

Hood- EVM Guide

Rev A1: 02/14/22



This document contains information on a product under development and the material is subject to change.

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1 Introduction

Congratulations on your purchase of an Elevate Semiconductor Hood evaluation system! You will find that it serves as an invaluable development platform to help get your product to market in the shortest possible time. The Hood evaluation board and GUI (Graphical User Interface) allow the customer to demonstrate and evaluate the Hood performance and functionality.

This document provides the instructions to install, setup, and operate the Hood EVM (Evaluation Module).

1.1 Unpacking – Hood EVM Contents

Please check the contents of the Hood EVM shipping carton to make sure you have received all the items listed in Table 1. The EVM system ships ready to operate except for a PC with USB port and connections to optional test equipment.

Table 1: Hood EVM Contents

Qty	Description
1 ea.	Hood EVM System (Zedboard FPGA and Hood Loadboard)
1 ea.	Hood EVM Getting Started (this document)
1 ea.	AC Adapter Power Plug
1 ea.	Elevate Semiconductor User Interface Program Installation Flash Drive
1 ea.	Micro - USB Cable

1.2 Recommended Test and Measurement Setup

1.2.1 Power Supply

The included power adapter provides all the power needed for the evaluation system (FPGA plus Hood loadboard). If the power adapter becomes lost or does not work, a +12V supply can be used to optionally provide power to the evaluation system. Table 2 provides the required power supply and current rating. The external power supply is connected to the board using standard banana plugs (not provided).

Table 2: Power Supply Requirements

Module	Supply	Current Rating
Hood EVM/FPGA	+12V	3 A

1.2.2 PC Controller

To use the Hood EVM User Interface Program (UIP), a PC with the following configuration is required:

- Windows 10
- USB Port (a USB cable is provided)

1.2.3 Lab Equipment

The below lab equipment can be used for evaluation of the Hood product along with any other equipment the user deems useful.

- Voltage and/or Current Source
- DMM
- Oscilloscope
- Pulse Generator
- Resistor/Capacitor Loads

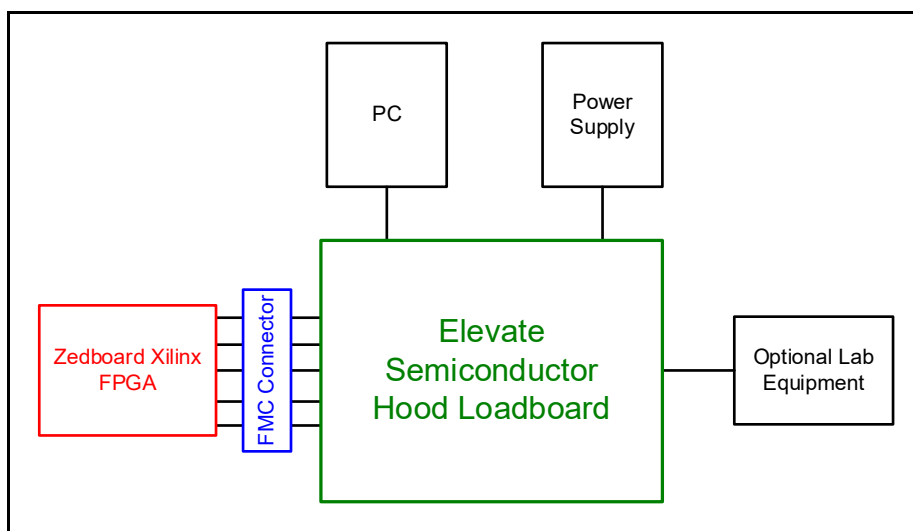


Figure 1: Hood EVM Setup

1.3 Software Installation

The Hood EVM includes self-installing software on the included flash drive. To ensure the evaluation board is correctly recognized when connected to the PC, the software should be installed before connecting the board to the PC's USB port.

Run the setup.exe located file located on the flash drive. If you have a prior version of the Hood GUI, it may be necessary to un-install that version before installing the newer version.

The setup program will create or add files to two (2) directories. The user has the option to use the default values or browse to another directory. The two directories are shown below:

1. A directory for the Hood GUI program and support files.
2. A directory for the National Instrument products that need to be installed.

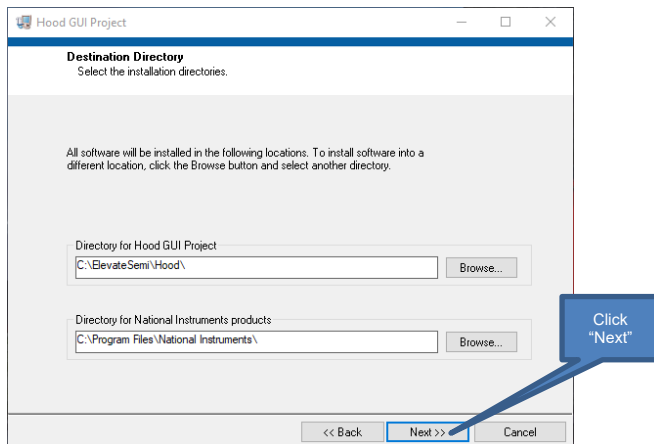


Figure 2: Setup Directories

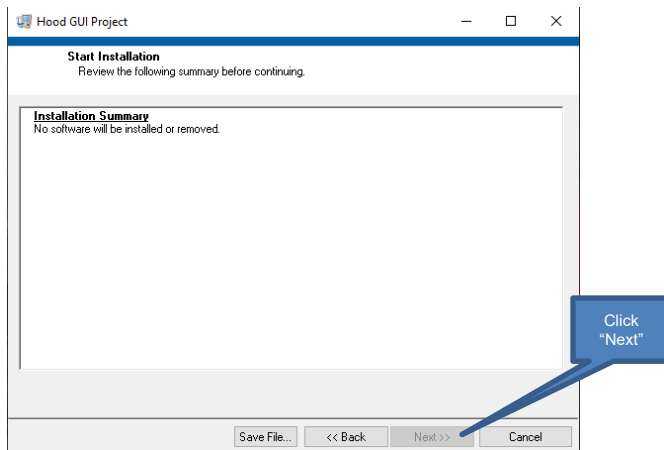


Figure 3: Start Installation

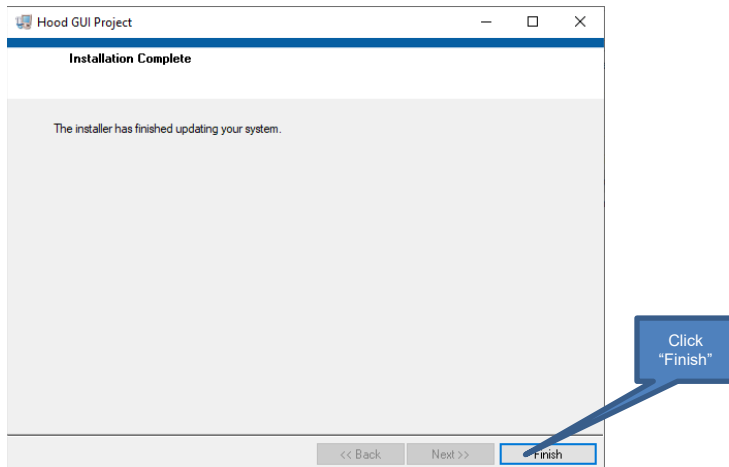


Figure 4: Installation Complete

The installation is now complete.

