DETAILED DATA SHEET

XTM 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, Europe and the US.

For further information, visit www.xicato.com.

ABOUT THIS DOCUMENT

This 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:

- Product detailed data sheets (DDS)
- Accessory selection tools for heatsinks, optics, drivers and power supplies
- CAD files and drawings in 2D and 3D, and in multiple formats
- Application and technical notes for proper handling, design-in, and usage of the products
- Brochures to assist our distributors, OEM and lighting designer customers in promoting our products
- XCA-XTM-XIM Performance Curves, which provides graphs of flux, CCT and efficacy performance vs. intensity and temperature

See the Xicato website for these tools and more.

TABLE OF CONTENTS

GENERAL DESCRIPTION

XTM

The Xicato Thin Module (XTM) consists of a Xicato Core Array (XCA), pressure fit into a compact yet robust holder designed to allow attachment of a large ecosystem of lenses and heatsinks to facilitate design and construction of a wide variety of downlight and spot fixtures. The XTM includes:

- LED emitting core
- Zhaga-compatible holder
- Fixed wires

The integration of core and holder, with full UL and CE approval, provides the assurance of quality, and simplifies the certification of customer luminaires. XTM can accommodate Xicato's entire portfolio of color, CCT, and output options.

Xicato is the only light source provider to give long term warranty on both lumen maintenance and color consistency, for lowest total cost of ownership and smallest ecological footprint. With Xicato's industry leading color quality, consistency and application-optimized light spectra, XTM provides simply the most beautiful lit effect, and our warranty insures that consistent lighting design quality is maintained from build to refurbish.

STANDARD SERIES

Xicato Standard Series products are designed to provide excellent, natural color rendition with high efficiency. XTM Standard Series comes in 2700K, 3000K, 3500K and 4000K CCT, and in flux packages from 700 to 5000 lumens, delivering typical CRI (R_a) of 83, and consistently high R values across all 15 CIE CRI samples.

XICATO CORRECTED COLD PHOSPHOR PORTFOLIO (SEE ALSO XLT)

Xicato Portfolio	Lumen Output	Correlated Color Temperature 2700K		3000K		3500K		4000K	
Artist Series® CIE CRI: Ra 95+, R9 90+ IES TM-30: Rf 96, Rg 103	700	◎		◎		◎		◎	
	1300	◎	◉	◎	◉	◎	◉	◎	◉
	2000	•	◉	•	◉	•	◉	•	◉
	3000		•		•		•		•
	4000		•		•		•		•
Beauty Series™ CIE CRI: Ra 95 IES TM-30: Rf 91, Rg 107									
	1300		◉						
	2000		◉						
Designer Series™ CIE CRI: Ra 90+, R9 50+ IES TM-30: Rf 88, Rg 101	700	◎		◎		◎		◎	
	1300	◎	◉	◎	◉	◎	◉	◎	◉
	2000	◎	◉	◎	◉	◎	◉	◎	◉
	3000		◉		◉		◉		◉
	4500				•		•		•
Standard Series CIE CRI: Ra 80+ IES TM-30: Rf 78, Rg 101	700	◎		◎		◎		◎	
	1300	◎	◉	◎	◉	◎	◉	◎	◉
	2000	◎	◉	◎	◉	◎	◉	◎	◉
	3000		◉		◉		◉		◉
	4000		•		•		•		•
	5000		•		•		•		•
Vibrant Series® V80 CIE CRI: Ra 80+ IES TM-30: Rf 73, Rg 105	700			◎					
	1300			◎	◉				
	2000			◎	◉				
	3000				◉				
	4000				•				
	5000				•				
Vibrant Series® V95 CIE CRI: Ra 95+ IES TM-30: Rf 93, Rg 106	700			◎					
	1300			◎	◉				
	2000			•	◉				
	3000				•				
	4000				•				

LEGEND	XCA+XTM	+XIM
9mm LES	•	◎
19mm LES	•	◉

Note:
CRI listed as XX+ are guaranteed minimum values. Typical values are min+3.

ORDERING GUIDE

PART NUMBERING SYSTEM

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

X	IM	19	95	30	13	A2	A
Xicato	CA: Core Array IM: Intelligent Module TM: Thin Module	Light Emitting Surface (LES mm) 09 = 9 19 = 19	Series 80: Standard 90: Designer 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 30: 3000 40: 4000 45: 4500 50: 5000	Feature Group A2 = DALI A3 = 1-10V A5 = DALI+BLE A6 = 1-10V+BLE CC = constant current	Revision

PART CODES AND DESCRIPTIONS

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

Part Number	Description
XTM09802707CCA	LED Module, XTM, LES09, Standard, 2700K, 700LM
XTM09802713CCA	LED Module, XTM, LES09, Standard, 2700K, 1300LM
XTM09802720CCA	LED Module, XTM, LES09, Standard, 2700K, 2000LM
XTM09803007CCA	LED Module, XTM, LES09, Standard, 3000K, 700LM
XTM09803013CCA	LED Module, XTM, LES09, Standard, 3000K, 1300LM
XTM09803020CCA	LED Module, XTM, LES09, Standard, 3000K, 2000LM
XTM09803507CCA	LED Module, XTM, LES09, Standard, 3500K, 700LM
XTM09803513CCA	LED Module, XTM, LES09, Standard, 3500K, 1300LM
XTM09803520CCA	LED Module, XTM, LES09, Standard, 3500K, 2000LM
XTM09804007CCA	LED Module, XTM, LES09, Standard, 4000K, 700LM
XTM09804013CCA	LED Module, XTM, LES09, Standard, 4000K, 1300LM
XTM09804020CCA	LED Module, XTM, LES09, Standard, 4000K, 2000LM

