

PCM9211EVM Record and Playback via USB Interface

Tahar Allag

Audio Interface Products

ABSTRACT

The [PCM9211 evaluation module](#) (EVM) is designed to allow users to record and play back audio signals via a USB interface while running CodecControl software on a PC. The USB interface uses the [TAS1020B USB interface device](#). This document presents a detailed description of the recording interface setup from an analog input to PC, and discusses how to play back a digital signal from the PC via a USB connection. In both cases, the path and the clock settings are enabled using the CodecControl software. Hardware setup and jumper configurations are also described.

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1 Introduction

The PCM9211EVM is an evaluation module for the PCM9211 codec. The PCM9211 includes optical S/PDIF input and output, coaxial S/PDIF input, analog stereo input, and USB interface circuitry. The [CodecControl software for PCM9211EVM](#), available for download at www.ti.com, exposes most of these features through an intuitive graphic user interface, or *GUI*.

The PCM9211 is an analog and digital front-end device for any media player/recorder. The device consists primarily of an integrated analog-to-digital converter (ADC), digital audio interface receiver (DIR), and digital audio interface transmitter (DIT). The PCM9211 can be controlled by either SPI™ or I²C™ interface modes.

The optical and the coaxial S/PDIF inputs are connected directly to the DIR of the PCM9211 through an integrated multiplexer. The analog input data are converted to digital data using the integrated ADC. The optical output can be obtained either from the DIT or directly from an outside digital source using the Multipurpose Input/Output (MPIO) pins on the device.

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This report describes the path and the registers settings (using the GUI software) of the PCM9211EVM for recording and playback via USB interface. Only analog input data are considered for recording. The playback of digital audio signals via USB to either an optical or a digital jumper output is also discussed. Test stand setup descriptions are provided, and the measured results are presented.

2 Recording Analog Audio Signal via USB

Figure 1 and Figure 2 show the required hardware connections, respectively, for the recording path for the PCM9211 in slave mode and the TAS1020B in master mode.

