

BIOSE Capacitive integrated Fingerprint Module TM6726B15CM Product Specification

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Preface

Thank you for using the fingerprint module of Shanghai Tuzheng Information Technology Co.,Ltd

This product specification is written for technical engineers , including module functions,software and hardware interfaces,etc. In order to ensure the smooth progress of application development, please read this specification carefully before module development. In addition to understanding and mastering the technical concept and use method of this specification, you should also carefully read the relevant chapters such as the definition of pins ,precautions for use ,etc.

Please keep the specification properly so that you can quickly consult the module related information in case of any problem.

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1.Product Overview

1.1 Features

The application of TM6726B15CM semiconductor fingerprint module provides a platform for realizing the function of fingerprint processing module through serial port and interactive communication according to TM2826B15CM integrated program communication protocol. It is convenient for secondary development and has the following characteristics.

1. Independent intellectual property

Algorithmic chip, fingerprint collection particle, software and hardware design related technologies are independently developed by graphic technology ,and the entire product chain can fully meet the needs of customers and have no concerns about intellectual property disputes.

2,Fingerprint has good anti-interference and adaptability

Fingerprint acquisition is suitable for different people,and automatic adaptation mechanism ensure the imaging quality of dry and wet fingers.

3,Excellent algorithm performance

According to the optimization design of fingerprint sensor imaging principle,it has self-learning function, and the algorithm has good correction and fault tolerance performance for deformed and poor quality fingerprint.

4. Flexible selection of safety level

For the different application scenarios,users can set the required security level according to their own and environmental requirements

5. Simple operation and strong plasticity

Users can develop the fingerprint recognition application system according to the module control instructions.

1.2 Applied Range

TM6726B15CM is widely used . It is suitable for fingerprint identification system from low end to high end as follows:

1.simple safety box,door lock,etc;

2.More complex access control system.

3.Fingerprint IC card identification terminal;

4.Fingerprint identification and authentication system online with PC.

According to the technical data provided in this manual, a variety of application systems based on fingerprint identification can be developed.

2.Performance

Number	Item	Parameter
1	Module package	Ø18.3mm*7.3mm
2	Pixel	160×160
3	Resolution	508DPI
4	Gray Level	256level

5	Data Connection	USART
6	Start speed	<50ms
7	Matching speed	1:1<600ms
8	Feature Learning and storage time	<400ms
9	RS232 (TTL)	RS232 (TTL)
10	Communication BPS	115200bps
11	Comparison Mode	1:1&1:N
12	Capture Mode	Active type
13	FRR	<1%
14	FAR	<0.001%
15	Storage	100pcs Fingerprints
16	Press times	1,000,000 次
17	Supported operating system	Embedded, Android, Linux, Wince, Windows ect

3. Electrical Features

Item	Min	Typical	Max	Unit
Touch supply voltage		3.3		V
Fingerprint supply voltage		3.3		V
Power Consumption		23	40	mA
Capture Peak current		35	45	mA
Static current	-	2	10	μ A
Working temperature	-20	-	60	℃
Working humidity (without condensation)	40		85	%RH
Storage temperature	-40	-	85	℃
Storage humidity (without condensation)	-	-	85	%RH
ESD non-contact	-	-	±15	KV
ESD contact	-	-	±8	KV

Instruction:

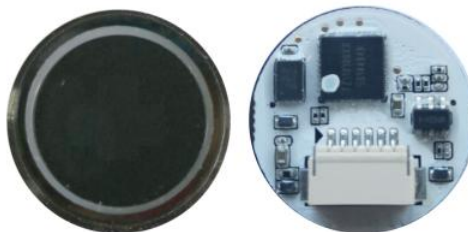
Working current refers to the current under capturing such as register and match .

Sleep current refers to the current under fingerprint supply voltage 0 level while touch supply voltage 3.3v .