1.3.1 Reboot Your PC

After installing the Hood EVM software, it may be required to re-boot your PC.

1.3.2 Launching the Elevate Semiconductor Program

The Hood GUI software can be launched using the following 2 methods:

1. Start->Programs->Hood
2. Navigate and run the installed executable: ../ElevateSemi/Hood/Hood.exe

1.3.3 Software Un-Installation

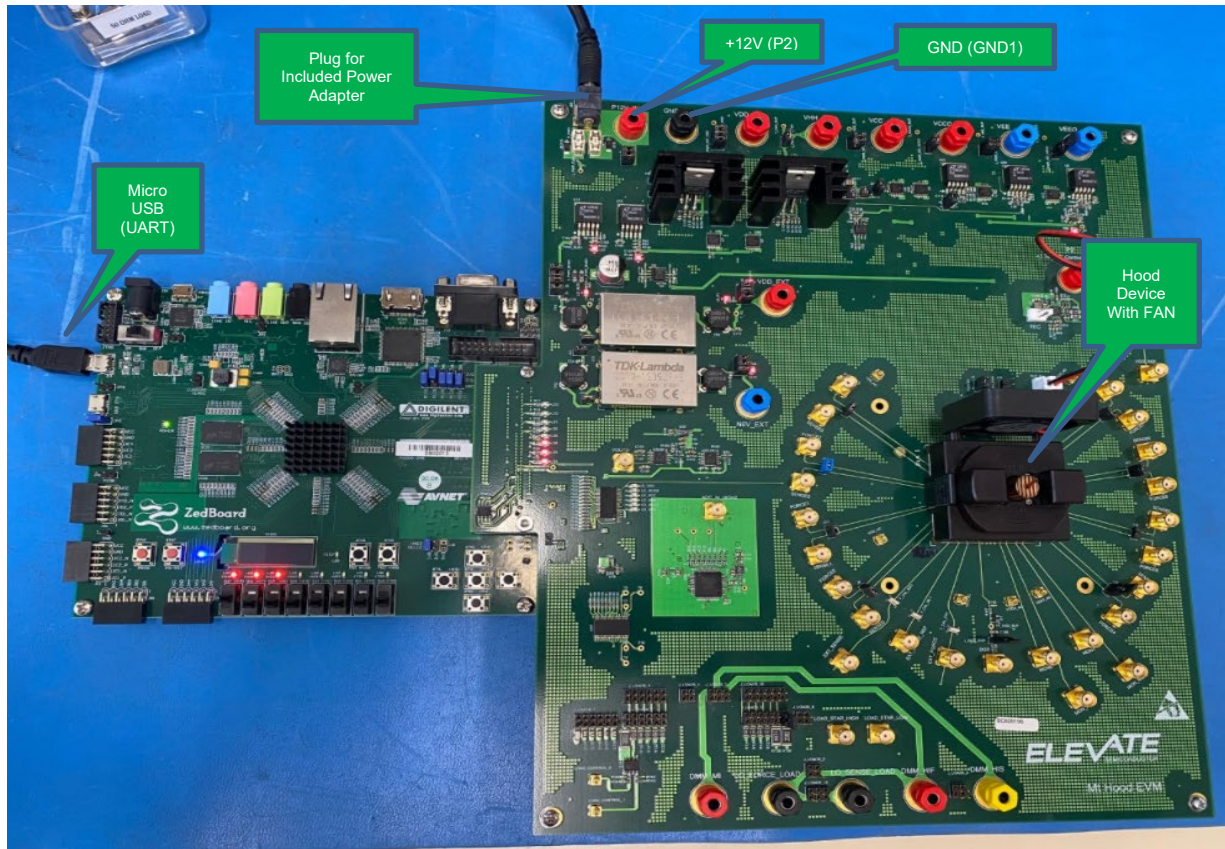
The Elevate Semiconductor demonstration program may be un-installed using the **Add/Remove Program** from the Windows Control Panel.

2 Hardware

The Hood EVM is shipped with several pre-configured states and a user interface program that allows a customer to evaluate the PPMU (Per-Pin Parametric Measurement Unit (Force Voltage/Current - Measure Voltage/Current) and other features.

Note: Any external equipment providing signal into the Hood device should only be enabled after the Hood EVM is enabled and the Hood device is powered on. The external equipment should also be disabled prior to disabling the Hood EVM.

Figure 5: Overview of Hood Evaluation Board



2.1 Caution

The Hood Socket may get hot even with the included fan running. The user should be cautious about handling the device or socket and take all safety precautions against board or personal damage.

2.2 Power Supply Options

There are 2 power options for the Hood EVM. ***Only 1 of the following options is required! Using more than 1 could cause damage to the EVM or device:***

1. Wall power adapter (Included with Evaluation System).
2. +12V External Supply.
 - a. Connect power supplies cables (not provided) from your power supply to the Elevate Semiconductor EVM Hood board's +12V (P2) and GND (GND1) banana connectors.
 - b. Set external power supplies voltage and current limits. Refer to Table 2 above.
 - c. Enable the supplies.

Refer to Figure 5 above for board connections.

2.3 Micro-USB

Connect the included micro-USB cable from your PC to the micro-USB port on the Hood EVM as show in Figure 5. This micro USB connector is labeled ***UART (J14)*** on the FPGA Zedboard.

This section is an overview of the what is contained in the Hood GUI. Powering up the device and details about specific pages are discussed later in this document.

