Doc. No.	YX-YF-M0007

Product User Manual

Prod. Name: Optical-flow Module

Prod. Code: UP-FLOW-LC-302-3C

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upixels 优象®

Revision Versions

No.	Changed contents	Changed By	Date	Version
01	Initial version	LVjj	2019.06.06	V1.1

Contents

1. Overview

The UPixels optical-flow module(UP-FLOW) includes an optical-flow chip and a CMOS image sensor.

The optical-flow module is used to detect the movement of a drone in the horizontal direction during flight, and the module transmits the result to the flight control. The flight control then combines with the altitude data to control the aircraft and achieve automatic hovering.

This document describes the module's interface, size, and specifications related parameters, so that related personnel can develop based on this module.

2. Size and Structure

This product model is UP-FLOW-LC-302-3C, the hardware part is mainly the main board. As shown in FIG. 1 , the schematic diagram of the main board size structure is as follows: Length 22 mm and Width 14 mm.

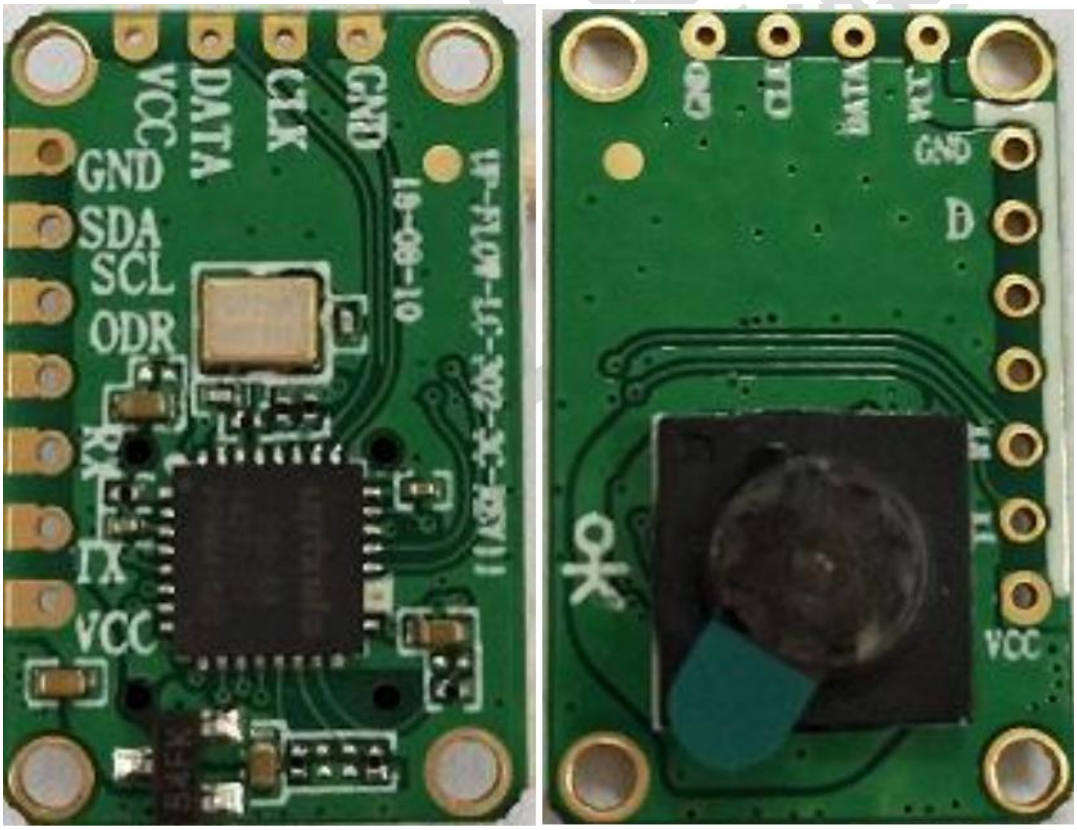

Fig. 1 UP-FLOW-LC-302-3C Product

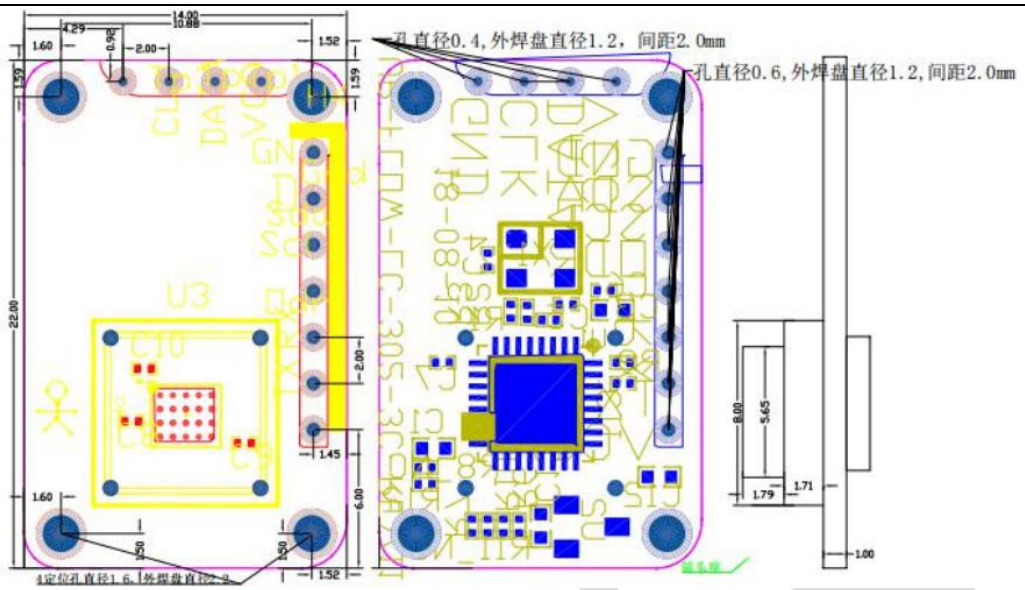

