VS10xx Evaluation Kit

"VLSI Solution VS1011/VS1002/VS1003"

Project Name: VS10XX

Revision History			
Rev.	**Date**	**Author**	**Description**
1.0	2003-12-09	HH	First release.
1.1	2003-12-18	HH	Bass Booster added (Chapter 4).
1.2	2004-03-19	HH	Added ADPCM Recording (Chapter 4.7) and Schematic Notes (Chapter 5.1).
1.3	2003-08-29	PLe	Updated schematics. Updated software documentation.

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1   General

1.1   Introduction

This document describes the VS1011/VS1002/VS1003 evaluation board.

1.2   Features and Restrictions

Features:

- MP3/MP3+V/WAV playback from MMC card using FAT-16 or FAT-32.
- IMA ADPCM playback with VS1002.
- WMA playback with VS1003 and VS1023.
- ADPCM recording with VS1003.

1.3   References

1. VS1011/VS1002/VS1003/VS1023 Datasheets (http://www.vlsi.fi/)

2. SanDisk MultiMediaCard Product Manual (http://www.sandisk.com/)

1.4   Disclaimer

This is a *preliminary* version of the documentation. All details are subject to change.

2   Definitions

ASIC Application Specific Integrated Circuit.

B Byte, 8 bits.

b Bit.

IC Integrated Circuit.

Ki "Kibi" = 2^{10} = 1024 (IEC 60027-2).

Mi "Mebi" = 2^{20} = 1048576 (IEC 60027-2).

VS_DSP VLSI Solution's DSP core.

W Word. In VS_DSP, instruction words are 32-bit and data words are 16-bit wide.

2.1   Conventions

As a default, all numbers are in decimal format. Hexadecimal numbers are written with a leading "0x", like "0x1234" (4660), and binary numbers are written with a leading "0b", like "0b11001010" (202).

3   The Player

Figure 1: VS1011 Evaluation Player Kit Front Side

In Figure 1 the front side of the player is presented. At the top, an LCD is presented. In the middle, between the battery compartment and the LCD, there is an MMC card. At the front left, there is a blue reset button. Front right, there is a black control switch.

Figure 2: VS1011 Evaluation Player Kit Back Side

Figure 2 shows the back side of the player. At the right, the power button is seen. An RS232 port is to the left, and a standard 3.5 mm earphone connector is at front left. At front right there is a connector for an external battery charger (currently unused).

4   User Interface

Figure 3: User Keys

When the unit is powered on it first checks the MMC cards file system. After the
file system is checked the playback is started from the first song on the MMC.

The user keys are presented in Figure 3. There is a controller with five different
functions that can be used: Push, Short Left, Short Right, Long Left, Long Right.
In this context "Long" means that you have to keep the controller in that direction
for at least one second. "Long" is not supported in the current software.

4.1   Menu system

Pushing the key enters the player menu. Each menu function (for example volume)
can be adjusted by pushing the controller left or right. Pushing the controller key
again enters the next menu. Player display returns to the normal normal play
mode after all menus are rotated through or after few seconds of inactivity.

In normal play mode the song can be changed by pushing controller left or right.

The current menu systems has the following displays:

- Main display
- Volume
- Bass
- Treble
- REW/CUE
- Record?

4.2   Main display

The VLSI Modular Player has two display modes. Default mode has a running "time elapsed" counter on the right and a spectrum analyzer on the left. Second mode is a text scrolling mode that can be entered by either browsing the menu through or pushing the controller once and waiting for few seconds.

4.3   Volume control

Output volume can be adjusted by tilting the controller left or right.

4.4   Bass Boost

The Bass Booster is a part of the VS1011/VS1002/VS1003/VS1023 functionality and demonstrated with this player. It helps improve bass perception in conditions where the earphones lack in bass or where background noise masks unenhanced bass (e.g. a inside a moving car).

The user may select both the cut-off frequency and decibel amplification of a mono bass channel.

Typical values for in-ear earphones would be 50...70 Hz and +8 dB. For high-end earphones 40 Hz and +6 dB could give very impressing results.

Note: The bass booster performs best when volume is not turned to maximum level. Adjusting the cut off frequency is currently not supported in the VLSI Modular Player. See older versions of the player code for this feature.

4.5   Treble Boost

VS1003 and VS1023 also have a treble boost feature. The amount of trebleboost cam be adjusted by tilting the controller.

4.6   Rev/Cue

In the Rew/Cue menu the current song can be fast rewinded or forwarded by holding the controller key left or right.

4.7 ADPCM Recording (VS1002/VS1003/VS1023)

If the chip on the evaluation board is VS1002, VS1003 or VS1023 , there is an ADPCM recdoring menu.

The recording starts as the controller is tilted right in the "Record?" menu. Recordig stops when the controller is pushed. After recording playback starts automaticly from the firts song. Recorded files are saved to MMC with the name "RECxxxxxx.wav" where x's are replace with a running number.

