HV2802 Analog Switch Evaluation Board User Guide

EV95H30A

Introduction

The HV2802 is a low harmonic distortion, low charge injection, 32-channel high-voltage switch for multiplexers/demultiplexers. It is intended for use in applications requiring high-voltage switching controlled by low-voltage control signals, such as medical ultrasound imaging, driving piezoelectric transducers and printers. When VPP and VNN biased at +100V and -100V, the analog switches can pass up to ±90V high-voltage pulses from SWA to SWB with a typical 18Ω R_{ON} and up to 50 MHz bandwidth for small signals. These switches are also designed to pass high-voltage DC signals to support printer head applications.

The HV2902 version incorporates bleed resistors on both sides of the switches, SW0, SW1... and SW31. The bleed resistor removes potential charge built-up in capacitive loads and in piezoelectric transducers.

The Evaluation Board contains two high-voltage pulsers formed by a pair of MD1822 and TC6320 ICs to evaluate the switch passing characteristics. The pulser can operate up to ±100V voltage swing with 2.5A current capability.

Features

The HV2802 Analog Switch Evaluation Board (EV95H30A) has the following features:

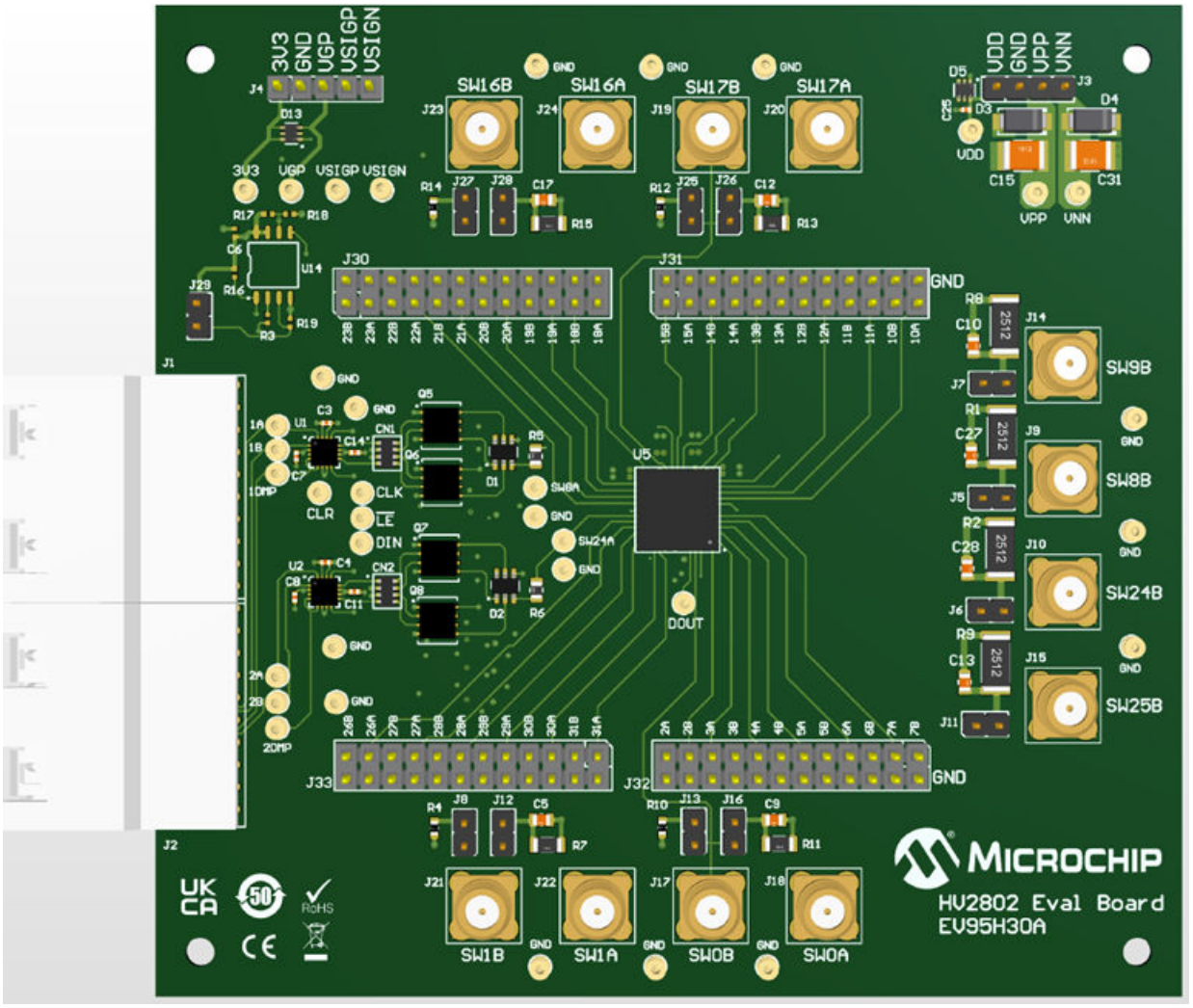
- HV2802 Analog HV Mux
- (2) ±100V 2.5A Pulsers

Kit Contents

The HV2802 Analog Switch Evaluation Board (EV95H30A) kit includes:

- HV2802 Analog Switch Evaluation Board (EV95H30A)

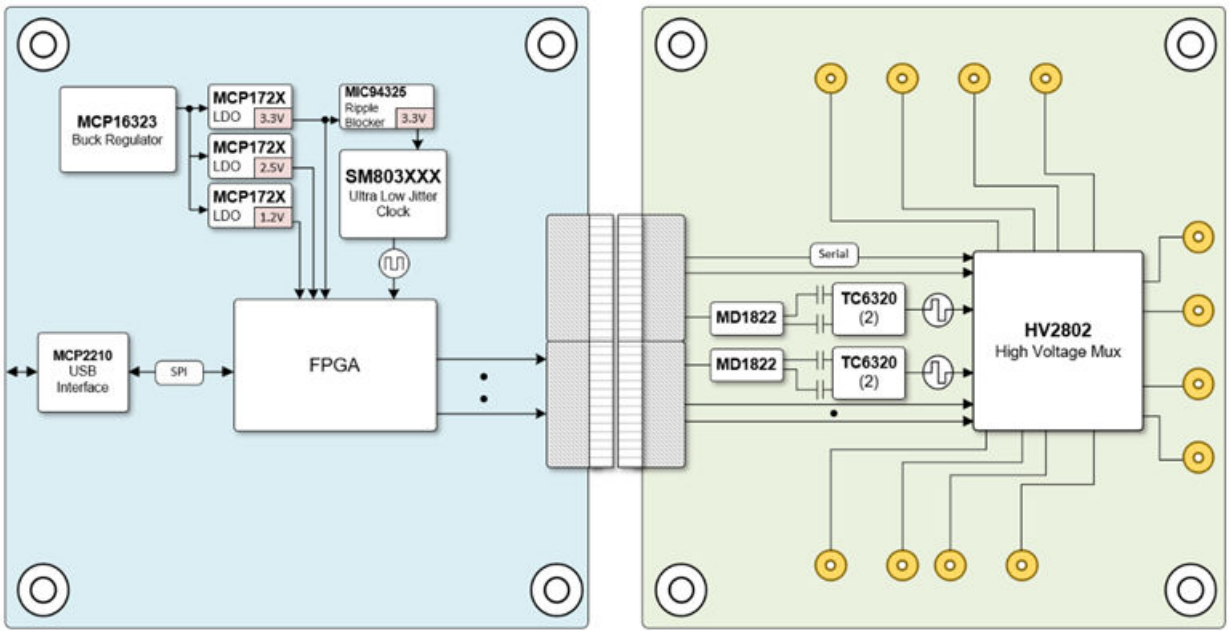
Figure 1. HV2802 Analog Switch Evaluation Board (EV95H30A)



1. Setup and Configuration

The HV2802 Evaluation Board requires the HV Mux Controller Board (EV34G23A) to operate and demonstrate the features of the high voltage Mux. The block diagram in Figure 1-1, illustrates functional setup for the boards with the HV Mux Controller on the left and the HV2802 Evaluation Board on the right. The Mux Controller board requires a PC Graphical User Interface (GUI) to be operational, HVMUX 64CH; this is available on the Microchip website.

