

PE4314 Evaluation Kit (EVK) User's Manual

Evaluation Kit User's Manual, 1 MHz–2.5 GHz



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Introduction

Introduction

The PE4314 is a 75Ω HaRP™ technology-enhanced 6-bit RF digital step attenuator (DSA) designed for use in CATV and multi-carrier applications. An integrated digital control interface supports both serial and parallel programming of the attenuation, including the capability to program an initial attenuation state at power-up. Covering a 31.5 dB attenuation range in 0.5 dB steps, it maintains high linearity and low power consumption from 1 MHz through 2.5 GHz. PE4314 also features an external negative supply option, and is offered in a 20-lead 4 × 4 mm QFN package. In addition, no external blocking capacitors are required if 0 VDC is present on the RF ports.

The PE4314 evaluation kit (EVK) requires the application software and hardware to control and evaluate the functionality of the DSA using a PC running the Windows® operating system to control the USB interface board.

Application Support

For any technical inquiries regarding the evaluation kit or software, please visit applications support at www.psemi.com (fastest response) or call (858) 731-9400.

Evaluation Kit Contents and Requirements

Kit Contents

The PE4314 EVK includes the following hardware required to evaluate the DSA.

Table 1 • PE4314 Evaluation Kit Contents

| Quantity | Description |
|----------|--|
| 1 | PE4314 DSA evaluation board assembly (PRT-62237) |
| 1 | Peregrine USB interface board assembly (PRT-50446) |
| 1 | USB 2.0 type A to type B mini cable |

Software Requirements

The DSA evaluation software will need to be installed on a computer with the following minimum requirements:

- PC compatible with Windows XP, Vista, 7, 8 or 10
- Mouse or other pointing device
- USB port
- Web browser with internet access
- Administrative privileges

Hardware Requirements

In order to evaluate the performance of the evaluation board, the following equipment is required:

- DC power supplies and DC cables
- Vector network analyzer (Note: A VNA with a 75Ω option, or 50 to 75Ω minimum loss pads are required for accurate measurements)

Caution: The PE4314 DSA EVK contains components that might be damaged by exposure to voltages in excess of the specified voltage, including voltages produced by electrostatic discharges. Handle the board in accordance with procedures for handling static-sensitive components. Avoid applying excessive voltages to the power supply terminals or signal inputs or outputs.

