

# **Add Camera to Refrigerator with M5Stack-TimerCamera (Saved on GoogleDrive)**

- Operation ON/OFF by Reed Switch
- Save the image of the refrigerator to Google Drive

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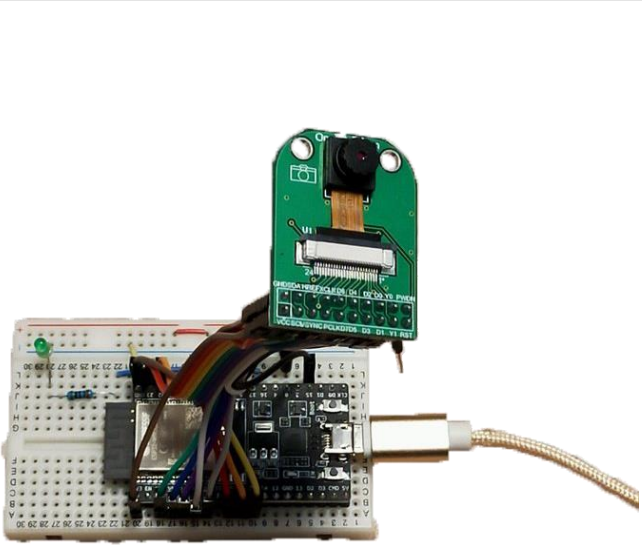

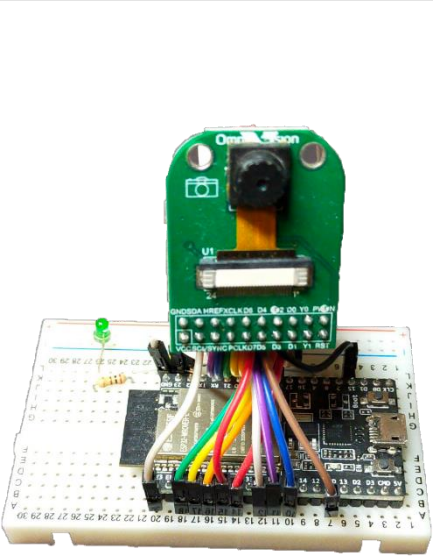

## Previous video

● TimerCamera setting and software writing  
《Watch videos on your smartphone [M5Stack TimerCamera]》  
[https://hobby-it.com/m5timer\\_webcam](https://hobby-it.com/m5timer_webcam)

● Google API settings and programs  
《Google Cloud Cloud APIs [GoogleDrive for Arduino program]》  
<https://hobby-it.com/googledriveapi/>  
《Save JPEG image to GoogleDrive[API] with ESP32 and OV2640 (Software)》  
<https://hobby-it.com/save-jpeg-image-with-gdriveapi-3/>

# 1. Equipment selection (target around 4000 yen or less)

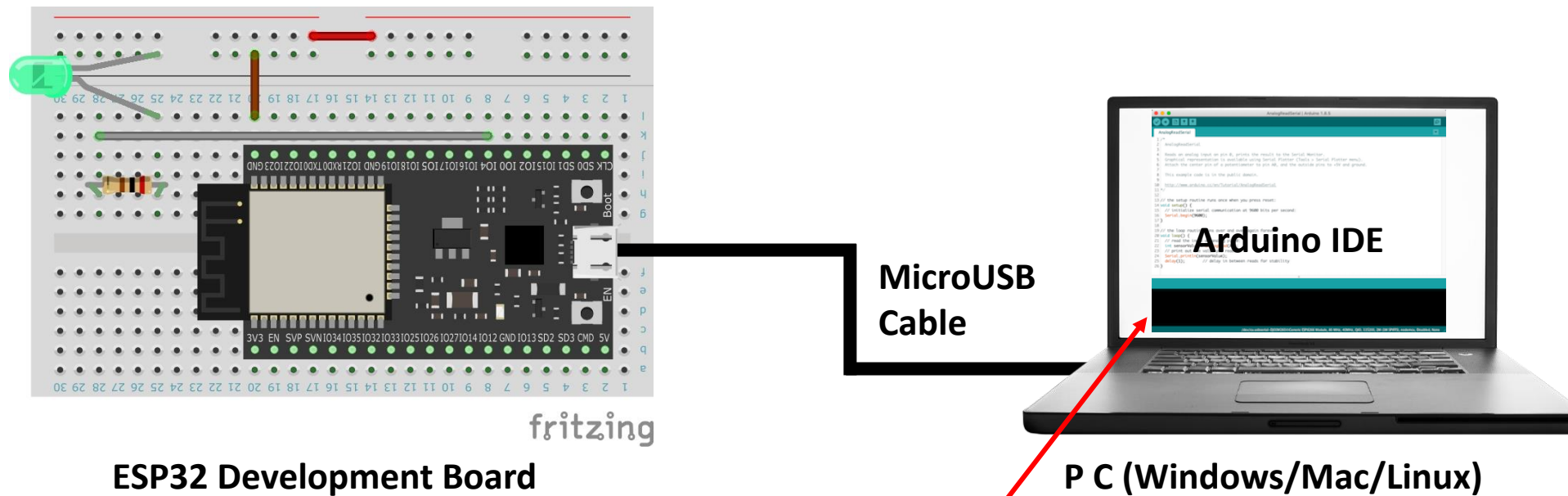
\*Please note that the cost varies depending on the season.

