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. The input paths support stereo FM line input and up to four analog (or two analog and two digital) microphones with two independent microphone biases. Comprehensive analog mixing and bypass paths to the output drivers are available.

The headphone output is true-ground Class G with integrated charge pump. There is also a differential Class AB speaker driver that can serve as a mono lineout.

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

Features

- 100dB SNR stereo audio playback into 16Ω headphones
- 3.1mW power consumption for stereo DAC to headphone playback
- 1.2W mono speaker driver
- 650µW mono voice recorder
- Stereo digital microphone support
- Supports up to four analog microphones
- Two low-noise microphone-bias outputs
- Low-power PLL provides system clocking and audio sample rate flexibility
- Built-in 5-band equalizer, ALC and noise-gate functions
- Built-in beep generator
- Integrated system controller to eliminate pops and clicks
- Minimized external component count
- 34-ball WLCSP (4.54 × 1.66 mm) package
- Staggered 0.5 mm pitch for easy PCB routing allowing low-cost manufacture

Kit Contents

- QCIOT-DA7212EVZ Click Board

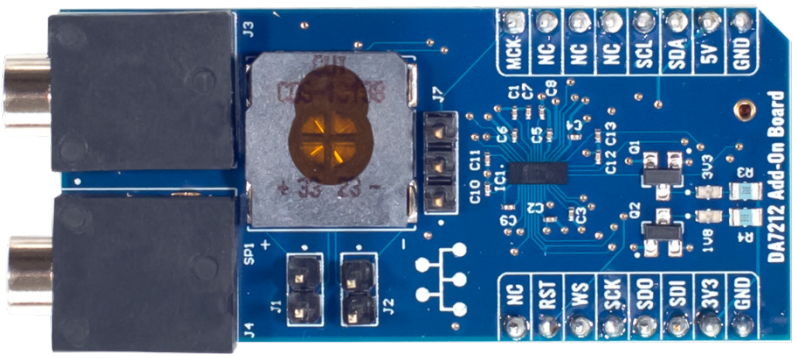


Figure 1. QCIOT-DA7212 Click Board

Contents

1. Functional Description 3
1.1 Setup and Configuration 3
1.1.1 Software Installation 3
1.1.2 Kit Hardware Connections 4
2. Board Design 5
2.1 Schematic Diagrams 6
2.2 Bill of Materials (BOM) 10
2.3 Board Layout 11
3. Software Design 13
3.1 Project Code Structure 13
4. Board Test 14
4.1 Run Code in Stand-Alone Mode 14
5. Ordering Information 17
6. Revision History 17

Figures

Figure 1. QCIOT-DA7212 Click Board 1
Figure 2. QCIOT-DA7212EVZ Click Board Block Diagram 3
Figure 3. QCIOT-DA7212EVZ Click Board with EK-RA2L1 MCU 4
Figure 4. US082 ZSSC3123 Pmod Board Image (Top) 5
Figure 5. US082 ZSSC3123 Pmod Board Image (Bottom) 5
Figure 6. DA7212 Connections Schematic 6
Figure 7. Audio Input/Output Connections Schematic 7
Figure 8. Codec Power Supply Schematic 8
Figure 9. mikroBUS Connection Schematic 9
Figure 10. Top Overlay 11
Figure 11. Top Layer 11
Figure 12. Layer 2 (GND) 11
Figure 13. Layer 3 (3V3) 11
Figure 14. Layer 4 (1V8) 12
Figure 15. Layer 5 (GND) 12
Figure 16. Bottom Layer 12
Figure 17. Bottom Overlay 12
Figure 18. Audio File Format 14
Figure 19. Generated .srec File 14
Figure 20. SEGGER J-Flash Lite Tool 15
Figure 21. PuTTY Settings 15
Figure 22. UART Output 16

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.

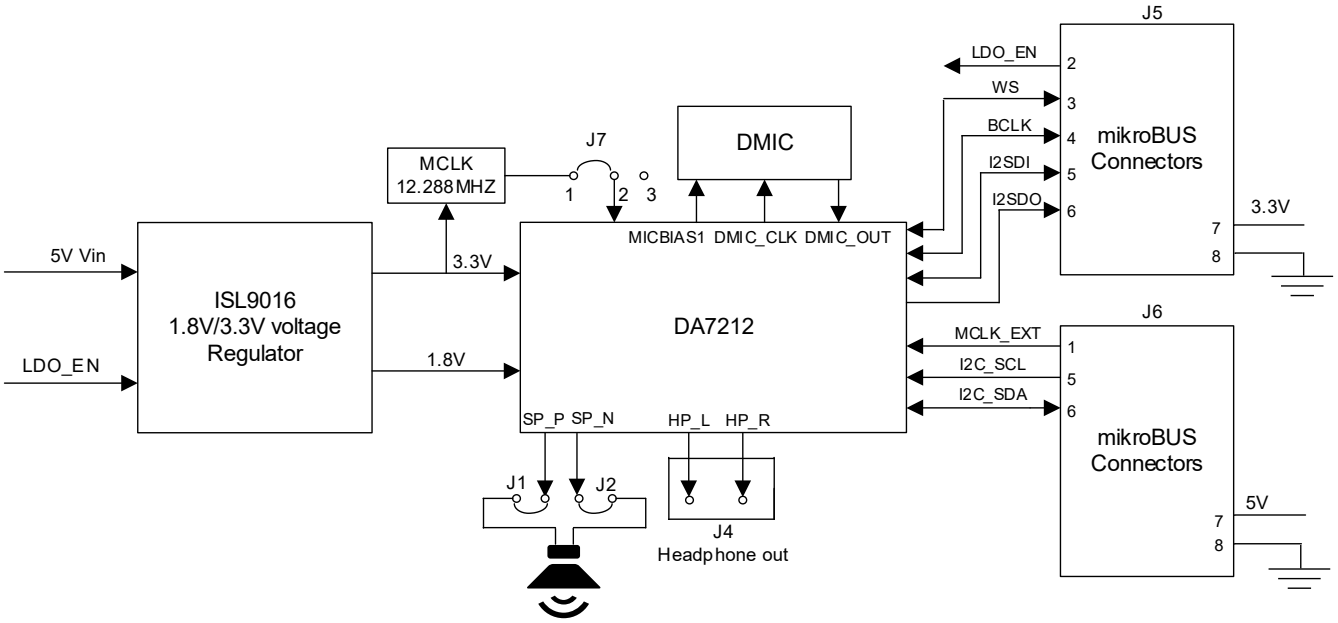


Figure 2. QCIOT-DA7212EVZ Click Board Block Diagram

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
- Micro-SD card reader Pmod
- Micro-SD card
- UART connection to the MCU

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)

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 on-board speaker. To play audio via Headphone (J4), populate only pins 1 and 2 of J7 with jumper and leave the rest open.
3. Ensure the EK-RA2L1 has the cyberon DSpotter license installed. To install the DSpotter license, refer to section 5 of the QCIOT-DA7212EVZ application note.
4. 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.
5. Connect the EK board to the computer with a USB micro-B cable.
6. Connect the Micro SD card using Pmod Micro SD card reader to PMOD2 on the MCU kit.
7. Connect the USB to TTL, RX to P302 on EK-RA2L1, TX to P301 on EK-RA2L1 and ground.
8. The device is now ready to be used in the system.

