CY4615B

EZ-USB® AT2LP™ Hi-Speed USB 2.0-to-ATA/ATAPI Reference Design Guide

Doc. # 001-69113 Rev. *C

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Contents

1. Introduction

Cypress's AT2LP™ Development Kit (DVK) board is a tool to demonstrate the features of EZ-USB® AT2LP (CY7C68300C/CY7C68301C and CY7C68320C/CY7C68321C). The EZ-USB AT2LP implements a fixed function bridge between one USB port and one or two ATA or ATAPI-based mass storage device ports. The AT2LP DVK is based on the 100-pin TQFP CY7C68320C. In the initial phase of the design, this board helps developers to understand the chip features and limitations before proceeding with a complete design. The DVK includes support documents related to board hardware, PC application software, and the EEPROM configuration data (*.iic*) files.

The AT2LP adheres to the USB Mass Storage Bulk Only-Transport (BOT) Specification. The Cypress ATA/ATAPI-6 controller can communicate with the following devices

- IDE devices (ATA complaint)
  - 3.5-inch and 2.5-inch hard disk drives
- Compact Flash (CF) and micro drives
- ATAPI devices
  - ZIP drives
  - CD-ROM/R/RW drives
  - DVD-ROM/RAM/RW drives
  - Tape drives

The 100-pin CY7C68320C device is a superset of the 56-pin CY7C68300C and CY7C68301C devices. Therefore, this board can be used as an evaluation platform for all devices in the AT2LP family.

1.1 Kit Contents

The CY4615B AT2LP Reference Design Kit includes:

- AT2LP Board based on CY7C68320C
- USB A-to-B cable
- 40-pin to 44-pin adapter
- 3 IC samples of CY7C68320C-100AXC
- A "Y" power adapter cable to connect supply power to IDE drives and CY4615B board.
- ATA/66/100 Cable to connect multiple ATA/ATAPI devices to the CY4615B board.
- Compact-flash (CF) card to demonstrate Kit functionality.

1.2 Features

The features of the AT2LP DVK are:

- Fixed function mass storage device, which does not require any firmware
- Allows to program AT2LP configuration files (.iic) to I2C based EEPROM

- Low-power operation with suspend current varying from 100 µA to 380 µA
- General purpose I/O (GPIO) pins can be individually configured as Input or Output mode
- Certified as USB 2.0 compliant
- 3.3 V operation with 5 V tolerant inputs
- Available in space saving 56-pin packages

1.2.1 ATA-ATAPI-6 Standard Features

- Complies with ATA-ATAPI-6 Specification
- Supports ATA security features, ATAPI serial number VPD page retrieval, and an optional Content Security Management (CSM) interface for Digital Rights Management (DRM) compatibility
- Supports data transfer modes such as PIO mode-0 and 4 multiword DMA mode 2, UDMA modes 2, 3, and 4
- Supports any ATA command with the ATACB function
- Supports mode page 5 for BIOS boot support
- ATA interface IRQ signal support
- Supports one or two ATA,ATAPI devices
- Supports CompactFlash and one ATA/ATAPI device. When using a CF device, the CF is always master and the ATA or ATAPI device must be set as the slave

1.2.2 Additional Features (CY7C68320C/CY7C68321C Only)

- Supports an HID interface or custom GPIOs to enable features such as single button backup, power-off, and LED-based notification
- 56-pin QFN and 100-pin TQFP Pb-free packages
- CY7C68321C is ideal for battery-powered designs
- CY7C68320C is ideal for self- and bus-powered designs

1.2.3 Additional Features (CY7C68300C/CY7C68301C Only)

- Pin-compatible with CY7C68300A (using backward compatibility mode)
- 56-pin SSOP and 56-pin QFN Pb-free packages
- CY7C68301C is ideal for battery-powered designs
- CY7C68300C is ideal for self- and bus-powered designs

1.3 Additional Learning Resources

Visit http://www.cypress.com for additional learning resources in the form of datasheets, Errata and application notes.

1.3.1 Reference Documents

- USB Specification - Revision 2.0, USB Implementers Forum. (www.usb.org)
- ATA/ATAPI-6 Specification, Proposed ANSI Standard (www.t13.org)
- USB Mass Storage Class - Bulk Only Transport.

1.4 Document History

Table 1-1. Revision History

Revision	PDF Creation Date	Origin of Change	Description of Change
**	05/03/2011	ROSM	Initial version of kit guide
*A	06/07/2011	ROSM	Corrected page numbering
*B	04/16/2012	ELIN	Updated kit documents with OOB review comments.
*C	04/25/2012	NMMA	Updated kit document content as per CY4615B kit installer changes.

1.5 Documentation Conventions

Table 1-2. Document Conventions for Guides

Convention	Usage
`Courier New`	Displays file locations, user entered text, and source code: `C:\...cd\icc\`
Italics	Displays file names and reference documentation: Read about the *sourcefile.hex* file in the *PSoC Designer User Guide*.
[**Bracketed, Bold**]	Displays keyboard commands in procedures: [**Enter**] or [**Ctrl**] [**C**]
File >> Open	Represents menu paths: File >> Open >> New Project
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** icon and then click **Open**.
Times New Roman	Displays an equation: 2 + 2 = 4
Text in gray boxes	Describes cautions or unique functionality of the product.

2. Getting Started

This chapter describes the installation and configuration of the CY4615B AT2LP RDK. It also provides configurations on CY4615B board to connect Compact Flash (CF) card in Bus power mode and ATA devices like DVD /IDE drives in Self-power mode.

2.1 Kit Installation

To install the kit software, follow these steps:

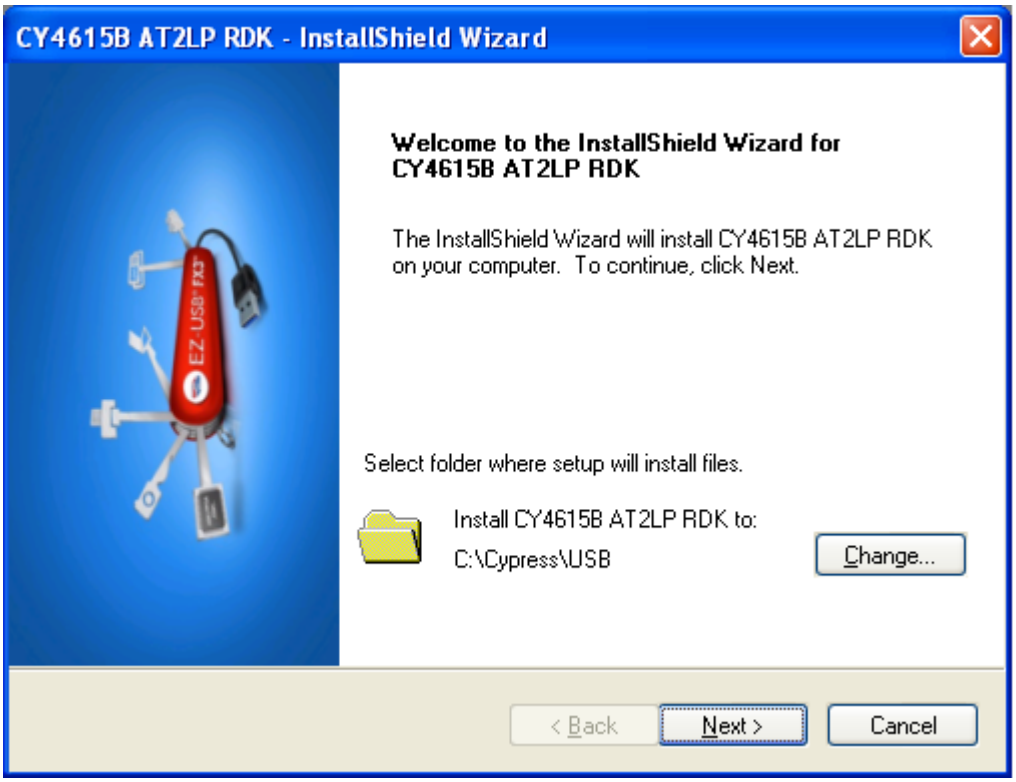
1. Insert the kit CD/DVD into the CD/DVD drive of your PC. The CD/DVD is designed to auto-run and the kit installer startup screen appears. You can also download the latest kit installer ISO file from http://www.cypress.com/go/CY4615B. Create an installer CD/DVD or extract the ISO using WinRar and install the executables.
2. Click “CY4615B AT2LP RDK” to start the installation, as shown in Figure 2-1.

Figure 2-1. Kit Installer Startup Screen

Note: If auto-run does not execute, double-click on the cyautorun.exe file in the root directory of the CD/DVD.