	Same hardware configuration		Similar hardware configuration	
	①ESP32 (WROOM) and OV2640	②M5Stack UnitCam (OV2640)	③ESP32 (WROVER) and OV2640	④M5Stack TimerCamera (OV3660)
Figure				
Specification	Memory [SRAM]: 520kbyte, Resolution: 2M pixel		Memory [SRAM]: 8Mbyte	
		プログラム書込にはキットが必要*1	Resolution: 2M pixel	Resolution: 3M pixel
Usage	Image		Image, Video	
Cost	¥3930	M5Stack: UnitCam \$18.95 [marutsu: ¥2946] + ¥1100*1	¥4080	M5Stack: F)\$19.95, X)\$17.95 [SwitchScience: F)¥2860, X)¥2596]
Soft	Almost Usable (There are differences in Arduino motherboard settings and port usage)			
Youtube Post	Saving images to GoogleDrive using GoogleAPI, GoogleAppScript[GAS]	-	-	Watch videos on smartphone Posting images to LINE with ESP32 saves images to Google Drive on time <b>Add Camera to Refrigerator</b>

this time

## 2. the development environment “Arduino”

We will use Arduino as the development environment.



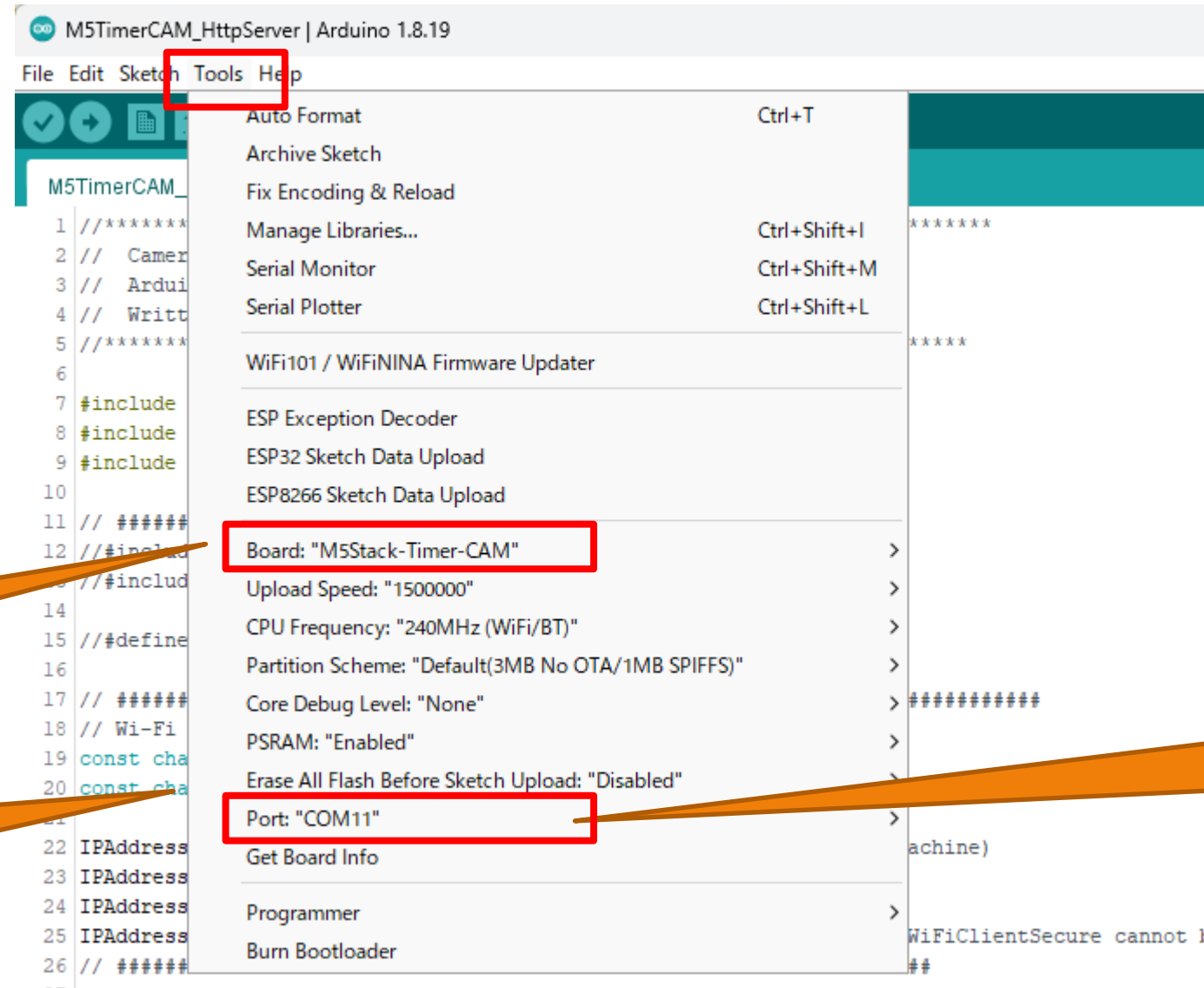
【Arduino Official site】

<https://www.arduino.cc/>

