EVM User's Guide: TAD5212EVM-K TAC5212EVM-K TAC5112EVM-K TAA5212EVM-K

TAx5x12EVM-K Evaluation Module

Description

This TAx5x12EVM-K evaluation module (EVM) allows user to test the capabilities of Texas Instruments' TAC5212 a low-power, stereo audio codec with 118 dB dynamic range ADC and 119 dB dynamic range DAC, TAC5112 low-power, stereo audio codec with 100 dB dynamic range ADC and 106 dB dynamic range DAC, TAD5212 a low-power stereo audio DAC with 119 dB dynamic range or TAA5212 a low-power stereo audio ADC with 118 dB dynamic range. The evaluation module is paired with the AC-MB, a flexible motherboard which provides power, control and digital audio data to the evaluation module.

Get Started

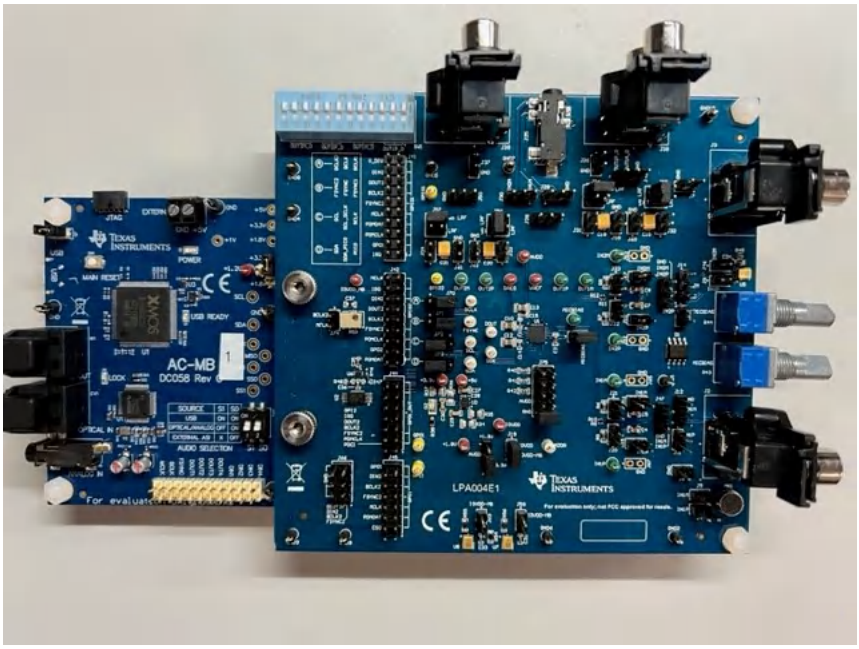
1. Order the EVM from TAx5x12 product folder.
2. Download the latest TAx5x12 data sheet.
3. Request access and download PPC3 GUI from TAx5x12 product folder.

Features

- Complete evaluation kit for the TAC5212; a stereo high-performance Codec, TAC5112; a stereo Codec, TAD5212; a stereo high-performance DAC or TAA5212; a stereo high-performance ADC
- On-board microphones provided for voice recording testing
- Direct access to digital audio signals and control interface for simple end-system integration
- USB connection to PC provides power, control, and streaming audio data for easy evaluation

Applications

- Land mobile radio
- IP Network camera
- IP Telephone
- Video conference system
- Professional audio mixer/control surface



1 Evaluation Module Overview

1.1 Introduction

The TAx5x12EVM is an evaluation module (EVM) designed to demonstrate the performance and functionality of the TAx5x12 family of devices. This family includes the devices shown in Table 1-1 with differences in performance and function noted. Other variants listed in Table 1-1 are also supported where the user replaces the U1 unit with the device of interest. This user's guide describes the functionality of TAC5212EVM-K, TAC5112EVM-K, TAD5212EVM-K or TAA5212EVM-K evaluation kit obtainable from ti.com.

Table 1-1. TAx5x12 Family

Device	ADC DR (dB)	DAC DR (dB)	Feature
TAC5212	118	119	Stereo CODEC
TAC5211	118	119	Mono CODEC
TAC5112	100	106	Stereo CODEC
TAC5111	100	106	Mono CODEC
TAD5212-Q1	NA	119	Stereo DAC
TAD5212	NA	119	Stereo DAC
TAD5112-Q1	NA	106	Stereo DAC
TAD5112	NA	106	Stereo DAC
TAA5212	118	NA	Stereo ADC

1.2 Kit Contents

- TAC5212, TAC5112, TAD5212 or TAA5212 device
- TAx5x12EVM/daughterboard
- AC-MB Controller/motherboard

1.3 Specification

The TAx5x12EVM-K evaluation module (EVM) paired with the AC-MB, a flexible motherboard which provides power, control and digital audio data to the evaluation module allows user to record and playback audio signal. The configuration for the TAx5x1x family of devices is done through the PurePathConsole 3 (PPC3) GUI.

1.4 Device Information

- TAC5212, a low-power, stereo audio codec with 118 dB dynamic range ADC and 119 dB dynamic range DAC.
- TAC5211, a low-power, mono audio codec with 118 dB dynamic range ADC and 119 dB dynamic range DAC.
- TAC5112, a low-power, stereo audio codec with 100 dB dynamic range ADC and 106 dB dynamic range DAC.
- TAC5111, a low-power, mono audio codec with 100 dB dynamic range ADC and 106 dB dynamic range DAC.
- TAD5212, a low-power stereo audio DAC with 119 dB dynamic range.
- TAD5112, a low-power stereo audio DAC with 106 dB dynamic range.
- TAD5212-Q1, an automotive low-power stereo audio DAC with 119 dB dynamic range.
- TAD5112-Q1, an automotive low-power stereo audio DAC with 106 dB dynamic range.
- TAA5212, a low-power, stereo audio ADC with 118 dB dynamic range and 8 ksps -768ksps sample rate support.

2 Hardware

2.1 Setup

The evaluation kit consists of the TAx5x12EVM daughterboard and the AC-MB controller board. The controller board is used to provide power, control, and digital audio signals to the evaluation module. The daughterboard contains the TAx5x12 device and the input output connections. Depending on the selected device, some components are not populated in the EVM.

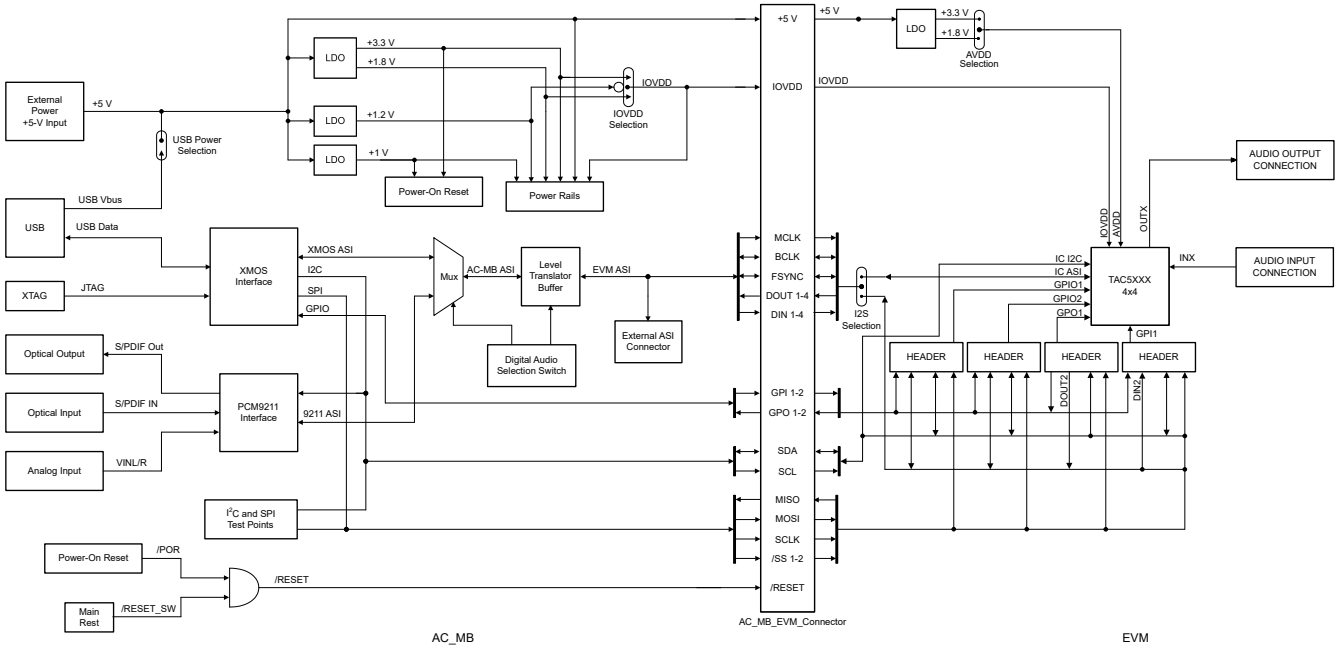


Figure 2-1. TAx5x12EVM Block Diagram

2.2 AC-MB Settings

2.2.1 Audio Serial Interface Settings

The AC-MB provides the digital audio signals to the evaluation module from the universal serial bus (USB), optical, stereo jack, and external audio serial interface (ASI) header. Figure 2-2 shows a block diagram of the ASI routing on the AC-MB.

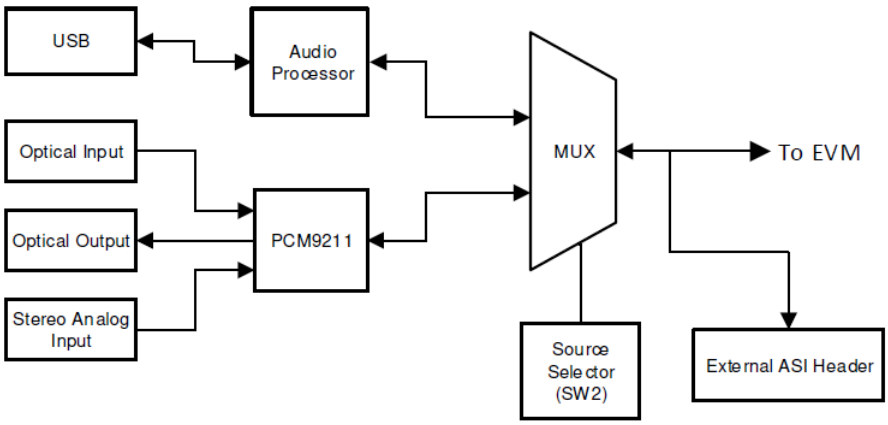


Figure 2-2. AC-MB Audio Interface Block Diagram

Switch SW2 on the AC-MB selects the audio serial bus that interfaces with the PCM6xx0EVM. Next to switch SW2, the AC-MB has a quick reference table to identify the audio serial interface source options and switch settings. The AC-MB acts as the controller for the audio serial interface, with three different modes of operation: USB, optical or analog, or external ASI.

The serial interface clocks and data are provided from the USB interface. The sampling rate and format are determined by the USB audio class driver on the operating system. The default settings for the USB audio interface are 32-bit frame size, 48-kHz sampling rate, BCLK and FSYNC ratio is 256, and the format is timedivision multiplexing (TDM).

2.2.1.1 USB Mode

The AC-MB is detected by the OS as an audio device with the name TI USB Audio UAC2.0. Figure 2-3 shows the AC-MB audio setting for the USB mode of operation.

Figure 2-3. AC-MB USB Audio Setting

2.2.1.2 Optical or Auxiliary Analog Audio Input Mode

Serial interface signals are provided from the PCM9211 digital transceiver, which is capable of sending digital data to the EVM from an analog input or optical input. Meanwhile, the data from the EVM can be streamed through the optical output.

Figure 2-4 shows the AC-MB audio setting for the optical and analog mode of operation.

Figure 2-4. AC-MB Optical or Auxiliary Analog Audio Input Setting

The optical output of the AC-MB streams the data captured on the EVM with the format determined by the input source used. When there is an optical input connected, the LOCK LED must be ON, and the PCM9211 streams the audio serial interface clocks with the format determined by the optical input frame. The digital data from the optical input is streamed to the evaluation module. If the optical input is not connected, the PCM9211 captures the input signal provided through the analog input, and streams the signal to the evaluation module. This feature can be useful when a digital input digital-to-analog converter (DAC) is connected to the AC-MB, providing an analog input for quick evaluation. In auxiliary analog audio mode, the audio serial interface format is fixed to a 24-bit, 48-kHz, I2S mode.

2.2.1.3 External Audio Interface Mode

In this mode, the audio serial interface clocks for the evaluation board are provided through connector J7 from an external source. This architecture allows an external system to be used for communication with the evaluation board, such as a different host processor or test equipment (for instance, Audio Precision™). The clocks generated from the USB interface and PCM9211 are isolated with this setting. Figure 2-5 shows the AC-MB audio setting for the external mode of operation.

Figure 2-5. AC-MB External Audio Interface Setting

Figure 2-6 shows how to connect the external audio interface. Odd numbered pins are signal carrying, and even numbered pins are connected to ground.

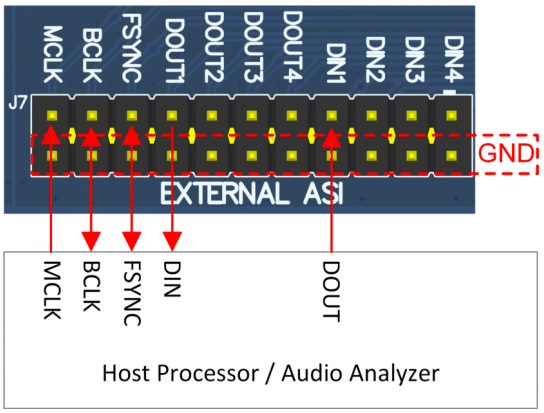


Figure 2-6. AC-MB Connection with External Audio Serial Interface

2.2.2 AC-MB Power Supply

The complete EVM system is powered from a single 5-V power supply. However, the motherboard has different low-dropout regulators (LDOs) integrated that provide the required power supplies to the different blocks of the board. Figure 2-7 shows a block diagram depicting the power structure of the AC-MB.

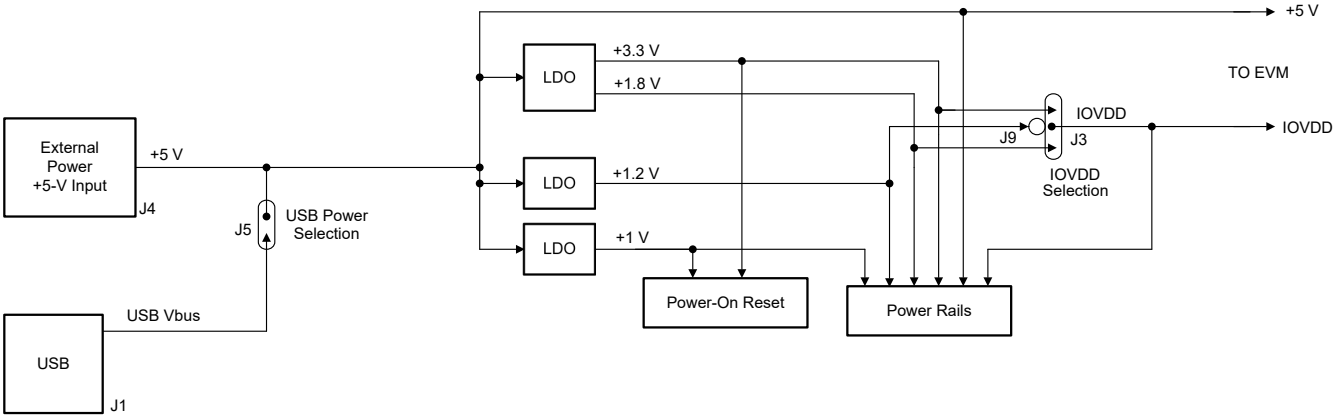


Figure 2-7. Power-Supply Distribution of the AC-MB

The AC-MB can be powered from the host computer by using the USB 5-V power supply (VBUS) by shorting header J5, USB POWER. Additionally, the AC-MB can be powered from an external power supply connected to terminal J4, EXTERNAL POWER. Header J5 must be open for external supply operation. The IOVDD voltage for the digital signals that is provided to the evaluation module is generated on the motherboard from the main power supply (USB or external).

The voltage levels available are 1.2V, 1.8 V and 3.3 V, and can be selected via the J9, J3 header IOVDD. For 1.2-V operation, short pin 1 of header J9 and pin 2 of header J3, for 1.8-V operation, short pins 2 and 3 of header J3; for 3.3-V operation, short pins 1 and 2 of header J3. When the motherboard is fully powered and the power supplies from the onboard LDOs are correct, the green POWER LED (D3) turns ON. The USB READY LED indicates that a successful USB communication is established between the AC-MB and the host computer.

2.3 TAx5x12EVM-K Hardware Settings

2.3.1 TAx5x12 EVM Input Hardware Settings

The TAx5x12 evaluation module has several input configuration options and offers extensive flexibility to allow the user to evaluate the device across multiple operation modes. The different operation modes are highlighted in this section.

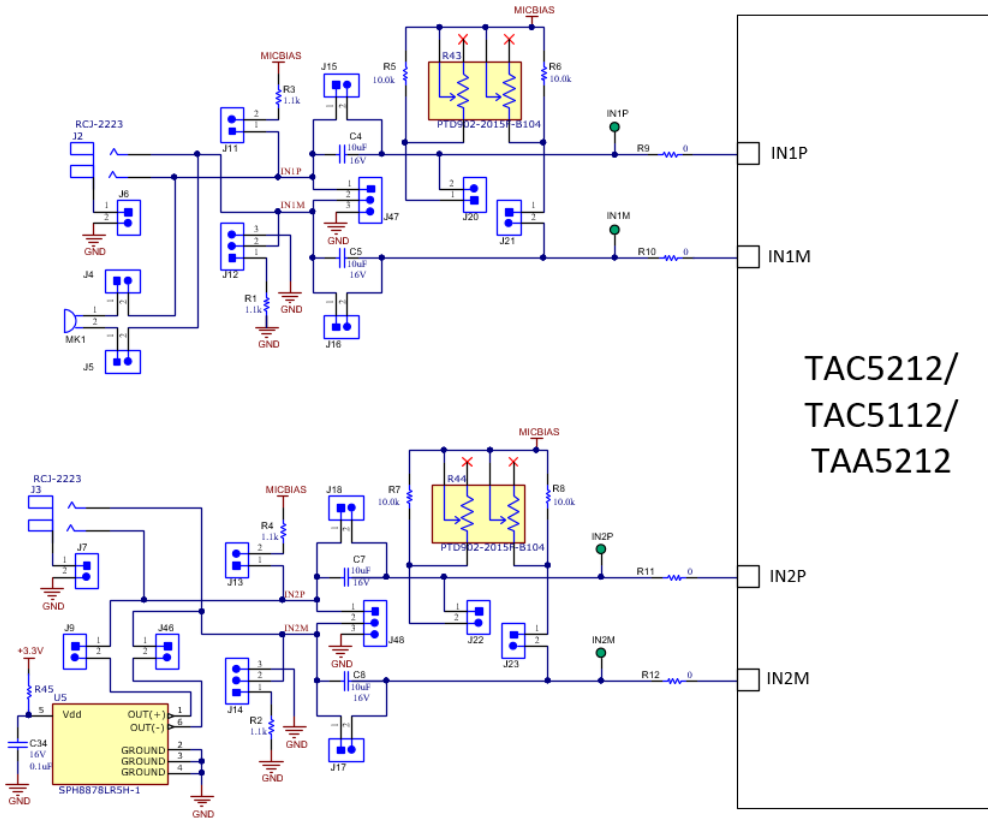


Figure 2-8. TAC5212 and TAC5112 EVM Input Architecture for Channel 1 and 2

The IN1 and IN2 input architecture allows these two channels to be quickly configured to support any of the supported operation modes. The INxP and INxM pins of the TAx5x12 can optionally connect to onboard microphones for quick evaluation of a microphone in AC- or DC-coupled modes. Jumper configuration details can be found in Table 2-1.

For mono devices, there's an option to connect unused inputs to ground though header J52 and J53 and for output jumper header J61 and J62. These jumpers are not populated by default.

For TAD5212 EVM, the input components are not populated.

Table 2-1. Input Jumper Configuration

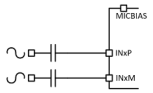
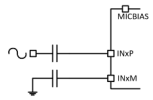
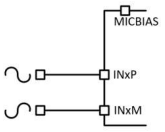
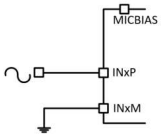
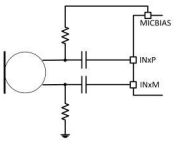
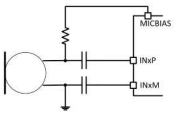
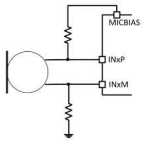
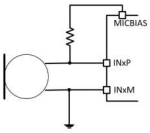
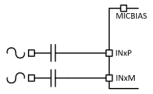
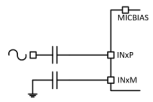
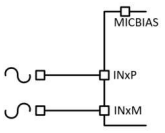
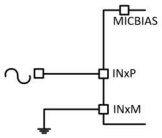
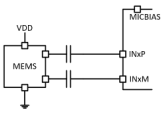
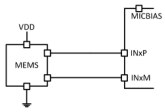
Input Terminal	Input Mode	Installed Jumpers	Uninstalled Jumpers	Input Swing	Topology	Register Setting
IN1	LINE-IN Differential, AC-coupled	J8	J4, J5, J6, J11, J12, J15, J16, J20, J21	2 V_{RMS}		B0_P0_R80, B0_P1_R115
	LINE-IN Single-ended, AC-coupled	J6, J8, J12 (2-3)	J4, J5, J11, J15, J16, J20, J21	1 V_{RMS}		B0_P0_R80, B0_P1_R115
	LINE-IN Differential, DC-coupled	J15, J16	J4, J5, J6, J11, J12, J20, J21, J8 (DUT MICBIAS is not used)	4 V_{RMS}		B0_P0_R80
	LINE-IN Single-ended, DC-coupled	J6, J12 (2-3), J15, J16	J4, J5, J11, J20, J21, J8 (DUT MICBIAS is not used)	2 V_{RMS}		B0_P0_R80
	On-board Electret Condenser Microphone (ECM) Differential, AC-coupled	J4, J5, J8, J11, J12 (1-2)	J6, J15, J16, J20, J21	Refer to data sheet		B0_P0_R80, B0_P1_R115
	On-board Electret Condenser Microphone (ECM) Single-ended, AC-coupled	J4, J5, J8, J11, J12 (2-3)	J6, J15, J16, J20, J21	Refer to data sheet		B0_P0_R80, B0_P1_R115
	On-board Electret Condenser Microphone (ECM) Differential, DC-coupled	J4, J5, J8, J11, J12 (1-2), J15, J16	J6, J20, J21	Refer to data sheet		B0_P0_R80, B0_P1_R115
	On-board Electret Condenser Microphone (ECM) Single-ended, DC-coupled	J4, J5, J8, J11, J12 (2-3), J15, J16	J6, J20, J21	Refer to data sheet		B0_P0_R80, B0_P1_R115
IN2	LINE-IN Differential, AC-coupled	J8	J7, J9, J13, J14, J17, J18, J22, J23, J46	2 V_{RMS}		B0_P0_R85, B0_P1_R115
	LINE-IN Single-ended, AC-coupled	J7, J8, J14 (2-3)	J9, J13, J17, J18, J22, J23, J46	1 V_{RMS}		B0_P0_R85, B0_P1_R115
	LINE-IN Differential, DC-coupled	J17, J18	J7, J9, J13, J14, J22, J23, J46, J8 (DUT MICBIAS is not used)	4 V_{RMS}		B0_P0_R80

Table 2-1. Input Jumper Configuration (continued)

Input Terminal	Input Mode	Installed Jumpers	Uninstalled Jumpers	Input Swing	Topology	Register Setting
	LINE-IN Single-ended, DC-coupled	J7, J14 (2-3), J17, J18	J9, J13, J22, J23, J46, J8 (DUT MICBIAS is not used)	2 V_{RMS}		B0_P0_R80
	On-board Analog MEMS microphone, AC-coupled	J8, J9, J46	J7, J13, J14, J17, J18, J22, J23	Refer to data sheet		B0_P0_R85, B0_P1_R115
	On-board Analog MEMS microphone, DC-coupled	J9, J17, J18, J46	J7, J13, J14, J22, J23, J8 (DUT MICBIAS is not used)	Refer to data sheet		B0_P0_R85, B0_P1_R115

2.3.1.1 Line Inputs

For the line input configuration shown in Figure 2-8, the TAx5x12 captures the audio signal provided through RCA terminals J2 (IN1), J3 (IN2) or header J47 or J48. The RCA white connector is connected to the INxP and RCA red connector is connected to the INxM. Depending on differential or single-ended configuration, populate J6 or J7 jumper as described in the Input Jumper Configuration table above accordingly. The input accepted in AC-Coupled mode is a differential 2-VRMS full-scale audio signal and if a single-ended source is used, the 1-VRMS signal is supported. For DC-Coupled, the input level is a differential 4-VRMS full-scale audio signal and 2-VRMS for single-ended.

