



# Data Sheet

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SMX-11M5x Series USB2.0 Cameras

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SMX-11M5x Series USB2.0 Cameras Data Sheet

Revision 2.1

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## Introduction

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The **SMX-11M5x Series** are 5 megapixel (2592 x 1944) CMOS cameras with USB2.0 interface suitable for scientific and industrial applications. They are designed for capturing, streaming and storing high quality digital images.

The SMX-11M5x Series Cameras are available in two modifications:

- **SMX-11M5M** camera has a monochrome 5 megapixel CMOS sensor with an optical format of 1/2.5 inch and features high sensitivity, low power consumption, frame rate of 8 fps (24 MHz) at the full (2592 x 1944) resolution and small size
- **SMX-11M5C** camera has a color 5 megapixel CMOS sensor with an optical format of 1/2.5 inch and features low power consumption, frame rate of 8 fps (24 MHz) at the full (2592 x 1944) resolution and small size

The cameras are available in **8, 10 and 12 bits** of output modifications.

Rolling shutter, External trigger input/output mode are available with the **SMX-11M5x** cameras.

Capturing of initial live streaming video images and still images are provided via USB 2.0 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.

## Key Features

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- 2592 x 1944 active imaging pixels
- High speed: 8 fps at 2592 x 1944
- Pixel rate up to 96 MHz
- External trigger input/output
- Rolling shutters
- Video and snapshot operations
- Low image noise
- Plug and play
- USB2.0 interface
- C/CS-Mount
- No external power supply required

## Specifications

**Table 1-1** Camera Specifications

### Output video and camera control characteristics

	SMX-11M5M	SMX-11M5C
Maximum resolutions of output window	2592 x 1944, full resolution mode	2592 x 1944, full resolution mode
Frame rate at resolution (48MHz)*	8-bit modification: <ul style="list-style-type: none"> <li>● 8 fps at 2592 x 1944, full resolution</li> <li>● 50 fps at 1024 x 768</li> <li>● 128 fps at 640 x 480</li> </ul> 10-bit modification: <ul style="list-style-type: none"> <li>● 7 fps at 2592 x 1944, full resolution</li> <li>● 40 fps at 1024 x 768,</li> <li>● 96 fps at 640 x 480</li> </ul> 12-bit modification: <ul style="list-style-type: none"> <li>● 7 fps at 2592 x 1944, full resolution</li> <li>● 37 fps at 1024 x 768</li> <li>● 78 fps at 640 x 480</li> </ul>	8-bit modification: <ul style="list-style-type: none"> <li>● 8 fps at 2592 x 1944, full resolution</li> <li>● 50 fps at 1024 x 768</li> <li>● 128 fps at 640 x 480</li> </ul> 10-bit modification: <ul style="list-style-type: none"> <li>● 7 fps at 2592 x 1944, full resolution</li> <li>● 40 fps at 1024 x 768,</li> <li>● 96 fps at 640 x 480</li> </ul> 12-bit modification: <ul style="list-style-type: none"> <li>● 7 fps at 2592 x 1944, full resolution</li> <li>● 37 fps at 1024 x 768</li> <li>● 78 fps at 640 x 480</li> </ul>
Output bits per pixel	8-bit modification: 8 bits 10-bit modification: 10 bits 12-bit modification: 12 bits	8-bit modification: 8 bits 10-bit modification: 10 bits 12-bit modification: 12 bits
Pixel rates	6 - 96 MHz	6 - 96 MHz
Exposure range (at maximum resolution), ms	min: 0.04 (at 48 MHz) max: 937.72 (at 6.66 MHz)	min: 0.04 (at 48 MHz) max: 937.72 (at 6.66 MHz)
Pixel gain control	Programmable hardware gain controls for R, G, B: 161 gain levels from 1 to 128 From 1 to 4 with increment 0.125 From 4.25 to 8 with increment 0.25 From 9 to 128 with increment 1	Programmable hardware gain controls for R, G, B: 161 gain levels from 1 to 128 From 1 to 4 with increment 0.125 From 4.25 to 8 with increment 0.25 From 9 to 128 with increment 1

