15-300mm F4

Thermal Imaging System Specification

15-300mm F4 Thermal Imaging System Specification is an advanced MWIR cooled thermal imaging used for long-distance detection. The highly sensitive MWIR cooled core with 640x512 resolution can produce very clear image with very high resolution; the 15mm～300mm continuous zoom infrared lens used in the product can effectively distinguish targets such as people, vehicles and ships in long distance.

Figure1 Thermal imaging image

1 Technical Specification

1.1 Detector

Detector	MCT 640 ×512
Spectral range	3.7 ~4.8μm
Pixel pitch	15μm
Cooling method	Stirling Refrigerator

1.2 Lens

Focal length	15 ㎜～300 ㎜ continuous zoom
F	4

1.3 Performance

FOV range	1.83°(H) ×1.46°（V）to 36.5°(H) ×29.2°（V）
Cooling time	≤8 minutes in normal temperature
Video Output	standard PAL format analog video signal
Frame Frequency	50Hz
NETD	≤25mk@25℃
Power source	DC 24 ~32 V, with power reverse polarity protection
Power consumption	≤15W@25℃, steady state ≤30W@25℃, start-up peak
Operation Temperature	-30℃~55℃
Storage Temperature	-40℃~70℃

1.4 Command and Control

Control communication	RS232
Correction	manual correction/background correction
Polarity control	white hot/black hot switch
Electronic Zoom	×2/×4 electronic zoom
Image enhancement	Yes
Cross display	Yes
Image turning	Horizontal/vertical

2 Physical Parameters

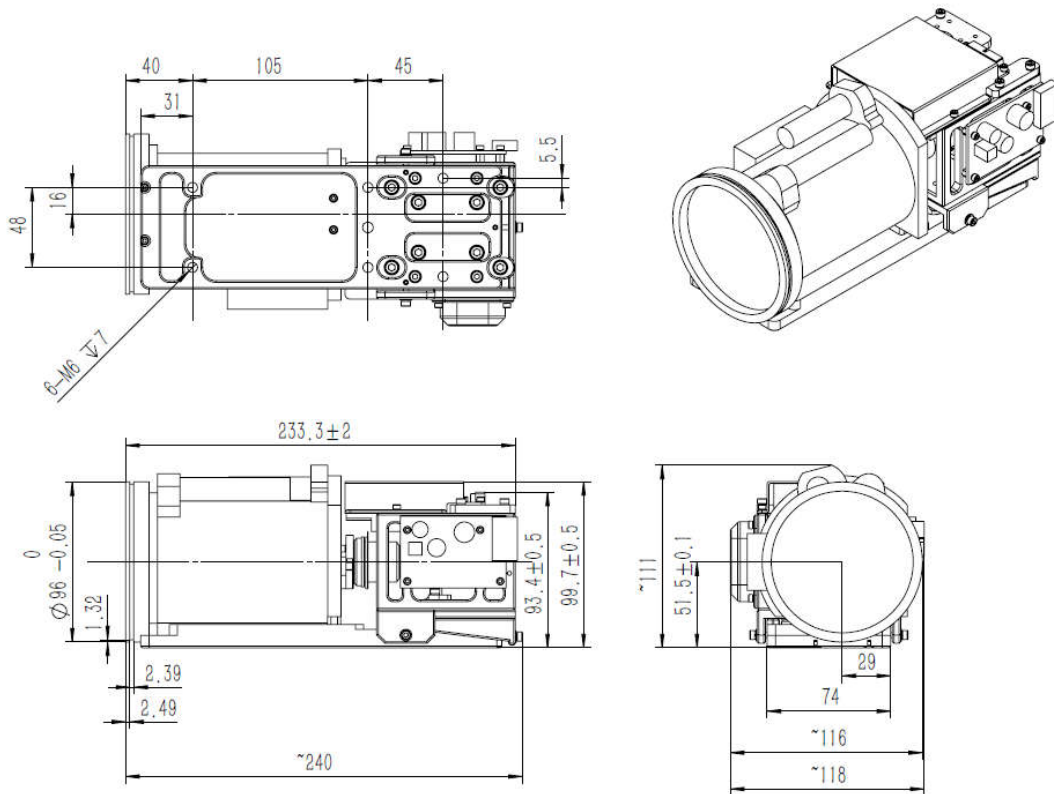|	
Weight	≤2200g
Sizes	see below

Figure2. Mechanical size illustration

3 Core Electrical Interface Definition

Table 1. Connector (HARWIN:M80-5401605) pin definitions

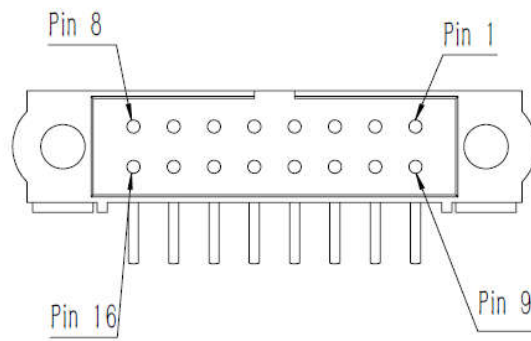| Pin Number	Definitions
1,9	Power +, input
2,10	Power -, input
3	Video + output
11	Video GND
4	RS422_A
12	RS422_B
5	RS422_Z
13	RS422_Y
6	RS232_RX
14	RS232_TX
7	GND
15	GND
8	SER_LVDS_OUT-
16	SER_LVDS_OUT+

