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Xcore HD Series

1280×1024/1024×768

Thermal Imaging Module

User Manual

V1.0.0

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This manual is used as a guide. The photos, graphics, diagrams and illustrations provided in the manual are only used to explain, which may be different from the specific product. Please refer to the real object. We try our best to make sure the contents in this manual are accurate. We do not provide any representations or warranties in this manual.

If you need the latest version of this manual, please contact us. IRay Photoelectric recommends that you use this manual under the guidance of professionals.

Version History

Version	Date	Description
V1.0.0	2019-3	·Initial version

1. Overview

Xcore HD series infrared thermal imaging module is designed for the applications that high definition are required. Xcore HD which is long wave infrared detector with pixel size of 12 μm and array format of 1280x1024 can provide more exquisite, larger field of view of the quality picture; supports multiple serial communication and video output interfaces, while providing a variety of lightweight infrared lens. The series of products can be widely used in optoelectric pod, visual enhancement equipment, machine vision, scientific research and other fields.

Xcore HD series has extremely small overall size , lighter weight and lower consumption and supports a variety of serial communication and video output interface , while providing a variety of optional lightweight infrared lens. It can provide us complete infrared imaging solutions such as all kinds of small hand-held telescope, helmet night vision equipment, lightweight UAV flight system and multiple light fusion and other optoelectronic products.

2. Product Model

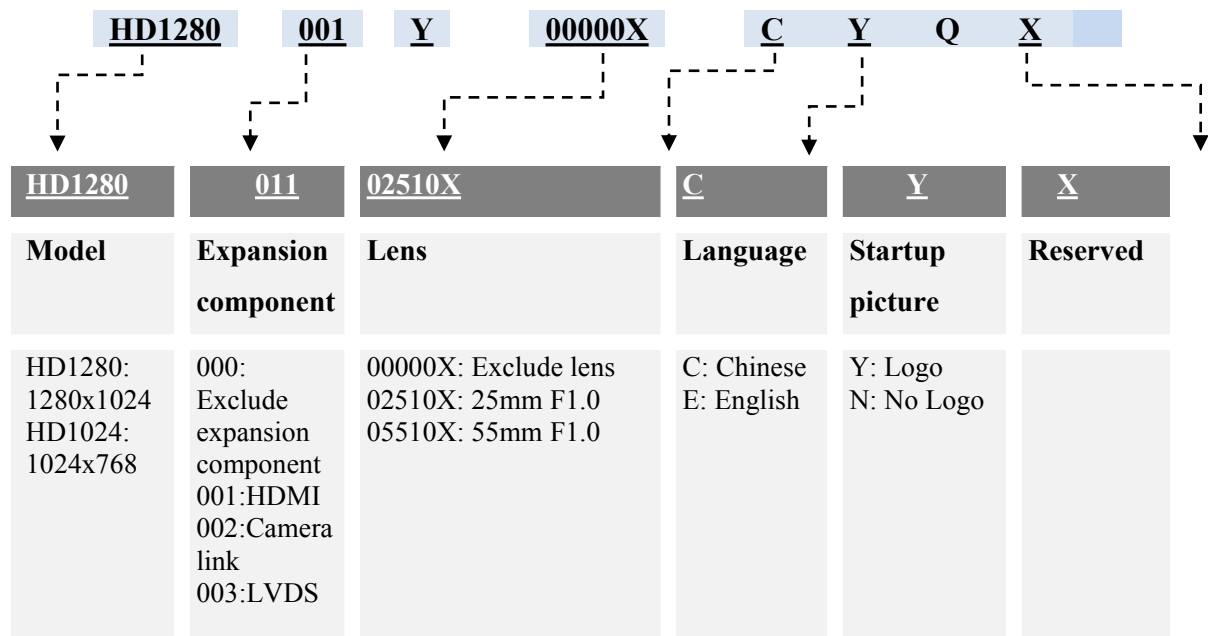


Figure 1 Product model

3. Lens Model

Table 1 HD1280 Optional lens

Focal distance	F#	Focus type	FOV Horizon*Vertical	I FOV
10mm	1.0	Athermalization	88°x70.4°	1.20 mrad
19mm	1.0	Athermalization	46.3°x37.1°	0.632mrad
25mm	1.0	Athermalization	35.2°x28.2°	0.48mrad
35mm	1.0	Athermalization	25.5°x20°	0.34mrad
55mm	1.0	Athermalization	16°x12.8°	0.218mrad
75mm	1.0	Athermalization	11.7°x9.4°	0.160mrad