Figure 1-1. Block Diagram Setup

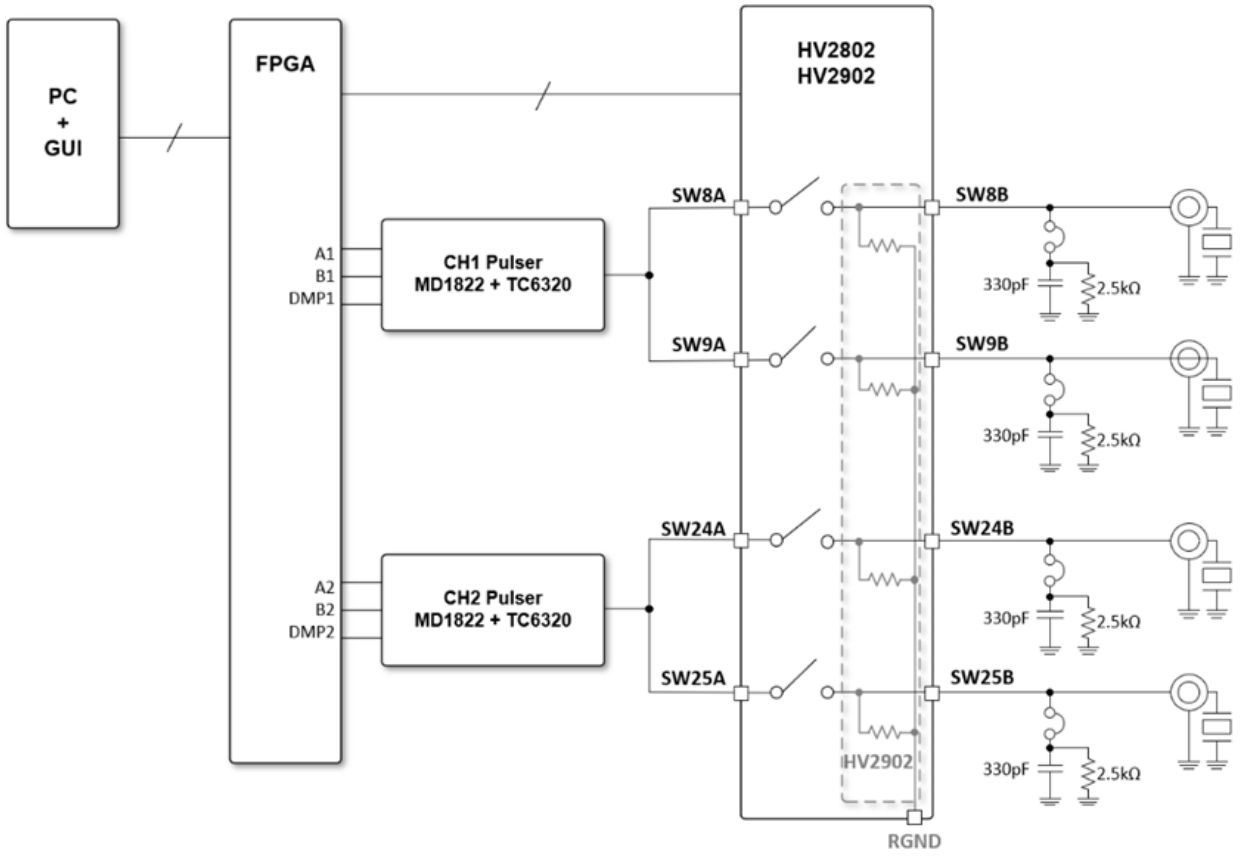


HV Mux Controller Board:

- Windows PC GUI
- Buck Controller MCP16323
- Programmable Ultra-Low Jitter Clock: SM803
- LDO MCP172
- Ripple Blocker MIC94325

Figure 1-2 shows the setup of the HV2802 and HV Mux Controller boards. The CH1 pulser output connects to SW8A and SW9A. CH2 pulser output connects to SW24A and SW25A. If the SMA connectors are not connected to transducers, the jumpers for the loads with 330 pF paralleled with 2.5 kΩ are required to be shorted to avoid CH1 and CH2 pulsers to drive under the no-load condition. The ON/OFF for the SW8, SW9, SW24 and SW25 can be controlled by the GUI, individually based on the application.

Figure 1-2. HV2802 Boards Setup Simplified Block Diagram



1.1. Graphical User Interface Installation

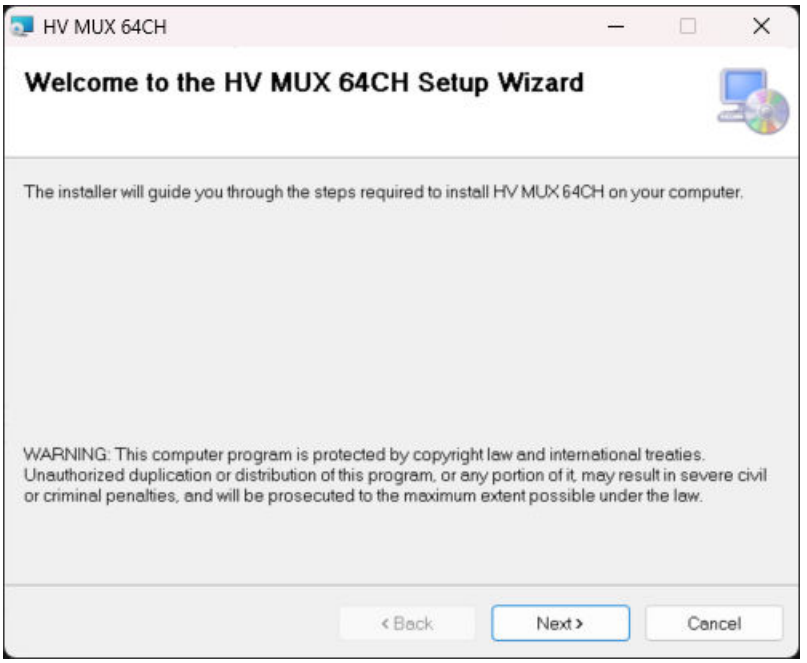
The installation setup can be found at www.microchip.com and searching for HV MUX Controller Board GUI Installer 64CH.

The following steps describe the installation:

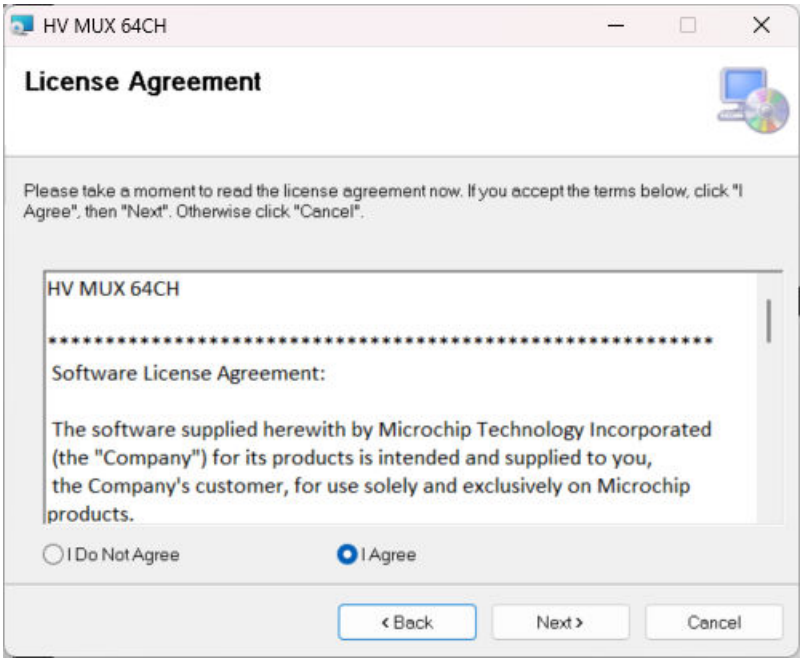
1. Locate **HV MUX Controller Board GUI Installer 64CH**, click **Download** and launch the HV MUX 64CH Installer Program.

