

DE2-115 Control Panel - Part II

Digital Circuit Lab

TA: Po-Chen Wu

Outline

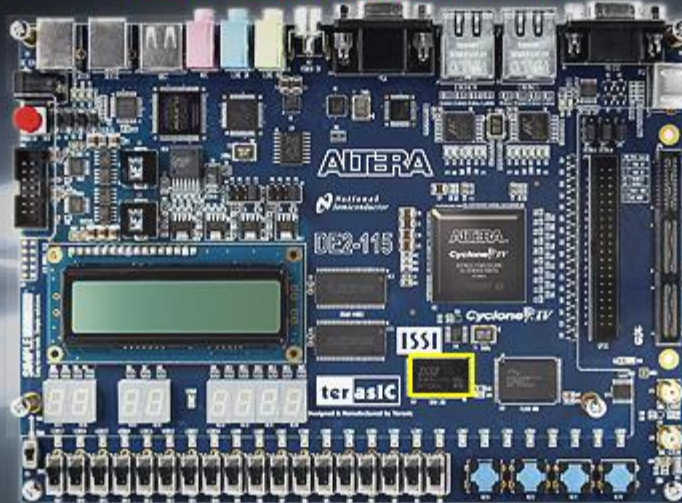
- SDRAM/SRAM/EEPROM/Flash Controller and Programmer
- VGA
- IR Receiver
- Others
 - USB, PS/2, SD Card, RS232, and HSMC
- Over all Structure of the DE2-115 Control Panel

SDRAM/SRAM/EEPROM/ Flash Controller and Programmer

Memory Controller and Programmer

- The Control Panel can be used to write/read data to/from the SRAM, SDRAM, EEPROM, and Flash chips on the DE2-115 board.
- As an example, we will describe how the **SRAM** may be accessed; the same approach is used to access the SDRAM, EEPROM, and Flash.

Terasic-DE2-115 Control Panel V1.0.1



LED LCD

7-SEG PS/2

Switches RS232

Memory VGA

USB HSMC

SD Card IR

Connected DISCONNECT

Memory Type **SRAM (100000h WORDS, 2 MB)**

Random Access

Address: 00000000 wDATA: 0000 rDATA: 0000

Chip Erase (15 sec) Write Read

Sequential Write

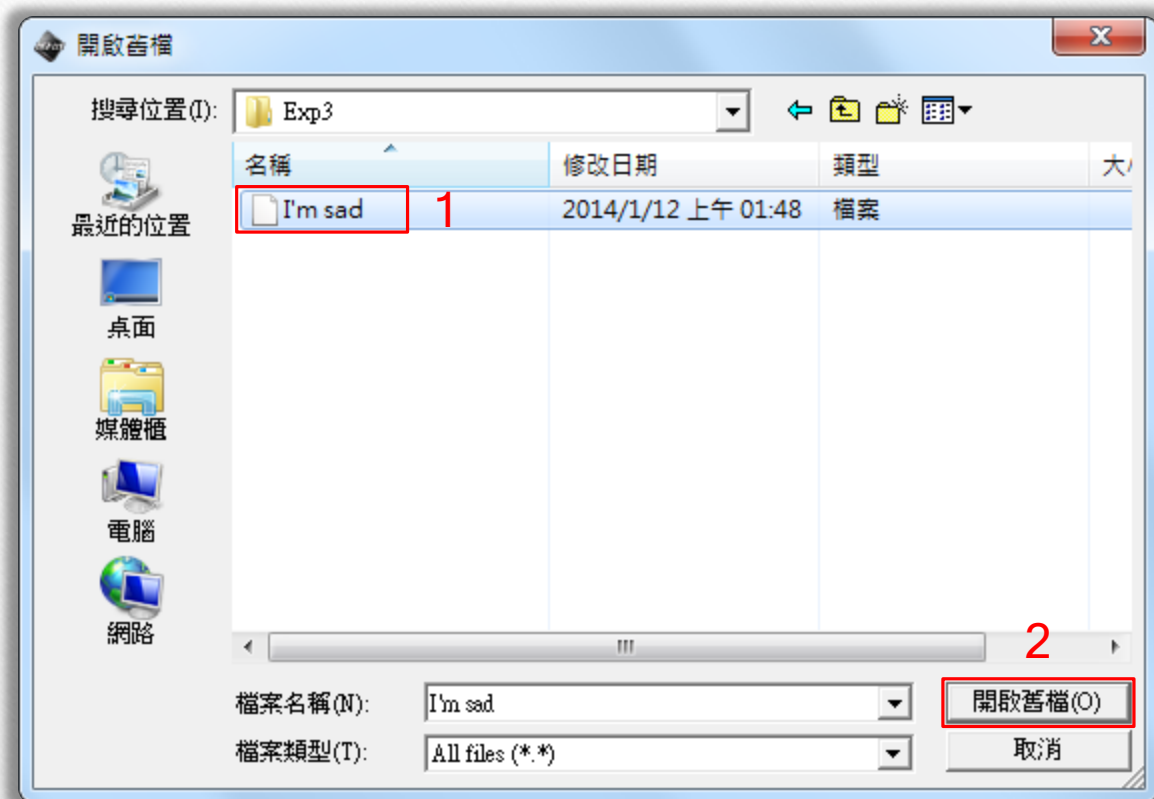
Address: 00000000 Length: 0 ☒ File Length