Table 2 HD1024 Optional lens

Focal distance	F#	Focus type	FOV Horizon*Vertical	IFOV
10mm	1.0	Athermalization	70.4°x52.8°	1.20 mrad
19mm	1.0	Athermalization	37.1°x21.1°	0.632mrad
25mm	1.0	Athermalization	28.2°x27.8°	0.48mrad
35mm	1.0	Athermalization	20.1°x15.1°	0.34mrad
55mm	1.0	Athermalization	12.8°x9.6°	0.218mrad
75mm	1.0	Athermalization	9.4°x7.0°	0.160mrad

4. Product Performance

Table 3 Product performance parameter

Model		HD1280	HD1024
Classify	Project		
Performance index	Detector type	VOx Uncooled Infrared FPA Thermal Imaging Sensor	
	Resolution	1280×1024	1024×768
	Pixel pitch	12μm	12μm
	Frame rate	30Hz	
	Response spectra	8 ~ 14μm	
	NETD	≤50mK@25°C,F#1.0	
	TEC	Including TEC	
Image Adjustment	Brightness & contrast adjustment	Manual/Auto0/Auto1	
	Polarity	Black hot/White hot	
	Palette	Supportable ⁽¹⁾	
	Reticle	Reveal/Hidden/Shift	
	Electric zoom	1.0~4.0× Continuing Zooming (step length 0.1)	
	Image processing	Non-uniformity correction	
		Digital Filter and Imaging Denoising	
Digital Detail Enhancement			
Video mirror	Right left/Up down/Upper Left Diagonal		
Power supply	Supply voltage	5V ⁽²⁾ , ±1	
		Expansion components support 5 ~ 24VDC ⁽²⁾	
	Power protection	Over-voltage/Under-voltage/Reverse Connection	
	Typical power consumption	<2.2W	<1.8W
Interface	Digital video	14Bit or 10Bit LVCMOS ⁽³⁾	
		LVDS	
	Control interface	RS-232	
		UART (3.3V)	
Button	4 buttons		
Expansion component	HDMI/Cameralink/LVDS/LAN/USB3.0		
Physical Property	Weight	142±3g	
	Size	55mm × 55mm x26mm ⁽⁴⁾	

Environmental adaptation	Operating temperature	-40°C ~ +80°C
	Storage temperature	-45°C ~ +85°C
	Humidity	5~95% , No condensation
	Vibration	6.06g , Random vibration, three axis and six direction
	Impact	80g , 4ms , Final peak sawtooth wave , three axis and six direction
Environmental certification	ROHS2.0	

Note :

- (1)If the output video is not in BT.656 data format, the function of palette, reticle reveal/hidden/shift, electric zoom, and video mirror are not supportable;
- (2)The lower the voltage, the smaller the power consumption;
- (3)The 14Bit or 10Bit LVCMOS digital video is supportable only on the Hirose 80pin connector of module;
- (4)No interface board dimensions

5. User Interface Description

The user interface of the imaging module component adopts Hirose 80-core DF40C(4.0)-80DP-0.4V(51)connector, which includes the power supply interface of the imaging module component, rs-232 serial communication interface, UART communication interface, analog video interface, bt-1120 digital video interface, 10Bit /14Bit LVCMOS digital video interface, and 4 buttons interfaces. Users can adopt DF40HC(4.0)-80DS-0.4V(51) to implement the connection between imaging module and user expansion components.

