

Fingerprint Module User Manual

FPM093D

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Preamble and Disclaimer

Thank you for purchasing the fingerprint module of Shenzhen isun Technology 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.Summary

FPM093D is a new type of face-array semiconductor fingerprint module, which has the advantages of small size, low power consumption, fast recognition speed, high recognition accuracy and so on, compared with the existing products in the market.

The FPM093D module is easy to use and is especially suitable for applications in smaller, battery-powered devices such as door locks, card readers, and safes, where low power consumption maintains excellent responsiveness and high recognition speed.

This module adopts capacitive fingerprint sensor, which can effectively detect the problem of fake finger by measuring the fingerprint signal. 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, FPM093D can withstand 15KV static electricity, which is not easy to damage the fingerprint sensor when used in winter or in the north and other areas where static electricity is relatively high.

The FPM093D module uses a 1.0mm connector that can be connected using ordinary cables for enhanced connection reliability.

FPM093D interface supports UART, the default baud rate of UART is 57600. you can set the baud rate by software. (Note: The baud rate takes effect immediately after it is set successfully, please use the **new baud rate to communicate**. If **you** forget the set baud rate, please return to the factory to reset or verify all baud rates that may have been set.)

2.Characteristic



Figure 1 FPM093D Module

- ❖ 160*160 pixels resolution face array fingerprint sensor
- ❖ Sensor surface covered with protective coating
- ❖ RGB tri-color LED lights
- ❖ UART interface
- ❖ 1.0mm connector to support reliable connections
- ❖ Fingerprint module supports 3.3V power supply
- ❖ ESD Protection Rating >15KV
- ❖ Supports storage of 100 fingerprint features (spliced 3 times)

3. Algorithm Specifications

- Recognition rate FAR(FalseAcceptanceRate) : $<1/1000000$
- Reject rate FRR(FalseRejectionRate) : $<1\%$
- Response speed: feature extraction time $<0.25s$, Single match time $<0.002s$
- Support fingerprint splicing, maximum number of splicing: 3 times
- Number of fingerprints: 100 fingerprints (spliced 3 times)

4. Application Scenario

- Security field: fingerprint door locks, safes, jewelry boxes
- Management area: licensing, management software, etc.
- Financial and other identity authentication fields: access control systems, POS machines, time and attendance machines, etc.

5. Definition of Structural Dimensions

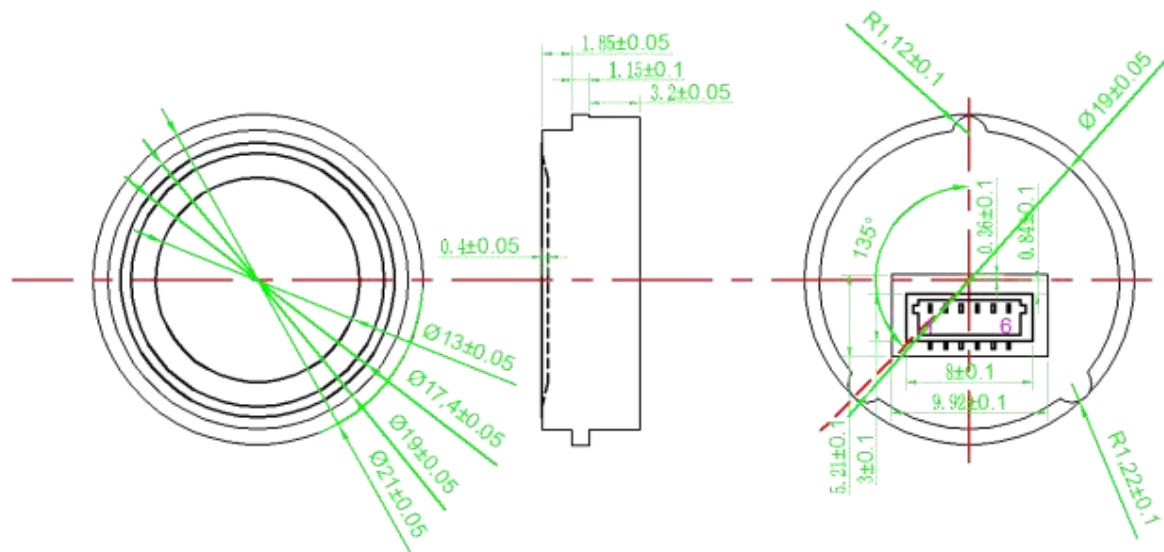
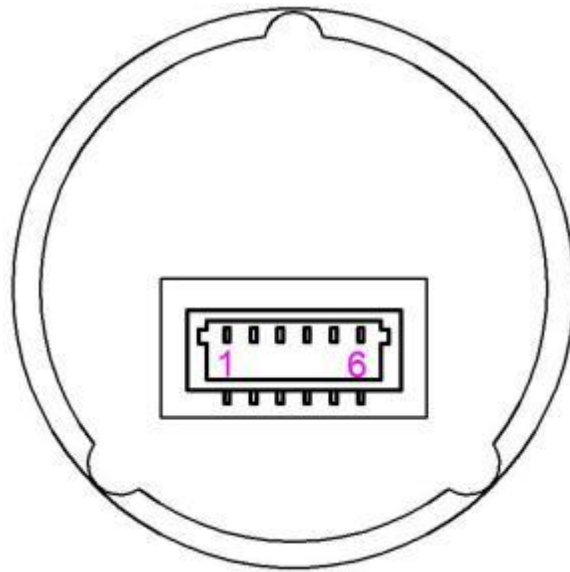


