

NOCTURN XS Monochrome Interface Control Document

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Table of Contents

1 Introduction5
 1.1*Scope* 5
 2 Electrical and Mechanical Interfaces5
 2.1*Introduction*..... 5
 2.2*NOCTURN XS Specifications*..... 5
 2.3*Quantum Efficiency*..... 7
 2.4*Electrical Interfaces*..... 8
 2.4.1I/O Connector: P301.....8
 2.5*Mechanical Interface*..... 13
 2.5.1Basic Mechanical Dimensions13
 2.5.2Mount Interfaces13
 2.6*Input Power Specifications*..... 13
 2.7*Output Power Specifications*..... 14
 2.8*Communication Interface*..... 14
 3 Interface Timing 15
 3.1*Digital Video Interface*..... 15
 4 Electrical Connectors 16
 4.1*I/O Connector: P301* 16

1 Introduction

1.1 Scope

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

2 Electrical and Mechanical Interfaces

2.1 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

2.2 NOCTURN XS Specifications

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 NOCTURN XS Specifications

Parameter	Specification
Sensor Resolution	1280 × 1024 Pixels
Sensor Pixel Pitch	9.7 μm × 9.7 μm
Sensor Well Capacity	> 25000 e-
Sensor Dynamic Range	> 60 dB
Sensor Read Noise	< 4 e- med. (60fps Mode)
Sensor Quantum Efficiency	> 60% 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 × H × D)	34.1 mm × 36.6 mm × 18 mm
Weight	< 45 grams
Digital Video Output	10bit 3.3V CMOS parallel output on 2 taps
Communication	Logic level serial interface
Image Correction	Bad pixel replacement and 2 points non uniformity correction
Contrast Enhancement	Contrast stretching, equalization and adaptive equalization
Gain Control	Automatic gain and exposure control or manual
Digital Zoom	Up to 8X (0.001 increment resolution) ¹
Synchronization	Frame start trigger (+3.3V) Analog output strobe reference (+3.3V)

¹ Option only available in 60 and 50Hz frame rate mode

Parameter	Specification
Windowing²	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° to +60° C
Storage Temperature	-50° to +80° C
Input Voltage	+2.5 to +5.5 VDC or regulated +4.5 ³ VDC (factory configurable)
Power (Typical)⁴	60/50Hz mode: 1.5W (typ.)

2.3 Quantum Efficiency

The typical quantum efficiency as a function of wavelength for the LYNX CMOS for versions with and without micro-lenses is shown in *Figure 2*.

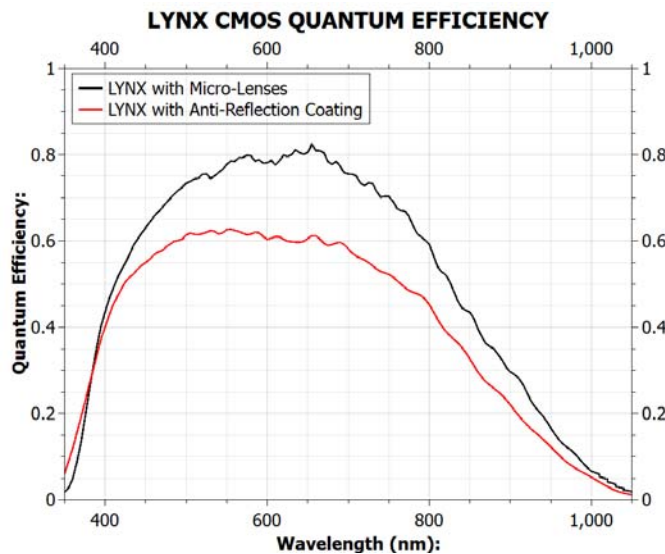


Figure 2 LYNX CMOS Quantum Efficiency Curve

² Feature only available on the digital video output interface with OSD disabled

³ Improves noise performance

⁴ Excluding analog video power

2.4 Electrical Interfaces

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*).

2.4.1 I/O Connector: P301

The external I/O connector (J301) electrical interface is given in *Table 2*. The physical pin numbering convention is shown in *Figure 3*.

