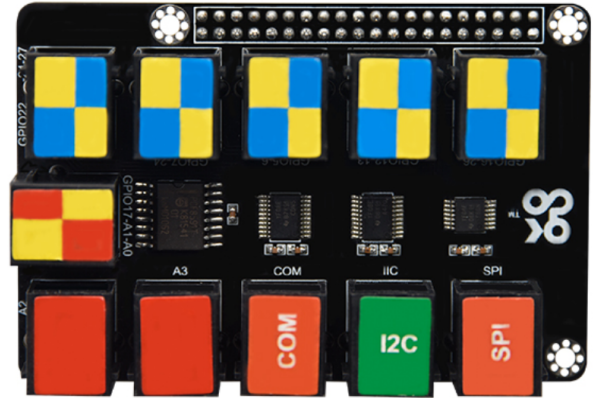


# Raspberry Pi IO Shield (000x0000 Article Number) (TS2180)

## Product Details

This shield, compatible with all 40 pins Raspberry Pi board, uses RJ11 interfaces. It also integrates a 3.3V-5V level conversion circuit and a PC8591 converter. The Raspberry Pi board can be connected to 5V sensors, read analog value and analog voltage.

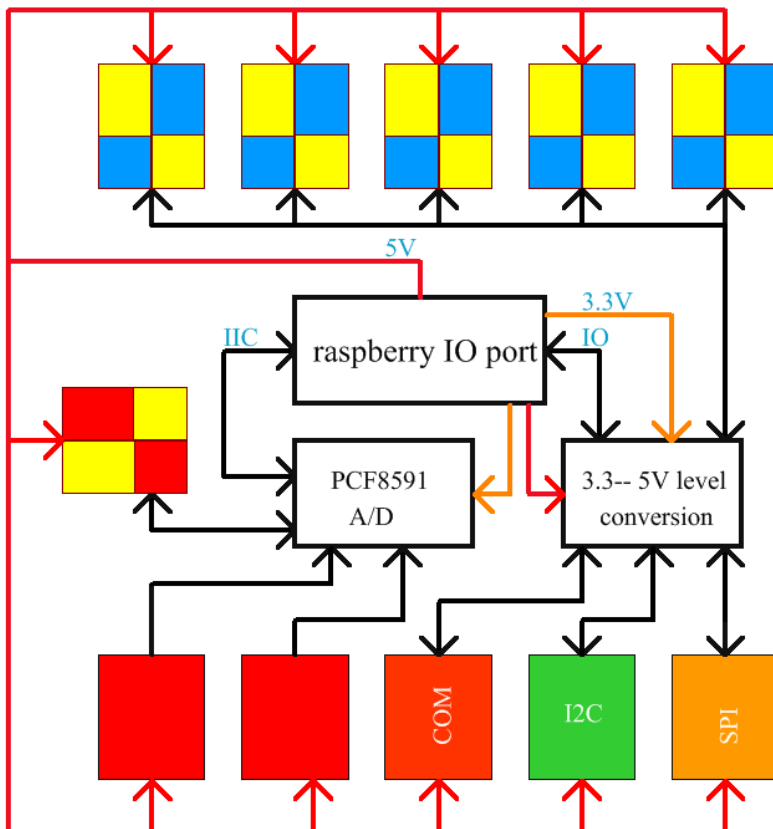


## Features and Benefits

- Output 5V voltage: Raspberry Pi on-board 5V
- PCF8591 A/D conversion: 8-bit precision
- PCF8591 ADC: 1-channel analog output
- PCF8591 I2C address: 0X48
- Interface: RJ116P6C
- IO 3.3/5V level conversion rate: 24 Mbps (Push Pull) 2 Mbps (Open Drain)
- IO maximum input/output current: 50mA
- Compatible with all 40-pin Raspberry Pi motherboards

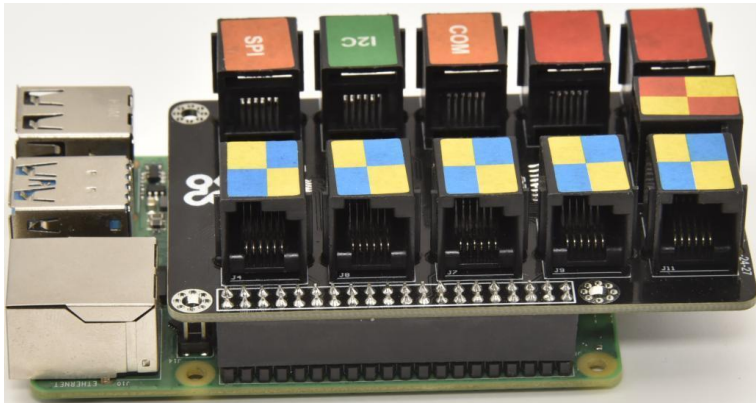
✦

## Technical Drawings



The Raspberry Pi IO shield works with this Raspberry Pi board

Insert the Raspberry Pi into the Raspberry Pi IO shield, as shown below;



## 2. Install Raspberry Pi OS System :

Hardware Tool :

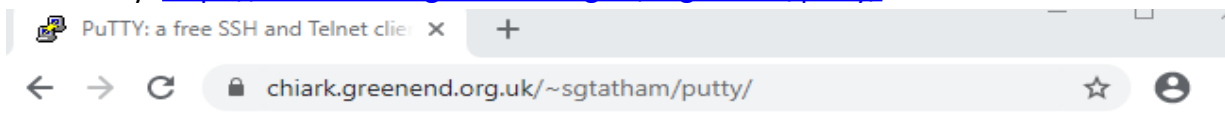
- Raspberry Pi 4B/3B/2B
- Above 8G TFT SD Card
- A card reader
- Computer and other parts

### (1) Install Software Tool

**Windows System :**

Install putty firstly:

Download Putty : <https://www.chiark.greenend.org.uk/~sgtatham/putty/>



### PuTTY: a free SSH and Telnet client

[Home](#) | [FAQ](#) | [Feedback](#) | [Licence](#) | [Updates](#) | [Mirrors](#) | [Keys](#) | [Links](#) | [Team](#)  
Download: [Stable](#) · [Snapshot](#) | [Docs](#) | [Changes](#) | [Wishlist](#)

PuTTY is a free implementation of SSH and Telnet for Windows and Unix platforms, along with an xterm terminal emulator. It is written and maintained primarily by [Simon Tatham](#).

The latest version is 0.74 [Download it here.](#)

**LEGAL WARNING:** Use of PuTTY, PSCP, PSFTP and Plink is illegal in countries where encryption is outlawed. We believe it is legal to use PuTTY, PSCP, PSFTP and Plink in England and Wales and in many other countries, but we are not lawyers, and so if in doubt you should seek legal advice before downloading it. You may find useful information at [cryptolaw.org](#), which collects information on cryptography laws in many countries, but we can't vouch for its correctness.

Use of the Telnet-only binary (PuTTYtel) is unrestricted by any cryptography laws.

### Latest news

#### 2020-11-22 Primary git branch renamed

The primary branch in the PuTTY git repository is now called `main`, instead of git's default of `master`. For now, both branch names continue to exist, and are kept automatically in sync by a symbolic-ref on the server. In a few months' time, the alias `master` will be withdrawn.

## Download PuTTY: latest release (0.74)

[Home](#) | [FAQ](#) | [Feedback](#) | [Licence](#) | [Updates](#) | [Mirrors](#) | [Keys](#) | [Links](#) | [Team](#)  
Download: [Stable](#) · [Snapshot](#) | [Docs](#) | [Changes](#) | [Wishlist](#)

This page contains download links for the latest released version of PuTTY. Currently this is 0.74, released on 2020-06-27.

When new releases come out, this page will update to contain the latest, so this is a good page to bookmark or link to. Alternatively, here is a [permanent link to the 0.74 release](#).

Release versions of PuTTY are versions we think are reasonably likely to work well. However, they are often not the most up-to-date version of the code available. If you have a problem with this release, then it might be worth trying out the [development snapshots](#), to see if the problem has already been fixed in those versions.

### Package files

You probably want one of these. They include versions of all the PuTTY utilities.

(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)


#### MSI ('Windows Installer')

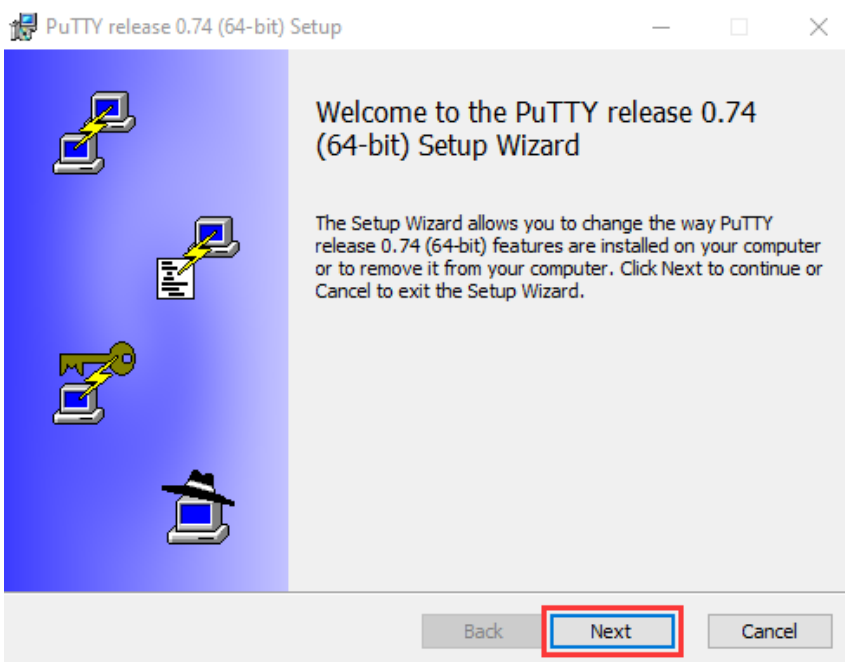
32-bit: [putty-0.74-installer.msi](#) (or by [FTP](#)) ([signature](#))

64-bit: [putty-64bit-0.74-installer.msi](#) (or by [FTP](#)) ([signature](#))

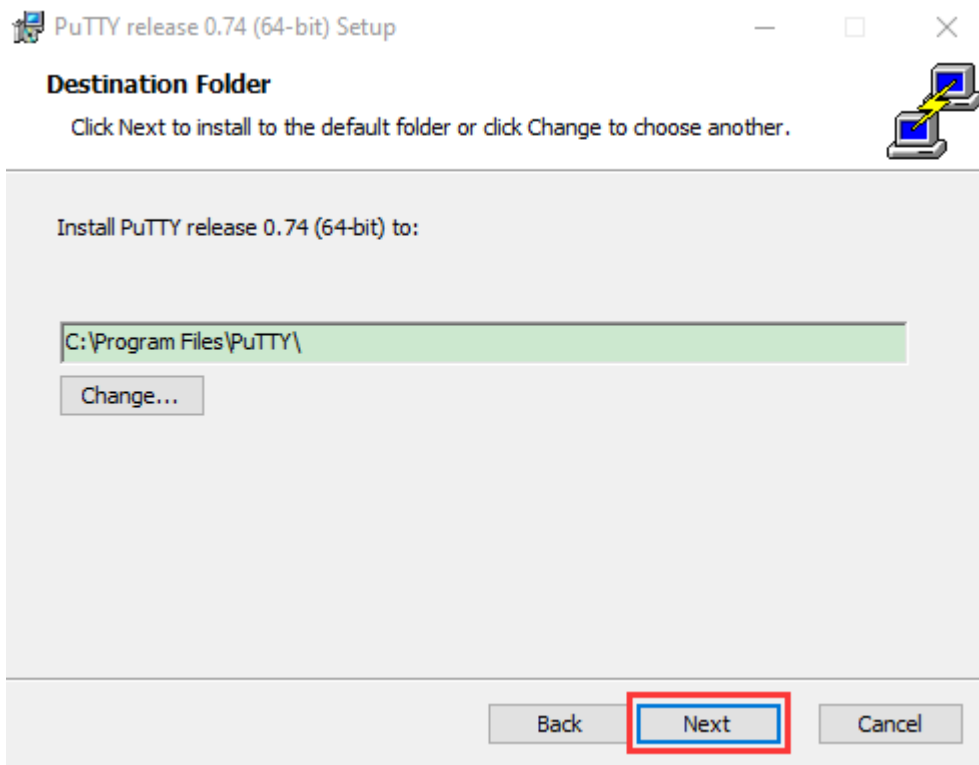
#### Unix source archive

.tar.gz: [putty-0.74.tar.gz](#) (or by [FTP](#)) ([signature](#))

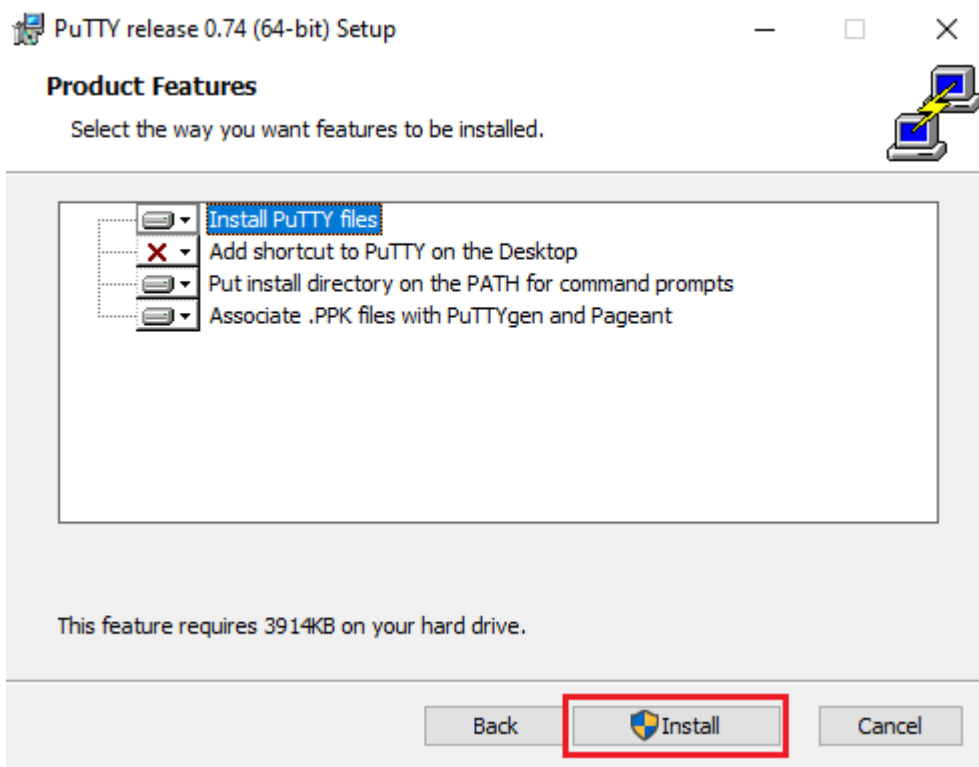
- a. After downloading the driver file  putty-64bit-0.74-installer, double-click it and tap "Next"



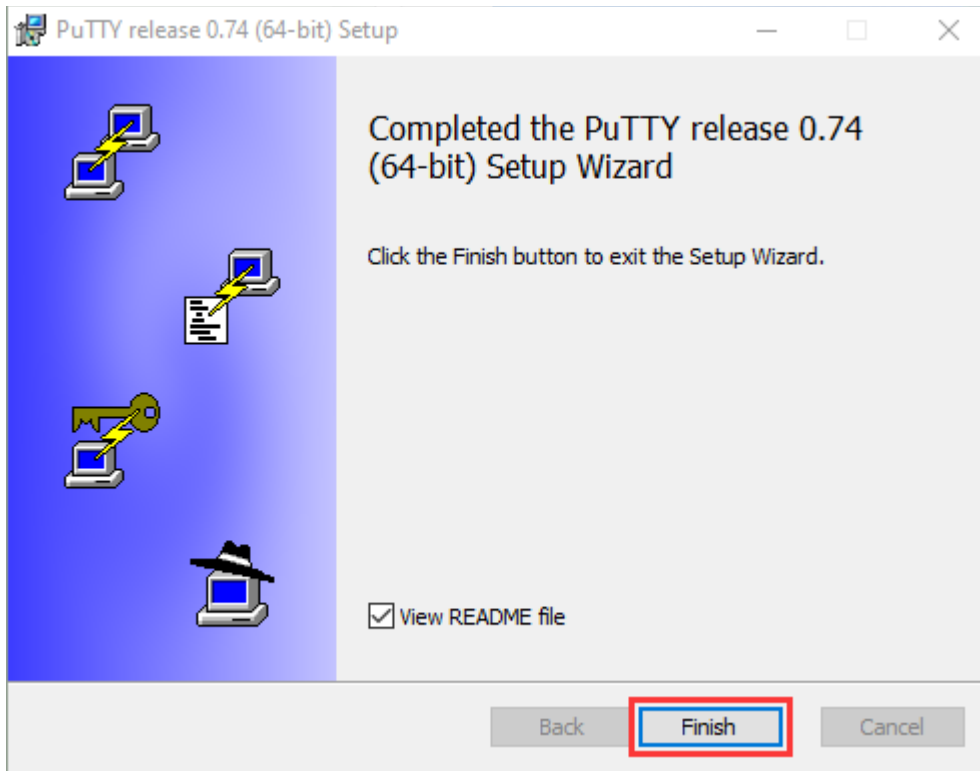
b. Click "Next"



c. Select "Install Putty files" and click "Install".





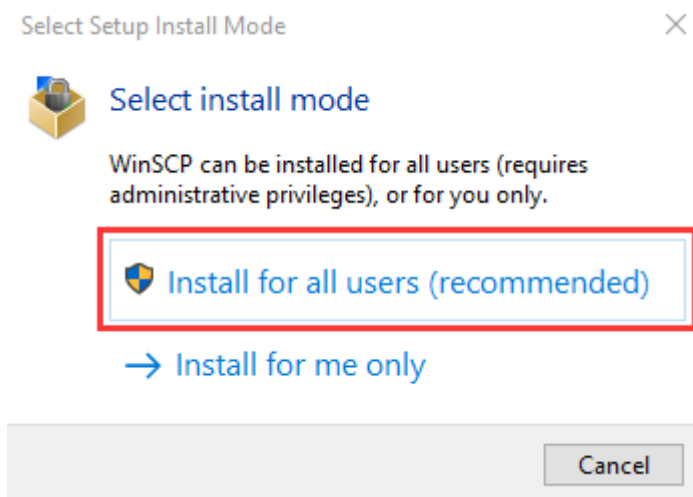
d. After a few seconds, click "Finish".



## (2) SSH Remote Login software -WinSCP

Download WinSCP : <https://winscp.net/eng/download.php>

- a. After downloading WinSCP, click  WinSCP-5.17.9-Setup.exe and  **Install for all users (recommended)** .



- b. Click "Accept" and follow instructions, as shown below

**License Agreement**

Please read the following important information before continuing.



Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

You can also review this license and further details online at:

<https://winscp.net/eng/docs/license>

- A. GNU General Public License
- B. License of WinSCP Icon Set
- C. Privacy Policy

A. GNU GENERAL PUBLIC LICENSE  
Version 3, 29 June 2007

Copyright (C) 2007 Free Software Foundation, Inc. <<https://www.fsf.org/>>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Help

Accept >

Cancel

**Setup Type**

What type of setup do you want?



