R308 optical fingerprint module
user manual

Hangzhou Grow technology Co., Ltd.

Jan /2015   Ver: 1.5

1. Introduction

R308 is a separate fingerprint reader, used high speed special DSP as core parts, compatible different fingerprint sensor. It is an intelligent module which can freely get fingerprint, image processing, verified fingerprint, search and storage, and it can work normally without upper monitor's participatory management.

Fingerprint processing includes two parts: fingerprint enrollment and fingerprint matching (the matching can be 1:1 or 1:N).

Enrolling fingerprint, user needs to enter the finger 2-4 times for every one finger, process finger images with many times, store generate templates on module. When fingerprint matching, enroll and process verified fingerprint image

And then matching with module (if match with appoint templates on the module, named fingerprint verification, For 1:1 matching method; if match with many templates on the module, named fingerprint search method also named 1:N) system will return the matching result, success or failure.

Power	DC 4.5V-6.0V	Interface	UART(TTL logical level)
Working current	Typical: 40mA Peak: 150mA	Matching Mode	1:1 and 1:N
Baud rate	(9600*N)bps, N=1～12 (default N=6）	Upper monitor	UART(3.3V TTL)
Image acquiring time	<0.5s	Template size	512 bytes
Storage capacity	120,240,500	Security level	5 (1, 2, 3, 4, 5(highest))
FAR	<0.001%	FRR	<0.5%
Average searching time	< 1s (1:1000)	Window dimension	18mm*22mm
Working environment	Temp: -20℃- +40℃	Storage environment	Temp: -40℃- +85℃
	RH: 10%-85%		RH: <90%
Outline Dimention	Size:55.5*21*20.5mm		
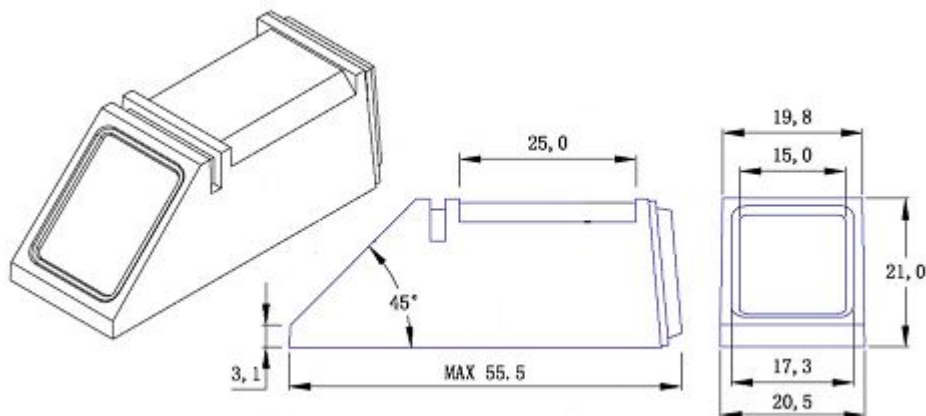
2. Hardware interface

R308 Serial Communication

Pin Nmuber	Name	Type	Function
1	Vt	in	Finger detection power(DC4.2～6V、about5uA),（wire color：red）
2	Vin	in	Power input（wire: black）
3	TXD	out	Data output. TTL logical level(wire color: yellow)
4	RXD	in	Data input. TTL logical level (wire color: green)
5	GND	—	Signal ground. Connected to power ground (color: blue）
6	Touch	out	Finger detection signal（maximum output current: 50mA）。Wire：white）

Note： 1： in= input to module   Out= out put from module。

To communicate with the PC(RS-232 level interface), increase the level conversion circuit between the module and the host computer (for example: MAX232 circuit).

Serial communication protocol

The mode is semiduplex asychronism serial communication. And the default baud rate is 57600bps. Transferring frame format is 10 bit: the low-level starting bit, 8-bit data with the LSB first, and an ending bit. There is no check bit.
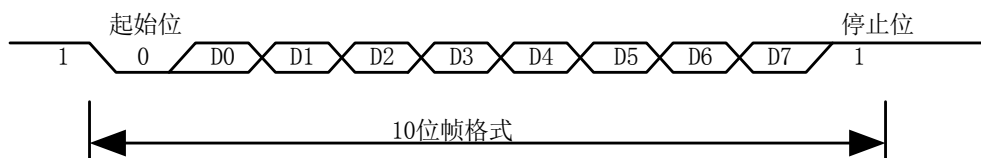
Power-on delay time

At power on, it takes about 300ms for initialization. During this period, the Module can't accept commands for upper computer.

