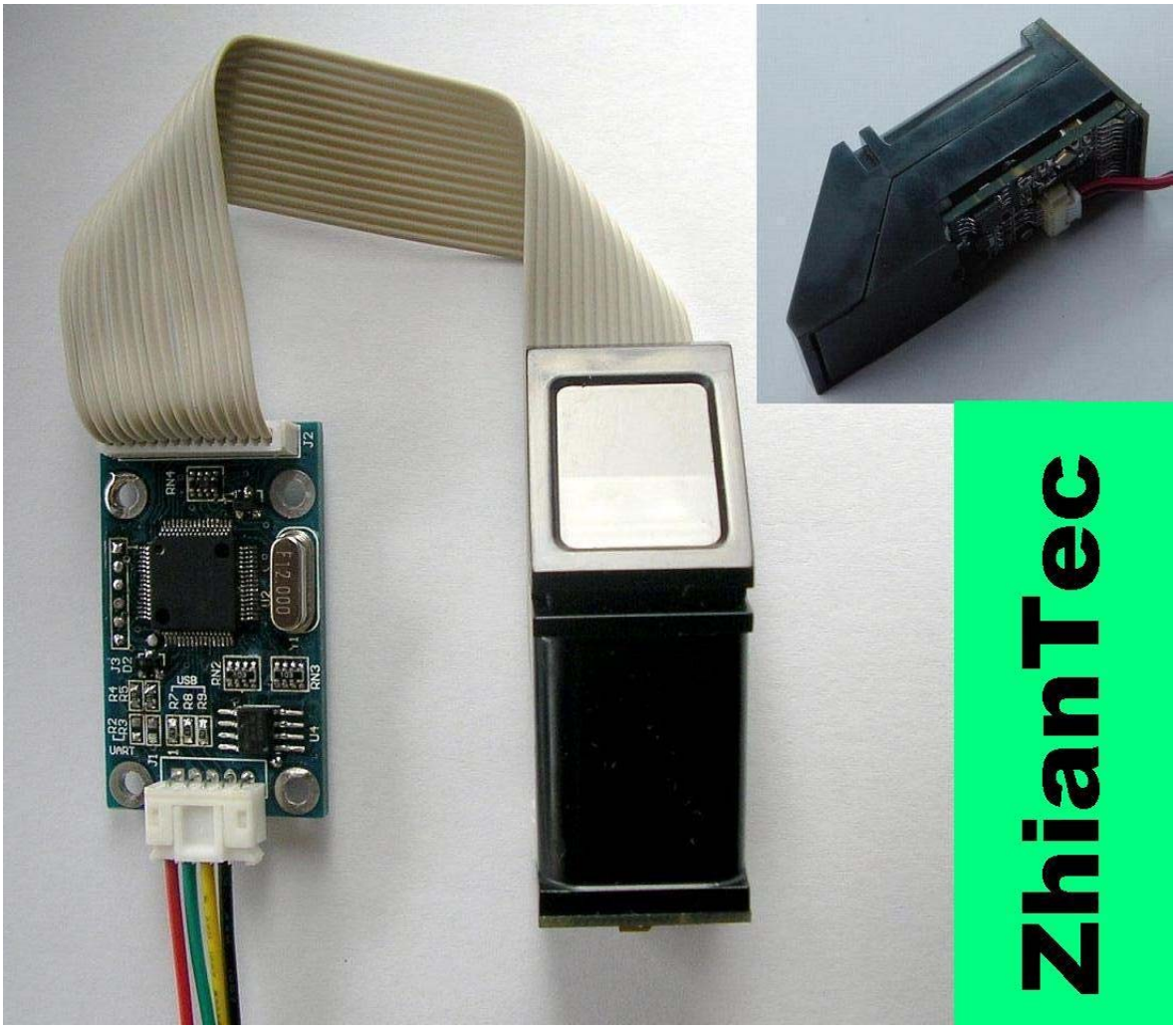
ZFM-20 series

Fingerprint recognition module

User manual



Hangzhou Zhian Technology Co., Ltd.

June 2010 Ver: 2.0

Foreword and statement

Thank you for purchasing the ZFM-20 series fingerprint recognition module (hereinafter referred to as the module) from Hangzhou Zhian Technology Co., Ltd. (hereinafter referred to as Zhian Company).

This user manual is written for software and hardware application development engineers, including hardware interfaces, system resources, instruction systems, installation information, etc. In order to ensure smooth application development, please read the manual carefully before proceeding with module development.

We have done our best to ensure the accuracy of this manual. However, if you have any questions or find errors, you can directly contact our company and/or our authorized agents, we will be very grateful.

Because our company pursues the purpose of continuously improving and improving products, the content of modules and manuals may be changed without notice. Please visit our company's website or call to get the latest information.

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Chapter 1 Overview

The ZFM-20 series of stand-alone fingerprint recognition module is launched by Hangzhou Zhian Technology Co., Ltd., with SynoChip high-speed DSP processor As the core, combined with the optical fingerprint sensor with the company's independent intellectual property rights, without the need for the upper computer to participate in the management, it has An intelligent module with functions such as fingerprint entry, image processing, fingerprint comparison, search and template storage.