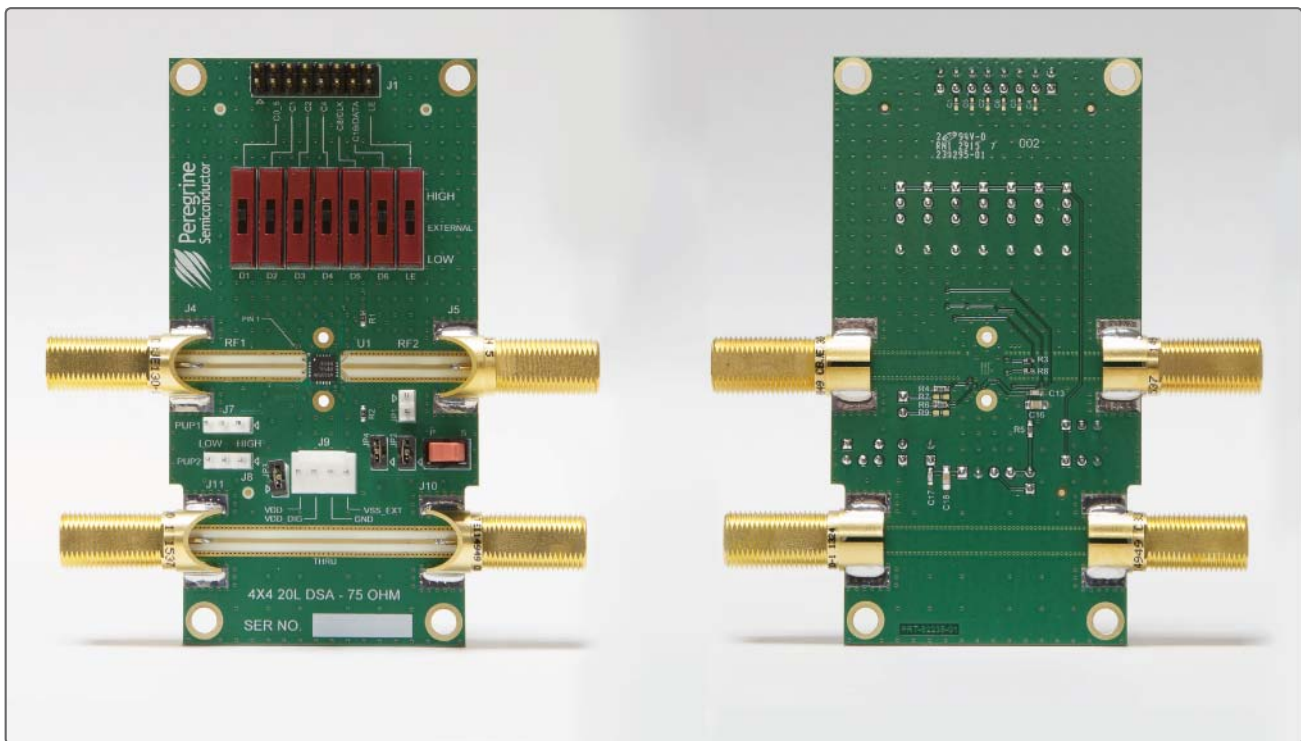
Evaluation Board Assembly



Evaluation Board Assembly Overview

The evaluation board (EVB) is assembled with a PE4314 DSA, SP2T mechanical switch (\bar{P}/S), SP3T mechanical switches (D1~D6 and LE), several headers and F connectors. The \bar{P}/S switch is used for Parallel or Serial mode selection. The D1~D6 and LE switches are used for setting the control bits in Direct Parallel programming mode.

Figure 1 • PE4314 Evaluation Board Assembly



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Quick Start Guide



Quick Start Overview

The EVB was designed to ease customer evaluation of the PE4314 DSA. This chapter will guide the user through the software installation, hardware configuration and using the graphical user interface (GUI).

Software Installation

USB Driver

The latest USB interface board drivers are available via Microsoft Windows update. Internet connectivity is required to download the drivers. Connect the USB interface board to the PC and select the Windows Update option to obtain and install the drivers (Figure 2).

If the USB board drivers are not installed, it will not be possible to run the program correctly. A USB interface board is included in the evaluation kit (Figure 3).

Figure 2 • USB Driver Installation (Detecting)

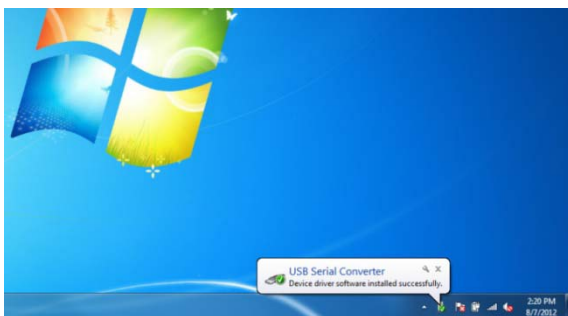
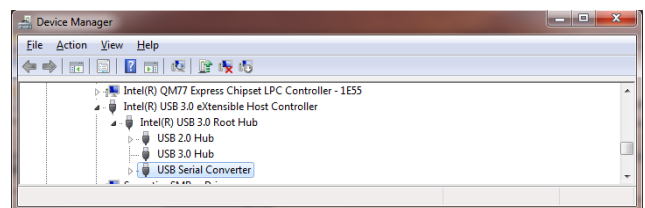


Figure 3 • USB Driver Installation (Device Manager)



EVK Software

In order to evaluate the PE4314 performance, the application software has to be installed on your computer. The USB interface and DSA application software is compatible with computers running Windows® XP, Vista, 7, 8 or 10. This software is available directly from Peregrine's website at www.psemi.com.

To install the DSA evaluation software, unzip the archive and execute the "setup.exe."