Write a File to Memory

Sequential Read

Address: 00000000 Length: 0 ☐ Entire Memory

Load Memory Content to a File



Terasic-DE2-115 Control Panel V1.0.1



Progress

Finish Percentage: 43%



Abort

LED

7-SEG

Switches

Memory

USB

SD Card

VGA

HSMC

IR

Connected

DISCONNECT

ADEPTA
UNIVERSITY
PROGRAM

terasic
www.terasic.com

Sequential Write

Address: 00000000

Length: 0

☒ File Length

Write a File to Memory

Sequential Read

Address: 00000000

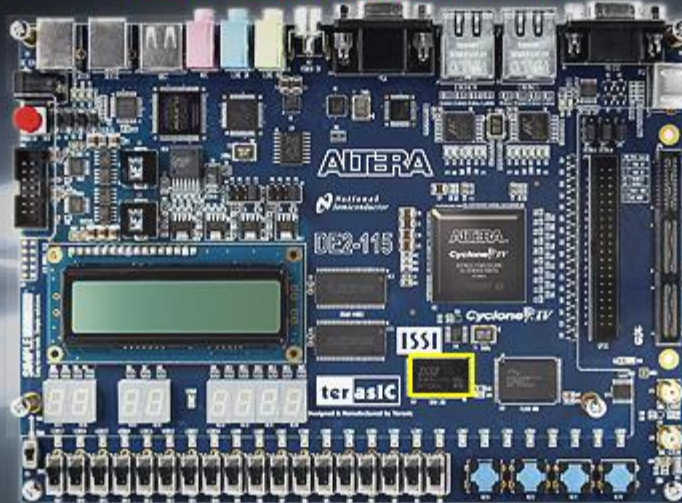
Length: 0

☐ Entire Memory

Load Memory Content to a File

Write a File to ...

Terasic-DE2-115 Control Panel V1.0.1



LED	LCD
7-SEG	PS/2
Switches	RS232
Memory	VGA
USB	HSMC
SD Card	IR

Connected

DISCONNECT

ALTERA
UNIVERSITY
PROGRAM

terasic
www.terasic.com

Memory Type **SRAM (100000h WORDS, 2 MB)**

Random Access

Address: 00000000

wDATA: 0000

rDATA: 0000

Chip Erase (15 sec)

Write

Read

Sequential Write

Address: 00000000

Length: 100000

☒ File Length

Write a File to Memory

Sequential Read

Address: 00000000

Length: 0

☐ Entire memory

Load Memory Content to a File

Write a File to (null) Success.[439.7sec]

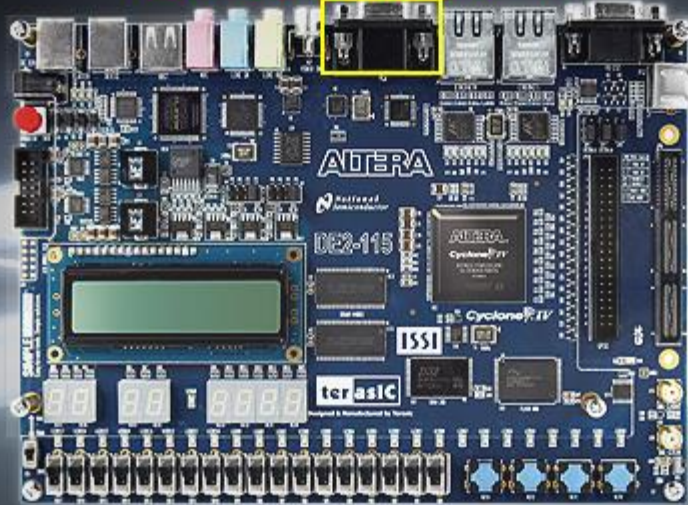
Let's listen to the song!

