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# ArduCam

## ArduCAM-M-2MP Camera Shield

2MP SPI Camera User Guide

Rev 1.0, Feb 2015



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# 1 Introduction

ArduCAM-M-2MP is optimized version of ArduCAM shield Rev.C, and is a high definition 2MP SPI camera, which reduce the complexity of the camera control interface. It integrates 2MP CMOS image sensor OV2640, and provides miniature size, as well as the easy to use hardware interface and open source code library. The ArduCAM mini can be used in any platforms like Arduino, Raspberry Pi, Maple, Chipkit, Beaglebone black, as long as they have SPI and I2C interface and can be well mated with standard Arduino boards. ArduCAM mini not only offers the capability to add a camera interface which doesn't have in some low cost microcontrollers, but also provides the capability to add multiple cameras to a single microcontroller.

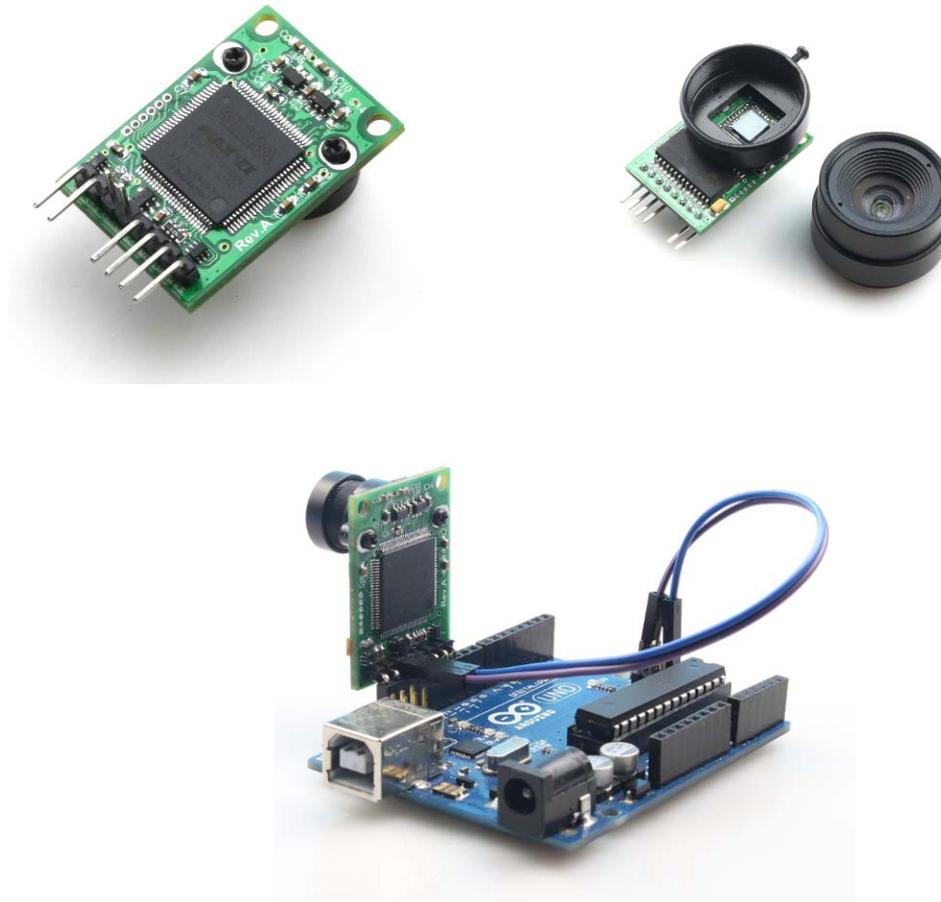


Figure 1 ArduCAM Mini Shield

## 2 Application

- IoT cameras
- Robot cameras
- Wildlife cameras
- Other battery-powered products
- Can be used in MCU, Raspberry Pi, ARM, DSP, FPGA platforms

### 3 Features

- 2MP image sensor OV2640
- M12 mount or CS mount lens holder with changeable lens options
- IR sensitive with proper lens combination
- I2C interface for the sensor configuration
- SPI interface for camera commands and data stream
- All IO ports are 5V/3.3V tolerant
- Support JPEG compression mode, single and multiple shoot mode, one time capture multiple read operation, burst read operation, low power mode and etc.
- Well mated with standard Arduino boards
- Provide open source code library for Arduino, STM32, Chipkit, Raspberry Pi, BeagleBone Black
- Small form of factor

### 4 Key Specifications

- Power supply
  - Normal :5V/70mA
  - Low power mode: 5V/20mA
- SPI speed: 8MHz
- Frame buffer: 384KB
- Size: 34 x 24 mm
- Weight: 20g
- Temperature: -10°C ~ +55°C
- Active array size: 1600x1200
- Shutter: rolling shutter
- Lens: 1/4 inch
- Resolution support:
  - UXGA, SVGA, VGA, QVGA, CIF, QCIF
- Format support: RAW, YUV, RGB, JPEG
- Pixel Size: 2.2µm x 2.2µm

