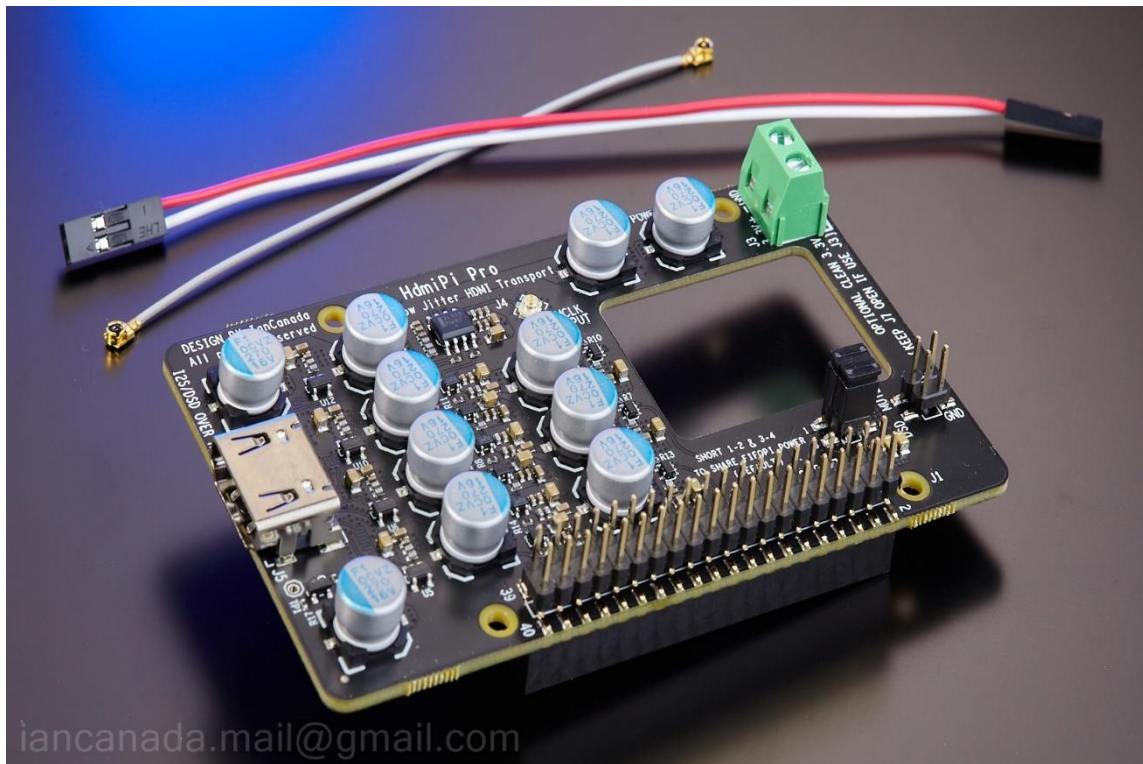# HdmiPi Pro

Flagship Ultra-low jitter I2S/DSD over HDMI transport interface

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A. Introduction

HdmiPi Pro is a dedicated I2S/DSD over HDMI transport interface board. Compared with all other solutions, it is the first one that uses discrete 1-bit LVDS drivers to achieve the highest HDMI signal quality and lowest noise levels. And it also integrates the well-reputed 1-bit discrete secondary re-clockers (similar to a ReClockPi) to ensure the best possible low-jitter performance. HdmiPi Pro is so far the flagship HDMI transport interface board for audiophiles to improve the sound quality of an external DAC to a higher level.

HdmiPi Pro works in SYNC clock mode so it will need a FifoPiMa, FifoPiQ7 or Q3 to operate.

## B. Highlighted Features and Specifications

- Discrete 1-bit LVDS drives to achieve the best possible LVDS signal quality and the lowest noise levels

- Built-in the well-reputed 1-bit discrete secondary re-clock stage

- Enhanced high bandwidth power supply filtering networks

- LDO free design to make it directly use the 3.3V ultracapacitor or battery power supply for the best power supply performance

- Could be so far the best I2S/DSD over HDMI streamer transport interface

- Optimized PCB impedance control for the high speed LVDS signals

- 4 layers PCB design with dedicate shield layers to eliminate EMI noise

- Metal film ultra-low noise resistors to ensure the lowest possible noise level

- Pure sync mode works with FifoPiQ7, FifoPiMa or FifoPiQ3 or other re-clockers.

