DATA SHEET

XIS: Xicato Intelligent Sensors

Figure 1: XIS01-D5M1LTH-B integrated sensor

Figure 2: XIS00-D5M1LTHXXY-B Integrated sensor, showing connectors for remote sensor elements

Figure 3: XIS-M4 remote PIR sensor

Figure 4: XIS02-B1THXYY Spider sensor body, top and bottom, showing connectors for external sensor elements

Figure 5: XIS-L remote Lux sensor

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 energy efficient, human-centric environments with our GalaXi™ portfolio of intelligent light sources, 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:

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

Visit www.xicato.com/support/documents-and-tools, or contact your local Xicato representative for more information

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GENERAL DESCRIPTION

XIS – XICATO INTELLIGENT SENSOR

Part of the Xicato GalaXi™ portfolio of Bluetooth wireless devices, Xicato Intelligent Sensors (XIS) are programmable to transmit sensor data – including occupancy, ambient light (lux) level, temperature, humidity, and vibration – on a periodic basis to affect lighting control, environmental management, and other applications.

Xicato GalaXi currently includes Xicato intelligent LED modules (XIM), IP gateways (XIG), drivers (XID), protocol translators, switches, and software.

Different XIS models are designed for different purposes. XIS01 are integrated sensors on a single board, whereas XIS02 are expandable through wired, external modules. Each is capable of various combinations of passive infrared (PIR) motion, lux, temperature, humidity and accelerometer sensing. XIS01 is DC powered at 6-56 volts, so can be powered by anything from a standard 9V battery, to a standard AC-DC "wall wart" power transformer, to a lighting track operating at 12V, 24V or 48V. XIS02 "spider" sensors are 3V CR2450 coin cell battery powered and designed to be wall or ceiling mounted, or hidden behind artwork, with up to three peripheral sensors designed to provide motion and lux sensing data.

XIS advertise (broadcasts) sensor information as BLE data in a Xicato-defined, open format, which can be detected by compliant lighting modules, gateways (XIG), drivers (XID), smartphones or tablets, or other BLE-enabled devices. It can therefore simultaneously affect the control of any number of lights, while providing environmental data input to HVAC and other building management systems.

XIS are available as printed circuit board assemblies (PCBA) that can be used as-is or adapted by third parties into enclosures suitable for different applications.

All Xicato GalaXi products will migrate to the new Bluetooth Mesh standard in the first half of 2018, expanding the GalaXi ecosystem by opening new opportunities for interoperability with 3rd party products and software.

FEATURES

XICATO INTELLIGENT SENSOR PROCESSOR

The conversion of sensor input to BLE messages on the XIS is handled by the Xicato Intelligent Sensor Processor (XISP). The XISP can support up to 3 "toggle" sensor inputs for motion sensors and two I2C busses for other standard sensors.

The toggle inputs are LVTTL/LVCMOS inputs that indicate motion/occupancy of a space by toggling the pin from low to high when the sensor detects motion/occupancy. There are no requirements on the type of sensor that should be used to detect motion/occupancy, only that the sensor toggles its output in response to detecting motion/occupancy. The standard XIS PIR motion sensor has a range of 5 meters, but can supply other PIR motion sensor types as described below.

The I2C interface can support a wide variety of standard sensors with firmware support currently available for lux and humidity sensors (please contact Xicato for specific sensor model numbers supported). Support is planned for accelerometers – e.g., to detect movement of the XIS itself – in future firmware updates.

PASSIVE INFRARED MOTION SENSING

The standard PIR motion sensor included on the XIS (M1 or M4) has a range of 5 meters, and detects occupancy of people and animals walking through the space. XIS can also be ordered with a slight motion sensor, which can detect very small motions at up to 2 meters, or a long-range sensor with a detection distance of 10-12 meters. The XIS01 integrates on the PCBA one PIR motion sensor. The XIS00, available for special order, has one PIR motion sensor on-

board, plus connectors for up to two additional remote PIR motion sensors, powered by the XIS00, which behave as independent sensors. The XIS02 has a single, 2-wire connector for a remote PIR sensor.