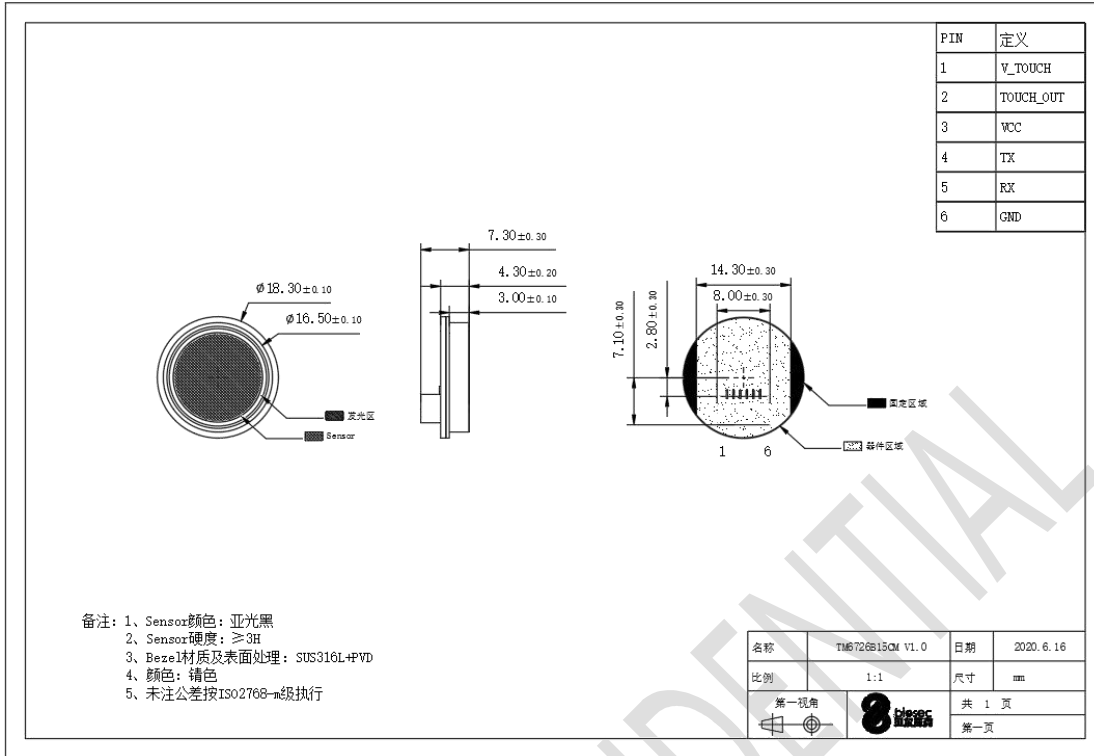
Abnormal conditions may occur when the touch supply voltage is outside the specified range.

4.Product Structure

4.1Appearance



4.2 Assembly Drawing

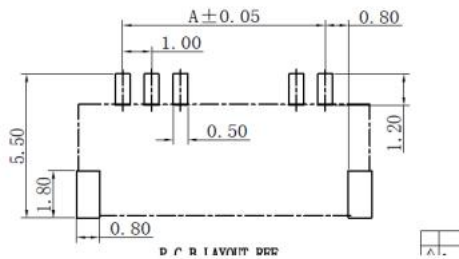


5. Hardware Interface

Communication interface: Standard UART TTL Level

Baud rate: 115200 bps, 1 start bit, 1 stop bit, 3.3V TTL level

Connector: 6Pin_ 1.0mm;



Pin sequence:

Pin	Definition	Instrucion
1	V_TOUCH	3.3V touch supply (always on)
2	TOUCH_OUT	Wake up IRQ (ture:1, flase:0)
3	VCC	3.3VFingerprint module VCC
4	TX	UART_TX (fingerprint module->MCU)
5	RX	UART_RX (MCU->fingerprint module)
6	GND	GND

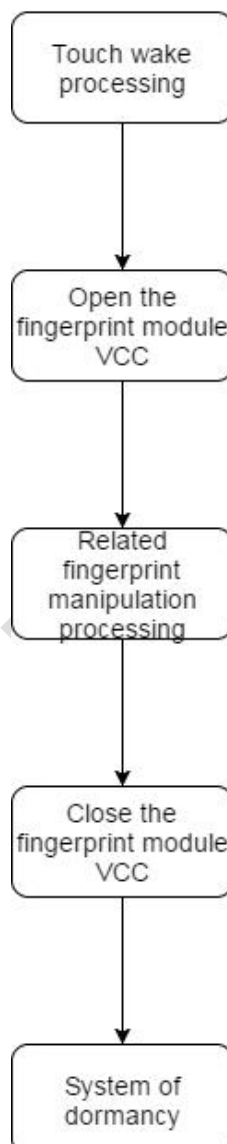
Instruction: serial port is 3.3V TTL, electrical level transfer is required when connecting to computer, please pay attention V_TOUCH needs on-going power supply, TOUCH_OUT is signal output for living body, its voltage is the same as touch's, default 1-True living body, 0-false living body. When the module is capturing, TOUCH_OUT detected true(touch doesn't affect finger press).After quit capturing, TOUCH_OUT will affect finger press. For example, after sending register command, the module is under

capturing, TOUCH_OUT detected true.

