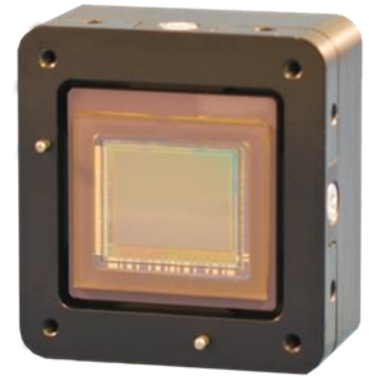




# NOCTURN XS MONOCHROME INTERFACE CONTROL DOCUMENT



## Features

- Day to Low light detection
- High frame rate, no latency
- Optimized for mobility applications
- OEM Interface for customisation

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29 Jan 2018	A0	Ref Doc 200-LC-0111 Version C.00, July 2014
27 Sept 2018	A1	Typo corrections

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# Introduction

## Scope

This document describes the electrical, mechanical and optical interfaces of the NOCTURN Monochrome XS camera module only. Operational instructions and additional support documentation are described in separate documents. Please contact PHOTONIS technical support if you require additional information.

## Electrical and Mechanical Interfaces

### Introduction

The NOCTURN product name identifies a family of low light level cameras developed around the PHOTONIS' 1280 × 1024 LYNX CMOS imaging sensor. The "XS" model indicates that the NOCTURN camera core that has a low voltage parallel output interface and no lens mount interface mount. This module is primarily meant for original equipment manufacturer and camera system integrators to have a small form factor core with the necessary image processing needed to optimize and control of LYNX CMOS (see Figure 1). This section provides detailed information on the NOCTURN XS specifications, power requirements as well as the electrical and mechanical interface of the module.



**IO Interface:  
P301**

**Figure 1: Back Side View of the NOCTURN XS Camera**



## NOCTURN XS specification

The NOCTURN XS is a rugged low light camera core module that features high - definition, high sensitivity and high dynamic range with low power consumption. It provides monochrome real - time imaging capabilities from daylight to bright starlight in the visible and near infrared spectrum. Its small size, weight and power (SWaP) makes this core ideal for integration into aerial, mobile and hand - held surveillance systems. Detailed specifications of the NOCTURN XS camera are given in Table 1.

**Table 1: Specifications**

Parameter	Specification
Sensor resolution	1280 x 1024 pixels
Sensor Pixel Pitch	9.7 x 9.7 $\mu\text{m}$
Sensor Well Capacity	> 25000 e-
Sensor Dynamic range	> 60 dB
Sensor read out noise	< 4 e- med (60fps mode)
Sensor quantum efficiency	> 80% at 600nm
Frame rate	50, 60 or 100Hz with full field resolution (user adjustable)
Sensor Image lag	< 0.1 %
Sensor Shutter mode	Rolling
Dimensions (W x H x D)	34.1mm x 36.6 mm x 18 mm
Weight	< 45 grams
Digital Video Output	10 bit 3.3V CMOS parallel output on 2 taps
Communication	Logic level Serial interface
Image Correction	Bad pixels replacement and 2 points Non Uniformity correction
Contrast Enhancement	Contrast stretching, equalization, adaptive equalization, clipping
Gain Control	Automatic gain and exposure control or manual
Digital Zoom	Up to 8x (0.001 increment resolution)
Synchronization	Frame start trigger (+3.3V) Analog output strobe reference (+3.3V)
Windowing	Full field of view down to 2 sensor lines
OSD	Full on screen display capability with text, standard geometrical shape and graphics
Snapshots	On board capture of *.jpg (8b) or *.pgm (8/10b)
Camera / Imaging start up time	< 5 seconds
Operating temperature	-40° C to +60° C
Storage temperature	-50° C to +80° C
Input Voltage	+2.5 to +5.5 VDC or regulated +4.5 VDC (factory configurable)
Power (Typical)	60 / 50 Hz mode : 1.5W



# Electrical Interfaces

## I/O Connector: P301

The electrical interface on the NOCTURN XS is done through a 100-pin connector (P301) located on the back of the processor board (see Figure 1 and Figure 4) : I/O Connector: P301. The external I/O connector (P301) electrical interface is given in Table 2. The physical pin numbering convention is shown in following figures.

