UM11208 TFA8200 GUI

TFA8200 Graphical User Interface
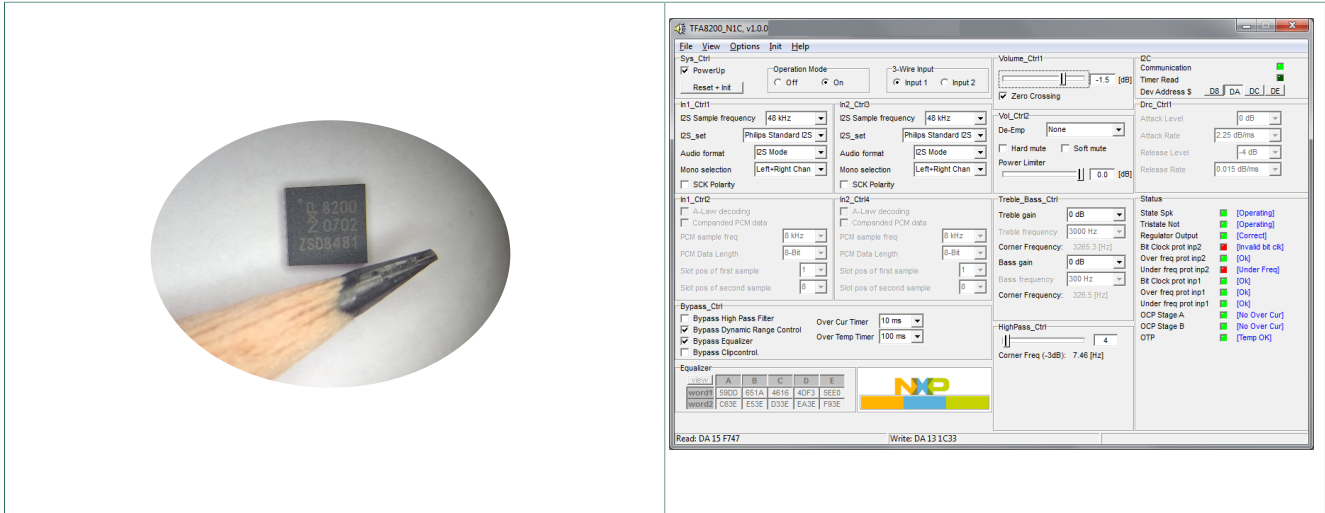
Rev. 1.0 — 12 August 2019　　　　　　　　　　　　　　　　**User manual**

Document information

Information	Content
Keywords	Class-D amplifier, Digital input, High efficiency, Filter free, IoT
Abstract	This User Manual describes the TFA8200 digital input mono Class-D Graphical User Interface (GUI). The TFA8200 device is intended for portable and IoT applications that support a digital output, which is less sensitive to external RF fields. The low power consumption will increase the battery life and an excellent audio performance with high PSRR is achieved by the integrated feedback loop. Furthermore the device is very robust due to the integrated protections like OCP, OTP and several input protections. The application PCB area for the TFA8200 is very small because only three external components are required.

Revision history

Rev	Date	Description
1	20190812	Release

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1   Introduction

This User Manual describes the TFA8200 Graphical User Interface (GUI) for NXP Semiconductors' TFA8200HN device. Extension "HN" is referring to the HVQFN24 package dedicated for reflow soldering.

The TFA8200 GUI in such a way that it is easy to operate the TFA8200 device for demonstration purposes and for validation. The GUI is intended to use in combination with the IoT Demonstration Board (see Figure 1):

Figure 1. : Demonstration PCB

The necessary information is given for a quick installation of the GUI (see chapter 2). Easy audio playback and hardware setup is described in chapter 3. Chapter 4 describes the advanced settings and in chapter 5 the usage of the 5 bands equalizer is explained.

The TFA8200 device has the following functions / features:

General

- Wide supply voltage range 2.5V…5.5V
- Two digital inputs (I2S and PCM/IOM2 formats, 1.8V and 3.3V tolerant) which are less sensitive to external RF fields
- Internal Phase-Locked Loop (PLL) requiring no system clock
- High efficiency of 92% and low power consumption
- Closed loop amplifier resulting in excellent audio performance:
- PSRR = -76 dB
- S/N = -95dB (A-weighted)
- THD+N = 0.015% at $100mW_{RMS}$
- High power capability:
- 2.7 W_{RMS} in 4Ω BTL at 5V
- 1.6 W_{RMS} in 8Ω BTL at 5V
- Protections including diagnostic via I2C

- I2S and PCM/IOM2 input protections
- Under Frequency Protection (UFP)
- Over Frequency Protection (OFP)
- Invalid Bit clock Protection (IBP)
- Over Current Protection (OCP)
- Over Temperature Protection (OTP)
- HVQFN24 package

DSP

- Volume control (-70dB to +24dB)
- 5-band parametric equalizer
- Dynamic Range Compression
- Bass-treble control (-18dB to +18dB)
- High-pass filter
- Power limiter (0dB to –124dB)
- Zero crossing detect

2   Software setup (GUI)

The TFA8200 is controlled via I2C. The Graphic User Interface (GUI) software communicates via USB with the demo board. It is designed such that it is easy to control the I2C registers in the TFA8200 in real time.

