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Product Brief

AS3527
Advanced Audio Processor System

1 Description

This highly flexible and fully integrated audio processor system (AS3527) combines strong calculating power, high performance audio features with system power management options for battery powered devices.

Using advanced process technology and large on chip RAM unique power management techniques leads to outstanding system level low power consumption of 52mW for a complete flash-player during MP3 playback.

Based on a powerful ARM9TDMI capable of performing up to 200MIPS it is suited to run MP3, AAC, WMA, OGG... decoders and encoders and, in addition, it can perform advanced user interfaces, motion graphics support, video playback and much more.

The AS3527 SOC (system-on-a-Chip) features dedicated high speed interfaces for ATA IDE, USB2.0 HS-OTG and SDRAM ensuring maximum performance for download, upload, and playback.

Furthermore interfaces for NAND flashes, MMC/SD cards and Memory Stick ensure most flexible system design possibilities. Hardware support for parallel interfaces lower the CPU load serving complex and/or colour user interfaces.

Additional SPI, Fast UARTs and configurable serial high-speed data and control interfaces enable the addition of a number of connectivity options, radio broadcast and communication front ends:

- Satellite radio (XM-Radio, HD-Radio, Sirius, DAB)
- BT2.0 radio front ends or complete chip sets
- WiFi chip sets
- Comm receivers (i.e. GSM, etc)
- GPS radio or complete chip set

Two independently programmable PLLs generate the required frequencies for audio playback/recording, for the processor core and for the USB interface at the same time. An additional external clock input eliminates the use of external crystals when used in multi-processor systems like mobile phones.

It has a variety of audio inputs and outputs to directly connect electret microphones, and auxiliary signal sources via a 10-channel mixer to a headset 16Ω/32Ω or auxiliary audio peripherals. Selectable mixer bypasses lower the power consumption for simple playback operations and enlarger the system design flexibility.

Further the device offers advanced power management functions. All necessary ICs and peripherals in a Digital Audio Player with flash or hard-disk memory are supplied by the AS3527. The different regulated supply voltages are fully programmable. The power management block generates 11 different supply voltages out of a single battery supply. CPU, NAND flash, SRAM, memory cards, harddisk, LCD, LCD back-light, USB-HOST and USB-OTG can be powered.

The AS3527 has an independent 32kHz real time clock (RTC) on chip, which allows a complete power down of the system CPU and peripherals.

AS3527 also contains a charger for Li-Io batteries.

The single supply voltage may vary from 3.0V to 5.5V.

2 Key Features

2.1 Digital Core

Embedded 32-Bit RISC Controller

- ARM922TDMI RISC CPU
- 2.5Mbit on-chip RAM
- 1Mbit on chip ROM
- Clock speed max. 250MHz (200MIPS)
- Standard JTAG interface

USB 2.0 HS & OTG Interface

- Up to 480Mbit/s transfer speed
- USB 2.0 HS/FS physical inlcuding OTG support
- USB 2.0 HS/FS digital core including OTG host
- Dedicated dual port buffer RAM
- DMA bus master functionality

IDE Host Controller

- Supporting Ultra ATA 33/66/100/133 modes
- Programmable IO and Multi-word DMA capability
- Dedicated dual port buffer RAM
- DMA bus master functionality

External Memory Controller

- Dynamic memory interface
- Asynchronous static memory
- DMA bus master functionality

DMA Controller

- Single Master DMA controller
- 2 DMA channels possible at the same time
- 16 DMA requests supported

Interrupt Controller

- Support for 32 standard interrupts
- Support for 16 vectored IRQ interrupts

Audio Subsystem Interface

- Dedicated 2 wire serial control master
- I2S input and output with dual port buffer RAM

Nand Flash Interface

- 8 and 16bit flash support
- 3, 4 & 5 byte address support
- hardware ECC

MMC/SD Interface

- MMC/SD Card host for multiple card support
- 4 data line support for SD cards

MS / MS Pro Interface

- Dedicated dual port buffer RAM

Display Interface

- Serial and parallel controller supported
- FiFo buffered
- Programmable timing

Synchronous Serial Interface

- Master and slave operation
- 8 and 16 bit support
- Several protocol standards supported

