HV2901 Analog Switch Evaluation Board User Guide

EV66J35A

Introduction

The HV2801/HV2901 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 HV2901 version incorporates bleed resistors on the 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 HV2901 Analog Switch Evaluation Board (EV66J35A) has the following features:

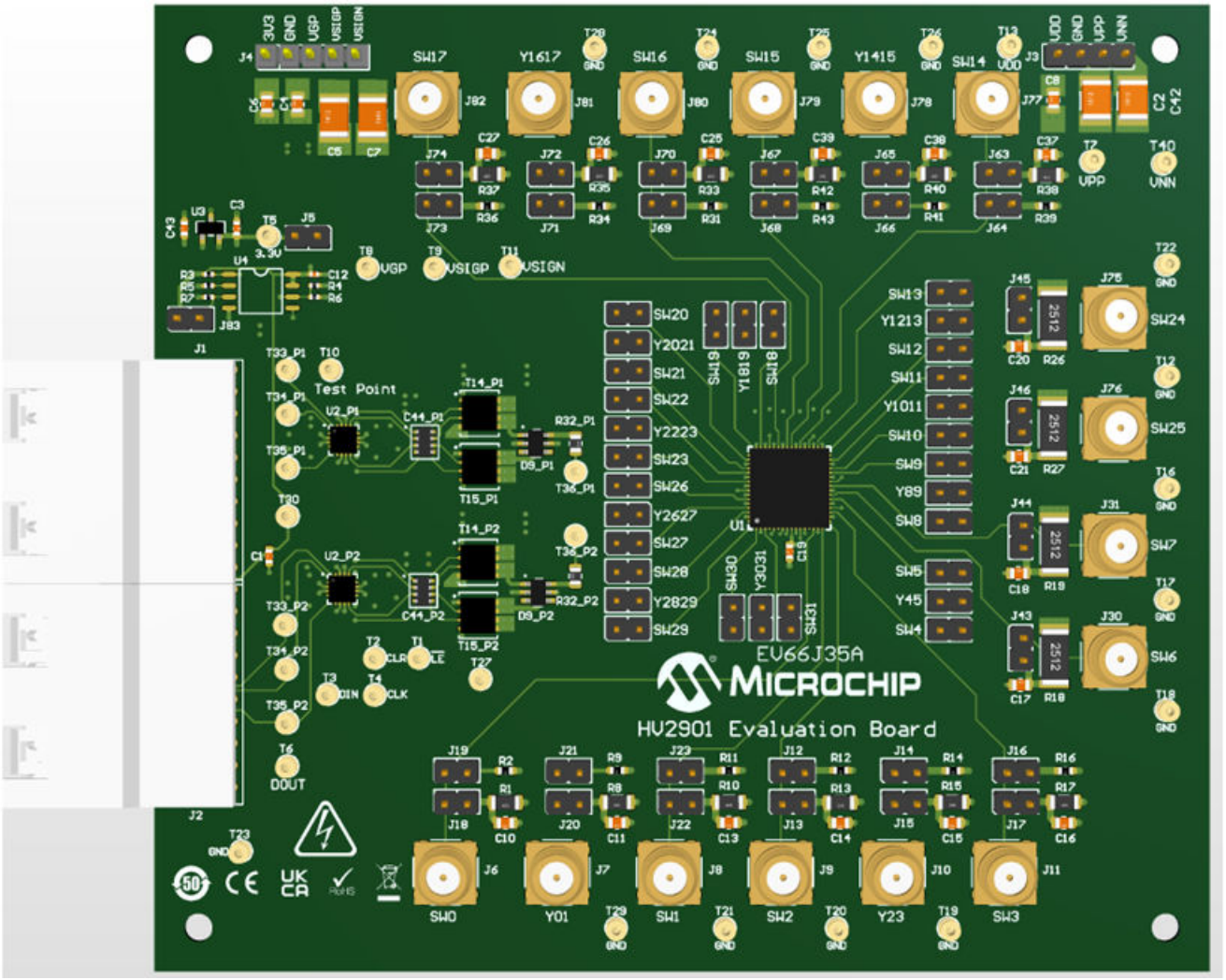
- HV2901 Analog HV Mux
- (2) ±100V 2.5A Pulsers

Kit Contents

The HV2901 Analog Switch Evaluation Board (EV66J35A) kit includes:

- HV2901 Analog Switch Evaluation Board (EV66J35A)

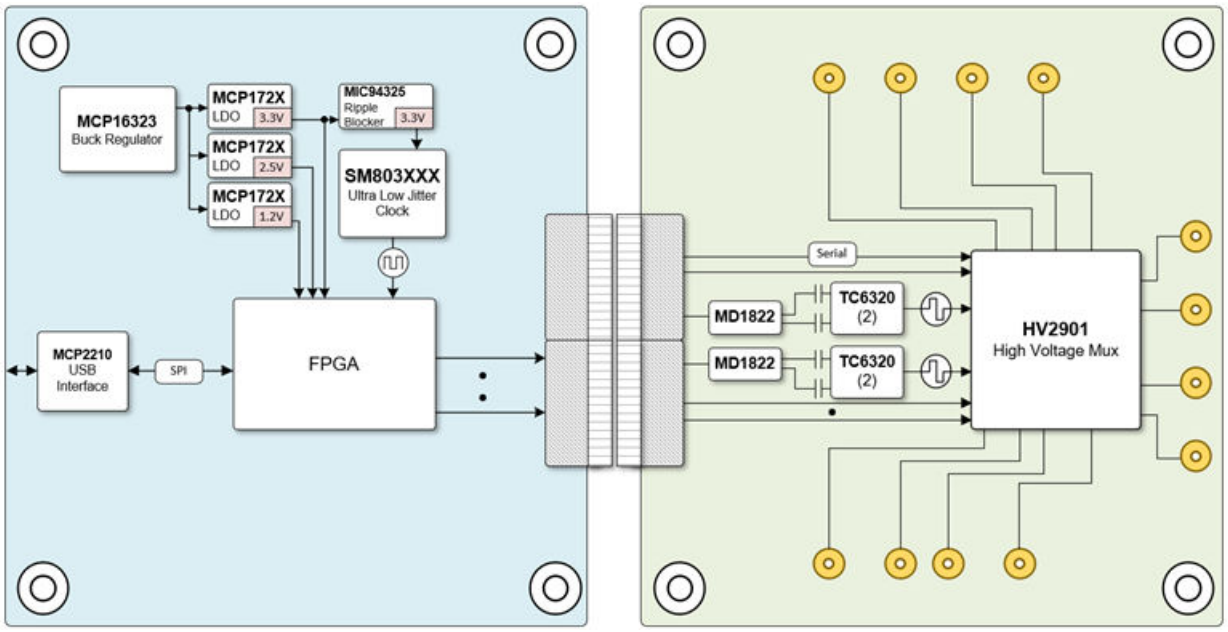
Figure 1. HV2901 Analog Switch Evaluation Board (EV66J35A)



1. Setup and Configuration

The HV2901 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 HV2901 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

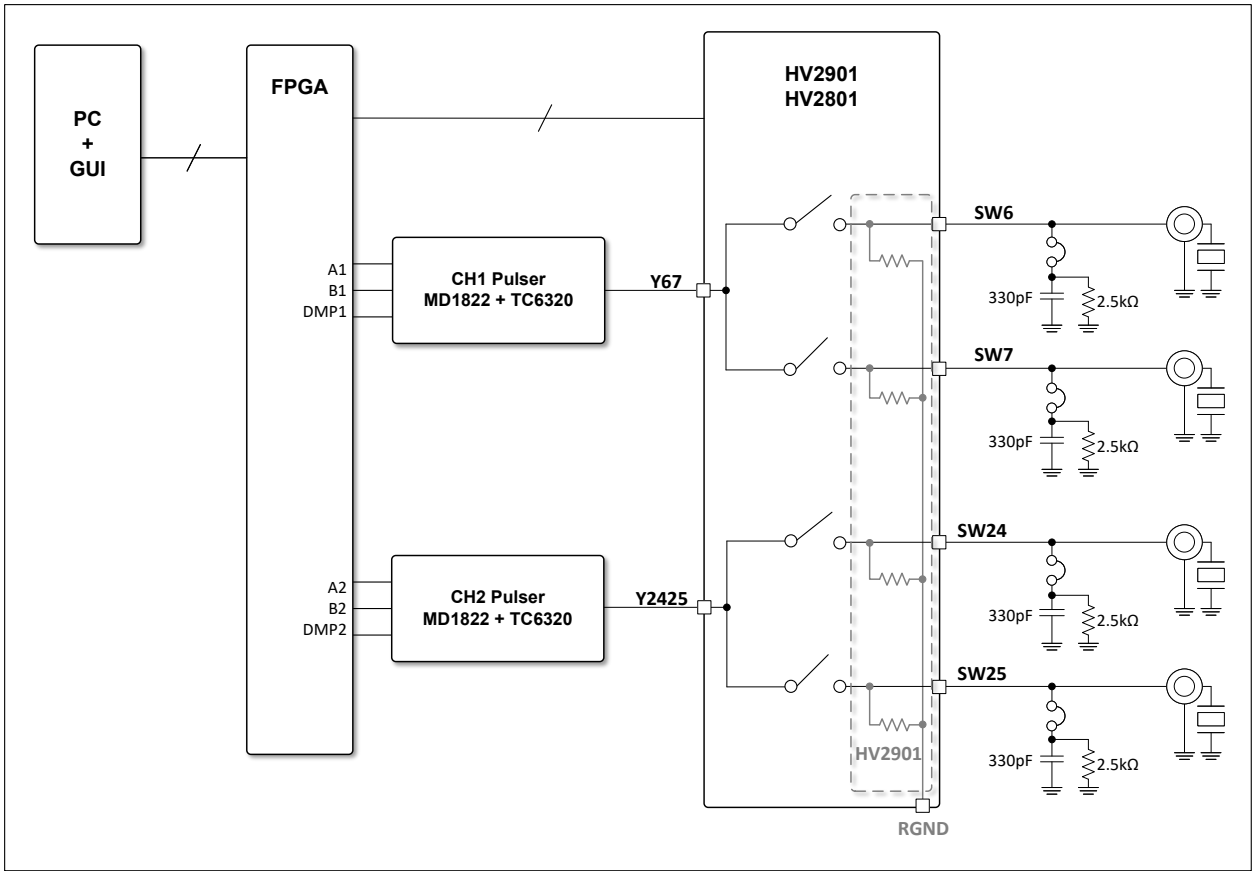


HV Mux Controller Board:

- 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 HV2901 and HV Mux Controller boards. HV2801 can be operated on the HV2901 Evaluation Board with removing two 0Ω resistors connected to Pin 36 and Pin 45 on the board. The CH1 pulser output connects to Y67. CH2 pulser output connects to Y2425. 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 SW6, SW7, SW24 and SW25 can be controlled by the GUI, individually based on the application.

