

Audio ADC, DAC, and CODEC for Professional Audio and Music Applications



Introduction

The professional audio market includes anything from compact home recording equipment and electric instruments for musicians, to high quality audio distribution infrastructure and large recording studio projects. As these technologies continue to evolve, there is a need for scalable audio designs to speed up the hardware and software development among designers. TI's complete product portfolio addresses the wide variety of applications in the professional audio market using a broad range of analog audio signal chain components and audio converters.

TI's new family of [TAx52xx](#) introduces a scalable ADC, DAC, and Audio CODEC™ family with various options such as channel count, control, and cost to address a broad range of applications such as [professional microphone and wireless systems](#), [speaker systems](#), [audio amplifiers](#), [mixers](#), [audio interfaces](#), [piano and musical instruments](#), [video cameras](#), [conferencing systems](#), and more.

The key requirements for professional audio market segment involve high-performance audio technology. TI's new [TAA5242](#) audio ADCs and [TAD5242](#) audio DACs offer performance increase in a highly integrated pin-control device. Designers can also access and harness the full performance and flexibility of the programmable software-controlled ADC ([TAA5212](#)) and DAC ([TAD5212](#)) for professional audio design that is unmatched in breadth and practical applicability. In addition, TI's advanced processing technology and analog design capability works with Burr-Brown's heritage of high-quality audio conversion and processing to provide a comprehensive tool kit for system designers.

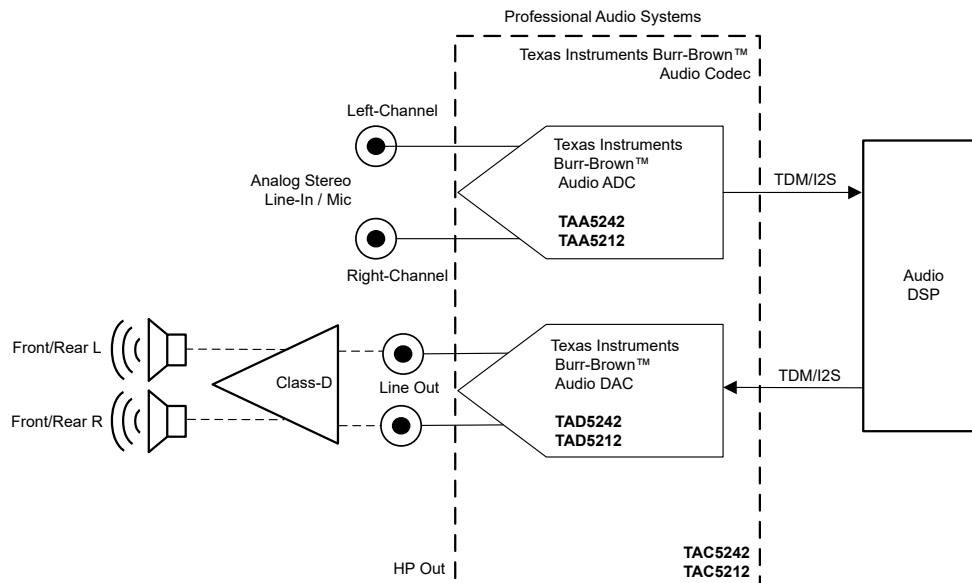


Figure 1. Professional Audio Block Diagram using TAx52x2

TAA52x2, TAD52x2, and TAC52x2 Devices

TAA52x2, TAD52x2, and TAC52x2 audio ADCs, DACs, and Codec provide the combination of high-performance with low-power mixed-signal processing designs to create differentiated professional audio equipment and consumer electronics. The three product families are pin-compatible to allow for scalable, quick designs. These TAx52x2 audio converters enable high-fidelity audio for crystal clear distortion-free audio capture in loud and noisy environments as a result of the following:

Codec for Professional Audio (TAC52x2) Salient Features:

ADC for Professional Audio (TAA52x2 or TAC52x2 Input)

- High performance:
 - 118dB wide dynamic range
 - Channel summation to boost SNR by 3dB
 - -95dB low total harmonic distortion and noise (THD+N)
 - 4.5 μ V_{RMS} low noise
 - Low-latency front-end for noise and echo cancellation
 - Input supported: Differential (2V_{rms}) / Single-ended (1V_{rms}), Line / Microphone
- Integration:
 - Configurable 1Hz and 12Hz digital HPF for DC removal and noise suppression
 - Voice activity detection
 - Programmable biquad filters
 - Programmable microphone bias
 - Input mixing and multiplexing options
 - Protection: Overcurrent, protection for MICBIAS
- Available in pin control option: TAA5242, TAC5242

DAC for Professional Audio (TAD52x2, TAC52x2 Output)

