WAVESHARE
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e-Paper Driver HAT

User Manual

Revision History

Version	Content	Date	Page
V1.0.0	New creation	2024/6/6	All

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1. OVERVIEW

This product is an e-Paper driver HAT, which can drive multiple e-Paper HATs with SPI interfaces designed by Waveshare.

1.1 FEATURES

- ✧ Standard Raspberry Pi 40PIN GPIO extension header, supports Raspberry Pi series boards, Jetson Nano.
- ✧ SPI interface, for connecting with other controller boards like Raspberry/Arduino/Nucleo, etc.
- ✧ Comes with online development resources and manual (examples for Raspberry Pi/Jetson Nano/Arduino/STM32).

1.2 PRODUCT PARAMETERS

Parameter	Specification	Unit
Operating Voltage	3.3	V
Communication Interface	3-wire SPI, 4-wire SPI	
Outline Dimension	65 × 30.2	mm
Mounting Hole Size	3.0	mm

1.3 INTERFACE SPECIFICATION

NO.	Name	Description
1	VCC	3.3V
2	GND	Ground
3	DIN	SPI MOSI pin
4	CLK	SPI SCK pin
5	CS	SPI chip selection pin, low active
6	DC	Data/Command control pin (high for data, low for command)
7	RST	External reset pin, low active
8	BUSY	Busy status output pin, low active

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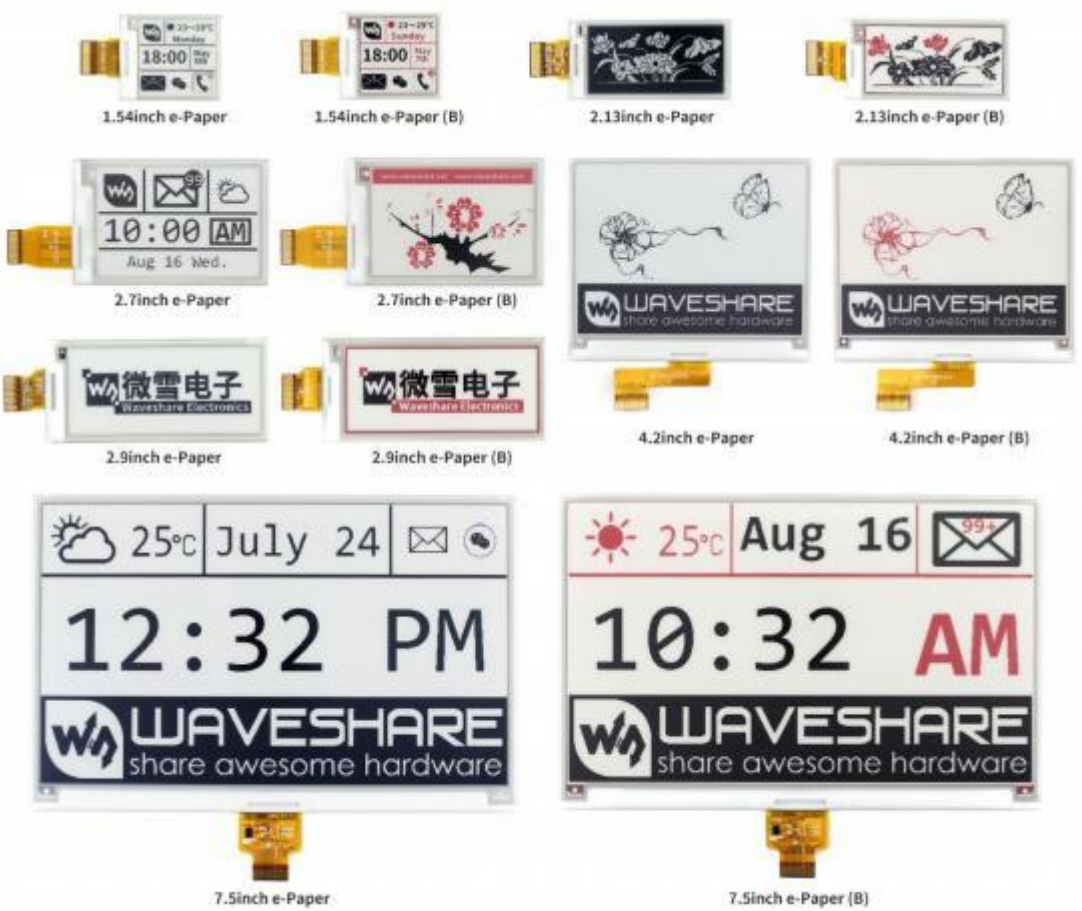
1.4 SUPPORTED E-PAPER MODELS