Figure 1-2. HV2901 Board Setup Simplified Block Diagram



1.1. Graphical User Interface Installation

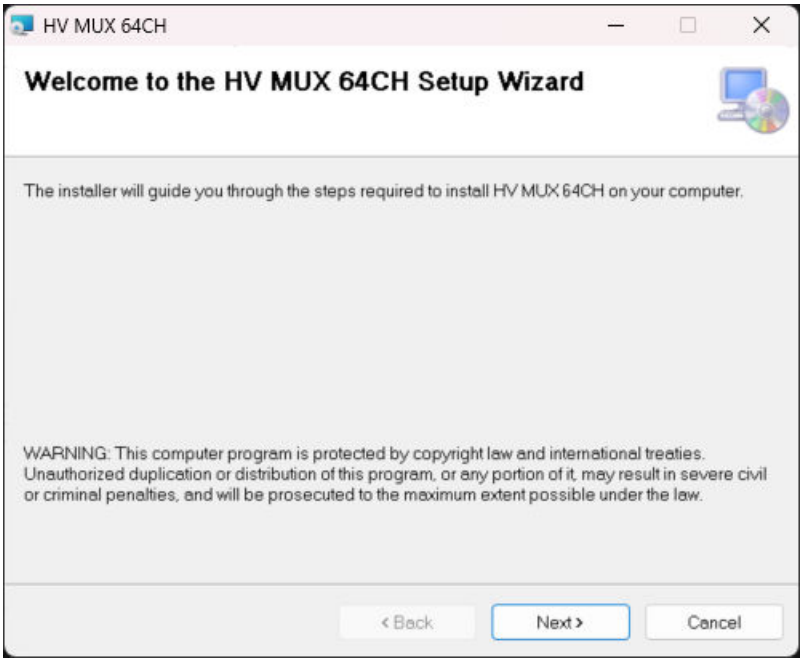
The installation setup can be found at www.microchip.com and searching for HV MUX 64CH.

The following steps describe the installation:

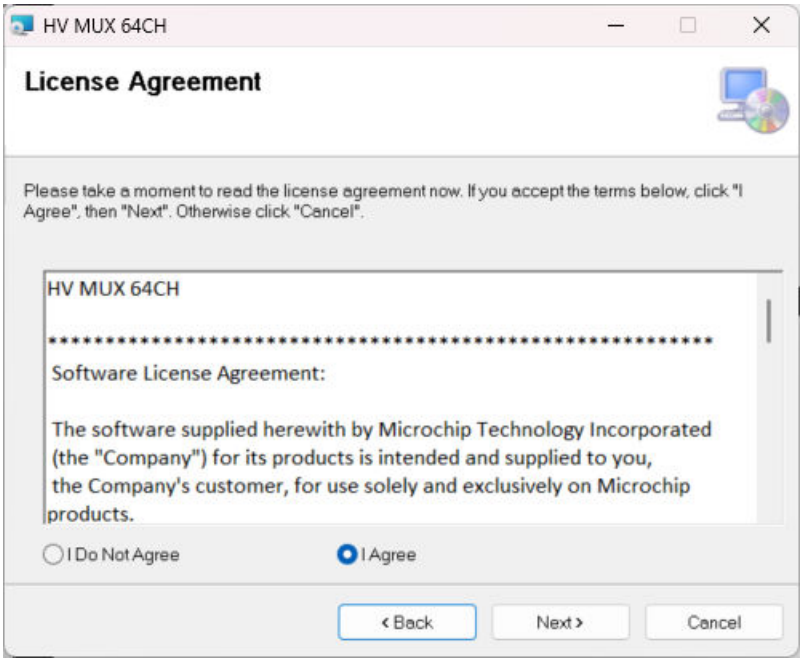
1. Click on the **HV MUX Controller Board GUI Installer 64CH** link to download the installer program.
2. Launch the HV MUX 64CH Installer Program.

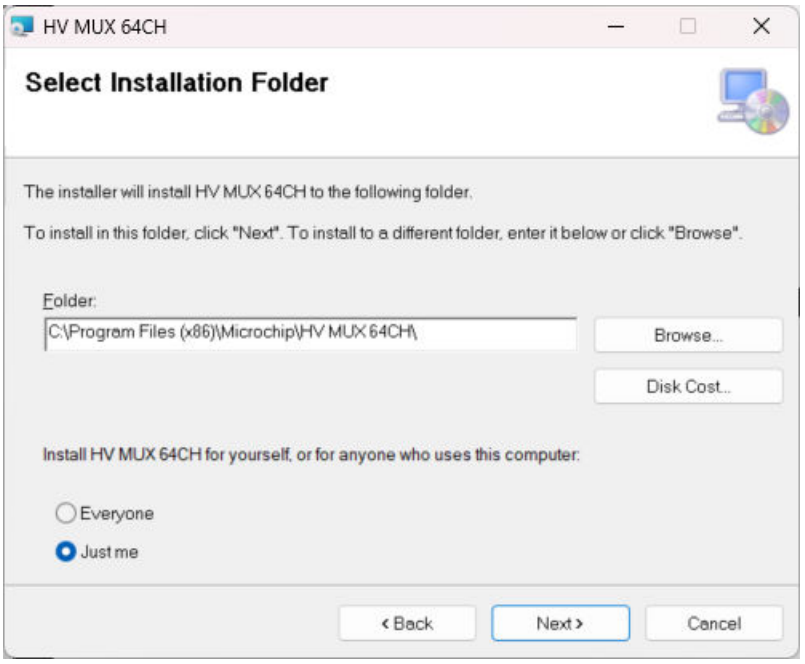
3. Follow the installation instructions for the HV MUX 64CH setup wizard.



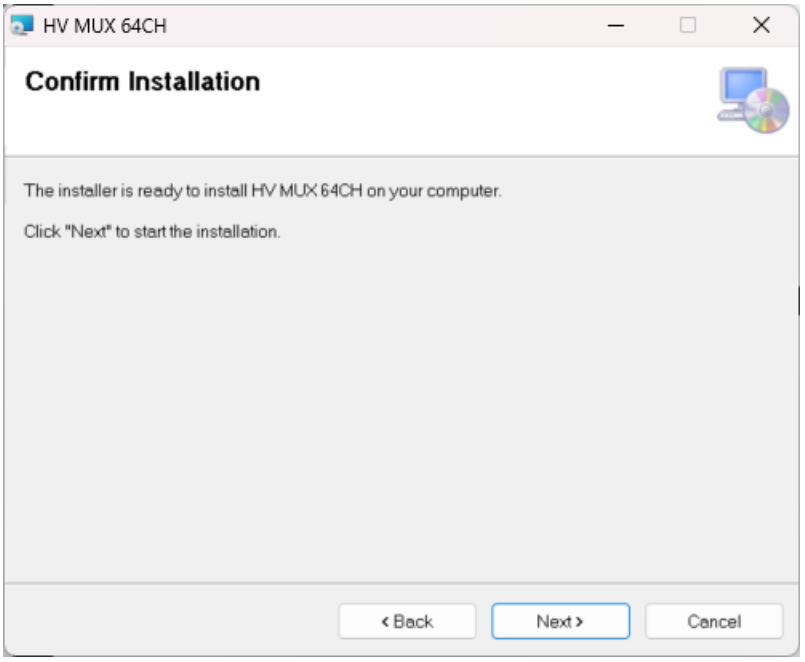
4. Agree to the License Agreement.



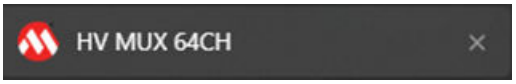
5. Select the location for the installation.



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



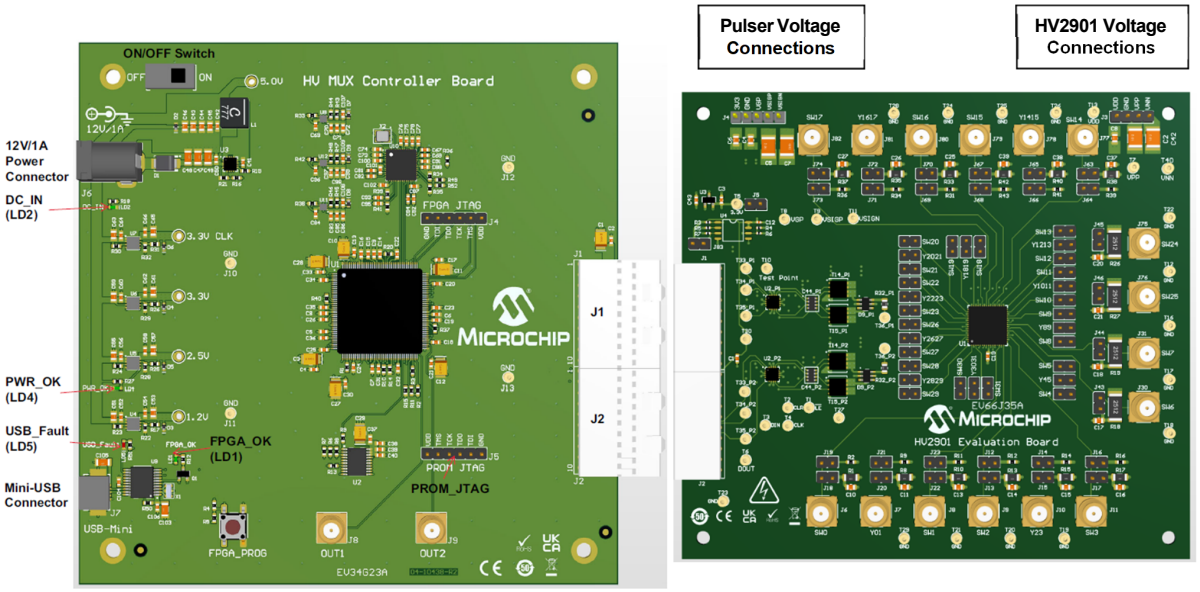
7. The installed program will appear in the Windows Start menu as **HV MUX 64CH**.