- Capable of I2S music up to 1536KHz

- Capable of native DSD music up to DSD1024

C. Layout and Dimensions (in mm)
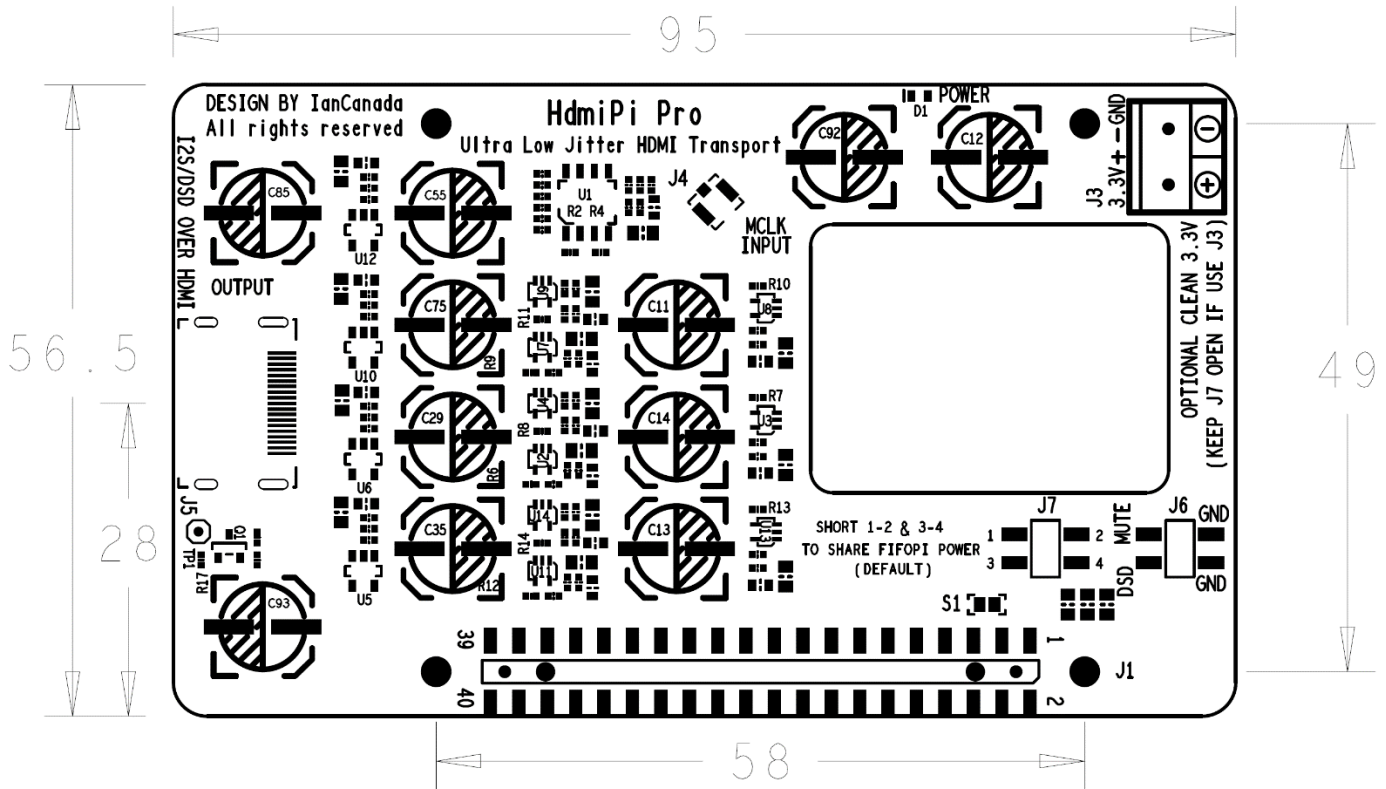

D. Getting start

1. Make sure you FifoPi and rest of the system are configured well and working properly.

2. Install the HdmiPi Pro into the GPIO port of the FifoPi. Please use the 13mm standoffs.

3. Connect the MCLK from FifoPi to the J4 of HdmiPi Pro by the supplied U.FL coaxial cable. Connect the DSD and MUTE signals (optional) from FifoPi to J6 of the HdmiPi Pro if your external DAC takes those control signal through the HDMI cable. Don't need to connect the GND.

