TABLE: Glow-wire test				-
Glow wire temperature		650°C			—
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Holder/Case, Type 3030	Chang Chun Plastic	0	NO	0	P
Contact Material Type UWT 1779	Unicolour Polymer Technology,	0	NO	0	P
Any flame or glowing of the sample extinguished within 30 s of withdrawing the glow-wire, and any burning or molten drop did not ignite the underlying parts (Yes/No)					P
Supplementary information:					

18 (18.4)	TABLE: Needle-flame test				-
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Connector (J1) Type 6T Nylon 30% GF	Tyco Electronics	10	NO	0	P
Contact Material Type UWT 1779	Unicolour Polymer Technology,	10	NO	0	P
Holder/Case, Type 3030	Chang Chun Plastic	10	NO	0	P
Supplementary information:					

IEC 62031					
Clause	Requirement + Test	Result - Remark			Verdict
18 (18.5)	TABLE: Proof tracking test				-
Test voltage PTI		175 V			—
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Contact Material Type UWT 1779	Unicolour Polymer Technology,	Y	Y	Y	P
Supplementary information:					

ANNEX 1	SELV-operated LED modules	N/A
	Cl. 5.5 refer to ANNEX I of IEC 61347-2-13 which refer to ANNEX L of IEC 61347-1 (clause numbers between parentheses refer to ANNEX L of IEC 61347-1)	—
(L.3)	Classification	N/A
	Class I	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Class II	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Class III	Yes <input type="checkbox"/> No <input type="checkbox"/>
	non-inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>
	inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>
	fail safe controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>
	non-short-circuit proof controlgear	Yes <input type="checkbox"/> No <input type="checkbox"/>
(L.4)	Marking	-
	Adequate symbols are used	N/A
(L.5)	Protection against electric shock	-
	Comply with 9.2 of IEC 61558-1	N/A
(L.6)	Heating	-
	No excessive temperatures in normal use	N/A
	Value if capacitor tc marked	—
	Winding insulation classified as Class	—
	Comply with tests of clause 14 of IEC 61558-1 with adjustments	N/A
(L.7)	Short-circuit and overload protection	-
	Comply with tests of clause 15 of IEC 61558-1 with adjustments	N/A
(L.8)	Insulation resistance and electric strength	-
(L.8.1)	Conditioned 48 h between 91 % and 95 %	N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
(L.8.2)	Insulation resistance		-
	Between input- and output circuits not less than 5 M Ω		N/A
	Between metal parts of class II convertors which are separated from live parts by basic insulation only and the body not less than 5 M Ω		N/A
	Between metal foil in contact with the inner and outer surfaces of enclosures of insulating material not less than 2 M Ω		N/A
(L.8.3)	Electric strength		-
	1) Between live parts of input circuits and live parts of output circuits		N/A
	2) Over basic or supplementary insulation between:		-
	a) live parts having different polarity		N/A
	b) live parts and body if intended to be connected to protective earth		N/A
	c) accessible metal parts and a metal rod of the same diameter as the flexible cable or cord		N/A
	d) live parts and an intermediate metal part		N/A
	e) intermediate metal parts and the body		N/A
	f) each input circuit and all other input circuits		N/A
	3) Over reinforced insulation between the body and live parts		N/A
(L.9)	Construction		-
(L.9.1)	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6		N/A
	HF transformer comply with 19 of IEC 61558-2-16		N/A
(L.10)	Components		-
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
(L.11)	Creepage distances and clearances		-
	1. Insulation between input and output circuits, basic insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	2. Insulation between input and output circuits, double or reinforced insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	c) measured values \geq specified values (mm)		N/A
	3. Insulation between adjacent <u>output</u> circuits		-
	- measured values \geq specified values (mm)		N/A
	4. Insulation between terminals for external connection:		-
	- measured values \geq specified values (mm)		N/A
	5. Basic or supplementary insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	d) measured values \geq specified values (mm)		N/A
	e) measured values \geq specified values (mm)		N/A
	6. Reinforced insulation or insulation:		-
	Between body and output circuit: measured values \geq specified values (mm)		N/A
	Between body and output circuit if provision against transient voltages: measured values \geq specified values (mm)		N/A
	7. Distance through insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 2 TABLE: Critical components information						
Object / part No.	Code	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Description:						
LED COB	B	Xicato	XCAQQXXVV YYCCW	50V $\overline{=}$, 1.5A, $t_c=90^{\circ}\text{C}$	IEC/EN 62031	UL Demko (DK-44596-UL)
Gap Pad	A	eMEI Group	E-Fill 8500	200°C, V-0	IEC/EN 62031 UL94	Tested with the appliance and UL (E310786)
Integral LED Controlgear PCB:						
Printed Circuit Board	A	Dynamic Electronic Co LTD	KM1-V0	FR4, 130°C, V-0, 1.0 mm thick,	IEC/EN 61347-2-13 UL 796	Tested with the appliance and UL (E255400)
Input Connector (J1)	A	Tyco Electronics	Mini CT 1.5 mm Series	Nylon, 1x6, 56 V, 105°C	IEC/EN 61347-2-13 UL1977	Tested with the appliance and UL certified (E28476)
Regulator (U2)	A	MPS	MP4569GQ	300 mA buck converter	IEC/EN 61347-2-13	Tested with the appliance
LED Driver (U4)	A	MPS	MP2489DN	60 V, 125°C	IEC/EN 61347-2-13	Tested with the appliance
Microcontroller (U6)	A	STMicro	STM8L151G6 U3	3.3 V, 125°C	IEC/EN 61347-2-13	Tested with the appliance
Inductor (L1)	A	Vishay	IHLP4040DZE R101M11	100uH, 2.25 A, 125°C	IEC/EN 61347-2-13	Tested with the appliance
Optical Isolator (ISO1, ISO2) – only used on DALI models	B	Fairchild	FODM8801B	125°C, 20 mA, 2750 Vrms	IEC/EN 60747-5-5	VDE (136480)
Integral Spring Contact LED Holder:						
Holder/Cover Material	C	Chang Chun Plastics Co LTD	48.7	PBT, 110°C. Overall 47mm OD, min 1.2 mm thick	IEC/EN 60838-2-2 UL94	Tested with the appliance and also UL certified (E59481)
Contact Holder Material	C	Unicolour Polymer Technology	UWT1779	FR-PBT, 110 °C, 1.0 mm thick	IEC/EN 60838-2-2	Tested with the appliance

IEC 62031						
Clause	Requirement + Test			Result - Remark		Verdict
Contacts	C	Xicato	C5191	Copper alloy nickel plating 80u" minimum with gold plating 5u" minimum, 0.2 mm thick	IEC/EN 60838-2-2	Tested with the appliance

Supplementary information:

¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

- A - The component is replaceable with another one, also certified, with equivalent characteristics
- B - The component is replaceable if authorised by the test house
- C - Integrated component tested together with the appliance
- D - Alternative component

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 3	Screw terminals (part of the luminaire)		N/A
(14)	SCREW TERMINALS		-
(14.2)	Type of terminal..... :		—
	Rated current (A)..... :		—
(14.3.2.1)	One or more conductors		N/A
(14.3.2.2)	Special preparation		N/A
(14.3.2.3)	Terminal size		N/A
	Cross-sectional area (mm ²)..... :		—
(14.3.3)	Conductor space (mm)..... :		N/A
(14.4)	Mechanical tests		-
(14.4.1)	Minimum distance		N/A
(14.4.2)	Cannot slip out		N/A
(14.4.3)	Special preparation		N/A
(14.4.4)	Nominal diameter of thread (metric ISO thread) :		N/A
	External wiring		N/A
	No soft metal		N/A
(14.4.5)	Corrosion		N/A
(14.4.6)	Nominal diameter of thread (mm) :		N/A
	Torque (Nm) :		N/A
(14.4.7)	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N) :		N/A
(14.4.8)	Without undue damage		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX 4	Screwless terminals (part of the luminaire)		-
(15)	SCREWLESS TERMINALS		-
(15.2)	Type of terminal..... :	Surface mount mating pin and socket connector, Tyco Electronics Mini CT 1.5 mm Series	—
	Rated current (A)..... :	6A	—
(15.3.1)	Material	Nylon	P
(15.3.2)	Clamping		N/A
(15.3.3)	Stop		N/A
(15.3.4)	Unprepared conductors		N/A
(15.3.5)	Pressure on insulating material		P
(15.3.6)	Clear connection method		N/A
(15.3.7)	Clamping independently		N/A
(15.3.8)	Fixed in position		N/A
(15.3.10)	Conductor size		N/A
	Type of conductor		N/A
(15.5.1)	Terminals internal wiring		-
(15.5.1.1)	Pull test spring-type terminals (4 N, 4 samples)		N/A
(15.5.1.2)	Pull test pin or tab terminals (4 N, 4 samples)		N/A
	Insertion force not exceeding 50 N		N/A
(15.5.1.2)	Permanent connections: pull-off test (20 N)		N/A
(15.5.2)	Electrical tests		-
	Voltage drop (mV) after 1 h (4 samples)..... :		P
	Voltage drop of two inseparable joints		P
	Number of cycles:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples)..... :		P
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples)..... :		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples)		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples)		N/A
(15.6)	Terminals external wiring		N/A

IEC 62031			
Clause	Requirement + Test	Result - Remark	Verdict
	Terminal size and rating		N/A
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N)		N/A
	Pull test pin or tab terminals (4 samples); pull (N)		N/A

(15.6.3.1)	TABLE: Contact resistance test										P
	Voltage drop (mV) after 1 h										—
terminal	1	2	3	4	5	6	7	8	9	10	
Initial voltage drop (mV)	11.5	0.52	0.43	11.8	-	-	-	-	-	-	
	Voltage drop of two inseparable joints					22.5mV limit					P
	Voltage drop after 10th alt. 25th cycle										P
	Max. allowed voltage drop (mV)					45mV					—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV) 10th cycle	11.8	0.45	1.3	11.0	-	-	-	-	-	-	
voltage drop (mV) 25th cycle	11.5	0.45	0.43	10.8	-	-	-	-	-	-	
	Voltage drop after 50th alt. 100th cycle										N/A
	Max. allowed voltage drop (mV)										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)	-	-	-	-	-	-	-	-	-	-	
	Continued ageing: voltage drop after 10th alt. 25th cycle										-
	Max. allowed voltage drop (mV)										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)	-	-	-	-	-	-	-	-	-	-	
	Continued ageing: voltage drop after 50th alt. 100th cycle										-
	Max. allowed voltage drop (mV)										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
Supplementary information:											

ATTACHMENT 1: CREEPAGE AND CLEARANCE

4.7 (11.2)		TABLE: Creepage and clearance distance measurements per IEC60598-1						
Class of luminaire..... :		Class I	Class II	Class III				—
Impulse withstand category..... :		Category II		Category II				—
Clearance (cl) and creepage distance (cr) at/of/between:	Insulation type	U peak (V)	U r.m.s. (V)	Required cl (mm)	Measured cl (mm)	Required cr (mm)	Measured cr (mm)	
Current-carrying parts of different polarity	-	-	-	-	-	-	-	
Current-carrying parts and accessible parts (Between Live Input Parts and metal base of COB)	B	56	39.6	0.2	(Fuse F1) 0.70	0.6	(LED) 1.14	
Current-carrying parts and outer accessible surface of insulating parts	-	-	-	-	-	-	-	
Parts becoming live due to breakdown of basic insulation and metal parts	-	-	-	-	-	-	-	
Outer surface of cable where it is clamped and metal parts	-	-	-	-	-	-	-	
Current-carrying parts and supporting surface	-	-	-	-	-	-	-	
Supplementary information: B – Basic; S – Supplementary; R – Reinforced								

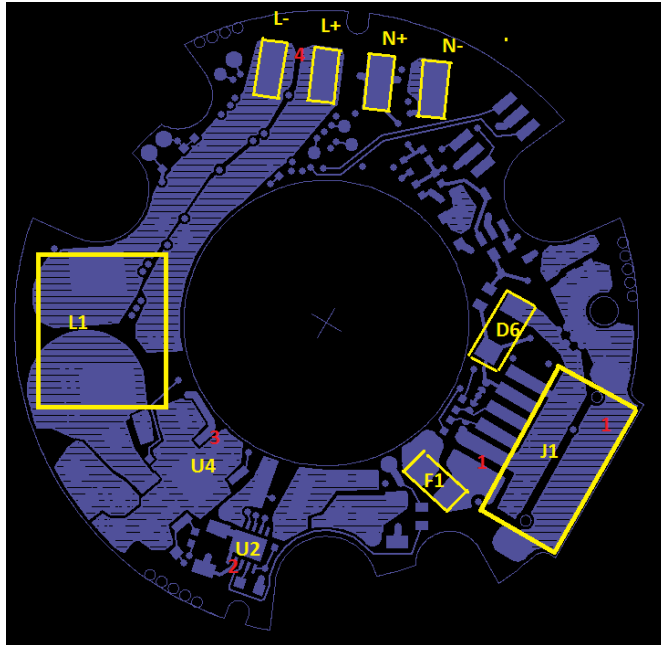
ATTACHMENT 1: CREEPAGE AND CLEARANCE

Creepage and Clearance distance measurements per IEC 61347-2-13						
Point	Vpeak / Vdc	Measured Clearance (mm)	Measured Creepage (mm)	Min Distance Fig. 2 (mm) CL/CR	Results	PWB SC
1 J1 pin 1 to pin 2	48	0.5	0.5	0.2/0.5	P	N/A
2 U2 pin 1 to pin 2	48	< 0.5	< 0.5	0.2/0.5	F	P
3 U4 pin 8 to pin 7	48	< 0.5	< 0.5	0.2/0.5	F	P
4 L- to L+	48	< 0.5	< 0.5	0.2/0.5	F	P
5 ISO1	16	4.32	4.32	0.2/0.5	P	N/A
6 Q3	16	0.67	0.67	0.2/0.5	P	N/A
7 Q5	16	1.22	1.22	0.2/0.5	P	N/A

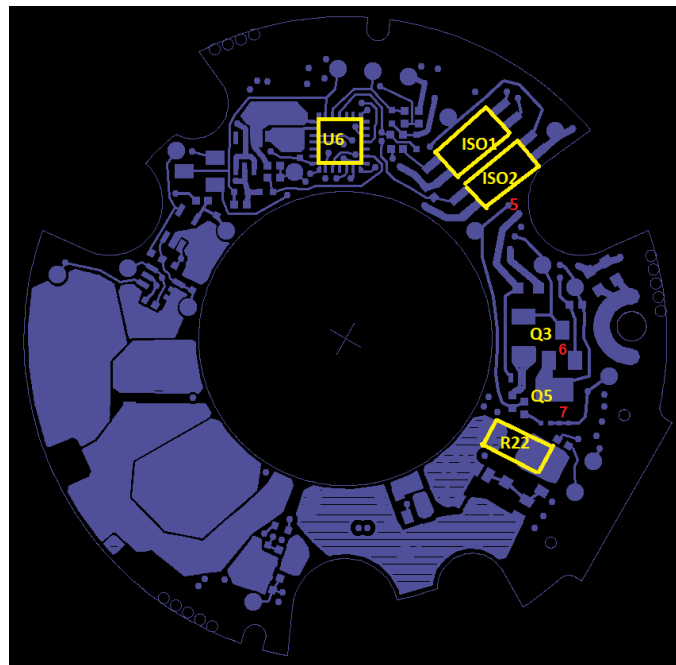
See indicated points on PCB trace layouts below.

ATTACHMENT 1: CREEPAGE AND CLEARANCE

PCB Top Layout



PCB Bottom Layout



ATTACHMENT 2: IEC/EN 62778 PHOTOBIOLOGICAL SAFETY ASSESSMENT


Product	LED-module XICATO XIM
Project number	2173700-PHO 14-199
Operating conditions	56VDC
Measurement distance	200mm
Source dimensions	20mm diameter
Average angular subtense	100mrad
Tested spectral range	200-3000nm
Date of test	3, 5 and 9 September 2014

Hazard	Measured value	Limit Exempt	Limit RG1	Limit RG2	Unit	Risk group designation
Actinic UV	1.28E-01	1	3	30	mW/m ²	Exempt
Near UV	4.44E-03	10	33	100	W/m ²	Exempt
Blue light 100mrad FOV	2.49E+03	100	NA	NA	W/(m ² .sr)	Fail (Exempt)
Blue light 11mrad FOV	4.92E+03	NA	10000	NA	W/(m ² .sr)	RG1
Blue light 1.7mrad FOV	N/A	NA	NA	4000000	W/(m ² .sr)	N/A
Retinal thermal	6.3E+04	2.80E+05	2.80E+05	7.10E+05	W/(m ² .sr)	Exempt
Infrared	3.79E-01	100	570	3200	W/(m ² .sr)	Exempt
Thermal skin	9.86E+01	3.56E+03			W/m ²	Pass

Resulting EN-IEC 62471 classification and labelling
--

Risk Group 1

No labelling required

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
3	GENERAL REQUIREMENTS		--
	Connectors for LED-modules shall be so designed and constructed that in normal use they function reliably and cause no danger to persons or surroundings		P
	Compliance is checked by the tests specified:		P
4	GENERAL CONDITIONS FOR TESTS		--
4.1	Tests according to this standard and type tests		P
	The tests of 16.1, 16.2 and 19 are carried out on three additional specimens for each test		P
4.2	Tests are made at an ambient temperature of 20° C ± 5° C, unless otherwise specified, and with the holder in the most unfavourable position for normal use		P
5	STANDARD RATINGS		
5.1	Maximum rated voltage is 50 V a.c.	42V~ or 60V pk or 	P
5.2	Rated current between 10 mA and 3 A	3A	
5.3	The rated operating temperature range is -30°C to +65°C		P
	Indoor use is exempt from lower limit		N/A
	For relevant application notice and symbol see IEC 60598-1.		P
6	CLASSIFICATION		--
	Unenclosed connectors for LED-modules		P
	Enclosed connectors for LED-modules		N/A
	Partly reinforced insulated connectors for LED-modules		N/A
	Reinforced insulated connectors for LED-modules		N/A
	Non-polarized connector for LED-modules		P
	Polarized connector for LED-modules		N/A
7	MARKING		--
7.1	Connectors for LED-modules marked with:		--
	a) mark of origin	Integral	N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	b) unique catalogue number or identifying reference		N/A
7.2	The following information given on the connectors for LED-modules or available in manufacturer's catalogue:		--
	a) the rated voltage and the rated pulse voltage, if applicable	42V~	P
	For polarized connectors: the rated voltage and the pair of rated pulse voltage		N/A
	b) the rated current in amperes	3A	P
	c) the rated operating temperature "T", if greater than 65° C, in steps of 10° C	90°C	P
	d) the conductor sizes for which the terminals are designed		N/A
	e) the high voltage arrow close to the relevant terminal for polarized lampholders, if applicable		N/A
	Required symbol used:		P
	– for voltage	V~	P
	– for current	A	P
	– for wattage		N/A
	For connectors for LED-modules in equipment where a higher degree of availability is expected, distances for impulse withstand category III may be applicable. This information has to be indicated in the manufacturer's catalogue or the like		N/A
	Enclosed reinforced insulated connectors offer an adequate level of protection for use in luminaries where they are accessible in normal use. This information shall be indicated in the manufacturer's catalogue or the like.		N/A
	For parity reinforced insulated connectors, sufficient creepage distances and clearances to outer accessible surfaces will require additional protection to some parts of the connector by the luminaire design or by use of additional attachment(s) or cover(s). This information has to be indicated in the manufacturer's catalogue or the like		N/A
	The instructions supplied contain the information required to ensure correct mounting and operation of the connectors for LED-modules		P
	The marking according to 7.1 and 7.2 durable and legible:		--
	– after test with water, 15 s	Embossed/stamped into cover	P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	– after test with petroleum spirit, 15 s	Embossed/stamped into cover	P
8	PROTECTION AGAINST ELECTRIC SHOCK		
8.1	Enclosed connectors for LED-modules are so constructed that, when they are been built-in or installed and wired as in normal use, their live parts are not accessible:		--
	– without a LED inserted		N/A
	– with the appropriate LED inserted		N/A
	– during insertion or removal of the LED		N/A
	Compliance checked with standard test finger of IEC 60529		N/A
9	TERMINALS		--
	The Connectors for LED-modules provided with:		--
	– terminals with screw clamping		N/A
	– screwless terminals of spring or wedge type		P
	– tabs or pins for push-on connections		N/A
	– posts for wire wrapping		N/A
	– soldering lugs		N/A
	– connecting leads (tails)		N/A
	Terminal screws and nuts have a metric thread		N/A
	The screwless terminals satisfactory with both rigid conductors and flexible cables or cords		N/A
	Other means of connection (example: a lampholder for extra low voltage halogen lamps providing electrical connection to a metal part of the luminaire during lampholder assembly).		N/A
9.2	Terminals with screw clamping comply with the requirements of clause 14 of IEC 60598-1	see annex 1	N/A
	Screwless terminals of spring or wedge type comply with the requirements of clause 15 of IEC 60598-1	see annex 2	P
	Tabs or pins for push-on connections comply with the requirements of clause 15 of IEC 60598-1	see annex 2	N/A
	Posts for wire wrapping comply with the requirement in IEC 60352-1		N/A
	Soldering lugs comply with relevant requirements in IEC 60068-2-20		N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	Connecting leads (tails) comply with the requirements of 9.3		N/A
	For T-marked connectors, the terminals are tested at the rated operating temperature, unless otherwise stated by the manufacturer.		N/A
	The conditions for a reliable installation and operation shall be given in the connector manufacturer' s or responsible vendor' s documents.		N/A
	Connector contacts providing electrical connection to a metal part of the luminaire during connector assembly shall comply with the requirements of IEC 60598-1, Section 15.		N/A
9.3	Connecting leads connected by:		--
	– soldering		N/A
	– welding		N/A
	– crimping		N/A
	Insulation of the leads complying with IEC 60227 or IEC 60245 or subclause 5.3 in IEC 60598-1		N/A
	Pull test: see clause 16		N/A
10	PROVISION FOR EARTHING		--
10.1	Connectors for LED-modules with provision for earthing provided with at least one earthing terminal		N/A
10.2	Accessible metal parts of Connectors for LED-modules with earthing terminal are permanently and reliable connected to the earthing terminal		N/A
	Accessible metal parts of Connectors for LED-modules without earthing terminal allow reliable earthing		N/A
	Earth continuity between external metal parts unless screened from live parts by double or reinforced insulation		N/A
	Test: see 12.2		--
10.3	Earthing terminal complies with clause 9		N/A
	Clamping means adequately locked against accidental loosening		N/A
	Screw terminals not possible to loosen by hand		N/A
	Screwless terminals not possible to loosen unintentionally by hand		N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
10.4	No risk of corrosion resulting from contact with the copper conductor		N/A
	The screw or the body of the earthing terminal made of brass or other metal no less resistant to corrosion		N/A
	Contact surfaces are bare metal		N/A
10.5	Metal parts of cord anchorage, including clamping screws, insulated from earthing circuit		N/A
11	CONSTRUCTION		--
11.1	Wood, cotton, silk, paper and similar materials not allowed as insulation unless suitably impregnated		P
	Lacquer or enamel are not deemed to provide insulation		P
	Minimum cross-sectional area for the connecting leads is 0.22 mm ²		N/A
	Minimum cross-sectional area for flat cables (rib-bon cables) is 0,09 mm ²		N/A
11.2	Connectors for LED-modules dimensions comply with relevant IEC standard		N/A
11.4	Contacts and all other current-carrying parts are so constructed as to prevent excessive temperature rise		P
	Test for 1h with 1,25 times rated current. Temperature rise does not exceed 45 K	Measured 21.9°C rise when tested @ 65°C ambient	P
11.5	Connectors designed with a barrel thread for shade holder rings and shade holder rings shall comply with IEC 60399 (checked by gauges).		N/A
12	MOISTURE RESISTANCE, INSULATION RESISTANCE AND ELECTRIC STRENGTH		--
12.1	Humidity treatment for 48h	95%RH @ 30°C	P
	No damage to the connectors for LED-modules		P
12.2	The insulation resistance and the electric strength of the connectors for LED-modules shall be adequate		P
12.2.1	Minimum insulation resistance at 500 V d.c		P
	- between live parts of different polarity	Measured: >10MΩ between contacts Limit: 1 MΩ	P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	- between live parts connected together and external metal parts intended to be earthed	Measured: >10MΩ between live parts and the bottom of unpopulated LED Module PCBs and Heatsink Limit: 1 MΩ	P
	- between such live parts and external metal parts, including fixing screws and metal foil	Measured: >10MΩ between live parts and the foiled cover Limit: 1 MΩ	P
12.2.2	Electric strength test for 1 min:		P
	– between live parts of different polarity	84V between contacts	P
	– between live parts connected together and external metal parts intended to be earthed	500V between live parts and the bottom of the unpopulated LED Module PCBs heatsink	P
	– between such live parts and external metal parts, including fixing screws and metal foil	500V between live parts and the foiled cover	P
	For connectors for LED-modules with a rated voltage up to and including 50 V, the test voltage is 500 V		P
	Between the contacts of Connectors for LED-modules, the test voltage is twice the working voltage	84V	P
	For all other cases, the test voltage is 2U + 1000 V		N/A
	For enclosed and unenclosed reinforced insulated connectors, the test voltage shall be determined from Table 10.2 of IEC 60598-1.		N/A
	No flash-over or breakdown occurs		N/A
	Test for earth continuity according to 10.2		N/A
13	MECHANICAL STRENGTH		--
	Impact test, 4 blows applied by pendulum apparatus according to fig. D.1:		--
	- ceramic parts (100 mm)		N/A
	- other materials (150 mm)	0.35Nm using Impact Hammer	P
	No serious damage		P
	Creepage distances and clearances not reduced below values of clause 15		P
14	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		-
	Screws, current-carrying parts and mechanical connections shall withstand mechanical stress occurring in normal use		P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict

