

# **Fingerprint Module User Manual**

## **HLK-FPM383F**

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## Preface and Statement

Thank you for purchasing the fingerprint module of Shenzhen Hi-Link Electronic Co., Ltd. This manual is written for software and hardware application development engineers, including hardware interface, system resources, command system, installation information, etc. In order to ensure the smooth progress of application development, please read this user manual carefully before module system integration, and please keep it properly , for quick reference in case of problems.

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# 1. Introduction

HLK-FPM383F is a new type of area array semiconductor fingerprint module. Compared with existing products on the market, this module has the advantages of small size, low power consumption, fast recognition speed and high recognition accuracy.

The HLK-FPM383F module is easy to use, and is especially suitable for small, battery-powered devices such as door locks, card readers, and safes; while maintaining low power consumption, it can maintain excellent response performance and high-speed recognition speed.

This module uses a capacitive fingerprint sensor, which can effectively detect fake fingers by measuring fingerprint signals. The surface of the fingerprint sensor uses a high-hardness coating, which can greatly reduce the wear and tear on the fingerprint sensor in daily use. In addition, HLK-FPM383F can withstand 15KV static electricity, which is not easy to damage the fingerprint sensor when used in winter or in areas with high static electricity such as the north.

The HLK-FPM383F module is with a 1.0mm connector, which can be connected with ordinary cables to enhance connection reliability.

The HLK-FPM383F interface supports UART, and the default baud rate of UART is 57600. The baud rate can be set by software. (Note: The baud rate will take effect immediately after the setting is successful. Please use the new baud rate for communication. If you forget the set baud rate, please return to the factory to reset or verify all possible set baud rates.)

## 2.Features



Figure 1 HLK-FPM383F module

- ❖ Area array fingerprint sensor
- ❖ Sensor surface covered with protective coating
- ❖ RGB tri-color LED lights
- ❖ UART interface
- ❖ 1.0mm connector for reliable connection
- ❖ Fingerprint module supports 3.3V power supply
- ❖ ESD protection level>15KV
- ❖ Support storage of 50 fingerprint features (spliced 12 times)

### 3. Algorithm Specification

- ❖ False Acceptance Rate FAR (FalseAcceptanceRate):  $<1/1000000$
- ❖ False Rejection Rate FRR (FalseRejectionRate):  $<2\%$
- ❖ Response speed: feature extraction time  $<0.30s$ , single matching time  $<0.025s$
- ❖ Support fingerprint stitching, the maximum number of stitching: 12 times
- ❖ Number of fingerprints: 50 fingerprints (spliced 12 times)



## 4. Application Scenario

- ❖ Security field: fingerprint door lock, safe, jewelry box
- ❖ Management areas: licensing, management software, etc.
- ❖ Financial and other identity authentication fields: access control systems, POS machines, attendance machines, etc.