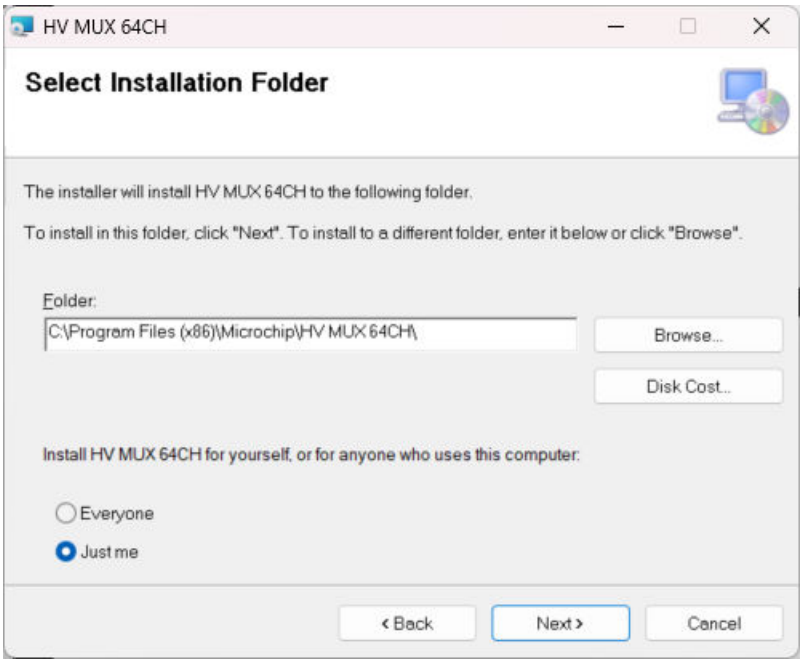
2. Follow the installation instructions in the HV MUX 64CH Setup Wizard.

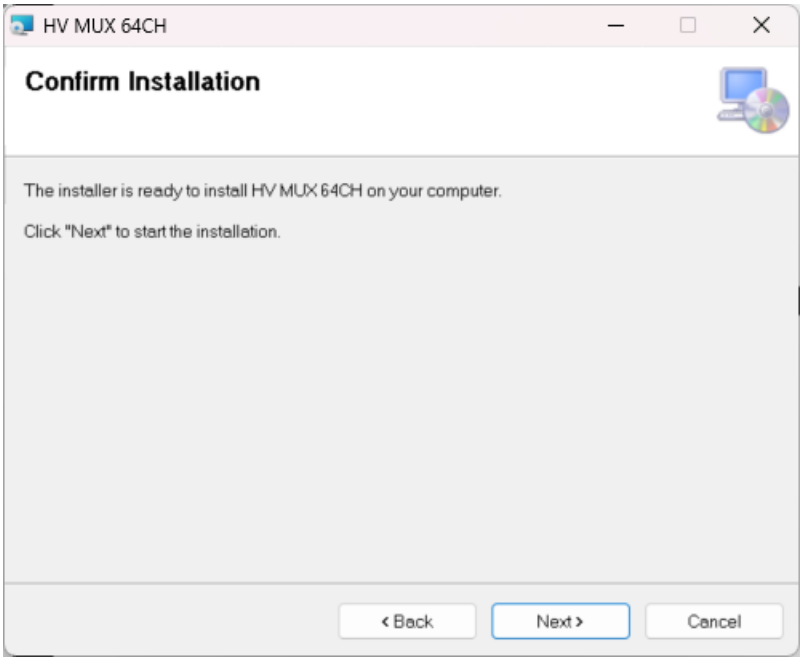
3. Click **Next** on the License Agreement.

4. Select the location for the installation folder and click **Next**.



5. Click **Next** to finalize the installation.



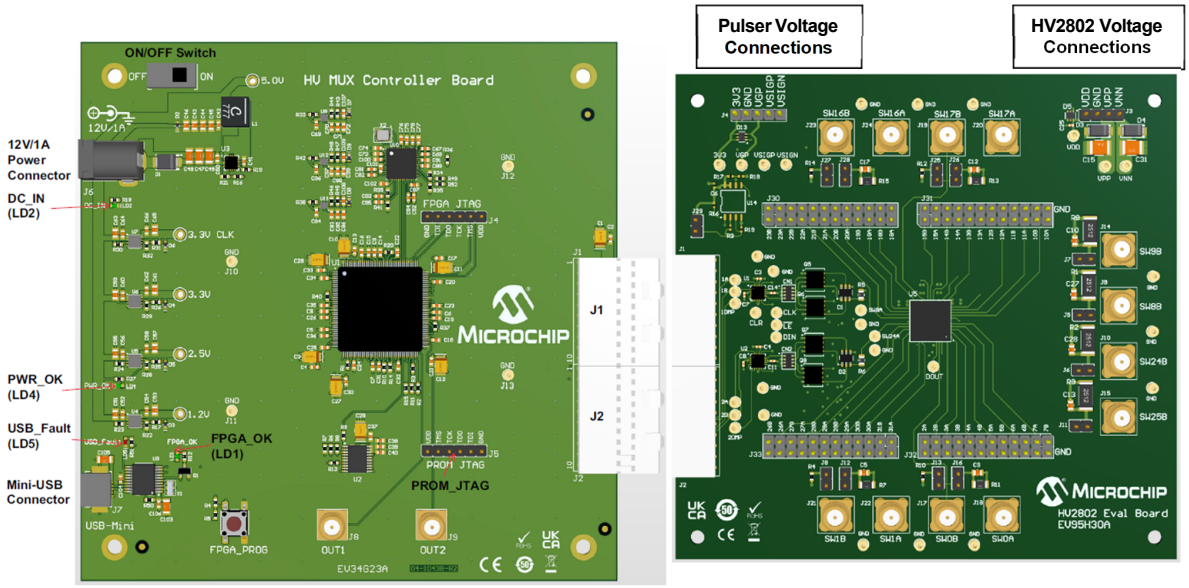
6. The installed program appears in the Windows Start menu as **HV MUX 64CH**.

1.2. Set-up and Voltage Settings

This section describes how to connect the HV Mux Controller Board and the HV2802 Evaluation Board.

1. Connect 12/1A power Adaptor to HV Mux Controller Board.

Figure 1-3. Boards Setup



2. Connect a USB-Mini to USB A on a PC.
3. Set up the desired voltages for the HV2802 and the Pulsers as shown in Table 1-1.
   Note: Follow the **Power-Up Sequence** when setting up the voltages.

Power-Up Sequence

1. Turn on HV Mux Controller
2. 3V3
3. VDD
4. VGP
5. VPP/VNN
6. VSIGP/VSIGN

Note: The **Power-Down Sequence** is simply the reverse order of the **Power-Up Sequence**.

Table 1-1. Power Supply Voltages and Current-Limit Settings

Terminal	Rail Name	Voltage	Current Limit (Note 1)
J3	V_{DD}	+5V	+20 mA
	GND	0V	—
	V_{PP}	Up to +100V	+20 mA
	V_{NN}	Down to -100V	-20 mA
J4	3V3	+3.3V	+150 mA
	GND	0V	—
	V_{GP} (Note 2)	+5V to +11.5V	+20 mA
	VSIGP	Up to V_{PP} - 10V	+20 mA
	VSIGN	Down to V_{NN} + 10V	+20 mA

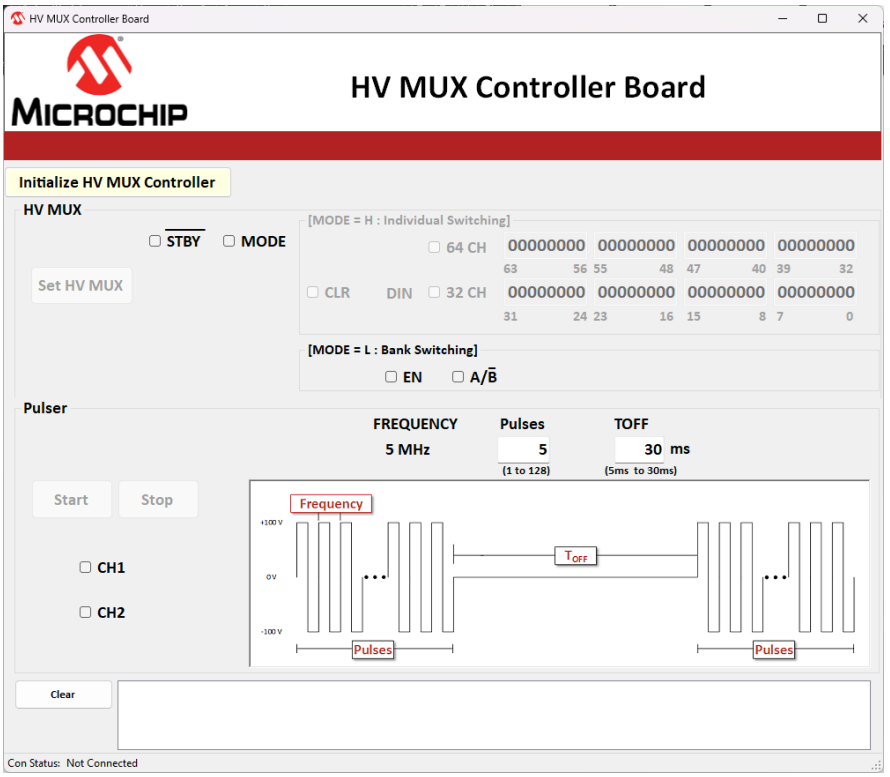
Notes:

1. Current limit settings on power supply are suggested but not required.
2. Adjusting VGP can change the slope of pulsers generated by MD1822 and TC6320.