	Compliance with 4.11 and 4.12 of IEC 60598-1	Copper alloy spring fingers with selective gold (0,75um) over nickel (1,25 um) plating	P
--	--	--	---

15	CREEPAGE DISTANCES AND CLEARANCES (SAMPLE 1, 2 AND 3)		--
	Live parts and adjacent metal parts shall be adequately spaced. Creepage distances and clearances shall be not less than the values shown in table 2a and 2b	Working Voltage 42V~ or 60V pk or ---	P
	Impulse withstand category II:		--
	Sinusoidal voltages		--
	1. between live parts of different polarity:		--
	basic insulation		--
	- insulation with PTI 600		N/A
	- insulation with PTI < 600	Measured Cr: 1.0 mm between contact Limit: 1.0 mm	P
	- clearances	Measured Cl: 1.0 mm between contact Limit: 0.2 mm	P
	reinforced insulation		--
	- insulation with PTI 600		N/A
	- insulation with PT < 600		N/A
	- clearances		N/A
	2. between live parts and external metal parts, or the outer surface of parts of insulating material which are permanently fixed to the holder, including screws or devices for fixing covers or fixing the holder to its support:		--
	basic insulation		--
	- insulation with PTI 600		N/A
	- insulation with PT < 600		N/A
	- clearances		N/A
	reinforced insulation		--
	- insulation with PTI 600		N/A
	- insulation with PT < 600		N/A
	- clearances		N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict

	3. between live parts and the mounting surface or a loose metal cover, if any, if the construction does not ensure that the values under item 2 are maintained under the most unfavourable circumstances		--
	- clearances		N/A
	Impulse withstand category III:		--
	Sinusoidal voltages:		--
	1. between live parts of different polarity:		--
	- insulation with PTI 600		N/A
	- insulation with PT < 600		N/A
	- clearances		N/A
	2.between live parts and external metal parts, or the outer surface of parts of insulating material which are permanently fixed to the holder, including screws or devices for fixing covers or fixing the holder to its support:		--
	- insulation with PTI 600		N/A
	- insulation with PT < 600		N/A
	- clearances		N/A
	3.between live parts and the mounting surface or a loose metal cover, if any, if the construction does not ensure that the values under item 2 are maintained under the most unfavourable circumstances:		--
	— clearances		N/A
	Minimum distances for non-sinusoidal pulse voltages (Table 3)		--
	— rated pulse voltage (peak kV)		N/A
	— clearances		N/A
	For polarized connectors, creepage distances and clearances to external metal parts or the outer surface of parts of insulating material may be designed and shall be checked for each pole separately.		N/A
	Compliance is checked by tests with the rated pulse voltage of the holder.		N/A
	Creepage distances are not less than the required minimum clearances		N/A

16	ENDURANCE		--
	Test by means of a commercial lamp cap, 10 cycles. The holder placed with a solid steel test cap in a heating cabinet for 48 h at specified temperature and loaded with 1,1 times the rated current. Cools down for 24 h		N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	For connectors for LED-modules which form an integral part of the luminaire, this temperature is replaced by that measured according to the operating conditions given in 12.4.2 of IEC 60598-1, plus 10 K, with a tolerance of ± 5 °C		N/A
	At the end of the test, the holder shows:		--
	- no reduction of protection against electric shock		N/A
	- no loosening of electrical contacts		N/A
	- no cracks, swelling or shrinking		N/A
	- compliance with the gauges of IEC 60061-3 as far as the exist		N/A
	The resistance of contacts and connections does not exceed $0,045 \Omega + (A*n)$		N/A
	Pull test for connecting leads with 20 N for 1 min according to 8.3		N/A
16.1	Connectors for LED-modules shall be capable of maintaining good electrical contact to the module during rapid change of temperature		P
	100 cycles temperature change test		P
	During the test, the connector for LED-modules shows:		--
	- no reduction of protection against electric shock		N/A
	- no loosening of electrical contacts		P
	- no cracks, swelling or shrinking		P
16.2	Connectors for LED-modules with good electrical contact to the module		P
	6 cycles damp heat test		P
	During the test, the connector for LED-modules shows:		--
	- no reduction of protection against electric shock		N/A
	- no loosening of electrical contacts		P
	- no cracks, swelling or shrinking		P
16.3	Resistance of connector contacts		P
	The resistance of contacts and connections does not exceed $0,045 \Omega + (A \times n)$:		--
	a) before 100 cycles temperature change test	Measured: 0.05Ω Limit: 0.105 (4 contacts)	P
	a) after 100 cycles temperature change test	Measured: 0.05Ω Limit: 0.105 (4 contacts)	P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict

	b) before 6 cycles damp heat test	Measured:0.0.03Ω Limit: 0.105 (4 contacts)	P
	b) after 6 cycles damp heat test	Measured: 0.03Ω Limit: 0.105 (4 contacts)	P

17	RESISTANCE TO HEAT AND FIRE		
17.1	External parts of insulating material providing protection against electric shock and parts of insulating material retaining live parts or ELV parts in position shall be resistant to heat	Cover Spring finger contacts Insert	P
	Ball pressure test at 25 °C ± 5 °C above the operating temperature, with a minimum of 125 °C for parts retaining live parts in position	125°C	P
	Diameter of impression not exceeding 2 mm	Cover: Measured 1.8 mm Spring finger contacts Insert:: Measured 1.0 mm	P
17.2	Parts of insulating material retaining live parts in position and external parts of insulating material providing protection against electric shock shall be resistant to flame and ignition.		P
17.3	Glow-wire test 650 °C on parts providing protection against electric shock, including those with a conductive exterior and parts of insulating material retaining ELV parts in position	Cover Spring finger contacts Insert	P
	Any flame or glowing extinguished within 30s, and any flaming drops do not ignite tissue paper		P
17.4	Needle flame test 10 s on parts retaining live parts in position or ELV lamp contacts in position	Cover Spring finger contacts Insert	P
	Any self sustaining flame extinguished within 30 s, and any flaming drops do not ignite tissue paper		P
17.5	Tracking test on parts retaining live parts or ELV parts in position of drip proof Connectors for LED-modules		P
	Connectors for LED-modules withstands 50 drops without failure at PTI 175		P
17.6	The resistance to heat of insulating material and/or outer parts of the connectors for LED-modules is tested 168 h in a heating cabinet		P
	115°C ± 5°C or	115°C	P
	(T + 35)°C ± 5°C by T-marked connectors for LED-modules		N/A

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
	This test is not made on connectors for LED-modules which are integral with the luminaire as a similar test is already given in IEC 60598-1.		N/A
	At the end of the test, the connectors for LED-modules shows		--
	- no reduction of protection against electric shock		P
	- no loosening of electrical contacts		P
	- no cracks, swelling or shrinking		P
	- compliance with the gauges of IEC 60061-3 as far as they exist	Relevant LED package	P
	The connectors for LED-modules withstands the mechanical strength test in 13, the height of fall being reduced to 50 mm	0.14Nm using Impact Hammer	P
	The sealing compound does not flow to such an extent that live parts are exposed		N/A
18	RESISTANCE TO EXCESSIVE RESIDUAL STRESSES (SEASON CRACKING) AND TO RUSTING		--
18.1	Contacts and other parts of copper or copper alloy do not show any cracks after the 24 h test in a cabinet with ammonium chloride solution, inspected at an optical magnification of 8x		P
18.2	Ferrous parts, the rusting of which may endanger the safety of the holder, shall be adequately rust-protected		P
19	VIBRATIONS		--
19.1	Connectors for LED modules shall be capable to satisfactorily maintain electrical contact to the module when affected to vibration in normal use		P
	Vibration test in accordance to IEC 60068-2-6 with 5 sweep cycles (10-500 Hz, 5 g, each axis) for 2 h		P
	After vibration test contact making is still present	Unit is still operational	P
20	HEAT MANAGMENT		--
	Information for heat management is provided in clause 21 and Annex D of IEC 62031 and in the relevant IEC 60061 data sheets		N/A
	ANNEX 1: screw terminals (IEC 60598-1)		--
(14)	SCREW TERMINALS		--

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
(14.2)	Type of terminal..... :		—
	Rated current (A)		—
(14.3.2.1)	One or more conductors		N/A
(14.3.2.2)	Special preparation		N/A
(14.3.2.3)	Terminal size		N/A
	Cross-sectional area (mm ²)..... :		N/A
(14.3.3)	Conductor space (mm)..... :		N/A
(14.4)	Mechanical tests		N/A
(14.4.1)	Minimum distance		N/A
(14.4.2)	Cannot slip out		N/A
(14.4.3)	Special preparation		N/A
(14.4.4)	Nominal diameter of thread (metric ISO thread) :		N/A
	External wiring		N/A
	No soft metal		N/A
(14.4.5)	Corrosion		N/A
(14.4.6)	Nominal diameter of thread (mm)		N/A
	Torque (Nm)		N/A
(14.4.7)	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N)		N/A
(14.4.8)	Without undue damage		N/A

	ANNEX 2: screwless terminals (IEC 60598-1)		--
(15)	SCREWLESS TERMINALS		--
(15.2)	Type of terminal..... :	Contact spring finger type	—
	Rated current (A)	3A	—
(15.3.1)	Material	Copper alloy with selective gold (0,75um) over nickel (1,25 um) plating	P
(15.3.2)	Clamping		P
(15.3.3)	Stop		P
(15.3.4)	Unprepared conductors		N/A
(15.3.5)	Pressure on insulating material		P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)			
Clause	Requirement + Test	Result - Remark	Verdict
(15.3.6)	Clear connection method		N/A
(15.3.7)	Clamping independently		N/A
(15.3.8)	Fixed in position		N/A
(15.3.10)	Conductor size		N/A
	Type of conductor		N/A
(15.5.1)	Terminals internal wiring		N/A
(15.5.1.1)	Pull test spring-type terminals (4 N, 4 samples).....:		N/A
(15.5.1.2)	Pull test pin or tab terminals (4 N, 4 samples).....:		N/A
	Insertion force not exceeding 50 N		N/A
(15.5.2)	Permanent connections: pull-off test (20 N)		N/A
(15.6)	Electrical tests		P
	Voltage drop (mV) after 1 h (4 samples)	See below	P
	Voltage drop of two inseparable joints		P
	Number of cycles.....:	10 & 25	—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples).....:	See below	P
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples).....:		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples)		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples)		N/A
(15.7)	Terminals external wiring		N/A
	Terminal size and rating		N/A
(15.8.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N) :		N/A
	Pull test pin or tab terminals (4 samples); pull (N)		N/A

ANNEX 2: screwless terminals (IEC 60598-1)				
(15.9)	Contact resistance test			
	Voltage drop (mV) after 1 h			
terminal	1	2	3	4
voltage drop (mV)	17.4	17.7	3.8	17.2
--	Voltage drop of two inseparable joints			P
--	Voltage drop after 10th alt. 25th cycle			P

ATTACHMENT 3 – REQUIREMENTS FOR CONNECTORS/HOLDERS FOR LED-MODULES (IEC60838-2-2:2006 + A1:2012 and EN60838-2-2:2006+A1:2012)					
Clause	Requirement + Test			Result - Remark	Verdict
--	Max. allowed voltage drop (mV)			30 mV (after 1 hr. for two inseparable joints) 45mV (after 10 th & 25 th cycle for two inseparable joints)	—
terminal	1	2	3	4	
voltage drop after 10 th cycle (mV)	17.1	17.3	1.0	18.0	
voltage drop after 25 th cycle (mV)	16.8	17.9	1.0	18.1	
Voltage drop after 50th alt. 100th cycle					
	Max. allowed voltage drop (mV)				—
terminal	1	2	3	4	
voltage drop (mV)					
Continued ageing: voltage drop after 10th alt. 25th cycle					
	Max. allowed voltage drop (mV)				—
terminal	1	2	3	4	
voltage drop (mV)					
Continued ageing: voltage drop after 50th alt. 100th cycle					
	Max. allowed voltage drop (mV)				—
terminal	1	2	3	4	
voltage drop (mV)					

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

4 (4)	GENERAL REQUIREMENTS		-
- (4)	Insulation materials according requirements in Annex N of IEC 61347-1	(see Annex N)	N/A
- (4)	Compliance of <u>independent controlgear enclosure</u> with IEC 60 598-1		N/A
- (4)	<u>Built-in magnetic ballast</u> with double or reinforced insulation comply with Annex I of IEC 61347-1		N/A
- (4)	<u>Built-in electronic controlgear</u> with double or reinforced insulation comply with Annex O of IEC 61347-1	(see Annex O)	N/A
4 (4)	<u>SELV controlgear</u> comply with Annex I of this part 2 and Annex L of IEC 61347-1	(see Annex L)	N/A
4 (-)	Transformer comply with IEC 61558		N/A
	Dielectric strength test of insulated winding wires is limited to 3 kV if input voltage \leq 300 V		N/A

6 (6)	CLASSIFICATION		-
	Built-in controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Independent controlgear.....	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Integral controlgear	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	—
6 (-)	Auto-wound controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Separating controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Isolating controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	SELV controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—

7 (7)	MARKING		-
7.1 (7.1)	Mandatory markings		-
	a) mark of origin		N/A
	b) model number or type reference		N/A
	c) symbol for independent controlgear, if applicable		N/A
	d) correlation between interchangeable parts and controlgear marked		N/A
	e) rated supply voltage (V)		N/A
	supply frequency (Hz)		N/A
	supply current (A)		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	f) earthing symbol		N/A
	k) wiring diagram		N/A
	l) value of t_c		N/A
	m) symbol for declared temperature		N/A
	t) LUM earthing symbol		N/A
	u) if not SELV maximum working voltage U_{out} between:		N/A
	- output terminals (V)		N/A
	- output terminals and earth (V)		N/A
7.1 (-)	Constant voltage type:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	—
	- rated output power P_{rated} (W)		N/A
	- rated output voltage U_{rated} (V)		N/A
	Constant current type:	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	- rated output power P_{rated} (W)		N/A
	- rated output current I_{rated} (A)		N/A
	Indication if for LED modules only		N/A
7.1 (7.2)	Marking durable and legible		N/A
	Rubbing 15 s water, 15 s petroleum; marking legible		N/A
7.2 (7.1)	Information to be provided, if applicable		-
	h) declaration on protection against accidental contact		N/A
	i) cross-section of conductors (mm ²)		N/A
	j) number, type and wattage of lamp(s)		N/A
	s) SELV symbol		N/A
7.2 (-)	- declaration of mains connected windings		N/A

8 (10)	PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS		-
- (10.1)	Controlgear protected against accidental contact with live parts	Integral device	N/A
- (A2)	Voltage measured with 50 k Ω	(see Annex A)	N/A
- (A3)	Voltage > 35 V peak or > 60 V d.c. or protective impedance device	(see Annex A)	N/A
- (10.1)	Lacquer or enamel not used for protection or insulation		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	Adequate mechanical strength on parts providing protection		N/A
- (10.2)	Capacitors > 0,5 μ F: voltage after 1 min (V): < 50 V		N/A
- (10.3)	Controlgear providing SELV		-
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear	Output not SELV	N/A
	No connection between output circuit and the body or protective earthing circuit		N/A
	No possibility of connection between output circuit and the body or protective earthing circuit through other conductive parts		N/A
	SELV outputs separated by at least basic insulation		N/A
	ELV conductive parts insulated as live parts		N/A
	Tests according Annex L of IEC 61347-1		N/A
- (10.4)	Accessible conductive parts in SELV circuits		-
	Output voltage under load ≤ 25 V r.m.s. or ≤ 60 V d.c.		N/A
	If output voltage > 25 V r.m.s. or > 60 V d.c.; No load output ≤ 35 V peak or ≤ 60 V d.c and touch current does not exceed 0,7 mA (peak) or 2 mA d.c.		N/A
	One conductive part is insulated if output voltage or current exceeding the values above and withstand test voltage 500 V		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		N/A
	Y1 or Y2 capacitors comply with IEC 60384-14		N/A
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A

9 (8)	TERMINALS		-
	Screw terminals according section 14 of IEC 60598-1:		-
	Separately approved; component list	(see Annex 1)	N/A
	Part of the controlgear	(see Annex 2)	N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	Screwless terminals according section 15 of IEC 60598-1:		-
	Separately approved; component list	(see Annex 2 of 62031 report)	N/A
	Part of the controlgear	(see Annex 4 of 62031 report)	N/A

10 (9)	PROVISION FOR PROTECTIVE EARTHING		-
- (9.1)	Provisions for protective earthing		-
	Terminal complying with clause 8		N/A
	Locked against loosening and not possible to loosen by hand		N/A
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	Earthing via means of fixing		N/A
	Earthing terminal only used for the earthing of the control gear		N/A
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material		N/A
	Contact surface bare metal		N/A
- (9.2)	Provision for functional earthing		-
	Comply with clause 8 and 9.1		N/A
- (9.3)	Earth contact via the track on the printed board		-
	Test with a current of 25 A between earthing terminal and each of the accessible metal parts; measured resistance (Ω) at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
- (9.4)	Earthing of built-in lamp controlgear		-
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		N/A
	Earthing terminal only for earthing the built-in controlgear		N/A
- (9.5)	Earthing via independent controlgear		-
- (9.5.1)	Earth connection to other equipment		N/A
	Looping or through connection, conductor min. 1,5 mm ² and of copper or equivalent		N/A
	Protective earthing wires in line with 5.3.1.1 and clause 7		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

- (9.5.2)	Earthing of the lamp compartments powered via the independent lamp controlgear		-
	Test with a current of 25 A between input and output earth terminals; measured resistance (Ω) between earthing terminal and each of the accessible metal parts at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A

11 (11)	MOISTURE RESISTANCE AND INSULATION		-
	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance with d.c. 500 V ($M\Omega$):		-
	For basic insulation $\geq 2 M\Omega$	See Clause 11 of 62031 report	N/A
	For double or reinforced insulation $\geq 4 M\Omega$		N/A
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		N/A
11 (-)	Adequate insulation between input and output terminals not bounded together in SELV-equivalent controlgear		N/A

12 (12)	ELECTRIC STRENGTH		-
	Immediately after clause 11 electric strength test for 1 min	See Clause 11 of 62031 report	N/A
	Basic insulation for SELV, test voltage 500 V		N/A
	Working voltage ≤ 50 V, test voltage 500 V		N/A
	Working voltage > 50 V ≤ 1000 V, test voltage (V):		-
	Basic insulation, $2U + 1000$ V		N/A
	Supplementary insulation, $2U + 1000$ V		N/A
	Double or reinforced insulation, $4U + 2000$ V		N/A
	No flashover or breakdown		N/A
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

14 (14)	FAULT CONDITIONS		-
- (14)	When operated under fault conditions the controlgear:		-
	- does not emit flames or molten material	See Clause 11 of 62031 report	N/A
	- does not produce flammable gases		N/A
	- protection against accidental contact not impaired		N/A
	Thermally protected controlgear does not exceed the marked temperature value		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected		N/A
- (14.1)	Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (except between live parts and accessible metal parts)		N/A
	Creepage distances on printed boards less than specified in clause 16 in Part 1 provided with coating according to IEC 60664-3		N/A
- (14.2)	Short-circuit or interruption of semiconductor devices		N/A
- (14.3)	Short-circuit across insulation consisting of lacquer, enamel or textile		N/A
- (14.4)	Short-circuit across electrolytic capacitors		N/A
- (14.5)	After the tests has been carried out on three samples:		-
	The insulation resistance $\geq 1 \text{ M}\Omega$		N/A
	No flammable gases		N/A
	No accessible parts have become live	Integral controlgear	N/A
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		N/A
- (14.6)	Relevant fault condition tests with high-power supply		—
14 (-)	Temperature declared thermally protected lamp controlgear fulfil requirements in Annex C		N/A

15 (-)	TRANSFORMER HEATING		
15.1	General		-

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict
	Transformer comply with clause L.6 and L.7 of IEC 61347-1		N/A
	Output voltage of SELV controlgear not exceed limits in 10.4 of IEC 61347-1 during the test of 15.1 and 15.2		N/A
15.2 (-)	Normal operation		-
	Comply with clause L.6 of IEC 61347-1		N/A
15.3 (-)	Abnormal operation		-
	Comply with clause L.7 of IEC 61347-1		N/A
	Double LED modules or equivalent load connected in parallel to the output terminals of constant voltage type		N/A
	Double LED modules or equivalent load connected in parallel to the output terminals of constant current type		N/A
15 (-)	During and at the end of the tests no defect impairing safety, nor any smoke or flammable gases produced		N/A

16 (15)	CONSTRUCTION		
- (15.1)	Wood, cotton, silk, paper and similar fibrous material		-
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
- (15.2)	Printed circuits		-
	Printed circuits used as internal connections complies with clause 14		P
- (15.3)	Plugs and socket-outlets used in SELV or ELV circuits		-
	No dangerous compatibility between output socket-outlet and a plug for socket-outlets for input circuit in relation to installation rules, voltages and frequencies		N/A
	Plugs and socket-outlets for SELV comply with IEC 60906-3 and IEC 60884-2-4		N/A
	Plugs and socket-outlets for SELV ≤ 3 A, ≤ 25 V r.m.s. or ≤ 60 V d.c. and ≤ 72 W comply with IEC 60906-3 and IEC 60884-2-4 or:		N/A
	- plugs not able to enter socket-outlets of other standardised system		N/A
	- socket-outlets not admit plugs of other standardised system		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	- socket-outlets without protective earth		N/A
--	---	--	-----

17 (16)	CREEPAGE DISTANCES AND CLEARANCES		-
- (16)	Creepage distances and clearances according to Table 3 and 4, as appropriate	DC Input.	N/A
	Controlgears providing SELV comply with L.1 in Annex L		N/A
	Insulating lining of metallic enclosures		N/A
	Basic insulation on printed boards tested according to clause 14	See Attachment 1	P
	Distances subjected to both sinusoidal voltage as non-sinusoidal pulses not less than value in either Table 3 or 4		N/A
	Creepage distances not less than minimum clearance	See Attachment 1	P

18 (17)	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		-
	Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		-
(4.11)	Electrical connections		-
(4.11.1)	Contact pressure	See Clause 17 in 62031 report	N/A
(4.11.2)	Screws:		-
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:		-
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		N/A
(4.11.5)	No contact to wood or mounting surface		N/A
(4.11.6)	Electro-mechanical contact systems		N/A
(4.12)	Mechanical connections and glands		-
(4.12.1)	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: torque (Nm); part		N/A
	Torque test: torque (Nm); part		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	Torque test: torque (Nm); part		N/A
(4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
(4.12.4)	Locked connections:		-
	- fixed arms; torque (Nm)		N/A
	- lampholder; torque (Nm).....		N/A
	- push-button switches; torque 0,8 Nm.....		N/A
(4.12.5)	Screwed glands; force (Nm)		N/A

19 (18)	RESISTANCE TO HEAT, FIRE AND TRACKING		-
- (18.1)	Ball-pressure test:		-
	- part tested; temperature (°C).....	See CI18 in 62031 report	N/A
	- part tested; temperature (°C).....		N/A
- (18.2)	Test of printed boards:		P
	- part tested.....	PCB UL approved (E28476), V-0 and tested in the application	N/A
	- part tested.....		N/A
- (18.3)	Glow-wire test (650°C):		-
	- part tested.....	See CI18 in 62031 report	N/A
	- part tested.....		N/A
- (18.4)	Needle flame test (10 s):		-
	- part tested.....	See CI 18 in 62031 report	N/A
	- part tested.....		N/A
- (18.5)	Tracking test:		-
	- part tested.....		N/A
	- part tested.....		N/A

20 (19)	RESISTANCE TO CORROSION		-
	- test according 4.18.1 of IEC 60598-1		N/A
	- adequate varnish on the outer surface		N/A

14	TABLE: tests of fault conditions		
Part	Simulated fault		Hazard
-	See 62031 report		-

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

17 (16)	TABLES: Creepage distances and clearances						-
Table 3	Minimum distances (mm) for a.c. (50/60 Hz) sinusoidal voltages						N/A
RMS working voltage (V) not exceeding	50	150	250	500	750	1000	
Creepage distances							
Required basic insulation, PTI \geq 600	0,6	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required basic insulation, PTI $<$ 600	1,2	1,6	2,5	5	8	10	
Measured: See 62031 report	-	-	-	-	-	-	
Required supplementary insulation PTI \geq 600	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required supplementary insulation PTI $<$ 600	-	1,6	2,5	5	8	10	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	3,2	5	6	8	11	
Measured	-	-	-	-	-	-	
Clearances							
Required basic insulation	0,2	0,8	1,5	3	4	5,5	
Measured : See 62031 report	-	-	-	-	-	-	
Required supplementary insulation	-	0,8	1,5	3	4	5,5	
Measured	-	-	-	-	-	-	
Required reinforced insulation	-	1,6	3	6	8	11	
Measured	-	-	-	-	-	-	
Table 4	Minimum distances (mm) for non-sinusoidal pulse voltages						N/A
Rated pulse voltage (peak kV)	2,0	2,5	3,0	4,0	5,0	6,0	8,0
Required clearances	1,0	1,5	2	3	4	5,5	8
Measured	-	-	-	-	-	-	-
Rated pulse voltage (peak kV)	10	12	15	20	25	30	40
Required clearances	11	14	18	25	33	40	60
Measured	-	-	-	-	-	-	-
Rated pulse voltage (peak kV)	50	60	80	100	-	-	-
Required clearances	75	90	130	170	-	-	-
Measured	-	-	-	-	-	-	-

