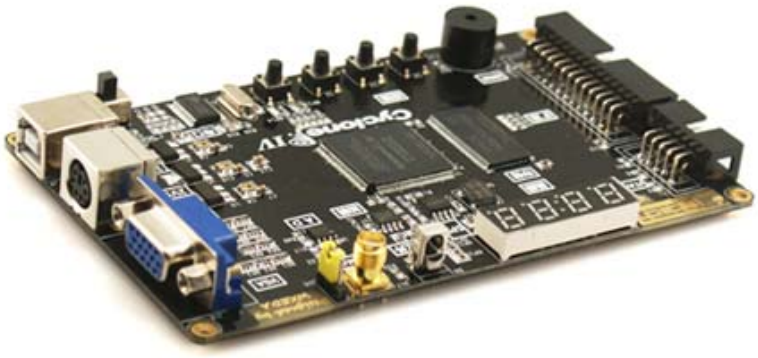

Cyclone IV

EP4CE6E22C8N

To our valued customers

I want to express my thanks to you for being interested in our products and for having confidence in LogiFind International CO,. Ltd..The primary aim of our company is to design and produce high quality electronic products and to constantly improve the performance thereof in order to better suit your needs.

Please share your thoughts and feelings regarding our operation so that we can serve you better in the future. I thank you for your continued support and patronage.
Your Dream is our Destination!

Sincerely,

Owner and General Manager
of LogiFind International CO,. Ltd.

Chapter 1.Resource and Revision History

Num	Resource	Parameter A	Parameter B	V1.10	V1.20	V2.00
1	FPGA	EP4CE6F22C8N	Altera	√	√	√
2	SDRAM	256Mbit	SAMSUNG	√	√	√
3	Serial FLASH	EPCS4	4Mbit	√	√	√
4	OSC	48MHz	Ceramic Shell	√	√	√
5	USB	UART	PL2303	√	√	√
6	LED	LED*4	Blue	√	√	√
7	Segmen LED	4 DIGIT	0.28” Common Cathode	√	√	√
8	VGA	16BIT TRUE COLOR	RGB565	√	√	√
9	PS2	PS2 Interface	Standard			√
10	KEY	Key*4		√	√	√
11	Buzzer		Active Type	√	√	√
12	AD	Serial AD		×	√	√
13	Flash	SPI FLASH	128Mbit	×	√	√
14	Infrared	Infrared Interface		√	√	√
15	Expand	ICD26 PORT			√	

Chapter 2.Cyclone IV FPGA EK

This chapter presents the features and design characteristics of the Cyclone IV FPGA EK board.

Layout and Components

A photograph of the Cyclone IV FPGA EK board is shown in following Figure 1 . It depicts the layout of the board and indicates the location of the connectors and key components.

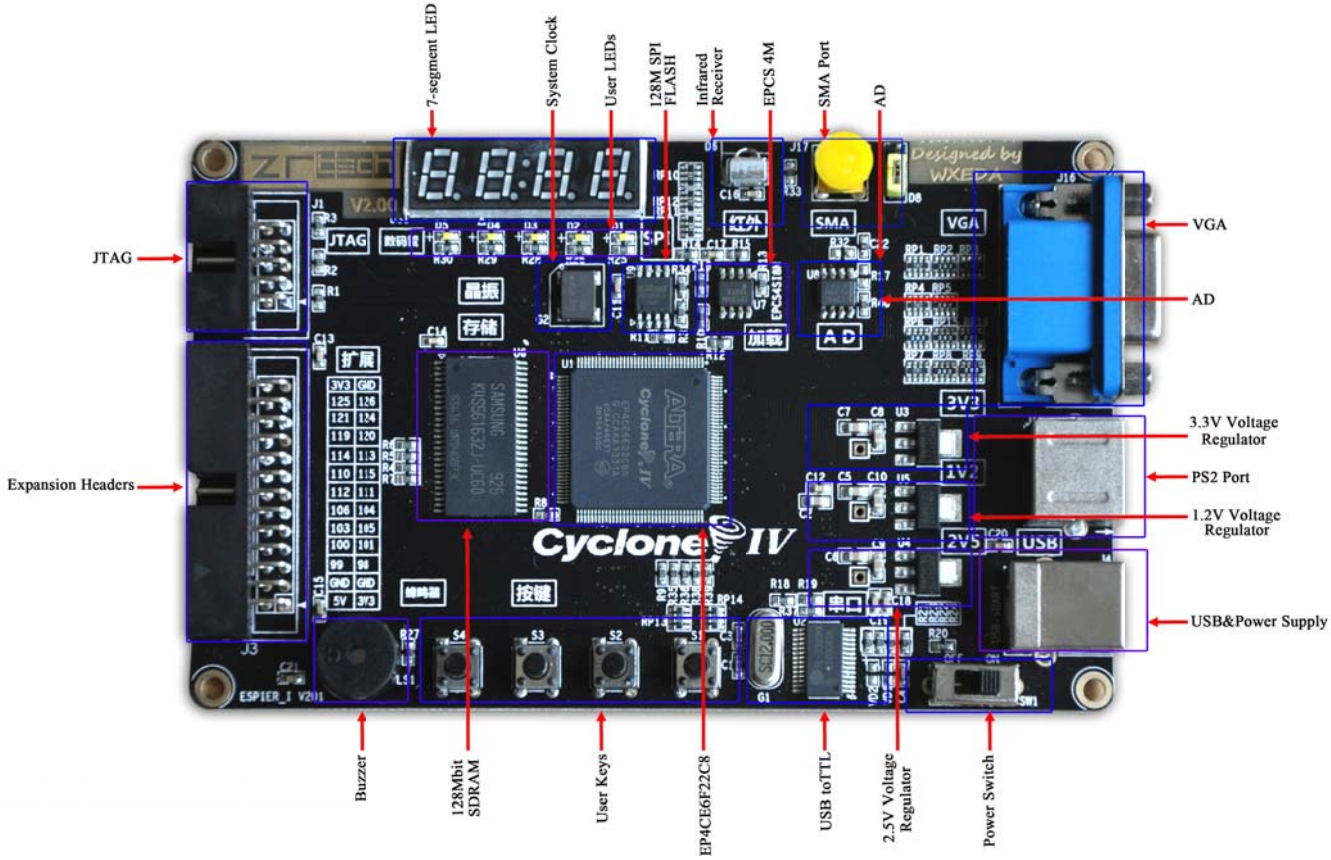

Figure 1 What's on Board

The Cyclone IV FPGA EK board has many features that allow the user to implement a wide range of designed circuits, from simple circuits to various multimedia projects.

The following hardware is provided on the Cyclone IV FPGA EK board:

- Altera Cyclone IV EP4CE6F22C8N FPGA Device
- Altera Serial Configuration Device – EPCS 4MBite
- JTAG Port for USB Blaster Programming
- 128Mbite SDRAM
- 128Mbite Flash Memory
- SP2 Mouse/Keyboard Connector
- 4 User Keys
- 26-pin Expansion Headers
- 5 User LEDs
- 48MHz oscillator for clock sources

- VGA connector
- USB to RS232 transceiver
- Buzzer
- 1.2V/2.5V/3.3V Voltage Regulator
- SMA Port
- ADC
- Infrared Receiver
- 7-Segment LED Display

Block Diagram of the Board

Figure 2 gives the block diagram of the Cyclone IV FPGA EK board. To provide maximum flexibility for the user, all connections are made through the Cyclone IV FPGA device. Thus, the user can configure the FPGA to implement any system design.

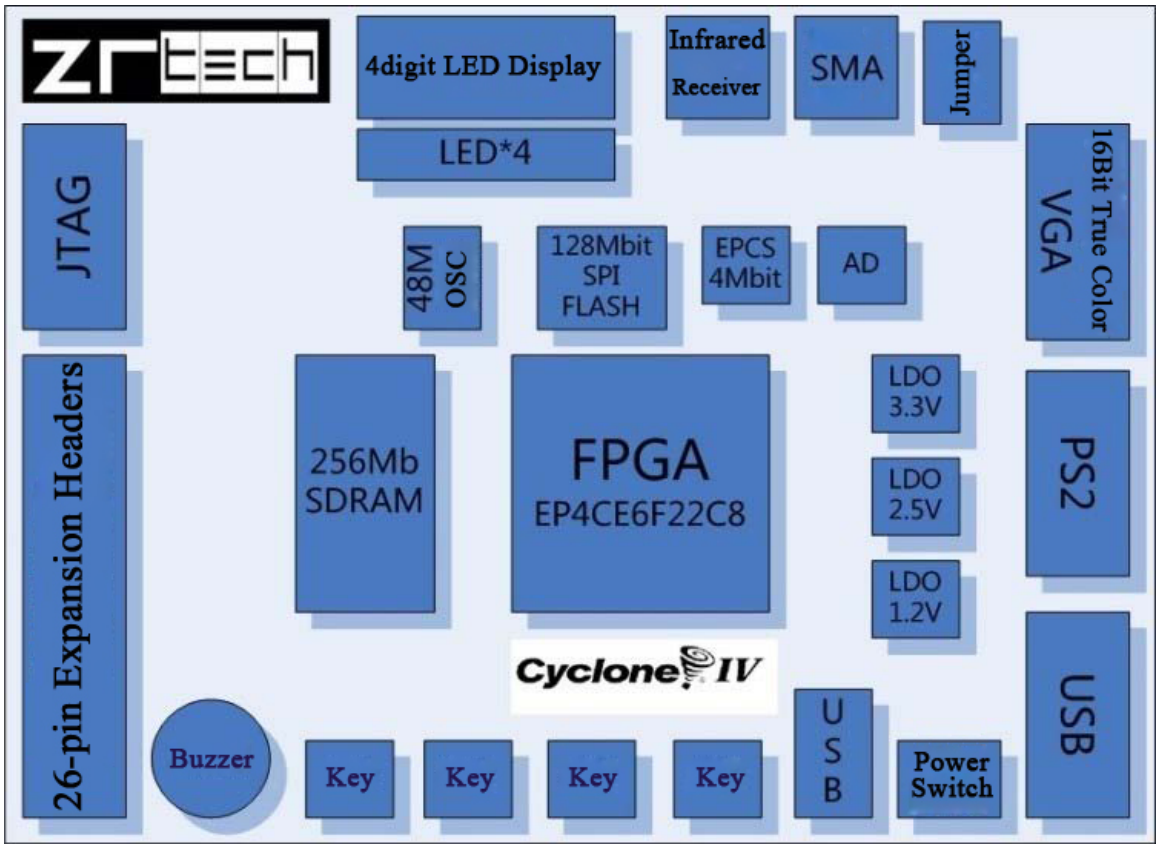

Figure 2 Block diagram

Following is more detailed information about the blocks in Figure 2:

Cyclone IV EP4CE6F22C8 FPGA

- 6,272 LEs
- 270Kbits Embedded Memory
- 10 Global Clock Networks
- 18*18 embedded multipliers

- 2 PLLs
- 179 Max User I/O pins
- 8 User I/O Banks

JTAG Port

- On-board JTAG Port for USB Blaster programming

SDRAM

- One 128Mbyte Single Data Rate Synchronous Dynamic RAM memory chip

Flash memory

- 128Mbyte NOR Flash memory
- Support Byte (8-bits)/Word (16-bits) mode

PS2 Port

- Provides this port for Mouse and Keyboard

Pushbutton switches

- 4 User Keys
- Normally high; generates one active-low pulse when the switch is pressed

Infrared Receiver

- Communicate with a Remoter for wireless control.

