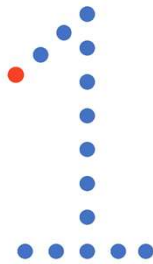




# ONE

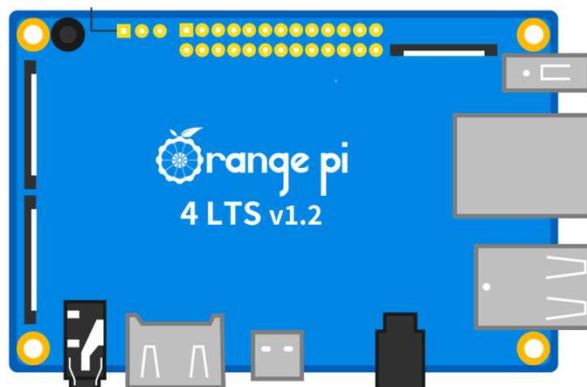
## Robot Controller



1

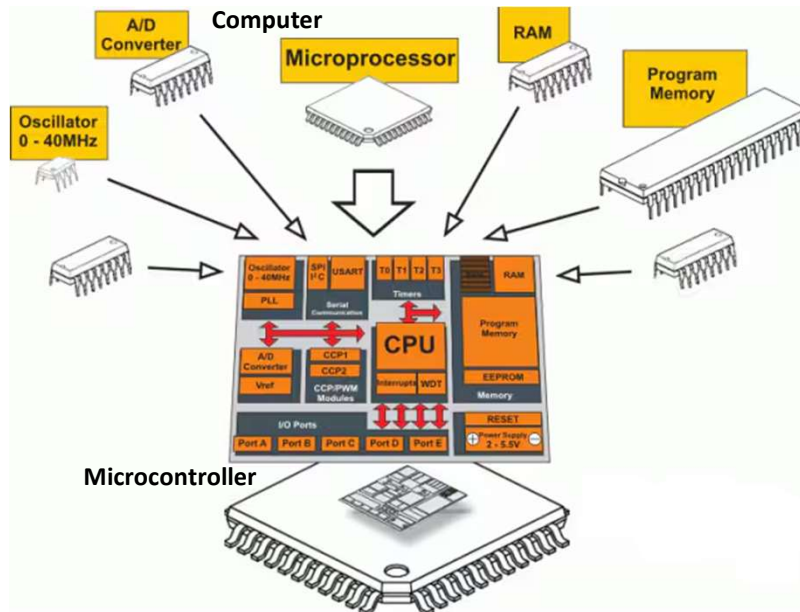


## Orange Pi 4 Single Board Computer (SBC)



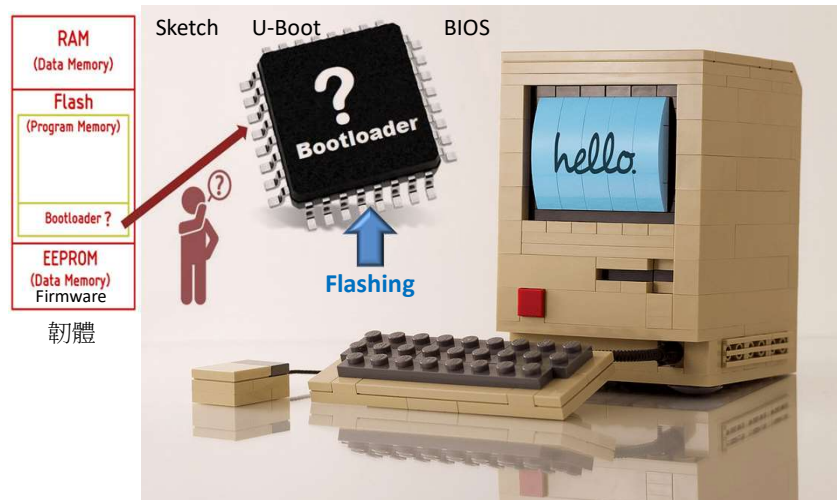
<https://drive.usercontent.google.com/download?id=1YaltDXzO7pPBj0BSmT3iMr6phdwMxg4j>  
[http://www.orangepi.cn/orangepiwiki/index.php/Orange\\_Pi\\_4\\_LTS](http://www.orangepi.cn/orangepiwiki/index.php/Orange_Pi_4_LTS)

