Eight Channel High Linearity Analog Isolation Board
Performance and User's Reference

Larry Wurtz, Phd

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This reference describes the performance and tuning of an eight channel high linearity isolation board based on the HCNR201 analog optocoupler. Each channel provides maximum overvoltage of up to 8000 Vpeak for 10 seconds. Although the HCNR201 provides an analog bandwidth from DC to >1 MHz, the following circuit has compensation capacitors in place to restrict the bandwidth from DC to 14 KHz for specific application to the Advanced CORFM programmable fiber optic delay line. The isolation board was designed to handle input voltages at least in a range from +28V to -28V.

Figure 1 below shows a top view of the eight channel isolation board. Components and, namely, tunable potentiometers R34, R33, and R30 comprising Channel 4 are shown as the top horizontal collection of components. The 2nd from top horizontal collection of components make up Channel 3. Similarly from top to bottom, horizontal collections of components make up the remaining channels 2, 1, 5, 6, 7, and 8. The grouping of components is important for channel tuning described below.

Figure 2 shows the schematic for channel 1 including the input and output connector pin assignments. The schematics from channels 2 through 8 are exactly like that of channel 1. The input signals, voltage sources, and ground on connector J1 are completely isolated from the output signals, voltage sources, and ground on connector J2; accordingly, isolated voltages of +15V, -15V and ground are required on input connector J1 and output connector J2 for fully isolated performance.

The procedure to tune channel 1 is following. The same procedure is used for the remaining channels.

1. Apply isolated +15V, -15V, and ground to connectors J1 and J2. Total current on the +15V source collectively was measured to be +13 mamps. The same current was observed on the -15V source collectively.

