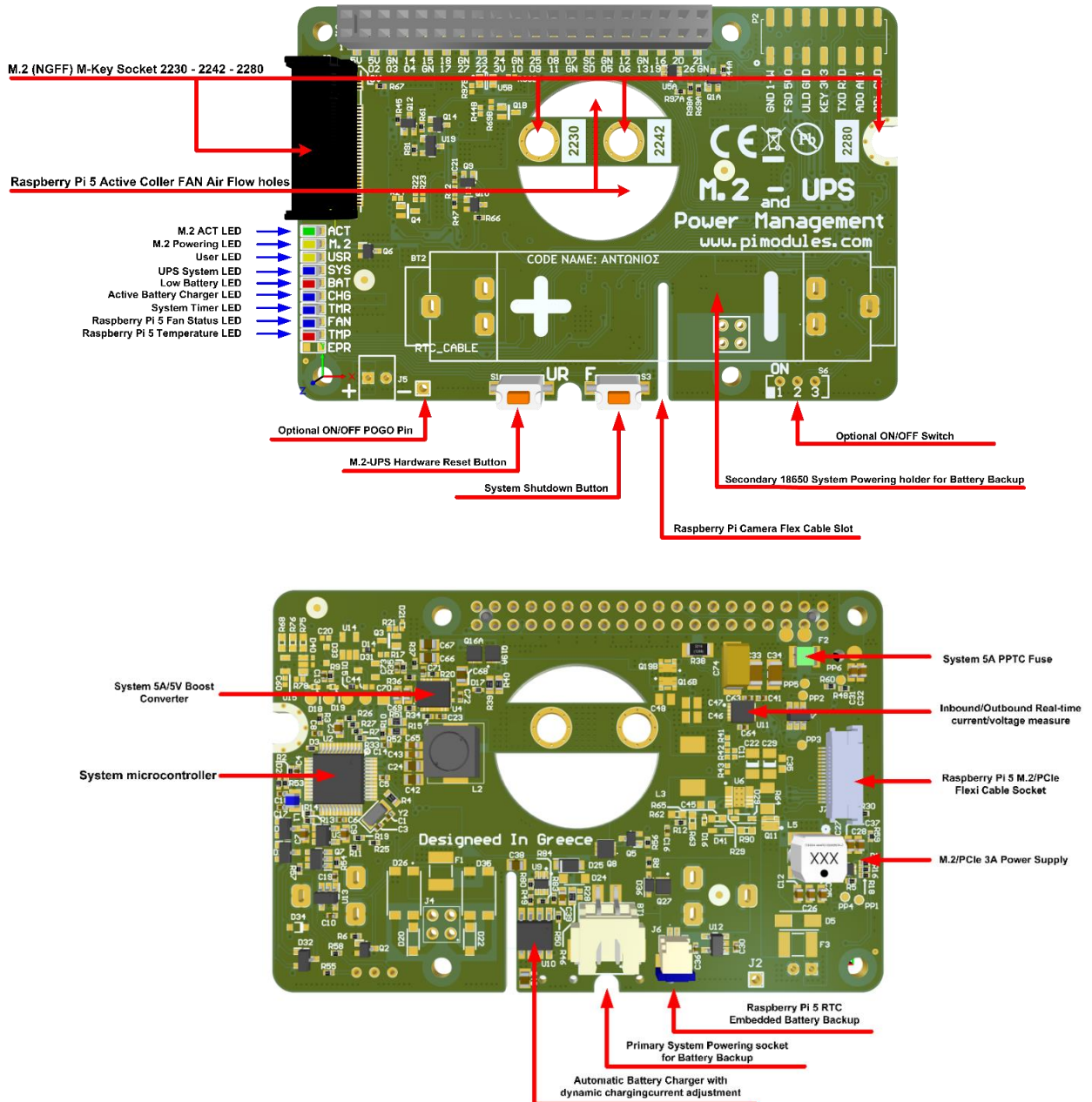


M.2 – UPS and Power Management HAT for Raspberry Pi 5 Version Standard

The M.2 **U**ltimate **P**ower **M**anagement **S**ystem with **R**TC, Enhanced **P**eripherals and **I**²**C** control Interface

