

# FPGA Board Programmable with NI LabVIEW and Xilinx ISE Tools and Integrated with NI ELVIS II/II+

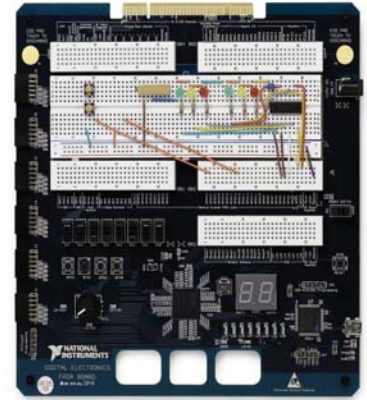
## NI Digital Electronics FPGA Board **NEW!**

- Teaching platform for digital electronics
- Programmable with both LabVIEW and Xilinx ISE tools
- JTAG-over-USB connectivity
- Full integration with NI ELVIS II/II+ design and prototyping platform
- Access to all NI ELVIS instruments including:
  - Oscilloscope
  - Digital multimeter
  - Function generator
  - Power supplies
  - Digital reader
  - Digital writer
- 500,000-gate Xilinx Spartan-3E FPGA
- 8 LEDs, 8 DIP switches
- 4 push buttons
- 2 seven-segment LED displays
- Large breadboarding and prototyping area included
- 12-bit ADC and DAC included
- 6 Pmod connectors

### Required Software

- LabVIEW
- LabVIEW FPGA
- Xilinx ISE tools
- NI-ELVISmx<sup>1</sup>

<sup>1</sup>Software for access to NI ELVIS II/II+ instruments



## Overview

The NI Digital Electronics FPGA Board is designed to help educators teach digital electronics with access to real-world signals and instrumentation for test. Based on the Xilinx Spartan-3E field-programmable gate array (FPGA) architecture, the board includes the necessary I/O to teach basic to advanced digital electronics. Table 1 shows the I/O available on the board.

I/O	Number
LEDs	8
DIP switches	8
Push buttons	4
Seven-segment LEDs	2
Pmod connectors	6
ADCs/DACs	2 AI ADCs and 4 AO DACs, 12-bit resolution
Encoder	1 rotary encoder with push-button shaft

Table 1. I/O on the NI Digital Electronics FPGA Board

## Programming Experience

You can program the NI Digital Electronics FPGA Board with Xilinx ISE tools and the NI LabVIEW graphical system design environment.

Xilinx ISE tools work with both the Verilog hardware descriptive language and VHDL so educators can reuse their curricula, port it for use with the NI Digital Electronics FPGA Board, and take advantage of the prototyping and breadboarding area as well as the added instrumentation capabilities with the National Instruments Educational Laboratory Virtual Instrumentation Suite (NI ELVIS).

Educators teaching students unfamiliar with Verilog or VHDL can also use this board for digital electronics instruction. With the LabVIEW FPGA Module, educators can target the NI Digital Electronics FPGA Board from LabVIEW.

Because LabVIEW is based on the graphical, dataflow paradigm, students can quickly design and prototype their systems on the FPGA without having to learn new languages such as Verilog or VHDL. LabVIEW and LabVIEW FPGA feature full support for the I/O on the board, making it easy to include any I/O on the board that students may want in their designs with a drag-and-drop interface. LabVIEW also provides a one-click compile, synthesize, place, and route design.

## Interactive Front Panels

Educators also can create interactive front panels in LabVIEW that interface to the FPGA, change the parameters, and see the results of their designs reflected immediately on the front panels. For example, Figure 1 shows an interactive front panel of a traffic light design that has been implemented on the NI Digital Electronics FPGA Board.



