

Key Features:

- Guarantees reboot after shutdown and when power returns.
- Several operating modes – operates as UPS; shuts down on power failure; reboot immediately when power returns or wait after power returns – all controlled by a Python script.
- Very configurable - all parameters are controlled using the Python script. Sample script provided.
- Several operating parameters are monitored: Input V, Output V, Battery V, Input current, Battery current and board temperature.
- Uses Li-Ion batteries. *Batteries not included.*
- Provides UPS functionality for all Pi models with a 40-pin header, including Pi-4.
- Connection points for on-off switch, power in-out-external battery.
- LEDs can be turned on/off via a jumper.

PiZ-UpTime PLUS

Guaranteed reboot after shutdown

After a soft shutdown, the power on a Raspberry Pi needs to be toggled to reboot. This is done by pulling the USB power source out or installing an on/off switch.



This becomes an issue when a Raspberry Pi is deployed remotely e.g. for monitoring temperature in a refrigeration unit or using a Pi with solar panels or other green energy sources or using a Pi in an automobile etc.

PiZ-UpTime PLUS supplies intelligent UPS capability in a Raspberry Pi-Zero-form-factor. It is designed to be used with regular sized Raspberry Pi's e.g., Pi-3 and Pi-4. To operate a Pi-Z-UpTime PLUS, connect a battery and start the provided Python script. The connector (2x4 pin connector) on PiZ-UpTime PLUS follows the 40 pin Raspberry Pi header format. Besides powering a Raspberry Pi, PiZ-UpTime PLUS also powers other SBC's following the Raspberry Pi header format. Alternately, by using the USB Power Out port other devices take advantage of the PiZ-UpTime PLUS capabilities.

PiZ-UpTime PLUS allows different modes of operation. For shutdown they are:

- Initiate a soft shutdown once power fails.
- Operate as a UPS till the battery runs low or the power returns. If the battery runs low, initiate a soft shutdown.

When power returns:

- Start the Raspberry Pi immediately.
- Wait for a designated period for power to stabilize or wait for other sensors / devices to come up before starting the Pi.

The operating modes can be mixed or matched as needed. LED's provide operational information. Sample Python code provides information on operational parameters.

Specifications

General Information

Model Number: PiZ-UpTime PLUS

Raspberry Pi Models supported

Any Raspberry Pi or other SBC with a 40-pin header compliant to Raspberry Pi Foundation header definition. Pins 2,4 are used for power. I²C is used to control operating parameters. External devices are powered using USB out port.

Power

Input power: Power-in via micro-USB connector. 25-30W capable power adapter recommended.

Batteries are charged only when power is provided to Power In connector on PiZ-UpTime PLUS board.

Power Adapter: 5V, 3.5A USB power recommended.

Power adapter not included.

Maximum Charge Current: Maximum of 2 Amps.

Maximum UPS current: 3.0A

Ripple: Less than 25mV p-p.

Battery Low shutdown trigger: 3.1V. Changed by the user in the Python code provided.

Input Operating range: 4.8 V to 6.0V. Above 6.0V the circuit will be damaged.

Output

UPS power: Regulated 5V, $\pm 1\%$ via OTG micro-USB and 2x4 pin header. Power provided to the Raspberry Pi via the 8-pin header, pins 2,4.

Batteries

Batteries: One Lithium Ion non-protected battery connected via terminal blocks. Recommend only one battery. Using multiple batteries may cause current loops and could damage the circuitry. Li-ion battery should be capable of charging with 2A charge current. Battery with less than 2A charge capability may be damaged.

Recommended Batteries: 18650 Li-Ion battery with wires for connection to the terminal block. Run time and charge time varies on capacity of the battery.

Battery capacity: Battery capacity will depend on your use. The higher the capacity, the longer the UPS run time, the longer the charge time.

LEDs: Yellow Charging LED is off when battery is charged, on when battery is charging. Green power LED shows input power is on. Blue UPS LED shows UPS is on. Blue Shutdown LED shows the operating parameters of the board (power on, waiting for power, shutting down).

