XICATO®

DATA SHEET

Xicato Miniature Drivers (XMD)

Figure 1: Xicato Miniature Driver (XMD) with Xicato GalaXi Card Bluetooth dongle shown inside a standard Stucchi® track adapter.

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.

ABOUT THIS DOCUMENT

This is just one of many documents and tools available from Xicato to assist customers in understanding and using various Xicato products. These include:

- Datasheets and performance graphs
- Test reports, including third party LM-80, UL, CE, and FCC
- Accessory selection tools for heatsinks, optics, and drivers
- CAD files and drawings
- Application and Technical Notes
- Training presentations
- Sales brochures
- Technical whitepapers
- … and much more

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GENERAL DESCRIPTION

XMD – XICATO MINIATURE DRIVER

Xicato Miniature Drivers (XMD) are compact, DC-powered, LED drivers that can stand alone as simple power on/off driver, or connect to a Bluetooth mesh dongle for wireless control. XMD provide constant current control to a wide variety of LED luminaires. As PCBA (printed circuit board assemblies) XMD are specifically designed to fit into highly space-constrained environments, such as inside a standard Stucchi track adapter. Multiple XMD can be mounted on 48V DC track powered by a single high capacity power supply unit (PSU), or can be individually powered by a separate, lower-powered AC-DC PSUs. All XMD models provide extremely accurate, programmable constant current output with deep, IEEE 1789-compliant dimming to 0.1% with Bluetooth wireless control.

FEATURES

LOW VOLTAGE 48V DC INPUT

XMD accepts 48V DC input for individual or group power from inexpensive, readily-available power supply units.

PROGRAMMABLE, CONSTANT CURRENT OUTPUT

XMD maximum current output can be factory limited using the Xicato Configuration Tool (XCT-0101) to between 50% and 100% of rated maximum. For example, XMD01-30C1D4P07-A1A has a maximum output of 700mA, but can be factory programmed as low as 350mA to accommodate lower rated LEDs, smaller fixtures with lower thermal dissipation capacity, or more challenging ambient temperature environments. The factory programmed limit is presented to the end user as 100% from the standpoint of dimming, and the dimming curve is adjusted accordingly to provide deep, smooth dimming to 0.1% with optimal flicker performance.

BROAD OUTPUT VOLTAGE RANGE

XMD can control LED arrays with voltages as low as 2.5V, and as high as 45V. This allows XMD to control individual LED point sources, COB arrays, linear solutions, and other luminaires up to 31W.

THERMAL FOLDBACK AND SHUTOFF

XMD contains internal sensors that detect the temperature of the internal electronics, and which ensure long life by reducing current output in the event that the temperature exceeds the rated temperature of the components. If, after reducing output, the temperature continues to exceed the maximum rating, the XMD automatically shuts off to preserve module lifetime, and to allow the user to troubleshoot the installation.

POTENTIOMETER CONTROL

XMD provides two solder pads on the main board that can be connected to an external 100kOhm potentiometer for wired control of maximum and/or power-on intensity.

BLUETOOTH® CONTROL

When paired with the optional Xicato GalaXi Card (XGC), XMD can communicate wirelessly over a Bluetooth mesh network with sensors, switches, gateways, and mobile devices, providing simple or complex responses to motion and occupancy, ambient light, schedules, and/or user commands.

WIRELESS DATA REPORTING

When paired with the optional XGC Bluetooth card, XMD regularly transmits its current intensity setting, temperature, input power (W), input voltage, and total operating hours, allowing proactive maintenance. It also stores a histogram of intensity settings and temperature for the life of the device, which can be downloaded on request from an application for lifecycle analysis and confirmation of warranty compliance. Among other things, this allows Xicato to verify its product warranty of 7-years or 50,000 hours, and allows users to plan replacement intervals well in advance.

BLUETOOTH BEACONS

When paired with the optional XGC, XMD can broadcast Apple iBeacons, Eddystone URI beacons, and/or Alt Beacons, enabling a wide variety of location-based information and navigation services.

Bluetooth beacons can act as indoor GPS satellites, allowing mobile apps to provide highly granular, accurate location of users in retail shops, hotels, restaurants, museums, airports, or other public and commercial spaces. Beacons can also trigger web searches, information screens, or other application responses based on a user's proximity to exhibits, merchandise, or other points of interest.

CONFIGURABLE ADVERTISING POWER AND INTERVAL

Transmission power for XMD beacons, operational data, and other data can be programmed independently. Users can set both advertising frequency and power levels, depending on their specific application requirements.

