innomaker DAC Pro HAT

Innomaker Raspberry Pi HiFi DAC Pro Hat ES9038Q2M Audio Card User Manual

Model: DAC Pro HAT

1. Introduction

The Innomaker Raspberry Pi HiFi DAC Pro Hat is a high-performance Digital-to-Analog Converter (DAC) designed to enhance the audio capabilities of your Raspberry Pi. Featuring the ES9038Q2M chip, it supports high-resolution PCM and DSD audio formats, delivering superior sound quality for various audio applications. This manual provides detailed instructions for setting up, operating, and maintaining your DAC Pro Hat.

2. Key Features

- **High Compatibility:** Compatible with all Raspberry Pi boards via the 40-pin connector, requiring no additional cables or soldering.
- **Premium DAC Chip:** Integrates the ES9038Q2M chip, supporting sample rates up to 384-KHz/32-Bit (PCM) and DSD Lossless High Resolution audio.
- **Advanced Amplification:** Equipped with 3 Texas Instruments SoundPlus HiFi audio operational amplifiers, providing 2.1vrms output.
- **Broad Software Support:** Supports popular Raspberry Pi music playback systems including LibreELEC, RuneAudio, Volumio, Moode, PiCorePlayer, OpenELEC, Raspbian, and Ubuntu.
- **Versatile Outputs:** Features an on-board 3.5mm high-end headphone jack and two balanced outputs (X- ,X+) for flexible audio connectivity.
- **Flexible Power Options:** Offers multiple power input methods, including a dedicated 5V/1A power supply option for optimal audio performance.

3. Product Overview

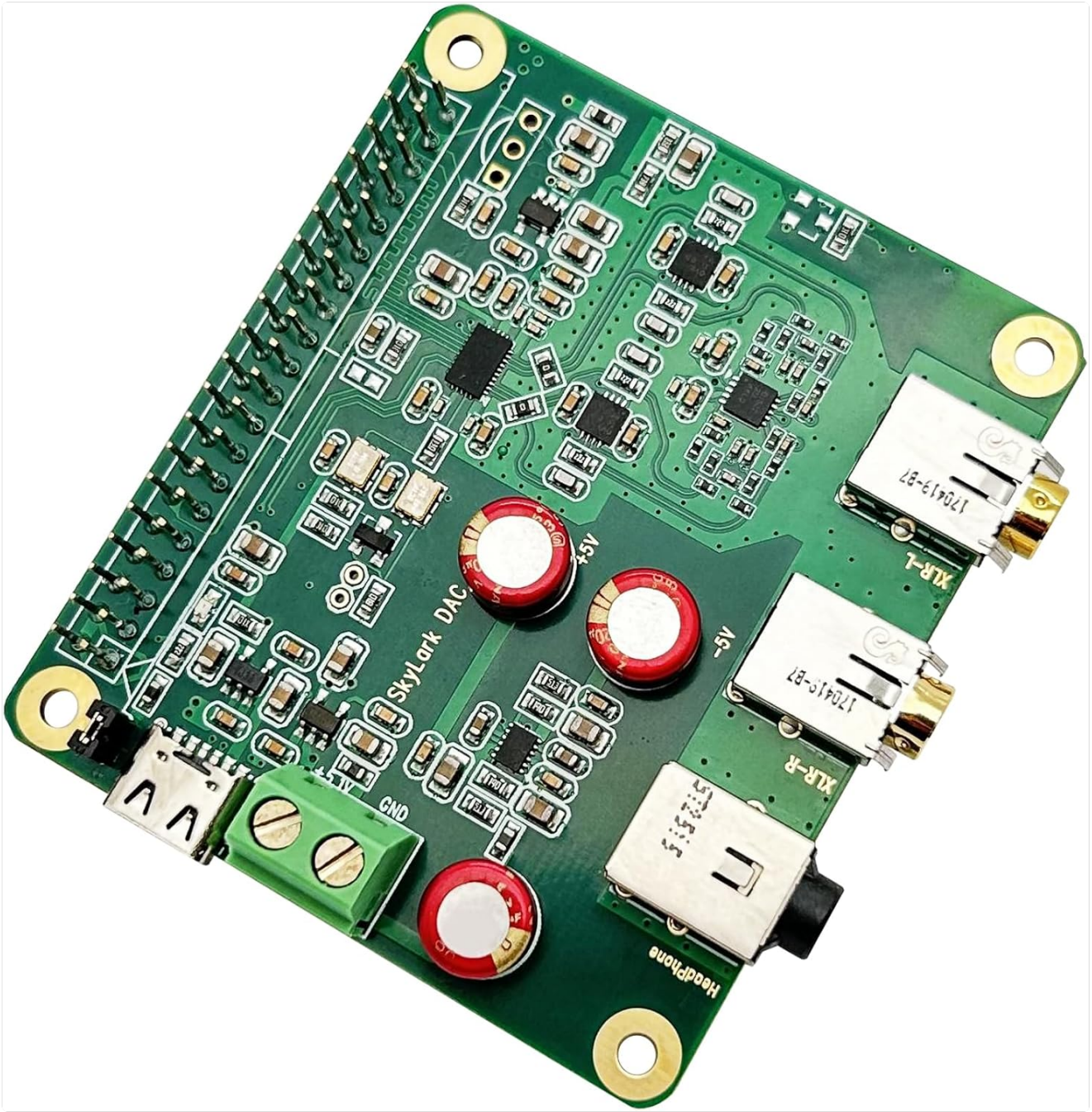


Figure 3.1: The Innomaker Raspberry Pi HiFi DAC Pro Hat, showcasing its compact design and various audio output ports.