**Table 1-1** Camera Specifications

Output window modes	View port (from 2592 x 1944 to 8 x 8 with 2 pixels/2 lines step positioning) Frame Decimation (1:1, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8) Frame Binning (1:2, 1:4) (averaging and summing modes available) Horizontal mirroring, hardware Vertical flipping, hardware	View port (from 2592 x 1944 to 8 x 8 with 2 pixels/2 lines step positioning) Frame Decimation (1:1, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8) Frame Binning (1:2, 1:4) (averaging and summing modes available) Horizontal mirroring, hardware Vertical flipping, hardware
Gamma, brightness and contrast control	Programmable with look-up table	Programmable with look-up table

\* Listed frame rate values at the defined resolutions are not the maximal possible. Increasing of frame rate can be done by reducing of the current Exposure value (the lower Exposure the higher frame rate), hiding of the active video window from the display, running the camera with a fast speed computer, etc.

### Imaging chip characteristics

Type	Monochrome 5 megapixel CMOS sensor with an optical format of 1/2.5 inch Manufactured by Micron Technology, Inc	Color 5 megapixel CMOS sensor with an optical format of 1/2.5 inch Manufactured by Micron Technology, Inc
Pixel size	2.2 $\mu\text{m}$ x 2.2 $\mu\text{m}$	2.2 $\mu\text{m}$ x 2.2 $\mu\text{m}$
Image array size	7.13 mm diagonal	7.13 mm diagonal
Shutter	Rolling (Optional Global Reset)	Rolling (Optional Global Reset)
Scanning mode	Progressive	Progressive
ADC resolution	12 bits	12 bits
Sensitivity	1.4 V/lux-sec (550nm)	1.4 V/lux-sec (550nm)
Dynamic range	70.1 dB	70.1 dB

### Camera electrical characteristics

Supply voltage	5 V supplied by USB2.0 interface	5 V supplied by USB2.0 interface
Supply current	176 mA (at 5.0 V)	176 mA (at 5.0 V)
Maximum power consumption	0.88 W	0.88 W

### Camera interface characteristics

Interface Type	USB2.0, 480 Mbps	USB2.0, 480 Mbps
Connector Type	USB mini-B, 2 pin	USB mini-B, 2 pin

### System requirements

**Table 1-1** *Camera Specifications*

Operating System	Windows XP SP1+/2003/Vista/2008/7 recommended: Windows 7 or XP 1+	Windows XP SP1+/2003/Vista/2008/7 recommended: Windows 7 or XP 1+
Processor	Intel P4 or higher recommended: Intel Core 2 Duo	Intel P4 or higher recommended: Intel Core 2 Duo
RAM	256 MB for XP (512 MB for 2008/Vista) recommended: 512 MB (1024 MB for W7)	256 MB for XP (512 MB for 2008/Vista) recommended: 512 MB (1024 MB for W7)
Performance	minimum: 300 Mflops recommended: 400 Mflops or higher	minimum: 300 Mflops recommended: 400 Mflops or higher
Hard Disk Space	About 15 MB for installation plus additional space for captured images	About 15 MB for installation plus additional space for captured images
Video	8 MB memory, recommended GeForce 4xxx/Radeon 9xxx or higher	8 MB memory, recommended GeForce 4xxx/Radeon 9xxx or higher
Hardware Interface	USB 2.0 Host Controller: recommended Intel integrated Host Controller (VIA-based USB Controller not recommended) USB 3.0 Host Controller is also supported at least one USB 2.0 port for connection	USB 2.0 Host Controller: recommended Intel integrated Host Controller (VIA-based USB Controller not recommended) USB 3.0 Host Controller is also supported at least one USB 2.0 port for connection

**Camera physical characteristics**

Operating temperature	0 to +60°C	0 to +60°C
Lens mount type	C/CS-mount	C/CS-mount
Weight (without lens)	55 g	55 g
Dimensions (W x L x H)	50.8 x 30.2 mm	50.8 x 30.2 mm
Camera housing material	Duralumin	Duralumin