2



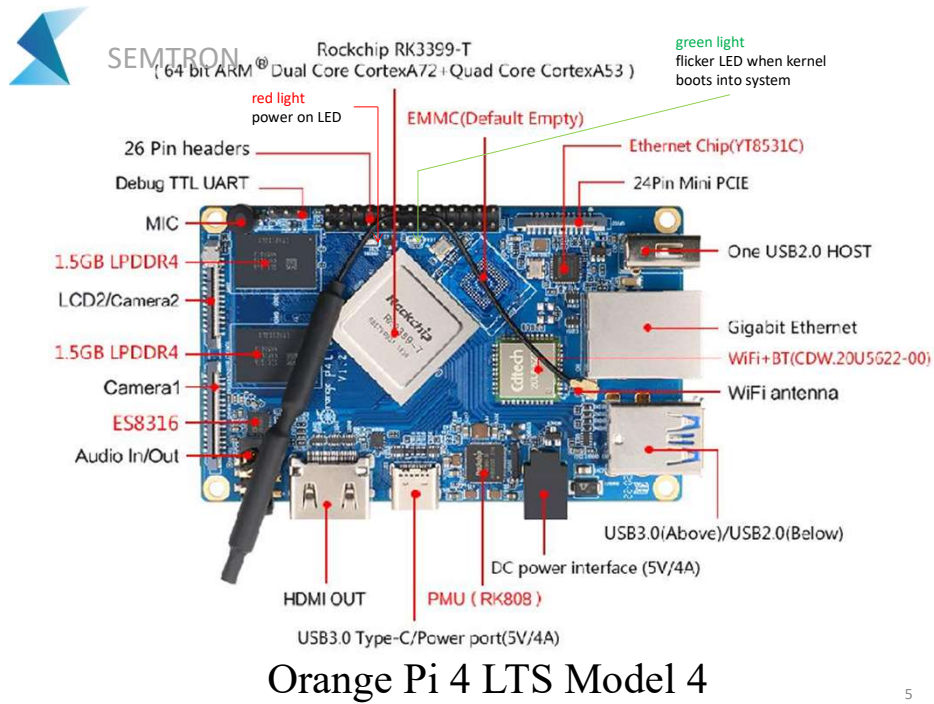
Computer and microcontroller

3



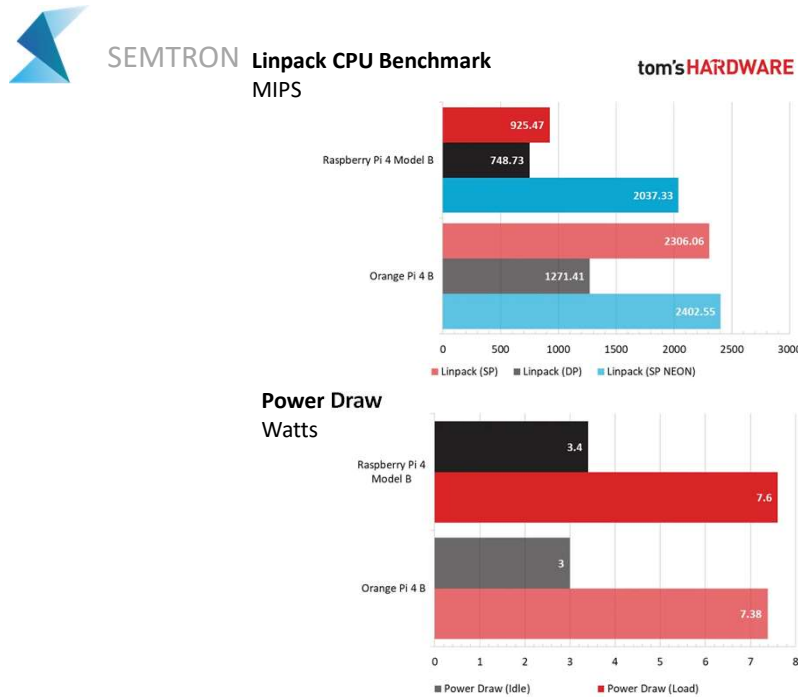
Computer and microcontroller

4



Orange Pi 4 LTS Model 4

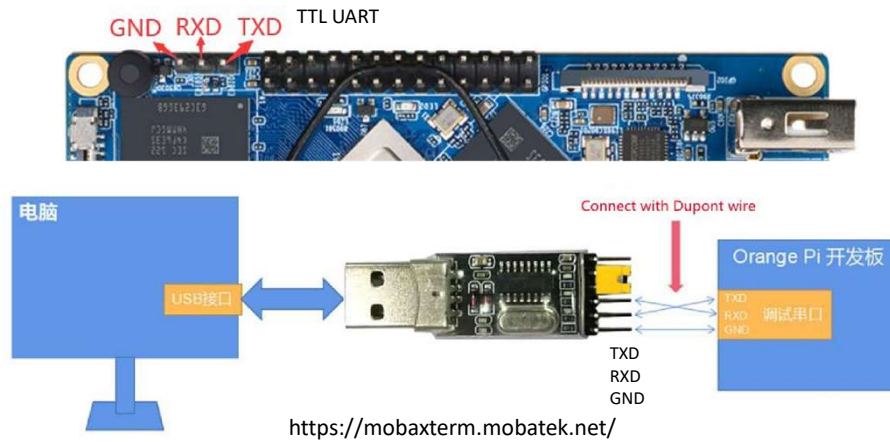