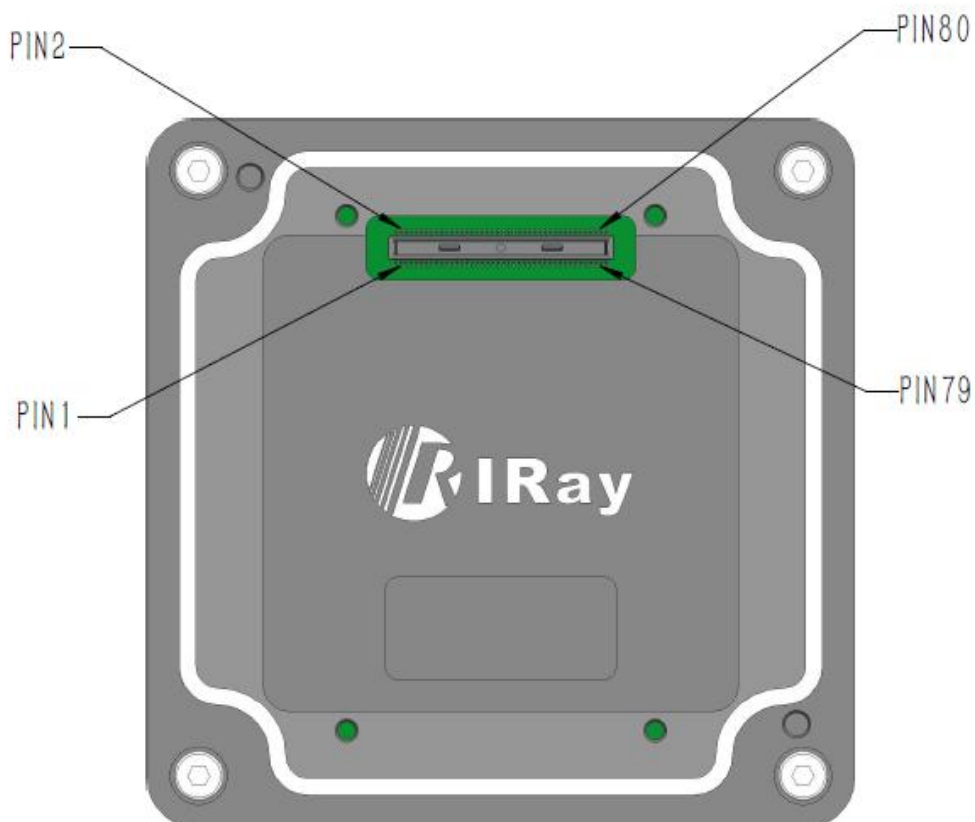


Figure 2 Hirose user interface of the imaging module component

5.1 Hirose 80 Connector Definition

Table 3 Hirose 80PINS connector definition

NO.	Name	Type	Description
1、 2、 3、 4	Power Supply	Power	Power input (4 ~ 6VDC) ⁽¹⁾
9、 10、 11、 12、 13、 14	—	—	Not available
15	RS-232_RX	Input	RS-232 Serial communication interface ⁽²⁾
16	RS-232_TX	Output	
17	UART_RX	Input	Serial communication interface
18	UART_TX	Output	
21	DV1	Output	Data
22	DV0		Data LSB
23	DV3		Data
24	DV2		Data
25	DV5		Data
26	DV4		Data
27	DV7		Data
28	DV6		Data
29	DV9		Data MSB(10bit)
30	DV8		Data
31	DV11		Data
32	DV10		Data
33	DV13		Data MSB(14bit)
34	DV12		Data
35	DV15		IO
36	DV16		IO
37	Line_Valid		Line valid signal
38	Frame_Valid		Frame valid signal
39	Clock		Clock signal
42	MOTOR_FP	Input	Motor interface
44	MOTOR_FN		
46	MOTOR_ZP		
48	MOTOR_ZN		
50	MOTOR_SDA		
52	MOTOR_SCL		
43	GPIO2	Input/Output	Universal programmable input/output interface 3.3V
45	GPIO3		
47	GPIO4		
49	GPIO5		
51	GPIO6		

NO.	Name	Type	Description
53	GPIO7		
54	GPIO0		
56	GPIO1		
72	GPIO8		
74	GPIO9		
76	EXT_SYNC		
57	LVDS_D4P	Output	Data signal
59	LVDS_D4N		Data signal
61	LVDS_D3N		Data signal
63	LVDS_D3P		Data signal
65	LVDS_D2P		Data signal
67	LVDS_D2N		Data signal
69	LVDS_D1N		Data signal
71	LVDS_D1P		Data signal
75	LVDS_CLKP		Clock signal
77	LVDS_CLKN		Clock signal
19、20、40、 41、55、58、 68、70、73、 79、80	GND	Power	Ground of power ⁽³⁾

Note :

(1) Typical value of power supply is 4VDC , setup time (10% ~ 90%) < 4mS , peak current > 1.0A , ripple&noise < 40mVp-p. All these requirements shall be met when the power supply reach to the connector on module;

(2) All the TX and RX of serial communication interfaces point to the imaging module's sending and receiving;

(3) GND and VGND are shorted internally.