Camera Mechanicals

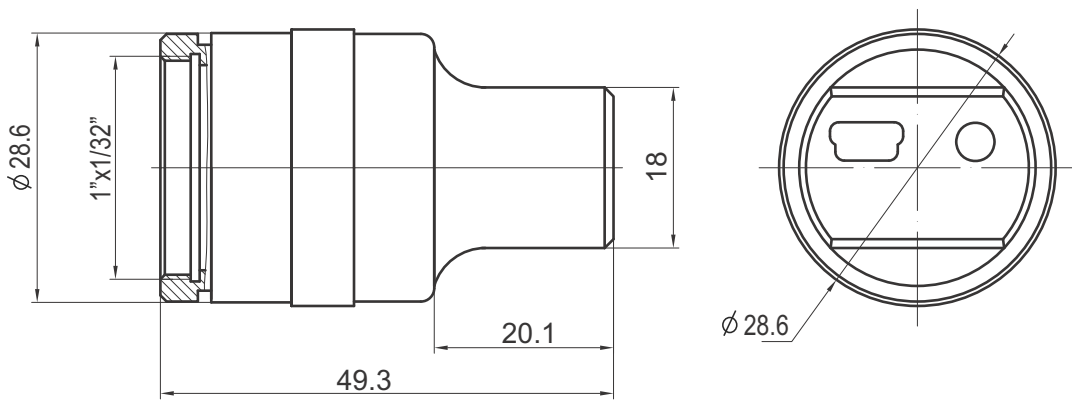


Figure 1-1 SMX-11M5x series camera case drawing

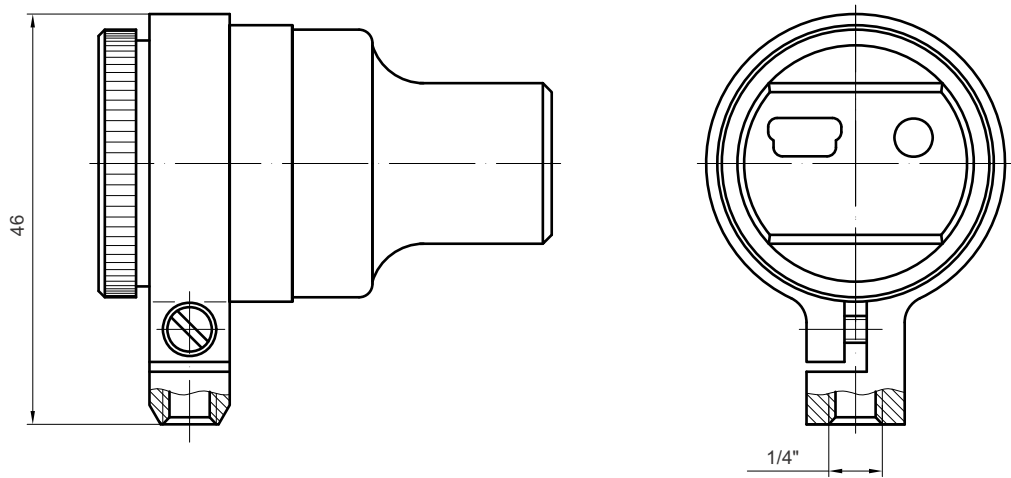


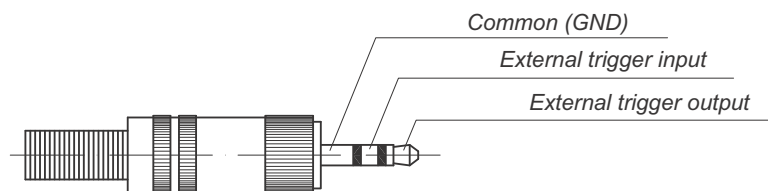
Figure 1-2 The SMX-11M5x Series camera case drawing with the Tripod Adapter

