TRIAD SEMICONDUCTOR

TS5510

Evaluation Board User Guide

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CONTACT US

www.triadsemi.com

+1 (336) 774-2150

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1 General Description

The Triad TS5510 Evaluation Board (EVB) enables testing and evaluation of the TS5510, a 2-channel low noise programmable gain input amplifier for modern at-home recording and professional mixing console applications. The EVB contains a microcontroller that connects to the TS5510's SPI interface for configuration and control of the 2 audio channels, as well as 2 rotary encoders for gain / mute control, and a display for gain and mute status.

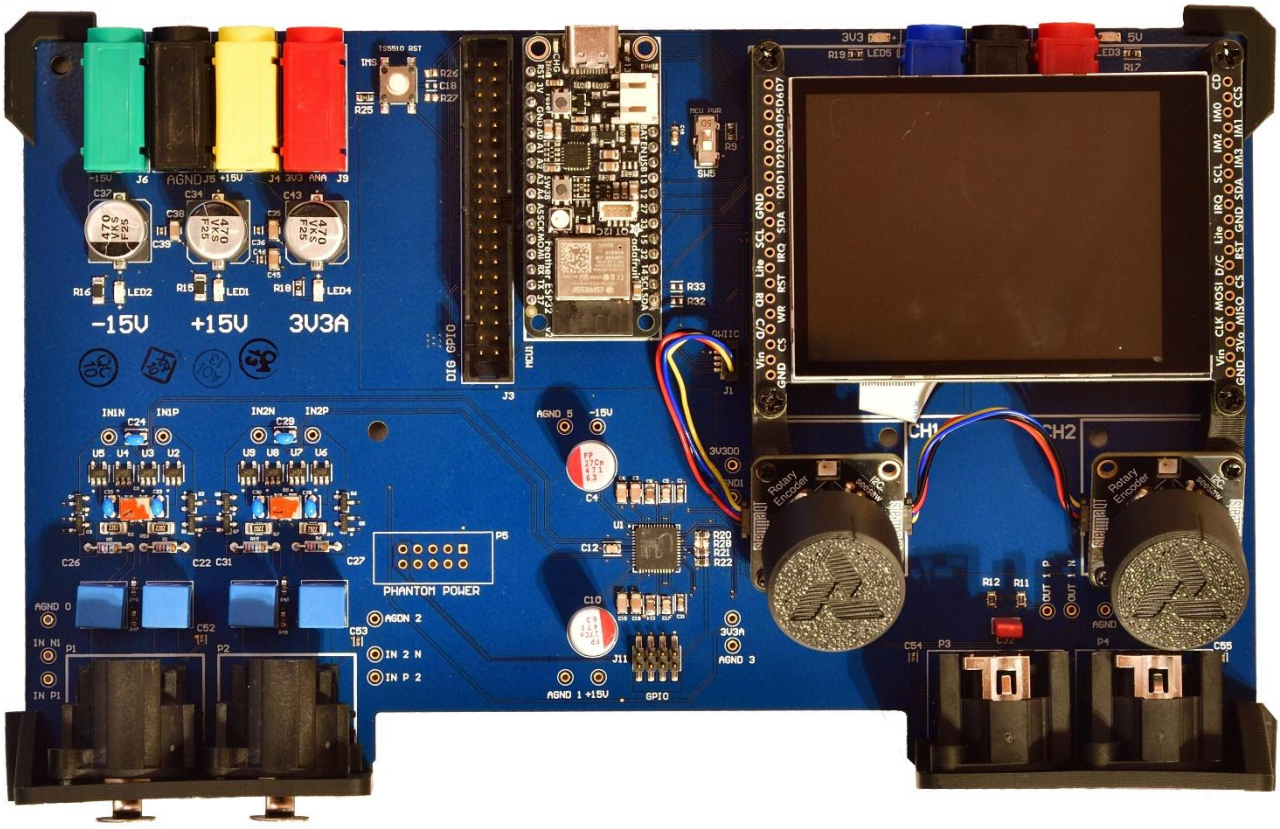

Figure 1: TS5510 Evaluation Board

2 EVB Hardware

The figure below shows the locations of the EVB hardware resources.

