

Microblaze Led , Button and Uart Design

➤ *Microblaze*를 활용하여 *I/O*를 제어

➔ *Led , Button and Uart Design*

[Reference] ■

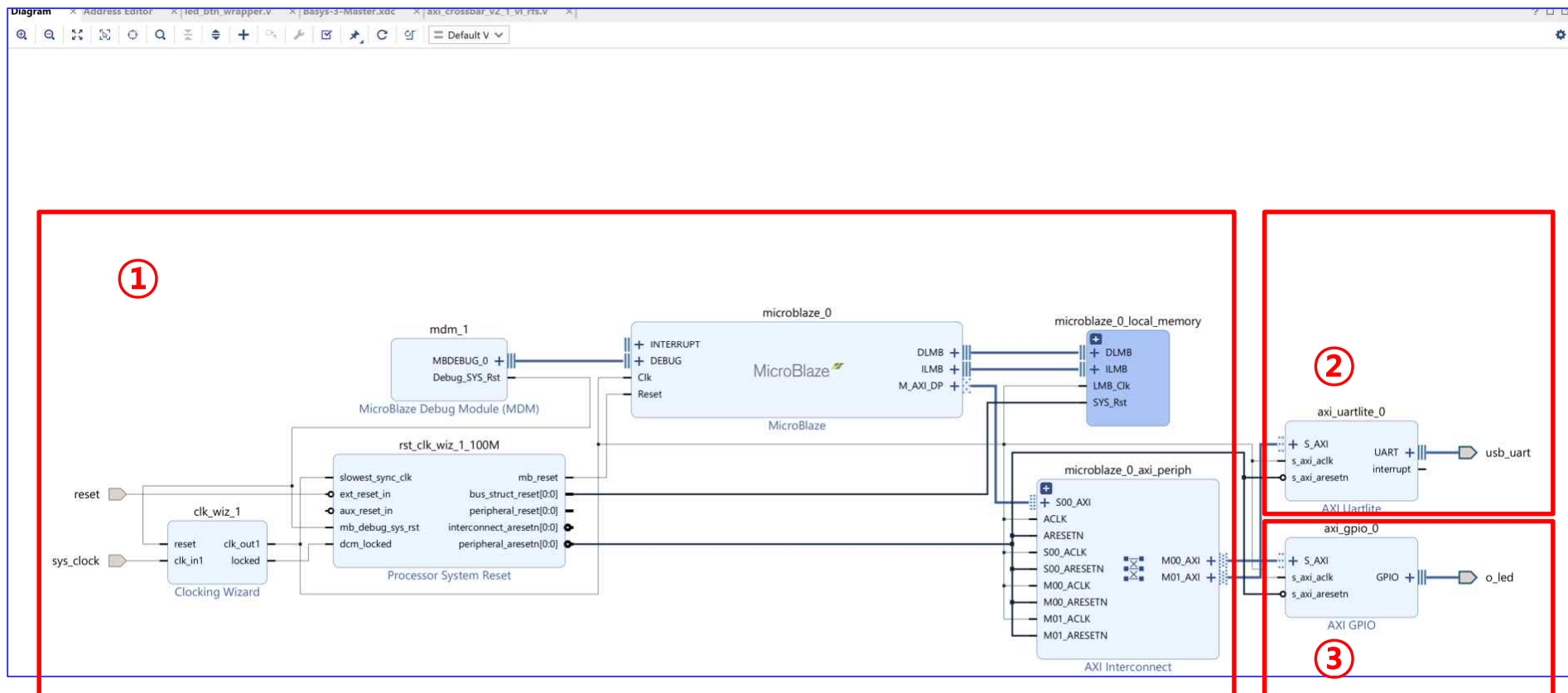
Microblaze Led , Button and Uart Design

[Microblaze Led and Uart Design]

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mb_led_btn_Exam.xpr

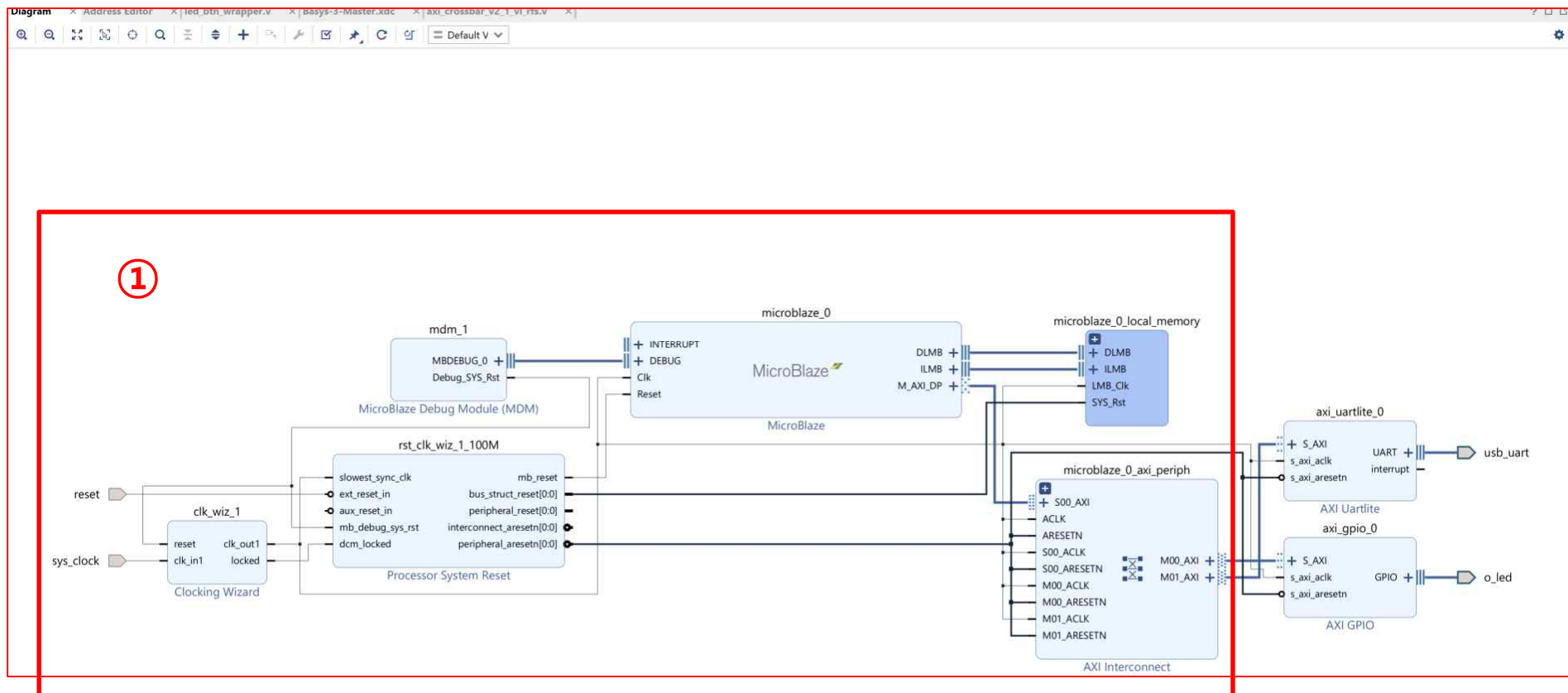
➤ Microblaze Led and Uart Design ➔ Block Design



