# DETAILED DATA SHEET

## XTM LED Module
## with Corrected Cold Phosphor Technology®

## Artist 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.

## ARTIST SERIES

Xicato Artist Series products are designed to provide the most accurate, natural color rendition possible, over the entire visual spectrum. Artist Series comes in 2700K, 3000K, 3500K and 4000K CCT, and in flux packages from 700 to 4000 lumens, delivering typical CRI ($R_a$) of 97, with typical R9 of 95, and extremely high R values across all 15 CIE CRI samples. These values outperform not only other LED solutions, but also traditional metal halide or fluorescent lamps.

# XICATO CORRECTED COLD PHOSPHOR PORTFOLIO (SEE ALSO XLT)

| Xicato Portfolio | Lumen Output | 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<br>IM: Intelligent Module<br>TM: Thin Module | Light Emitting Surface (LES mm)<br><br>09: 9<br>19: 19 | Series<br><br>80: Standard<br>90: Designer<br>95: Artist<br>BT: Beauty<br>V8: Vibrant 80<br>V9: Vibrant 95 | CCT (K)<br><br>27 = 2700<br>30 = 3000<br>35 = 3500<br>40 = 4000<br>01 = NA | Flux (nominal)<br><br>07: 700<br>13: 1300<br>20: 2000<br>30: 3000<br>40: 4000<br>45: 4500<br>50: 5000 | Feature Group<br><br>A2: DALI<br>A3: 1-10V<br>A5: DALI+BLE<br>A6: 1-10V+BLE<br>CC: constant current | Revision |

## PART CODES AND DESCRIPTIONS

## XTM ARTIST SERIES WITH 9MM LIGHT EMITTING SURFACE (LES)

| Part Number | Description |
|-------------|-------------|
| XTM09952707CCA | LED Module, XTM, LES09, Artist, 2700K, 700LM, |
| XTM09952713CCA | LED Module, XTM, LES09, Artist, 2700K, 1300LM |
| XTM09952720CCA | LED Module, XTM, LES09, Artist, 2700K, 2000LM |
| XTM09953007CCA | LED Module, XTM, LES09, Artist, 3000K, 700LM |
| XTM09953013CCA | LED Module, XTM, LES09, Artist, 3000K, 1300LM |
| XTM09953020CCA | LED Module, XTM, LES09, Artist, 3000K, 2000LM |
| XTM09953507CCA | LED Module, XTM, LES09, Artist, 3500K, 700LM |
| XTM09953513CCA | LED Module, XTM, LES09, Artist, 3500K, 1300LM |
| XTM09953520CCA | LED Module, XTM, LES09, Artist, 3500K, 2000LM |
| XTM09954007CCA | LED Module, XTM, LES09, Artist, 4000K, 700LM |
| XTM09954013CCA | LED Module, XTM, LES09, Artist, 4000K, 1300LM |
| XTM09954020CCA | LED Module, XTM, LES09, Artist, 4000K, 2000LM |

