e-book

2,9" E-Paper Display

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Description

The E-paper screen module works via the SPI interface and can also communicate with MCUs with a voltage level of 3.3V or 5V. The E-paper display consumes very little electricity, so you only need the electricity if you update it.

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

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Features

Type	2.9" E-Paper Display
Dimensions	89.0 × 45.0 × 8.9 mm
Weight	66 g
Operating voltage	3.3V/5V
Interface	3-wire SPI, 4-wire SPI
Display size	66.89 mm × 29.05 mm
Point distance	0.138 × 0.138
Resolution	296 × 128 pixels
Pins	8

Details:

- **Deport of:** black, white, red
- **Gray level:** 2
- **Partly refresher time:** 0.3s
- **Full refresher time:** 2s
- **Refreshing performance:** 26.4mW (type.)
- **Standby performance:** $<$ 0.017mw
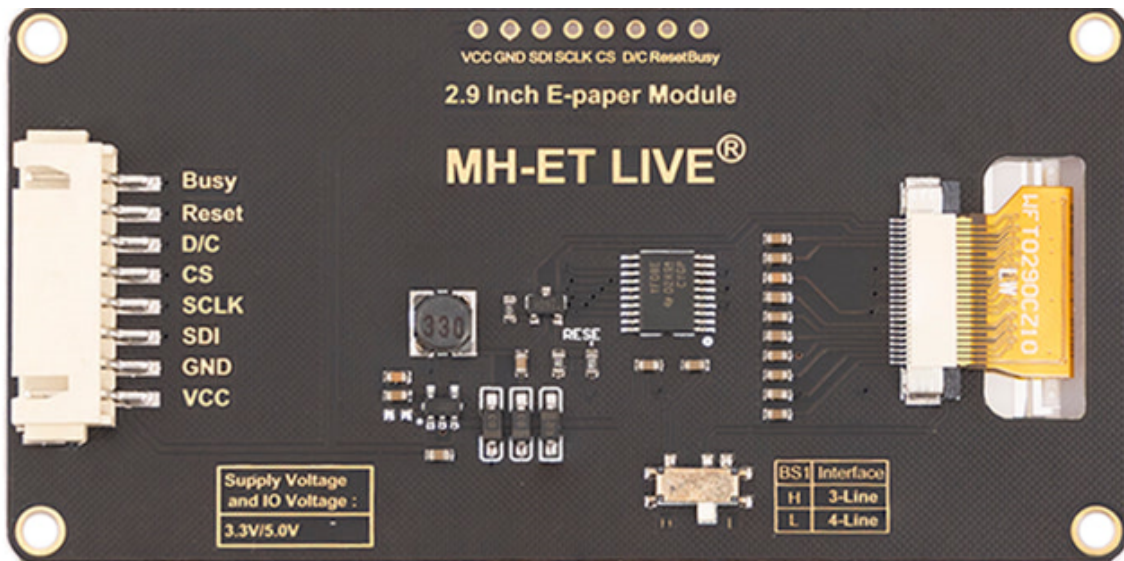- **Consideration angle:** $>$ 170 °C

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Applications Examples

- Suitable For Price Tags
- Asset/Equipment Tags
- Shelf Labels
- Conference Name Tags

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Hardware Overview

Pinout

Pin name	Description
Vcc	5v Power pin
GND	Ground pin
SDI	SPI MOSI pin
SCLK	SPI SCK pin (SPI communication clock)
CS	chip select pin, when CS is low, the chip is enabled
D/C	data/command control pin, write command when DC=0; write data when DC=1
Reset	External reset, low active
Busy	Busy status output, high active

How 2.9" E-Paper Display Works

This product is an E-paper device adopting the image display technology of Microencapsulated Electrophoretic Display, MED. The initial approach is to create tiny spheres, in which the charged color pigments are suspended in the transparent oil and would move depending on the electronic charge. The E-paper screen displays patterns by reflecting the ambient light, so it has no background light requirement. Under ambient light, the E-paper screen still has high visibility with a wide viewing angle of 180 degrees. It is the ideal choice for E-reading. (Note that the e-Paper cannot support updating directly under sunlight)

Pixel and Byte:

We define the pixels in a monochrome picture, 0 is black and 1 is white.