2.3.1.2 On-board Microphone Input

For the on-board microphone input configuration shown in Figure 2-8, the TAx5x12 records the audio captured from the microphones MK1 (ECM) or U5 (Analog MEMS) which port is located on the bottom of the board. Electret Microphone (MK1) is connected to IN1P/M and MICBIAS is used to power the on-board microphone, so the header J8 must be installed. For MEMS microphone (U5), this can be configured as either a single ended or differential input and is connected to IN2P/M. There must not be any connections to J1 or J2 while the on-board microphone is used to preserve the performance of the microphone. Gain adjustment can be needed in the device depending on the microphone sensitivity.

2.3.2 TAx5x12 EVM Output Hardware Settings

The TAx5x12 evaluation module has several output configuration options and offers flexibility to allow the user to evaluate the device with different load conditions and configurations. The different configurations are highlighted in this section.

The EVM analog audio output port provides option for AC/DC-Coupled, filter/filter-less path for easy evaluation. By default the filter components are not populated.

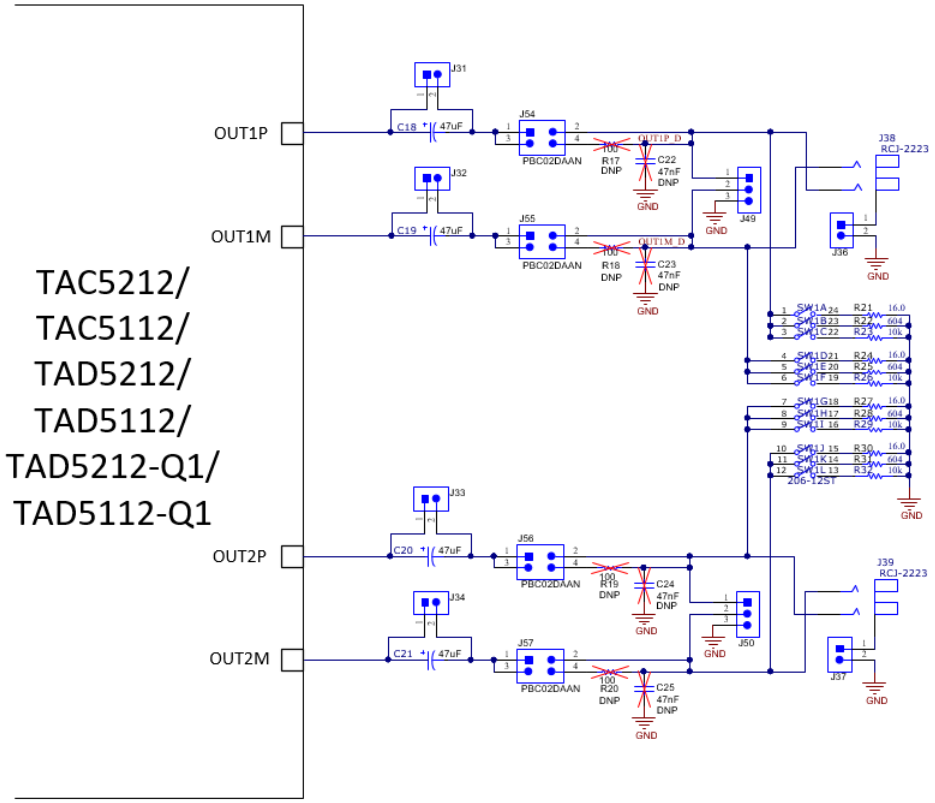


Figure 2-9. TAx5x12 EVM Output Architecture for Channel 1 and 2

OUT1 and OUT2 audio output pins have connection options with external load or the on-board load selections. A pair of RCA connectors, white from OUTP and red from OUTM allows users to connect to external device either as differential or single ended. Jumper header J36 or J37 needs to be populated if single-ended is desired or removed otherwise for differential configuration.

Switch SW1 allows users to select respective load for each output pair for 16 Ohm, 604 Ohm or 10K Ohm if needed. These resistors are for quick evaluation, and can be bypassed for actual load. SW1 and the output RCA connectors are located on the top left hand side shown in Figure 2-10.

Table 2-2. SW1 Pin

SW1 pin	Load Configuration	Resistor Rating	Output Module Register Setting
1, 4, 7, 10	16 Ohm	0.5 W	B0_P0_R101
2, 5, 8, 11	604 Ohm	0.125 W	B0_P0_R101
3, 6, 9, 12	10 KOhm	0.4 W	B0_P0_R101

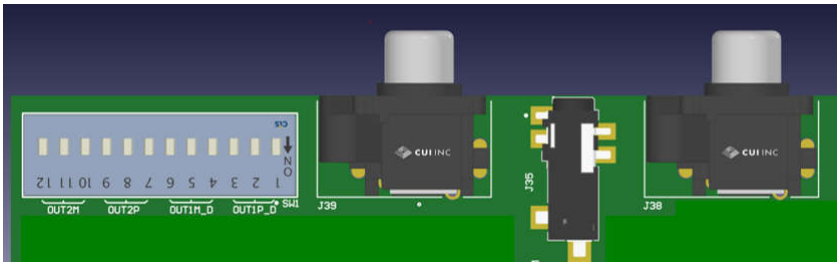


Figure 2-10. TAx5x12 Analog Output Connections

2.3.3 TAx5x12 Headset Connection

This evaluation module provides a 3.5mm TRRS jack supporting CTIA headset configuration. The headset stereo audio inputs are connected to OUT1P (Tip) and OUT2P (Ring), the ground connection can support either ground or ground-sense for DC-Coupled mode through OUT1M or OUT2M pin (Ring) and microphone input (Sleeve) which can be routed to either IN1M or IN2M. The connection is shown in the circuit below.

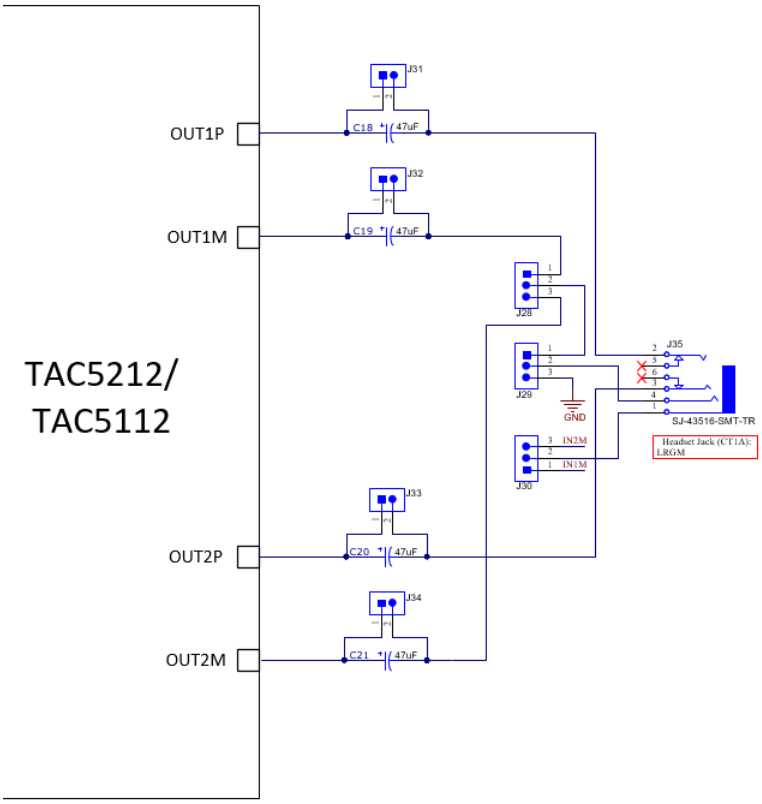


Figure 2-11. TAx5x12 Headset Connection

2.3.4 GPIO1 Hardware Configurations

GPIO1 has many configuration options through J41 header, but only one setting is allowed at a time. GPIO1 can be configured for general purpose input output, a PDM/Digital MIC or a second audio serial interface (ASI2). For Digital Microphone application, GPIO1 can be configured as the Digital Microphone Clock or Data and for Audio Serial Interface. GPIO1 can be configured as either the WCLK, BCLK, DIN or DOUT in controller or target mode. In controller mode, GPIO1 can be configured to receive MCLK as well. This is shown in the figure below.

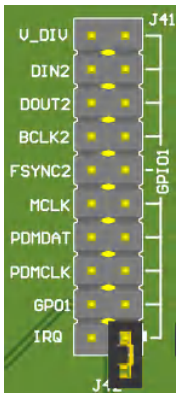


Figure 2-12. GPIO1 Configuration

2.3.5 GPIO2 Hardware Configurations

GPIO2 has many output configuration options through J42 header, but only one setting is allowed at a time. GPIO2 can be configured for general purpose output, a PDM/Digital MIC clock or data or as a second audio serial interface (ASI2). For Audio Serial Interface, GPIO2 can be configured as either the WCLK, BCLK, DIN or DOUT in controller or target mode. In controller mode, GPIO2 can be configured to receive MCLK as well. This is shown in the figure below.

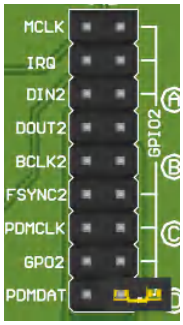


Figure 2-13. GPIO2 Configuration

2.3.6 GPI1 Hardware Configurations

GPI1 supports input configuration options through J45 header, but only one setting is allowed at a time. GPI1 can be configured for general purpose input, a PDM/Digital MIC data, a Serial Peripheral Interface (SPI) device select or a second audio serial interface (ASI2). In Audio Serial Interface, GPI1 can be configured as either the WCLK, BCLK or DIN in target mode. GPI1 can be configured to receive MCLK as well for controller mode. This is shown in the figure below.

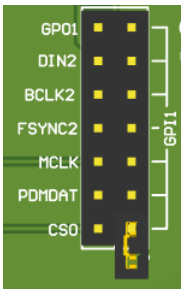


Figure 2-14. GPI1 Configuration

2.3.7 GPO1 Hardware Configurations

GPO1 supports input configuration options through J44 header, but only one setting is allowed at a time. GPO1 can be configured for general purpose output, a PDM/Digital MIC clock, a Serial Peripheral Interface (SPI) data output or a second audio serial interface (ASI2). In Audio Serial Interface, GPO1 can be configured as either the WCLK, BCLK in controller mode or DOUT in controller/target mode. This is shown in the figure below.

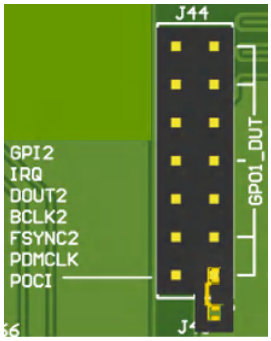


Figure 2-15. GPO1 Configuration

2.3.8 I2C Address Hardware Configurations

Configuring the address of the TAx5x12 device on the EVM is typically not required for evaluation use, however configuring the address is supported by placing jumper on header J75 to either low (ground), low through a resistor, high (pull-up to AVDD) or high to AVDD through resistor. See table below for the different I2C addressing.

Table 2-3. I2C Address Configuration

ADDR Setting	Device Address (7-bit addressing)	Device Address (8-bit addressing)
Short to Ground	0x50	0xA0
Pull down 4.7KOhm to ground	0x51	0xA2
Pull up 22KOhm to AVDD	0x52	0xA4
Pull up 4.7KOhm to AVDD	0x53	0xA6

2.3.9 Audio Serial Interface Hardware Configurations

The TAx5x12 EVM supports secondary audio serial interface (SASI), by default the EVM is configured for primary interface (PASI) from the AC-MB with jumpers populated on header J70 pin 2-3 for BCLK and header J71 pin 2-3 for WCLK. If secondary ASI is desired from AC-MB then move jumpers on header J70 and J71 to pin 1-2 and configure TAx5x12 device for secondary audio interface.

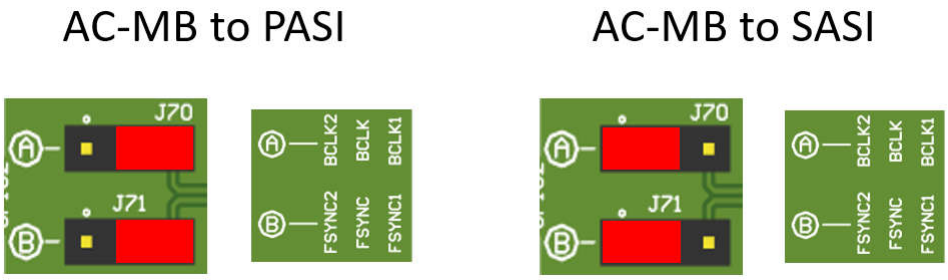


Figure 2-16. AC_MB Audio Serial Interface Connection

External audio interface can also be used for Secondary Audio Interface (SASI) with header J66. This is preferable for making measurements, remove jumpers on header J70 and J71.

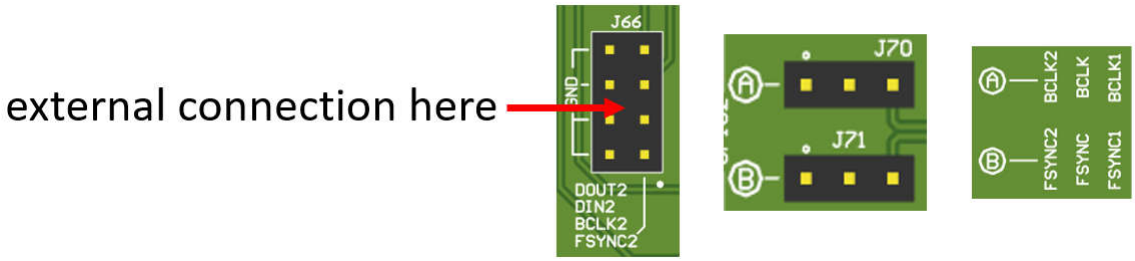


Figure 2-17. External Audio Serial Interface Connection

3 Software

3.1 Software Description

Texas Instrument's PurePath™ console 3 (PPC3) graphical development suite is a program that serves as a platform for many of TI's audio products. PPC3 is designed to simplify the evaluation, configuration, and debug process associated with the development of audio products.

3.2 PurePath Console 3 Installation

The TAx5x12 EVM GUI is an application that installs into the PPC3 framework. PPC3 must be installed prior to downloading the TAx5x12 EVM GUI. Click here to download the PPC3 and request access. If the PPC3 is already installed, then proceed to Section 3.3. Figure 3-1 shows the setup directory for the PPC3 installation.

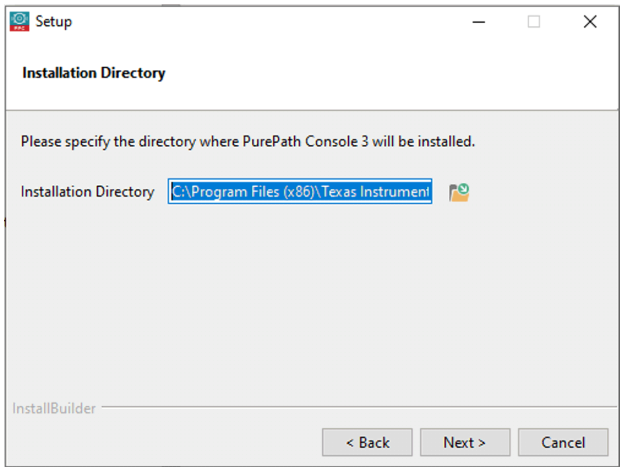


Figure 3-1. PurePath Console 3 Installation

Open the PPC3 installer and follow the instructions in the setup wizard.

3.2.1 USB Audio Setup

Note

When using the USB audio interface, the Texas Instruments USB audio device control panel opens with the input setting configured for 8 channel, 32 bits, as shown in Figure 3-2. For USB audio, 32-bit mode must be used on the EVM as well.

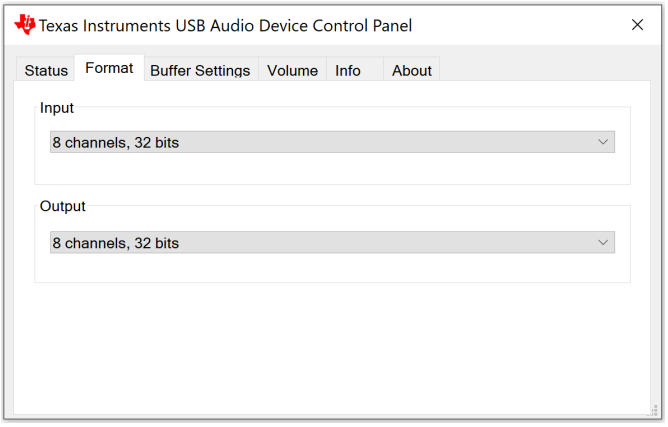


Figure 3-2. Texas Instruments USB Audio Device Control Panel

3.3 TAx5x12 EVM GUI

Open the PPC3 application in the directory chosen for the GUI installation in Section 3.2. Figure 3-3 shows the resulting app center window. Click on the TAC5x1x-Q1 app tile.

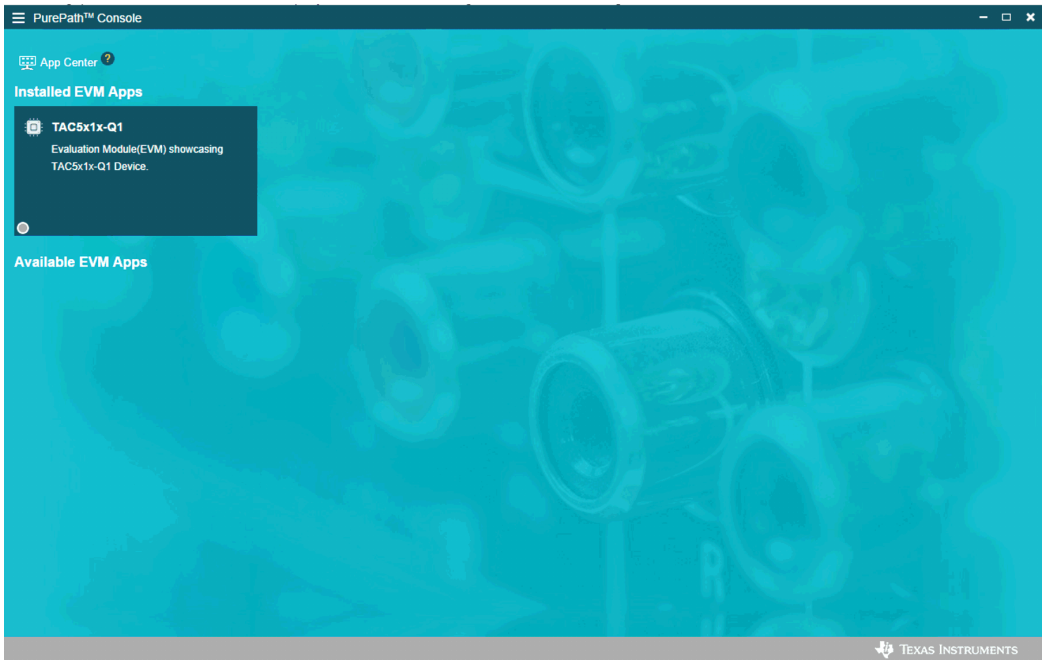


Figure 3-3. PurePath Console 3 App Center

The TAx5x12 GUI is designed to work with up to four devices at any time. When an EVM is connected, the GUI automatically detects the device, as shown in Figure 3-4. In this example, *TAC5212* is detected and subsequent PPC3 Software sections are based on this device. Choose the *1 device* radio button and click New.

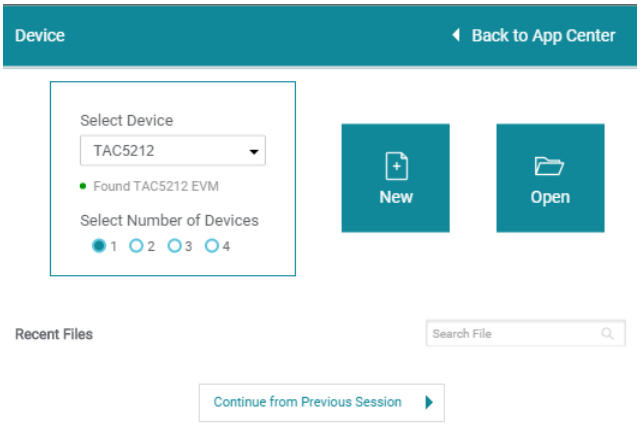


Figure 3-4. Select Device Configuration

The GUI loads the default configuration and a warning message appears. Choose either to update the GUI with device values or overwrite the device with GUI values; either selection works for the initial setup.

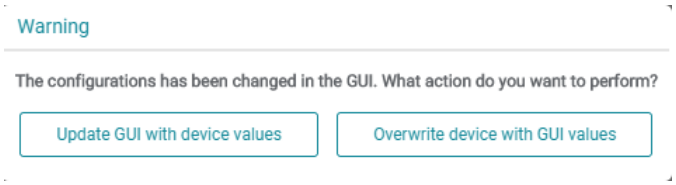


Figure 3-5. Update GUI-Device

The default tabs of the connected device are displayed as shown below.

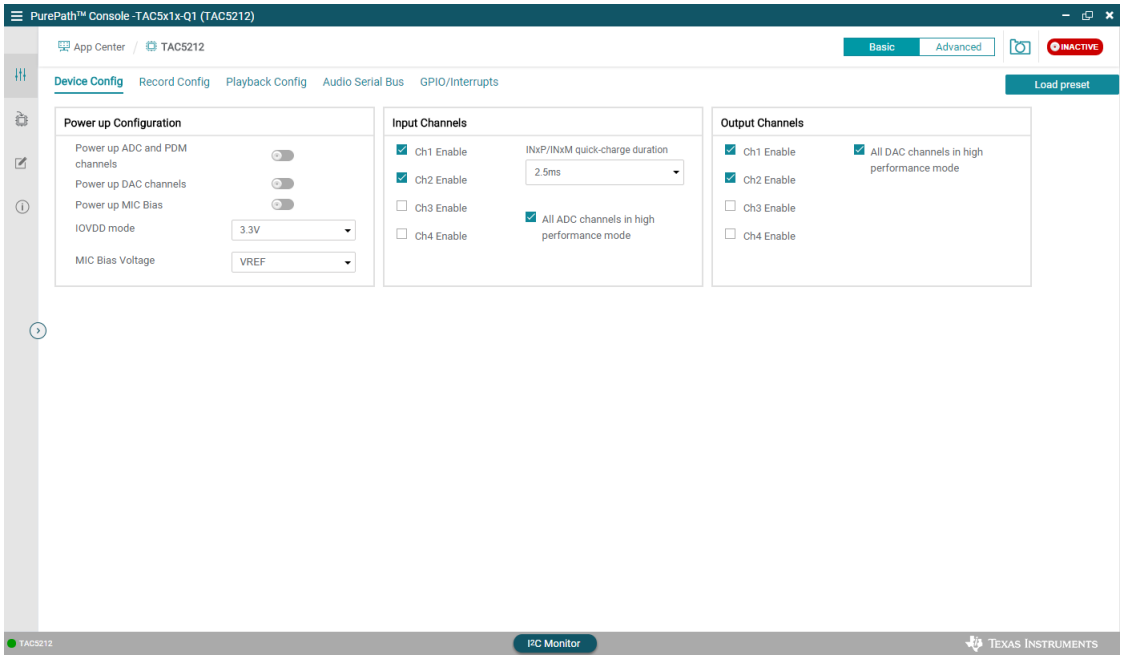


Figure 3-6. Device Config Tab

Before changing any parameters, check the lower left corner of the PPC3 window to verify that the EVM is connected. If no EVM is detected, the text reads TAC5212 - OFFLINE. To connect, plug the USB cable to the computer.

Figure 3-7. Hardware Connection

To activate the GUI, hit the *INACTIVE* red button to change to *ACTIVE* green button. The GUI is now in operation. The user can configure the device first, then activate the PPC3. Once the PPC3 is activated, some controls are greyed out until the *ACTIVE* button is de-activated.

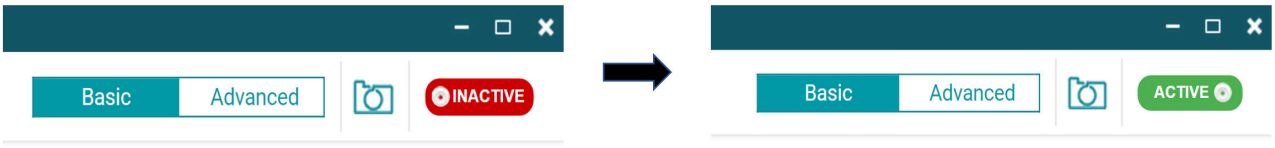


Figure 3-8. Activate GUI

3.3.1 Software Overview

The TAx5x12 EVM control software allows for the configuration of the TAx5x12 EVM-PDK. The application is organized into three main views: Configuration, End System Integration and Register Map. These views are detailed in this section. Some controls in these tabs are grayed out when the tabs are not applicable to the selected device variant.

