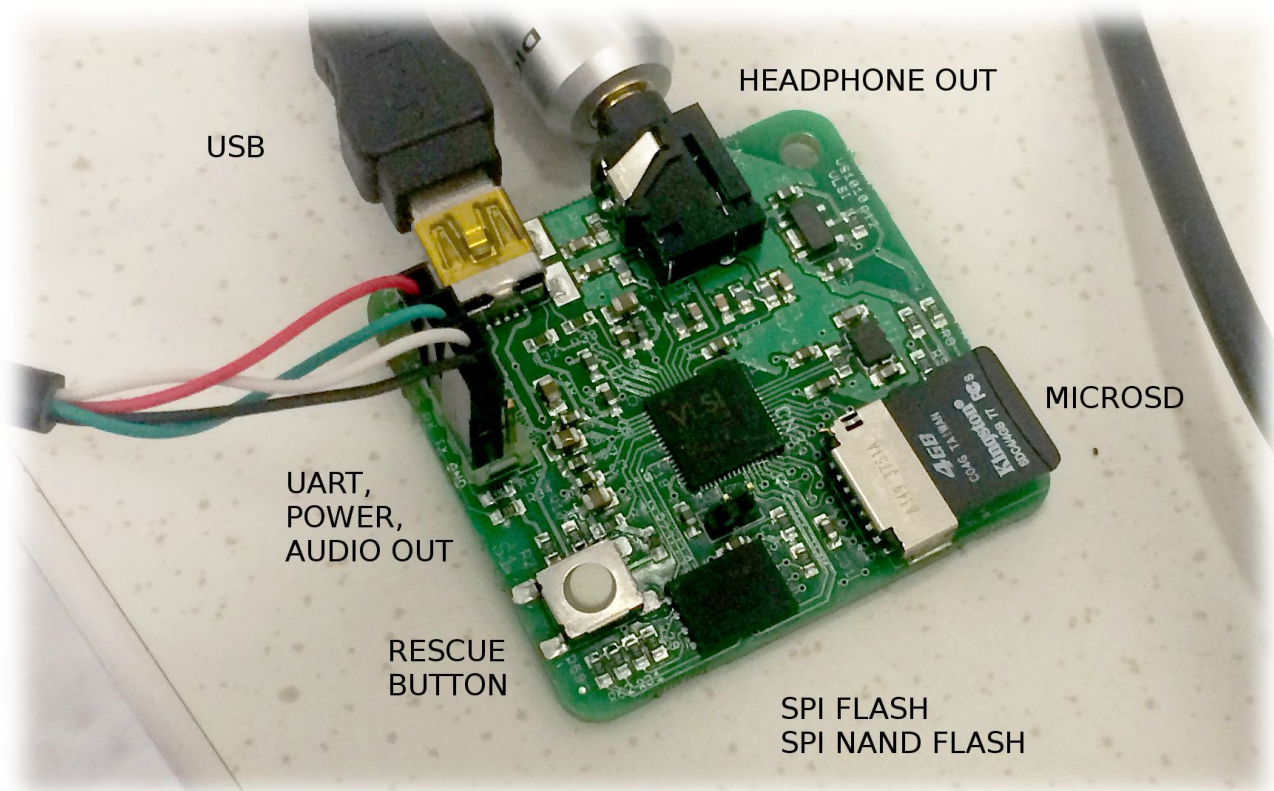# Installing the Nand Flash driver and tools to VS1010

Tested on the VS1010 MiniDemo board, which has a 128 megabytes SPI Nand flash (W25N01GVZEIT) installed

VS1010C MiniDemo board

Quick Start:

- Download the SpiNandSdRoot.zip package from www.vsdsp-forum.com.

- Follow the instructions in "Format SD card to smaller size in Windows.pdf" to make an SD card with partition size 126 megabytes.

