OVERVIEWS

- This is an Expansion board of Raspberry Pi Compute Module series. It is compatible with Compute Module IO Board V3 from Raspberry Pi Foundation, along with various common use components. Supports Compute Module 3, Compute Module 3 Lite, Compute Module 3+ (8G/16G/32G), Compute Module 3+ Lite.

FEATURES

- Compatible with the Compute Module IO Board V3 from the Raspberry Pi Foundation
- Raspberry Pi GPIO header, for connecting sorts of Raspberry Pi HATs
- Arduino connectivity, also supports Arduino shields
- 1-WIRE interface, for connecting single-bus devices like DS18B20
- 4x keys, 4x LEDs, 1x Buzzer, for I/O testing
- Onboard USB HUB, allows connecting more USB devices
- IR receiver, IR remote control is available
- Onboard USB TO UART, for serial debugging
- Sensor interface
- 10-bit ADC, 38KSPS, 11-ch (6-ch for Arduino interface, 5-ch for sensors)
- 16-bit DAC, 2-ch
- Onboard RTC, one of the most common and useful functions

WHAT’S ONBOARD
1. **Compute Module interface**: for connecting Compute Module 3, Compute Module 3 Lite, Compute Module 3+ (8G/16G/32G) or Compute Module 3+ Lite

2. **Compute Module GPIO header**: breakout all the Compute Module pins

3. **Raspberry Pi GPIO header**: for connecting Raspberry Pi HATs

4. **CSI interface**: camera ports, for connecting Raspberry Pi Camera

5. **DSI interface**: display ports, for connecting Raspberry Pi LCD

6. **HDMI port**

7. **USB ports**: for connecting USB devices

8. **USB SLAVE interface**: allows you to burn system image in to Compute Module 3

9. **USB TO UART interface**: for serial debugging

10. **Arduino header**: for connecting Arduino shields

11. **AD/DA input/output screw terminals**

12. **1-WIRE interface**: for connecting single-bus devices like DS18B20

13. **Sensor interface**
14. **Power port**: 5V 2.5A

15. **FE1.1S**: USB HUB chip

16. **12MHz crystal**

17. **CP2102**: USB TO UART converter

18. **Micro SD card slot**: insert a Micro SD card with pre-burnt system, to start up Compute Module 3 Lite

19. **TLC1543**: AD converter

20. **DAC8552**: 16-bit DAC, 2-ch

21. **DS3231**: high-precision RTC chip, I2C interface

22. **RTC battery holder**: supports CR1220 batteries

23. **Voltage regulator**: 3.3V / 2.5V / 1.8V

24. **LFN0038K**: IR receiver

25. **Buzzer**

26. **Power indicator**

27. **ACT indicator**: indicating the Micro SD card status

28. **User LEDs**

29. **User Keys**

30. **BOOT selection**
   - **EN**: enable the PC to access SD card/eMMC through USB SLAVE
   - **DIS**: the Compute Module will boot from SD card/eMMC

31. **VGx power selection**: config the I/O level

32. **USB HUB enable jumper**: HUB enable and USB SLAVE power selection

33. **ADC/DAC configuration**: config the power supply and reference voltage of ADC/DAC

34. **Peripheral configuration**: config the control pins of UART, user keys, user LEDs, 1-WIRE interface, IR receiver, and buzzer

35. **Arduino AD selection**
   - **connect 1 and 2**: Arduino A0-A5 as digital control pin
   - **connect 2 and 3**: Arduino A0-A5 as AD input
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HOW TO USE

INSTALLATION

CM3/CM3+

If you use Compute Module 3 or Compute Module 3+, you need to write OS image to the embedded EMMC, otherwise they cannot work. Here show you how to write image to EMMC

1. Pull the jumpers of USB SLAVE 1/2/3/4 SELECTION (you need to pull two jumpers here), set the BOOT ENABLE USB SLAVE jumpers to EN position.

2. Install USB driver. Run the software **rpiboot_setup** (You can download it from Resource of wiki) to install the drivers and boot tool.

3. Connect 5V power adapter to Power interface, plug the USB SLAVE port of IO Board Plus into your host PC USB.

4. Run the rpiboot.exe tool. After a few seconds, the CM3 eMMC will be recognized as a disk.

5. Run WinDiskImager.exe tool to burn the image to eMMC of CM3.

**Note:**

Ensure you are not writing to any USB devices while installation.

