UM11150

NxH3670 SDK board

Rev. 1 — 20 March 2019 User manual

Document information

Information	Content
Keywords	NxH3670, SDK board configuration
Abstract	This user manual describes the different user configurations of the NxH3670 SDK board.

Revision history

Revision history

Rev	Date	Description
v.1	20190320	first issue

1 Introduction

The NxH3670 SDK board is intended to be used for:

- Demos
- Software development
- Measurements (power consumption and RF)
- Prototyping

Do not use the NxH3670 SDK board for range testing. The NxH3670ADK (12NC 9353 7468 4598) is recommended for range testing.

2 Board overview

2.1 Block diagram

The NxH3670 SDK board is designed to support the dongle and the headset configuration.

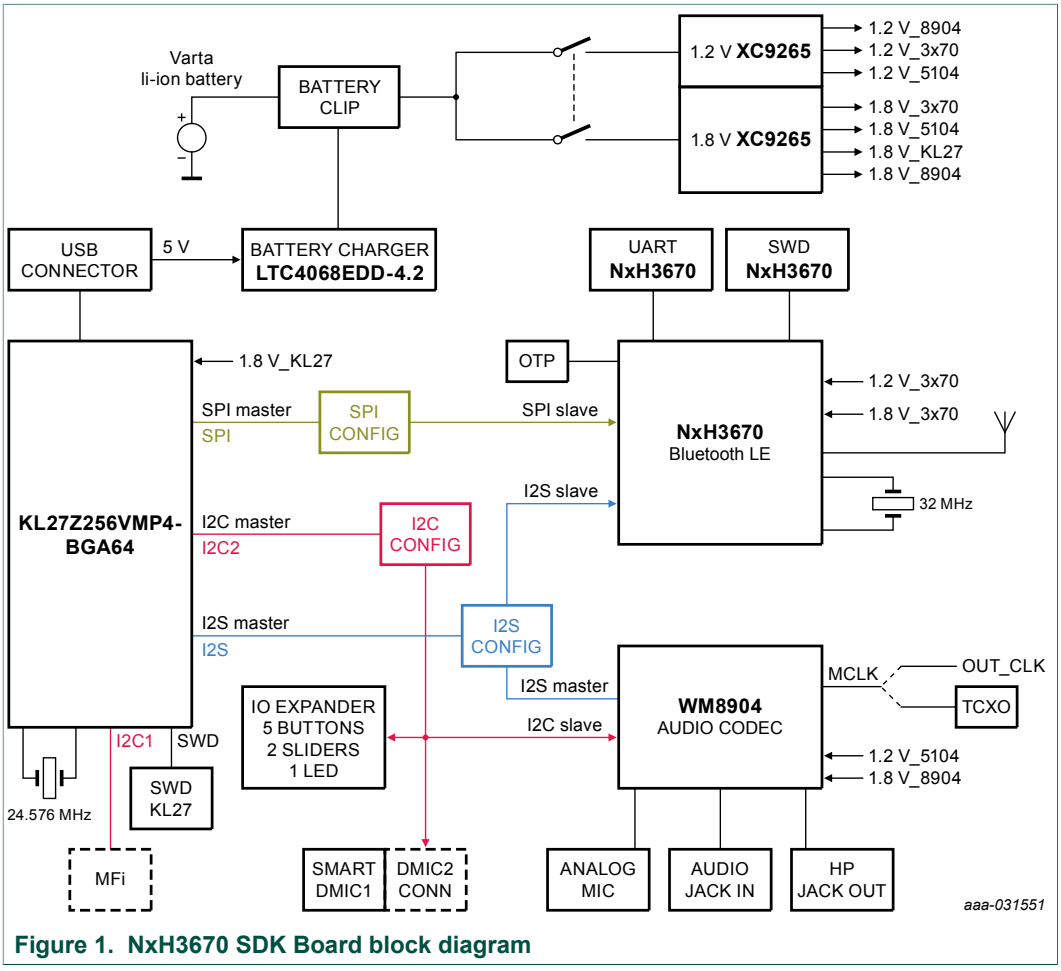
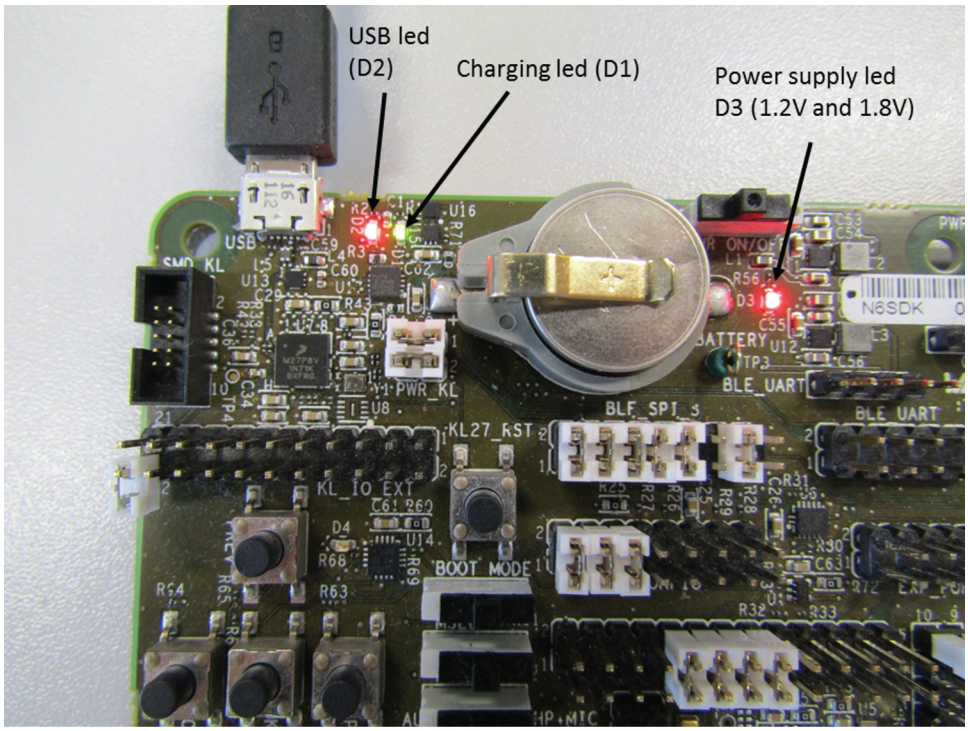


