ZYRO

THERMAL SERIES

Observation Uncooled Infrared Module

Product Manual | Brand Style Edition | V2.0



12um VOx Detector High-frame-rate infrared focal plane detector	**Up to 640x512** 256 / 384 / 640 resolution options	**NETD <=40mK** Sensitive thermal imaging performance	**MIPI / DVP / USB** Flexible integration interfaces
Shutter-less Algorithm Smooth imaging with no mechanical shutter stutter	**Low Power** Typical USB output power below 0.7W	**Lightweight** Lensless module weight under 8.6g	**UAV Ready** Suitable for payloads, robots and smart vision

01 Product Overview

The ZYRO Thermal Series observation uncooled infrared module is designed for compact thermal imaging platforms requiring high performance, small size, low weight, low power consumption and cost-effective integration. The series offers 256x192, 384x288 and 640x512 resolution options and uses a 12um WLP packaged detector with a dedicated infrared ISP image processor.

The series adopts a shutter-less algorithm for smooth image output and a dedicated infrared image algorithm for clear, detailed imaging. Multiple digital interfaces are provided for flexible integration into UAV payloads, robots, portable terminals and intelligent vision systems.

Key Features

- High frame rate thermal imaging with 12um pixel pitch.
- Standard shutter-less algorithm for smooth, stable output.
- High-quality image display with brightness, contrast, palette and digital zoom control.
- Compact SWaP design: optimized size, weight, power and price.
- Flexible video interfaces: DVP / BT656 / USB2.0 / MIPI, plus PAL/NTSC analog video.

Application Scenarios

- UAV payloads and aerial observation.
- Outdoor handheld terminals and helmet night vision.
- Security/fire inspection, perimeter scanning, inspection robots and fire warning systems.
- Assisted driving, smart home appliances and intelligent integration platforms.

02 Product Selection

Model families are standardized under the ZYRO naming system. Lensless versions and multiple lens combinations are available for different field-of-view and detection requirements.

Model Encoding Rules

Example	Lens Code	Gain Mode	Thermal Core Mode	Focus Type	Lens Serial
ZYRO384 09110X H NR M A	09110X: 9.1 mm F1.0; 18011X: 18 mm F1.1; 55010X: 55 mm F1.0	H: High-quality	NR: Imaging	S: Fixed focus; M: Manual focus; N: No lens	A: First lens; B: Second lens
ZYRO256 / ZYRO384 / ZYRO640	00000X: No lens; other lens codes refer to lens table	-	-	-	-

Table 2-1. ZYRO Thermal Module Model Encoding Rules

Recommended Models

Lens / Selection	ZYRO 256	ZYRO 384	ZYRO 640
No lens	ZYRO25600000XHNRZA	ZYRO38400000XHNRZA	ZYRO64000000XHNRZA
9.1 mm F1.0 manual focus	19.3 x 14.5 deg / ZYRO25609110HNRSAX	28.9 x 21.7 deg / ZYRO38409110HNRSAX	48.0 x 38.4 deg / ZYRO64009110HNRSAX
13.5 mm F1.0 manual focus	Not supported	Not supported	31.9 x 25.7 deg / ZYRO64013510XHNRMA
15 mm F1.0 manual focus	11.7 x 8.8 deg / ZYRO25601510XHNRMA	17.5 x 13.1 deg / ZYRO38401510XHNRMA	Not supported
18 mm F1.1 manual focus	Not supported	Not supported	24.2 x 19.5 deg / ZYRO64018011XHNRMA
25 mm F1.0 fixed focus	7.0 x 5.3 deg / ZYRO25625010XHNRMA	10.5 x 7.9 deg / ZYRO38425010XHNRMA	17.5 x 14.0 deg / ZYRO64025010XHNRMA
35 mm F1.0 fixed focus	Not supported	7.5 x 5.7 deg / ZYRO38435010XHNRMA	12.5 x 10.0 deg / ZYRO64035010XHNRMA
55 mm F1.0 fixed focus	Not supported	Not supported	8.0 x 6.4 deg / ZYRO64055010XHNRMA

Table 2-2. Recommended ZYRO Thermal Series Models

Notes: Models without lenses can be offered. The symbol "Not supported" indicates that the model is not recommended in the standard list. Custom combinations can be evaluated as needed.

