UPiS - Uninterruptible Power intelligent Supply

Introduction

The **UPiS** is an Advanced Powering add-on Module for the RaspberryPi® that adds a wealth of additional features to the powering functionality. It is equipped with a LiPO battery (1150 or 2600 mAh) and features a buck/boost switching power converter. There is no need for any additional cabling or power supply, as the **UPiS** is powered by the same power supply of your original RaspberryPi®; you just insert the **UPiS** on the top of the **P1** connector of your RaspberryPi®. The **UPiS** has an embedded measurement system that continuously checks the powering voltage and current consumption, and when the cable power is absent or insufficient, it automatically switches to the battery source. Then, it keeps checking the input voltage on all power sources, and when cable power is available again, it switches to it automatically, turning the battery source off. The **UPiS** uses exactly the same micro USB Power Supply that you are using to supply your RaspberryPi®, however it also has an extended external voltage input[1] for other non-standard powering sources.

Applications

The **UPiS** as an add-on Module is addressed to all users that need a power back-up and/or sensing features for applications running on the RaspberryPi®. All applications running on the RaspberryPi® can take advantage of the *uninterruptible power supply* feature of the **UPiS** (ranging from RaspberryPi®-based fan-less servers to solar-powered applications), but in

[1] The extended external voltage input is available only in the advanced version of the **UPiS**

addition, the **UPiS** provides a wealth of sensors and features, all cumulated in a single all-in-one unit, that can enable writing many innovative applications.

Features

The features of the **UPiS Module** can be categorized as follows:

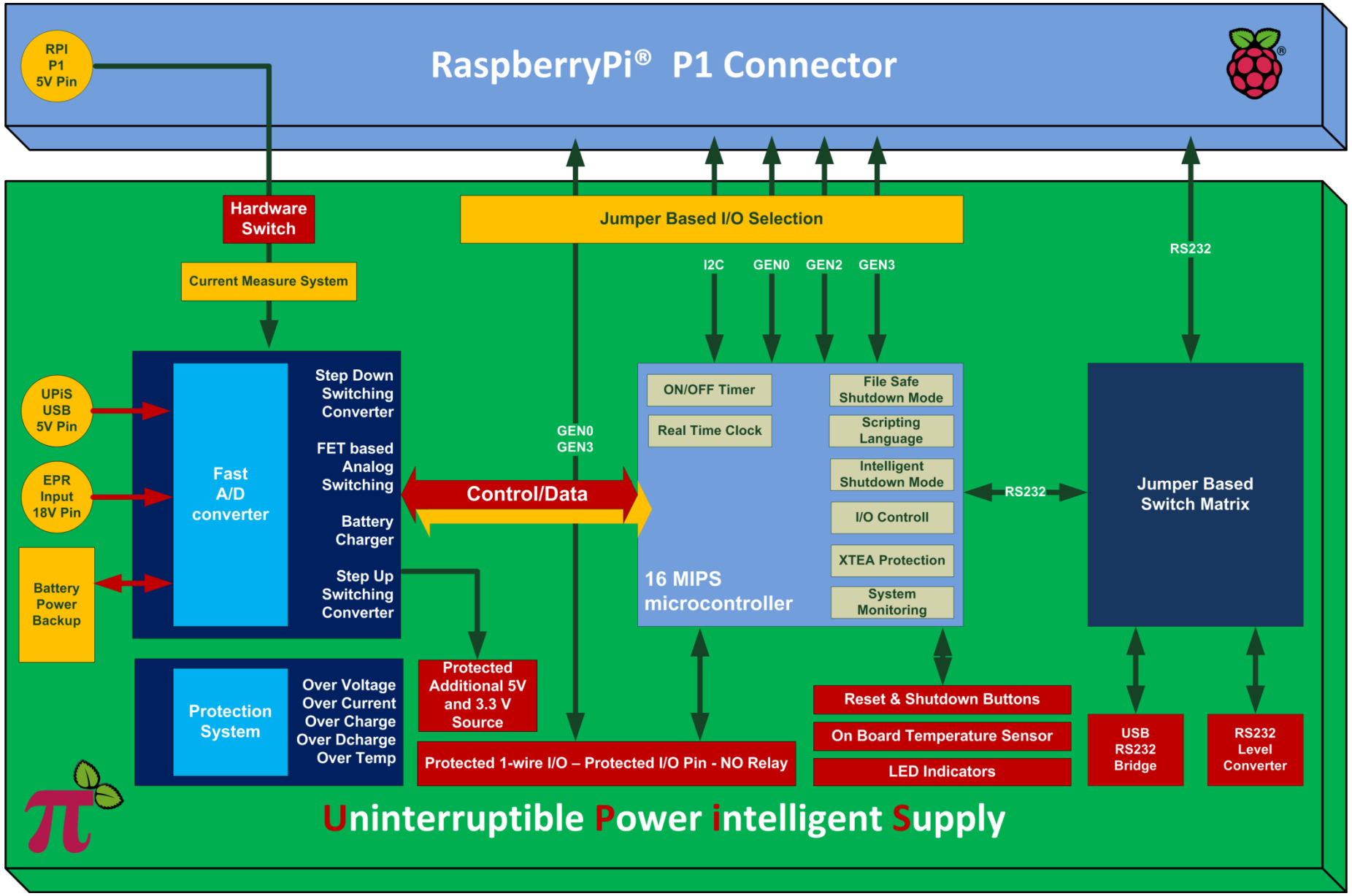
- Powering functionalities
- I/O and control functionalities
- RTC functionalities
- Interfaces functionalities
- Software Protection functionalities
- Environment supervising functionalities

