ShieldPi Pro MkIII

Multi-functional Raspberry Pi EMI shield / power cleaner HAT

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A. Introduction

ShieldPi Pro MkIII is not only a powerful Raspberry Pi EMI shield HAT, but also:

- A high-performance power supply cleaner/filter
- Raspberry safe ON/OFF button
- A GPIO extender/multiplier
- An ultra-low noise 3.3V power supply
- An IR-remote control Receiver
- Power a RaspberryPi from GPIO
- Power ON/OFF indication and signal
- Zero current single-point grounding shield plate to eliminate EMI noise of the Raspberry Pi
- Ultra-low ESR wide bandwidth 5V power supply filtering networks cover the frequency range up to GHz

ShieldPi Pro MkIII is suitable to all RespberryPi applications to reduce EMI noise and improve power supply performance. Improvement can be made right away by just installing it into the GPIO connector of a RaspberryPi.

B. Highlighted Features and Specifications

- Zero current single-point grounding shield plate to eliminate EMI noise of the Raspberry Pi
- Ultra-low ESR wide bandwidth 5V power supply filtering networks cover the frequency range up to GHz

  ESR: 2mΩ@200KHz, 0.3mΩ/@2Mhz, 1mΩ@20MHz, 4mΩ/@200MHz
- Full 40 pins GPIO extender
- Full 40 pins GPIO multiplier (AUX GPIO)
- Has a Raspberry Pi GPIO power ON/OFF button and a connector to external power button
- Has an optional power on indication LED and a power on/off control signal output
- Can implement Raspberry Pi's IR-remote control function when working with a MonitorPi
- Reduce both EMI noise and power supply noise
- Improve Raspberry Pi application's performance to a higher level
- Full size shield HAT that can cover the whole Raspberry Pi PCB area
- Better EMI suspension performance will be expected
- High profile GPIO connector makes it possible to work with RPi that is equipped with a heatsink
- DIY friendly and plug and play