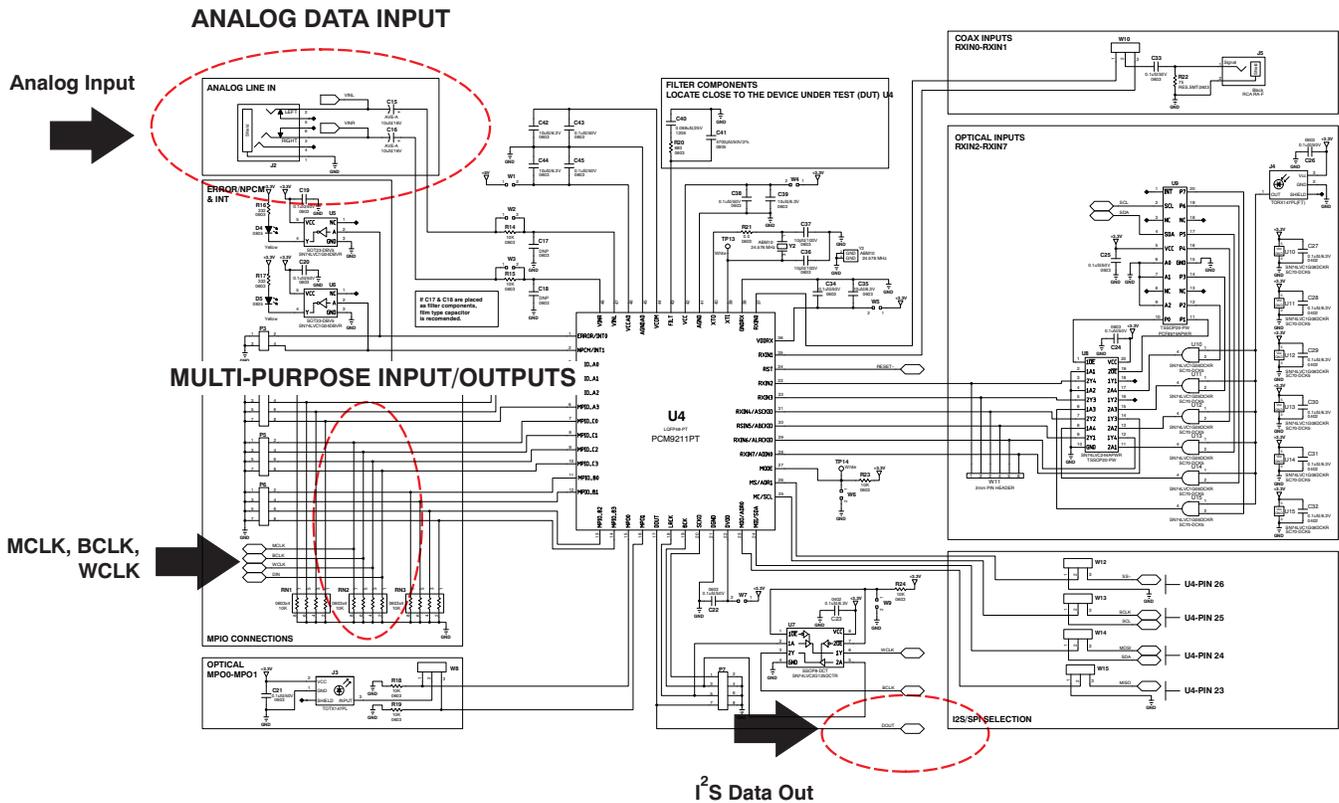


Figure 1. Hardware Connection for Record Path: PCM9211 in Slave Mode

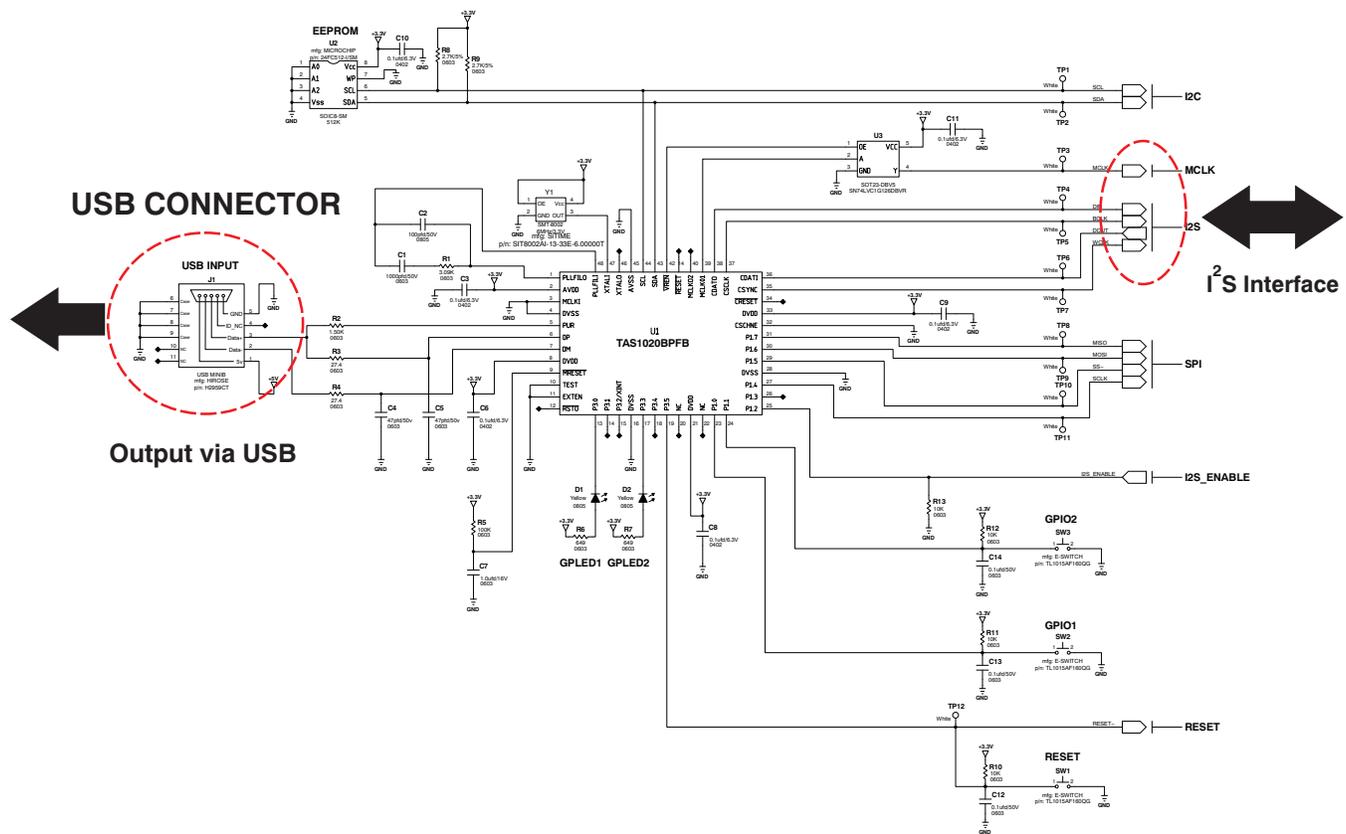


Figure 2. Hardware Connection for Record Path: TAS1020B in Master Mode

In Figure 1, the analog line-in of the PCM9211EVM receives the analog signal. These input lines are connected directly to the inputs of the integrated ADC within the PCM9211. Jumpers W2 and W3 are used to select the RC filter, which is not considered in this application.