- Copy the files from the SpiNandSdRoot.zip package to the SD card so that SYS folder, boot.dlx file and config.txt files are in the root folder of the SD card.
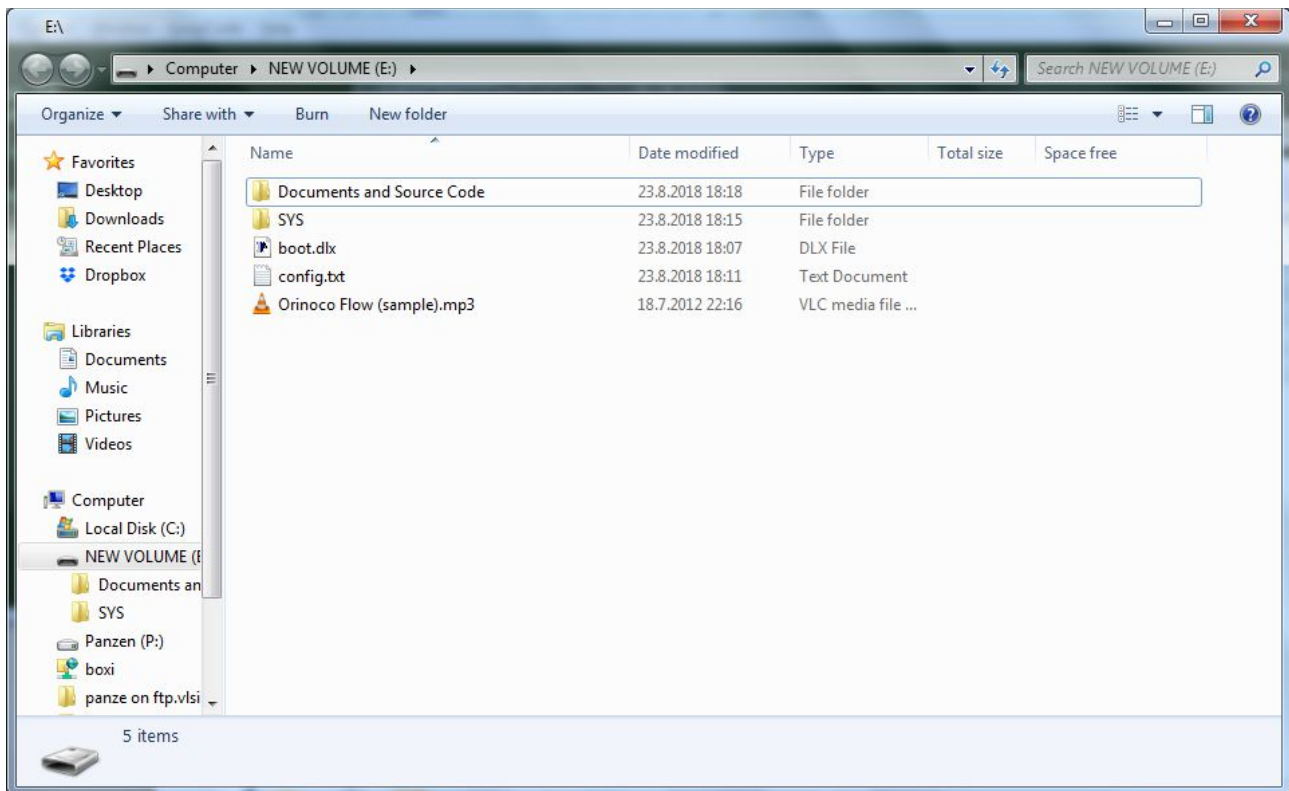
Start TeraTerm (or your favorite terminal program) to get access to the VS1010 command line

Insert the SD card to the VS1010 MiniDemo board and boot the board. The board will play the Orinoco Flow sample from the SD card. Hit Enter a couple of times to get to the command prompt.

