



Qualcomm Technologies International, Ltd.



ADK 4.3 Audio Sink Application ANC

User Guide

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1 Ambient Noise Cancellation – overview

The QUIL Ambient Noise Cancellation (ANC) solution is designed for stereo headsets. It uses a feed-forward algorithm requiring two microphones (one mounted on the outside of each ear cup). The ANC microphones capture ambient noise which the ANC algorithm uses to create anti-noise in the ear cup to cancel out the ambient background noise. ANC has been integrated into the Audio Sink application allowing ANC to be active while streaming music, making calls etc.

- NOTE**
- (1) This documentation is for users that have a copy of the QUIL ANC additional installer for QUIL ADKs. This can be obtained from [createpoint](#).
 - (2) The document describes an additional feature of the Audio Sink application. It may be beneficial to have the *Audio Sink Application User Guide* documentation available when reading this document.
 - (3) This document should be used in conjunction with the *ANC Tuning Tool User Guide* and *ANC: ADK 4.3 with CSR8675 User Guide*
 - (4) ANC is available on CSR8675 target hardware (it has an optimized low-latency IP block). It is not available for use on CSR8670 devices.

2 ANC installation procedure

The ANC feature is added to a standard QUIL ADK installation by running the additional ADK ANC installer.

2.1 ANC installation preparation

When the ANC Add-on installer is run, the first few windows of the installer allow the user to configure the installation.

Destination location

The ANC Add-on must be installed to the same directory as the standard QUIL ADK. This is because the ANC Add-on installer adds new files and also overwrites some existing files in the standard ADK installation.

Installation

During the installation process the installer asks if you would like to overwrite a few files. When prompted, you must choose to accept each as if you do not the installation fails.

Build VM application libraries

By default, the ANC Add-on installer is configured to automatically build the ANC VM libraries as part of the installation process. If the intention is to do the build them later, uncheck the **Build VM Application Libraries** tick box when it appears during the installation.

3 How to configure the VM project for ANC operation

After the ANC VM library has been built it can be included in the Audio Sink application project.

3.1 Sink application ANC properties

[Table 3-1](#) lists particular **Build Properties** setting requirements for ANC features to work.

Table 3-1 Build Properties required to use ANC

Build Property	Action
Ambient Noise Cancellation	Ensure that the Ambient Noise Cancellation property is set to Enabled.

To set the **Project Properties**:

1. Run xIDE from the Windows **Start** menu, that is:
All Programs\ <ADK>\ > <ADK> (xIDE).
2. In xIDE select **Properties** from the **Project** menu.
3. The **Properties** window appears.
4. Click on **Build System** in the **Configuration Properties** pane to view the **Build Properties**.
5. Locate the entries for Ambient Noise Cancellation and disable and enable them as detailed in [Table 3-1](#).

3.2 ANC VM library

To enable ANC, the ANC library need to be added to the project.

To add/modify the libraries included in a project, using xIDE.

1. Select **Properties...** from the **Project** menu.
2. Click on **Build System** in the **Configuration Properties** pane to view the **Build Properties**.
3. Locate **Libraries** from the list of **Build System** entries.
4. Add `anc` to the list of included libraries for the project.
5. Select **Rebuild Active Project** from the xIDE **Build** menu to rebuild the project with the `anc` library included.

4 To complete the ANC Headset Sink application

After successfully building and deploying the Headset Sink application to the target device, it is necessary to add an ANC security key and then initiate Pairing mode to enable ANC mode:

ANC security key

The ANC feature requires a security key, see [ANC security key](#), or the *ANC: ADK 4.3 with CSR8675 User Guide* for further guidance.

Initiating Pairing mode after a successful build

To put the Audio Sink ANC application into Pairing mode, after a successful build:

1. Ensure that the **Hold** switch on the development board is in the **On** position.
2. Perform a Reset.
The green and blue LED lights on H13179v2 board flash, indicating that the device is ready to pair.

NOTE If the LEDs do not flash, this indicates that the build and the PSRs have essential components missing. If this is the case, QTI recommends repeating the build and installation procedure.

A ANC PS Key configuration

This appendix details the PS Keys used by the ANC feature. The ANC Tuning Tool generates a PSR file, which contains coefficients, gains, and other data used by the ANC algorithm.

