Product Bulletin

TLV320AIC33/3106/34 Stereo Audio Converters

16/20/24/32-Bit, High-Performance, Low-Power Audio Codecs Support Digital Microphones

Key Features

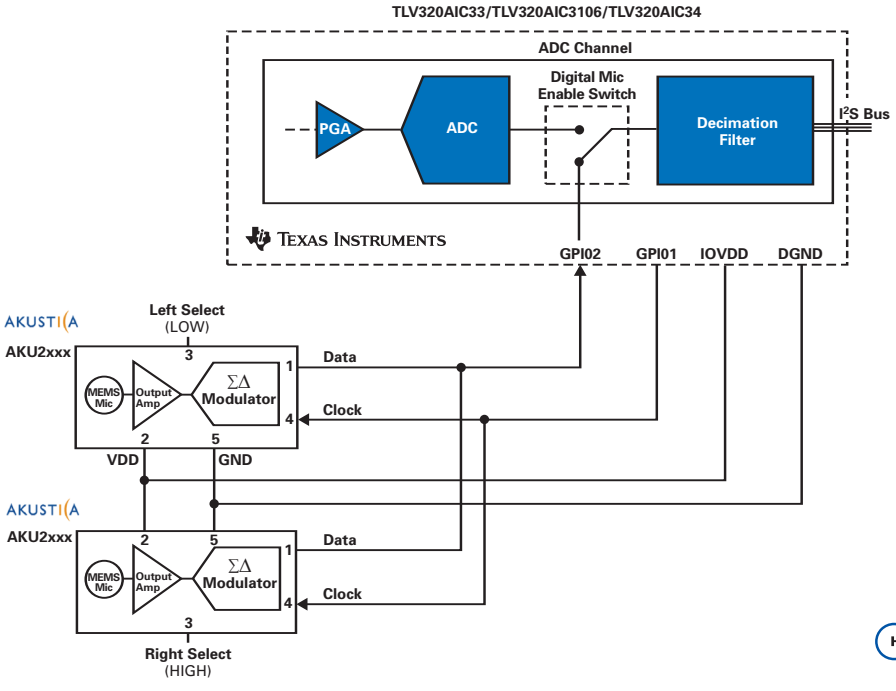
- Interfaces directly to digital or analog microphones
- Supports 8-96 ksps sampling rates
- High SNR (100-102dB DAC, 92dB ADC)
- Integrated PLL supporting a wide range of audio clocks
- Low-power headphone, speaker and playback modes for portable systems
- Programmable digital audio effects include 3D sound, bass, treble, EQ and de-emphasis
- Analog microphone inputs with bias, preamp and AGC
- SPI or I²C control bus options for TLV320AIC3106 and 'AIC33
- I²S, L/R- Justified, DSP, PCM and TDM audio data
- Small BGA (5 mm x 5 mm) or QFN (7 mm x 7 mm) packages for the 'AIC33/3106 and small BGA (6 mm x 6 mm) package for the 'AIC34

The TLV320AIC33, TLV320AIC3106 and TLV320AIC34 high-performance, low-power stereo audio codecs are the industry's only I²S codecs capable of interfacing directly to digital or analog microphones. These codecs, which are ideal for portable applications like smartphones, personal digital assistants (PDAs), voice/audio processors, conferencing IP phones and other portable audio equipment, accept either a digital bit stream from a digital microphone or the typical differential or single-ended inputs from traditional analog microphones.

Digital Microphones

Digital microphones, which perform the analog-to-digital conversion in the microphone capsule or package itself, are becoming increasingly prevalent in various audio applications because they can provide better audio quality by generating a digital audio signal that is less susceptible to electrical noise. With analog microphones, designers often strive to keep the traces between the microphone and the codec as short as possible, since longer traces make analog signals more susceptible to electrical noise, which can degrade the audio quality of the system. Additionally, the signals from an analog microphone in a portable audio application are usually relatively small, which makes them even more vulnerable to electrical noise.

With digital microphones, designers have greater freedom in the placement of the codec relative to the microphone because the digital output signal of the microphone is considerably more immune to electrical noise than an analog signal. This is particularly important in applications such as laptops, smartphones, PDAs or other high-complexity audio systems where the circuit board is densely populated with chips and placing the codec in close proximity to the microphone can be logistically difficult.



Digital Stereo Microphone Implementation

Flexible Codec Devices

The 'AIC33, 'AIC3106 and 'AIC34 codecs feature similar advanced audio processing functionality, but the capabilities of each device vary slightly to meet the specific needs of a wide range of end-equipments.