- High performance:
 - 119dB wide SNR
 - -95dB low total harmonic distortion and noise (THD+N)
 - Outputs supported: Differential (2V_{rms}), pseudo-differential (1V_{rms}), single-ended (1V_{rms}), line, headphones
- Integration:
 - Stereo headphone amplifier
 - Analog input to output bypass
 - Programmable HPF and biquad filters
 - Battery protection
 - Signal distortion limiter
 - Thermal foldback
 - Protection: Overcurrent, protection for MICBIAS and analog outputs, battery guard, distortion limiter, thermal foldback
- Available in pin control option: TAD5242, TAC5242

Design Flexibility and Benefits using TAx52x2:

- Single power-supply operation
- Integrated low-jitter phase-locked loop (PLL) for flexible clocking
- Sample rates Up to 768kHz (TAx5212) and 192kHz (TAx5242)
- No software required with pin control devices (TAx5242 family)
- Software available with I2C and SPI controlled devices (TAx5212 family)
- Available in compact 4 × 4mm QFN package which is pin compatible between ADC, DAC and Audio CODEC
- Low power: Power tune modes and automatic wakeup and shutdown on clock

Table 1. High-Performance TA52x2 Audio Converters Comparison Table

Features	TAA5212	TAA5242	TAD5212	TAD5242	TAC5212	TAC5242
Product family	ADC	ADC	DAC	DAC	Codec	Codec
Control interface	I2C, SPI	Pin control	I2C, SPI	Pin control	I2C, SPI	Pin control
Digital audio serial interface	TDM, I2S, LJ	TDM, I2S, LJ	TDM, I2S, LJ	TDM, I2S, LJ	TDM, I2S, LJ	TDM, I2S, LJ
ADC channel	Two (Up to four record channels)	2	-	-	Two (Up to four record channels)	2
Digital microphone channel	4	-	-	-	4	-
Microphone bias	✓ (Programmable)	✓ (Fixed)	✓ (Programmable)	✓ (Fixed)	✓ (Programmable)	✓ (Fixed)
ADC dynamic range	118dB	118dB	-	-	118dB	118dB
DAC channel	-	-	Two (Up to four single-ended channels)	2	Two (Up to four single-ended channels)	2
DAC dynamic range	-	-	119dB	119dB	119dB	119dB
Sample rates	8kHz to 768kHz	8kHz to 192kHz	8kHz to 768kHz	8kHz to 192kHz	8kHz to 768kHz	8kHz to 192kHz
Controller and target modes	✓	✓	✓	✓	✓	✓
Configurable TDM slot	✓	✓	✓	✓	✓	✓
Word length	16, 20, 24, 32 bits	16, 24, 32 bits	16, 20, 24, 32 bits	16, 24, 32 bits	16, 20, 24, 32 bits	16, 24, 32 bits
Dual I2S or TDM	✓	-	✓	-	✓	-
Headphone amplifier	-	-	✓	✓	✓	✓
Channel summation	✓ (121dB mono mode)	-	-	-	✓ (121dB mono mode)	-
Voice activity detection	✓	-	-	-	✓	-
Digital HPF	Programmable	Selectable 1Hz and 12Hz cutoff	Programmable	Selectable 1Hz and 12Hz cutoff	Programmable	Selectable 1Hz and 12Hz cutoff
Decimation filter	Linear phase or low latency	Linear phase	Linear phase or low latency	Linear phase	Linear phase or low latency	Linear phase
High CMRR mode	✓ (80dB CMRR)	-	-	-	✓ (80dB CMRR)	-
Mixer or multiplexer	✓	-	✓	-	✓	-
Analog input to output bypass	-	-	✓	-	✓	-
Programmable channel gain, phase and gain calibration	✓	-	✓	-	✓	-
Volume control	✓	✓	✓	✓	✓	✓
Automatic gain controller	✓	-	✓	-	✓	-
Single supply operation	✓ (1.8V or 3.3V)					
Temperature grade	-40°C ≤ TA ≤ +125°C					
Compatibility	Pin-to-pin package					
Package	QFN , 28-pin, 4mm × 4mm (0.5mm pitch)					

Technical Resources

1. Texas Instruments, [Analog Input Configurations, Mixing and Muxing of TAx5x1x Devices](#), application note.
2. Texas Instruments, [DAC Swings and Common Mode Settings in AC Coupled and DC Coupled DAC](#), application note.
3. Texas Instruments, [Clocking Configuration of Device and Flexible Clocking For TAx5x1x Family](#), application note.
4. Texas Instruments, [TAx5x1x Synchronous Sample Rate Conversion](#), application note.
5. Texas Instruments, [Clock Error Configuration, Detection, and Modes Supported in TAx5x1x Family](#), application note.

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