Figure 1. Interactive Front Panel of a Traffic Light Design Implemented on the NI Digital Electronics FPGA Board

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## NI ELVIS Integration

The NI Digital Electronics FPGA Board is fully integrated with the NI ELVIS platform, which features 12 of the most commonly used instruments in the laboratory including an oscilloscope, digital multimeter, function generator, variable power supplies, digital reader/writer, two- and three-wire current-voltage analyzers, and a Bode analyzer. Integration with the NI ELVIS platform gives students the ability to build comprehensive test benches and analog mixed-signal circuits that can be designed and tested in one platform. Figure 2 shows the NI Digital Electronics FPGA Board plugged into NI ELVIS II. The board works with both NI ELVIS II and NI ELVIS II+. For more information on the NI ELVIS platform, visit [ni.com/nielvis](http://ni.com/nielvis).



Figure 2. NI Digital Electronics FPGA Board Plugged into NI ELVIS II

## Ordering Information

NI Digital Electronics FPGA Board.....	781025-01
NI ELVIS II+ Basic Bundle.....	780378-02
NI ELVIS II Basic Bundle.....	780378-01
Includes NI ELVIS II workstation, NI ELVIS II prototyping board, NI LabVIEW, and user manuals.	
NI ELVIS II instrumentation design and training platform.....	780380-01
NI ELVIS II prototyping board.....	188432-01

## BUY NOW

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/nielvis](http://ni.com/nielvis).

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## Specifications

Specifications listed below are typical at 25 °C unless otherwise noted.

### FPGA

FPGA.....	XC3S500E-4FTG256C
System gates.....	500 k
Logic cells.....	10,476
User I/O.....	190 maximum
I/O output drive.....	12 mA
Logic family.....	CMOS
Platform Flash configuration PROM.....	4 Mbits
SPI serial Flash (STMicro)	
for FPGA configuration storage.....	6 Mbits
Onboard USB-based FPGA/CPLD download/debug interface	

### General-Purpose I/O

GPIO lines.....	32 general-purpose digital I/O lines, 3.3 V
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### Analog Output

DAC.....	SPI-based
Channels.....	4
Resolution.....	12 bits
Range	
DAC0, DAC1.....	0 to 3.3 V
DAC2, DAC3.....	0 to 2.5 V
Error.....	±1.5 mV
Generation.....	Single-point

### Analog Input

ADC.....	SPI-based, with programmable gain amplifier with serial digital interface
Channels.....	2
Resolution.....	12 bits, simultaneously sampled
Range.....	0 to 3.3 V
Offset error.....	±1 LSB
Gain error.....	±5 LSB
Sample-and-hold acquisition time.....	39 ns
Acquisition.....	Single-point

### Flash

Platform Flash.....	Xilinx XCF04S
Platform Flash frequency.....	25 MHz CCLK

### Oscillator

Clock oscillator.....	50 MHz clock oscillator
Output duty cycle.....	40 to 60%
Oscillator accuracy.....	±2500 Hz or ±50 ppm

### General

ON/OFF power switch.....	1
Reset button.....	1
LEDs.....	8, discrete
Slide switches.....	8
Push buttons.....	4
LED display.....	2-digit, 7-segment
Rotary encoder with	
push-button shaft.....	1
12-pin expansion connectors (Pmod)....	6, Digilent
Signal breadboard area	
For NI ELVIS.....	1
For FPGA.....	1
General-purpose breadboard area.....	3e
NI ELVIS connector interface.....	1, PCI type

### Bus Interface

USB.....	Full-Speed USB
USB connector.....	Mini-USB Type B

### Power Requirement

DC power supply.....	15 VDC, 650 mA
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### Physical

Dimensions.....	20.95 by 21.59 cm (8.25 by 8.5 in.)
Weight.....	283.5 g (10 oz)

### Maximum Working Voltage

Maximum working voltage refers to the signal voltage plus the common-mode voltage.

Channel-to-earth.....	±12 V, Measurement Category I
Channel-to-channel.....	±24 V, Measurement Category I

**Caution:** Do not use the NI Digital Electronics FPGA Board for connection to signals in Measurement categories II, III, or IV.

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