3.3.2 Configuration View

The configuration view, shown in Figure 3-9, contains all of the settings used to configure and program the TAx5x12 EVM. This view has tabs for each of the device configuration and is described in this section.

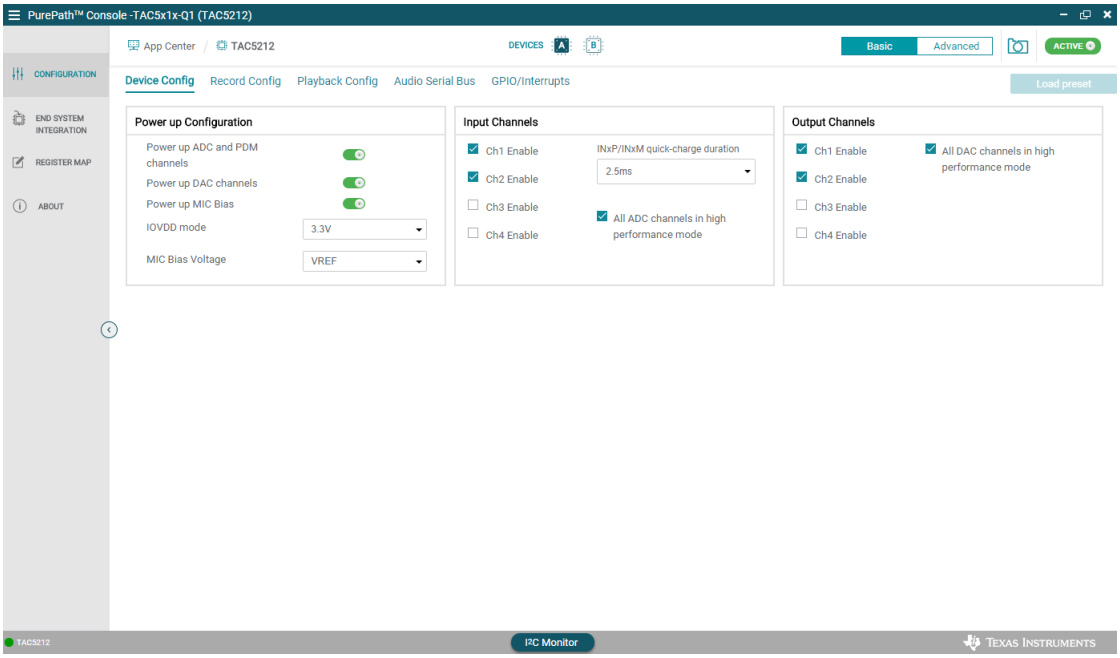


Figure 3-9. Configuration View

3.3.2.1 Device Config Tab

The Device Config tab contains control to power/enable the analog blocks, the IO, MIC Bias level, the different input and output channel selections. Input channel 3 and channel 4 are associated with the PDM input channels.

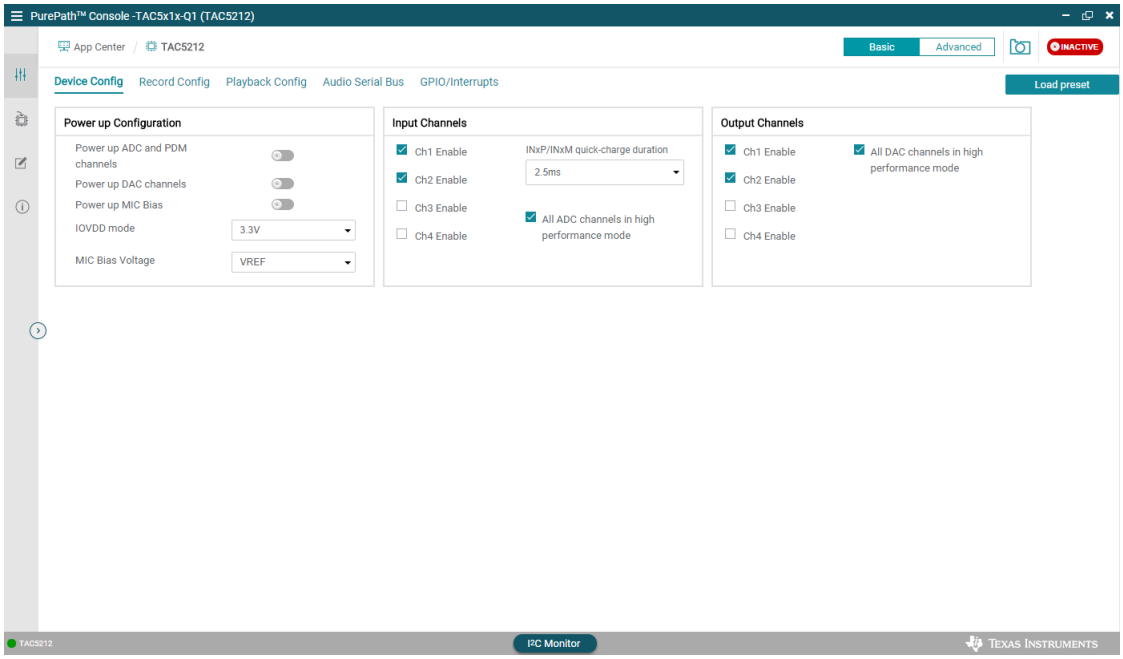


Figure 3-10. Device Config Tab

3.3.2.2 Record Config Tab

The Record Config tab contains the controls for the analog inputs, the different input mode, the input impedance, the bandwidth and the level. The Record Config tab also has the slide buttons for adjusting the digital volume as well as the phase and gain calibrations. On the right hand side, there are pull down menus for selecting the HPF cutoff frequency and the latency of the decimation filter.

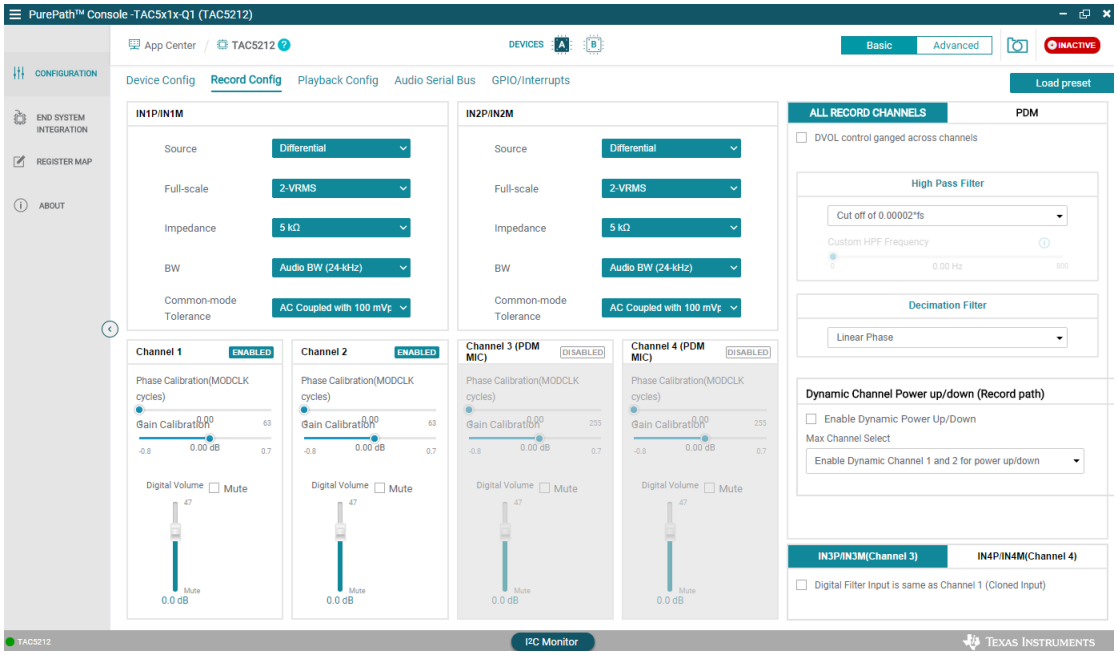


Figure 3-11. Record Config Tab

Input channel 3 and channel 4 are associated with Digital Microphone inputs. For PDM input, several PDM clock selections are available with the associated data and clock triggering in this record config tab.

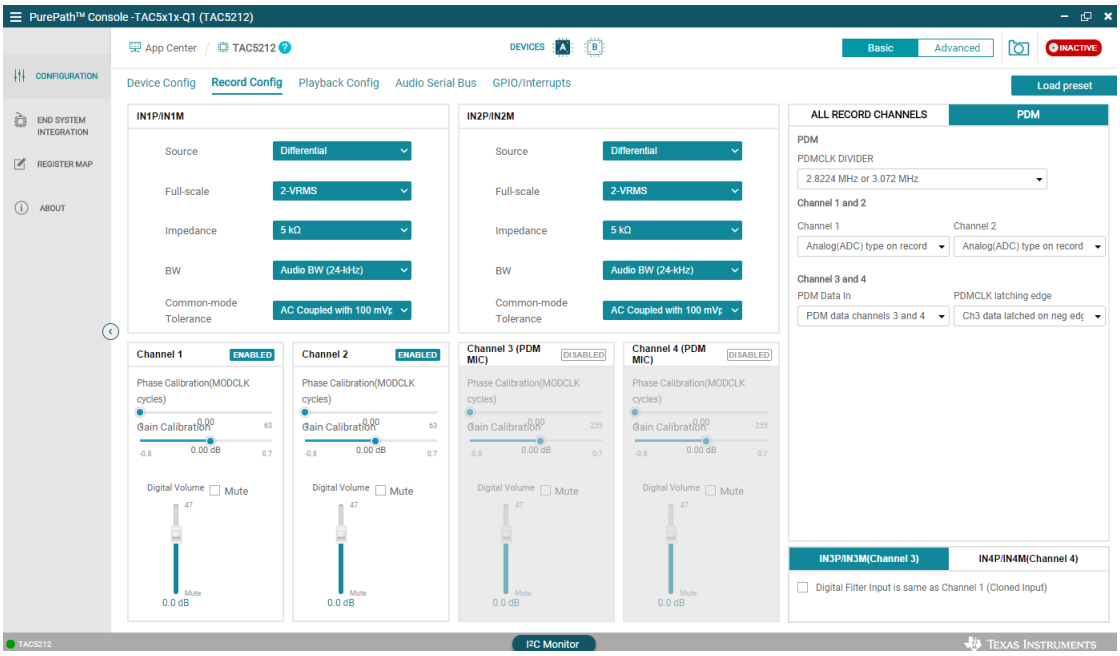


Figure 3-12. PDM Record Config Tab

3.3.2.3 Playback Config Tab

In playback tab, the configurations to set the audio analog output path are provided here. The user can set the source of the output driver data, the output type, the output driver (either LINEOUT or HEADPHONE), and the output gain level. On the right hand side, the playback tab provides the high pass filter (HPF) cutoff frequency, the latency and the output common voltage (Vcom) and bandwidth. When gain is needed to compensate the output drivers, the gain calibration slide button can be used. Depending on the selection, some of the controls are grayed out, which means the controls are not available for configuration.

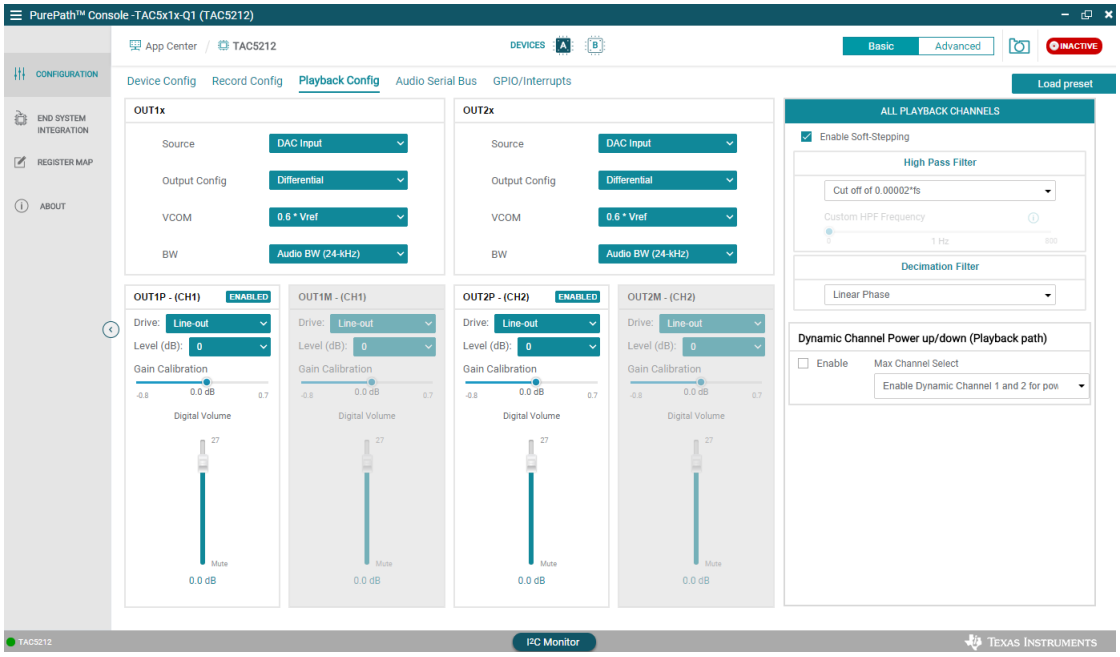


Figure 3-13. Playback Config Tab

3.3.2.4 Audio Serial Bus Tab

The TAx5x12 family of devices feature a very flexible audio serial bus. Allowing these devices to function seamlessly with a wide range of DSPs, SoCs, or other audio devices. The audio serial bus tab provides controls to configure the EVM to the required format, mode and the different supported MCLK frequency.

Besides the primary audio serial bus, audio serial bus tab supports a secondary audio serial bus when needed to interface with an external controller/device with the same flexibility.

3.3.2.4.1 Configuring Primary Audio Serial Bus

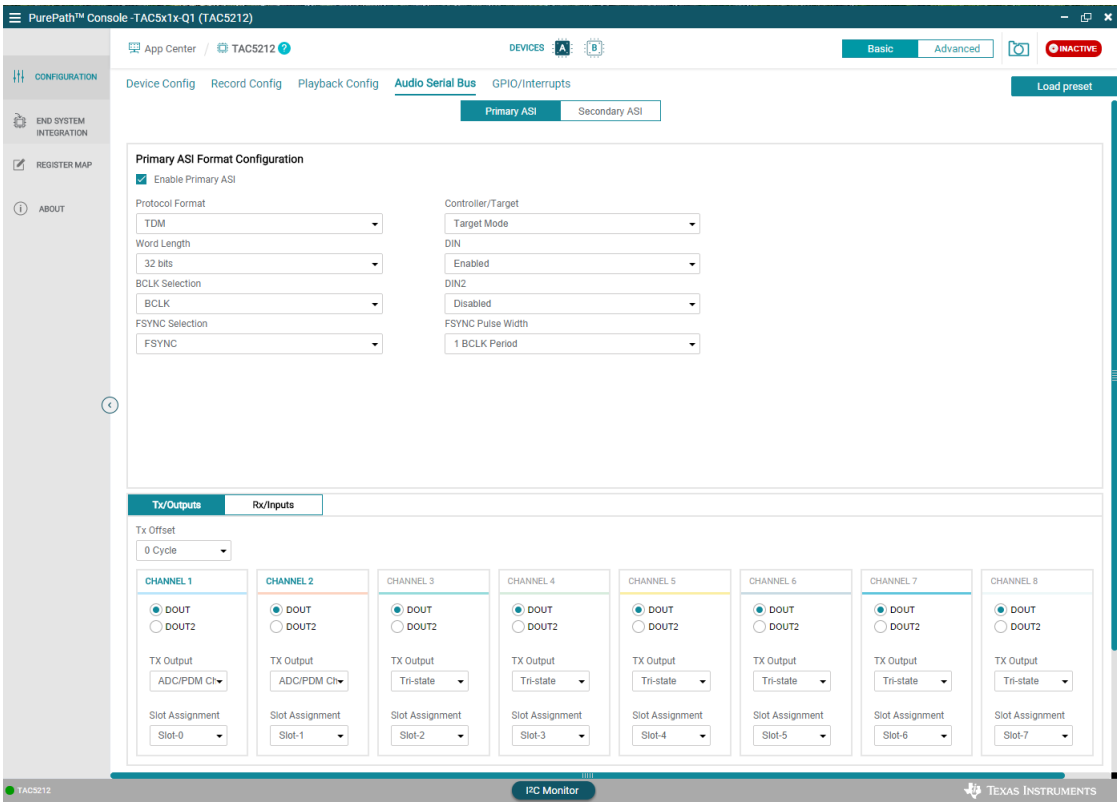


Figure 3-14. Primary Audio Serial Bus Page 1

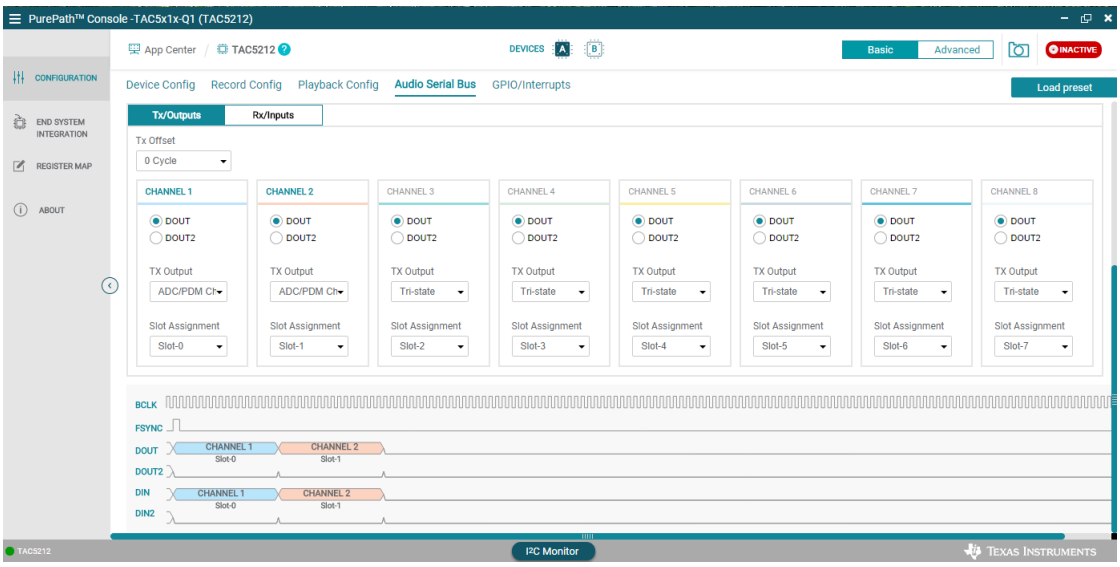


Figure 3-15. Primary Audio Serial Bus Page 2

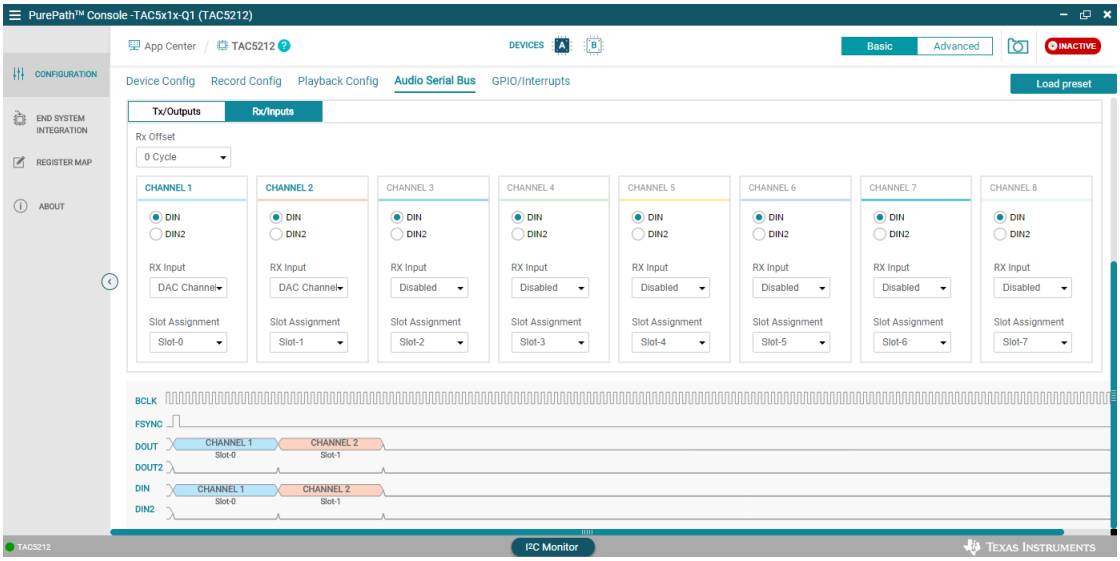


Figure 3-16. Primary Audio Serial Bus Page 3

3.3.2.4.2 Configuring Secondary Audio Serial Bus

When a second audio serial bus is needed, a similar audio serial bus setting to Primary interface is available under the Secondary ASI tab.

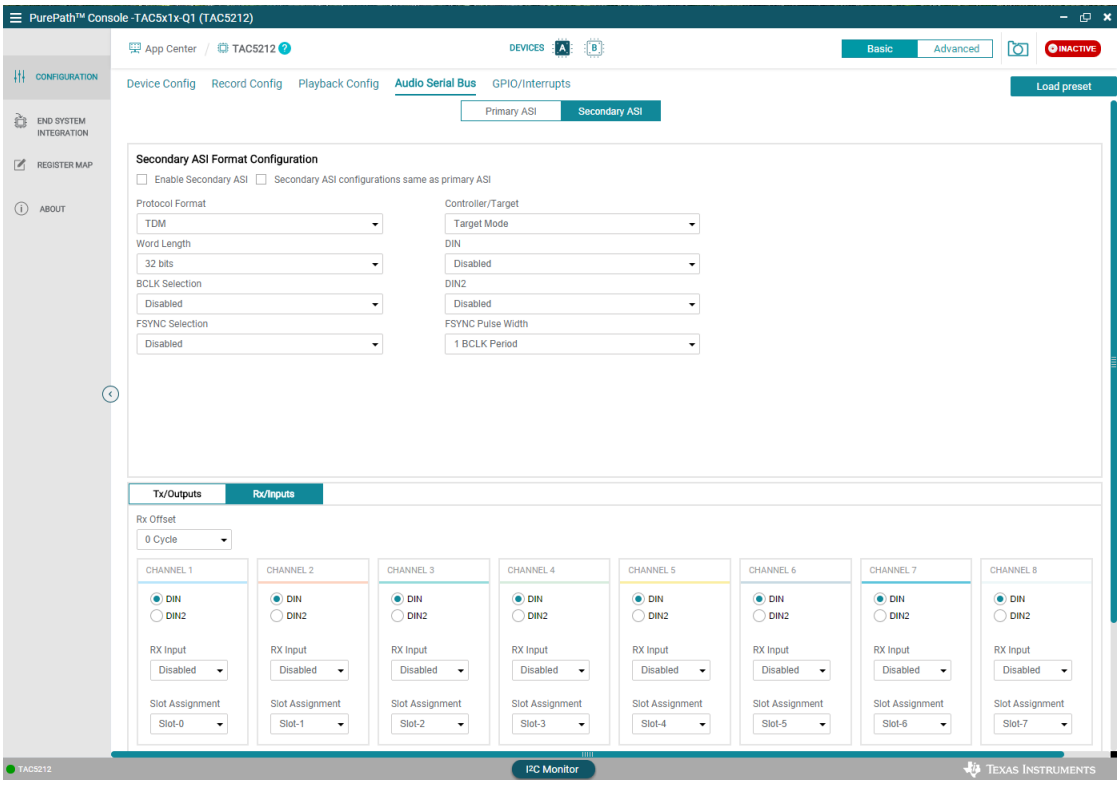


Figure 3-17. Secondary Audio Serial Bus Page 1

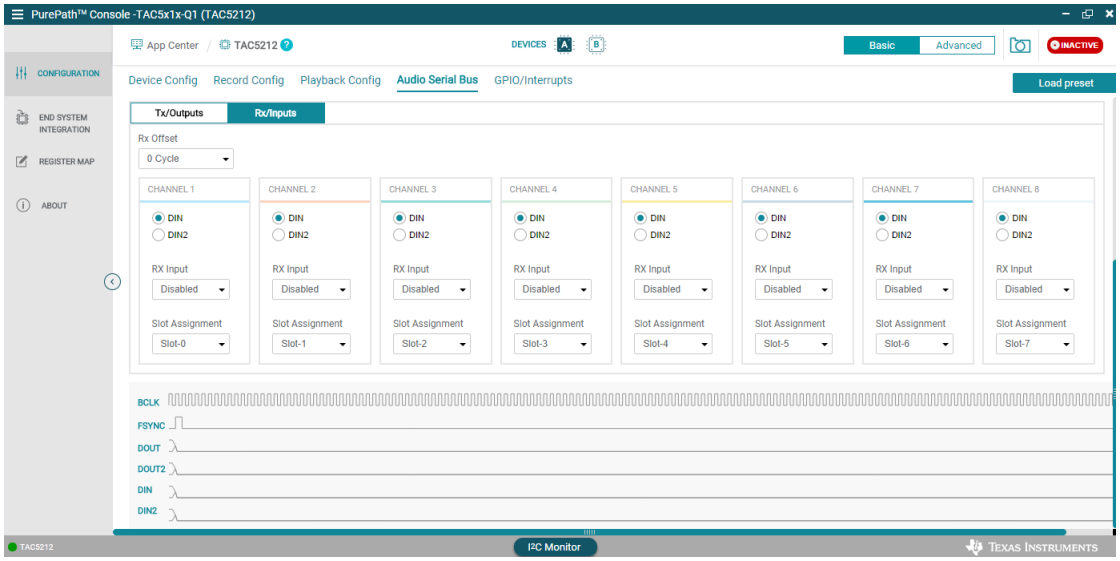


Figure 3-18. Secondary Audio Serial Bus Page 2

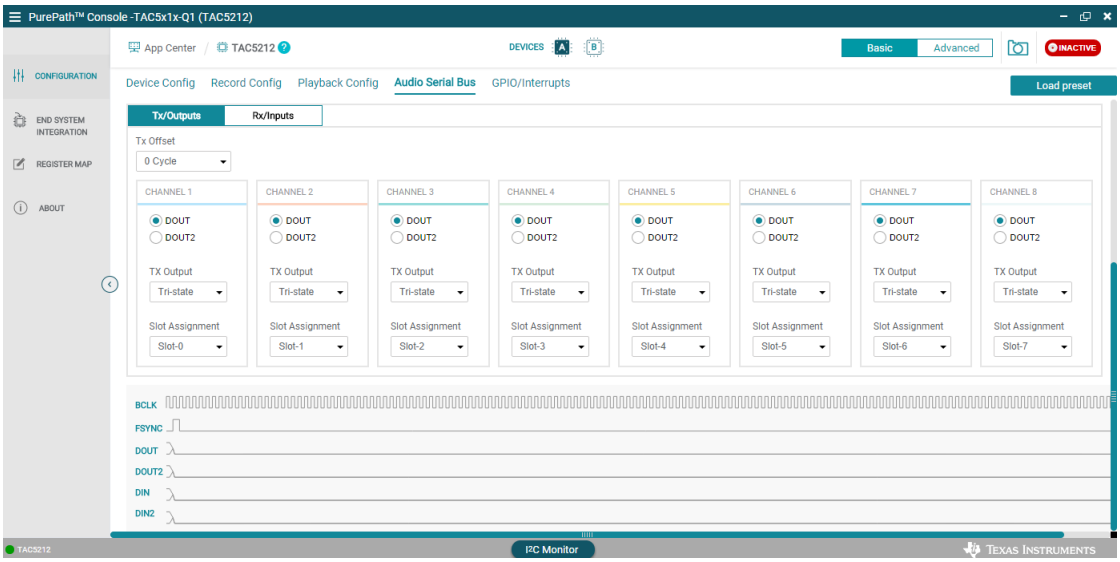


Figure 3-19. Secondary Audio Serial Bus Page 3

3.3.2.4.3 Example Configuring I2S Interface

The TAx5x12 features a highly flexible audio serial bus that can be configured to implement a wide range of data formats. The default format is TDM, however the GUI can be used to change the data format to I2S/LJ. This section shows a configuration example for a 2-channel I2S output to a USB audio at 16 bits and 48 kHz.

