EVAL-ADUCM310QSPZ User Guide

UG-829

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ADuCM310 Development Systems Getting Started Tutorial

DEVELOPMENT SYSTEM KIT CONTENTS

Evaluation board (EVAL-ADUCM310QSPZ) that facilitates performance evaluation of the device with a minimum of external components
Analog Devices, Inc., J-Link OB emulator (USB-SWD/UART-EMUZ)
1 USB cable
1 installation DVD

INTRODUCTION

The ADuCM310 is a multidie stack system on-chip for diagnostic control of tunable laser optical module applications. The ADuCM310 features a 14-bit, multichannel, successive approximation register analog-to-digital converter (SAR ADC); an ARM® Cortex-M3 processor; eight voltage DACs; six current output DACs; and Flash/EE memory packaged in a 6 mm × 6 mm, 112-ball CSP_BGA package.

GENERAL DESCRIPTION

The ADuCM310 development system allows evaluation of ADuCM310 silicon. This quick start guide introduces the support features and the tools supplied with the evaluation kit. In addition, this user guide shows and describes how to connect the evaluation hardware.

This user guide works as a tutorial by providing a step-by-step account of how to download evaluation versions of third-party software tools. Instructions are provided on how to load code examples that are supplied.

By working through this guide, users can start to generate and download their own user code for use in their own unique end-system requirements.

Full specifications on the ADuCM310 are available in the product data sheet, which should be consulted in conjunction with this user guide when working with the evaluation kit.

TYPICAL SETUP

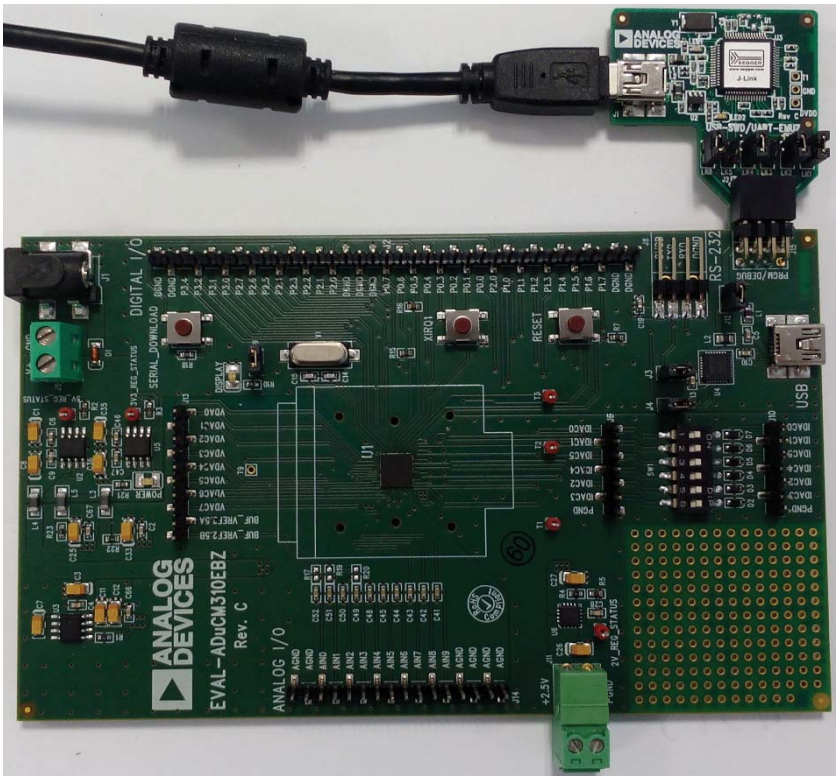

Figure 1. EVAL-ADUCM310QSPZ Evaluation Board and Analog Devices J-Link OB Emulator

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REVISION HISTORY

6/15—Revision 0: Initial Version

GETTING STARTED

SOFTWARE INSTALLATION PROCEDURES

Perform the steps described in this section before plugging any of the USB devices into the PC.

