FifoPiMa Master mode Raspberry Pi I2S/DSD/DoP Re-clocker user's guide

By Ian Jin, Sep.02, 2022 Ver. 1.5b
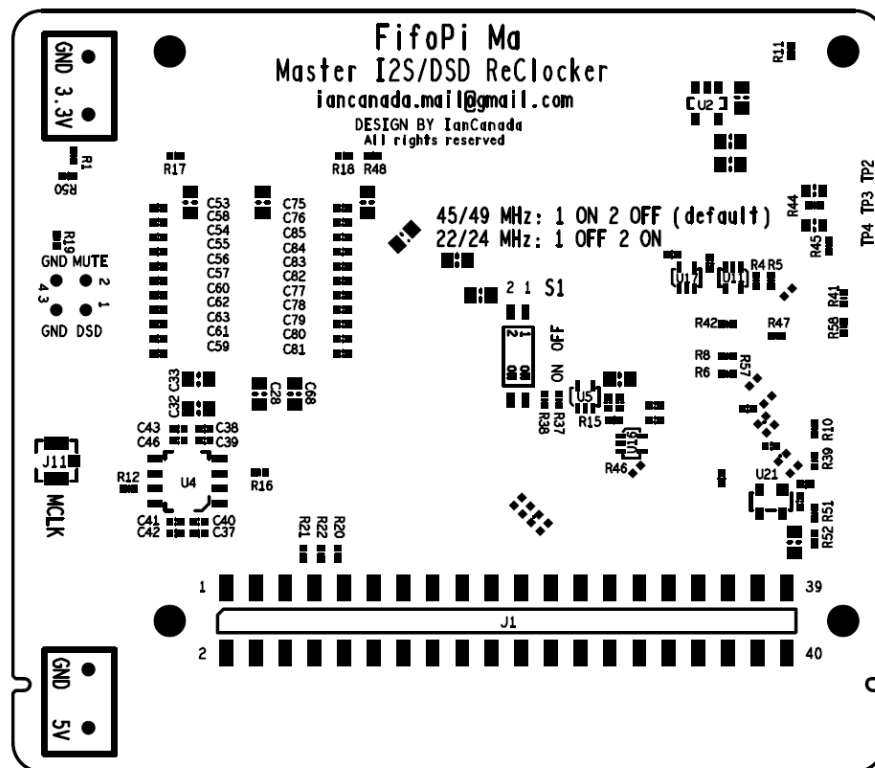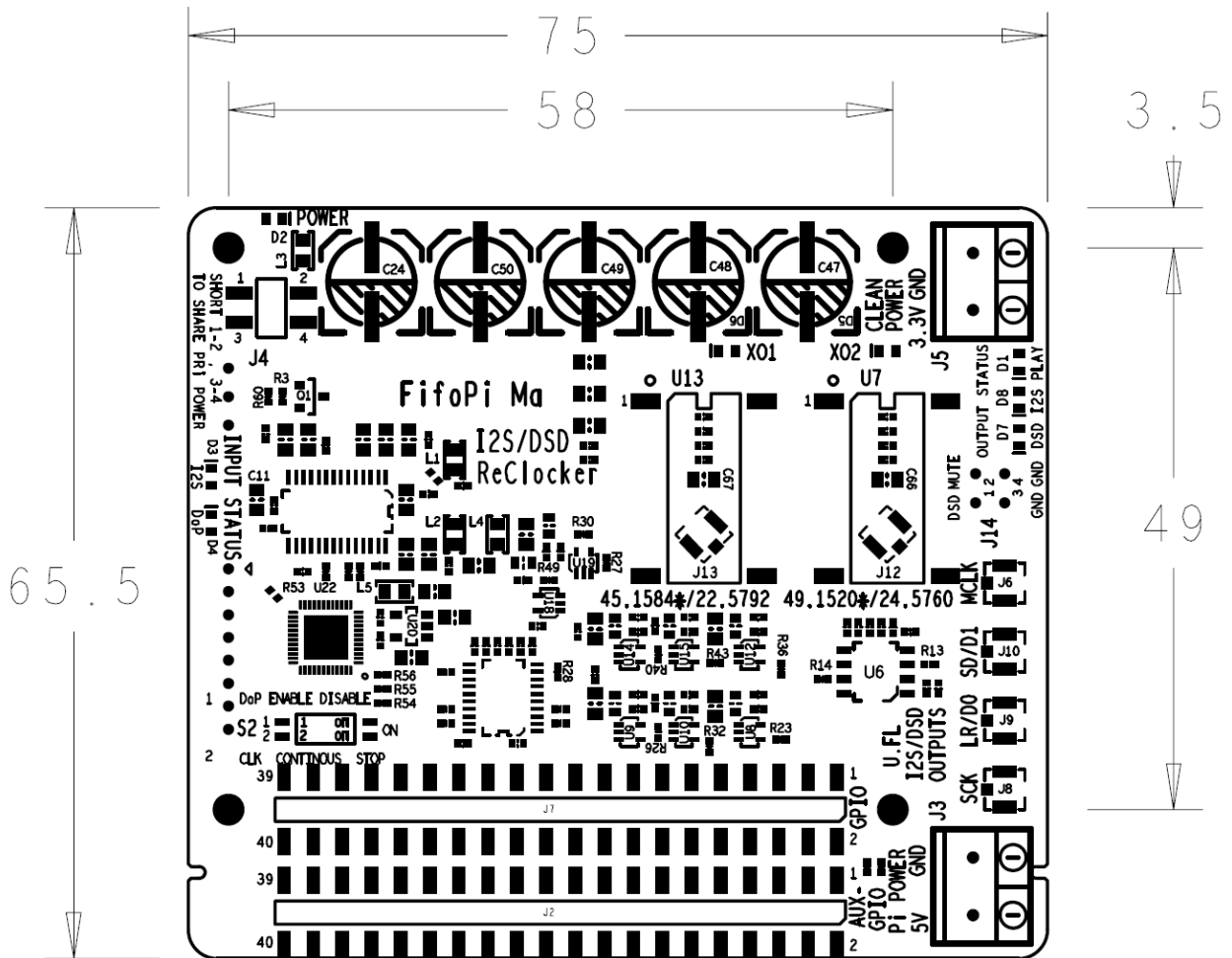
A. Introduction

FifoPi Ma is an audiophile grade Raspberry Pi I2S/DSD/DoP re-clocker that works in master clock mode. It is functionally equivalent to a FifoPiQ3 plus a ReclockPi. FifoPiMa successfully achieves an ultra-low jitter and ultra-low noise performance by using IanCanada's well reputed 1-bit multistage discrete re-clock technology. The output signal quality of the FifoPiMa is almost the perfect. It works great for Paspberry Pi streamer transports, SYNC mode DACs, external DACs and many other digital audio applications to improve the sound quality. As a less expensive alternative solution, FifoPi Ma is compatible with FifoPi Q3 in both physical dimensions and electronic connections.

