

Common Extension Board

Pmod I2S Audio Extension Board

User's Manual: Hardware

Y-COMMON-PMOD-I2S-AUDIO-EXT

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General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between VIL (Max.) and VIH (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between VIL (Max.) and VIH (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems.

The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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1. Introduction

The Pmod I2S Audio Extension Board enables evaluation and development of audio functions on MCU host platforms equipped with a compatible Pmod interface, for example the Common Main Board (Y-COMMON-MB-T1-V1) and the RH850/U2C Starter Kit (Y-ASK-RH850U2Cx).

Notes

1. This document describes the functionality of the communication board and guides the user through its operation.
For details regarding the operation of the microcontroller, refer to the device's Hardware User's Manual.
2. In this document active low signals are marked by an appended 'Z' or '#' to the pin or signal name. E.g. the reset pin is named RESETZ or RESET#.
3. In this document the following abbreviations are used:
 - H level, L level: high or low signal level of a digital signal, the absolute voltage value depends on the signal

1.1 Package Components

The Y-COMMON-PMOD-I2S-AUDIO-EXT product package consists of the following items. After you have unpacked the box, check if your Y-COMMON-PMOD-I2S-AUDIO-EXT package contains all these items.

Table 1.1 Package Components for Pmod I2S Audio Board shows the packing components of the extension board package.

Table 1.1 Package Components for Pmod I2S Audio Board

Item	Description	Quantity
D021446	Pmod I2S audio extension board	1
D021446-24	Product contents list	1

Note

Please keep the extension board packing box at hand for later reuse in sending the product for repairs or for other purposes. Always use the original packing box when transporting the extension board Y-COMMON-PMOD-I2S-AUDIO-EXT. If packing of your product is not complete, it may be damaged during transportation.

1.2 Main Features

- Small audio extension board to be used with other RH850 or R-Car boards providing a Type 7 Pmod interface
- 3.3V power supply via Pmod connector
- 32-bit stereo A/D and D/A converter
- Supports target and controller mode
- Integrated MCLK
- Integrated speaker and microphone
- 3.5 mm jacks for connection of external speaker and microphone
- Operation temperature 0°C ≤ Ta ≤ +40°C