Intelligent **M**obile **P**ower **B**ank Ultra - High Current Extended Buck Supply of 5.0A



The **M.2 – UPS & Power Management HAT** is an Ultimate Power Management System HAT designed especially for **Raspberry Pi® 5** that open the full functionality of their embedded PCIe (M.2) interface and adds a wealth of innovative powerful and development features to the **Raspberry Pi® 5** microcomputer!

It has been designed especially for the **Raspberry Pi® 5** and considers all enhanced power and cooling requirements of the **Raspberry Pi® 5** models. It has been designed to work with **Official Cooler** exploring their enhanced cooling capabilities for **Raspberry Pi** as also for the added **M.2** devices.

The core functionality of the **M.2 – UPS & Power Management HAT** is to provide an interface for **M.2(NGFF) M-Key (2230, 2242 and 2280)** and at the same time protect and automatically shut-down your **Raspberry Pi® 5** if there is a cable power failure and can be set to automatically monitor and reboot your Pi once cable power has been restored!

However, it is only a small part of plenty and powerful functionalities that are implemented on this small HAT. The new **M.2 – UPS & Power Management HAT** contains two selectable backup power sources that can be used (once at a time). The wide available on the market Battery 18650 Li-Ion or large selection line of **XH-2.5** connector (600 mAh – 10 000 mAh) cover any extended Battery Backup request.

The new **M.2 – UPS & Power Management HAT** is the only one that supplies the **Raspberry Pi® 5 RTC** with battery backup (J5) and eliminates the need to use an additional battery for this purpose.

Last but not least is that implemented M.2 interface is equipped with **32786 kHz clock**, similar to the official **Raspberry Pi® 5 M.2 HAT**.

The new **M.2 – UPS & Power Management HAT** does not need any additional powering cable and thanks to the implemented proprietary monitoring algorithm monitors the and current consumption via GPIO.

