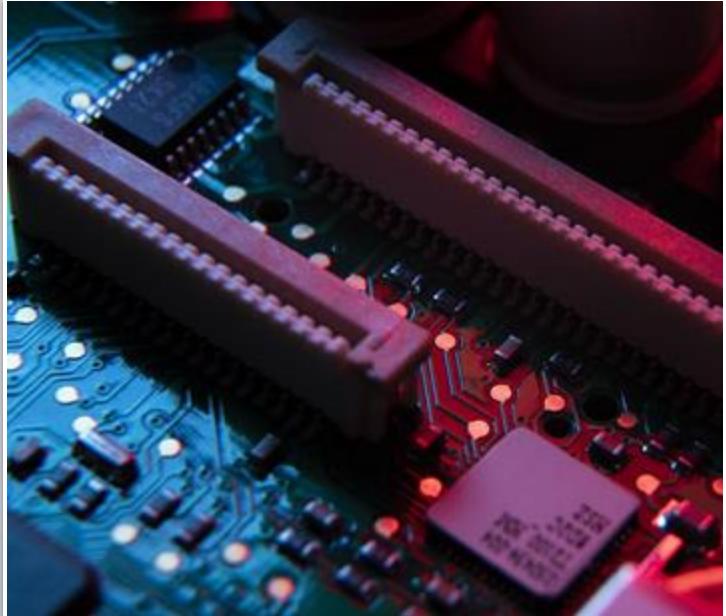


Smart Locker System

Design by Group 20
WONG, King Keung & Li, Hongrun





Our Functions

Digital password lock (4x4 digital keyboard)	Use an external soft keyboard to enter digital passwords
Fingerprint lock (AS608)	Fingerprint identification unlocking
NFC lock (PN532)	Near-Field Communication recognition unlocking
Voice broadcast module (SYN6288)	Input text to speak
Touch screen and LCD screen (XPT2046)	Used for display and touch to achieve human-computer interaction
Micro servo motor (SG90)	A small motor that can be turned to control the opening and closing of locks



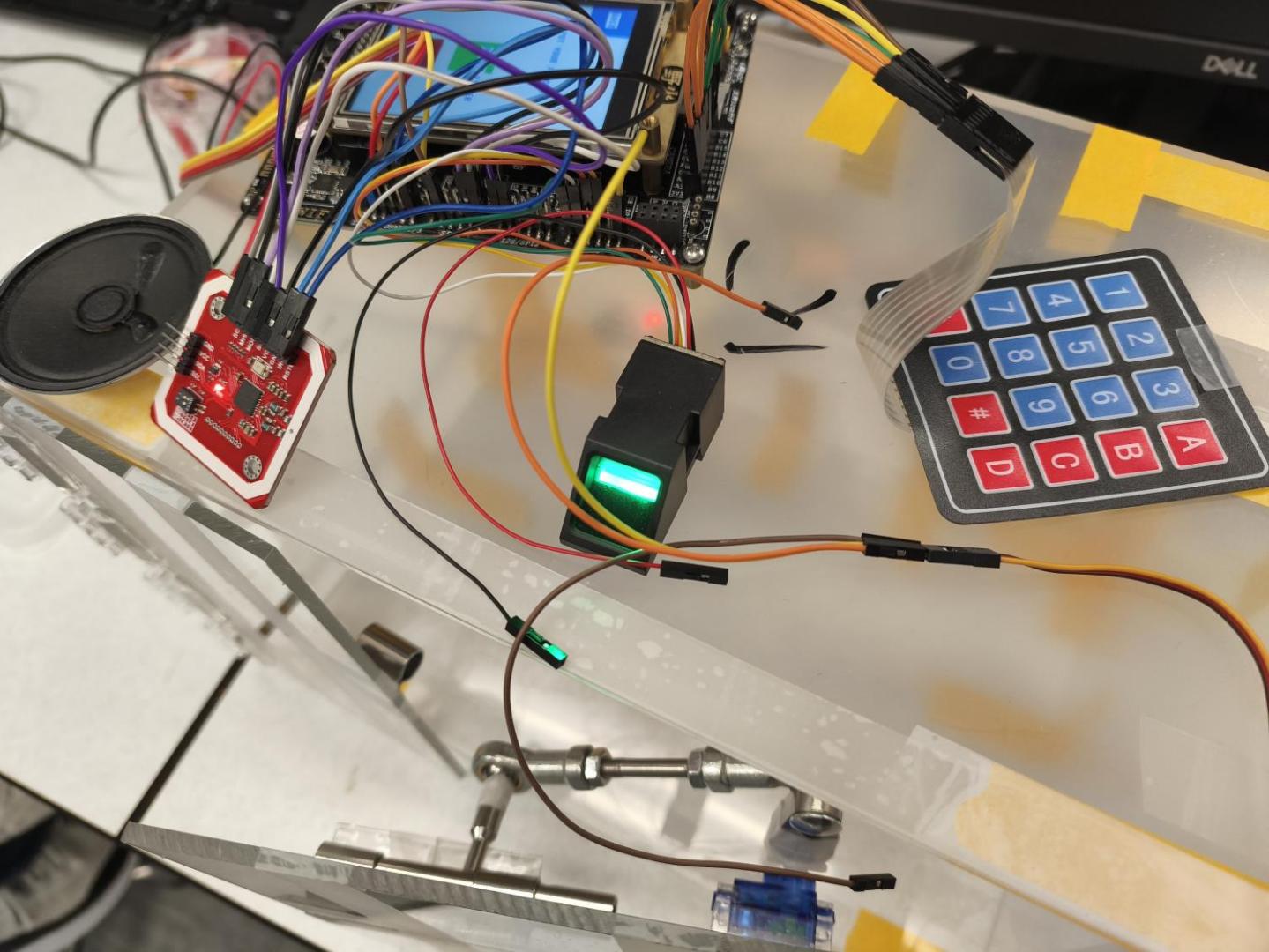




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01

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02

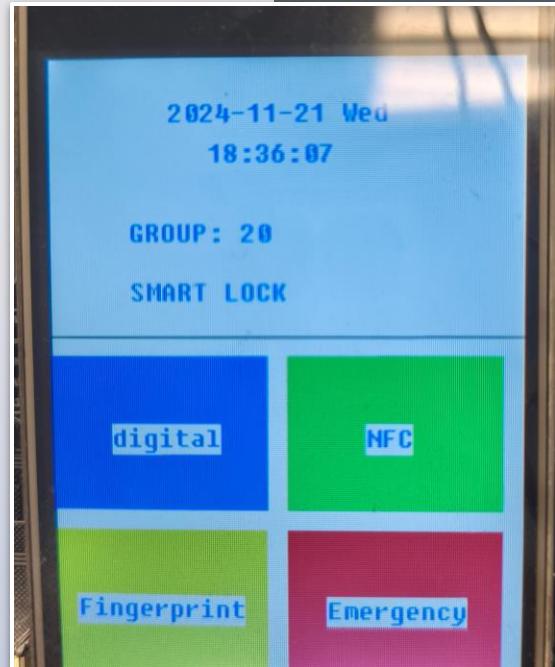
Fingerprint

03

NFC

04

Emergency

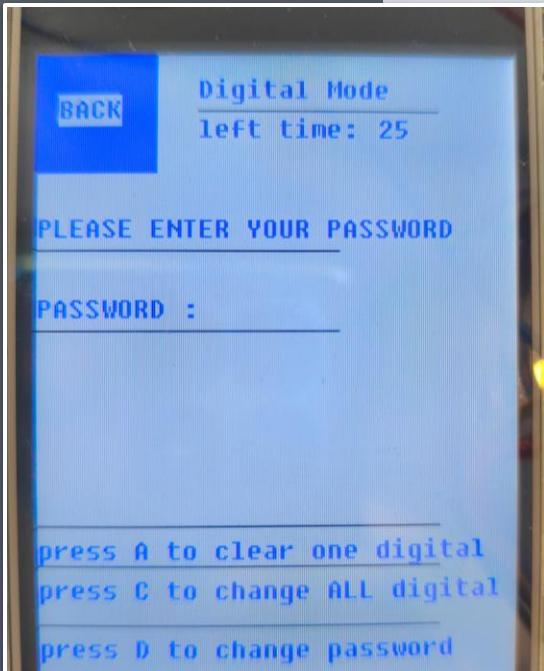


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01

Password

4X4 Matrix Keypad (GPIO)





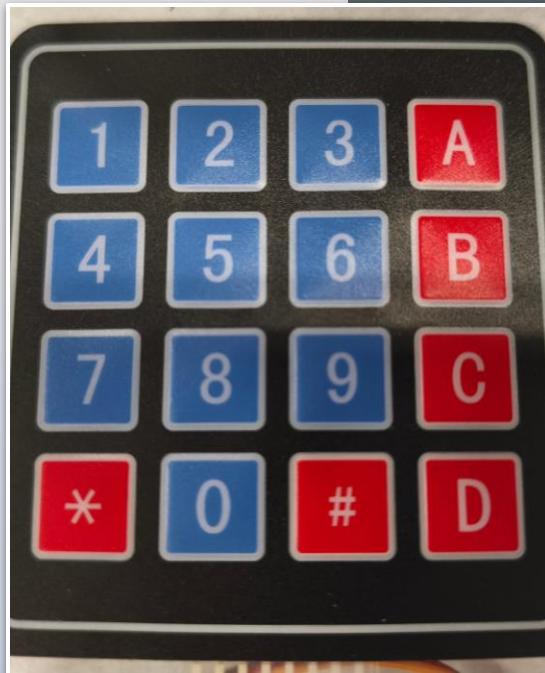
What is our design?