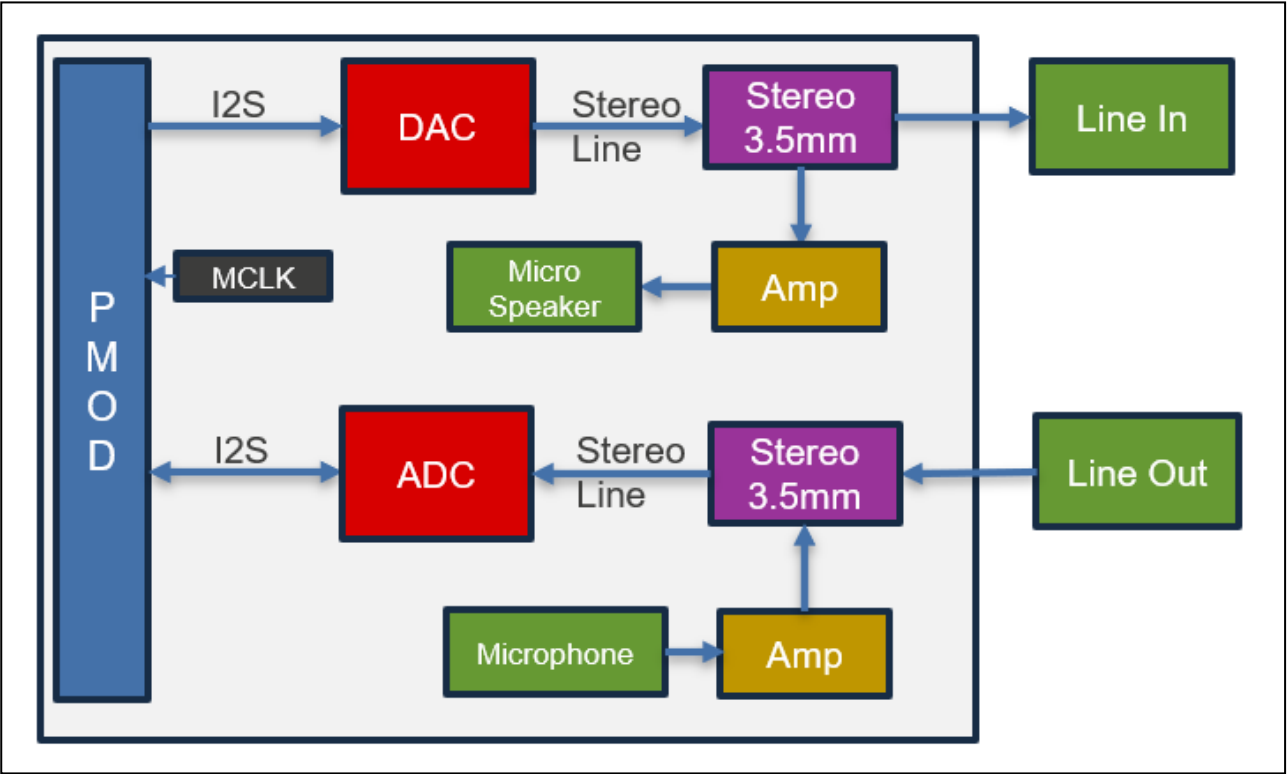


Figure 1.1 Functional overview

1.3 Extension Board Versions

The actual version of the audio extension board is

Table 1.2 Y-COMMON-PMOD-I2S-AUDIO-EXT board versions

Board Version	Schematic Version
D021446_06_V0100	D021446_06_V0100, only internal use
D021446_06_V0200	D021446_06_V0200

Board version D021446_06_V0100 has never been released to the public.

1.4 Extension Board Views

Below pictures show top and bottom view of the audio extension board.