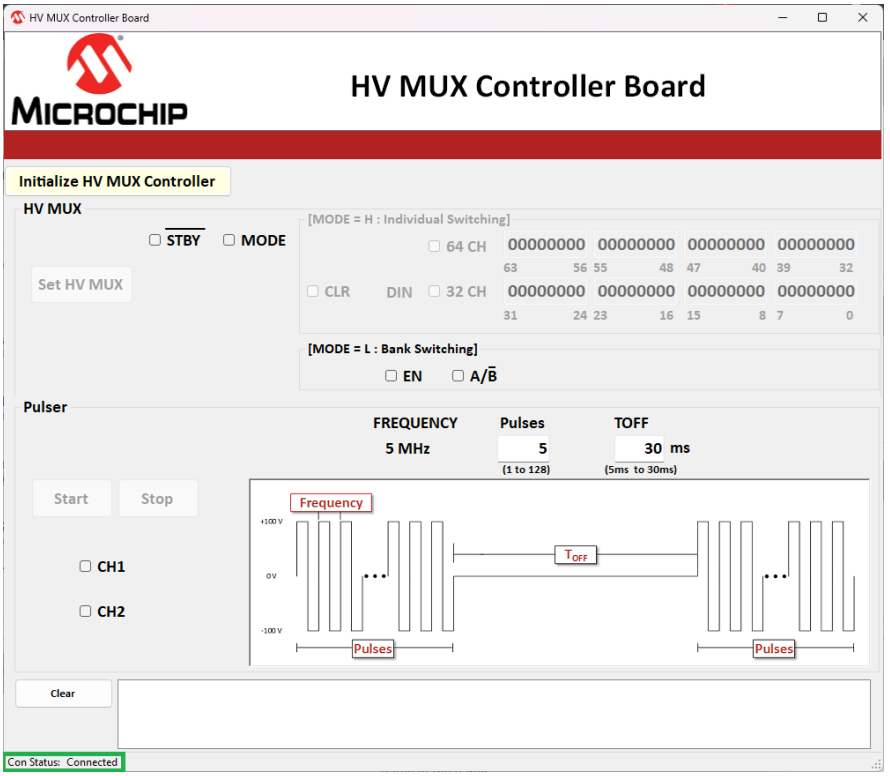
2. Graphical User Interface Operation

The Graphical User Interface (GUI) serves as the primary point of interaction between users and the system. This section provides an overview of GUI operation, in regards to Modes, channels and other settings.

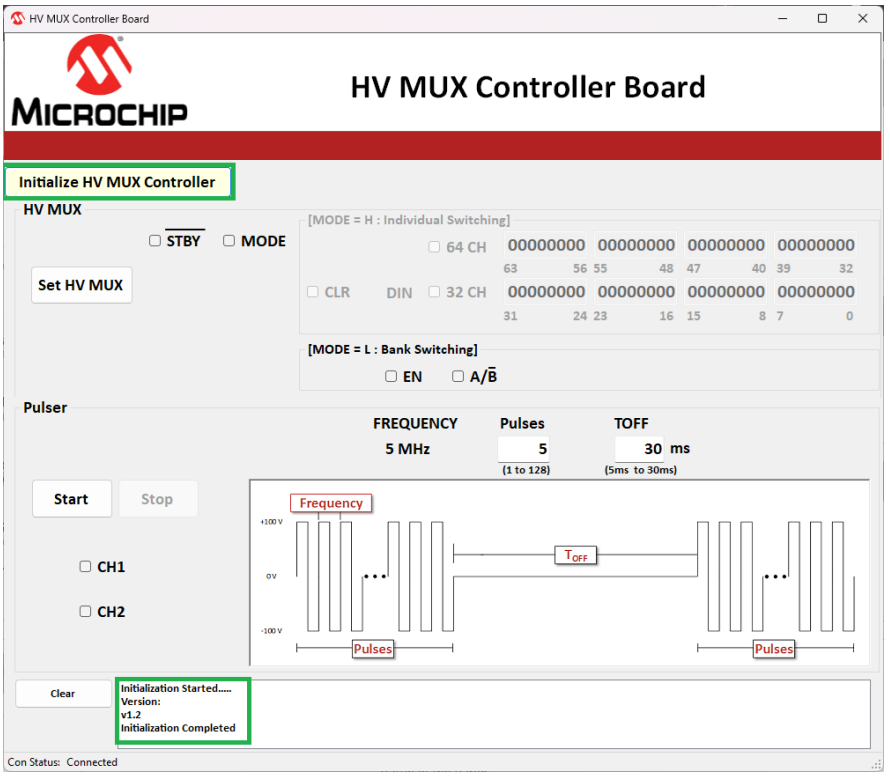
1. Once the boards are properly connected and powered, launch the HV MUX 64CH Application.



2. The HV Mux Board will be detected by the GUI.

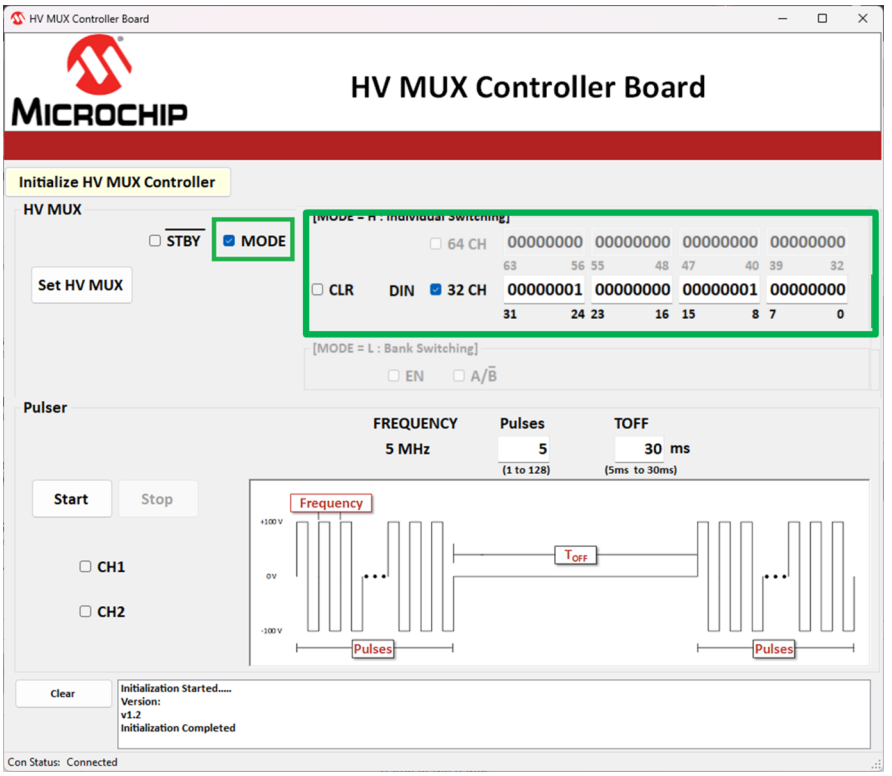


3. Click the **Initialize HV MUX Controller** button to establish the communication connection between the GUI and HV MUX Controller Board.