NOTE Refer to the *Audio Sink Application Configuration Tool User Guide* for details on using the configuration tool.

A.1 Audio sink application ANC configuration

The ANC feature is controlled by the Audio Sink application; this control can be configured using the Audio Sink Application Configuration Tool.

ANC configuration

To open the required configuration page in the Configuration Tool navigate to:

Configuration Set\Audio\Ambient Noise Cancellation (ANC)

The **ANC Configuration** page allows the user to configure the initial setup ANC when the device Powers On. [Table A-1](#) lists the options available.

Table A-1 ANC configuration options

Configuration	Description
Initial ANC State	The initial ANC state to use when the device is Powered On
Persist ANC State On Power Off	If selected, the ANC state when the device is Powered Off persists and becomes the ANC state when the device is Powered On again
Initial ANC Mode	The initial ANC mode to use when the device is Powered On
Persist ANC Mode on Power Off	If selected, the ANC mode when the device is Powered Off persists and become the ANC mode when the device is Powered On again.
Initial ANC Sidetone Gain	The initial ANC sidetone gain to set when ANC is enabled
Persist ANC Sidetone Gain	If selected, the ANC sidetone gain when the device is Powered Off persists and becomes the initial ANC sidetone gain when the device is Powered On again.
ANC ADC Digital Gain fine mode step	The ADC Digital Gain fine mode step to use for fine-tuning. This step size is used to cycle through Digital gain in fine mode in 3 Steps, that is $\text{Default_Gain} - \text{step}$, Default_Gain , $\text{Default_Gain} + \text{step}$...
Assign Feed Forward Left Mic	The microphone to use for feed forward left
Assign Feed Forward Right Mic	The microphone to use for feed forward right

Table A-1 ANC configuration options (cont.)

Configuration	Description
Assign Feed Back Left Mic	Not Applicable for CSR8675
Assign Feed Back Right Mic	Not Applicable for CSR8675

NOTE If ANC is to be enabled by default, ensure that Initial ANC State is set to **Enabled**.

Microphone configuration tool setup:

To configure the Microphones, using the Audio Sink Application Configuration Tool, navigate to pages:

- Configuration Set\Audio\Microphone\Microphone 1-a
- Configuration Set\Audio\Microphone\Microphone 1-b

Audio instances for both 1a and 1b microphones should be set up accordingly, see [Table A-2](#).

ANC shared microphone configuration

It is possible to use a microphone in a shared configuration where it can serve both as an ANC microphone and voice microphone.

NOTE CSR8675 can support a total of 6 mic inputs (6 digital or 2 analog and 4 digital), which can support systems that implement cVc 2-mic voice processing simultaneously with ANC.

Table A-2 Setup of options for analog and digital microphones

Configuration Label	Required Setting Option
Audio Instance for Mic [1a/1b]	Audio Instance n_1 (where n_1 is the same for both 1a and 1b microphones)
BIAS for ANC Mic [1a/1b]	Mic Bias 0
ANC Mic [1a/1b] Digital	Checked
Drive PIO/BIAS Selection for ANC Mic [A/B]	Use Drive PIO
ANC Mic A Drive PIO	PIO n_2 (where PIO n_2 provides the power to both A and B microphones)

A.2 Digital microphone configuration – physical setup

Digital microphone – single

For more details about the digital microphone, search online for the *Akustika AKU230 datasheet*.