Figure3. M80-5401605 pin sequence diagram

4 Communication protocol

4.1 Electrical Interface Description for Communication Channel

Communication between the thermal infrared imager and the host is achieved via an RS232 asynchronous serial communication interface, whose serial port setting is as follows:

Baud rate: 19200 bps

Start bits   1 bit

Stop bits: 1 bit

Verification: None

      Data bits: 8 bit

The parameters listed above may be different in practice, subject to requirement of the client.

4.2 Software Interface Description for Communication Protocol

a) The host controls the certain action of the thermal infrared imager by sending commands to the thermal infrared imager through the serial port; communication command is sent in given packet format; if the

interval between characters of the packet sent from the host to the thermal infrared imager is over 10ms, the imaging system may decline to implement the command.

b) Packet Protocol

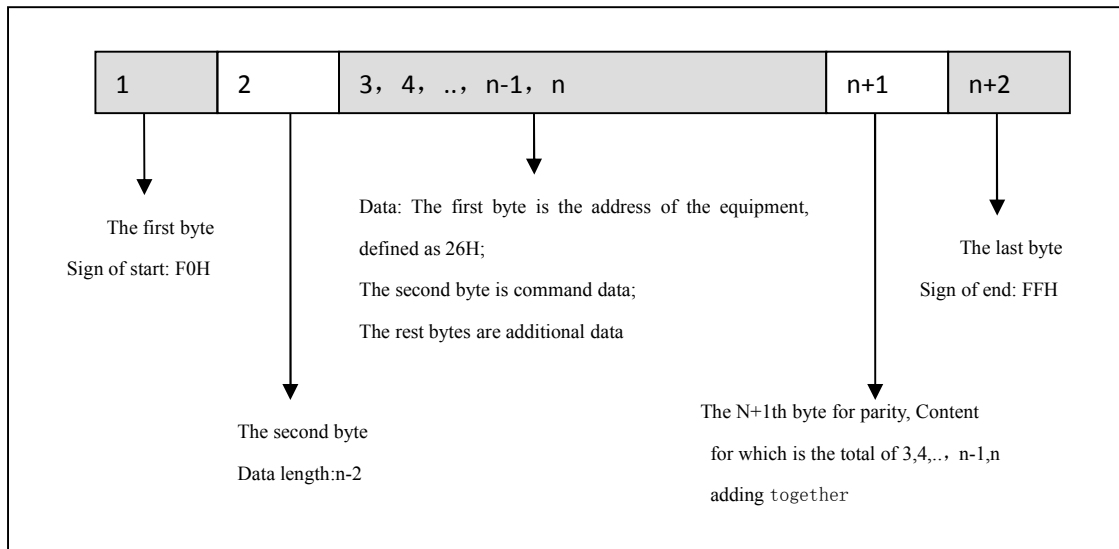Packet protocol is defined in Figure 4: Packet Protocol.

Figure4 Packet Protocol

Table2. Communication data packet protocol explanation

Data packet protocol	Explanation
Start sign	1 byte, hex value FOH
Data length	1 byte, X
Data	Data of X bytes
Checksum	low 8 bytes for the sum of X bytes
End sign	1 byte, hex value FFH
Data Link Escape Character	In the packet, if "FOH" emerges in data other than the signs of start and end, i.e. data between the second and N+1th, it should be changed to "F5H 00H"; "FFH" should be changed to "F5H 0FH"; "F5H" should be changed to "F5H 05H".

Note data length	Data length of the packet shall be determined by the number of effective data, and there is no need for bytes of the escape character to be added in.

4.3 Communication Protocol Control Commands List

Communication protocol control commands list—pool of commands that can be sent from the host. See Table 3.

Table3 Communication Protocol Control Commands List

Name of Command	Equipment Address	Function Code	Additional Data	Notes
Status Inquiry	26H	00H		With feedback
background correction	26H	02H		
manual correction	26H	03H		
Crosshair display	26H	04H	1 byte. 00H is for crosshair hiding ; 0FH is for crosshair showing	
Polarity setting	26H	05H	1 byte. 00H is for white hot; 0FH is for black hot	
Gamma adjustment	26H	06H	1 byte, 1~23, default value is 8.	
Auto correction setting	26H	07H	1 byte. 00H is for off; 0FH is for on	Automatic manual correction, default setting off
Electronic zoom setting	26H	08H	1 byte. 00H is for off; 0FH is for on	
Video gain setting	26H	09H	1 byte. 0~255. Default value is 128	
Video brightness setting	26H	0AH	1 byte. 0~255. Default value is 128	
Crosshair X coordinate	26H	0BH	2 bytes. 0~65535 from low to high	
Crosshair Y coordinate	26H	0CH	2 bytes. 0~65535 from low to high	
Image enhancement	26H	0EH	1 byte. 00H is for off; 0FH is for on	
DDE setting	26H	77H	1 byte, 0~255.	

