SMX-20S12x Camera

Data Sheet

SMX-20S12x USB3.0 Camera Data Sheet

Revision 1.2

Copyright © 2001-2019 Sumix Corporation

3532 Seagate Way, Suite 100,

Oceanside, CA, 92056

Tel.: (877)233-3385; Fax: (508) 300 5526

Email: camera@sumix.com

www.sumix.com

Contents

Introduction

The **SMX-20S12x** Series cameras are one of the smallest and lightest 12.3 megapixel (4096 x 3000) CMOS cameras with USB 3.0 interface suitable for scientific, microscopy and industrial applications. They are designed for capturing, streaming and storing high quality digital images.

The **SMX-20S12x** Series cameras are available in two modifications:

- **SMX-20S12M** camera is based on monochrome 12.3 megapixel CMOS sensor with an optical format of 1.1 inch
- **SMX-20S12C** camera is based on color 12.3 megapixel CMOS sensor with an optical format of 1.1 inch.

Global Shutter, programmable general purpose TTL input/output and triggering options are available with the SMX-20S12x cameras.

They can be easily integrated into your system or synchronized with other cameras.

Capturing of initial live streaming video images and still images are provided via USB 3.0 digital interface – no additional frame grabber is needed.

The cameras are provided with Software package, all needed drivers and API library allowing quick integration of camera functions into user's applications.

2 Features and Benefits

TABLE 2.1

Ultra compact:	One of the smallest 12.3 MP cameras in the world; fits into places where no other camera can fit
Lightweight:	Weighs only 57 grams (2.0 Oz)[a]
	Perfect for autonomous systems like robots, aerospace applications, etc.
Extremely fast:	USB3.0 interface allows data rate up to 400 MBytes per second
	Especially well-suited to use in multi-camera systems and 3D applications, as well as for fast process capturing
Robust:	Aircraft grade aluminum housing with a screw lock for USB cable, as well as shockproof electronic design allows the camera to survive under high vibration and shock[b]
	Highly reliable even in harsh, demanding environments
Efficient and cool:	Less than 4.5 W power consumption through the USB cable
	Increases battery lifetime for autonomous devices with the camera onboard
	No additional heat sinks required due to low heat generation
Connectivity:	Programmable general purpose TTL input/output and triggering options
	Can be easily integrated into your system or synchronized with other cameras
Compatibility:	Comes with a set of software examples included into the SDK, is compatible with popular vision and image processing libraries and third party software like Labview, MATLAB, HALCON, etc.
	Simplifies integration into existing systems, no need to employ highly-qualified software developers
Low noise:	We offer one of the best signal/noise parameter among the cameras based on the same sensor
Easy to use:	Sumix camera application has automatic real-time Exposure and White Balance, Input and Output trigger functions allowing to control the camera even without human involvement

a. Without accessories

b. Maximum tested values consult with Sumix prior to using the camera under high g-force

3 Specifications

3.1 Output Video and Camera Control

Output Video and Camera Control characteristics are shown in the table below.

TABLE 3.1

	SMX-20S12x
Maximum resolutions of output window:	4096x3000
Frame rate at resolution (50 MHz):	15 fps at 4096×3000
Output bits per pixel:	Selectable, 8 bits or 12 bits
Lookup table:	Downloadable for user selected 8 bits mode: converts 12 bits of imaging chip's ADC to 8 bits of output
Frequency	5-100 MHz
Pixel gain control:	Programmable hardware gain controls: Analog gain: from 0 to 24 with increment 0.1dB; from 24.1 to 48 with increment 24dB. Digital gain: from 0.1 to 24 with increment 0.1dB
Output window modes:	View port (from 4096×3000 to 320×240 with 4 pixels/2 lines step positioning) Frame Decimation (1:1, 1:2), hardware Frame Binning (1:2, 1:4), hardware Horizontal and Vertical flipping, hardware
Gamma, brightness and contrast control:	Programmable with lookup table

3.2 Imaging Chip

The SMX-20S12x cameras use Sony 1.1 inch CMOS digital image sensor with an active-pixel array of 4096 H x 3000 V and on-chip analog-to-digital converter (ADC) that provides 12 bits per pixel.

