Shenzhen Hi-Link Electronics Co.Ltd.

HLK-TX510 User Manuals

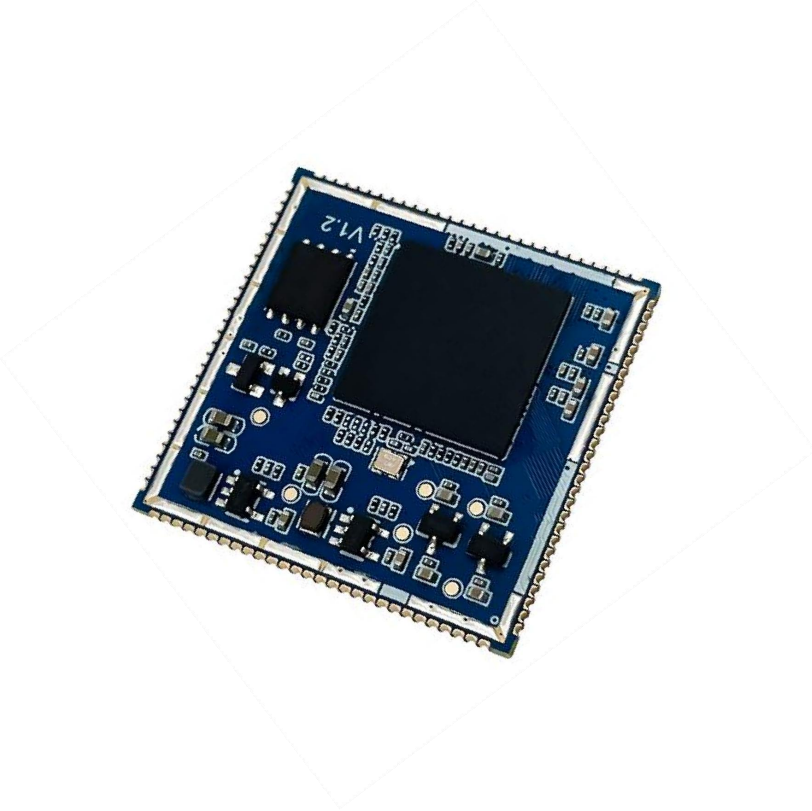

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Table of Contents

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 High success rate, can be widely used in smart door lock, smart access control, financial payment and other industries.

1.1. 产品特性

- 5V/1A power input
- module is simple and small in 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	Model	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 人
	Interface	UART,USB,MIPI,I2C
	Power consumption	
	Operating Voltage	5V
Serial port parameters	Baud rate	115200
	Working humidity	<90%

