

PiFinger : Fingerprint HAT for Raspberry Pi





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PiFinger For Raspberry Pi

Introduction

PiFinger HAT for Raspberry Pi Comprise of onboard Nuvoton MCU with an on-chip crypto-accelerator, Cortex-M23 TrustZone, and XOM facilities. A user can use the communication protocol to the PiFinger with commands over the UART protocol with the Baud rate 115200 bps or USB 2.0 full speed.

<u>Pinout</u>

PiFinger Peripheral	Raspberry Pi Pin (BCM)
Fingerprint TX	GPIO15 (RXD)
Fingerprint RX	GPIO14 (TXD)
OLED SDA	GPIO2 (SDA)
OLED SCL	GPIO3 (SCL)
BUZZER	GPIO13

Note: First registered fingerprint will act as an administrator Fingerprint. A user needs to confirm the admin fingerprint before running the registration command or else PiFinger will stay in compare mode.



Features

- Capacitive Contact Technology
- On Chip-Crypto Accelerator
- High-Speed UART Interface
- Register up to 24 Fingerprints
- Nuvoton MCU
- Cortex-M23 Trust zone

Fingerprint Comparison	
Image Scanning Transmission	
Registered Fingerprint Storage	
System Unique Internal Code Protection Mechanism	
Search Data	Q



Specification of Board

- Sensor Capacitive Chip Sensor
- Active sensing area 8.8 x 8.8 mm
- Scanning speed 25 Frame/ sec
- Image resolution 508dpi
- Gray level 8 bits/pixel, max 256 grayscales
- Image ratio to width 1:1
- Interface UART / USB
- Power DC 3V±10% (Standby:45mA, Matching duration: 470 mA)
- Operating Temperature (20 ~ 60 °C)
- Operating humidity 0 ~ 90% Non-Condense
- Matching Mode 1:1; 1:N
- Matching speed < 0.3 sec
- Enrollment time < 0.2 sec
- FRR(False Rejection Rate) <0.1% (Security Level, 3)
- FAR(False Acceptance Rate) < 0.001%(Security level, 3)
- Sensor Coating surface color Black Matte
- Sensor Coating RCA @175 g >700 cycles



Specification of Sensor

- Dimensions 13.75 x 12.65 x 1.95 mm
- Dimensions (sensor) 9.6 x 9.4 mm
- ESD (IEC 61000-4-2, level X, air discharge) ±15 kV
- Operating temperature (-20 ~ 80 °C)
- Extended humidity range < 90 %
- Operating voltage range 2.7~3.3 V
- IO pin voltage range 1.8~3.3 V
- Normal mode current 2 mA
- Stand-by mode current 20 uA
- Interface SPI
- 2D capacitive Fingerprint area sensor
- High-performance fingerprint algorithm
- Register at most 24 fingerprints
- High comparison speed
- Matching mode 1:1; 1:N



Hardware











Installation Process

Enable I2C and Serial Interface for Raspberry Pi

Open a terminal or GUI and run the following commands to enable I2C and Serial :

• sudo raspi-config

Choose Interfacing Options -> I2C ->yes

• GUI Method to enable i2c and Serial

() Programming	>	Raspberry Pi Configuration 👻					~ ~ ×
Internet	·	System	Display	Interfaces	Performance	Localisation	
Sound & Video	>	Camera:		۲	Enable	O Disable	
🝟 Graphics	· 1	SSH.			Enable	O Disable	
System Tools	>	0011.	2		LIIdDIE	Disable	
Accessories	>	VNC:		۲	Enable	 Disable 	
Holp		SPI:		۲	Enable	 Disable 	
Theip		12C:		•	Enable	🔿 Disable	
🚎 Preferences	Add / Remove Software	Serial Port		۲	Enable	O Disable	
Run	Appearance Settings	Serial Console:		0	Enable	• Disable	
1 Logout	Keyboard and Mouse	1-Wire:		0	Enable	• Disable	
Monitor-HAT	Main Menu Editor	Remote GPIO:			Enable	Disable	
	Raspberry Pi Configuration						
	Recommended Software					Cancel	OK



