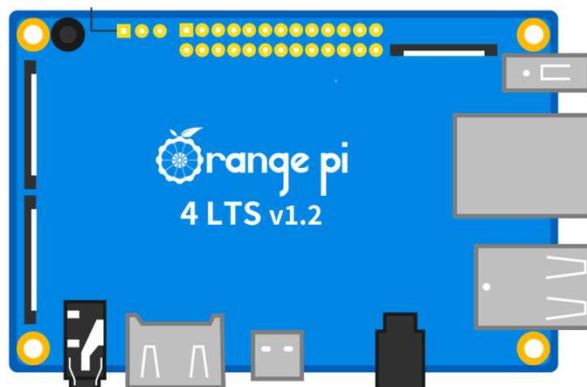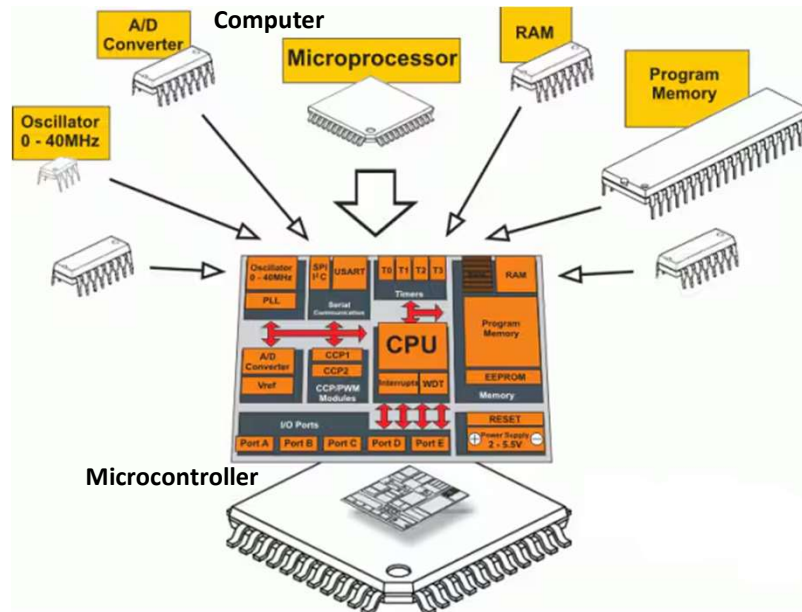SEMTRON

ONE

Robot Controller

1

SEMTRON

Orange Pi 4
Single Board Computer (SBC)