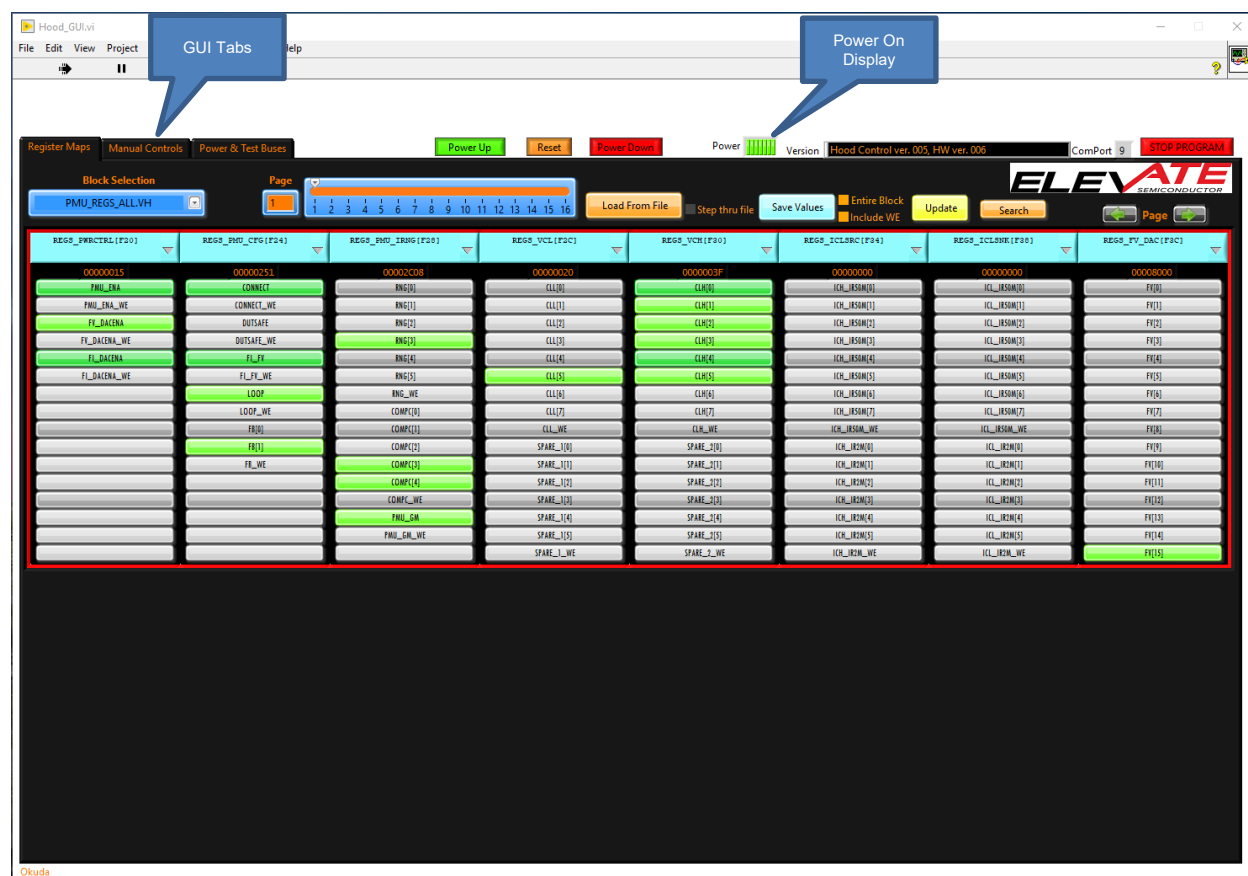


Figure 6: GUI Overview

1. Upon startup of the software (with 1 of the power options connected) the EVM board is powered on, but the Hood device will not be powered up. The EVM board contains DC-DC converters which supply power to the Hood device. The DC-DC converters connected to the Hood device are indicated on the “Power On Display” as shown in Figure 6. At this time, the power output bars will be uncolored. After powering up the Hood device, these bars will turn green. (The power up sequence is shown below in Section 4: Powering Up and Powering Down the Hood Device).
2. The Elevate GUI software is broken up into 3 main tabs. Each of these tabs is briefly touched-on below and will be discussed in more depth later in this document.
 - a. **Register Maps:** The Hood device can be programmed using register settings versus graphical setup. There are options to set register bits and DAC levels for individual channels or all channels. There are also options to save and load setups from files.
 - b. **Manual Controls:** Generally used by advanced users only to control power sequencing or read internal registers.
 - c. **Power & Test Buses:** This page has options to set/measure power supply levels, measure the calibration/monitor pins, and measure the per channel temperature of the device.
3. Each of the GUI controls is a visual representation of a register in the Hood device. Once the user moves a scroll bar, changes a pull down, etc., a register in the Hood device will be programmed to match the corresponding GUI input.

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4 Powering Up and Powering Down the Hood Device

This section is designed to show the user how to power up the Hood Device.

