M.2 - UPS
Power Management HAT
for Raspberry Pi® 5

Technical Specifications

M.2 - UPS & Power Management HAT for Raspberry Pi® 5		
Features	**Standard**	**Advanced/Passive PoE (5V0-32V)**
Raspberry Pi® 5 System Compatibility		
Compatible Raspberry Pi Models	Especially Designed for **Raspberry Pi® 5**	Especially Designed for **Raspberry Pi® 5**
HAT EEPROM	Not Exist	Not Exist
HAT Dimensions	85mm x 56mm	85mm x 56mm
Raspberry Pi® 5 System Interfaces		
Use I²C API for Raspberry Pi® 5 interaction **User selectable addresses**	GND, SDA0, SCL0 I²C Addresses 1: **68 69 6a 6b 6c 6d 6e 6f** I²C Addresses 2: **58 59 5a 5b 5c 5d 5e 5f** I²C Addresses 3: **48 49 4a 4b 4c 4d 4e 4f** I²C Addresses 4: **69 6b**	GND, SDA0, SCL0 I²C Addresses 1: **68 69 6a 6b 6c 6d 6e 6f** I²C Addresses 2: **58 59 5a 5b 5c 5d 5e 5f** I²C Addresses 3: **48 49 4a 4b 4c 4d 4e 4f** I²C Addresses 4: **69 6b**
Selectable use of Raspberry Pi® 5 RS232 serial0	GND, TXD0, RXD0 OFF(HiZ)	GND, TXD0, RXD0 OFF(HiZ)
Raspberry Pi® 5 RTC Powering	Offered via dedicated cable supplying Raspberry Pi RTC via UPS Battery	Offered via dedicated cable supplying Raspberry Pi RTC via UPS Battery
Selectable use of Raspberry Pi® GPIO	I²C only for interaction with	I²C only for interaction with GPIO_GEN4 (only if 1-wire is used)
Passive Cooling	4 layers PCB 2oz copper with enhanced ground and cooling planes, covered with huge number of thermal vias Cooling hole over Official Cooling FAN for air circulation	4 layers PCB 2oz copper with enhanced ground and cooling planes, covered with huge number of thermal vias Cooling hole over Official Cooling FAN for air circulation
Active Cooling	Hole Placed exactly above the Official Raspberry FAN Offers improved Cooling for the Raspberry Pi 5 as also SSD above	Hole Placed exactly above the Official Raspberry FAN Offers improved Cooling for the Raspberry Pi 5 as also SSD above
Dedicated Passive PoE on PCB	none	5V-32V DC with reverse polarity, 2 level ESD and PPTC fuse protection Continuously current measure over Passive PoE supply on 12V-32V
M2. Interface		
Supported M.2 SSD Interfaces	2230 – 2242 – 2280	2230 – 2242 – 2280
Supported M.2 SSD Height	3.2mm	3.2mm
Supported M.2 SSD Cooling	Via Offcial Raspberry Pi 5 Cooler Air Pass Hole	Via Offcial Raspberry Pi 5 Cooler Air Pass Hole
M.2 SSD Indicators	ACT, M.2 (PWR)	ACT, M.2 (PWR)
Supported ower Supply Current	3A	3A
Supported M.2 32.768 Hz Clock	Yes	Yes
UPS Fucntionality on M2. SSD	Yes	Yes
Power Monitoring		
UPS Type	Line Interactive on Raspberry Pi® 5V GPIO	Line Interactive on Raspberry Pi® 5V GPIO On-line on EPR On-line on PPoE
UPS Response time	Line Interactive Maximum 50 uS	Line Interactive Maximum 50 uS On-Line 0 uS
Automatic Restart on Cable Power Return	YES	YES
Raspberry Pi Battery Backup	5.25V@5A current continuous supply to Raspberry Pi via 5V GPIO Pins Power Backup cover also the M.2	5.25V@5A current continuous supply to Raspberry Pi via 5V GPIO Pins Power Backup cover also the M.2