6.Module Usage Requirement

Design considerations for FINGERPRINT module VCC and touch VCC

- 1.The fingerprint chip is sensitive to the power supply, so the voltage fluctuation of the fingerprint module VCC is as small as possible. The peak-to-peak value $V_{pp} < 100\text{mV}$ is required, otherwise, it will lead to acquisition anomaly.
- 2.The voltage fluctuation of touch VCC requires the peak-to-peak value $V_{pp} < 100\text{mV}$; otherwise, it will lead to abnormal touch output. In particular, if the customer MCU turns off the touch VCC during use, the VCC shall be guaranteed to fall below 0.3V and the voltage of 0V shall be maintained above 2ms before the VCC is turned on; otherwise, the touch power off reset is insufficient.
- 3.The fingerprint module VCC front stage in the system will be caused due to its high power consumption at startup moment Large pressure drop may cause abnormal system operation. It is recommended to use separate LDO for fingerprint module Power (above 100mA with load capacity), or ask the customer to evaluate the power brought by startup moment Effect of transient current mutation on application system.



- 1.Use the rising edge to detect the touch of the finger to wake up, and suggest to do the software shake off treatment;
- 2.Touch signal is only recommended for the system to wake up, do not do finger interpretation; Finger interpretation during image acquisition is implemented through the module related instruction (0x30 instruction). In particular, when the customer MCU is working normally, the MCU program must not set the touch jump as the source of interruption, so as to avoid the complex asynchronous logic causing uncontrollable program flow.

- 1.After the fingerprint module is powered on, the module will send 0x55 to the serial port after initialization. The customer MCU can complete the electric initialization of the fingerprint head by waiting for receiving 0x55.

