

2.13inch e-Paper HAT

Note: The raw panel require a driver board, If you are the first time use this e-Paper, we recommend you to buy the HAT version or buy more one driver hat for easy use, otherwise you need to make the driver board yourself. And this instruction is based on the version with PCB or driver board. 250x122, 2.13inch E-Ink display HAT for Raspberry Pi, SPI interface.

Versions

The 2.13inch e-Paper have updated to v2 version. The controller of 2.13inch e-Paper v2 is different with the old version. Demo code is updated, and it is not compatible with the old version.

Please check which version of e-paper do you get before you download demo codes. The e-Paper which has v2 sticker is new version.

Interfaces

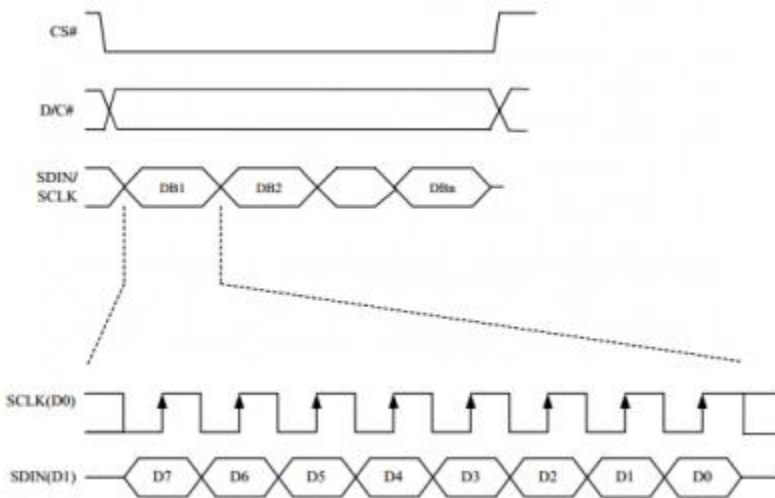
VCC	3.3V
GND	GND
DIN	SPI MOSI
CLK	SPI SCK
CS	SPI chip select (Low active)
DC	Data/Command control pin (High for data, and low for command)
RST	External reset pin (Low for reset)
BUSY	Busy state output pin (Low for busy)

Working principle

Introduction

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 suspending in the transparent oil and would move depending on the electronic charge. The E-paper screen display patterns by reflecting the ambient light, so it has no background light requirement. **(Note that the e-Paper cannot support updating directly under sunlight)**

Communication protocol



Note: Different from the traditional SPI protocol, the data line from the slave to the master is hidden since the device only has display requirement.

- CS is slave chip select, when CS is low, the chip is enabled.
- DC is data/command control pin, when DC = 0, write command, when DC = 1, write data.
- SCLK is the SPI communication clock.
- SDIN is the data line from the master to the slave in SPI communication.

SPI communication has data transfer timing, which is combined by CPHA and CPOL.

1. CPOL determines the level of the serial synchronous clock at idle state. When CPOL = 0, the level is Low. However, CPOL has little effect to the transmission.
 2. CPHA determines whether data is collected at the first clock edge or at the second clock edge of serial synchronous clock; when CPHL = 0, data is collected at the first clock edge.
- There are 4 SPI communication modes. SPI0 is commonly used, in which CPHL = 0, CPOL = 0.

As you can see from the figure above, data transmission starts at the first falling edge of SCLK, and 8 bits of data are transferred in one clock cycle. In here, SPI0 is in used, and data is transferred by bits, MSB first.

- [Instruction about make new font](#)
- [Make BMP file for e-Paper](#)
- [Schematic](#)

Demo code

- [Demo code\(Purchase before April 26, 2019\)](#)
- [Demo code V2\(Purchased after April 26, 2019, the V2 logo is attached to the screen.\)](#)
- [Github](#)

Demo video

- [2.13inch e-paper Demo video](#)

Datasheets

- [1.54inch e-Paper Datasheet.pdf](#)
- [2.13inch e-Paper Datasheet.pdf](#)
- [2.9inch e-Paper Datasheet.pdf](#)

Datasheet for V2 version

- [2.13inch e-Paper Specification](#)

Related Resources

- [Waveshare e-Paper display with SPI](#)
- [Pisugar case](#)