High-quality audio recording in Windows with Audiohub Nano

Selecting the right Windows audio driver for optimal recording quality

About this document

Scope and purpose

This document aims to assist users select the right Windows audio driver for recording high-quality audio. It clarifies the differences between various drivers available in Windows and explains the importance of bit depth and sample frequency in audio recording. It also provides recommendations based on specific needs and constraints.

Intended audience

The document is intended for design engineers, technicians, and developers of electronic audio systems as well as anyone involved in audio recording and processing using Windows-based applications.

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1 Digital conversion requirements for high dynamic range microphones

Using high dynamic range microphones requires a good understanding of digital conversion principles in order to record high-quality audio. The two foundational elements are:

- **Bit depth:** Determines the precision and dynamic range of the audio, capturing subtle nuances and variations in sound intensity. Higher bit depths, such as 24-bit, enable a greater range of audio dynamics, essential for accurately reproducing the full range of high SNR microphones. With 24-bit audio, the recorded sound has more detail, and less quantization noise compared to 16-bit audio
- **Sample frequency:** Refers to the number of samples taken per second. Higher sample frequencies, like 48 or 96 kHz, ensure a more detailed and faithful representation of the original audio signal, minimizing artifacts and preserving the integrity of the recorded sound

For further information, refer to this KBA.

