

1280*1024 Thermal Imaging Core iSE1212 User Manual



ERDI TECH LTD

Version History

Date	Version	Comments	author
20250122	V1.0	Initial Release	Wang
20251202	V1.1	Modified Pin Definition	Wang
20260204	V1.2	Added 25~75mm Continuous Zoom Lens	Wang

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Scope

The iSE1212 series core is a standard uncooled infrared thermal imaging core. This document provides relevant information and technical support for core integration and secondary development applications.

User Guidelines





Safety Precautions

This chapter aims to ensure users use the product correctly to avoid danger or property loss. Please read this manual carefully before use and keep it properly for future reference.

Precautions are divided into **Warning** and **Caution**:

- **Warning:** Ignoring warning items may result in death or serious personal injury.
- **Caution:** Ignoring caution items may cause personal injury or property loss.

	
<p>Warning signs remind users to guard against potential death or serious injury hazards.</p>	<p>Caution signs remind users to prevent potential personal injury or property loss.</p>



Warning

- Strictly abide by national and local electrical safety regulations during product use.
 - Do not connect multiple cores to the same power adapter; exceeding the adapter load may cause overheating or fire hazards.
 - Disconnect the core power supply before wiring, disassembly and assembly; **do not operate with power on.**
 - Immediately cut off the power supply and contact the dealer or service center if the core emits smoke, peculiar odor or abnormal noise during operation.
 - If the device malfunctions, contact the store of purchase or the nearest service center.
- Do not disassemble or modify the device in any way. The Company shall not be liable for problems caused by unauthorized modification or maintenance.



Caution

· Do not aim the core at high-energy sources such as the sun, lava, laser beams, etc. The maximum observable temperature for the standard core is less than 600°C; observing targets above 600°C will cause irreversible burn damage to the core. Customized cores are available for scenarios requiring observation of targets over 600°C.

- Follow the mechanical installation guide strictly during disassembly and assembly. Use specified screw size, length and torque to avoid core damage.
- Do not drop objects on the device or subject it to strong vibration. Keep the device away from magnetic interference areas. Do not install the device on surfaces prone to vibration or impact (negligence may cause equipment damage).
- Do not operate the device under ambient conditions: temperature above 70°C or below -40°C, or humidity higher than 95%.
- Do not place the device in direct sunlight, poorly ventilated areas, or near heat sources such as heaters (negligence may lead to fire risks).
- Avoid frequent power cycling of the device; the restart interval after shutdown shall be no less than 30 seconds, otherwise the core service life will be affected.
- **Do not hot-swap the 50pin interface** to prevent permanent core damage.
- Do not directly touch the coating on the core lens surface with hands or scratch the lens with hard objects, which may blur imaging and degrade image quality.
- Clean the core lens only with a soft dry cloth; never use alkaline detergent for cleaning.

Disclaimer

Users shall carefully read and fully understand the user manual and this disclaimer before use, and install and operate the product strictly in accordance with the specifications. Improper installation or use may cause great inconvenience, property loss and personal injury. The Company shall assume no legal liability for property loss and personal injury caused by user's improper installation and operation.

Service Policy

- One-month replacement and one-year warranty for this series of products. Specific warranty services shall be implemented in accordance with the attached warranty card or official website warranty policy.
- For discontinued, obsolete, special-price and clearance models, the service standard shall be subject to the Company's official notice.

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1 Product Overview

1.1 Product Introduction

The iSE1212 series core is a high-performance general-purpose **uncooled infrared thermal imaging core**, featuring large array, high resolution and vibration resistance.



Figure 1 iSE1212 Outline Schematic (50mm Version Example)

iSE1212 Core Features:

- Compact size: Bare core dimension $\leq 38 \times 39 \times 28$ mm (excluding lens and expansion board)
- Light weight: Minimum weight ≤ 46.9 g (excluding lens and expansion board)
- Fast imaging startup: Boot time ≤ 7 s
- Low power consumption: ≤ 1.2 W
- Support Non-Uniformity Correction (NUC)
- 3D Digital Noise Reduction (3DNR)
- 2D Noise Reduction (DNS)
- Dynamic Range Compression (DRC)
- Edge Enhancement (EE)
- Super-resolution image algorithm supported
- Shutterless function supported
- Strong expandability: Plug-and-play support for CameraLink/HDMI/USB3.0/GigE/MIPI/SDI/PC expansion modules, easy for integration.

Equipped with high-performance signal processing circuit and image processing algorithms, the core ensures clear imaging and smooth video output. It provides industry-standard interfaces for OEM secondary development, serving as a standardized professional infrared core solution widely applied in thermal sight, marine, vehicle-mounted and other fields.

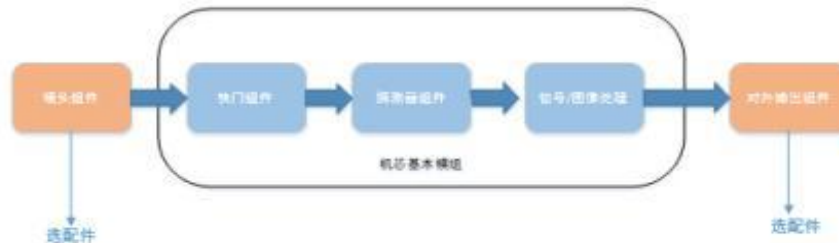


Figure 2 iSE1212 Series Core Framework Diagram

The basic core module consists of three units: shutter assembly, detector assembly and signal/image processing assembly:

- Shutter assembly: Solenoid valve shutter with excellent uniformity and fast response.
- Detector assembly: Adopts world-class advanced uncooled detector.
- Signal/Image processing assembly: Implements image algorithm processing, video display and output.

1.2 Product Configuration

1.2.1 Technical Specifications

Table 1 Technical Specifications

Item	iSE1212
Infrared Detector	
Infrared Detector	Uncooled Vanadium Oxide
Resolution / Pixel Pitch	1280×1024/12μm
Spectral Wavelength	8~14μm
NETD	≤30mk/F1.0/25℃
Image Processing	
Effective Pixels	1280×1024
Frame Rate	25Hz/30Hz/50Hz
Digital Video Formats	YUV420/YUV422/RGB888/RAW
Boot Time	≤7s
Image Algorithms	NUC/DRC/DNS/DDE/SFFC
Super-Resolution Algorithms	Supported
Shutterless	Supported