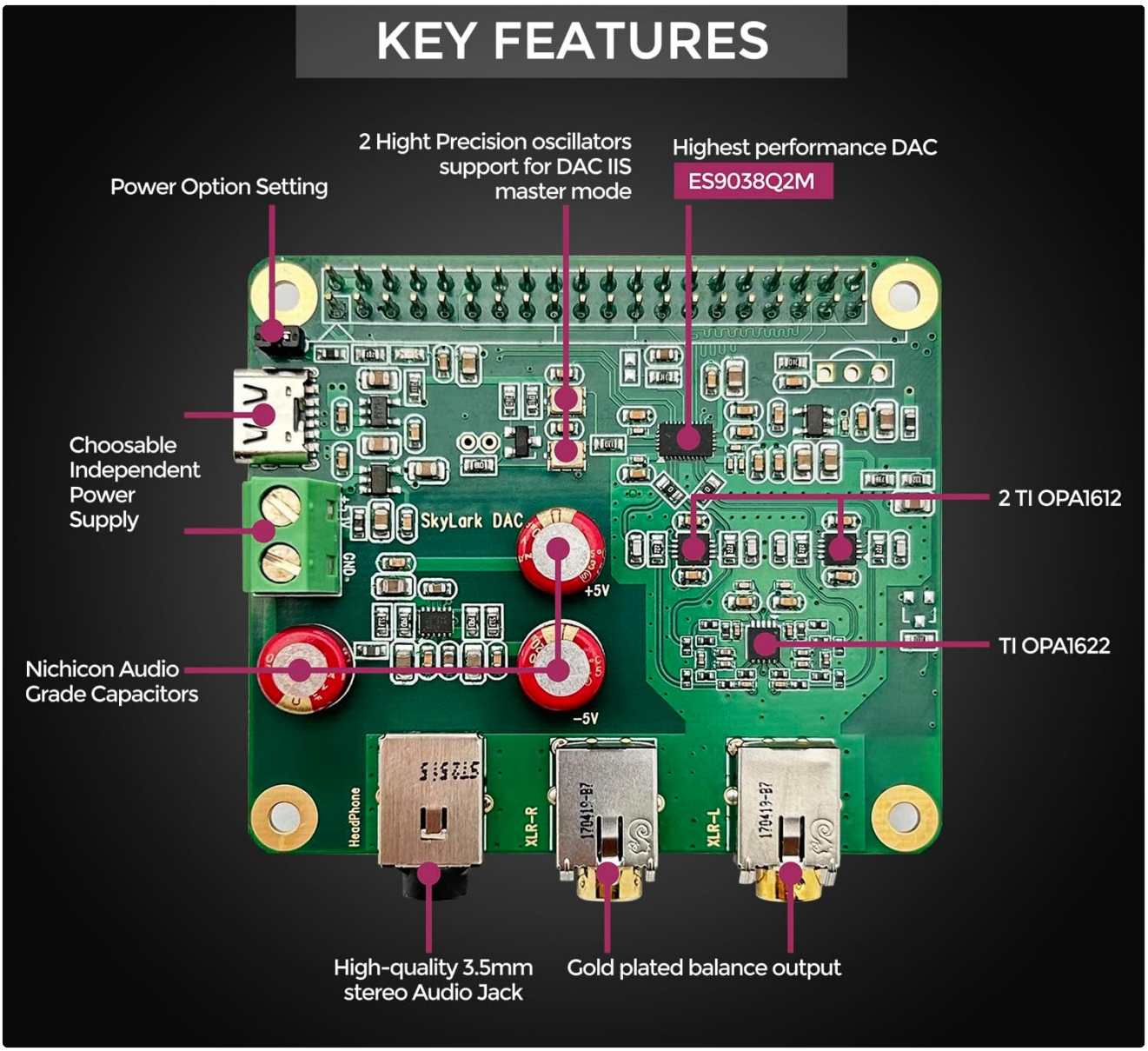


Figure 3.2: Diagram highlighting key features and components of the DAC Pro Hat, including power options, oscillators, and audio outputs.