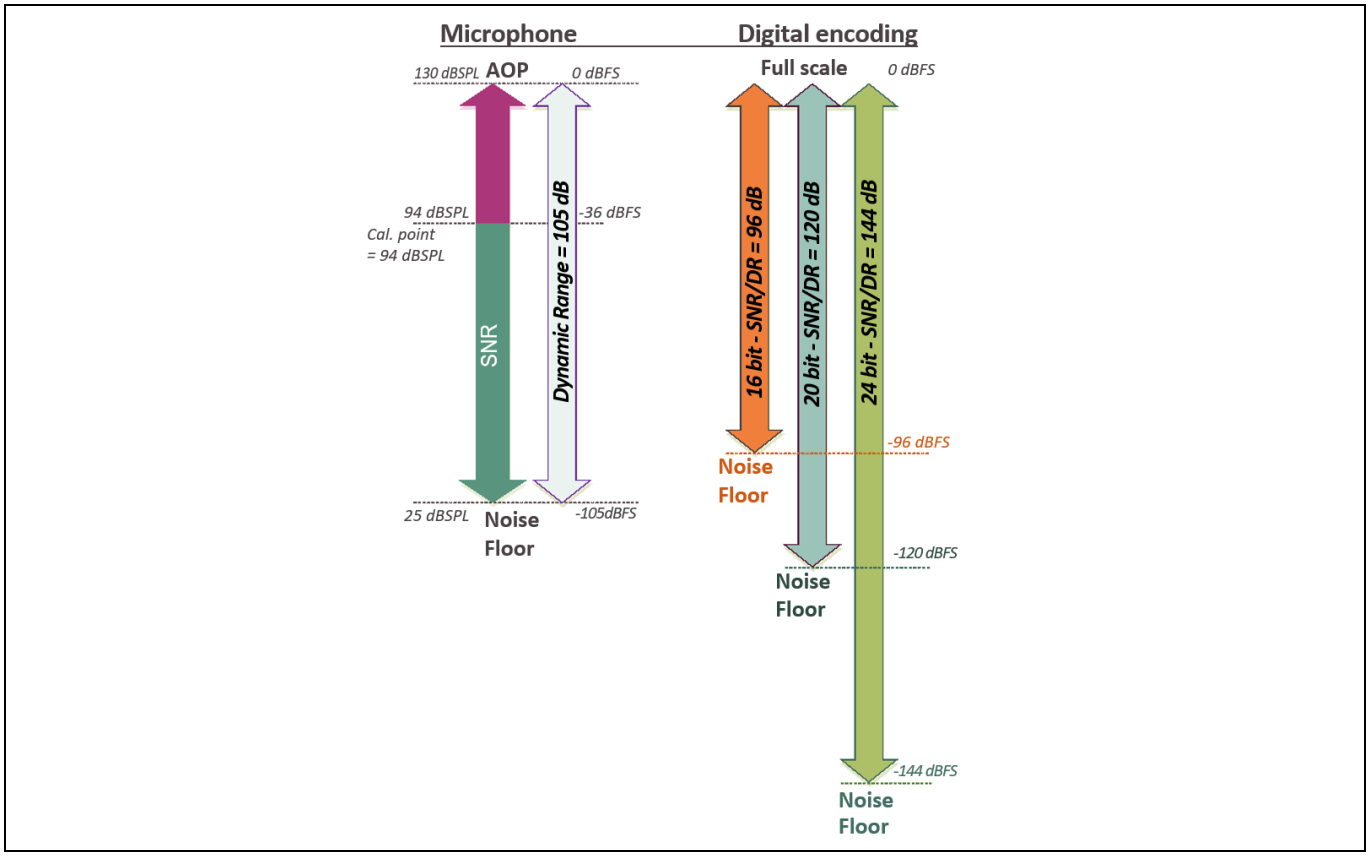

Figure 1 Microphone's dynamic range for 16-bit, 20-bit, and 24-bit digital encoding

16-bit encoding clearly does not have sufficient dynamic range for this microphone. The system performance is limited by the audio encoding scheme. In this case. A 20-bit or 24-bit audio signal chain should be used to allow full microphone performance.

2 Infineon hardware for audio evaluation

To evaluate Infineon's XENSIV™ MEMS microphone offerings, Infineon offers Audiohub Nano evaluation boards:

- For digital microphones: EVAL AHNB DIGITALV01
- For analog microphones: EVAL AHNB ANALOGV01

Figure 2 EVAL AHNB DIGITALV01

Audiohub Nano features

- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Mode switch for toggling between normal mode and low power mode with 4 predefined gain configurations
- LED indication for configured gain level in normal and low power modes
- Volume unit meter display with onboard LEDs
- Powered through Micro-USB

3 Windows audio driver

3.1 Understanding Windows audio drivers

The quality of an audio recording on a Windows system depends on the audio driver. Windows offers several built-in drivers, each with its own capabilities and limitations. Understanding these options helps you select the best driver for your use case, ensuring optimal audio fidelity and performance.

Basic audio recording and playback is mostly sufficient for gaming and general multimedia applications. However, evaluating the higher dynamic range of microphones requires high-quality audio recording and playback which provide low latency and high fidelity, making them suitable for professional audio applications.

For more information, see:

- ASIO Audio Interface
- USB Audio 2.0 drivers
- Low Latency Audio
- Steinberg built-in ASIO Driver: information & download
- ASIO4ALL Official Home

Note: Please note that ASIO is a third-party driver, and its use may require additional installation and license conditions.

3.2 Audio driver selection recommendations

While using Infineon high-performance XENSIV™ MEMS microphones, it is highly recommended to use drivers such as **WASAPI** or **ASIO** as both these options support **24-bit audio**, high sample frequencies, and low latency to provide the best recording fidelity and dynamic range – essential for professional use.

Figure 3 shows the audio quality difference between WASAPI (left) and DirectSound (right) while recording a very low dB microphone signal at the same level. This difference stems from their varying bit width resolutions.