B. Features and Specifications

- Master clock mode

- Support I2S up to 384KHz

- Support DSD output from DSD64 to DSD 128

- On-board DoP decoder enables Raspberry Pi native DSD playback over GPIO

- Two user-replaceable socket-mounted clocks (XOs or OCXOs, with/without OE pin) support frequencies 22.5792/24.5760 and 45.1584/49.1520 MHz for both 44.1KHz and 48KHz family digital music. FifoPiMa also works with SinePi to use external high quality sine clocks.

- Includes two re-clock stages to achieve lowest possible jitter performance.

- 1-bit discrete re-clock technology to ensure so far the best ultra-low noise performance as the same as a ReClockPi. The final I2S/DSD signal quality is almost perfect in terms of the signal integrity.

- Zero delay time

- Two separate DC inputs to provide both clean power to the FiFoPiMa and the optional Raspberry Pi power via GPIO.

- 3.3V ultracapacitor and LifePO4 battery power supplies can be used directly for the FifoPiMa

- Optimized decoupling networks to improve power supply performance more.

- AUX GPIO connector is designed to install DAC controllers, MonitorPi or other RPi accessories without affecting the output signal quality.

- Has three output groups: U.FL connectors, GPIO and the AUX GPIO. They are all independent from each other.

- To achieve the best possible low jitter performance, high quality U.FL coaxial cable connectors are designed for MCLK and other I2S/DSD outputs in order to runs DACs, digital interface transports in a more professional way.

- Also provides Mute and DSD EN control signals for the following DACs and transport streamers.

- MCLK jitter = square (XO jitter^2 + 18fs^2) @(12kHz-20MHz)

- I2S/DSD signals jitter = square (XO jitter^2 + 18fs^2 + flip-flop additive jitter^2) @(12kHz-20MHz)

- With DoP pass through function

- With both continuous and stop clock mode for mute state.

- Bit-perfect

- Need a standard Linux driver to operate

- Can work with an IsolatorPi to have a galvanic isolation between Raspberry Pi

- Has built-in hardware based lossless 16bit to 32bit convertor, works with all kinds of DACs even they don't support 44.1KHz 16bit music format

- High performance re-clock solution fit your budget.

C. Layout and Dimensions (in mm)

Top board (dimensions: 75, 58, 3.5, 49, 65.5)

POWER
D2
L3
1 2
J4 3 4
SHORT 1-2, 3-4
TO SHARE PRI POWER
R3
C1
•INPUT STATUS
D3
D4
C11
I2S
DoP
DoP ENABLE DISABLE
S2 1
    2
CLK CONTINOUS STOP
39
40
39
40

C24 C50 C49 C48 C47

FifoPi Ma
I2S/DSD
ReClocker

L1
L2 L4
R30
L5
R53 U22
R56
R55
R54
1 2 on
   on ON
2

U13
1
C67
J13
45.1584*/22.5792

U7
1
C66
J12
49.1520*/24.5760

R49
R43
R36
R14 U6
R13
R32
R23

J7

J2

CLEAN
POWER
3.3V GND
J5

XO1 XO2

DSD MUTE
OUTPUT STATUS
D7 D8 D1
1 2
3 4
DSD GND DSD I2S PLAY
J14

GND GND

MCLK
J6
SD/D1
J10
LR/D0
J9
SCK
J8
J3
U.FL
I2S/DSD
OUTPUTS
GPIO
1
AUX-
GPIO
Pi POWER
5V
GND
1
2

Bottom board

GND 3.3V
R11
FifoPi Ma
Master I2S/DSD ReClocker
iancanada.mail@gmail.com
DESIGN BY IanCanada
All rights reserved

R17
R18 R48
U2

R50
R1
R19
GND MUTE
2 1
4 3
GND DSD

R44
R45
TP4 TP3 TP2

45/49 MHz: 1 ON 2 OFF (default)
22/24 MHz: 1 OFF 2 ON

2 1 S1
R4 R5
R42 R47
R58 R41
R8
R6 R5
R10
R39
R52 R51
U21
U5
R37
R15 R38
R46

R4

J11
MCLK
C53 C75
C58 C76
C54 C85
C55 C84
C56 C83
C57 C82
C60 C77
C62 C78
C63 C79
C61 C80
C59 C81

C32 C33
C28
C68
C43 C38
C46 C39
R12
U4
R16
C41 C40
C42 C37
R21
R22 R20

1 J1 39
2   40

GND 5V

D. Quick-Start Guide

1. Install the FifoPiMa on top of a Raspberry Pi.

2. Connect a TransportPi, a HdmiPi, or a SYNC mode ESS DAC, or other audio HAT on top of FifoPiMa (or connect to an external DAC through the U.FL connectors). Connect the MCLK in between through the U.FL coaxial cable if it is required.

3. Install a micro-SD card loaded with your player image into your Raspberry Pi.

4. Connect a good 3.3V DC power supply (LifePO4 battery or Ultracapacitor supply are preferred) to J5.

   (or you can short J4 1-2 and 3-4 to share Paspberry Pi power supply while keep J5 unconnected)

5. Power the Raspberry Pi with 5V DC power supply either at J3 of FifoPiMa (via GPIO) or by a PurePi from bottom side of Raspberry Pi GPIO, or directly by a USBC power adapter.

6. Turn on the power supplies. The Input and output status LEDs will be quickly flashed and then the power LED become solid red.

7. In the player software setups, select the standard PCM5122 I2S device, such as Hifiberry DAC+ pro, as the Linux driver. Make other configurations as needed to enable your Raspberry Pi player to operate.

8. Enjoy the music.

Note: PurePi is highly recommended as a power supply for FifoPiMa. It can provide two high quality outputs: A 5V ultracapacitor voltage rail and an isolated 3.3V pure LifePO4 battery voltage rail.

