

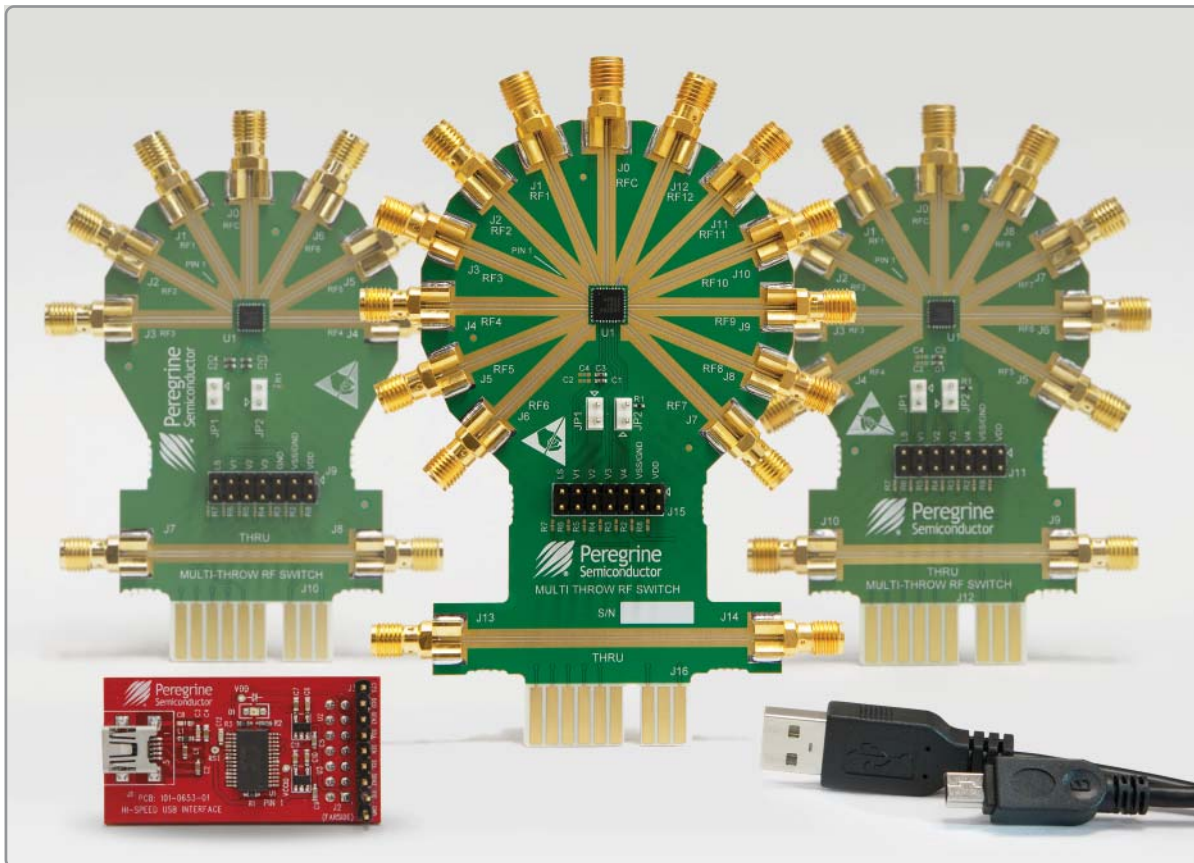
# Multi-throw Count RF Switch Evaluation Kit (EVK) User's Manual

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SP6T: PE42562, PE42462, PE426462

SP8T: PE42582, PE42482, PE426482

SP12T: PE42512, PE42412, PE426412



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# Introduction



## Introduction

The SP6T (PE42562, PE42462, PE426462), SP8T (PE42582, PE42482, PE426482) and SP12T (PE42512, PE42412, PE426412) are HaRP™ technology-enhanced absorptive high throw count RF switches manufactured on Peregrine's UltraCMOS® process, a patented variation of silicon-on-insulator (SOI) technology.

These products deliver high port-to-port isolation, low insertion loss and fast switching time, making them ideal for filter bank switching and RF signal routing in test and measurement (T&M) and wireless applications up to 8 GHz. No blocking capacitors are required if DC voltage is not present on the RF ports.

Device versions are available in SP6T, SP8T and SP12T configurations with and without an external  $V_{SS}$  pin for bypassing the internal negative voltage generator for true spur-free performance. These products operate down to 10 MHz, with special T&M versions available down to 9 kHz. The SP6T and SP8T devices are available in a 24-lead 4 × 4 mm QFN package. SP12T devices are available in a 32-lead 5 × 5 mm QFN package.

Each evaluation kit (EVK) includes all hardware required to control and evaluate the functionality of the multi-throw count RF switches. The Multi-throw Count RF Switch evaluation software can be downloaded at [www.psemi.com](http://www.psemi.com) and requires a PC running the Windows® operating system to control the RF switch via the USB interface board.

## Application Support

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

## Evaluation Kit Contents and Requirements

### Kit Contents

The Multi-throw Count RF Switch EVK includes the following hardware required to evaluate the high throw count RF switches.

**Table 1 • Multi-throw Count RF Switch Evaluation Kit Contents**

Quantity	Description	Device	Part Number
1	Multi-throw Count RF Switch evaluation board assembly	PE42562	PRT-66070
		PE42462	PRT-65914
		PE426462	PRT-66739
		PE42582	PRT-66238
		PE42482	PRT-65969
		PE426482	PRT-66791
		PE42512	PRT-66122
		PE42412	PRT-66018
		PE426412	PRT-66843
1	Peregrine USB interface board assembly	ALL	PRT-50866
1	USB 2.0 type A to type B mini cable	ALL	PRT-58894

### Software Requirements

The Multi-throw Count RF Switch 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 (for downloading software)
- User account with administration privileges (for installing software)

### Hardware Requirements

To evaluate the performance of the evaluation board, a network analyzer is recommended. A signal generator and spectrum analyzer are required for harmonic measurements. Linearity measurements may require an additional signal generator and additional filtering to reduce the fundamental signal delivered to the spectrum analyzer in order to resolve the low level intermodulation tones.

**Caution:** The Multi-throw Count RF Switch 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, RF ports, and digital inputs.

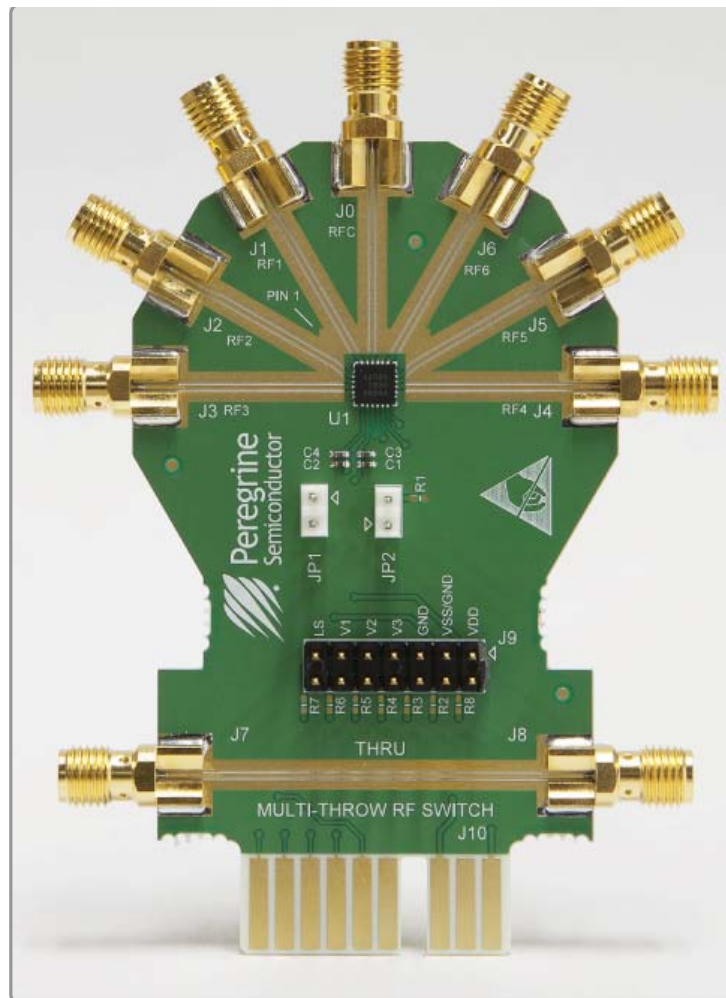
# Evaluation Board Assembly



## SP6T Evaluation Board Assembly Overview

The SP6T evaluation board (EVB) is assembled with the PE42562, PE42462 or PE426462, test headers and SMA connectors. The RF traces from each SMA connector to the RF switch are equal length, easing the task of de-embedding. The PCB includes an additional RF "thru" trace that can be measured and used to remove the PCB loss when de-embedding. The length of the "thru" trace is twice the length of an RF trace connected to the RF switch.