Figure 1. NxH3670 SDK Board block diagram

2.1.1 Power supply

The NxH3670 SDK board is powered and charged via USB. The 1.2 V and 1.8 V switched mode power supplies are supplied by the battery. A switch is put in between the battery and the switched mode power supplies.

Dedicated jumpers on the 1.2 V and 1.8 V power rail are foreseen for KL27 Host, NxH3670, and Codec. In this way, the individual power figures can easily be observed/ measured.



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D1 (green): This LED is on while the battery is charging.
D2 (red): This LED is on when USB power is present.
D3 (red): This LED is on when the 1.2 V and 1.8 V supplies are enabled.

Figure 2. Power supply LEDs

2.1.2 Host controller

The MKL27Z256VMP4 acts as host controller for the NxH3670. To communicate with the NxH3670 SPI slave interface, it has an SPI master interface.

In the dongle configuration, the host controller converts the audio from USB to I^2S. The host controller is the I^2S master while the NxH3670 is the I^2S slave.

In addition, the host controller has an I^2C master interface which can be connected to the codec or any external I^2C device.

2.1.3 EEPROM

For the NxH3670, the EEPROM is not used.

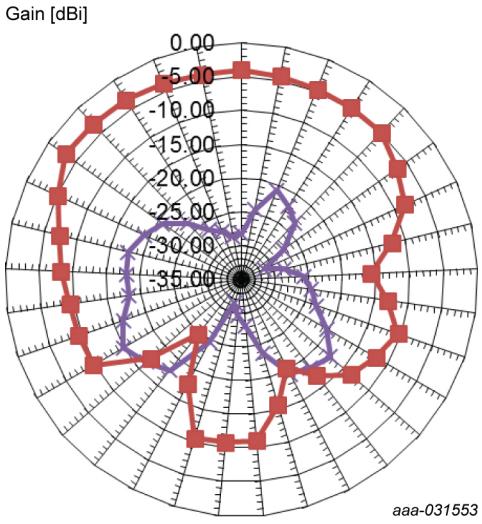
2.1.4 Bluetooth low energy

The NxH3670 is the Bleutooth low energy device. It is a single chip, ultra-low power 2.4 GHz transceiver with embedded MCU, targeted at wireless audio streaming for hearables, wireless headsets, and headphones.