White: □: Bit 1

Black: ■: Bit 0

- The dot in the figure is called a pixel. As we know, 1 and 0 are used to define the color, therefore we can use one bit to define the color of one pixel, and 1 byte = 8 pixels
- For example, If we set the first 8 pixels to black and the last 8 pixels to white, we show it by codes, they will be 16 bit as below:

Pixel	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bit	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Color	■	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□

For computer, the data is saved in MSB format:

| Pixel	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Index	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Color	■	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□
Byte	0x00								0xFF							

So we can use two bytes for 16 pixels.

How to Use a 2.9" E-Paper Display

The uses of this product are very simple. In this section of this article, we will discuss how we can hook up an E-paper screen module and work with it, so firstly we need a setup which described below:

Test with Microcontroller:

Setup for Development environment, we need:

-   **Microcontroller ATmega328**
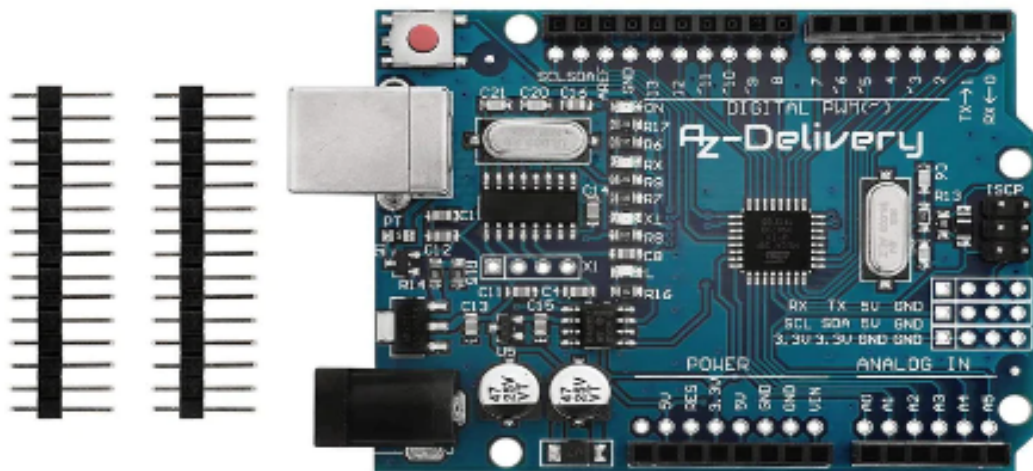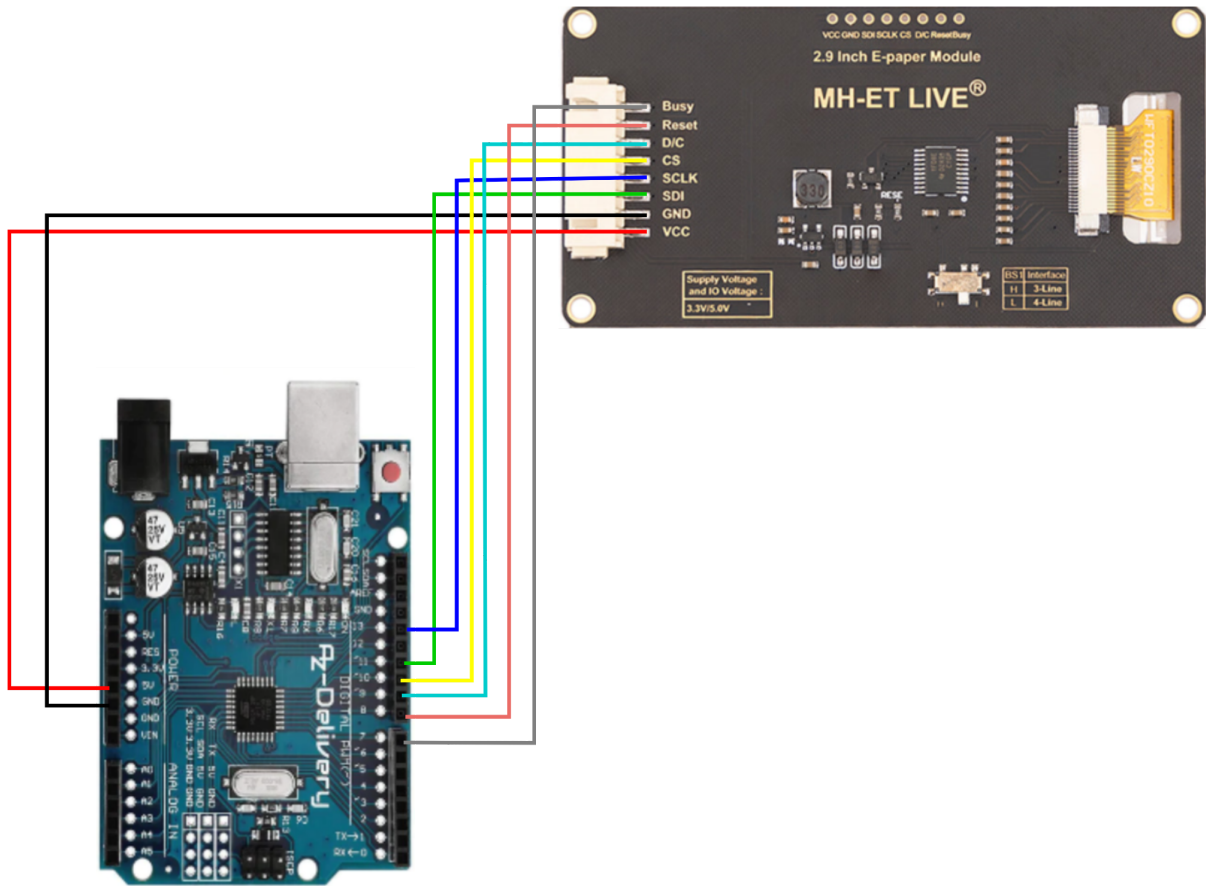

