Using the ADN8810 Demo Board v2.0
by Troy Murphy and Chris Kung

OVERVIEW

The ADN8810 is a 12-bit, high output current D/A converter that is controlled through a serial peripheral interface (SPI). The device can be used as a current source for tunable lasers or other precision high output current applications, like 4–20 mA control loops. Refer to the ADN8810 data sheet for technical specifications.

The demo board for the ADN8810 provides a complete solution, which includes a precision 4.096 V reference (ADR292), simple connections for power supplies and output load, and 25-pin D-sub plugs to connect to the parallel port of a computer.

Multiple devices can be controlled from one computer by daisy-chaining demo boards together. Use jumpers to short header pins on the board to set the address code for the ADN8810. Eight address codes are available, allowing separate control of eight demo boards from a single computer.

POWER SUPPLY CONNECTION

The power supply connection block is located at the top of the demo board. The board can be powered from two configurations: all single supplies or positive and negative supplies. Table I shows the required supply voltages.

Table I. Required Power Supply Voltages

	Single-Supply (V)	Split-Supply (V)
AVDD	5	3
PVDD	3.0 to 3.3	1.0 to 1.3
GND	0	0
VSS	0	–2

Note that VSS must be connected to 0 V for single-supply operation. VSS and GND are not directly connected on the demo board.

Most applications can use the single-supply configuration. However, some laser diodes require a connection to –2 V for proper operation. These applications require a negative VSS supply voltage.

LASER DIODE OR LOAD CONNECTION

The laser diode or load connection block is located at the bottom of the board. Output current from the ADN8810 comes out of LD+ and returns to LD–. The ADN8810 can only source current. The output voltage can typically go as high as 2.5 V. This is indicated in the data sheet as output compliance voltage. The LD+ output cannot sink current.

The LD– terminal is connected directly to VSS on the board. If operated from a single supply, VSS must be set to 0 V.

SHUTDOWN CONTROL AND ADDRESS HEADERS

The SHUTDOWN terminal is labeled $\overline{SD}$ and is located at the bottom of the demo board. No connection is required to this terminal. A pull-up resistor is provided on the board, activating the ADN8810 even with no interface cable connected. The green LED indicates an active device.

Shutdown for the ADN8810 is also controlled from the demo board software. Although the demo board includes a 100 Ω protection resistor, forcing a voltage on the SHUTDOWN terminal with the interface cable still connected could damage the parallel port on your computer.

INTERFACING WITH AN EXTERNAL MICROCONTROLLER

The ADN8810 demo board can be controlled with an external microcontroller or DSP. Solder a wire with the appropriate logic signal to the right side of resistors R1 through R6, located toward the right of the demo board. These resistors are labeled with their respective pin names. The shutdown signal can be connected directly to the SHUTDOWN terminal at the bottom of the demo board.

BOARD FAULT AND ACTIVE INDICATION

The red LED indicates an output FAULT and will illuminate if the output (labeled LD+) is short-circuited to GND, VSS, or LD–. This LED also turns on if the output voltage is greater than PVDD – 0.6, since this indicates a potential open-circuit to the load.

The green LED turns on if the ADN8810 is active. Power must be supplied to the demo board and the $\overline{SD}$ pin must be logic high for the device to be active. A pull-up resistor is included on the demo board, allowing the ADN8810 to remain active even with no parallel port cable connected.

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ADJUSTING MAXIMUM OUTPUT CURRENT

The full-scale output current from the ADN8810 is set by two external resistors of equal value, RS1 and RS2:

$$I_{FS} \approx \frac{4.096}{10 \times R_S} \qquad (1)$$

where R_S is equal to RS1 and to RS2. These are 1.6 Ω 1% surface-mount resistors on the demo board, setting the full-scale output current to approximately 256 mA.

To change the full-scale output current, remove RS1 and RS2 and insert new resistors according to Equation 1. Holes are provided on the demo board for these sense resistors. Resistor matching of 1% or better is recommended to ensure high output impedance for the current source.

The output current from the ADN8810 is proportional to the 12-bit code sent to the device.

$$I_{OUT} = Code \times \frac{4.096}{4096} \times \frac{1}{R_S} \times \left(\frac{R_S}{15k} + 0.1 \right) \qquad (2)$$

The decimal code value range is 0 to 4,095. The demo board software automatically calculates the output current.

CONNECTING DEMO BOARDS TO THE COMPUTER

Connect the parallel port of the computer to the INPUT jack on the ADN8810 demo board with a DB-25 straight-through male-to-female cable. Do not use a printer or null-modem cable as these cross wires and will not control the board. The OUTPUT jack does not require any connection.