In Figure 2, the TAS1020B receives data from the DOUT pin of the codec (I²S™ interface) and interfaces the data with the USB output connector. Jumper P7 is removed to avoid forcing the DOUT pin to ground.

The CodecControl settings of the PCM9211 are shown in Figure 3. The output of the ADC is connected to the DOUT of the main block. The integrated ADC takes its clock from the MPIO-C, as shown in the ADC setting window. The ADC is driven in slave mode and the ADC-DOUT is selected as the output. The MPIO-C SELECTOR is set to AUXIN1, as shown in the MPIO-C setting window in Figure 3. SCKO/BCK/LRCK of the main output ports are connected to the AUXIN1 pin through the integrated multiplexer.

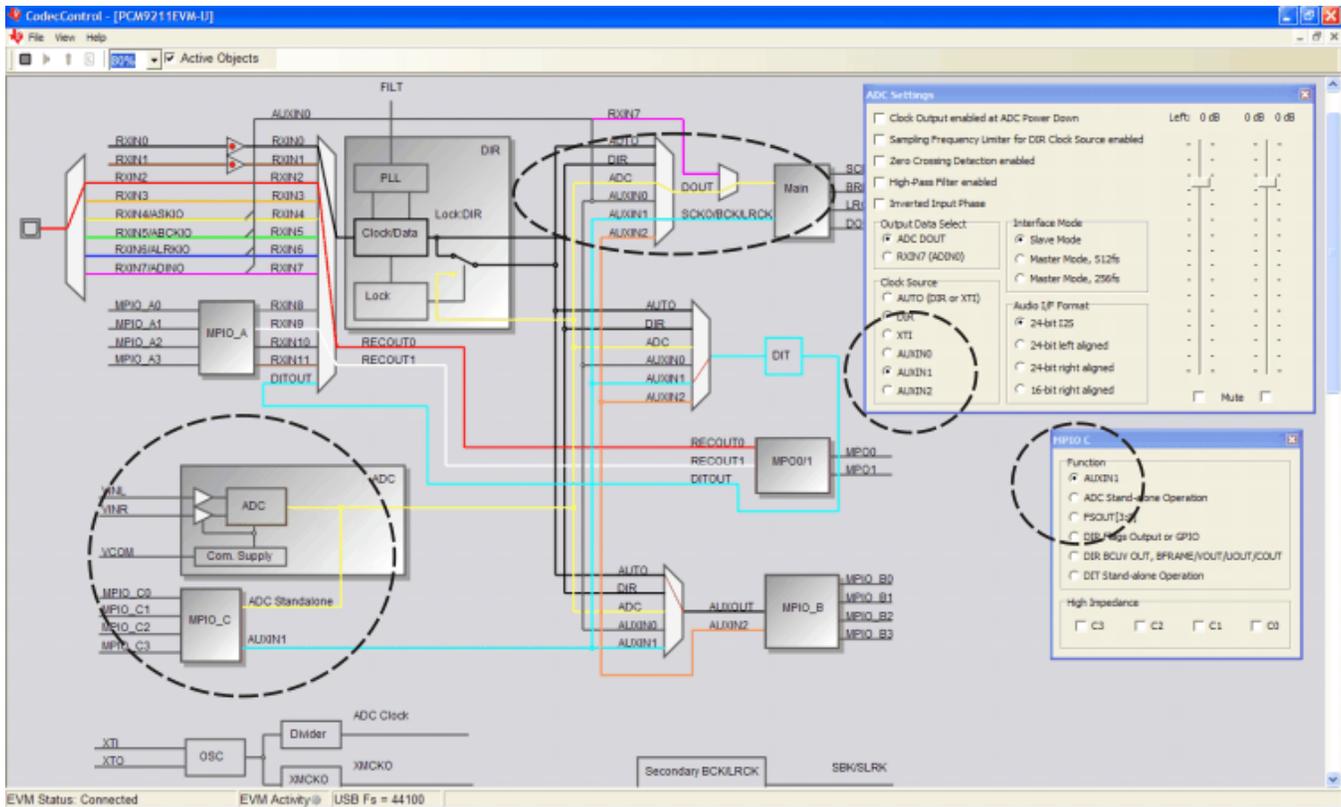


Figure 3. CodecControl Path Settings for Recording

I²S interface outputs are used to transfer the DOUT data from the main block of the PCM9211 to the TAS1020B as digital inputs. The TAS1020B is an integrated circuit