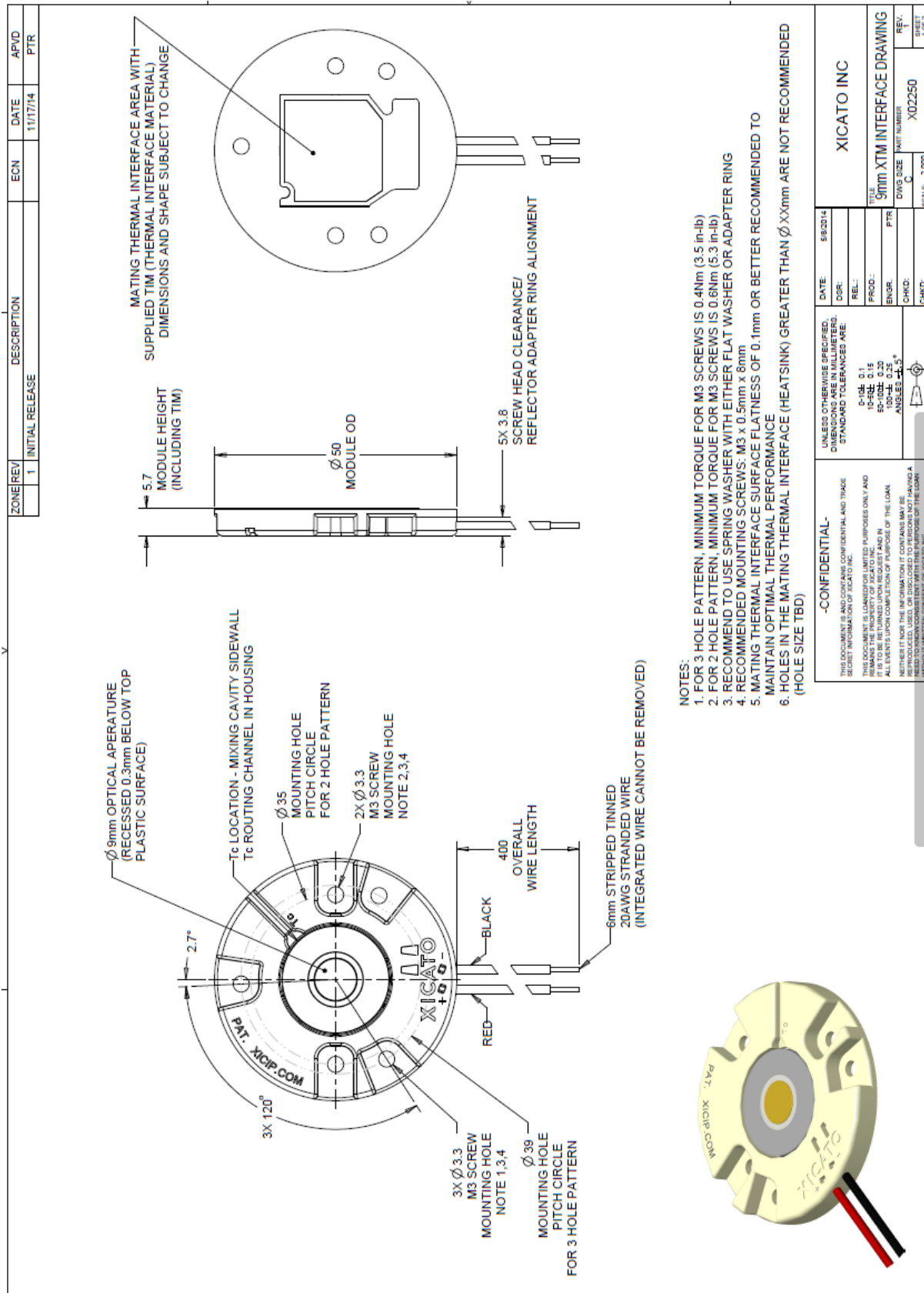| Part Number | Description |
|---|---|
| **XTM19952713CCA** | LED Module, XTM, LES19, Artist, 2700K, 1300LM |
| **XTM19952720CCA** | LED Module, XTM, LES19, Artist, 2700K, 2000LM |
| **XTM19952730CCA** | LED Module, XTM, LES19, Artist, 2700K, 3000LM |
| **XTM19952740CCA** | LED Module, XTM, LES19, Artist, 2700K, 4000LM |
| **XTM19953013CCA** | LED Module, XTM, LES19, Artist, 3000K, 1300LM |
| **XTM19953020CCA** | LED Module, XTM, LES19, Artist, 3000K, 2000LM |
| **XTM19953030CCA** | LED Module, XTM, LES19, Artist, 3000K, 3000LM |
| **XTM19953040CCA** | LED Module, XTM, LES19, Artist, 3000K, 4000LM |
| **XTM19953513CCA** | LED Module, XTM, LES19, Artist, 3500K, 1300LM |
| **XTM19953520CCA** | LED Module, XTM, LES19, Artist, 3500K, 2000LM |
| **XTM19953530CCA** | LED Module, XTM, LES19, Artist, 3500K, 3000LM |
| **XTM19953540CCA** | LED Module, XTM, LES19, Artist, 3500K, 4000LM |
| **XTM19954013CCA** | LED Module, XTM, LES19, Artist, 4000K, 1300LM |
| **XTM19954020CCA** | LED Module, XTM, LES19, Artist, 4000K, 2000LM |
| **XTM19954030CCA** | LED Module, XTM, LES19, Artist, 4000K, 3000LM |
| **XTM19954040CCA** | LED Module, XTM, LES19, Artist, 4000K, 4000LM |