## 5. Structure Size Definition

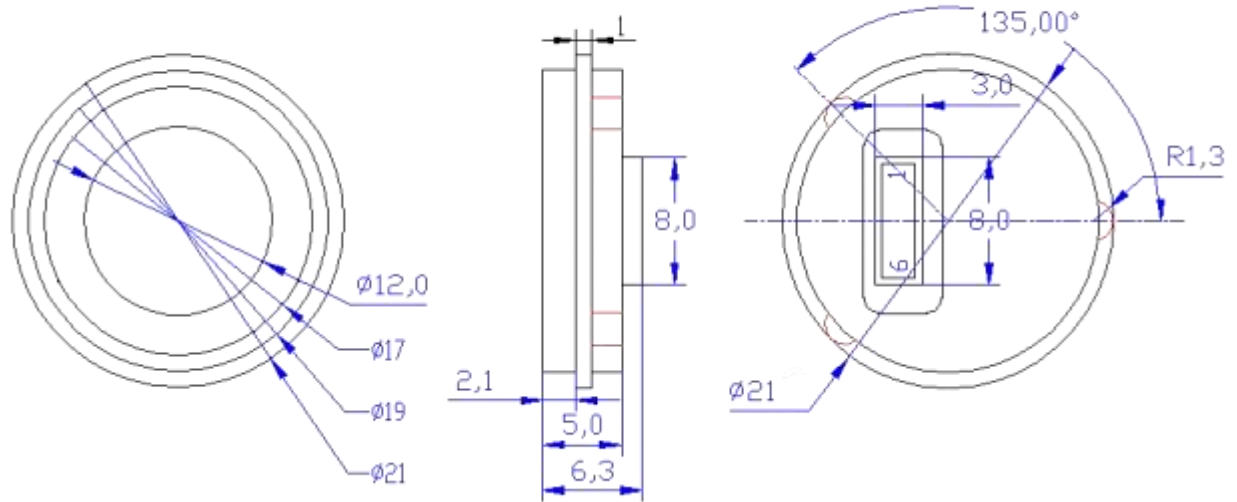


Figure 2 Module front structural dimensions

## 6.External Interface Definition

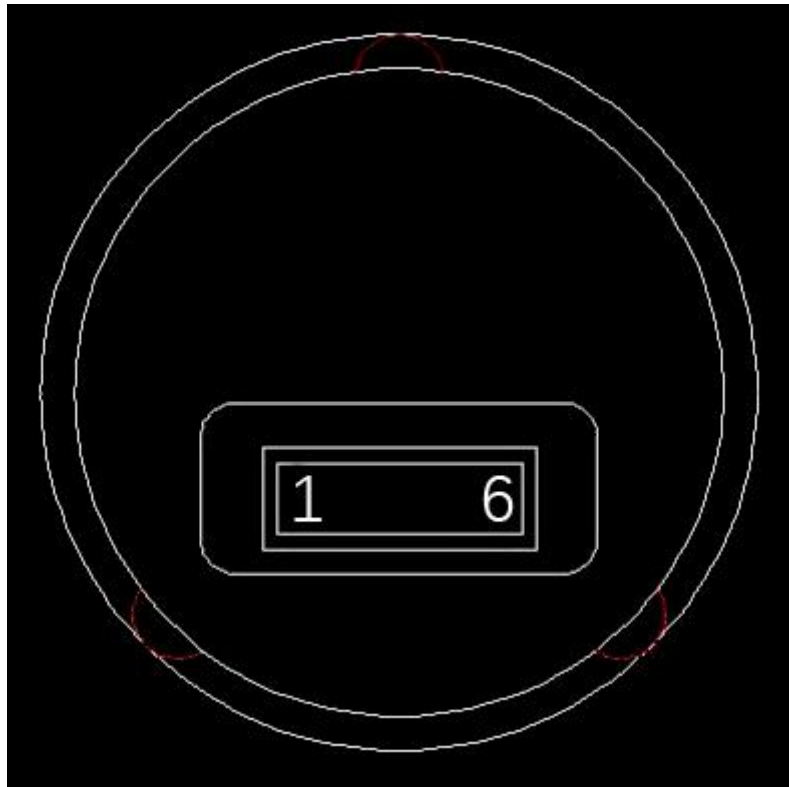


Figure 3 Interface definition on the back of the module

The module interface is defined as follows, **please pay attention to the RXD/TXD sequence of the master when connecting with the Host :**

1	2	3	4	5	6
V_TOUCH Only supports 3.3V power supply	TOUCHOU T —	VCC Only supports 3.3V power supply	TX	RX	GND

## 7. Specification Definition

Parameter	Describe	Value	Unit
Interface	1.00mm connector	6	pin
Supply voltage	DC voltage (typ.)	3.3	V
Supply current	Typical value (Supply voltage: 3.3V, single color LED lights up)	<40	mA
Sleep mode	Typical value (fingerprint detection)	<25	uA
Serial baud rate	Baud rate	57600	Bps
Size	Appearance structure, standard value	Φ21.00	mm
Pixel resolution	256 gray values	8	bit
Static protection	IEC61000-4-2,levelX, Air discharge	±15	kV
Natural wear and tear	Press repeatedly under 0.6N	>1 million	Time
Working environment	Temperature	-20~+55	°C
	Relative humidity	40%~85%(No condensation)	RH
Storage environment	Temperature	-40~+85	°C
	Fingerprint storage	<85%(No condensation)	RH
Fingerprint storage	Splice 12 times	50	Piece

Table 1 Specification definition table



## 8.Custom Specifications

None

## 9.Hardware Reference Design

### A. Power supply design

1. The voltage range is 3.0V~3.6V (measured at the module interface). If it is not in this voltage range, the module will not work properly or be damaged. It is recommended that the power supply of the fingerprint module should not share one VCC with other devices that require high current (such as motors, power amplifiers, etc.), to prevent module reset or fingerprint registration abnormality due to power fluctuations;

2. The peak current of the module at the moment of power-on can reach up to 100mA, so the LDO powering the module needs to be able to output sufficient current. At the same time, the peak current of the module at the moment of power-on may cause a short-term drop in the output voltage of the LDO. It is recommended that the module and the main control MCU do not share the same LDO. If the module and the main control MCU share one LDO, it is recommended to add 220uF Capacitors are used to prevent voltage drops from affecting the work of the main control MCU.