ORDERING GUIDE

XMD NUMBERING CONVENTION

Product	Form	Watts	Channels	Input Voltage	Output per channel	Control
XMD	01	15 30 45	Cx = Constant Current x1 = 1ch	Dx = DC x4 = 48V	Pxx = Programmable x03 = 350mA x07 = 700mA x10 = 1050mA x14 = 1400mA	A1A = control connector A4A = Bluetooth

ORDER CODES (PRELIMINARY)

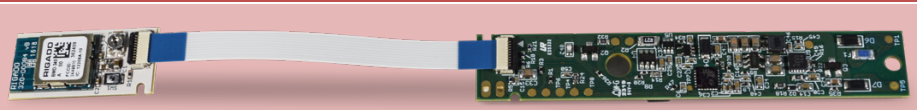
Part Number[1,2]	Description
XMD01-15C1D4P03-A1A	Xicato Miniature Driver, 15W, 48Vdc, programmable 350mA, control connector
XMD01-30C1D4P07-A1A	Xicato Miniature Driver, 30W, 48Vdc, programmable 700mA, control connector
XMD01-45C1D4P10-A1A	Xicato Miniature Driver, 45W, 48Vdc, programmable 1050mA, control connector
XGC-01-XDI-U3	Xicato Control Card, PCBA 10 pin FPC connector, for XMD01
XDA-001	Ribbon cable, FFC 0.50mm, 10 conductor, 65mm, Molex 0152660603 for XGC-01-* cards

Notes:

1. Output current is programmable in all cases, but A1A devices have no Bluetooth control interface. A100kOhm pot can be connected to A1A and A4A models for manual dimming, but A1A otherwise operates in on/off mode only.
2. Ribbon cables are not included unless specifically ordered. They are widely available, off the shelf, TE Connectivity products, carried by Xicato as a convenience to our customers.

MECHANICAL, ELECTRICAL AND WIRELESS SPECIFICATIONS

COMMON SPECIFICATIONS: DRIVERS

Specification: Driver Boards	
Image (preliminary)	
Form Factor	PCBA
Dimensions (driver board)	77mm x 12.5mm x 6mm
Weight	6 grams (with or without Bluetooth)
Electrical Input	48V DC, non-polarized, via solder pads
Constant Current Output	2-wire poke-in, 20-26 AWG solid or stranded
Electrical Protection	Inrush over-current and over-voltage protection. Sustained over-voltage protection via non-replaceable fuse.
Off-State Power Consumption	< 300mW with Bluetooth dongle
Dimming Curve	Logarithmic (default setting) or Linear
Minimum Constant Dim Level	0.1% of programmed maximum
Dim to Off	Yes
Dim to On/Off Intensity Threshold	<0.05%
On-board Sensors	Temperature, Input voltage, Input voltage ripple

DRIVE CURRENT RANGES

	Maximum	Minimum programmable setting*
XMD01-15C1D4P03-A1A/A4A	350mA (default setting)	175mA
XMD01-30C1D4P07-A1A/A4A	700mA (default setting)	350mA
XMD01-45C1D4P10-A1A/A4A	1050mA (default setting)	525mA

* Minimum programmable setting that preserves dimming performance to 0.1%

RECOMMENDED OPERATING LIMITS (ALL)

	XMD01-xxC1D6Pxx-A1A	Notes
Input Voltage range	45.6Vdc to 50.4Vdc	1
Output Voltage range	2.7Vdc to 39Vdc	
Temperature at Tc (max)	-20˚C to +60˚C	

Note 1: Input voltage must be supplied by an SELV (CE) or Class 2 (UR/CNR) power supply to ensure compliant operation with CE or UL safety requirements respectively.

ABSOLUTE LIMITS: COMMON

Specification	Value	Notes
Minimum Input Voltage (48V operation)	Turn on: 42Vdc Turn off: 41Vdc Shutdown: 30Vdc	1
Maximum Input Voltage	48Vdc ±10%	1
Input Power Factor (PF)	1	
Maximum Output Voltage (U-OUT)	56Vdc	2
Maximum Output Voltage (U_{rated})	46Vdc	2
Output Voltage (min)	2.5Vdc	2
Tc (max)	70˚C	
Ta	45˚C / 60˚C	
Thermal Foldback Temperature	83˚C	
Thermal Restore Temperature	75˚C	
Thermal Shutdown Temperature	88˚C	
Storage Temperature	-40˚C to +85˚C	

ABSOLUTE LIMITS: SPECIFIC

	Max V_{input} (V ⎓)	I_{input} (mA)	U-OUT (V ⎓)	Max U_{rated} (V ⎓)	Max I_{rated} (mA)	Max P_{rated} (W)	T_a (˚C)	T_c (˚C)
XMD01-15C1D4P03-A1A	48	350	48	46	350	15	60	70
XMD01-30C1D4P07-A1A	48	700	48	46	700	30	45	70
XMD01-45C1D4P10-A1A	48	1050	48	46	1050	45	45	70
Notes	1		2					70

Notes:

1. Input supply voltage is SELV/Class 2 = 48 V⎓
2. Outputs are Class 2
3. LED output push-in terminals support AWG20 to AWG26 (Max ø 1.60mm). To remove wire from push-in terminal, twist and pull wire from terminal.
4. These are LED DRIVER products suitable for driving LED loads only.

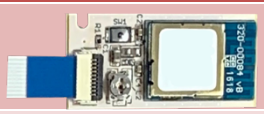
CONNECTION TO XICATO CONFIGURATION TOOL

Requires XCT hardware running Xicato configuration tool software.

Connect XCT to XMD power input side. Wired connection is for power only. XCT configuration/programming connection to XMD is via Bluetooth.