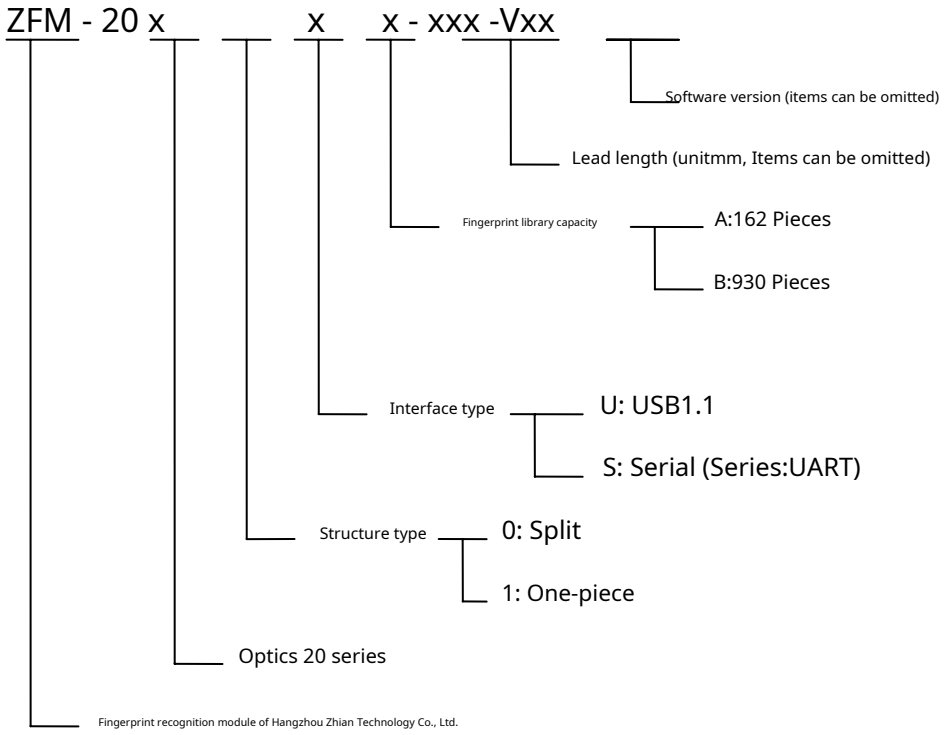
1.1 working principle

Fingerprint processing includes two processes: fingerprint login process and fingerprint matching process [Fingerprint matching is divided into fingerprint comparison (1:1) And fingerprint search (1:N) Two ways].

When fingerprint login, enter each fingerprint 2 Times, will 2 The input images are processed, and the composite template is stored in the module. During fingerprint matching, the fingerprint sensor is used to input the fingerprint image to be verified and processed, and then it is matched and compared with the fingerprint template in the module (if it matches with a template specified in the module, it is called the fingerprint comparison method, namely1:1 Method; if it matches with multiple templates, it is called the fingerprint search method, that is 1:NMode), the module gives the matching result (pass or fail).

1.2 Ordering Information

The complete model of our company's fingerprint module adopts the following rules. When ordering products from our company, please fill in the complete model number as required so that we can provide you with better service.



Note: 1) The lead length refers to the cable length of the connection between the module main board and the optical fingerprint sensor. The integrated module does not have this lead.

2) The software version can be omitted when ordering for the first time or a non-specified version, that is, the latest version of our company is adopted by default.

Chapter Two Main Technical Indicators

Supply voltage:DC 3.6~6.0V

Supply current:

Working current: <120mA

Peak current: <150mA

Fingerprint image entry time:＜1.0 second

Window area: 14╳18 mm

Matching method:

Comparison method (1:1)

Search method (1:N)

Signature file:256 bytes

Template file:512 bytes

storage capacity:162/930 pieces

Security Level: Five levels (from low to high: 1, 2, 3, 4, 5)

False Acceptance Rate (FAR):＜0.001% (when the safety level is 3)

False Rejection Rate (FRR):＜1.0% (When the security level is 3)

Search time:＜1.0 second (1:200, average value)

Host computer interface: UART (TTL logic level) or USB1.1

Communication baud rate (UART): (9600╳N)bps where N=1～12 (default value N=6, that is, 57600bps)

working environment:

Temperature: -20℃－+50℃

Relative humidity: 40%RH-85%RH (no condensation)

Storage environment:

Temperature: -40℃－+85℃

Relative humidity: <85%H (no condensation)

Dimensions (L╳W╳H):

Split type:

mold Block: 42╳25╳8.5mm (Installation size: 31.5╳19 mm)

Fingerprint sensor: 56╳20╳21.5mm

One-piece:56╳20╳21.5mm

Chapter 3 Hardware Interface

3.1 Host computer interface (marked on the board:J1)

No matter what you order isUART still isUSB Interface type (but the factory settings of the hardware circuit on the board are different, please do not mix them), PCB On the board, the interface between the module and the user equipment uses the same single-row socket/pin (the split type is 5 core 2.0 Pitch, one-piece is 4 core 1.27 spacing).

When the user has no special requirements, the provided user interface lead length is 150mm.

3.1.1 Serial communication

During the serial communication between the module and the user equipment, the interface J1 The pin definition is as follows:

Pin number	name	Types of	Work Can describe Narrate
1	Vin	in	Power supply positive input terminal. (Thread color: red)
2	TD	out	Serial data output. TTL logic level. (Line color: green) Serial
3	RD	in	data input. TTL logic level. (Line color: white) Signal ground.
4	GND	-	Internally connected to the power ground (Thread color: black)
5	NC	-	Undefined, floating. ((**Integrated module does not have this pin)**

Note: Type column, in Means input to the module, out Output from the module.

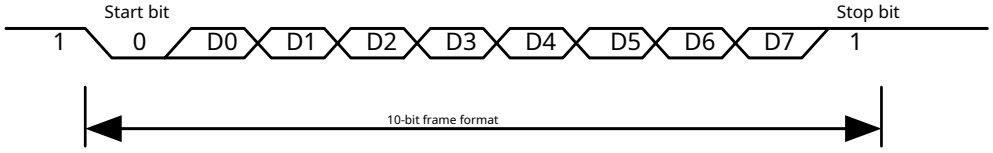
3.1.1.1 Hardware connection

The module can be directly used with the serial communication interface 3.3V or 5V The MCU of the power supply communicates: the module data sending pin (2 foot TD) Connect to the data receiving end of the host computer (RXD), module data receiving pin (3 foot RD) Connect to the data sending end of the host computer (TXD).

If needed with RS-232 Level (for example:PC Host computer) for communication, please add a level conversion circuit between the module and the host computer (for example:MAX232 Circuit).

3.1.1.2 Serial protocol

Use half-duplex asynchronous serial communication. The default baud rate is57600bps, Can be set to 9600~115200bps.



The transmitted frame format is 10 Bit 0 Level start bit,8 Bit data (low bit first) and one stop bit, no parity Bit.

3.1.1.3 Power-on delay time

After the module is powered on, about **500mS** Time for initialization work. During this period, the module cannot respond to host computer commands.

3.1.1.4 Electrical parameters (Power/signal ground GND Reference level)

1. power input

project	parameter			unit	Prepare Note
	The smallest	typical	maximum		
voltageVin	3.6		6.0	V	Normal working value
Limit voltageVin$_{max}$	- 0.3		7.0	V	**Beyond this range may cause permanent damage**
Working current Icc	90	100	110	mA	
Peak current Ipeak			150	mA	

2. TXD(Output,TTLLogic level)

project	Article Pieces	Participate number			unit	Remarks
		The smallest	typical	maximum		
V_{OL}	I_{OL}=-4mA			0.4	V	logic 0
V_{OH}	I_{OH}= 4mA	2.4		**3.3**	V	logic 1

3. RXDFeet (input,TTL Logic level)

project	Article Pieces	Participate number			unit	Remarks
		The smallest	typical	maximum		
V_{IL}				0.6	V	logic 0
V_{IH}		2.4			V	logic 1
I_{IH}	V_{IH} =5V		1		mA	
	V_{IH} =3.3V		30		uA	
V_{Imax}		- 0.3		5.5	V	**Limit input voltage**

3.1.2 USB communication

Module and user equipmentUSB When communicating, the interface J1 The pin definition is as follows:

Pin number	name	Types of	Work Can describe Narrate
1	Vin	in	Power supply positive input terminal. (See 3.1.1.4 for electrical
2	DP+	In/Out	parameters) USB data cable.
3	DP-	In/Out	USB data cable.
4	GND	-	Signal ground. Internally connected to the power ground.
5	END	-	Protected area. Hanging or can be connected to the shielding layer of the communication lead. ((**Integrated module does not have this pin**)

Note: Type column,in Means input to the module,out Output from the module.