**It is recommended to use the circuit in the following way:**

Use an independent 1-channel LDO for power supply. When the PWR\_EN pin is pulled low, the module is powered on, and when the PWR\_EN pin is pulled high, the module is powered off.

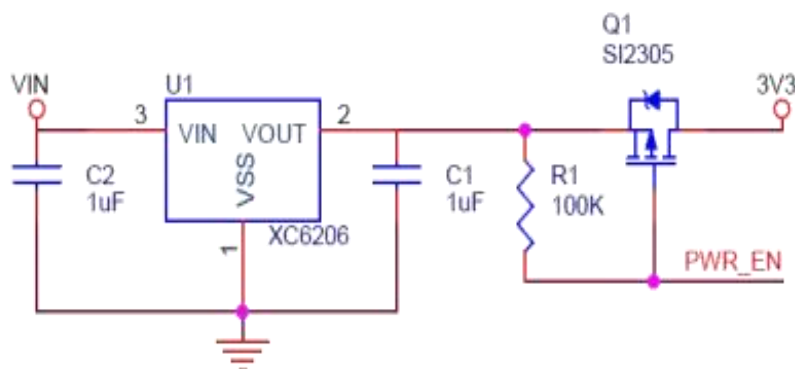


Figure 4 Low power consumption reference circuit design

## B.Serial port design

The RX of the UART serial port of the fingerprint module is connected to a pull-up resistor but the TX is not connected, so the corresponding RX needs to be connected with a pull-up resistor to ensure the normal communication of the UART serial port. When the user uses the same direction cable and the layout package of the fingerprint module connector, the line sequence of the J1 interface in the schematic diagram should be opposite to that of the layout package.

The client software needs to follow the following regulations: After the fingerprint module VCC is powered on, configure the fingerprint module serial port to work normally; before the fingerprint module VCC is powered off, set the MCU serial port to input high-impedance state to prevent the client MCU from feeding power to the fingerprint Module (based on the fingerprint VCC voltage being 0 level after power-off).

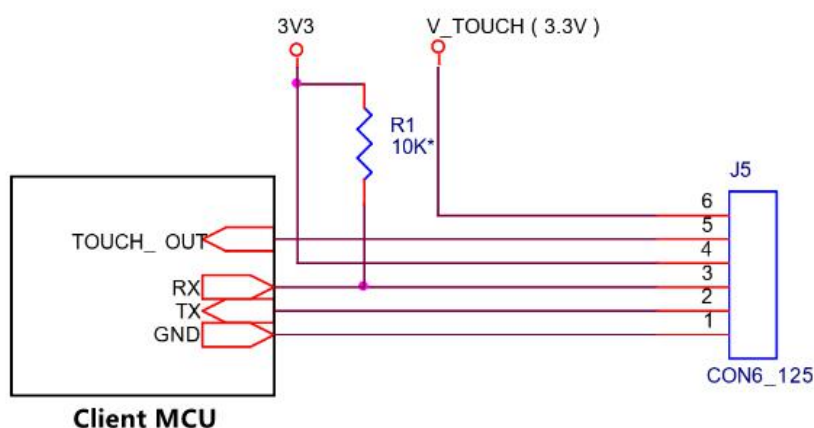


Figure 5 Serial port circuit design

## C. Interrupt circuit design

The module interrupt signal is generated by the Sensor chip. The interrupt output pin has a pull-down resistor by default. During sleep, the interrupt output pin will maintain a low level until a finger presses the fingerprint sensor. At this time, the interrupt output is high, and the sensor enters sleep again. goes low.

It is recommended that the MCU on the user end shield the interrupt trigger function of the interrupt pin after the module wakes up, and then enable the interrupt trigger after the module enters sleep mode, and set it as a rising edge trigger.

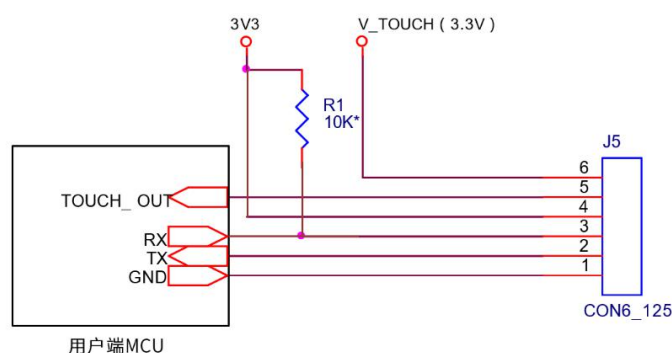


Figure 6 Interrupt circuit design

## D. ESD protection design

During ESD testing, in order to reduce the impact of static electricity on the main control board, it is recommended to add ESD devices next to the connector of the main control board to reduce the impact of static electricity on the main control board. The ESD device should be as close as possible to the fingerprint module connector to improve the protection effect of the ESD device.