2. Apply a 10 Vpp signal with frequency of 1000 Hz to the channel 1 input and observe the channel 1 output on J2.

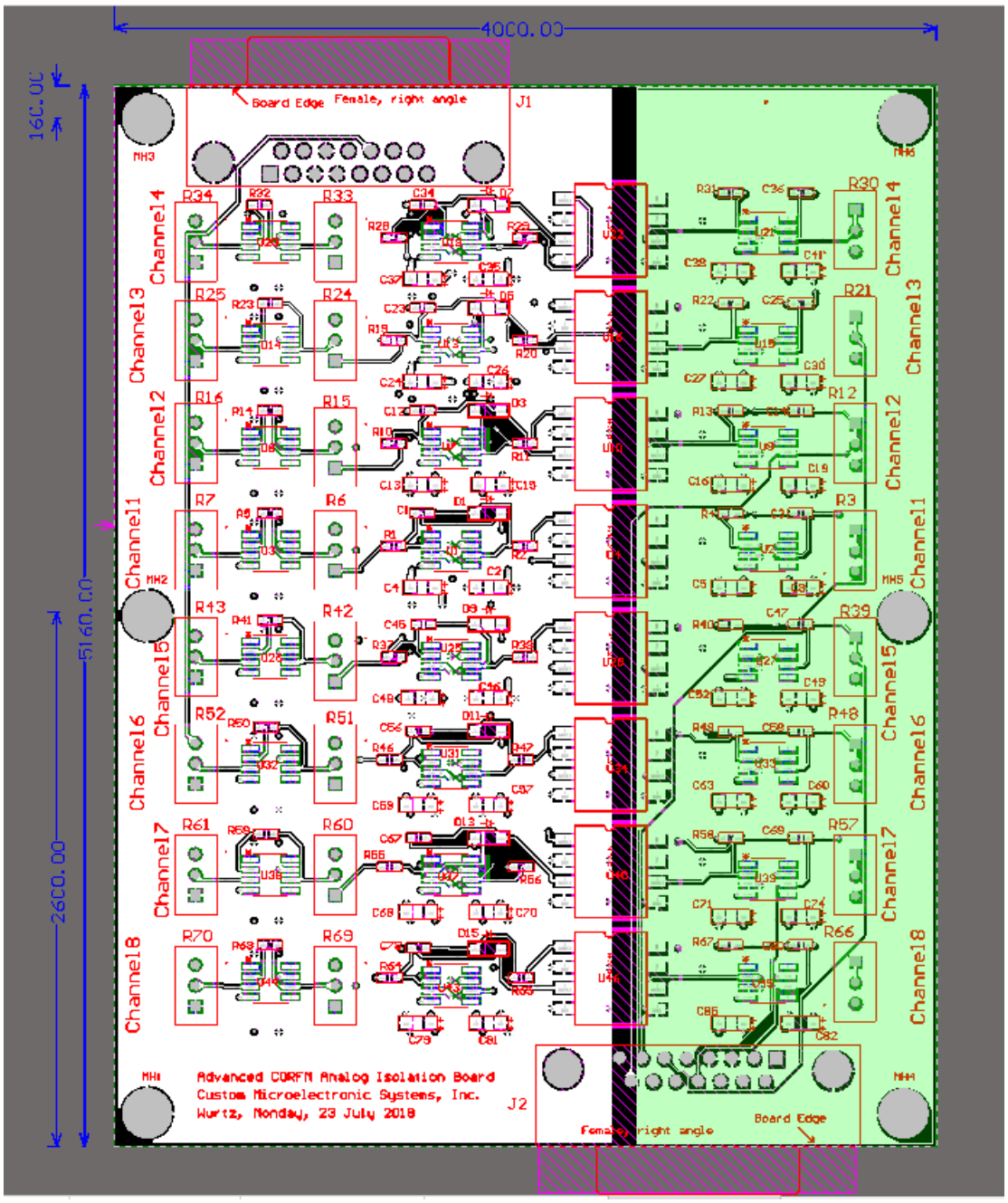

Figure 1. Top view of isolation board.

3. Turn potentiometer R7 completely clockwise until a clicking sound is heard. R7 allows voltages greater than +15 Volts and less than -15 Volts to be applied at the channel input.