General User Interfaces

- 4 User LEDs (Active low)
- 4 digit 7-segment displays (Active high)
- Active Type Buzzer

System Clock inputs

- 48MHz oscillator

VGA output

- Uses a 8-bit resistor-network DAC under RGB565 Mode
- With 15-pin high-density D-sub connector

AD Circuit and SMA input

- Use an AD chip
- Use a SMA port for AD signal input.

Voltage Regulator Circuit

- Provides 1.2V,2.5V and 3.3V for system power supply.

Jumper

- Selection for External or on-board AD signal source.

On-board USB to TTL/RS232 Module

- Use PL2303 for USB-TTL/RS232 Converting (Without DB-9 serial connector)

26-PIN Expansion Headers

- Cyclone IV I/O pins, as well as 3 power and ground lines, are brought out to the 26-pin expansion connectors

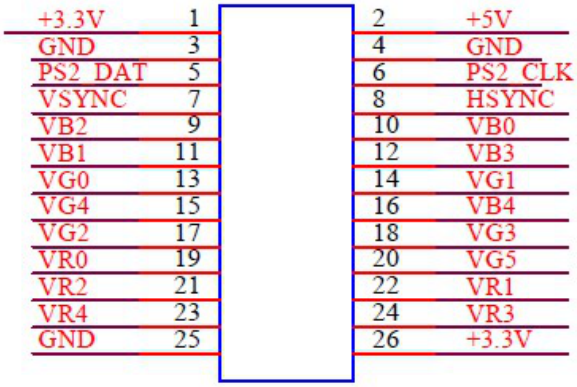

Figure 3 26-PIN Expansion Headers

Power-up the Cyclone IV FPGA EK Board

The Cyclone IV FPGA EK board comes with a preloaded configuration bit stream to demonstrate some features of the board. This bit stream also allows users to see quickly if the board is working properly. To power-up the board perform the following steps:

1. Connect the provided USB cable to the host computer. If you are using the on-board USB-TTL function,it is necessary to install the PL2303 USB-TTL driver software.
2. Turn the Power switch on.

At this point you should observe the following:

- D2 are flashing
- D1,D3 are ON
- D4,D5 are OFF
- 7-segment display is showing “0000”

Harware Test Method

Take an example for testing the board,the following shows the steps

1.Install Quartus and ModelSim.

2.Plug USB Blaster.

3.Install USB Blaster driver.

4.Open the project from "\0-example_test_board\"

5.Click "Tool" and select "Programmer"

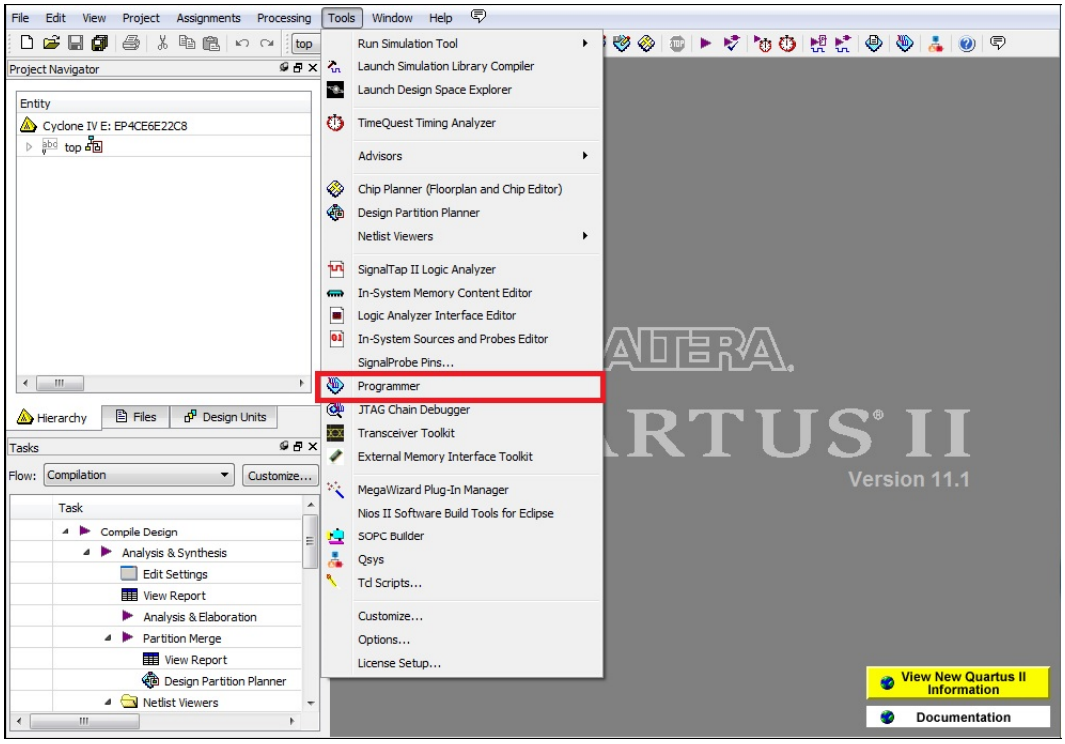

Figure 4

6.Power on the board and click "Start"

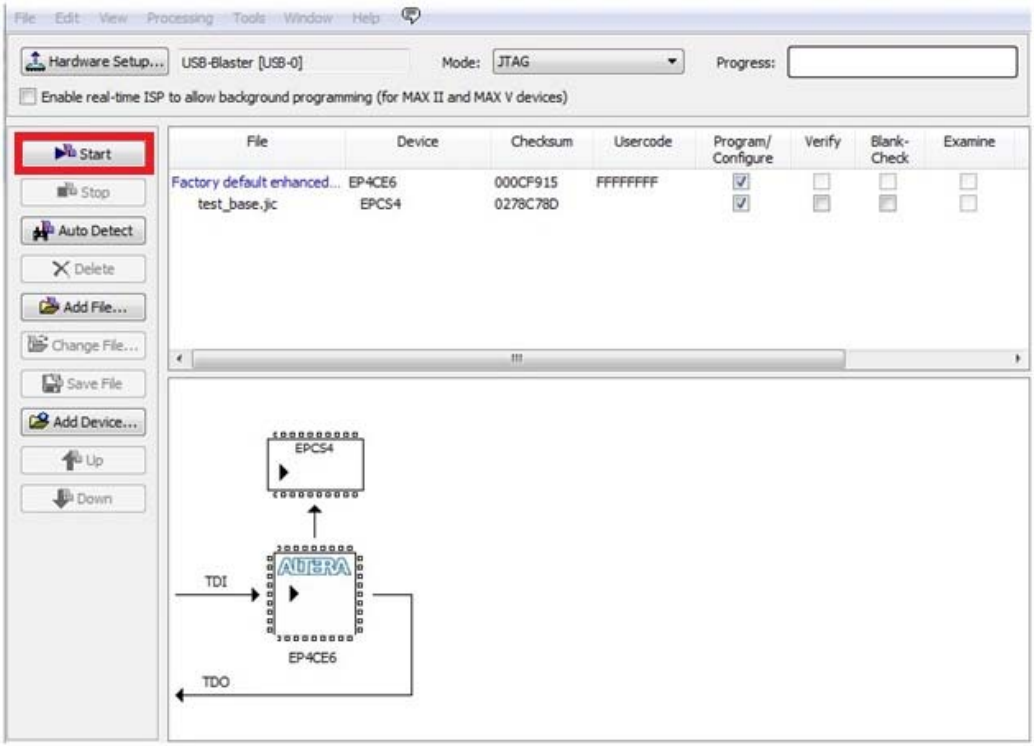

Figure 5

7.Wait till programming completed.turn off the power and turn on again.You will see 3 LEDs in “ON” status and the segment LED shows “0000”.

Chapter 3.Modules TEST

Controlling the LEDs and KEYs

- **Hardware Description**

This board has 5 LEDs.D1-System 3.3V power, (D2,D5)-FPGA IO control and reused with segment LED display PIN DS_D, DS_C, DS_G and DS_DP.

- **Software operation**

Upload the sample program using USB BLASTER.

- **Result**

D1-D3 will be ON,and press any button of S1-S4, the status of D4 and D5 will be changed.

