

ELP-USBGS1200P02

90 FPS/120 FPS Global Shutter USB Camera Module

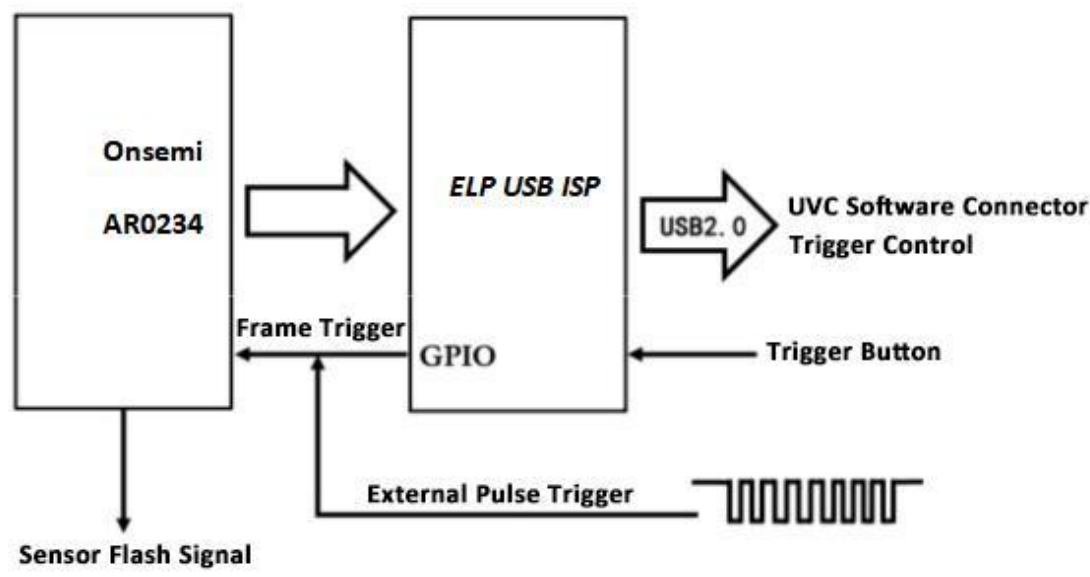
Trigger and Flash Function Operation Instruction



2024.4.30 Ver.A

- 1. Functional Architecture.....3
- 2. Output Formats.....3
- 3. UVC Software Control Interface.....4
- 4. Trigger Function Configuration.....5
- 5. Hardware Interface..... 6
- 6. External Pulse Trigger Timing..... 7
- 7. External Auto Trigger Timing..... 7
- 8. Exposure Control..... 8
- 9. Gain Control..... 9

1.Functional Architecture



AR0234 provides a frame trigger input pin and a flash signal output pin. The GPIO of USB ISP connected to the frame trigger pin can realize continuous trigger, single frame trigger, and on-board button-controlled trigger through UVC software; External hardware connected to the frame trigger pin supports pulse trigger and high-level automatic trigger. The flash signal is synchronized with the trigger signal, enabling microsecond-level flash control of the flash.

2.Output Formats

Resolution	Ratio	Frame Rate		Output Interface
		YUY	MJPEG	
1920 x 1200	16 : 10	5 FPS	90 FPS	USB2.0
1920 x 1080	16 : 9	5 FPS	90 FPS	
1280 x 720	16 : 9	10 FPS	120 FPS	
1600 x 1200	4 : 3	5 FPS	90 FPS	
1280 x 960	4 : 3	5 FPS	90 FPS	
1024 x 768	4 : 3	10 FPS	120 FPS	
960 x 720	4 : 3	15 FPS	120 FPS	
800 x 600	4 : 3	20 FPS	120 FPS	
640 x 480	4 : 3	30 FPS	120 FPS	

