UM11161

NXH3670 application development kit

Rev. 1 — 20 March 2019 User manual

Document information

Information	Content
Keywords	NXH3670ADK, application development kit (ADK), board description
Abstract	This document gives an overview of the ADK board features of the NXH3670ADK

Revision history

Revision history

Rev	Date	Description
v.1	20190320	Initial version

1 Scope

This user manual describes the ADK board aspects of the NXH3670ADK (application development kit) which consists of a dongle and headset board. The NXH3670ADK is an example of how an NXH3670 application can be made and is a reference in terms of performance.

2 Dongle

The dongle board (Ref. 1) basically consists of a KL27 acting as host, the NXH3670, and an antenna.

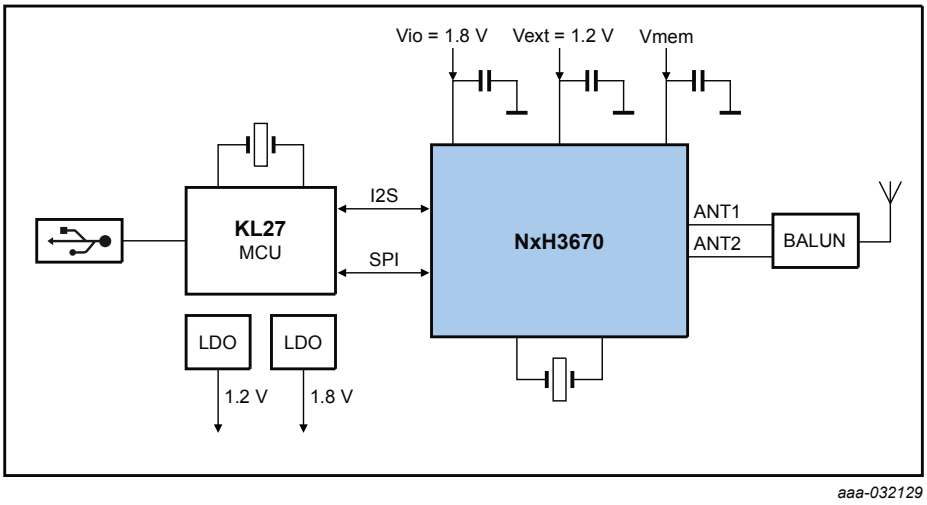


Figure 1. Block diagram ADK3670 dongle

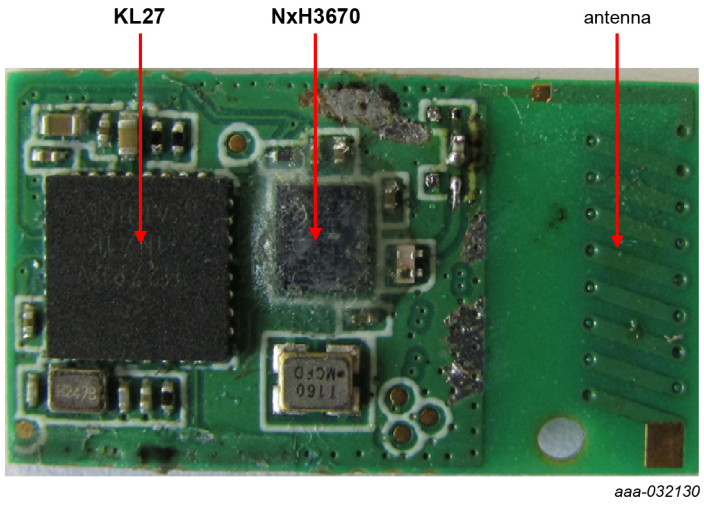
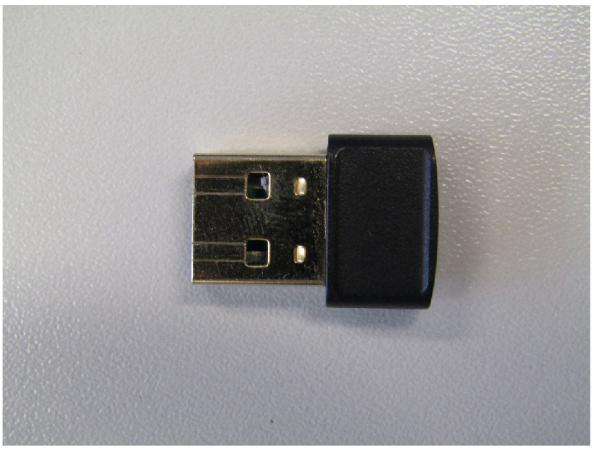


Figure 2. ADK3670 dongle



aaa-032132

Figure 3. ADK3670 dongle in plastic

The dongles are delivered in a housing that can be inserted in a USB slot directly. Since the housing is glued, do not open it.