A four-digit password:

We use a 4x4 external soft keyboard to implement the input:

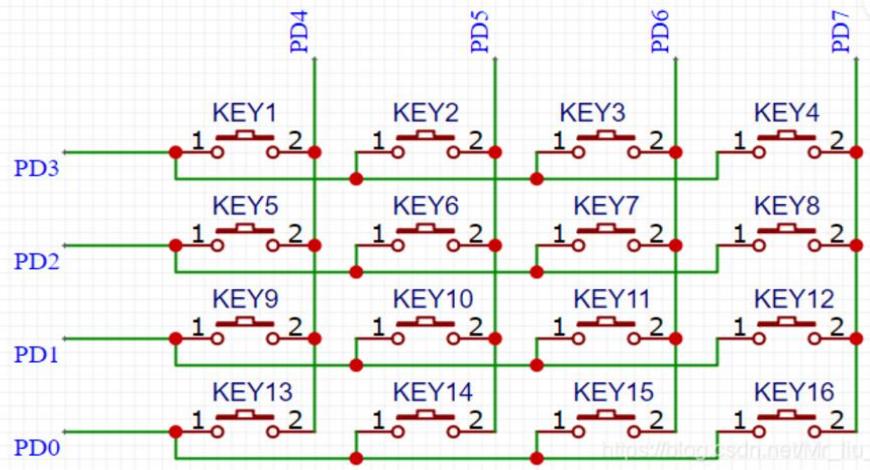
- The blue button is used to enter numbers.
- The 'D' button is used to reset the password.
- The 'A' button is used to delete
- The 'C' button is used to backspace.

Users can see the operation process through the LCD screen.





Our design principles



A 4*4 matrix keypad requires a total of 8 microcontroller GPIO pins.

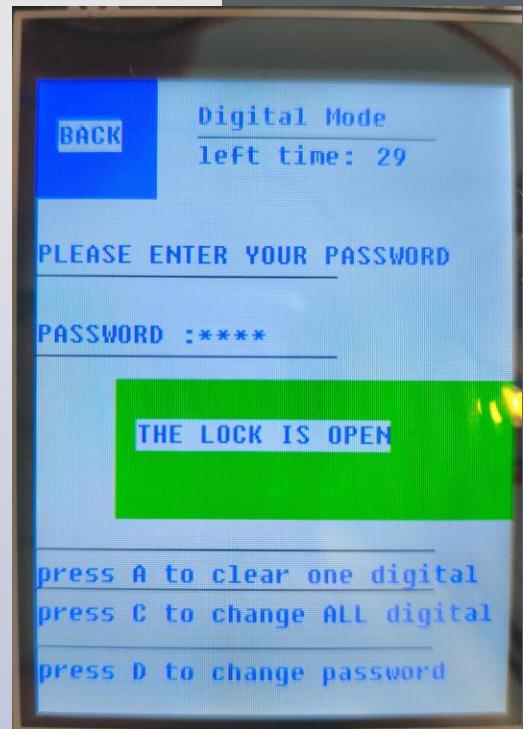
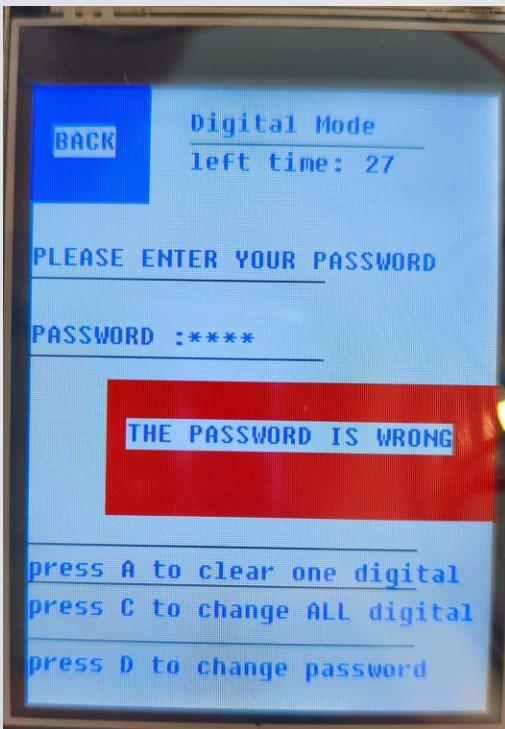
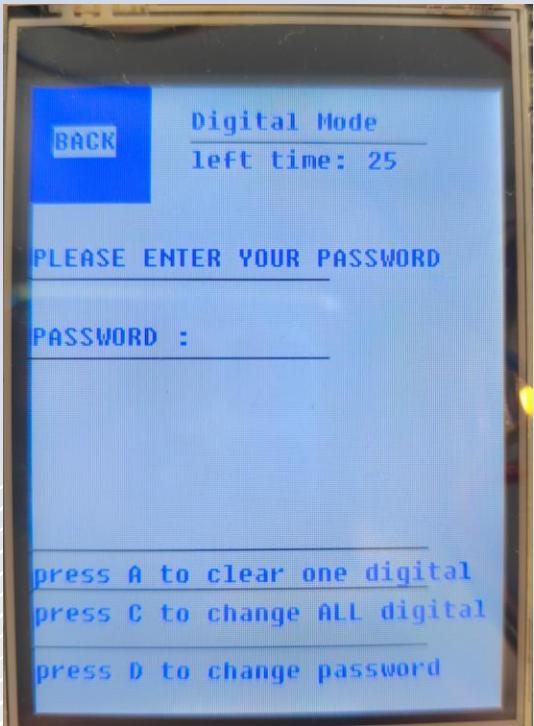
Set the pins controlling the rows as outputs.

The pins controlling the columns as input pull-ups.