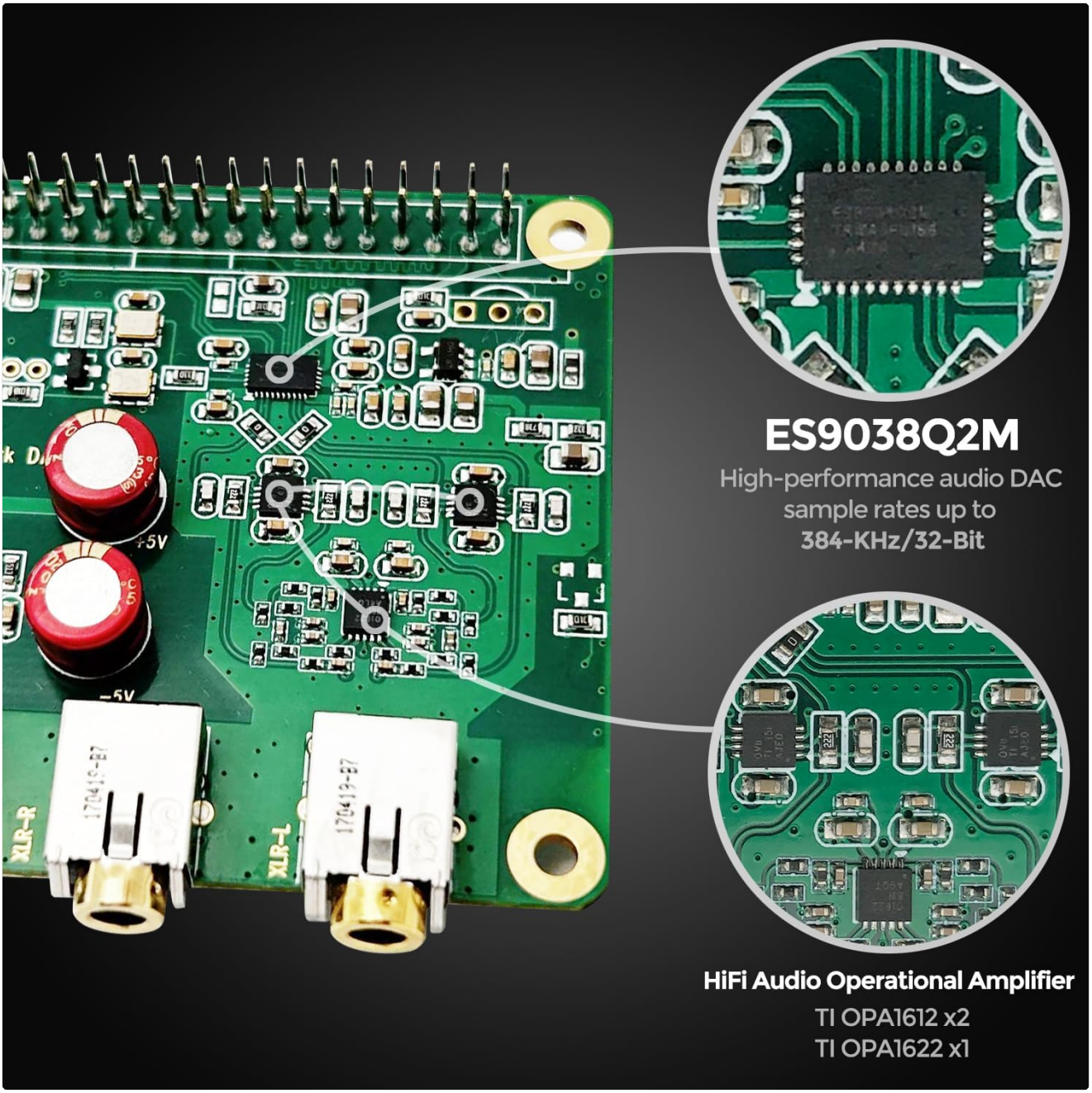


Figure 3.3: Close-up view of the high-performance ES9038Q2M DAC chip and the Texas Instruments SoundPlus HiFi audio operational amplifiers.

