Ras p-On

Features

■Power on by Tactile Switch
■Cut Off Power Supply Safely after Detecting Shutdown Completely
■Cut off Supply to GPIO of 5V and 3.3V, USB Port Completely in Cutting off Power Supply
■Notification of Shutdown Execution by Pushing down Tactile Switch
■Forced Shutdown by holding Tactile Switch Pressed down
■Support Automatic Power-On Mode via AC adapter Supply Input. Enable to Boot at Once via Centralized Power Control
■Low Leaking Current in Cutting Off Power Supply: 60μ@6V Input
■Equipped with Regulator Supporting Wide Input Power Supply Range (6V～25V)
※Refer to "Handling Precautions of Power Supply" at the end of this documment.
■Linear Regulator with Low Noise Adopted
■Sufficient Power Supply to Raspberry Pi with 5.1V Voltage, 3A Maximum Output Current
■DC Input Jack (5.5mm External – 2.1mm Internal)
■External Power Supply Output Port - Amount of 3A Power Supply for Peripheral Circuit of such as LCD Panels
■DS1307 RTC(Real Time Clock) Equipped with Coin lithium Battery (CR1220) Backup
■ESD HBM Input of Tactile Switch: ±25kV
■Reverse Current Protection Circuit by Power Supply from Both Raspberry Pi USB and "Ras p-On"
■Stackable GPIO Port
■Changeable Exclusive Use GPIO
■Two Types are available for Enclosing

Overview

Ras p-On" adds 3 functions to Raspberry Pi 4B/3B/3B+/2B, which are ON/OFF by the power switch, regulator to provide various kinds of AC adapter, RTC(Real Time Clock) to keep making present time.

Raspberry Pi has grown to be required for trial production or development of IoT devices beyond the boundaries of education or personal use now. However, sometimes three inconveniences come out in using it seriously as follows:

① No power supply switch
② Less freedom of kinds of AC adapter
③ No RTC

To plug and unplug AC adapter by hand is needed for booting Raspberry Pi without power switch. Also the CPU just transits to HALT and power supply to GPIO port continues after shutdown. So peripheral circuits can not be turned off. Therefore we come to provide a circuit which can supply and cut off power by switch control safely.

Also AC adapter recommended for Raspberry Pi is 5.1V/2.5A(3A@Raspberry Pi 4B) and Micro-USB(USB Type-C@Raspberry Pi 4B).
AC adapter following the condition is almost only genuine actually.

So we equipped a regulator circuit on "Ras p-On", and the add-on board allows various kinds of AC adapter or battery commercially available which can supply 15W.

DC Jack easy to handle can be used without using USB connector easily broken.
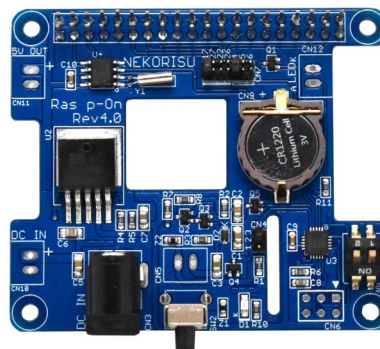
The add-on board is equipped with RTC required in real operation.
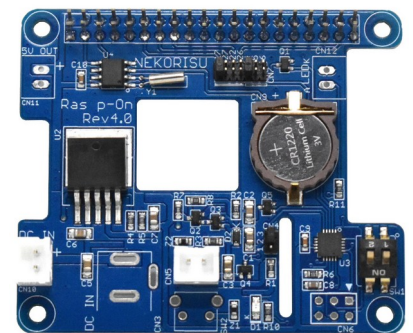
Exterior
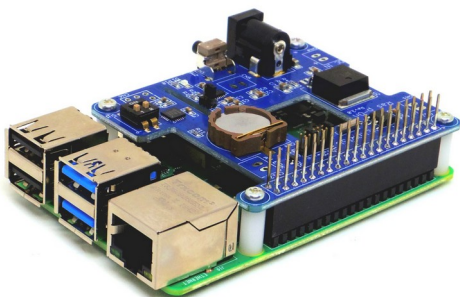
"Ras p-On" with Raspberry Pi 4B

Type-A

With DC Jack, Tactile Switch

Type-B

With Connector for Power Suuply Input and Connctor for Switch

Details of Features

① Power Switching Circuit

"Ras p-On" provides a switching circuit turning ON/OFF power of Raspberry Pi completely.
The switching circuit avoids chattering in the event of the switch pushed down and power ON/OFF definitely. ESD protection of +/-25kV is designed with it to prevent high voltage by such as static shock. Low current consumption of 60μA is achieved as the waiting current to monitor the switch pushed down in power-off in using 6V AC adapter.

The power switching circuit work with the dedicated software in Raspberry Pi OS.
The dedicated software is provided with the install script. The software installed works as a service on the background.

② Power on Sequence

When "Ras p-On" detects tactile switch pushed down, it turns on the regulator after a blanking time of 32msec to avoid chattering and it starts supplying power to the Raspberry Pi.(Timing Chart 1)

③ Power off Sequence

"Ras p-On" detects OS shutdown and turn off the system safely.
GPIO is used for shutdown detection.

One of GPIO 17, 22, 26, 27 is available for OS shutdown detection.
(Use jumper pins on add-on board to select GPIO)

Dedicated software service asserts GPIO for OS shutdown detection to High state quickly when Raspberry Pi boots up.

