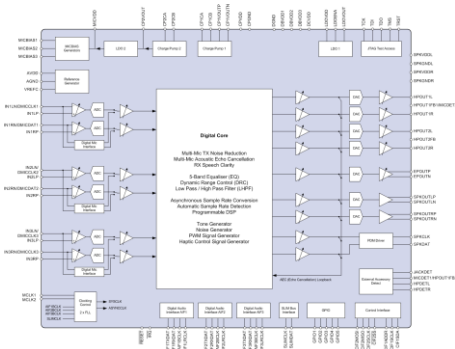# WM5102: AUDIO HUB CODEC WITH VOICE PROCESSOR DSP

DESCRIPTION

The WM5102 is a highly-integrated low-power audio system for smartphones, tablets and other portable audio devices. It combines wideband telephony voice processing with a flexible, high-performance audio hub CODEC.

The WM5102 digital core provides a powerful combination of fixed-function signal processing blocks with a programmable DSP. These are supported by a fully-flexible, all-digital audio mixing and routing engine with sample rate converters, for wide use-case flexibility. The programmable DSP is optimised for Wolfson's wideband voice processing which includes multi-mic noise reduction and echo cancellation. Many other audio algorithms can be implemented. Fixed-function signal processing blocks include filters, EQ, dynamics processors and sample rate converters.

A SLIMbus interface supports multi-channel audio paths and host control register access. Multiple sample rates are supported concurrently via the SLIMbus interface. Three further digital audio interfaces are provided, each supporting a wide range of standard audio sample rates and serial interface formats. Automatic sample rate detection enables seamless wideband/narrowband voice call handover.

Two stereo headphone drivers each provide stereo ground-referenced or mono BTL outputs, with noise levels as low as 2.3µVRMS for hi-fi quality line or headphone output. The CODEC also features stereo 2W Class-D speaker outputs, a dedicated BTL earpiece output and PDM for external speaker amplifiers. A signal generator for controlling haptics devices is included; vibe actuators can connect directly to the Class-D speaker output, or via an external driver on the PDM output interface. All inputs, outputs and system interfaces can function concurrently.

The WM5102 supports up to six microphone inputs, each either analogue or PDM digital. Microphone activity detection with interrupt is available. A smart accessory interface supports most standard 3.5mm accessories. Impedance sensing and measurement is provided for external accessory and push-button detection.

The WM5102 power, clocking and output driver architectures are all designed to maximise battery life in voice, music and standby modes. Low-power 'Sleep' is supported, with configurable wake-up events. The WM5102 is powered from a 1.8V external supply. A separate supply is required for the Class D speaker drivers (typically direct connection to 4.2V battery).

Two integrated FLLs provide support for a wide range of system clock frequencies. The WM5102 is configured using the I2C, SPI or SLIMbus interfaces. The fully-differential internal analogue architecture, minimal analogue signal paths and on-chip RF noise filters ensure a very high degree of noise immunity.

FEATURES

- Audio hub CODEC with integrated voice processor DSP
- Programmable audio effects and voice processing functions
  - Transmit-path noise reduction and echo cancellation
  - Receive-path enhancement and noise reduction
  - Wind noise, sidetone and other programmable filters
  - Dynamic Range Control, Fully parametric EQs
- Multi-channel asynchronous sample rate conversion
- Integrated 6/7 channel 24-bit hi-fi audio hub CODEC
  - 6 ADCs, 96dB SNR microphone input (48kHz)
  - 7 DACs, 113dB SNR headphone playback (48kHz)
- Audio inputs
  - Up to 6 analogue or digital microphone inputs
  - Single-ended or differential mic/line inputs
- Multi-purpose headphone / earpiece / line output drivers
  - 2 stereo output paths
  - 29mW into 32Ω load at 0.1% THD+N
  - 100mW into 32Ω BTL load at 5% THD+N
  - 6.5mW typical headphone playback power consumption
  - Pop suppression functions
  - 2.3μVRMS noise floor (A-weighted)
- Mono BTL earpiece output driver
- 2 x 2W stereo Class D speaker output drivers
  - Direct drive of external haptics vibe actuators
- Two-channel digital speaker (PDM) interface
- SLIMbus® audio and control interface
- 3 full digital audio interfaces
  - Standard sample rates from 4kHz up to 192kHz
  - Ultrasonic accessory function support
  - TDM support on all AIFs
  - 8 channel input and output on AIF1
- Flexible clocking, derived from MCLKn, BCLKn or SLIMbus
- 2 low-power FLLs support reference clocks down to 32kHz
- Advanced accessory detection functions
  - Low-power standby mode and configurable wake-up
- Configurable functions on 5 GPIO pins
- Integrated LDO regulators and charge pumps
- Support for single 1.8V supply operation
- Small W-CSP package, 0.4mm pitch