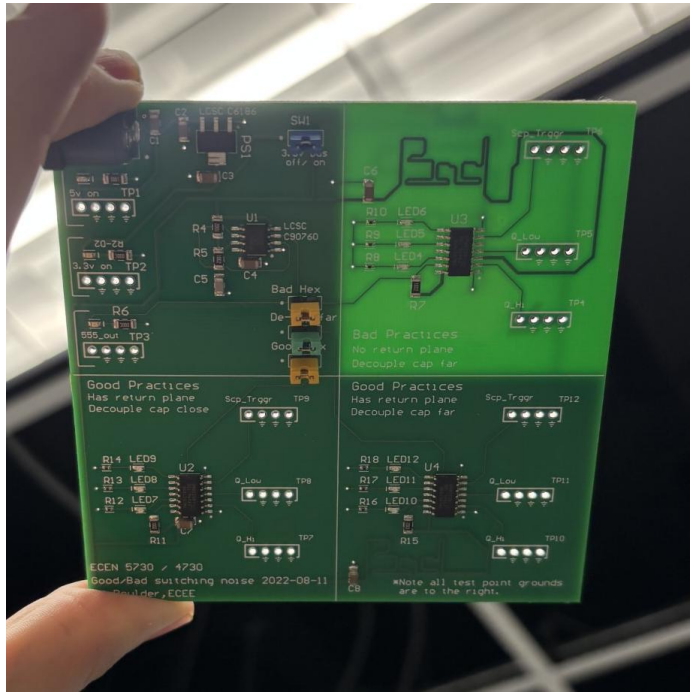
Lab 15: Switching Noise Board

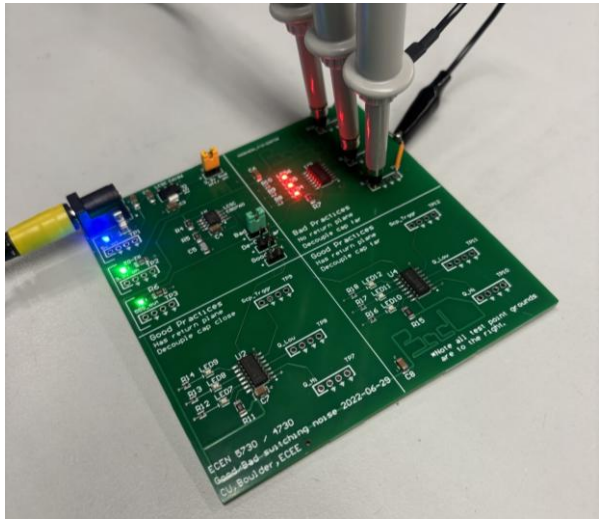
Haley Basti

Overview

- The goal of this lab was to explore the results of good design practices of a shared return plane and a decoupling capacitor placed close to the DUT, versus two bad ones: having the decoupling capacitor placed far away from the DUT, and one with the same decoupling capacitor placement as well as not having a return plane, as seen in the image to the right.
- The rise time as well as voltage rail collapse (peak-to-peak voltage) were the metrics measured in this lab.



Key findings



- Rise times collected during clock switching
- Peak-to-peak voltage transition was measured
  - Bad_cap was 1.7x slower with a 3.6x rail collapse
  - Bad_bad was 2.3x slower with a 4.4x rail collapse

	Rise time (ns)	Voltage rail collape (mV)
Good	1.974	253.8
Bad – decoupling cap far	3.303	922.1
Bad – no return plane	4.586	1120.6