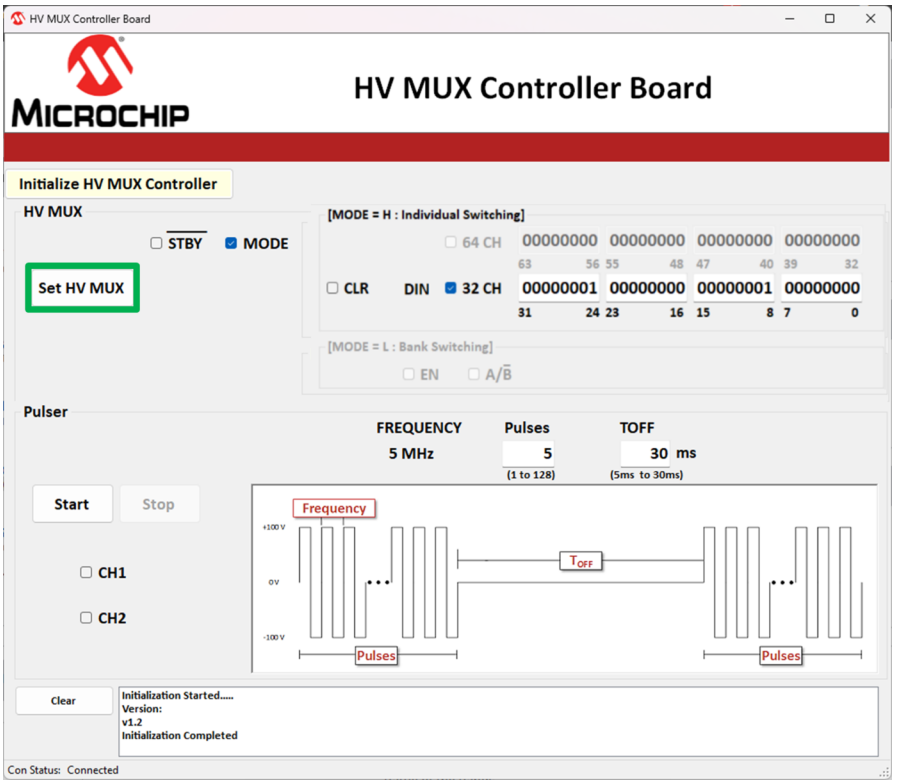


4. Select **MODE** and **DIN 32 CH** checkboxes.

5. Under the 32 CH section, select the channels to be turned on (= 1) or turned off (= 0).



6. Select **Set HV MUX** to turn on/off the selected channels.

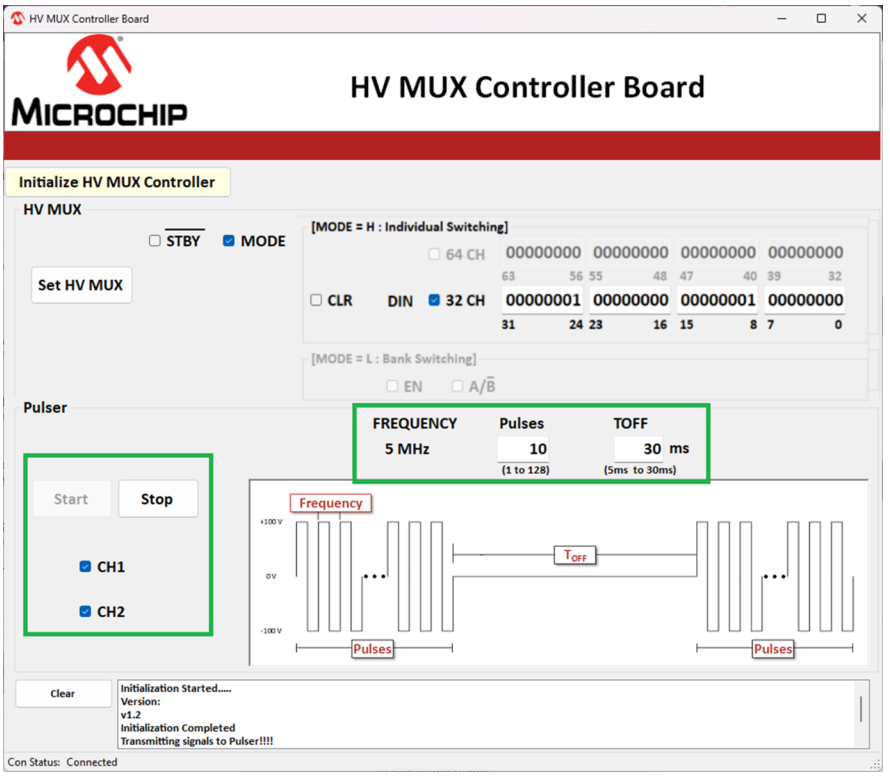


7. To start the HV Pulsers, select the **CH1** and/or **CH2** pulsers.
   - Pulser (CH1) is connected to SW8A and SW9A
   - Pulser (CH2) is connected to SW24A and SW25A

Refer to the HV2802 schematic for more information.

8. Enter the number of Pulses and the Time Off in milliseconds.
9. Select **START** to start the transmission (this is continuous).
   - Probe on TP8 and TP16 for pulser outputs.

   Refer to the HV2802 schematic for more information.
10. Select **STOP** to end the pulse transmission.

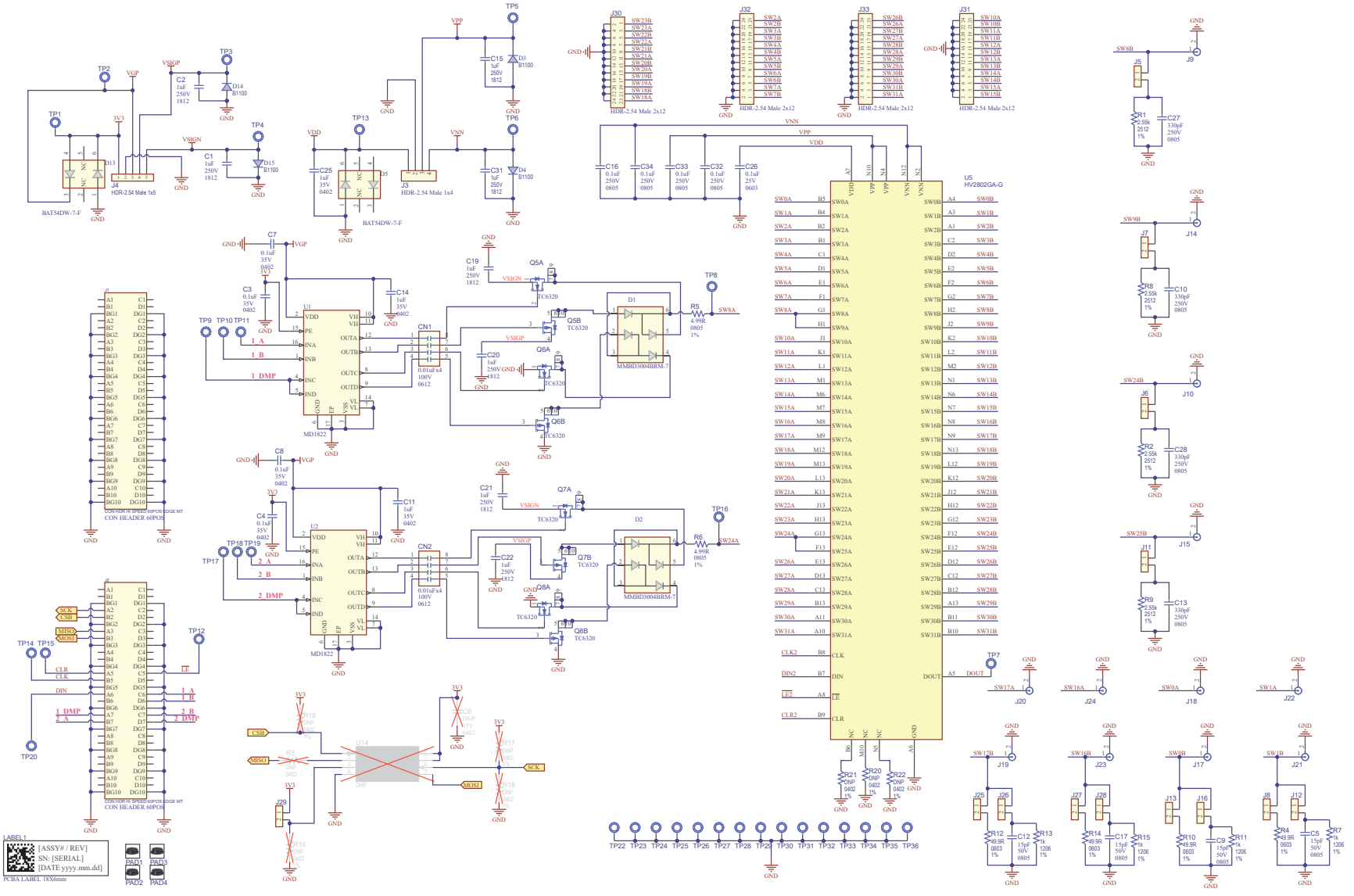


3. Board Design

This section contains the following schematic and layouts for the HV2802 Analog Switch Evaluation Board (EV95H30A):

