



MP3 Player Presentation Based on VS1005 SoC

June 2012

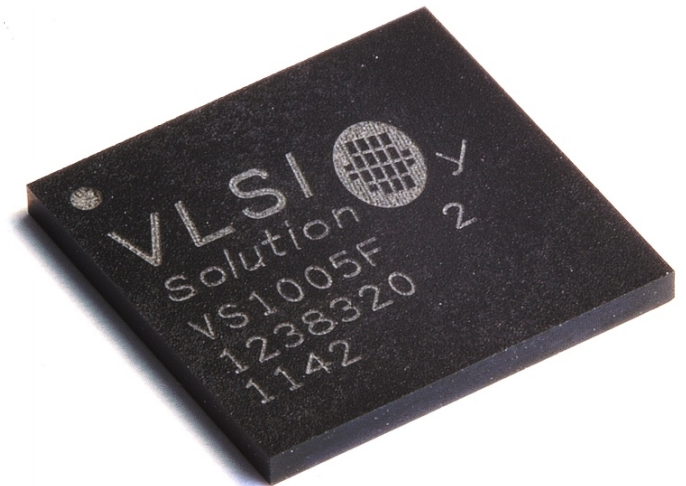


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What is VLSI Solution?

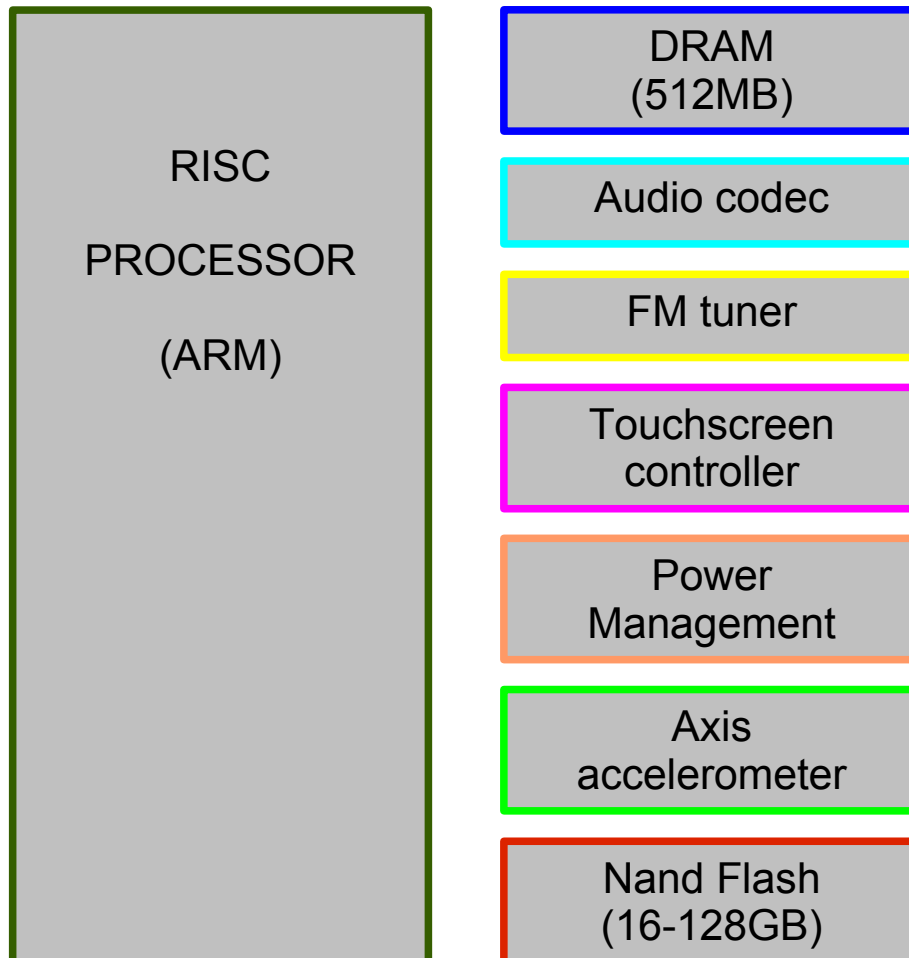
- VLSI Solution, founded in 1991, is a new technology creator who designs and manufactures integrated circuits
- VLSI has an extensive IP library and advanced know-how in digital audio
- VLSI's Audio IP has been used for instance in the original PC SoundBlaster sound cards
- VLSI is one of the three 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