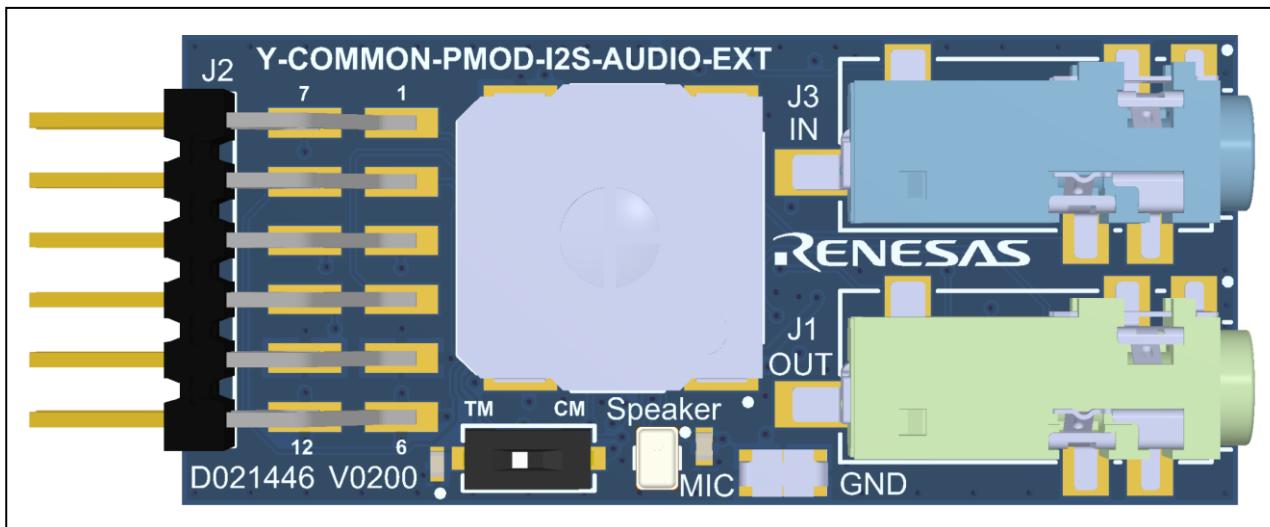


Figure 1.2 Y-COMMON-PMOD-I2S-AUDIO-EXT board top view

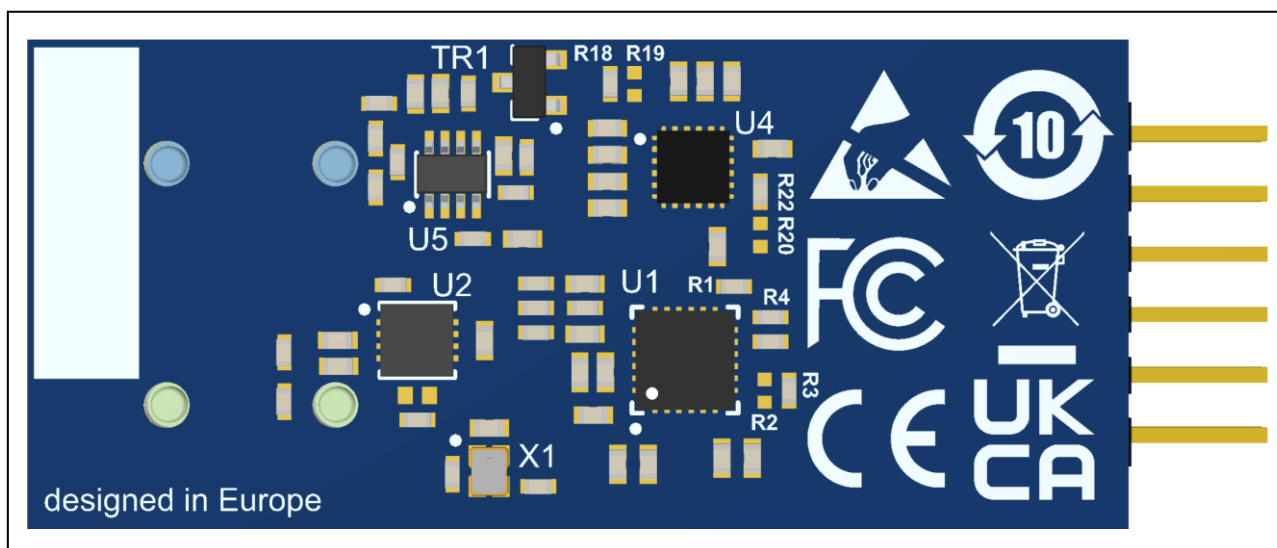


Figure 1.3 Y-COMMON-PMOD-I2S-AUDIO-EXT board bottom view

Below pictures show component placement.