- Board - Schematic
- Board - Top Silk
- Board - Top Copper and Silk
- Board - Top Copper
- Board - Mid Layer 1
- Board - Mid Layer 2
- Board - Mid Layer 3
- Board - Mid Layer 4
- Board - Bottom Copper
- Board - Bottom Copper and Silk
- Board - Bottom Silk

3.1. Schematic



3.2. Layouts

Figure 3-1. Top Silk

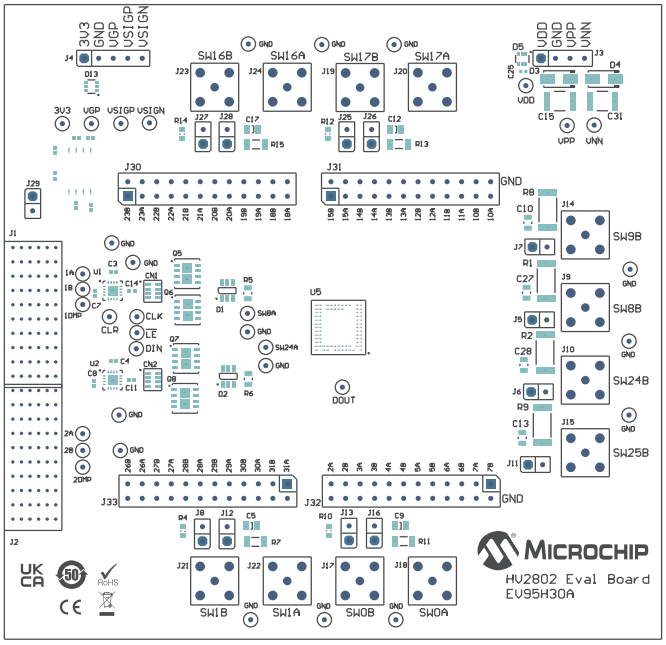


Figure 3-2. Top Copper and Silk

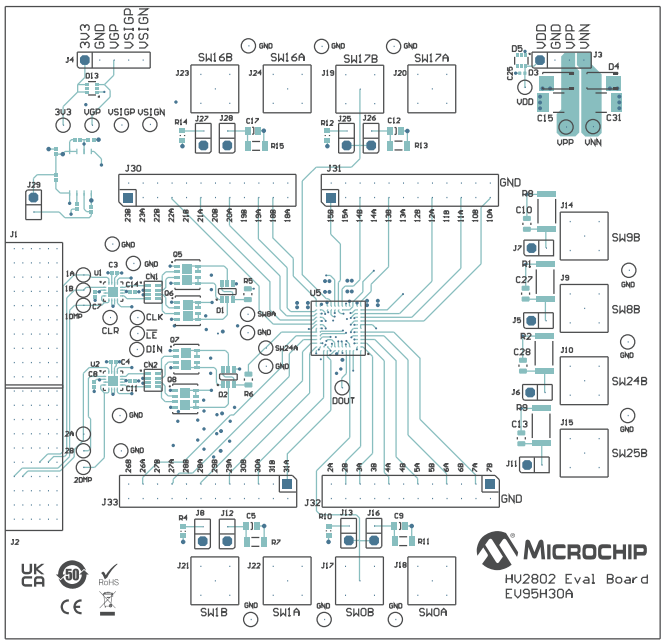


Figure 3-3. Top Copper

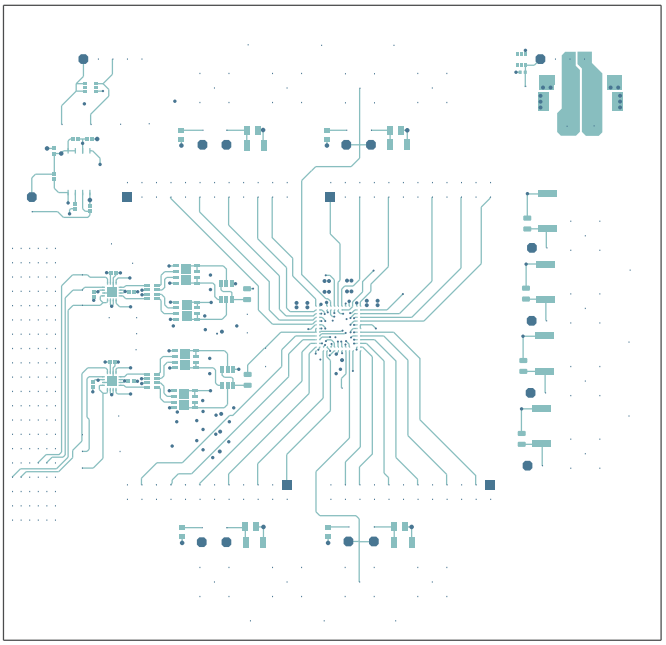


Figure 3-4. Mid Layer 1

