Lab 9 Report:

Measure cross talk between signal-return loops in a special test board.

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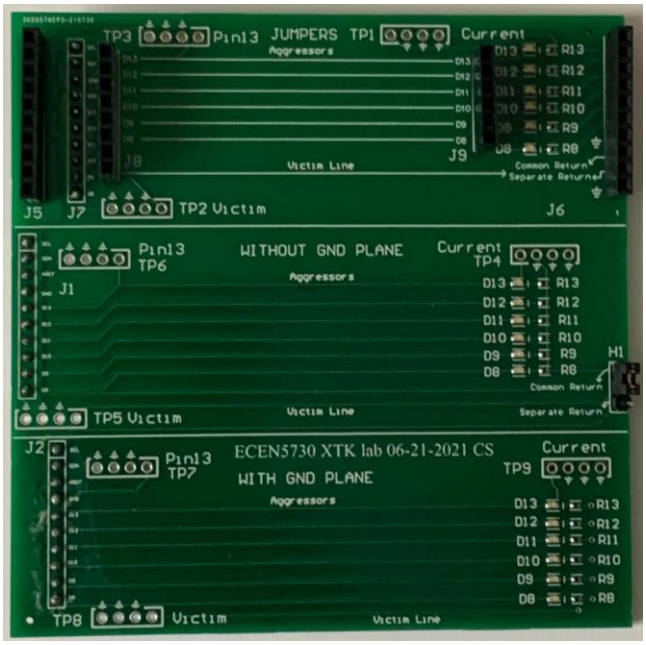
This lab experiment is to analyze the cross talk between the signal return loops in a test board given by the professor. The board looks like,



With a part connected to the ground plane and the other not having a ground plane but has common return path and separate return path.

Through an Arduino code, the LED's are powered with logic high and the LED's glow. The current passes through the return path. In the middle board without the ground plane, there are two options for the return path of current, one being the common return path, second being the separate return path.

There are a few test scenarios that one can work on and analyse. First, I tried to switch ON all the pins with HIGH, and used a common return path. When probed for TP6 and TP5, the noise generated can be viewed using the below figure.

Channel 1(Yellow), I used as the TP5 input (Pin 13 input) and TP6 is for the common return path on channel 2(Green). You can find a greater noise around 1.8V with all pins ON when probed at TP6.

Some of the observations in the experiment are,

One pin ON – Pin 13: 600mV noise

One pin ON - Pin 8: 570mV

With 2 Pins ON – Pin 12&13: 770mV

With 3 Pins ON – Pin 11, 12 & 13: 1.2V

With 4 Pins ON – Pin 10, 11, 12 & 13: 1.48V

With 5 Pins ON – Except 8: 1.62V

Even while trying with one pin switching ON and OFF, and the other pin switching ON and OFF, the amount of noise checked at TP6 is around same as 545mV. This can be observed in the below figure:

While changing to separate returns,

For 1 pin ON – Pin 13, the noise calculated is 157mV.

For all pins ON, the noise is 475mV.

The above figure shows the channel 1 and channel 2 outputs probed at TP5 and TP6 with separate return path.

With ground plane, the noise is almost reduced to zero. Hence the ground plane reduces the noise of the return path.

According to my observation, the noise obtained with the ground plane board, when all six pins are connected, is 213mV.