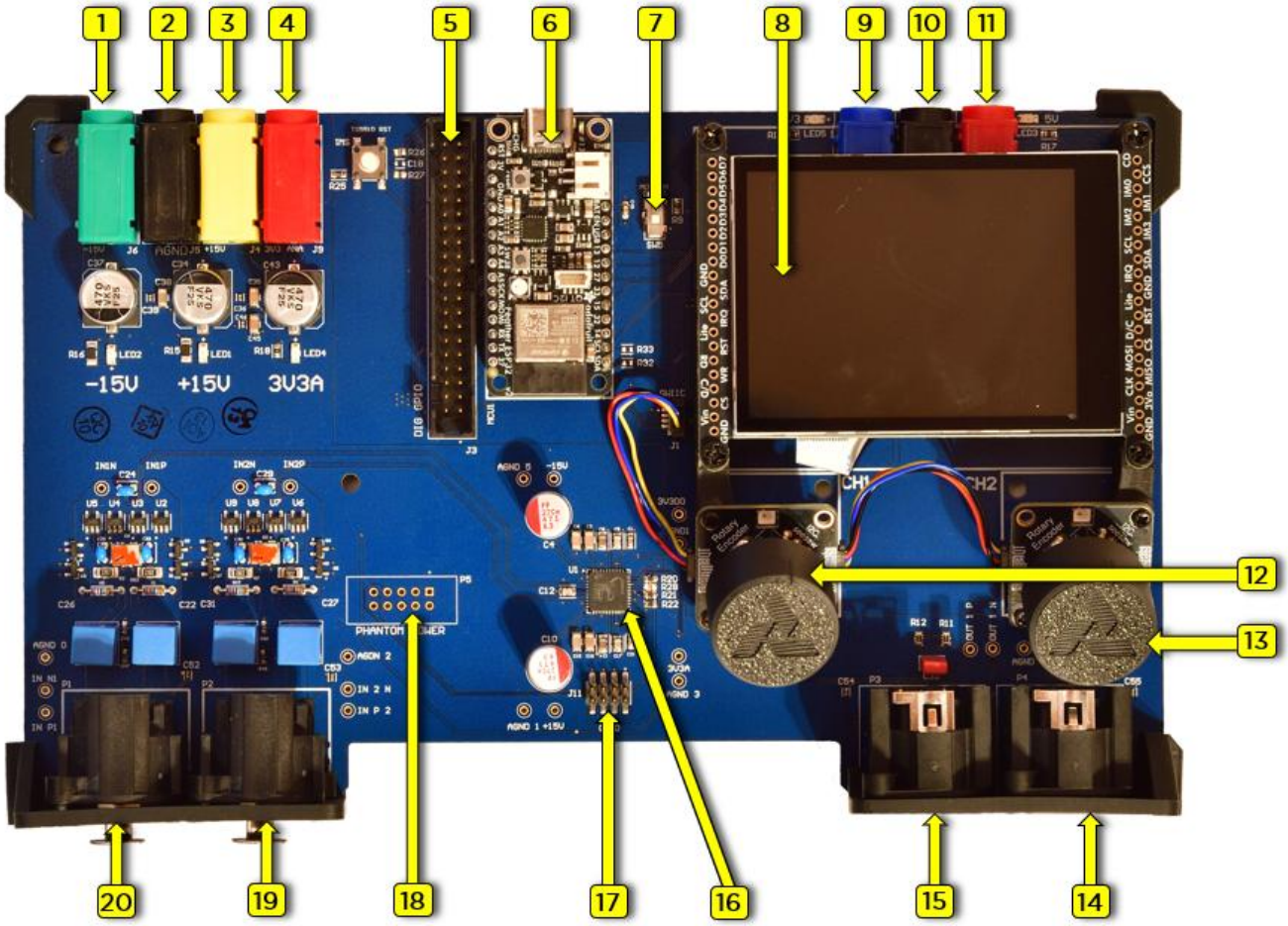

Figure 2: Hardware Resources

Table 1: Descriptions of Hardware Resources

Item	Description	Item	Description
1	-15V TS5510 Analog Power Supply	2	Analog GND Supply
3	+15V TS5510 Analog Power Supply	4	+3.3V TS5510 Analog Power Supply
5	User Interface Breakout Header	6	User Interface Microcontroller
7	User Interface Power Switch	8	LCD Display
9	+3.3V TS5510 Digital Power Supply	10	Digital GND Supply
11	+5V User Interface Power Supply	12	Ch1 Gain / Mute Control
13	Ch2 Gain / Mute Control	14	Ch2 Audio Output
15	Ch1 Audio Output	16	TS5510
17	TS5510 GPIO Breakout Header	18	Phantom Power Daughterboard Connector*
19	Ch2 Audio Input	20	Ch1 Audio Input

** Contact Triad Semiconductor Sales for information regarding the Phantom Power Daughterboard*

3 Power Supplies and Power Up Sequencing

The EVB requires 5 power supply rails for operation: +/-15V analog, +3.3V analog, +3.3V digital, and +5V digital. For best performance, these supplies should be well-filtered, low-noise, lab-grade supplies capable of up to 200mA. Refer to Figure 3 for a power supply connection diagram.