1.2. Set-up and Voltage Settings

1. Complete the following steps (shown below) to connect the HV Mux Controller Board and the HV2901 Evaluation Board.

Figure 1-3. Boards Setup



2. Connect 12/1A power Adaptor to HV Mux Controller Board.
3. Connect a USB-Mini to USB A on a PC.
4. Set up the desired voltages for the HV2901 and the Pulsers as shown in HV2901 Recommended Voltage Settings.
   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: To complete the **Power-Down Sequence** simply reverse the order of the Power-Up Sequence.

Table 1-1. HV2901 Evaluation Board Recommended Voltage Settings

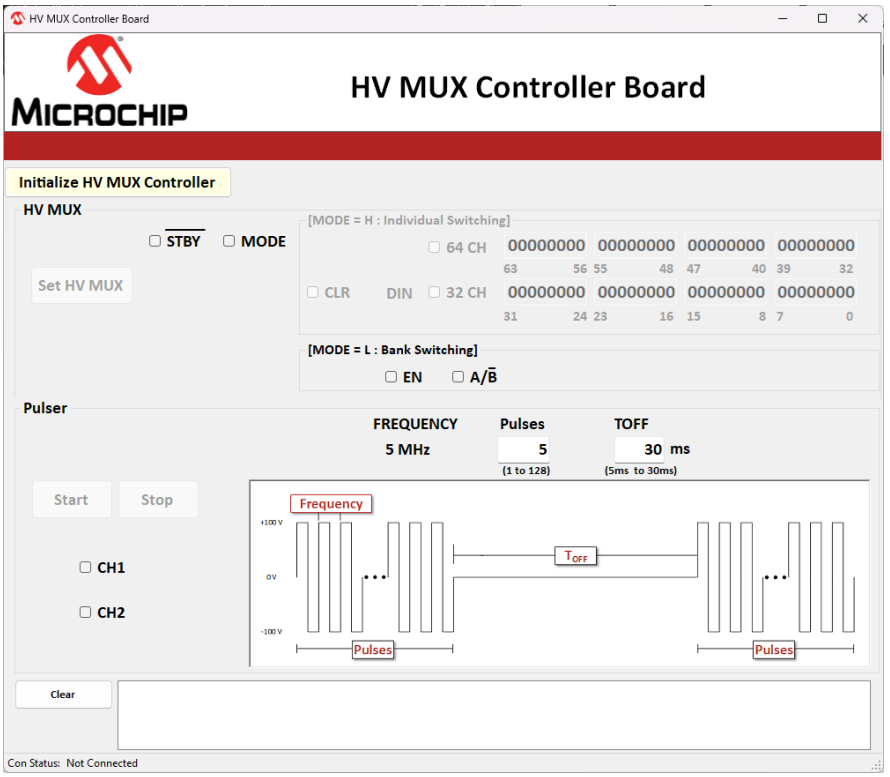
Terminal	Rail Name	Voltage	Current Limit (Note 1)
J3	V_{DD}	+5V	+20 mA
	GND	0V	—
	V_{PP}	Up to +100V	+20 mA
	V_{NN}	Down to -100V	-20 mA
J4	3V3	+3.3V	+150 mA
	GND	0V	—
	V_{GP} (Note 2)	+5V to +11.5V	+20 mA
	VSIGP	Up to V_{PP} - 10V	+20 mA
	VSIGN	Down to V_{NN} + 10V	+20 mA

Notes:

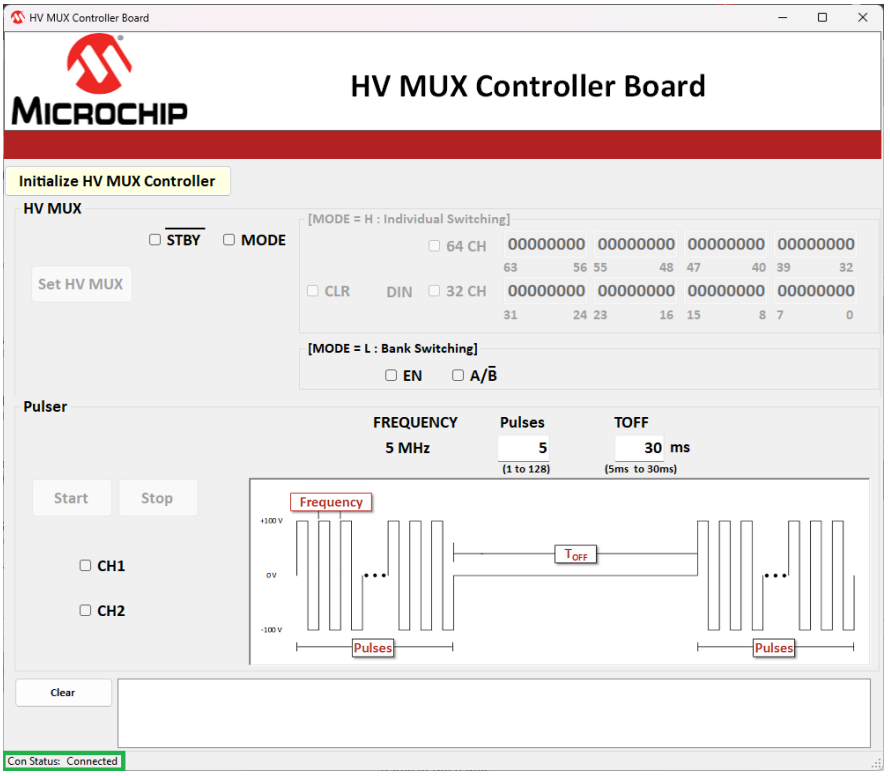
1. Current limit settings on power supply are suggested but not required.
2. Adjusting VGP can change the slope of pulsers generated by MD1822 and TC6320.

2. Graphical User Interface Operation

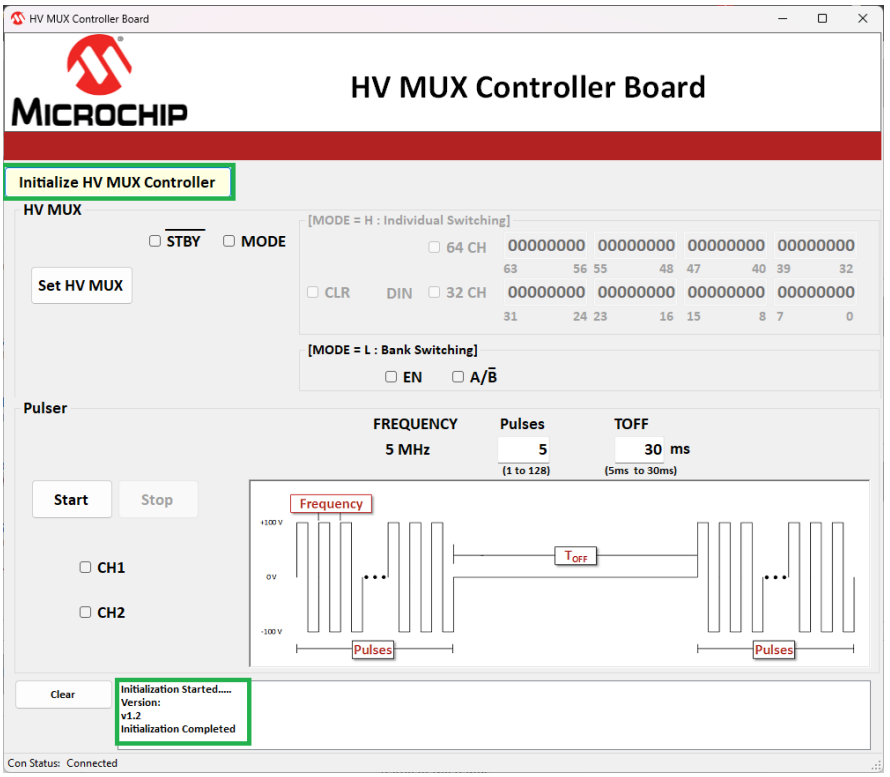
1. Once the boards are properly connected and powered, launch the HV MUX 64CH Application.



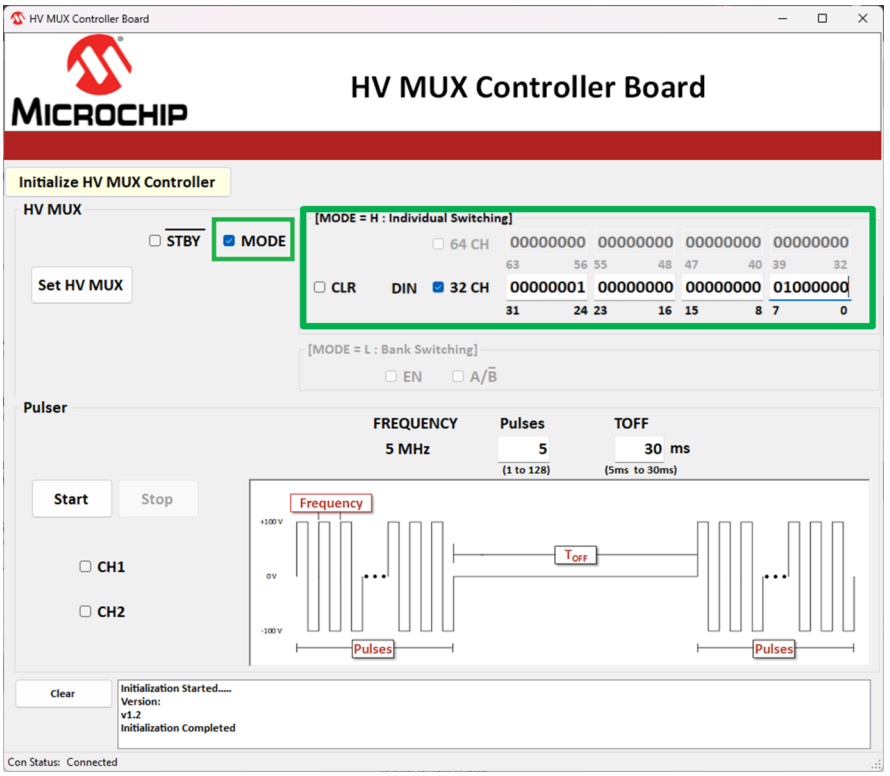
The HV Mux Board will be detected by the GUI.