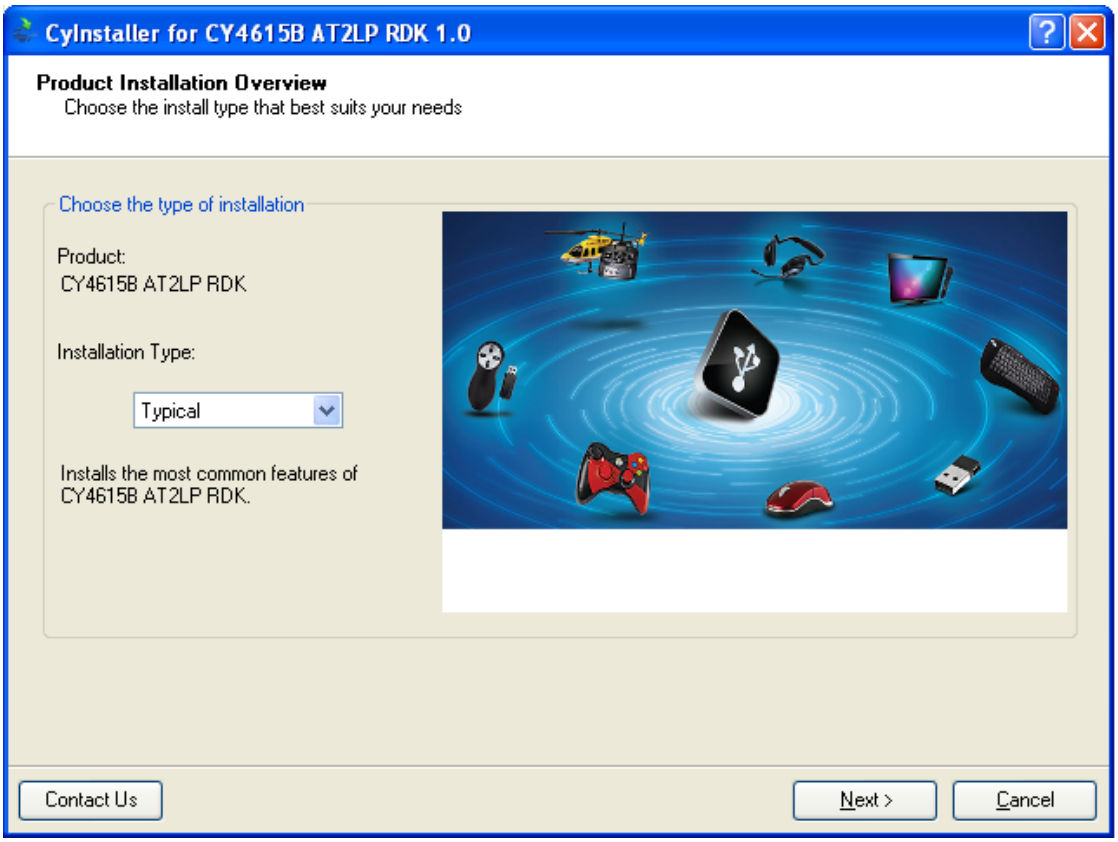
3. The InstallShield Wizard screen appears. The default location for setup is shown on the InstallShield Wizard screen. You can change the location for setup using Change button, as shown in Figure 2-2. Click **Next** after selecting the installed directory to launch the kit installer

Figure 2-2. InstallShield Wizard



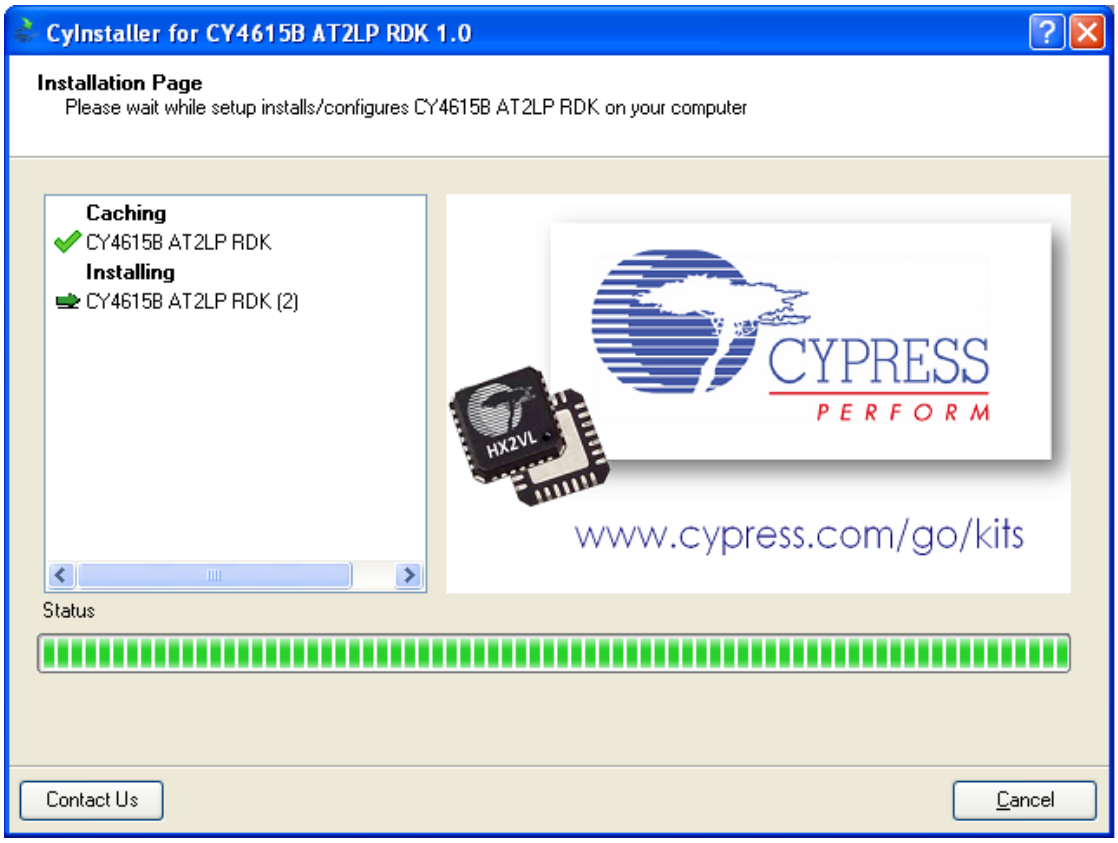
4. On the Product Installation Overview screen, select the installation type that best suits your requirement. The drop-down menu has three options - **Typical**, **Complete**, and **Custom**, as shown in Figure 2-3. For this kit all these types of installations would result in the installation of same set of kit components. Click **Next** to start the installation

Figure 2-3. Installation Type Options



5. When the installation begins, all packages are listed on the Installation page. A green check mark appears adjacent to every package that is downloaded and installed, as shown in Figure 2-4.

Figure 2-4. Installation Page



6. Wait until all the packages are cached and installed successfully. Click **Finish** to complete the installation.

Figure 2-5. Installation Completion Page

Note: After software installation, verify your installation and setup.

2.2 Reference Design Kit Contents

After installation of CY4615B contents successfully as explained in Kit Installation on page 9 the kit contents can be located at install directory <Installed_Directory>\<version>\.The <Installed_Directory> term referenced throughout this document refers to C:\Cypress\USB\CY4615B AT2LP RDK as default path. If the installed directory was modified during installation the corresponding path needs to be verified. Following is the summary of CY4615B kit content folders with respect to <Installed_directory>\<version>

- **Documentation**-Contains Release notes, Quick start Guide, Kit User Guide (This doc), Application notes, AT2LP datasheet, Errata...etc related to the kit.
- **Hardware**-contains Kit BOM, Schematic, PCB, Gerber and Layout files related to CY4615B board.
- **Manufacturing Software**-contains Blaster and Primer tools to program configuration files (.iic) to external I2C EEPROM connected to the AT2LP IC. Using the configuration file parameters CY4615B communicates with different ATA/ATAPI-6 compliant devices.
- **Manufacturing Software\Drivers-**This folder contains cypress *cyusb4615brdk.inf* and *cyusb.sys* USB driver to bind CY4615B board with PC Host containing Windows OS.The Cypress USB drivers are supported on Windows 2000,XP,Vista and 7 on both 32/64-bit processor types.
- **Windows Driver-**This folder contains Cypress USB Mass Storage Driver which provides support for the entire line of Cypress USB Mass Storage products (AT2, FX, FX2, ISD-200, ISD-300, ISD-300LP, and SL11R-IDE) on Windows 98 Second Edition, Millennium Edition, 2000 Professional Edition, and XP Home and Professional Editions.