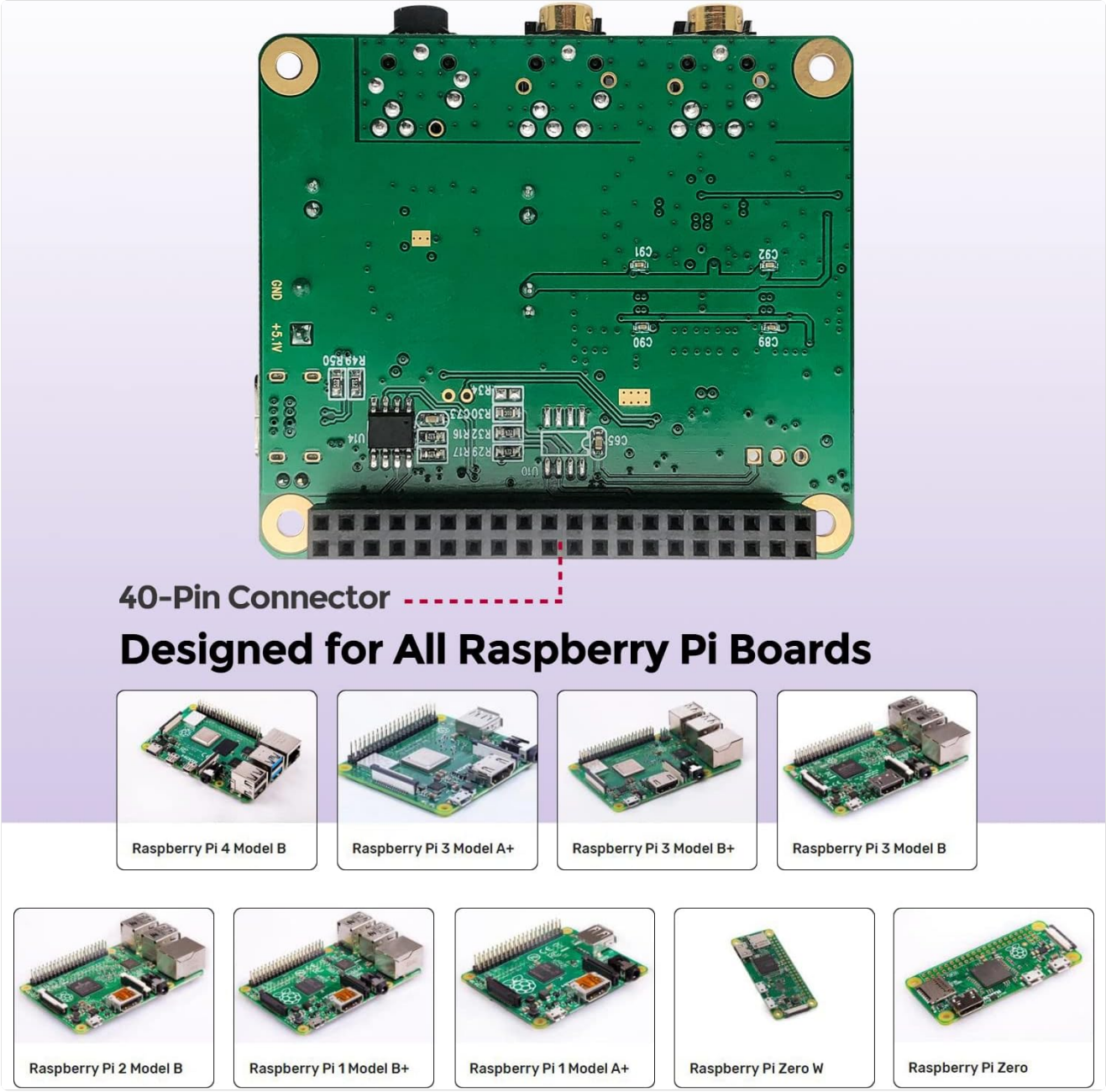


Figure 3.4: The underside of the DAC Pro Hat showing the 40-pin connector, designed for seamless integration with various Raspberry Pi models.

4. Compatibility

The Innomaker HiFi DAC Pro Hat is designed to be compatible with a wide range of Raspberry Pi single-board computers. It connects directly to the 40-pin GPIO header found on most modern Raspberry Pi models.

Supported Raspberry Pi Models:

- Raspberry Pi 5
- Raspberry Pi 4 Model B
- Raspberry Pi 3 Model B+
- Raspberry Pi 3 Model B
- Raspberry Pi 3 Model A+
- Raspberry Pi 2 Model B
- Raspberry Pi 1 Model B+
- Raspberry Pi 1 Model A+

- Raspberry Pi Zero W
- Raspberry Pi Zero
- Raspberry Pi CM4 (with appropriate adapter board)
- Raspberry Pi CM3+ (with appropriate adapter board)

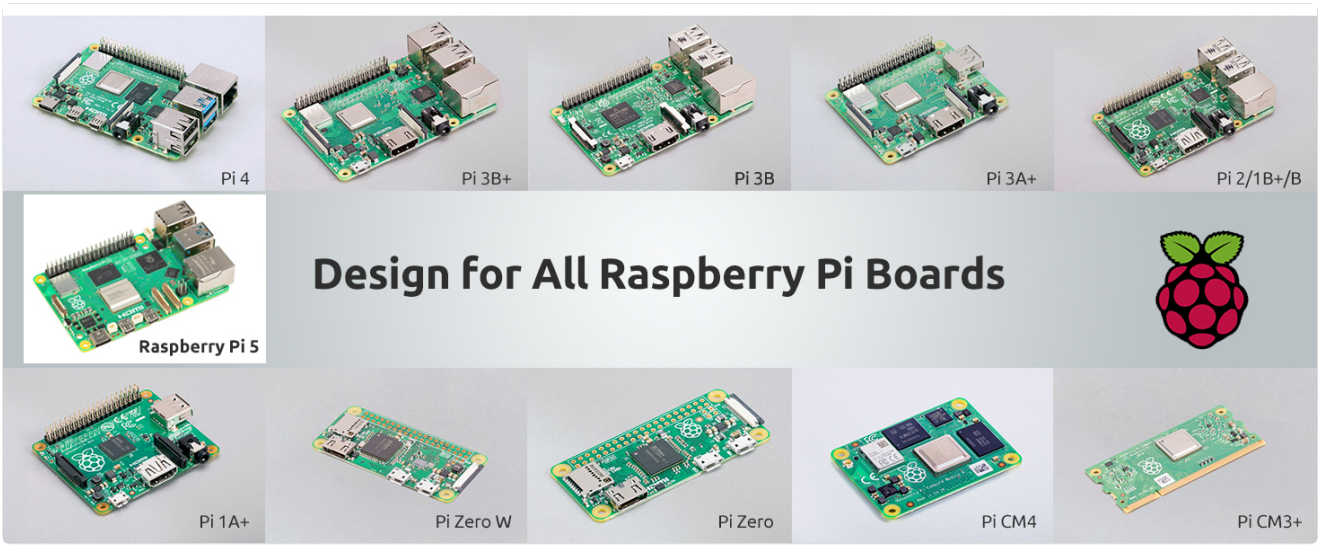


Figure 4.1: Visual representation of the DAC Pro Hat's compatibility with a range of Raspberry Pi boards.

5. Setup Guide

5.1 Hardware Installation

1. **Prepare Raspberry Pi:** Ensure your Raspberry Pi is powered off and disconnected from all peripherals.
2. **Attach DAC Pro Hat:** Carefully align the 40-pin connector on the DAC Pro Hat with the GPIO pins on your Raspberry Pi. Gently press down until the Hat is securely seated. No soldering is required.
3. **Consider Heat Management:** Due to the close proximity of the DAC Hat to the Raspberry Pi's main board, it is highly recommended to use a heatsink and/or cooling fan unit designed for your specific Raspberry Pi model to prevent overheating.
4. **Connect Audio Output:** Connect your headphones to the 3.5mm jack or your audio system to the balanced XLR outputs.