Palette Mode	Black Hot / White Hot / Pseudocolor	
Digital zoom	Center zoom: 1x/2x/4x/8x	
Image Mirror	Horizontal / Vertical / Diagonal	
Image brightness	Auto / Manual	
Image contrast	Auto / Manual	
Compensation mode	Manual	
Physical Interface		
External Expansion Interface	50pin: BP040SB-50-0114-B-R0	
Communication Mode	TTL-232/USB3.0	
Digital Video Interface	DVP16/BT1120/USB3.0/MIPI-DSI-4LANE	
Expansion Modules	USB3.0/SDI/HDMI/GIGE/Cameralink/VPC/ MIPI-CSI-2LANE	
Power Supply Interface		
Power Supply Voltage	2.7V-5.3V	
Power Consumption	≤1.2W@25hz@23±3℃	
Software		
Host Computer	Compatible with Windows	
SDK	Windows & Linux version supported (USB3.0)	
System Functions		
One-Click Parameter Recovery	Supported	
Menu Setting	Customizable	
Menu Language	Chinese / English	
PIP	Supported; optional top-left/top-middle/top-right with reticle	
Hot Spot Tracking	Supported	
Types of Reticles	10 types	
Reticle Brightness	10 types	
Reticle Color	Red, blue, yellow, black, white	
Reticle Settings	Supported types; brightness and color settings can be saved	
Zeroing	Supported	
Buttons	Supports ≥4 buttons (Power/Menu/Custom)	
OLED Driving	Support I2C, 16bit/24bit parallel interface; directly drive MicroOLED MDP03/MDP02, Olightek SVGA060, Sony ECX334A; support MIPI driving for IBOE VX039FHP-NH4	
Physical Parameters		
Physical Dimension (Bare Core)	38×39×28mm (Fixed focal: 14mm/19mm/25mm/35mm)	68×69×24.7mm (Fixed focal: 50mm, Motorized focus:75mm/100mm/150mm, Continuous zoom 25~75mm/28~90mm/30~180mm/30~300 mm)

Weight (Bare Core)	65±3g (Fixed focal:14mm/19mm/25mm/35mm)	88.5±3g (Fixed focal: 50mm, Motorized focus: 75mm/100mm/150mm, Continuous zoom: 25~75mm/28~90mm/30~180mm/25~225mm /30~300mm)
Lens Configuration	Fixed focal lengths: 14mm, 19mm, 25mm, 35mm, 50mm, 100mm; Motorized focus: 75mm, 100mm, 150mm Continuous zoom: 25~75mm, 28~90mm, 30~180mm, 25~225mm, 30~300mm	
Shutter Assembly	Optional	
Dustproof & Waterproof	Front lens: IP67	
Environment Parameters		
Operating Temperature	-40℃~+70℃	
Storage Temperature	-45℃~+85℃	
Humidity	5%~95% Non-condensing	
Vibration	5.35g random vibration, 3-axis	5.35g random vibration, 3-axis
Shock	With shutter	Without shutter
	Sine half-wave, 40g/11ms, X-axis 3 times	500G@1ms (without lens)
Certification		
Certification	RoHS2.0/Reach	

1.2.2 Optical Configuration

Table 2 Optical Configuration

Focal Length	Focus Mode	Coating	Resolution	f/#	FOV(H × V,±5%)	Front Lens Rating
14mm	Fixed Athermal	DLC	1280*1024	1.2	62.4°×50°	IP67
19mm	Fixed Athermal	HD	1280*1024	1.2	44°×35.8°	IP67
25mm	Fixed Athermal	HD	1280*1024	1	34.2°×27.6°	IP67
35mm	Fixed Athermal	HD	1280*1024	1	24.7°×20°	IP67
50mm	Fixed Athermal	HD	1280*1024	1	17.5°×14°	IP67
100mm	Fixed Athermal	HD	1280*1024	1	8.8°×7.0°	IP67
75mm	Motorized Focus	DLC	1280*1024	1	11.7°×9.4°	IP67
100mm	Motorized Focus	HD	1280*1024	1	8.8°×7.0°	IP67
150mm	Motorized Focus	DLC	1280*1024	1	5.9°×4.7°	IP67

25-75mm	Continuous Zoom	DLC	1280*1024	0.95-1.2	36°×28.6° 11.5°×9.2°	IP67
28-90mm	Continuous Zoom	DLC	1280*1024	1.22-1.25	30.7°×24.8° 9.8°×7.8°	IP67
30-180mm	Continuous Zoom	DLC	1280*1024	0.9-1.2	28.7°×23.1° 4.9°×3.9°	IP67
25-225mm	Continuous Zoom	DLC	1280*1024	0.95-1.5	35.7°×28.4° 3.8°×3.1°	IP67
30-300mm	Continuous Zoom	DLC	1280*1024	1.0-1.2	28.72°×23.15° 2.93°×2.35°	IP67

Note:
 DLC = Diamond-Like Carbon coating;
 HD = Hard Durable coating.

**1.3
PC**

Software Introduction

The **Uncooled Infrared Camera Application** realizes online control of the iSE1212 core.

- OS Support: Windows 7/8/10/11
- Language: Chinese / English
- Recommended Hardware: Intel i5 processor and above

1.4 Unpacking

Standard Package: 1×iSE1212 thermal imaging core, 1×Product Certificate; optional accessories provided separately.

The core contains electrostatic-sensitive electronic components. Unpack and operate in an ESD-protected environment to avoid electrostatic damage. The package is filled with anti-static foam for transportation protection.

2 Interface Description

2.1 Power Requirements

- Steady-state power consumption: $\leq 1.2W$ @5V @23±3°C @25Hz
- Transient power consumption (shutter triggering): $\leq 3W$, duration <1s
- Supply voltage range: **2.7V~5.3V DC** (voltage measured at core terminal; reserve margin in actual application)
- Insufficient power supply capacity may cause abnormal startup or operation.

2.2 Hardware Interface

The standard bare core adopts a **50PIN external interface**, integrating power input/output, digital video, TTL-232 serial port, USB3.0 and general IO.

- Core interface model: BP040SB-50-0114-B-R0
- Recommended mating connector: BS040SB-50-0390-B-R0

The 50PIN interface supports three hardware working modes via factory configuration:

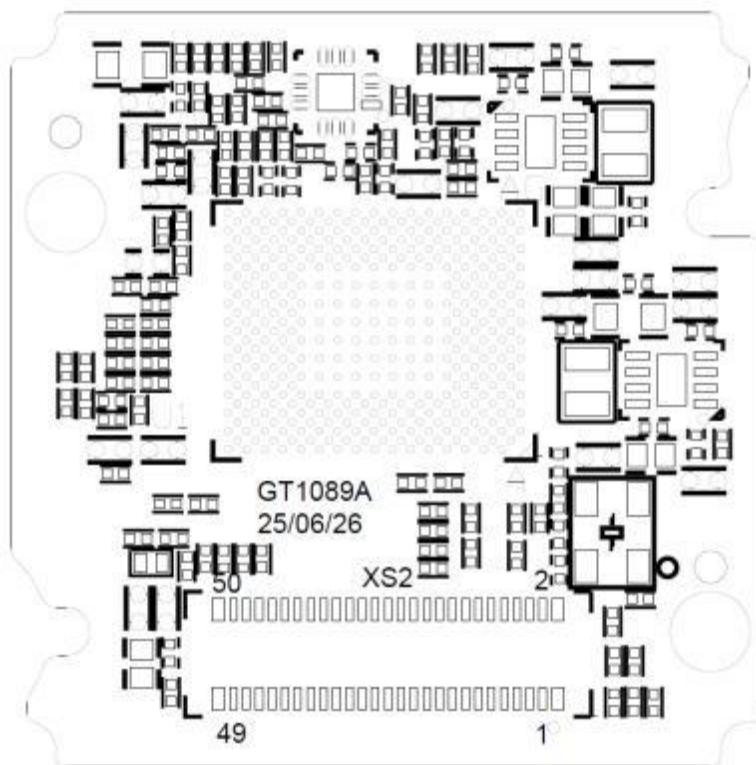


Figure 3 50PIN interface

- DVP16/BT1120/USB3.0/MIPI-DSI-4LANE (Standby / Reset mode)
- RGB888 mode

2.2.1 DVP16/BT1120/USB3.0/MIPI

The core supports one of DVP16/BT1120/USB3.0/MIPI-DSI-4LANE output, switchable via **Uncooled Infrared Camera Application** or firmware upgrade.