When the electric circuit of add-on board detects this GPIO pin's Low state, it initiates shutdown sequence.
GPIO17, 22, 26, 27 is definitely Low state after OS shutdown, as they are not pull up following specifications of Raspberry Pi.
Thus OS shutdown can be detected by monitoring these GPIO pins.
(These GPIO pins don't need to be asserted to Low State by script on shutdown.)

This device cuts off power supply to the system by turning off regulator after confirming them staying Low state during the specified blanking time when it detects the GPIO pins are Low state.
(Timing Chart 2)
This blanking time is needed for waiting for the system to complete accessing to the SD card and to cut off power supply safely.

Additionally, to support reboot, this blanking time should be long enough for the GPIO pin to transition to a low state by shutdown and then return to a high state on the next boot.

The blanking time is assigned by the DIP switches on add-on board during 15 to 25 seconds.

SW2	SW1	Blanking Time
OFF	OFF	15s（Default）
OFF	ON	20s
ON	OFF	25s
ON	ON	Disable cut off function

Timing Chart 1   Power ON sequence

Timing Chart 2   Power OFF sequence
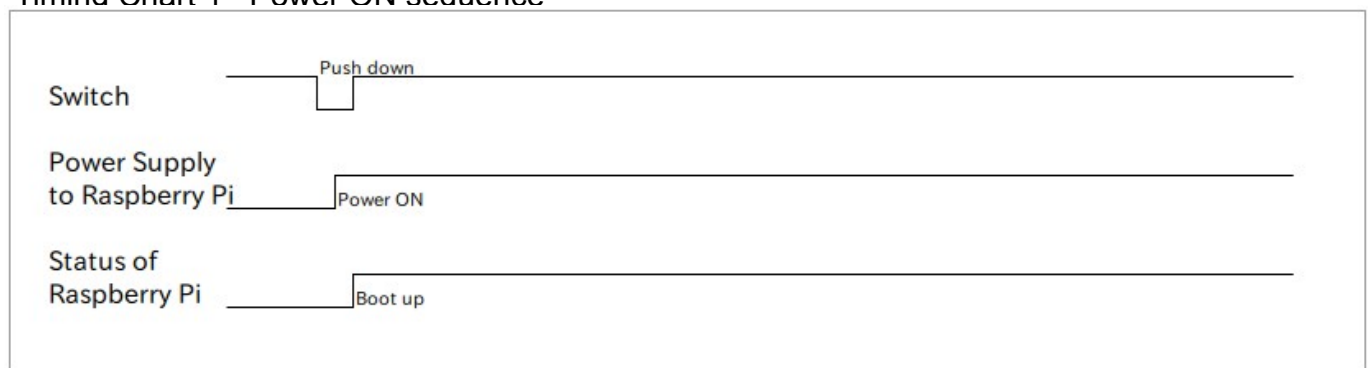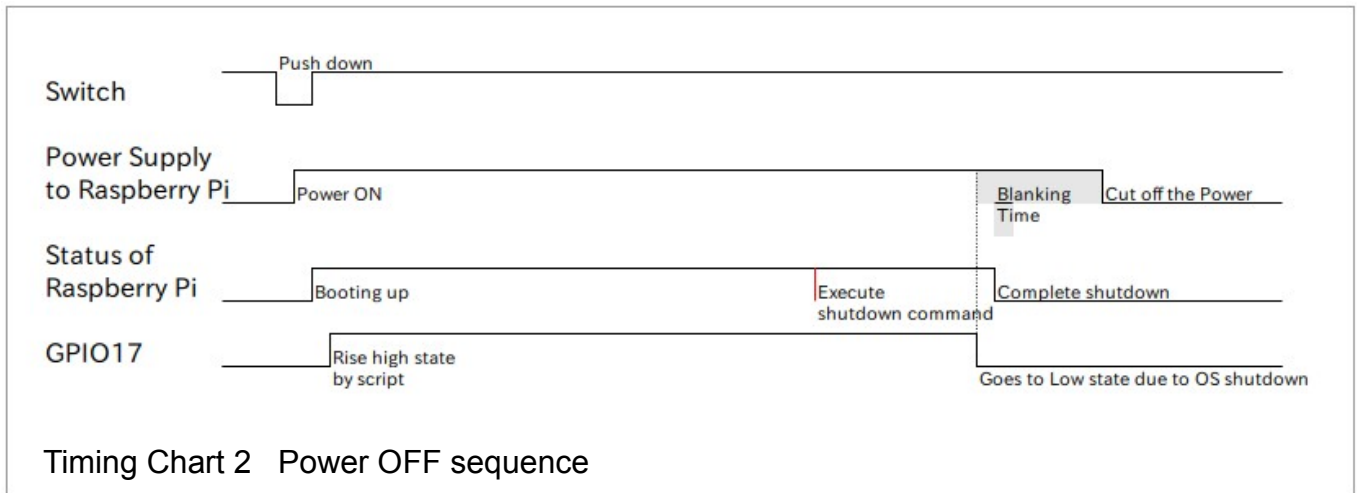
To disable the ability to cut off the power supply, set both of the DIP switches ON. This mode is used to install the OS or set up the dedicated software for the add-on board. Until the dedicated software is completely set up, as the GPIO pin for shutdown detection cannot be asserted High, power supply is cut off in the middle of installing.

④ Power off sequence by switch
When switch is pushed down while OS is activating, the push event is notified via GPIO.
One of GPIO4, GPIO5, GPIO6 can be selected as GPIO pin for push button event.
(Select one using jumper pin on add-on board.)
These GPIO pins are pulled up following specifications of Raspberry Pi.
These pins will normally stay High state as soon as Raspberry Pi boot up when they are not assigned to the other functions.