Figure 2 Dimensions of The Front Structure of The Module

6.External Interface Definition



The module interfaces are defined as follows, please note the RXD/TXD order of the Master when connecting to the Host:

1	2	3	4	5	6
V_TOUCH only supports 3.3V power supply	TOUCHOUT —	VCC supports 3.3V power supply only	TX	RX	GND

Description:

Under low power consumption, you need to disconnect the VCC power supply, and only keep V_touch to supply power to the touch IC, after the metal ring detects the finger pressing on it, TOUCHOUT will output a level, and then supply power to the VCC to read the fingerprint information again.

7.Specification Definition

Parameters	Descriptive	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)	<30	mA
Sleep mode	Typical (Fingerprint detection)	<12	uA
Serial port baud rate	Baud rate	57600	Bps
Size	Appearance structure, standard value	Φ21.00	mm
Pixel resolution	256 grayscale values	8	bit
Electrostatic protection	IEC61000-4-2,levelX, air discharge	±15	kV
Natural wear and tear	Repeated pressing at 0.6N	>1 Million	time
Working environment	Temperature	-20~+55	°C
	Relative humidity	40%~85% (No condensation)	RH
Storage environment	Temperature	-40~+85	°C
	Relative humidity	<85%(No condensation)	RH
Fingerprint storage	Splicing 6 times	100	pc

Figure 3 Specification Definition Table



8.Customized Specifications

None

9. Hardware Reference Design

A、Power Supply Design

1、The voltage range is 3.0V~3.6V (measured at the interface of the module), when it is not in this voltage range, it will cause the module to work abnormally or damaged. It is recommended that the power supply of the fingerprint module should not share the same VCC with other devices that require high current (e.g. motors, amplifiers, etc., in order to prevent power fluctuations that may cause the module to reset or fingerprints to register incorrectly.;

2、The peak current of the module at the moment of power-on can reach up to 100mA, so the LDO supplying power to the module needs to be able to output enough current. At the same time, the peak current of the module power-on moment may cause the LDO output voltage to fall briefly, it is recommended that the module and the main control of the MCU do not share the same LDO, if the module and the main control of the MCU share the same LDO, it is recommended to increase the capacitance of 220uF to prevent the voltage drop affecting the main control of the MCU's work. (SI2305 FET/MOSFET)

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

Use a separate one way LDO linear regulator (XC6206) to supply power, the module powers up when the PWR_EN pin is pulled low, and powers down when it is pulled high.

