



Megapixel USB2.0 CMOS
CAMERA

Data Sheet

SMX-M95x Series USB2.0 Cameras

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4005 Avenida de la Plata, Suite 201

Oceanside, CA, 92056

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

Email: camera@sumix.com

www.sumix.com

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Contents

Introduction	5
Key Features	5
Specifications	6
Output video and camera control characteristics	6
Imaging chip characteristics	7
Camera electrical characteristics	7
Camera interface characteristics	7
System requirements	7
Camera physical characteristics	8
Camera Mechanicals	9
External connector pinout	10
General Sensor Characteristics	10
SMX-M95x Software Package	11
Drivers	12
System requirements	12
API function categories	12
Camera application controls	13
Third-Party IDE/Software Compatibility	13
Assistance and Help	14
Camera Customization	14
Camera Accessories	14
Figures	17

Introduction

The **SMX-M95x 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-M95x Series Cameras are available in two modifications:

- **SMX-M95M** 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-M95C** 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

Rolling shutter, External trigger input/output mode are available with the SMX-M95x 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

- 2592 x 1944 active imaging pixels
- High speed: 8 fps at 2592 x 1944
- Output 8, 10 and 12 bits per pixel
- Pixel rate up to 96 MHz
- External trigger input/output
- Rolling and Global Reset shutters
- Video and snapshot operations
- Low image noise
- Plug and play
- USB2.0 interface
- C-Mount
- No external power supply required

Specifications

Table 1-1 Camera Specification

	SMX-M95M	SMX-M95C
Output video and camera control characteristics		
Maximum resolutions of output window	2592 x 1944, full resolution mode	2592 x 1944, full resolution mode
Frame rate at resolution (40MHz)*	8-bit mode: <ul style="list-style-type: none"> ● 8 fps at 2592 x 1944, full resolution ● 50 fps at 1024 x 768 ● 128 fps at 640 x 480 10-bit mode: <ul style="list-style-type: none"> ● 6 fps at 2592 x 1944, full resolution ● 40 fps at 1024 x 768, ● 96 fps at 640 x 480 12-bit mode: <ul style="list-style-type: none"> ● 4 fps at 2592 x 1944, full resolution ● 25 fps at 1024 x 768 ● 64 fps at 640 x 480 	8-bit mode: <ul style="list-style-type: none"> ● 8 fps at 2592 x 1944, full resolution ● 50 fps at 1024 x 768 ● 128 fps at 640 x 480 10-bit mode: <ul style="list-style-type: none"> ● 6 fps at 2592 x 1944, full resolution ● 40 fps at 1024 x 768, ● 96 fps at 640 x 480 12-bit mode: <ul style="list-style-type: none"> ● 4 fps at 2592 x 1944, full resolution ● 25 fps at 1024 x 768 ● 64 fps at 640 x 480
Output bits per pixel	Selectable, 8 bits, 10 bits or 12 bits	Selectable, 8 bits, 10 bits or 12 bits
Lookup table	Downloadable for user selected 8 bits mode: converts 11 bits of imaging chip's ADC to 8 bits of output	Downloadable for user selected 8 bits mode: converts 11 bits of imaging chip's ADC to 8 bits of output
Pixel rates	6.66 - 96 MHz	6.66 - 96 MHz
Exposure range (at highest resolution), ms	min: 0.04 (at 48 MHz) max: 937.72 (at 6.66 MHz) (up to 31 sec with fps decrease)	min: 0.04 (at 48 MHz) max: 937.72 (at 6.66 MHz) (up to 31 sec with fps decrease)
Pixel gain control	Programmable (Hardware): 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): 161 gain levels from 1 to 128; 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 Specification

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 Vertical flipping	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 lookup table	Programmable with lookup table, software gamma correction