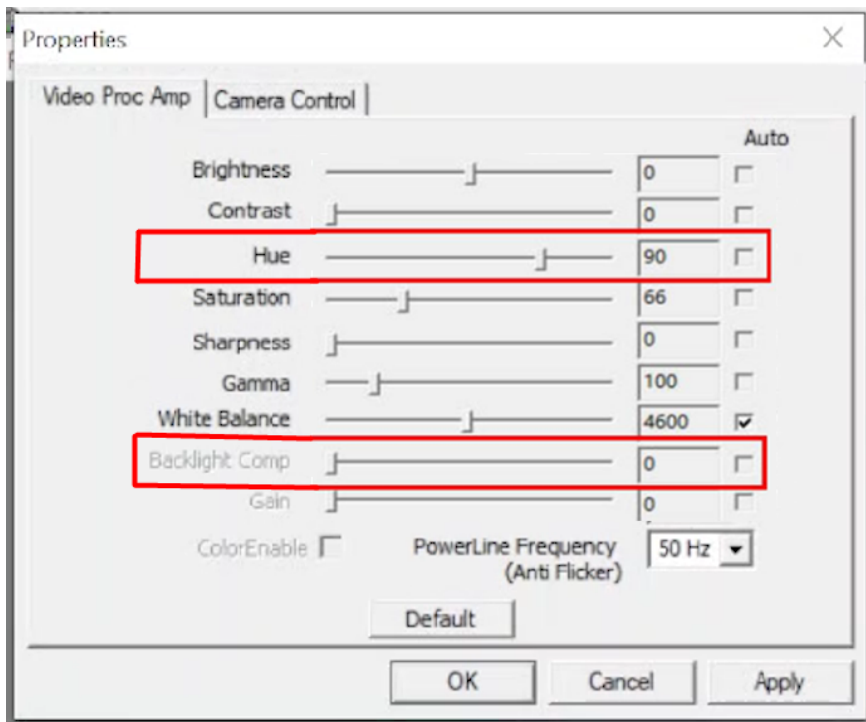
320 x 240	4 : 3	90 FPS	120 FPS	
-----------	-------	--------	---------	--

3.UVC Software Control Interface

Third party software can set relevant functional parameters based on the following control interfaces through UVC.

- (1) Backlight: video stream output/software successive triggering/hardware trigger/instruction single-frame triggering/button triggering
- (2) Hue: setting of software trigger mode pulse frequency/instruction single-frame triggering
- (3) Exposure: auto/manual,manual exposure supports 14 level setting of preset exposure value
- (4) Sharpness: close automatic exposure at first, support direct writing of actual exposure time(us/ms)
- (5) Gain: close automatic exposure at first,support sensor gain setting
- (6) Support to save parameter after power off:
Follow the steps-set up parameters >OK>close video tools>reopen the video tool or unplug&plug USB. Directly power outage after setting parameters could not save parameters.

4.Hardware Interface



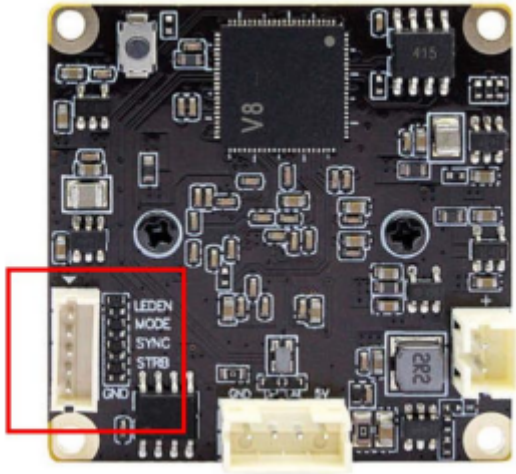
To use the trigger mode, need to set the “Backlight” parameter of the UVC, as shown in the above picture.

Note: Software trigger mode and hardware trigger mode cannot be used at the same time.

- 1) Backlight contrast value is 0: non triggered mode, the video stream is automatically output at the highest frame rate.
- 2) Backlight contrast value is 1: software triggers mode. The third-party software triggers the Trigger pulse frequency setting through the "Hue" parameter of the UVC Frequency setting, according to the set trigger frequency continuous output frame, the actual frame rate is determined by the trigger frequency and exposure time. The pulse frequency cannot exceed the maximum frame rate of the current resolution, such as 1920x1200@90 frame, pulse range 1HZ-90Hz, 1280x720@120 frame, pulse range 1Hz-120Hz.
- 3) Backlight contrast value is 2: hardware trigger mode, provided by the external trigger pulse signal or high level signal.
- 4) Backlight contrast value is 3: the command is triggered by a single frame, and the third-party software fixes it through the "Hue" parameter of the UVC

The command (decimal 100) controls the single frame trigger, sending 100 each time and output one frame. No command, no frame output.
- 5) Backlight contrast value is 4: triggered by the button, press the button on the board, press once, output one frame.