4. Tune potentiometer R3 for a channel gain of one. R3 can be tuned for a channel gain greater than one, if needed.

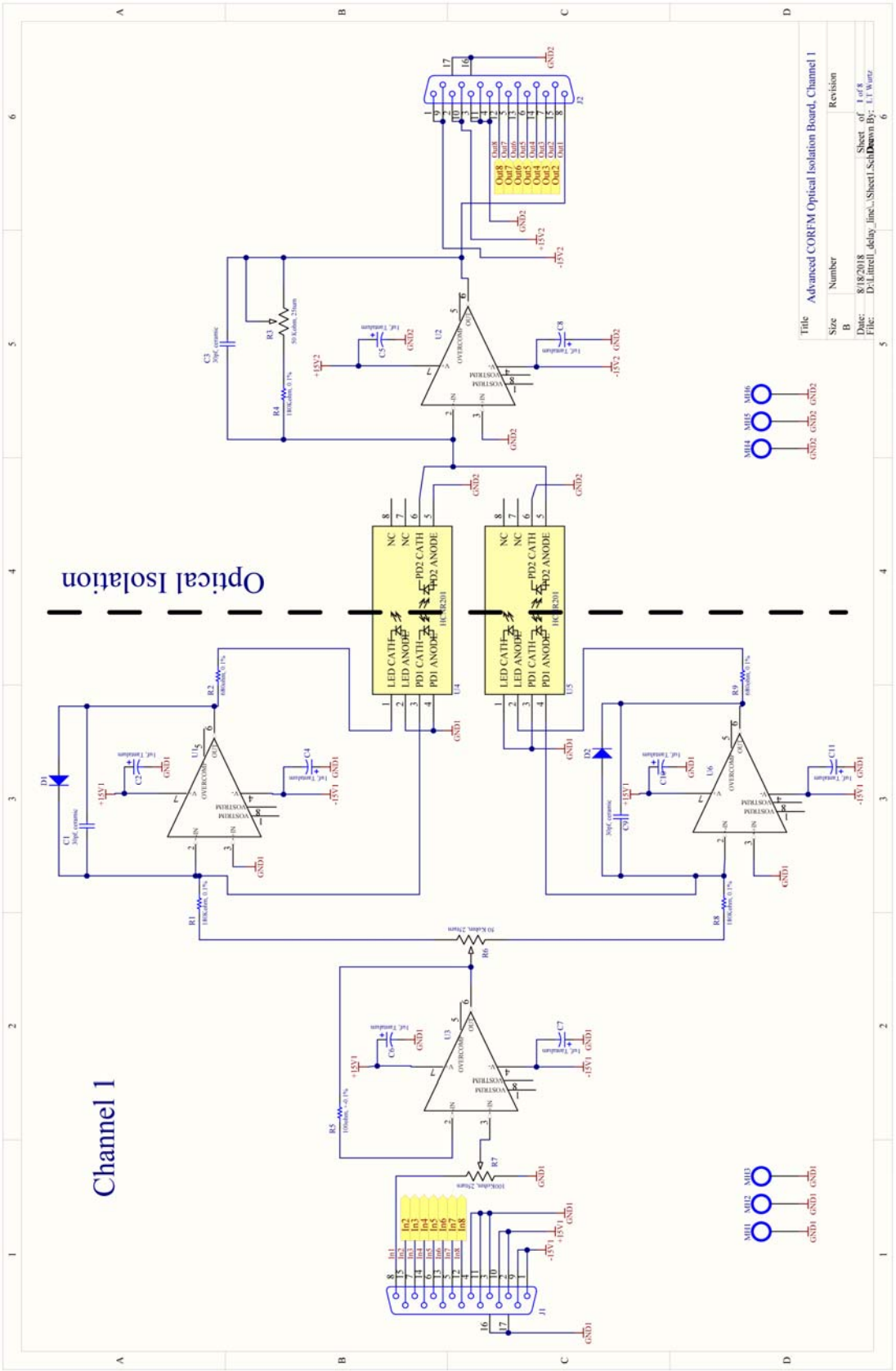

Figure 2. Schematic of isolation channel 1

5. Tune potentiometer R6 to center the output signal swing symmetrically about a zero voltage offset as shown in Figure 3.

