# QCIOT-DA7212EVZ

Click Board™

## Description

The QCIOT-DA7212EVZ Click Board™ demonstrates the functionality and performance of the DA7212. The DA7212 is an ultra-low power audio codec targeting portable audio devices. Comprehensive analog mixing and bypass paths to the output drivers are available.

Digital audio transfer to/from the external processor is via a bi-directional digital audio interface that supports all common sample rates and formats. The device may be operated in slave (target) or master (controller) modes using the internal PLL, which may be bypassed if not required. To fully optimize each customer application, a range of built-in filtering, equalization and audio enhancements are available. These are accessible by the processor over the $I^2C$ serial interface

The board operates as an audio development expansion for a host MCU board and allows for the development of a complete audio input/output solution by including an on-board speaker and microphone. It also includes input and output jacks to connect to external devices. The Click Board connects to a host board via the Renesas mikroBUS™ interface.

## Features

- DA7212 audio codec (for details and specifications, see the DA7212 product page)
- 3.5mm jack for external line-in audio
- 3.5mm jack for headphone output (or externally powered speaker output)
- Digital MEMS microphone
- Mono-channel SMD speaker
- mikroBUS™ interface for inter-board communication
- Selectable on-board or external master clock for DA7212
- Low-power PLL provides system clocking and audio sample rate flexibility
- Built-in 5-band equalizer, ALC and noise-gate functions

## Kit Contents

- QCIOT-DA7212EVZ Click Board

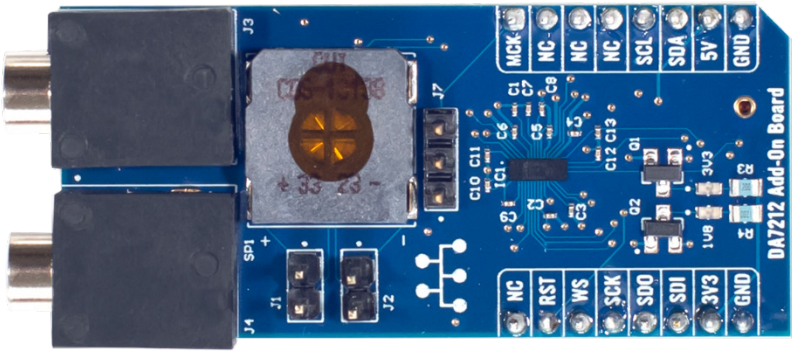


**Figure 1. QCIOT-DA7212 Click Board**

# Contents



# Figures

# 1. Functional Description

The QCIOT-DA7212EVZ Click board is intended as a quick connect prototyping solution for DA7212. Figure 2 highlights the main parts of the system.

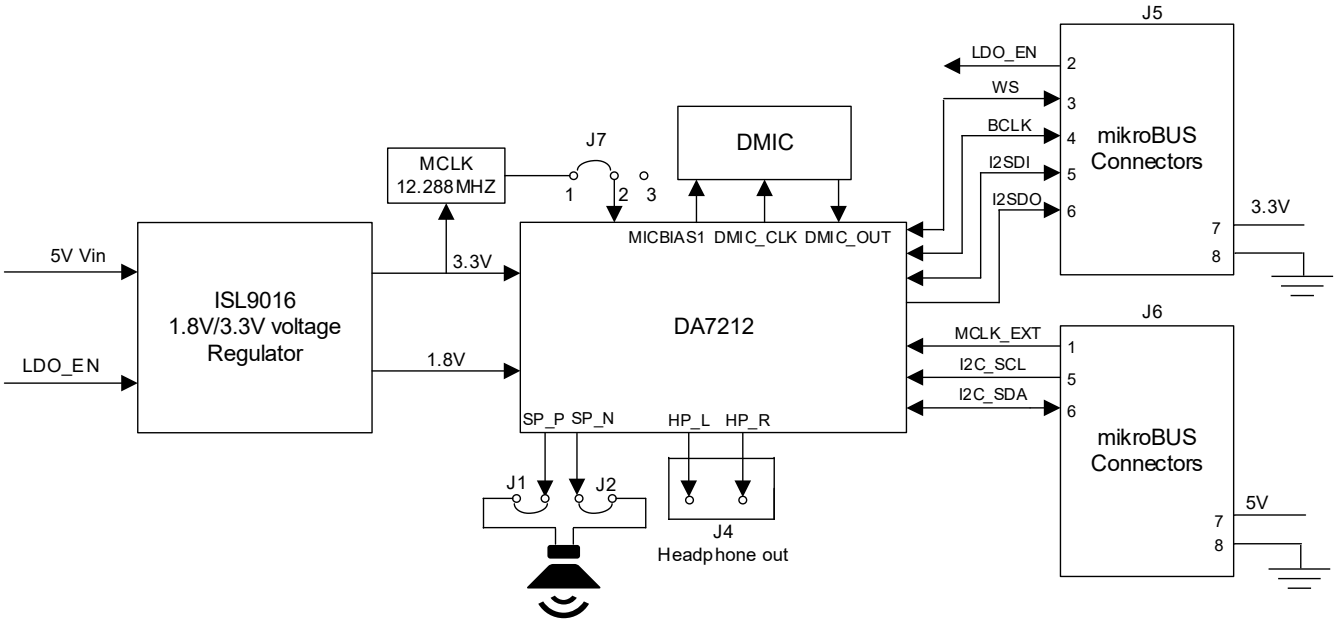


**Figure 2. QCIOT-DA7212EVZ Click Board Block Diagram**

## 1.1 Setup and Configuration

Required or recommended user equipment:

- Renesas Evaluation Board: EK-RA2L1
- USB micro-B cable (provided with RA board)
- PC running Windows 10/11 with at least two USB ports.
- QCIOT-DA7212EVZ Click board

Required or recommended software:

- Renesas Flexible Software Package (FSP) v5.9.0 platform installation
  - Renesas e² studio 2025-04 or later
  - FSP 5.9.0 or later
  - GCC Arm Embedded 13.3.1 or later
- Sample code files (available on QCIOT-DA7212EVZ webpage)

  *Note*: There are multiple code files available on the QCIOT-DA7212EVZ web page. Import the sample project **ek_ra2l1_da7212evz_example_comms_layer** to e$^2$ studio.

### 1.1.1 Software Installation

Visit the e² studio webpage for the latest version of the installer software.

### 1.1.2 Kit Hardware Connections

Follow these procedures to set up the kit (see Figure 3).

1. Ensure that the MCU development kit supports mikroBUS-type connector.
   a. For EK-RA2L1, mikroBUS connector is available.
2. On the QCIOT-DA7212EVZ board, populate J1, J2, J7 (Pin 1 and 2) with jumpers to use the on-board and oscillator.
3. Plug in the QCIOT-DA7212EVZ board to the mikroBUS connector of EK-RA2L1. Ensure to align Pin 1 of J5 and J6 on QCIOT-DA7212EVZ and MCU kit pin 1 of J21 and J22.
4. Connect the EK board to the computer with a USB micro-B cable.
5. Short P401 and P403 on EK-RA2L1.
6. The device is now ready to be used in the system.