4. Make sure your external DAC's HDMI interface configurations are match the format of the HdmiPi's output signals. Connect a HDMI cable (4K, V2.0 or higher) from the HdmiPi Pro output connector J5 to the HDMI input of the external DAC.

5. Turn on the power supply. Make sure POWER LED D1 is light up. Play the music files as normal. Enjoy the music.
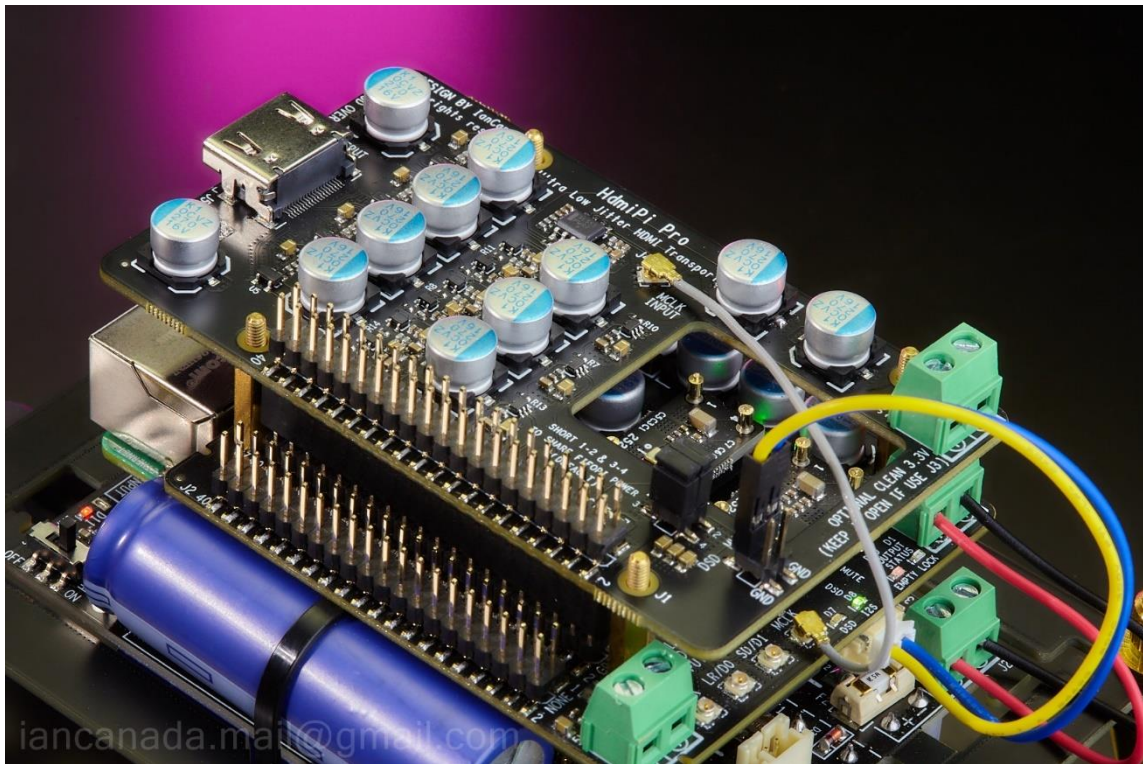
E. Connectors

J5: HDMI output connector

Standard HDMI type A connector. To output LVDS PCM/DSD/DoP signals to receiver through HDMI cable.

For higher signal quality, high speed HDMI cables version 2.0 (4K) or higher are recommended.