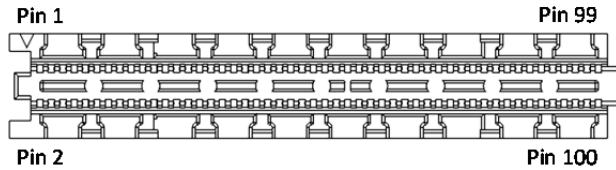


Figure 3 I/O Connector: P301

Table 2 I/O Connector: P301

Pin	Signal Name	Function	Description
P301-1	RESERVED	-	Reserved (No Connect)
P301-2	DATA_OUT0	Output	Digital Data Output (Bit 0)
P301-3	RESERVED	-	Reserved (No Connect)
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	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

Pin	Signal Name	Function	Description
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	+1.8V 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 (No Connect)

Pin	Signal Name	Function	Description
P301-34	DATA_OUT15	Output	Digital Data Output (Bit 15)
P301-35	RESERVED	-	Reserved (No Connect)
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 (No Connect)
P301-40	DATA_OUT17	Output	Digital Data Output (Bit 17)
P301-41	RESERVED	-	Reserved (No Connect)
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 (No Connect)
P301-46	DATA_OUT20	Output	Digital Data Output (Bit 20)
P301-47	RESERVED	-	Reserved (No Connect)
P301-48	DATA_OUT21	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 (No Connect)
P301-52	DATA_OUT23	Output	Digital Data Output (Bit 23)
P301-53	RESERVED	-	Reserved (No Connect)
P301-54	GND	Power	Primary Ground Return
P301-55	GND	Power	Primary Ground Return
P301-56	DV_CLK_OUT	Output	Digital Video Clock
P301-57	RESERVED	-	Reserved (No Connect)

Pin	Signal Name	Function	Description
P301-58	DV_PWR_DN_N	Output	Digital Video Power Down Active Low 3.3V Logic Level (Disables Camera Link chip on Nocturn XL)
P301-59	COM_RTS_FROM_FPGA	Output	RTS Serial Data 3.3V Logic Level
P301-60	GND	Power	Primary Ground Return
P301-61	COM_CTS_TO_FPGA	Input	CTS Serial Data 3.3V Logic Level
P301-62	DV_DVAL	Output	Digital Video Data Valid Signal
P301-63	COM_RXD_TO_FPGA	Input	RX Serial Data 3.3V Logic Level (FPGA Receiving)
P301-64	DV_LVAL	Output	Digital Video Line Valid Signal
P301-65	COM_TXD_FROM_FPGA	Output	TX Serial Data 3.3V Logic Level (FPGA Transmitting)
P301-66	DV_FVAL	Output	Frame Valid Signal
P301-67	STATUS_LED_RED_N	Output	RED Status LED Active Low
P301-68	AUX_COM_TXD	Output	AUX Serial TX Data 3.3V Logic Level
P301-69	STATUS_LED_GREEN_N	Output	Green Status LED Active Low
P301-70	AUX_COM_RXD	Input	AUX Serial Rx Data 3.3V Logic Level
P301-71	RESERVED	-	Reserved (No Connect)
P301-72	GND	Power	Primary Ground Return
P301-73	RESERVED	-	Reserved (No Connect)
P301-74	RESERVED	-	Reserved (No Connect)
P301-75	RESERVED	-	Reserved (No Connect)
P301-76	RESERVED	-	Reserved (No Connect)
P301-77	RESERVED	-	Reserved (No Connect)
P301-78	GND	Power	Primary Ground Return

Pin	Signal Name	Function	Description
P301-79	RESERVED	-	Reserved (No Connect)
P301-80	RESERVED	-	Reserved (No Connect)
P301-81	RESERVED	-	Reserved (No Connect)
P301-82	RESERVED	-	Reserved (No Connect)
P301-83	EXT_TRIGGER_OUT_3V3_N	Output	External Trigger Out Active Low 3.3V Logic Level
P301-84	RESERVED	-	Reserved (No Connect)
P301-85	EXT_TRIGGER_IN_3V3	Input	External Trigger In Active Low 3.3V Logic Level
P301-86	RESERVED	-	Reserved (No Connect)
P301-87	GND	Power	Primary Ground Return
P301-88	RESERVED	-	Reserved (No Connect)
P301-89	RESERVED	-	Reserved (No Connect)
P301-90	RESERVED	-	Reserved (No Connect)
P301-91	RESERVED	-	Reserved (No Connect)
P301-92	RESERVED	-	Reserved (No Connect)
P301-93	RESERVED	-	Reserved (No Connect)
P301-94	RESERVED	-	Reserved (No Connect)
P301-95	RESERVED	-	Reserved (No Connect)
P301-96	RESERVED	-	Reserved (No Connect)
P301-97	RESERVED	-	Reserved (No Connect)
P301-98	RESERVED	-	Reserved (No Connect)
P301-99	GND	Power	Primary Ground Return
P301-100	GND	Power	Primary Ground Return

2.5 Mechanical Interface

2.5.1 Basic Mechanical Dimensions

The basic mechanical dimensions of the NOCTURN XS camera are provided in *Figure 4*. If additional information is required please contact PHOTONIS technical support.

