L1280

Uncooled Thermal Imaging Module

Product Manual

V1.0.0

Version History

Version	Date	Descriptions
V1.0.0	2024-07	Initial release

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1. Product Descriptions

The L1280 uncooled thermal imaging module is the smallest 1280 array solution on the market, designed for UAS and ADAS. It features LWIR detector with a pixel size of 12μm and an array format of 1280×1024. It supports various serial communication and video output interfaces while providing a selection of lightweight infrared lenses. This series of products can be widely used in electro-optical payloads, vision enhancement devices, machine vision, scientific research, and other fields.

2. Lens Options

Table 2.1 Optional Lenses

Array Format	E.F.L./F#	Lens Type	FOV (H×V)	IFOV
1280×1024	10mmF1.2	Athermal	78°(H)×64.9°(V)	1.200mrad
	35mmF1.0	Athermal	24.6°(H)×19.8°(V)	0.343mrad
	50mmF1.2	Athermal	17.4°(H)×14°(V)	0.240mrad
	75mmF1.2	Athermal	11.6°(H)×9.3°(V)	0.160mrad

3. Product Performance Parameters

Table 3.1 Product Performance Parameters

Product Model	1280	1280 Radiometric
Performance Indicators		
Detector Type	VOx Uncooled IRFPA	
Resolution	1280×1024	
Pixel Pitch	12μm	
Frame Rate	30Hz	
Spectral Range	8～14μm	
NETD	≤50mK@25℃,F#1.0	
Image Adjustment		
Brightness &Contrast Adjustment	Manual/Auto	
Polarity	Black-hot/White-hot	
Color Palettes	Support (1)	

Image Processing	w/o TEC NUC	
	DNR	
	DDE	
Image Mirror	Up-down/Left-right/Diagonal	
Power Supply		
Power Supply Range	4.0~5.5VDC(2)	
	The user expansion component supports 4.1~5.5VDC(2)	
Typical Voltage	5VDC	
Typical Power Consumption	1.1W	1.2W
	0.9W (3)	1W(3)
Interfaces		
Digital Video	14Bit or 8Bit LVCMOS(4)	
	BT1120	CDS2
	MIPI(4)	
	USB3.0	
Control Interface	UART(3.3V)	
Radiometric Function		
Temperature Measurement Range	For radiometric modules: -20℃～+150℃, 100℃～+650℃	
Temperature Measurement Accuracy	For radiometric modules: ±2℃ or ±2% of the reading(The larger value shall prevail) @ambient temperature 15℃～35℃	
Temperature Measurement Tools	Spot, line, region for secondary analysis	
Physical Properties		
Weight	24.5g(5)	
Dimension	29mm × 29 mm × 18.9mm(5)	
Environmental Adaptation		
Operating Temperature Range	-40℃～+70℃ (-20℃~60℃ for radiometric function)	
Storage Temperature Range	-45℃～+80℃	
Humidity	5~95%, no condensation	
Vibration	6.06g, random vibration, three-axis, six-direction	
Shock	80g, 4ms, trailing edge sawtooth wave, three-axis, 6-direction	

Note:

(1) Color palettes function is unavailable for LVCMOS;

(2) Different input voltages for standard cores result in varying power consumption performance;

(3) The power consumption is tested at 25°C and does not include the interface board power consumption;

(4) LVCMOS and MIPI digital video are only supported in the Hirose 70-pin interface;

(5) *Weight and dimensions are module parameters, excluding optical components, rear shell, and expansion boards.*

4 User Interface Description

The module's user interface uses a Hirose 70-pin DF40C-70DP-0.4V(51) connector, which includes the module's power supply interface, UART communication interface, BT.1120 digital video interface, 8-bit/14-bit LVCMOS digital video interface, 2-lane MIPI digital video interface, and 4 GPIO, among others. Users can connect with the module's user interface with a Hirose 70-pin DF40HC(3.0)-70DS-0.4V(51) board-to-board connector.