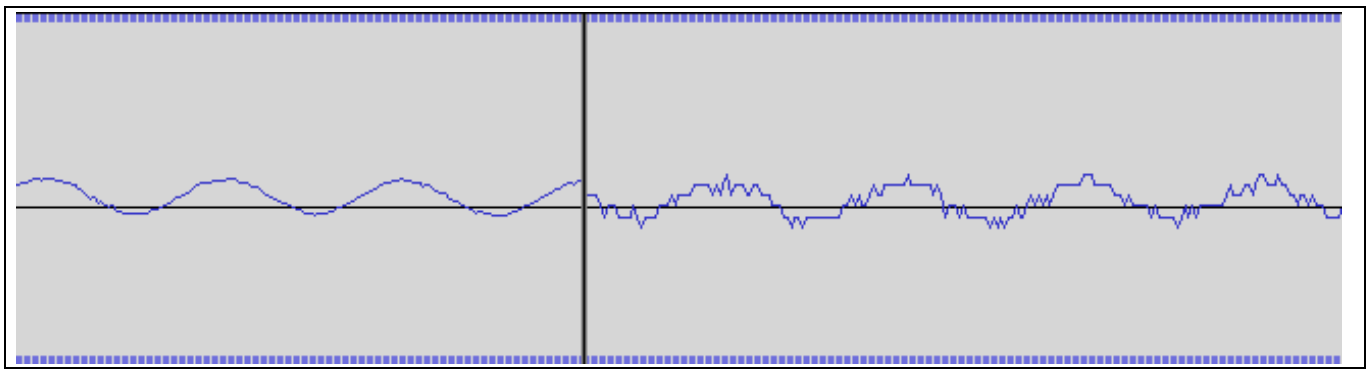

Figure 3 Audio quality difference: WASAPI vs. DirectSound

4 Software

4.1 Audacity

You can use Audacity for audio recording, including audible input monitoring and playback by interfacing with audio devices via WASAPI. See the Audacity webpage for more information.

Follow these steps to set up Audacity with the appropriate settings:

1. Go to **View** > **Toolbars** and enable **Device Toolbar** to easily select input and output devices, and the driver

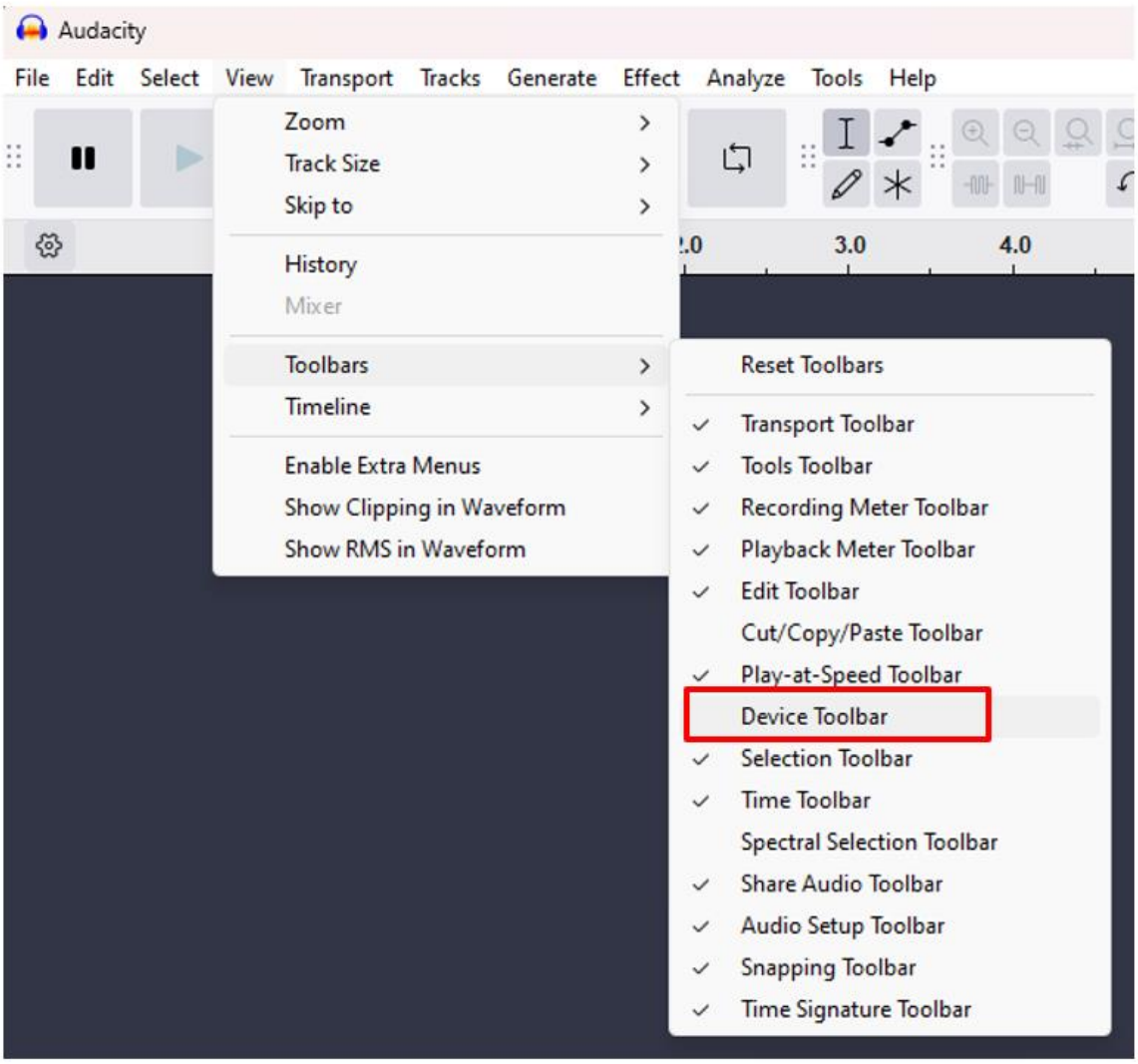

Figure 4 Enable Device Toolbar

2. Within **Device Toolbar**, select the **Windows WASAPI** driver and Audiohub Nano (**2- IFX-AUDIOHUB2D**) microphone device

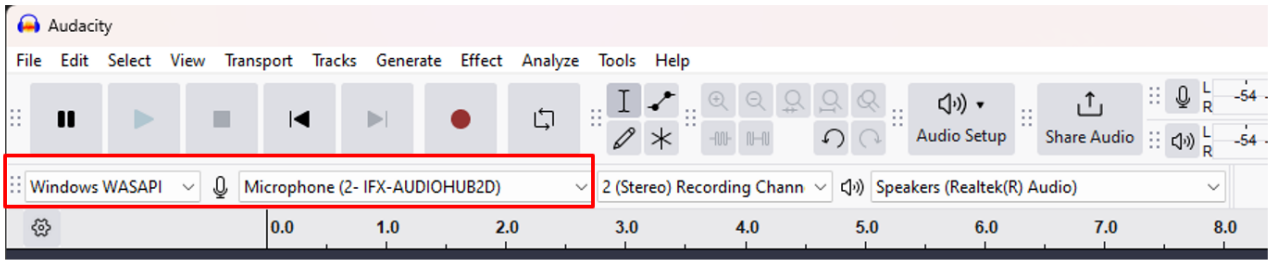

Figure 5 Selecting the microphone and driver withing Device Toolbar

3. Go to **Edit** > **Preferences** to select the recommended Audacity audio settings

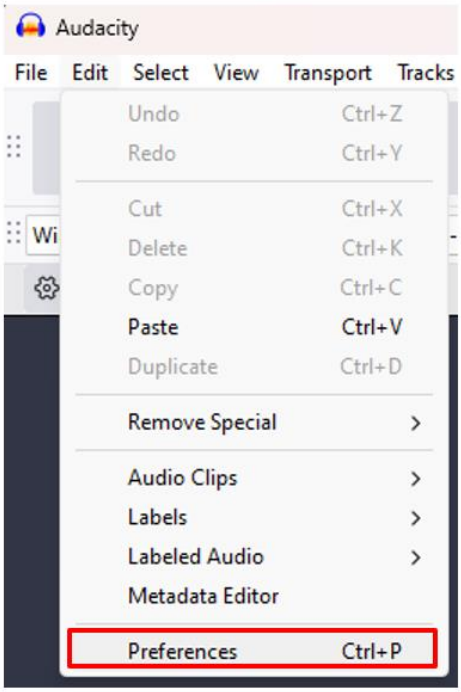

Figure 6 Selecting preferences

4. In **Preferences: Audio Settings**, select the following options under **Quality**:
   - **Project Sample Rate:** 48000 Hz
   - **Default Sample Rate:** 48000 Hz
   - **Default Sample Format:** 24-bit

   As the Audiohub Nano has only one set of audio settings, ensure selecting the proper **Quality** options. Otherwise WASAPI adopts and calculates (leading to latency) and reshapes the original signal