- Support YUV / RAW data output
- USB3.0: YUV422 / YUV420 selectable
- MIPI-DSI: Only RGB888 output
- DVP16/BT1120: Progressive output only, no interlace; TTL serial level for secondary development
- MIPI-DSI-4LANE: For pixel data transmission to display devices

Table 3 50PIN Interface Definition (DVP16/BT1120/USB3.0/MIPI Mode)

Pin No.	Signal Definition	Direction	Level	Description
1	UART4_TXD	O	3.3V	User communication serial port
2	UART4_RXD	I	3.3V	User communication serial port
3	NC	NC	NC	NC
4	NC	NC	NC	NC
5	UART3_TX/I2C4_S DA	I/O	3.3V	Serial/I2C
6	UART3_RX/I2C4_S CL	I/O	3.3V	
7	DGND	GND	0V	Digital ground

8	NC	NC	NC	NC
9	TYPEC_RXP2	I/O	3.3V	USB3.0 RX differential
10	DGND	GND	0V	Digital ground
11	TYPEC_RXN2	I/O	3.3V	USB3.0 RX differential
12	TYPEC_USB_D M	I/O	3.3V	USB3.0 differential
13	TYPEC_TXN2	I/O	3.3V	USB3.0 TX differential
14	TYPEC_USB_D P	I/O	3.3V	USB3.0 differential
15	TYPEC_TXP2	I/O	3.3V	USB3.0 TX differential
16	NC	NC	NC	NC
17	GPIO	I/O	3.3V	Reserved GPIO
18	DGND	GND	0V	Digital ground
19	DVP15	O	1.8V	DVP OUT_DATA15/BT1120_OUT_DATA15
20	DVP10	O	1.8V	DVP OUT_DATA10/BT1120_OUT_DATA10
21	DVP_HSYNC	O	1.8V	DVP multiplexed data
22	DVP11	O	1.8V	DVP OUT_DATA11/BT1120_OUT_DATA11
23	DVP_VSYNC	O	1.8V	DVP multiplexed data
24	MIPI_D2P/DVP4	O	1.8V	MIPI_D2P/DVP_OUT_DATA4/BT1120_OUT_DATA4
25	MIPI_D3P/DVP6	O	1.8V	MIPI_D3P/DVP OUT_DATA6/BT1120_OUT_DATA6
26	MIPI_D2N/DVP5	O	1.8V	MIPI_D2N/DVP OUT_DATA5/BT1120_OUT_DATA5
27	MIPI_D3N/DVP7	O	1.8V	MIPI_D3N/DVP OUT_DATA7/BT1120_OUT_DATA7
28	MIPI_CLKN/DVP9	O	1.8V	MIPI_CLKN/DVP_OUT_DATA9/BT1120_OUT_DATA9
29	MIPI_D1N/DVP3	O	1.8V	MIPI_D1N/DVP OUT_DATA3/BT1120_OUT_DATA3
30	MIPI_CLKP/DVP8	O	1.8V	MIPI_CLKP/DVP OUT_DATA8/BT1120_OUT_DATA8
31	MIPI_D1P/DVP2	O	1.8V	MIPI_D1P/DVP OUT_DATA2/BT1120_OUT_DATA2
32	DVP13	O	1.8V	DVP OUT_DATA13/BT1120_OUT_DATA13
33	MIPI_D0N/DVP1	O	1.8V	MIPI_D0N/DVP OUT_DATA1/BT1120_OUT_DATA1
34	DVP12	O	1.8V	DVP OUT_DATA12/BT1120_OUT_DATA12
35	MIPI_D0P/DVP0	O	1.8V	MIPI_D0P/DVP OUT_DATA0/BT1120_OUT_DATA0
36	DVP14	O	1.8V	DVP OUT_DATA14/BT1120_OUT_DATA14
37	DGND	GND	0V	Digital ground
38	DGND	GND	0V	Digital ground
39	DATA_OUT_CLK	O	1.8V	DVP/BT1120 clock
40	STANDBY	I	1.8V	Sleep function (default)
	RESET	I	1.8V	Reset function
41	DGND	GND	0V	Digital Ground

42	NC	NC	NC	NC
43	GPIO	I/O	3.3V	Reserved GPIO
44	GPIO	I/O	3.3V	Reserved GPIO
45	DGND	GND	0V	Digital Ground
46	POWER_IN	VIN	2.7V-5.3V	Power input
47	DGND	GND	0V	Digital Ground
48	POWER_IN	VIN	2.7V-5.3V	Power input
49	GPIO	I/O	3.3V	Reserved GPIO
50	NC	NC	NC	NC

Notes:

- O=Output, I=Input, NC=No Connection (must be left floating)
- Video output format and interface mode are switchable via upper computer software
- Pin40 Multiplexing: Default **Standby**; contact sales engineer for Reset function customization
Standby Mode: Pull Pin40 low for $\geq 200\text{ms}$ to enter low-power standby (power $< 1\text{W}$, detector shut down, no video output); pull low again $\geq 200\text{ms}$ to wake up.
Reset Mode: Pin40 must be pulled high externally for normal startup after power-on. After system stabilization, pull low for $\leq 1\text{s}$ then release high to trigger system hardware restart.

2.2.2 RGB888

Table 4 50PIN Interface Definition (RGB888 Mode)

Pin No.	Signal Definition	Direction	Level	Description
1	UART4_TXD	O	3.3V	User communication serial port
2	UART4_RXD	I	3.3V	User communication serial port
3	NC	NC	NC	NC
4	NC	NC	NC	NC
5	UART3_TX/I2C4_SDA	I/O	3.3V	serial port/I2C
6	UART3_RX/I2C4_SCL	I/O	3.3V	
7	DGND	GND	0V	Digital Ground
8	DVP22	O	1.8V	Parallel Data Signals
9	NC	NC	NC	NC
10	DGND	GND	0V	Digital Ground
11	DVP16	O	1.8V	Parallel Data Signals
12	DVP21	O	1.8V	Parallel Data Signals