In detail, the list of **UPiS** features is below:

1. Supervised and Protected Powering from all cable sources
    a. RaspberryPi ® micro USB (5 VDC) – available from firmware release V1.20
    b. Additional micro USB (5V DC)
    c. Extended External Powering Input (7V DC – 18V DC) [Advanced version only]
2. Battery Power Backup on each cable powering source (including original RaspberryPi® micro USB – optional after firmware activation) – the UPS feature
3. Onboard Rechargeable LiPO Battery (1150/2600 mAh) – battery working time is from 2 to 5 hours, depending on the version, system load and configuration
4. Onboard enhanced multiple level protection system for the LiPO battery:
    a. Cut-off jumper
    b. PTC fuse
    c. Onboard Thermometer
    d. Over-charge and Over-discharge protection
    e. Over-voltage and Under-voltage protection
5. Onboard Intelligent Automatic LiPO Battery Charger (Charges the battery automatically only if the supply voltage is present and can provide enough current to both feed the RaspberryPi® and charge the battery)
6. RaspberryPi® Hardware ON/OFF Switch
7. Embedded Emulated RTC (Real Time Clock – DS1307) accessible via RaspberryPi® I2C and/or RS232 provided from the System
8. Onboard Analog Thermometer (accessible via RaspberryPi® RS232)
9. Onboard True USB interface (can be used as RS232 – USB Bridge)
10. Programmable Time, RaspberryPi® File Safe Shutdown Button[2]
11. Full monitoring of all UPiS Powering Parameters via RaspberryPi® RS232 port:
    a. Current Consumption
    b. Voltage on each Power source
    c. System Temperature

[2] Requires that the RaspberryPi® be powered from the second micro USB placed on the UPiS board or from Extended External Powering Input

   d. Battery Level
   e. Powering source
12. RTC based programmed Startup/Shutdown
13. Onboard UPiS Reset Button (resets UPiS and RaspberryPi® but not RTC by cutting the powering of the RaspberryPi® for a very short time)
14. Onboard NO RELAY controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN0)
15. Onboard ESD Protected 1-wire interface, controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN3) with separate 3.3V supply pull-up resistor.
16. Onboard ESD Protected I/O pin, controlled via RS232 or RaspberryPi® Pin (selectable by jumper GPIO_GEN3)
17. Onboard True 12 V RS232 interface to the external world (with level converter)
18. Protected (Resettable fuse 140 mA) 5 VDC output for user applications, with battery backup feature
19. Non-protected 3.3 VDC output for user applications (usually used for 1-wire application), separate and independent from the RaspberryPi® 3.3 supply.
20. Extended Tiny Encryption Algorithm (*XTEA*) cryptographic Customer Software Protection System (with custom defined protection keys)
21. Scripting language
22. LED-based Status Information System
23. Bootloader feature for lifetime firmware update.


