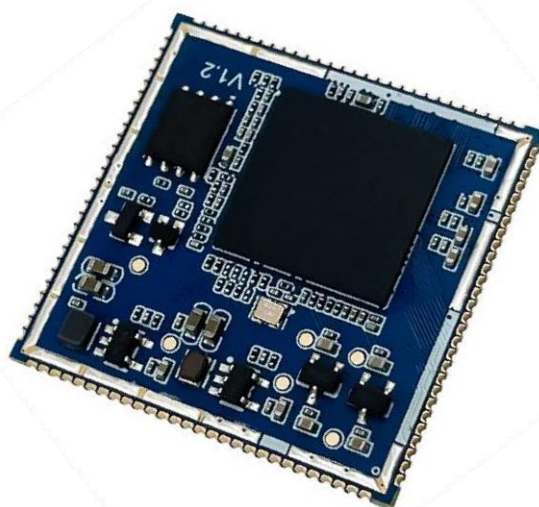




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# Shenzhen Hailinke Electronics Co.

## HLK-TX510 User Manual



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## 1. Product Description

HLK-TX510 is a module developed based on the artificial intelligence chip TX510, AI algorithm 1.2T@8bit/9.6T@binary, support hybrid accuracy, can quickly detect faces, support 3D live detection, 3D face recognition, infrared live detection, visible light live detection, etc., can resist two-dimensional attacks such as photos, videos, three-dimensional attacks such as masks, recognition With high success rate, it can be widely used in smart door lock, smart access control, financial payment and other industries.

### 1.1. Product Features

- 5V/1A power input
- Simple modules, small size
- RISC32 core, CK804 is the main controller, CK805 is the auxiliary controller
- Support main frequency up to 400Mhz
- Fast start-up and fast comparison
- Support 1000 face database, matching time less than 1 second
- Infrared fill light + infrared sensor, support dark light environment comparison

## 1.2. Technical Specifications

Modules	Mode 1	HLK-TX510
	Package	SMD
Wireless Parameters	CPU	TX510
	Neural Networks	1TOPS AI
	RAM	64M Byte
	FLASH	16M
	Operating System	RTOS
Hardware Parameters	Start-up time	<1000ms
	Identification time	<600ms
	Face Gallery	1000 people
	Interface	UART, USB, MIPI, I2C
	Power consumption	
	Operating Voltage	5V
Serial port parameters	Baud rate	115200
	Working humidity	<90%