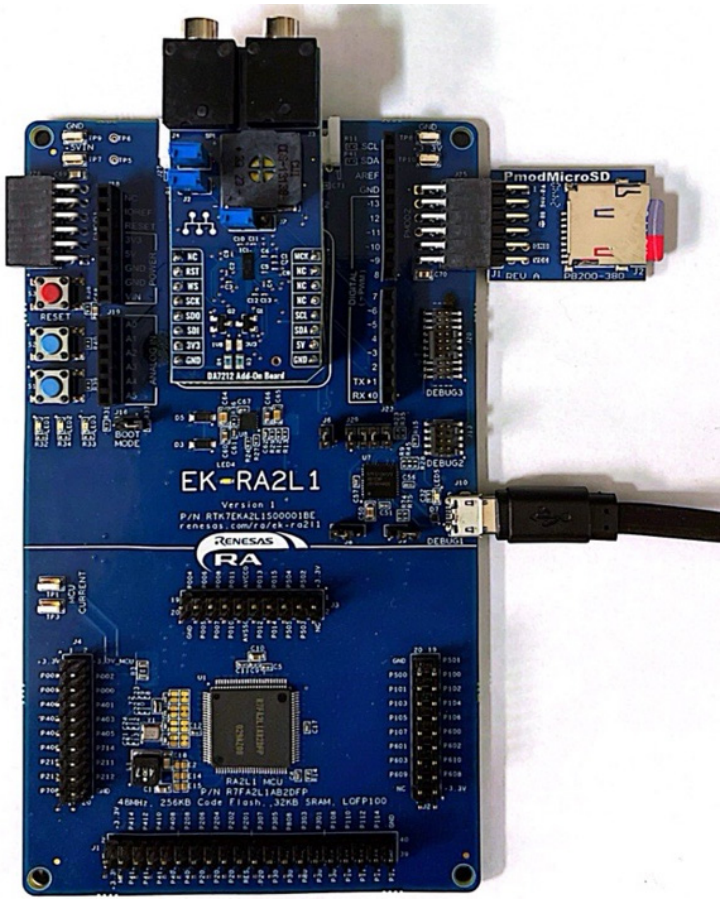


Figure 3. QCIOT-DA7212EVZ Click Board with EK-RA2L1 MCU

2. Board Design

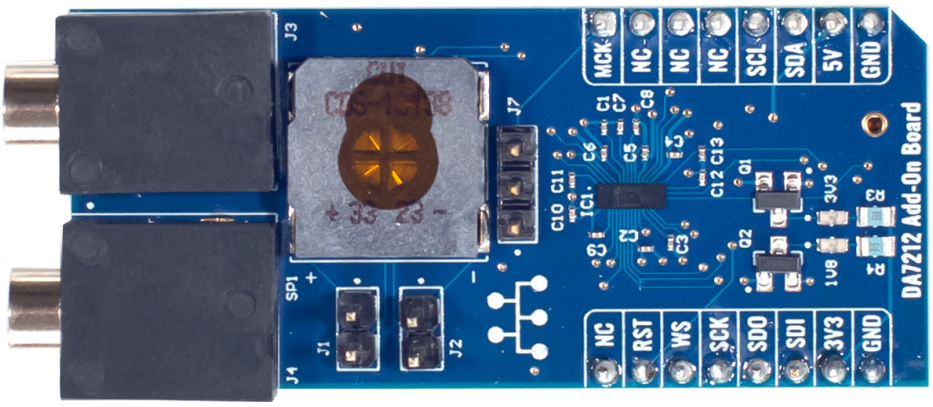


Figure 4. US082 ZSSC3123 Pmod Board Image (Top)

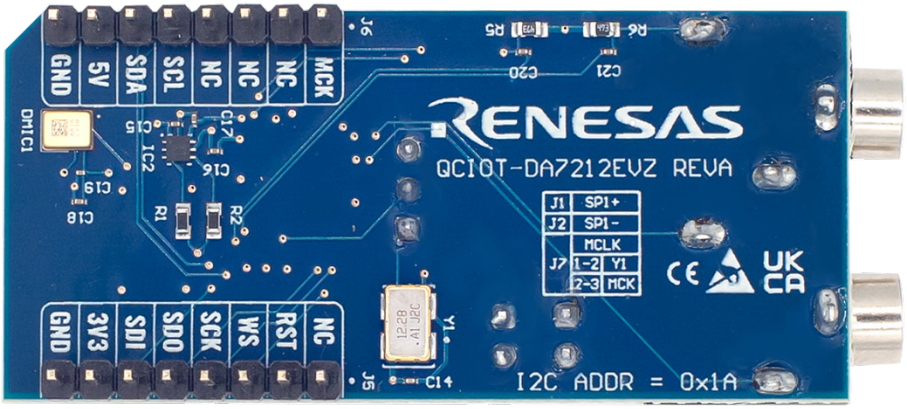


Figure 5. US082 ZSSC3123 Pmod Board Image (Bottom)