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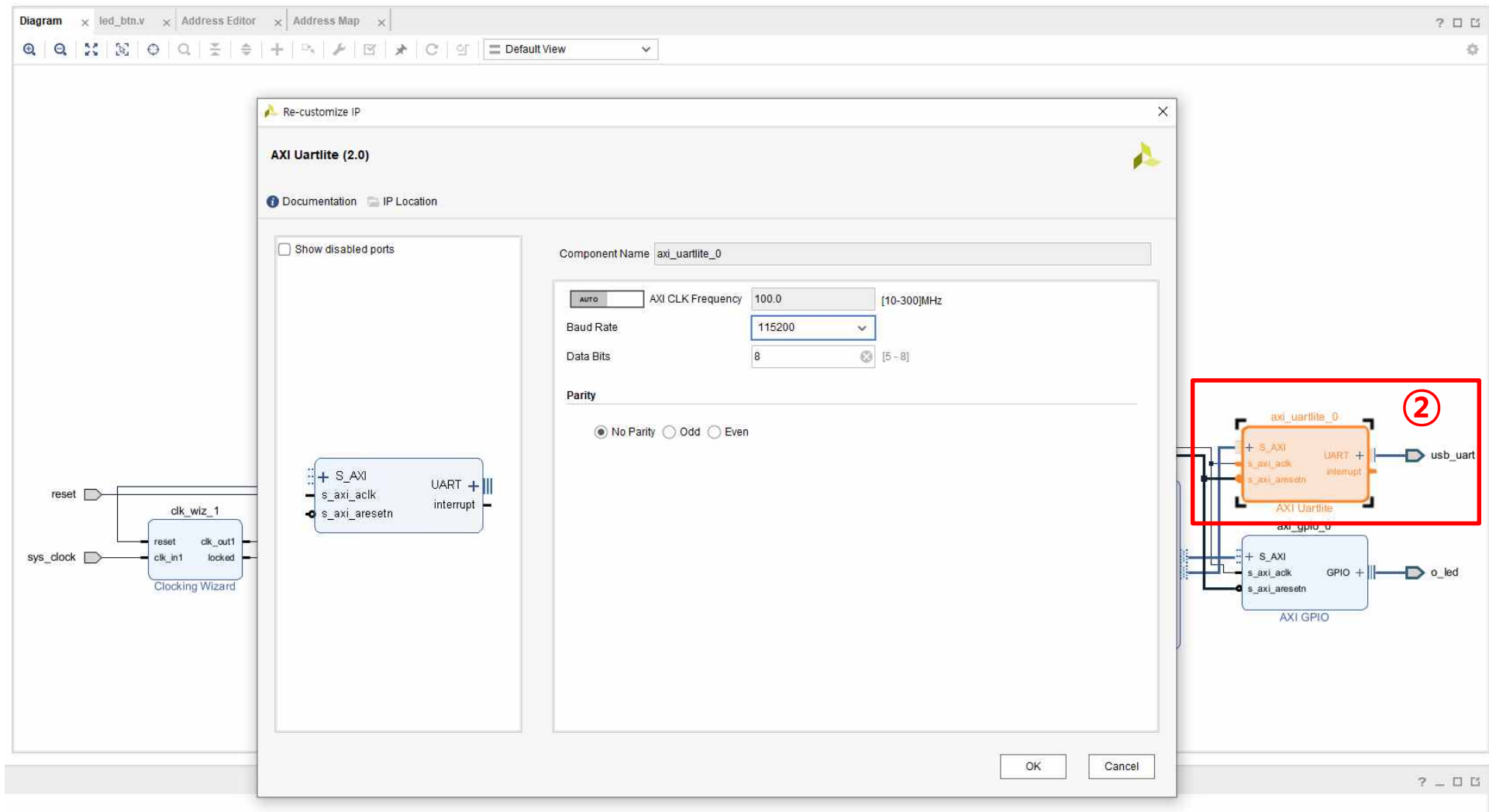
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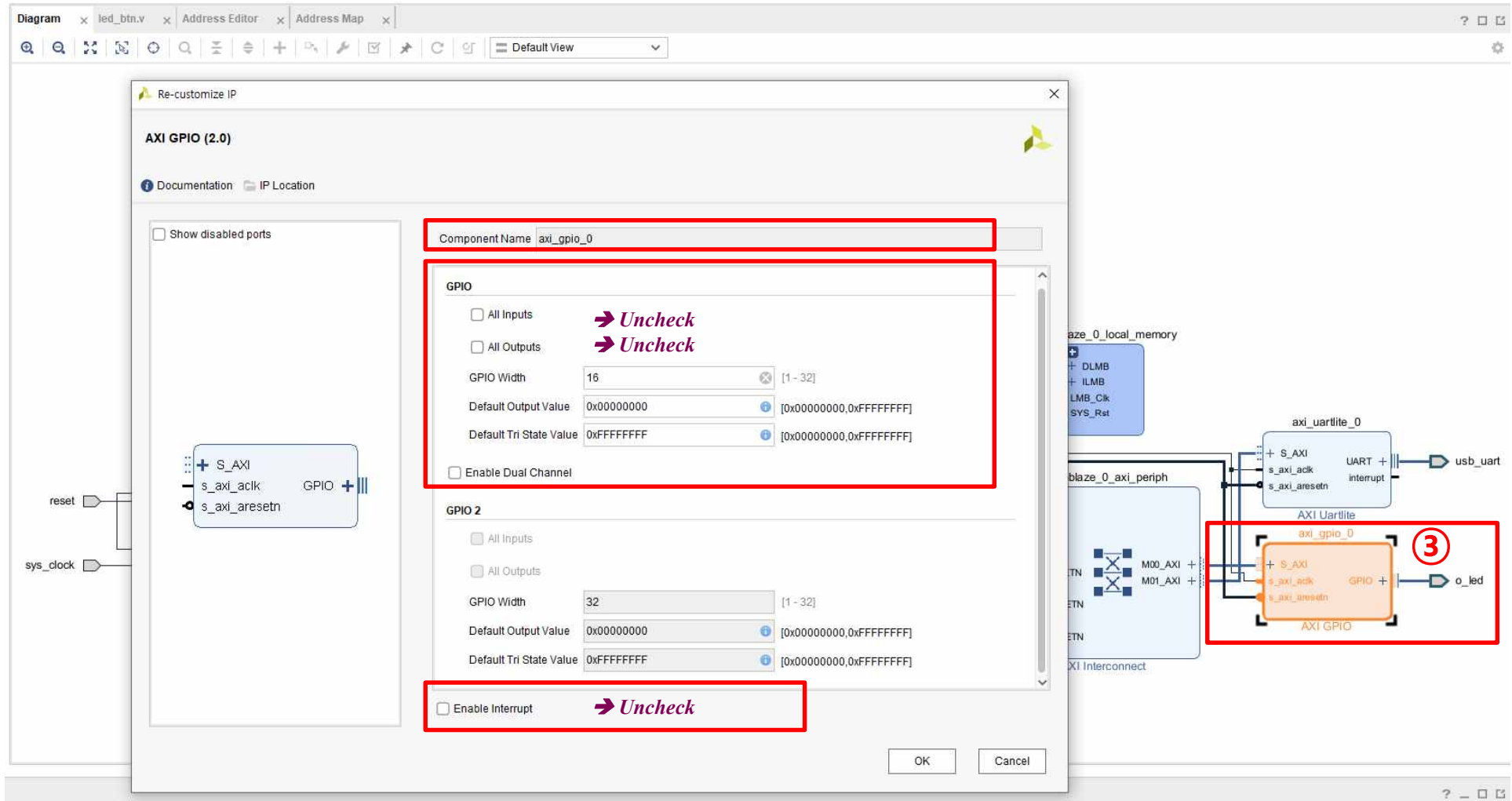
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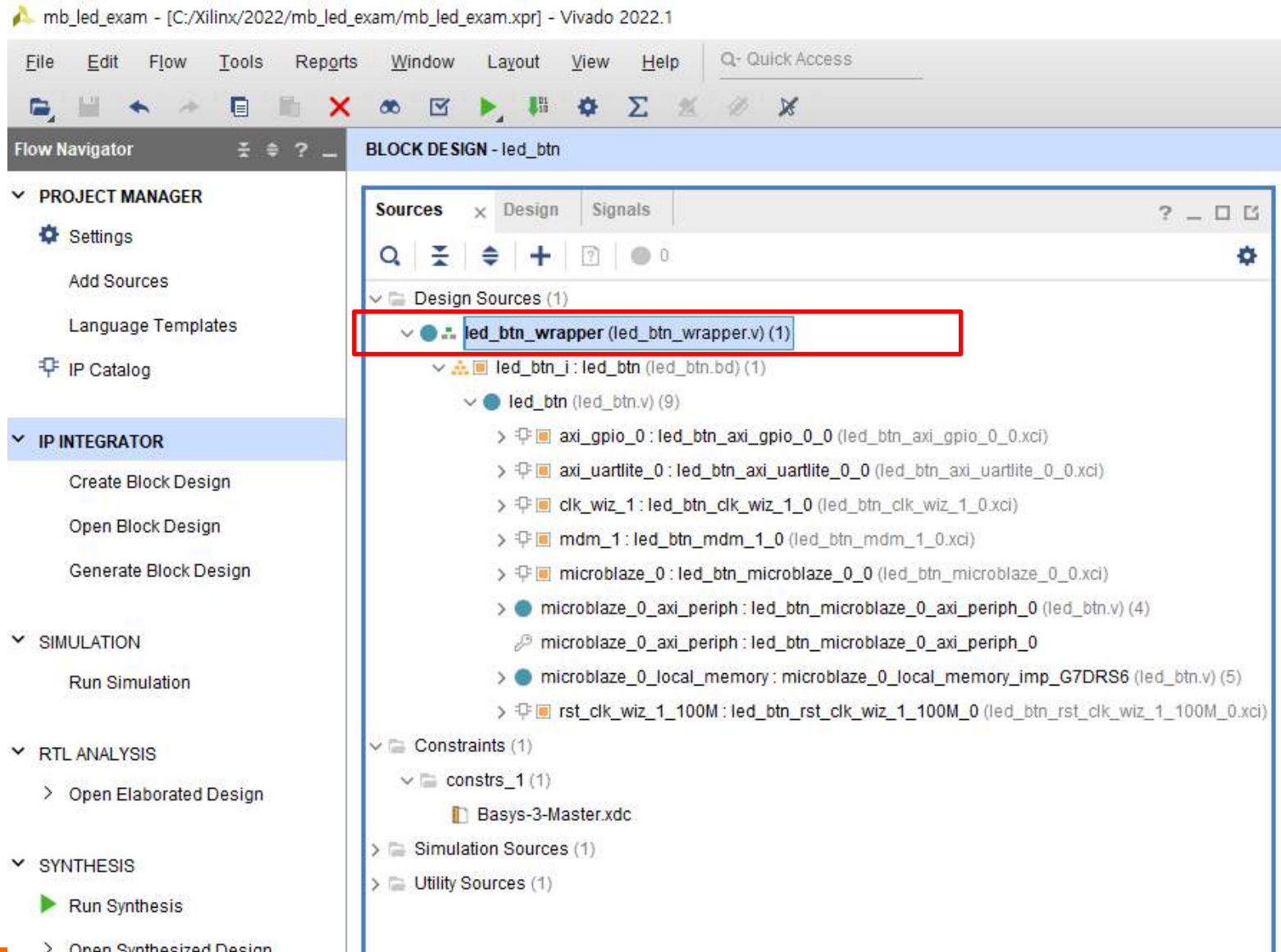
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mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ HDL Wrapper

```
Diagram  x Address Editor  x led_btn_wrapper.v  x Basys-3-Master.xdc  x axi_crossbar_v2_1_vl_rfs.v  x ?  x
c:/Xilinx/2022/vitis_led_btn/vitis_led_btn.gen/sources_1/bd/led_btn/hdl/led_btn_wrapper.v

1 //Copyright 1986-2022 Xilinx, Inc. All Rights Reserved.
2 //
3 //Tool Version: Vivado v.2022.1 (win64) Build 3526262 Mon Apr 18 15:48:16 MDT 2022
4 //Date       : Wed Sep  8 15:28:58 2023
5 //Host       : DESKTOP-QVKKRPG running 64-bit major release (build 9200)
6 //Command    : generate_target led_btn_wrapper.bd
7 //Design     : led_btn_wrapper
8 //Purpose    : IP block netlist
9 //
10 `timescale 1 ps / 1 ps
11
12 module led_btn_wrapper
13     (o_led_tri_io,
14      reset,
15      sys_clock,
16      usb_uart_rxd,
17      usb_uart_txd);
18     inout [15:0]o_led_tri_io;
19     input  reset;
20     input  sys_clock;
21     input  usb_uart_rxd;
22     output usb_uart_txd;
23
24     wire [0:0]o_led_tri_i_0;
25     wire [1:1]o_led_tri_i_1;
26     wire [10:10]o_led_tri_i_10;
27     wire [11:11]o_led_tri_i_11;
28     wire [12:12]o_led_tri_i_12;
29     wire [13:13]o_led_tri_i_13;
30     wire [14:14]o_led_tri_i_14;
31     wire [15:15]o_led_tri_i_15;
32     wire [2:2]o_led_tri_i_2;
33     wire [3:3]o_led_tri_i_3;
34     wire [4:4]o_led_tri_i_4;
35     wire [5:5]o_led_tri_i_5;
36     wire [6:6]o_led_tri_i_6;
37     wire [7:7]o_led_tri_i_7;
38     wire [8:8]o_led_tri_i_8;
39     wire [9:9]o_led_tri_i_9;
40     wire [0:0]o_led_tri_io_0;
41     wire [1:1]o_led_tri_io_1;
42     wire [10:10]o_led_tri_io_10;
43     wire [11:11]o_led_tri_io_11;
44     wire [12:12]o_led_tri_io_12;
```