RPI
P1
5V Pin
RaspberryPi® P1 Connector
Hardware Switch
Current Measure System
Jumper Based I/O Selection
I2C
GEN0
GEN2
GEN3
RS232
UPiS
USB
5V Pin
EPR
Input
18V Pin
Battery
Power
Backup
Fast
A/D
converter
Step Down
Switching
Converter
FET based
Analog
Switching
Battery
Charger
Step Up
Switching
Converter
GEN0
GEN3
Control/Data
ON/OFF Timer
Real Time Clock
File Safe
Shutdown Mode
Scripting
Language
Intelligent
Shutdown Mode
I/O Controll
XTEA Protection
System
Monitoring
16 MIPS
microcontroller
RS232
Jumper Based
Switch Matrix
Protection
System
Over Voltage
Over Current
Over Charge
Over Dcharge
Over Temp
Protected
Additional 5V
and 3.3 V
Source
Protected 1-wire I/O – Protected I/O Pin - NO Relay
Reset & Shutdown Buttons
On Board Temperature Sensor
LED Indicators
USB
RS232
Bridge
RS232
Level
Converter
Uninterruptible Power intelligent Supply

NEW Product for the B+/A+

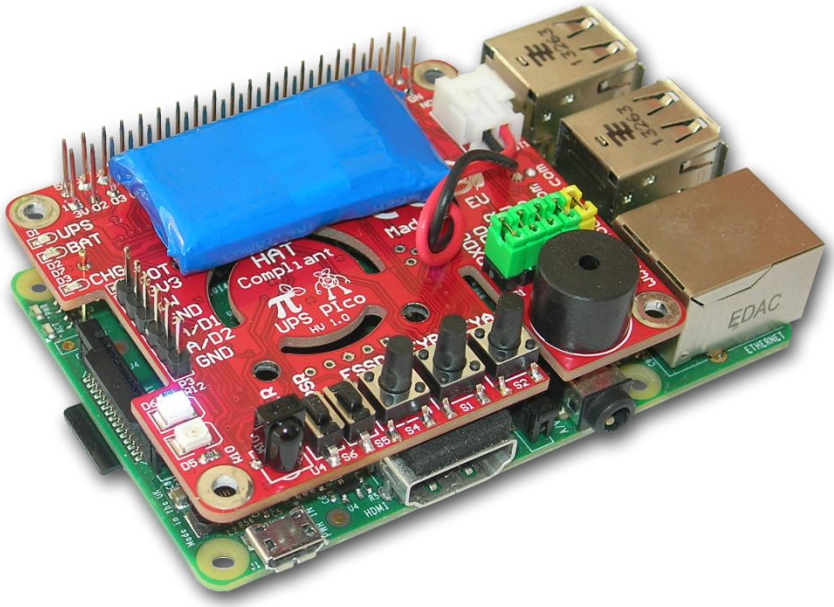
UPS PIco

Uninterruptible Power Supply

with Integrated Battery, Peripherals and I²C control Interface

for use with

Raspberry Pi® B+, A+, B, and A



HAT Compliant

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Designed and Manufactured by PiModules and ModMyPi
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System Overview

Introduction

The **UPS PIco** is an advanced uninterruptible power supply for the Raspberry Pi® that adds a wealth of innovative power back-up functionality and development features to the innovative microcomputer!

The standard **UPS PIco** is equipped with a 300mAh LiPO battery specially designed to enable safe shutdown during a power cut. Additionally, this can be easily upgraded to the extended 3000mAh version, which enables prolonged use of a Raspberry Pi for **up to 8 hours** without a power supply connected!