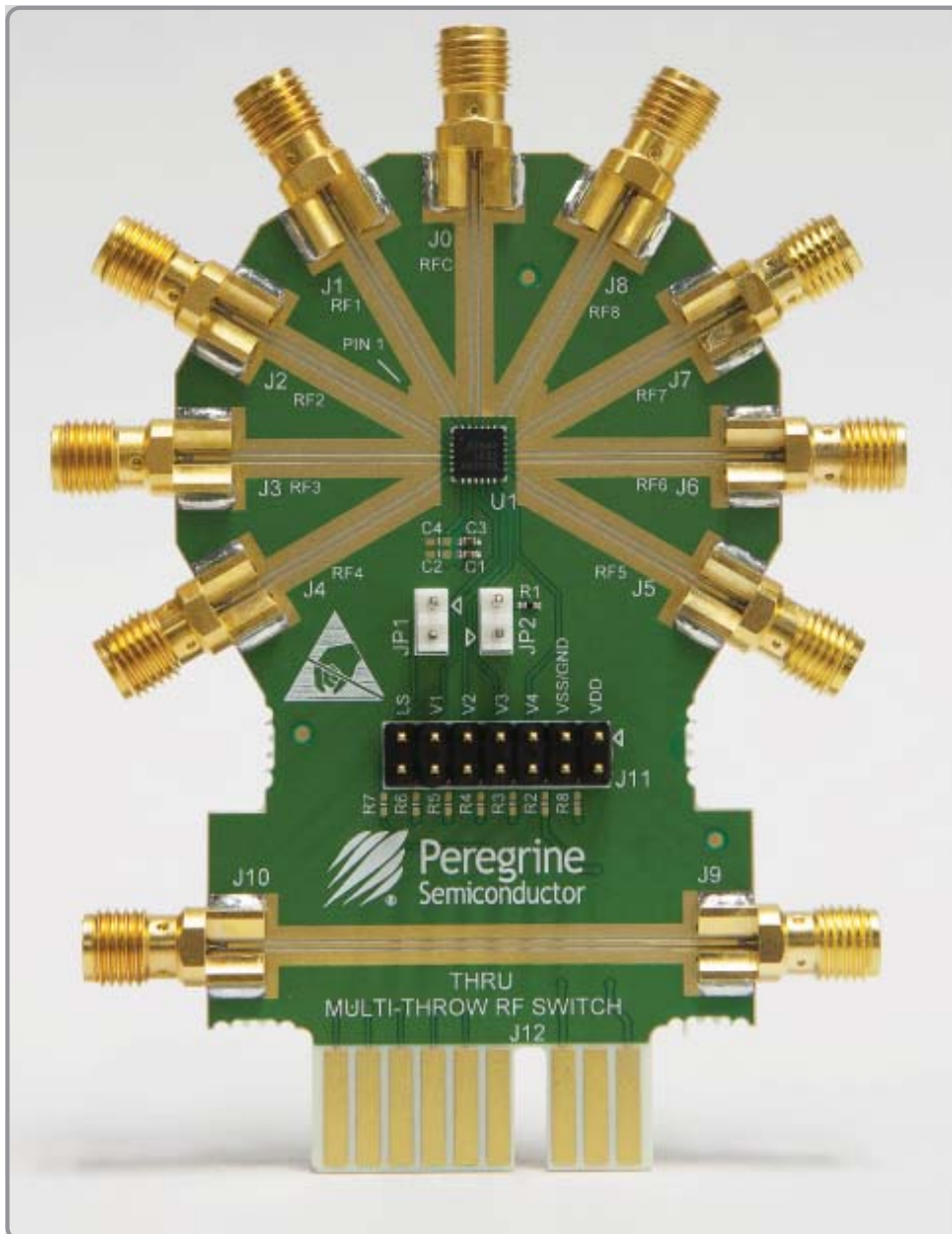
Figure 1 • SP6T RF Switch Evaluation Board Assembly



## SP8T Evaluation Board Assembly Overview

The SP8T EVB is assembled with the PE42582, PE42482 or PE426482, test headers and SMA connectors. The RF traces from each SMA connector to the RF switch are equal length, easing the task of de-embedding. The PCB includes an additional RF "thru" trace that can be measured and used to remove the PCB loss when de-embedding. The length of the "thru" trace is twice the length of an RF trace connected to the RF switch.

Figure 2 • SP8T RF Switch Evaluation Board Assembly

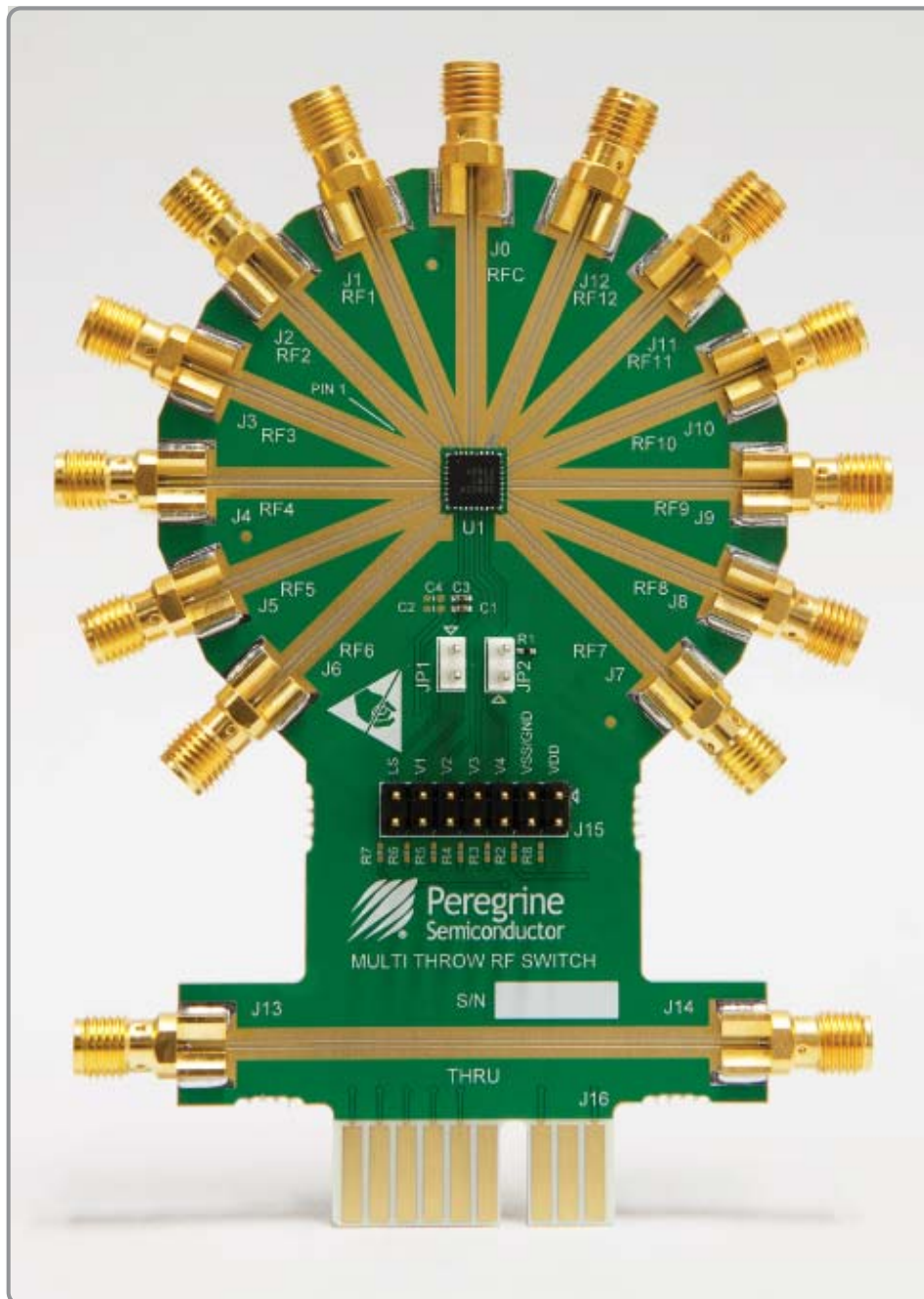




## SP12T Evaluation Board Assembly Overview

The SP12T EVB is assembled with the PE42512, PE42412 or PE426412, test headers and SMA connectors. The RF traces from each SMA connector to the RF switch are equal length, easing the task of de-embedding. The PCB includes an additional RF "thru" trace that can be measured and used to remove the PCB loss when de-embedding. The length of the "thru" trace is twice the length of an RF trace connected to the RF switch.

Figure 3 • SP12T RF Switch Evaluation Board Assembly



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# Quick Start Guide



## Quick Start Overview

The EVB was designed to ease customer evaluation of the multi-throw count RF switches. This chapter will guide the user through the software installation, hardware configuration and using the graphical user interface (GUI).

## Software Installation

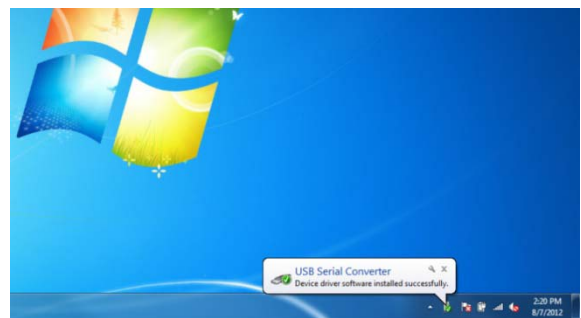
### USB Driver

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 4).

If Windows Update is not available; the USB interface board driver can be downloaded directly from the manufacturer at [www.ftdichip.com/Drivers/D2XX.htm](http://www.ftdichip.com/Drivers/D2XX.htm) and selecting the link for the Windows operating system driver. It is recommended to select the "Setup Executable" option when choosing the driver to download.

A USB interface board (Figure 14) is included with the evaluation kit, and must be connected and driver installation completed prior to installing the Multi-throw Count RF Switch evaluation software.

Figure 4 • USB Driver Installation (Detecting)

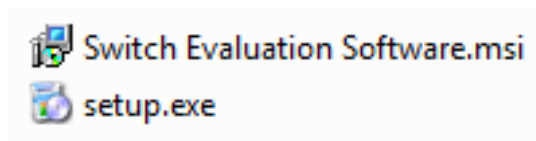


### EVK Software

To evaluate the Multi-throw Count RF Switch performance, the application software should be installed on your computer. The USB interface and Multi-throw Count RF Switch application software are compatible with computers running Windows® XP, Vista, 7, 8 or 10 in 32- or 64-bit configuration. This software is available directly from Peregrine's website at [www.psemi.com](http://www.psemi.com).

To install the Multi-throw Count RF Switch evaluation software, unzip the archive and execute "setup.exe" (Figure 5).

Figure 5 • Multi-throw Count RF Switch Evaluation Software Setup



When executed, the installation application will display a welcome screen. It is strongly recommended that all programs be closed prior to continuing. Click the “Next>” button to proceed.

Figure 6 • *Multi-throw Count RF Switch Evaluation Software Setup*



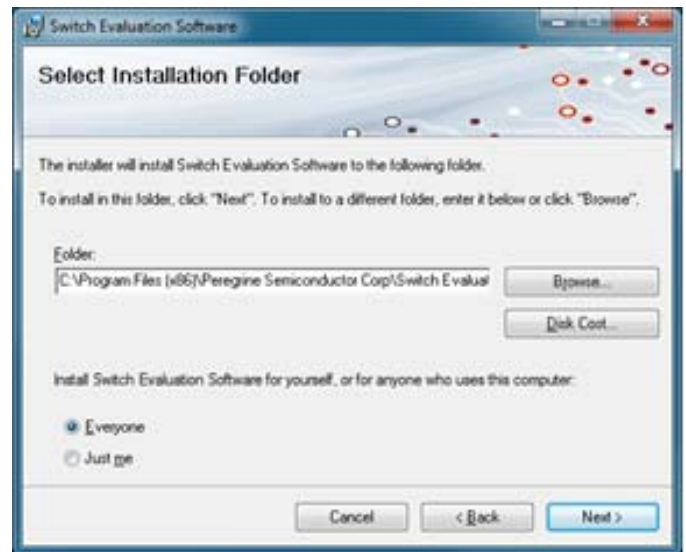
Review the license agreement, then click the “I Agree” radio button followed by the “Next>” button.

