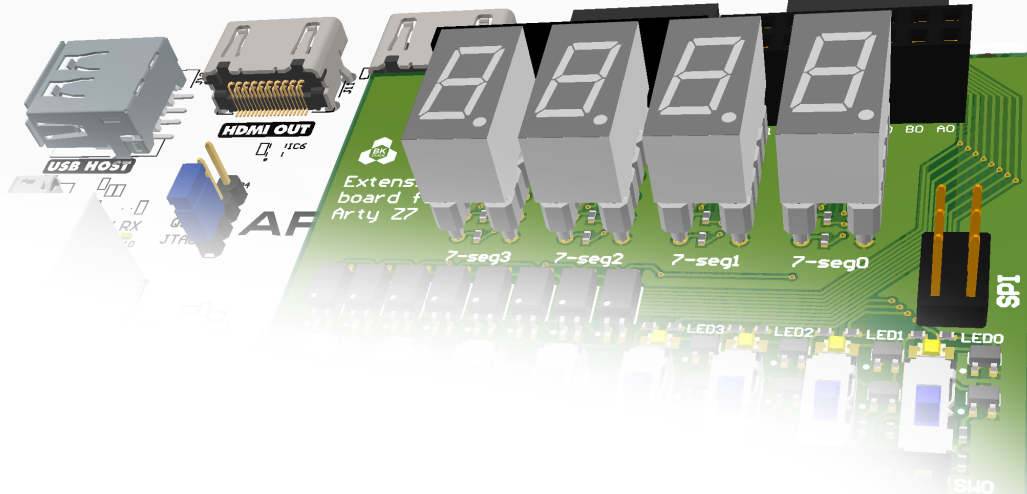




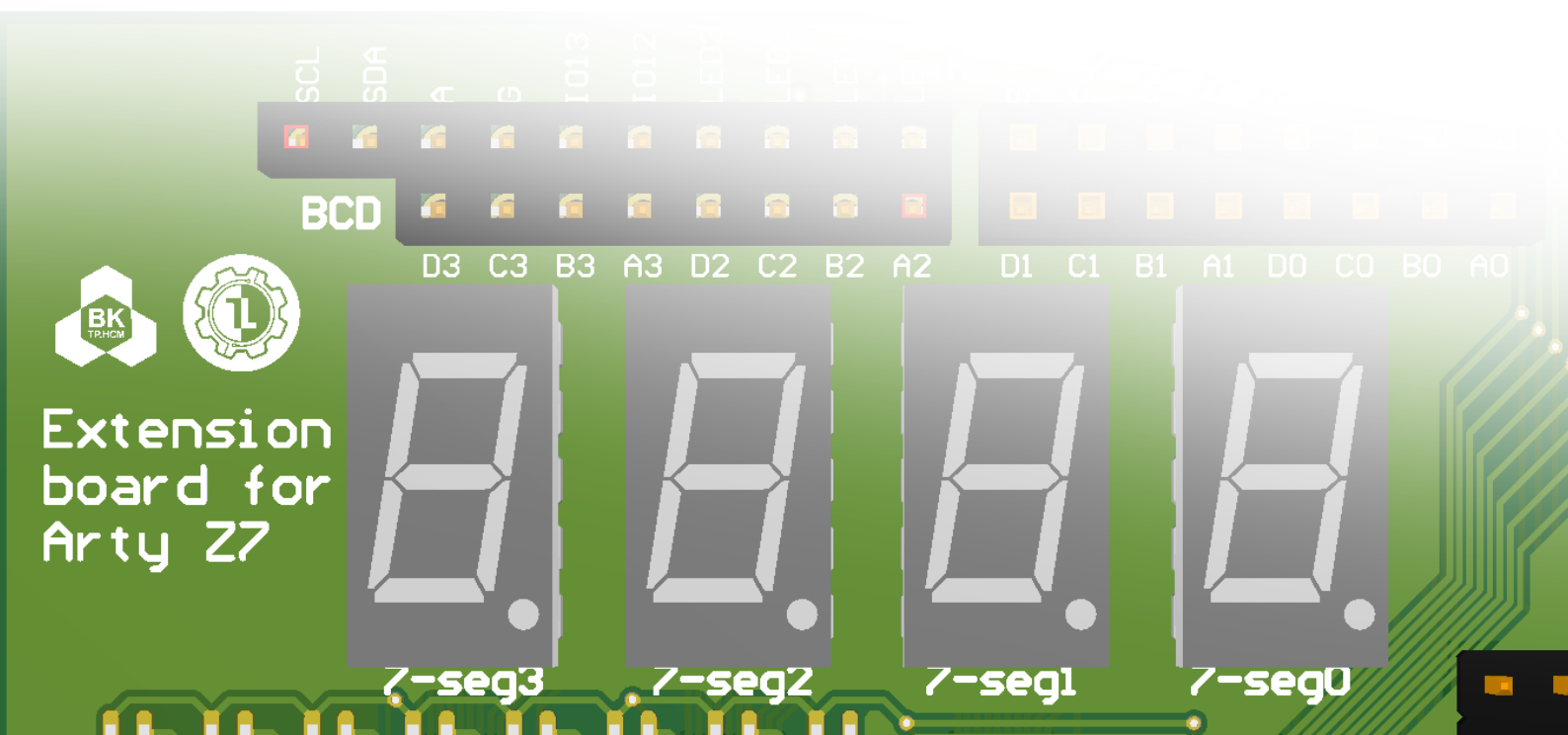
User Manual

Extension board for Arty Z7

Ho Chi Minh City, 2023

Features

- 8 extended switches
- 4 extended single LEDs
- 4 extended seven-segment LEDs

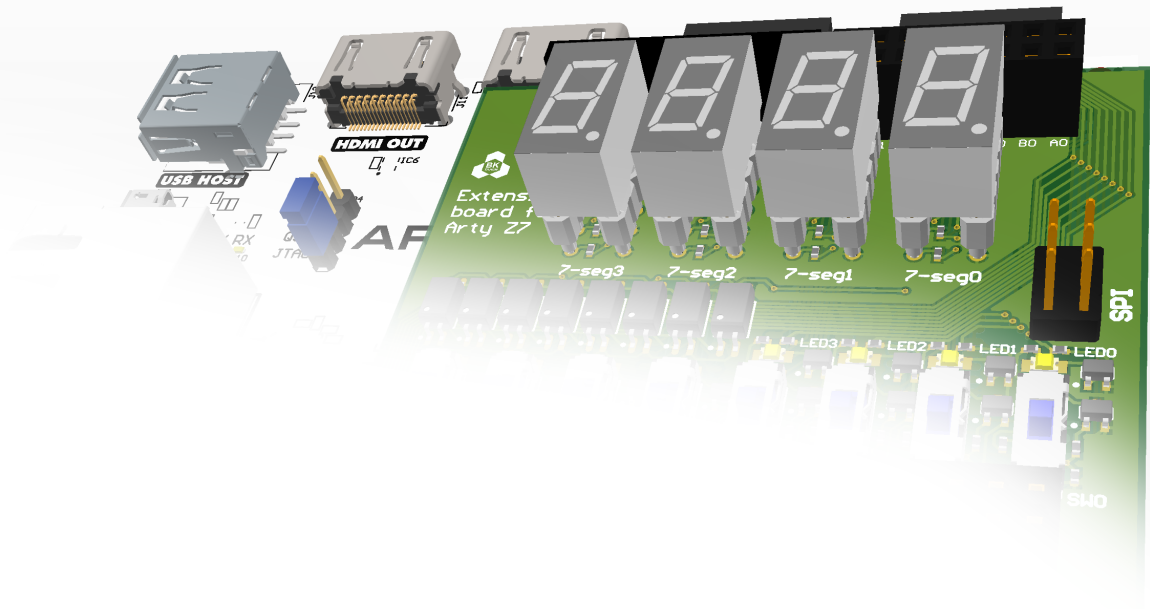


Extension
board for
Arty Z7



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Part I

Introduction to Extension board for Arty Z7

Chapter 1

Extension board for Arty Z7

1.1 Overview

Extension board for Arty Z7 is used for FPGA Arty Z7 board, extended more switches, single LEDs, and seven-segment LEDs. The Extension board is used to support for Logical Design with verilog HDL subject, helps students use the extended functions that the Extension board supports. All functions are connected through the headers used to connect the Arty Z7 and other peripherals.