Typical installation (recommended)

- installs to default destination
- installs all components
- enables most typical features

Custom installation

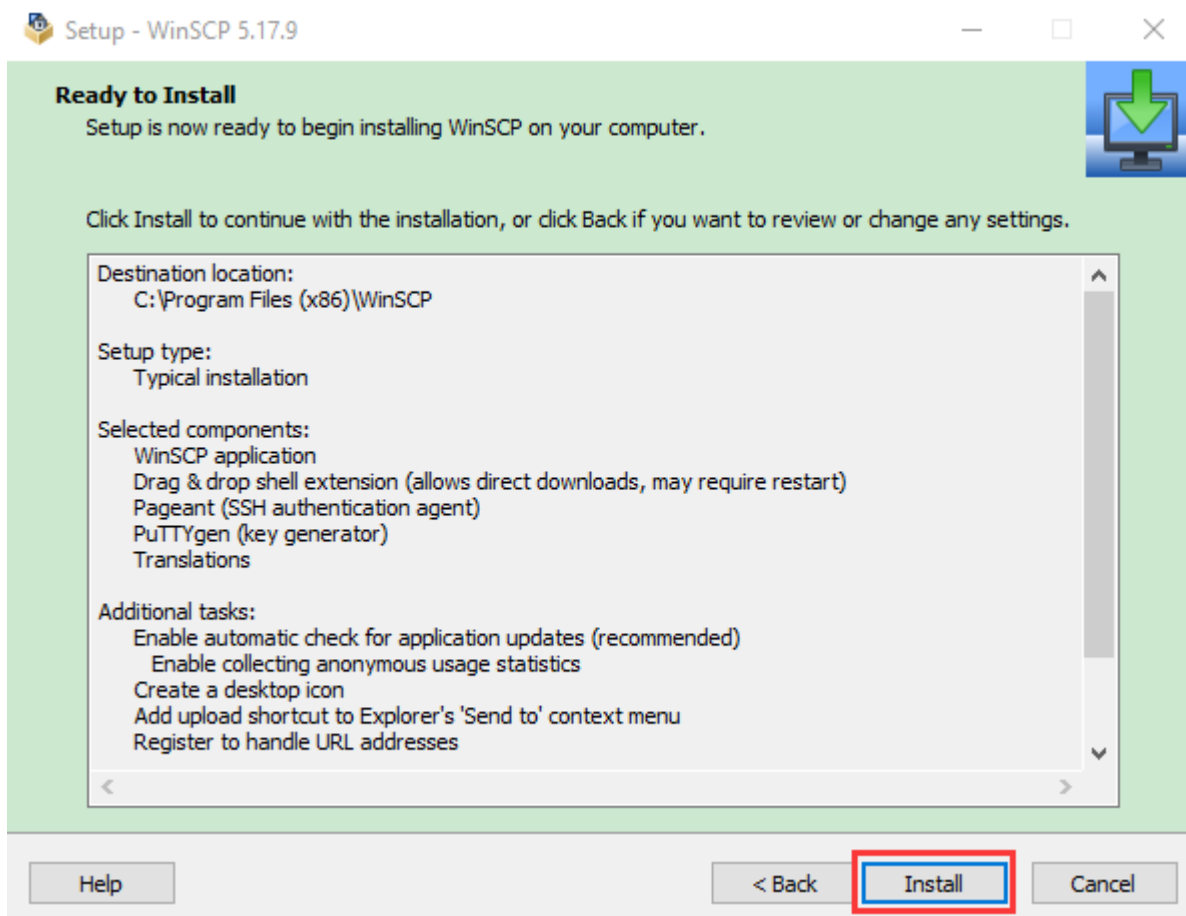
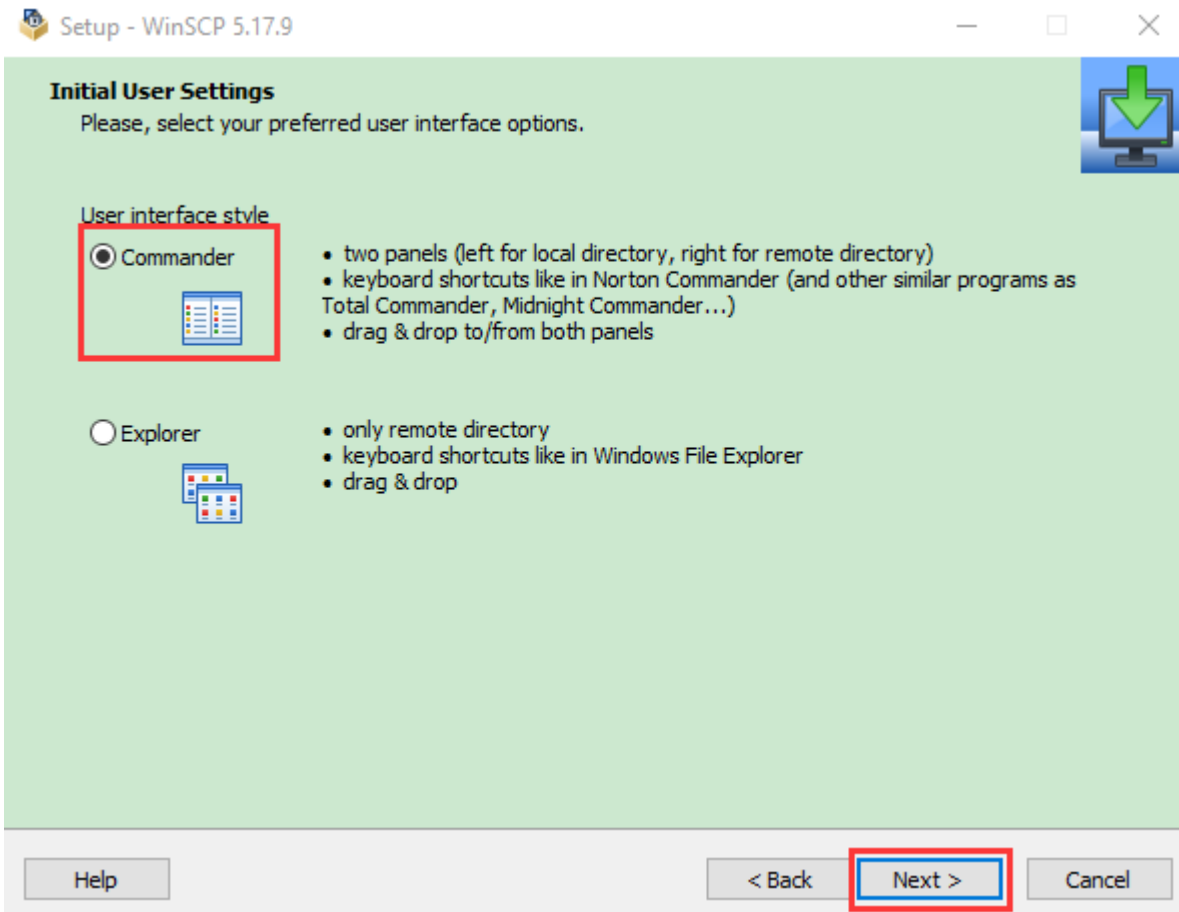
- allows full selection of destination, components and features

Help

< Back

Next >

Cancel



c. After a few seconds, the installation is completed and click "Finish";



### (3) SD Card Formatter

Format TFT card tool

Download SD Card Formatter :

[http://www.canadiancontent.net/tech/download/SD\\_Card\\_Formatter.html](http://www.canadiancontent.net/tech/download/SD_Card_Formatter.html)



## SD Card Formatter

Free Formatter Download

Software Downloads > Hardware Software > Hard Drive Software > Hard Drive Formatters >

**SD Card Formatter 5.0.1**

Update Submitted 12 May 2019

**Software Review:**

SD Card Formatter is a simple and basic formatted which is designed to be used with SD, SDHC and SDXC memory cards.

The application itself isn't too different from the format utility included with Windows and includes two modes: Quick format and Overwrite format. CHS format size adjustment is the only other option.

Once the appropriate card and volume label has been selected, the format can begin after hitting "Format".

Version 5.0.1 is a freeware program which does not have restrictions and it's free so it doesn't cost anything.

### Download File

Download SD Card Formatter

6 MB - Filesize

#### Details

Publisher:	Tuxera
License:	Freeware
OS/Platform:	Windows 7, Windows 8 (64-bit, 32-bit) / Vista / XP
Filesize:	6 MB
Filename:	SDCardFormatterv5_WinEN.z...
Cost (Full Version):	Free
Rating:	3 out of 5 based on 1 rating.
Notes	▶ This file download is licensed as freeware for Windows 7, Windows 8 (64-bit, 32-bit) / Vista / XP.
TrustRank	Based on many factors, we give this program a Trust rating of 5 / 10.

SD Card Formatter screenshot

[Register Account](#)

Software Downloads > Hardware Software > Hard Drive Software > Hard Drive Formatters > SD Card Formatter > Download SD Card Formatter

### Download **SD Card Formatter 5.0.1** (x64 & x32) Free



**Have you tried the SD Card Formatter before? If yes, please consider recommending it by clicking the Facebook "Recommend" button!**

Download SD Card Formatter 5.0.1 from Hosted by Sdcard.org

**SD Card Formatter has been tested for viruses and malware**

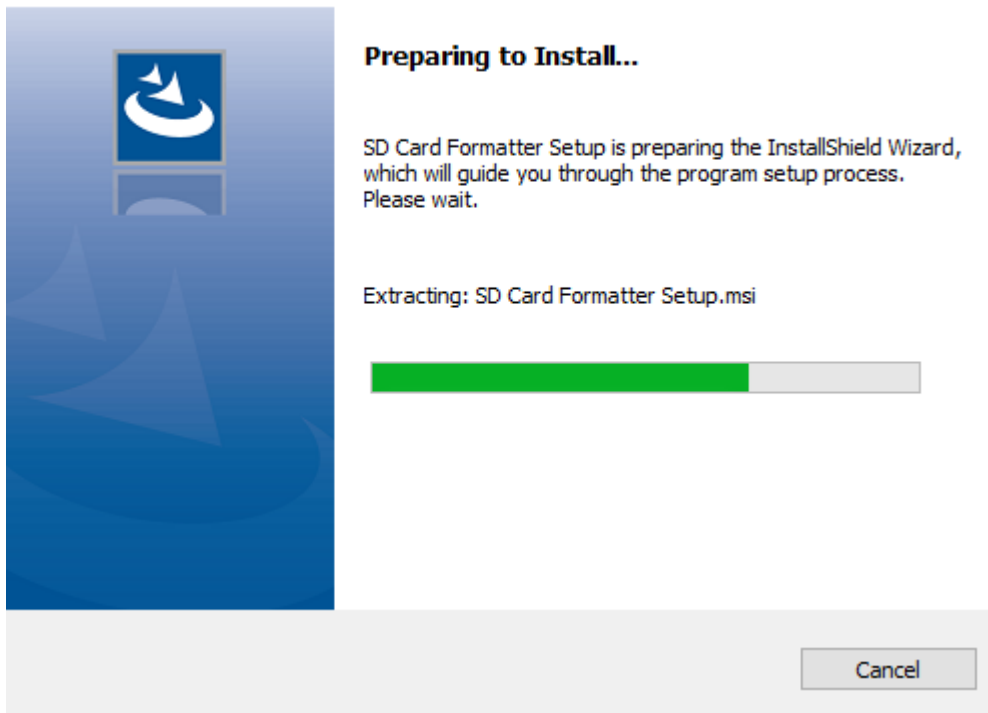
This download is 100% clean of viruses. It was tested with 24 different antivirus and anti-malware programs and was clean **100%** of the time. View the full SD Card Formatter homepage for virus test results.

The file that was tested: SDCardFormatterv5\_WinEN.zip.

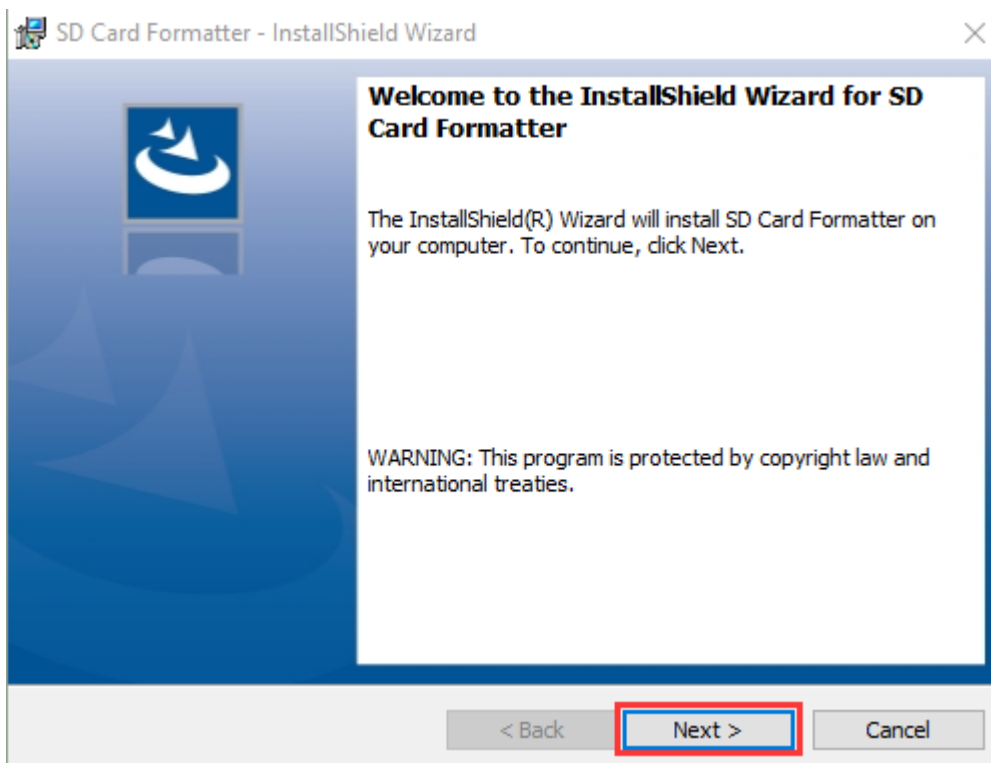
Tip: If you're experiencing trouble downloading this file, please disable any download managers to SD Card Formatter you may be using.

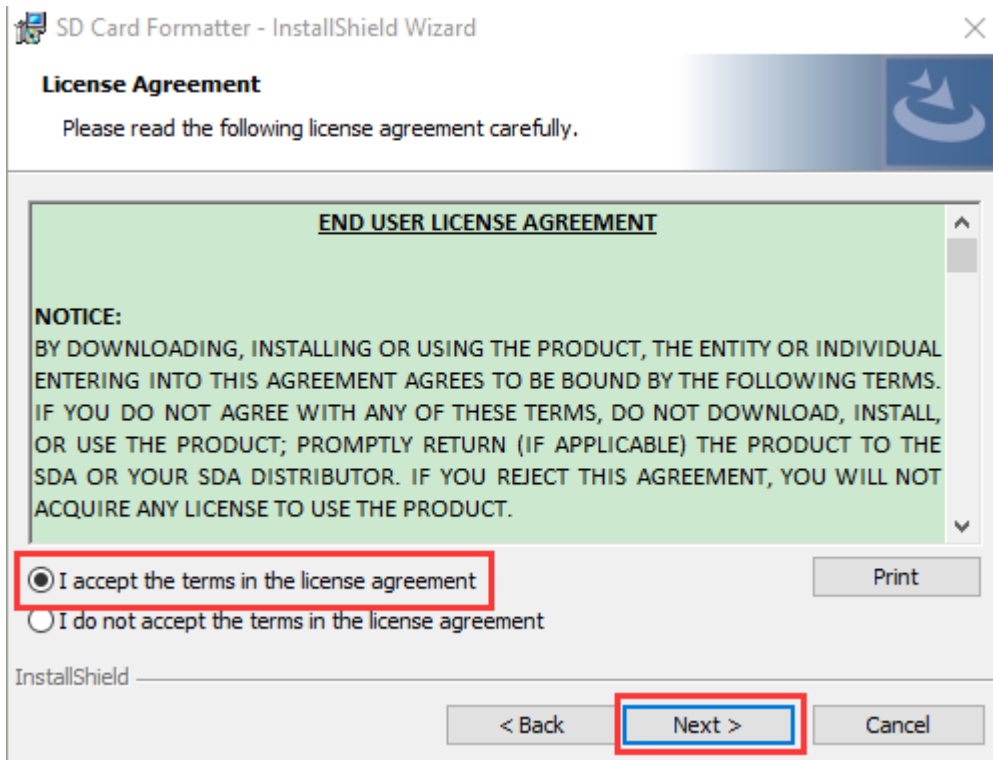
If you're receiving a 404 File Not Found error, this means the publisher has taken the file offline and has not updated their links with us for SD Card Formatter. Please do drop us a note in the event of a missing file.

- a. Unzip the SDCardFormatterv5\_WinEN package, double-click **SD Card Formatter 5.0.1 Setup.exe** to run it.

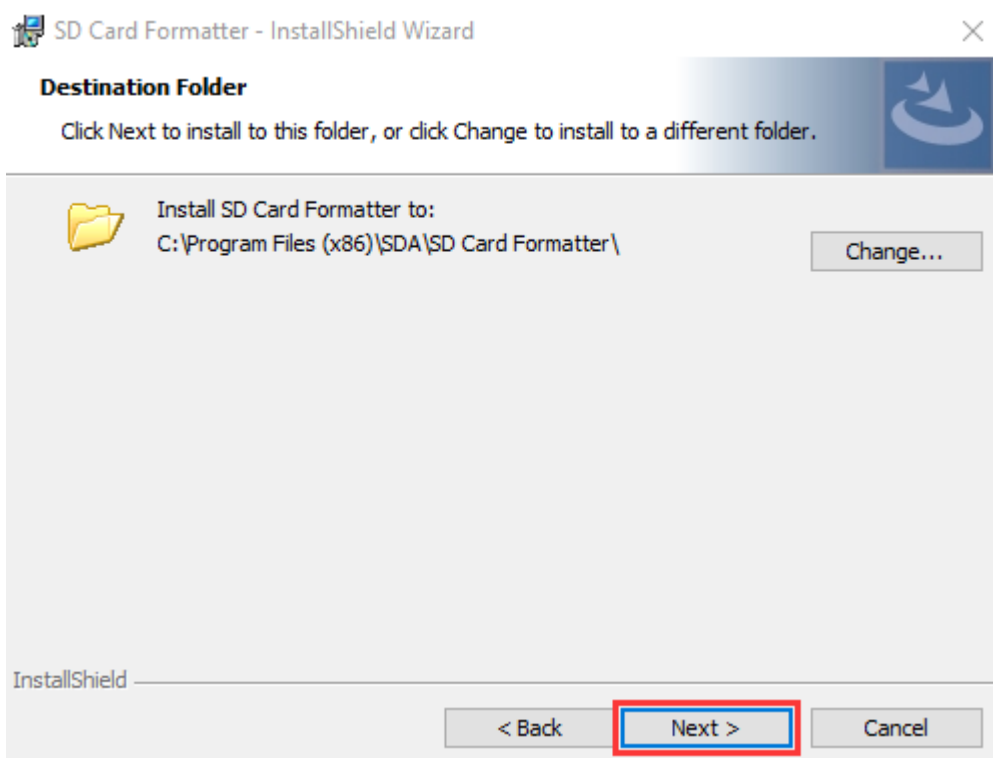


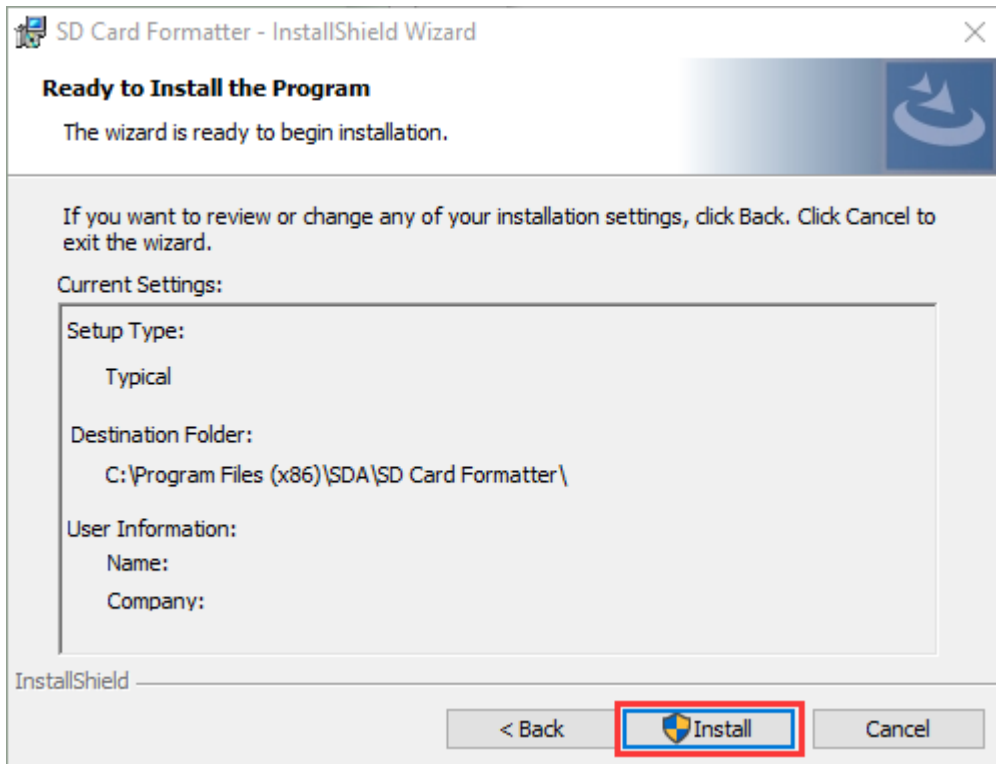
b. Click "Next" and choose  I accept the terms in the license agreement , then tap "Next"