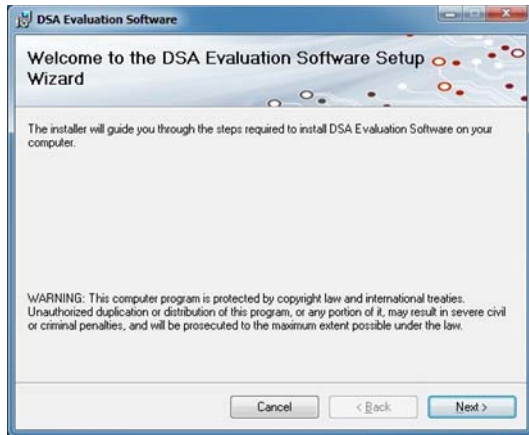
Figure 4 • DSA Evaluation Software Installer



After the setup.exe file has been executed, the installer may prompt you to install Windows Installer 3.1 or Microsoft® .NET Framework 4.0. Follow the instructions as prompted to download and install these packages directly from Microsoft.

Next, a welcome screen will appear. It is strongly recommended that all programs be closed prior to running the install program. Click the “Next>” button to proceed.

Figure 5 • *DSA Evaluation Software Setup*



Take a moment to read the license agreement, then click “I Agree” and “Next>.”

Figure 6 • *License Agreement*



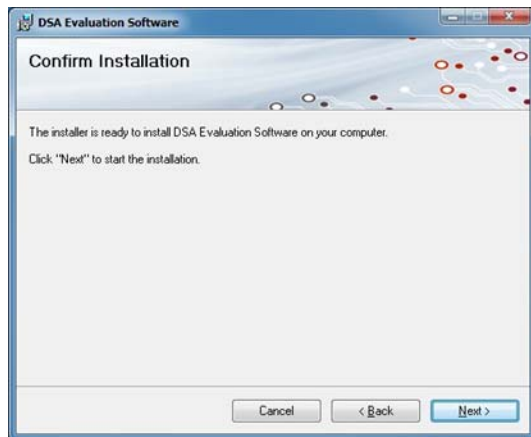
For most users the default install location for the program files is sufficient. If a different location is desired, the install program can be directed to place the program files in an alternate location. The software is installed for “Everyone” by default. Once the desired location is selected click “Next>.”

Figure 7 • *Select Installer Folder*



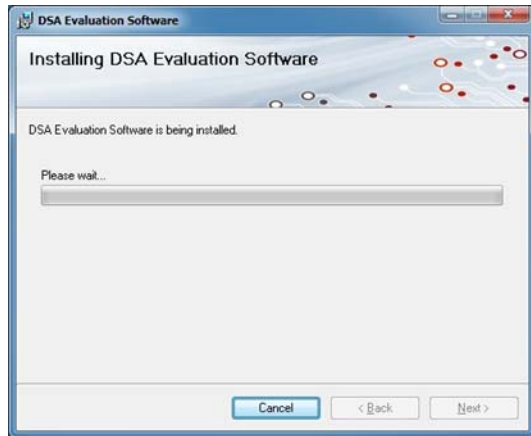
In the window of Confirm Installation, click “Next>” to proceed with the software installation.

Figure 8 • *Confirm Installation*



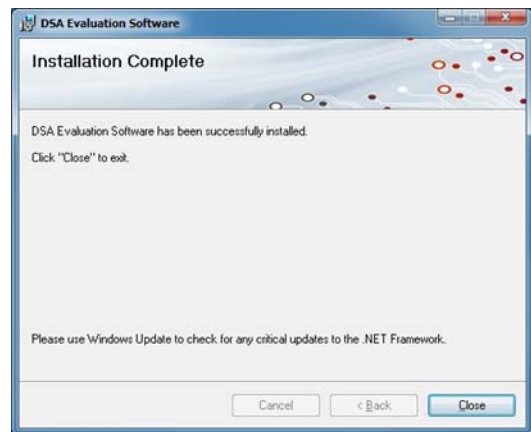
As the software files are installed, a progress indicator will be displayed. On slower computers, installation of the software may proceed for a few moments.

Figure 9 • Progress Indicator



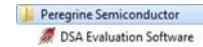
Once the evaluation software is installed, click "Close" to exit.

Figure 10 • Installation Complete



If using Windows XP, Vista, 7, 8.1 or 10 operating system, a new Start Menu under Peregrine Semiconductor will appear in the start menu of your computer. Select "DSA Evaluation Software" to launch the GUI.

Figure 11 • DSA Evaluation Software Launch



If using Windows 8 operating system, show all applications on the tile screen, then navigate to Peregrine Semiconductor Corp, and click on "DSA Evaluation Software." You can also right click on the "DSA Evaluation Software" application and select "Pin to Start" to add an icon to the Start Menu to run the application.