The **UPS PIco** features an embedded measurement system that continuously checks the powering voltage of the Raspberry Pi®. When the cable power on the Raspberry Pi® is absent, insufficient, or the device detects a power failure, the **UPS Pico** automatically switches to the unit's battery source. The module then continues to check the voltage on the Pi and switches automatically back to the regular cable supply when power is once again available.

The **UPS PIco** is powered and the battery pack intelligently charged via the GPIO pins on the Raspberry Pi®, so no additional cabling or power supply is required.

The **UPS PIco** is designed to be 100% compliant with **HAT standards** for the Raspberry Pi® B+ and A+, and is mechanically compatible with the original Raspberry Pi® models A and B when an extension header is used. In addition to this, because the **UPS Pico** requires no external powering and fits within the footprint of the Raspberry Pi®, it is compatible with most cases.

The **UPS PIco** can also be equipped with an optional **Infra-Red Receiver** which is routed directly to GPIO18 via the PCB. This opens the door for remote operation of the Raspberry Pi®and **UPS Pico**!

Finally, the **UPS Pico** features an implemented Automatic Temperature Control **PWM FAN controller**, and can be equipped with a micro fan kit, which enables the use of the Raspberry Pi® in extreme conditions including very high temperature environments.

Applications

UPS PIco is equipped with plenty of features which make it an extremely useful tool for Raspberry Pi® project development. It not only provides powering continuity, but also offers extra user programmable LEDs, Sensors, buttons and I/O's. The unit also features a dedicated **10-bit analogue to digital converter** with two channels making it the perfect board for remote and unmanned sensor deployment. These extra features result in the **UPS Pico** being a superior all-in-one device perfect for many innovative projects, and embedded applications.

Features

The list of features of the **UPS PIco** is as follows:

- Raspberry Pi B+ **HAT Compliant**
- **Plug and Play**
- **Smart Uninterruptible Power Supply (UPS)**
- **Integrated LiPO Battery** (8-10 Minutes of Power Back-Up)
- **Intelligent Automatic Charger**
- **No Additional External Power Required**
- **Additional 3000 mAh** Battery for 8 Hours Run-Time (Not Included)
- **5V 2A Power Backup (Peak Output 5V 3A)**
- Integrated Software Simulated **Real Time Clock (RTC)** with Battery Back-Up
- **File Safe Shutdown** Functionality
- Raspberry Pi B+ **Activity Pin**
- **PWM FAN control** (Fan Not Included)
- **2 User Defined LEDs**
- **2 User Defined Buttons**
- **Integrated Buzzer** for UPS and User Applications
- **Status Monitoring** - Powering Voltage, UPS Battery Voltage and Temperature
- **I2C PICo Interface** for Control and Monitoring
- **RS232 Raspberry Pi** Interface for Control and Monitoring
- **XTEA Based** Cryptography User Software Protection
- 2 Level **Watch-dog Functionality** with **FSSD and Hardware Reset**
- **Raspberry Pi B+ Hardware Reset Button via Spring Test Pin** (Not Included)
- **Jumpers for Raspberry Pi B+ Pin** Functionality Selection
- **Stackable Header** for Add-On Boards
- **Boot Loader** for Live Firmware Update
- Compatible with **Intelligent IR Remote Power ON/OFF (PowerMyPi)**
- **Integrated ESD-Protected 2 Channel A/D 10 Bit Converters 0-5.2V**
- **Integrated ESD-Protected 1-Wire Interface**
- **Labeled J8 Raspberry Pi B+ GPIO Pins** for Easy Plug & Play
- **Infra Red Receiver** Sensor Interface (IR Not Included)
- **Upgradable** with **PIco Add-on Boards**
- **Fits Inside Most Existing Cases**