3.2 Sensor interface (marked on the board:J2)

The split module provides a dedicated interface with the optical fingerprint sensor board (15-core single-row socket/pin, pin pitch 1.25mm). Use this interface to connect to the sensor board through a 15-core cable. When the user has no special requirements, the lead length provided is 150mm.

The interface of the integrated module is internal connection and does not need to be considered by the user.

Chapter 4 System Resources

In order to meet the needs of different customers, the module system provides a large amount of resources for the user's system to use.

4.1 Buffer

There is a 72K bytes image buffer ImageBuffer and two 512 bytes feature file buffers CharBuffer1 and CharBuffer2 in the module RAM. Users can read and write any buffer through instructions. The contents of the image buffer and the two feature file buffers are not saved when the module is powered off.

4.1.1 Image buffer

The image buffer ImageBuffer is used to store image data and the internal image processing of the module. When uploading/downloading images, the image format is256×288 Pixels.

In order to speed up the upload or download of images through the UART port, only the high four bits of the pixel byte are used, that is, 16 gray levels are used, and each byte represents two pixels (the high four bits are one pixel, and the low four bits are the same One pixel in the next adjacent column of the row, that is, two pixels are combined into one byte for transmission). Since the image is16 Gray levels, uploaded to PCWhen displaying (corresponding BMP Format), the gray scale should be expanded (expanded to 256 Gray scale, namely 8bit Bitmap format).

The transmission through the USB port is a full 8-bit pixel, that is, 256 gray levels.

4.1.2 Signature file buffer

The feature file buffer CharBuffer1 or CharBuffer2 can be used to store ordinary feature files or template feature files.

4.2 Fingerprint library

The module has opened up a storage area in FLASH as the fingerprint template storage area, which is commonly known as fingerprint library. The data in the fingerprint library is protected against power failure.

The fingerprint template is stored according to the serial number. If the fingerprint library capacity is N, the serial number of the fingerprint template in the fingerprint library is defined as: 0, 1, 2...N-2, N-1. Users can only access the contents of the fingerprint library based on the serial number.

4.3 System configuration parameters

For the convenience of users, the module opens some system parameters, allowing users to individually modify the specified parameter value (through the parameter number) through instructions. See the command for setting the basic parameters of the module systemSetSysPara And read system parameter command ReadSysPara.

When the host computer sends an instruction to modify the system parameters, the module first responds according to the original configuration. After the response, the system settings are modified and the configuration is recorded in FLASH. After the system is powered on next time, it will work according to the new configuration.

4.3.1 Baud rate control (parameter number:4)

This parameter controls the communication baud rate when the module communicates with the host computer through UART. If the parameter value is N (N ranges from 1 to 12), the corresponding baud rate is (9600×N)bps.

4.3.2 Security level (parameter number: 5)

This parameter controls the comparison threshold of fingerprint comparison and search, divided into 5 Level, the value range is:1,2,3,4,5. When the security level is 1, the false recognition rate is the highest, and the rejection rate is the lowest. The security level is5 The false recognition rate is the lowest, and the rejection rate is the highest.

4.3.3 Package content length (parameter serial number: 6)

This parameter controls the maximum length of the packet content in the data during each transmission when the module communicates with the host computer. The value range is: 01,2,3, The corresponding lengths (number of bytes) are:32,64,128,256.

4.4 System status register

The system status register indicates the current working status of the module. It can be read by the instruction ReadSysPara, the length is 1Word. Its members are defined as follows:

Tag	15 4	3	2	1	0
significance	Reserved	ImgBufStat	PWD	Pass	Busy

Note:

Busy: Occupy 1 bit, set 1 to indicate that the system is executing commands, 0 indicates that the system is idle; Pass: Occupy 1 bit, set 1 to indicate that the fingerprint verification is passed;

PWD: occupy one bit, set 1 to indicate that the device handshake password has been verified; ImgBufStat: occupy one bit, set 1 to indicate that there is a valid fingerprint image in the fingerprint image buffer.

4.5 Module password

After the module is powered on and reset, it will first check whether the device handshake password has been modified. If it has not been modified, the module thinks that the host computer does not need to verify the password and directly enters the normal working state; that is, when the module password is the default password, the password does not need to be verified. The password is4 Byte, the factory default password is:0x00000000.

If the internal password of the module has been modified (see Set Password Command SetPwd), the device handshake password must be verified first, and the module enters the normal working state after the password is passed. Otherwise, the module refuses to execute any instructions.

After the password is modified, the new password will be saved in Flash, and it will still be saved after power off. See verify passwordVfyPwd Command and set password SetPwd instruction.

4.6 Module address

Each module has an identification address. When the module communicates with the host computer, each instruction/data is transmitted in the form of a data packet, and each data packet contains an address and an address item. The module only responds to commands and data packets that contain the same address as its own address.

The module address is 4 bytes, and the factory default value is 0xFFFFFFFF. The user can modify the module address through instructions (see SetAdder). After the module address is modified, the new address will still be saved after the module is powered off.

4.7 Random number generator

The module integrates a hardware 32-bit random number generator (no random number seed is required), and the user can generate a random number and upload it through the instruction, please refer to the sampling random number instruction GetRandomCode.

Chapter 5 Communication Protocol

The communication protocol defines the rules for information exchange between ZFM-20 series modules and the host computer. Regardless of whether the hardware uses UART or

It is a USB interface type, all of which use the same set of communication protocols and instruction sets. If the host computer is a PC, it is recommended to order the USB interface

Type of module to improve the system speed (because the upload image has many gray levels and fast speed when using USB, the module can be used for fingerprints at this time

Collector use)

5.1 Packet format

The module communicates with the host computer, and the receiving and sending of commands, data, and results are all carried out in the form of data packets.

