Shenzhen Hi-Link Electronics Co., Ltd.

HLK-ZW0608 Specification

Square Fingerprint Module

Version: V1.0 Modification date: 2024-1-26

Contents

1. Product introduction

1.1. Overview

HLK-ZW0608 fingerprint module is a capacitive fingerprint recognition module. Consumers use fingerprint recognition modules for user identity determination. When the user touches the fingerprint recognition module with their finger, the fingerprint recognition module will scan the user's fingerprint and then match it with the fingerprint database for determination.

The HLK-ZW0608 fingerprint module has functions such as fingerprint image processing, template extraction, template matching, fingerprint search and template storage. Compared with similar fingerprint products, this fingerprint module has the following features:

- **Strong fingerprint adaptability**

During the fingerprint image reading process, an adaptive parameter adjustment mechanism is adopted to achieve better imaging quality for both wet and dry fingers, and is applicable to a wider range of people.

- **Simple to use and easy to expand**

No fingerprint recognition expertise is required to apply. Users can develop powerful fingerprint recognition application systems by themselves according to the rich control commands provided by the HLK-ZW0608 module.

- **Flexible setting of security levels**

Users can set different security levels for different applications.

1.2. Application scope

The HLK-ZW0608 module is widely used and suitable for all fingerprint recognition systems from low-end to high-end. like:

- Door locks; more complex access control systems;
- Fingerprint IC card identification terminal;
- Fingerprint recognition and authentication system connected to PC.

Users can develop a variety of fingerprint recognition-based application systems according to the technical information provided in this manual.

2. Technology Parameter

2.1.Conventional Technology Parameter

Serial number	Item	Technical Parameters
1	Module size	19*19mm
2	sensor size	12.05*12.05mm
3	resolution	508dpi
4	Number of pixels	160*160pixel
5	Data Connections	USART
6	Interface Protocol	RS232 (TTL)
7	Serial communication baud rate	Default baud rate 57600bps, 1 start bit, 1 stop bit, 3.3V TTL level
8	Interface and line sequence	6pin, 1.25mm horizontal sticker, please refer to the actual picture for the wiring sequence.
9	Fingerprint database capacity	100 pieces
10	Storage temperature and humidity	-40℃~+85℃; 45%~95%RH

11	Operating temperature and humidity		-25℃~+85℃; 45%~85%RH
12	False recognition rate		<0.001%
13	rejection rate		<=1%
14	Comparison method		1N
15	After initialization is completed, a handshake command is actively sent.		support
16	Self-learning function		none
17	Fingerprint unique serial number		support
18	Fingerprint entry buffer definition		160*160 fingerprint head: bufferCharBuffer1, CharBuffer2 or CharBuffer3 are 0x00, 0x01, 0x02 respectively
19	Instructions use buffer definition		support
20	Fingerprint head security level		Default is level 3
21	Sensor	sensor solution	Sensor wake up
		Sleep command reliability	It is recommended that the lock end issues a sleep command during the process to support active sleep of the module.sensor
		Sensor scan time	Default 200ms
		Quiescent Current	Average current 9-10uA
		Output level	It is usually high level, and outputs low level when your finger touches the fingerprint sensor.
22	HBS system identification code		According to HBS communication protocol, the system identification code in the read system parameters (ReadSysPara) is defined according to the HBS assigned identification code, which facilitates the lock terminal to identify the fingerprint head type.
23	Module version number		hardware version:HLK-ZW0608-V1.0 Software version:G1.10.4

24	Three-proof paint application requirements	1. Press HBS Engineering Department defines and implements the specifications, which requires the thickness to be greater than 0.05mm and the coating to be even. 2. Whole lock 96After H salt spray, the fingerprint head does not appear abnormal (such as functional failure or abnormal power consumption).
25	ESD requirements: Contact discharge: ±8KV Air discharge: ±15KV	HBS static electricity requirements: 1. The fingerprint head needs to be subjected to two types of contact discharge and air discharge, with at least 6 groups of each voltageAfter x10 discharges, there should be no functional failure or abnormal power consumption. 2. The number of test samples is required to be greater than 5pcs
26	Inspection report of the third police station	Support authentication
27	technical standard	satisfyGA701-2007/GA374-2019 standard, including anti-radiation interference capability