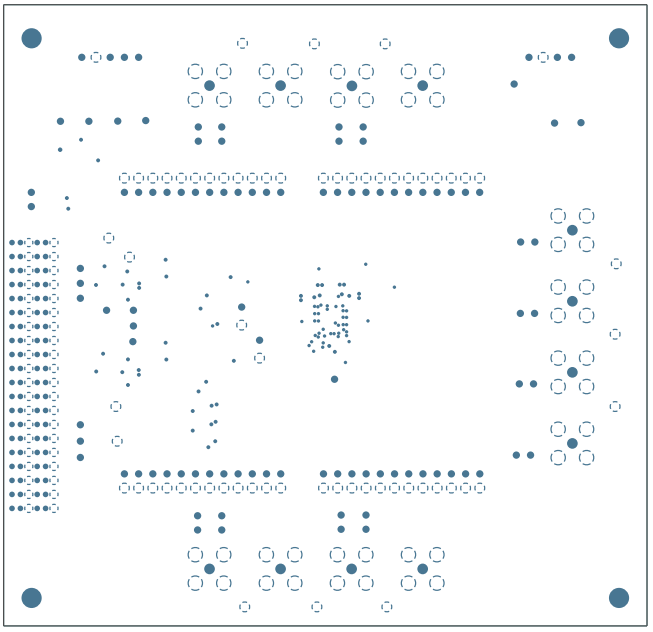


Figure 3-5. Mid Layer 2

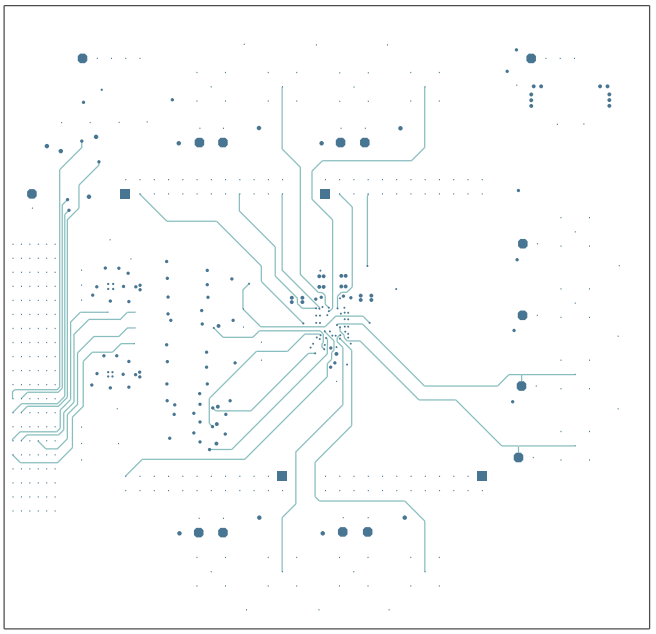


Figure 3-6. Mid Layer 3

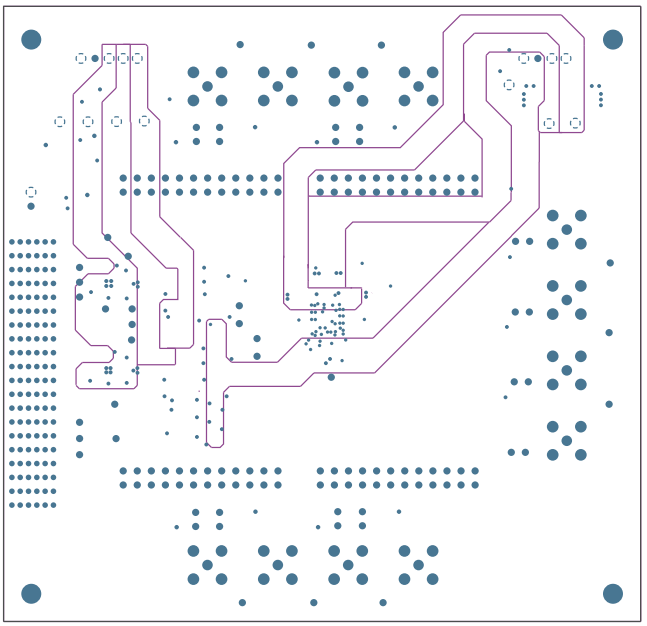


Figure 3-7. Mid Layer 4

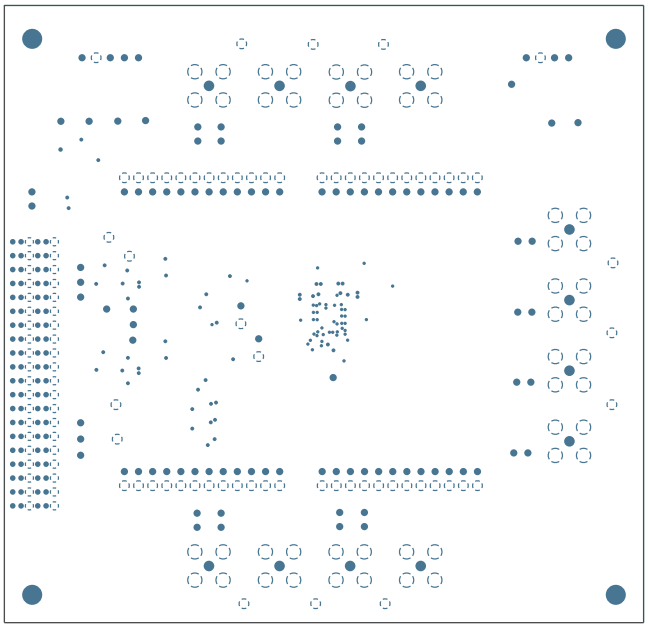


Figure 3-8. Bottom Copper

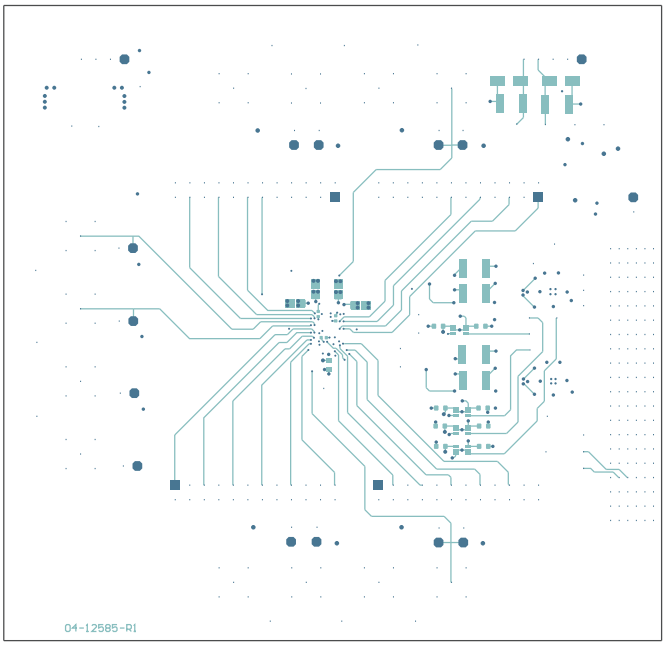


Figure 3-9. Bottom Copper and Silk

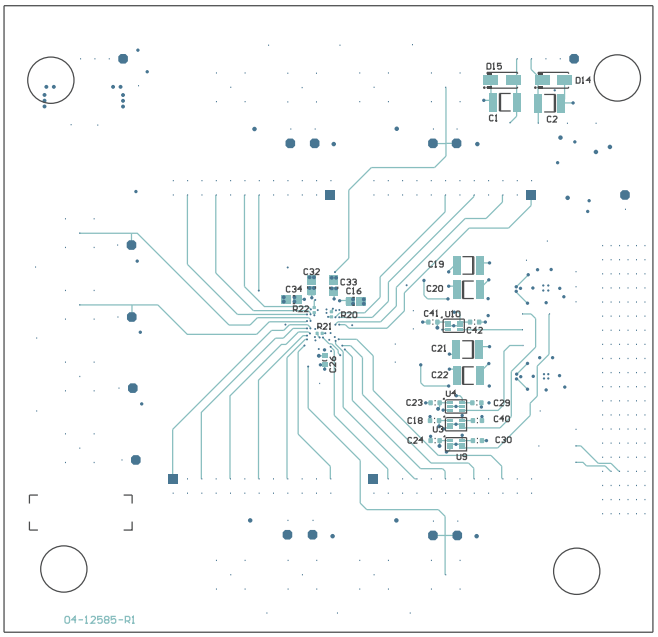
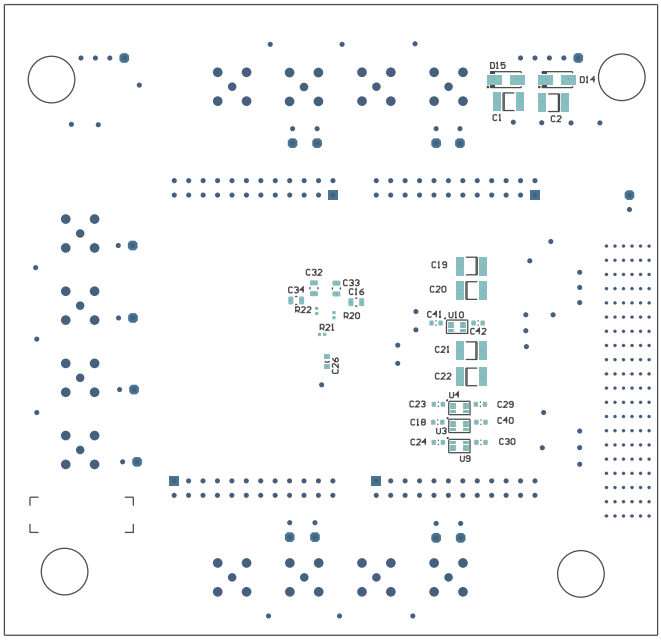


Figure 3-10. Bottom Silk



4. Bill of Materials (BOM)

Table 4-1. Bill of Materials (BOM)