Part Number	Description
XTM19802713CCA	LED Module, XTM, LES19, Standard, 2700K, 1300LM
XTM19802720CCA	LED Module, XTM, LES19, Standard, 2700K, 2000LM
XTM19802730CCA	LED Module, XTM, LES19, Standard, 2700K, 3000LM
XTM19802740CCA	LED Module, XTM, LES19, Standard, 2700K, 4000LM
XTM19802750CCA	LED Module, XTM, LES19, Standard, 2700K, 5000LM
XTM19803013CCA	LED Module, XTM, LES19, Standard, 3000K, 1300LM
XTM19803020CCA	LED Module, XTM, LES19, Standard, 3000K, 2000LM
XTM19803030CCA	LED Module, XTM, LES19, Standard, 3000K, 3000LM
XTM19803040CCA	LED Module, XTM, LES19, Standard, 3000K, 4000LM
XTM19803050CCA	LED Module, XTM, LES19, Standard, 3000K, 5000LM
XTM19803513CCA	LED Module, XTM, LES19, Standard, 3500K, 1300LM
XTM19803520CCA	LED Module, XTM, LES19, Standard, 3500K, 2000LM
XTM19803530CCA	LED Module, XTM, LES19, Standard, 3500K, 3000LM
XTM19803540CCA	LED Module, XTM, LES19, Standard, 3500K, 4000LM
XTM19803550CCA	LED Module, XTM, LES19, Standard, 3500K, 5000LM
XTM19804013CCA	LED Module, XTM, LES19, Standard, 4000K, 1300LM
XTM19804020CCA	LED Module, XTM, LES19, Standard, 4000K, 2000LM
XTM19804030CCA	LED Module, XTM, LES19, Standard, 4000K, 3000LM
XTM19804040CCA	LED Module, XTM, LES19, Standard, 4000K, 4000LM
XTM19804050CCA	LED Module, XTM, LES19, Standard, 4000K, 5000LM