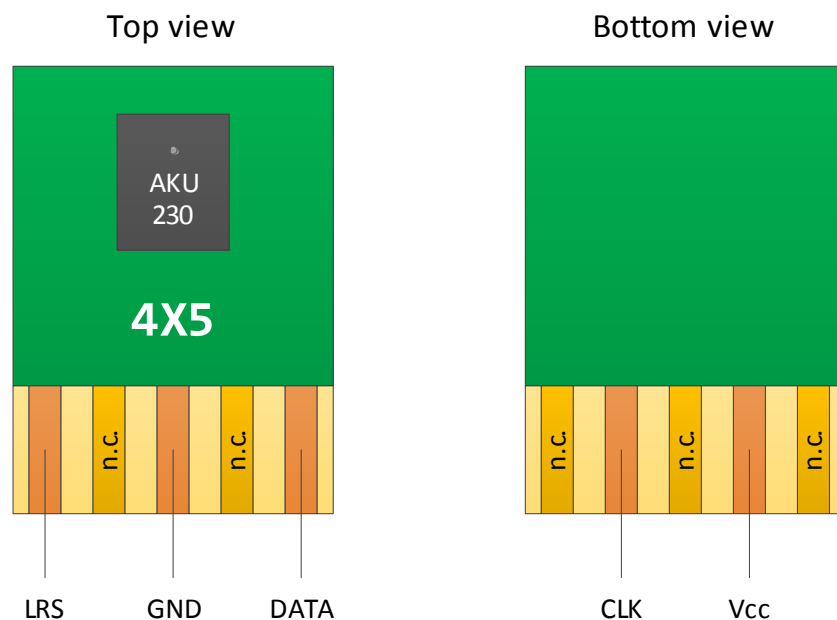


Figure A-1 Digital microphone pinout

Table A-3 Digital microphone pinout

Pin	Description	CSR867x IDC40 pin number	CSR867x IDC40 pin name
LRS	Left/right select; short-circuit with Vcc	36	1V8
GND	Ground	40	GND
DATA	Mic. Data output	4	PIO0
CLK	Mic. Data clock	1	PIO3
Vcc	Power supply	36	1V8