-   **Jumper wires**

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Connection diagram Microcontroller

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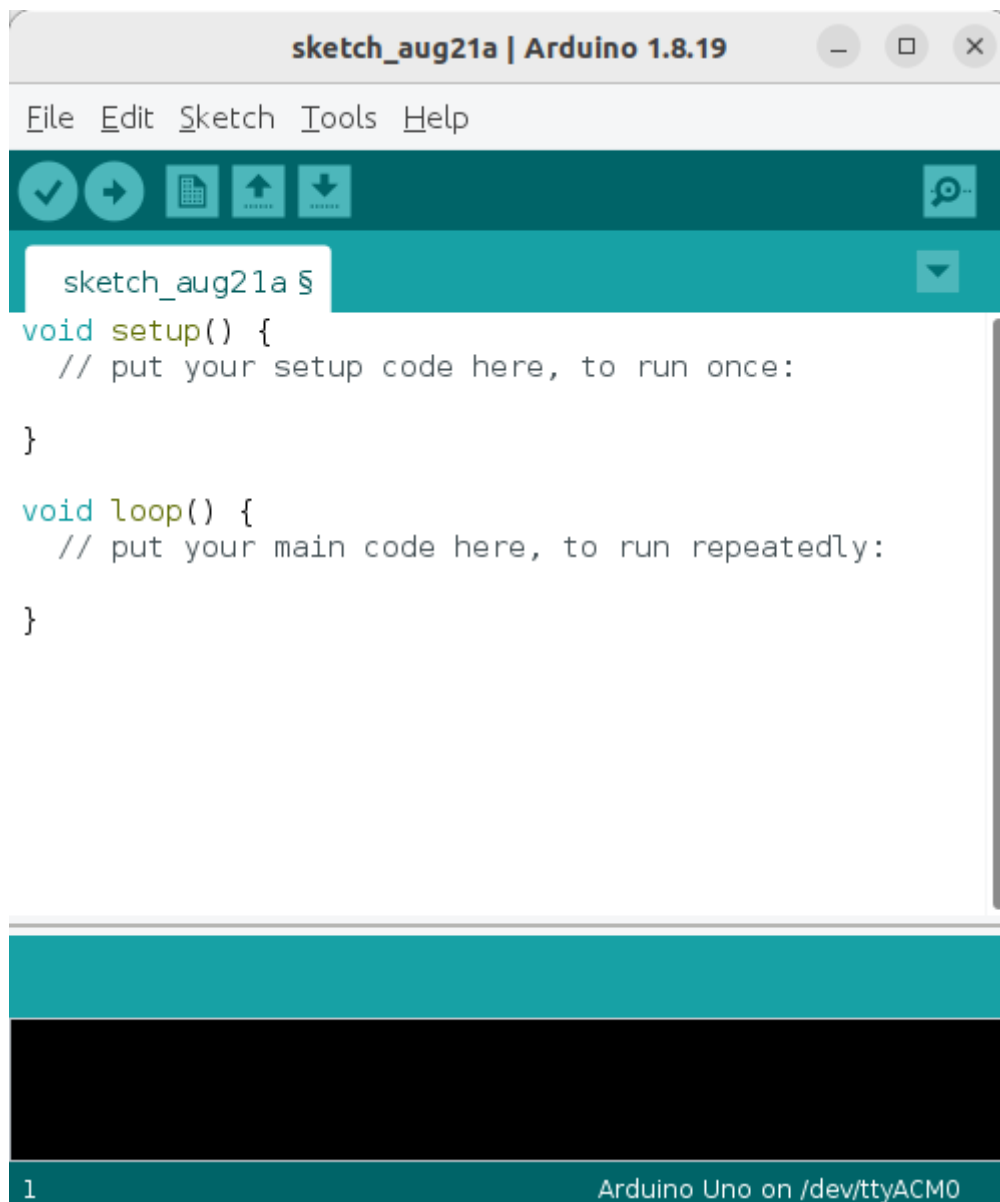
Microcontroller connection pin correspondence:

E-paper pin	Microcontroller PIN
GND	GND
VCC	5V
SDI	D11
SCLK	D13
CS	D10
D/C	D9
RST	D8
BUSY	D7

Software installation

Install Arduino IDE from this link :

https://www.arduino.cc/en/Main/Software Just find your operating system, download it and install it. When you install it and open the app, this will be the starting window.

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here are the steps to install the gxEPD2 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 "gxEPD2" using the search bar at the top of the window.

4- Select the gxEPD2 library from the search results.

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

6- Wait for the installation to complete.

