

SmartBeat DA7413 mono codec with wideband digital hybrid ANC

Outstanding audio and battery lifetime for wired and wireless headphones

Renesas DA741x family is a high performance, ultra-low power HiFi codec with hybrid active noise cancellation (ANC) for hearables, and USB-C™ and Bluetooth® headphone, headset or and hearable applications.

With high-performance playback and record paths, the DA741x family is designed for high dynamic range and minimum latency. Two integrated, individually operatable, digital signal processors are provided. The first, running at 192 kHz, is dedicated to noise cancellation applications whilst the second, running at 48 kHz or 192 kHz, can perform music and voice processing such as equalization, limiting, mixing, beamforming, and gain control. A dedicated fast equalization (FEQ) path, operating at the digital microphone (DMIC) clock rate, delivers improved high frequency noise cancellation with ultra-low latency. Supporting 4 ADC which enables customer to use up to 4 analog microphones (AMIC) or 6 digital-microphones (DMIC).

DA741x is a family of high-performance, ultra-low-power, hi-fi codecs for USB-C™ and Bluetooth® headphone (HP), headset, or hearable applications. The family consists of two devices. DA7414 supports stereo output and DA7413 supports mono output. And both devices share the same driver and compatible with each other.

Applications

- Wireless (Bluetooth) in-ear mono earbud
- Wired (USB-C) in-ear earbud
- Wired/Wireless microphone

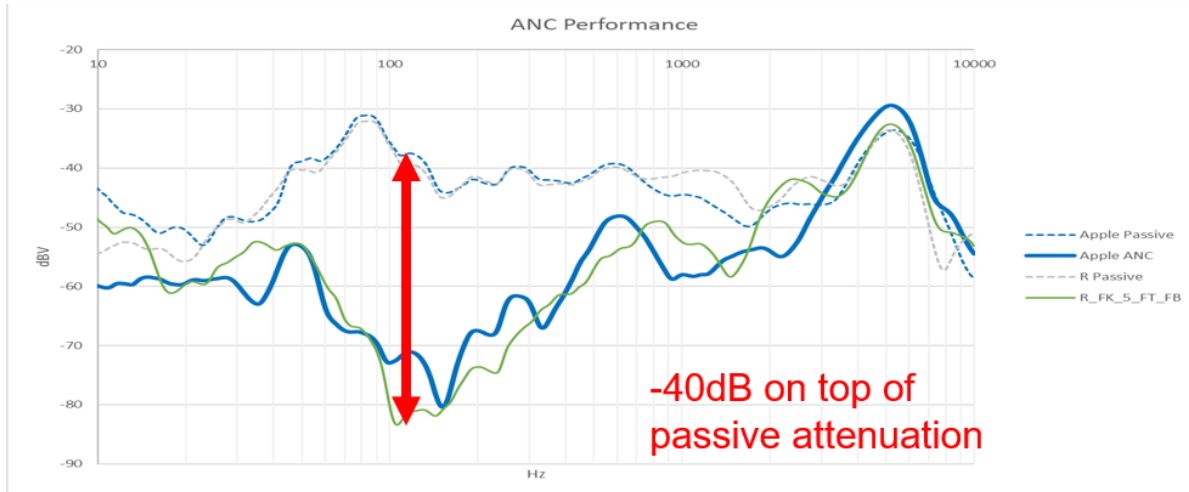
Benefits

- Superior audio performance with 115dB dynamic range DAC
- World-class magnitude and range of ambient noise suppression with up to 40dB noise suppression.
- Four channel ADC supports up to 4 Analog mic and up to 6 Digital mic.
- Class-leading low power consumption
- Highly compact footprint
- Development kit and extensive tooling speed product development
- Family of pin-compatible variants simplifies creation of a complete portfolio.