VGA

VGA Controller

- DE2-115 Control Panel provides VGA pattern function that allows users to output color pattern to LCD/CRT monitor using the DE2-115 board.
- Remember to plug a D-sub cable to VGA connector of the DE2-115 before using the Control Panel.

Terasic-DE2-115 Control Panel V1.0.1

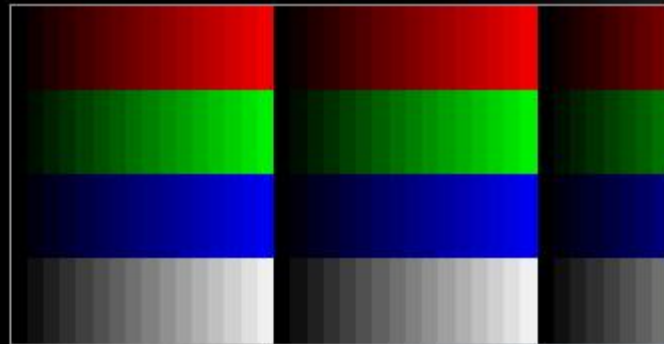


LED	LCD
7-SEG	PS/2
Switches	RS232
Memory	VGA
USB	HSMC
SD Card	IR

Connected DISCONNECT

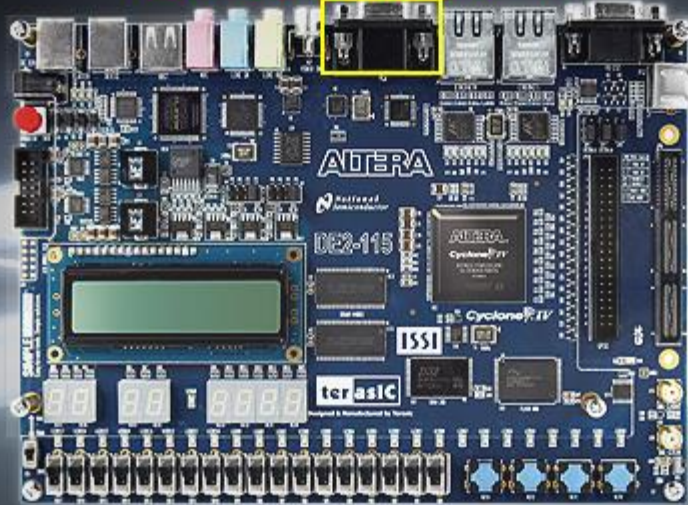
VGA Pattern Display

Pattern: Scale



Set VGA Success

Terasic-DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

Connected

DISCONNECT

ALTERA
UNIVERSITY
PROGRAM

terasic
www.terasic.com

VGA Pattern Display

Pattern:

Scale

Scale

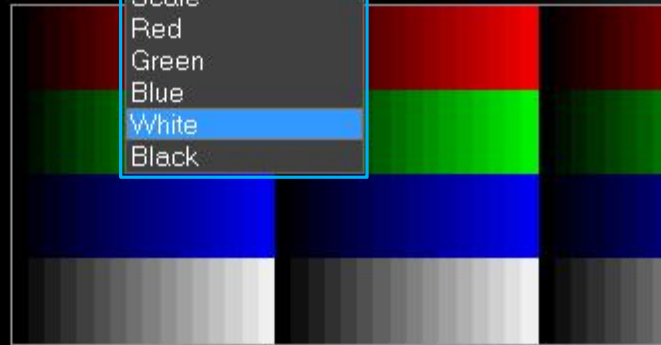
Red

Green

Blue

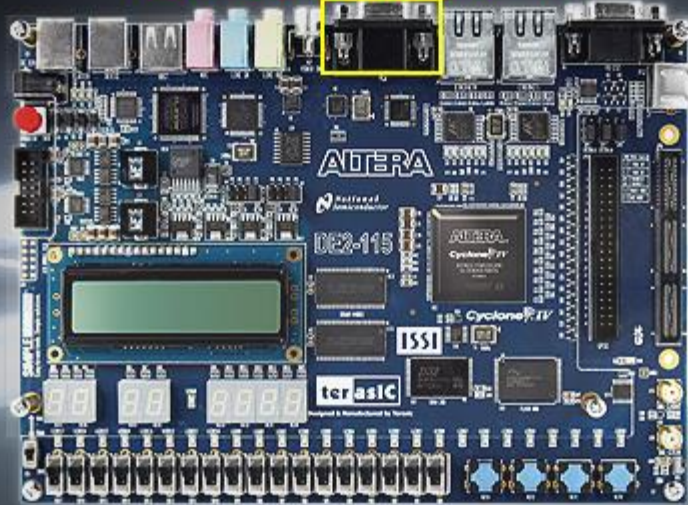
White

Black



Set VGA Success

Terasic-DE2-115 Control Panel V1.0.1



LED	LCD
7-SEG	PS/2
Switches	RS232
Memory	VGA
USB	HSMC
SD Card	IR

Connected

DISCONNECT

ALTERA
UNIVERSITY
PROGRAM
terasic
www.terasic.com

VGA Pattern Display

Pattern:



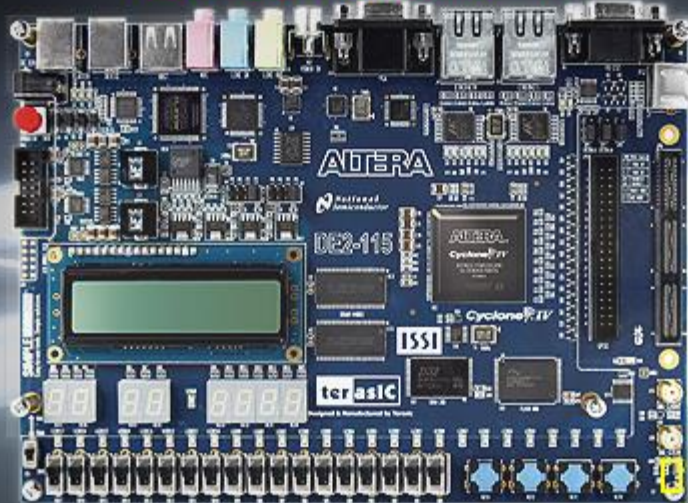
Set VGA Success

IR Receiver

IR Receiver

- From the control panel, we can test the IR receiver on the DE2-115 by sending **scan code** from a remote controller.
- When the scan code is received, the information will be displayed on the Receiver window represented in **hexadecimal**.
- Also, the **pressed button** on the remote controller will be indicated on the graphic of remote controller on the IR receiver window.

Terasic-DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

Connected

DISCONNECT

IR Receiver

Scan Code (Heximal)

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08

Clear

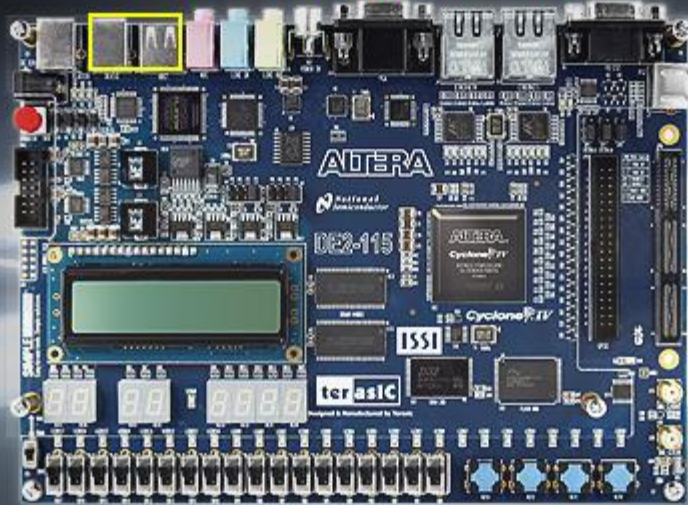


IR Monitor...