2.1 Schematic Diagrams

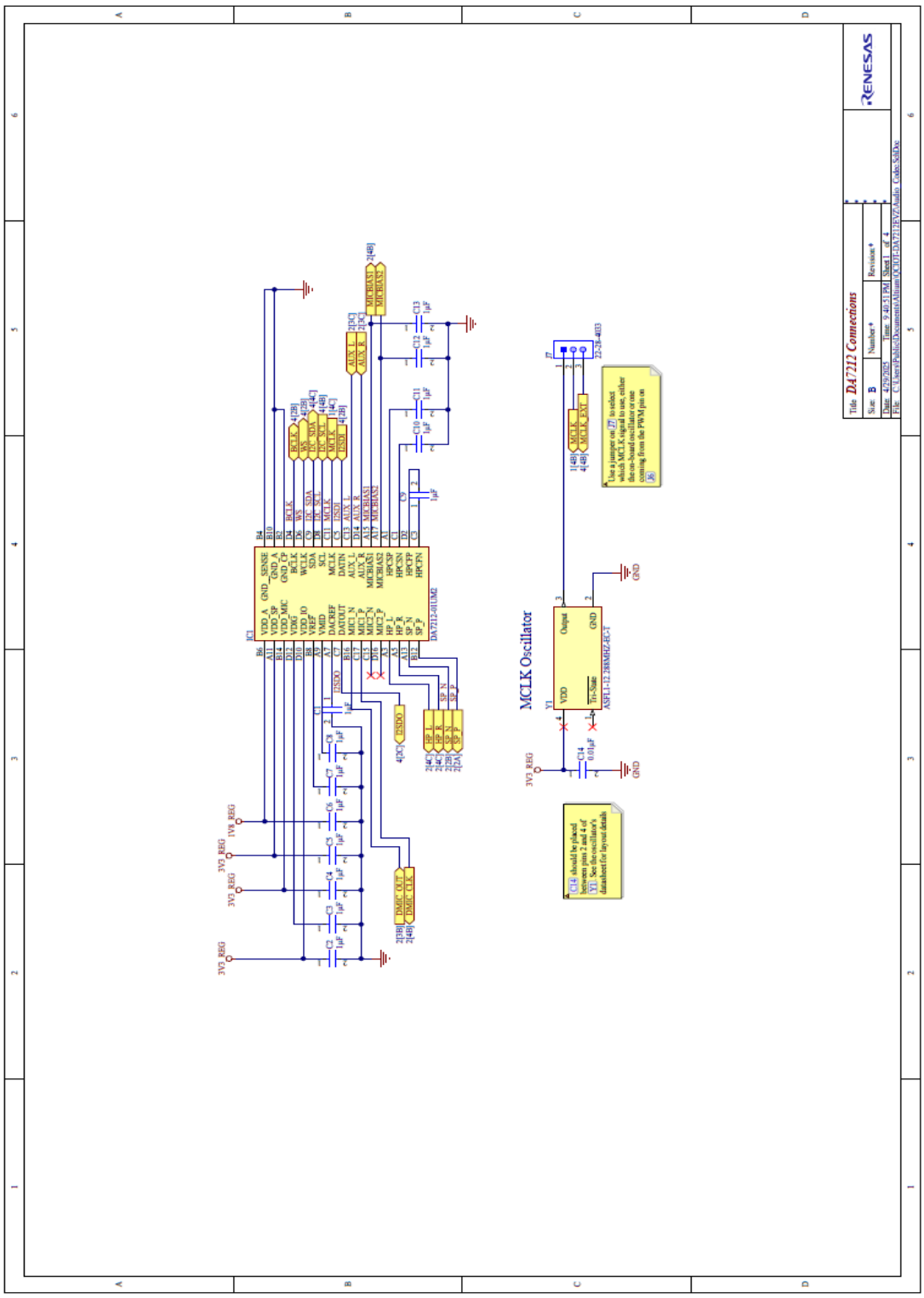


Figure 6. DA7212 Connections Schematic

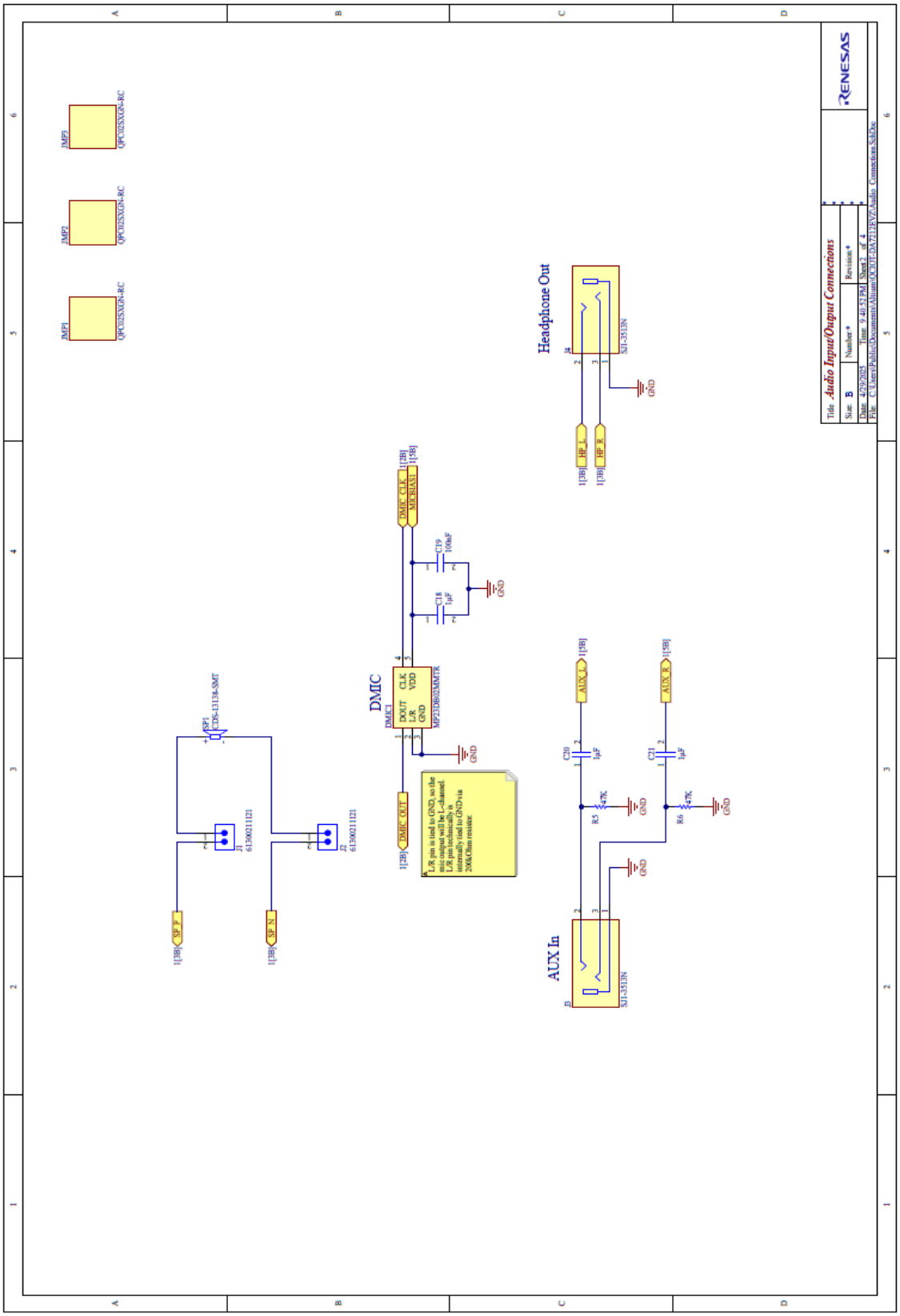


Figure 7. Audio Input/Output Connections Schematic

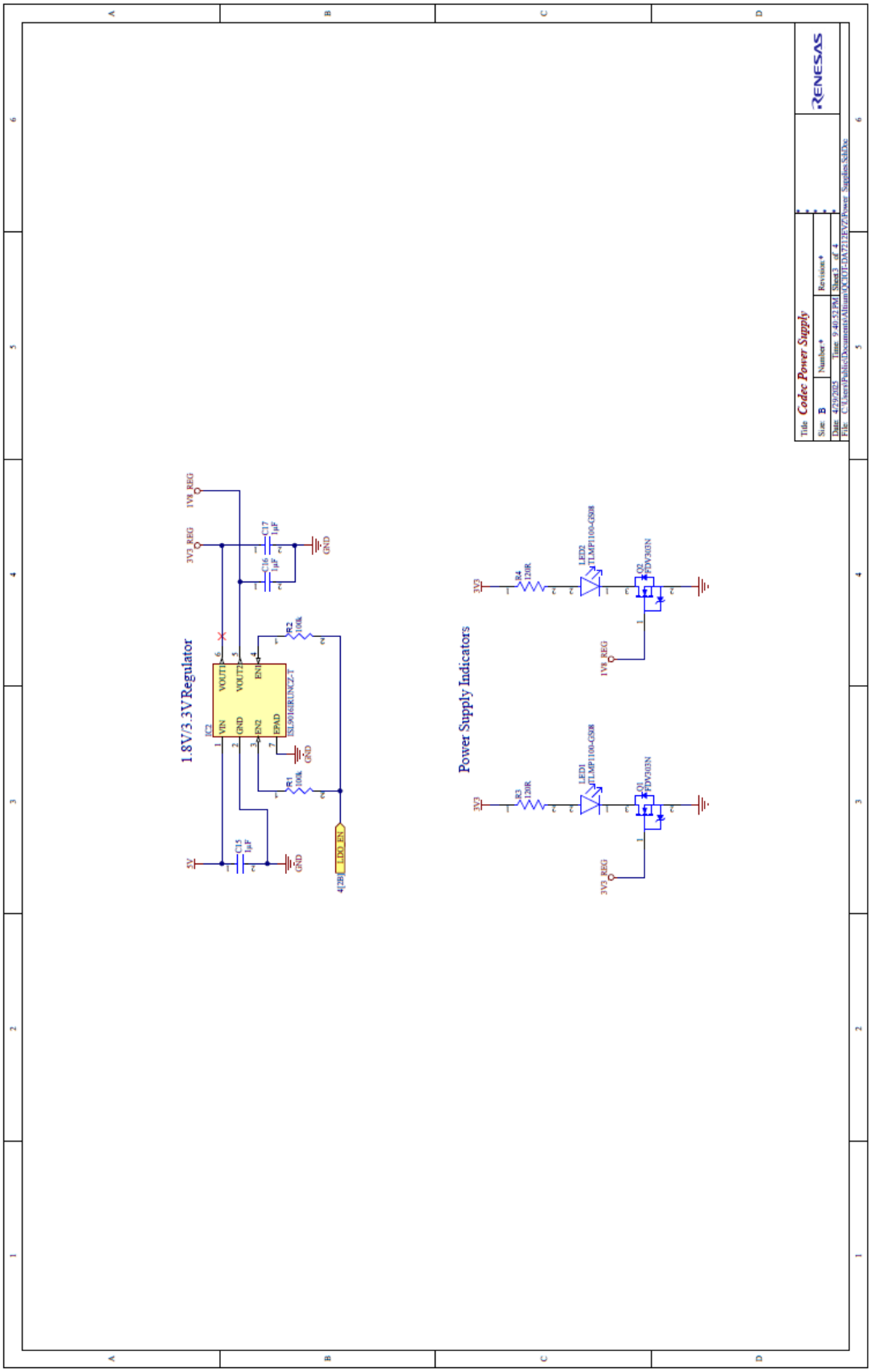


Figure 8. Codec Power Supply Schematic

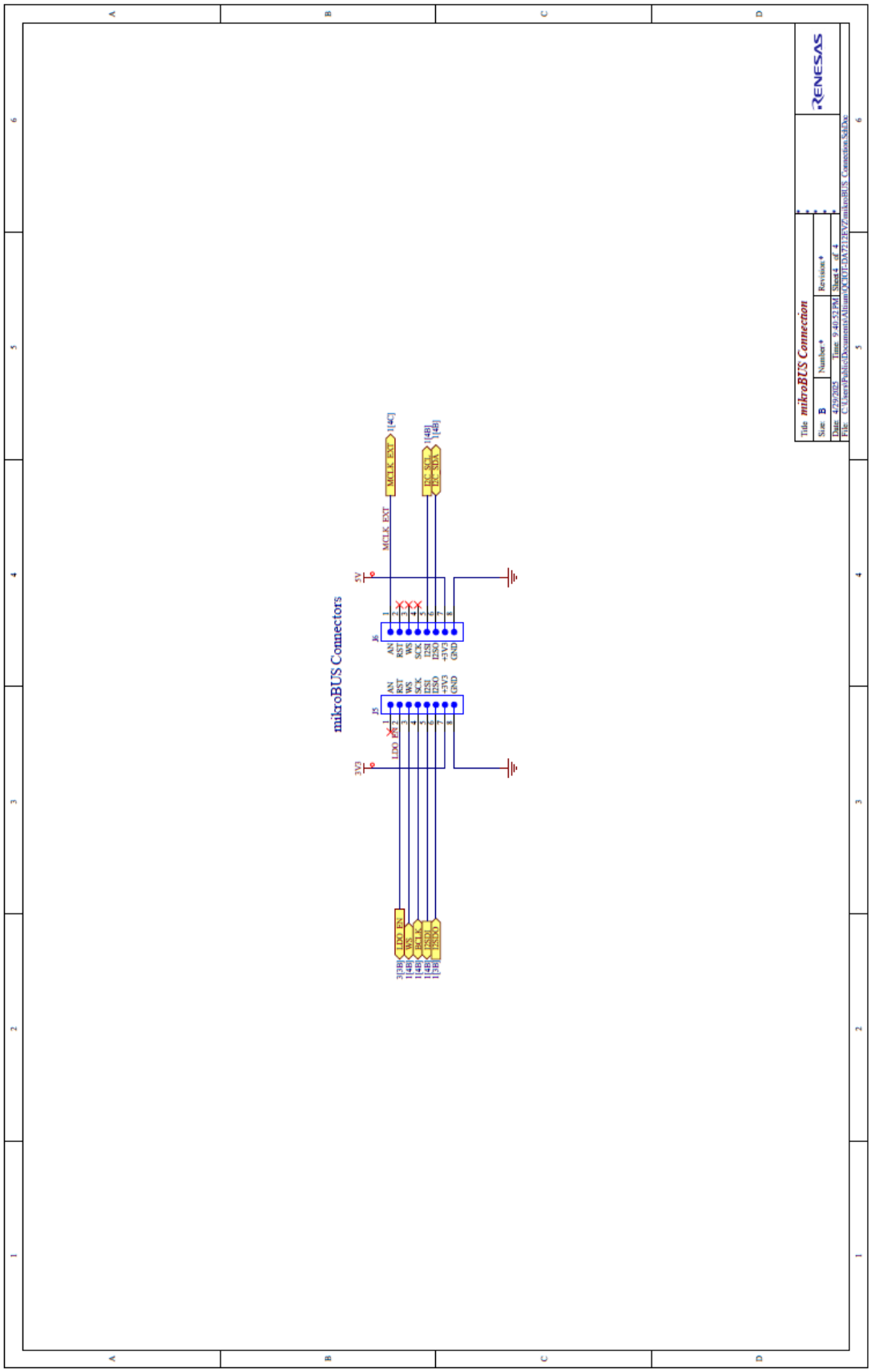