Unlike other so-called "intelligent" sensors, which are paired with specific lighting circuits and must be programmed, the Xicato PIR sensor transmits a simple binary signal when motion is detected. This allows the motion detection to be used by any number of lights, by other devices in the space, such as ventilation systems, by the Xicato Intelligent Driver (XID), or other control devices, or by the Xicato IP Gateway (XIG), which can forward the data to a remote server for tracking of visitor occupancy and motion for a variety of purposes. See the Xicato website for more information.

LUX SENSING

The XIS supports an I2C based lux sensor with a reporting range of 1 lux to 65,535 lux and with a measurement integration time of less than 1 second. In addition, the lux sensor is designed to closely match the photopic response of the human eye, including significant infrared rejection. XIS00 and XIS01 include a single on-board lux sensor. XIS00 also has a 4-wire I2C connector for a single remote lux sensor. The XIS02 includes I2C connectors for two remote lux sensors.

TEMPERATURE AND RELATIVE HUMIDITY SENSING

Included on all XIS models is temperature built into the Bluetooth module. XIS00 and XIS02 have a dedicated temperature and relative humidity (RH) sensor. Temp and RH are also available on XIS01. The values read from the sensor are reported from the XIS on a regular period that is configurable by the user.

MOVEMENT (ACCELEROMETER)

XIS00 and XIS02 are pre-configured with an I2C based movement sensor (i.e., accelerometer), in anticipation of support in a future firmware release that can be updated over the air (OTA) over the Bluetooth network. Once implemented, this will allow for the detection of movement of the XIS as well as any impacts detected beyond a specified threshold.

FLEXIBLE INPUT VOLTAGE (XIS00 AND XIS01)…

XIS00 and XIS01 can be powered by anything from a 9V battery to a standard 48V wall wart transformer. It is particularly well suited for installation on 12V, 24V or 48V track.

… OR STANDALONE BATTERY POWER (XIS02)

XIS02 is 3V powered using a standard CR2450 coin cell battery, providing the flexibility to mount it anywhere – behind a painting. Under a retail shelf. Next to a door or window. XIS02 alone can simply detect temperature and humidity, or can be wired to remote motion (XIS-M1) or lux (XIS-L) sensor elements for flexible occupancy and light level sensing. Depending on how you configure the advertising power and cadence, the battery can provide years of reliable operation, and because it reports its battery level to the Xicato Control Panel or Xicato Intelligent Gateway (XIG) you will know well in advance when it is time to replace it.

CONFIGURABLE ADVERTISING POWER AND INTERVAL

Depending on your application, XIS can be configured with different transmit power settings and intervals to increase data granularity, or to conserve battery power. All configuration of the XIS can be performed through Xicato's Control Panel software, or using compatible software from third party vendors.

ORDERING GUIDE

GUIDE TO PART NUMBERING

Product	Form	-	Input Voltage	Sensor	-	Comms
XIS = sensor XSA = accessory	"" = sensor only 00 = custom 01 = integrated 1 02 = spider		B1 = 3V battery D5 = 9-48V	M1 = Std Motion M2 = Fine Motion M3 = Long Motion M4 = Hybrid Motion L = Lux T = Temperature H = Relative Humidity A = Accelerometer C = eCO2 (VOC) X = 3w toggle conn Y = 4w I2C conn		B = BLE