designed specifically to interface digital data to the USB input. By using Microsoft® Windows®-compatible audio recording software such *Gold-Wave* or *Cool-Edit-Pro*, the received data can be recorded. In our test setup, a 1-kHz analog sine wave signal was sent. The recorded signal with its FFT representation is shown in [Figure 4](#).

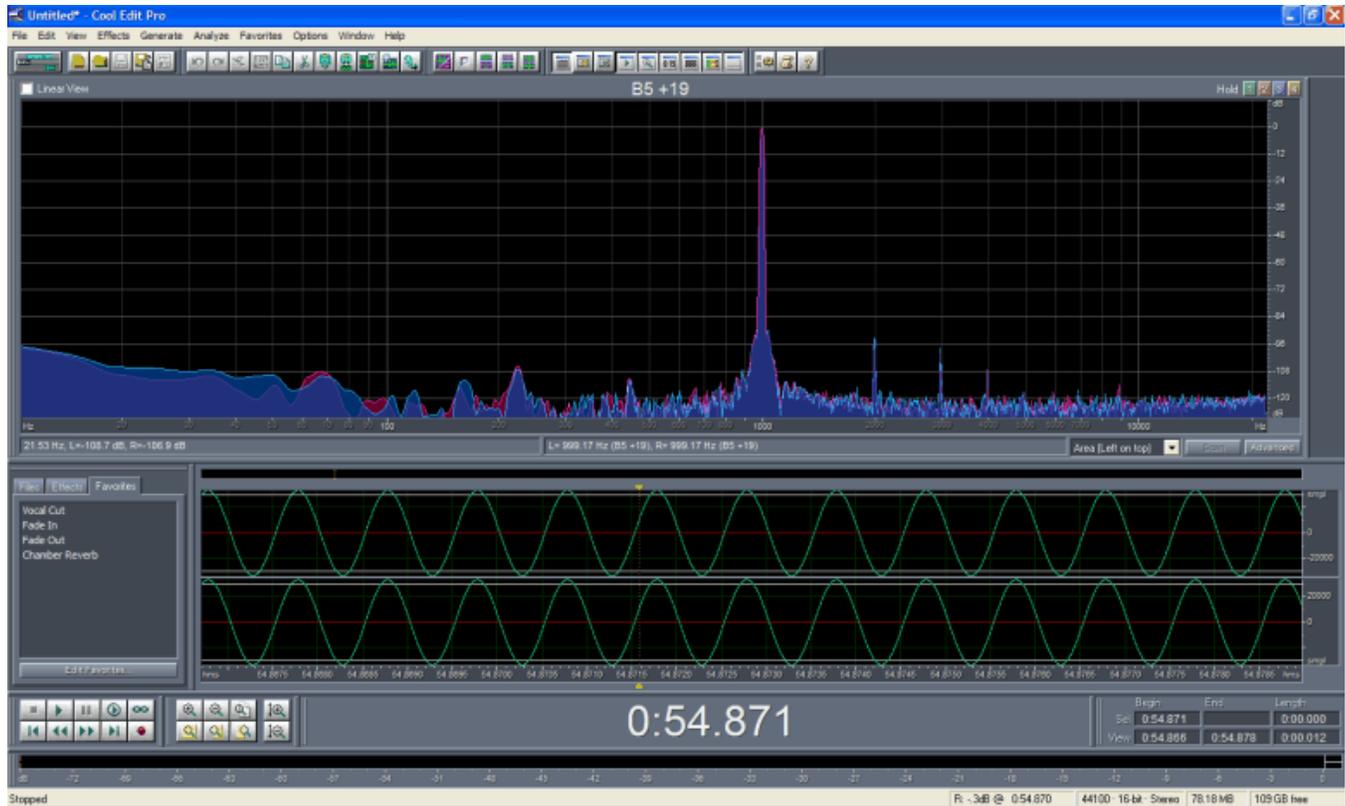


Figure 4. Recorded Sine Wave Signal via USB

As shown in [Figure 1](#) and [Figure 2](#), the TAS1020B is used as a master and the PCM9211 is used in slave mode. The TAS1020B sends the Master CLK, Bit CLK, and Word CLK through I²S outputs into the MPIOs of the PCM9211. MPIO-C0 is used for MCLK, MPIO-C1 is used for BCLK, and MPIO-C2 is used for receiving WCLK. In this case, the DIN pin is not used because there is no data input sent from the TAS1020B to the PCM9211. The sampling frequency used in this application is 44.1 kHz, and all the clocks are set accordingly.