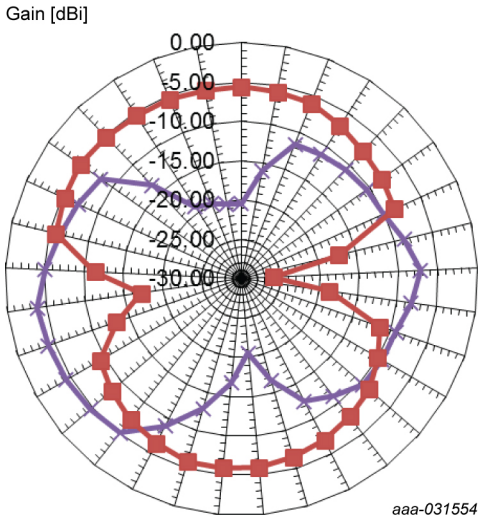
2.1.5 Antenna

The NxH3670 SDK board contains a PCB antenna W3092 of Pulse electronics. It is possible to do RF measurements via cable via J19. In that case, the antenna is disconnected and an adapter cable is required from Murata with part number MXHS83QE3000. This cable can be sourced via the Digikey and Mouser web sites.

As mentioned the NxH3670 SDK board is not suited to do range testing. However, it is well suited for software development. The radiation pattern contains some major dips which result in a reduced range for some particular orientations (see Figure 3).



a. Horizontal plane



b. Vertical plane

Figure 3. Radiation patterns of the NxH3670 SDK board

2.1.6 Audio

As audio codec the Wolfson WM8904 is used. The codec is controlled via I^2C and can be connected to the MKL27Z256VMP4, or NxH3670 an external device. The I^2S port of the codec acts as master and can be connected to the NxH3670 or an external device. An external master clock is provided to the codec.

A 3.5 mm jack for AUDIO_IN and HP+MIC is available on the board. By default, the HP+MIC connector is configured to support a 3-pole audio connector (generic sound connector). The standard 4-pole connector can be supported by adding R19 and removing R20.

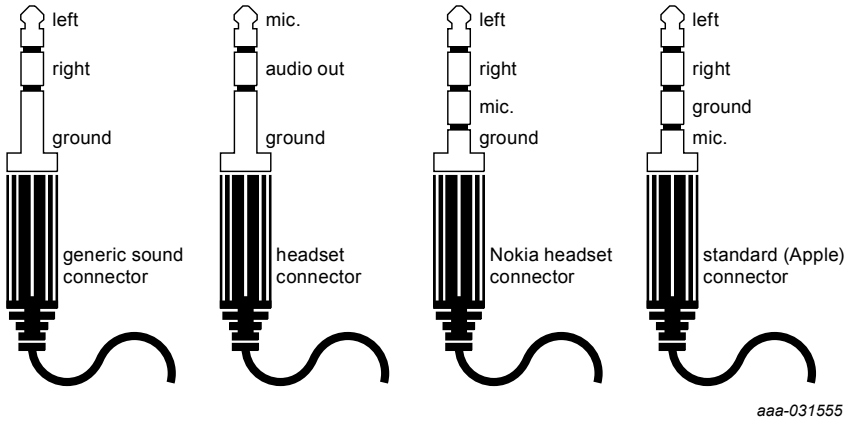


Figure 4. 3.5 mm Jack connectors 3 versus 4 pole configuration

2.1.7 Clocks

Three reference clocks used on the board:

- 24.576 MHz crystal connected with the MKL27Z256VMP4
- 32 MHz crystal connected with the NxH3670
- 12.288 MHz TCXO for the codec

It is possible to route via J10 an alternative MCLK (e.g. coming from KL27) to the codec.