## 1.3. Applications

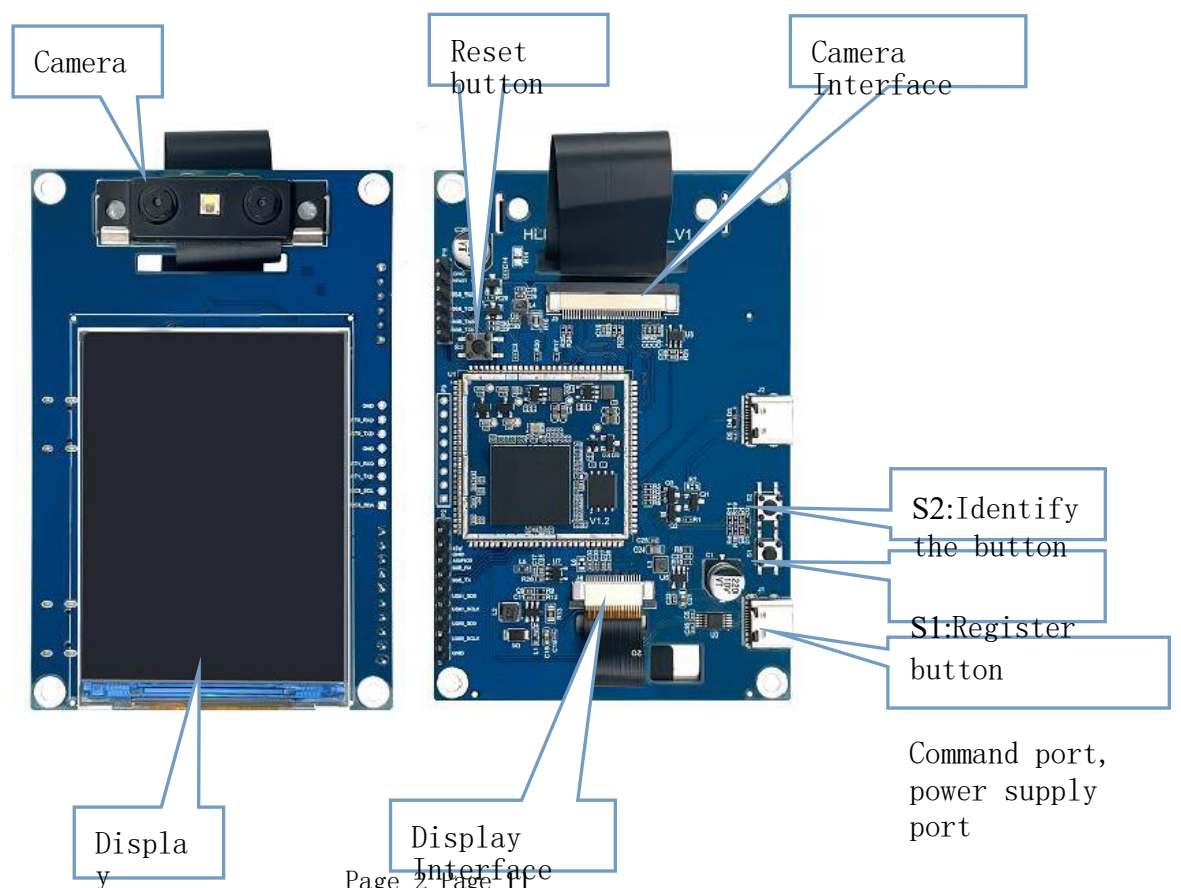
- Smart homes.
- Intelligent access control.
- Smart door locks.
- Intelligent integrated management of security.

## 2. Electrical parameters

### 2.1. Operating Voltage

Para mete rs	Minimum	Typical	Maximum	Unit
Supply voltage	4.5	5	5.5	V
Average power consumption of the module	250	310	500	mA
Power supply current requirement		$\geq 800$		mA

## 3. Hardware Description.



## 4. Key Function.

Key S1: Registration key, press and hold S1 key for

6 seconds to delete all records Key S2:

Identification key

Button S3: Reset button

Short press S1 button, face close to the camera about 50cm, will carry out the registration of the face, if the registration is successful, will record the results of the recognition; long press the button for 6 seconds, will clear all the results of the recognition.

Short press the S2 key, the face needs to be registered before the recognition will be successful, if not registered, the screen will indicate that the face is not registered.

## 5. Serial port configuration and communication protocol

Configuration items	Description
Baud rate	Default 115200
Hardware/software flow control	No use
Data bits	8
Stop bit	1
Parity check bits	n

### 5.1. Communication message format

The basic message format for communication between the master and the module is shown in the table below.

SyncWord	MsgID	Size	Data	ParityCheck
2 bytes	1 byte	4 bytes	N bytes	1 byte

The detailed description of each field is shown in the table below.

Fields	Length	Description
SyncWord	2bytes	Fixed message opening sync word 0xEF 0xAA
MsgID	1byte	Message ID (e. g. RESET)

Size	4bytes	Data size, in byte
Data	N bytes	The data corresponding to the message, such as the parameters corresponding to the <b>command</b> message. 65535>=N>=0, N=0 means this message has no parameters.
Parity Check	1 byte	The checksum of the protocol is calculated by adding the remaining bytes of the entire protocol after the <b>Sync Word</b> part is removed. Methodology.