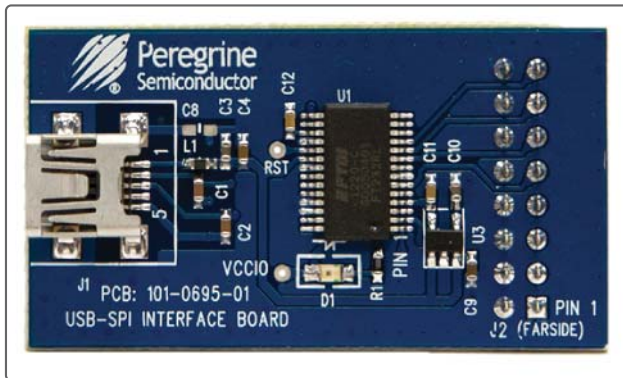
Hardware Configuration

The EVB can be configured to operate in serial mode using the GUI, parallel mode using the switches located on the EVB or driven by external digital logic.

USB Interface Board Overview

The USB interface board (**Figure 12**) is included in the evaluation kit. This board allows the user to send serial peripheral interface (SPI) commands to the device under test by using a PC running the Windows® operating system. To install the software, extract the zip file to a temporary directory and follow the installation procedure included.

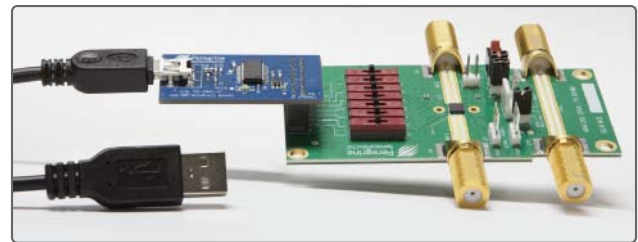
Figure 12 • USB Interface Board



Connection of the USB Interface Board to the Evaluation Board

The EVB and the USB interface board contain a 16 pin header. This feature allows the USB interface board (socket) to connect directly to the EVB (header) on the front side as show in **Figure 13**. Use caution when making the connection to insure the USB interface board is aligned and connected to both rows of pins properly.