Downloadable

### 3. Arduino settings (Board settings)

Set Board to "M5Stack-Timer-CAM"



Select "M5Stack-Timer-CAM"

No other settings changed  
(with default value)

For Port, select the port to  
which TimerCamera is connected  
[Write error when selection fails]

## 4. About ReedSwitch

Using a reed switch, we will recognize ON / OFF of door opening and closing.

### ● Items that can be used



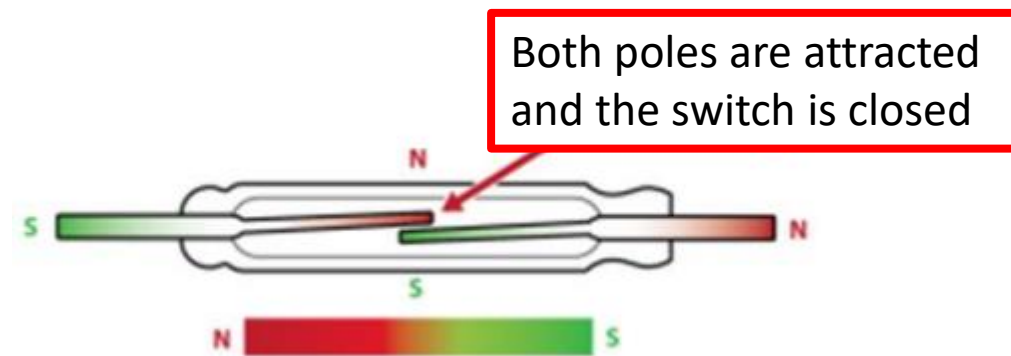
Door sensor switch (reed switch)  
SPS-320 [250 yen]

<https://akizukidenshi.com/catalog/g/gP-13371/>

\*This time, I used the same reed switch I had on hand.

### ● Overview of operation

A reed switch is a switch that conducts when a magnet is brought close to it.



[Reference]

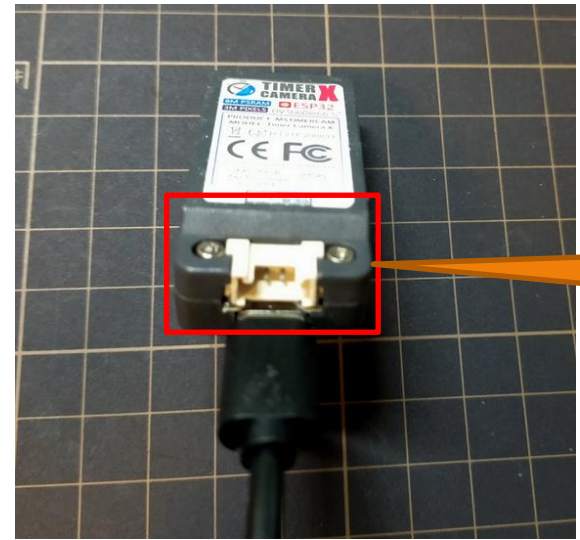
[https://standelectonics.com/wp-content/uploads/2015/02/Application-Brief-Reed-Switch-Operation\\_JP.pdf](https://standelectonics.com/wp-content/uploads/2015/02/Application-Brief-Reed-Switch-Operation_JP.pdf)

