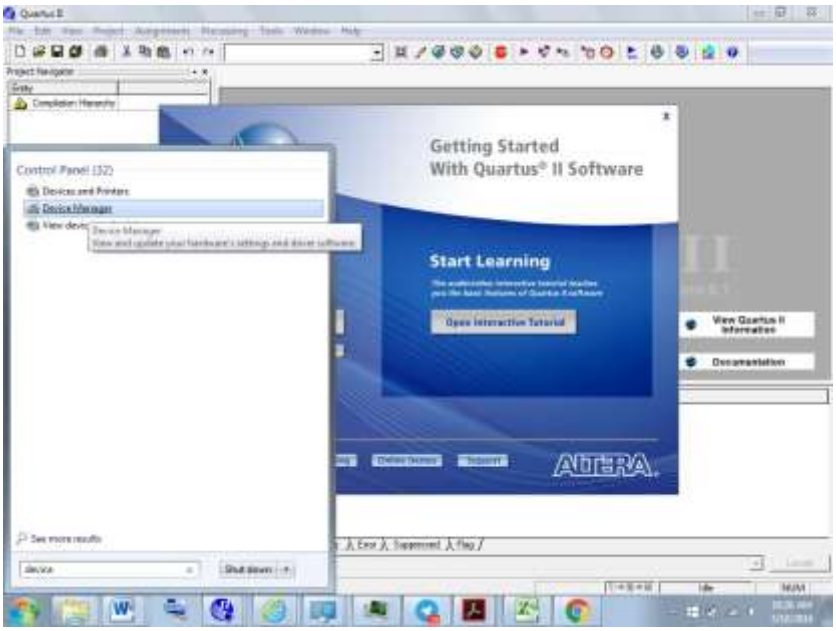
AN-GoLD-01

USB BLASTER TUTORIAL

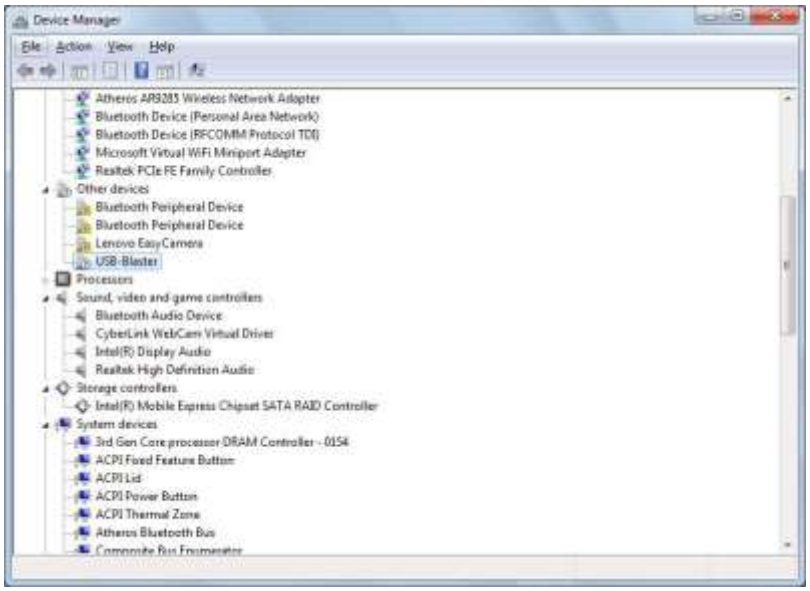
With Altera Quartus and EPM240 CPLD | Zuraimi Yahya

