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Abstract—This manual provides an introduction to Verilog programming using the Icoboard-Lattice FPGA.

Download the manual and codes from below link

<https://github.com/pratibha444/icoboard>

1 COMPONENTS

The necessary components for this manual are listed in Table

Component	Quantity
Icoboard	1
Raspberry Pi 4	1
Male-Male Jumper Wires	20
Breadboard	1
Seven segment display	1

TABLE I

2 SOFTWARE SETUP

2.1 Icoboard

For installing icoboard Open a terminal and execute the following commands.

```
git clone https://github.com/WiringPi/WiringPi
.git
cd WiringPi && ./build
sudo apt install build-essential clang bison
flex libreadline-dev gawk tcl-dev libffi-
dev mercurial graphviz xdot pkg-config
libftdi-dev
```

```
#Icoprog
#On termuxarch run as root user
#With termuxarch and pizero, this is the only
  tool required at the pi
svn co http://svn.clifford.at/handicraft/2015/
  icoprog
cd icoprog && make install

#Icestorm
#On termuxarch run as normal user without
  sudo
git clone https://github.com/cliffordwolf/
  icestorm
cd icestorm && make -j4 && sudo make
  install

#arachne-pnr
#On termuxarch run as normal user without
  sudo
git clone https://github.com/cseed/arachne-pnr
cd arachne-pnr && make -j4 && sudo make
  install

#Yosys
#On termuxarch run as normal user without
  sudo
git clone https://github.com/cliffordwolf/yosys
cd yosys && make -j4 && sudo make install
```

3 HARDWARE SETUP

3.1 4 bit binary input

- The hardware connections between the Icoboard and Raspberry Pi 4 are available in below figures.
- In figure 2 and 3 the Icoboard and raspberry pi connections are shown. And fig 4 shows the Raspberry Pi pin configuration.
- Place icoboard on Raspberry Pi 4 and make the connections according to following steps:
- Take the wires and connect them to A5,A2,C3,B4 of the icoboard . These

pins are used to give input manually.

- Similarly make connection to GND pin and 3.3V pin of Icoboard
- Connect GND and 3.3V pin on the bread board
- Give the binary input using input pins .
- For example connect all the input pins to GND pin on bread board
- Now open the terminal give the following commands

```
cd ICOBOARD
cd codes
cd Binary
make v_fname=binary
python binary.py
```

- The output is displayed on terminal as 0
- Similarly you can change the values.
- If 1 is to be given as input connect it to 3.3V pin and if 0 is to be given as input then connect it to GND pin.

3.2 Seven segment display

Make the connections according to the Tabel II.

The pin configuration of seven segment display is shown in fig 1.

- Open the terminal and execute the following commands

```
cd ICOBOARD
cd codes
cd seven
make v_fname=seven
python seven.py
```