Hardware Upgrades – the PIco Add-on Boards

The UPS PIco is equipped with plenty of features that make it an extremely useful tool for Raspberry Pi® based project development. However, it can't do everything! In order to cover a broader range of user requirements, we are developing a wide range of add-on boards that can be hosted on the top of **UPS PIco.** These **PIco Add-on Boards** will be designed to extend the functionality of the product, whilst being simple to integrate by plugging directly on top! However, in order to keep compatibility with **HAT standard**, each **PIco Add-on Boards** data will be stored in the **UPS PIco HAT EEPROM**. The following upgrade boards are in development and will be available soon:

- **EPR PIco Board**

  The **E**xtended **P**owe**r**ing **PIco Board,** will be designed to accept external powering voltage from 6 - 32V DC, and enable the use of solar panels. The device will also be equipped with various sensors, an RS232 converter, a USB interface, a bi-stable Relay and many more useful I/O's. The **EPR** will of course retain the powering functionality of the **UPS Pico**.

- **MCOM PIco Board**

  A **M**ulti-**Com**munication **PIco Board**, offering a multiple communication channels including 4 x RS232, RS485, etc.

- **RBT PIco Board**

  A **R**o**B**o**T PIco Board**, offering a toolset for the ROBOT projects development.

- **SNS PIco Board**

  A **S**e**N**sor**S PIco Board**, offering a toolset for various sensors projects development.