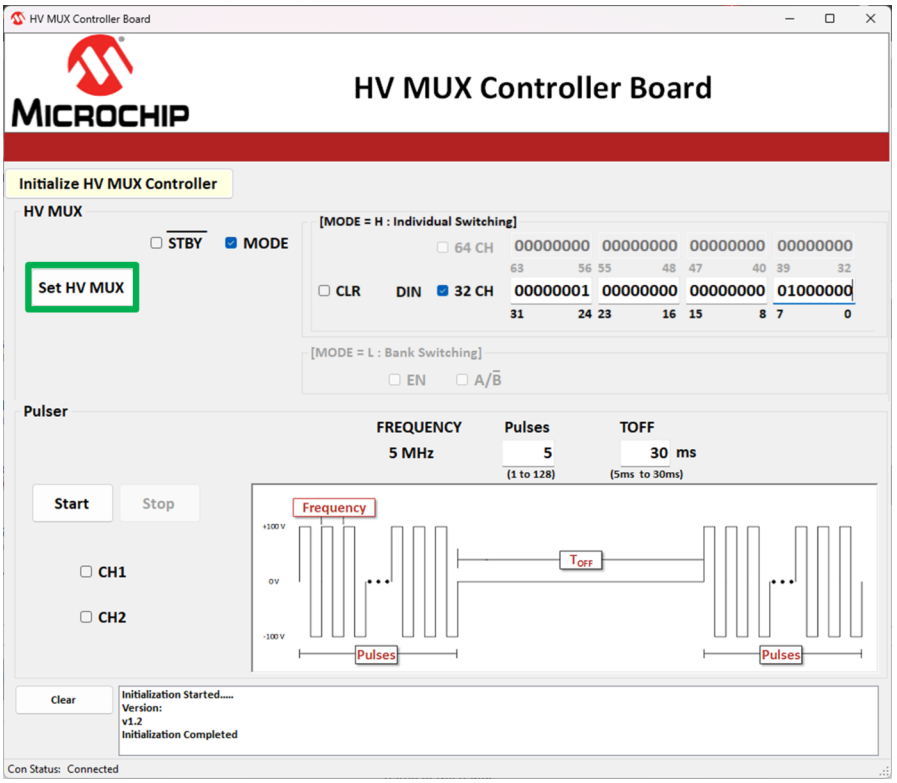
2. Click the **Initialize HV MUX Controller** button to establish the communication connection between the GUI and HV MUX Controller Board.



3. Select the **MODE** and **DIN 32 CH** checkboxes.
4. Under the 32 CH section, select the channels to be turned on (**1**) or turned off (**0**).



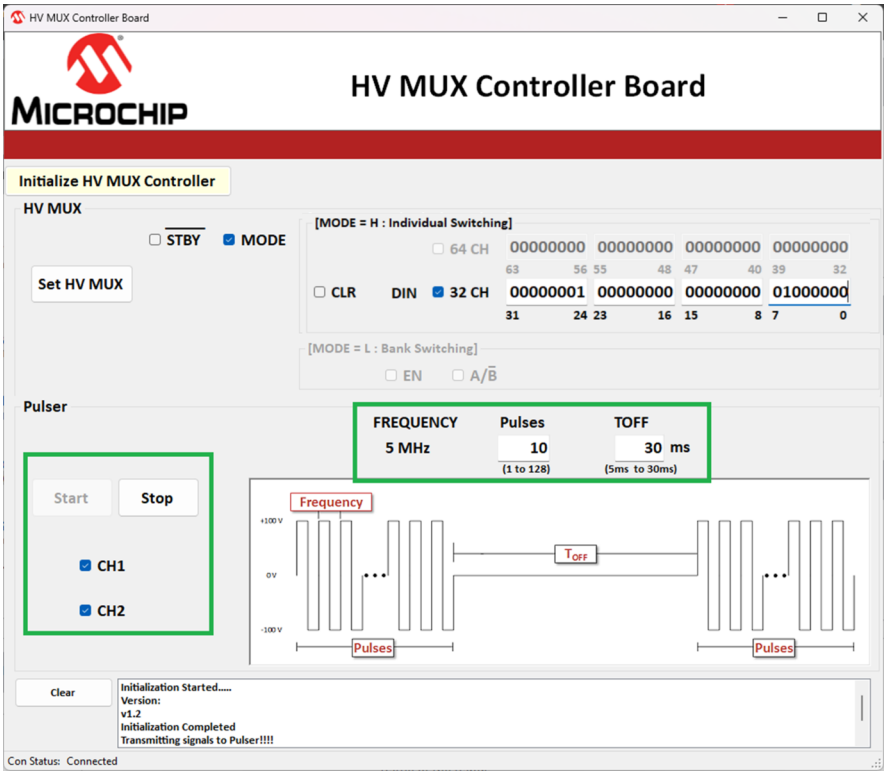
5. Select **Set HV MUX** to turn on/off the selected channels.



6. To start the HV Pulsers, select the **CH1** and/or **CH2** pulsers.
   - Pulser (CH1) is connected to Y67.
   - Pulser (CH2) is connected to Y2425.

   Refer to the HV2901 Schematic for more information.
7. Enter the number of Pulses and the Time Off in milliseconds.
8. Click **START** to begin the transmission (this is continuous).
   - Probe on T36_P1 (Y2425) and T36_P2 (Y67) for pulser outputs.

   Refer to the HV2901 Schematic for more information.
9. Click **STOP** to end the pulse transmission.



3. Board Design

This section contains the following schematic and layouts for the HV2901 Analog Switch Evaluation Board (EV66J35A):

- Board - Schematic
- Board - Output Connection
- Board - Power
- Board - Pulse Generator 1
- Board - Pulse Generator 2
- Board - SPI Flash
- 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

