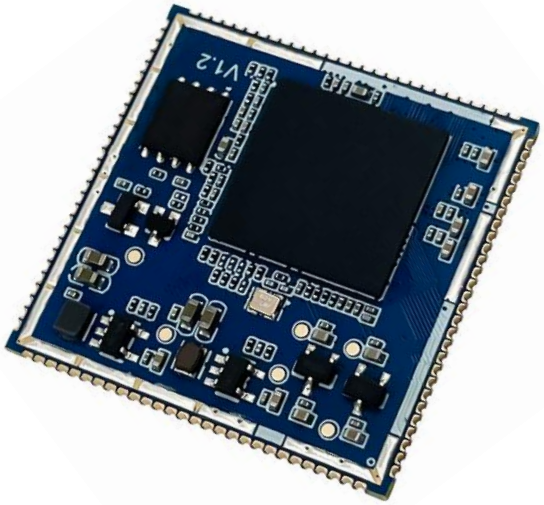
Shenzhen Hailingke Electronics Co., Ltd.

HLK-TX510 User Manual



Version: V1.0 Last revision date: June 6, 2022

Table of contents

1.Product Introduction..... 1

1.1.Product Features..... 1

1.2.Technical Specifications..... 1

1.3.Application field..... 1

2.Electrical parameters..... 2

2.1.Operating Voltage..... 2

3.Hardware description: 2

4.Key Function:..... 3

5.Serial port configuration and communication protocol..... 3

5.1.Communication message format 3

5.2.Recognition command: (HOST->module) 4

5.3.Registration command: (HOST->module) 4

5.4.Delete user command :(HOST->module) 5

5.5.Delete all commands :(HOST->module) 5

5.6.Backlight control command: (HOST->module) 6

5.7.Display control commands: (HOST->module) 6

5.8.White light control command: (HOST->module) 6

5.9.Version query command: (HOST->module) 7

5.10.Restart command:(HOST->module) 7

5.11.Baud rate setting command: (HOST->module) 8

5.12.Command to read the number of registered users: (HOST->module) 8

5.13.Write characteristic value command: (HOST->module) 9

5.14.Read characteristic value instruction: (HOST->module) 9

appendixADocument Revision History 11

1.product introduction

HLK-TX510 is a module developed based on artificial intelligence chip TX510, AI computing power 1.2T@8bit / 9.6T@binary , Support mixed precision, can quickly detect faces, support 3D live detection, 3D face recognition, infrared live detection, visible Optical liveness detection, etc., can resist two-dimensional attacks such as photos and videos, and three-dimensional attacks such as masks, with a high recognition success rate and can be widely used Used in smart door locks, smart access control, financial payment and other industries.

1.1.Product Features

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

1.2.technical specifications

module	model	HLK-TX510
	encapsulation	patch
wireless parameters	CPU	TX510
	Neural Networks	1 TOPS AI
	RAM	64M Byte
	FLASH	16M
	operating system	RTOS
hardware parameters	Start Time	<1000ms
	recognition time	<600ms
	Face database	1000 people
	interface	UART,USB,MIPI,I2C
	power consumption	
	Operating Voltage	5V
Serial parameters	baud rate	115200
	Working humidity	<90%