# MECHANICAL CHARACTERISTICS

## MECHANICAL SPECIFICATIONS

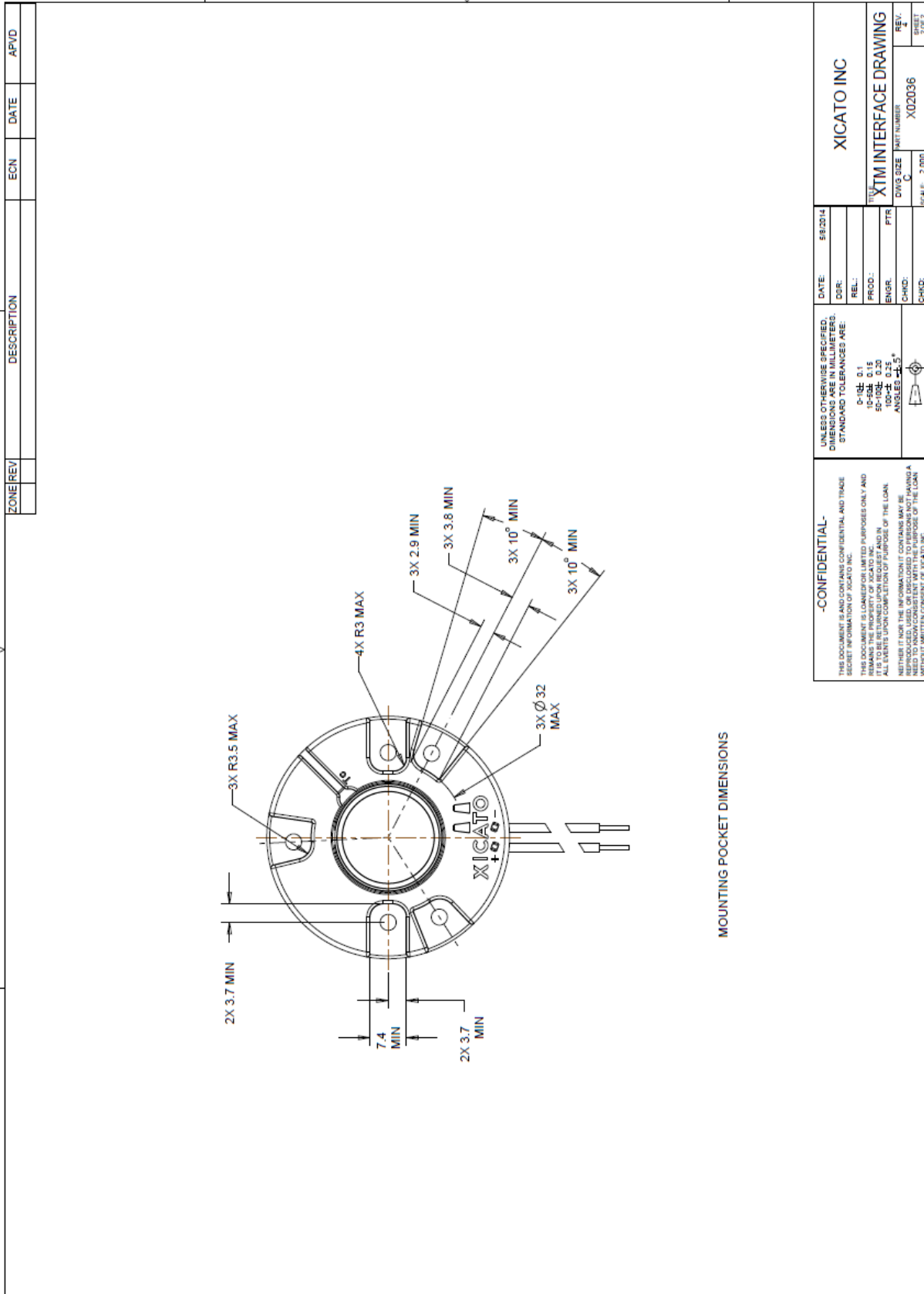| | |
|---|---|
| Module Housing Material: | Injection molded glass filled PBT |
| Dimensions: | 50mm x 5.7mm (1.97" x 0.78") |
| Weight: | 48 grams (1.69 oz.) |
| Light Emitting Surface options: | Ø 9mm (0.35")<br>Ø 19mm (0.75") |
| Module Source Type: | Corrected Cold Phosphor Technology® |
| Interfaces – Electrical: | Fixed 20 gauge wires 600mm |
| 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)<br>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")<br>3 kg (7 lbs.) |
| Storage Temperature: | -40°C to +85°C |
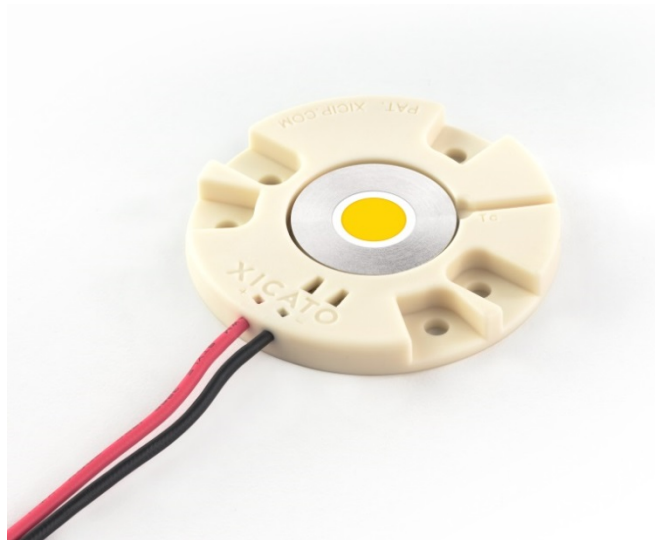


XTM with 9mm LES

# MECHANICAL DRAWINGS

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



**NOTES:**
1. FOR 3 HOLE PATTERN, MINIMUM TORQUE FOR M3 SCREWS IS 0.4Nm (3.5 in-lb)
2. FOR 2 HOLE PATTERN, MINIMUM TORQUE FOR M3 SCREWS IS 0.6Nm (5.3 in-lb)
3. RECOMMEND TO USE SPRING WASHER WITH EITHER FLAT WASHER OR ADAPTER RING
4. RECOMMENDED MOUNTING SCREWS: M3 x 0.5mm x 8mm
5. MATING THERMAL INTERFACE SURFACE FLATNESS OF 0.1mm OR BETTER RECOMMENDED TO MAINTAIN OPTIMAL THERMAL PERFORMANCE
6. HOLES IN THE MATING THERMAL INTERFACE (HEATSINK) GREATER THAN Ø XXmm ARE NOT RECOMMENDED (HOLE SIZE TBD)

XICATO INC

TITLE: 9mm XTM INTERFACE DRAWING

PART NUMBER: X02250

REV. 1

SHEET 1 OF 2

MOUNTING POCKET DIMENSIONS

3X 2.9 MIN
3X 3.8 MIN
3X 10° MIN
3X 10° MIN
4X R3 MAX
3X ⌀32 MAX
3X R3.5 MAX
2X 3.7 MIN
7.4 MIN
2X 3.7 MIN

ZONE | REV | DESCRIPTION | ECN | DATE | APVD.

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UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS. STANDARD TOLERANCES ARE:
0-10± 0.1
10-50± 0.15
50-100± 0.20
100± 0.25
ANGLES ±1.5°

| DATE: | 5/8/2014 |
| DSR: | |
| REL: | |
| PROD: | |
| ENGR: | PTR |
| CHKD: | |
| CHKD: | |

XICATO INC

XTM INTERFACE DRAWING

DWG SIZE | C
PART NUMBER | X02036
REV. | 4
SCALE: 2.000 | SHEET 2 OF 2

# COLOR METRICS: ARTIST SERIES

Optimized for precise, accurate, natural color rendering.