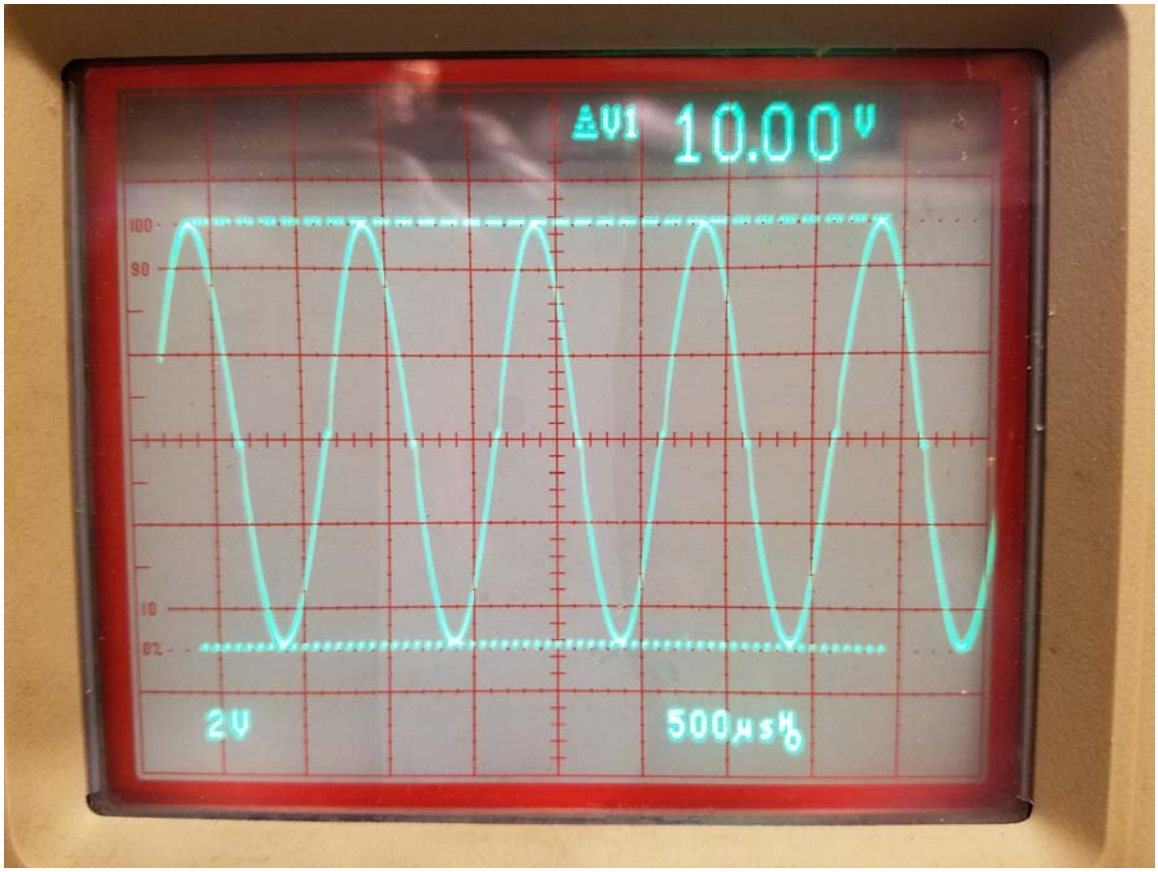

Figure 3. Channel 1 isolated output with input 10 Vpp signal at 1000 Hz.

Figure 4 shows the upper 3dB bandwidth to be ~14 KHz. Components C1, C9, C3, and R4 can be tuned to achieve a greater bandwidth if desired. The HCNR201 can reach a bandwidth > 1 MHz.

Table 1 lists the potentiometers and associated functions for each isolation channel. Reference this table with tuning instructions back to Figure 1 to tune the remaining isolation channels.

Channel Number from top of board to bottom	Potentiometer for input signal adjustment	Potentiometer for offset adjustment	Potentiometer for channel gain
4	R34	R33	R30
3	R25	R24	R21
2	R16	R15	R12

1	R7	R6	R3
5	R43	R42	R39
6	R52	R51	R48
7	R61	R60	R57
8	R70	R69	R66

Table 1. Channel number versus potentiometer tuning function

Figures 5 and 6 show the simulated and real 3D views of the isolation board top and are included to illustrate the 3D viewing feature of Altium Designer. Figures 7 and 8 show 3D views of the isolation board bottom.