Model	Colors	Grey Scale	Resolution	Display Size (mm)	Outline Dimension (mm)	Refresh Time (s)	Partial Refresh	Control Interface
1.54inch e-Paper	black, white	2	200x200	27.60×27.60	37.3 ×31.8	2	√	SPI
1.54inch e-Paper (B)	red, black, white	2	200x200	27.60×27.60	37.3 ×31.8	8	×	SPI
2.13inch e-Paper	black, white	2	250x122	48.55×23.71	59.2 ×29.2	2	√	SPI
2.13inch e-Paper (B)	red, black, white	2	212x104	48.55×23.71	59.2 ×29.2	15	×	SPI
2.7inch e-Paper	black, white	2	264x176	57.29×38.19	70.4 ×45.8	6	×	SPI
2.7inch e-Paper (B)	red, black, white	2	264x176	57.29×38.19	70.4 ×45.8	15	×	SPI
2.9inch e-Paper	black, white	2	296x128	66.89×29.05	79.0 ×36.7	2	√	SPI
2.9inch e-Paper (B)	red, black, white	2	296x128	66.89×29.05	79.0 ×36.7	15	×	SPI
4.2inch e-Paper	black, white	2	400x300	84.80×63.60	90.1 ×77.0	4	×	SPI
4.2inch e-Paper (B)	red, black, white	2	400x300	84.80×63.60	90.1 ×77.0	15	×	SPI
7.5inch e-Paper	black, white	2	640×384	163.20×97.92	170.2 ×111.2	6	×	SPI
7.5inch e-Paper (B)	red, black, white	2	640×384	163.20×97.92	170.2 ×111.2	31	×	SPI

Note: Refresh Time refers to the global refresh time, that is, the time used to refresh each frame of the image; If the e-paper HAT supports partial refresh, it takes about 0.3 seconds.

Please refer to the figure below for different models:



2. USAGE

2.1 SWITCH SETTING INTRODUCTION

As shown in the following figure, there are two toggle switches on the front of the e-Paper Driver HAT: Display Config and Interface Config. The following describes how to set the two switches.

2.1.1 DISPLAY CONFIG SETTINGS

The Display Config switch on the e-Paper Driver HAT is set to support driving multiple e-Paper HATs of Waveshare. The switch has two ends: A/B. When connecting different models of e-Paper HATs, the Display Config switch must be set in the following table:

B (If connected to the following models, the switch must be flipped to the B end)	A (If connected to the following models, the switch must be flipped to the A end)
1.54inch e-Paper (B)	1.54inch e-Paper
2.13inch e-Paper (B)	2.13inch e-Paper
2.7inch e-Paper	2.9inch e-Paper
2.7inch e-Paper (B)	
2.9inch e-Paper (B)	
4.2inch e-Paper	
4.2inch e-Paper (B)	
7.5inch e-Paper	
7.5inch e-Paper (B)	

2.1.2 INTERFACE CONFIG SETTINGS

The Interface Config switch can switch the e-Paper HAT to use 3-line SPI or 4-line SPI.

When the switch is flipped to 1, the module works in 3-line SPI;

When the switch is flipped to 0, the module works in 4-line SPI;

The example program uses 4-line SPI by default.