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

A (A)	ANNEX A - TEST TO ESTABLISH WHETHER A CONDUCTIVE PART IS A LIVE PART WHICH MAY CAUSE AN ELECTRIC SHOCK		-
(A.1)	Comply with A.2 or A.3	Integral controlgear	N/A
(A.2)	Voltage ≤ 35 V peak or ≤ 60 V d.c. :		N/A
(A.3)	If voltage > 35 V peak or > 60 V d.c. or protective impedance device; touch current does not exceed 0,7 mA (peak) or 2 mA d.c. :		N/A
	Comply with Annex G of IEC 60598-1		N/A

C (C)	ANNEX C – PARTICULAR REQUIREMENTS FOR ELECTRONIC LAMP CONTROLGEAR WITH MEANS OF PROTECTION AGAINST OVERHEATING		-
(C3)	GENERAL REQUIREMENTS		-
(C3.1)	Thermal protection means integral with the convertor, protected against mechanical damage		N/A
	Renewable only by means of a tool		N/A
	If function depending on polarity, for cord-connected equipment protection means in both leads		N/A
	Thermal links comply with IEC 60691		N/A
	Electrical controls comply with IEC 60730-2-3		N/A
(C3.2)	No risk of fire by breaking (clause C7)		N/A
(C5)	CLASSIFICATION		-
	a) automatic resetting type		—
	b) manual resetting type		—
	c) non-renewable, non-resetting type		—
	d) renewable, non-resetting type		—
	e) other type of thermal protection; description .. :		N/A
(C6)	MARKING		-
(C6.1)	Symbol for temperature declared thermally protected ballasts		N/A
(C6.2)	Declaration of the type of protection provided		N/A
(C7)	LIMITATION OF HEATING		-
(C7.1)	Preselection test:		-
	Test sample placed for at least 12 h in an oven having temperature ($t_c - 5$) K		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	No operation of the protection device		N/A
(C7.2)	Functioning of protection means:		-
	Normal operation of the sample in a test enclosure according to Annex D at an ambient temperature such that ($t_c +0$; -5) °C is obtained		N/A
	No operation of the protection device		N/A
	Introducing of the most onerous test condition determined during test of clause 14		N/A
	Output of windings connected to the mains supply short-circuited, and other part of the convertor operated under normal conditions		N/A
	Increasing of the current through the windings continuously until operation of the protection means		N/A
	Continuous measuring of the highest surface temperature		N/A
	Ballasts according to C5 a) or C5 e) operated until stable conditions are achieved		N/A
	Automatic-resetting thermal protectors working 3 times		N/A
	Ballasts according to C5 b) working 6 times		N/A
	Ballasts according to C5 c) and C5) d) working once		N/A
	Highest temperature does not exceed the marked value		N/A
	Any overshoot of 10% over the marked value within 15 min		N/A

D (D)	ANNEX D – REQUIREMENTS FOR CARRY OUT THE HEATING TESTS OF THERMALLY PROTECTED LAMP CONTROLGEAR		-
	Tests in C7 performed in accordance with Annex D, if applicable		N/A

E (E)	ANNEX E – USE OF CONSTANT S OTHER THAN 4500 IN t_w TESTS		-
	Comply with tests according Annex E		N/A

F	ANNEX F - DRAUGHT-PROOF ENCLOSURE		-
	Draught-proof enclosure in accordance with the description		P

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	Dimensions of the enclosure		P
	Other design; description		P

H (H)	ANNEX H - TESTS		-
	All tests performed in accordance with the advice given in Annex H, if applicable	Integral controlgear	P

I (L)	ANNEX I: PARTICULAR ADDITIONAL REQUIREMENTS FOR SELV D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES		-
(L.3)	Classification		-
	Class I	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Class II	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	Class III	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	non-inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	inherently short circuit proof controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	fail safe controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
	non-short-circuit proof controlgear	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	—
(L.4)	Marking		-
	Adequate symbols are used		N/A
(L.5)	Protection against electric shock		-
	Comply with 9.2 of IEC 61558-1		N/A
(L.6)	Heating		-
	No excessive temperatures in normal use		N/A
	Value if capacitor t_c marked		—
	Winding insulation classified as Class		—
	Comply with tests of clause 14 of IEC 61558-1 with adjustments		N/A
(L.7)	Short-circuit and overload protection		-
	Comply with tests of clause 15 of IEC 61558-1 with adjustments		N/A
(L.8)	Insulation resistance and electric strength		-
(L.8.1)	Conditioned 48 h between 91 % and 95 %		N/A
(L.8.2)	Insulation resistance		-

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict
	Between input- and output circuits not less than 5 M Ω		N/A
	Between metal parts of class II convertors which are separated from live parts by basic insulation only and the body not less than 5 M Ω		N/A
	Between metal foil in contact with the inner and outer surfaces of enclosures of insulating material not less than 2 M Ω		N/A
(L.8.3)	Electric strength		-
	1) Between live parts of input circuits and live parts of output circuits		N/A
	2) Over basic or supplementary insulation between:		-
	a) live parts having different polarity		N/A
	b) live parts and body if intended to be connected to protective earth		N/A
	c) accessible metal parts and a metal rod of the same diameter as the flexible cable or cord		N/A
	d) live parts and an intermediate metal part		N/A
	e) intermediate metal parts and the body		N/A
	f) each input circuit and all other input circuits		N/A
	3) Over reinforced insulation between the body and live parts		N/A
(L.9)	Construction		-
(L.9.1)	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6		N/A
	HF transformer comply with 19 of IEC 61558-2-16		N/A
(L.10)	Components		-
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		N/A
(L.11)	Creepage distances and clearances		-
	1. Insulation between input and output circuits, basic insulation:		N/A
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	2. Insulation between input and output circuits, double or reinforced insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

	c) measured values \geq specified values (mm) :		N/A
	3. Insulation between adjacent <u>input</u> circuits		-
	- measured values \geq specified values (mm) :		N/A
	3. Insulation between adjacent <u>output</u> circuits		-
	- measured values \geq specified values (mm) :		N/A
	4. Insulation between terminals for external connection:		-
	- measured values \geq specified values (mm) :		N/A
	5. Basic or supplementary insulation:		-
	a) measured values \geq specified values (mm) :		N/A
	b) measured values \geq specified values (mm) :		N/A
	c) measured values \geq specified values (mm) :		N/A
	d) measured values \geq specified values (mm) :		N/A
	e) measured values \geq specified values (mm) :		N/A
	6. Reinforced insulation or insulation:		-
	Between body and output circuit: measured values \geq specified values (mm) :		N/A
	Between body and output circuit if provision against transient voltages: measured values \geq specified values (mm) :		N/A
	7. Distance through insulation:		-
	a) measured values \geq specified values (mm) :		N/A
	b) measured values \geq specified values (mm) :		N/A
	c) measured values \geq specified values (mm) :		N/A

(N)	ANNEX N: REQUIREMENTS FOR INSULATION MATERIALS USED FOR DOUBLE OR REINFORCED INSULATION		-
(N.4)	General requirements		-
(N.4.1)	Material comply with IEC 60085 and IEC 60216 series		N/A
(N.4.2)	Solid insulation		-
	Electric strength test at least 5 kV or 1,35 x test voltage in Table N.1		N/A
	If not classified according IEC 60085 and IEC 60216 series: Electric strength test increased 10 % of 5,5 kV or 1,5 x test voltage in Table N.1		N/A
(N.4.3)	Thin sheet insulation		-

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

(N.4.3.1)	Thickness and composition of thin sheet insulation		-
	- Inside the ballast and not subjected to handling or abrasion during the production and during maintenance		N/A
	- Non-separated layers: Min. 3 layers and fulfil mandrel test of 150N		N/A
	- Separated layers: Min. 2 layers and each layer fulfil mandrel test of 50N		N/A
	- Separated layers (alternative): Min. 3 layers and 2/3 of the layers fulfil mandrel test of 100N		N/A
(N.4.3.2)	Mandrel test (electric strength test during mechanical stress)		-
	Electric strength test after mandrel test:		-
	- Non-separated layers: min. 5 kV or 1,35 x test voltage in Table N.1		N/A
	- 2/3 of min. 3 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	- one of 2 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	No flashover or breakdown occurred		N/A

(O)	ANNEX O: ADDITIONAL REQUIREMENTS FOR BUILT-IN ELECTRONIC CONTROLGEAR WITH DOUBLE OR REINFORCED INSULATION		N/A
(O.6)	Marking		-
	Marking according clause 7 (7)	See clause 7	N/A
	Special symbol		N/A
	Meaning of the special symbol explained in catalogue		N/A
(O.7)	Protection against accidental contact with live parts		-
	Requirements of clause 8 (10)	See clause 8	N/A
	Test finger not possible to make contact with basic insulated metal parts		N/A
(O.8)	Terminals		-
	Clause 9 (8)	See clause 9	N/A
(O.9)	Provision for earthing		-
	Functional earthing terminals comply with clause 9 of part 1		N/A
	No protective earthing terminal		N/A

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict

(O.10)	Moisture resistance and insulation		-
	Clause 11 (11)	See clause 11	N/A
(O.11)	Electric strength		-
	Clause 12 (12)	See clause 12	N/A
(O.13)	Fault conditions		-
	Clause 14 (14)	See clause 14	N/A
	End of test, between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface comply with dielectric strength test reduced to 35 % of values according Table 1 in part 1		N/A
	Insulation resistance according to O.10 between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface not less than 4 MΩ		N/A
(O.14)	Construction		-
	Clause 17 (15)	See clause 17	N/A
	Accessible metal parts insulated from live parts by double or reinforced insulation		N/A
	Live part insulated from supporting surface in contact with external faces by double or reinforced insulation		N/A
(O.15)	Creepage distances and clearances		-
	Clause 18 (16)	See clause 18	N/A
	Comply with corresponding values for luminaries in IEC 60598-1		N/A
(O.16)	Screws, current-carrying parts and connections		-
	Clause 19 (17)	See clause 19	N/A
(O.17)	Resistance to heat and fire		-
	Clause 20 (18)	See clause 20	N/A
(O.18)	Resistance to corrosion		-
	Clause 21 (19)	See clause 21	N/A

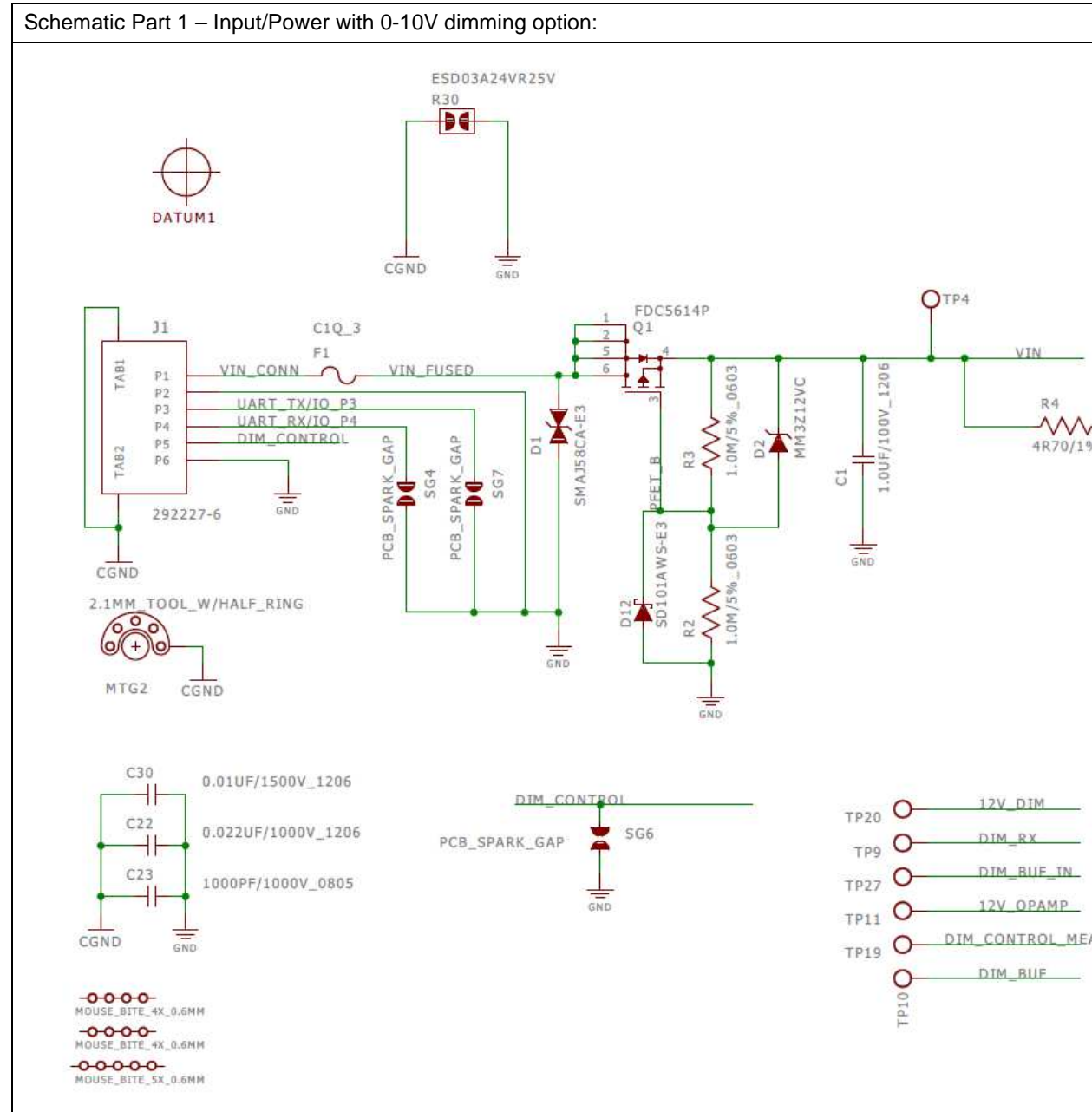
J	ANNEX J: PARTICULAR ADDITIONAL SAFETY REQUIREMENTS FOR A.C., A.C./D.C. OR D.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR EMERGENCY LIGHTING		N/A
J.1	General		-
	Intended for centralized emergency power supply	Yes <input type="checkbox"/> No <input type="checkbox"/>	—

ATTACHMENT 4: REQUIREMENTS FOR D.C. OR A.C. SUPPLIED ELECTRONIC CONTROLGEAR FOR LED MODULES (IEC 61347-2-13:2014-09 and EN 61347-2-13:2014)			
Clause	Requirement + Test	Result - Remark	Verdict
J.2	Marking		-
J.2.1	Mandatory markings		-
	a) symbol EL		N/A
	b) rated emergency supply voltage (V)		N/A
J.2.2	Information to be provided if applicable		-
	a) Limits of ambient temperature		N/A
	b) Emergency output factor (EOF _x)		N/A
	c) Information if intended for use in luminaires for high-risk task area lighting		NA
J.3	General notes on tests		-
	Length of output cable in tests..... :		N/A
	Load instead of LED lamps/modules..... :		N/A
J.4	Starting conditions		-
	Start rated load in emergency mode without adversely affecting the performance		N/A
J.5	Operating condition		-
	Comply with the requirements of 7.2 of IEC 62384 at 90% and 110% of rated emergency supply voltage		N/A
J.6	Emergency supply current		-
	Emergency supply current not differ more than ±15 %		N/A
	Supply of low impedance and low inductance		N/A
J.7	EMC immunity		-
	Comply with the requirements of IEC 61547		N/A
J.8	Pulse voltage from central battery systems		-
	Withstand pulses according Table J.1		N/A
J.9	Tests for abnormal conditions		-
	Comply with the requirements of 12 of IEC 62384		N/A
J.10	Comply with the requirements of 13 of IEC 62384		N/A
J.11	Functional safety (EOF _x)		-
	Declared emergency output factor (EOF _x) achieved during emergency operation		N/A

ATTACHMENT 5: HEATING TEST RESULTS

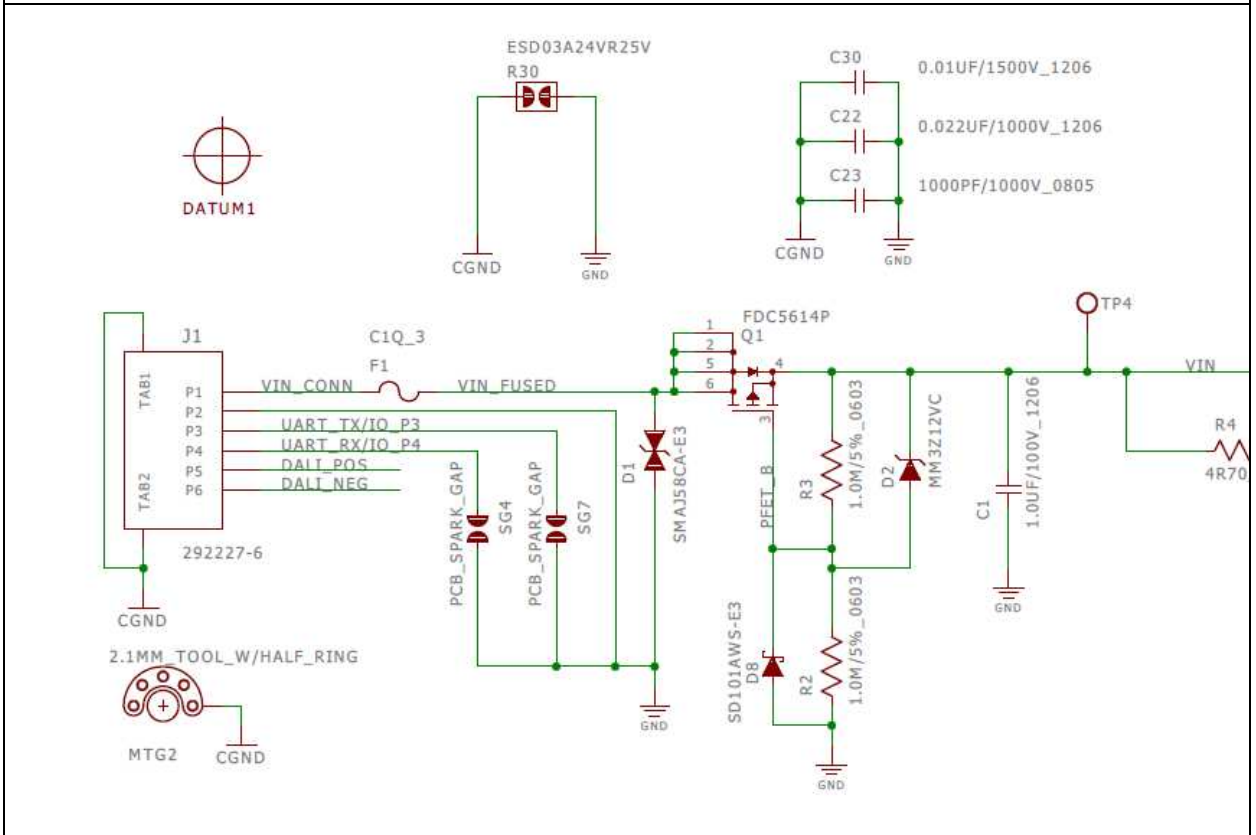
Cond.	U_n (Vdc)	I_n (A)	P_n (W)	Operating Condition/Status	
1	56	589	32.7	Initial Normal Operation	
		585	32.8	Final Normal Operation	
Model/Sample No.:			XIM with 9 mm LED array		--
Load Type.....:			Integral LED array		--
Temperature Rise dT or Max Temp of Part			Max Temp °C		Normal Temp Limit max °C
			Test Condition No.		
T/C Ch. No.	Monitored point:		Condition 1		
1	Tc point on case		90		90
2	Input connector J1 body, center		78.5		110
3	PCB between L1 and thermal base		97.9		130
4	L1 top center		100.3		125
5	PCB next to D6 BR1		86.2		130
5	PCB next to J3		86.4		130
6	Oven Ambient		43.6		-
7	Room Ambient		21.7		20-27

ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT



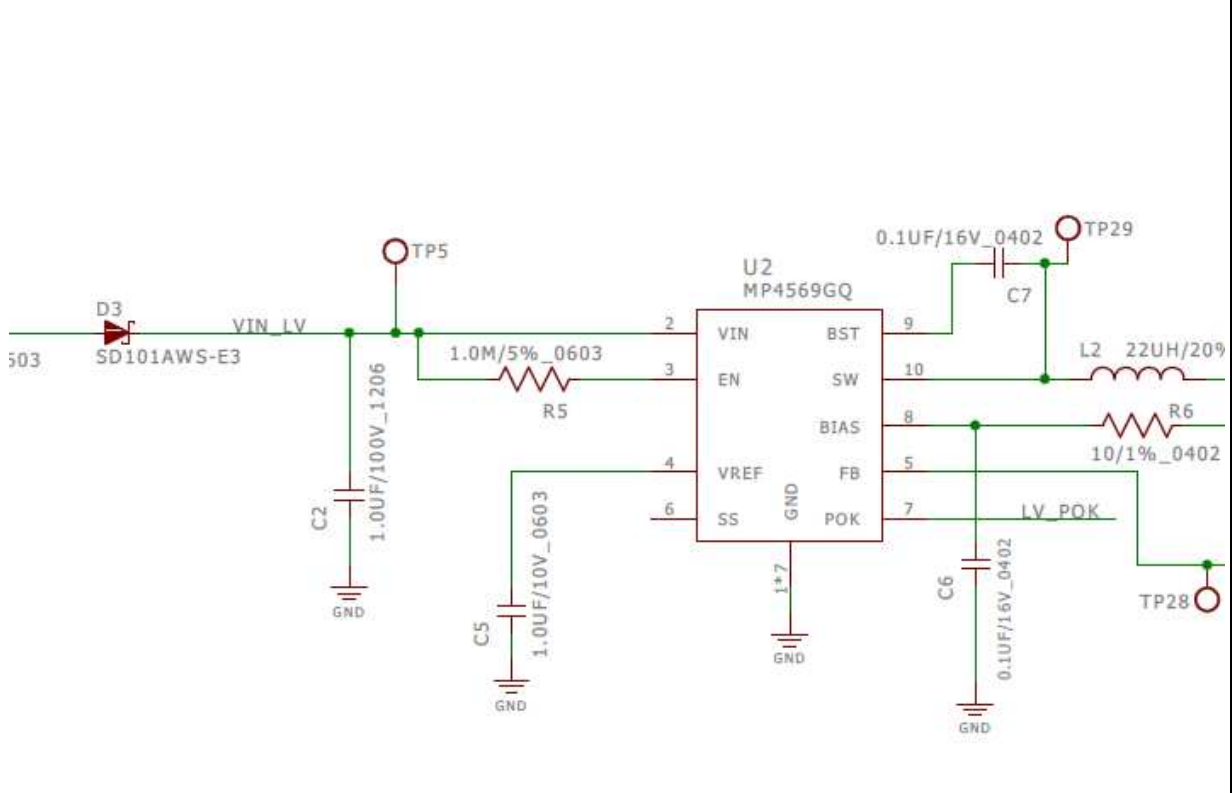
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Schematic Part 2 – Input/Power with DALI dimming option:

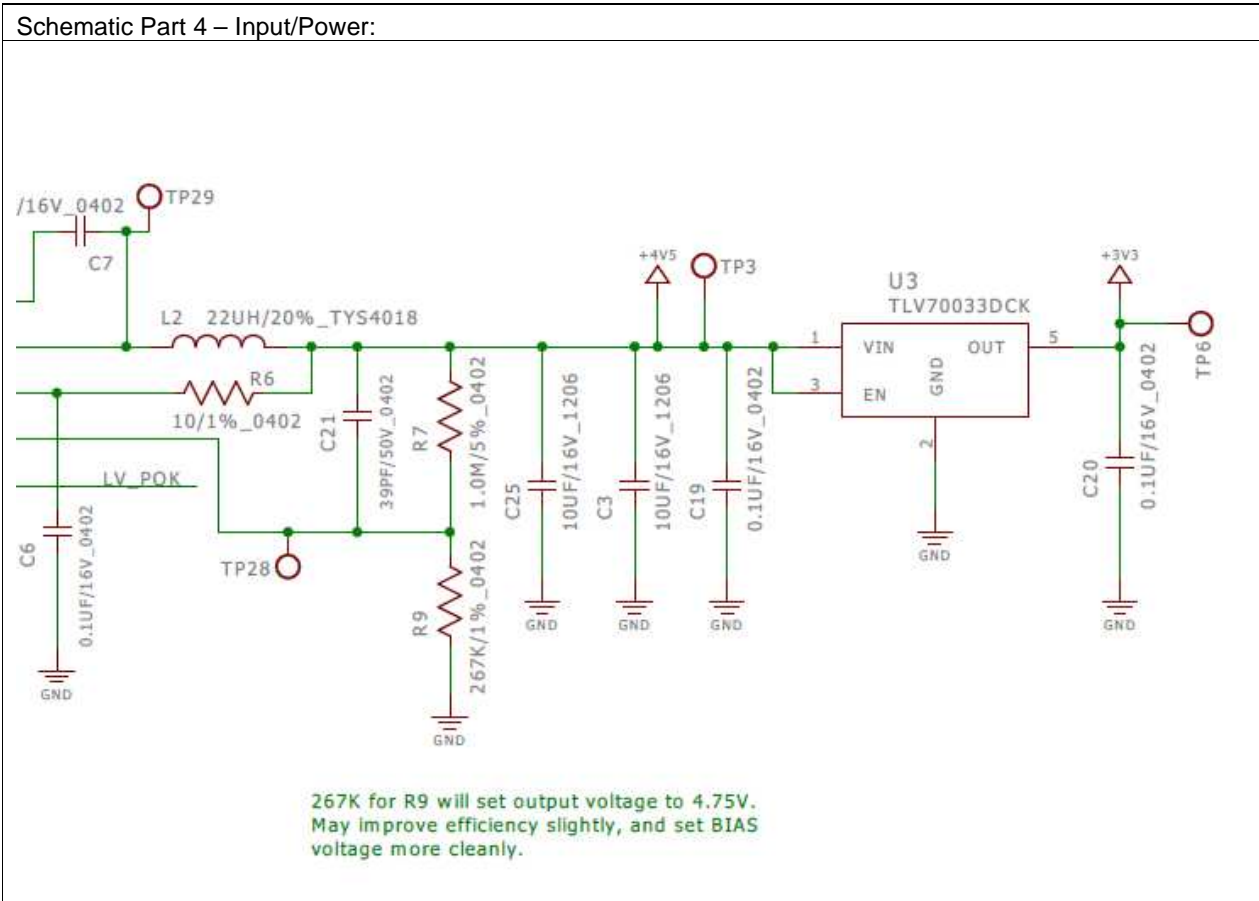


ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

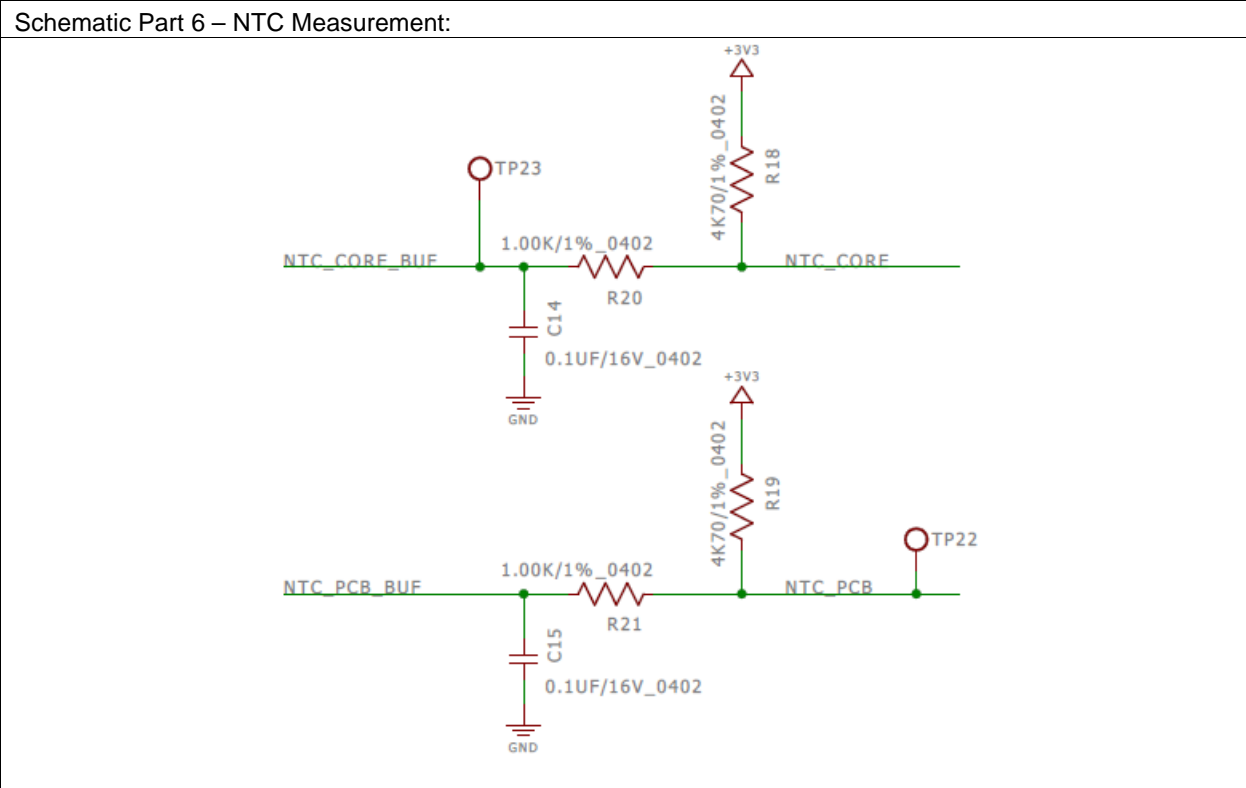
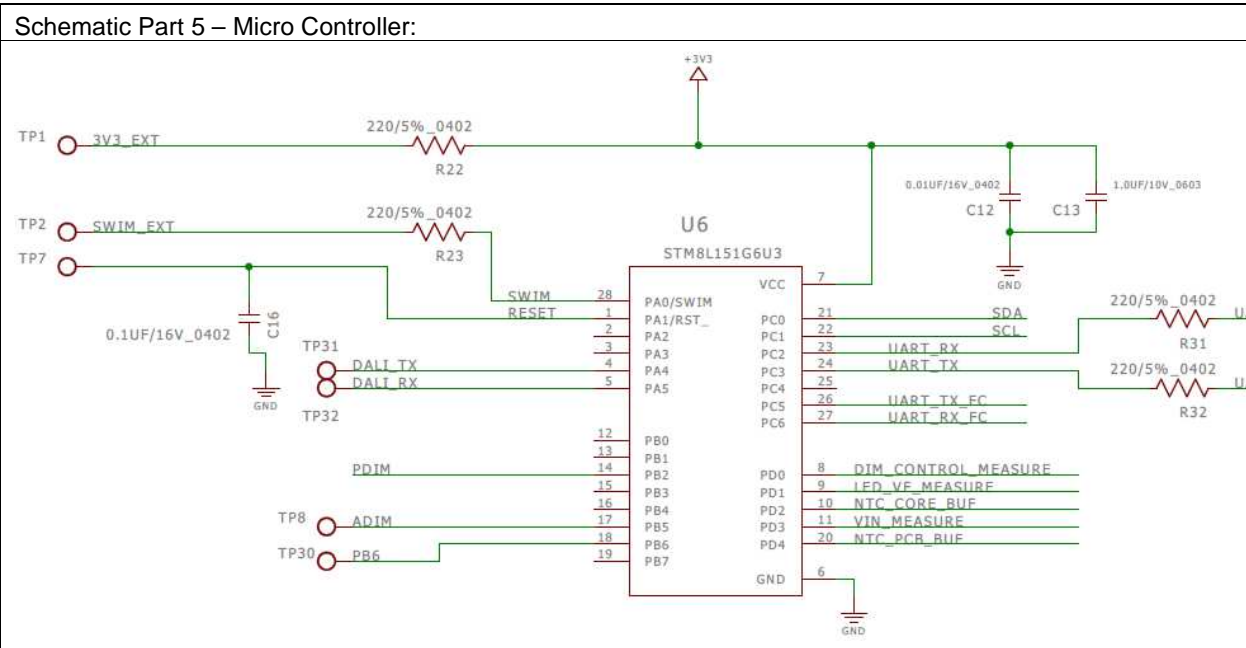
Schematic Part 3 – Input/Power:



ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

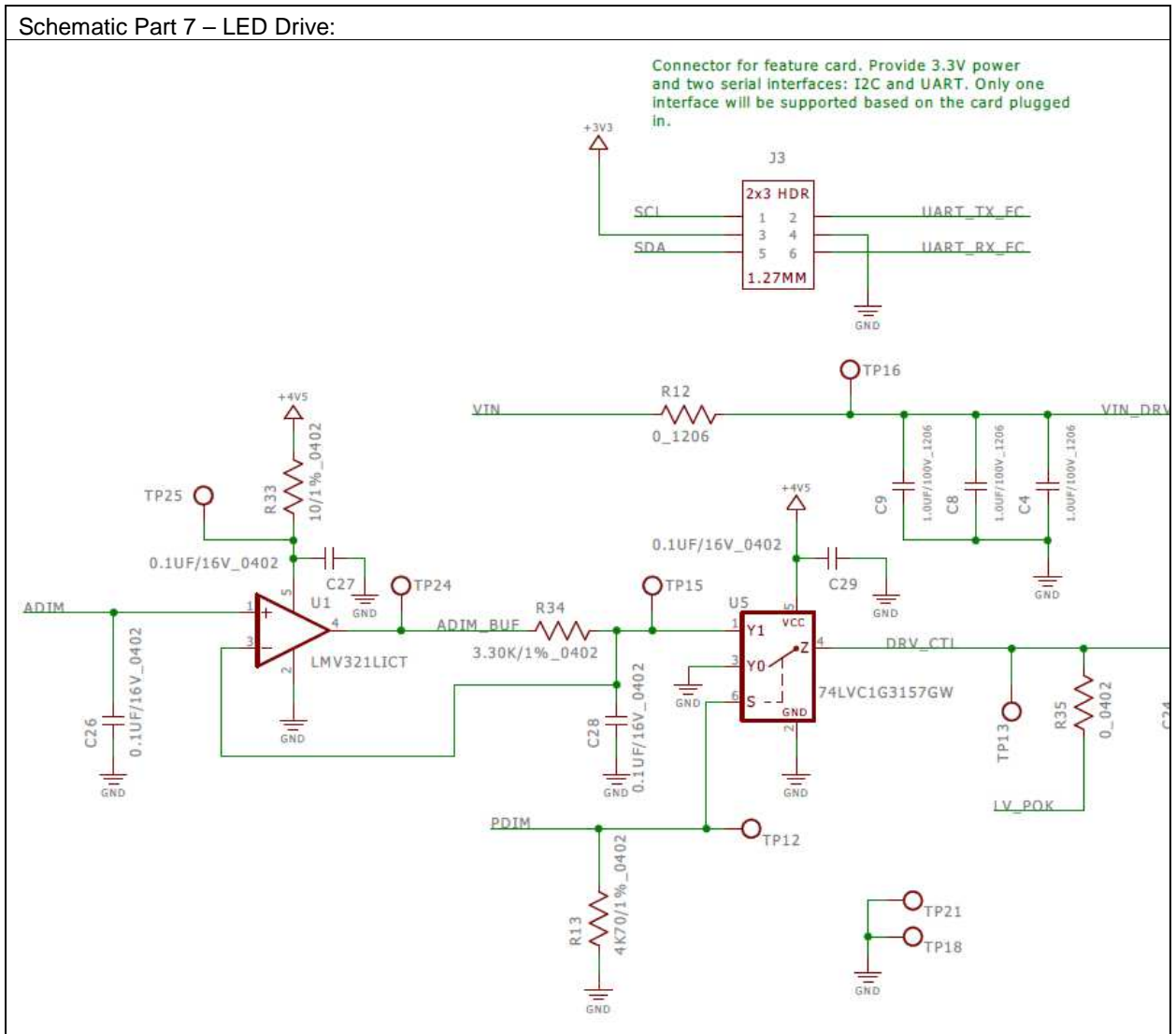


ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT



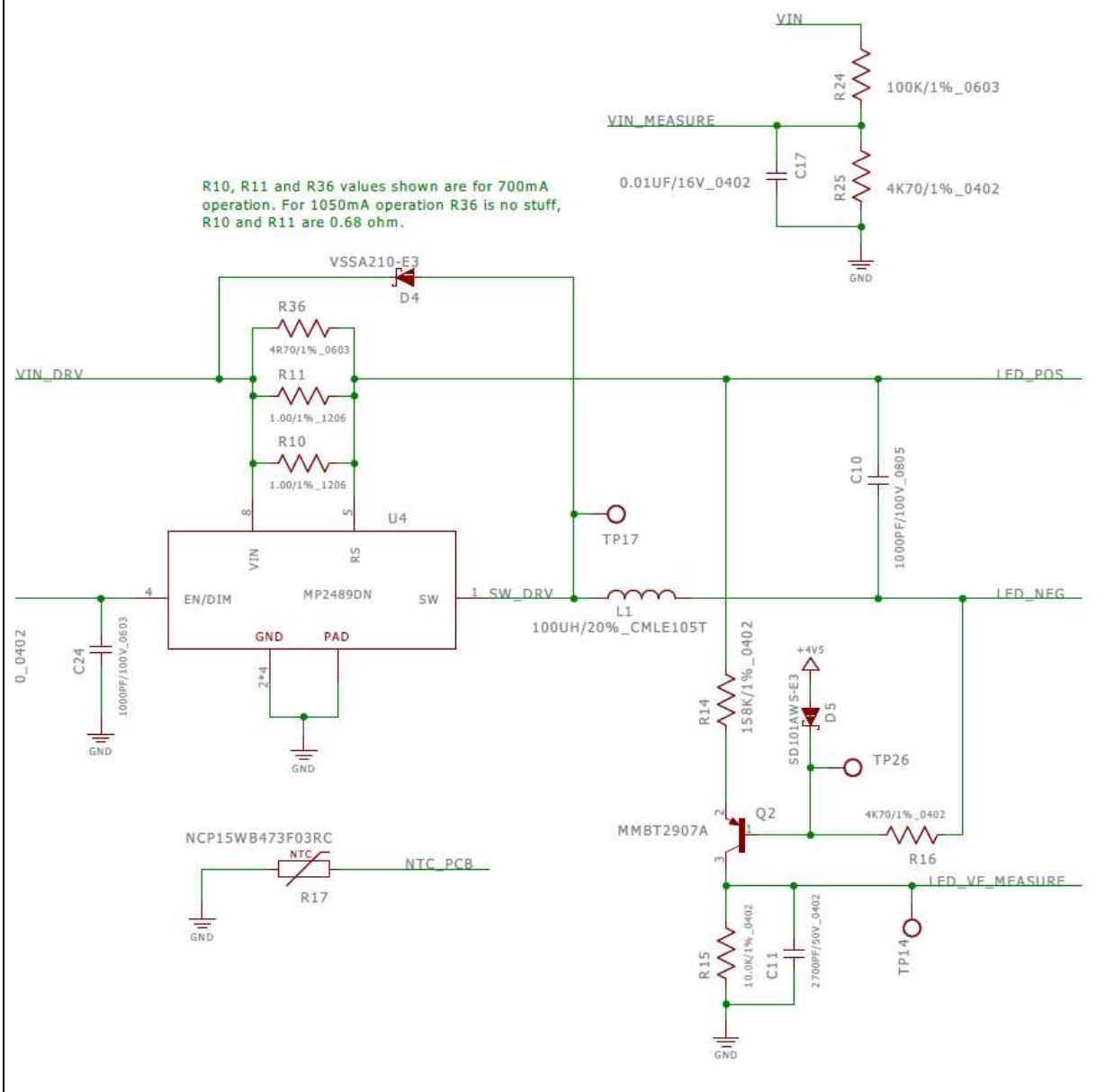
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Schematic Part 7 – LED Drive:



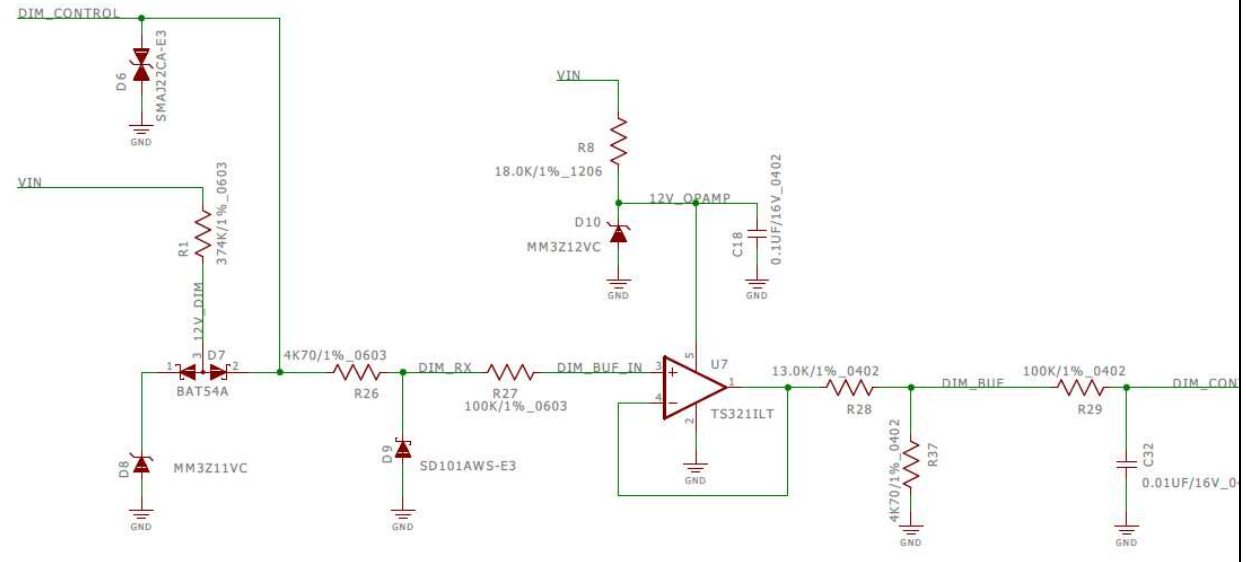
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Schematic Part 8 – LED Drive:

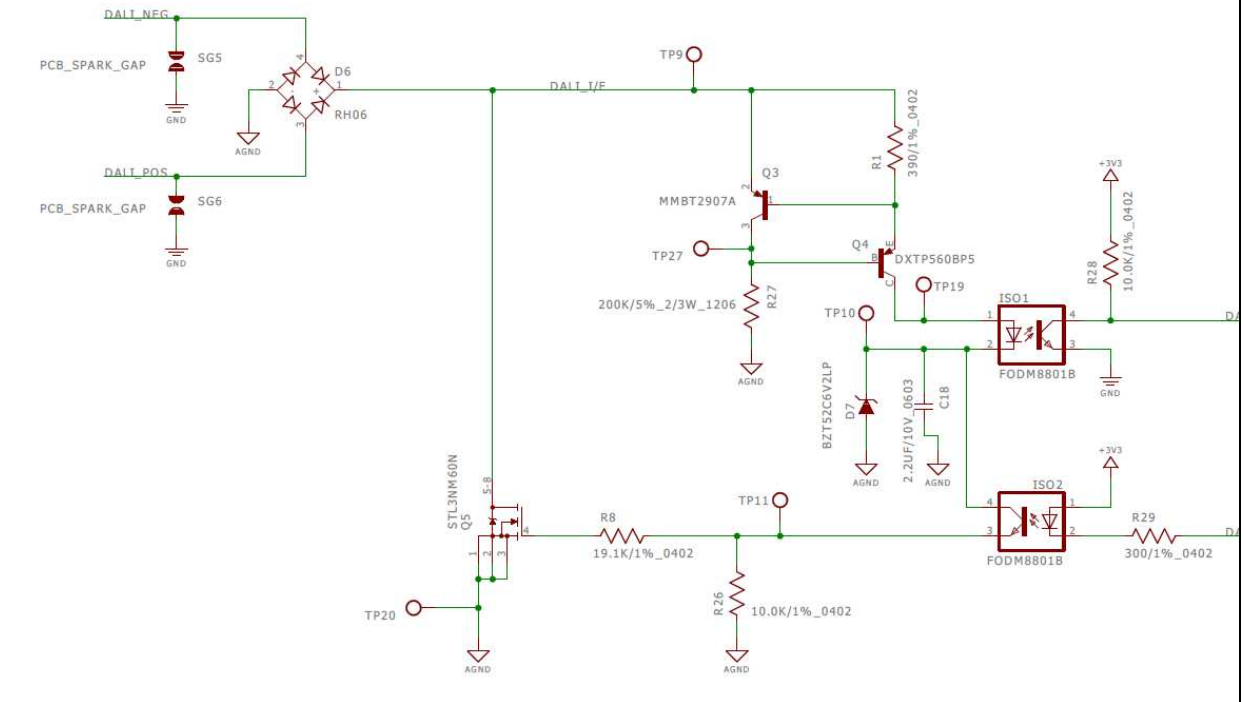


ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

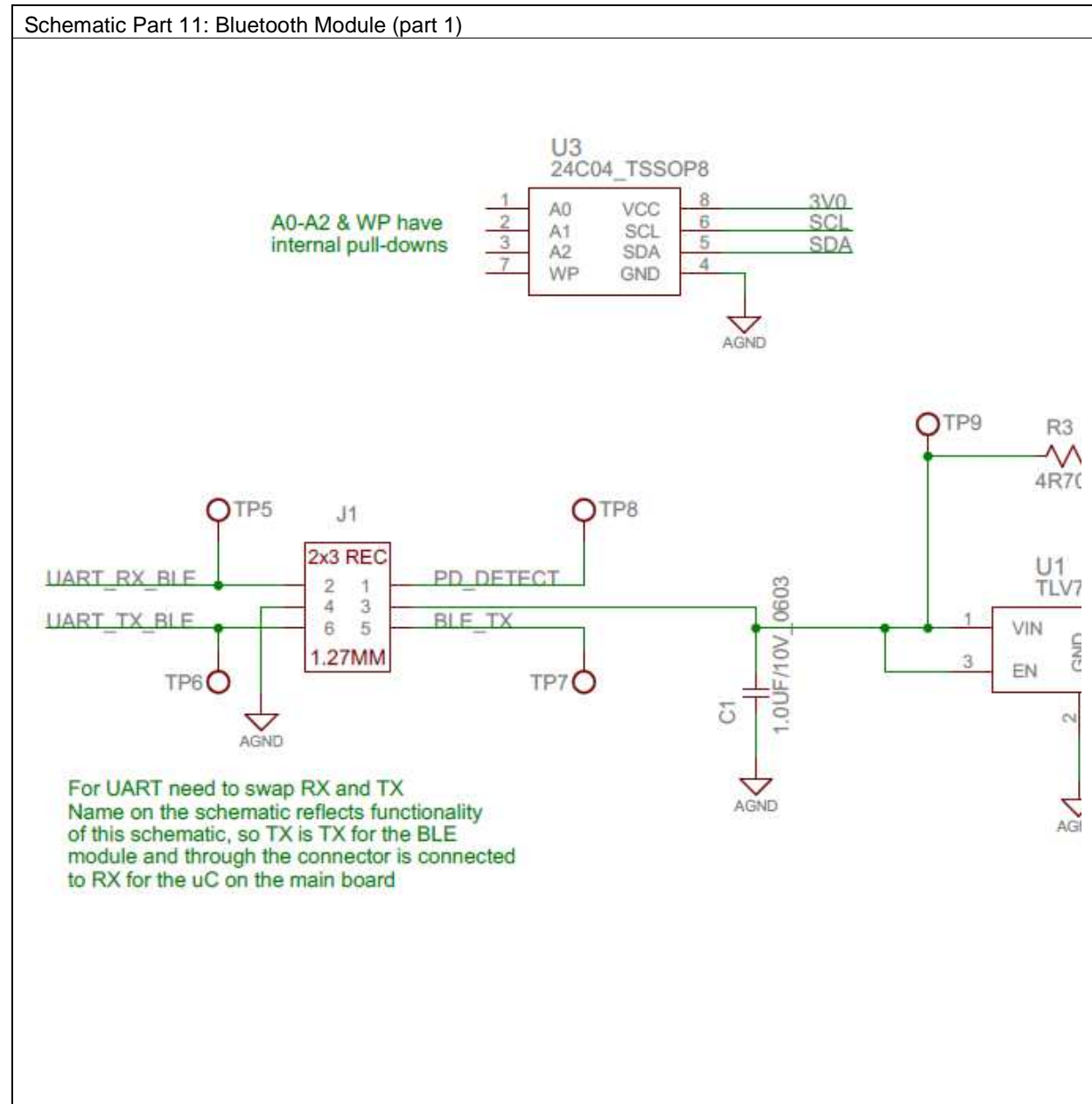
Schematic Part 9 – 0-10V Dimming Output Option:



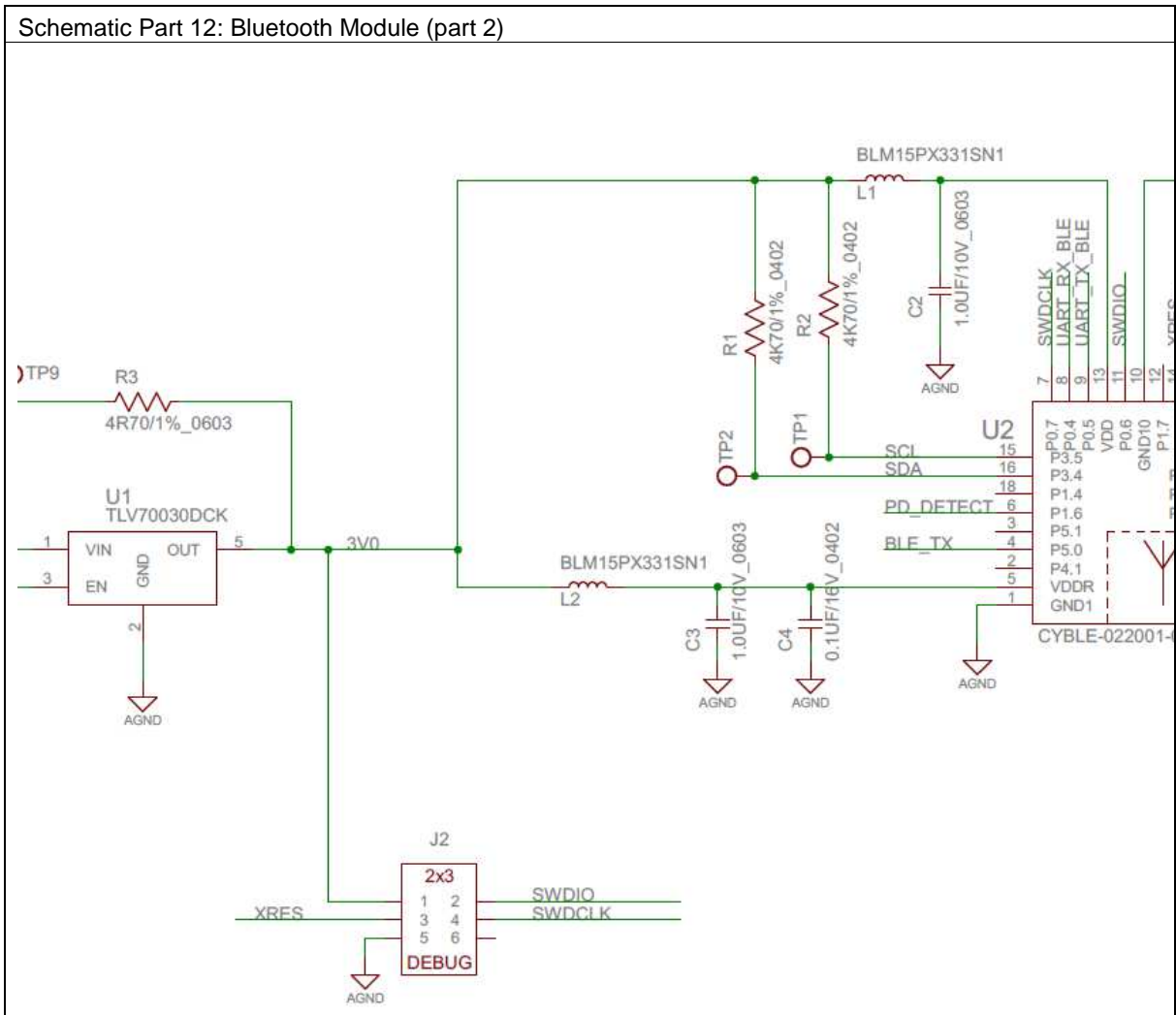
Schematic Part 10 – DALI Dimming Input Option:



ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

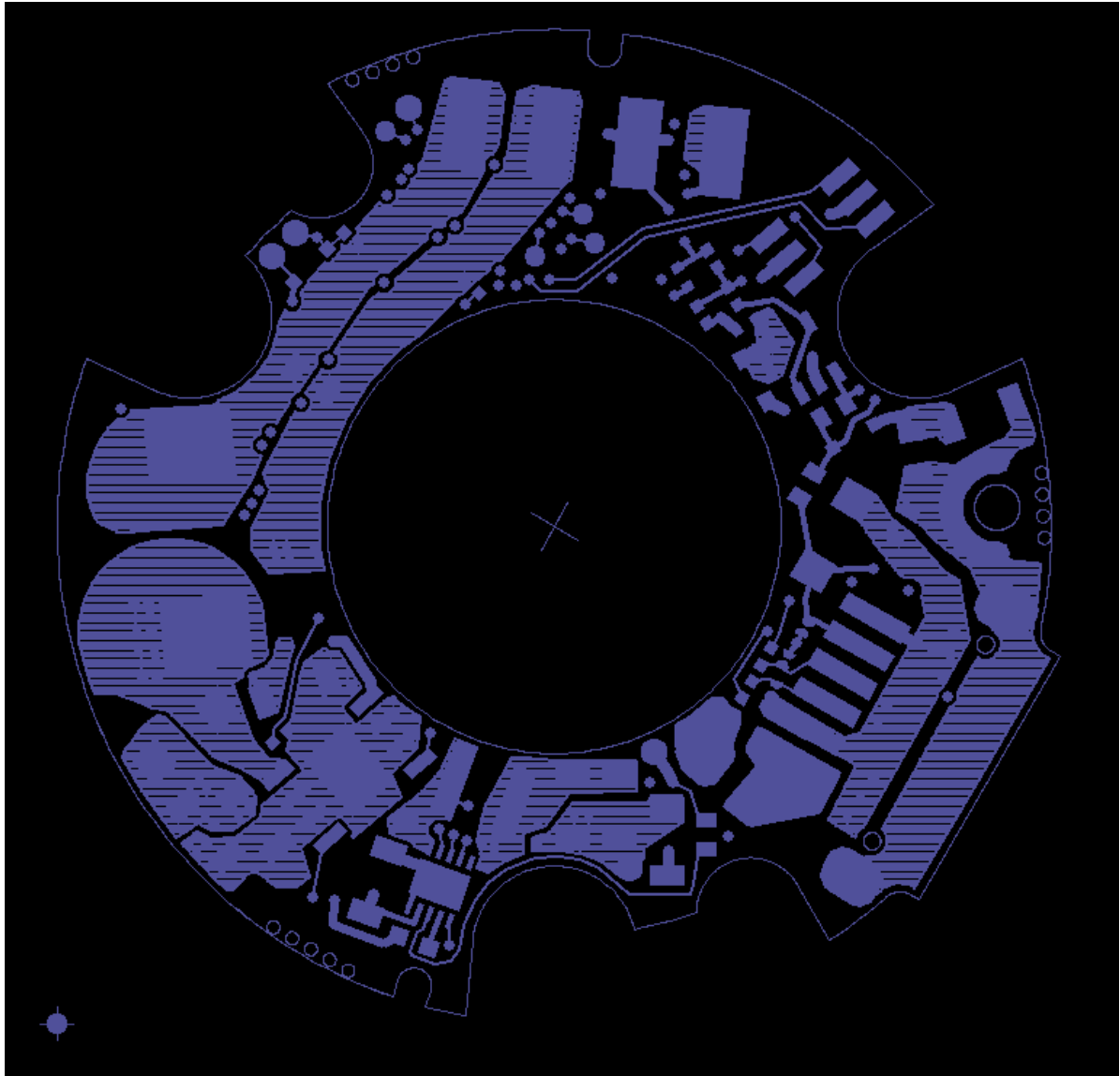


ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT



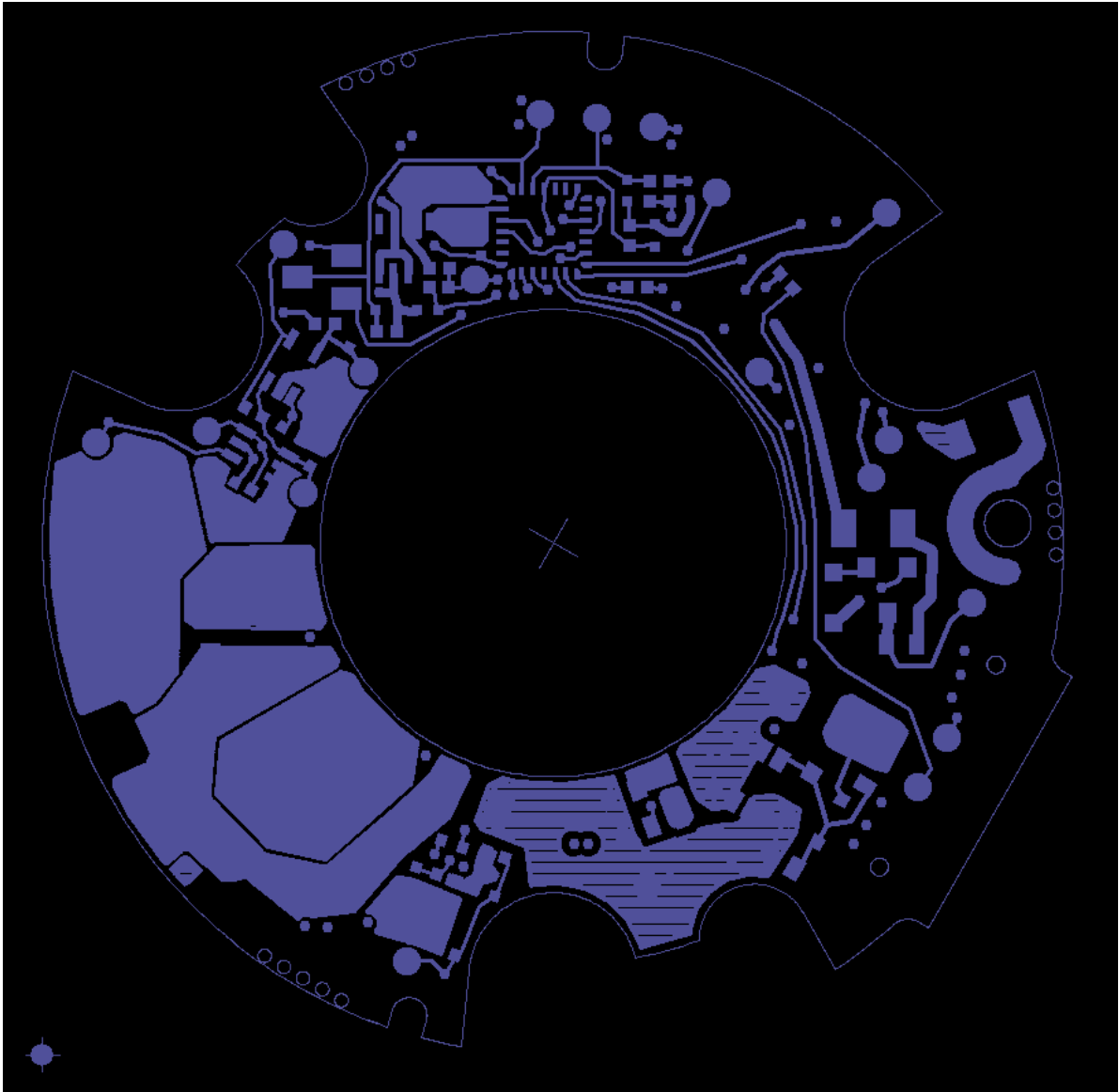
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Top Trace Layout for module with 0-10V dimming



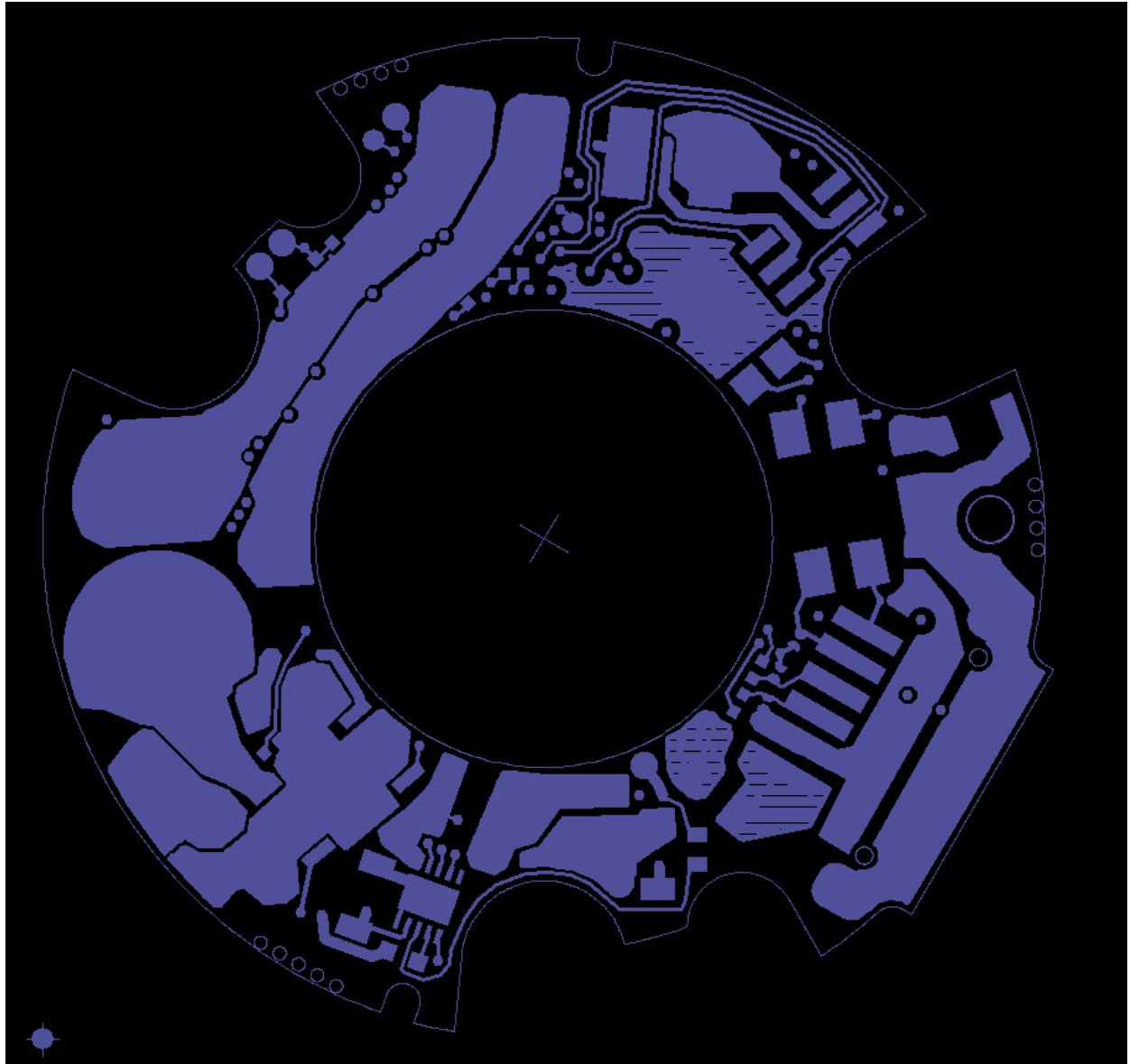
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Bottom Trace Layout for module with 0-10V dimming option



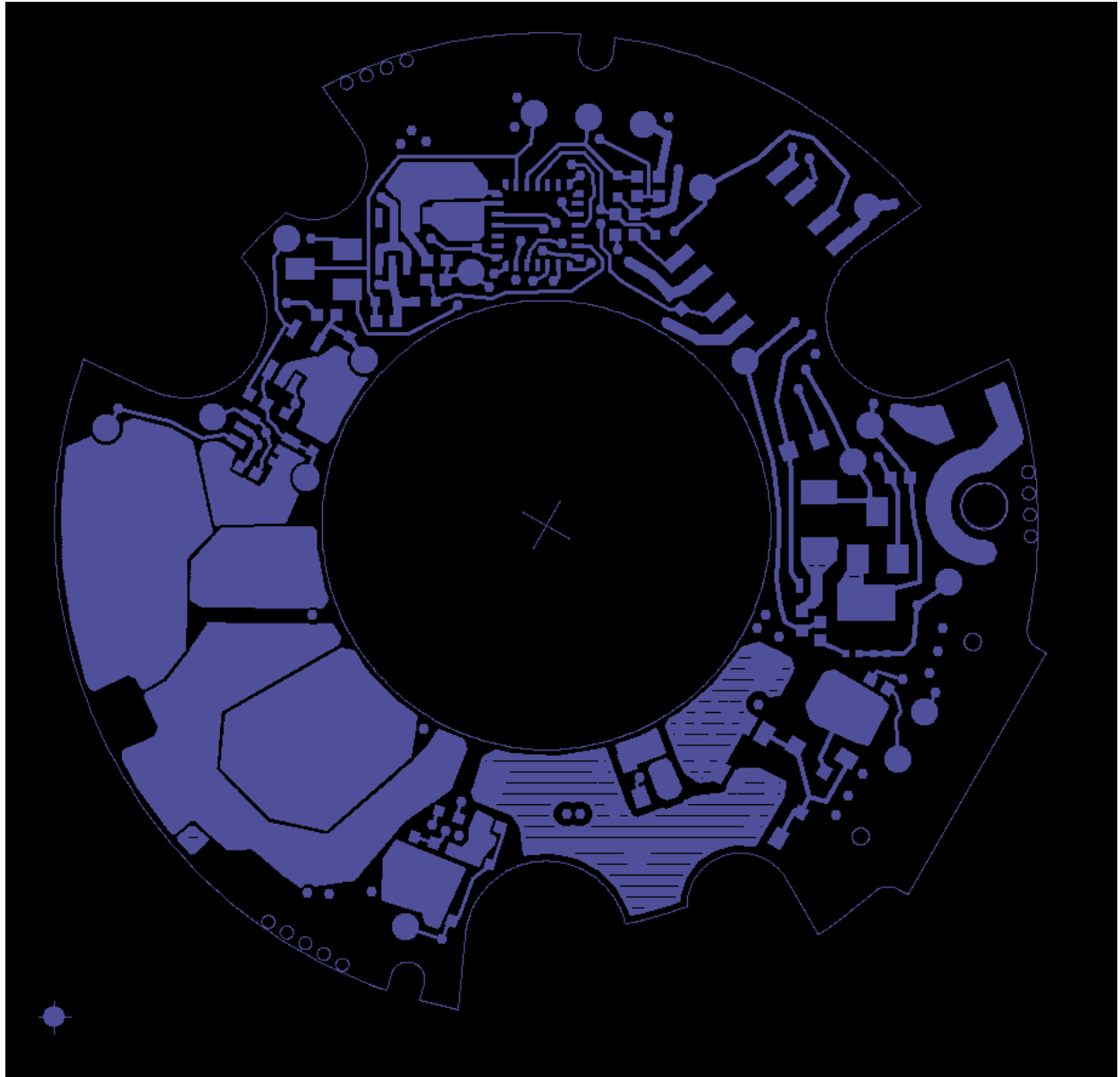
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Top Trace Layout for module with DALI dimming option



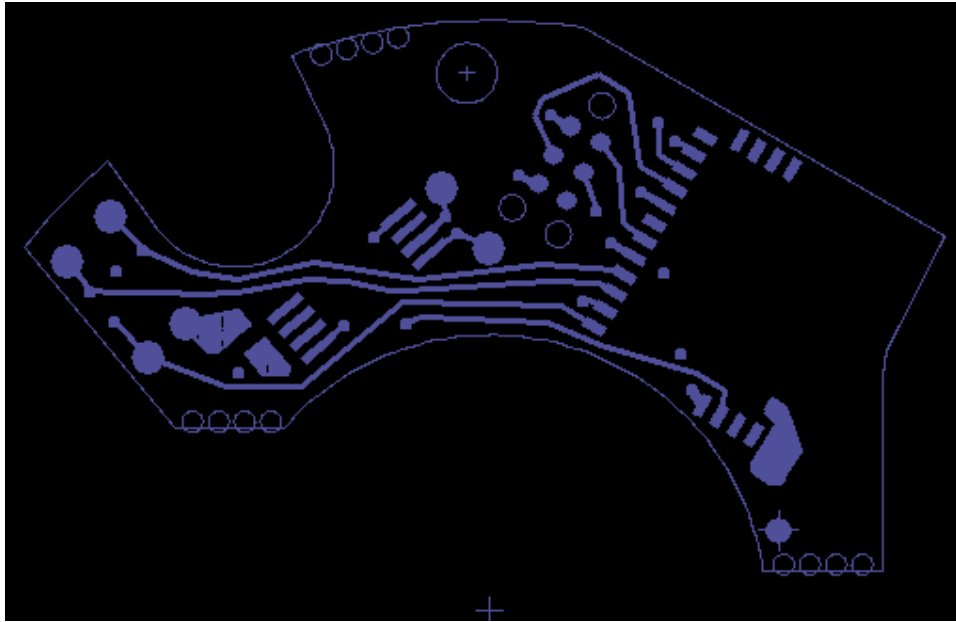
ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Bottom Trace Layout for module with DALI dimming option

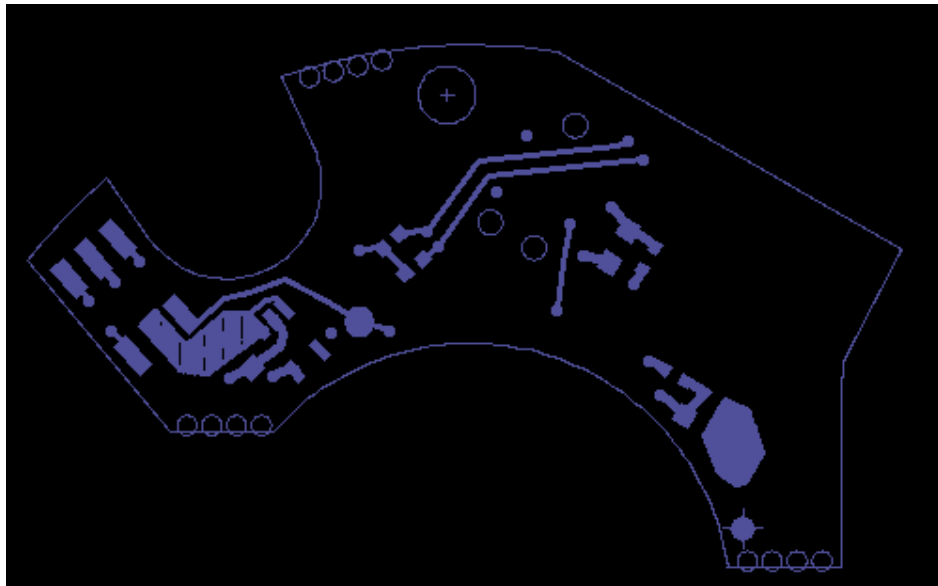


ATTACHMENT 6: SCHEMATIC AND TRACE LAYOUT

Top Trace Layout for Bluetooth Optional Board



Bottom Trace Layout for Bluetooth Option Board



ATTACHMENT 7: PHOTOS

PHOTO 1: Top view of module



PHOTO 2: Bottom view of module



ATTACHMENT 7: PHOTOS

PHOTO 3: Thermal base with PCB removed

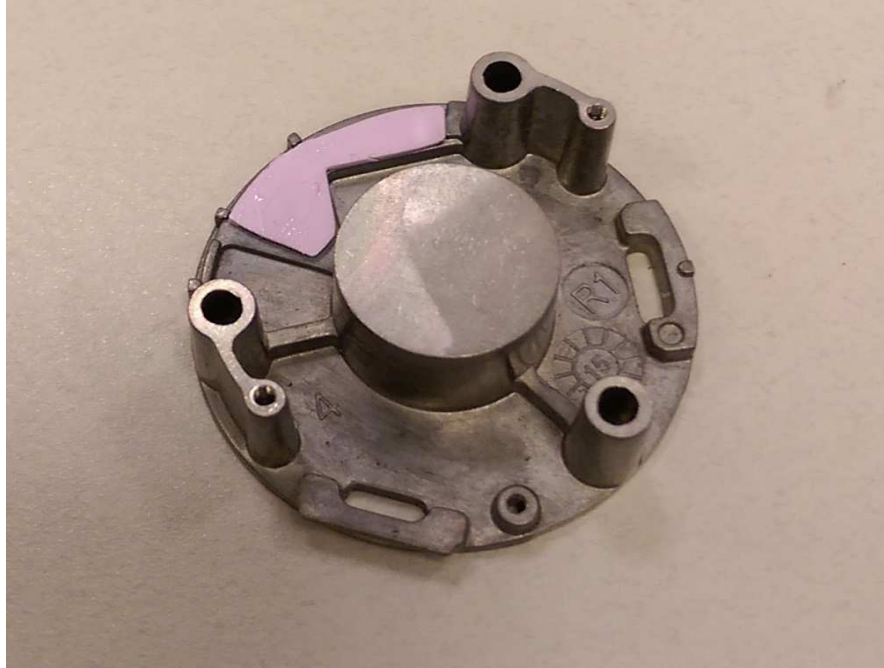
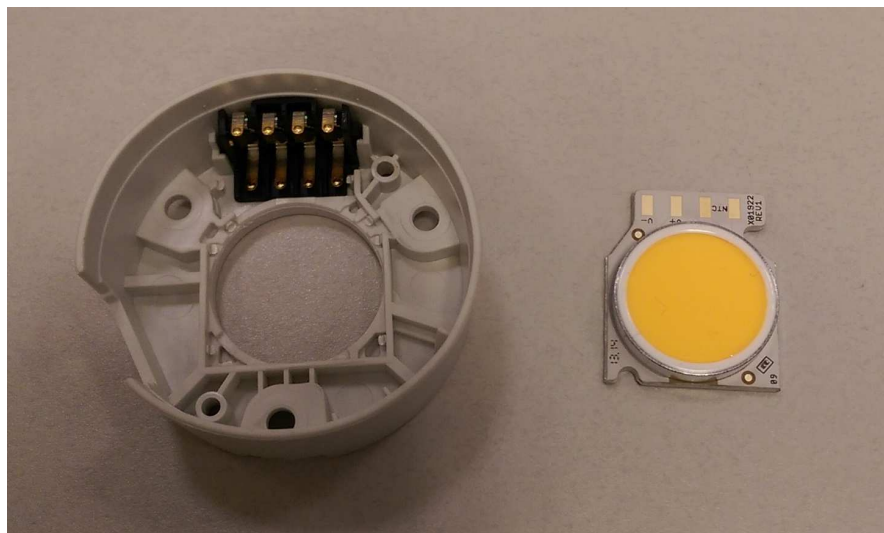