Please refer the following schematic for the LVDS I2S/DSD signal configurations (PS Audio format).
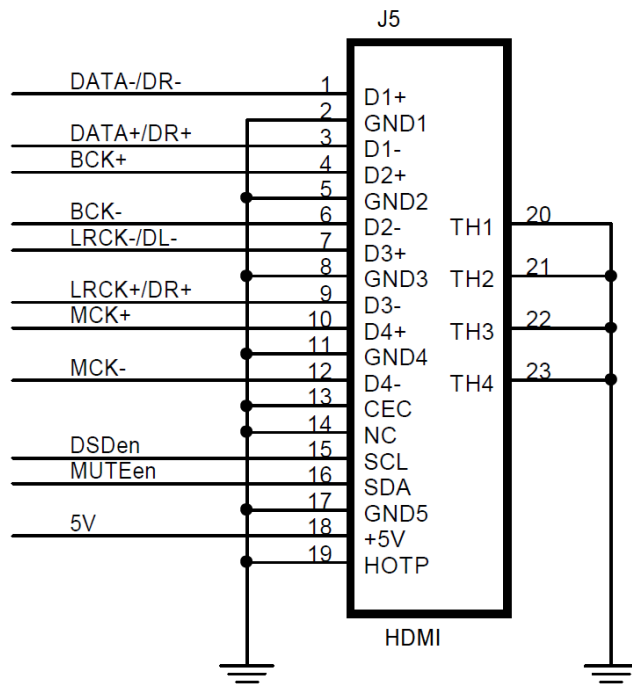
J1, J2: 40 pin GPIO connectors

pin number	**J2** 40 PIN GPIO connector to board below (Raspberry Pi, IsolatorPi I/II, FiFoPi, or similar)	**J1** Optional 40 PIN GPIO connector to HAT on top
1,17	3.3V from preceding board	3.3V from preceding board
2,4	5V or 3.3V from preceding board	5V or 3.3V from preceding board
6,9,14,20, 25,30,34, 39	GND	GND
12	SCK input	SCK from preceding board
35	LRCK/DL input	LRCK/DL PIN from preceding board
40	DATA/DR input	DATA/DR PIN from preceding board
All other pins	same pin from preceding board	same pin from preceding board

40 pin GPIO connector note: All input/output signals are LVTTL (3.3V) logic level except power and ground.

J6: DSD and MUTE control signals input

HDMI Control	Low or unconnected	High
DSD	To play PCM	To play DSD
MUTE	To play normally	To mute DAC

Note: GND signals on J6 don't need to be connected to FifoPi

J4: External MCLK input (u.fl coaxial cable socket)

When including the MCLK signal into HDMI cable, connect the external MCLK signal from a FifoPi or similar low jitter re-clocking source using a u.fl coaxial cable.

J3: Optional 3.3V DC power supply input

By default, HdmiPi Pro takes 3.3V power supply from FifoPi clean side through GPIO. If you want an independent power supply for HdmiPi Pro, you can connect a 3.3V (100mA or higher) power supply to the 2-pin 5.0mm terminal J3. MAINTAINING CORRECT POLARITY!!! J7 jumpers must keep open in this case. Low noise linear 3.3V power supply will be good for HdmiPi Pro. 3.3V ultracapacitor or LifePO4 battery power supplies are great and highly recommended.

J7: Power supply jumpers

Jumpers	**Short**	**Open**
1-2 3-4	Takes 3.3V power supply from FifoPi through GPIO	Takes 3.3V power supply from J3

F. LED indicator

D3: Power indicator, Light up to indicate that the 3.3V power supply is applied.

G. Application examples

**1. Compact size Ultra-low jitter Raspberry Pi I2S/DSD over HDMI transport**

Components

(1). HdmiPi Pro

(2). FifiPi Q7 (or FifoPi Q3, or FifoPi Ma)

(3). MonitorPi (optional)

(4). Raspberry Pi

Power supply

PurePi

Connections

(1). Connect the MCLK from FifoPi to J4 of HdmiPi Pro

(2). Connect the 3.3V pure battery output from J2 of PurePi to 3.3V clean side DC input of FifoPi