1. Close all open applications.
2. Insert the installation DVD into your DVD drive.
3. Double-click **ADuCM310.exe** and follow the on-screen instructions. A dialog box displays installation options, as shown in Figure 2.

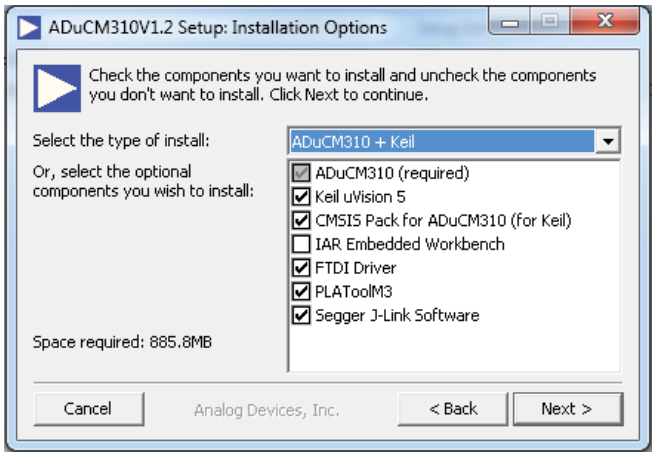


Figure 2. Installation Options

The following are installed on the PC by default:

- Example code and function sets for most peripherals
- Elves.exe: an application with which functions can be easily chosen from the provided function sets; the user can then choose the function parameters.
- CM3WSD.exe: an application for downloading hex file to the ADuCM310 over UART.

The user also has the option to install the following:

- Keil development tools (compiler, debugger, and programming tools). The revision used is V5.14. Analog Devices has developed a CMSIS software pack to support the ADuCM310.
- IAR development tools (compiler, debugger, and programming tools).
- FTDI drivers for the evaluation board.
- PLAToolM3: an application for configuring the PLA peripheral on the ADuCM310.
- Segger J-Link software: this is the software and drivers for the emulator.

The Segger J-Link software is selected by default in the installation menu. It is advised to leave it selected, which automatically installs the J-Link serial port driver. Select **Install USB Driver for J-Link-OB with CDC**, as shown in Figure 3. If this step is missed, run **Setup_JLink_Vxxxx.exe** located in the **Segger** folder on the DVD. After this step, if there is an issue with the drivers, the drivers can be reinstalled from **Program Files\SEGGER\JLinkARM_Vxxxx\USBDriver**. The CDC driver must be installed.

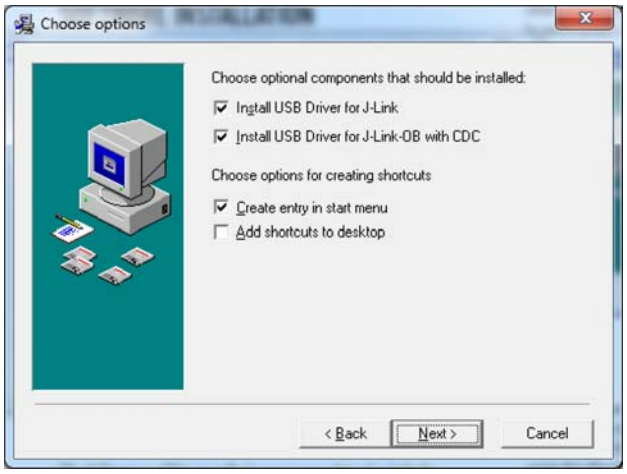


Figure 3. Installing J-Link Software

If the IAR tools are to be used, the entire contents of the supplied arm directory (for example, **C:\ADuCM310…\IAR\IAR_M310_Patch.zip\arm**) must be copied to the IAR tools directory (for example, **C:\Program Files\IAR Systems\Embedded Workbench 7.2\arm**).

Future updates will be available from the Analog Devices FTP site.

1. When the software installation is completed, plug the debugger/programmer into the USB port of your PC using the USB cable supplied.
2. Verify that the emulator board appears in the Windows® **Device Manager** (see Figure 4).