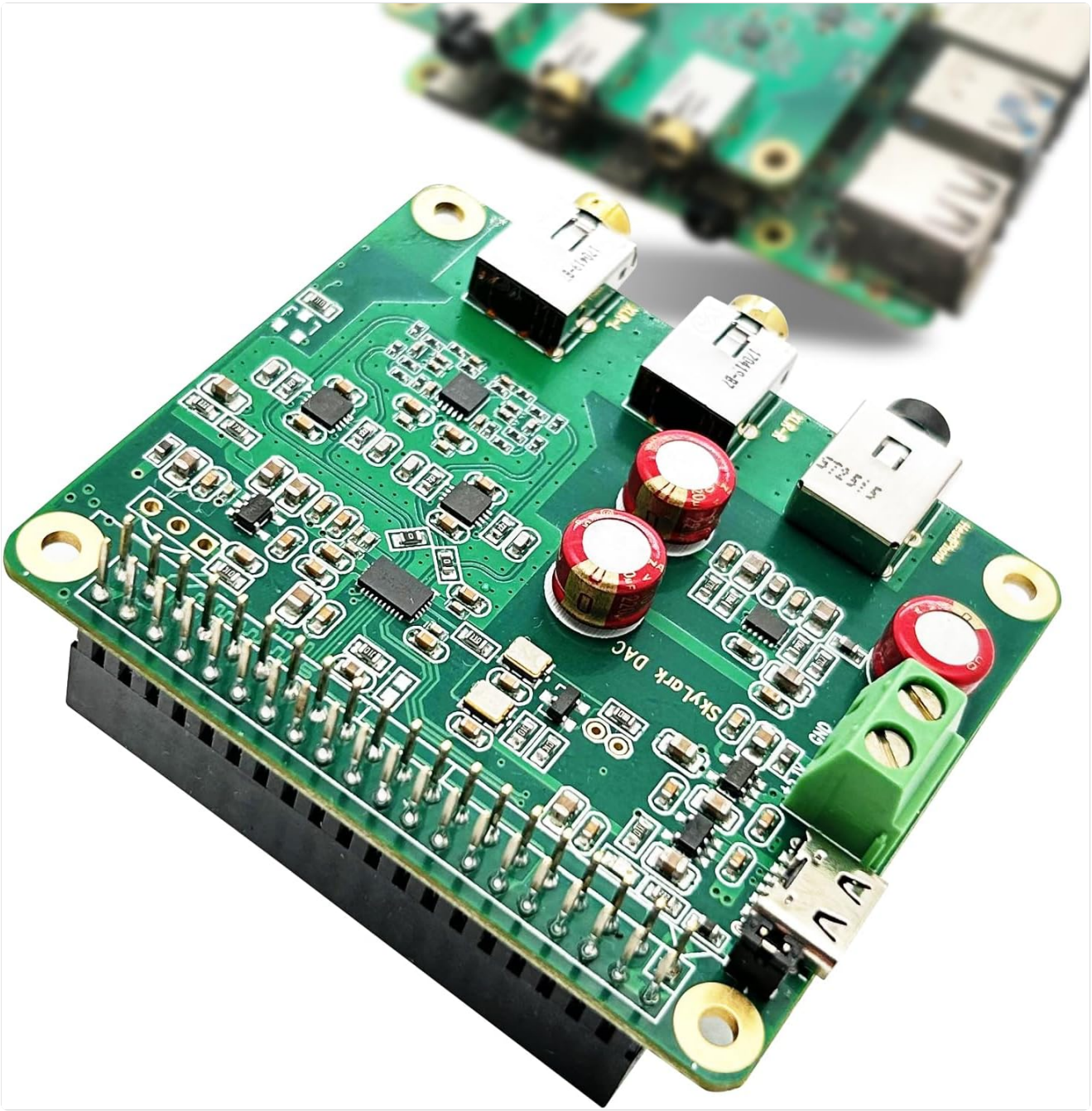


Figure 5.1: The DAC Pro Hat securely mounted onto a Raspberry Pi board.

5.2 Power Supply Configuration

The DAC Pro Hat offers flexible power options. For optimal audio performance and to minimize noise, it is recommended to power the DAC Hat separately from the Raspberry Pi.

1. **Separate Power Supply (Recommended for Best Audio Quality):**
    - Locate the jumper on the DAC Hat (refer to Figure 5.2). Remove this jumper.
    - Connect a **regulated 5V @ 1A minimum** power supply to the dedicated USB-C port or the terminal block on the DAC Hat.
    - Power the Raspberry Pi separately using its standard power input.
    - This method properly isolates the Raspberry Pi and DAC Hat, leading to improved sound quality.
2. **Shared Power Supply (Less Optimal):**
    - Keep the jumper in place.
    - Power the Raspberry Pi using its standard power input. The DAC Hat will draw power from the

Raspberry Pi's GPIO pins.
    - While functional, this method may introduce more electrical noise compared to using separate power supplies.

Remove the jumper, Power the Raspberry Pi and DAC Hat separartely.
This way can properly isolate the Raspberry Pi and DAC Hat.
The DAC Hat need only 5V/1A independent power supply.
This is the best power supply way for music quality

