Interfacing SLS USB1.1 Core with various USB Transceiver PHY chips

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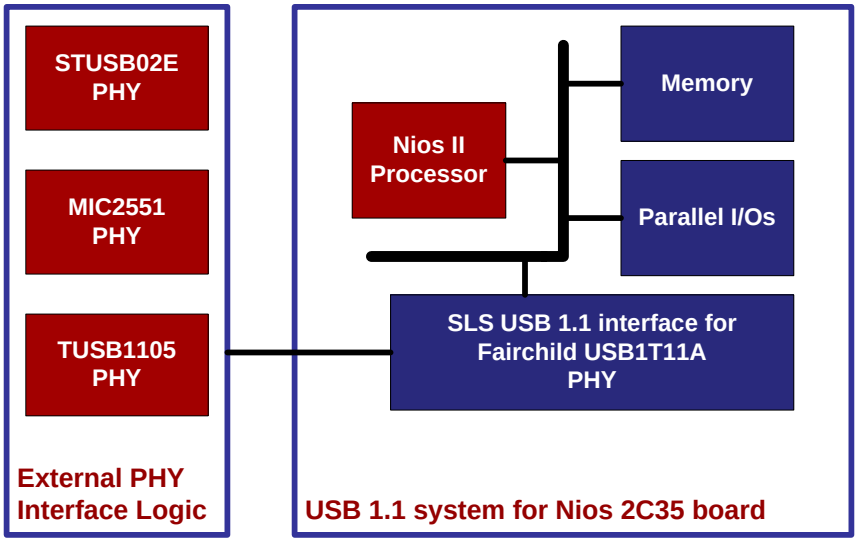
1. Objective

This application aims to demonstrate and guide the readers towards the usage of STMicroelectronics STUSB02E PHY, Micrel MIC2551A PHY and Texas Instruments TUSB1105 PHY chips with the SLS USB 1.1 IP Core in any design (for e.g. the standard reference design for Nios II Development Kit, Cyclone II edition - with 2C35 chip).

2. Application System Overview

The application system consists of the SLS USB 1.1 IP Core standard package (designed for Fairchild Semiconductor USB1T11A PHY chip) from which we will be using the standard reference design for Nios II Development Kit, Cyclone II edition (with 2C35 chip) and will modify it such that it can be used with STUSB02E, MIC2551A PHY and TUSB1105 PHY chips as well. The Figure 2-1 below shows the Application system Block Diagram. The reference design can be downloaded from http://www.slscorp.com/download/appnotes/408/Ref_design_2c35.zip

Figure 2-1 Application System Block Diagram



The SLS USB 1.1 IP Core is developed such that it can be interfaced with the Fairchild USB1T11A chip without any extra logic. The SLS USB 1.1 Snap On Board can be used for the hardware PHY chip interface with any development board having Altera Santa Cruz header.

The Figure 2-2 shows the picture of USB 1.1 Snap On Board with the Fairchild PHY.

Figure 2-2 SLS USB 1.1 Snap On Board

The datasheet for the PHY chip used in the board can be downloaded from http://www.fairchildsemi.com/ds/US%2FUSB1T11A.pdf

The USB interfaces from the PHY chip are listed below along with their connections in the design.

Table 2-1 Fairchild PHY Chip Interfaces with the Core

USB1T11A PHY Pin Names	SLS USB 1.1 Interface
OE#	tx_oe
VMO/FSEO	tx_dn
VPO	tx_dp
RCV	rx_d
VP	rx_dp
VM	rx_dn

3. Using Other PHY Chips with the Core

The following section will explain the usage of STUSB02E, MIC2551A and TUSB1105 PHY chips with the SLS USB 1.1 IP Core.

3.1 Using STMicroelectronics STUSB02E PHY

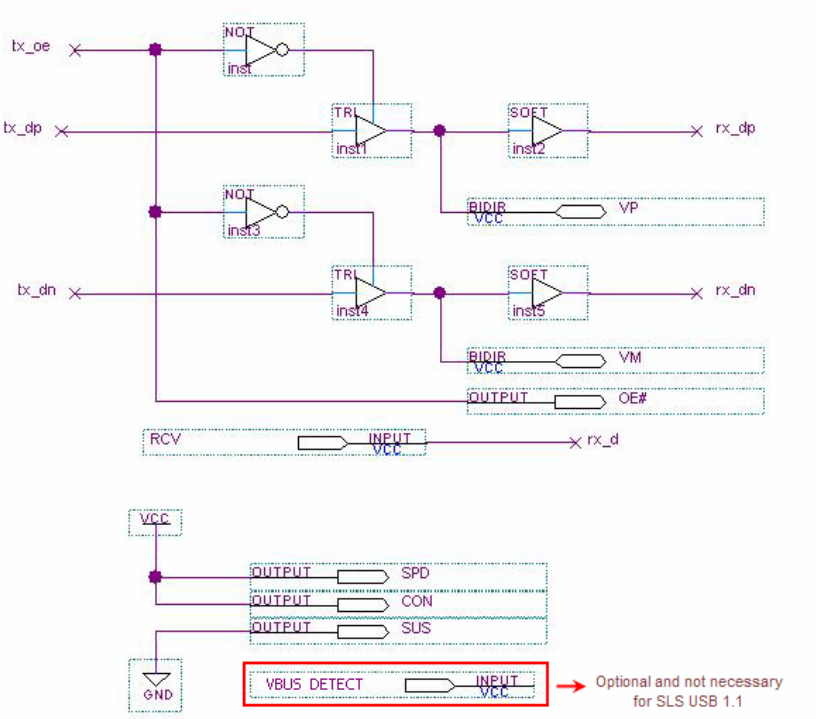
The USB 1.1 PHY chip from ST Microelectronics can also be used with the SLS USB 1.1 Core. The datasheet for the chip can be downloaded from http://www.st.com/stonline/products/literature/ds/11749.pdf . The USB interfaces from the PHY chip are listed below along with their connections in the design.