*Artist Series is designed to perfectly emulate natural light sources, with precise color rendering by CIE or IES standards, for the most exacting illumination of art, architecture, or other surfaces.*

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<br>3000K used as test reference. |
| Initial Color Consistency: | ≤ 1 x 2 Macadam ellipses (SDCM) at 70°C, B0 |
| CIE CRI Minimums: | $R_a$ ≥ 95, R9 ≥ 90 |
| Color Maintenance: | Consistency maintained < 0.003 Δu'v' at 50,000 hours |
| Lumen Maintenance: | L70/B0 at 50,000 hours |
| Warranty: | 5 year for individual modules (B0) on mortality, color and lumen maintenance.<br>Details at www.xicato.com/support/warranty |

## CIE CRI COLOR METRICS (VALUES ARE TYPICAL)

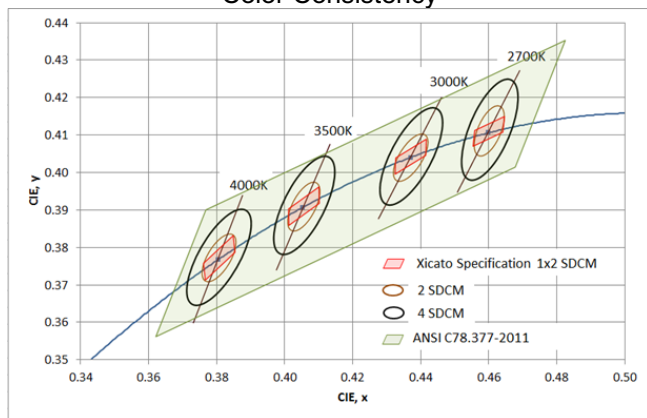| | $R_a$ | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 | $GAI_{BB}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Artist Series | 97 | 98 | 99 | 97 | 96 | 98 | 97 | 98 | 97 | 95 | 99 | 93 | 94 | 98 | 97 | 99 | 109 |

### Spectral Power Distribution vs. Reference Source
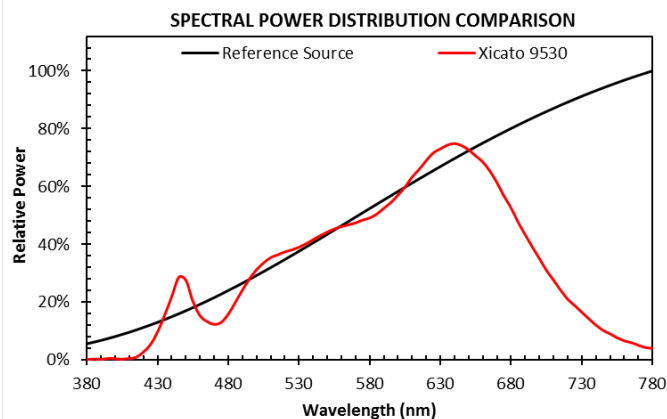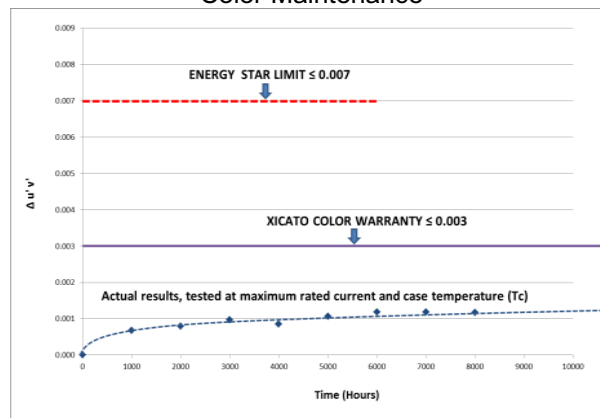


### CIE Color Gamut
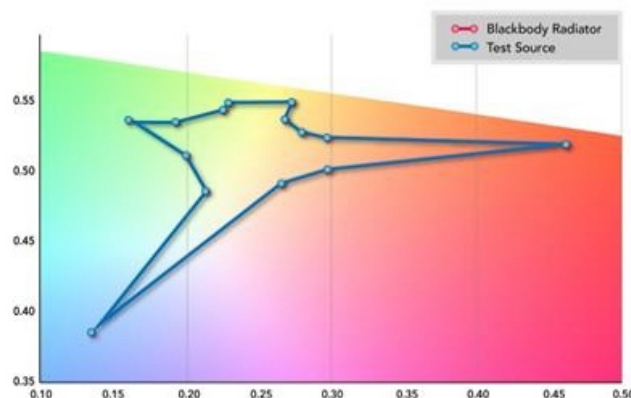


### Color Consistency



### Color Maintenance
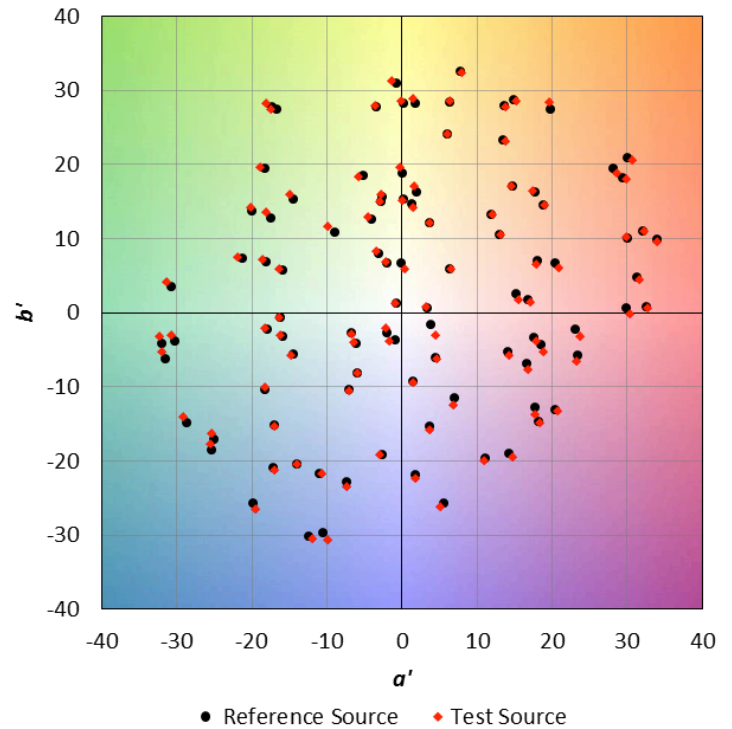
# IES TM-30 COLOR METRICS

(Values are typical. Based on 3000K CCT)