(3). Connect DSD/MUTE control signals from FifoPi to J6 of HdmiPi Pro
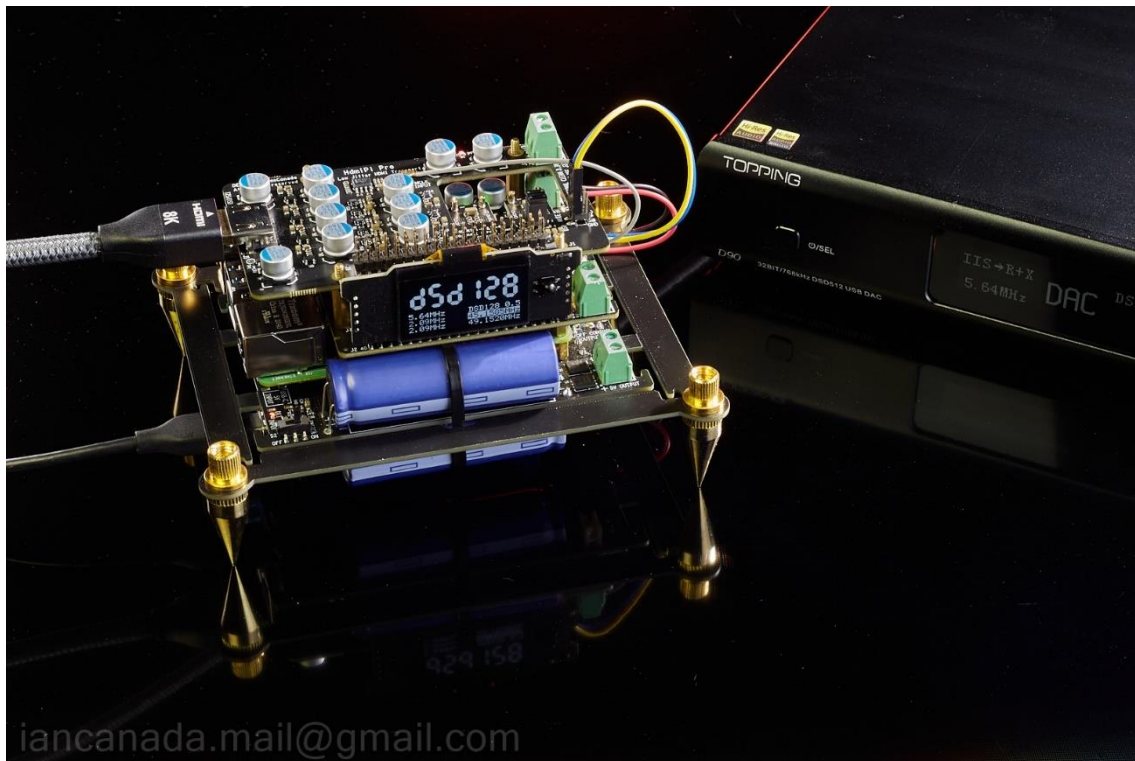
2. **Flagship I2S/DSD over HDMI transport**

Components

(1). HdmiPi Pro

(2). FifiPi Q7 or FifoPi Q3

(3). StationPi Pro

(4). GEN4-ULCD-24PT Touch screen

(5). Raspberry Pi

(6). Amanero Combo384 or compatible size USB streamer (optional).

Power supply

(1). LinearPi 5V + UcConditioner 5V

(2). LifePO4 Mini + UcConditioner 3.3V

(3). Hammond 1182N6 transformer

Connections

(1). Connect the MCLK from FifoPi to J4 of HdmiPi Pro

(3). Connect DSD/MUTE control signals from FifoPi to J6 of HdmiPi Pro

(3). Connect the 3.3V output from UcConditioner 3.3V to 3.3V clean side DC input of FifoPi

(4). Connect the 5V output from UcConditioner 5V to the 5V input of StationPi pro.

(5). Keep both jumpers at J9 on StationPi Pro short to share 5V with FifoPi Pi side

