





## ▶▶▶ 하드웨어 사양

종류	항목	사양
FPGA	Intel Module (default)	<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>
	Xilinx Module (option)	<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>
Base	Clock Block	<ul style="list-style-type: none"> <li>• 0 Hz ~ 50 MHz의 16단계의 클럭 공급 [ 0Hz, 1Hz, 10Hz, 50Hz, 100Hz, 500Hz, 1kHz, 5kHz, 10kHz, 50kHz, 100kHz, 500kHz, 1MHz, 5MHz, 25MHz, 50MHz ]</li> <li>• 3 digit 7-Segment와 LED를 통해 설정 클럭 확인</li> </ul>
	TFT LCD	• 5inch, 800 x RGB x 480 pixel, 24bit
	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	• Stereo Audio Codec, 8 ~ 96kHz, Integrated Headphone Amplifier
	SD Socket	• T Flash Memory Socket
	Memory	• 4Mbit SRAM, 256Mb SDRAM, 16kB 2Wire Serial EEPROM
	Display	• 16x2 Text LCD, 4 digit 7-Segment 2EA, LED 8EA (확산형 RED), Full Color LED 4EA
	Actuator	• Step Motor 1EA with magnetic sensor (status LED 4EA)
	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	• Push Button Switch 8EA, DIP Switch 8EA, 3x4 Keypads
	ETC	• Piezo
	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	• 2x25 Box Header (44pin I/O)
Size	500 x 290 x 160(mm), 케이스	

## ▶▶▶ 소프트웨어 사양

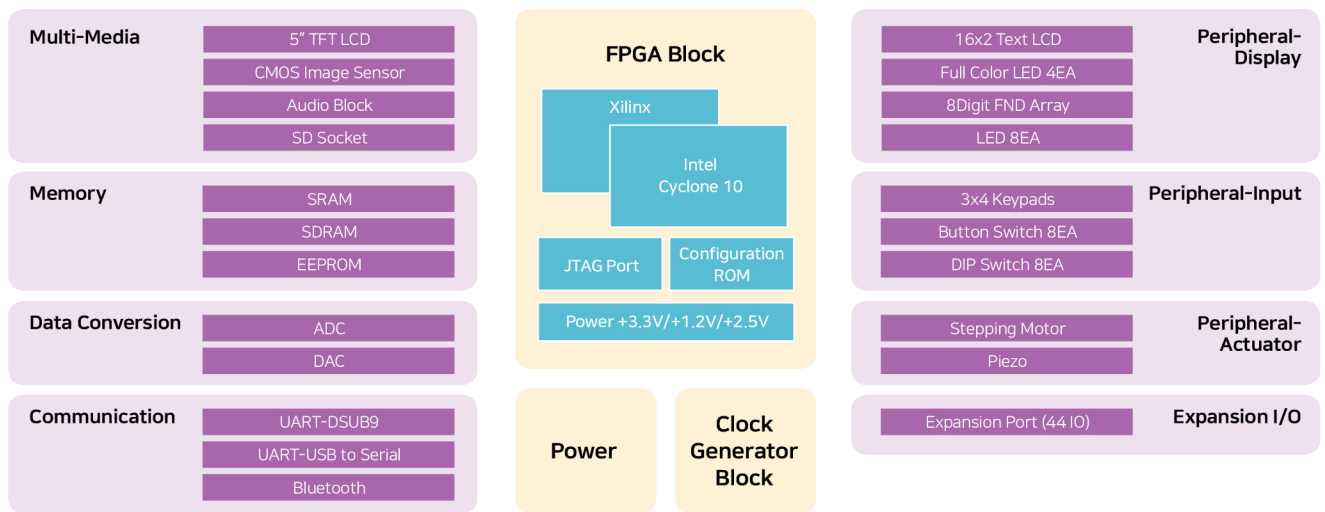
항목	사양
Intel Module	Quartus II Prime Lite Edition
Xilinx Module	Vivado HL WebPACK Edition

## ▶ ▶ ▶ 교육 챗터

### [ FPGA를 이용한 디지털 논리회로 설계 및 제어 ]

- ▶ Design Tool 설치 및 Getting Started
- ▶ 제어 로직 및 응용 설계 실험
  - 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
- ▶ Multi-Media 응용 실습

## ▶ ▶ ▶ 블록도



## ▶ ▶ ▶ 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                |