* 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 1/2.5 inch 5 megapixel CMOS sensor manufactured by Micron Technology, Inc	Color 1/2.5 inch 5 megapixel CMOS sensor manufactured by Micron Technology, Inc
Pixel size	2.2 μm x 2.2 μm	2.2 μm x 2.2 μm
Image array size	7.13 mm diagonal	7.13 mm diagonal
Shutter	Global reset release (GRR), snapshot only electronic rolling shutter (ERS)	Global reset release (GRR), snapshot only electronic rolling shutter (ERS)
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	456 mA (at 5.0 V)	456 mA (at 5.0 V)
Maximum power consumption	2.28 W	2.28 W

Camera interface characteristics

Interface Type	USB2.0, 480 Mbps	USB2.0, 480 Mbps
Connector Type	USB mini-B, 5 pin	USB mini-B, 5 pin

System requirements

Table 1-1 Camera Specification

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 +50°C	0 to +50°C
Lens mount type	C-mount	C-mount
Weight (without lens)	108 g	108 g
Dimensions (W x L x H)	54.2 x 54.2 x 32.6 mm	54.2 x 54.2 x 32.6 mm
Camera housing material	Duralumin	Duralumin

Camera Mechanicals

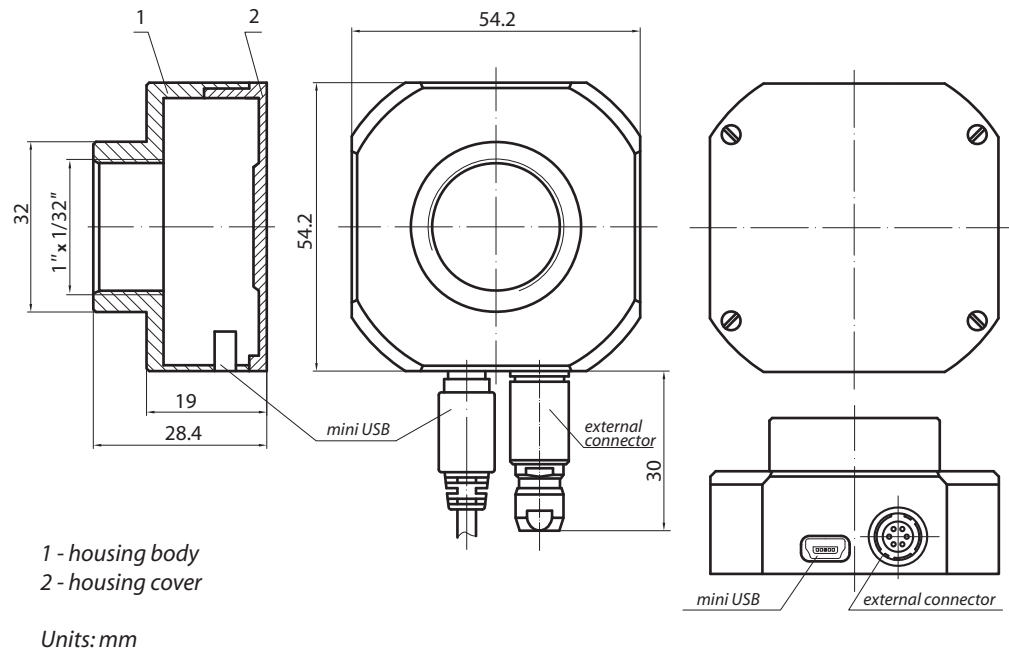


Figure 1-1 Camera drawing



Figure 1-2 SMX-M95x camera outlook

External connector pinout

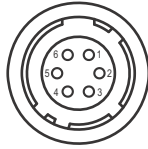


Figure 1-3 Pinout

- 1 Trigger / Event input (Positive)
- 2 Programmable output
- 3 Programmable output
- 4 Trigger / Event input (Negative)
- 5 Programmable output
- 6 Common (Ground)

General Sensor Characteristics

The SMX-M95x 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-M95x cameras' sensor produces extraordinarily clear and sharp digital pictures. It is able to capture both continuous video and single frames.