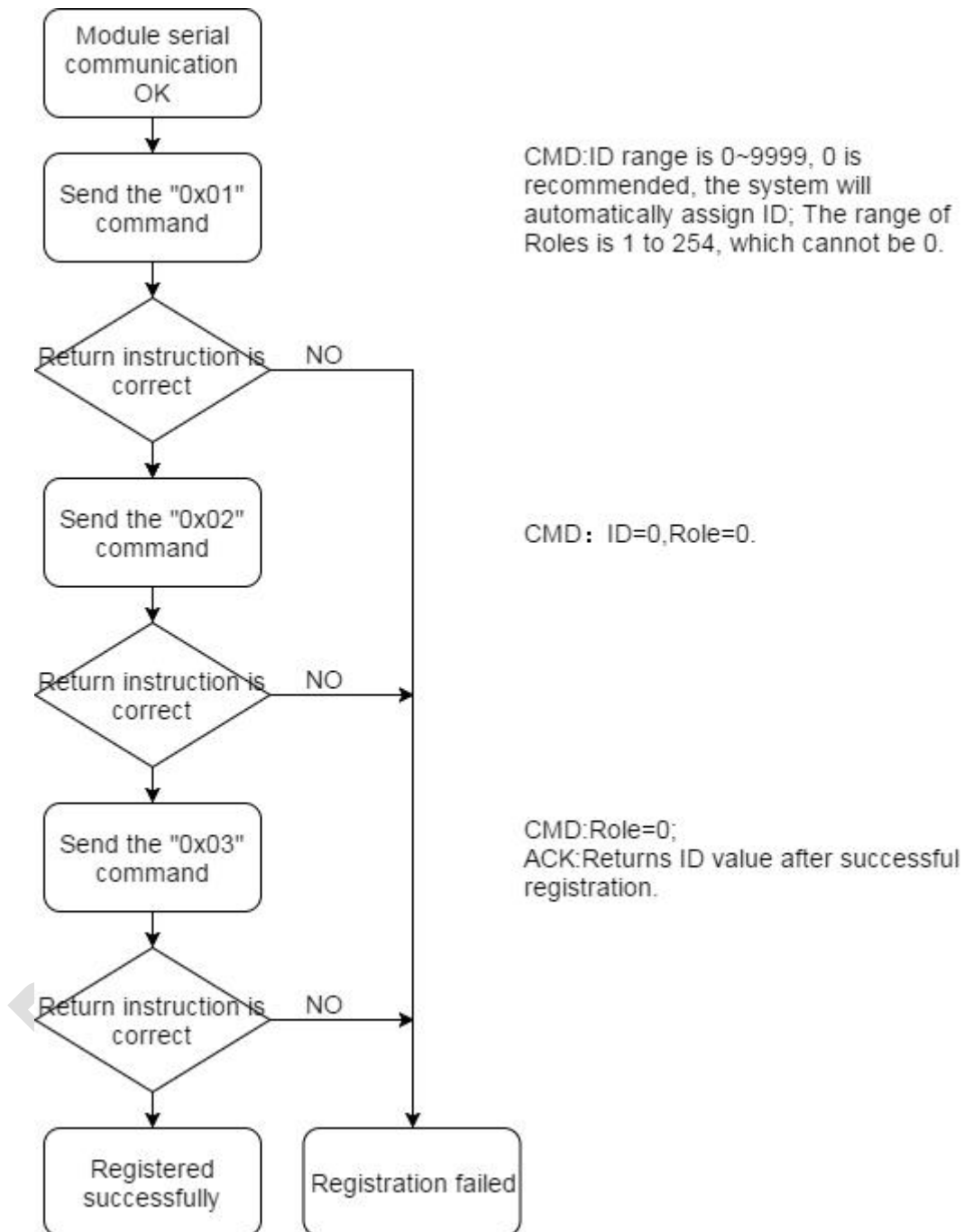
- 1.In order to prevent the improper configuration of TX/RX in the client MCU from interfering with the feed of the fingerprint module and preventing it from entering the low power consumption, the TX/RX configuration of the client MCU follows the following principles: "Before the VCC of the fingerprint module fingerprint module loses power, reverse initialize the TX/RX port, and set TX/RX as the input high resistance state". In particular, the TX of the customer MCU is high in the serial port state. If it is not set to the input high resistance, the power loss process will continuously feed IO to the fingerprint module, which will lead to the abnormal power loss of the fingerprint module, and thus affect the working stability of the fingerprint module. If TX/RX is not set to the high resistance state before the fingerprint module VCC is switched off, the client system may not be able to enter the low power consumption or the fingerprint module cannot be started after VCC is opened due to interference.

- 2.Before turning off the fingerprint module VCC, the fingerprint module should be in a non-photographic state. Because the fingerprint module has FLASH storage operation, abnormal power loss will lead to the risk of FLASH data loss and complete failure, please be sure to avoid; The specific empty instruction (0xFE) can be implemented.

- 1.Turn off fingerprint VCC and delay 200ms before system dormancy.