Fig.2 UP-FLOW-LC-302-3C size info.

3. Functional block

The optical flow module detects the horizontal moving distance of the aircraft in real time in a GPS-free environment, realizing high-precision positioning of the drone. The module obtains the image data through the COMS module and sends it to the optical flow chip. The chip uses the camera to capture the screen to get the displacement information of the drone, and then outputs it to the flight control through the UART interface, so as to control the horizontal movement distance of the aircraft and achieve the purpose of hovering. The structure of the optical flow module is shown in Figure 3.

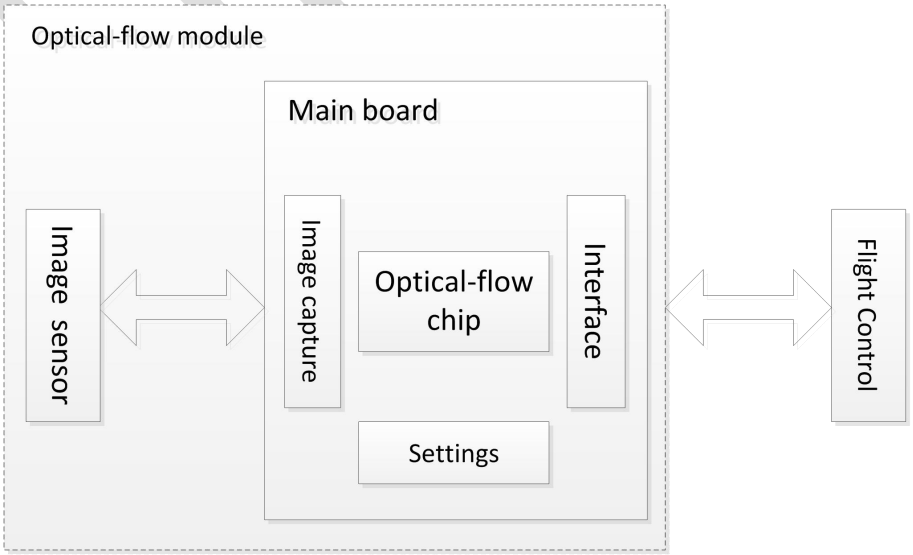

Fig.3 Functional block diagram

4. Optical-flow module access method

The optical-flow module connects to the flight controller via the UART interface. The UART data format is 1 start bit, 8 data bits, 1 stop bit, no parity bit, and the baud rate is 19200. The optical-flow module and flight control interface sequence is shown in Fig. 4, where UART_TXD, UART_RXD is based on the optical-flow module, VCC is 3.0V-5.0V power supply input. The maximum power consumption is 90mW at 3.0V and 150mW at 5.0V.