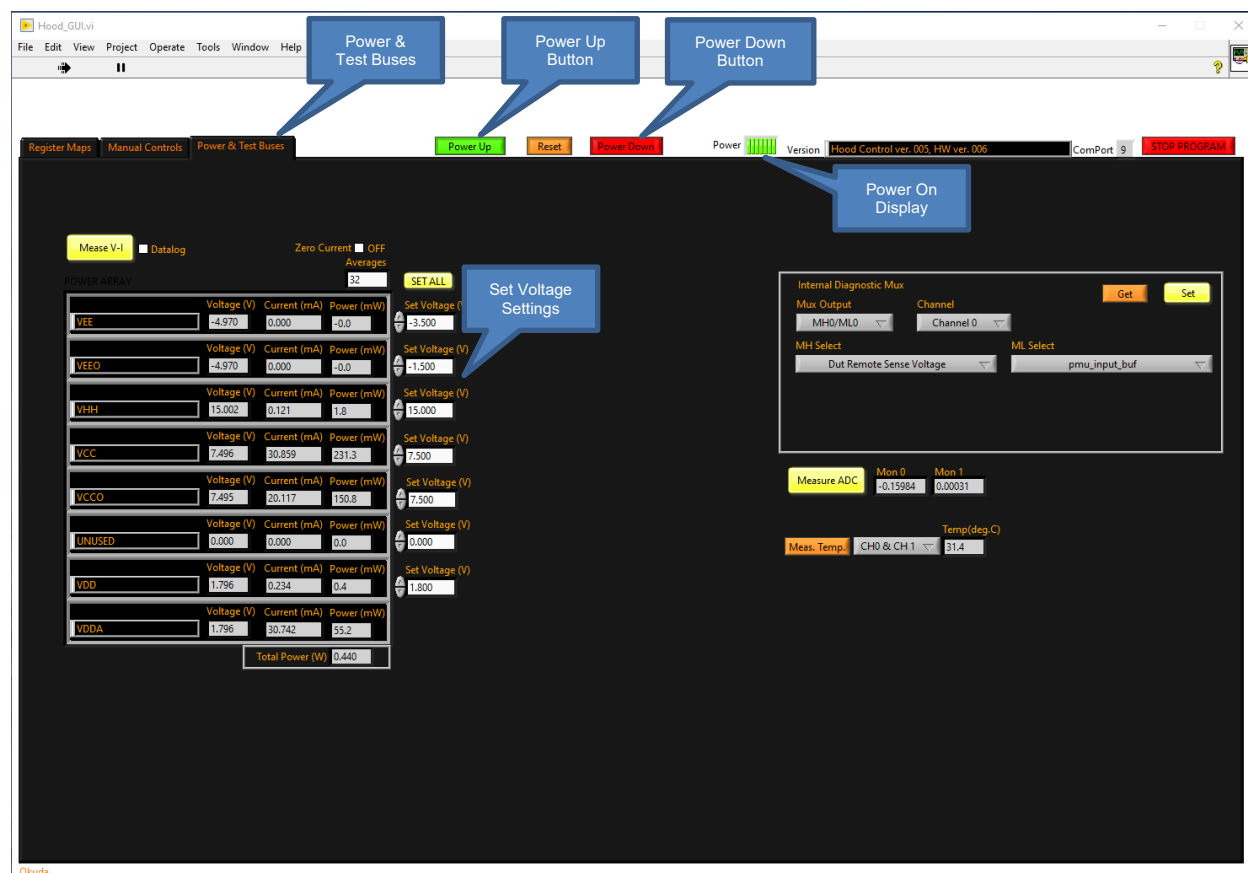


Figure 7: Power & Test Buses

4.1 Powering Up the Hood Device

- After installing the Elevate GUI software as shown in the Software Installation Section, run the Hood GUI software.

Note: When running the Hood GUI software, the board is powered up and connected via USB to the PC otherwise the software will generate errors.
- Powering up the Hood device uses the “Power & Test Buses” tab of the Hood GUI. The remainder of the “Power & Test Buses” page will be discussed later in this guide.
- Powering up Hood Device,
 - Select the “Power & Test Buses” Tab.
 - Each of the supplies is pre-programmed with the nominal voltage value for each of the supplies. Both before and after the device is powered-up, the supply values can be changed by entering a new value in the “Set Voltage (V)” dialog box of each individual supply. Enter a new value and Hit the Enter key. If an invalid number is written to one of the Set Voltage dialog boxes, the dialog box will flash red and set the closest valid value.
 - After setting the desired voltage, press the “Power Up” button on the top of the page to enable the supplies.
 - Figure 8 below open. The measured voltage, current, and power for each supply are displayed.

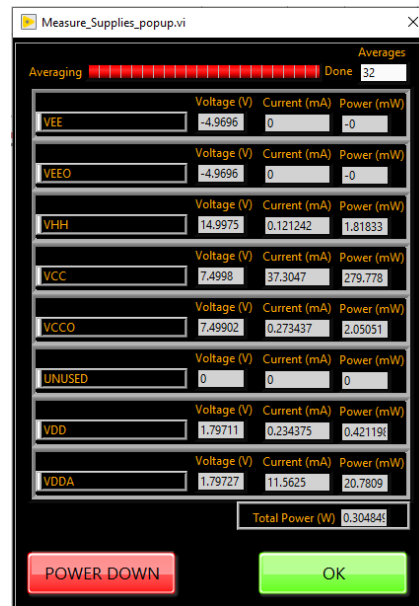


Figure 8: Supply Settings and Measurements

- Hit the "OK" button to continue with the powering up the device or "POWER DOWN" to discontinue power-up.
- After power up, the "Power On Display" indicator at the top of the GUI will change to green.
- At this point, the device is now in a powered-up state and ready to start characterizing or testing.
- The user can go back to this page as needed and enter new voltage settings into the set voltage dialog boxes to change the power supplies or measure voltages/currents.

4.2 Powering Down the Hood Device

To power down the Hood device, left-click the "Power Down" button as shown in Figure 7. The "Power On Display" indicator will change from green to no color. This will indicate Hood no longer is powered up.

5 Main GUI Tabs

Each of the major GUI tab sections will be discussed below. There are 3 major sections of the Graphical User Interface as stated in the GUI overview section. Each will be discussed or shown below:

1. Register Maps
2. Manual Controls
3. Power and Test buses

5.1 Register Maps

The Hood device can also be programmed using register settings. There are options to set register bits and DAC levels for individual channels or all channels.

There is also the option to save register setups and load register setups from files. These are used to set and save the Hood device in a known configuration.