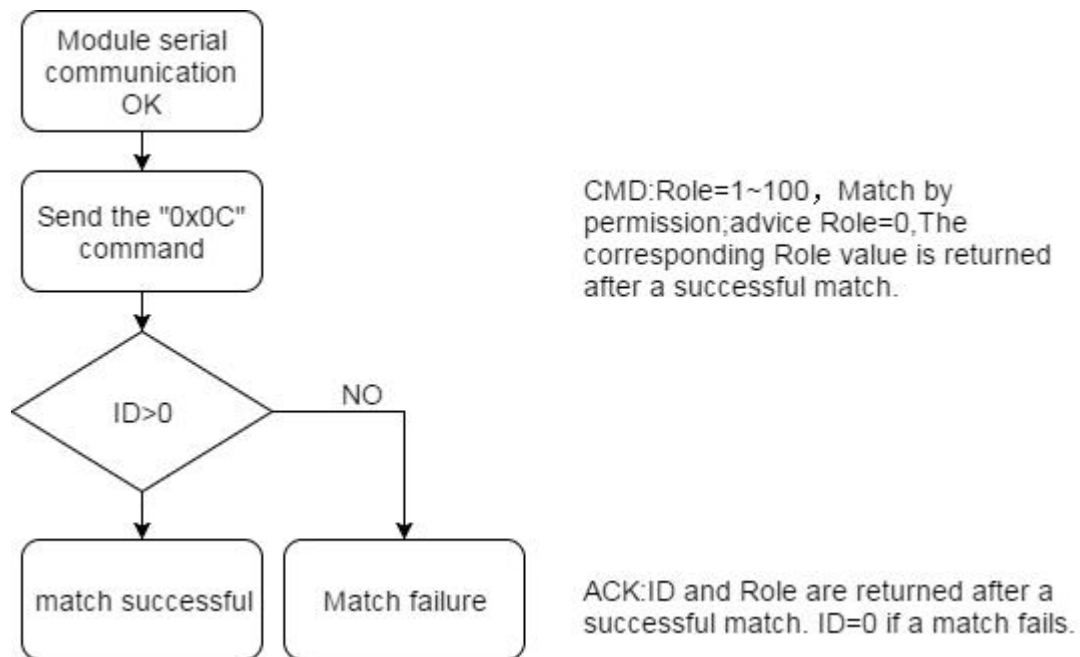
7.Registration Process Description

7.1、160*160 is registered and collected three times by default . The registration process is as follows:



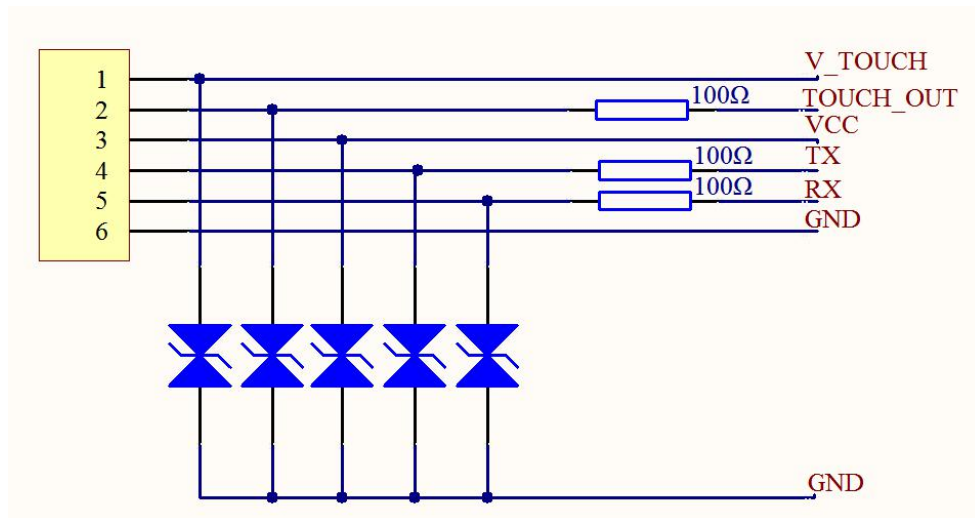
8. Compare Process Description

Fingerprint comparison is mainly divided into two stages , image acquisition comparison and learning storage. The default comparison mode of the protocol is “after sending 0C instruction , after the image acquisition comparison and learning storage process and returning the successful or not instruction”.At the same time , the protocol is compatible with “quick comparison mode”,which can shorten the response time(nearly 300ms).Refer to Appendix I for the details.



9.ESD Performance

This product review ICE61000-4-2 standard, and can pass the static eletricity test of $\pm 15\text{KV}$ air and $\pm 8\text{KV}$ contact. In order to meet customers' s more use scenarios and increase the anti-interference ability of the product to static electricity, customers can do the following processing at the connector end : the power line and signal line are combined with TVS tube, and the TVS tube model can refer to CESD882NC5VB, including TX, RX, touch_The out signal line is connected with a series of 100 Ω resistors, as shown in the figure below.



10.Environment Requirement

The product meets the RoHS requirements.

Appendix1: Quick comparison mode

instructions:

At present, the graph is the default matching mode adopted by customers, and the response time of fingerprint matching is slightly slower. In order to meet the faster response time, a new matching mode must be adopted, which can shorten the response time by nearly 300ms.

implementation:

Fingerprint matching can be divided into two stages: image matching and learning storage. The default matching mode of figure positive protocol is "after sending 0x0C instruction, the successful command is returned after image matching and memory learning"; In the new release version of the program, a new matching mode (i.e., fast matching mode) is added into the Graph protocol, "after sending 0x0C instruction, the command of success or failure is returned after image matching". Fast matching mode can speed up the client's fingerprint matching response time by about 300ms.