Figure 7 • *License Agreement*



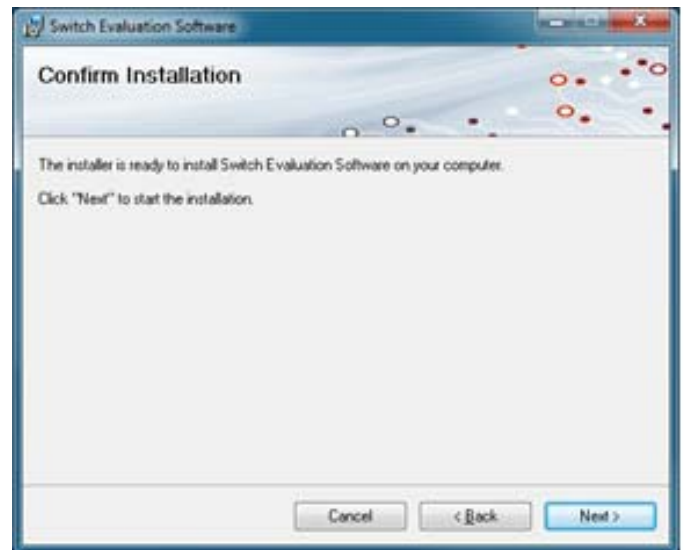
For most users the default install location for the program files is sufficient. If a different location is desired, the install program can be directed to place the program files in an alternate location. The software is installed for “Everyone” by default. Once the desired location is selected click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

Figure 8 • *Select Installation Folder*



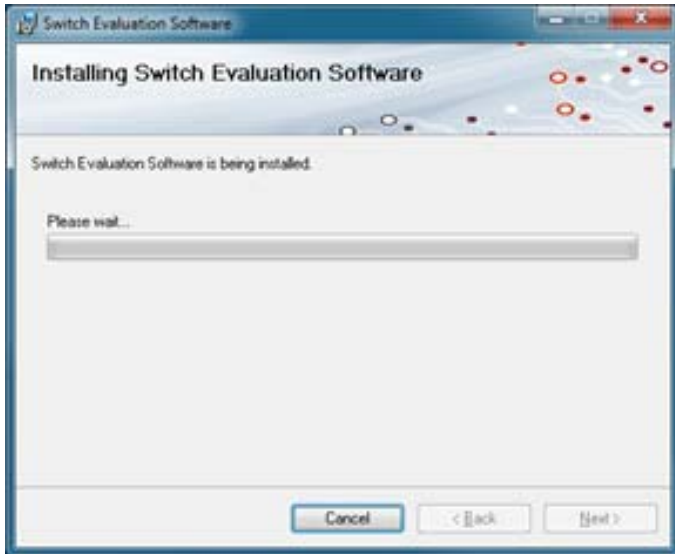
In the Confirm Installation window, click “Next>” to proceed with the software installation.

Figure 9 • *Confirm Installation*



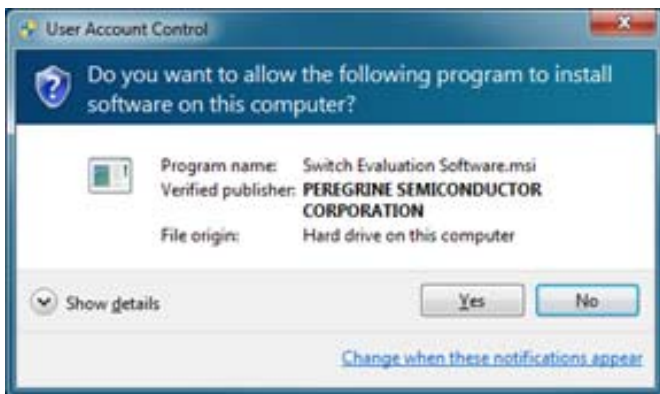
As the software files are installed, a progress indicator will be displayed. On slower computers, installation of the software may proceed for a few moments.

Figure 10 • Progress Indicator



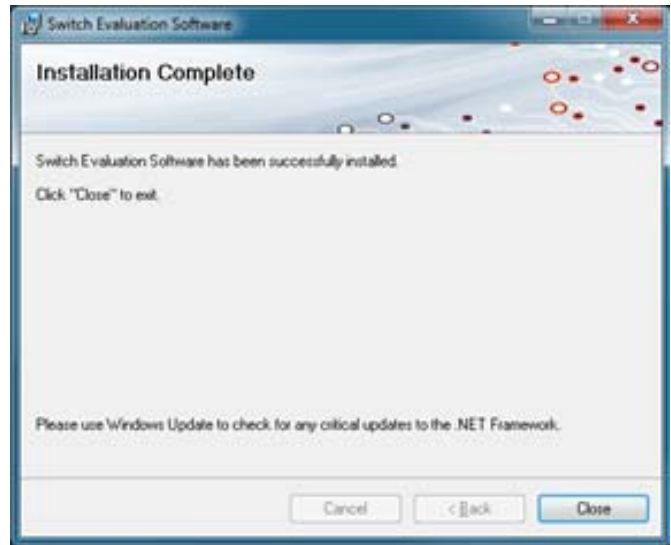
If prompted to confirm the installation of the application, click “Yes” to confirm that the verified publisher is “Peregrine Semiconductor Corporation.”

Figure 11 • Confirming the Installation



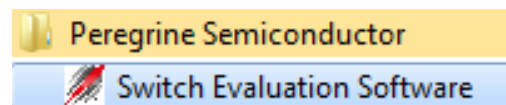
Once the evaluation software is installed, click “Close” to exit.

Figure 12 • Installation Complete



A new Start Menu item under Peregrine Semiconductor will appear in the start menu of your computer. Select “Switch Evaluation Software” to launch the evaluation software (Figure 13).

Figure 13 • Multi-throw Count RF Switch Evaluation Software Launch

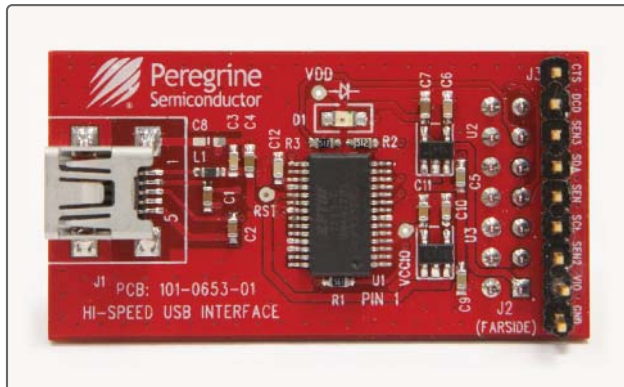


## Hardware Configuration

### USB Interface Board Overview

The USB interface board (**Figure 14**) is included in the evaluation kit. This board allows the user to control the digital input signals at the RF switch by using Peregrine software running the Windows® operating system. To install the software, see “**Software Installation**” on page 7.

**Figure 14** • *USB Interface Board*



## Evaluation Board Overview (SP6T, SP8T, SP12T)

The evaluation boards are designed to ease customer evaluation of Peregrine's multi-throw count RF switches. The board contains:

- 1) Standard 0.1-inch headers for power supply, digital control signals and USB interface board.
- 2) SMA connectors for RF performance verification and for connecting the THRU trace to calibrate board trace loss.

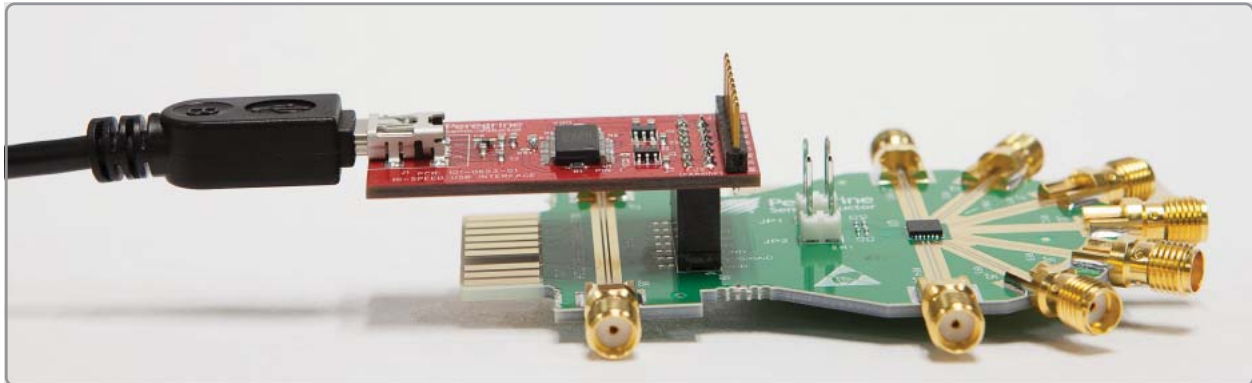
The schematic and evaluation board outline are provided in this user manual.

