USB 3.0 Camera Module

USB is one of the most popular plug and play interface that is being used in computer world. Its plug and play feature and ease of building devices around it has enabled it to be adopted in various kinds of devices. Starting from as simple as mouse to complex system as mobile phone. USB is continuously evolving and new interface specifications are getting defined and adopted. Current new generations of devices are built around USB specifications 3.0, named 'Super Speed'. It is completely compatible with its predecessor USB 2.0 (high speed) and has numerous advantages listed below.

USB 3.0 over USB 2.0

- **Transfer speed** – USB 3.0 is 10 times faster than USB 2.0 with the transmission speed up to 5 Gbit/s
- **Increased bandwidth** – USB 3.0 is full duplex whereas USB 2.0 is half duplex. If utilized both ways, USB 3.0 gives potential total bandwidth to 20 times of USB 2.0
- **Better power management** – USB 3.0 delivers more power
- **Asynchronous traffic flow** instead of polled traffic flow
- **Support for streaming** – Stream Protocol allows a large number of logical streams within an Endpoint

*About Us*

PathPartner based out of California, USA and Bangalore India is a leading provider of Consulting, Services and Solutions for digital media-centric devices market. Our services range from Product Engineering / R&D and System Integration to Middleware, Applications and System solutions.

With an expert management team which has rich experience in Technology, Engineering & Business practices, PathPartner comprises of 160+ DSP & Embedded system software engineers and Sales & marketing presence in USA, Europe, Korea and Taiwan. The company specializes in addressing challenges faced by leading OEMs, Silicon and OS providers in their product development.
5MP USB 3.0 Camera Module

5MP Autofocus HD USB 3.0 Camera Module is based on OV5640 CMOS image sensor from Omnivision and is fully compliant with USB Video Class (UVC) 1.0 standard and USB Audio Class (UAC) 1.0 standard. OV5640 provides full functionality of complete camera including anti-shake technology, AF Control, integrated JPEG compression engine and automatic image control functions and outputs the data in high speed dual lane MIPI interface.

Features

➤ Output formats: RAW RGB, RGB565/555/444, YUV 422/420, YCbCr422 and compression Size
➤ Support for LED Flash/torch during low light conditions
➤ Built in microphone support for audio streaming
➤ Frame Rate supported:

<table>
<thead>
<tr>
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<th>USB 3.0</th>
<th>USB 2.0</th>
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<tbody>
<tr>
<td>VGA</td>
<td>45fps</td>
<td>30fps</td>
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<tr>
<td>HD</td>
<td>60fps</td>
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<tr>
<td>Full HD</td>
<td>30fps</td>
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<tr>
<td>Full Resolution 5MP</td>
<td>15fps</td>
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➤ Temperature Range: Operation: -20°C to 70°C and Stable Image: 0°C to 50°C
➤ User configurable general purpose pins available
➤ RoHS compliant
➤ USB Powered device operating at 5V ± 250 mV

Camera Module Features

➤ ¼ inch 4 plastic + IR Lens is used with an view angle of 67.4°
➤ Object Distance: 100 mm to infinity
➤ Signal to Noise Ratio: 36 dB and dynamic range: 68dB @ 8X gain
➤ Lens size: 8.5mm x 8.5mm x 4.95mm
➤ Module Size: 19mm x 8.5mm x 4.95mm

Video HDR

➤ The video quality of 5MP USB3.0 camera under high dynamic range scenes can be improved by using PP’s HDR algorithm avoiding the need for expensive HDR sensors
➤ PP’s HDR Video algorithm is a software based algorithm running in PC by capturing differently exposed frames alternately from the sensor used in 5MP USB3.0 camera module
➤ The algorithm is optimized to get 720p 30fps
8MP USB 3.0 Camera Module

8MP Autofocus HD USB 3.0 Camera Module is based on OV8825 CMOS image sensor from Omnivision and is fully compliant with USB Video Class (UVC) 1.1 standard and USB Audio Class (UAC) 1.0 standard. OV8825 outputs the data in high speed MIPI interface and its OmniBSI + Pixel architecture improve image and video capture in both bright and low-light conditions, making it a highly attractive solution for smartphones and tablets. It supports 8MP still image capturing along with 720p @ 30 fps and 1080p @ 30 fps video streaming capability.