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mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ HDL Wrapper

```
1. `timescale 1 ps / 1 ps
2. module led_btn_wrapper
3.     (o_led_tri_io,
4.      reset, sys_clock, usb_uart_rxd,
5.      usb_uart_txd);
6.     inout [15:0]o_led_tri_io;
7.     input reset;
8.     input sys_clock;
9.     input usb_uart_rxd;
10.    output usb_uart_txd;
11.
12.    wire [0:0]o_led_tri_i_0;
13.    wire [1:1]o_led_tri_i_1;
14.    wire [10:10]o_led_tri_i_10;
15.    wire [11:11]o_led_tri_i_11;
16.    wire [12:12]o_led_tri_i_12;
17.    wire [13:13]o_led_tri_i_13;
18.    wire [14:14]o_led_tri_i_14;
19.    wire [15:15]o_led_tri_i_15;
20.    wire [2:2]o_led_tri_i_2;
21.    wire [3:3]o_led_tri_i_3;
22.    wire [4:4]o_led_tri_i_4;
23.    wire [5:5]o_led_tri_i_5;
24.    wire [6:6]o_led_tri_i_6;
25.    wire [7:7]o_led_tri_i_7;
26.    wire [8:8]o_led_tri_i_8;
27.    wire [9:9]o_led_tri_i_9;
28.    wire [0:0]o_led_tri_io_0;
29.    wire [1:1]o_led_tri_io_1;
30.    wire [10:10]o_led_tri_io_10;
31.    wire [11:11]o_led_tri_io_11;
32.    wire [12:12]o_led_tri_io_12;
33.    wire [13:13]o_led_tri_io_13;
34.    wire [14:14]o_led_tri_io_14;
35.    wire [15:15]o_led_tri_io_15;
36.    wire [2:2]o_led_tri_io_2;
37.    wire [3:3]o_led_tri_io_3;
38.    wire [4:4]o_led_tri_io_4;
39.    wire [5:5]o_led_tri_io_5;
40.    wire [6:6]o_led_tri_io_6;
41.    wire [7:7]o_led_tri_io_7;
42.    wire [8:8]o_led_tri_io_8;
43.    wire [9:9]o_led_tri_io_9;
44.    wire [0:0]o_led_tri_o_0;
45.    wire [1:1]o_led_tri_o_1;
```

```
46. wire [10:10]o_led_tri_o_10;
47. wire [11:11]o_led_tri_o_11;
48. wire [12:12]o_led_tri_o_12;
49. wire [13:13]o_led_tri_o_13;
50. wire [14:14]o_led_tri_o_14;
51. wire [15:15]o_led_tri_o_15;
52. wire [2:2]o_led_tri_o_2;
53. wire [3:3]o_led_tri_o_3;
54. wire [4:4]o_led_tri_o_4;
55. wire [5:5]o_led_tri_o_5;
56. wire [6:6]o_led_tri_o_6;
57. wire [7:7]o_led_tri_o_7;
58. wire [8:8]o_led_tri_o_8;
59. wire [9:9]o_led_tri_o_9;
60. wire [0:0]o_led_tri_t_0;
61. wire [1:1]o_led_tri_t_1;
62. wire [10:10]o_led_tri_t_10;
63. wire [11:11]o_led_tri_t_11;
64. wire [12:12]o_led_tri_t_12;
65. wire [13:13]o_led_tri_t_13;
66. wire [14:14]o_led_tri_t_14;
67. wire [15:15]o_led_tri_t_15;
68. wire [2:2]o_led_tri_t_2;
69. wire [3:3]o_led_tri_t_3;
70. wire [4:4]o_led_tri_t_4;
71. wire [5:5]o_led_tri_t_5;
72. wire [6:6]o_led_tri_t_6;
73. wire [7:7]o_led_tri_t_7;
74. wire [8:8]o_led_tri_t_8;
75. wire [9:9]o_led_tri_t_9;
76. wire reset;
77. wire sys_clock;
78. wire usb_uart_rxd;
79. wire usb_uart_txd;
80.
81. led_btn led_btn_i
82. (.o_led_tri_i({o_led_tri_i_15,o_led_tri_i_14,o_led_tri_i_13,o_led_tri_i_12,o_
83. led_tri_i_11,o_led_tri_i_10,o_led_tri_i_9,o_led_tri_i_8,o_led_tri_i_7,o_led_t
84. ri_i_6,o_led_tri_i_5,o_led_tri_i_4,o_led_tri_i_3,o_led_tri_i_2,o_led_tri_i_1,
85. o_led_tri_i_0}),
86. .o_led_tri_o({o_led_tri_o_15,o_led_tri_o_14,o_led_tri_o_13,o_led_tri_o_12,o_
87. led_tri_o_11,o_led_tri_o_10,o_led_tri_o_9,o_led_tri_o_8,o_led_tri_o_7,o_
88. led_tri_o_6,o_led_tri_o_5,o_led_tri_o_4,o_led_tri_o_3,o_led_tri_o_2,o_
89. led_tri_o_1,o_led_tri_o_0}),
90. .reset(reset),.sys_clock(sys_clock),.usb_uart_rxd(usb_uart_rxd),.u
91. sb_uart_txd(usb_uart_txd));
```

```
82. IOBUF o_led_tri_iobuf_0
83. (.I(o_led_tri_o_0),.IO(o_led_tri_io[0]),
84. .O(o_led_tri_i_0),.T(o_led_tri_t_0));
85. IOBUF o_led_tri_iobuf_1
86. (.I(o_led_tri_o_1),.IO(o_led_tri_io[1]),
87. .O(o_led_tri_i_1),.T(o_led_tri_t_1));
88. IOBUF o_led_tri_iobuf_10
89. (.I(o_led_tri_o_10),.IO(o_led_tri_io[10]),
90. .O(o_led_tri_i_10),.T(o_led_tri_t_10));
91. IOBUF o_led_tri_iobuf_11
92. (.I(o_led_tri_o_11),.IO(o_led_tri_io[11]),
93. .O(o_led_tri_i_11),.T(o_led_tri_t_11));
94. IOBUF o_led_tri_iobuf_12
95. (.I(o_led_tri_o_12),.IO(o_led_tri_io[12]),
96. .O(o_led_tri_i_12),.T(o_led_tri_t_12));
97. IOBUF o_led_tri_iobuf_13
98. (.I(o_led_tri_o_13),.IO(o_led_tri_io[13]),
99. .O(o_led_tri_i_13),.T(o_led_tri_t_13));
100. IOBUF o_led_tri_iobuf_14
101. (.I(o_led_tri_o_14),.IO(o_led_tri_io[14]),
102. .O(o_led_tri_i_14),.T(o_led_tri_t_14));
103. IOBUF o_led_tri_iobuf_15
104. (.I(o_led_tri_o_15),.IO(o_led_tri_io[15]),
105. .O(o_led_tri_i_15),.T(o_led_tri_t_15));
106. IOBUF o_led_tri_iobuf_2
107. (.I(o_led_tri_o_2),.IO(o_led_tri_io[2]),
108. .O(o_led_tri_i_2),.T(o_led_tri_t_2));
109. IOBUF o_led_tri_iobuf_3
110. (.I(o_led_tri_o_3),.IO(o_led_tri_io[3]),
111. .O(o_led_tri_i_3),.T(o_led_tri_t_3));
112. IOBUF o_led_tri_iobuf_4
113. (.I(o_led_tri_o_4),.IO(o_led_tri_io[4]),
114. .O(o_led_tri_i_4),.T(o_led_tri_t_4));
115. IOBUF o_led_tri_iobuf_5
116. (.I(o_led_tri_o_5),.IO(o_led_tri_io[5]),
117. .O(o_led_tri_i_5),.T(o_led_tri_t_5));
118. IOBUF o_led_tri_iobuf_6
119. (.I(o_led_tri_o_6),.IO(o_led_tri_io[6]),
120. .O(o_led_tri_i_6),.T(o_led_tri_t_6));
121. IOBUF o_led_tri_iobuf_7
122. (.I(o_led_tri_o_7),.IO(o_led_tri_io[7]),
123. .O(o_led_tri_i_7),.T(o_led_tri_t_7));
124. IOBUF o_led_tri_iobuf_8
125. (.I(o_led_tri_o_8),.IO(o_led_tri_io[8]),
126. .O(o_led_tri_i_8),.T(o_led_tri_t_8));
127. IOBUF o_led_tri_iobuf_9
128. (.I(o_led_tri_o_9),.IO(o_led_tri_io[9]),
129. .O(o_led_tri_i_9),.T(o_led_tri_t_9));
130. endmodule
```

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mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ Port(Pin) Mapping(xdc)

```
Diagram x Address Editor x led_btn_wrapper.v x Basys-3-Master.xdc x axi_crossbar_v2_1_v1_rfs.v x ? □ □
C:/Xilinx/2022/vitis_led_btn_wrapper.v srcs/constrs_1/imports/digilent-xdc-master/Basys-3-Master.xdc

1  ## This file is a general .xdc for the Basys3 rev B board
2  ## To use it in a project:
3  ## - uncomment the lines corresponding to used pins
4  ## - rename the used ports (in each line, after get_ports) according to the top level signal names in the project
5
6  ## Clock signal
7  set_property -dict { PACKAGE_PIN W5 IOSTANDARD LVCMOS33 } [get_ports sys_clock]
8  create_clock -add -name sys_clk_pin -period 10.00 -waveform {0 5} [get_ports sys_clock]
9
10
11 ## Switches
12 set_property -dict { PACKAGE_PIN V17 IOSTANDARD LVCMOS33 } [get_ports {sw[0]}]
13 set_property -dict { PACKAGE_PIN V18 IOSTANDARD LVCMOS33 } [get_ports {sw[1]}]
14 set_property -dict { PACKAGE_PIN W16 IOSTANDARD LVCMOS33 } [get_ports {sw[2]}]
15 set_property -dict { PACKAGE_PIN W17 IOSTANDARD LVCMOS33 } [get_ports {sw[3]}]
16 set_property -dict { PACKAGE_PIN W15 IOSTANDARD LVCMOS33 } [get_ports {sw[4]}]
17 set_property -dict { PACKAGE_PIN V15 IOSTANDARD LVCMOS33 } [get_ports {sw[5]}]
18 set_property -dict { PACKAGE_PIN W14 IOSTANDARD LVCMOS33 } [get_ports {sw[6]}]
19 set_property -dict { PACKAGE_PIN W13 IOSTANDARD LVCMOS33 } [get_ports {sw[7]}]
20 set_property -dict { PACKAGE_PIN V2 IOSTANDARD LVCMOS33 } [get_ports {sw[8]}]
21 set_property -dict { PACKAGE_PIN T3 IOSTANDARD LVCMOS33 } [get_ports {sw[9]}]
22 set_property -dict { PACKAGE_PIN T2 IOSTANDARD LVCMOS33 } [get_ports {sw[10]}]
23 set_property -dict { PACKAGE_PIN R3 IOSTANDARD LVCMOS33 } [get_ports {sw[11]}]
24 set_property -dict { PACKAGE_PIN W2 IOSTANDARD LVCMOS33 } [get_ports {sw[12]}]
25 set_property -dict { PACKAGE_PIN U1 IOSTANDARD LVCMOS33 } [get_ports {sw[13]}]
26 set_property -dict { PACKAGE_PIN T1 IOSTANDARD LVCMOS33 } [get_ports {sw[14]}]
27 set_property -dict { PACKAGE_PIN R2 IOSTANDARD LVCMOS33 } [get_ports {reset}]
28
29
30 ## LEDs
31 set_property -dict { PACKAGE_PIN U16 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[0]}]
32 set_property -dict { PACKAGE_PIN E19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[1]}]
33 set_property -dict { PACKAGE_PIN U19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[2]}]
34 set_property -dict { PACKAGE_PIN V19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[3]}]
35 set_property -dict { PACKAGE_PIN W18 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[4]}]
36 set_property -dict { PACKAGE_PIN U15 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[5]}]
37 set_property -dict { PACKAGE_PIN U14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[6]}]
38 set_property -dict { PACKAGE_PIN V14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[7]}]
39 set_property -dict { PACKAGE_PIN V13 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[8]}]
40 set_property -dict { PACKAGE_PIN V3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[9]}]
41 set_property -dict { PACKAGE_PIN W3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[10]}]
42 set_property -dict { PACKAGE_PIN U3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[11]}]
43 set_property -dict { PACKAGE_PIN P3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[12]}]
44 set_property -dict { PACKAGE_PIN N3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[13]}]
45 set_property -dict { PACKAGE_PIN P1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[14]}]
46 set_property -dict { PACKAGE_PIN L1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[15]}]
47
48
49 ##7 Segment Display
50 set_property -dict { PACKAGE_PIN W7 IOSTANDARD LVCMOS33 } [get_ports {seg[0]}]
51 set_property -dict { PACKAGE_PIN W5 IOSTANDARD LVCMOS33 } [get_ports {seg[1]}]
52
53
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122
123
124
125
126
127
128 set_property -dict { PACKAGE_PIN R19 IOSTANDARD LVCMOS33 } [get_ports {vsync}]
129
130
131
132 ##USB-RS232 Interface
133 set_property -dict { PACKAGE_PIN B18 IOSTANDARD LVCMOS33 } [get_ports {usb_uart_rxd}]
134 set_property -dict { PACKAGE_PIN A18 IOSTANDARD LVCMOS33 } [get_ports {usb_uart_txd}]
135
136
137 ##USB HID (PS/2)
138 set_property -dict { PACKAGE_PIN C17 IOSTANDARD LVCMOS33 PULLUP true } [get_ports {PS2Clk}]
139 set_property -dict { PACKAGE_PIN B17 IOSTANDARD LVCMOS33 PULLUP true } [get_ports {PS2Data}]
140
141
142 ##Quad SPI Flash
143 ##Note that QCLK_0 cannot be placed in 7 series devices. You can access it using the
144 ##STARTUPE2 primitive.
145 set_property -dict { PACKAGE_PIN D18 IOSTANDARD LVCMOS33 } [get_ports {qspi0b[0]}]
146 set_property -dict { PACKAGE_PIN D19 IOSTANDARD LVCMOS33 } [get_ports {qspi0b[1]}]
147 set_property -dict { PACKAGE_PIN G18 IOSTANDARD LVCMOS33 } [get_ports {qspi0b[2]}]
148 set_property -dict { PACKAGE_PIN F18 IOSTANDARD LVCMOS33 } [get_ports {qspi0b[3]}]
149 set_property -dict { PACKAGE_PIN K19 IOSTANDARD LVCMOS33 } [get_ports {qspi0sh}]
150
151
152 ## Configuration options, can be used for all designs
153 set_property CONFIG_VOLTAGE 3.3 [current_design]
154 set_property CFGBVS VCC0 [current_design]
155
156 ## SPI configuration mode options for QSPI boot, can be used for all designs
157 set_property BITSTREAM.GENERAL.COMPRESS TRUE [current_design]
158 set_property BITSTREAM.CONFIG.CONFIGRATE 33 [current_design]
159 set_property CONFIG_MODE SPIx4 [current_design]
160
```