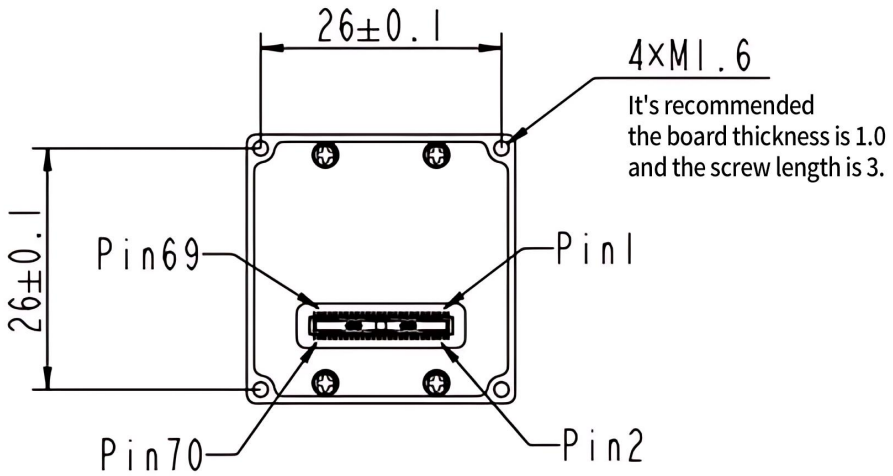


Figure 4.1 User Interface

4.1 Definition of Hirose 70-pin Connector

Table 4.1 Definition of Hirose 70-pin Connector

Pin No.	Pin Name	Type	Description
1, 2, 3, 4	Main Power	Power	Power input(4～5.5VDC) (1)
5, 7	1.8V	Power	Digital power input 1.8V
6, 8	3.3V	Power	Digital power input 3.3V
13	UART_TX	Output	UART serial communication interface

Pin No.	Pin Name	Type	Description	
14	UART_RX	Input	(3.3V)[2]	
30	DV0	Output	14Bit or 8Bit LVCMOS 16bit BT.1120/CDS2 (1.8V)	Data signal LSB
29	DV1			Data signal
32	DV2			Data signal
31	DV3			Data signal
34	DV4			Data signal
33	DV5			Data signal
36	DV6			Data signal
35	DV7			MSB(8bit)
38	DV8			Data signal
37	DV9			Data signal
40	DV10			Data signal
39	DV11			Data signal
42	DV12			Data signal
41	DV13			Data signal MSB(14bit)
44	DV14			Data signal
43	DV15			Data signal MSB(16bit)
46	Frame_Valid			Frame valid signal
45	Line_Valid			Line valid signal
47	Clock_OUT			Clock signal
48	EXT_SYNC	Input	Reserved external trigger(3.3V)	
15	GPIO0	Input/Output	Reserved GPIO(1.8V)	
17	GPIO1			
58	GPIO2			
60	GPIO3			
57	MIPI_DATA1+	Output	Reserved 2 Lane MIPI	
59	MIPI_DATA1-			
62	MIPI_DATA2+			
64	MIPI_DATA2-			
61	MIPI_CLK+			
63	MIPI_CLK-			
16, 18, 23, 24, 25, 26, 51, 52, 53, 54, 65, 66, 67, 68	--	--	Not available, suspended	

Pin No.	Pin Name	Type	Description
9, 10, 11, 12, 19, 20, 21, 22, 27, 28, 49, 50, 55、56, 69, 70	GND	Power	Power Ground

Note:

(1) The voltage for Main Power is 5VDC. The voltage values mentioned here refer to the voltage at the module connector. The power-up time (10% to 90%) is less than 4mS, peak current is greater than 1.0A, and ripple and noise are less than 40mVp-p.

The following diagram illustrates the power-up timing for Main Power, 3.3V, and 1.8V:

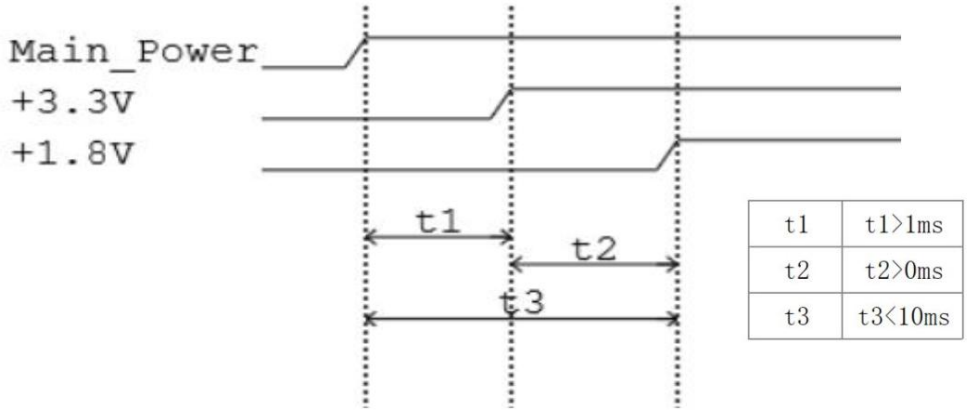


Figure 4.2 Module Power-up Timing Diagram

(2) In the serial communication interface, TX and RX both refer to the transmission and reception of the module.

4.2 Digital Video

In the digital video output interface, the imaging core defaults to output BT.1120, while the radiometric core defaults to output CDS2.

4.2.1 14bit or 8bit LVCMOS Digital Video

The module supports the output of 14-bit or 8-bit LVCMOS digital video. This digital video includes one clock signal (Clock), one line valid signal (Line_Valid), one frame valid signal (Frame_Valid), and 14 data signals (DV0-DV13).

The pixel data can be either 14-bit or 8-bit:

When the user selects outputting raw data (ORG) or non-uniformity correction (NUC) data, the data is 14-bit, i.e., DV[13:0], where DV0 is the least significant bit (LSB), and DV13 is the most significant bit (MSB).

When the user selects outputting image-processed (DRC) data, the data is 8-bit, i.e., DV[7:0], where DV0 is LSB, and DV7 is MSB.

When choosing to use 8-bit LVCMOS digital video, it supports brightness/contrast adjustment, polarity selection, but does not support pseudo-color selection and image mirroring.

Table 4.2 LVCMOS Clock Frequency

Product Model	Clock Frequency (Clock)
1280	87.931MHz

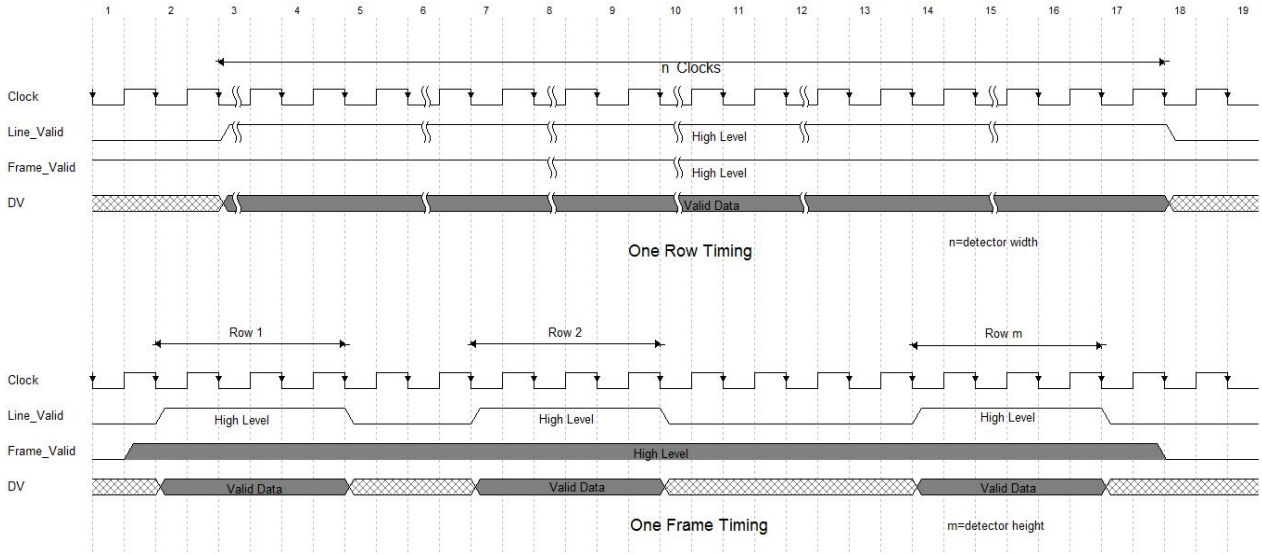


Figure 4.3 14bit or 8bit LVCMOS Digital Video Timing

Note:

(1) DV is recommended to be sampled on the rising edge of the Clock.