2.1   Installing software

Follow below steps for a proper installation of the GUI

Run the installation file (TFA8200_Installer.exe) on a Windows 7 operating system (or higher).
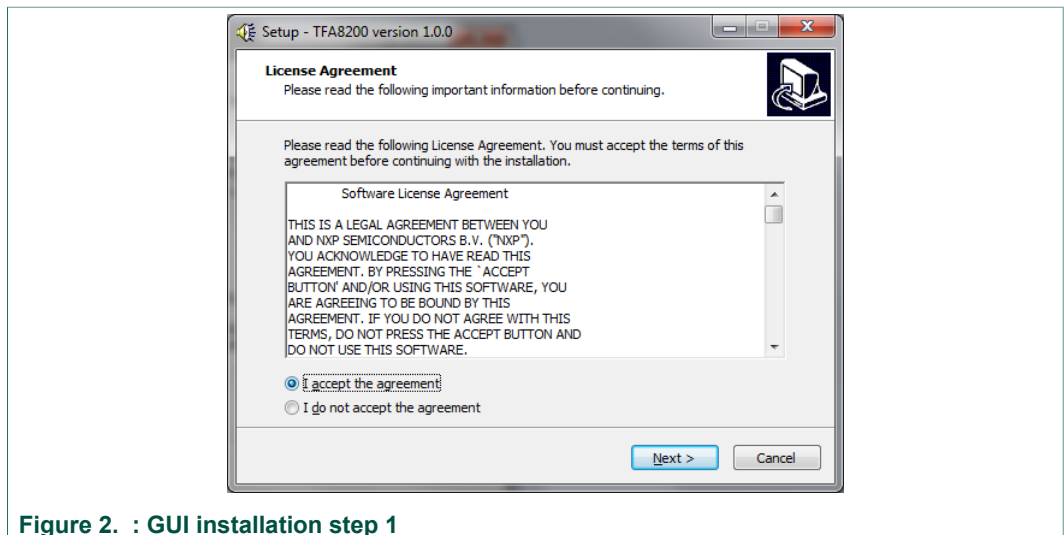

Figure 2. : GUI installation step 1

Select *I accept the agreement* and press *Next*.

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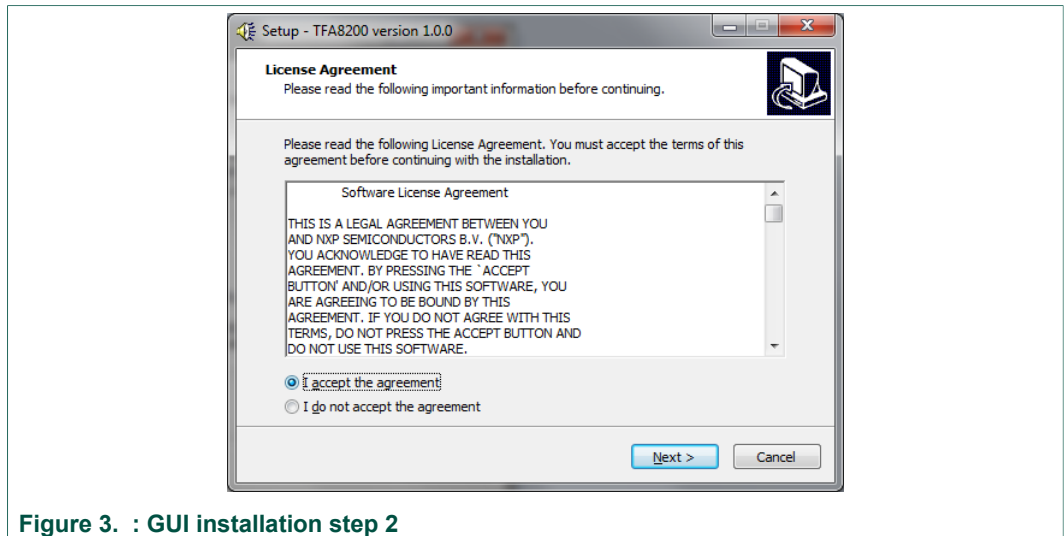
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Figure 3. : GUI installation step 2