Add-on board transit selected GPIO pin to Low state when detecting the button pushed down. 'Shutdown' command is executed and then the system is shutdown safely when the dedicated software monitors the GPIO pin and detects its transition to Low state.
This ensures systems to shutdown safely by switch control, even if they are headless, such as servers or embedded IoT devices (which are not equipped monitors, mouse or keyboards).
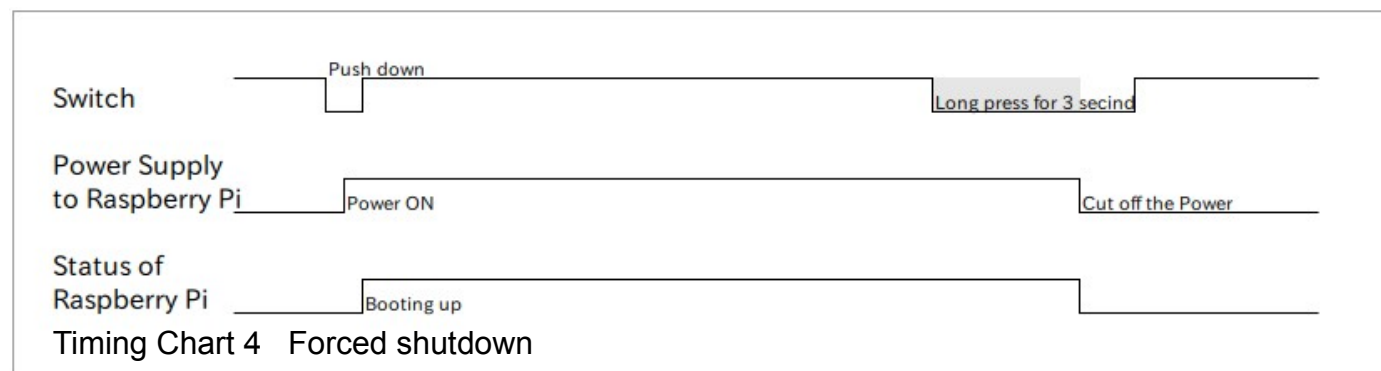The system can be turned off safely and completely following the turn off sequence of ③ when shutdown is executed.(Timing Chart 3)

Timing Chart t 3   Power OFF sequence by Pushing switch

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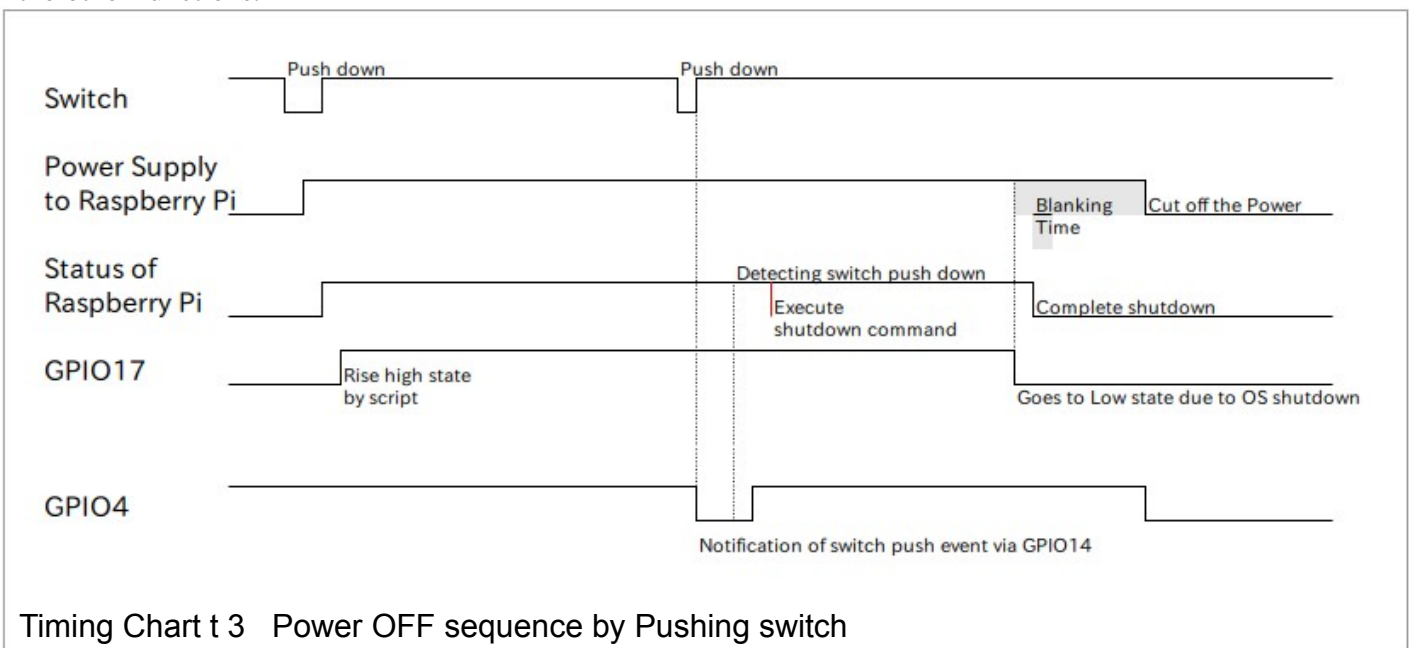
⑤ Forced shutdown

Power supply to the system is forced to be cut off by holding the switch pushed down for over 3s.When the system cannot shutdown on account of frozen OS, you can force it to power down.
(Timing Chart 4)

⑥ 30s blanking time

"Ras p-On" is designed with a blanking time during which no switch operation is accepted for 30seconds after immediately power on to prevent erroneous operation.