Figure 9. mikroBUS Connection Schematic

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, 100 kOhm, ±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, 47 KOhm, ±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

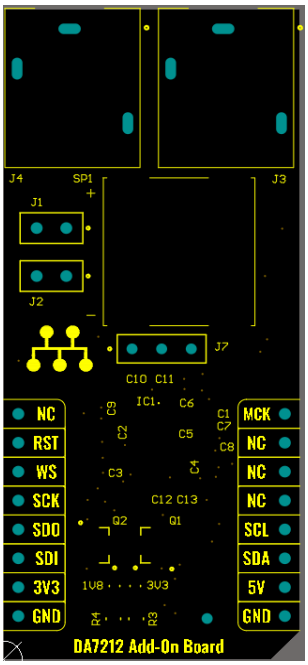


Figure 10. Top Overlay

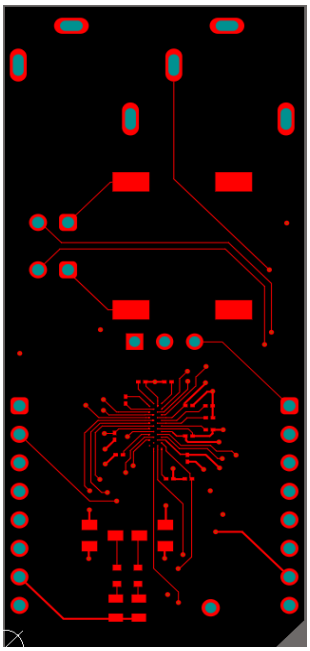


Figure 11. Top Layer

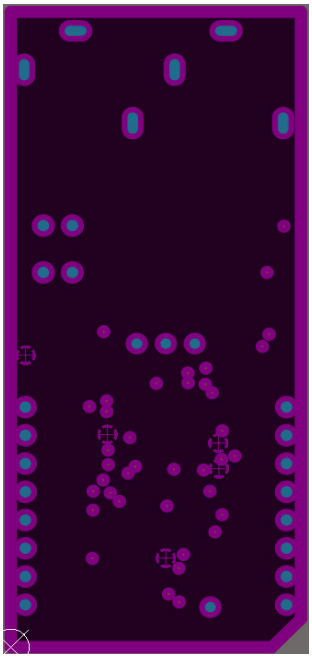


Figure 12. Layer 2 (GND)

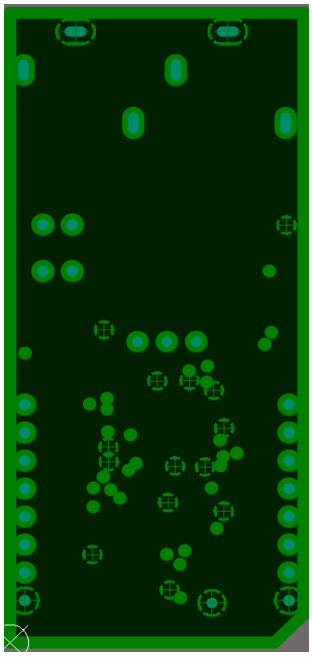


Figure 13. Layer 3 (3V3)

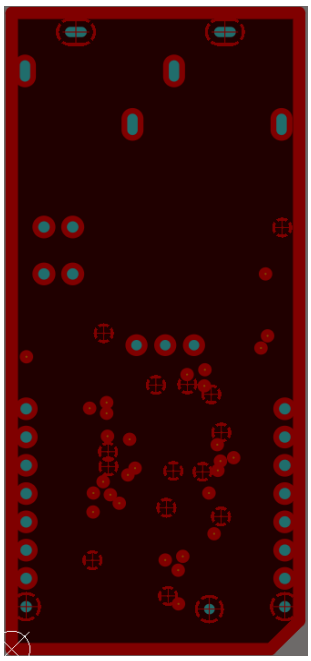


Figure 14. Layer 4 (1V8)

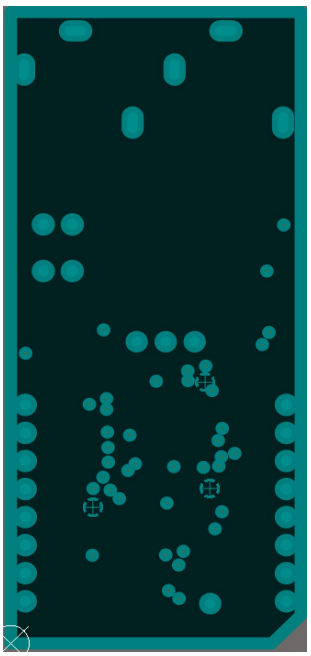


Figure 15. Layer 5 (GND)