7- The installation is finished, you should see a message indicating that the library was successfully installed.
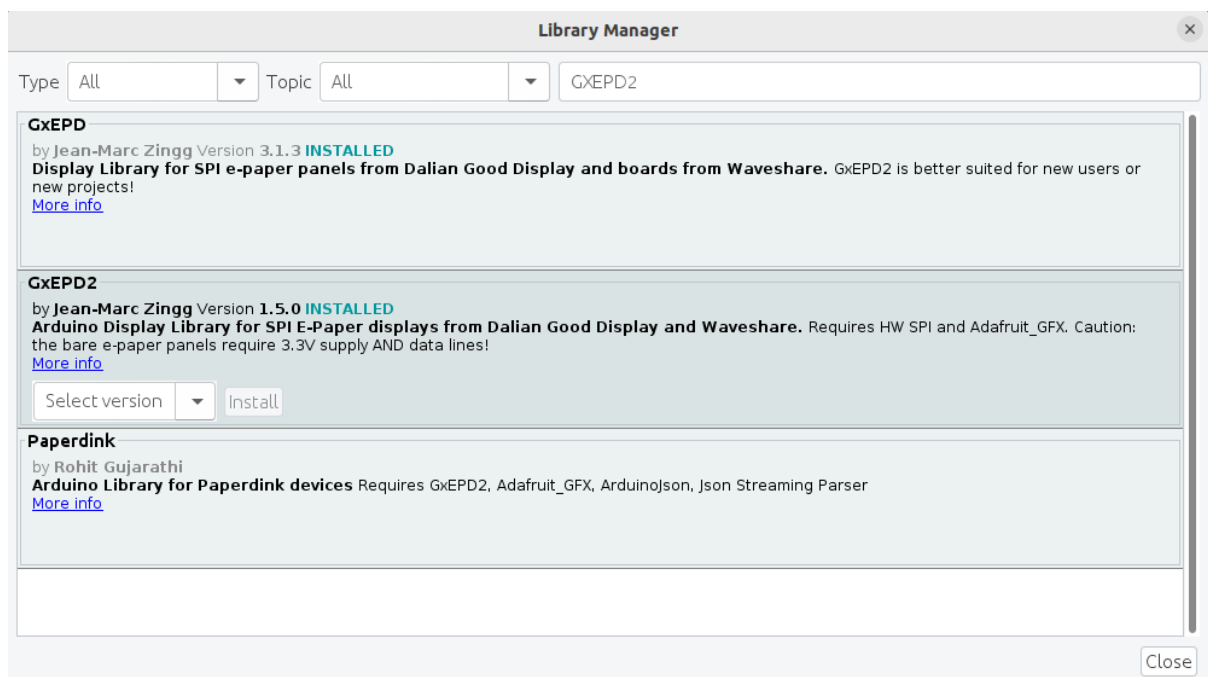
Arduino Sketch

Upload the following code to Arduino IDE:

```cpp
#include <GxEPD2_3C.h>
#include <Fonts/FreeMonoBold9pt7b.h>
#define EPD_SS   10
#define EPD_DC    9
#define EPD_RST   8
#define EPD_BUSY 7
#define MAX_DISPLAY_BUFFER_SIZE 800
#define MAX_HEIGHT(EPD) (EPD::HEIGHT <= (MAX_DISPLAY_BUFFER_SIZE / 2)
/ (EPD::WIDTH / 8) ? EPD::HEIGHT : (MAX_DISPLAY_BUFFER_SIZE / 2) /
(EPD::WIDTH / 8))


GxEPD2_3C<GxEPD2_290_C90c, MAX_HEIGHT(GxEPD2_290_C90c)>
display(GxEPD2_290_C90c(EPD_SS, EPD_DC, EPD_RST, EPD_BUSY));


void setup()
{
 display.init(115200);
 helloWorld();
 display.hibernate();
}


const char HelloWorld[] = "Hello from az-delivery!";
void helloWorld()
{
 display.setRotation(1);
 display.setFont(&FreeMonoBold9pt7b);
 display.setTextColor(GxEPD_BLACK);
 int16_t tbx, tby; uint16_t tbw, tbh;
 display.getTextBounds(HelloWorld, 0, 0, &tbx, &tby, &tbw, &tbh);
 // center the bounding box by transposition of the origin:
 uint16_t x = ((display.width() - tbw) / 2) - tbx;
 uint16_t y = ((display.height() - tbh) / 2) - tby;
 display.setFullWindow();
 display.firstPage();
 do
 {
   display.fillScreen(GxEPD_WHITE);
```

```
    display.setCursor(x, y);
    display.print(HelloWorld);
  }
  while (display.nextPage());
}


void loop() {};
```

Code Explication:

This code initializes a 2.9 inch e-paper display using the GxEPD2_3C library and displays the message "Hello from az-delivery!" in the center of the display.

The code first defines some pin configurations for the e-paper display and creates an instance of the GxEPD2_3C class with a specified e-paper model (GxEPD2_290_C90c) and maximum display buffer size.

In the setup() function, the e-paper display is initialized with a baud rate of 115200 and the helloWorld() function is called to display the message. Finally, the display is put in hibernation mode to save power.

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

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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.

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Have Fun!

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