Timing Chart 4   Forced shutdown

⑦ Support for centralized power control

Supply from AC adapter can turn on the system automatically by changing short pins' position on add-on board without pushing power button.
This function can be used when you power on all devices connected to a system at once by centralized power control. (All functions are also effective, such as power-down and power-on by the button on this mode after next time.)

⑧ LED Indicator

Green LED Indicator is equipped on. This LED blinks on and off for a period of blanking time after shutdown detected. An external connecting port is available to pull out LED in casing. 180Ω resistor is in, so almost all LED can be connected directly. (5V)

⑨ Power regulator

Linear regulator is equipped in the power control circuit, which can supply power of 5.1V/3A.The supply input covers a wide range from 6V to 25V, so various kinds of AC adapters commercially available can be used. Using AC adapter of supply current over 3A allows Raspberry Pi 4B/3B+ to perform well. Use sufficient power supply which covers current consumption of peripheral circuit.
Design systems with efficient heat release when using over 6V input. For more details, free to check out "Handling Precautions of Power Supply" at the end of this document.

⑩ Two types are available

They have different connectors respectively, one is for experiment using Raspberry Pi directly, the other is for using enclosed.

Type-A
   With DC-Jack for AC adapter and tactile switch as power button
   (DC-Jack : Center plus, 5.5mm (external) - 2.1mm (Internal))

Type-B
   With XH 2-pin connectors for connecting to power supply and turn-on switch when using enclosed.

⑪ RTC(Real Time Clock)

Equipped with a function of RTC(Real Time Clock) backed up by coin lithium battery. This allows the system to keep time and get correct time even if not accessing to the Internet. DS1307 popular with Raspberry Pi is used as RTC chip.
Ready to use it with built-in driver in the Raspberry Pi OS. The dedicated software configures the system time automatically when Raspberry Pi boots up.

⑫ Function of Adjusting Waiting Time by the Dedicated Software

The Ras p-On is designed with a waiting time until it cuts off power supply effectively after the GPIO(GPIO17, GPIO22, GPIO26, GPIO27) for shutdown detection goes Low state as mentioned in "②power-off sequence".

This waiting time is needed to support for reboot, which provides sufficient time until the GPIO pin goes back High state after it goes Low state once. This waiting time is adjustable by DIP switches, but OS tend to need longer time for reboot these days. The dedicated software allows to set any amount of the time in case the waiting time preset on the DIP is short.

Configure the waiting time via I2C.
The waiting time configured is needed to be set every time the system boots up as it will disappear after power-off. (Script of the command on .bashrc etc. allows automatic configuration when the system boots.) Availability to set the waiting time as many times as needed also allows to set the waiting time suitable for condition. For example, a short waiting time for turn-off and a sufficient waiting time for reboot is available.

One waiting time is configurable independently of the position of the DIP switch. (The function of power-cut is disable if the DIP switches are both ON) The waiting time by the dedicated software overrides the preset time by the DIP switch.

Use "i2cset" command in configuration. It is normally installed in Raspberry Pi OS.
Install "i2c-tools" if "i2cset" command is not found.

The setting method of configuration by "i2cset"command is as follows:

    sudo i2cset -y 1 [Addr] 0x00 [Time]

Specify I2c device address for [Addr].
The device address can be specified by the position of the DIP switches.

SW2	SW1	Addr
OFF	OFF	0x6A
OFF	ON	0x6B
ON	OFF	0x6C
ON	ON	Function of power-cut is Disable

Select an address not to be conflict with any other sensor devices.

Specify the waiting time by seconds for [Time].
From 15 seconds to 200 seconds can be used.

ex.) Configuration for both of the DIP switches is OFF and the waiting time is 30s:

    sudo i2cset -y 1 0x6A 0x00 30

ex.) Configration for only SW1 is ON of the DIP switches and the waiting time is 1m

    sudo i2cset -y 1 0x6B 0x00 60

Reference

If i2cset command is not found, install "i2C-tools" by use the following command:
    sudo apt install i2c-tools

Make I2C enable if not enable as follows:

    By using GUI
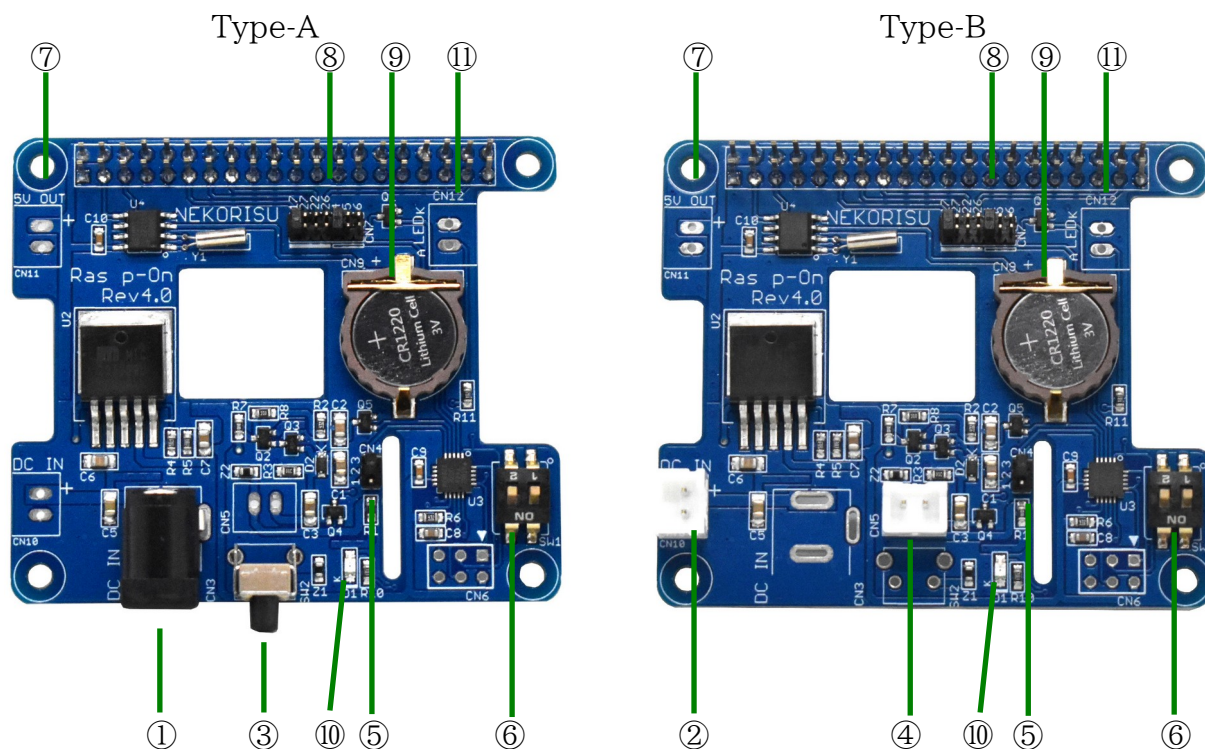   [Preferences] - [Raspberry Pi Configuration] - [Interfaces] - [I2C] -> Check on Enable.
     Or
        sudo raspi-config -> [Interface Options]-「I2C」 -> Enable
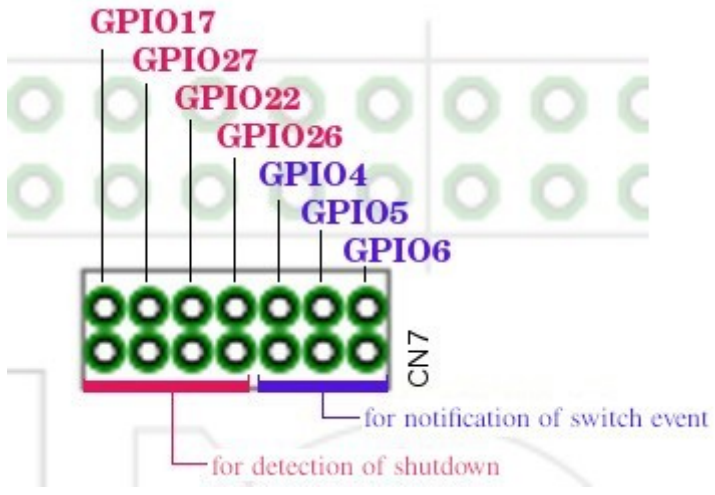
   By using CUI
        sudo raspi-config nonint do_i2c 0

Names and Functions of each part

Type-A   Type-B

No.	Connector	Function
1	DC-Jack	5.5mm(External) – 2.1mm(Internal), Center Plus (only on TypeA)
2	DC-IN Connector	XH 2-pin connectors for DC power supply input (only on TypeB)
3	Tactile Switch	Power ON/OFF switch (only on TypeA)
4	External Switch Connector	Connector for pulling out power ON/OFF switch. Enable to connect push switch(momentary normal open). XH 2-pin(only on TypeB)
5	Power-ON Mode Selector	1-2 short allows automatic power ON by AC adapter supply. 2-3 short allows power ON only by switch control.
6	Waiting Time or I2C Device Address Configuration DIP Switch	Configure the waiting time by combination of the switches. Specify I2C device's address by combination of the switches when the waiting time is configured by the dedicated software.

Ras p-On Rev 4.0

7	Power supply External Port	Port for supplying power to peripheral circuit such as LCD. 5.1V Output. Able to supply up to amount of 3A with Raspberry Pi current consumption. Able to use connectors such as XH 2-pin.(2.5mm pitches) No connectors included. Connect suitably for an enclosure cased in properly.
8	GPIO Selector	The position of the short pins indicates the GPIO to use as shown in figure below. Select the GPIO not for the other use.
9	RTC Backup Battery	Set a lithium coin battery for RTC Backup.
10	LED Indicator	Indicator notifying power supply status.
11	LED External Connector Port	Port enable to use for pulling LED Indicator out. 2.5mm pitches. (enable to equip XH connector) 5V Output Voltage. 180 ohm current limit register is inserted. Caution for the Polarity of anode or cathode. (Shown by silk on the board)