Others

USB, PS/2, SD Card, RS232, and HSMC

Terasic-DE2-115 Control Panel V1.0.1



- | | |
|------------|-------|
| LED | LCD |
| 7-SEG | PS/2 |
| Switches | RS232 |
| Memory | VGA |
| USB | HSMC |
| SD Card | IR |

Connected

DISCONNECT

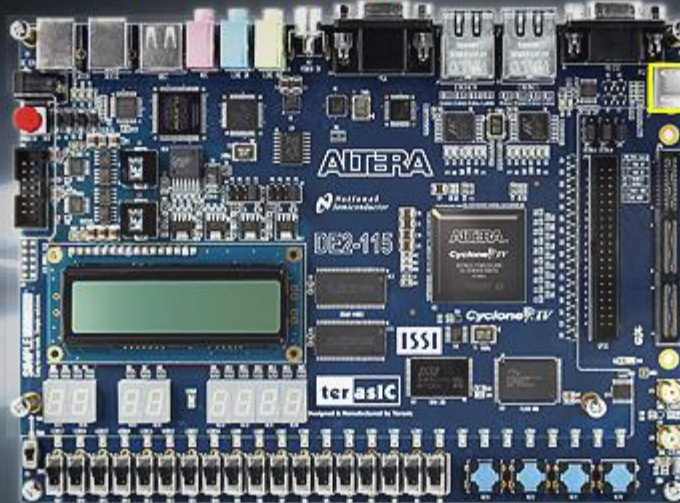
Host Port:

USB Mouse



A device is found in the USB Port.

Terasic-DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

Connected

DISCONNECT

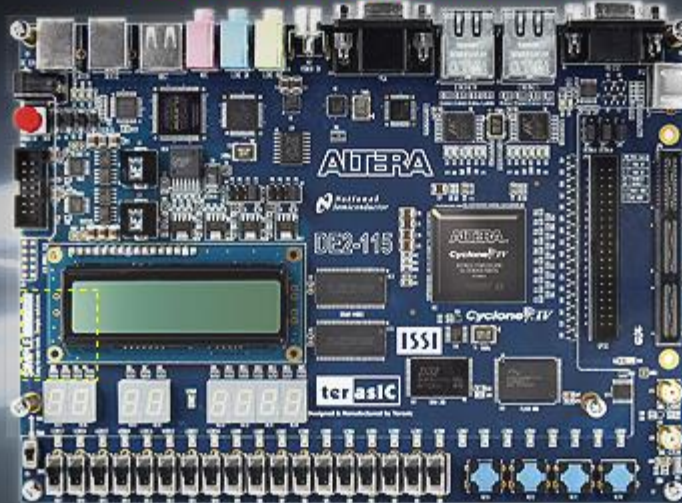
PS/2 Mouse Trace



Stop

PS/2-Mouse Monitor...

Terasic-DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card**
- IR

Connected

DISCONNECT

ALTERA
UNIVERSITY
PROGRAM

tcrasic
www.tcrasic.com

Card Identification

- Manufacturer ID:03h
- OEM/Application ID:4453h
- Product Name:SD08G
- Product Revision:80h
- Serial No.:018FCAC6h
- Date Code:09Bh



Card Specific Data

- CSD Version 2.0
- Read Access Time:1000 us
- Read Access Time (NSAC):0 (x100 cycle)
- Max. Data Transfer Rate:25 Mbits/s
- Max. Read Data Block Length:512 Byte
- Memory Capacity:7680MB

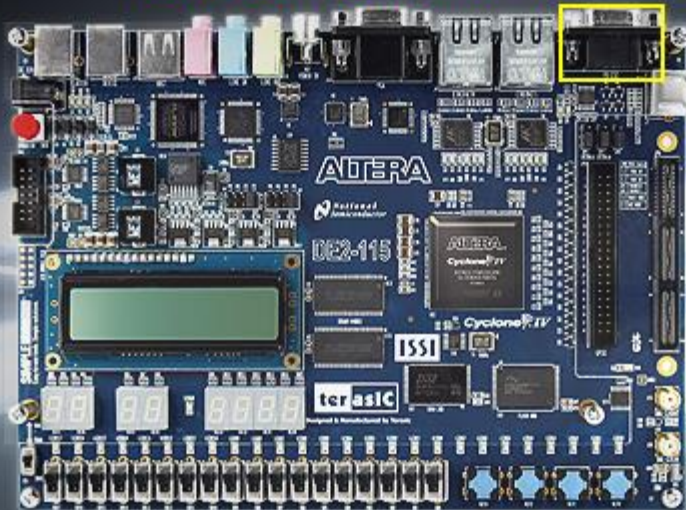
File System:

FAT32

Read

Read SDCARD read successfully

Terasic-DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232**
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

Connected

DISCONNECT

RS232 TX/RX

Receive:

I love DCLab!