Features

➤ Output formats: YUV2 Size
➤ Support for LED Flash/torch during low light conditions
➤ Built in microphone support for audio streaming
➤ Frame Rate supported:

<table>
<thead>
<tr>
<th>Format</th>
<th>USB 3.0</th>
<th>USB 2.0</th>
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<tbody>
<tr>
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<td>30 fps</td>
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<tr>
<td>HD (720p)</td>
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<tr>
<td>Full HD (1080p)</td>
<td>30 fps</td>
<td>-</td>
</tr>
<tr>
<td>Full Resolution (8MP)</td>
<td>11 fps</td>
<td>-</td>
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➤ Temperature Range: Operation: -30° C to 70° C and Stable Image: 0° C to 50° C
➤ User configurable general purpose pins available
➤ RoHS compliant
➤ USB Powered device operating at 5V ± 250 mV

Camera Module Features

➤ 1/3.2 inch 4 plastic + IR Lens is used with a view angle of 66.1°
➤ Object Distance: 100 mm to infinity
➤ Signal to Noise Ratio: 35.7 dB and dynamic range: 70.45dB at 8X gain
➤ Lens size: 8.5mm x 8.5mm x 5.9 mm
➤ Module Size: 24mm x 8.5mm x 5.9 mm

UVC Camera control options

➤ Brightness, Focus, Contrast, Sharpness, White balance, Hue

Targeted Applications

➤ Industrial and Medical applications
➤ Webcam
PathPartner’s Imaging Expertise and Offer

**Computational Imaging Algorithms**
PathPartner offers wide range of application-specific custom imaging algorithms, development and optimization on various embedded platforms. PathPartner’s Imaging team has strong experience in developing Digital camera Imaging algorithms like:
- 2A (Auto Exposure, Auto white balance)
- Face Priority based Auto Exposure for Video Conferencing and Surveillance applications
- Spatial and Temporal Noise removal for videos in challenging lighting conditions
- High Dynamic Range algorithm for Image and Video
- Depth Map estimation algorithm for ToF, Stereo Cameras
- Software Imaging Pipeline for Bayer Image sensors

The Imaging team also expert in optimizing the imaging algorithm to get real time performance on platforms/ frameworks like:
- TI’s Media SoC series (DM365, DM8127, DM385, OMAP4)
- Custom HW imaging accelerators used in TI’s high end Media SoCs
- ARM Platforms (Neon)
- Intel x86 Platforms (SSE)
- OpenCL for GPU acceleration

**Image Quality Tuning & Benchmarking**
PathPartner offers expert service on Image quality tuning for various platforms consisting of discrete / embedded ISPs to achieve best image quality under various lighting conditions for different combination of lens and sensors
- PathPartner has a dedicated imaging lab for performing the quality tuning, calibration and tests with necessary lab equipment like Light box, Light meter, Macbeth color chart, Kodak Q14 chart, ISO resolution chart, different real world objects carefully chosen to test camera characteristics
- Set up for simulating motion sequence for video noise filter and HDR Video testing
- Typically ISP tuning is performed for various camera parameters
- Color accuracy, white balance accuracy, sharpness, noise, tonal response, dynamic range, optical distortion etc.,
- Objective Image quality evaluation and benchmarking is achieved utilizing Imatest metric

**Camera Sensor Driver Development and Integration**
PathPartner offers expert service on developing and integrating camera drivers for various embedded platforms:
- Integration and bringing up of image sensors
- Development of sensor driver and configuring sensor registers
- Configuration of I2C driver for communicating with sensor
- Configuration of SoC ISP registers to collect pixel data from sensor
- Configuration of sensor parameters such as resolution, color format, brightness and gain

**PathPartner’s Hardware Design Expertise**
PathPartner offers end-to-end system design services for digital media-centric devices. We offer design, development, prototyping, verification and manufacturing of complex systems involving with media processor and low power micro controller with connectivity, storage, video, FPGA, audio, display and touch. Our hardware design service offerings include:
- Prototype design and testing
- BOM optimized designs: Design for Manufacturability (DFM) and Design for Test (DFT)
- Customization of camera boards based on requirements and small form factor
- Low volume and bulk manufacturing support through partners
- Pre-certification and certification tests: FCC, CE, UL
- Hardware Integration
- Complete product development life cycle for higher yield
- Product Sustenance and support

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**Stay Connected!**

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