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Dimensions
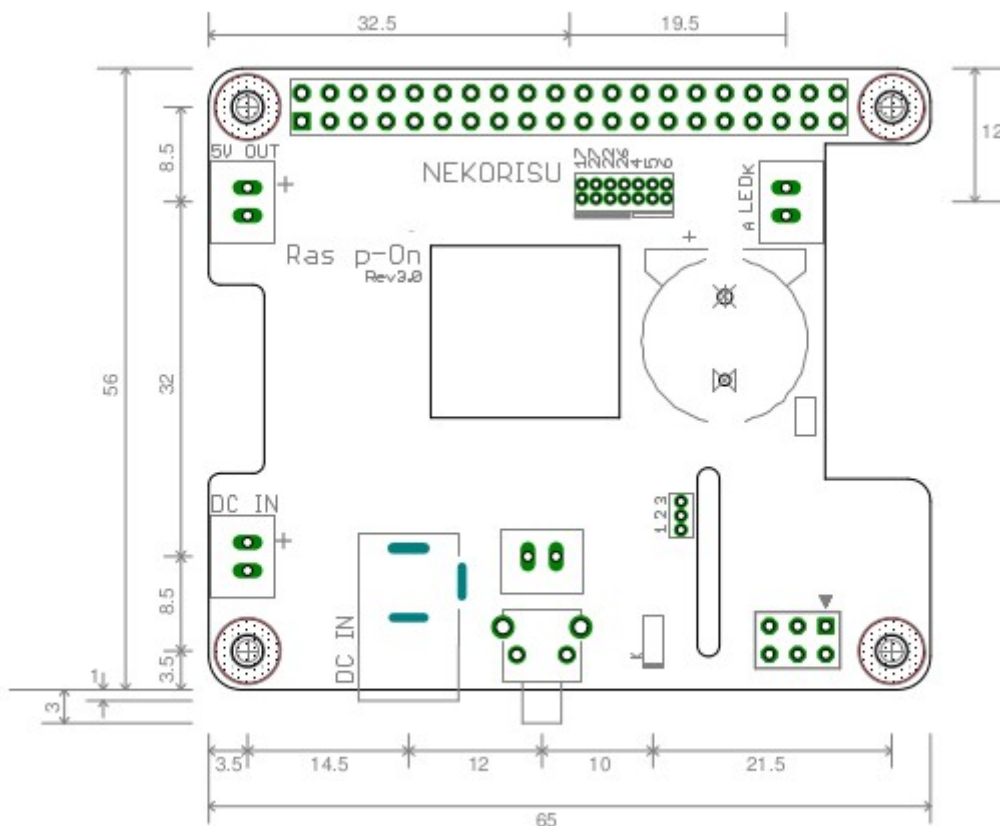
Specifications

Parameter	Min.	TYP	MAX.	Units
Input Supply	6		25	V
Output Supply	5.03	5.1	5.17	V
Output Current			3	A
Sleeping Current Consumption	60			μA
Switch Pressed Notification Pulse Time	2.8	3	3.2	sec
Forced Shutdown Switch Pressed Time	2.8	3	3.2	sec

Available Versions of Raspberry Pi Raspberry Pi 4B/3B/3B+/2B
Weight 22g
Environmental Standards RoHS Compliant

Software

Power supply switch circuit and RTC circuit work with the dedicated software installed on Raspberry Pi. This software is written in shell script and it works as a service in background when booting.

① A software for power supply switch circuit
   A script is as follows: /usr/local/bin/raspon/pwrctl.sh

```bash
#!/bin/bash

###############################
# PIN DEFINITION
###############################
GPIO_SHUTDOWN_NOTIFY_PIN=17
GPIO_REQUEST_DETECT_PIN=4
```
A

```bash
###############################
# Rise up shutdown notify pin
###############################
if [ ! -e /sys/class/gpio/gpio$GPIO_SHUTDOWN_NOTIFY_PIN ]; then
    echo $GPIO_SHUTDOWN_NOTIFY_PIN > /sys/class/gpio/export
    if [ $? -ne 0 ]; then
        exit 1
    fi
    sleep 1
    while [ ! -e /sys/class/gpio/gpio$GPIO_SHUTDOWN_NOTIFY_PIN/direction ]
    do
        sleep 0.2
    done
    echo out > /sys/class/gpio/gpio$GPIO_SHUTDOWN_NOTIFY_PIN/direction
    if [ $? -ne 0 ]; then
        exit 1
    fi
    echo 1 > /sys/class/gpio/gpio$GPIO_SHUTDOWN_NOTIFY_PIN/value
fi
```
B

```bash
###############################
# Wait shutdown request and shutdown
###############################
if [ ! -e /sys/class/gpio/gpio$GPIO_REQUEST_DETECT_PIN ]; then
    echo $GPIO_REQUEST_DETECT_PIN > /sys/class/gpio/export
    if [ $? -ne 0 ]; then
        exit 1
    fi
    sleep 1
    while [ ! -e /sys/class/gpio/gpio$GPIO_REQUEST_DETECT_PIN/direction ]
    do
        sleep 0.2
    done
    echo in > /sys/class/gpio/gpio$GPIO_REQUEST_DETECT_PIN/direction
    if [ $? -ne 0 ]; then
        exit 1
    fi
fi

while :
do
    pin_state=`cat /sys/class/gpio/gpio$GPIO_REQUEST_DETECT_PIN/value`
    if [ $pin_state -eq 0 ]; then
        shutdown -h now
        exit 1
    fi
    sleep 0.5
done
```
C

Details of Script

The script is made of 3 blocks.

A Block

Define GPIO for use.

The GPIO for shutdown detection is GPIO17, the GPIO for notification of power supply switch pressed and shutdown request is GPIO4 by default.

These pins need to be the same as configuration of short pins for GPIO selection.

B Block

Assert the GPIO pin for shutdown detection (GPIO_SHUTDOWN_NOTIFY_PIN) High state.