It incorporates sophisticated camera functions, such as windowing, column and row skip mode, snapshot mode. The SMX-20S12x camera sensor produces extraordinarily clear and sharp digital pictures. It is able to capture both continuous video and single frames.

TABLE 3.2

	SMX-20S12x
Types:	Monochrome (SMX-20S12M) and color (SMX-20S12C) 12.3 megapixel CMOS sensor with an optical format of 1.1 inches manufactured by Sony
Pixel size:	3.45 µm × 3.45 µm
Image array size:	17.6 mm diagonal
Shutter:	Global Shutter
Scanning mode:	Progressive
ADC resolution:	12 bits
Dynamic Range:	71 dB

3.3 Camera Electrical

Camera Electrical characteristics are shown in the table below.

TABLE 3.3

|	SMX-20S12x
Supply voltage:	5V supplied by USB 3.0 interface
Power consumption:	Less than 4.5 W (depends on operating modes)

3.4 Trigger Connector

Camera has two configuration pin, which could be used in two modes: trigger mode and pulse function mode.

FIGURE 3.1   *6-pin Hirose trigger connector (without a cable)*

Trigger connector pin-out could be found on picture below, also on camera body.

FIGURE 3.2   *External connector pin-out*
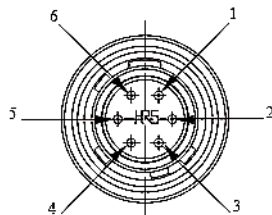
Where: 1 – NC, 2 – Pin_0, 3 – Pin_1, 4 –Common (GND), 5 - VCC (+5V), 6 – NC.

Two modes of two configuration pin:

1   **Trigger mode** of configuration pin

This mode could be used for synchronization of image shooting with external devices as well as for general purpose Input/Output.

Pin_0 – trigger mode (IN)

Pin_1 – trigger mode (OUT)

2   **Pulse function mode** of configuration pin

This camera has a pulse output function that indicates each state of shutter operation.

Pin_0 - TOUT1 (OUT)

Pin_1 - TOUT2 (OUT)

Both input and output are 5V TTL compatible.

Maximum allowed voltage on trigger connector pins is 5.3V.

Trigger internal circuits are shown in the Figure below.
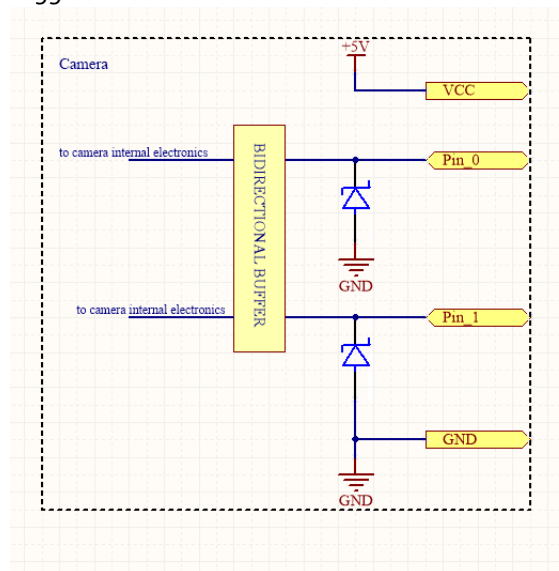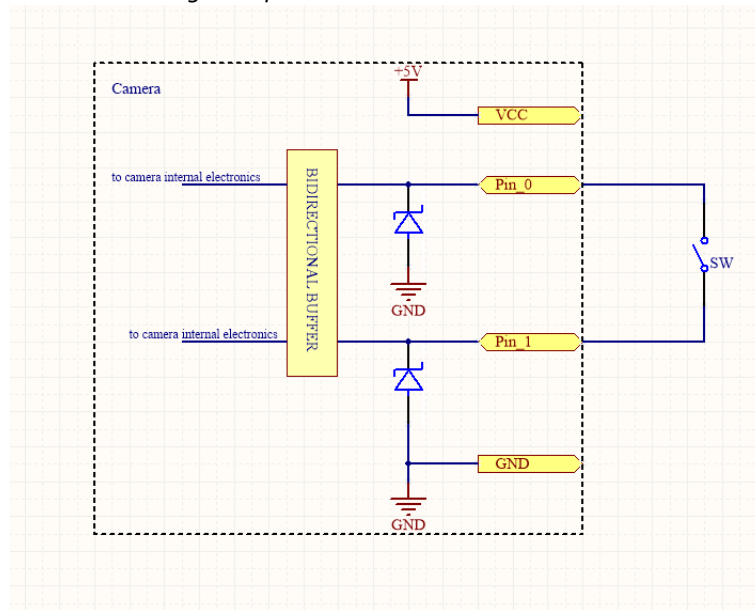
FIGURE 3.3   *Trigger internal circuits*

