

# AS3543

Preliminary Product Brief

## High End Stereo Audio Codec with System PMU

### General Description

The AS3543 is an ultra low power stereo audio codec and is designed for Portable Digital Audio Applications.

It allows high-end quality playback with up to 100dBa SNR and recording in FM quality. With one microphone (including pre-amplifier and supply for an electret microphone) and two line inputs, it allows connecting a variety of audio inputs. The different audio signals can be mixed via a 6-channel mixer and fed to either a headphone output for 16 /32 headsets or a line output. Both outputs have a ground noise cancellation to use it e.g. in car docking stations. The audio outputs have also an auto fading implemented which performs the fade-in, fade-out as well as the transition between specific volume levels automatically with an selectable timing.

Further the device offers advanced power management functions. All necessary ICs and peripherals in a Digital Audio Player are supplied by the AS3543. It features 2 DCDC converters for core and memory/periphery supply as well as 4 LDOs. Both DCDC converter feature DVM (dynamic voltage management) with an selectable timing for the voltage stepping. The different regulated supply voltages are programmable via the serial control interface.

The step-up converter for the backlight can operate up to 25V (with an external transistor even higher) in voltage and current control mode. An internal voltage protection is limiting the output voltage in the case of external component failures. 2 high voltage current sinks can be used to operate two , if needed also unbalanced, LED strings. An automatic dimming function allows a logarithmic on/off of the backlight with selectable timing.

AS3543 also contains a Li-Ion battery charger with constant current, constant voltage and trickle charging. The maximum charging current is 460mA. An integrated battery switch is separating the battery during charging or whenever an external power supply is present. With this switch it is also possible to operate with no or deeply discharged batteries.

The AS3543 has an on-chip, phase locked loop (PLL) which generates the needed internal CODEC master clock. I2S Frame and shift-clock have to be applied from the processor for playback and recording.

Further the AS3543 has an independent 32kHz real time clock (RTC) on chip which allows a complete power down of the system CPU while only consuming less than 1µA. An internal switch automatically switches between the RTC backup-battery and main battery supply.

The single supply voltage may vary from 2.7V (2.4V) to 5.5V.

### Key Features

#### Audio

##### Audio power consumption:

- - 5mW: 96dB DAC to Headphone @ 1.8V, 32Ω
- - 7mW: 100dB DAC to Headphone @ 2.9V, 32Ω

##### Sigma Delta Converters

- DAC
  - 98dB SNR ('A' weighted) @ 1.8V
  - 102dB SNR ('A' weighted) @ 2.9V
- ADC
  - 83dB SNR ('A' weighted) @ 1.8V
- Sampling Frequency
  - DAC: 8-48kHz
  - ADC: 8-24kHz

##### High Efficiency Headphone Amplifier

- volume control via serial interface
- 32 steps @1.5dB and MUTE
- 2x12mW @16 driver capability@ 1.8V supply
- THD -74dB @16Ω; 1.8V
- 2x40mW @16 driver capability@ 2.9V supply
- THD -77dB @16Ω; 2.9V
- headphone and over-current detection
- phantom ground eliminates large capacitors
- ground noise cancellation

##### Line Output

- volume control via serial interface
- 32 steps @1.5dB and MUTE
- 0.6Vp @10kΩ
- ground noise cancellation



## Microphone Input

- 3 gain pre-setting (28dB/34dB/40dB) and AGC
- 2 gain steps @1.5dB and MUTE
- supply for electret microphone
- microphone detection
- remote control by switch

## 2 Line Inputs

- volume control via serial interface
- 32 steps @1.5dB and MUTE
- stereo or 2x mono

## Audio Mixer

- 6 channel input/output mixer with AGC
- mixes line inputs and microphone with DAC
- left and right channels independent

## Power Management

### Voltage Generation

- step down for CPU core (0.61V-3.35V, 250mA)
- step down for peripheral (0.61V-3.35V, 250mA)
- LDO1 for AFE supply (1.7V (1.65-3.2V), 50mA)
- LDO2 for AFE supply (2.7V (2.3-3.5V), 200mA)
- LDO3 for peripherals (1.2V-3.5V, 100/200mA)
- LDO4 for peripherals (1.2V-3.5V, 100/200mA)
- VBUS comparator
- separate input for LDO3
- power supply supervision & hibernation modes
- 5sec and 10sec emergency shut-down

### Backlight Driver

- step up for backlight (25V)
- current control mode (1.2-36mA)
- voltage control mode
- 2 current sinks
- automatic dimming
- over-voltage protection

### Battery Charger

- automatic trickle charge (55mA)
- prog. constant current charging (55-460mA)
- prog. constant voltage charging (3.9V-4.25V)
- current limitation for USB mode
- integrated battery switch

## General

### Supervisor

- automatic battery monitoring with interrupt generation and selectable warning level
- automatic temperature monitoring with interrupt generation and selectable warning and shutdown levels