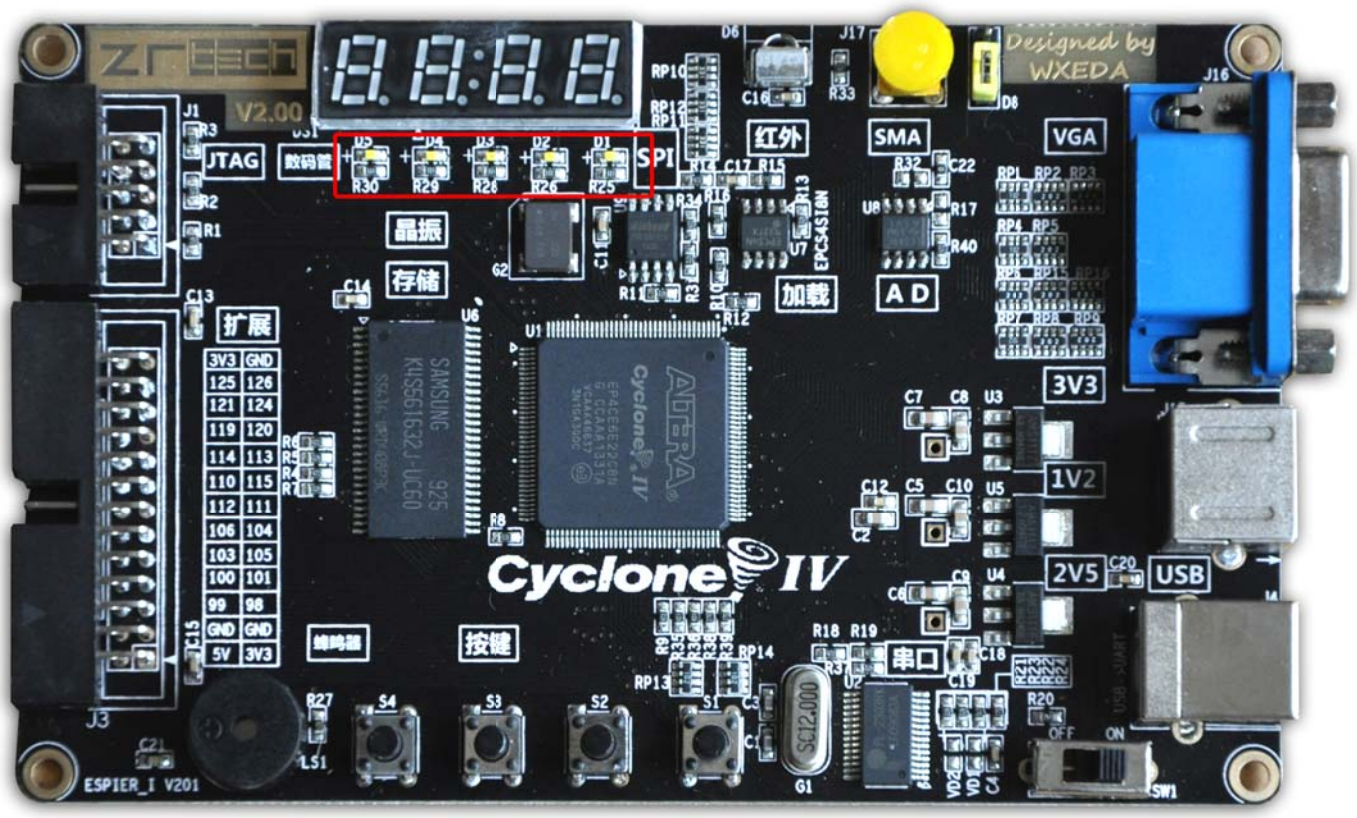

Figure 6

Controlling 7-Segment Displays

- **Hardware Description**

The board equip a 0.28inch-4digit-common cathode segment LED display.

- **Software operation**

Upload the sample program using USB BLASTER.

- **Result**

-After uploading the Segment LED Display sample program and power on, the Segment LED will be initialized to “0000”;

-Press button S2-S4, the first digit from left side display from 0 to 9, and A to F;
-Press button S1, the second digit from left side display from 0 to 9, and A to F;
-Using Infrared remoter, press the button of the remoter , the two LED of right side will display the keycode.

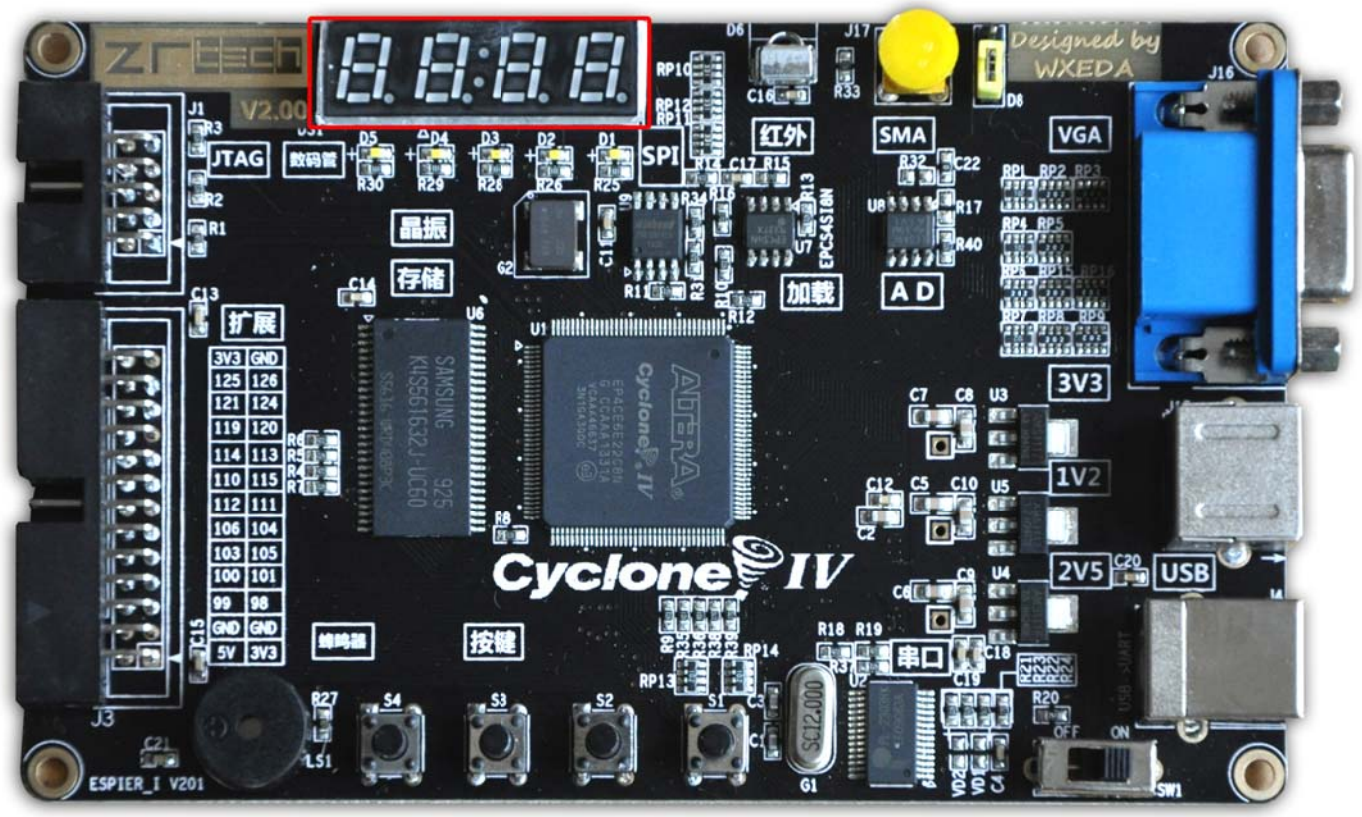

Figure 7

Buzzer

- **Hardware Description**

The board equip an active buzzer. .

- **Software operation**

Upload the sample program using USB BLASTER.

- **Result**

After uploading the buzzer sample program and power on, Press the buttonS1-S4,the buzzer will emit a continuous sound;

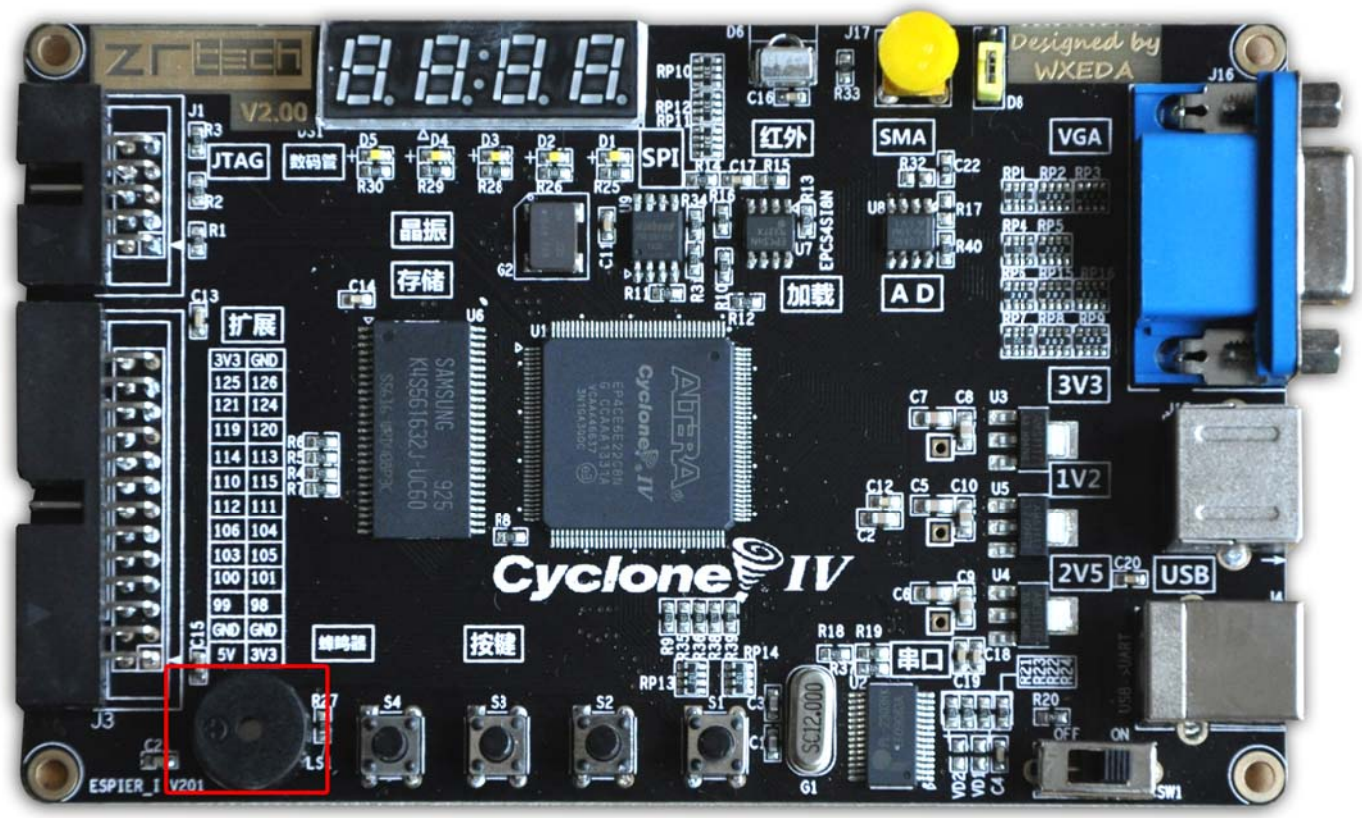

Figure 8

Infrared Receiver

- **Hardware Description**

It equipe a 38KHZ Standard Infrared Receiver.

- **Software operation**

Upload the sample program using USB BLASTER.