Note: ADPCM recoding with VS1002 is not currently supported in VLSI Modular Player. Refer to older versions. Recording feature is still under heavy developement.
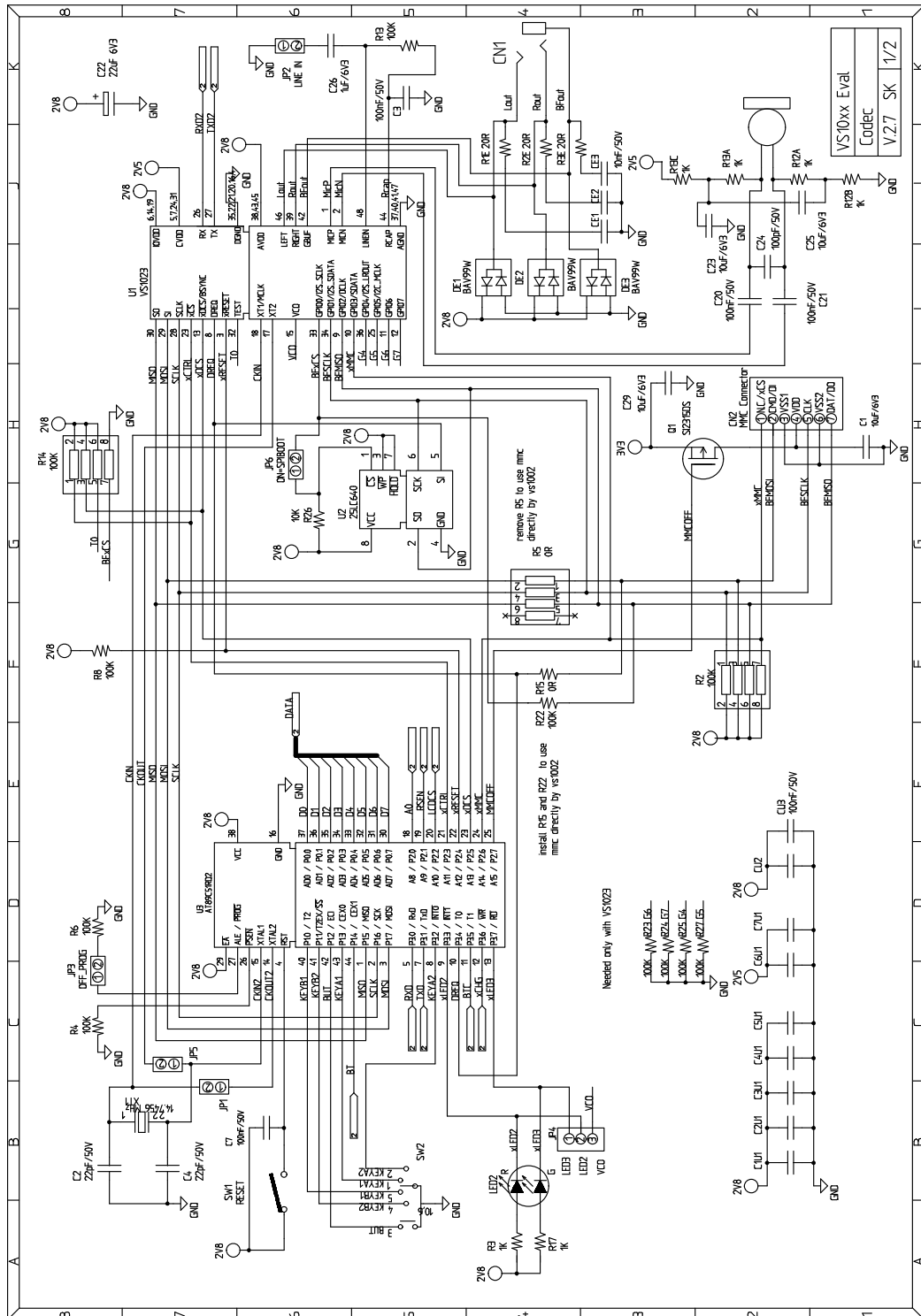
5 Schematics