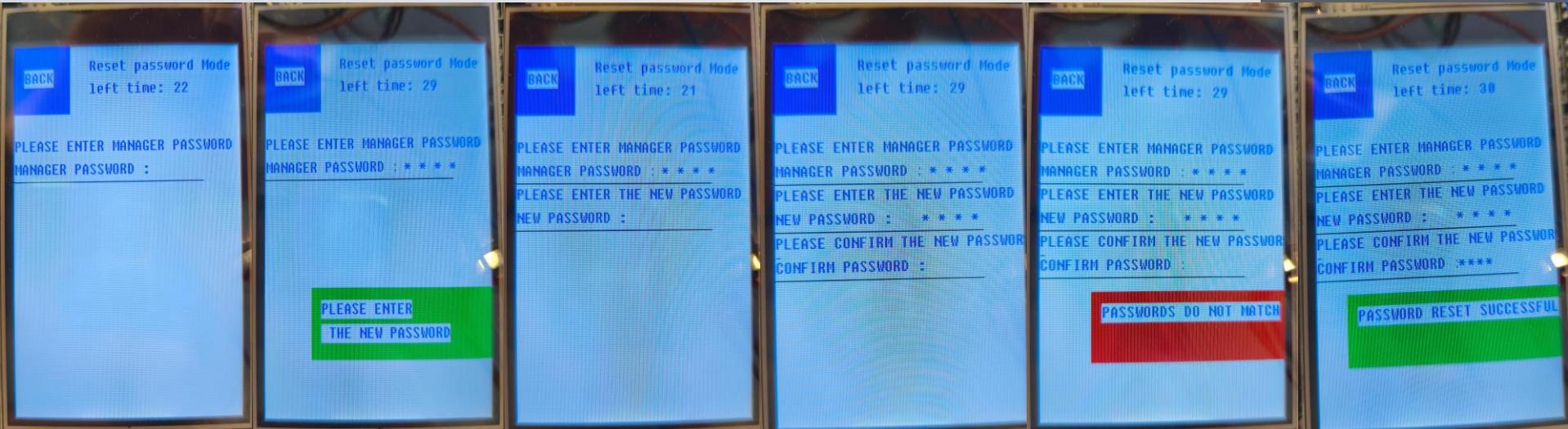
Function demonstration

Enter password



Function demonstration

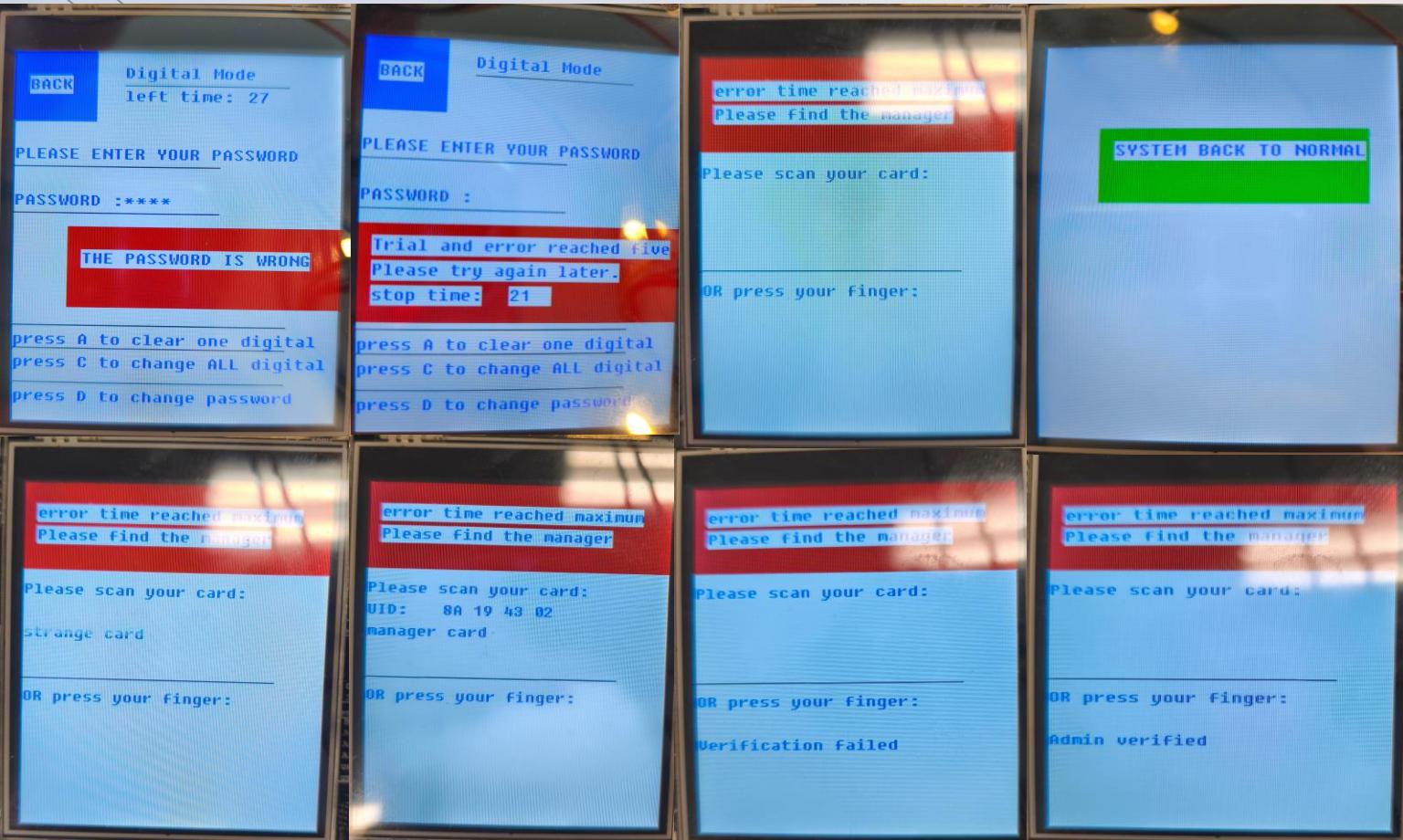
Reset password



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Function demonstration

Trial and error section



02



Fingerprint

AS608 (USART3)

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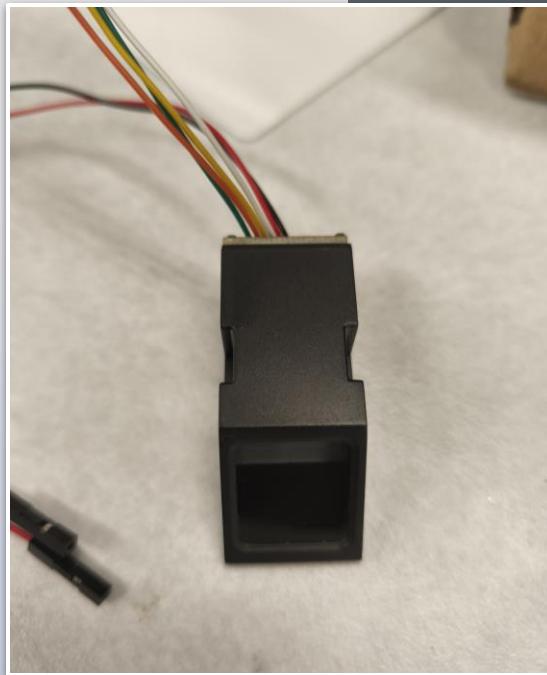


What is our design?

Fingerprint module:

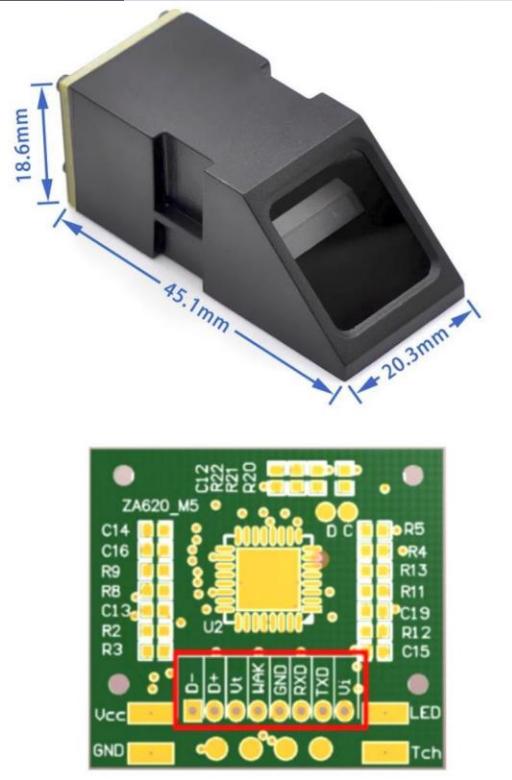
Unlocking with fingerprints generated by AS608
Administrator can verify the administrator's
Fingerprint and carry out corresponding.
Operation commands (add, delete).

If the number of errors is too high, the system will
carry out the corresponding operation.





Our design principles



Pin connect:

TX -> RX (PC10)

RX -> TX (PC11)

VCC -> 3.3V

GND -> GND

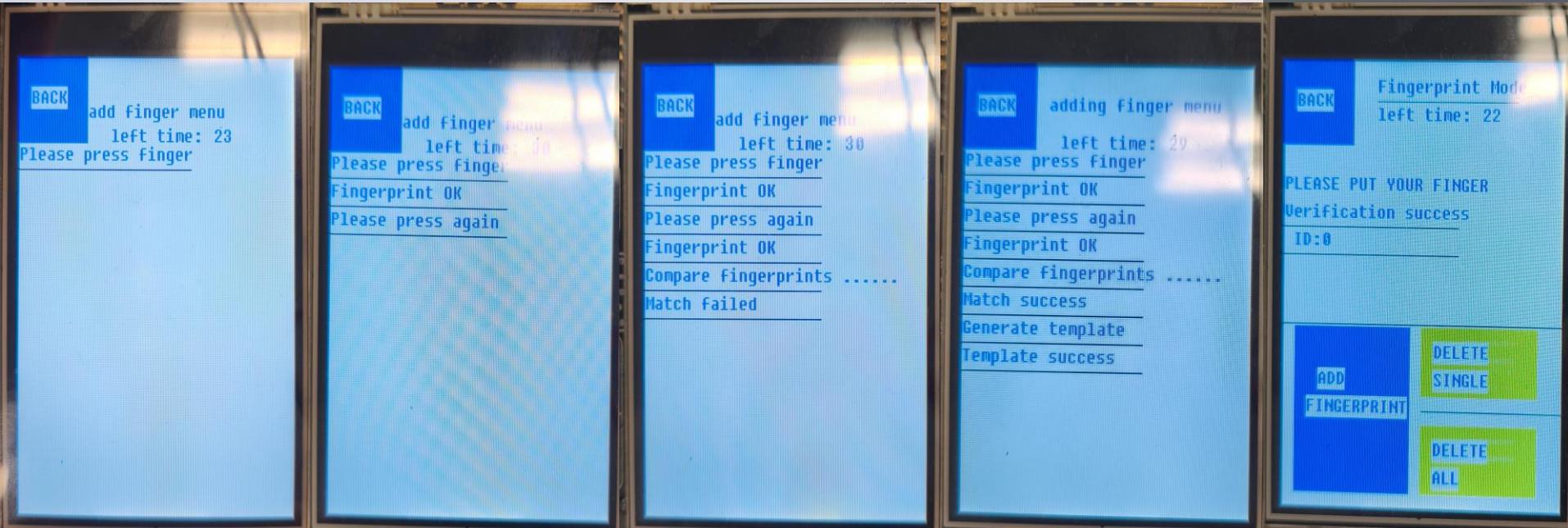
Fingerprint send command flow:

1. Get fingerprint image command
2. Generate fingerprint feature command
3. Search verification fingerprint command(compare, add, delete)



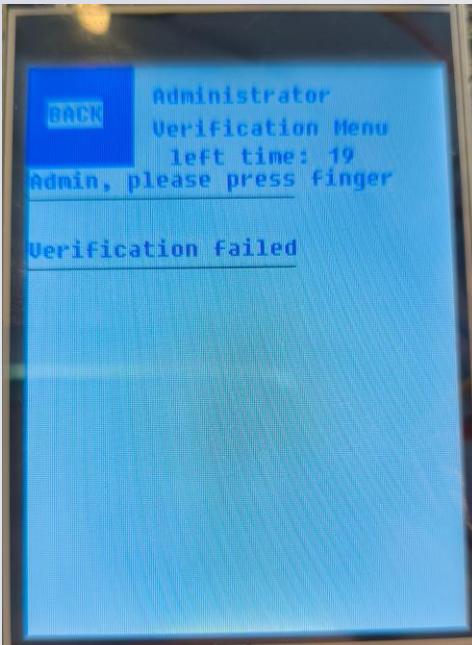
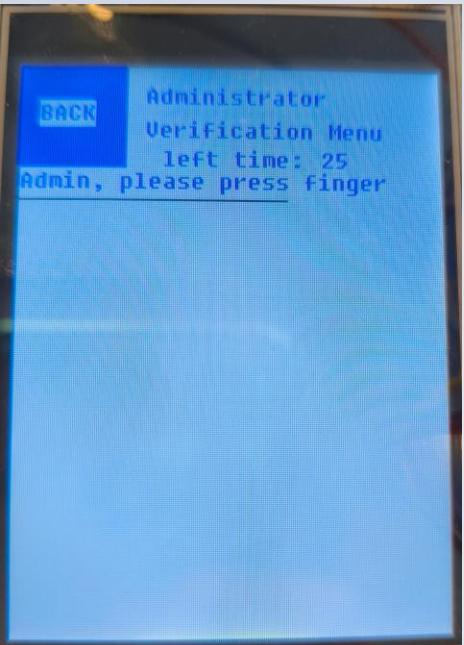
Function demonstration