No reply when the command does not exist

## 5.2. Identification command: (host-> module)

Name	SyncWord	MsgID	Size	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 byte
Content	0xEFAA	0x12	0x00	0x12

Identification command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	User_id	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	2 bytes	1 byte
Content	0xEFAA	0x00	0x04/0x02	0x12	0x00/0x01	0x00,0x01	...

**Result:** 0x00, if the identification is successful, the user\_id after the identification is the successful id, if the identification fails, no user\_id after the identification

When the module starts, it performs the recognition function once and then returns the recognition result

## 5.3. Register command: (host-> module)

Name	SyncWord	MsgID	Size	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	N bytes	1 byte
Content	0xEFAA	0x13	0x00	None	0x13

Registration command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	User_id	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	2 bytes	1 byte
Content	0xEFAA	0x00	xx	0x13	0x00/0x01	0x00,0x01	

**Result:** 0x00, registration is successful, the user\_id after is the id of the successful identification

If registration fails, User\_id is not returned



## 5.4. Delete user command: (host-> module)

Name	SyncWord	MsgID	Size	User_id	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	2 bytes	1 byte
Content	0xEFAA	0x20	0x02	0x00,0x01	0x23

**user\_id**: the user to be deleted

Delete user command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0x20	0x00/0x01	0x22/0x23

Result: 0x00,Delete successfully

## 5.5. Delete all commands: (host-> module)

Name	SyncWord	MsgID	Size	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 byte
Content	0xEFAA	0x21	0x00	0x21

Delete all commands return: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0x21	0x00/0x01	0x23/0x24

Result: 0x00,delete  
 success 0x01,delete  
 failure

Description of the corresponding result value in the registration and identification ACK.

Result Value	Description
0x00	Success
0x01	Detection of unmanned faces
0x03	Face posture angle is too large
0x06	2D in vivo did not pass
0x07	3D in vivo did not pass
0x08	Match not passed
0x09	Repeat Registration

0x0a

Failed to save ID

## 5.6. Backlight control command: (host-> module)

Name	SyncWord	MsgID	Size	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
Content	0xEFAA	0xC0	0x01	0x00/0x01	0xC1/0xC2

Data:0x00,turn off  
 the backlight  
 0x01,turn on the  
 backlight

Backlight control command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0xC0	0x00	0xC2

Result: 0x00,Success

## 5.7. Display control command: (host-> module)

Name	SyncWord	MsgID	Size	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
Content	0xEFAA	0xC1	0x01	0x00/0x01	0xC2/0xC3

Data:0x00,turn off  
 display and backlight  
 0x01,turn on display  
 and backlight

Display control command return: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0xC1	0x00	0xC3

Result: 0x00,Success

## 5.8. White light control command: (host-> module)

Name	SyncWord	MsgID	Size	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
Content	0xEFAA	0xC2	0x01	0x00/0x01	0xC3/0xC4

Data:0x00,turn off  
 the white light  
 0x01,turn on the  
 white light

The white light control command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0xC2	0x00	0xC4

Result: 0x00,Success

## 5.9. Version query command: (host-> module)

Name	SyncWord	MsgID	Size	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 byte
Content	0xEFAA	0x30	0x00	0x30

The version query command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Chip_ID	Result	ParityC
Number of bytes	2 bytes	1 byte	4	1 bytes	8 bytes	N bytes	1 byte
Content	0xEFAA	0x00	0x09	0x30	....	48 4C 4B 2D 54 58 35 31 30 28 56 31 2E 30 30 2E 30 30 30 30 29 "HLK-TX510(V1.00.0000)	0x86

Chip\_ID:Chip ID

Result: Version

number

## 5.10. Reboot command: (host-> module)

Name	SyncWord	MsgID	Size	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 byte
Content	0xEFAA	0xC3	0x00	0xC3

Reboot command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0xC3	0x00	0xC5

Result: 0x00, the command was received successfully, and the module will be restarted after

returning the data

## 5.11. Baud rate setting command: (host-> module)

Name	SyncWord	MsgID	Size	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
Content	0xEFAA	0x51	0x01	0x04	0x56

Data Meaning.

