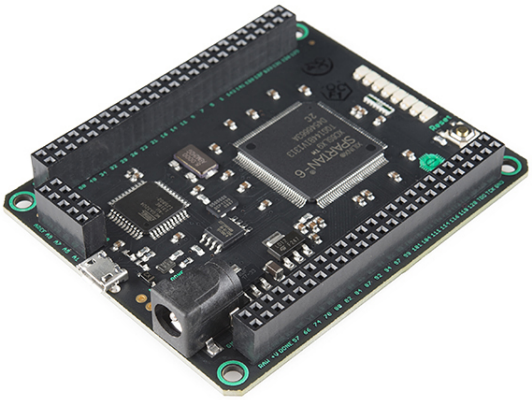
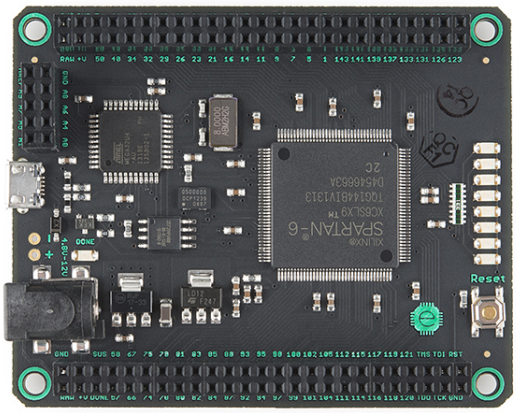
Board Name	Board Brand	Chip Name	Chip Brand	MicroController	Supplier	Price	link
Mojo v3	Embedded Micro	Spartan 6 Lx9	Xilinx	Yes (AT)	Sparkfun	$74.95	Link
DEO-Nano	Altera	Cyclone IV	Altera	No	Adarfuit	$99.95	Link
Papilio Pro	Gadget Factory	Spartan 6 LX	Xilinx	Yes (AT)	Gadget Factory	$84.99	Link
DE1 SOC Board	Altera	Cyclone V	Altera	Yes (ARM)	Altera	$175.00	Link
DE2 115	Altera	Cyclone IV	Altera	No	Altera	$309.00	Link
Zybo Zynq	Digilent	Zynq-7000	Xilinx	Yes (ARM)	Digilent	$125.00	Link
Zedboard Zynq	Digilent	Zynq-7000	Xlinx	Yes (Arm)	Digilent	$ 319.00	Link
Anvyl	Digilent	Spartan-6	Xilinx	No	Digilent	$ 356.00	Link
Nexys Video	Digilent	Atrix-7	Xilinx	No	Digilent	$299.00	Link
Nexys 4-DDR	Digilent	Atrix-7	Xilinx	No	Digilent	$159.00	Link
Basys 3	Digilent	Atrix-7	Xilinx	No	Digilent	$79.00	Link

1 Mojo V3



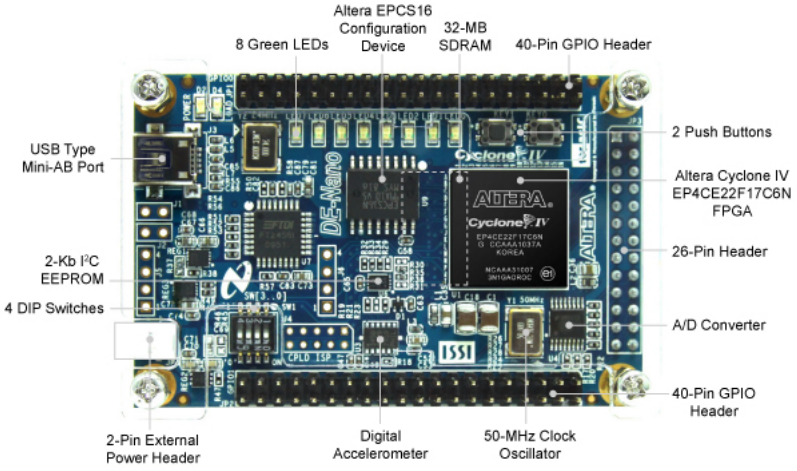


This FPGA is sold by sparkfun. Tutorials are provided by Embedded Micro, the developer. This is a small board featuring the Xilinx Spartan 6 and the Atmega32U. It features:

- 84 Digital IO Pins
- 8 Analog Inputs
- 8 GP LED's
- On Board voltage regulation
- on board flash memory

The tutorial documents can be found here. The tutorials are written in Verilog.