Packet format:

Baotou	address code	Package ID	Bag length	Package content (command/data/parameter/confirmation code)	Checksum

Data package detailed definition table

name	symbol	length	Say Bright	
Baotou	START	2 bytes	It is fixed to 0xef01, and the high byte comes first during transmission.	
address code	ADDER	4 bytes	The default value is 0xffffffff, and the user can generate a new address through instructions. The module will reject the packet with the wrong address. The high byte comes first during transmission.	
Package ID	PID	1 byte	0x01	Represents a command packet (Command packet).
			0x02	Indicates that it is a data packet, and there are follow-up packets. The data packet cannot enter the execution process alone, it must follow the instruction packet Or after the response packet.
			0x07	Indicates that it is an ACK packet , There can be follow-up packages.
			0x08	Indicates that it is the last data packet, that is, the end packet (EndData packet).
Bag length	LENGTH	2 bytes	The maximum value is 256 bytes; the packet length refers to the length of the packet content (command/data) plus the length of the checksum (ie, the length of the packet content + 2). The length is in bytes, and the high byte comes first during transmission.	
Package contents	DATA	-	It can be commands, data, command parameters, response results, etc. (Fingerprint feature values and fingerprint templates are all data)	
Checksum	SUM	2 bytes	The arithmetic cumulative sum of all bytes of the packet identifier, packet length, and packet content, and the carry over 2 bytes is ignored. The high byte comes first during transmission.	

5.2 Data packet verification and response

Commands can only be given to the module by the upper computer, and the module responds to the upper computer.

After the module receives the command, it will report the execution and result of the relevant command to the host computer through the response packet. The response contains parameters and can be followed by subsequent data packets. The host computer can only confirm the module's packet reception and instruction execution status after receiving the module's response packet.

The content of the response packet includes a one-byte confirmation code (required) and possible return parameters.

Confirmation code definition table:

1. 0x00: indicates that the command is executed or OK;
2. 0x01: indicates that the data packet is received incorrectly;
3. 0x02: Indicates that there is no finger on the sensor;
4. 0x03: Indicates that the fingerprint image entry failed;
5. 0x06: Indicates that the fingerprint image is too messy to produce features;
6. 0x07: indicates that the fingerprint image is normal, but the feature points are too few (or the area is too small) to produce features;
7. 0x08: indicates that the fingerprint does not match;
8. 0x09: indicates that no fingerprint is found;
9. 0x0a: indicates that the feature merge failed;
10. 0x0b: Indicates that the address sequence number is out of the fingerprint library range when accessing the fingerprint library;
11. 0x0c: indicates that the template read from the fingerprint library is wrong or invalid;
12. 0x0d: Indicates that the upload feature failed;
13. 0x0e: indicates that the module cannot accept subsequent data packets;
14. 0x0f: Indicates that the image upload failed;
15. 0x10: Failed to delete the template;
16. 0x11: Indicates that the fingerprint database has failed to be cleared;
17. 0x13: indicates that the password is incorrect;
18. 0x15: Indicates that there is no valid original image in the buffer and no image is generated;
19. 0x18: indicates an error in reading and writing FLASH;
20. 0x1a: invalid register number;
21. 0x20: address code error;
22. 0x21: The password must be verified;
23. Others: reserved by the system.

Chapter 6 Module Command System

There are 21 commands in total for ZFM-20 series modules. Application programs realize various fingerprint recognition functions through different combinations of instructions.

All instructions/data are transmitted in the form of data packets. Package format and definition see 5.1 Packet format.

6.1 System instructions

1) Verify password VfyPwd

Function description: verify the module handshake password (see 4.6 Module Password).

Input parameter: PassWord

Return parameter: Confirmation code

Command code: 0x13

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	4 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Password	Checksum
0xef01	XXXX	0x01	0x0007	0x13	PassWord	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 Indicates that the password verification is correct;

Confirmation code=0x01 Indicates an error in the package receipt

Confirmation code=0x13 Indicates that the password is incorrect;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Password(4 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

2) Set password SetPwd

Function description: Set the module handshake password (see 4.6 Module password).

Input parameter: PassWord

Return parameter: confirmation word

Command code: 0x12

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	4 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Password	Checksum
0xef01	XXXX	0x01	0x0007	0x12	PassWord	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 Means OK;

Confirmation code=0x01 Indicates an error in the package receipt

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Password(4 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

3) Set the module address SetAdder

Function description: Set the module address (see 4.7 Module address)

Input parameter: the new address of the module

Return parameter: confirmation word

Command code: 0x15

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	4 bytes	2 bytes
Baotou	Module original address	Package ID	Bag length	Script	Module new address	Checksum
0xef01	XXXX	0x01	0x0007	0x15	XXXX	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module new address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means that the address is generated successfully;

Confirmation code=0x01 means there is an error in receiving the package;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Module new address (4 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

4) Set the basic parameters of the module system SetSysPara

Function description: working parameter setting (see 4.4 system configuration parameters).

Input parameter: parameter number

Return parameter: confirmation word

Instruction code: 0x0e

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Parameter number	content	Checksum
0xef01	XXXX	0x01	0x0005	0x0e	4/5/6	X	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 Means OK;

Confirmation code=0x01 Indicates an error in the package receipt

Confirmation code=0x1a Indicates that the serial number of the register is incorrect;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Parameter number (1 byte)

+content(1 byte);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

name	Parameter number	content
Baud rate	4	9600×N bps (N value range: 1～12) Divided
Security Level	5	into 5 levels, value range: 1, 2, 3, 4, 5
Package content length	6	Value range: 0, 1, 2, 3, corresponding length (number of bytes): 32, 64, 128, 256

5) Read system parameters ReadSysPara

Function description: Read the module's status register and basic system configuration parameters (see 4.4 System Configuration Parameters and 4.5 System status register).

Input parameter: none

Return parameters: confirmation word + basic parameters

Command code: 0x0f

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x0f	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	16 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Basic parameters	Checksum
0xef01	XXXX	0x07	0x0013	X	See the table below for the structure	Sum

Note: Confirmation code=0x00 means OK;

Confirmation code=0x01 means there is an error in receiving the package;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)= Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+Basic parameters(16 bytes);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

name	Content description	Offset (word)	Size (words)
Status register	System status register content	0	1
System ID	Fixed value: 0x0000	1	1
Fingerprint library size	Fingerprint library capacity	2	1
Security Level	Security level code (1, 2, 3, 4, 5) 32-bit	3	1
Device address	device address	4	2
Packet size	Data packet size code (0, 1, 2, 3) N	6	1
Baud rate setting	(corresponding to the baud rate of 9600×N bps)	7	1

6) Read fingerprint template index table ReadConList

Function description: Read the module fingerprint template index table, and read the index table of up to 256 fingerprint templates each time.