1.3.Application field

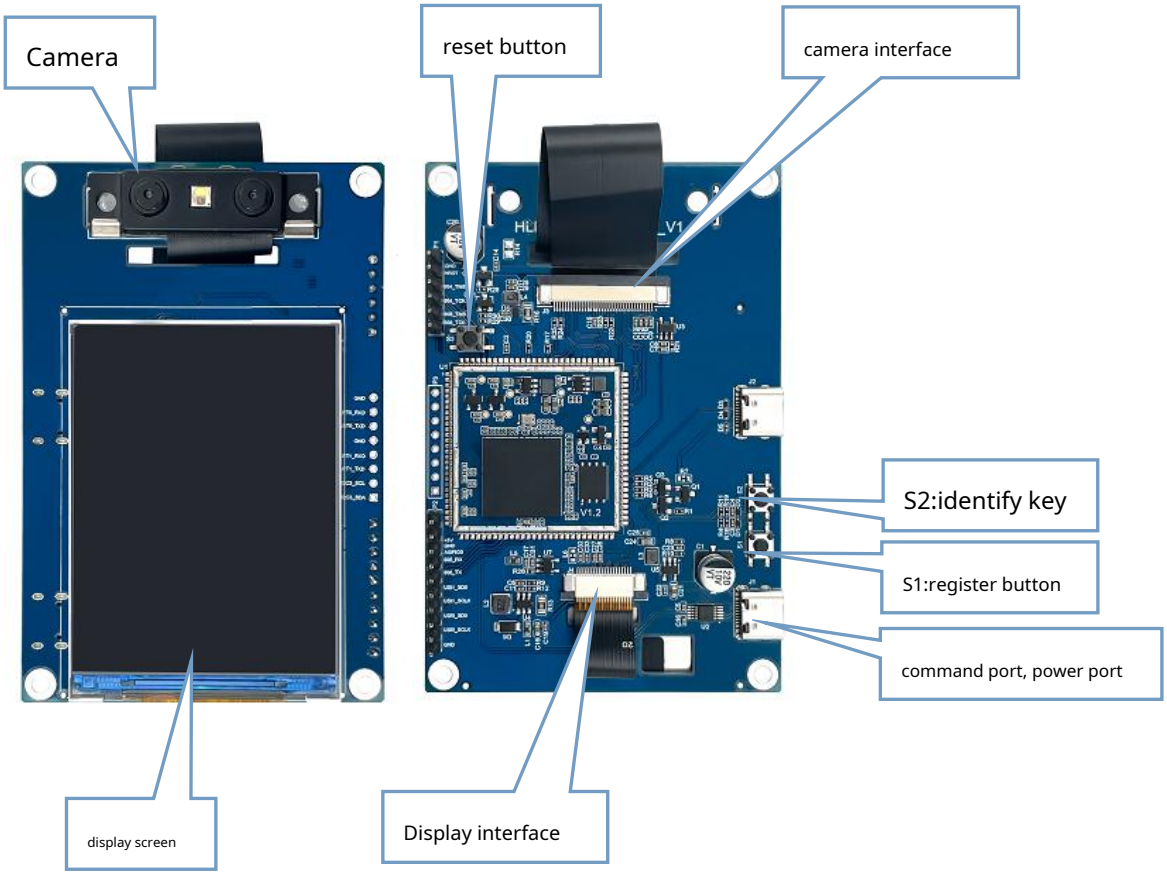
- smart home;
- Smart access control;
- smart door lock;
- Security intelligent integrated management;

2.Electrical parameters

2.1.Operating Voltage

parameter	the smallest	typical	maximum	unit
supply voltage	4.5	5	5.5	V
Module average power consumption	250	310	500	mA
Supply Current Requirements		≥800		mA

3.Hardware description:



4.Key Function:

buttonS1: Register button, long pressS1key6seconds, delete all records

buttonS2: identify key

buttonS3: Reset button

short pressS1Press the button, the face is close to the camera50cmLeft and right, face registration will be performed. If the registration is successful, the recognition result will be recorded; long press the button6seconds, all the recognition results will be cleared.

short pressS2button, the face has to be registered to be recognized successfully, if not registered, the screen will prompt that the face is not registered.

5.Serial port configuration and communication protocol

configuration item	illustrate
baud rate	default115200
Hardware/Software Flow Control	Do not use
data bit	8
stop bit	1
parity bit	no

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	Parity Check
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 word0xEF 0xAA
MsgID	1byte	informationID(E.gRESET)
size	4bytes	Data size,unitbyte
Data	N bytes	corresponding to the messagedata,likecommandParameters corresponding to the message. 65535>=N>=0,N=0Indicates that this message has no parameters.
Parity Check	1 byte	The verification code of the agreement, the calculation method is to remove the entire agreementSync WordAfter the part, the remaining bytes are added.