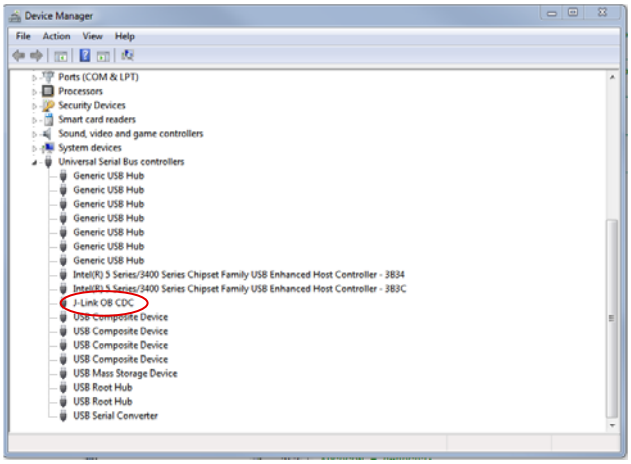


Figure 4. Device Manager

EVALUATION BOARD SETUP PROCEDURES

Assembling the Hardware

Do not plug in the USB cable before the software is installed.

Connecting the Hardware

Take the following steps to connect the hardware:

1. Insert the USB cable provided between the PC and the J-Link OB emulator.
2. The red LED (LED1) flashes briefly until initialization of the drivers is complete.
3. Driver installation details may appear on your screen; allow the installation of these drivers to complete, because these drivers provide a virtual communication port on your PC, allowing the evaluation board to appear as a virtual serial communication port to the UART port of the ADuCM310 device.
4. Note that the emulator drives P1.0 of the ADuCM310 high. If P1.0 is needed for other uses, LK5 on the emulator can be removed.
5. If the virtual serial communication port to the UART is to be used, ensure that Jumper LK3 and Jumper LK5 are in place (see Figure 6). If the UART on J8 is to be used, LK3 and LK5 must be removed to prevent contention.
6. Plug the 10-pin DIL connector of the J-Link OB emulator into the EVAL-ADUCM310QSPZ.
7. To power up the evaluation board, apply a 2.5 V supply capable of providing up to 2 A of current for the IDACs, and one of the following:
   - A voltage between 6 V and 20 V to J5.
   - A voltage between 6.7 V and 20 V to J1. Note that the J1 connector is center ground and outside positive.
8. The green power LED turns on.

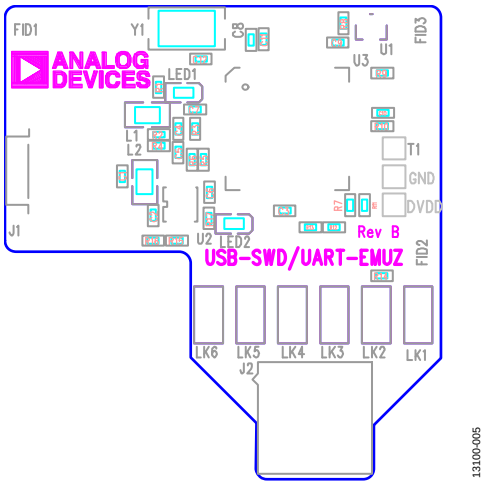


Figure 5. Emulator, Top View

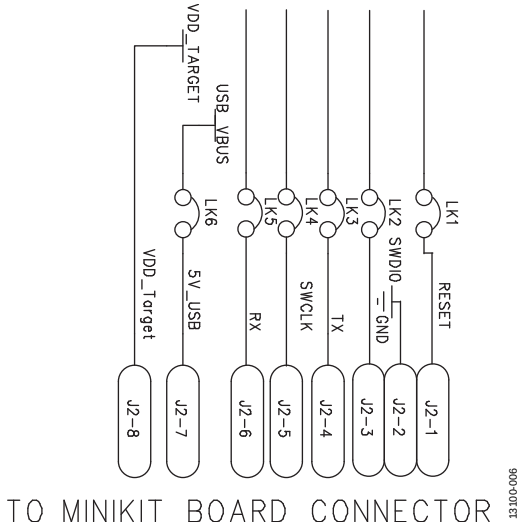


Figure 6. J-Link OB Connection Details

KEIL µVISION5

The Keil µVision5 integrated development environment (IDE) integrates all the tools necessary to edit, assemble, and debug code. The free version that ships with the ADuCM310 evaluation kit is limited to 32 kB code.