The installer is checking if the Visual C++ Redistributable Packages which are needed to run this GUI are already installed on the computer. If not you need to install them first. If yes, then press Next to proceed to the next step.
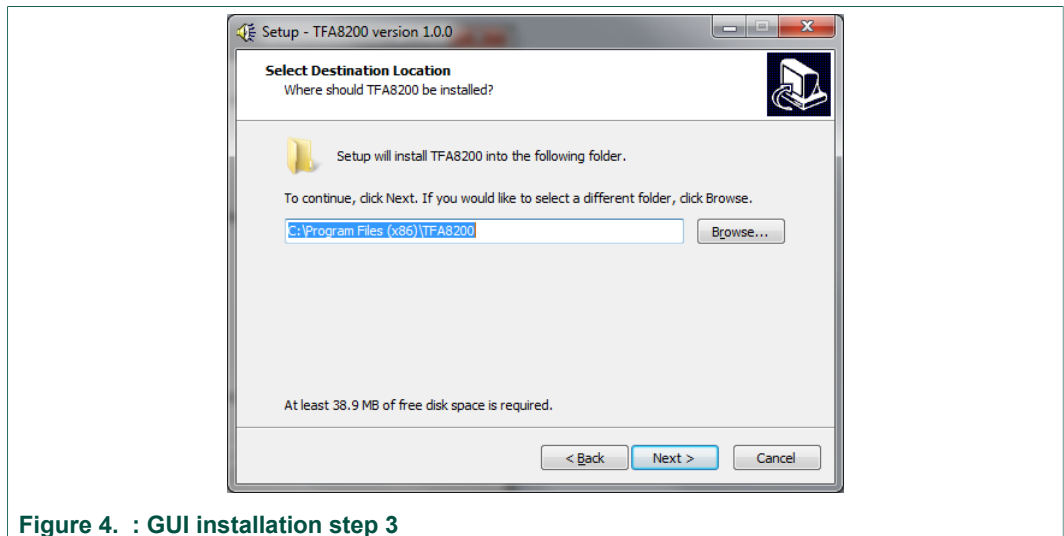

Figure 4. : GUI installation step 3

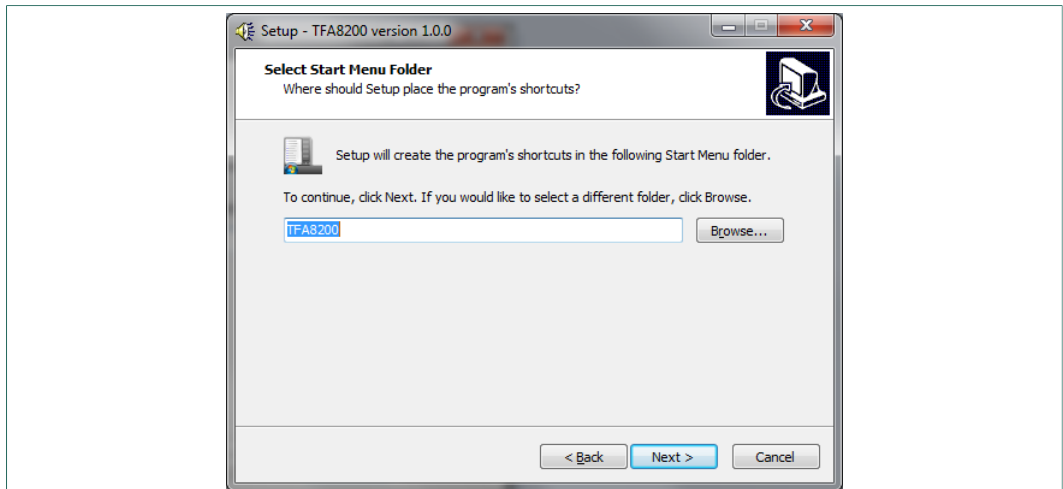Edit the suggested destination folder when prefered. Press Next to continue.