## SP6T Evaluation Board

### *SP6T EVB Connection to USB Board*

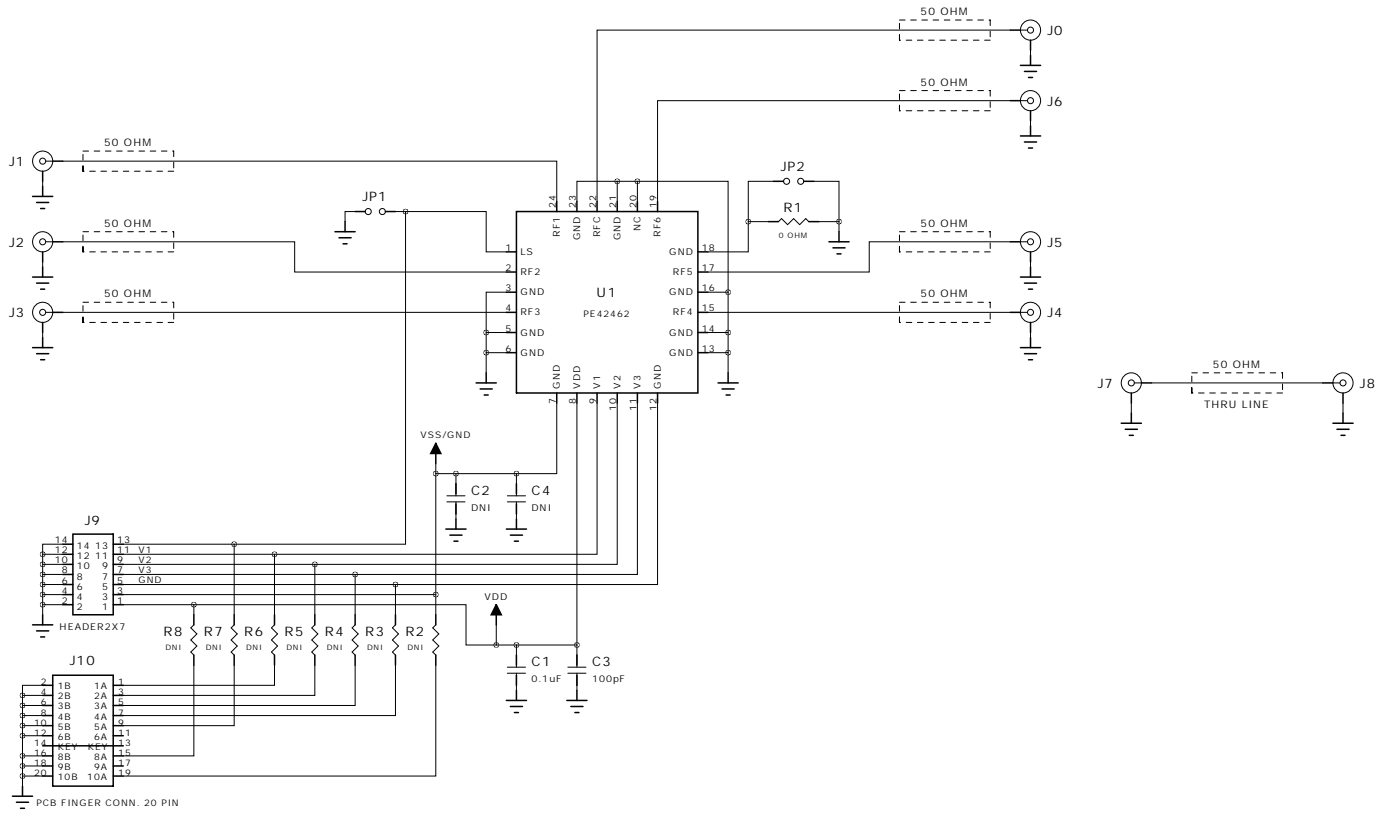
The SP6T EVB and the USB interface board mate with a 14-pin connector. This feature allows the USB interface board (socket) to connect directly to the EVB (pin) on the front side (**Figure 15**). Use caution when making the connection to ensure the USB interface board is aligned and connected to both rows of pins properly.

**Figure 15** • *USB Interface Board Connected to the SP6T Evaluation Board*



**SP6T Schematic**

**Figure 16 • SP6T Evaluation Board Schematic**



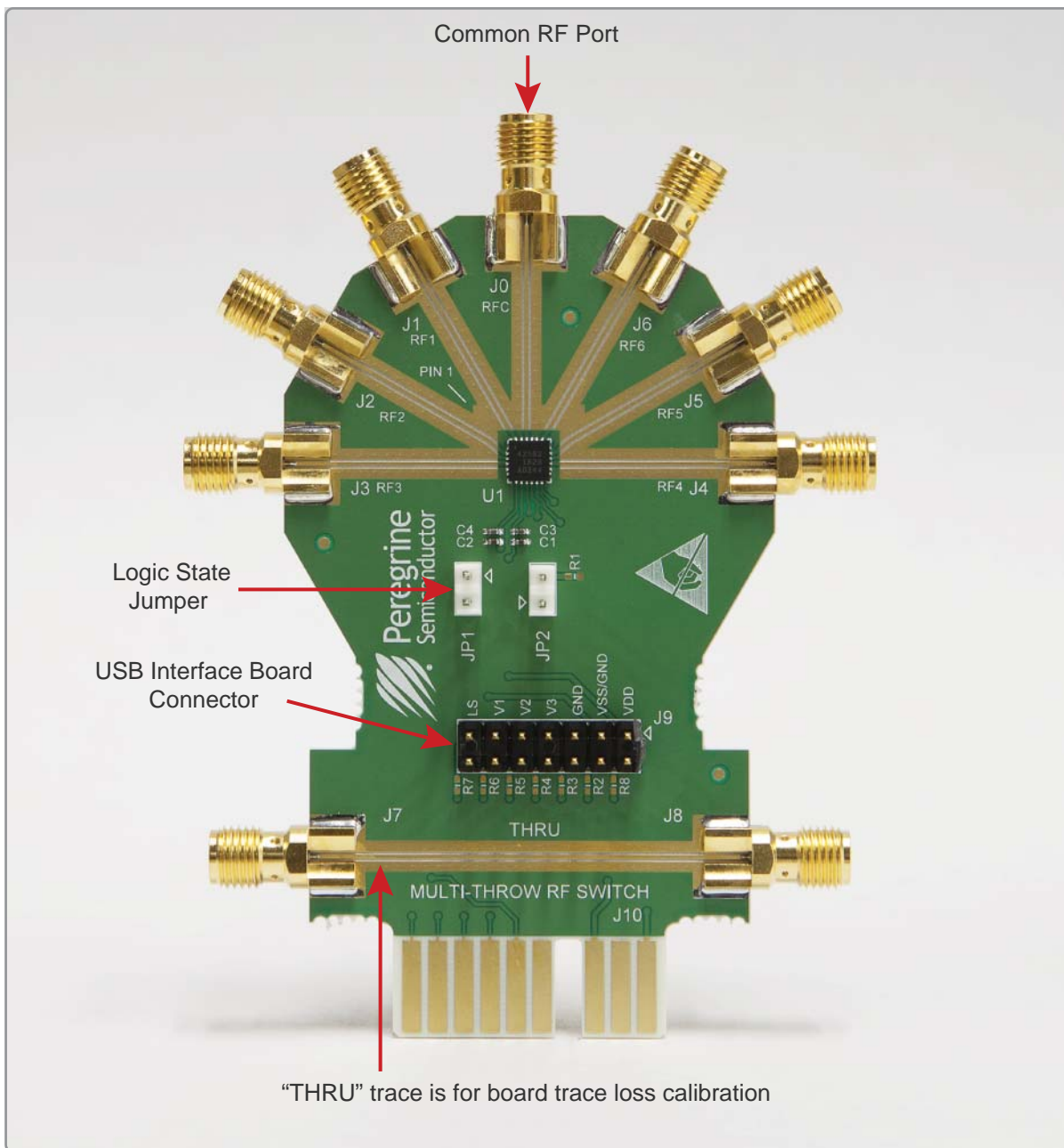
**NOTES:**

- 1: Contains Parts and Assemblies susceptible to damage by electrostatic discharge (ESD)



**SP6T EVB Functional Overview**

**Figure 17 • SP6T Evaluation Board Functional Overview**



## SP6T Hardware Operation

### Operation with USB Interface Board and Software Control

The guidelines for operating the SP6T evaluation board with the USB interface board are listed in this section.

**Warning:** Peregrine devices with external  $V_{SS}$  supply voltage applied are not supported on the SP6T evaluation board when the USB interface board is connected. The USB interface board will be damaged if external  $V_{SS}$  voltage is applied. Refer to the “**Manual Operation with External Supplies and External Control Inputs (External  $V_{SS}$ )**” section below for configuring and evaluating the device with an external  $V_{SS}$  supply.

Follow these steps to configure the hardware for basic evaluation.

- 1) Remove any jumpers that are installed on JP1 and JP2.
- 2) Connect the USB interface board on J9, as shown in **Figure 14**. Note the correct orientation.
- 3) Calibrate board trace loss with THRU trace between J7 and J8. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

### Manual Operation with External Supplies and External Control Inputs (External $V_{SS}$ )

The guidelines for operating the SP6T evaluation board with no software and external supplies (Including external  $V_{SS}$  for spur-free performance) to control device are listed in this section.

Follow these steps to configure the hardware for external supply evaluation.

- 1) Disconnect the USB interface board from the evaluation board.
- 2) Install a jumper on JP1 if a logic low is desired on Logic State input. Removing JP1 presents a logic high on Logic State (internal pull-up resistor)
- 3) Remove any jumper that may be installed on JP2.
- 4) Connect an external  $V_{DD}$  power supply lead (3.3V) to J9–1 and ground to J9–2.
- 5) If supported by the device, connect an external  $V_{SS}$  power supply lead (–3.0V) to J9–3 and ground to J9–4.
- 6) For V1–V3, connect an external power supply positive lead (3.3V) to J9–11, J9–9 and J9–7 respectively if a logic level high is desired. Ground may be connected at J9–12, J9–10 or J9–8. Refer to **Table 3** for the SP6T truth table for V1–V3 logic level port mapping
- 7) Calibrate board trace loss with THRU trace between J7 and J8. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

## SP6T Digital Control Pin Descriptions

Table 2 • SP6T Digital Control Pin Descriptions

Pin Name	Description
LS	Logic Select-used to determine the definition for V1, V2 and V3 pins
V1	Digital control logic input 1
V2	Digital control logic input 2
V3	Digital control logic input 3