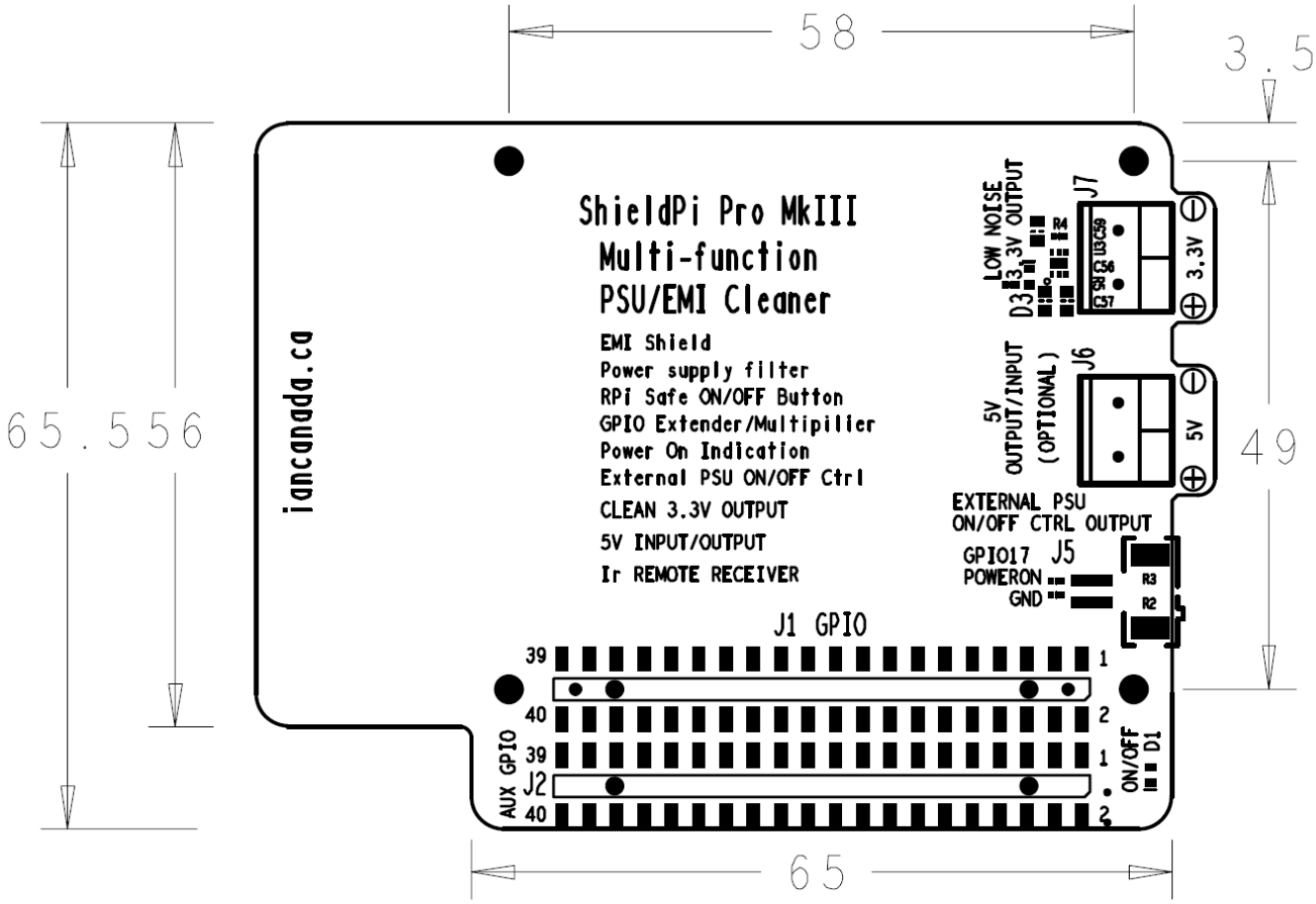
C. ShieldPi Pro MkIII new features

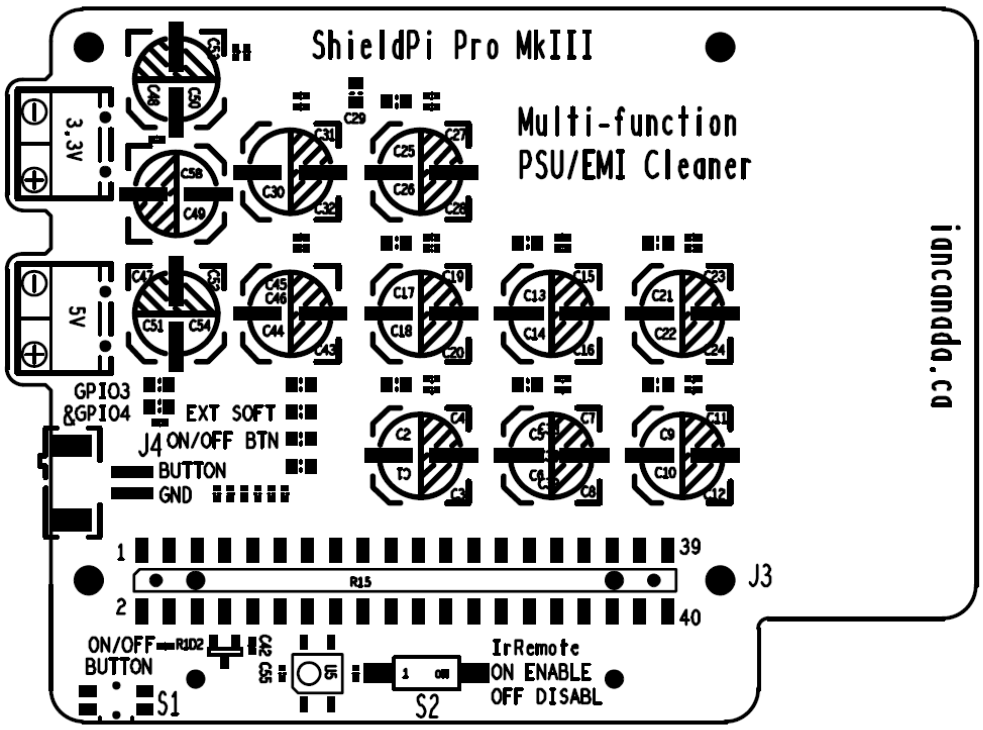
- Built-in ultra-low noise 3.3V/500mA power supply, capable of powering FifoPi, DAC or other devices without using additional 3.3V power supply
- Optical receiver makes IR remote controller working for RaspberryPi
- 5V input/output connector can power a RaspberryPi directly from GPIO with bypassing the USB power
- Optimized PCB layout