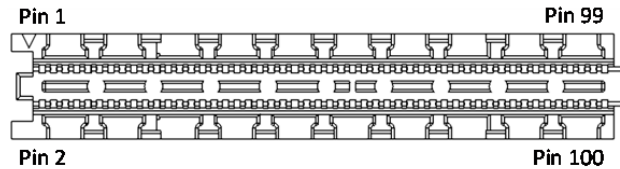


Figure 2: I/O Connector: P301

Table 2: I/O Connector: P301

Pin	Signal Name	Function	Description
P301-1	RESERVED	-	Reserved
P301-2	DATA_OUT0	Output	Digital Data Output (Bit 0)
P301-3	RESERVED	-	Reserved
P301-4	DATA_OUT1	Output	Digital Data Output (Bit 1)
P301-5	+4.5V	Power Input	Primary Voltage Supply (2.5-5.5V)
P301-6	DATA_OUT2	Output	Digital Data Output (Bit 2)
P301-7	+4.5V	Power Input r	Input Primary Voltage Supply (2.5-5.5V)
P301-8	DATA_OUT3	Output	Digital Data Output (Bit 3)
P301-9	GND	Power	Primary Ground Return
P301-10	DATA_OUT4	Output	Digital Data Output (Bit 4)
P301-11	GND	Power	Primary Ground Return
P301-12	DATA_OUT5	Output	Digital Data Output (Bit 5)
P301-13	+3.3V	Power Output	+3.3V Supply
P301-14	DATA_OUT6	Output	Digital Data Output (Bit 6)
P301-15	+3.3V	Power Output	+3.3V Supply
P301-16	DATA_OUT7	Output	Digital Data Output (Bit 7)
P301-17	+2.5V	Power Output	+2.5V Supply
P301-18	GND	Power	Primary Ground Repair
P301-19	+2.5V	Power Output	+2.5V Supply
P301-20	DATA_OUT8	Output	Digital Data Output (Bit 8)
P301-21	GND	Power	Primary Ground Return
P301-22	DATA_OUT9	Output	Digital Data Output (Bit 9)
P301-23	GND	Power	Primary Ground Return
P301-24	DATA_OUT10	Output	Digital Data Output (Bit 10)
P301-25	+1.8V	Power Output	+1.8V Supply
P301-26	DATA_OUT11	Output	Digital Data Output (Bit 11)

P301-27	+1.8V	Power Output	+1.2V Supply
P301-28	DATA_OUT12	Output	Digital Data Output (Bit 12)
P301-29	+1.2V	Power Output	+1.2V Supply
P301-30	DATA_OUT13	Output	Digital Data Output (Bit 13)
P301-31	+1.2V	Power Output	+1.2V Supply
P301-32	DATA_OUT14	Output	Digital Data Output (Bit 14)
P301-33	RESERVED	-	Reserved
P301-34	DATA_OUT15	Output	Digital Data Output (Bit 15)
P301-35	RESERVED	-	Reserved
P301-36	GND	Power	Primary Ground Return
P301-37	GND	Power	Primary Ground Return
P301-38	DATA_OUT16	Output	Digital Data Output (Bit 16)
P301-39	RESERVED	-	Reserved
P301-40	DATA_OUT17	Output	Digital Data Output (Bit 17)
P301-41	RESERVED	-	Reserved
P301-42	DATA_OUT18	Output	Digital Data Output (Bit 18)
P301-43	GND	Power	Primary Ground Return
P301-44	DATA_OUT19	Output	Digital Data Output (Bit 19)
P301-45	RESERVED	-	Reserved
P301-46	DATA_OUT20	Output	Output Digital Data Output (Bit 20)
P301-47	RESERVED	-	Reserved
P301-48	DATA_OUT21	Output	Output Digital Data Output (Bit 21)
P301-49	GND	Power	Primary Ground Return
P301-50	DATA_OUT22	Output	Digital Data Output (Bit 22)
P301-51	RESERVED	-	Reserved
P301-52	DATA_OUT23	Output	Output Digital Data Output (Bit 23)
P301-53	RESERVED	-	Reserved
P301-54	GND	Power	Primary Ground Return
P301-55	GND	Power	Primary Ground Return
P301-56	DV_CLK_OUT	Input	Digital Video Clock
P301-57	RESERVED	-	Reserved
P301-58	DV_PWR_DN_N	Input	Digital Video Power Down Active Low 3.3V Logic Level (Disables Camera Link chip on Nocturn XL)
P301-59	COM_RTS_FROM_FPGA	Input	RTS Serial Data 3.3V Logic Level
P301-60	GND	Power	Primary Ground Return
P301-61	COM_CTS_TO_FPGA	Output	CTS Serial Data 3.3V Logic Level
P301-62	DV_DVAL	Input	Digital video Data Valid Signal
P301-63	COM_RXD_TO_FPGA	Output	RX Serial Data 3.3V Logic Level (FPGA receiving)
P301-64	DV_LVAL	Input	Digital Video Line Valid Signal
P301-65	COM_TXD_FROM_FPGA	Input	TX Serial Data 3.3V Logic Level (FPGA Transmitting)
P301-66	DV_FVAL	Input	Frame Valid Signal