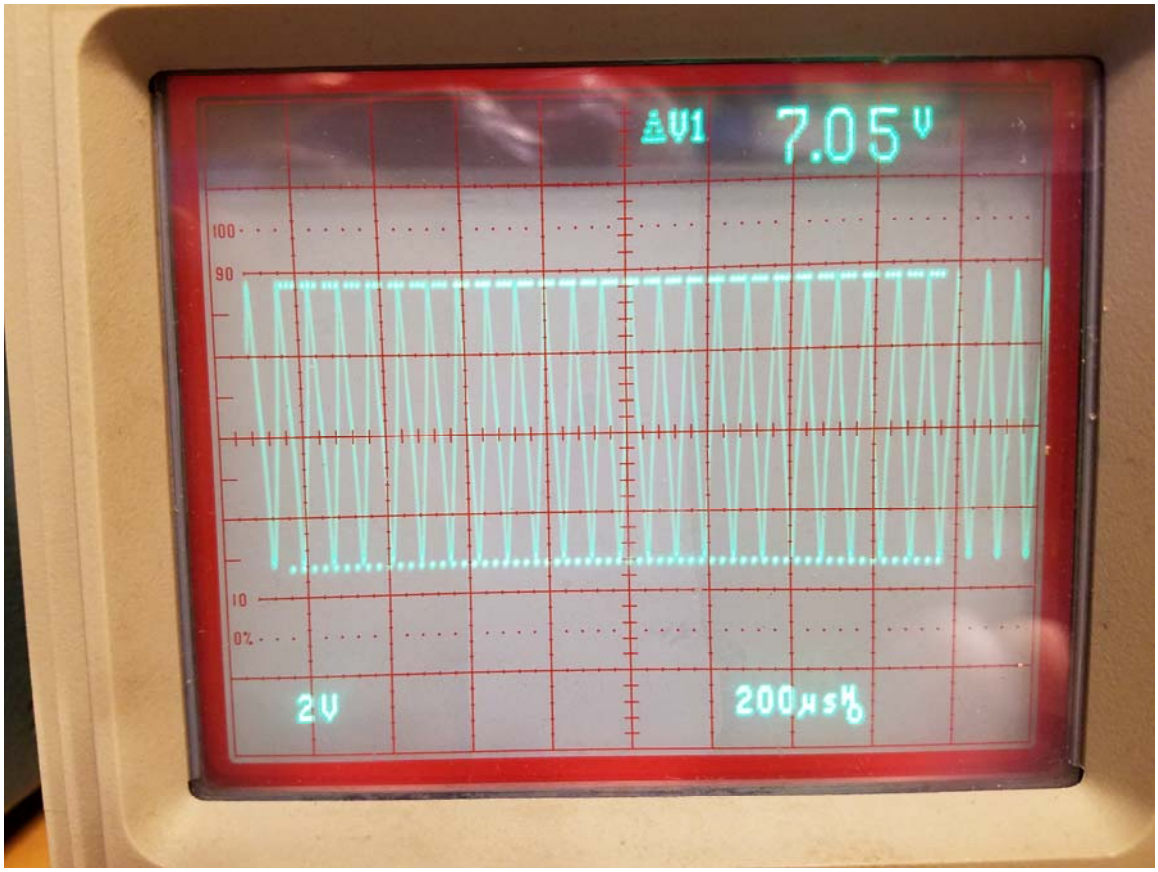

Figure 4. Upper 3 dB bandwidth of 14 KHz

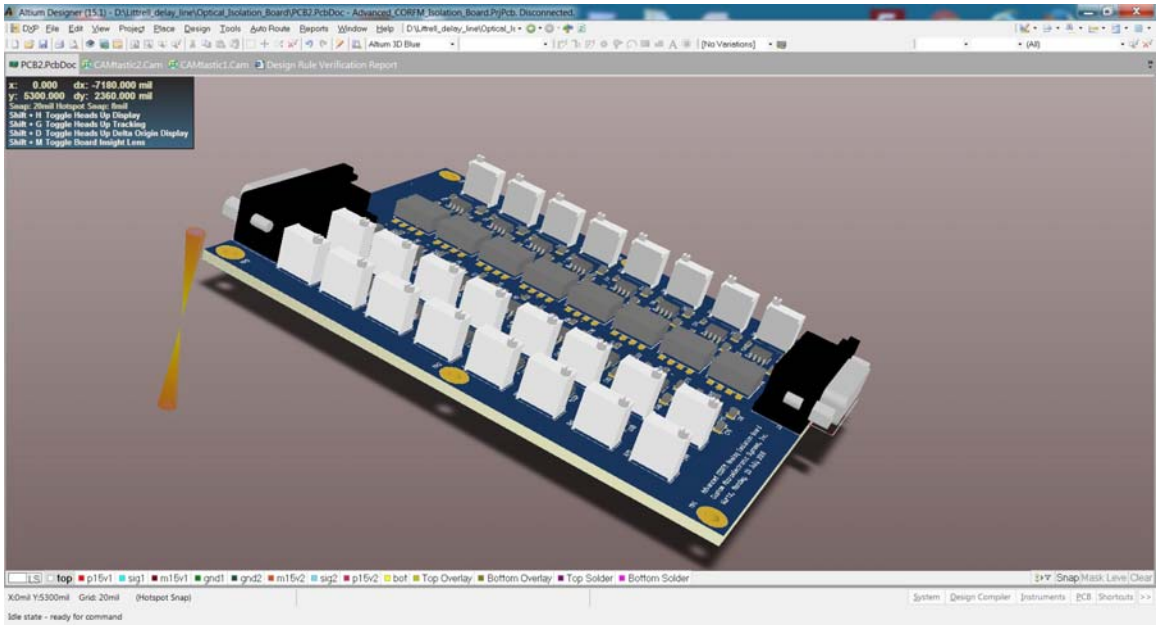

Figure 5. Altium Designer 