ArduCAM-M-5MP Camera Shield
5MP SPI Camera User Guide
Rev 1.1, Mar 2015
# Table of Contents

1. Introduction ................................................................................................................. 2  
2. Application .................................................................................................................. 2  
3. Features ...................................................................................................................... 3  
4. Key Specifications ...................................................................................................... 3  
5. Pin Definition ............................................................................................................. 3  
6. Block Diagram ........................................................................................................... 4  
7. Functions .................................................................................................................... 4  
   7.1 Single Capture Mode .............................................................................................. 4  
   7.2 Multiple Capture Mode ......................................................................................... 4  
   7.3 JPEG Compression ............................................................................................... 4  
   7.4 Normal Read and Burst Read Operation ............................................................. 4  
   7.5 Rewind Read Operation ....................................................................................... 5  
   7.6 Low Power Mode .................................................................................................. 5  
   7.7 Image Sensor Control ......................................................................................... 5  
8. Lens Options ............................................................................................................... 6  
9. Mechanical Dimension ............................................................................................... 7  
10. Order Information ..................................................................................................... 7
1 Introduction

ArduCAM-M-5MP is optimized version of ArduCAM shield Rev.C, and is a high definition 5MP SPI camera, which reduce the complexity of the camera control interface. It integrates 5MP CMOS image sensor OV5642, 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

- 5MP image sensor OV5642
- 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/390mA
  - Low power mode: 5V/20mA
- Active array size: 2592x1944
- SPI speed: Max 8MHz
- Resolution support: 5MP, 1080p, 720p, VGA, QVGA
- Frame buffer: 512KB
- Lens: 1/4 inch
- Size: 34 x 24 mm
- Format support: RAW, YUV, RGB, JPEG
- Weight: 20g
- Pixel Size: 1.4µm x 1.4µm
- Temperature: -10°C ~ +55°C

Note: OV5642 sensor consumes too much current when working in full power, onboard LDOs can be very hot due to the high voltage drop. Recommend to enter low power mode after capture, or use lower input power voltage.

5 Pin Definition

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>PIN NAME</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>Input</td>
<td>SPI slave chip select input</td>
</tr>
<tr>
<td>2</td>
<td>MOSI</td>
<td>Input</td>
<td>SPI master output slave input</td>
</tr>
<tr>
<td>3</td>
<td>MISO</td>
<td>Output</td>
<td>SPI master input slave output</td>
</tr>
<tr>
<td>4</td>
<td>SCLK</td>
<td>Input</td>
<td>SPI serial clock</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground</td>
<td>Power ground</td>
</tr>
<tr>
<td>6</td>
<td>+5V</td>
<td>POWER</td>
<td>3.3V~5V Power supply</td>
</tr>
<tr>
<td>7</td>
<td>SDA</td>
<td>Bi-directional</td>
<td>Two-Wire Serial Interface Data I/O</td>
</tr>
<tr>
<td>8</td>
<td>SCL</td>
<td>Input</td>
<td>Two-Wire Serial Interface Clock</td>
</tr>
</tbody>
</table>
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 5MP CMOS OV5642 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.

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.

8 Lens Options

The ArduCAM-M-5MP camera shield is shipped with default LS-40136 (S mount) or LS-6018 (CS mount), lenses specification list as follows.

Please contact us admin@arducam.com for more lens options.

**LS-40136 Lens Specification**

A. Specifications:
- **LS-40136**
  1. sensor size: 1/4”
  2. focal length(EFL): 3.2 mm
  3. F/NO[aperture]: 2.0
  4. back focal length: 1.6 mm

B. Layout

6. Field of view:
- Diagonal: 85°
- Horizontal: 63.7°
- Vertical: 70°

7. Thread size: M12×P0.5
8. Elements: 5E+1R

![Figure 3 S Mount Lens Specification](image)

**LS-6018 Lens Specification**

<table>
<thead>
<tr>
<th>型号</th>
<th>Model No.</th>
<th>视场角</th>
<th>Field of View</th>
<th>备注</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LS-6018CS</td>
<td></td>
<td>68°</td>
<td>(\Phi 28 \times 24.2) mm</td>
<td></td>
</tr>
<tr>
<td>焦距</td>
<td>Focal Length</td>
<td>6.0 mm</td>
<td></td>
<td></td>
<td>Metal</td>
</tr>
<tr>
<td></td>
<td>Aperture(F)</td>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mount</td>
<td>CS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Format</td>
<td>1/2.7”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 4 CS Mount Lens Specification](image)
9 Mechanical Dimension

10 Order Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArduCAM-M-5MP-SM01</td>
<td>S Mount Preinstalled Pin Header</td>
</tr>
<tr>
<td>ArduCAM-M-5MP-SM02</td>
<td>S Mount Without Preinstalled Pin Header</td>
</tr>
<tr>
<td>ArduCAM-M-5MP-CSM01</td>
<td>CS Mount Preinstalled Pin Header</td>
</tr>
<tr>
<td>ArduCAM-M-5MP-CSM02</td>
<td>CS Mount Without Preinstalled Pin Header</td>
</tr>
</tbody>
</table>