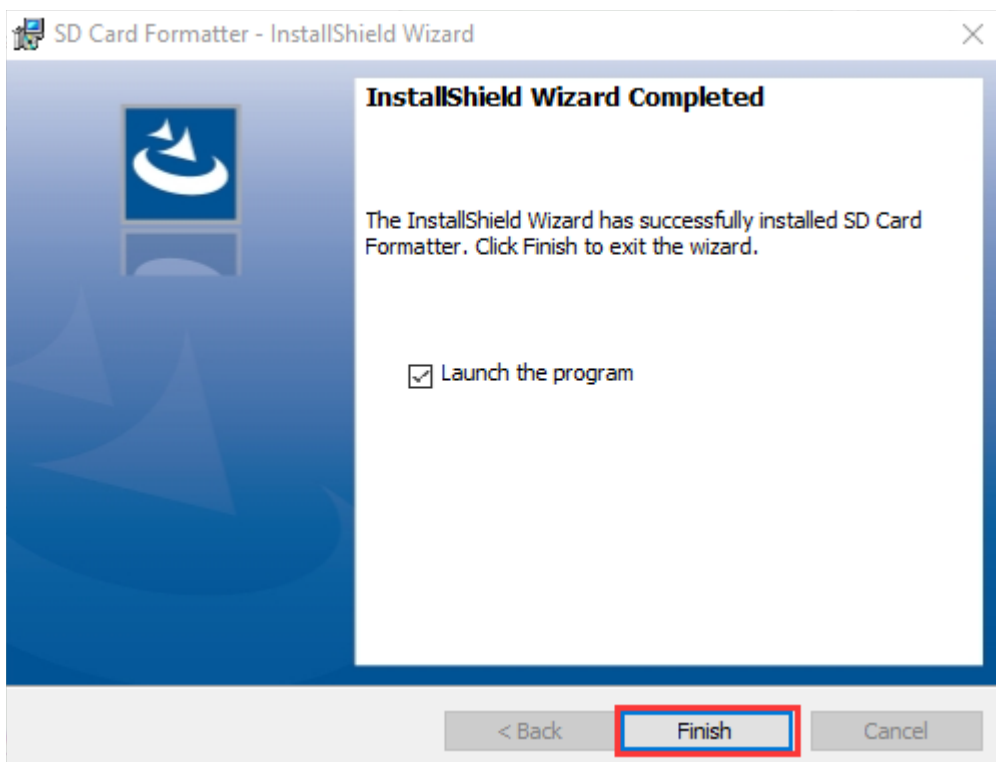


c. Click "Next" and "Install".





d. After a few seconds, click“Finish”



#### (4) Burn Win32DiskImager

Download Link: <https://sourceforge.net/projects/win32diskimager/>



# Win32 Disk Imager

A Windows tool for writing images to USB sticks or SD/CF cards

Brought to you by: [gruemaster](#), [tuxinator2009](#)

★★★★☆ 112 Reviews

Downloads: 42,251 This Week

Last Update: 2018-06-07

**Download**

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Summary

Files

Reviews

Support

Wiki

Feature Requests

Bugs

Code

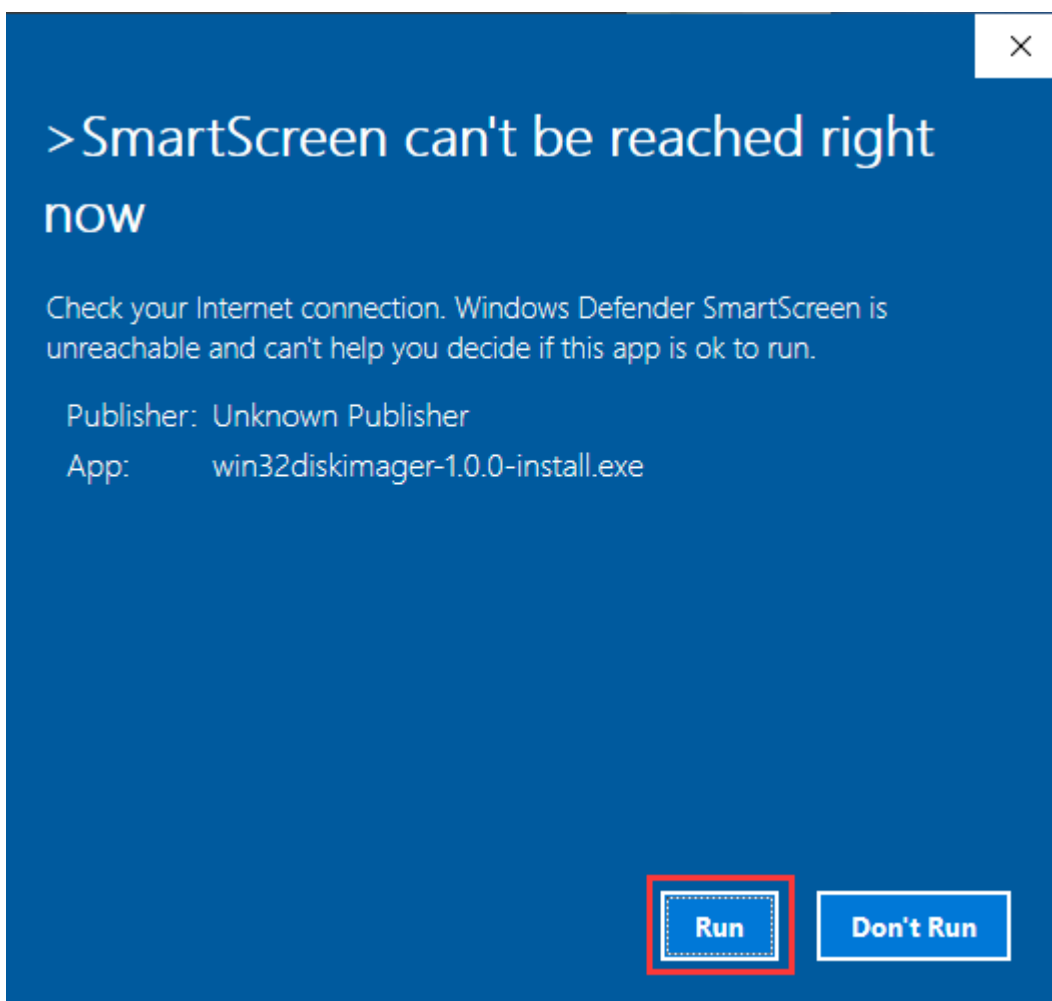
Mailing Lists

Blog

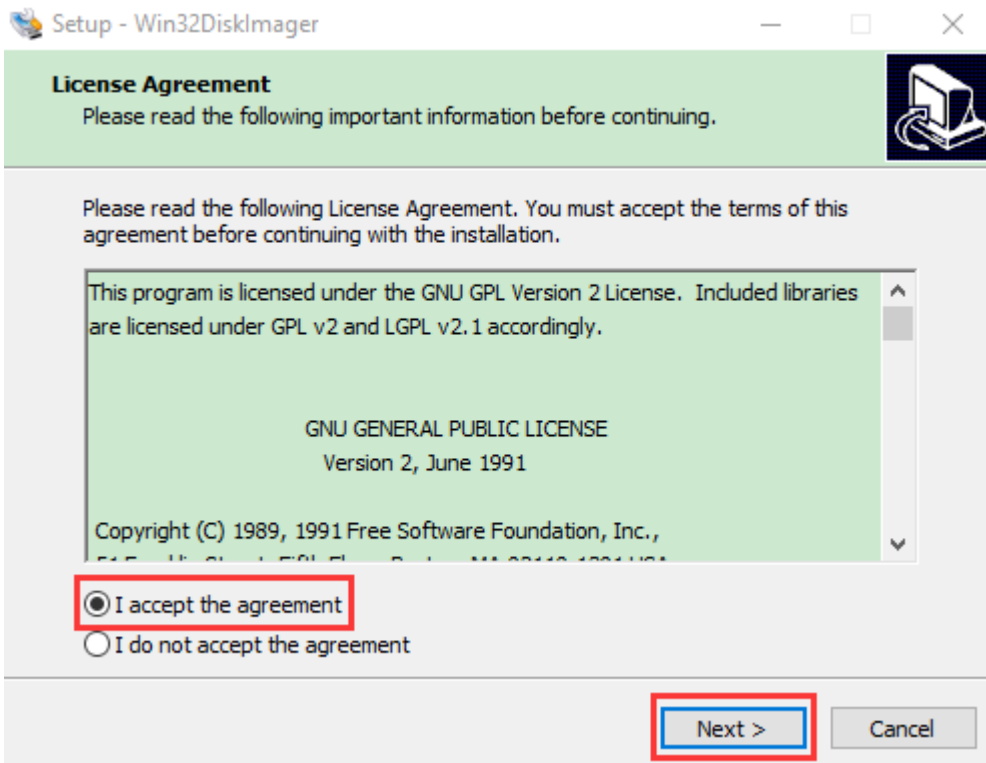
This program is designed to write a raw disk image to a removable device or backup a removable device to a raw image file. It is very useful for embedded development, namely Arm development projects (Android, Ubuntu on Arm, etc). Anyone is free to branch and modify this program. Patches are always welcome.

This release is for Windows 7/8.1/10. It will should also work on Windows Server 2008/2012/2016 (although not tested by the developers). For Windows XP/Vista, please use v0.9 (in the files archive).

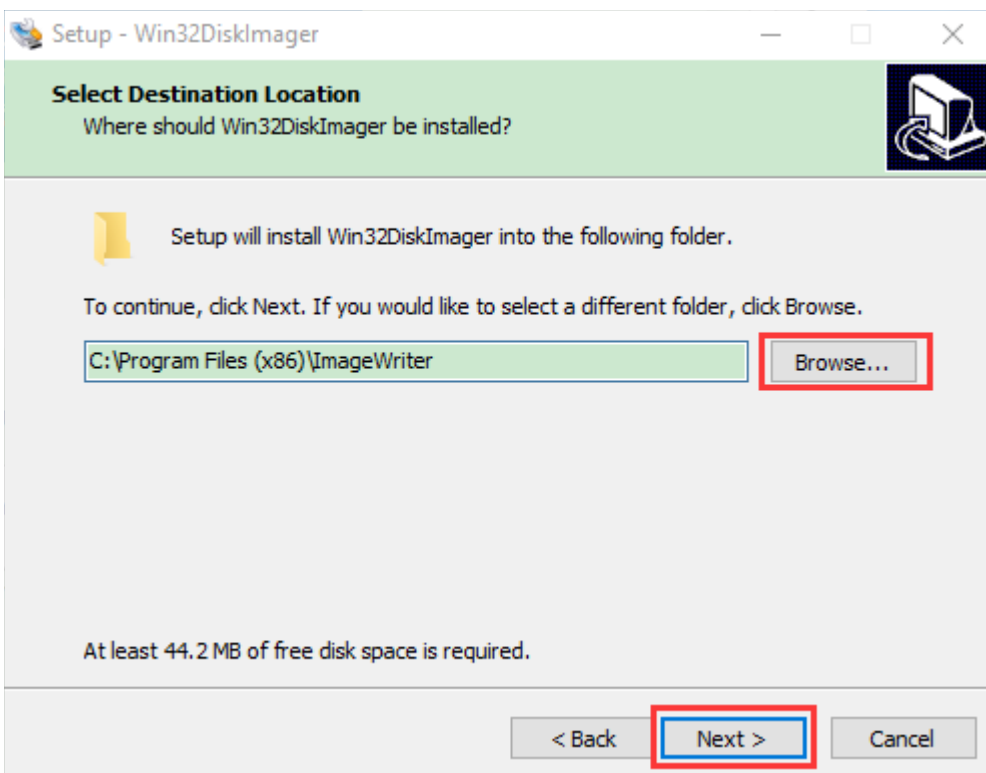
a. After the download, double-click `win32diskimager-1.0.0-install.exe` and tap "Run"

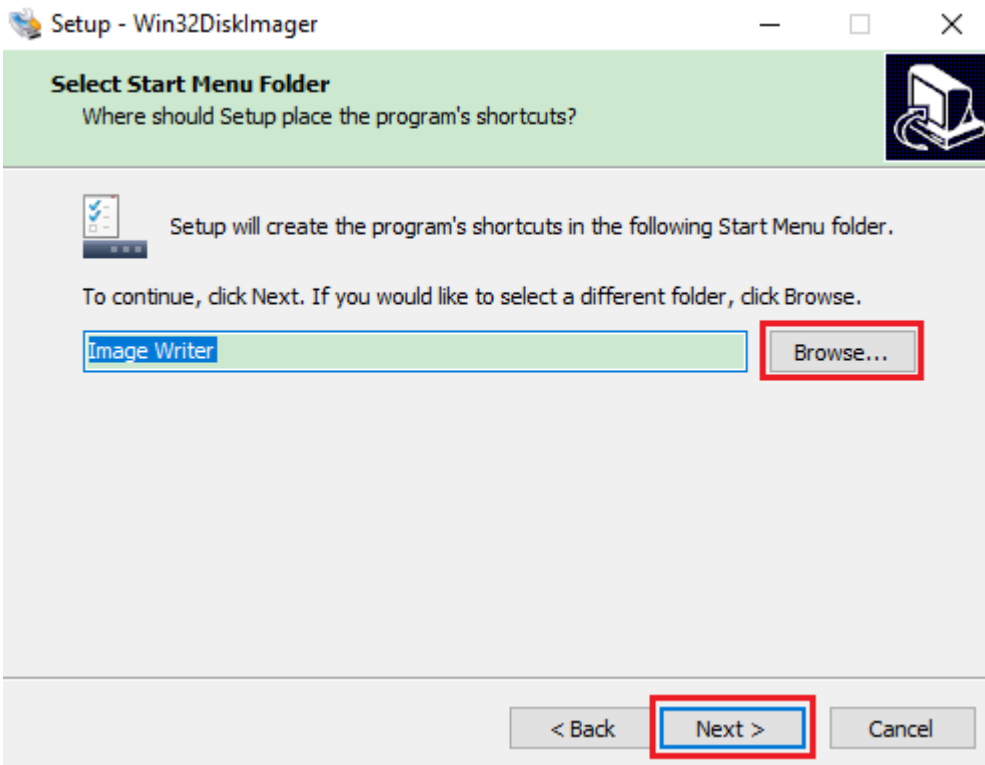


b. Select `I accept the agreement` and tap "Next".

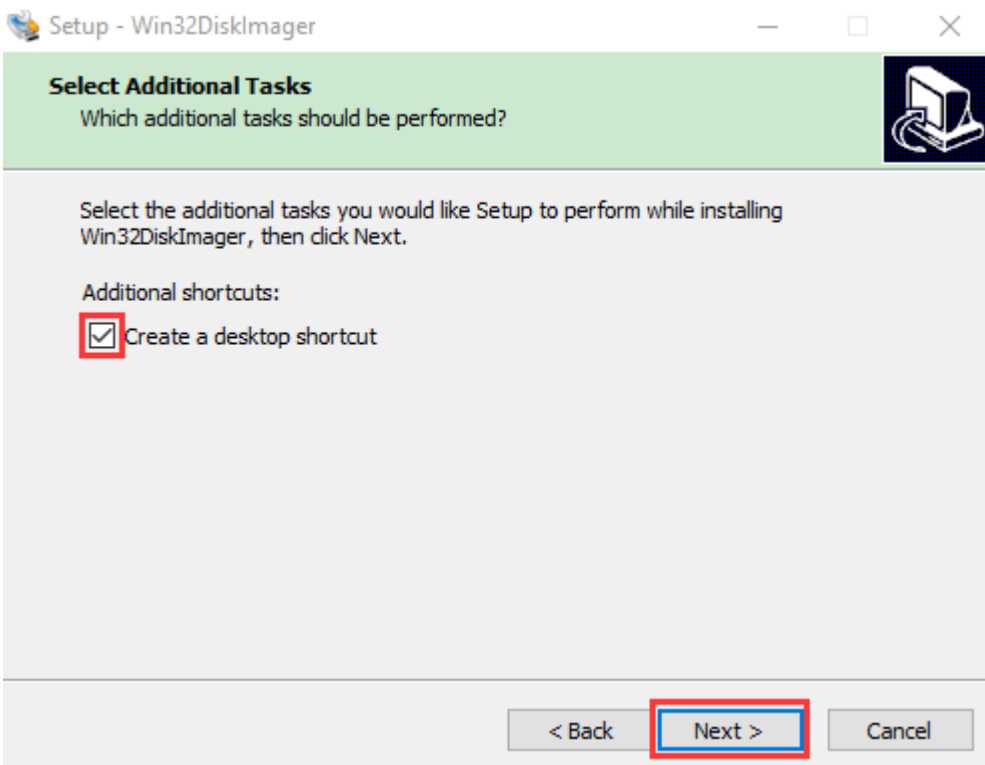


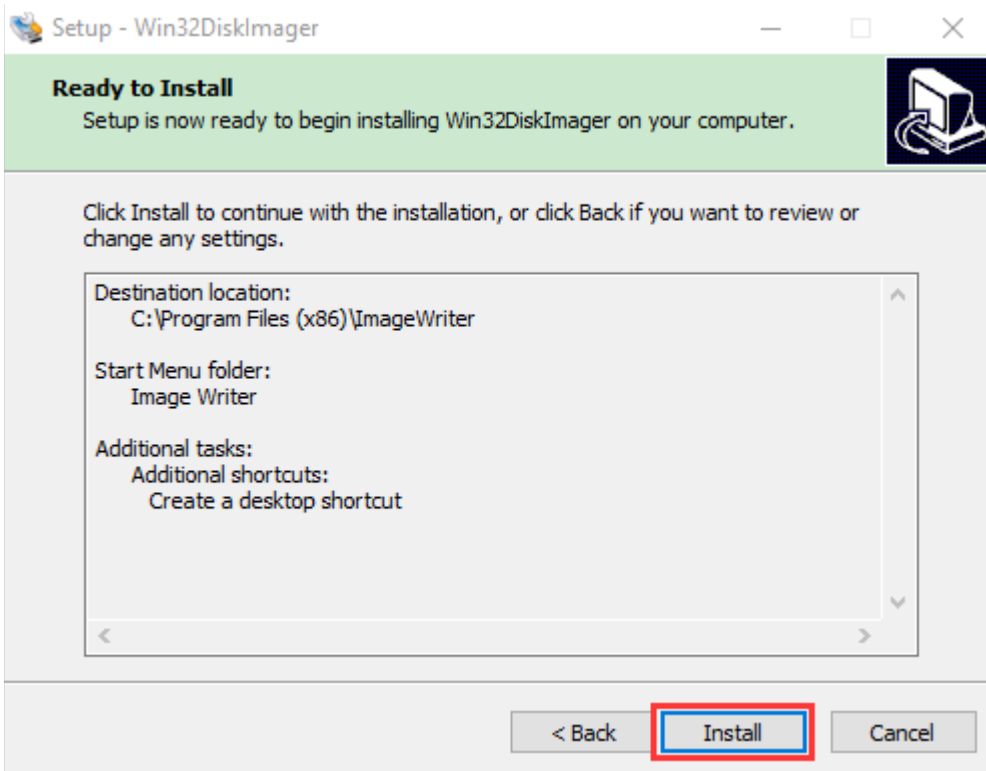
c. Click "Browse..." and find out the folder where the Win32DiskImager is located, and tap "Next".