5.2 Digital Video

Among the digital video interfaces, LVCMOS and BT.1120 digital video are shared hardware interfaces. Other digital video is off in default and it can be turned on through the PC software or sending the corresponding command.

5.2.1 14bit or 10bit LVCMOS Digital Video

- This imaging module can output 14bits or 10bits LVCOMS video. LVCMOS video consist of a clock signal(Clock), a line valid signal(Line_Valid), a frame valid signal(Frame_Valid) and 14 bits data signals(DV0~DV13).

- When the original data(ORG) , non-uniformity correction data(NUC) or denoising data(DNS) is selected, the video data is 14bits which is DV[13:0]. Among them, DV0 is LSB and DV13 is MSB.
- When the DRC data is selected and the data bits is 10bit which is DV[9:0]. Among them, DV0 is LSB and DV9 is MSB.

When selecting the 10bits LVCOMS digital video, the product supports the function of brightness/contrast adjustment and polarity selection, but not support the function of palette selection, reticle control, electric zoom and image mirroring.

Table 4 LVC MOS clock frequency

Product model	Clock frequency (Clock)
HD1024	36.00MHz
HD1280	45.00MHz

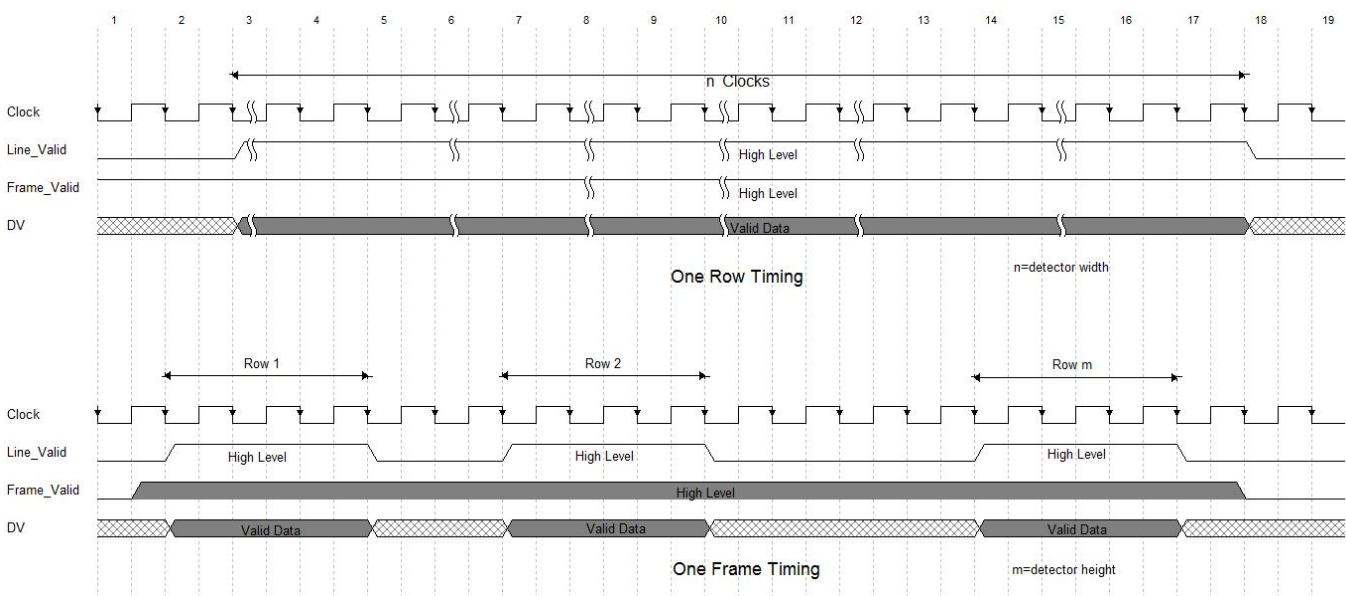


Figure 3 14bit or 10bit LVC MOS digital video timing diagram

Note :

- (1) It is recommended to sample DV data at the rising edge of clock;
- (2) The high level is valid for Line_Valid、 Frame_Valid ;
- (3) On a certain line, after the Line_Valid turns to be valid (logic '1') and lasts for n clocks, the data from column 1 to column n are valid.