WIRELESS SPECIFICATIONS

OPTIONAL BLUETOOTH DONGLE

	XGC-B8-XMD-01
Image (showing end of cable)	
Form Factor	PCBA
Dimensions	26.5mm x 12.5mm x 3mm
Weight	< 1 gram
Electrical and Communications I/O	10 pin FFC/FPC connector, poke-in to driver and dongle, Molex 0152660603

Feature	Specification
Processor	ARM Cortex M0, 32-bit, 48 MHz
Wireless Protocol	Bluetooth 5
Wireless Spectrum	2.4 GHz ISM band
Bandwidth	1 Mbps (2 Mbps capable)
Channels	40
Transmit Power	Configurable in 1 dBm increments to +8.5 dBm
Receive Sensitivity	-95 dBm
RSSI Resolution	1 dBm

FIRMWARE SPECIFICATIONS

CONTROL PROGRAMMING

Feature	Specification
Site Scalability	Over 140 trillion individually addressable nodes (2^37)
Maximum # of Secure Network Zones	Over 4 billion (2^32). Secure networks cannot overlap.
Maximum devices per secure network	32,767 (2^15-1). One secure network per node.
Max # of Groups per Secure Network	16,383 (2^14-1). Groups can overlap.
Max # of Scenes per Secure Network	65,535 (2^16-1). Scenes can overlap. Scenes can span groups.
Max # of Groups per Device	16
Max # of Scenes per Device	32
Protocol Security	AES-128 (128-bit encryption), other mechanisms

DIMMING INFORMATION: BLUETOOTH

Dimming Profile	Logarithmic (default) or linear, configurable
Minimum Dim Setting	0.1% of maximum intensity
Dimming Granularity	0.01% resolution (10,000 steps from 100% to 0.01%)

DIMMING AND FLICKER PERFORMANCE

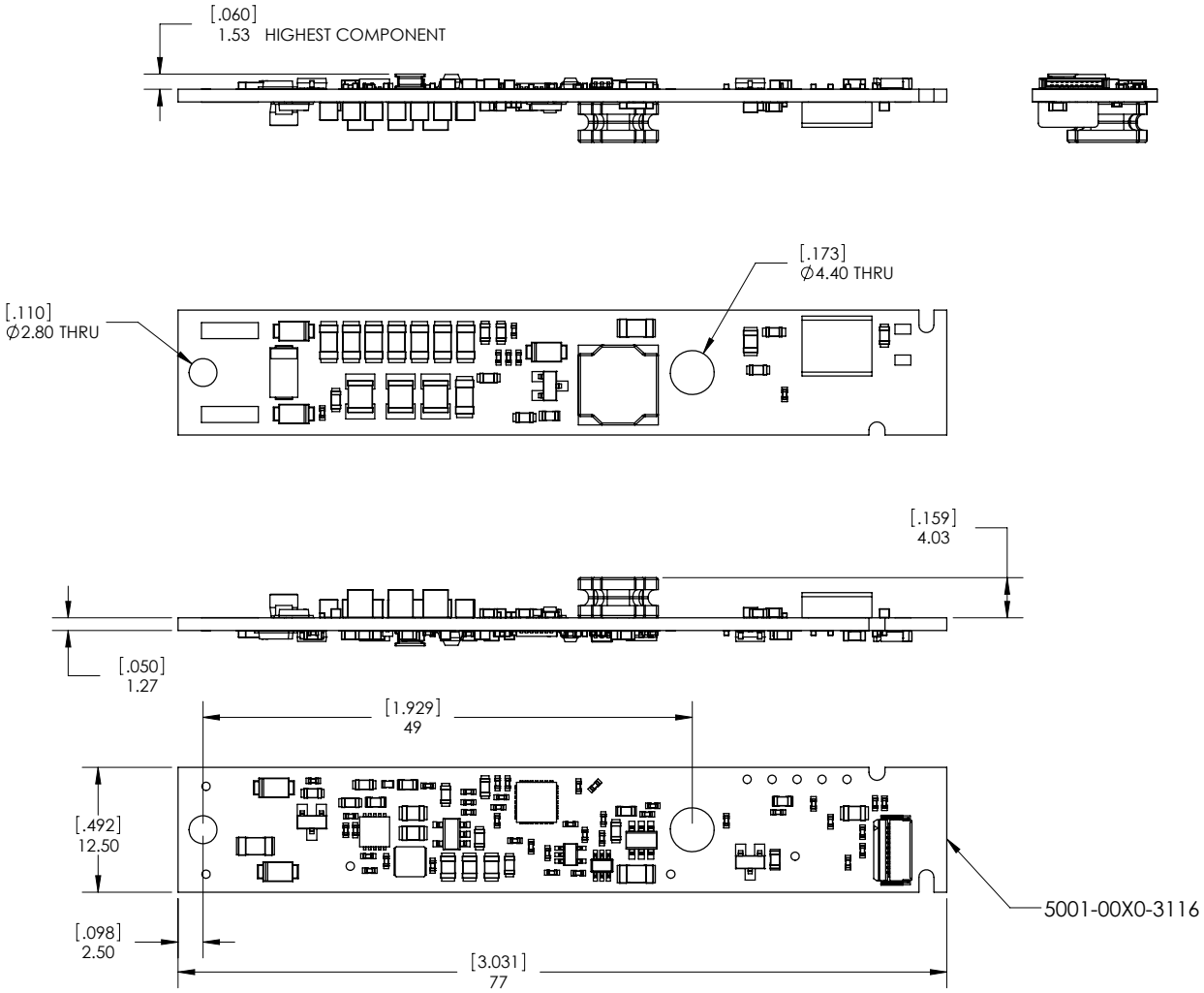
Reference	Luminous Intensity	Modulation Frequency	Risk Level
Reference IEEE Std 1789-2015: "IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers"	100% - 1.25% of max	≥ 3,000 Hz	No Effect
	1.25% - 0.5% of max	≥ 1,250 Hz	Low Risk
	0.5% - 0.1% of max	> 250 Hz	Medium Risk