3D view of isolation board top

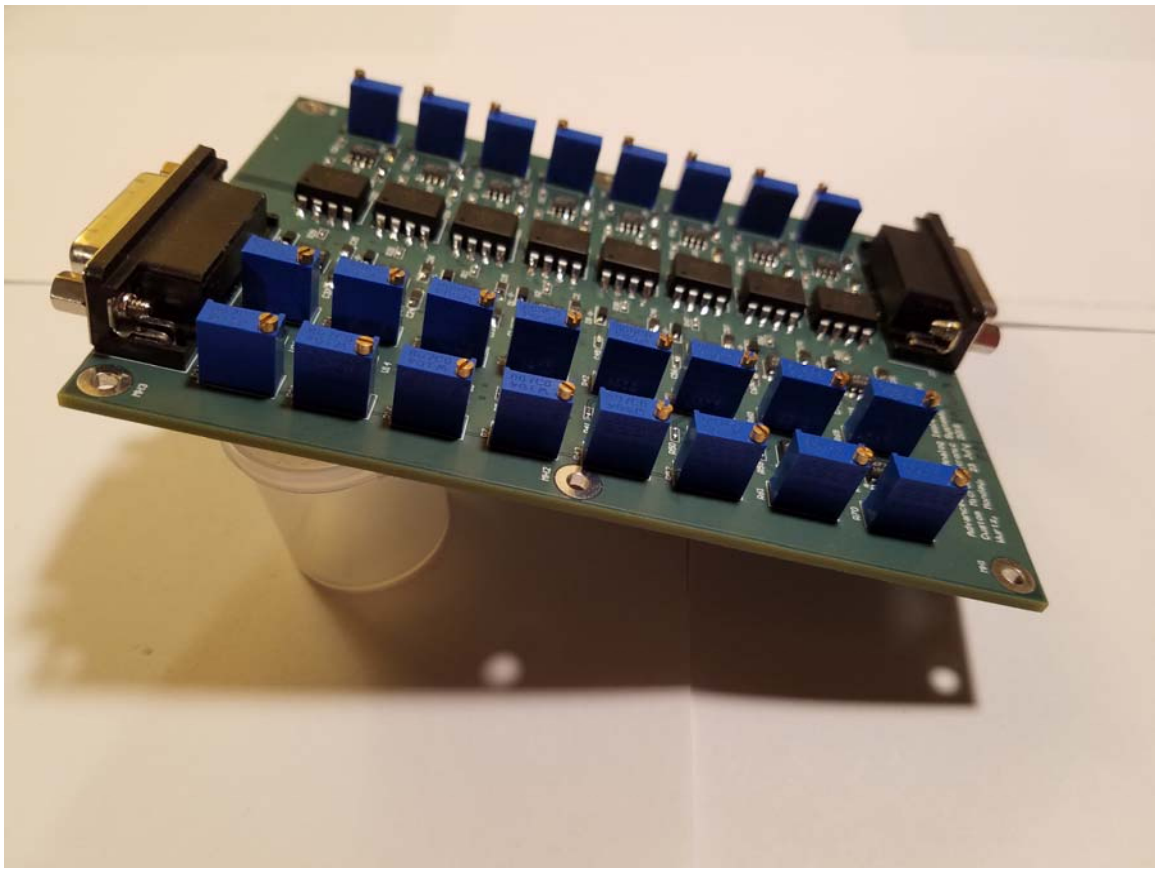

Figure 6. Top view of real isolation board

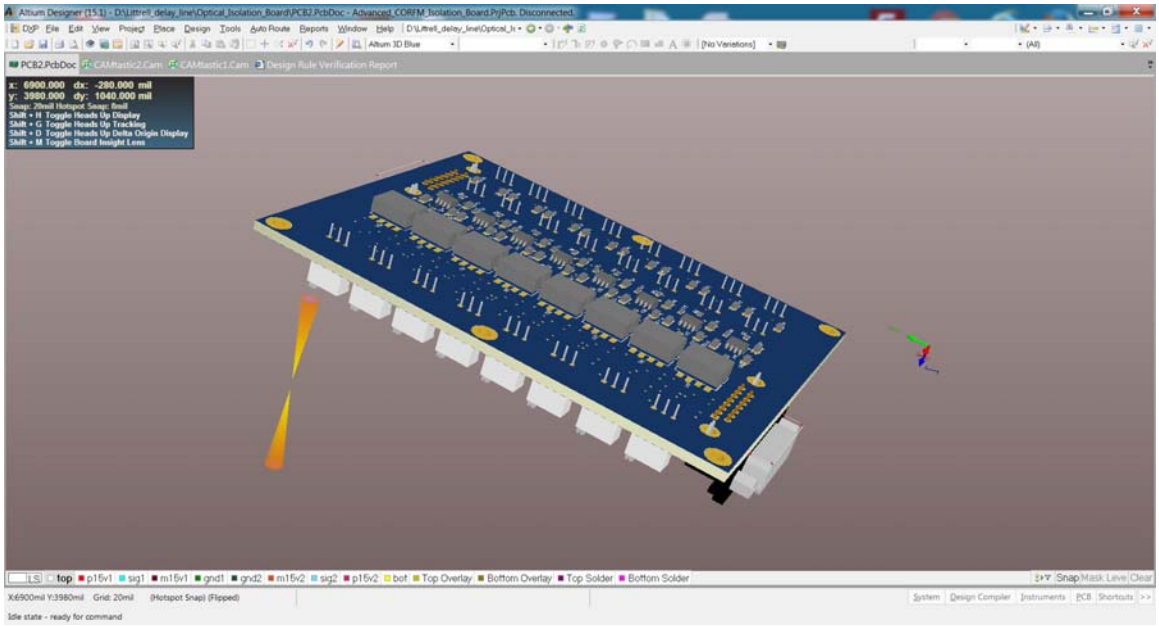