Manager fingerprint



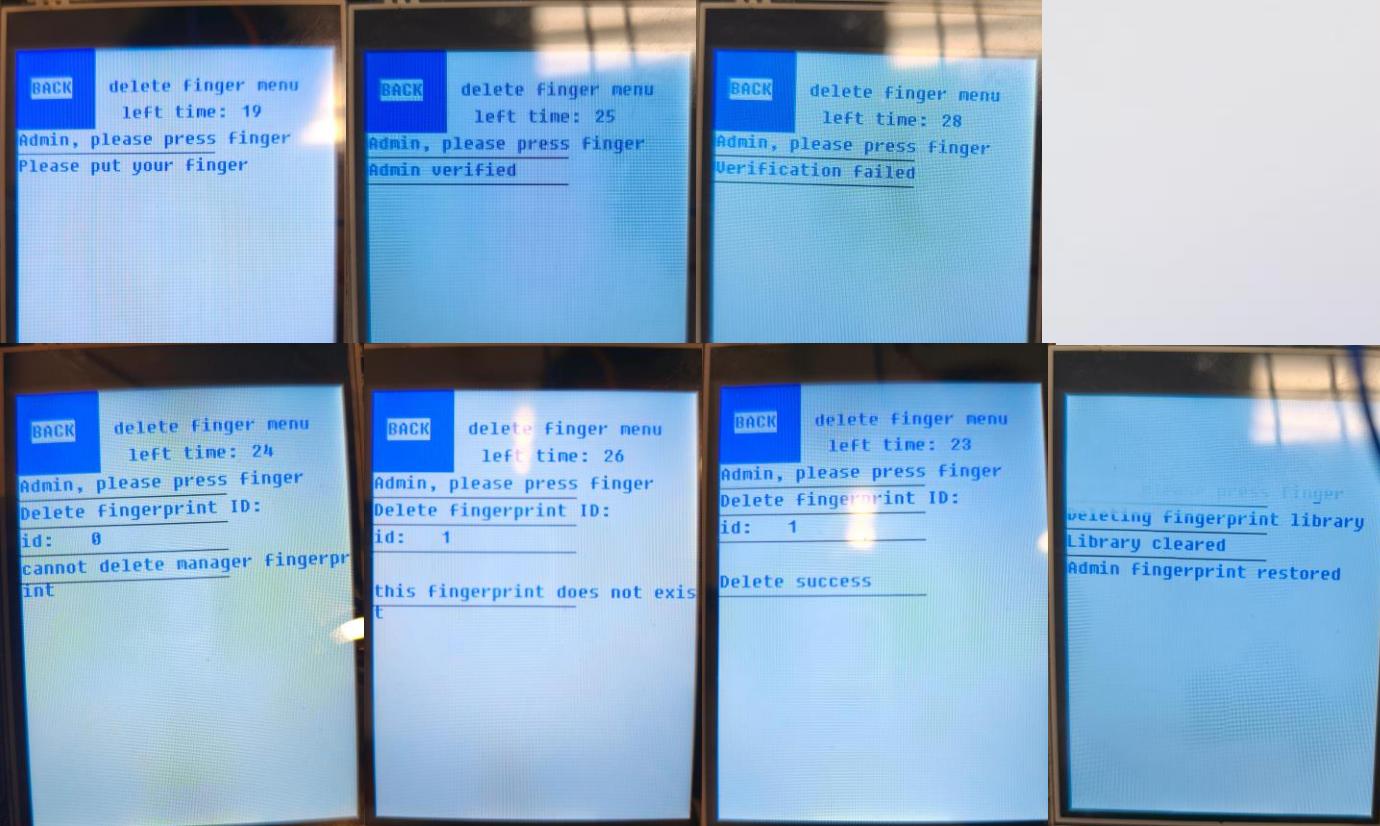
Function demonstration

Add fingerprint



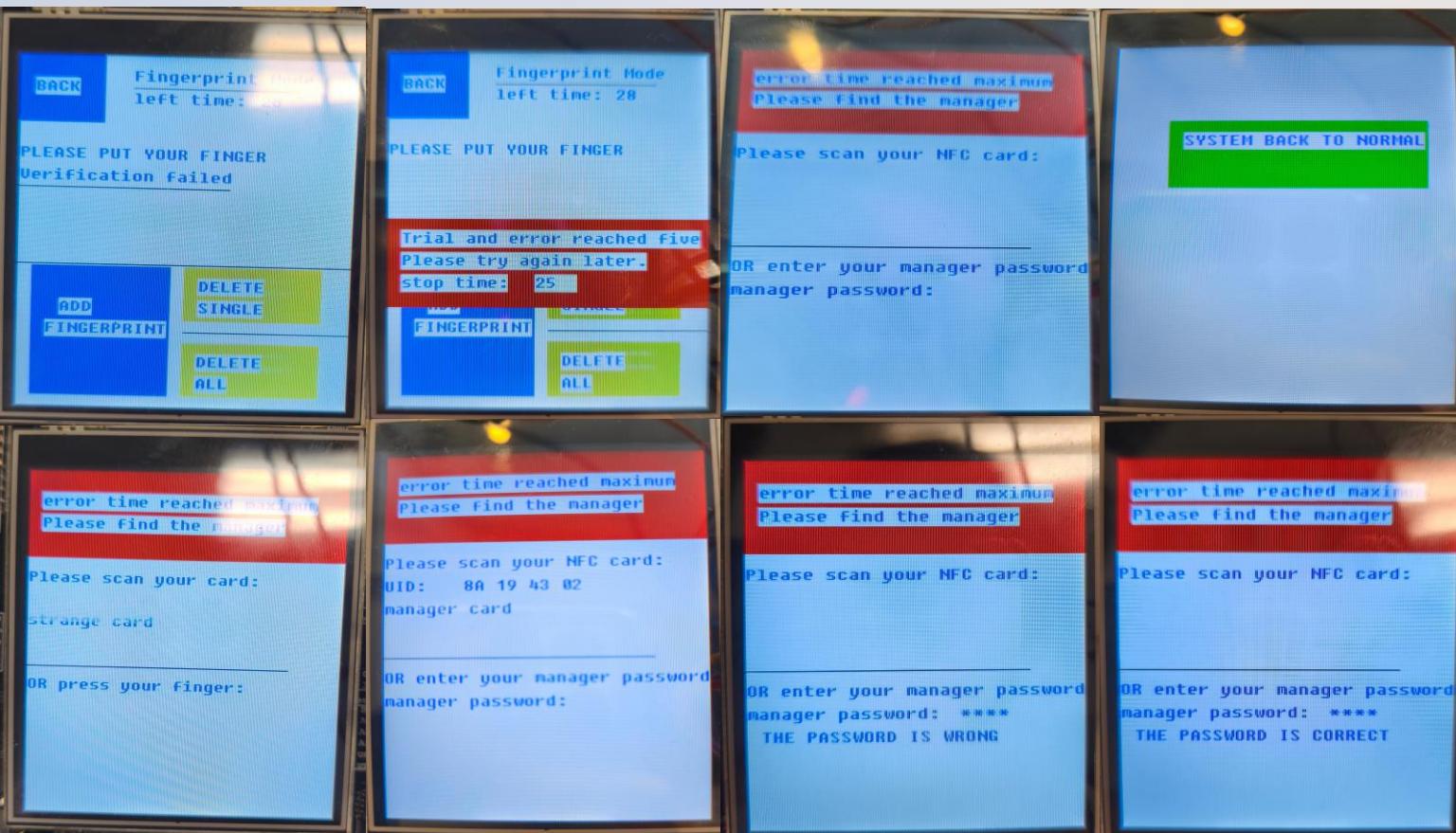
Function demonstration

Delete fingerprint



Function demonstration

Too much trial and error





03

NFC

PN532 (SPI)





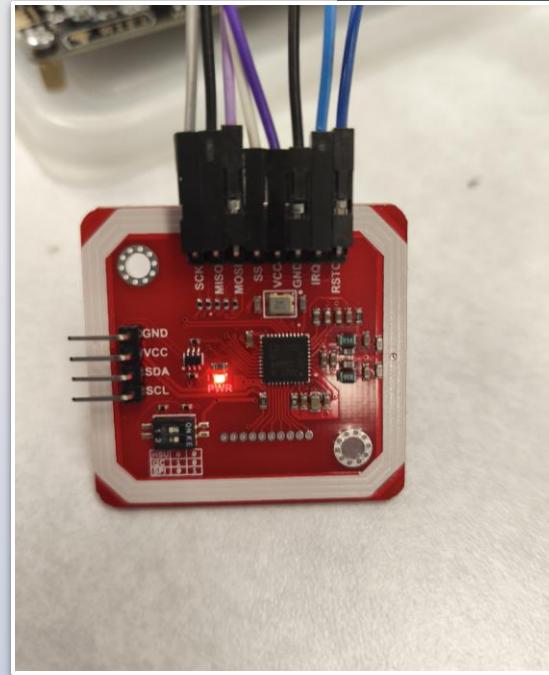
What is our design?

NFC module:

Command to read id of NFC tag with PN532:

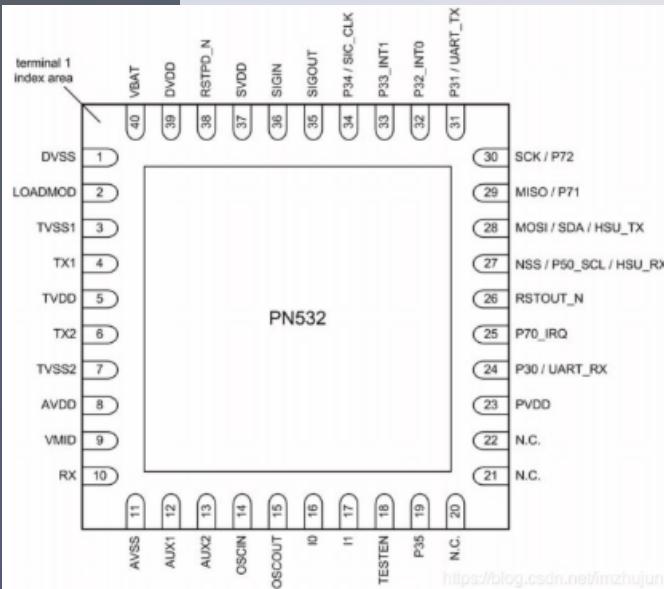
- The system performs operations (authentication) on the scanned ids.
- The administrator can also perform administrator operations (add and delete) through the management card.

If the number of errors is too high, the system will display a “warning”.





Our design principles



Pin connect:
VCC -> 5V
GND -> GND
SCK -> PA5
MISO -> PA6
MOSI -> PA7
SS -> PA4

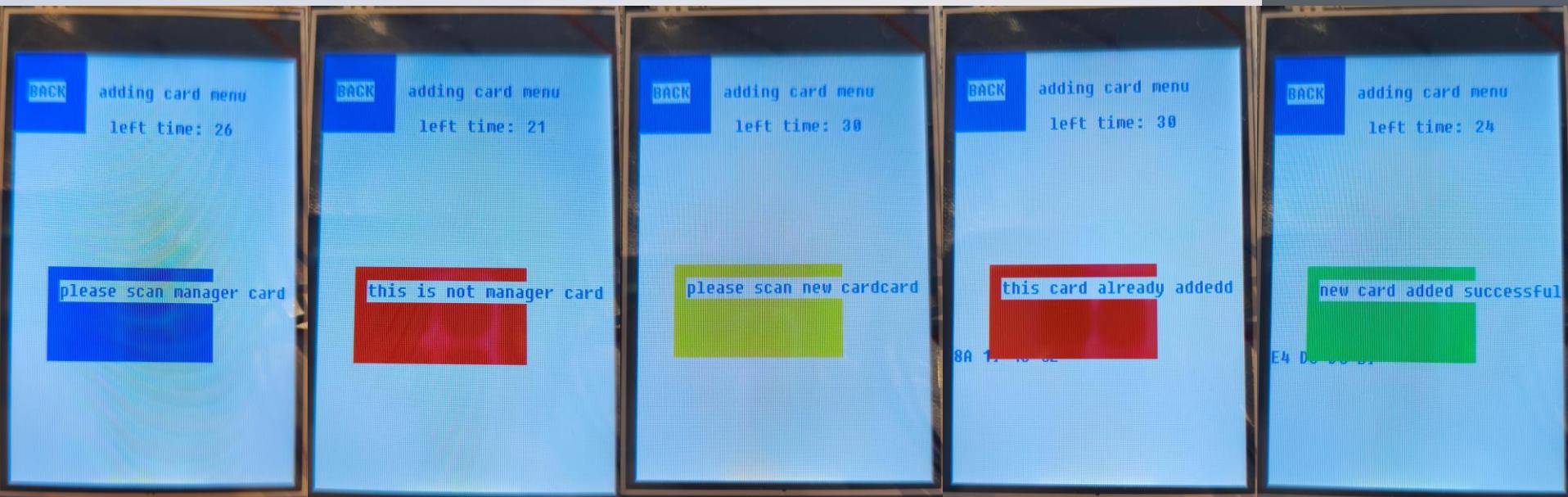
PN532 Communication Frame:

- **Preamble and Start Code**
0x00 0x00 0xFF
- **Length Byte**
- Indicates length from TF1 to PDn
- **Length Checksum Byte**
- Length byte + Checksum = 0x00
- **Direction Byte**
- D4 for data to PN532
- D5 for data from PN532
- **Command and Data**
- PD0 ~ PDn
- **Data Checksum Byte**
- Sum from direction byte to checksum = 0x00
- **End Code**
- 0x00