(2) Line_Valid and Frame_Valid are both active-high signals.

(3) After Line_Valid becomes active, data remains valid for n Clock cycles, corresponding to the first column to the last column of that row.

4.2.2 BT.1120 Timing

The module supports the output of 16-bit BT.1120 digital video. This digital video includes one clock signal (Clock), one line valid signal (Line_Valid), one frame valid signal (Frame_Valid), and 16 data signals (DV0-DV15).

The pixel data is 16-bit, the data array is 1280*1024, the image format is YUV422, and the timing diagram is as follows:

Table 4.3 BT.1120 Clock Frequency

Product Model	Clock Frequency (Clock)
1280	87.931MHz

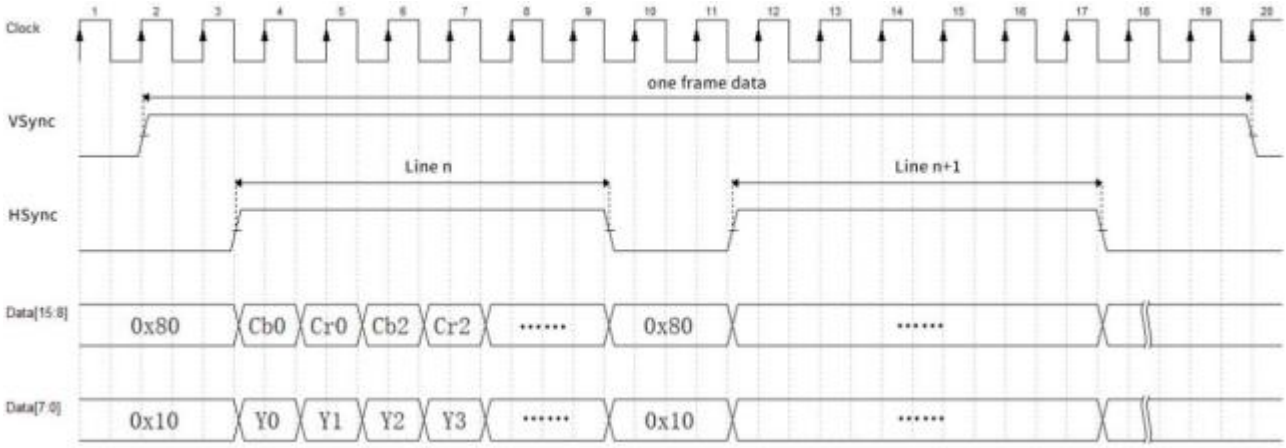


Figure 4.4 Timing of BT.1120 Digital Video in External Sync Mode

Table 4.4 Timing of BT.1120 Digital Video in Internal Sync Mode

Invalid Line Reference Code EAV 0xB6B6	Blanking Area 0x8010	Invalid Line Reference Code SAV 0xABAB	Invalid data 0x8010
Valid Line Reference Code EAV 0x9D9D	Blanking Area 0x8010	Valid Line Reference Code SAV 0x8080	Valid data area CbYCrY The valid data area is 1280*1024 for thermal imaging modules with 1280*1024 array format.
Invalid Line Reference Code EAV 0xB6B6	Blanking Area 0x8010	Invalid Line Reference Code SAV 0xABAB	Invalid data 0x8010

4.2.3 CDS2 Timing

The module supports the output of 16-bit CDS2 digital video. This digital video includes one clock signal (Clock), one line valid signal (Line_Valid), one frame valid signal (Frame_Valid), and 16 data signals (DV0-DV15).