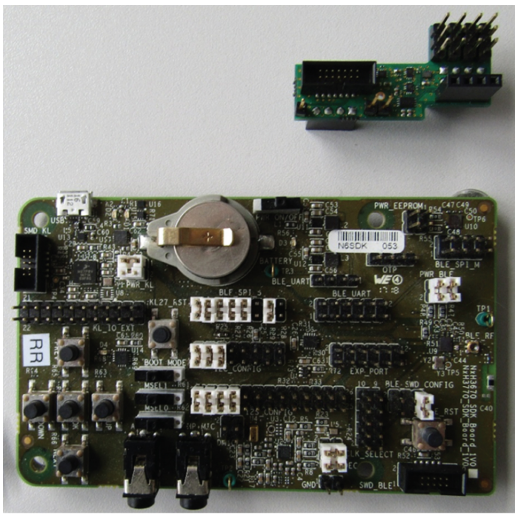
2.1.8 Serial wire debug (SWD)

A serial wire debug interface is foreseen for the MKL27Z256VMP4. As debugger the LPC-Link2 is provided.

2.1.9 UART

For debug purposes UART interfaces are available on the KL27 and NxH3670.

If the KL27 UART0 is available on PTA1/2 and UART2 on PTE22/23, the UART of the NxH3670 can be routed to the KL27 or to a pin header via J21. Additionally, it is possible to connect the UART pins to the serial expansion interface (J3) of the LPC link 2 board. In this case, an SDK extender board must be added as indicated in below picture. The SDK extender board contains the required level shifters.



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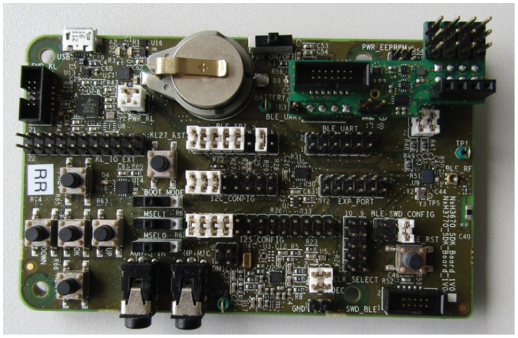

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Figure 5. NxH3670 SDK board with SDK extender board

A 14-pin flat cable must be connected between the LPC Link2 board and the SDK extender board.

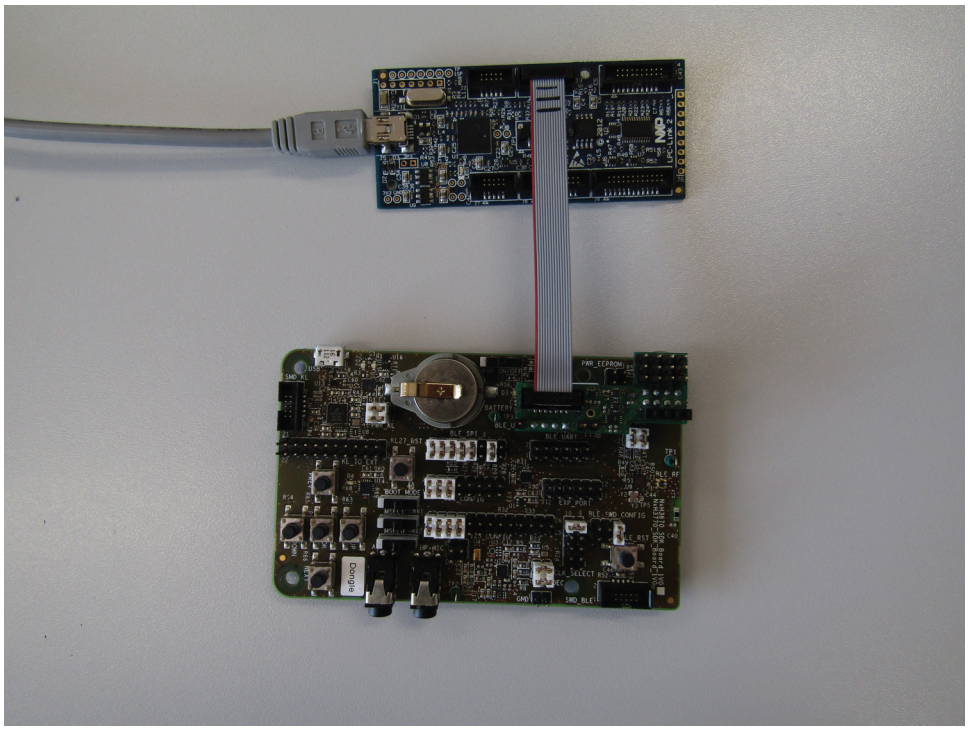

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Figure 6. NXH3670 SDK Board with SDK extender board