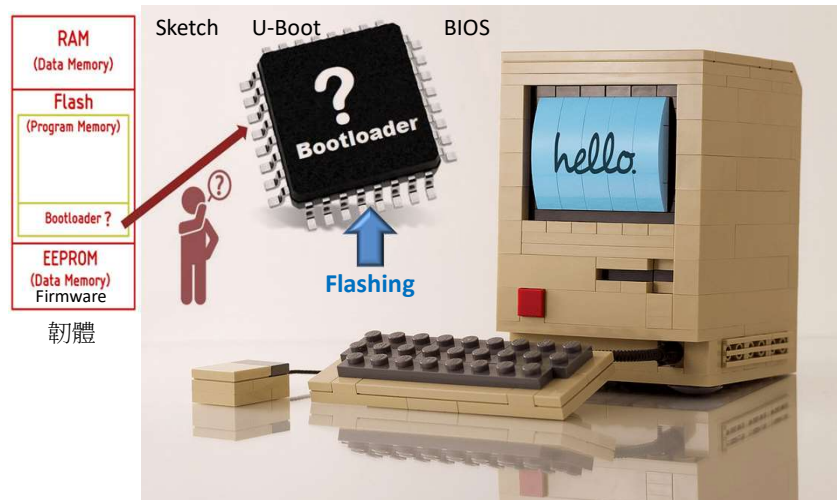https://drive.usercontent.google.com/download?id=1YaltDXzO7pPBJ0BSmT3iMr6phdwMxg4j
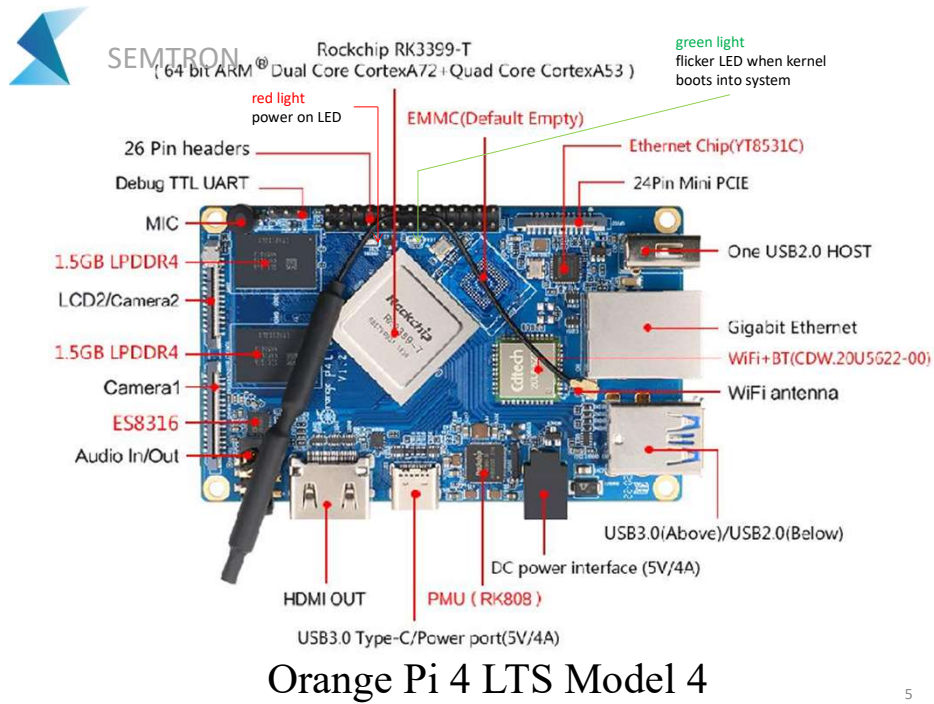http://www.orangepi.cn/orangepiwiki/index.php/Orange_Pi_4_LTS
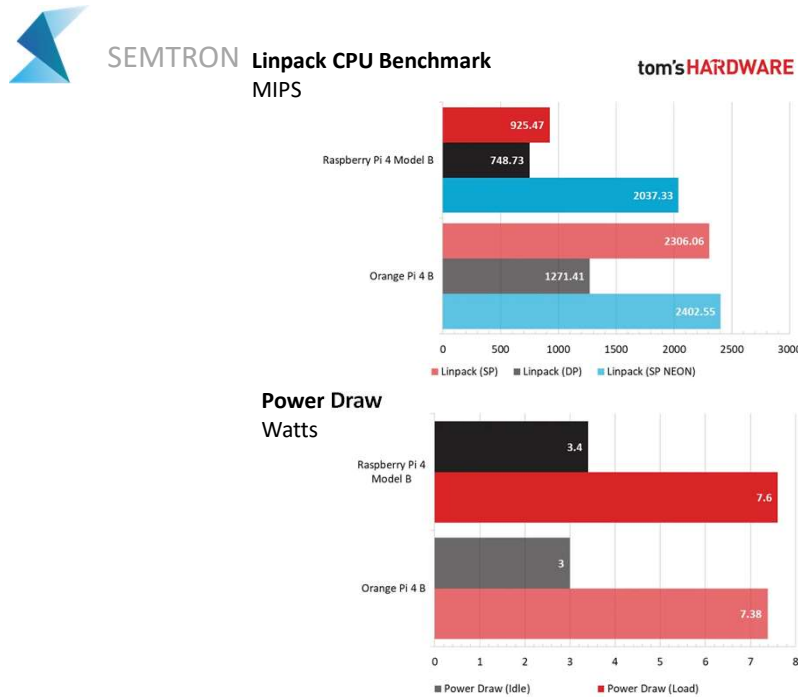
2