03 Lens Parameters

Lens Code	Focal Length (mm)	F-number	IFOV	Focus	Detection Distance	Recognition Distance	Identification Distance / Weight
09110X	9.1	1.0	1.3 mrad	1.73 m - infinity	1.1 km	0.25 km	0.17 km / 10.5g +/-5%
13510X	13.5	1.0	0.9 mrad	3.8 m - infinity	1.5 km	0.37 km	0.19 km / 15.2g +/-5%
15010X	15	1.0	0.8 mrad	4.7 m - infinity	1.7 km	0.42 km	0.21 km / 20.48g +/-5%
18011X	18	1.1	0.7 mrad	6.14 m - infinity	2.0 km	0.5 km	0.25 km / 25g +/-5%
25010X	25	1.0	0.48 mrad	13.02 m - infinity	2.8 km	0.7 km	0.35 km / 67g +/-2%
35010X	35	1.0	0.34 mrad	25.52 m - infinity	3.9 km	0.97 km	0.49 km / 111g +/-2%
55010X	55	1.0	0.22 mrad	63 m - infinity	6.1 km	1.5 km	0.76 km / 191g +/-2%

Detection, recognition and identification distances are estimated according to Johnson's Criteria, using a pedestrian target of 1.8 x 0.5 x 0.3 m. Weight only indicates lens weight; complete system weight includes lens, module, FPC and optional USB accessories.

04 Technical Specifications

Category	Technical Parameter	ZYRO 256	ZYRO 384	ZYRO 640
Overview	Detector Type	Vanadium Oxide Uncooled Infrared Focal Plane Detector		
Overview	Resolution	256x192	384x288	640x512
Overview	Effective Frame Rate	25/50Hz	30/60Hz	30/60Hz
Overview	Pixel Pitch	12um		
Overview	Spectral Band	8-14um		
Overview	NETD	<=40mK @25C, F#1.0, 25Hz		
Overview	Thermal Time Constant	<12ms		
Image Adjustment	Non-uniformity Correction	Shutter correction / shutter-less algorithm correction		
Image Adjustment	Brightness / Contrast	0-100, optional		
Image Adjustment	Polarity / Palette	White-hot / Black-hot / various palettes supported		
Image Adjustment	Digital Zoom	1.0-8.0x continuous zoom, step size 0.1		
Image Adjustment	Image Mirroring	Vertical / Horizontal / Diagonal		
Electrical	Analog Video	PAL / NTSC		
Electrical	Digital Video	DVP / BT656 / USB2.0 / MIPI		
Electrical	Communication Interface	UART / I2C / USB2.0		
Electrical	Power Supply Input	5V		
Electrical	Typical USB Power @25C	<0.35W	<0.42W	<0.7W
Physical	Weight without lens	<7g	<7g	<8.6g
Physical	Dimensions without lens	21 x 21 x 10.3 mm		
Environment	Operating Temperature	-40C to +80C		
Environment	Storage Temperature	-50C to +85C		
Environment	Humidity	5%-95%, non-condensing		
Environment	Vibration	6.06g, random vibration, all axes		
Environment	Impact	80g, 4ms, final peak sawtooth wave, three axes and six directions		

The parameters above are measured under laboratory conditions. Actual specifications and test methods should be confirmed by the corresponding test report.

05 Interfaces and Accessories

50-pin male connector model: DF40C-50DP-0.4V (51). Original interface diagrams are retained for engineering reference.