Input parameters: index page

Index page 0 means reading 0～255 Fingerprint template index table index page

1 means reading 256～511 Fingerprint template index table index page 2 means

reading 512～767 Fingerprint template index table index page 3 means reading

768～1024 fingerprint template direction chart

Return parameters: Confirmation word + fingerprint template index table

Instruction code: 0x1f

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes
Baotou	Chip address	Package ID	Bag length	Script	Index page	Checksum
0xef01	XXXX	0x01	0x0004	0x1f	0/1/2/3	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	32 bytes	2 bytes
Baotou	Chip address	Package ID	Bag length	Confirmation code	direction chart	Checksum
0xef01	XXXX	0x07	0x0023	X	See the table below for the structure	Sum

Note: 1. Confirmation code=0x00 means reading the index table successfully;

Confirmation code=0x01 means there is an error in receiving the package;

2. Read up to 256 fingerprint template index data at a time, and fill in "0" if the data is less than 256 bits .

3. Index table data structure: every 8 bits are a group, and each group starts output from the high bit. See the table below for details:

Transmission sequence	The output is sequentially from low byte to high byte, and each byte is output from the high byte.								
lowest	Template number 7 6	5 4 3					2	1	0
Valid byte	Template index table data	0/1 0/1	0/1 0/1	0/1			0/1	0/1	0/1
Low second	Template number 15	14 13 12	11				10	9	8
Valid byte	Template index table data	0/1 0/1	0/1 0/1	0/1			0/1	0/1	0/1
...	...	...							
highest	Template number	255	254	253	252	251	250	249	248
Valid byte	Template index table data	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Note: The index table data "0" means there is no valid template in the corresponding position;"1" means there is a valid template at the corresponding position.									

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Index page(1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+direction chart(N bytes);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

7) Read the number of valid templates TempleteNum

Function description: Read the number of fingerprint templates stored in the module.

Input parameter: none

Return parameter: Confirmation word + number of templates N

Instruction code: 0x1d

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x1d	0x0021

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Number of templates	Checksum
0xef01	XXXX	0x07	0x0005	X	N	Sum

Note: Confirmation code=0x00 means reading is successful;

Confirmation code=0x01 means there is an error in receiving the package;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+Number of templates (2 bytes);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

6.2 Fingerprint processing instructions

8) Fingerprint image GenImg

Function description: Detect the finger, and store the fingerprint image in ImageBuffer after detection, and return to confirm that the input is successful code. If no finger is detected, it directly returns the no-finger confirmation code.

Input parameter: none

Return parameter: confirmation word

Command code: 0x01

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x01	0x0005

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum

0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means the entry is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x02 means there is no finger on the sensor;

Confirmation code=0x03 means the entry was unsuccessful;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

9) Upload image UpImage

Function description: Upload the data in the image buffer ImageBuffer of the module to the upper computer and upload it to the upper computer (see 1.1.1 Image buffer).

Input parameter: none

Return parameter: confirmation word

Instruction code: 0x0a

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x0a	0x000e

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Data packet (with subsequent packets) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x02	N+2	Image data	Sum

End package (no follow-up package) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x08	N+2	Image data	Sum

Note: 1. Confirmation code=0x00 means to send subsequent data packets;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0f means that subsequent data packets cannot be sent;

2. Send the command packet, the module sends the data packet or the end packet after the module responds, and there is no response packet for the data packet and the end packet; 3. The value of the number of bytes in the packet content N is determined by the length of the packet content, and the factory packet content length is set to 128 bytes;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

10) Download image DownImage

Function description: the host computer downloads the image data to the image buffer ImageBuffer of the module. See 1.1.1 Image buffer Area).

Input parameter: none

Return parameter: confirmation word

Instruction code: 0x0b

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x0b	0x000f

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Data packet (with subsequent packets) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x02	N+2	Image data	Sum

End package (no follow-up package) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x08	N+2	Image data	Sum

Note: 1. Confirmation code=0x00 means that subsequent data packets can be received;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0e means that subsequent data packets cannot be received.

2. Send the instruction packet, the module will receive the data packet or end the packet after the module responds.

3. The value of the number of bytes in the package content N is determined by the length of the package content, and the factory package content length is set to 128 bytes.

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

11) Image generation feature Img2Tz

Function description: Generate fingerprint features from the original image in ImageBuffer, and save the file in CharBuffer1 or CharBuffer2.

Input parameter: BufferID (characteristic buffer number)

Return parameter: confirmation word

Command code: 0x02

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	Checksum
0xef01	XXXX	0x01	0x0004	0x02	BufferID	Sum

Note: The BufferIDs of CharBuffer1 and CharBuffer2 are 0x01 and 0x02 respectively, if you specify them

Its value is processed according to CharBuffer2.

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means the feature generation is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x06 means that the fingerprint image is too messy to produce features;

Confirmation code=0x07 means that the fingerprint image is normal, but there are too few feature points to produce a

feature; Confirmation code=0x15 means that there is no valid original image in the image buffer and no image is produced;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer number (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

12) Feature synthesis template RegModel

Function description: Combine the feature files in CharBuffer1 and CharBuffer2 to generate a template, and save the result in

CharBuffer1 and CharBuffer2 (the contents of both are the same).

Input parameter: none

Return parameter: confirmation word

Command code: 0x05

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x05	0x0009

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means the merge is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0a means the merge failed (the two fingerprints do not belong to the same finger);

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

13) Upload feature or template UpChar

Function description: Upload the characteristic file in the characteristic buffer CharBuffer1 or CharBuffer2 to the upper computer.

Input parameter: BufferID (buffer number)

Return parameter: confirmation word

Instruction code: 0x08

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	Checksum
0xef01	XXXX	0x01	0x0004	0x08	BufferID	Sum

Note: The BufferID of CharBuffer1 and CharBuffer2 are 0x01 and 0x02 respectively

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Data packet (with subsequent packets) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x02	N+2	Template data	Sum

End package (no follow-up package) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x08	N+2	Template data	Sum

Note: 1. Confirmation code=0x00 means sending data packets later;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0d means the command execution failed;

2. Send the instruction packet, the module sends the data packet or the end packet after the module responds, and the data packet and the end packet have no response packet.

3. The value of the number of bytes in the package content N is determined by the length of the package content, and the package content length is set to 128 bytes at the factory.

4. This instruction does not affect the content in the module feature buffer.

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer is good (1 byte);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

14) Download features or templates **DownChar**

Function description: The host computer downloads the characteristic file to a characteristic buffer of the module.