E. FifoPiMa picture
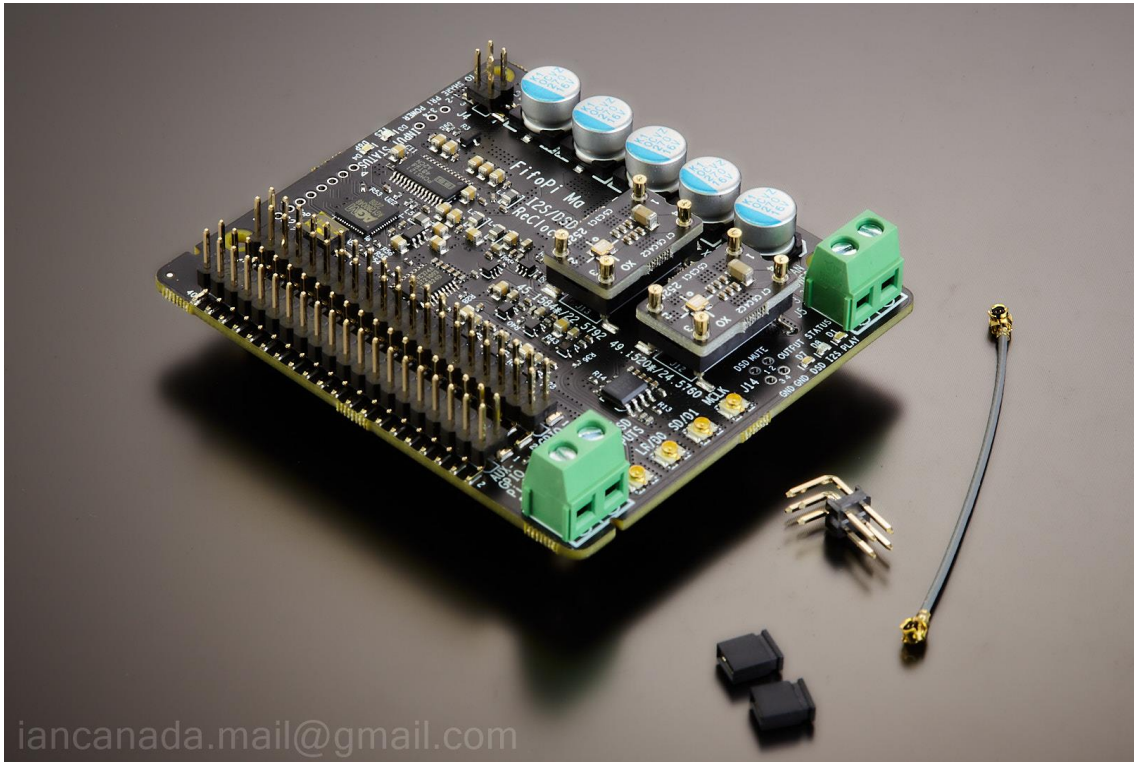
F. Connectors

J5: Clean FiFoPiMa DC power input

Connect a 3.3V DC / 200mA (minimum) power supply to J5 to power the FiFoPi, MAINTAINING CORRECT POLARITY!!! The FiFoPiMa consumes about 100mA average current with typical 45.1584/49.1520 MHz XO clocks, a little higher with higher frequency clocks. If you use OCXOs or other high current-consuming clocks, you MUST account for the additional current required in your clocks in your choice of a power supply. We prefer to use a 3.3V ultracapacitor / LifePO4 battery direct power supply to achieve best possible sound quality. PurePi is recommend as a decent power supply solution to start. LifePO4Mini 3.3V with a UcConditioner 3.3V would be an even better option to get more improvement. To use this direct 3.3V DC input, a fast start-up power will be required. Be very careful with some linear power supply, they may not meet the timing of FifoPiMa's initialization timing if they have a soft start performance.

J3: RaspberryPi power input (optional)

You can power your RaspberryPi via GPIO through J3, bypassing the Micro-USB connection. To do so, connect a 5V 2A DC power supply to J3, MAINTAINING CORRECT POLARITY!!! We highly recommend you power your RaspberryPI via GPIO to lower power supply noise on your Raspberry Pi. DO NOT connect power to J3 if you already power your Raspberry Pi by a PurePi to the GPIO at the bottom side, or via another method, such as the Micro-USB port.

J6, J11: MCLK outputs (U.FL coaxial cable socket)

MCLK (master clock) output for DAC HAT or external DAC. To operate a DAC (HAT or external) in synchronized clock mode you must connect this to your DAC. J11, a second MCLK output socket, is located at the bottom side of PCB.

J8: SCK outputs (U.FL coaxial cable socket)

SCK (bit clock) output for external DAC. This output is the same for both PCM and DSD format.

J9: LRCK/D1 output (U.FL coaxial cable socket)

LRCK/D1 (PCM left/right clock or DSD data 1) output for external DAC. This Serial Audio Data line is formatted as LRCK when the signal is PCM I2S or D1 when the signal is DSD.

J10: SD/D2 output (U.FL coaxial cable socket)

SD/D2 (PCM data or DSD data 2) output for external DAC. This Serial Audio Data line is formatted as SD when the signal is PCM I2S or D2 when the signal is DSD

40PIN GPIO connectors

	J1	J2	J7
PIN#	GPIO connecting Raspberry Pi to FiFoPiMa	AUX GPIO for a controller or other digital devices	Prime GPIO for a DAC HAT or other audio devices
1,17	Raspberry Pi 3.3V output	Raspberry Pi 3.3V output	Only 1 for FifoPiMa clean 3.3V
2,4	Raspberry Pi 5V input/output	RaspberryPi 5V input/output	FiFoPiMa clean 3.3V internally connected to J5+
6,9,14,20, 25,30,34, 39	GND	GND	GND
3	I2C DA of RPi	I2C DA of FifoPiMa	I2C DA of FifoPiMa
5	I2C CL of RPi	I2C CL of FifoPiMa	I2C CL of FifoPiMa
12	SCK Input	AUX SCK output	Prime SCK output
35	LRCK Input	AUX LRCK/D1 output	Prime LRCK/D1 output
40	SD/D2 Input	AUX SD/D2 output	Prime SD/D2 output
All other pins	Connected to the GPIO pins of the Raspberry Pi	Duplicating the same # GPIO pins of the Raspberry Pi	Not connected

J14: MUTE/DSD control signals

Pin 1: DSD_EN signal. A logic high output indicates native DSD format is playing. This signal is optional. Can be used for external or internal DAC that need this signal to switch between PCM and DSD.
Pin 2: MUTE signal. A logic high output indicates DAC should be muted. This signal is optional. Most DACs or DAC HATs do not need this signal.
Pin 3,4: GND

J12/J13: Optional External oscillator inputs in U.FL

J12/J13 can be used to connect to external oscillators via U.FL coaxial cables. Uninstalled by default.

XO sockets U7 and U13 have to be removed before soldering U.FL sockets to J12 and J13 position.