FIGURE 3.4   *Push button using example*

3.5 Camera Interface

Camera interface characteristics are shown in the table below.

TABLE 3.4

	SMX-20S12x
Interface Type:	USB 3.0
Connector Type:	USB 3.0 micro-B with locking screws

3.6 System Requirements

Camera System Requirements are shown in the table below.

TABLE 3.5

SMX-20S12x		
Operating System:	Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, Windows 7, Windows 8, Windows 8.1, Windows 10	
Processor:	**Recommended configuration**	**Minimal configuration**
	Cameras will function with nominal frame rates	Cameras will function with **reduced** frame rates
	Intel i7-3770, Samsung Exynos5422 Cortex™-A15 2.0Ghz quad core, Cortex™-A7 quad core	PIV 2Ghz
RAM:	4GB DDR3	2048 Mb
Video Card:	Any with 24 bit True Color	Any with 24 bit True Color
Hardware Interface:	Intel integrated USB 3.0 Host Controller. At least one USB 3.0 port for connection	Any USB 3.0 Host Controller. At least one USB 3.0 port for connection
Hard Drive:	SSD (write speed 150 MB/s minimum)	N/A

3.7 Camera Physical Characteristics

Camera physical characteristics are shown in the table below.

TABLE 3.6

	SMX-20S12x
Operating temperature[*]	0 to +50°C
Lens mount type	C-mount
Weight	57 g (2.0 oz)
Dimensions (L x W x D)	40.1 × 36 × 36 mm (1.58 × 1.42 × 1.42 inches)
Camera housing material	Aircraft grade aluminum

*.   camera case temperature should not rise above 60 degrees Celsius for normal operation. It's not recommended to power-on camera without lens or another heatsink. Any industrial C mount lens is enough for addition camera heat dissipation.
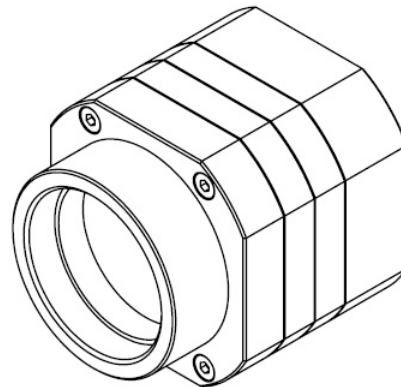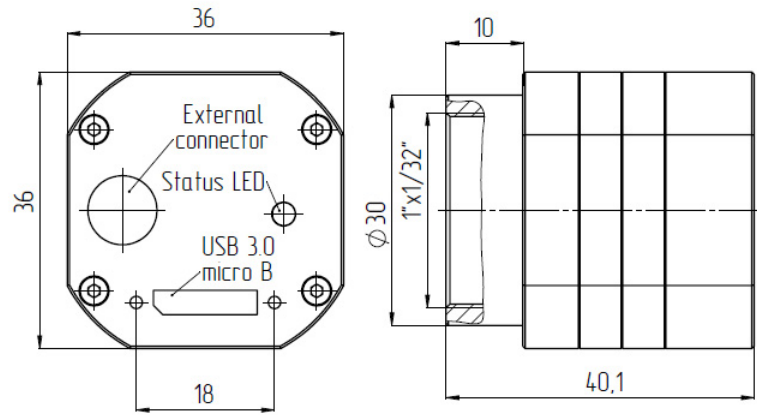
4 Camera Mechanicals

