

# Digital Control Design using FPGA

## FPGA Digital Logic Design



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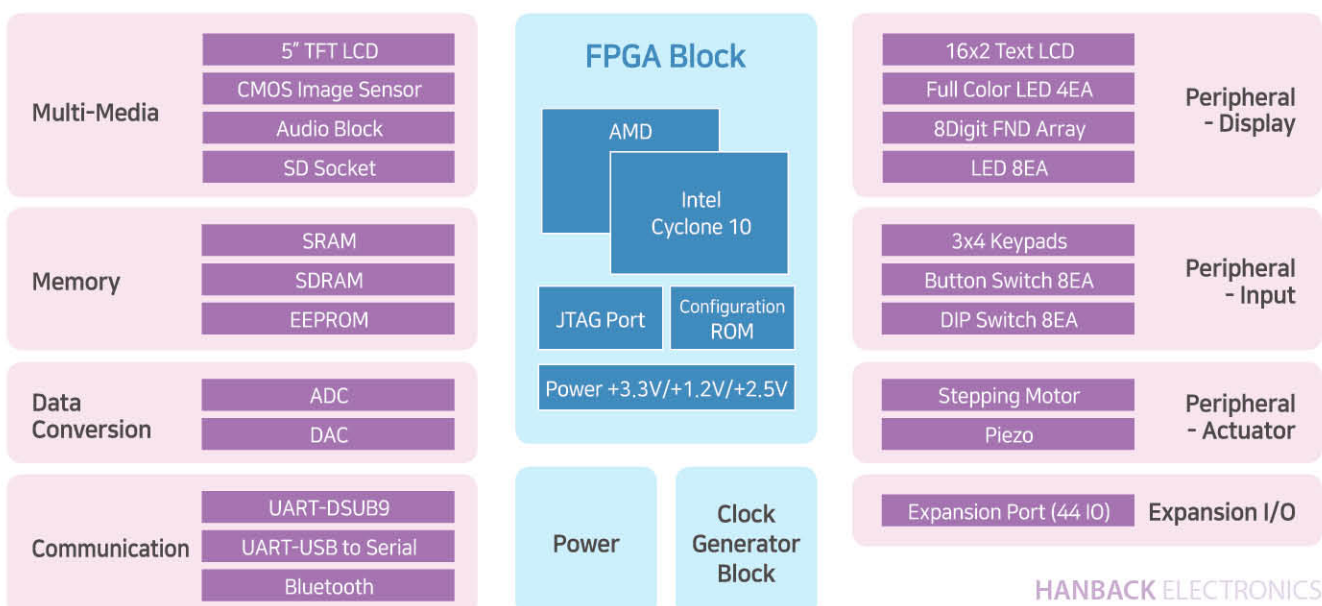
FPGAs Digital Logic Design uses the best FPGA device configured as a module, which enables selectable use of Intel (Altera) or Xilinx FPGAs.

You can control the environment of Multi Media via TFT LCD and CMOS Image Sensor in the equipment. This product also can be controlled on Android Smartphone by configuring Bluetooth for wireless communication.

## Product Features

- Uses FPGA (Intel, formerly Altera - Cyclone 10 Series, Xilinx-Spartan 7 Series) Devices
- Modularized to enable the replacement of Altera and Xilinx devices, taking into account the flexibility and scalability of FPGA devices
- Provides systematic training contents for Digital Logic Design
- Provides 16 types of clock between 0Hz - 50MHz configured in Clock Control Block for application circuit
- 5"-TFT LCD, CMOS Image Sensor, Audio Block and SD Socket for multi-media control
- Full color LED, 7-segment display device, step motor, piezo enable various application design
- Able to design sensor application circuit and analog signal control design through ADC / DAC
- Configure the expansion port to control other devices outside the board
- Organize textbook contents for users to design application examples using devices configured in equipment as well as basic digital logic design using FPGA

## Block Diagram



## ••• Software Specifications

List	Specifications
Intel Module	Quartus Prime Lite Edition
AMD Module	Vivado WebPACK Edition