No XO selection logic is required for external oscillators.

J4: Jumper to share RPi power supply with FifoPiMa

1-2 open, 3-4 open (default): To power FifoPiMa by a good 3.3V power supply via J5.

1-2 short, 3-4 short: To share PRi power supply with FifoPiMa. In this case, only one 5V power supply is needed for both RaspberryPi and FifoPiMa. J5 must be kept unconnected.

G. Jumper settings

S1: (located at bottom side of the PCB)

1-ON, 2-OFF (default) Install 45.1584 MHz in XO1 socket (U13) and 49.1520MHz in XO2 socket (U7).

1-OFF, 2-ON Install 22.5792 MHz in XO1 socket (U13) and 24.5760MHz in XO2 socket (U7).

S2: (located at top side of the PCB)

Jumper Switch S2	OFF (default)	ON
1	DoP decoding enabled	DoP decoding disabled
2	Continuously output I2D/DSD clocks when music is stopped	Stop output I2D/DSD clocks when music is stopped
	Enable the 16bit to 32bit lossless convertor	Disable the 16bit to 32bit lossless convertor

Switch 1 Note: Some DAC chips (such as ES9038Q2M) have a built-in DoP decoder. If you want to use the internal DoP decoder, you need to disable FifoPi's DoP decoding function. Otherwise, any DoP stream will be converted into DSD format using FifoPiMa's internal DoP decoder. When DoP decoder is disabled, DoP stream will be treated as PCM format and passed through un-converted.

Switch 2 Note: Continuous clock mode would be a good option for most of the audio devices to avoid click sound at the moment when music started or stopped. However, if really required by the device, you can set FifoPiMa to stop clock mode to stop I2S/DSD clock at mute time. Switch 2 also shares with the enable/disable the 16bit to 32bit convertor function.

H. LED indicators

Group	LED	Description	On Indicates...
Input status	D3	I2S	I2S format input
	D4	DoP	DoP format input and converted into DSD format
Output status	D8	I2S	I2S format output
	D7	DSD	DSD format output
FIFO status	D1	PLAY	Lit to indicate FifoPiMa is playing music
			Off when music is stopped or mute
Clock Selection	D6	XO1	XO1 is selected for MCLK
	D5	XO2	XO2 is selected for MCLK

I. Application examples

1. **Simplest Raspberry Pi re-clocker project**
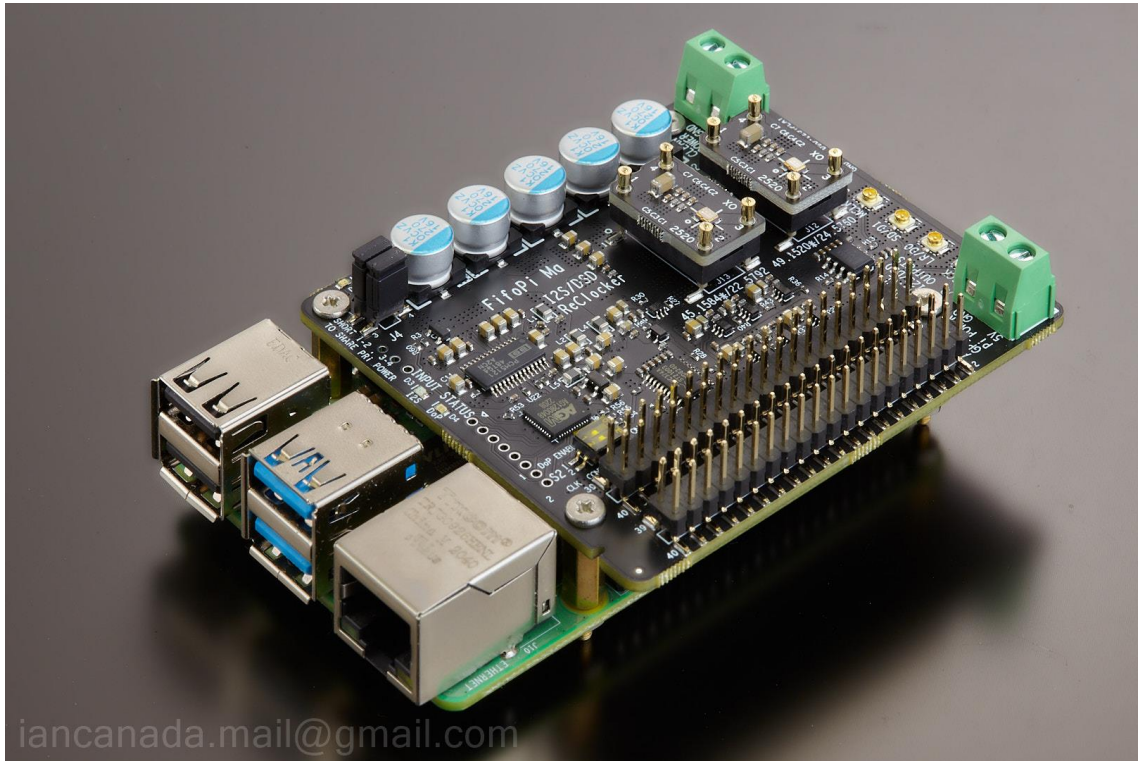
Components:

(1). Raspberry Pi

(2). FifoPiMa

Power supply:

Regular Raspberry Pi power supply

Configurations:

Short 1-2 and 3-4 of the FifoPiMa to make it sharing the power supply form Raspberry Pi.

Connections:

(1). Connect to an external DACs via the U.FL cables

Or (2). Install a suitable audio HAT on top of FifoPiMa with proper power supply arrangement. Don't forget connecting the MCLK cable if required.