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Figure 5. : GUI installation step 4

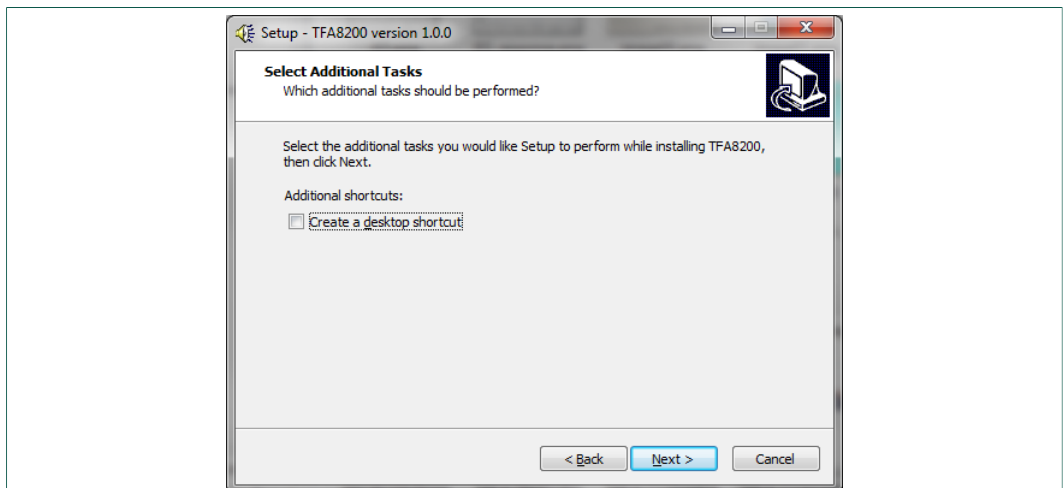Select the Start Menu folder and press Next to proceed to the next step.

Figure 6. : GUI installation step 5

Check the checkbox if you want to create a desktop shortcut. When you are ready then press Next to continue.
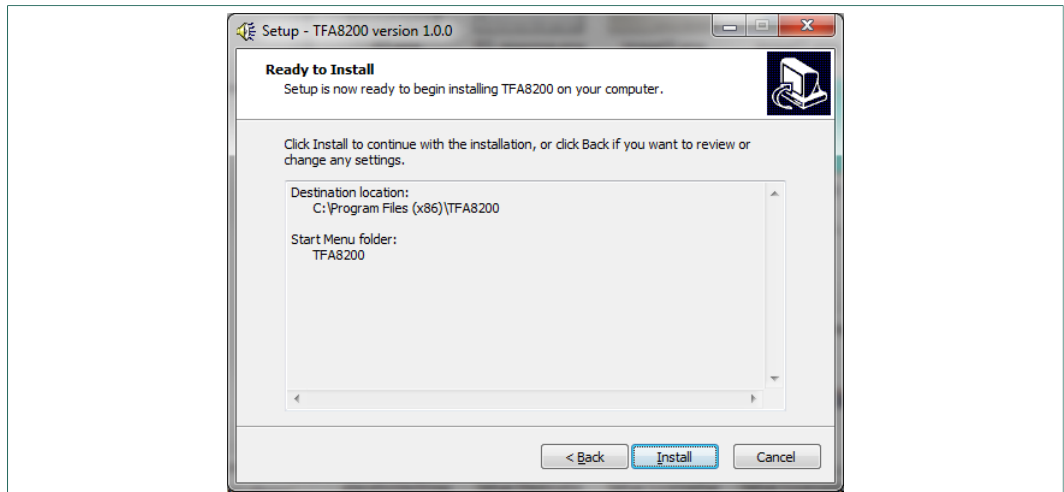
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Figure 7. : GUI installation step 6

Setup is now ready to install. Press Install to start installation.
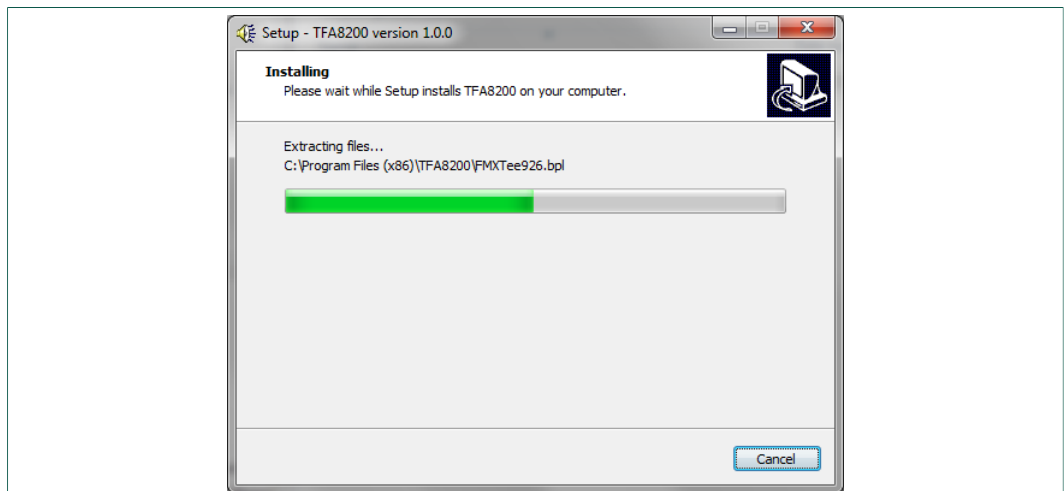
Figure 8. : GUI installation step 7

The installation is in progress now...