Clear

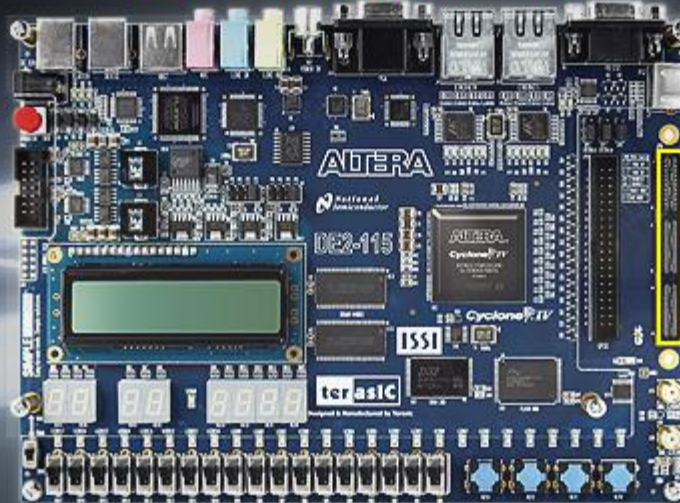
Send:

I love DCLab!

Send

RS232 transmit successfully.

Terasic-DE2-115 Control Panel V1.0.1



HSMC Loopback Verify

Loopback Installation

Please make sure the HSMC loopback adapter has connected to the HSMC connector of DE2-115. Otherwise please follow the steps below.

1. Turn off the DE2-115 board
2. Plug the HSMC loopback adapter into the HSMC connector of DE2-115
3. Turn on the the DE2-115 board
4. Re-launch the DE2-115 control panel



Verify

PASS

HSMC Loopback Test: PASS

Over all Structure of the DE2-115 Control Panel

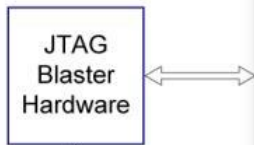
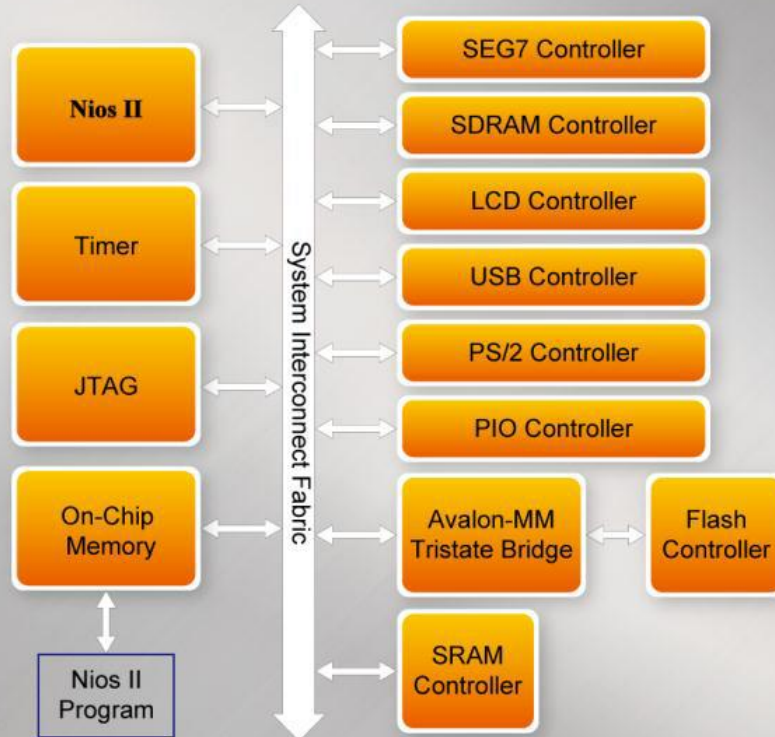
Overall Structure (1/2)

- The DE2-115 Control Panel is based on a **Nios II SOPC system** instantiated in the Cyclone IV E FPGA with software running on the on-chip memory.
- The software part is implemented in **C code**; the hardware part is implemented in **Verilog HDL code** with SOPC builder.
 - The source code is not available on the DE2_115 System CD.

Overall Structure (2/2)

- Each input/output device is controlled by the **Nios II Processor** instantiated in the FPGA chip.
- The communication with the PC is done via the **USB Blaster** link.
- The Nios II interprets the commands set from the PC and performs the corresponding actions.

FPGA/SOPC



The End.

Any question?

Reference

1. "DE2-115 User Manual" by Terasic Technologies Inc.