13	DVP19	O	1.8V	Parallel Data Signals
14	DVP17	O	1.8V	Parallel Data Signals
15	DVP18	O	1.8V	Parallel Data Signals
16	DVP20	O	1.8V	Parallel Data Signals
17	GPIO	I/O	3.3V	Reserved GPIO
18	DGND	GND	0V	Digital Ground
19	DVP15	O	1.8V	Parallel Data Signal
20	DVP10	O	1.8V	Parallel Data Signal
21	DVP_HSYNC	O	1.8V	Video Data Row Synchronization Signal
22	DVP11	O	1.8V	Parallel Data Signal
23	DVP_VSYNC	O	1.8V	Video Data Field Synchronization Signal
24	DVP4	O	1.8V	Parallel Data Signal
25	DVP6	O	1.8V	Parallel Data Signal
26	DVP5	O	1.8V	Parallel Data Signal
27	DVP7	O	1.8V	Parallel Data Signal
28	DVP9	O	1.8V	Parallel Data Signal
29	DVP3	O	1.8V	Parallel Data Signal
30	DVP8	O	1.8V	Parallel Data Signal
31	DVP2	O	1.8V	Parallel Data Signal
32	DVP13	O	1.8V	Parallel Data Signal
33	DVP1	O	1.8V	Parallel Data Signal
34	DVP12	O	1.8V	Parallel Data Signal
35	DVP0	O	1.8V	Parallel Data Signal
36	DVP14	O	1.8V	Parallel Data Signal
37	DGND	GND	0V	Digital Ground
38	DGND	GND	0V	Digital Ground
39	DATA_OUT_CLK	O	1.8V	Clock signal
40	DVP23	O	1.8V	Parallel Data Signal
41	DGND	GND	0V	Digital Ground
42	GPIO	I/O	3.3V	Reserved GPIO
43	GPIO	I/O	3.3V	Reserved GPIO
44	GPIO	I/O	3.3V	Reserved GPIO
45	DGND	GND	0V	Digital Ground
46	POWER_IN	VIN	2.7V-5.3V	Power Input
47	DGND	GND	0V	Digital Ground
48	POWER_IN	VIN	2.7V-5.3V	Power Input
49	GPIO	I/O	3.3V	Reserved GPIO
50	GPIO	I/O	3.3V	Reserved GPIO

I Pin signal definition omitted, consistent with manual table; all reserved NC pins must be floating;
O=Output, I=Input)

I **Note:** Motorized focus / continuous zoom lens **cannot be used** under RGB888 mode.

2.3 Digital Video

When the module outputs digital video directly, the data format is YUV422 (UYVY), YUV420Plane, or RGB888. When the output interface is USB 3.0, the module can output YUV422 or YUV420; when the output interface is MIPI-DSI, the module outputs only RGB888; for DVP or other interfaces, the module can only output YUV422; when the hardware supports RGB888, it outputs only the RGB888 format.

I Data format: YUV422 is output in either Cb,Y,Cr,Y or Y,Cb,Y,Cr order; YUV420 is output with Y first, followed by U or V.

I Supports progressive scan mode; does not support interlaced mode.

I Resolution

YUV or RAW: The maximum supported resolution is 1280×1024, with an effective resolution of 1280×1024. In the application, the resolution can be set to 1280×1024. For YUV+parameter line or RAW+parameter line configurations, if using a USB interface, the maximum supported resolution is 1280×1025, with an effective resolution of 1280×1024 and an additional parameter line. In applications, the resolution can be set to 1280×1025. For DVP16/BT1120, the maximum supported resolution is 1280×1026, with an effective resolution of 1280×1024 and 2 parameter lines. In applications, the resolution can be set to 1280×1026. MIPI-DSI does not support parameter line mode.

Y16+YUV+parameter line: USB 3.0 supports 1 parameter line, DVP16/BT1120 supports 2 parameter lines. For USB 3.0, the maximum supported resolution is 1280×2049, with an effective resolution of 1280×2048. The data from the additional parameter line allows the resolution to be set to 1280×2049 in applications. For DVP16/BT1120, the maximum supported resolution is 1280×2050, with an effective resolution of 1280×2048. The remaining two parameter lines are reserved for data; in applications, the resolution can be configured to 1280×2050. MIPI-DSI does not support parameter line mode.

L. Supports frame-by-frame transmission only

L. The engine supports output in multiple digital video formats; the output video clock is determined by the system standard, frame rate, and DVP interface bit width, as shown in Table 5:

Table 5: Overview of Digital Video Clocks (Unit: MHz)

Digital source	Image Resolution	1280*1024		
	Frame Rate	25Hz	30Hz	50Hz
	DVP Bit Width	16bit		
Y16	43.18	43.21	74.98	

Y16+ parameter line		43.18	43.21	74.98
YUV422		43.18	43.21	74.98
YUV422+parameter line		43.18	43.21	74.98
Digital source	Image Resolution	1280*2048		
	Frame Rate	25Hz	30Hz	50Hz
	DVP Bit Width	16bit		
Y16+ YUV422		86.36	/	/
Y16+YUV422+parameter line		86.36	/	/

1) Y16

Y16[15:0],Y16[15:0], etc

2) YUV422

Cb[7:0],Y [15:8],Cr[7:0],Y [15:8],etc

Note:

1. DVPx indicates that data is transmitted using x physical channels;

2.The parameter line format is as follows:

DVP 16 : Head1[15:0], Head2[15:0],Para1[15:0] , Para2[15:0]...Para40[15:0], End1[15:0] , End2[15:0];

2.3.1 16-bit Parallel (DVP16)

2.3.1.1 DVP16 without parameter lines

The timing parameters for parallel 16-bit digital video (excluding the parameter line) are shown in Table 6.

16-bit digital port timing parameters (excluding the parameter line) (25 Hz)

Video Format (Data Source)	25Hz (Y16/YUV422)			25Hz (Y16+YUV422)		
	Typical value	Unit	Remark	Typical value	Unit	Remark
Resolution	1280*1024			1280*2048		
NW	1280			1280		
NH	1024			2048		
DIGITAL_CLK	43.18	MHz		43.18	MHz	
TLine	31.50	us	1360CLK	15.75	us	1360CLK

TLine_Valid	29.64	us	1280CLK	14.82	us	1280CLK
TLine_Blank	1.85	us	80CLK	0.93	us	80CLK
TPixel	0.023	us	1 CLK	0.012	us	1 CLK
TStart	/	us	/	/	us	/
TFrame	40	ms	1270 Line	40	ms	2540 Line
TField_Valid	32.25	ms	1024 Line	32.25	ms	2048 Line
TField_Blank	7.75	ms	246Line	7.75	ms	492Line

Video Format (Data Source)	30Hz (Y16/YUV422)			50Hz (Y16/YUV422)		
	Typical value	Unit	Remark	Typical value	Unit	Remark
Resolution	1280*1024			1280*1024		
NW	1280			1280		
NH	1024			1024		
DIGITAL_CLK	43.21	MHz		74.98	MHz	
TLine	31.48	us	1360CLK	18.89	us	1416CLK
TLine_Valid	29.62	us	1280CLK	17.01	us	1280CLK
TLine_Blank	1.85	us	80CLK	1.81	us	80CLK
TPixel	0.023	us	1 CLK	0.013	us	1 CLK
TStart	/	us	/	/	us	/
TFrame	33.33	ms	1059 Line	20	ms	1059 Line
TField_Valid	32.23	ms	1024 Line	19.34	ms	1024 Line
TField_Blank	1.10	ms	35Line	0.66	ms	35Line

The data source is a Y16/YUV422 line-field relationship timing diagram without parameter lines, as shown in Figure 4.