(6). Connect the control cable from FifoPi to StationPi Pro
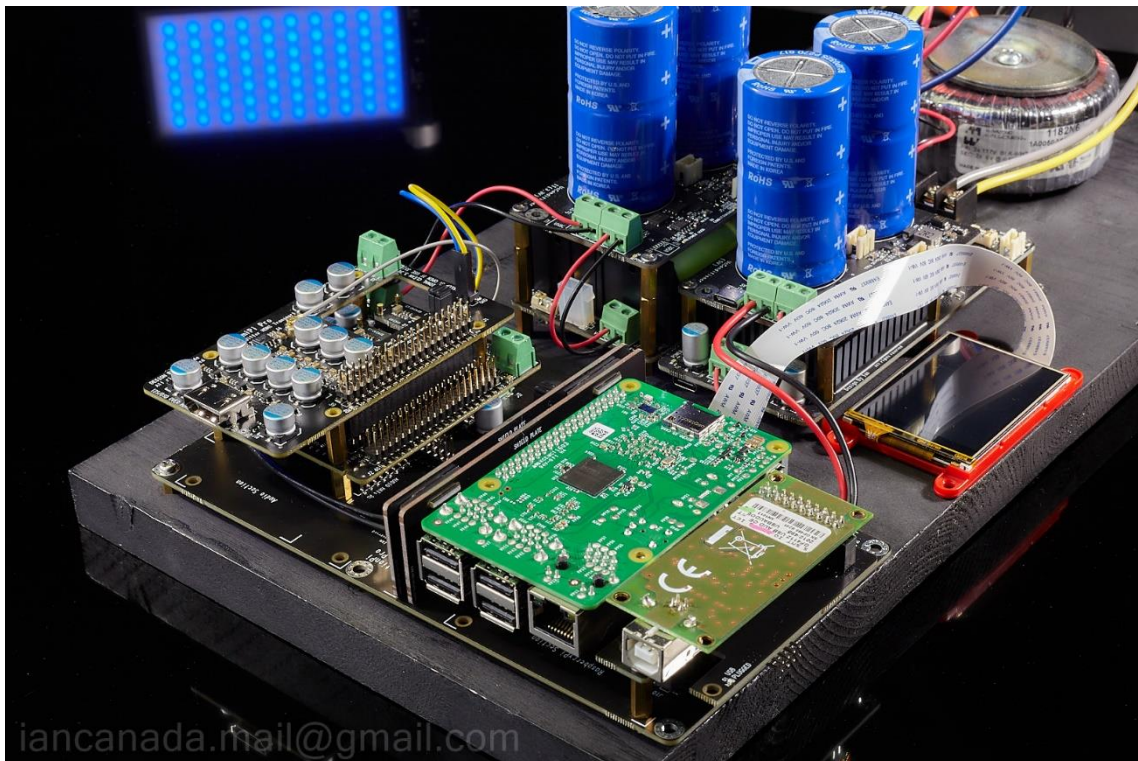
H. How to work with external DACs by the I2S/DSD over HDMI input

HdmiPi Pro uses the standard PS Audio format for the I2S/DSD over HDMI connections. However, some DACs are designed to support multiple formats. In this case, we need to config those DACs properly to work with HdmiPi Pro.

(1). Holo Spring 3 R-2R DAC
I2S Format: ALT2

(2). Denafrips TERMINATOR II
I2S Pinout configuration: MODE0

(3). Topping D90
IIS interface phase setting: IIS PHASE | REV
DSD channel setting: IIS DSDR | DATA
DSD Flag bit: DSD Flag 15

(4). SMSL VMV D2
I2S MODE: INVERTED
I2S DSD CHANNEL: DSDL=PCM LRCK
I2S DSD FLAG=PIN15

I. Q &A

1. **My DAC has no sound when play DSD music, why?**

   First, you have to make sure your DAC is capable of native DSD music playback. Second, if you DAC cannot automatically switch between PCM and DSD, you have to connect the DSD/MUTE control signals from FifoPi to HdmiPi Pro to enable the DSD mode. Please also make sure the DSD flag signal is connected to PIN15 of the HDMI input of your DAC.

2. **My DAC plays pop sound at the moment of music start/stop, or switch between PCM and DSD. How to fix?**

   You need to connect the DSD/MUTE control signals from FifoPi to HdmiPi Pro as long as your DAC takes MUTE control signal at HDMI PIN16. Or, you can enable the continuous clock mode at FifoPi Q7 to eliminate the pop sound to a best possible degree.

3. **The left and right channels are reversed when I play music, how to solve the problem?**

   It was because the LVDS LRCK+/- signals was opposite to HdmiPi Pro at your DAC input. Please config your DAC's HDMI format to reverse the LRCK+/- signals.

4. **My DAC plays noise rather than music, what's the problem.**

   BCK+/- or DATA+/- signals could be reversed. Please try different HDMI configuration on your DAC to see if the problem can be solved.