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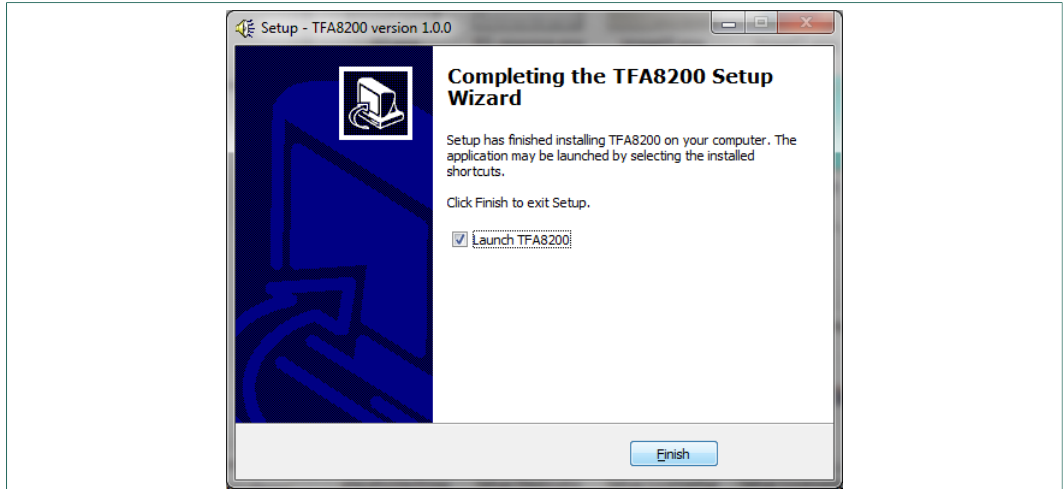**Rev. 1.0 — 12 August 2019**

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Figure 9. : GUI installation step 8

Installation finished. Press *Finish* to launch the GUI.

3 Steps to play audio

Follow below six steps to play audio.

First make sure you place the daugther board containing the TFA8200 and connect the Demonstration Board with the USB-C cable to the computer. The board can be powered completely with the USB-C cable when the USB port from the computer can deliver enough power. Alternatively the Demonstration Board may be powered with a 5Vdc power supply. For example the Mean Well GST60A05-P1J which is general available on the market.

1) Open the GUI by selecting it from the Windows Start Menu

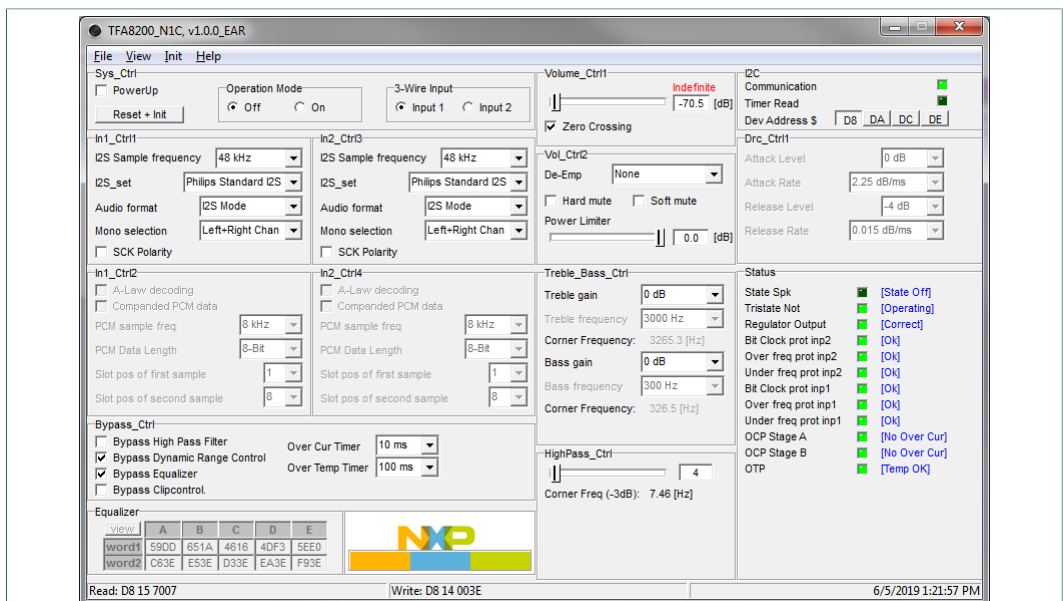2) The window shown looks like this:

Figure 10. : GUI basic view

3) Now first verify if the GUI has comunication with the TFA8200:

- check the box in the upper right corner
- the box 'Communication' should be green (if it's red there is no communication)
- the box 'Timer Read' now binks
- When there is no communication try to change the I^{2}C device address by pressing the buttons one by one.
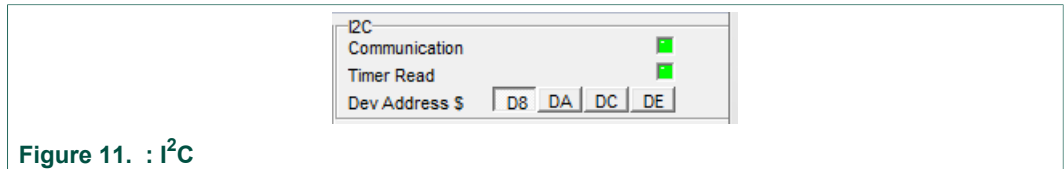

Figure 11. : I^{2}C

4) Drag the volume slider to 0.0 dB or type the prefered value in the text box:
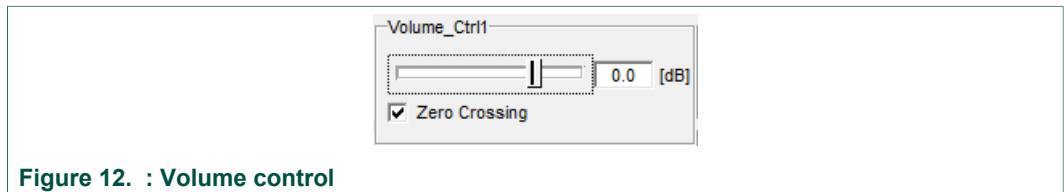

Figure 12. : Volume control

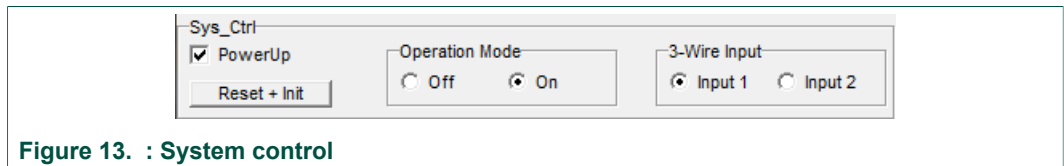5) Select 3-Wire Input *Input 1*, Operation Mode *On* and check PowerUp

Figure 13. : System control

6) Select in Windows the audio device called: "NXP IoT Demo" and play your favorit song.

4   Advanced settings

The TFA8200 Graphical User Interface is desiged as an easy to use tool that lets the user configure the TFA8200's I^{2}C registers by smart drop-down boxes, check boxes or sliders.

4.1 Digital input selection

The TFA8200 supports multiple types of digital audio formats and has two independent digital audio inputs. All of them can be configured via *In<x>_Ctrl<y>*

Mind that the USB audio interface on the IoT Demonstation Board is connected to 3-Wire Input 1 and supports I^{2}S Philips Standard only. The sample rate set in the GUI must correspond with the settings of the sound card settings in Windows.

If other audio formats are required a compatible audio source has to be connected to J32 of the IoT Demonstration Board and the input selector set corresponding this.
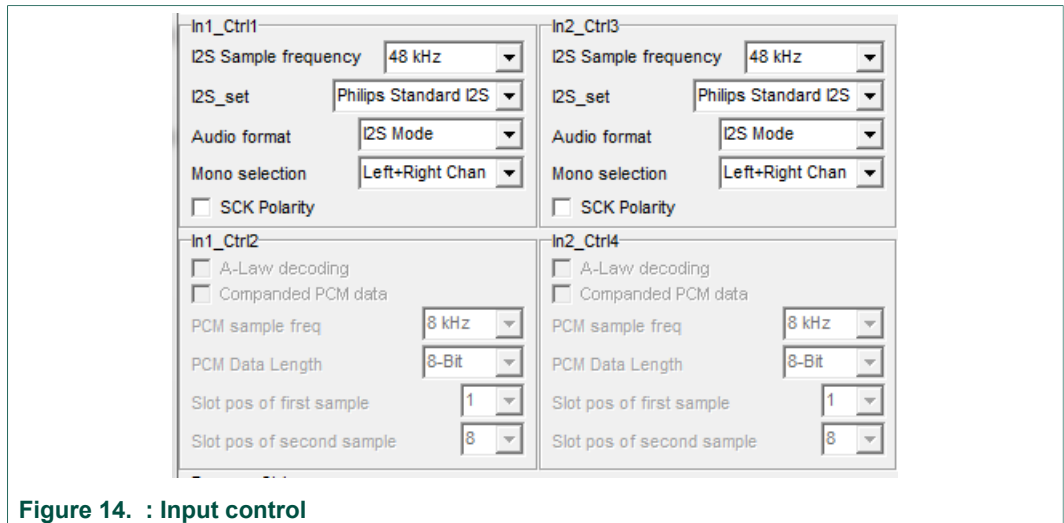
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Figure 14. : Input control