**SP6T Control Logic Truth Table**

**Table 3 • Truth Table for SP6T**

LS <sup>(1)</sup>	V3	V2	V1	RFC–RF1	RFC–RF2	RFC–RF3	RFC–RF4	RFC–RF5	RFC–RF6
0	0	0	0	ON	OFF	OFF	OFF	OFF	OFF
0	1	0	0	OFF	ON	OFF	OFF	OFF	OFF
0	0	1	0	OFF	OFF	ON	OFF	OFF	OFF
0	1	1	0	OFF	OFF	OFF	ON	OFF	OFF
0	0	0	1	OFF	OFF	OFF	OFF	ON	OFF
0	1	0	1	OFF	OFF	OFF	OFF	OFF	ON
1	1	0	1	ON	OFF	OFF	OFF	OFF	OFF
1	0	0	1	OFF	ON	OFF	OFF	OFF	OFF
1	1	1	0	OFF	OFF	ON	OFF	OFF	OFF
1	0	1	0	OFF	OFF	OFF	ON	OFF	OFF
1	1	0	0	OFF	OFF	OFF	OFF	ON	OFF
1	0	0	0	OFF	OFF	OFF	OFF	OFF	ON
X <sup>(2)</sup>	0	1	1	OFF	OFF	OFF	OFF	OFF	OFF

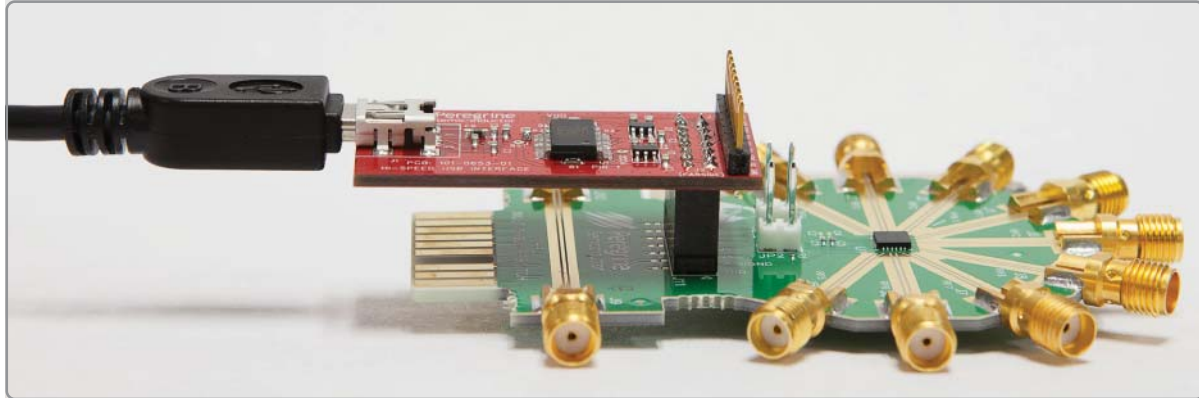
**Notes:**

- 1) LS has an internal 1 MΩ pull-up resistor to logic high. Connect LS to GND externally to generate a logic 0. Leaving LS floating will generate a logic 1.
- 2) LS = don't care, V3 = 0, V2 = V1 = 1, all ports are terminated to provide an all isolated state.

## SP8T EVB Connection to USB Board

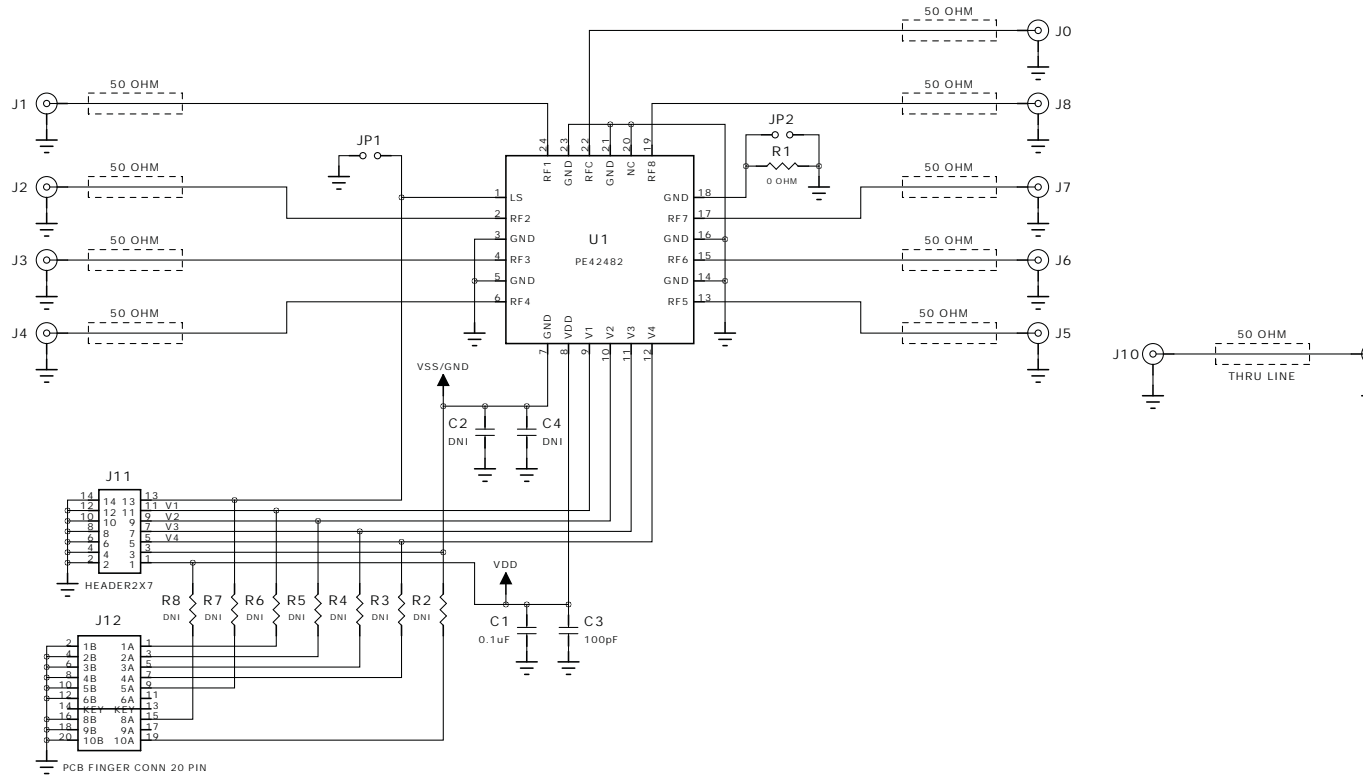
The SP8T EVB and the USB interface board mate with a 14-pin connector. This feature allows the USB interface board (socket) to connect directly to the EVB (pin) on the front side (**Figure 18**). Use caution when making the connection to ensure the USB interface board is aligned and connected to both rows of pins properly.

**Figure 18 • USB Interface Board Connected to the SP8T Evaluation Board**



## SP8T Schematics

Figure 19 • SP8T Evaluation Board Schematic

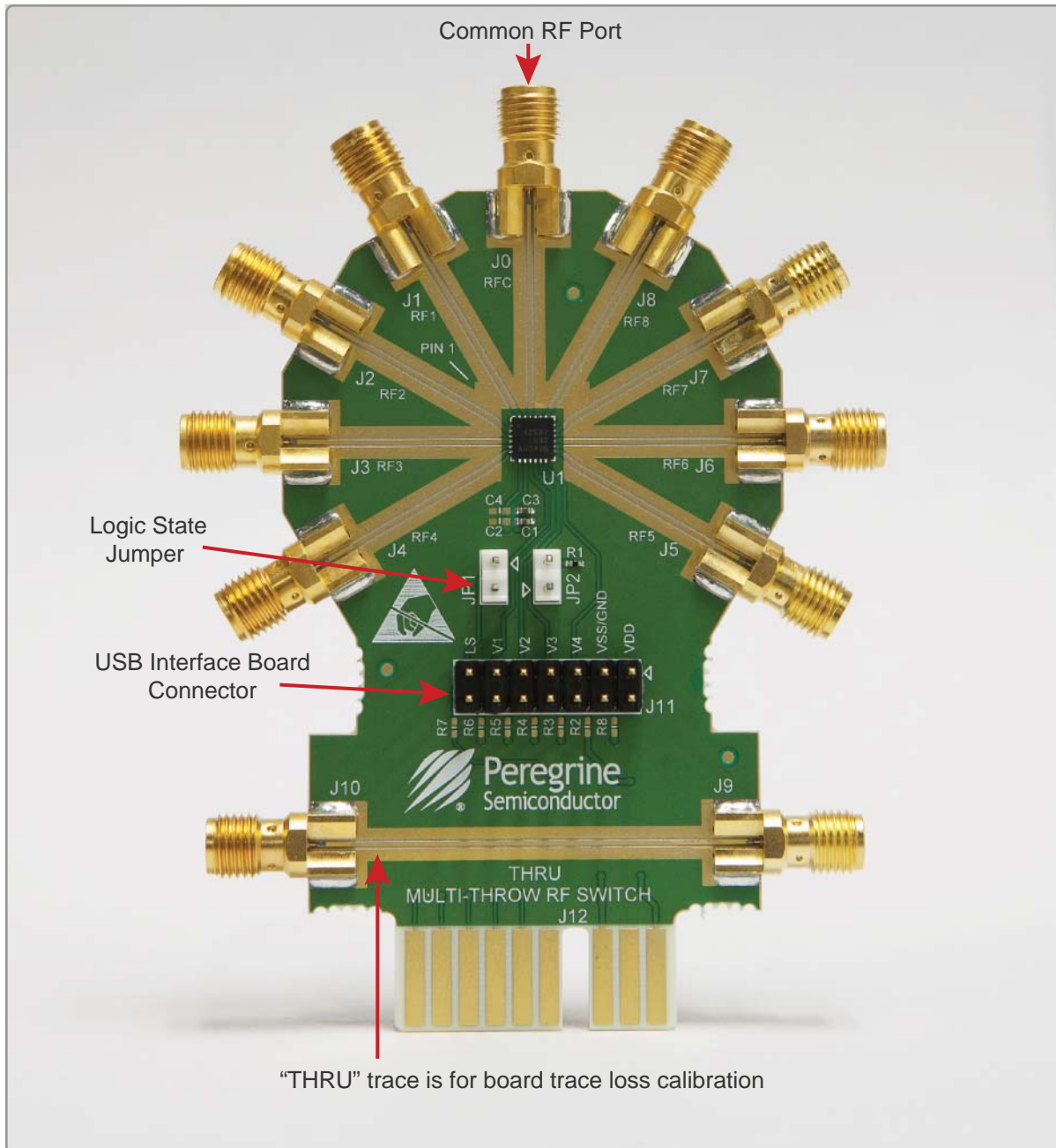


**NOTES:**

1: Contains Parts and Assemblies susceptible to damage by electrostatic discharge (ESD)

**SP8T EVB Functional Overview**

**Figure 20 • SP8T Evaluation Board Functional Overview**



## SP8T Hardware Operation

### Operation with USB Interface Board and Software Control

The guidelines for operating the SP8T evaluation board with the USB interface board are listed in this section.