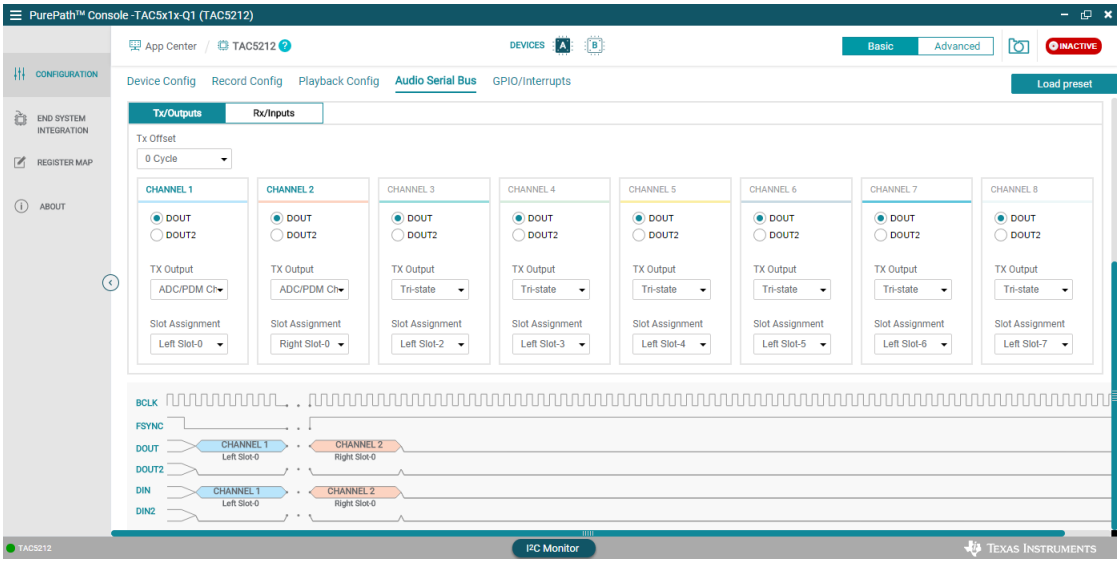


Figure 3-20. I2S Configuration Example

3.3.2.5 GPIO/Interrupts Tab

The GPIOs function and interrupt behavior, as shown in figure below, can be configured in this tab. There is 1 General Purpose Input (GPI1), 1 General Purpose Output (GPO1) and 2 General Purpose Input Output (GPIO1 and GPIO2) in the TAx5x12 devices. These general purpose input/output drivers also provide several multiplexing functions and the selection can be configured in this tab as well.

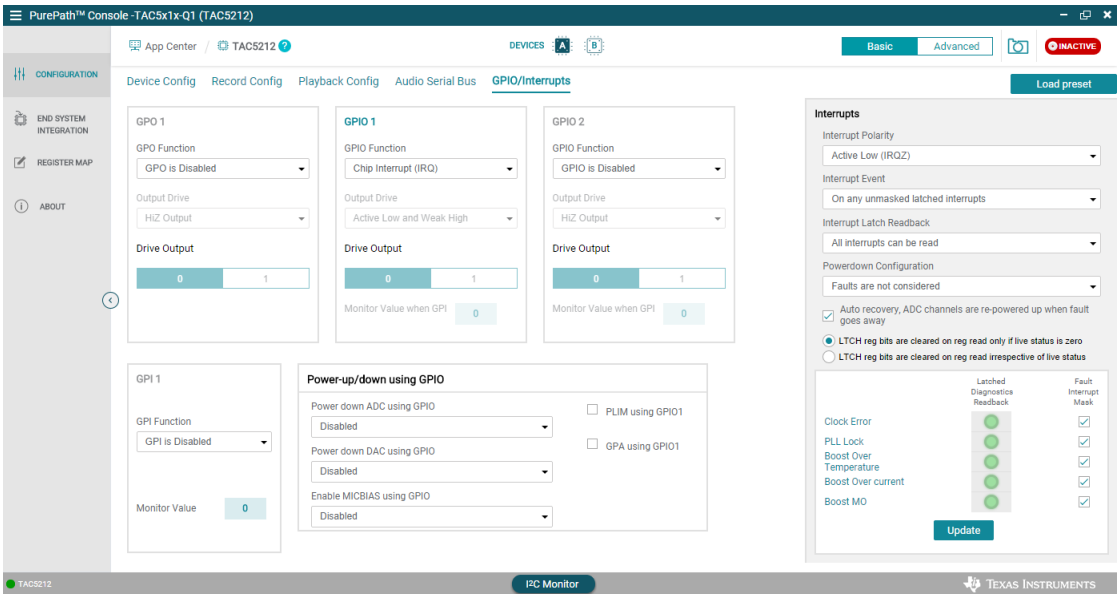


Figure 3-21. GPIO/Interrupts Tab

3.3.2.6 Advanced Tabs

The following tabs are available in the Advanced feature. Click the *Advance* tab and a selection of other features are displayed. Select the feature to bring up the panel. Some of these features are not available in some device variants.

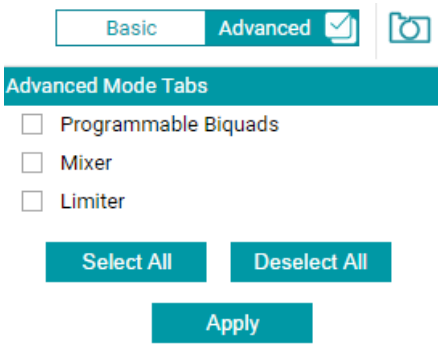


Figure 3-22. Advanced Feature

3.3.2.6.1 Programmable Biquads Tab

Configuration of the biquad filters is made easy with the GUI in the programmable biquads tab. Biquad coefficients can be generated using the filter designers within PPC3, or coefficients from an external filter design tool can be manually entered. Each biquad can be configured individually and then the gain and phase responses can be shown for individual channels or for all channels. Note PPC3 uses the detected sampling rate from the audio serial bus tab to determine the biquad coefficients. The TAx5x12 device must be receiving the desired sampling rate when the audio serial bus tab is opened, and the clock monitor must be updated by clicking on the Read button. If no EVM is connected, PPC3 assumes sampling rate of 48 kHz for all biquad calculations.

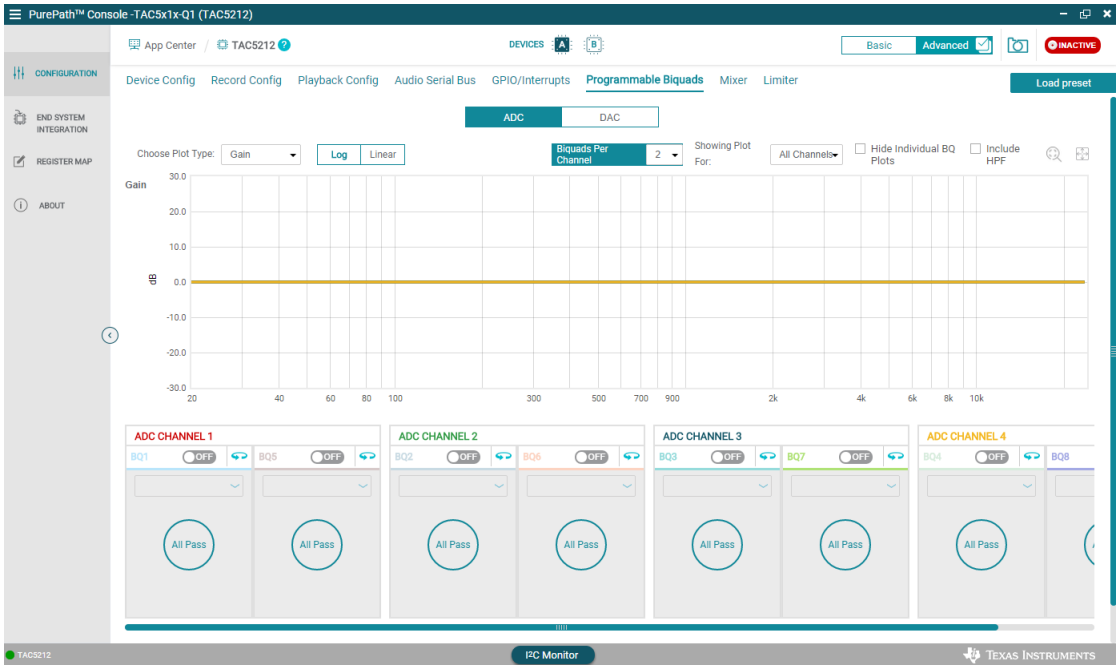


Figure 3-23. Programmable ADC Biquads Tab

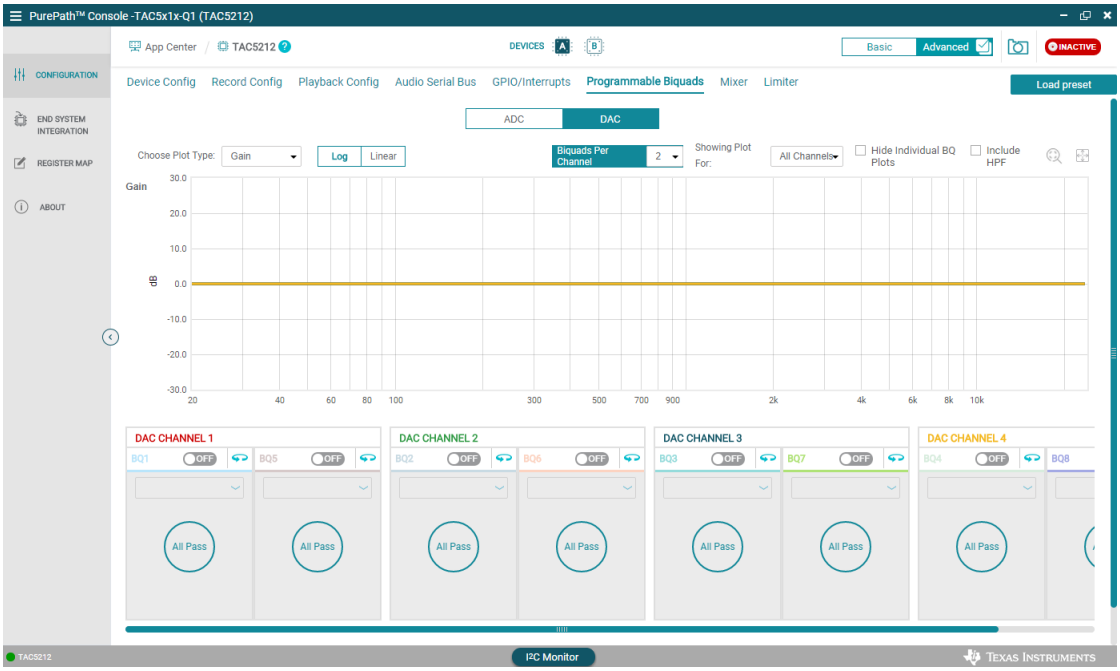


Figure 3-24. Programmable DAC Biquads Tab

3.3.2.6.2 Mixer Tab

Some TAx5x1x devices support several mixing feature, settings are available in this tab. The ADC tab provides the mixing level/coefficient for each of the 4 ADC Mixers and the ADC Loopback. The level is in ratio. For example, 0.5 represents half of the mixer full-scale range.

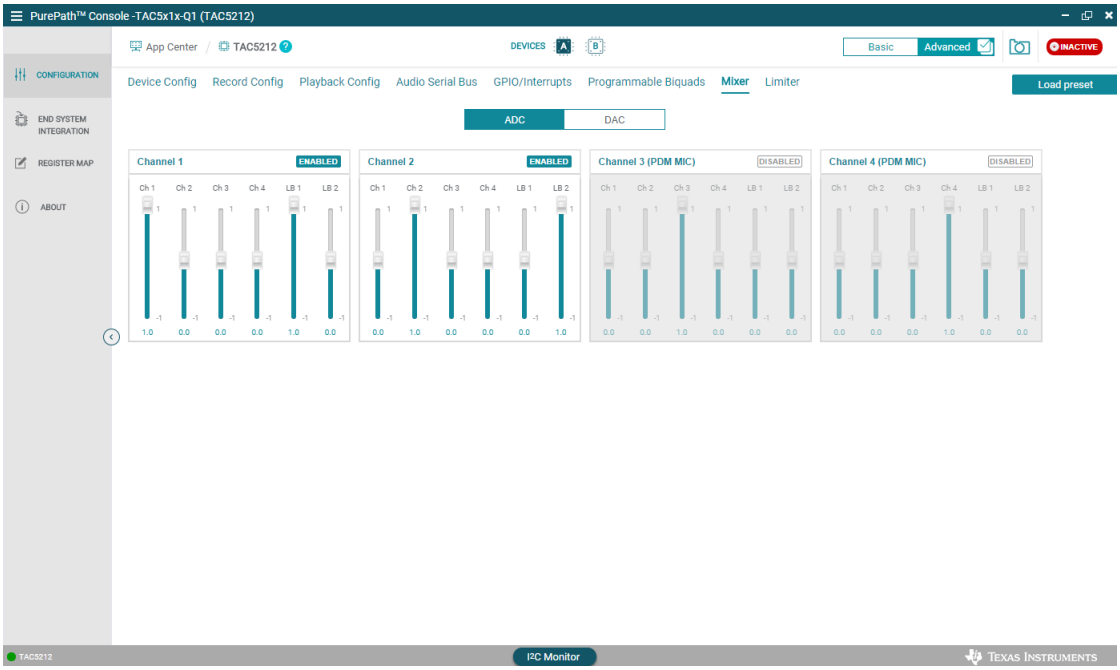


Figure 3-25. Mixer ADC Tab

In DAC tab, there are 8 possible channels from main ASI and 2 possible channels from Auxiliary channels. The level is ratio of the mixer full-scale and user can enter in the cell provided. Besides the external inputs, there are beep and chirp generators that user can mix in DAC mixer as well.

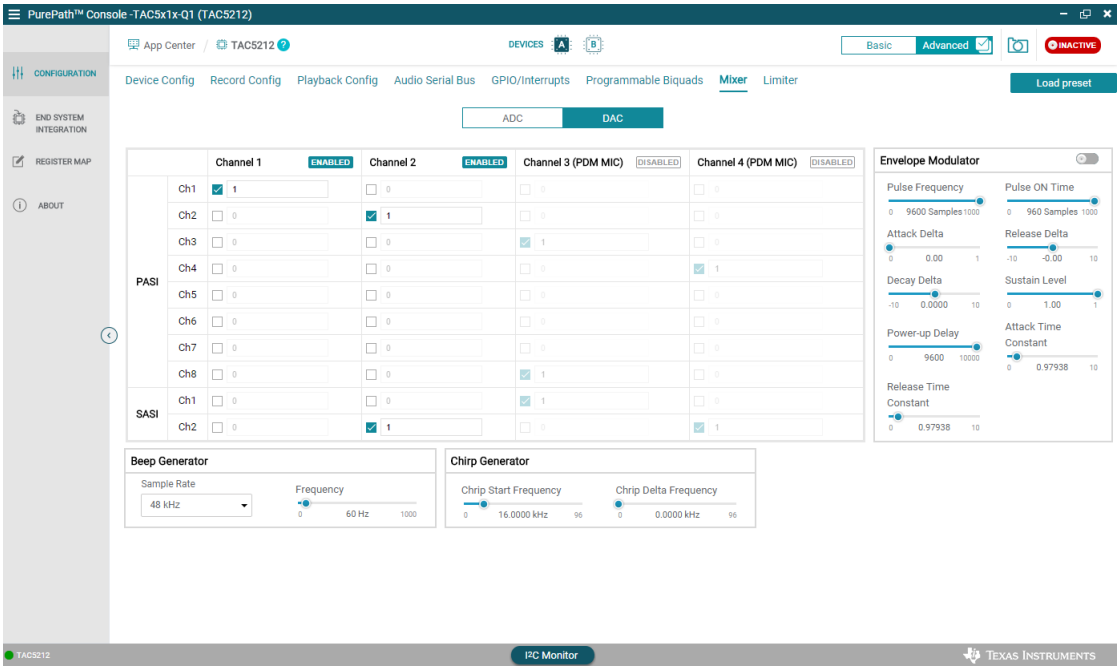


Figure 3-26. Mixer DAC Tab

3.3.2.6.3 Limiter Tab

Various device's limiter like brown out, temperature are available in this tab.

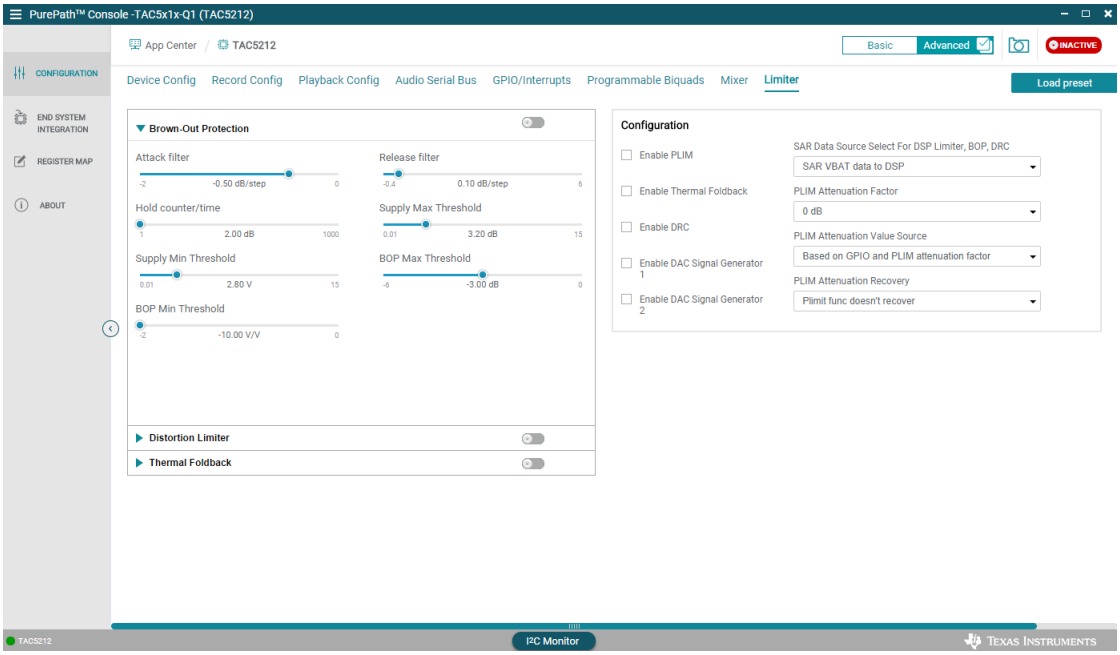


Figure 3-27. Limiter Tab

3.3.3 End System Integration View

The end system integration view provides methods for exporting the current configuration to a header (.h) or .cfg file. The header file can be used for quick integration with a simple microcontroller.

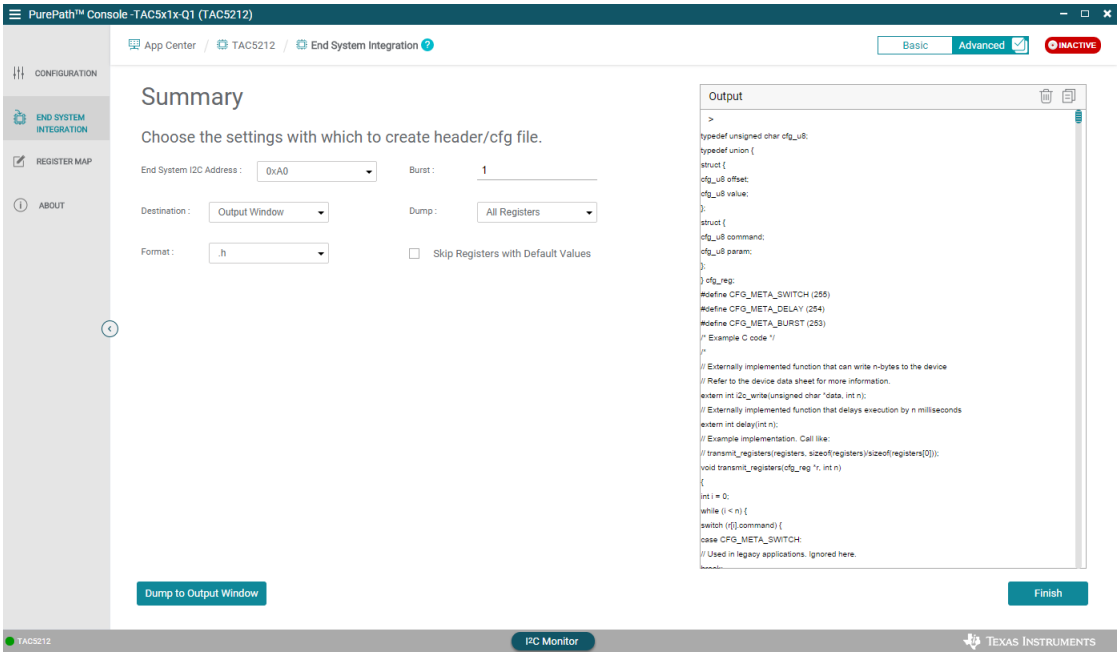


Figure 3-28. End System Configuration

3.3.4 Register Map View

The register map view provides a view of page 0, page 1 and page 3 of the register map.