Below digital formats are supported by the TFA8200 device:

I2S formats (fs = 8kHz to 96kHz)

- Philips standard I2S
- Japanese I2S MSB-justified
- Sony I2S LSB-justified

PCM/IOM2 formats (fs = 8kHz)

- Long frame sync
- Short frame sync

4.2 Volume control

Volume control can be done in two ways. Via *Volume_Ctrl1* the input signal gain may be set from -71 to +24 [dB]. Checking the *Zero Crossing* box ensures gain changes are only applied at zero crossing and as such prevent pop noise.
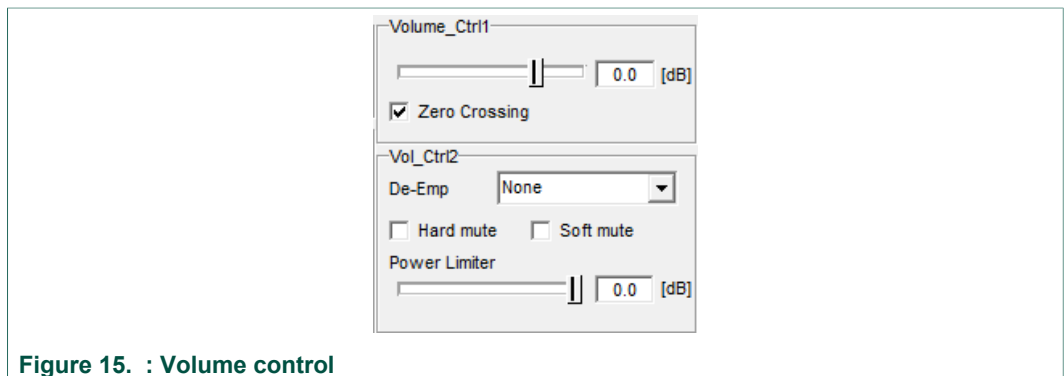

Figure 15. : Volume control

Volume_Ctrl2 allows the user to set de-emphasis, hard- and soft-mute.

The power limiter controls the maximum output voltage in amplifier mode. This feature makes it possible to limit the output voltage across a peripheral (speaker) when necessary.

The TFA8200 output voltage depends on:

• The analog supply voltage on pin VDDP

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• The gain of the power limiter (G)

• The power limiter input signal (Xi)

The bass/treble output signal is connected to the power limiter input and is relative to the fraction of full scale (FFS), from −1 to +1.

4.3 Sound taste control

To control the sound taste there are several options available. Simple treble and bass enhancement and a more sophisticated 5-bands parametric equalizer.

4.3.1 Treble, base and high pass filter control

The TFA8200 contains first-order shelving filters for bass and treble control. The device can attenuate or boost the bass and high frequency signals independently in 2 dB steps within a −18 dB to +18 dB range. Attenuation and boosting depend on the audio signal zero crossing settings. The bass and treble corner frequencies are adjustable.
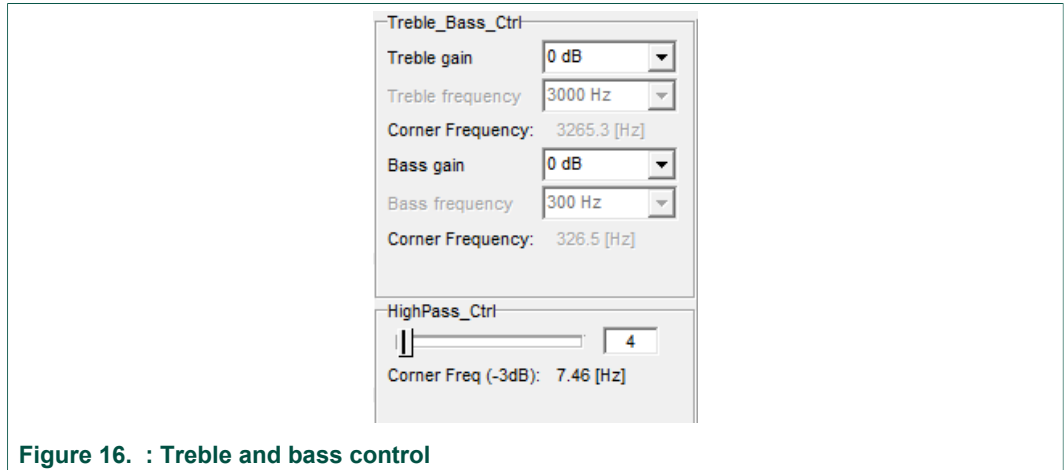
Figure 16. : Treble and bass control