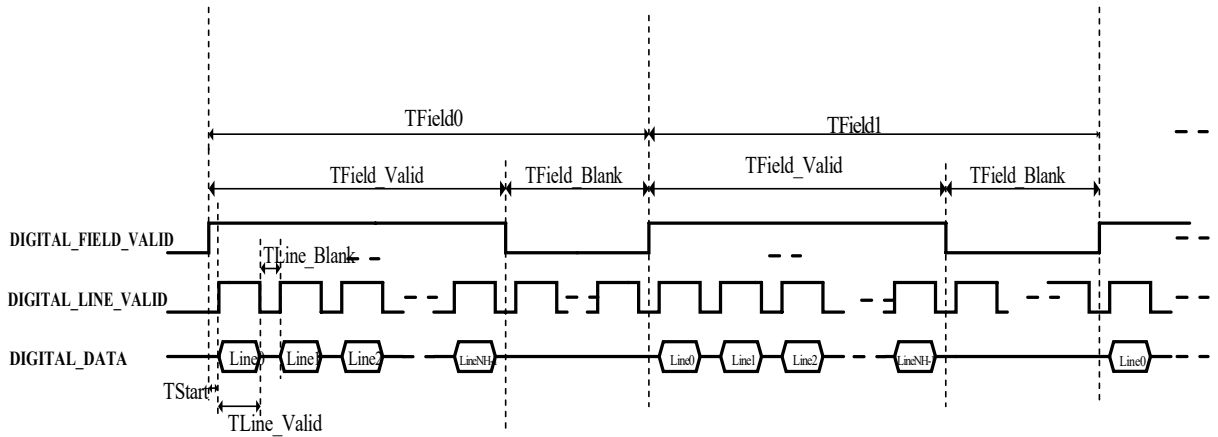


Figure 4: Timing diagram for parallel 16-bit video without parameter line format or line-field relationship

Figure 5 shows the row-to-data-timeline relationship diagram for data source Y16.

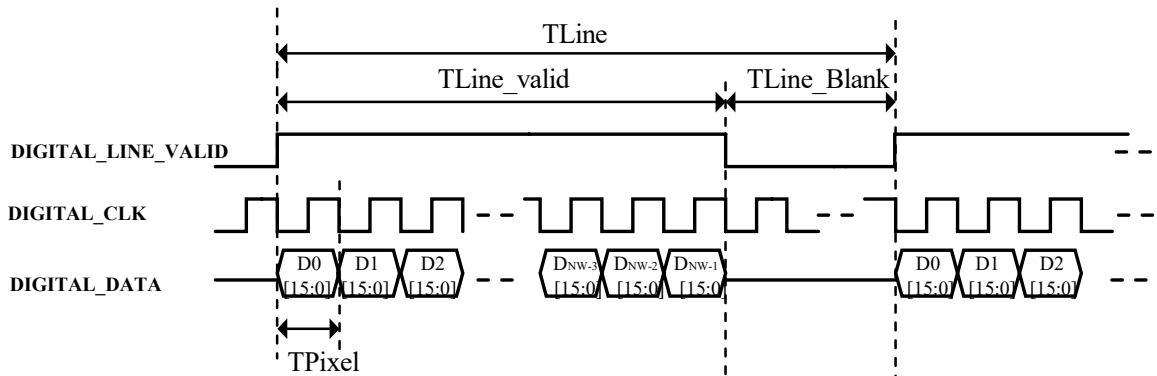


Figure 5: CMOS16 Y16 Row and Data Timing Diagram

The timing diagram for the line and data timing relationship of the YUV422 data source is shown in Figure 6.

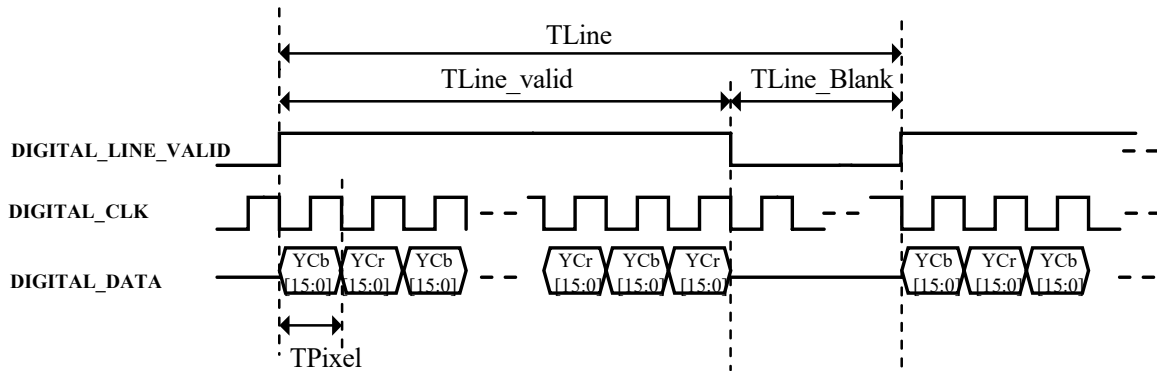


Figure 6: CMOS16 YUV422 Horizontal and Data Timing Diagram

2.3.1.2 DVP16 with parameter lines

The timing parameters for the 16-bit parallel digital video (including 3 parameter lines) are shown in Table 7.

Table 6: 16-bit Digital Port Timing Parameters (with parameter row) (25HZ)

Video Format (Data Source)	25Hz (Y16/YUV422+Parameter line)			25Hz (Y16+YUV422+Parameter line)		
	Name	Typical value	Unit	Remark	Typical value	Unit
Resolution	1280*1024			1280*2048		
NW	1280			1280		
NH	1024			2048		
DIGITAL_CLK	43.18	MHz		43.18	MHz	
TLine	31.50	us	1360CLK	15.75	us	1360CLK
TLine_Valid	29.64	us	1280CLK	14.82	us	1280CLK
TLine_Blank	1.85	us	80CLK	0.93	us	80CLK
TPixel	0.023	us	1 CLK	0.012	us	1 CLK
TStart	/	us	/	/	us	/
TFrame	40	ms	1270Line	40	ms	2540 Line
TField_Valid	32.31	ms	1026 Line	32.28	ms	2050 Line
TField_Blank	7.69	ms	244Line	7.72	ms	490Line

Video Format (Data Source)	25Hz (Y16/YUV422+Parameter line)			50Hz (Y16+YUV422+Parameter line)		
	Name	Typical value	Unit	Remark	Typical value	Unit
Resolution	1280*1024			1280*1024		
NW	1280			1280		
NH	1024			1024		
DIGITAL_CLK	43.21	MHz		74.98	MHz	
TLine	31.48	us	1360CLK	18.89	us	1416CLK
TLine_Valid	29.62	us	1280CLK	17.07	us	1280CLK
TLine_Blank	1.85	us	80CLK	1.81	us	136CLK
TPixel	0.023	us	1 CLK	0.013	us	1 CLK

TStart	/	us	/	/	us	/
TFrame	33.33	ms	1059Line	20	ms	1059Line
TField_Valid	32.29	ms	1026Line	19.38	ms	1026Line
TField_Blank	1.04	ms	33Line	0.62	ms	33Line

The data source is a Y16/YUV422 line-field relationship timing diagram with parameter lines, as shown in Figure 7.