### Real Time Clock

- ultra low power 32kHz oscillator
- 32bit RTC sec counter, 96 days auto wake-up
- selectable alarm (seconds or minutes)
- 128bit free SRAM for random settings
- 32kHz clock output to peripheral
- voltage generation
- trim able oscillator
- <1uA total power consumption

### Auxiliary Oscillator (system clock generation)

- low power 12-24MHz oscillator
- clock output

### General Purpose ADC

- 10bit resolution
- 19 inputs analog multiplexer

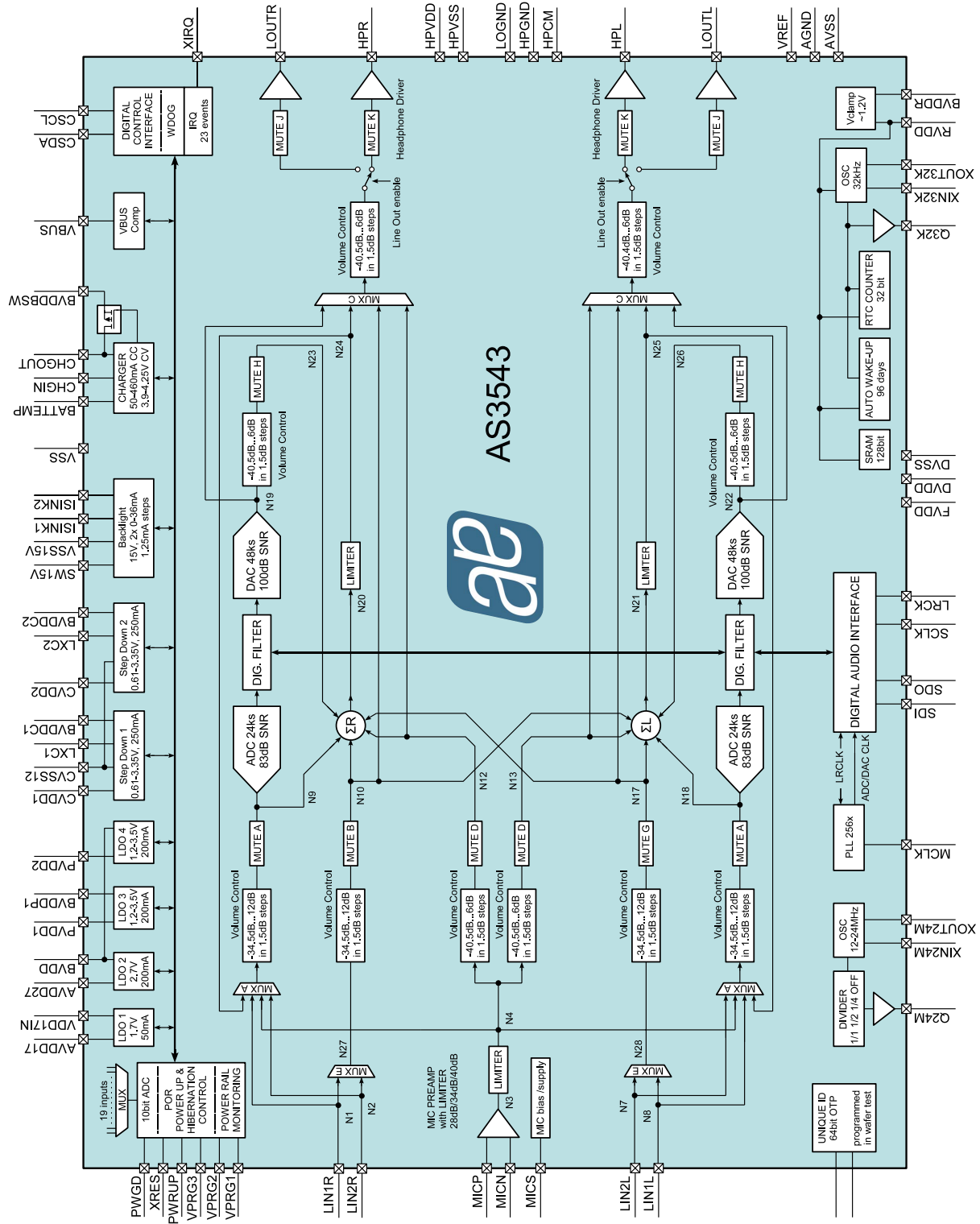
### Interfaces

- 2 wire serial control interface
- reset pin with selectable delay, power good pin
- 64bit unique ID (OTP)
- 22 different interrupts
- Package CTBGA68 [6.0x6.0x1.1mm] 0.5mm pitch

## Applications

Portable Digital Audio/Video Player and Recorder  
PDA, Smartphone

Figure 1. Block Diagram



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