3.communication of protocol

1.Data package format

When communicating, the transferring and receiving of command/data/result are all wrapped in data package format.

Data package format

Header	Adder	Package identifier	Package length	Package content (instuction/data/Parameter）	Checksum

Definition of Data package

Name	Symbol	Length	Description		
Header	Start	2 bytes	Fixed value of 0xEF01; High byte transferred first.		
Adder	ADDER	4 bytes	Default value is 0xFFFFFFFF, which can be modified by command. High byte transferred first and at wrong adder value, module will reject to transfer.		
Package identifier	PID	1 byte	01H	Command packet;	
			02H	Data packet; Data packet shall not appear alone in executing processs, must follow command packet or acknowledge packet.	
			07H	Acknowledge packet;	
			08H	End of Data packet.	
Package length	LENGTH	2 bytes	Refers to the length of package content (command packets and data packets) plus the length of Checksum(2 bytes). Unit is byte. Max length is 256 bytes. And high byte is transferred first.		
Package contents	DATA	—	It can be commands, data, command's parameters, acknowledge result, etc. (fingerprint character value, template are all deemed as data);		
Checksum	SUM	2 bytes	The arithmetic sum of package identifier, package length and all package contens. Overflowing bits are omitted. high byte is transferred first.		

2. Module Instruction System

1. To collect finger image   GetImage

Description: detecting finger and store the detected finger image in ImageBuffer while returning successfull confirmation code; If there is no finger, returned confirmation code would be "can't detect finger".

Input Parameter: none

Return Parameter: Confirmation code (1 byte)

Instuction code: 01H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	Checksum
0xEF01	Xxxx	01H	03H	01H	05H

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	Xxxx	07H	03H	xxH	Sum

Note: Confirmation code=00H: finger collection successs;

Confirmation code=01H: error when receiving package;

Confirmation code=02H: can't detect finger;

Confirmation code=03H: fail to collect finger;

2. To generate character file from image   Genchar

Description: to generate character file from the original finger image in ImageBuffer and store the file in CharBuffer1 or CharBuffer2.

Input Parameter: BufferID (character file buffer number)

Return Parameter: Confirmation code (1 byte)

Instuction code: 02H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	Buffer number	Checksum
0xEF01	xxxx	01H	04H	02H	BufferID	sum

Note: BufferID of CharBuffer1 and CharBuffer2 are 1h and 2h respectively. Other values (except 1h, 2h) would be processed as CharBuffer2.

Acknowledge package format:

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

Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	xxxx	07H	03H	XxH	sum

Note: Confirmation code=00H: generate character file complete;

Confirmation code=01H: error when receiving package;

Confirmation code=06H: fail to generate character file due to the over-disorderly fingerprint image;

Confirmation code=07H: fail to generate character file due to lackness of character point or over-smallness of fingerprint image;

Confirmation code=15H: fail to generate the image for the lackness of valid primary image;

3. To search finger library   Search

Description: to search the whole finger library for the template that matches the one in CharBuffer1 or CharBuffer2. When found, PageID will be returned.

Input Parameter: BufferID, StartPage (searching start address), PageNum（searching numbers）

Return Parameter: Confirmation code (1 byte), PageID (matching templates location）

Instuction code: 04H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	buffer number	Parameter	Parameter	Checksum
0xEF01	xxxx	01H	08H	04H	BufferID	StartPage	PageNum	sum

Note: BufferID of CharBuffer1 and CharBuffer2 are 1h and 2h respectively. Other values (except 1h, 2h) would be processed as CharBuffer2.

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes	2 bytes	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	页码	得分	Checksum
0xEF01	xxxx	07H	7	xxH	PageID	MatchScore	sum

Note 1: Confirmation code=00H: found the matching finer;

Confirmation code=01H: error when receiving package;

Confirmation code=09H: No matching in the library (both the PageID and matching score are 0);

2: The instruction doesn't affect the contents of the buffers.