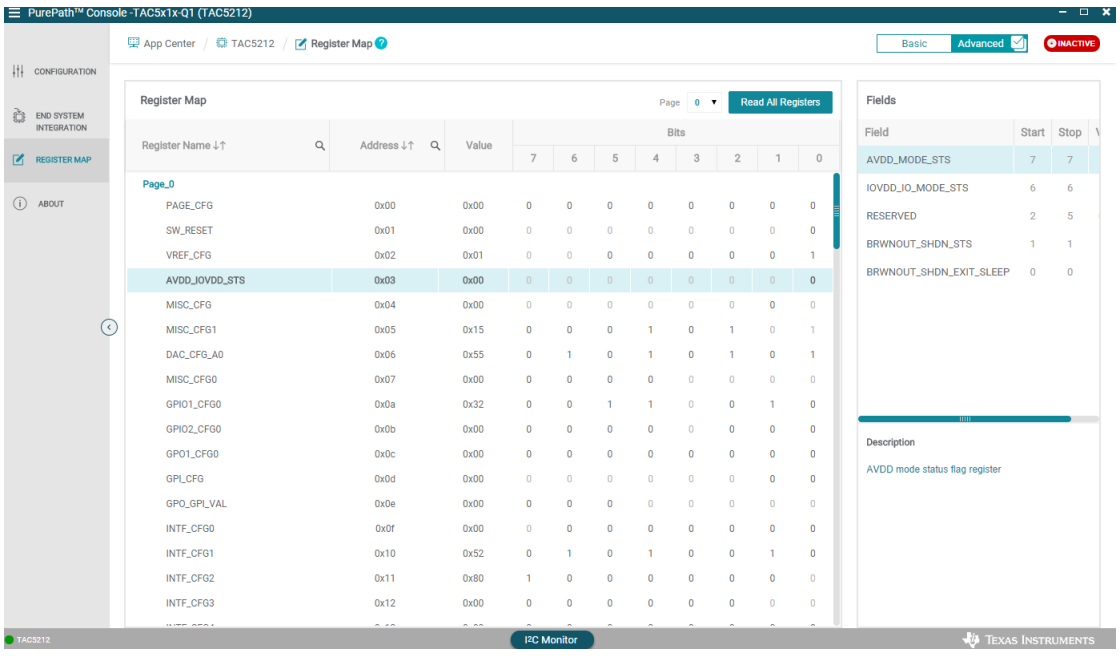


Figure 3-29. Register Map View

3.3.5 Preset Configuration

There are several preset configurations that allow user to check the functionality of the device with the AC-MB Controller. Depending upon the device connected to the setup, the preset configurations that are available varies accordingly. Clicking the *Load Preset* button lists the preset configurations available for the device. Select and hit *Load* to configure the device with the selected preset script and then activate the GUI.

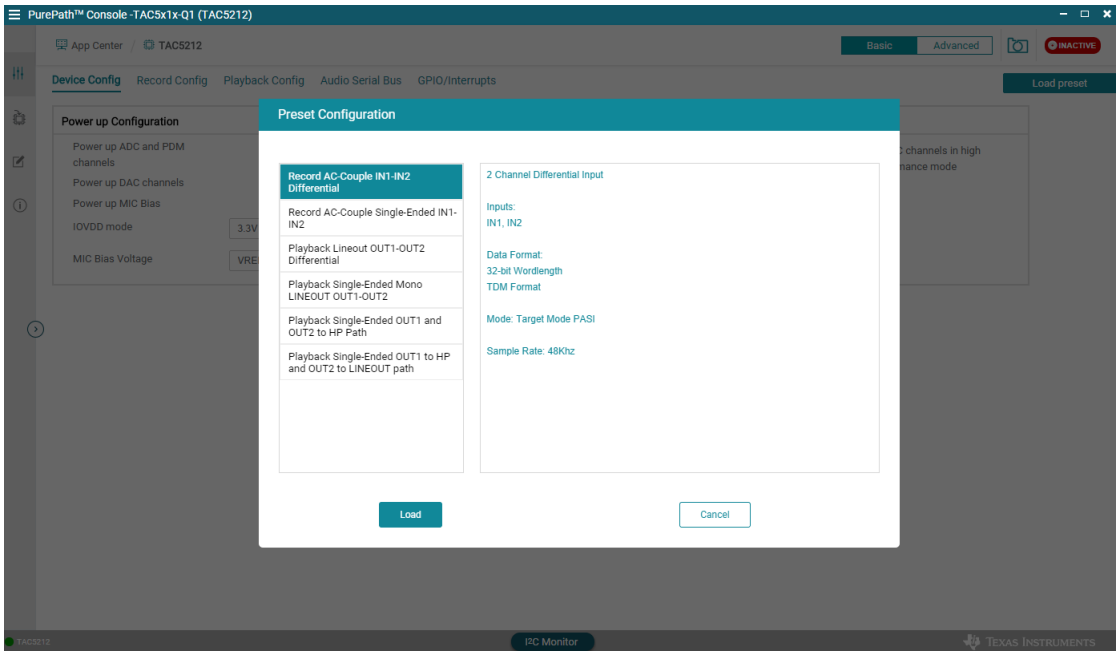


Figure 3-30. Preset Configuration

3.3.6 I2C Monitor View

The I2C Monitor tab allows users to load existing device configuration files or direct I2C transactions to the device registers. To access this window panel, click on the *I2C Monitor* button at the bottom of the GUI. The I2C monitor window opens as shown in the figure below. The LOG screen allows users to log or record any I2C transaction. This is useful for when users want to record device register to use at later time; users can click on the green LED button once and the button turns red for recording. To stop recording, click the red LED button once and the button turns back to green.

To load an existing file or to manually write or read I2C transaction, click on the I/O button to open the input/ output window.

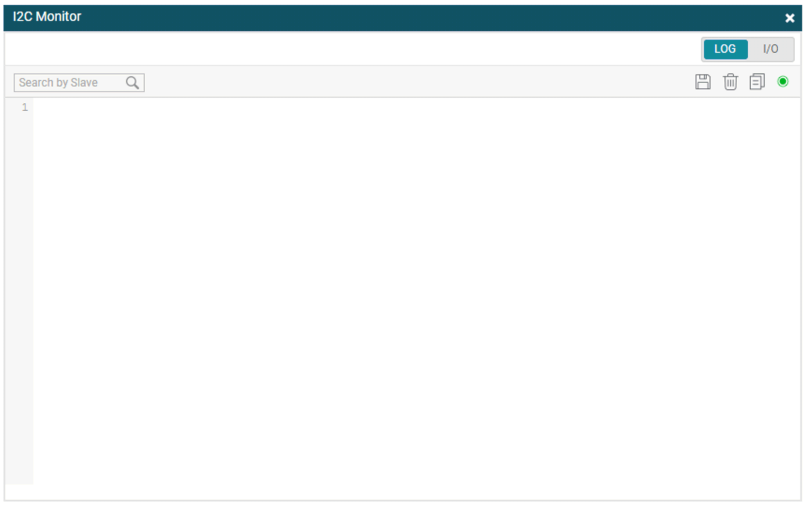


Figure 3-31. I2C Monitor Window

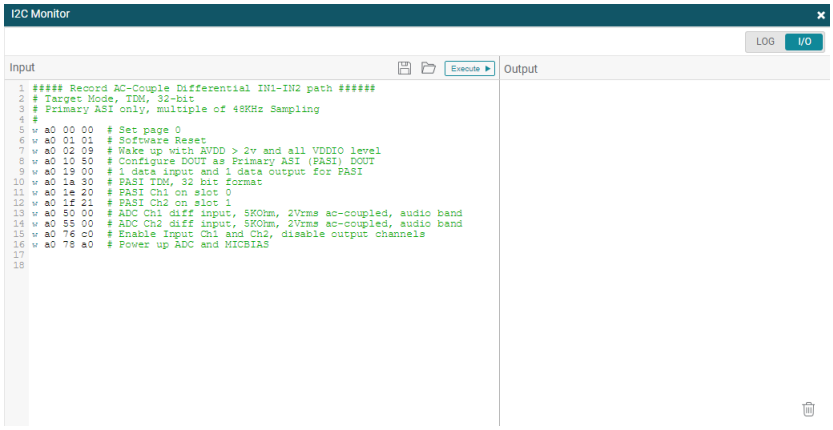


Figure 3-32. I2C Monitor I/O Window

3.4 Configuration Examples

The following several examples are of configuring the device into the respective paths. These device configurations can be used with external host or instrument like Audio Precision. For testing with the AC_MB host of the EVM, use the GUI Preset Configuration. This is because the AC_MB host is configured to support only TDM and the polarity is different from these devices.

Users can copy the settings below and paste them into the I2C Monitor window to configure the device when used with external host/instrument.

- Target Mode Differential AC-Couple Recording with Primary Audio Serial Interface (PASI)

This configuration is for differential audio recording (ADC) with 48 KHz sampling rate, TDM format and 32-bit depth.

```
##### Record AC-Couple Differential IN1-IN2 path ######
# Target Mode, TDM, 32-bit
# Primary ASI only, multiple of 48KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 10 50    # Configure DOUT as Primary ASI (PASI) DOUT
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 30    # PASI TDM, 32 bit format
w a0 1e 20    # PASI Ch1 on slot 0
w a0 1f 21    # PASI Ch2 on slot 1
w a0 50 00    # ADC Ch1 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 55 00    # ADC Ch2 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 76 c0    # Enable Input Ch1 and Ch2, disable output channels
w a0 78 a0    # Power up ADC and MICBIAS
```

- Target Mode Single-Ended AC-Couple Recording with Primary Audio Serial Interface (PASI)

This configuration is for single-ended audio recording (ADC) with 48 KHz sampling rate, I2S format and 32-bit depth.

```
##### Record AC-Couple Single-Ended IN1-IN2 path ######
# Target Mode, I2S, 32-bit
# Primary ASI only, multiple of 48 KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 10 50    # Configure DOUT as Primary ASI (PASI) DOUT
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 1e 20    # PASI Ch1 on Left slot 0
w a0 1f 30    # PASI Ch2 on Right slot 0
w a0 50 40    # ADC Ch1 SE input, 5KOhm, ac-coupled, 2Vrms ac-coupled, audio band
w a0 55 40    # ADC Ch2 SE input, 5KOhm, ac-coupled, 2Vrms ac-coupled, audio band
w a0 76 c0    # Enable Input Ch1 and Ch2, disable output channels
w a0 78 a0    # Power up ADC and MICBIAS
```

- Controller Mode Differential AC-Couple Recording with Primary Audio Serial Interface (PASI).

This configuration is for differential audio recording (ADC) with 48 KHz sampling rate, I2S format and 32-bit depth and MCLK of 12.288MHz.

```
##### Record AC-Couple Differential IN1-IN2 path ######
# Controller Mode, I2S, 32-bit, GPIO1=CCLK from BCLK2 @ 12.288MHz
# Primary ASI only, multiple of 48KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 0a 10    # configure GPIO1 as input
w a0 0f 20    # Set GPIO1=CCLK
w a0 10 50    # Configure DOUT as Primary ASI (PASI) DOUT
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 1e 20    # PASI Ch1 on Left slot 0
w a0 1f 30    # PASI Ch2 on Right slot 0
w a0 32 50    # PASI Fs=48KHz with auto clock configuration
w a0 34 48    # PLL always enabled with fractional allowed and from fixed clk frequency
w a0 37 30    # Use MCLK=12.288MHz, PASI in controller mode
w a0 38 80    # Use internal BCLK for FSYNC generation in controller mode
w a0 39 40    # Set controller mode BCLK/FSYNC ratio to 64 = h40
w a0 50 00    # ADC Ch1 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 55 00    # ADC Ch2 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 76 c0    # Enable Input Ch1 and Ch2, disable output channels
w a0 78 a0    # Power up ADC and MICBIAS
```

- Target Mode Digital MIC Recording with Primary Audio Serial Interface (PASI)

This configuration is for audio recording (ADC) from 2 Digital Microphone with 48 KHz sampling rate, I2S format and 32-bit depth.

```
##### Record from DMIC Test ######
# Target Mode, I2S, 32-bit
# Primary ASI only, multiple of 48KHz Sampling 4x4
# PDMCLK=GPIO1, PDM Data=GPI1
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 0a 41    # Configure GPIO1 as PDMCLK with drive active high and low
w a0 0d 02    # Configure GPI1 as input
w a0 10 50    # Configure DOUT as Primary ASI (PASI) DOUT
w a0 13 cc    # Configure PDM data on GPI1 with channel 1 data latched on the negative edge and
channel 2 data latched on the positive edge
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 1e 20    # PASI Ch1 on Left slot 0
w a0 1f 30    # PASI Ch2 on Right slot 0
w a0 35 00    # PDM_CLK is 2.8224 MHz or 3.072 MHz
w a0 76 c0    # Enable input Chl and Ch2, disable output channels
w a0 78 80    # Power up ADC
```

- Target Mode Differential AC-Couple Recording with Secondary Audio Serial Interface (SASI)

This configuration is for differential audio recording (ADC) with 48 KHz sampling rate, TDM format and 32-bit depth.

```
##### Record AC-Couple Differential IN1-IN2 path ######
# Target Mode, TDM, 32-bit
# Secondary ASI only, multiple of 48KHz Sampling
# GPIO2=Secondary FSYNC, GPIO1=Secondary BCLK, GPO1=Secondary DOUT, GPI1=Secondary DIN for 4x4
#
w a0 00 00    # Sets page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 0a 10    # GPIO1 as input
w a0 0b 10    # GPIO2 as input
w a0 0d 02    # GPI1 as input
w a0 0c 70    # GPO1 as Secondary DOUT
w a0 11 22    # Set GPIO2 as Secondary FSYNC and GPIO1 as Secondary BCLK
w a0 12 60    # Set GPI1 as Secondary DIN
w a0 18 80    # Disable Primary ASI
w a0 34 44    # SASI BCLK is the input clock source
w a0 00 03    # Sets page 3
w a0 1e 20    # SASI Ch1 on slot 0
w a0 1f 21    # SASI Ch2 on slot 1
w a0 00 00    # Sets page 0
w a0 50 00    # ADC Ch1 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 55 00    # ADC Ch2 diff input, 5KOhm, 2Vrms ac-coupled, audio band
w a0 76 C0    # Enable Input Ch1 and Ch2, disable output channels
w a0 78 A0    # Power up ADC and MICBIAS
```

- Target Mode Differential DC-Couple Recording with Primary Audio Serial Interface (PASI).

This configuration is for differential audio recording (ADC) with 48 KHz sampling rate, I2S format and 32-bit depth.

```
##### Record DC-Couple IN1-IN2 path ######
# Target Mode, I2S, 32-bit
# Primary ASI only, multiple of 48KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 10 50    # Configure DOUT as Primary ASI (PASI) DOUT
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 1e 20    # PASI Ch1 on Left slot 0
w a0 1f 30    # PASI Ch2 on Right slot 0
w a0 50 06    # ADC Ch1 DIFF input, 5KOhm, ac/dc-coupled, 4Vrms, audio band
w a0 55 06    # ADC Ch2 DIFF input, 5KOhm, ac/dc-coupled, 4Vrms, audio band
w a0 76 c0    # Enable Input Ch1 and Ch2, disable output channels
w a0 78 a0    # Power up ADC and MICBIAS
```

- Target Mode Playback to Differential LINEOUT with Primary Audio Serial Interface (PASI)

This configuration is for differential audio playback (DAC) with 48 KHz sampling rate, TDM format and 32-bit depth.

```
##### Playback Differential LINEOUT Path ######
# Target Mode, TDM, 32-bit
# Primary ASI only, multiple of 48KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 11 80    # Enable PASI DIN
w a0 19 00    # 1 data inputs and 1 data outputs for PASI
w a0 1a 30    # PASI TDM, 32 bit format
w a0 28 20    # PASI DIN Ch1 on TDM slot 0
w a0 29 21    # PASI DIN Ch2 on TDM slot 1
w a0 64 20    # Configure OUT1P/M as differential from DAC1
w a0 65 20    # Configure OUT1P LINEOUT 0dB audio band
w a0 66 20    # Configure OUT1M LINEOUT 0dB 2Vrms Differential
w a0 6b 20    # Configure OUT2P/M as differential from DAC2
w a0 6c 20    # Configure OUT2P LINEOUT 0dB audio band
w a0 6d 20    # Configure OUT2M LINEOUT 0dB 2Vrms Differential
w a0 76 0c    # Disable all input channels and enable output channel 1 and 2
w a0 78 40    # Power up all DAC channel
```

- Target Mode Playback to Single-Ended LINEOUT with Primary Audio Serial Interface (PASI).

This configuration is for single-ended mono audio playback (DAC) with 48 KHz sampling rate, TDM format and 32-bit depth.

```
##### Playback Single-Ended Mono LINEOUT Path ######
# Target Mode, TDM, 32-bit
# Primary ASI only, multiple of 48KHz Sampling
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 11 80    # Enable PASI DIN
w a0 19 00    # 1 data inputs and 1 data outputs for PASI
w a0 1a 30    # PASI TDM, 32 bit format
w a0 28 20    # PASI DIN Ch1 on TDM slot 0
w a0 29 21    # PASI DIN Ch2 on TDM slot 1
w a0 64 28    # Configure OUT1P/M as single-ended from DAC1
w a0 65 20    # Configure OUT1P LINEOUT 0dB audio band
w a0 66 20    # Configure 2Vrms Differential
w a0 6b 28    # Configure OUT2P/M as single-ended from DAC2
w a0 6c 20    # Configure OUT2P LINEOUT 0dB audio band
w a0 6d 20    # Configure 2Vrms Differential
w a0 76 0c    # Disable all input channels and enable output channel 1 and 2
w a0 78 40    # Power up all DAC channel
```

- Target Mode Playback to Differential LINEOUT with Secondary Audio Serial Interface (SASI).

This configuration is for differential audio playback (DAC) with 48 KHz sampling rate, TDM format and 32-bit depth.

```
##### Playback Differential LINEOUT Path ######
# Target Mode, TDM, 32-bit
# Secondary ASI only, multiple of 48KHz Sampling
# GPIO2=Secondary FSYNC, GPIO1=Secondary BCLK, GPI1=Secondary DIN, GPO1=Secondary DOUT for 4x4
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 0a 10    # GPIO1 as input
w a0 0b 10    # GPIO2 as input
w a0 0d 02    # GPI1 as input
w a0 0c 71    # GPO1 as Secondary DOUT
w a0 11 22    # Set GPI2A as Secondary FSYNC and GPIO1 as Secondary BCLK
w a0 12 60    # Set GPI1A as Secondary DIN
w a0 18 80    # Disable Primary ASI
w a0 34 44    # SASI BCLK is the input clock source
w a0 19 00    # 1 data input and 1 data output for SASI
w a0 00 03    # Set page 3
w a0 1a 30    # SASI TDM, 32 bit format
w a0 28 20    # SASI DIN Ch1 on TDM slot 0
w a0 29 21    # SASI DIN Ch2 on TDM slot 1
w a0 00 00    # Set page 0
w a0 64 20    # Configure OUT1P/M as differential from DAC1
w a0 65 20    # Configure OUT1P LINEOUT 0dB audio band
w a0 66 20    # Configure OUT1M LINEOUT 0dB 2Vrms Differential
w a0 6b 20    # Configure OUT2P/M as differential from DAC2
w a0 6c 20    # Configure OUT2P LINEOUT 0dB audio band
w a0 6d 20    # Configure OUT2M LINEOUT 0dB 2Vrms Differential
w a0 76 0c    # Disable all input channels and enable output channel 1 and 2
w a0 78 40    # Power up all DAC channels
```

- Controller Mode Playback to Differential LINEOUT with Secondary Audio Serial Interface (SASI)

This configuration is for differential audio playback (DAC) with 44.1KHz sampling rate, TDM format and 32-bit depth and MCLK of 12.288MHz.

```
##### Playback Differential LINEOUT Path ######
# Controller Mode MCLK=12.288MHz, TDM, 32-bit
# Secondary ASI only, multiple of 44.1KHz Sampling
# GPIO1=Secondary FSYNC, GPIO2=CCLK Input, GPI1=Secondary DIN, GPO1=Secondary BCLK for 4x4
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 0a a0    # GPIO1 as Secondary FSYNC output
w a0 0b 10    # GPIO2 as input
w a0 0d 02    # GPI1 as input
w a0 0c 90    # GPO1 as Secondary BCLK output
w a0 0f 40    # GPIO2 as CCLK input
w a0 11 10    # GPIO1 as Secondary FSYNC
w a0 12 60    # Set GPI1 as Secondary DIN
w a0 18 80    # Disable Primary ASI
w a0 32 00    # Auto clock configuration
w a0 33 50    # SASI Fs=48KHz (41895-49440) with Auto clock configuration
w a0 34 48    # PLL always enabled with fractional allowed and from fixed clk frequency
w a0 36 00    # auto detect the ratio
w a0 37 29    # Use MCLK=12.288MHz, SASI in controller configuration with rate multiple of 44.1KHz
w a0 3a 81    # Use internal BCLK for FSYNC generation for SASI, BCLK/FSYNC ratio=256
w a0 3b 00    # use BCLK/FSYNC ratio of 256 for SASI
w a0 00 03    # Set page 3
w a0 1a 30    # SASI TDM, 32 bit format
w a0 28 20    # SASI DIN Ch1 on TDM slot 0
w a0 29 21    # SASI DIN Ch2 on TDM slot 1
w a0 00 00    # Set page 0
w a0 64 20    # Configure OUT1P/M as differential from DAC1
w a0 65 20    # Configure OUT1P LINEOUT 0dB audio band
w a0 66 20    # Configure OUT1M LINEOUT 0dB 2Vrms Differential
w a0 6b 20    # Configure OUT2P/M as differential from DAC2
w a0 6c 20    # Configure OUT2P LINEOUT 0dB audio band
w a0 6d 20    # Configure OUT2M LINEOUT 0dB 2Vrms Differential
w a0 76 0c    # Disable all input channels and enable output channel 1 and 2
```

```
w a0 78 40    # Power up all DAC channels
```

- Target Mode Playback to Differential Headphone with Primary Audio Serial Interface (PASI)

This configuration is for differential audio playback (DAC) with 48 KHz sampling rate, I2S format and 32-bit depth.

```
##### Playback Differential Headphone Path ######
# Target Mode, I2S, 32-bit
# Primary ASI only, multiple of 48KHz Sampling
# Playback through Stereo OUT1P and OUT2P for Headphone
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 11 80    # Enable PASI DIN
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 28 20    # PASI DIN Ch1 on Left slot 0
w a0 29 30    # PASI DIN Ch2 on Right slot 0
w a0 64 20    # Configure OUT1P/M as differential from DAC1
w a0 65 60    # Configure OUT1P as Headphone 0dB audio band
w a0 66 60    # Configure OUT1M as Headphone 0dB audio band
w a0 6b 20    # Configure OUT2P/M as differential from DAC2
w a0 6c 60    # Configure OUT2P as Headphone 0dB audio band
w a0 6d 60    # Configure OUT2M as Headphone 0dB audio band
w a0 76 0c    # Enable output channel 1 and 2 and disable all input channels
w a0 78 40    # Power up DAC channel
```

- Target Mode Playback to Single-Ended Headphone with Primary Audio Serial Interface (PASI).

This configuration is for Single-Ended audio playback (DAC) with 48 KHz sampling rate, I2S format and 32-bit depth.

```
##### Playback Single-Ended Headphone Path ######
# Target Mode, I2S, 32-bit
# Primary ASI only, multiple of 48 KHz Sampling
# Playback through Stereo OUT1P and OUT2P for Headphone
#
w a0 00 00    # Set page 0
w a0 01 01    # Software Reset
w a0 02 09    # Wake up with AVDD > 2v and all VDDIO level
w a0 11 80    # Enable PASI DIN
w a0 19 00    # 1 data input and 1 data output for PASI
w a0 1a 70    # PASI I2S, 32 bit format
w a0 28 20    # PASI DIN Ch1 on Left slot 0
w a0 29 30    # PASI DIN Ch2 on Right slot 0
w a0 64 28    # Configure OUT1P as mono single-ended from DAC1
w a0 65 60    # Configure OUT1P as Headphone 0dB audio band
w a0 66 60    # Configure 2Vrms Differential
w a0 6b 28    # Configure OUT2P as mono single-ended from DAC2
w a0 6c 60    # Configure OUT2P as Headphone 0dB audio band
w a0 6d 60    # Configure 2Vrms Differential
w a0 76 0c    # Enable output channel 1 and 2 and disable all input channels
w a0 78 40    # Power up DAC channel
```

3.5 System Overview

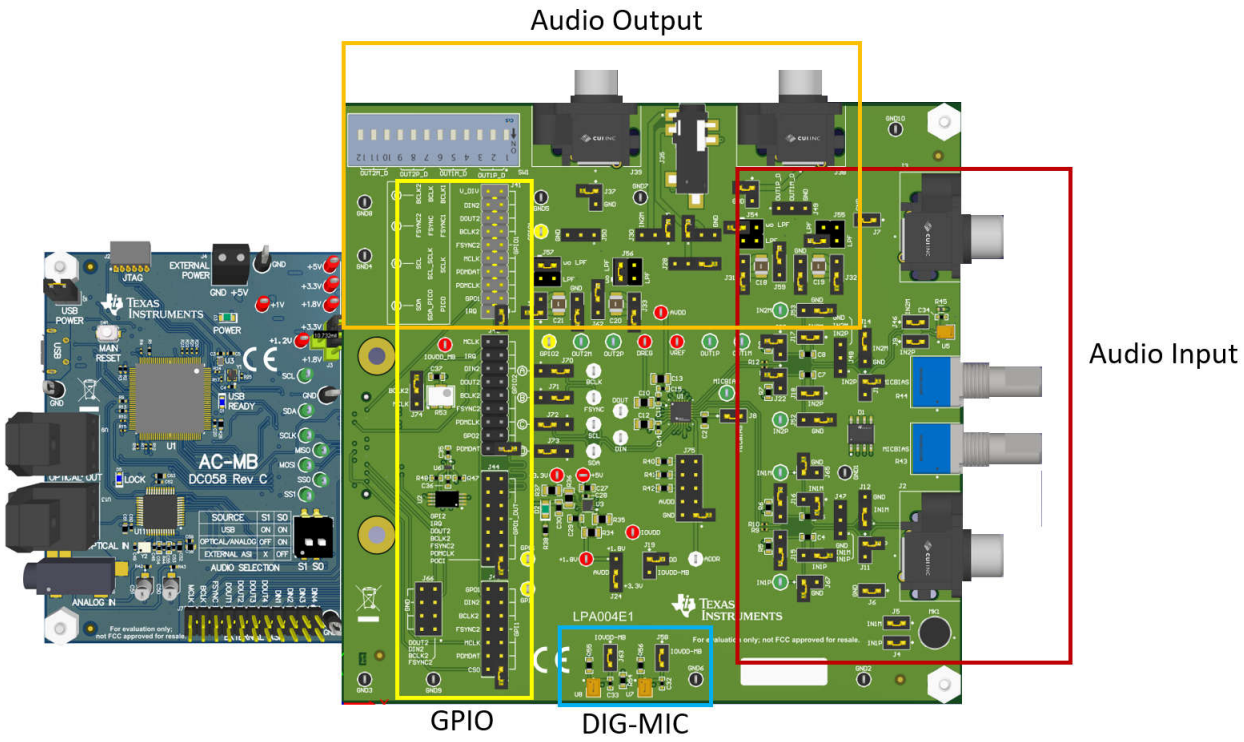


Figure 3-33. System Overview

4 Hardware Design Files

This section provides the schematics, layout example and bill of materials (BOM) for each TAx5x12 EVM variant.