# 5. Wiring consideration

- Pin Map (HY2.0-4P)

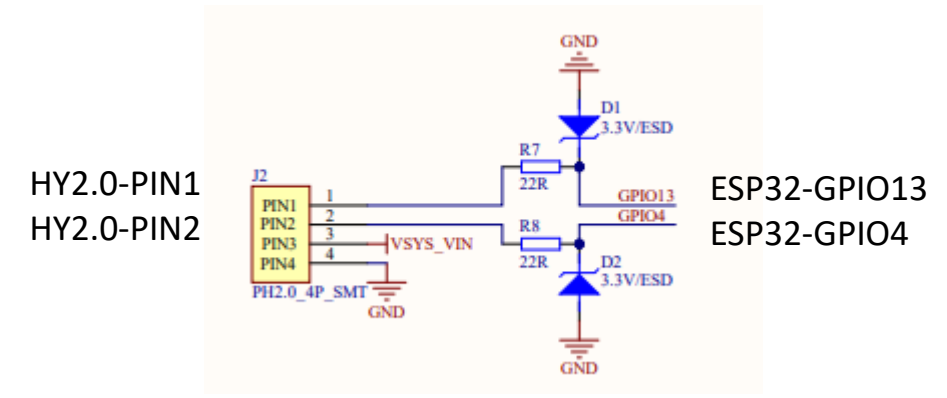
HY2.0-4P

HY2.0-4P	TimerCamera
SCL	G13
SDA	G4
5V	5V
GND	GND

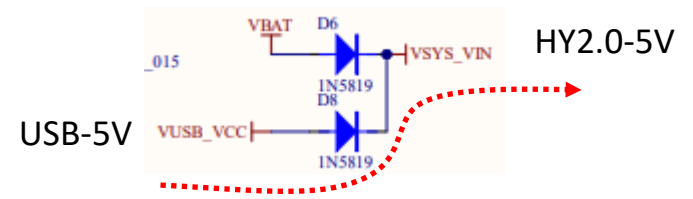


HY2.0 connector

- Schematic (HY2.0-4P)



You can see that the ESD (Electro Static Discharge) protection diode is wired, but it is wired to GPIO4,13.



The 5V terminal has a rectifier, but you can see that the 5V of the USB power supply flows as it is.



# 5. ESP32 input terminal

## 5. Electrical Characteristics

### 5.1 Absolute Maximum Ratings

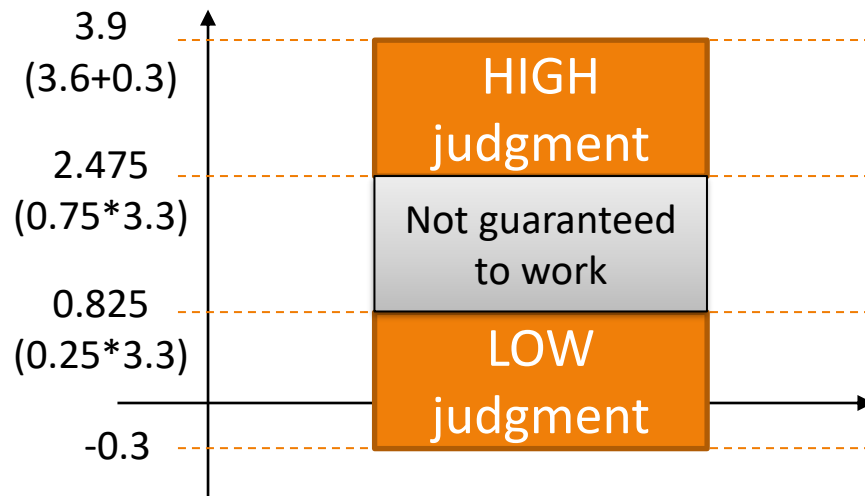
Stresses beyond the absolute maximum ratings listed in the table below may cause permanent damage to the device. These are stress ratings only, and do not refer to the functional operation of the device that should follow the recommended operating conditions.