2.2.Important Technical Parameters

Category	Subcategory	Smallest	Typical	Maximum	Unit	Remark Illustrate
frequency	Number of entries	-	**3**	-	Second-rate	
time parameters	Power-on initialization time		**100**		ms	
	Picture collection time	145	**150**	155	ms	
	Generate feature value time	185	**190**	195	ms	
	Fusion storage time	80	**90**	100	ms	Merge time + storage time
	Algorithm comparison time (1:99)	10	**80**	150	ms	This is only applicable to the response time of

						successful comparison.
	Lock end waiting command timeout		**1000**	1500	ms	Valid when comparing commands
Voltage and current	Supply voltage (algorithm)	2.7	**3.3**	3.6	V	
	Supply voltage (Sensor)	2.7	**3.3**	3.6	V	
	Operating current (algorithm)		**37**	48	mA	
	Quiescent current (Sensor)		**9**	10	uA	

2.3.Structural parameters

Project	Material	Comment
Metal ring	Stainless steel	Stamping, natural color, thickness 1.5±0.1mm
Sensor	Resin	Black, thickness 0.68±0.05mm
PCB	FR-4	Matt green, thickness 0.8±0.1mm

Project	Parameter	Unit
Sensor size	12.05*12.05	mm
Window size	12*12	mm
Sensing area	8*8	mm
Connection method	SPI	/
Model	HLK-ZW0608	/

3. Hardware description

3.1. Physical pictures of the module and examples of conformal paint application

Module front HLK-ZW0608

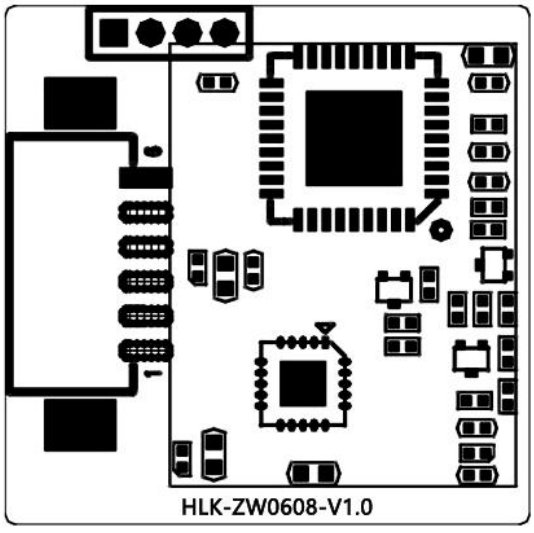
Module reverse side(No conformal paint applied)

Remark:

The picture above is Physical sample of HLK-ZW0608 fingerprint module, painted according to HBS conformal paint specifications when shipped, thickness >0.05mm.

3.2. Interface definition

pin	definition
6	GND
5	RXD
4	TxD
3	VDD_3.3V
2	Detect
1	SENSOR_3.3V



Fingerprint module interface

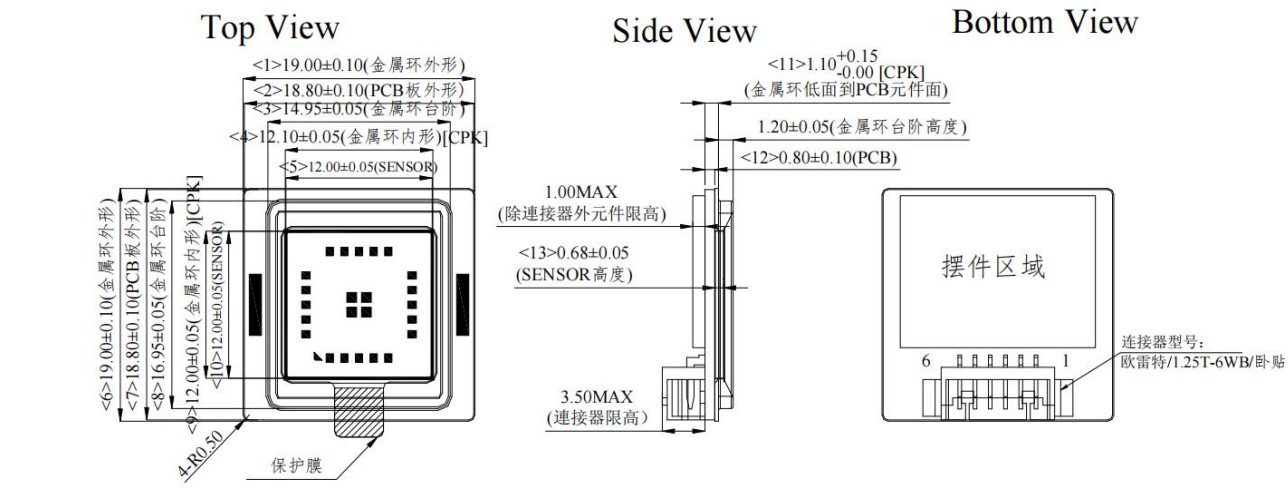
The interface is defined in detail as follows:

Pin number	Name	Definition	Type	Remark
1	SENSOR_3.3V	SENSOR module power supply	P	Requires constant power supply without power outage
2	Detect	Sense power-on signal	O	When a finger touches the fingerprint sensor, it outputs a high level
3	VDD_3.3V	Used for overall power supply of fingerprint module	P	Please make sure to turn off the power supply in standby mode
4	TxD	Serial port transmitter TXD	O	Connect lock terminal RX
5	RXD	Serial port transmitter RXD	O	Connect lock terminal TX
6	GND	land	P	Lock terminal

Illustrate:

1. The serial port is3.3V TTL level. If you need to connect to the serial port of a PC, you need to connect the TTL-USB adapter board before communication.
2. **1 foot(SENSOR module circuit power supply) needs to be powered at all times.** Please ensure that the power supply has small ripple and is not interfered by other power supplies.
3. After the MCU is powered on, if the finger presses the sensor or takes a picture command, the Detect pin still has an interrupt signal. At this time, the lock board does not need to process the signal.
4. Distinguish models according to the following symbols: P---power supply, ground; I---signal input; O--- signal output.

3.3. Structural dimension drawing



备注：
1、未注公差：±0.20；
2、带<n>序号为重点管控尺寸；
3、带[CPK]为CPK尺寸，CPK≥1.33。

4. Design constraints and considerations

4.1. Interrupt signal handling

For the lock board, the interrupt signal is only used to wake up the system. After waking up, the interrupt can be blocked and turned on after the fingerprint module goes to sleep.

4.2. Fingerprint module internal circuit description:

① Directly using the fingerprint sensor FD mode, the SENSOR wake-up is highly reliable and reduces the risk of false triggering.

② When there is no finger touch, the Detect signal line is high level. When the finger touches the fingerprint sensor, the signal is triggered to low level, and then changes to high level when the finger leaves.

③ When using the Detect signal for secondary development, you need to pay attention to the following matters:

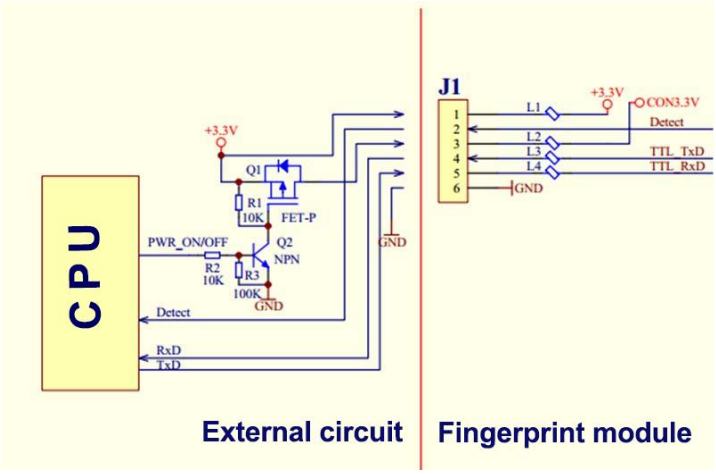
When the HLK-ZW0608 fingerprint recognition module is in sleep state, it is used as a wake-up signal. When a finger touches the fingerprint sensor, the touch signal is activated, which then wakes up the system (powering on the fingerprint module). At this time, the secondary developer can ignore the signal and wait for the normal operation of the fingerprint module (collection, registration, comparison, etc.) to be completed, and then power down the module MCU power supply (CON3.3V) (for the CON3.3V power supply, For control, please refer to the 3.3V power control circuit section below). This signal can be reused when the fingerprint module is touched again.

4.3. Power supply ripple noise requirements

The sensor source needs to control the power supply ripple within 200mV to avoid excessive power supply ripple causing the sensor to reset at low voltage, causing the sensor to not work properly.

4.4. Fingerprint module external circuit description:

The external master can reduce power consumption by controlling the CON3.3V power supply to turn off. The circuit is shown in the figure below:



3.3V power control circuit

The function of the upper left circuit is to control the Q2 transistor on and off through the PWR_ON/OFF signal of the external MCU, thereby reducing circuit power consumption. When the 3.3V power supply is cut off, only the sensor module is working in the entire module, and when the sensor is in detection mode, the power consumption is less than 10μA.