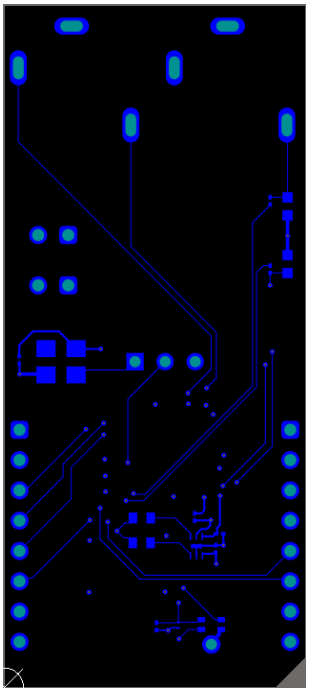


Figure 16. Bottom Layer

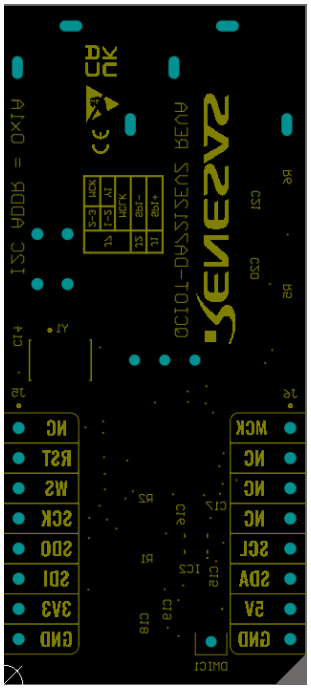


Figure 17. Bottom Overlay

3. Software Design

The following sections present an overview of the software implementation and detail the project's code structure, the system's software modules, and the main system flow for the QCIOT-DA7212EVZ Click board. This is based on the Renesas RA Family's Flexible Software Package (FSP).

The provided demo sets the mikroBUS Reset pin to high to enable the LDO on the QCIOT-DA7212EVZ Click board on start-up and uses **audio_codec_init** routine to initialize the QCIOT-DA7212EVZ Click board for audio input/output handling.

The **fie_initFileSystem** routine initializes the FAT FS for media access and initializes the cyberon Dspotter engine. The **voice_main** routine is responsible for processing the user voice input using the on-board microphone and for playing audio either on the on-board speaker or via headphone.

For more information on software design, refer to the QCIOT-DA7212EVZ application note.

3.1 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 18 shows the structure of the project in e^2 studio.

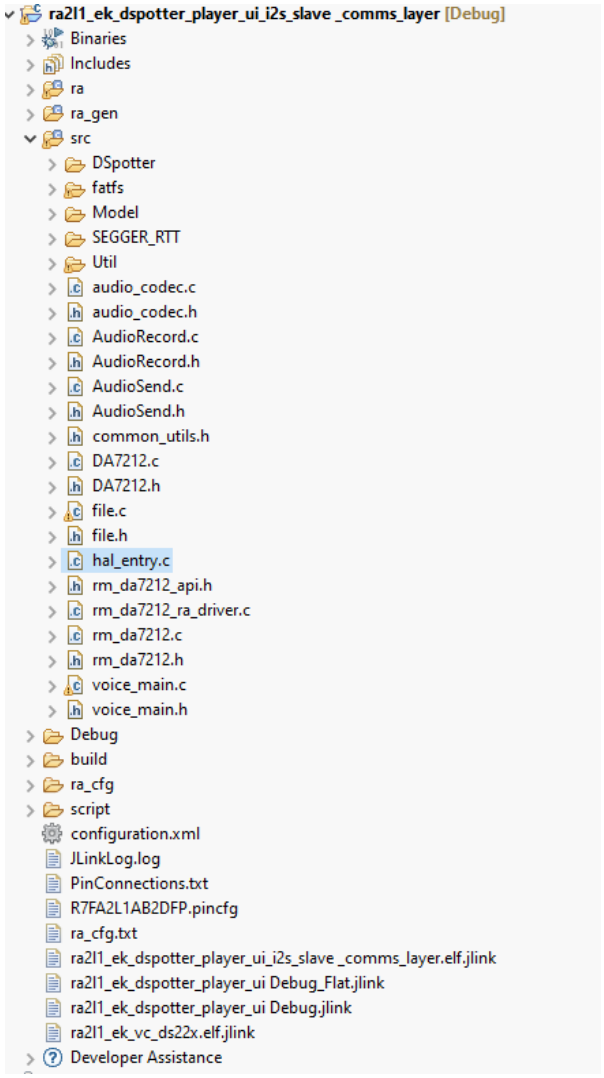


Figure 18. Project Structure

4. Board Test

4.1 Run Code in Stand-Alone Mode

1. Before loading the sample project to the MCU, ensure the SD card contains loaded music files.

   Note: The music files should be formatted as **.wav** files, channels should be set to Mono, and the sample rate should be 16kHz. The Audacity tool is used to export audio.