Table 11: Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
VDDA, VDD3P3, VDD3P3_RTC, VDD3P3_CPU, VDD_SDIO	Voltage applied to power supply pins per power domain	-0.3	3.6	V
I <sub>output</sub> *	Cumulative IO output current	-	1,200	mA
T <sub>store</sub>	Storage temperature	-40	150	°C

\* The chip worked properly after a 24-hour test in ambient temperature at 25 °C, and the IOs in three domains (VDD3P3\_RTC, VDD3P3\_CPU, VDD\_SDIO) output high logic level to ground.

### ● Input HIGH/LOW judgment of ESP32



### 5.3 DC Characteristics (3.3 V, 25 °C)

Table 13: DC Characteristics (3.3 V, 25 °C)

Symbol	Parameter	Min	Typ	Max	Unit
C <sub>IN</sub>	Pin capacitance	-	2	-	pF
V <sub>IH</sub>	High-level input voltage	0.75×VDD <sup>1</sup>	-	VDD <sup>1</sup> +0.3	V
V <sub>IL</sub>	Low-level input voltage	-0.3	-	0.25×VDD <sup>1</sup>	V
I <sub>IH</sub>	High-level input current	-	-	50	nA
I <sub>IL</sub>	Low-level input current	-	-	50	nA
V <sub>OH</sub>	High-level output voltage	0.8×VDD <sup>1</sup>	-	-	V
V <sub>OL</sub>	Low-level output voltage	-	-	0.1×VDD <sup>1</sup>	V
I <sub>OH</sub>	High-level source current (VDD <sup>1</sup> = 3.3 V, V <sub>OH</sub> >= 2.64 V, output drive strength set to the maximum)	VDD3P3_CPU power domain <sup>1, 2</sup>	-	40	mA
		VDD3P3_RTC power domain <sup>1, 2</sup>	-	40	mA
		VDD_SDIO power domain <sup>1, 3</sup>	-	20	mA
I <sub>OL</sub>	Low-level sink current (VDD <sup>1</sup> = 3.3 V, V <sub>OL</sub> = 0.495 V, output drive strength set to the maximum)	-	28	-	mA
R <sub>PU</sub>	Pull-up resistor	-	45	-	kΩ
R <sub>PD</sub>	Pull-down resistor	-	45	-	kΩ
V <sub>IL_nRST</sub>	Low-level input voltage of CHIP_PU to power off the chip	-	-	0.6	V

#### Notes:

1. Please see Table IO\_MUX for IO's power domain. VDD is the I/O voltage for a particular power domain of pins.
2. For VDD3P3\_CPU and VDD3P3\_RTC power domain, per-pin current sourced in the same domain is gradually reduced from around 40 mA to around 29 mA, V<sub>OH</sub>>=2.64 V, as the number of current-source pins increases.
3. For VDD\_SDIO power domain, per-pin current sourced in the same domain is gradually reduced from around 30 mA to around 10 mA, V<sub>OH</sub>>=2.64 V, as the number of current-source pins increases.

IO-Pin  
Maximum input voltage

3.9 (3.6+0.3)