IES TM-30 Color Fidelity ($R_f$)  96

IES TM-30 Color Gamut ($R_g$)  103

## 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.



● Reference Source  ◆ Test Source

## 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.
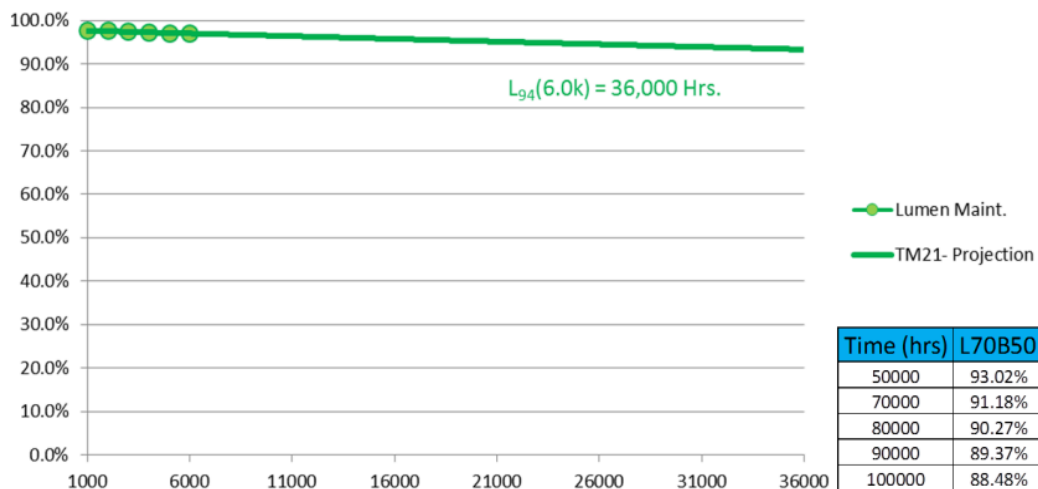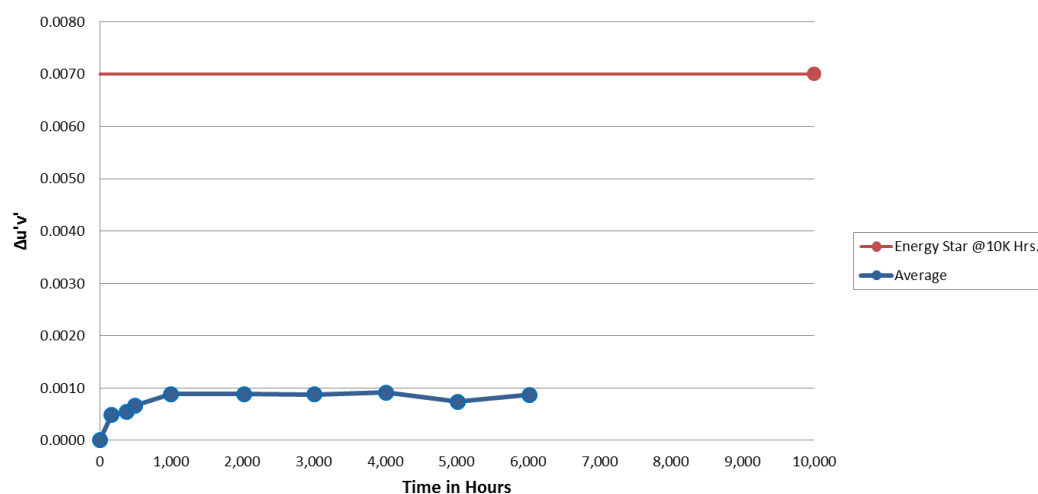- Length of arrow indicates degree of shift.



—Reference Illuminant  —Xicato 9530
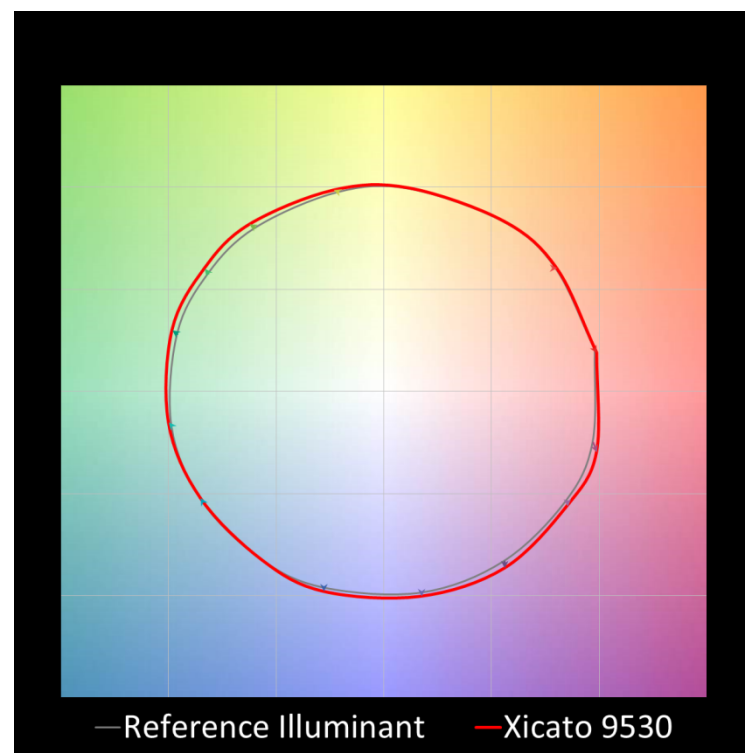
# IES LM-80

## ARTIST SERIES® 19MM LES, 2700K, 2000LM

Testing conducted at $T_c = 90°C$, $I_f = 1050mA$, HTOL, 6000 Hrs.