2. **Compact size high performance Raspberry Pi streamer transport**
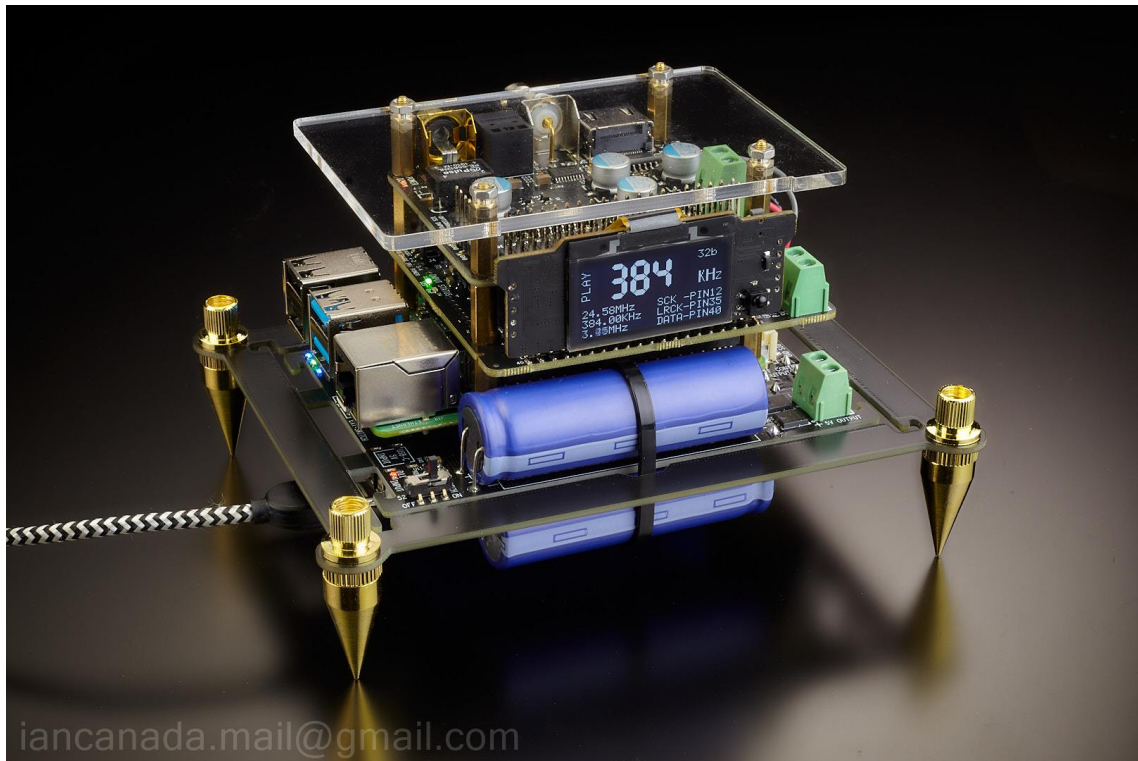
Components:

(1). Raspberry Pi

(2). FifoPiMa

(3). TransportPi MKII (or HdmiPi, or the coming TransportAES and the HdmiPiPro)

(4). MonitorPi as OLED display (optional)

Power supply:

PurePi (5V ultracapacitor, 3.3V LifePO4 battery power supply combo) with USBC input (2.5A)

Configurations:

Keep everything no change as default

Connections:

(1). Connect the MCLK signal from J6 of FifoPiMa J6 to J4 of TransportPi MKII.

(2). Connect the 3.3V battery power supply from J2 of PurePi to J5 of FifoPiMa with two high quality wires.

(3). Install the MonitorPi onto the AUX GPIO of the FifoPiMa (optional)

Note:

The spike feet kit can be found at Amazon.

3. **Audiophile grade ultra-low jitter Raspberry Pi streamer transport or DAC**
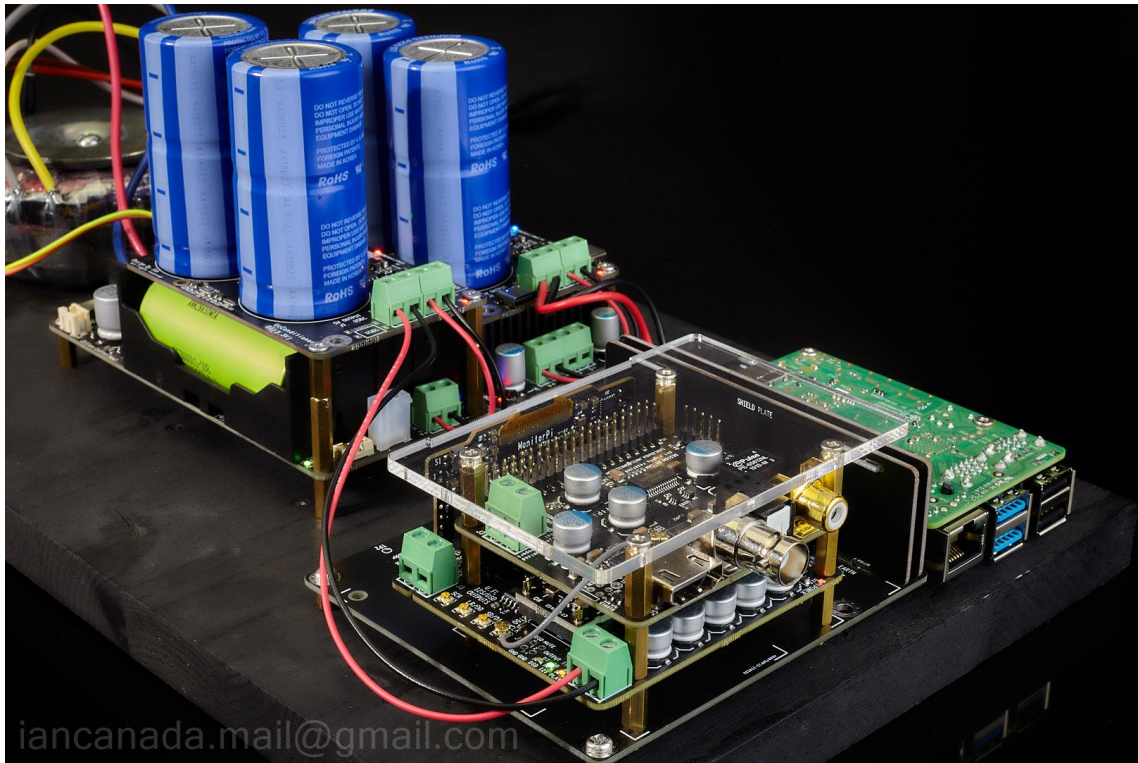
Components:

(1). Raspberry Pi

(2). FifoPiMa

(3). TransportPi MKII (or HdmiPi, or the coming TransportAES and the HdmiPiPro)

(4). StationPi

(5). MonitorPi as OLED display (optional)

Power supply:

(1). LinearPi 5V with 6V or 9V AC input

(2). LifePO4Mini 3.3V with a 6V AV input

(3). UcConditioner 5V (optional but highly recommended)

(4). UcConditioner 3.3V (optional but highly recommended)

Configurations:

(1). Keep J5 of the stationPi unconnected

(2). Short 1-2 and 3-4 of J4 of the FifoPiMa if a MonitorPi or an ESS controller is installed to its AUX GPIO.

Connections:

(1). If UcConditioners are used, connect them properly with the LinearPi 5V and the LifePO4 Mini 3.3V.