MECHANICAL CHARACTERISTICS

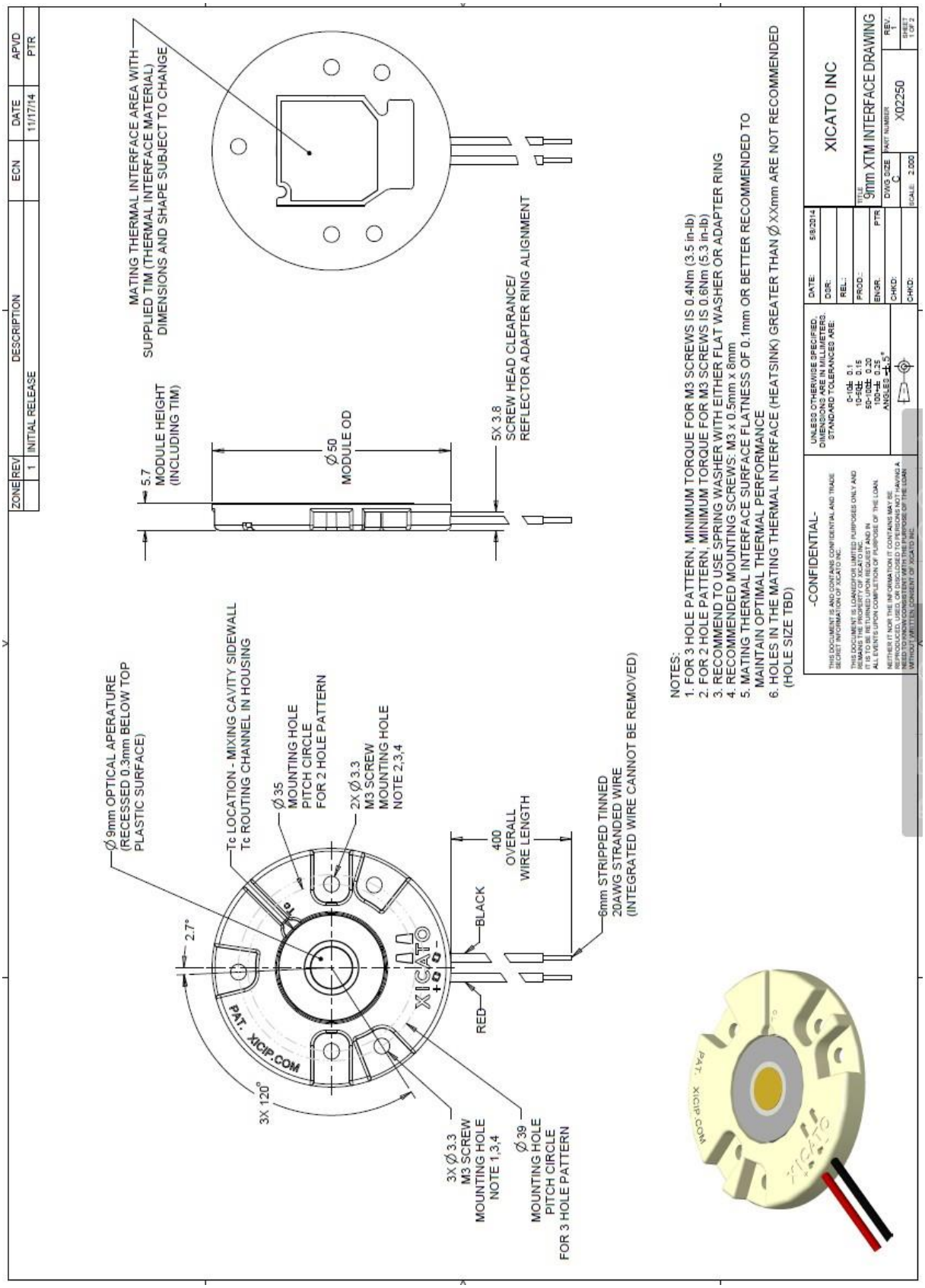
MECHANICAL SPECIFICATIONS

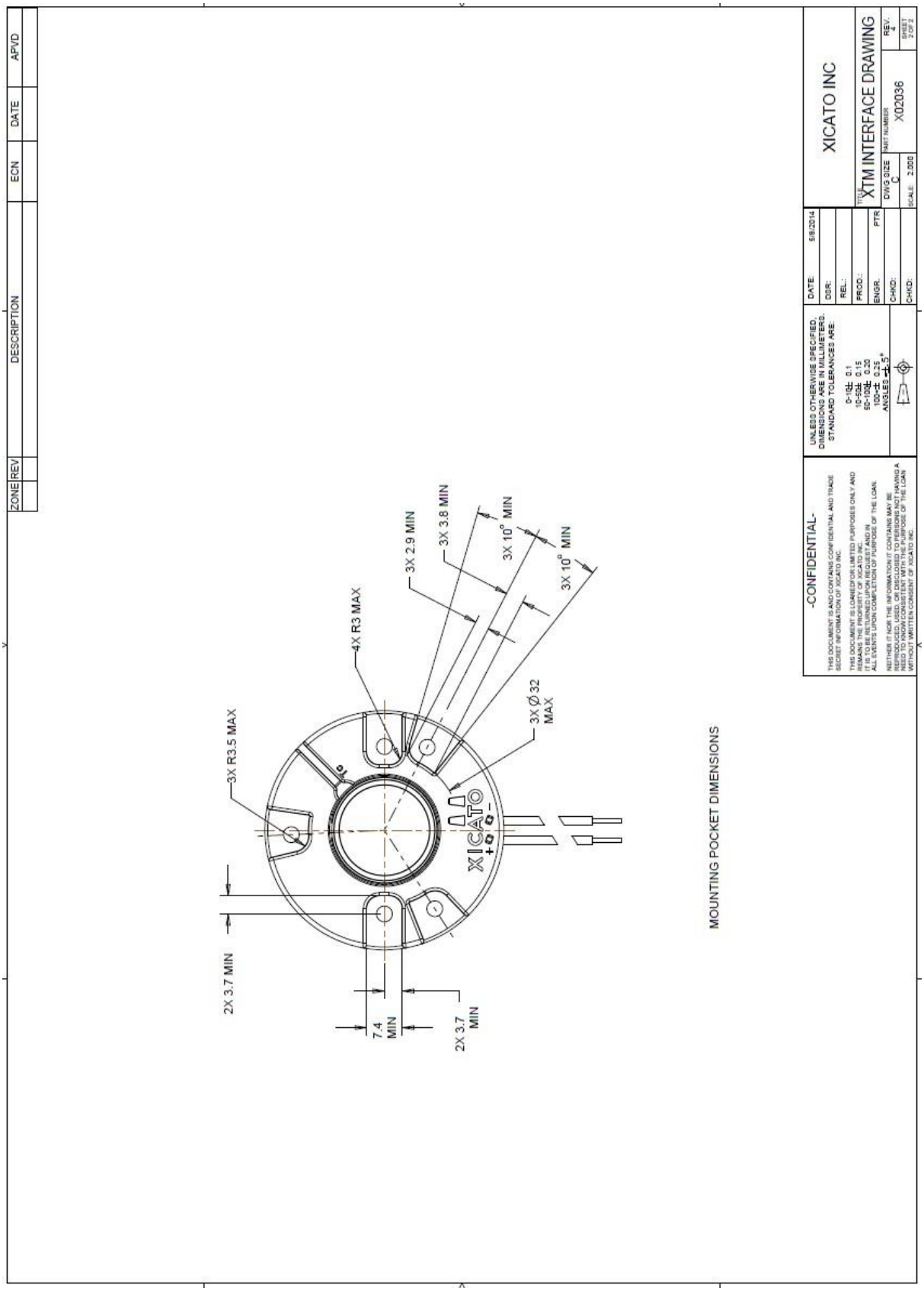
Dimensions:	50mm x 5.7mm (1.97” x 0.78”)
Weight:	48 grams (1.69 oz.)
Light Emitting Surface options:	Ø 9mm (0.35”) Ø 19mm (0.75”)
Module Source Type:	Corrected Cold Phosphor Technology®
Interfaces – Electrical:	Fixed 20 gauge wires 400mm
Interfaces – Mechanical:	Recommended mounting screws: M3 x 0.5mm x 8mm with split lock washer.
Mounting Torque:	Three-hole pattern: min 0.36 Nm (3.2 in-lbs); max 0.43 Nm (3.8 in-lbs) Two-hole pattern: min 0.54 Nm (4.8 in-lbs); max 0.65 Nm (5.8 in-lbs)
Interface – Thermal:	Integrated thermal pad. Recommend a mating thermal interface (i.e. heatsink) surface flatness of ≤ 0.1mm in order to maintain thermal performance. Center hole diameter affects thermal performance and max power – see Application Note on Xicato website.
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

XTM with 9mm LES

MECHANICAL DRAWINGS

NOTE: XTM with 9mm LES and 19mm LES is identical except for the diameter of the light emitting surface.