5



6



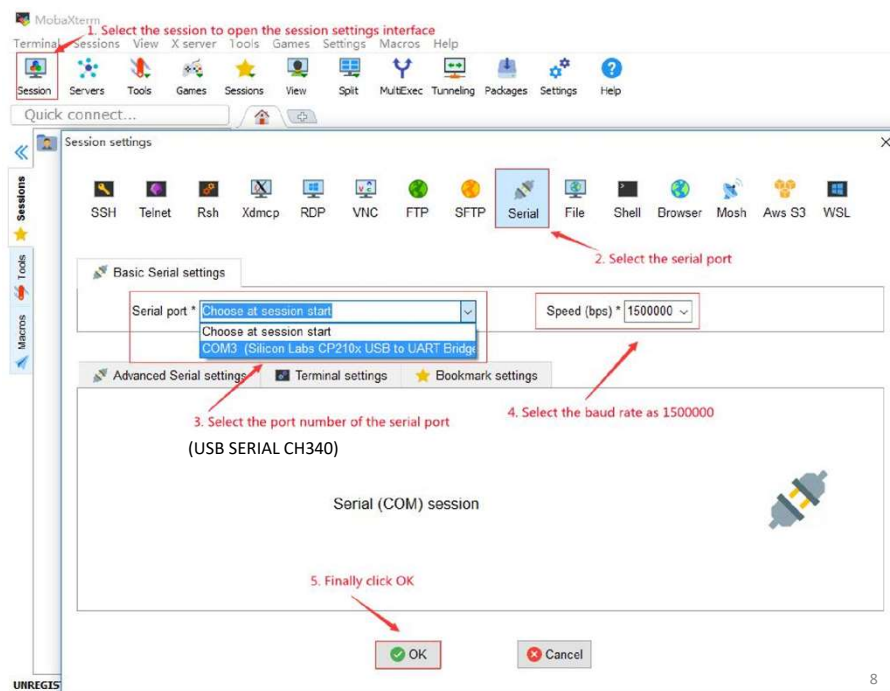
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Schematic diagram of connecting the USB to TTL module to the computer and the Orange Pi development board