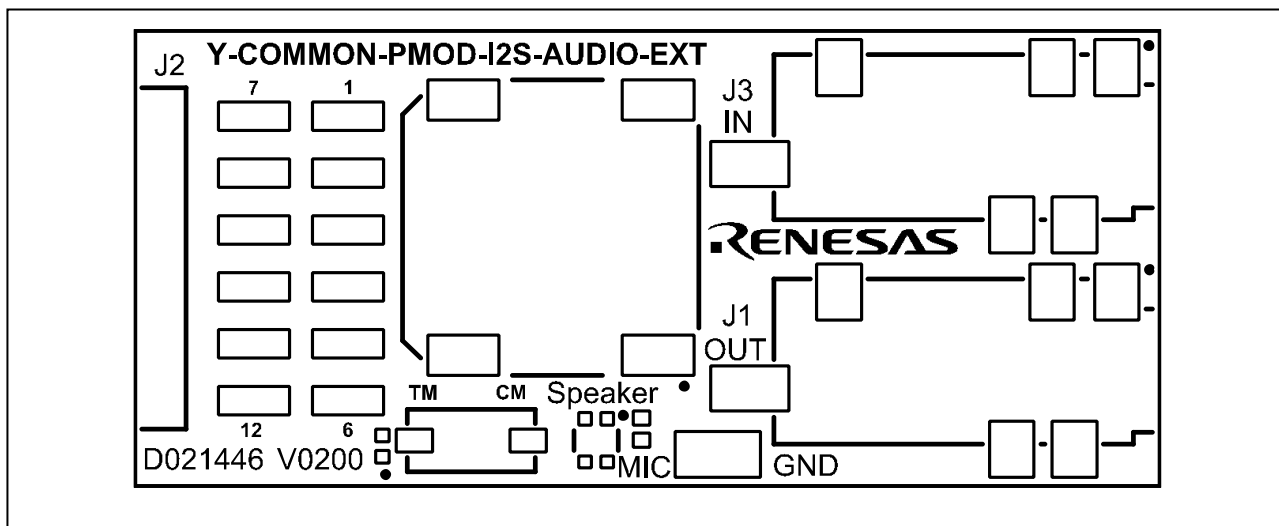


Figure 1.4 Placement of components on the top side of the audio extension board

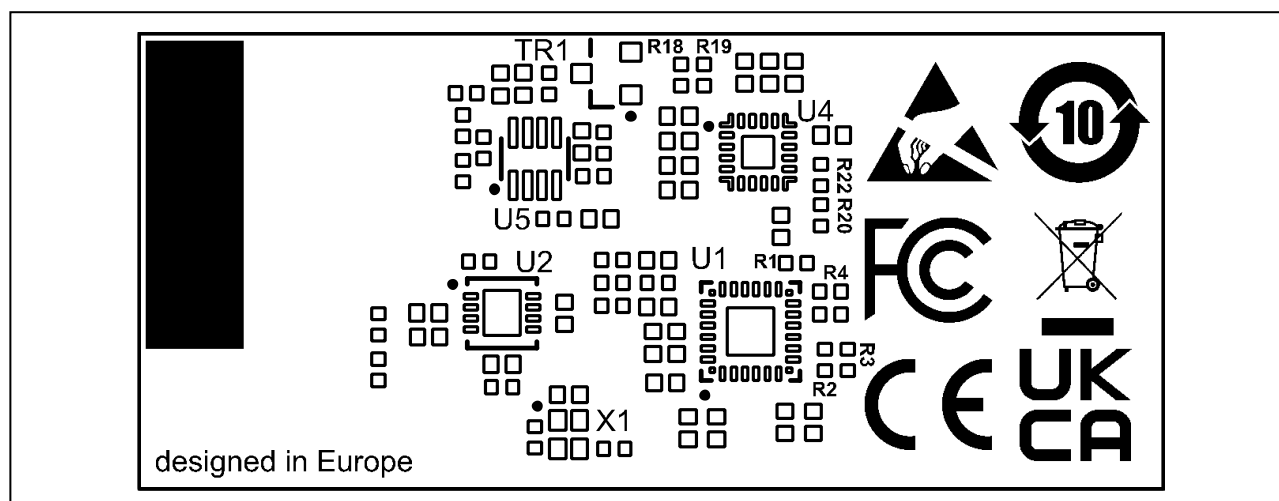


Figure 1.5 Placement of components on the bottom side of the audio extension board

2. Functions

2.1 General Overview

The audio extension board is controlled from a microcontroller board via a type 7 Pmod interface.

MCLK is generated on the audio extension board.

The audio extension board uses ADC and DAC circuits capable of stereo signal processing. External stereo line input and line output signals are connected through 3.5 mm stereo line jacks.

The board has also onboard speaker and microphone. They are both used for a single channel mono signal.

Figure 2.1 shows the block diagram of audio extension board.

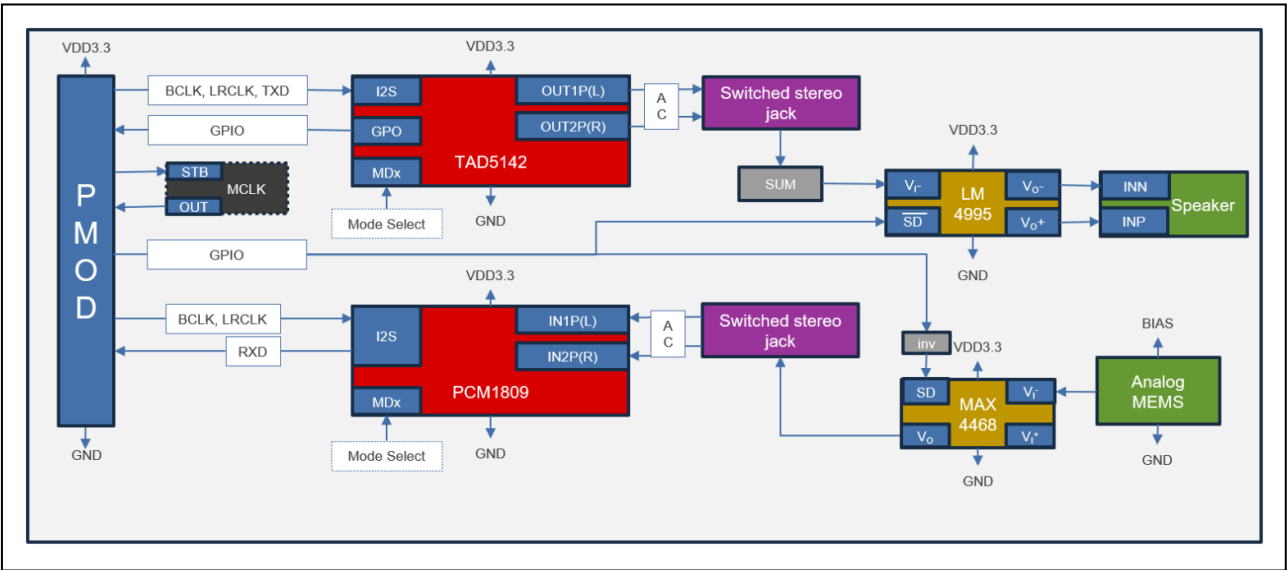


Figure 2.1 Functional overview

2.2 Pmod Interface

The audio extension board uses Pmod type 7 (I2S CODEC) for communication with a processor.

The pins 1-4 and pin 9 of the Pmod interface are used as I2S interface.

Pin 7 is a shut-down signal for amplifier ICs.

Pin 8 is an output signal from the microcontroller to enable the oscillator circuit to generate the MCLK signal .

Pin 10 is an interrupt signal from the DAC to the microcontroller.

Figure 2.2 shows the circuit diagram of the Pmod interface.

Table 2.1 lists all pins and shows their functionality.

