Cyclone V GT FPGA Development Kit

Quick Start Guide

A Complete Development Environment

Introduction

Altera's Cyclone® V GT FPGA Development Kit, which comes with a one-year license for Quartus® II software, provides all that you need to begin developing high-performance, low cost designs.

You can use this development kit to:

- Develop and test PCI Express® (PCIe®) 2.0 designs using the PCI-SIG®-compliant development board.
- Develop and test memory subsystems consisting of DDR3 memory.
- Develop modular and scalable designs by using high-speed mezzanine card (HSMC) connectors to interface to one of over 40 different "HSMCs" provided by Altera® partners. For a complete list of HSMC connectors available for this development kit, refer to www.altera.com/products/devkits/kit-daughter_boards.jsp

What's in the Box

Hardware

The development kit includes the following hardware:

- Cyclone V GT FPGA development board running on Cyclone V GT 5CGTFD9EF35C7N FPGA
- DDR3 memory
- Two HSMC connectors supporting LVDS and single-ended I/Os plus DQ/DQS pins for additional memory connectivity
- PCIe x4 edge connector
- Serial digital interface (SDI) channel (optional)
- Character LCD
- Debug and loopback HSMC boards
- AC adapter power cables
- Ethernet, SMB-SMB, and USB cables

Software

Download and install Cyclone V GT FPGA Development Kit Installer to obtain the following items:

- Design examples
  - Board Update Portal design
  - Board Test System (BTS) design
- Documentation
  - Cyclone V GT FPGA Development Kit User Guide
  - Cyclone V GT FPGA Development Board Reference Manual
  - Board design files
- Design software*
  - Quartus II software (required)
  - Nios® II processor (optional)
  - MegaCore® intellectual property (IP) library (optional)
  - Mentor Graphics® ModelSim®-Altera software (optional)

*You can download the kit installer directly from www.altera.com/products/devkits/altera/kit-cyclone-v-gt.html. You can also order the Development Kit installation DVD along with the Quartus II software DVD on the Documentation page (www.altera.com/literature/lit-index.html) of the Altera website.

Keep Your Board Current with the Board Update Portal

The Board Update Portal design example included in this development kit facilitates easy development kit software and board flash memory updates, allowing you to:

- Access useful information on www.altera.com, including the page that contains updated software and design examples.
- Load designs into the flash memory on your board.

The following steps ensures that you have the latest software available on both your computer and your board. The Board Update Portal design example, which includes a Nios II embedded processor, an Ethernet media access control (MAC), and a web page, is stored in the "factory" portion of your board's flash memory. The source for this design is installed with the development kit software. When your board is connected to a DHCP-enabled network, the Nios II processor obtains an Internet protocol address and allows you to interface with your board over the network through a web page.

Before you proceed, ensure that you have the following:

- A computer with a connection to a working Ethernet port on a DHCP-enabled network.
- A separate working Ethernet port connected to the same network for your board.
- The Ethernet, power cables, and development board included in your kit.

Step 1. Connect your board

1. With the board powered down, set the DIP switch SW4.3 to the OFF position (factory default), which loads the factory design into flash on power-up.
2. Attach the Ethernet cable from the board to your network hub.
3. Power up the board. The board connects to your network server and obtains an Internet protocol address, which will be displayed on the board's LCD when it has been assigned. Meanwhile, the LCD displays "Connecting."
4. Launch a web browser on a computer that is connected to the same network, and type the Internet protocol address displayed on the LCD in the address bar. The Board Update Portal web page appears on your screen.
5. Click on the "Cyclone V GT FPGA Development Kit" and download the latest version of the development kit software. The version number noted in the "Downloads" section of the website corresponds to the version of Quartus II software used to create the design examples.
6. Browse through the additional designs that are available. Check this website often for new designs and for updates to existing designs and documentation. Note that some designs may require specific versions of the Altera Complete Design Suite to function properly.
7. If necessary, click on the link to the Software Download Center to install the latest Altera software tools, including Quartus II software, Nios II processor, and IP functions.
8. This development kit is supported by a free license for Quartus II Web Edition software. You can generate a free license at www.altera.com/download/licensing/lic-index.html. To download the Quartus II Web Edition software, visit www.altera.com/products/software/quartus-ii/web-edition/qts-we-index.html.