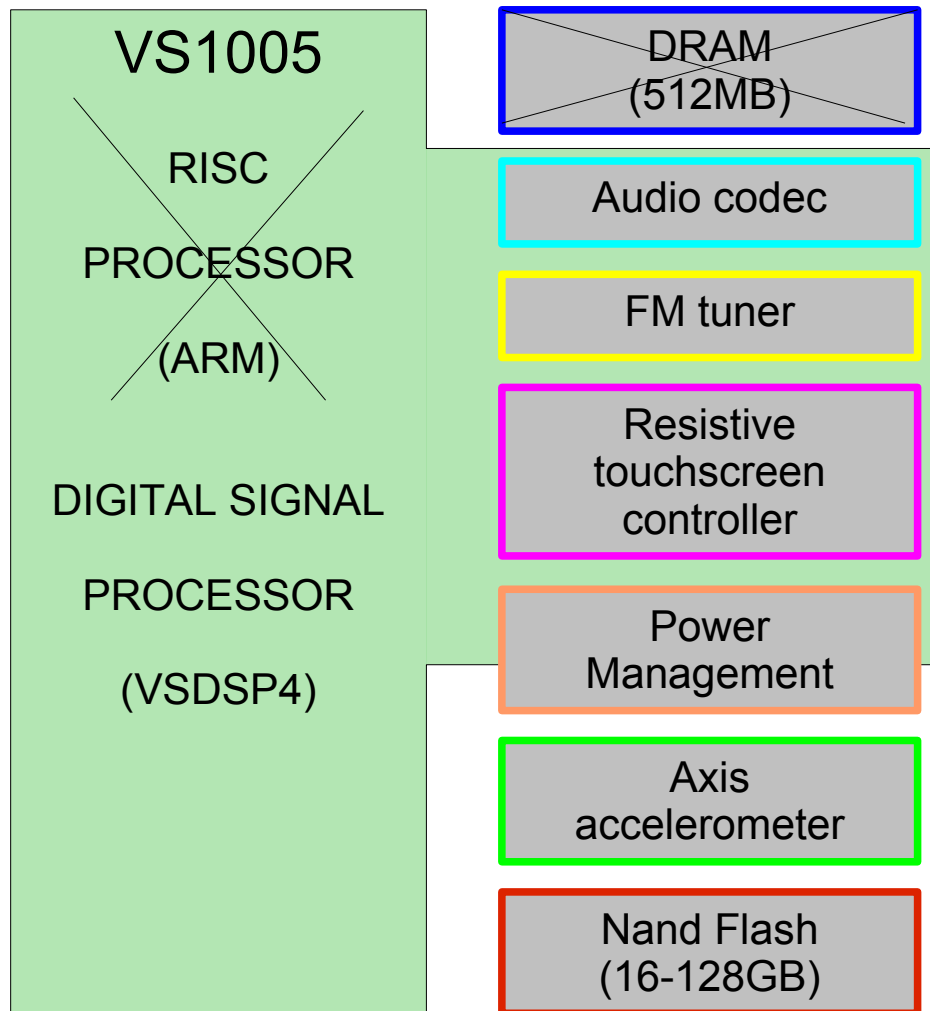
Current MP3 Player Trends

- 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

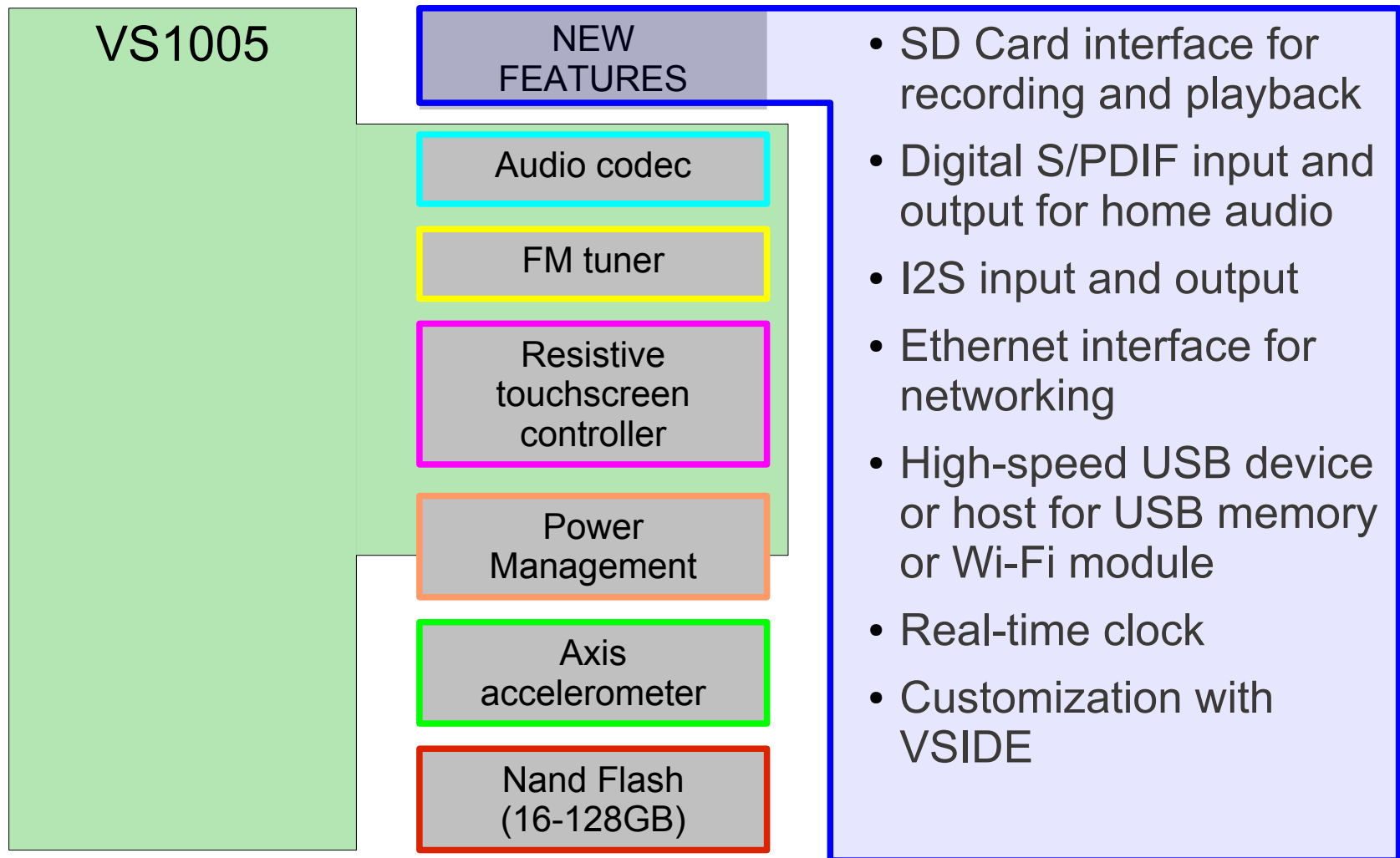


MP3 Player Based on VS1005 SoC