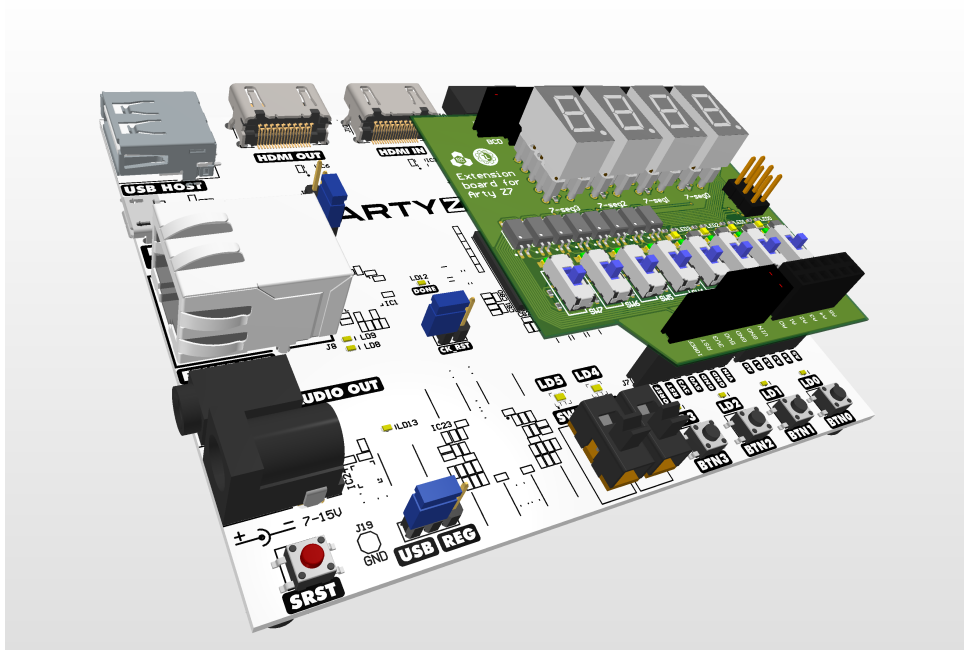


Figure 1.1: Extension board for Arty Z7

1.2 Package contents

Extension board for Arty Z7 package includes:

- The Extension board.
- Constraint file "Arty-Z7-20-Extension-board-Master.xdc".

1.3 Getting helps

Here are the address where you can get help if you encounter any problems:

- Fanpage: <https://www.facebook.com/thiennhan.hardware/>
- Email: thiennhan.hardware@gmail.com

Extension board's Layout

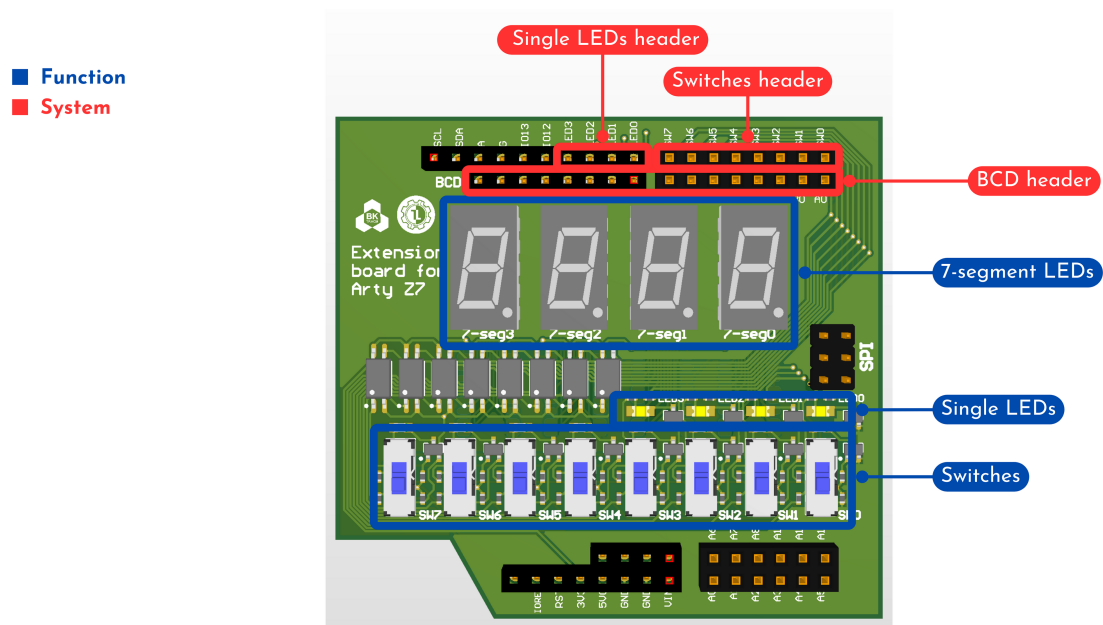


Figure 2.1: Extension board's layout

Chapter 3

Getting Started

Attention

Before Arty Z7 is powered, or uploaded code, all the switches must be set at the LOW level and the pins connected to the Arty Z7 must be configured as LVCMOS33 standard.