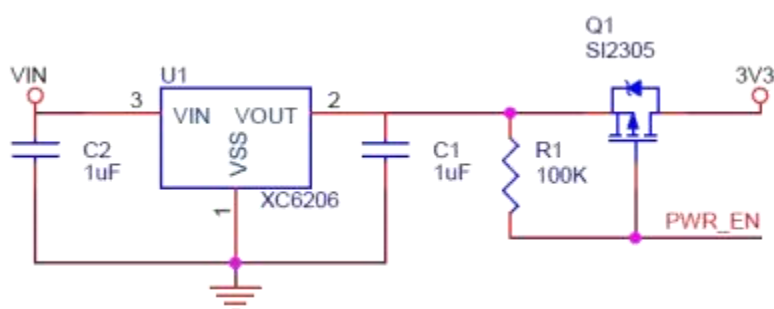


Figure 5 Low-power Reference Circuit Design

B、Serial Port Design

Fingerprint module UART serial port RX is connected with pull-up resistor but TX is not added, so the corresponding RX should be added with pull-up resistor to ensure the UART serial port communicates normally. When the user uses the same wiring and the fingerprint module connector layout package, the wire sequence of the J1 interface in the schematic diagram should be opposite to the wire sequence of the layout package.

The client software needs to follow the following rules: after the fingerprint module VCC is powered up, configure the fingerprint module serial port to work in normal mode; before the fingerprint module VCC is powered down, set the MCU serial port to be in the input high-resistance state, in order to prevent the client MCU from feeding power to the fingerprint module (based on the fingerprint VCC voltage being at the level of 0 after the power down).

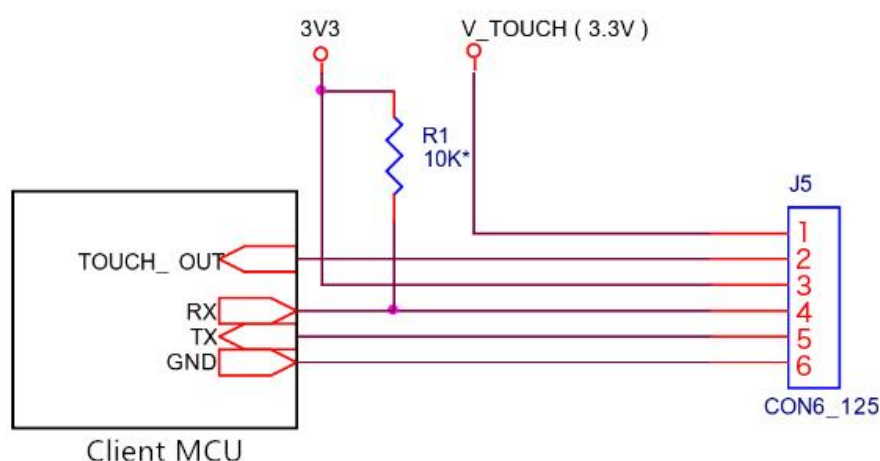


Figure 6 Design of The Serial Port Circuit

C、Interrupt Circuit Design

The module interrupt signal is generated by the Sensor chip, and the interrupt output pin is added with pull-down resistor by default, the interrupt output pin will keep low level when it is sleeping until there is a finger pressing the fingerprint sensor, and then the interrupt output will be high level pulse.

It is suggested that the user MCU should block the interrupt trigger function of the interrupt pin after the module wakes up, and then turn on the interrupt trigger after the module goes to sleep, and set it as a rising edge trigger.

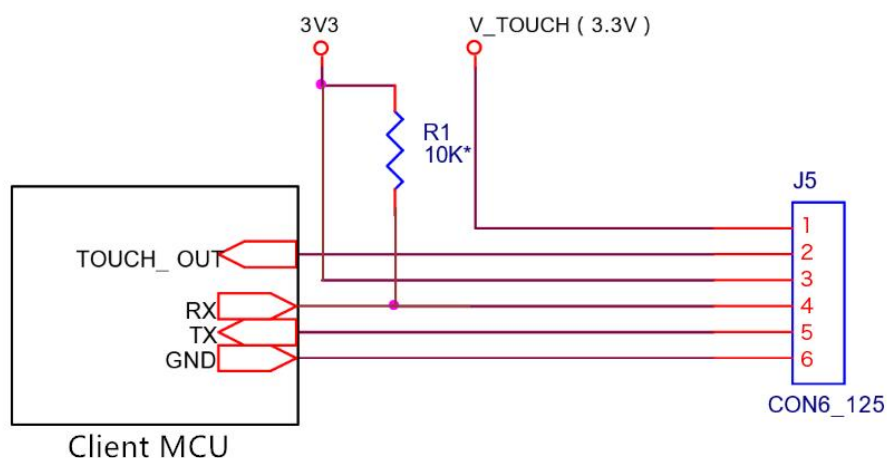


Figure 7 Interrupt Circuit Design

D、ESD Protection Design

During the ESD test, in order to reduce the impact of static electricity on the main control board, it is recommended to increase the ESD device 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 connector of the fingerprint module to improve the protection effect of the ESD device.

