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zilog
Embedded in Life
An IXYS Company

Z8051™ Family of 8-Bit Microcontrollers

Z51F6412 Development Kit

User Manual

UM025901-1112

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Revision History

Each instance in the Revision History table below reflects a change to this document from its previous version.

Date	Revision Level	Description	Page
Dec 2012	01	Original issue.	N/A

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Introduction

This manual describes how to set up Zilog's Z51F6412 Development Kit (Zilog part number Z51F6412000ZCOG) and use it to evaluate your Z8051-based designs and applications.

The Kit features a development board consisting of five LEDs, five pushbuttons, a buzzer, port pin headers and a UART-to-USB port. The Board features the Z51F6412 MCU in an 80-pin LQFP package, plus a DBG connector to connect the Board to a host development PC using the Z8051 USB On-Chip Debugger (OCD) cable. For more details about the Z51F6412 MCU, please refer to the Z51F6412 Product Specification (PS0303).

This document guides you through the following tasks:

- Install the Z8051 OCD Software and Documentation – see page 6
- Configure the Z8051 OCD and Z51F6412 Development Board – see page 16
- Build and Run the Z51F6412 Demo Project – see page 19

Figure 1 shows an image of the Z51F6412 Development Kit.

Figure 1. The Z51F6412 Development Kit

Kit Contents

Table 1 lists the contents of the Z51F6412 Development Kit.

Table 1. Z51F6412000ZCOG Contents

Item	Description	Quantity
1	Z51F6412 Development Board	1
2	Z8051 USB On-Chip Debugger (OCD)	1
3	Z8051 OCD Target Cable (10ckt)	1
4	USB Cable: A (male) to Mini-B	2
5	Z51F6412 Development Kit Insert (FL0150)	1

Figure 2 shows an image of the Z51F6412 Development Board.

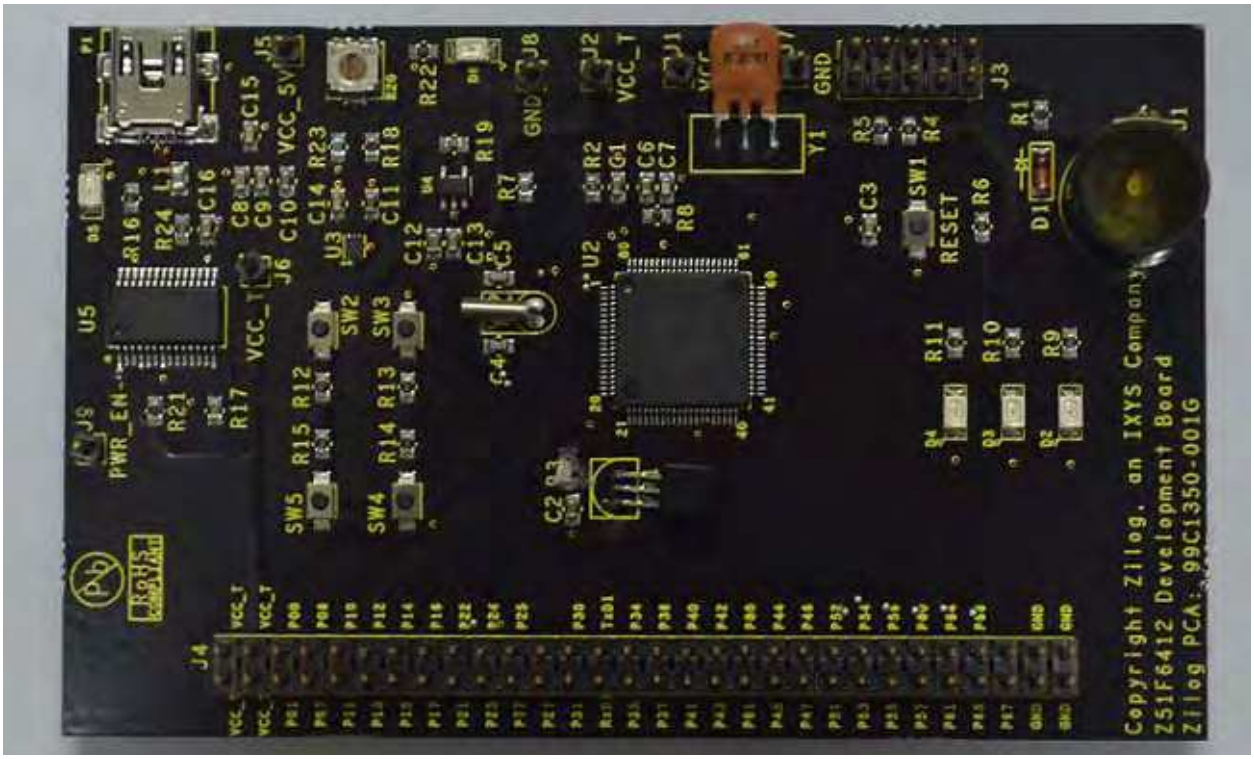

Figure 2. Z51F6412 Development Board

Supported Operating Systems

The Z51F6412 Development Board and the Z8051 On-Chip Debugger support the following operating systems:

- Microsoft Windows XP
- Microsoft Windows Vista (32-bit/64-bit)
- Microsoft Windows 7 (32-bit/64-bit)

Z51F6412 Development Board Block Diagram

Figure 3 shows a block diagram of the Z51F6412 Development Board.