4.5. Touch powered design

The sensor wakes up without a touch IC. To ensure normal touch function, the sensor power supply needs to be stable and avoid low-voltage reset. To ensure that the sensor is in FD mode when sleeping, it is recommended to delay power-off or issue a sleep command before power-off.

4.6. Sleep instruction design

For modules that are awakened by the sensor, the main purpose of the sleep command is to ensure that the sensor enters FD mode normally. After the MCU is powered off, it can detect fingers normally and output a valid interrupt signal. After the sleep command is sent, the corresponding response to the command must be received before the MCU can be controlled to power down. During the command execution process, software reset and calibration will be performed. If the power is lost before the reset is completed, it will cause sensor abnormality.

4.7. Timing design requirements

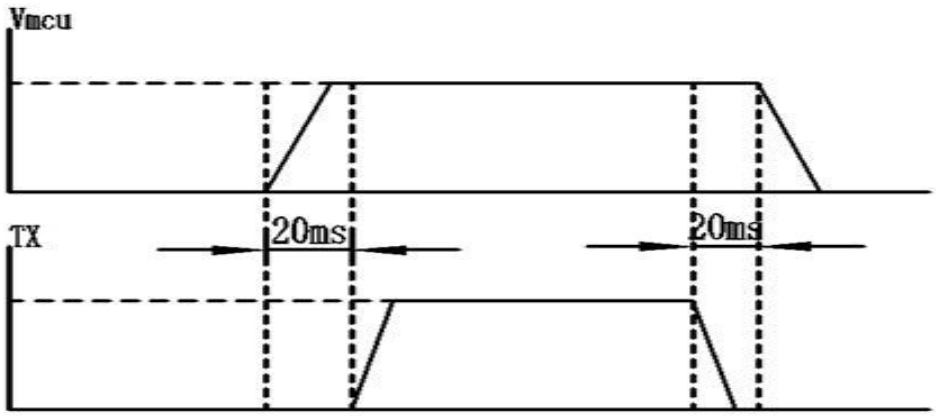
In order to ensure the normal power-on and operation of the algorithm chip, it must be powered on and off strictly according to the following power-on sequence: power-on must wait 100ms before interacting with instructions.

① After the main control MCU receives the INT wake-up signal, it first controls the MCU3.3V to power on, and then opens the serial port.

With particular emphasis on:It is forbidden to open the serial port first and then control the MCU3.3V to power on. Otherwise, power-on abnormality will occur due to leakage of the serial port signal line, and the module cannot be used.

② After completing the fingerprint unlocking, before entering sleep, first turn off the serial port, and then control the MCU3.3V to avoid excessive power consumption caused by leakage of the serial port; to avoid abnormality of the MCU caused by leakage of the serial port.

With particular emphasis on: After sleeping, the serial port must be closed and TX and RX must be pulled low.