## Connecting SBC via terminal access

7



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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 armv7l

OrangePi Lite

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

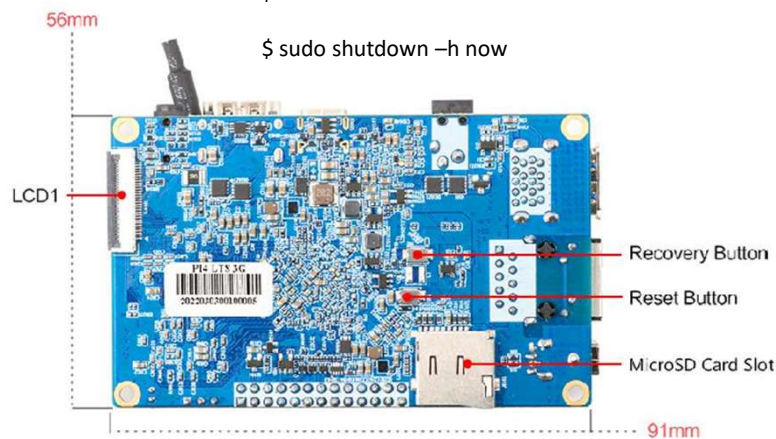
9



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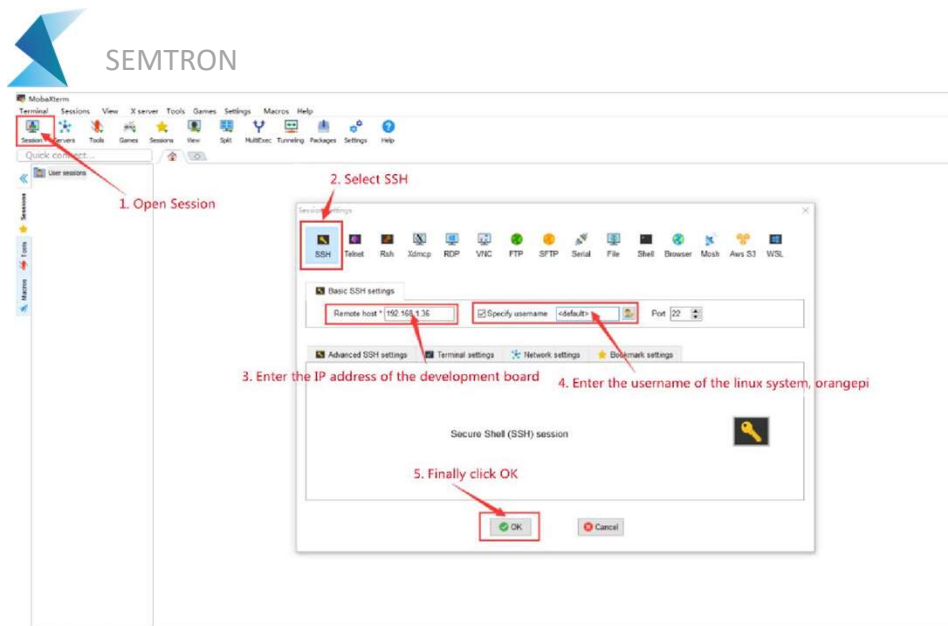
```
$ nmcli dev wifi
$ nmcli dev wifi connect wifi_name password wifi_passwd
$ ip addr show wlan0
$ exit

$ sudo shutdown -h now
```