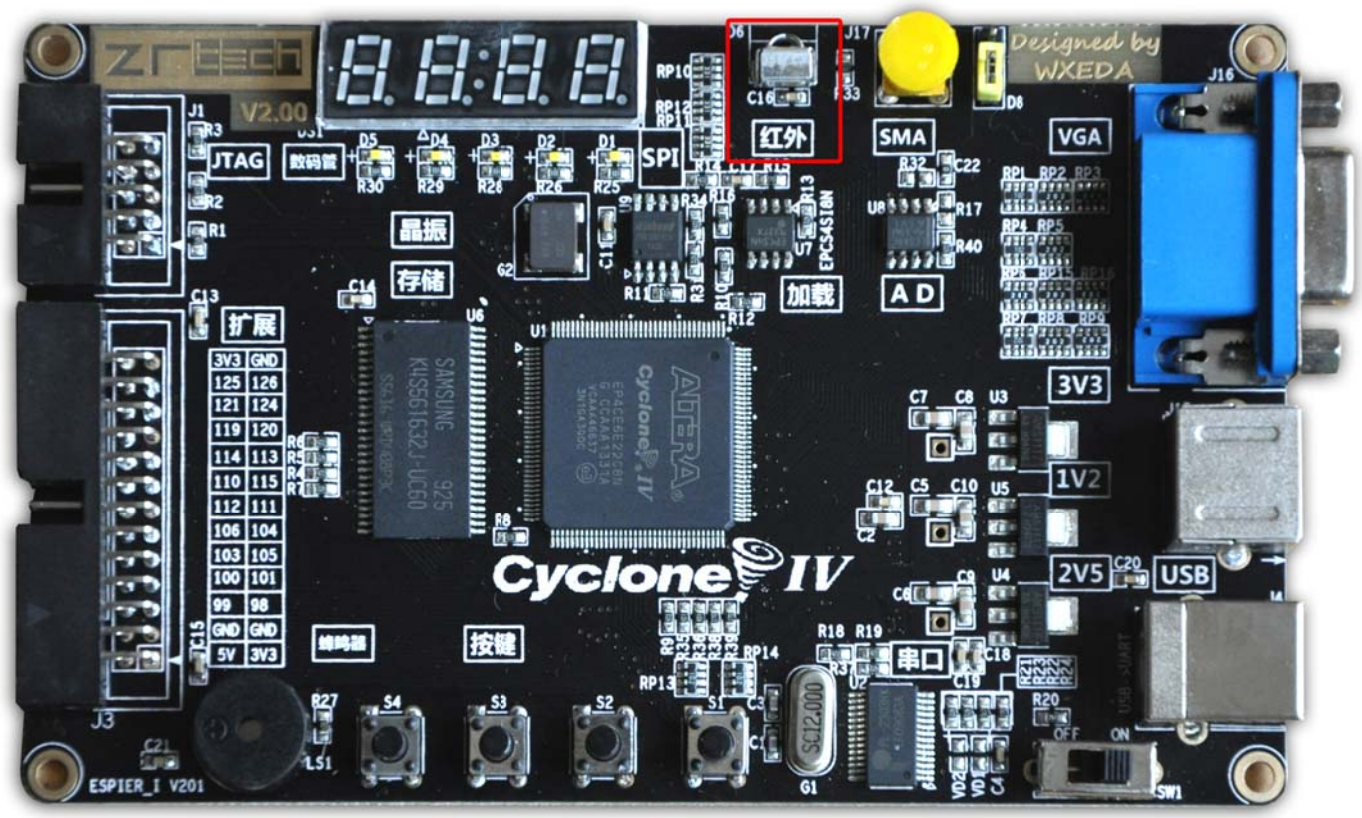

Figure 9

Figure 10

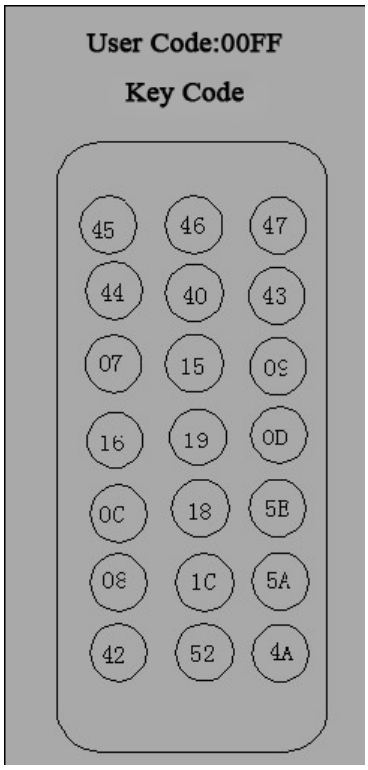

Figure 11 Key Code

- **Result**

Press the key on the remoter,and the 7-segment LED will display the corresponding key code.

VGA

- **Hardware Description**

It equipe a Resistance Control circuit on board for the DA ,and use RGB565 mode to achieve 16bit true color.

- **Software operation**

Upload the sample program using USB BLASTER.

- **Hardware Connection**

-Plug a D-sub cable to the VGA connector of the DE0 board and LCD/CRT monitor.

-Upload the VGA test sample program.

-The LCD/CRT monitor will display the same color pattern on the control panel window. Shown as Figure12.

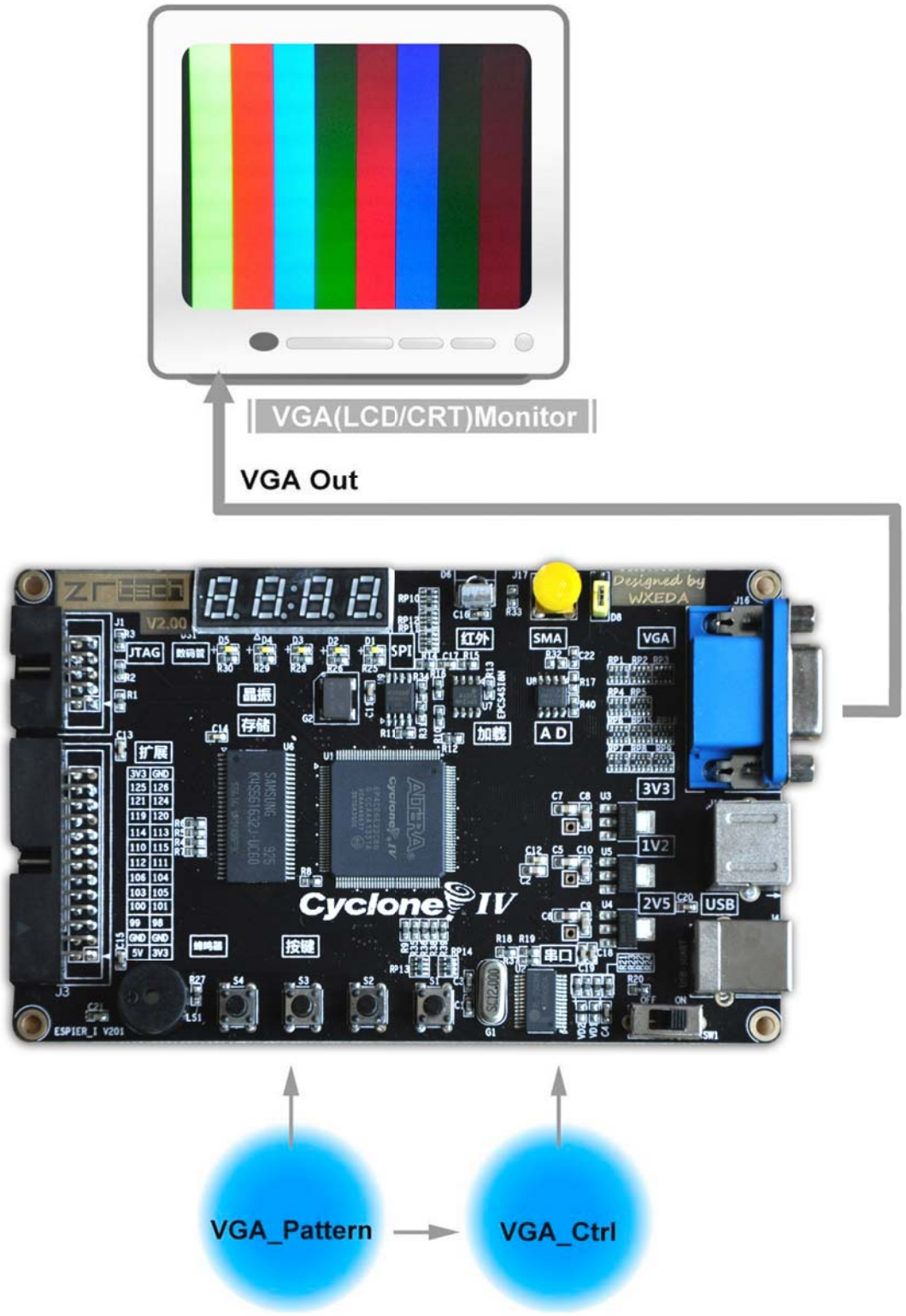
VGA(LCD/CRT)Monitor
VGA Out
Designed by WXEDA
Cyclone IV
VGA_Pattern
VGA_Ctrl

Figure 12

USB-UART

- **Hardware Description**

It equipe a USB-TTL circuit using a PL2303 chip.

- **Software operation**

Upload the sample program using USB BLASTER.