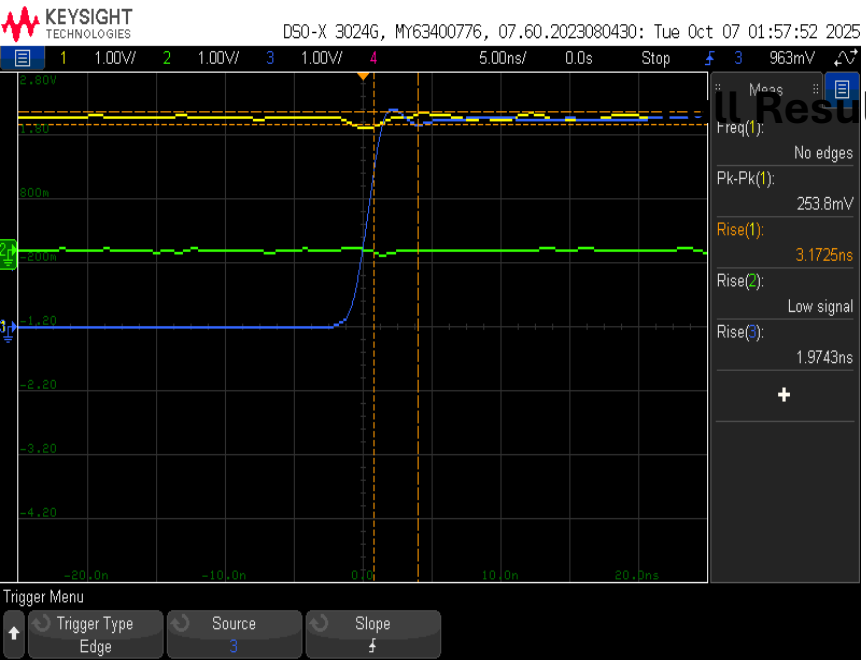
Summary

- This simple design allows us to see the effects of not having a return plane as well as how moving the decoupling capacitor far away can negatively impact the switching noise of the DUT
- Future board designs will have a decoupling capacitor close to the power rail as well as a return plane

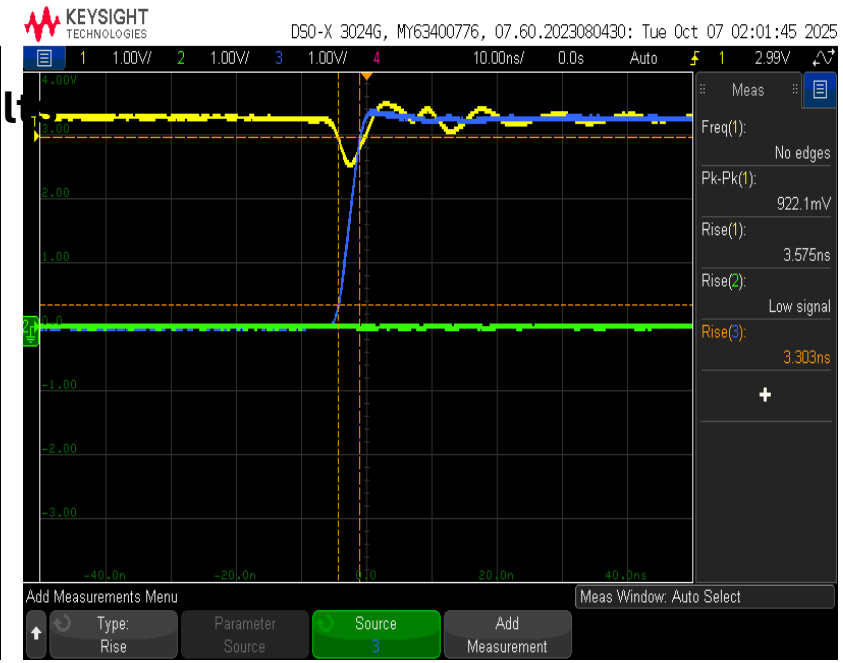
	Rise time (ns)	Voltage rail collape (mV)
Good	1x	1x
Bad – decoupling cap far	1.7x	3.6x
Bad – no return plane	2.3x	4.4x

Full Results

Good



Bad - decoupling cap far away



Bad -no return plane