## ••• Hardware Specifications

List	Specifications	
FPGA	AMD Module (default) <ul style="list-style-type: none"> <li>• Spartan 7 Device : XC7S75A484</li> <li>• Logic Cells : 76,800</li> <li>• Embedded Memory : 3,240kbit</li> <li>• DSP Slices : 140</li> <li>• Configuration ROM</li> <li>• Power Block : IN (+5V, +3.3V) Generation (+1.2V, +1.8V, +2.5V)</li> <li>• JTAG Port, Reconfiguration Switch</li> </ul>	
	Intel Module (option) <ul style="list-style-type: none"> <li>• Cyclone 10 LP Device : 10CL080YF484</li> <li>• Logic Cells : 81,264</li> <li>• Embedded Memory : 2,745kbit</li> <li>• Embedded 18x18 Multiplier : 244</li> <li>• Configuration ROM</li> <li>• Power Block : IN (+5V, +3.3V) Generation (+1.2V, +2.5V)</li> <li>• JTAG Port, Reconfiguration Switch</li> </ul>	
Base	Clock Block <ul style="list-style-type: none"> <li>• Provides 16 levels of clock from 0 Hz to 50 MHz [ 0Hz, 1Hz, 10Hz, 50Hz, 100Hz, 500Hz, 1kHz, 5kHz, 10kHz, 50kHz, 100kHz, 500kHz, 1MHz, 5MHz, 25MHz, 50MHz ]</li> <li>• 3 digit 7-Segment and LED to check the set clock</li> </ul>	
	TFT LCD	<ul style="list-style-type: none"> <li>• 5inch, 800 x RGB x 480 pixel, 24bit</li> </ul>
	CMOS Image Sensor	<ul style="list-style-type: none"> <li>• 0.3M pixel, 1/6inch, 640x480 VGA</li> <li>• Output Support for Raw RGB, RGB, YUV, YCbCr</li> </ul>
	Audio	<ul style="list-style-type: none"> <li>• Stereo Audio Codec, 8 ~ 96kHz, Integrated Headphone Amplifier</li> </ul>
	SD Socket	<ul style="list-style-type: none"> <li>• T Flash Memory Socket</li> </ul>
	Memory	<ul style="list-style-type: none"> <li>• 4Mbit SRAM, 256Mb SDRAM, 16kB 2Wire Serial EEPROM</li> </ul>
	Display	<ul style="list-style-type: none"> <li>• 16x2 Text LCD, 4 digit 7-Segment 2EA, LED 8EA (Diffusion Type RED), Full Color LED 4EA</li> </ul>
	Actuator	<ul style="list-style-type: none"> <li>• Step Motor 1EA with magnetic sensor (status LED 4EA)</li> </ul>
	Data Conversion	<ul style="list-style-type: none"> <li>• Parallel ADC : 1 Channel 8bit 32M Sampling Speed</li> <li>• Parallel DAC : 1 Channel 8bit 100M Sampling Speed</li> </ul>
	Input	<ul style="list-style-type: none"> <li>• Push Button Switch 8EA, DIP Switch 8EA, 3x4 Keypads</li> </ul>
	ETC	<ul style="list-style-type: none"> <li>• Piezo</li> </ul>
	Communication	<ul style="list-style-type: none"> <li>• Bluetooth</li> <li>• 2 Channel UART (USB to Serial 1 Port , D-Sub 9 Pin 1 Port )</li> </ul>
Expansion Port	<ul style="list-style-type: none"> <li>• 2x25 Box Header (44pin I/O)</li> </ul>	
Size	500 x 290 x 160(mm), Case	

## ••• Training Contents

### Digital Logic Circuit Design and Control Using FPGA

#### Installing Design Tool and Getting Started

#### Experiments for Control Logic and Application Design

- LED / Button Switch / DIP Switch / 7-Segment / Keypads / Piezo / Step Motor
- Full Color LED / Text LCD / DAC / ADC / RS232 / USB to Serial / Audio
- SRAM / SDRAM / EEPROM / TFT LCD / CMOS Image Sensor / SD Socket / Bluetooth

#### Experiments for Multi-Media Application

## ••• Layout



- |                  |                               |
|------------------|-------------------------------|
| 1 ADC Block      | 13 Clock Generator Block      |
| 2 Full Color LED | 14 Piezo                      |
| 3 DAC Block      | 15 Stepping Motor with Sensor |
| 4 Bluetooth      | 16 <b>FPGA Module</b>         |
| 5 Text LCD       | 17 CMOS Image Sensor          |
| 6 USB to Serial  | 18 SRAM                       |
| 7 FND Array      | 19 SDRAM                      |
| 8 RS232C         | 20 EEPROM                     |
| 9 LED            | 21 Expansion Port             |
| 10 Button Switch | 22 SD Socket                  |
| 11 Keypads       | 23 5" TFT LCD                 |
| 12 DIP Switch    | 24 Audio Block                |

## ••• Components



FPGA Digital Logic Design



AC Power Cable



USB Cable  
(A to B Type)



Platform USB



USB Programmer



User Guide book