INTERNAL SENSOR DATA COLLECTION & STORAGE

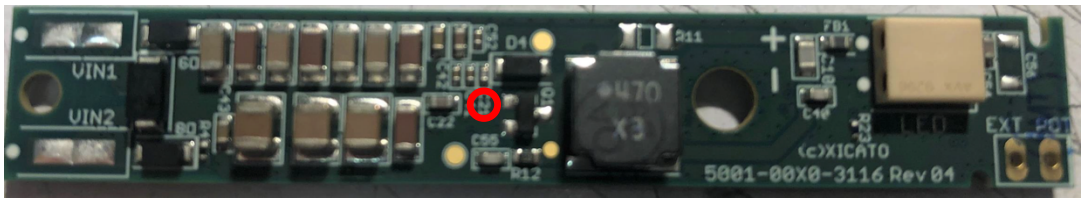
Real-time reporting	Current Intensity level Current Temperature of electronics printed circuit board (PCB). Current Input power, voltage and ripple Current Group membership (provisioned) Current Scene membership (provisioned)
Stored operating history	Total operating hours (at > 0% intensity) Power cycles (power on/off) LED cycles (LEDs turned on/off, unit still powered) Histogram of time spent in 9 temp ranges: < 50˚C, 50-54˚C, 55-59˚C, …, 90-94˚C, ≥ 95˚C Histogram of time spent in 12 intensity ranges: 0%, 0.1-1.0%, 1-10%, 11-20%, …, 91-100%
Stored module Information	XMD part number GTIN Serial number XMD hardware revision XMD firmware revision Bluetooth firmware revision Maximum current Programmed current
Stored OEM programming	OEM serial number (12 bytes) 36 bytes optional free text data