Figure 3-1. Board - Schematic

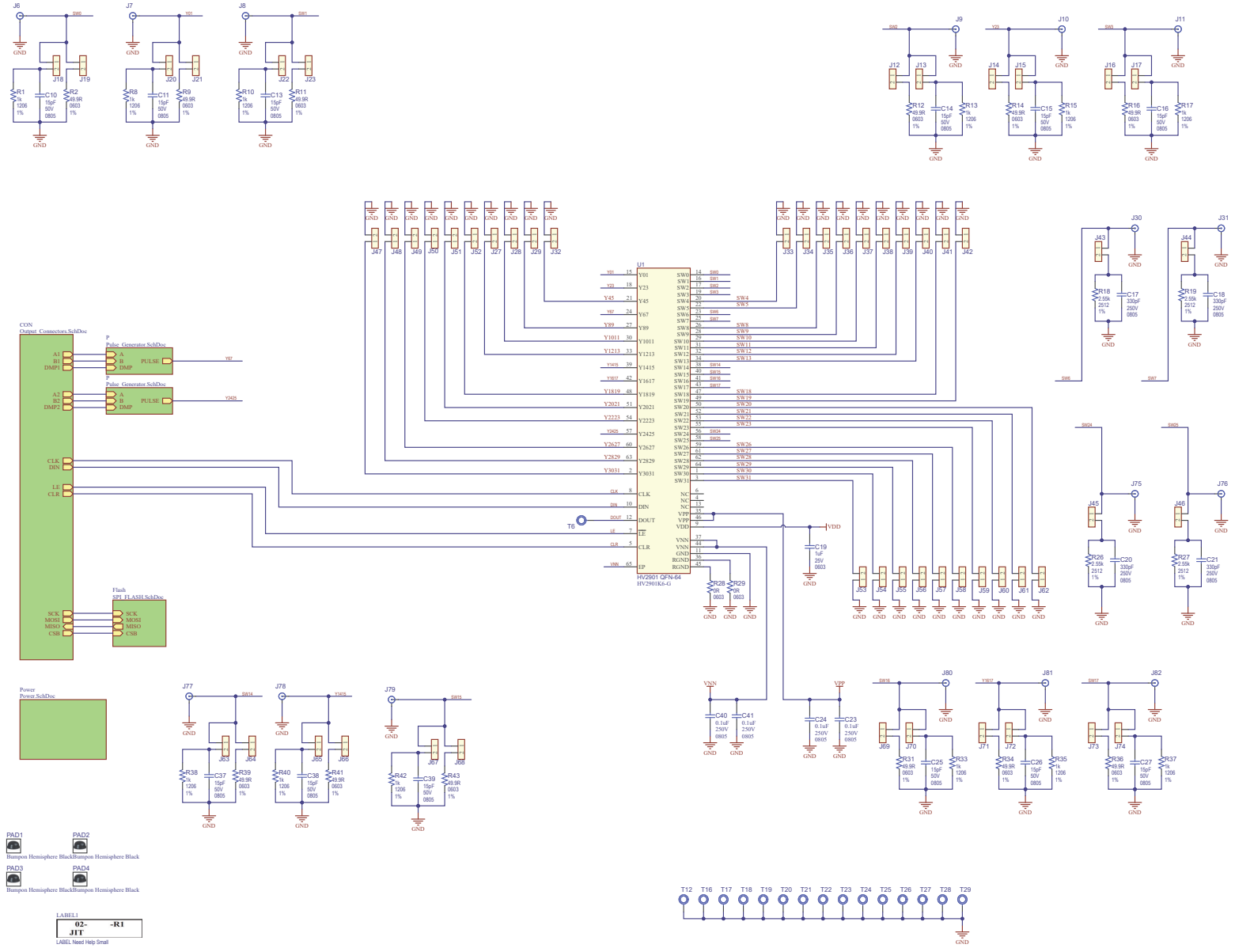


Figure 3-2. Board - Output Connection

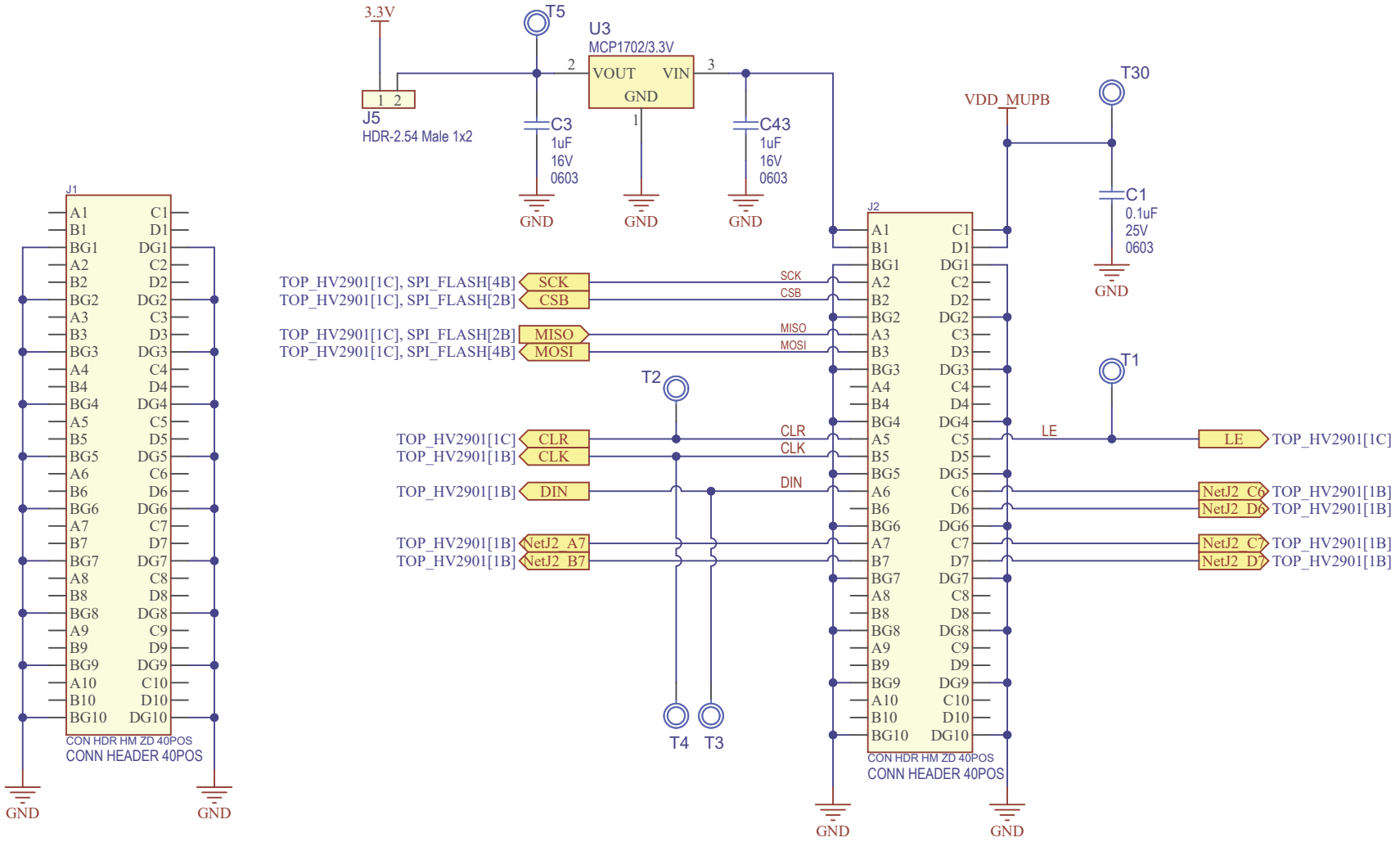


Figure 3-3. Board - Power

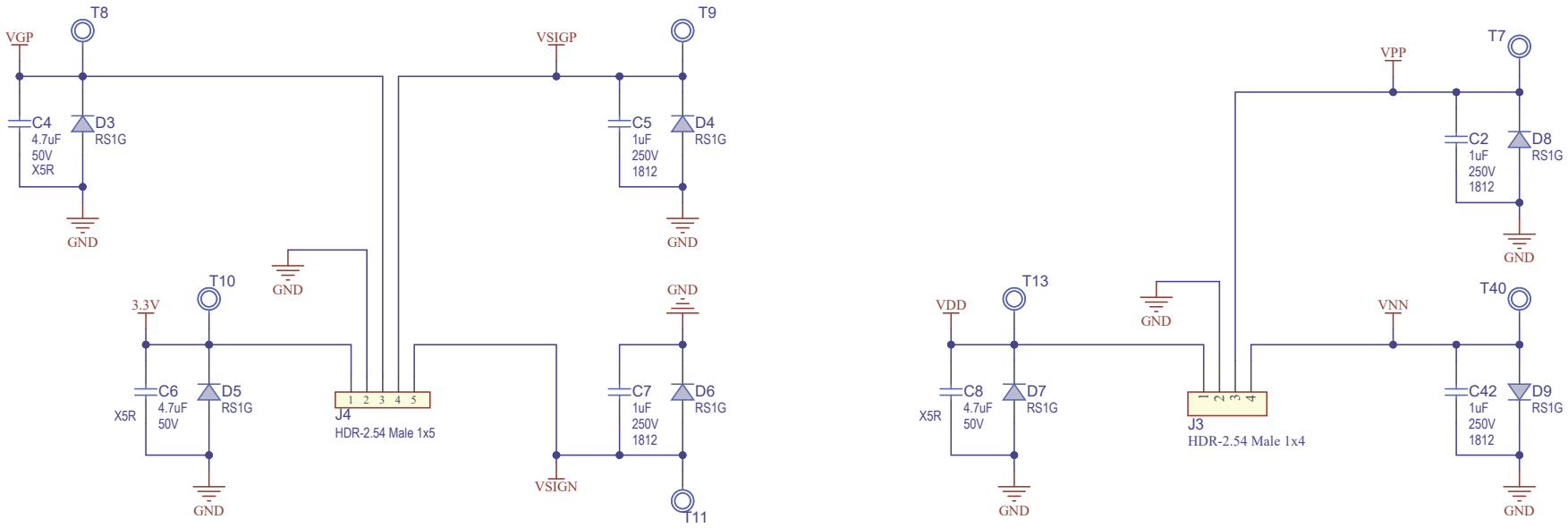