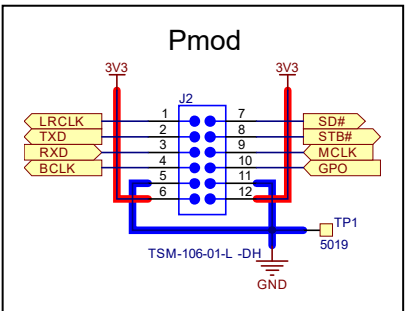


Figure 2.2 Pmod connection

Table 2.1 Pin configuration of Pmod connector J2

Pin	Pmod Function (Type 7)	Function on the Audio Extension Board
1	LRCLK	FSYNC signal for DAC (TAD5142) and ADC (PCM1809)
2	TXD	Data input to DAC (TAD5142)
3	RXD	Data output of ADC (PCM1809)
4	BCLK	BCLK signal for DAC (TAD5142) and ADC (PCM1809)
5	GND	Power supply for audio extension board: GND
6	VCC	Power supply for audio extension board: 3.3V
7	GPIO	SD# of amplifier ICs LM4995 and MAX4468
8	GPIO	STB# of MCLK
9	MCLK	Clock output for MCLK
10	GPIO	Output of DAC (TAD5142)
11	GND	Power supply for audio extension board: GND
12	VCC	Power supply for audio extension board: 3.3V

2.3 Audio Input

The audio input circuit consists of following parts:

- Mono microphone input with amplifier circuit.
- 3.5mm stereo input jack.
- AD converter with I2S interface.

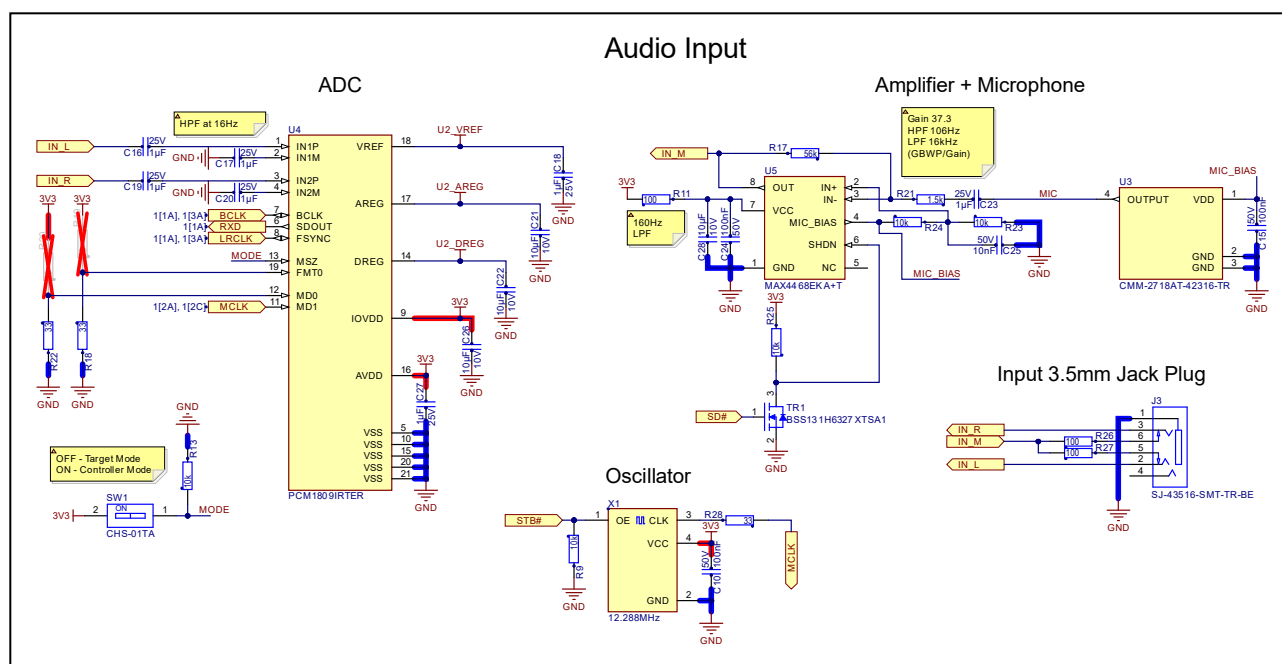


Figure 2.3 Audio signal input

The AD converter has an external oscillator circuit. The output signal from the oscillator can be used as MCLK signal for signal sampling.

The AD converter has 2 operating modes. The operating mode is selected by switch SW1.

- SW1[ON]: Operating mode = controller mode – BCLK and FSYNC are output pins.
- SW1[OFF]: Operating mode = target mode – BCLK and FSYNC are input pins.

The input signal from the onboard microphone is automatically disconnected if the 3.5mm jack connector is used for an external microphone.

In addition, the microphone amplifier can be switched off using the SD# signal on the Pmod interface.

2.4 Audio Output

The audio output circuit consists of following parts:

- Mono speaker output with amplifier circuit.
- 3.5mm stereo output jack.
- DA converter with I2S interface.

