ebook
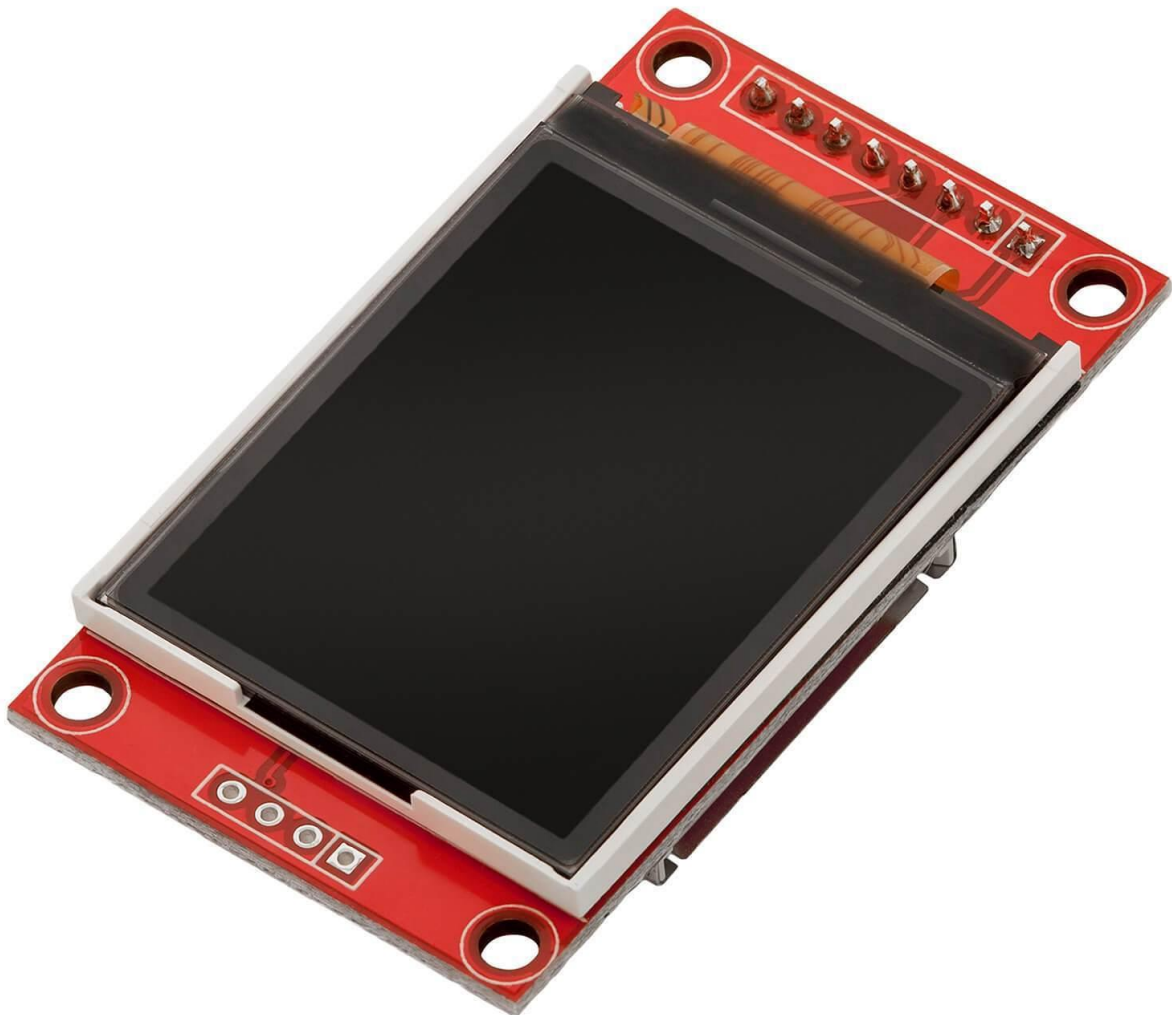
1.8 Inch Color TFT Display Module

Areas of application

Education and teaching: Use in schools, universities and training institutions to teach the basics of electronics, programming and embedded systems. Research and development: Use in research and development projects to create prototypes and experiments in the fields of electronics and computer science. Prototype development: Use in the development and testing of new electronic circuits and devices. Hobby and Maker Projects: Used by electronics enthusiasts and hobbyists to develop and implement DIY projects.

Required knowledge and skills

Basic understanding of electronics and electrical engineering. Knowledge of programming, especially in the C/C++ programming language. Ability to read schematics and design simple circuits. Experience working with electronic components and soldering.

Operating conditions

The product may only be operated with the voltages specified in the data sheet to avoid damage. A stabilized DC power source is required for operation. When connecting to other electronic components and circuits, the maximum current and voltage limits must be observed to avoid overloads and damage.

Environmental conditions

The product should be used in a clean, dry environment to avoid damage caused by moisture or dust. Protect the product from direct sunlight (UV), as this can negatively affect the lifespan of the display.

Intended Use

The product is designed for use in educational, research and development environments. It is used to develop, program and prototype electronic projects and applications. The product is not intended as a finished consumer product, but rather as a tool for technically savvy users, including engineers, developers, researchers and students.