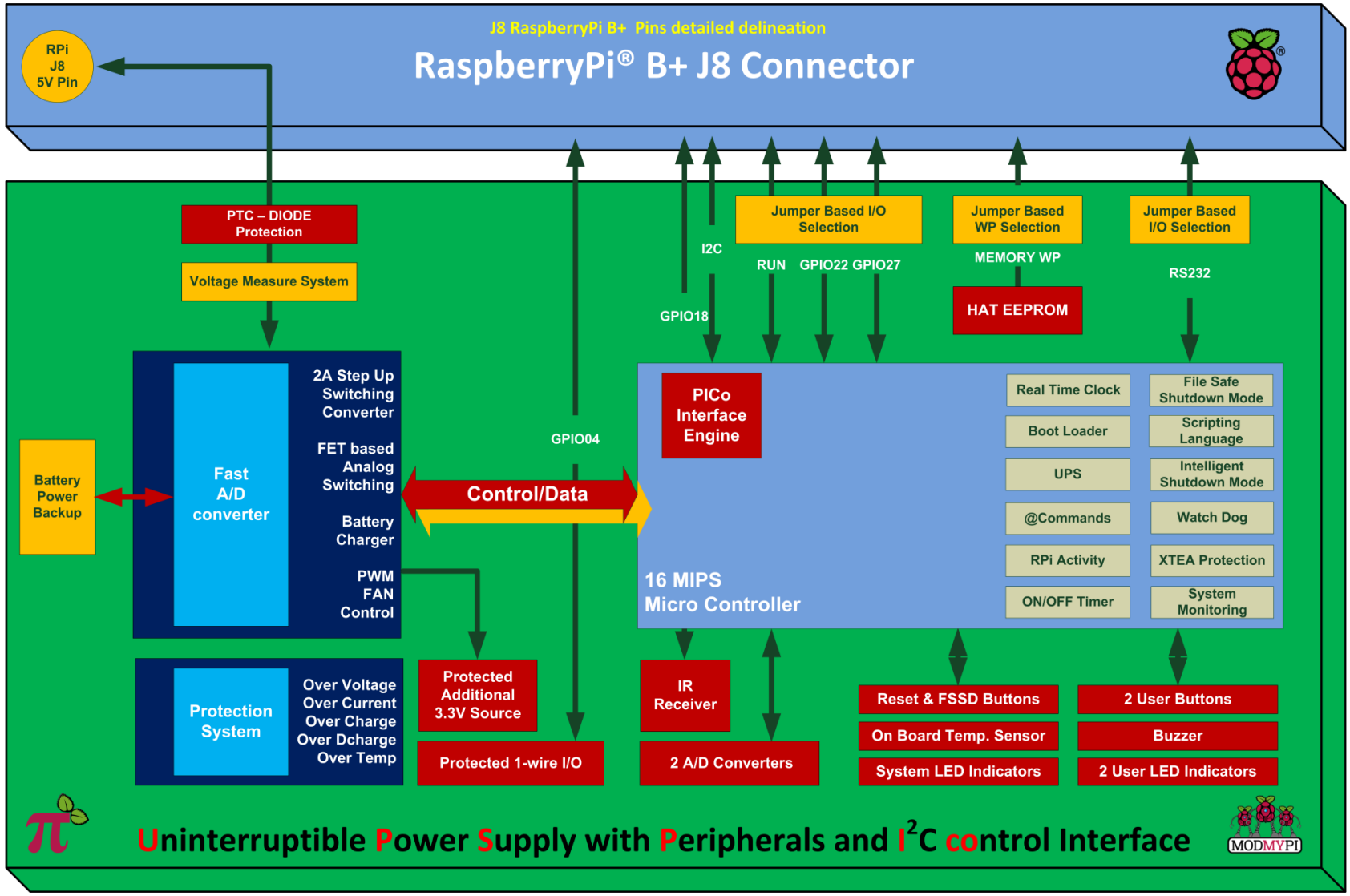
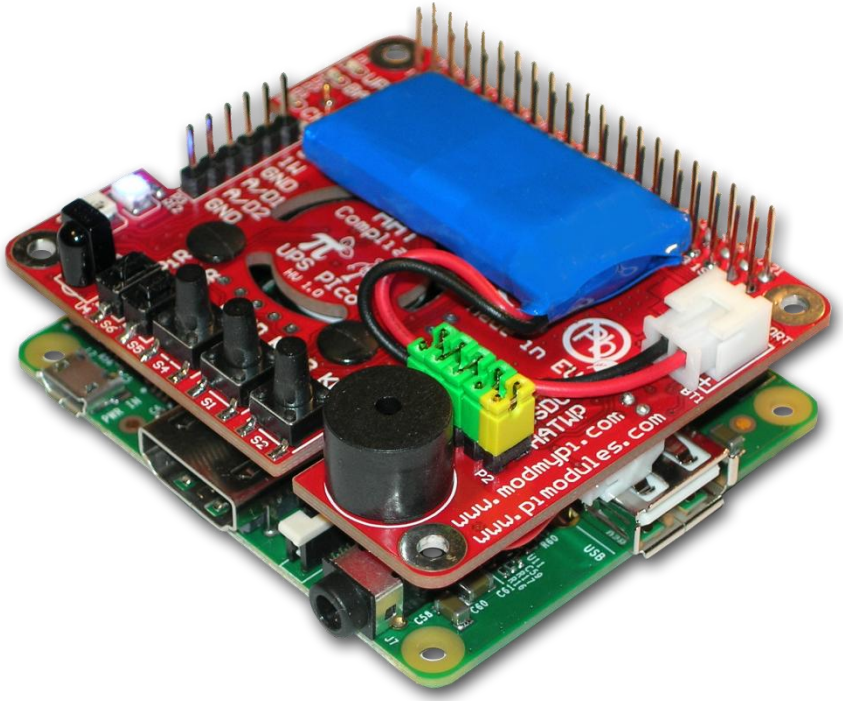
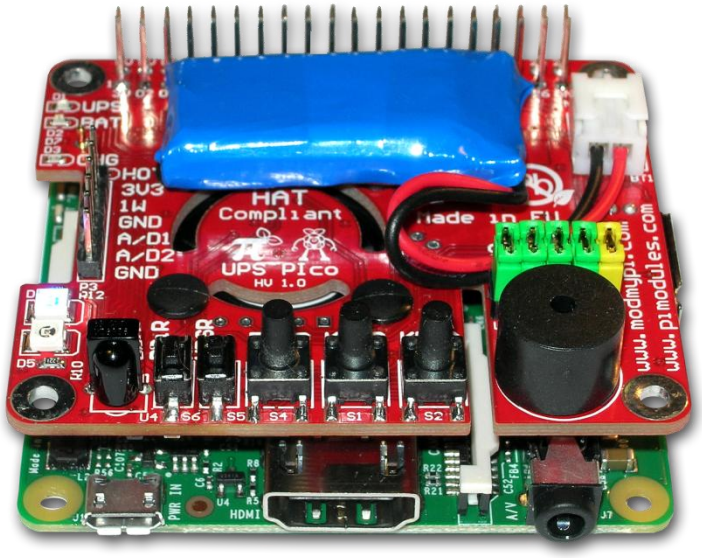
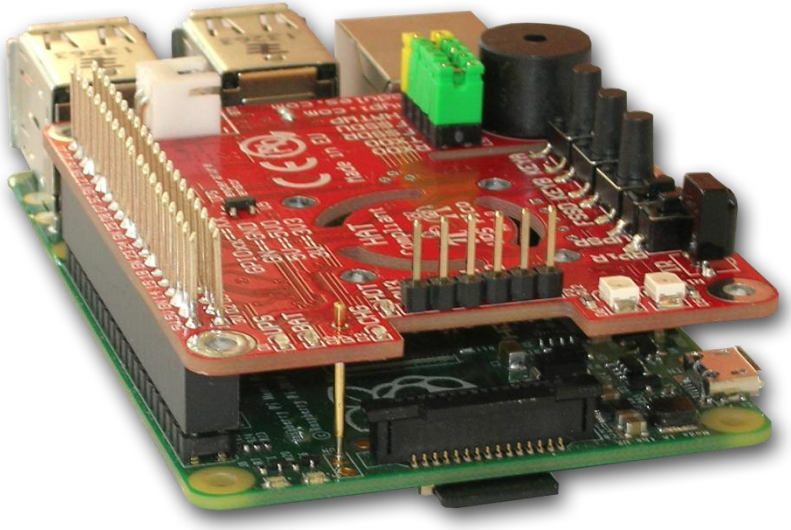
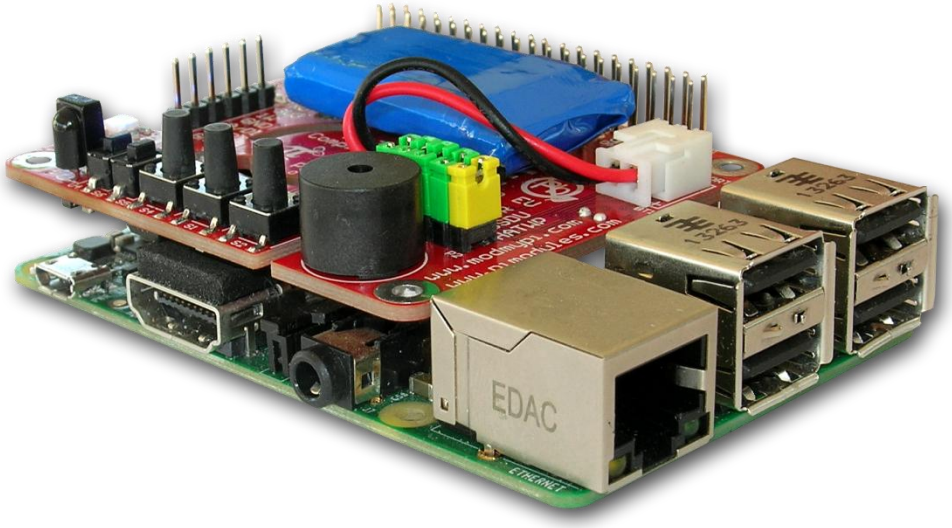