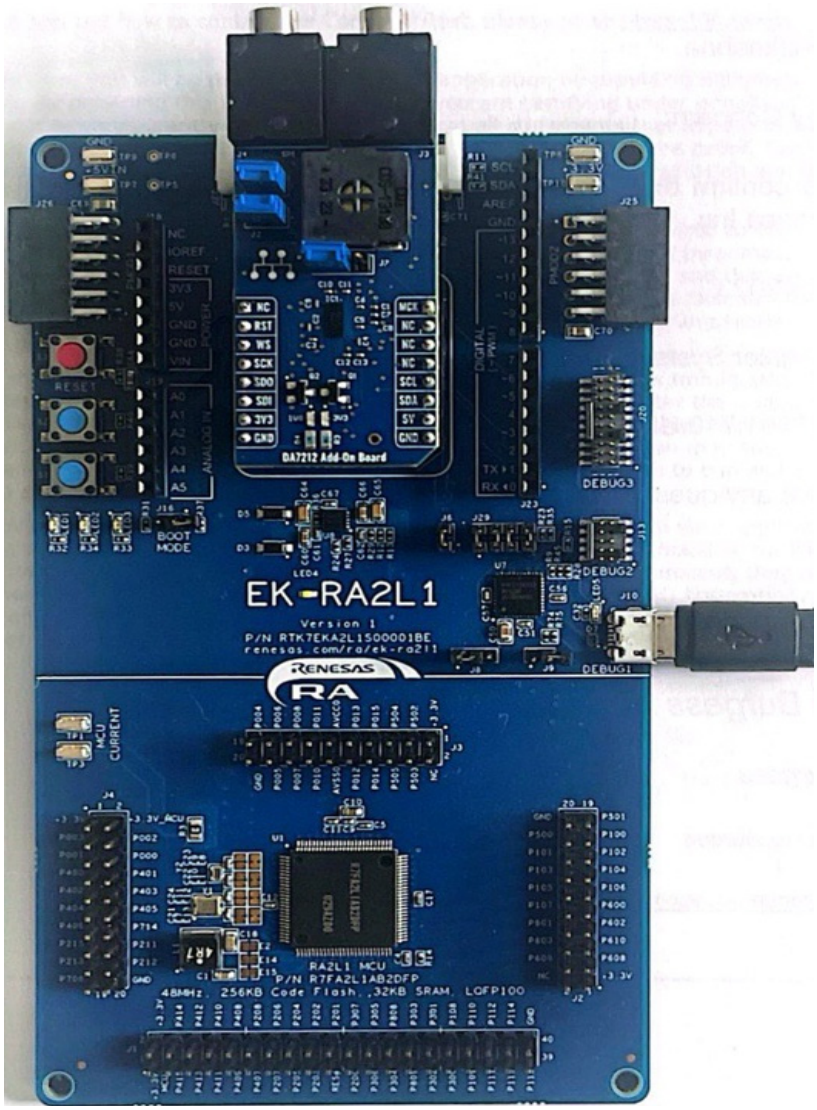


**Figure 3. QCIOT-DA7212EVZ Click Board with EK-RA2L1 MCU**

# 2. Board Design

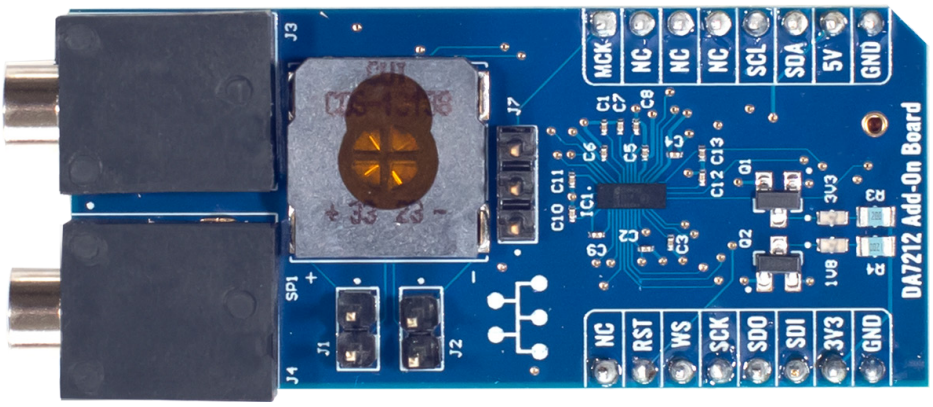


Figure 4. QCIOT-DA7212EVZ Board Image (Top)

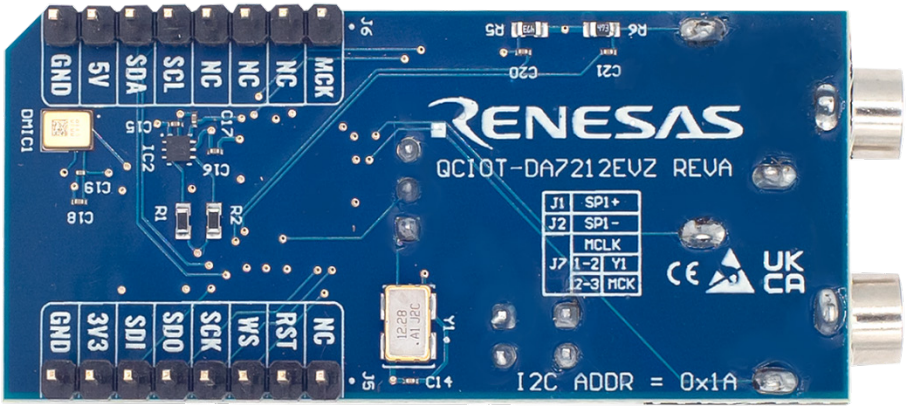


Figure 5. QCIOT-DA7212EVZ Board Image (Bottom)