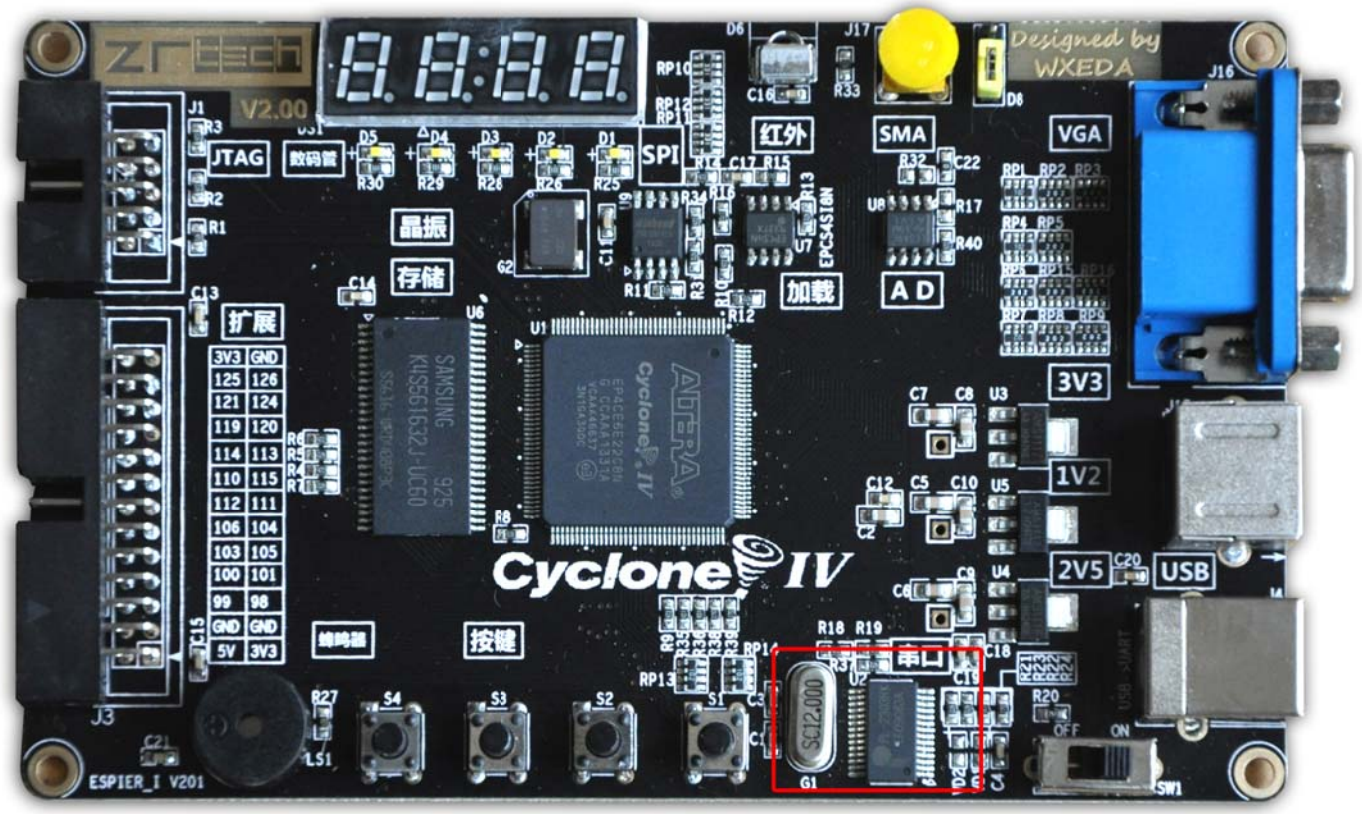

Figure 13

- **Hardware Connection and Driver Installing**

-Connect the board to the PC using the USB Cable we provided.

-Install the Driver.“PL2303-driver_XP2K” for XP and “WIN7 PL2303”for WIN7.

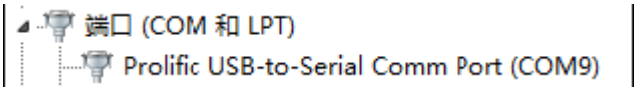

Figure 14

-Upload the Sample program.

-Run the COM port test software.

- **Result**

The data of RX/TX is the same as each other.

Figure 15

AD

- **Hardware Description**

A jumper provide a selection for external and on-board sample signal of AD. By default,we use on-board sample signal which comes from one of channels of VGA----Green Signal.

We use the Green Signal as the AD sample signal.

- **Software operation**

Upload the sample program using USB BLASTER.

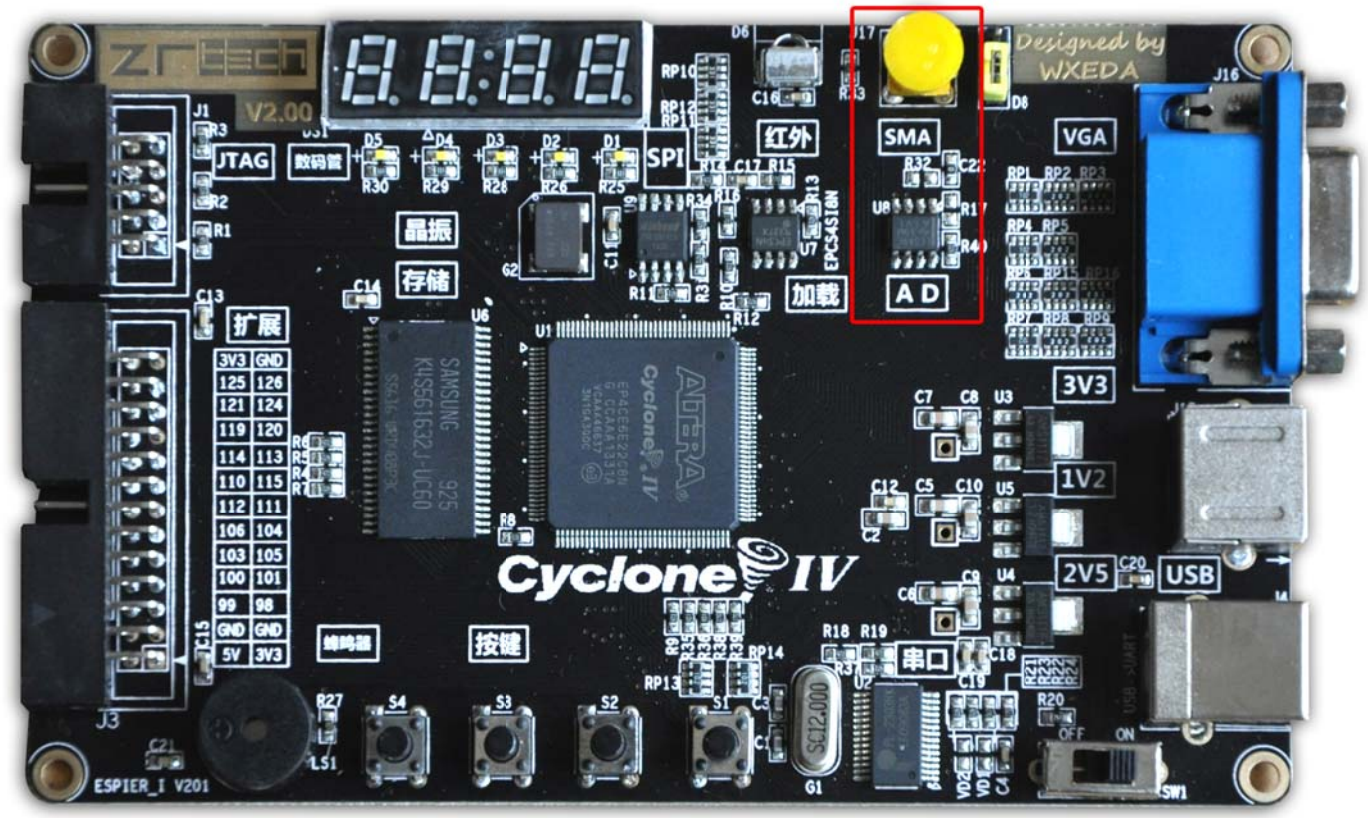

Figure 16

- **Hardware Connection and Software Operation**

-Power Up the board.

-Connect the USB Blaster and upload the sample program.

-Open “SignalTap II Logic Analyzer”

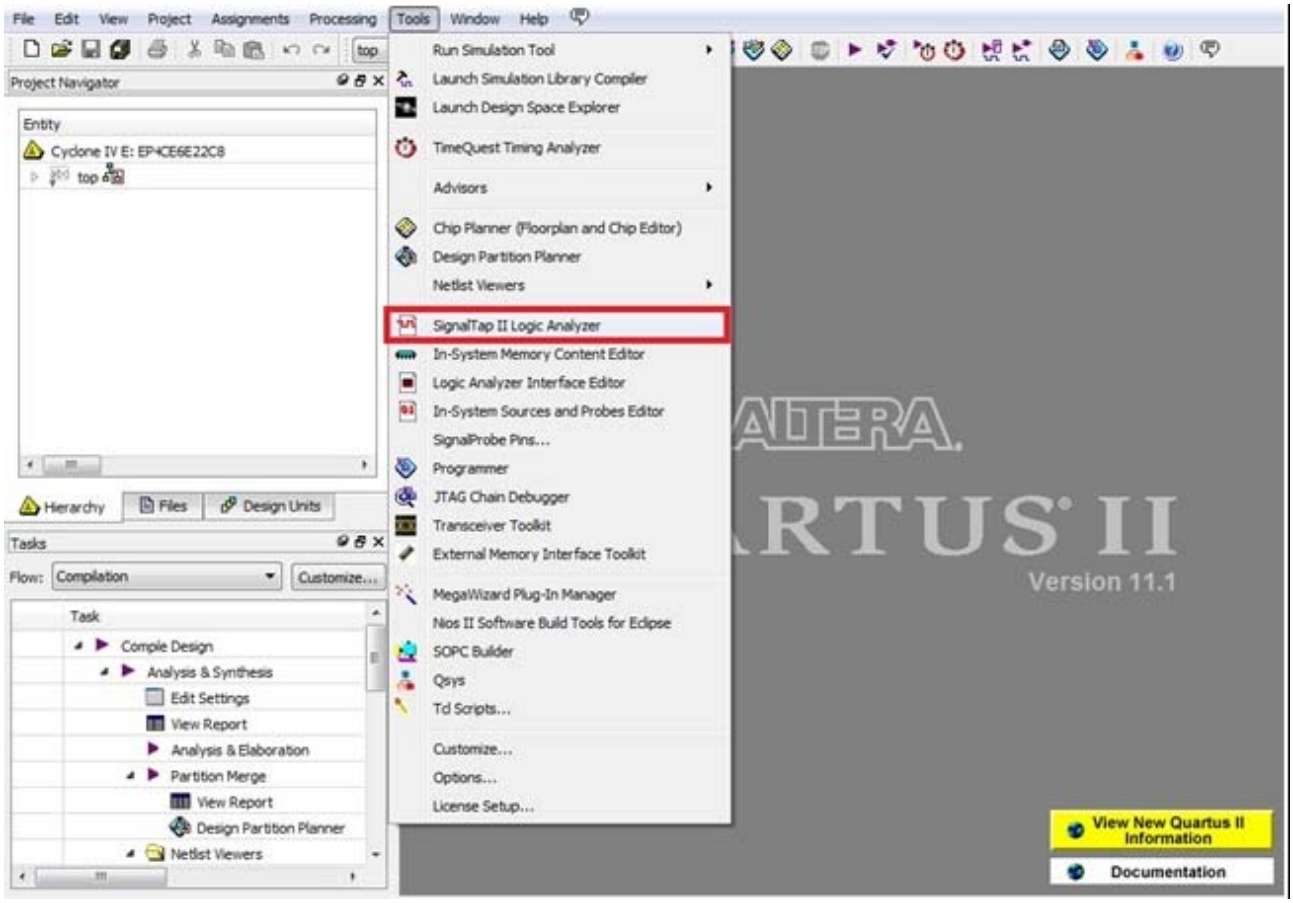

Figure 17

-Click “Data”and then 2 to run.