2.2 Schematic

The schematic is available as a dedicated document. The standard delivery is in pdf format. Design files in Orcad format are available on request.

2.3 Component placement

Figure 7 shows the indication of the most important components of the board.

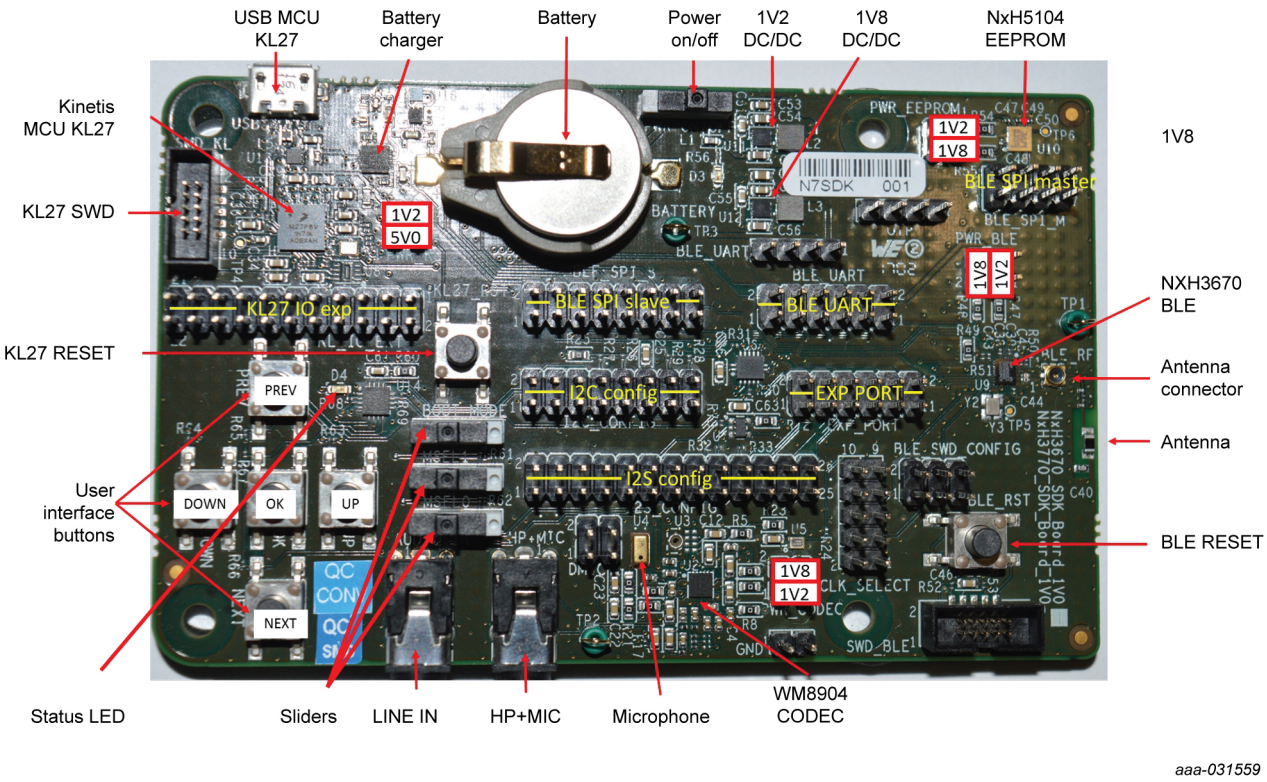

Figure 7. Component placement NxH3670 SDK board

3 Dongle configuration

3.1 Block diagram

The dongle application is using the KL27 as host controller. The KL27 has a SPI master interface to control the NxH3670 and an I^2S master interface for the audio communication with NxH3670.