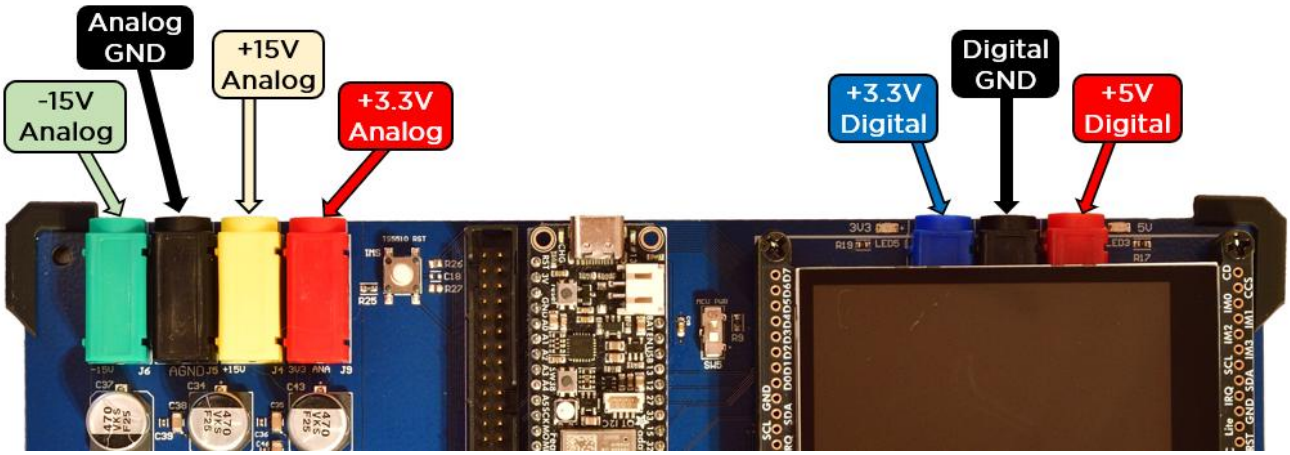

Figure 3: Power Supply Connections

The EVB power up sequencing must be as follows to avoid potential damage to the EVB and TS5510:

1) Disconnect all input signal sources
2) Apply +3.3V TS5510 Digital supply

3) Apply +3.3V TS5510 Analog supply
4) Apply +/-15V TS5510 Analog supplies
5) Apply +5V User Interface supply

A summary of the power supply input connectors and LED indicators is summarized below in Table 2. AGND and DGND are separated on the EVB and connected together inside the TS5510.

Table 2: Power Supply Connector Description

Supply	Input Connector	LED Indicator	Purpose
-15V TS5510 Analog	J6	LED2	TS5510 Analog front end
Analog GND	J5	--	Analog supply ground
+15V TS5510 Analog	J4	LED1	TS5510 Analog front end
+3.3V TS5510 Analog	J9	LED4	TS5510 internal analog circuits
+3.3V TS5510 Digital	J8	LED5	TS5510 internal digital circuits
Digital GND	J10	--	Digital supply ground
+5V User Interface	J7	LED3	User interface circuits

4 Audio I/O Connectors

There are 2 audio input XLR connectors and 2 audio output XLR connectors, 1 in / out pair for each channel, that support balanced audio signals. Refer to Figure 2 and Table 1 for the location of the audio in / out connectors. The XLR audio connectors have the pinouts shown below.

Table 3: Audio Connector Pin Description

XLR Pin Number	Signal
1	GND
2	+ Input (Hot)
3	- Input (Cold)

Figure 4: Audio Input Connector Pinout

Figure 5: Audio Output Connector Pinout

5 User Interface

5.1 Local User Interface

The EVB's local user interface consists of 2 rotary encoders for gain / mute controls, an LCD display, and a user interface power switch. Refer to Figure 2 and Table 1 for the location of these resources.

