



OTL- HP TC121023 10X Zoom Thermal Module

High Sensitivity • Long-Range Detection • Intelligent Imaging

Product Overview

The **OTL- HP TC121023** 10X Zoom Thermal Module is developed based on the latest uncooled infrared technology and infrared optical technology. It adopts advanced digital circuit and imaging processing algorithms. The thermal camera is capable of penetrating dust, fog, rain, and darkness. With wide power input, easy connection and operation, it ensures convenient control and reliable performance.

The uncooled network thermal imaging module integrates a 1280×1024 vanadium oxide detector with $12\mu\text{m}$ pixel pitch, capable of detecting infrared radiation in the $8 \sim 14\mu\text{m}$ band. It provides high-definition thermal imaging, network output, and can be widely used in remote observation, fire prevention, security, key area protection, police law enforcement, scientific research and other civil applications.



1280 × 1024
Thermal Sensor



12 μm
Pixel Size



22–230mm
Motorized Zoom



Long-Range
Detection



16 Pseudo Color
Modes



ONVIF
Protocol



Reliable in
Harsh Conditions



Easy
Integration

Product Highlights



NETD $\leq 35\text{mK}$

Enhanced imaging details even in foggy / rainy / snowy weather.



SDK & ONVIF

Supports SDX and ONVIF protocol for customer development.



Life Index Recording

Function of life index recording for thermal camera.



WZ Non-Uniform Image Correction

Good image uniformity and dynamic range.



SDE Digital Image Processing

No image noise, 16 pseudo color images.



DATASHEET

OTL-HP TC121023 10X Zoom Thermal Module

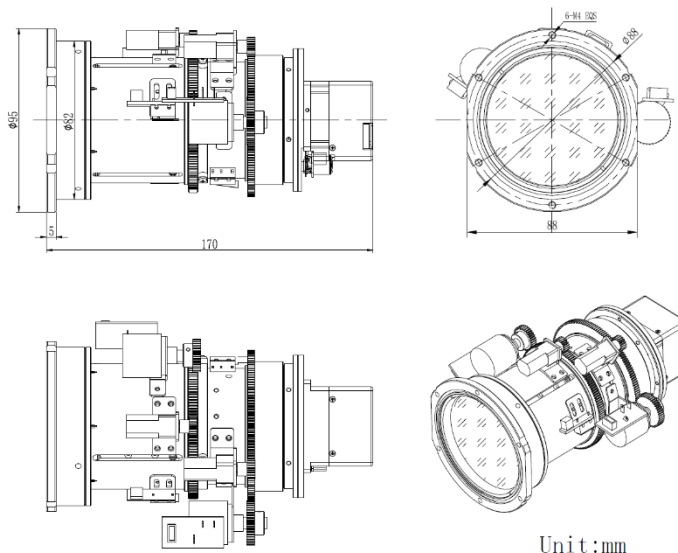
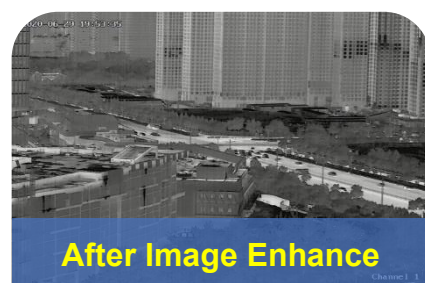
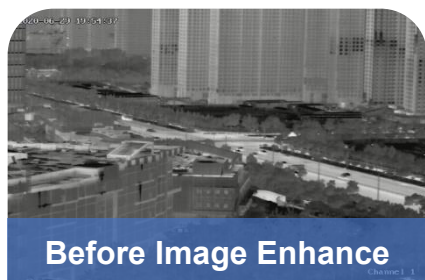


IP Thermal Module is developed on the basis of latest uncooled infrared technology and infrared optical technology. It adopts advanced digital circuit and imaging processing algorithm. Thermal camera is capable of penetrating dust, fog, rain, and darkness. Machine uses wide power, easy to connect and operate, can ensure the control convenience.