D. Pictures

ShieldPi Pro MkIII

E. Layout and Dimensions (in mm)


58
3.5
65.556
49
65
ShieldPi Pro MkIII
Multi-function
PSU/EMI Cleaner
EMI Shield
Power supply filter
RPi Safe ON/OFF Button
GPIO Extender/Multipilier
Power On Indication
External PSU ON/OFF Ctrl
CLEAN 3.3V OUTPUT
5V INPUT/OUTPUT
Ir REMOTE RECEIVER
iancanada.ca
LOW NOISE
3.3V OUTPUT
J7
3.3V
5V
OUTPUT/INPUT
(OPTIONAL)
J6
EXTERNAL PSU
ON/OFF CTRL OUTPUT
GPIO17
POWERON
GND
J5
J1 GPIO
AUX GPIO
J2
ON/OFF
D1


ShieldPi Pro MkIII
Multi-function
PSU/EMI Cleaner
iancanada.ca
3.3V
5V
GPIO3
&GPIO4
EXT SOFT
J4 ON/OFF BTN
BUTTON
GND
J3
R15
ON/OFF
BUTTON
S1
S2
IrRemote
ON ENABLE
OFF DISABL

F. Getting start

1. Make sure your RaspberryPi system hardware and software are configured well and working properly.
2. Install the ShieldPi Pro MkIII GPIO socket J3 into the GPIO connector of the RaspberryPi. Please use the supplied 16mm standoffs.
3. Install the rest of HATs on top of the GPIO port J1 of the ShieldPi Pro MkIII.
4. Install the MonitorPi/Pro into the AUX GPIO J2 of the ShieldPi Pro MkIII(optional).
5. Power on the system as usual.
6. Enjoy the music.

G. Connectors and other resources

J3: GPIO socket

J1 need to be installed into the Raspberry Pi GPIO connector.

J1: GPIO connector

J2 is the extension of the Raspberry Pi GPIO port. DAC or other HATs need to be installed into this GPIO connector.

J2: AUX GPIO connector

J2 is a duplicated Raspberry Pi GPIO port. A MonitorPi/pro or other accessories can be installed into this connector.

J7: Ultra-low noise 3.3V/500mA output

J7 can be used to power FifoPi, DAC or other audio devices that need a clean 3.3V power supply.

J4: External ON/OFF button connector

J4 is functionally equivalent to S1. An external button can be connected to this connector to perform the same ON/OFF control function. J4 is a 2pin PH2.0mm connector.

J5: External power supply ON/OFF control signal output

J5 is the designed to control the on/off of an external power supply, such as a DAC power supply. J5 is logically equivalent to power status LED D1. It should keep logic high when power is on. J5 is a 2pin PH2.0mm connector.

J6: Optional 5V input/output

You can connect an external 5V power supply to this connector to power the RaspberryPi from GPIO. The USB power needs to be unconnected to bypass. This connector can also be used as a 5V output (filtered) just in case you need of a 5V power supply. J6 is not assembled by default.