A USB interface is available on the KL27 to connect with an external host device.

An optional I^2C interface is available on the KL27 for buttons, sliders, or LEDs.

The SWM mapping of the NxH3670 is as configuration A in the data sheet.

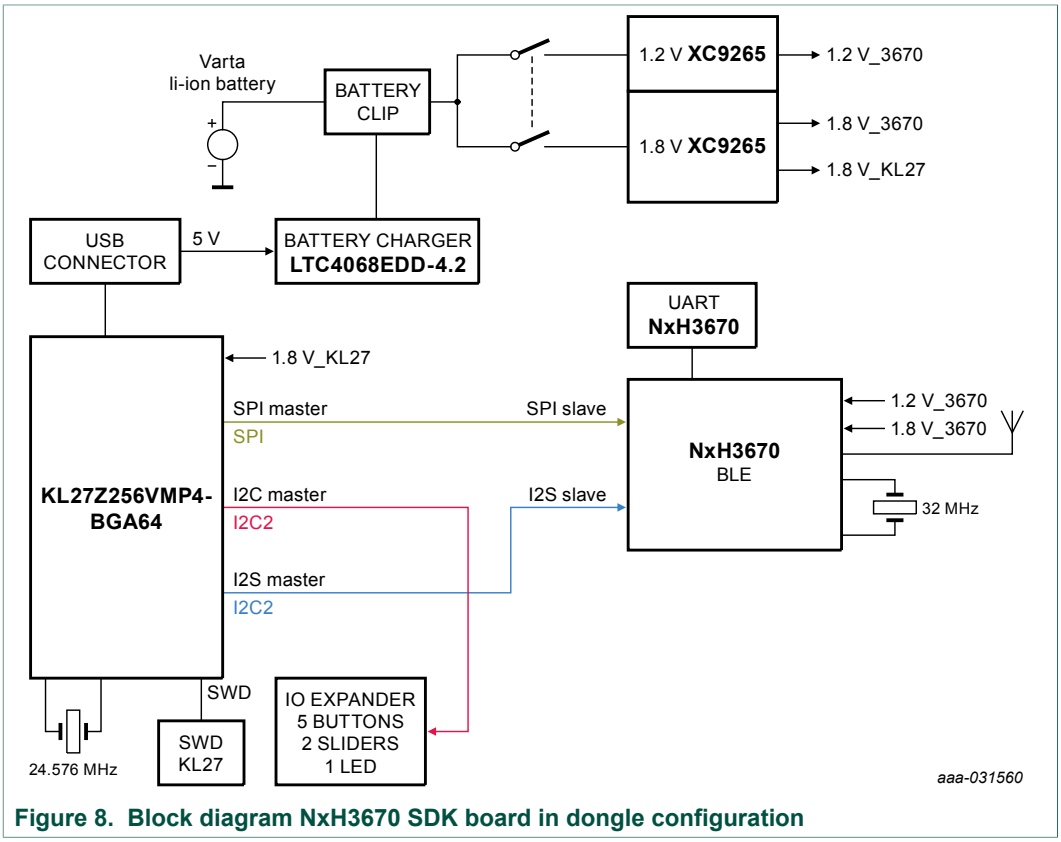

Figure 8. Block diagram NxH3670 SDK board in dongle configuration

3.2 Board configuration

Below the jumper configuration of the SDK board in dongle mode. The codec is supplied as well while it is not used because it is connected to I^2C together with the IO expander. Without suppling the codec, the I^2C pins of the codec, and so also the I^2C interface, is unstable.