The pixel data is 16-bit, the data array is 2560*1024, with the left 1280*1024 image format as YUV422 and the right 1280*1024 radiometric format as Raw16. The timing diagram is as follows:

Table 4.5 CDS2 Clock Frequency

Product Model	Clock Frequency (Clock)
1280	87.931MHz

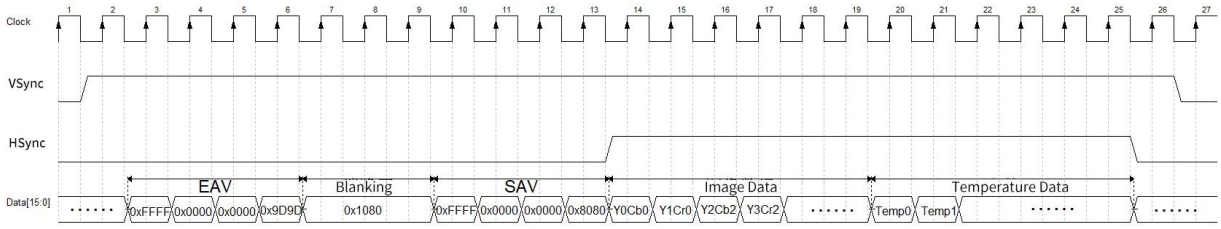


Figure 4.5 Timing of CDS2 Digital Video

Note:

"Temp" represents temperature data (with the valid data bits being the lower 14 bits, and the higher two bits padded with zeros)

4.2.4 MIPI Protocols

This product uses a 2-lane MIPI interface, which includes one pair of source-synchronous differential clocks (MIPI_CLK+, MIPI_CLK-) and two pairs of differential data lines (MIPI_DATA0+, MIPI_DATA0-, MIPI_DATA1+, MIPI_DATA1-).

The clock signal enters high-speed mode at the beginning of each frame and exits high-speed mode at the end of each frame, with low-power mode between frames (both data and clock lines are at a 1.2V high level). The clock frequency is 218MHz.

At the beginning of each frame, the data lines transmit a frame start packet, and at the end of each frame, they transmit a frame end packet. Between the frame start and end packets, there are 1024 long packets of data. Each long packet contains one line of 1280*2 valid data (1280 pixels).

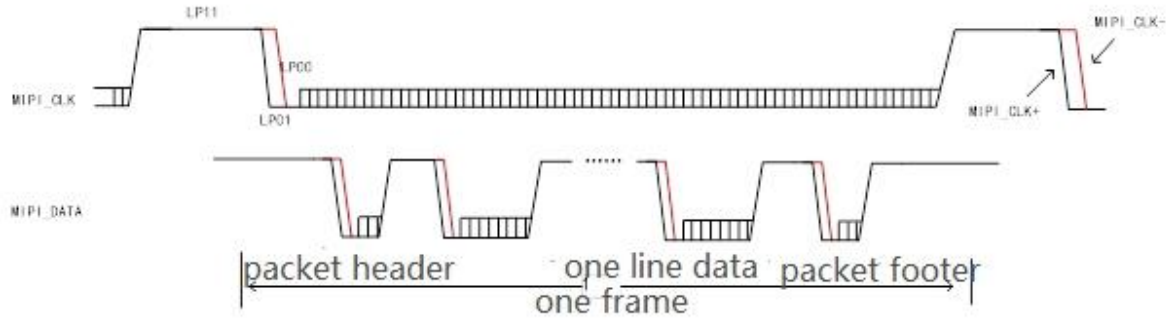


Figure4.6 A Frame of Data

After the thermal module is powered on, it starts outputting MIPI digital video. The output data format is RAW8 (standard MIPI CSI-2 protocol), and the array should be set as (1280*2) * 1024. The backend needs to splice the data into 1280*1024*16-bit data, with the low byte first. One line of valid data is image data (when pseudo-color is present, UV comes before Y, UYVY) as shown in Figure 7.

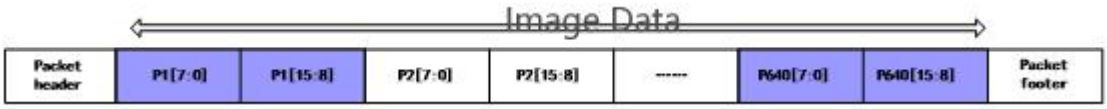
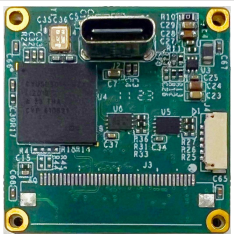


Figure 4.7 A Line of Valid Data

4.3 User Expansion Component

The L1280 series uncooled thermal imaging module can be optionally equipped with various types of user extension components to achieve signal interface conversion and functionality expansion.