S1: Power ON/OFF button

Raspberry Pi can be turned on or safe shutdown by just pressing this button (may need software support).

S2: IR receiver enable/disable

ON: Enable IR receiver

OFF: Disable IR receiver

D1: Power status LED

D1 is designed to indicate the power on/off status. This function needs to be enabled by the software.

D2: 3.3V power supply indicator

H. Operating principle

ShieldPi Pro MkIII is designed in two side surface mounted PCB.

The top side, or we call it the audio side is a pure shield layer. This layer is a whole piece of single-point grounded copper plate. Because of there is no any current going through this shield layer, the EMI noise from Raspberry Pi will be blocked without introducing into the audio HATs through the space in between.

The bottom side, or we call it the Pi side is the wide bandwidth power supply filtering network to improve Raspberry Pi power supply dynamic response and lower the noise. This filtering network uses the combination of polymer, and NP0 capacitor groups to achieve an ultra-low ESR performance over a wide frequency range extended GHz.

With a ShiledPi Pro MkIII installed in the system, both EMI noise and power supply noise will be reduced. Therefore, improvements can be expected.

To perform a safe power on and shut down function, ShiledPi Pro MkIII is integrated with a Raspberry Pi GPIO power on/off button and power status LED. The power on control wire is connected to GPIO3 (or PIN5, the Raspberry Pi default power on GPIO pin), while the power off control wire is connected to GPIO4 (PIN7). The power indication LED D1 is connected to GPIO17 (PIN11)

The RaspberryPi IR-remote control function can also be implemented if the on-board IR receiver is enabled. IR receiver output will be connected to pin22 (GPIO25) of a RaspberryPi.

I. How to enable the RaspberryPi safe shutdown/ power on button?

The GPIO power on function is enabled by default. The Raspberry Pi can be turned on at any time when press the button S1 after it was shutdown.

However, the S1 safe shutdown button function has to be enabled in the software. To implement, you will need to edit the file /boot/config.txt on the SD image, adding a new line to the end, then save the **config.txt** file.

dtoverlay=gpio-shutdown,gpio_pin=4

There are many ways to edit the config.txt, but the simplest way is directly open the config.txt file on a PC using a SD card reader.

Note: Please use the latest version Raspberry Pi with the most updated bootloader to ensure this function.

J. How to enable the power status LED and external power supply on/off control signal?

To enable this function, you just need to edit the /boot/config.txt again, adding a new line to the end, then save the **config.txt** file.

