Compute Module IO Board Plus User Manual

OVERVIEWS

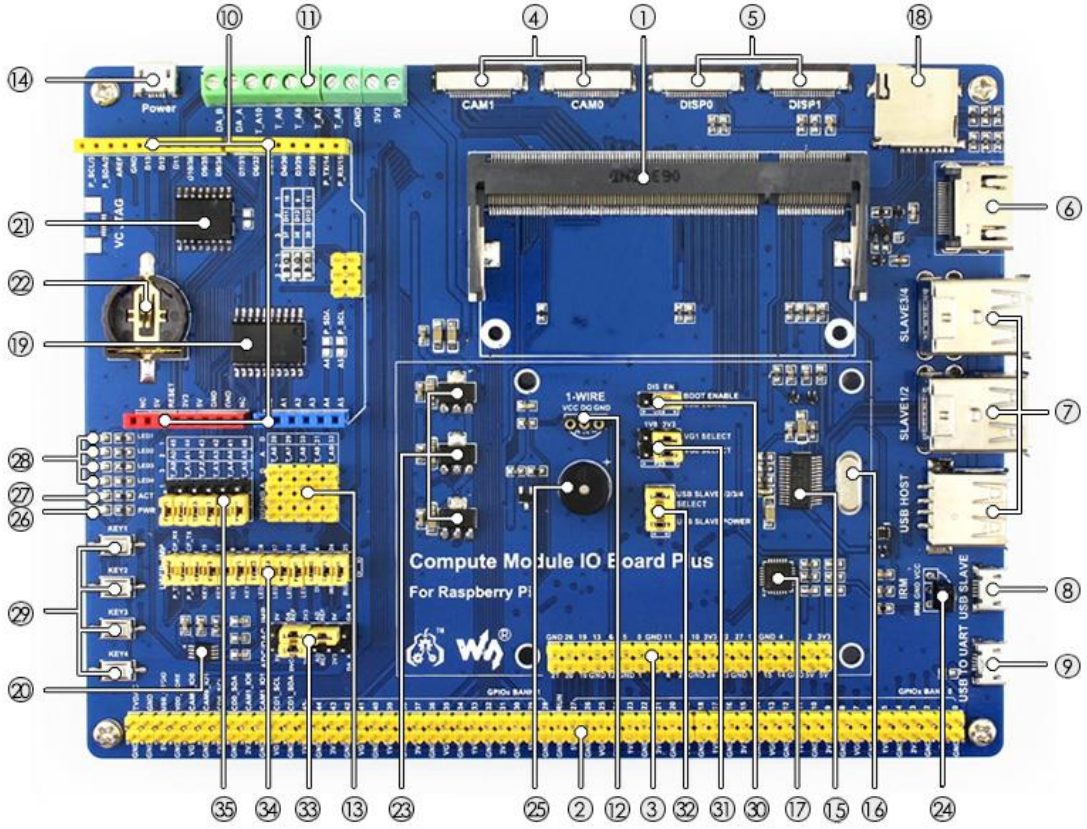
- This is an Expansion board of Compute Module 3 and Compute Module 3 Lite. It is compatible with Compute Module IO Board V3 from Raspberry Pi Foundation, along with various common use components.

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

Version：V1.0，Date：20171101



1. **Compute Module interface:** for connecting Compute Module 3 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

CONTENTS

HOW TO USE

INSTALLATION

CM3

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_set to install the drivers and boot tool.
3. Plug the USB SLAVE port of IO Board Plus into your host PC USB. (don't need to connect power adapter to the IO Board Plus)
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
sudo apt-get install raspberrypi-ui-mods

CM3L

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 OFFICAIL 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 WVESHARE 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

   GPIO1<->CD1_SCL

   GPIO4<->CAM1_IO1

   GPIO5<->CAM1_IO0

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 -I 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:

  cd /home/pi/CM3/Buzzer_PWM/python/

- Execute command to run the program:

  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.