Connecting the Extension board onto Arty Z7

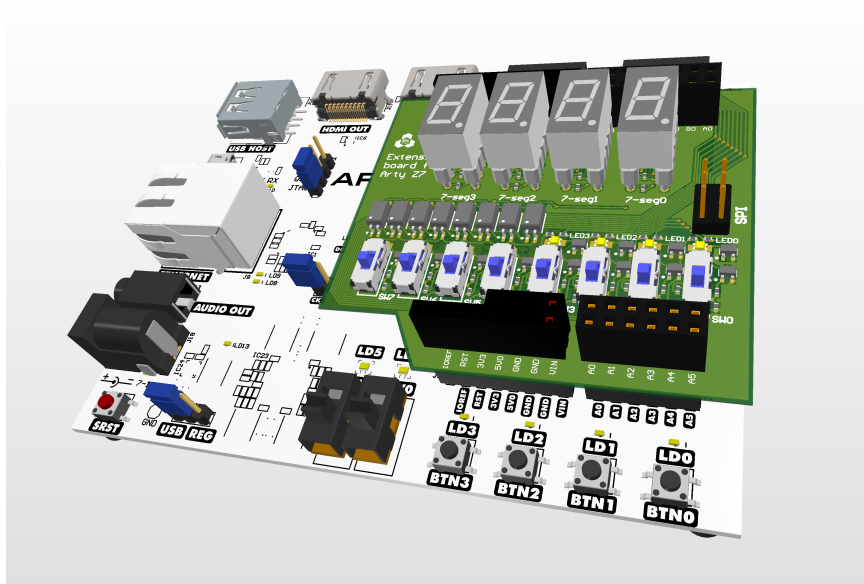
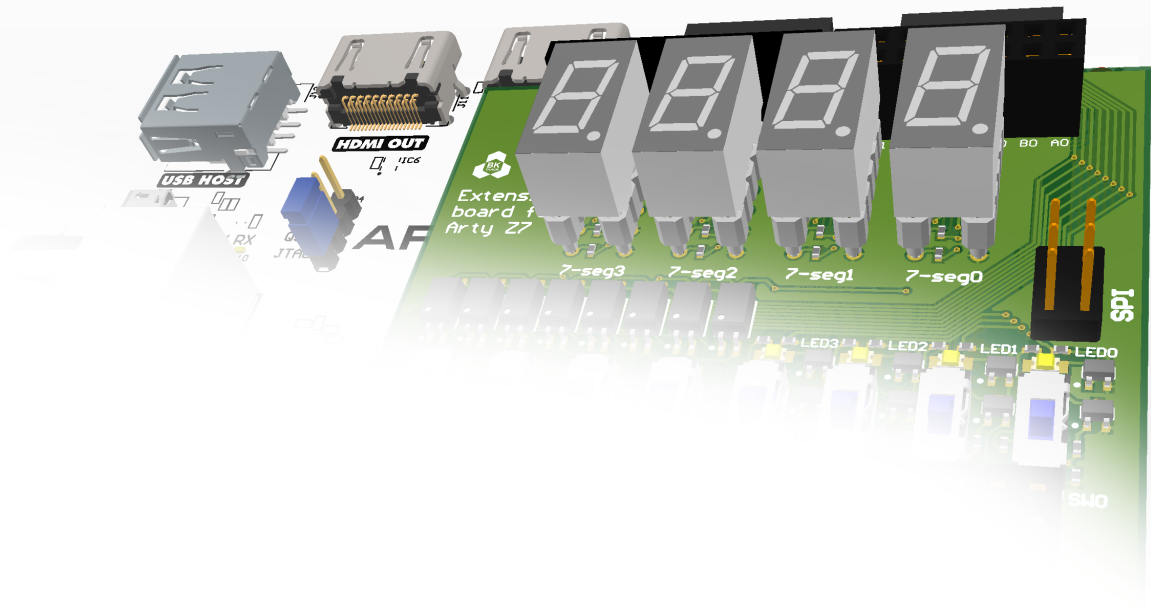