1.3. Applications

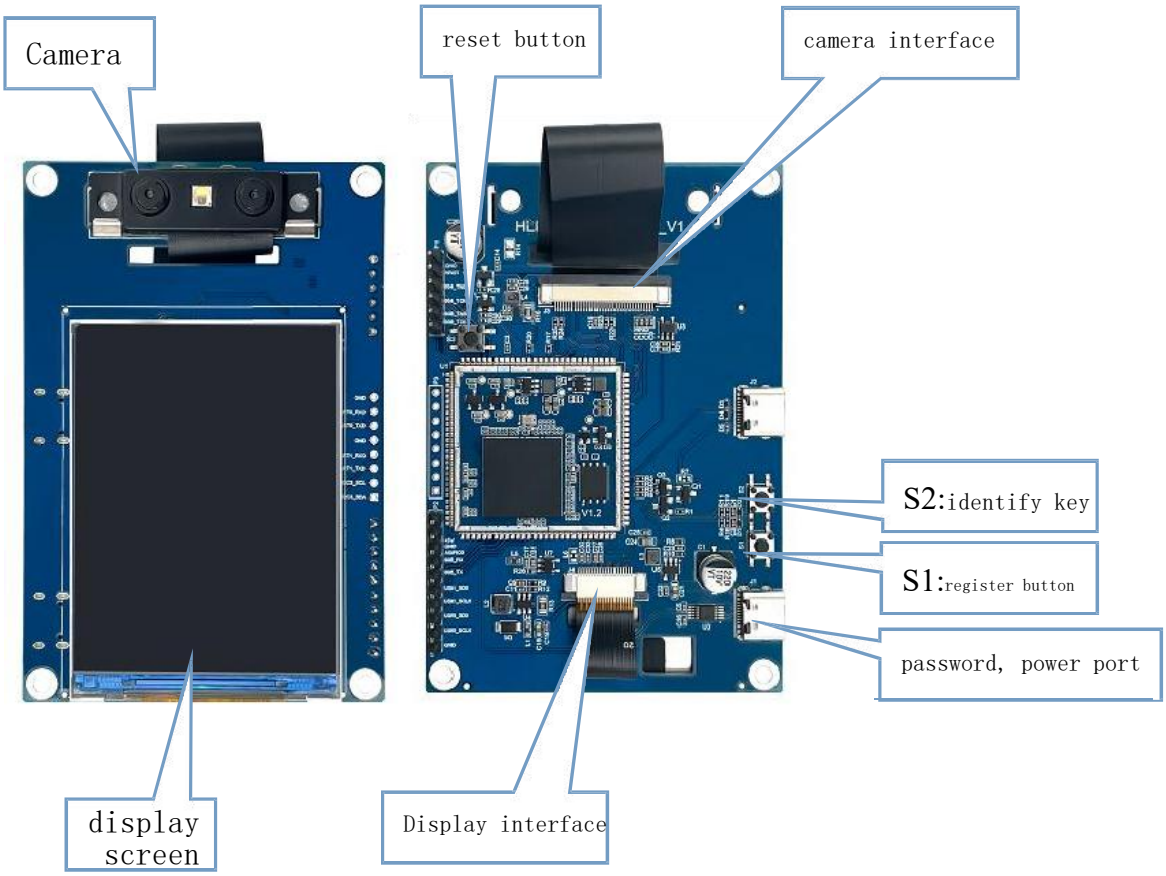
- Smart Home;
- Intelligent Access Control;
- Smart Door Lock;
- Security intelligent integrated management;

2. Electrical parameters

2.1. Operating Voltage

Parameters	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		≥800		mA

3. Hardware Description:



4. Key Function:

Key S1: Registration key, press and hold S1 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, it will register the face, if the registration is successful, it will record the result of recognition; long press the button for 6 seconds, it will clear all the results of recognition.

Press the S2 key briefly, The face needs to be registered for the recognition to be successful. If the face is not registered, the screen will indicate that the face is not registered.

5. Serial port configuration and communication protocol

Configuration	Description
Baud rate	default115200
Hardware/software flow control	Do not use
Data bits	8
Stop bit	1
parity check bit	n

5.1. Communication message format

The basic message format of the communication between the main control 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。

field	length	illustrate
SyncWord	2bytes	Fixed message start sync word 0xEF 0xAA
MsgID	1byte	Message ID (e.g. RESET)
Size	4bytes	Data size,unit, byte
Data	N bytes	The data corresponding to the message, such as the parameters corresponding to the command message. 65535>=N>=0, N=0 means this message has no parameters.
Parity Check	1 byte	The verification code of the protocol is calculated by adding the remaining bytes after the Sync Word part is removed from the entire protocol.

No reply when command does not exist

5.2. Recognition command: (host->module)

name	SyncWord	MsgID	Size	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	1 byte
content	0xEFAA	0x12	0x00	0x12

The recognition command returns: (module->host)

name	SyncWord	Reply_MsgI	Size	MsgID	Result	User_id	ParityCheck
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, the recognition is successful, the following user_id is the id of the successful recognition, if the recognition fails, there is no User_id behind
When the module starts, it will perform a recognition function, and then return the recognition result

5.3. Registration command: (host->module)

name	SyncWord	MsgID	Size	Data	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	N bytes	1 byte
content	0xEFAA	0x13	0x00	无	0x13

The registration command returns: (module->host)

name	SyncWord	Reply_MsgID	Size	MsgID	Result	User_id	ParityCheck
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, the registration is successful, and the following user_id is the id of successful identification
If registration fails, no User_id is returned

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

name	SyncWord	MsgID	Size	User_id	ParityCheck
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
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
content	0xEFAA	0x00	0x02	0x20	0x00/0x01	0x22/0x23

Result: 0x00, deleted successfully

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

name	SyncWord	MsgID	Size	ParityCheck
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
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 successfully 0x01, delete failed

Instructions corresponding to the result value in the registration and identification ACK.