P301-67	STATUS_LED_RED_N	Input	RED Status LED Active Low
P301-68	AUX_COM_TXD	Input	AUX Serial TX Data 3.3V Logic Level
P301-69	STATUS_LED_GREEN_N	Input	Green Status LED Active Low
P301-70	AUX_COM_RXD	Output	AUX Serial Rx Data 3.3V Logic Level
P301-71	RESERVED	-	Reserved
P301-72	GND	Power	Primary Ground Return
P301-73	RESERVED	-	Reserved
P301-74	RESERVED	-	Reserved
P301-75	RESERVED	-	Reserved
P301-76	RESERVED	-	Reserved
P301-77	RESERVED	-	Reserved
P301-78	GND	Power	Primary Ground Return
P301-79	RESERVED	-	Reserved
P301-80	RESERVED	-	Reserved
P301-81	RESERVED	-	Reserved
P301-82	RESERVED	-	Reserved
P301-83	EXT_TRIGGER_OUT_3V3_N	Input	External Trigger Out Active Low 3.3V L
P301-84	RESERVED	-	Reserved
P301-85	EXT_TRIGGER_IN_3V3	Output	External Trigger In Active Low 3.3V L
P301-86	RESERVED	-	Reserved
P301-87	GND	Power	Primary Ground Return
P301-88	RESERVED	-	Reserved
P301-89	RESERVED	-	Reserved
P301-90	RESERVED	-	Reserved
P301-91	RESERVED	-	Reserved
P301-92	RESERVED	-	Reserved
P301-93	RESERVED	-	Reserved
P301-94	RESERVED	-	Reserved
P301-95	RESERVED	-	Reserved
P301-96	RESERVED	-	Reserved
P301-97	RESERVED	-	Reserved
P301-98	RESERVED	-	Reserved
P301-99	GND	Power	Primary Ground Return
P301-100	GND	Power	Primary Ground Return



### Input Power specification

The NOCTURN XS can be powered through the P301 connector (see Table 2). The input voltage must be within a range of +2.5 to +4.5 VDC (see Table 3).

**Table 3: Input Power specifications**

Parameter	Description	Min	Typ	Max	Units
Vin	Input Voltage	2.5	4.5	5.5	V
Icc	Input Current in 50/60Hz mode		330	415	mA

### Output Power specification

The NOCTURN XS can supply output power for peripheral integrated circuits through the P301 connector (see Table 2). The output current should not exceed the maximum values given (see Table 4).

**Table 4: Output Power specifications**

Parameter	Description	Min	Typ	Max	Units
+3.3V Supply	Output Voltage		+3.3		V
+3.3V Supply	Output Current			60	mA
+2.5V Supply	Output Voltage		+2.5		V
+2.5V Supply	Output Current			80	mA
+1.8V Supply	Output Voltage		+1.8		V
+1.8V Supply	Output Current			40	mA
+1.2 V Supply	Output Voltage		+1.2		V
+1.2V Supply	Output Current			100	mA

### Communication Interface

Control of the camera can be done using the serial communication protocol over the logic level serial interface via serial message using printable ASCII characters. The serial port settings should be 8 bits data, no parity, 1 stop bit and no flow control with a default baud rate of 115200 bits per second. The user should refer to the NOCTURN User Guide for a list of valid commands.

### I/O Connector: P301 reference:

Camera Connector:

Manufacturer: SAMTEC INC

Description: 0.4mm Ultra Fine Pitch Low Profile Terminal Strip

Manufacturer part number: ST4-50-1.00-L-D-P-TR

Mating Connector:

Manufacturer: SAMTEC INC

Description: 0.4mm Ultra Fine Pitch Low Profile Socket Strip

Manufacturer Part Number: SS4-50-3.00-L-D-K-TR





# Interface Timing

## Digital Video interface

The digital video interface is provided via a parallel video interface. This interface is setup at the factory to output the 1280×1024 10b digital video data over the 24 lowest bits (DATA\_OUT0 - 23) on the P301 connector in single data rate mode. In the latter, the video data will be interleaved vertically (ABABABAB) following the bit mapping of Table 5. The pixel clock is by default at 48MHz for 60 and 50 fps operation mode. The DV\_FVAL, digital video Frame Valid is defined HIGH for valid lines. The DV\_LVAL, digital video Line Valid is defined HIGH for valid pixels and the DV\_DVAL, digital video Data Valid, is defined HIGH when data is valid.

**Table 5: Pixel bit Mapping**

Piin	Pixel Mapping
DATA_OUT0	Pixel A bit 0
DATA_OUT1	Pixel A bit 1
DATA_OUT2	Pixel A bit 2
DATA_OUT3	Pixel A bit 3
DATA_OUT4	Pixel A bit 4
DATA_OUT5	Pixel A bit 5
DATA_OUT6	Pixel A bit 6
DATA_OUT7	Pixel A bit 7
DATA_OUT8	Pixel A bit 8
DATA_OUT9	Pixel A bit 9
DATA_OUT16	Pixel B bit 0
DATA_OUT17	Pixel B bit 1
DATA_OUT18	Pixel B bit 2
DATA_OUT19	Pixel B bit 3
DATA_OUT20	Pixel B bit 4
DATA_OUT21	Pixel B bit 5
DATA_OUT22	Pixel B bit 6
DATA_OUT23	Pixel B bit 7
DATA_OUT12	Pixel B bit 8
DATA_OUT13	Pixel B bit 9

# Optical Interface

## Sensor characteristics

Lynx sensor is placed in a pga ceramic carrier.