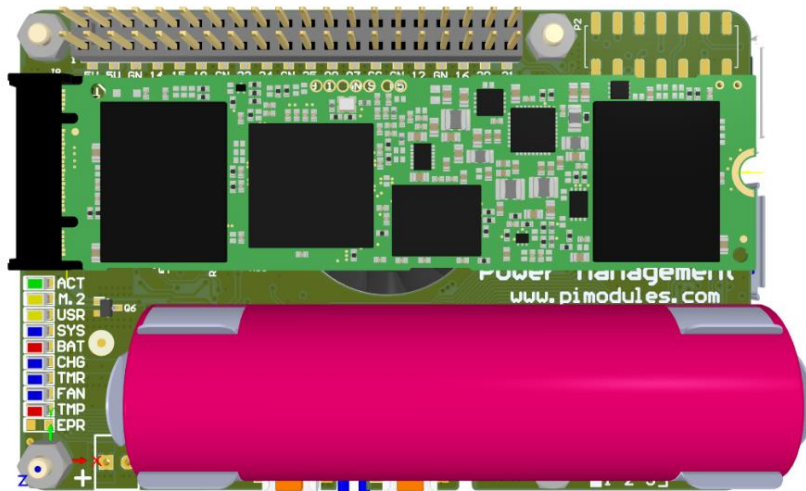
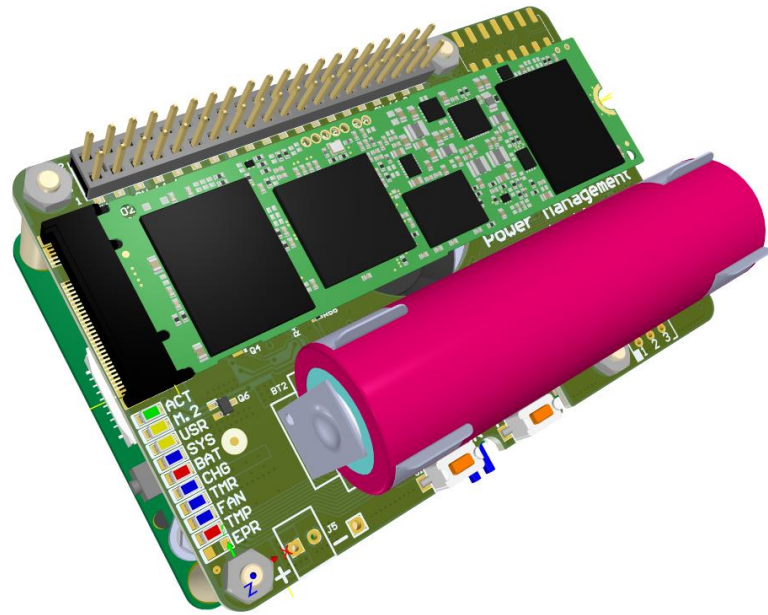
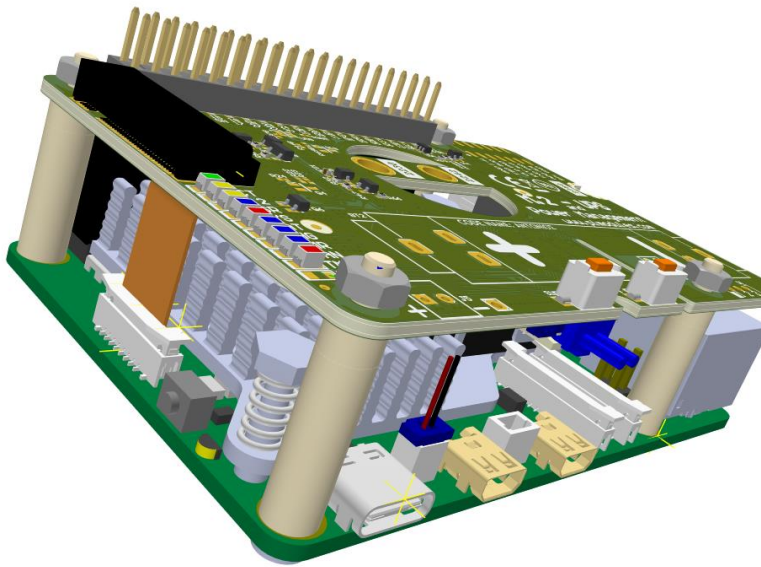