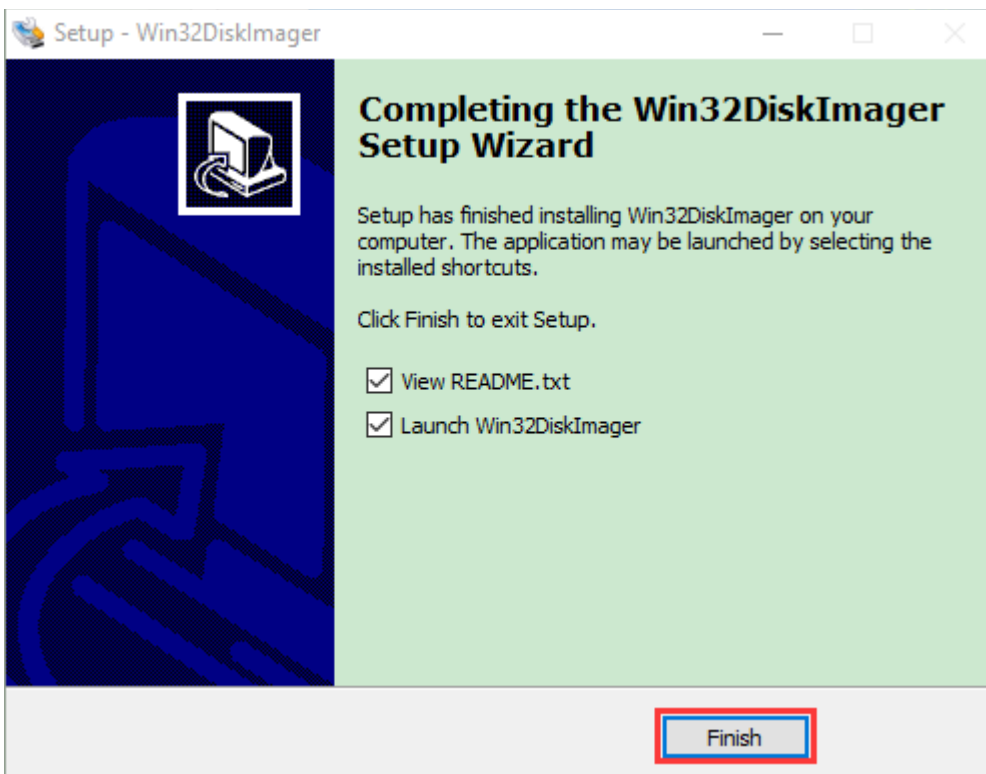


d. Tick **Create a desktop shortcut** , click “Next” and “Install”





e. After a few seconds, click“Finish”.



Scan to search ip address software tool---WNetWatcher

Download Link : <http://www.nirsoft.net/utis/wnetwatcher.zip>

## (5) Raspberry Pi Imager

<https://www.raspberrypi.org/downloads/raspberry-pi-os/>

(recommend downloading the version with desktop and commonly used software)



# Operating system images

Many operating systems are available for Raspberry Pi, including Raspberry Pi OS, our official supported operating system, and operating systems from other organisations.

[Raspberry Pi Imager](#) is the quick and easy way to install an operating system to a microSD card ready to use with your Raspberry Pi. Alternatively, choose from the operating systems below, available to download and install manually.

Download:  
[Raspberry Pi OS \(32-bit\)](#)  
[Raspberry Pi Desktop](#)  
[Third-Party operating systems](#)

## Raspberry Pi OS

Compatible with:  
[All Raspberry Pi models](#)



### Raspberry Pi OS with desktop and recommended software

Release date: December 2nd 2020  
Kernel version: 5.4  
Size: [2,949MB](#)  
[Show SHA256 file integrity hash:](#)  
[Release notes](#)

Download

[Download torrent](#)

### Raspberry Pi OS with desktop

Release date: December 2nd 2020  
Kernel version: 5.4  
Size: [1,177MB](#)  
[Show SHA256 file integrity hash:](#)  
[Release notes](#)

Download

[Download torrent](#)

### Raspberry Pi OS Lite

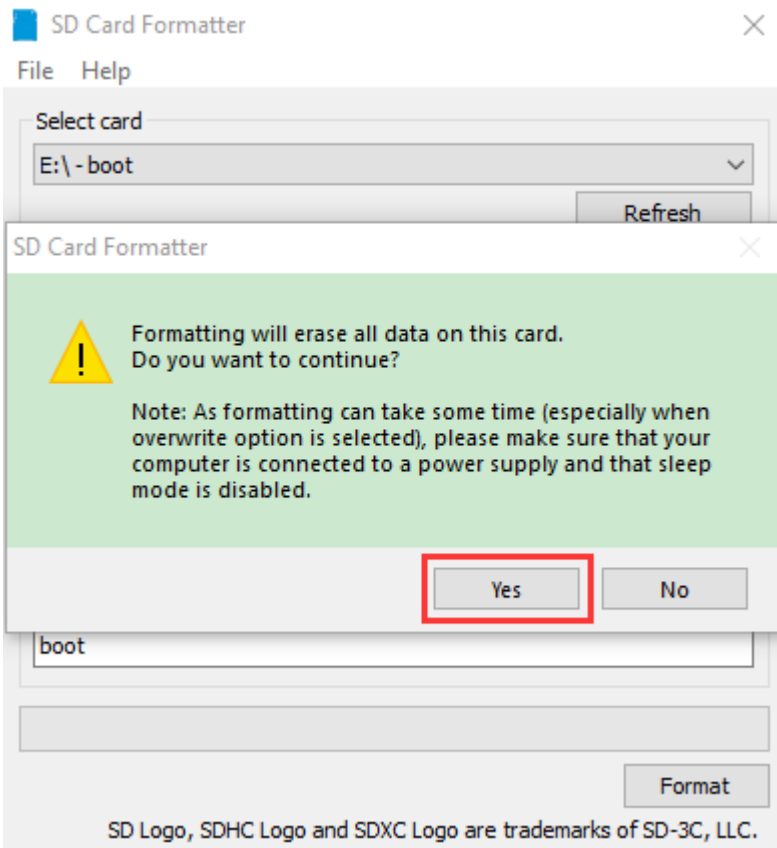
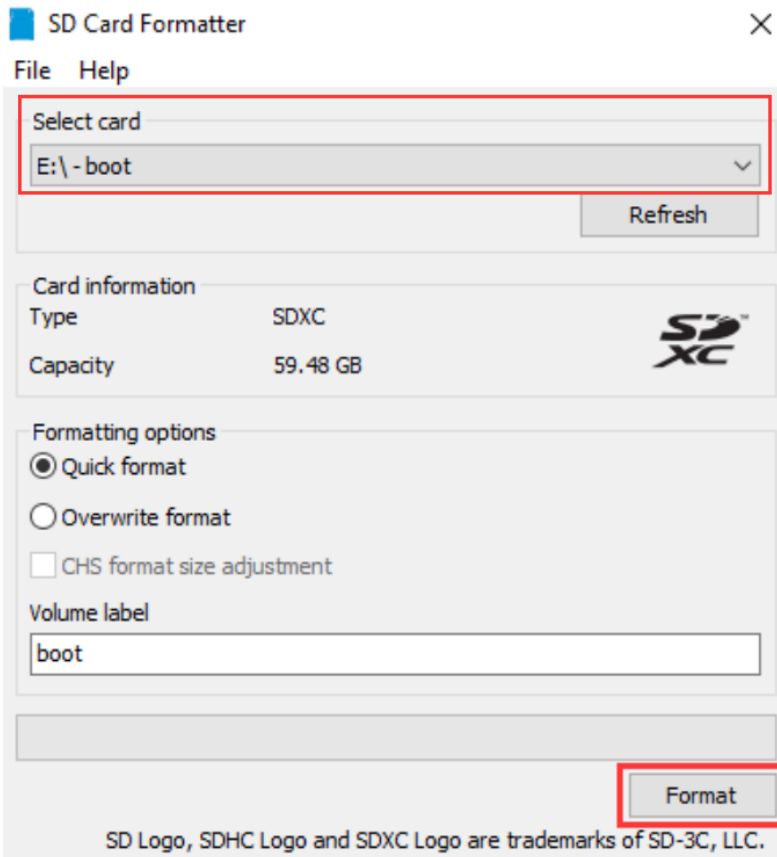
Release date: December 2nd 2020  
Kernel version: 5.4  
Size: [438MB](#)  
[Show SHA256 file integrity hash:](#)  
[Release notes](#)

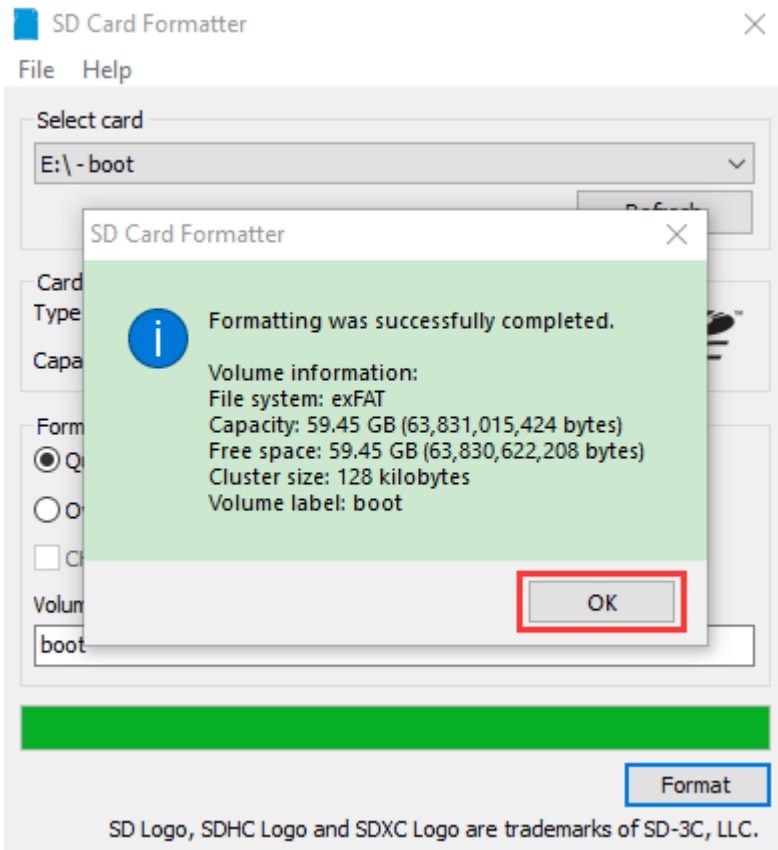
Download

[Download torrent](#)

## 1. Install Raspberry Pi OS on Raspberry Pi 4B

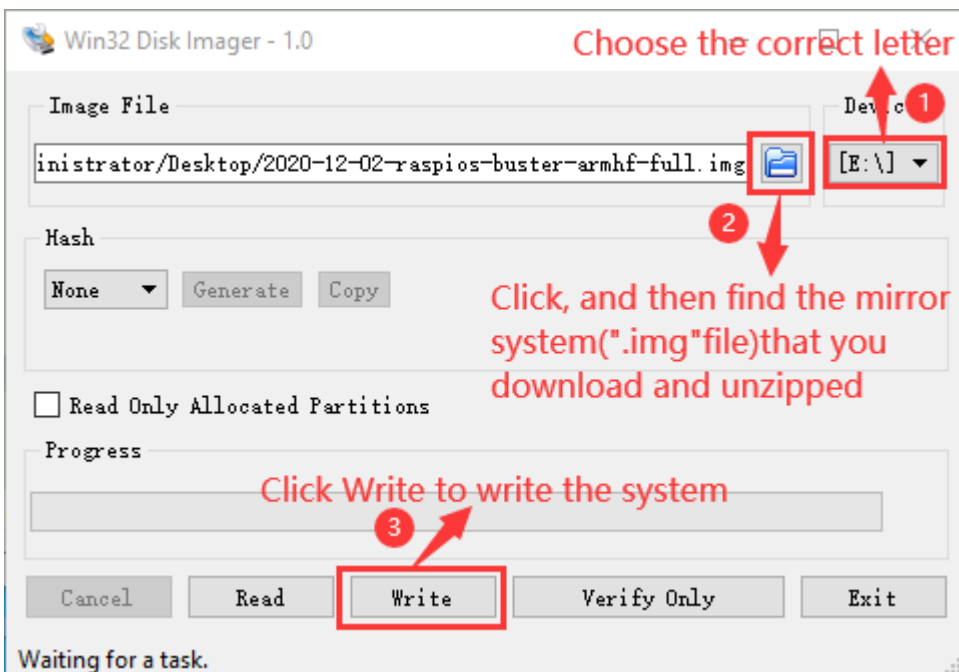
1. Insert the TFT RAM card to the card reader, then interface the card reader with the USB port of computer.
2. Format the TFT RAM card with SD Card Formatter software, as shown below:

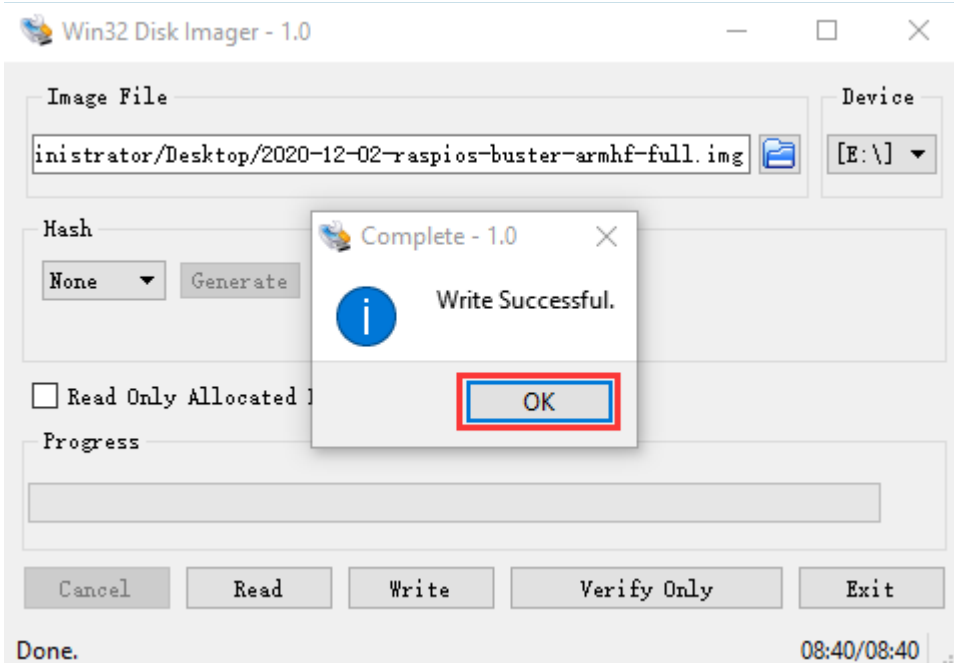
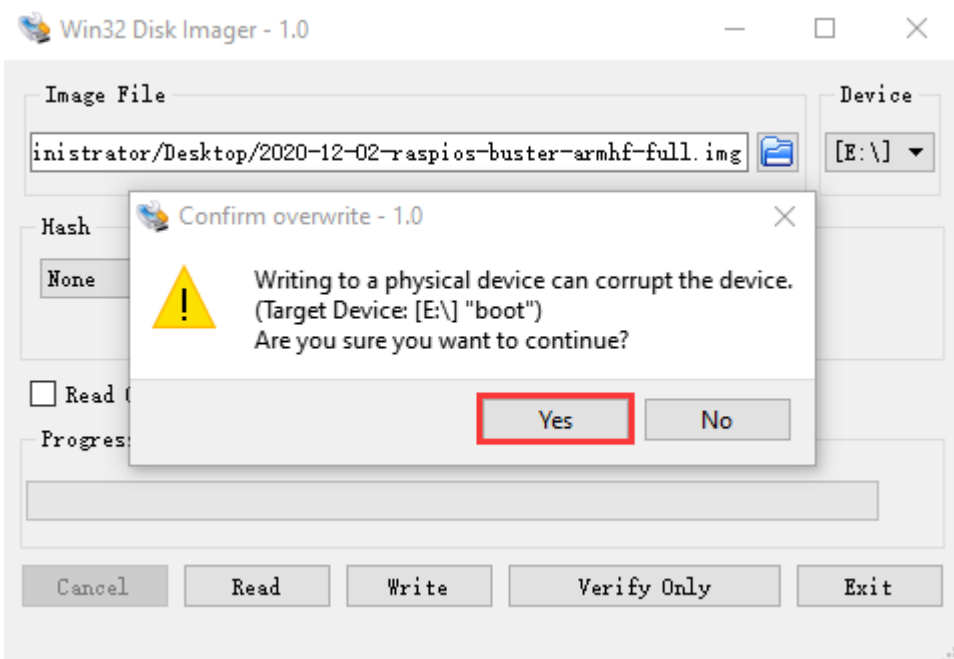




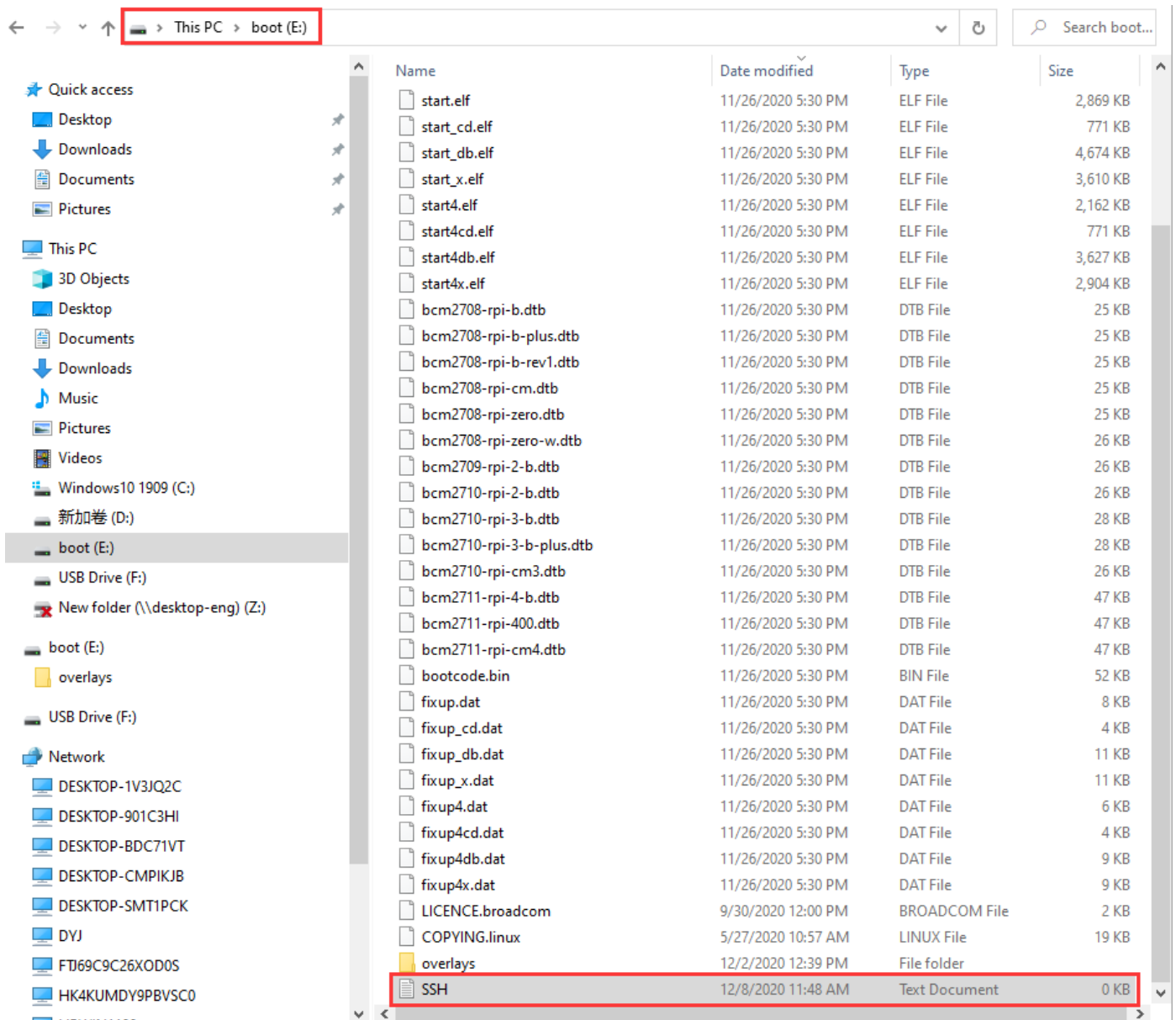
### (1) Burn System

Burn the Raspberry Pi OS system to the TFT card using Win32DiskImager software.