2.3 Quick Start

The AT2LP DVK board is by default configured to connect to a Compact Flash (CF) card in a Bus-powered mode. Please verify the Jumper settings for “Bus-powered CF” mentioned in Recommended Settings on page 16. To verify Self-powered ATA devices like DVD and HDD refer to Detecting Self-powered Hard Disk (IDE) Using CY4615B Board on page 16.

2.4 Jumpers and Switches

The AT2LP DVK board has many switches and jumpers to help you evaluate the features of the AT2LP.

Jumper/Switch	Function
J1	CF connector. To use the CF connector, the board must be reconfigured as described in Recommended Settings on page 16
J2	40-pin IDE connector
J3	USB connector
J4	VBUSPWRD 1-2 = Bus-powered 2-3 (default) = Self-powered
J5, J6, J8, J10, J14, J15	GPIO input signals. 1-2 (default) = GPIO0, GPIO1, and GPIO2 are driven high. Removed = The GPIOs are pulled low and can be driven high by the AT2LP or pushbuttons S2-S7
J7	CompactFlash power source. Note that this is an input to Q4, which switches the CF power on and off under AT2LP control VCC_3.3V (recommended) = Supply 3.3 V to the CF socket VCC_5V = CF power comes from external 5 V supply VBUS = CF power comes from VBUS
J9	EEPROM enable. This jumper should not be removed. If the EEPROM is programmed incorrectly, unplug the IDE cable, short pins 1 to 3 on the IDE connector, and cycle power to return to manufacturing mode
J11	CompactFlash power control select 1-2 = Bus-powered. CF power is driven by PWR500# pin. 2-3 (default) = Self-powered. CF power is driven by the DRV_PWR_VALID signal (CF CD2#)
J12	External power connector. Connect to standard 4-pin floppy connector. 12 V is not required
J13	Power select 2-3 (default) = Self (external) power. Board is powered from J12. J4 and J11 must also be changed to move from Self-powered to bus-powered 1-2 = Bus power. Board is powered from USB (J2)
J16, J17	UDMA on CF socket. Default = OFF. Connect these two jumpers to enable UDMA on the CF socket for micro drive class devices. If these lines are connected to a CF that is not UDMA capable, the CF may interfere with any other devices on the bus.

2.5 DIP Switches

Switch	Function
SW1-1	ATA_EN OFF (default) = Normal operation ON = Disconnect from USB. Tri-state the ATA bus if the EEPROM configuration is set to tri-state.
SW1-2	DRV_PWR_VALID OFF (default) = Normal operation ON = Simulate CompactFlash connection
SW1-3	SPARE
SW1-4	LED enable OFF = Disable power LED, GPIO LEDs ON (default) = Enable power LED, GPIO LEDs

2.6 Pushbutton Switches

Button	Function
S1	SYSIRQ: Pushing this button pulls up the SYSIRQ line. This line latches the GPIO pins into the interrupt endpoint. Note that this button has no function when the GPIOs are used in HID mode.
S2-S7	When the GPIO pins are used as inputs, they are pulled down by default. These buttons pull the GPIOs high when they are pressed. To tie the GPIOs high for longer periods of time, use J5, J6, J8, J10, J14, and J15.

2.7 Recommended Settings

Jumper/Switch	Name	Bus-Powered CF	Self-Powered DVD or HDD
J1	CF connector	CF	unused
J2	40-pin IDE connector	Unused	80-pin IDE cable
J3	USB connector	USB	USB
J4	VBUSPWRD	1-2 Bus-powered	2-3 Self-powered
J5, J6, J8, J10, J14, J15	GPIO input signals	Application specific	Application-specific
J7	Compact Flash power source	VCC_3.3V (recommended) = Supply 3.3 V to the CF socket	N/A
J9	EEPROM enable	Inserted	Inserted
J11	Compact Flash power control select	1-2 = Bus-powered. CF power is driven by PWR500# pin.	2-3 = Self-powered. CF power is driven by the DRV_PWR_VALID signal (CF CD2#)
J12	External power connection	Do not supply power through this connector in bus-powered mode.	Connect to standard 4-pin floppy connector. 12V is not required
J13	Power Select	1-2 = Bus power. Board is powered from USB (J3).	2-3 (default) = Self (External) power. Board is powered from J12
J16, J17	UDMA on CF socket	Connect these two jumpers to enable UDMA on the CF socket for micro drive class devices. If these lines are connected to a CF that is not UDMA capable, the CF may interfere with any other devices on the bus.	N/A (CF socket is not used)
SW1-1	BUS_PWR_VALID / ATA_EN	Off (ATA is enabled)	Off (ATA is enabled)
SW1-2	SPARE		
SW1-3	SPARE		
SW1-4	LED enable	Off = Disable power LED, GPIO LEDs	On (Default) = Enable power LED, GPIO LEDs

2.8 Detecting Self-powered Hard Disk (IDE) Using CY4615B Board

The procedure to detect self powered Hard disk involves the following steps:

1. Binding Cypress Manufacturing Mode USB driver as explained in Binding Cypress Manufacturing Mode USB Driver to Blaster Tool on page 23.This step can be skipped if the binding process was already completed. The Manufacturing Mode USB drivers support Windows XP, Vista, and 7 platforms in both 32 and 64-bit configurations.

2. Program Configuration file (100_self_ATA.iic) to external I2C EEPROM on CY4615B board using Blaster utility. The procedure to program Configuration file is explained in further in section User Interface on page 22 and Using Configuration Files with CY4615B Board on page 24.
3. After programming the configuration file disconnect the USB cable between PC and CY4615B board.
4. Verify the Jumper settings mentioned for Self powered ATA devices in recommended settings in Recommended Settings on page 16.
5. If you are using more than one device, configure one as a master and the other as slave. If you are only using one device, master/slave configuration does not matter.
6. Plug the device into the 40-pin ATA connector via the 80-pin ribbon cable.
7. Connect the 4-pin EXT power (J12) connector to your external power supply.
8. Connect your ATA device to an external power supply.
9. Turn on the power supply and plug the USB cable into a host
10. The Hardware Connections are explained in detailed under “Hardware Connection” section of the Application note titled- Multiple IDE Drives Access using AT2LP - AN63019.The application note explains the hardware set up and PC software configuration process required to access more than one hard drive using AT2LP. It uses AT2LP DVK board (CY4615B) and an 80 conductor IDE cable to interface two self-powered hard drives to the AT2LP. With this set up, when the AT2LP board is connected to the PC using a USB cable, you can access all the logical partitions available in both the drives simultaneously.

2.9 ATA Security

ATA security is supported via ATACB commands, the same method used by the ISD-300LP. ATACB commands are not supported by the major operating system drivers so the Cypress driver must be used to support ATA security. BIOS authors can find the entire ATACB description in the data sheet.

IDE hard drives only prompt for the password on a hard reset. If the SKIP_PIN_RESET bit is set in the EEPROM, the device will ask for a password only on initial power-up. If the SKIP_PIN_RESET bit is cleared, the device will ask for a password when it is unplugged from the host or when the host is power-cycled.

3. Convert AT2 EEPROM to AT2LP

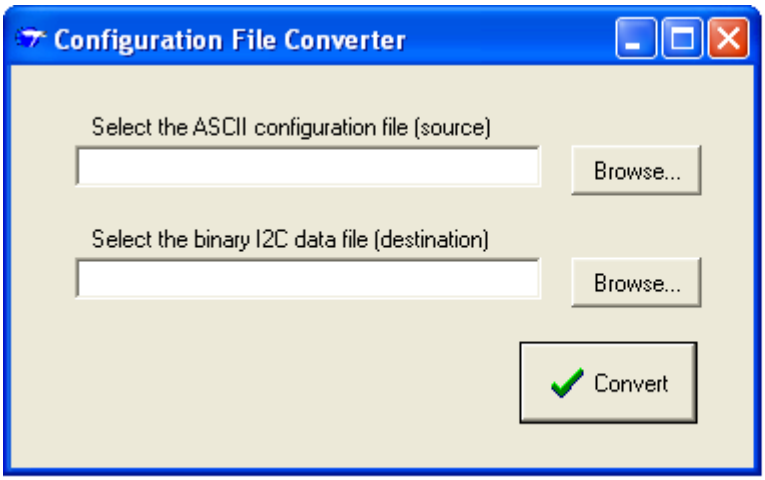
To further aid the transition from the AT2 to the AT2LP, Cypress has developed a simple tool that will convert the EEPROM configuration files used with the AT2 into a format that can be used with the AT2LP manufacturing software. The AT2 configuration files are text files with a “W56” extension. The AT2LP configuration files are hex files with an “IIC” extension. The CfgToI2C application reads the W56 files and converts them into IIC format. This tool is located at <Installed_Directory>/<version>/ Manufacturing Software/AT2 to AT2LP conversion tool

3.1 User Interface

The application's user interface is simple and intuitive. The top field displays the W56 file that will be converted to IIC format. The bottom field displays the location into which the newly converted IIC file will be placed. Click the **Convert** button to launch the conversion process. Enter the source and destination paths manually or use the **Browse** button to open a browser window to choose the path.