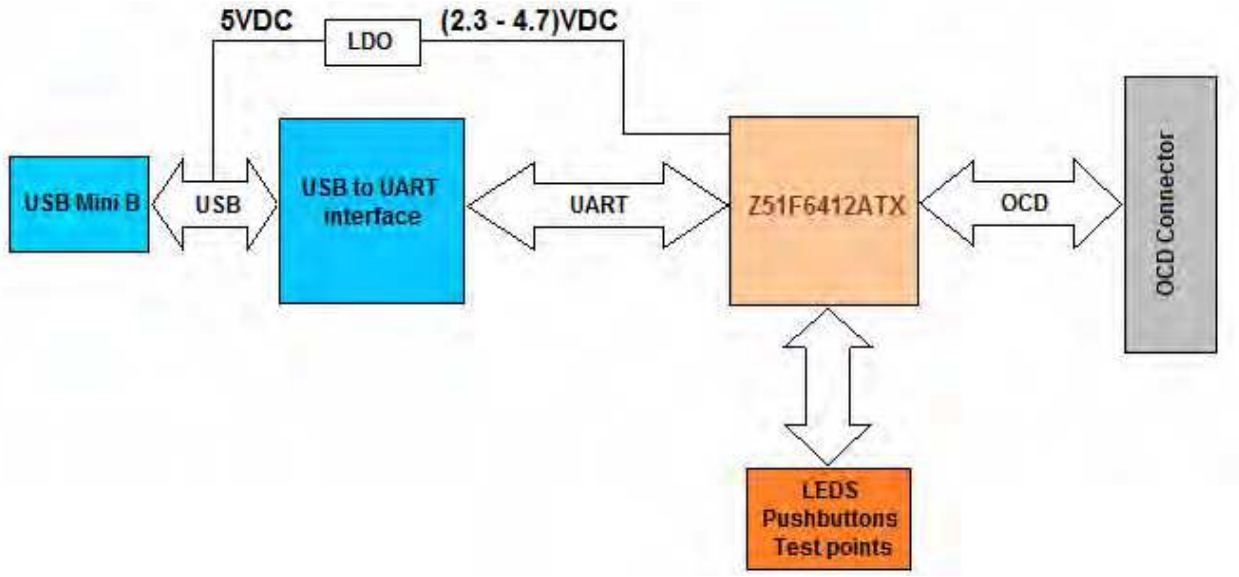

Figure 3. Block Diagram of the Z51F6412 Development Board

Z51F6412 Development Board Description

The Z51F6412 Development Board consists of the following components:

- Z51F6412: U2, 80-pin LQFP chip
- 3 LEDs: Green (D2), Red (D3) and Yellow (D4) connected to the GPIO pins of the Z51F6412 MCU
- 1 green LED to indicate USB power: D5

- 1 red LED to indicate an overcurrent condition: D6
- 5 pushbuttons:
  - SW1: RESET
  - SW2–SW5: connected to the GPIO pins of the Z51F6412 MCU
- USB connector: P1
- OCD connector: J3
- USB-to-UART interface: U5
- USB interface providing power and communication to the Board through adjustable LD0: U3
- Power supply level that can be adjusted with potentiometer R20
- Overcurrent protection circuit on the Board: U4 and D6
- External source of reference voltage (2.5V) for the on-chip ADC: VR1
- MCU current consumption measurement resistor R2 with test points J1 and J2
- Buzzer: U1
- Test points and headers

The Z51F6412 Development Board, with its key components highlighted, is shown in Figure 4.