Add-on board "Ras p-On" recognizes that shutdown is completed when the GPIO pin for shutdown detection is Low.

The GPIO pin must be thus asserted High state after immediately Raspberry Pi boots as quickly as possible.

※The GPIO pin is not pulled up with Raspberry Pi specifications, which allows it to be Low state automatically when CPU of Raspberry Pi halts.

The Pin has no need to be Low state by the dedicated software when shutdown.

C Block

It is a loop monitoring that the power supply switch of Ras p-On is pressed and shutdown command is requested.

It monitors the state of the GPIO pin for shutdown（GPIO_REQUEST_DETECT_PIN）in infinite loops of 0.5s after configuring the GPIO pin to input mode.

It recognizes "Ras p-On" requests shutdown and executes shutdown command when the pin goes Low state.

※The GPIO pin is pulled up following Raspberry Pi Hardware Specifications.

It goes High automatically after Raspberry Pi boots.

Registration as a Service

This script needs to boot automatically as quickly as possible when Raspberry Pi boots.

So make and register a service definition file as follows:

（/etc/systemd/system/pwrctl.service)

```
[Unit]
Description=Power Contrlo Script
DefaultDependencies=no
After=slices.target
Before=local-fs-pre.target
ConditionPathIsDirectory=/usr/local/bin/raspon

[Service]
ExecStart=/usr/local/bin/raspon/pwrctl.sh
Restart=no
Type=simple

[Install]
WantedBy=multi-user.target
```

②A software for the RTC (real time clock)

A script is as follows: /usr/local/bin/raspon/rtcsetup.sh

```bash
#!/bin/bash

RTC_LOCAL=0

echo ds1307 0x68 > /sys/class/i2c-adapter/i2c-1/new_device

if [ ${RTC_LOCAL} -eq 0 ]; then
   ntpdate ntp.nict.jp
   if [ $? -eq 0 ]; then
      hwclock -w
   else
      hwclock -s
   fi
else
   hwclock -s
fi

exit 0
```

Details of Script

This script is automatically executed immediately after boot up.

1. Setup I2C address for RTC driver (DS1307)

2. Set the RTC time as the OS time.

At this time, if the NTP server on the network is accessible, the time obtained from the NTP server is used as the system time. At the same time, the RTC clock is also corrected.
If the time cannot be obtained from an NTP server, the RTC time is used as the system time.

Registration as a Service

This script needs to boot automatically as quickly as possible when Raspberry Pi boots.
So make and register a service definition file as follows:
（/etc/systemd/system/rtcsetup.service）

```
[Unit]
Description=RTC setup script
Wants=network.target
After=network.target
ConditionPathIsDirectory=/usr/local/bin/raspon

[Service]
ExecStart=/usr/local/bin/raspon/rtcsetup.sh
Restart=no
Type=simple

[Install]
WantedBy=multi-user.target
```

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Install of Software

Software needed can be installed by the dedicated install script.
Refer to "User's Manual" for details of Install procedure.

Supported OS

OS operation confirmed for "Ras p-On" are as follows:

Raspberry Pi OS (32bit) with desktop
  based on Debian Bullseye

Raspberry Pi OS (32bit) Lite
  based on Debian Bullseye

Raspberry Pi OS (32bit) with desktop
  based on Debian Buster

Raspberry Pi OS (32bit) Lite
  based on Debian Buster

RASPBIAN DESKTOP
  Jessie (Debian Version 8 Kernal Version 4.4.48) 2017-02-16 Release or later
  Stretch (Debian Version 9)
  Buster   (Debian Version 10)

RASPBIAN Lite
  Jessie (Debian Version 8 Kernal Version 4.4.48) 2017-02-16 Release or later
  Stretch (Debian Version 9)
  Buster   (Debian Version 10)

Ubuntu MATE
  16.04

FAQ

Q1 "Ras p-On" power off immediately even if powered on.
 A1 The dedicated software for "Ras p-On" is not installed properly.
   Please install it following the set-up procedure of User's Manual.

Q2 The power supply will be cut off in the middle of installing for updating OS version.
 A2 "Ras p-On" doesn't recognize that Raspberry Pi is working in installing OS and thus it cuts off power supply. Please set both of the DIP switches ON in installing OS or before the dedicated software for "Ras p-On" is completely installed.

Q3 "Ras p-On" cannot be powered off even if power supply switch is pushed down after immediately booting.
 A3 Power supply switch operation cannot be accepted for 30s after immediately power on to prevent erroneous operation.

Q4 Power supply will not cut off in spite of shutdown
 A4 Both of the DIP switches are ON.
   Please set both OFF.

Q5 Power supply cuts off and Raspberry Pi does not reboot while rebooting.
 A5 The power supply can be cut off in rebooting on condition that process of OS shutdown and reboot takes much time. Please change the waiting time of "Ras p-On" by the DIP switches in such as this situation.
   It takes much more time in rebooting on the condition of the system installed by NOOBS.
   Raspberry Pi OS (or Raspbian) is recommended to be installed directly.
   The waiting time is can be changed by the dedicated software in case of that the power supply cuts off in rebooting despite of changing the position of the DIP switches. Up to 2 minutes extends is enable at most. Please refer to "⑫ function of adjusting waiting time by the dedicated software" on P.5 for details.

Q6 The power supply cuts off and "Ras p-On" doesn't work properly when changing the setting of the short pin selected.
 A6 The dedicated software need to be fixed when changing the setting of the short pin selected.
   Please fix the definition of the GPIO following the part of script details.