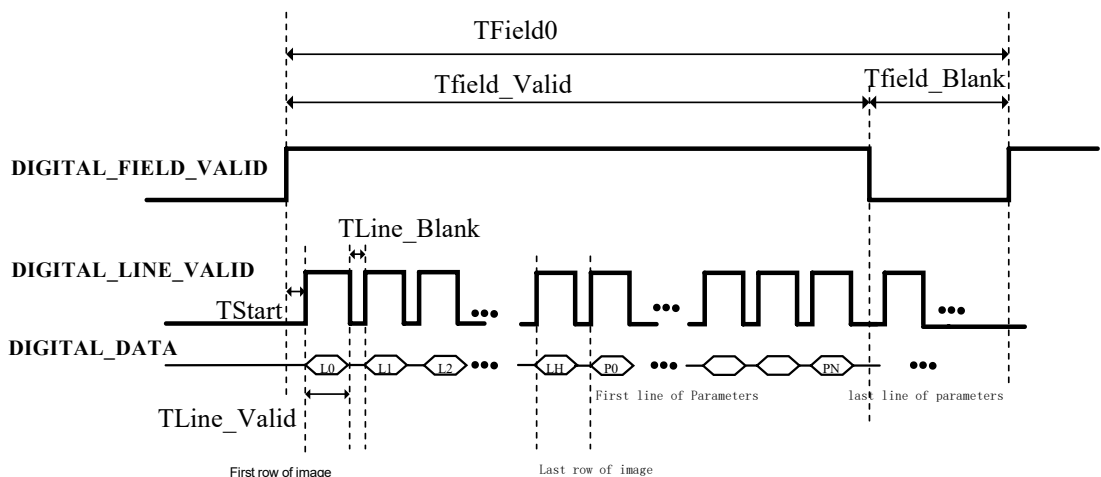


Figure 7: Timing diagram of the row-field relationship for Y16/YUV422+ parameters

Figure 8 shows the timeline of data for the Y16+ parameter row;

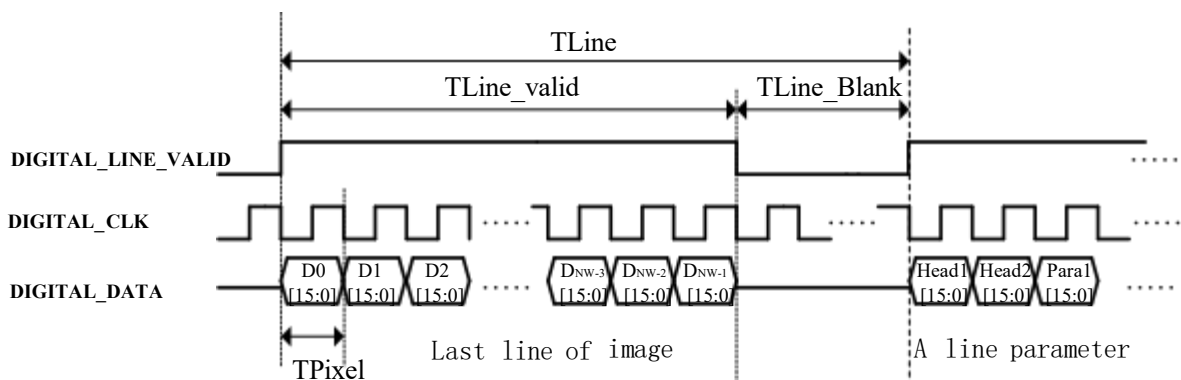


Figure 8: Timing Diagram for the CMOS16 Y16+ Parameter Lines and Data Lines

The data source is a diagram illustrating the timing relationship between the YUV422+ parameter line and the data. The timing is shown in Figure 9.

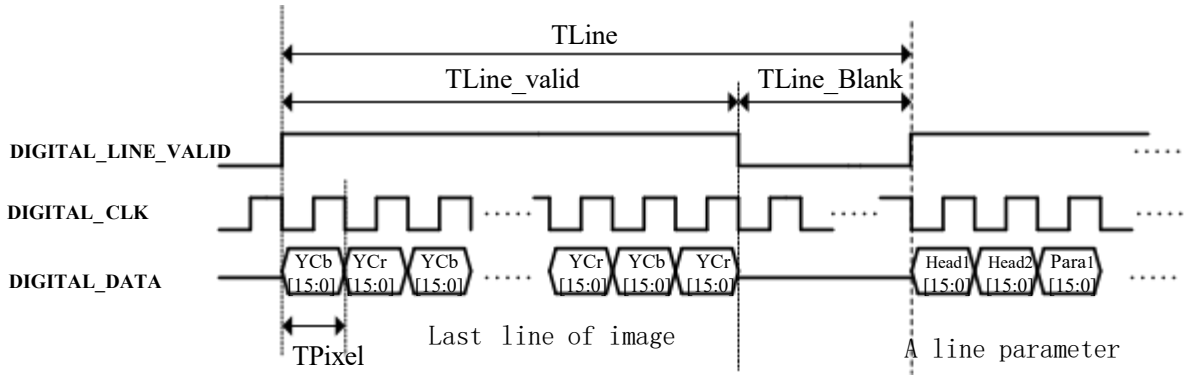


Figure 9: CMOS16 YUV422+ Parameter Row-by-Row and Data Timing Diagram

2.3.2 BT.1120 Interface

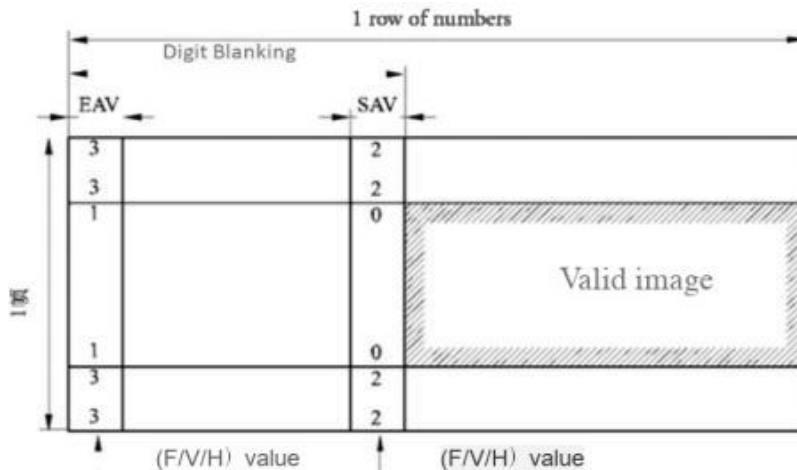
The camera's digital video output supports the BT.1120 interface, with video data formats including YUV422 and RAW16, as well as parameter line data transmission.