Cover lid is D263 Glass / dimensions 21.2 x 18.8 x 0.7 / Refraction index 1.52

With multi-layer AR coating on 2 sides, end layer SiO<sub>2</sub>

$R(\text{abs}) < 1.5\%$  @ 400nm - 900nm (per surface).

AOI = 15°. Coating abrasion resistance met ISO 9211-4-01-01

Reflexion coefficient has been measured as follow :

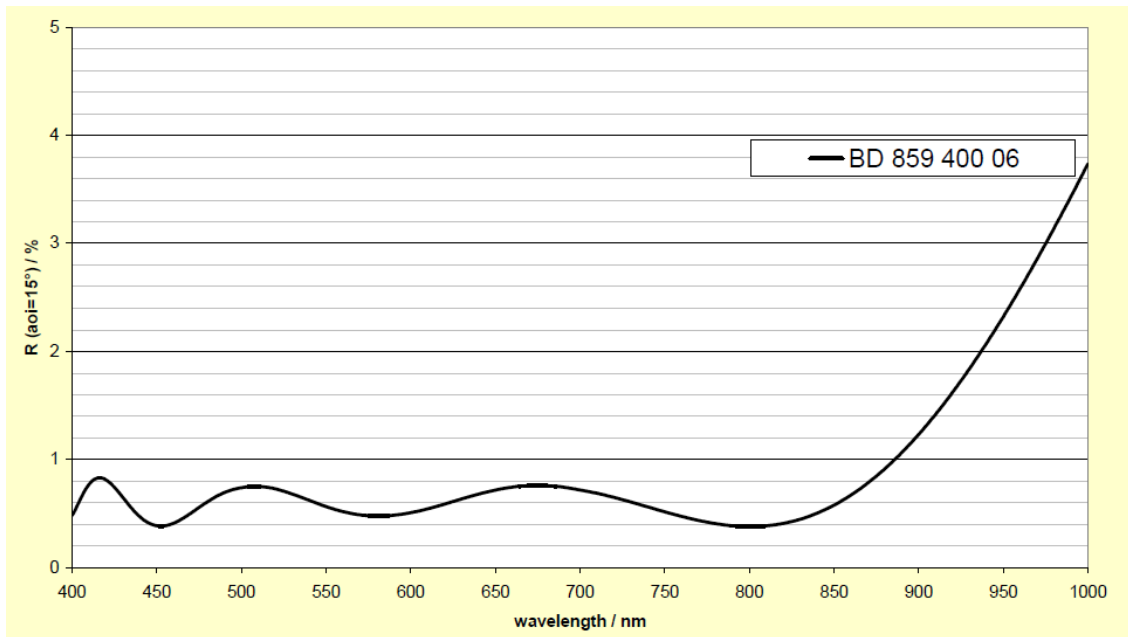


Figure 3 : sensor glass characteristics



Sensor mechanical drawing :