AVAILABLE PARTS

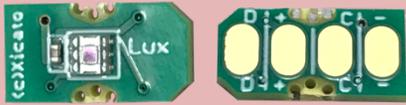| Part Number	Description
XIS00-D5M1LTHAXXY-B	PCBA, integrated sensor, 6-56V, PIR, lux, temp, humidity, accel, 2x PIR port, 1x lux port
XIS01-D5M1LTH-B	PCBA, integrated sensor, 6-56V, PIR, lux, temp, humidity
XIS01-D5M1T-B	PCBA, integrated sensor, 6-56V, PIR, temp
XIS02-B1THAXYY-B	PCBA, spider sensor body, temp, humidity, accel, 1x PIR port, 2x lux port
XIS-L	PCBA, remote Lux sensor. Requires XIS00 or XIS02.
XIS-M4	PCBA, remote PIR sensor. Requires XIS00 or XIS02.
XIS02-BUNDLE1	PCBA, spider sensor bundle, 1x XIS02-B0THAXYY, 1x XIS-M1, 2x XIS-L (wires not included)
XSA-334	XIS 2-pin power wire harness, TE 2058943-1

MECHANICAL, ELECTRICAL AND WIRELESS SPECIFICATIONS

|	XIS00-D5M1LTHAXXY-B	XIS01-D5M1LTH-B	XIS01-D5M1T-B	XIS02-B1THAXYY-B
Form factor	PCBA	PCBA	PCBA	PCBA
Dimensions	52 x 32 x 18.3 mm (2.0 x 1.3 x 0.7 in)	52 x 32 x 18.3 mm (2.0 x 1.3 x 0.7 in)	52 x 32 x 18.3 mm (2.0 x 1.3 x 0.7 in)	43 x 40 x 8.9 mm (⌀46 mm max)
Weight	8 grams	6 grams	6 grams	8 grams (without coin battery)
Operating temp	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C	-25°C to +85°C
Storage temp	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Input Voltage	6V to 56V DC	6V to 56V DC	6V to 56V DC	3V coin cell battery CR2450
Power Connection	TE 2106091-1	TE 2106091-1	TE 2106091-1	Not Applicable
Wire Harness Part #	TE 2058943-1	TE 2058943-1	TE 2058943-1	Not Applicable
Power Consumption[1]	< 10mW @ 48V	< 10mW @ 48V	< 10mW @ 48V	< 1mW @ 3V
PIR motion sensors	1	1	1	0
Lux sensors	1	1	0	0
Temperature sensors	1	1	1	1
RH sensors	1	1	0	1
Accelerometer	1	0	0	1
Ports: 4-wire I2C (lux)	1	0	0	2
Ports: 3-wire toggle (PIR)	2	0	0	1
Processor	ARM Cortex M0, 32-bit, 48 MHz			
Wireless Protocol	Bluetooth Low Energy v4.1			
Wireless Spectrum	2.4 GHz ISM band			
Bandwidth	1 Mbps			
Channels	40			
Transmit Power	-18 dBm to +3 dBm			
Receive Sensitivity	-87 dBm			
RSSI Resolution	1 dBm			
Signal to Noise Ratio (SNR)	> 5:1			

[1] Typical. Actual power consumption is dependent on user-configurable transmit power and frequency settings.

PERIPHERAL SENSORS TO XIS00 AND XIS02

Both the XIS00 and XIS02 have ports for connecting specific types of remote sensors. Remote sensors are delivered as shown, with no wires.

