MP3 Player Presentation
Based on VS1005 SoC

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What is VLSI Solution?

- VLSI Solution, founded in 1991, is a new technology creator who designs and manufactures integrated circuits.
- VLSI has an extensive IP library and advanced know-how in digital audio.
- VLSI's Audio IP has been used for instance in the original PC SoundBlaster sound cards.
- VLSI is one of the three MP3 decoder IC pioneers. Our VS1xxx chips are well-known audio co-processors with a large customer base.
- VLSI currently has the broadest selection of audio codecs in the market.
- VLSI has sold over 32 million chips in the last decade.
- VLSI's major selling point is very good sound quality.
Current MP3 Player Trends

- Commodity MP3 player market is shrinking and the special product segment is growing
  => customization of special products needed
- Apple has set the user interface standards
  => color touch screen, shuffle controls
- Compressed audio (e.g. MP3) is replacing CD in home audio
  => digital interface such as S/PDIF to connect with amplifier
  => lossless compression such as FLAC
  => audio performance requirements from home audio
- Much memory needed to store audio, internal flash price volatility
  => external removable flash such as SD card preferred
- Cloud music services
  => connection to internet and/or personal streaming
Structure of a Typical MP3 Player

- RISC PROCESSOR (ARM)
- DRAM (512MB)
- Audio codec
- FM tuner
- Touchscreen controller
- Power Management
- Axis accelerometer
- Nand Flash (16-128GB)
MP3 Player Based on VS1005 SoC

- The processor has been optimized for digital signal processing
- No need for external DRAM, all memory is internal SRAM
- High integration: Audio codec, FM tuner, resistive touchscreen controller, and linear regulators have been integrated
- All above allows for lower cost, lower component count and smaller size product than with any other IC
New Features of a VS1005 Based MP3 Player

- Resistive touchscreen controller
- Axis accelerometer
- Audio codec
- FM tuner
- Power Management
- Nand Flash (16-128GB)

- SD Card interface for recording and playback
- Digital S/PDIF input and output for home audio
- I2S input and output
- Ethernet interface for networking
- High-speed USB device or host for USB memory or Wi-Fi module
- Real-time clock
- Customization with VSIDE
VS1005 SoC Flexible Audio Path
VS1005 SoC Hardware Highlights 1/2

- Internal linear regulators
- Voltage monitor ADC
- 480 Mbit/s USB device or host
- Master/slave S/PDIF
- Master/slave I2S
- High performance analog
- Integrated FM tuner
- Dedicated high speed memory interfaces
- Supports GPIO for modern user interface
- All operations from a single clock source (RTC optional)
VS1005 SoC Hardware Highlights 2/2

Power
• Internal voltage regulators
• SAR for monitoring

Analog Audio
• 2 x 24-bit / 96kHz DAC
• 3 x 24-bit / 192kHz ADC
• Integrated FM tuner (76-108 MHz)
• Headphone output
• Stereo microphone amplifier

Digital Audio
• S/PDIF input and output (+AES/EBU support)
• I2S input and output
• 24-bit sample rate converter
• High-speed USB slave or host
• Ethernet interface

Memory
• Nand flash interface
• High speed SD card interface

General Purpose IO
• Resistive Touch Screen interface
• JTAG interface
• 8-bit bus for LCD
• PWM output

Other
• Real-time clock
• LFGA-88 package
  10x10x0.8mm
VS1005 SoC Application Firmware

- Application firmware is developed by using VSIDE which contains the MegaLib library and the VSOS operating system.
- The MegaLib library supports device drivers, audio encoders, decoders and other signal processing functions.
- With VSIDE a custom signal path or user interface can quickly be built or modified.
- VLSI's 1005 Development KIT includes an example for an MP3 player.
- Application firmware can be protected.
Application Firmware Protection Alternatives

VS1005xF (embedded flash)
• Application code is added into the default on-chip Flash
  or
• Customer will reprogram the entire embedded Flash

VS1005x (non-flash version)
• Application code is located in the external memory (such as external Flash) in encrypted format. The code is decrypted inside VS1005
• The seed for the decryption algorithm can be chip, lot or customer specific
VS1005 SoC System Firmware Highlights

- VSOS operating system (File IO, Device Drivers, Application Loading, Multitasking, Graphical Interface)
- Decodes various audio formats (MP3, WMA, Ogg Vorbis, AAC, HE-AAC, FLAC)
- Encodes various formats (MP3, Ogg Vorbis)
- DSP features (EarSpeaker, Parametric EQ, VU Meter, Mixer, Speed Shifter, Fast Forward/Rewind)
- Graphical display with resistive touch screen control
- Audio input or output can be analog or digital
- Digital FM receiver (76-108 MHz, Japanese band included)
- Internet Radio
- USB device or host
- RTC Wake-up and shut-down
VLSI's Offering

- VS1005 Developer Board that uses VS1005 SoC
- VS1005 Developer Board contains a complete MP3 player example with top-level application source code for VSIDE
- Free VSIDE toolkit (compiler, emulator, HW debugger, user friendly graphical interface, MegaLib, VSOS)
- HW protection for application firmware
- Technical support
- VS1005 is available in two versions: one with internal flash for application firmware, one without flash that boots from external non-volatile memory
**Summary**

- VS1005 is the world's most integrated MP3 encoder / decoder chip
- VS1005 supports extensive interfacing (USB host, S/PDIF, Ethernet, ADC, DAC, Regulators, RTC, FM receiver)
- VS1005 can be highly customized with application firmware
- Application firmware customization toolkit VSIDE is available for free
- Application firmware can be protected
- The supplementary offering includes a complete MP3 reference design with interface to VSIDE and technical support
- Availability: preliminary datasheet available, samples 06/2012, production 10/2012
### VS1005 order code variants

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