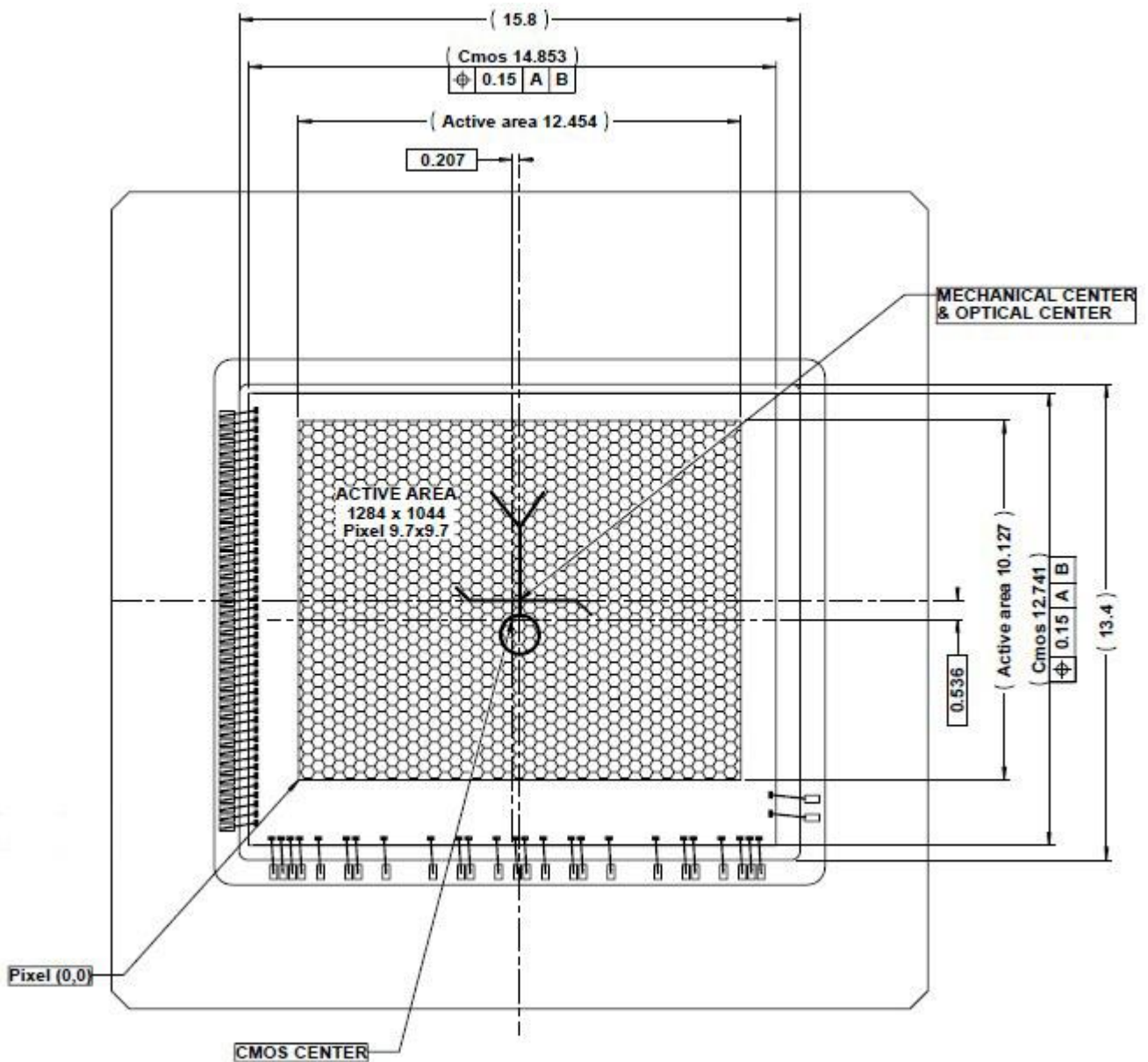


Figure 4 : sensor mechanical drawing

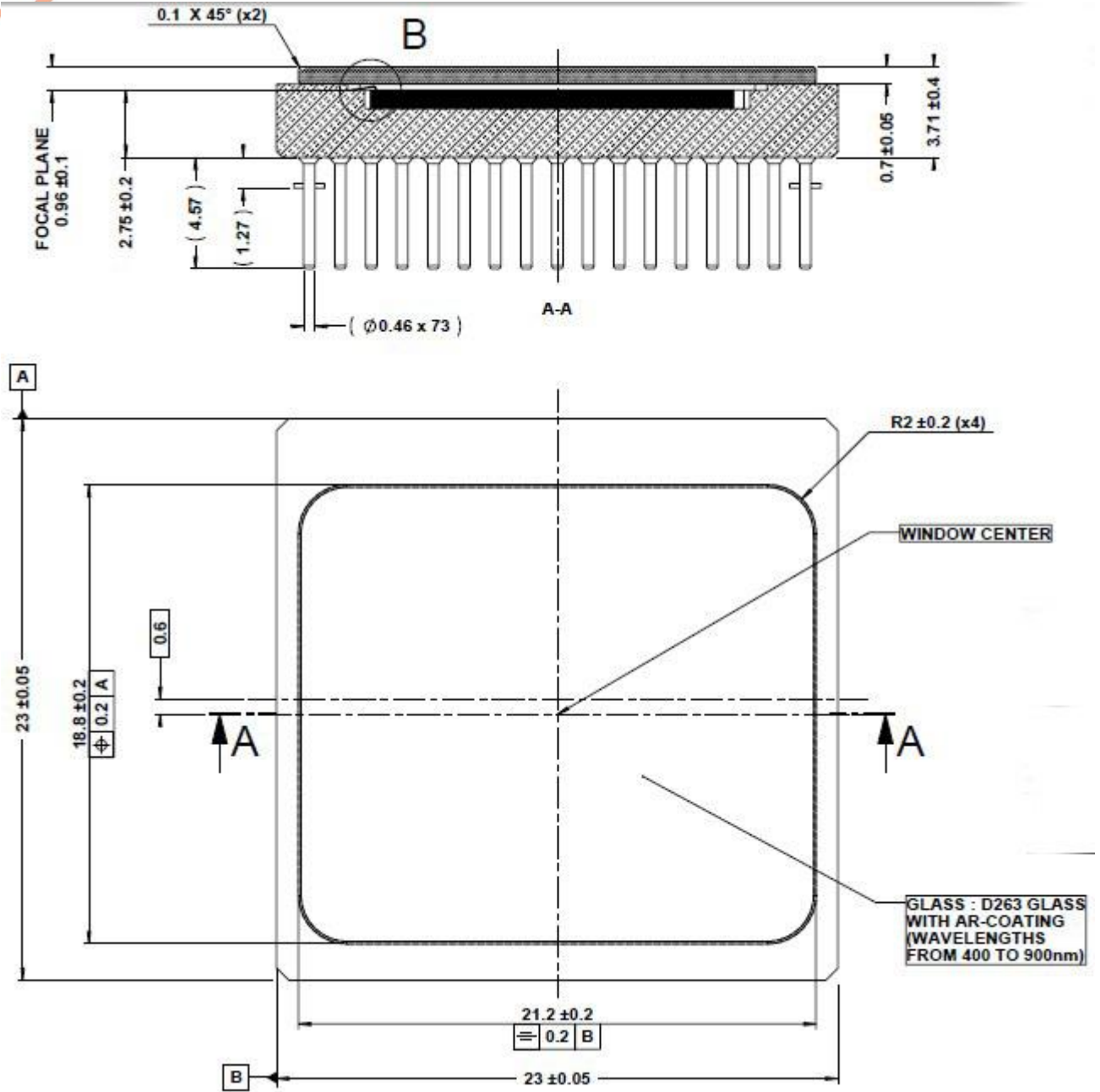