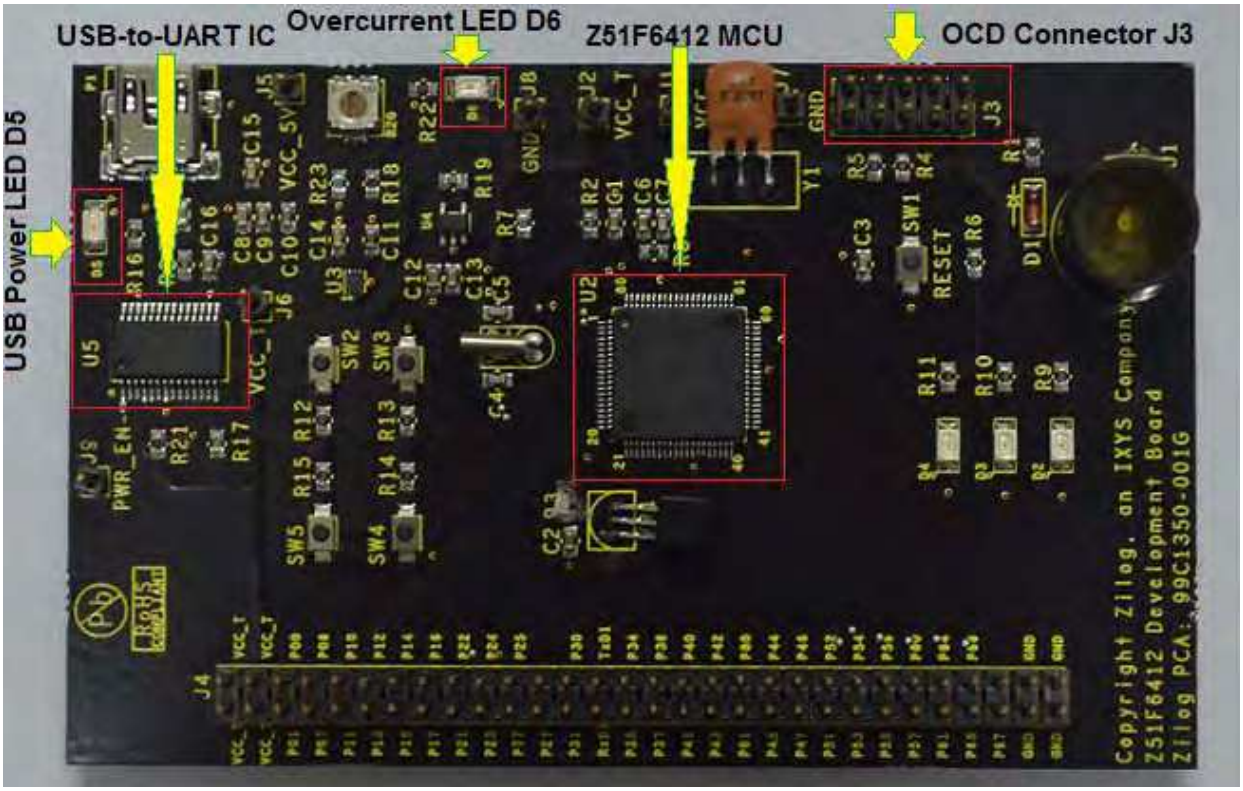

Figure 4. Z51F6412 Development Board: Highlighted Components

If a short on the Board should occur, or if its attached component(s) require more than 500 mA, the overcurrent protection functionality will trigger the red LED D6 to illuminate. In this instance, power to the Board will be terminated, and the USB port of the PC will be protected from shorting.

Schematic diagrams of the Z51F6412 Development Board are presented on pages 37 and 38 of this document.

The physical dimensions of the Board are 4.01" x 2.50" (101.8 mm x 63.5 mm).

Install the Z8051 OCD Software and Documentation

The Z8051 On-Chip Debugger (OCD) interface is the interface by which your PC will communicate with the Z51F6412 MCU to download and execute code. In addition to the OCD, software such as development tools and sample applications will be installed.

Note: If you have already downloaded the Z8051 software and documentation from the Zilog Store and installed it following the procedure on the paper insert in your kit (FL0150), skip this section, and proceed to the Z8051 OCD Driver Installation section, below.

Observe the following procedure to install the Z8051 On-Chip Debugger software and documentation on your computer.

1. Ensure that the OCD interface hardware is not connected to your PC.
2. In a web browser, download the Z8051 Software and Documentation v2.1 or later from the Zilog Store. When the download is complete, unzip the file to your hard drive and double-click to launch the installation file named `Z8051_<version>.exe`.
3. From the main menu, select **Go to the installation page**, then select one of the following options:
   - If you do not plan to use the Keil µVision4 IDE, select **Zilog OCD + Samples + SDCC**.
   - If you will be using the Keil µVision4 IDE, select **Zilog OCD + Samples + Keil µVision4 IDE Debugging Support**.
   - If you only plan to use the programming features and do not plan to perform any development, select **Zilog OCD**.
   - To install all files, select **All of the above**.

Note: In this filename, `<version_number>` refers to the version number of the OCD Software and Documentation release. For example, this version number may be `2.1`.

4. Follow the on-screen instructions to complete the OCD software installation.

Z8051 OCD Driver Installation

The driver programs for the Z8051 On-Chip Debugger are copied during the software and documentation installation. In the following procedure for PCs running the Windows 7 32- and 64-bit operating systems, ensure that the target side of the OCD will remain unconnected while you install these drivers.

Note: If you are running Windows Vista, see Appendix A on page 39 to install your device drivers. If you are running Windows XP, see Appendix B on page 42.

1. Connect the OCD hardware to the USB port of your PC by connecting the A (male) end of one of the two USB A (male)-to-Mini-B cables with the host PC's USB port. Connect the Mini-B end to the OCD device.
2. After the PC detects the new hardware, it will display the *Installing device driver software* dialog shown in Figure 5.