ZONE
REV
DESCRIPTION
ECN
DATE
APVD
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0-10 ± 0.1
10-50 ± 0.15
50-100 ± 0.20
100+ ± 0.25
ANGLES ± 2.5°
DATE: 5/8/2014
DSR:
REL.:
PROD.:
ENGR.: PTR
CHKD:
CHKD:
XICATO INC
TITLE: XTM INTERFACE DRAWING
DWG SIZE: C
PART NUMBER: X02036
REV: 4
SCALE: 2.000
SHEET 2 OF 2
3X R3.5 MAX
4X R3 MAX
3X 2.9 MIN
3X 3.8 MIN
3X 10° MIN
3X 10° MIN
3X Ø32 MAX
2X 3.7 MIN
7.4 MIN
2X 3.7 MIN
MOUNTING POCKET DIMENSIONS

COLOR METRICS: STANDARD SERIES

Optimized for excellent, natural color rendition with high efficiency.

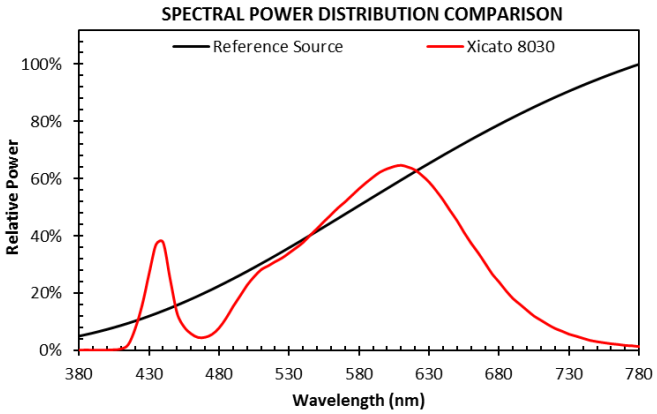
All color rendering data at highest rated drive current and 70°C case temperature (T_c)
Tester consistency (reproducibility) ± 0.0002 Duv (CIE 1964) from NIST reference

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:	5 years for individual modules (B0) on mortality, color and lumen maintenance (XIM only). Details at www.xicato.com/support/warranty

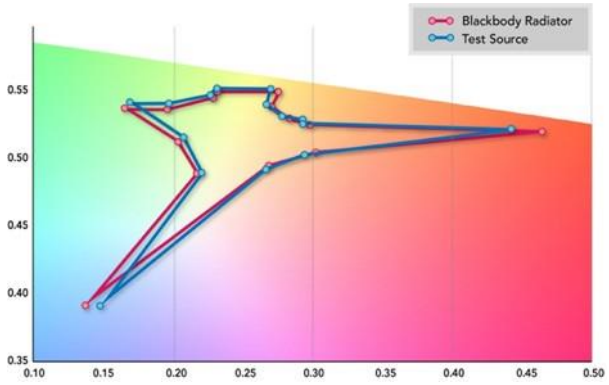
CIE CRI COLOR METRICS (VALUES ARE TYPICAL)

	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

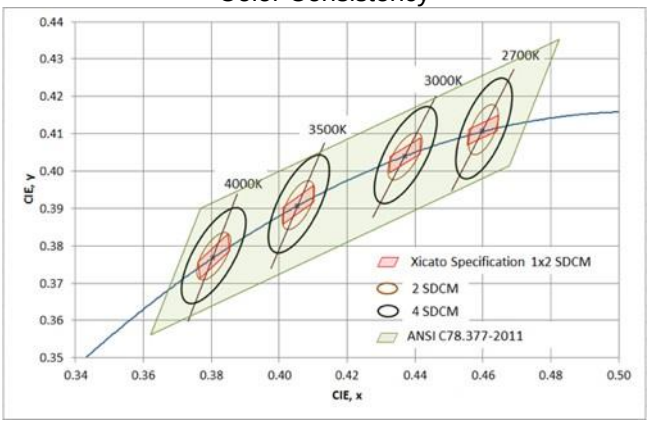
Spectral Power Distribution vs. Reference Source