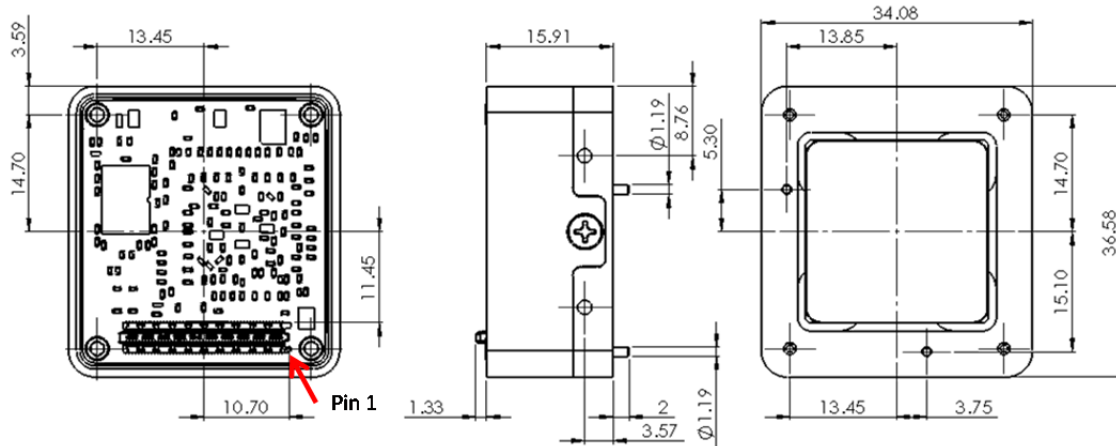


Figure 4 Basic Mechanical Dimensions of the NOCTURN XS Camera (all dimensions are in mm)

2.5.2 Mount Interfaces

The NOCTURN XS camera cores have 2-56” mounting holes located on all four sides parallel to the optical axis (see *Figure 5*).

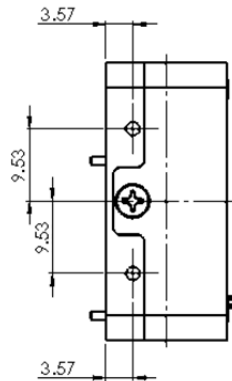


Figure 5 2-56” Mounting Holes Location on Side of NOCTURN XS Camera (all dimensions are in mm)

2.6 Input Power Specifications

The NOCTURN XS input power is through the J301 connector pins 5 & 7 (see Table 2). The input voltage must be within a range of +2.5 to +4.5 VDC (see Table 3).

Table 3 NOCTURN XS Input power Specifications

Parameter	Description	Min	Typ	Max	Units
Vin	Input Voltage	2.5	4.5	5.5	V
Icc	Input Current ⁵	--	330 ⁶	415	mA

2.7 Output Power Specifications

The NOCTURN XS can supply output power for peripheral integrated circuits through the J301 connector (see Table 2). The output current should not exceed the maximum values given (see Table 4).

Table 4 NOCTURN XS 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
+1.2V Supply	Output Voltage	-	+1.2	-	V
+1.2V Supply	Output Current	-	-	100	mA

2.8 Communication Interface

Control of the camera can be done using the serial communication protocol over the logic level serial interface (see **Error! Reference source not found.**) 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.

⁵ Digital video output only without image processing enabled

⁶ Measured with 4.5VDC input

3 Interface Timing

Timing for the NOCTURN XS video outputs are described in this section.

3.1 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 to P301

Pin	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

Pin	Pixel Mapping
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_OUT33	Pixel B Bit 9

4 Electrical Connectors

This section provides the part number of all the user accessible connectors and suggested mating connector when applicable.

4.1 I/O Connector: P301

Camera Connector:

Manufacturer: SAMTEC INC

Description: 0.4mm Ultra Fine Pitch Low Profile Terminal Strip

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