5.External Pulse Trigger Timing



Connected using ZH1.5-5P terminals, the pin definitions of external trigger and flash control signals are as follows:

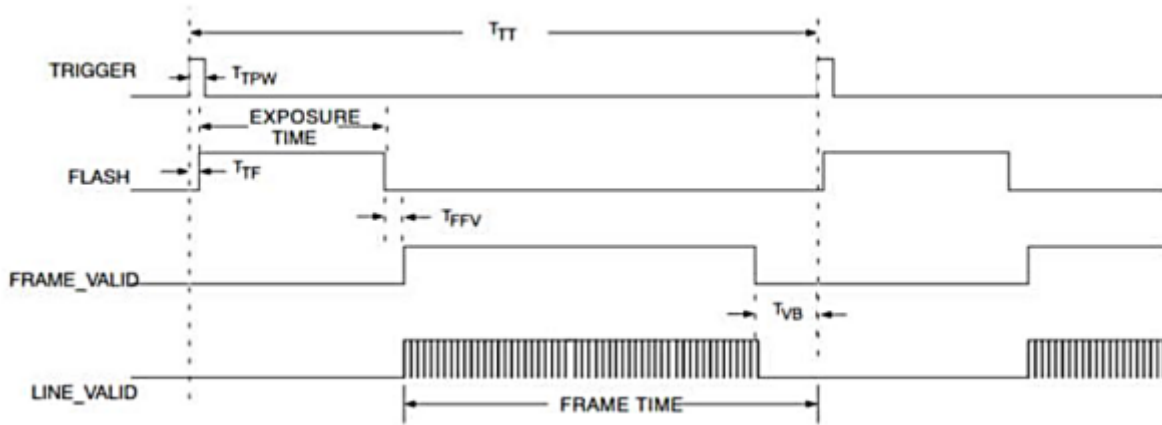
Pin No.	Definition	State	Explanation
1	LEDEN	Input	Flash enabled, 3.3V benchmark
2	MODE	Input	Trigger mode selection, 3.3V benchmark
3	SYNC/Trigger	Input	Hardware trigger input, 1.8V benchmark
4	STRB/Flash	Output	Flash signal output, 1.8V benchmark
5	GND		Geodesic

Explanation:

- Flash Enabled: Connect the external pin to control the flash function on/off,
High level - Turn on the flash function (in trigger mode, Pin4 outputs flash signal)
Low level - Turn off the flash function (in trigger mode, Pin4 does not output flash signal)
 The default state is high
- Trigger Mode Selection: Connect external pins to switch trigger mode
 High level - hardware trigger mode, which can be triggered by an external trigger signal, the "backlight contrast" setting is invalid
 Low level- Non-triggered mode (video streaming mode)
 The default state is low
- Hardware Trigger Input: In the hardware trigger mode, the **trigger pulse** is input from this **pin**, and the **time sequence** is shown in section 6; Or lost from this pin on high, see section 7 for time sequence.

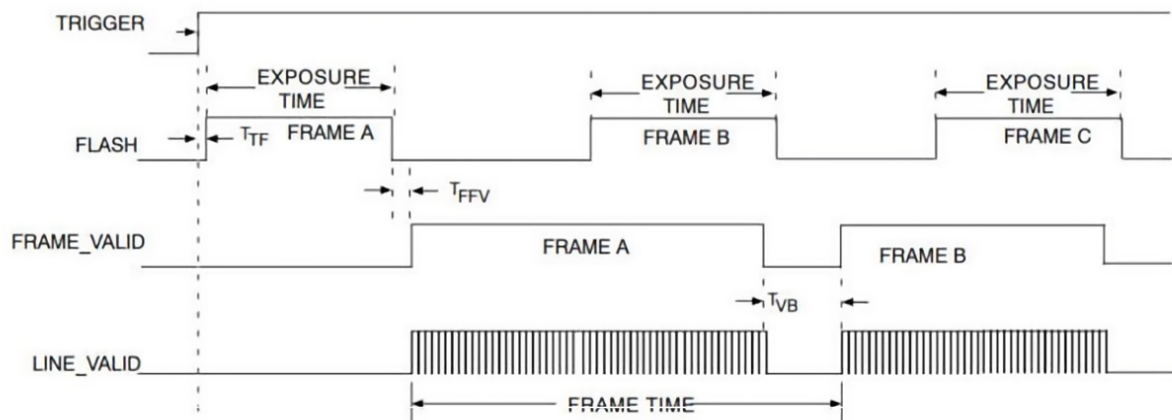
- 4) Flash Signal Output: In trigger mode, the flash signal is output from the pin, the time sequence is shown in section 6.