Terminal method to enable i2c and serial can be followed as:

1 Change Us 2 Network Op 3 Boot Optic 4 Localisat: 5 Interfaci 6 Overclock 7 Advanced (8 Update 9 About rasp	Raspberry er Password ptions ons ion Options ng Options Options pi-config	Pi Software Conf Change password Configure networ Configure option Set up language Configure connec Configure overcl Configure advanc Update this tool Information abou	iguration Tool (for the current k settings s for start-up and regional set tions to periphe ocking for your ed settings to the latest w t this configura	raspi-config) user tings to match rals Pi version tion tool	your locatio
	<select></select>			<finish></finish>	
P1 Camera P2 SSH P3 VNC P4 SPI P5 I2C P6 Serial P7 1-Wire P8 Remote GP	Enable/D Enable/D Enable/D Enable/D Enable/D Enable/D Enable/D PIO Enable/D	isable connection isable remote con isable graphical isable automatic isable automatic isable shell and isable one-wire isable remote ac	n to the Raspber mmand line access remote access t loading of SPI loading of I2C kernel messages interface cess to GPIO pin	ry Pi Camera s to your Pi u o your Pi usin kernel module kernel module on the serial s	sing SSH g RealVNC connection
	<select></select>			<back></back>	
	Would you li	ike the ARM I2C i	nterface to be e	mabled?	

• sudo raspi-config

Choose Interfacing Options -> Serial -> No -> Yes



Would you like a login shell to be accessible over serial?	Would you like the serial port hardware to be enabled?
<yes></yes>	<yes> <no></no></yes>

Testing

- Connect PiFinger on top of 40 pins stackable GPIO header of Raspberry Pi.
- Now Clone/Download PiFinger Repository by running below command or directly download from github

git clone https://github.com/sbcshop/PiFinger.git

• Open cloned/downloaded folder and choose your environment folder (i.e.: Raspberry Pi or Windows)

Source code Link : <u>https://github.com/sbcshop/PiFinger</u>

For Raspberry Pi

• Run PiFinger GUI by running the below command:

python3 PiFinger_GUI.py or using any python3 supported ide.

 Select COM port and Baud Rate (default is 9600) from the above GUI ("/dev/ttyS0" in case of default connection), and click on connect button to start communication with a fingerprint sensor.





For Windows

- Run PiFinger GUI by running "PiFinger_GUI.py" file with any python3 supported ide.
- Select COM port and Baud Rate (default is 9600) from above GUI ("COM7 " (check com port from device manager) in case of default connection), and click on connect button to start communication with a fingerprint sensor.



Fingerprint Sensor		• •		×
Components				
Compare Fingerprint				
Add Fingerprint				
Remove Fingerprint by ID	Compare			
Remove All Pingerprints				
Comm Port Baud Rate 9600			d	
Connect				
	This is finger compare	window		
Components				

GUI Features

- 1. Compare Fingerprint Option to compare registered Fingerprint.
- 2. Adds Fingerprint Add New Fingerprint, will assign an ID for each successful registration.
- 3. Remove Fingerprint (By ID) Remove registered Fingerprint for a specific ID.
- Remove All Fingerprint (Registered) Remove all fingerprints in a single click.



LED display explanation

The LED light of the PiFinger shows the current working status.

If the LED1 and the LED2 flash, in turn, it means that the PiFinger is in operation mode. If the LED1 or the LED2 is blinking alone, it means that the PiFinger is in demo mode.

The PiFinger will be in the demo mode after powered on or reset. Send any command to it will make it leave demo mode and enter operation mode immediately, and it will process the received command. When the PiFinger is in operation mode, only power on or resets it can make it back to demo mode.

Communication Protocol :

https://github.com/sbcshop/PiFinger/wiki/Communication-Protocol