Computer and microcontroller

3

SEMTRON

Computer and microcontroller

4

Orange Pi 4 LTS Model 4

Linpack CPU Benchmark
MIPS

Power Draw
Watts

SEMTRON

GND RXD TXD   TTL UART

Connect with Dupont wire

电脑

USB接口

Orange Pi 开发板

TXD
RXD   调试串口
GND

TXD
RXD
GND

https://mobaxterm.mobatek.net/
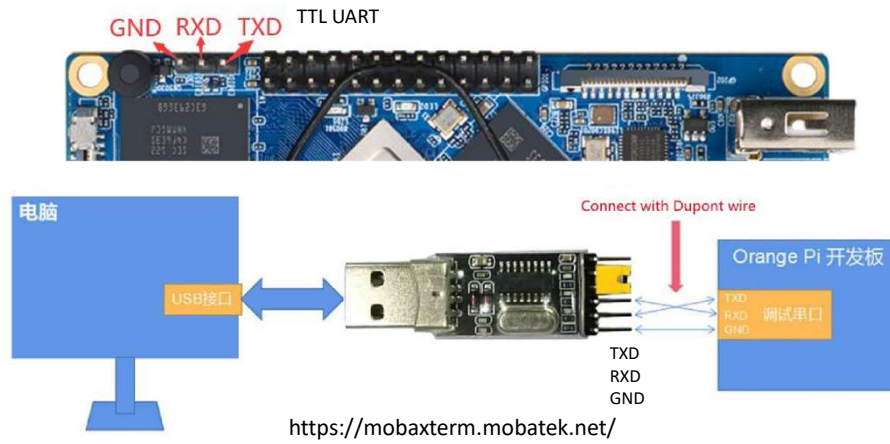
Schematic diagram of connecting the USB to TTL module to the computer and the Orange Pi development board

Connecting SBC via terminal access

7

MobaXterm
1. Select the session to open the session settings interface
Terminal Sessions View X server Tools Games Settings Macros Help

Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help

Quick connect...

Session settings

SSH Telnet Rsh Xdmcp RDP VNC FTP SFTP Serial File Shell Browser Mosh Aws S3 WSL

2. Select the serial port

Basic Serial settings

Serial port * Choose at session start   Speed (bps) * 1500000

Choose at session start
COM3 (Silicon Labs CP210x USB to UART Bridge

Advanced Serial settings   Terminal settings   Bookmark settings

3. Select the port number of the serial port   4. Select the baud rate as 1500000
(USB SERIAL CH340)

Serial (COM) session

5. Finally click OK

OK   Cancel

UNREGIS   8

4

SEMTRON

orangepi4-lts login: orangepi
Password: orangepi

```
COM15 - PuTTY                                                    —  □  ×
            Starting Update UTMP about System Runlevel Changes...
[  OK  ] Started Update UTMP about System Runlevel Changes.
[  22.626292] ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready

Debian GNU/Linux 8 orangepilite ttyS0

orangepilite login: root
Password:
Linux orangepilite 3.4.113-sun8i #6 SMP PREEMPT Fri Jan 20 22:09:45 CET 2017 arm
v7l

  ___                          ___  _  _     _
 / _ \ _ __ __ _ _ __   __ _ / _ \(_)| |   (_) |_ ___
| | | | '__/ _` | '_ \ / _` | |_) | || |   | | __/ _ \
| |_| | | | (_| | | | | (_| |  __/| || |___| | ||  __/
 \___/|_|  \__,_|_| |_|\__, |_|   |_||_____|_|\__\___|
                       |___/

Welcome to ARMBIAN 5.24 stable Debian GNU/Linux 8 (jessie) 3.4.113-sun8i
System load:   0.52            Up time:       49 sec
Memory usage:  9 % of 494Mb    IP:            10.0.0.3
CPU temp:      32°C
Usage of /:    14% of 7.2G

root@orangepilite:~#
```