Figure 3.1: The Arty Z7 with connected Extension board



Part II

Extension board for Arty Z7

GUIDELINE

Chapter 4

Pin Configurations on Arty Z7

PIN TYPE	PACKAGE PIN	FUNCTION
Switches		
SW0	T14	Digital input
SW1	U12	Digital input
SW2	U13	Digital input
SW3	V13	Digital input
SW4	V15	Digital input
SW5	T15	Digital input
SW6	R16	Digital input
SW7	U17	Digital input

PIN TYPE	PACKAGE PIN	FUNCTION
Single LEDs		
LED0	V17	Digital input/output
LED1	V18	Digital input/output
LED2	T16	Digital input/output
LED3	R17	Digital input/output

PIN TYPE	PACKAGE PIN	FUNCTION
Seven-segment LEDs		
7-seg0_A	U5	Digital input/output
7-seg0_B	V5	Digital input/output
7-seg0_C	V6	Digital input/output
7-seg0_D	U7	Digital input/output
7-seg1_A	V7	Digital input/output
7-seg1_B	U8	Digital input/output
7-seg1_C	V8	Digital input/output
7-seg1_D	V10	Digital input/output
7-seg2_A	W10	Digital input/output
7-seg2_B	W6	Digital input/output
7-seg2_C	Y6	Digital input/output
7-seg2_D	Y7	Digital input/output
7-seg3_A	W8	Digital input/output
7-seg3_B	Y8	Digital input/output
7-seg3_C	W9	Digital input/output
7-seg3_D	Y9	Digital input/output

Chapter 5

Functions on Extension board

5.1 Switches

There are 8 switches used to generate logic level for Arty Z7 or other peripherals. These switches must be configured as digital input (detailed instruction provided in Chapter 6), otherwise, it may damage Arty Z7.

When a switch is pulled up, the corresponding header pin will generate a HIGH logic level and its green LED will turn on. Contrarily, a pulled-down switch indicates a LOW logic level in the corresponding pin and its green LED will turn off.

To use switches, please configure the corresponded pins be digital input. The switches create logic level into Arty Z7 or connected peripherals.

Note: Please don't configure output pin for switches, it may damage Arty Z7.

5.2 Single LEDs

The Extension board supports 4 single LEDs. The LED will be on at HIGH logic level and will be off at LOW logic level.

The pins used to control single LEDs must be configured as follows:

- When Arty Z7 generate signal to control the LEDs, the corresponding pins must be configured as digital output. Signal from that pin can also be used by peripherals.
- When peripherals generate signal to control the LEDs, the corresponding pins must be configured as digital input. Signal from that pin can also be used by Arty Z7.

5.3 Seven-segment LEDs

The Extension board supports 4 seven-segment LEDs that is controlled by BCD code. The LEDs only display the number from 0 to 9, the rest will be blank.

Note: The dot segment is disable.

To use seven-segment LEDs, the user may configure the corresponded pins be digital input or output similar to how the pins are configured in the single LEDs section above.

Chapter 6

Setting I/O Ports on Vivado

The user write code verilog using the function on the Extension board.