2.1 KL27

Similar to the SDK board, the dongle is using a KL27 as host controller. To minimize the design in terms of size (and cost), a 32-pins QFN version of the KL27 was used while the SDK board is using a 64-pins BGA version.

The KL27 controls the NXH3670 via a SPI interface and converts the USB audio into I^2S. The KL27 is master for both SPI and I^2S. The programming is done via USB.

The KL27 integrated flash memory is storing all firmware used for the KL27 and the NXH3670.

2.2 NXH3670

The RF output of the NXH3670 is directly connected to the antenna. There is no possibility to do conducted RF measurements.

2.3 Antenna

The dongle has an embedded helical PCB antenna. A dedicated app note is available about the antenna design (see Ref. 3).

3 Headset

The headset board consists basically of a KL27 acting as a host, NXH3670, codec, PMU, and antenna. Next to that some peripherals are present such as rotary switches, audio jack, debug connectors, power button, etc (see Ref. 2 for the full schematic).

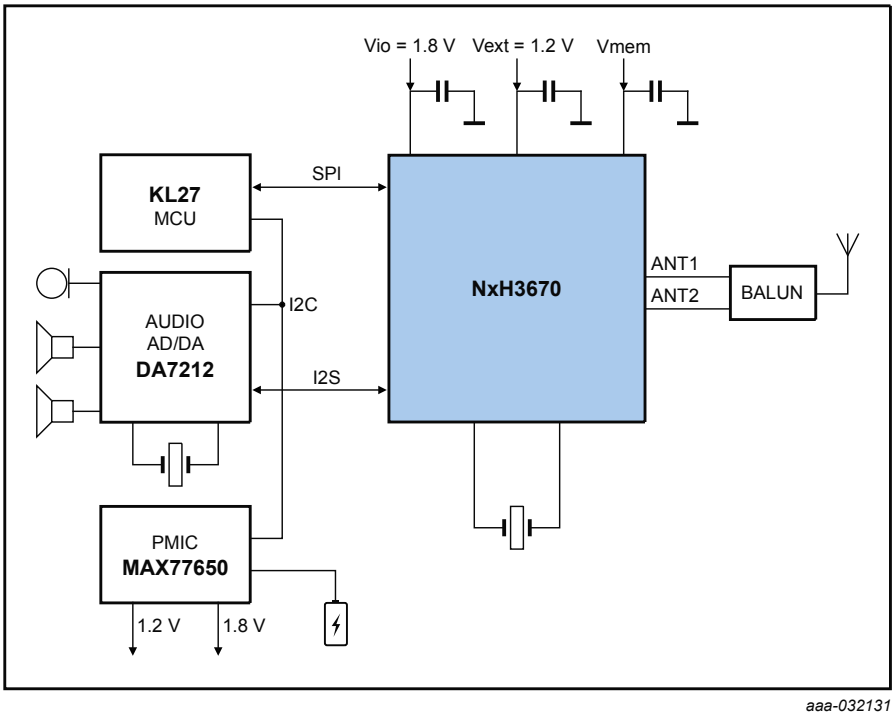


Figure 4. Block diagram ADK3670 headset board

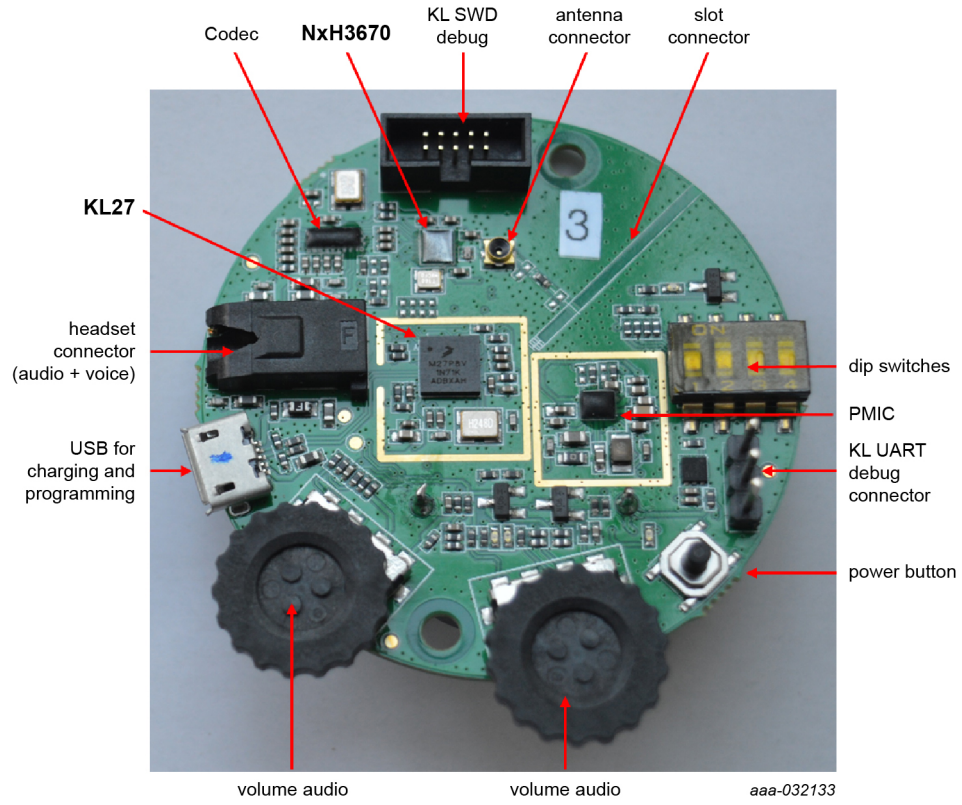


Figure 5. ADK3670 headset PCB

3.1 KL27

The same 64-pins BGA version of the KL27 is used as on the SDK board. Programming of the KL27 is done via USB while debug of the KL can be done via the SWD connection.

The KL27 controls the NXH3670 via a SPI and the codec via I^2C. The KL27 acts as master for both SPI and I^2C.