Figure 5. Install Device Driver Dialog, Windows 7

IMPORTANT NOTE: If you should encounter the scenarios indicated in Figures 6 or 7, right-click your mouse on **ZILOG OCD I/F** (highlighted in Figure 6) or **Unknown device** (highlighted in Figure 7) and select **Update Driver Software...**

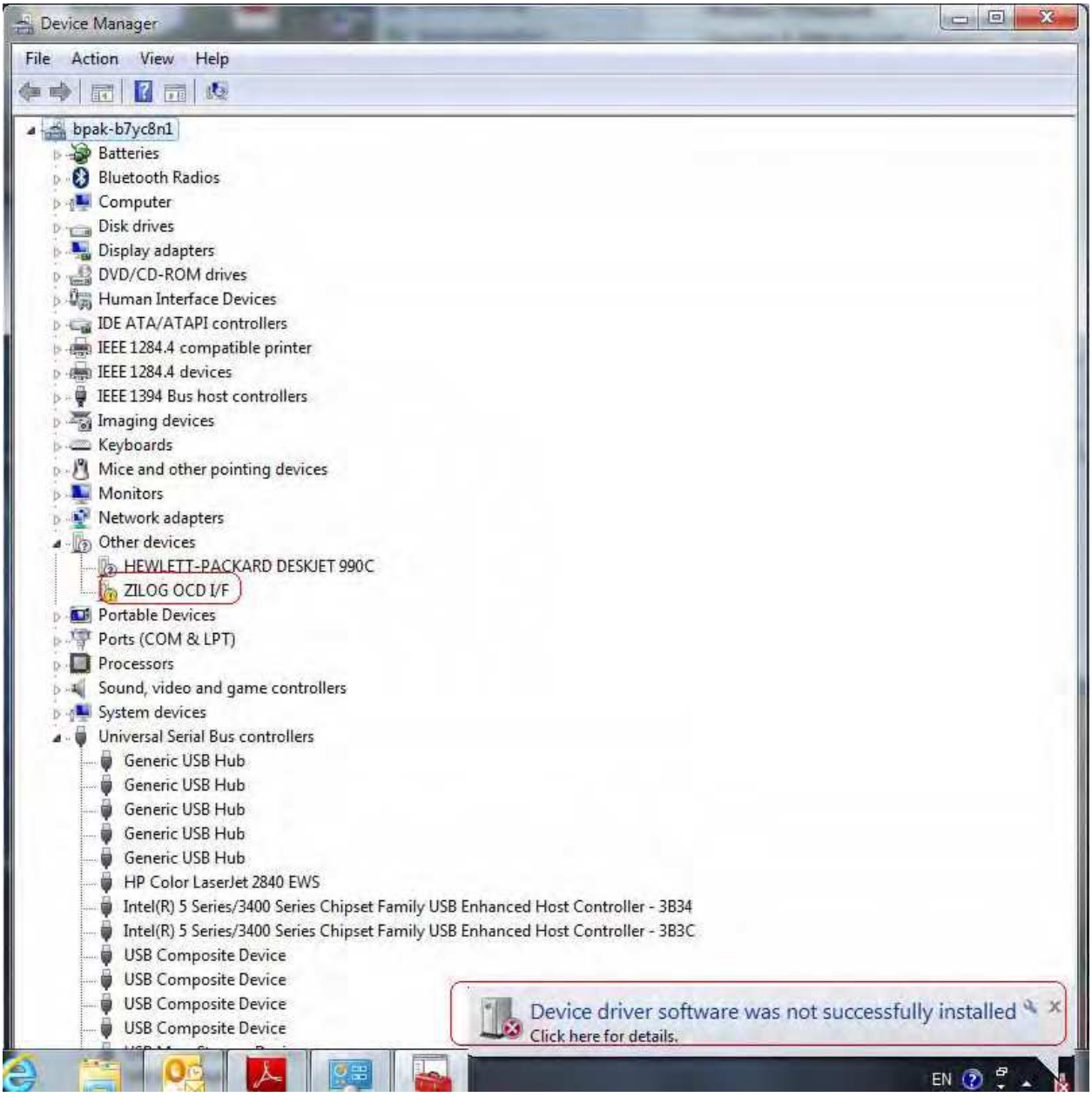

Figure 6. Unsuccessful Installation, Scenario 1

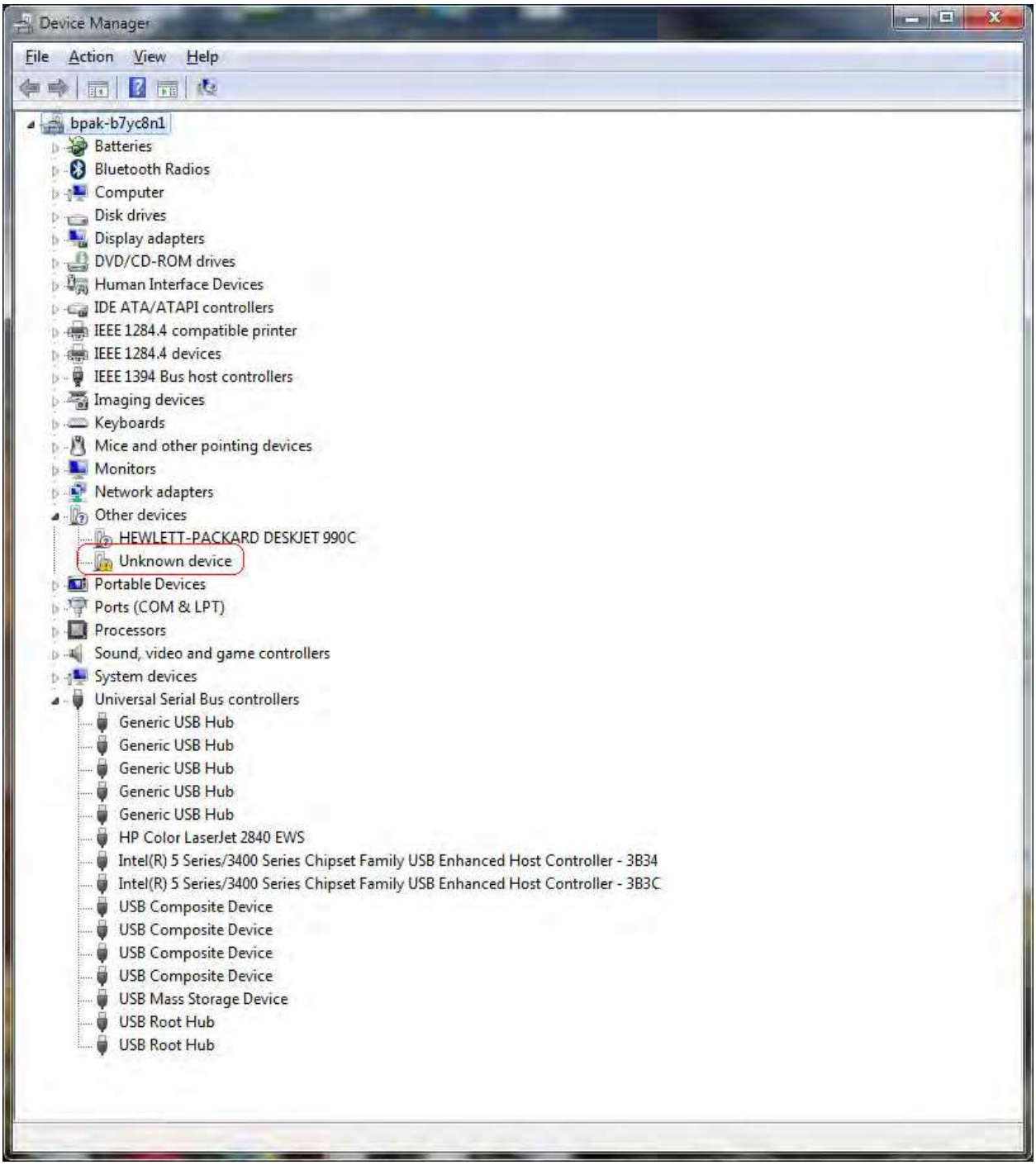

Figure 7. Unsuccessful Installation, Scenario 2

3. Select **Browse my computer for driver software (advanced)** to display the dialog shown in Figure 8, which prompts you to key in or browse for the location of the `.inf` file. Depending on the type of computer you use (32- bit or 64-bit), use the **Browse** button to navigate to one of the following paths, then click the **Next** button.
   – On 32-bit machines, use the following path:

     <Z8051 Installation>\Z8051_<version_number>\device drivers\OCD USB\x32

   – On 64-bit machines, use the following path:

     <Z8051 Installation>\Z8051_<version_number>\device drivers\OCD USB\x64

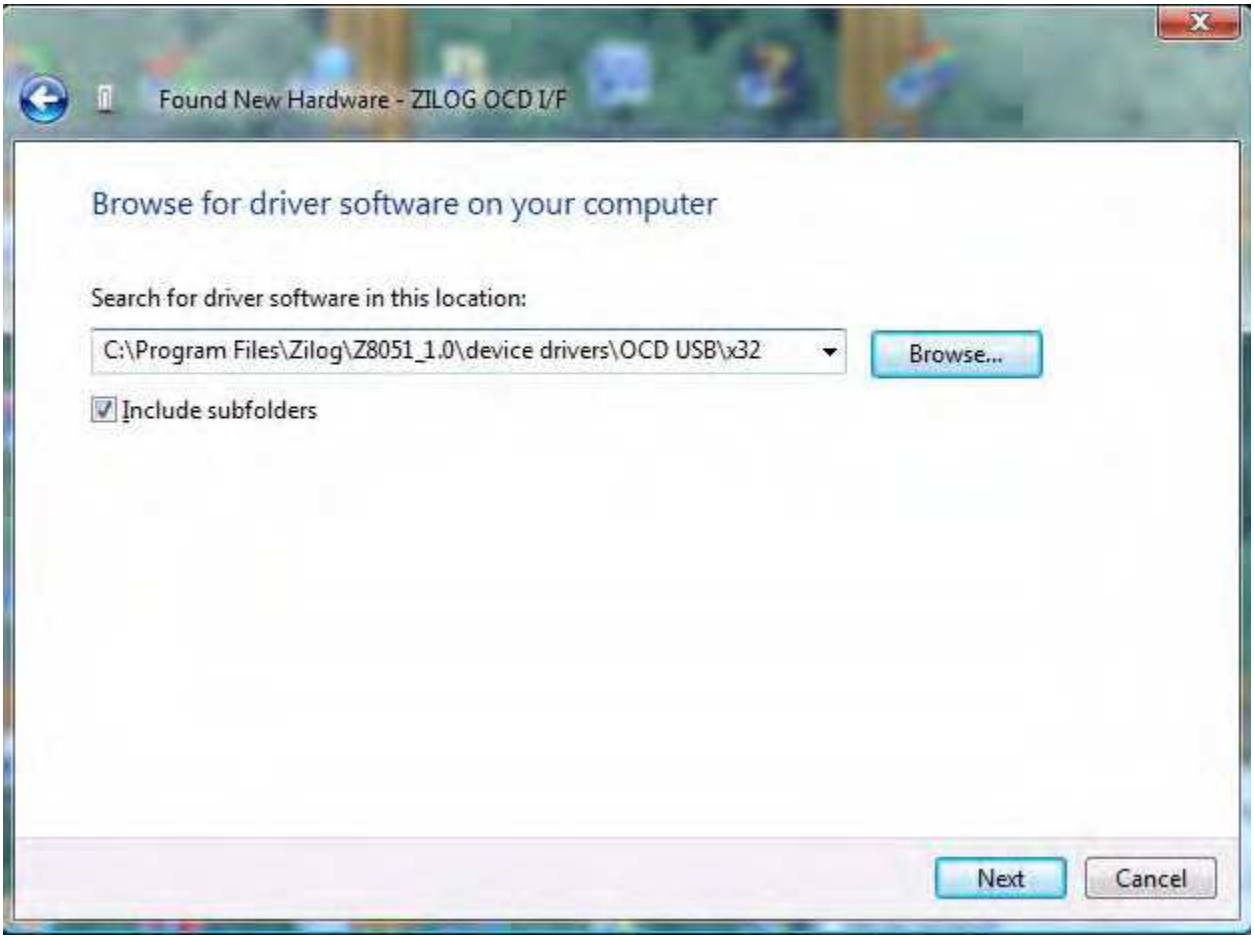

Figure 8. Browse For Driver Dialog, Windows Vista

4. When Windows prompts you whether to install or not install, as shown in Figure 9, click **Install this driver software anyway** and wait until the installation is completed (Windows may prompt you more than once).

Figure 9. Can't Verify Publisher Dialog, Windows Vista

5. When the installation is complete, the screen shown in Figure 10 will appear. Click **Close** to exit the OCD driver installation.

Figure 10. Successfully Installed Dialog, Windows Vista

Note: On some installations, the Found New Hardware screen shown in Figure 10 may also display the text string, `Zilog Z8051 USB OCD - No Firmware`. This occurrence is normal and can be disregarded.

6. If *Zilog Z8051 USB OCD* appears in the Device Manager (as highlighted in Figure 11), the OCD driver software has been successfully installed.

Figure 11. Device Manager Dialog, Windows 7

FTDI USB-to-UART Driver Installation

An FTDI USB-to-UART driver is required to allow your PC to communicate through its USB port to the on-chip UART of the Z51F6412 MCU. Observe the following procedure to perform these connections.

1. Ensure that the USB cable is not plugged in to the Z51F6412 Development Board's P1 connector.
2. Navigate to the following filepath and double-click the `CDM20802_setup.exe` file to begin the driver installation.

   <Z8051 Installation>\Z8051_*<version_number>*\device drivers\FTDI Uart

3. The installation process will begin and you should observe output similar to the following messages on the screen of your PC:

```
32-bit OS detected
<installation path>\dpinstx86.exe
Installation driver
FTDI CDM driver installation process completed.
```

Note: The above message may appear for a short time, but will then disappear from your window. This occurrence is normal.

4. When the installation is complete, plug in the Mini-B connector of the second USB cable into the Board, and the larger A connector into the USB port of your PC. Refer to Figure 15 on page 18 for guidance.
5. If the driver installation was successful, the *Ports (COM & LPT)* section of the Device Manager will display *USB Serial Port (COMx)* or similar message, as highlighted in Figure 12.