PHOTO 4: Empty enclosure and LED array



ATTACHMENT 7: PHOTOS

PHOTO 5: LED Array in 19 mm and 9 mm

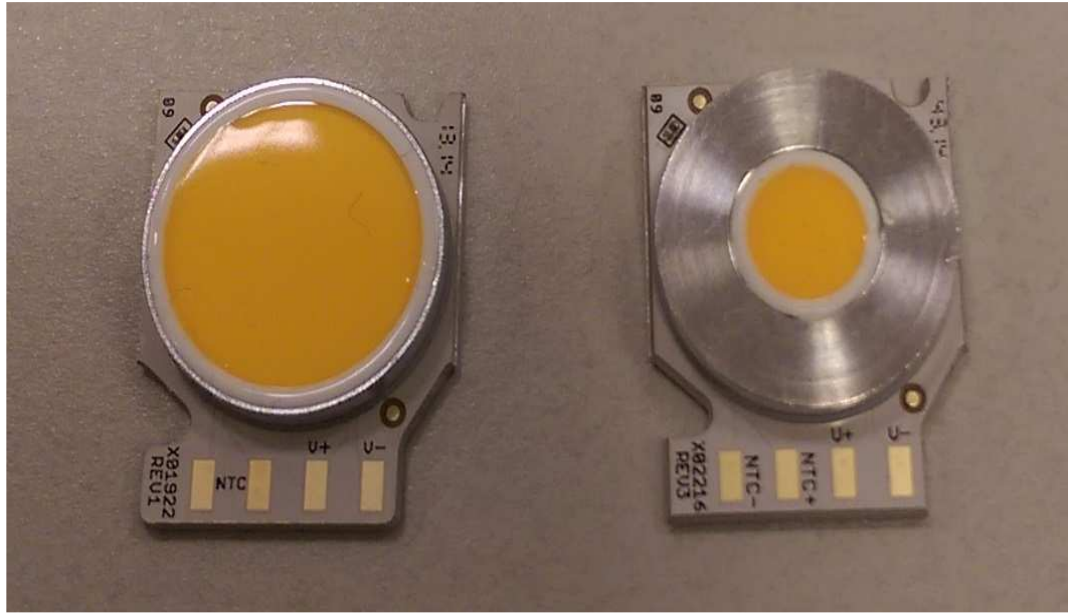
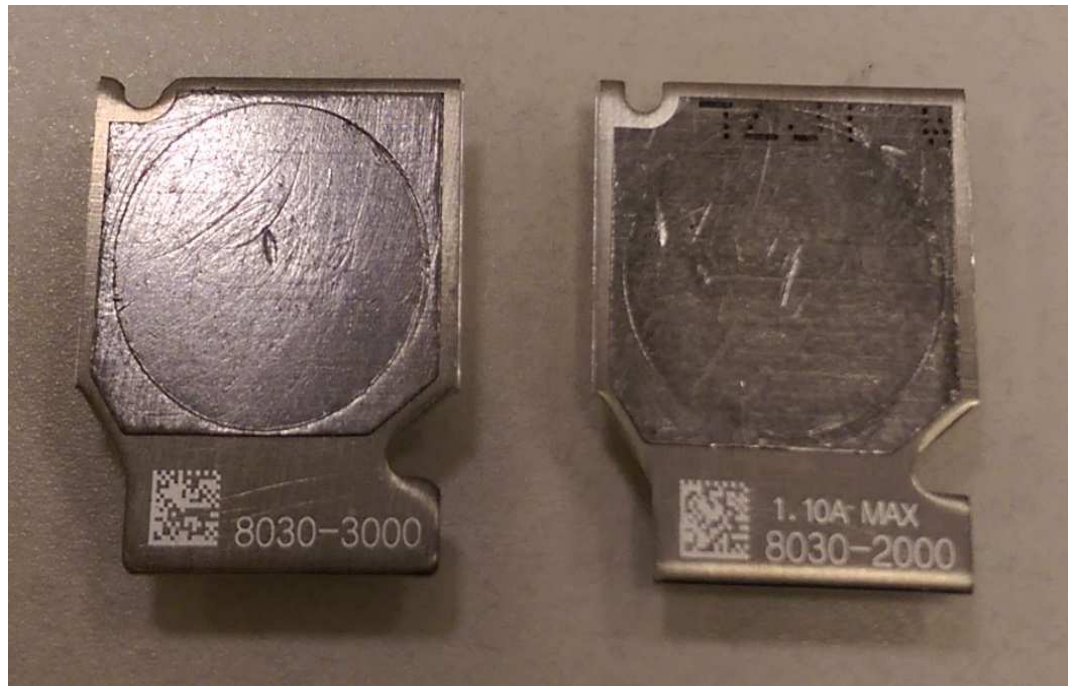


PHOTO 6: LED Array Back Side



ATTACHMENT 7: PHOTOS

PHOTO 7: LED Controlgear PCB, top view with 0-10V dimming option

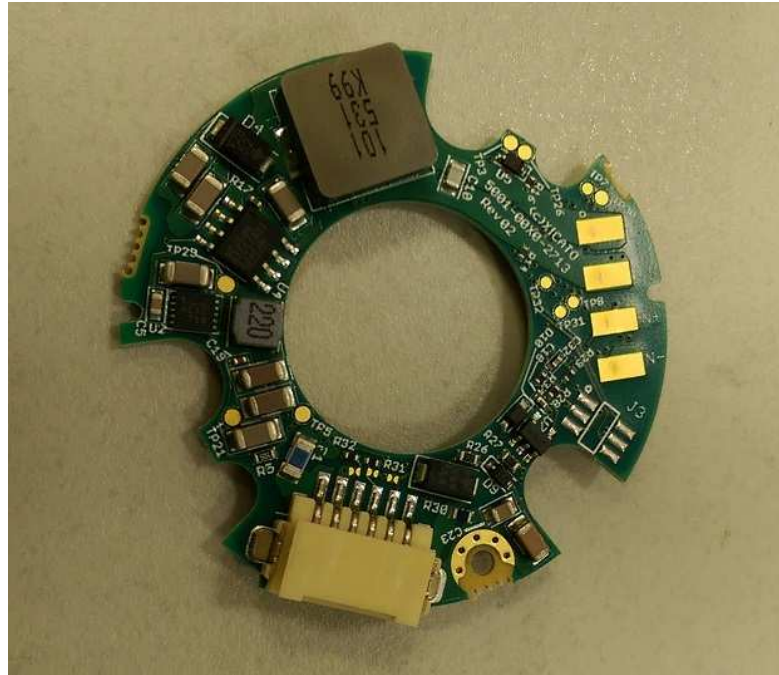
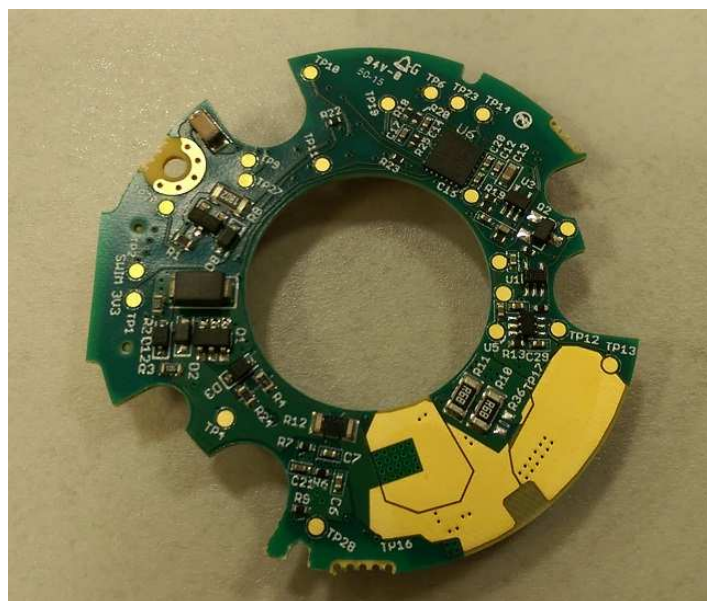


PHOTO 8: LED Controlgear PCB, bottom view with 0-10V dimming option



ATTACHMENT 7: PHOTOS

PHOTO 11: PCB top view, Bluetooth Module option

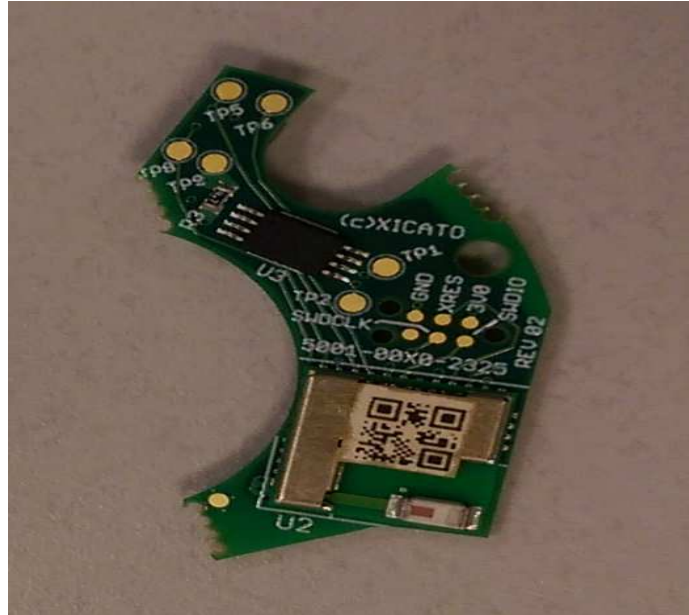
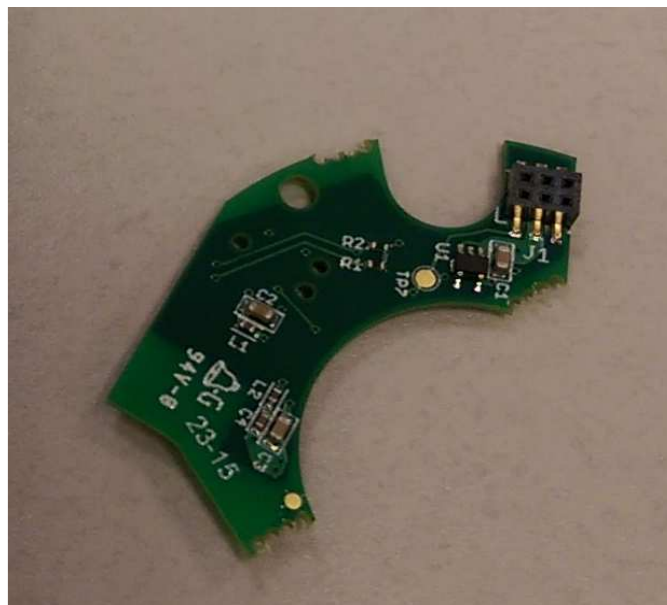


PHOTO 12: PCB bottom view, Bluetooth Module option



ATTACHMENT 7: PHOTOS

PHOTO 13: PCBs assembled to Thermal Base



ATTACHMENT 8: ILLUSTRATIONS

ILLUSTRATION 1: OVERALL ASSEMBLY

ZONE REV	INITIAL RELEASE	DESCRIPTION	EON	DATE	AP/VD
1	3002-0000-2329	UPREV TO 4		2/17/15	
2	2000-0000-2344	UPREV TO 2		4/16/15	
3	3003-0000-2343	UPREV TO 3		4/28/15	

ITEM#	PART#	DESCRIPTION	DATE	QTY
10	XXXXXX-CORE	CORE, GENERIC	XXX	
9	X02230	PCBA, DALI	XXX	1
8	X02108	TIM, CORE	XXX	1
7	X01871	M2X4 PAN HEAD SCREW	XXX	1
6	X01870	M2X8 FLAT HEAD SCREW	XXX	2
5	3003-0000-2348-1	GAP PAD, OPTO XIM-CV50 G2	XXX	1
4	3003-0000-2343-5	GAP PAD, XIM-CV50 G2	XXX	1
3	3003-0000-2331-2	TIM, XIM-CV50 G2	XXX	1
2	3002-0000-2328-4	THERMAL BASE, XIM-CV	XXX	1
1	2000-0000-2344-2	SUB-ASSY, HOUSING, XIM-CV50 G2	XXX	1

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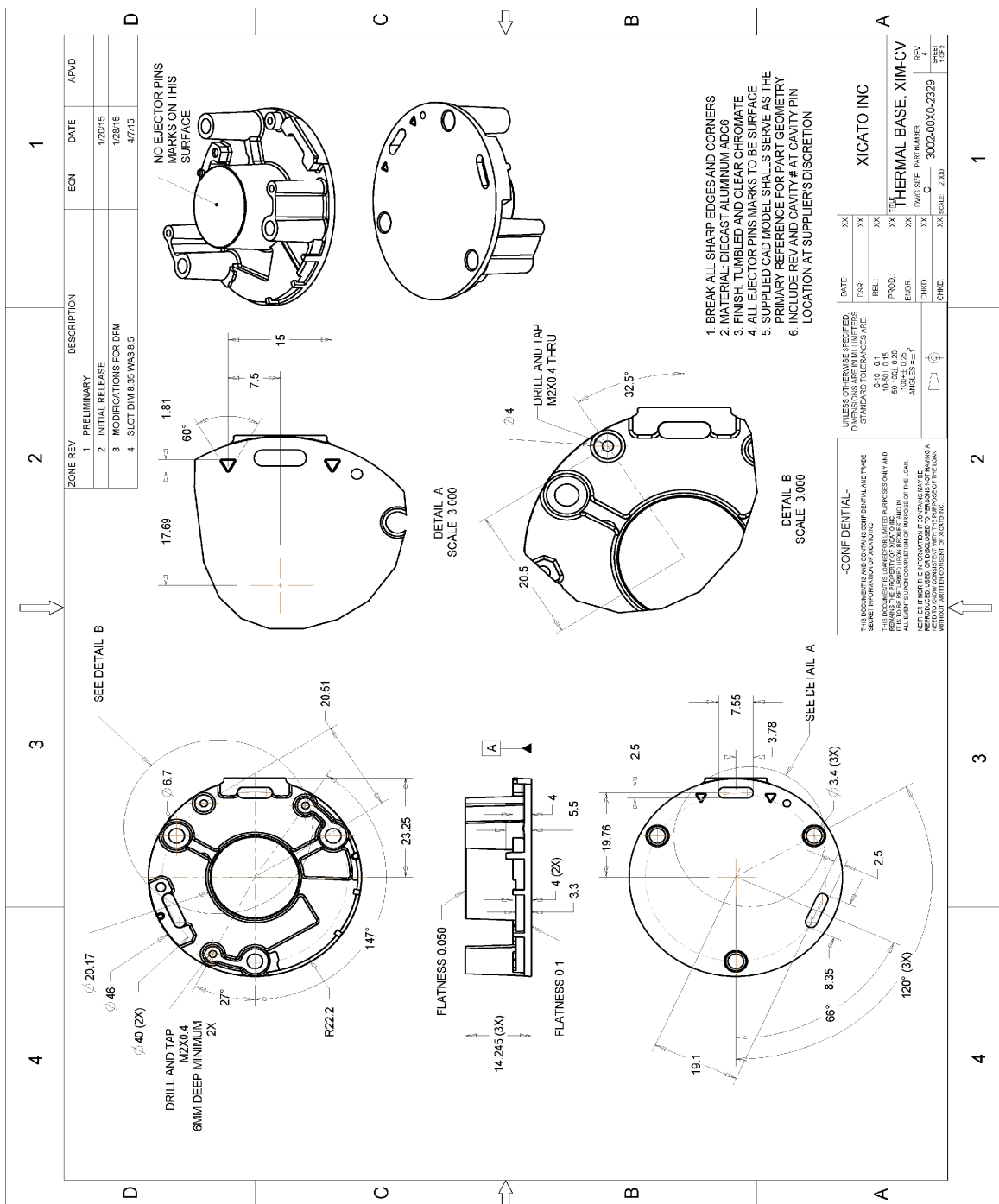
DATE: 04/15/15
 REL: 01/15/15
 PROD: 02/02/15
 ENGR: 02/02/15
 CHND: 02/02/15
 CHND: 02/02/15

XXX SCALE: 2:300

XICATO INC
 THE ASSY, XIM-CV50 G2 DALI
 PART NUMBER
 2000-0000-2346
 REV 1 OF 1

ATTACHMENT 8: ILLUSTRATIONS

ILLUSTRATION 2: Thermal Base



ATTACHMENT 9 – SPECIFICATION SHEET

XICATO®

DETAILED DATA SHEET

XIM LED Module
with Corrected Cold Phosphor Technology®
Standard Series**About Xicato**

Xicato designs and develops light sources and electronics that enable architects, designers and building managers to create beautiful, smart spaces in which people love to live and work. With thousands of installations around the globe, Xicato continues to be a leading supplier of high quality lighting solutions. Xicato is defining the future of intelligent light sources by integrating electronics, software and connectivity. Founded in 2007, Xicato's headquarters is based in Silicon Valley and the company has offices in China, Japan, Europe and the US.

For further information, visit www.xicato.com.

ATTACHMENT 9 – SPECIFICATION SHEET



ABOUT THIS DOCUMENT

This datasheet is just one of many documents and tools available from Xicato to assist lighting designers, specifiers, and luminaire manufacturers in understanding and using Xicato products. These include:

ACCESSORY SELECTION TOOLS (HEATSINKS, OPTICS, DRIVERS)

Xicato has a searchable database of driver, reflectors, and heat sinks that have been evaluated by Xicato and can be integrated with Xicato's light sources. Users can search and filter on a wide range of parameters to match the desired solution for their application. Contact your sales representative or technical application representative for more details.

CAD FILES & DRAWINGS

3D files are available for download on the Xicato website.

APPLICATION & TECHNICAL NOTES

Xicato has an extensive list of application notes for proper handling and usage of the modules.

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IES LM-80	13
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ATTACHMENT 9 – SPECIFICATION SHEET



GENERAL DESCRIPTION

XIM

The Xicato Intelligent Module (XIM) is a compact, integrated LED lighting module designed to fit a wide variety of downlight and spot fixtures, and to simplify the design and assembly of controllable LED luminaires. The XIM includes:

- LED emitting core
- Drive electronics – constant voltage to constant current
- Microprocessor with firmware and static random access memory (SRAM)
- Internal sensors that detect

The extremely high quality integrated XIM driver dims more smoothly and deeply than high-end standalone LED drivers. Combined with Xicato’s industry leading color quality, consistency and application-optimized light spectra, XIM provides simply the most beautiful lit effect.

Integration makes the XIM more affordable to implement and enables smaller downlight or spotlight fixtures.

Xicato is the only light source provider to give long term warranty on both output and color consistency, creating a strong case for lowest total cost of ownership and smallest ecological footprint, while insuring consistent lighting design quality from build to refurbish.

Over its broad dimming range, XIM exceeds the highest international standards for avoiding health effects related to flicker - it is the only LED solution to achieve this.

STANDARD SERIES

Xicato Standard Series products are designed to provide excellent, natural color rendition with high efficiency. XIM Standard Series comes in 2700K, 3000K, 3500K and 4000K CCT, and in flux packages from 700 to 3000 lumens, delivering typical CRI (R_a) of 83, and consistently high R values across all 15 CIE CRI samples.

- 9mm LES ●
- 19mm LES ●

XIM	NOMINAL FLUX	COLOR TEMPERATURE			
		2700	3000	3500	4000
Standard Series CRI 83, GA ₁₈₈ 97	700 lm	●	●	●	●
	1300 lm	● ●	● ●	● ●	● ●
	2000 lm	● ●	● ●	● ●	● ●
	3000 lm	●	●	●	●
Vibrant Series® V80 CRI 83, GA ₁₈₈ 97	700 lm		●		
	1300 lm		● ●		
	2000 lm		● ●		
	3000 lm		●		
Vibrant Series® V95 CRI 83, GA ₁₈₈ 97	700 lm		●		
	1300 lm		● ●		
	2000 lm		●		
Artist Series® CRI 83, GA ₁₈₈ 97	700 lm	●	●	●	●
	1300 lm	● ●	● ●	● ●	● ●
	2000 lm	●	●	●	●

ATTACHMENT 9 – SPECIFICATION SHEET



ORDERING GUIDE

PART NUMBERING SYSTEM

NOTE that all combinations are not available. Please see listing, below.

X	I	M	19	95	30	13	A2	A
Xicato	C = Core I = Intelligent T = Thin	A = Array M = Module	Light Emitting Surface (LES mm) 09 = 9 19 = 19	Series 80 = Standard 95 = Artist BT = Beauty V8 = Vibrant 80 V9 = Vibrant 95	CCT (K) 27 = 2700 30 = 3000 35 = 3500 40 = 4000 01 = NA	Flux (nominal) 07 = 700 13 = 1300 20 = 2000 etc.	Control (XIM) A2 = DALI A3 = 1-10V CC = const. current	Revision

Part code listing on next page...

ATTACHMENT 9 – SPECIFICATION SHEET



PART CODES AND DESCRIPTIONS

XIM STANDARD SERIES WITH 9MM LIGHT EMITTING SURFACE (LES)

Part Number	Description
XIM09802707A2A	LED Module, XIM, LES09, Standard, 2700K, 700LM, DALI
XIM09802707A3A	LED Module, XIM, LES09, Standard, 2700K, 700LM, 1-10V
XIM09802713A2A	LED Module, XIM, LES09, Standard, 2700K, 1300LM, DALI
XIM09802713A3A	LED Module, XIM, LES09, Standard, 2700K, 1300LM, 1-10V
XIM09802720A2A	LED Module, XIM, LES09, Standard, 2700K, 2000LM, DALI
XIM09802720A3A	LED Module, XIM, LES09, Standard, 2700K, 2000LM, 1-10V
XIM09803007A2A	LED Module, XIM, LES09, Standard, 3000K, 700LM, DALI
XIM09803007A3A	LED Module, XIM, LES09, Standard, 3000K, 700LM, 1-10V
XIM09803013A2A	LED Module, XIM, LES09, Standard, 3000K, 1300LM, DALI
XIM09803013A3A	LED Module, XIM, LES09, Standard, 3000K, 1300LM, 1-10V
XIM09803020A2A	LED Module, XIM, LES09, Standard, 3000K, 2000LM, DALI
XIM09803020A3A	LED Module, XIM, LES09, Standard, 3500K, 2000LM, 1-10V
XIM09803507A2A	LED Module, XIM, LES09, Standard, 3500K, 700LM, DALI
XIM09803507A3A	LED Module, XIM, LES09, Standard, 3500K, 700LM, 1-10V
XIM09803513A2A	LED Module, XIM, LES09, Standard, 3500K, 1300LM, DALI
XIM09803513A3A	LED Module, XIM, LES09, Standard, 3500K, 1300LM, 1-10V
XIM09803520A2A	LED Module, XIM, LES09, Standard, 3500K, 2000LM, DALI
XIM09803520A3A	LED Module, XIM, LES09, Standard, 3500K, 2000LM, 1-10V
XIM09804007A2A	LED Module, XIM, LES09, Standard, 4000K, 700LM, DALI
XIM09804007A3A	LED Module, XIM, LES09, Standard, 4000K, 700LM, 1-10V
XIM09804013A2A	LED Module, XIM, LES09, Standard, 4000K, 1300LM, DALI
XIM09804013A3A	LED Module, XIM, LES09, Standard, 4000K, 1300LM, 1-10V
XIM09804020A2A	LED Module, XIM, LES09, Standard, 4000K, 2000LM, DALI
XIM09804020A3A	LED Module, XIM, LES09, Standard, 4000K, 2000LM, 1-10V

Suggested Cable Harness
(one per unit,
order separately)

XSA-331

XIM 6-pin 600mm
1-10V/DALI
Wire Harness

ATTACHMENT 9 – SPECIFICATION SHEET



XIM STANDARD SERIES WITH 19MM LIGHT EMITTING SURFACE (LES)

Part Number	Description
XIM19802713A2A	LED Module, XIM, LES19, Standard, 2700K, 1300LM, DALI
XIM19802713A3A	LED Module, XIM, LES19, Standard, 2700K, 1300LM, 1-10V
XIM19802720A2A	LED Module, XIM, LES19, Standard, 2700K, 2000LM, DALI
XIM19802720A3A	LED Module, XIM, LES19, Standard, 2700K, 2000LM, 1-10V
XIM19802730A2A	LED Module, XIM, LES19, Standard, 2700K, 3000LM, DALI
XIM19802730A3A	LED Module, XIM, LES19, Standard, 2700K, 3000LM, 1-10V
XIM19803013A2A	LED Module, XIM, LES19, Standard, 3000K, 1300LM, DALI
XIM19803013A3A	LED Module, XIM, LES19, Standard, 3000K, 1300LM, 1-10V
XIM19803020A2A	LED Module, XIM, LES19, Standard, 3000K, 2000LM, DALI
XIM19803020A3A	LED Module, XIM, LES19, Standard, 3000K, 2000LM, 1-10V
XIM19803030A2A	LED Module, XIM, LES19, Standard, 3000K, 3000LM, DALI
XIM19803030A3A	LED Module, XIM, LES19, Standard, 3000K, 3000LM, 1-10V
XIM19803513A2A	LED Module, XIM, LES19, Standard, 3500K, 1300LM, DALI
XIM19803513A3A	LED Module, XIM, LES19, Standard, 3500K, 1300LM, 1-10V
XIM19803520A2A	LED Module, XIM, LES19, Standard, 3500K, 2000LM, DALI
XIM19803520A3A	LED Module, XIM, LES19, Standard, 3500K, 2000LM, 1-10V
XIM19803530A2A	LED Module, XIM, LES19, Standard, 3500K, 3000LM, DALI
XIM19803530A3A	LED Module, XIM, LES19, Standard, 3500K, 3000LM, 1-10V
XIM19804013A2A	LED Module, XIM, LES19, Standard, 4000K, 1300LM, DALI
XIM19804013A3A	LED Module, XIM, LES19, Standard, 4000K, 1300LM, 1-10V
XIM19804020A2A	LED Module, XIM, LES19, Standard, 4000K, 2000LM, DALI
XIM19804020A3A	LED Module, XIM, LES19, Standard, 4000K, 2000LM, 1-10V
XIM19804030A2A	LED Module, XIM, LES19, Standard, 4000K, 3000LM, DALI
XIM19804030A3A	LED Module, XIM, LES19, Standard, 4000K, 3000LM, 1-10V