## 2.1 Schematic Diagrams

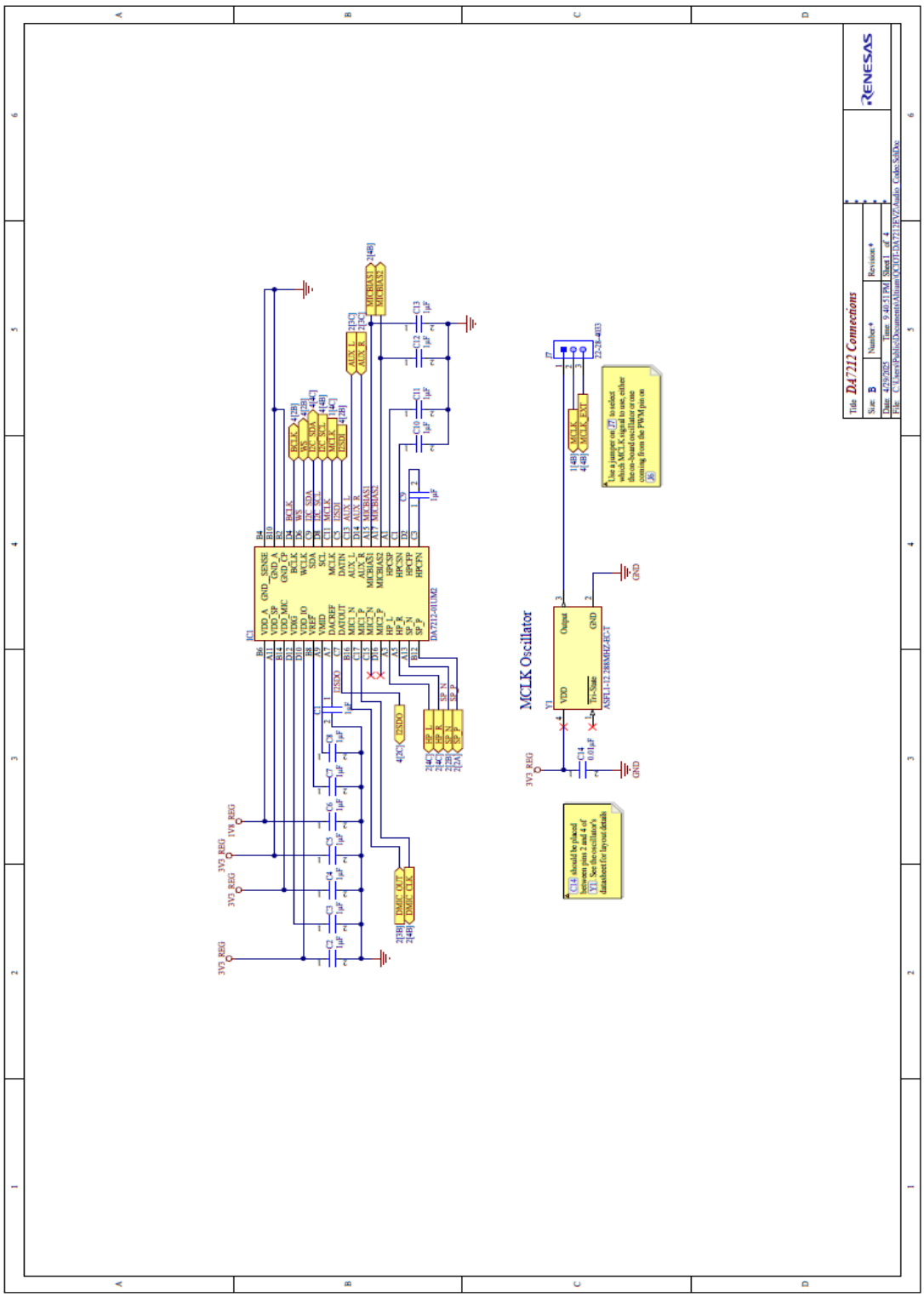


**Figure 6. DA7212 Connections Schematic**

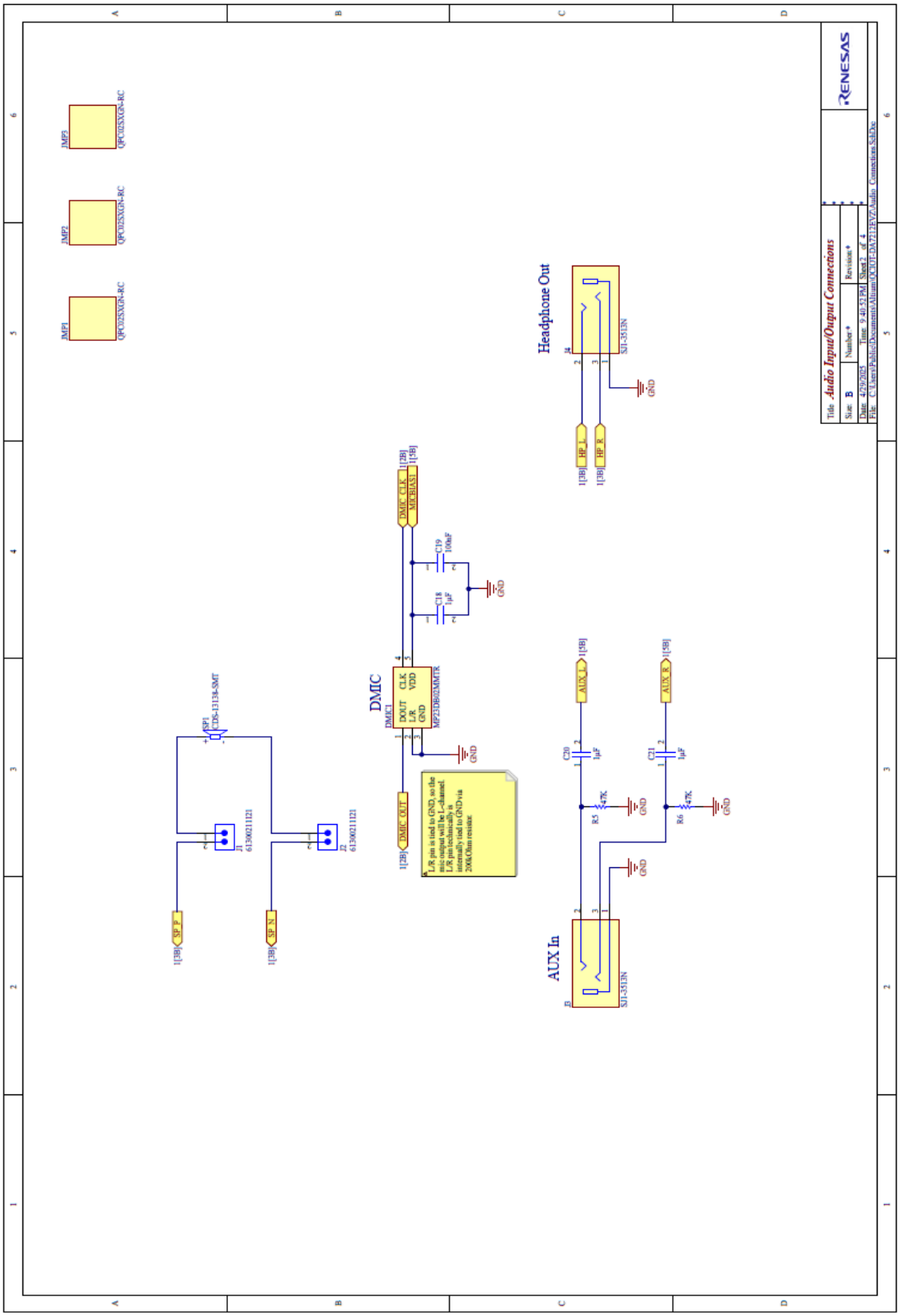


**Figure 7. Audio Input/Output Connections Schematic**

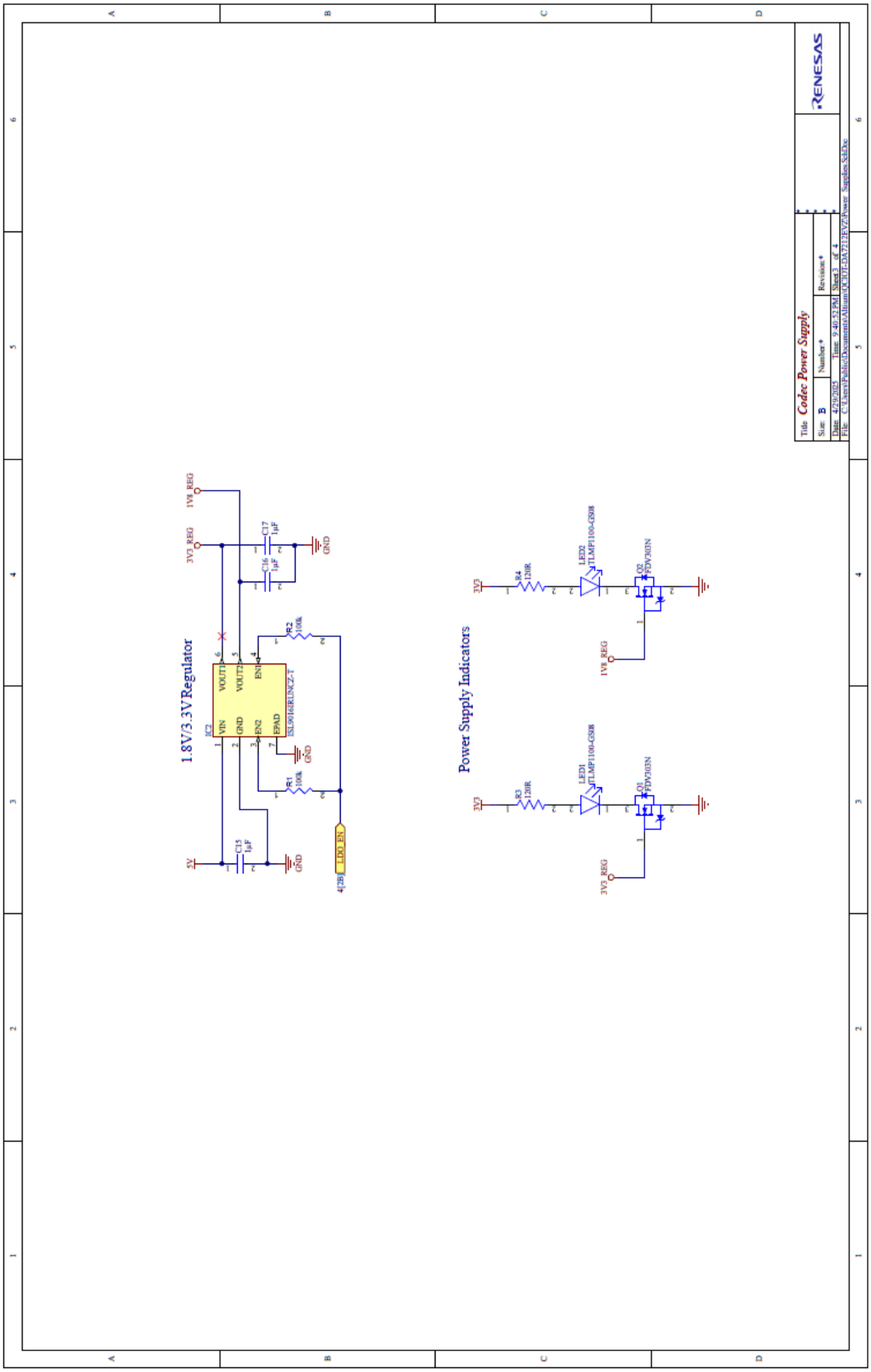


**Figure 8. Codec Power Supply Schematic**

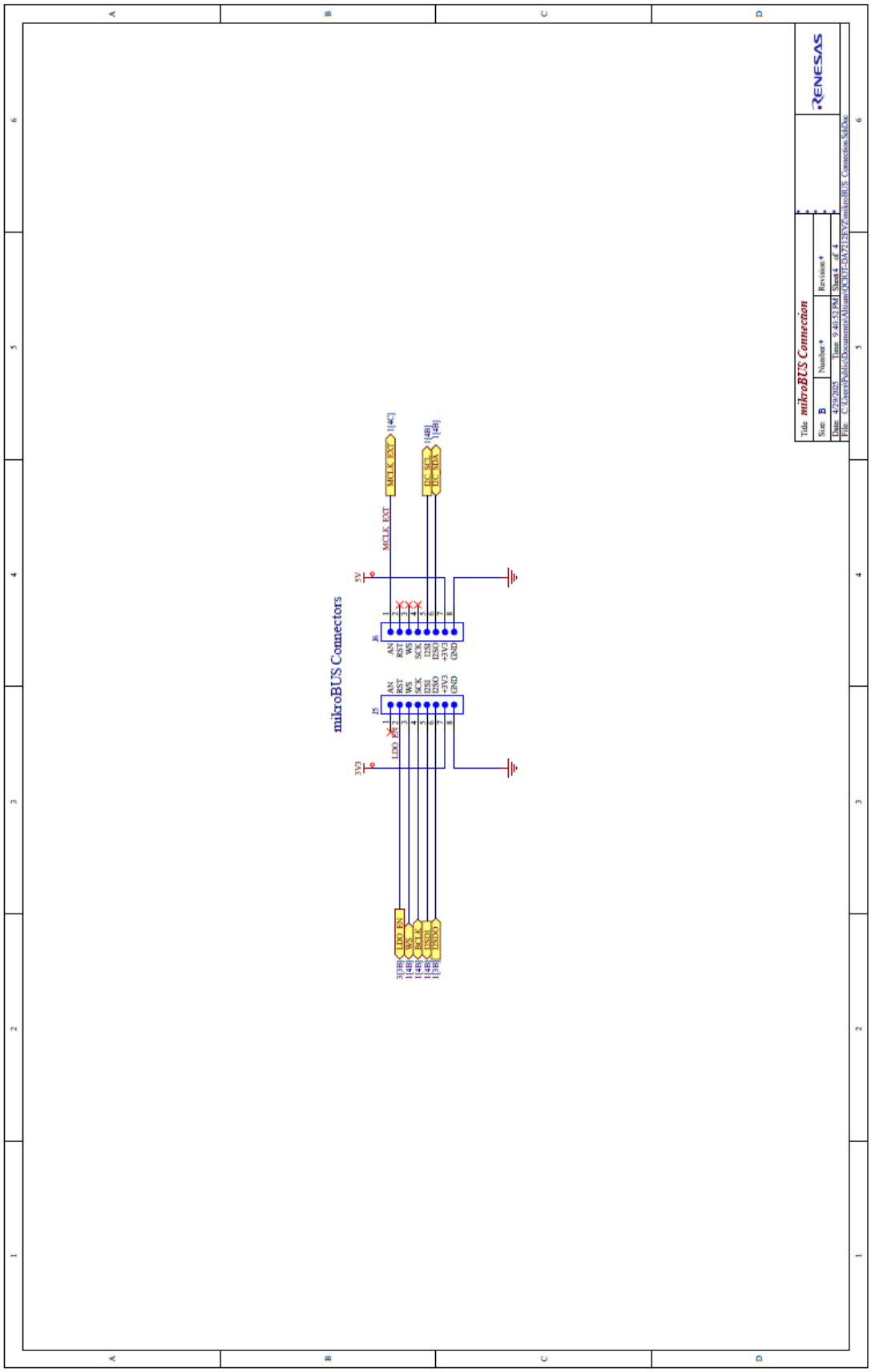


**Figure 9. mikroBUS Connection Schematic**

## 2.2 Bill of Materials (BOM)

| Qty | Reference Designator | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|
| 19 | C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C15, C16, C17, C18, C20, C21 | Chip Multilayer Ceramic Capacitors for General Purpose, 0201, 1.0µF, X5R, 15%, 20%, 6.3V | Murata | GRM033R60J105MEA2D |
| 1 | C14 | Chip Multilayer Ceramic Capacitors for General Purpose, 0201, 10000pF, X7R, 15%, 10%, 10V | Murata | GRM033R71A103KA01D |
| 1 | C19 | Chip Multilayer Ceramic Capacitors for General Purpose, 0201, 0.10µF, X5R, 15%, 10%, 6.3V | Murata | GRM033R60J104KE19D |