4.3.2 Equalizer

The TFA8200 provides a DRC to adjust power levels automatically according to programmable attack and release levels. The attack level is related to the peak value of the signal. The release level is related to the RMS value of the signal. The attack level is programmable using 16 available levels in the range −12 dB to +10 dB. The release level is programmable using 16 available levels in the range −29 dB to 0 dB relative to the attack level. The signal level is measured after equalizer, bass, and treble processing, but before it reaches the power limiter.
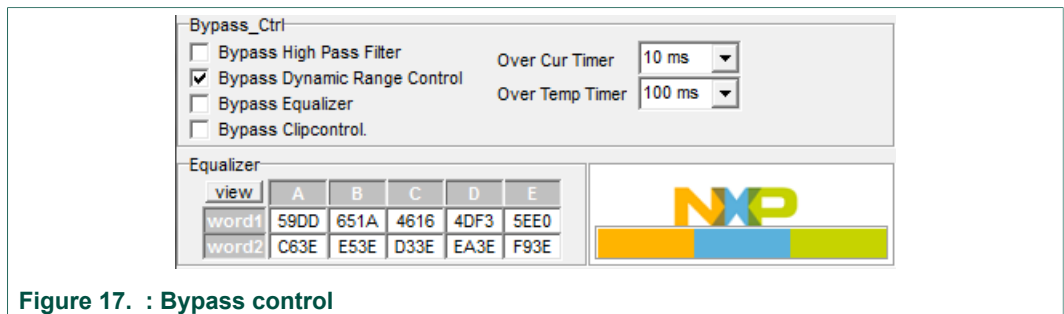
Figure 17. : Bypass control

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The 5-band parametric equalizer can be used to equalize the mono audio stream. It can be used for speaker transfer curve compensation to optimize the audio performance of the speakers.

Unchecking the *Bypass Equalizer* box enables the 5-band parametric equalizer and allows us to press the *view* button in the Equalizer section of the GUI to open the EQ view.
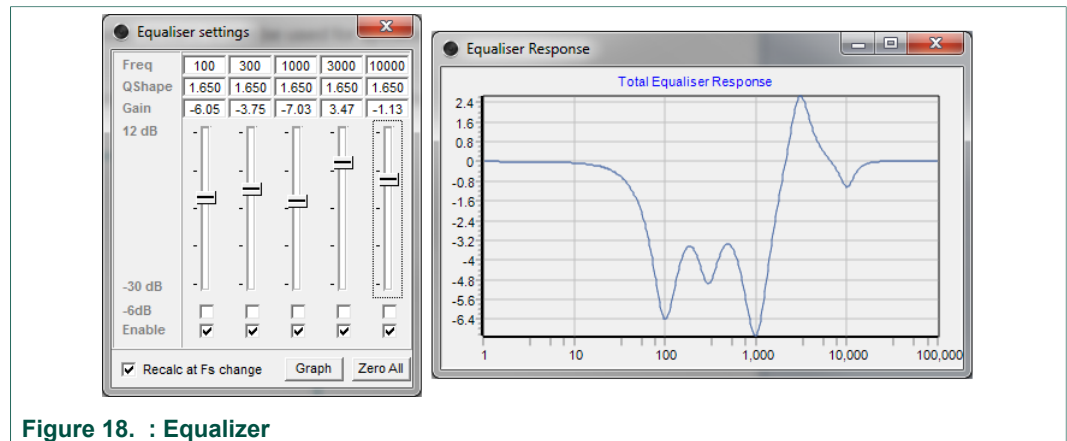

Figure 18. : Equalizer

Now the sliders may be used to do your equalization. All changes are instantanious applied to the TFA8200 which makes tuning easy.

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