(2). Connect the 3.3V power supply to the J5 of FifoPiMa with two high quality wires.

(3). Connect the 5V power supply to the J3 of the StationPi with two high quality wires.

(4). Connect the MCLK signal from J6 of FifoPiMa J6 to J4 of TransportPi MKII

(3). If a MonitorPi is used, install it onto the AUX GPIO of the FifoPiMa, or via a GPIO extender KIT to the front panel.

Notes:

(1). You can use a DAC HAT to replace the TransportPi

(2). If a DAC HAT is used, it will need extra power supplies as required.

(3). Please don't use StationPi Pro with FifoPiMa

J. How to produce the best sound quality using your FiFoPiMa

1. Install great clocks

The primary mechanism the FifoPiMa uses to lower jitter and improve the sound is by recreating the audio stream referenced to low-jitter clocks. The better clock you use, the more improvement you can get from your FiFoPiMa.

The two XO oscillators supplied with the board are carefully selected low jitter XOs and batter then the most low-cost generic clocks. They are great for you to get started to experience the improvement of low jitter clocks. We have tested the CCHD-957 series XO oscillators from Crystek and found to be a good choice at a reasonable price. Another good choice are the SDA series from NDK, but you will need SMT XO adapter to install.

You may also use OCXOs with better phase noise performance for even better results as long as you factor in the higher current requirements of these devices. Ultra-low phase noise sine wave clocks can also be used for FifoPiMa through the SinePi adapter.

Trying different clocks for better sound is an interesting experience similar to capacitor, tube or opamp rolling.

2. Power your FiFoPiMa from a directly-connected 3.3V ultra capacitor or LiFePO4 battery supply

The quality of your FiFoPi power supply directly impacts both FiFoPi and clock performance. As an alternative to very good quality linear power supplies, we have used a directly-connected 3.3V LiFePO4 battery or UcConditioner 3.3V ultracapacitor power supplies. Our experience is that these types of supplies do a very good job of improving the resulting sound quality AND are very hard to better with a traditional active power supply. You can connect this type of supply directly to the isolated DC input terminal J5.

If you are building a compact system, PurePi power supply will be highly recommended to provide both ultracapacitor 5V and pure isolated LifePO4 3.3V for both RaspberryPi and the FifoPiMa at a more reasonable

cost.

Otherwise, A LinearPi 5V and a LinearPi 3.3V, with a ConditionerPi 5V and a ConditionerPi 3.3V combination would be a great option.

If your system needs more voltage rails, the LifePO4 power supply could be a good option to provide up to six 3.3V battery outputs and one 5V linear output. UcMateConditioer and UcHybrid and UcAdapter are also available to upgrade this solution with ultracapacitors.

3. Install an IsolatorPi between FifoPiMa and RaspberryPi

To achieve a best possible sound quality, you can also install an IsolatorPi II between FifoPiMa and the RaspberryPi to provide a galvanic isolation by cutting the ground loop and the common mode EMI noise. In this case, IsolatoPi must be configured in master mode (J13 short by two jumpers and J12 open). 1-2 and 3-4 of J4 of the FifoPiMa must be shorted by the two jumpers. A 3.3V power supply must be connected to J5 of FifoPiMa to provide a clean power for both the FifoPiMa the IsolatorPi at the clean side. Under this configuration, the IsolatorPi doesn't need any extra power supply at the clean side. And because of the isolation delay, the maximal Fs will be limited to 192KHz if the isolatorPi is installed.

K. Some application notes

1. Can FifoPiMa work with TransportPi or HdmiPi?

Yes, FifoPiMa works with all SYNC mode audio HATs such as a TransportPi or HdmiPi to improve sound quality.

2. What kinds of DACs can a FifoPiMa work with?

Any kinds of SYNC mode DACs, such as the dual mono ESS9038Q2M DAC, the ES9028Q2M DAC, external DACs and so on, should work greatly with FifoPiMa. However, by principle, any master clock mode DACs, such as a Hifiberry DAC+, have no way work with any re-clockers including the FifoPiMa, FifoPiQ3 and FifoPi Q7.

3. Can FifoPiMa work with ReceiverPi or a RaspberryPi free application?

No, The master clock mode principle decides that FifoPiMa doesn't work for the ReceiverPi nor any Raspberry free application.

4. XO warm-up time

All XO and OCXO oscillators take time to warm-up and stabilize before producing their lowest jitter, best sounding clock signal. This will take anywhere from a couple of minutes to a half hour or even longer. Please allow for your clocks to warm up and stabilize before performing any critical evaluations.

5. How to remove/replace SMT XO sockets

XO sockets may get loose if being used for many times. In this case, we need to replace the sockets.

Cut the four pins by a side cutter at bottom of a SMT XO socket.

Clean the pads by de-soldering wick

Solder a new SMT XO socket at the same position.

6. The size of standoffs

11mm M2.5 standoffs are suggested to be installed between RaspberryPi and the FifoPiMa.

13mm M2.5 standoffs can be used between FifoPiMa and other HATs on top.

7. Power supply selection guide for FifoPiMa

Power supply is very significant to FifoPiMa to achieve its low noise and low jitter performance at the highest possible level. Here are some power supply options:

(a). Share the Raspberry Pi power supply

FifoPiMa is designed can share the Raspberry Pi power supply by short J4 1-2 and 3-4 with jumpers. But Raspberry Pi processor can generate a lot of noise over the voltage rails. So unless you really want to save on power supply or just do some function tests, I don't recommend powering the FifoPiMa in this way.

(b). SMPS

A 3.3V SMPS is OK for FifoPiMa for a function test. However a SMPS itself can generate a lot of EMI noise and it is almost impossible to filter out that noise. So I don't suggest using SMPS for FifoPi at a real listening experience.

(c) 3.3V linear regulator or LDO

Linear regulator has much less noise than a SMPS. It will be one of the good options to power a FifoPiMa. However, some linear regulators have very slow start-up time which may not meet the FifoPiMa's initialization timing. So have to carefully select a fast start-up linear power supply for the FifoPiMa. On the other hand, the active components in the linear regulators can result in higher 1/f noise and flicker noise level, so they may not perform as good as an ultracapacitor power supply or battery power supply for the FifoPiMa.

(d). PurePi

I highly recommend the PurePi for compact size FifoPiMa applications because it integrates both 5V ultracapacitor power supply and 3.3V isolated pure LifePO4 battery power supply together for RaspberryPi and FifoPiMa. Furthermore, there are still rooms to improve if you install an UcConditioner 3.3V to work with the PurePi battery voltage rail down the road. PurePi is also not expensive compared with the performance.