| 1 | DMIC1 | Integrated circuit | STMicroelectronics | MP23DB02MMTR |
| 1 | IC1 | Integrated circuit | Dialog Semiconductor | DA7212-01UM2 |
| 1 | IC2 | ISL9016IRUNCZ-T Pb-free Dual Ldo W/low Noise, High Psrr, Low Iq 1.6 × 1.6 Ut | Renesas | ISL9016IRUNCZ-T |
| 2 | J1, J2 | Conn Header Vert 2 Pos 2.54mm | Wurth Electronics | 61300211121 |
| 2 | J3, J4 | 3.5 mm, Stereo, Right Angle, Through Hole, 3 Conductors, 0–2 Internal Switches, Audio Jack Connector | Same Sky | SJ1-3513N |
| 2 | J5, J6 | THT Vertical Pin Header WR-PHD, Pitch 2.54mm, Single Row, 8 pins | Wurth Electronics | 61300811121 |
| 1 | J7 | Male Header, Pitch 2.54 mm, 1 × 3 Position, Height 8.38mm, Tail Length 3.18mm, RoHS, Bulk | Molex | 22-28-4033 |
| 3 | JMP1, JMP2, JMP3 | Conn Jumper Shorting .100" Gold | Sullins | QPC02SXGN-RC |
| 2 | LED1, LED2 | LED Green 0603 SMD | Vishay | TLMP1100-GS15 |