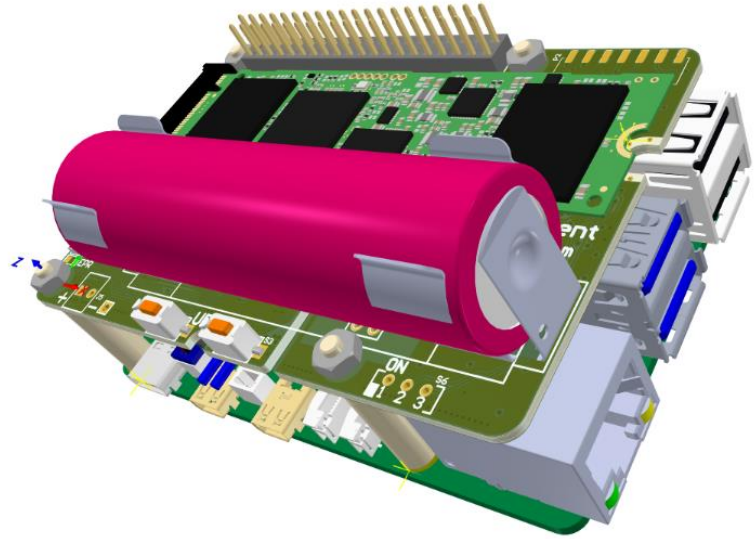
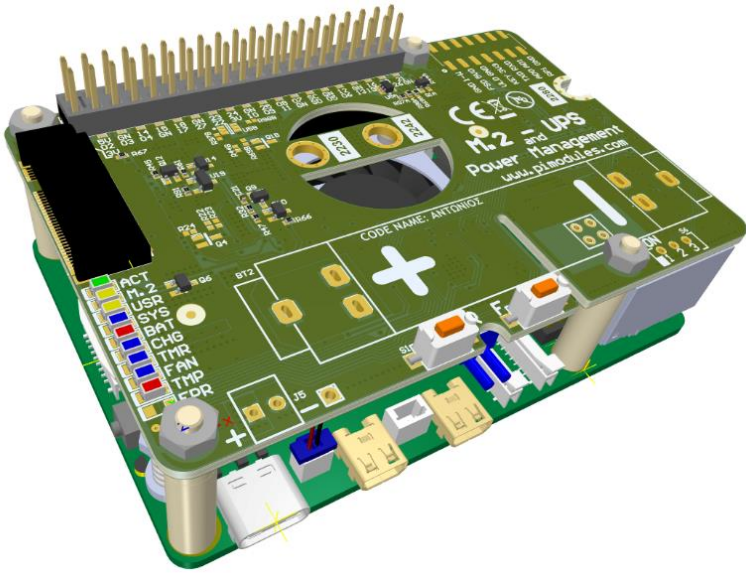