Table 8 User Expansion Component

Model	Illustration	Main Interfaces	Compatible Modules
TLX04V100F016C		USB 3.0 Type C standard interface;5V power supply	1280/1280 radiometric

5 Structural Drawing

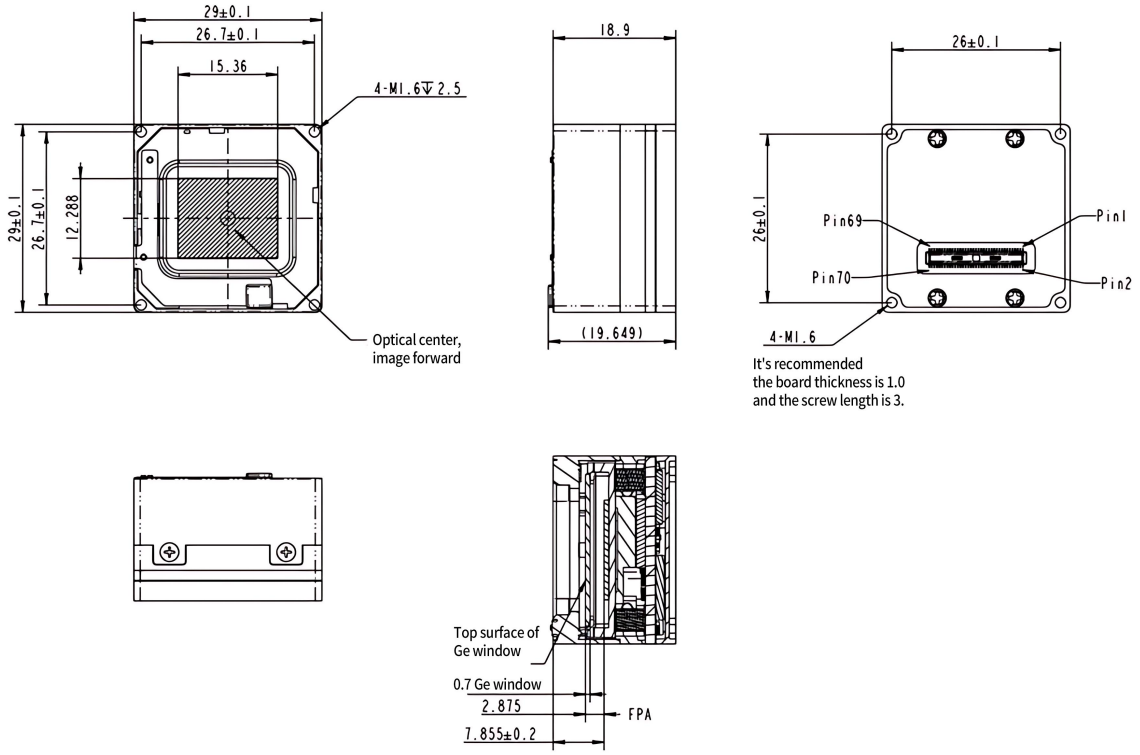


Figure 5.1 Dimensions of Module W/O Lens

6 Precautions

To protect yourself and others from injury or prevent damage to your equipment, please read the following information before using your device.

1. Avoid direct exposure of the module to intense radiation sources such as the sun.
2. The ideal operating temperature is between -20°C and 50°C.
3. Do not touch the detector window with your hands or any other objects.
4. Do not touch the equipment and cables with wet hands.
5. Avoid bending or damaging the various connecting cables.
6. Do not use solvents to clean your equipment.
7. Do not plug or unplug other cables without disconnecting the power.
8. Do not connect the provided cables incorrectly to avoid damaging the equipment.
9. Be mindful of preventing static electricity.
10. Do not disassemble the equipment. In case of malfunctions, please contact our company for professional repair assistance.