	XIS-M4	XIS-L
Form Factor	PCBA	PCBA
Dimensions	∅18 mm x 18.4 mm	10 mm x 5 mm
Weight	2g	1g
Physical Interface	3 wire, customer soldered	4-wire, customer soldered
Electrical Interface	V+, V-, data	I2C
Incremental power consumption		
Maximum Wire Length (distance from body)		
Detection Range	5m (standard) 2m (slight motion option) 12m (long range option)	NA
Reporting Range	Binary (high/low)	1 lux to 65,535 lux
Response / Integration Time		< 1 sec integration time
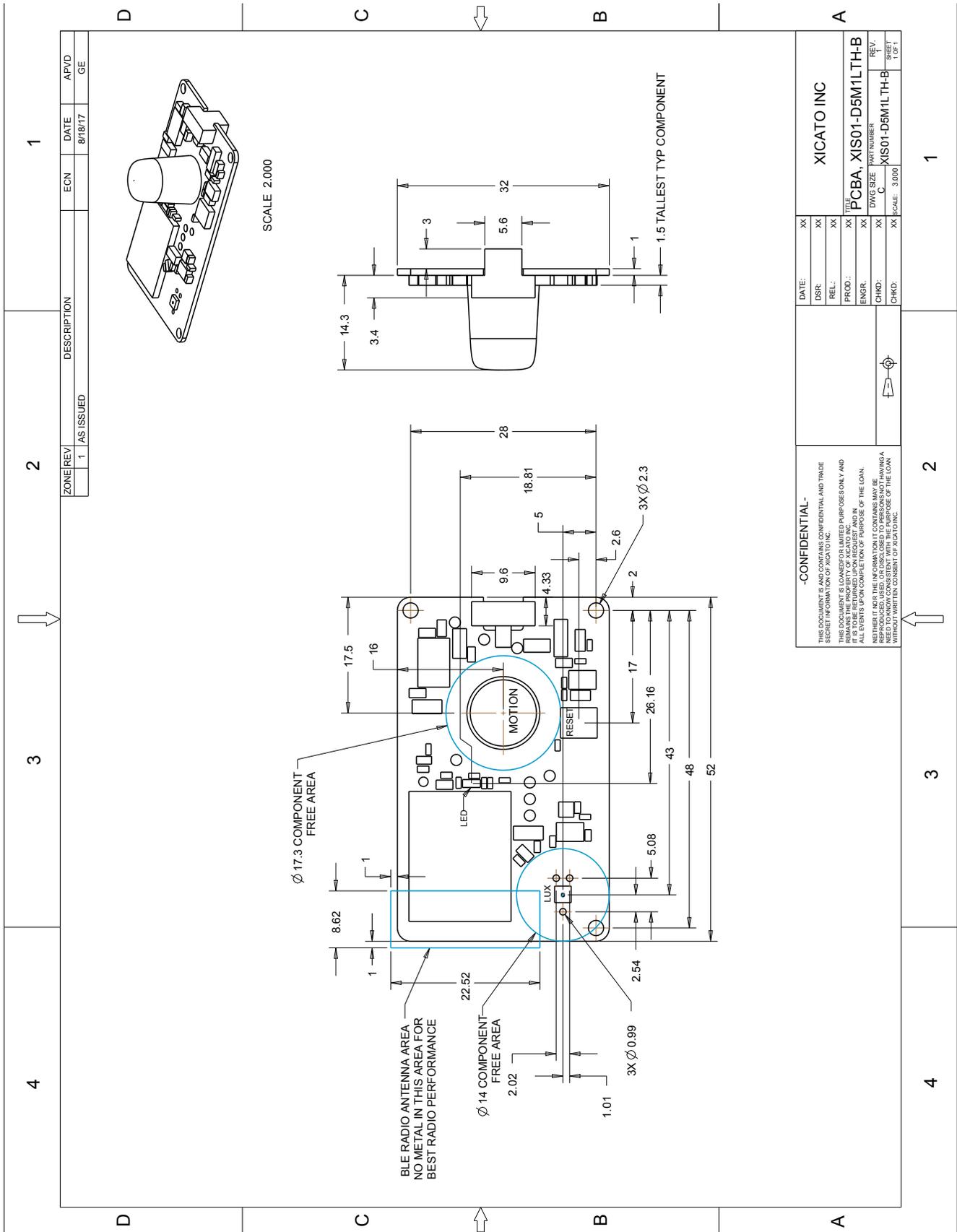
MOTION DETECTION PATTERNS & PERFORMANCE

NOTE: The integrated standard and long reach motion sensors have slightly asymmetrical detection patterns on perpendicular axes, as shown. On the XIS00 and XIS01, the longer TOP VIEW pattern is oriented along the shorter width of the PCBA, while the SIDE VIEW is oriented along the length.

The standalone, remote XIS-M4 sensor is a hybrid sensor, with fine motion in the central area and standard motion in the surrounding area.