I2S Interface

- Input multiplexed with audio subsystem
- selectable SPDIF input conversion
- Dedicated dual port buffer RAM

2 Wire Serial Control Interface

- Master and slave operation
- Standard and fast mode support

General Purpose IO Interface

- 4x 8-bit ports

Multiple Boot Options

- Selection of internal ROM or external boot device
- Internal boot loader supporting boot from external NorFlash, NandFlash, IDE, SPI host
- Internal USB boot loader with USB promer supporting initial factory programming and firmware update

2.2 Audio

Multi-bit Sigma Delta Converters

- DAC: 18bit with 94dB SNR ('A' weighted)
- ADC: 20bit with 90dB SNR ('A' weighted)
- Sampling Frequency: 8-48kHz
- 32 gain steps @ 1.5dB and MUTE

2 Line Inputs

- stereo, 2x mono or mono differential inputs
- 32 gain steps @ 1.5dB and MUTE

2 Microphone Inputs

- differential inputs
- 3 gain pre-sets (28/34/40 dB) and OFF with AGC
- 32 gain steps @ 1.5dB and MUTE
- microphone detection with about 50uA
- supply for electret microphone max 1mA
- voice activation and remote control by switch

2 Line Outputs

- max 1Vp @ 10kΩ in single ended stereo mode
- >32Ω in mono differential mode to drive ear-pieces
- Mixer bypass
- 32 gain steps @ 1.5dB and MUTE

Stereo Headphone Audio Amplifier

- 2x 60mW @ 16Ω driver capacity
- 32 gain steps @ 1.5dB and MUTE
- Click- and pop-less start-up and power down
- Headphone and over-current detection
- Phantom ground eliminates large capacitors
- Mixer bypass

10 Channel Audio Mixer

- mixes Line inputs, Mic inputs and DAC output
- separate selectable source for right and left channel
- possibility to select AGC to prevent clipping

2.3 Power Management

Li-Io Battery Charger

- automatic 50mA trickle charging
- prog. constant current charging (50 – 400mA)
- prog. constant voltage charging (3.9 - 4.25V)

Voltage Generation

- step down for harddisk (0.65V-3.4V, 500mA)
- step down for CPUcore (1.05V-1.2V, 250mA)
- step down for peripheral (0.65V-3.4V, 250mA)
- charge pump for USB OTG (5V, 10mA)
- step up for USB HOST/OTG (5V, 500mA)
- LDO for digital supply (2.9V, 200mA)
- LDO for analog supply (2.9V, 200mA)
- LDO for peripherals (1.2V-3.5V, 200mA)
- LDO for USB transceiver (3.26V, 200mA)
- LDO for RTC (1.0V-2.5V, 2mA)

25V Back-light step up converter

- for driving up to 6 white LEDs in series to achieve a uniform illumination
- current programmable up to 40mA (1.25mA steps)
- dimming with selectable timing

2.4 System

RTC

- ultra low power 32kHz oscillator
- 32bit RTC second counter, 96 days auto wake-up
- selectable alarm (seconds or minutes)
- trim able oscillator
- 128bit free SRAM for random settings
- 32kHz clock output to peripherals

Oscillator

- low power 12-24MHz Oscillator
- generating main system clock

Supervisor

- automatic battery monitoring with interrupt generation and selectable warning level
- automatic temp supervision with interrupt generation and selectable warning and shutdown levels
- power rail monitoring

General Purpose ADC

- 10bit resolution
- 21 inputs analog multiplexer

UID

- Unique Identification Number in OTP ROM for DRM

General

- Reset pin, watchdog, power good pin
- PWM output
- hibernation modes
- 5sec and 10sec emergency shut-down
- Wide battery supply range 3V – 5.5V
- MP3 playback with 52mW

Packages:

- AS3527-A: CTBGA224 13x13mm, 0.8mm pitch

3 Application

- Portable Digital Audio Player and Recorder
- Portable Digital Media Player
- PDA
- Smartphone

4 Block Diagram

Figure 1 AS3527 Block Diagram