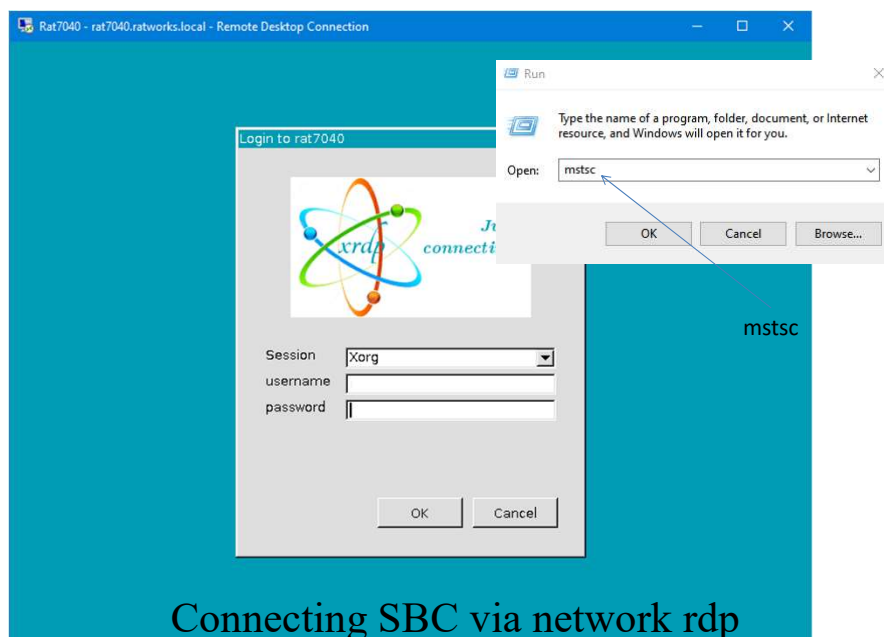
## Connecting SBC via WiFi

10



Connecting SBC via network ssh

11

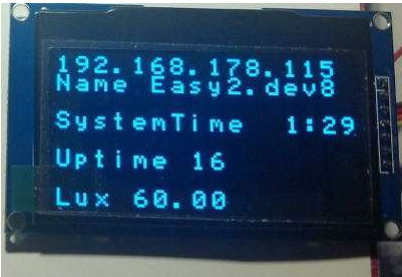


Connecting SBC via network rdp