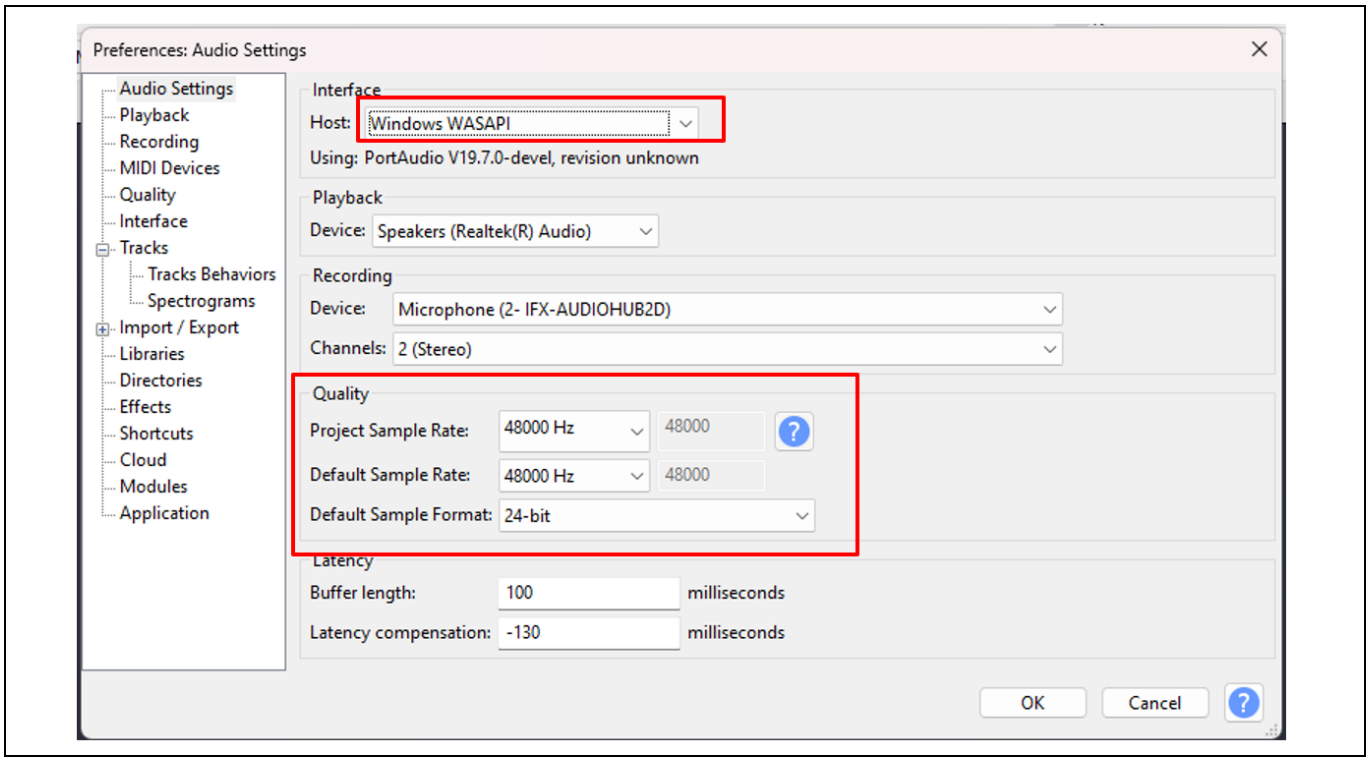

Figure 7 Selecting audio settings

5. (Optional) Activate **Audible input monitoring** to enable live audio output during recording

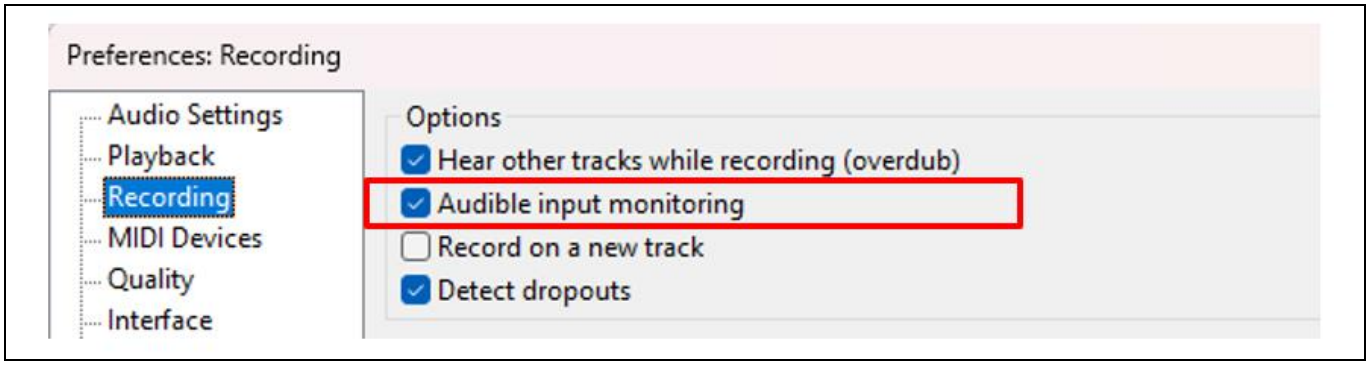

Figure 8 Activate Audible input monitoring

6. (Optional) Enable **Multi-view** to show waveform and spectrum in parallel, as shown in Figure 9