Table 3-1 STUSB02E PHY Chip Interface with the Core

STUSB02E PHY Pin Names	SLS USB 1.1 Interface
VP	Refer Figure 3-1
VM	Refer Figure 3-1
OE#	tx_oe
RCV	rx_d
SPD	VCC
SUS	GND
CON	GND
VBUS_DETECT	Not used

For using the PHY chip with the core, you need to add some additional interfacing logic. The Figure 3-1 shows the external logic to interface between the STUSB02E PHY and SLS USB 1.1 IP Core

Figure 3-1 Logic for STUSB02E PHY with the SLS USB 1.1 Core Interface



3.2 Using Micrel MIC2551A PHY

The USB1.1 PHY chip from Micrel can also be used with the SLS USB 1.1 Core. The datasheet for the chip can be downloaded from http://www.micrel.com/_PDF/mic2551a.pdf

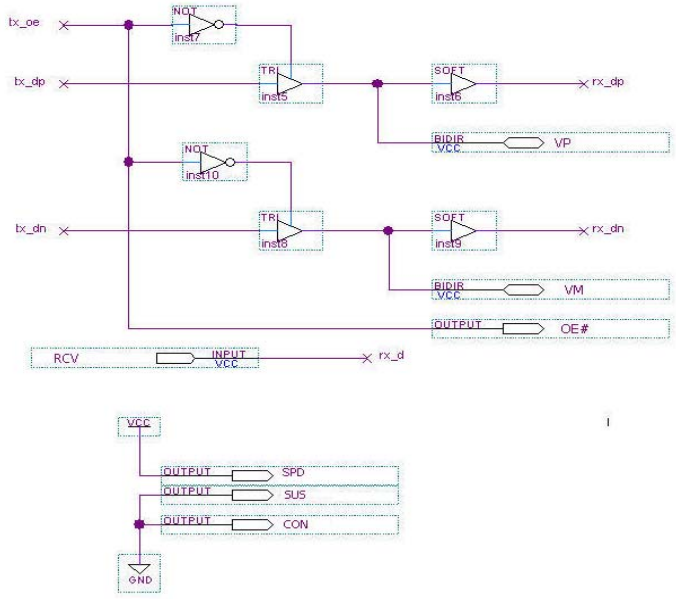
The USB interfaces from the PHY chip are listed below along with their connections in the design.

Table 3-2 MIC2551A PHY Chip Interface with The Core

MIC2551A PHY Pin Names	SLS USB 1.1 Interface
VP	Refer Figure 3-2
VM	Refer Figure 3-2
OE#	tx_oe
RCV	rx_d
SPD	VCC
SUS	GND
CON	GND

For using the PHY chip with the core, you need to add some additional interfacing logic. The Figure 3-2 shows the external logic to interface between the MIC2551A PHY and SLS USB 1.1 IP Core

Figure 3-2 Logic for MICREL 2551A PHY with the SLS USB 1.1 Core Interface



3.3 Using Texas Instruments TUSB1105 PHY

The USB1.1 PHY chip from Texas Instruments can directly be used with the SLS USB 1.1 Core. The datasheet for the chip can be downloaded from http://www.ti.com/lit/gpn/tusb1105

The USB interfaces from the PHY chip are listed below along with their connections in the design

Table 3-3 TUSB1105 PHY Chip Interface with the Core

TUSB1105 PHY Pin Names	SLS USB 1.1 Interface
OE#	tx_oe
VMO/FSEO	tx_dn
VPO	tx_dp
RCV	rx_d
VP	rx_dp
VM	rx_dn

4. Conclusion

The SLS USB 1.1 IP Core package can be used with STUSB02E (from ST Microelectronics) MIC2551A (from Micrel), TUSB1105 (from Texas Instruments) as well as USB1T11A (from Fairchild Semiconductor) PHY chips.

5. Further Information

For queries regarding interface of other PHY chips, please contact support@slscorp.com.

6. Revision History

First Release of the Application Note.

Version 1.1 – Changed the reference design download link

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