Because the eMMC of CM3 is only 4G, the image file flashed should be small than 4G. If you want the GUI, you can install it with these commands after installation

```
sudo apt-get update
dsudo apt-get install raspberrypi-ui-mods
```

CM3L/CM3+ L

1. Download the image for CM3L

2. Connect the SD card to computer with card reader. The capacity of SD card should larger than 8G.

3. Run the Win32DiskImager.exe, choose the CM3L image and burn it to SD card.

4. After burning successfully, insert the card to the card slot of IO Board Plus
CONNECTING DISPLAY AND CAMERA

Download the test image provide by us and install them.

Note: Before using, please check that whether the BOOT ENABLE USB SLAVE jumper is set onto the DIS option.

CONNECTING THE OFFICIAL 7INCH DISPLAY

1. You need an adapter plate and a 22PIN FFC to connect the display to DISP1 interface of IO Board Plus
2. Connect the 5V and GND pin of display to 5V and GND pin of IO Board Plus with wires.
3. Connect these pins together with wires:
   
   GPIO0<->CD1_SDA
   
   GPIO1<->CD1_SCL

4. Connect the power adapter
5. Wait for a few seconds, the display will be powered on.

CONNECT WVESHAPE 7INCH HDMI LCD (C)

1. Make sure the official 7inch display don’t be connect to IO Board Plus. Only without the DISP interface display, the Raspbian will display via HDMI interface by default.
2. Connect the HDMI interface of LCD to the HDMI interface of IO Board IO Plus
3. Connect power adapter
4. Waiting for a few seconds, the LCD will be powered on

CONNECT CAMERA

1. Connect camera to the CAM1 interface of IO Board Plus (need RPi Zero V1.3 Camera Cable 15cm)
2. Connect these pins together:
   
   GPIO0<->CD1_SDA
3. Connect to power

4. If you want to connect more than one camera, you can connect another to CAM0 interface.

5. Use the CAM0 interface, you need to connect these pins together:
   - GPIO28<->CD0_SDA
   - GPIO29<->CD0_SCL
   - GPIO30<->CAM0_IO1
   - GPIO31<->CAM0_IO0

6. Execute these commands to use the camera:
   - raspivid -t 0 -cs 0
   - raspivid -t 0 -cs 1

Note:

1. -cs: Used to choose the camera 0 or 1. Parameter 0 means CAM1, and 1 means CAM0

2. Original Raspbian has no boot files for official display and official. If you use original Raspbian, you need to convert dts files which are provided by Raspberry Pi to bin files and copy the bin files to pi/boot/ of Raspbian.

   Commands:
   
   sudo dtc -l dts -O dtb -o /boot/dt-blob.bin dt-blob-disp1-cam2.dts

If you use the image provide by us, the OS has been pre-configured. You need to configure it again.
EXAMPLES

While test the examples, you had better connect a display and keyboard to the IO Board Plus.

If you use original Raspbian, you have to install necessary libraries before first. For more information about how to install libraries, please refer to Libraries Installation for RPi.

BUZZER

PYHTON CODE

- Execute command to enter the folder of program:

  \texttt{cd /home/pi/CM3/Buzzer\_PWM/python/}

- Execute command to run the program:

  \texttt{sudo ./buzzer.py}

WIRINGPI CODE
Execute command to enter the folder of program:

```
cd /home/pi/CM3/Buzzer_PWM/wiringPi/
```

Execute command to run the program:

```
sudo ./buzzer
```

**EXPECTED RESULT**
The buzzer will sound, and the sound is changing from low to high, and turn to low again.

**Note:**
The buzzer will sound even though not be used because of noise. In this case, you can pull the buzzer jumper manually. (the last one of USER JMP)

---

**DAC**

**BCM2835 CODE**

- Connect DA_A and DA_B to LED1 and LED2 of USER JMP separately with wires.
- Execute command to enter the folder of program

```
cd /home/pi/CM3/DAC8532
```

- Execute command to run the program

```
sudo ./dac8532
```

**EXPECTED RESULT**
The brightness of LED1 and LED2 turns brighter and then turns dim alternately.

---

**DS18B20**

Testing this code, you need a DS18B20 module. Insert the DS18B20 into the 1-WIRE interface of IO Board Plus. Note that the semicircle should faces the buzzer. The DS18B20 will produce high temperature even hurt your fingerprint if it is inserted incorrectly. Please be carefully.