Units: mm



**Figure 1-3** *SMX-11M5x Series camera view*

### External connector pinout



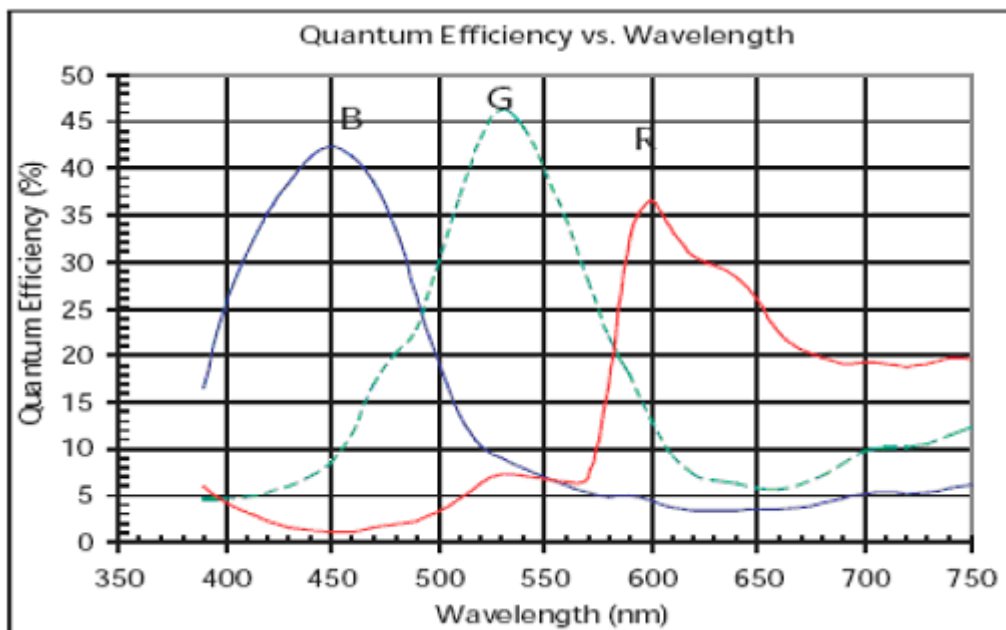
## General Sensor Characteristics

The SMX-11M5x Series cameras use Micron's 1/2.5-inch CMOS digital image sensor with an active-pixel array of 2592 H x 1944 V. It incorporates sophisticated camera functions such as windowing, column and row skip mode, snapshot mode. It is programmable through a simple two-wire serial interface. The SMX-11M5x Series camera sensor produces extraordinarily clear and sharp digital pictures. It is able to capture both continuous video and single frames.

### General Description

An on-chip analog-to-digital converter (ADC) provides 12 bits per pixel.

The 5-megapixel CMOS image sensor features DigitalClarity Micron's low-noise CMOS imaging technology that achieves CCD image quality (based on signal-to-noise ratio and low-light sensitivity) while maintaining the inherent size, cost, and integration advantages of CMOS.



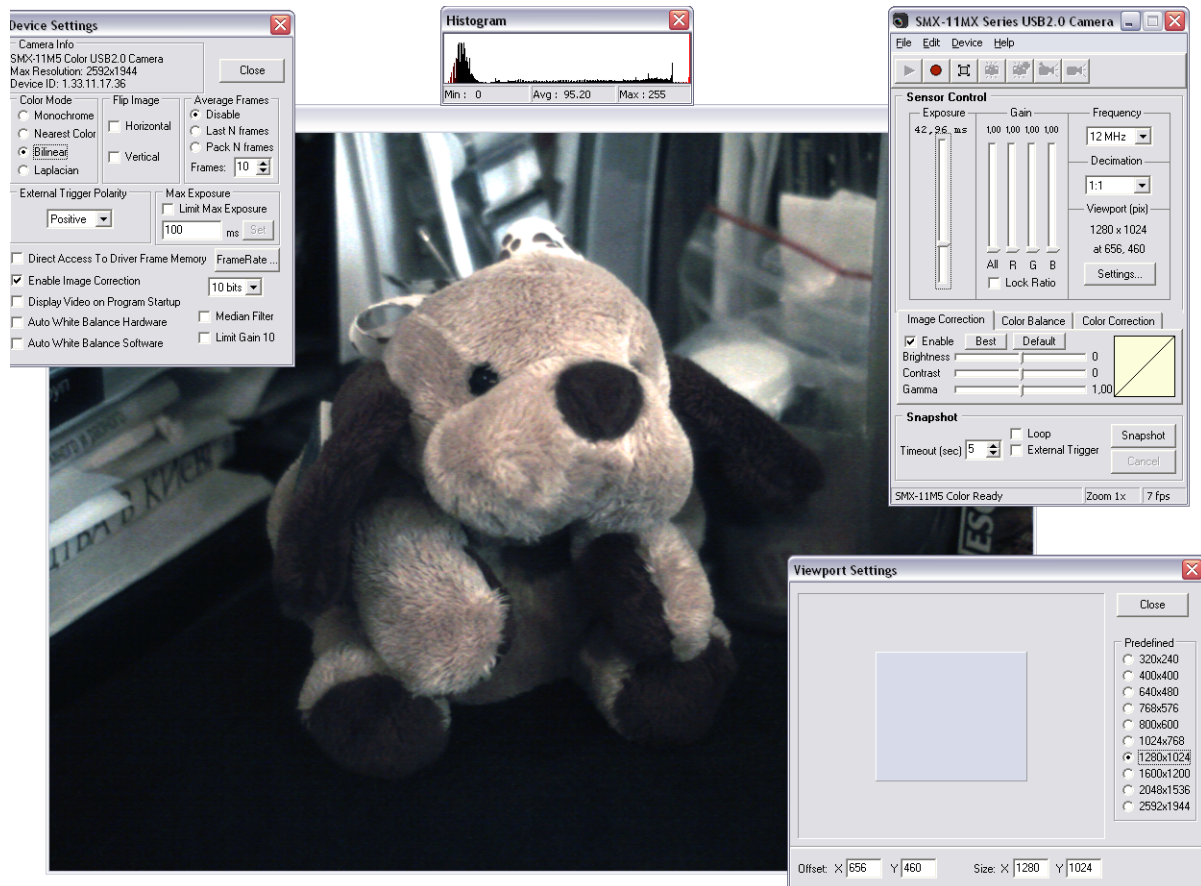
**Figure 1-4** *Quantum Efficiency versus Wavelength*