2 DE0-Nano

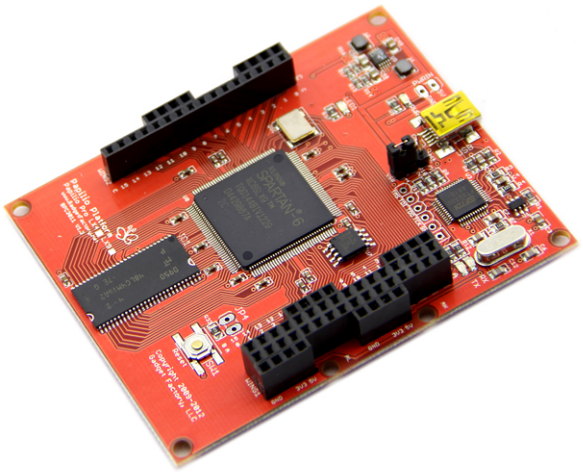


Another small form factor board. This board features an Altera Cyclone IV. It can be purchased through Altera or Adafruit Its feature list includes:

- 22,320 LEs
- 66 embeded 18 x 18 multipliers
- Built in USB-Blaster cable for programming the FPGA
- Three-axis accelerometer
- 8 channel, 12-bit A/D Converter
- 2 40 pin and 1 26 pin expansion header
- 32-MB SDram
- 2-Kb EEPROM
- 8 LEDs
- 4 Dip Switches
- 2 Push Buttons
- 50-MHz clock.

The main training resources for Altera are online classes that require a fee to view. They can be found here.

3 Papilio Pro



I would not recommend this device as it seems to not have a lot of support. It is an oper source board however with schematics avaialable so it was included. It has an on board microcontroller which is nice. There are not many other features that would make this a better option over other designs. It uses a Xilinx Spartan 6 microcontroller.

4 DE1-SoC Board

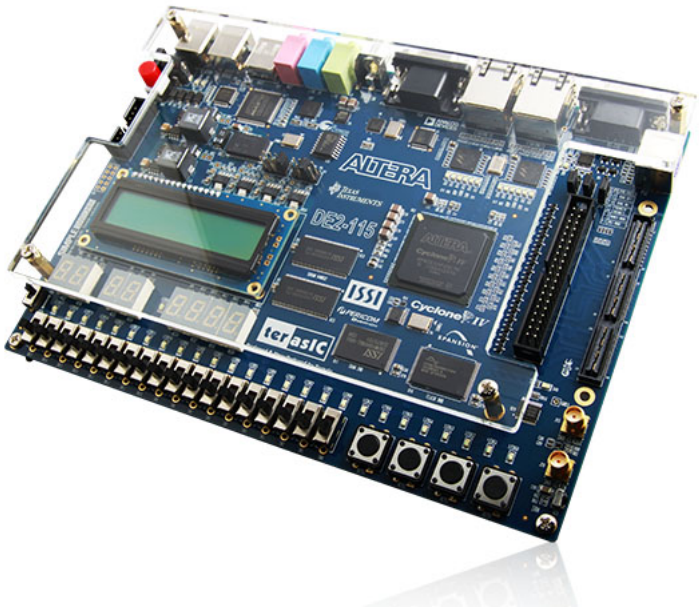
This is a great board from Altera. It has a lot of features. Since it is an SoC development board, it features both an FPGA and a Microcontroller. It features the Cyclone V FPGA and a dual core ARM Cortex-A9. Other features include:

- 85k LEs
- 4,450 kBits embedded memory
- 6 Fractional Phased Locked Loops (PLL)
- on board USB Blaster
- 64MB SDRAM on FPGA
- 1GB DDR3 SDRAM on microcontroller
- Micro SD Card socket
- USB to UART
- 10/100/1000 ethernet
- PS/2 mouse/keyboard
- IR Emitter/Reciever
- 2 40-pin expansion Headers
- 1 10-pin ADC Input Header
- VGA output and DAC
- 24-bit CODEC, line in, line out, microphon in

- NTSC/PAL/SECAM input TV Decoder
- 8 channel 12 bit ADC
- 4 user keys on FPGA
- 10 user switches on FPGA
- 10 LEDs on FPGA, 1 on MCU
- 2 microcontroller reset buttons
- six 7-segment displays
- G-sensor on microcontroller