INSTALL THE DEVICE DRIVER

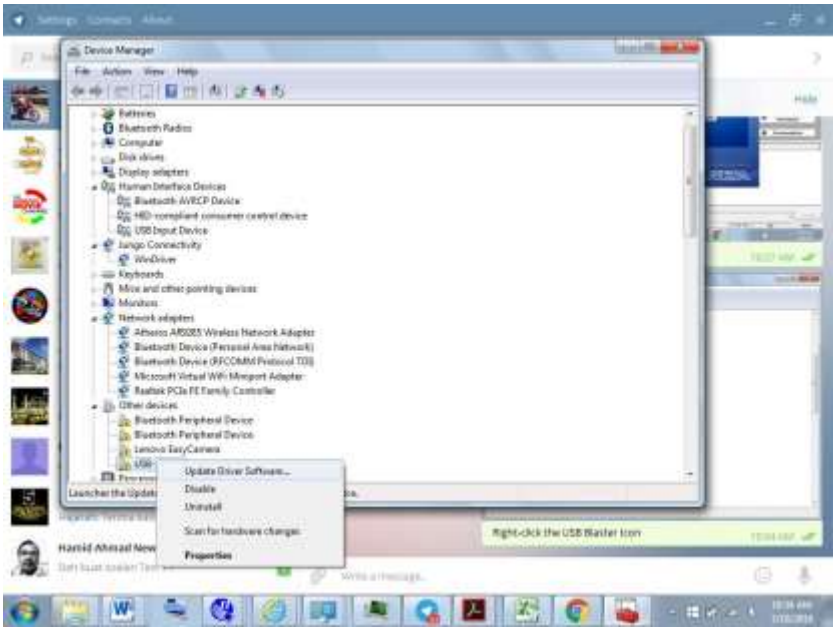
1. Connect USB Blaster to any USB connector
2. Open Device Manager by searching “device” from “Start Menu” if on windows 7 or Search Menu if on Windows 8 as shown below.



3. In Device Manager, Right-click the USB Blaster Icon



4. Select Update Driver.



5. In “Select Update Driver Software – USB Blaster” window: Select "Browse My computer for driver software"

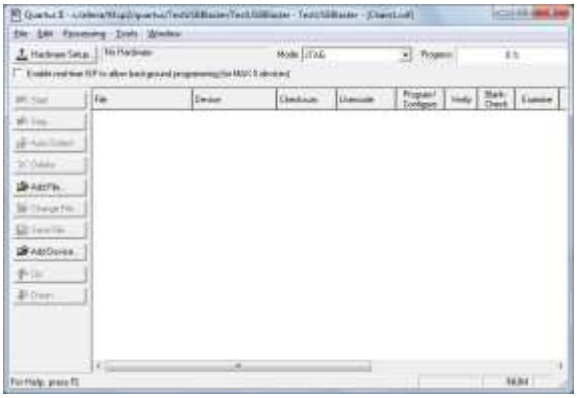
6. Browse to "C:\altera\91sp2\quartus\drivers\usb-blaster" folder and select “Next”. (Note: If the Quartus version is other than 9.1, browse under the particular version’s directory.

7. In Windows Security window: Select "Install"

8. Installation of device driver is complete when you get this dialog box.

GET QUARTUS TO RECOGNIZE USB BLASTER

9. Open Quartus 9.1 and Create project "TestUSBBlaster".
10. To connect Quartus 9.1 to the USB Blaster, select “**Tools|Programmer**”



11. Select "Hardware Setup"

12. Double-Click "USB Blaster"

Currently selected hardware will select “USB Blaster [USB-0]”