Q7 What kind of AC adapters can be used?
 A7 Confirm output voltage, maximum output current and shape of plug.
   *Output Voltage is from 6v to 25V.
   *Maximum output Current is over than 2.5A.
   *Shape of plug is 5.5mm(external) – 2.1mm(internal)
   AC Adapter over 3A is recommended for maximizing performance of Raspberry Pi 4B / 3B+.
   Design a system with sufficient heat release when using AC Adapter over 6V.
   For more details, free to check out "Handling Precautions of Power Supply" at the end of this document.

Q8　The circuit of "Ras p-On" gets very hot.

A8　If high voltage AC Adapter is used, which results in heat loss and peripheral circuit of the power supply gets hot. Please think about heat release such as heat sink if high voltage power supply is used. The function of thermal shutdown is asserted if the temperature rises to 85 ℃.
With caution for burn.
For more details, free to check out "Handling Precautions of Power Supply" at the end of this document.

Q9　The mode that the system boots automatically with power supply is set by using the short pins of "changes of power ON mode". When the system of power supply boots automatically by using central power control, it boots once but sometimes it will not boot later.

A9　The mode of automatic boot asserts the system to power ON when the system detects riging edge of supply power rising edge. Some AC Adapters take much time for releasing charges from power off to 0V. Please make sure to take sufficient time for the AC Adapter to release the charges completely and then power ON when using central power control and so on for power ON/OFF. Some AC Adapters needs for more than 1 minutes interval.

Q10　Is a coin buttery needed?

A10　"Ras p-On" has a coin buttery to make the time of real time clock on it.
No coin buttery is needed for operation without the real time function.

Q11　Can the coin buttery be replaced?

A11　Yes. Please replace it with "coin type lithium buttery CR1220" commercially available.

Q12　The system will not work with NTP when it boots.

A12　The network connection needs to be succeeded before RTC set up script executes.
Sometimes the situation gets better by configuring "Wait for Network at Boot".

Q13　The waiting time for shutdown will be short despite of extending it by the dedicated software.

A13　The waiting time configures by i2cset command disappears when the system powers off.
A configuration for each boot is needed.
Additional i2c command in .bashrc allows automatic configuration when booting.

Q14　The waiting time for shutdown can not be extended. A error message shows up instead.

A14　If "Error: Write failed" shows up, the device address doesn't match. It can be selected from 0x6A, 0x6B, 0x6C by the position of the DIP switches.
Check if the device address matches the address by DIP switches.
The I2C function of Raspberry Pi is disable if "Error: Could not open file '/dev/i2c-1' or '/dev/i2c/1' : No such file or directory" shows up.
Please check out "⑫ function of adjusting waiting time by the dedicated software" on P.5 for more details.

Q15 Can the dedicated software be installed without the Internet?

A15 Connection to the Internet is needed for setting up "Ras p-On" normally.
There are two reasons why as follows:
* Download of install files are needed.
* Installing ntpdate command is needed.
Setting up by the following procedure is able under condition that connection to the Internet is really difficult to get.

① Download the install files needed for set up in advance using PC with Internet connection is available. Those files can be downloaded on our Web site
"http://www.nekorisu-embd.com/ras_p-on_products.html "
by using browsers or by using the following command
" wget http://www.nekorisu-embd.com/download/raspon-installer.tar.gz ".

② Save the files downloaded to a USB flush memory and then connect it to Raspberry Pi.

③ Set up on Raspberry Pi by the following procedure:
sudo tar xzpvf raspon-installer.tar.gz
sudo ./install.sh -local

Notes) The function of time correction using NTP server is disable when setting up following the above procedure.

Q16 Please show the way of uninstalling the dedicated software.

A16 It is able to uninstall completely by the following commands:
sudo systemctl stop pwrctl.service
sudo systemctl disable pwrctl.service
sudo systemctl stop rtcsetup.service
sudo systemctl disable rtcsetup.service
sudo rm -r /usr/local/bin/raspon

Q17 Is there any occupied GPIO on "Ras p-On"?

A17 The GPIO on "Ras p-On" are used by default as follows:
GPIO17 for detection of shutdown
GPIO4 for notification of shutdown
These GPIO can be changeable.

The caution in handling of Power Supply

① Take care not to use the Micro-USB/USB Type-C on Raspberry Pi in power supply on "Ras p-On". Raspberry Pi 4B / 3B+ don't have any circuits for reverse current protection, thus Power supply from Micro-USB/USB Type-C on Raspberry Pi could be a cause of damage to them, although that couldn't be a cause of damage on "Ras p-On" because of its circuit for reverse current protection. (The protection circuit is equipped on Raspberry Pi 3 model B, Raspberry Pi 2 model B.)

② Use wires over 3A-5W rated current in supplying power from the connector of TypeB add-on board. Some wires, Jacks, connectors cannot supply sufficient power to Raspberry Pi or the peripheral circuits. Use JST XHP-2 as housing to fit the DC IN connector. Make sure the polarity and wire properly.

③ 6V/3A power supply is highly recommended for the add-on board. A linear regulator is adapted as regulator of the add-on board, thus all the loss of power supply is released as heat loss. For example, if 24V power supply is used, (24V - 6V) x 3A = 54W, and thus the maximum power loss becomes 54W amount of heat loss. This indicates amount of heat which leads to 100℃ in tens of seconds. Proper heat release is needed and very big heat sinks and a powerful fans are needed. In actual operation, step the power supply down to about 6V by DC/DC converter before input to the add-on board really in need of using power supply over 6V to work with the other devices enclosed.