6.External Auto Trigger Timing



- 1) Exposure and flash delay T_{TF} : 1.456ms
- 2) Trigger pulse width T_{TPW} : minimum 3ms
- 3) Trigger cycle T_{TT} : Controlled by external trigger signal frequency
- 4) Flash signal is output by Sensor, effective time is equal to exposure time
- 5) Exposure time needs to be configured manually, please refer to the exposure control description. Exposure is complete when frame output begins.

7.External Auto Trigger Timing

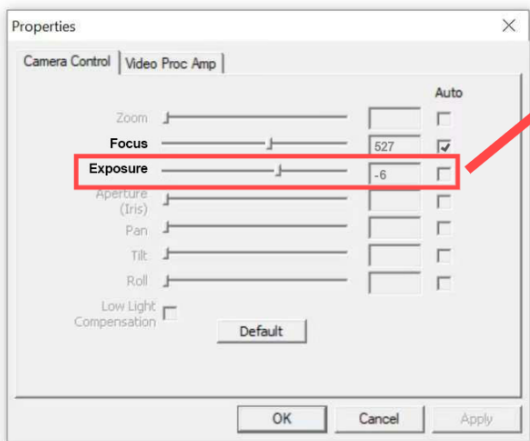


- 1) Exposure and flash delay T_{TF} : 1.456ms
- 2) Flash signal is output by Sensor, effective time is equal to exposure time
- 3) Exposure time needs to be configured manually, please refer to the exposure control description. Exposure is complete when frame output begins.

8.Exposure Control

Exposure Control Mode 1

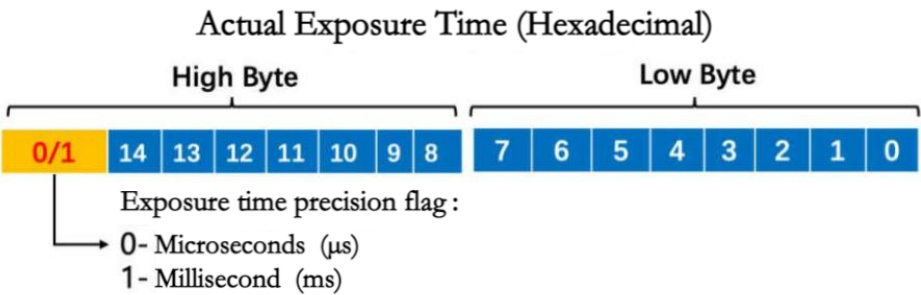
Disable automatic exposure. Exposure time can be configured through the UVC “Exposure” option. The actual exposure times corresponding to the 14 standard exposure presets of the UVC Windows system are listed below, along with the corresponding exposure parameter values for the UVC Linux system.



System Exposure value		Exposure Time (ms)	Actual Frame Rate (fps)
Windows	Linux		
-13	1	0.025	The actual frame rate is related to the trigger period, exposure time, and delay.
-12	2	0.05	
-11	5	0.1	
-10	10	0.2	
-9	20	0.4	
-8	39	0.8	
-7	78	1.6	
-6	156	3.2	
-5	312	10	
-4	625	20	
-3	1250	40	
-2	2500	100	
-1	5000	200	
0	10000	500	

Exposure Control Mode 2

Disable automatic exposure. Use the UVC “Sharpness” option. Third-party software can directly write the actual exposure time through this interface. The format for the exposure time must follow the definitions below:



Note:

In trigger mode, if the sum of (exposure time + frame time + exposure delay + frame delay) exceeds the trigger cycle, the actual frame rate will be reduced by at least half. To maintain the frame rate, (exposure time + frame time + exposure delay + frame delay) must be less than or equal to the trigger cycle; in this case, it is necessary to reduce the exposure time.

9.Gain Control

Explanation: With automatic exposure disabled, the sensor gain can be configured through the “Gain” option. Higher gain increases brightness, but also amplifies image noise.