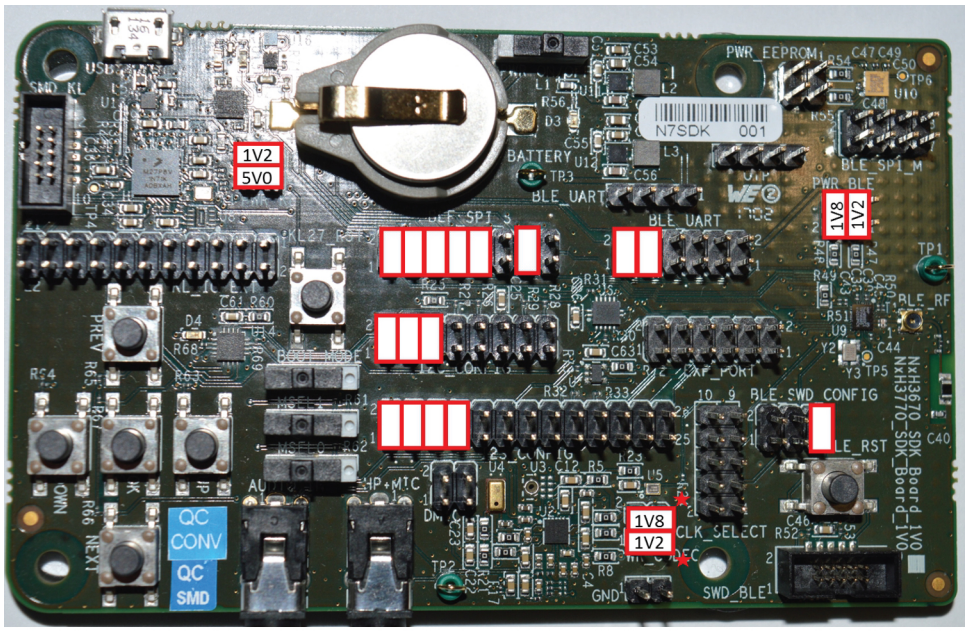

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Figure 9. NxH3670 SDK board dongle configuration

4 Configuration

The headset application is using the same KL27 host controller as the dongle. The host controller has a SPI master interface to control theNxH3670 and an I^2C interface to control the codec and user interface.

The I^2S audio from the codec is connected with the NxH3670. The codec is the I^2S master.