Give command **spinandprog** to see that you have a connection to the SPI nand flash:
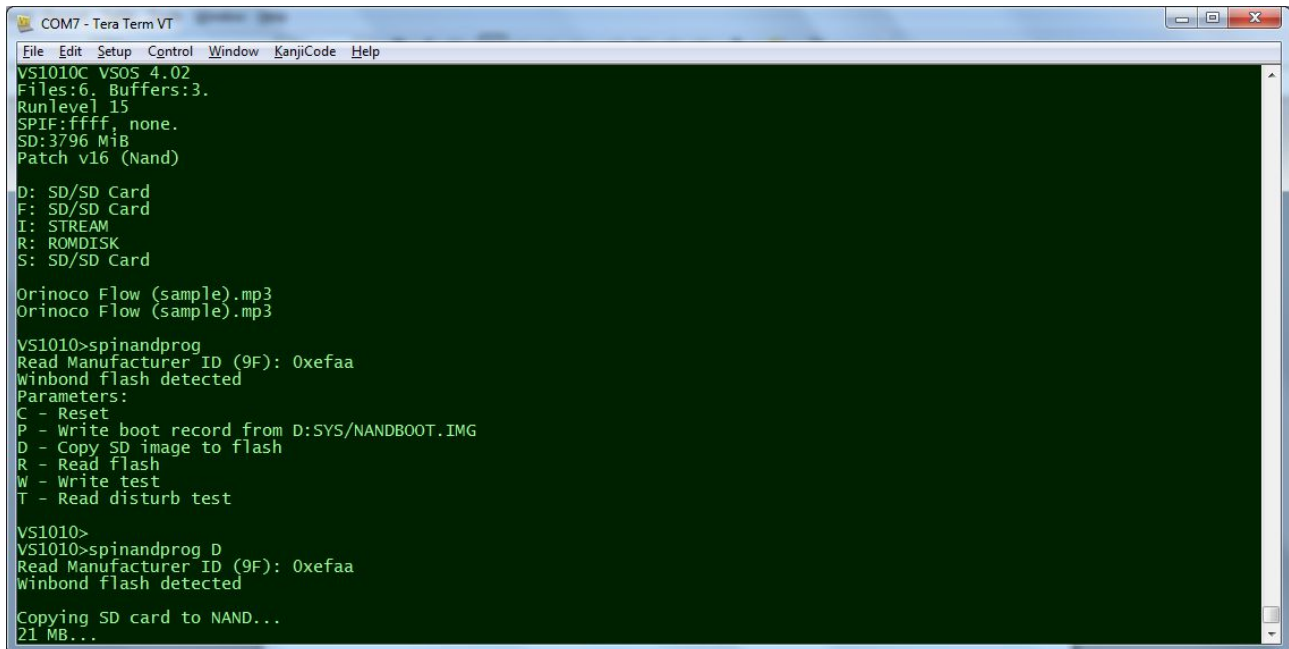
The command should say "Winbond Flash Detected". If you have another type of nand flash, send it to me and I can see if I can add support for it.

Next, give command **spinandprog D**
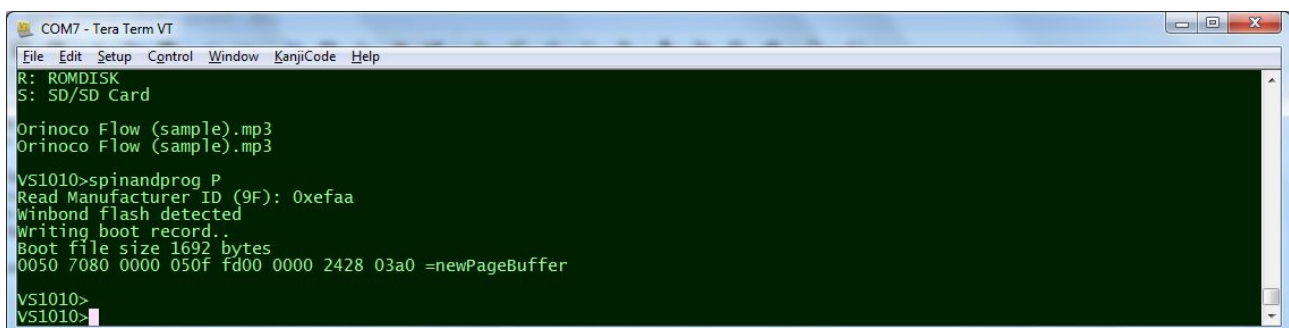
The SD card is now copying to the nand flash. It takes about a minute to copy 128 megabytes.

Next, give command **spinandprog P**

This will install the nand flash driver from S:SYS/NANDBOOT.IMG into the Nand Flash. With the driver installed to the beginning of the SPI NAND flash, it's possible to play music and run programs directly from the SPI nand flash without having an SD card in the system.

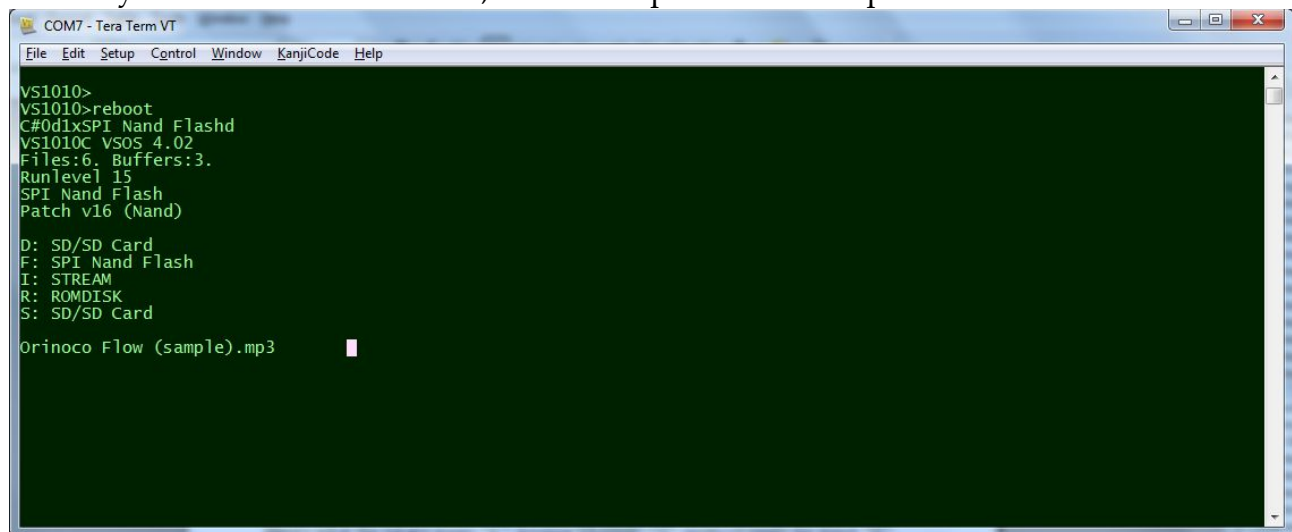Next, give command REBOOT to reboot the system with the driver installed.