4. To generate template   RegModel

Description: To combine information of character files from CharBuffer1 and CharBuffer2 and generate a template which is stroed back in both CharBuffer1 and CharBuffer2.

Input Parameter：none

Return Parameter：Confirmation code (1 byte)

Instuction code: 05H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	Checksum
0xEF01	xxxx	01H	03H	05H	09H

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	xxxx	07H	03H	xxH	sum

Note: Confirmation code=00H: operation success;

Confirmation code=01H: error when receiving package;

Confirmation code=0aH: fail to combine the character files. That's, the character files don't belong to one finger.

5.   To store template   Store

Description: to store the template of specified buffer (Buffer1/Buffer2) at the designated location of Flash library.

Input Parameter: BufferID(buffer number), PageID（Flash location of the template, two bytes with high byte front and low byte behind）

Return Parameter: Confirmation code (1 byte)

Instuction code: 06H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	1 byte	2 bytes	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	buffer number	Location number	Checksum
0xEF01	xxxx	01H	06H	06H	BufferID	PageID	sum

Note: BufferID of CharBuffer1 and CharBuffer2 are 1h and 2h respectively. Other values (except 1h, 2h) would be processed as CharBuffer2.

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	Xxxx	07H	03H	xxH	sum

Note: Confirmation code=00H: storage success;

Confirmation code=01H: error when receiving package;

Confirmation code=0bH: addressing PageID is beyond the finger library;

Confirmation code=18H: error when writing Flash.

6. To delete template DeletChar

Description: to delete a segment (N) of templates of Flash library started from the specified location (or PageID);

Input Parameter: PageID (template number in Flash), N (number of templates to be deleted)

Return Parameter: Confirmation code (1 byte)

Instuction code: 0cH

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes	2bytes	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	Page number	number of templates to be deleted	Checksum
0xEF01	Xxxx	01H	07H	0cH	PageID	N	sum

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	Xxxx	07H	03H	xxH	sum

Note: Confirmation code=00H: delete success;

Confirmation code=01H: error when receiving package;

Confirmation code=10H: faile to delete templates;

7. To empty finger library Empty

Description: to delete all the templates in the Flash library

Input Parameter: none

Return Parameter: Confirmation code (1 byte)

Instuction code: 0dH

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Instruction code	Checksum
0xEF01	Xxxx	01H	03H	0dH	0011H

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package length	Confirmation code	Checksum
0xEF01	Xxxx	07H	03H	xxH	sum

Note: Confirmation code=00H: empty success;

Confirmation code=01H: error when receiving package;

Confirmation code=11H: fail to clear finger library;

8. Verify passwoard VfyPwd

Description: Verify Module's handshaking password. (Refer to 4.6 for details)

Input Parameter: PassWord (4 bytes)

Return Parameter: Confirmation code (1 byte)

Instruction code: 13H

Command (or instruction) package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	4 byte	2 bytes
Header	Module address	Package identifier		Instruction code	Password	Checksum
0xEF01	xxxx	01H	07H	13H	PassWord	sum

Acknowledge package format:

2 bytes	4bytes	1 byte	2 bytes	1 byte	2 bytes
Header	Module address	Package identifier	Package Length	Confirmation code	Checksum
0xEF01	xxxx	07H	03H	xxH	sum