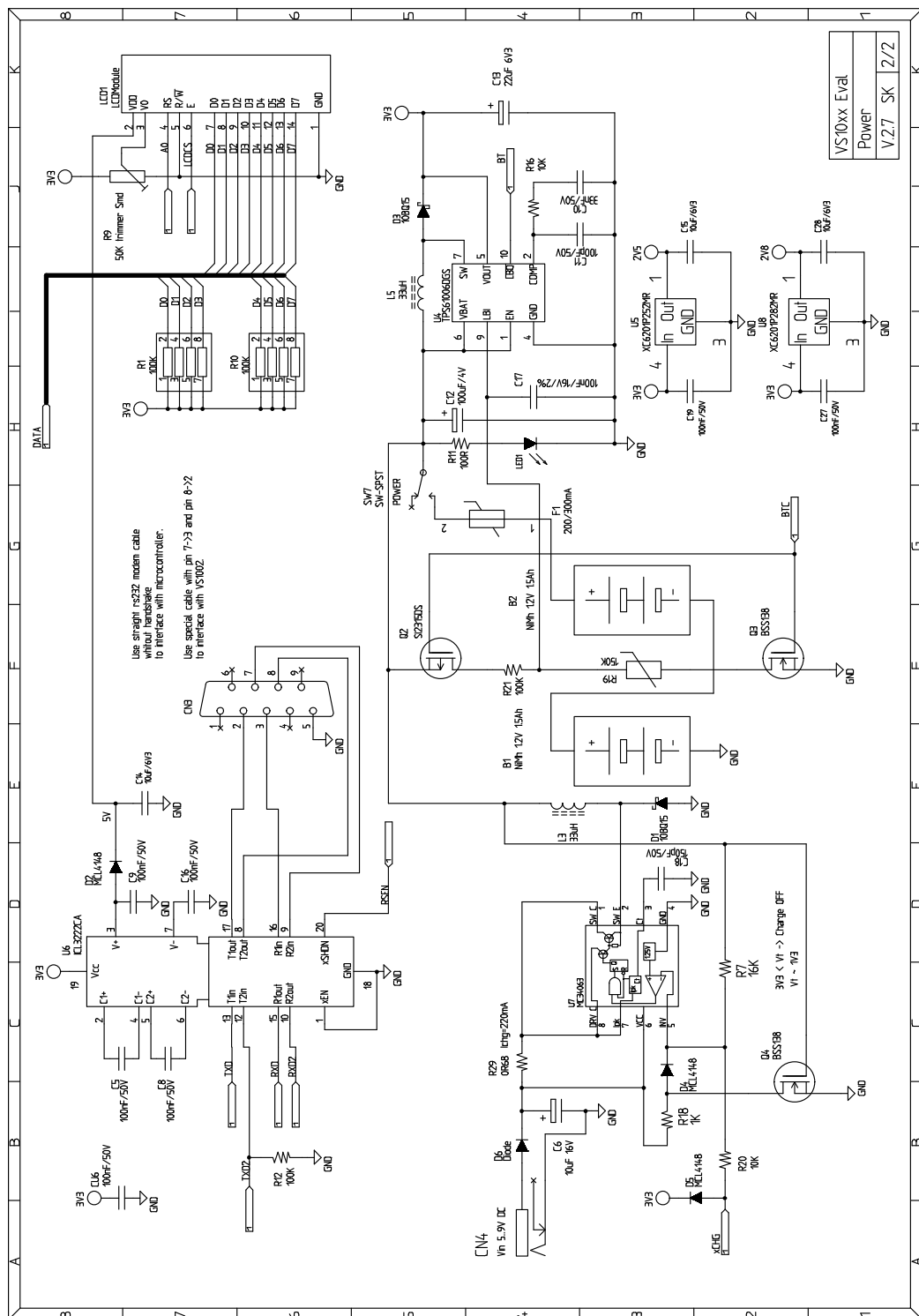Figure 4: Evaluation Player Schematic, Page 1 of 2

Figure 5: Evaluation Player Schematic, Page 2 of 2

5.1   Schematic Notes

The schematic presented in this chapter is for Evaluation Player 2.7.

5.1.1   Microphone

Evaluation player board 1.15 lacks separate places for R12A, R12B, R13A, R13B, C25 and C23. They have been retrofitted to the boards by VLSI Solution.

Boards older than 1.15 lack some microphone components and audio quality may be non-perfect on these boards (different kinds of noise can be heard). To get good audio quality, remove R12 and R13 and connect R12A, R12B, R13A, R13B, C25 and C23 as shown in these schematics.

New VS1002/VS1003 boards all have microphone and other required components fitted.

5.1.2   Serial Eeprom

Evaluation boards do not contain U2, JP2 and R26 (U2, R22 and R15 in boards from version 2.5) These components are for special test purposes only.

For more info on SPI-boot refer to the Prototyping board at:
http://www.vlsi.fi/player_vs10xx_proto/player.shtml

5.1.3   DC connector

The DC connector is meant only for recharging the batteries. This feature is currently not implemeted in our software.

6 Replacing the Evaluation Kit Firmware

6.1 Compiling and Loading New Code

To load user code you will need the following:

- An RS232 cable between your computer and the evaluation kit

  - Female connector for computer end.
  - Male connector for Evaluation Board.
  - For code download connect pin 2 to 2, 3 to 3 and 5 to 5 (simple null-modem cable). Do not connect pins 7 and 8 on the Evaluation Board side as they are used as TX and RX pins for VS1002's debug interface.
  - Remove jumper JP3 to put the 8051 to recording mode.

- To load new code to the Atmel microcontroller, you may use FLIP, available at *http://www.atmel.com/* . Version 1.8.8 Linux version has been used successfully at VLSI.

- To compile new code, SDCC 2.3.6 has been used in VLSI, available at *http://sdcc.sourceforge.net/* .

6.2 Versions of Firmware

There are two versions of the firmware available, the older versions avalable at:
http://www.vlsi.fi/player_vs1011_1002_1003/an/an.shtml

The current supported version is the VLSI Modular Player. See the documentation at:
http://www.vlsi.fi/player_vs1011_1002_1003/modularplayer/index.html

The source code is supplied with Evaluation kit and available on request for customers who bought their kit before the VSLI Modular Player was released.

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