As shown in Figure 2 below, the fast matching mode needs to send the configuration instruction "F5 3F 00 40 00 00 7F F5" before using 0x0C instruction, and after receiving the 0C return instruction, the fingerprint module will lose power after 500ms delay.

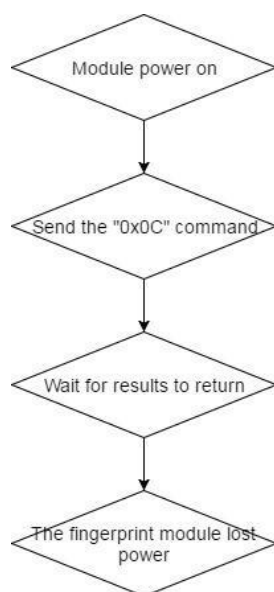


Figure 1 default matching pattern

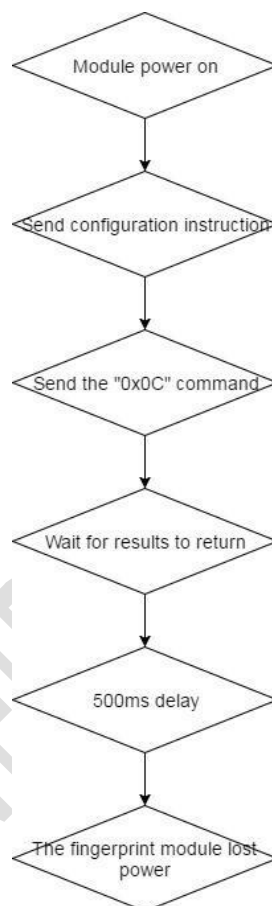


Figure 2 Fast matching patterns

Matters needing attention

1. Fast matching mode, suitable for 160 pixel and 176 pixel products and 8K -47.6 and above versions of the program.
2. 3F configuration instruction, please refer to Biosec Fingerprint Module Command Protocol V1.7 20200114 for details.
3. The configuration instruction should be sent before sending 0x0C instruction, and the "fast matching mode" should not be saved after the module loses power.
4. In the fast matching mode, after receiving the 0x0C return instruction, the fingerprint module shall be switched off after 500ms delay; The quick return pattern does not reduce the matching process, it just returns the match results quickly, and the "learning store" phase still has enough time to process.

Appendix 2: Precautions for active fingerprint sensor

1. Precautions in the scene of "GND of client PCB contacts metal shell": the PCBA of the client is connected to the "active" fingerprint sensor, i.e. "fingerprint head" in figure (1), and the GND of PCBA is directly connected to the metal shell; at this time, if the finger presses the fingerprint sensor and contacts the metal shell, the "excitation source signal" on the metal ring of the sensor (no image without this signal) will be attenuated. The result is that the fingerprint sensor does not collect image or the effect is poor. In order to avoid the above problems, a resistor and a TVS tube need to be connected between the GND of PCBA and the metal shell. As shown in figure (2), the TVS tube requires that "the static electricity level is above 15kV, the junction capacitance is less than 50p", and the resistance is 1m. But note that some customers need to remove TVS tube if they want to perform 500V voltage withstand.
2. In any use scenario of the client, the metal parts or conductive materials cannot directly contact the metal ring of the sensor, and the metal ring and the metal parts must be isolated with insulating materials; the above requirements are based on the fact that when the metal ring is used as the touch sensitive pad and the conductive materials are contacted, the touch sensitive parameters will be changed, resulting in poor touch effect.