2.3.2.1 BT.1120 Timing Configuration

The characteristics of the BT.1120 video output interface are as follows:

- I Data formats: YCb, YCr, YCb, YCr, etc.;
- I Supports progressive scan mode; does not support interlaced mode;
- I The BT.1120 clock is configurable based on resolution.
- I Supports only frame-by-frame transmission; transmission of the same frame across two fields is not supported

I BT.1120 internal synchronization: Figure 10 shows the BT.1120 internal synchronization format



2.3.3 MIPI-DSI-4lane

The chip supports MIPI output and can operate in DSI-4lane mode, with the output image format being RGB888. In the RGB888 format, each pixel's R, G, and B components occupy 8 bits each. The data format is as follows::

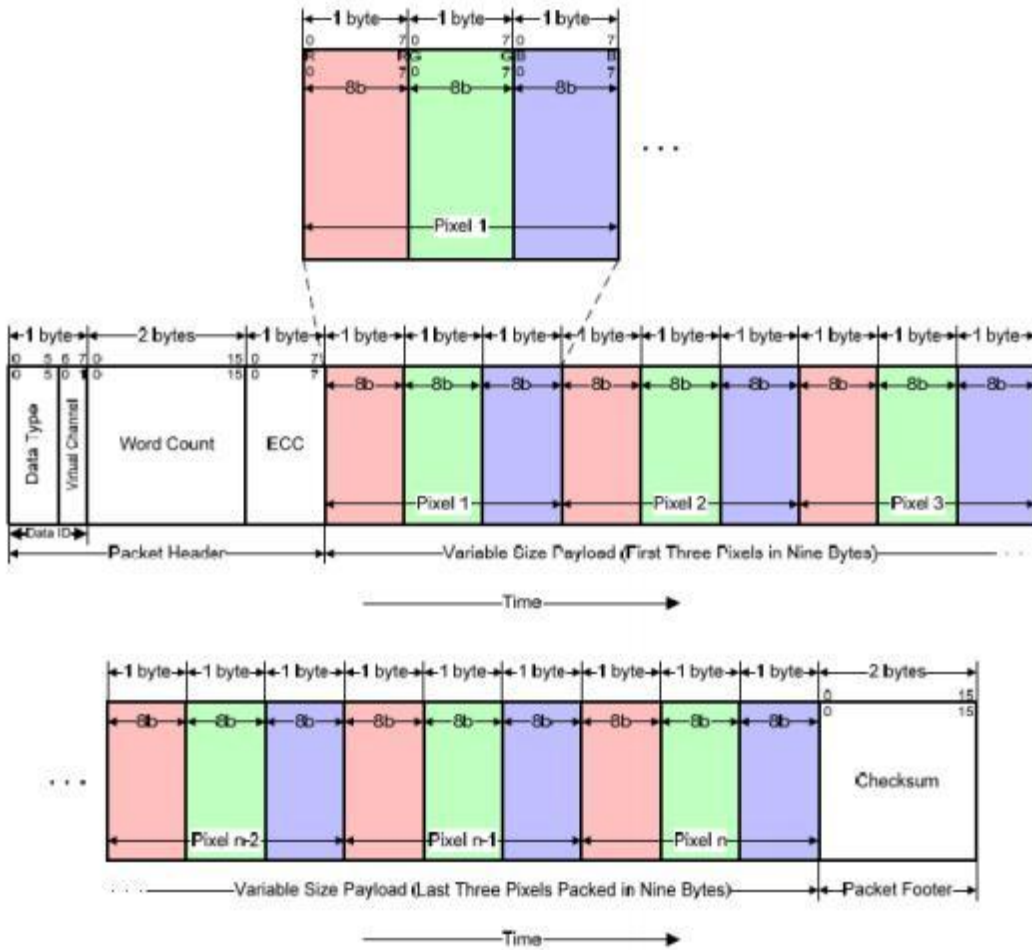


Figure 11: MIPI-DSI Timing Diagram

3 Extension Components

In addition to the interfaces listed above, the digital video output port on the main unit can be expanded to support other commonly used industrial interfaces via expansion modules, thereby meeting the diverse needs of various industries.

3.1 USB3.0 Expansion board



Figure 12: USB 3.0 Expansion Module12 USB 3.0

3.1.1 Function Introduction

- Standard Type-C interface
- Board power consumption: $\leq 200\text{mW @}5\text{V}$ (TBD)
- Serial port baud rate: 115200bps, 8N1
- Support UVC video protocol
- Built-in hot-swap protection
- Driver-free for Win7/Win10; dedicated driver required for matching upper computer software

3.1.2 Application Description

Dedicated digital video acquisition board for iSE1212 core, supporting video transmission and serial control. Compatible with Uncooled Infrared Camera Application for core configuration and video preview. Refer to separate **USB3.0 Expansion Board User Manual** for details.

3.2 SDI Expansion Board



Figure 13 SDI Expansion Module

3.2.1 Function Introduction

- Support HD-SDI / 3G-SDI
- Max 1080P@50/60Hz
- Board power consumption: ~0.6W

3.2.2 Application Description

Support HD-SDI/3G-SDI video transmission and serial control. Refer to **SDI Expansion Board User Manual**.

3.3 HDMI Expansion Board



Figure 14 HDMI Extension Module

3.3.1 Function Introduction

- Standard HDMI interface
- Board power consumption: $\leq 350\text{mW @}5\text{V}$ (TBD)
- Support high-definition video transmission and device configuration

3.3.2 Application Description

Convenient HD video acquisition and transmission for industrial and civilian scenarios. Refer to **HDMI Expansion Board User Manual**.

3.4 GigE Expansion Board



Figure 15: GigE Expansion Module

3.4.1 Function Introduction

- Gigabit Ethernet (GigE) interface
- Board power consumption: $\leq 900\text{mW @}5\text{V}$ (TBD)
- Compliant with GigE Vision industrial vision standard
- High-speed long-distance image transmission

3.4.2 Application Description

Support GigE Vision protocol for industrial image acquisition, long transmission distance and flexible network topology. Refer to **GigE Expansion Board User Manual**.

3.5 CameraLink Expansion Board



Figure 16: CameraLink Expansion Module

3.5.1 Function Introduction

- Standard CameraLink interface
- Board power consumption: $\leq 250\text{mW @}5\text{V}$
- High-speed anti-interference video transmission
- Integrated device configuration function

3.5.2 Application Description

High-speed data transmission for machine vision systems with multi-frame cache, suitable for high real-time and high-definition imaging scenarios. Refer to **CameraLink Expansion Board User Manual**.

3.6 VPC Expansion Board



Figure 17 VPC Extension Components

3.6.1 Function

3.6.2 Application

Refer to dedicated **VPC Expansion Board User Manual** for detailed specifications and operation.

4 FAQ

4.1 Application Demonstration



Figure 18: Application Demo

4.2 Frequently Asked Questions

Q1: PC software fails to connect the device

Troubleshooting Steps:

- Check USB driver installation status in Windows Device Manager.
- Disable built-in laptop camera to avoid resource conflict.
- Verify PC USB port and USB3.0 cable compliance.
- Close all camera software, power cycle the core and retry manual connection.

5 Serial Communication Protocol

Refer to separate **Up/Down Serial Communication Protocol Document**.


6 Mechanical Interface Drawing


Refer to 2D & 3D structural drawings.