Don't eject the card reader after burning mirror system. Build a file named SSH, then delete .txt. The SSH login function can be activated by copying the SSH file to boot category, as shown below.



## (2) Eject Card Reader

Log in system (Raspberry Pi and PC should be in the same local area network)

Insert the TFT card into Raspberry Pi, connect an internet cable and power it up.

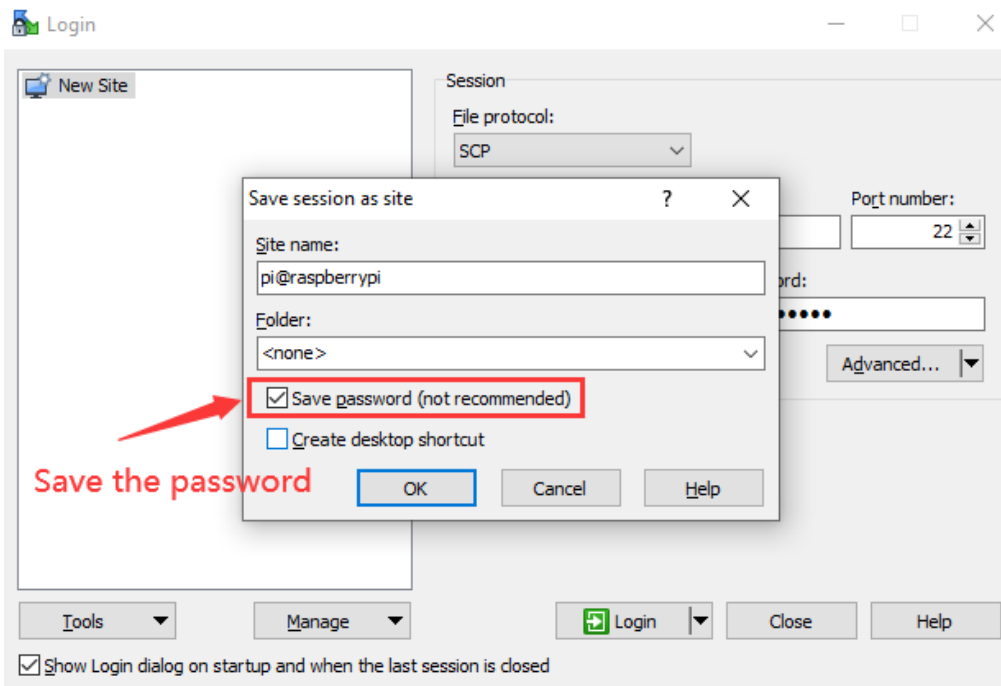
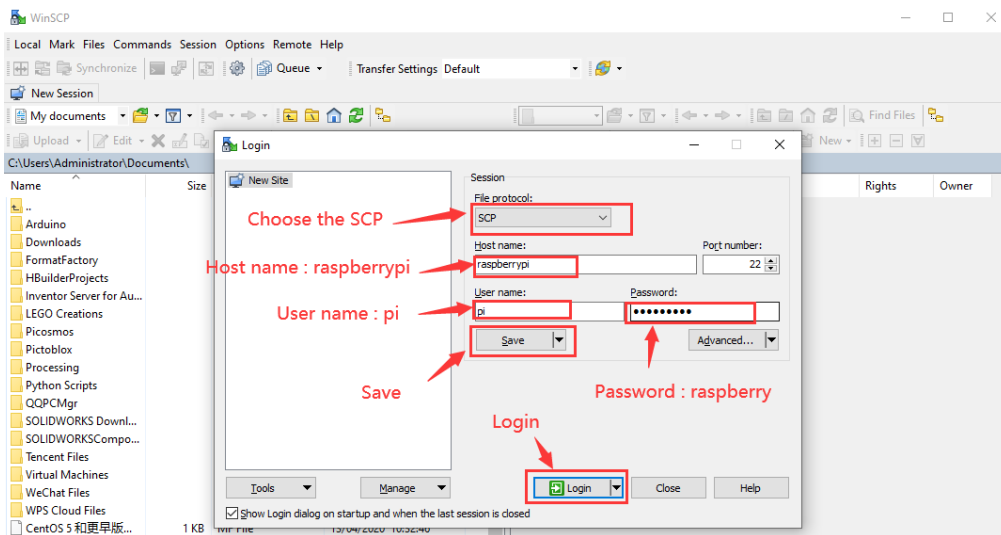
If you have a screen and the HDMI cable of Raspberry Pi, you can view Raspberry Pi OS system activating.

If without the HDMI cable, you can enter the desktop of Raspberry Pi via xrdp or achieve SSH remote login by WinSCP.

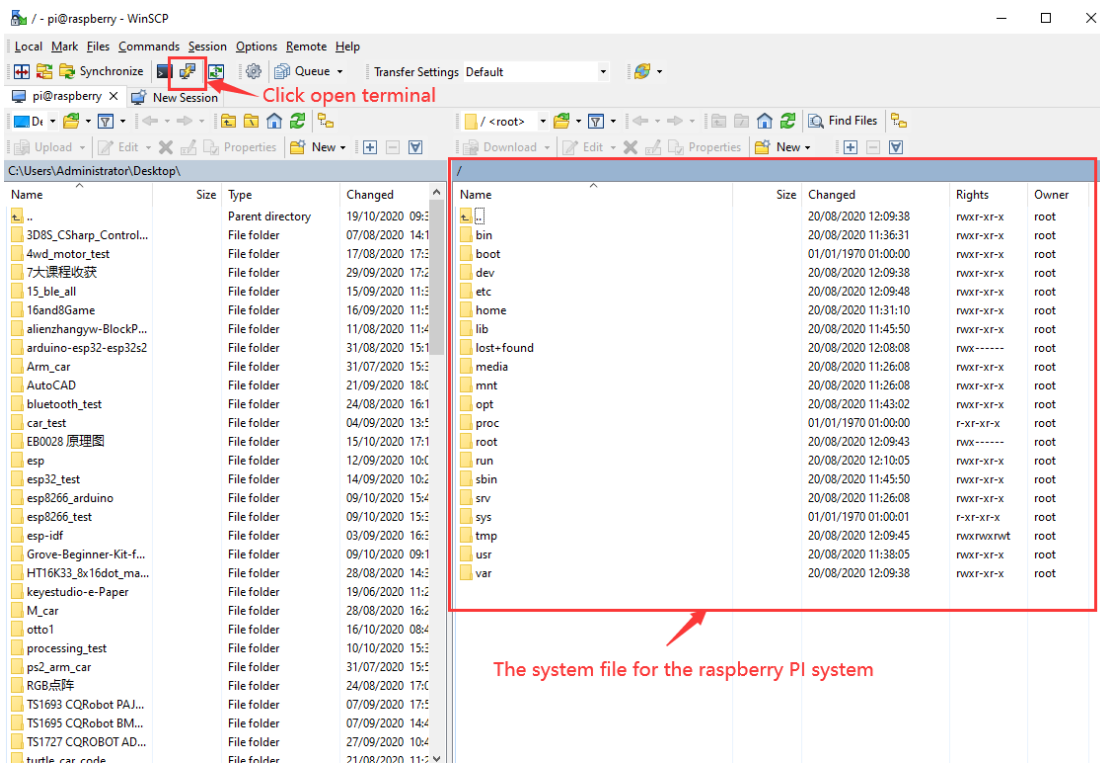
## (3) Remote Login

Use WinSCP to log in with the default name, default user name, and default password of the Raspberry Pi system.

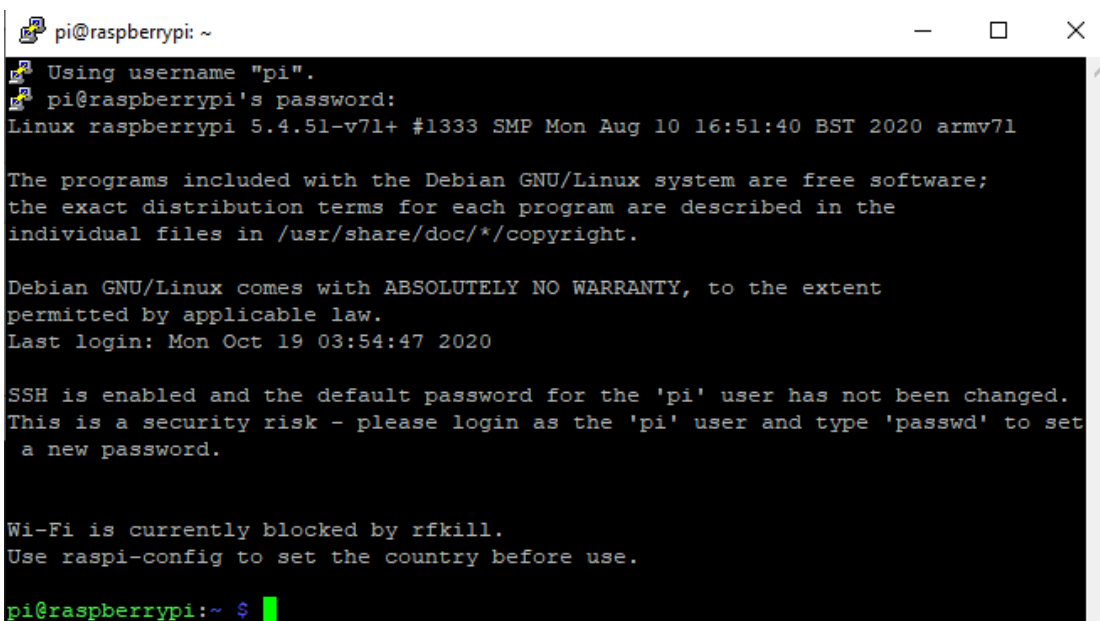
Only a Raspberry Pi is connected in same network.



#### (4) Check ip and mac address



Click to open terminal and input the password **raspberrypi**, and press“Enter”on keyboard.



Logging in successfully, open the terminal, input **ip a** and tap“Enter”to check ip and Mac address.

```
pi@raspberrypi: ~
Wi-Fi is currently blocked by rfkill.
Use raspi-config to set the country before use.

pi@raspberrypi:~ $ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether dc:a6:32:17:61:9c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.128/24 brd 192.168.1.255 scope global dynamic noprefixroute eth0
        valid_lft 1357sec preferred_lft 1132sec
    inet6 fe80::1e7d:5653:59e9:3262/64 scope link
        valid_lft forever preferred_lft forever
3: wlan0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether dc:a6:32:17:61:9d brd ff:ff:ff:ff:ff:ff
pi@raspberrypi:~ $
```

From the above figure, mac address of this Raspberry Pi is [a6:32:17:61:9c](#), and ip address is [192.168.1.128](#)(use ip address to finish xrdp login)

Since the mac address never changes, you can confirm ip via it.

### (5) Fix the ip address of Raspberry Pi

Ip address is changeable; therefore, we need to make ip address fixed for convenient use.

Switch to root user

If without root user's password

①Set root password

Input `sudo passwd root` in the terminal and set password

②Switch to root user

`su root`

③Fix the configuration file of ip address

Firstly change the ip address of the following configuration file

(#New ip address: address [192.168.1.99](#))

Copy the above new address to terminal and press“Enter”

Configuration File:

`echo -e '`

`auto eth0`

`iface eth0 inet static`

`#Change IP address`

`address 192.168.1.99`

`netmask 255.255.255.0`

`gateway 192.168.1.1`

`network 192.168.1.0`

`broadcast 192.168.1.255`

`dns-domain 119.29.29.29`



```
dns-nameservers 119.29.29.29
metric 0
mtu 1492
'>/etc/network/interfaces.d/eth0
```

As shown below:

```
pi@raspberrypi:~ $ su root
Password:
root@raspberrypi:/home/pi# echo -e '
> auto eth0
> iface eth0 inet static
>     #Change IP address
>     address 192.168.1.99
>     netmask 255.255.255.0
>     gateway 192.168.1.1
>     network 192.168.1.0
>     broadcast 192.168.1.255
>     dns-domain 119.29.29.29
>     dns-nameservers 119.29.29.29
>     metric 0
> mtu 1492
> '>/etc/network/interfaces.d/eth0
root@raspberrypi:/home/pi#
```

④ Reboot the system and activate the configuration file  
Input the restart command in the terminal: `sudo reboot`  
You can log in via fixed ip afterwards.

⑤ Check IP and insure ip address fixed well

```
pi@raspberrypi:~ $ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1492 qdisc mq state UP group default qlen 1000
    link/ether dc:a6:32:17:61:9c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.99/24 brd 192.168.1.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 192.168.1.128/24 brd 192.168.1.255 scope global secondary dynamic nopredictor fixroute eth0
        valid_lft 1730sec preferred_lft 1505sec
    inet6 fe80::1e7d:5653:59e9:3262/64 scope link
        valid_lft forever preferred_lft forever
3: wlan0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether dc:a6:32:17:61:9d brd ff:ff:ff:ff:ff:ff
pi@raspberrypi:~ $
```

## (6) Log in Desktop on Raspberry Pi Wirelessly

In fact, we can log in desktop on Raspberry Pi wirelessly even without a screen and a HDMI cable. VNC and Xrdp are commonly used to log in desktop of Raspberry Pi wirelessly. Let's take an example of Xrdp.

### Install Xrdp Service in the terminal

Install Command:

Switch to Root User: `su root`

Install `apt-get install xrdp`

Enter y and press "Enter"

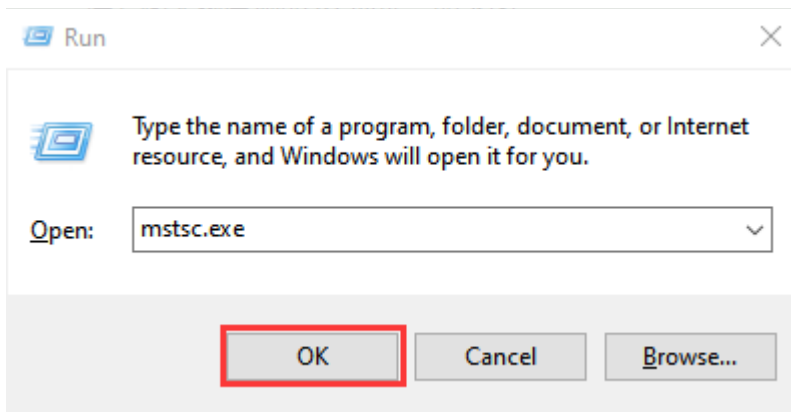
As shown below:

```
pi@raspberrypi: ~  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
  
SSH is enabled and the default password for the 'pi' user has not been changed.  
This is a security risk - please login as the 'pi' user and type 'passwd' to set  
a new password.  
  
pi@raspberrypi:~$ sudo apt-get install xrdp  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  ssl-cert  
Suggested packages:  
  openssl-blacklist guacamole xrdp-pulseaudio-installer  
The following NEW packages will be installed:  
  ssl-cert xrdp  
0 upgraded, 2 newly installed, 0 to remove and 373 not upgraded.  
Need to get 415 kB of archives.  
After this operation, 2,722 kB of additional disk space will be used.  
Do you want to continue? [Y/n] y
```

### Open the remote desktop connection on Windows

Press WIN+R on keyboard and enter [mstsc.exe](#)

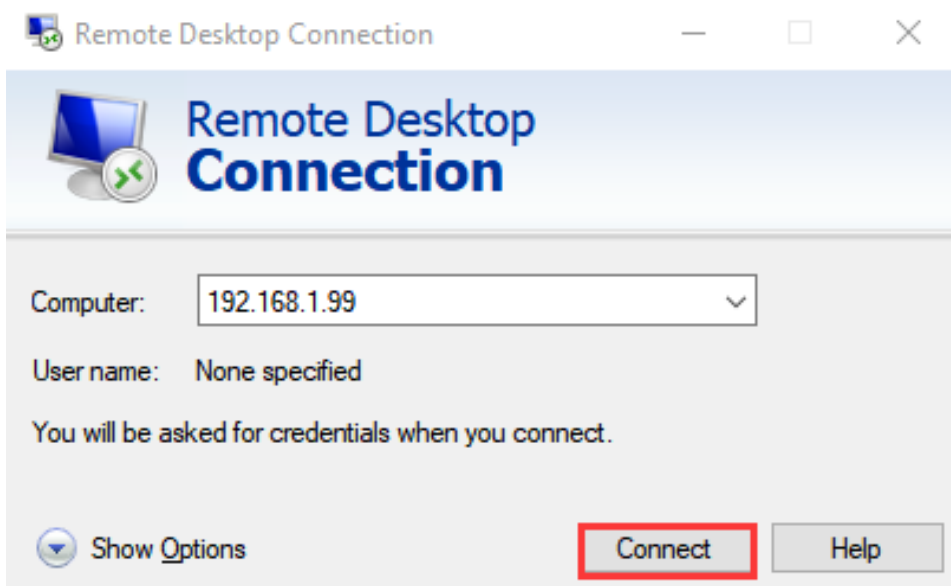
As shown below :

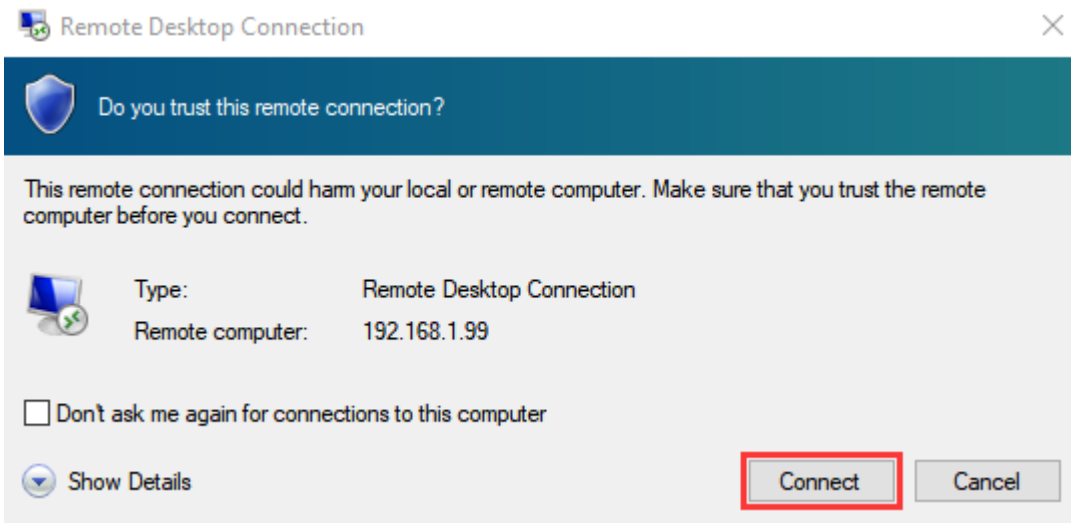


Input the ip address of Raspberry Pi, as shown below.