Focus position value setting	26H	18H	3bytes,first byte is"12H" 2~3byte:0~65535 from low to high	
Zoom position value setting	26H	18H	3bytes,first byte is"22H" 2~3byte:0~65535 from low to high	
Inquire Focus & zoom position value	26H	1DH	1byte,00H	
Inquire max and min values of Focus & zoom position	26H	1DH	1byte,20H	
Read accumulated working time	26H	1DH	10H	
Automatic blind element processing	26H	57H	3bytes: 1byte:64H 2byte:51H 3byte:62H	Doing automatic blind processing requires the thermal imager to face the uniform background.
System reset	26H	80H		Restore the default setting for parameters of the thermal imager

The commands listed above may be different in practice, subject to requirement of the client. The set ID is 26H, but it can be changed according to application environment.

4.4 Communication Protocol Feedback Commands List

Communication protocol feedback commands list – pool of the thermal infrared imager feedback commands.

Instead of actively sending data, the thermal infrared imager only responds when it receives "status inquiry" command. Its responding packet conforms to "communication packet protocol".

Table4. Communication Protocol feedback commands list

Responding packet	Equipment address	Function Code	Additional Data
Status inquiry	26H	00H	The first byte: B0：Crosshair display, 0 is off, 1 is on; B1：Polarity indication, 0 is white hot, 1 is black hot; B2：Auto correction setting, 0 is off, 1 is on; B3：electronic zoom setting, 0 is off, 1 is on; B5：Image enhance setting, 0 is off, 1 is on; The rest are reserved, setting as 0. The second byte: video gain. The third byte: video brightness. The fourth and fifth bytes: crosshair X coordinate, from low to high. The sixth and seventh bytes: crosshair Y coordinate, from low to high. The eighth byte: Gamma From the ninth to the sixteenth bytes: reserved.
Inquire Focus & zoom position value	26H	1DH	The first byte:06H,cmd type 2~3byte: temperature of core 4~5byte: zoom position value 6~7byte: focus position value
Inquire max and min value of Focus & zoom	26H	1DH	The first byte:28H,cmd type 2~3byte: Min value of focus position 4~5byte: Max value of focus position 6~7byte: Min value of zoom position 8~9byte: Max value of zoom position

position			
Inqure working time	26H	1DH	The first byte:16H 2~5byte：working time ，from low to high， 1LSB=1s 6~7byte：Boot times ，from low to high, The rest are reserved

The commands listed above may be different in practice, subject to requirement of the client. The set ID is 26H, but it can be changed according to application environment.

5 Digital video interfaces

LVDS transmission chip MAX9257 (use MAX9258 to receive). Definitions are in Table 5.

Table 5. LVDS signal list

MAX9257	Digital image definition
Din0	Pxl_D0：image data，the 0th（the lowest）
Din1	Pxl_D1：image data，the 1th
Din2	Pxl_D2：image data，the 2nd
Din3	Pxl_D3：image data，the 3rd
Din4	Pxl_D4：image data，the 4th
Din5	Pxl_D5：image data，the 5th
Din6	Pxl_D6：image data，the 6th
Din7	Pxl_D7：image data，the 7th
Din8	Pxl_D8：image data，the 8th
Din9	Pxl_D9：image data，the 9th
Din10	Pxl_D10：image data，the 10th
Din11	Pxl_D11：image data，the 11th
Din12	Pxl_D12：image data，the 12th
Din13	Pxl_D13：image data，the 13th（the highest）

HSYNC	HS：line synchronized and high efficient
VSYNC	FS：field synchronized and high efficient
PCLK	Pxl_Clk：pixel clock
Others	Reserved

Data time sequence which is transmitted to MAX9257 transmission chip is showed in the following figure.
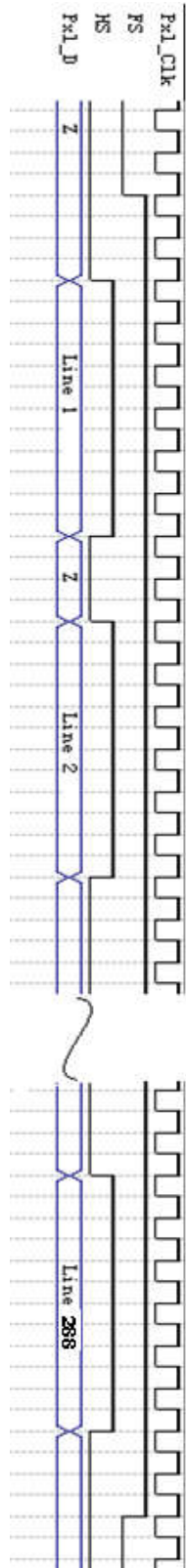
Figure 5. Data time sequence transmitted to MAX9257 transmission chip