The CfgToI2C application can read several different file types, so make certain that the W56 type is selected in the drop-down menu in the browser window.

Figure 3-1. Configuration File Converter



When the W56 configuration file is converted to the IIC format, it can be used with the AT2LP manufacturing software. However, the converted file will still follow the format specified in the AT2 data sheet, rather than what is listed in the AT2LP data sheet.

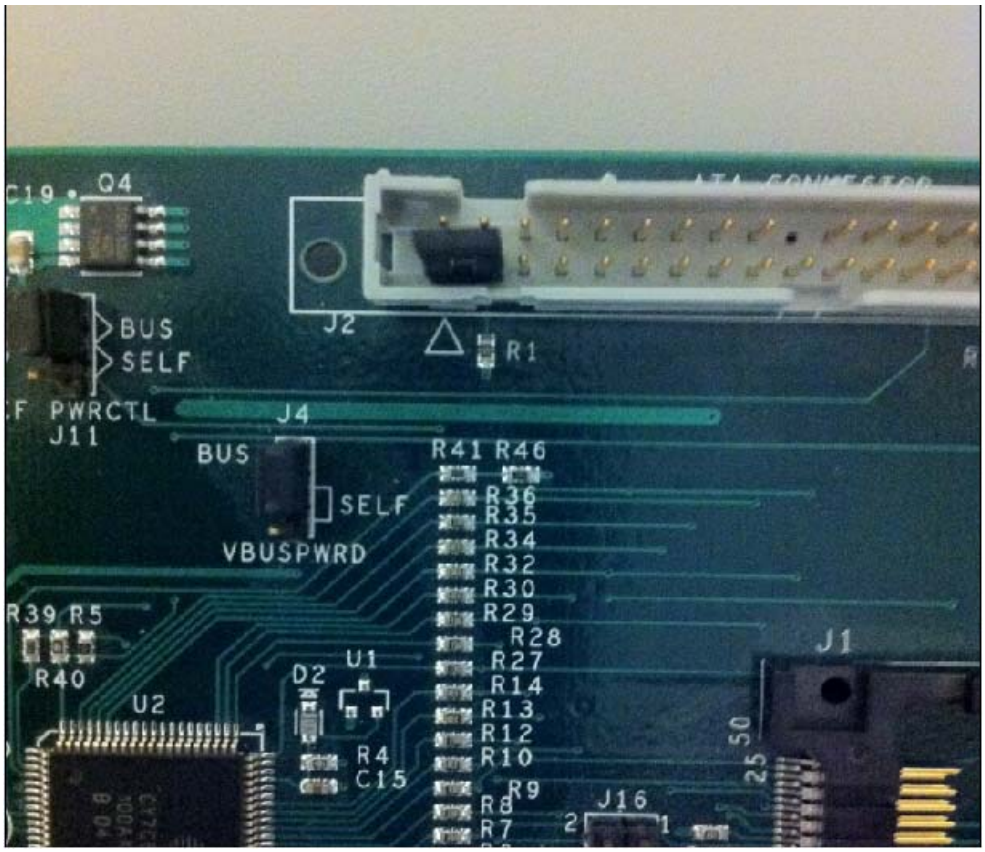
3.2 EEPROM Settings

Many major functions of the AT2LP are controlled by EEPROM settings. To modify the EEPROM settings, run the Blaster.exe program located at <Installed_Directory>/<version>/Manufacturing Software.

If an EEPROM configuration prevents the AT2LP board from enumerating, follow this procedure to get the board into manufacturing mode:

1. Turn off the power
2. Unplug the ATA cable or 80-pin connector and any CompactFlash that is installed
3. Short pins 1 to 3 of the ATA connector with a jumper block
4. Turn on the power
5. The board is now in manufacturing mode. It can be reprogrammed using AT2LPBlaster

Figure 3-2. AT2LP Board



4. Configuration Utility

4.1 Cypress AT2LP Configuration Utility Blaster.Exe

The Cypress AT2LP Configuration Utility Blaster.exe is a PC application software provided with the CY4615B AT2LP DVK. This software is located in the Manufacturing Software folder in the kit installation directory. The AT2LP board is a fixed function device and initially requires EEPROM configuration (.iic) files with appropriate configuration information. Blaster.exe software performs the following major operations:

- Reads the configuration files already pre-programmed to on-board EEPROM
- Writes the configuration file to on-board EEPROM

The Read configuration files can be modified based on certain ATA-ATAPI parameters to suit a certain type of mass storage device.

4.1.1 Components

The software consists of the executable utility (Blaster.exe), manufacturing driver (CYUSB.sys and cyusb4615brdk.inf), and user guide (this file).

4.1.2 Supported Platforms

The cypress AT2LP Configuration utility has been tested and supports Windows 2000 professional , Windows XP(32/64 bit),Vista(32/64 bit) and Windows-7(32/64 bit).The utility will not work with Windows 95 or any version of Windows NT

4.2 Overview

The Cypress AT2LP uses 16 bytes of configuration settings, which define how the part interacts with the attached storage device and the USB host. The AT2LP also uses a standard set of USB descriptors to provide information about the product to the USB host. The AT2LP contains default configuration settings and USB descriptors in its internal ROM. These settings and USB descriptors are not suitable for use in shipping products, because the USB descriptors do not provide unique serial numbers, and are therefore not Mass Storage Class compliant. Therefore, circuit designs using the Cypress AT2LP store the configuration settings and USB descriptors externally, on either a serial EEPROM, or the attached storage device.

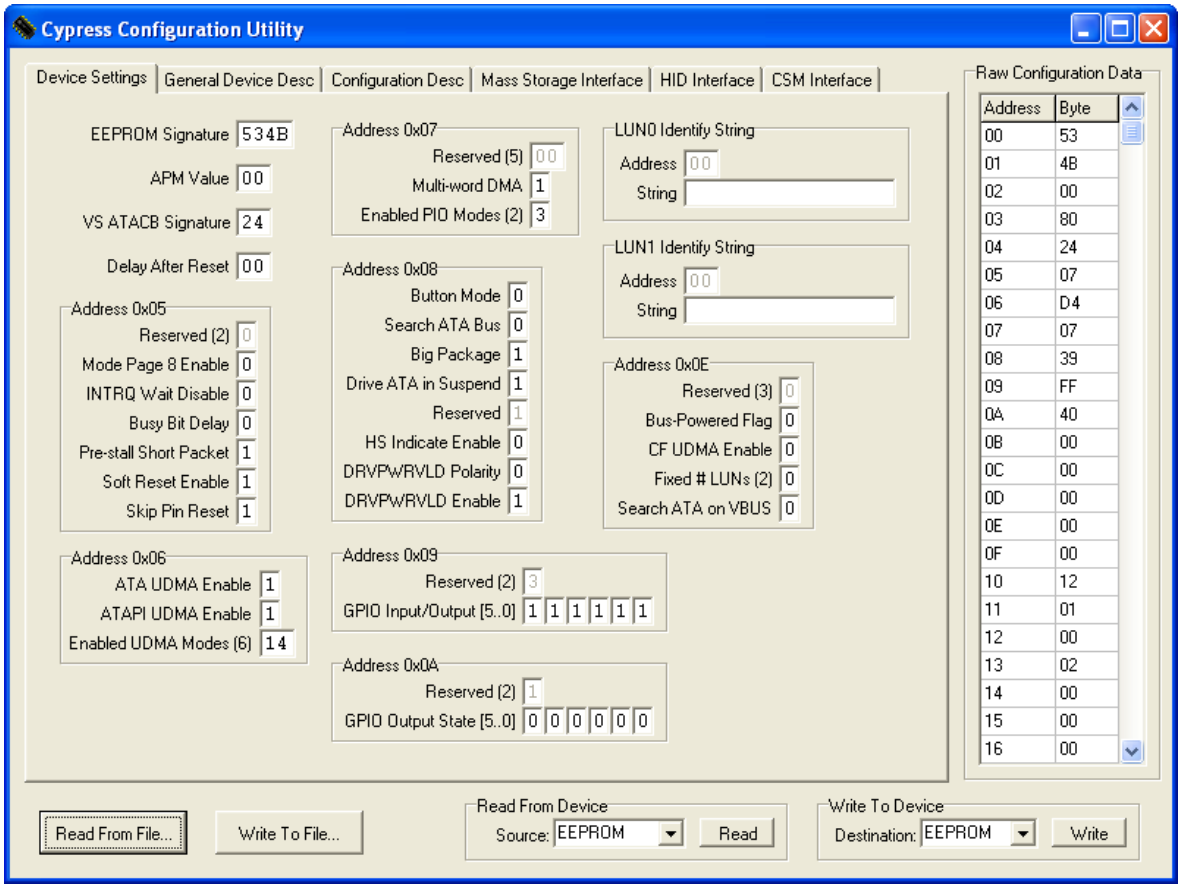
The Cypress AT2LP Configuration Utility is used to edit the configuration settings and USB descriptors for the AT2LP. The configuration settings and USB descriptors can be stored in an AT2LP config (.iic) file on the PC, or the utility can work directly with settings and descriptors from a USB-attached AT2LP-based board.