3 Play Back Digital Audio Signals via USB

In the playback test, the digital input signal is sent from any Windows multimedia player through the USB interface as shown in Figure 5 and Figure 6. The USB data (\pm) pins are connected directly to the IN/OUT pins of the TAS1020B. The I²S outputs of the TAS1020B are used to transfer the data and send the required clock signals to the PCM9211 codec device.

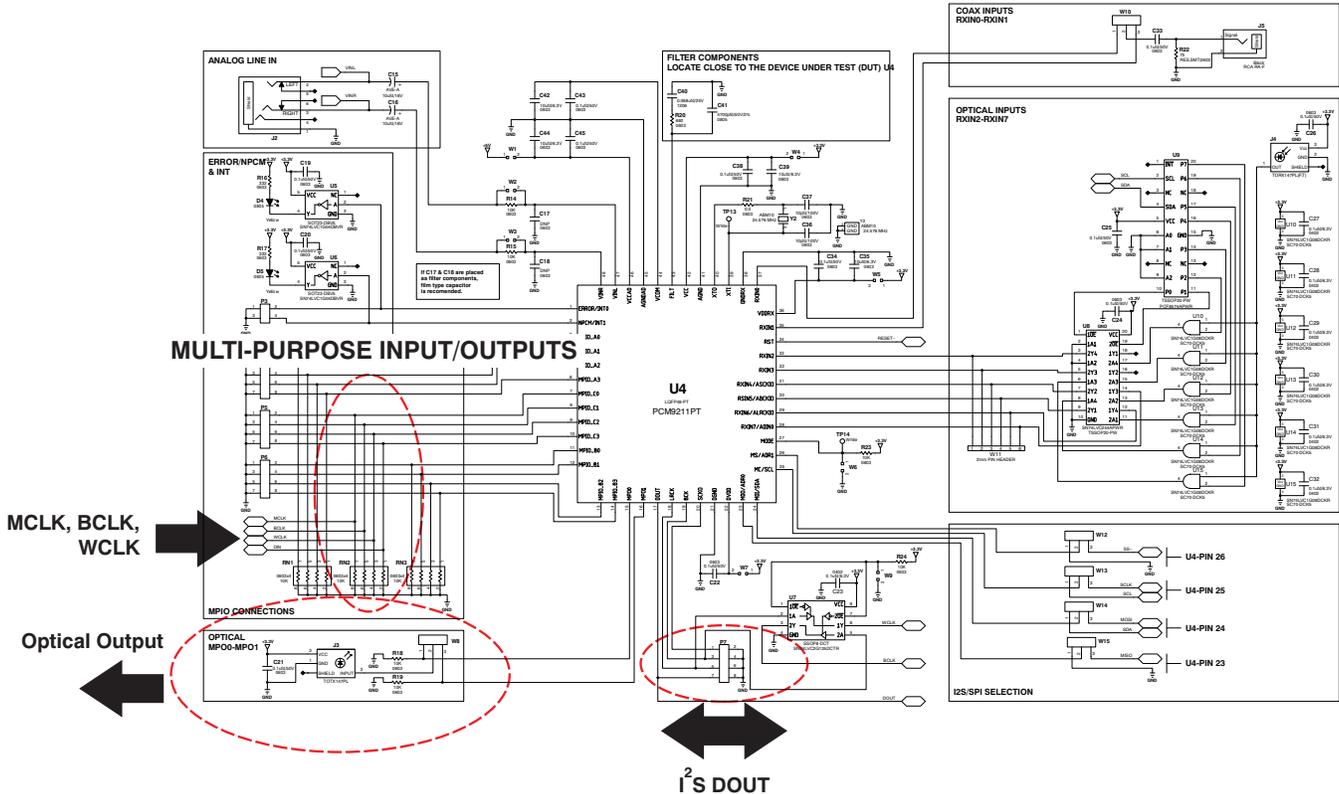


Figure 5. Hardware Connections for Playback via USB: PCM9211 in Slave Mode

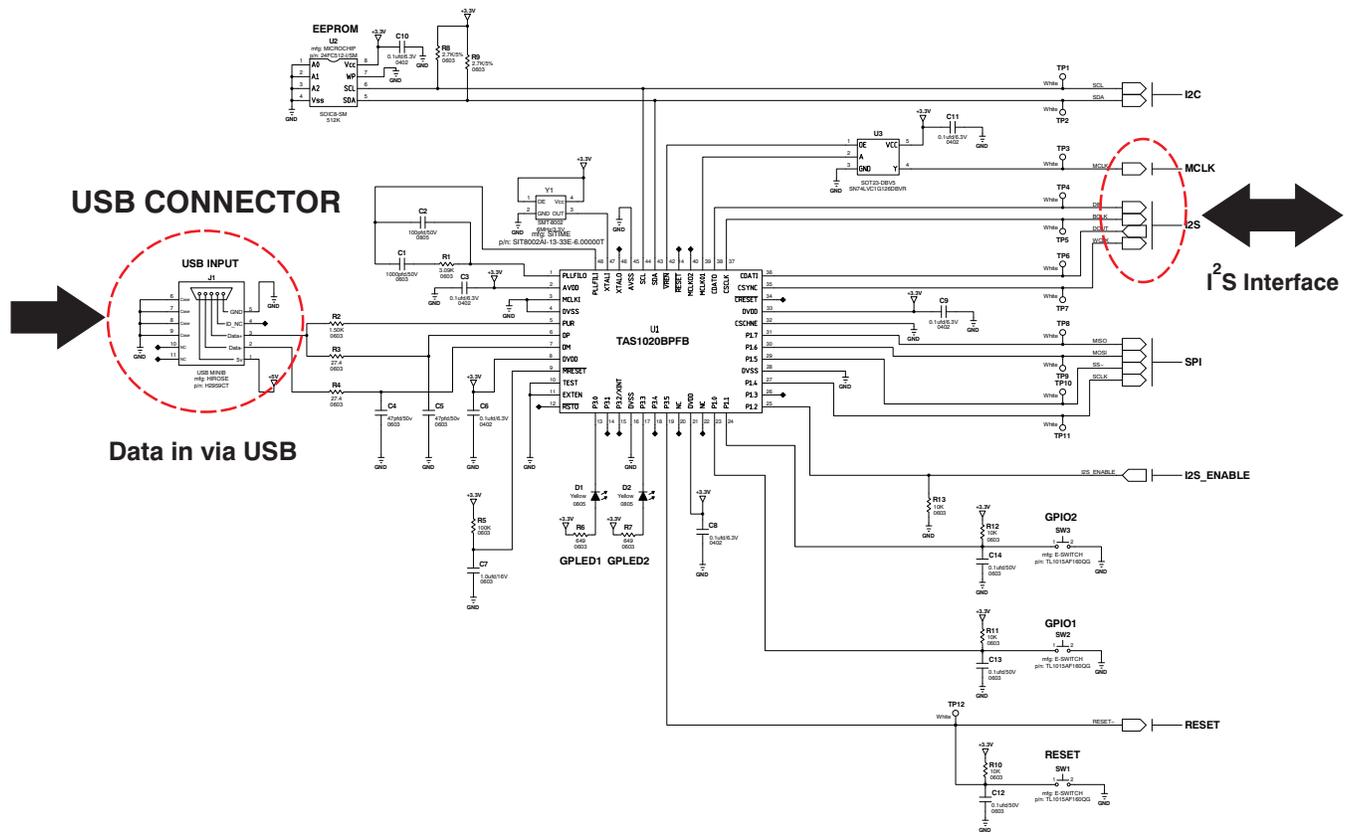


Figure 6. Hardware Connections for Playback via USB: TAS1020B in Master Mode

As in the previous section, the MPIOs of the PCM9211EVM receive the data. MCLK, BCLK, and WCLK are connected to MPIO-C0, MPIO-C1, and MPIO-C2, respectively. However, the DIN pin is used to send to the data to the PCM9211 through pin MPIO-C3, as shown in Figure 5.

The path setting of the integrated MPIO-C is important. As shown in Figure 7, AUXIN1 is chosen as the output path of the MPIO block. Using the multiplexer, AUXIN1 is connected to both DOUT and the SCKO/BCLK/LRCK signals of the Main output port. Note that the TAS1020B sends both the signal and the clocks to the PCM9211 device. Thus, the PCM9211 is set to operate in slave mode and the TAS1020B is set in master mode, as in the previous section. The sampling frequency is set to be 44.1 kHz in this application.