Suggested Cable Harness
(one per unit,
order separately)

XSA-331

XIM 6-pin 600mm
1-10V/DALI
Wire Harness

ATTACHMENT 9 – SPECIFICATION SHEET



MECHANICAL CHARACTERISTICS

MECHANICAL SPECIFICATIONS

Dimensions:	50mm x 20mm (1.97" x 0.78") * Xicato recommends an allowance of +2mm (0.08") in diameter
Weight:	48 grams (1.69 oz.)
Module Source Type:	Corrected Cold Phosphor Technology®
Module Housing:	Injection molded glass filled PBT
Light Emitting Surface options:	Ø 9mm (0.35") Ø 19mm (0.75")
Interfaces: Electrical	6-Pin terminal. Tyco part # 353908-6P. Mating connector Tyco 353907-1. Pin-out: P1 + power, P2 - power, P3 open, P4 open, P5 control+, P6 control-. 600mm wire harness accessory available through Avnet (part #2829114-2), Xicato Part # XSA-331.
Interfaces: Mechanical	Recommended mounting screws: M3 x 0.5mm x 25mm with split lock washer.
Mounting Torque:	Min: 0.36N-m (3.2in-lbs). Max: 0.43N-m (3.8in-lbs)
Interface: Thermal	Integrated thermal pad. A mating thermal interface (i.e. heatsink) surface flatness of ≤ 0.1 mm and center hole less than Ø12 mm is recommended in order to maintain thermal performance.
Maximum Case Temperature:	90°C
Shipping (100 count box):	533mm x 254mm x 153mm (21" x 10" x 6") 3 kg (7 lbs.)
Storage Temperature:	-40°C to +85°C



XIM 9mm



XIM 9mm top



XIM 19mm



XIM 19mm top

ATTACHMENT 9 – SPECIFICATION SHEET



ZONE/REV	DESCRIPTION	ECN	DATE	APVD

**XIMCV SIDE ACCESS DETAIL
6 PIN MINI CT CONNECTOR**

24.8
TO BACK
TO MATE
OF MATING
CONNECTOR

4

XIMCV PIN OUT					
PIN#	WIRE COLOR	FUNCTION	AWG	RATING	LENGTH
1	RED	+48V POWER	24 (1.12 MM MAX INULATION OD)	1200mA	600 MM
2	BLACK	-48V POWER	24 (1.12 MM MAX INULATION OD)	1200mA	600 MM
3	DNU	XICATO RESERVED	N/A	N/A	N/A
4	DNU	XICATO RESERVED	N/A	N/A	N/A
5	VIOLET	1-10V DALI CONTROL 1	24 (1.12 MM MAX INULATION OD)	50V 250mA	600 MM
6	GREY	1-10V DALI CONTROL 2	24 (1.12 MM MAX INULATION OD)	50V 250mA	600 MM

6.85

5.8
TO BASE OF
MATING CONNECTOR

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DATE: XIC DESK: XIC REL: XIC PROC: XIC ENGR: XIC CHKD: XIC CHECKED: XIC	TITLE: XIC DWG NO: XIC DWG SCALE: 2:100 REV: XIC DATE: XIC

ATTACHMENT 9 – SPECIFICATION SHEET



ELECTRICAL CHARACTERISTICS

Module Electronics Lifetime 100,000 hrs. MTBF @ 90°C

OVER TEMPERATURE PROTECTION

Fold Back Temperature	93°C (reduces to 85% of set level)
Shut-off Temperature	98°C
Restore Temperature	85°C (increases back to 100% of set level)

SENSOR DATA COLLECTION & STORAGE

Operating Parameters	Electronics temperature LEDs temperature Operating time Intensity level
Data Storage Format	Histogram representing time spent at operating parameter range

DIMMING INFORMATION: DALI (XIM-----A2A)

Dimming Protocol	DALI (IEC 62386-101/102:2009 and IEC 62386-207)
Dimming Profile	Logarithmic (default) or linear, configurable
Dimming Compatibility	DALI 1.0. Additional compatibility information available at www.xicato.com
Potentiometer Compatibility	NA
Modulation	Frequency > 1,250Hz between 1% and 100% light output level Modulation between 0% and 20% of max Modulation and frequency fall within the Recommended Operating Area of IEEE Std 1789-2015 (IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers).

DIMMING INFORMATION: 1-10V (XIM-----A3A)

Dimming Protocol	1-10V / 0-10V (IEC 60929 Annex E)								
Dimming Profile	<table> <tr> <td>< 0.5V</td> <td>0% (off) (> 0.75V to turn back on)</td> </tr> <tr> <td>≥ 0.5V and < 1.0V</td> <td>1%</td> </tr> <tr> <td>≥ 1.0V and < 9.0V</td> <td>12.375% x (V_{1-10V} - 1) + 1%</td> </tr> <tr> <td>≥ 9.0V</td> <td>100%</td> </tr> </table>	< 0.5V	0% (off) (> 0.75V to turn back on)	≥ 0.5V and < 1.0V	1%	≥ 1.0V and < 9.0V	12.375% x (V _{1-10V} - 1) + 1%	≥ 9.0V	100%
< 0.5V	0% (off) (> 0.75V to turn back on)								
≥ 0.5V and < 1.0V	1%								
≥ 1.0V and < 9.0V	12.375% x (V _{1-10V} - 1) + 1%								
≥ 9.0V	100%								
Dimming Compatibility	XIM is compatible with a wide range of 1-10V sink dimming systems. Refer to dimming compatibility documentation at www.xicato.com .								
Potentiometer Compatibility	100kOhm typical								
Modulation	Frequency > 1,250Hz between 1% and 100% light output level Modulation between 0% and 20% of max Modulation and frequency fall within the Recommended Operating Area of IEEE Std 1789-2015 (IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers).								

ATTACHMENT 9 – SPECIFICATION SHEET



COLOR METRICS: STANDARD SERIES

Optimized for excellent, natural color rendition with high efficiency.

All color rendering data at highest rated drive current and 70°C case temperature (T_c)

Correlated Color Temperature: 2700K, 3000K, 3500K, or 4000K nominal
3000K used as test reference.

Initial Color Consistency: ≤ 1 x 2 Macadam ellipses (SDCM) at 70°C, B0

CIE CRI Minimums: R_a ≥ 80, R₉ ≥ 0

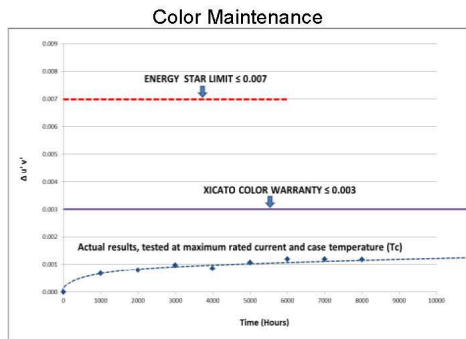
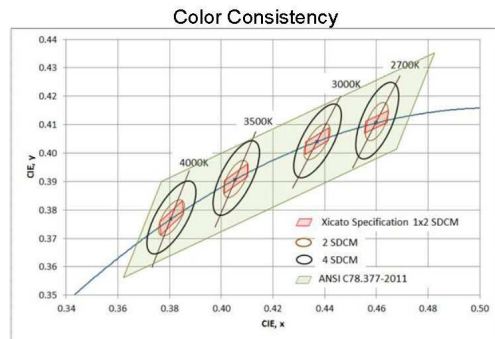
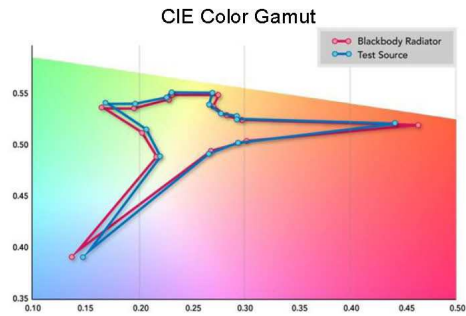
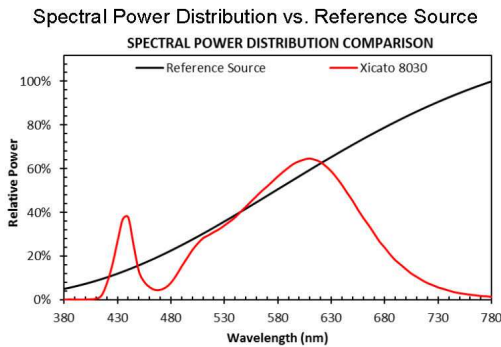
Color Maintenance: Consistency maintained < 0.003 Δu'v' at 50,000 hours

Lumen Maintenance: L70/B0 at 50,000 hours

Warranty: Verifiable 7 years or 50,000 hours for individual modules (B0) on mortality, color and lumen maintenance (XIM only). Details at www.xicato.com/support/warranty

CIE CRI COLOR METRICS (VALUES ARE TYPICAL)

	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	GAI _{BB}
Standard Series	83	80	88	95	81	80	85	85	63	14	73	80	70	81	97	74	96



ATTACHMENT 9 – SPECIFICATION SHEET



IES TM-30 COLOR METRICS

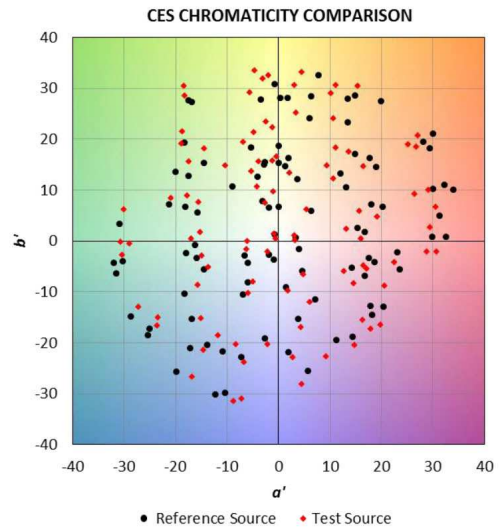
(Values are typical. Based on 3000K CCT)

IES TM-30 Color Fidelity (R_f) 78

IES TM-30 Color Gamut (R_g) 101

CES CHROMATICITY COMPARISON

This plot shows the shift in chromaticity for each individual color evaluation sample (CES). Closer proximity between paired dots indicates higher fidelity.

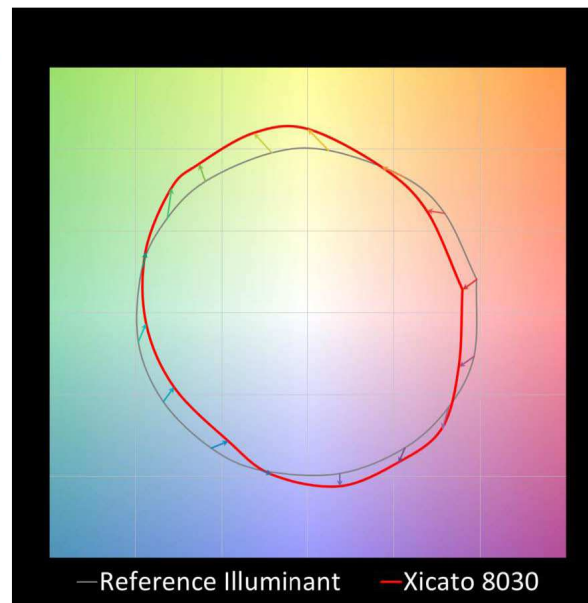


COLOR VECTOR GRAPHIC

This plot shows the average chromaticity shift for the samples within each of 16 hue bins, which are compiled out of the 99 IES TM-30 Color Evaluation Samples. The values are normalized so that the reference is a circle.

Vector arrows indicate the direction and degree of the shift for each hue bin.

- Radial shift indicates an increase/decrease in saturation.
- Tangential shift indicates a shift in hue.
- Length of arrow indicates degree of shift.



ATTACHMENT 9 – SPECIFICATION SHEET

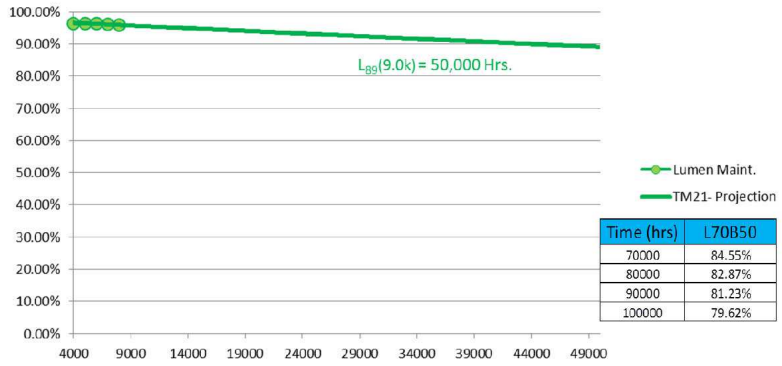


IES LM-80

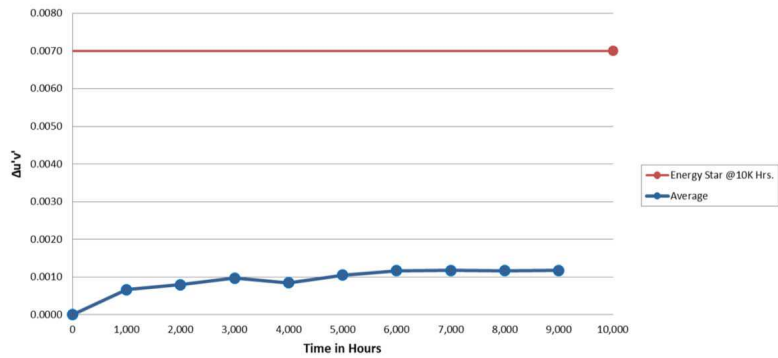
STANDARD SERIES, 19MM, 3000K, 3000 LUMENS

Testing conducted at BACL. $T_c = 90^\circ\text{C}$, $I_f = 1050\text{mA}$, HTOL, 8000 Hrs.

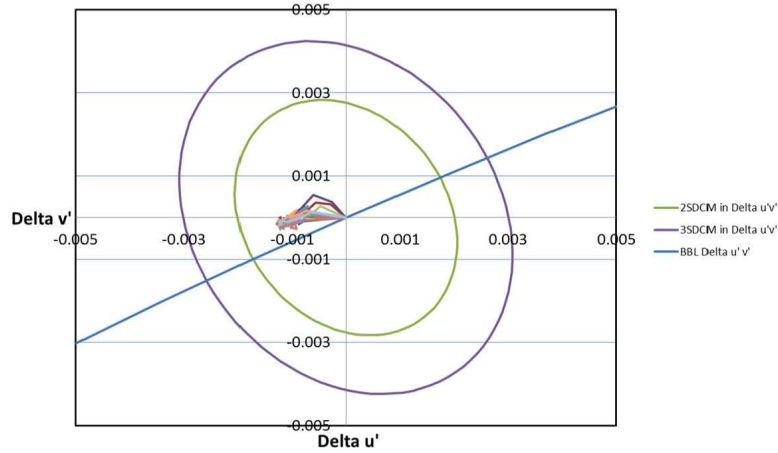
LUMEN MAINTENANCE



COLOR MAINTENANCE



COLOR MAINTENANCE (NORMALIZED)



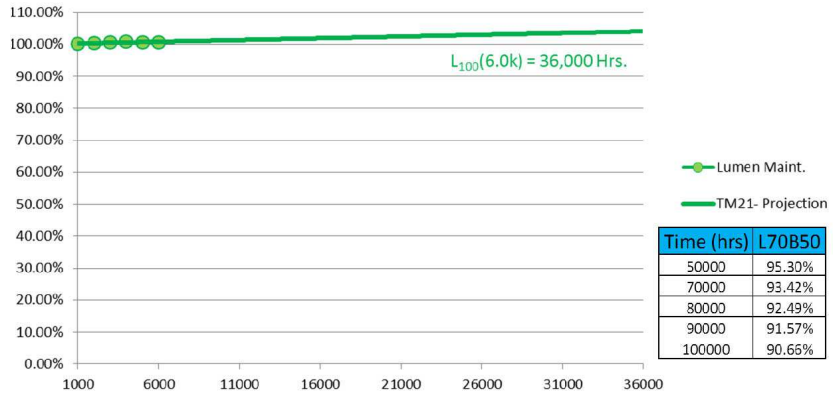
ATTACHMENT 9 – SPECIFICATION SHEET



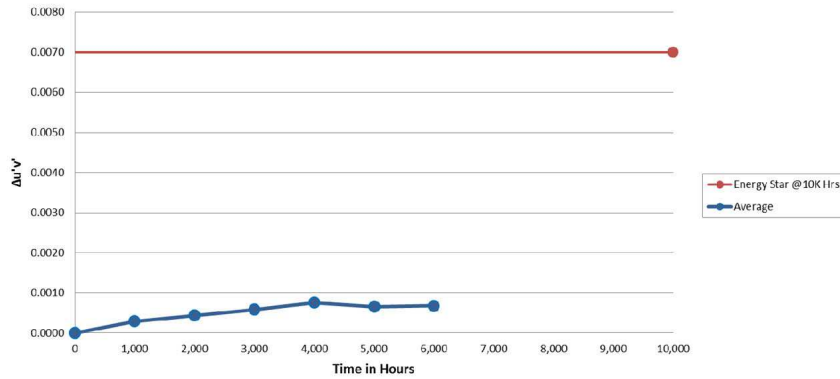
STANDARD SERIES, 19MM, 3000K, 5000 LUMENS

Testing conducted at BACL. $T_c = 90^\circ\text{C}$, $I_f = 1400\text{mA}$, HTOL, 6000 Hrs.

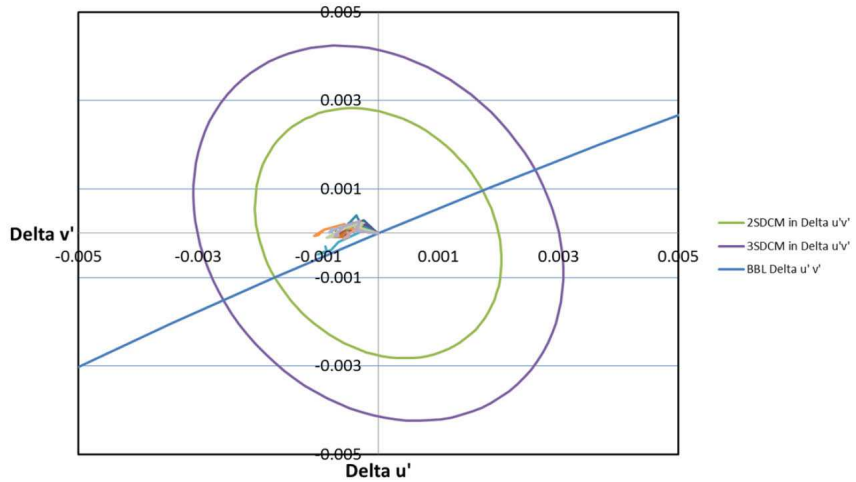
LUMEN MAINTENANCE



COLOR MAINTENANCE



COLOR MAINTENANCE (NORMALIZED)



ATTACHMENT 9 – SPECIFICATION SHEET



PERFORMANCE CHARACTERISTICS

More extensive performance data is available from your Xicato sales representative.

NOTES:

1. Data shown in the tables below are taken at a recommended operating test point (Tc) temperature of 70°C.
2. Voltage data is based on 20°C to 90°C operating range. For operation outside this range, contact Xicato.
3. Module is designed for use with a 48V DC constant voltage power supply.
 - a. Absolute minimum voltage is 41V.
 - b. Absolute maximum voltage is 56V.
4. These specifications include PSU output tolerance, ripple, noise, wire length voltage drop, line regulation, load regulation, over/undershoot, turn on delay, or any other source of variation.
5. While the PSU is energized, the PSU must be able to supply up to 5mA, even when the light is commanded off via a lighting control system.
6. Specifications for DALI (A2A) and 1-10V (A3A) variants are the same
7. CCT data ANSI/NEMA compliant.
8. Absolute range of lumen output is $\pm 10\%$ of typical value.
9. Specifications are subject to change without notice.

INITIAL COLOR CONSISTENCY

Correlated Color Temp		Initial Color Consistency		
Nominal	Actual	CCT	SDCM	$\Delta u'v'$
2700K	2700K	$\pm 40K$	$\leq 1 \times 2$	0.001
3000K	2950K	$\pm 50K$		
3500K	3420K	$\pm 60K$		
4000K	4000K	$\pm 70K$		

ATTACHMENT 9 – SPECIFICATION SHEET



TYPICAL PERFORMANCE*

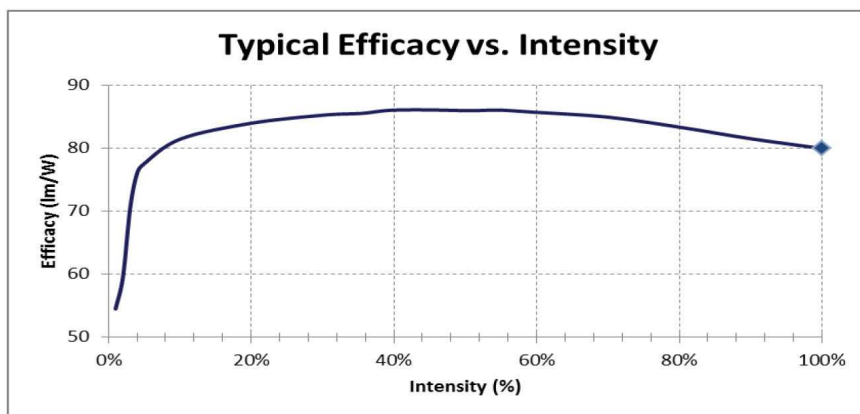
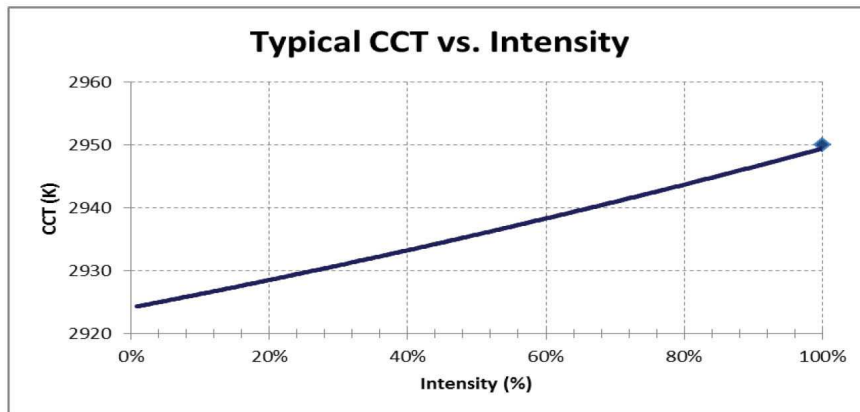
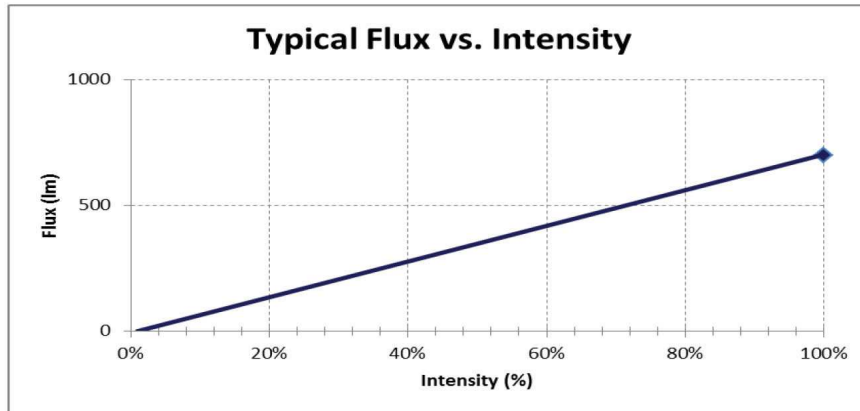
XIM Part Number	LES	CCT	Lumens	mA (Min)	Watts Typ	Watts Max	Lm/W
XIM09802707AxA	9mm	2700	700	360	9.7	10.4	72
XIM09802713AxA	9mm	2700	1,300	460	17.6	18.8	74
XIM09802720AxA	9mm	2700	2,000	845	32.2	34.6	62
XIM09803007AxA	9mm	3000	700	360	9.7	10.4	72
XIM09803013AxA	9mm	3000	1,300	580	17.6	18.8	74
XIM09803020AxA	9mm	3000	2,000	845	32.2	34.6	62
XIM09803507AxA	9mm	3500	700	360	9.7	10.4	72
XIM09803513AxA	9mm	3500	1,300	580	17.6	18.8	74
XIM09803520AxA	9mm	3500	2,000	845	32.2	34.6	62
XIM09804007AxA	9mm	4000	700	360	9.7	10.4	72
XIM09804013AxA	9mm	4000	1,300	580	17.6	18.8	74
XIM09804020AxA	9mm	4000	2,000	845	32.2	34.6	62
XIM19802713AxA	19mm	2700	1,300	360	13.1	14.8	99
XIM19802720AxA	19mm	2700	2,000	580	21.2	23.8	94
XIM19802730AxA	19mm	2700	3,000	863	31.8	35.4	94
XIM19803013AxA	19mm	3000	1,300	360	13.1	14.8	99
XIM19803020AxA	19mm	3000	2,000	580	21.2	23.8	94
XIM19803030AxA	19mm	3000	3,000	863	31.8	35.4	94
XIM19803513AxA	19mm	3500	1,300	360	13.1	14.8	99
XIM19803520AxA	19mm	3500	2,000	580	21.2	23.8	94
XIM19803530AxA	19mm	3500	3,000	863	31.8	35.4	94
XIM19804013AxA	19mm	4000	1,300	360	13.1	14.8	99
XIM19804020AxA	19mm	4000	2,000	580	21.2	23.8	94
XIM19804030AxA	19mm	4000	3,000	863	31.8	35.4	94

* See NOTES on previous page.