**LUMEN MAINTENANCE**



$L_{94}(6.0k) = 36,000$ Hrs.

Legend: Lumen Maint., TM21- Projection

| Time (hrs) | L70B50 |
|---|---|
| 50000 | 93.02% |
| 70000 | 91.18% |
| 80000 | 90.27% |
| 90000 | 89.37% |
| 100000 | 88.48% |

**COLOR MAINTENANCE**



Legend: Energy Star @10K Hrs., Average

**COLOR MAINTENANCE (NORMALIZED)**



Legend: 2SDCM in Delta u'v', 3SDCM in Delta u'v', BBL Delta u' v'
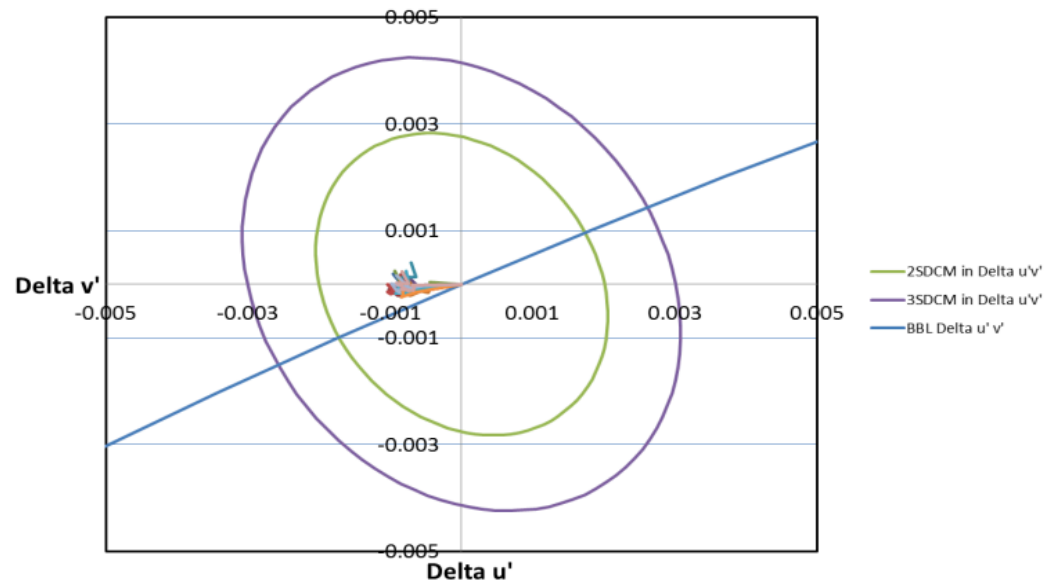
## ARTIST SERIES® 19MM LES, 3000K, 3000LM

Testing conducted at $T_c$ = 90°C, $I_f$ = 1050mA, HTOL, 6000 Hrs.
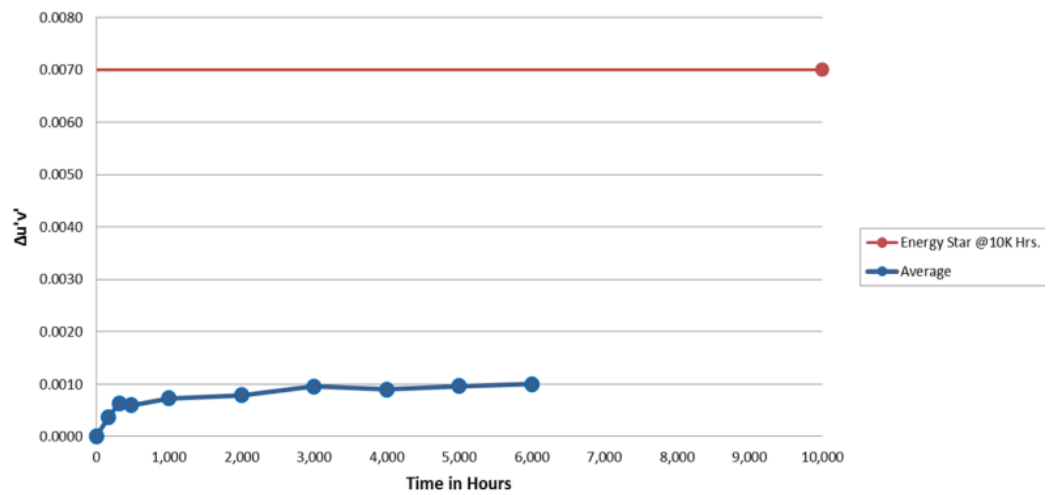
### LUMEN MAINTENANCE

$L_{92}(6.0k) = 36,000$ Hrs.