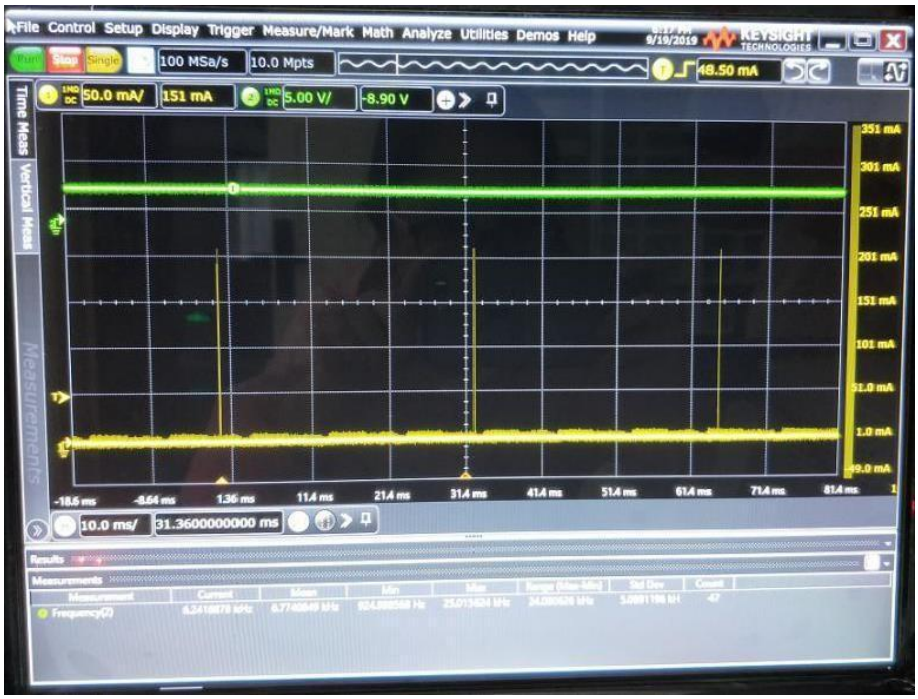


Timing diagram

4.8. Fingerprint chip FD mode application precautions

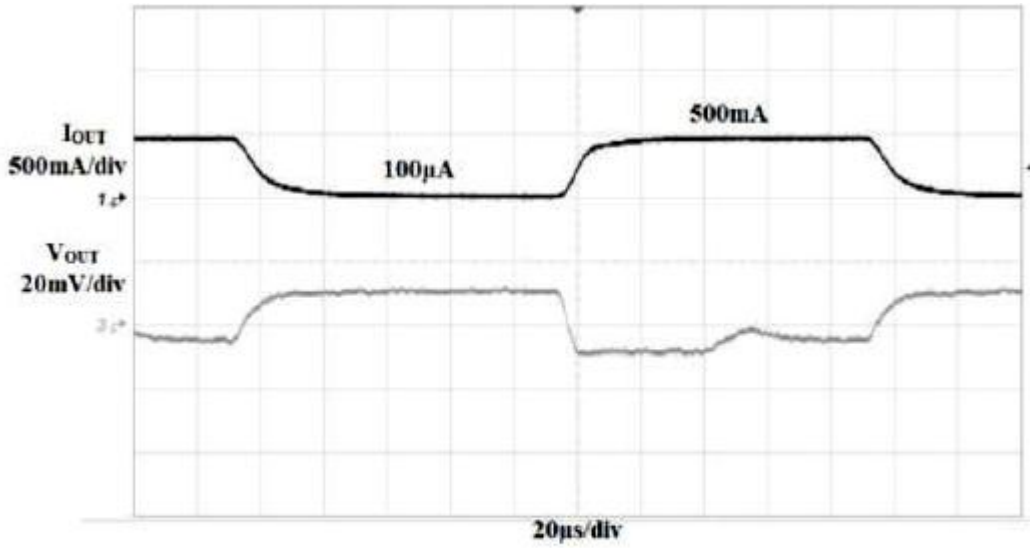
4.8.1. Fingerprint sensor chip power supply requirements

Due to the characteristics of the fingerprint chip itself, in the FD (FingerDetect) working state, that is, when the fingerprint chip is scanning and detecting fingerprints, a peak current of about 200mA will appear for 4us. Therefore, there are strict requirements for the power supply of the fingerprint chip.



The operating current of the fingerprint chip in FD mode is shown in the figure above