Figure 3-4. Board - Pulse Generator 1

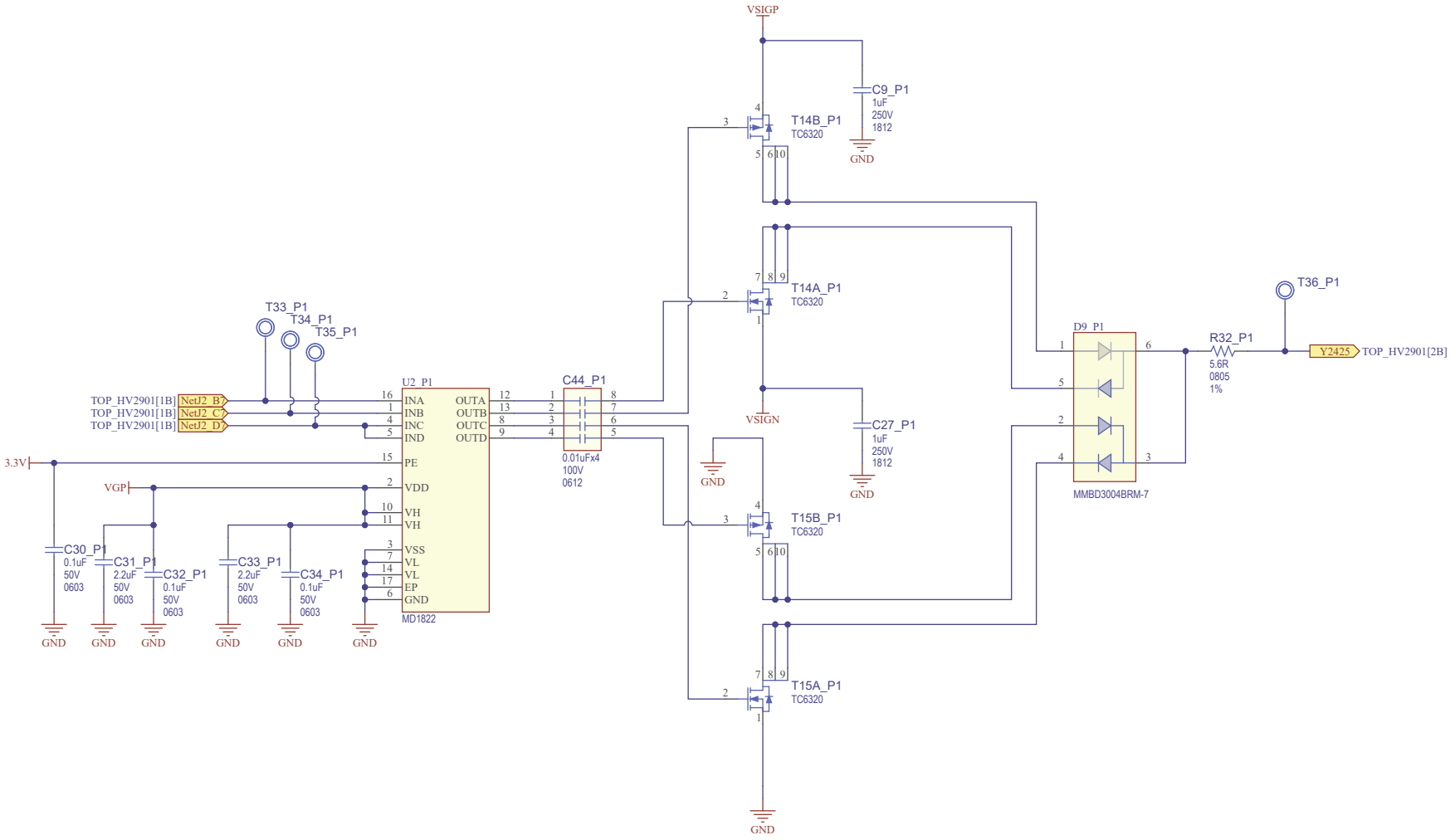


Figure 3-5. Board - Pulse Generator 2

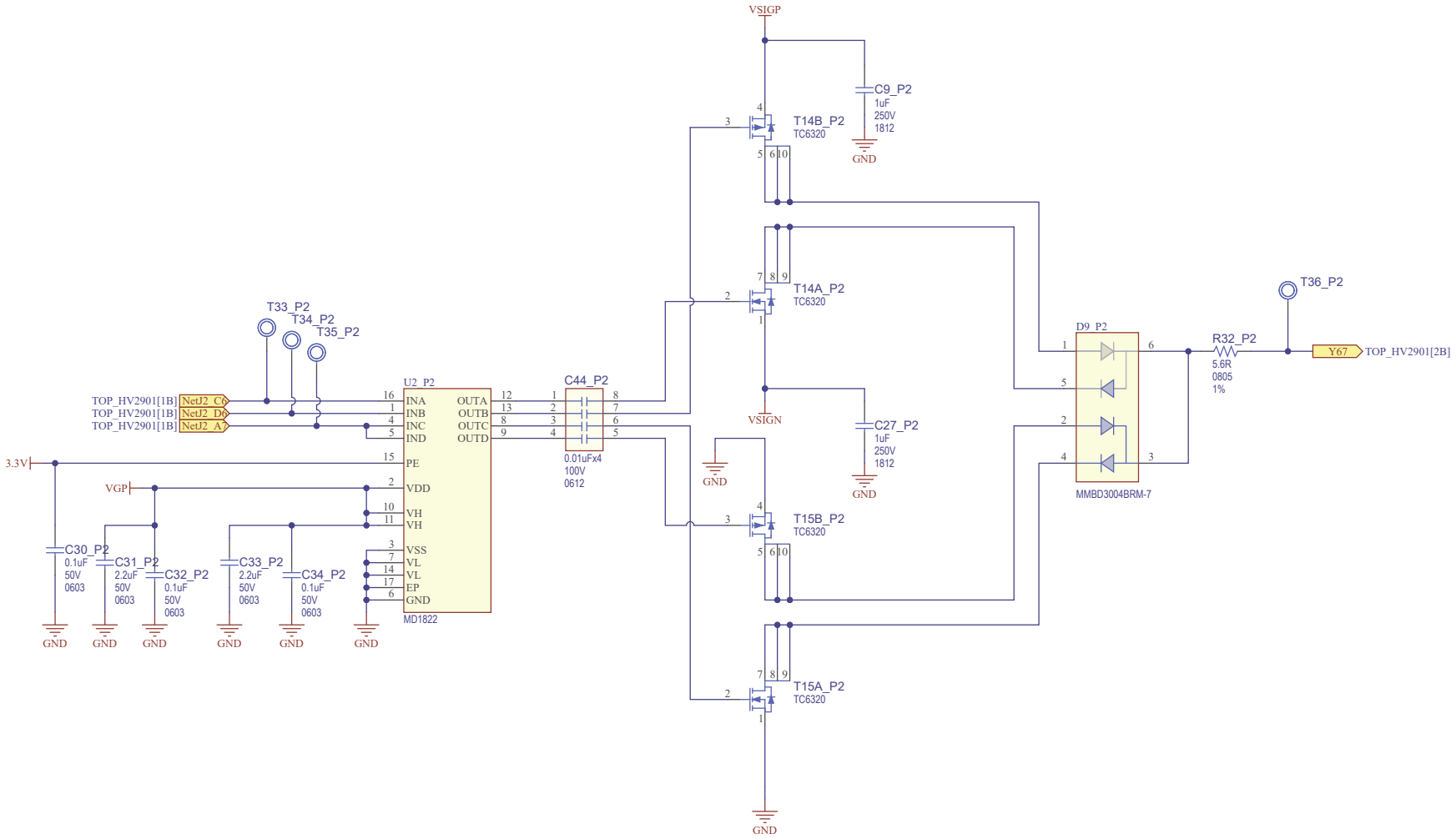
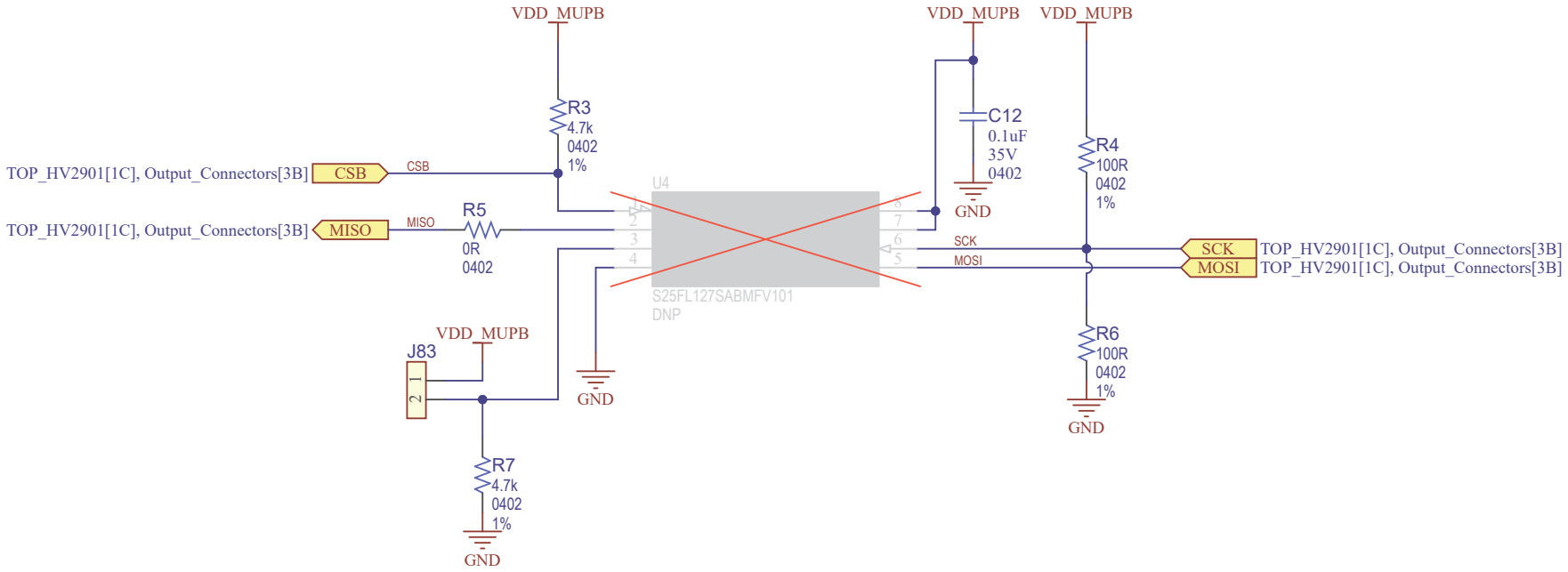