Improper foreseeable use

The product is not suitable for industrial use or safety-relevant applications. Use of the product in medical devices or for aviation and space travel purposes is not permitted

disposal

Do not discard with household waste! Your product is according to the European one Directive on waste electrical and electronic equipment to be disposed of in an environmentally friendly manner. The valuable raw materials contained therein can be recycled become. The application of this directive contributes to environmental and health protection. Use the collection point set up by your municipality to return and Recycling of old electrical and electronic devices. WEEE Reg. No.: DE 62624346

electrostatic discharge

The display is sensitive to electrostatic discharge (ESD), which can damage or destroy the electronic components. Please note the following safety instructions to avoid ESD hazards: Attention: Electrostatic charges on your body can damage the display. Note: Ground yourself by wearing an anti-static wrist strap connected to a grounded surface or by touching a grounded metal surface before handling the display. Attention: Use anti-static mats and bags to protect the display. Note: Place the display on an anti-static work mat and store in anti-static bags when not in use. Note: A clean and grounded workplace minimizes the risk of ESD. Action: Keep your workplace clean and free of materials that can generate electrostatic charges. Make sure all surfaces used are grounded.

safety instructions

Although the display complies with the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residual chemical hazards may still exist. Please note the following safety instructions: Attention: The back of the display and the circuit board can release chemical residues from manufacturing or during operation. Note: Wear protective gloves when handling or installing the display for a long time to avoid skin irritation. Caution: Electronic components can emit small amounts of volatile organic compounds (VOCs), especially if the display is new. Note: Make sure you work in a well-ventilated area to minimize the concentration of fumes in the air. Caution: Do not use harsh chemicals or solvents to clean the display as they may damage the protective coating or electronics. Note: Use an anti-static cleaning cloth or special electronics cleaner to carefully clean the display. Although the display complies with

the requirements of the RoHS Directive (2011/65/EU) and does not contain any hazardous substances in quantities above the permitted limits, residual chemical hazards may still exist. Please note the following safety instructions: Attention: The back of the display and the circuit board can release chemical residues from manufacturing or during operation. Note: Wear protective gloves when handling or installing the display for a long time to avoid skin irritation. Caution: Electronic components can emit small amounts of volatile organic compounds (VOCs), especially if the display is new. Note: Make sure you work in a well-ventilated area to minimize the concentration of fumes in the air. Caution: Do not use harsh chemicals or solvents to clean the display as they may damage the protective coating or electronics. Note: Use an anti-static cleaning cloth or special electronics cleaner to carefully clean the display. The display contains sensitive electronic components and a top layer. Improper handling or excessive pressure can cause damage to the display or injury. Observe the following safety instructions to avoid mechanical hazards: Attention: The cover of the display is fragile and can break if handled improperly. Note: Avoid applying strong pressure or bending the display. Handle the display carefully and only by the circuit board to avoid breakages. Caution: Drops or impacts can crack the surface of the display and damage the electronic components on the back. Note: Avoid dropping the display and protect it from impacts. Use a soft surface when working to avoid scratches. Attention: If the display breaks, sharp pieces of glass can cause injuries. Note: If the display breaks, handle the fragments carefully and wear protective gloves to avoid cuts. Dispose of the glass pieces safely. Note: Improper attachment can lead to mechanical stress and breakage of the display. Action: Attach the display securely and without excessive pressure. Use appropriate brackets or housings to mount the display stably. Caution: Improper cleaning methods may scratch or damage the surface. Note: Only use soft, anti-static cloths to clean the display. Avoid aggressive cleaning agents and strong friction. The display operates with electrical voltages and currents that, if used improperly, can cause electric shocks, short circuits or fires. Please note the following safety instructions: Attention: Use the product only with the specified voltages. Note: The performance limits of the product can be found in the associated data sheet Note: Improper voltage sources can damage the display or cause dangerous situations. Action: Only use tested and suitable power supplies or batteries to power your circuits. Make sure the voltage source meets the requirements of the display. Caution: Avoid short circuits between the connectors and components of the product Note: Make sure that no conductive objects touch or bridge the circuit board. Use insulated tools and pay attention to the arrangement of connections. Caution: Do not perform any work on the product when it is connected to a power source. Note: Disconnect the product from power before making any circuit changes or connecting or removing components. Note: Look for signs of electrical damage such as smoke, unusual odors, or discoloration. Action: If such signs occur, turn off the power immediately and inspect the circuit thoroughly for errors. The display can generate heat during operation, which could lead to overheating, burns or fire if handled improperly. Please note the following safety instructions: Attention: Some components of the display can heat up during operation or in the event of an error. Measure: After switching off, allow the display to cool down sufficiently before touching the individual components on the back directly. Avoid direct contact with hot components. Caution: Overloading can cause excessive heating of the electronic components. Note: Make sure the power and voltage supply meets the specifications of the display and does not cause overload.

Table of Contents

Introduction

Thank you for purchasing Our AZ-Delivery **1.8 inch Spi TFT Display 128 x 160 pixels**. The 1.8 Inch Color TFT Display Module is a small electronic component that displays images and text in color. This lovely little display breakout is the best way to add a small, colorful, and very bright display to any project. Since the display uses 4-wire SPI to communicate and has its own pixel-addressable frame buffer, it can be used with every kind of microcontroller. Even a very small one with low memory and few pins available, The 1.8" display has 128x160 18-bit full color pixels and is driven by the ST7735 display controller.

On the following pages, we will introduce you to how to use and how to set-up this handy device.

Specifications

IC Chip	ST7735
Display Size	1.8 inch
Dimensions	34,5 x 58 x 7,5 mm
Display area	32 x 38 mm
Display Resolution	128 x 160
Display Color	RGB Full Color
RGB Resolution	18 Bits
Number of Pins	12 pins
Operating Voltage	3.3V or 5V logic
Interface Type	SPI

Overview:

PIN function :

PIN	Description function
GND	Ground
VCC	Module power supply – 3.3/5 V
CS	SPI Chip Select pin
RESET	Reset signal
A0	Data/Command selection
SDA	Serial data input
SCK	Serial clock input
LED	Backlight control

How does the 1.8 Inch Color TFT Display work?

The 1.8 Inch Color TFT Display Module is a small electronic component that displays images and text in color. It typically consists of a display panel, a driver circuit, and a backlight system.

The display panel is made up of a thin film transistor (TFT) array, which controls the color and brightness of each pixel on the screen. Each pixel is composed of three sub-pixels, typically colored red, green, and blue (RGB), which combine to produce a full-color image.
The backlight system is used to illuminate the display panel, allowing the images and text to be visible. The backlight is typically made up of a series of light-emitting diodes (LEDs) placed around the perimeter of the display panel.