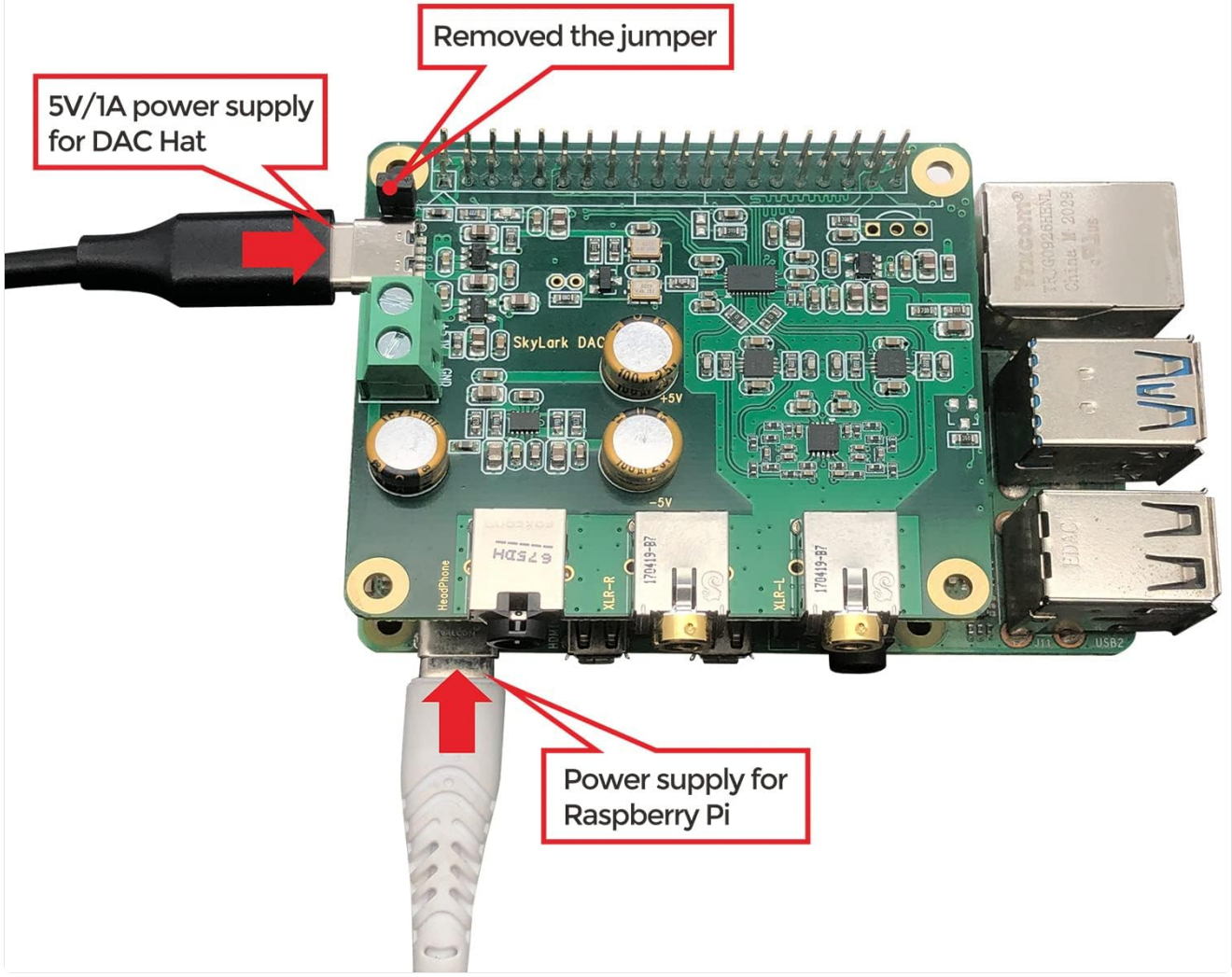


Figure 5.2: Diagram illustrating the recommended separate power supply configuration for the DAC Hat and Raspberry Pi.

5.3 Software Configuration

The Innomaker DAC Pro Hat is supported by various Raspberry Pi audio playback systems.

- **Recommended Operating Systems:** Volumio, Moode Audio, RuneAudio, PiCorePlayer, LibreELEC, OpenELEC, Raspbian, Ubuntu.
- **Installation:** Install your preferred audio operating system onto an SD card for your Raspberry Pi. Most of these systems have inherent support for DAC HATs.
- **Configuration:** Within the chosen operating system's settings, select the Innomaker DAC Pro Hat (often listed as ES9038Q2M DAC or similar) as the primary audio output device. Specific steps may vary slightly between operating systems. Refer to the documentation of your chosen OS for detailed configuration instructions.
- **Volume Adjustment:** If the sound output is initially too soft, check the mixer settings within your audio software (e.g., ALSA mixer in Linux-based systems) and ensure the output level is set appropriately, such as

0dB. Always lower your amplifier's volume before making changes to prevent sudden loud sounds.

Figure 5.3: Logos of various Raspberry Pi music playback systems supported by the DAC Pro Hat.

6. Operation

6.1 Audio Playback

Once the hardware and software are configured, you can begin playing audio through your Innomaker DAC Pro Hat.

- **Source Material:** The DAC supports playing music from local storage (e.g., USB drives, SSDs connected to Raspberry Pi) or over a network (e.g., streaming services, network-attached storage).
- **High-Resolution Audio:** Leverage the DAC's capabilities by playing high-resolution audio files, including PCM up to 384kHz/32-bit and DSD formats.
- **Output Selection:**
    - **3.5mm Headphone Jack:** For direct headphone connection.
    - **Balanced XLR Outputs (X- ,X+):** For connecting to audio equipment with balanced inputs. Note that these are 3.5mm XLR connectors, requiring specific cabling (e.g., 3.5mm stereo plug to standard XLR

connectors).

6.2 Important Considerations

- **Bluetooth Usage:** It is strongly advised **NOT** to use the internal Raspberry Pi Bluetooth for streaming music when using this DAC. If Bluetooth streaming is desired, use a separate external Bluetooth transceiver connected to the Raspberry Pi.
- **Audio Quality:** The quality of your audio experience will be influenced by the power supply configuration, the quality of your audio files, and the connected amplification/speakers.

7. Maintenance

The Innomaker DAC Pro Hat is designed for durability and requires minimal maintenance.

- **Cleaning:** Use a soft, dry cloth to gently wipe the surface of the board. Avoid using liquid cleaners or solvents.
- **Handling:** Always handle the board by its edges to avoid touching components or pins. Be mindful of static electricity, especially when installing or removing the Hat.
- **Storage:** When not in use, store the DAC Hat in an anti-static bag in a cool, dry place.
- **Firmware Updates:** Periodically check the Innomaker GitHub page or official resources for any potential firmware updates for the DAC Hat, though these are less common for DAC hardware than for software.