Figure 13 • USB Interface Board Connected to the PE4314 EVB



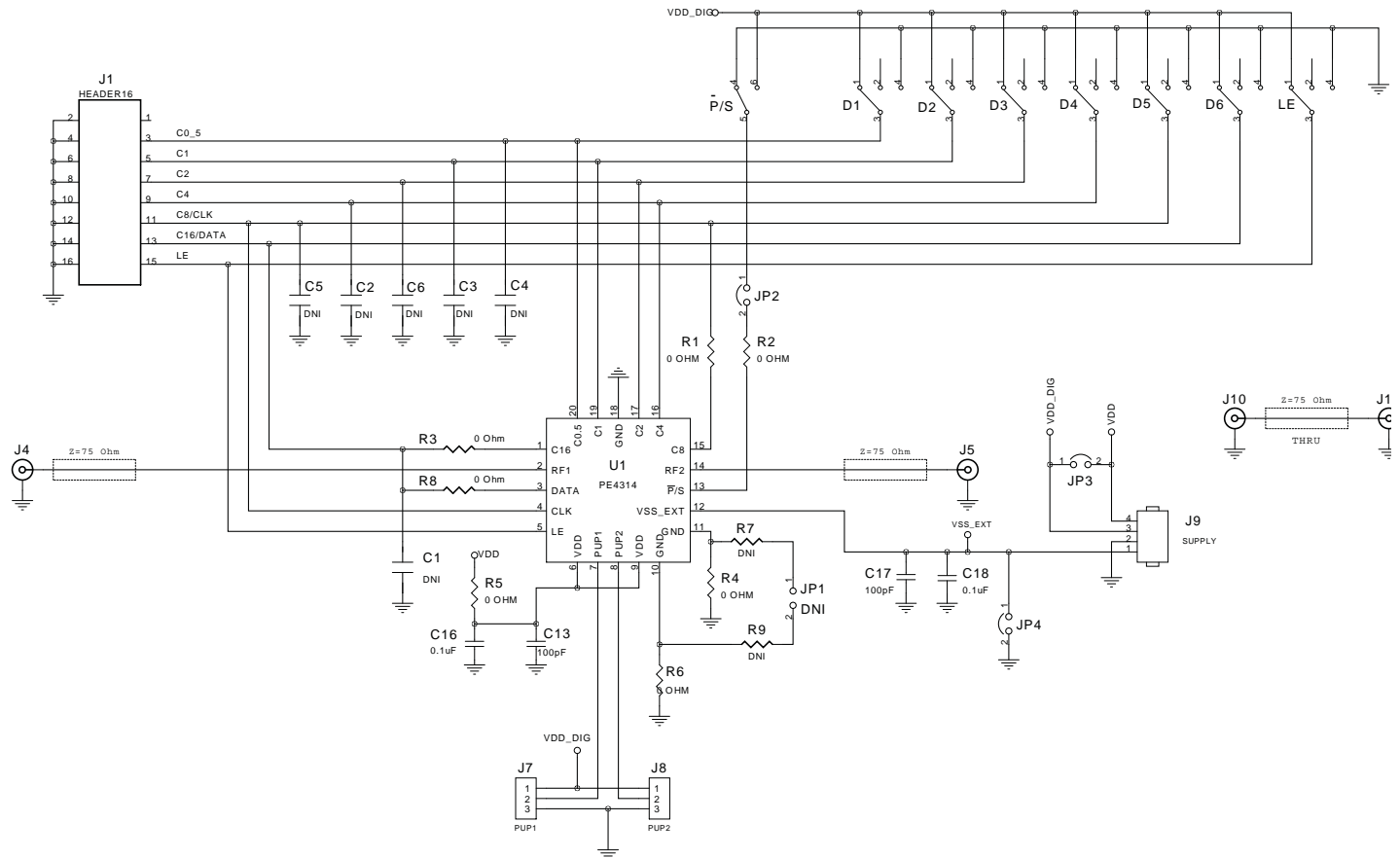
Evaluation Board Overview

The evaluation board is designed to ease customer evaluation of Peregrine's products. The board contains:

- 1) Digital signal connectors that are connected for power supply, digital control signals and USB interface board
- 2) F connectors that are connected for RF performance verification and THRU trace to calibrate board trace loss
- 3) Jumpers to select power supply configuration

The schematic and evaluation board outline are provided in this user manual.

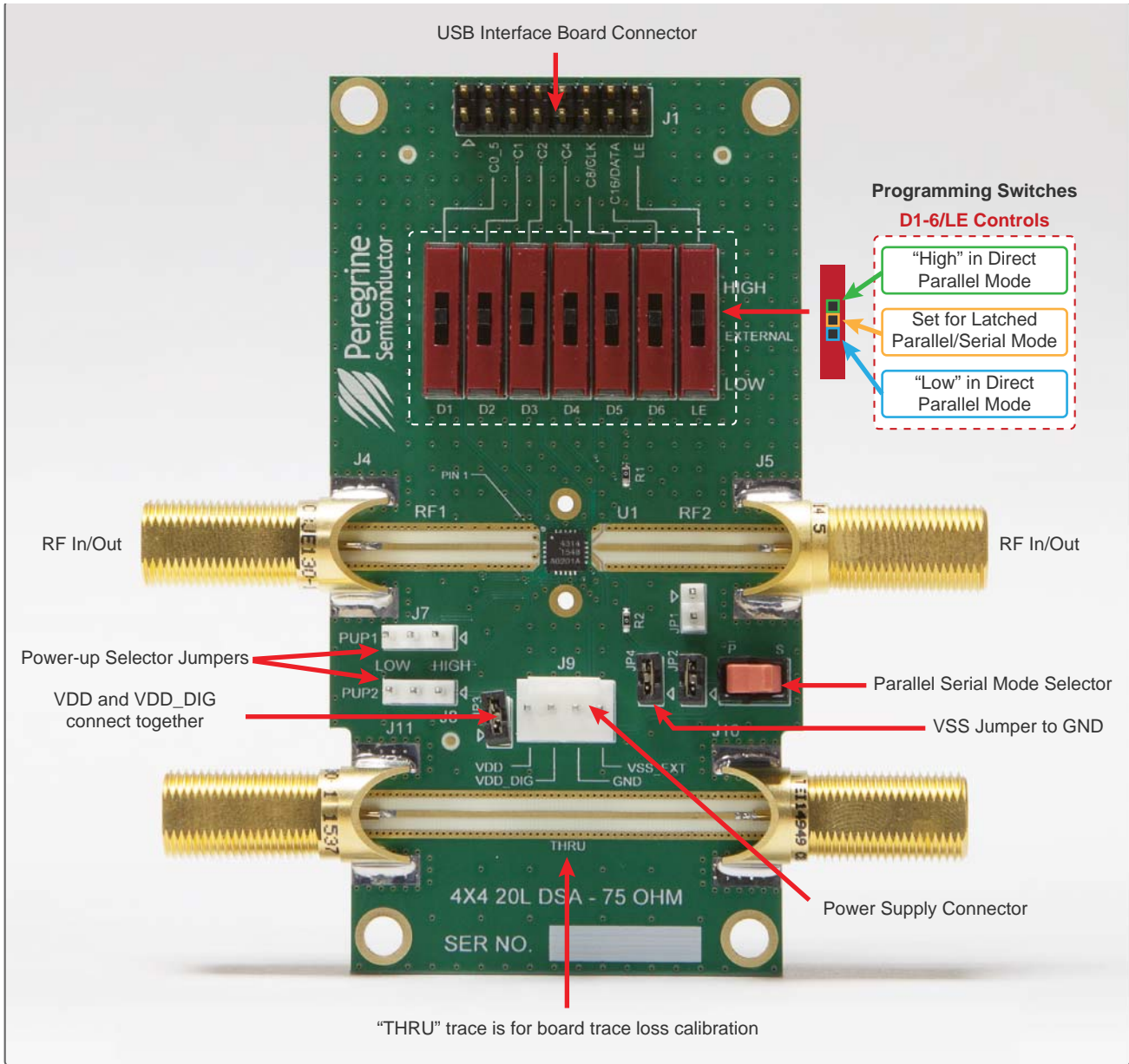
Figure 14 • PE4314 Evaluation Board Schematic