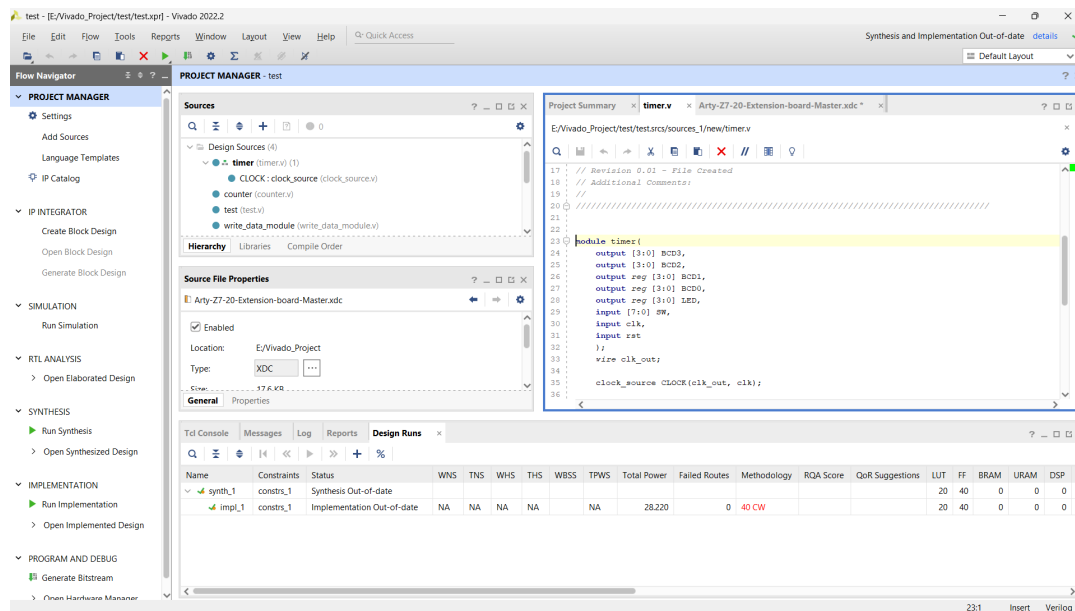


Figure 6.1: Verilog code

The user's constraint file used to configure pins must be selected "Set as Target Constraint File".

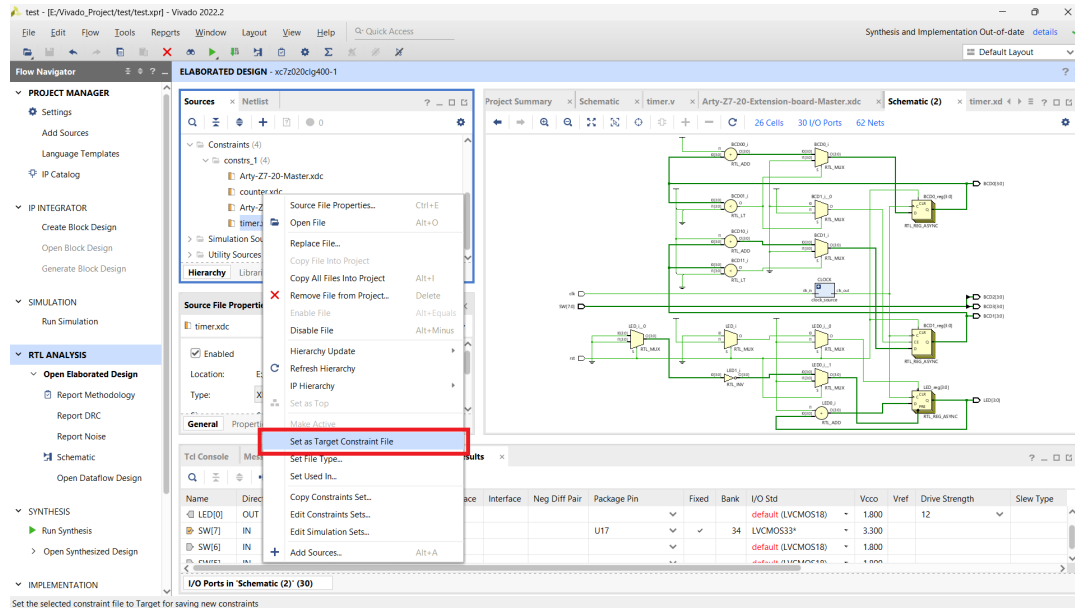


Figure 6.2: Set as Target Constraint File

Open Schematic → I/O Ports, and on the screen will display the table to configure I/O Ports.