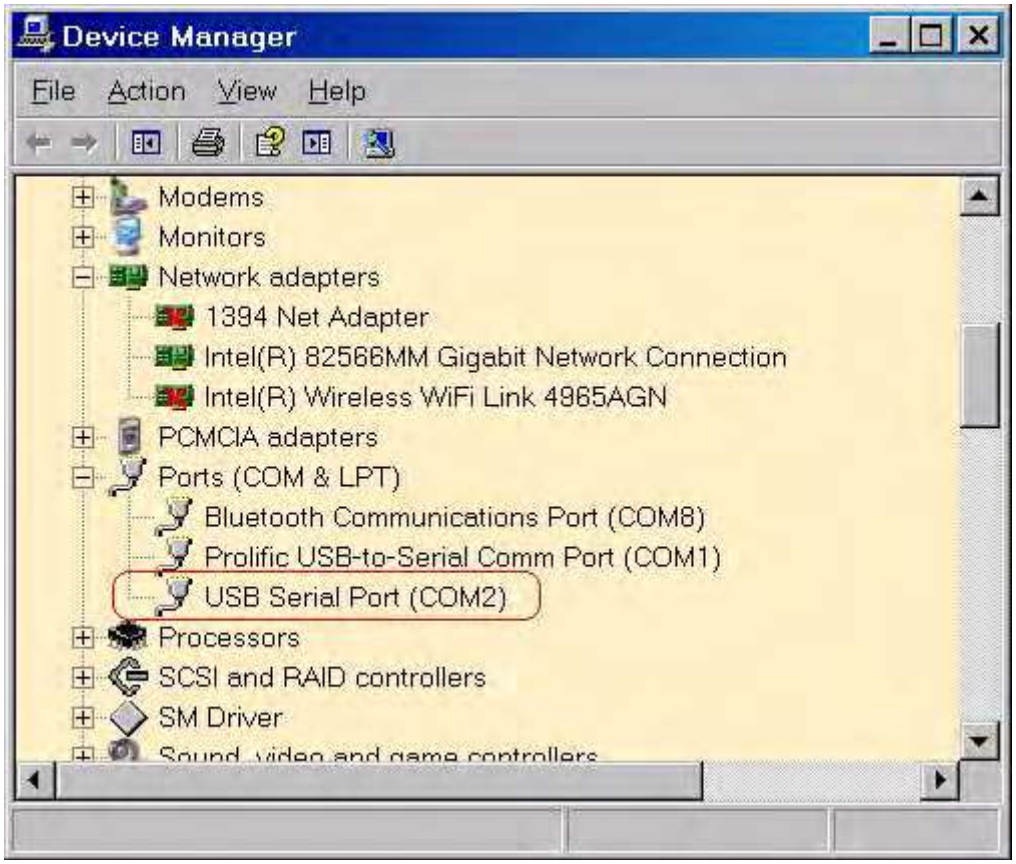

Figure 12. A Successful USB-to-UART Driver Installation

Note: To launch the Device Manager on Windows 7 systems, launch the Start menu, enter *device manager* in the **Search programs and files** field, and press the Enter key.

To open the Device manager on earlier Windows systems, navigate via the following path:

Start → Control Panel → System → Hardware → Device Manager → Ports (COM& LPT)

Configure the Z8051 OCD and Z51F6412 Development Board

Observe the following procedure to set up and configure the Z8051 On-Chip Debugger and the Z51F6412 Board.

Caution: Steps number 1 to 4 present the power-up sequence. Carefully follow these steps to avoid encountering an improper connection or disconnection.

1. Connect the Z8051 On-Chip Debugger (OCD) to the host PC's USB port.
2. Connect one end of the 10-circuit cable to the Z8051 OCD.
3. Connect the other end of the 10-circuit cable connector to the Board's J3 connector. Pin 1 of the cable connector is indicated by a red stripe, as shown in Figure 13.