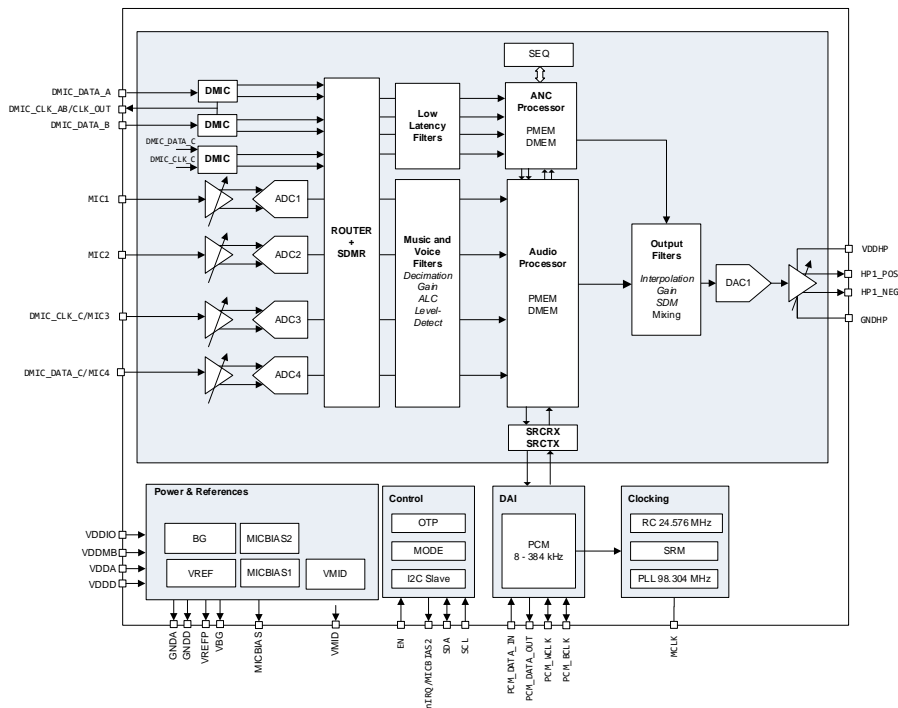


Wideband digital hybrid ANC

The DA7413 features our proprietary digital ANC technology that can be configured to work in feedback, feedforward or a novel hybrid mode. In hybrid mode it delivers best-in-class ambient noise suppression in terms of both magnitude (up to 40 dB at 200 Hz) and frequency range (over 2.5 kHz).



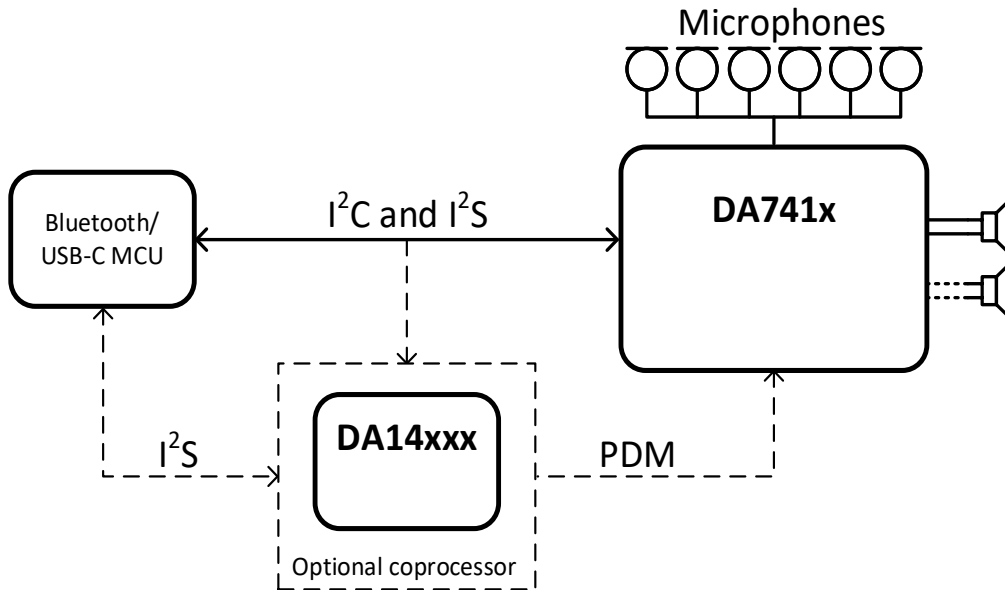
Key to this performance is a custom DSP that is specifically optimized and used for ANC and enables an input-to-output latency of just 25µs. Meanwhile a dedicated fast equalization (FEQ) path operating at the digital microphone (DMIC) clock rate improves cancellation at high frequencies and putting latency down to just 5.2µs.