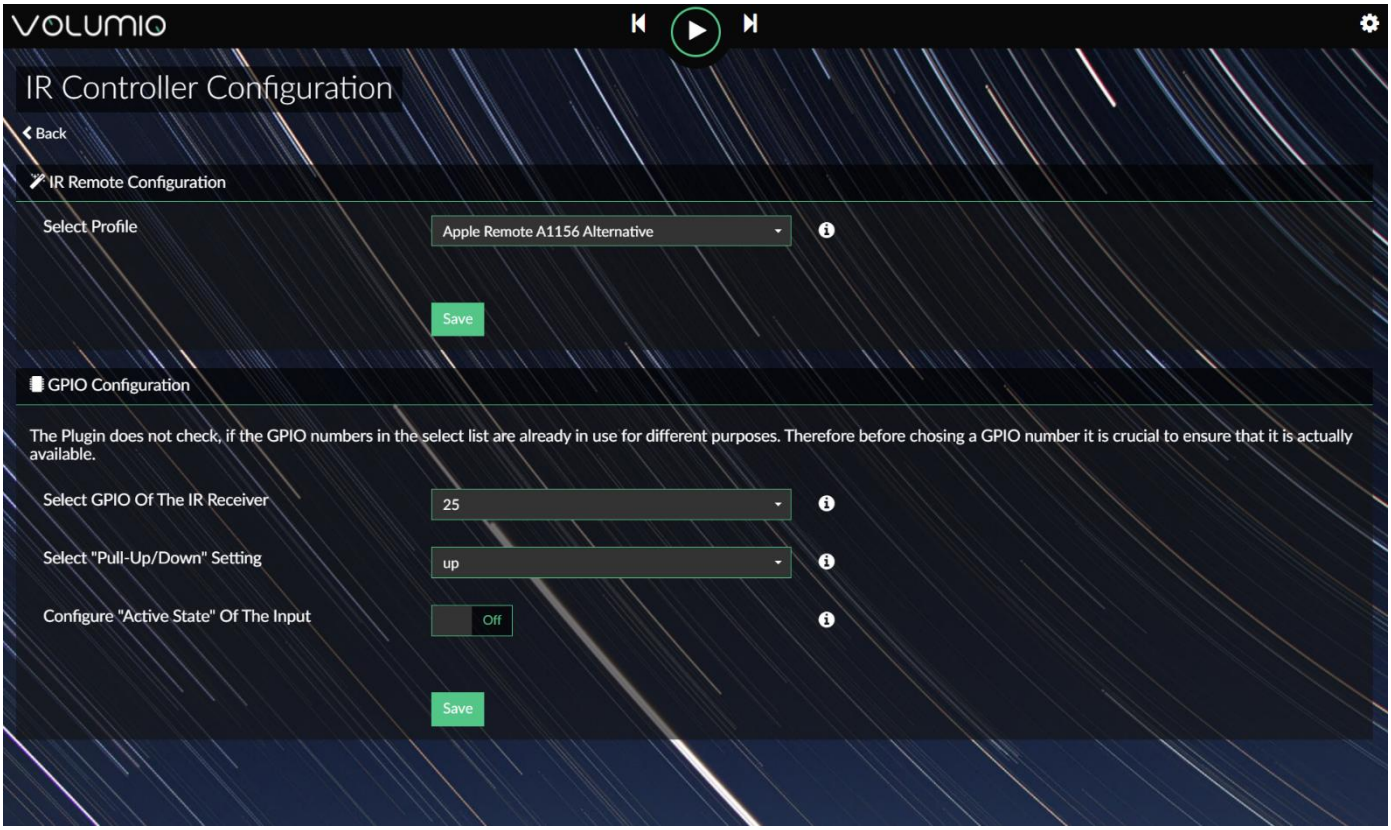
gpio=17=op,dh

Once enabled, we can use J5 to control the external power supply, such as LifePO4 power supply, LifePO4 Mini,

LinearPi, UcPure and so on.

K. How to enable the IR-remote controller function

1. Switch S2 to ON position.
2. If use Volumio software, we need to install the IR Remote Controller plugin.
1. Config this plugin settings as below.



Please note, the IR-remote controller will not work if wrong profile is selected. For the Apple aluminum remote controller, we need to select the **A1156 Alternative**. For other remote controller, we need to select the profile accordingly. You can also try different profiles until the remote controller works.

L. Application examples

1. Upgrade the high performance Audiophonics I-Sabre ES9038Q2M DAC

Components

(1). Audiophonics I-Sabre ES9038Q2M DAC

(2). ShieldPi Pro MkII

(3). MonitorPi (optional)

(4). Raspberry Pi

Power supply

UcPi 5V ultracapacitor power supply (optional)

2. Improve the ultra-low jitter TransportPi Digi/II network streamer transport

Components

(1). TransportPi Digi/II

(2). ShieldPi Pro MkIII

(3). MonitorPi (optional)

(4). Raspberry Pi

Power supply

UcPi 5V ultracapacitor power supply (optional)