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.

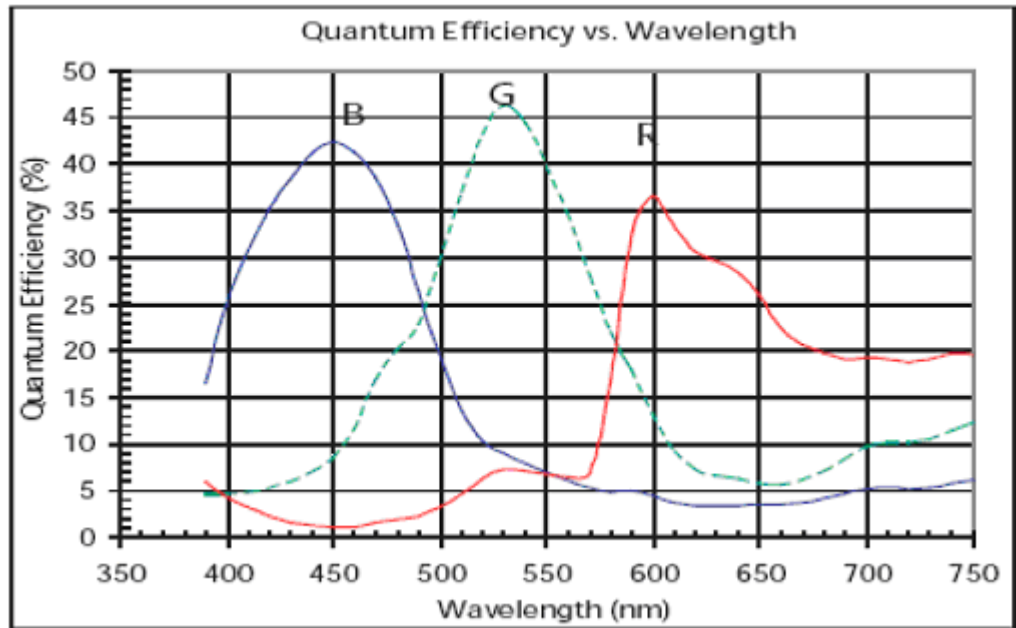


Figure 1-4 Quantum Efficiency versus Wavelength

SMX-M95x Software Package

The SMX-M95x cameras usually go with 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.