5.2.2 BT.1120 Digital Video

BT.1120 digital video output signals line by line, it includes clock signals(Clock), frame valid signal, line

valid signal, 16 bits data signals (DV0-DV15). As shown in figure 6, take n*m array for example in the time diagram:

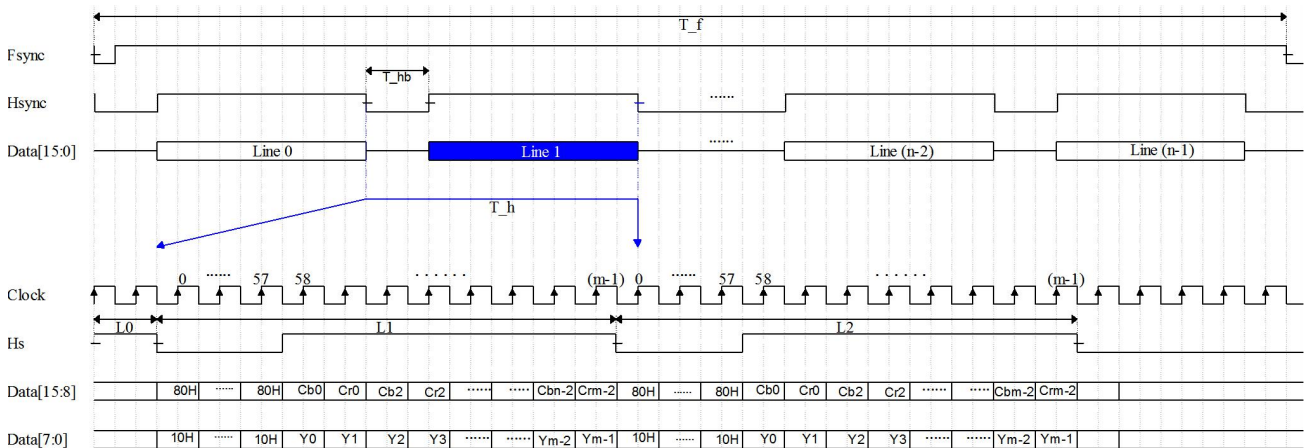


Figure 6 BT.1120 digital video sequence diagram

When BT.1120 digital video is selected, the functions like digital zoom, menu display are not supportable.

5.2.3 LVDS_H Digital Video

LVDS_H digital video includes one clock signal(LVDS_CLK), and four data signals(LVDS_DATA1, LVDS_DATA2, LVDS_DATA3 and LVDS_DATA4). It is convenient to be parsed by mainstream encode/code chip.

LVDS_H digital video can be turned on/off by control command. When it is turned on, original data(RAW), nonuniformity correction data (NUC) and image processing data can be selected.

When the original data (RAW) and nonuniformity correction data (NUC) are selected, function of polarity selection, digital zoom, digital detail enhancement, digital filter and imaging denoising and menu are not supportable.

When data after image processing (DRC) is selected, function of digital zoom and menu are not supportable.

When data after image processing (DRC) is selected, function of digital zoom and menu are not supportable.