A pin header is foreseen to debug the KL27 by using the UART interface.

The KL27 integrated flash memory is storing all firmware used for KL27 and NXH3670.

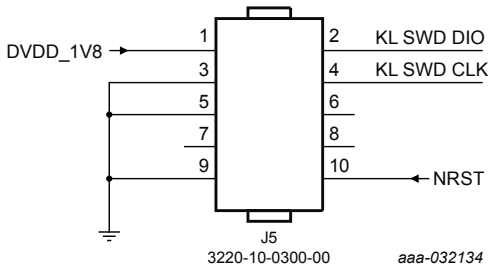


Figure 6. KL SWD debug connector

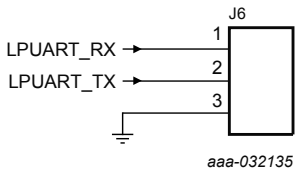


Figure 7. KL UART debug connector

3.2 Codec

To improve the power consumption, a different codec was used compared to the SDK board. The ADK3670 uses the DA7212 from the dialog semiconductor. The I^2S audio coming from the NXH3670 is connected with the codec. The codec acts as I^2S master.

The codec is connected with a 4-pole audio connector and configured according to the CTIA standard.

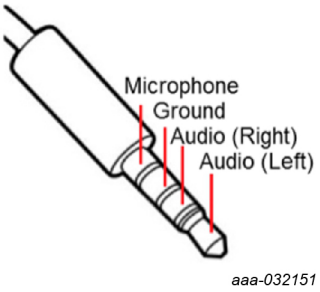


Figure 8. Audio connector configuration

3.3 PMU

While the SDK board was using discrete components for the supply and charging, a single device is used for the ADK3670 headset. The selected PMU is the MAX77650 from Maxim Semiconductors and contains a 1.2 V supply, a 1.8 V supply, and a charging circuit. The charging is done via USB.

3.4 NXH3670

The NXH3670 has an antenna connector to do conducted RF measurements. If no RF cable is attached, the slot antenna is connected.

RF adapters from Murata MXHS83QE1000 or MM126056 are available to convert to SMA.

3.5 Antenna

The ADK3670 headset board contains a slot antenna which is described in detail in a dedicated application note (see Ref. 4).

3.6 USB

The headset board can be charged and programmed via USB.