**Warning:** Peregrine devices with external VSS supply voltage applied are not supported on the SP8T evaluation board when the USB Interface board is connected. The USB Interface Board will be damaged if external VSS voltage is applied. Refer to the “Manual Operation with External Supplies and External Control Inputs (External V<sub>SS</sub>)” section below for configuring and evaluating the device with an external VSS supply.

Follow these steps to configure the hardware for basic evaluation.

- 1) Remove any jumpers that are installed on JP1 and JP2.
- 2) Connect the USB Interface Board on J11, as shown in **Figure 18**. Note the correct orientation.
- 3) Calibrate board trace loss with THRU trace between J9 and J10. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

### Manual Operation with External Supplies and External Control Inputs (External V<sub>SS</sub>)

The guidelines for operating the SP8T evaluation board with no software and external supplies (Including external V<sub>SS</sub> for spur-free performance) to control device are listed in this section.

Follow these steps to configure the hardware for external supply evaluation.

- 1) Disconnect the USB interface board from the evaluation board.
- 2) Install a jumper on JP1 if a logic low is desired on Logic State input. Removing JP1 presents a logic high on Logic State (internal pull-up resistor)
- 3) Remove any jumper that may be installed on JP2.
- 4) Connect an external V<sub>DD</sub> power supply lead (3.3V) to J11–1 and ground to J11–2.
- 5) If supported by the device, connect an external V<sub>SS</sub> power supply lead (–3.0V) to J11–3 and ground to J11–4.
- 6) For V1–V4, connect an external power supply positive lead (3.3V) to J11–11, J11–9, J11–7 and J11–5 respectively if a logic level high is desired. Ground may be connected at J11–12, J11–10, J11–8 or J11–6. Refer to **Table 5** for the SP8T truth table for V1–V4 logic level port mapping
- 7) Calibrate board trace loss with THRU trace between J9 and J10. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

### SP8T Digital Control Pin Descriptions

Table 4 • SP8T Digital Control Pin Descriptions

Pin Name	Description
LS	Logic Select-used to determine the definition for V1, V2, V3 and V4 pins
V1	Digital control logic input 1
V2	Digital control logic input 2
V3	Digital control logic input 3
V4	Digital control logic input 4

**SP8T Control Logic Truth Table**

Table 5 • Truth Table for SP8T

LS <sup>(1)</sup>	V4	V3	V2	V1	RFC–RF1	RFC–RF2	RFC–RF3	RFC–RF4	RFC–RF5	RFC–RF6	RFC–RF7	RFC–RF8
0	0	0	0	0	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	0	1	0	0	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
0	0	0	1	0	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
0	0	1	1	0	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
0	0	0	0	1	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
0	0	1	0	1	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
0	0	0	1	1	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
0	0	1	1	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
1	0	1	1	1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	0	0	1	1	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
1	0	1	0	1	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
1	0	0	0	1	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
1	0	1	1	0	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
1	0	0	1	0	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
1	0	1	0	0	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
1	0	0	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
X <sup>(2)</sup>	1	0	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

**Notes:**

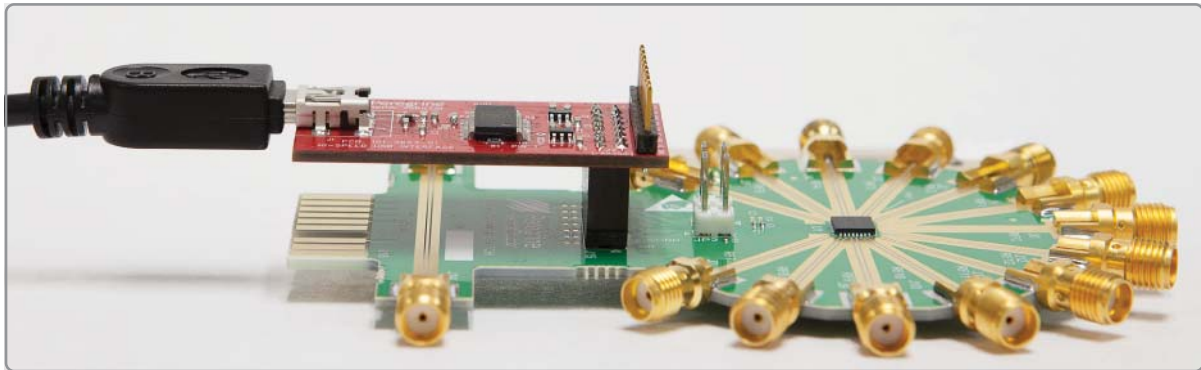
- 1) LS has an internal 1 M $\Omega$  pull-up resistor to logic high. Connect LS to GND externally to generate a logic 0. Leaving LS floating will generate a logic 1.
- 2) LS = don't care, V4 = 1, V3 = V2 = V1 = 0, all ports are terminated to provide an all isolated state.



## SP12T EVB Connection to USB Board

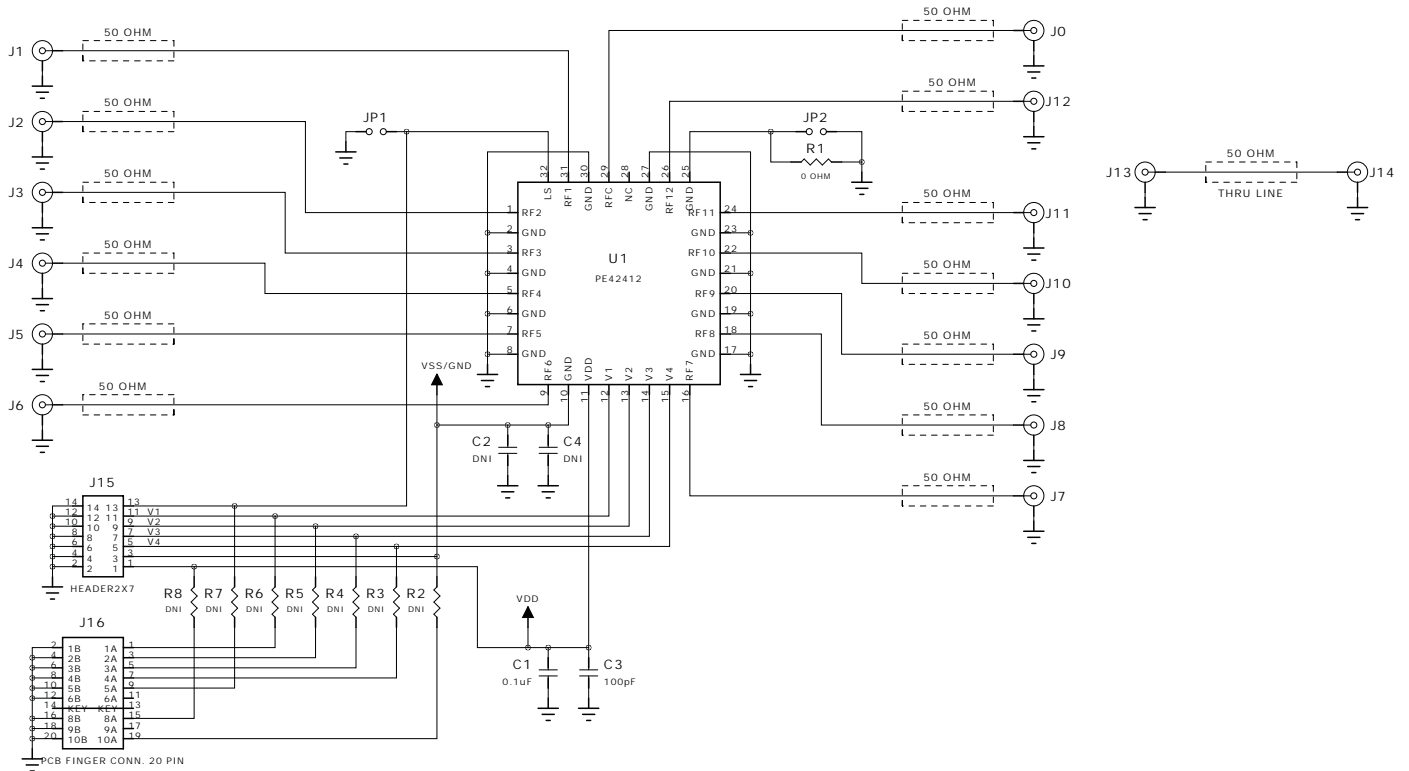
The SP12T EVB and the USB interface board mate with a 14-pin connector. This feature allows the USB interface board (socket) to connect directly to the EVB (pin) on the front side (**Figure 21**). Use caution when making the connection to ensure the USB interface board is aligned and connected to both rows of pins properly.