The Cypress AT2LP Configuration Utility provides developers an opportunity to develop an optimal set of AT2LP configuration settings and USB descriptors by experimenting with those settings and descriptors on their product. When an optimal configuration is developed, it can be saved to an AT2LP config (.iic) file, which can be used with the Cypress AT2LP Manufacturing Utility for mass production.

4.3 User Interface

The Cypress AT2LP Configuration Utility user interface consists of a single window, as shown in the following image. Blaster.exe is available at <Installed_directory>\<version>\Manufacturing Software.

Figure 4-1. Configuration Utility



Configuration settings can be stored in a file on the PC. The "**Read From File…**" button at the bottom-left of the window opens a file browser and enable you to select a AT2LP config (.iic) file to load from the location <Installed_Directory>\<version>\Manufacturing Software\Config_files. The "**Write To File…**" button at the bottom-right of the window opens a file browser and allows to save the AT2LP config (.iic) file.

Alternatively, the utility can work with configuration settings directly from a USB-attached AT2LP part. The "**Read from Device**" controls in the bottom-center of the window enable you to select a source to read the configuration settings from and upload the settings. The sources the configuration settings can be read from are the serial EEPROM or the internal RAM.

The configuration settings can also be downloaded directly to the USB attached AT2LP part. The "Write to Device" controls at the bottom-right of the window enable you to select the destination to write to and download the settings. The configuration settings can be written to the serial EEPROM or the internal RAM.

Note: The AT2LP's internal RAM only contains device configuration settings and not the USB descriptors.

The tabs at the top-left of the window provides a parsed display of the configuration settings and USB descriptors. All configuration settings and USB descriptors are displayed on one of the six tabs (Device Settings, General Device Desc., Configuration Desc., Mass Storage Interface, HID Interface, and CSM Interface). Not all configuration settings or USB descriptor fields can be edited in parsed display. If a field cannot be edited, it is because it is a read-only, obsolete, or utility-managed value. The definitions of the configuration settings fields on the Device Settings tab is available in the Cypress AT2LP data sheet “Table 11. Configuration Data Organization”. The definitions of the USB descriptor fields on the General Device Desc., Configuration Desc., High-Speed Interface Desc, and Full-Speed Interface Desc. tabs can be found in the same table and also in the Chapter-9 of the USB 2.0 Specification.

The table to the right of the window named Raw Configuration Data displays the configuration settings and USB descriptors in a raw format (as they are stored). The contents of this table can be edited and provide a way for advanced developers to edit settings that cannot be edited in the parsed display.

4.4 Binding Cypress Manufacturing Mode USB Driver to Blaster Tool

The Blaster Configuration Utility in windows PC requires Cypress Manufacturing Mode USB driver to upload or download configuration file(*.iic*) to external I2C EEPROM connected to AT2LP. The driver consists of two parts, the device driver (*cyusb.sys*), and the driver information file (*cyusb4615brdk.inf*). Both files are located in the *Drivers* sub-directory, which can be found in the same directory as the Blaster.exe application file located at (<Installed_Directory>\<version>\Manufacturing Software\).

4.4.1 Installing Cypress Manufacturing Mode USB Driver

The CY4615B board by default is programmed to connect with Compact Flash (CF) card in Bus power mode. As a result, it is necessary for the user to change jumper settings specify to detect Cypress Manufacturing driver. Follow these steps to install the Cypress Manufacturing mode driver for the CY4615B board:

1. Disconnect USB A-to-B cable between USB connector (J9) on CY4615B board and PC.
2. Short pins 1-3 of the 40-pin ATA connector J2. This is to ensure the AT2LP boots in Manufacturing Mode with VID/PID-0x04B4/6830. Ensure J9 is open to ensure CY4615B does not boot with default configuration File(.iic) in external EEPROM.
3. Connect USB A-to-B cable between PC USB Host controller port and Type-B connector (J3) on CY4615B board and PC.
4. The **Hardware Update wizard** window pops up due to enumeration of CY4615B enumeration in manufacturing mode. Select the **Yes, this time only** option and click **Next**. In Windows Vista/7 machine choose **“Browse My computer for driver software**”
5. In the next window, select **Install from a list or specific location** and click **Next**.
6. Select **Dont search. I will choose driver to install** and click **Next**.
7. Select “Universal Serial Bus Controllers” in the next Window.Click on the **Have Disk** button in the next window. A new window pops up on top of the existing window.
8. In Windows Vista/7 machines browse directly after step-4 to matching Driver information file as mentioned below. Click **Browse** and point to the driver path for each OS and select the INF file as shown in the below path
   a. Windows XP 32-bit: <Installed_Directory>\<version>\Manufacturing Software\Drivers\wxp\x86
   b. Windows XP 64-bit: <Installed_Directory>\<version>\Manufacturing Software\Drivers\wxp\x64
   c. Windows Vista/7 32-bit:<Installed_Directory>\<version>\Manufacturing Software\Drivers\wlh\x86

d. Windows Vista/7 64-bit: <Installed_Directory>\<version>\Manufacturing Software\Drivers\wlh\x64

9. For Windows XP 32-/64-bit, Vista, and Windows 7 in 32-bit configurations, it is not required for the drivers to be digitally signed. The *cyusb.sys* supplied with the kit is an unsigned driver and Windows may present a warning dialog. Choose **Continue** on the warning dialog. For more information on signing drivers, look at Windows Hardware Quality Labs (WHQL) documentation on the Microsoft website.
10. For Windows Vista and Windows 7 64-bit machines, we need to turn off the Driver Signature Enforcement by rebooting the PC OS with **Advanced Boot Options** (accessed via F8 on boot up). Click on **Disable Driver Signature Enforcement**; repeat steps 2 and 3. The Cypress driver *cyusb.sys* is not digitally signed and can be properly installed only when the Driver Signature Enforcement is turned off. This setting is temporary and does not propagate to the next reboot automatically.
11. Because the drivers are not digitally signed, Windows cannot verify the publisher and throws security warning. Choose **Install this driver software anyway** option to begin installation.
12. The hardware wizard now reports successful installation of the Cypress driver for the CY4615B board. Open the device manager by right clicking on My computer/Computer properties, select Hardware Tab and click on Device Manager Button. Observe the updated CY4615B board name (as defined in the *cyusb4615brdk.inf* file) in the expanded list of USB controllers.
13. However, if you reprogram devices that have already been programmed with a different Vendor ID and Product ID combination, the driver information file needs to be modified so that the driver matches the new VID/PID. The driver information file can be edited in any plain text editor (such as Notepad) to add support for a new VID/PID. Comments are included in the driver information file indicating where to add new entries to enable support for a new VID/PID. For more details about modifying the driver information file, see application note, AN61465, which is part of the kit documentation

Note: The Cypress USB Driver package (cyusb4615brdk.inf and *cyusb.sys*) are unsigned driver package i.e they do not contain Microsoft digital signature.The driver package must be used only for programming Configuration files (.iic) files and validate the functionality of different ATA/ATAPI devices using AT2LP board. Microsoft provides native drivers to support(usbstor.sys)Mass storage functionality. Both Manufacturing and Mass storage modes of AT2LP board use common VID/PID-0x04B4/0x6830.To avoid driver loading problems between windows native mass storage driver and Cypress Manufacturing mode drivers(if digitally signed) the current USB driver package is not WHQL certified. Please use step-10 as workaround to load cypress USB driver package in Windows Vista/7 64-bit OS.The unsigned driver loading problems are not stringent in 32-bit configuration of Windows OS.

