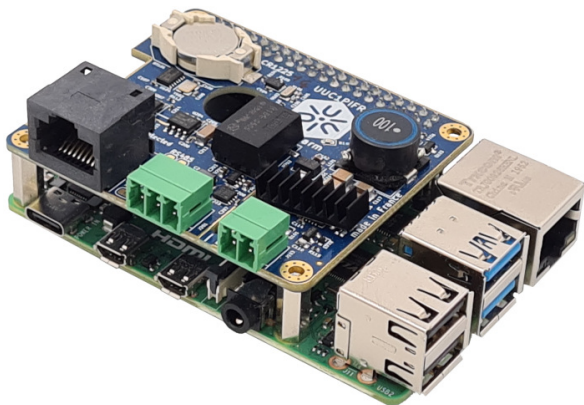


HARDWARE DATASHEET

Raspberry HAT with CAN Fd, RS485 and Real-Time Clock

Description

UUC1PI product line is an HAT (Hardware Attached on Top) module for Raspberry PI. It provides a Real Time Clock, a RS485 communication, a CAN communication and in option an improved power system for the PI.



Features

- Compatible with Raspberry PI Zero/2/3/4
- Real time clock
- CAN and RS-485 communication
- Compatibility with CAN Open protocol
- Optional 6.5-55V power supply

Interfaces

- CAN Fd bus up to 8 Mbds
- RS485 / RS422 interface (up to 50 Mbds) for protocols like Modbus, Profibus or DMX512...
- 1 kV isolation between power-side and interface-side

Reference	Platform	Input Voltage	RTC	RS485	CAN Fd	Isolated
UUC1PIFR	Raspberry PI Zero/2/3/4	6.5 V - 55 V	1	1	1	-
UUC1PIFR-I						1000V

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Chapter 1

Specifications

1.1 Technical data

Electrical	
Power supply voltage	6.5 V - 55 V
ESD protection	30 kV
Interfaces	
CAN	max 8 Mbit/s
RS-485	max 50 Mbit/s
Isolation	1 kV
Physical	
Operating temperature	0°C...+85°C
Dimensions (L x W)	65.1 mm x 56.1 mm
Mounting	4 mounting holes for M2.5 screws

Figure 1.1: Technical data table

1.2 Electrical

UUCPI have 4 connectors.

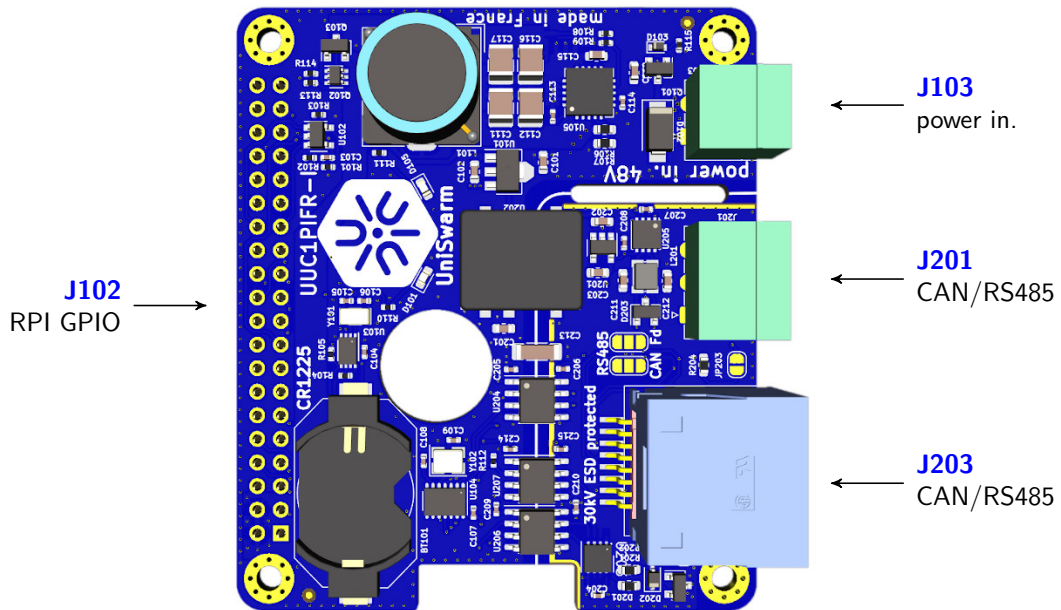


Figure 1.2: UUC1PI connectors

1.2.1 Power input

There are two different possibilities to power the UUC.