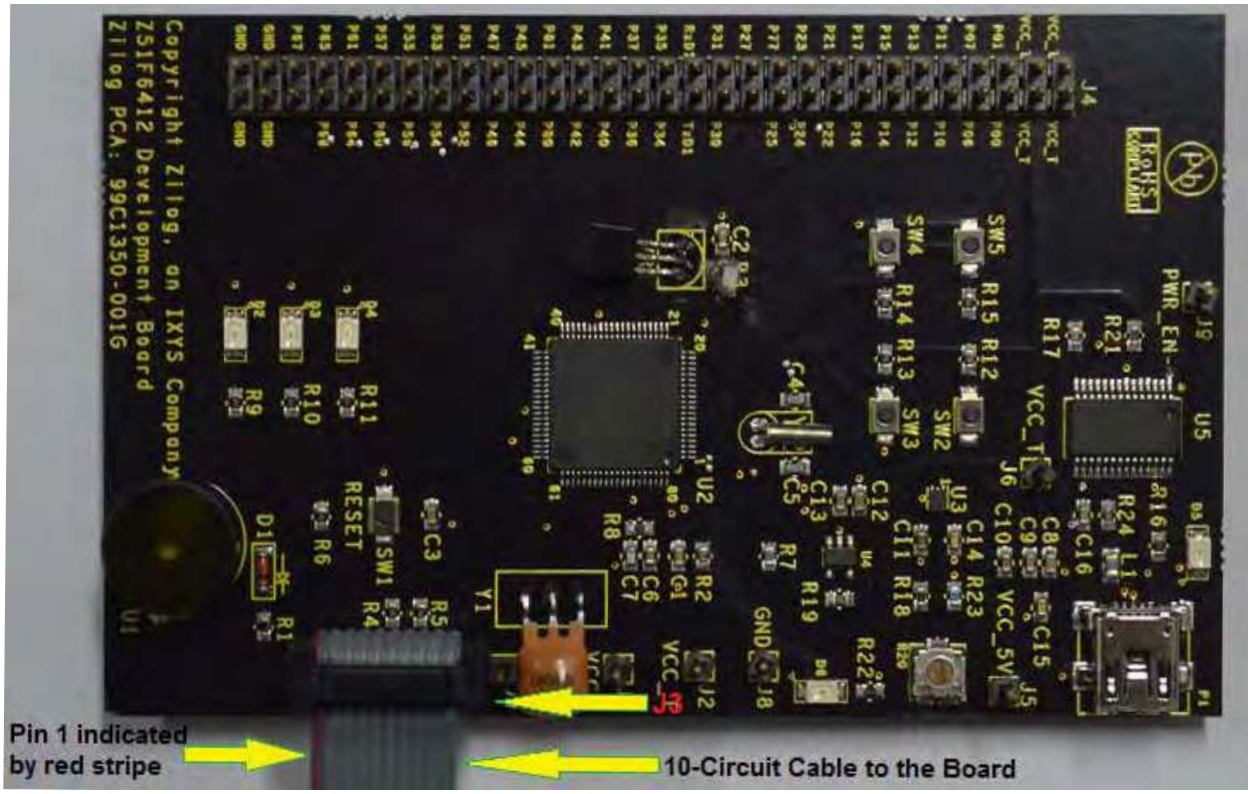

Figure 13. Connecting the 10-Circuit Cable to the Board

4. Using the second USB-to-Mini-B cable, connect the standard USB end to the host PC's USB port.
5. Connect the other end of this second Mini-B cable to the Z51F6412 Board's P1 connector to apply power to the Board. Note that the green LED D5 is ON; see Figure 14.

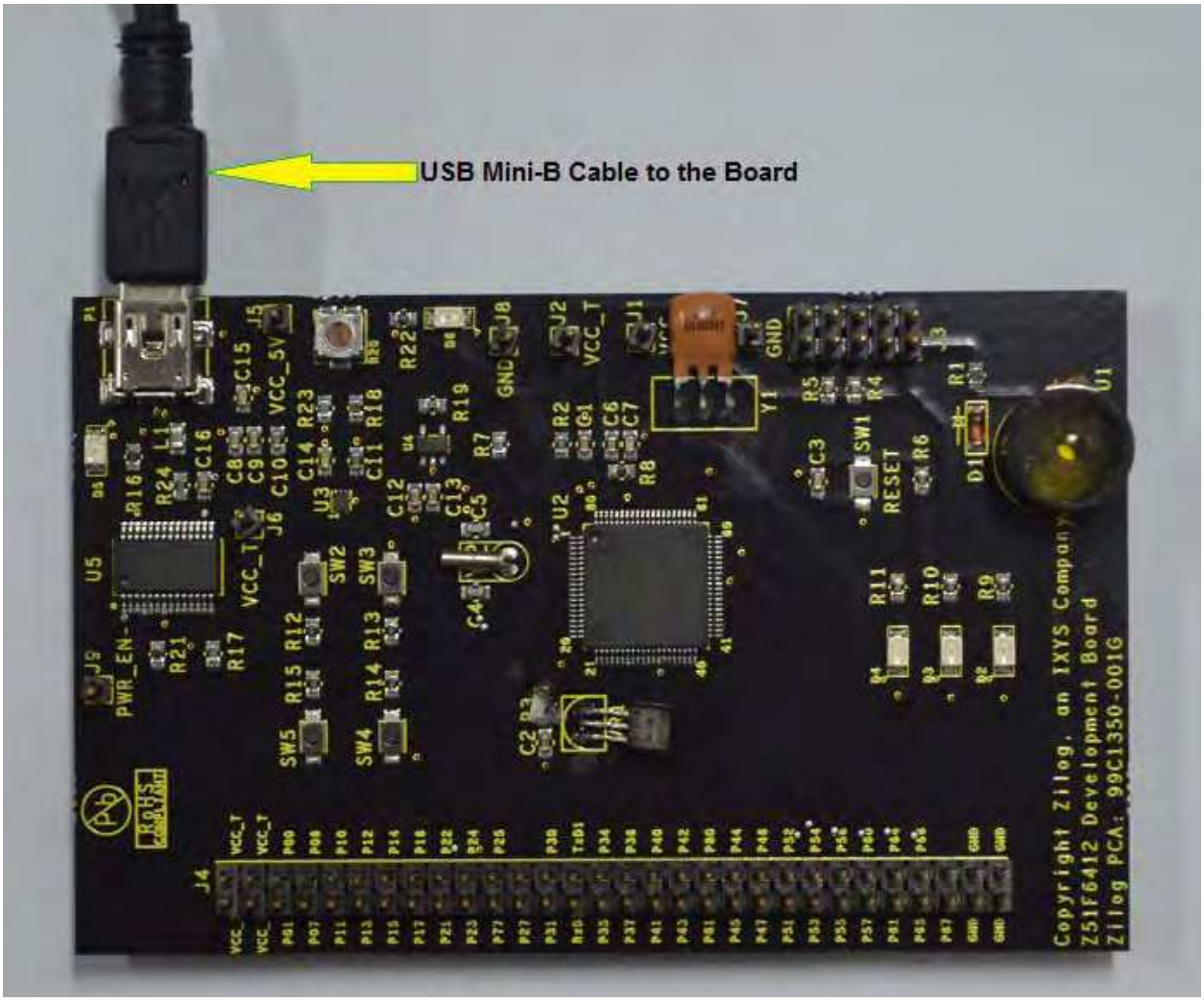

Figure 14. Connecting the USB Mini-B Cable to the Board

Figure 15 shows an example of a completed hardware and software setup.

Figure 15. An Example Setup