To use the 1.8 Inch Color TFT Display Module, a microcontroller or other device sends data to the driver circuit, which translates the data into signals that can

be understood by the display panel. The driver circuit then controls the refresh rate and timing of the display, updating the image or text on the screen as needed. The backlight system provides illumination, allowing the display to be seen in various lighting conditions.
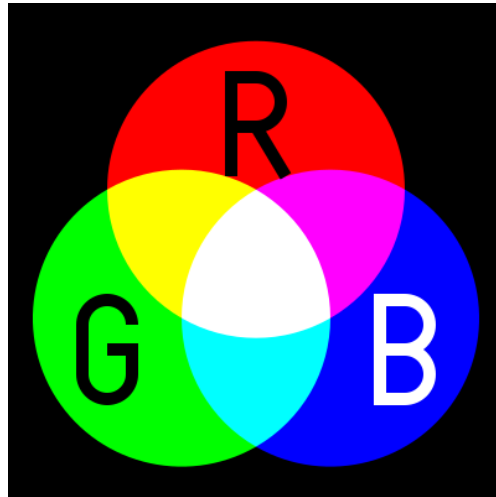
1.8 Inch Color TFT Display Module Applications:

The 1.8 Inch Color TFT Display Module has a wide range of applications, thanks to its compact size, high resolution, and colorful display capabilities. Here are some examples of its common applications:

Consumer electronics: Portable electronic devices such as digital cameras, handheld game consoles, and portable media players often use these display modules to provide a high-quality visual experience for users.

How to Use the Display Module ?

The uses of this module are very simple. In this section of this article, we will discuss how we can hook up a module and work with it, so first of all we need a setup which described below:

Setup for Development environment, we need :

-**Microcontroller board**
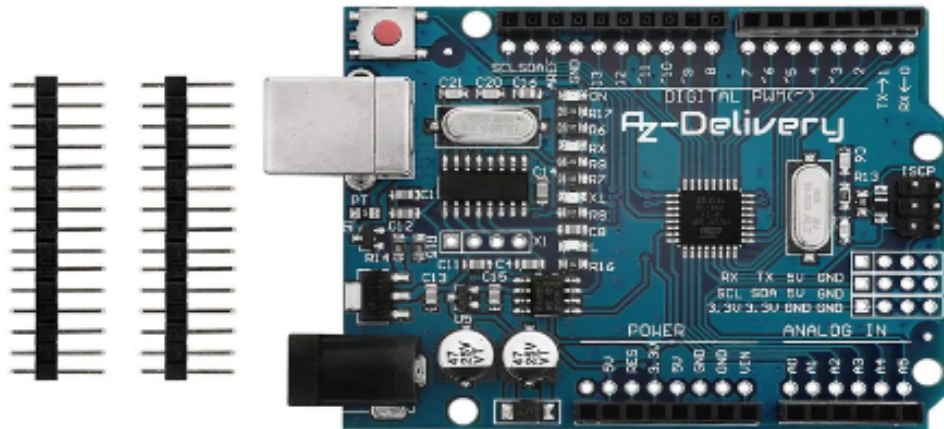
-1.8 Inch Color TFT Display Module:

-Jumper Wire:

The Circuit wiring
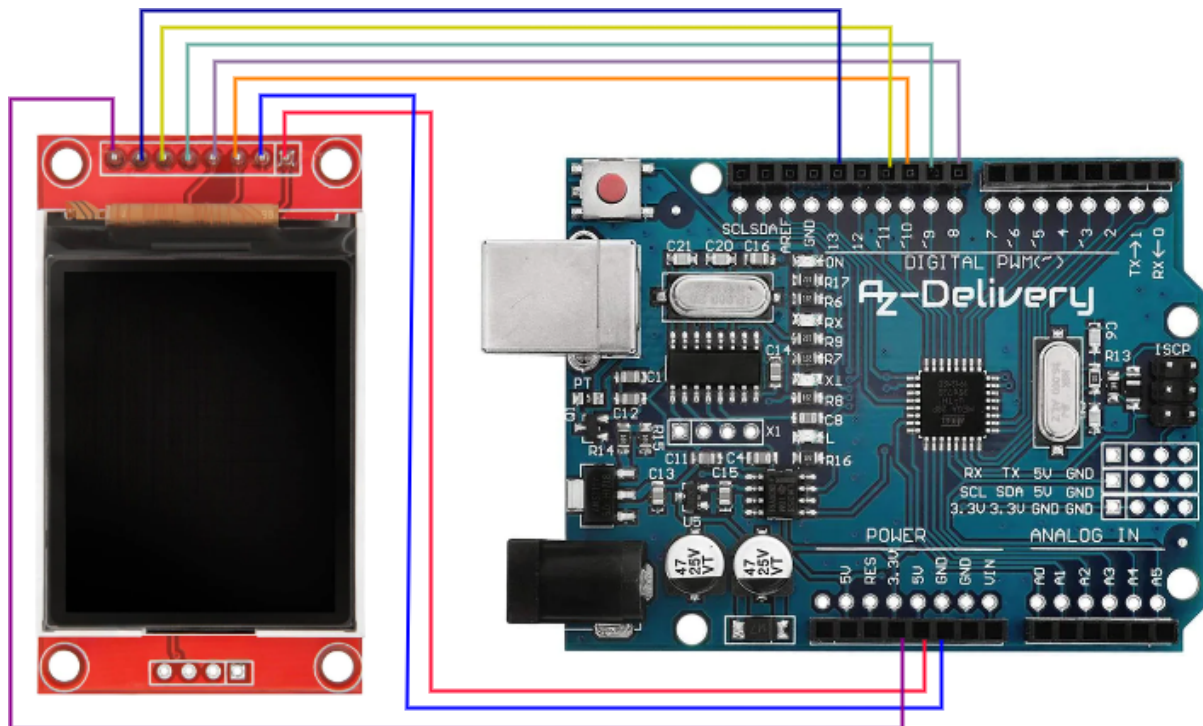
connections:

Display Module	Arduino
LED	3.3V
SCK	Digital Pin 13
SDA	Digital Pin 11
A0	Digital Pin 9
RESET	Digital Pin 8
CS	Digital Pin 10
GND	GND
VCC	5V

Software installation

Download the latest version of Arduino IDE here:
https://www.arduino.cc/en/software

Downloads

After starting the Arduino IDE installation file
"arduino-ide_2.0.0_Windows_64bit.exe" the license conditions of the
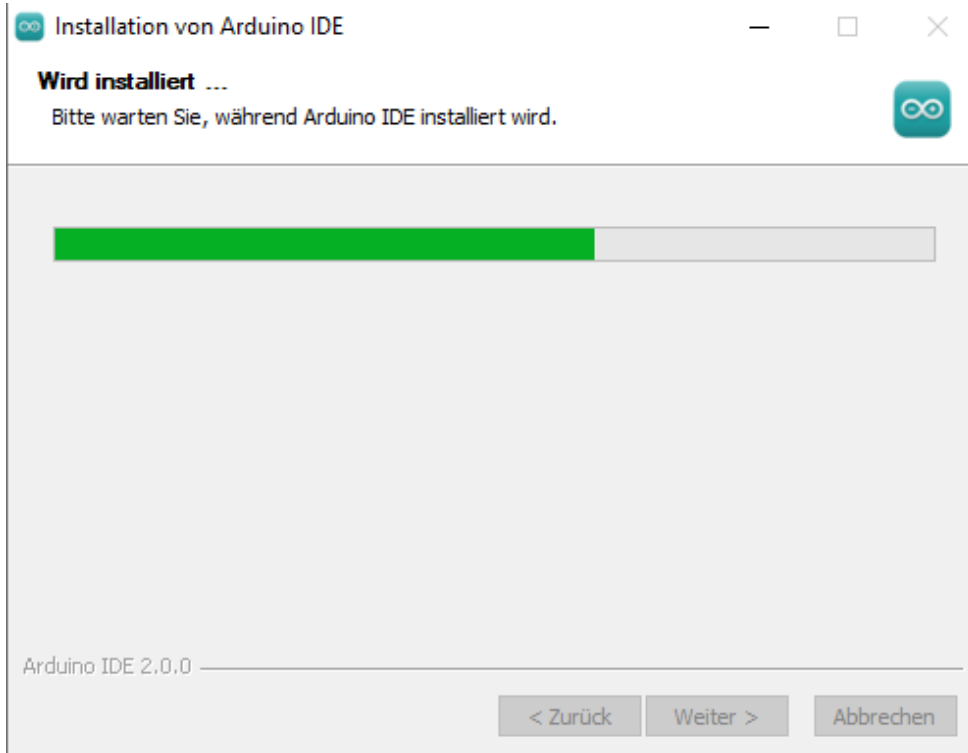software must be read and accepted.
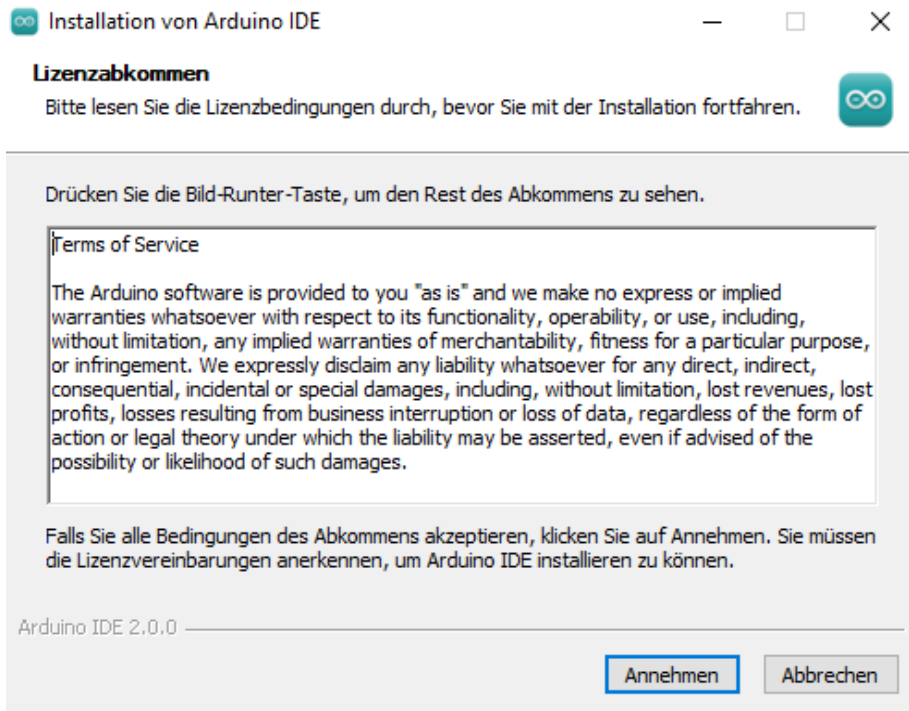
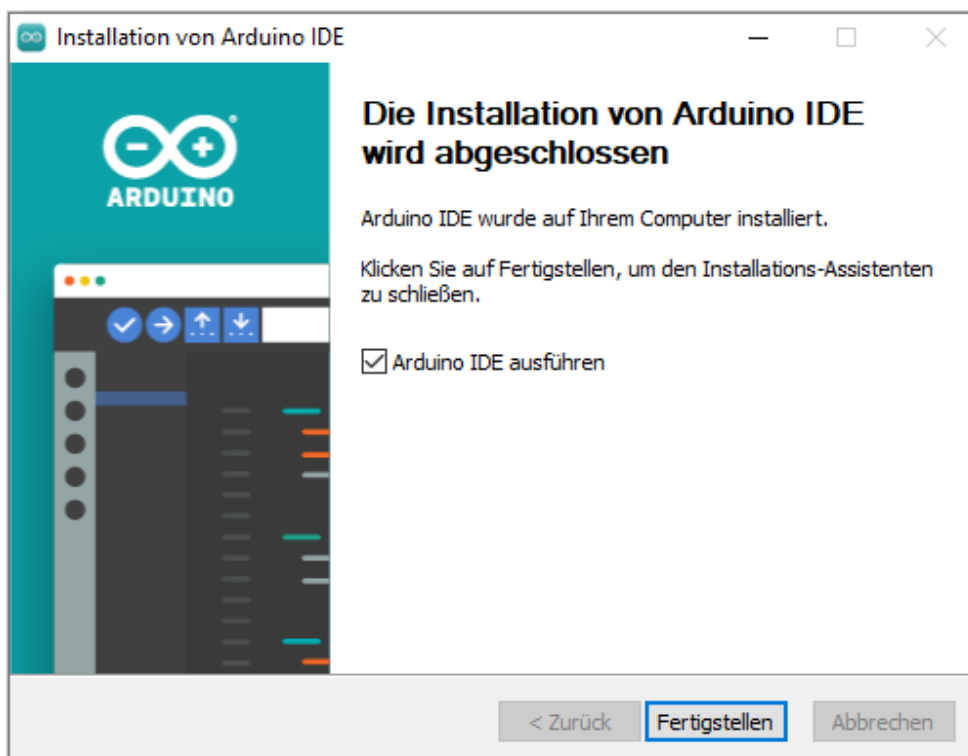In the next step, different options can be selected for installation.