**Figure 21** • *USB Interface Board Connected to the SP12T Evaluation Board*



**SP12T Schematics**

**Figure 22 • SP12T Evaluation Board Schematic**

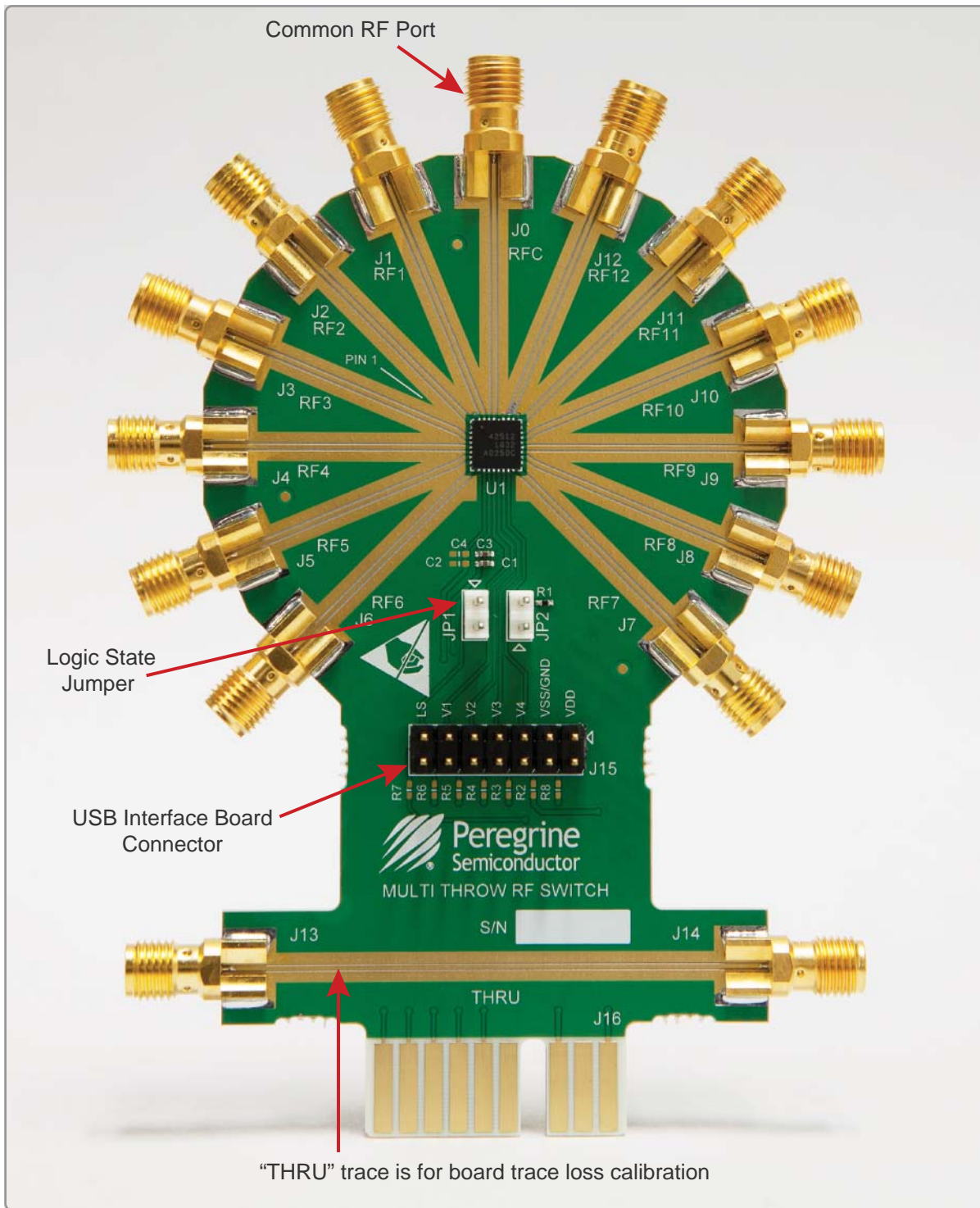


**NOTES:**

- 1: Contains Parts and Assemblies susceptible to damage by electrostatic discharge (ESD)

**SP12T EVB Functional Overview**

**Figure 23 • SP12T Evaluation Board Functional Overview**



## SP12T Hardware Operation

### Operation with USB Interface Board and Software Control

The guidelines for operating the SP12T evaluation board with the USB interface board are listed in this section.

**Warning:** Peregrine devices with external  $V_{SS}$  supply voltage applied are not supported on the SP12T evaluation board when the USB interface board is connected. The USB interface board will be damaged if external  $V_{SS}$  voltage is applied. Refer to the “**Manual Operation with External Supplies and External Control Inputs (External  $V_{SS}$ )**” section below for configuring and evaluating the device with an external  $V_{SS}$  supply.

Follow these steps to configure the hardware for basic evaluation.

- 1) Remove any jumpers that are installed on JP1 and JP2.
- 2) Connect the USB Interface Board on J15, as shown in **Figure 21**. Note the correct orientation.
- 3) Calibrate board trace loss with THRU trace between J13 and J14. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

### Manual Operation with External Supplies and External Control Inputs (External $V_{SS}$ )

The guidelines for operating the SP12T evaluation board with no software and external supplies (Including external  $V_{SS}$  for spur-free performance) to control device are listed in this section.

Follow these steps to configure the hardware for external supply evaluation.

- 1) Disconnect the USB interface board from the evaluation board.
- 2) Install a jumper on JP1 if a logic low is desired on Logic State input. Removing JP1 presents a logic high on Logic State (internal pull-up resistor)
- 3) Remove any jumper that may be installed on JP2.
- 4) Connect an external  $V_{DD}$  power supply lead (3.3V) to J15–1 and ground to J15–2.
- 5) If supported by the device, connect an external  $V_{SS}$  power supply lead (–3.0V) to J15–3 and ground to J15–4.
- 6) For V1–V4, connect an external power supply positive lead (3.3V) to J15–11, J15–9, J15–7 and J15–5 respectively if a logic level high is desired. Ground may be connected at J15–12, J15–10, J15–8 or J15–6. Refer to **Table 7** for the SP12T truth table for V1–V4 logic level port mapping
- 7) Calibrate board trace loss with THRU trace between J13 and J14. THRU calibration is sufficient for initial measurements. If more accurate results are desired, a full vector de-embedding can be done with the THRU trace.

## SP12T Digital Control Pin Descriptions

Table 6 • SP12T Digital Control Pin Descriptions

Pin Name	Description
LS	Logic Select-used to determine the definition for V1, V2, V3 and V4 pins
V1	Digital control logic input 1
V2	Digital control logic input 2
V3	Digital control logic input 3
V4	Digital control logic input 4

## SP12T Control Logic Truth Table

Table 7 • Truth Table for SP12T

LS <sup>(1)</sup>	V4	V3	V2	V1	RFC- RF1	RFC- RF2	RFC- RF3	RFC- RF4	RFC- RF5	RFC- RF6	RFC- RF7	RFC- RF8	RFC- RF9	RFC- RF10	RFC- RF11	RFC- RF12
0	0	0	0	0	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	1	0	0	0	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	0	1	0	0	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	1	1	0	0	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	0	0	1	0	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
0	1	0	1	0	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
0	0	1	1	0	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
0	1	1	1	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
0	0	0	0	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
0	1	0	0	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
0	0	1	0	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
0	1	1	0	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
1	1	1	0	1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	0	1	0	1	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	1	0	0	1	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	0	0	0	1	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	1	1	1	0	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	0	1	1	0	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
1	1	0	1	0	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
1	0	0	1	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
1	1	1	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
1	0	1	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
1	1	0	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
1	0	0	0	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
X <sup>(2)</sup>	0	0	1	1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

**Notes:**

- 1) LS has an internal 1 MΩ pull-up resistor to logic high. Connect LS to GND externally to generate a logic 0. Leaving LS floating will generate a logic 1.
- 2) LS = don't care, V4 = 0, V3 = 0, V2 = V1 = 1, all ports are terminated to provide an all isolated state.

## Using the Graphical User Interface

Figure 24 shows the Multi-throw Count RF Switch application software graphical user interface (GUI), which has a single USB interface board connected to the computer. The status bar on the lower left corner displays the message "USB Interface Board #101-0653 connected." This message indicates that the USB interface board is connected and recognized. See the sections on hardware operations for detailed information about configuring the hardware for operation with the GUI software:

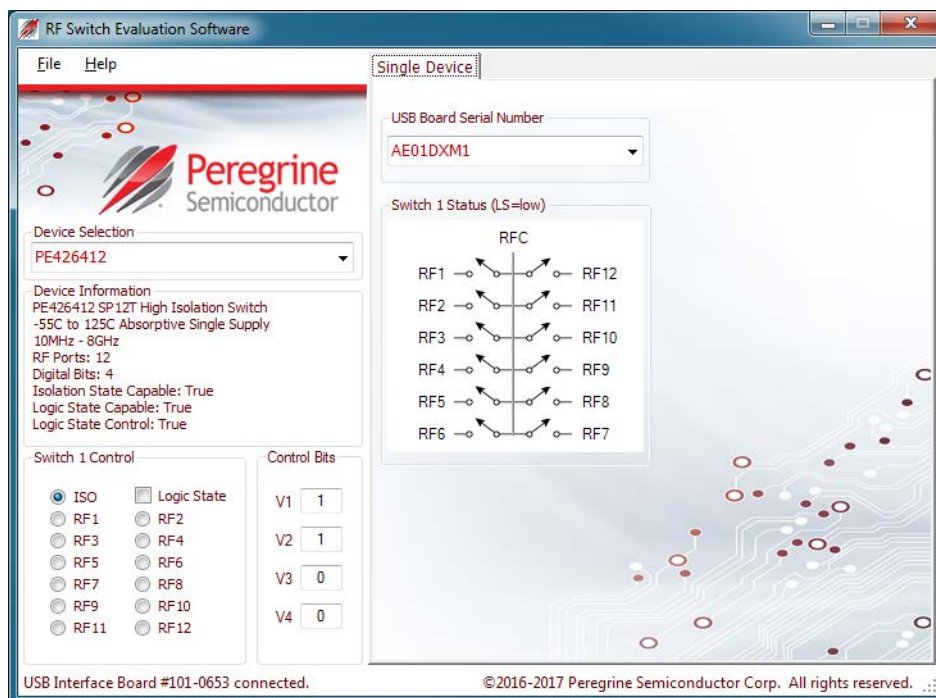
- For SP6T devices, see “**SP6T Hardware Operation**” on page 14.
- For SP8T devices, see “**SP8T Hardware Operation**” on page 19.
- For SP12T devices, see “**SP12T Hardware Operation**” on page 24.

If the USB interface board is not connected when the application software is launched, the message "No interface found! Please connect USB Interface #101-0653" appears in the lower left corner status bar.

The GUI supports multiple Peregrine devices and requires the user to select the part number that will be controlled. The selected device shown is PE426412. To change the part number, click the triangle to the right of the part number in the device selection box under the Peregrine Semiconductor logo. The drop-down menu contains all the supported part numbers for evaluation. After the new device is selected, information about the device appears below the part number box.

The high throw count RF switches application software GUI is displayed in Figure 24 and illustrates the available controls and messages available to the user when controlling a single EVK.

Figure 24 • Multi-throw Count RF Switch Evaluation Software Graphical User Interface (Single EVK)

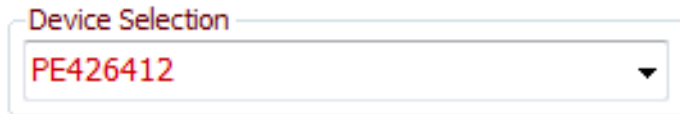


## Graphical User Interface Controls

### Device Selection

The drop-down control allows the user to select the EVB device to control (see **Figure 25**). The device information section is updated when this control is changed.