### 5 Pin Definition

Table 1 ArduCAM-M-2MP Pin Definition

Pin No.	PIN NAME	TYPE	DESCRIPTION
1	CS	Input	SPI slave chip select input
2	MOSI	Input	SPI master output slave input
3	MISO	Output	SPI master input slave output
4	SCLK	Input	SPI serial clock
5	GND	Ground	Power ground
6	+5V	POWER	5V Power supply
7	SDA	Bi-directional	Two-Wire Serial Interface Data I/O
8	SCL	Input	Two-Wire Serial Interface Clock

## 6 Block Diagram

Figure 2 shows the block diagram of ArduCAM mini shield which is composed by lens, image sensor and an ArduChip. The lens is changeable and can be mounted by S-mount (M12x0.5) or CS-mount lens holder. The image sensor is 2MP CMOS OV2640 from Omnivision. The ArduChip uses ArduCAM proprietary third generation camera controller technology which handles the complex camera, memory and user interface hardware timing and provides a user friendly SPI interface.

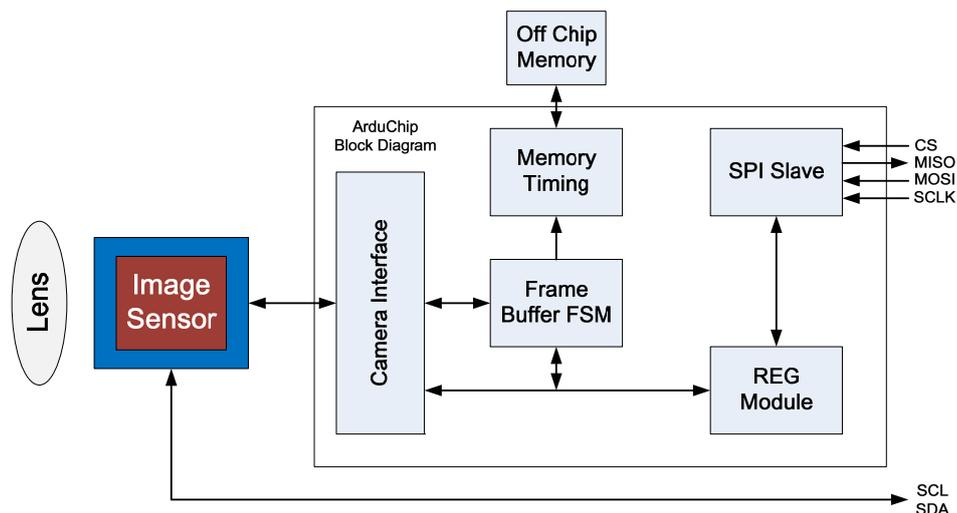


Figure 2 ArduCAM Mini Shield Block Diagram

## 7 Functions

### 7.1 Single Capture Mode

Single capture mode is the default capture mode of the camera. After issuing a capture command via SPI port, the ArduCAM will wait for a new frame and buffer the one entire image data to the frame buffer, and then assert the completion flag bit in the register. User only needs to poll the flag bit from the register to check out if the capture is done.

### 7.2 Multiple Capture Mode

Multiple capture mode is advanced capture mode. By setting the number of frames in the capture register, the ArduCAM will capture consequent frames after issuing capture command. Note that number of frames should be set properly and make sure do not exceed the maximum memory space.

### 7.3 JPEG Compression

The JPEG compression function is implemented in the image sensor. With proper register settings to the sensor, user can get different resolution with JPEG image stream output. It is recommended to use JPEG output to get higher resolution than RGB mode, due to the limitation of frame buffer.

### 7.4 Normal Read and Burst Read Operation

Normal read operation reads each image data by sending a read command in one SPI read operation cycle. While burst read operation only need to send a read command then read multiple image data in one SPI read operation cycle. It is recommended to use burst read operation to get better throughput performance.

### **7.5 Rewind Read Operation**

Sometimes user wants to read the same frame of image data multiple times for processing, the rewind read operation is designed for this purpose. By resetting the read pointer to the beginning of the image data, user can read the same image data from the start point again.

### **7.6 Low Power Mode**

Some battery power device need save power when in the idle status, the ArduCAM offers the low power mode to reduce power consumption, by shutdown the sensor and memory circuits.

### **7.7 Image Sensor Control**

Image sensor control function is implemented in the image sensor. By setting proper set of register settings, user can control the exposure, white balance, brightness, contrast, color saturation and etc.

More technical information about ArduCAM mini shield, please read ArduCAM-M-2MP Hardware Application Note.pdf and ArduCAM-M-2MP Software Application Note.pdf for detail.

## 8 Lens Options

The ArduCAM-M-2MP camera shield is shipped with default LS-4011 (S mount) or LS-6018 (CS mount), lenses specification list as follows. S mount lenses normally have build IR cut filter, while the CS mount lenses doesn't have build in IR cut filter.

Please contact us [admin@arducam.com](mailto:admin@arducam.com) for more lens options.