Function demonstration

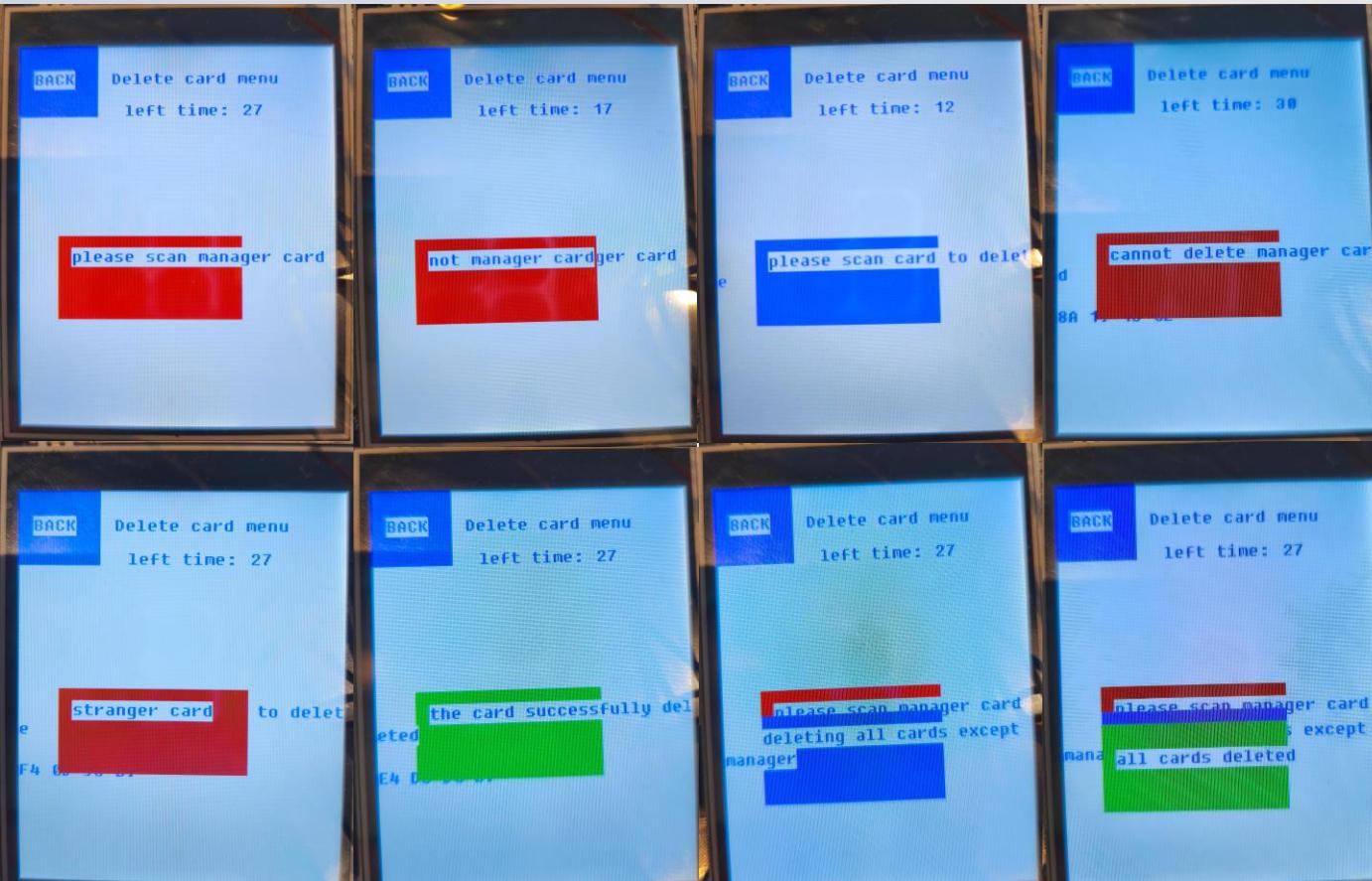
Add NFC



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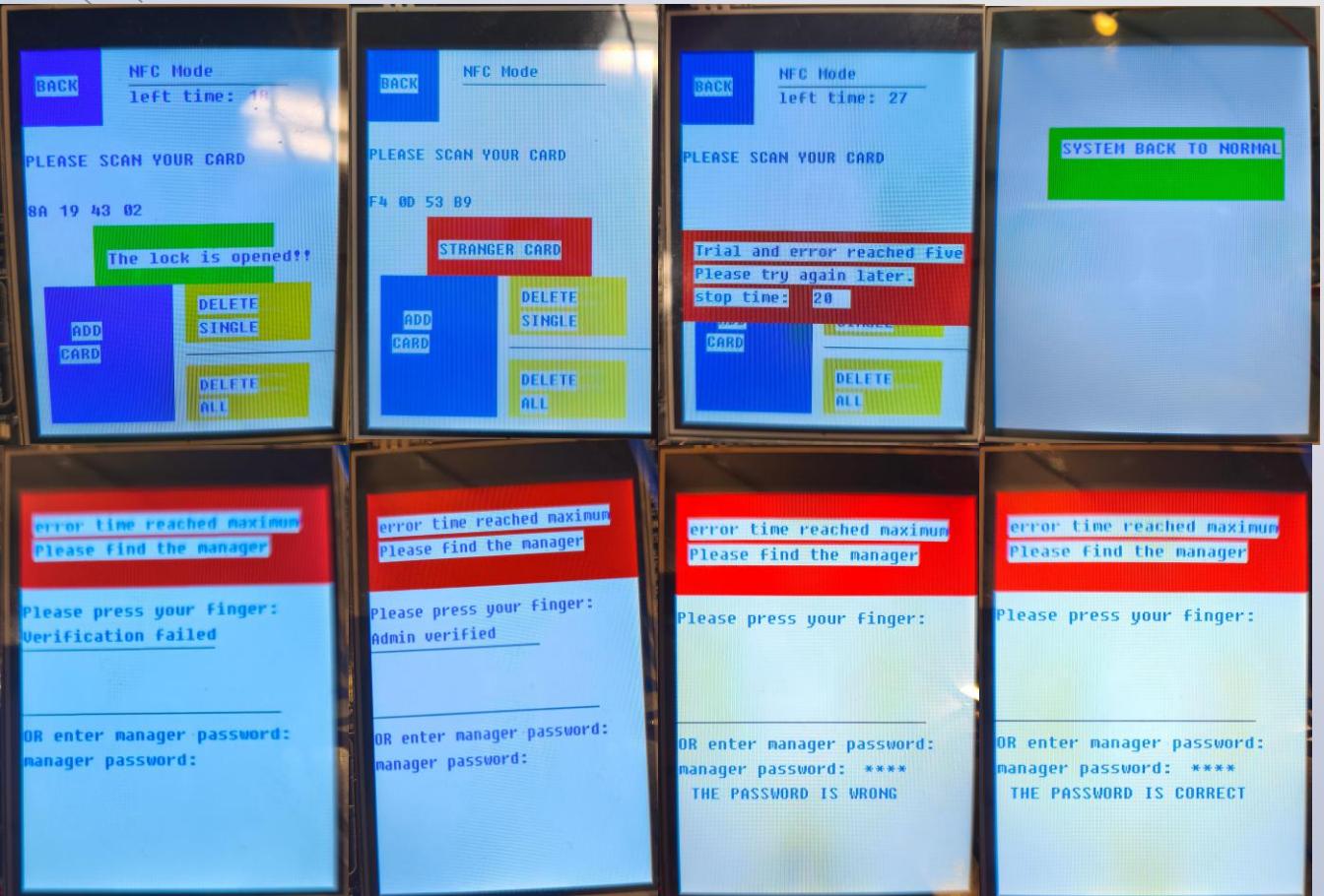
Function demonstration

Delete NFC



Function demonstration

Too much trial and error

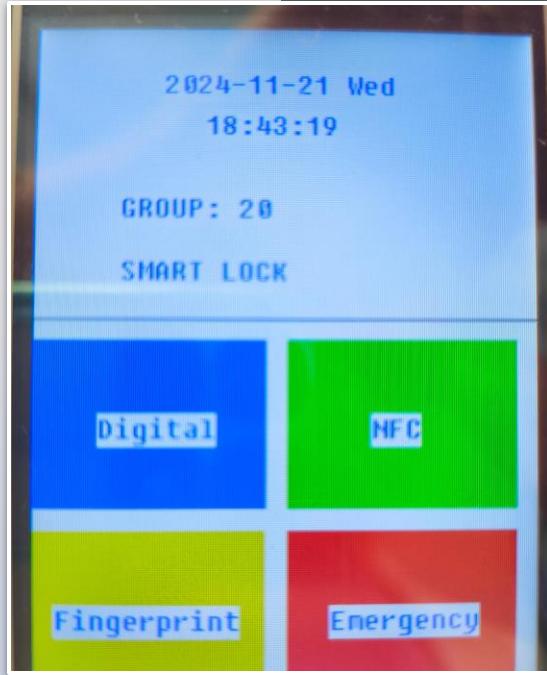




04

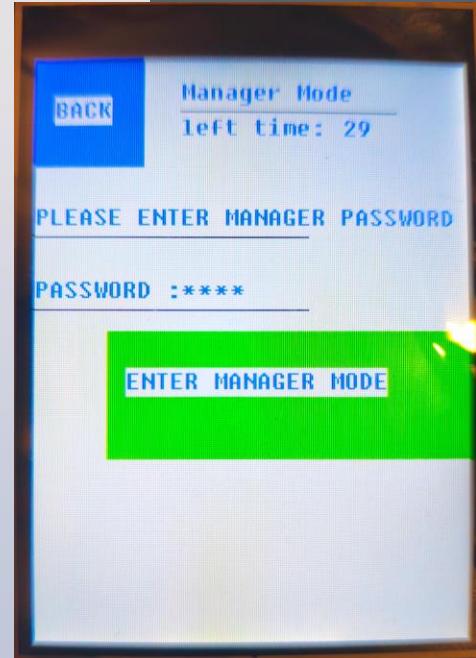
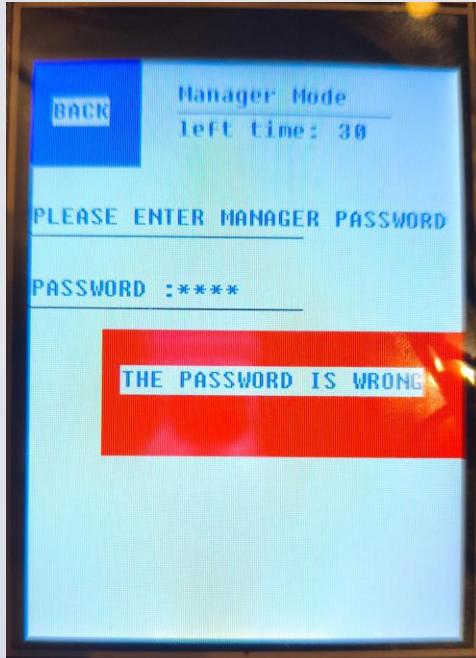
Emergency