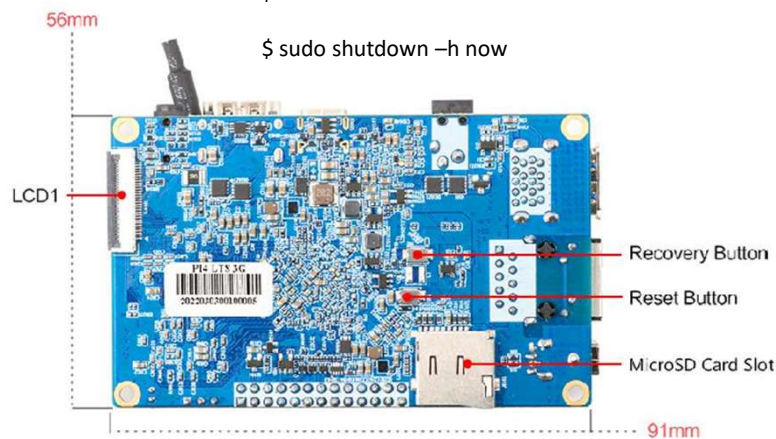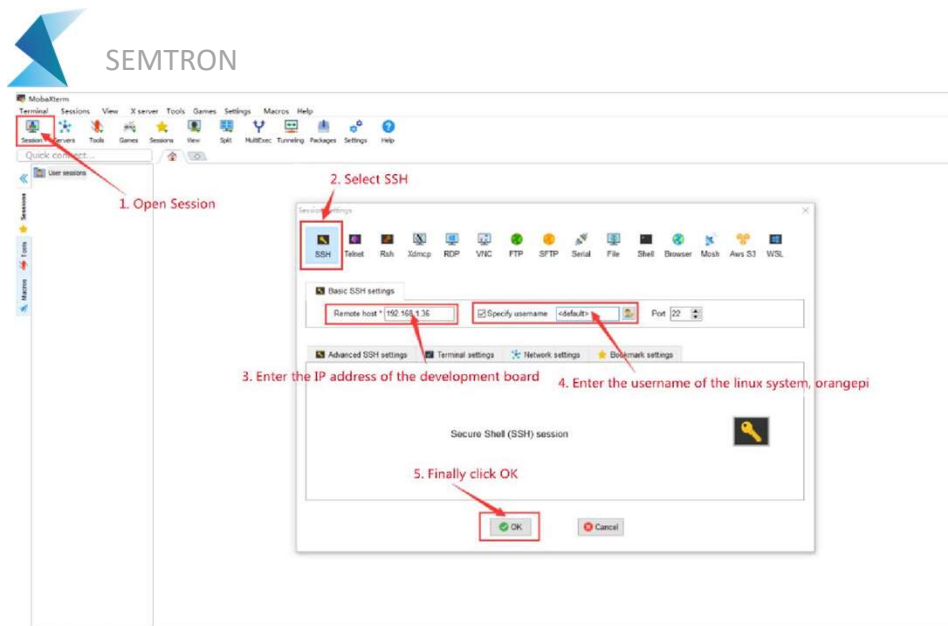Connecting SBC via terminal access

9

SEMTRON

$ nmcli dev wifi
$ nmcli dev wifi connect *wifi_name* password *wifi_passwd*
$ ip addr show wlan0
$ exit

$ sudo shutdown –h now

56mm

LCD1 —

PI4 LTS 3G
20220202001000005

Recovery Button
Reset Button
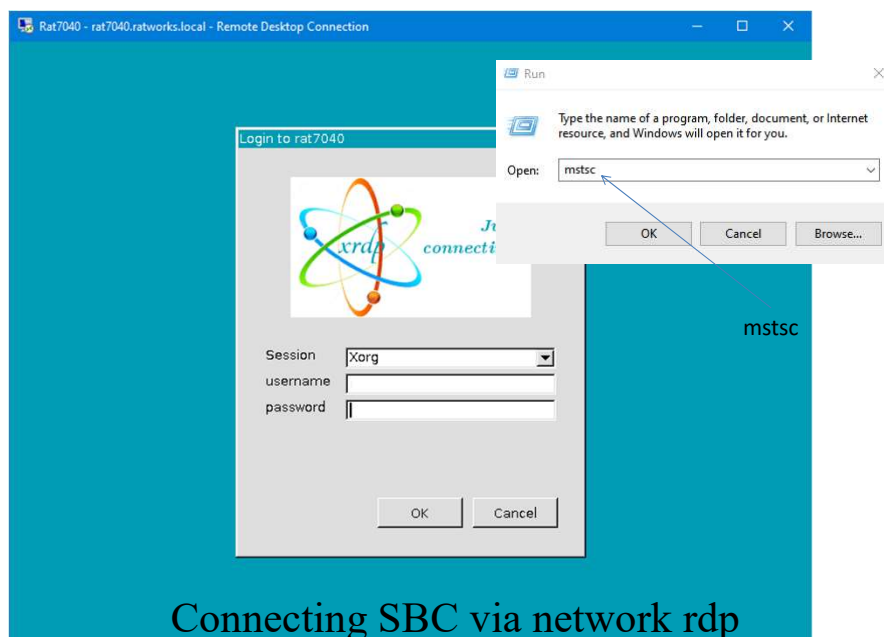MicroSD Card Slot

