

ALTERA®

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# FPGA Trainer

## Training kit based on Altera® Cyclone® FPGA devices



### Why use FPGAs?

FPGAs are the electronic designers friend, as they are programmable hardware, as opposed to microcontrollers which are programmable software. In other words, they can be placed in a circuit and programmed to do different functions, either different signal routing, logic or features such as counters. They can also be re-programmed to change the design on the fly to cope with different conditions or new circuit requirements.

So, being able to use FPGAs gives the designer an edge and makes the design process more efficient. At first sight, they look horribly complicated, but in reality given the correct design tools, they are relatively easy. This kit supplies both the right tools and the information to use them effectively.

### Why Altera Cyclone?

A traditional belief about FPGAs is that they are horribly expensive but that has changed with the new generation of FPGAs from Altera, called the Cyclone range. They use a cost efficient technology that delivers extra performance for half the cost of traditional FPGA devices.

As well as being low cost, the Cyclone FPGAs incorporate lots of features to make the designer's life simpler, including embedded memory, external memory interfaces and clock management circuitry. They come in a wide range of sizes, both in the number of pins and the number of Logic Elements (LE) so that the you can choose the best device for the job in hand.



So, Cyclone FPGAs make FPGAs a sensible choice for more electronic tasks, but that is no use if you can't design for them and this is where this kit comes in to play.

### The FPGA design Process

An FPGA must be programmed to carry out the functions required and the standard way of doing this has been to use a software language called VHDL or Hardware Definition Language. Each circuit element and their interrelationships are defined in the VHDL code that is then compiled by the software. The output of the compiler is fitted into the particular FPGA chosen and converted into a bit stream that is programmed into the FPGA.

The alternative method that can be done with this kit is to use a schematic of the circuit as the starting point. This has a lot of attraction for electronic engineers who can design a circuit schematically but can't write VHDL programs.

The software is able to take a schematic and convert it into a bit stream for the FPGA programmer. This limits the number of new skills that have to be learnt before FPGAs can be employed.

So, whether your background is hardware or software, you have a route into FPGA design using this kit.

### Elements of the FPGA Training Kit



This Kit includes a complete copy of Altera's Quartus II® software. This is a sophisticated package that includes Schematic Entry, VHDL editor and compiler plus fitters and programmer interface.

As well as these elements that create the FPGA design, it includes a range of debug tools to get the design right, including Simulation software that analyses the whole design and the SignalTap® Logic Analyser to debug on the hardware.

The software is no use on its own, so we supply the three elements that allow you to actually develop FPGA designs. These are a programmer to program code into the device, a complete hardware board to try out the designs, and most importantly, a range of tutorials and notes to let you learn the whole design process.

### Board

The board has these features.

- 4 tactile keys
- 8 DIP switches
- Dedicated reset switch with Schmitt triggers
- 4-Digit numeric display
- 8 LED indicators
- Flexible power choices - 1.5V, 3.3V and 5V
- 34-pin expansion port
- 20MHz clock



The tutorials cover the use of these board features amongst other functions. With the board schematics, the kit gives you enough information to produce your own embedded design using I/O, Displays and much more.

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