MECHANICAL DRAWINGS

XMD WITHOUT HEATSINK

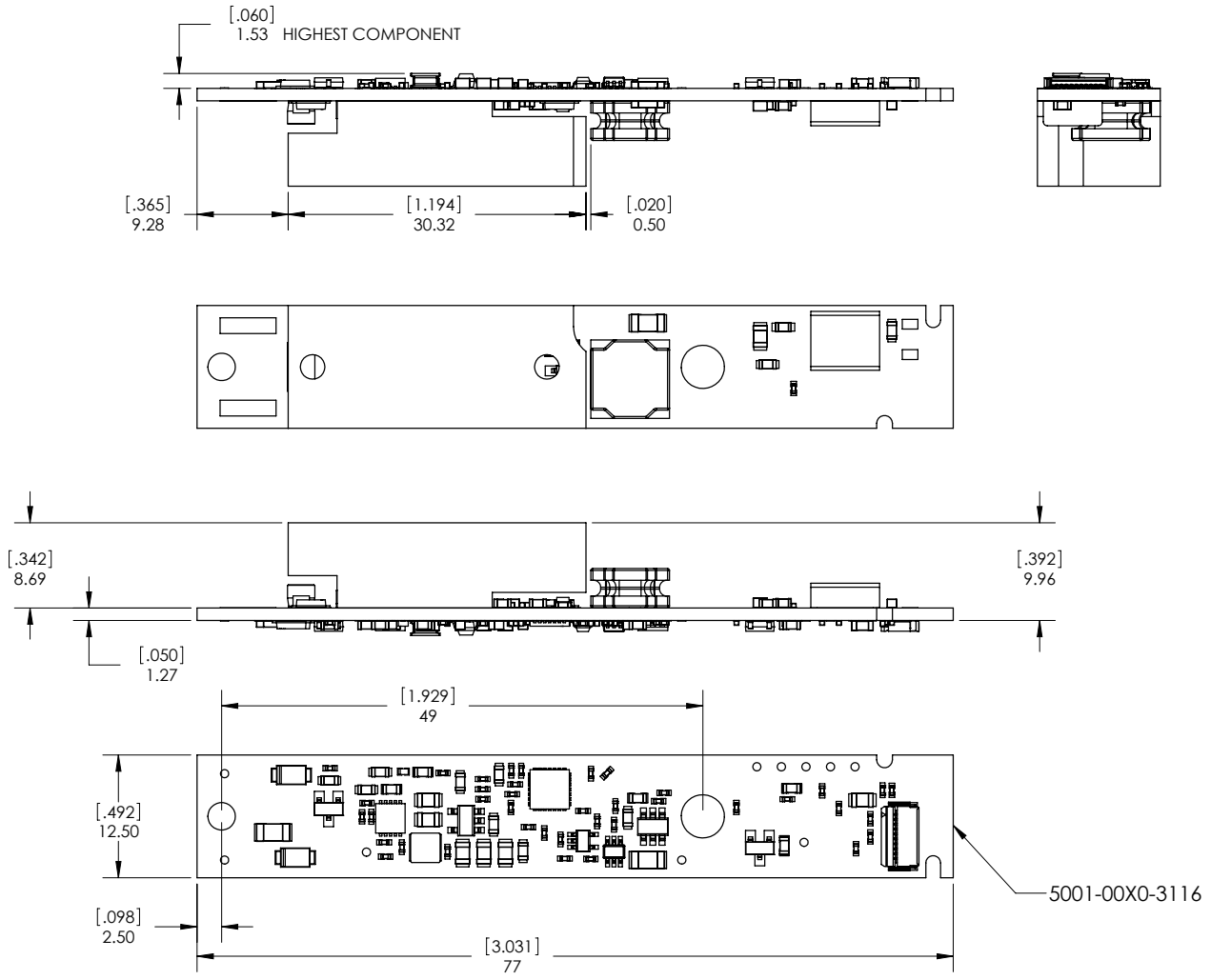


XMD TC POINT LOCATION – NO HEATSINK

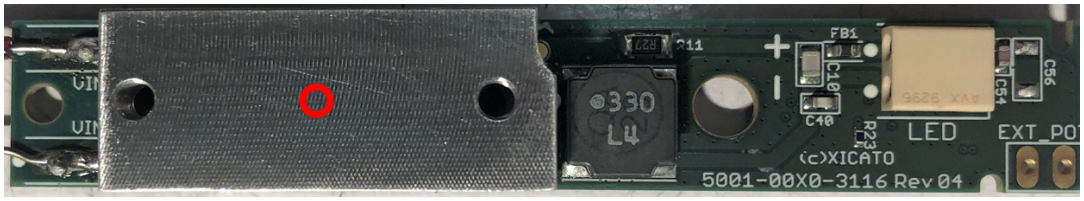


Tc point is on board next to Q1

XMD WITH HEATSINK



XMD TC POINT LOCATION – HEATSINK



Tc point is in the center of the metal plate

XMD WIRING DIAGRAM

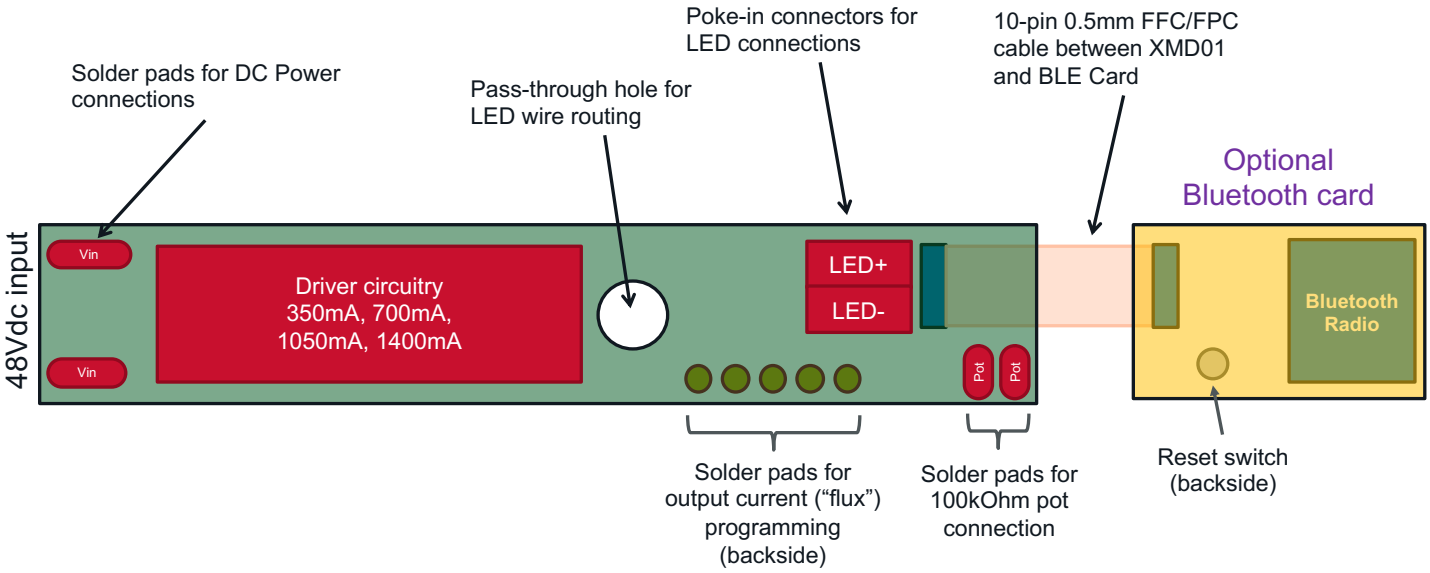


Figure 2: XMD wiring diagram

XMD PERFORMANCE VS. INTENSITY AND VF

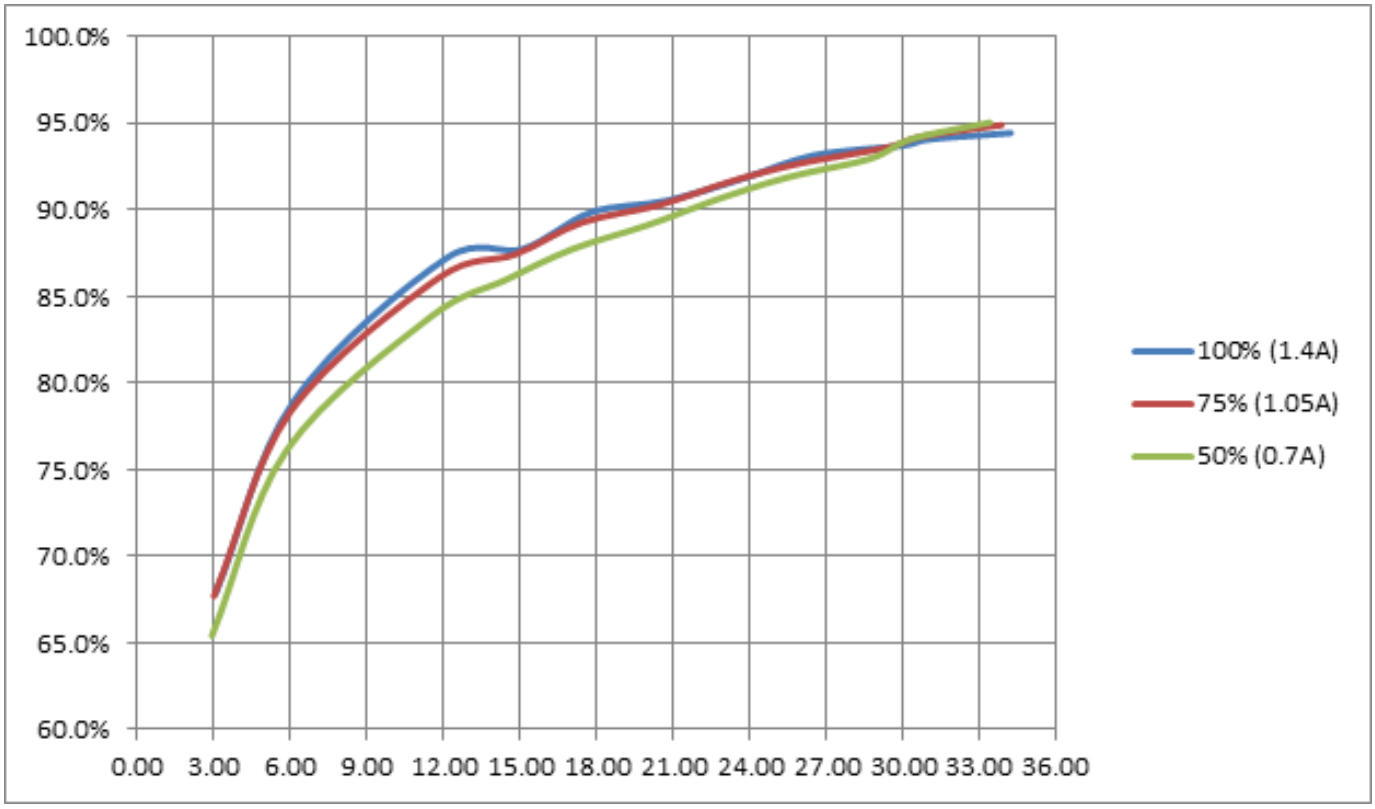
EXAMPLE XMD EFFICIENCY BASED ON DIE CONFIGURATION AND INTENSITY

Efficiency is calculated as power delivered to LED light source(s), divided by power into XMD. All data is for 48V input to XMD01-50C1D6P14-A6. Maximum Vf must remain -3Vdc below input voltage.

Intensity (dim level):	100%				75%				50%			
Die Configuration	Vf	Total	Adder	Efficiency	Vf	Total	Adder	Efficiency	Vf	Total	Adder	Efficiency