0x00: 9600

0x01:19200

0x02:38400

0x03:57600

0x04:115200

Baud rate setting command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
Content	0xEFAA	0x00	0x02	0x51	0x00	0x53

Result: 0x00,Success, after the baud rate is set successfully, it needs to reboot to take effect.

## 5.12. Read the number of registered users command: (host-> module)

Name	SyncWord	MsgID	Size	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 byte
Content	0xEFAA	0xC4	0x00	0xC4

Read the number of registered users command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	Data	Face_id1	Face_id N	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	2 bytes	2 byte	2 byte	1 byte
Content	0xEFAA	0x00	0x04	0xC4	0x00	0x0001	...	...	...

Result: 0x00,Success

Data : Number of registered users

Face\_id1:The first registered face ID

...

Face\_id N:The Nth registered face ID

### 5.13. Write eigenvalue command: (host-> module)

Name	SyncWord	MsgID	Size	Rand	Seq	Data	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1bytes	1byte		1 byte
Content	0xEFAA	0xC5	0x02	0x00	...		...

**Rand:** random number, the data with the same random number is considered to be the same packet of feature data

**Seq:** Sequence number, the total length of a feature value is 1k, divided into 4 packages for transmission, 256 Byte each time, bit0 bit 1 indicates the beginning of a feature value data, also indicates the transmission of a feature value of the first package; bit1 is 1 indicates the second package, bit2 is 1 indicates the third package, bit3 is 1 indicates the fourth package, when the fourth package transmission is completed, the feature value will be written into the When seq is 0x0f, it means that the feature value is not transmitted in packets, and 1024 bytes are transmitted at one time.

**Data Meaning:** Feature data

The write eigenvalue command returns: (module->host)

Name	SyncWord	Reply_Msg	Size	MsgID	Result	Rand	Seq	FaceID	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 bytes	1 bytes	2 bytes	1 byte
Content	0xEFAA	0x00	0x0403	0xC5	0x00	0x00	...	0x00	...

**Result :** 0x00,success,means the word  
 command is sent successfully  
 0x01,failure  
 0x09,Face duplication

**Rand:** Random number, random number when writing data

**Seq :** 0x01/0x03/0x07/0x0f, the corresponding bit is 1, which means the corresponding packet is received successfully.

Only when Seq=0x0f,and Result=0x00, it means the feature value is written to the storage successfully, and the corresponding

**FaceID** is the only valid

### 5.14. Read eigenvalue command: (host-> module)

Name	SyncWord	MsgID	Size	Rand	FaceID	Seq	ParityCheck
------	----------	-------	------	------	--------	-----	-------------



Number of bytes	2 bytes	1 byte	4 bytes	1 byte	2bytes	1bytes	1 byte
Content	0xEFAA	0xC6	0x04	...	0x0001		...

**Rand:**Random number, the data with the same random number is considered to be the feature data of the same package **FaceID Meaning:** Feature value ID

**Seq.**

0x01,Read the first packet of face eigenvalue data

0x02,Read the second packet of face eigenvalue data

0x04,Read the third packet of face eigenvalue data

0x08,Read the fourth packet of face eigenvalue data

0x0f,read out one face feature data at a time, length 1024Byte

Read Eigenvalue command returns: (module->host)

Name	SyncWord	Reply_MsgID	Size	MsgID	Result	Rand	FacelD	Seq	faceFeature	ParityCheck
Number of bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte	2 bytes	1 byte	256/1024	1 byte
Content	0xEFAA	0x00	0x0106	0xC6	0X00	0x00	0x00	...	...	...

Result: 0x00,Success

Rand : Random number, random number

when reading data Seq : Sequence

number of the corresponding face

feature packet faceFeature: feature

value for face recognition

## Appendix A Document Revision Log

Version number	Revision Scope	Date
V1.0	Initial version.	2022-6-6
V1.1	Add read/write eigenvalue command, check weight description	2022-11-25