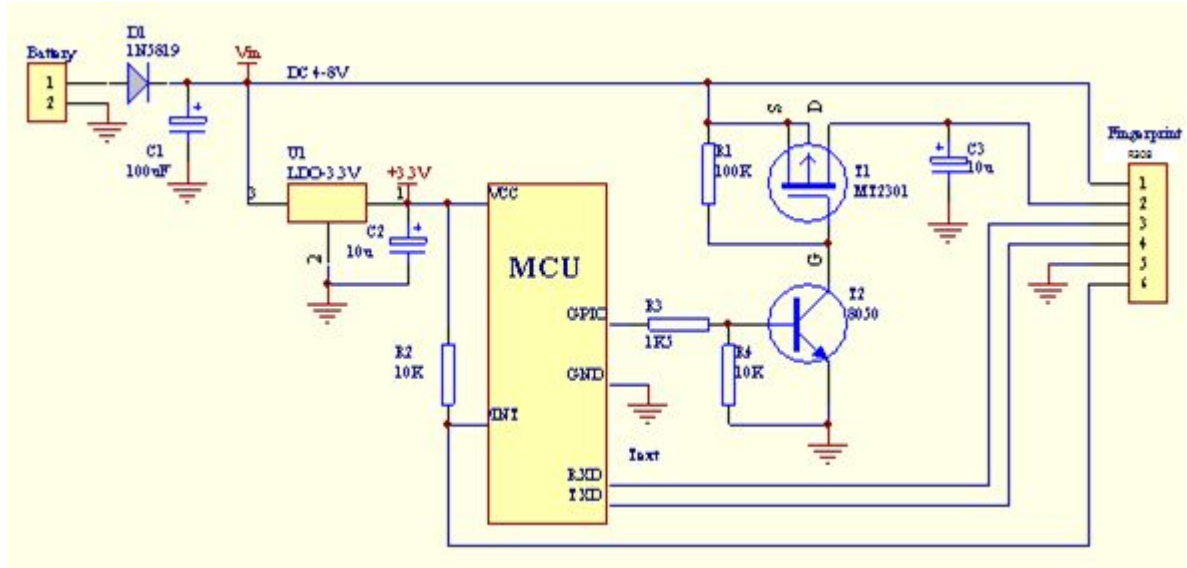Note: Confirmation code = 00H: Correct password;

Confirmation code = 01H: error when receiving package;
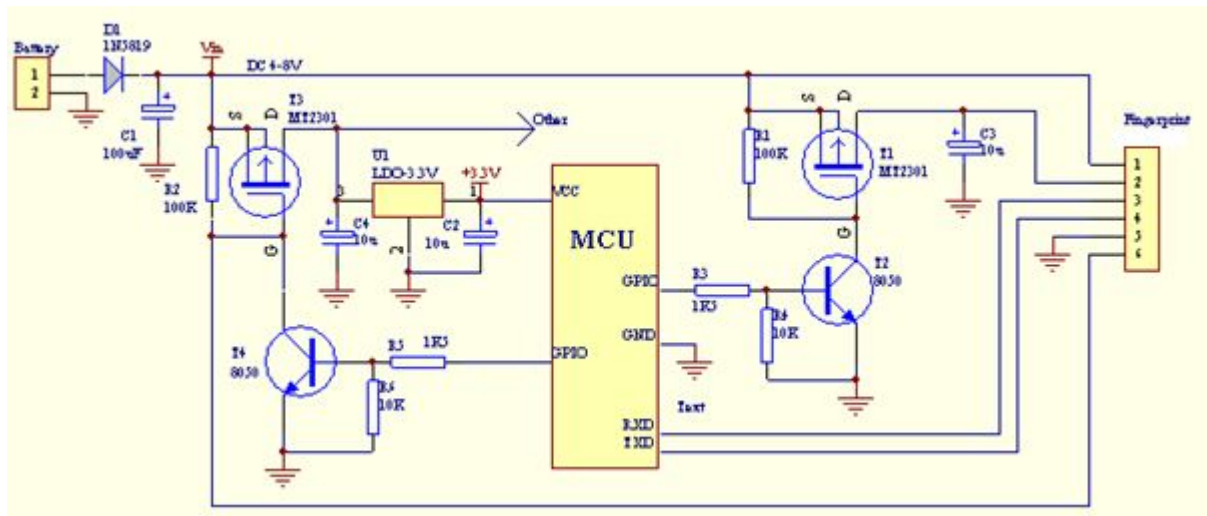
Confirmation code = 13H: Wrong password;

4. Guide of develop products

4.1 Reference circuit

For door lock, SCM unable power fails and at resting state ,at this time ,to use detect finger function ,please ref below information :

At power fails state, use detect finger function at mould for the power on, please refer below diagram:

Above pic, If the power supply ripple is large, can increase the total filter capacitor C1. C3 may reduce or not.

4.2.when mould at power supply, and need to temporarily cut off the electricity, wait at least 300mS and then give the module power, to give sufficient time to the module internal capacitor discharge (if the C3 exists and larger capacity, the time should be extended).

4.3 Module UART communication interface to the 3.3V level, but the interior has a protection circuit, compatible with 5V logic. When cut off the power supply at module, to avoid leakage current to MCU module through the UART, suggest MCU's TXD, RXD ports are low current.