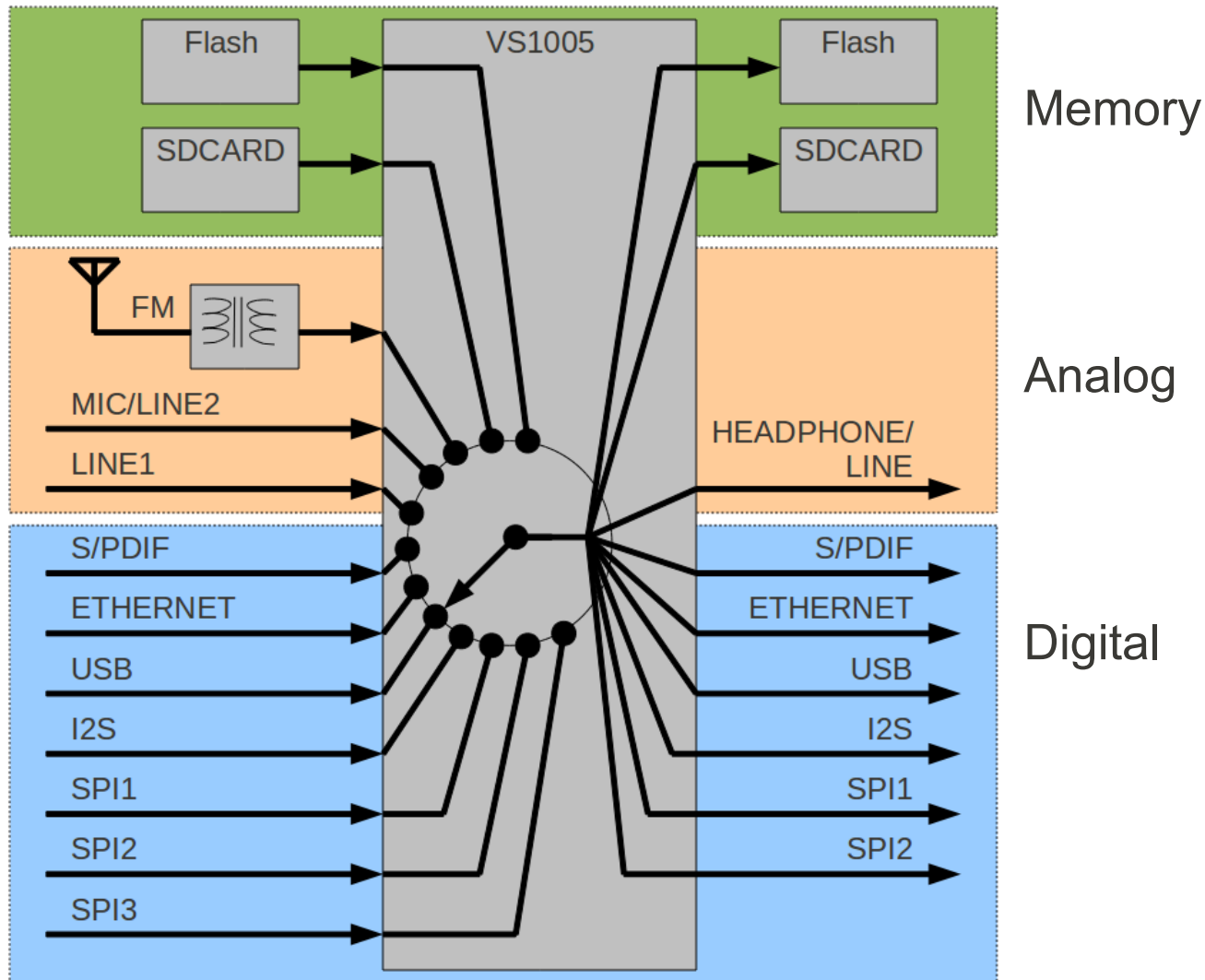


- The processor has been optimized for digital signal processing
- No need for external DRAM, all memory is internal SRAM
- High integration: Audio codec, FM tuner, resistive touchscreen controller, and linear regulators have been integrated
- All above allows for lower cost, lower component count and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