No reply when command does not exist

5.2.Recognition command: (host->module)

name	SyncWord	MsgID	size	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 byte
content	0xEFAA	0x12	0x00	0x12

The identify command returns:**(Module->host)**

name	SyncWord	Reply_MsgI	size	MsgID	Result	User_id	Parity Check
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 identification is successful, and the followinguser_idto identify the successfulid, if the identification fails, there will be noUser_id 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	Parity Check
Bytes	2 bytes	1 byte	4 bytes	N bytes	1 byte
content	0xEFAA	0x13	0x00	none	0x13

The register command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	User_id	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	2 bytes	1 byte
content	0xEFAA	0x00	xxx	0x13	0x00/0x01	0x00,0x01	

Result: 0x00,The registration is successful, the followinguser_idto identify the successful id If registration fails, do not returnUser_id

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

name	SyncWord	MsgID	size	User_id	Parity Check
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

The delete user command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
content	0xEFAA	0x00	0x02	0x20	0x00/0x01	0x22/0x23

Result: 0x00,successfully deleted

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

name	SyncWord	MsgID	size	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 byte
content	0xEFAA	0x21	0x00	0x21

The delete all command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	1 byte
content	0xEFAA	0x00	0x02	0x21	0x00/0x01	0x23/0x24

Result: 0x00,successfully deleted

0x01,failed to delete

Registration and IdentificationACKmiddleresultThe value corresponds to the description.

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

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

name	SyncWord	MsgID	size	Data	Parity Check
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 The command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
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 commands: (host->module)

name	SyncWord	MsgID	size	Data	Parity Check
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 The command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
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	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
content	0xEFAA	0xC2	0x01	0x00/0x01	0xC3/0xC4

Data: 0x00,turn off white light

0x01,Turn on the white light

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

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
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	Parity Check
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	Parity C
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:chipID

Result:version number

5.10.Restart command:(host->module)

name	SyncWord	MsgID	size	Parity Check
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	Parity Check
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	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1bytes	1 byte
content	0xEFAA	0x51	0x01	0x04	0x56

Datameaning:

0x00: 9600

0x01:19200

0x02:38400

0x03:57600

0x04:115200

The baud rate setting command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Parity Check
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	Parity Check
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	Parity Check
Bytes	2 bytes	1 byte	4 bytes	1 bytes	1 bytes	2 bytes	2 bytes	2 bytes	1 byte
content	0xEFAA	0x00	0x04	0xC4	0X00	0x0001	…	…	…

Result: 0x00,success

Data :Number of registered users

Face_id1:The first registered faceID . . .

Face_id N:No.Nregistered facesID

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

name	SyncWord	MsgID	size	Rand	Seq	Data	Parity Check
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 is1k,Minute4packets are transmitted each time256indivualByte, bit0bit1when, means The beginning of a characteristic value data, also means the first packet of transmitting a characteristic value;bit1for1means the second pack,bit2 for1Indicates the third package,bit3for1Indicates the fourth packet. When the fourth packet transmission is completed, the feature value will be written into the storage space. Multiplebitfor1and not equal to0x0fWhen , it means that the packet data is invalid, whenseqfor0x0fWhen , it means that the eigenvalues are transmitted without dividing into packets, and one transmission1024bytes

DataMeaning: characteristic data

The write characteristic value command returns:**(Module->host)**

name	SyncWord	Reply_Msg	size	MsgID	Result	Rand	Seq	FaceID	Parity Check
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,fail

0x09,face duplication

Rand :Random number, random number when writing data

Seq : 0x01/0x03/0x07/0x0f,The corresponding bit is1, indicating that the corresponding data packet is received successfully,

only whenSeq= =0x0f,andResult = =0x00When , it means that the feature value is successfully written into the storage space, and the corresponding FaceIDis effective

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

name	SyncWord	MsgID	size	Rand	FaceID	Seq	Parity Check
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 as the feature data of the same package FaceIDMeaning: EigenvalueID

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 package 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 is1024Byte The read

characteristic value command returns:**(Module->host)**

name	SyncWord	Reply_MsgID	size	MsgID	Result	Rand	FaceID	Seq	faceFeature	Parity Check
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 package

faceFeature:Eigenvalues for face recognition

appendixADocument 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