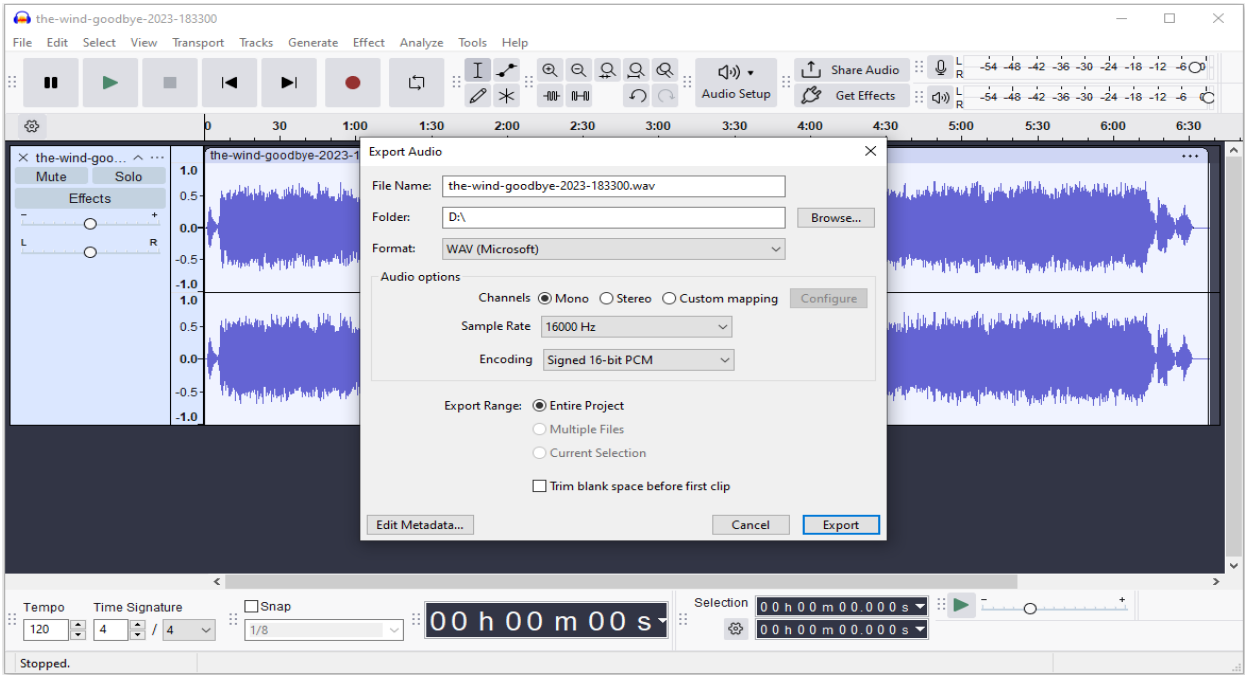


Figure 18. Audio File Format

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

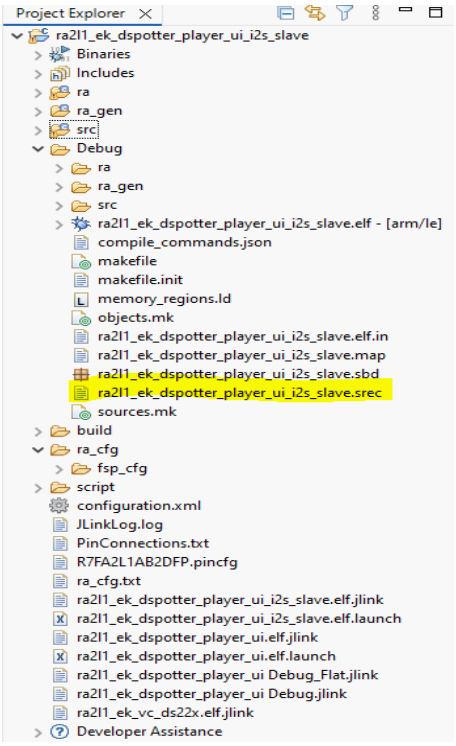


Figure 19. Generated .srec File

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

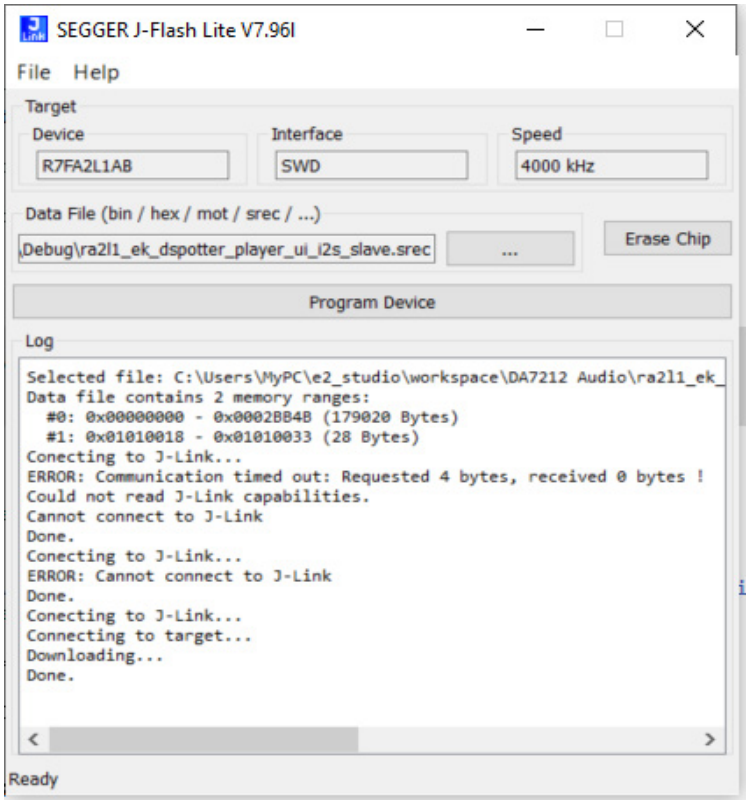


Figure 20. SEGGER J-Flash Lite Tool

4. Connect the USB to TTL. On the EK-RA2L1, connect RXD to P302, TXD to P301, and GND to GND.
5. Open PuTTY and select the appropriate correct COM port. Change the Speed (baud) rate to 115200.

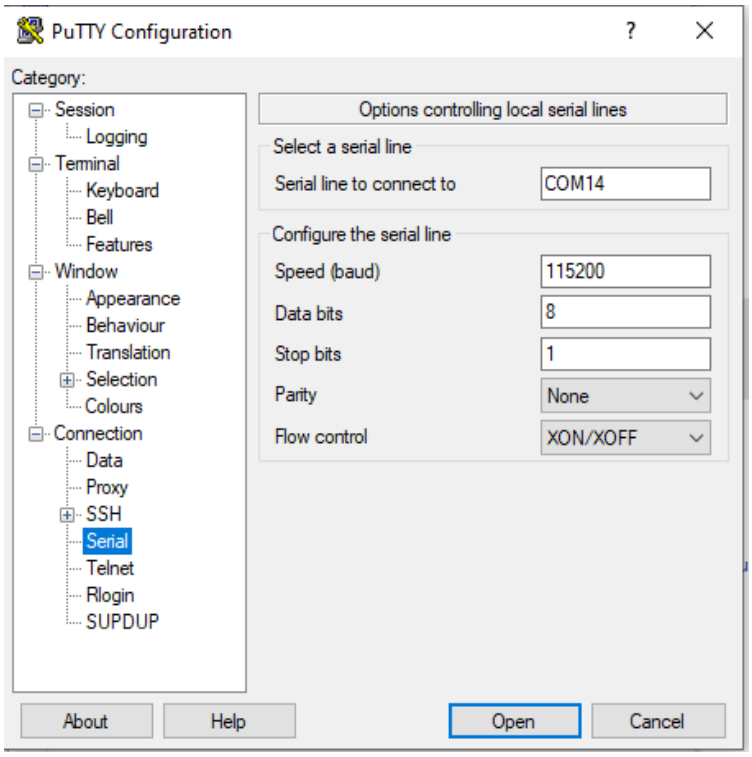


Figure 21. PuTTY Settings

6. Connect the 5V power supply to TP7 and GND to TP 9 on the EK-RA2L1. Switch on power supply. Ensure the following message is displayed on PuTTY as shown in Figure 22.