ATTACHMENT 9 – SPECIFICATION SHEET



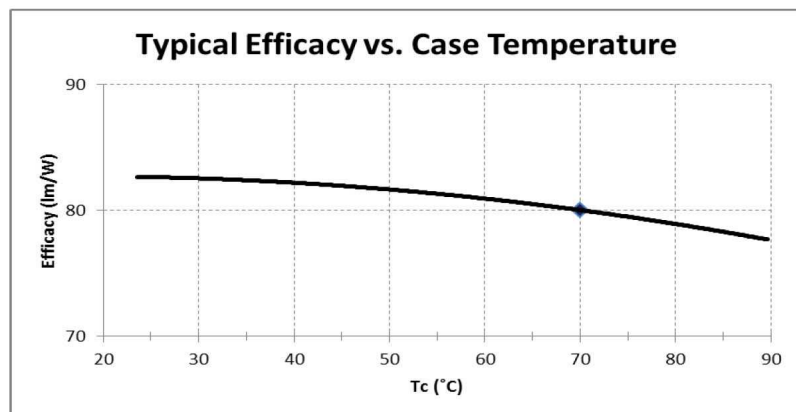
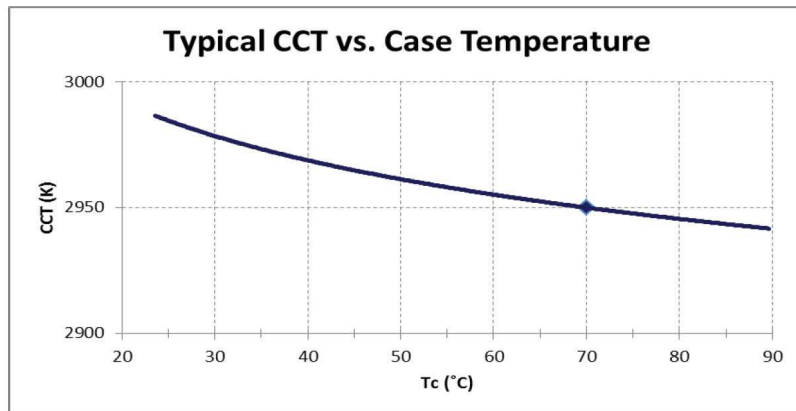
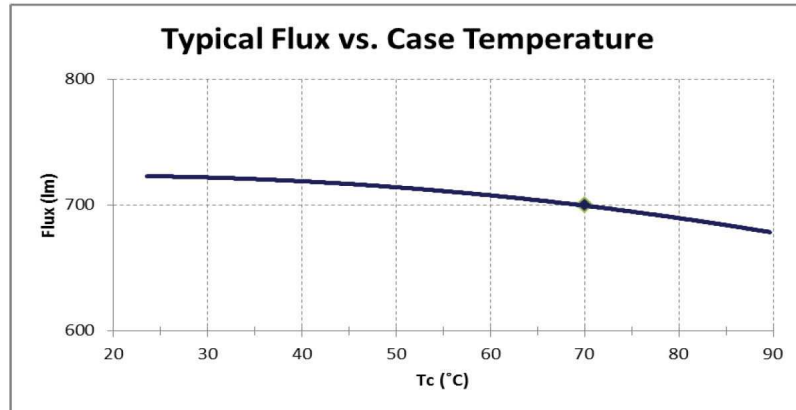
TYPICAL PERFORMANCE VS. INTENSITY: STANDARD SERIES, 9MM LES, 3000K, 700LM



ATTACHMENT 9 – SPECIFICATION SHEET



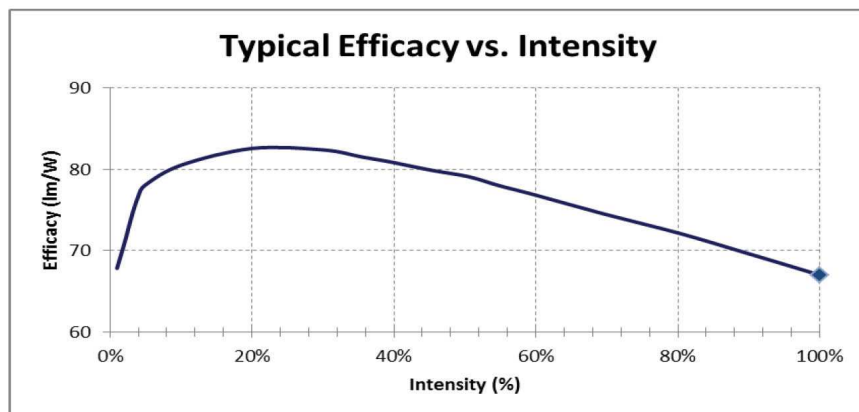
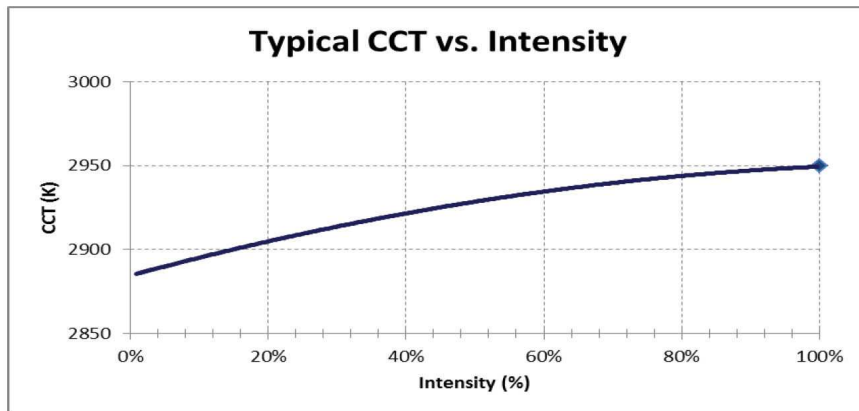
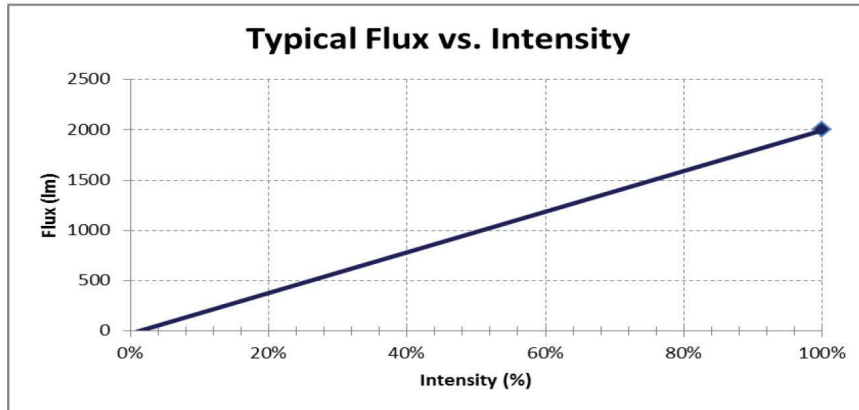
TYPICAL PERFORMANCE VS. CASE TEMPERATURE: STANDARD, 9MM LES, 3000K, 700LM



ATTACHMENT 9 – SPECIFICATION SHEET



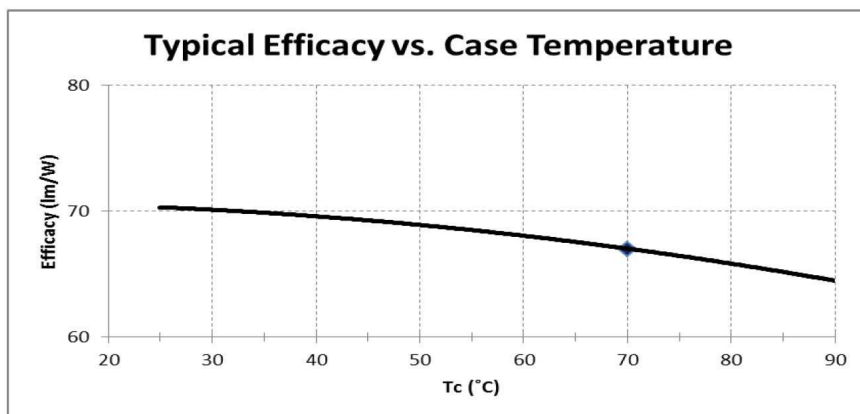
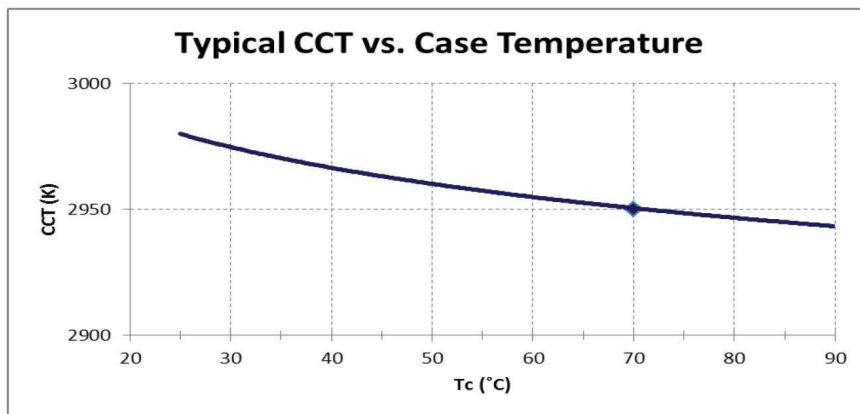
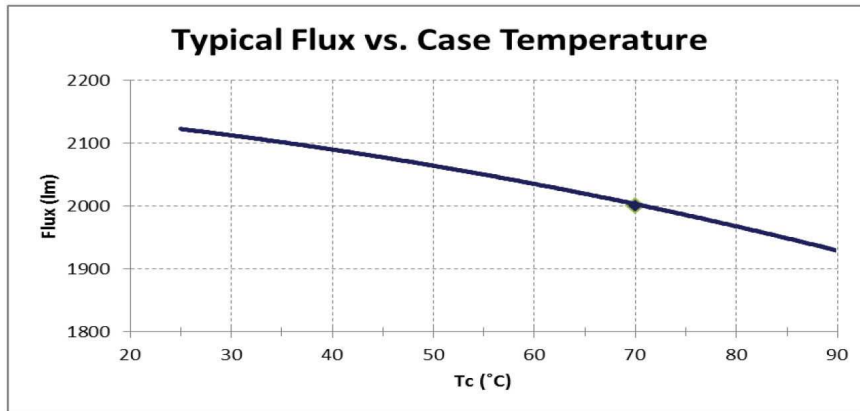
TYPICAL PERFORMANCE VS. INTENSITY: STANDARD SERIES, 9MM LES, 3000K, 2000LM



ATTACHMENT 9 – SPECIFICATION SHEET



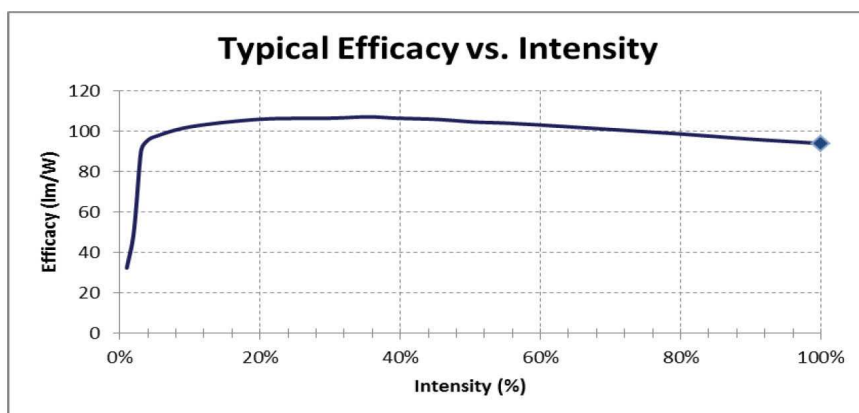
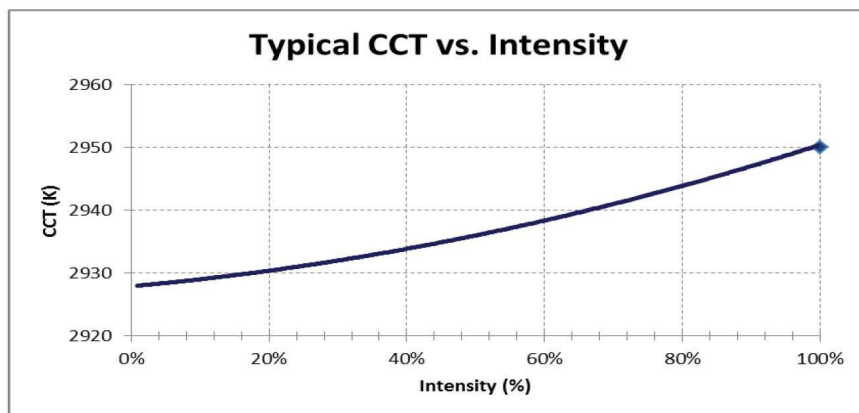
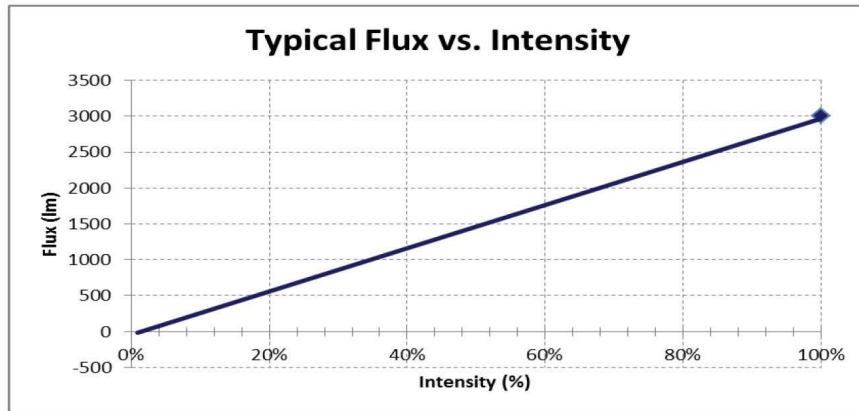
TYPICAL PERFORMANCE VS. CASE TEMPERATURE: STANDARD, 9MM LES, 3000K, 2000LM



ATTACHMENT 9 – SPECIFICATION SHEET



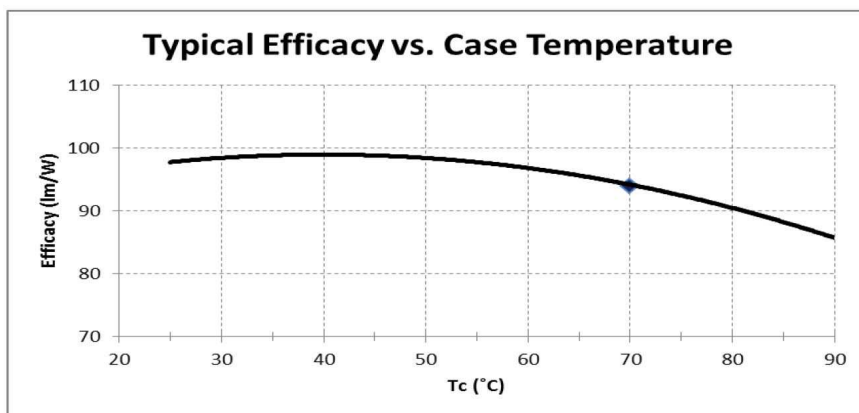
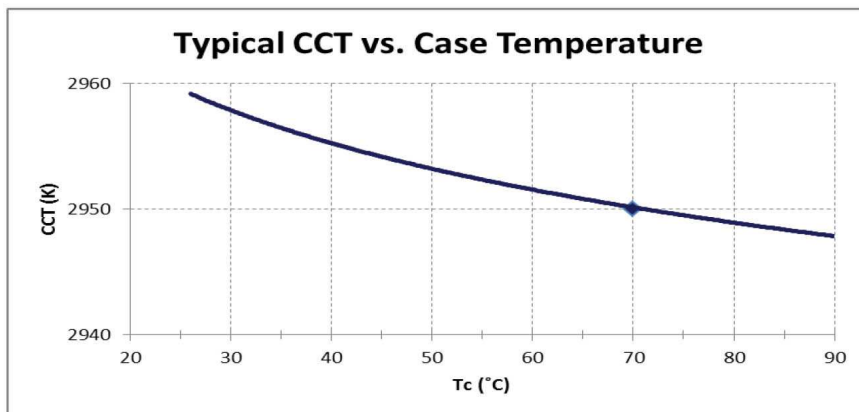
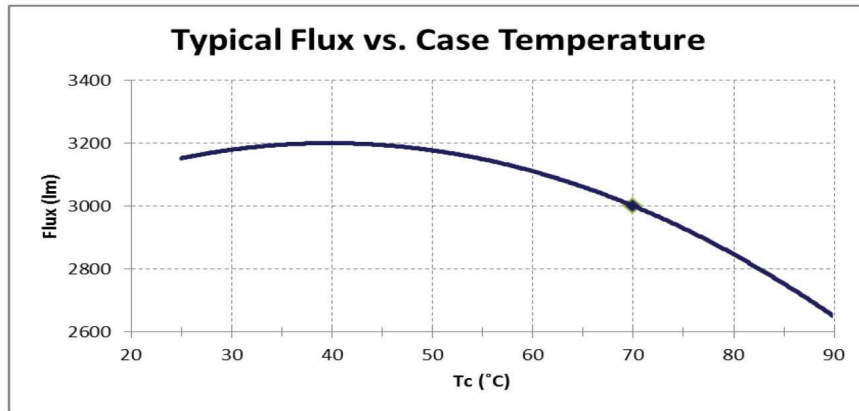
TYPICAL PERFORMANCE VS. INTENSITY: STANDARD SERIES, 19MM LES, 3000K, 3000LM



ATTACHMENT 9 – SPECIFICATION SHEET



TYPICAL PERFORMANCE VS. CASE TEMPERATURE: STANDARD, 19MM LES, 3000K, 3000LM



ATTACHMENT 9 – SPECIFICATION SHEET

XICATO®

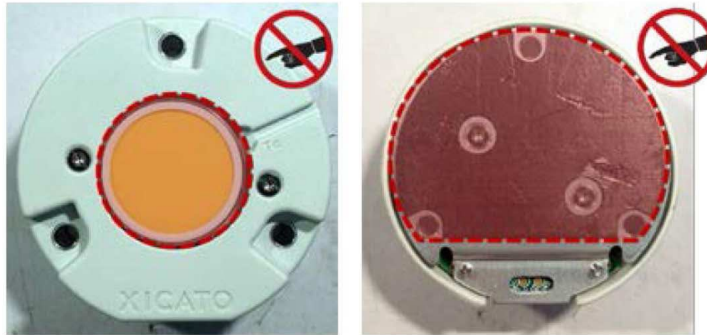
BASIC HANDLING AND ASSEMBLY

GENERAL HANDLING

Make sure your **hands and tools are clean** before handling module.

Do not drop module or allow modules to rattle in a loosely packed container. This may dislodge internal electrical components, or scratch the phosphor or thermal interface pad.

Do not touch the phosphor coating on top of the LED array (the light emitting surface) **or the integrated thermal pad** underneath. These surfaces are sensitive to scratches, contamination, and debris which may decrease module performance. If any dust or debris accumulates on either surface, clean the surface by blowing on it with clean air. The phosphor surface can also be cleaned by gently wiping with isopropyl alcohol.



Do not touch sensitive surfaces. Keep them clean.

ASSEMBLY

Always use recommended screws and fasteners, and apply recommended torque. Take caution not to exceed these values as this may damage the module. Xicato recommends using a spring lock washer with either a flat washer or adapter ring at all mounting locations to reduce the likelihood that the fasteners will loosen under shock, vibration, or thermal cycling.

Be sure not to reverse polarity on the electrical leads to the module, as this may damage the module. Be absolutely certain to use the proper wire gauge and color and, when required, poke them into the proper connector. One-time poke-in connectors are not guaranteed to function properly if wires are pulled loose and reinserted.

Make sure that surfaces of thermal interface pad and heat sink are clean and free of debris before assembly. Visually verify that there are no gaps between thermal surfaces, and that pressure has been evenly applied across the entire surface.

Please note that Xicato is the only authorized distributor and supplier of twist-lock adaptor rings. For more information on adaptor ring options, contact your XICATO account manager or technical representative.

For more detailed handling and assembly instructions, including:

- How to mount reflectors, adapters, fasteners
- How to mount unit to heat sinks
- Wiring and wire harness
- How to test the module for thermal performance

...and more, please see "Application Note - XIM Assembly Instructions" on the Xicato website.

ATTACHMENT 9 – SPECIFICATION SHEET



REGULATORY INFORMATION

DRIVE CURRENT

The product is designed for use with a constant voltage power supply. Refer to the Performance Characteristics section for details on operating voltage and current requirements.

ELECTRICAL SAFETY & HANDLING

CE: IEC 62031:2008 + A1:2012

UL: 8750 recognized. Class 2. Suitable for dry and damp locations.

Ingress Protection rating: IP20

CSA: C22.2 No. 250.13-12.

ESD Class 3B (HBM). No special ESD handling procedures required.

EYE SAFETY

The product is tested in accordance with IEC TR 62778.
For Blue Light it is rated for Risk Group 1.

CHEMICAL SAFETY

The following chemicals should be avoided, even in small quantities, within the module:

Hydrochloric Acid	MEK (Methyl Ethyl Ketone)	Dichloromethane
Sulfuric Acid	MIBK (Methyl Isobutyl Ketone)	Rosin Flux Solder
Nitric Acid	Toluene	Castor Oil
Acetic Acid	Xylene	Lard Oil
Sodium Hydroxide	Benzene	Linseed Oil
Potassium Hydroxide	Gasoline	Petroleum Oil
Ammonia	Mineral Spirits	Silicone Oil
Sulfur (Used in Rubber Processing)	Tetrachloromethane (Carbon tetrachloride – CCl ₄)	Halogenated Hydrocarbons (Containing F, Cl, or Br)

ENVIRONMENTAL SAFETY

RoHS compliant

Lead content: None

Mercury content: None

UV or IRC Emissions: None

ATTACHMENT 9 – SPECIFICATION SHEET



LUMINAIRE SPECIFICATION: RECOMMENDED LED MODULE

GENERAL DESCRIPTION

Color Rendering Index shall be ≥ 80 , with a typical value of 83.

Initial Color Consistency: $\leq 1 \times 2$ MacAdam Ellipses
 Every light source shall be within a 1 x 2 MacAdam Ellipse (1x2 SDCM)
 Flux and color point tuned at case temperature 70°C

Initial Color Point Accuracy: within $\pm 0.001 \Delta u'v'$ of Black Body Locus (BBL)

Color Maintenance: Remains within 3 MacAdam Ellipses (C3) at 50,000 hours at maximum operating drive current and maximum case temperature (90°C).
 LM-80 data shall show Duv < 0.003 at 6,000 hours.

Lumen Maintenance: LM better than 70% (L70, B0, F0) at 50,000 hours at maximum operating drive current and maximum case temperature (90°C).
 LM-80 data shall show LM > 94.8% at 6,000 hours.

Phosphor Technology: Remote, Corrected Cold Phosphor® technology.

Warranty: Verifiable 7 years or 50,000 hours, including minimum on mortality, lumen maintenance, and color maintenance.
 Mortality: B0 – No failures.
 Lumen maintenance: L70, B0 (better than 70% on all units).
 Color maintenance: < 0.003 Duv at 50,000 hours

DETAILED COLOR SPECIFICATIONS

IES TM-30-15 Color rendering fidelity (R_f) shall be 78.

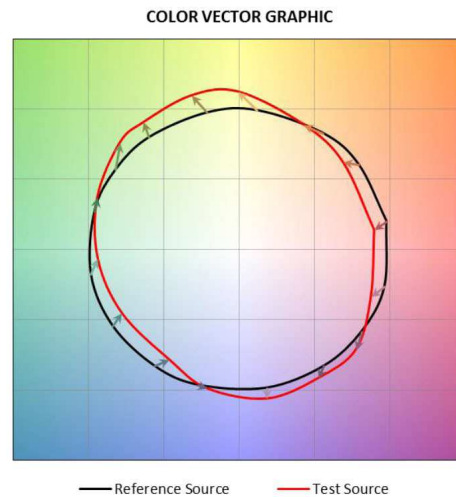
IES TM-30-15 Color rendering gamut (R_g) shall be 101.

Minimum CIE CRI (R_a) shall be 80; minimum R9 shall be 0.

Typical CIE CRI R values shall be:

R1: 80	R9: 14
R2: 88	R10: 73
R3: 95	R11: 80
R4: 81	R12: 70
R5: 80	R13: 81
R6: 85	R14: 97
R7: 85	R15: 74
R8: 63	

Typical CIE CRI Gamut Area Index GAI_{BB} shall be 96.



LED module shall be Xicato Module # _____