1x1	3.05	6.29	2.02	67.9%	2.99	4.64	1.50	67.7%	2.91	3.11	1.07	65.4%
2x1	6.12	10.85	2.28	79.0%	5.98	8.02	1.74	78.3%	5.84	5.37	1.28	76.1%
4x2	12.12	19.50	2.48	87.2%	11.83	14.40	2.00	86.1%	11.50	9.60	1.55	83.8%
5x2	15.08	24.06	2.95	87.7%	14.79	17.76	2.23	87.4%	14.43	11.75	1.65	86.0%
6x2	17.78	27.70	2.81	89.9%	17.42	20.49	2.20	89.3%	17.03	13.59	1.67	87.7%
7x3	20.76	32.10	3.04	90.5%	20.42	23.75	2.31	90.3%	19.99	15.70	1.71	89.1%
8x2	23.80	36.30	2.96	91.9%	23.30	26.70	2.22	91.7%	22.7	17.50	1.65	90.6%
9x3	26.50	39.80	2.72	93.2%	26.00	29.50	2.15	92.7%	25.5	19.40	1.58	91.9%
10x3	30.00	44.80	2.81	93.7%	29.40	33.00	2.11	93.6%	28.7	21.60	1.52	93.0%
11x4	31.01	46.20	2.74	94.1%	30.69	34.20	1.98	94.2%	30.37	22.60	1.33	94.1%
12x4	34.22	50.70	2.82	94.4%	33.86	37.50	1.91	94.9%	33.4	24.60	1.22	95.0%