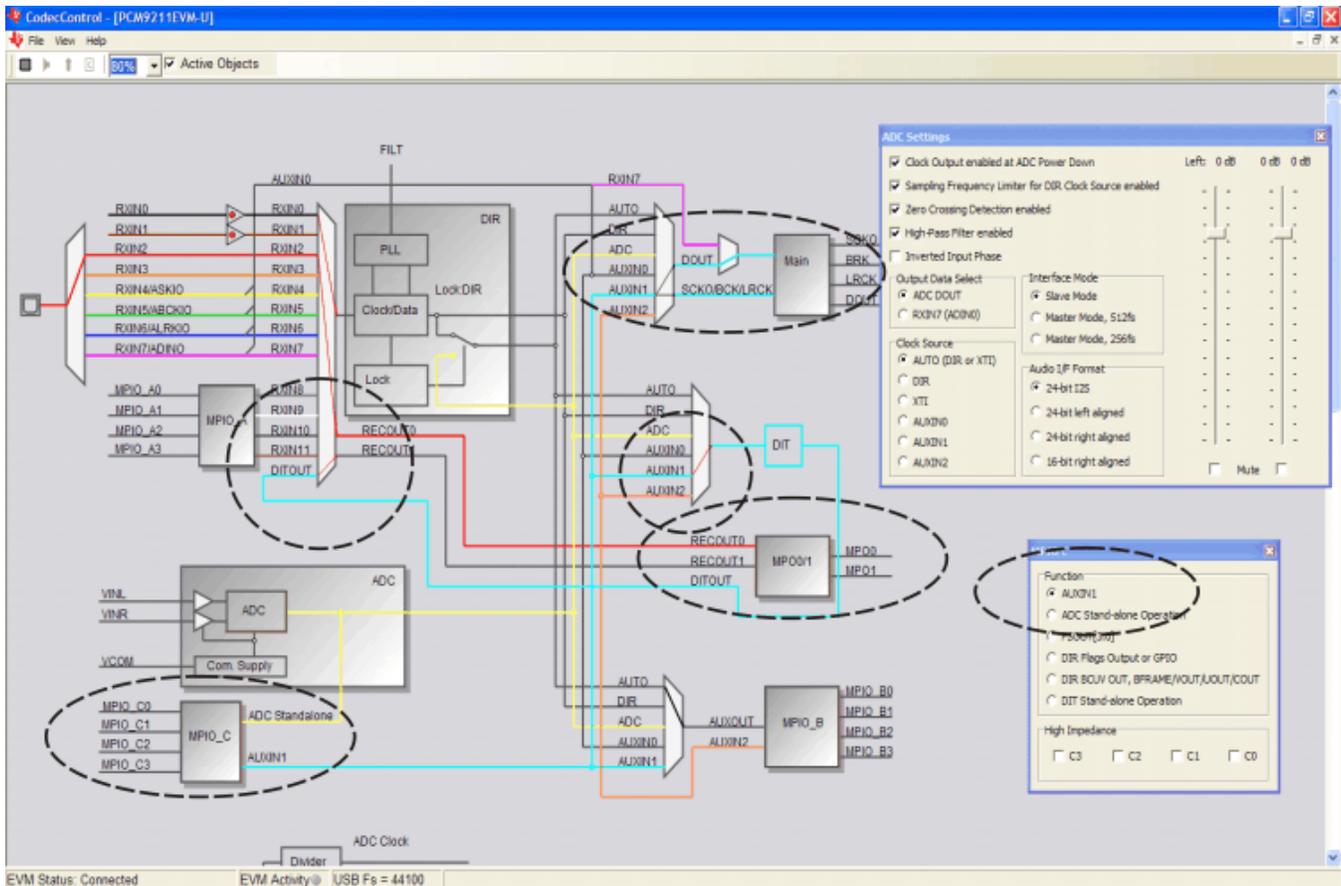


Figure 7. CodecControl Path Setting for Playback

There are two choices to the final path of the playback. The user can choose to take the digital audio data directly from the DOUT, LRCK, BCK, and SCKO pins of the PCM9211EVM by using the P7 jumpers. However, special care is needed for the buffer U7. This buffer must first be disabled; this step can be done simply by removing jumper W9. The user also can use the optical output through MPO0 and MPO1.