MOTION DETECTION PERFORMANCE, M1 – M3

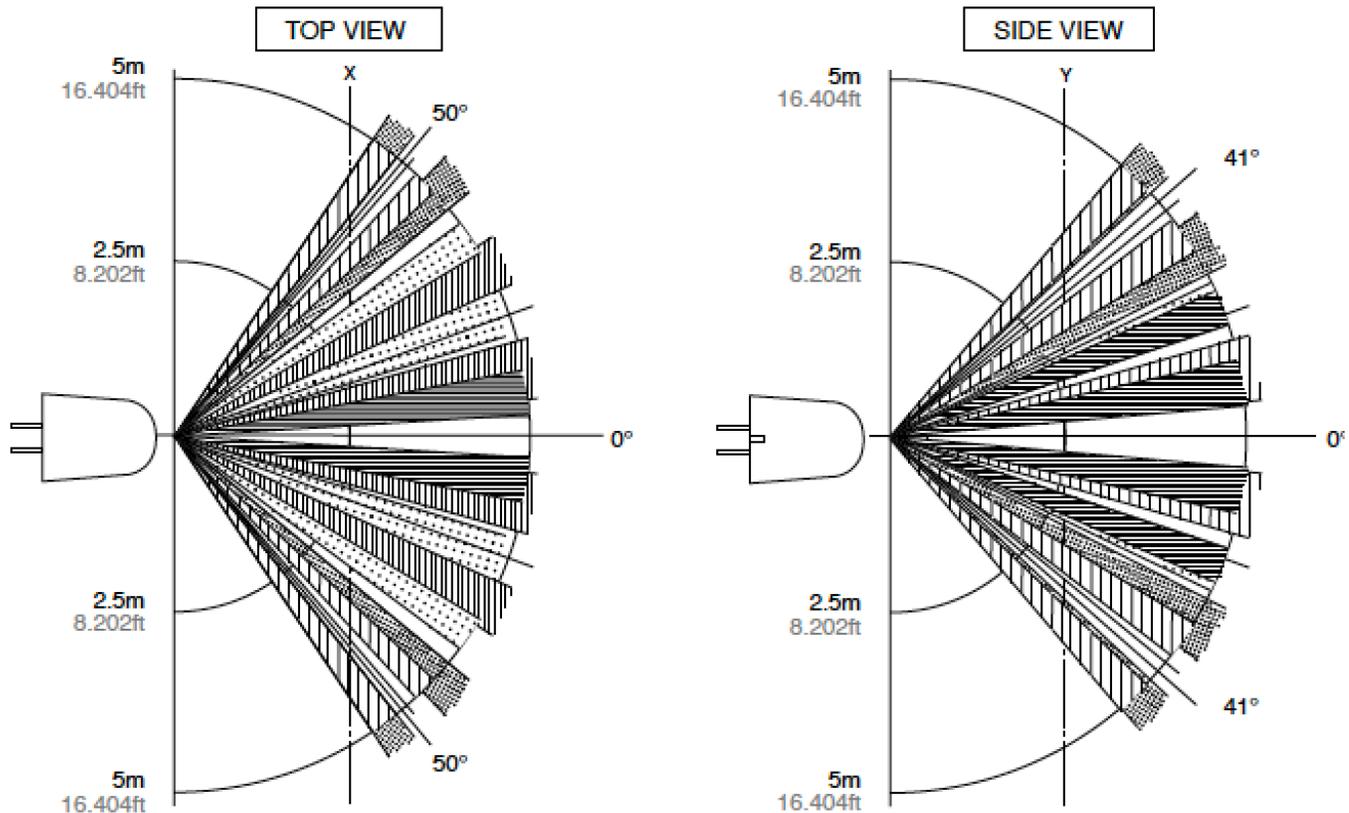|	M1 Standard Motion	M2 Slight Motion	M3 Long Motion
Detection Distance	5m (16.40 ft)	2m (6.56 ft)	10m (32.8 ft)
Detection angles (HxV)	100˚ x 82˚	91˚ x 91˚	110˚ x 93˚
Detection Zones	64	104	80
Temp difference between target and background	> 4˚C		
Target movement speed	0.8 – 1.2 m/s	0.5 m/s	0.8 – 1.2 m/s
Target size	700 x 250mm (human body)	200 x 200mm (human head)	700 x 250mm (human body)