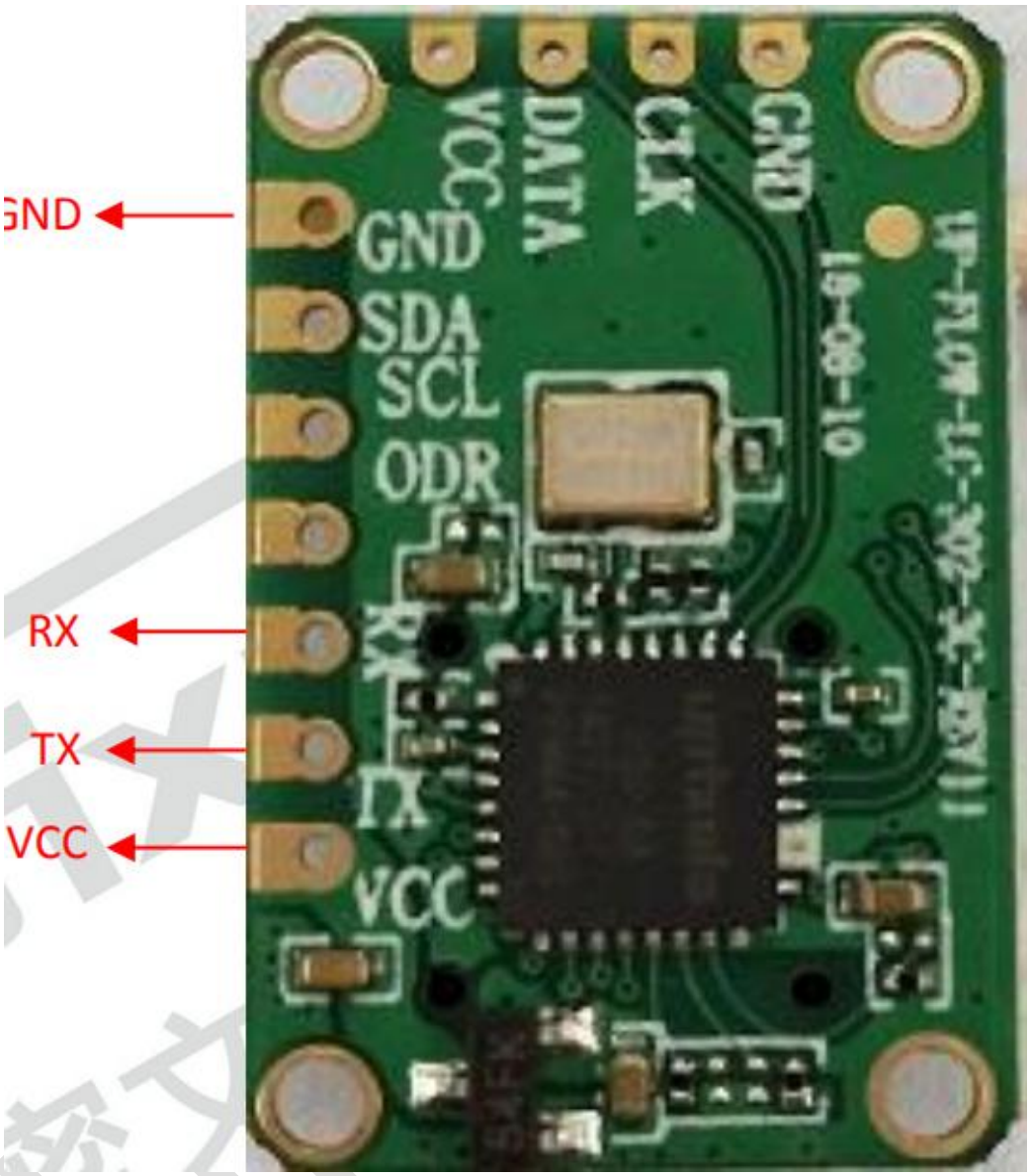

Fig. 4 The optical-flow access interface

5. The Optical-flow coordinate system

Fig.5 The Optical-flow coordinate system

6. Optical-flow module initialization and Data Definition

After the optical-flow module is powered on, it will be initialized by itsefe. At least 100 ms delay is required between powering up the optical-flow module and the initialization.

7. Output format of the optical-flow module

No.	Data	Packet data	Description
1	**Packet Header**	0xFE	The beginning of the packet
2		0x0A	Number of packet bytes (fixed value 0x0A)
3		Low byte of flow_x_integral	Accumulated displacement during the accumulation of X pixels, (radians*10000) [The actual
4		High byte of flow_x_integral	

	Optical-flow data structure		displacement (mm) is divided by 10000, and then multiplies the height (mm)]
5		Low byte of flow_y_integral	Accumulated displacement during the accumulation of Y pixels, (radians*10000) [The actual displacement (mm) is divided by 10000, and then multiplies the height (mm)]
6		High byte of flow_y_integral	
7		Low byte of integration_timespan	The accumulative time (us) from the last transmission of optical data to the current transmission of optical data
8		High byte of integration_timespan	
9		Low byte of ground_distance	Reserved. Default value is 999 (0x03E7)
10		High byte of ground_distance	
11		valid	State value: 0 (0x00), optical-flow data is invalid; 245 (0xF5), is optical-flow data is valid
12		version	version of the optical-flow module
13	**Check value**	XOR	3~12 bytes XOR
14	**End of the packet**	0x55	Ending packet identifier (fixed value 0x55)

```
typedef struct optical_flow_data
{
    // Accumulated displacement during the accumulation of X pixels,
    // (radians*10000) [The actual displacement (mm) is divided by 10000,
    // and then multiplies the  height (mm)]
    int16_t flow_x_integral;
```

```
    // Accumulated displacement during the accumulation of Y pixels,
    // (radians*10000) [The actual displacement (mm) is divided by 10000,
    // and then multiplies the  height (mm)]
    int16_t flow_y_integral;

    //The accumulative time (us) from the last transmission of optical data
    // to the current transmission of optical data
    uint16_t integration_timespan;

    //  Reserved. Default value is 999 (0x03E7)
    uint16_t ground_distance;

    // State value: 0 (0x00), optical-flow data is  invalid;
    // 245 (0xF5), is optical-flow data is valid
    uint8_t valid;

    // version of the optical-flow module
    uint8_t version;
} Upixels_OpticalFlow;
```