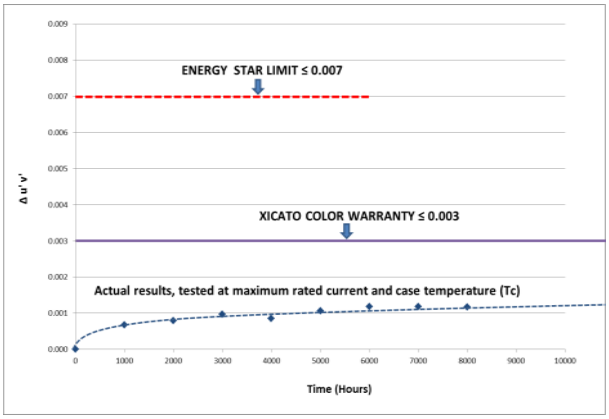
CIE Color Gamut



Color Consistency



Color Maintenance



IES TM-30 COLOR METRICS

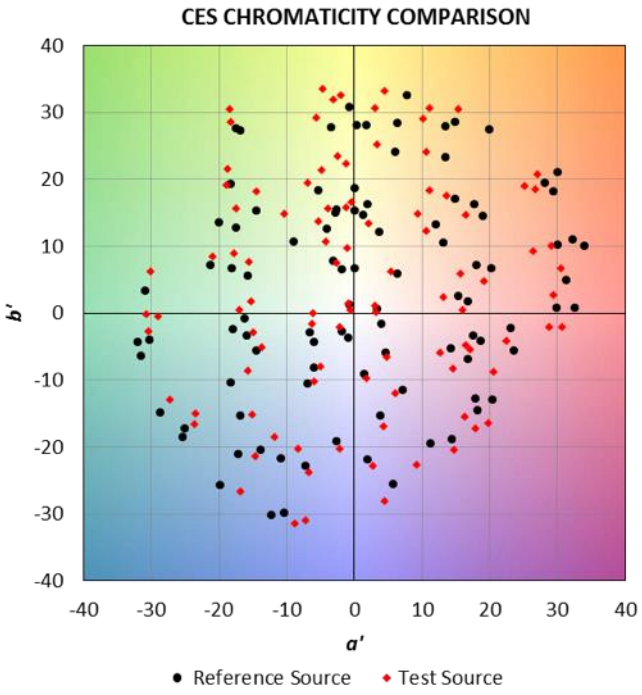
(Values are typical. Based on 3000K CCT)

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.

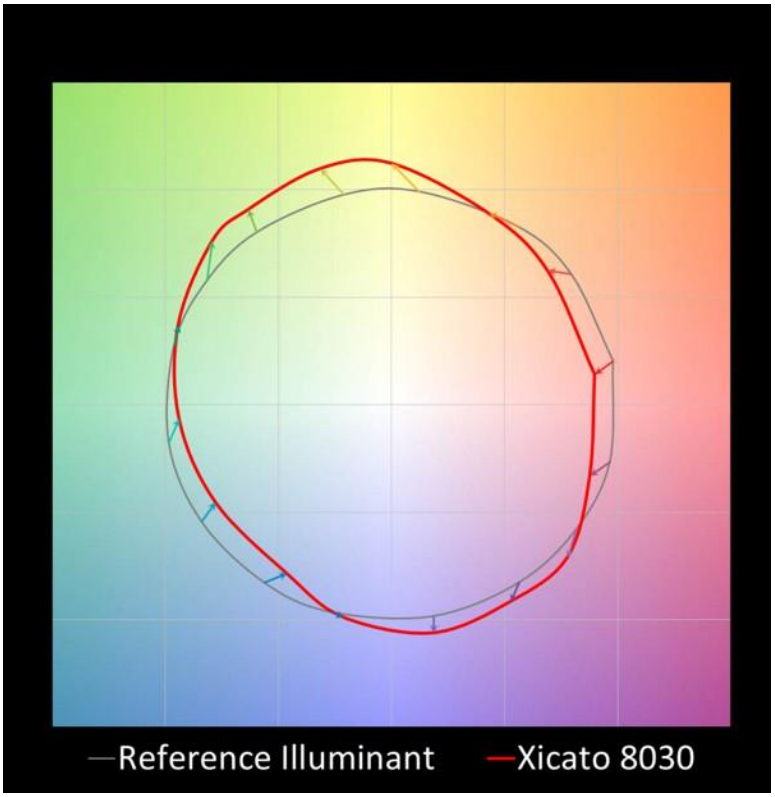


COLOR VECTOR GRAPHIC

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.