Documentation and manuals are available here

5 DE2



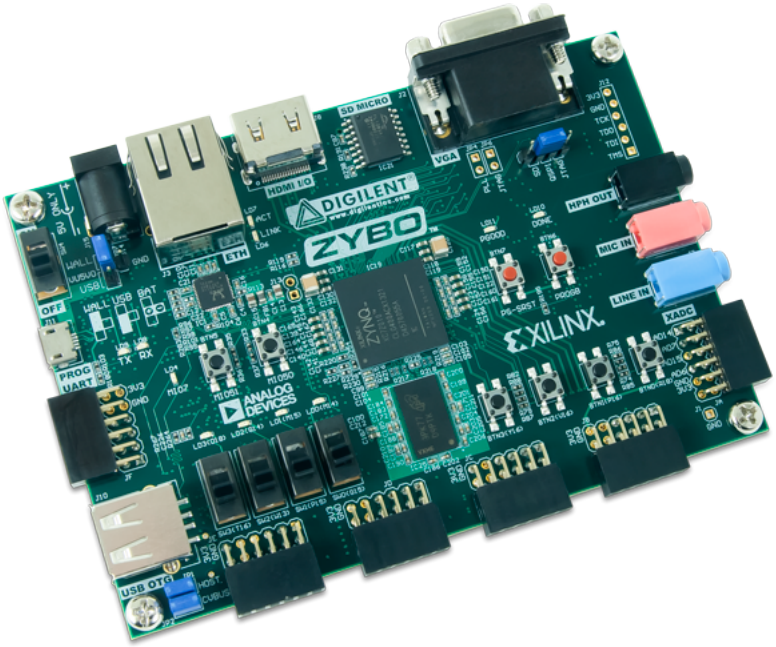
This is the next step up from the DE1 mentioned above. This is a nice board with a lot of on board peripherals. On this there is a Cyclone IV FPGA. However, this device does not have an on board microcontroller. The list of features includes:

- nearly 115k LEs
- 3,888 Embedded Memory
- 266 embedded 18x18 multipliers
- 4 general purpose PLLs
- 528 User IO's
- on board USB Blaster
- 128 MB SDRam
- 2MB SRam
- 8MB Flash
- 32Kbit EEProm
- 18 switches
- 4 push buttons
- 8 7 segment displays

- 24 bit CODEC, line in line out, microphone in jacks
- 16 x 2 LCD Display
- Three 50MHz clocks + SMAs for external clocks
- SD Card Slow
- 2 10/100/1000 Ethernet
- USB Type A and B
- 40 pin expansion port
- VGA-out connector
- DB-9 Serial Connector
- PS/2 Connector
- Infrared Reciever
- TV Decoder(NTSC/PAL/SECAM)

All resources and manuals are availbe here

6 Zybo Zynq



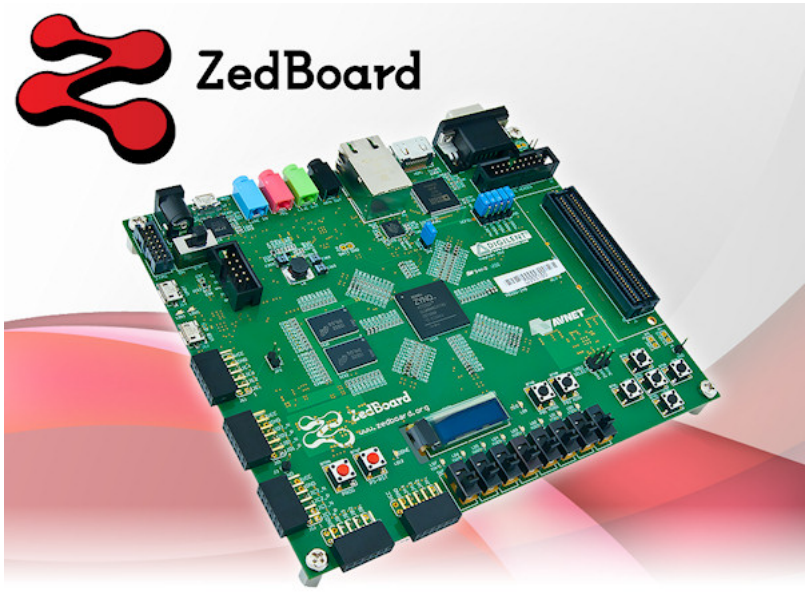
This is a board based off of a Xilinx Zynq-7000 SoC. This board integrates a Xilinx 7-series FPGA with an ARM Cortex A9 microprocessor. This system also benefits from being a diglient board, meaning it is able to interface to Digilet's large number of expansion boards. Its features include:

- 650 MHz dual core A9 processor
- 512MB DDR3 Memory
- 10/100/1000 Ethernet
- USB 2.0
- SPI, UART, I2C
- Equivalent of an Artix-7 FPGA (28k logic cells)
- 12 bit, 2 channel ADC
- MicoSD slot
- 16 bit VGA output port
- Dual Role HDMI Port
- External EEPROM

- Audio Code with headphone, mic and line in
- On-board JTAG
- on-board UART to USB
- 6 push buttons
- 4 slide switches
- 5 LEDs
- 6 PMOD (proprietary add on board) connectors

There is a free PDF textbook to help people get started with this series of FPGA available here.