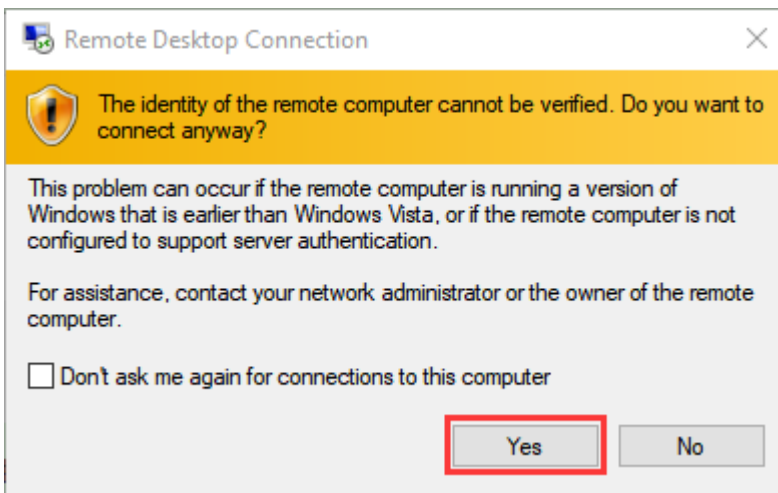
Click "Connect" and tap "Connect".

192.168.1.99 is the ip address we use, you can change into yours ip address.

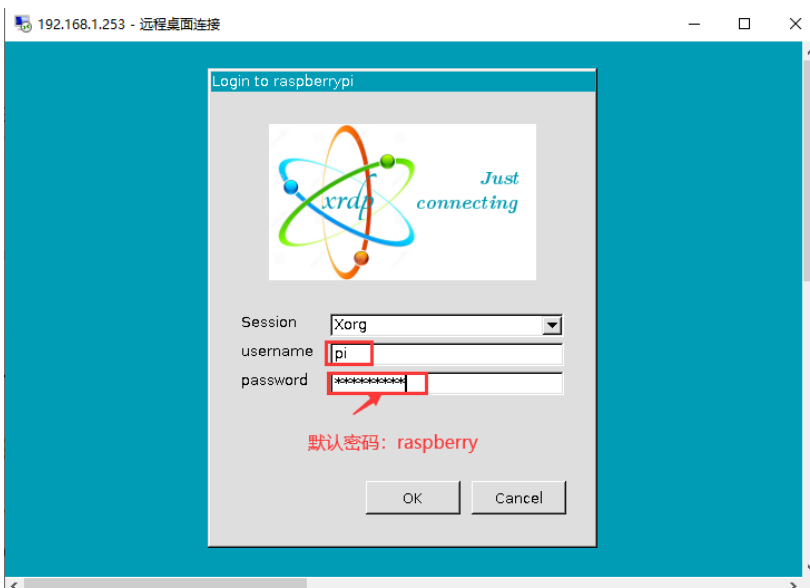




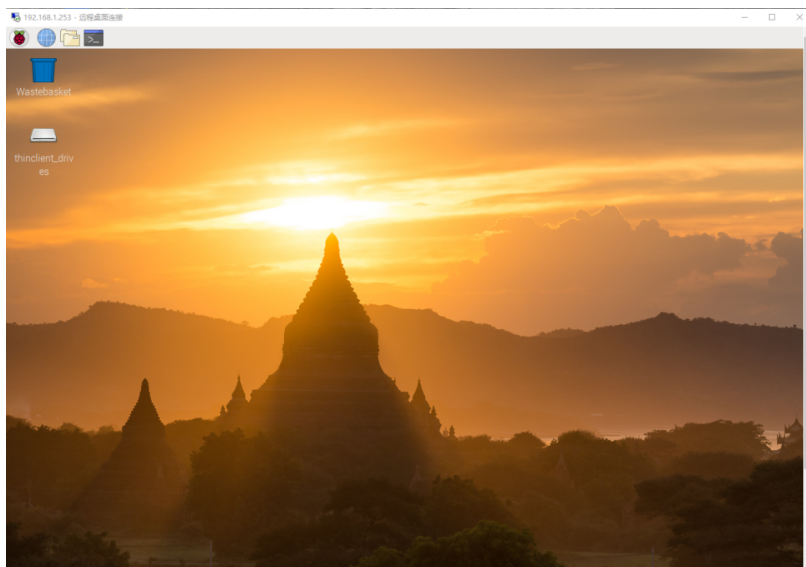
Click "Yes".



Input user name: `pi`, default password: `raspberrypi`, as shown below:



Click "OK" or "Enter", you will view the desktop of Raspberry Pi OS, as shown below:



Now, we finish the basic configuration of Raspberry Pi OS.

## 2. Preparations for C Language

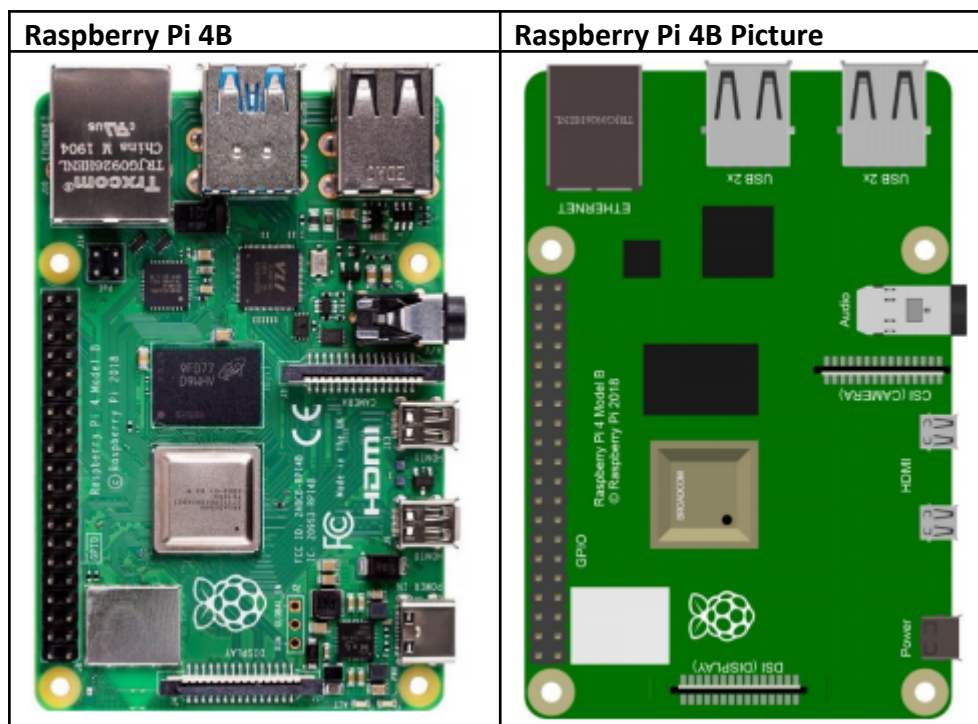
C language is a procedural programming language. It was initially developed by Dennis Ritchie in the year 1972. It was mainly developed as a system programming language to write an operating system. The main

[www.OKdo.com](http://www.OKdo.com) | [#LetsOKdo](https://twitter.com/LetsOKdo) | Design The World

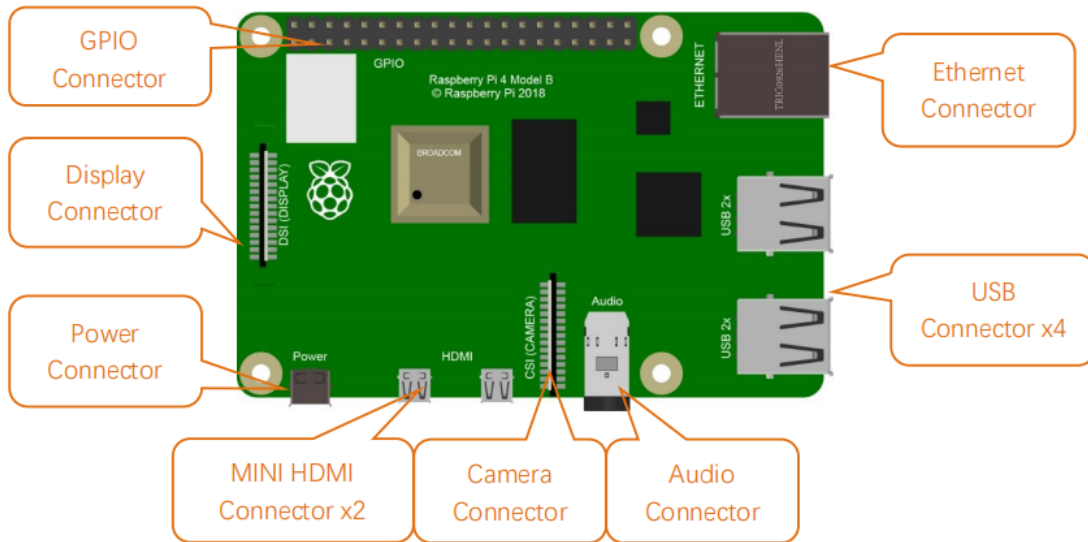
features of C language include low-level access to memory, a simple set of keywords, and clean style, and these features make C language suitable for system programmings like an operating system or compiler development.

Next to control 40 pins of Raspberry Pi via C language

- (1) Hardware:
- (2) Raspberry Pi 4B:



Hardware Interfaces:



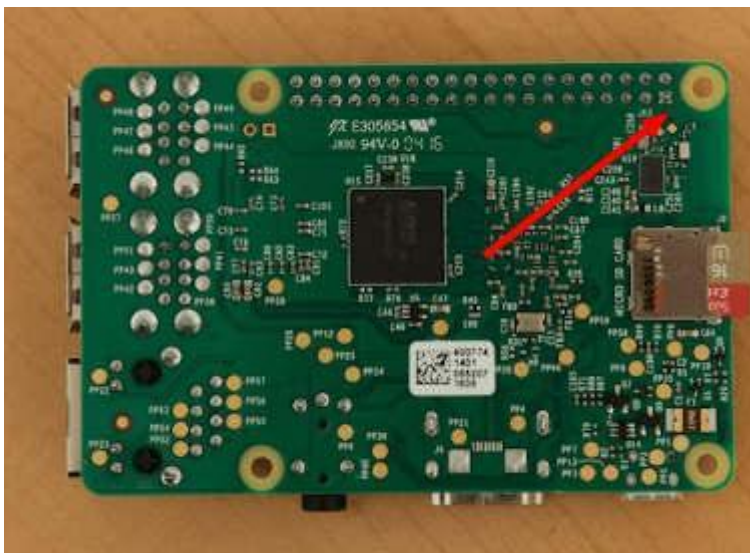
### 40-Pin GPIO Header Description :

GPIO pins are divided into BCM GPIO number, physics number and WiringPi GPIO number.

We usually use WiringPi GPIO number when using C language and BCM GPIO and physics number are used to Python, as shown below:

In these lessons, we use C language, so WiringPi GPIO number is adopted.

Note: pin(3.3 V) on the left hand is square, but other pins are round. Turn Raspberry Pi over, there is a square GPIO on the back.(you can tell from pin(3.3V)).

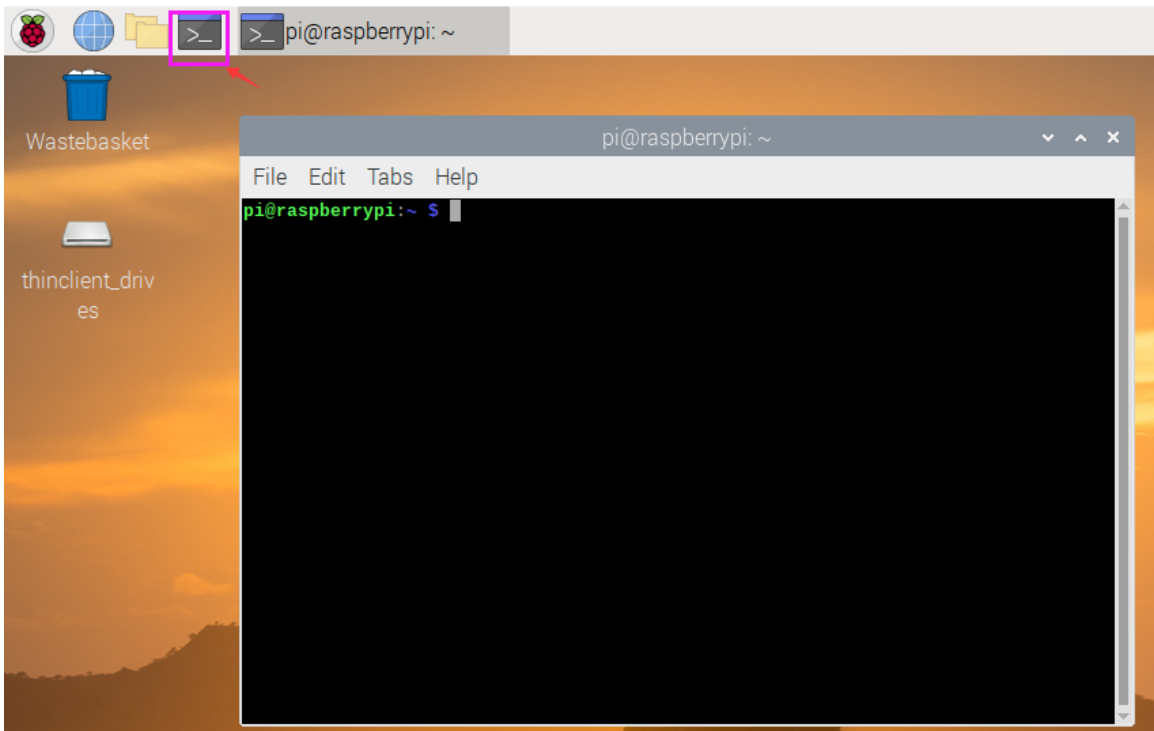


Note: the largest input current of each pin on Raspberry Pi 4B is 16mA and the aggregate current of all pins is less than 51mA.

### (2) Install the WiringPi GPIO Library

We will control IO ports of Raspberry Pi by WiringPi GPIO library, let's install the [WiringPi GPIO library](#).

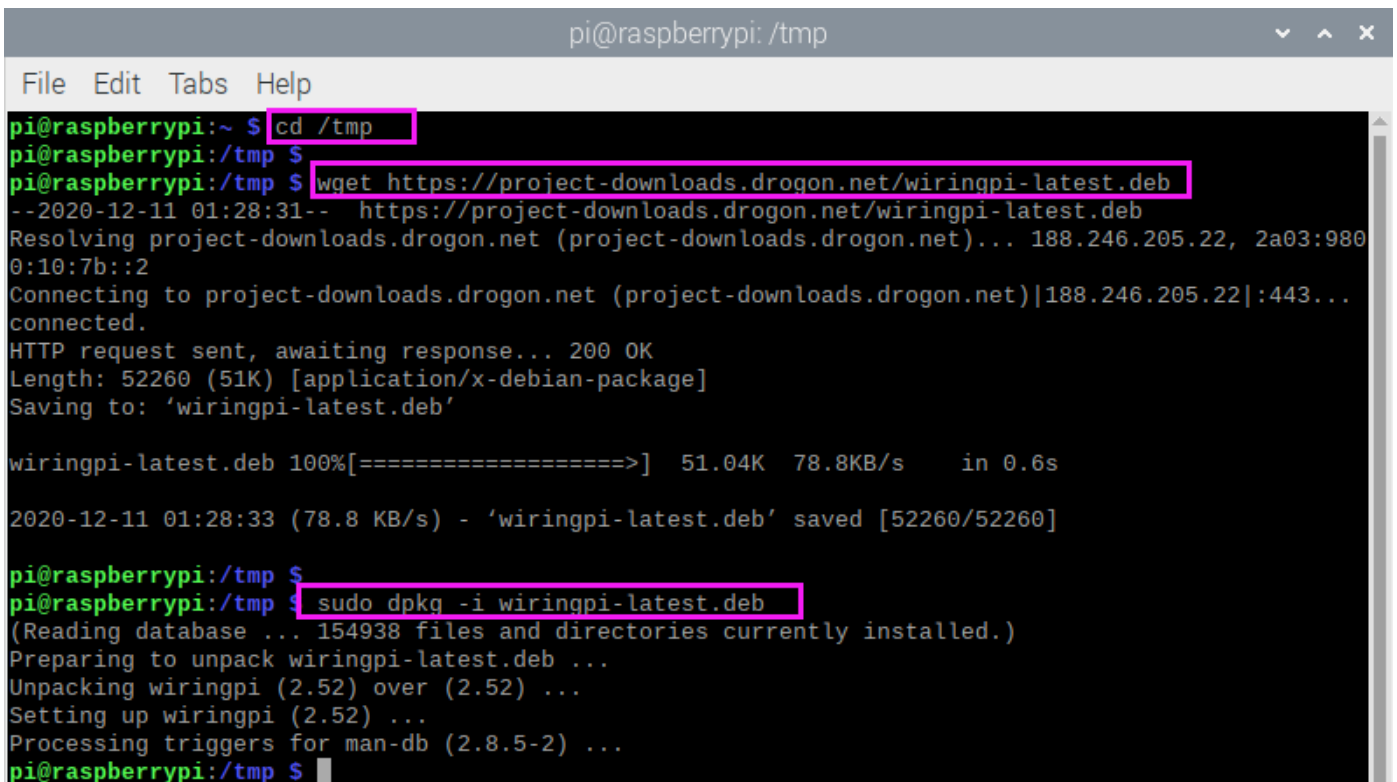
Click the terminal icon of Raspberry Pi and open the terminal, as shown below:



Enter the following commands in the terminal and tap "Enter"

```
cd /tmp
wget https://project-downloads.drogon.net/wiringpi-latest.deb
sudo dpkg -i wiringpi-latest.deb
```

As shown below:



Check the version of WiringPi GPIO library and corresponding definition of 40-pin headers  
Input the following commands and press“Enter”

```
gpio -v  
gpio readall
```

The version of WiringPi GPIO library is 2.52

```
pi@raspberrypi:/tmp $ gpio -v  
gpio version: 2.52  
Copyright (c) 2012-2018 Gordon Henderson  
This is free software with ABSOLUTELY NO WARRANTY.  
For details type: gpio -warranty  
  
Raspberry Pi Details:  
Type: Pi 4B, Revision: 01, Memory: 2048MB, Maker: Sony  
* Device tree is enabled.  
*--> Raspberry Pi 4 Model B Rev 1.1  
* This Raspberry Pi supports user-level GPIO access.
```

Pins definition of WiringPi GPIO Library

(Note: the silk mark of our extension board is defined by pins of BCM GPIO as well)