Starting µVision5

First, ensure that the CMSIS pack for the ADuCM310 has been installed (see the Software Installation Procedures section).

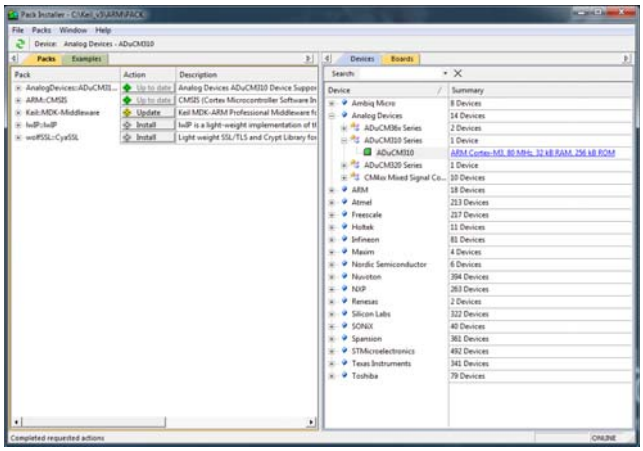
After installing Keil µVision5, a shortcut appears on the desktop. Double-click the shortcut to open Keil µVision5.

Figure 7. Keil µVision5 Desktop Shortcut

1. When Keil opens, click the **Pack Installer** button on the toolbar.

*Figure 8. **Pack Installer** Button*

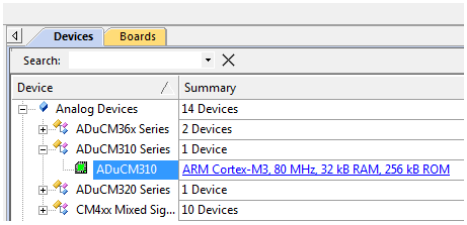
2. The **Pack Installer** window opens.



13100-009

*Figure 9. **Pack Installer** Window*

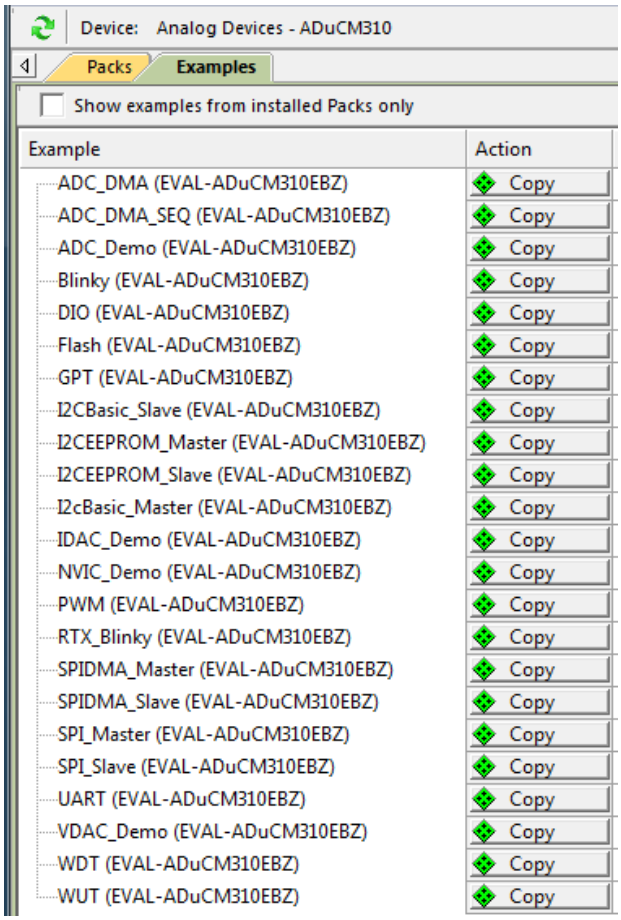
3. From the right-hand portion of the window, under the **Devices** tab, click **Analog Devices** > **ADuCM310 Series** > **ADuCM310**.