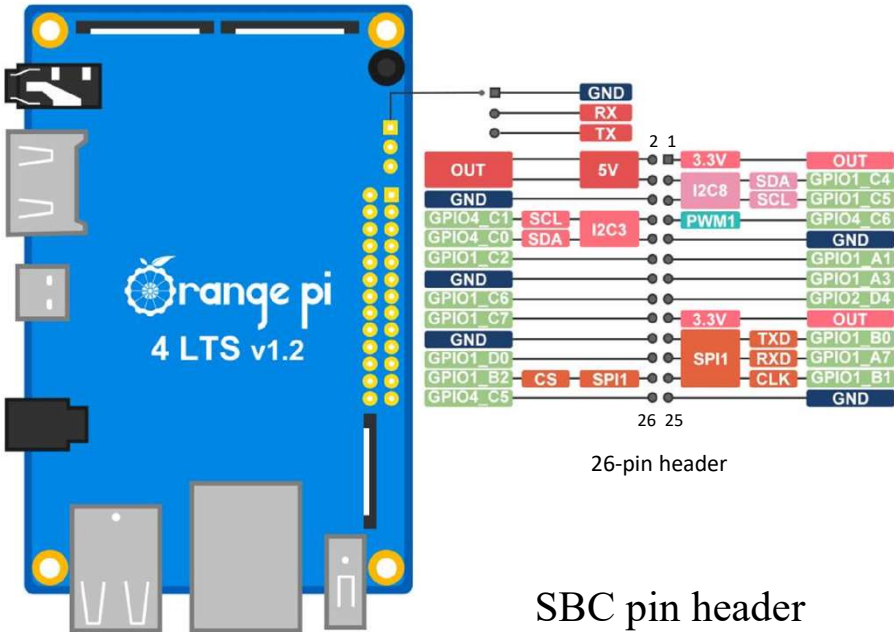
12



# SPI/IIC Robotic Displays



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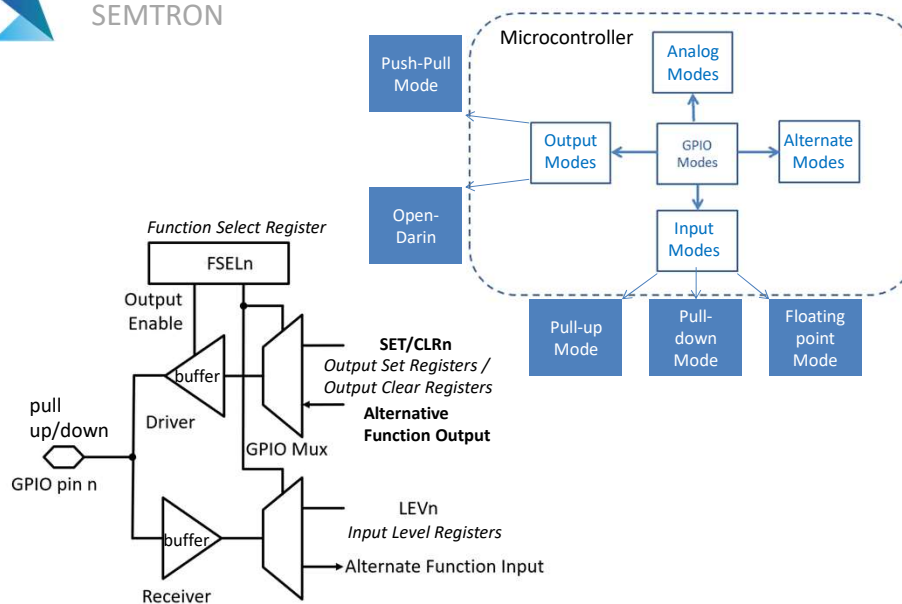