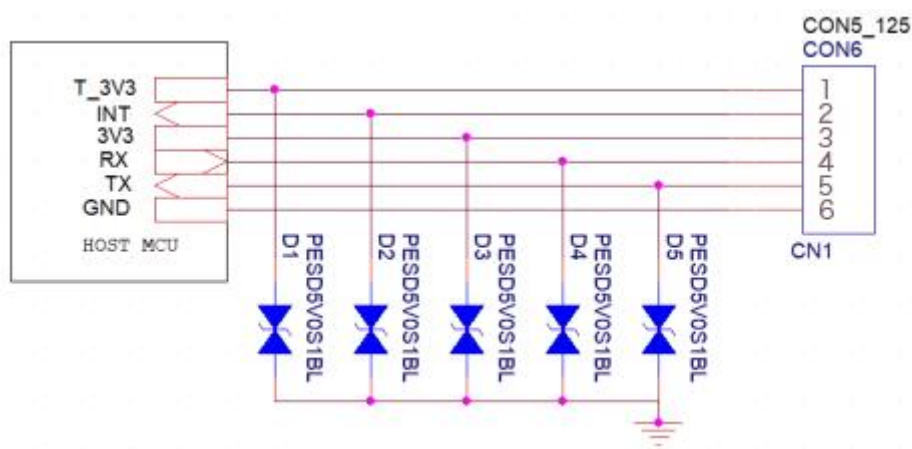


Figure 8 ESD Protection Design

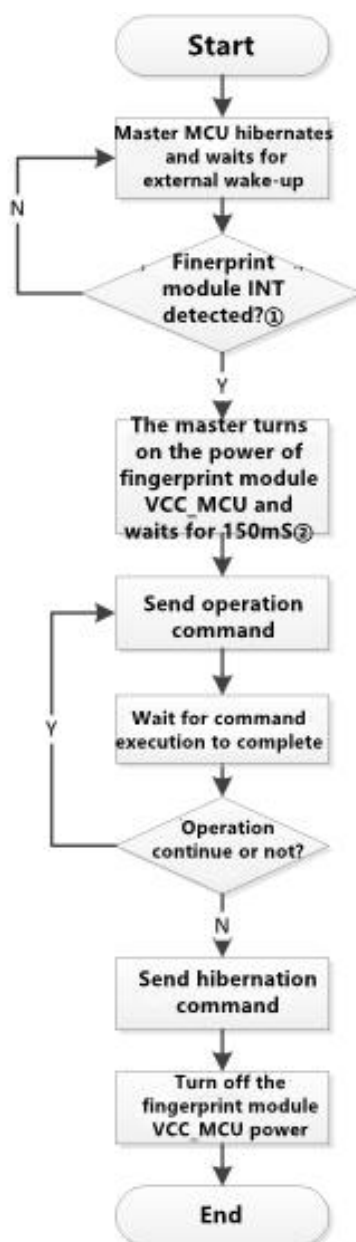
10. Software Reference Design

Master wake-up module workflow:



Description:

1. The measured power-on startup time of the module is about 100ms, it is recommended to delay 150ms before operating the module. When sending the command of query result, the module may not reply because it is processing the task corresponding to the current command, at this time, you can try to delay about 100ms to resend the command of query result 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 master MCU can also check whether it receives this flag to determine whether the initialization of the module is completed.

Module wake-up master workflow:**Description:**

① After the main control detects the fingerprint module INT, the main control turns on the module VCC_MCU.

② The actual reset start time is about 100ms, it is recommended to delay 150ms, when sending the command of query result, the module may not reply because it is processing the task corresponding to the current command, at this time, you can try to delay 100ms or so to re-send the command of query result 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 master MCU can also check whether it receives this flag to determine whether the initialization of the module is completed.

11.Ordering Information

Type Number	Description
FPM093D	Black matte Sensor with black high gloss metal ring (default shipping)

12.Revised Record

Version	Revisions	Date	Modifiedby
V1.0.3		2024-08-21	<u>Admin</u>