IO-Pin  
Output Current

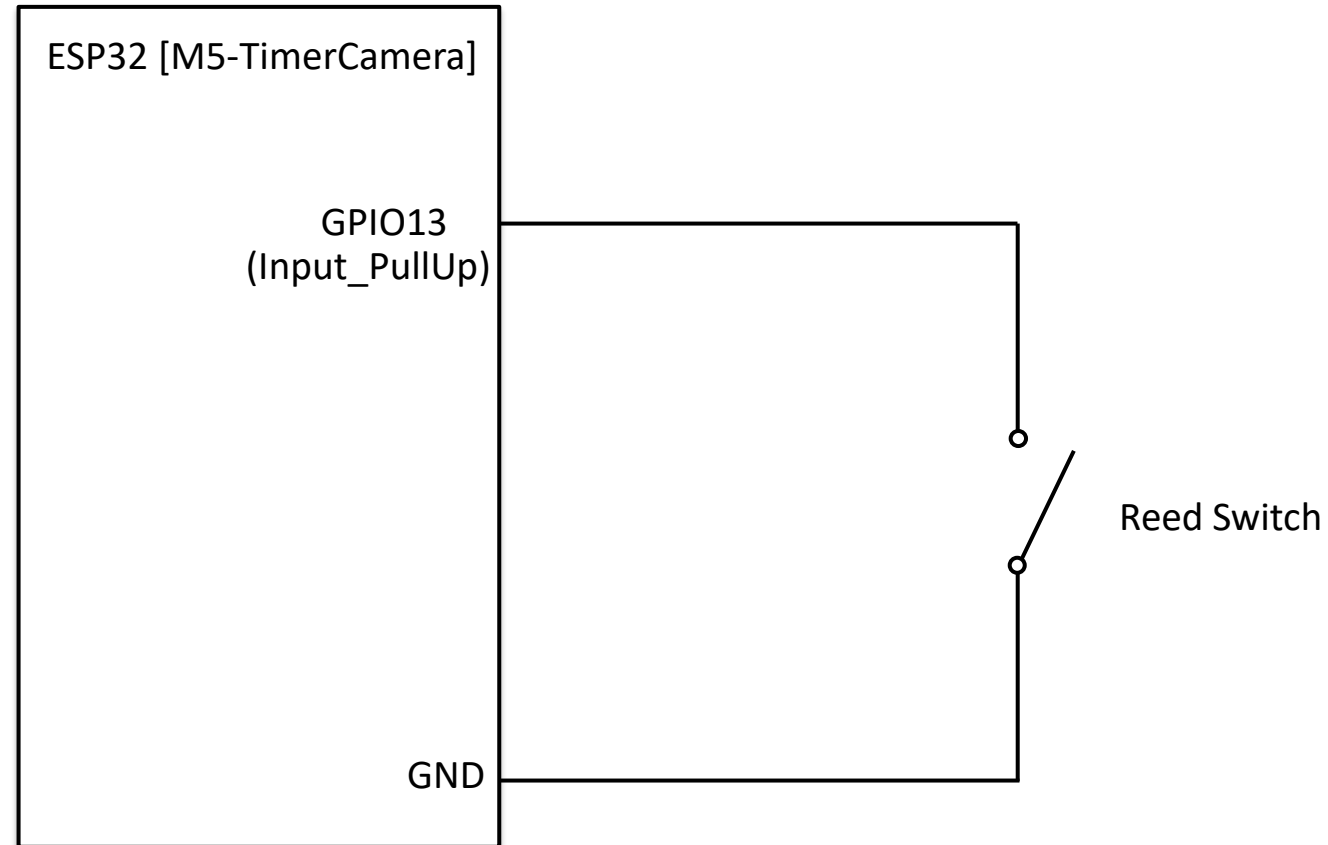
40mA

Since the input is up to MAX3.9V, it is impossible to input a 5V signal.



# 3. Circuit diagram

By setting IO13 to INPUT\_PULLUP, it is always in the HIGH state.  
Reed Switch is connected so that IO13 goes LOW.



## 5. Arduino program (ReedSwitch program)

```
1 //*****
2 // ReedSwitch Ver2023.2.13
3 // Arduino Board : M5Stack-Timer-CAM [M5Stack ver 2.0.6]
4 // Written by IT-Taro
5 //*****
6
7 -----
8 const byte LED_PIN = 2; // green LED
9 const byte REED_PIN = 13; // REED Input PullUp
10 bool reedVal = false;
11 bool preVal = false;
12 -----
13
14 // the setup function runs once when you press reset or power the board
15 void setup() {
16   Serial.begin(115200);
17   // initialize digital pin LED_BUILTIN as an output.
18   pinMode(LED_PIN, OUTPUT);
19   // REED Setting
20   pinMode(REED_PIN, INPUT_PULLUP);
21 }
22 -----
23
24 // the loop function runs over and over again forever
25 void loop() {
26   // Read Reed switch status
27   reedVal = digitalRead(REED_PIN); ←
28
29   // Check Status of Reed Switch
30   if (reedVal != preVal) {
31     digitalWrite(LED_PIN, reedVal); // Change LED Status
32     Serial.print ( "Reed:" );
33     Serial.println ( reedVal );
34     preVal = reedVal;
35   }
36   delay(1);
37 }
```

Port and variable definition

LED and ReedSwitch port settings

Get ReedSwitch status

If there is a change in ReedSwitch status,  
turn on/off LED and serial monitor display

