LamaPLC: CJMCU-3901/PMW-3901 compact optical flow sensor module/IC by PixArt with SPI communication

The **CJMCU-3901** is a compact optical flow sensor module that integrates the **PixArt PMW3901** chip. It is mainly designed for X-Y motion detection and precise positioning in drones and robotics, particularly in indoor or GPS-denied settings.

Key Technical Specifications

- **Sensor:** PixArt PMW3901MB-TXQT.
- **Operating Voltage: 1.8V to 3.6V** (typically used at 3.3V).
- **Operating Range:** 80mm to infinity (no lens adjustment required).
- **Interface:** 4-wire SPI (up to 2MHz).
- **Power Consumption:** Very low, typically less than 9mA in active mode.
- **Field of View (FOV):** Approximately 40°.

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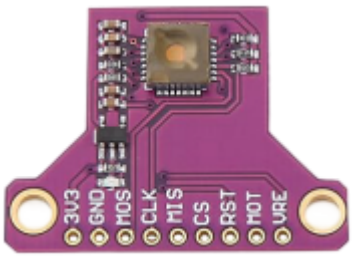
CJMCU-3901 pinout



Pin Name	Function	Description
3V3	Power Supply	Typically 3.3V (range: 1.8V – 3.6V)
GND	Ground	Connect to the common ground of your system
MOS	SPI Data In	Master Out Slave In; receives commands from the controller
CLK	SPI Clock	Serial clock signal generated by the master

Pin Name	Function	Description
MIS	SPI Data Out	Master In Slave Out; sends motion data to the controller
CS	Chip Select	Active-low signal to enable the sensor for communication
RST	Reset	Optional active-low hardware reset pin
MOT	Interrupt	Motion detection output; triggers when new motion is detected
VRE	reference voltage output	It provides access to the sensor's internal regulated voltage, which is used as a reference for its internal optoelectronic operations

Connection Requirements

- **Logic Levels:** This sensor uses **3.3V logic**. If you are using a 5V microcontroller, such as an Arduino Uno, you must use a level shifter to prevent damage to the chip.
- **SPI Speed:** The module supports SPI clock speeds up to 2 MHz.
- **Orientation:** Look for a small notch or arrow on the board; this usually indicates the “back” or “front” to ensure correct X-Y coordinate tracking in your firmware.

Arduino wiring

Since the CJMCU-3901 operates on 3.3V logic, you must use a 3.3V Arduino (e.g., Nano 33 IoT) or a level shifter if using a 5V Arduino (e.g., Uno).

CJMCU-3901 Pin	Arduino Pin (Uno/Nano)	Function
VCC	3.3V	Power Supply
GND	GND	Ground
CS	D10 (or any Digital Pin)	Chip Select
MOSI	D11	SPI Data In
MISO	D12	SPI Data Out
SCLK	D13	SPI Clock

Arduino code

Need to install the **Bitcraze_PMW3901 library** via the Arduino Library Manager.

```
#include "Bitcraze_PMW3901.h"

// Using digital pin 10 for chip select
Bitcraze_PMW3901 flow(10);

void setup() {
  Serial.begin(9600);

  // Initialize the sensor
  if (!flow.begin()) {
    Serial.println("Initialization of the flow sensor failed");
    while(1); // Halt if sensor not found
  }
}
```

```
int16_t deltaX, deltaY;

void loop() {
  // Get motion count since the last call
  flow.readMotionCount(&deltaX, &deltaY);

  Serial.print("X: ");
  Serial.print(deltaX);
  Serial.print(" | Y: ");
  Serial.println(deltaY);

  delay(100); // Small delay for readability
}
```

Operational Notes

- **Measurement Units:** The sensor outputs unitless *"ticks"* representing the amount of motion.
- **Surface Texture:** The sensor requires a textured surface (not solid black or mirrored) to track movement effectively.
- **Focus:** The built-in lens is typically pre-focused from 80mm to infinity.

CJMCU-3901, CJMCU, PMW3901, PMW-3901, optical flow, sensor, PixArt, SPI, communication, arduino, code, PMW3901MB-TXQT