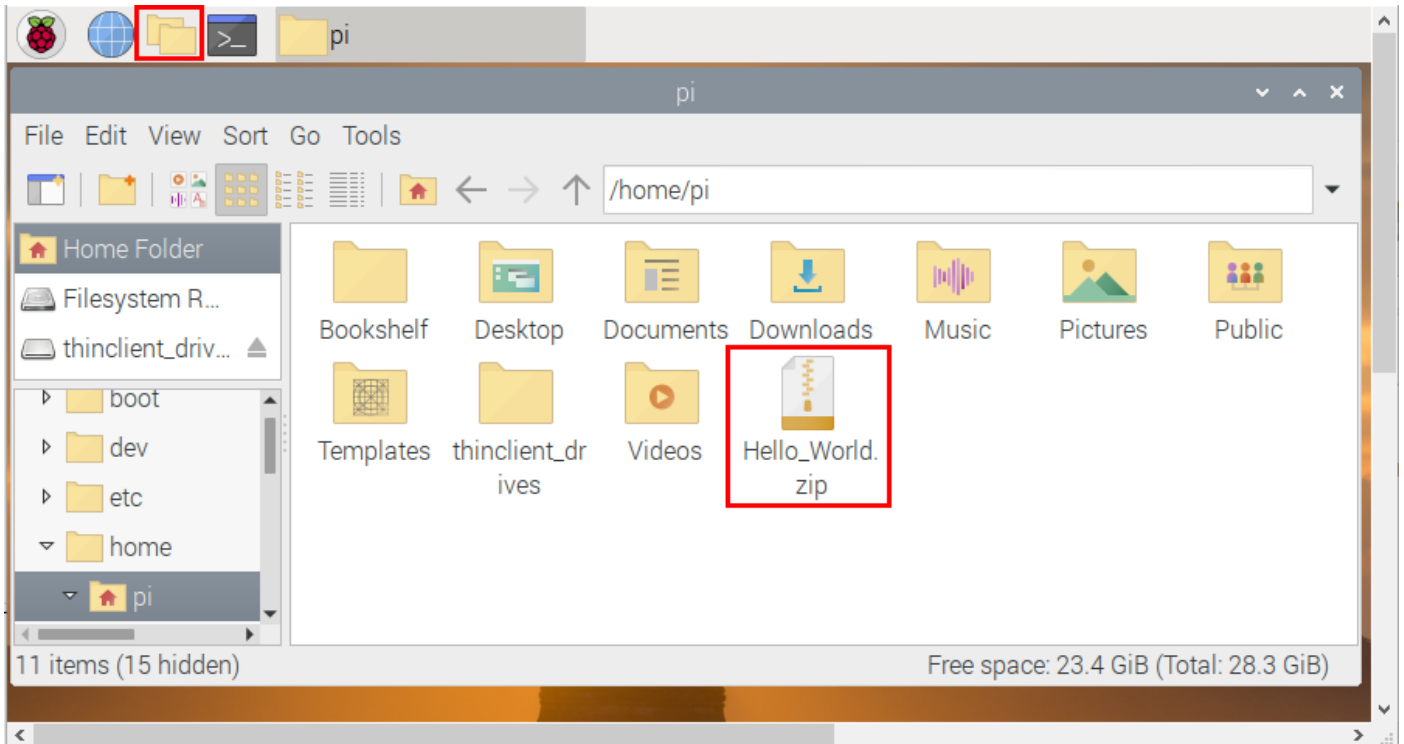
```

pi@raspberrypi:/tmp $ gpio readAll
-----Pi 4B-----
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| BCM | wPi | Name | Mode | V | Physical | V | Mode | Name | wPi | BCM |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|      |      | 3.3v |      |   | 1 | 2 |      |      |      |      | |
| 2   | 8   | SDA.1 | ALT0 | 1 | 3 | 4 |      | 5v   |      |      |
| 3   | 9   | SCL.1 | ALT0 | 1 | 5 | 6 |      | 5v   |      |      |
| 4   | 7   | GPIO.7 | IN   | 1 | 7 | 8 | 0 | IN   | TxD  | 15  | 14  |
|      |      | 0v    |      |   | 9 | 10 | 0 | IN   | RxD  | 16  | 15  |
| 17  | 0   | GPIO.0 | IN   | 0 | 11 | 12 | 0 | IN   | GPIO.1 | 1  | 18  |
| 27  | 2   | GPIO.2 | IN   | 0 | 13 | 14 | 0 |      | 0v    |      |      |
| 22  | 3   | GPIO.3 | IN   | 0 | 15 | 16 | 0 | IN   | GPIO.4 | 4  | 23  |
|      |      | 3.3v  |      |   | 17 | 18 | 0 | IN   | GPIO.5 | 5  | 24  |
| 10  | 12  | MOSI  | ALT0 | 0 | 19 | 20 | 0 |      | 0v    |      |      |
| 9   | 13  | MISO  | ALT0 | 0 | 21 | 22 | 1 | OUT  | GPIO.6 | 6  | 25  |
| 11  | 14  | SCLK  | ALT0 | 0 | 23 | 24 | 1 | OUT  | CE0   | 10  | 8   |
|      |      | 0v    |      |   | 25 | 26 | 1 | OUT  | CE1   | 11  | 7   |
| 0   | 30  | SDA.0 | IN   | 1 | 27 | 28 | 1 | IN   | SCL.0 | 31  | 1   |
| 5   | 21  | GPIO.21 | IN  | 1 | 29 | 30 | 0 |      | 0v    |      |      |
| 6   | 22  | GPIO.22 | IN  | 1 | 31 | 32 | 0 | IN   | GPIO.26 | 26 | 12  |
| 13  | 23  | GPIO.23 | IN  | 0 | 33 | 34 | 0 |      | 0v    |      |      |
| 19  | 24  | GPIO.24 | IN  | 0 | 35 | 36 | 0 | IN   | GPIO.27 | 27 | 16  |
| 26  | 25  | GPIO.25 | IN  | 0 | 37 | 38 | 0 | IN   | GPIO.28 | 28 | 20  |
|      |      | 0v    |      |   | 39 | 40 | 0 | IN   | GPIO.29 | 29 | 21  |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| BCM | wPi | Name | Mode | V | Physical | V | Mode | Name | wPi | BCM |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----Pi 4B-----

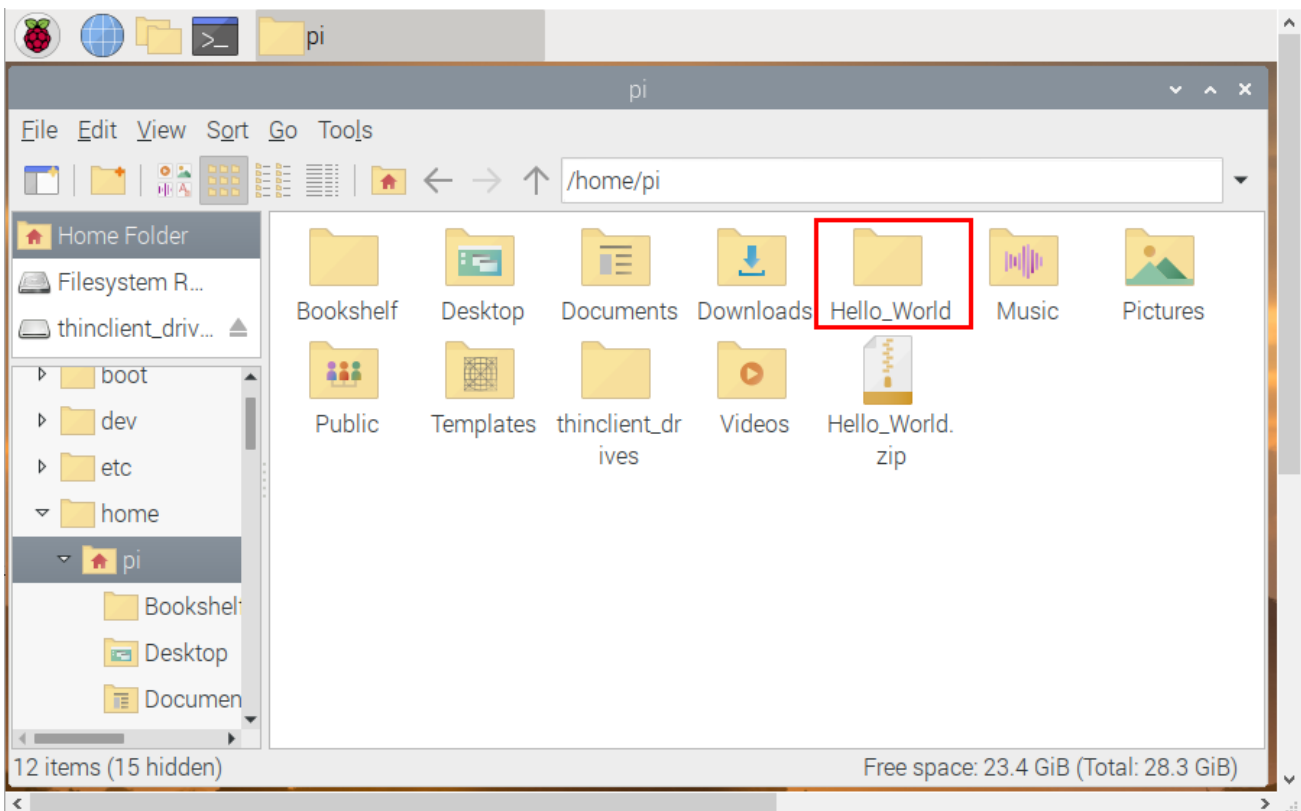
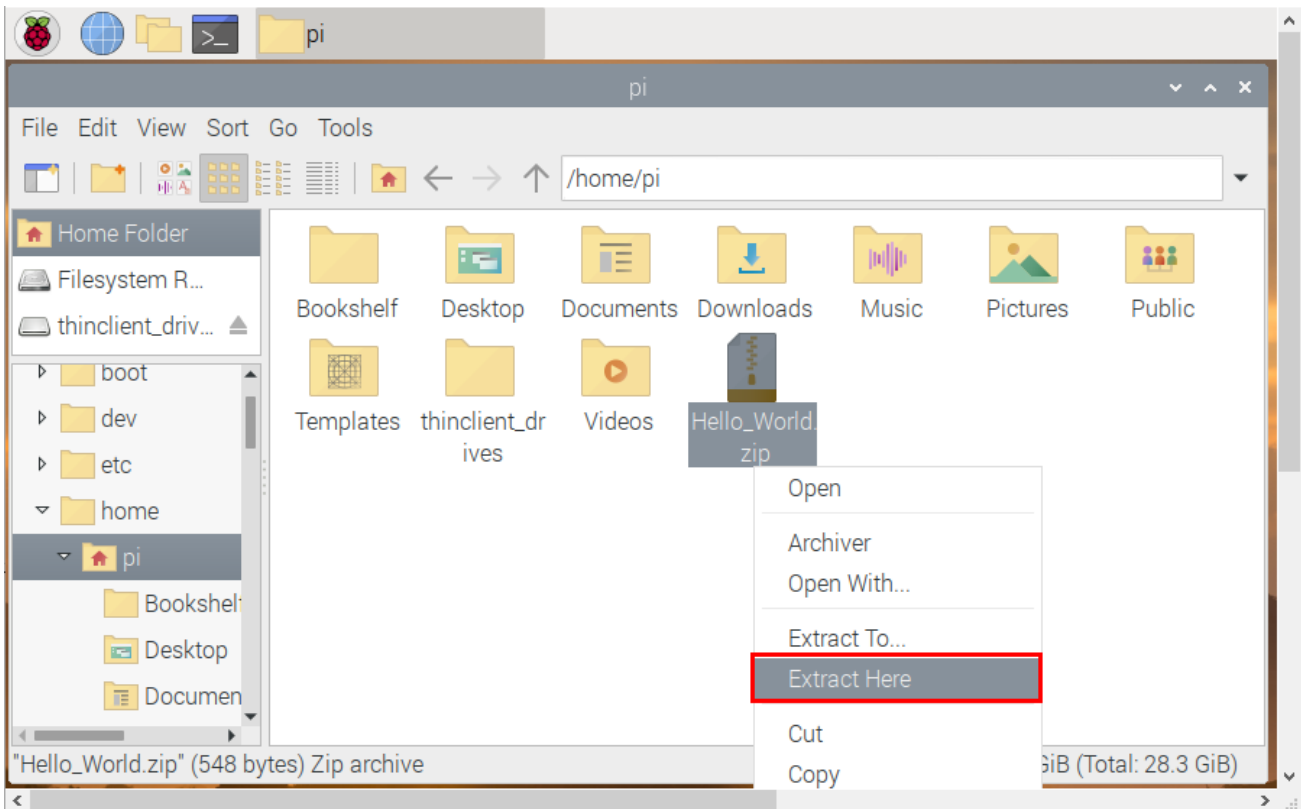
```

**(3) Run Example Code :**

Save the test code in the **pi** folder of Raspberry Pi system. Then place the **Hello\_World.zip** file we provide in the **pi** folder, right-click and click **Extract Here**. As shown below:







Compile and run test code :

Input the following code and press“Enter”

```
cd /home/pi/Hello_World  
gcc HelloWorld.c -o HelloWorld -lwiringPi  
sudo ./HelloWorld
```

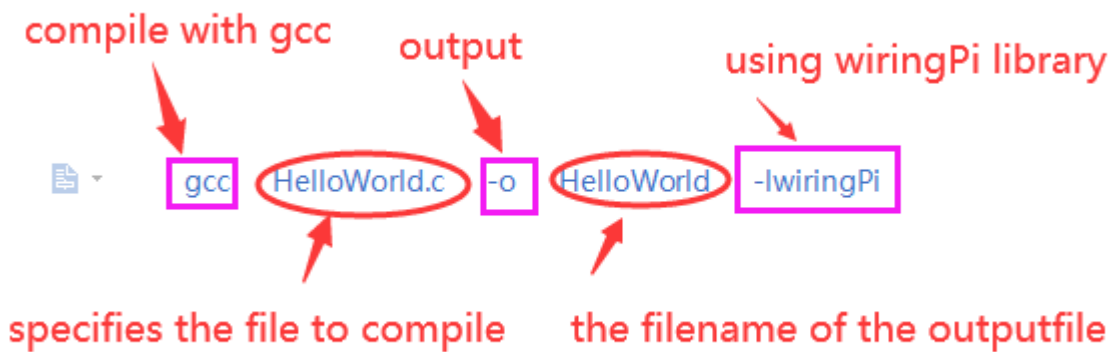
**Test Result :**

The terminal prints Hello World ! as shown below

Note: press Ctrl + C to exit code running

```
pi@raspberrypi: ~/Hello_World
File Edit Tabs Help
pi@raspberrypi:~ $ cd /home/pi/Hello_World
pi@raspberrypi:~/Hello_World $
pi@raspberrypi:~/Hello_World $ gcc HelloWorld.c -o HelloWorld -lwiringPi
pi@raspberrypi:~/Hello_World $
pi@raspberrypi:~/Hello_World $ sudo ./HelloWorld
Hello World!
Hello World!
Hello World!
Hello World!
Hello World!
Hello World!
Hello World!
```

Command Explanation



(4) Test Code

File name : HelloWorld.c

```

#include <wiringPi.h> //wiringPi GPIO library
#include <stdio.h> //standard input & output library

int main() //Main function, the entry of the program
{

wiringPiSetup(); //Initializes the wiringPi GPIO library
while(1) //An infinite loop
{
printf("Hello World!\n"); //\n is a newline print
delay(1000); //delay 1000ms
}
}

```

Note: You need to enter the command in the terminal in the form of the following structure:

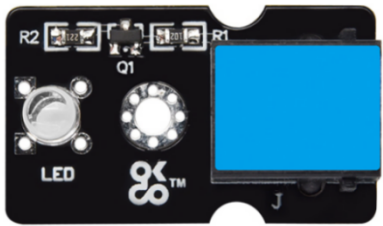
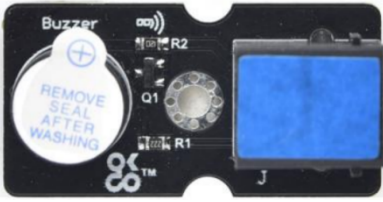
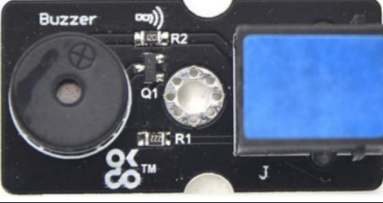
```

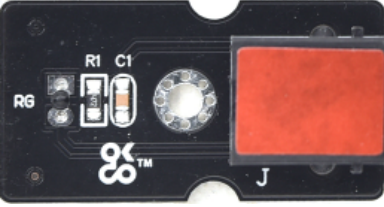
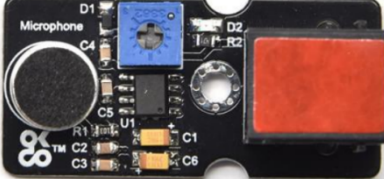
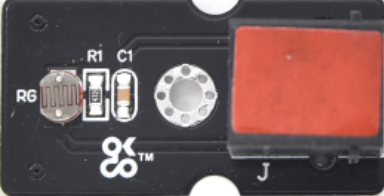
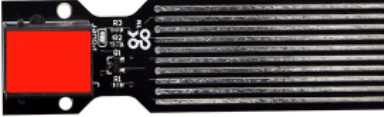
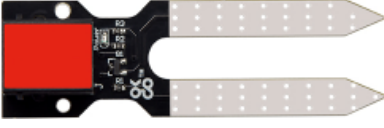
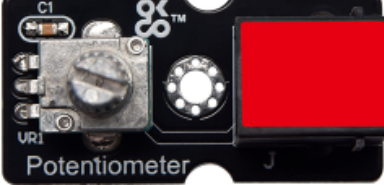
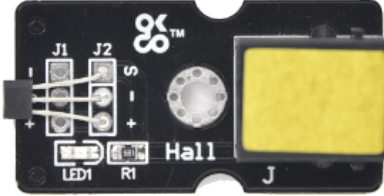
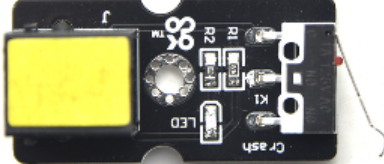
cd /home/pi/file folder
gcc file.c -o file -lwiringPi
sudo ./file

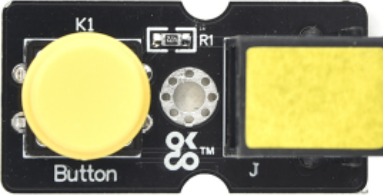

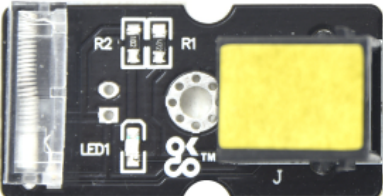
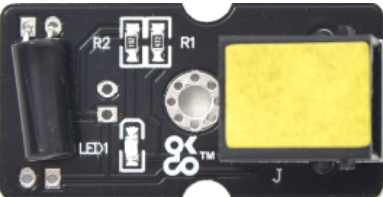


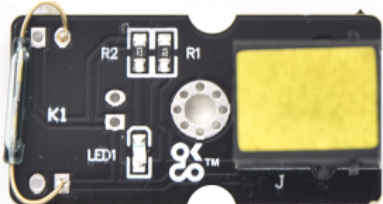
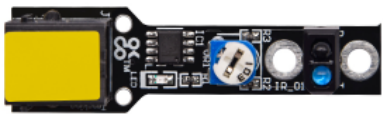
```


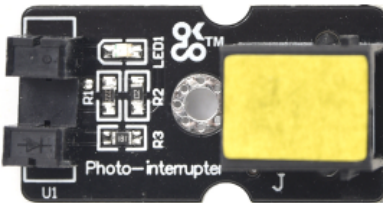
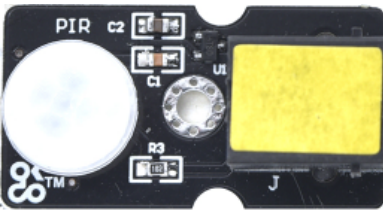
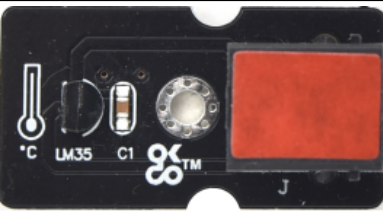
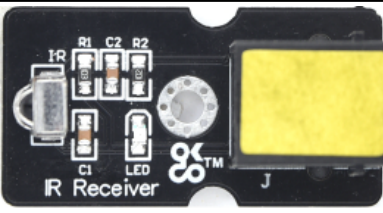
\*\*\*END\*\*\*


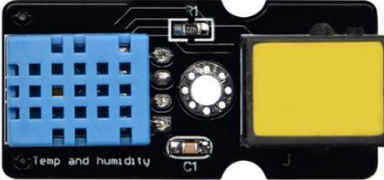
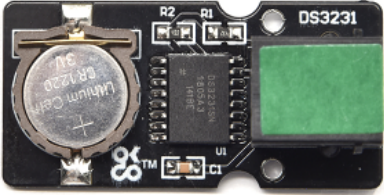


This shield is compatible with the following modules


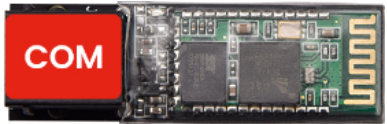
Name	Picture	Specifications	MPN	RS Code
White LED Module		Sensor type: Digital output Working voltage:3.3V-5V LED color: white Dimensions: 34mm*20mm*18mm Weight: 3.8g	TS2129	
Active Buzzer		Sensor type: Digital output Working voltage:3.3V-5V Dimensions: 39mm*20mm*18mm Weight: 6g	TS2130	
Passive Buzzer		Sensor type: Digital output Working voltage:3.3V-5V Dimensions: 39mm*20mm*18mm Weight: 6g	TS2131	