If you cannot connect to the Board Update Portal, go to www.altera.com/products/devkits/altera/kit-cyclone-v-gt.html to ensure that you have the latest development kit software.

Step 2. Install the development kit software

Install the latest development kit software tools from www.altera.com and follow the on-screen instructions to complete the installation.

Step 3. If necessary, use the Board Update Portal to update your board and load the latest BTS

The Board Update Portal allows you to download new FPGA configurations to the user portion of the board's flash memory. If your board is up to date, you can skip this step and proceed to *Using the BTS* section of this quick start guide.

If you cannot connect to the Board Update Portal, refer to the kit's user guide for other options to update the flash memory.

To update the user portion of flash memory on your board, follow these steps:

1. Perform the steps in Step 1 to display the Board Update Portal web page.
2. In the **Hardware File Name** field, specify the **.flash** file (*<installation directory>***kits\cycloneVGT_5cgtfd9ef35_fpga\factory_recovery\build_factory_source\bts_config.flash**) that you downloaded from the Altera website. Because the design does not have a software component, leave the **Software File Name** field blank.
3. Click **Upload**.
4. Reconfigure the FPGA with the new files:
   a. Press the PGM_SEL (S6) push button until PGM_LED1 (LED D13) illuminates.
   b. Press the PGM_CONFIG (S5) push button, to configure the FPGA from the "user_hardware1" portion of the flash memory.

The BTS design now runs in the FPGA.

You can also use the Board Update Portal to upload your custom designs. The kit's user guide describes in detail how to prepare your designs for use with the Board Update Portal.

Using the BTS

The BTS interface allows you to verify most of the components on your board. All design files for the BTS are included in the *<installation directory>* **\kits\cycloneVGT_5cgtfd9ef35_fpga\examples\board_test_system** directory.

BTS Interface

When you launch the **BoardTestSystem.exe** file in that directory, the screen shown in Figure 1 appears. To view each tab, select the design from the Configure menu. Each tab has options for interfacing to one or more of the board components. The Help menu provides further information about each test design.

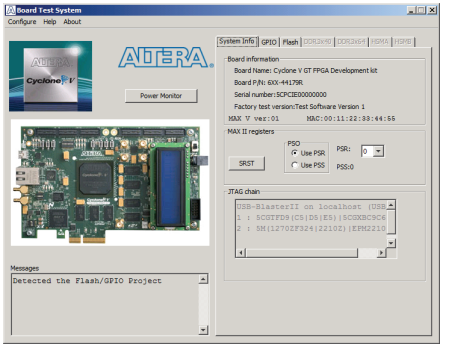


Figure 1. BTS Interface

Power Measurement Tool

The power measurement tool, available via the buttons in the upper left of the BTS interface, can be used to see how any design—including your custom design—affects the FPGA's power consumption.

Related Links

Kit-specific resources

- Cyclone V GT FPGA Development Kit: www.altera.com/products/devkits/altera/kit-cyclone-v-gt.html
- Cyclone V GT devices: www.altera.com/devices/fpga/cyclone-v-fpgas/cyv-index.jsp

General Design Resources

- Board Design Resource Center: www.altera.com/technology/signal/board-design-guidelines/sgl-bdg-index.html
- Licensing: www.altera.com/download/licensing/lic-index.html
- Software Download Center: www.altera.com/download/dnl-index.jsp
- Technical Support Center: www.altera.com/support/spt-index.html
- Development kits: www.altera.com/products/devkits/kit-index.html
- Embedded processing: www.altera.com/embedded
- Altera Forum: www.alteraforum.com

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