4.5 Using Configuration Files with CY4615B Board

Several configuration files (.iic) of 170-200 bytes size are provided along with the kit to verify CY4615B kit functionality with various ATA/ATAPI-6 compliant devices like Compact Flash, DVD, CDROM, HDD, and so on. Refer to ReadMe.txt (under Installed_Directory>\<version>\Manufacturing Software\Config_files) to understand the complete functionality of each file. After binding the CY4615B board to the Cypress Manufacturing Mode USB Driver Short Jumper-J9 to connect external I2C EEPROM to AT2LP.The user can now Read/Write Configuration file parameters to external I2C EEPROM as explained User Interface on page 22.

5. AT2LP Manufacturing Software

5.1 Cypress AT2LP Manufacturing Software Primer.exe

This software tool located at “<Installed_Directory>\<version>\Manufacturing Software” allows you to program the EEPROM configuration (.iic) files at the click of a button. The tool initially prompts you to plug-in the AT2LP device and then the EEPROM is automatically programmed with the image specified as a configuration file. The status box of this software window turns yellow during programming, green if successful, or red if otherwise. This tool does not allow you to change any of the ATA/ATAPI parameters such as the Blaster tool. The tool is useful for mass programming of AT2LP boards.

5.1.1 Components

The software consists of the executable utility (Primer.exe), a configuration file (Primer.ini), manufacturing driver (*cyusb.sys* and *cyusb4615brdk.inf*), and user guide (this file).

5.1.2 Supported Platforms

The Cypress AT2LP Manufacturing Utility has been tested and is supported on Windows 2000 professional, Windows XP(32/64 bit), Vista(32/64 bit), and Windows-7(32/64 bit). The utility is not supported on Windows Millennium Edition or Windows 98. The utility will not work with Windows 95 or any version of Windows NT.

5.2 Overview

Circuit designs using the Cypress AT2LP use a serial EEPROM to store the device firmware. For AT2LP-based designs, the EEPROM can conveniently be programmed via the USB interface using the Cypress AT2LP Manufacturing Utility. The Cypress AT2LP Manufacturing Utility software is invoked by double-clicking the Primer.exe icon. The Cypress AT2LP Manufacturing Utility has a very simple user interface consisting of a single screen that guides the user through the programming process. Manufacturing options for the Cypress AT2LP Manufacturing Utility can be adjusted using a configuration file (Primer.ini).

5.3 User Interface

Figure 5-1 shows the user interface for the Cypress AT2LP Manufacturing Utility. The name of the firmware image file used to program devices is shown in the box at the bottom-left of the window. The programming process can be abandoned at any point by closing the window, which will quit the application. The Instruction field displays instructions to the user. The Status field indicates the programming process.

First, plug in the device to be programmed. Note that due to a limitation in Windows, if the device is already plugged in when the utility is started, the utility will not be able to detect it.

Figure 5-1. Manufacturing Utility

When the device is plugged in, the external EEPROM is programmed using the firmware image specified in the configuration file. During this step, the background of the Status field turns yellow, and the text indicates that the device is being programmed.

If the device is successfully programmed, the Status field turns green, and the status message "Programming Succeeded" is displayed. If the device cannot be programmed successfully, the Status field turns red, and the status message "Programming Failed" is displayed. The user is prompted to disconnect the device and plug in the next device.

5.4 Configuration File

The Cypress AT2LP Manufacturing Utility uses a configuration file (Primer.ini) to configure the global settings in the utility. This file can be found in the same directory as the Primer.exe application file. The file can be edited in any plain text editor (such as Notepad) to change the global settings.

When the file is opened in a text editor, the following is displayed:

```
//
// Manufacturing SW Custom Settings
//
// Copyright (c) 2012 Cypress Semiconductor
//
[General]
[DefStartupOpts]
SerNumPrefix=0xDEF1 ;SN prefix value (0xDEF1 is default)
ConfigFile=CFGFiles\100_bus_CF.iic ;The AT2LP config file to load at startup
```

The SerNumPrefix should contain the four digit serial number prefix. The utility generates serial numbers based upon the host computer's clock. To guarantee uniqueness, the serial number prefix should be different for each host computer being used to program devices. The ConfigFile setting tells the utility which firmware image file to download to devices. Note that the ConfigFile setting must contain the complete path to the firmware image file. If a relative path is used, it is considered to start from the directory where the utility resides. The "." (current directory) and ".." (parent directory) path designators do not work for the ConfigFile setting.

5.5 Driver

The Cypress AT2LP Manufacturing Utility requires a special device driver to download device firmware to the external EEPROM and test AT2LP-based devices. Refer Binding Cypress Manufacturing Mode USB Driver to Blaster Tool on page 23 for more details on installing the manufacturing mode USB driver.

6. Resources

6.1 Hardware Resources

The CY4615B AT2LP DVK software kit has several hardware resources that guide you in designing your own custom board. Some documents in the hardware directory of the DVK kit software are:

- CY4615B_PCBA_BOM.xls: This document lists all the vendor hardware components used in designing the AT2LP DVK board.
- CY4615B_Schematic.DSN and CY4615B_Schematic.pdf: These document shows the schematic design of the DVK board.
- CY4615B_Board Layout.brd and CY4615B_Board Layout.pdf: These files can be opened in the PCB software (for example Allegro) to understand the via, trace lengths, and so on of the AT2LP DVK board.
- CY4615B_Gerber.zip: Contains the gerber files for CY4615B DVK

6.2 Firmware Resources

The CY4615B AT2LP board is designed based on CY7C68320C. This is a fixed function device and requires only EEPROM configuration files (.iic) in the range of 170 to 200 bytes to communicate with different ATA-ATAPI-6 compliant mass storage devices.

The CY4611B is a reference design based on the FX2LP chip, which is a firmware programmable version. This firmware contains all the ATA/ATAPI-6 commands support to communicate with different storage devices. For more information on this kit, see Reference Designs on page 31.

6.3 Application Notes

For the AT2LP family of chipsets, the following documents are available on the Cypress website:

- Working with INF File of Device using CyUSB.sys - AN61465

  Microsoft Windows uses the INF file to bind a device to its appropriate driver. If a window has a native driver for that USB device class, then an INF file is not required and the device is bound to the native driver. However, to bind the device to a custom driver, a custom INF file is required. This application note describes the sections of the INF file and provides guidelines to modify them based on requirement.
- EZ-USB AT2LP™ Features - AN5071

  This application note describes the features in the AT2LP that are new to the AT2 family of chips, as well as any features that may behave differently than with the previous AT2 chips.
- Migrating from CY7C68300A (AT2) to CY7C68300B/C (AT2LP) - AN5047C

  This application note discusses the hardware and some of the EEPROM configuration changes to be done when end customer designs switch from older AT2 chipsets to newer AT2LP. The AT2LP is an enhanced version of older AT2 series. Only a few schematic changes need to be done because both series of chipsets are pin-to-pin compatible.
- EZ-USB AT2LP™ Hardware Design Review Guide - AN14705

This application note provides a detailed review of important hardware circuits such as RESET, crystal, EEPROM, and power on AT2LP DVK board (CY4615B). The document serves as a guideline to avoid problems when designing a custom AT2LP board.

- Troubleshooting USB 2.0 Signal Quality -AN13632

  This application note outlines the problems in measuring signal quality of the USB. It helps the designer to isolate setup issues from design issues.

- High-speed USB PCB Layout Recommendations - AN1168

  This application note describes general guidelines to be followed when designing any Cypress high-speed USB 2.0 device products based on the FX2LP/NX2LP/AT2LP family of chips.

- Multiple IDE Drives Access using AT2LP - AN63019

  This application note explains the hardware set up and PC software configuration process required to access more than one hard drive using AT2LP. It uses AT2LP DVK board (CY4615B) and a 80 conductor IDE cable to interface two self-powered hard drives to the AT2LP. With this set up, when the AT2LP board is connected to the PC using a USB cable, you can access all the logical partitions available in both the drives simultaneously.

- AT2LP Revision: C Reset Issue and Workaround - AN14569

  This application note describes the hard drive hang-up failure seen during boot time (or) soft reset in AT2LP Rev. C chipsets. The note suggests a workaround on how to modify the RESET duration of AT2LP using the Blaster tool software.