Thermistor		<p>Sensor type: Analog input  Working voltage: 3.3V-5V  Temperature range: -55°C~315°C  Dimensions:  38mm*20mm*18mm  Weight: 4.2g</p>	TS2132	
Analog Sound Sensor		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Operating current: &lt;10mA  Dimensions:  42mm*20mm*18mm  Weight: 6.0g</p>	TS2133	
Photoresistor		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Dimensions:  38mm*20mm*18mm  Weight: 4.3g</p>	TS2134	
Water Level Sensor		<p>Sensor type: Analog input  Operating voltage: 3.3V-5V  Operating current: &lt;20mA  Detection area: 40mm x16mm  Operating temperature:  10%~90% without condensation  Dimensions:  68mm*20mm*18mm  Weight: 5.7g</p>	TS2135	
Soil Moisture Sensor		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Working Current: ≤ 20mA  Output Voltage: 0-2.3V  Dimensions:  66mm*20mm*18mm  Weight: 4.8g</p>	TS2136	
Potentiometer		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Dimensions:  38mm*20mm*18mm  Weight: 9.1g</p>	TS2137	
Hall Magnetic Sensor		<p>Sensor type: Digital input  Working voltage:3.3V-5V  Detection range: up to 75px  Dimensions:  38mm*20mm*18mm  Weight: 9.1g</p>	TS2138	
Collision Sensor		<p>Sensor type: Digital input  Working voltage:3.3V-5V  Dimensions:  44mm*20mm*18mm  Weight: 5.5g</p>	TS2139	

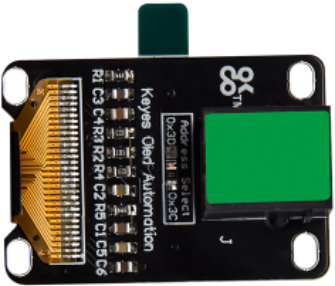
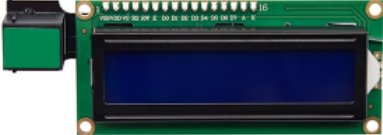
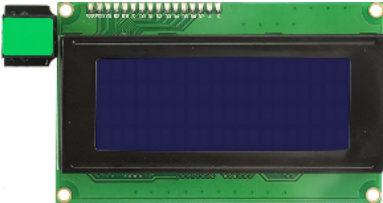
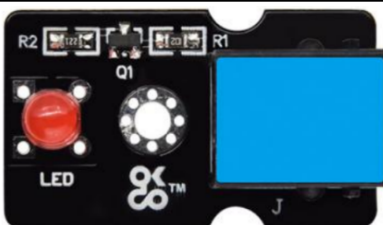
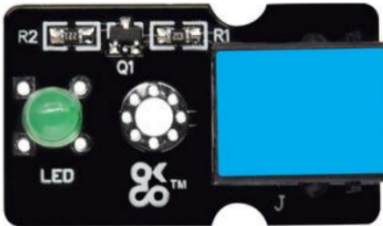
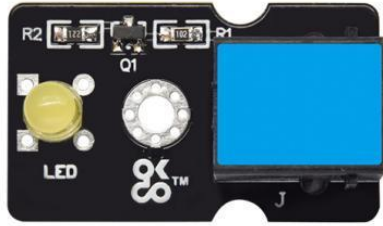
Digital Push Button Sensor		Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 44mm*20mm*18mm Weight: 5.5g	TS2140	
Capacitive Touch Sensor		Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 44mm*20mm*18mm Weight: 5.5g	TS2141	
Knock Sensor		Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 44mm*20mm*18mm Weight: 5.5g	TS2142	
Tilt Sensor		Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 44mm*20mm*18mm Weight: 5.5g	TS2143	
Flame Sensor		Sensor type: Digital input Working voltage:3.3V-5V Detection range: 500px (4.8V) ~ 2500px (1V) Spectral Bandwidth Range: 760nm ~ 1100nm Operating temperature: -25°C to 85°C Dimensions: 48mm*17mm*18mm Weight: 4.6g	TS2144	
Vibration Sensor		Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 46mm*16.7mm*17.6mm Weight: 6.2g	TS2145	
Reed Switch Module		Sensor type: Digital input Working voltage:3.3V-5V Working current: ≥20mA Working temperature: -10°C to +50°C Detection distance: ≤10mm Dimensions: 39mm*20mm*18mm Weight: 4.6g	TS2146	
Line Tracking Sensor		Sensor type: Digital input Working voltage:5V Operating current: <10mA Operating temperature: 0°C~ 50°C	TS2147	

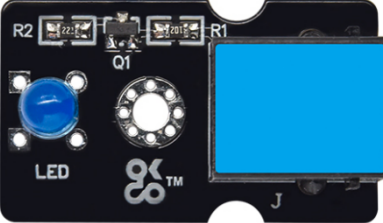

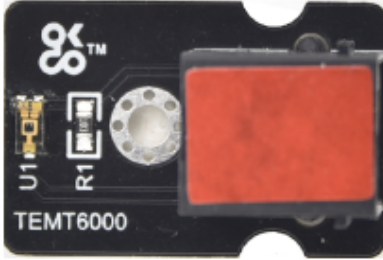

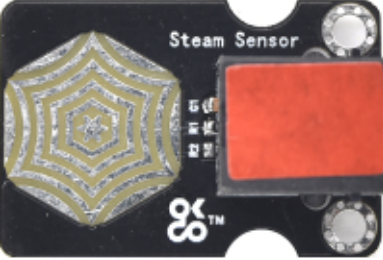
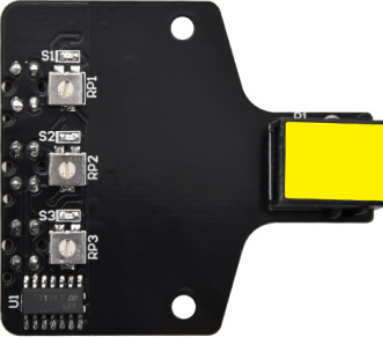
		<p>Dimensions: 57mm*16mm*18mm Weight: 4.8g</p>		
IR Obstacle Avoidance Sensor		<p>Sensor type: Digital input Working voltage:3.3V-5V Working current: ≥20mA Working temperature: -10°C to +50°C Detection distance: 2~40cm Effective Angle: 35° Dimensions: 52mm*17mm*18mm Weight: 6.2g</p>	TS2148	
Photointerrupter		<p>Sensor type: Digital input Working voltage:3.3V-5V Dimensions: 38mm*20mm*18mm Weight: 4.8g</p>	TS2149	
PIR Motion Sensor		<p>Sensor type: Digital input Working voltage:3.3V-5V Working Current: 15uA Working Temperature: -20 ~ 85°C Output Voltage: High 3V, Low 0V Output Delay Time (High Level): About 2.3 to 3 Seconds Detection angle: 100° Detection distance: 7 meters Output Indicator LED (When output HIGH, it will be ON) Pin limit current: 100mA Dimensions: 38mm*20mm*18mm Weight: 5.6g</p>	TS2150	
LM35 Temperature Sensor		<p>Sensor type: Analog input Working voltage:3.3V-5V Sensitivity: 10mV per degree Celsius Function range: 0°C to 100°C Dimensions: 38mm*20mm*18mm Weight: 4.6g</p>	TS2151	
IR Receiver Module		<p>Sensor type: Digital input Working voltage:3.3V-5V Modulate Frequency: 38Khz Dimensions: 38mm*20mm*18mm Weight: 5g</p>	TS2152	


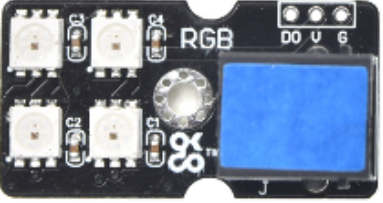


Relay Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  Rated current: 10A (NO) 5A (NC)  Maximum switching voltage: 150VAC 24VDC  Control signal: TTL level  Contact action time: 10ms  Dimensions:  47mm*28mm*19mm  Weight: 17.4g</p>	TS2182	
DHT11 Temperature and Humidity Sensor		<p>Sensor type: Digital input  Working voltage:5V  Relative Humidity and temperature measurement :  Good for 20-90% humidity readings with 5% accuracy ;  Good for 0-50°C temperature readings ±2°C accuracy  Dimensions:  42mm*20mm*18mm  Weight: 5.6g</p>	TS2153	
DS3231 Clock Module		<p>Sensor type: I2C  Working voltage:3.3V-5V  Temperature range: -40°C to +85°C  Timing accuracy: about ± 5ppm  Output: 1Hz and 32.768kHz  High speed (400kHz), I2C serial bus  Output Level: TTL level  Dimensions:  38mm*20mm*18mm  Weight: 5.4g</p>	TS2154	
Analog MQ-2 Gas Sensor		<p>Sensor type: Digital and Analog  Working voltage:5V  Can be used to Measure or detect LPG, Alcohol, Propane, Hydrogen, CO and even methane  Analog output voltage: 0V to 5V  Digital Output Voltage: 0V or 5V (TTL Logic)  Preheat duration 20 seconds  Dimensions:  56mm*20mm*18mm  Weight: 9g</p>	TS2155	
Analog MQ-3 Alcohol Sensor		<p>Sensor type: Digital and Analog  Working voltage:5V  Current Consumption: 150mA  DO output: TTL digital 0 and 1 ( 0.1 and 5V)</p>	TS2156	

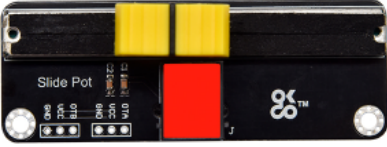
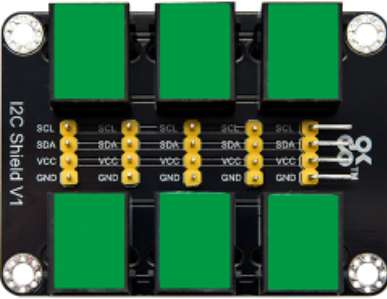
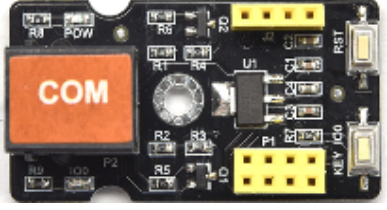
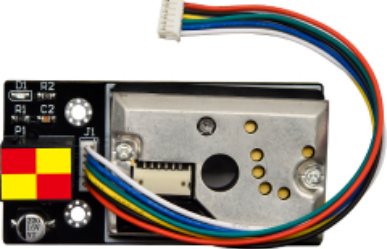
		<p>AO output: 0.1- 0.3 V (relative to pollution), the maximum concentration of a voltage of about 4V</p> <p>Detecting Concentration: 0.05-10mg/L Alcohol</p> <p>Heater consumption: less than 750mW</p> <p>Operating temperature: 14 to 122 °F (-10 to 50°C)</p> <p>Load resistance: 200kΩ</p> <p>Sensitivity S: <math>R_s(\text{in air})/R_s(0.4\text{mg/L Alcohol}) \geq 5</math></p> <p>Sensing Resistance <math>R_s</math>: 2KΩ-20KΩ(in 0.4mg/l alcohol)</p> <p>Dimensions: 56mm*20mm*18mm</p> <p>Weight: 7.5g</p>		
MQ-135 Air Quality Sensor		<p>Sensor type: Digital and Analog</p> <p>Working voltage:5V</p> <p>Detect/Measure NH3, NOx, alcohol, Benzene, smoke, CO2, etc.</p> <p>Analog output voltage: 0V to 5V</p> <p>Digital output voltage: 0V or 5V (TTL Logic)</p> <p>Preheat duration 20 seconds</p> <p>Dimensions: 56mm*20mm*18mm</p> <p>Weight: 9.2g</p>	TS2157	
Bluetooth 2.0 Module		<p>Working voltage:5V</p> <p>Bluetooth protocol: Bluetooth 2.1+ EDR standard</p> <p>USB protocol: USB v1.1/2.0</p> <p>Operating frequency: 2.4GHz ISM frequency band</p> <p>Modulation mode: GFSK (Gauss Frequency Shift Keying)</p> <p>Transmit power: ≤ 4dBm, class 2</p> <p>Sensitivity: ≤ -84dBm at 0.1% Bit Error Rate</p> <p>Transfer rate: Asynchronous: 2.1Mbps(Max)/160kbps ; Synchronous: 1Mbps/1Mbps</p> <p>Supported configuration: Bluetooth serial port</p> <p>Operating temperature: -20°C to +55°C</p> <p>Dimensions: 52mm*16mm*18mm</p> <p>Weight: 5.3g</p>	TS2183	



OLED Module		<p>Sensor type: I2C  Working voltage:5V  0.96" diagonal OLED  Pixels: 128 × 64  Color Depth: Monochrome  (White)  Brightness (cd/m2): 100 (Typ)  Dimensions:  39mm*27mm*18mm  Weight: 7g</p>	TS2158	
i2c 1602 LCD Module		<p>Sensor type: I2C  Working voltage:5V  16 characters wide, 2 rows  I2C Address: 0x27  Back Light: Blue  Text Color: White  Dimensions:  99mm*37mm*21mm  Weight: 37.4g</p>	TS2159	
i2c I2C 2004 LCD Module		<p>Sensor type: I2C  Working voltage:5V  I2C address: 0x27  Back Light: Blue  Text Color: White  20 characters wide, 4 rows  Dimensions:  114mm*60mm*22mm  Weight: 77.7g</p>	TS2160	
Red LED Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  LED color: <b>Red</b>  Dimensions:  34mm*20mm*18mm  Weight: 3.8g</p>	TS2161	
Green LED Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  LED color: <b>Green</b>  Dimensions:  34mm*20mm*18mm  Weight: 3.8g</p>	TS2162	
Yellow LED Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  LED color: <b>Yellow</b>  Dimensions:  34mm*20mm*18mm  Weight: 3.8g</p>	TS2163	

Blue LED Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  LED color: <b>Blue</b>  Dimensions:  34mm*20mm*18mm  Weight: 3.8g</p>	TS2164	
L9110 Fan Module		<p>Sensor type: Digital output  Working voltage:3.3V-5V  Fan diameter: 75mm  Interface: double digital  Dimensions:  50mm*75mm*18mm  Weight: 14.2g</p>	TS2165	
TEMT6000 Ambient Light Sensor		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Operating Temperature:  -40~85°C  Illumination Range: 1 – 1000  Lux  Output: analog voltage, 0 – 5V  @VCC=5V  Dimensions:  30mm*20mm*18mm  Weight: 3.5g</p>	TS2166	
Joystick Module		<p>Sensor type: Digital and Analog  Working voltage:5V  Internal Potentiometer value:  10k  Operating temperature: 0 to 70  °C  Dimensions:  45mm*28mm*33mm  Weight: 12.5g</p>	TS2184	
Steam Sensor		<p>Sensor type: Analog input  Working voltage:3.3V-5V  Working Current: &lt;20mA  Working Temperature: -10°C  ~ +70°C  Dimensions:  35mm*24mm*18mm  Weight: 4.6g</p>	TS2167	
Three-channel Line Tracking Sensor		<p>Sensor type: Digital input  Working voltage:3.3V-5V  Sensor: TCRT5000, high  sensitivity  Sensitivity: digital  potentiometer to adjust  Sensing distance: 0 to 3 cm  Digital switch output: (0 and 1)  Comparator: LM393 chips, work  stability</p>	TS2168	

		Detection reflection distance: 1mm to 25mm		
4-Digit LED Display		Sensor type: I2C Working voltage:3.3V-5V Control chip:TM1637 Module current: 30--80MA Tube colour: 0.36 inches LED, red highlights Dimensions: 50mm*23mm*18mm Weight: 9g	TS2169	
2812 2x2 RGB Module		Sensor type: Digital output Working voltage:5V Power: 0.1W Light Source: SMD 5050 RGB IC model: 4 / WS2812 Gray level: 256 levels Illumination angle: 180° Luminous color: Full colour Dimensions: 38mm*20mm*18mm Weight: 4.5g	TS2170	
Thin-film Pressure Sensor		Sensor type: Digital input Working Voltage: DC 3.3V—5V Range: 0-0.5KG Thickness: <0.25mm Response Point: <20g Repeatability: <±5.8% (50% load) Accuracy: ±2.5% (85% range interval) Durability: >100 thousand times Initial Resistance: >100MΩ (no load) Response Time: <1ms Recovery Time: <15ms Working Temperature: -20°C to 60°C Dimensions: 80mm*20mm*18mm Weight: 4.4g	TS2171	
Servo Module and Servo		Sensor type: Digital output Working Voltage: DC 5V Angle range: about 180°(in 500→2500μsec) Pulsewidth range: 500→2500μsec No-load speed: 0.12±0.01 sec/60 (DC 4.8V); 0.1±0.01 sec/60 (DC 6V)	TS2172	

		<p>No-load current: 200±20mA (DC 4.8V); 220±20mA (DC 6V)          Stop torque: 1.3±0.01kg/cm (DC 4.8V); 1.5±0.1kg/cm (DC 6V)          Stop current: ≤850mA (DC 4.8V); ≤1000mA (DC 6V)          Standby current: 3±1mA (DC 4.8V); 4±1mA (DC 6V)          Operation temperature: -10°C ~ 50°C          Save temperature: -20°C ~ 60°C</p>		
Slide Potentiometer		<p>Sensor type: Analog input          Working voltage: 3.3V-5V          Resistance: 5K          Dimensions:          28mm*76.7mm*31.3mm          Weight: 17g</p>	TS2173	
i2c Interface Conversion Shield		<p>Sensor type: Adapter          Working voltage: DC 5V          Interface : I2C          Pin pitch: 2.54mm          Dimensions:          60mm*44.4mm*17.5mm          Weight: 20.2g</p>	TS2174	
WiFi and Bluetooth Shield		<p>Sensor type: Adapter          Working voltage: 3.3V-5V          Interface: WiFi .Bluetooth          Pin pitch: 2.54mm          Dimensions:          44mm*24mm*18mm          Weight: 6.4g</p>	TS2185	
GP2Y1014AU PM2 Dust Sensor		<p>Sensor type: Digital input          Working Voltage: DC 5V          Working temperature: -10 to +65 degrees Celsius          Current consumption: 20mA maximum          Minimum particle detection: 0.8 microns          Sensitivity: 0.5V/(0.1mg/m3)          Voltage in clean air: 0.9V (typical)          Working temperature: -10°C to 65°C          Storage temperature: -20°C to 80°C          Dimensions: 35.6mm *69.7mm * 28mm          Weight: 27g</p>	TS2175	

<p>DHT22 Temperature and Humidity Sensor</p>		<p>Sensor type: Digital input Working voltage:3.3V-5V Humidity measurement range: 0----100%RH Humidity measurement accuracy: ±2%RH Temperature measurement range: - 40°C to 80°C Temperature measuring accuracy: ±0.5°C Dimensions: 43mm * 26mm * 18mm Weight: 9.3g</p>	<p>TS2176</p>	
<p>3W LED Module</p>		<p>Sensor type: Digital output Working voltage:3.3V-5V Emitting color: Yellow Recommended use current: 600 — 700ma Luminance: 200— 220LM Input signal: digital signal Dimensions: 49mm*27mm*18mm Weight: 7.7g</p>	<p>TS2186</p>	
<p>Breakout Board</p>		<p>Sensor type: Adapter Working voltage: 5V Interface: 2.54mm pin headers Fixing hole diameter: 3.2mm Dimensions: 49mm*18mm*16mm Weight : 8.9g</p>	<p>TS2128</p>	
<p>Ultrasonic Sensor</p>		<p>Sensor type: Digital output and input Sensor type: I2C Operating Voltage: DC 5V Operating Current: 15mA Operating Frequency: 40KHz Max Range: 3--5m Min Range: 2cm Measuring Angle: 15 degree Trigger Input Signal: 10μS TTL pulse Dimensions: 49mm*26mm*28mm Weight: 11.3g</p>	<p>TS2181</p>	