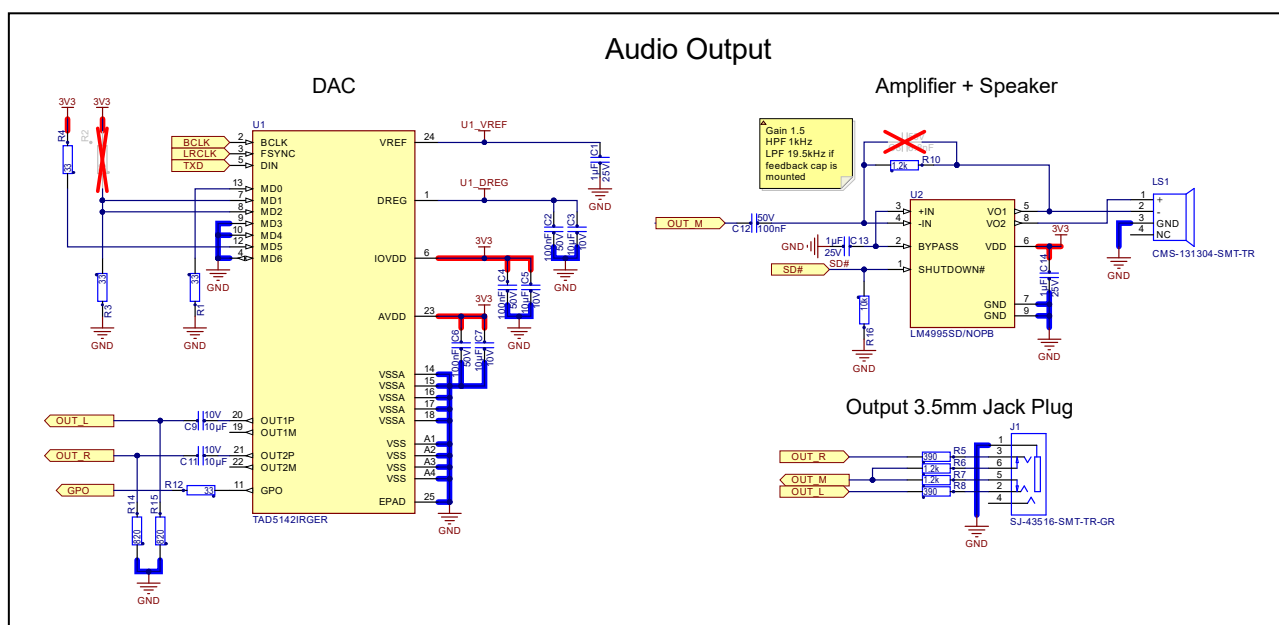


Figure 2.4 Audio signal output

The output signal to the onboard speaker is automatically disconnected if the 3.5mm jack connector is used for external speakers.

In addition, the speaker amplifier can be switched off using the SD# signal on the Pmod interface.