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mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ Port(Pin) Mapping(xdc)

```
1.  ## Clock signal

2.  set_property -dict { PACKAGE_PIN W5  IOSTANDARD LVCMOS33 } [get_ports sys_clock]
3.  create_clock -add -name sys_clk_pin -period 10.00 -waveform {0 5} [get_ports sys_clock]

4.  ## Switches

5.  set_property -dict { PACKAGE_PIN R2  IOSTANDARD LVCMOS33 } [get_ports {reset}]

6.  ## LEDs

7.  set_property -dict { PACKAGE_PIN U16  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[0]}]
8.  set_property -dict { PACKAGE_PIN E19  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[1]}]
9.  set_property -dict { PACKAGE_PIN U19  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[2]}]
10. set_property -dict { PACKAGE_PIN V19  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[3]}]
11. set_property -dict { PACKAGE_PIN W18  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[4]}]
12. set_property -dict { PACKAGE_PIN U15  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[5]}]
13. set_property -dict { PACKAGE_PIN U14  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[6]}]
14. set_property -dict { PACKAGE_PIN V14  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[7]}]
15. set_property -dict { PACKAGE_PIN V13  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[8]}]
16. set_property -dict { PACKAGE_PIN V3  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[9]}]
17. set_property -dict { PACKAGE_PIN W3  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[10]}]
18. set_property -dict { PACKAGE_PIN U3  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[11]}]
19. set_property -dict { PACKAGE_PIN P3  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[12]}]
20. set_property -dict { PACKAGE_PIN N3  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[13]}]
21. set_property -dict { PACKAGE_PIN P1  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[14]}]
22. set_property -dict { PACKAGE_PIN L1  IOSTANDARD LVCMOS33 } [get_ports
{o_led_tri_io[15]}]
```

23. ##USB-RS232 Interface

```
24. set_property -dict { PACKAGE_PIN B18  IOSTANDARD LVCMOS33 }
[get_ports usb_uart_rxd]
25. set_property -dict { PACKAGE_PIN A18  IOSTANDARD LVCMOS33 }
[get_ports usb_uart_txd]
```

26. ## Configuration options, can be used for all designs

```
27. set_property CONFIG_VOLTAGE 3.3 [current_design]
28. set_property CFGBVS VCCO [current_design]
```

29. ## SPI configuration mode options for QSPI boot, can be used for all designs

```
30. set_property BITSTREAM.GENERAL.COMPRESS TRUE [current_design]
31. set_property BITSTREAM.CONFIG.CONFIGRATE 33 [current_design]
32. set_property CONFIG_MODE SPIx4 [current_design]
```

Microblaze Led and Uart Design

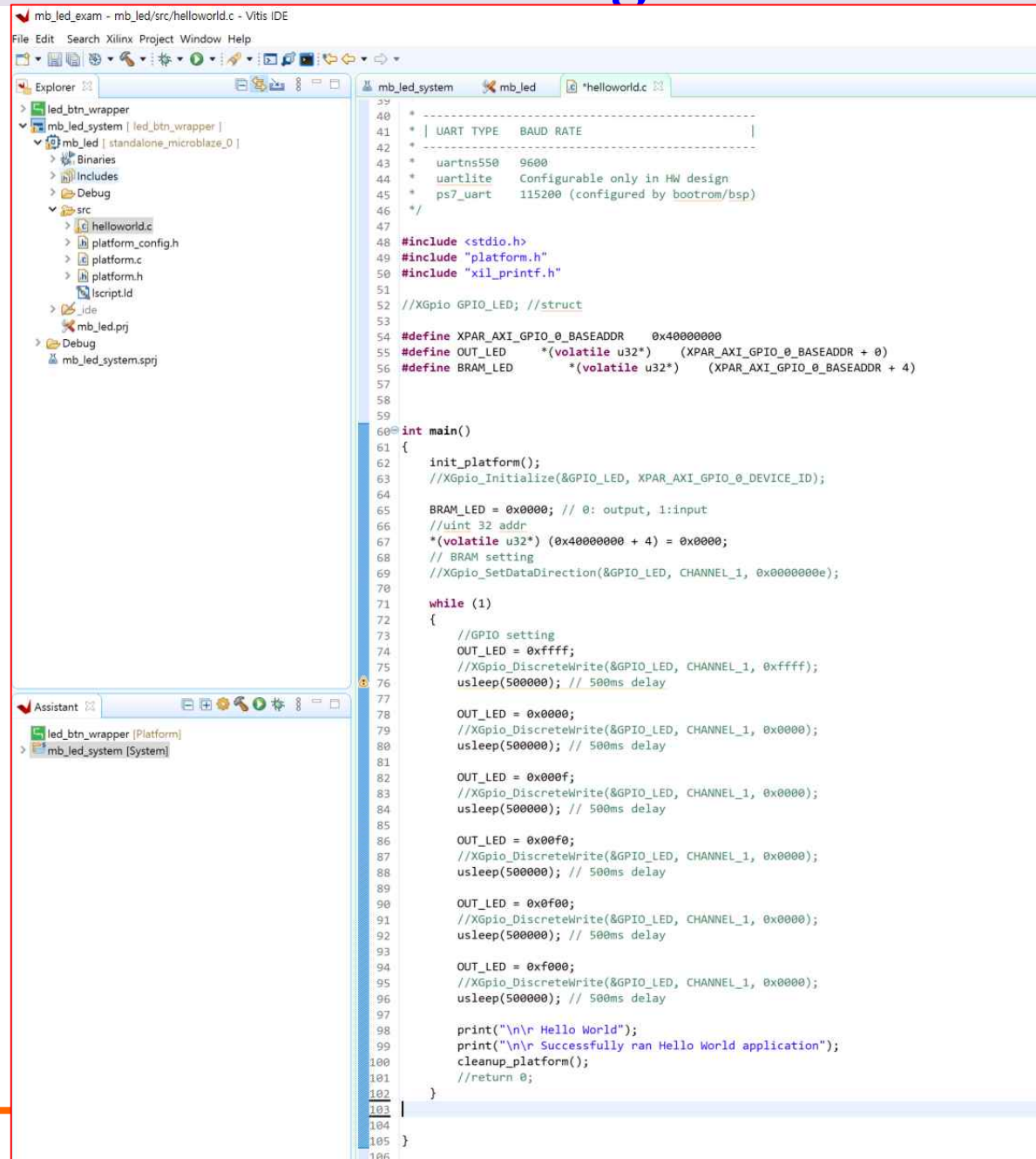
[Vitis Application SW]

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart

Design ➔ Vitis ➔ Helloworld.c



```
mb_led_exam - mb_led/src/helloworld.c - Vitis IDE
File Edit Search Xilinx Project Window Help

Explorer
> led_btn_wrapper
> mb_led_system [led_btn_wrapper]
  > standalone_microblaze_0 [ ]
    > Binaries
    > Includes
    > Debug
    > src
      > helloworld.c
      > platform_config.h
      > platform.c
      > platform.h
      > Iscript.ld
    > _ide
    > mb_led.prj
    > Debug
    > mb_led_system.sprj

Assistant
> led_btn_wrapper [Platform]
> mb_led_system [System]

helloworld.c
39
40
41 * | UART TYPE  BAUD RATE  |
42 *
43 * uarts550  9600
44 * uartslite Configurable only in HW design
45 * ps7_uart  115200 (configured by bootrom/bsp)
46 */
47
48 #include <stdio.h>
49 #include "platform.h"
50 #include "xil_printf.h"
51
52 //XGpio GPIO_LED; //struct
53
54 #define XPAR_AXI_GPIO_0_BASEADDR  0x40000000
55 #define OUT_LED    *(volatile u32*) (XPAR_AXI_GPIO_0_BASEADDR + 0)
56 #define BRAM_LED   *(volatile u32*) (XPAR_AXI_GPIO_0_BASEADDR + 4)
57
58
59
60 int main()
61 {
62     init_platform();
63     //XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);
64
65     BRAM_LED = 0x0000; // 0: output, 1:input
66     //uint 32 addr
67     *(volatile u32*) (0x40000000 + 4) = 0x0000;
68     // BRAM setting
69     //XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
70
71     while (1)
72     {
73         //GPIO setting
74         OUT_LED = 0xffff;
75         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xffff);
76         usleep(500000); // 500ms delay
77
78         OUT_LED = 0x0000;
79         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
80         usleep(500000); // 500ms delay
81
82         OUT_LED = 0x000f;
83         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
84         usleep(500000); // 500ms delay
85
86         OUT_LED = 0x00f0;
87         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
88         usleep(500000); // 500ms delay
89
90         OUT_LED = 0x0f00;
91         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
92         usleep(500000); // 500ms delay
93
94         OUT_LED = 0xf000;
95         //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
96         usleep(500000); // 500ms delay
97
98         print("\n\r Hello World");
99         print("\n\r Successfully ran Hello World application");
100        cleanup_platform();
101        //return 0;
102    }
103
104
105 }
```


Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ Vitis ➔ Helloworld.c

```
1. #include <stdio.h>
2. #include "platform.h"
3. #include "xil_printf.h"

4. //XGpio GPIO_LED; //struct

5. #define XPAR_AXI_GPIO_0_BASEADDR      0x40000000

6. #define OUT_LED *(volatile u32*) (XPAR_AXI_GPIO_0_BASEADDR + 0)
7. #define BRAM_LED *(volatile u32*) (XPAR_AXI_GPIO_0_BASEADDR + 4)

8. int main()
9. {
10.    init_platform();

11.    //XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);

12.    BRAM_LED = 0x0000; // 0: output, 1:input

13.    //uint 32 addr
14.    *(volatile u32*) (0x40000000 + 4) = 0x0000;
15.    // BRAM setting
16.    //XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
```

```
17. while (1)
18. {
19.     //GPIO setting
20.     OUT_LED = 0xffff;
21.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xffff);
22.     usleep(500000); // 500ms delay

23.     OUT_LED = 0x0000;
24.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
25.     usleep(500000); // 500ms delay

26.     OUT_LED = 0x000f;
27.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
28.     usleep(500000); // 500ms delay

29.     OUT_LED = 0x00f0;
30.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
31.     usleep(500000); // 500ms delay

32.     OUT_LED = 0x0f00;
33.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
34.     usleep(500000); // 500ms delay

35.     OUT_LED = 0xf000;
36.     //XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
37.     usleep(500000); // 500ms delay

38.     print("\n\r Hello World");
39.     print("\n\r Successfully ran Hello World application");
40.     cleanup_platform();
41.     //return 0;
42. }

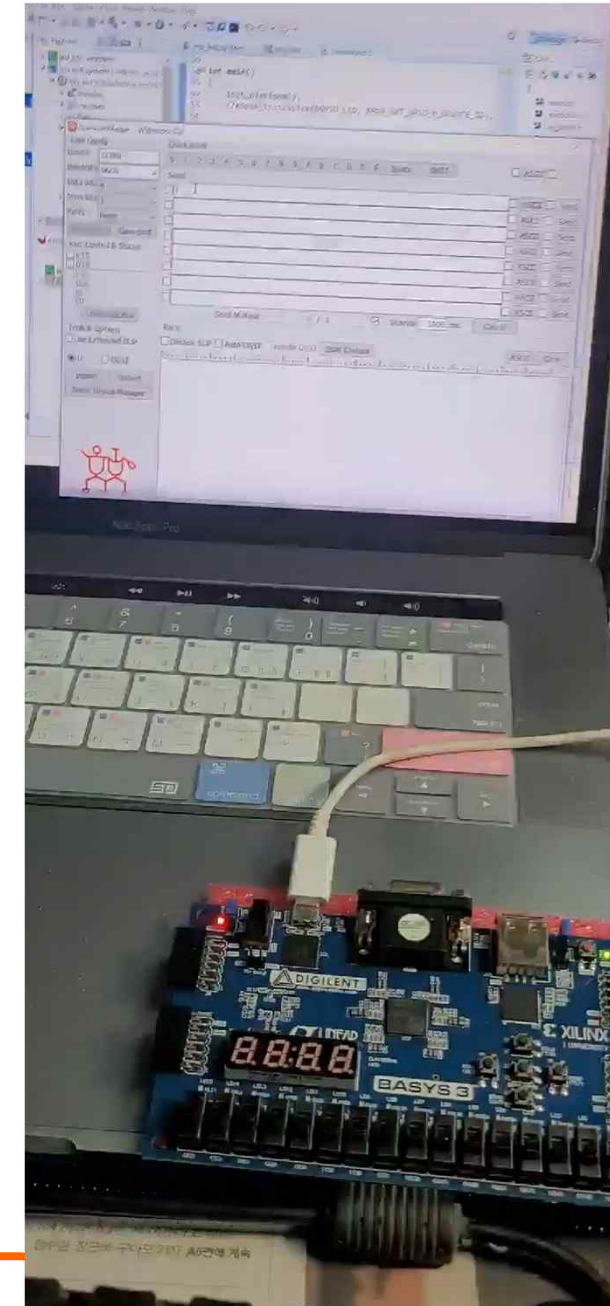
43. }
```

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ Vitis ➔ Helloworld.c

▪ Build Project ➔ Program Device



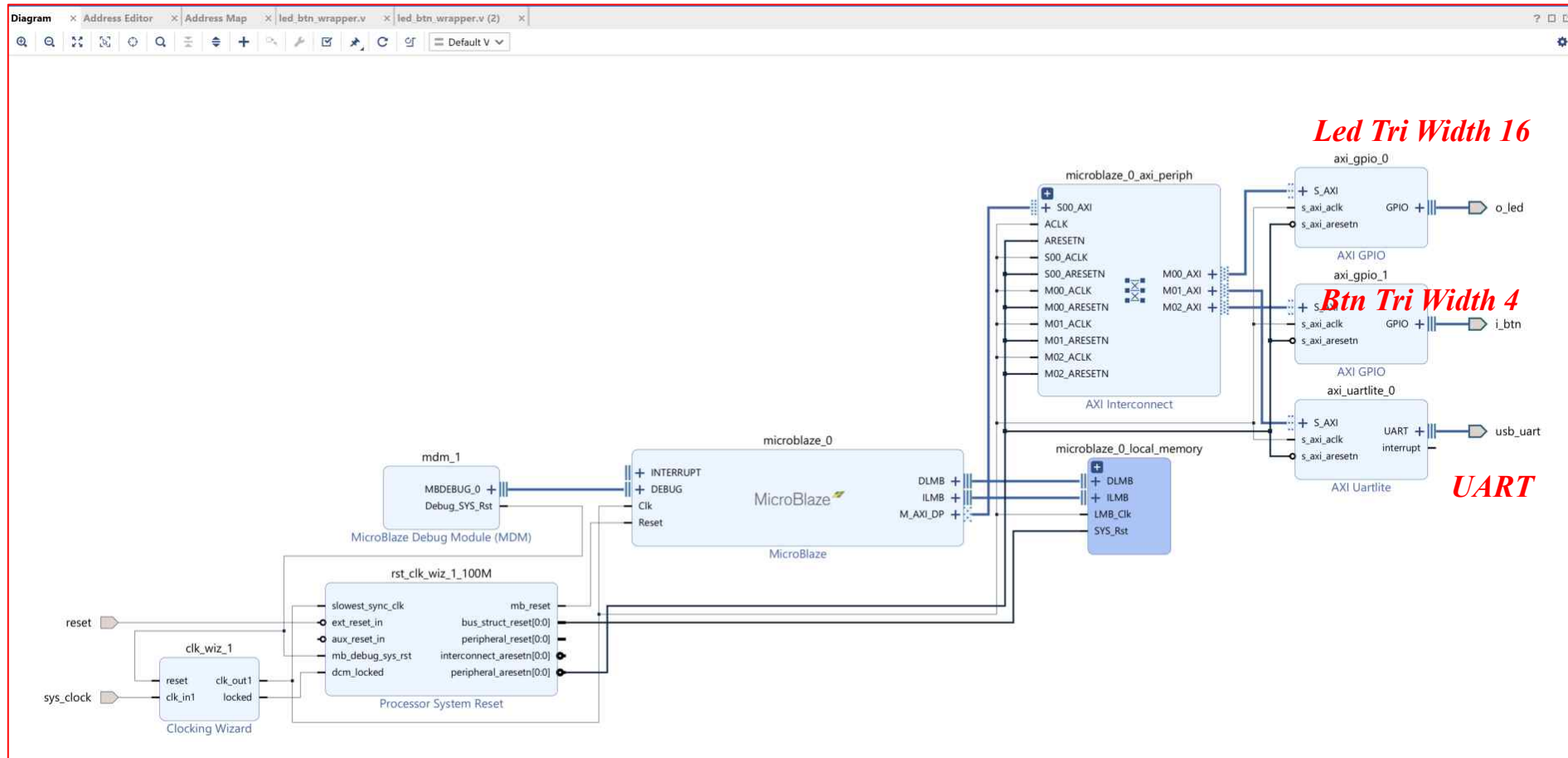
Microblaze Led , Button and Uart Design

[Microblaze Led , Uart and Button Design(1)]

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ Block Design



Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ HDL Wrapper

The screenshot displays the Xilinx Vivado IDE interface for a project named "BLOCK DESIGN - led_btn". The left sidebar shows the "Sources" pane with a hierarchy of design sources: "led_btn_wrapper (led_btn_wrapper.v) (1)", "led_btn_i : led_btn (led_btn.bd) (1)", and "led_btn (led_btn.v) (10)". Below this is the "Constraints" pane showing "constrs_1 (1)" and "Basys-3-Master.xdc". The "Simulation Sources" pane shows "sim_1 (2)" with "led_btn_wrapper (led_btn_wrapper.v) (1)", "led_btn_i : led_btn (led_btn.bd) (1)", and "led_btn (led_btn.v) (10)". The "Utility Sources" pane shows "Utility Sources (1)".

The main editor area shows the "Diagram" tab with the "led_btn_wrapper.v" file open. The code is a Verilog HDL wrapper for the "led_btn" block. It includes a copyright notice, tool version information, and a timescale of 1 ps / 1 ps. The module "led_btn_wrapper" has inputs for "i_btn_tri_io", "o_led_tri_io", "reset", "sys_clock", "usb_uart_rxd", and "usb_uart_txd". It also has an output for "usb_uart_txd". The code defines several wires for the internal signals and connects them to the "led_btn" block.

The "Source File Properties" pane for "led_btn_wrapper.v" shows the following details:

- Location: c:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.gen/sources_1/bd/led_btn/hdl/led_btn_wrapper.v
- Type: Verilog
- Library: xil_defaultlib
- Size: 6.9 KB
- Modified: Today at 21:39:12 PM
- Copied to: c:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.gen/sources_1/bd/led_btn/hdl/led_btn_wrapper.v