MOTION DETECTION PATTERNS, M1-M3

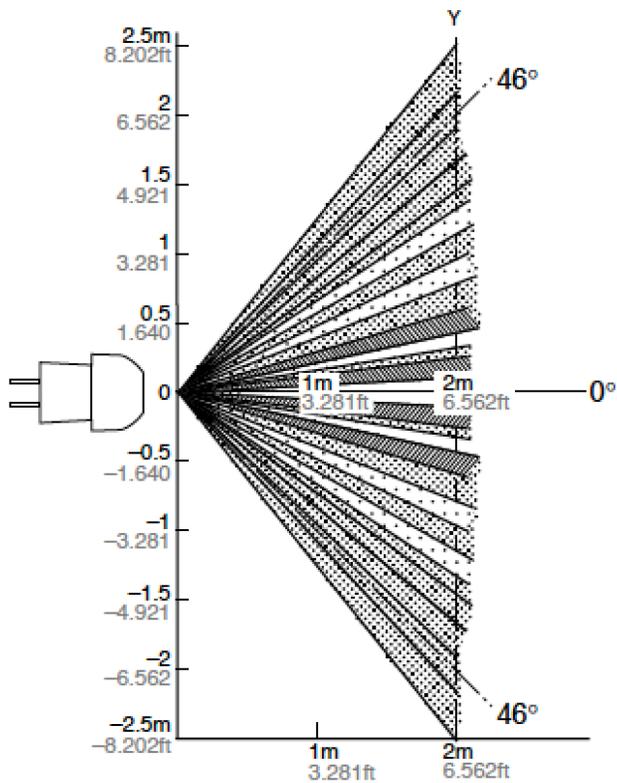

Figure 6: (above) M1 Standard Motion detection pattern
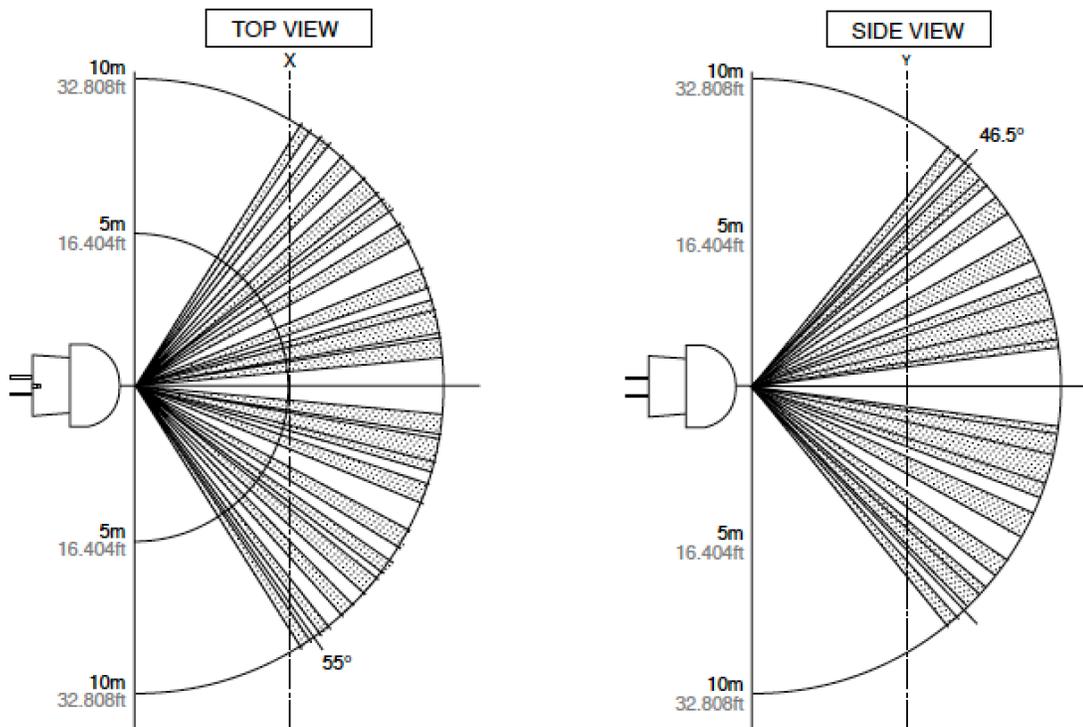
Figure 7: (above) M2 slight motion detection pattern

