Getting the 'Next186 SoC' core running on FleaFPGA Ohm

****** WARNING/DISCLAIMER ****:** As with any procedure that performs low-level sector writes to removable disks, care should be exercised when executing the steps contained within this how-to document. Please be aware this procedure can potentially render any valuable data you have on your removable volumes totally useless. I do not accept any responsibility for any damage or loss caused through the execution of the steps outlined herein. All files provided on this GitHub page are provided on an 'as-is' basis and do not come with any warranty.

Before you begin:

You will need:
1.) 1 x FleaFPGA Ohm board, configured with Next186 SoC core (See SETUP PROCEDURE below).
2.) 1 x correctly-prepared SDHC card (see SETUP PROCEDURE below).
3.) 1 x PS/2 keyboard and/or mouse, including all necessary adapter cabling to connect to the Ohm.
4.) 1 x mini-HDMI to HDMI cable.
5.) If using DVI variant of Next186: DVI compatible PC monitor that support both 640x400 *and* 640x480 screen modes.
5.) If using HDMI variant of Next186: HDMI compatible TV that support both 640x400 *and* 640x480 screen modes.

Files as found in this GitHub page:

- **FreeDOS_502MB_HDD.bin** Basically holds a copy of the MBR+1st_partition data, which is essentially a FreeDOS bootable partition and little else..

- **BIOS_Next186.bin** Contains the BIOS ROM image as required by the Next186 System-on-Chip (SoC)

- **Next186_SoC_HDMI_Flash_Era_Prgm.vme** FPGA Configuration bitfile. Turns FleaFPGA Ohm into
  an fast low-end x86 machine intended for use with TV displays (with integrated audio)

- **Next186_SoC_DVI_Flash_Era_Prgm.vme** FPGA Configuration bitfile. Turns FleaFPGA Ohm into an fast low-end x86 machine intended for use with PC monitors, with audio out being wired to the GPIO pins as shown in the picture shown below.

- **Next186_GPIO_Pinout.jpg** FleaFPGA Ohm pin configuration of all Next186 SoC pins, including a schematic for the audio out circuit (Note: GPIO audio out is redundant for the HDMI variant of Next186)

- **Next186_howto_readme.rtf** This readme file ;-)

- **Next186_SoC_DVI_Diamond_Project.zip** Includes all Next186 DVI project verilog sources, DOS utilities etc. Has been saved as a Lattice Diamond Project archive and can be opened and modified under Lattice Diamond.

*** Next186 SETUP PROCEDURE ***

Step 1.) Installing the Next186 FPGA configuration (.vme) file into the FleaFPGA Ohm board:

Please select either HDMI or DVI configuration bit-file as per above and program your selected bit-file as outlined in the FleaFPGA Ohm Quickstart Guide. Once you have done this, plug a PS/2 Keyboard and video display into your FleaFPGA Ohm and then cycle power to it.You should be greeted by the following message at the top of the display:

"BIOS not present on SDCard last 8KB, waiting on RS232... etc"

You are now ready to install a BIOS ROM, please proceed to the next step.

Step 2.) Applying the Next186 BIOS ROM image to a blank/new SDHC card:

You will need to manually apply the 8KByte BIOS ROM image (Next186_BIOS.bin) to the last sixteen PHYSICAL sectors of your SD card. For example, if your SD card is 4GBytes, that’s 4294967296 Bytes or 8388608 sectors, you would need to dump the BIOS image right onto sectors 8388593 through to 8388608.

***** PLEASE NOTE! ***** For copying the actual BIOS image data to the SDHC card, I suggest using HxD (Hex Editor for Windows). However, if using Windows Vista/7/8 etc. I should point out this program MUST be run as an administrator! **Warning:** MAKE SURE that you close any explorer windows into the drive volume before begin, otherwise you may NOT be able to update (i.e. write to) the raw sectors of the SDHC card!

When running HxD, select ‘open disk’ mini-icon from the toolbar. Then un-select the ‘Open as Read-only’ protection and the select ‘Removable Disk 1’ (AS A PRECAUTION, MAKE SURE that NO OTHER REMOVABLE DRIVES are present in your system) and click ‘Ok’

Next, load Next186_BIOS.bin into another tab, and then copy/paste the contents from it into the ***last 16 sectors*** of ‘Removable Disk1’ volume. Click on the save icon and follow the prompts etc.

Put the SDHC card back into FleaFPGA. If the BIOS image was transferred Ok, you should see a BIOS splash screen...

Please proceed to the next step - that of turning the SD card into a FreeDOS bootable disk :)

Step 3.) Making the SDHC card bootable using a bootable FreeDOS image:

You will need to manually apply the data contained in the FreeDOS_502MB_HDD.bin file, to the very start (i.e. starting from sector 0, byte 0) of your SDHC card (Note: this will overwrite the MBR of your SDHC card - this is OK).

When running HxD, select ‘open disk’ mini-icon from the toolbar. Then un-select the ‘Open as Read-only’ protection and the select ‘Removable Disk 1’ (Assuming no other removable drives are present in your system) and click ‘Ok’

Next, load FreeDOS_502MB_HDD.bin into another tab, and then copy/paste the contents from it into the **very start** of the ‘Removable Disk1’ volume. Click on the save icon and follow the prompts etc.

Put the SDHC card back into FleaFPGA Ohm. If the FreeDOS image transferred correctly, you should see a FreeDOS Boot process! Job Done!! :-D

OK, So where here to from here?

While FreeDOS provides a good starting point for playing with Next186, for compatibility reasons using MS-DOS 6.22 is still recommended (in my opinion) but lies beyond the scope of this Next186 startup guide. It is an exercise for the reader to install MS-DOS 6.22 on the SD-card 502MB partition and then load the startup files contained in subfolder "\186Code\dos" of the zipped Diamond project archive found on this GitHub page. Feel free to check them all out! :)

HDL sources for the HDMI audio variant of Next186 will be added to the GitHub page you are viewing this setup guide from in the near future...

Well that's it for now - Good luck and (as always) Happy Experimenting!

Regards,
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