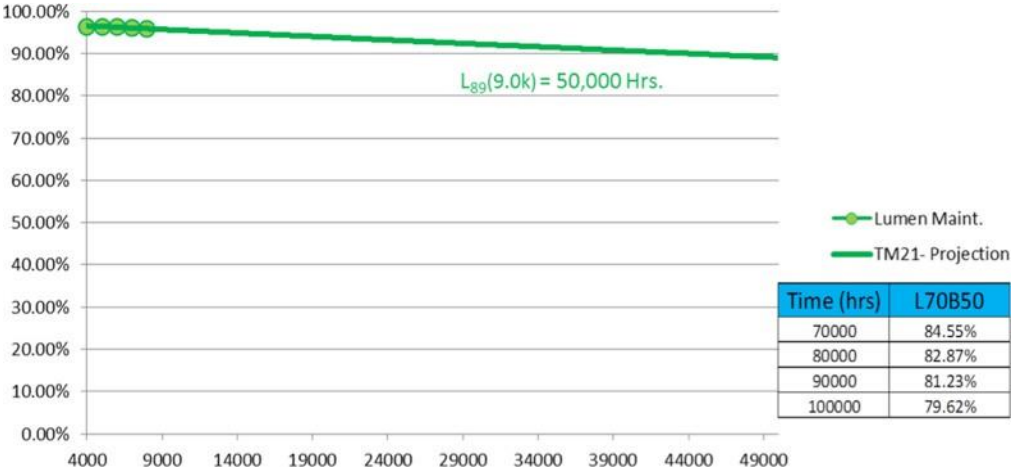


IES LM-80

STANDARD SERIES, 19MM, 3000K, 3000 LUMENS

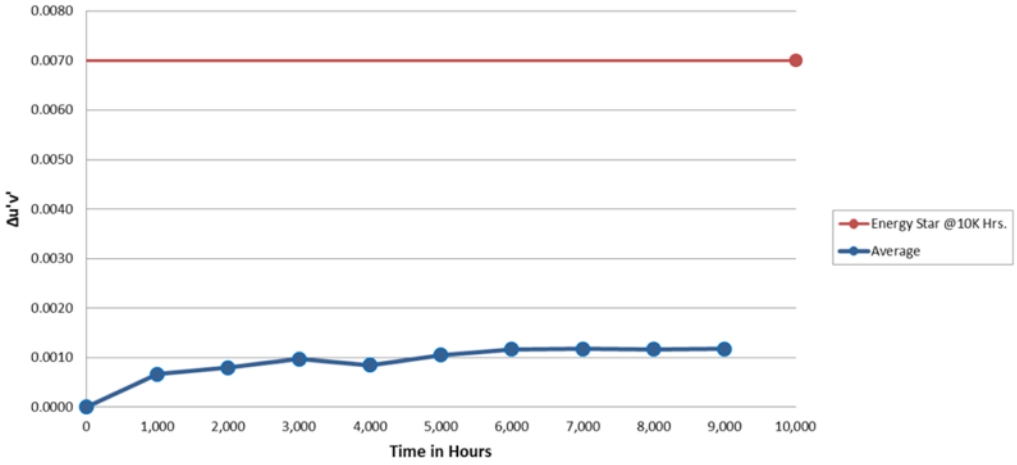
Testing conducted at BACL. T_c = 90°C, I_f = 1050mA, HTOL, 8000 Hrs.

LUMEN MAINTENANCE

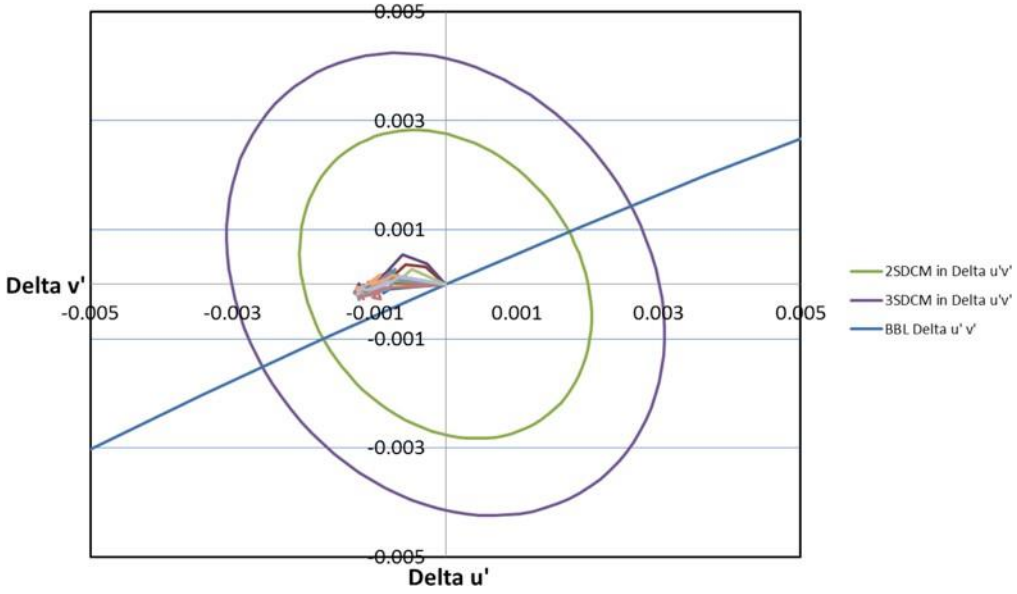


Time (hrs)	L70B50
70000	84.55%
80000	82.87%
90000	81.23%
100000	79.62%

COLOR MAINTENANCE



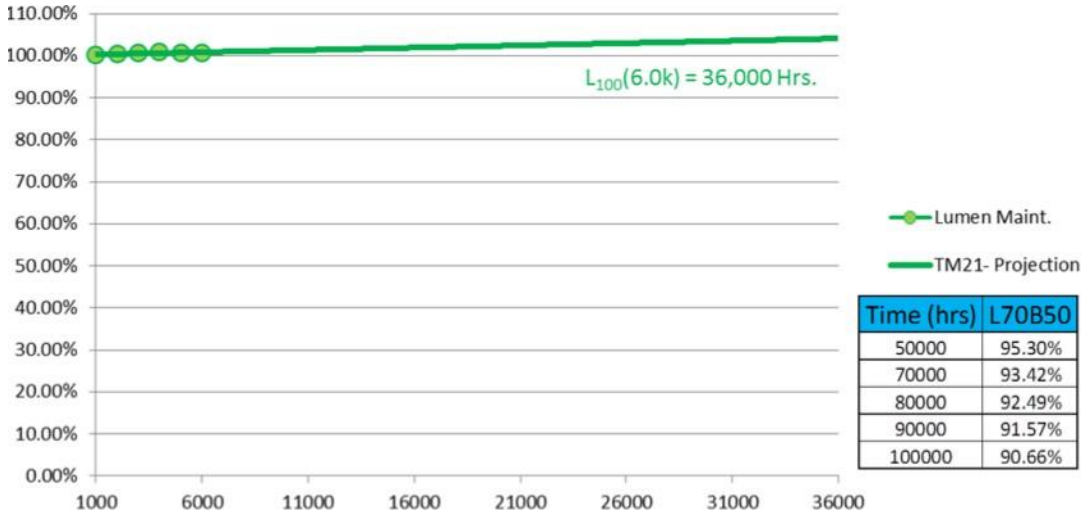
COLOR MAINTENANCE (NORMALIZED)