91mm

Connecting SBC via WiFi

10

5

Connecting SBC via network ssh

11

Connecting SBC via network rdp

12

SEMTRON

SPI/IIC Robotic Displays


13

26-pin header

SBC pin header

14

SEMTRON
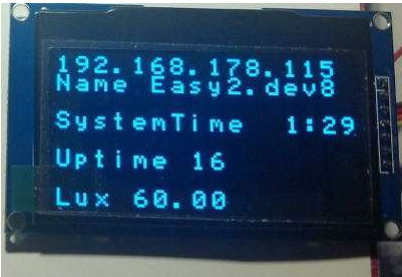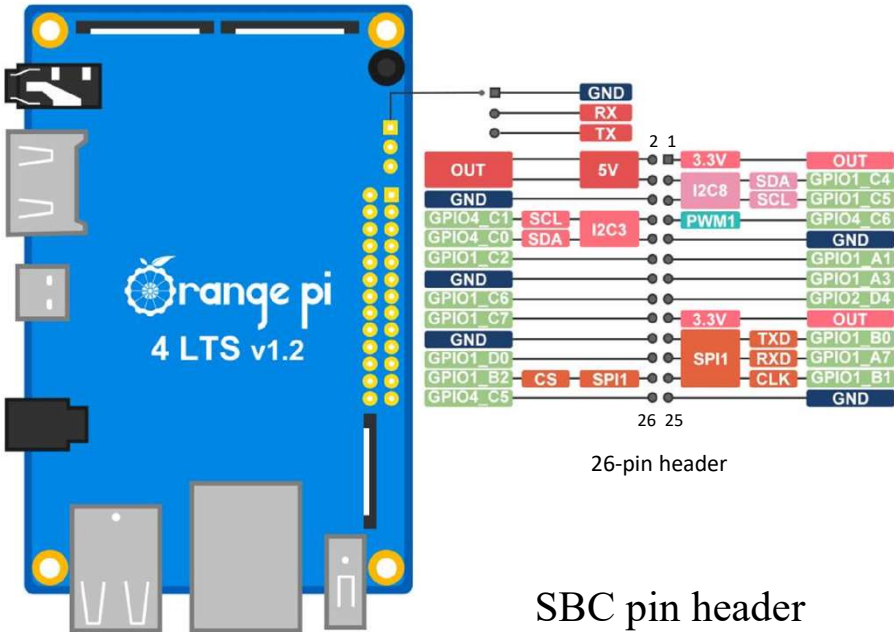
$ gpio readall

```
+------+-----+----------+--------+---+ OPi 4 LTS+---+--------+----------+-----+------+
| GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  |   Name   | wPi | GPIO |
+------+-----+----------+--------+---+----++-----+---+--------+----------+-----+------+
|      |     |     3.3V |        |   |  1 || 2  |   |        | 5V       |     |      |
|   64 |   0 | I2C8_SDA |  ALT2  | 1 |  3 || 4  |   |        | 5V       |     |      |
|   65 |   1 | I2C8_SCL |  ALT2  | 1 |  5 || 6  |   |        | GND      |     |      |
|  150 |   2 |     PWM1 |   IN   | 0 |  7 || 8  | 1 |  ALT2  | I2C3_SCL | 3   | 145  |
|      |     |      GND |        |   |  9 || 10 | 1 |  ALT2  | I2C3_SDA | 4   | 144  |
|   33 |   5 | GPIO1_A1 |   IN   | 0 | 11 || 12 | 1 |  IN    | GPIO1_C2 | 6   | 50   |
|   35 |   7 | GPIO1_A3 |  OUT   | 1 | 13 || 14 |   |        | GND      |     |      |
|   92 |   8 | GPIO2_D4 |   IN   | 0 | 15 || 16 | 0 |  IN    | GPIO1_C6 | 9   | 54   |
|      |     |     3.3V |        |   | 17 || 18 | 0 |  IN    | GPIO1_C7 | 10  | 55   |
|   40 |  11 | SPI1_TXD |  ALT3  | 0 | 19 || 20 |   |        | GND      |     |      |
|   39 |  12 | SPI1_RXD |  ALT3  | 1 | 21 || 22 | 0 |  IN    | GPIO1_D0 | 13  | 56   |
|   41 |  14 | SPI1_CLK |  ALT3  | 1 | 23 || 24 | 1 |  ALT3  | SPI1_CS  | 15  | 42   |
|      |     |      GND |        |   | 25 || 26 | 0 |  IN    | GPIO4_C5 | 16  | 149  |
+------+-----+----------+--------+---+----++-----+---+--------+----------+-----+------+
| GPIO | wPi |   Name   |  Mode  | V | Physical | V |  Mode  |   Name   | wPi | GPIO |
+------+-----+----------+--------+---+ OPi 4 LTS+---+--------+----------+-----+------+
```