Figure 3-6. Board - SPI Flash



3.2. Layouts

Figure 3-7. Top Silk

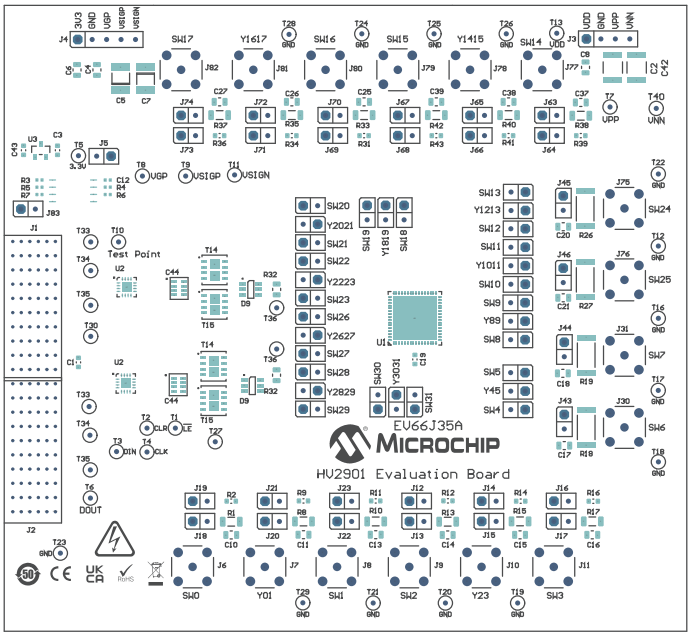


Figure 3-8. Top Copper and Silk

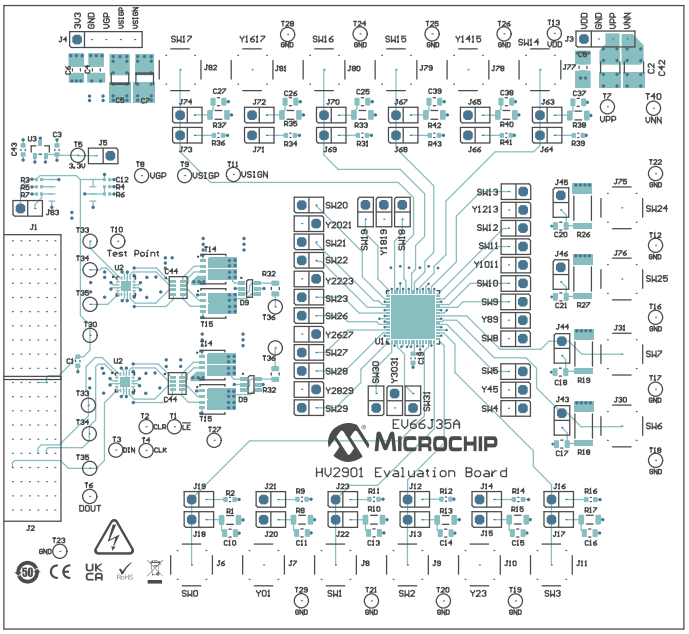


Figure 3-9. Top Copper

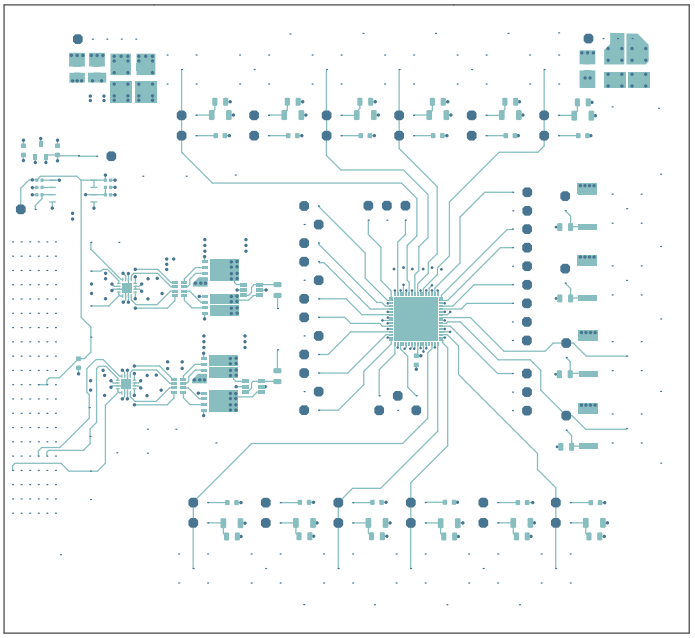


Figure 3-10. Mid Layer 1

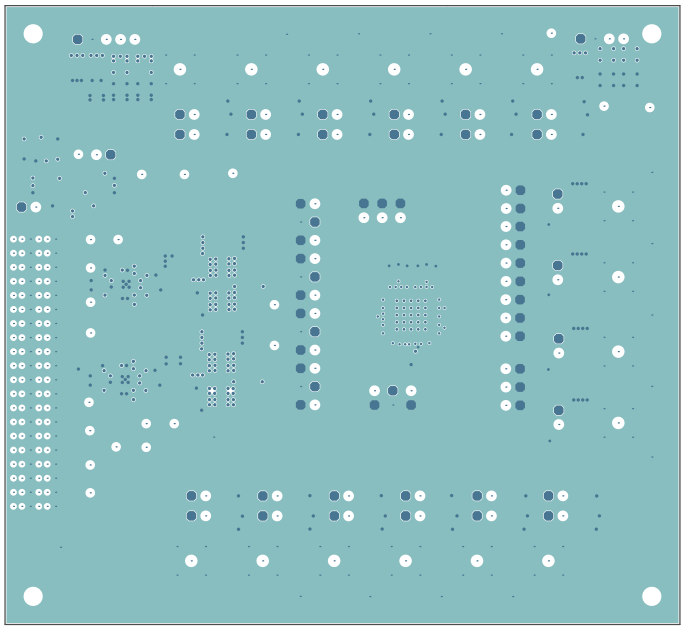


Figure 3-11. Mid Layer 2

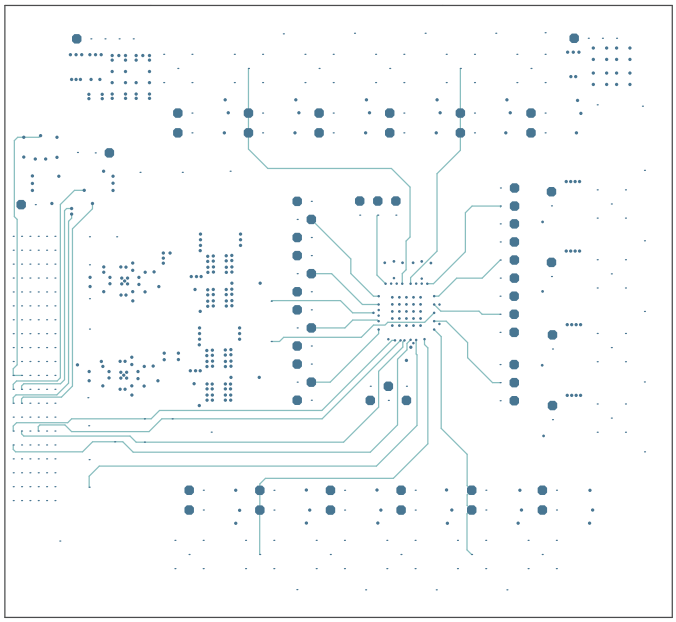


Figure 3-12. Mid Layer 3

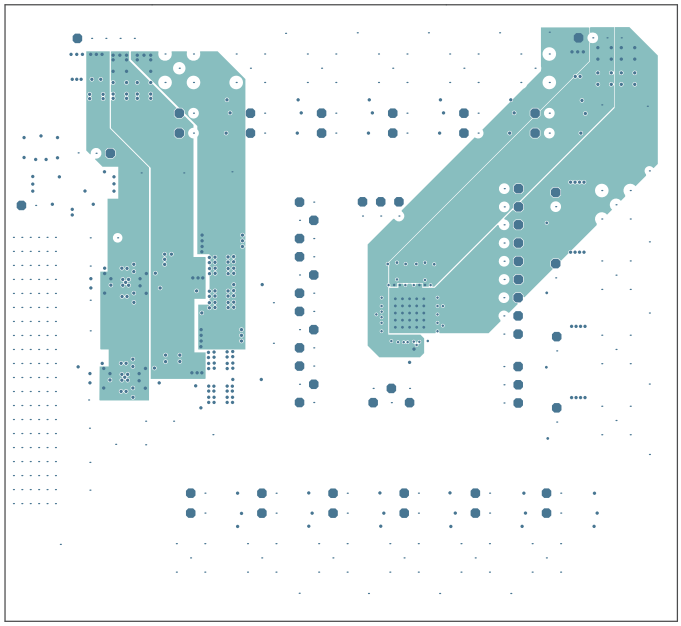


Figure 3-13. Mid Layer 4

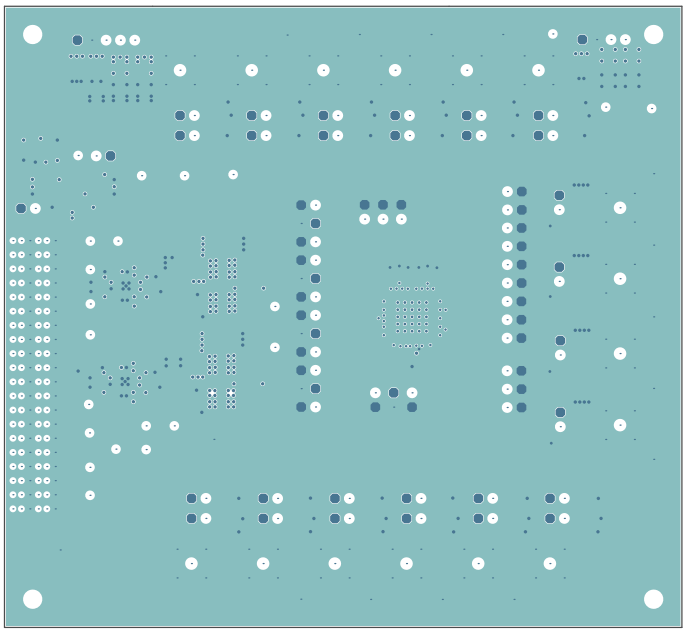


Figure 3-14. Bottom Copper

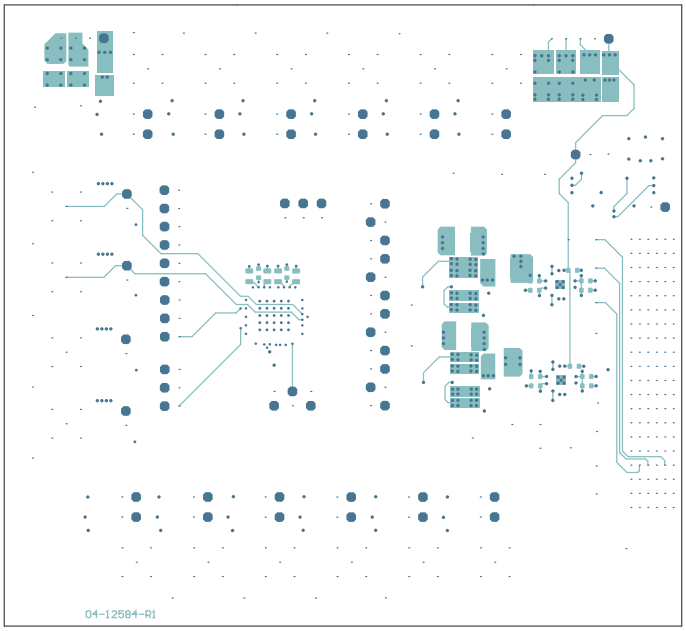


Figure 3-15. Bottom Copper and Silk

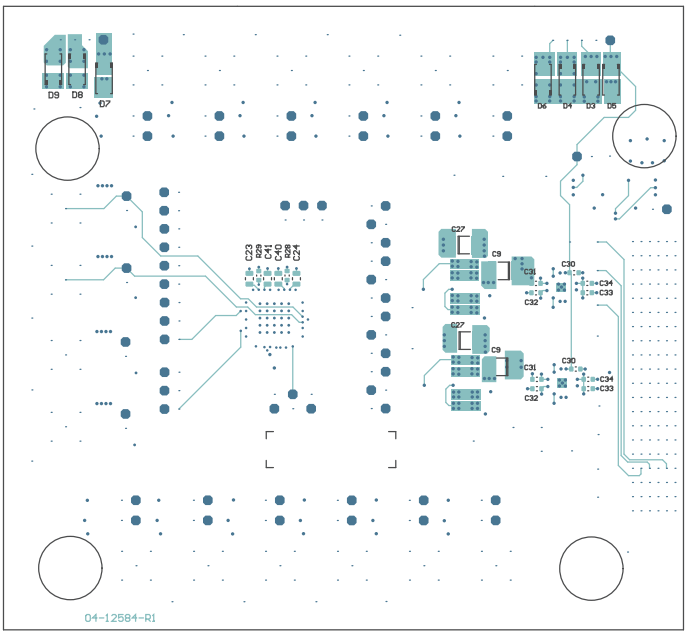
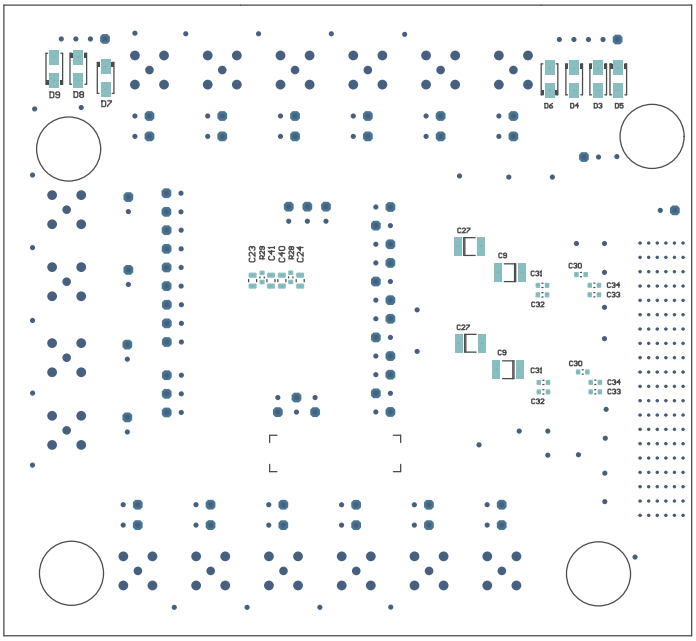