4.1 Block diagram

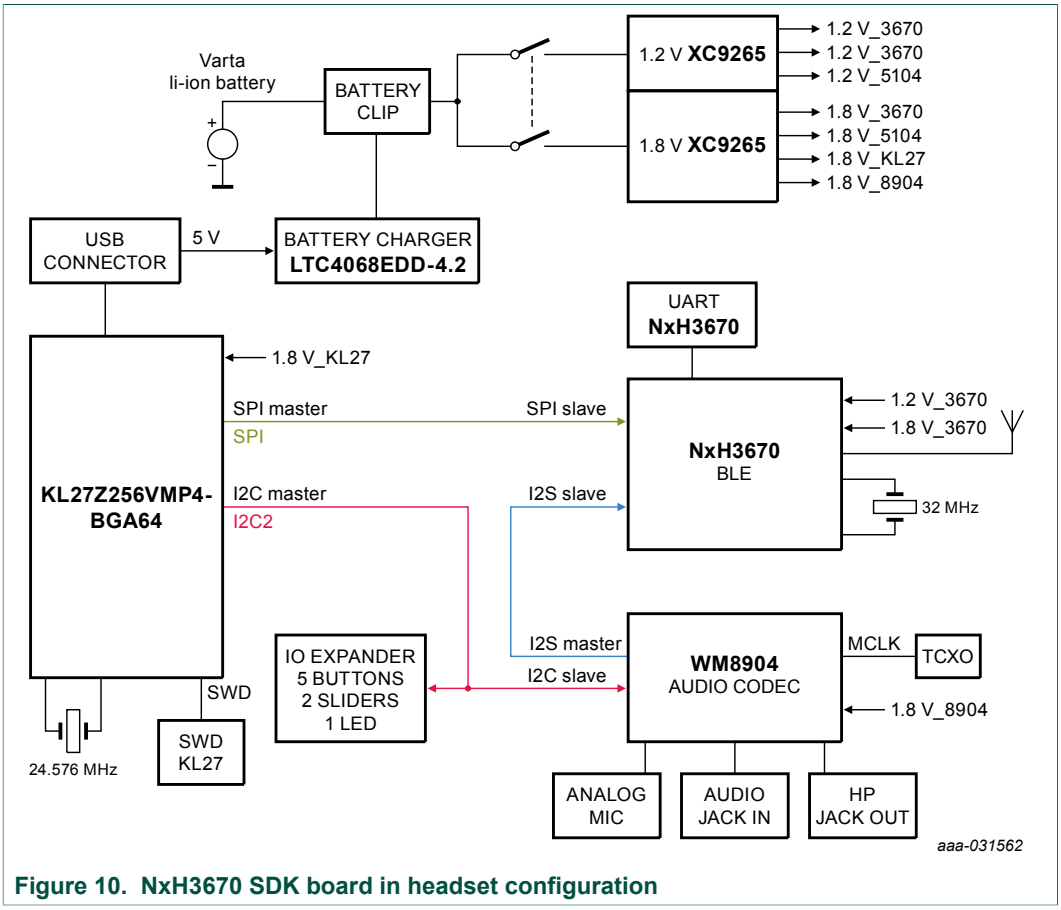

Figure 10. NxH3670 SDK board in headset configuration

4.2 Board configuration

Below the jumper settings for the NxH3670 SDK board in headset configuration.

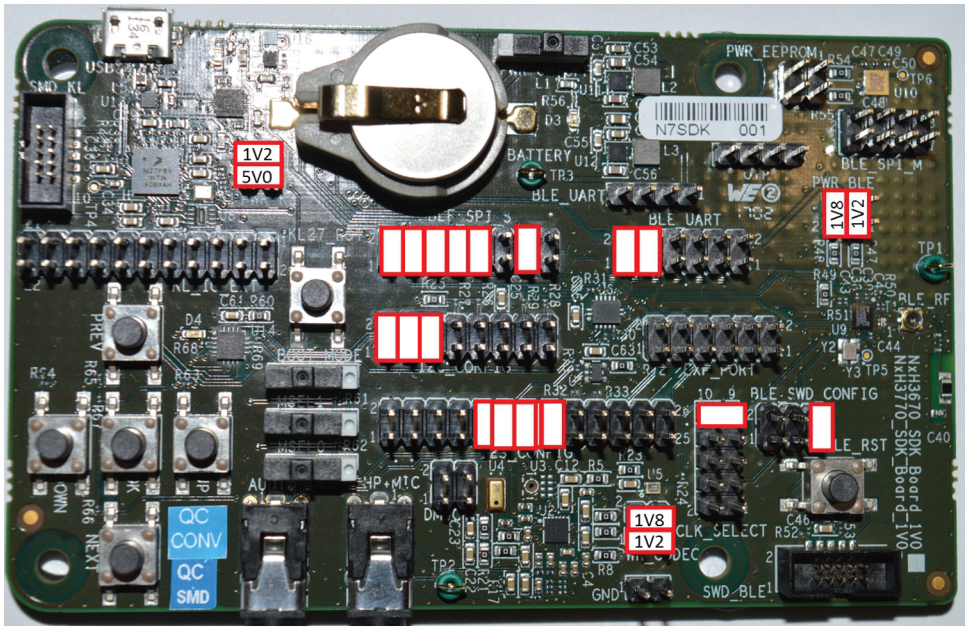

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Figure 11. NXH3670 SDK board configuration for a headset application

5 Known limitations

Audio artifacts while changing volume	Audio artifacts can be discerned when changing the volume on the SDK board using both Windows OS and Mac OS. The volume management in the Wolfson codec WM8904 causes this issue.
180° phase shift on audio output	Wolfson codec WM8904 introduces a 180° phase shift on its audio output.
Multi-path crosstalk	Due to multi-path crosstalk in the Wolfson codec WM8904, there is signal leakage from the forward channel into the backchannel. More information can be found in the data sheet of the Wolfson codec WM8904.
USB suspend not available	The USB suspend feature cannot be tested on the SDK board as delivered. It can be tested on the ADK board though.
Unstable power supply upon low battery voltage	When the battery voltage is low (e.g. battery almost drained), the onboard supply circuits are unable to output a stable voltage on the 1.2 V and 1.8 V lines. This issue in turn causes undefined behavior on the KL27 and the NxH3670 ICs. This limitation does not apply for the ADK Board, as it features a PMIC.

6 References

[1] NxH3670 SDK board schematic

[2] NxH3670 SDK board layout

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