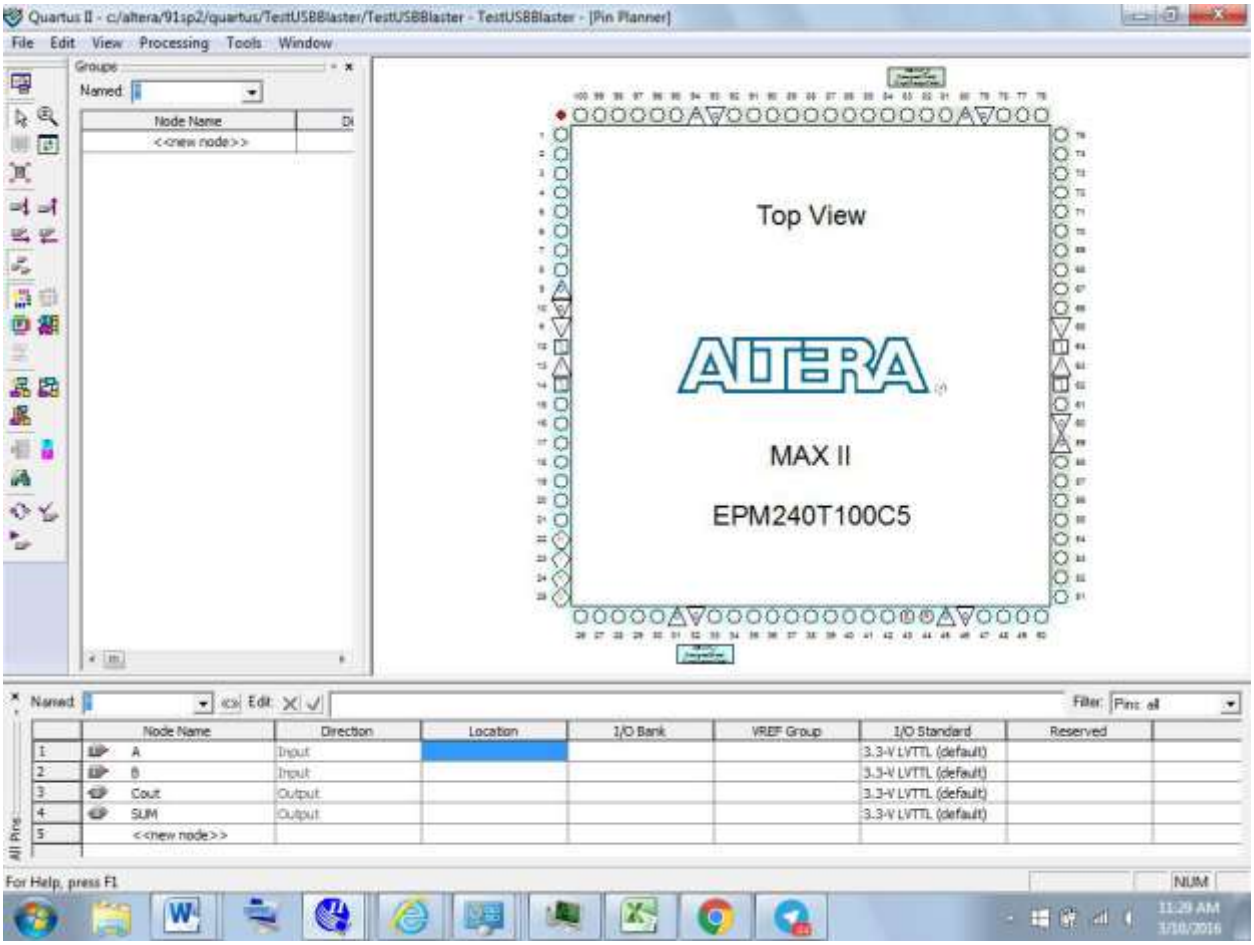
PREPARE BITSTREAM AND PIN ASSIGNMENT

13. Create the following Verilog HDL design:

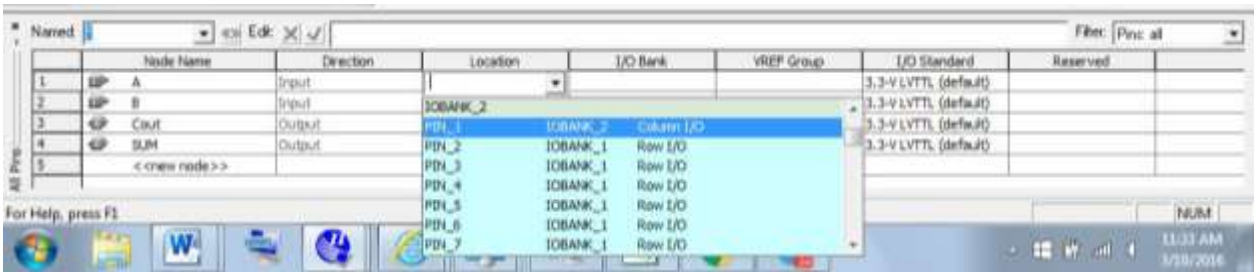
```
module TestUSBBlaster(A,B,Cout,SUM);
  input A,B;
  output Cout,SUM;
  assign SUM=A&B;
  assign Cout= A^B;
endmodule
```

14. Compile the design until you get no errors.

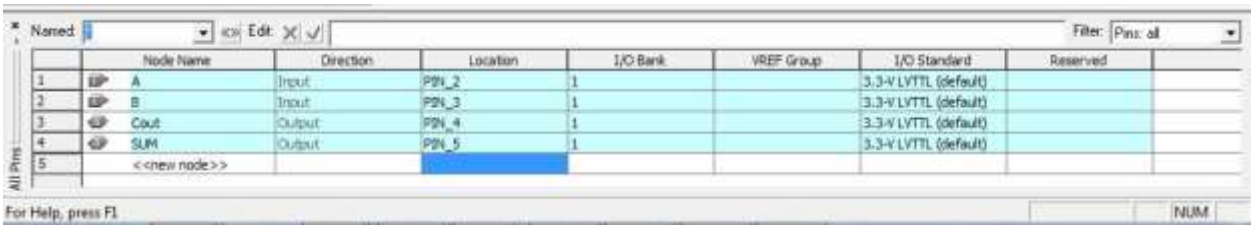
15. Before you program you must select the pins of else you will be programming nothing to the pins. To do so select **Assignment|Pin Planner**.