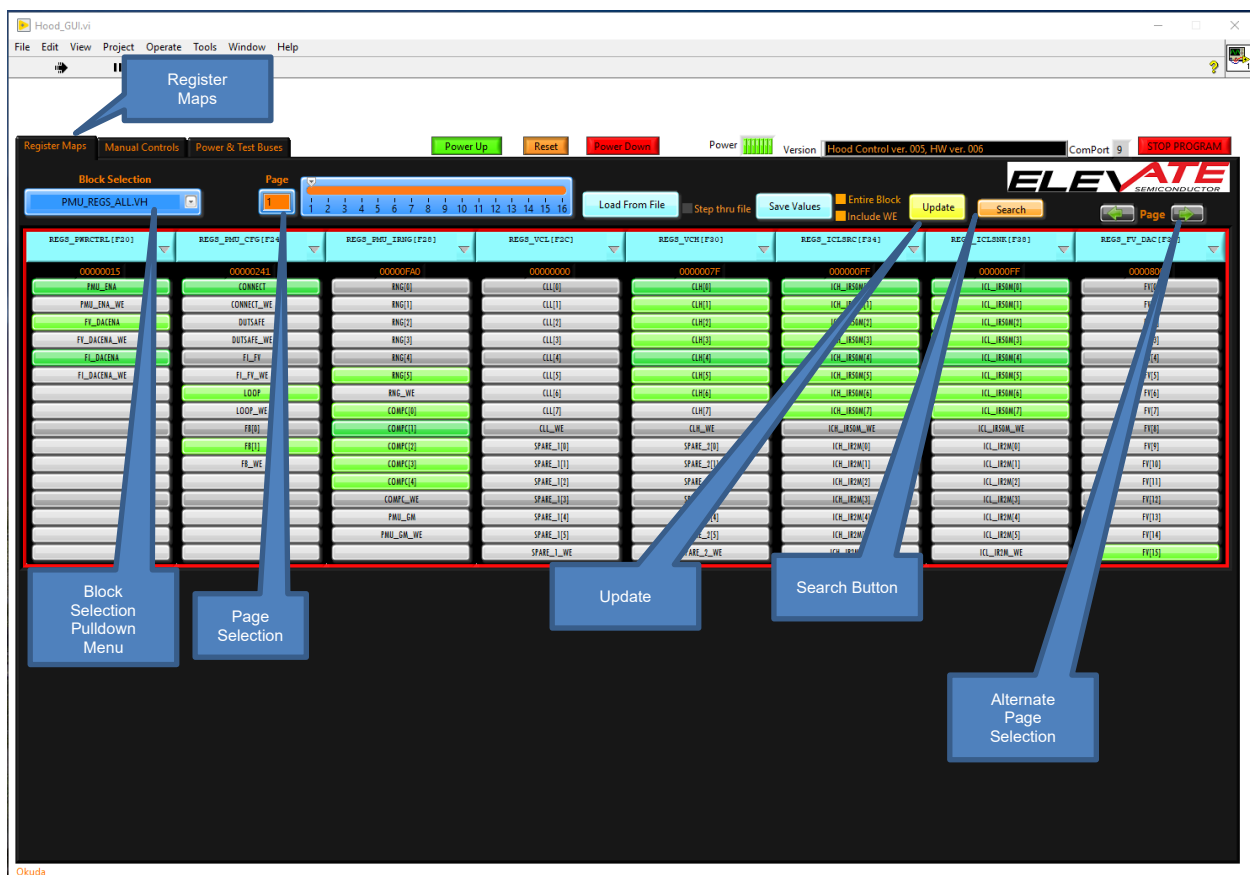


Figure 9: Register Maps Tab

REGS_PWRCTRL(F30)	REGS_PMD_PG(F34)	REGS_PMD_IRNG(F38)	REGS_VCL(F3C)	REGS_VCH(F30)	REGS_ICLDRIC(F34)	REGS_ICLSNR(F38)	REGS_FV_DAC(F3C)
00000015	00000241	00000FA0	00000000	0000007F	000000FF	000000FF	00000000
PMU_ENA	CONNECT	ENG(0)	CLL(0)	CLK(0)	ICL_IRSNM(0)	ICL_IRSNM(0)	FX(0)
PMU_ENA_WE	CONNECT_WE	ENG(1)	CLL(1)	CLK(1)	ICL_IRSNM(1)	ICL_IRSNM(1)	FX(1)
FX_DACENA	OUTSAFE	ENG(2)	CLL(2)	CLK(2)	ICL_IRSNM(2)	ICL_IRSNM(2)	FX(2)
FX_DACENA_WE	OUTSAFE_WE	ENG(3)	CLL(3)	CLK(3)	ICL_IRSNM(3)	ICL_IRSNM(3)	FX(3)
FL_DACENA	FL_FX	ENG(4)	CLL(4)	CLK(4)	ICL_IRSNM(4)	ICL_IRSNM(4)	FX(4)
FL_DACENA_WE	FL_FX_WE	ENG(5)	CLL(5)	CLK(5)	ICL_IRSNM(5)	ICL_IRSNM(5)	FX(5)
	LOOP	ENG(6)	CLL(6)	CLK(6)	ICL_IRSNM(6)	ICL_IRSNM(6)	FX(6)
	LOOP_WE	COMP(0)	CLL(7)	CLK(7)	ICL_IRSNM(7)	ICL_IRSNM(7)	FX(7)
	FX(0)	COMP(1)	CLL_WE	CLK_WE	ICL_IRSNM_WE	ICL_IRSNM_WE	FX(8)
	FX(1)	COMP(2)	SPARE_1(0)	SPARE_2(0)	ICL_IRSNM(0)	ICL_IRSNM(0)	FX(9)
	FX_WE	COMP(3)	SPARE_1(1)	SPARE_2(1)	ICL_IRSNM(1)	ICL_IRSNM(1)	FX(10)
		COMP(4)	SPARE_1(2)	SPARE_2(2)	ICL_IRSNM(2)	ICL_IRSNM(2)	FX(11)
		COMP_WE	SPARE_1(3)	SPARE_2(3)	ICL_IRSNM(3)	ICL_IRSNM(3)	FX(12)
		PMU_GM	SPARE_1(4)	SPARE_2(4)	ICL_IRSNM(4)	ICL_IRSNM(4)	FX(13)
		PMU_GM_WE	SPARE_1(5)	SPARE_2(5)	ICL_IRSNM(5)	ICL_IRSNM(5)	FX(14)
			SPARE_1_WE	SPARE_2_WE	ICL_IRSNM_WE	ICL_IRSNM_WE	FX(15)

Figure 10: PMU_REGS_0.VH Block selection

5.1.1 Manually selecting registers

1. The Register Maps GUI tab for the Hood Device is broken into 3 sections. Blocks, Pages, and Registers. Blocks and pages are only terms used in the GUI and are not part of the device. Each of these concepts is explained below:
 - a. Block Selection: Blocks are just a term for a grouping of registers that are related in the Hood device. Each of the blocks can have many registers or just a few. Each block of registers controls a separate section of the device. All blocks related to the Hood are shown in the “Block Selection” pulldown menu.
 - i. Per Chip Blocks: This selection affects the central section of the device. The GLOBAL.VH section of the register map is per-chip selection and is shown above. The GLOBAL.VH block selection is a section of the register map that is central to the device and is not specific to any channel.
 - ii. Per Channel Blocks: These block selections will only affect 1 channel. For example CHAN_0.VH will only affect channel 0. The Per-channel selections will be indicated by: “Block Name” + “_” + “channel number” + “.VH”.
 - iii. All channel Blocks: Selecting this block will affect all channels when a register is written. For example, CHAN_ALL.VH: The All-channel selections will be indicated by: “Block Name” + “_” + “ALL” + “.VH”.
 - b. Page: Each Block Selection is further broken into 16 pages. The 16 pages of each block can be selected using the slider bar as shown above. Each page holds up to 8 individual registers. Although each block can be broken into 16 pages, none of the blocks have enough registers to fill all 16 pages (8 registers a page). For this reason, only as many pages as needed are populated.
 - c. Registers: The registers in Hood are all 16-bit registers. As an example, Page 1 of the CHAN_3.VH Register Block is shown in Figure 10 above.
 - i. Register Name: This matches the register map name in the datasheet. PWR_CTRL in the above example.
 - ii. Register Address: The address of the register is next to the Register name. Address 300 in the above example. The first number in the address matches the channel number (channel 3). The second 2 numbers match the REG ADR in the datasheet (address 00).
 - iii. If a register bit is written as a ‘0’, the register bit is gray. If the register bit is a ‘1’, the register is Green.
 - iv. Many registers have multiple smaller bit fields that can be written independently without affecting the other bit fields in that register. For these registers each independent bit field has a WE (write enable) bit defined that must be set to “1”

for those bits to be affected by a write. Any bit fields whose WE bit is set to "0" during a write to that register will not be changed. Not all register have WE bits. The user should read the datasheet to get more information about these bits.

1. Register Fields with no associated 'WE' bit: Left click to change the bit from a '0' to a '1' or from a '1' to a '0'. This will be shown when the register bit changes color.
2. Register Fields with as associated 'WE' bit.
 - a. 'Ctrl key' + left-click bit name
 - b. Release 'Ctrl key'
 - c. Left click 'WE' bit associated with the bit name.
- v. The user should press the "Update" button after writing registers to make sure the correct registers were written.