3. Dimensions

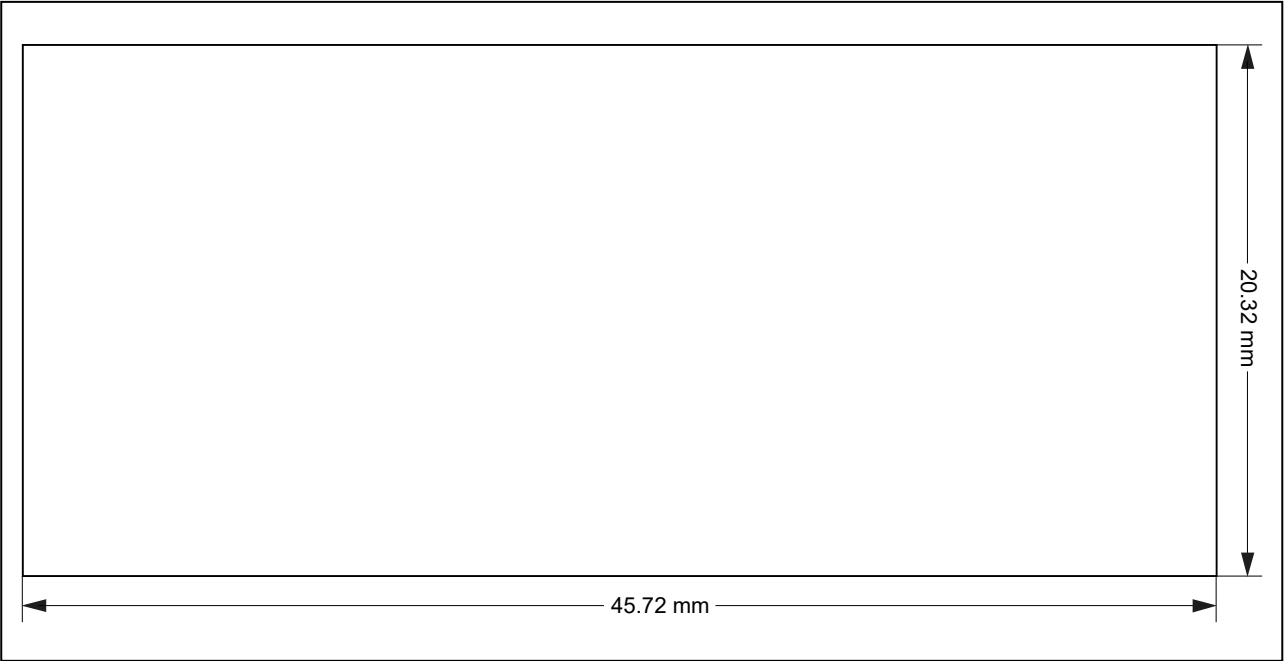


Figure 2.1 Board dimensions

4. Schematics

CAUTION

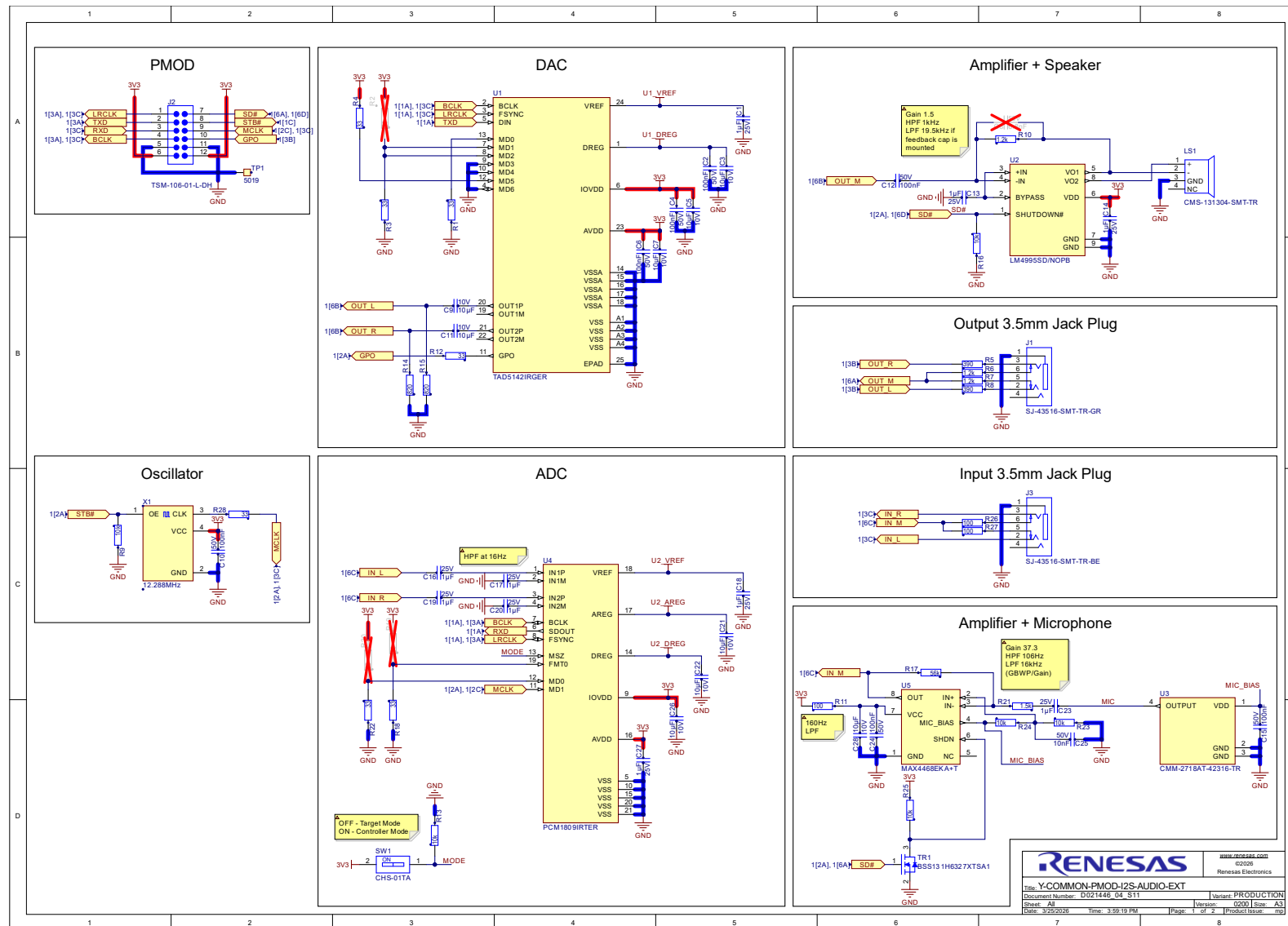
The schematics shown in this document are not intended to be used as a reference for mass production. Any usage in an application design is in sole responsibility of the customer.