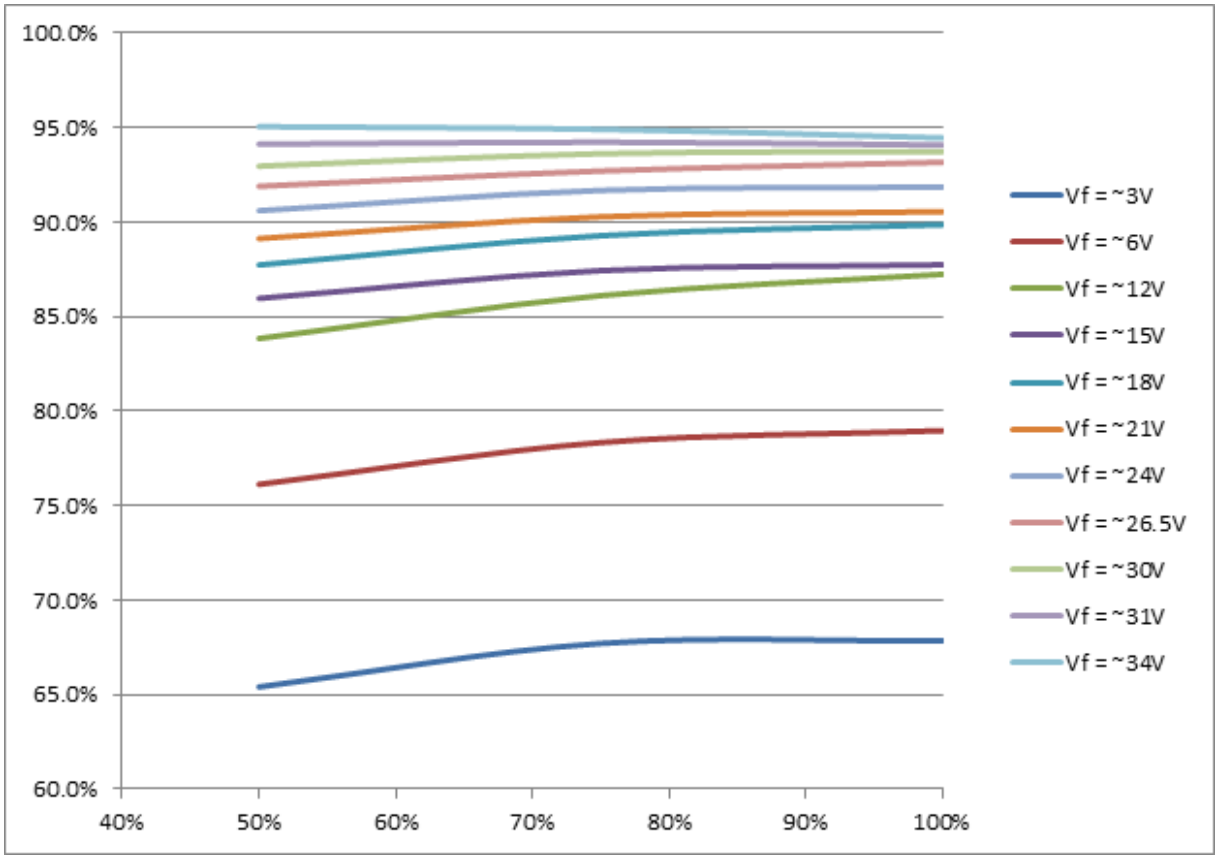
XMD EFFICIENCY VS. INTENSITY AND FORWARD VOLTAGE

y-axis is XMD efficiency, x-axis is forward voltage.