7 Mechanical Installation Guide

To prevent damage to the movement caused by improper handling during installation and use, the following precautions are provided for your reference.

7.1 Output Image Orientation

For units shipped with the camera module attached, the module itself can output clear infrared images. Please ensure that the module is installed in the correct orientation relative to the entire device and that the image is oriented correctly. The correct orientation is indicated by an icon  in the 2D structural diagram..

If the camera module is shipped without a lens, please install a compatible lens yourself. The camera module can only produce clear infrared images when equipped with a suitable lens. When installing the camera module, pay attention to the image orientation. The structural 2D diagram uses an icon  to indicate the correct image orientation (default configuration: a standard infrared lens with a 180-degree image inversion) and uses “(1,1)” to mark the pixel corner at the first row and first column of the detector’s pixel array to assist in verification.

7.2 Design & Installation Space Reservation

Reserve sufficient assembly margin to compensate optical tolerance and structural cumulative tolerance.

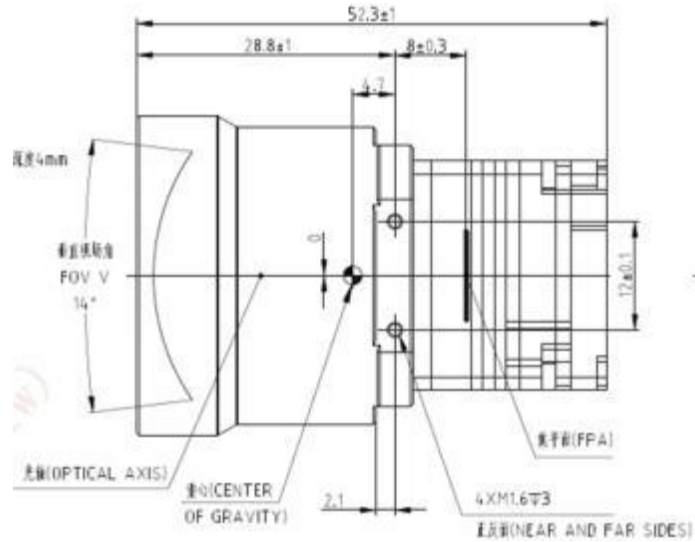


Figure 19: Installation Diagram

7.3 Installation Method & Notes

The thermal cores are typically secured using clamping mechanisms or screws.

- a) If clamping with structural components, select an area with a large contact surface and avoid direct contact on both sides as much as possible. It is recommended that the pressure on a single side not exceed 20 N;
- b) If securing with screws, ensure that the screw engagement length is at least 4 threads, and that the length does not exceed the specified maximum depth. It is recommended to apply the recommended torque. Common thread specifications are shown in Table 7;

Table 7: Recommended Torque Values for Common Thread Sizes

Deployment Environment	Thread Specifications	Recommended tightening torque
The entire unit is securely fastened, with screws fastened to the structural components	M1.2×0.25	4cN·m±15%
	M1.4×0.3	6cN·m±15%
	M1.6×0.35	9cN·m±15%
	M2.0×0.4	18cN·m±15%
	M2.5×0.45	36cN·m±15%
	M3.0×0.5	63cN·m±15%
The screws are mounted directly onto the circuit board	M1.2×0.25	2cN·m±15%
	M1.4×0.3	3cN·m±15%
	M1.6×0.35	4.5cN·m±15%

	M2.0×0.4	9cN·m±15%
	M2.5×0.45	18cN·m±15%
	M3.0×0.5	32cN·m±15%

c) If other circuit board components or FPC cables are installed at the rear of the module, refer to Table 7 to determine the recommended torque values based on whether the screws are secured to structural components or directly to the circuit board. Disassembling the module is not recommended. If disassembly is necessary under special circumstances, observe the following precautions:

Disassembling the module is not recommended. If disassembly is necessary under special circumstances, observe the following precautions:

d) When tightening or removing screws, follow a diagonal crisscross pattern, tightening or loosening them gradually rather than all at once. As shown in Figure 20, tighten them in the order of 1, 3, and 2, 4.;

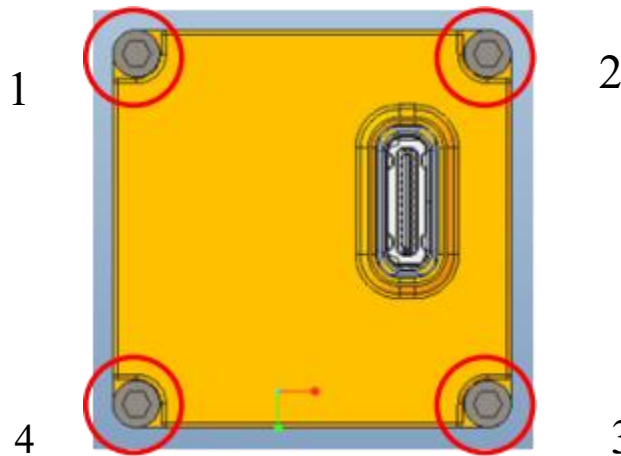


Figure 20: Interface Board Installation Diagram

We recommend using a torque wrench or torque screwdriver. First, pre-tighten the screws to the structural components using a lower torque setting, then retighten them to the recommended torque value.

If you encounter a situation as shown in Figure 21—where screws 1 and 3 secure the main unit, and screws 2 and 4 secure the interface board, with screws 2 and 4 extending into the interior of the main unit—you must install and tighten them in sequence by layer. Again, pre-tighten them with a low torque first to prevent abnormal stress distribution within the main unit, and then tighten them to the recommended torque.

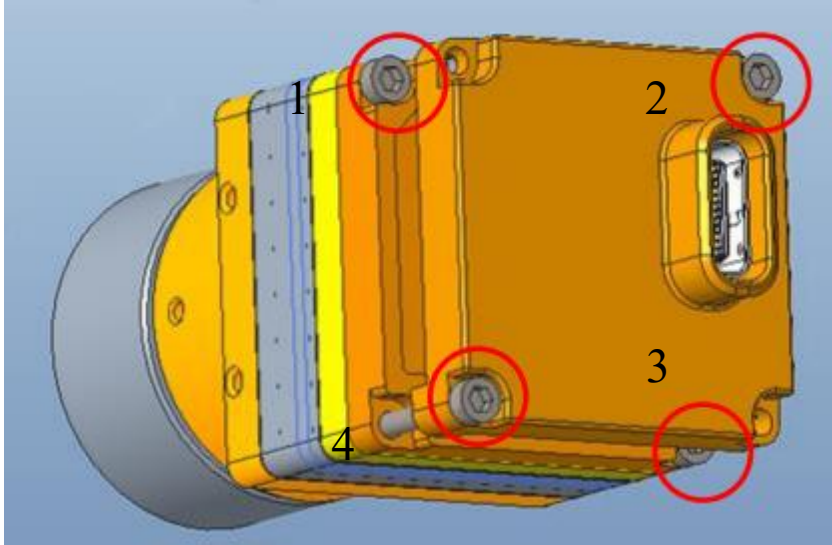


Figure 21: Movement Assembly Diagram