Finally, the destination folder must be specified. The installation requires approx. 500MB of free disk space.
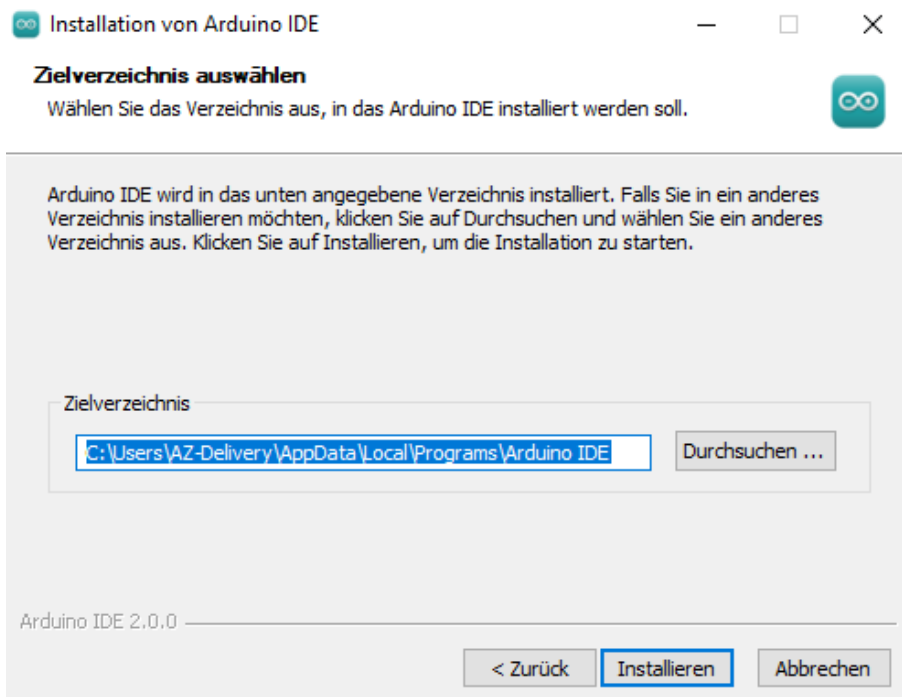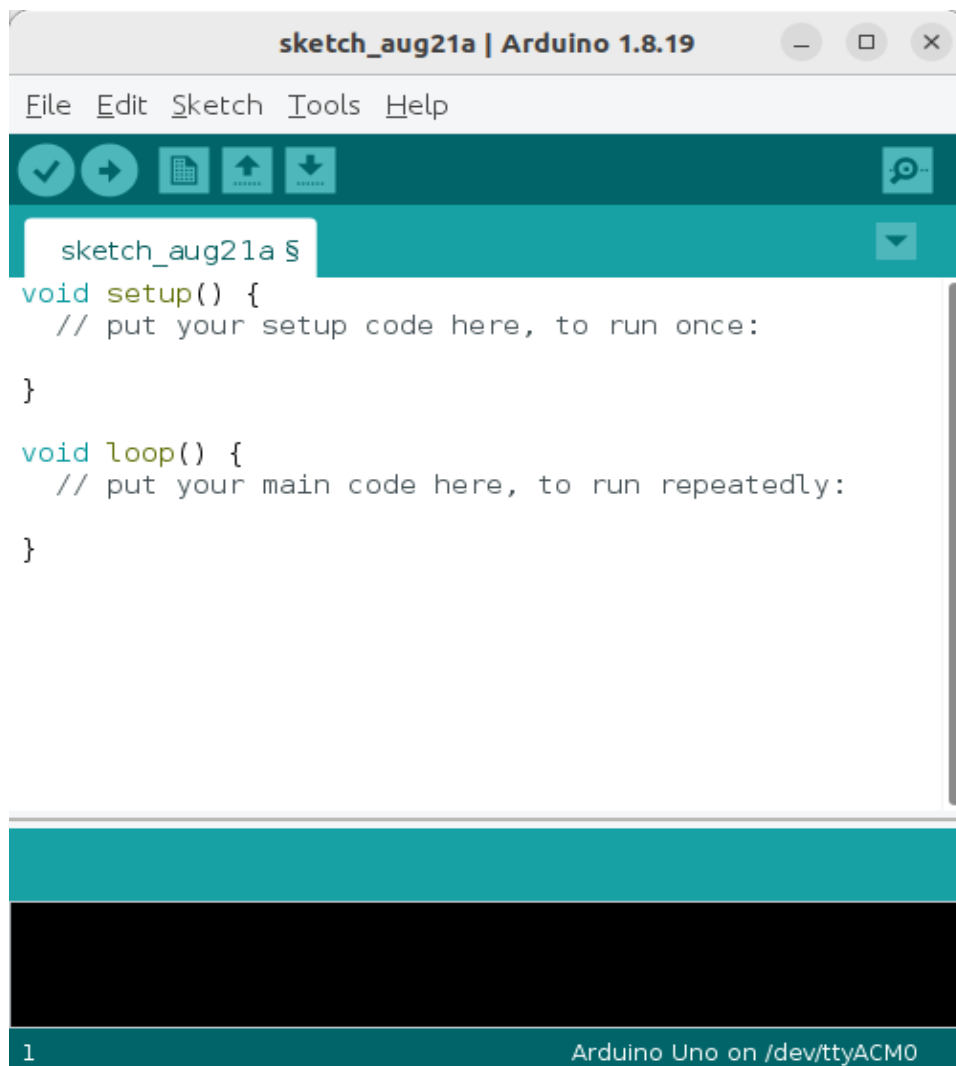