---

**SYSFS CODE**
- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/DS18B20/fs/`

- Execute command to run the program
  
  `sudo ./ds18b20`

**PYTHON CODE**

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/DS18B20/python/`

- Execute command to run the program
  
  `sudo ./ds18b20.py`

**EXPECTED RESULT**

The terminal will output the temperature value measured by DS18B20.

**RTC DS3231**

**BCM2835 CODE**

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/DS3231/bcm2835/`

- Execute command to run the program
  
  `sudo ./ds3231`

**WIRINGPI CODE**

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/DS3231/wiringPi/`

- Execute command to run the program
  
  `sudo ./ds3231`

**PYTHON CODE**
Execute command to enter the folder of program

```
cd /home/pi/CM3/DS3231/python/
```

Execute command to run the program

```
sudo ./ds3231.py
```

**EXPECTED RESULT**
The terminal will output the information of date.

**IRM**
You need an infrared remote controller. Please take the interleaving paper down before using.

**BCM2835 CODE**

Execute command to enter the folder of program

```
cd /home/pi/CM3/IRM/bcm2835/
```

Execute command to run the program

```
sudo ./irm
```

**WIRINGPI CODE**

Execute command to enter the folder of program

```
cd /home/pi/CM3/IRM/wiringPi/
```

Execute command to run the program

```
sudo ./irm
```

**PYTHON CODE**

Execute command to enter the folder of program

```
cd /home/pi/CM3/IRM/python/
```

Execute command to run the program

```
sudo ./irm.py
```
EXPECTED RESULT

Press the buttons on Infrared Remote Controller, the terminal will output the corresponding value.

KEY

BCM2835 CODE

- Execute command to enter the folder of program
  
  ```
  cd /home/pi/CM3/KEY/bcm2835/
  ```
  
- Execute command to run the program
  
  ```
  sudo ./key
  ```

WIRINGPI CODE

- Execute command to enter the folder of program
  
  ```
  cd /home/pi/CM3/KEY/wiringPi/
  ```
  
- Execute command to run the program
  
  ```
  sudo ./key
  ```

PYTHON CODE

- Execute command to enter the folder of program
  
  ```
  cd /home/pi/CM3/KEY/python/
  ```
  
- Execute command to run the program
  
  ```
  sudo ./key.py
  ```

EXPECTED RESULT

Press the keys (KEY1, KEY2, KEY3, KEY4), corresponding value will outputted on the terminal. For example, if you press KEY1, the terminal will output press the key: 0.

LED
BCM2835 CODE

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/LED/bcm2835/
  `  

- Execute command to run the program
  
  `sudo ./led`

WIRINGPI CODE

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/LED/wiringPi/
  `  

- Execute command to run the program
  
  `sudo ./led`

PYTHON CODE

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/LED/python/
  `  

- Execute command to run the program
  
  `sudo ./led.py`

EXPECTED RESULT

Four LEDs blink alternately.

ADC

BCM2835 CODE

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/TLC1543/bcm2835/
  `  

- Execute command to run the program
  
  `sudo ./tlc1543`
WIRINGPI CODE

- Execute command to enter the folder of program

  cd /home/pi/CM3/TLC1543/wiringPi/

- Execute command to run the program

  sudo ./tlc1543

PYTHON CODE

- Execute command to enter the folder of program

  cd /home/pi/CM3/TLC1543/python/

- Execute command to run the program

  sudo ./tlc1543.py

EXPECTED RESULT

AD information are outputted on terminal.

UART

Connect the USB TO UART interface of IO Board Plus to PC with USB cable. Open the Putty on your PC, set the Baudrate as 115200.

Enter the user name and password to log in the CM3/CM3L (user name is pi and password is raspberry by default)

Here you need to run the program with keyboard and LCD (On IO Board Plus) instead of Putty.

WIRINGPI CODE

- Execute command to enter the folder of program

  cd /home/pi/CM3/UART/wiringPi/

- Execute command to run the program

  sudo ./uart
PYTHON CODE

- Execute command to enter the folder of program
  
  `cd /home/pi/CM3/UART/python/`

- Execute command to run the program
  
  `sudo ./uart.py`

EXPECTED RESULT

Every time run the program, on the Putty, you can see that *Hello World!!!* is printed.