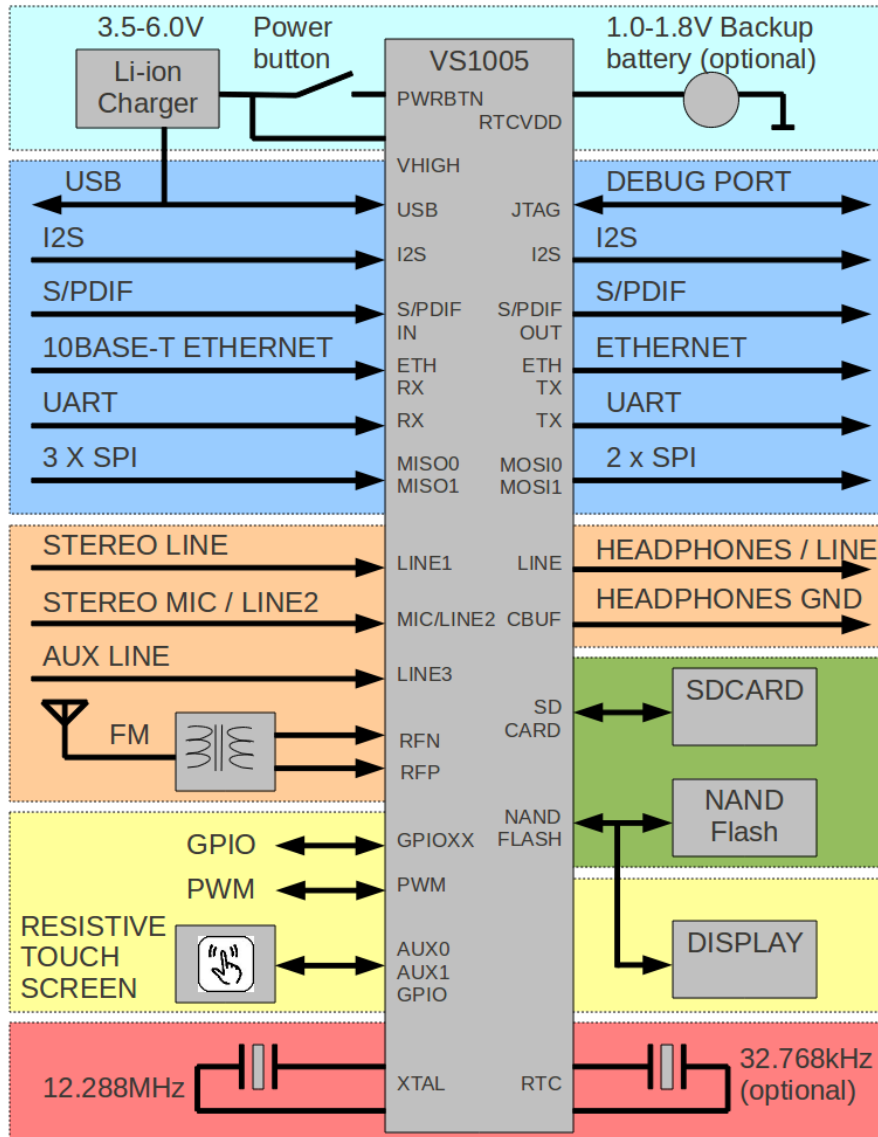
New Features of a VS1005 Based MP3 Player



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

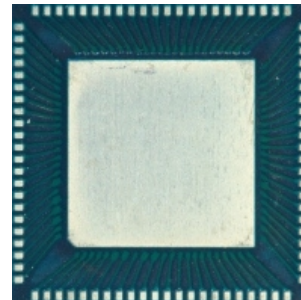
- Nand flash interface
- High speed SD card interface

General Purpose IO

- Resistive Touch Screen interface
- JTAG interface
- 8-bit bus for LCD
- PWM output