13100-010

*Figure 10. **Devices** Tab*

4. In the left-hand side of the window, click the **Examples** tab.



13100-011

*Figure 11. **Examples** Tab*

5. Select the **DIO** example and click **copy**.

6. Choose a destination folder and click **ok**. It is recommended to place your projects under **C:\ADuCM310Vx.x\code\ADuCM310\MyProjects**. This copies the DIO example, necessary startup files, and library functions to the folder of your choice.

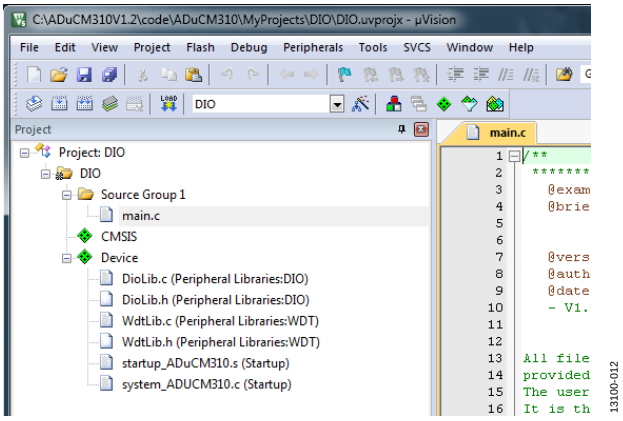


*Figure 12. **DIO** Example*

7. The example must to be compiled by clicking the **Build** button on the toolbar, or by pressing the F7 key.

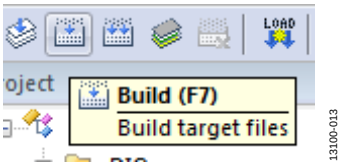


*Figure 13. **Build** Button*

8. When the build has completed, the message shown in Figure 14 appears.

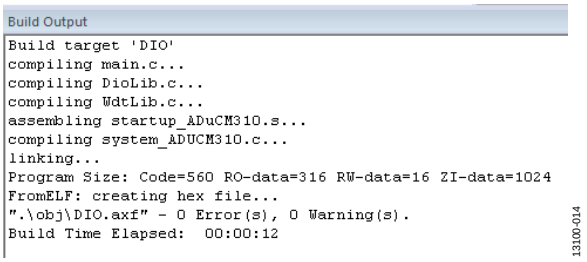


Figure 14. Build Output

9. To download the code to the EVAL-ADUCM310QSPZ board, click the **Download** button.

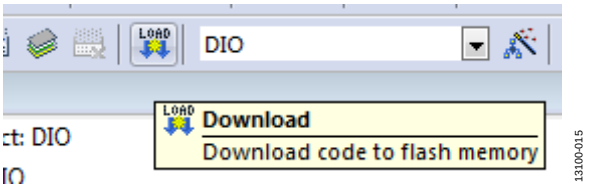


*Figure 15. **Download** Button*

10. When the download is complete, the message shown in Figure 16 appears.

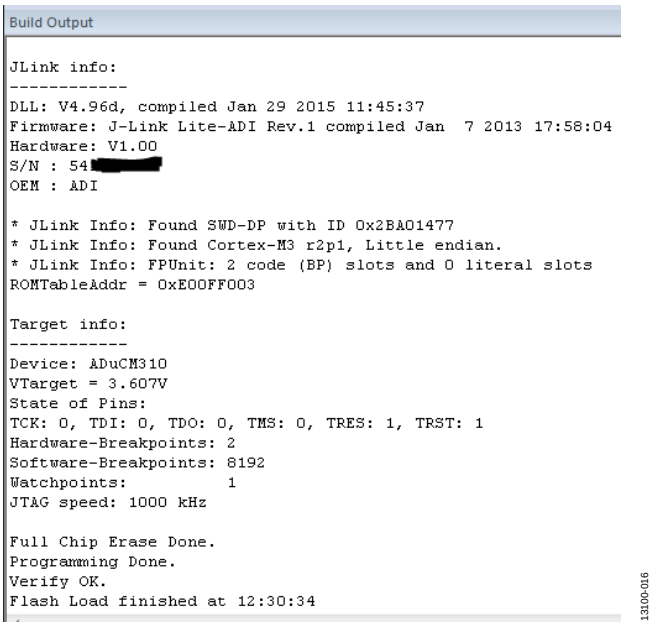


Figure 16. Download Message

11. After the code is downloaded to the board, press the reset button on the evaluation board. The red **DISPLAY** starts toggling.
12. The code can be debugged by clicking the **Debug** button.

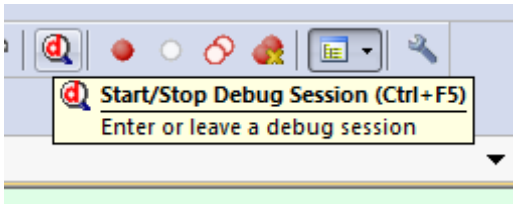


*Figure 17. **Debug** Button*