## 8. Google settings and Arduino program (GoogleDrive save program)

- Google API settings and programs

《Google Cloud Cloud APIs [GoogleDrive for Arduino program]》

<https://hobby-it.com/googledriveapi/>

《Save JPEG image to GoogleDrive[API] with ESP32 and OV2640 (Software)》

<https://hobby-it.com/save-jpeg-image-with-gdriveapi-3/>

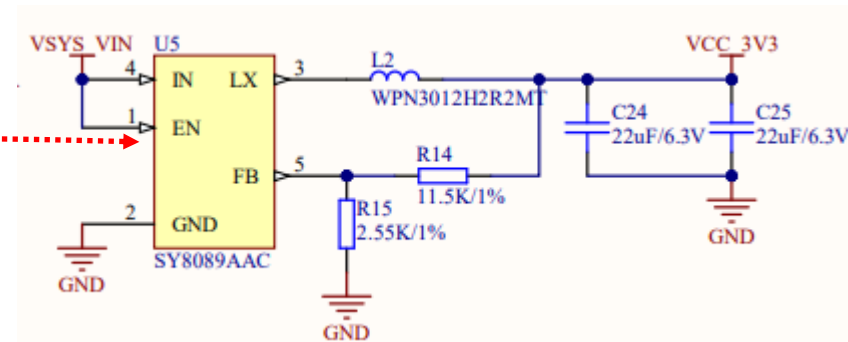
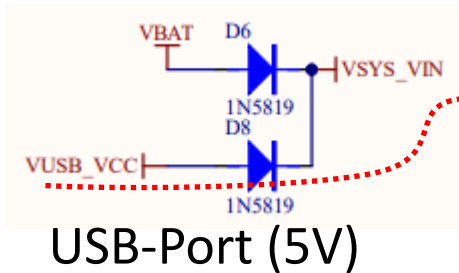
The program used this time is open to the public.

《Add Camera to Refrigerator with M5Stack-TimerCamera (Saved on GoogleDrive)》

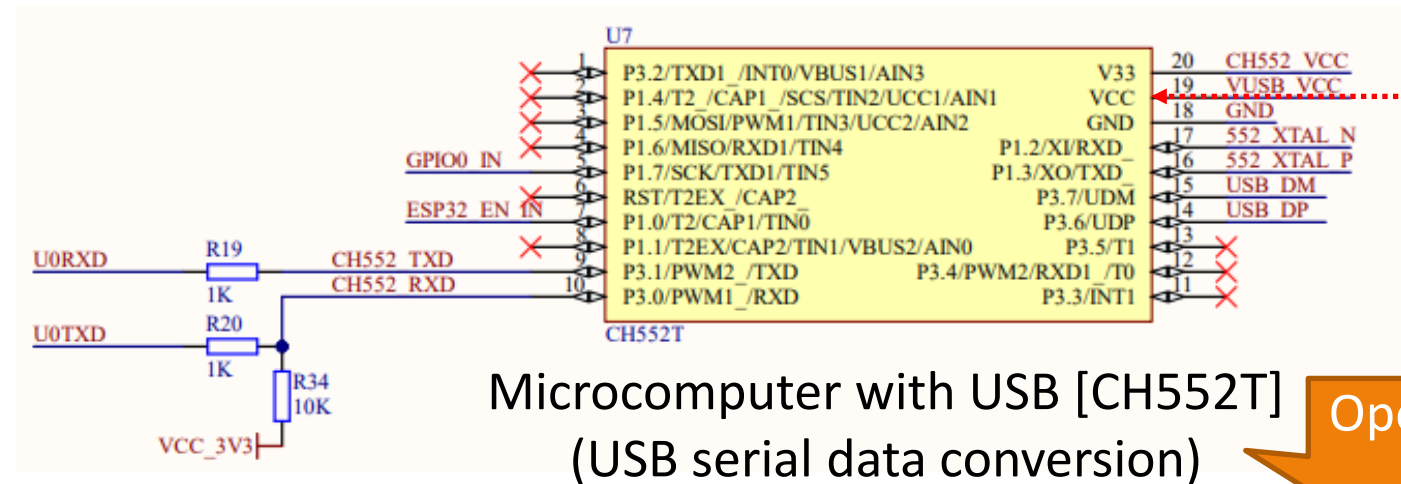
[https://hobby-it.com/m5timer\\_refrigerator](https://hobby-it.com/m5timer_refrigerator)

# 11. Installation to refrigerator and operation check

Use a 5V power adapter.



Operating voltage 2.7 to 5.5V, up to 5.5V



Operating voltage 3.7 to 5.5V, up to 5.5V

USBポート (5V)



Prepare a 5V power adapter

# 11. Installation to refrigerator and operation check

I installed it on the top of the refrigerator door, but I couldn't use it for the following reasons.  
There is no problem with the operation itself.

1) The lower part cannot be photographed, 2) The photographing range varies depending on how the door is opened.