The uncooled network thermal imaging movement has an area array size of 1280×1024 vanadium oxide detectors, which can detect infrared radiation in the $8 \sim 14\mu\text{m}$ band. $12\mu\text{m}$ pixel center distance makes it have better imaging performance. Integrated network coding, network port output is convenient for connection and transmission, and can be widely used in civil fields such as remote observation, fire prevention, security, key area protection, police law enforcement, scientific research, etc.

Product's Highlights:

- NETD 45mk enhance the imaging details even in foggy/rainy/snowy weather.
- SDK and ONVIF protocol for customer developing
- Function of life index recording for thermal camera
- WZ Non-uniform image correction technology, good image uniformity and dynamic range.
- SDE digital image processing, no image noise, 16 pseudo color images



Size Reference with Sensor

Model		OTL-HP TC121023WZ
Effective Distance	Vehicle (2.3*2.3m)	Detection: 18km; Recognition: 4.8km; Identification: 2.5km
	Human (1.8*0.6m)	Detection: 6.8km; Recognition: 3.8km; Identification: 1.8km
	IVS Range	7km for Vehicle; 2.5km for Human
Thermal Sensor	Sensor	7th generation uncooled FPA sensor
	Effective Pixels	1280x1024
	Pixel Size	12μm
	TEC	Support
	NETD	≤35mK
	Spectral Range	7.5~14 μ m, LWIR
	Frequency	50Hz
Thermal Lens	Focal length	22-230mm 10X
	FOV (640*512)	3.8° × 3.0° ~38.4° × 31.2°
	Angular radian	0.05~0.52mrad
	Focus	Manual/Auto Focus (3A adaptive active focusing algorithm, supports multiple trigger modes).
	Lens Type	Motorized (Electronic Zoom)
Image	Enhance	Stable operational temperature without TEC, starting time less than 4 seconds
	SDE/AGC	Support
	Pseudo Color	16 pseudo color and B/W, B/W inverse
	Digital Zoom	1X~8X continuous zoom (Step 0.1)

	Ranging Ruler	Support
Enhance	Strong Light Protect	Support
	Temp Correction	Thermal imaging clarity is not affected by temperature.
	Scene mode	Support multi-configuration scenarios, adapt to different environment
	Lens Servo	Support lens preset, focal length return and focal length location.
	Azimuth Information	support angle real-time return and positioning; azimuth video overlay real-time display.
	Parameter Setting	OSD Menu Remote Call Operations.
	Security	Support authority management, IP/Mac address black and white list
	Life Index Recording	Working time, shutter times, ambient temperature, core device temperature
Intelligent	Motion detection	Support
	AI Analysis	Support intrusion, cross-border detection, entry / exit area, movement, wandering, gathering, rapid movement detection; Target tracking, item leaving and item taking; Human / vehicle target detection; Support human/vehicle filtering; Support target temp filtering
	AI Identification	Optional for vehicle/human, ship, drone, etc
	ROI	8 ROI regions can be set, and the image quality can be adjusted
	Hot-Point/Fire Alarm	Support
	Temp measurement	it supports the measurement of the highest and lowest temperature o
Interface	Interface	1-way RJ45, 10/100 Base-T adaptive
	Protocol	TCP/IP, UDP, IPv4/v6; support HTTP, RTSP, DHCP, NTP, FTP; support ONVIF network protocol
	Coding	Coding method: H.264, H.265
	Output Resolution	Resolution: 1920x1080/1280x960/640x512/384x288
Environmental	Power Supply	DC12V
	Working Temp	-40℃~60℃
	Storage Temp	-45℃~70℃
	Weight	<5kg

Interface:

No.	1	2	3	4	5	6
Definition	12v	GND	RS422 T-	RS422 T+	RS422 R-	RS422 R+
No.	7	8	9	10	11	12
Definition	RS232 TXD	RS232 RXD	ALARM IN	ALARM OUT	VIDEO+	AUDIO IN
No.	13	14	15	16		
Definition	AUDIO OUT	GND	SD CARD	RJ45		

Communication:

Serial communication is adopted between the ATC and the host. The hardware interface is TTL serial port, and the serial port hardware is set as follows:

Baud rate: 19200 bps

Starting bit: 1 bit

Stop bit: 1 bit

Verification: No verification

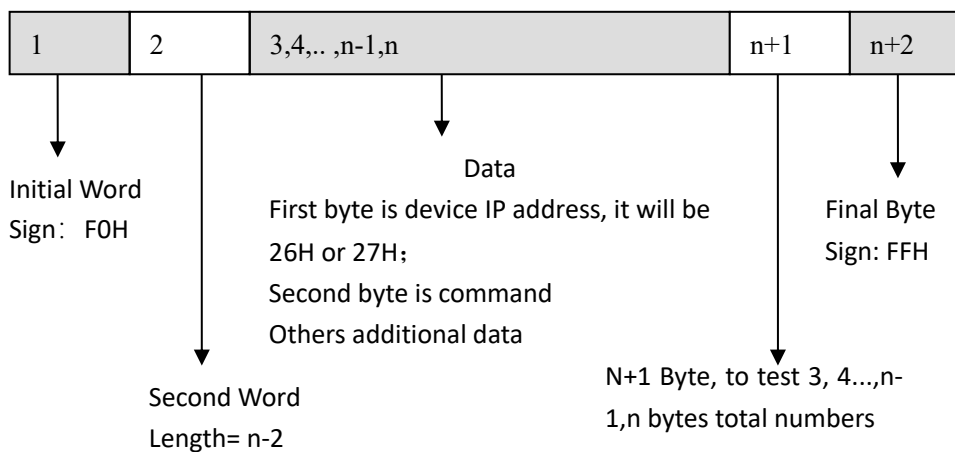
Data bit: 8 bits

The host sends instructions to the ATC module device through a serial port to control the infrared thermal imaging module. The communication command is sent in the agreed packet format. If the interval between characters in the data packet sent by the host to the ATC module exceeds 10ms, the infrared thermal imaging module may refuse to execute the command.

Unsustain orders are not conflict with each other; For example, after sending the "focus close" command and the "manual shutter correction" command, the focusing action will continue until the mechanical limit or the host sends the "focus stop" command.

Sustain command conflicts with a similar command before it is terminated, then the latest command will be executed. For example, after the host sends the "focus far" command, it then sends the "focus near" command. At this time, the infrared thermal imaging module will execute the "focus near" command.

The communication data packet agreement is as follows:



- (1) Start: One byte, F0 under Hexadecimal
- (2) Data length length: 1 byte, X
- (3) Date: bytes number = lengt
- (4) Test Total Value: 8 digits for total data value of bytes (number = lengt)
- (5) Finish: One byte, FF under Hexadecimal
- (6) Except start and finish byte, if it has F0, FF or F5, then they need to be changed to F5 00, F5 0F, F5 05
- (7) Lengt is decided by real data. No need to add additional transfer identify bytes

Order	Add.	Singe	Additional Order	Remark
Image Process				
Background Calibrate	26H	02H		
Shutter Calibration	26H	03H		
Timing Calibration	26H	07H	One byte.00H is Off; 0FH is On.	Default On
Time Calibration Interface	26H	13 H	One byte, value*10s is interval	Default48*10 = 480s 8min
Bad Point Saves	26H	94H		
Move Bad Point	26H	96H	Totally 4 bytes. First wo bytes means x , last two bytes means y	
Location of Bad Point	26H	97H		
Cancel Bad Point	26H	86H		