13. Breakpoints can be added by clicking the breakpoint button. The ADuCM310 is limited to two hardware breakpoints. The J-Link software comes with an evaluation version of unlimited flash breakpoints, which work by reprogramming the ADuCM310 flash to add a special instruction that the debugger is aware of.
14. The execution of the code on the ADuCM310 can be controlled using the **Debug** toolbar. The ADuCM310 can be reset, the program can be started and stopped, and it is possible to step through the code. Note that stepping through the code uses one of the two available hardware breakpoints.

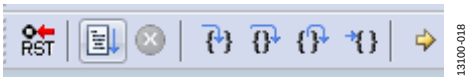


*Figure 18. **Debug** Toolbar*

15. The registers for the various peripherals on the ADuCM310 can be viewed by going to the **Peripherals** menu and selecting the **System Viewer** submenu. The registers can be read and written to here. The registers can also be expanded to obtain the bit information and possible enumerations that can be used for certain bits. Note that reading certain status registers or reading from FIFO registers can affect the normal operation of code; therefore, the user is advised to be cautious with the use of **System Viewer**.

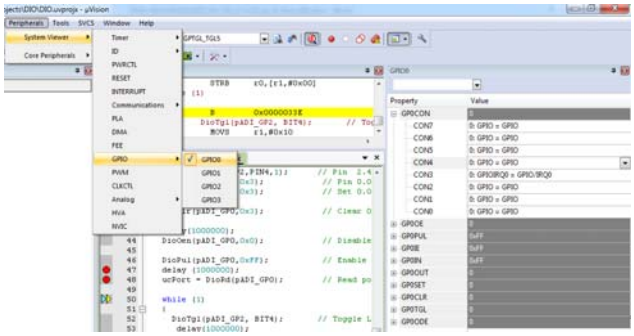


*Figure 19. **System Viewer** Menu*

16. After a debug session is complete, new code can be written and rebuilt. Included in the evaluation kit is an extensive set of library functions. These can be included in a project with the **Manage Run-Time Environment** button. The libraries can be found under the **Device** > **Peripheral Libraries** category, as shown in Figure 21.