3. Upgrade a standard RaspberryPi DAC

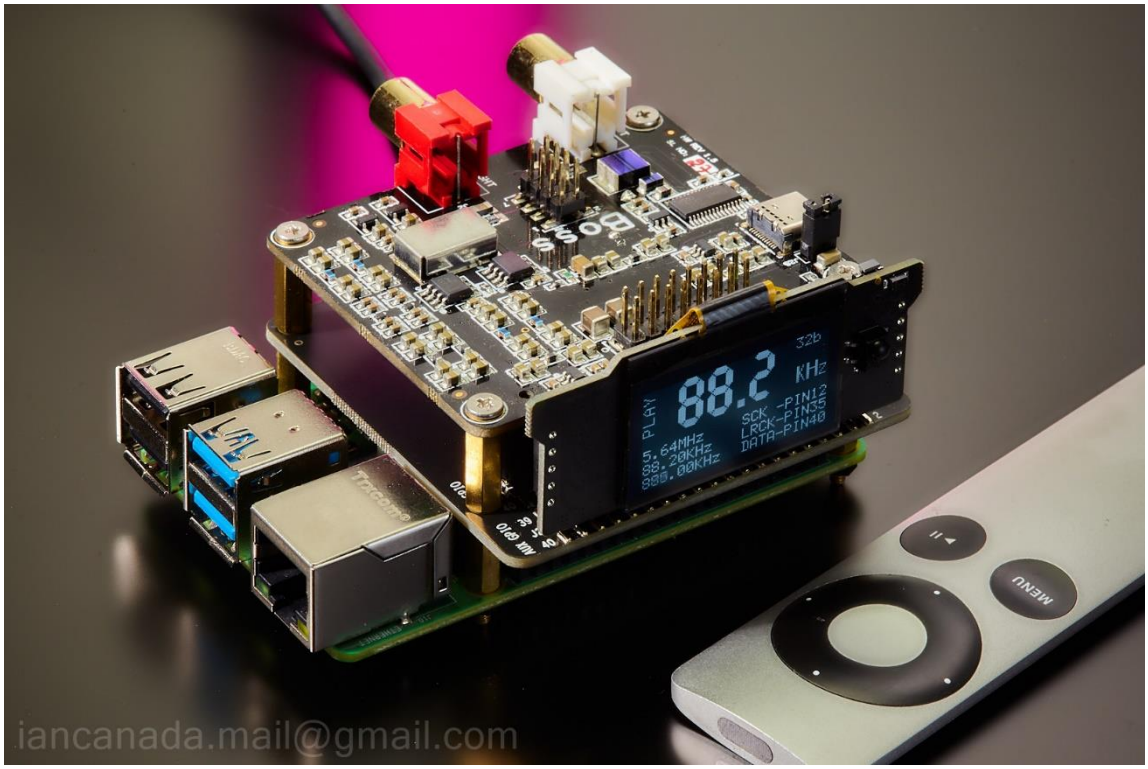
Components

(1). BOSS PCM5122 DAC or other Pi DACs

(2). ShieldPi Pro MkII

(3). MonitorPi (optional)

(4). Raspberry Pi



4. Upgrade a basic RaspberryPi DAC or digi interface

(1). Hifiberry DAC+ Pro (or Hifiberry Digi+)

(2). ShieldPi Pro MkII

(3). Raspberry Pi

5. **Run a FifoPiQ7or FifoPi MA directly without using an additional 3.3V power supply**

(1). FifoPiQ7 or FifoPi MA

(2). ShieldPi Pro MkII

(3). Raspberry Pi

(4). MonotorPi/Pro (optional)

Power supply

Standard USB power adapter or UcPi 5V ultracapacitor power supply

6. **Run a IanCanada ESS DAC directly without using an additional 3.3V power supply**

(1). ES9038Q2M Dual Mono DAC

(2). Transformer I/V

(2). ShieldPi Pro MkII

(3). Raspberry Pi

(4). MonotorPi Pro as controller

Power supply

Standard USB power adapter or UcPi 5V ultracapacitor power supply

7. ShieldPi Pro MkIII works with Raspberry Pi that is equipped with a heatsink

Note: special size standoffs that come with the heatsink could be required to install

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