4.1 Schematics

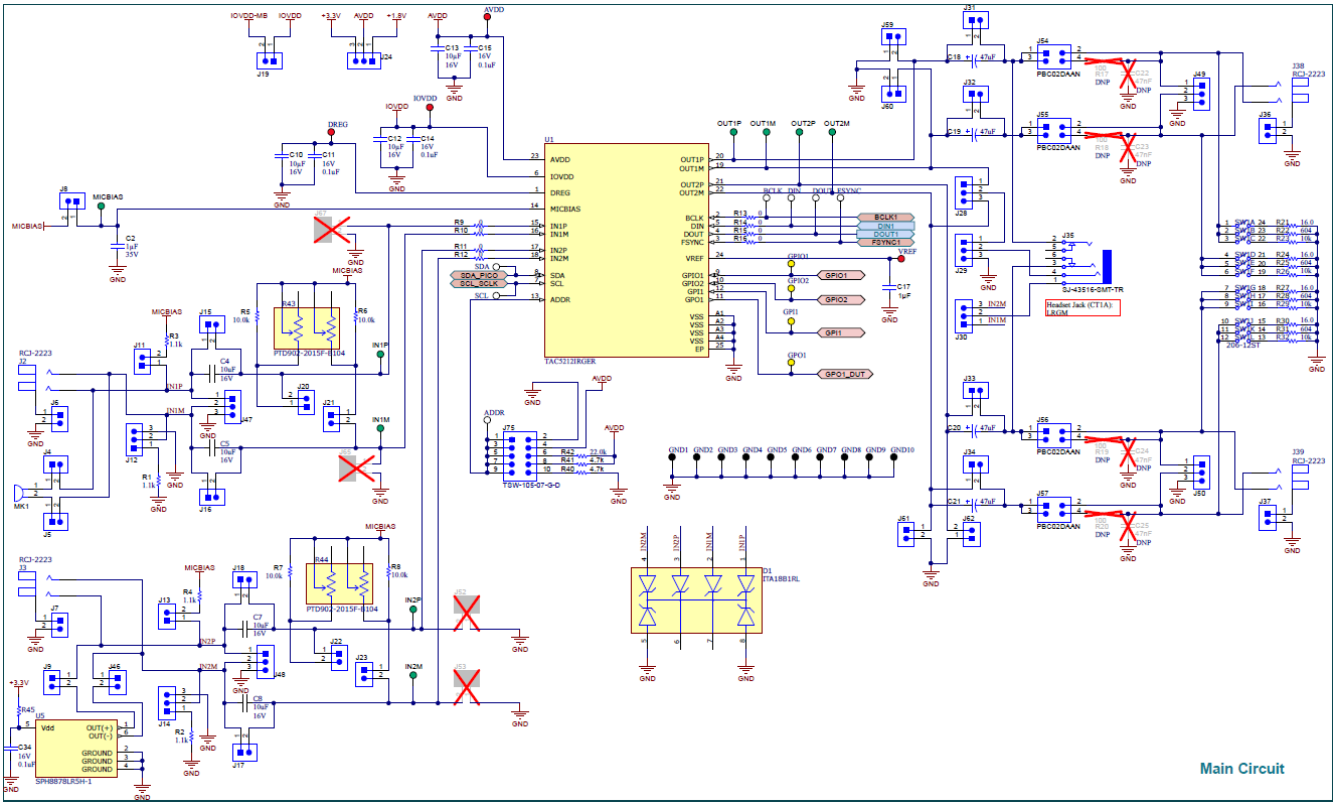


Figure 4-1. TAC5212 EVM Main DUT Schematic

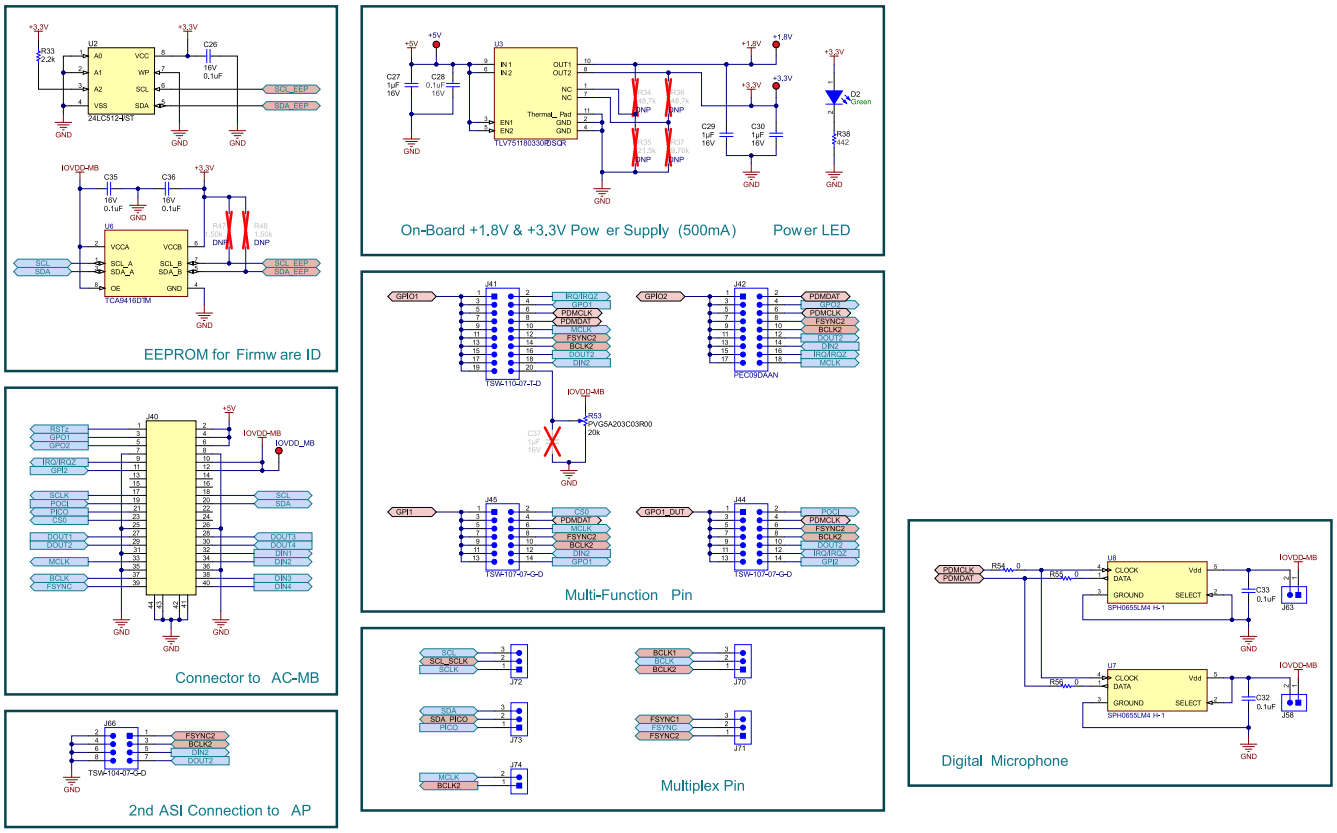


Figure 4-2. TAC5212 EVM Connectors and Supporting Circuitry Schematic

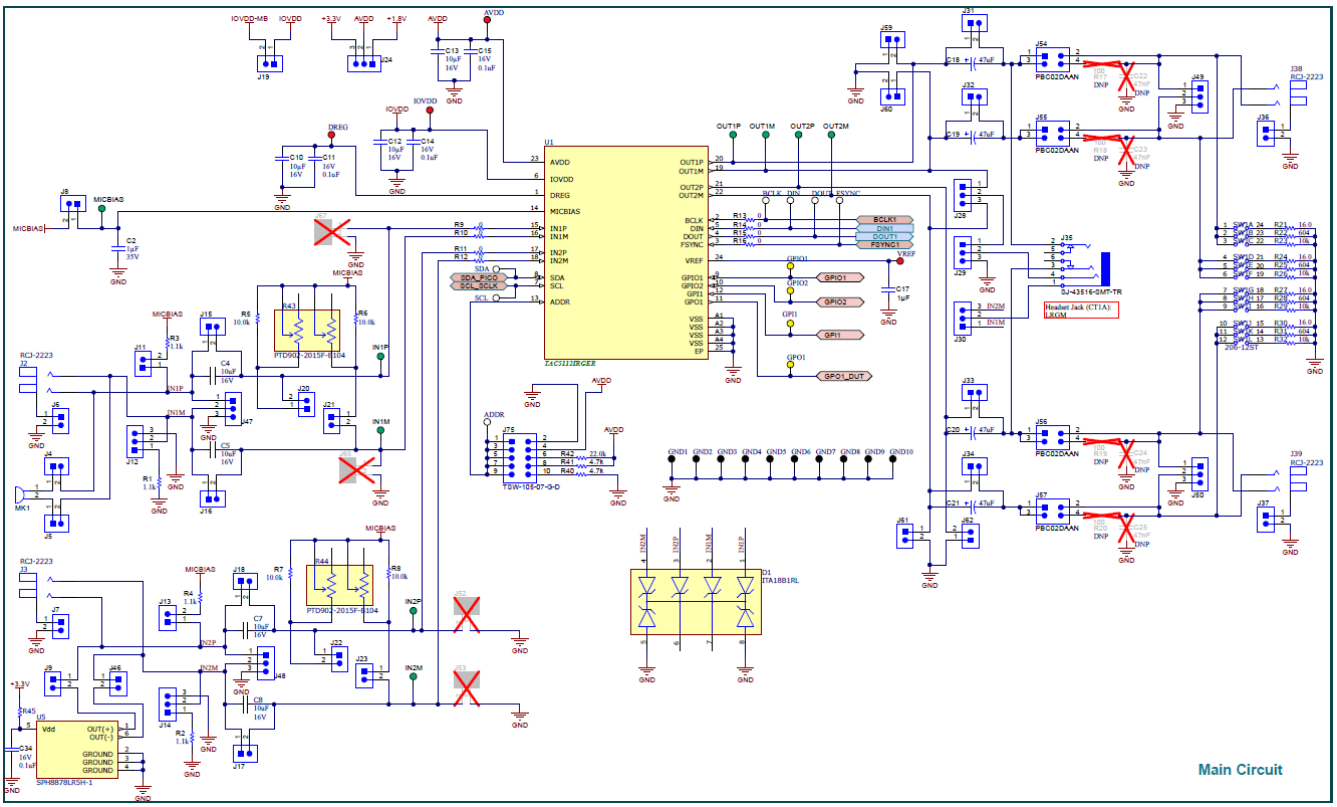


Figure 4-3. TAC5112 EVM Main DUT Schematic

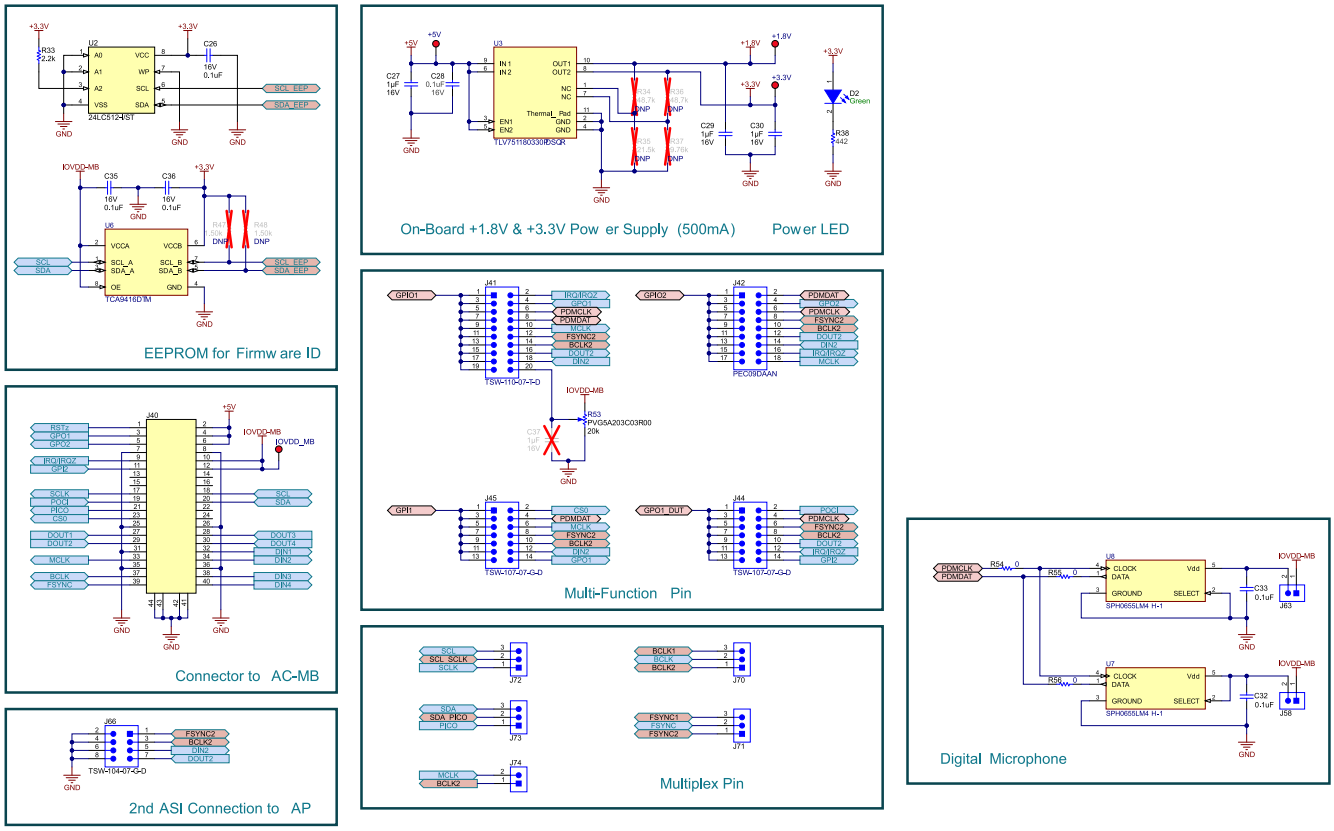


Figure 4-4. TAC5112 EVM Connectors and Supporting Circuitry Schematic

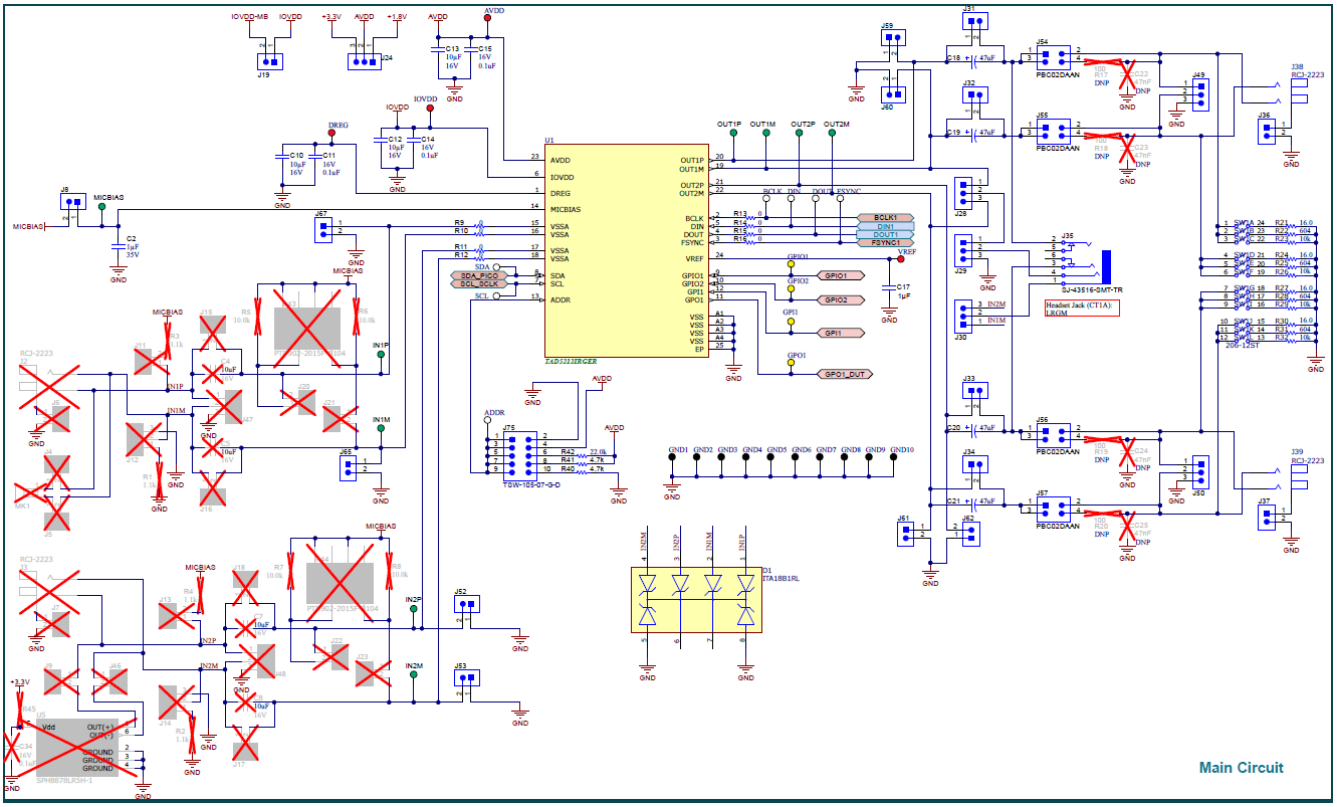


Figure 4-5. TAD5212 EVM Main DUT Schematic

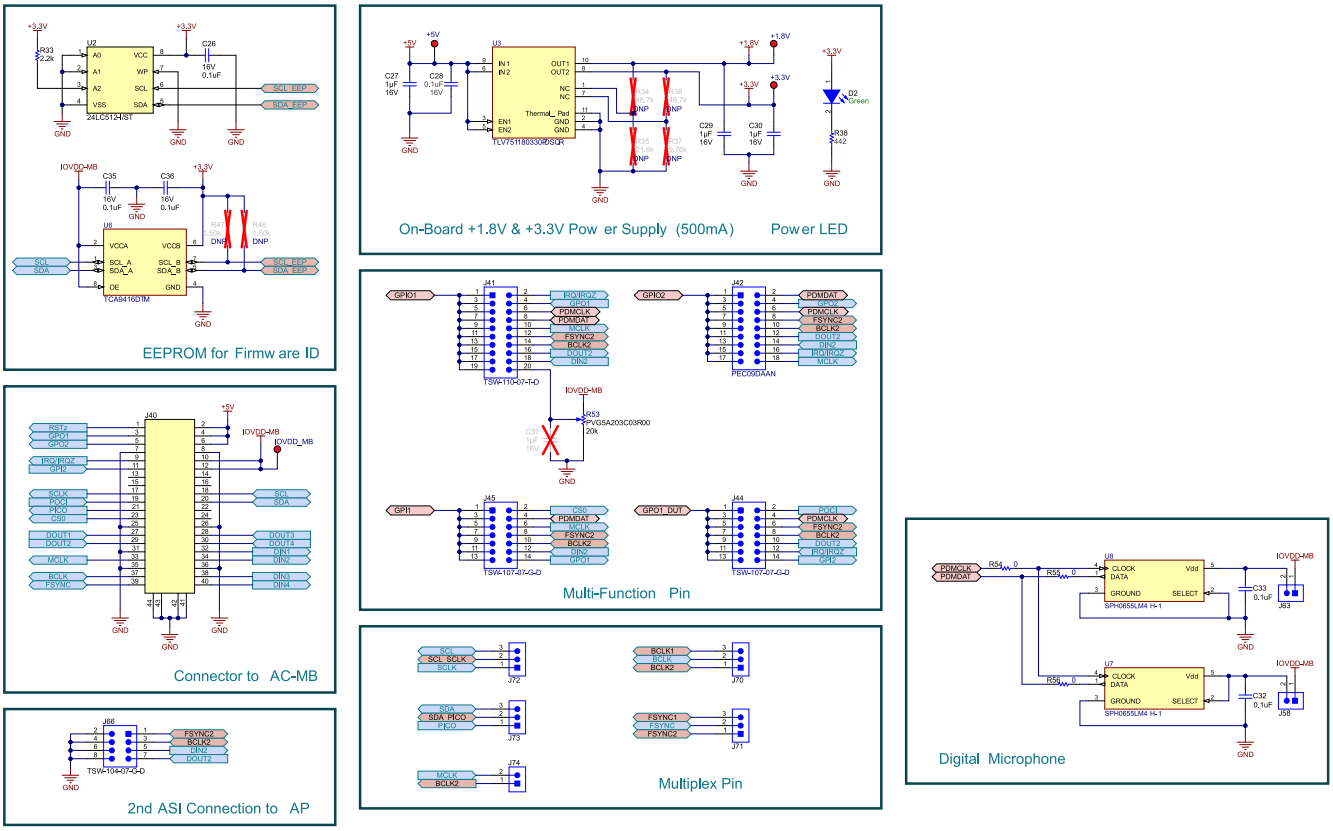


Figure 4-6. TAD5212 EVM Connectors and Supporting Circuitry Schematic

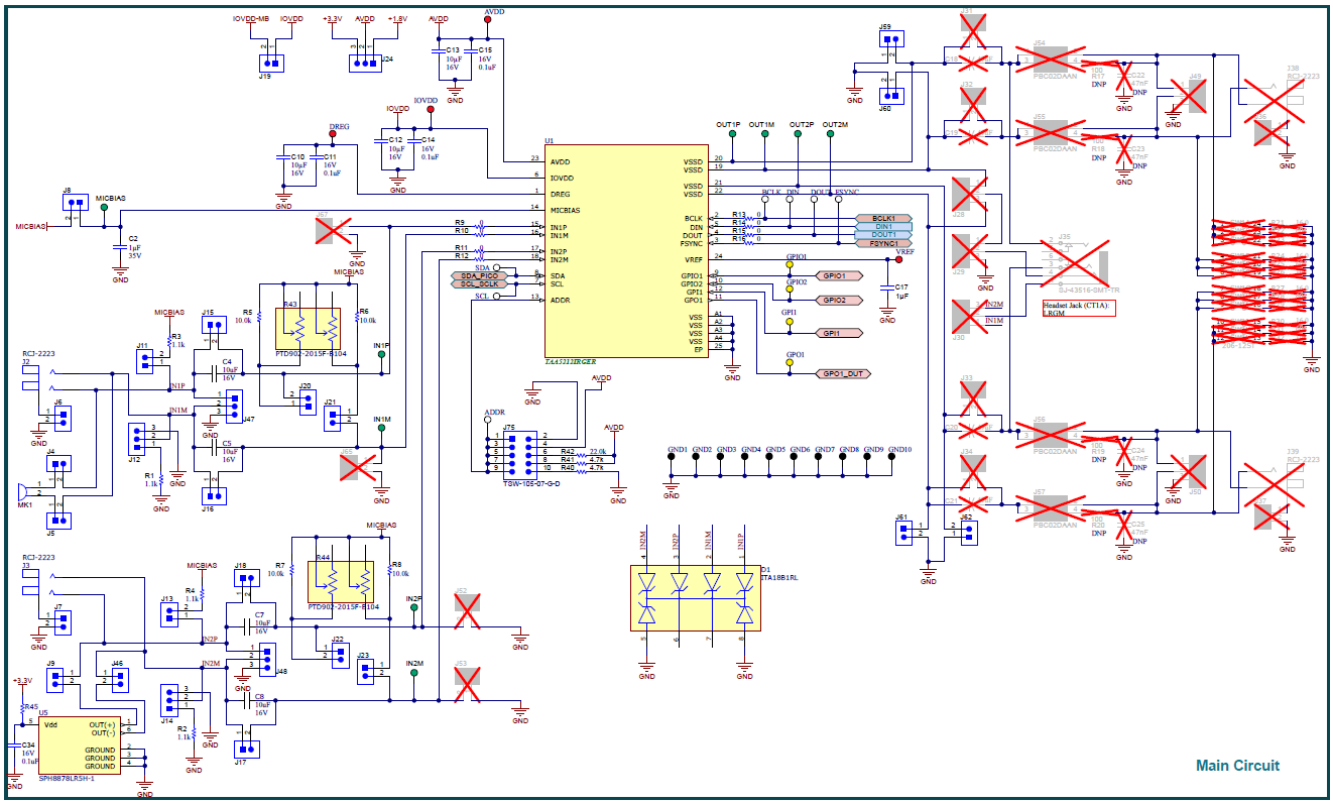


Figure 4-7. TAA5212 EVM Main DUT Schematic

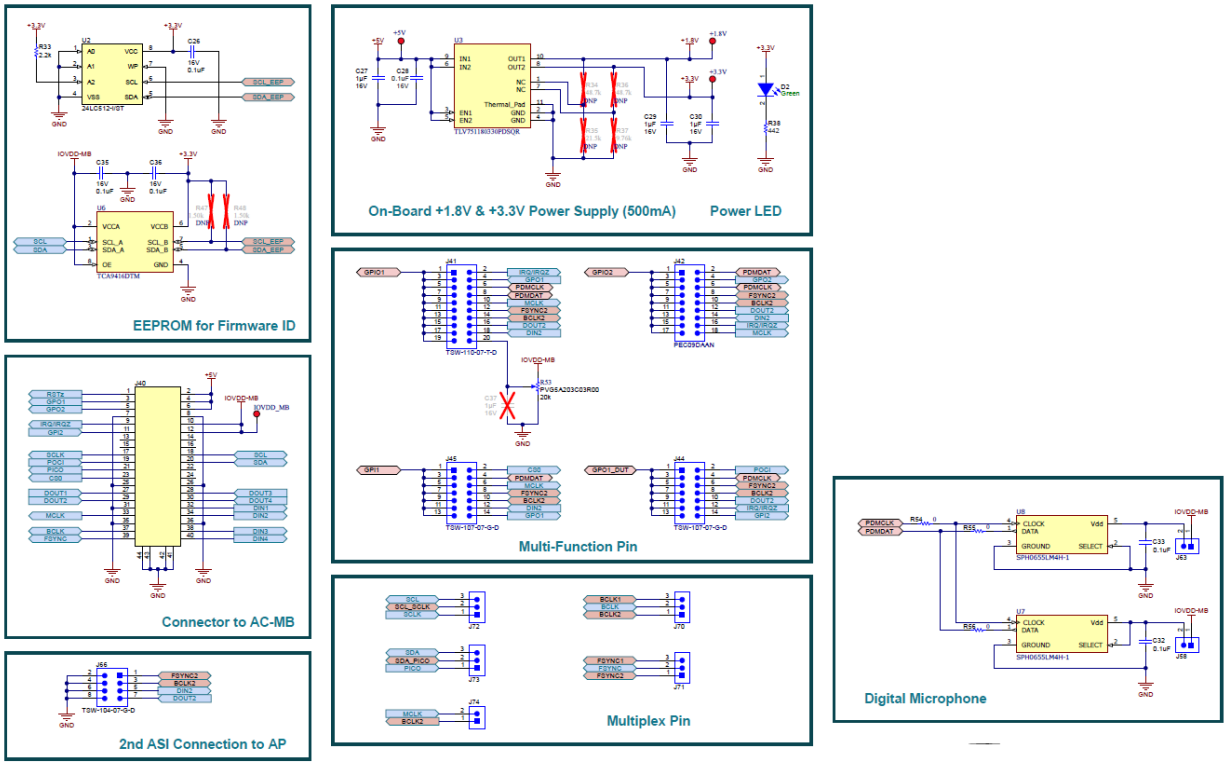


Figure 4-8. TAA5212 EVM Connectors and Supporting Circuitry Schematic

4.2 TAx5x12 EVM Board Layout

The board layout consists of the top and bottom silkscreen, the top and bottom layer routings, the power planes, the 2 inner layout routings and the ground planes. The layout applies to all the TAx5x12 EVM.

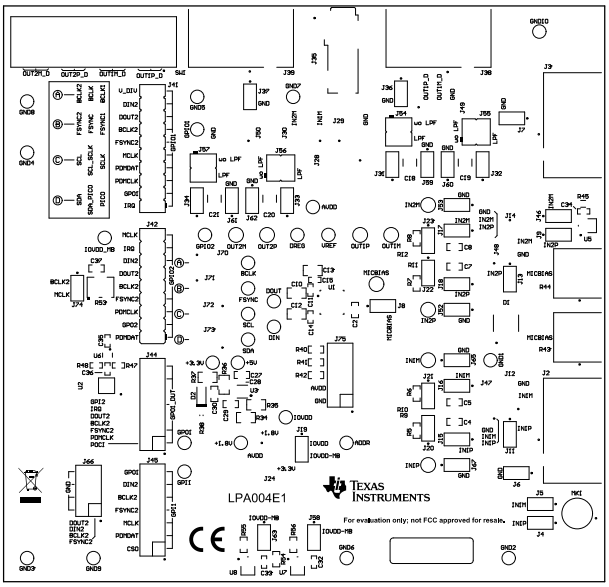


Figure 4-9. TAx5x12 EVM Top Silkscreen

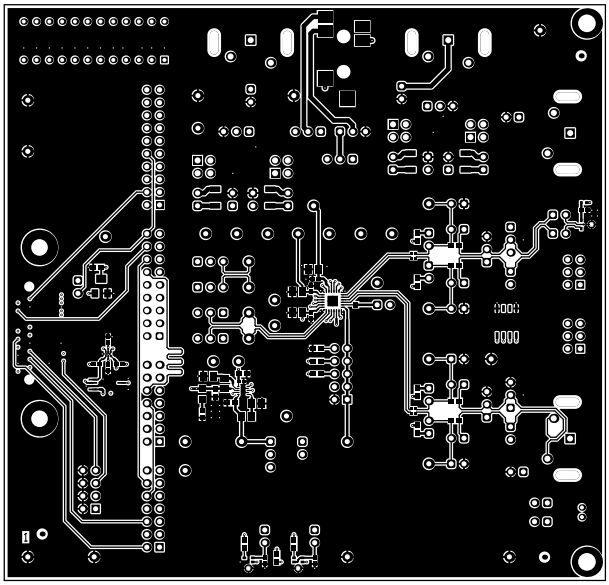


Figure 4-10. TAx5x12 EVM Top Layer

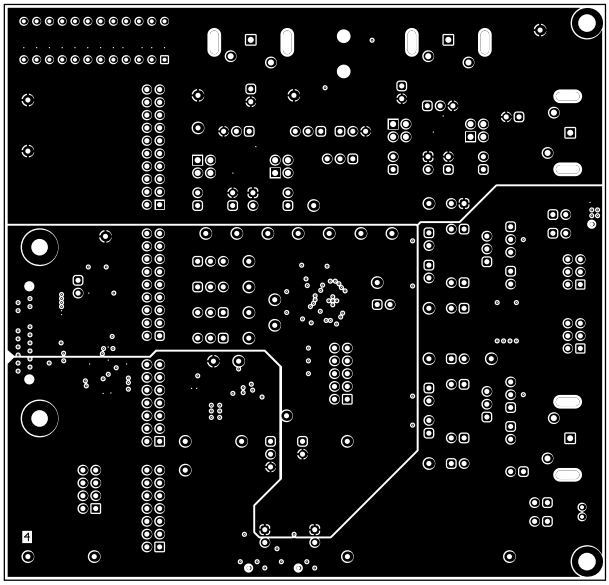


Figure 4-11. TAx5x12 EVM Power Layer 1

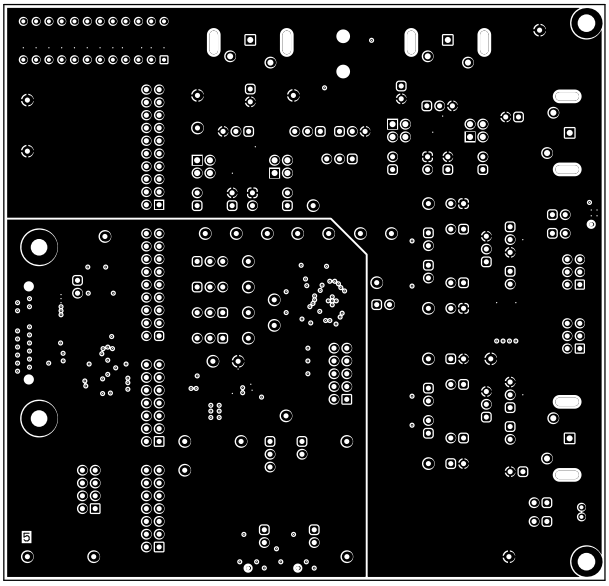


Figure 4-12. TAx5x12 EVM Power Layer 2

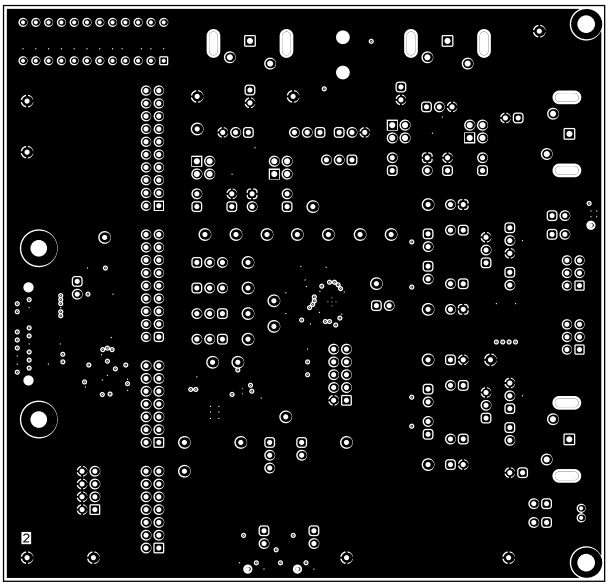


Figure 4-13. TAx5x12 EVM Ground Layer 1

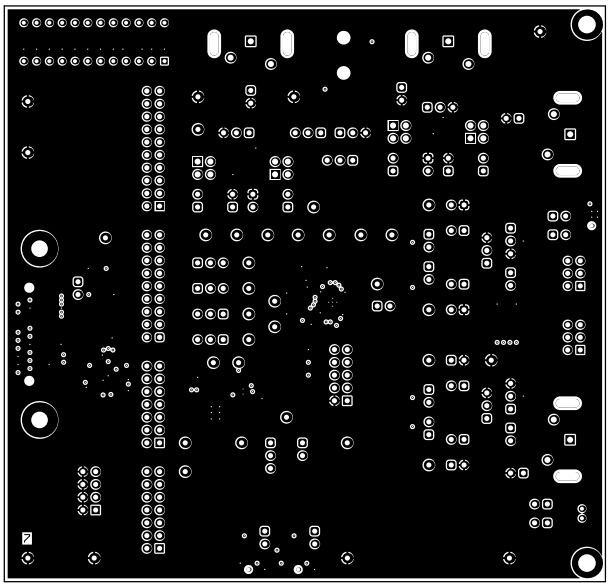


Figure 4-14. TAx5x12 Ground Layer 2

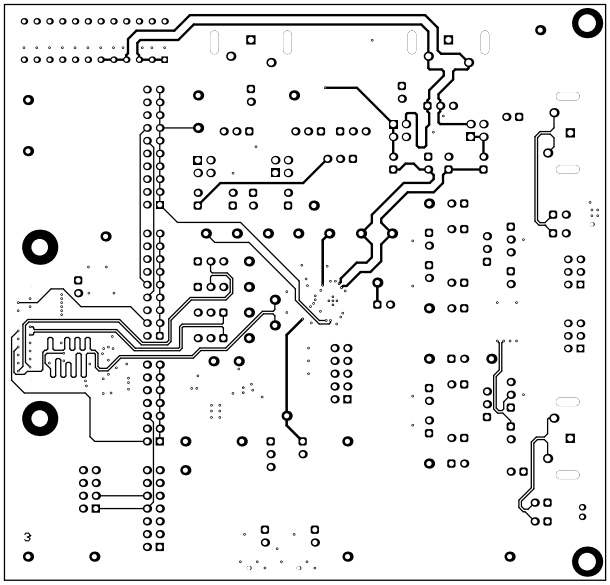


Figure 4-15. TAx5x12 EVM Signal Layer 1

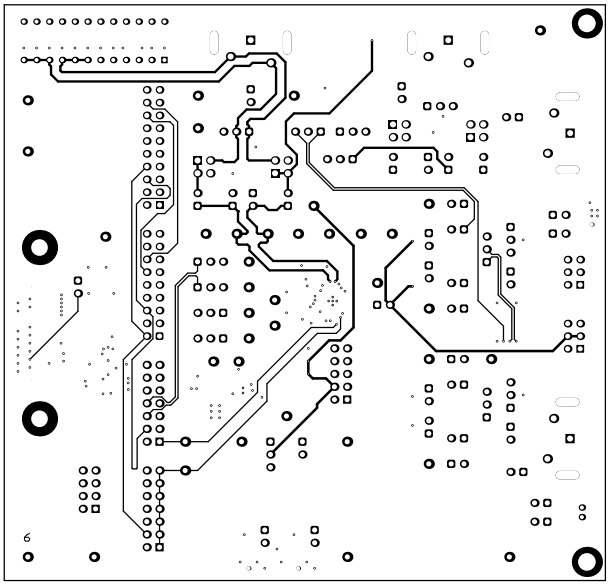


Figure 4-16. TAx5x12 EVM Signal Layer 2

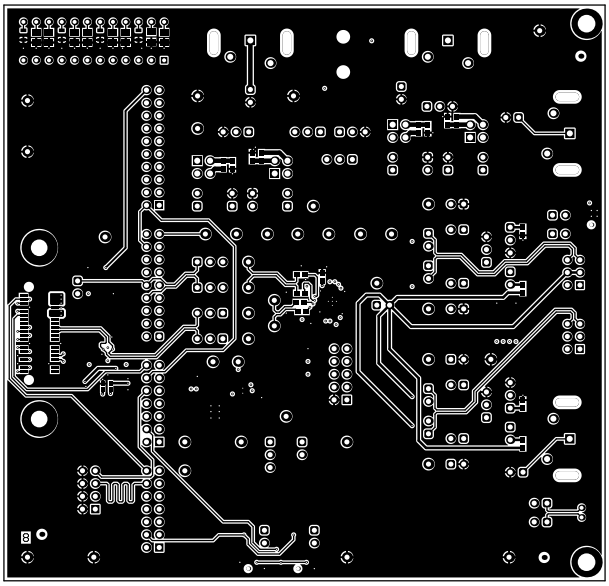


Figure 4-17. TAx5x12 EVM Bottom Layer

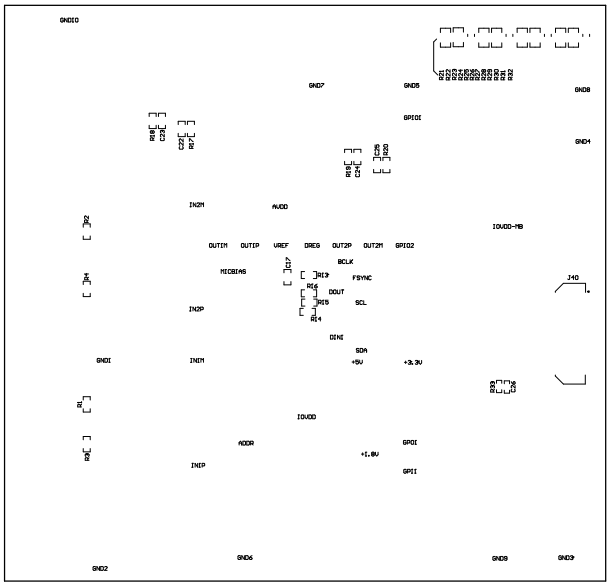


Figure 4-18. TAx5x12 EVM Bottom Silkscreen

4.3 Bill of Materials (BOM)

4.3.1 TAC5212 EVM Bill of Materials

Table 4-1. TAC5212 EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB	1		Printed Circuit Board		LPA004	Any		
+1.8V, +3.3V, +5V, AVDD, DREG, IOVDD, IOVDD_MB, VREF	8		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone Electronics		
ADDR, BCLK, DIN, DOUT, FSYNC, SCL, SDA	7		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone Electronics		
C2	1	1uF	CAP, CERM, 1 uF, 35 V, +/- 10%, X7R, 0603	0603	C1608X7R1V105K080AC	TDK		
C4, C5, C7, C8	4		CAP CER 10UF 16 V X5R 0603	0603 (1608 Metric)	C1608X5R1C106M080AB	TDK Corporation		
C10, C12, C13	3	10uF	CAP, CERM, 10 µF, 16 V,+/- 10%, X7R, 0805	0805	EMK212BB7106KG-T	Taiyo Yuden		
C11, C14, C15, C26, C28, C32, C33, C34, C35, C36	10	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	8.85012E+11	Wurth Elektronik		
C17, C27, C29, C30	4	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
C18, C19, C20, C21	4	47uF	CAP, TA, 47 uF, 10 V, +/- 10%, 0.5 ohm, SMD	3528-21	TPSB476K010R0500	AVX		
D1	1		28 V Clamp 25 A (8/20µs) Ipp Tvs Diode Surface Mount 8-SOIC	SOIC8	ITA18B1RL	STMicroelectronics		
D2	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		
GND1, GND2, GND3, GND4, GND5, GND6, GND7, GND8, GND9, GND10	10		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone Electronics		
GPI1, GPIO1, GPIO2, GPO1	4		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone Electronics		

Table 4-1. TAC5212 EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
H1, H2	2		Small nylon hex nut, 0.10 thick with a 0.250 outside diameter and a 4-40 threading	Hex Nut,4-40 Thread, 250" Head Dia	9605	Keystone		
H3, H4	2		HEX STANDOFF 4-40 NYLON 3/4"	HEX STANDOFF 4-40 NYLON 3/4"	4804	Keystone		
IN1M, IN1P, IN2M, IN2P, MICBIAS, OUT1M, OUT1P, OUT2M, OUT2P	9		Test Point, Miniature, Green, TH	Green Miniature Testpoint	5116	Keystone		
J2, J3, J38, J39	4		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J4, J5, J6, J7, J8, J9, J11, J13, J15, J16, J17, J18, J19, J20, J21, J22, J23, J31, J32, J33, J34, J36, J37, J46, J58, J59, J60, J61, J62, J63, J74	31		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J12, J14, J24, J28, J29, J30, J47, J48, J49, J50, J70, J71, J72, J73	14		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J35	1		AUDIO JACK 3.5mm 4COND, SMT	AUDIO JACK 3.5mm 4COND, SMT	SJ-43516-SMT-TR	CUI Inc.		
J40	1		Connector, Header, High Speed, 20 pairs, SMT	QTE-020-01-X-D-A	QTE-020-01-L-D-A	Samtec		