STANDARD SERIES, 19MM, 3000K, 5000 LUMENS

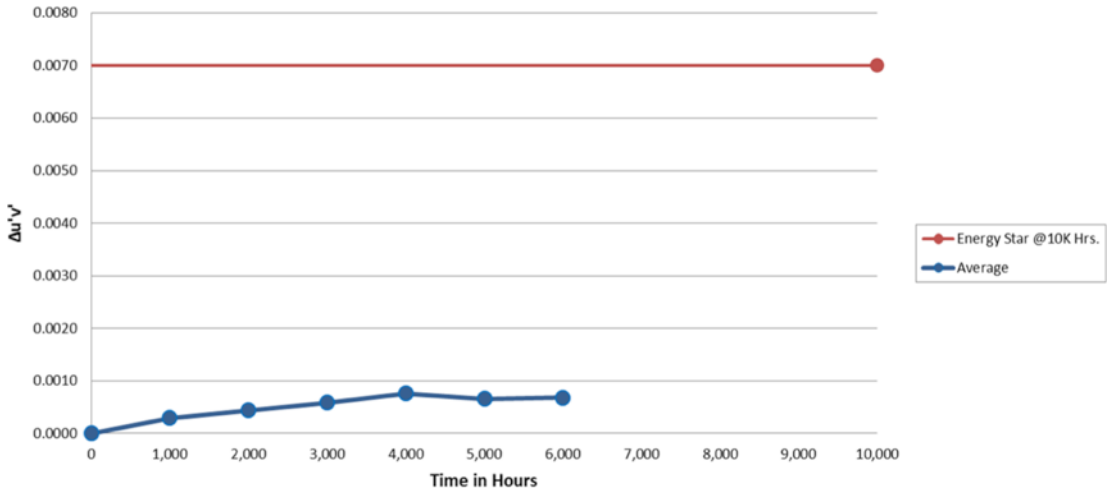
Testing conducted at BACL. T_c = 90°C, I_f = 1400mA, HTOL, 6000 Hrs.

LUMEN MAINTENANCE

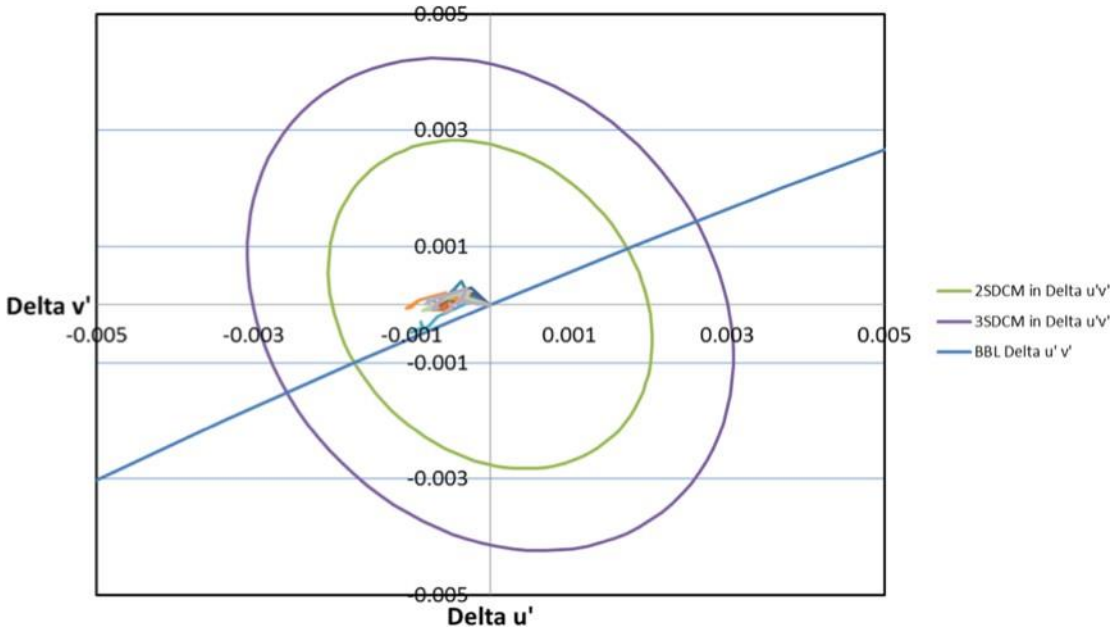


Time (hrs)	L70B50
50000	95.30%
70000	93.42%
80000	92.49%
90000	91.57%
100000	90.66%

COLOR MAINTENANCE



COLOR MAINTENANCE (NORMALIZED)



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 constant current power supply with maximum output current, including tolerance, of up to 770mA (700mA), 1100mA (1050mA), and 1500mA (1400mA).
4. Voltage data based on 20°C to 90°C operating range. For operation outside this range, contact Xicato.
5. Minimum, Maximum, and Typical power consumption can be calculated from the ranges provided.
6. Absolute range of lumen output is ±10% of typical value
7. Maximum peak ripple current with frequencies ≥ 100Hz for each product are 1400mA (700 lm), 2000mA (1300 lm) and 2800mA (2000 lm).
8. CCT data ANSI/NEMA compliant.
9. Specifications are subject to change without notice.