Notes:

- 1) CAUTION: Parts and assemblies susceptible to damage by electrostatic discharge (ESD).
- 2) Install shunt connector on JP2, JP3 and JP4.
- 3) Cut center pin of connectors J4, J5, J10 and J11 to be 2 mm in length before installing.

Figure 15 • PE4314 Evaluation Board Outline Showing Functional Overview



Hardware Operation

The general guidelines for operating the hardware evaluation board are listed in this section. Follow the steps below to configure the hardware properly for the performance.

- 1) Verify that all DC power supplies are turned off before proceeding.
- 2) Connect the jumper on JP2.
- 3) Position the $\overline{P/S}$ switch to Parallel or Serial mode.
- 4) Set jumpers of PUP1 (J7) and PUP2 (J8) to be HIGH at RIGHT position and LOW at LEFT position.
- 5) Set the D1~D6 and LE at the middle position to support Latched Parallel and Serial modes with GUI application software and proper position of $\overline{P/S}$.
 - a) Place D1~D6 and LE at the middle position to support Latched Parallel and Serial modes with GUI application software and proper position of P/S switch.
 - b) In Direct Parallel mode, D1~D6 can be set to HIGH or LOW to manually program the attenuation state while LE is connected to HIGH without using the USB interface board and GUI application software.
- 6) Provide external power supply to the J9 connector (refer to the Operating Ranges table in the datasheet for voltage range).
 - a) VDD is the positive power supply with 3.3V typical.
 - b) VDD_DIG is the positive power supply for control signals with 1.8V typical, and it can be connected to VDD with jumper on JP3 to simplify the test setup.
 - c) VSS is the external negative power supply with -3.4V typical. To simplify the test setup, it can be shorted to GND with jumper on JP4 to enable using the internal negative voltage generator.
- 7) Calibrate board trace loss with THRU trace between J10 and J11.

Using the Graphical User Interface

The DSA application software graphical user interface (GUI) is displayed in **Figure 16** and illustrates the available controls and messages available to the user.

Functions

Connection Status

The connection status box is located in the upper right area of the GUI, below the block diagram of the digital step attenuator and indicates if the USB interface board is connected to the computer. Verify the Connection Status field is green and contains the message “**Hi-Speed USB-SPI Interface Board #101-0695 connected.**” This indicates that the GUI has established communication with the red USB interface board and is ready to be used.