Result value	illustrate
0x00	success
0x01	Detecting No Faces
0x03	Face pose angle is too large
0x06	2D living failed
0x07	3D living failed
0x08	Match failed
0x09	duplicate registration
0x0a	Failed to save ID

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

name	SyncWord	MsgID	Size	Data	ParityCheck
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
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
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 the display and backlight

Display control command returns: (module->host)

name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
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
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

White light control command returns: (module->host)

name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
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
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
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. Restart command: (host->module)

name	SyncWord	MsgID	Size	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	1 byte
content	0xEFAA	0xC3	0x00	0xC3

The restart command returns: (module->host)

name	SyncWord	Reply_MsgID	Size	MsgID	Result	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
content	0xEFAA	0x00	0x02	0xC3	0x00	0xC5

Result: 0x00, the command is received successfully, and the module will restart after returning the data

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

name	SyncWord	MsgID	Size	Data	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
content	0xEFAA	0x51	0x01	0x04	0x56

Data 含义：

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
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 be restarted to take effect.

5.12. Command to read the number of registered users: (host->module)

name	SyncWord	MsgID	Size	ParityCheck
Bytes	2 bytes	1 byte	4 bytes	1 byte
content	0xEFAA	0xC4	0x00	0xC4

The command to read the number of registered users returns: (module->host)

name	SyncWord	Reply_MsgID	Size	MsgID	Result	Data	Face_id1	Face_id N	ParityCheck
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: Nth registered face ID

5.13. Write characteristic value command: (host->module)

name	SyncWord	MsgID	Size	Rand	Seq	Data	ParityCheck
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 as the feature data of the same package

Seq: serial number, the total length of a characteristic value is 1k, divided into 4 packets for transmission, 256 Byte each time, when bit0 is 1, it means

The beginning of a eigenvalue data also indicates the first packet of a eigenvalue transmission; bit1 is 1 to indicate the second packet, bit2 is 1 to indicate the third packet, bit3 is 1 to indicate the fourth packet, when the transmission of the fourth packet is completed , the feature value will be written into the storage space. When multiple bits are 1 and not equal to 0x0f, it means that the packet data is invalid. When seq is 0x0f, it means that the feature value is not divided into packets, and 1024 bytes are transmitted at a time.

Data meaning: feature data

Write characteristic value command returns: (module->host)

name	SyncWord	Reply_Msg	Size	MsgID	Result	Rand	Seq	FaceID	ParityCheck
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, indicating that the entry command is sent successfully 0x01, failure 0x09, face repeat

Rand : random number, random number when writing data

Seq: 0x01/0x03/0x07/0x0f, the corresponding bit is 1, indicating that the corresponding data packet is received successfully,

Only when Seq= =0x0f, and Result = =0x00, it means that the characteristic value is successfully written into the storage space, and the corresponding

FaceID is what works

5.14. Read characteristic value instruction: (host->module)

name	SyncWord	MsgID	Size	Rand	FaceID	Seq	ParityCheck
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 regarded as the characteristic data of the same package FaceID Meaning: characteristic value ID

Seq:

0x01, read the first packet of face feature value data

0x02, read the second packet of face feature value data

0x04, read the third packet of face feature value data
0x08, read the fourth packet of face feature value data
0x0f, read one face feature value data at a time, the length is 1024Byte

The command to read the characteristic value returns: (module->host)

名称	SyncWord	Reply_MsgID	Size	MsgID	Result	Rand	FaceID	Seq	faceFeature	ParityCheck
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: The serial number of the corresponding face feature data packet faceFeature: Feature value of face recognition

Appendix A Document Revision History

version number	scope of revision	date
V1.0	initial version。	2022-6-6
V1.1	Add read and write eigenvalue instructions, check instructions	2022-11-25