- Lumen Maint.
- TM21- Projection

| Time (hrs) | L70B50 |
|---|---|
| 50000 | 89.24% |
| 70000 | 85.74% |
| 80000 | 84.04% |
| 90000 | 82.37% |
| 100000 | 80.74% |

### COLOR MAINTENANCE

$\Delta u'v'$

Time in Hours

- Energy Star @10K Hrs.
- Average

### COLOR MAINTENANCE (NORMALIZED)

Delta v'

Delta u'

- 2SDCM in Delta u'v'
- 3SDCM in Delta u'v'
- BBL Delta u' v'
- Series1
- Series2
- Series3
- Series4
- Series5
- Series6
- Series8
- Series11
- Series12
- Series13
- Series14
- Series15
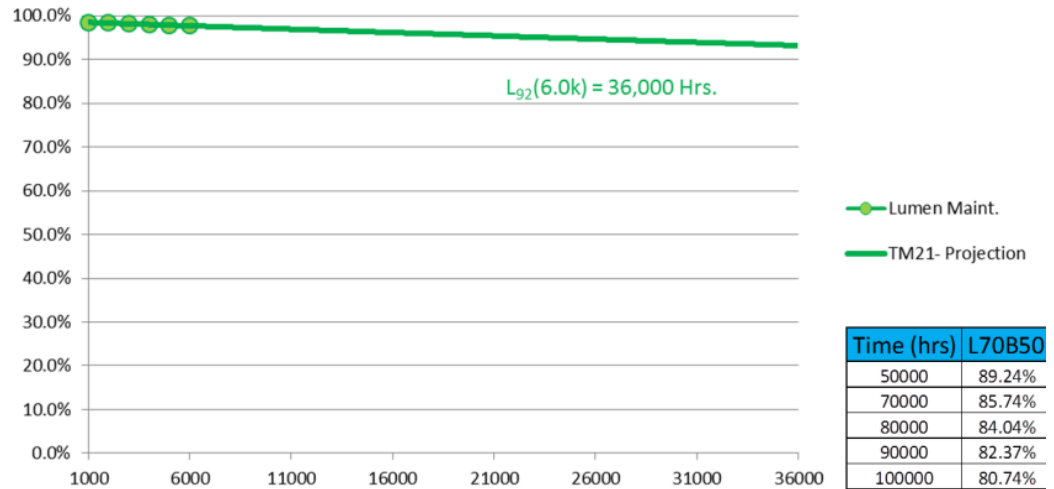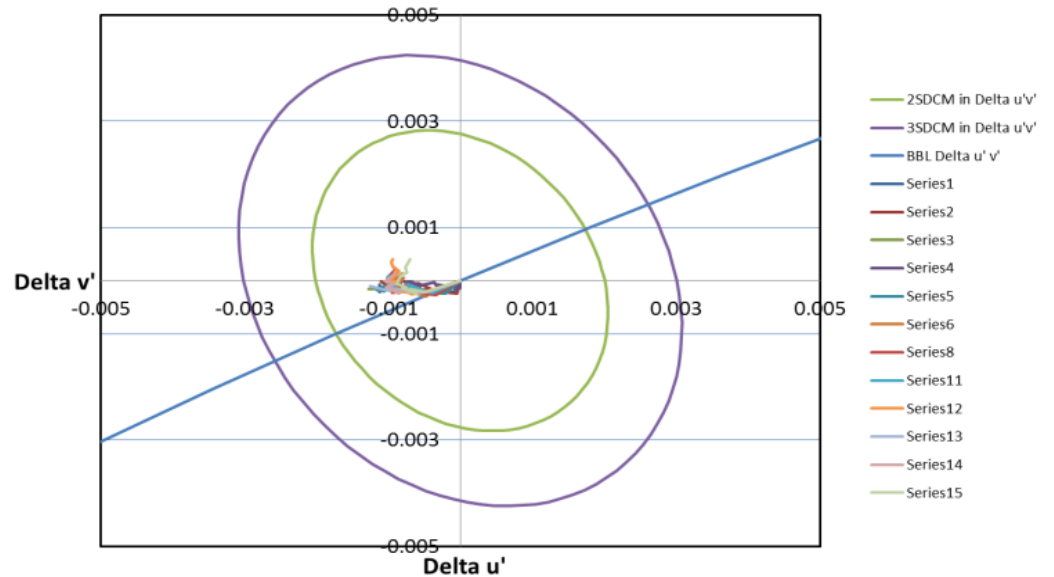
# PERFORMANCE CHARACTERISTICS

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. Minimum, Maximum, and Typical power consumption can be calculated from the ranges provided.
5. Absolute range of lumen output is ±10% of typical value
6. Maximum peak ripple current with frequencies ≥ 100Hz for each product are 1400mA (700 lm), 2000mA (1300 lm) and 2800mA (2000 lm).
7. CCT data ANSI/NEMA compliant.
8. Specifications are subject to change without notice.

## INITIAL COLOR CONSISTENCY

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

## ELECTRICAL AND EFFICACY PERFORMANCE

| LES | Rated Lumens | Current | Forward Voltage | | | Power | Flux | Efficacy |
|-----|-------------|---------|------|------|------|-------|------|----------|
| | | mA | Min | Typ | Max | (W) | Lm | Lm/W |
| 9mm | 700 | 700 | 12.3 | 13.6 | 15.0 | 9.5 | 700 | 74 |
| | | 500 | 12.0 | 13.2 | 14.3 | 6.6 | 550 | 83 |
| | | 350 | 11.7 | 12.9 | 14.3 | 4.5 | 400 | 89 |
| | 1300 | 1050 | 17.9 | 22.5 | 24.8 | 23.6 | 1300 | 55 |
| | | 700 | 17.3 | 21.7 | 24.0 | 15.2 | 930 | 61 |
| | | 500 | 16.8 | 21.1 | 23.4 | 10.6 | 700 | 66 |
| | | 350 | 16.4 | 20.6 | 22.9 | 7.2 | 500 | 69 |
| | 2000 | 1400 | 24.1 | 29.4 | 32.3 | 41.2 | 2000 | 49 |
| | | 1050 | 23.1 | 28.1 | 31.0 | 29.5 | 1560 | 53 |
| | | 700 | 22.2 | 27.2 | 30.0 | 19.0 | 1110 | 58 |
| | | 500 | 21.6 | 26.4 | 29.2 | 13.2 | 800 | 61 |