Input parameter: BufferID (buffer number)

Return parameter: confirmation word

Command code: 0x09

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	Checksum
0xef01	XXXX	0x01	0x0004	0x09	BufferID	Sum

Note: The BufferID of CharBuffer1 and CharBuffer2 are respectively 0x01 and 0x02

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Data packet (with subsequent packets) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x02	N+2	Template data	Sum

End package (no follow-up package) format:

2 bytes	4 bytes	1 byte	2 bytes	N bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Package contents	Checksum
0xef01	XXXX	0x08	N+2	Template data	Sum

Note: 1. Confirmation code=0x00 means that subsequent data packets can be received;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0e means that subsequent data packets cannot be received;

2, Send the instruction packet, the module will receive the data packet or end the packet after the module responds.

3. The value of the number of bytes in the package content N is determined by the length of the package content, and the factory package content length is set to 128 bytes.

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer number (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

15) Storage template Store

Function description: Store the template data in the specified characteristic buffer (CharBuffer1 or CharBuffer2) to

Flash Specify the location in the fingerprint library.

Input parameters: BufferID (buffer number) + PageID (fingerprint library location number, two bytes, high byte first).

Return parameter: confirmation word

Command code: 0x06

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	Location number	Checksum
0xef01	XXXX	0x01	0x0006	0x06	BufferID	PageID	Sum

Note: The BufferID of CharBuffer1 and CharBuffer2 are 0x01 and 0x02 respectively

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means storage is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0b means PageID is out of the fingerprint library range;

Confirmation code=0x18 Means write FLASHError

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer number (1 byte)

+Location number (2 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

16) Read out the template LoadChar

Function description: read the fingerprint template with the specified ID number in the flash database into the template buffer CharBuffer1 or CharBuffer2.

Input parameters: BufferID (buffer number) + PageID (fingerprint library template number, two bytes, high byte first).

Return parameter: confirmation word

Command code: 0x07

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	page number	Checksum
0xef01	XXXX	0x01	0x0006	0x07	BufferID	PageID	Sum

Note: The BufferID of CharBuffer1 and CharBuffer2 are 0x01 and 0x02 respectively

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means reading is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x0c means that the reading is wrong or the template is invalid;

Confirmation code=0x0b Means PageIDBeyond the scope of the fingerprint library;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer number (2 bytes)
+page number(2 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

17) Delete template DeletChar

Function Description:Delete a specified section (N fingerprint templates starting with the specified ID number) template in the fingerprint library of the module.

Input parameter: PageID (fingerprint library template number) + N the number of deleted templates.

Return parameter: confirmation word

Instruction code: 0x0c

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Script	page number	Number of deletions	Checksum
0xef01	XXXX	0x01	0x0007	0x0c	PageID	N	Sum

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means that the template is deleted successfully;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x10 means that the template deletion failed;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+page number(2 bytes)

+Number of deletions (2 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

18) Clear fingerprint library Empty

Function description: delete all fingerprint templates in the fingerprint library in the module.

Input parameter: none

Return parameter: confirmation word

Instruction code: 0x0d

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x0d	0x0011

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Checksum
0xef01	XXXX	0x07	0x0003	X	Sum

Note: Confirmation code=0x00 means emptying is successful;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x11 means emptying failed;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

19) Accurately compare the features of two fingerprints Match

Function description: module accurate comparison (1:1) Characteristic files in CharBuffer1 and CharBuffer2, and compare The result.

Input parameter: none

Return parameters: confirmation word + comparison score

Command code: 0x03

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes

Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x03	0x0007

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	Score	Checksum
0xef01	XXXX	0x07	0x0005	X	XX	Sum

Note: 1. Confirmation code=0x00 means fingerprint matching;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x08 means the fingerprint does not match;

2, After the instruction is executed, the contents of the two characteristic buffers remain unchanged.

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+Score(2 bytes);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

20) Search fingerprint Search

Function description: Search the whole or part of the fingerprint library with the characteristic file in CharBuffer1 or CharBuffer2. Ruosou

If requested, the page number will be returned.

Input parameters: BufferID + StartPage (start page) + PageNum (page number)

Return parameters: Confirmation word + page number (matching fingerprint template)

Command code: 0x04

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Buffer number	Start page	Page number	checksum
0xef01	XXXX	0x01	0x0008	0x04	BufferID	StartPage	PageNum	Sum

Note: The BufferID of CharBuffer1 and CharBuffer2 are 0x01 and 0x02 respectively

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes	2 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	page number	Score	Checksum
0xef01	XXXX	0x07	0x007	X	PageID	MatchScore	Sum

Note: 1. Confirmation code=0x00 means searched;

Confirmation code=0x01 means there is an error in receiving the package;

Confirmation code=0x09 means it was not found;

2,After the instruction is executed, the content in the feature buffer remains unchanged.

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte)+Buffer number (1 bytes) +Start page(2 bytes)+Number of pages (2 bytes);

★ Reply packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+page number(2 bytes) +Score(2 bytes);

★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

6.3 Other instructions

twenty one) Sampling random number GetRandomCode

Function description: Make the module chip generate a random number and return it to the host computer (see 4.8 Random Number Generator).

Input parameter: none

Return parameter: confirmation word

Command code: 0x14

Command packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	2 bytes
Baotou	Module address	Package ID	Bag length	Script	Checksum
0xef01	XXXX	0x01	0x0003	0x14	0x0018

Response packet format:

2 bytes	4 bytes	1 byte	2 bytes	1 byte	4 bytes	2 bytes
Baotou	Module address	Package ID	Bag length	Confirmation code	random number	Checksum
0xef01	XXXX	0x07	0x0007	X	XXXX	Sum

Note: Confirmation code=0x00 means successful generation;

Confirmation code=0x01 means there is an error in receiving the package;

★ Instruction packet checksum (2 bytes)=Package identifier (1 byte)+Package length (2 bytes)+Script (1 byte); ★ Reply packet checksum (2 bytes)= Package identifier (1 byte)+Package length (2 bytes)+Confirmation code (1 byte)+random number(4 bytes);