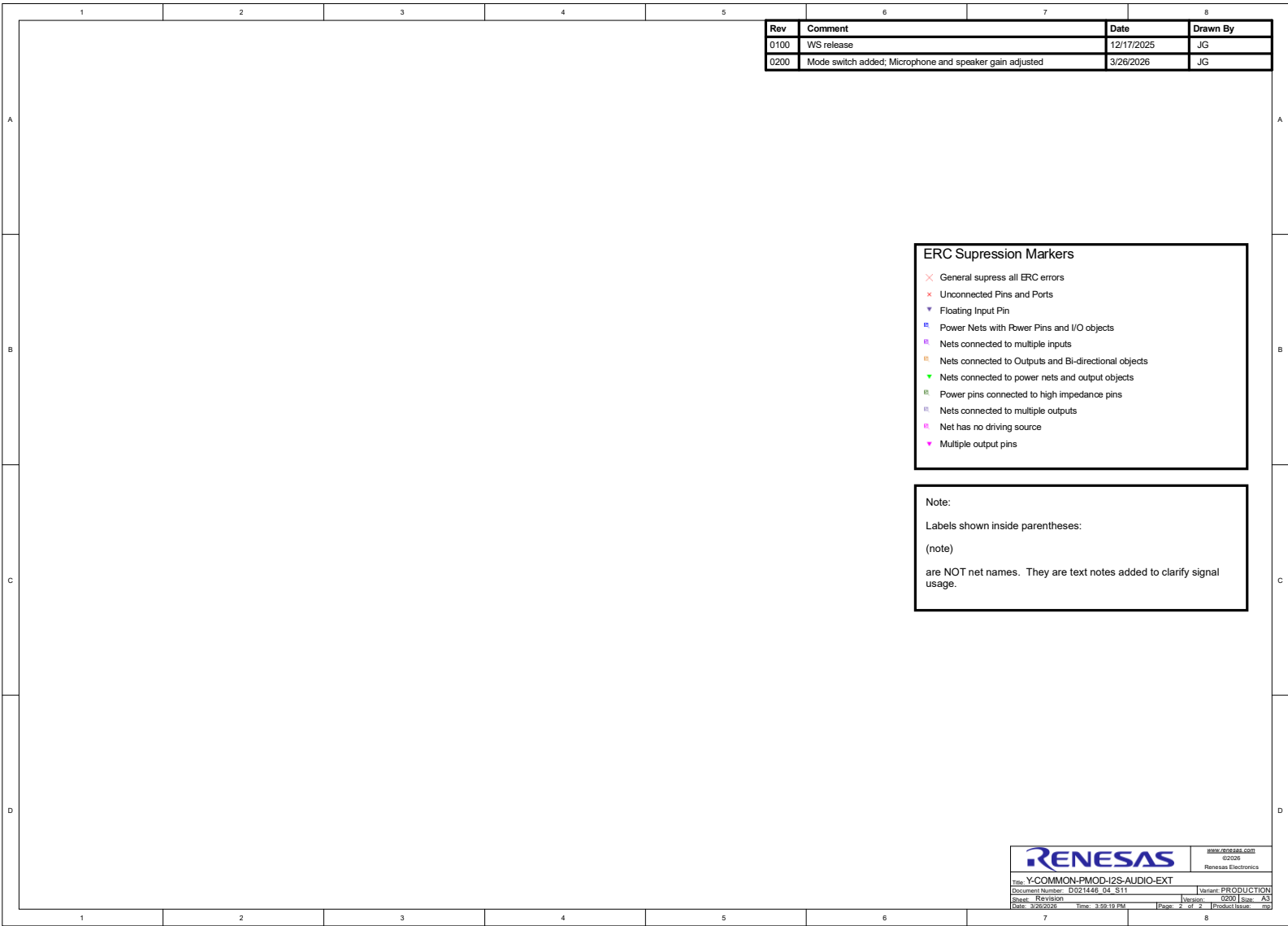
The following components described in the schematics are not provided with the board upon delivery:

- Capacitors: C8
- Resistors: R2, R19, R20

Above components are crossed out in the schematics.

4.1 Board Version D021446_06_V0200





Revision History

Rev.	Date	Description	
		Page	Summary
V1.00	2026-08-25	–	Initial release for Common Pmod I2S Audio Extension Board.

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