| LES | Rated Lumens | Current | Forward Voltage | | | Power | Flux | Efficacy |
|-----|-------------|---------|------|------|------|-------|------|----------|
| | | mA | Min | Typ | Max | (W) | Lm | Lm/W |
| 19mm | 1300 | 700 | 14.8 | 19.0 | 21.0 | 13.3 | 1300 | 98 |
| | | 500 | 14.4 | 18.5 | 20.5 | 9.2 | 965 | 104 |
| | | 350 | 14.0 | 18.1 | 20.0 | 6.3 | 720 | 114 |
| | 2000 | 1050 | 17.3 | 19.0 | 24.0 | 20.0 | 2000 | 100 |
| | | 700 | 16.7 | 18.4 | 23.3 | 12.9 | 1400 | 109 |
| | | 500 | 16.3 | 18.0 | 22.8 | 9.0 | 1055 | 117 |
| | | 350 | 16.0 | 17.7 | 22.5 | 6.2 | 800 | 129 |
| | 3000 | 1050 | 26.4 | 29.0 | 35.1 | 30.5 | 3000 | 98 |
| | | 700 | 25.7 | 28.4 | 34.3 | 19.9 | 2140 | 108 |
| | | 500 | 25.2 | 27.9 | 33.8 | 13.9 | 1580 | 113 |
| | | 350 | 24.9 | 27.5 | 33.4 | 9.6 | 1240 | 129 |
| | 4000 | 1400 | 29.6 | 32.6 | 36.0 | 45.6 | 4000 | 88 |
| | | 1050 | 28.8 | 31.7 | 35.1 | 33.3 | 3080 | 93 |
| | | 700 | 28.1 | 30.9 | 34.3 | 21.7 | 2160 | 100 |
| | | 500 | 27.5 | 30.4 | 33.8 | 15.2 | 1624 | 107 |

# 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.
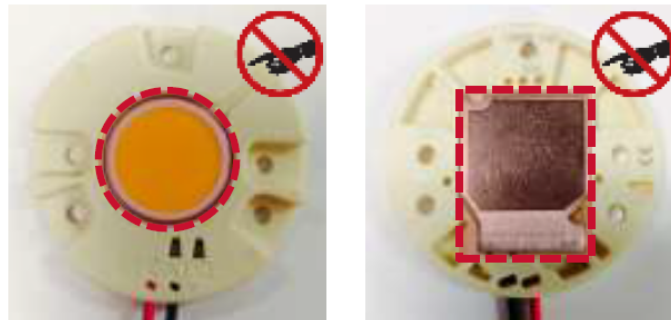


Do not touch sensitive surfaces. Keep them clean.

**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 Technical Data table 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 Ethly 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 Point and Spectral Power Distribution shall be optimized for high fidelity, natural color rendering.

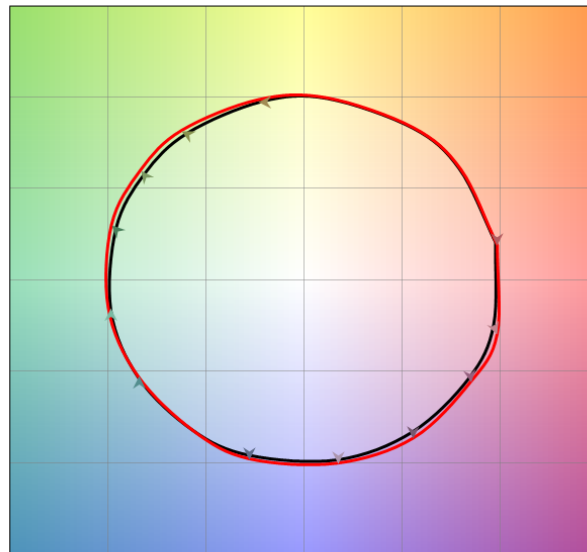| | |
|---|---|
| Initial Color Consistency: | ≤ 1 x 2 MacAdam Ellipses<br>Every light source shall be within a 1 x 2 MacAdam Ellipse (1x2 SDCM)<br>Flux and color point tuned at case temperature 70°C |
| Initial Color Point Accuracy: | within ± 0.001 Δu'v' of Black Body Locus (BBL) |
| Color Maintenance: | Remains within 3 MacAdam Ellipses (C3) at 50,000 hours at maximum operating drive current and maximum case temperature (90°C).<br>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).<br>LM-80 data shall show LM > 94.8% at 6,000 hours. |
| Phosphor Technology: | Corrected Cold Phosphor® technology. |
| Warranty: | 5 years, including minimum on mortality, lumen maintenance, and color maintenance.<br>Mortality: B0 – No failures.<br>Lumen maintenance: L70, B0 (better than 70% on all units).<br>Color maintenance: < 0.003 Duv at 50,000 hours |

## DETAILED COLOR SPECIFICATIONS

**COLOR VECTOR GRAPHIC**

IES TM-30-15 Color rendering fidelity ($R_f$) shall be 96.

IES TM-30-15 Color rendering gamut ($R_g$) shall be 103.

Minimum CIE CRI (Ra) shall be 95; minimum R9 shall be 90.

Typical CIE CRI R values shall be:

| R1: | 98 | R9: | 95 |
|---|---|---|---|
| R2: | 99 | R10: | 99 |
| R3: | 97 | R11: | 93 |
| R4: | 96 | R12: | 94 |
| R5: | 98 | R13: | 98 |
| R6: | 97 | R14: | 97 |
| R7: | 98 | R15: | 99 |
| R8: | 97 | | |

Typical CIE CRI Gamut Area Index $GAI_{BB}$ shall be 109.



—— Reference Source       —— Test Source

LED module shall be Xicato Module # _____