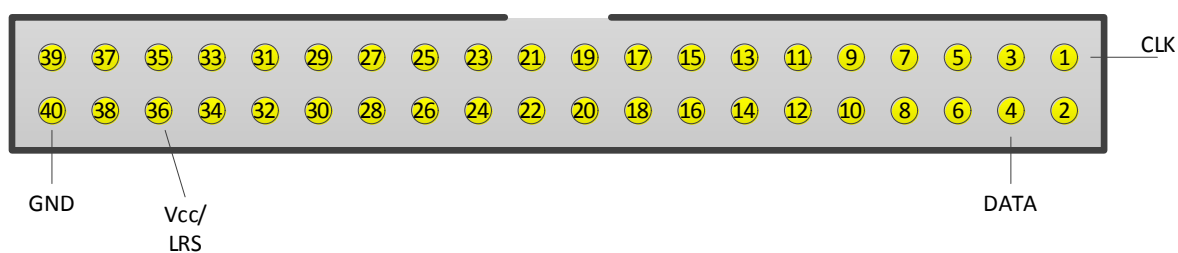


Figure A-2 CSR867x IDC40-to-digital mic pinout

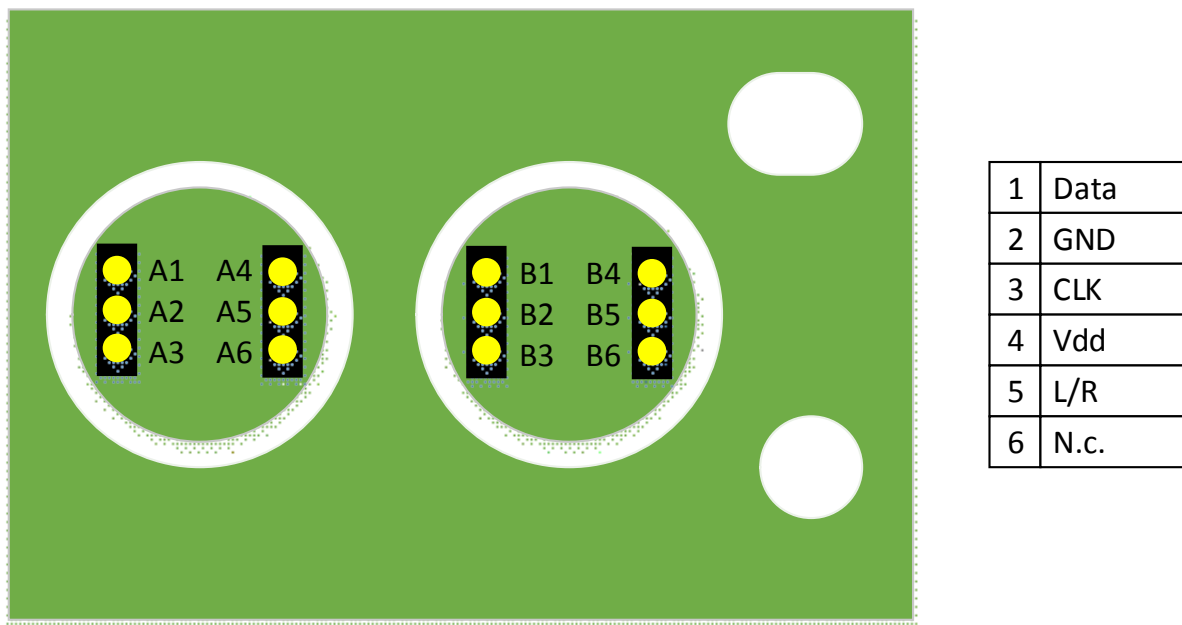


Figure A-3 Digital microphone, dual

The part number for these microphones is STEVAL-MK1129V1

For connection to the 40-pin GPIO header, see [A.2.1](#).

A.3 ANC security key

ANC requires a Security Key to function. QTI will provide the customer with a Security Key and corresponding range of valid Bluetooth addresses. The key is labeled `FEATURE_LICENSE_KEY` and is stored at the PS Store address `0x2601`. When obtained the Security Key must be merged using PSTool, refer to the *PSTool User Guide*.

NOTE The device's Bluetooth Address must also be within the valid range supplied.

A.4 Recommended PS Key settings for ANC

When using the ANC feature, QTI recommends applying the following configuration values:

1. MMU Bandwidth for audio system (`PSKEY_MMU_BW_AUDIO`) key should be set to `0x0007`, when using a DAC rate of 192 kHz. This is instead of the default `0x0005`.
2. If using digital microphones, the PIO for clock and data must be configured using the appropriate key for the microphone instance used, for example set `DIG_MIC_0_PIOS` for digital mics on instance 0. The clock can use any even PIO, while data can use any odd PIO. Setting a value of `0x0302` would indicate the clock on `PIO[2]` and data on `PIO[3]`.

A.5 Audio sink ANC application events

The ANC feature can be controlled by the user using the Audio Sink application User Events, listed in [Table A-4](#).

Table A-4 Audio sink application events controlling ANC

Audio Sink Application Event	Description
EventUsrAncOn	Turn ANC on
EventUsrAncOff	Turn ANC off
EventUsrAncToggleOnOff	Toggle ANC on/off
EventUsrAncLeakthroughMode	Enable Leakthrough mode (loads coefficients in PSKEY_DSP_USR2)
EventUsrAncActiveMode	Enable ANC Active mode (loads coefficients in PSKEY_DSP_USR1)
EventUsrAncNextMode	Toggles ANC mode between active and leakthrough
EventUsrAncVolumeDown	Increases the volume of the digital sidetone gain
EventUsrAncVolumeUp	Decreases the volume of the digital sidetone gain
EventUsrAncCycleGain	Cycle through ADC Digital gain for fine-tuning gain

B ANC limitations

Due to the use of the analog input, Wired Source mode is not available if using analog microphones for ANC.

Document references

Document	Reference
<i>Audio Sink Application User Guide</i>	80-CT439-1/CS-00236868-UG
<i>ANC Tuning Tool User Guide</i>	80-CT529-1/CS-00333401-UG
<i>Qualcomm PSTool User Guide</i>	80-CT424-1/CS-00101505-UG
<i>ADK Configuration Tool User Guide</i>	80-CT554-1/CS-00401879-UG
<i>ADK 4.3 Audio Sink Application ANC User Guide</i>	80-CF319-1/CS-00406499-UG

Terms and definitions

Term	Defintion
A2DP	Advanced Audio Distribution Profile
ADK	Audio or Application Development Kit
AG	Audio Gateway
ANC	Ambient Noise Cancellation
Bluetooth	Set of technologies providing audio and data transfer over short-range radio connections
DAC	Digital to Analog Converter
IC	Integrated Circuit
IP	Intellectual Property
Mic	Microphone
PIO	Programmable Input Output
PS	Persistent Store
QTIL	Qualcomm Technologies International, Ltd.
VM	Virtual Machine
xIDE	The QTIL Integrated Development Environment