Pin header GPIO

15

SEMTRON

Pin header GPIO

16
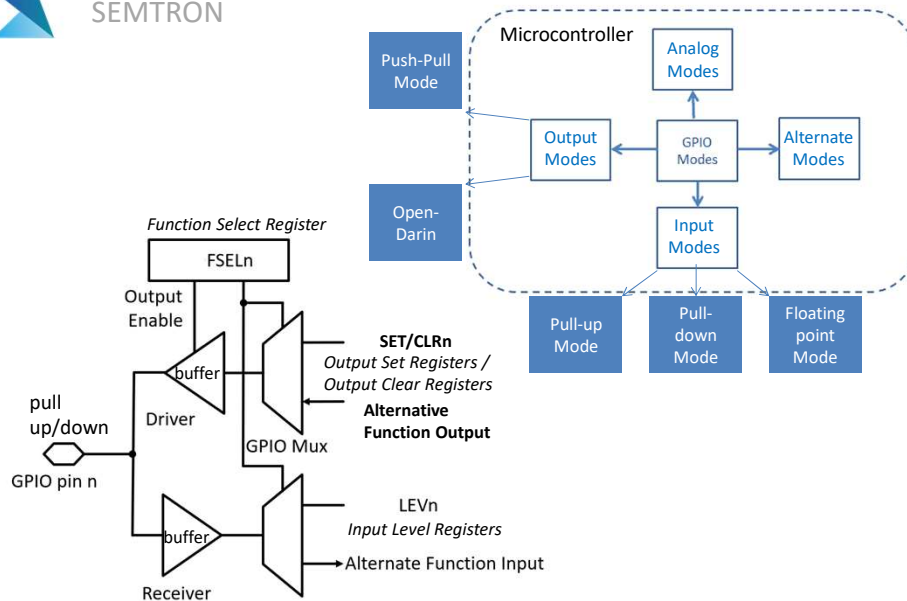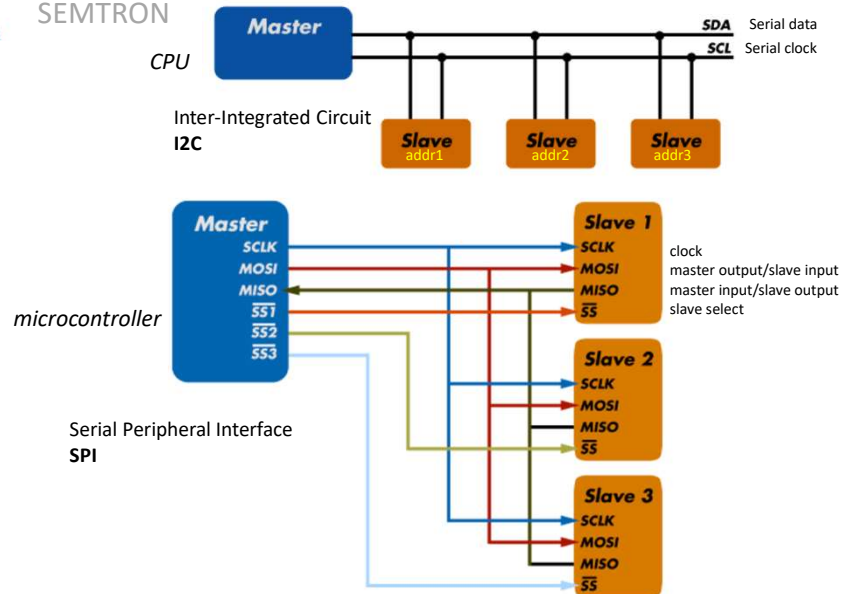
GPIO emulate IIC and SPI
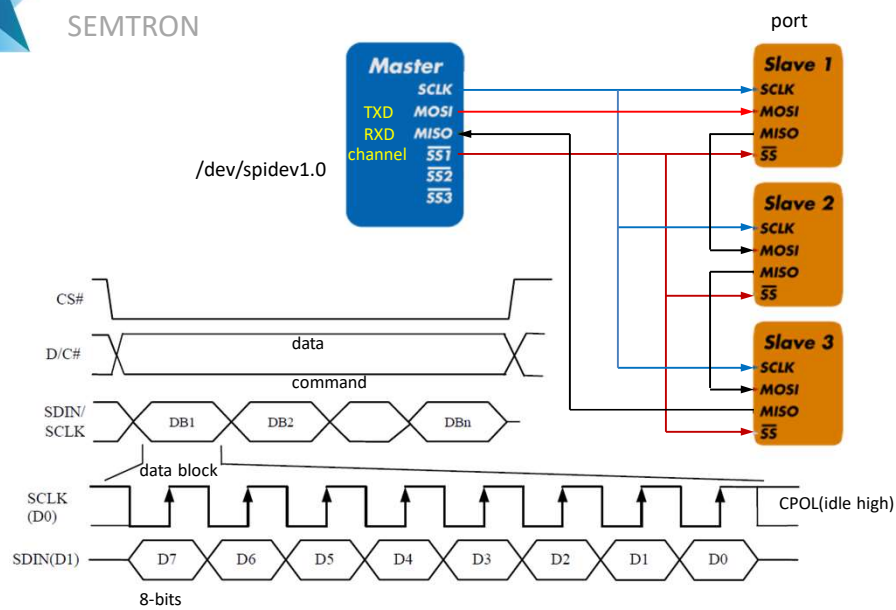
SPI daisy chain