Image Reverse	26H	16H	02 left/right; 01 up/down; 03 reverse	
Cross	26H	04H	One byte.00H is not display; 0FH is display	Default Off
Vertical Cross	26H	0BH	Two bytes. 0~704. From low to high	Default value 352
Pitch Cross	26H	0CH	Two bytes. 0~576. From low to high	Default value 288
Image Enhance	26H	0EH	One byte.00H is Off; 0FH is On.	
Enhance Level	26H	77H	One byte.64 means 1X; 0~255	Default32
Filter	26H	0FH	One byte.00H is Off; 0FH is on	Default On
Timing Filter	26H	3DH	One byte.00H is Off; 0FH is On.	Default On
Lightness	26H	0AH	0-255,	Default128
Contrast	26H	09H	0-255,	Default128
AGC	26H	82H	1: Manual 2: Auto 1 3: Auto 2 4: Auto 3 (dark environment)	Default2
Anti-Sun				
Anti-Sun	26H	0x6C	One byte.00H is Off; 0FH is On.	Default Off
Level	26H	0x50	One byte	Default 237
Block Time	26H	0x51	One byte, value*5s	Default 24 2min
Point Numbers	26H	0x6B	One byte. when points*8, start function	Default 10
AF				
Focus	26H	01H	One byte.00H is close; 0FH is far	
Zoom	26H	11H	One byte.00H is far; 0FH is close	
Stop	26H	10H		
Demo:				
Zoom out: F0 03 26 11 00 37 FF Zoom stop: F0 02 26 10 36 FF				
Zoom in: F0 03 26 11 0F 46 FF Zoom stop: F0 02 26 10 36 FF				
Focus in: F0 03 26 01 00 27 FF Focus stop: F0 02 26 10 36 FF				
Focus out: F0 03 26 01 0F 36 FF Focus stop: F0 02 26 10 36 FF				
TRIGGER_AF	26	0x34	One time auto focus	
Focus/zoom Location	0x26	0xC9	4 bytes, with the low byte first. The first Two bytes represent the zoom position, and the last Two bytes represent the focus position	The highest position of focus is indicated by focus direction;
Set the zoom focus position based on the ad value	0x26	0xCA	4 bytes, with the low byte first. The first Two bytes represent the zoom position, and the second Two bytes represent the focus position. The corresponding value is 0, indicating no setting	The highest position of the focus value is indicated by the focus direction; If no position correspond value is set to be 0;
Auto focus after zooming in	0x26	0xC2	Off: f0 04 26 c2 79 00 61 ff On: f0 04 26 c2 79 01 62 ff	
Auto focus after zoom out	0x26	0xC2	Off: f0 04 26 c2 79 02 63 ff On: f0 04 26 c2 79 03 64 ff	
Lens				
Lens	26H	CBH	0x01 Self-checking 0x03 Set FOV (2 bytes) 0x04 Set focus (2 bytes)	

Lens Parameter	26H	CCH	0x00 query lens self-check status; return data: low byte, bit 0 represents Zoom self-check status, 1 represents error; bit 1 represents focus self-check status, 1 represents error. high byte: lens function identifier 0x01 Query field of view angle; returns 2 bytes 0x02 Query focal length; returns 2 bytes 0x0a query the current magnification of the lens; returns 2 bytes 0x0b maximum magnification for querying shots; returns 2 bytes	Return: Type+Data (Can be queried and returned, real-time return of field of view angle, focal length, current multiple, maximum multiple information for lens changes)
Temperature Parameter	27H	B6H	None: Query; Return: 2 bytes (detector temperature), 2 bytes (ambient temperature)	
Working Condition	26H	38H	None: Query; Return data: 4 bytes (working time, unit hour), 4 bytes (shutter count), 1 byte (historical lowest temperature), 1 byte (historical highest temperature), 4 bytes (On machine count), 4 bytes (doubling motor rotation), 4 bytes (focusing motor rotation)	
Version Information	27	B3	No; Search; Back	
Condition Search	26H	00H	First byte: B0: Cross display, 0 is Off closed, 1 is on; B1: Two-point correction status return B2: Auto calibration, 0 is Off closed, 1 is On B3: B4: Spatial filtering On/Off, 0 is Off, 1 is On B5: Image enhances, 0 is Off off, 1 is On; B6: Time domain filtering On/Off Second byte: Video contrast Third byte: Video brightness The fourth and fifth bytes: cross axis, low first and then high Bytes 6 and 7: Cross vertical axis, low first and then high Eighth byte: Gamma Ninth byte: Pseudo color mode Section Cross: Time Intervals Eleventh: Column noise threshold Twelfth byte: Temperature interval 13th: Column noise enable 14th byte: Low 4-bit digital video source selection, high 4-bit image flipping method Fifteenth byte: Gain mode selection 16th byte: Image magnification	
Synchronization				
Synchronization	27	10	1 byte, 01 represents internal synchronization output; 02 represents external synchronous output	Option function

OTL CATALOG EXPANSION

OTL-HP TC121023 10X Zoom Thermal Module

1. Product Summary

The OTL-HP TC121023 is presented in the source datasheet as a network thermal imaging module based on uncooled infrared and infrared optical technologies. The source describes integrated digital circuitry and image-processing algorithms intended to support thermal imaging in dust, fog, rain, and darkness.