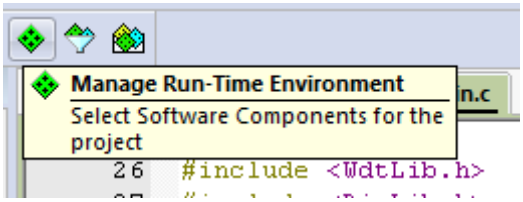


*Figure 20. **Manage Run-Time Environment** Button*

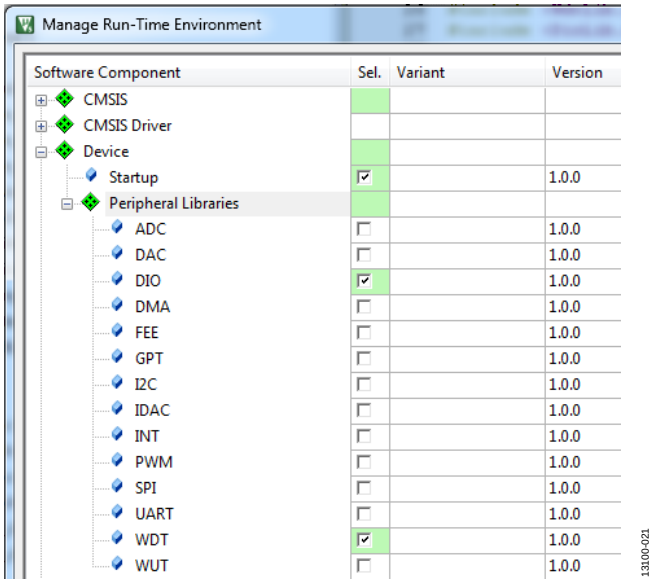


Figure 21. Adding Peripheral Libraries to a Project

17. The libraries are documented with Doxygen comments, which can be interpreted by the Elves program. The Elves program provides a GUI that can be used to select the correct parameters to be passed to a library function. For more information, see the Elves section.

IAR EWARM

The EWARM integrated development environment (IDE) integrates all the tools necessary to edit, assemble, and debug code. The fastest way to get started is to open an existing workspace by taking the following steps:

1. Open the IAR tools from the start menu, **IAR Systems\...\IAR Embedded Workbench**.
2. Within the IAR IDE, click **File** > **Open** > **Workspace**, and open a workspace provided (for example, **C:\ADuCM310…\code\ADuCM310\examples\DIO\DIO.eww**).
3. Compile and download to the device by clicking **Project** > **Rebuild All**, and then clicking **Project** > **Download Active Application**.
4. If a pop-up window about an unknown device appears, click **No**.
5. To run the code, press reset on the board or enter debug mode by using the **Download and Debug** button and then clicking **Go**.

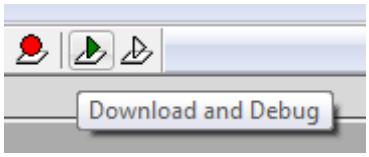


*Figure 22. **Download and Debug** Button*

*Figure 23. **Go** Button*

6. When the code is running, the red LED marked **DISPLAY** on the board flashes.
7. Breakpoints can be enabled using the **Toggle Breakpoint** button. The ADuCM310 is limited to two hardware breakpoints. The J-Link software comes with an evaluation version of unlimited flash breakpoints, which work by reprogramming the ADuCM310 flash to add a special instruction that the debugger is aware of.

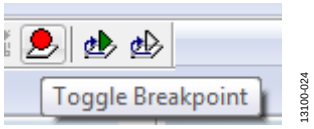


*Figure 24. **Toggle Breakpoint** Button*

8. In debug mode, the execution of the program can be altered using the **Debug** toolbar. Note that stepping through the code uses one of the two available hardware breakpoints.

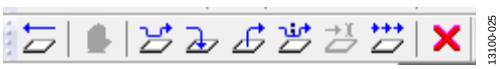


*Figure 25. **Debug** Toolbar*

9. The peripheral registers can be read and modified using the **Register** window, which can be accessed from the **View** menu. Note that reading certain status registers or reading from FIFO registers can affect the normal operation of code; therefore, the user is advised to be cautious with the use of the **Register** window.