NOTE: The SPI Nand Flash (W25N01GVZEIT) boots up in a special mode called "Continuous Mode" which is different from a standard SPI flash. The driver installed this way is compatible with the SPI Nand flash "Continuous Mode" power up. But if the flash is in Buffered mode, which is used normally, then it cannot boot, and a power reset is required. The driver configures the SPI nand flash back to Continuous mode after each operation, so hardware reset will be able to reboot from the driver. But if the chip is executing a Read operation when the hardware reset occurs, the bootup will fail. In this case, to restore the W25N01GVZEIT flash into Continuous mode, you must switch the nand flash power off and on. The VS1010 bootup will then succeed the next time.

To verify that the driver is loaded, see the output of the boot process.

Upon reboot, you see the boot process tokens: `C#0d1x`**`SPI Nand Flash`**`d`
Here's what the tokens mean: "C": booting VS1010C. "#": stream protocol ready for input. "0": access internal SPI bus. "d": Done (e.g. nothing to do any more with that bus). "1" access external SPI bus. "x": found extended record. "SPI Nand Flash": message from the driver. "d": Done.

If you see the normal boot tokens C#0d1d, it means that no boot record is found from the nand flash. And this may be because the nand flash is in the wrong mode, and a power off - power on reset is required.

In the SPI boot phase, the driver loads itself to the end of the user IRAM (locations between 0x0E00 and 0x0FFF) and the last few words of the default 2K stack space in XY so there is minimal chance of it interfering with normal user programs.

At this time, the driver temporarily installs itself to the D:, F: and S: drive letters to deny any attempts of the VS1010 ROM initializing the flash or the SD card, because we need to allow the SPI Nand driver to finish its init first. Anyway, the boot execution record just sets these pointers and installs a post-boot vector. Then the ROM boot process continues normally and you see the familiar "VS1010C VSOS 4.02" message.

The system should work just as it does without the NAND flash driver, only a little bit of RAM is set aside for the custom NAND flash storage driver. We let VSOS init normally so that we have the capability to open files and use FAT32 filesystem. Then, at the postboot handler, the NAND flash driver really inits the nand flash and uses normal VSOS methods to attach FAT filesystem handler to the new storage.

Then the driver checks if SD card is present. If SD card is found, it becomes drive letter S: so that programs are run from the SD card and not the NAND flash. This way you can override system operation by inserting an SD card into the system and rebooting it. If you don't want this to happen, edit the nand flash driver (file main.c in SpiNandC project:)
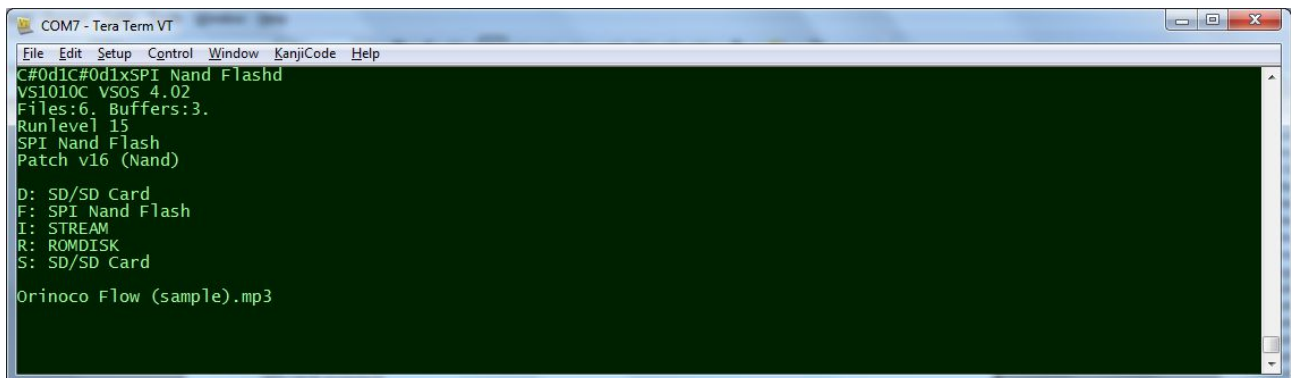
```
if (DevSdSdCreate(&sdcard, NULL, 0) == S_OK) {
   VODEV('S') = &sdcard;
} else {
   sdSize = 1;
}
```