If the USB interface board is not connected when the application is launched, the message “**No interface board connected! Please connect Hi-Speed USB-**

SPI Interface Board #101-0695.” will appear at the bottom of the screen. Typically this can be corrected by reinserting the USB interface board connection cable from your PC. The GUI is successfully installed when the driver is loaded in the Device Manager (see **Figure 3**). Restart the DSA evaluation software and verify that the Connection Status field is green.

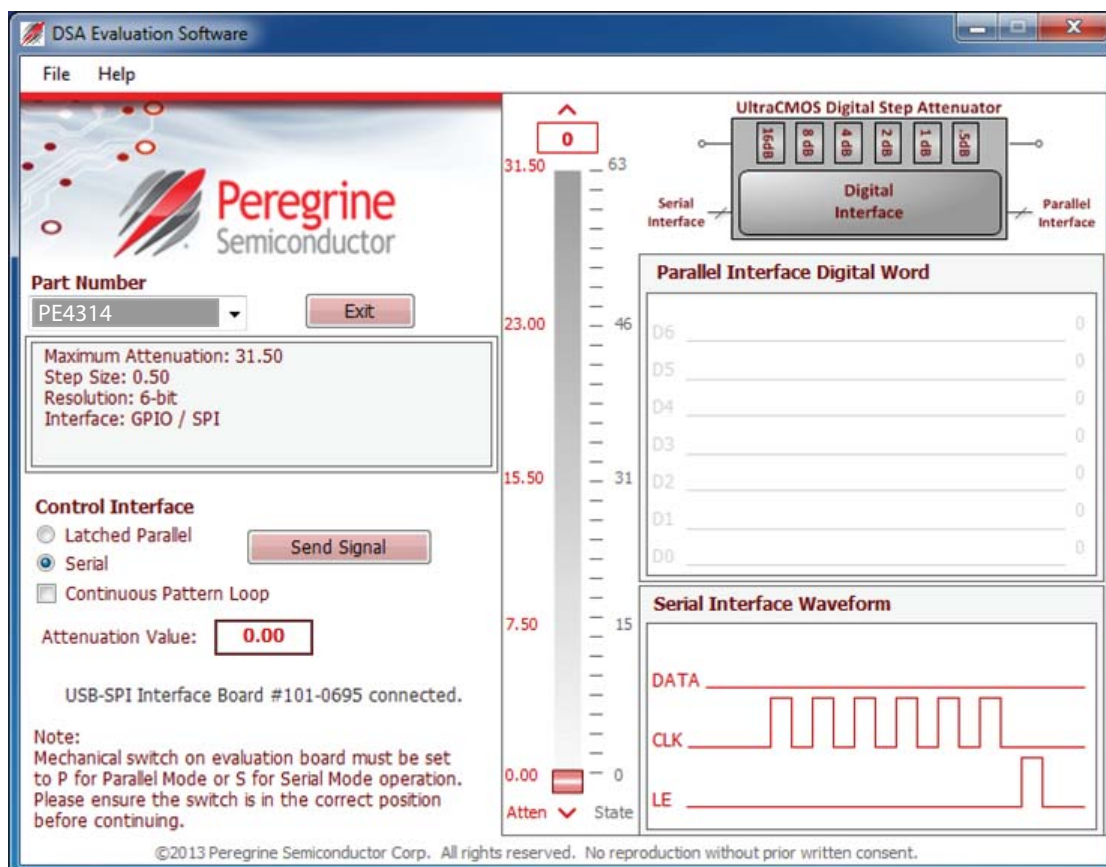
Part Number

In the upper left corner under the Peregrine logo, there is a drop down menu item to select the part for evaluation.

Part Description

The part description information box is located directly below the part number drop down menu and displays information pertinent to the selected device. This includes the maximum attenuation value, step size resolution and interface of the device.

Figure 16 • DSA Evaluation Software Graphical User Interface



Send Signal and Send Latch Buttons

The Send Signal Button (Figure 17) sends the programming waveform to the device at the same attenuation value. When in Serial mode the button appears as the Send Signal button. When in Latched Parallel mode, the button appears as Send Latch (Figure 18).