J8 RaspberryPi B+ Pins detailed delineation
RaspberryPi® B+ J8 Connector
RPi J8 5V Pin
PTC – DIODE Protection
Voltage Measure System
I2C
GPIO18
Jumper Based I/O Selection
RUN
GPIO22
GPIO27
Jumper Based WP Selection
MEMORY WP
HAT EEPROM
Jumper Based I/O Selection
RS232
GPIO04
Battery Power Backup
Fast A/D converter
2A Step Up Switching Converter
FET based Analog Switching
Battery Charger
PWM FAN Control
Control/Data
PICo Interface Engine
16 MIPS Micro Controller
Real Time Clock
File Safe Shutdown Mode
Boot Loader
Scripting Language
UPS
Intelligent Shutdown Mode
@Commands
Watch Dog
RPi Activity
XTEA Protection
ON/OFF Timer
System Monitoring
Protection System
Over Voltage
Over Current
Over Charge
Over Dcharge
Over Temp
Protected Additional 3.3V Source
Protected 1-wire I/O
IR Receiver
2 A/D Converters
Reset & FSSD Buttons
On Board Temp. Sensor
System LED Indicators
2 User Buttons
Buzzer
2 User LED Indicators
Uninterruptible Power Supply with Peripherals and I2C control Interface
MODMYPI