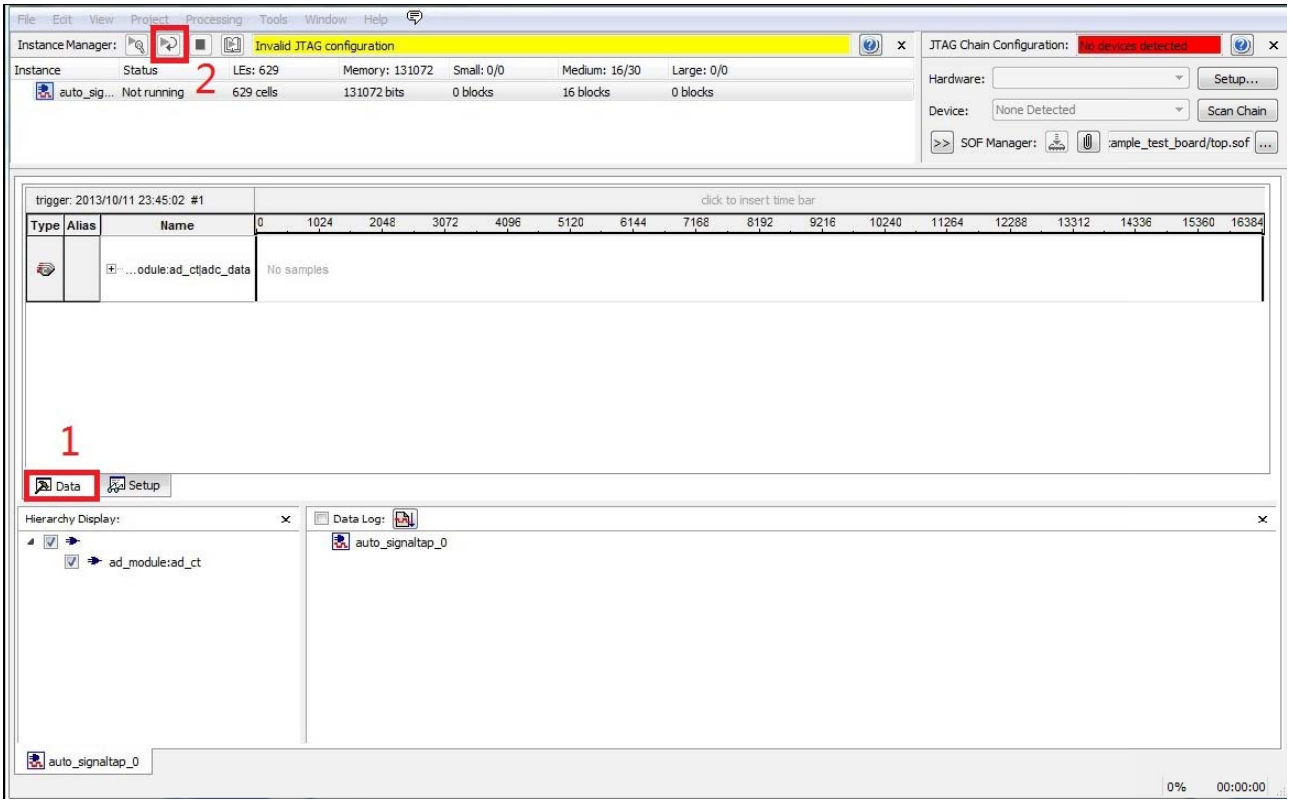

Figure 18

-You will see the following signal wave.

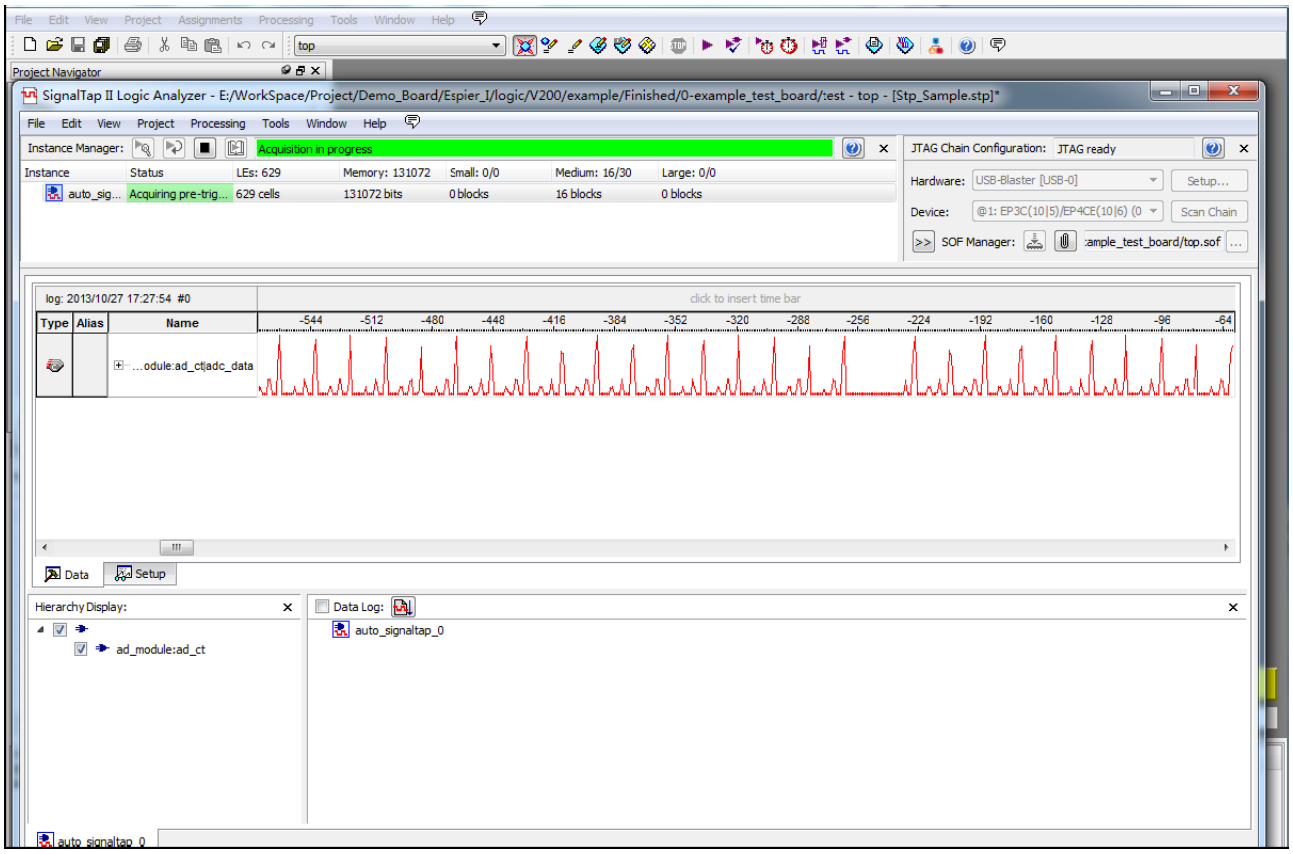

Figure 19

SDRAM

- **Hardware Description**

SDRAM interface is more complex,and therefore we use NIOS self-programming & self-verificating function.

- **Software operation**

Upload the sample program using USB BLASTER.

- **Result**

The SDRAM is working properly if we get the following result,shown as Figure

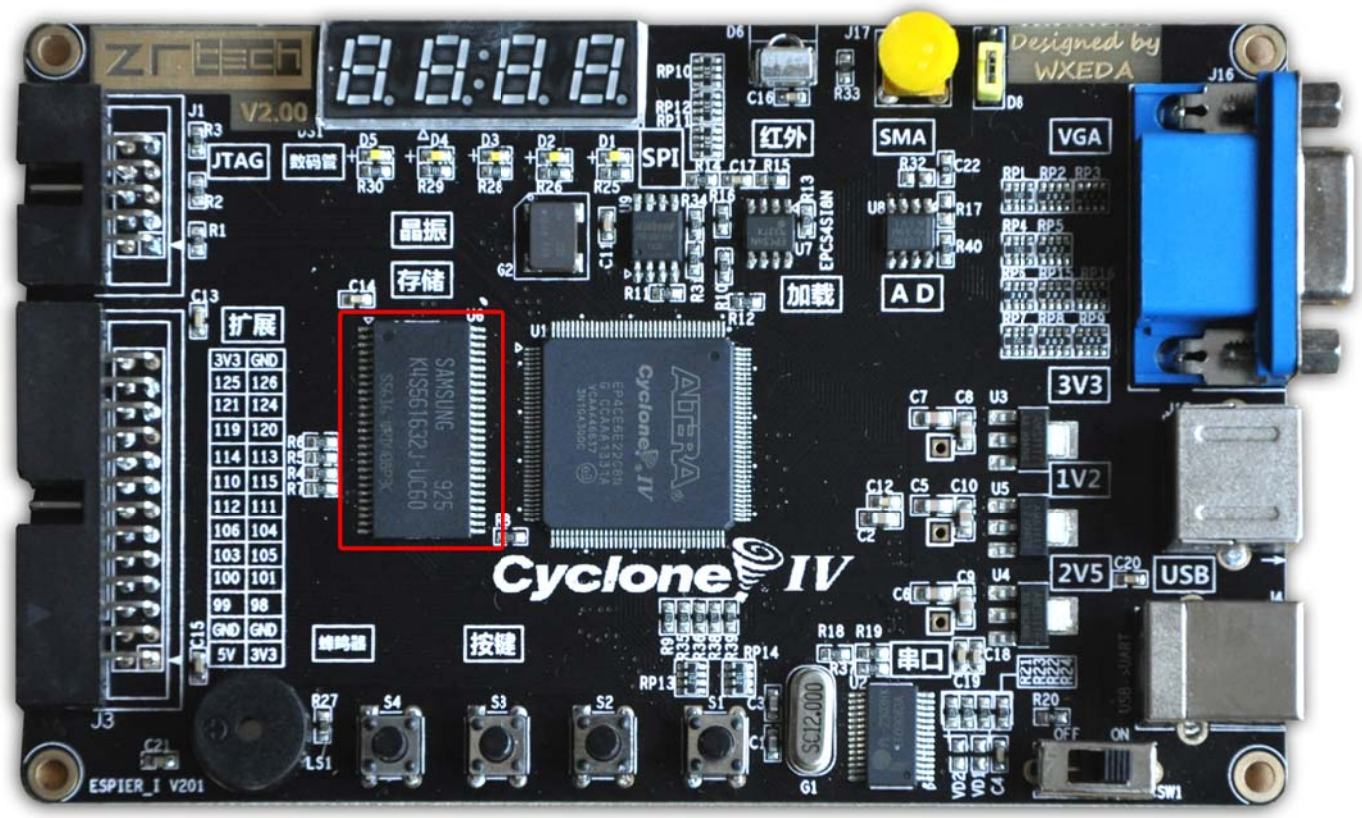

Figure 20

- **Hardware Connection and Software Operation**

-Connect the USB cable and the Blaster programmer to the PC.