Each rotary encoder controls gain and mute for its respective channel. A clockwise turn of the rotary encoder increases gain in 1dB increments, a counterclockwise turn decreases gain in 1dB increments, and pressing the encoder toggles mute on and off. Status of the current gain and mute settings is shown on the LCD display. When the mute indicator on the display is red, mute is enabled.

The user interface power switch is provided to power-down the user interface to shut off the microcontroller and associated digital circuitry to minimize noise sources primarily for measuring the TS5510's noise performance. When the switch is in the DOWN or ON position, as shown in Figure 6, the user interface is powered by the +5V supply. When the user interface switch is in the UP or OFF position, the user interface circuits are powered off and the LCD display will be dark. The user interface power switch can be toggled at any time without damage to the EVB.

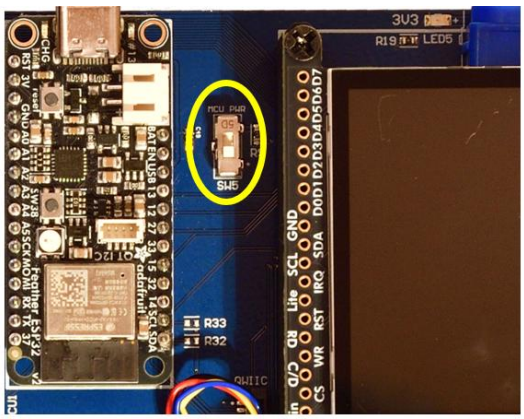

Figure 6: User Interface Power Switch in the DOWN or ON Position

The anticipated use-case for the user interface power switch is as follows:

1) Configure each channel's desired gain and mute
2) Toggle the switch to UP or OFF position to power off the user interface digital circuits
3) Perform audio measurements
4) Toggle the switch to the DOWN or ON position to power on the user interface and set new gain / mute conditions for the next measurement

5.2 Graphical User Interface

The EVB has a Beta test version of a graphical user interface that adds control for a few of the TS5510's internal register settings. Contact Triad Semiconductor Sales for more information.

6 Using the EVB

The following procedure should be used for powering up the EVB and performing audio measurements. Refer to Figure 2 and Table 1 for the location of EVB hardware resources.

1) Set the user interface power switch to the DOWN or ON position as described in Section 5. If this switch is not in the DOWN or ON position, the LCD will remain dark after power is applied.
2) Power up the EVB following the procedure prescribed in Section 3.
3) If the LCD display remains dark, check that the user interface power switch is in the DOWN or ON position.
4) Connect your audio source to the EVB's XLR inputs using short XLR cables for best performance.
5) Connect the EVB's XLR audio outputs to your audio analyzer. (Note: The EVB audio outputs are designed to directly drive an ADC so they will be biased up at a DC level between 1V and 3V when powered up.)
6) Set the desired operating conditions for each channel (refer to Section 5).
7) If you are performing noise tests such as Input Referred Noise, for best performance prior to making the measurement, toggle the user interface power switch to the UP or OFF position (see Section 5) to power down the user interface's microcontroller and associated digital circuits.
8) Perform the measurement.
9) If the user interface power switch was toggled UP or OFF to perform a measurement, toggle it back DOWN or ON to enable the user interface.
10) If performing more measurements, start again at step 6).

7 Troubleshooting

Problem: The EVB's local display is stuck on the splash screen and does not advance to the gain and mute control screen.

1) The likely issue is that the user interface microcontroller cannot communicate with the TS5510 over the SPI bus. While the splash screen is being displayed, the microcontroller will read the TS5510's DEV_ID register. If the read returns an unknown ID value then the local display's splash screen will persist as an indication of an error. Confirm that all of the power supplies connected to the EVB are turned on.

Problem: The EVB's local interface gain and mute controls quit working.

1) The 2 rotary encoders that control the gain and mute functions are attached to the EVB via 2 cables for I2C communications. One or more of the ends of the cables could have become disconnected. Check to be sure both cables are firmly connected.

8 Schematics and PCB Layout

EVB Schematics and the PCB layout are provided on the TS5510 home page on the Triad Semiconductor website.

9 Revision History

Revision	Modifications	Modification Date
1.0	Initial release	January 16, 2026

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Triad Semiconductor
1760 Jonestown Road
Winston-Salem NC 27103
United States

www.triadsemi.com
info@triadsemi.com
sales@triadsemi.com

phone: (336) 774-2150
fax: (336) 774-2140