Figure 7. Altium Designer 3D view of isolation board bottom

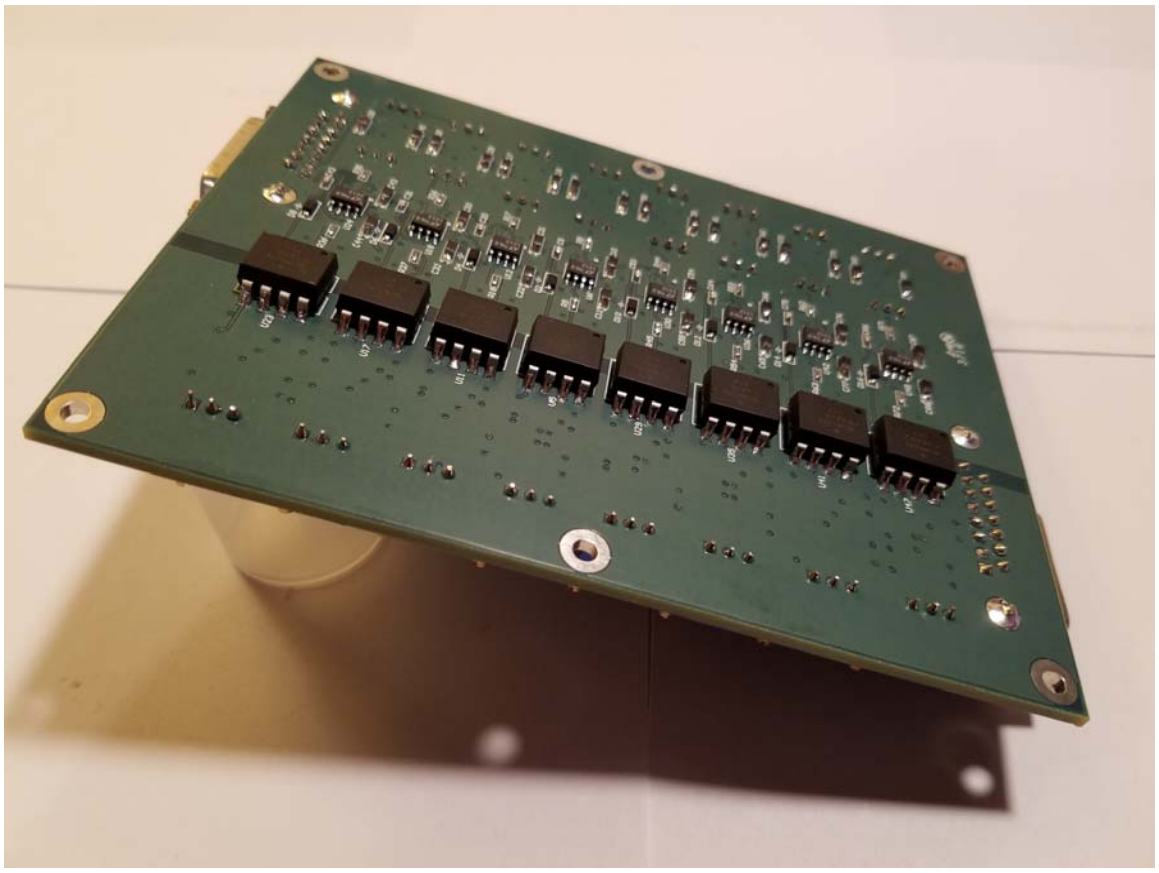

Figure 8. Bottom view of real isolation board