Cable Power Input	Raspberry Pi® GPIO 5V	Raspberry Pi® GPIO 5V UPS External Power Input 5V-32V DC supplying Pi with 5V@5A Can be used both (GPIO 5V and EPR) at the same time (isolated with ZVD)
Cable Power Monitoring Point	Raspberry Pi® GPIO 5V	Raspberry Pi® GPIO 5V/EPR/PPoE
UPS Activation Powering Triggers/Thresholds	Proprietary Algorithm of Falling Power Peak Analysis Programmable by user Self-learning system	Proprietary Algorithm of Falling Power Peak Analysis Programmable by user Self-learning system
Cable Powering Reactivation	After 10s of continuously cable powering (without power spikes)	After 10s of continuously cable powering (without power spikes) on any cable power source (GPIO or External or Passive PoE)
Auxiliary 5V and 3V3 Battery Backed Supply on I/O Pins	none	5V@200 mA current and 3V3@200 mA continuous supplies on I/O Pin battery backed, with possibility to continuous supply auxiliary devices with Raspberry Pi disconnected
Power Back-up		
Total Back-up Power	5.25V 5A continuously Supply	5.25V 5A continuously Supply
Number Power Back-up Sources	Two (One at the time can be used)	Two (One at the time can be used)
Power Back-up Source Types	Cable Battery or 18650 Socket (One at the time can be used)	Cable Battery or 18650 Socket (One at the time can be used)
Supported Batteries Power Back-up		
Supported Batteries Chemistry	LiPO, LiFePO4, Li-Ion, Super Capacitor 4000F	LiPO (standard Supported with system), LiFePO4, Li-Ion, Super Capacitor 4000F
On bard XH-2.5mm Battery Socket (with mechanical reverse polarity protection)		
Default (standard)	PCM Protected LiPO 3.7V, 450 mAh 15C with silicone high current cables	PCM Protected LiPO 3.7V, 450 mAh 15C with silicone high current cables
Optional bigger Capacities Batteries	Supported in all Chemistries	Supported in all Chemistries
On bard 18650 Battery Holder (with electronic reverse polarity protection)		
18650 Support	All chemistries batteries are supported via the Single 18650	All chemistries batteries are supported via the Single 18650
Charging process		
LiPO/LiFePO4/Li-Ion/Super Capacitor	Automatic Selected: Full Charging Cycle Trickle Charging	Automatic Selected: Full Charging Cycle Trickle Charging
Maximum Charging Current	380mA	1.1A
Charging Current Setting	Yes, from 100mA to 380 mA Dynamically Decrease/Increase the charging current to appropriate level according to cable power available	Yes, from 100mA to 1.1A mA Dynamically Decrease/Increase the charging current to appropriate level according to cable power available
Batteries Protection		
Standard LiPO 450 mAh	PCM and on-board cut-off protection system overcharge or over discharge, over voltage and under voltage PCB temperature monitoring (if battery is placed on PCB)	PCM and on-board cut-off protection system overcharge or over discharge, over voltage and under voltage PCB temperature monitoring (if battery is placed on PCB)
High-Capacity Li-Ion, LiPO, LiFePO4	PCM and on-board cut-off protection system overcharge or over discharge, over voltage and under voltage PCB temperature monitoring (if battery is placed on PCB)	PCM and on-board cut-off protection system overcharge or over discharge, over voltage and under voltage PCB temperature monitoring (if battery is placed on PCB)
Battery Electrical Isolation System	Battery is Electrically Isolated (however cable connected) until system start up for the first time and receive 5V from GPIO	Battery is Electrically Isolated (however cable connected) until system start up for the first time and receive 5V from GPIO (or Passive PoE or 5V0-32V from EXT
Optional	Slide ON/OFF switch (external or internal), OFF always with File Save shutdown functionality	Slide ON/OFF switch (external or internal), OFF always with File Save shutdown functionality
Independent of the Cable Battery Powering		
Direct Battery Powering (Intelligent Power Bank) with Internal/External ON/OFF Slide Switch	Optional ON/OFF Slide Switch with File Safe Shutdown functionality when switching to OFF (keep battery powering ON until system shutdown)	Optional ON/OFF Slide Switch with File Safe Shutdown functionality when switching to OFF (keep battery powering ON until system shutdown)
Additional Features		
Power Consumption Measure	Dedicated IC measuring Inbound/Outbound Current/Voltage/Power	Dedicated IC measuring Inbound/Outbound Current/Voltage/Power
ESD Protected True 5V0/3V3 1-wire interface	Not implemented	Directly connected to Raspberry Pi ® (if used only) GPIO04
Independent from Raspberry Pi ® 3V3 battery backed supply @200 mA With battery Back-up (Raspberry Pi® 5 can be OFF when the power Auxiliary 3V3 source is available)	Not implemented	Yes On separated pins
Independent from Raspberry Pi ® 5V0 supply @200 mA With battery Back-up (Raspberry Pi® 5 can be OFF when power Auxiliary 5V0 source is available)	Not implemented	Yes On separated pins