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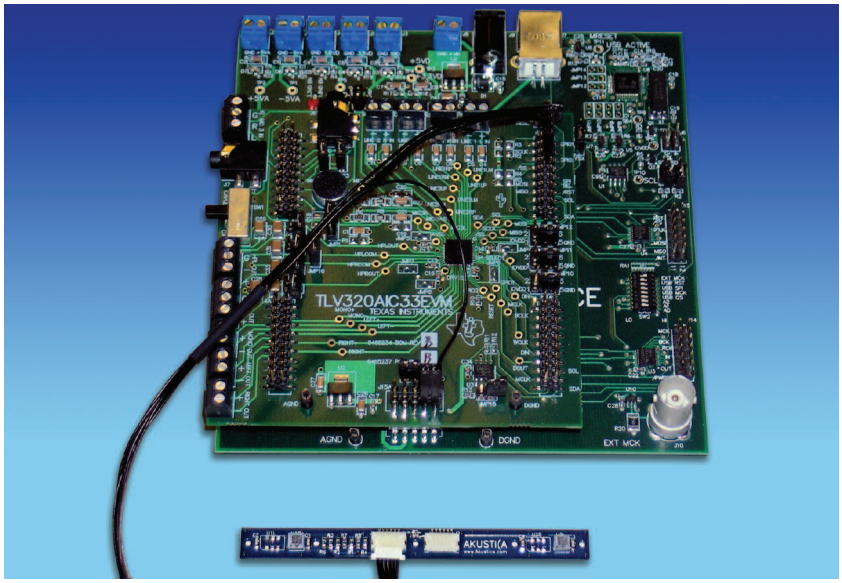

Reference Design PCB featuring TI's codec and Akustica's digital microphone array evaluation module.

• *TLV320AIC33*

The 2-channel 'AIC33 provides high flexibility in terms of its number of inputs, outputs, mixing, muxing and audio features. The device's wide range of audio features include analog and digital microphones, low-power Class-AB speaker amplifiers for 8-Ω speakers (500 mW), 16-Ω stereo headphones (40 mW) and stereo playback mode (14 mW at 48 ksps). The programmable digital filter features advanced digital effects like 3D sound, bass, treble, EQ and de-emphasis. An integrated PLL can generate an audio clock over a wide range from 512 kHz to 50 MHz.

• *TLV320AIC3106*

The 'AIC3106 includes all of the capabilities of the 'AIC33 with additional filtering capabilities for audio recording. It does not integrate any Class-AB speaker amplifiers, reducing costs and giving designers the ability to attach higher-powered and more efficient Class-D amplifiers to these outputs when required by the application. Also, the 'AIC3106 features a low-power bypass mode that switches the analog inputs directly to the analog outputs, allowing all other modules in the codec to shut down and consume negligible power. Other salient features are improved signal-to-noise ratio on the DAC outputs for greater audio performance, ADC digital filtering effects and a programmable ADC high-pass filter. The 'AIC3106 also features 102 dB SNR.

• *TLV320AIC34*

The 'AIC34 integrates a 4-channel codec consisting of two separate stereo codec blocks that can operate fully independently of each other and at distinct sample rates. The 'AIC34 includes integrated Class-AB speaker amplifiers that can drive about 500 mW into an 8-Ω load.

Features	*TLV320AIC33*	*TLV320AIC3106*	*TLV320AIC34*
Digital MIC Input	•	•	•
DAC Digital Effect Filters	•	•	•
ADC Digital Effect Filters		•	•
Programmable ADC HP Filter		•	•
Low-Power Bypass Mode		•	•
Dual Simultaneous Digital Audio Bus			•
Programmable PLL	•	•	•
Class-AB Speaker Amplifiers	•		•
Number of RX (or TX) Channels	2	2	4
BGA Package	5 mm x 5 mm	5 mm x 5 mm	6 mm x 6 mm

Designing with Digital Microphones

TI's support programs and technical documentation for these audio codecs include a detailed application note that provides a step-by-step example for setting up the evaluation module for the TLV320AIC33/3106/34 devices and information on how to connect one of the codecs to a digital microphone, such as those provided by Akustica. See TI's application note titled: "Using the Digital Microphone Function on TLV320AIC33 with AIC33EVM/USB-MODEVM System."

For more information

For more information on TI's TLV320AIC33/3106/34 stereo audio converters or Akustica's AKU2xxx digital microphones, please visit **www.ti.com/AIC34converter**