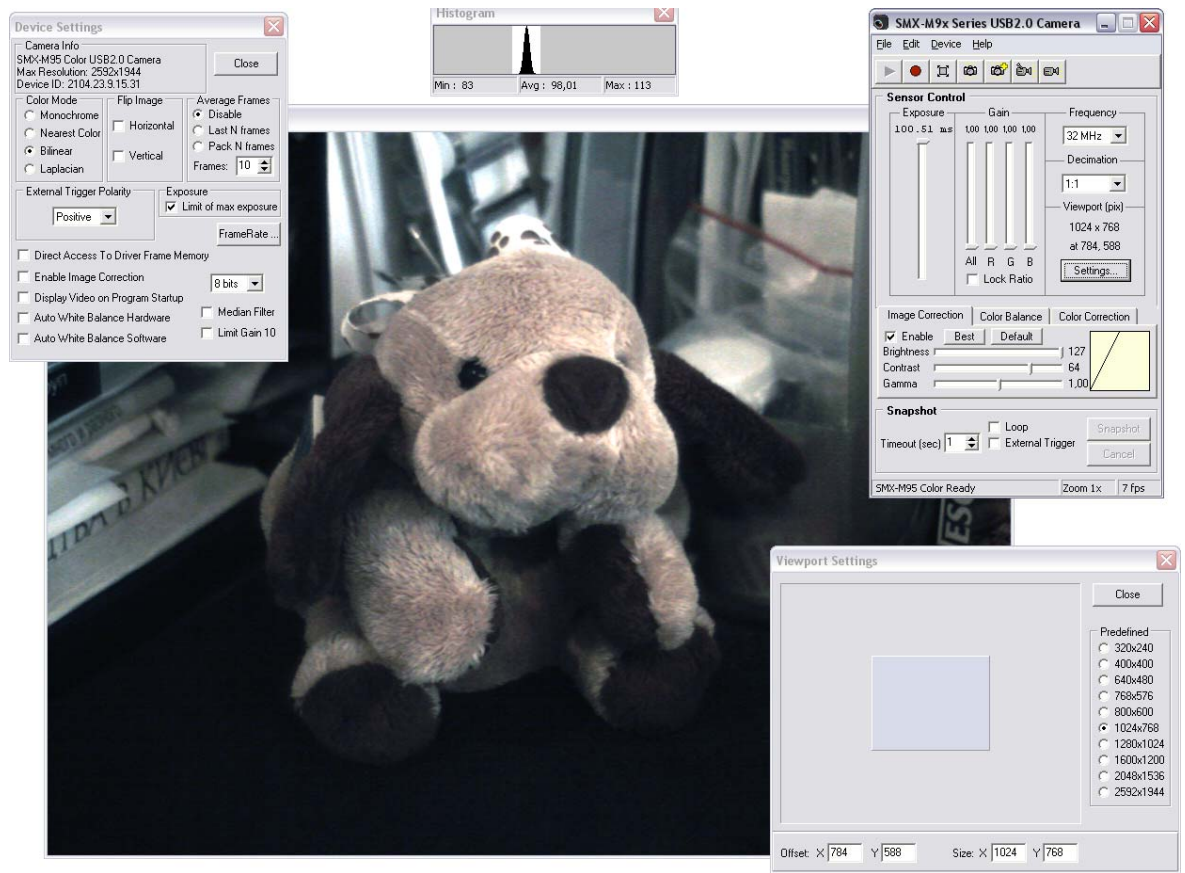


Figure 1-5 SMX-M95C camera application

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 6.66 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 Gain (10)
- Limit Exposure
- Histogram
- External trigger polarity
- Software zoom
- Selectable (8 bits, 10 bits or 12 bits) mode output
- Frame rate control

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

Third-Party IDE/Software Compatibility

The SMX-M95x 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

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

Camera Customization

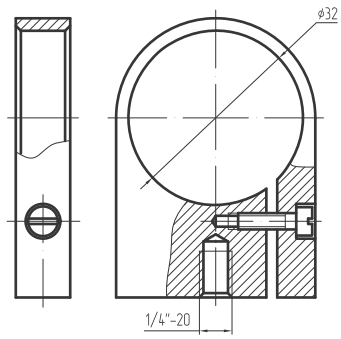
Sumix Corporation offers hardware and software customization services to meet customers' specific needs. Recent camera custom development examples:

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

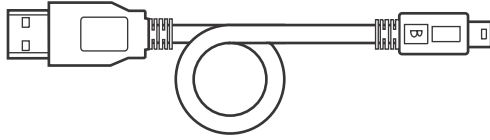
Camera Accessories

The SMX-M95x USB2.0 Cameras usually go with:

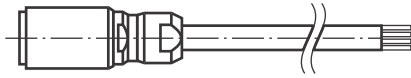
- 1 Tripod adapter: the lightweight duralumin adapter allows quick and easy camera fixing to the tripod, offering additional protection of the camera



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



3 6 pin Hirose trigger connector (without a cable)



4 IR-cut Filter and Ring-adapter

The SMX-M95x 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-M95x cameras.

When the camera is used with the IR-cut filter, the focus distance is increased to 0.66 m. To restore the focus distance to the original value (when the camera is used with no IR-cut filter ring and no ring-adapter) the ring-adapter is also used:



Figures

Camera drawing	9
SMX-M95x camera outlook	9
Pinout	10
Quantum Efficiency versus Wavelength	11
SMX-M95C camera application	12