INITIAL COLOR CONSISTENCY

Correlated Color Temp		Initial Color Consistency		
Nominal	Actual	CCT	SDCM	Duv
2700K	2700K	± 40K	≤ 1 x 2	± 0.001
3000K	2950K	± 50K		
3500K	3420K	± 60K		
4000K	4000K	± 70K		

ELECTRICAL, EFFICACY PERFORMANCE

LES	Module	Current	Forward Voltage			Typ. Power Consumption	Actual Output	Efficacy (Typical)
		mA	Min	Typical	Max	(W)	(Lm)	Lm/W
9mm	700 lm	700	9.9	11.1	12.0	7.8	700	90
		500	9.6	10.8	11.7	5.4	550	102
		350	9.4	10.6	11.4	3.7	400	108
	1300 lm	700	17.3	22.3	24.0	15.6	1300	83
		500	16.8	21.7	23.4	10.9	965	89
		350	16.4	21.2	22.9	7.4	720	97
	2000 lm	1050	23.1	28.8	31.0	30.2	2000	66
		700	22.2	27.9	30.0	19.5	1400	72
		500	21.6	27.1	29.2	13.6	1055	78
		350	21.0	26.5	28.6	9.3	800	86

19mm LES on next page…

LES	Module	Current	Forward Voltage			Typ. Power Consumption	Actual Output	Efficacy (Typical)
		mA	Min	Typical	Max	(W)	(Lm)	Lm/W
19mm	1300 lm	700	12.3	13.6	18.0	9.5	1300	137
		500	12.0	13.2	17.5	6.6	965	146
		350	11.7	12.9	17.2	4.5	720	160
	2000 lm	700	19.8	21.7	27.0	15.2	2000	131
		500	19.2	21.1	26.3	10.6	1490	141
		350	18.7	20.6	25.8	7.2	1105	153
	3000 lm	1050	19.8	24.4	27.0	25.7	3000	117
		700	19.1	23.6	26.2	16.5	2100	127
		500	18.7	23.1	25.7	11.6	1585	137
		350	18.3	22.8	25.3	8.0	1195	150
	4000 lm	1400	23.4	24.4	30.0	34.2	4000	117
		1050	22.7	23.8	29.2	24.9	3080	123
		700	22.2	23.2	28.6	16.2	2160	133
		500	21.7	22.8	28.2	11.4	1630	143
	5000 lm	1400	28.6	29.9	36.0	41.8	5000	120
		1050	27.7	29.0	35.1	30.5	3850	126
		700	27.1	28.4	34.3	19.9	2700	136
		500	26.6	27.9	33.8	13.9	2030	146

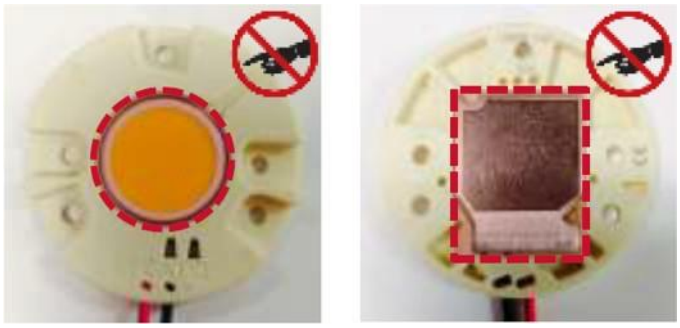
BASIC HANDLING AND ASSEMBLY

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 loosen the LED array from its protective holder, 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.

Take special care not to press down on the phosphor surface of the array. Pressure to this area may cause the array to dislodge itself from its protective plastic housing.

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 will damage the LED array. 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 adapter ring options, contact your XICATO account manager or technical representative.

For more detailed handling and assembly instructions, including:

- How to properly reinsert an LED array into its holder
- How to mount reflectors, adapters, fasteners
- How to mount unit to heat sinks
- How to mount spacers
- How to test the module for thermal performance

…and more, please see Application Note - XTM Assembly Instructions on the Xicato website.

REGULATORY INFORMATION

DRIVE CURRENT

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

ELECTRICAL SAFETY & HANDLING

CE:	IEC 62031:2008, Class III
UL:	8750 recognized. Class 2. Suitable for dry and damp locations.
Ingress Protection rating:	IP-20
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 62471 and is rated as exempt for Actinic UV, and Near UV.
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)	Tetracholoromethane (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

OTHER

Zhaga compliant

LUMINAIRE SPECIFICATION: RECOMMENDED LED MODULE

GENERAL DESCRIPTION

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

Initial Color Consistency:	≤ 1 x 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 ± 0.001 Δu'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:	5 years, 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.

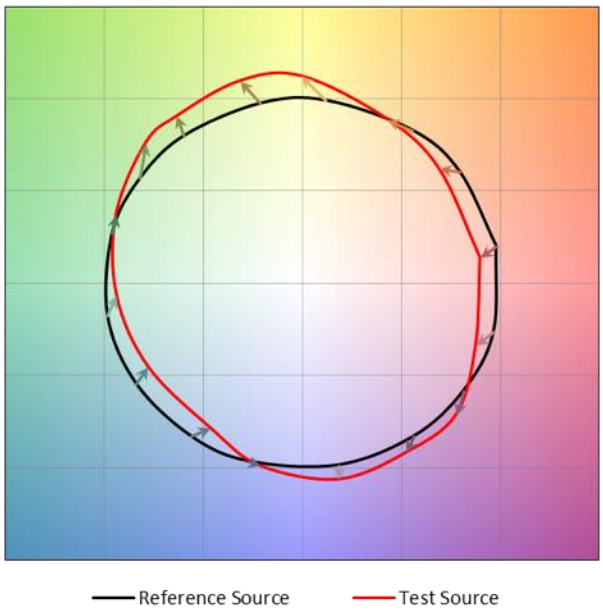
Minimum CIE CRI (Ra) shall be 80; minimum R9 shall be 0.

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.

COLOR VECTOR GRAPHIC



LED module shall be Xicato Module # _____