## SMX-11M5x Software Package

The SMX-11M5x Series cameras usually go with a software package that contains Standard Application, Driver, User Guide and SDK (API, examples, documentation).

Standard Application provides control of various set-up commands demonstrating cameras performance.

API allows full control of all camera features and along with examples and documentation enable easy integration of the camera into the customers' applications.



**Figure 1-5** SMX-11M5C camera application

## Drivers

- WDM compatible

## System Requirements

- Windows 7 or XP 1 and higher

For more information see [“System requirements” on page 7](#).

## API Function Categories

- Get camera info
- Get/Set camera features
- Video stream controls (Start/Stop)
- Image grabbing
- Image correction controls (brightness, contrast, gamma)
- Snapshot controls (Exposure)
- Open /Close camera

- Frequency (from 6 to 96 MHz), fluent frequency changing

### Camera Application Controls

- Image correction (brightness, contrast, gamma)
- Color Balance (R, G, B, for color models only)
- Color Correction (Brightness, Contrast, Saturation)
- Viewport
- Image capture
- Video capture
- Color Bayer algorithm selection
- Selectable Exposure, Gain and Frequency (sensor controls)
- Decimation
- Auto Exposure
- Horizontal and Vertical flipping
- Averaging frames
- Limit Exposure
- Histogram
- External trigger polarity
- Software zoom
- Frame rate control

A set of examples included into SDK serves as tutorial in developing new applications.

### Third-Party IDE/Software Compatibility

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The SMX-11M5x Series USB2.0 cameras are compatible with the following programming environments and software:

- Any Win32 C/C++ compiler (by request)
- Microsoft C++ (Visual Studio 6.0, 2002, 2003, 2005, 2008, 2010)
- Delphi
- C# (SDK, upcoming)
- C# 2003, 2008
- C++ Net
- Visual Basic 6.0 (SDK, upcoming)

## Assistance and Help

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

## Camera Customization

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

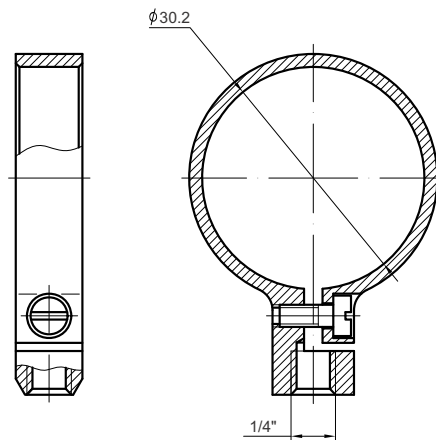
- Camera case mechanical modification
- External trigger output mode customization
- Unique sensor modification

## Camera Accessories

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The SMX-11M5x Series USB2.0 Cameras usually go with:

- 1 Tripod adapter: the lightweight duralumin adapter allows quick and easy camera fixing to the tripod, offering additional protection of the camera



- 2 USB A to Mini B cable, 1.75 m long



### 3 IR-cut Filter

The SMX-11M5x series cameras are sensitive to IR-light. IR-cut filter will block the (near) infrared light and make the colors of the image more realistic.

Using the camera in an environment rich for infrared light may result in highlighted images. In order to avoid highlighted images use the IR-cut filter for the SMX-11M5C cameras.







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