2.1.3 SETTING EXAMPLE

As shown in the following figure, when the driver board is used for "7.5inch e-Paper", the Display Config must be set to B; the Interface Config is set to 0, and the module works in 4-line SPI mode.

2.2 WORK WITH RASPBERRY PI

2.2.1 INSTALL NECESSARY LIBRARIES

When the e-Paper HAT works with the Raspberry Pi, you need to install the necessary libraries (WiringPi, bcm2835, python libraries), otherwise the following demo may not work properly.

2.2.2 HARDWARE CONNECTION

Hardware connection to development board Raspberry Pi (Raspberry Pi 3B):

e-Paper	Raspberry Pi 3B
3.3V	3.3V
GND	GND
DIN	MOSI
CLK	SCLK
CS	CE0
DC	25 (BCM)
RST	17 (BCM)
BUSY	24 (BCM)

2.2.3 EXPECTED RESULT

1) After installing the corresponding library, copy it to the Raspberry Pi and go to the corresponding directory:
   - bcm2835: Execute the command: make, which will compile the code and generate an execution file named epd. Execute the command: sudo./epd, and the demo will run.
   - Wiringpi: Execute the command: make, which will compile the code and generate an execution file named epd. Execute the command: sudo./epd, and the demo will run.
   - Python: Execute the command: sudo python main.py.
2) The screen will display the image.

Note: The module refreshes slowly and blinks several times during the refreshing process. Please wait patiently.

2.3 WORK WITH ARDUINO

2.3.1 HARDWARE CONNECTION

Hardware connection to development board UNO PLUS:

e-Paper	Arduino
3.3V	3.3V
GND	GND
DIN	D11
CLK	D13
CS	D10
DC	D9
RST	D8
BUSY	D7

2.3.2 EXPECTED RESULT

1) Copy the files from the arduino/libraries directory in the sample package to documents/arduino/libraries, this location can be specified by clicking “ArduinoIDE”→ “File”→ “Preferences”→ “Sketchbook location”.
2) Click “Upload" to upload the project.
3) The screen will display the image.

Note:

- **The module refreshes slowly and blinks several times during the refreshing process. Please wait patiently.**
- **The RAM of the Arduino UNO is only 2K, and the module requires at least 30720 bytes of memory to fully update 1 frame of an image, and it cannot be partially refreshed (that is, it cannot refresh a partial image multiple times to fully update a frame of an image). Therefore, only the still image display program for Arduino is provided.**

2.4 WORK WITH STM32

- The NUCLEO-F103RB is used as the demo development board for three e-Paper HATs, 1.54 inch/2.13 inch/2.9 inch e-Paper HATs, other types of e-Paper HAT with STM32F103ZE.
- The demo is based on the HAL library, so the sample program can be ported to other STM chips using the STM32CubeMX.
- The demo is compiled in the Keilv5 environment.

2.4.1 HARDWARE CONNECTION

If the development board used in the demo is STM32F103ZE, the hardware connection is as follows:

e-Paper	STM32F103ZE
3.3V	3.3V
GND	GND
DIN	PA7 (MOSI)
CLK	PA5 (SCK)
CS	PA4
BUSY	PA3
DC	PA2
RST	PA1

If the development board used in the demo is NUCLEO-F103RB, the hardware connection is as follows:

e-Paper	NUCLEO-F103RB
3.3V	3.3V
GND	GND
DIN	PA7
CLK	PA5
CS	PB6
BUSY	PA8
DC	PC7
RST	PA9

2.4.2 EXPECTED RESULT

1) Open the Keil project (epd-demo.uvprojx) in the MDK-ARM directory.
2) Click “Build” to compile the project.
3) Click “Download” to write the project to the chip.
4) After the development board is reset, the screen displays the image.

Note: The module refreshes slowly and blinks several times during the refreshing process. Please wait patiently.