1 x 12 Bit A/D converters ESD protected, pre-scaled to 5V or 25V with Sampling rate 200K SPS, DMA buffered, Low Pass Software filtered/ Nonfiltered Both A/D with Voltage Follower buffer	Not implemented	Yes
3V3 RS232 Port that can be programmed as: primary Raspberry Pi® Port Secondary (independent from the existing on Raspberry Pi®)	Not implemented	Yes
System LEDs Indicators	User LED - **USR** M.2 SSD Activity - **ACT** M.2 Powering – **M.2** Timer (Scheduler Activity) - **TMR** System Status - **SYS** Official Cooler Activity - **FAN** System Temperature (RPi Core) - **TMP** Integrated Battery Level - **BAT** Integrated Battery Charger Status - **CHG**	User LED - **USR** M.2 SSD Activity - **ACT** M.2 Powering – **M.2** Timer (Scheduler Activity) - **TMR** System Status - **SYS** Official Cooler Activity - **FAN** System Temperature (RPi Core) - **TMP** Integrated Battery Level - **BAT** Integrated Battery Charger Status - **CHG** External Power Supply Status - **EPR**
User LED Indicator	White With capability to connected external LEDs (soldering) Possibility of Mapping of System Events to User LED	White With capability to connected external LEDs (plug in) Possibility of Mapping of System Events to User LED
System Keys	UPSR, FSSD	UPSR, FSSD
User Programmable Key	AKEY (soldered cable only)	AKEY
External Connectivity to Keys	FSSD, AKEY With capability to connected external KEYs) Optional ON/OFF slide Switch	FSSD, AKEY With capability to connected external KEYs) Optional ON/OFF slide Switch
Independent to Raspberry Pi® Watchdog (Still Alive)	Yes	Yes
Battery Backed Hardware Real Time Clock and Calendar	Yes/Selectable When UPS (power cycling is used)	Yes/Selectable When UPS (power cycling is used)
System Switch ON/OFF	Optional Supported with Embedded or external ON/OFF slide switch or external one (even is system is powered by USB C) Selectable/Combined In addition to Raspberry Pi 5 Push button	Optional Supported with Embedded or external ON/OFF slide switch or external one (even is system is powered by USB C) Selectable/Combined In addition to Raspberry Pi 5 Push button
Solar Panel Supply Input	on 5V0 USB-C battery charging current adopted to existing solar conditions	on 5V0 USB-C on EPR (5V-32VDC) battery charging current adopted to existing solar conditions
System Cooling		
Advanced Automatic Active Cooling System (FAN)	Adopted to Official Raspberry Pi® Coller, read directly from Raspberry Pi Core Temperature and FAN Status, passing this info to External LEDs	Adopted to Official Raspberry Pi® Coller, read directly from Raspberry Pi Core Temperature and FAN Status, passing this info to External LEDs
Passive Cooling	Thought extended hole system supporting air circulation, extended cooling copper planes	Thought extended hole system supporting air circulation, extended cooling copper planes
System Control		
Vital System Information	Thought Registers Set accessed via I²C API	Thought Registers Set accessed via I²C API
Selected Vital System Information	Thought Commands accessed via RS232 interface (optional)	Thought Commands accessed via RS232 interface (optional)
Programmable/Accessible all the system parameters via I²C API	YES, System is full programmable and parameterized	YES, System is full programmable and parameterized
SysInfo Register	Yes, Provide core information about the system: System FSSD Reason - System Wakeup Reason - Power Management Restart Reason -	Yes, Provide core information about the system: System FSSD Reason - System Wakeup Reason - Power Management Restart Reason -
M.2 - UPS & Power Management HAT Running Register	YES, provide information to remote user if system is running properly	YES, provide information to remote user if system is running properly
Remote and local Bootloader for Live Firmware Update	YES	YES
e-mail sending on event	YES	YES
Measuring and Monitoring System		
Real Time Raspberry Pi® System current measure	Dual High-side bi-directional Hardware Current Sensing Monitor with power calculation (5V0 path)	Dual High-side bi-directional Hardware Current Sensing Monitor with power calculation (5V0 path) (5V0-32V DC path)
Powering Mode Status	YES	YES
Battery Level	YES	YES

Raspberry Pi® 5V level	YES	YES
External Powering Level	NO	YES
Passive PoE Level	NO	YES
Raspberry Pi® Core Temperature	YES	YES
Raspberry Pi® Active cooler FAN status	YES	YES
A/D(s) Level	YES	YES
Charger Status	YES	YES
Scheduler		
Time/Calendar Scheduler	YES	YES
Shut-down/Weak-up on	Time/Calendar Event Low Battery Event ON/OFF Slide Switch Event FSSD Button Event Loss of Cable Powering Event External Serial Activity (any) Data Event External Serial Activity (dedicated) Data Event Raspberry Pi Core Temperature Event Raspberry Pi Shutdown Command Event	Time/Calendar Event Low Battery Event ON/OFF Slide Switch Event FSSD Button Event Loss of Cable Powering Event External Serial Activity (any) Data Event External Serial Activity (dedicated) Data Event A/D Event RS232 Event Raspberry Pi Core Temperature Event Raspberry Pi Shutdown Command Event
Manufacturing		
PCB Manufacturing	4 Layers, 2 OZ Copper, 6mils/6mils Immersion Gold Plated PB Free alloy assembly	4 Layers, 2 OZ Copper, 6mils/6mils Immersion Gold Plated PB Free alloy assembly