Click on "Install" to start the installation.

After successful installation, the installation programme can be terminated via the "**Finish**" button.
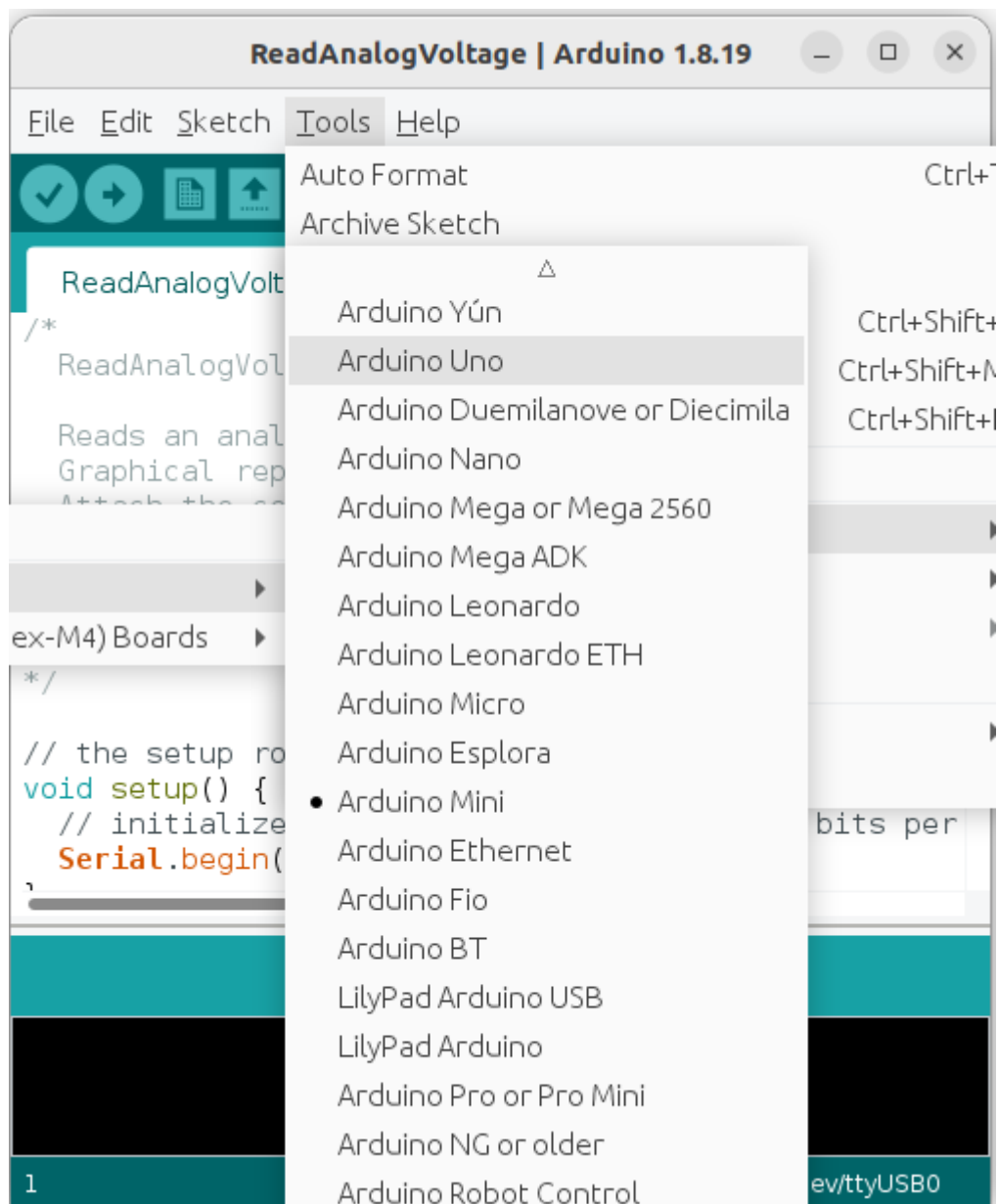
The starting window:
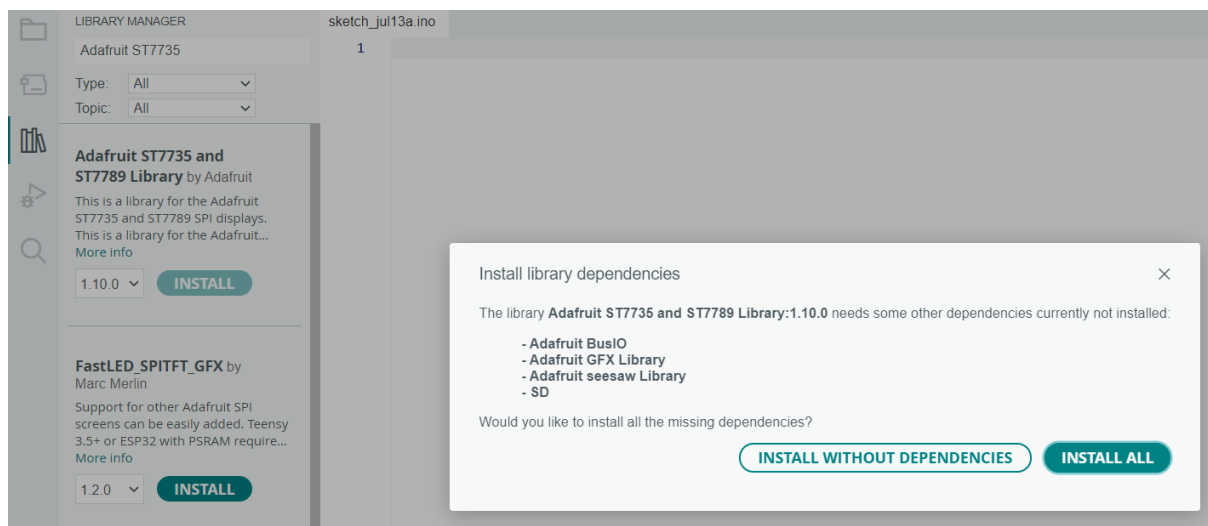
Select the UNO Board:

Tools -> Board -> Arduino Uno

Library installation

here are the steps to install the **ST7735** library from the Arduino Library Manager:

1 - Click on the "Sketch" menu and select "Include Library" -> "Manage Libraries".

3- In the Library Manager, search for "**Adafruit ST7735**" using the search bar at the top of the window.

4- Select the **Adafruit ST7735 and ST7789** library from the search results.

5- Click the "**Install ALL**" button to install the library.

6- Wait for the installation to complete.

7- When the installation is finished, you should see a message indicating that the library was successfully installed in the bottom console.

```
#include <Adafruit_GFX.h>    // Core graphics library
#include <Adafruit_ST7735.h> // Hardware-specific library for ST7735
#include <SPI.h>

#define TFT_CS     10
#define TFT_RST    8
#define TFT_DC     9

Adafruit_ST7735 tft = Adafruit_ST7735(TFT_CS, TFT_DC, TFT_RST);
void setup(void)
{
  Serial.begin(9600);
  Serial.print(F("init 1.8 tft screen"));

  tft.initR(INITR_BLACKTAB);      // Init ST7735S chip, black tab
  Serial.println(F("Initialized"));

  tft.fillScreen(ST77XX_BLACK);
  drawtext("Hello! from \n AZ-delivery", ST77XX_RED);
  delay(1000);

  fillScreenBlink(ST77XX_WHITE, ST77XX_RED);
  delay(500);

  Serial.println("done");
  delay(1000);
}

void loop() {
  tft.invertDisplay(true);
  delay(500);
  tft.invertDisplay(false);
  delay(500);
}

void drawtext(char *text, uint16_t color) {
```

```
  tft.setCursor(0, 50);
  tft.setTextColor(color);
  tft.setTextSize(2);
  tft.setTextWrap(true);
  tft.print(text);
}
void fillScreenBlink(uint16_t color1, uint16_t color2) {
  tft.fillScreen(color1);
  delay(1000);
  tft.fillScreen(color2);
}
```

How the code Works :

This code sets up The necessary libraries for graphics and hardware-specific functions are included at the beginning of the code.

The pins used to communicate with the display (TFT_CS, TFT_RST, TFT_DC) are defined, and an instance of the Adafruit_ST7735 class is created using these pins.

The **setup**() function initializes the serial communication and the display, clears the screen with black color, and prints "hello from AZ-DELIVERY" in red color using the **drawtext**() function, after that screen will blink in white and red.

The **loop**() function repeatedly inverts the display with a delay of 500ms, creating a blinking effect.

The **drawtext**() function sets the cursor position to (0,0) and prints the input string in the specified color.

Setting up the Raspberry Pi and Python

For the Raspberry Pi, the operating system must first be installed, then everything must be set up so that it can be used in headless mode. Headless mode allows remote connection to the Raspberry Pi without the need for a PC screen monitor, mouse or keyboard. The only things used in this mode are the Raspberry Pi itself, power supply and internet connection. All this is explained in detail in the free eBook:

[Raspberry Pi Quick Startup Guide](#)

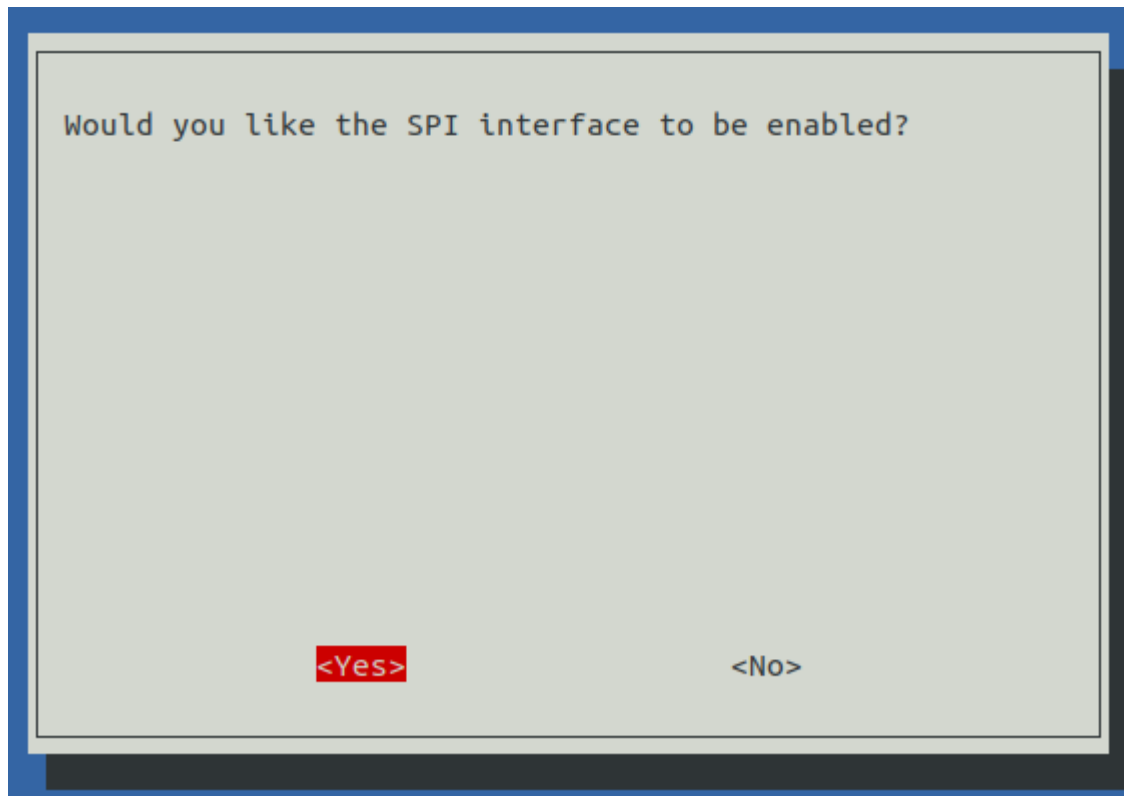Python is preinstalled on the Raspberry Pi OS.