Designed and Manufactured in Europe by
Pi Modules Technologies L.P.
www.pimodules.com



System Specifications

<p>General</p> <ul style="list-style-type: none"> - Dimensions: 85mm x 56mm - Email broadcasting on events (Cable Power loss/return, Wake-up, User Button, System Status) - Plug and Play - Ultra-light System.d Daemon based on threading - GPIO free (all GPIOs are available for user application) interaction with Raspberry Pi® via I²C - Enhanced System Monitoring and Programming API - Labeled J8 Raspberry Pi® GPIO Pins for Easy Plug & Play of experimental cables - Standard THT 40 Pin connector (not soldered) - Remote bootloader for Live Firmware Update on remote locations - Local bootloader for Live Firmware Update 	<p>Powering Options</p> <ul style="list-style-type: none"> - Protected (ESD, over current (PPTC fuse), 5A Supply @5V) - 2 selectable power back-up sources: 18650 Battery or XH-2P socket cable Battery - Enhanced Line Interactive UPS functionality (25us response time) powered via Raspberry Pi® 5 5V GPIO - Automatic Advanced Proprietary Power Spikes Tracking Algorithm - Additional/Alternative to Raspberry Pi® 5 File Safe Shutdown and Start-up Functionality on a Single Button - Continuously 5.0A@5.25V supply on battery power backup - Intelligent Mobile Power Bank functionality with safe shutdown/start-up, with Internal or External Slide Switch and RTC - Backup Supply Source (via additional Cable to J5) to Raspberry Pi® 5 RTC
<p>Supported Battery Types and Capacities</p> <ul style="list-style-type: none"> - Supports a wide range of different Chemistry and capacities batteries and Super Capacitor (LiPO/LiFePO4/Li-Ion/ Super Capacitor 4000F) - Support for Li-Ion 18650 low-cost batteries (from Electronic Cigarettes) with dedicated holder on top - Support for LiPO 18650 batteries with dedicated holder on top - Support for LiFePO4 18650 with dedicated holder on top <p>User/Programmer Interface</p> <ul style="list-style-type: none"> - I²C Pico API Interface for Control and Monitoring, with over 50 programming registers - Support for 4 different users selectable I²C addresses sets: DEFAULT: 0x68, 0x69, 0x6A, 0x6B, 0x6C, 0x6D, 0x6E, 0x6F NO_RTC: 0x69, 0x6B ALTERNATE1: 0x58, 0x59, 0x5A, 0x5B, 0x5C, 0x5D, 0x5E, 0x5F ALTERNATE2: 0x48, 0x49, 0x4A, 0x4B, 0x4C, 0x4D, 0x4E, 0x4F 	<p>System Monitoring</p> <ul style="list-style-type: none"> - Status Monitoring – Powering Mode, Inbound current, Outbound current, Powering Voltage, Battery Voltage, Temperature (Raspberry Pi® 5 Core and M.2 – UPS & Power Management HAT), Timer State - Events Pi Log feature - System LEDs – ACT, M.2, USR, SYS, BAT, CHG, TMR, FAN, TMP (optionally selected can be mapped to User LEDs) - System Healthy, that informs user remotely if Raspberry Pi® 5 Core and M.2 – UPS & Power Management HAT are running properly, and system is power protected (based on various internal system triggers) <p>System Protection</p> <ul style="list-style-type: none"> - Optional Direct Raspberry Pi® 5 Button via Spring Loaded Pogo Pinpoint to J2 - Programmable Watch-Dog Hardware feature (Still Alive Timer) - PPTC 5A@5V fuse - ZVD circuit on all 5V GPIO connections - Micro-controller-based watchdog - Over-Temperature protection - Over-Current protection
<p>Embedded Peripherals and Interfaces</p> <ul style="list-style-type: none"> - 1 User Programmable button (externally accessed) - 1 User Programmable LEDs (with mapping capability of the system behavior LEDs) - System File Safe Shutdown/Start-up button with additional cable connectivity to external button (similar/alternative to Raspberry Pi® 5 but with ultra-low current consumption) - Integrated Hardware Real Time Clock (RTC) with Battery Back-Up in addition and independent (synchronized) to Raspberry Pi® 5 RTC - Dedicated Cable for the Raspberry Pi® 5 RTC battery Supply 	<p>Embedded Sensors</p> <ul style="list-style-type: none"> - Inbound/Outbound High-side bi-directional hardware current/voltage sensing monitor with power calculation on 5V supply - onboard Voltage sensors: Battery Voltage Level Raspberry Pi GPIO 5V level Voltage - onboard additional Temperature Sensor
<p>RTC Support and System Scheduler</p> <ul style="list-style-type: none"> - RTC Scheduler - Enhanced shutdown and start-up system based on various internal/external events: Time stamp, Cable Powering/Loss (UPS), Battery Level, etc. 	<p>Case Compatibility</p> <ul style="list-style-type: none"> - Dedicated Case Coming soon
<p>PCB Construction</p> <ul style="list-style-type: none"> - 2 oz copper PCB manufactured for proper high current supply and cooling - 6 mils track/6 mils gap technology 4 layers PCB - PCB Surface Finishing – Immersion Gold - Multi-layer Copper Thermal Pipes for increased System Thermal Response and better passive cooling 	<p>System Design</p> <ul style="list-style-type: none"> - Designed and Simulated with PDA Analyzer with one of the most advanced CAD/CAM Tools – Altium Designer - Design Based on Microchip 16-bit 16 MIPS micro controller - Industrial Originated
<p>M.2 (NGFF) M-Key Interface</p> <ul style="list-style-type: none"> - Supports 2230, 2242 and 2280 - Implemented SUSCLK 32.768 kHz - Independent 3A Power Supply with Battery Backup - Connectivity with Raspberry Pi® 5 via 16 pins FPC 	<p>System Indicators</p> <ul style="list-style-type: none"> - M.2 ACT LED - M.2 Powering LED - User LED - UPS System LED - Low Battery LED - Active Battery Charger LED - System Timer LED - Raspberry Pi 5 Fan Status LED - Raspberry Pi 5 Temperature LED



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