Figure 3-16. Bottom Silk



4. Bill of Materials (BOM)

Table 4-1. Bill of Materials (BOM)

Qty	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor, Ceramic, 0.1 µF, 25V, 5%, X7R, SMD, 0603	KEMET	C0603C104J3RACTU
8	C2, C5, C7, C9_P1, C9_P2, C27_P1, C27_P2, C42	Capacitor, Ceramic, 1 µF, 250V, 20%, X7T, SMD, 1812	TDK Corporation	C4532X7T2E105M250KA
2	C3, C43	Capacitor, Ceramic, 1 µF, 16V,10%, X5R, SMD, 0603	KYOCERA AVX Corporation	0603YD105KAT2A
3	C4, C6, C8	Capacitor, Ceramic, 4.7 µF, 50V, 10%, X5R, SMD, 0805	TDK Corporation	C2012X5R1H475K125AB
12	C10, C11, C13, C14, C15, C16, C25, C26, C27, C37, C38, C39	Capacitor, Ceramic, 15 pF, 50V, 5%, C0G/NP0, SMD 0805	Johanson Dielectrics Inc	500R15N150JV4T
1	C12	Capacitor, Ceramic, 0.1 µF, 35V, 10%, X7R, SMD, 0402	TDK Corporation	CGA2B3X7R1V104K050BB
4	C17, C18, C20, C21	Capacitor, Ceramic, 330 pF, 250V, 5%, C0G/NP0, SMD, 0805	Murata Electronics®	GRM21A5C2E331JW01D
1	C19	Capacitor, Ceramic, 1 µF, 25V, 10%, X7R, SMD, 0603	TDK Corporation	CGA3E1X7R1E105K080AC
4	C23, C24, C40, C41	Capacitor, Ceramic, 0.1 µF, 250V, 10%, X7T, SMD, 0805	TDK Corporation	C2012X7T2E104K125AA
6	C30_P1, C30_P2, C32_P1, C32_P2, C34_P1, C34_P2	Capacitor, Ceramic, 0.1 µF, 50V, 20%, X7R, SMD, 0603	TDK Corporation	C1608X7R1H104M
4	C31_P1, C31_P2, C33_P1, C33_P2	Capacitor, Ceramic, 2.2 µF, 50V, 10%, X5R, SMD, 0603	Murata Electronics®	GRM188R61H225KE11D
2	C44_P1, C44_P2	Capacitor, Array, 0.01 µFx4, 100V, 20%, X7R, SMD, 0612	KYOCERA AVX Corporation	W3A41C103MAT2A
7	D3, D4, D5, D6, D7, D8, D9	Diode, Rectifier,1.3V, 1A, 400V, DO-214AC_SMA	Fairchild/ON Semiconductor	RS1G
2	D9_P1, D9_P2	Diode, Rectifier, Array, 1V, 225 mA, 350V, SMD, SOT-23-6	Diodes Incorporated®	MMBD3004BRM-7-F
2	J1, J2	Connector, Header, 40POS, R/A, HM-ZD, TIN	TE Connectivity AMP Connectors	6469169-1
1	J3	Connector, HDR-2.54, Male, 1x4, Gold, 5.84MH, Through Hole, Vertical	Samtec, Inc.	TSW-104-07-G-S
1	J4	Connector, HDR-2.54, Male, 1x5, Gold, 5.84MH, Through Hole, Vertical	Samtec, Inc.	TSW-105-07-S-S
60	J5, J12, J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J23, J27, J28, J29, J32, J33, J34, J35, J36, J37, J38, J39, J40, J41, J42, J43, J44, J45, J46, J47, J48, J49, J50, J51, J52, J53, J54, J55, J56, J57, J58, J59, J60, J61, J62, J63, J64, J65, J66, J67, J68, J69, J70, J71, J72, J73, J74, J83	Connector, HDR-2.54, Male, 1x2, Gold, 5.84MH, Through Hole, Vertical	FCI	77311-118-02LF
16	J6, J7, J8, J9, J10, J11, J30, J31, J75, J76, J77, J78, J79, J80, J81, J82	Connector, RF, Coaxial SMA Female, 2P, Through Hole, Vertical	TE Connectivity	5-1814832-1
12	R1, R8, R10, R13, R15, R17, R33, R35, R37, R38, R40, R42	Resistor, Thick Film, 1k 1% 1/4W SMD 1206	Yageo Corporation	RC1206FR-071KL
12	R2, R9, R11, R12, R14, R16, R31, R34, R36, R39, R41, R43	Resistor, Thick Film, 49.9R, 1%, 1/4W, SMD, 0603	Vishay/Dale	CRCW060349R9FKEAHP

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

Qty	Reference	Description	Manufacturer	Part Number
2	R3, R7	Resistor, Thick Film, 4.7K, 1%, 1/10W, 0402	KOA Speer	RK73H1ETTP4701F
2	R4, R6	Resistor, Thick Film, 100R, 1%, 1/10W, SMD, 0402	Panasonic Electronic Components	ERJ-2RKF1000X
1	R5	Resistor, Thick Film, 0R, 1/16W, SMD, 0402	Yageo Corporation	RC0402JR-070RL
4	R18, R19, R26, R27	Resistor, Thick Film, 2.55k, 1%, 1W, SMD, 2512	Stackpole Electronics Inc	RMCF2512FT2K55
2	R28, R29	Resistor, Thick Film, 0R, 1/10W, SMD, 0603	Panasonic Electronic Components	ERJ-3GSY0R00V
2	R32_P1, R32_P2	Resistor, Thick Film, 5.6R, 1%, 1/8W, SMD, 0805	Vishay/Dale	CRCW08055R60FKEA
37	T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T27, T28, T29, T30, T33_P1, T33_P2, T34_P1, T34_P2, T35_P1, T35_P2, T36_P1, T36_P2, T40	Connector, Test Point, PAD, PCB, 1.5x0.9, Through Hole, AU	Mill-Max Mfg. Corporation	3132-0-00-15-00-00-08-0
1	PCB1	Printed Circuit Board	Microchip Technology Inc.	04-12584-R1
1	PCBA1	PCB Assembly	Microchip Technology Inc.	02-01541-R1

Table 4-2. Microchip Parts

Qty	Reference	Description	Manufacturer	Part Number
4	T14_P1, T14_P2, T15_P1, T15_P2	Analog, MOSFET, Dual, P-N-CH, 200V, 2A, DFN-8	Microchip Technology Inc.	TC6320K6-G
1	U1	Analog, Switch, 2:1 32ch QFN-64	Microchip Technology Inc.	HV2901K6-G
2	U2_P1, U2_P2	Analog, FET Driver, Quad-Two, Inverting-Two, Non Inverting, 16-Lead QFN	Microchip Technology Inc.	MD1822K6-G
1	U3	Analog, LDO 3.3V	Microchip Technology Inc.	MCP1702-3302E/CB

Table 4-3. Mechanical Parts

Qty	Reference	Description	Manufacturer	Part Number
1	LABEL1	Label, ASSY W/REV Level (Small Modules) PER MTS-0002		
4	PAD1, PAD2, PAD3, PAD4	Mechanical HW, Rubber PAD, Bumpon Hemisphere, 0.44" x 0.20" Black	3M	SJ-5003 (BLACK)

Table 4-4. Do Not Populate Parts

Qty	Reference	Description	Manufacturer	Part Number
0	U4	Memory, Serial, SPI, Flash, 128 Mb (16M x 8) 108 MHz, SOIC-8	Cypress Semiconductor Corp	S25FL127SABMFV101

5. Performance

Figure 5-1. Pulser: CH1 & CH2 ±50V. HV2901: Loads Connected; SWB6 & SWB24 - Turned On.

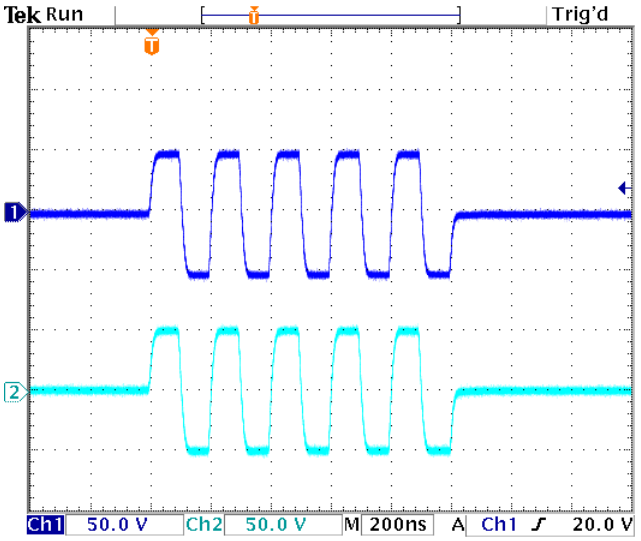
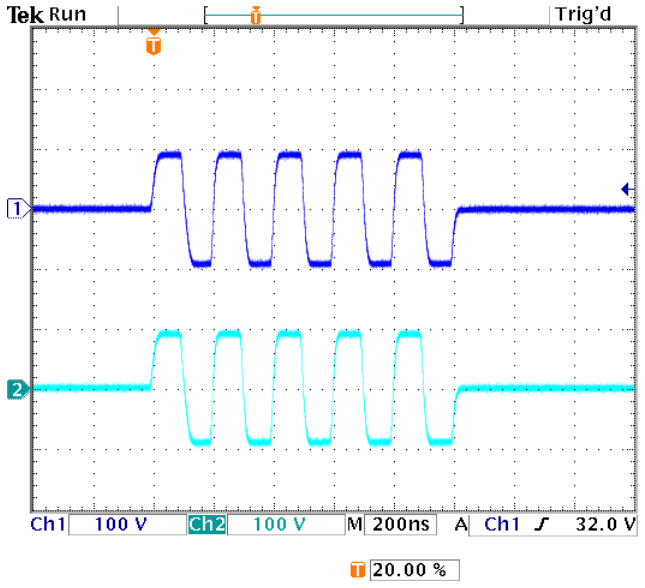


Figure 5-2. Pulser: CH1 & CH2 ±90V. HV2901: Loads Connected; SWB6 & SWB24 - Turned On.



6. References

Table 6-1. Recommended Reading

Source	Document Title	Literature Number	Available
Microchip Technology, Inc.	HV2901 Data Sheet	DS20005840	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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ISBN: 979-8-3371-2901-3

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