16. All pins with circle legend can be used as Input/Output pin to be connected to your Quartus design Input/Ouput Specification that is shown above.
17. On the lower box of the screen, under **Location** column, Double-Click a cell to select a pin on Chip for the respective node. In the example below "Node Name: A" is Double-Click and PIN_ is selected.



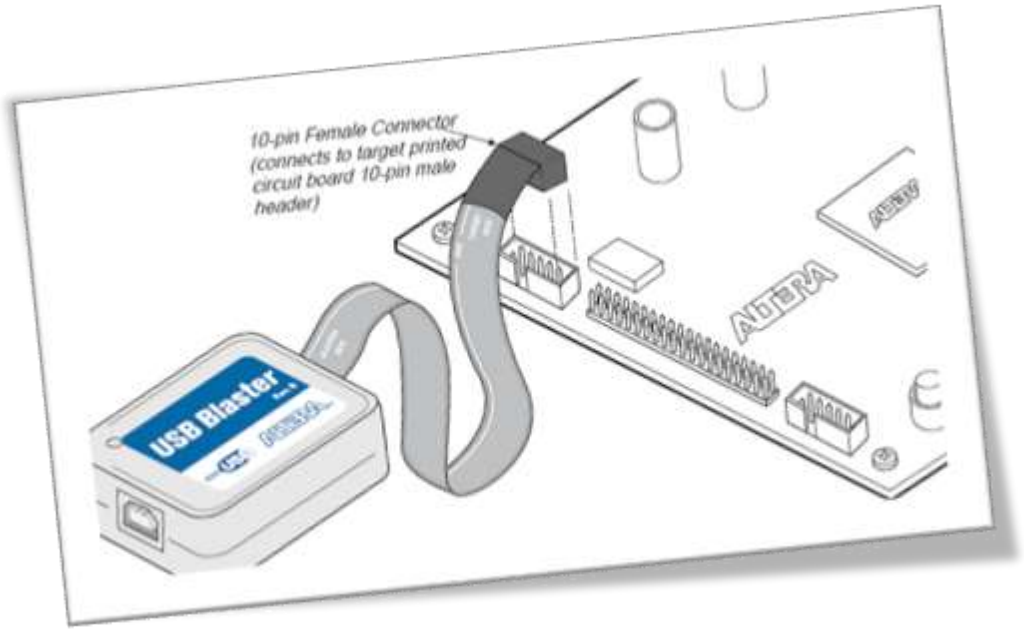
18. The following pin selections for all other Nodes have been made. Red dot on the chip will indicate that pin has been selected.