-Open the Quartus project from \0_example_test_nios\.

-Click “Program” in “Tools”

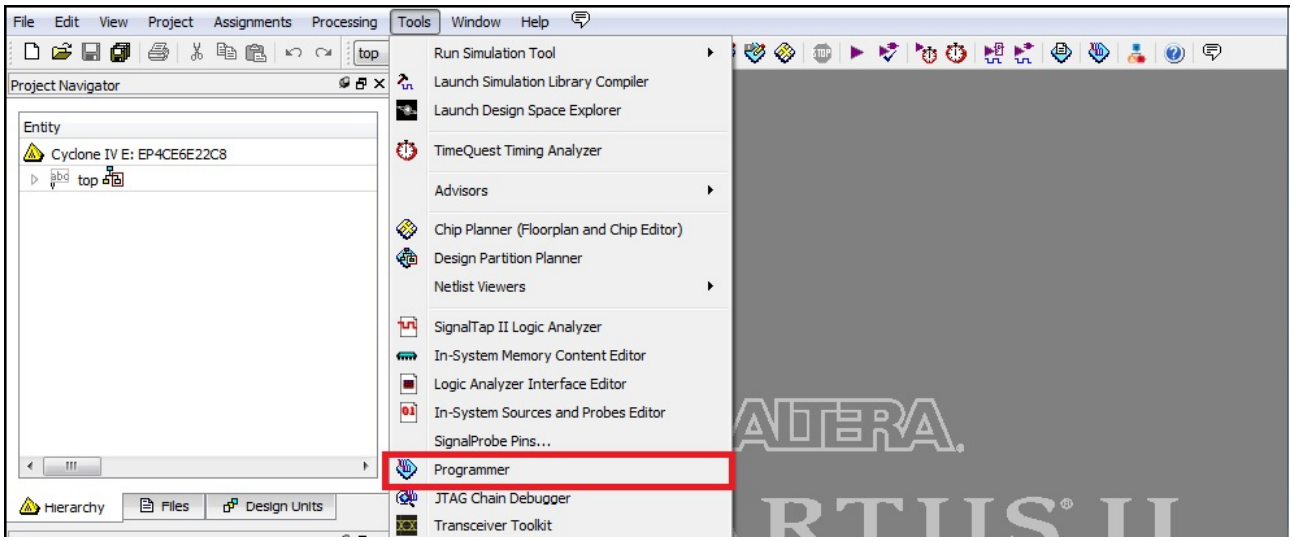

Figure 21

-Power up the board,and click “Start”.

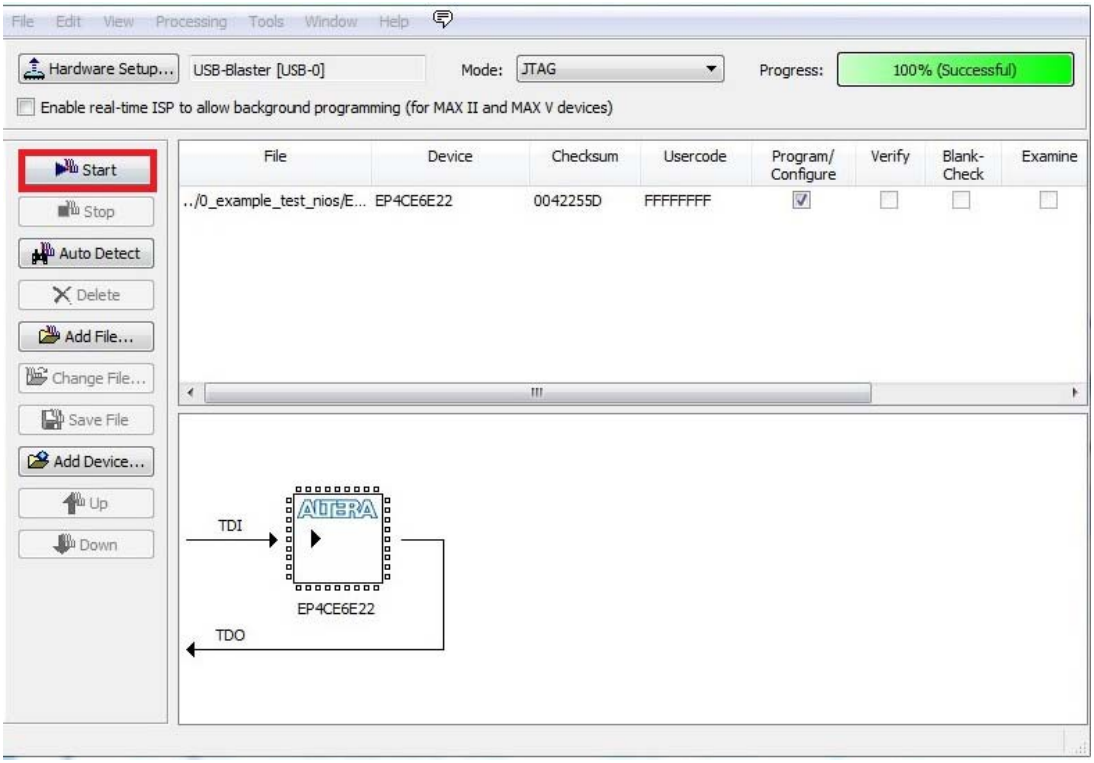

Figure 22

-After Downloading 100% completed,click “Nios II software Build Tools for Eclipse”

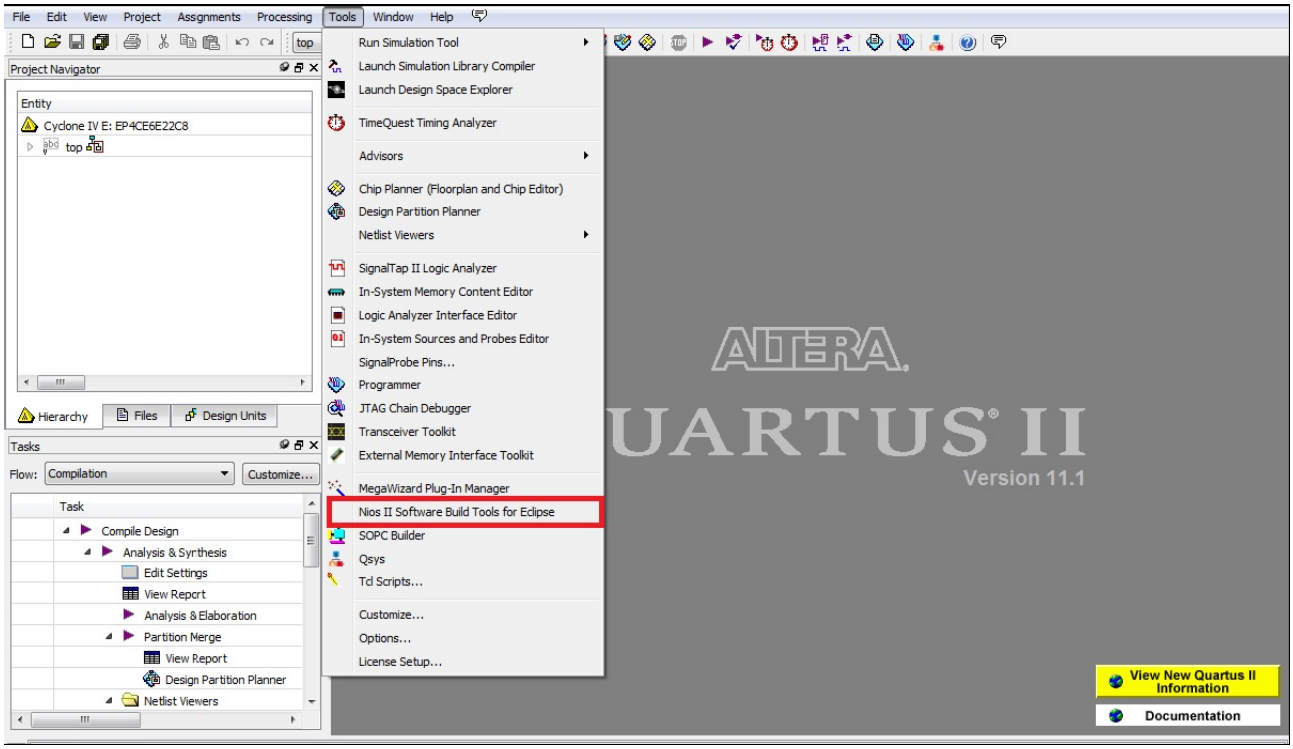

Figure 23

-Open “Flash Programmer”