7 ZedBoard Zynq

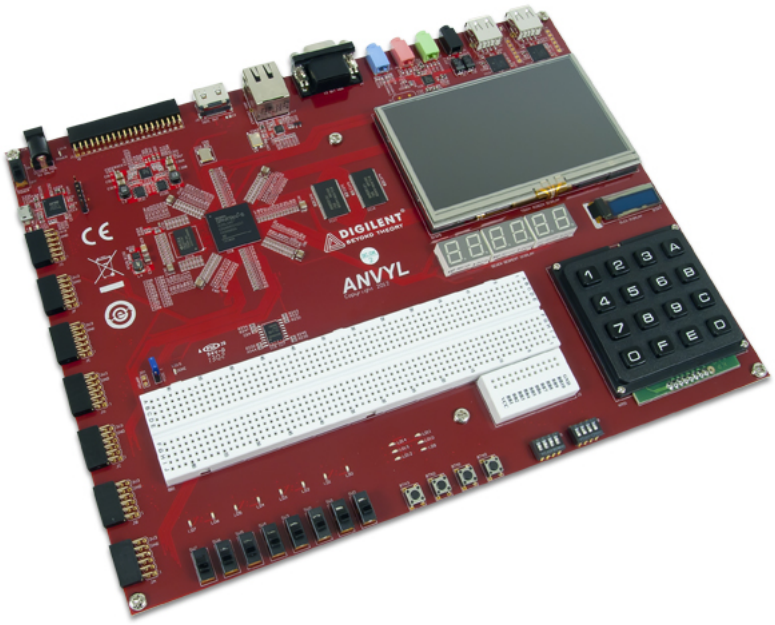


This is the big brother to the Zybo. Its a lot more expensive but provides more features. Again, it feautres the dual FPGA/Processor combo.

- Zynq-7000 AP
- Dual Core ARM Cortex A9
- 512 MB DDR3
- 256 Mb Quad-SPI Flash
- 4 GB SD Card
- onboard USB-JTAG Programming
- 10/100/1000 Ethernet
- USB 2.0 and USB-UART
- PMOD controllers
- ADCs
- HDMI
- 8 bit VGA
- 128 X 32 OLED
- Audio Code

For some reason this device had less information on its listing than the previous one. It seems that it may not be worth the extra cost versus the Zybo. This board is also part of the Xilinx University Program. It would use the same online book as mentioned previously.

8 Anvyl



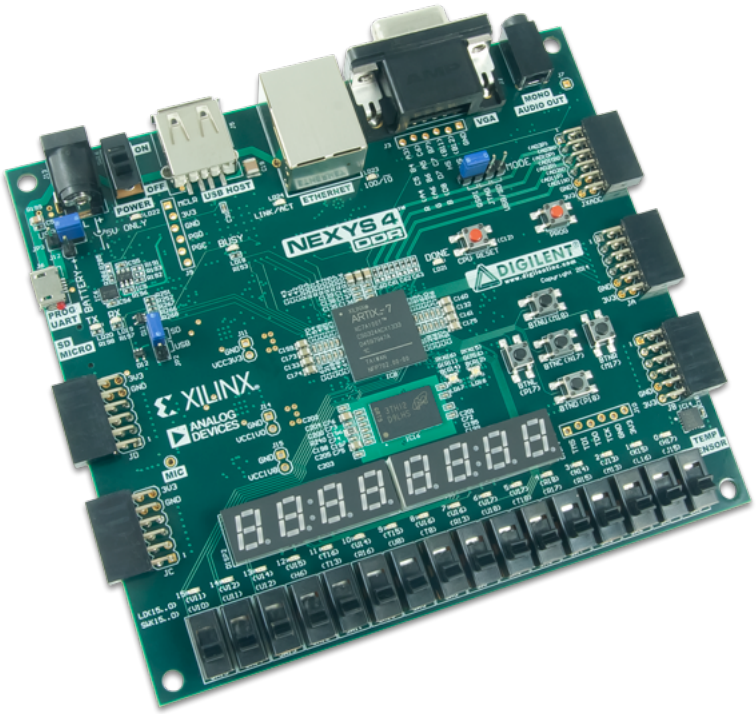
This is a very large board with a lot of features. It is based off of the Sparan6 FPGA and does not feature an additional processor. The rest of its features include:

- Spartan6 FPGA with 45,000 LEs
- 128MB DDR SDRam
- 2MB SRAM
- 16 MB FLASH
- 10/100 Ethernet
- HDMI Video Output
- 12 bit VGA Port
- 4.3" LED Backlit LCD
- 128x32 pixel 0.9" OLED Screen
- 3 two-digit 7 segment displays
- Audio Codec w/line in, out, mic, and headphone
- 100 MHz Crystal Oscillator

- USB2 ports for programming and HID (mouse/keyboard)
- USB-JTAG
- USB-UART
- Keypad with 16 labeled Keys (0-F)
- 14 LEDs
- 8 slide switches
- 8 DIP Switches
- 4 push buttons
- breadboard with 10 Digital I/O's
- 32 I/O's routed to 40 pin expansion connector
- 7 12-pin Pmod connecotrs

This board may not feature the fasted FPGA, or have an extra processor, but there is a LOT on the board. It would be very easy to make an entire semester's worth of projects with no external equipment at all. This board is also supported by the Xilinx University Program. More information can be found here.

9 Nexys 4 DDR



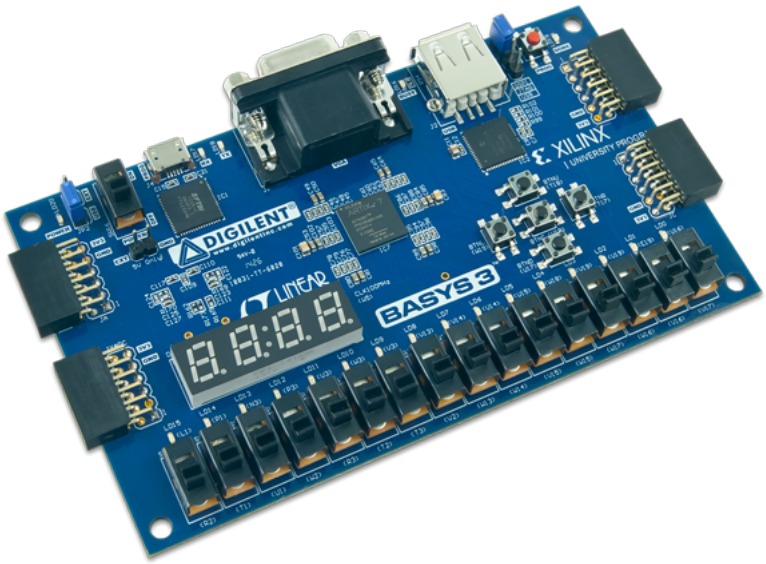
This board is the successor to the board I used to learn FPGAs. These feature a decent selection of features for a reasonable price. There is a version just called the Nexys 4 that has been discontinued due to an EOL memory chip (hence the new name of DDR). The specifications for this board are:

- 100k LE's
- 4,860 kbits of RAM
- 240 DSP Slices
- on chip ADC
- 16 user switches
- USB-UART Bridge
- 12-bit VGA Output
- 3-axis accelerometer
- 128MiB DDR2
- Pmod for ADC signals

- 16 user LEDs
- Two PWM Tricolor LEDs
- PWM audio output
- Temperature Sensor
- Serial Flash
- USB-JTAG
- 2 4 digit 7 segment displays
- MicroSD card slot
- PDM Microphone
- 10/100 Ethernet
- Four Pmod Ports
- USB HID for mic, keyboard, memory sticks

As this is part of the Xilinx University Program, additional resources can be found here. This is a good board with a lot of peripherals and a good amount of power.

10 Basys 3



This is a cheaper board made by digilent. IT has less power and speed than the other boards but is only $80.00. This may be a good board for buying in large quantities, but will require more external peripherals than many of the other options. This is also part of the Xilinx University program, therefore additional resources can be found here. Its features include:

- 33k LE's
- 1,800 Kbits of RAM
- 5 clock management tiles with PLLs
- 90 DSP slices
- intenal clock speeds of 450 MHz
- on chip ADC
- 16 user switches
- 16 user LEDs
- 5 user pushbuttons
- 4-digit 7 segment displays
- 4 pmod connecotrs (1 with ADC connections)
- 12 bit VGA output

- USB-UART Bridge
- Serial Flash
- USB-JTAG
- USB HID Host for mice, keyboards, and memory sticks