- From the PI via the GPIO port : The UUC is powered by the PI through the 5V GPIO Pin. This method can be use for every UUC it just needs to be plug on the PI.
- From an external power supply via the UUC external power in : The PI is powered by the HAT through the 5V GPIO Pin. This method can only be used by UUCPI with the optional power supply. It accepts voltage between 6.5V and 55V and it's protected against polarity reverse.

To know if your UUC has a power part you have to look if it has a J103 connector.

Connector J103, power input

Pins	Name	Description
1	+V	Power in +
2	GND	Ground, power in -

Figure 1.3: J103 pins

Recommended connector references

Screw connection :

- Phoenix® : MC 1,5/2-ST-3,5

Push-in spring connection :

- Phoenix® : FK-MCP 1,5/ 2-ST-3,5

1.2.2 Buses

Both buses (RS485 and CAN Fd) have 30 kV Electrostatic Discharge (ESD) protection and high quality filters for noisy environment.

A full 1kV isolation is present between bus-side and power-side to prevent damage and avoid noise to propagate through the bus.

Each bus had a 120 Ohm terminaison resistor that can be welded thank to a dedicated jumper (JP204 for RS-485 and JP203 for CAN).

Both buses are link to the RJ45 connector and a jumper (JP201) can select which one is on the J201 connector.

Speed of both buses can be set by software. CAN Bus can reach 8 Mbps. RS-485 can reach 50 Mbps.

Recommended connector references

Standard straight RJ45 cable.

Connector J203, CAN Fd / RS485

Pins	Name	Description
1	CAN H	CAN Fd dominant
2	CAN L	CAN Fd recessive
3	GND	Ground, connected to 7
4	RS485 B	RS485 B side
5	RS485 A	RS485 A side
6	-	Unused, not connected
7	GND	Ground, connected to 3
8	-	Unused, not connected

Figure 1.4: J203 pins

Connector J201, CAN Fd / RS485

Pins	Name	Description
1	GND	Ground
2	CAN H/ 485A	CAN Fd dominant or RS485 A side
3	CAN L/ 485B	CAN Fd recessive or RS485 B side

Figure 1.5: J201 pins

Recommended connector references

Screw connection :

- Phoenix® : MC 1,5/3-ST-3,5

Push-in spring connection :

- Phoenix® : FK-MCP 1,5/ 3-ST-3,5

1.2.3 Raspberry PI connection

The UUC use the Raspberry PI connectivity and have the J104 connector on the back of the board that must be connected with the 40 GPIO port of the Raspberry PI.

This port is compatible with Pi Zero/Zero W/ Zero WH/2B/3B/3B+/4

The UUC board uses some of the GPIO:

- One of the SPI buses is used for the communication between the Raspberry PI and the CAN module.
- The I2C bus is used for the communication between the Raspberry PI and an EEPROM memory.
- The UART bus is used for the communication between the Raspberry PI and the RS485 module.
- One GPIO is used for the led.

Connector J102, Raspberry PI GPIO

The following figure resume all the GPIO used by the UUC.

Pins	Name	Description
1	3v3	Power 3,3v
2	5v	Power
3	GPIO 2	I2C1 SDA
4	5v	Power
5	GPIO 3	I2C1 SCL
6	GND	Ground
7	GPIO 4	-
8	GPIO 14	UART TX
9	GND	Ground
10	GPIO 14	UART RX
11	GPIO 17	RS485-DE
12	GPIO 18	-
13	GPIO 27	-
14	GND	Ground
15	GPIO 22	-
16	GPIO 23	-
17	3v3	Power
18	GPIO 24	-
19	GPIO 10	SPI0 MOSI
20	GND	Ground
21	GPIO 9	SPI0 MISO
22	GPIO 25	-
23	GPIO 11	SPI0 SCLK
24	GPIO 8	SPI0 CEO
25	GND	Ground
26	GPIO 7	-
27	GPIO 0	EEPROM SDA
28	GPIO 1	EEPROM SCL
29	GPIO 5	-
30	GND	Ground
31	GPIO 6	-
32	GPIO 12	-
33	GPIO 13	-
34	GND	Ground
35	GPIO 19	-
36	GPIO 16	-
37	GPIO 26	LED
38	GPIO 20	-
39	GND	Ground
40	GPIO 21	-

Figure 1.6: J203 pins, Raspberry PI GPIO

More information about the Raspberry PI GPIO can be found on the official site (<https://www.raspberrypi.org/documentation/usage/gpio/>)