8. Troubleshooting

Problem	Possible Cause	Solution
No sound or very low volume.	◦ Incorrect audio output selected in software. ◦ Volume level too low in software mixer. ◦ DAC Hat not properly seated on GPIO pins. ◦ Incorrect power supply for DAC Hat.	◦ Verify the DAC (e.g., ES9038Q2M) is selected as the audio output in your Raspberry Pi's OS settings. ◦ Adjust the volume in the software mixer (e.g., ALSA mixer) to 0dB or higher. ◦ Ensure the DAC Hat is firmly connected to the Raspberry Pi's 40-pin header. ◦ If using separate power, ensure the DAC Hat has its own regulated 5V/1A power supply and the jumper is removed.

Problem	Possible Cause	Solution
Distorted or noisy audio.	◦ Power supply interference. ◦ Ground loop issues. ◦ Using internal Raspberry Pi Bluetooth.	◦ Use a separate, regulated power supply for the DAC Hat (as described in Section 5.2). ◦ Ensure all audio components are properly grounded. ◦ Avoid using the Raspberry Pi's internal Bluetooth for audio streaming. Use an external Bluetooth adapter if needed.
DAC Hat not recognized by Raspberry Pi.	◦ Improper installation. ◦ Software driver issues.	◦ Power off the Raspberry Pi, remove the DAC Hat, and re-seat it carefully. ◦ Ensure your chosen audio operating system is up-to-date and supports the ES9038Q2M DAC. Consult the OS documentation for specific driver installation steps if necessary.
DSD files not playing or playing incorrectly.	◦ Software limitation or configuration.	◦ Some audio playback systems (e.g., Moodeaudio) may require specific configurations or may not fully support DSD playback beyond certain resolutions. Volumio is often reported to work well with DSD files. Consider trying a different audio OS if issues persist.

9. Specifications

Feature	Detail
Product Dimensions	2.56 x 2.36 x 0.98 inches
Item Weight	2.46 ounces
Manufacturer	innomaker
Item Model Number	DAC Pro HAT
Country of Origin	China
Compatible Devices	Personal Computer (Raspberry Pi boards)
Hardware Interface	40-pin GPIO, USB 2.0 (for power input)
Audio Output Mode	Stereo (3.5mm headphone, Balanced XLR)
DAC Chip	ES9038Q2M
Sample Rates (PCM)	Up to 384-KHz/32-Bit
DSD Support	Lossless High Resolution DSD

Feature	Detail
Operational Amplifiers	3 x Texas Instruments SoundPlus HiFi audio operational amplifiers (e.g., TI OPA1612, TI OPA1622)
Output Voltage	2.1vrms
Power Input	5V/1A (dedicated for DAC Hat, via USB-C or terminal block)

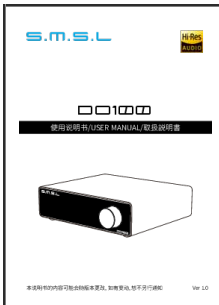
10. Support and Resources

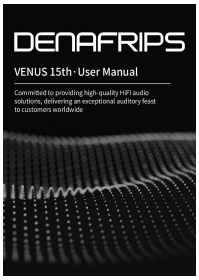
For further assistance, software downloads, and detailed documentation, please refer to the official Innomaker resources.

- **Official GitHub:** Access software, drivers, and additional technical documentation. The link is typically provided with the product packaging or can be found on the Innomaker official website.
- **Technical Support:** For specific technical inquiries, contact Innomaker customer support through their official channels.

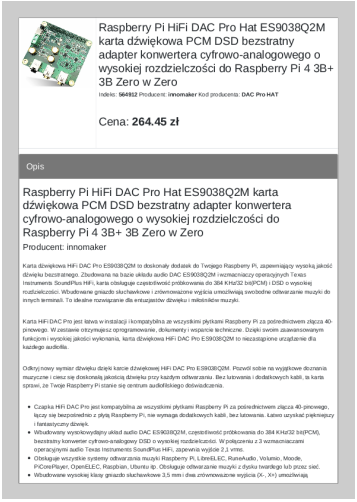
Note: Information regarding specific warranty terms is not provided in the product details. Please refer to your purchase documentation or contact the seller for warranty information.

Related Documents - DAC Pro HAT

	SMSL DO100 High-Resolution USB DAC User Manual User manual for the SMSL DO100, a high-resolution USB DAC, detailing its features, specifications, operation, and warranty information.
	Amulech AL-38432DR High-Resolution Audio DAC & Headphone Amplifier User Manual Comprehensive user manual for the Amulech AL-38432DR, detailing features, setup, installation, operation, and specifications for this high-resolution audio DAC and headphone amplifier. Learn how to connect and use your device for optimal audio performance.

	[KORG DS-DAC-10R Owner's Manual: USB DAC/ADC for High-Resolution Audio] Comprehensive owner's manual for the KORG DS-DAC-10R, a 1-bit USB DAC/ADC supporting DSD native playback and recording on Windows and macOS. Includes setup, operation, troubleshooting, and specifications.
	[Lampizator Poseidon DAC User Manual] A comprehensive user manual for the Lampizator Poseidon DAC, detailing its design, features, operation, tube compatibility, digital inputs, and optimal listening setup.
	[RME ADI-2 DAC FS User's Guide: High-Resolution Audio Converter and Headphone Amplifier] Discover the RME ADI-2 DAC FS, a premium 2-channel digital-to-analog converter and headphone amplifier. This guide details its advanced features, operation, and technical specifications for professional and audiophile use.
	[DENAFRIPS VENUS 15th User Manual: HiFi DAC Setup and Operation] Comprehensive user manual for the DENAFRIPS VENUS 15th HiFi DAC. Learn about setup, configuration, technical specifications, driver installation, and troubleshooting for this advanced digital audio decoding solution.