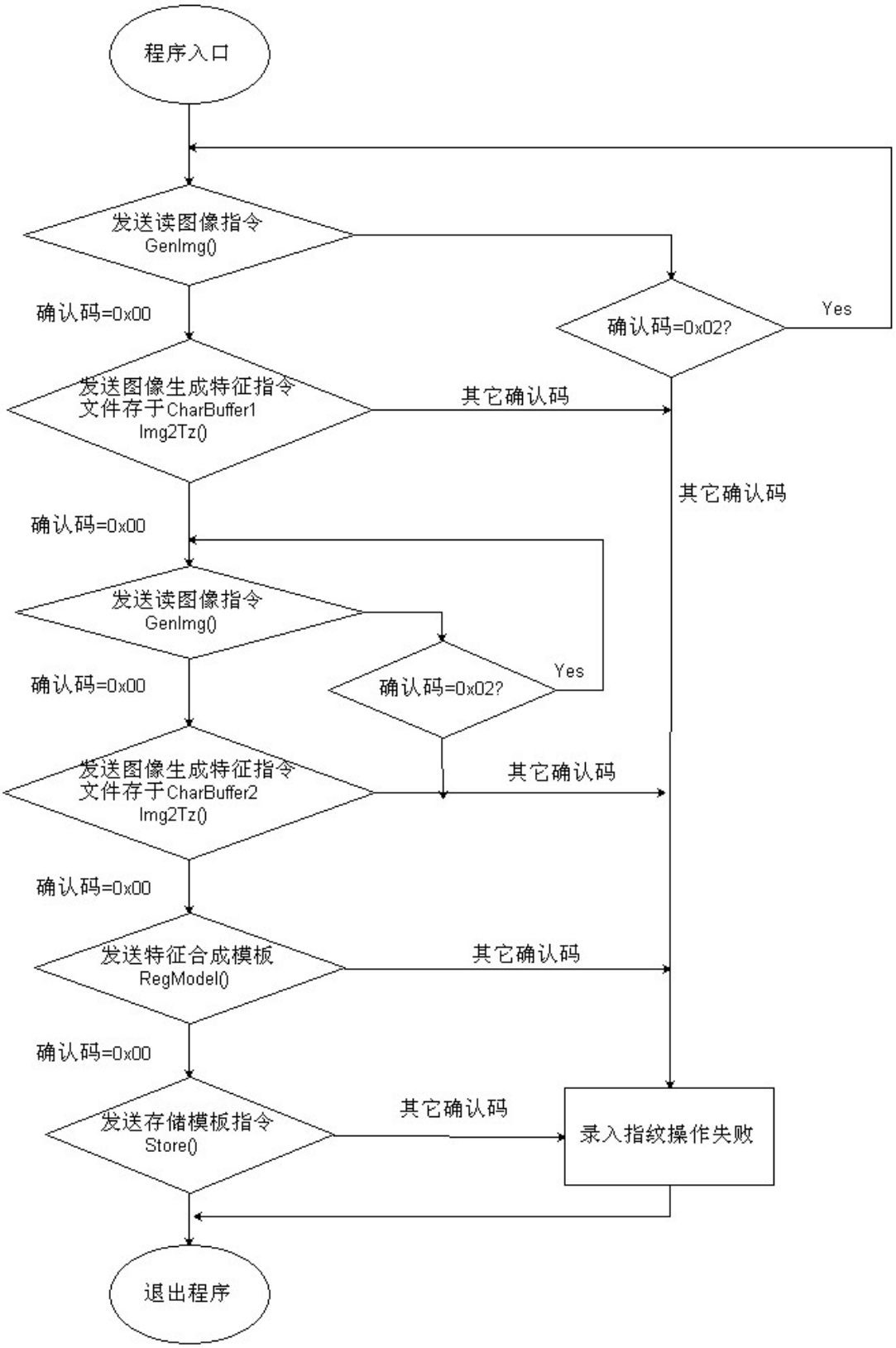
★ The checksum is added in bytes, the carry over 2 bytes is ignored, and the high byte comes first during transmission;

★ The default module address is "0xffffffff"; The default password is "0x00000000".