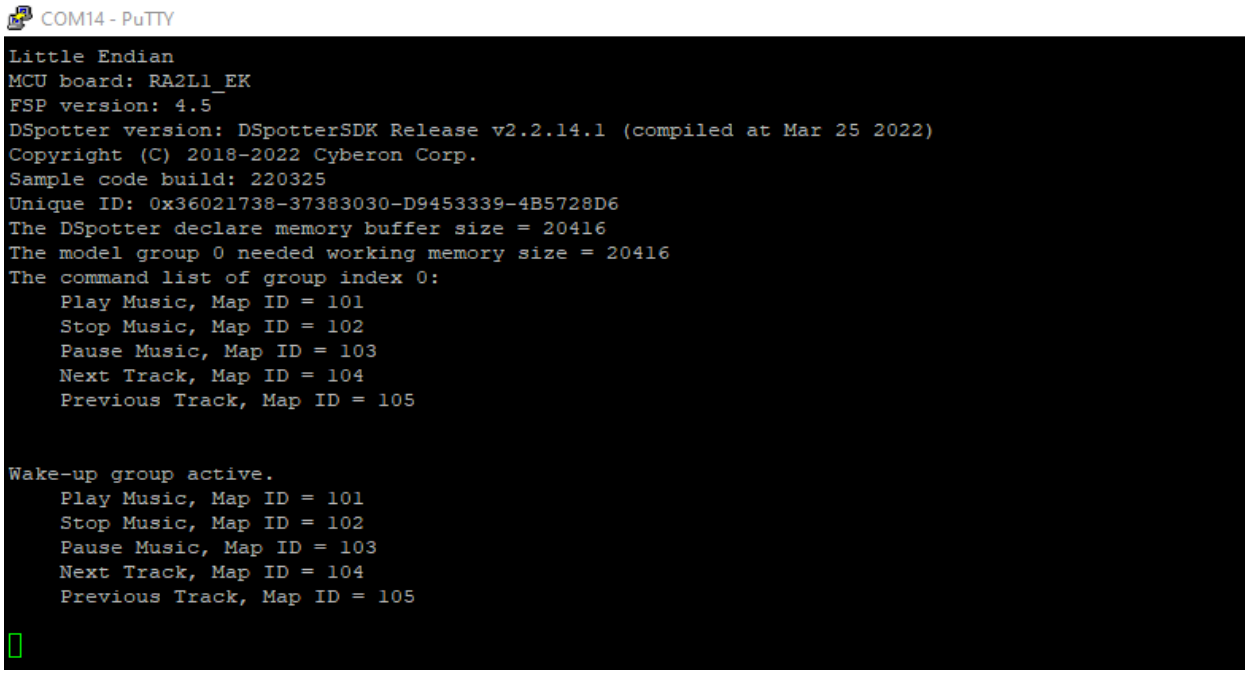
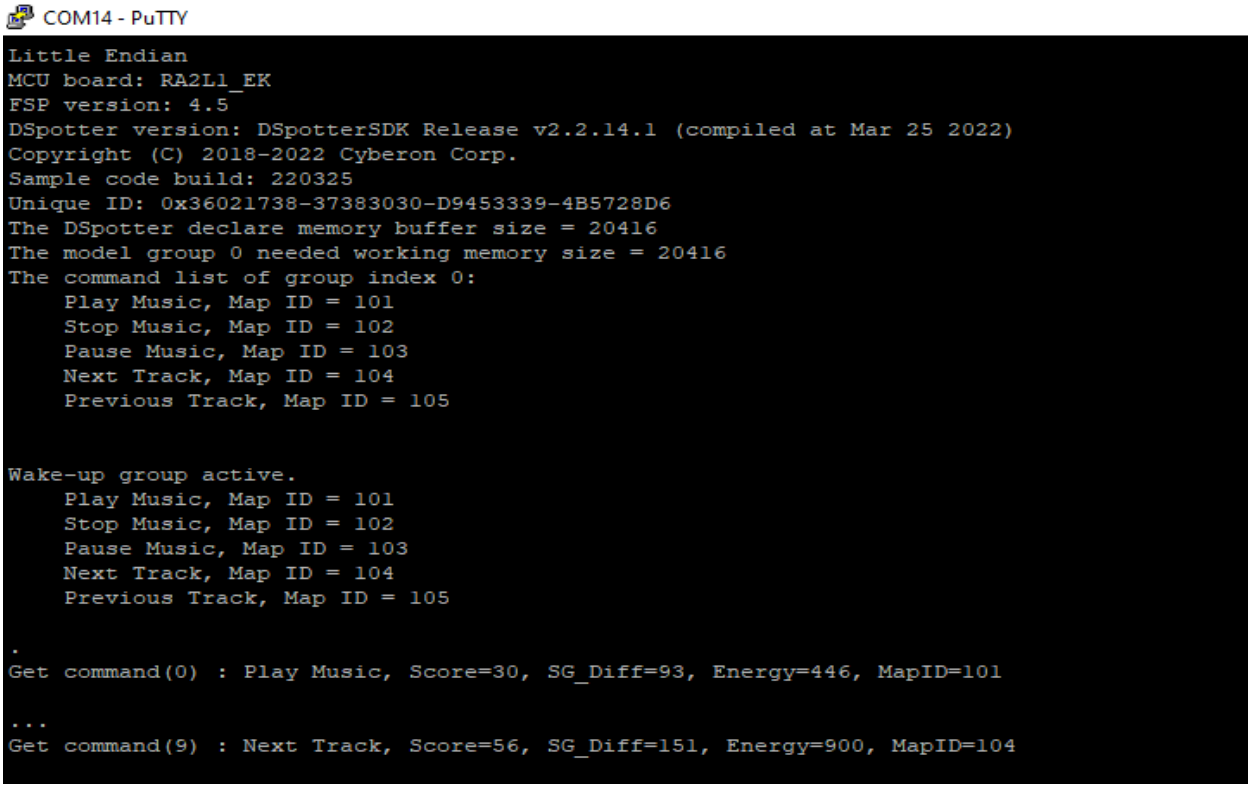


Figure 22. UART Output

7. Press switch S1 on EK-RA2L1 to run Cyberon-Dspotter. Say “Play music“ to start playing music using the on-board speaker.
8. Press Switch S1 on EK-RA2L1. Say “Next track” to switch to the next track.



5. Ordering Information

Orderable Part Number	Description
QCIOT-DA7212EVZ	DA7212 Click Board

6. Revision History

Revision	Date	Description
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.