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ Port(Pin) Mapping(xdc)

```
Diagram | Address Editor | Address Map | Basys-3-Master.xdc | led_btn_wrapper.v |  
C:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.srcs/constrs_1/imports/digilent-xdc-master/Basys-3-Master.xdc  
1 ## This file is a general .xdc for the Basys3 rev B board  
2 ## To use it in a project:  
3 ## - uncomment the lines corresponding to used pins  
4 ## - rename the used ports (in each line, after get_ports) according to the top level signal name  
5  
6 ## Clock signal  
7 set_property -dict { PACKAGE_PIN W5 IOSTANDARD LVCMOS33 } [get_ports sys_clock]  
8 create_clock -add -name sys_clk_pin -period 10.00 -waveform {0 5} [get_ports sys_clock]  
9  
10  
11 ## Switches  
12 set_property -dict { PACKAGE_PIN V17 IOSTANDARD LVCMOS33 } [get_ports {sw[0]}]  
13 set_property -dict { PACKAGE_PIN V18 IOSTANDARD LVCMOS33 } [get_ports {sw[1]}]  
14 set_property -dict { PACKAGE_PIN W18 IOSTANDARD LVCMOS33 } [get_ports {sw[2]}]  
15 set_property -dict { PACKAGE_PIN W17 IOSTANDARD LVCMOS33 } [get_ports {sw[3]}]  
16 set_property -dict { PACKAGE_PIN W15 IOSTANDARD LVCMOS33 } [get_ports {sw[4]}]  
17 set_property -dict { PACKAGE_PIN V15 IOSTANDARD LVCMOS33 } [get_ports {sw[5]}]  
18 set_property -dict { PACKAGE_PIN W14 IOSTANDARD LVCMOS33 } [get_ports {sw[6]}]  
19 set_property -dict { PACKAGE_PIN W13 IOSTANDARD LVCMOS33 } [get_ports {sw[7]}]  
20 set_property -dict { PACKAGE_PIN V2 IOSTANDARD LVCMOS33 } [get_ports {sw[8]}]  
21 set_property -dict { PACKAGE_PIN T3 IOSTANDARD LVCMOS33 } [get_ports {sw[9]}]  
22 set_property -dict { PACKAGE_PIN T2 IOSTANDARD LVCMOS33 } [get_ports {sw[10]}]  
23 set_property -dict { PACKAGE_PIN R3 IOSTANDARD LVCMOS33 } [get_ports {sw[11]}]  
24 set_property -dict { PACKAGE_PIN R2 IOSTANDARD LVCMOS33 } [get_ports {sw[12]}]  
25 set_property -dict { PACKAGE_PIN U1 IOSTANDARD LVCMOS33 } [get_ports {sw[13]}]  
26 set_property -dict { PACKAGE_PIN T1 IOSTANDARD LVCMOS33 } [get_ports {sw[14]}]  
27 set_property -dict { PACKAGE_PIN R2 IOSTANDARD LVCMOS33 } [get_ports {reset}]  
28  
29  
30 ## LEDs  
31 set_property -dict { PACKAGE_PIN U16 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[0]}]  
32 set_property -dict { PACKAGE_PIN E19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[1]}]  
33 set_property -dict { PACKAGE_PIN U19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[2]}]  
34 set_property -dict { PACKAGE_PIN V19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[3]}]  
35 set_property -dict { PACKAGE_PIN W18 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[4]}]  
36 set_property -dict { PACKAGE_PIN U15 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[5]}]  
37 set_property -dict { PACKAGE_PIN U14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[6]}]  
38 set_property -dict { PACKAGE_PIN V14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[7]}]  
39 set_property -dict { PACKAGE_PIN V13 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[8]}]  
40 set_property -dict { PACKAGE_PIN V3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[9]}]  
41 set_property -dict { PACKAGE_PIN W3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[10]}]  
42 set_property -dict { PACKAGE_PIN U3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[11]}]  
43 set_property -dict { PACKAGE_PIN P3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[12]}]  
44 set_property -dict { PACKAGE_PIN P1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[13]}]  
45 set_property -dict { PACKAGE_PIN P1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[14]}]  
46 set_property -dict { PACKAGE_PIN L1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[15]}]  
47  
48  
49 ##7 Segment Display  
50 set_property -dict { PACKAGE_PIN W7 IOSTANDARD LVCMOS33 } [get_ports {seg[0]}]  
51 set_property -dict { PACKAGE_PIN W6 IOSTANDARD LVCMOS33 } [get_ports {seg[1]}]  
52 set_property -dict { PACKAGE_PIN U8 IOSTANDARD LVCMOS33 } [get_ports {seg[2]}]  
53 set_property -dict { PACKAGE_PIN V8 IOSTANDARD LVCMOS33 } [get_ports {seg[3]}]  
54 set_property -dict { PACKAGE_PIN U5 IOSTANDARD LVCMOS33 } [get_ports {seg[4]}]  
55 set_property -dict { PACKAGE_PIN V5 IOSTANDARD LVCMOS33 } [get_ports {seg[5]}]  
56 set_property -dict { PACKAGE_PIN U7 IOSTANDARD LVCMOS33 } [get_ports {seg[6]}]  
57  
58 set_property -dict { PACKAGE_PIN V7 IOSTANDARD LVCMOS33 } [get_ports {d0}]  
59  
60 set_property -dict { PACKAGE_PIN U2 IOSTANDARD LVCMOS33 } [get_ports {an[0]}]  
61 set_property -dict { PACKAGE_PIN U4 IOSTANDARD LVCMOS33 } [get_ports {an[1]}]  
62 set_property -dict { PACKAGE_PIN V4 IOSTANDARD LVCMOS33 } [get_ports {an[2]}]  
63 set_property -dict { PACKAGE_PIN W4 IOSTANDARD LVCMOS33 } [get_ports {an[3]}]  
64  
65  
66 ##Buttons  
67 set_property -dict { PACKAGE_PIN U18 IOSTANDARD LVCMOS33 } [get_ports {btn0}]  
68 set_property -dict { PACKAGE_PIN T18 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[0]}]  
69 set_property -dict { PACKAGE_PIN W19 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[1]}]  
70 set_property -dict { PACKAGE_PIN T17 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[2]}]  
71 set_property -dict { PACKAGE_PIN U17 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[3]}]  
72  
73  
74 ##Pmod Header JA  
75 set_property -dict { PACKAGE_PIN J1 IOSTANDARD LVCMOS33 } [get_ports {JA[0]}] #Sch name = JA1  
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Microblaze Led , Button and Uart Design

[Vitis Application SW]

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ Vitis ➔ Helloworld.c

```
mb_led_btn_system mb_led_btn *helloworld.c xgpio_i.h platform.h
37 * PS7 UART (Zynq) is not initialized by this application, since
38 * bootrom/bsp configures it to baud rate 115200
39 *
40 * -----
41 * | UART TYPE    BAUD RATE
42 * -----
43 * | uarts550     9600
44 * | uartlite     Configurable only in HW design
45 * | ps7_uart     115200 (configured by bootrom/bsp)
46 */
47
48 #include <stdio.h>
49 #include "platform.h"
50 #include "xil_printf.h"
51 #include "xgpio.h"
52 #include "xparameters.h"
53
54 #define CHANNEL_1 1
55 #define CHANNEL_2 2
56
57 #define BTN_UP 0
58 #define BTN_LEFT 1
59 #define BTN_RIGHT 2
60 #define BTN_DOWN 3
61
62 XGpio GPIO_LED;
63 XGpio GPIO_BTN;
64
65 int main()
66 {
67     init_platform();
68
69
70     XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);
71     XGpio_Initialize(&GPIO_BTN, XPAR_AXI_GPIO_1_DEVICE_ID);
72     // XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
73     XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x00000000);
74     XGpio_SetDataDirection(&GPIO_BTN, CHANNEL_1, 0x0000000f);
75
76
77
```

```
mb_led_btn_system mb_led_btn *helloworld.c xgpio_i.h platform.h platform_config
84     usleep(500000);
85
86     XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
87     usleep(500000);
88
89     print("Hello World\n\r");
90     print("Successfully ran Hello World application");
91     cleanup_platform();
92     return 0;
93
94 }
95
96
97 while (1)
98 {
99     //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 1){ // BTN_UP
100    //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 2){ // BTN_LEFT
101    //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 4){ // BTN_RIGHT
102    if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 8){ // BTN_DOWN
103        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xffff);
104        usleep(500000); // 500ms delay
105        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
106        usleep(500000); // 500ms delay
107        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x000f);
108        usleep(500000); // 500ms delay
109        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x00f0);
110        usleep(500000); // 500ms delay
111        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0f00);
112        usleep(500000); // 500ms delay
113        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xf000);
114        usleep(500000); // 500ms delay
115
116        print("Hello World\n\r");
117        print("Successfully ran Hello World application");
118        cleanup_platform();
119        return 0;
120    }
121    else {
122        XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x1111);
123        usleep(500000); // 500ms delay
124
125    }
126
```

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ *Microblaze Led and Uart Design ➔ Vitis ➔ Helloworld.c*

```

1.  #include <stdio.h>
2.  #include "platform.h"
3.  #include "xil_printf.h"
4.  #include "xgpio.h"
5.  #include "xparameters.h"

6.  #define CHANNEL_1          1
7.  #define CHANNEL_2          2

8.  #define BTN_UP              0
9.  #define BTN_LEFT           1
10. #define BTN_RIGHT          2
11. #define BTN_DOWN           3

12. XGpio GPIO_LED;
13. XGpio GPIO_BTN;

14. int main()
15. {
16.     init_platform();

17.     XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);
18.     XGpio_Initialize(&GPIO_BTN, XPAR_AXI_GPIO_1_DEVICE_ID);
19.     // XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
20.     XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x00000000);
21.     XGpio_SetDataDirection(&GPIO_BTN, CHANNEL_1, 0x0000000f);

```

```

23. while (1)
24. {
25.     //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 1){ //
BTN_UP
26.     //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 2){ //
BTN_LEFT
27.     //if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 4){ //
BTN_RIGHT
28.     if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) == 8){ //
BTN_DOWN
29.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xffff);
30.         usleep(500000); // 500ms delay
31.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
32.         usleep(500000); // 500ms delay
33.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x000f);
34.         usleep(500000); // 500ms delay
35.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x00f0);
36.         usleep(500000); // 500ms delay
37.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0f00);
38.         usleep(500000); // 500ms delay
39.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xf000);
40.         usleep(500000); // 500ms delay

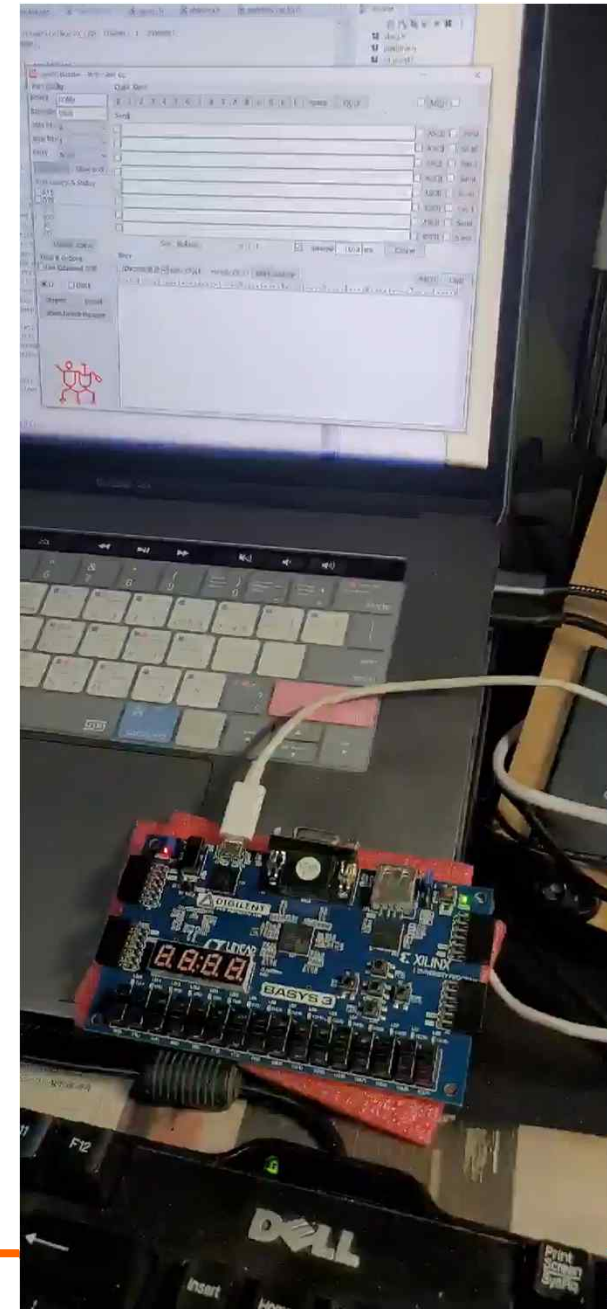
41.         print("Hello World\n\r");
42.         print("Successfully ran Hello World application");
43.         cleanup_platform();
44.         //
45.         return 0;
46.     }
47.     else {
48.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x1111);
49.         usleep(500000); // 500ms delay
50.     }
51. }
52. }

```

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

- Microblaze Led , Btn and Uart Design ➔ Vitis ➔ Helloworld.c
 - Build Project ➔ Program Device



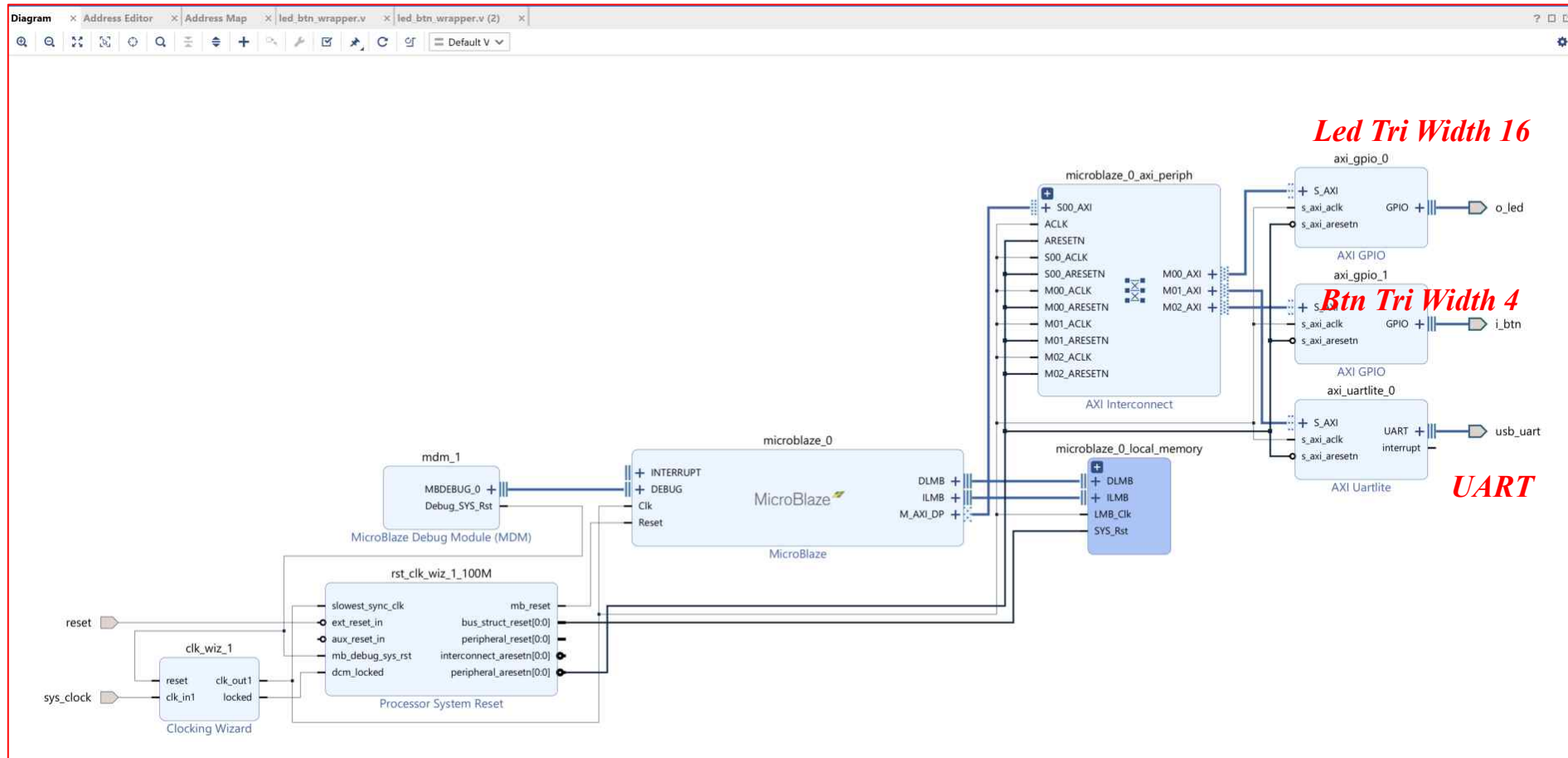
Microblaze Led , Button and Uart Design

[Microblaze Led , Uart and Button Design(2)]

Microblaze Led , Button and Uart Design

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mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ Block Design



Microblaze Led , Button and Uart Design

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➤ *Microblaze Led , Button & Uart Design ➔ HDL Wrapper*

The screenshot displays the Xilinx Vivado IDE interface. On the left, the 'Sources' pane shows a project hierarchy for 'led_btn_wrapper'. The 'Design Sources' section includes 'led_btn_wrapper (led_btn_wrapper.v) (1)', which contains 'led_btn_i: led_btn (led_btn.bd) (1)' and 'led_btn (led_btn.v) (10)'. The 'Constraints' section shows 'constrs_1 (1)' with 'Basys-3-Master.xdc'. The 'Simulation Sources' section shows 'sim_1 (2)' with 'led_btn_wrapper (led_btn_wrapper.v) (1)', which contains 'led_btn_i: led_btn (led_btn.bd) (1)' and 'led_btn (led_btn.v) (10)'. The 'Utility Sources' section shows 'led_btn_wrapper (led_btn_wrapper.v)'. Below the 'Sources' pane is the 'Hierarchy' pane, which shows 'IP Sources', 'Libraries', and 'Compile Order'. The 'Source File Properties' pane shows the properties for 'led_btn_wrapper.v', including 'Location: c:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.gen', 'Type: Verilog', 'Library: xil_defaultlib', 'Size: 6.9 KB', 'Modified: Today at 21:39:12 PM', and 'Copied to: c:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.gen'. On the right, the 'Diagram' pane shows the Verilog code for 'led_btn_wrapper.v'. The code includes a copyright notice, tool version information, and a module declaration for 'led_btn_wrapper'. The module has inputs 'i_btn_tri_io', 'o_led_tri_io', and 'reset', and outputs 'sys_clock', 'usb_uart_rxd', and 'usb_uart_txd'. The code also includes signal assignments for 'i_btn_tri_io', 'o_led_tri_io', and 'sys_clock'.

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design ➔ Port(Pin) Mapping(xdc)