SEMTRON

M242-12864	wPi	OPI 4 LTS (BOARD)
GND		PIN20 GND
VCC		PIN17 3.3V
SCK	14	PIN23 SPI1_CLK
SDA (MOSI)	12	PIN19 SPI1_TXD
RES	9	PIN16 GPIO1_C6
DC (Data/Command)	7	PIN13 GPIO1_A3
CS	15	PIN24 SPI1_CS

Connecting SBC to SPI OLED display

PAGE0 (COM0-COM7)	Page 0	Row re-mapping
		PAGE0 (COM 63-COM56)
PAGE1 (COM8-COM15)	Page 1	PAGE1 (COM 55-COM48)
PAGE2 (COM16-COM23)	Page 2	PAGE2 (COM47-COM40)
PAGE3 (COM24-COM31)	Page 3	PAGE3 (COM39-COM32)
PAGE4 (COM32-COM39)	Page 4	PAGE4 (COM31-COM24)
PAGE5 (COM40-COM47)	Page 5	PAGE5 (COM23-COM16)
PAGE6 (COM48–COM55)	Page 6	PAGE6 (COM15-COM8)
PAGE7 (COM56-COM63)	Page 7	PAGE7 (COM 7-COM0)
	SEG0 --SEG127	
Column re-mapping	SEG127 --SEG0	
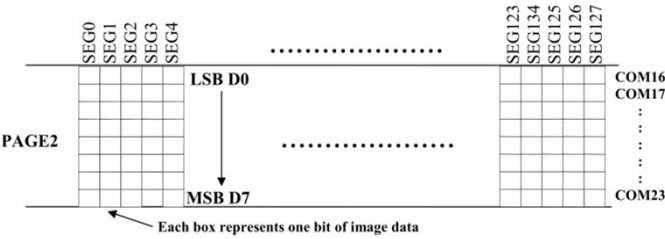
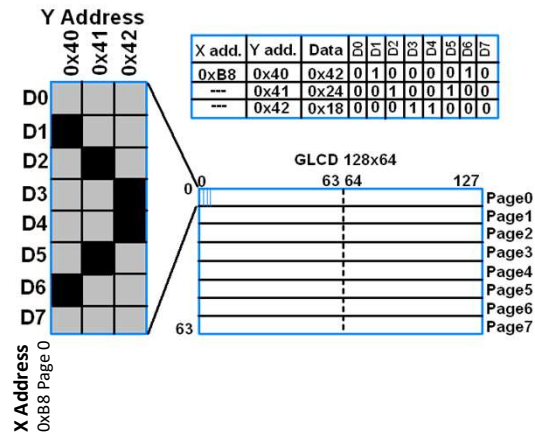## Graphic Display Data RAM (GDDRAM)