5.1.2 Load and Save Register setups.

The "Save Values" and "Load From File" buttons can be used to save and load register settings. These 2 selections are discussed below:

1. "Save Values" button:
 - a. "Entire Block" checkbox:
 - i. Selected: This will save the entire selected block when saving.
 - ii. Not selected: Only the viewed page will be saved.
 - b. "Include WE" checkbox:
 - i. Selected: Include the WE bits when saving.
 - ii. Not selected: Will not include the WE bits when saving.
2. "Load From File" button:
 - i. Selected: Step through the selected setup file selected and will wait between each write command for the user to continue. Shown below in Figure 11 and Figure 12.

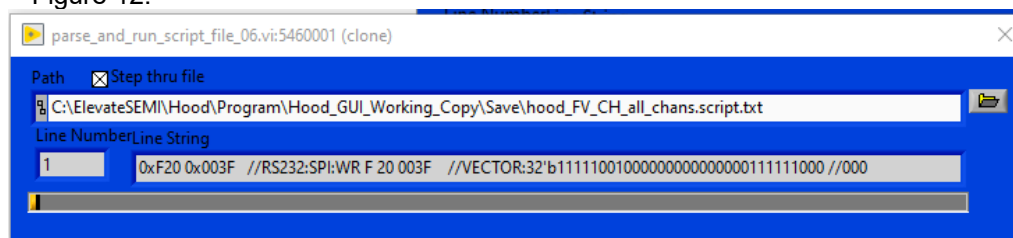


Figure 11: Load From File

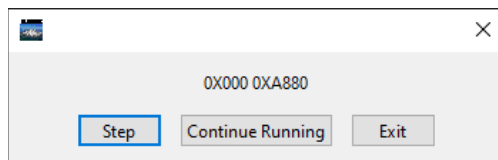


Figure 12: Load from File Step/Continue

- ii. Not selected: Runs the entire setup file selected and writes all the registers at one time.

5.1.3 Search

The search button can be used to search for specific registers in the register map. To search for a register as seen in the datasheet, select the "Search" button. Type in part of the name of the register and hit 'return'. A dialog box will appear with the name of any found registers. To see a list of all found registers, hit the right-most triangle to show a pull-down menu. An example of searching for the ILOAD_EN is shown below.

1. Select the "Search" button on the "Register Maps" tab.

2. Type in the name or address of the register to search for.

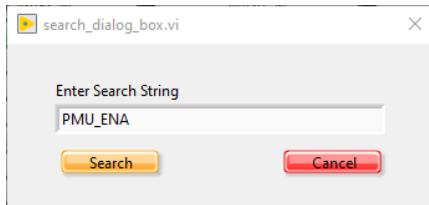


Figure 13: Search Dialog Box

3. Left click the triangle at the right to show all matching registers. Channel registers will show multiple times in the pull-down menu since they are located in every channel.

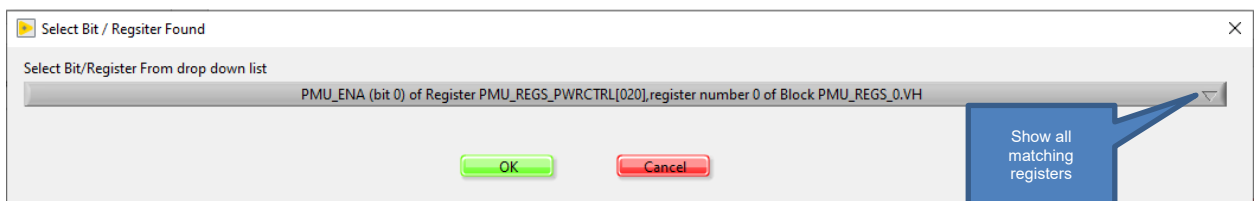


Figure 14: Select Register Dialog Box

4. Hit the "OK" button to show the selected register. Or "Cancel" to cancel the search.

5.2 Power & Test Buses

The “Power & Test Buses” tab is used for a variety of tasks. These will be discussed below.

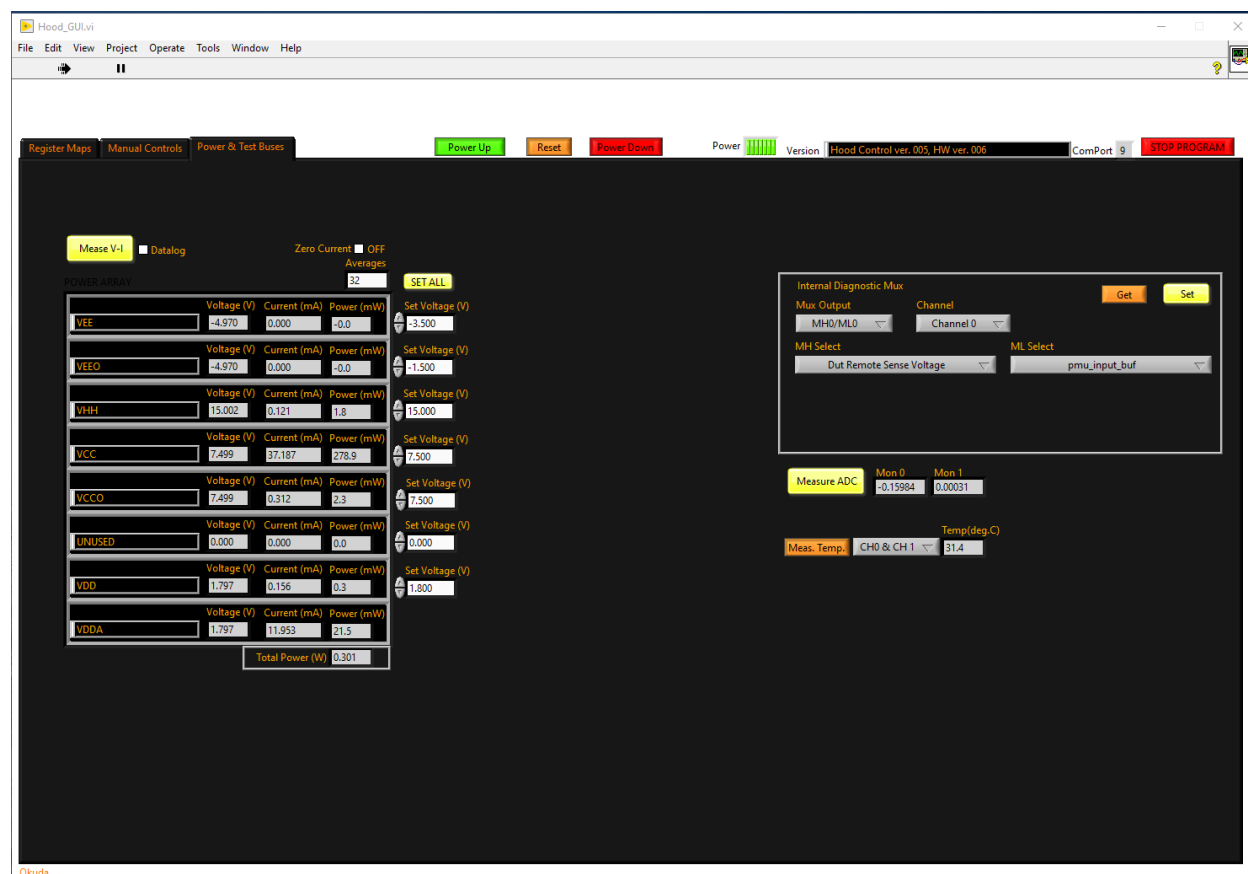


Figure 15: Power & Test Buses

5.2.1 Hood device power up and measurement:

The left side of the tab has been discussed in Section 4: “Powering up the Hood Device”.