CONNECT USB BLASTER TO THE BOARD

19. Before Programming and erasing the EPM240 chip, you must connect the EPM240 board to the USB Blaster via the JTAG connector as follows:
    a) Disconnect the power cable from the EPM240 board
    b) Connect the USB Blaster cable to your PC
    c) Plug the USB Blaster cable into the 10-pin header on the device board
    d) Connect the power cable to the EPM240 board.

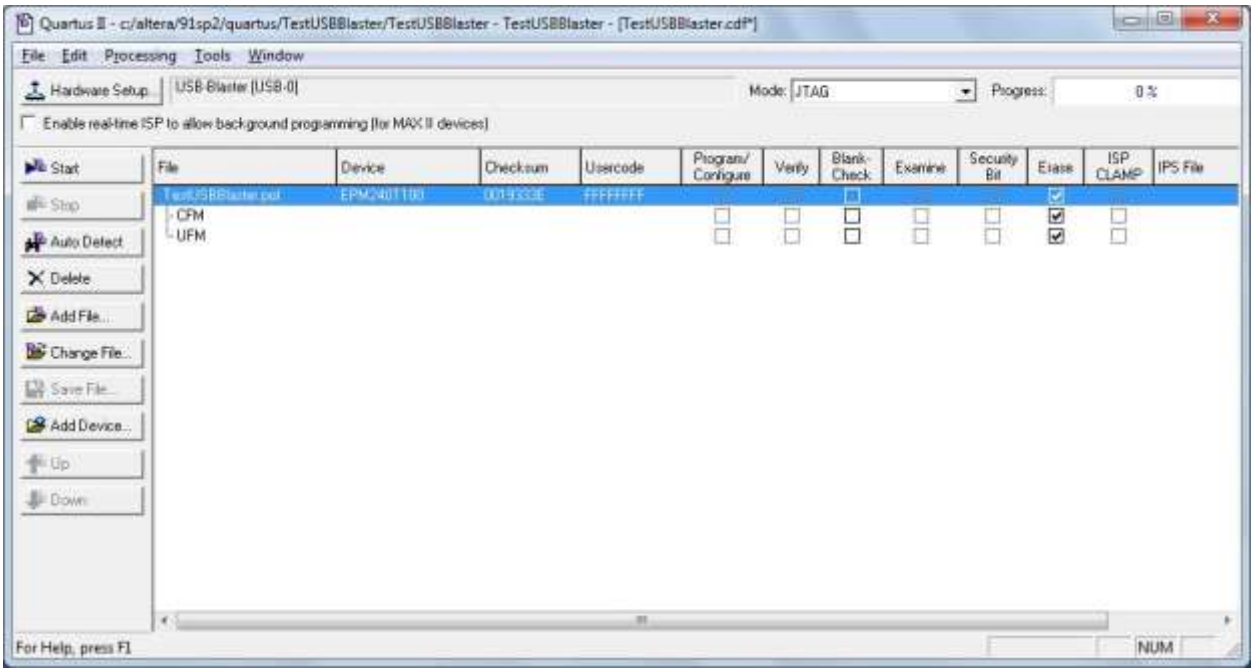
    The Found New Hardware wizard may open and prompt you to install a new a device driver. Close the wizard and follow the steps to install the hardware driver found in this tutorial



20. To disconnect the USB Blaster, follow the steps to ensure the cable and board are not damaged
    a) Remove power from the EPM240 board
    b) Unplug the USB Blaster from the board
    C) Unplug the USB Blaster from your PC