```
Diagram | Address Editor | Address Map | Basys-3-Master.xdc | led_btn_wrapper.v |  
C:/Xilinx/2022/mb_led_btn_Exam/mb_led_btn_Exam.srcs/constrs_1/imports/digilent-xdc-master/Basys-3-Master.xdc  
1 ## This file is a general .xdc for the Basys3 rev B board  
2 ## To use it in a project:  
3 ## - uncomment the lines corresponding to used pins  
4 ## - rename the used ports (in each line, after get_ports) according to the top level signal na  
5  
6 ## Clock signal  
7 set_property -dict { PACKAGE_PIN W5 IOSTANDARD LVCMOS33 } [get_ports sys_clock]  
8 create_clock -add -name sys_clk_pin -period 10.00 -waveform {0 5} [get_ports sys_clock]  
9  
10  
11 ## Switches  
12 set_property -dict { PACKAGE_PIN V17 IOSTANDARD LVCMOS33 } [get_ports {sw[0]}]  
13 set_property -dict { PACKAGE_PIN V18 IOSTANDARD LVCMOS33 } [get_ports {sw[1]}]  
14 set_property -dict { PACKAGE_PIN W18 IOSTANDARD LVCMOS33 } [get_ports {sw[2]}]  
15 set_property -dict { PACKAGE_PIN W17 IOSTANDARD LVCMOS33 } [get_ports {sw[3]}]  
16 set_property -dict { PACKAGE_PIN W15 IOSTANDARD LVCMOS33 } [get_ports {sw[4]}]  
17 set_property -dict { PACKAGE_PIN V15 IOSTANDARD LVCMOS33 } [get_ports {sw[5]}]  
18 set_property -dict { PACKAGE_PIN W14 IOSTANDARD LVCMOS33 } [get_ports {sw[6]}]  
19 set_property -dict { PACKAGE_PIN W13 IOSTANDARD LVCMOS33 } [get_ports {sw[7]}]  
20 set_property -dict { PACKAGE_PIN V2 IOSTANDARD LVCMOS33 } [get_ports {sw[8]}]  
21 set_property -dict { PACKAGE_PIN T3 IOSTANDARD LVCMOS33 } [get_ports {sw[9]}]  
22 set_property -dict { PACKAGE_PIN T2 IOSTANDARD LVCMOS33 } [get_ports {sw[10]}]  
23 set_property -dict { PACKAGE_PIN R3 IOSTANDARD LVCMOS33 } [get_ports {sw[11]}]  
24 set_property -dict { PACKAGE_PIN R2 IOSTANDARD LVCMOS33 } [get_ports {sw[12]}]  
25 set_property -dict { PACKAGE_PIN U1 IOSTANDARD LVCMOS33 } [get_ports {sw[13]}]  
26 set_property -dict { PACKAGE_PIN T1 IOSTANDARD LVCMOS33 } [get_ports {sw[14]}]  
27 set_property -dict { PACKAGE_PIN R2 IOSTANDARD LVCMOS33 } [get_ports {reset}]  
28  
29  
30 ## LEDs  
31 set_property -dict { PACKAGE_PIN U16 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[0]}]  
32 set_property -dict { PACKAGE_PIN E19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[1]}]  
33 set_property -dict { PACKAGE_PIN U19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[2]}]  
34 set_property -dict { PACKAGE_PIN V19 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[3]}]  
35 set_property -dict { PACKAGE_PIN W18 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[4]}]  
36 set_property -dict { PACKAGE_PIN U15 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[5]}]  
37 set_property -dict { PACKAGE_PIN U14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[6]}]  
38 set_property -dict { PACKAGE_PIN V14 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[7]}]  
39 set_property -dict { PACKAGE_PIN V13 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[8]}]  
40 set_property -dict { PACKAGE_PIN V3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[9]}]  
41 set_property -dict { PACKAGE_PIN W3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[10]}]  
42 set_property -dict { PACKAGE_PIN U3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[11]}]  
43 set_property -dict { PACKAGE_PIN P3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[12]}]  
44 set_property -dict { PACKAGE_PIN N3 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[13]}]  
45 set_property -dict { PACKAGE_PIN P1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[14]}]  
46 set_property -dict { PACKAGE_PIN L1 IOSTANDARD LVCMOS33 } [get_ports {o_led_tri_io[15]}]  
47  
48  
49 ##7 Segment Display  
50 set_property -dict { PACKAGE_PIN W7 IOSTANDARD LVCMOS33 } [get_ports {seg[0]}]  
51 set_property -dict { PACKAGE_PIN W6 IOSTANDARD LVCMOS33 } [get_ports {seg[1]}]  
52 set_property -dict { PACKAGE_PIN U8 IOSTANDARD LVCMOS33 } [get_ports {seg[2]}]  
53 set_property -dict { PACKAGE_PIN V8 IOSTANDARD LVCMOS33 } [get_ports {seg[3]}]  
54 set_property -dict { PACKAGE_PIN U5 IOSTANDARD LVCMOS33 } [get_ports {seg[4]}]  
55 set_property -dict { PACKAGE_PIN V5 IOSTANDARD LVCMOS33 } [get_ports {seg[5]}]  
56 set_property -dict { PACKAGE_PIN U7 IOSTANDARD LVCMOS33 } [get_ports {seg[6]}]  
57  
58 set_property -dict { PACKAGE_PIN V7 IOSTANDARD LVCMOS33 } [get_ports {d0}]  
59  
60 set_property -dict { PACKAGE_PIN U2 IOSTANDARD LVCMOS33 } [get_ports {an[0]}]  
61 set_property -dict { PACKAGE_PIN U4 IOSTANDARD LVCMOS33 } [get_ports {an[1]}]  
62 set_property -dict { PACKAGE_PIN V4 IOSTANDARD LVCMOS33 } [get_ports {an[2]}]  
63 set_property -dict { PACKAGE_PIN W4 IOSTANDARD LVCMOS33 } [get_ports {an[3]}]  
64  
65  
66 ##Buttons  
67 set_property -dict { PACKAGE_PIN U18 IOSTANDARD LVCMOS33 } [get_ports {btn0}]  
68 set_property -dict { PACKAGE_PIN T18 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[0]}]  
69 set_property -dict { PACKAGE_PIN W19 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[1]}]  
70 set_property -dict { PACKAGE_PIN T17 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[2]}]  
71 set_property -dict { PACKAGE_PIN U17 IOSTANDARD LVCMOS33 } [get_ports {i_btn_tri_io[3]}]  
72  
73  
74 ##Pmod Header JA  
75 set_property -dict { PACKAGE_PIN J1 IOSTANDARD LVCMOS33 } [get_ports {JA[0]}] #Sch name = JA1  
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```

Microblaze Led , Button and Uart Design

[Vitis Application SW]