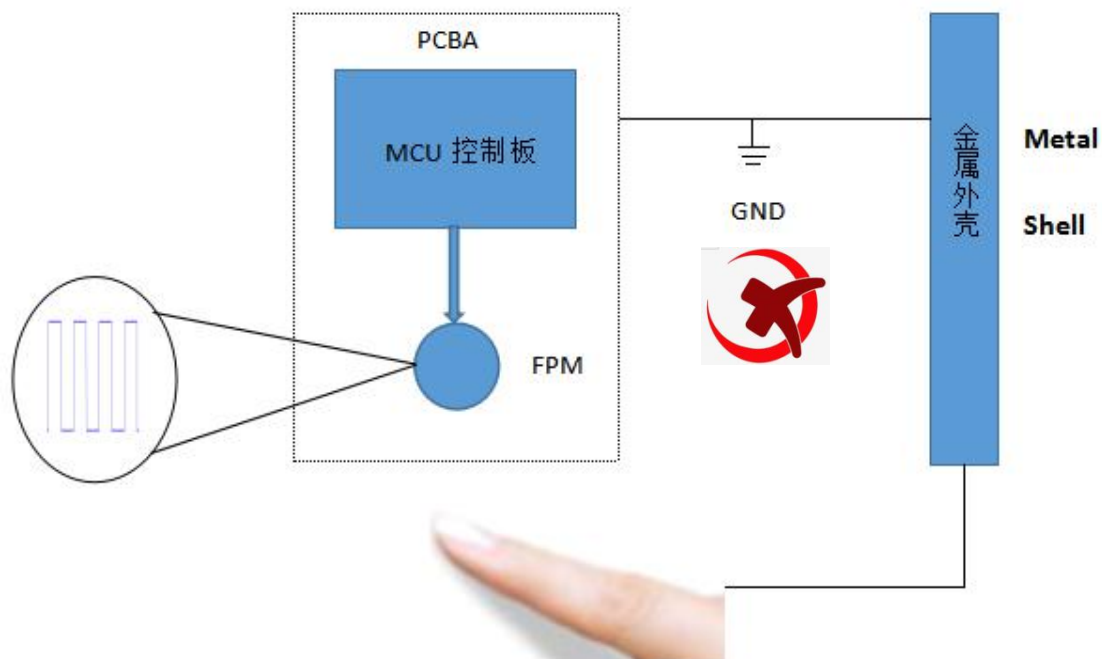


Figure (1) GND Error Indication

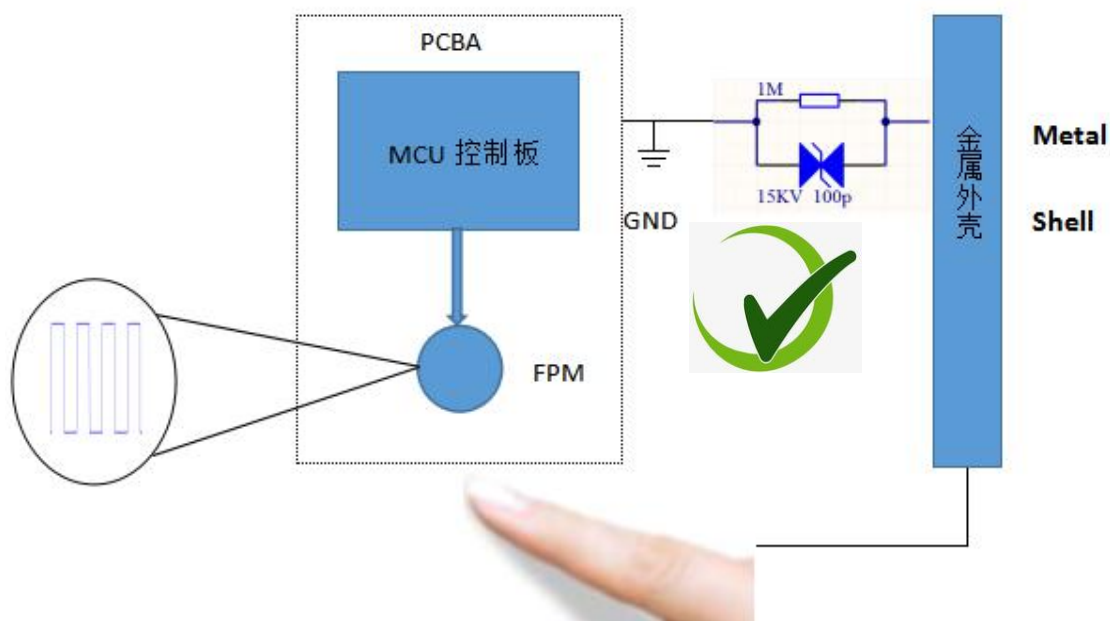


Figure (2) GND Correct Indication

Version Record

Version Number	Content	Date	confirm
V1.0	Write	2020.6.20	Kevin. Yu

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