Multiple ADN8810 demo boards can be daisy-chained together, allowing control from a single computer. Connect the output jack from one board to the input jack of another board using a DB-25 straight-through male-to-female cable. Alternatively, the boards can be plugged together directly with no cable. Supply voltages must be connected to each demo board.
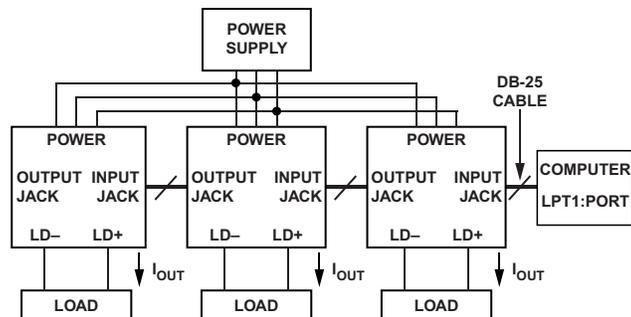
Figure 1. Connecting Multiple ADN8810 Demo Boards

DEMO SOFTWARE INSTALLATION AND UNINSTALLATION PROCEDURES

To run the ADN8810EVB Controller installation script:

1. Insert the CD into the CD-ROM drive.

2. Double-click the My Computer icon on your Windows® desktop.

3. Navigate to the CD-ROM drive and double-click Setup.exe to launch the installation wizard.

4. Follow the directions in the wizard to complete the installation process.

To uninstall the ADN8810EVB Controller, do the following:

1. Select Control Panel from Settings under the Windows Start menu.

2. When the Control Panel opens, double-click the Add/Remove Programs icon.

3. From the Add/Remove Programs dialog, select ADN8810EVB Controller.

4. Click Remove.

5. Follow the directions in the wizard for uninstallation.

RECOMMENDED SYSTEM REQUIREMENTS

To install the ADN8810EVB Controller, the computer must meet the following minimum system requirements:

• Windows 95, Windows 98, Windows ME, Windows NT 4.0 (Intel®) operating system with Service Pack 4 installed, Windows 2000 (administrative privileges required), or Windows XP

• Pentium®-class PC (200 MHz or higher recommended)

• 128 megabytes (MB) of RAM

GETTING STARTED

The ADN8810EVB Controller installation wizard places a shortcut on the Windows desktop and under the Program Files folder of the Start menu to launch the application. Using either of these shortcuts will launch the ADN8810EVB Controller.

The main interface window of the ADN8810EVB Controller is shown in Figure 2. There are four sections that a user must become acquainted with in order to properly use the ADN8810EVB Controller and evaluate the capabilities of the ADN8810 device: 1) Mode Settings, 2) Device Selection, 3) Output Current Selection, and 4) Control Buttons.
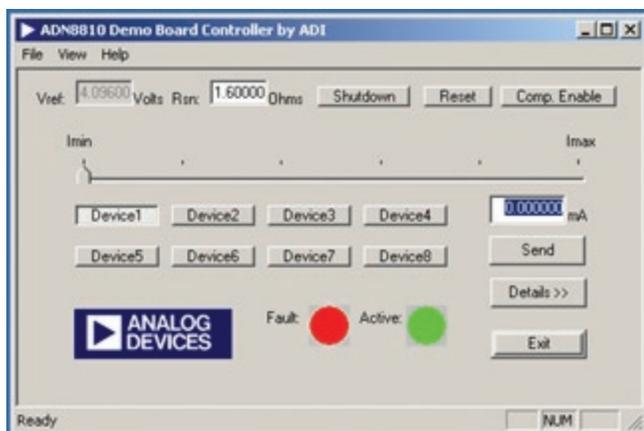
Figure 2. ADN8810EVB Controller Main Window

Mode Settings

The Mode Settings section of the main interface window is composed of the components shown in Figure 3. In this section, users can change the full-scale output current by modifying the sense resistor value, R_{SN}. The demo board comes with 1.6 Ω RS1 and RS2 resistors. For more information on changing the full-scale output current, see the Adjusting Maximum Output Current section.

In addition to setting the R_{SN} value, the Mode Settings area of the ADN8810EVB Controller allows you to toggle Shutdown, Reset, and Comp Enable. For more details on internal compensation of the ADN8810, see the ADN8810 Data Sheet.

Figure 3. Mode Settings Section

Device Selection

The Device Selector section consists of eight radio buttons labeled Device1 to Device8. The default selection for the ADN8810EVB Controller is Device1, which has a binary address of 0000. To select a different device to program, simply select another radio button by left clicking the desired device. Note that although the binary address of the device is four bits long, only eight different device addresses can be used, so the highest binary address, 0111, corresponds to Device8.

Figure 4. Device Selector Section

Output Current Selection

The Slider and Edit box components in this section of the main interface window provide two ways to modify the output current level of an ADN8810 device. By moving the slider or typing an output current value in the edit box, the ADN8810EVB Controller will calculate the proper DAC bit code to send to the selected ADN8810 device address. Changing the slider position will result in a modified display value in the Edit box and vice versa.

Figure 5. Output Current Selector Section

Control Buttons

The Control Buttons section of the ADN8810EVB Controller main application window are Send, Details, and Exit. The selected device will not be programmed with the output current selection (Edit box value) until the Send button is clicked.