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Button & Uart Design

➔ Vitis ➔ Helloworld.c

```
mb_led_btn_system  mb_led_btn  *helloworld.c  xgpio_i.h  platform.h
37 * PS7 UART (Zynq) is not initialized by this application, since
38 * bootrom/bsp configures it to baud rate 115200
39 *
40 * -----
41 * | UART TYPE   BAUD RATE
42 * -----
43 * | uarts550    9600
44 * | uartrlite   Configurable only in HW design
45 * | ps7_uart    115200 (configured by bootrom/bsp)
46 */
47
48 #include <stdio.h>
49 #include "platform.h"
50 #include "xil_printf.h"
51 #include "xgpio.h"
52 #include "xparameters.h"
53
54 #define CHANNEL_1 1
55 #define CHANNEL_2 2
56
57 #define BTN_UP      0
58 #define BTN_LEFT   1
59 #define BTN_RIGHT   2
60 #define BTN_DOWN    3
61
62 XGpio GPIO_LED;
63 XGpio GPIO_BTN;
64
65 int main()
66 {
67     init_platform();
68
69     XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);
70     XGpio_Initialize(&GPIO_BTN, XPAR_AXI_GPIO_1_DEVICE_ID);
71     // XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
72     XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x00000000);
73     XGpio_SetDataDirection(&GPIO_BTN, CHANNEL_1, 0x0000000f);
74
75
76
77
```

```
mb_led_btn_system  mb_led_btn  helloworld.c  xgpio_i.h  platform.h  platform_config.h
122 XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x1111);
123 usleep(500000); // 500ms delay
124
125 }
126 /
127 while (1)
128 {
129     if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_UP)){ // 0x0001&1 <<0
130         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x000f);
131         usleep(500000); // 500ms delay
132         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
133         usleep(500000); // 500ms delay
134         print("Hello World\n\r");
135         print("Successfully ran Hello World application");
136         cleanup_platform();
137         // return 0;
138     }
139     else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_LEFT)){ // 0x0001&1 <<1
140         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x00f0);
141         usleep(500000); // 500ms delay
142         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
143         usleep(500000); // 500ms delay
144         print("Hello World\n\r");
145         print("Successfully ran Hello World application");
146         cleanup_platform();
147         // return 0;
148     }
149     else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_RIGHT)){ // 0x0001&1 <<2
150         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0f00);
151         usleep(500000); // 500ms delay
152         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
153         usleep(500000); // 500ms delay
154         print("Hello World\n\r");
155         print("Successfully ran Hello World application");
156         cleanup_platform();
157         // return 0;
158     }
159     else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_DOWN)){ // 0x0001&1 <<3
160         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xf000);
161         usleep(500000); // 500ms delay
162         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
163         usleep(500000); // 500ms delay
164         print("Hello World\n\r");
165         print("Successfully ran Hello World application");
166         cleanup_platform();
167         // return 0;
168     }
169
170 }
171
172
```

Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led and Uart Design ➔ Vitis ➔ Helloworld.c

```
1. #include <stdio.h>
2. #include "platform.h"
3. #include "xil_printf.h"
4. #include "xgpio.h"
5. #include "xparameters.h"
```

```
6. #define CHANNEL_1      1
7. #define CHANNEL_2      2

8. #define BTN_UP         0
9. #define BTN_LEFT       1
10. #define BTN_RIGHT      2
11. #define BTN_DOWN       3
```

```
12. XGpio GPIO_LED;
13. XGpio GPIO_BTN;
```

```
14. int main()
15. {
16.     init_platform();
```

```
17.     XGpio_Initialize(&GPIO_LED, XPAR_AXI_GPIO_0_DEVICE_ID);
18.     XGpio_Initialize(&GPIO_BTN, XPAR_AXI_GPIO_1_DEVICE_ID);
19. //
```

```
    XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x0000000e);
20.    XGpio_SetDataDirection(&GPIO_LED, CHANNEL_1, 0x00000000);
21.    XGpio_SetDataDirection(&GPIO_BTN, CHANNEL_1, 0x0000000f);
```

```
23. while (1)
24. {
```

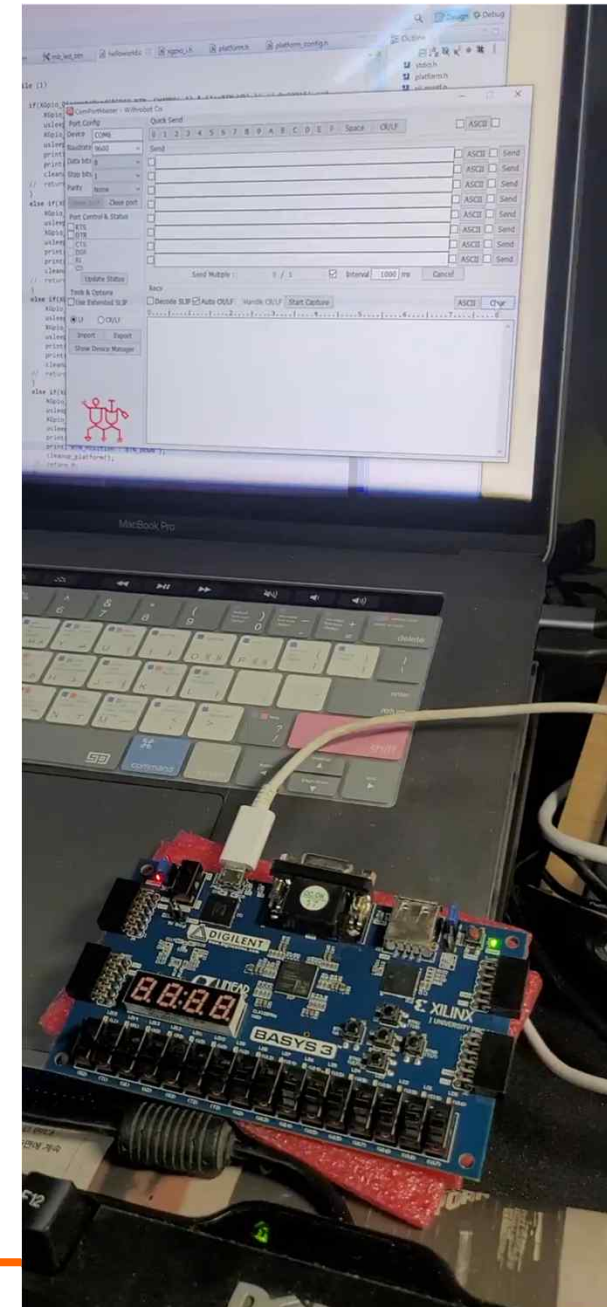
```
25.     if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_UP)) { // 0x0001 & 1 << 0
26.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x000f);
27.         usleep(500000); // 500ms delay
28.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
29.         usleep(500000); // 500ms delay
30.         print("Hello World\n\r");
31.         print("BTN_Position : BTN_UP");
32.         cleanup_platform();
33.         //
34.         return 0;
35.     } else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_LEFT)) { // 0x0001 & 1 << 1
36.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x00f0);
37.         usleep(500000); // 500ms delay
38.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
39.         usleep(500000); // 500ms delay
40.         print("Hello World\n\r");
41.         print("BTN_Position : BTN_LEFT");
42.         cleanup_platform();
43.         //
44.         return 0;
45.     } else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_RIGHT)) { // 0x0001 & 1 << 2
46.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0f00);
47.         usleep(500000); // 500ms delay
48.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
49.         usleep(500000); // 500ms delay
50.         print("Hello World\n\r");
51.         print("BTN_Position : BTN_RIGHT");
52.         cleanup_platform();
53.         //
54.         return 0;
55.     } else if(XGpio_DiscreteRead(&GPIO_BTN, CHANNEL_1) & (1<<BTN_DOWN)) { // 0x0001 & 1 << 3
56.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0xf000);
57.         usleep(500000); // 500ms delay
58.         XGpio_DiscreteWrite(&GPIO_LED, CHANNEL_1, 0x0000);
59.         usleep(500000); // 500ms delay
60.         print("Hello World\n\r");
61.         print("BTN_Position : BTN_DOWN");
62.         cleanup_platform();
63.         //
64.         return 0;
65.     }
66. }
```

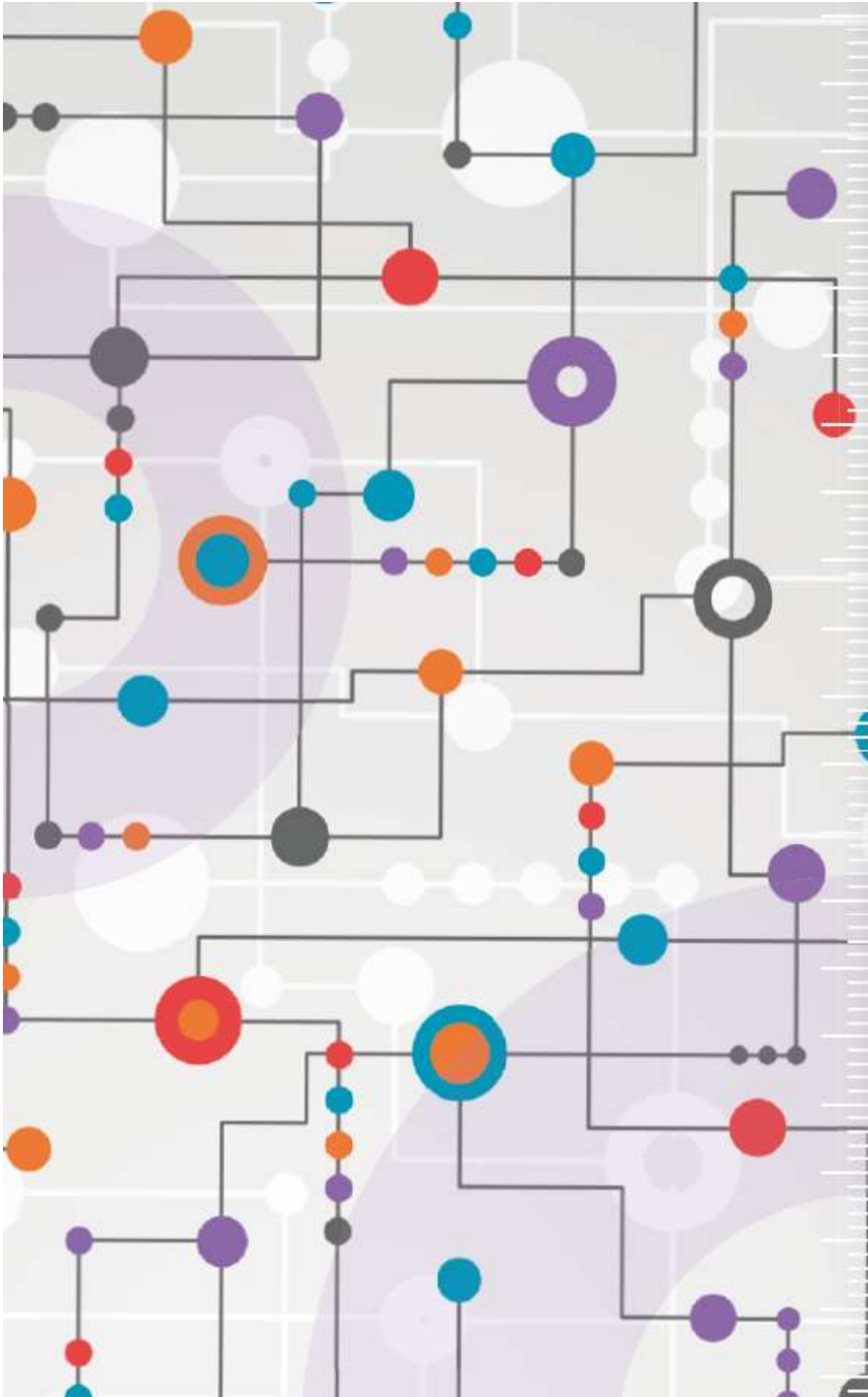
Microblaze Led , Button and Uart Design

mb_led_Exam.xpr
mb_led_btn_Exam.xpr

➤ Microblaze Led , Btn and Uart Design ➔ Vitis ➔ Helloworld.c

▪ Build Project ➔ Program Device





수고하셨습니다.