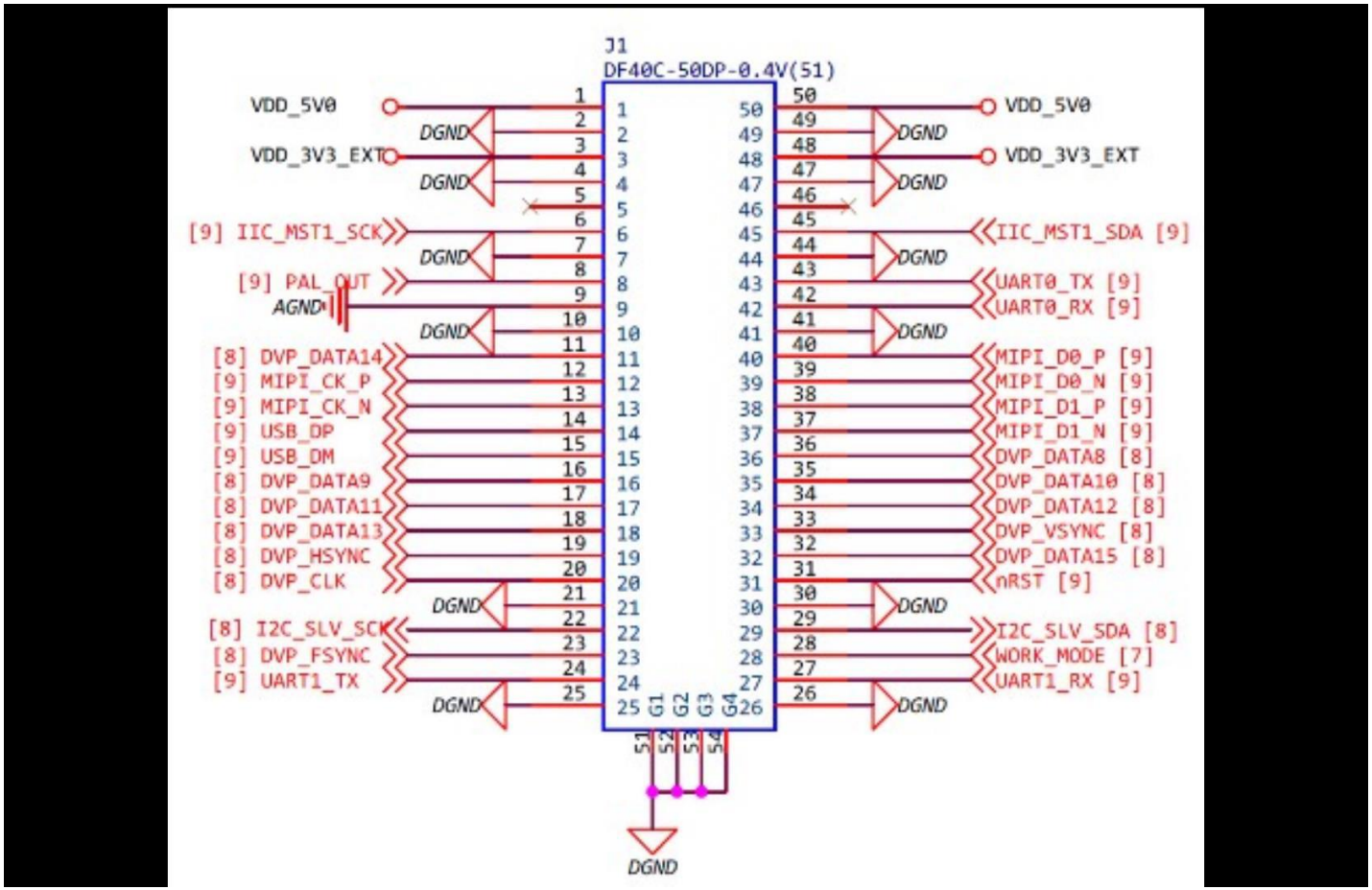


Figure 5-1. Hirose50 Pinout Diagram A

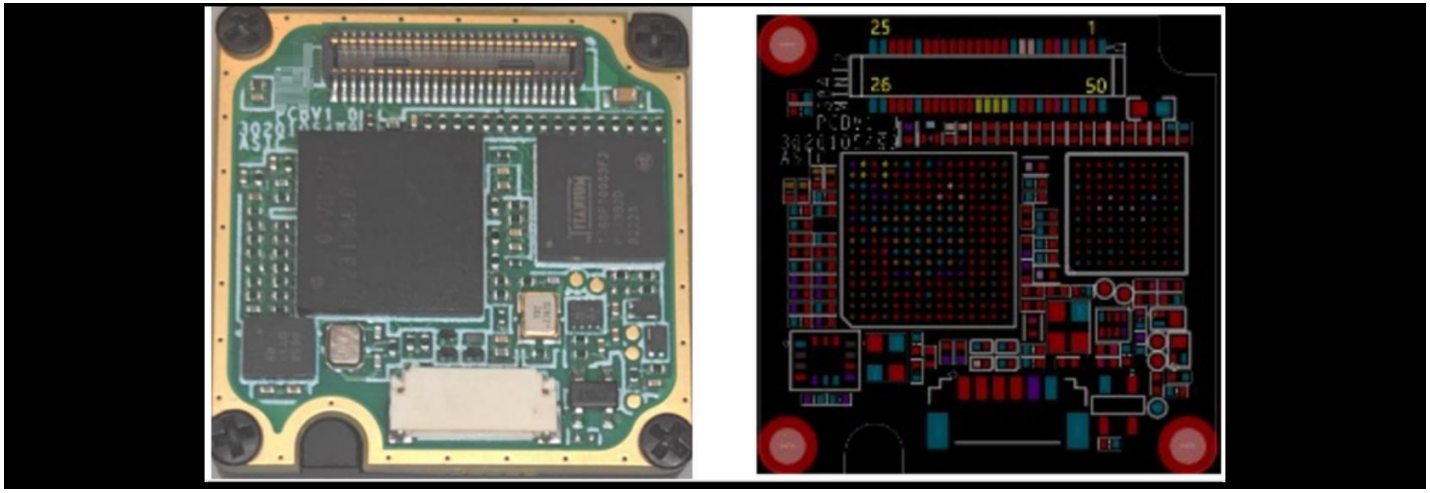


Figure 5-2. Hirose50 Pinout Diagram B

06 HIROSE50 Pin Definition

No.	Name	Type	Description
20, 33, 19, 32, 11, 18, 34, 17, 35, 16, 36	DVP_CLK; DVP_VSYNC; DVP_HSYNC; DVP_DATA15-8	Output	DVP data signal. DATA15: MSB; DATA8: LSB.
12, 13, 40, 39, 38, 37	MIPI_CK_P/N; MIPI_D0_P/N; MIPI_D1_P/N	Output	2-lane MIPI data signal.
14, 15	USB_DP; USB_DM	Output	USB2.0 data signal.
8, 9	PAL_OUT; AGND	Output	Analog output signal and analog ground.
43, 42	UART0_TX; UART0_RX	Output	UART pins for control module use.
24, 27	UART1_TX; UART1_RX	I/O	UART pins for debugging; can print module operating log and also be used as general I/O.
22, 29	I2C_SLV_SCK; I2C_SLV_SDA	I/O	I2C slave clock and data pins.
6, 45	IIC_MST1_SCK; IIC_MST1_SDA	I/O	I2C master clock and data pins.
23	DVP_FSYNC	I/O	External synchronous input signal, not a DVP synchronous output signal; can also be used as general I/O.
28	WORK_MODE	Input	Enter update mode; active high; leave floating if unused.
31	Nrst	Input	Enter reset mode; active low; leave floating.
1, 50	VDD5.0	Power	External 5V power input. The module can operate normally with only 5V supply.
3, 48	VDD3.3	Power	External 3.3V power input. Reserved and does not require power supply.
2, 4, 7, 10, 21, 25, 26, 30, 41, 44, 47, 49	DGND	Power	Ground.
5, 46	NC	NC	Not available.

Notes: DVP and I2C slave default voltage is 1.8V and can be switched to 3.3V by command. UART0, UART1 and I2C master default voltage is 3.3V and cannot be switched. CVBS only supports black-hot / white-hot switching.

07 Structure and Dimensions

The drawings below include a 384 lensless module and a 384 module with 9.1 mm lens. Drawings for other configurations can be provided as needed. Original mechanical drawings are retained for reference.