| 2 | Q1, Q2 | N-Channel MOSFET Transistor, 8 V VGSS, 25 V VDSS, 0.68A, -55 to 150 °C, 3-Pin SOT23, RoHS, Tape and Reel | ON Semiconductor / Fairchild | FDV303N |
| 2 | R1, R2 | Chip Resistor, 100kOhm, ±1%, 0.1 W, -55 to 155 °C, 0603 (1608 Metric) | Vishay | CRCW0603100KFKEAC |
| 2 | R3, R4 | RES Thick Film, 120Ω, 1%, 0.125W, 100ppm/°C, 0805 | Vishay | CRCW0805120RFKEA |
| 2 | R5, R6 | Chip Resistor, 47kOhm, ±1%, 0.1 W, -55 to 155 °C, 0603 (1608 Metric), RoHS, Tape and Reel | Panasonic | ERJ-3EKF4702V |
| 1 | SP1 | 13 mm, Square Frame, 0.7 W, 8 Ohm, Samarium Cobalt Magnet, Mylar Cone | Same Sky | CDS-13138-SMT-TR |
| 1 | Y1 | XTAL Oscillator 12.288MHz ±50ppm HCMOS, TTL 3.3V 4-SMD 5mm × 3.2mm | Abracon | ASFL1-12.288MHZ-EC-T |

## 2.3 Board Layout

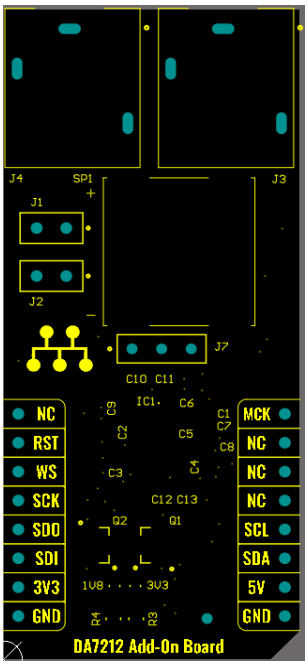


Figure 10. Top Overlay

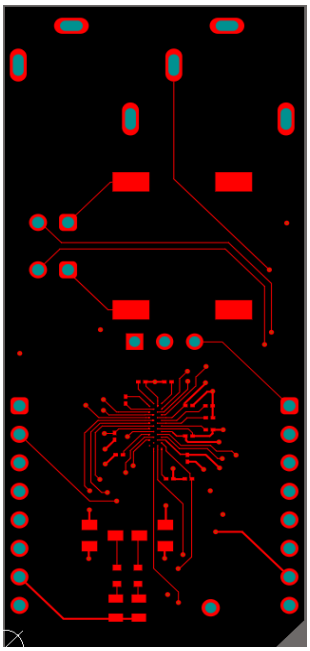

Figure 11. Top Layer

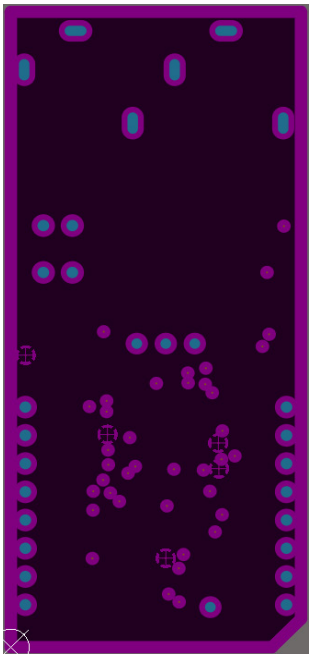

Figure 12. Layer 2 (GND)