Comprehensive Application



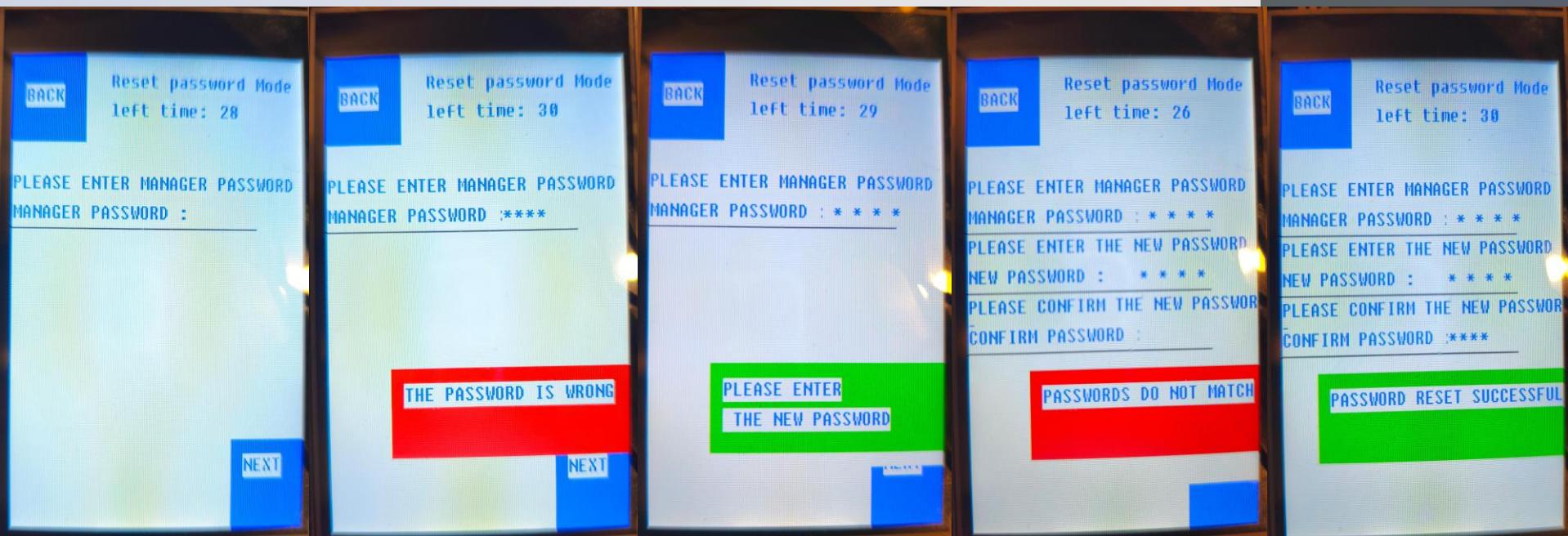
Function demonstration

Administrator Verification



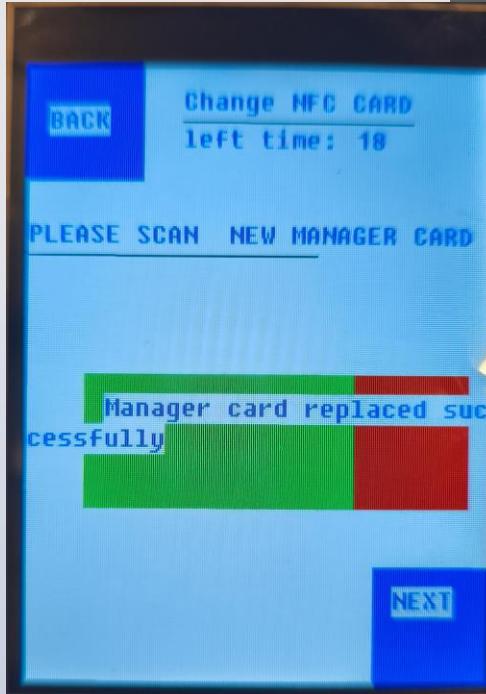
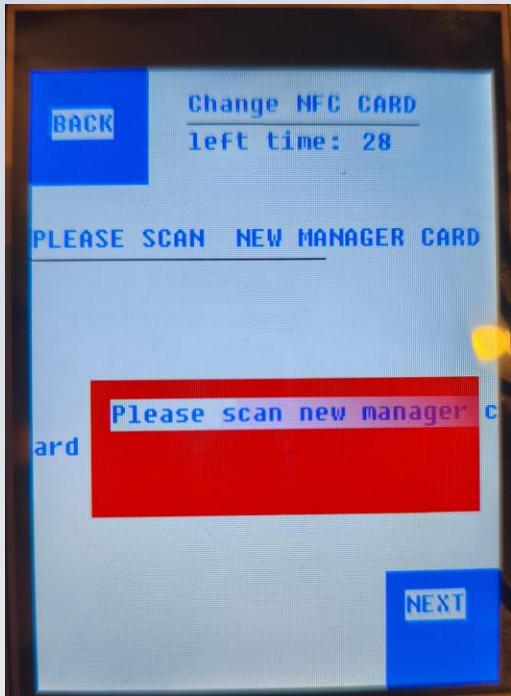
Function demonstration

Password



Function demonstration

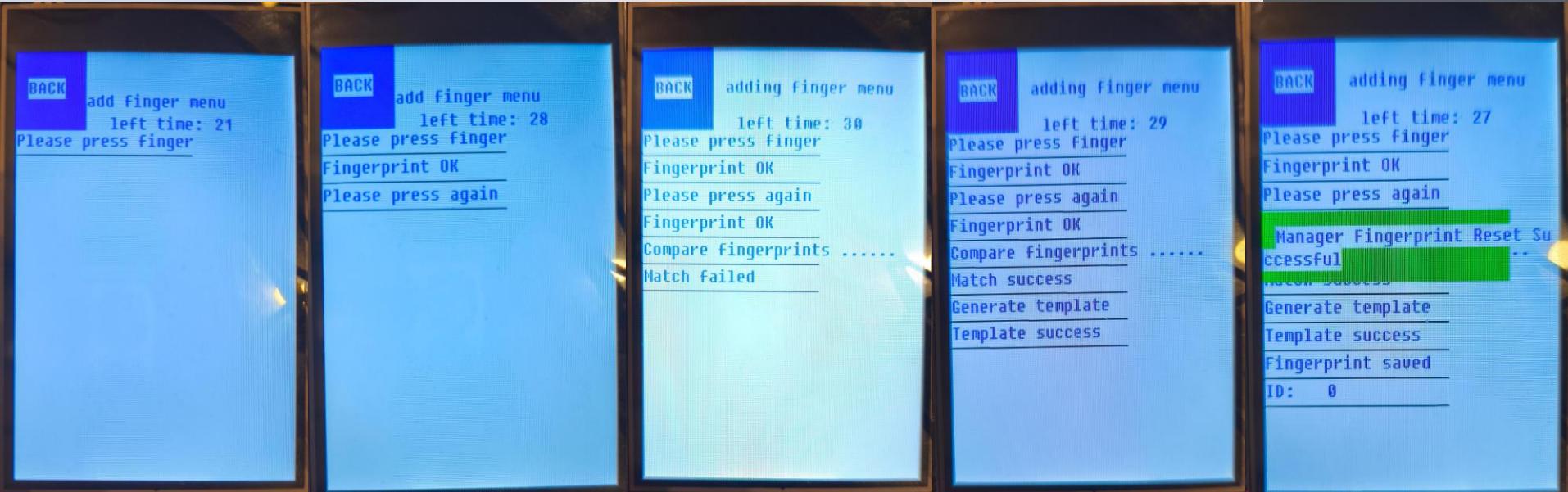
NFC



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Function demonstration

Finger





Others

Voice broadcast

SYN6288 (USART2)





What is our design?