After powering up the Hood device, there are options to:

1. Measure the Voltage and current: Use the “Meas V-I” button to measure the current value of the Hood supplies.
2. Save the Measure Voltage and Current to a file (.csv format). Select the “Save to File” checkbox before the “Meas V-I” button is selected and the values will be save to a file.
3. Measure current relative to previous measurements. Select the “Zero Current” checkbox before the “Meas V-I” button is selected and the Measure Current and Measure Voltage values will be measured relative to the current measured values.

5.2.2 Measure Analog Mux (Diagnostic Mux)

On the right side of the “Power and Test Buses” tab are options to Measure the Analog Mux using an ADC located on the Hood EVM. Options for the Voltages that can be measured on the Internal Analog Mux are described in the Hood datasheet.

5.2.3 Measure Die Temperature

There is also an option to measure the internal temperature of the Hood device. The die temperature of Hood is measured between adjacent channels. Channels 0&1, 2&3, 4&5, 6&7 share Internal temperature diodes. Therefore, the temperature measurements on adjacent channels will be the same. This procedure is detailed in the Device Guide.

6 Hood EVM Loadboard Description

6.1 EVM Loadboard

Figure 16 below illustrates a high-level view of the Hood EVM loadboard. The loadboard contains the Hood device as well as all the necessary surrounding circuitry to validate and characterize the device in the bench environment.

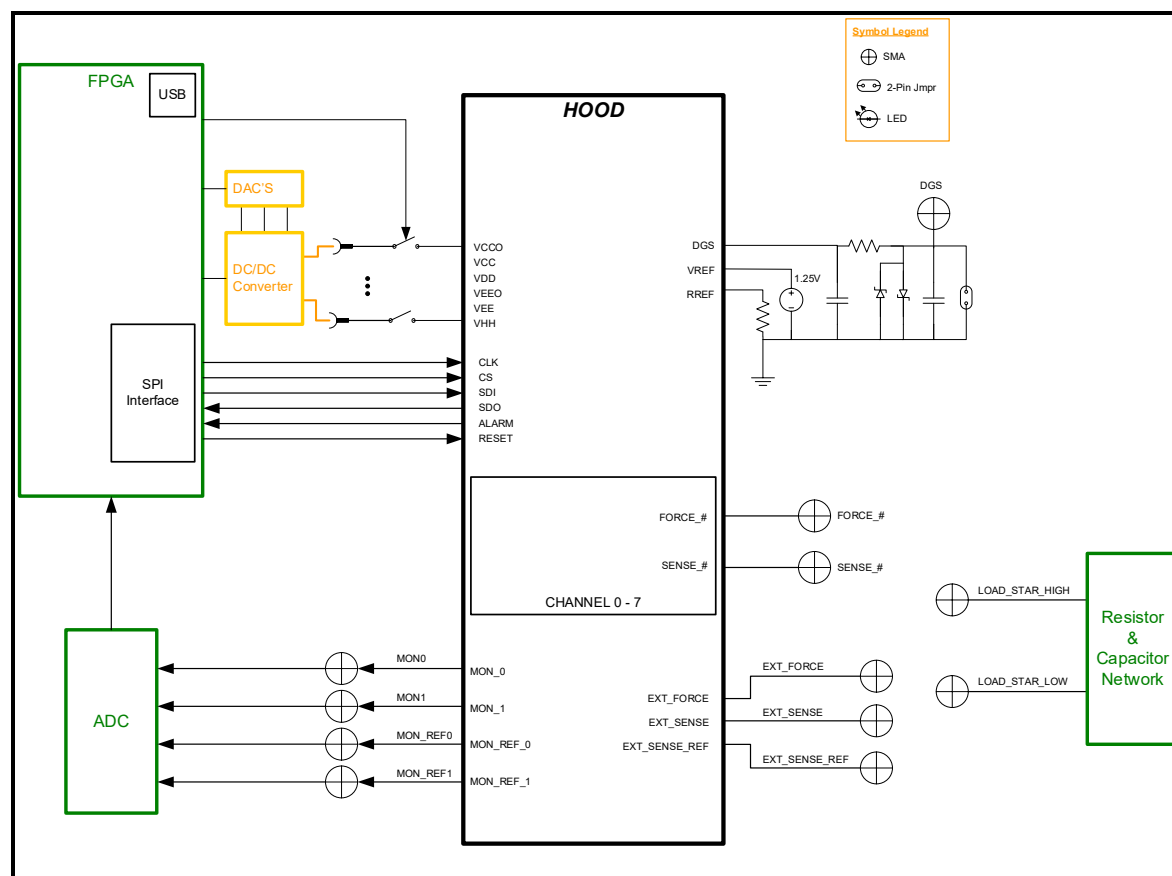


Figure 16: EVM HARDWARE

6.2 EVM Resistor/Capacitor Network

The figure below illustrates the resistor/capacitor network located on the EVM board. To use this network, the channel to be tested needs to be connected via SMA cables from the **FORCE_#** SMA to the **LOAD_STAR_HIGH** SMA. If using **SENSE_#**, the **SENSE_#** pins need to be connected to the **DMM_HIS** SMA. This network can optionally be connected to the onboard ADC using the **J_LOADS_1** jumper. Each of the resistors/capacitors is connected using the 2 pin jumper connectors.