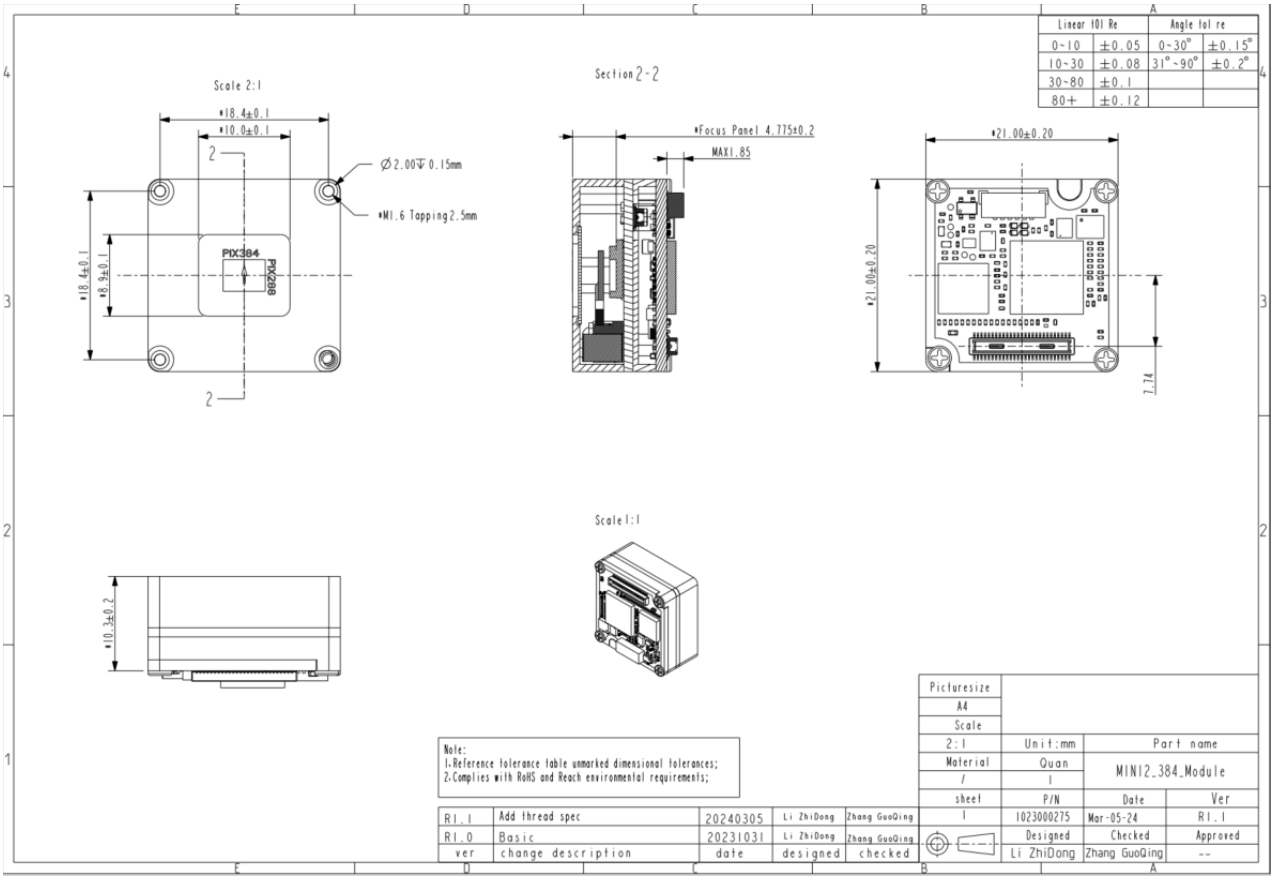


Figure 7-1. ZYRO 384 Lensless Module Drawing

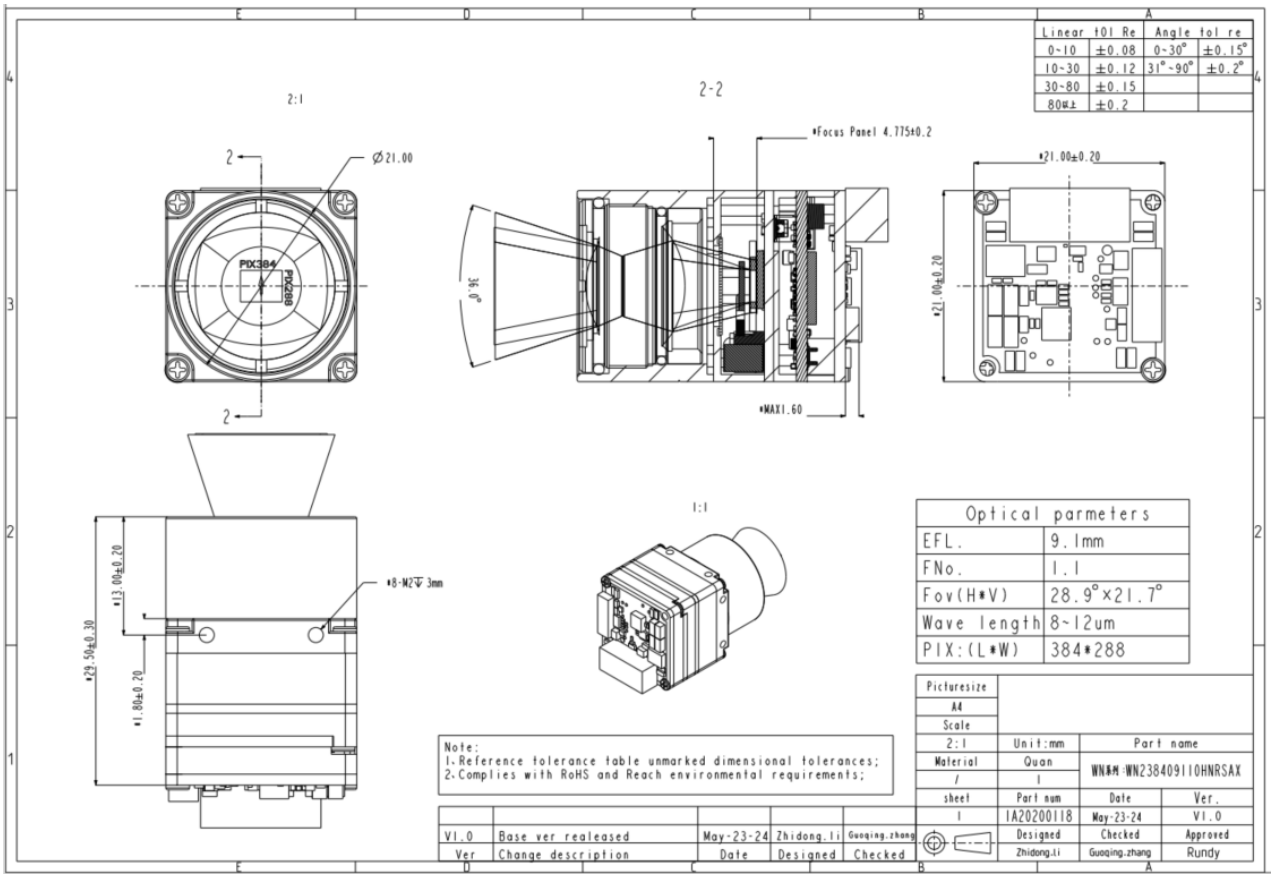


Figure 7-2. ZYRO 384 9.1 mm Lens Module Structure Drawing

08 Precautions

- Do not look directly at high-intensity radiation sources such as the sun.
- The recommended operating environment temperature is -40C to +80C.
- Do not touch devices or cables with wet hands.
- Do not bend or damage cables.
- Do not clean the device with diluent or aggressive solvents.
- Disconnect power before unplugging cables.
- Do not connect cables incorrectly, to avoid damaging the device.
- Take proper ESD protection measures during handling and integration.
- Do not disassemble the device. If any fault occurs, contact ZYRO technical support for professional service.

09 Warranty Policy

Thank you for choosing ZYRO products. Under normal use conditions, the product is covered by a one-year warranty and lifetime maintenance service.

The warranty does not cover unauthorized modification or repair, damage caused by third-party software or services, accidental or human-caused damage, incorrect voltage input, liquid ingress, cable damage, missing or damaged product labels, improper installation or storage, expiration of the warranty period, or force majeure events such as fire, earthquake or flood.

10 Technical Support

ZYRO provides pre-sales consultation, integration support and after-sales maintenance services. For detailed hardware development information and customized model selection, please contact ZYRO sales or technical representatives.