DA7413 block diagram

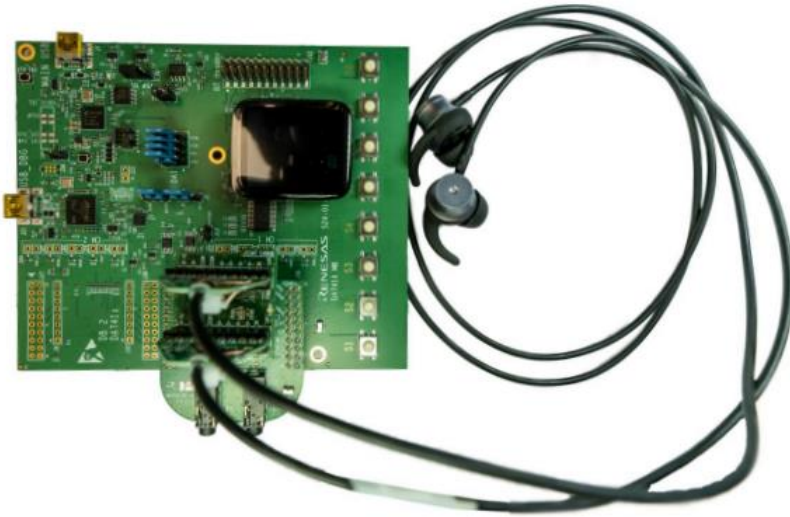
Tailored support

Renesas offers all the tools and support you need to develop new DA741x-based applications fast. This includes the option for hand-on support from experts in our audio labs in Europe and South East Asia.



Development kit

The DA741x development kit contains all the hardware you need to explore the potential of this high-performance ANC codec for yourself. The motherboard includes the codec and a DA14195 co-processor, while the daughterboard features the DA7414 in package.



Development tools

We also offer an extensive range of tools covering the whole development cycle to help you design and tune your hardware and software. They include a semi-automatic ANC tuning tool to simplify and speed up the optimization of your ANC configuration. In addition, an easy-to-use production line calibration tool helps you compensate for tolerances within commercial microphones to ensure consistently great performance in every product you make.

DA741x Driver	Generic host driver Example implementation on DA14195
DA14195 Host FW Program	USB playback & recording USB/UART tuning & configuration
CUH	Desktop driver communicating with the device over CUP
ProfileTools	PIM VMPRW
SmartCanvas	Memory/Register configuration tool Scripting
Audio Tuning Tool	Hybrid ANC tuning Equalization, Beamforming
Production Cal Tool	Available with CLIO 12 Soundcard, Soundcheck

Key features

- Active Noise Cancellation
 - Support Hybrid, Feedforward, and Feedback topologies
 - 40 dB cancellation at 200 Hz
 - 5.2 μ s microphone input to headphone output latency through FEQ
 - 25 μ s microphone input to headphone output latency through DSP
 - Automated calibration and tuning tools
- Power management
 - 4.3mW mono music playback quiescent power consumption
 - 11mW mono hybrid ANC playback power consumption at 0.1 mW
- Digital Audio Interfaces
 - Up to 32-bit 384 kHz sample rate support
 - Three stereo PDM inputs for digital microphones and/or low latency connection from host processors
- Stereo differential headphone path
 - 115 dB dynamic range
 - Output power 2 x 30 mW into 32 Ω
- Input paths
 - Four single-ended or two differential microphone/line-inputs
 - 110 dB dynamic range
 - Integrated dual low-noise microphone bias
- Pop-free startup and shutdown
- Digital Signal Processor
 - Dual 98 MHz DSPs
 - 192 kHz, low delay Active Noise canceller (ANC) DSP
 - Dedicated 6 MHz Fast equalization FEQ path
 - 48 kHz/192 kHz, music and voice DSPs
 - Fully-flexible digital mixing with independent gains
- Bypassable asynchronous sample rate converters
- Clocking
 - Fract-N Phase-locked loop
 - Sample rate tracking
 - Internal oscillator
 - MCLK free operation
- 2-wire I2C-compatible control interface
- Temperature range -40 to +85 °C
- 32 ball 3.42 mm x 1.77 mm 0.4 mm pitch WL-CSP