Seven segment display	Icoboard
a	A5
b	A2
c	C3
d	B4
e	B7
f	B6
g	B3
COM	3.3v

TABLE II

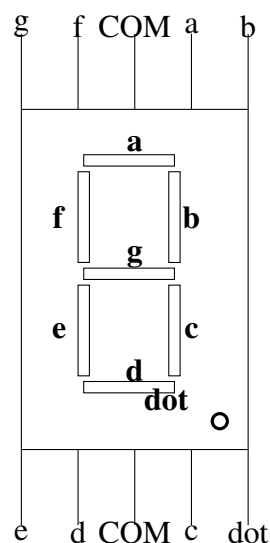


Fig. 1: SSD pin configuration

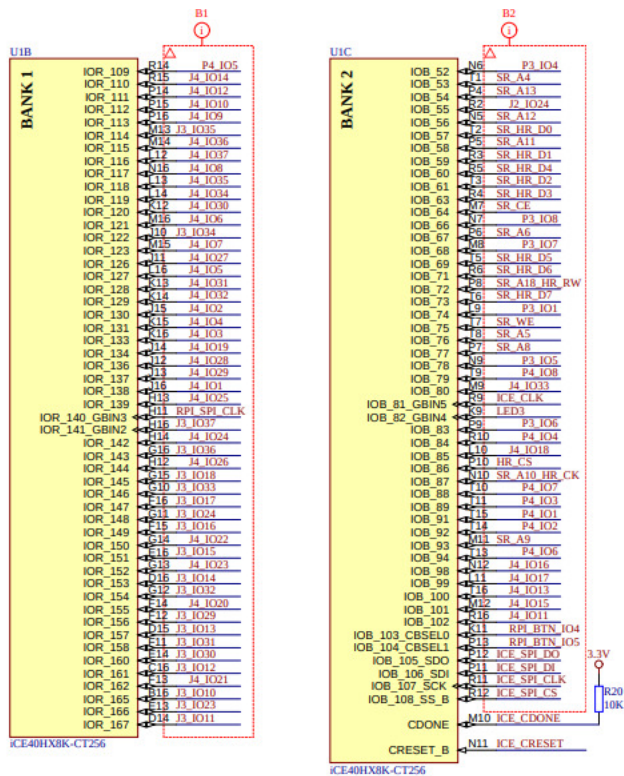


Fig. 2: Icoboard pin configuration

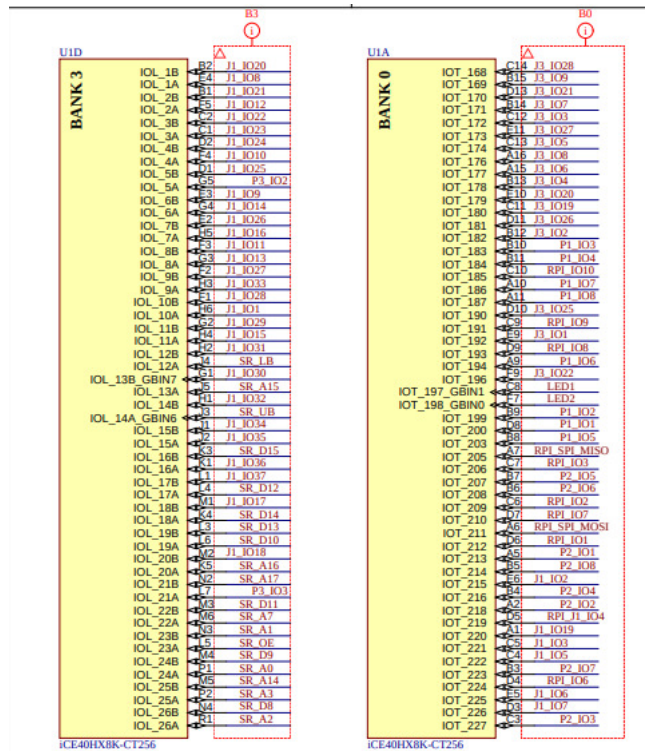


Fig. 3: Icoboard pin configuration

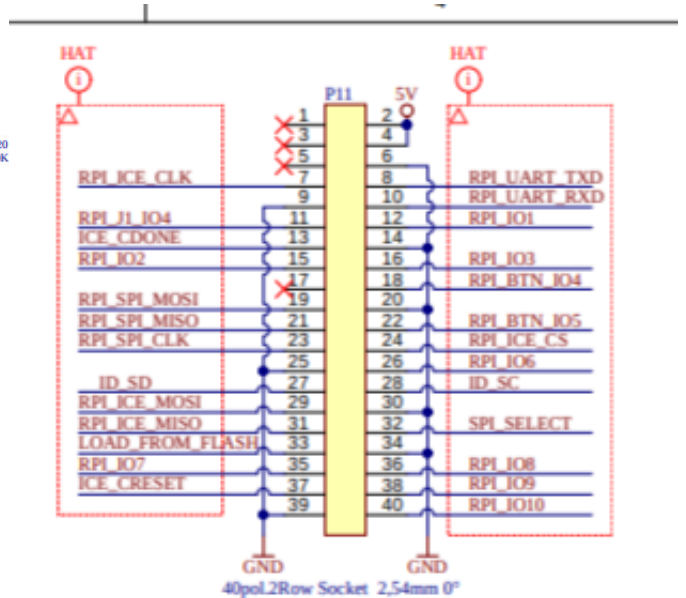


Fig. 4: RaspberryPi pin configuration