FIGURE 4.1   *SMX-20S12x camera case view*

FIGURE 4.2   *SMX-20S12x camera case drawings*

All dimensions are in millimeters.

5 SMX-20S12x Software Package

Sumix camera software package contains a standard application, drivers, User Guide and SDK (API, examples, documentation).

Standard application is a ready solution covering basic user requirements.

API provides full control of all camera features from user applications using many programming languages and platforms (C/C++, C#, VB, LabView, MatLab). Along with examples and documentation it enables easy integration of the camera into the custom-developed applications.

5.1 Camera Standard Application Controls

- Image sensor options (viewport, decimation, image, flip, exposure, gain, frequency)
- Selectable video data depth
- Frame rate control
- Auto Exposure
- Image correction (brightness, contrast, gamma)
- Input/Output trigger control
- Histogram
- Image and video capture
- Software zoom

5.2 Compatibility With 3rd Party Software/IDE

- HALCON
- MATLAB IMAQ adapter
- MATLAB mex-file, extending basic MATLAB command set to control the camera parameters
- ActiveX component
- LabVIEW
- Streampix

API allows:

- getting camera/sensor identification information
- getting/setting all sensor parameters
- image grabbing
- image correction: white balance, hot pixel correction
- connectivity with external devices
- multi-camera configuration

A set of examples is included into the SDK as a tutorial for developing new applications in:

- C/C++
- Matlab
- C#
- LabView

Our developers are ready to advise and assist with the integration of the SDK into your application.
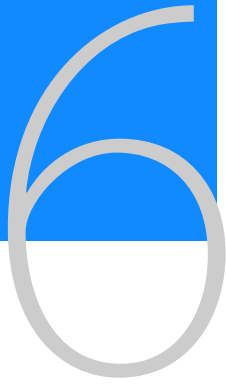
6 Assistance and Help

Our developers are ready to advise and assist with integration of the SDK into relevant applications.

For questions/proposals contact us via camera@sumix.com

7 Camera Customization

Sumix Corporation offers hardware and software customization services to meet customers' specific needs. Recent camera custom development examples:

- Camera case mechanical modification
- External trigger output mode customization
- Unique sensor modification

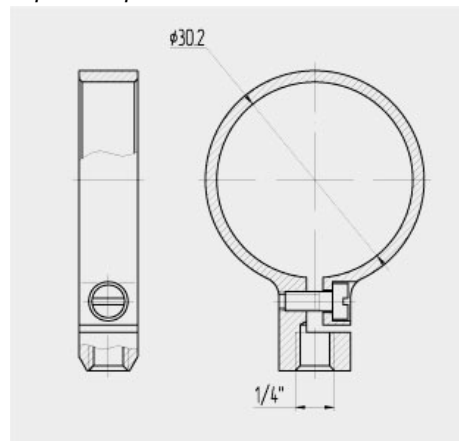For more information please contact us via camera@sumix.com

8 Camera Accessories

The SMX-20S12x USB3.0 Cameras usually go with:

- Tripod adapter:

The lightweight aluminum adapter with two screws allows quick and easy camera fixing to the tripod, offering additional protection of the camera

FIGURE 8.1 *Tripod Adapter*

- USB 3.0 A to Micro B screwable cable 2 m long

FIGURE 8.2   *USB 3.0 A to Micro B Screwable Cable*