10

SEMTRON

Dot Matrix panel Alphanumeric
Display look up table control

X add.	Y add.	Data	D0	D1	D2	D3	D4	D5	D6	D7
0xB8	0x40	0x42	0	1	0	0	0	0	1	0
---	0x41	0x24	0	0	1	0	0	1	0	0
---	0x42	0x18	0	0	0	1	1	0	0	0
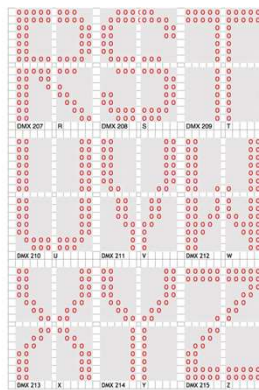
Display alphanumeric data on OLED

21

SEMTRON

luma.oled device driver

22

SEMTRON

Pillow's coordinate system

The upper left corner is (0,0)

128

x increases from left to right

y increases from top to bottom

64

rotate=0

`luma.oled.device.ssd1306`(*serial_interface=None, width=128, height=64, rotate=0, **kwargs*)

luma.oled device driver

23

SEMTRON

Kernel vs user space

luma.oled   luma.examples   Application code   wiringOP-Python

OPi-GPIO   Your program   User space
                                  C library   wiringOP

                                  System interface   ▢ Filesystem Drivers
                                                          ▢ System Calls
Linux kernel   Generic services   Kernel space

Character, Block, Network   Device drivers   entries driver

Hardware   GPIO, SPI/IIC   ssd1309

24

SEMTRON

```
$ sudo mv *.rules /etc/udev/rules.d/
$ sudo groupadd -f --system spi
$ sudo usermod -a -G spi orangepi
$ sudo groupadd -f --system gpio
$ sudo usermod -aG gpio orangepi
$ sudo shutdown -r now


$ cd Downloads
$ ln -s wiringOP-Python/wiringOP wiringOP
$ cd wiringOP
$ ./build clean && ./build


$ pip install pytest OPi.GPIO-ex
$ pip install pillow==9.2.0
```

```
$ cd ~/notebooks
$ git clone https://github.com/rm-
hull/luma.examples.git
$ mv luma.examples luma && cd luma
$ sudo -H pip install -e .
$ pip install psutil==5.9.7



$ scp orangepi@: pin_mappings.py
/home/orangepi/.local/lib/python3.8/site-
packages/OPi
```

25

SEMTRON

```
$ python3 examples/demo.py --help usage: demo.py [-h] [--config CONFIG] [--display DISPLAY]
                      [--width WIDTH] [--height HEIGHT] [--rotate ROTATION]
                      [--interface INTERFACE] [--i2c-port I2C_PORT] [--i2c-address I2C_ADDRESS]
                      [--spi-port SPI_PORT] [--spi-device SPI_DEVICE]
                      [--spi-bus-speed SPI_BUS_SPEED]
                      [--spi-transfer-size SPI_TRANSFER_SIZE]
                      [--spi-cs-high SPI_CS_HIGH] [--ftdi-device FTDI_DEVICE]
                      [--framebuffer-device FRAMEBUFFER_DEVICE]
                      [--gpio GPIO] [--gpio-mode GPIO_MODE]
                      [--gpio-data-command GPIO_DATA_COMMAND]
                      [--gpio-chip-select GPIO_CHIP_SELECT]
                      [--gpio-reset GPIO_RESET] [--gpio-backlight GPIO_BACKLIGHT]
                      [--gpio-reset-hold-time GPIO_RESET_HOLD_TIME]
                      [--gpio-reset-release-time GPIO_RESET_RELEASE_TIME]
                      [--block-orientation ORIENTATION] [--mode MODE]
                      [--framebuffer FRAMEBUFFER] [--num-segments NUM_SEGMENTS]
                      [--bgr] [--inverse] [--h-offset H_OFFSET]
                      [--v-offset V_OFFSET] [--backlight-active VALUE] [--debug]
                      [--transform TRANSFORM] [--scale SCALE] [--duration DURATION]
                      [--loop LOOP] [--max-frames MAX_FRAMES]


$ python examples/sys_info.py -d ssd1309 -i spi --spi-port 1 --spi-device 0 --gpio
OPi.GPIO --gpio-mode OPi.GPIO.BOARD --gpio-data-command 13 --gpio-reset 11
```
26

13