3.7 Rotary and dip switches

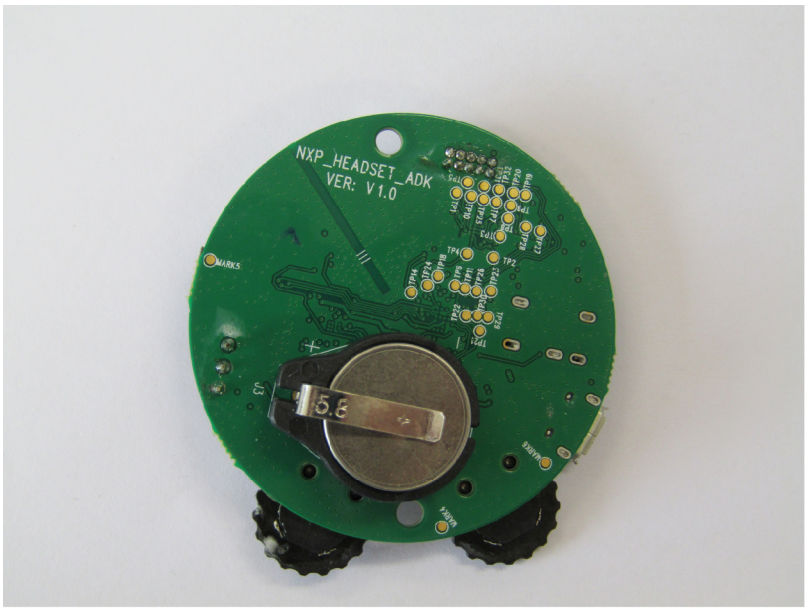
The rotary switches are intended for the volume control of the microphone and audio. The software defines the function of the dip switches.

3.8 Power button

The board can be powered up with the power button which is directly connected to the MAX77650. To switch off the board, the power button must be pressed for about 20 seconds (see the MAX77650 data sheet for more information).

3.9 Battery

The headset board is supplied by a Varta battery (CP1654A2). The battery is charged via USB. As mentioned in the data sheet of the battery, charging must happen between 0 °C and 45 °C. Discharging can be done between −20 °C and +60 °C.



aaa-032152

Figure 9. Backside ADK3670 headset

3.10 Known limitations

PMIC generates spurious interrupts	When no battery is connected, the PMIC (MAX77650) generates spurious interrupts. The reference application gracefully handles these spurious interrupts. No functionality is harmed. However it causes higher current consumption.
External Xtal on ADK is always enabled	The ADK crystal driving the codec and I^2S bus has an enable pin. However, this pin is hardwired to a pull-up resistor. When the headset does not receive audio, the crystal cannot be disabled. It consumes power regardless. When using the ADK design as a reference, ensure that the enable pin for the crystal is connected to a KL27 GPIO. In this way, when the crystal does not have to be active, the current consumption is reduced dynamically.
Missing pull-up resistor for MAX77650 nIRQ	Using the internal pull-ups of the KL27 seems to work, although they are only 20 kΩ instead of 100 kΩ.

4 Abbreviations

Table 1. Abbreviations

Acronym	Description
ADK	application development kit
BGA	ball grid array
PCB	printed-circuit board
PMU	power management unit
RF	radio frequency
SDK	software development kit
SPI	serial peripheral interface
SWD	serial wire debug
UART	universal asynchronous receiver-transmitter
USB	universal serial bus

5 References

[1] **Schematic dongle** — NxH3670_0009_GEN_ADK_Dongle_Schematic_Rev1.01

[2] **Schematic headset** — NxH3670_0013_GEN_ADK_Headset_Schematic_Rev.1.00

[3] **AN12243 application note** — NxH3670 dongle antenna; 2018, NXP Semiconductors

[4] **AN12242 application note** — NxH3670 hadphone antenna; 2018, NXP Semiconductors

6 Legal information

6.1 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

6.2 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors. In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Evaluation products — This product is provided on an "as is" and "with all faults" basis for evaluation purposes only. NXP Semiconductors, its affiliates and their suppliers expressly disclaim all warranties, whether express, implied or statutory, including but not limited to the implied warranties of non-infringement, merchantability and fitness for a particular purpose. The entire risk as to the quality, or arising out of the use or performance, of this product remains with customer. In no event shall NXP Semiconductors, its affiliates or their suppliers be liable to customer for any special, indirect, consequential, punitive or incidental damages (including without limitation damages for loss of business, business interruption, loss of use, loss of data or information, and the like) arising out the use of or inability to use the product, whether or not based on tort (including negligence), strict liability, breach of contract, breach of warranty or any other theory, even if advised of the possibility of such damages. Notwithstanding any damages that customer might incur for any reason whatsoever (including without limitation, all damages referenced above and all direct or general damages), the entire liability of NXP Semiconductors, its affiliates and their suppliers and customer's exclusive remedy for all of the foregoing shall be limited to actual damages incurred by customer based on reasonable reliance up to the greater of the amount actually paid by customer for the product or five dollars (US$5.00). The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails of its essential purpose.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — While NXP Semiconductors has implemented advanced security features, all products may be subject to unidentified vulnerabilities. Customers are responsible for the design and operation of their applications and products to reduce the effect of these vulnerabilities on customer's applications and products, and NXP Semiconductors accepts no liability for any vulnerability that is discovered. Customers should implement appropriate design and operating safeguards to minimize the risks associated with their applications and products.

6.3 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 20 March 2019
Document identifier: UM11161