The module is described as using a 7th-generation uncooled focal-plane-array sensor with 1280×1024 effective pixels and a $12 \mu\text{m}$ pixel pitch. Its stated spectral range is $7.5\text{--}14 \mu\text{m}$ (LWIR), with 50 Hz frequency.

2. Main Highlights

Image enhancement: the source lists $\text{NETD} \leq 35 \text{ mK}$ in the detailed specification table and separately mentions “NETD 45mk” in the opening highlights. These values conflict and should be confirmed with the manufacturer before publication.

Zoom and lens: the detailed table lists a motorized electronic zoom lens with 22–230 mm focal length and 10X zoom. The listed field of view is $3.8^\circ \times 3.0^\circ$ to $38.4^\circ \times 31.2^\circ$ (the source labels this FOV as 640×512).

Image controls: listed functions include SDE/AGC, 16 pseudo-colour modes plus black-and-white and inverse black-and-white, continuous digital zoom from 1X to 8X in 0.1 steps, a ranging ruler, strong-light protection, temperature correction, scene modes, lens presets, and azimuth information overlay.

Intelligent functions: the source lists motion detection, intrusion and cross-border detection, entry/exit-area detection, movement and loitering detection, gathering and rapid-movement detection, target tracking, left/removed-item detection, human/vehicle detection and filtering, target-temperature filtering, optional AI identification, ROI regions, hot-point/fire alarms, and temperature measurement.

3. Integration and Interfaces

The source lists one adaptive 10/100 Base-T RJ45 network interface. Network protocols listed include TCP/IP, UDP, IPv4/IPv6, HTTP, RTSP, DHCP, NTP, FTP, and ONVIF. Video encoding is listed as H.264 and H.265, with output resolutions of 1920×1080 , 1280×960 , 640×512 , and 384×288 .

The interface pin table in the source identifies power and ground, RS-422 transmit/receive pairs, RS-232 TXD/RXD, alarm input/output, video+, audio input/output, SD card, and RJ45. Refer to the original interface table for the numbered pin assignments.

The serial communication section specifies 19200 bps, 1 start bit, 1 stop bit, no parity verification, and 8 data bits. It also states that a character gap greater than 10 ms in a host-sent packet may cause the module to refuse the command.

4. Environmental and Mechanical Data

The source lists a DC 12 V power supply, operating temperature of -40°C to $+60^\circ\text{C}$, storage temperature of -45°C to $+70^\circ\text{C}$, and weight below 5 kg.

The original document includes before/after image-enhancement examples and several mechanical size-reference drawings. Keep these drawings as the reference for mechanical integration; dimensions should be taken from the original drawings because not every dimension is clearly represented in the extracted text.

5. Communication Protocol Notes

The original packet description identifies F0H as the start byte and FFH as the final byte, with a data-length field and data bytes. It also describes byte substitution when F0, FF, or F5 appears inside the payload: F5 00, F5 0F, and F5 05 respectively.

The command tables include image-processing, calibration, crosshair, enhancement, filter, brightness/contrast, AGC, anti-sun, focus, zoom, lens parameter, temperature parameter, working-condition, version-information, condition-search, and synchronization commands. Preserve command values exactly as shown in the source when implementing control software.

The protocol text contains wording and formatting ambiguities in places. Treat the original command tables as manufacturer-provided reference material and request a confirmed protocol document before relying on unclear fields or command descriptions.

6. Items to Confirm Before Release

NETD: the opening highlights state 45 mK, while the detailed specification table states ≤ 35 mK. Confirm the correct published value.

Field of view: the detailed table labels the range as FOV (640×512), while the listed output resolutions include multiple formats. Confirm which resolution and measurement conditions apply to the FOV values.

Temperature measurement: the source sentence ends with incomplete wording (“highest and lowest temperature o”). Request the complete temperature-measurement specification and any accuracy/range values.

Company/product identity: the source document names Hope-Wish Technologies Inc. and lists a contact person and email. The cover is styled for the OTL catalog workflow; confirm branding, distribution rights, contact details, and warranty information before external publication.