\$ gpio readall

Op1 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	
Op1 4 LTS+											

## Pin header GPIO

15



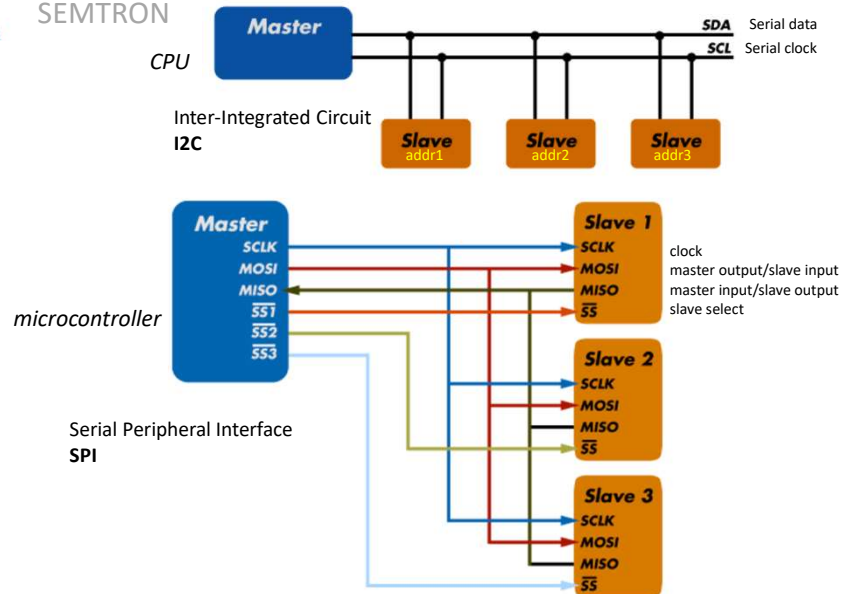
## Pin header GPIO

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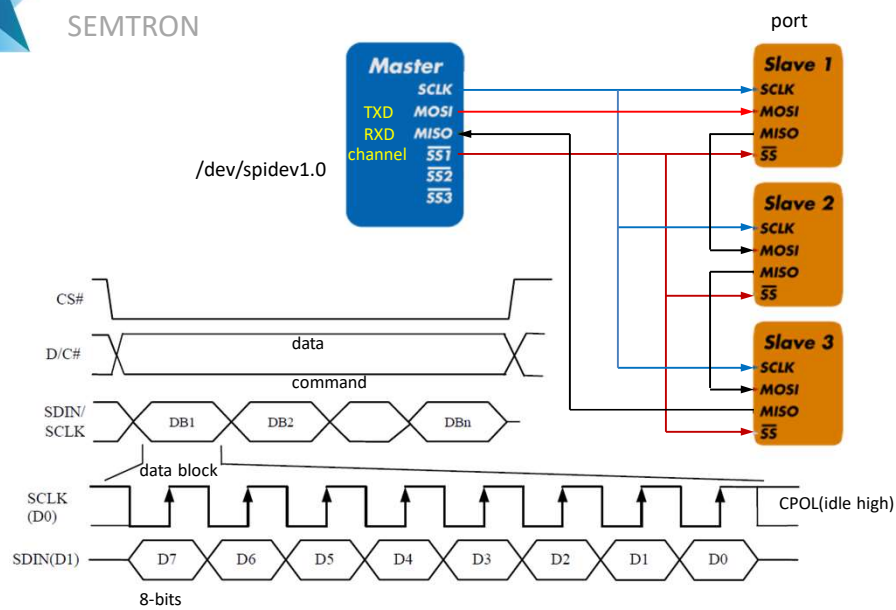


## GPIO emulate IIC and SPI

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## Connecting SBC to SPI OLED display

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Diagram illustrating the bit layout of a 16-bit word. The word is divided into segments: SEG0, SEG1, SEG2, SEG3, SEG4, followed by an ellipsis, then SEG123, SEG134, SEG125, SEG126, and SEG127. The left side is labeled PAGE2. The right side is labeled COM16, COM17, an ellipsis, and COM23. An arrow points from LSB D0 to the first bit of SEG4, and another arrow points from MSB D7 to the last bit of SEG4. A note at the bottom states: Each box represents one bit of image data.

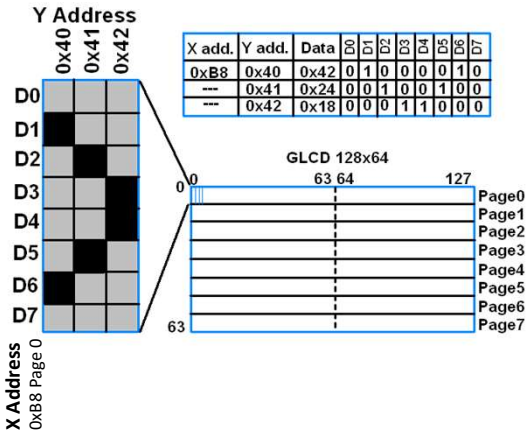
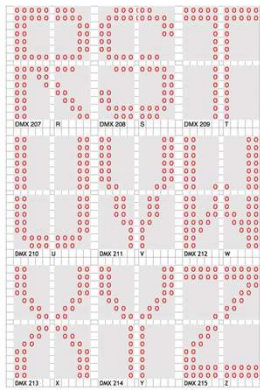
## Graphic Display Data RAM (GDDRAM)

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Dot Matrix panel Alphanumeric  
Display look up table control