1.2.4 Real Time Clock (RTC)

The UUC can provide a Real Time Clock and Calendar with the following information :

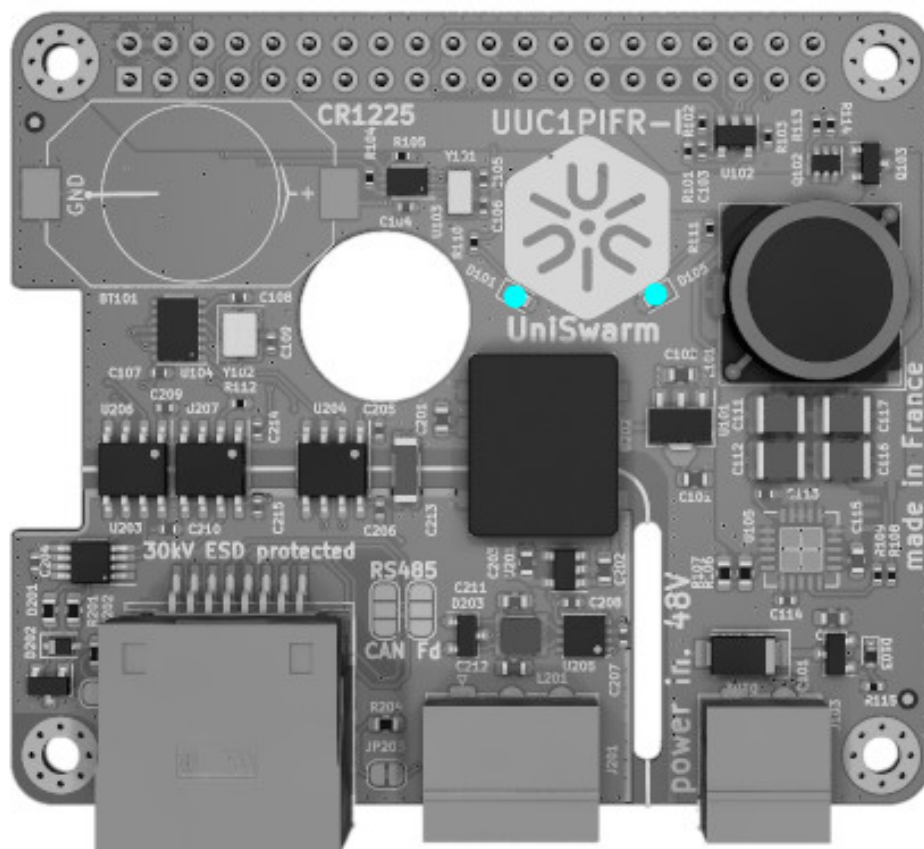
- Seconds
- Minutes
- Hours
- Day of Week
- Day
- Month
- Year

The module can be configured using the I2C communication. Thanks to a 3V CR1225 battery, the RTC can keep time even in case of main power failure.