7. Reference Designs

7.1 CY4611B - USB 2.0 to ATA Reference Design

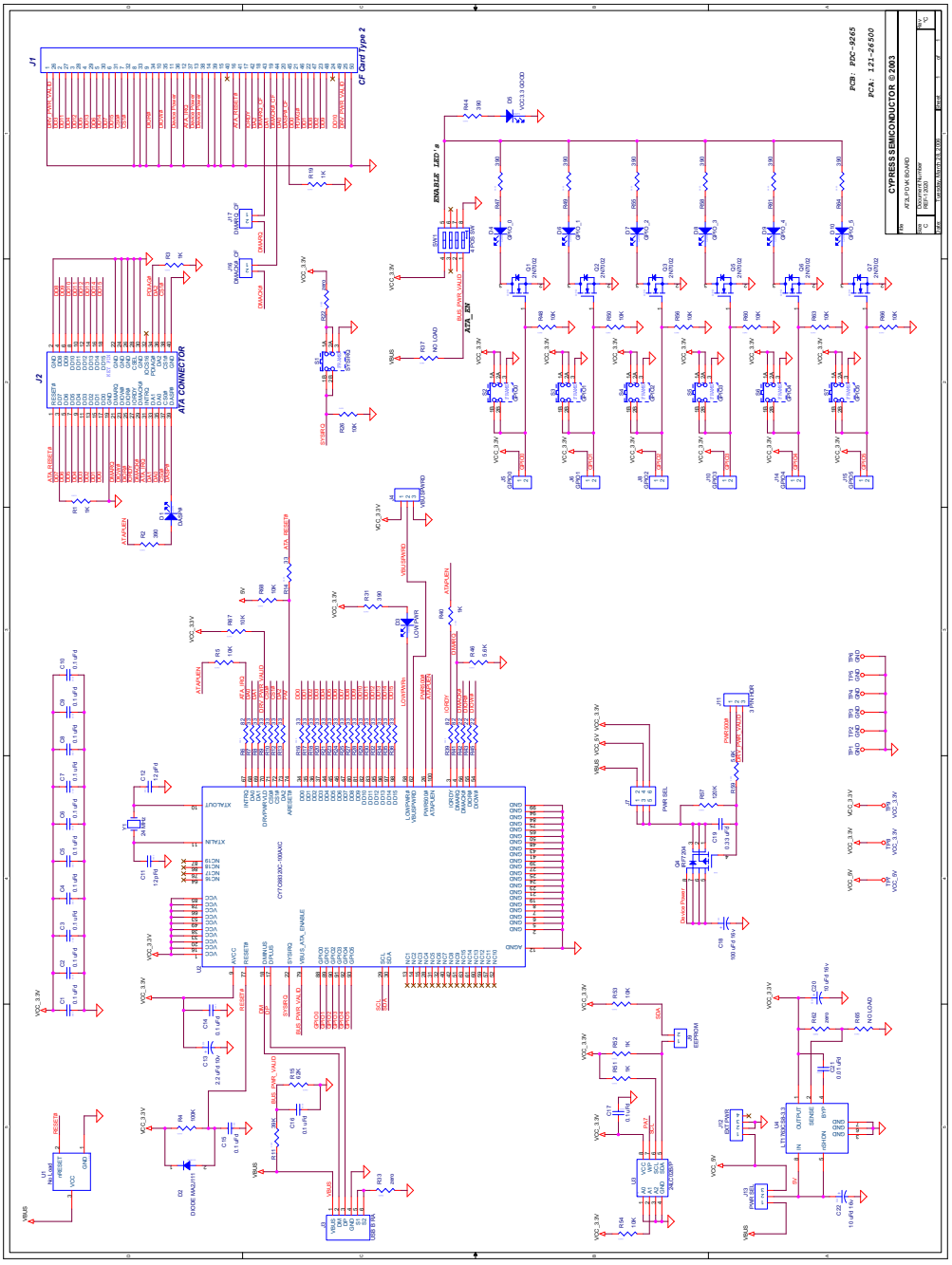
You can test a variety of storage devices using the CY4615 DVK board by changing only the EEPROM configuration (.iic) files, but storage device related features cannot be updated. The CY4611B reference design kit can be used to add or update features. The board that comes along with CY4611B is based on the EZ-USB FX2LP™ chip, a general-purpose USB 2.0 high-speed device. After programming the ATA/ATAPI command processing firmware and the configuration files (.iic) combined, the board emulates AT2LP (similar to CY4615B DVK board). Here, you can modify the firmware by adding new features or modifying the existing firmware logic. The reference design kit contains documents related to hardware, firmware, and application software useful while working with the board available in this kit.

7.2 CY4651 v1.3 - Cypress and AuthenTec Reference Design for Biometric Security in External USB Hard Disk Drives

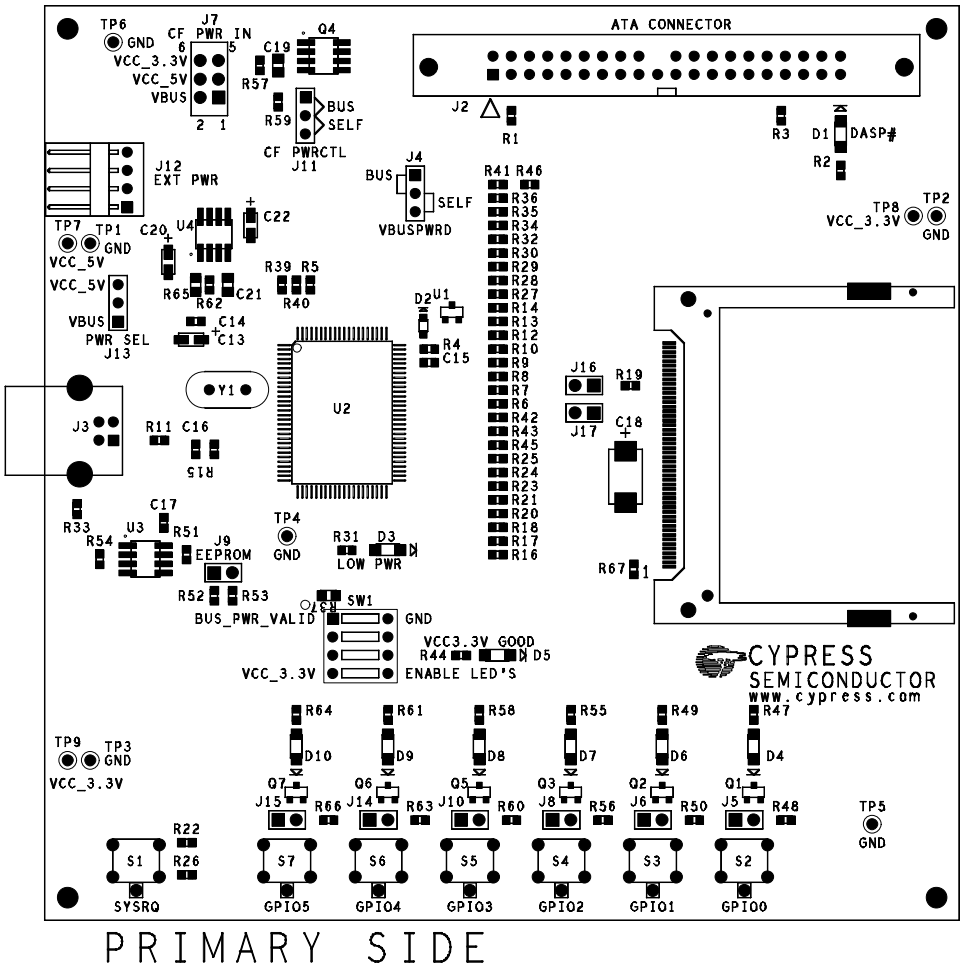
The CY4651 is a third-party reference design from AuthenTec. The design uses the AuthenTec EntrePad 2510, biometric fingerprint slide sensor, and Cypress's EZ-USB FX2LP microcontroller, the industry's most popular high-speed USB 2.0 microcontroller, which interfaces with AuthenTec's sensor and delivers data from the HDD to the host computer.