and remove the line "VODEV('S') = &sdcard;".

In all cases, drive letter F: will point to the Nand flash and drive letter D: will point to the SD card (no matter if there is a card in the slot or not, accessing D: will attempt to restart the SD card.
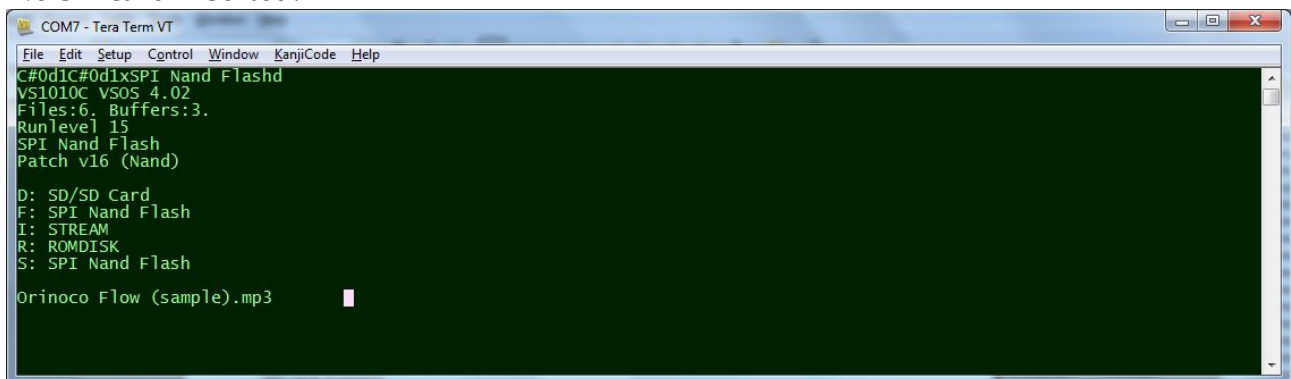
To summarise:
SD card inserted:

No SD card inserted:

The difference is the System disk S: – if no SD card is found, it points to the Nand.

You can now use VS1010 normally.

For example, hit Enter a couple of times to get the prompt. Then if you give commands "DIR F:" and "DIR D:" you will get the directory listings of the Nand flash and the SD card. Since we've just copied all the files from the SD card into the Nand flash, they will show the same files.

```
Orinoco Flow (sample).mp3

VS1010>devices
D: SD/SD Card
F: SPI Nand Flash
I: STREAM
R: ROMDISK
S: SD/SD Card

VS1010>
VS1010>dir F:
File list of SPI Nand Flash F:*
D    1: Documents and Source Code
D    2: SYS
     3: BOOT.DLX
     4: CONFIG.TXT
     5: Orinoco Flow (sample).mp3
 5 file(s) found.

VS1010>
VS1010>dir d:
File list of SD/SD Card d:*
D    1: Documents and Source Code
D    2: SYS
     3: BOOT.DLX
     4: CONFIG.TXT
     5: Orinoco Flow (sample).mp3
 5 file(s) found.

VS1010>
VS1010>█
```

To play files from the SD card, give a command such as **play D:*.mp3** (or **play D:music/*.mp3**) and to play files from the Nand flash give a command such as **play F:*.mp3** .

Hint: You can terminate your command with the [TAB] key instead of the [Enter] key in the VS1010 built-in mini command shell. If your terminal uses [CR]+[LF] to terminate lines, the first [CR] will start to play the file and the [LF] will cancel the playback (any keypress will cancel playback from the UART command line) and the net effect is that you will hear no sound – the playback immediately cancels. Using [TAB] instead of [Enter] to terminate commands eliminates this inconvenience.

That's it. Good luck, and please report any issues to the VS1010 Discussion Forum at www.vsdsp-forum.com .

    -Panu / VLSI