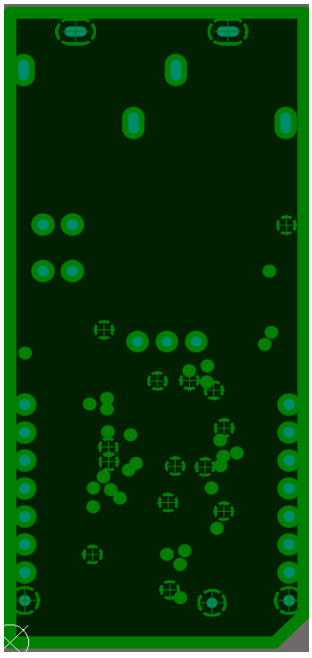

Figure 13. Layer 3 (3V3)

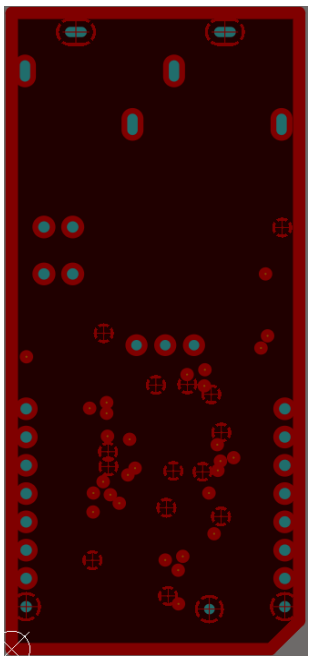

Figure 14. Layer 4 (1V8)

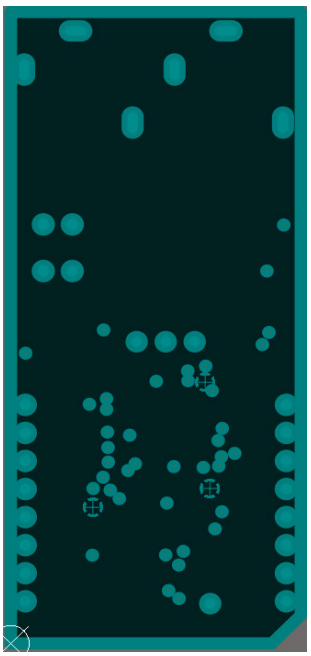

Figure 15. Layer 5 (GND)

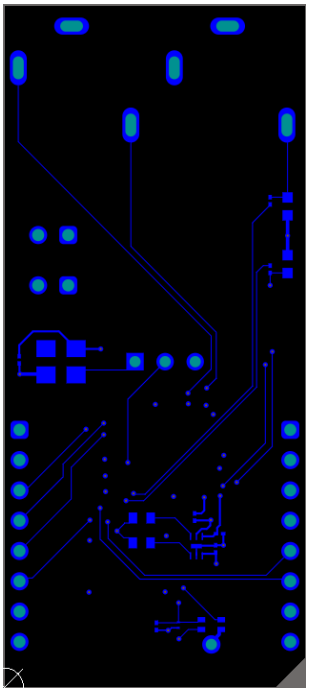

Figure 16. Bottom Layer

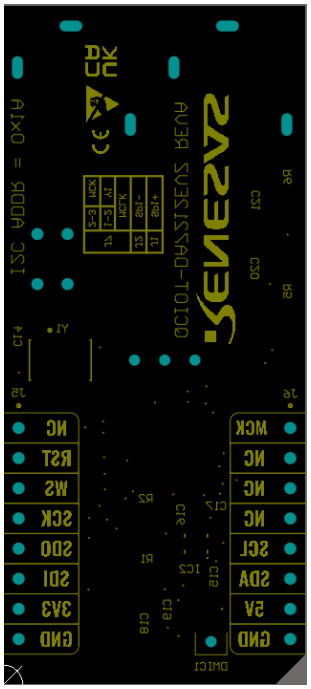


Figure 17. Bottom Overlay

# 3. Software Design

The following sections present an overview of the software implementation for the QCIOT-DA7212EVZ Click board, which is based on the Renesas RA Family's Flexible Software Package (FSP). The software has two modes:

1. **Wav Playback Mode** to test the Audio playback feature.
2. **Microphone Loopback Mode** to test the Microphone.

The following sections describe the two different software modes and the project's code structure.

## 3.1 Wav Playback Mode

Enter this mode by enabling the **PLAYBACK_MODE_WAV** macro located in the **audio_codec.h** file within **src** folder of the sample code. In this mode, perform the following steps:

1. Enable the LDO on the QCIOT-DA7212EVZ board.
2. Initialize the $I^2C$ peripheral and configure the QCIOT-DA7212EVZ Codec board
3. Initialize the SCI SPI for $I^2S$ interface.

When the **PLAYBACK_MODE_WAV** macro is successfully enabled, the codec board will start playing the Audio File data from the MCU.

A high-level software algorithm flowchart is shown in Figure 18.

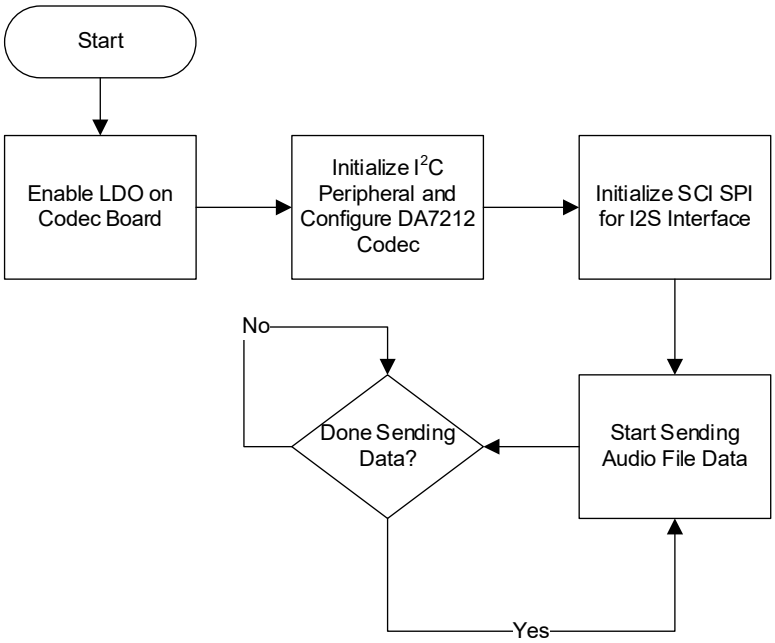


**Figure 18. Wav Playback Mode Algorithm Flowchart**

## 3.2 Microphone Loopback Mode

Enter this mode by disabling the **PLAYBACK_MODE_WAV** macro located in the **audio_codec.h** file within the **src** folder of the sample code. In this mode, perform the following steps:

1. Enable the LDO on the QCIOT-DA7212EVZ board.
2. Initialize the $I^2C$ peripheral and configure the QCIOT-DA7212EVZ Codec board.
3. Initialize the SCI SPI for $I^2S$ interface.