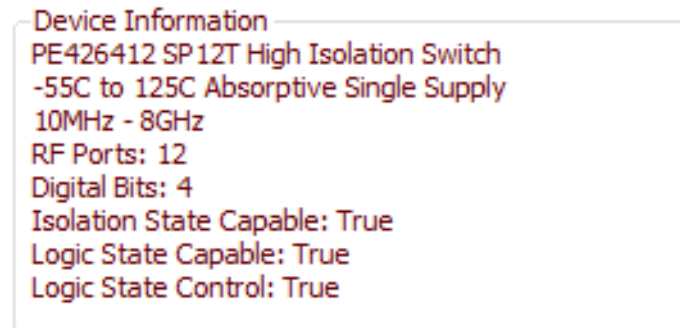
Figure 25 • Graphical User Interface Device Selection



### Device Information

The device information area displays basic information about the selected device (see **Figure 26**). Information consists of frequency range, switch type (absorptive or reflective), number of RF ports, number of digital control bits and whether the device supports isolation setting. Additional information that determines the GUI functionality for logic state control is also shown.

Figure 26 • Graphical User Interface Device Information

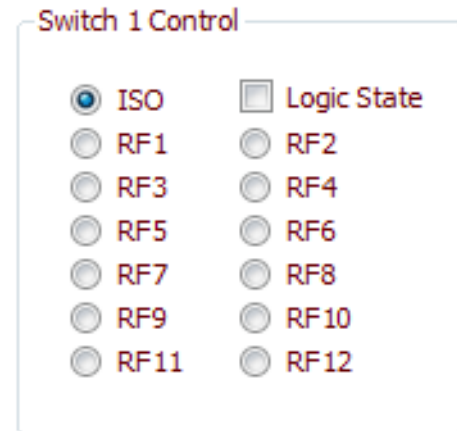


### Switch 1 Control

The switch position of the EVB device is determined by the radio button the user clicks on to select. If supported by the device, ISO button is shown and represents RF isolation state or no connection between the RF common port and the other ports. Clicking on the radio button immediately updates the RF switch on the EVB and the GUI Switch 1 Status display shown in **Figure 29**.

When evaluating devices that feature Logic State control, a check box also appears in the control area. This allows the user to toggle the Logic State input to the device on the EVB. In addition to setting the Logic State input, the GUI uses the appropriate truth table for V1–V4 that matches the selected Logic State to maintain the user selection for RF port.

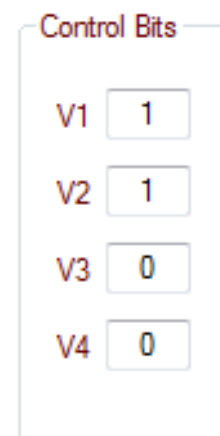
Figure 27 • Graphical User Interface Switch 1 Control



### Control Bits

**Figure 28** shows the current Logic State of the digital control bits presented to the RF switch by the USB interface board. Clicking on a radio button in **Figure 27** immediately updates the USB interface board values which update the RF switch mounted on the EVB. The table shown in **Figure 28** also is updated.

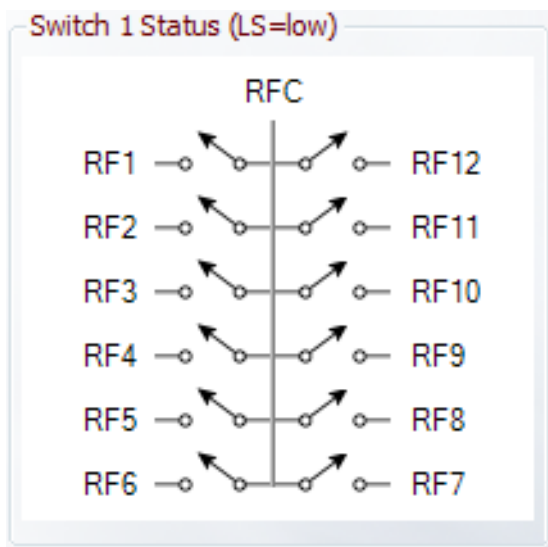
Figure 28 • Current Logic State of Digital Control Bits



### Switch 1 Status

Figure 29 shows the current condition of the RF switch on the EVB. Clicking on the radio button in Figure 27 immediately updates the RF switch on the EVB and the graphic in Figure 29. The current Logic State signal level is shown in parenthesis "(LS=low)"

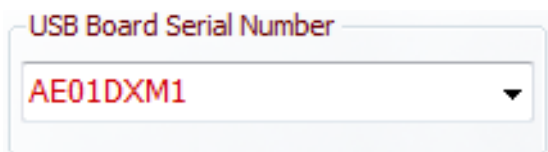
Figure 29 • Graphical User Interface Switch 1 Status



### Switch 1 USB Board Serial Number

Figure 30 shows the USB Board Serial Number drop-down menu that displays the selected USB Interface board serial number (red board). This serial number field is useful to identify the unique serial number of the interface board connected to the computer. If multiple USB Interface boards are connected to the same computer, the active board can be selected by choosing the desired serial number.

Figure 30 • Graphical User Interface Switch 1 USB Board Serial Number



### Controlling Multiple EVBs

The Multi-throw Count RF Switch GUI supports multiple EVBs to enable the user to easily evaluate and control two EVBs with devices that feature Logic State input control. To use this feature in the GUI, two EVBs are required along with two USB Interface boards.

Before connecting the second USB Interface board, note the serial number of each USB Interface board that will be used. Connect them one at a time and note the serial number that is displayed in the GUI. Mark the USB Interface Board with the serial number to ensure the Logic State signal level is routed to the appropriate EVB.

Enable the feature in the software by connecting two USB Interface boards. The status bar on the lower left hand corner will display the message "QTY 2 USB-SPI Interface Boards #101-0653 connected" when both USB interface boards are connected and recognized.

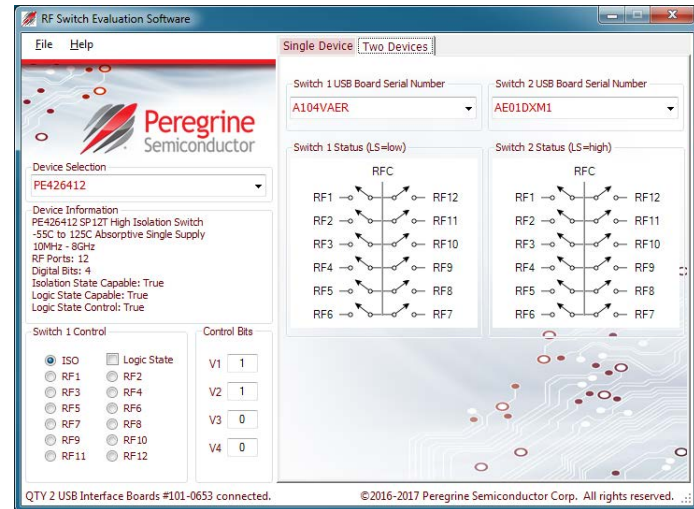
A second measurement tab appears when the second USB Interface board is detected. Click on the "Two Devices" tab to activate the additional functionality and control of two EVBs. The "Two Devices" tab displays the status of the USB Interface board, the value of Logic State, and the RF switch state of each EVB.

The second EVB Logic State signal will be inverted with respect to the first board. This allows identical V1-V4 signals to be applied to both boards while utilizing the alternate Logic State truth table. Ensure the serial number of the primary board shown in the software interface is connected to the primary EVB.



The high throw count RF switches application software GUI in **Figure 31** shows the available controls and messages available to the user when controlling dual EVKs. Note the serial number of the USB Interface and the Logic State signal level in the Switch Status titles (LS=low / high).

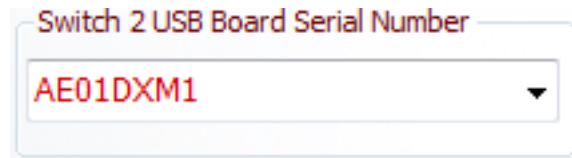
**Figure 31 • Multi-throw Count RF Switch Software Graphical User Interface (Dual EVKs)**



**Switch 2 USB Board Serial Number**

**Figure 33** shows the USB Board Serial Number drop-down menu that displays the selected USB interface board serial number connected to the second EVB.

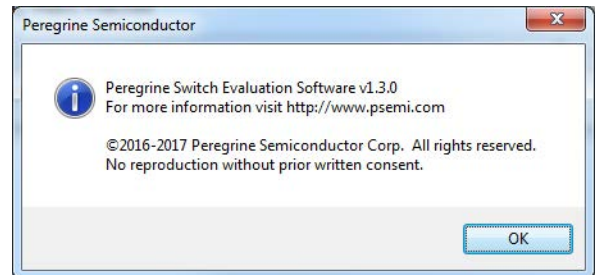
**Figure 33 • Graphical User Interface Switch 2 USB Board Serial Number**



**Software Version**

The software version of the GUI may be found by selecting Help -> About from the main menu bar.

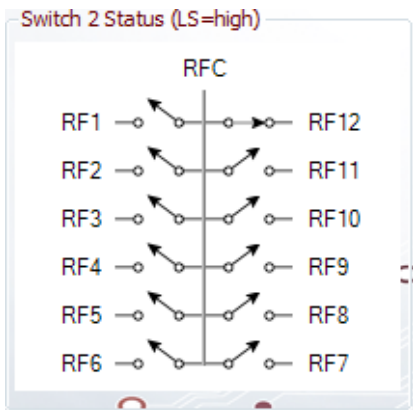
**Figure 34 • Graphical User Interface Software Version**



**Switch 2 Status**

**Figure 32** shows the current condition of the RF switch on the EVB. Clicking on the radio button in **Figure 27** updates the RF switch on the EVB and the graphic in **Figure 29** and **Figure 32** immediately. The current Logic State signal level is shown in parenthesis "(LS=high)".

**Figure 32 • Graphical User Interface Switch 2 Status**



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# Technical Resources



## Technical Resources

Additional technical resources are available for download in the Products section at [www.psemi.com](http://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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