Documents - innomaker – DAC Pro HAT



Raspberry Pi HiFi DAC Pro Hat ES9038Q2M karta dźwiękowa PCM DSD bezstratny adapter konwertera cyfrowo-analogowego o wysokiej rozdzielczości do Raspberry Pi 4 3B+ 3B Zero w Zero

Indeks: **564912** Producent: **innomaker** Kod producenta: **DAC Pro HAT**

Cena: **264.45 zł**

Opis

Raspberry Pi HiFi DAC Pro Hat ES9038Q2M karta dźwiękowa PCM DSD bezstratny adapter konwertera cyfrowo-analogowego o wysokiej rozdzielczości do Raspberry Pi 4 3B+ 3B Zero w Zero

Producent: innomaker

Karta dźwiękowa HiFi DAC Pro ES9038Q2M to doskonały dodatek do Twojego Raspberry Pi, zapewniający wysoką jakość dźwięku bezstratnego. Zbudowana na bazie układu audio DAC ES9038Q2M i wzmacniaczy operacyjnych Texas Instruments SoundPlus HiFi, karta obsługuje częstotliwość próbkowania do 384 KHz/32 bit(PCM) i DSD o wysokiej rozdzielczości. Wbudowane gniazdo słuchawkowe i zrównoważone wyjścia umożliwiają swobodne odtwarzanie muzyki do innych terminali. To idealne rozwiązanie dla entuzjastów dźwięku i miłośników muzyki.

Karta HiFi DAC Pro jest łatwa w instalacji i kompatybilna ze wszystkimi płytkami Raspberry Pi za pośrednictwem złącza 40-pinowego. W zestawie otrzymujesz oprogramowanie, dokumenty i wsparcie techniczne. Dzięki swoim zaawansowanym funkcjom i wysokiej jakości wykonania, karta dźwiękowa HiFi DAC Pro ES9038Q2M to niezastąpione urządzenie dla każdego audiofila.

Odkryj nowy wymiar dźwięku dzięki karcie dźwiękowej HiFi DAC Pro ES9038Q2M. Pozwoli sobie na wyjątkowe doznania muzyczne i ciesz się doskonałą jakością dźwięku przy każdym odtwarzaniu. Bez lutowania i dodatkowych kabli, ta karta sprawi, że Twoje Raspberry Pi stanie się centrum audiofilskiego doświadczenia.

- Czapka HiFi DAC Pro jest kompatybilna ze wszystkimi płytkami Raspberry Pi za pośrednictwem złącza 40-pinowego, łączy się bezpośrednio z płytą Raspberry Pi, nie wymaga dodatkowych kabli, bez lutowania. Łatwo uzyskać piękniejszy i fantastyczny dźwięk.
- Wbudowany wysokiewydajny układ audio DAC ES9038Q2M, częstotliwość próbkowania do 384 KHz/32 bit(PCM), bezstratny konwerter cyfrowo-analogowy DSD o wysokiej rozdzielczości. W połączeniu z 3 wzmacniaczami operacyjnymi audio Texas Instruments SoundPlus HiFi, zapewnia wyjście 2.1 vrms.
- Obsługuje wszystkie systemy odtwarzania muzyki Raspberry Pi, LibreELEC, RuneAudio, Volumio, Moode, PiCorePlayer, OpenELEC, Raspbian, Ubuntu itp. Obsługuje odtwarzanie muzyki z dysku twardego lub przez sieć.
- Wbudowane wysokiej klasy gniazdo słuchawkowe 3,5 mm i dwa zrównoważone wyjścia (X-, X+) umożliwiają

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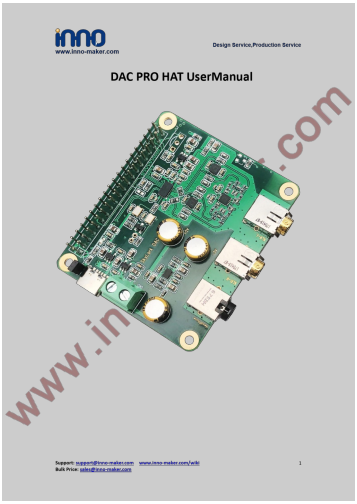

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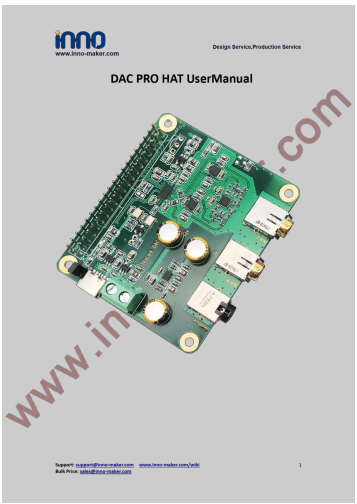

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admin DAC PRO HAT UserManual Raspberry Pi 30 sept 2022 — 4 VOLUMIO Setup 8 Raspbian Lite SetUp attention to align the first leg of raspberry pi and HIFI module 3 1 Overview 29 pages Pro User ManualV1 0 inno maker 09 DACPROHATUserManual DA InnoMaker General The Innomaker is based on world s highest performance audio chip ES9038Q2M handles up 32 bit 384kHz PCM DSD256 DSD512 data in master or slave timing modes It use critically acclaimed ESS patented HyperStream II architecture Time Domain Jitter Eliminator delivers a DNR 129dB THD N 120db PLUGIN Touch Display Page 67 Plugins Volumio Community |||

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