Clicking the Details button launches a Bit-Code Details window similar to the one in Figure 6. This window has three bit codes. The first (top) bit code is the complete code sent via the SPI interface to the ADN8810 device. The second and third bit codes are simply the address bits and the code used to program the internal DAC of the ADN8810, respectively. This window is provided so users of the evaluation software and demo board can easily write applications to program a desired current output to the ADN8810 device in their applications.
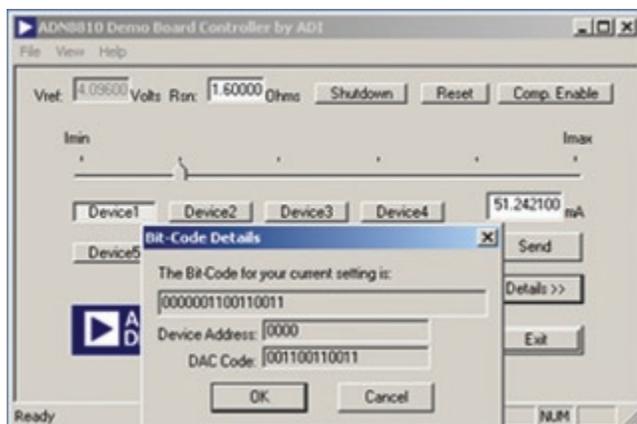
Figure 6. Details Dialog Window

The Exit button simply closes the ADN8810EVB Controller. Exiting the ADN8810EVB Controller does not put the ADN8810 device(s) into shutdown or reset mode. As long as power is provided to the demo board(s), the ADN8810 device(s) will retain its output current setting.

DEMO BOARD SCHEMATIC AND LAYOUT

Figure 7 shows the schematic for the ADN8810 demo board. JP1 is the address header where jumpers can short 1–2, 3–4, and 5–6.

The board is constructed with four layers. PVDD and AVDD are split on one middle layer, and VSS and GND are split on another. All four layers and the top overlay

labels are shown in Figure 8. The board perimeter is included in all figures for reference.

The top and bottom layers show copper traces. However, the VSS/GND and PVDD/AVDD layers are split planes and their figures show where copper is removed. Note that both sets of split planes are electrically isolated from each other. For single-supply operation, both VSS and GND must be connected to 0 V.

Figure 7. ADN8810 Demo Board v2.0 Schematic

Figure 8a. Top Layer

Figure 8d. Bottom Layer
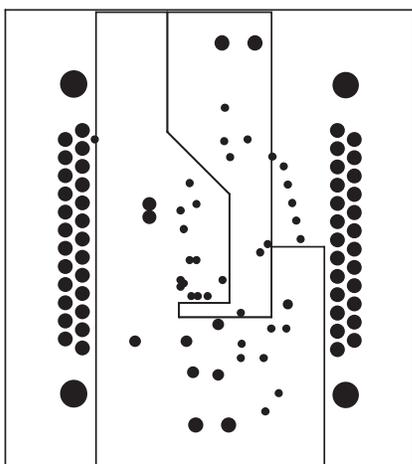
Figure 8b. GND/VSS Planes
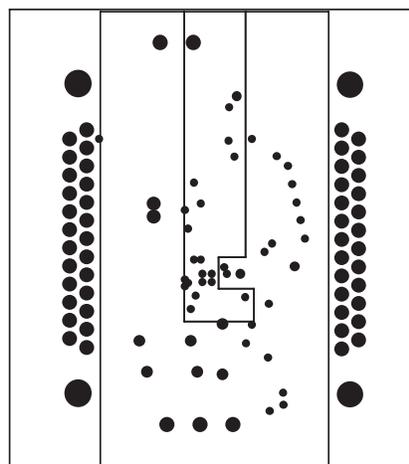
Figure 8e. PVDD/AVDD Planes
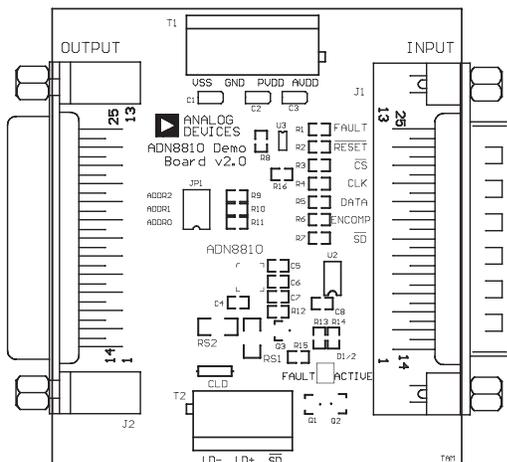
Figure 8c. Top Overlay
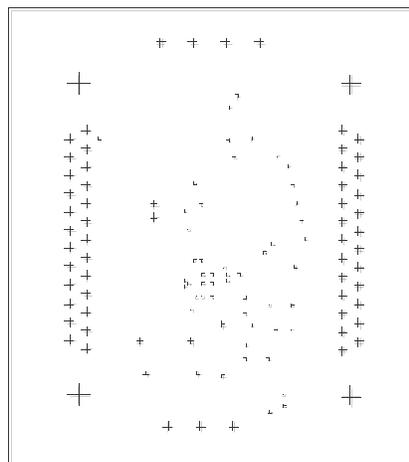
Figure 8f. Drill Guide

Figure 8. Demo Board Layers

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