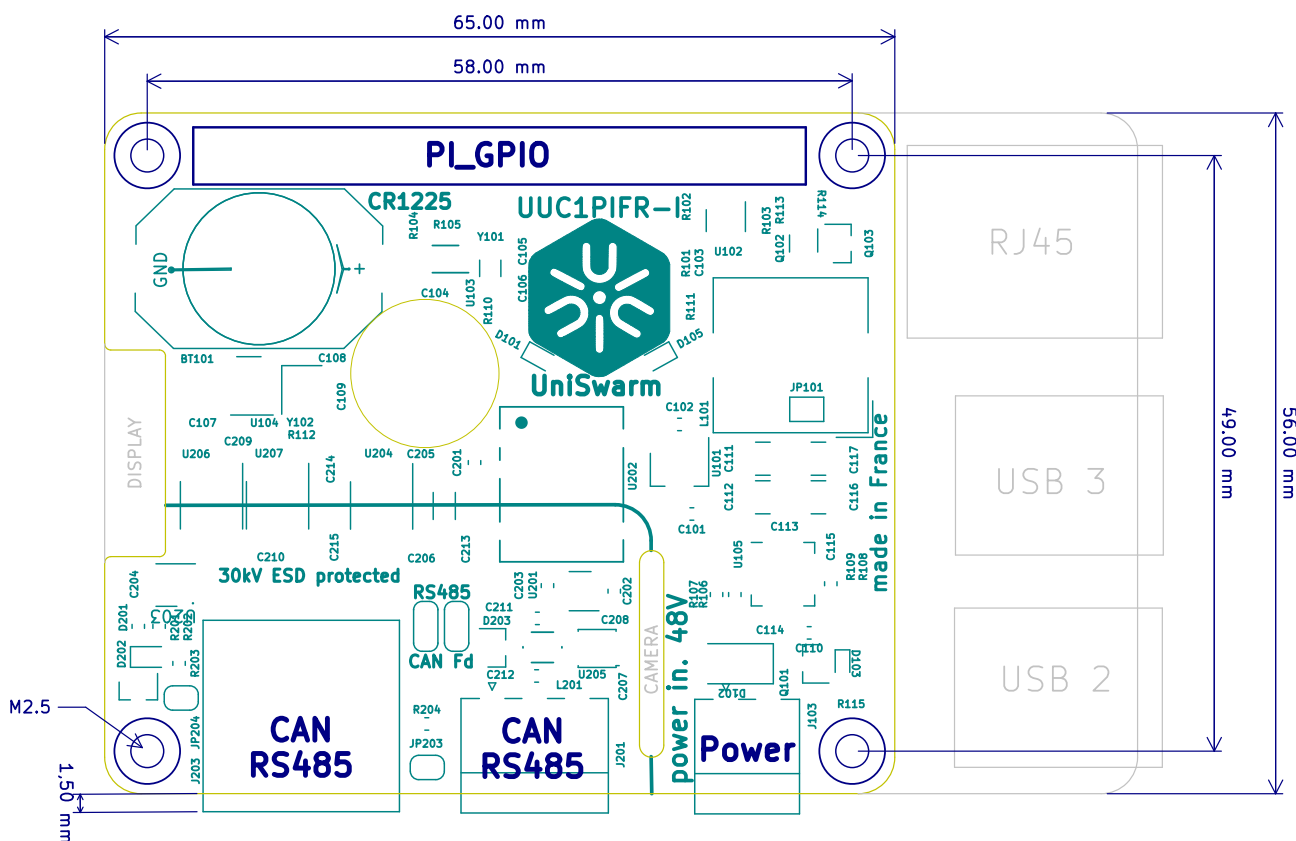
1.2.5 Leds

There are 2 leds on the UUC board:

- One to indicate that the card is powered.
- The other one that can be activated with the PI GPIO.



1.3 Drawings



Maximum height (UUC only) : 23.00 mm

Maximum height with PI4 : 32.00 mm

1.4 Installation

1.4.1 Driver

Install driver :

```
unzip mcp2518fd_module_pi4b.zip -d path
cd mcp2518fd_module_pi4b
sudo ./install.sh
```

1.4.2 CAN Fd

Set baud rate

You can set the baud rate:

```
sudo ip link set can0 type can bitrate 1000000
sudo ip link set can0 up
```

1.4.3 Enable I2C

Configure your Pi and enable the I2C

```
sudo raspi-config
```


Select *Interfacing Options* → *I2C* → *YES* to enable the I2C driver by kernel.
Then you can check if the I2C is enabled:

```
lsmod
```

If I2C enabled, the terminal echoes an `i2c-bcm2708` device. Else you can also add it manually.

```
sudo nano /etc/modules
```

append:

```
i2c-bcm2708 i2c-dev
```

1.4.4 RS485

Open the terminal and modify `config.txt` file by commands:

```
sudo nano /boot/config.txt
```

Add the line below to the file, the `int_pin` should be set according to the actual welding:

```
dtoverlay=sc16is752-spi1,int_pin=24
```

Then restart Raspberry Pi

```
sudo reboot
```

After rebooting, the driver of SC16IS752 will be loaded into the system kernel. You can run command `ls /dev` to check the following devices:

```
gpiochip3
ttySC0
ttySC1
```

1.4.5 Horloge RTC

The i2c must be enable.
Start oscillator:

```
i2cset -y 1 0x6f 0 0x80
```

Enable VBAT

```
i2cset -y 1 0x6f 3 0x08
```

1.4.6 LED

LED pin configure as output

```
raspi-gpio set 26 op
```

LED On

```
raspi-gpio set 26 op pn dh
```

LED Off

```
raspi-gpio set 26 dl
```

Appendix A

Hardware revision history

Version	Date	Change
v1.0.1	2020/08/10	Initial public version
v1.0.2	2021/03/20	Improved DC/DC performance Removed border line mask

Appendix B

Datasheet revision history

Revision	Date	Change
A	2020/10/15	Initial public revision