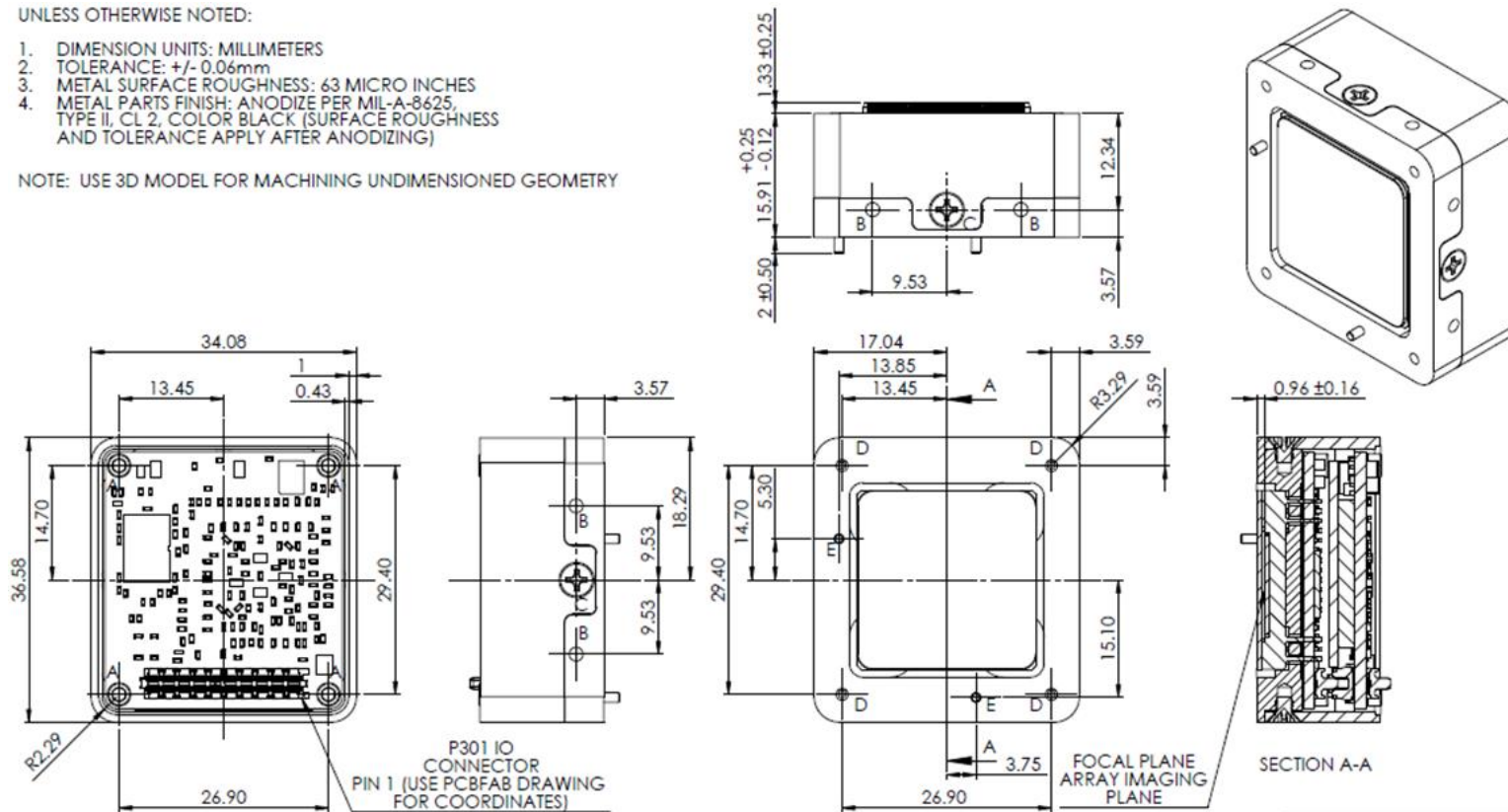
Figure 5 : sensor carrier mechanical drawing