### LS-4011 Lens Specification

#### SPECIFICATION:

- 1.Sensor Format: max.  $\phi 5.3\text{mm}$
- 2.EFL: 3.96 mm
- 3.F-number: 2.6
- 4.Construction: 4P+1IR
- 5.TV Distortion: <1.2%
- 6.FOV: 56.8°
- 7.FBL: 1.29mm
- 8.IR: 645nm

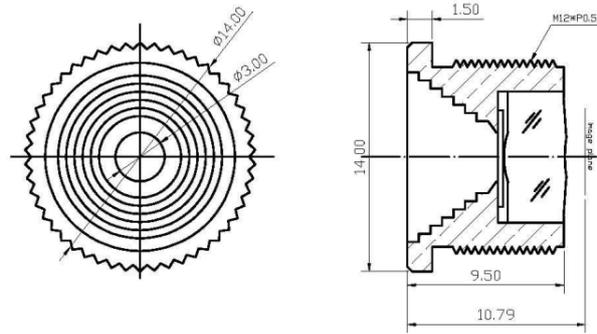


Figure 3 S Mount Lens Specification

### LS-6018 Lens Specification

#### 技术参数

Technical parameters

型号 Model No.	LS-6018CS	视场角 Field of View	68°
焦距 Focal Length	6.0MM	外型尺寸 Dimensions	$\phi 28 * 24.2\text{mm}$
通光口径 Aperture(F)	1.4	近摄距离 M.O.D(m)	0.1
接口 Mount	CS	净重 Weight(g)	29.0
靶面尺寸 Format	1/2.7"	备注 Remarks	<b>Metal</b>

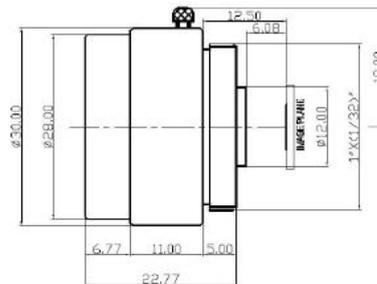
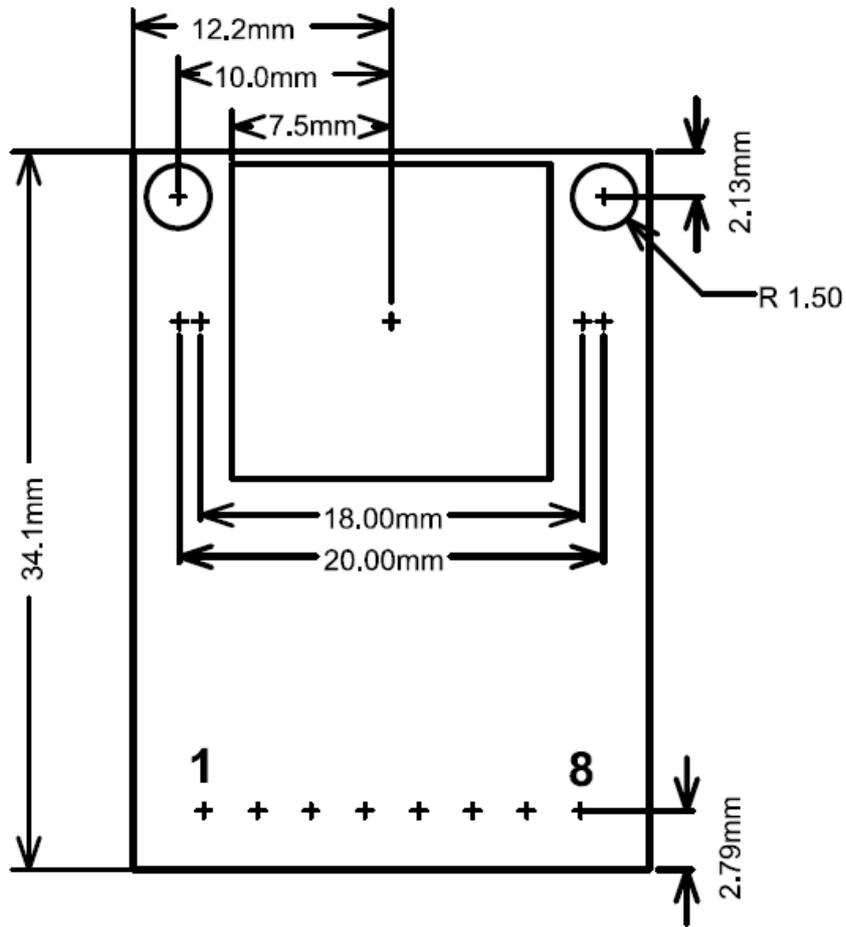


Figure 4 CS Mount Lens Specification

## 9 Mechanical Dimension



## 10 Order Information

Part Number	Description
ArduCAM-M-2MP-SM01	S Mount Preinstalled Pin Header
ArduCAM-M-2MP-SM02	S Mount Without Preinstalled Pin Header
ArduCAM-M-2MP-CSM01	CS Mount Preinstalled Pin Header
ArduCAM-M-2MP-CSM02	CS Mount Without Preinstalled Pin Header