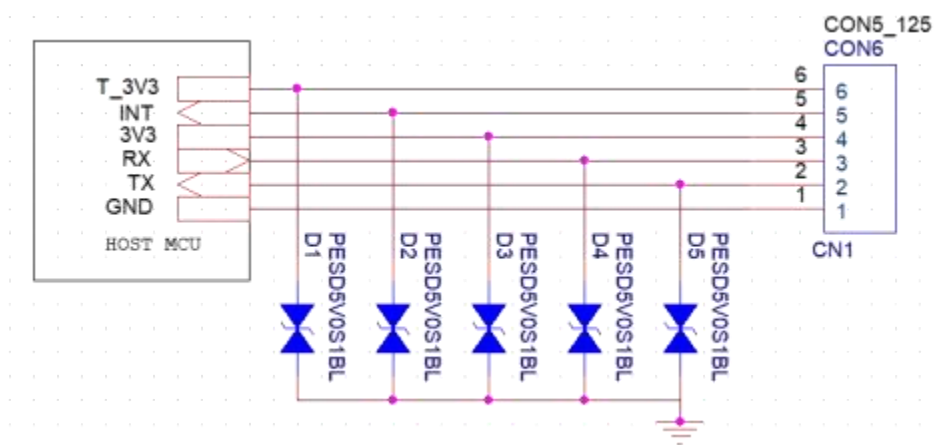


Figure 7 ESD protection design

## 10. Software Reference Design

**The main control wake-up module workflow:**

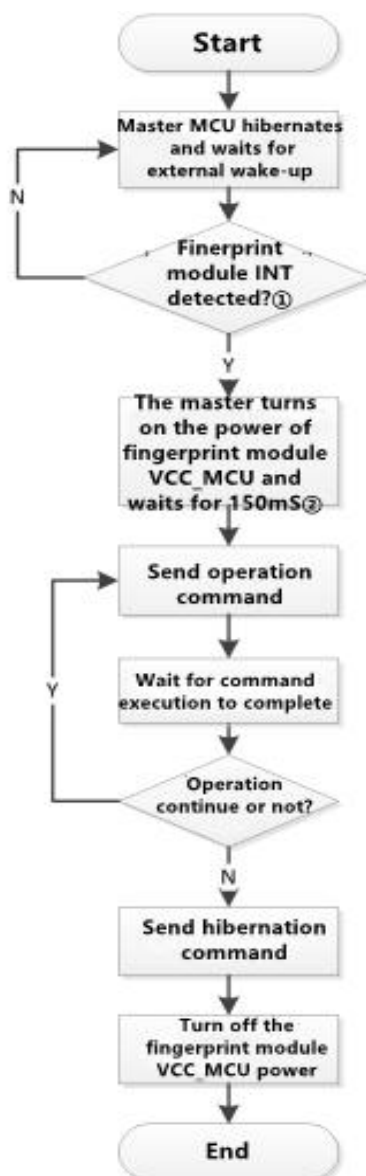


### Description:

1 The measured power-on time of the module is about 130ms, and it is recommended to operate the module after a delay of 180ms. When sending the query result command, the module may not reply because it is processing the task corresponding to the current command. At this time, you can try to delay the query result command by about 100ms until the module replies. In addition, when the module is powered on, the serial port of the module will output "0x55" after the system initialization is completed, and the main control MCU can also judge whether the initialization of the module is completed by checking whether it receives this flag.



## The module wakes up the main control workflow:



### Description:

① After the main control detects the fingerprint module INT, the main control turns on the module VCC\_MCU.

② The measured reset startup time is about 130ms, and the recommended delay is 180ms. When sending the query result command, the module may not reply because it is processing the task corresponding to the current command. At this time, can try to delay the query result command by about 100ms until the module replies. In addition, when the module is powered on, the serial port of the module will output "0x55" after the system initialization is completed, and the main control MCU can also judge whether the initialization of the module is completed by checking whether it receives this flag.

## 11.Ordering Information

Typenumber	Description
HLK-FPM383F	Black matte Sensor, black metal ring (default delivery)

## 12. Revision History

Version	Revisions	Date	Modifiedby
V1.0.2		2022-03-20	<u>Admin</u>