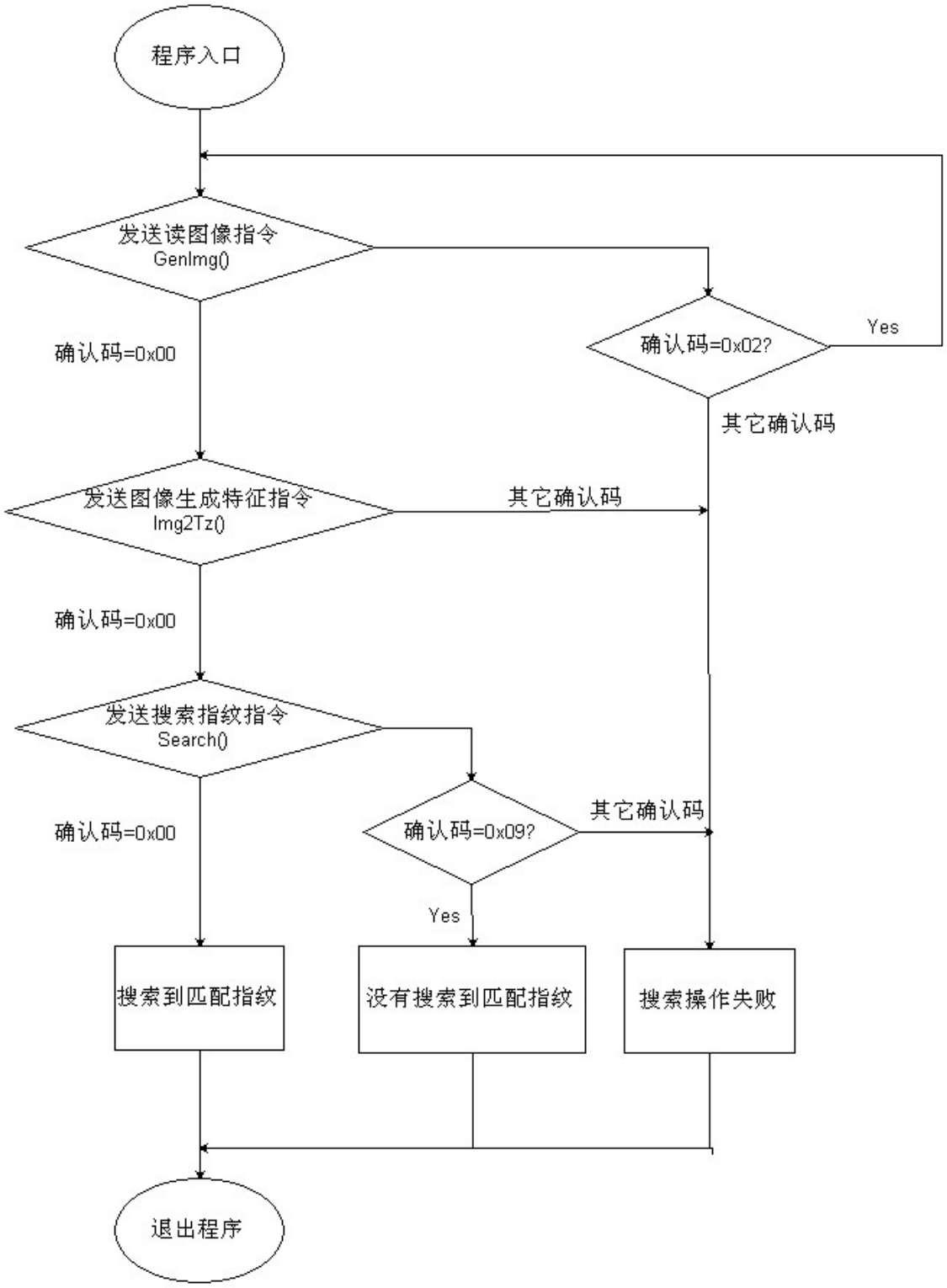
Chapter 7 Program Development Guide

7.Program flow chart

Enrolling fingerprint flow chart



Fingerprint search flow chart



6.4 Instruction set summary table

6.4.1 Classified by function

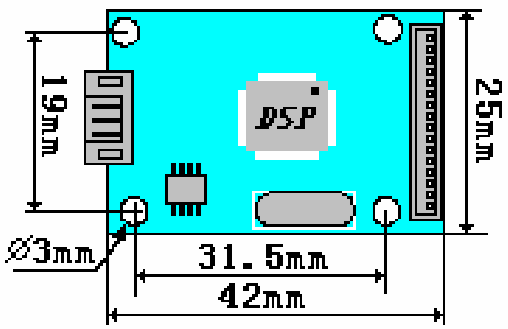
Types of	Serial number	Code	Function Description	Types of	Serial number	Code	Function Description
system	1	0x13	valid password	Means	13	0x08	upload feature
	2	0x12	set password		14	0x09	download features
Unify	3	0x15	set address	Pattern	15	0x06	storage template
	4	0x0e	Set system parameters		16	0x07	Read out the template
class	5	0x0f	read system parameters	Place	17	0x0c	delete template
	6	0x1f	Read fingerprint template index table		18	0x0d	Clear fingerprint library
	7	0x1d	read fingerprint template number	Reason	19	0x03	Compare fingerprints
Means	8	0x01	fingerprint image	class	20	0x04	search fingerprint
Pattern	9	0x0a	upload image				
Place	10	0x0b	download image	its	twenty one	0x14	sampling random number
Reason	11	0x02	image to feature	he			
class	12	0x05	Feature synthesis template	class			

6.4.2 In order of instruction code

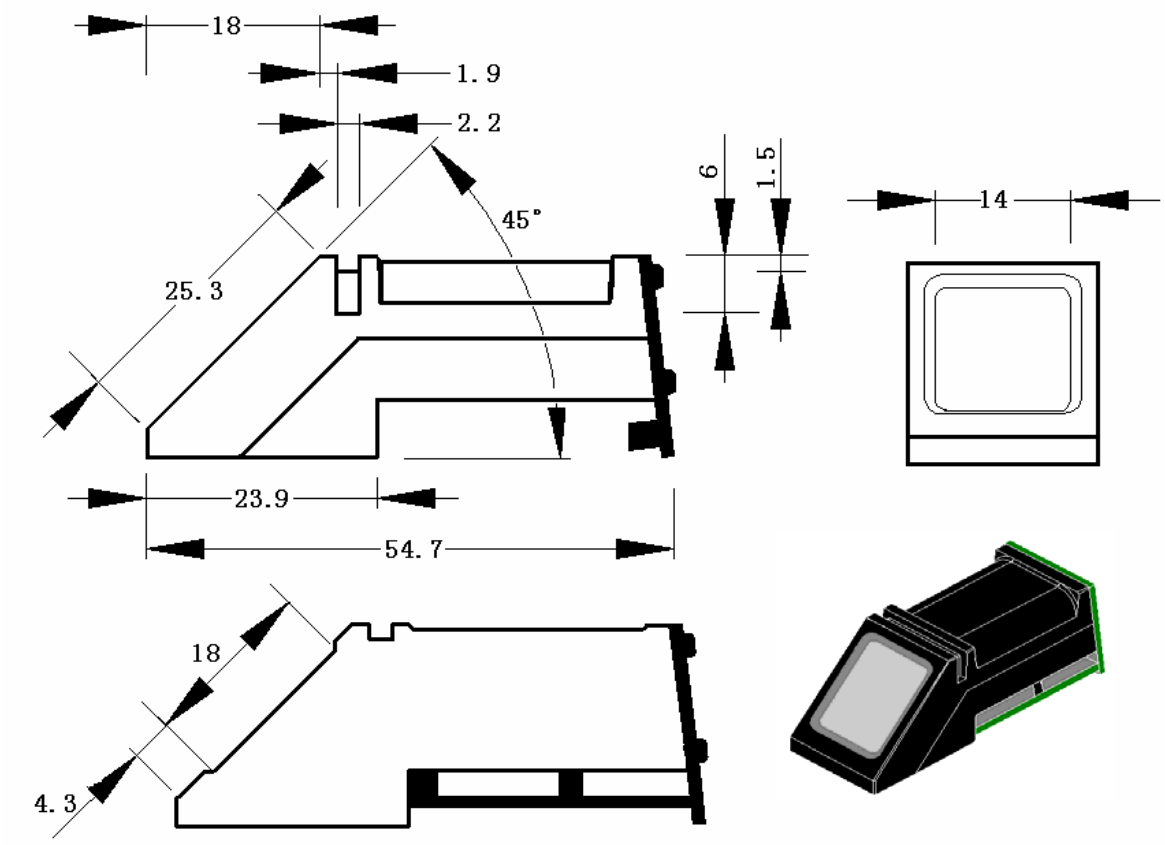
Code	Mnemonic	Function Description	Code	Mnemonic	Function Description
0x01	GenImg	Fingerprint image	0x0d	Empty	Clear fingerprint library
0x02	Img2Tz	Image to feature	0x0e	SetSysPara	Set system parameters
0x03	Match	Fingerprint comparison	0x0f	ReadSysPara	Read system parameters
0x04	Serach	Search fingerprint	0x12	SetPwd	Set password
0x05	RegModel	Feature synthesis template	0x13	VfyPwd	Valid password
0x06	Store	Storage template	0x14	GetRandomCode	sampling random number
0x07	LoadChar	Read template	0x15	SetAdder	set address
0x08	UpChar	Upload feature	0x1d	TempleteNum	Read fingerprint template number
0x09	DownChr	Download features	0x1f	ReadConList	Read fingerprint template index table
0x0a	UpImage	Upload image			
0x0b	DownImage	Download image			
0x0c	DeletChar	Delete template			

annex

1 External dimensions of split motherboard



2 Dimensions of optical fingerprint sensor (or integrated module) (unit:mm)



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