# Mechanical Interface

UNLESS OTHERWISE NOTED:

1. DIMENSION UNITS: MILLIMETERS
2. TOLERANCE: +/- 0.06mm
3. METAL SURFACE ROUGHNESS: 63 MICRO INCHES
4. METAL PARTS FINISH: ANODIZE PER MIL-A-8625, TYPE II, CL 2, COLOR BLACK (SURFACE ROUGHNESS AND TOLERANCE APPLY AFTER ANODIZING)

NOTE: USE 3D MODEL FOR MACHINING UNDIMENSIONED GEOMETRY



### HOLE, SCREW AND PIN DEFINITION

- A - (4) - BLACK OXIDE ALLOY STEEL SOCKET HEAD CAP SCREW, 1-72 THREAD 1/8" LENGTH
- B - (8) - #50 DRILL (1.778)  $\nabla$  5 AND 2-56 UNC -2B TAP  $\nabla$  3.5
- C - (4) - 18-8 SS FLAT HEAD PHILIPS MACHINE SCREW, 2-56 THREAD 1/8" LENGTH.
- D - (4) - #53 DRILL (1.511) THRU AND 1-72 UNC -2B TAP THRU
- E - (2) - ALLOY STEEL DOWEL PIN 3/64" DIAMETER, 3/8" LENGTH. PRESS FIT. SEE MCMASTER PART #98381A972

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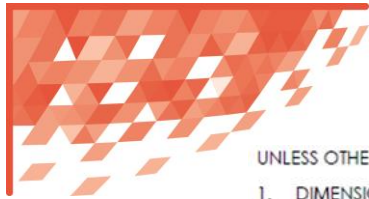
DRAWN BY: LDB  
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 Frisco, Texas, 75033  
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PHOTONIS USA, Inc.		
TITLE: CAMERA CORE, NOCTURN XS		
SIZE <b>B</b>	DWG. NO. 200-AS-1010	REV B
SCALE: 2:1	WEIGHT:	SHEET 1 OF 3

Figure 6 : Nocturn XS drawing



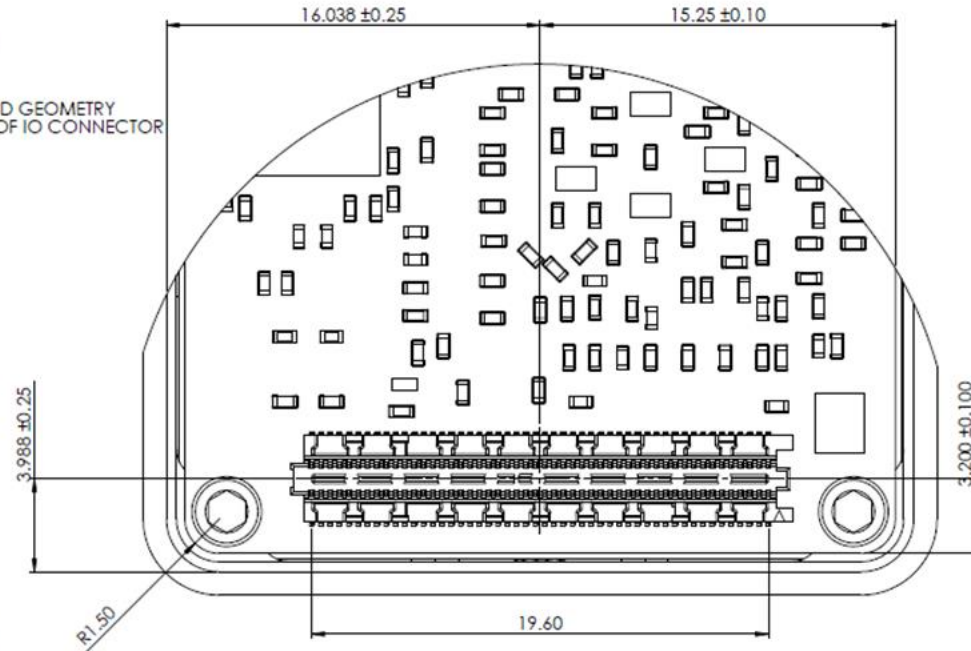
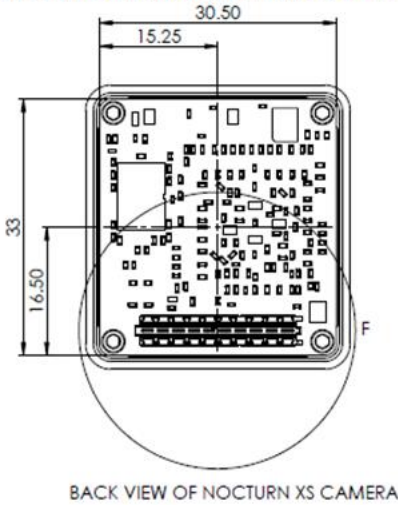