4.8.2. To power the fingerprint chip, an LDO module with fast transient response is required;

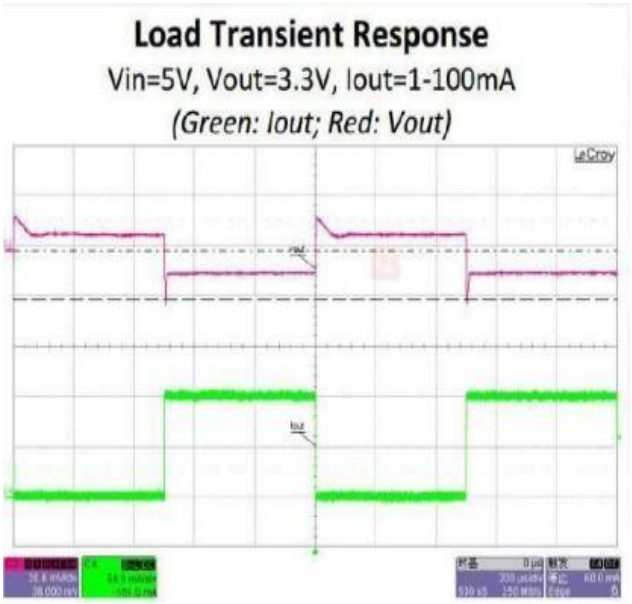


Load transient response waveform

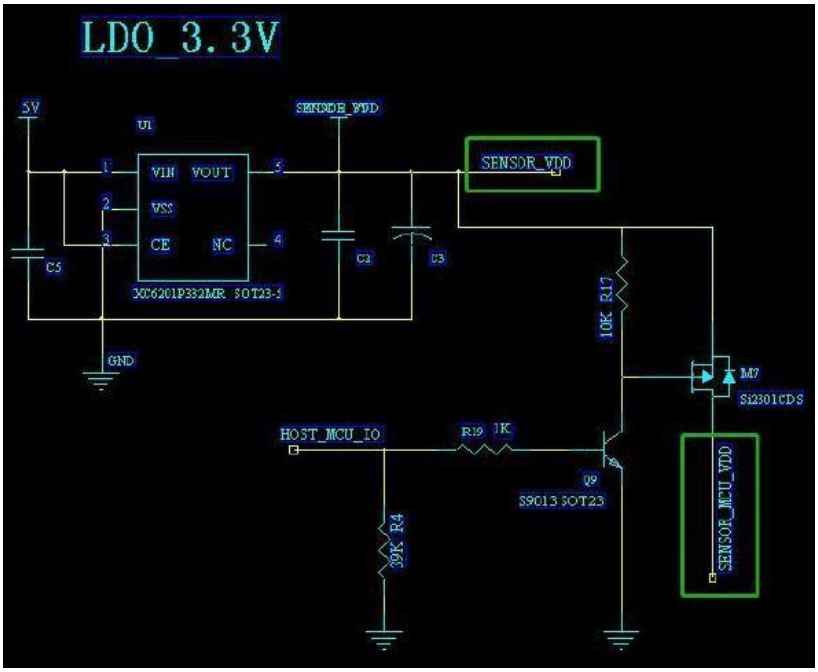
4.8.3. LDO selection

1. The output current of fingerprint-powered LDO is recommended to be ≥250mA;

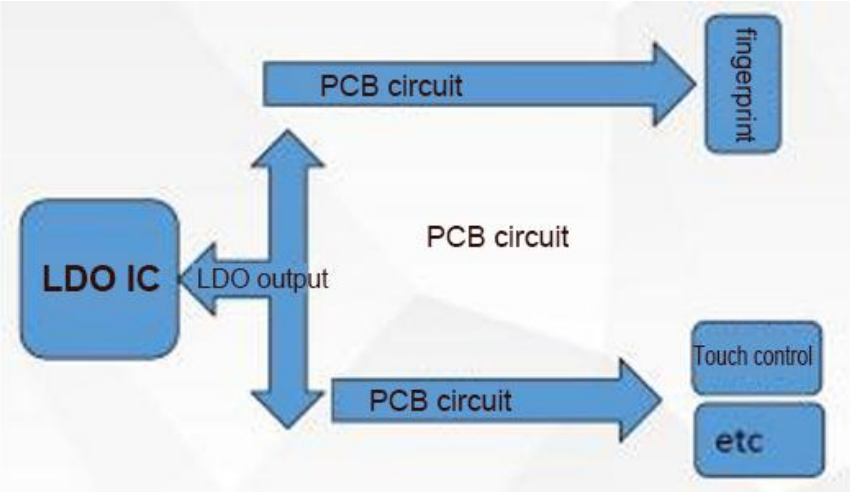
2. Choose a fast-response LDO;



3. It is recommended to use a separate LDO to power the fingerprint module. The LDO output line supplies power to the fingerprint chip all the way, and a separate line is controlled by a MOS switch to power the fingerprint module algorithm MCU.



4. When the fingerprint module shares the LDO power supply with other modules, the fingerprint module power supply needs to be routed separately from the LDO output on the PCB Layout.



4.9. Other requirements

1. The following situations may cause the sensor to fail to sleep and lose the touch wake-up function. It is necessary to re-power the algorithm chip and initialize the sensor.

① The sensor power supply is unstable and the voltage is pulled down.

② The sleep command is not issued and the algorithm chip suddenly loses power.

2. The following situations may cause the fingerprint module to re-awaken or self-awaken

① The protective film on the sensor surface has not been removed

② Press the sensor with your finger for a long time (only for level trigger wake-up)

3. A large area of water droplets adheres to the surface of the sensor, which will cause high standby power consumption. Please pay attention to cleaning when using it.

4. When assembling the fingerprint module, it is necessary to avoid direct contact between the burning point and the metal structural parts, otherwise it may cause abnormal functions and power consumption.

5. Version revision history

Version	Revision Notes	date	Revised by
V1.0	first draft	2024-1-26	Chrales

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