Figure 8: (above) M3 long reach motion detection pattern
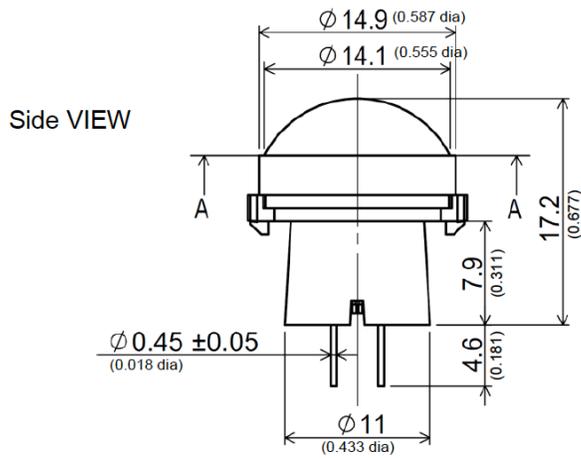
M4 HYBRID MOTION DETECTION
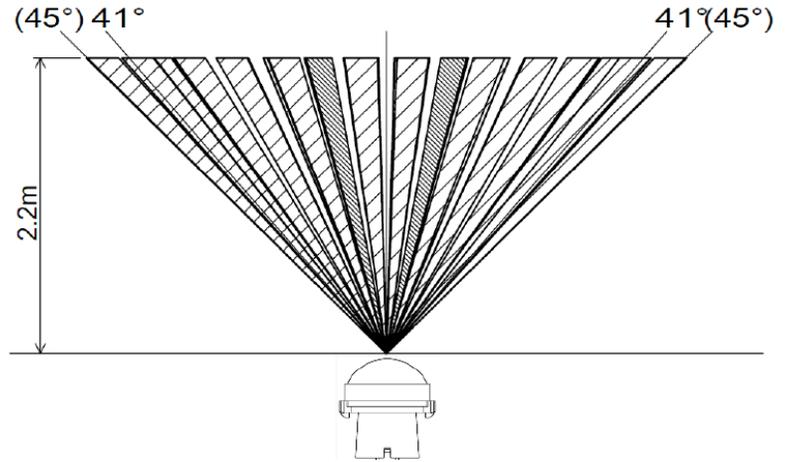
Side VIEW

Figure 9: M4 hybrid motion mechanical dimensions

Figure 10: M4 hybrid motion detection pattern

M4 DETECTION PERFORMANCE

		Temperature Difference	Value	Target Conditions
Detection Range	Slight motion detection area	8°C (14.4°F)	Max 3m	Movement speed: 0.5m/s Target is human head (~200x200mm) Passing 1 zone
		4°C (7.2°F)	Max 2.2m	
	Standard motion detection area	8°C (14.4°F)	Max 3m	Movement speed: 1.0m/s Target is human body (~400x200mm) Passing 2 zones
		4°C (7.2°F)	Max 2.2m	

			Value
Detection Area	Slight motion detection area	Horizontal	44° (± 22°)
		Vertical	44° (± 22°)
		Detection Zones	36
	Standard motion detection area	Horizontal	90° (± 45°)
		Vertical	90° (± 45°)
		Detection Zones	48

ENVIRONMENTAL SAFETY

RoHS compliant

Lead content: None

Mercury content: None

UV or IRC Emissions: None