Figure 17 • Send Signal Button

Control Interface

- Latched Parallel
- Serial

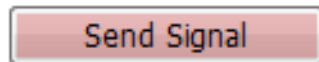
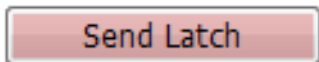


Figure 18 • Send Latch Button

Control Interface

- Latched Parallel
- Serial



The DSA application software GUI supports Latched Parallel and Serial modes, and shows the control bit waveform at the right side of the GUI when the mode is selected.

Figure 19 • Latched Parallel Mode

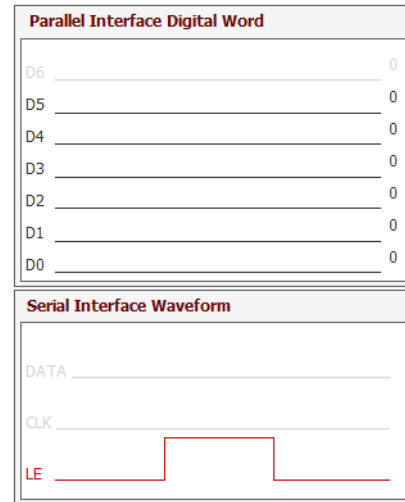
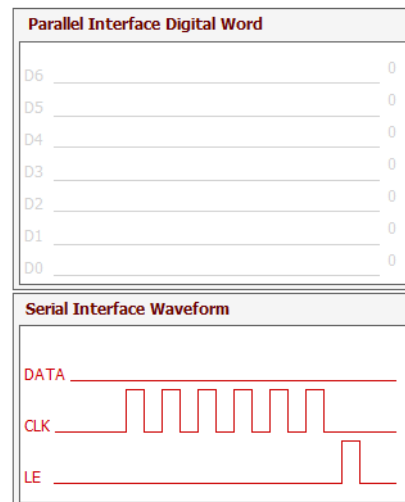


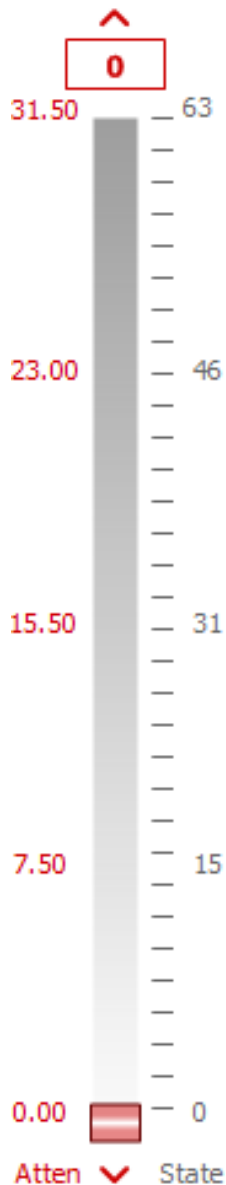
Figure 20 • Serial Mode



Attenuation Slider

In the center of the GUI is the attenuation slider (see **Figure 21**). This allows the user to quickly select the desired attenuation. The states and attenuation values automatically change to valid values based on the capability of the part number selected. The arrows at the top and bottom can be clicked to increase or decrease the attenuation state at the minimum step size. Each time the attenuation slider is changed, the hardware is programmed with the updated value displayed in the Attenuation Value text box (see **Figure 22**).

Figure 21 • Attenuation Slider



Attenuation Value

The Attenuation Value text box (see **Figure 22**) is updated with each change of the attenuation slider. This control is two-way; the user can also enter a valid attenuation value into this text box followed by the ENTER key to program the hardware with the updated value. This is useful in comparing attenuation steps.

Figure 22 • Attenuation Value Text Box

Attenuation Value:

Continuous Pattern Loop

The Continuous Pattern Loop checkbox (see **Figure 23**) allows the user to observe the evaluation board automatically step through each of the attenuation states. Once the GUI reaches the maximum state value the cycle begins again at the minimum state value. This function can be started and stopped at any time by selecting the checkbox.

Figure 23 • Continuous Pattern Loop

Continuous Pattern Loop

Technical Resources



Technical Resources

Additional technical resources are available for download in the Products section at www.psemi.com. These include the Product Specification datasheet, S-parameters, zip file, evaluation kit schematic and bill of materials, material declaration form and PC-compatible software file.

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Document Categories

Advance Information

The product is in a formative or design stage. The document contains design target specifications for product development. Specifications and features may change in any manner without notice.

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