J41	1		Header, 10x2, 2.54mm, Tin, TH	Header, 10x2, 2.54mm, Tin, TH	TSW-110-07-T-D	Samtec		

Table 4-1. TAC5212 EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
J42	1		Header, 2.54mm, 9x2, Tin, TH	Header, 2.54mm, 9x2, TH	PEC09DAAN	Sullins Connector Solutions		
J44, J45	2		Header, 100mil, 7x2, Gold, TH	7x2 Header	TSW-107-07-G-D	Samtec		
J54, J55, J56, J57	4		Header, 2.54mm, 2x2, Gold, TH	Header, 2.54mm, 2x2, TH	PBC02DAAN	Sullins Connector Solutions		
J66	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J75	1		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G-D	Samtec		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
MK1	1		Microphone, Condenser, Analog, Omnidirectional, -42DB, TH	6 mm DIA	POM-2242P-C33-R	PUI Audio		
R1, R2, R3, R4	4	1.1k	RES, 1.1 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031K10JNEA	Vishay-Dale		
R5, R6, R7, R8	4	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603FT10K0	Stackpole Electronics Inc		
R9, R10, R11, R12	4	0	RES, 0, 5%, 0.05 W, 0201	0201	CRCW02010000Z0ED	Vishay-Dale		
R13, R14, R15, R16, R54, R55, R56	7	0	RES, 0, 0%, 0.25 W, AEC-Q200 Grade 0, 0603	0603	PMR03EZPJ000	Rohm		
R21, R24, R27, R30	4	16	RES, 16.0, 1%, 0.5 W, 0805	0805	ERJ-P06F16R0V	Panasonic		
R22, R25, R28, R31	4	604	RES, 604, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW0805604RFKEA	Vishay-Dale		
R23, R26, R29, R32	4		RES SMD 10K OHM 5% 0.4W 0805	0805	ESR10EZPJ103	Rohm Semiconductor		
R33	1	2.2k	RES, 2.2 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04022K20JNED	Vishay-Dale		
R38	1	442	RES, 442, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603442RFKEA	Vishay-Dale		
R40, R41	2	4.7k	RES, 4.7 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEYJ472V	Panasonic		

Table 4-1. TAC5212 EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R42	1	22.0k	RES, 22.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-223-B-T5	Susumu Co Ltd		
R43, R44	2	100 kΩ	Res POT Carbon Element 100kOhm 20% 1/20W/1/40W PC Pins Thru-Hole	PTH_POT_9MM50_24MM65	PTD902-2015F-B104	Bourns		
R45	1	10k	10k ±5% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	0402	RC0402JR-1310KL	Yageo		
R53	1	20k	Trimmer Potentiometer, 20 k ohm, 0.25 W, SMD	Trimmer, 4.8,3.9x5.1mm	PVG5A203C03R00	Bourns		
SH1, SH2, SH3, SH4, SH5, SH6, SH7, SH8, SH9, SH10, SH11, SH12, SH13, SH14, SH15, SH16, SH17, SH18, SH19, SH20, SH21, SH22, SH23, SH24, SH25, SH26, SH27, SH28, SH29, SH30, SH31, SH32, SH33, SH34, SH35, SH36, SH37, SH38, SH39, SH40, SH41, SH42, SH43, SH44, SH45, SH46, SH51, SH52, SH53, SH54	50	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
SW1	1		Dip Switch SPST 12 Position Through Hole Slide (Standard) Actuator 50 mA 24VDC	DIP24	206-12ST	CTS		

Table 4-1. TAC5212 EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
U1	1		Libra SW Controlled Low Voltage Stereo	VQFN24	TAC5212IRGER	Texas Instruments		
U2	1		EEPROM, 512KBIT, 400 KHZ, 8TSSOP	TSSOP-8	24LC512-I/ST	Microchip		
U3	1		500-mA, low-IQ, high-PSRR, dual-channel low-dropout (LDO) voltage regulator 10-WSON -40 to 125	WSON10	TLV751180330PDSQR	Texas Instruments		
U5	1		Approx. 7 Hz to 36 kHz Analog Microphone MEMS (Silicon). Approx. 2.3 V to 3.6 V Omnidirectional (-44dB ±0.5dB SPL) Solder Pads	LGA	SPH8878LR5H-1	Knowles	SPH1878LR5H-C	Knowles
U6	1		TCA9416DTM X2SON8	X2SON8	TCA9416DTM	Texas Instruments		
U7, U8	2		Digital, PDM Microphone MEMS (Silicon) Omnidirectional (-37dB ±1dB @ 94 dB SPL) Solder Pads	SMT_MIC_2MM65_3MM50	SPH0655LM4H-1	Knowles		
C22, C23, C24, C25	0	0.047uF	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H473K080AA	TDK		
C37	0	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
J52, J53, J65, J67	0		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
R17, R18, R19, R20	0	100	RES, 100, 1%, 0.1 W, 0603	0603	RC0603FR-07100RL	Yageo		
R34, R36	0	48.7k	RES, 48.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080548K7FKEA	Vishay-Dale		
R35	0	21.5k	RES, 21.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080521K5FKEA	Vishay-Dale		
R37	0	9.76k	RES, 9.76 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08059K76FKEA	Vishay-Dale		
R47, R48	0	1.50k	RES, 1.50 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT1K50	Stackpole Electronics Inc		

Table 4-1. TAC5212 EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
SH47, SH48, SH49, SH50	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M