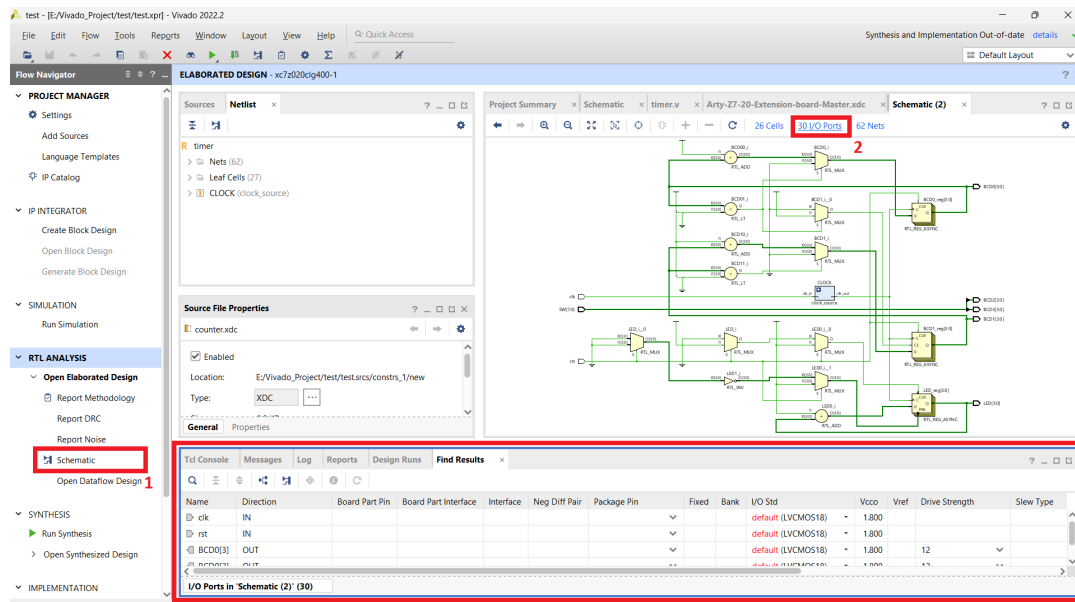


Figure 6.3: I/O Ports

The Package Pin and I/O Std for corresponded pin must be configured based on constraint file "Arty-Z7-20-Extension-board-Master.xdc". For example, to set input pin SW[7] be switch SW7 on Extension board, Package Pin is configured to U17 and I/O Std is configured to LVCMOS33.

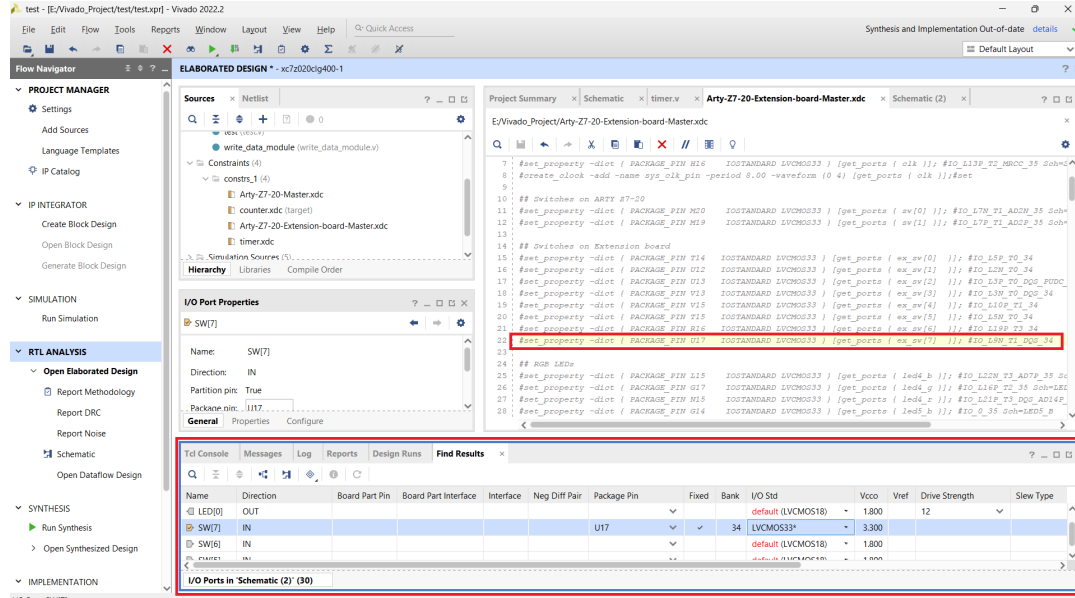


Figure 6.4: I/O Ports setting

After save the setting, constraint file created previously will auto-setup for I/O pins in Generate Bitstream process.