Installed on the top of the door

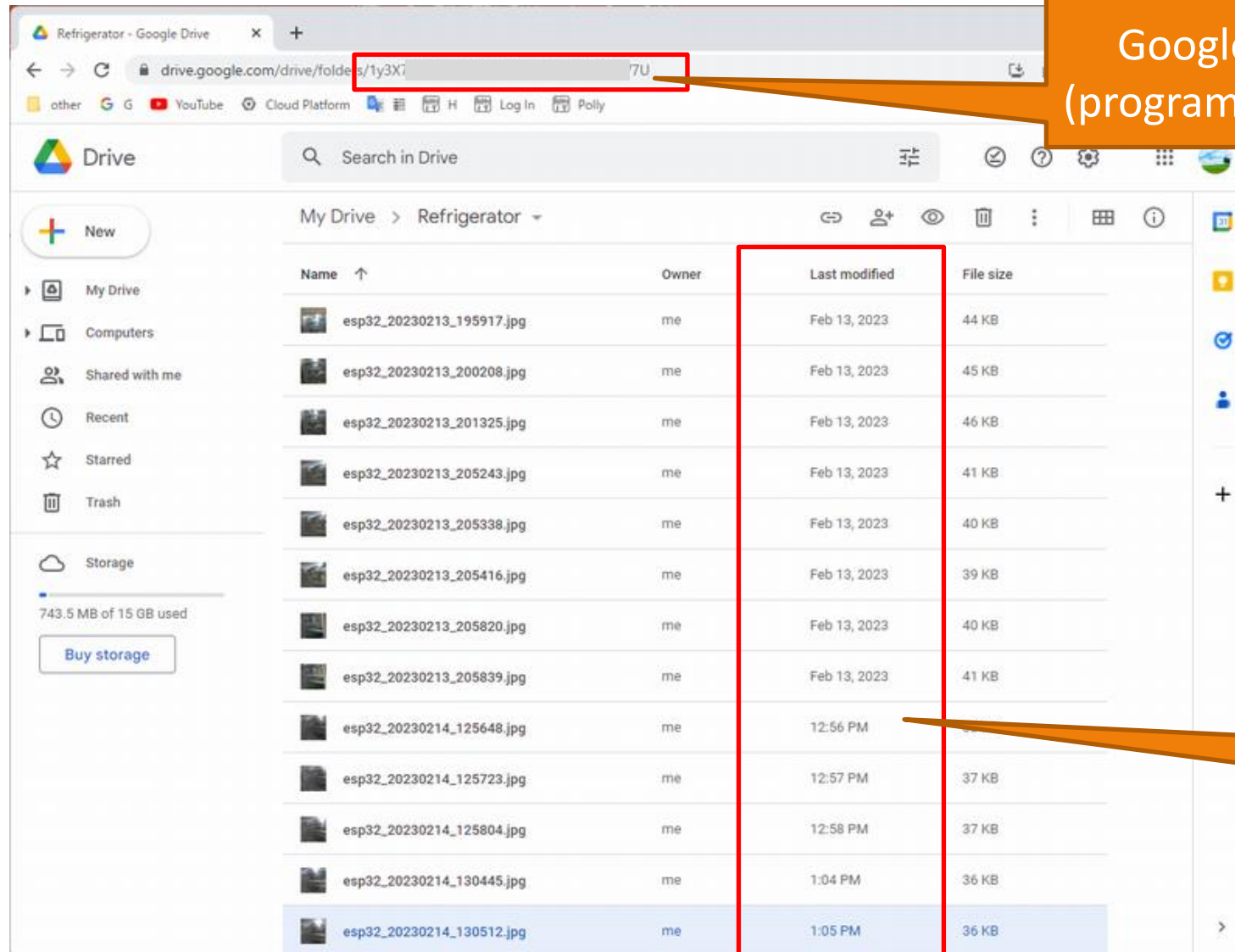


Shooting screen by TimerCamera-X



# 11. Installation to refrigerator and operation check

Create a new folder in GoogleDrive and save it.



Google Folder-ID  
(programmatically set)

An image is saved each  
time the door is opened



# 11. Installation to refrigerator and operation check

We installed it on the left side of the refrigerator, but the viewing angle (66.5°) is too narrow, so there is room for improvement. There is no problem with the operation itself.

Installed on the left side (fixed shape with wire)



Shooting screen by TimerCamera-X



# 11. Installation to refrigerator and operation check

It is installed on the left side of the refrigerator and uses TimerCamera-F to widen the viewing angle (120°). There is no problem with the operation itself.

Installed on the left side (fixed shape with wire)



Shooting screen by TimerCamera-F