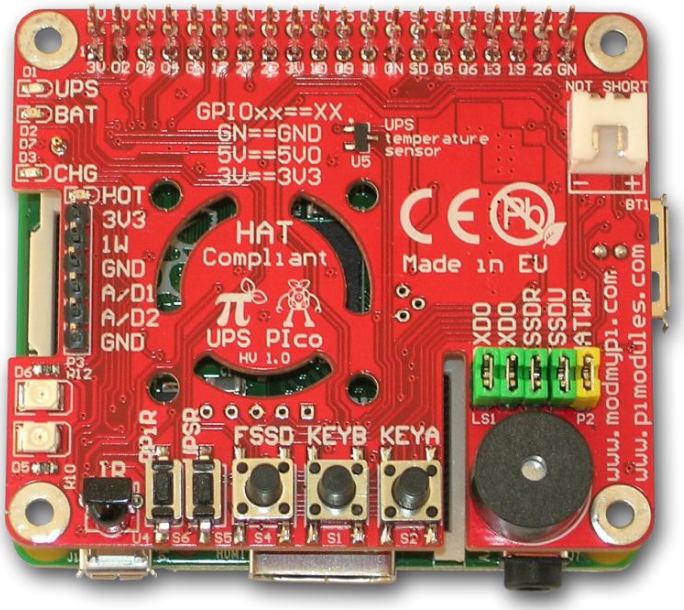
Photo Gallery








EDAC


UPS
BAT
CHG
HOT
3V3
1W
GND
A/D1
A/D2
GND
GPIOxx==XX
GN==GND
5V==5V0
3V==3V3
UPS temperature sensor
NOT SHORT
HAT
Compliant
Made in EU
UPS PIco
HV 1.0
FSSD KEYB KEYA
XDO
XDO
SSDR
SSDU
ATWP
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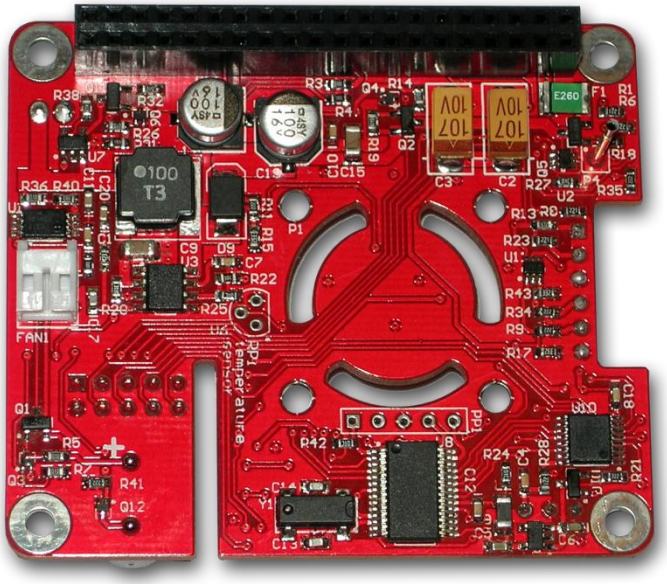


UPS
BAT
CHG
UPS Pico