Qty	Reference	Description	Manufacturer	Part Number
8	C1, C2, C15, C19, C20, C21, C22, C31	Capacitor, Ceramic, 1 µF, 250V, 20%, X7T, SMD, 1812	TDK Corporation	C4532X7T2E105M250KA
4	C3, C4, C7, C8	Capacitor, Ceramic, 0.1 µF, 35V, 10%, X7R, SMD, 0402	TDK Corporation	CGA2B3X7R1V104K050BB
4	C5, C9, C12, C17	Capacitor, Ceramic, 15 pF, 50V, 5%, C0G, SMD, 0805	AVX Corporation	08055A150JAT2A
4	C10, C13, C27, C28	Capacitor, Ceramic, 330 pF, 250V, 5%, C0G/NP0. SMD, 0805	Murata Electronics®	GRM21A5C2E331JW01D
3	C11, C14, C25	Capacitor, Ceramic, 1 µF, 35V, 10%, X5R, SMD, 0402	Murata Electronics®	GRM155R6YA105KE11D
4	C16, C32, C33, C34	Capacitor, Ceramic, 0.1 µF, 250V, 10%, X7T, SMD, 0805	TDK Corporation	C2012X7T2E104K125AA
9	C18, C23, C24, C26, C29, C30, C40, C41, C42	Capacitor, Ceramic, 0.1 µF, 25V, 20%, X7R, SMD. 0603	KEMET	C0603C104M3RACTU
2	CN1, CN2	Capacitor, Array, 0.01 µFx4, 100V, 20%, X7R, SMD, 0612	Kyocera AVX	W3A41C103MAT2A
2	D1, D2	Diode, Rectifier, Array, 1V, 225 mA, 350V, SMD, SOT-23-6	Diodes Incorporated®	MMBD3004BRM-7-F
4	D3, D4, D14, D15	Diode, Schottky, B1100, 790 mV, 1A, 100V, DO-214AC_SMA	Diodes Incorporated®	B1100-13-F
2	D5, D13	Diode, Schottky, Array, 1V, 200 mA, 30V, SMD, SOT363	Diodes Incorporated®	BAT54DW-7-F
2	J1, J2	Connector, HDR-0.098, Male, 4x10+20GND Press-Fit, Through Hole, Right Angle	TE Connectivity	6469169-1
1	J3	Connector, HDR-2.54, Male, 1x4, Gold, 5.84 MH, Through Hole, Vertical	Samtec, Inc.	TSW-104-07-G-S
1	J4	Connector, HDR-2.54, Male, 1x5, Gold, 5.84 MH, Through Hole, Vertical	Samtec, Inc.	TSW-105-07-S-S
12	J5, J6, J7, J8, J11, J12, J13, J16, J25, J26, J27, J28	Connector, HDR-2.54, Male, 1x2, Gold, 5.84 MH, Through Hole, Vertical	Amphenol FCI	77311-118-02LF
12	J9, J10, J14, J15, J17, J18, J19, J20, J21, J22, J23, J24	Connector, RF, Coaxial, SMA, Female 2P, Through Hole, Vertical	Adam Technologies Inc.	RF2-04A-T-00-50-G
4	J30, J31, J32, J33	Connector, HDR-2.54, Male, 2x12, Gold, 5.84 MH, Through Hole, Vertical	Samtec, Inc.	TSW-112-07-G-D
4	R1, R2, R8, R9	Resistor, Thick Film, 2.55k, 1%, 1W, SMD, 2512	Digikey	PT2.55KAFCT-ND
4	R4, R10, R12, R14	Resistor, Thick Film, 49.9R, 1%, 1/4W, SMD, 0603	Vishay/Dale	CRCW060349R9FKEAHP
2	R5, R6	Resistor, Thick Film, 4.99R, 1%, 1/2W, SMD, 0805, AEC-Q200	Vishay/Dale	CRCW08054R99FKEAHP
4	R7, R11, R13, R15	Resistor, Thick Film, 1k, 1%, 1/4W, SMD, 1206	Yageo Corporation	RC1206FR-071KL

Table 4-1. Bill of Materials (BOM) (continued)

Qty	Reference	Description	Manufacturer	Part Number
35	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP36	Connector, Test Point, PAD, PCB, 1.5x0.9, Through Hole, AU	Mill-Max Mfg. Corporation	3132-0-00-15-00-00-08-0
4	U3, U4, U9, U10	IC Special Voltage Level Translator Bidirectional, SC70-6	Texas Instruments	SN74LVC1T45MDCKREP
1	PCB1	Printed Circuit Board	Microchip Technology Inc.	04-12585-R1
1	PCBA1	PCB Assembly	Microchip Technology Inc.	02-01542-R1

Table 4-2. Microchip Parts

Qty	Reference	Description	Manufacturer	Part Number
4	Q5, Q6, Q7, Q8	Analog, MOSFET, Dual, P-N-CH, 200V, 2A, DFN-8	Microchip Technology Inc.	TC6320K6-G
2	U1, U2	Analog, FET Driver, Quad-Two Inverting-Two Non Inverting 16-Lead QFN	Microchip Technology Inc.	MD1822K6-G
1	U5	Analog, Switch, HV, 200V, VFBGA-78	Microchip Technology Inc.	HV2802GA-G

Table 4-3. Mechanical Parts

Qty	Reference	Description	Manufacturer	Part Number
1	LABEL1	Label, PCBA, 18x6mm, Datamatrix Assy# / Rev / Serial / Date	ACT Logimark AS	505462
4	PAD1, PAD2, PAD3, PAD4	Mechanical HW, Rubber PAD, Cylindrical, D7.9, H5.3, Black	3M	SJ61A11

Table 4-4. Do Not Populate Parts

Qty	Reference	Description	Manufacturer	Part Number
0	C6	Capacitor, Ceramic, 0.1 µF, 35V, 10%, X7R, SMD, 0402	TDK Corporation	CGA2B3X7R1V104K050BB
1	J29	Connector, HDR-2.54, Male, 1x2, Gold, 5.84, MH, Through Hole, Vertical	FCI	77311-118-02LF
0	R3	Resistor, Thick Film, 0R 1/16W, SMD, 0402	Yageo Corporation	RC0402JR-070RL
0	R16, R19	Resistor, Thick Film, 4.7K, 1%, 1/10W, 0402	KOA Speer Electronics, Inc.	RK73H1ETTP4701F
0	R17, R18	Resistor, Thick Film,100R, 1%, 1/10W, SMD, 0402	Panasonic® - ECG	ERJ-2RKF1000X
3	R20, R21, R22	Resistor, Thick Film, 100R, 1%, 1/10W, SMD 0402	Panasonic® - ECG	ERJ-2RKF1000X
0	U14	Memory, Serial, Flash, 16M, 104 MHz, SOIJ-8	Micron Technology	SST26VF016B-104I/SM

5. Performance

Performance metrics represent quantitative measures used to assess the efficiency, power and effectiveness of a system. They provide objective data that help evaluate how well the system meets its intended goals and identify areas for improvement.

Figure 5-1. Pulser: CH1 & CH2 ±50V. HV2802: Loads Connected; SW8B & SW24B are turned on.

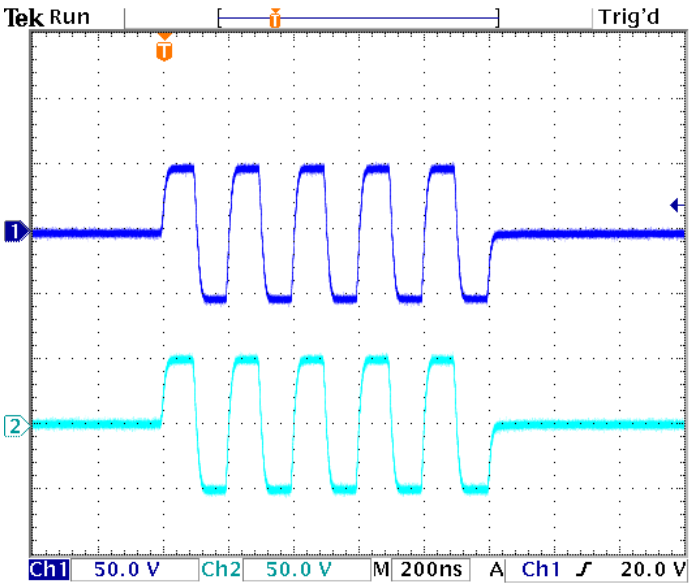
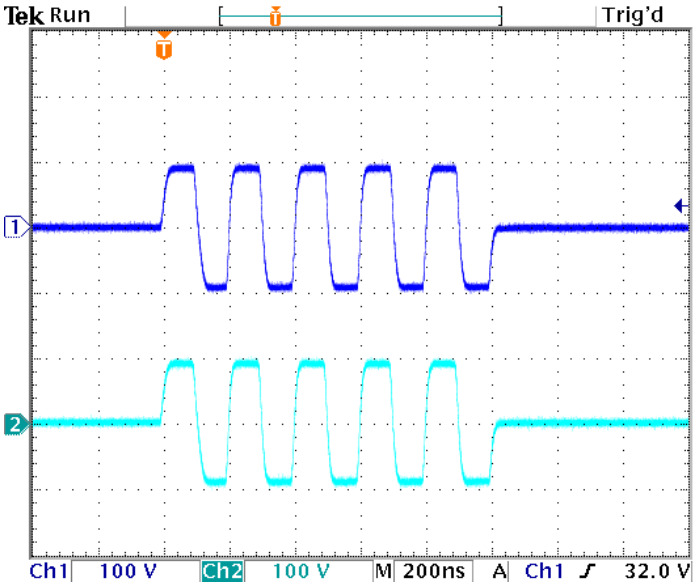


Figure 5-2. Pulser: CH1 & CH2 ±90V. HV2802: Loads Connected; SW8B & SW24B are turned on.



6. References

Table 6-1. Recommended Reading

Source	Document Title	Literature Number	Available
Microchip Technology, Inc.	HV2802 Data Sheet	DS20005449	Low Harmonic Distortion, 32-Channel SPST, High-Voltage Analog Switch
Microchip Technology, Inc.	HV Mux Controller Board		HV Mux Controller Board
Microchip Technology, Inc.	HV MUX 64CH	N/A	Search for HV MUX 64CH on www.microchip.com and download first option.

7. Revision History

Doc. Rev.	Date	Comments
A	02/2026	Initial release of this document.

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