4.3.2 TAC5112 EVM Bill of Material

Table 4-2. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB	1		Printed Circuit Board		LPA004	Any		
+1.8V, +3.3V, +5V, AVDD, DREG, IOVDD, IOVDD_MB, VREF	8		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone Electronics		
ADDR, BCLK, DIN, DOUT, FSYNC, SCL, SDA	7		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone Electronics		
C2	1	1uF	CAP, CERM, 1 uF, 35 V, +/- 10%, X7R, 0603	0603	C1608X7R1V105K080AC	TDK		
C4, C5, C7, C8	4		CAP CER 10UF 16 V X5R 0603	0603 (1608 Metric)	C1608X5R1C106M080AB	TDK Corporation		
C10, C12, C13	3	10uF	CAP, CERM, 10 µF, 16 V,+/- 10%, X7R, 0805	0805	EMK212BB7106KG-T	Taiyo Yuden		
C11, C14, C15, C26, C28, C32, C33, C34, C35, C36	10	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	8.85012E+11	Wurth Elektronik		
C17, C27, C29, C30	4	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
C18, C19, C20, C21	4	47uF	CAP, TA, 47 uF, 10 V, +/- 10%, 0.5 ohm, SMD	3528-21	TPSB476K010R0500	AVX		
D1	1		28 V Clamp 25 A (8/20µs) Ipp Tvs Diode Surface Mount 8-SOIC	SOIC8	ITA18B1RL	STMicroelectronics		
D2	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		
GND1, GND2, GND3, GND4, GND5, GND6, GND7, GND8, GND9, GND10	10		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone Electronics		
GPI1, GPIO1, GPIO2, GPO1	4		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone Electronics		

Table 4-2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
H1, H2	2		Small nylon hex nut, 0.10 thick with a 0.250 outside diameter and a 4-40 threading	Hex Nut,4-40 Thread, 250" Head Dia	9605	Keystone		
H3, H4	2		HEX STANDOFF 4-40 NYLON 3/4"	HEX STANDOFF 4-40 NYLON 3/4"	4804	Keystone		
IN1M, IN1P, IN2M, IN2P, MICBIAS, OUT1M, OUT1P, OUT2M, OUT2P	9		Test Point, Miniature, Green, TH	Green Miniature Testpoint	5116	Keystone		
J2, J3, J38, J39	4		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J4, J5, J6, J7, J8, J9, J11, J13, J15, J16, J17, J18, J19, J20, J21, J22, J23, J31, J32, J33, J34, J36, J37, J46, J58, J59, J60, J61, J62, J63, J74	31		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J12, J14, J24, J28, J29, J30, J47, J48, J49, J50, J70, J71, J72, J73	14		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J35	1		AUDIO JACK 3.5mm 4COND, SMT	AUDIO JACK 3.5mm 4COND, SMT	SJ-43516-SMT-TR	CUI Inc.		
J40	1		Connector, Header, High Speed, 20 pairs, SMT	QTE-020-01-X-D-A	QTE-020-01-L-D-A	Samtec		
J41	1		Header, 10x2, 2.54mm, Tin, TH	Header, 10x2, 2.54mm, Tin, TH	TSW-110-07-T-D	Samtec		

Table 4-2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
J42	1		Header, 2.54mm, 9x2, Tin, TH	Header, 2.54mm, 9x2, TH	PEC09DAAN	Sullins Connector Solutions		
J44, J45	2		Header, 100mil, 7x2, Gold, TH	7x2 Header	TSW-107-07-G-D	Samtec		
J54, J55, J56, J57	4		Header, 2.54mm, 2x2, Gold, TH	Header, 2.54mm, 2x2, TH	PBC02DAAN	Sullins Connector Solutions		
J66	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J75	1		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G-D	Samtec		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
MK1	1		Microphone, Condenser, Analog, Omnidirectional, -42DB, TH	6 mm DIA	POM-2242P-C33-R	PUI Audio		
R1, R2, R3, R4	4	1.1k	RES, 1.1 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031K10JNEA	Vishay-Dale		
R5, R6, R7, R8	4	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603FT10K0	Stackpole Electronics Inc		
R9, R10, R11, R12	4	0	RES, 0, 5%, 0.05 W, 0201	0201	CRCW02010000Z0ED	Vishay-Dale		
R13, R14, R15, R16, R54, R55, R56	7	0	RES, 0, 0%, 0.25 W, AEC-Q200 Grade 0, 0603	0603	PMR03EZPJ000	Rohm		
R21, R24, R27, R30	4	16	RES, 16.0, 1%, 0.5 W, 0805	0805	ERJ-P06F16R0V	Panasonic		
R22, R25, R28, R31	4	604	RES, 604, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW0805604RFKEA	Vishay-Dale		
R23, R26, R29, R32	4		RES SMD 10K OHM 5% 0.4W 0805	0805	ESR10EZPJ103	Rohm Semiconductor		
R33	1	2.2k	RES, 2.2 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04022K20JNED	Vishay-Dale		
R38	1	442	RES, 442, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603442RFKEA	Vishay-Dale		
R40, R41	2	4.7k	RES, 4.7 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEYJ472V	Panasonic		

Table 4-2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R42	1	22.0k	RES, 22.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-223-B-T5	Susumu Co Ltd		
R43, R44	2	100 kΩ	Res POT Carbon Element 100kOhm 20% 1/20W/1/40W PC Pins Thru-Hole	PTH_POT_9MM50_24MM65	PTD902-2015F-B104	Bourns		
R45	1	10k	10k ±5% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	0402	RC0402JR-1310KL	Yageo		
R53	1	20k	Trimmer Potentiometer, 20 k ohm, 0.25 W, SMD	Trimmer, 4.8,3.9x5.1mm	PVG5A203C03R00	Bourns		
SH1, SH2, SH3, SH4, SH5, SH6, SH7, SH8, SH9, SH10, SH11, SH12, SH13, SH14, SH15, SH16, SH17, SH18, SH19, SH20, SH21, SH22, SH23, SH24, SH25, SH26, SH27, SH28, SH29, SH30, SH31, SH32, SH33, SH34, SH35, SH36, SH37, SH38, SH39, SH40, SH41, SH42, SH43, SH44, SH45, SH46, SH51, SH52, SH53, SH54	50	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
SW1	1		Dip Switch SPST 12 Position Through Hole Slide (Standard) Actuator 50 mA 24VDC	DIP24	206-12ST	CTS		

Table 4-2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
U1	1		TAC5112IRGER	VQFN24	TAC5112IRGER	Texas Instruments		
U2	1		EEPROM, 512KBIT, 400 KHZ, 8TSSOP	TSSOP-8	24LC512-I/ST	Microchip		
U3	1		500-mA, low-IQ, high-PSRR, dual-channel low-dropout (LDO) voltage regulator 10-WSON -40 to 125	WSON10	TLV751180330PDSQR	Texas Instruments		
U5	1		Approx. 7 Hz to 36 kHz Analog Microphone MEMS (Silicon). Approx. 2.3 V to 3.6 V Omnidirectional (-44dB ±0.5dB SPL) Solder Pads	LGA	SPH8878LR5H-1	Knowles	SPH1878LR5H-C	Knowles
U6	1		TCA9416DTM X2SON8	X2SON8	TCA9416DTM	Texas Instruments		
U7, U8	2		Digital, PDM Microphone MEMS (Silicon) Omnidirectional (-37dB ±1dB @ 94 dB SPL) Solder Pads	SMT_MIC_2MM65_3MM50	SPH0655LM4H-1	Knowles		
C22, C23, C24, C25	0	0.047uF	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H473K080AA	TDK		
C37	0	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
J52, J53, J65, J67	0		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
R17, R18, R19, R20	0	100	RES, 100, 1%, 0.1 W, 0603	0603	RC0603FR-07100RL	Yageo		
R34, R36	0	48.7k	RES, 48.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080548K7FKEA	Vishay-Dale		
R35	0	21.5k	RES, 21.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080521K5FKEA	Vishay-Dale		
R37	0	9.76k	RES, 9.76 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08059K76FKEA	Vishay-Dale		
R47, R48	0	1.50k	RES, 1.50 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT1K50	Stackpole Electronics Inc		
SH47, SH48, SH49, SH50	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M

4.3.3 TAD5212 EVM Bill of Materials

Table 4-3. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB	1		Printed Circuit Board		LPA004	Any		
+1.8V, +3.3V, +5V, AVDD, DREG, IOVDD, IOVDD_MB, VREF	8		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone Electronics		
ADDR, BCLK, DIN, DOUT, FSYNC, SCL, SDA	7		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone Electronics		
C2	1	1uF	CAP, CERM, 1 uF, 35 V, +/- 10%, X7R, 0603	0603	C1608X7R1V105K080AC	TDK		
C10, C12, C13	3	10uF	CAP, CERM, 10 µF, 16 V,+/- 10%, X7R, 0805	0805	EMK212BB7106KG-T	Taiyo Yuden		
C11, C14, C15, C26, C28, C32, C33, C35, C36	9	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	8.85012E+11	Wurth Elektronik		
C17, C27, C29, C30	4	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
C18, C19, C20, C21	4	47uF	CAP, TA, 47 uF, 10 V, +/- 10%, 0.5 ohm, SMD	3528-21	TPSB476K010R0500	AVX		
D1	1		28 V Clamp 25 A (8/20µs) Ipp Tvs Diode Surface Mount 8-SOIC	SOIC8	ITA18B1RL	STMicroelectronics		
D2	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		
GND1, GND2, GND3, GND4, GND5, GND6, GND7, GND8, GND9, GND10	10		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone Electronics		
GPI1, GPIO1, GPIO2, GPO1	4		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone Electronics		
H1, H2	2		Small nylon hex nut, 0.10 thick with a 0.250 outside diameter and a 4-40 threading	Hex Nut,4-40 Thread, 250" Head Dia	9605	Keystone		

Table 4-3. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
H3, H4	2		HEX STANDOFF 4-40 NYLON 3/4"	HEX STANDOFF 4-40 NYLON 3/4"	4804	Keystone		
IN1M, IN1P, IN2M, IN2P, MICBIAS, OUT1M, OUT1P, OUT2M, OUT2P	9		Test Point, Miniature, Green, TH	Green Miniature Testpoint	5116	Keystone		
J8, J19, J31, J32, J33, J34, J36, J37, J52, J53, J58, J59, J60, J61, J62, J63, J65, J67, J74	19		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J24, J28, J29, J30, J49, J50, J70, J71, J72, J73	10		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J35	1		AUDIO JACK 3.5mm 4COND, SMT	AUDIO JACK 3.5mm 4COND, SMT	SJ-43516-SMT-TR	CUI Inc.		
J38, J39	2		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J40	1		Connector, Header, High Speed, 20 pairs, SMT	QTE-020-01-X-D-A	QTE-020-01-L-D-A	Samtec		
J41	1		Header, 10x2, 2.54mm, Tin, TH	Header, 10x2, 2.54mm, Tin, TH	TSW-110-07-T-D	Samtec		
J42	1		Header, 2.54mm, 9x2, Tin, TH	Header, 2.54mm, 9x2, TH	PEC09DAAN	Sullins Connector Solutions		
J44, J45	2		Header, 100mil, 7x2, Gold, TH	7x2 Header	TSW-107-07-G-D	Samtec		
J54, J55, J56, J57	4		Header, 2.54mm, 2x2, Gold, TH	Header, 2.54mm, 2x2, TH	PBC02DAAN	Sullins Connector Solutions		
J66	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J75	1		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G-D	Samtec		

Table 4-3. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
R9, R10, R11, R12	4	0	RES, 0, 5%, 0.05 W, 0201	0201	CRCW02010000Z0ED	Vishay-Dale		
R13, R14, R15, R16, R54, R55, R56	7	0	RES, 0, 0%, 0.25 W, AEC-Q200 Grade 0, 0603	0603	PMR03EZPJ000	Rohm		
R21, R24, R27, R30	4	16	RES, 16.0, 1%, 0.5 W, 0805	0805	ERJ-P06F16R0V	Panasonic		
R22, R25, R28, R31	4	604	RES, 604, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW0805604RFKEA	Vishay-Dale		
R23, R26, R29, R32	4		RES SMD 10K OHM 5% 0.4W 0805	0805	ESR10EZPJ103	Rohm Semiconductor		
R33	1	2.2k	RES, 2.2 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04022K20JNED	Vishay-Dale		
R38	1	442	RES, 442, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603442RFKEA	Vishay-Dale		
R40, R41	2	4.7k	RES, 4.7 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEYJ472V	Panasonic		
R42	1	22.0k	RES, 22.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-223-B-T5	Susumu Co Ltd		
R53	1	20k	Trimmer Potentiometer, 20 k ohm, 0.25 W, SMD	Trimmer, 4.8,3.9x5.1mm	PVG5A203C03R00	Bourns		

Table 4-3. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
SH1, SH2, SH3, SH22, SH23, SH24, SH25, SH26, SH27, SH28, SH29, SH30, SH31, SH32, SH33, SH34, SH35, SH36, SH37, SH38, SH39, SH40, SH41, SH42, SH43, SH44, SH45, SH46, SH47, SH48, SH49, SH50, SH51, SH52, SH53, SH54	36	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
SW1	1		Dip Switch SPST 12 Position Through Hole Slide (Standard) Actuator 50 mA 24VDC	DIP24	206-12ST	CTS		
U1	1		Epsilon SW Controlled Stereo/Quad	VQFN24	TAD5212IRGER	Texas Instruments		
U2	1		EEPROM, 512KBIT, 400 KHZ, 8TSSOP	TSSOP-8	24LC512-I/ST	Microchip		
U3	1		500-mA, low-IQ, high-PSRR, dual-channel low-dropout (LDO) voltage regulator 10-WSON -40 to 125	WSON10	TLV751180330PDSQR	Texas Instruments		
U6	1		TCA9416DTM X2SON8	X2SON8	TCA9416DTM	Texas Instruments		
U7, U8	2		Digital, PDM Microphone MEMS (Silicon) Omnidirectional (-37dB ±1dB @ 94 dB SPL) Solder Pads	SMT_MIC_2MM65_3MM50	SPH0655LM4H-1	Knowles		
C4, C5, C7, C8	0		CAP CER 10UF 16 V X5R 0603	0603 (1608 Metric)	C1608X5R1C106M080AB	TDK Corporation		
C22, C23, C24, C25	0	0.047uF	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H473K080AA	TDK		
C34	0	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	8.85012E+11	Wurth Elektronik		

Table 4-3. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
C37	0	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
J2, J3	0		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J4, J5, J6, J7, J9, J11, J13, J15, J16, J17, J18, J20, J21, J22, J23, J46	0		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J12, J14, J47, J48	0		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
MK1	0		Microphone, Condenser, Analog, Omnidirectional, -42DB, TH	6 mm DIA	POM-2242P-C33-R	PUI Audio		
R1, R2, R3, R4	0	1.1k	RES, 1.1 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031K10JNEA	Vishay-Dale		
R5, R6, R7, R8	0	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603FT10K0	Stackpole Electronics Inc		
R17, R18, R19, R20	0	100	RES, 100, 1%, 0.1 W, 0603	0603	RC0603FR-07100RL	Yageo		
R34, R36	0	48.7k	RES, 48.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080548K7FKEA	Vishay-Dale		
R35	0	21.5k	RES, 21.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080521K5FKEA	Vishay-Dale		
R37	0	9.76k	RES, 9.76 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08059K76FKEA	Vishay-Dale		
R43, R44	0	100 kΩ	Res POT Carbon Element 100kOhm 20% 1/20W/1/40W PC Pins Thru-Hole	PTH_POT_9MM50_24MM65	PTD902-2015F-B104	Bourns		

Table 4-3. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R45	0	10k	10k ±5% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	0402	RC0402JR-1310KL	Yageo		
R47, R48	0	1.50k	RES, 1.50 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT1K50	Stackpole Electronics Inc		
SH4, SH5, SH6, SH7, SH8, SH9, SH10, SH11, SH12, SH13, SH14, SH15, SH16, SH17, SH18, SH19, SH20, SH21	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
U5	0		Approx. 7 Hz to 36 kHz Analog Microphone MEMS (Silicon). Approx. 2.3 V to 3.6 V Omnidirectional (-44dB ±0.5dB SPL) Solder Pads	LGA	SPH8878LR5H-1	Knowles		

4.3.4 TAA5212 EVM Bill of Materials

Table 4-4. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
!PCB	1		Printed Circuit Board		LPA004	Any		
+1.8V, +3.3V, +5V, AVDD, DREG, IOVDD, IOVDD_MB, VREF	8		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone Electronics		
ADDR, BCLK, DIN, DOUT, FSYNC, SCL, SDA	7		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone Electronics		
C2	1	1uF	CAP, CERM, 1uF, 35V, +/- 10%, X7R, 0603	0603	C1608X7R1V105K080AC	TDK		
C4, C5, C7, C8	4		CAP CER 10UF 16V X5R 0603	0603 (1608 Metric)	C1608X5R1C106M080AB	TDK Corporation		
C10, C12, C13	3	10uF	CAP, CERM, 10µF, 16V,+/- 10%, X7R, 0805	0805	EMK212BB7106KG-T	Taiyo Yuden		
C11, C14, C15, C26, C28, C32, C33, C34, C35, C36	10	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	8.85012E+11	Wurth Elektronik		
C17, C27, C29, C30	4	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
D1	1		28V Clamp 25A (8/20µs) Ipp Tvs Diode Surface Mount 8-SOIC	SOIC8	ITA18B1RL	STMicroelectronics		
D2	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		
GND1, GND2, GND3, GND4, GND5, GND6, GND7, GND8, GND9, GND10	10		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone Electronics		
GPI1, GPIO1, GPIO2, GPO1	4		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone Electronics		

Table 4-4. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
H1, H2	2		Small nylon hex nut, 0.10 thick with a 0.250 outside diameter and a 4-40 threading	Hex Nut,4-40 Thread, 250" Head Dia	9605	Keystone		
H3, H4	2		HEX STANDOFF 4-40 NYLON 3/4"	HEX STANDOFF 4-40 NYLON 3/4"	4804	Keystone		
IN1M, IN1P, IN2M, IN2P, MICBIAS, OUT1M, OUT1P, OUT2M, OUT2P	9		Test Point, Miniature, Green, TH	Green Miniature Testpoint	5116	Keystone		
J2, J3	2		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J4, J5, J6, J7, J8, J9, J11, J13, J15, J16, J17, J18, J19, J20, J21, J22, J23, J46, J58, J59, J60, J61, J62, J63, J74	25		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J12, J14, J24, J47, J48, J70, J71, J72, J73	9		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J40	1		Connector, Header, High Speed, 20 pairs, SMT	QTE-020-01-X-D-A	QTE-020-01-L-D-A	Samtec		
J41	1		Header, 10x2, 2.54mm, Tin, TH	Header, 10x2, 2.54mm, Tin, TH	TSW-110-07-T-D	Samtec		
J42	1		Header, 2.54mm, 9x2, Tin, TH	Header, 2.54mm, 9x2, TH	PEC09DAAN	Sullins Connector Solutions		
J44, J45	2		Header, 100mil, 7x2, Gold, TH	7x2 Header	TSW-107-07-G-D	Samtec		
J66	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J75	1		Header, 100mil, 5x2, Gold, TH	5x2 Header	TSW-105-07-G-D	Samtec		

Table 4-4. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
MK1	1		Microphone, Condenser, Analog, Omnidirectional, -42DB, TH	6mm DIA	POM-2242P-C33-R	PUI Audio		
R1, R2, R3, R4	4	1.1k	RES, 1.1 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031K10JNEA	Vishay-Dale		
R5, R6, R7, R8	4	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603FT10K0	Stackpole Electronics Inc		
R9, R10, R11, R12	4	0	RES, 0, 5%, 0.05 W, 0201	0201	CRCW02010000Z0ED	Vishay-Dale		
R13, R14, R15, R16, R54, R55, R56	7	0	RES, 0, 0%, 0.25 W, AEC-Q200 Grade 0, 0603	0603	PMR03EZPJ000	Rohm		
R33	1	2.2k	RES, 2.2 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04022K20JNED	Vishay-Dale		
R38	1	442	RES, 442, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603442RFKEA	Vishay-Dale		
R40, R41	2	4.7k	RES, 4.7 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEYJ472V	Panasonic		
R42	1	22.0k	RES, 22.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-223-B-T5	Susumu Co Ltd		
R43, R44	2	100kΩ	Res POT Carbon Element 100kOhm 20% 1/20W/1/40W PC Pins Thru-Hole	PTH_POT_9MM50_24MM65	PTD902-2015F-B104	Bourns		
R45	1	10k	10k ±5% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Moisture Resistant Thick Film	0402	RC0402JR-1310KL	Yageo		
R53	1	20k	Trimmer Potentiometer, 20 k ohm, 0.25 W, SMD	Trimmer, 4.8,3.9x5.1mm	PVG5A203C03R00	Bourns		

Table 4-4. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
SH1, SH2, SH3, SH4, SH5, SH6, SH7, SH8, SH9, SH10, SH11, SH12, SH13, SH14, SH15, SH16, SH17, SH18, SH19, SH20, SH21, SH22, SH36, SH37, SH38, SH39, SH40, SH41, SH42, SH43, SH44, SH45, SH46, SH51, SH52, SH53, SH54	37	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
U1	1		Sirius SW Controlled Low Voltage Stereo	VQFN24	TAA5212IRGER	Texas Instruments		
U2	1		EEPROM, 512KBIT, 400KHZ, 8TSSOP	TSSOP-8	24LC512-I/ST	Microchip		
U3	1		500-mA, low-IQ, high-PSRR, dual-channel low-dropout (LDO) voltage regulator 10-WSON -40 to 125	WSON10	TLV751180330PDSQR	Texas Instruments		
U5	1		7 Hz ~ 36 kHz Analog Microphone MEMS (Silicon) 2.3 V ~ 3.6 V Omnidirectional (-44dB ±0.5dB SPL) Solder Pads	LGA	SPH8878LR5H-1	Knowles	SPH1878LR5H-C	Knowles
U6	1		TCA9416DTM X2SON8	X2SON8	TCA9416DTM	Texas Instruments		
U7, U8	2		Digital, PDM Microphone MEMS (Silicon) Omnidirectional (-37dB ±1dB @ 94dB SPL) Solder Pads	SMT_MIC_2MM65_3MM50	SPH0655LM4H-1	Knowles		
C18, C19, C20, C21	0	47uF	CAP, TA, 47 uF, 10 V, +/- 10%, 0.5 ohm, SMD	3528-21	TPSB476K010R0500	AVX		

Table 4-4. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
C22, C23, C24, C25	0	0.047uF	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H473K080AA	TDK		
C37	0	1uF	CAP, CERM, 1uF, 16V, +/- 10%, X7R, 0603	0603	8.85012E+11	Wurth Elektronik		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
J28, J29, J30, J49, J50	0		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J31, J32, J33, J34, J36, J37, J52, J53, J65, J67	0		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J35	0		AUDIO JACK 3.5mm 4COND, SMT	AUDIO JACK 3.5mm 4COND, SMT	SJ-43516-SMT-TR	CUI Inc.		
J38, J39	0		3.20mm ID, 9.00mm OD (RCA) Phono (RCA) Jack Mono Connector Solder	CONN_RCA_DUAL	RCJ-2223	CUI Devices		
J54, J55, J56, J57	0		Header, 2.54mm, 2x2, Gold, TH	Header, 2.54mm, 2x2, TH	PBC02DAAN	Sullins Connector Solutions		
R17, R18, R19, R20	0	100	RES, 100, 1%, 0.1 W, 0603	0603	RC0603FR-07100RL	Yageo		
R21, R24, R27, R30	0	16	RES, 16.0, 1%, 0.5 W, 0805	0805	ERJ-P06F16R0V	Panasonic		
R22, R25, R28, R31	0	604	RES, 604, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW0805604RFKEA	Vishay-Dale		
R23, R26, R29, R32	0		RES SMD 10K OHM 5% 0.4W 0805	0805	ESR10EZPJ103	Rohm Semiconductor		
R34, R36	0	48.7k	RES, 48.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080548K7FKEA	Vishay-Dale		
R35	0	21.5k	RES, 21.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080521K5FKEA	Vishay-Dale		

Table 4-4. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate PartNumber	Alternate Manufacturer
R37	0	9.76k	RES, 9.76 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08059K76FKEA	Vishay-Dale		
R47, R48	0	1.50k	RES, 1.50 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT1K50	Stackpole Electronics Inc		
SH23, SH24, SH25, SH26, SH27, SH28, SH29, SH30, SH31, SH32, SH33, SH34, SH35, SH47, SH48, SH49, SH50	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
SW1	0		Dip Switch SPST 12 Position Through Hole Slide (Standard) Actuator 50mA 24VDC	DIP24	206-12ST	CTS		

5 Additional Information

5.1 Trademarks

PurePath™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

6 References

Cable Reference

The following are cables that can be used for evaluation with external audio instrument-like Audio Precision:

- BNC Male to RCA Male Cable
- RCA Speaker Cable with Banana Plugs

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (September 2023) to Revision A (January 2024)	Page
• Updated images in *Software* section	15
• Added schematic for TAA5212EVM-K	38
• Added *Bill of Materials* table for TAA5212EVM-K	63

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・インスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), 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 AND 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 skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265