Sound Module:

Go to function with SYN6288.

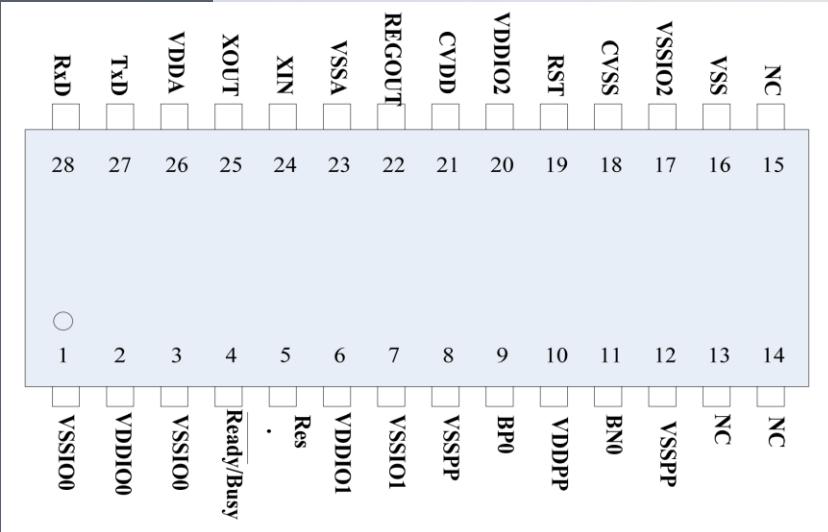
Use GB2312 to encode Chinese characters and input to the system.

For unlocking, locking, administrator mode, warning and other parts of the voice prompts.

VSSIO0	1	○	28	RxD
VDDIO0	2		27	TxD
VSSIO0	3		26	VDDA
Ready/Busy	4		25	XOUT
Res.	5		24	XIN
VDDIO1	6		23	VSSA
VSSIO1	7		22	REGOUT
VSSPP	8		21	CVDD
BP0	9		20	VDDIO2
VDDPP	10		19	RST
BN0	11		18	CVSS
VSSPP	12		17	VSSIO2
NC	13		16	VSS
NC	14		15	NC



Our design principles



Pin connect:

VCC -> 5V

GND -> GND

RX -> PA2

TX -> PA3

Adopting GB2312 encoding
to input Chinese into the
system

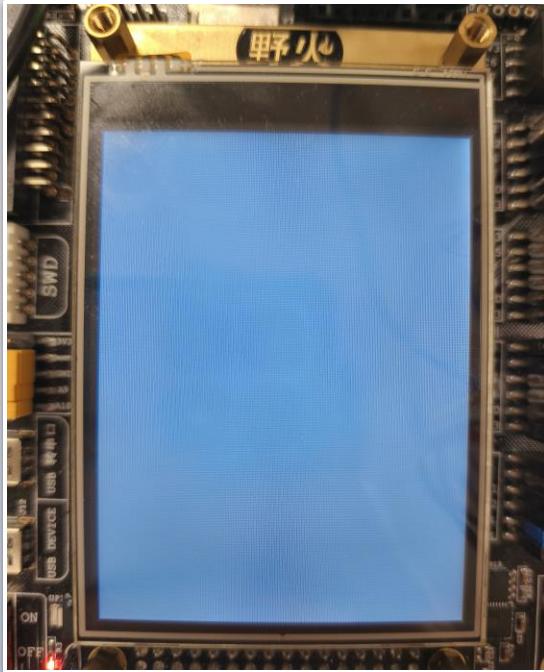
SYN6288 provides a full-duplex UART interface for communication with a microprocessor or PC using TxD, RxD, and GND. It supports data transmission up to 206 bytes.



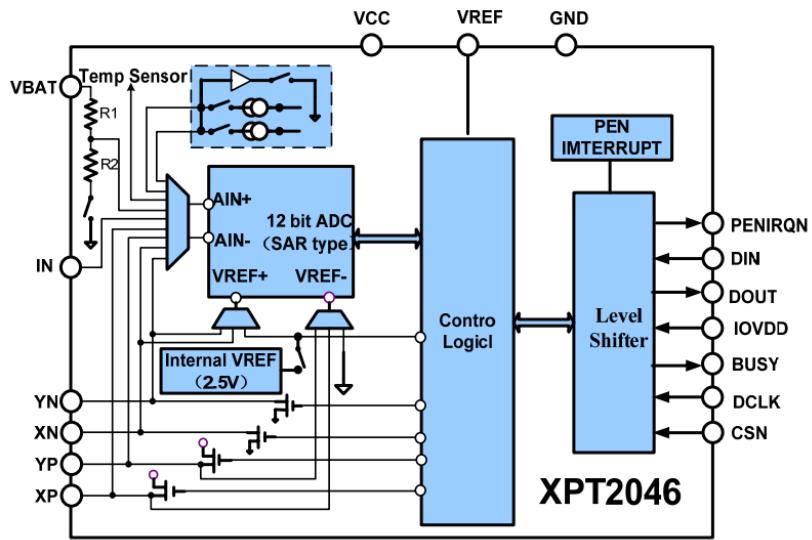
Others

LCD Touch Screen

XPT2046 (FSMC)



Our Design



Prompts the user to perform the activity through the LCD screen display

Detecting the area where the user touches the screen and performing the corresponding action

Display the functions of the smart lock through different screen interfaces.



Others

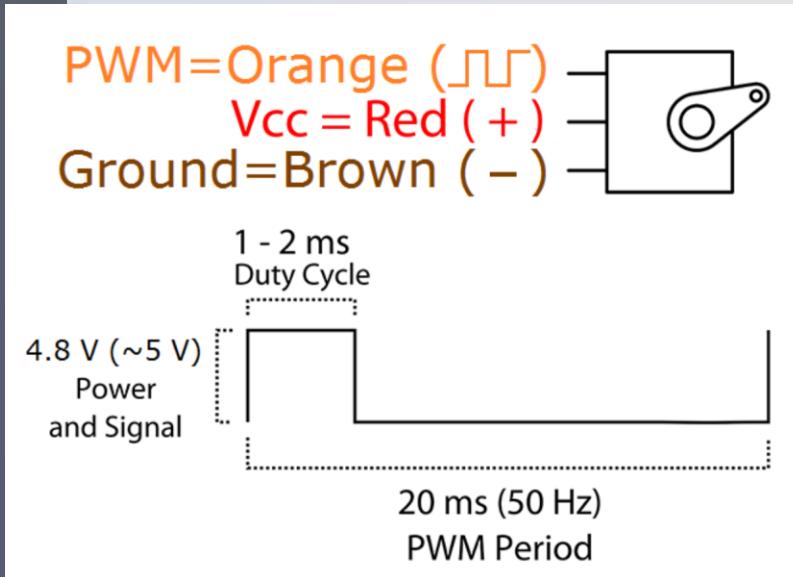
Micro servo motor

SG90 (TIM1)





Our design principles



Pin connected:

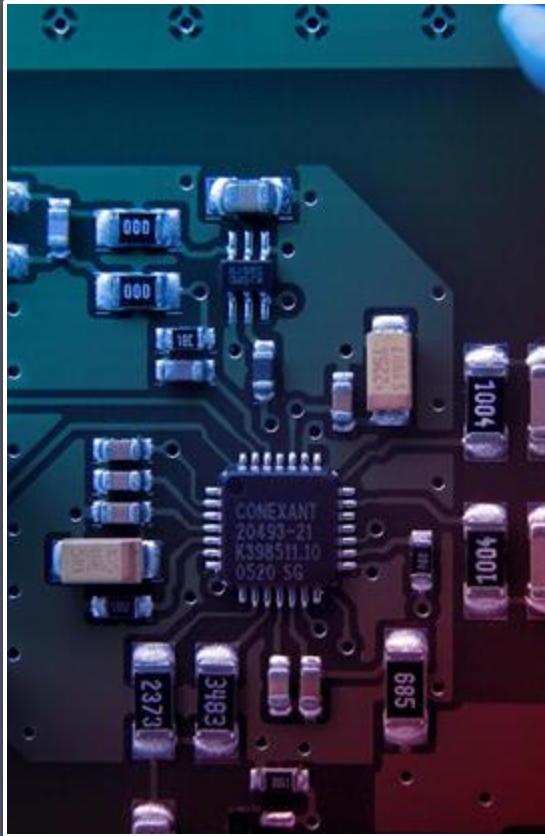
VCC - > 5V

GND - > GND

PWM -> PA11

To drive the SG90 servo, generate a 20ms period square wave with a high pulse width between 0.5ms and 2.5ms.





Thanks!

By Group 20

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