Circuit Connection
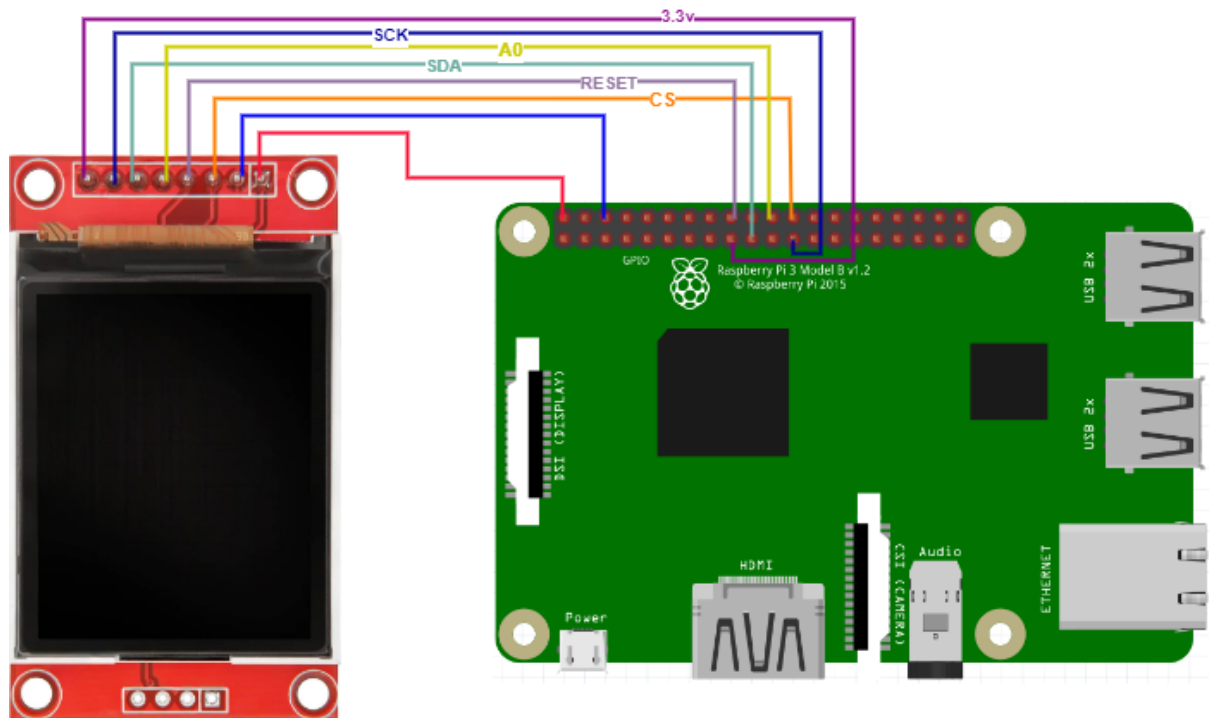
connections:

Display Module	Raspberry
VCC	3.3V
GND	GND
CS	GPIO 8 - CE0
RESET	GPIO 24
A0	GPIO 25
SDA	GPIO 10
SCK	GPIO 11 - SCLK
LED	3.3 V

Enable SPI

Open terminal, use command to enter the configuration page

```
sudo raspi-config
Choose Interfacing Options -> SPI -> Yes  to enable SPI interface
```


Library Installation

1 - install ST7789 Library

sudo python3 -m pip install st7735

2 - install Dependencies

sudo python3 -m pip install RPi.GPIO spidev Pillow numpy

Python Example

```python
from PIL import Image
from PIL import ImageDraw
from PIL import ImageFont

import ST7735

disp = ST7735.ST7735(port=0, cs=0, dc=25, backlight=None,
rst=24, width=128, height=160, rotation=0, invert=False)

WIDTH = disp.width
HEIGHT = disp.height

img = Image.new('RGB', (WIDTH, HEIGHT))
draw = ImageDraw.Draw(img)

# Load default font.
font = ImageFont.load_default()

# Write some text
draw.text((5, 5), "Hello from AZ-delivery!", font=font,
fill=(255, 255, 255))


# display!
disp.display(img)
```

Circuit in Action :

```
pi@raspberry:~ $ touch  st7735.py
// copy code content into st7735.py

pi@raspberry:~ $ sudo python3 st7735.py
```

You've done it, you can now use your module for your projects :)

Now it is time to learn and make the Projects on your own. You can do that with the help of many example scripts and other tutorials, which you can find on the internet.

If you are looking for the high quality microelectronics and accessories, AZ-Delivery Vertriebs GmbH is the right company to get them from. You will be provided with numerous application examples, full installation guides, eBooks, libraries and assistance from our technical experts.

https://az-delivery.de

Have fun!

Impressum

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