UNLESS OTHERWISE NOTED:

1. DIMENSION UNITS: MILLIMETERS
2. TOLERANCE: +/- 0.06mm
3. METAL SURFACE ROUGHNESS: 63 MICRO INCHES
4. METAL PARTS FINISH: ANODIZE PER MIL-A-8625, TYPE II, CL 2, COLOR BLACK (SURFACE ROUGHNESS AND TOLERANCE APPLY AFTER ANODIZING)

NOTE: USE 3D MODEL FOR MACHINING UNDIMENSIONED GEOMETRY  
REFER TO PCB LAYOUT DRAWINGS FOR FAB LOCATION OF IO CONNECTOR



DETAIL F  
SCALE 6 : 1

CONNECTOR DEFINITION

P301 - IO CONNECTOR - SAMTEC INC- ST4-50-1.00-L-D-L-P-TR

SUGGESTED MATE - SAMTEC INC- SS4-50-3.00-L-D-K-TR

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TITLE: CAMERA CORE, NOCTURN XS		
SIZE <b>B</b>	DWG. NO. 200-AS-1010	REV B
SCALE: 2:1	WEIGHT:	SHEET 2 OF 3

Figure 7 : Nocturn XS back side view



UNLESS OTHERWISE NOTED:

1. DIMENSION UNITS: MILLIMETERS
2. TOLERANCE FOLLOW "LYNX CMOS ASSEMBLY IN PGA" PHOTONIS S.A.S. DRAWING 3311 172 55171

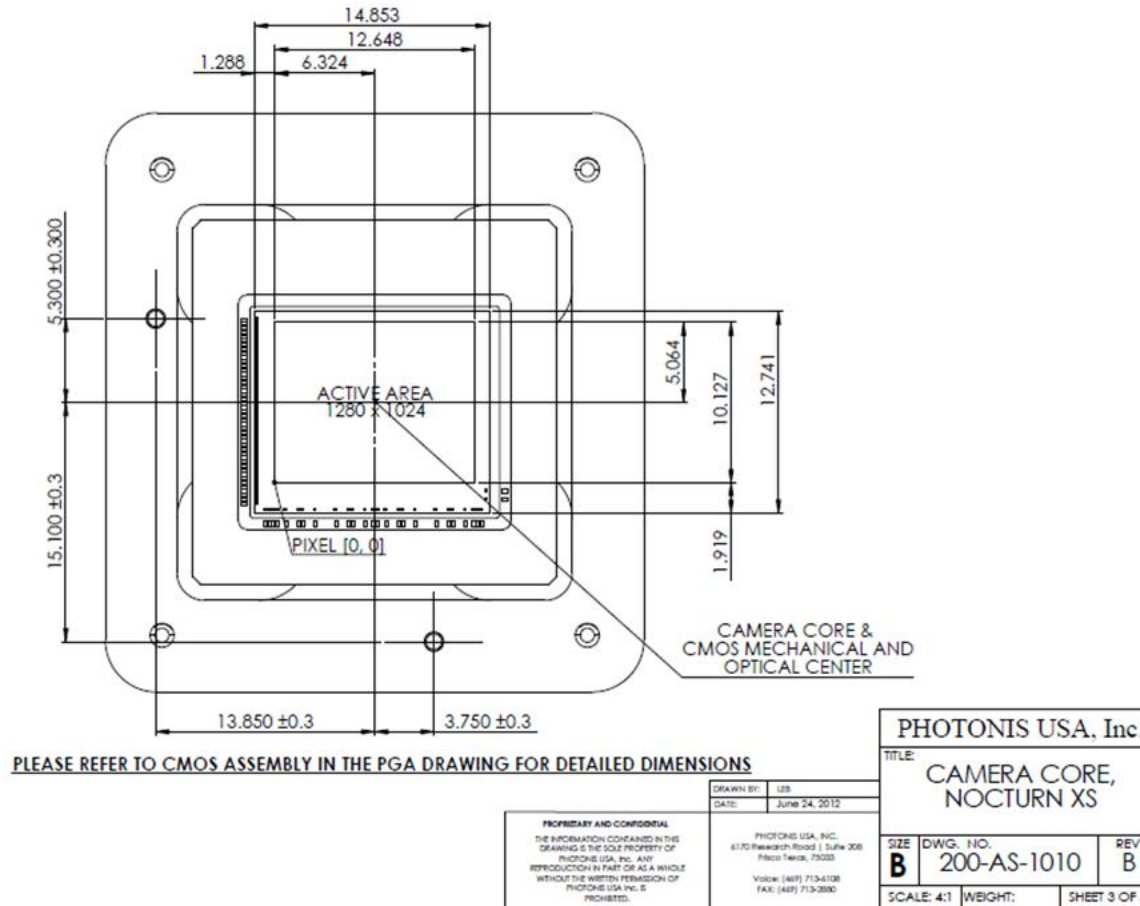


Figure 8 : Nocturn XS front side view