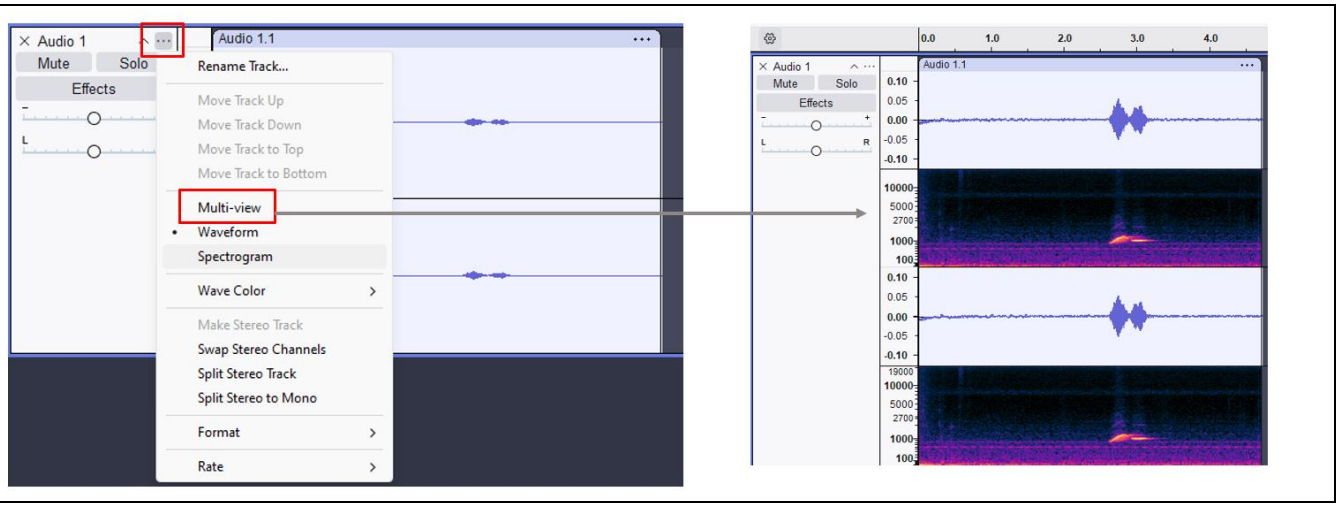

Figure 9 Enabling Multi-view

7. If you want to export recorded audio data, set the correct parameters. Export data by selecting **File** > **Export Audio**, and select the following:
   - **File Name and Folder:** Select the file destination
   - **Format:** WAV (Microsoft)
   - **Channels:** Mono for a single connected microphone and Stereo for two connected microphones
   - **Sample Rate:** 48000 Hz
   - **Bit Depth:** 24-bit

4.2 Python

To interact with audio devices directly, it is recommended to use the sounddevice python library. Follow external instructions and documentations: Play and Record Sound with Python and sounddevice 0.5.1.

4.3 ASIO4ALL

Follow external instructions to use ASIO via ASIO4ALL, which enables the lowest latency and raw microphone data without any dithering or data manipulation. You may also use ASIO4ALL via Python or Audacity. However, ensure to check your license conditions. For more details, check ASIO4ALL OFFICIAL HOME.

5 Additional information

For further details and resources, see ASIO Audio Interface.

You can also operate Audiohub Nano in Linux. Make sure to select the correct driver and data formats. Due to the variety of distributions and driver, this topic is not covered in this document.

References

[1] Microsoft: *Windows Audio Architecture*; Available online

[2] Microsoft: *DirectSound*; Available online

[3] Infineon Technologies AG: *UG095149: Audiohub Nano Digital user guide;* Available online

[4] Infineon Technologies AG: *UG093400: Audiohub Nano Analog user guide;* Available online

Revision history

Document revision	Date	Description of changes
1.00	2025-05-30	Initial release

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