Shutdown LED: Flashes 5 times when power is first connected. When shutdown is initiated, Shutdown LED flashes the number of times as set by timer variable in the sample Python script. After that, flashes for five seconds fast to show power is being turned off. Shutdown LED blinks for 2 seconds on and two seconds off when waiting for power to stabilize. The time and functions are set in the sample Python code provided.

Battery polarity: Marked on terminal blocks / board. **Inserting batteries incorrectly will damage the electronics and will cause the board to get extremely hot.**

Terminal Blocks recommended/used: Two Position Wire-to-Board Terminal Block, Horizontal with Board, 2.54mm (0.1inch) pitch, green color (color may vary), Thermoplastic, -30°C ~ 105°C, 6A, 125V. 20-30AWG wire is be used. Steel Zinc Screws, max torque 0.15 Nm (1.3 lb-in). Brass contact and clam material. RoHS 2 compliant. Recommend Onshore Technology Inc OSTVN02A150 Terminal blocks. Other manufacturers also provide equivalent terminal blocks.

Safety: On-board circuitry prevent over charging and negative flow (from battery to power supply). If the battery is depleted, the charging is done slowly initially. After safe level, the CCCV charging method is initiated.

Battery Charging: Uses CCCV charging method. Safe operating temperature range recommended is from 0°C to 50°C.

Depleted Batteries: Senses depleted batteries and uses low current charging to bring charge level up

and then CCCV charging. Initial charging for depleted batteries is a max of 100mA.

Monitoring: Monitor Input V, Output V, Battery V and board temperature using an on-board ADC. Sample Python Code provides capabilities to monitor ADC and shutdown the Pi when the battery V is low.

ADC capabilities: A 12-bit, SAR analog-to-digital converter (ADC). I²C addresses is changed via sample Python script. Use with extreme caution and testing if I²C code is changed. Minimum measurement sensitivity is 3mV.

Battery Full Charge Voltage: Li-Ion, Li-Polymer 4.2 V. Nominal 3.7V.

Spacers

M2.5x10mm. Not included. Spacers are recommended for mechanical stability and provide ambient cooling air space.

Connection Points

Connection points are spaced 2.54mm (0.1 inches) apart. Jumper studs, terminal-blocks or JST connectors are used for connections. Connections are marked on the board top layer as well as on the bottom layer.

Power on/off Switch

Reset: Turn power off by pulling out power On/Off jumper shunt. Turn power back on by inserting jumper shunt. Power shunt remove-reinsert sequence causes a power reset and a reboot.

External Switch: Instead of a shunt, an external on/off switch is connected to the jumpers via a cable. The shunts are 2.54mm. Please make sure the switch sustains a minimum of 10V, 5A or more.

On/Off Switch cable: Available at several web sites. An example is via Amazon, product-id B07FXXDN2M.

Dimensions

Board dimensions: 65mm x 30mm x 12mm (2.6" x 1.2" x 0.5").

Weight: About 20g (0.7 oz.) without batteries. Note each battery adds approximately 30 grams of weight.

Header: Female pins on bottom. Pin thickness appx. 0.6mm. Female pin height appx 8.5 mm. No male pins on the top.

Warranty

90-day limited warranty. Warranty voided by improper use.

Other Information

Temperature:

Battery Charging Temperature: 0°C to +50°C, outside this range, battery charging is not recommended. Since the battery is separate from the board, battery temperature is not monitored. Only the board temperature is monitored.

Board Operating Temperature: -40°C to +80°C

Operating Humidity: 10% to 80% non-condensing.

RoHS etc.

RoHS Compliance: Electronic components, board etc. are all RoHS compliant.

Other: CE Compliance certificate available on request.

Recommended peripherals:

Please visit www.alchemy-power.com/products for recommended products.

Code download: www.alchemy-power.com/downloads

Product Video: none currently.



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