In our test, a sine wave signal with 1-kHz fundamental frequency is played using Cool-Edit-Pro software as shown in Figure 8. The FFT representation of the signal is also shown here. The signal is sent via USB to the TAS1020B, then to the PCM9211. The 2700 series AudioPrecision signal analyzer can be used to analyze the resulting output signal.

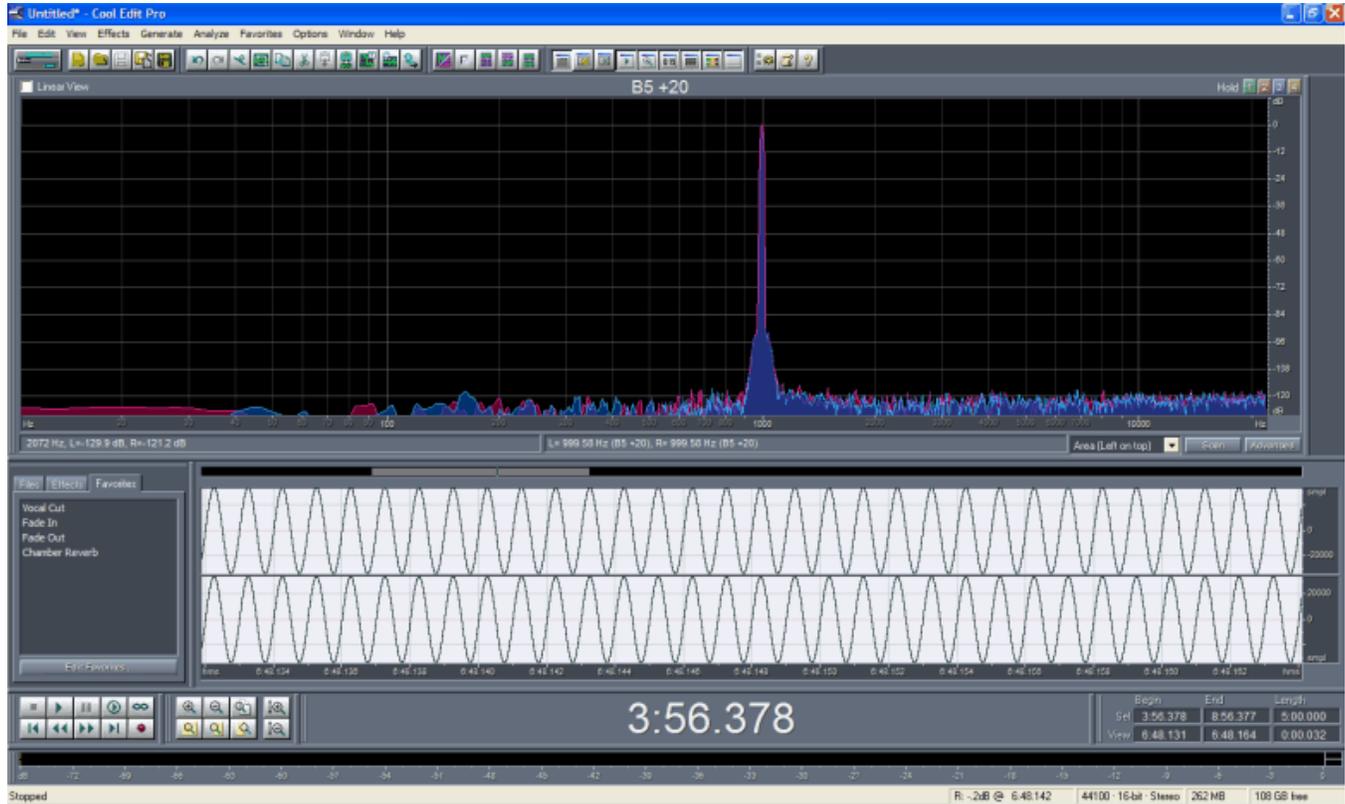


Figure 8. Send Sine Wave 1-kHz Signal via USB for Playback

4 Conclusion

This application note described the path settings for the playback and record functions of the PCM9211EVM through using the CodecControl software and a specified jumper configuration. The TAS1020B is set to operate in master mode. The multi-purpose input and output (MPIO) pins of the PCM9211 provide the device with the MCLK, BCLK, and WCLK signals. In the record mode, the DOUT of the codec is used to transfer data to the USB interface. For the playback mode, the DIT block is used to loop the input data to the optical output pins. Each application was shown with results provided. Recording digital data coming from either the coax input or the optical inputs was not discussed in this application report.

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