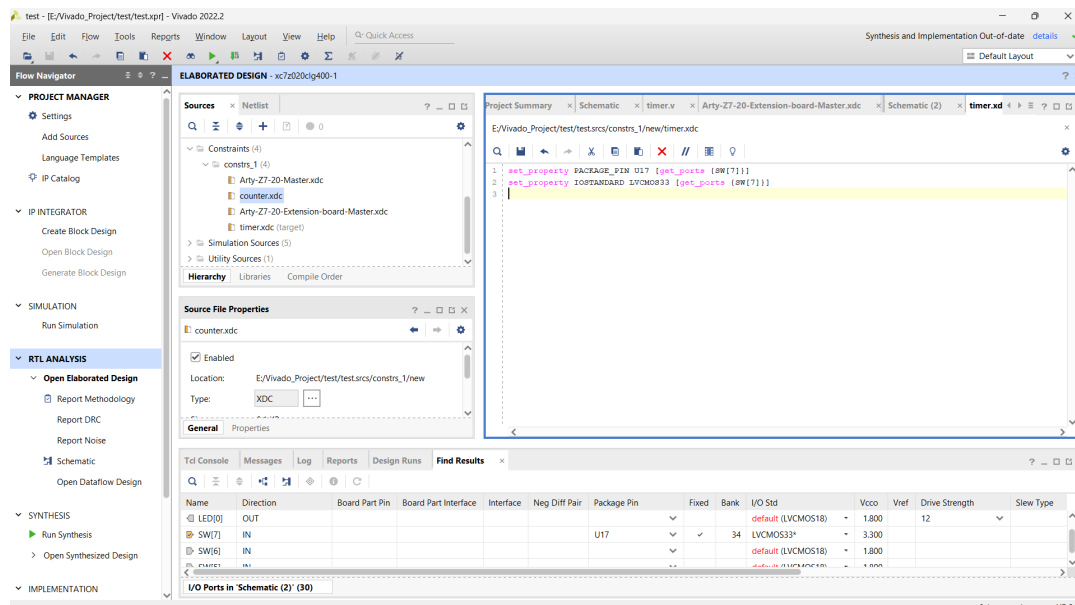
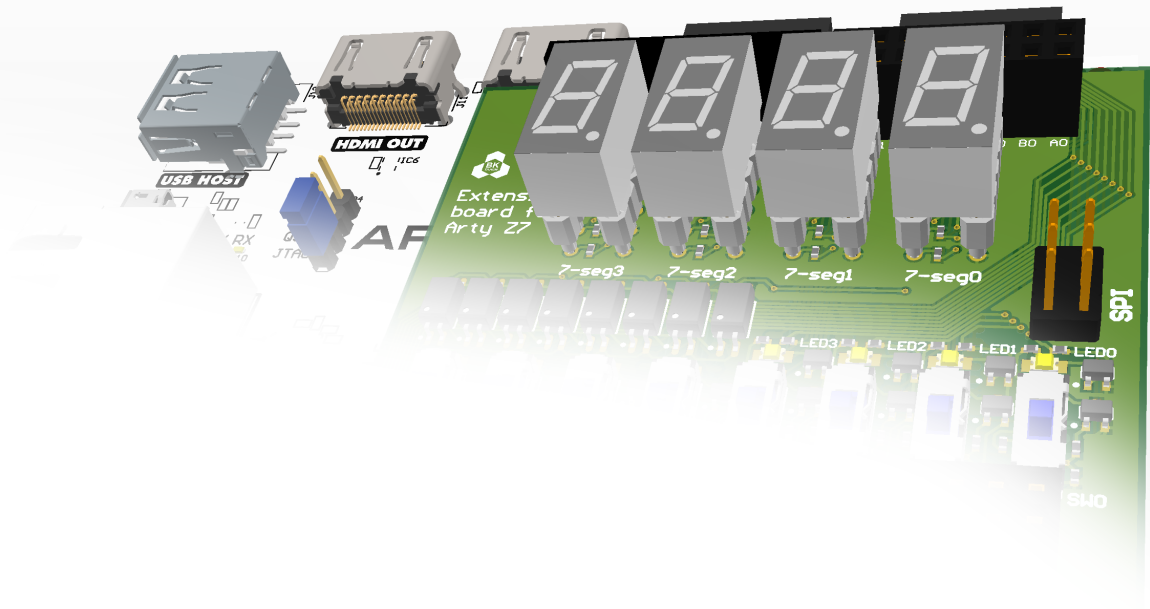


Figure 6.5: Constraint file



Part III

Appendix

Chapter 7

Revision History

Version	Change Log
V1.0	Initial Version