Once the Microphone data is received, copy the microphone data to the Output Buffer and send it to the Codec to allow reading of the data.

A high-level software algorithm flowchart is shown in Figure 19.

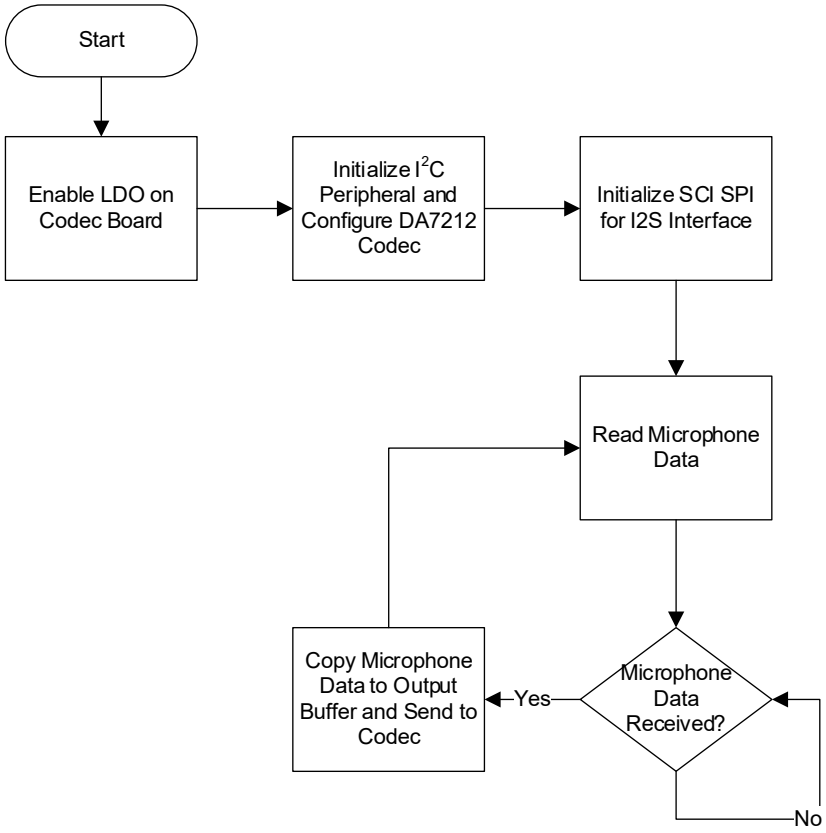


**Figure 19. Microphone Loopback Mode Algorithm Flowchart**

## 3.3 Project Code Structure

The Quick Connect project is designed to be a highly modular solution that can be easily configured independently of other modules (if required) or ported to other end-applications.

Figure 20 shows the structure of the project in e$^2$ studio.

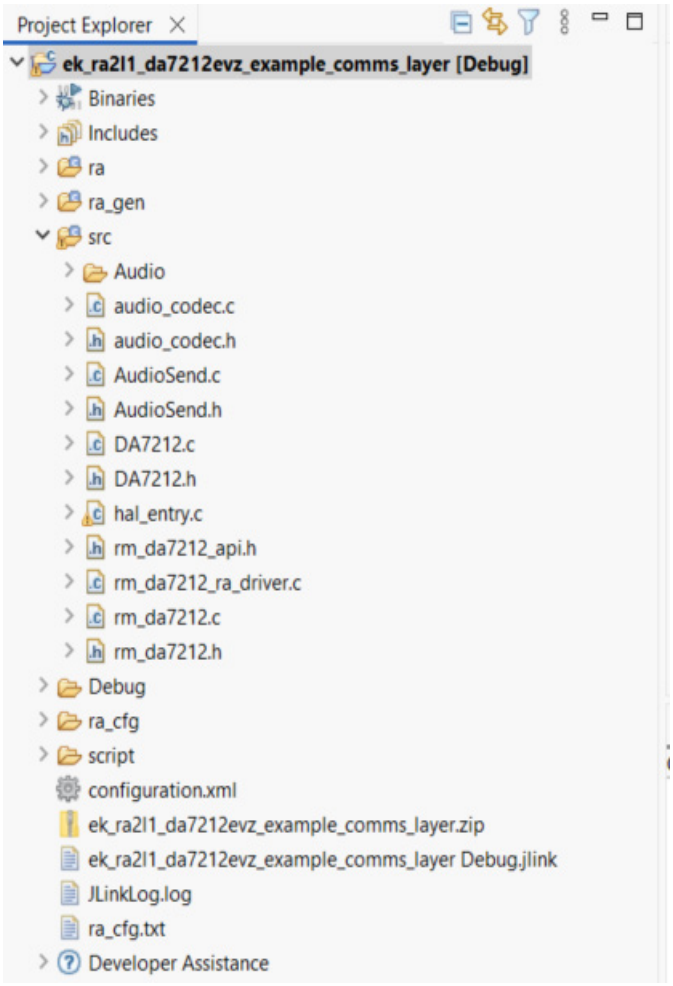


**Figure 20. Project Structure**

# 4. Board Test

## 4.1 Wav Playback Mode

1. Run the code in standalone mode to test the on-board speaker and headphone jack.

   *Note*: There are multiple sample codes available on the QCIOT-DA7212EVZ web page. Import the sample code **ek_ra2l1_da7212evz_example_comms_layer** to e$^2$ studio.