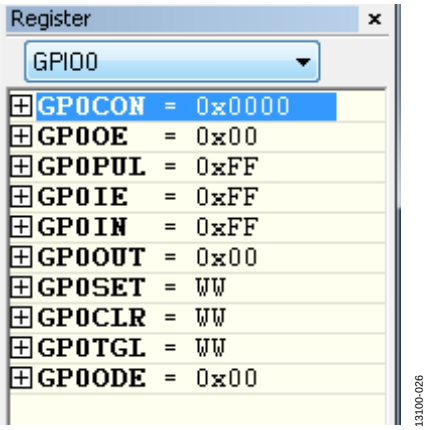


*Figure 26. **Register** Window*

ELVES

Elves.exe is an application that the user can use to easily choose functions from the provided function sets, and then choose the function parameters. Elves can be integrated into the Keil and IAR tools under their tools menus. For instructions, run Elves.exe (for example, at **C:\ADuCM310…\Software Tools\Elves\Elves.exe**) and press the F1 key or click the **Help** button for further instructions.

1. The library files for a particular µVision5 project are copied by µVision5 from the CMSIS pack to the RTE folder under the project folder.
2. All the included libraries are available under **C:\ADuCM310Vx.x\code\ADuCM310\common**. These files can be used for both the IAR and the Keil installation.

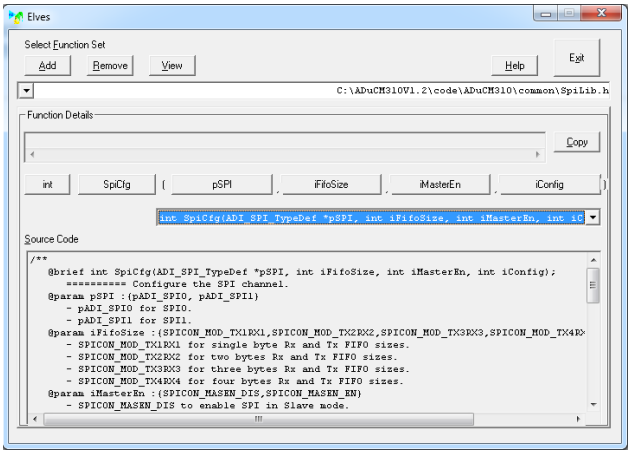


Figure 27. Elves

CM3WSD

CM3WSD.exe is an application that can download hex files to the ADuCM310 over the UART. CM3WSD is installed under **C:\ADuCM310…\Software Tools\CM3WSD\CM3WSD.exe**. To use this application, the device must be in serial download mode. Enter serial download mode by pressing the **SERIAL_DOWNLOAD** button, which is connected to P2.3 on the ADuCM310, and then by resetting the device.

For details of the Cortex-M3 based ADuCxxx serial download protocol used by CM3WSD, see the AN-1160 Application Note.

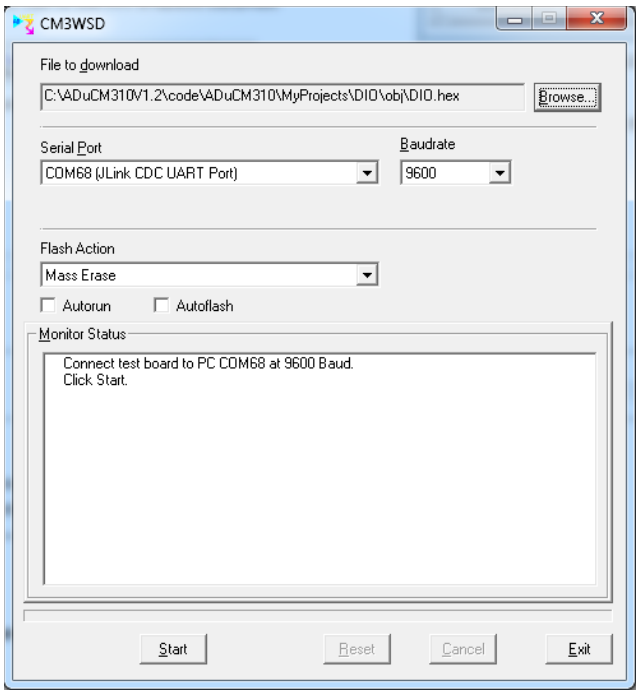


Figure 28. CM3WSD

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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