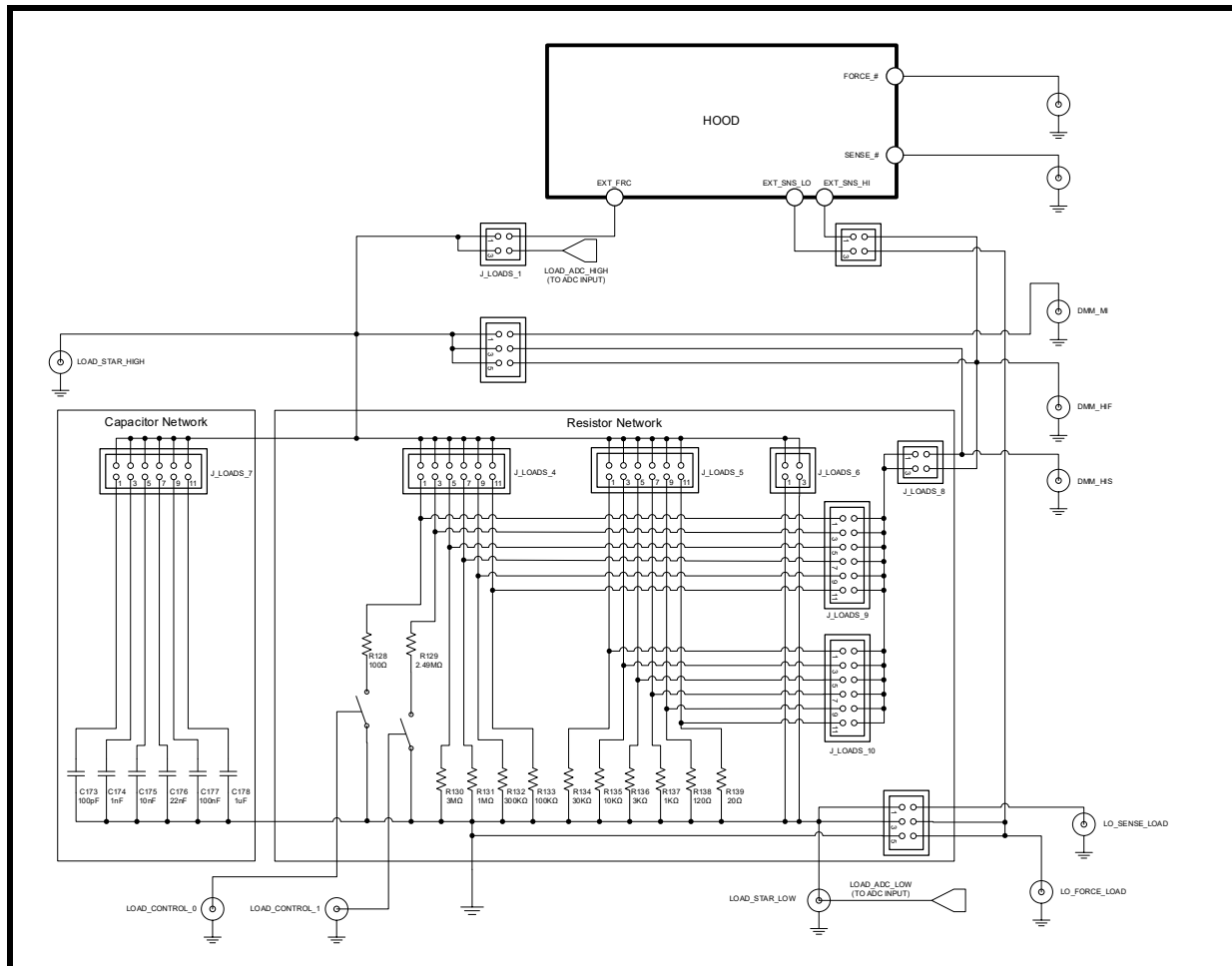


Figure 17: Resistor/Capacitor Network

7 Basic Setups

Included with the EVM software are setups that can help the user program the Hood product into some basic configurations to evaluate the part. Below are some of the setups included.

7.1 PMU

When testing out the PMU, table 3 illustrates the recommended configuration for PMU FV or FI. An external SMU (source measurement unit) should be configured in the opposite mode as Hood. See below in order to act as a load:

Table 3: Hood PMU - SMU Configuration

Hood Configuration	SMU Configuration
FVMI	FIMV
FIMV	FVMI

After the configuration is complete, use the PMU FV/VI levels GUI interface to change the Hood output levels and configuration.

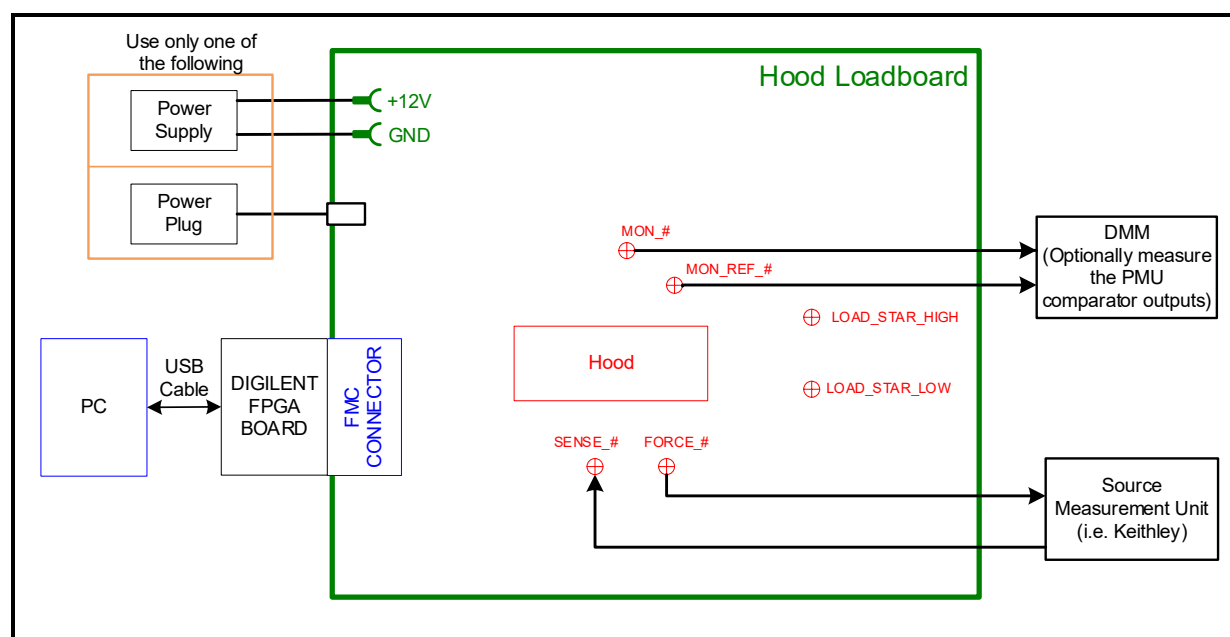


Figure 18: PMU Setup

7.2 Loading Setup Files

Setup files are predefined scripts which put the Hood into a known condition. Using the “Load From File” button on the “Register Maps” page of the Hood Gui:

Navigate to Hood\Support_Files\Documentation\TestSetups

7.2.1 hood_FV_CH_all_chans_50mA.script.txt

All channels programmed to Force Voltage mode 50mA range.

7.2.2 hood_fi_CH_all_chans_Clamps_Enabled_2mA.script.txt

All channels programmed to Force Current mode 2mA range with voltage clamps enabled.

8 Document Revision History

Revision	Date	Description
A1	02/14/2022	Initial Release