2. Build the sample code in e$^2$ studio to generate the **.srec** file under the Debug folder.

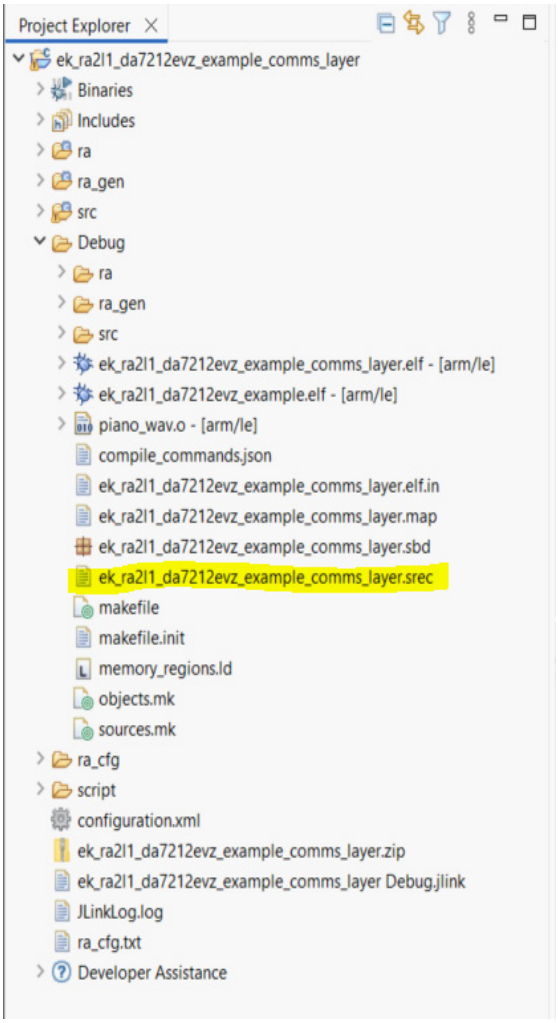


**Figure 21. Sample Code .srec File**

3. Load the **.srec** file to the EK-RA2L1 MCU using the SEGGER J-Flash Lite tool.

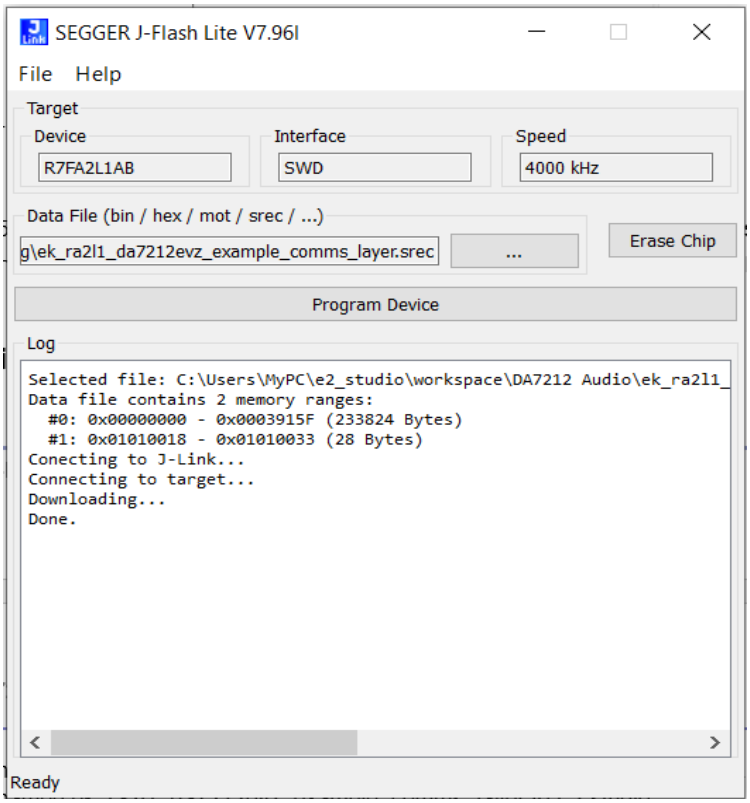


**Figure 22. SEGGER J-Flash Lite Tool**

4. Connect a 5V power supply to TP7 and GND to TP9 on the EK-RA2L1. Switch on the power supply.
5. It should now start looping a brief piano audio clip through the speaker and the headphone jack.

## 4.2 Microphone Loopback Mode

1. Run the code in standalone mode to test the microphone.

   *Note*: There are multiple sample projects located in the QCIOT-DA7212EVZ web page. Import the sample project **ek_ra2l1_da7212evz_example_comms_layer** to e$^2$ studio

2. Open the sample code project in e$^2$ studio. Go to the **audio_codec.h** file and comment out the line **//#define PLAYBACK_MODE_WAV** (see Figure 23).

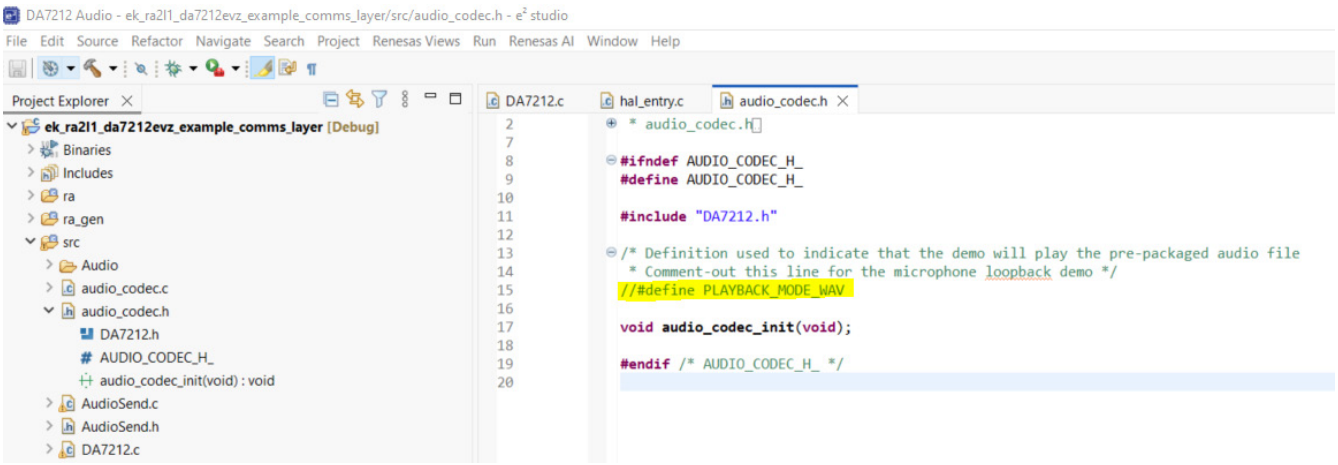


**Figure 23. Sample Code audio_codec.h File**

3. Rebuild the sample code in e$^2$ studio to generate the updated **.srec** file under the Debug folder. Ensure that there are zero errors and warnings.
4. Load the updated **.srec** file to the EK-RA2L1 MCU using the SEGGER J-Flash Lite tool.
5. Connect a 5V power supply to TP7 and GND to TP9 on EK-RA2L1. Switch-on the power supply.
6. It should now play whatever the microphone picks up through the headphone jack.

   *Note*: This mode does not support speaker due to feedback noise from the microphone being in close proximity.

# 5. Ordering Information

| Orderable Part Number | Description |
|---|---|
| QCIOT-DA7212EVZ | DA7212 Click Board |

# 6. Revision History

| Revision | Date | Description |
|---|---|---|
| 1.01 | Jun 16, 2025 | ▪ Updated Description and Features on page 1.<br>▪ Updated sections 1.1, 1.1.2, 3, and 4.<br>▪ Added new sections 3.1, 3.2, 4.1 and 4.2. |
| 1.00 | Jun 9, 2025 | Initial release. |

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)


### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com


### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit www.renesas.com/contact-us/.

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.