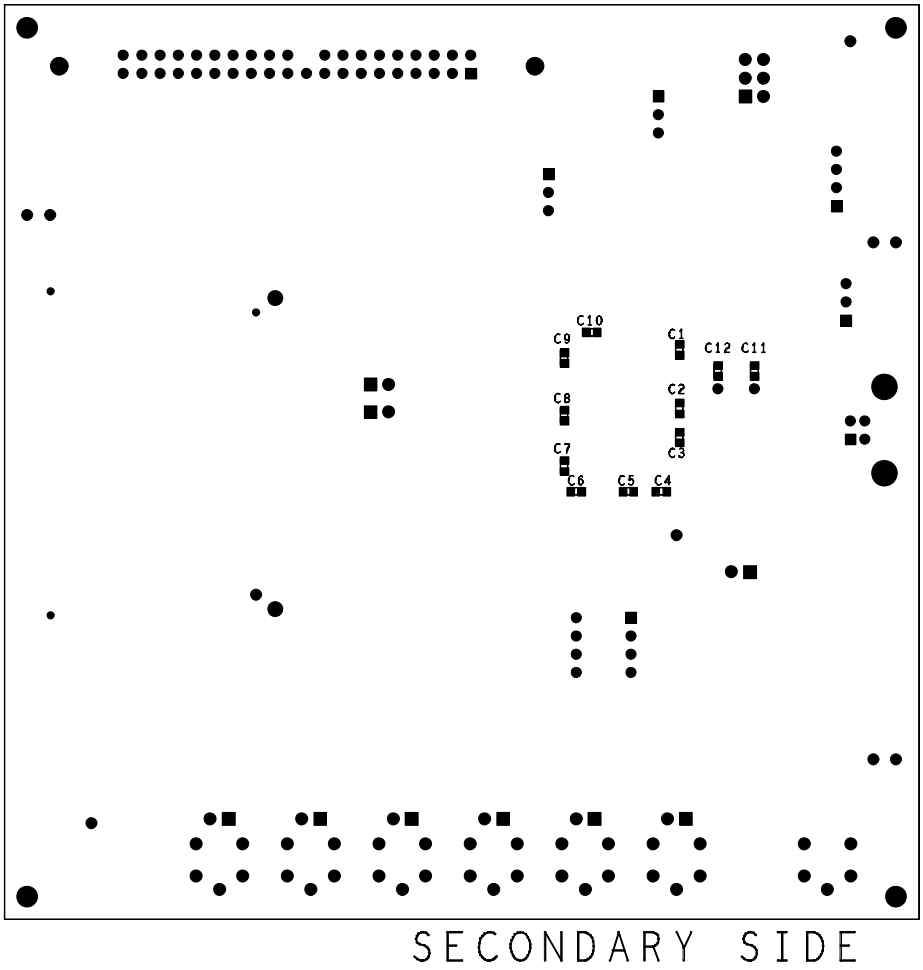
A. Appendix

A.1 Schematic



A.2 Board Layout




C10
C9
C1
C12
C11
C8
C2
C7
C3
C6
C5
C4
SECONDARY SIDE

A.3 BOM

Item	Qty	Reference	Description	Manufacturer	Mfr Part Number
1	14	C1,C2,C3,C4,C5,C6,C7, C8,	CAP .1UF 50V CERAMIC Y5V 0603	Panasonic - ECG	ECJ-1VF1H104Z
		C9,C10,C14,C15,C16,C 17			
2	2	C11,C12	CAP 22PF 50V CERAMIC 0603 SMD	Panasonic - ECG	ECJ-1VC1H220J
3	1	C13	CAP 2.2UF 10V TANTA-LUM 20% 3216	Panasonic - ECG	ECS-H1AY225R
4	1	C18	CAP 100UF 16V TANTA-LUM 20% 7343	AVX	TAJD107M016S
5	1	C19	CAP .33UF 16V CERAMIC X7R 0805	Panasonic - ECG	ECJ-2YB1C334K
6	2	C22,C20	CAP 10UF 16V TANTA-LUM 10% 3216	AVX	TAJA106K016R
7	1	C21	CAP 0.01UF 50V CERAMIC X7R 0603	Panasonic - ECG	ECU-V1H103KBV
8	8	D1,D4,D5,D6,D7,D8,D9, D10	LED GREEN CLEAR 1206 SMD	Chicago Miniature Lamp, Inc	CMD15-21VGC/TR8
9	1	D2	DIODE SWITCH 80V 100MA SMINI 2P	Panasonic - SSG	MA2J11100L (MA111-TX)
10	1	D3	LED HI EFF RED CLEAR 1206 SMD	Chicago Miniature Lamp, Inc	CMD15-21VRC/TR8
11	1	J1	CONN CF CARD TYPE 2 HEADER	JST	ICM-MA2H-SS52-N11B
12	1	J2	HEADER SHROUDED 40 POS STRAIGHT	3M/ISD	2540-6002UB
13	1	J3	CONN USB RECEPT TYPE B PCB	AMP/TYCO	787780-1
14	3	J4,J11,J13	CONN HDR BRKWAY 3POS STR AU PCB	AMP Division of TYCO	103185-3
15	9	J5,J6,J8,J9,J10,J14,J15 , J16,J17	CONN HDR BRKWAY 2POS STR AU PCB	AMP Division of TYCO	103185-2
16	1	J7	CONN HDR BRKWAY 6POS STR AU PCB	AMP/TYCO	103186-3
17	1	J12	CONN HEADER 4 PIN HZ .100"	AMP/TYCO	171826-4
18	6	Q1,Q2,Q3,Q5,Q6,Q7	MOSFET N-CHN 60V 7.5 OHM SOT23	Fairchild Semiconduc-tor	2N7002
19	1	Q4	HEX/MOS PCH LOG - 20V-5.3A 8-SOIC	International Rectifier	IRF7204
20	6	R1,R3,R19,R40,R51,R5 2	RES 1.0K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ102V
21	9	R2,R31,R44,R47,R49,R 55, R58,R61,R64	RES 390 OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ391V
22	1	R4	RES 100K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ104V

Item	Qty	Reference	Description	Manufacturer	Mfr Part Number
23	12	R5,R26,R48,R50,R53,R54, R56,R60,R63,R66,R67,R68	RES 10K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ103V
24	3	R6,R39,R41	RES 82 OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ820V
25	23	R7,R8,R9,R10,R12,R13,R14, R16,R17,R18,R20,R21,R23, R24,R25,R27,R28,R29,R30, R32,R34,R35,R36	RES 33 OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ330V
26	1	R11	RES 39K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ393V
27	1	R15	RES 62K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ623V
28	3	R22,R33,R62	RES ZERO OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEY0R00V
29	2	R37,R65	RES NO LOAD 0805 SMD	NA	NA
30	3	R42,R43,R45	RES 22 OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ220V
31	2	R59,R46	RES 5.6K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ562V
32	1	R57	RES 120K OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ124V
33	1	SW1	SWITCH 4POS STAND PLASTISOL DIP	AMP/Tyco Electronics	3-435640-5
34	7	S1,S2,S3,S4,S5,S6,S7	LT SWITCH 6MM 100GF H=7MM TH	Panasonic - ECG	EVQ-PBC07K
35	6	TP1,TP2,TP3,TP4,TP5,TP6	TEST POINT 43 HOLE 65 PLATED BLACK	Keystone Electronics	5001
36	1	TP7	TEST POINT 43 HOLE 65 PLATED RED	Keystone Electronics	5000
37	2	TP8,TP9	TEST POINT 43 HOLE 65 PLATED ORANGE	Keystone Electronics	5003
38	1	U1	NO LOAD IC RESET CIRCUIT 4.0V SOT23-3	Maxim IC	MAX809JEUR-T
39	1	U2	IC USB2.0 TO ATA/ ATAPI BRIDGE TQFP100	Cypress Semiconductor	CY7C68320b-100
40	1	U3	IC EEPROM CMOS SERIAL SO8	MICROCHIP TECHNOLOGY	24LC02B/P
41	1	U4	IC REGULATOR LDO 3.3V 500MA SO8	Linear Technology	LT1763CS8-3.3
42	1	Y1	CRYSTAL 24.000MHZ 20PF HC-49/US	ECS Inc.	ECS-240-20-4
43	1	PCB	PRINTED CIRCUIT BOARD	Cypress Semiconductor	PCB: PDC-9265 REV *A

Item	Qty	Reference	Description	Manufacturer	Mfr Part Number
44	5	** SEE ADDITIONAL ASSY INST.**	SHUNTS 2 POSITION	SULLINS	SSC02SYAN
45	1	LABEL (DO NOT PLACE NEAR J1)	SERIAL NUMBER		XXXXXX
46	1	LABEL (DO NOT PLACE NEAR J1)	ASSEMBLY NUMBER	PCA: 121-26500	PCA: 121-26500
47	4	INSTALL TO THE 4 CORNERS	FEET RUBBER SELF ADHESIVE	3M	SJ-5518-BLACK

Additional Assembly Instructions
1. Place one shunt on each of the following jumpers: J9.
2. Place one shunt on pins 1 and 2 of each of the following jumpers: J4,J11,J13
3. Place one shunt on pins 5 and 6 of each of the following jumpers: J7.
4. Place the labels (items 45-46) on the top side of the board.

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