PROGRAM THE BOARD

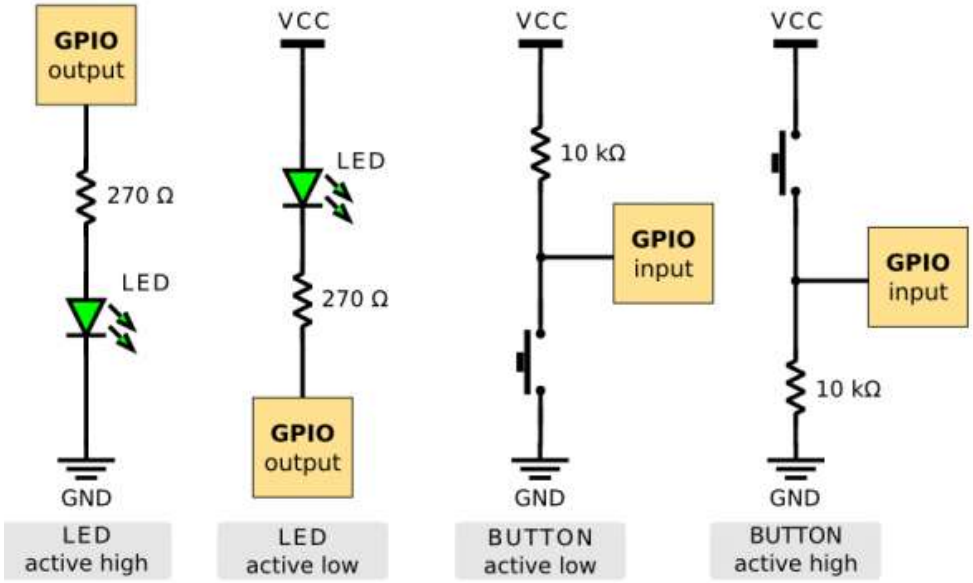
21. Now you can erase and program the chip from the "**Tools|Program**" menu. If the MAX II have been pre-programmed you need to Erase chip before programming. Select START and the Programmer will execute selected task which is Erase chip. The “Progress” box should increments from 0% to finally display 100%.



22. To program the Chip, select Configure and Verify checkbox. The select Start, the programmer will execute the programming task and verify. The “Progress” box should increments from 0% to finally display 100%.

WIRING I/O DEVICES TO THE PINS ON THE BOARD SELECTED IN THE PIN PLANNER

23. On the EPM240 board locate the pin selected in the Pin Planner and connect appropriately and correctly, to switches for input nodes (pins) and to LEDs for output nodes (pins) using the following wiring configurations. The switch and LED devices can be implemented on protoboard or other suitable means. Note that the Vcc to the EPM240T100C5 is 3.3V which can be taken from the Vcc pin on the board. The GPIO is any the relevant pin on the EPM240 board.



TESTING THE CIRCUIT THAT HAS BEEN PROGRAMMED ON THE BOARD

24. Change the combination of the switch position (wired active low) and check if the display on the LED (wired active high) conform to the Truth Table (shown below) of the circuit generated by the Verilog HDL given in para 13.

	Inputs		**Outputs**	
A = Switch at Pin 2	**B = Switch at Pin 3**		**Cout = LED at Pin 4**	**Sum = LED at Pin 4**
0 = ON	0 = ON		0 = Not lighted	0 = Not lighted
0 = ON	1 = OFF		0 = Not lighted	1 = Lighted
1 = OFF	0 = ON		0 = Not lighted	1 = Lighted
1 = OFF	1 = OFF		1 = Lighted	0 = Not lighted

REFERENCES

[1] Altera, *USB-Blaster Download Cable User Guide*, UG-USB81204, 2015.

[2] Altera, *Using the Internal Oscillator in Altera MAX Series*, AN-496, 2014