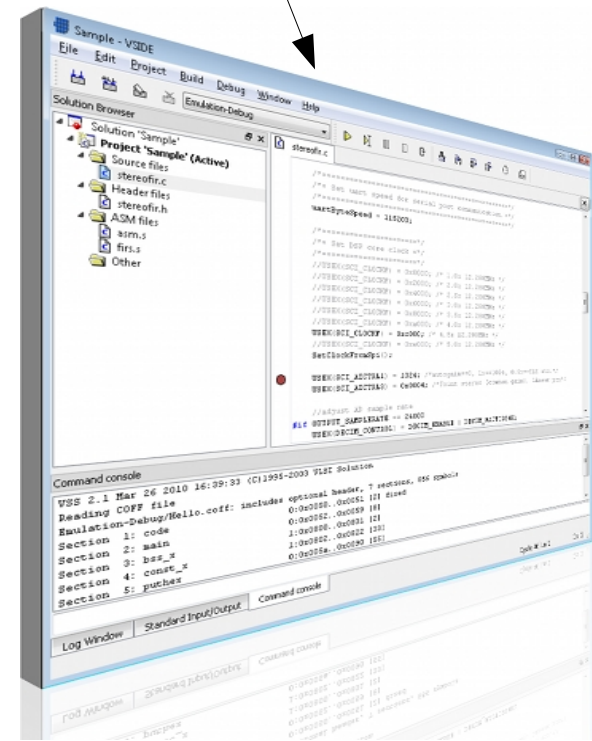
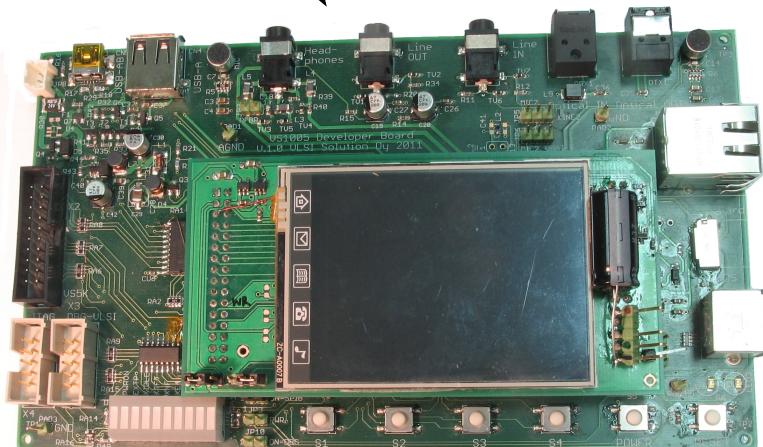
Other

- 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

VS1005x^F (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

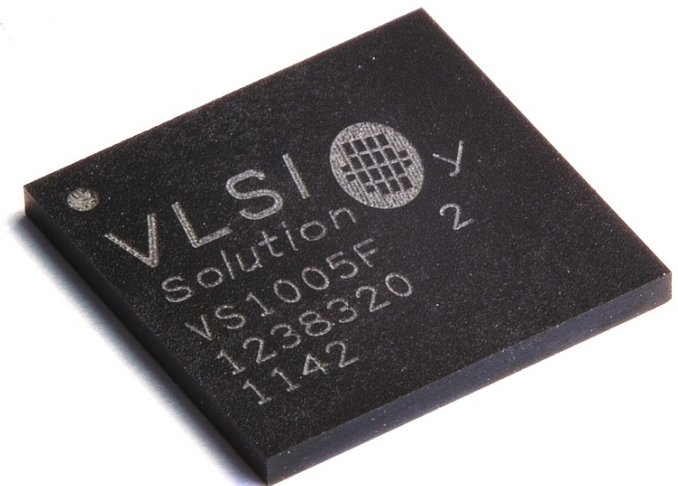
- VSOS operating system (File IO, Device Drivers, Application Loading, Multitasking, Graphical Interface)
- Decodes various audio formats (MP3, WMA, Ogg Vorbis, AAC, HE-AAC, FLAC)
- Encodes various formats (MP3, Ogg Vorbis)
- DSP features (EarSpeaker, Parametric EQ, VU Meter, Mixer, Speed Shifter, Fast 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

Device ID	mp3 encoder	mp3 decoder	embedded 8Mbit flash
VS1005G-Q		X	
VS1005G-F-Q		X	X
VS1205G-Q	X	X	
VS1205G-F-Q	X	X	X
VS8005G-Q			
VS8005G-F-Q			X