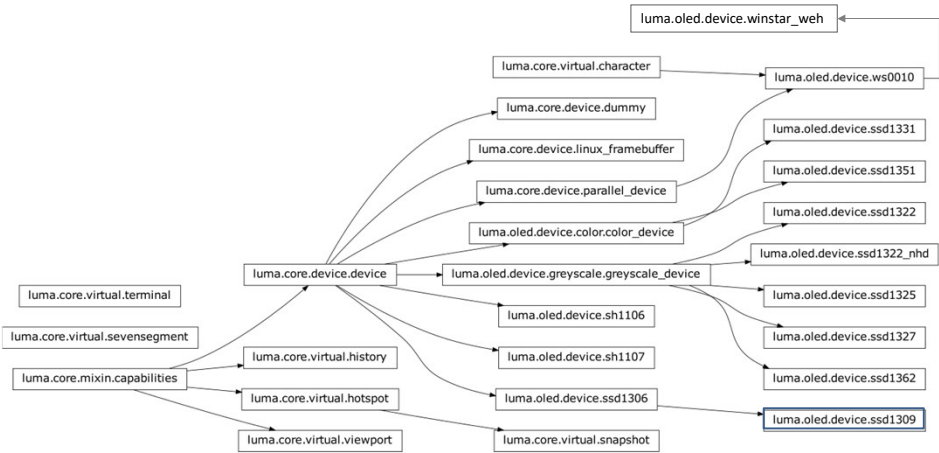


# Display alphanumeric data on OLED

21

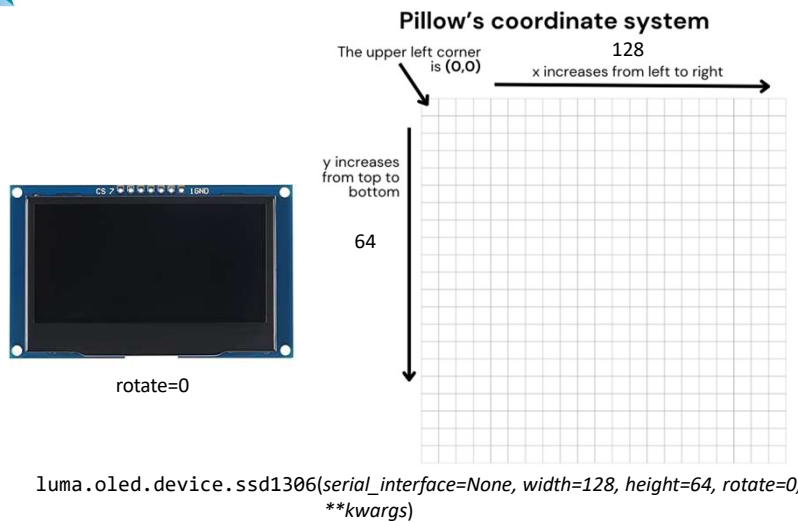


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# luma.oled device driver

22

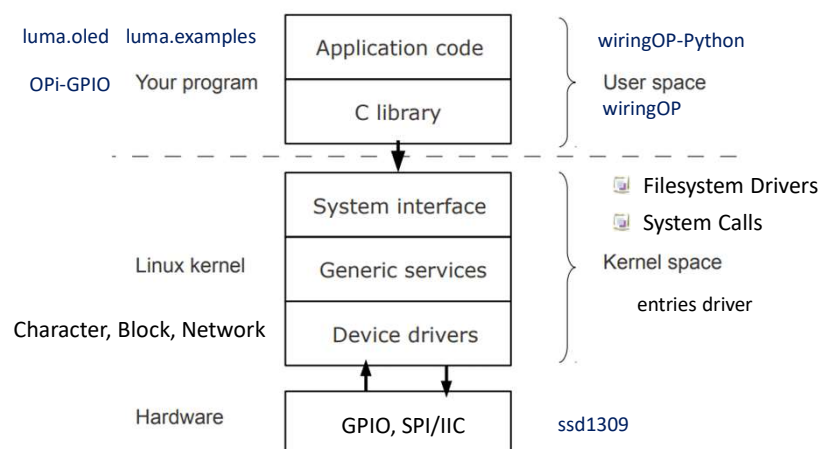


luma.oled device driver

23



## Kernel vs user space



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```

$ sudo mv 90-gpio-spi.rules 99-gpio.rules
/etc/udev/rules.d/
$ sudo groupadd -f --system spi gpio
$ sudo usermod -a -G spi orangepi
$ sudo groupadd -f --system gpio
$ sudo usermod -aG gpio orangepi
$ sudo shutdown -r now

$ 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

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

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

$ pip install pytest OPI.GPIO-ex
$ pip install pillow==9.2.0

$ 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

```

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