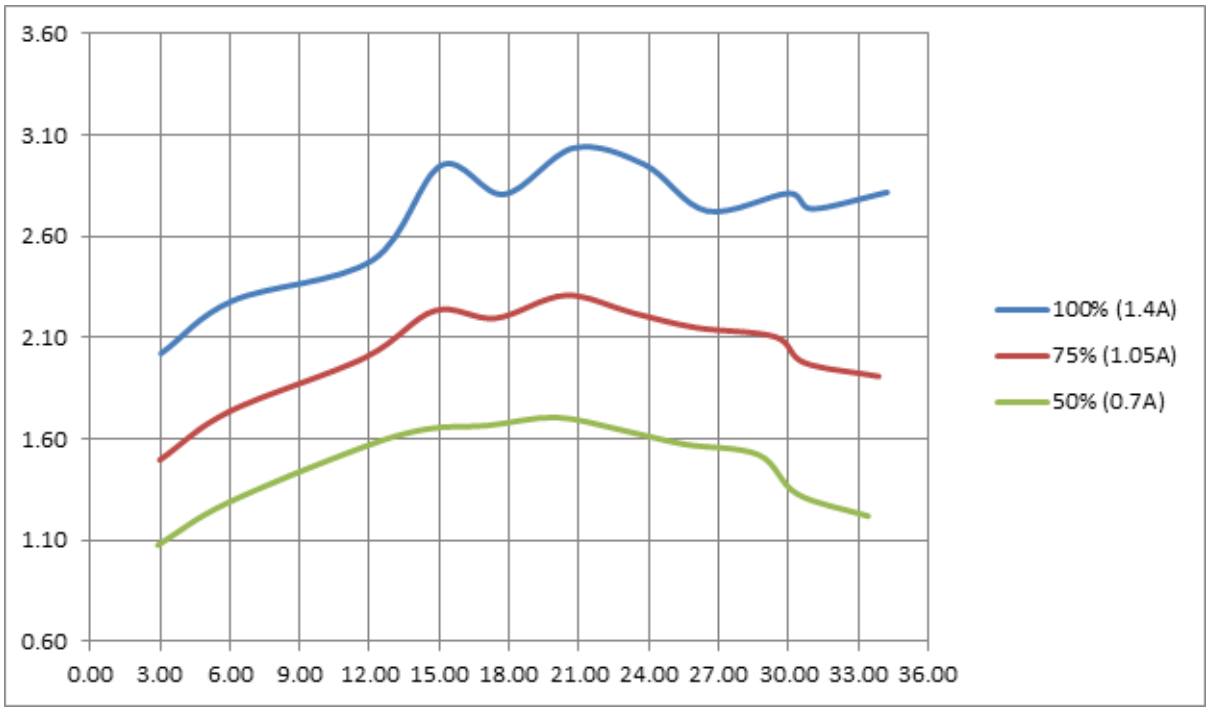
XMD EFFICIENCY VS. INTENSITY AT FIXED FORWARD VOLTAGES

y-axis is XMD efficiency; x-axis is intensity (% of maximum drive current of 1.4A)



XMD POWER CONSUMPTION VS. FORWARD VOLTAGE AND DRIVE CURRENT

y-axis is power consumed by XMD (not delivered to LED array); x-axis is forward voltage



WARRANTY

Warranty duration:	5 years Temperature and power parameters must be kept within recommended specifications. Verification based on actual operating data stored in each module.
Warranty coverage:	Covers electronics on EVERY module (B0). No failures.
Full warranty text at:	www.xicato.com/support/warranty

REGULATORY & AGENCY APPROVALS

ELECTRICAL SAFETY & HANDLING

CE:	IEC61347-1 (Ed. 3), IEC 61347-2-13 (Ed. 2), IEC 61347-2-13 (Ed. 2);am1
UL:	8750 – Light Emitting Diode (LED) Equipment for Use in Lighting Products 1310 – Standard for Class 2 Power Units. File E494343
Ingress Protection rating:	IP20, Suitable for dry and damp locations
CSA:	C22.2 No. 250.13-14.

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

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

WIRELESS COMPLIANCE

UNITED STATES

FCC NOTICE: This device complies with Part 15 of the FCC Rules. The device meets the requirements for the modular transmitter approval as detailed in FCC public Notice DA00-1407. Transmitter Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

LABELING REQUIREMENTS: The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate FCC identifier for this product as well as the FCC Notice above. The FCC identifier is FCC ID: WAP2006. In any case the end product must be labeled on the exterior with "FCC ID: WAP2006"

CANADA

ISED NOTICE: The device complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-GEN. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

L'appareil est conforme aux Règles RSS-GEN de Canada. L'appareil répond aux exigences d'approbation de l'émetteur modulaire tel que décrit dans RSS-GEN. L'opération est soumise aux deux conditions suivantes: (1) Cet appareil ne doit pas causer d'interférences nuisibles, et (2) Cet appareil doit accepter toute interférence reçue, y compris les interférences pouvant entraîner un fonctionnement indésirable.

ISED INTERFERENCE STATEMENT FOR CANADA

This device complies with Innovation, Science and Economic Development (ISED) Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme à la norme sur l'innovation, la science et le développement économique (ISED) norme RSS exempte de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED RADIATION EXPOSURE STATEMENT FOR CANADA

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme aux limites d'exposition aux radiations ISED prévues pour un environnement incontrôlé.

LABELING REQUIREMENTS:

The Original Equipment Manufacturer (OEM) must ensure that ISED labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate IC identifier for this product as well as the ISED Notice above. The IC identifier is 7922A-2006. In any case, the end product must be labeled in its exterior with "IC: 7922A-2006".

EUROPE

Declaration of Conformity: Hereby, Xicato declares that the XIM series products comply with the essential requirements and other relevant provisions of RED 2014/53/EU.

JAPAN

MIC Japan certificate 203-JN0599

KOREA

KC Korea certificate MSIP-CRM-Cyp-2006