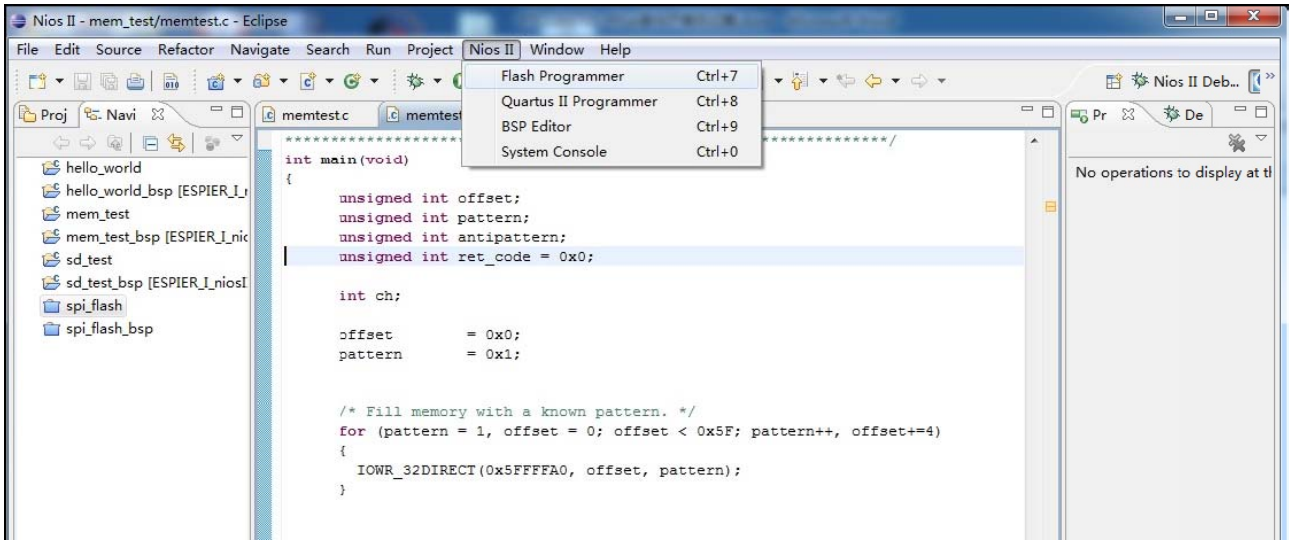

Figure 24

-File—>New

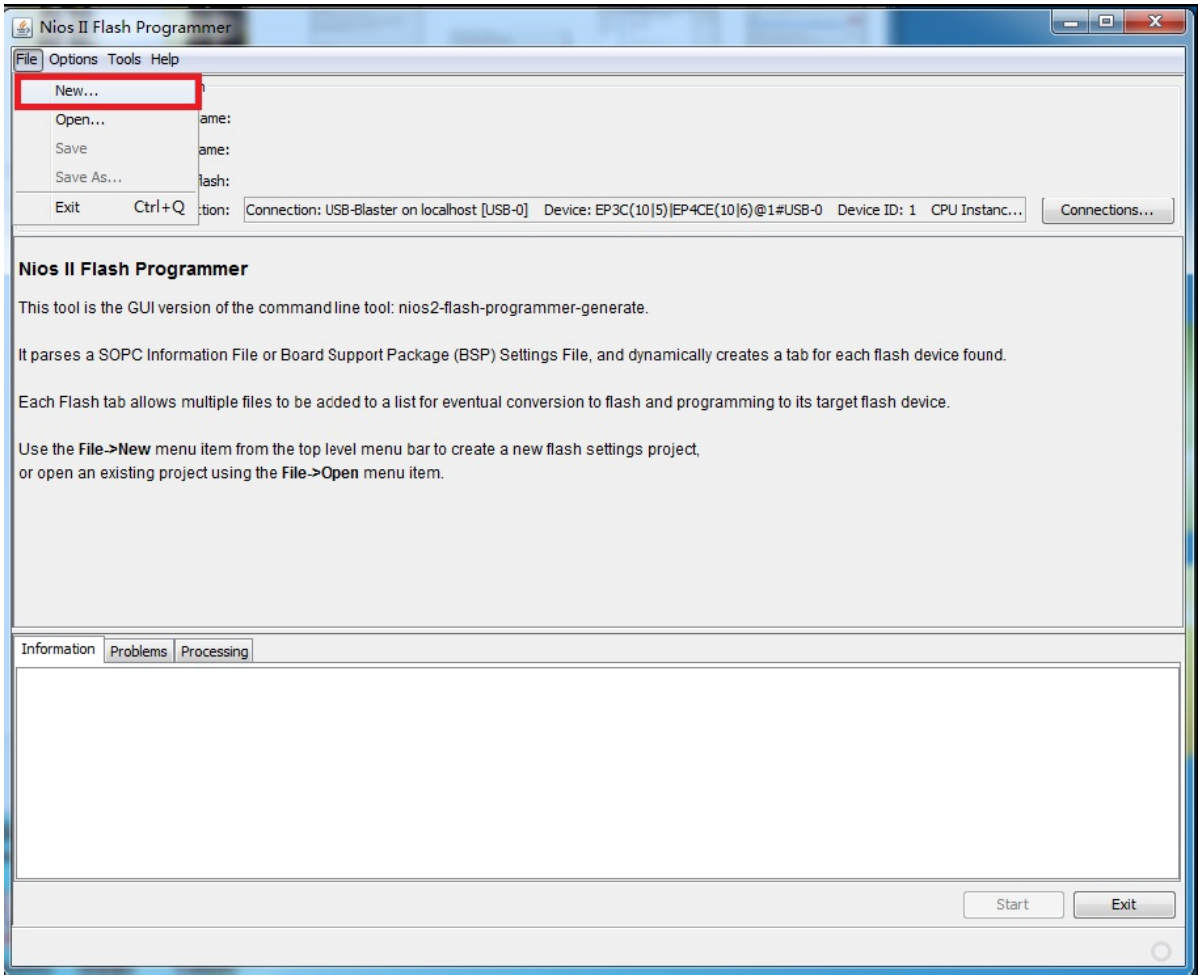

Figure 25

-Select ".sopcinfo" file，and "OK"

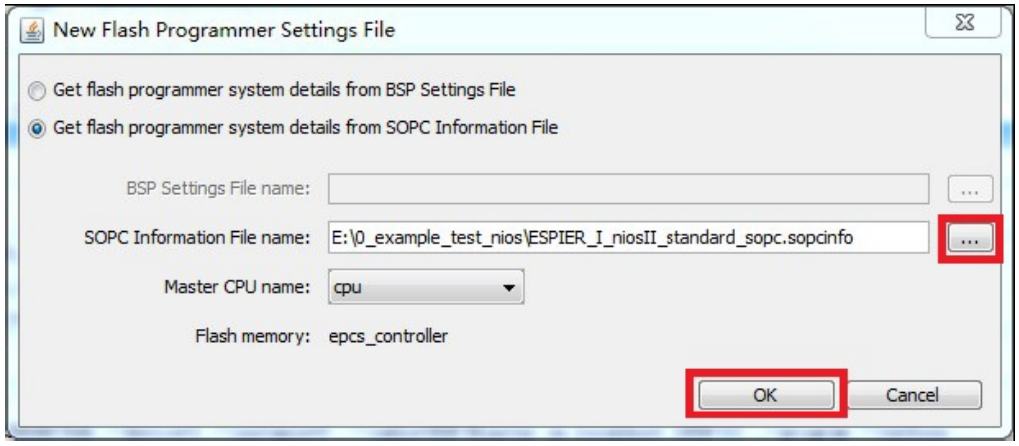

Figure 26

-Click “Add”， select “sof” and “elf” file，and then click “Start”. “Leaving target processor paused”

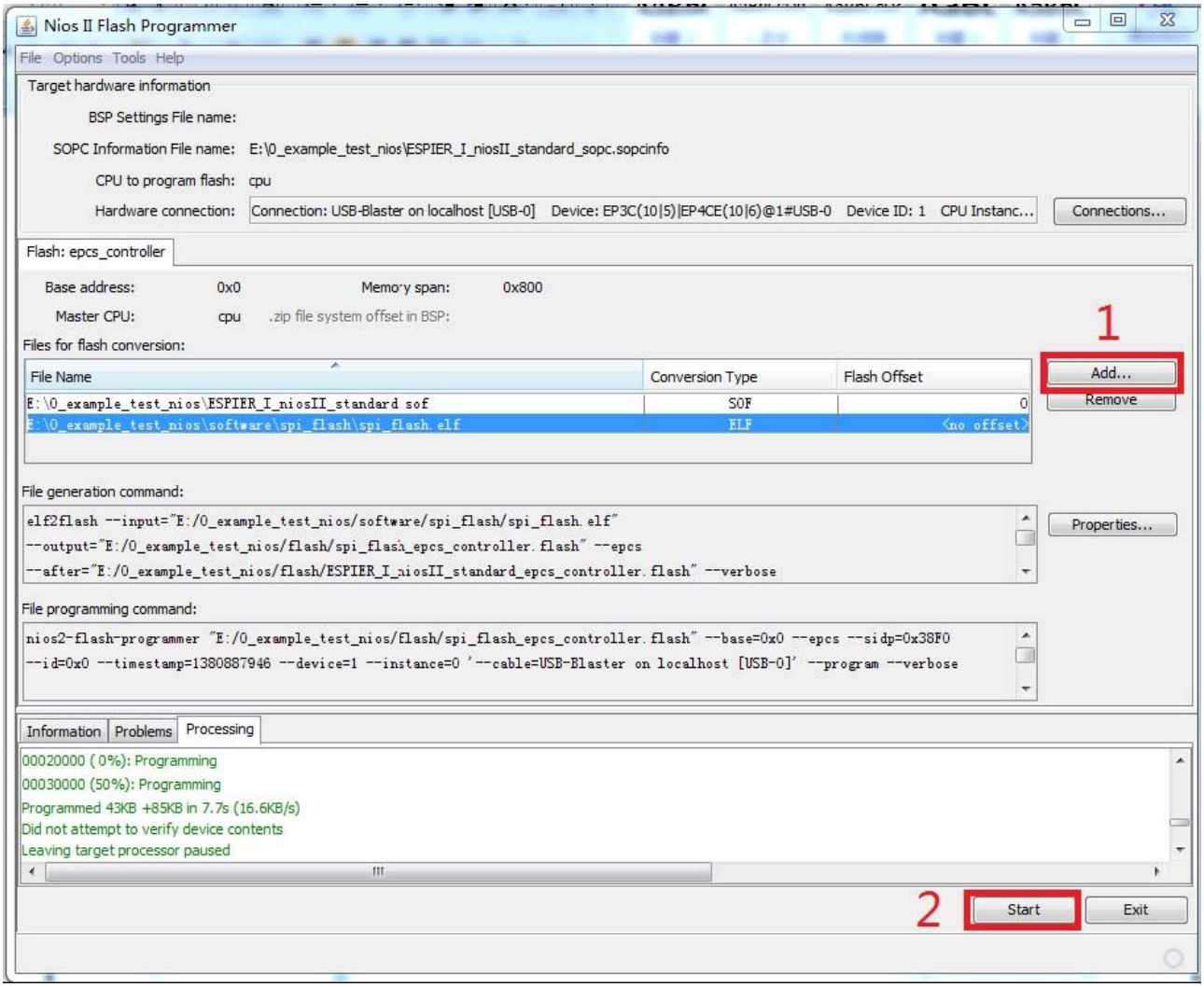

Figure 27

- **Result**

The 7-segment will display “0000”-“F000”-“A000”

“0000”-operation completed

“F000”-Hardware Start Completed

“A000”-Software loading completed

SPI FLASH

- **Hardware Description**

It equip an SPI Flash with 128Mbit memory and we test it using NIOS.

- **Software operation**

Upload the sample program using USB BLASTER.

- **Result**

The 7-segment will display “0000”-“F000”-“A000”

“0000”-Hardware initialization completed

“F000”-Software start to run.

“A000”-Verification completed

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