

## T4.1 OV7670 Library

NOTE: Work In Progress. Added for pinout diagrams

### ***Introduction***

This library allows you to collect image data from an OV7670 camera module on A Teensy 4.1 using the CMOS Sensor Interface (CSI) hardware. This interface collects image data and stores it in two designated memory buffers with minimal processing overhead. The CSI hardware automatically alternates between the two memory buffers, which allows the foreground program more than 30 milliseconds unimpeded access to a collected image while the other buffer is accepting image data transferred from the OV7670 by the CSI DMA channels.

This library works only on the Teensy 4.1. This is the only Teensy that has both the CSI interface and the requisite set of exposed IO pins to connect the CSI to the camera. Since the library works only on the T4.1, the source code is blessedly free of the blizzard of *#ifdefs* needed to make other libraries work across a range of Teensy boards.

### ***Why the OV7670?***

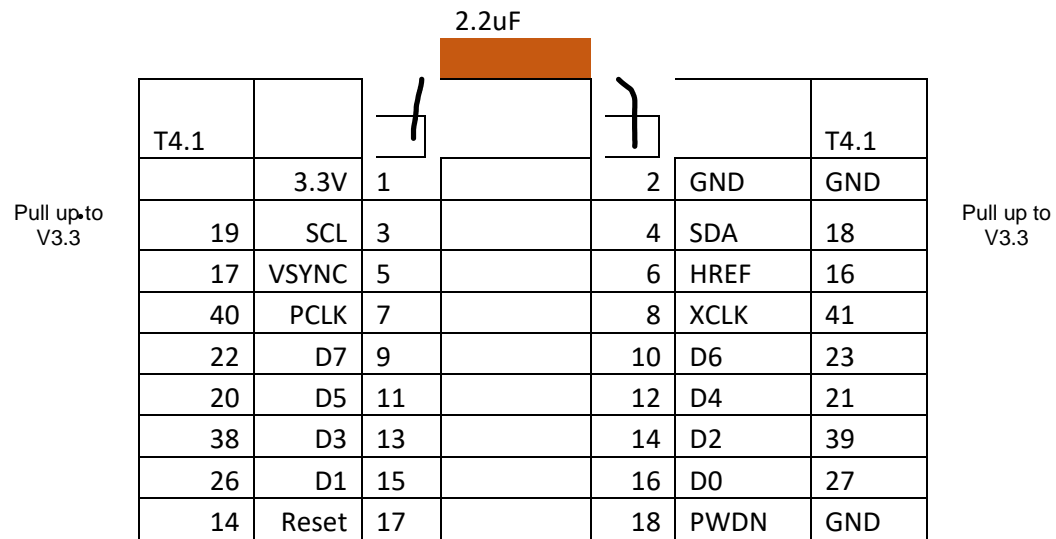
There are several low-cost CMOS camera modules available that can be connected to Teensy or other Arduino systems. The OV7670 was selected for several reasons:

- Low Cost. You can purchase these modules for less than \$5. They are widely available on Amazon and other e-commerce sites.
- Full VGA (640x480) resolution at up to 30 Frames Per Second (FPS)
- A wide range of output formats: VGA, QVGA (320 X 240), QQVGA (160 X 120) and data formats (RGB, YUV, etc.).
- Lots of public domain example code to assist in the complex process of initializing the camera's internal control registers.

## Hardware Connections

The following hardware connections are required to use this library:

## OV7670



The connections are shown in tabular form on the next page.

T4.1 Pin	Signal Name	Camera Function	OV7670 Pin	Port Bit	Comment
V3.3	3.3V	3.3V	1		
GND	GND	GND	2		
19	SCL	SCL	3	SCL0	4K Pullup to V3.3
18	SDA	SDA	4	SDA0	4K Pullup to V3.3
40	CSI_PIXCLK	PCLK	7	AD_B1_04	Output from T4.1
41	CSI_MCLK	MCLK	8	AD_B1_05	
16	CSI_HSYNC	HS	6	AD_B1_07	
17	CSI_VSYNC	VS	5	AD_B1_06	
27	CSI_D2	D0	16	AD_B1_15	
26	CSI_D3	D1	15	AD_B1_14	
39	CSI_D4	D2	14	AD_B1_13	
38	CSI_D5	D3	13	AD_B1_12	
21	CSI_D6	D4	12	AD_B1_11	
20	CSI_D7	D5	11	AD_B1_10	
23	CSI_D8	D6	10	AD_B1_09	
22	CSI_D9	D7	9	AD_B1_08	
14	RST	RST	17		Output from T4.1
NC		PWDN	18		Tie to GND

***Using the Library***

***Memory Requirements***

***Data Format***

***Configuring the Camera***

***Example Programs***

***Potential Enhancements***