(e). LifePO4 Mini 3.3V

LifePO4 Mini 3.3V would be highly recommended for larger scale FifoPiMa applications (with StationPi for example).   It has bigger battery cells than the PurePi, so the ESR will be lower and the pure time will be longer. LifePO4Mini 3.3V can also be upgraded by an UcConditioner 3.3V to achieve a higher performance level.

(f). UcPure pure ultracapacitor power supply in 3.3V configuration

UcPure could be the best performance ultra-low noise high dynamic power supply so far in the world. Performance wise, it's the best of the best. However the 3000F ultracapacitors could be too big and too expensive. That is the only drawback I can see.

L. Some measurement results of FifoPiMa

1. FifoPiMa I2S/DSD signals
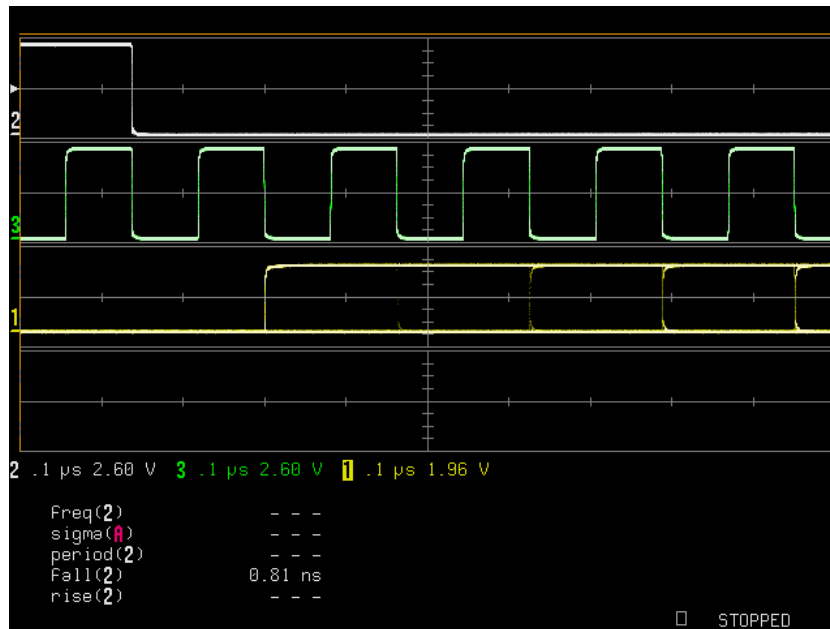
Under a 1GHz bandwidth 8Gs sampling digital oscilloscope, the quality of the FifoPiMs output signals is almost perfect. The noise levels are very low. No overshoot and no ring. There is also no ripple over the logic levels. The eye diagram of the DATA signal looks great. Both LRCK and DATA signals are precisely aligned to the falling edges of the SCK. FifoPiMa's output signal quality could be so far the best.
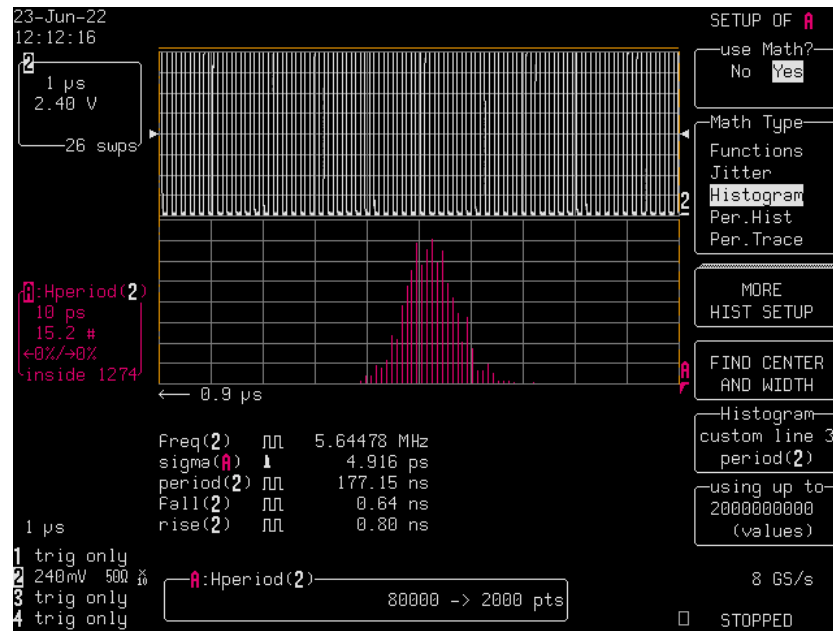
2. FifoPiMa MCLK time jitter measurement
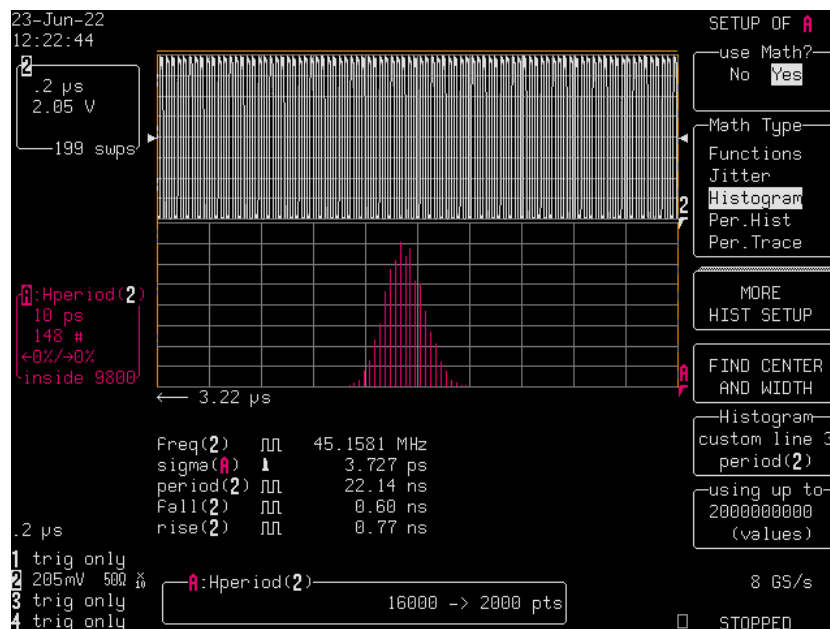
FifoPiMa MCLK (45.1544MHz) jitter is measured 3.14ps RMS (noise floor excluded)
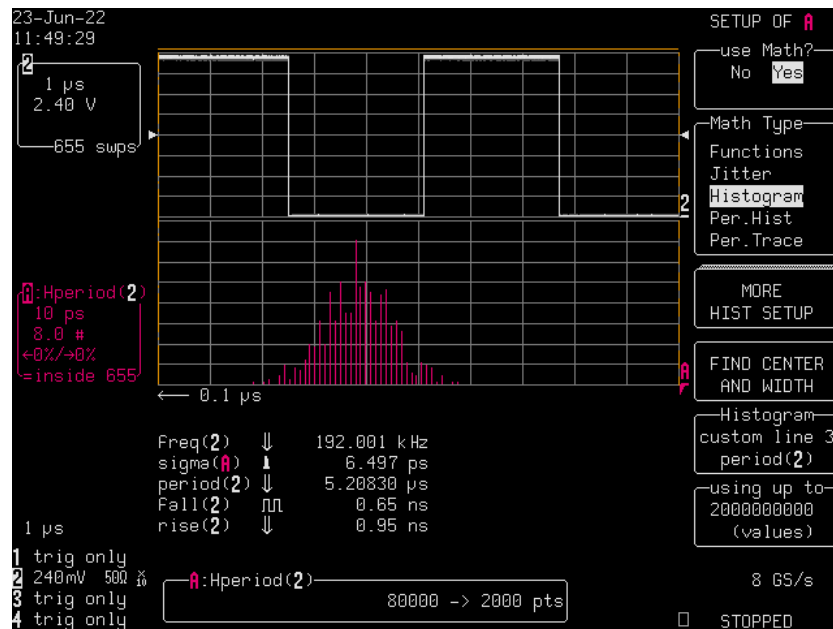
3. FifoPiMa SCK time jitter measurement