Table 5 LVDS_H clock frequency

Model	LVDS_CLK
HD1024	63.00MHz
HD1280	78.75MHz

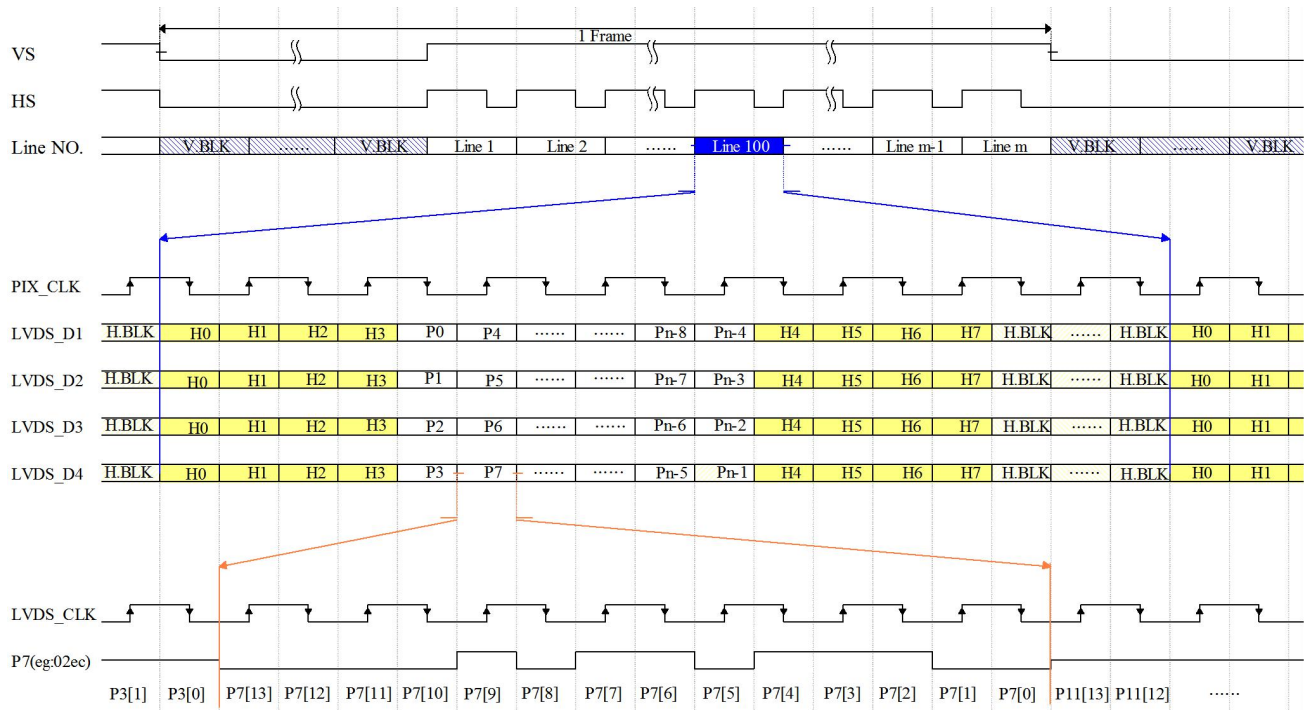


Figure 5 LVDS_H digital video sequence diagram (n*m array)



Table 6

	H0	H1	H2	H3	H4	H5	H6	H7
BLANK LINE	3FFF	0000	0000	2AC0	3FFF	0000	0000	2D80
VALID LINE	3FFF	0000	0000	2000	3FFF	0000	0000	2740

5.3 User Expansion Component

There are different user expansion components for Xcore HD series infrared thermal imaging module and can implement the conversion among different interfaces and expansion functions.

Table 6 User expansion components

Model	Expansion Component Figure	Interface	User connector
HD00-V110F015C		<ul style="list-style-type: none"> ● Power supply: 5~24VDC, typical voltage:12VDC ● USB ● HDMI digital video 	USB Type C HDMI Type A connector
HD00-V110F008C		<ul style="list-style-type: none"> ● Power supply: 3.5~18 VDC, typical voltage:12 VDC ● USB ● HDMI digital video 	USB Type C Camera link connector

6. Announcements

To protect you and others from injury or to protect your equipment from damage, please read all of the following information before using your equipment.

1. The product shall not face towards the sun or other high-intensity radiation sources directly;
2. The optimal environment temperature for operating is $-20\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$;
3. The detector window shall not be touched or hit with hands or other objects;
4. The equipment and cables shall not be touched with wet hands;
5. Scrubbing your equipment with diluents is prohibited;
6. All the cables shall not be bended or destroyed;
7. Should not unplug and plug cables when the power is on;
8. Wrong cable should not be connected in case that brings damages to the equipment;
9. Please pay attention to prevent static electricity;
10. Please do not disassemble the equipment. If there is any fault, please contact us, and professional personnel will carry out maintenance.

7. Supports and Services

7.1 Technical Supports

1. Refitting and designing schemes according to users' application requirements ;
2. Providing professional and systematic technical training for users and operators ;

7.2 After-sales Services

Xcore HD is developed and manufactured by IRay. It has good after-sales service guarantees such as technical support and equipment maintenance. If you have any questions, please contact us.

8. Company Information

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