FifoPiMa SCK (5.6448MHz) jitter is measured 4.49ps RMS (noise floor excluded)

4. FifoPiMa LRCK time jitter measurement

FifoPiMa LRCK (192KHz) jitter is measured 6.18ps RMS (noise floor excluded)

M. FifoPiMa, FifoPiQ3 and FifoPiQ7 cross reference

Comparison	FifoPiMa	FifoPi Q3	FifoPi Q7
Mode	Master	SYNC	SYNC
Low jiter MCLK output	Yes	Yes	Yes
FIFO Memory	None	64Mbit	64Mbit
I2S/DSD Re-clocker	2 stages low noise discrete one-bit re-clockers	1 stage multi-bits re-clocker	3 stages low noise discrete one-bit re-clockers
Built-in Isolator	None	Yes, with integrated isolator	Yes, with low noise discrete isolators for the best possible isolation performance
Ouput signal quality	ultra low noise, almost perfect signal quality	Signal quality is great but still has chance to improve by installing a ReClockPi	ultra low noise with isolation, almost perfect signal quality
PCM input/output	384KHz	768KHz	768KHz
DSD input/output	DSD 128 output only	DSD1024	DSD1024
DoP input/output	DoP Decode/pass through	DoP Decode/pass through	DoP Decode/pass through
Architecture	N/A	16bit	32bit
Linux driver	Need	No Need	No Need
XO sockets	Yes, upgradable	Yes, upgradable/swappable	Yes, upgradable/swappable
Work with RPi	Yes	Yes	Yes
Work USB	No	Yes	Yes
Work with S/PDIF or I2S over HDMI as input	No	Yes	Yes
StationPi Pro External Controller	No support	Yes	Yes
Support MonitorPi as Controller	No support	NO	Yes

GPIO OLED controller	Works with MonitorPi but no control function	External controller of Works with MonitorPi but no control function	Yes, Works with MonitorPi for both control and monitoring functions, Also works with external controller
Continuous clock mode	Yes	No	Yes
Clean Side power supply	3.3V /Ultracapacitor/battery	Isolated 3.3V /Ultracapacitor/battery	Isolated 3.3V /Ultracapacitor/battery
XO frequencies support (MHz)	22/24, 45/49	5.6/6.1,11/12,22/24,45/49,90/98	5.6/6.x,11/12,22/24,45/49,90/99
Delay Time	No delay	fixed 0.2s delay time for all Fs	Programmable delay time between 0.1s - 1s
Work with SinePi	Yes	Yes	Yes
16bit to 32bit lossless convertor	Yes (V1.5 or higher)	Yes	Yes
Bit-perfect	Bit-perfect	Bit-perfect	Bit-perfect
Size and dimension	Same and compatible	Same and compatible	Same and compatible
Price	Lower	Higher	Even higher

N. Troubleshootings

1. The issue:
I use a LinearPi 3.3V together with a UcConditioner 3.3V as the FifoiMa power supply for J5. But the FifoPiMa doesn't work. All input and output LEDs are lit but not solid bright. No sound. No output. What's the problem?

The reason:
As an ultra-low noise linear power supply, the LinearPi has a soft starting feature. But the start-up time could be too long for the FifoPiMa to meet the correct initialization timing.

The solution:
Replace the LinearPi 3.3V with a LifePO4 Mini 3.3V (even higher quality), then connect to the UcConditioner as the same as before. The Issue gets fixed.
You can also use PurePi as power supply solution. It works great with FifoPiMa projects.

Note: LifePOe Mini 3.3V can use exactly the same AC power input as the LinearPi used before.

2. The issue:

FifoPiMa has no sound. Neither XO1 LED nor XO2 LED are lit when playing music. PLAY LED also doesn't turn on. But both Input LED D3 and output I2S LED D8 are lit.

The reason:

The issue was caused by a wrong Linux driver. FifoPiMa needs a standard PCM5122 Linux driver to function. Other drivers will not work for FifoiMa, such as Generic I2S, Hifiberry DAC and so on.

The solution:

When selecting **Hifiberry DAC+ Pro** as the output device driver, the issue was fixed.

3. The issue:

FifoPiMa has no sound when installed into StationPi Pro. But all LED indicators seem correct.

The reason:

FifoPiMa works in master mode so it doesn't work with StationPi Pro (SYNC mode).

The solution:

Issue will be fixed when replace when install FifoPiMa into a StationPi.

4. The issue:

I confirmed that my DAC supports 44.1KHz 16bit music format through the I2S over HDMI input. Can I disable the FifoPiMa's 16bit to 32bit lossless converter function to play the original 16bit music format?

The solution:

Yes, you can. By default, the 16bit to 32bit lossless converter function was enabled. To disable it, all you need is just to set the S2 Pin2 to the "ON" position. It doesn't affect the playback of 32bit music format.
Please note that the continuous output clock mode will be disabled at the same time.